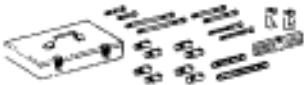

ENGINE

ENGINE MECHANICAL

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09201-10000	Valve Guide Bushing Remover & Replacer Set	
	(09201-01060)	Valve Guide Bushing Remover & Replacer 6	
	09202-70010	Valve Spring Compressor	
	09213-70010	Crankshaft Pulley Holding Tool	
	09222-30010	Connecting Rod Bushing Remover & Replacer	
	09223-15030	Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09248-55040	Valve Clearance Adjust Tool Set	
	(09248-05410)	Valve Lifter Press	
	(09248-05420)	Valve Lifter Stopper	
	09301-00110	Clutch Guide Tool	2JZ-GE M/T
	09316-60010	Transmission & Transfer Bearing Replacer	
	(09316-00010)	Replacer Pipe	Crankshaft front oil seal Camshaft oil seal

	(09316-00050) Replacer "D"	Camshaft oil seal
	09330-00021 Companion Flange Holding Tool	Crankshaft pulley
	09608-30022 Front Hub Bearing Replacer Set	
	(09608-05010) Handle	Crankshaft rear oil seal Valve guide bushing
	09816-30010 Oil Pressure Switch Socket	Knock sensor Oil pressure switch
	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	Camshaft pulley
	09960-10010 Variable Pin Wrench Set	
	(09962-01000) Variable Pin Wrench Arm Assy	Camshaft timing pulley

	(09963-01000) Pin 10	Camshaft timing pulley

RECOMMENDED TOOLS

	09040-00010 Hexagon Wrench Set	
	09043-50100 Bi-hexagon Wrench 10 mm	Cylinder head bolt
	09044-00020 Torx Socket E10	A/C compressor stud bolt
	09082-00050 TOYOTA Electrical Tester Set	
	09090-04010 Engine Sling Device	For suspending engine
	09200-00010 Engine Adjust Kit	
	09258-00030 Hose Plug Set	

EQUIPMENT

Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune-up tester	

Heater	
Micrometer	
Mirror	
Magnetic finger	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	
V-block	

SSM (SERVICE SPECIAL MATERIALS)

08826-00080	Seal Packing Black or equivalent (FIPG)	No.1 camshaft bearing cap Cylinder head Rear oil seal retainer
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	Drive plate bolt (A/T) Union for oil cooler hose (2JZ-GTE)
08833-00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Idler pulley pivot bolt Oil pressure switch

IDLE AND OR 2500 RPM CO HC CHECK

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 system, etc. should be properly connected.

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

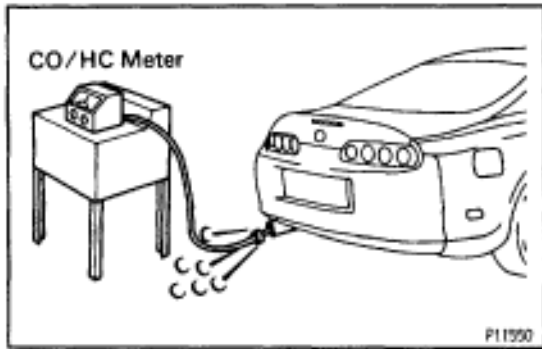
2. START ENGINE

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 performing 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.

- (a) Check (main heated) oxygen sensors operation.
(See oxygen sensor(s) inspection in SFI System)
- (b) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

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

COMPRESSION CHECK

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

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. 2JZ-GE:

DISCONNECT DISTRIBUTOR CONNECTOR

3. 2JZ-GTE:

DISCONNECT CAMSHAFT POSITION SENSOR CONNECTORS

4. 2JZ-GE:

DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

(See high-tension cords and cord clamps removal in Ignition System)

5. 2JZ-GTE:

REMOVE IGNITION COILS ASSEMBLIES

(See ignition coils removal in Ignition System)

6. REMOVE SPARK PLUGS

7. CHECK CYLINDER COMPRESSION

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

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

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

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

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

Standard pressure:

2JZ-GE

1,275 kPa (13.0 kgf/cm², 185 psi) or more

2JZ-GTE

1,079 kPa (11.0 kgf/cm², 156 psi) or more

Minimum pressure:

2JZ-GE

1,079 kPa (11.0 kgf/cm², 156 psi)

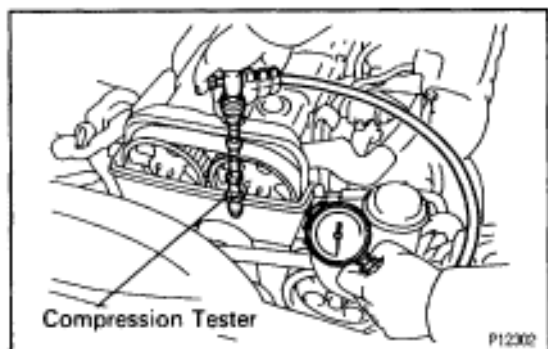
2JZ-GTE

883 kPa (9.0 kgf/cm², 128 psi)

Difference between each cylinder:

98 kPa (1.0 kgf/cm², 14 psi) or less

(d) 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 (b) for the cylinder with low compression.



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

8. REINSTALL SPARK PLUGS

9. 2JZ-GE:

RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

(See high-tension cords and cord clamps installation in Ignition System)

10. 2JZ-GTE:

REINSTALL IGNITION COILS ASSEMBLIES

(See ignition coils installation in Ignition System)

11. 2JZ-GE:

RECONNECT DISTRIBUTOR CONNECTOR

12. 2JZ-GTE:

RECONNECT CAMSHAFT POSITION SENSOR CONNECTORS

VALVE CLEARANCE INSPECTION AND ADJUSTMENT (2JZ-GE)

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

1. REMOVE THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY

(See steps 1 to 9 in injector removal in SFI System)

2. DISCONNECT HIGH-TENSION CORDS FROM CYLINDER HEAD COVERS

(See high-tension cords and cord clamps removal in Ignition System)

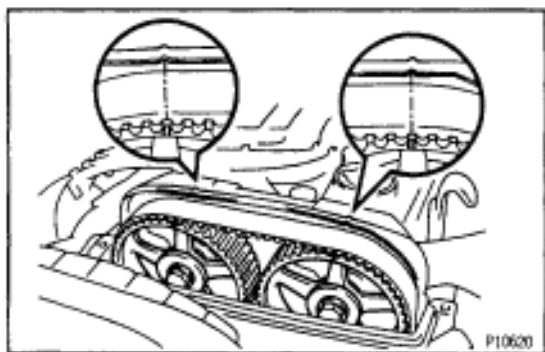
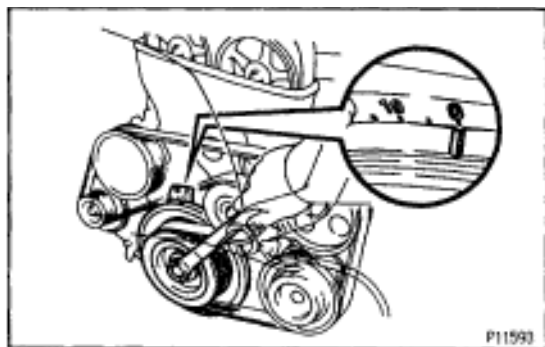
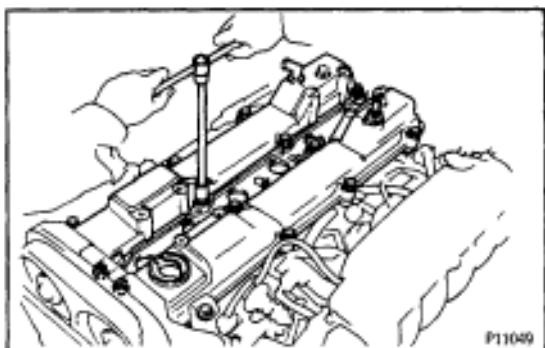
3. REMOVE NO.3, NO.1 AND NO.2 CYLINDER HEAD COVERS

- Remove the 4 bolts, 4 nuts and No.3 cylinder head cover.
- Remove the 4 bolts, No.1 cylinder head cover and gasket.
- Remove the 4 bolts, No.2 cylinder head cover and gasket.

4. SET NO.1 CYLINDER TO TDC/COMPRESSION

- Turn the crankshaft pulley, and align its groove with timing mark "O" of the No.1 timing belt cover.

NOTICE: Always turn the crankshaft clockwise.

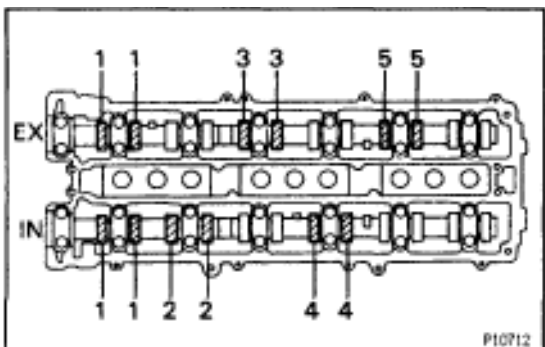


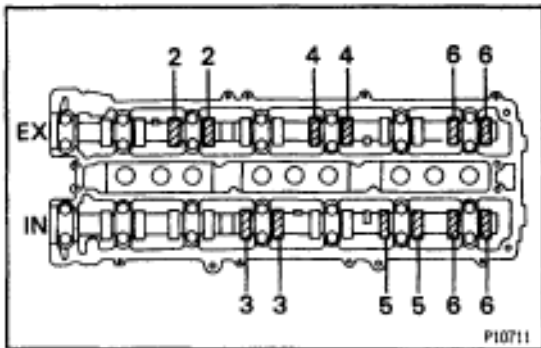
- Check that the timing marks of the camshaft timing pulleys are aligned with the timing marks of the No.4 timing belt cover.

If not, turn the crankshaft 1 revolution (360°).

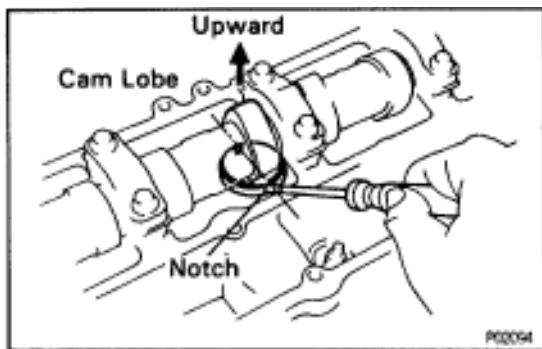
5. INSPECT VALVE CLEARANCE

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

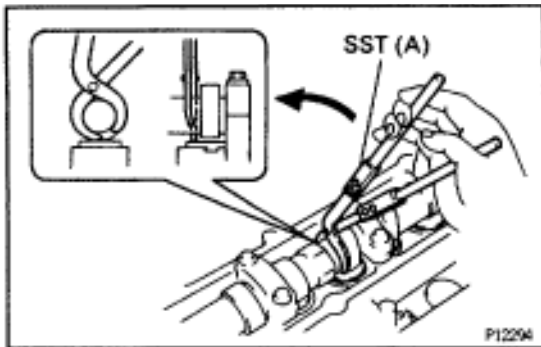


Valve clearance (Cold):**Intake****.15–0.25 mm (0.006–0.010 in.)****Exhaust****.25–0.35 mm (0.010–0.014 in.)**

- (b) Turn the crankshaft pulley 1 revolution (360°), and align the groove with timing mark "O" of the No.1 timing belt cover.
- (c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))

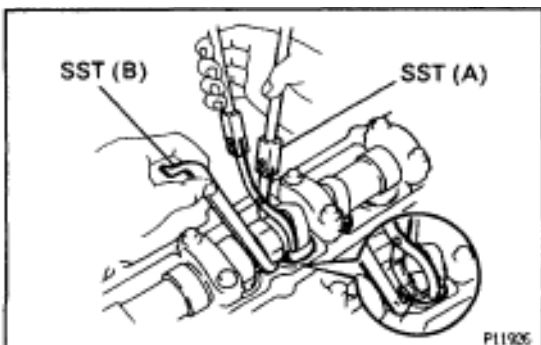
**6. ADJUST VALVE CLEARANCE**

- (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), hold the camshaft as shown in the illustration.

SST 09248-55040 (09248-05410)

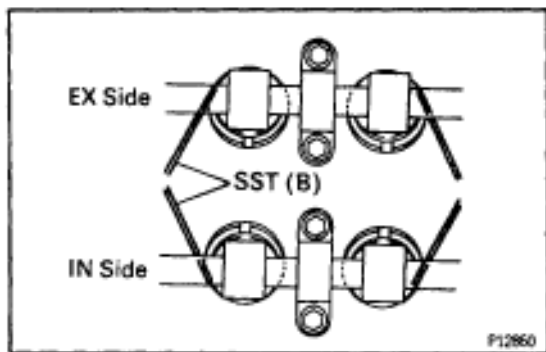


- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

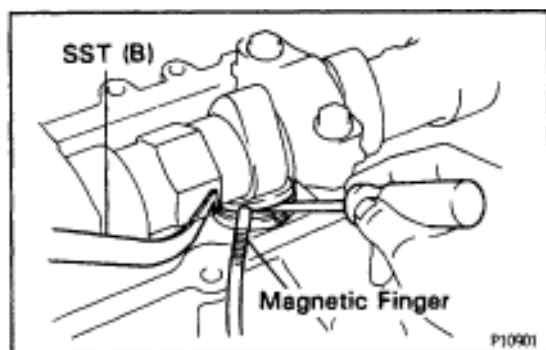
SST 09248-55040 (09248-05410, 09248-05420)

HINT:

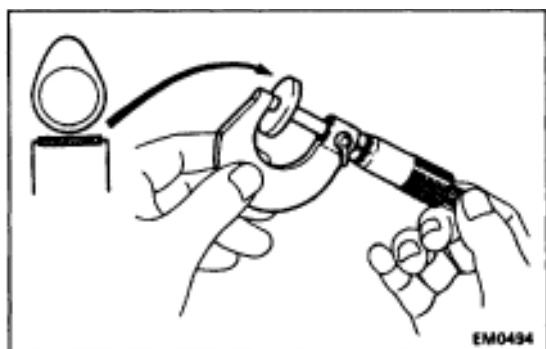
- Apply SST (B) at slight angle on the side marked with "7", at the position shown in the illustration.



- Insert SST (B) gently from the inside as shown in the illustration.



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



- (b) Determine the replacement adjusting shim size according to the following Formula or Charts on the next 2 pages:

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

T Thickness of used shim

A Measured valve clearance

N Thickness of new shim

Intake

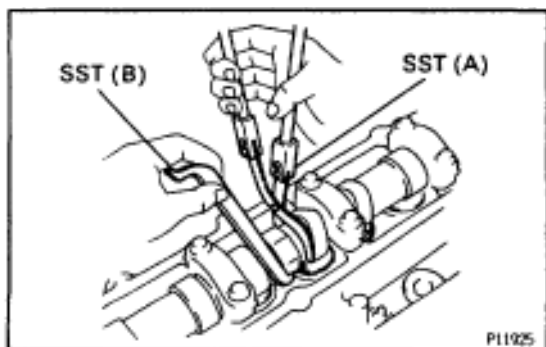
$$N = T + (A - 0.20 \text{ mm (0.008 in.)})$$

Exhaust

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

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

- (d) Recheck the valve clearance.

Adjusting Shim Selection Chart (Intake)

Measured clearance mm (in.)	Installed shim thickness mm (in.)	Shim No.	Thickness mm (in.)	Shim No.	Thickness mm (in.)
0.000 - 0.020 (0.0000 - 0.0008)	1.1	1	2.500 (0.0984)	10	2.950 (0.1161)
0.021 - 0.040 (0.0008 - 0.0016)	1.1	1	2.500 (0.0984)	11	3.000 (0.1181)
0.041 - 0.060 (0.0016 - 0.0024)	1.1	1	2.500 (0.0984)	12	3.050 (0.1201)
0.061 - 0.080 (0.0024 - 0.0032)	1.1	1	2.500 (0.0984)	13	3.100 (0.1220)
0.081 - 0.100 (0.0032 - 0.0040)	1.1	1	2.500 (0.0984)	14	3.150 (0.1240)
0.101 - 0.120 (0.0040 - 0.0048)	1.1	1	2.500 (0.0984)	15	3.200 (0.1260)
0.121 - 0.140 (0.0048 - 0.0056)	1.1	1	2.500 (0.0984)	16	3.250 (0.1280)
0.141 - 0.160 (0.0056 - 0.0064)	1.1	1	2.500 (0.0984)	17	3.300 (0.1299)
0.161 - 0.180 (0.0064 - 0.0072)	1.1	1	2.500 (0.0984)	18	3.350 (0.1319)
0.181 - 0.200 (0.0072 - 0.0080)	1.1	1	2.500 (0.0984)	19	3.400 (0.1339)
0.201 - 0.220 (0.0080 - 0.0088)	1.1	1	2.500 (0.0984)	20	3.450 (0.1359)
0.221 - 0.240 (0.0088 - 0.0096)	1.1	1	2.500 (0.0984)	21	3.500 (0.1379)
0.241 - 0.260 (0.0096 - 0.0104)	1.1	1	2.500 (0.0984)	22	3.550 (0.1399)
0.261 - 0.280 (0.0104 - 0.0112)	1.1	1	2.500 (0.0984)	23	3.600 (0.1419)
0.281 - 0.300 (0.0112 - 0.0120)	1.1	1	2.500 (0.0984)	24	3.650 (0.1439)
0.301 - 0.320 (0.0120 - 0.0128)	1.1	1	2.500 (0.0984)	25	3.700 (0.1459)
0.321 - 0.340 (0.0128 - 0.0136)	1.1	1	2.500 (0.0984)	26	3.750 (0.1479)
0.341 - 0.360 (0.0136 - 0.0144)	1.1	1	2.500 (0.0984)	27	3.800 (0.1499)
0.361 - 0.380 (0.0144 - 0.0152)	1.1	1	2.500 (0.0984)	28	3.850 (0.1519)
0.381 - 0.400 (0.0152 - 0.0160)	1.1	1	2.500 (0.0984)	29	3.900 (0.1539)
0.401 - 0.420 (0.0160 - 0.0168)	1.1	1	2.500 (0.0984)	30	3.950 (0.1559)
0.421 - 0.440 (0.0168 - 0.0176)	1.1	1	2.500 (0.0984)	31	4.000 (0.1579)
0.441 - 0.460 (0.0176 - 0.0184)	1.1	1	2.500 (0.0984)	32	4.050 (0.1599)
0.461 - 0.480 (0.0184 - 0.0192)	1.1	1	2.500 (0.0984)	33	4.100 (0.1619)
0.481 - 0.500 (0.0192 - 0.0200)	1.1	1	2.500 (0.0984)	34	4.150 (0.1639)
0.501 - 0.520 (0.0200 - 0.0208)	1.1	1	2.500 (0.0984)	35	4.200 (0.1659)
0.521 - 0.540 (0.0208 - 0.0216)	1.1	1	2.500 (0.0984)	36	4.250 (0.1679)
0.541 - 0.560 (0.0216 - 0.0224)	1.1	1	2.500 (0.0984)	37	4.300 (0.1699)
0.561 - 0.580 (0.0224 - 0.0232)	1.1	1	2.500 (0.0984)	38	4.350 (0.1719)
0.581 - 0.600 (0.0232 - 0.0240)	1.1	1	2.500 (0.0984)	39	4.400 (0.1739)
0.601 - 0.620 (0.0240 - 0.0248)	1.1	1	2.500 (0.0984)	40	4.450 (0.1759)
0.621 - 0.640 (0.0248 - 0.0256)	1.1	1	2.500 (0.0984)	41	4.500 (0.1779)
0.641 - 0.660 (0.0256 - 0.0264)	1.1	1	2.500 (0.0984)	42	4.550 (0.1799)
0.661 - 0.680 (0.0264 - 0.0272)	1.1	1	2.500 (0.0984)	43	4.600 (0.1819)
0.681 - 0.700 (0.0272 - 0.0280)	1.1	1	2.500 (0.0984)	44	4.650 (0.1839)
0.701 - 0.720 (0.0280 - 0.0288)	1.1	1	2.500 (0.0984)	45	4.700 (0.1859)
0.721 - 0.740 (0.0288 - 0.0296)	1.1	1	2.500 (0.0984)	46	4.750 (0.1879)
0.741 - 0.760 (0.0296 - 0.0304)	1.1	1	2.500 (0.0984)	47	4.800 (0.1899)
0.761 - 0.780 (0.0304 - 0.0312)	1.1	1	2.500 (0.0984)	48	4.850 (0.1919)
0.781 - 0.800 (0.0312 - 0.0320)	1.1	1	2.500 (0.0984)	49	4.900 (0.1939)
0.801 - 0.820 (0.0320 - 0.0328)	1.1	1	2.500 (0.0984)	50	4.950 (0.1959)
0.821 - 0.840 (0.0328 - 0.0336)	1.1	1	2.500 (0.0984)	51	5.000 (0.1979)
0.841 - 0.860 (0.0336 - 0.0344)	1.1	1	2.500 (0.0984)	52	5.050 (0.1999)
0.861 - 0.880 (0.0344 - 0.0352)	1.1	1	2.500 (0.0984)	53	5.100 (0.2019)
0.881 - 0.900 (0.0352 - 0.0360)	1.1	1	2.500 (0.0984)	54	5.150 (0.2039)
0.901 - 0.920 (0.0360 - 0.0368)	1.1	1	2.500 (0.0984)	55	5.200 (0.2059)
0.921 - 0.940 (0.0368 - 0.0376)	1.1	1	2.500 (0.0984)	56	5.250 (0.2079)
0.941 - 0.960 (0.0376 - 0.0384)	1.1	1	2.500 (0.0984)	57	5.300 (0.2099)
0.961 - 0.980 (0.0384 - 0.0392)	1.1	1	2.500 (0.0984)	58	5.350 (0.2119)
0.981 - 1.000 (0.0392 - 0.0400)	1.1	1	2.500 (0.0984)	59	5.400 (0.2139)
1.001 - 1.020 (0.0400 - 0.0408)	1.1	1	2.500 (0.0984)	60	5.450 (0.2159)
1.021 - 1.040 (0.0408 - 0.0416)	1.1	1	2.500 (0.0984)	61	5.500 (0.2179)
1.041 - 1.060 (0.0416 - 0.0424)	1.1	1	2.500 (0.0984)	62	5.550 (0.2199)
1.061 - 1.080 (0.0424 - 0.0432)	1.1	1	2.500 (0.0984)	63	5.600 (0.2219)
1.081 - 1.100 (0.0432 - 0.0440)	1.1	1	2.500 (0.0984)	64	5.650 (0.2239)
1.101 - 1.120 (0.0440 - 0.0448)	1.1	1	2.500 (0.0984)	65	5.700 (0.2259)
1.121 - 1.140 (0.0448 - 0.0456)	1.1	1	2.500 (0.0984)	66	5.750 (0.2279)
1.141 - 1.160 (0.0456 - 0.0464)	1.1	1	2.500 (0.0984)	67	5.800 (0.2299)
1.161 - 1.180 (0.0464 - 0.0472)	1.1	1	2.500 (0.0984)	68	5.850 (0.2319)
1.181 - 1.200 (0.0472 - 0.0480)	1.1	1	2.500 (0.0984)	69	5.900 (0.2339)
1.201 - 1.220 (0.0480 - 0.0488)	1.1	1	2.500 (0.0984)	70	5.950 (0.2359)
1.221 - 1.240 (0.0488 - 0.0496)	1.1	1	2.500 (0.0984)	71	6.000 (0.2379)
1.241 - 1.260 (0.0496 - 0.0504)	1.1	1	2.500 (0.0984)	72	6.050 (0.2399)
1.261 - 1.280 (0.0504 - 0.0512)	1.1	1	2.500 (0.0984)	73	6.100 (0.2419)
1.281 - 1.300 (0.0512 - 0.0520)	1.1	1	2.500 (0.0984)	74	6.150 (0.2439)
1.301 - 1.320 (0.0520 - 0.0528)	1.1	1	2.500 (0.0984)	75	6.200 (0.2459)
1.321 - 1.340 (0.0528 - 0.0536)	1.1	1	2.500 (0.0984)	76	6.250 (0.2479)
1.341 - 1.360 (0.0536 - 0.0544)	1.1	1	2.500 (0.0984)	77	6.300 (0.2499)
1.361 - 1.380 (0.0544 - 0.0552)	1.1	1	2.500 (0.0984)	78	6.350 (0.2519)
1.381 - 1.400 (0.0552 - 0.0560)	1.1	1	2.500 (0.0984)	79	6.400 (0.2539)
1.401 - 1.420 (0.0560 - 0.0568)	1.1	1	2.500 (0.0984)	80	6.450 (0.2559)
1.421 - 1.440 (0.0568 - 0.0576)	1.1	1	2.500 (0.0984)	81	6.500 (0.2579)
1.441 - 1.460 (0.0576 - 0.0584)	1.1	1	2.500 (0.0984)	82	6.550 (0.2599)
1.461 - 1.480 (0.0584 - 0.0592)	1.1	1	2.500 (0.0984)	83	6.600 (0.2619)
1.481 - 1.500 (0.0592 - 0.0600)	1.1	1	2.500 (0.0984)	84	6.650 (0.2639)
1.501 - 1.520 (0.0600 - 0.0608)	1.1	1	2.500 (0.0984)	85	6.700 (0.2659)
1.521 - 1.540 (0.0608 - 0.0616)	1.1	1	2.500 (0.0984)	86	6.750 (0.2679)
1.541 - 1.560 (0.0616 - 0.0624)	1.1	1	2.500 (0.0984)	87	6.800 (0.2699)
1.561 - 1.580 (0.0624 - 0.0632)	1.1	1	2.500 (0.0984)	88	6.850 (0.2719)
1.581 - 1.600 (0.0632 - 0.0640)	1.1	1	2.500 (0.0984)	89	6.900 (0.2739)
1.601 - 1.620 (0.0640 - 0.0648)	1.1	1	2.500 (0.0984)	90	6.950 (0.2759)
1.621 - 1.640 (0.0648 - 0.0656)	1.1	1	2.500 (0.0984)	91	7.000 (0.2779)
1.641 - 1.660 (0.0656 - 0.0664)	1.1	1	2.500 (0.0984)	92	7.050 (0.2799)
1.661 - 1.680 (0.0664 - 0.0672)	1.1	1	2.500 (0.0984)	93	7.100 (0.2819)
1.681 - 1.700 (0.0672 - 0.0680)	1.1	1	2.500 (0.0984)	94	7.150 (0.2839)
1.701 - 1.720 (0.0680 - 0.0688)	1.1	1	2.500 (0.0984)	95	7.200 (0.2859)
1.721 - 1.740 (0.0688 - 0.0696)	1.1	1	2.500 (0.0984)	96	7.250 (0.2879)
1.741 - 1.760 (0.0696 - 0.0704)	1.1	1	2.500 (0.0984)	97	7.300 (0.2899)
1.761 - 1.780 (0.0704 - 0.0712)	1.1	1	2.500 (0.0984)	98	7.350 (0.2919)
1.781 - 1.800 (0.0712 - 0.0720)	1.1	1	2.500 (0.0984)	99	7.400 (0.2939)
1.801 - 1.820 (0.0720 - 0.0728)	1.1	1	2.500 (0.0984)	100	7.450 (0.2959)
1.821 - 1.840 (0.0728 - 0.0736)	1.1	1	2.500 (0.0984)	101	7.500 (0.2979)
1.841 - 1.860 (0.0736 - 0.0744)	1.1	1	2.500 (0.0984)	102	7.550 (0.2999)
1.861 - 1.880 (0.0744 - 0.0752)	1.1	1	2.500 (0.0984)	103	7.600 (0.3019)
1.881 - 1.900 (0.0752 - 0.0760)	1.1	1	2.500 (0.0984)	104	7.650 (0.3039)
1.901 - 1.920 (0.0760 - 0.0768)	1.1	1	2.500 (0.0984)	105	7.700 (0.3059)
1.921 - 1.940 (0.0768 - 0.0776)	1.1	1	2.500 (0.0984)	106	7.750 (0.3079)
1.941 - 1.960 (0.0776 - 0.0784)	1.1	1	2.500 (0.0984)	107	7.800 (0.3099)
1.961 - 1.980 (0.0784 - 0.0792)	1.1	1	2.500 (0.0984)	108	7.850 (0.3119)
1.981 - 2.000 (0.0792 - 0.0800)	1.1	1	2.500 (0.0984)	109	7.900 (0.3139)
2.001 - 2.020 (0.0800 - 0.0808)	1.1	1	2.500 (0.0984)	110	7.950 (0.3159)
2.021 - 2.040 (0.0808 - 0.0816)	1.1	1	2.500 (0.0984)	111	8.000 (0.3179)
2.041 - 2.060 (0.0816 - 0.0824)	1.1	1	2.500 (0.0984)	112	8.050 (0.3199)
2.061 - 2.080 (0.0824 - 0.0832)	1.1	1	2.500 (0.0984)	113	8.100 (0.3219)
2.081 - 2.100 (0.0832 - 0.0840)	1.1	1	2.500 (0.0984)	114	8.150 (0.3239)
2.101 - 2.120 (0.0840 - 0.0848)	1.1	1	2.500 (0.0984)	115	8.200 (0.3259)
2.121 - 2.140 (0.0848 - 0.0856)	1.1	1	2.500 (0.0984)	116	8.250 (0.3279)
2.141 - 2.160 (0.0856 - 0.0864)	1.1	1	2.500 (0.0984)	117	8.300 (0.3299)
2.161 - 2.180 (0.0864 - 0.0872)	1.1	1	2.500 (0.0984)	118	8.350 (0.3319)
2.181 - 2.200 (0.0872 - 0.0880)	1.1	1	2.500 (0.0984)	119	8.400 (0.3339)
2.201 - 2.220 (0.0880 - 0.0888)	1.1	1	2.500 (0.0984)	120	8.450 (0.3359)
2.221 - 2.240 (0.0888 - 0.0896)	1.1	1	2.500 (0.0984)	121	8.500 (0.3379)
2.241 - 2.260 (0.0896 - 0.0904)	1.1	1	2.500 (0.0984)	122	8.550 (0.3399)
2.261 - 2.280 (0.0904 - 0.0912)	1.1	1	2.500 (0.0984)	123	8.600 (0.3419)
2.281 - 2.300 (0.0912 - 0.0920)	1.1	1	2.500 (0.0984)	124	8.650 (0.3439)
2.301 - 2.320 (0.0920 - 0.0928)	1.1	1	2.500 (0.0984)	125	8.700 (0.3459)
2.321 - 2.340 (0.0928 - 0.0936)	1.1	1	2.500 (0.0984)	126	8.750 (0.3479)
2.341 - 2.360 (0.0936 - 0.0944)	1.1	1	2.500 (0.0984)	127	8.800 (0.3499)
2.361 - 2.380 (0.0944 - 0.0952)	1.1	1	2.500 (0.0984)	128	8.850 (0.3519)
2.381 - 2.400 (0.0952 - 0.0960)	1.1	1	2.500 (0.0984)	129	8.900 (0.3539)
2.401 - 2.420 (0.0960 - 0.0968)	1.1	1	2.500 (0.0984)	130	8.950 (0.3559)
2.421 - 2.440 (0.0968 - 0.0976)	1.1	1	2.500 (0.0984)	131	9.000 (0.3579)
2.441 - 2.460 (0.0976 - 0.0984)	1.1	1	2.500 (0.0984)	132	9.050 (0.3599)
2.461 - 2.480 (0.0984 - 0.0992)	1.1	1	2.500 (0.0984)	133	9.100 (0.3619)
2.481 - 2.500 (0.0992 - 0.1000)	1.1	1	2.500 (0.0984)	134	9.150 (0.3639)

New shim thickness mm (in.)

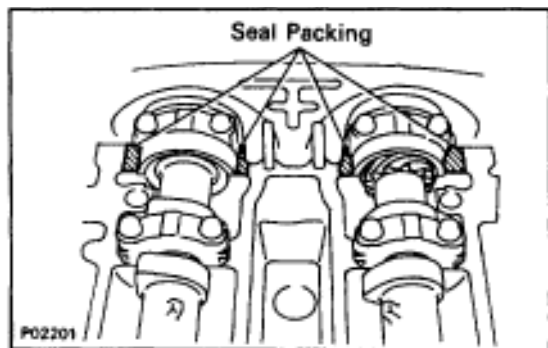
Shim No.	Thickness mm (in.)	Shim No.	Thickness mm (in.)
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)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

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

Adjusting Shim Selection Chart (Exhaust)

Installed shim thickness mm (in.)	Measured clearance mm (in.)	Shim No.	Thickness	Shim No.
0.000 - 0.002 (0.0000 - 0.0008)	0.000 - 0.002 (0.0000 - 0.0008)	1	2.500 (0.0984)	10
0.002 - 0.004 (0.0008 - 0.0016)	0.002 - 0.004 (0.0008 - 0.0016)	2	2.550 (0.1004)	11
0.004 - 0.006 (0.0016 - 0.0024)	0.004 - 0.006 (0.0016 - 0.0024)	3	2.600 (0.1024)	12
0.006 - 0.008 (0.0024 - 0.0032)	0.006 - 0.008 (0.0024 - 0.0032)	4	2.650 (0.1043)	13
0.008 - 0.010 (0.0032 - 0.0040)	0.008 - 0.010 (0.0032 - 0.0040)	5	2.700 (0.1063)	14
0.010 - 0.012 (0.0040 - 0.0048)	0.010 - 0.012 (0.0040 - 0.0048)	6	2.750 (0.1083)	15
0.012 - 0.014 (0.0048 - 0.0056)	0.012 - 0.014 (0.0048 - 0.0056)	7	2.800 (0.1102)	16
0.014 - 0.016 (0.0056 - 0.0064)	0.014 - 0.016 (0.0056 - 0.0064)	8	2.850 (0.1122)	17
0.016 - 0.018 (0.0064 - 0.0072)	0.016 - 0.018 (0.0064 - 0.0072)			
0.018 - 0.020 (0.0072 - 0.0080)	0.018 - 0.020 (0.0072 - 0.0080)			
0.020 - 0.022 (0.0080 - 0.0088)	0.020 - 0.022 (0.0080 - 0.0088)			
0.022 - 0.024 (0.0088 - 0.0096)	0.022 - 0.024 (0.0088 - 0.0096)			
0.024 - 0.026 (0.0096 - 0.0104)	0.024 - 0.026 (0.0096 - 0.0104)			
0.026 - 0.028 (0.0104 - 0.0112)	0.026 - 0.028 (0.0104 - 0.0112)			
0.028 - 0.030 (0.0112 - 0.0120)	0.028 - 0.030 (0.0112 - 0.0120)			
0.030 - 0.032 (0.0120 - 0.0128)	0.030 - 0.032 (0.0120 - 0.0128)			
0.032 - 0.034 (0.0128 - 0.0136)	0.032 - 0.034 (0.0128 - 0.0136)			
0.034 - 0.036 (0.0136 - 0.0144)	0.034 - 0.036 (0.0136 - 0.0144)			
0.036 - 0.038 (0.0144 - 0.0152)	0.036 - 0.038 (0.0144 - 0.0152)			
0.038 - 0.040 (0.0152 - 0.0160)	0.038 - 0.040 (0.0152 - 0.0160)			
0.040 - 0.042 (0.0160 - 0.0168)	0.040 - 0.042 (0.0160 - 0.0168)			
0.042 - 0.044 (0.0168 - 0.0176)	0.042 - 0.044 (0.0168 - 0.0176)			
0.044 - 0.046 (0.0176 - 0.0184)	0.044 - 0.046 (0.0176 - 0.0184)			
0.046 - 0.048 (0.0184 - 0.0192)	0.046 - 0.048 (0.0184 - 0.0192)			
0.048 - 0.050 (0.0192 - 0.0200)	0.048 - 0.050 (0.0192 - 0.0200)			
0.050 - 0.052 (0.0200 - 0.0208)	0.050 - 0.052 (0.0200 - 0.0208)			
0.052 - 0.054 (0.0208 - 0.0216)	0.052 - 0.054 (0.0208 - 0.0216)			
0.054 - 0.056 (0.0216 - 0.0224)	0.054 - 0.056 (0.0216 - 0.0224)			
0.056 - 0.058 (0.0224 - 0.0232)	0.056 - 0.058 (0.0224 - 0.0232)			
0.058 - 0.060 (0.0232 - 0.0240)	0.058 - 0.060 (0.0232 - 0.0240)			
0.060 - 0.062 (0.0240 - 0.0248)	0.060 - 0.062 (0.0240 - 0.0248)			
0.062 - 0.064 (0.0248 - 0.0256)	0.062 - 0.064 (0.0248 - 0.0256)			
0.064 - 0.066 (0.0256 - 0.0264)	0.064 - 0.066 (0.0256 - 0.0264)			
0.066 - 0.068 (0.0264 - 0.0272)	0.066 - 0.068 (0.0264 - 0.0272)			
0.068 - 0.070 (0.0272 - 0.0280)	0.068 - 0.070 (0.0272 - 0.0280)			
0.070 - 0.072 (0.0280 - 0.0288)	0.070 - 0.072 (0.0280 - 0.0288)			
0.072 - 0.074 (0.0288 - 0.0296)	0.072 - 0.074 (0.0288 - 0.0296)			
0.074 - 0.076 (0.0296 - 0.0304)	0.074 - 0.076 (0.0296 - 0.0304)			
0.076 - 0.078 (0.0304 - 0.0312)	0.076 - 0.078 (0.0304 - 0.0312)			
0.078 - 0.080 (0.0312 - 0.0320)	0.078 - 0.080 (0.0312 - 0.0320)			
0.080 - 0.082 (0.0320 - 0.0328)	0.080 - 0.082 (0.0320 - 0.0328)			
0.082 - 0.084 (0.0328 - 0.0336)	0.082 - 0.084 (0.0328 - 0.0336)			
0.084 - 0.086 (0.0336 - 0.0344)	0.084 - 0.086 (0.0336 - 0.0344)			
0.086 - 0.088 (0.0344 - 0.0352)	0.086 - 0.088 (0.0344 - 0.0352)			
0.088 - 0.090 (0.0352 - 0.0360)	0.088 - 0.090 (0.0352 - 0.0360)			
0.090 - 0.092 (0.0360 - 0.0368)	0.090 - 0.092 (0.0360 - 0.0368)			
0.092 - 0.094 (0.0368 - 0.0376)	0.092 - 0.094 (0.0368 - 0.0376)			
0.094 - 0.096 (0.0376 - 0.0384)	0.094 - 0.096 (0.0376 - 0.0384)			
0.096 - 0.098 (0.0384 - 0.0392)	0.096 - 0.098 (0.0384 - 0.0392)			
0.098 - 0.100 (0.0392 - 0.0400)	0.098 - 0.100 (0.0392 - 0.0400)			
0.100 - 0.102 (0.0400 - 0.0408)	0.100 - 0.102 (0.0400 - 0.0408)			
0.102 - 0.104 (0.0408 - 0.0416)	0.102 - 0.104 (0.0408 - 0.0416)			
0.104 - 0.106 (0.0416 - 0.0424)	0.104 - 0.106 (0.0416 - 0.0424)			
0.106 - 0.108 (0.0424 - 0.0432)	0.106 - 0.108 (0.0424 - 0.0432)			
0.108 - 0.110 (0.0432 - 0.0440)	0.108 - 0.110 (0.0432 - 0.0440)			
0.110 - 0.112 (0.0440 - 0.0448)	0.110 - 0.112 (0.0440 - 0.0448)			
0.112 - 0.114 (0.0448 - 0.0456)	0.112 - 0.114 (0.0448 - 0.0456)			
0.114 - 0.116 (0.0456 - 0.0464)	0.114 - 0.116 (0.0456 - 0.0464)			
0.116 - 0.118 (0.0464 - 0.0472)	0.116 - 0.118 (0.0464 - 0.0472)			
0.118 - 0.120 (0.0472 - 0.0480)	0.118 - 0.120 (0.0472 - 0.0480)			
0.120 - 0.122 (0.0480 - 0.0488)	0.120 - 0.122 (0.0480 - 0.0488)			
0.122 - 0.124 (0.0488 - 0.0496)	0.122 - 0.124 (0.0488 - 0.0496)			
0.124 - 0.126 (0.0496 - 0.0504)	0.124 - 0.126 (0.0496 - 0.0504)			
0.126 - 0.128 (0.0504 - 0.0512)	0.126 - 0.128 (0.0504 - 0.0512)			
0.128 - 0.130 (0.0512 - 0.0520)	0.128 - 0.130 (0.0512 - 0.0520)			
0.130 - 0.132 (0.0520 - 0.0528)	0.130 - 0.132 (0.0520 - 0.0528)			
0.132 - 0.134 (0.0528 - 0.0536)	0.132 - 0.134 (0.0528 - 0.0536)			
0.134 - 0.136 (0.0536 - 0.0544)	0.134 - 0.136 (0.0536 - 0.0544)			
0.136 - 0.138 (0.0544 - 0.0552)	0.136 - 0.138 (0.0544 - 0.0552)			
0.138 - 0.140 (0.0552 - 0.0560)	0.138 - 0.140 (0.0552 - 0.0560)			
0.140 - 0.142 (0.0560 - 0.0568)	0.140 - 0.142 (0.0560 - 0.0568)			
0.142 - 0.144 (0.0568 - 0.0576)	0.142 - 0.144 (0.0568 - 0.0576)			
0.144 - 0.146 (0.0576 - 0.0584)	0.144 - 0.146 (0.0576 - 0.0584)			
0.146 - 0.148 (0.0584 - 0.0592)	0.146 - 0.148 (0.0584 - 0.0592)			
0.148 - 0.150 (0.0592 - 0.0600)	0.148 - 0.150 (0.0592 - 0.0600)			
0.150 - 0.152 (0.0600 - 0.0608)	0.150 - 0.152 (0.0600 - 0.0608)			
0.152 - 0.154 (0.0608 - 0.0616)	0.152 - 0.154 (0.0608 - 0.0616)			
0.154 - 0.156 (0.0616 - 0.0624)	0.154 - 0.156 (0.0616 - 0.0624)			
0.156 - 0.158 (0.0624 - 0.0632)	0.156 - 0.158 (0.0624 - 0.0632)			
0.158 - 0.160 (0.0632 - 0.0640)	0.158 - 0.160 (0.0632 - 0.0640)			
0.160 - 0.162 (0.0640 - 0.0648)	0.160 - 0.162 (0.0640 - 0.0648)			
0.162 - 0.164 (0.0648 - 0.0656)	0.162 - 0.164 (0.0648 - 0.0656)			
0.164 - 0.166 (0.0656 - 0.0664)	0.164 - 0.166 (0.0656 - 0.0664)			
0.166 - 0.168 (0.0664 - 0.0672)	0.166 - 0.168 (0.0664 - 0.0672)			
0.168 - 0.170 (0.0672 - 0.0680)	0.168 - 0.170 (0.0672 - 0.0680)			
0.170 - 0.172 (0.0680 - 0.0688)	0.170 - 0.172 (0.0680 - 0.0688)			
0.172 - 0.174 (0.0688 - 0.0696)	0.172 - 0.174 (0.0688 - 0.0696)			
0.174 - 0.176 (0.0696 - 0.0704)	0.174 - 0.176 (0.0696 - 0.0704)			
0.176 - 0.178 (0.0704 - 0.0712)	0.176 - 0.178 (0.0704 - 0.0712)			
0.178 - 0.180 (0.0712 - 0.0720)	0.178 - 0.180 (0.0712 - 0.0720)			
0.180 - 0.182 (0.0720 - 0.0728)	0.180 - 0.182 (0.0720 - 0.0728)			
0.182 - 0.184 (0.0728 - 0.0736)	0.182 - 0.184 (0.0728 - 0.0736)			
0.184 - 0.186 (0.0736 - 0.0744)	0.184 - 0.186 (0.0736 - 0.0744)			
0.186 - 0.188 (0.0744 - 0.0752)	0.186 - 0.188 (0.0744 - 0.0752)			
0.188 - 0.190 (0.0752 - 0.0760)	0.188 - 0.190 (0.0752 - 0.0760)			
0.190 - 0.192 (0.0760 - 0.0768)	0.190 - 0.192 (0.0760 - 0.0768)			
0.192 - 0.194 (0.0768 - 0.0776)	0.192 - 0.194 (0.0768 - 0.0776)			
0.194 - 0.196 (0.0776 - 0.0784)	0.194 - 0.196 (0.0776 - 0.0784)			
0.196 - 0.198 (0.0784 - 0.0792)	0.196 - 0.198 (0.0784 - 0.0792)			
0.198 - 0.200 (0.0792 - 0.0800)	0.198 - 0.200 (0.0792 - 0.0800)			
0.200 - 0.202 (0.0800 - 0.0808)	0.200 - 0.202 (0.0800 - 0.0808)			
0.202 - 0.204 (0.0808 - 0.0816)	0.202 - 0.204 (0.0808 - 0.0816)			
0.204 - 0.206 (0.0816 - 0.0824)	0.204 - 0.206 (0.0816 - 0.0824)			
0.206 - 0.208 (0.0824 - 0.0832)	0.206 - 0.208 (0.0824 - 0.0832)			
0.208 - 0.210 (0.0832 - 0.0840)	0.208 - 0.210 (0.0832 - 0.0840)			
0.210 - 0.212 (0.0840 - 0.0848)	0.210 - 0.212 (0.0840 - 0.0848)			
0.212 - 0.214 (0.0848 - 0.0856)	0.212 - 0.214 (0.0848 - 0.0856)			
0.214 - 0.216 (0.0856 - 0.0864)	0.214 - 0.216 (0.0856 - 0.0864)			
0.216 - 0.218 (0.0864 - 0.0872)	0.216 - 0.218 (0.0864 - 0.0872)			
0.218 - 0.220 (0.0872 - 0.0880)	0.218 - 0.220 (0.0872 - 0.0880)			
0.220 - 0.222 (0.0880 - 0.0888)	0.220 - 0.222 (0.0880 - 0.0888)			
0.222 - 0.224 (0.0888 - 0.0896)	0.222 - 0.224 (0.0888 - 0.0896)			
0.224 - 0.226 (0.0896 - 0.0904)	0.224 - 0.226 (0.0896 - 0.0904)			
0.226 - 0.228 (0.0904 - 0.0912)	0.226 - 0.228 (0.0904 - 0.0912)			
0.228 - 0.230 (0.0912 - 0.0920)	0.228 - 0.230 (0.0912 - 0.0920)			
0.230 - 0.232 (0.0920 - 0.0928)	0.230 - 0.232 (0.0920 - 0.0928)			
0.232 - 0.234 (0.0928 - 0.0936)	0.232 - 0.234 (0.0928 - 0.0936)			
0.234 - 0.236 (0.0936 - 0.0944)	0.234 - 0.236 (0.0936 - 0.0944)			
0.236 - 0.238 (0.0944 - 0.0952)	0.236 - 0.238 (0.0944 - 0.0952)			
0.238 - 0.240 (0.0952 - 0.0960)	0.238 - 0.240 (0.0952 - 0.0960)			
0.240 - 0.242 (0.0960 - 0.0968)	0.240 - 0.242 (0.0960 - 0.0968)			
0.242 - 0.244 (0.0968 - 0.0976)	0.242 - 0.244 (0.0968 - 0.0976)			
0.244 - 0.246 (0.0976 - 0.0984)	0.244 - 0.246 (0.0976 - 0.0984)			
0.246 - 0.248 (0.0984 - 0.0992)	0.246 - 0.248 (0.0984 - 0.0992)			
0.248 - 0.250 (0.0992 - 0.1000)	0.248 - 0.250 (0.0992 - 0.1000)			
0.250 - 0.252 (0.1000 - 0.1008)	0.250 - 0.252 (0.1000 - 0.1008)			
0.252 - 0.254 (0.1008 - 0.1016)	0.252 - 0.254 (0.1008 - 0.1016)			
0.254 - 0.256 (0.1016 - 0.1024)	0.254 - 0.256 (0.1016 - 0.1024)			
0.256 - 0.258 (0.1024 - 0.1032)	0.256 - 0.258 (0.1024 - 0.1032)			
0.258 - 0.260 (0.1032 - 0.1040)	0.258 - 0.260 (0.1032 - 0.1040)			
0.260 - 0.262 (0.1040 - 0.1048)	0.260 - 0.262 (0.1040 - 0.1048)			
0.262 - 0.264 (0.1048 - 0.1056)	0.262 - 0.264 (0.1048 - 0.1056)			
0.264 - 0.266 (0.1056 - 0.1064)	0.264 - 0.266 (0.1056 - 0.1064)			
0.266 - 0.268 (0.1064 - 0.1072)	0.266 - 0.268 (0.1064 - 0.1072)			
0.268 - 0.270 (0.1072 - 0.1080)	0.268 - 0.270 (0.1072 - 0.1080)			
0.270 - 0.272 (0.1080 - 0.1088)	0.270 - 0.272 (0.1080 - 0.1088)			
0.272 - 0.274 (0.1088 - 0.1096)	0.272 - 0.274 (0.1088 - 0.1096)			
0.274 - 0.276 (0.1096 - 0.1104)	0.274 - 0.276 (0.1096 - 0.1104)			
0.276 - 0.278 (0.1104 - 0.1112)	0.276 - 0.278 (0.1104 - 0.1112)			
0.278 - 0.280 (0.1112 - 0.1120)	0.278 - 0.280 (0.1112 - 0.1120)			
0.280 - 0.282 (0.1120 - 0.1128)	0.280 - 0.282 (0.1120 - 0.1128)			
0.282 - 0.284 (0.1128 - 0.1136)	0.282 - 0.284 (0.1128 - 0.1136)			
0.284 - 0.286 (0.1136 - 0.1144)	0.284 - 0.286 (0.1136 - 0.1144)			
0.286 - 0.288 (0.1144 - 0.1152)	0.286 - 0.288 (0.1144 - 0.1152)			
0.288 - 0.290 (0.1152 - 0.1160)	0.288 - 0.290 (0.1152 - 0.1160)			
0.290 - 0.292 (0.1160 - 0.1168)	0.290 - 0.292 (0.1160 - 0.1168)			
0.292 - 0.294 (0.1168 - 0.1176)	0.292 - 0.294 (0.1168 - 0.1176)			
0.294 - 0.296 (0.1176 - 0.1184)	0.294 - 0.296 (0.1176 - 0.1184)			
0.296 - 0.298 (0.1184 - 0.1192)	0.296 - 0.298 (0.1184 - 0.1192)			
0.298 - 0.300 (0.1192 - 0.1200)	0.298 - 0.300 (0.1192 - 0.1200)			

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



7. REINSTALL NO.2, NO.1 AND NO.3 CYLINDER HEAD COVERS

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

- (c) Install the gaskets to the No.1 and No.2 cylinder head covers.
- (d) Install the No.2 cylinder head cover with the 4 bolts.

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

- (e) Install the No.1 cylinder head cover with the 4 bolts.

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

- (f) Install the No.3 cylinder head cover with the 4 bolts and 4 nuts.

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

8. RECONNECT HIGH-TENSION CORDS TO CYLINDER HEAD COVERS

(See high-tension cords and cord clamps installation in Ignition System)

9. REINSTALL THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY

(See steps 8 to 17 in injector installation in SFI System)

VALVE CLEARANCE INSPECTION AND ADJUSTMENT (2JZ-GTE)

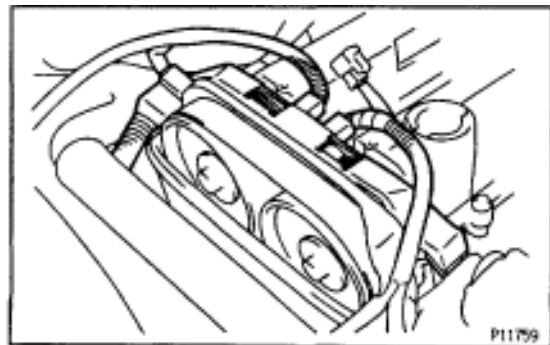
HINT: Inspect and adjust the valve clearance when the engine is cold.

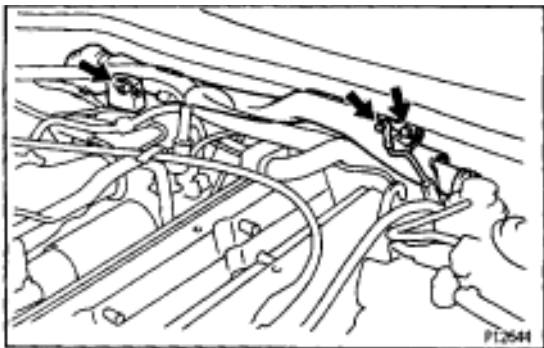
1. REMOVE IGNITION COILS ASSEMBLIES

(See ignition coils removal in Ignition System)

2. DISCONNECT ENGINE WIRE PROTECTOR FROM NO.4 TIMING BELT COVER

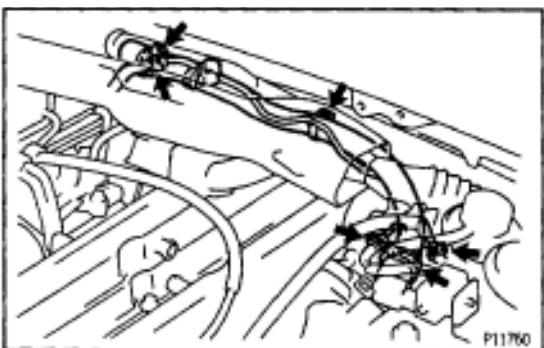
- (a) Disconnect the engine wire from the 4 wire clamps.
- (b) Lift out the engine wire protector from the cylinder head covers.





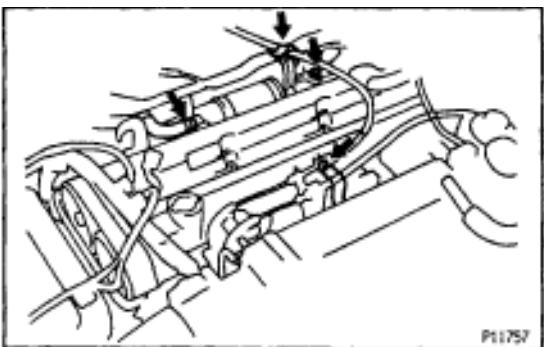
3. DISCONNECT ENGINE WIRE PROTECTOR FROM COWL TOP PANEL

- (a) Remove the bolt, and disconnect the ground strap.
- (b) Remove the 2 bolts, and lift up the engine wire protector.



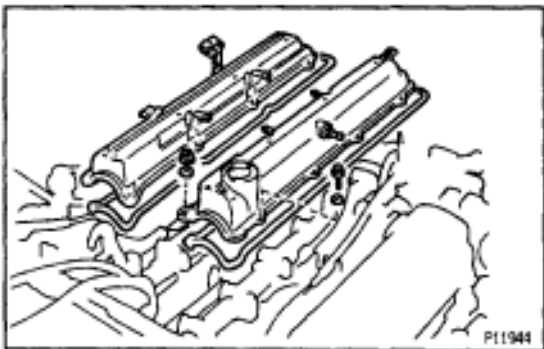
4. REMOVE IAC VALVE PIPE

- (a) Disconnect the 5 air hoses from the IAC valve pipe.
- (b) Remove the IAC valve pipe from the pipe clamp on the No.1 cylinder head cover.



5. REMOVE NO.1 AND NO.2 CYLINDER HEAD COVERS

- (a) Disconnect the cruise control actuator cable from the cable bracket.
- (b) Remove the bolt holding the VSV to the turbo outlet duct.
- (c) Disconnect the 2 PCV hoses from the cylinder head covers.



- (d) Remove the 6 bolts, 2 nuts, 8 seal washers, No.1 cylinder head cover and gasket.
- (e) Remove the 6 bolts, 2 nuts, 8 seal washers, No.2 cylinder head cover and gasket.

6. SET NO.1 CYLINDER TO TDC/COMPRESSION

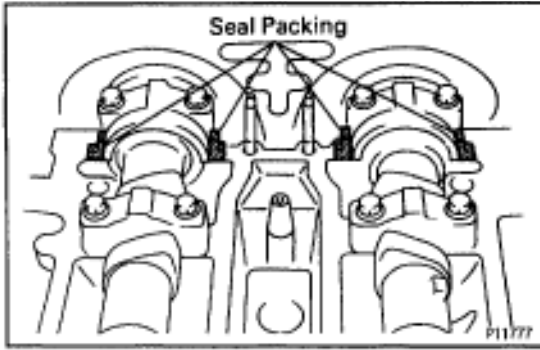
(See step 4 in valve clearance inspection and adjustment (2JZ-GE))

7. INSPECT VALVE CLEARANCE

(See step 5 in valve clearance inspection and adjustment (2JZ-GE))

8. ADJUST VALVE CLEARANCE

(See step 6 in valve clearance inspection and adjustment (2JZ-GE))



9. REINSTALL NO.1 AND NO.2 CYLINDER HEAD COVERS

- Remove any old packing (FIPG) material.
- Apply seal packing to the cylinder head as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

- Install the gaskets to the No.1 and No.2 cylinder head covers.
- Install the 12 seal washers to the bolts.
- Install the No.2 cylinder head cover with the 6 bolts, 4 seal washers and 4 nuts.

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

- Install the No.1 cylinder head cover with the 6 bolts, 4 seal washers and 4 nuts.

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

- Connect the 2 PCV hoses to the cylinder head covers.
- Install the bolt holding the VSV to the turbo outlet duct.
- Connect the cruise control actuator cable to the cable bracket.

10. RECONNECT ENGINE WIRE PROTECTOR TO NO.4 TIMING BELT COVER

11. REINSTALL IAC VALVE PIPE

12. RECONNECT ENGINE WIRE PROTECTOR TO COWL TOP PANEL

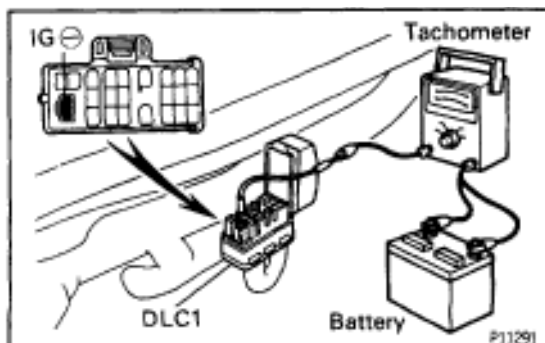
13. REINSTALL IGNITION COILS ASSEMBLIES

(See ignition coils installation in Ignition System)

IGNITION TIMING INSPECTION AND ADJUSTMENT (2JZ-GE)

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TACHOMETER AND TIMING LIGHT

Connect the tester probe of a tachometer to terminal IG x of the DLC1.

NOTICE:

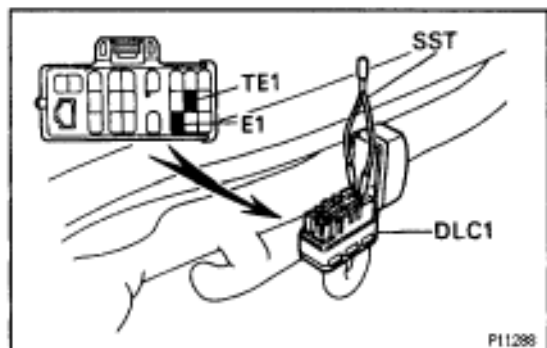
- Never allow the tachometer terminal to touch ground as it could result in damage to the Igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.

3. CHECK IDLE SPEED

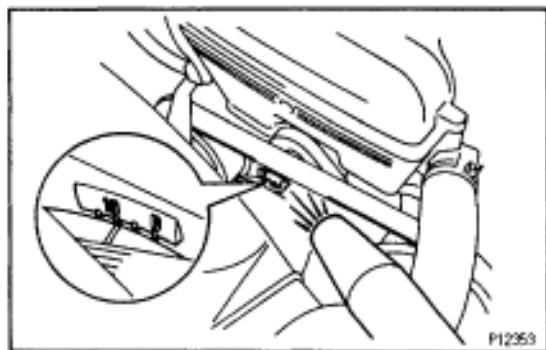
- (a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
- (b) Check the idle speed.

Idle speed:

700 ± 50 rpm

**4. ADJUST IGNITION TIMING**

- (a) Using SST, connect terminals TE1 and E1 of the DLC 1.
SST 09843-18020

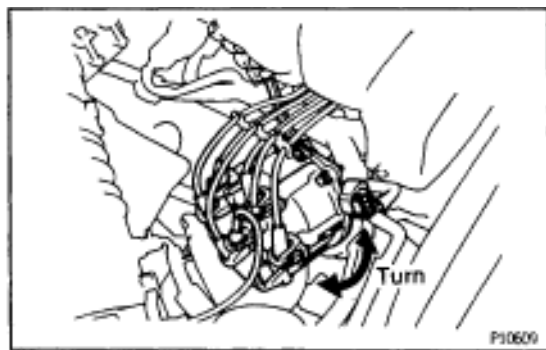


- (b) Using a timing light, check the ignition timing.

Ignition timing:

$10 \pm 2^\circ$ BTDC @ idle

(Transmission in neutral position)



- (c) Loosen the nut, and adjust by turning the distributor.

Ignition timing:

10° BTDC @ idle

(Transmission in neutral position)

- (d) Tighten the nut, and recheck the ignition timing.

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

- (e) Remove the SST from the DLC1.

SST 09843-18020

5. FURTHER CHECK IGNITION TIMING

Ignition timing:

$7-19^\circ$ BTDC @ idle

(Transmission in neutral position)

HINT: The timing mark moves in a range between 7° and 19° .

6. DISCONNECT TACHOMETER AND TIMING LIGHT

IGNITION TIMING INSPECTION (2JZ-GTE)

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CONNECT TACHOMETER AND TIMING LIGHT

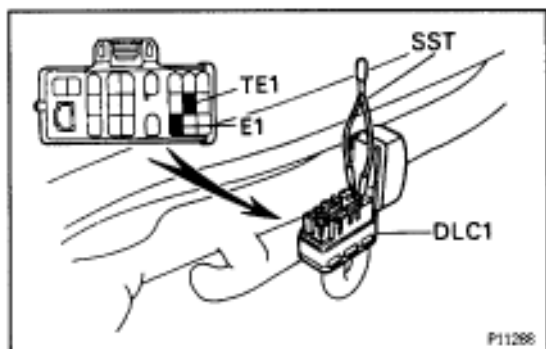
(See step 2 in ignition timing inspection and adjustment (2JZ-GE))

3. CHECK IDLE SPEED

- Race the engine speed at 2,500 rpm for approx. 90 seconds.
- Check the idle speed.

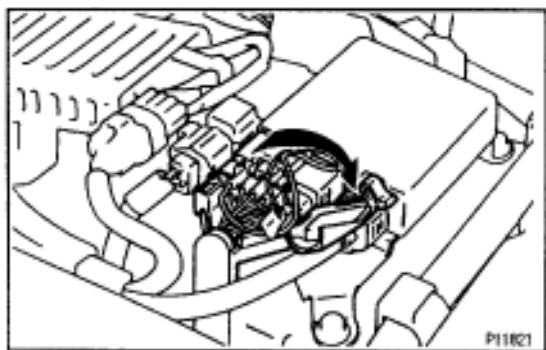
Idle speed:

650 ± 50 rpm

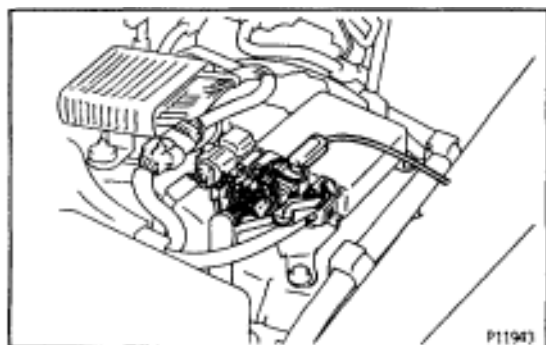


4. CHECK IGNITION TIMING

- Using SST, connect terminals TE1 and E1 of the DLC 1. SST 09843-18020



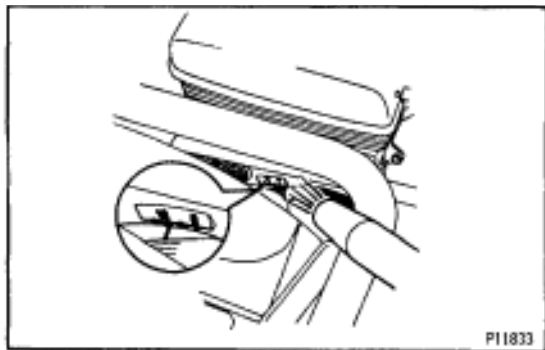
- Open the igniter connector cover and remove the green lead wire.



- Connect the timing light clip to the green lead wire.

NOTICE:

- Use a timing light that can detect the primary signal.
- After finishing the inspection, make sure the lead wire is stored inside the connector cover.



- (d) Using a timing light, check the ignition timing.

Ignition timing:

$10 \pm 2^\circ$ BTDC @ idle

(Transmission in neutral position)

If the ignition timing is not as specified, check the valve timing. (See step 14 in timing belt installation)

- (e) Remove the SST from the DLC1.

SST 09843-18020

5. FURTHER CHECK IGNITION TIMING

Ignition timing:

$10-20^\circ$ BTDC @ idle

(Transmission in neutral position)

HINT: The timing mark moves in a range between 10° and 20° .

6. DISCONNECT TACHOMETER AND TIMING LIGHT

IDLE SPEED INSPECTION

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected

HINT: All vacuum hoses for EGR system, etc. should be properly connected.

- (f) SFI system wiring connectors fully plugged
- (g) Ignition timing set correctly
- (h) Transmission in neutral position

2. CONNECT TACHOMETER

(See step 2 in ignition timing inspection and adjustment (2JZ-GE))

3. INSPECT IDLE SPEED

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

Idle speed:

2JZ-GE

700 ± 50 rpm

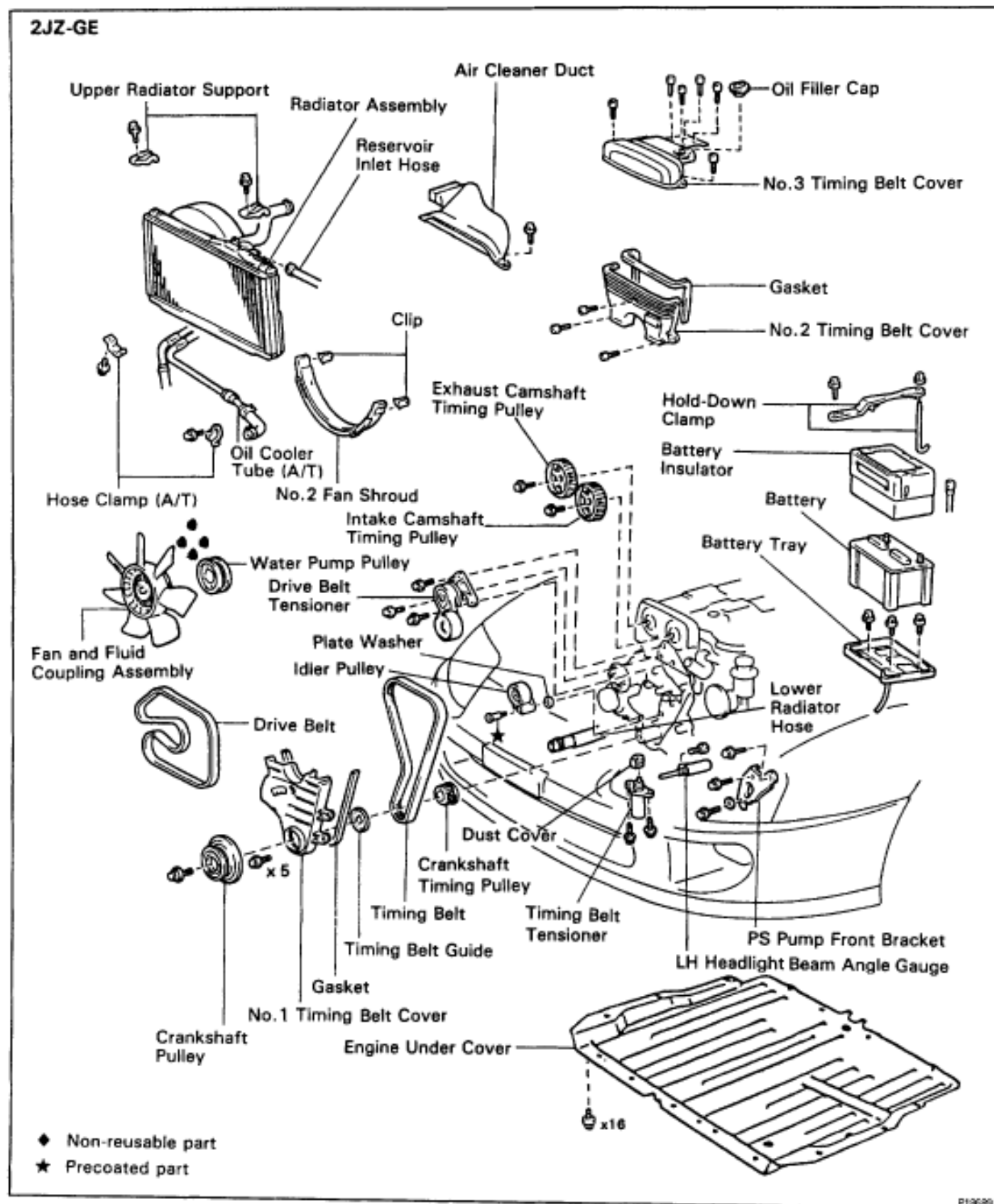
2JZ-GTE

650 ± 50 rpm

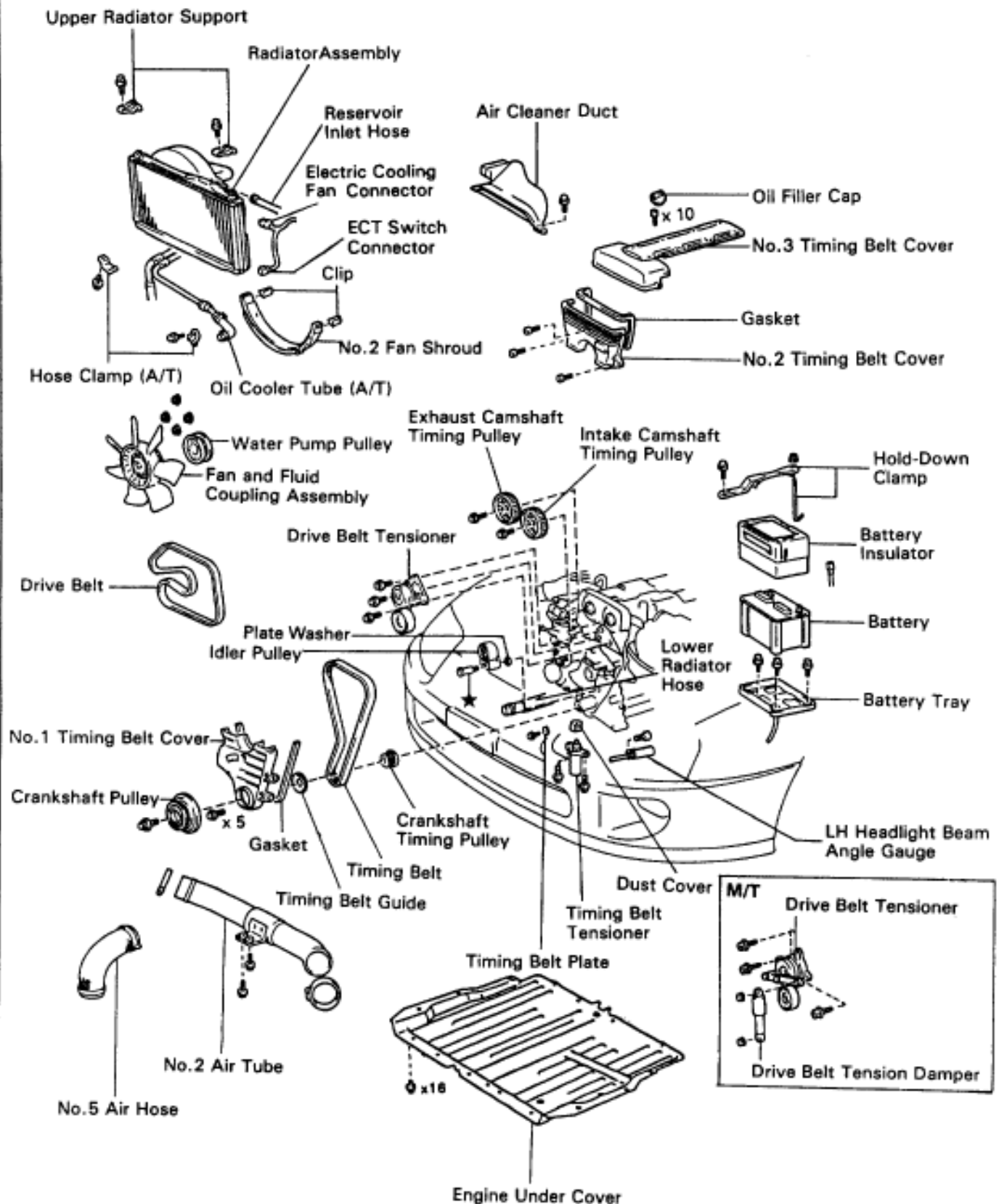
If the idle speed is not as specified, check the IAC valve. (See on-vehicle inspection in ISC valve in SFI System)

4. DISCONNECT TACHOMETER

TIMING BELT COMPONENTS FOR REMOVAL AND INSTALLATION

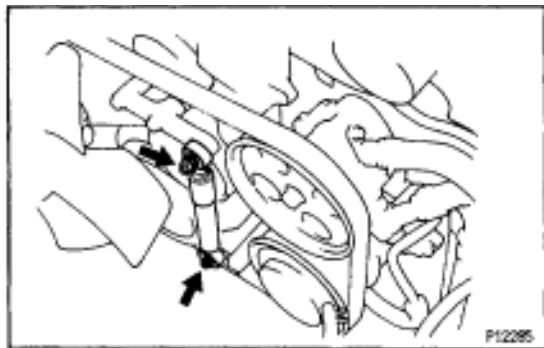


2JZ-GTE



◆ Non-reusable part

★ Precoated part

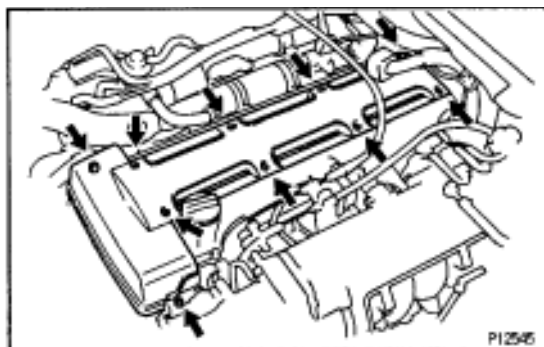


TIMING BELT REMOVAL

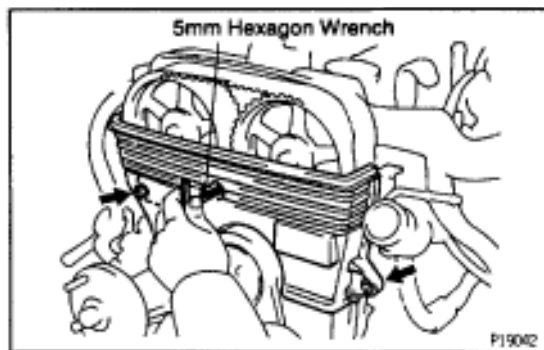
1. **REMOVE RADIATOR ASSEMBLY**
(See radiator removal in Cooling System)
2. **2JZ-GTE M/T:**
REMOVE DRIVE BELT TENSIONER DAMPER
Remove the 2 nuts and tensioner damper.
3. **REMOVE DRIVE BELT, FAN, FLUID COUPLING ASSEMBLY AND WATER PUMP PULLEY**
(See step 6 in water pump removal in Cooling System)
4. **REMOVE NO.3 TIMING BELT COVER**
 - (a) Remove the oil filler cap.
 - (b) 2JZ-GE:
Using a 5 mm hexagon wrench, remove the 6 bolts and belt cover.



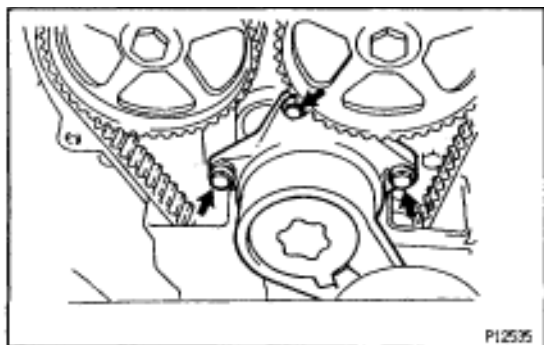
- (c) 2JZ-GTE:
Using a 5 mm hexagon wrench, remove the 10 bolts and belt cover.



5. **REMOVE NO.2 TIMING BELT COVER**
Using a 5 mm hexagon wrench, remove the 3 bolts, belt cover and gasket.
If you are unable to loosen the bolt on the right because the PS pump pulley interferes with the hexagon wrench, first remove the pulley.



6. **REMOVE DRIVE BELT TENSIONER**
Remove the 3 bolts and tensioner.

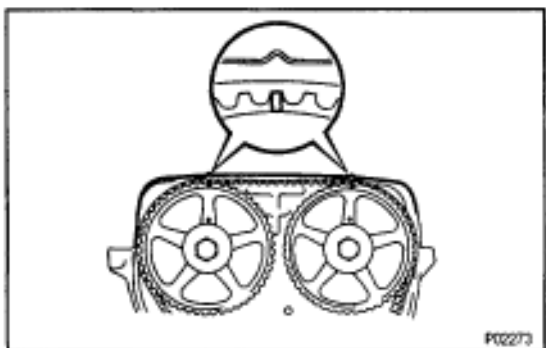




7. SET NO.1 CYLINDER TO TDC/COMPRESSION

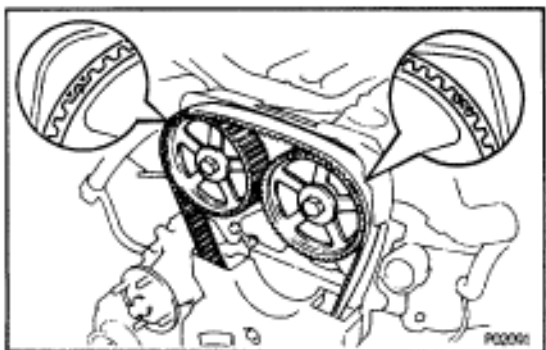
- (a) Turn the crankshaft pulley, and align its groove with timing mark "O" of the No.1 timing belt cover.

NOTICE: Always turn the crankshaft clockwise.



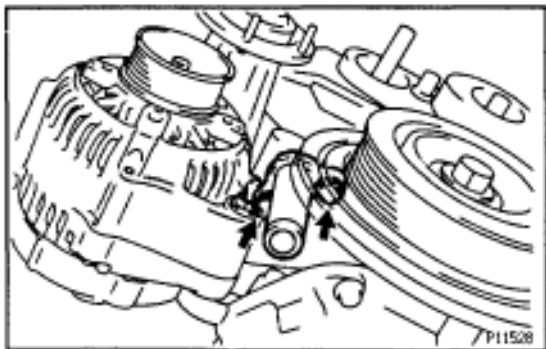
- (b) Check that the timing marks of the camshaft timing pulleys are aligned with the timing marks of the No.4 timing belt cover.

If not, turn the crankshaft 1 revolution (360°).



8. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS

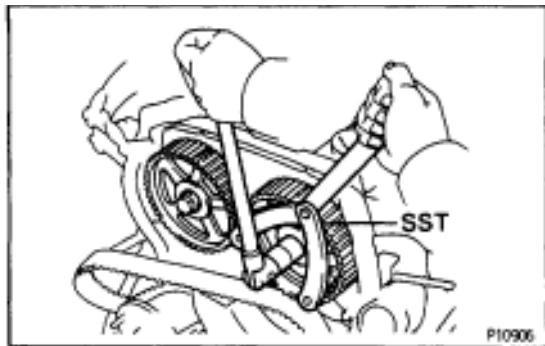
HINT (Re-using timing belt): Place matchmarks on the timing belt and camshaft timing pulleys as shown in the illustration.



- (a) Alternately loosen the 2 bolts, and remove them, the tensioner and dust boot.

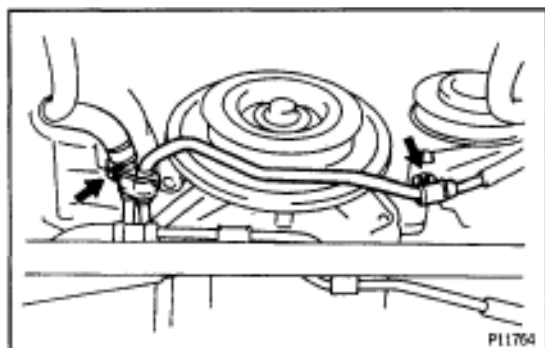


- (b) Disconnect the timing belt from the camshaft timing pulleys.

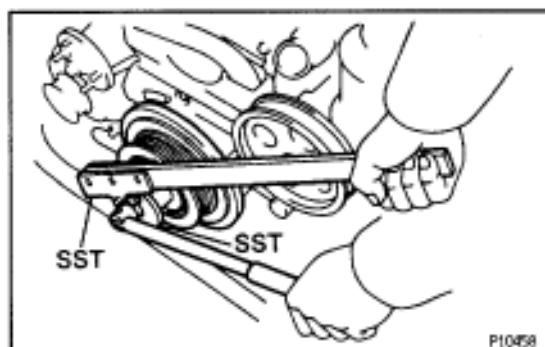
**9. REMOVE CAMSHAFT TIMING PULLEYS**

Using SST, remove the pulley bolt. Remove the 2 timing pulleys.

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

**10. A/T:****DISCONNECT OIL COOLER TUBES**

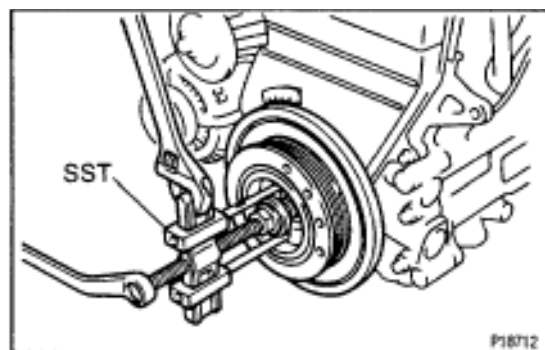
Remove the 2 bolts and hose clamps, and disconnect oil cooler tubes.

**11. REMOVE CRANKSHAFT PULLEY**

(a) Using SST, loosen the pulley bolt.

SST 09213-70010, 09330-00021

(b) Remove the pulley bolt.

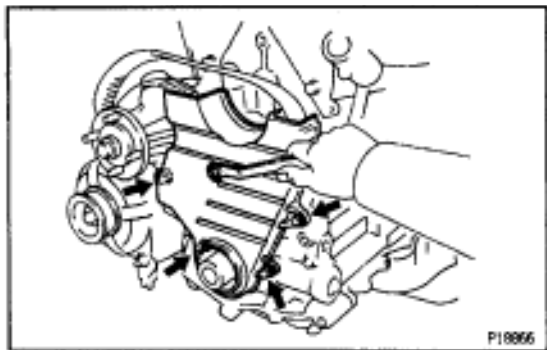


(c) Using SST, remove the pulley.

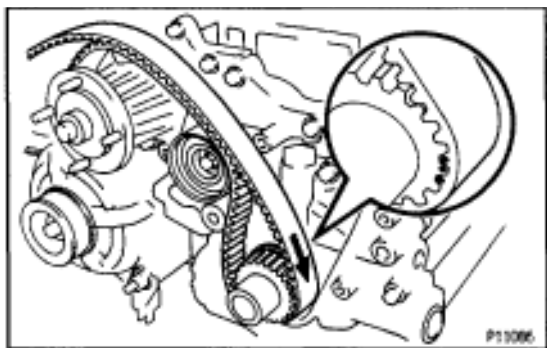
SST 09950-50010 (09954-05030, 09551-05010, 09552-05010, 09553-05020)

**12. 2JZ-GE:****REMOVE PS PUMP FRONT BRACKET**

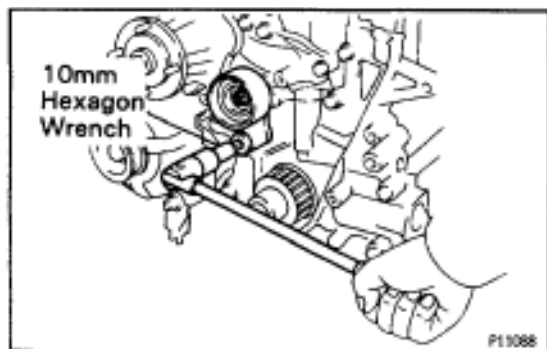
Remove the 3 bolts, plate washer and pump front bracket.

**13. REMOVE NO.1 TIMING BELT COVER**

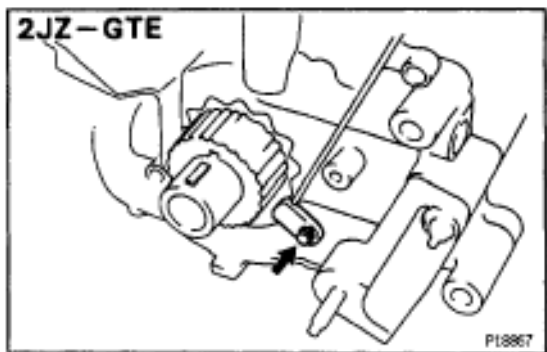
Remove the 5 bolts, timing belt cover and gasket.

14. REMOVE TIMING BELT GUIDE**15. REMOVE TIMING BELT**

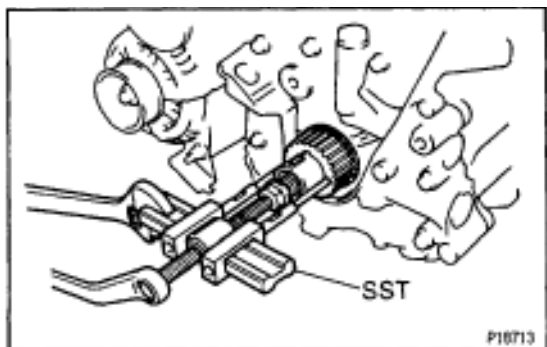
HINT (When re-using timing belt): Draw an arrow on the timing belt in the direction of engine revolution, and place match-marks on the timing belt and crankshaft timing pulley.

**16. REMOVE IDLER PULLEY**

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

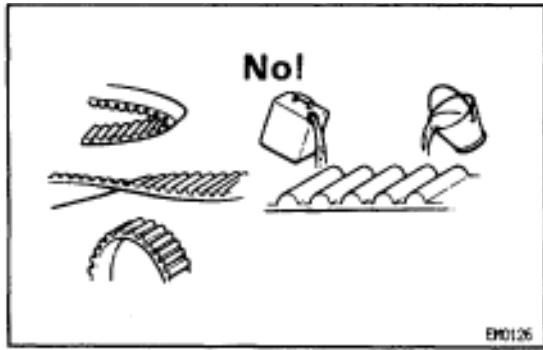
**17. REMOVE CRANKSHAFT TIMING PULLEY****(a) 2JZ-GTE:**

Remove the bolt and timing belt plate.

**(b) Remove the crankshaft timing pulley.**

If the pulley cannot be removed by hand, use SST to remove the crankshaft timing pulley.

SST 09950-50010 (09951-05010, 09952-05010, 09953-05020, 09954-00010)



TIMING BELT COMPONENTS INSPECTION

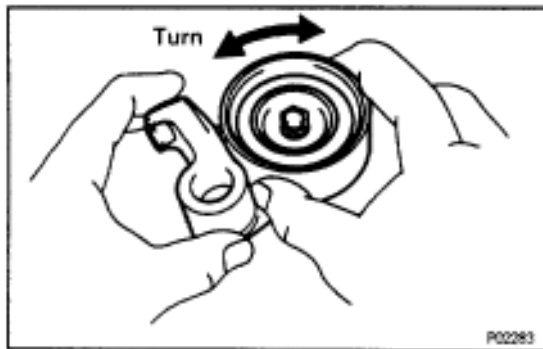
1. INSPECTION TIMING BELT

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 the following points.

- Premature parting
 - Check for proper installation.
 - Check the timing cover gasket for damage and proper installation.
- If the belt teeth are cracked or damaged, check to see if either camshaft is locked.
- 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.
- If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.
- If there is noticeable wear on the belt teeth, check timing cover for damage and check gasket has been installed correctly and for foreign material on the pulley teeth. If necessary, replace the timing belt.

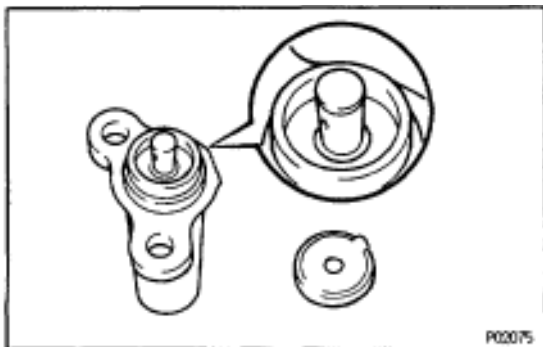


2. INSPECT IDLER PULLEY

Check the turning smoothness of the idler pulley. If necessary, replace the idler pulley.

3. INSPECT DRIVE BELT TENSIONER

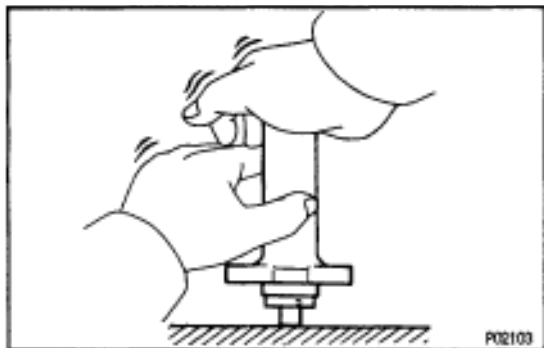
Check the turning smoothness of the tensioner. If necessary, replace the tensioner.



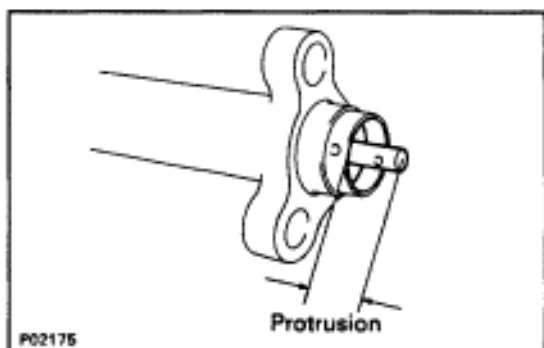
4. INSPECT TIMING BELT TENSIONER

- Visually check tensioner for oil leakage.

HINT: If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right. If leakage is found, replace tensioner.



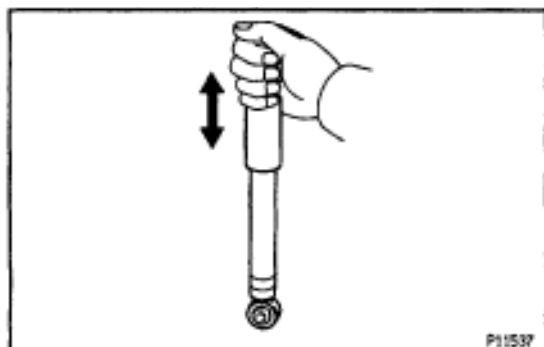
- (b) Hold the tensioner with both hands and push the push rod strongly against the floor or wall to check that it doesn't move. If the push rod moves, replace the tensioner.



- (c) Measure the protrusion of the push rod from the housing end.
Protrusion:

8.0–8.8 mm (0.315–0.346 in.)

If the protrusion is not as specified, replace the tensioner.

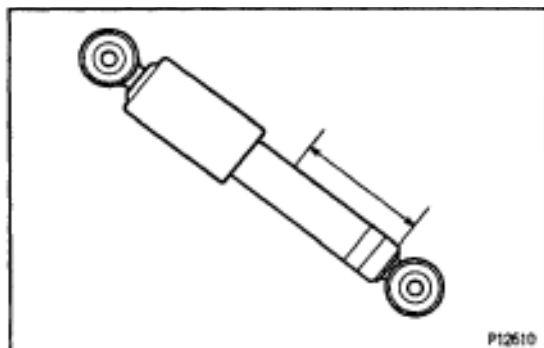


5. 2JZ-GTE M/T:

INSPECT DRIVE BELT TENSION DAMPER

Compress and extend the tension damper rod and check that there is no abnormal resistance or unusual operation sounds.

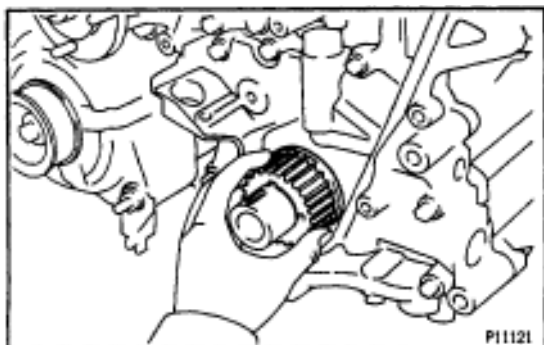
If there is any abnormality, replace the tension damper with a new one.



NOTICE: When discarding the tension damper, use the following procedure.

- Fully extend the damper rod.
- Using a drill, make a hole in the cylinder as shown to release the gas inside.

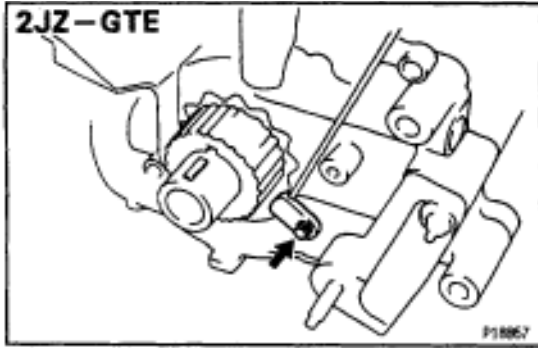
CAUTION: The gas coming out is harmless, but be careful of the chips which may fly up when drilling.



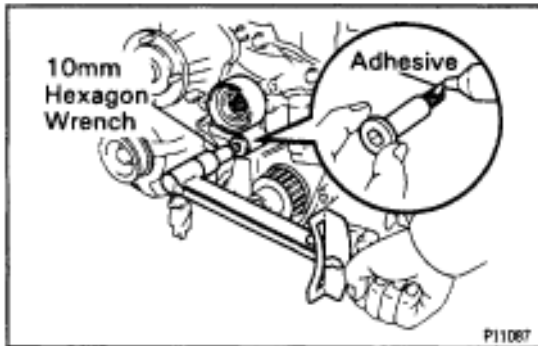
TIMING BELT INSTALLATION

1. INSTALL CRANKSHAFT TIMING PULLEY

- Align the pulley set key with the key groove of the pulley.
- Slide on the timing pulley facing the flange side inward.

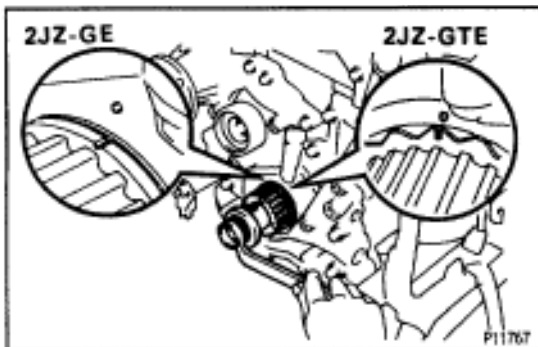


- (c) 2JZ-GTE:
Install the timing belt plate with the bolt.
Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)



2. INSTALL IDLER PULLEY

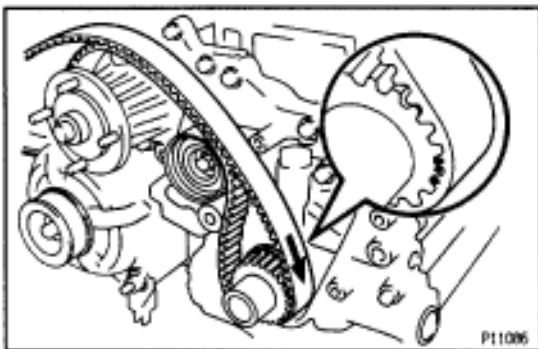
- (a) Apply adhesive to 2 or 3 threads of the pivot bolt.
Adhesive:
Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent
- (b) Using a 10 mm hexagon wrench, install the plate washer and pulley with the pivot bolt.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)
- (c) Check that the pulley bracket moves smoothly.



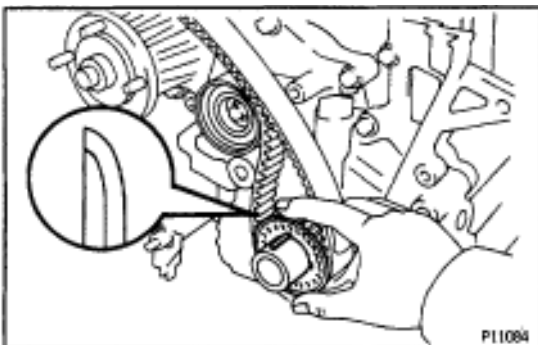
3. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

- (a) Using the crankshaft pulley bolt, 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 and idler pulley, and keep them clean.



- (c) Install the timing belt on the crankshaft timing pulley and idler pulley.
HINT (When re-using timing belt): Align the match marks of the crankshaft timing pulley and timing belt, and install the belt with the arrow pointing in the direction of engine revolution.



4. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.

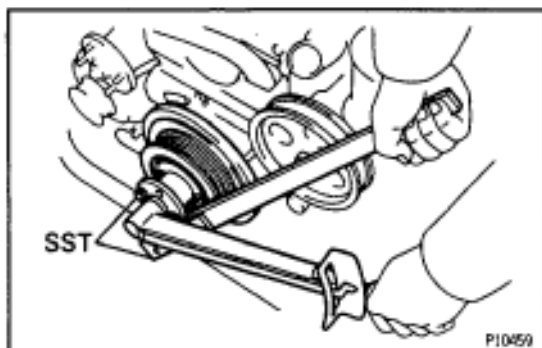
5. INSTALL NO.1 TIMING BELT COVER



6. 2JZ-GE:

INSTALL PS PUMP FRONT BRACKET

- (a) Install the pump front bracket with the 2 bolts (A).
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)
- (b) Install the plate washer and bolt (b) to the oil pump.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

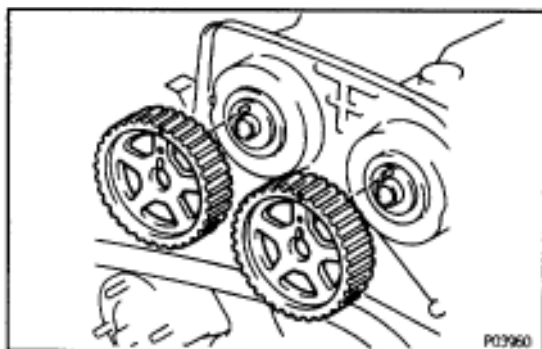


7. INSTALL CRANKSHAFT PULLEY

- (a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.
- (b) Using SST, install the bolt.
SST 09213-70010, 09330-00021
Torque: 324 N·m (3,300 kgf·cm, 239 ft·lbf)

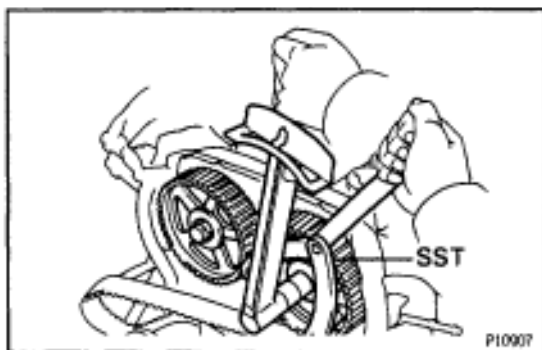
8. A/T:

CONNECT OIL COOLER TUBES



9. INSTALL CAMSHAFT TIMING PULLEYS

- (a) Align the camshaft knock pin with the groove of the pulley, and slide on the timing pulley.
- (b) Temporarily install the timing pulley bolt.

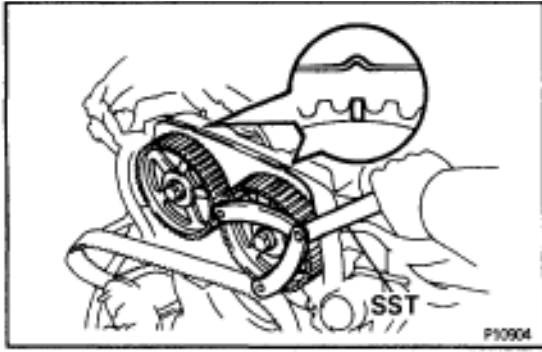


- (c) Using SST, tighten the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 79 N·m (810 kgf·cm, 59 ft·lbf)

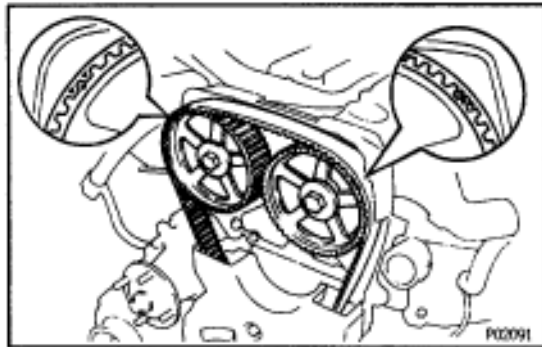


10. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley, and align its groove with timing mark "O" of the No.1 timing belt cover.
NOTICE: Always turn the crankshaft clockwise.



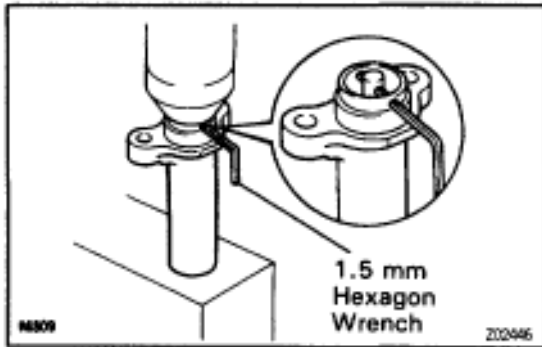
- (b) Using SST, align the timing marks of the camshaft timing pulleys and No.4 timing belt cover.
SST 09960-10010 (09962-01000, 09963-01000)



11. INSTALL TIMING BELT

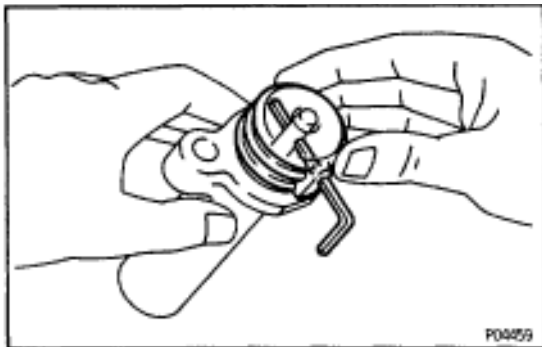
HINT (When re-using timing belt): Align the matchmarks of the timing belt and camshaft timing pulleys.

- (a) Remove any oil or water on the camshaft timing pulley, and keep it clean.
(b) Install the timing belt, checking the tension between the crankshaft timing pulley and exhaust camshaft timing pulley.

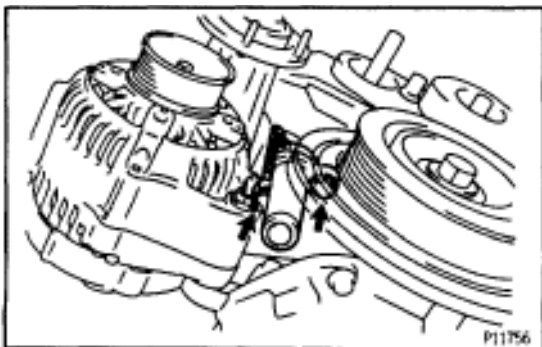


12. SET TIMING BELT TENSIONER

- (a) Using a press, slowly press in the push rod using 981 –9,807 N (100–1,000 kgf, 220–2,205 lbf) of force.
(b) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the push rod retracted.
(c) Release the press.

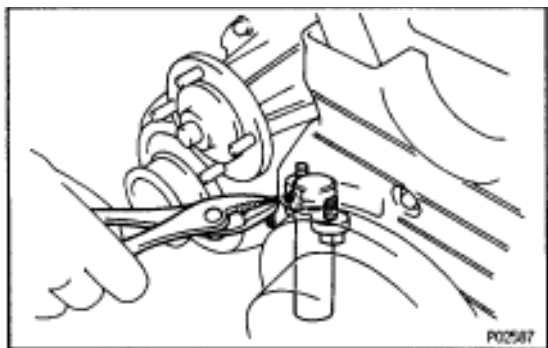


- (d) Install the dust boot onto the tensioner.

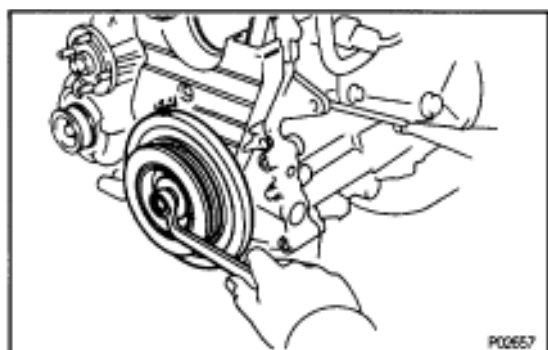


13. INSTALL TIMING BELT TENSIONER

- (a) Temporarily install the tensioner with the 2 bolts.
(b) Alternately tighten the 2 bolts.
Torque: 26 N·m (270 kgf·cm, 20 ft·lbf)



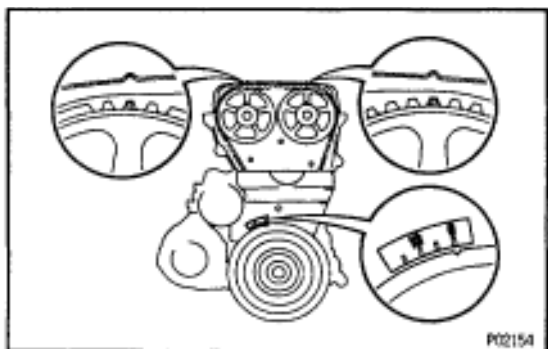
- (c) Remove the 1.5 mm hexagon wrench from the tensioner.



14. CHECK VALVE TIMING

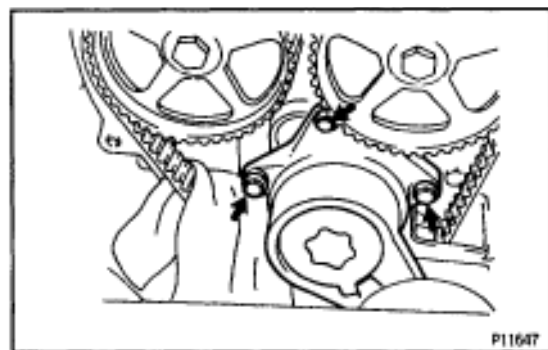
- (a) Slowly turn the crankshaft pulley 2 revolutions from TDC to TDC.

NOTICE: Always turn the crankshaft clockwise.



- (b) Check that each pulley aligns with the timing marks as shown in the illustration.

If the marks do not align, remove the timing belt and reinstall it.



15. INSTALL DRIVE BELT TENSIONER

Install the tensioner with the 3 bolts.

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

NOTICE: Be careful not to drop the bolts inside the timing belt cover.

16. INSTALL NO.2 TIMING BELT COVER

17. INSTALL NO.3 TIMING BELT COVER

18. INSTALL WATER PUMP PULLEY, FAN, FLUID COUPLING ASSEMBLY AND DRIVE BELT

(See step 10 in water pump installation in Cooling System)

19. 2JZ-GTE M/T:

INSTALL DRIVE BELT TENSIONER DAMPER

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

20. INSTALL RADIATOR ASSEMBLY

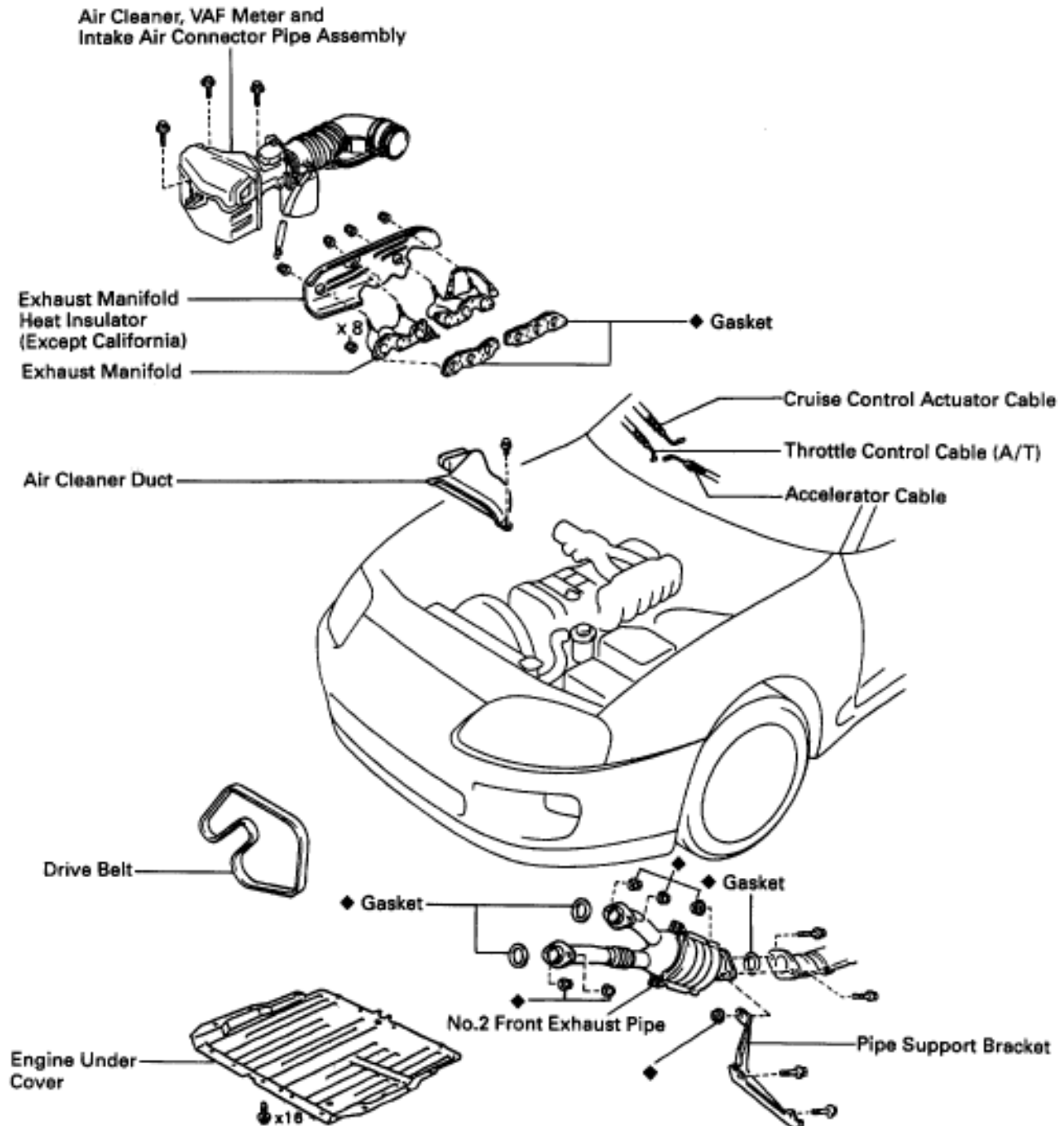
(See radiator installation in Cooling System)

21. ROAD TEST VEHICLE

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

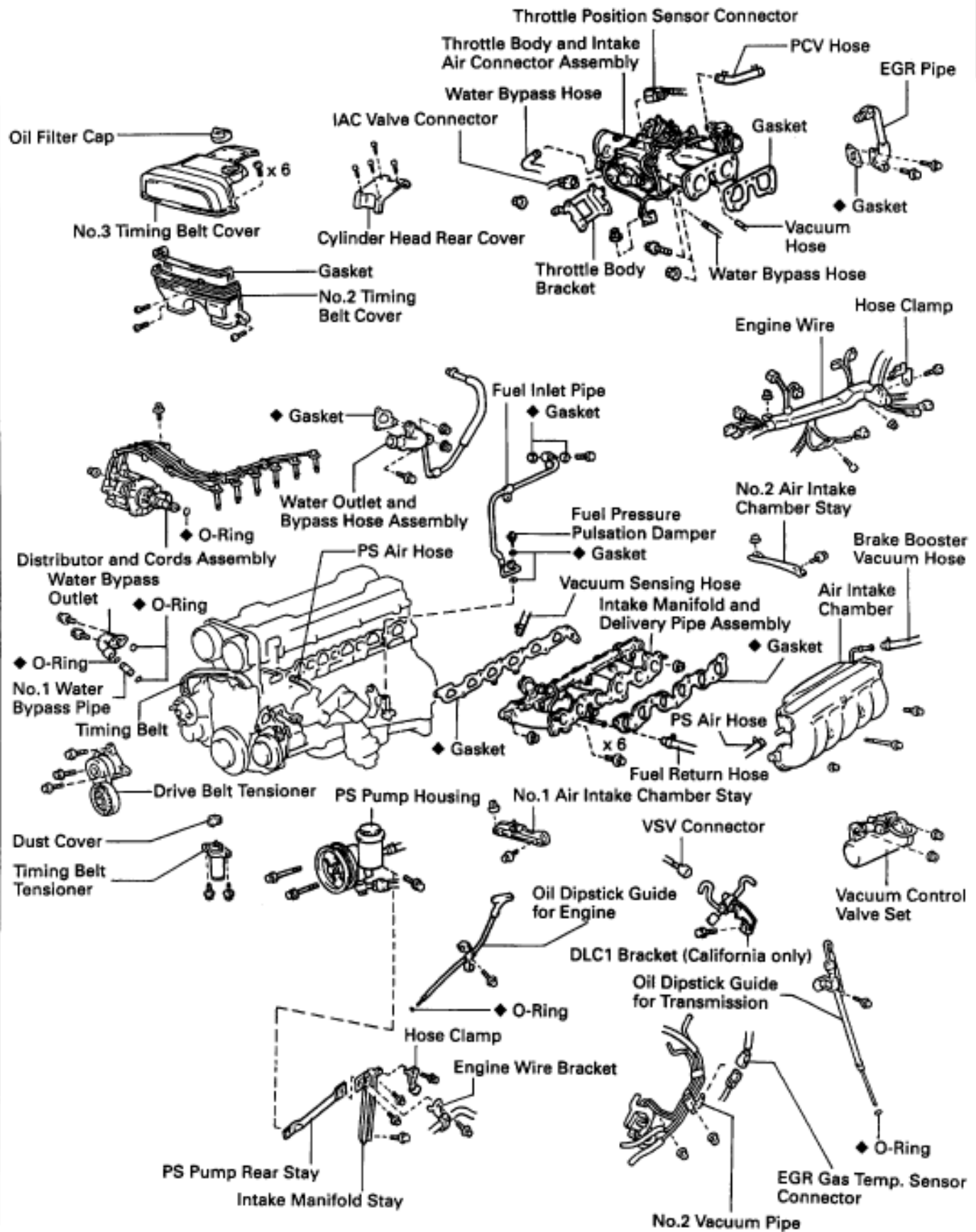
CYLINDER HEAD COMPONENTS FOR REMOVAL AND INSTALLATION

2JZ-GE

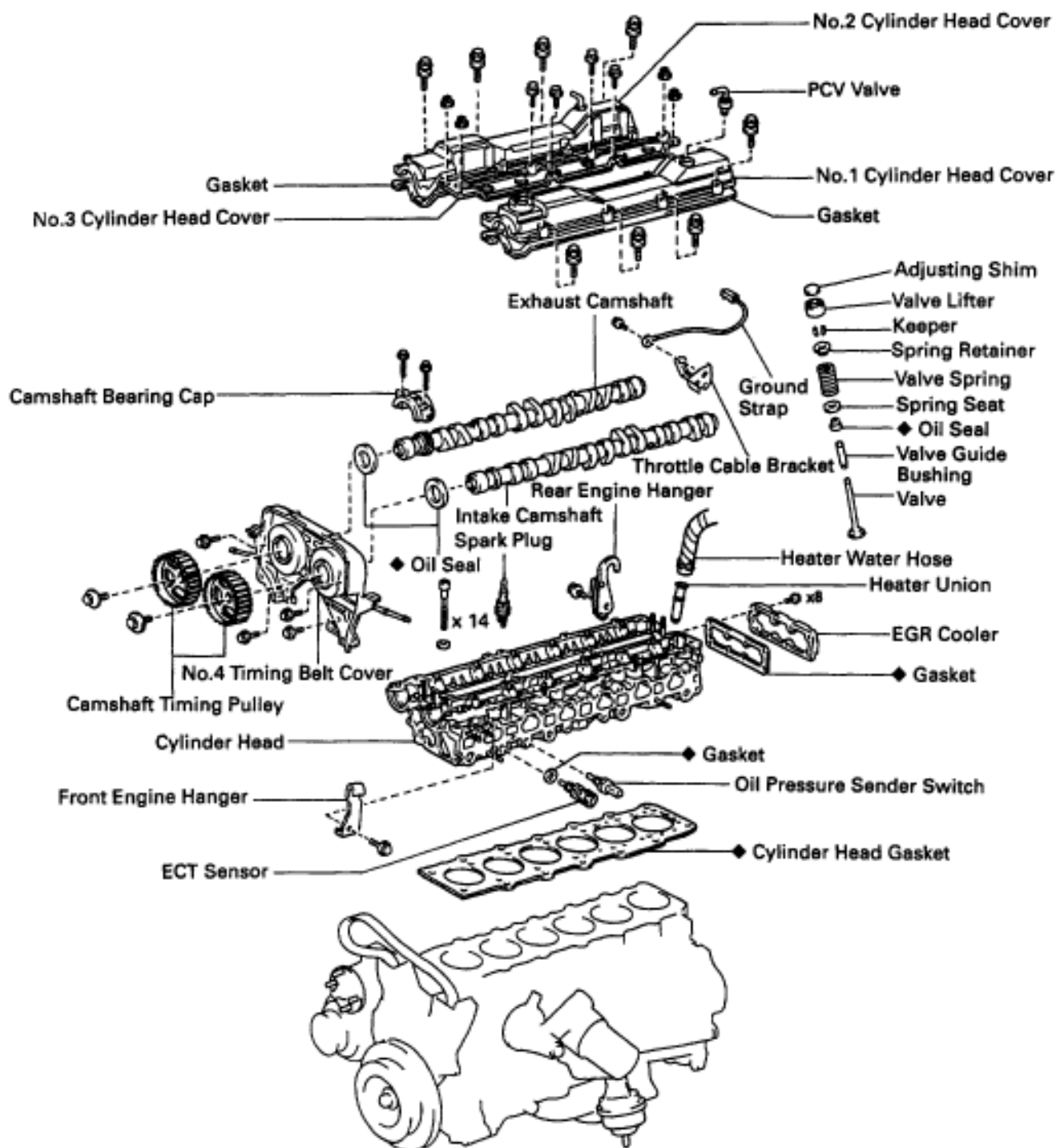


◆ Non-reusable part

2JZ-GE

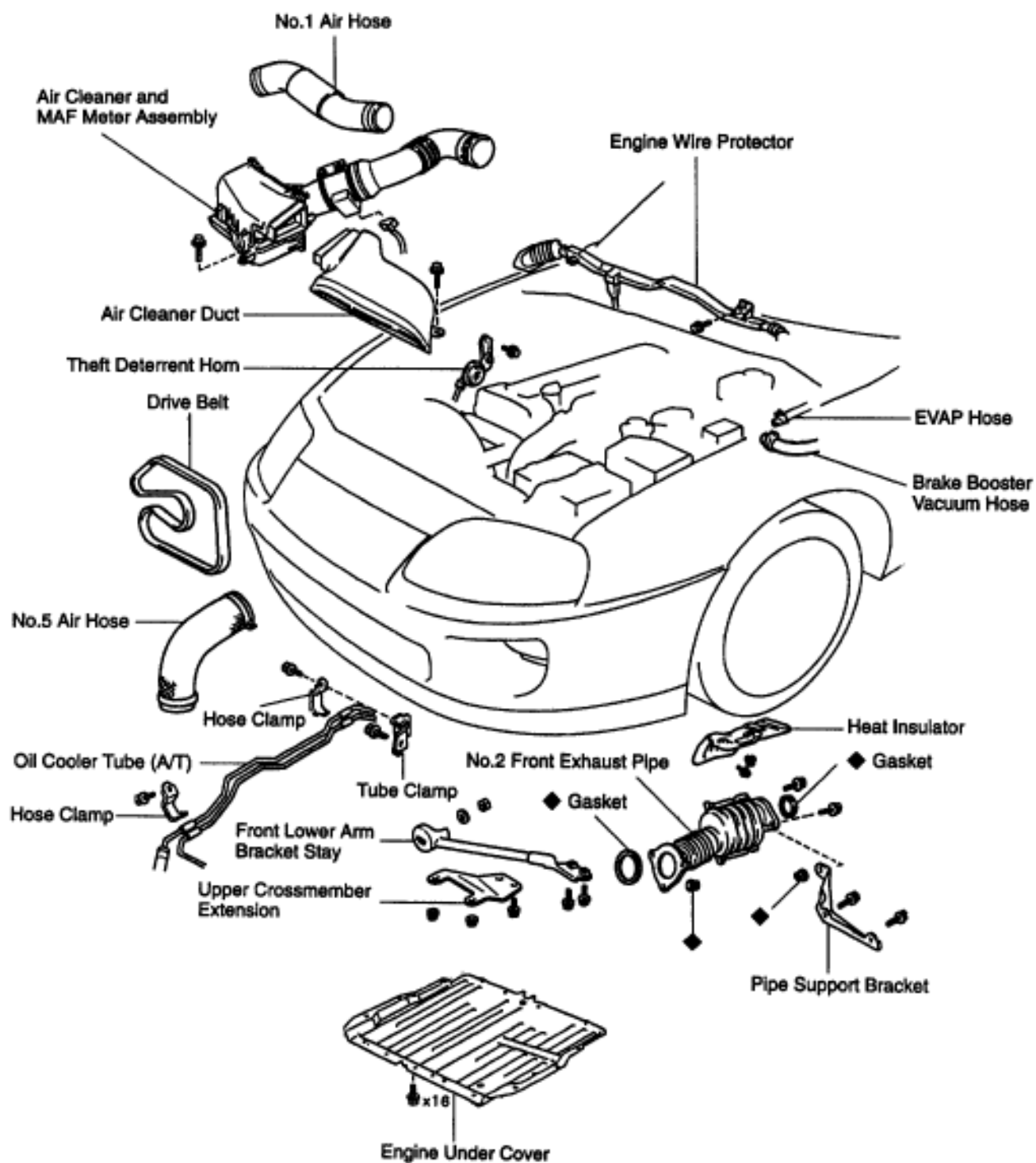


2JZ-GE



◆ Non-reusable part

2JZ - GTE

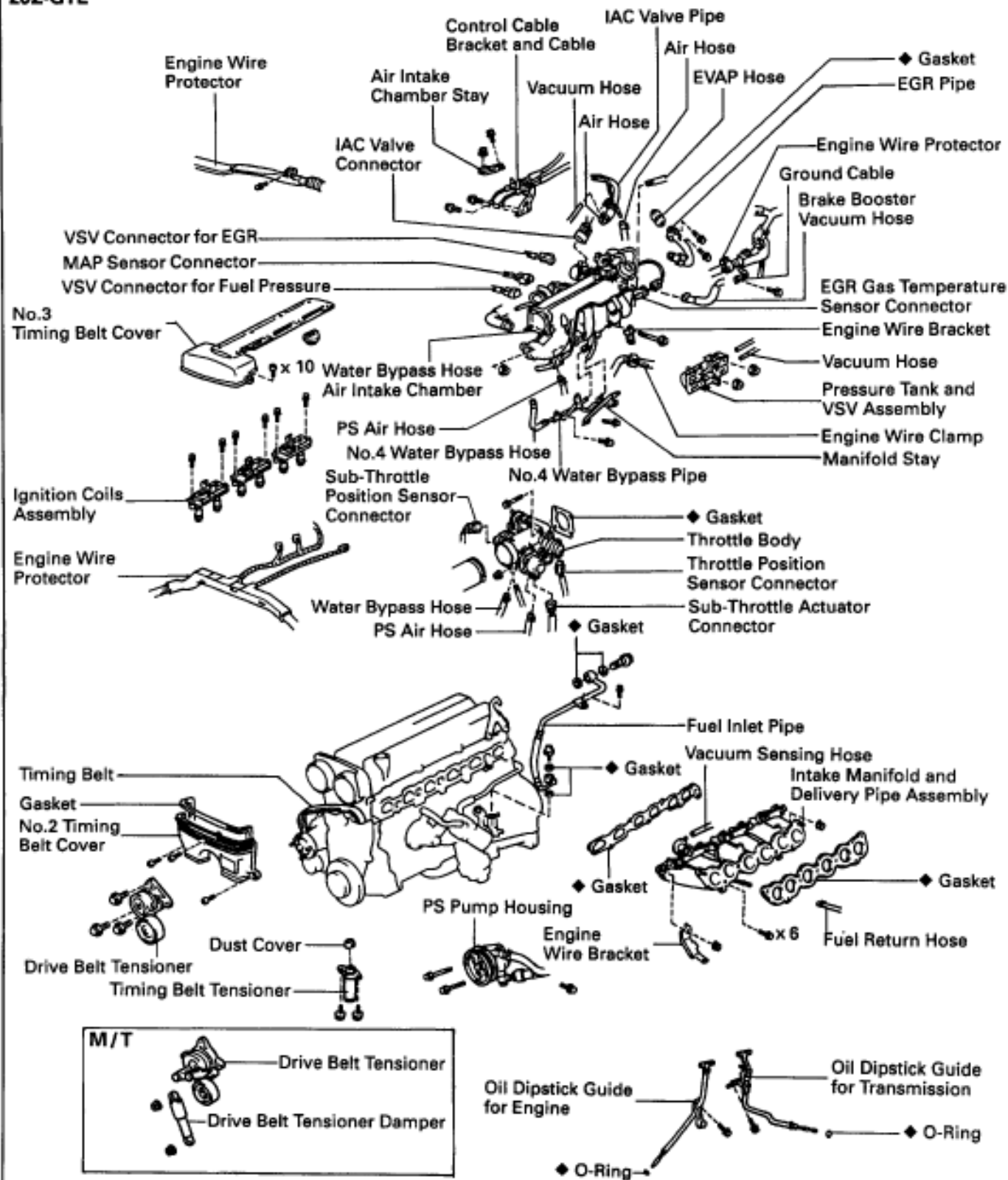


◆ Non-reusable part

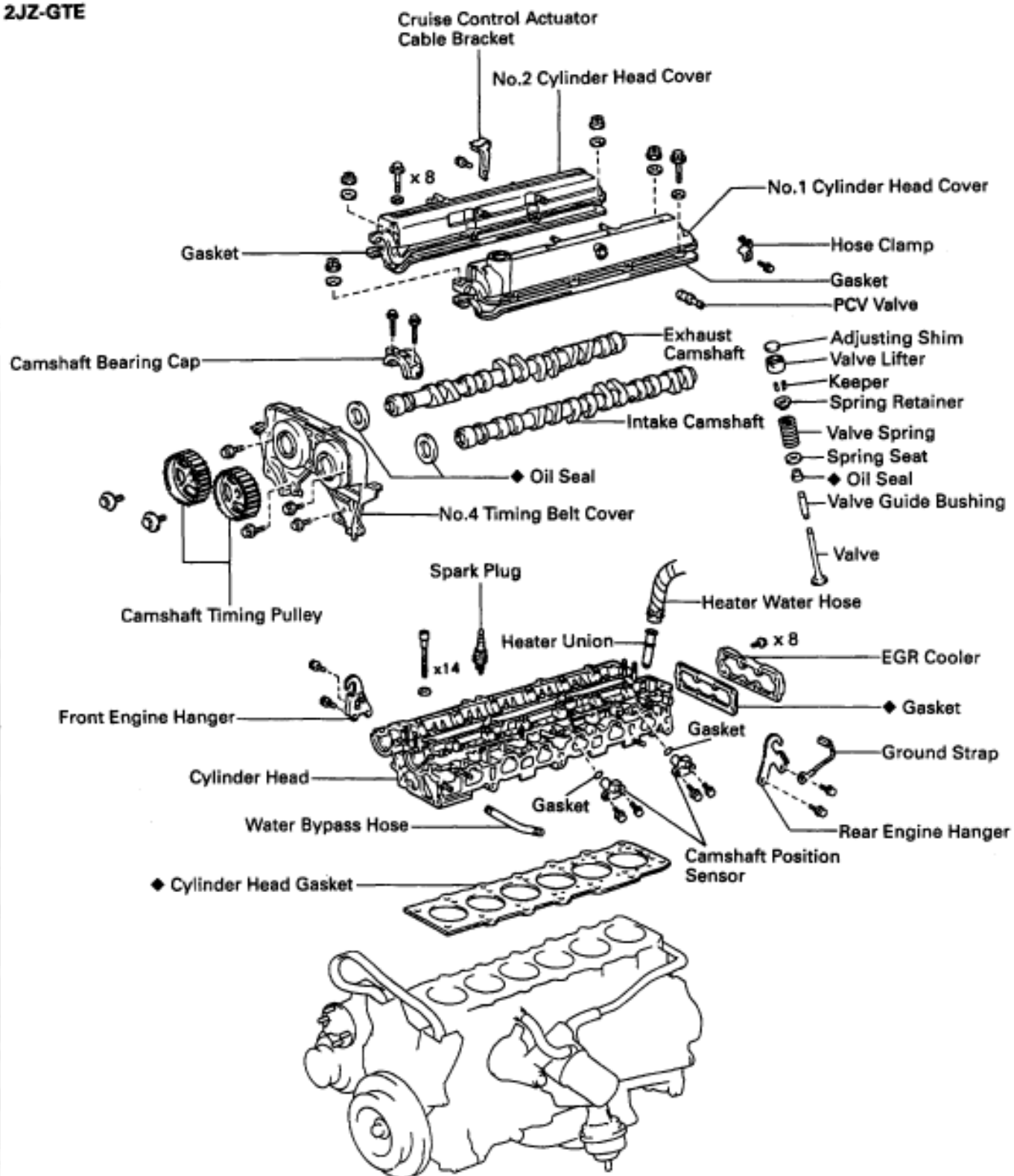
P12614

Z13597

2JZ-GTE



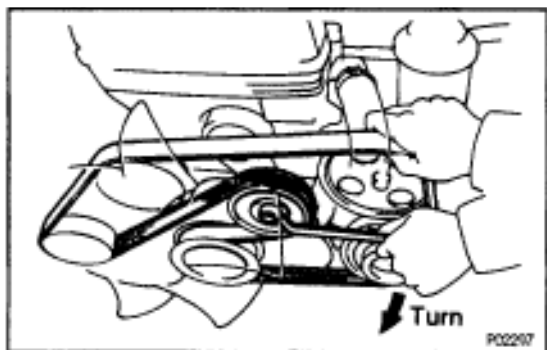
2JZ-GTE



◆ Non-reusable part

CYLINDER HEAD REMOVAL (2JZ-GE)

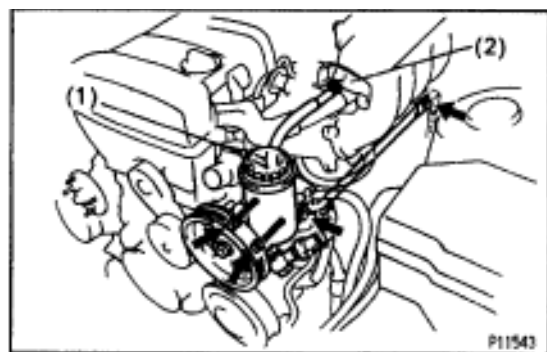
1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE AIR CLEANER DUCT
4. REMOVE AIR CLEANER, VAF METER AND INTAKE AIR CONNECTOR PIPE ASSEMBLY
(See step 6 in engine removal in Engine Mechanical)



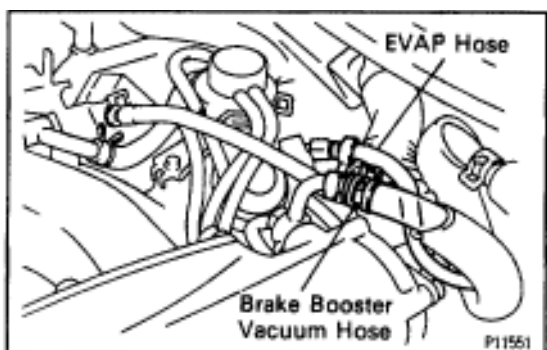
5. REMOVE DRIVE BELT
Loosen the drive belt tension by turning the drive belt tensioner clockwise, and remove the drive belt.
6. REMOVE NO.2 FRONT EXHAUST PIPE
(See step 22 in engine removal in Engine Mechanical)



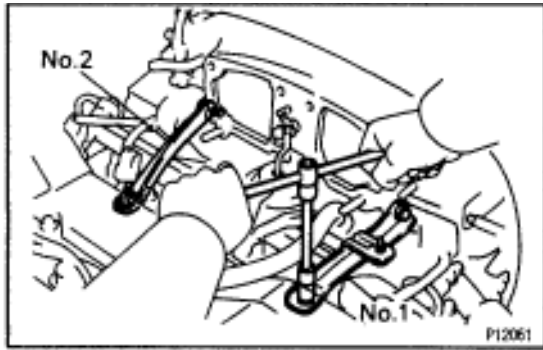
7. REMOVE EXHAUST MANIFOLDS
 - (a) Except California:
Remove the 4 nuts and manifold heat insulator.
 - (b) Disconnect the 2 (main heated) oxygen sensor connectors.
 - (c) Remove the 4 nuts, exhaust manifold and gasket.
Remove the No.1 and No.2 exhaust manifolds.



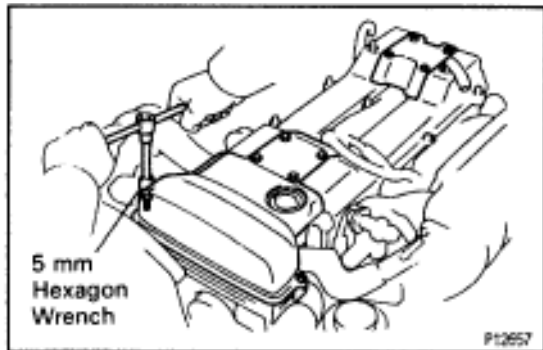
8. DISCONNECT PS PUMP WITHOUT DISCONNECTING HOSES
 - (a) Disconnect these hoses:
 - (1) Air hose from No.4 timing belt cover
 - (2) Air hose from air intake chamber
 - (b) Remove the 2 bolts, and disconnect the pump housing from the pump bracket.
HINT: Put aside the pump housing, and suspend it.
 - (c) Remove the 2 bolts and pump rear stay.



9. DISCONNECT BRAKE BOOSTER VACUUM HOSE
10. DISCONNECT EVAP HOSE
11. REMOVE THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY
(See injector removal in SFI System)

**12. REMOVE AIR INTAKE CHAMBER STAYS**

- (a) Remove the bolt, nut and No.1 stay.
- (b) Remove the bolt, nut and No.2 stay.

13. REMOVE NO.2 VACUUM PIPE AND VSV ASSEMBLY**14. REMOVE NO.3 TIMING BELT COVER**

- (a) Remove the oil filler cap.
- (b) Using a 5 mm hexagon wrench, remove the 6 bolts and timing belt cover.

15. REMOVE CYLINDER HEAD REAR COVER

Using a 5 mm hexagon wrench, remove the 4 bolts and cylinder head rear cover.

16. DISCONNECT HIGH-TENSION CORDS FROM CYLINDER HEAD COVERS

(See step 4 in high-tension cords and cord clamps removal in Ignition System)

17. REMOVE DISTRIBUTOR AND CORDS ASSEMBLY

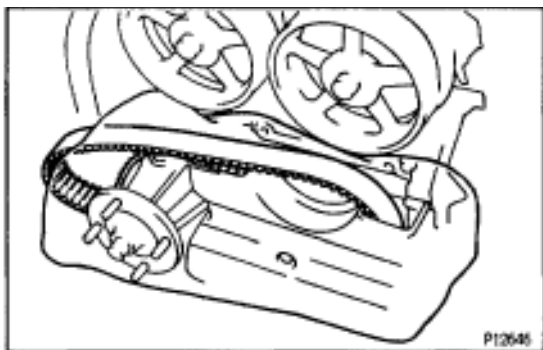
(See steps 1 to 3 in distributor removal in Ignition System)

18. REMOVE SPARK PLUGS**19. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS**

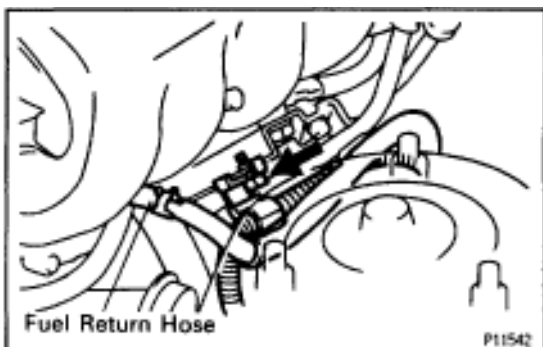
(See steps 5 to 8 in timing belt removal)

NOTICE:

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

**20. REMOVE WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE**

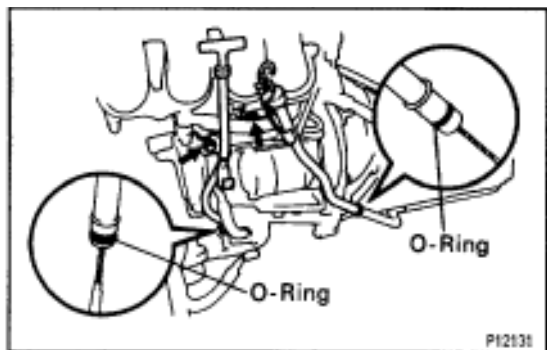
(See step 13 in water pump removal in Cooling System)

**21. DISCONNECT FUEL RETURN HOSE**

- (a) Disconnect the fuel return hose from the fuel return pipe. Plug the hose end.
- (b) Disconnect the fuel return hose from the oil dipstick guide.

22. REMOVE ENGINE WIRE BRACKET

Remove the bolt and bracket, disconnect the engine wire the intake manifold stay.

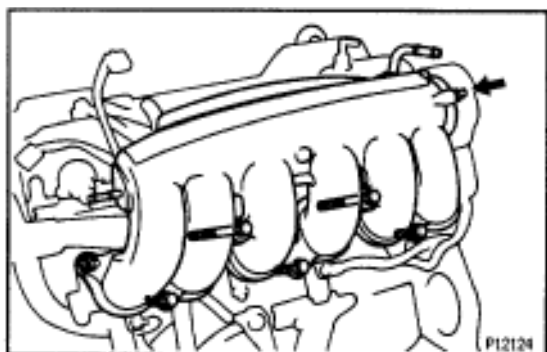


23. REMOVE OIL DIPSTICK GUIDES FOR ENGINE AND TRANSMISSION

- (a) Remove the 2 bolts.
- (b) Pull out the dipstick guide together with the dipstick.
- (c) Remove the O-ring from the dipstick guide.

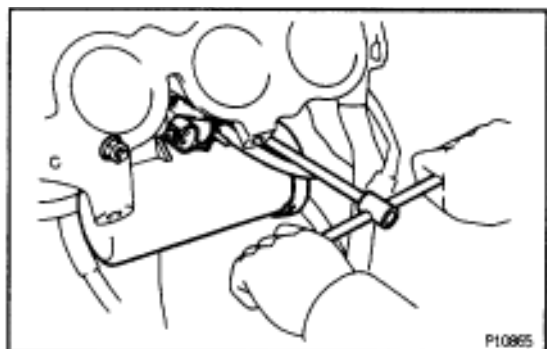
24. REMOVE STARTER

(See starter removal in Starting System)



25. REMOVE AIR INTAKE CHAMBER

- (a) Except California:
Disconnect the vacuum sensing hose from the fuel pressure regulator.
- (b) Remove the bolt holding the engine wire protector to the the air intake chamber.
- (c) Remove the 5 bolts, nut, air intake chamber and gasket.



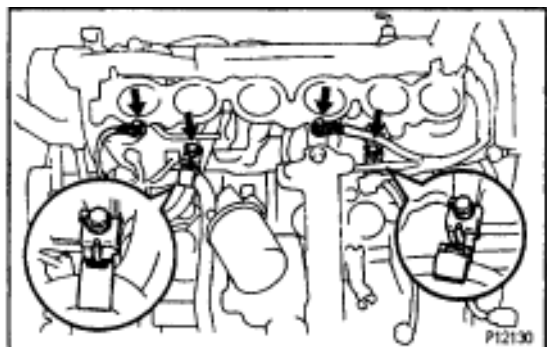
26. REMOVE VACUUM CONTROL VALVE SET

- (a) Disconnect the VSV connector.
- (b) Remove the 2 nuts and vacuum control valve set.

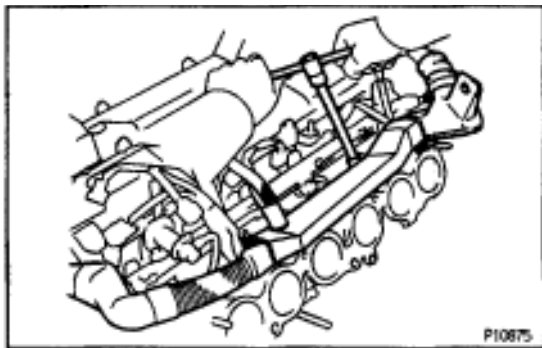


27. DISCONNECT ENGINE WIRE

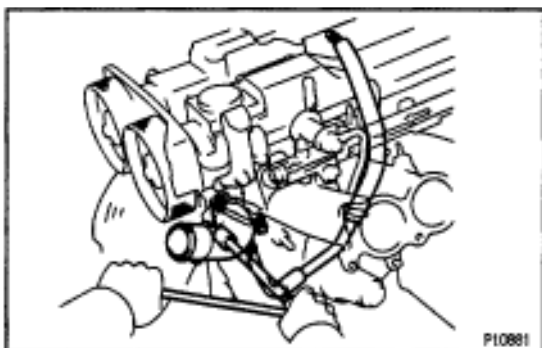
- (a) Remove the bolt, and disconnect the engine wire bracket from the water pump.



- (b) Remove the 2 bolts, and disconnect the 2 ground straps from the intake manifold.
- (c) Remove the 2 bolts, and disconnect the 2 wire clamps from the intake manifold.
- (d) Disconnect these connectors:
 - 6 injector connectors
 - ECT sensor connector
 - ECT sender gauge connector

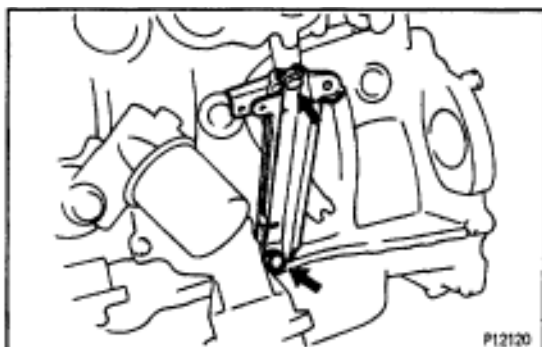


- (e) Remove the 3 nuts, and disconnect the engine wire protector from the intake manifold.



28. REMOVE WATER OUTLET AND NO.1 BYPASS HOSE ASSEMBLY

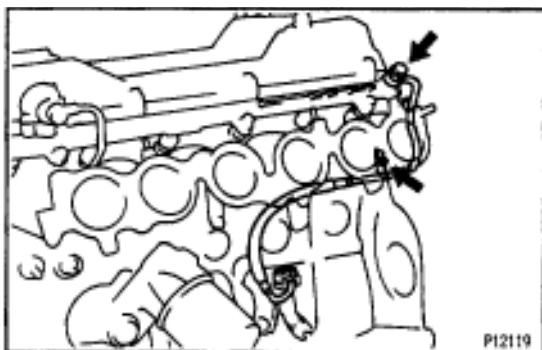
Remove the 2 nuts, bolt and water outlet.



29. REMOVE INTAKE MANIFOLD STAY

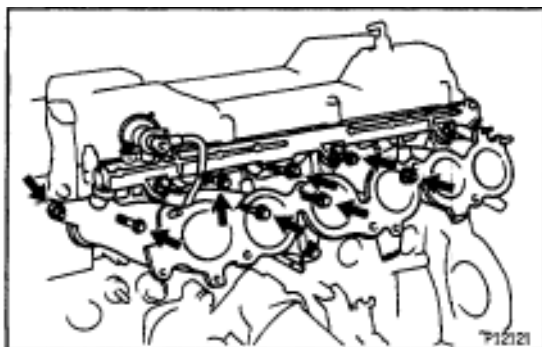
Remove the 2 bolts and manifold stay.

30. REMOVE FUEL PRESSURE PULSATION DAMPER
(See step 2 in fuel pressure pulsation damper in SFI System)



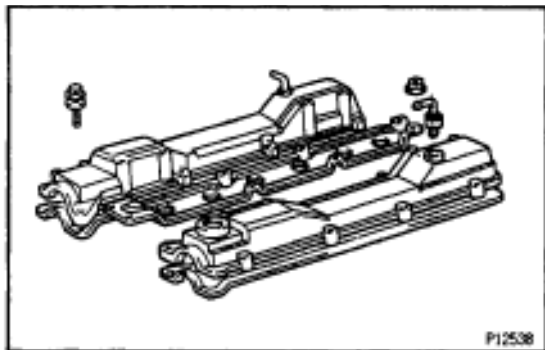
31. REMOVE FUEL INLET PIPE

- (a) Remove the clamp bolt from the intake manifold.
(b) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet pipe.



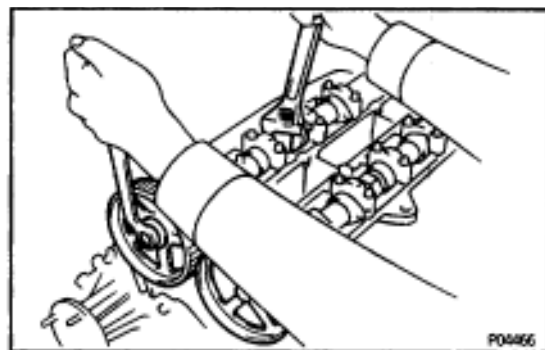
32. REMOVE INTAKE MANIFOLD AND DELIVERY PIPE ASSEMBLY

Remove the 6 bolts, 2 nuts, the intake manifold, delivery pipe assembly and gasket.



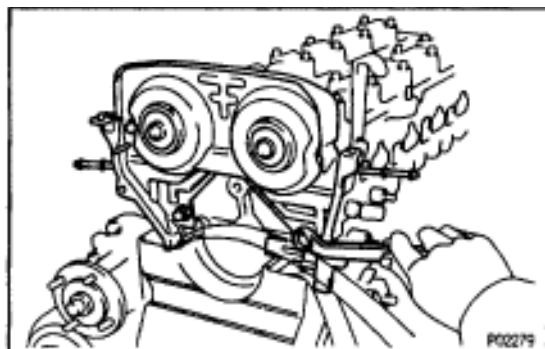
33. REMOVE NO.3, NO.1 AND NO.2 CYLINDER HEAD COVERS

- (a) Remove the PCV valve.
- (b) Remove the 4 bolts, 4 nuts and No.3 cylinder head cover.
- (c) Remove the 4 bolts, No.1 cylinder head cover and gasket.
- (d) Remove the 4 bolts, No.2 cylinder head cover and gasket.



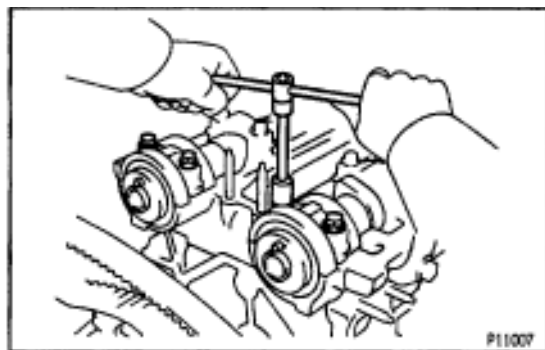
34. REMOVE CAMSHAFT TIMING PULLEYS

Hold the hexagon portion of the camshaft with a wrench, and remove the pulley mounting bolt and camshaft pulley.



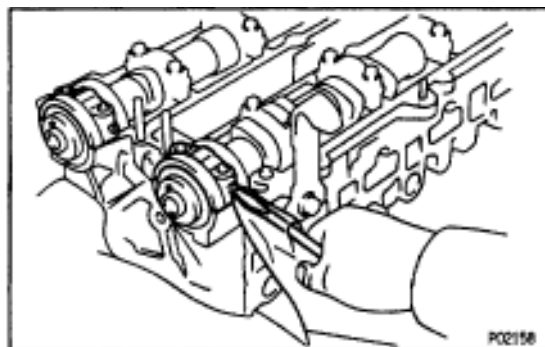
35. REMOVE NO.4 TIMING BELT COVER

Remove the 4 bolts and timing belt cover.



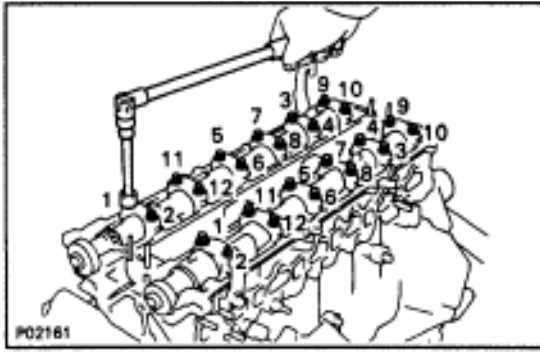
36. REMOVE CAMSHAFTS

- (a) Uniformly loosen and remove the 4 No.1 bearing cap bolts.

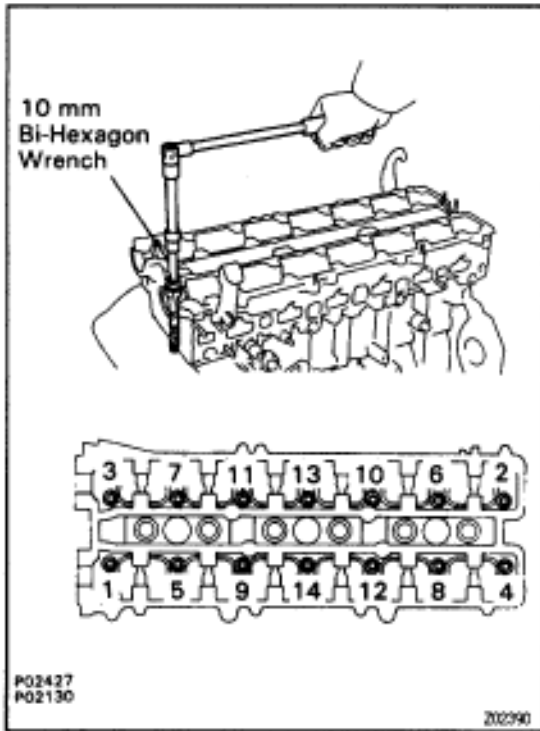


- (b) Using a screwdriver, pry out the 2 No.1 camshaft bearing caps and oil seals.

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

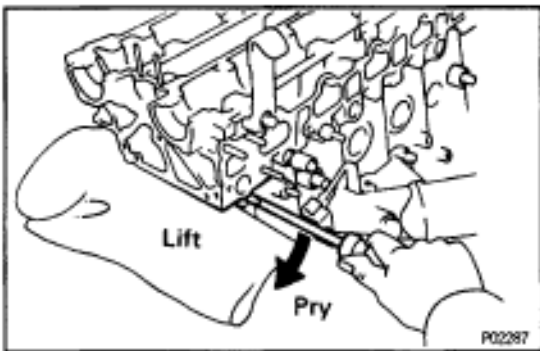


- (c) Uniformly loosen and remove the 12 bearing cap bolts, in several passes, in the sequence shown, and remove the 6 bearing caps and camshaft.
- (d) Remove the intake and exhaust camshafts.

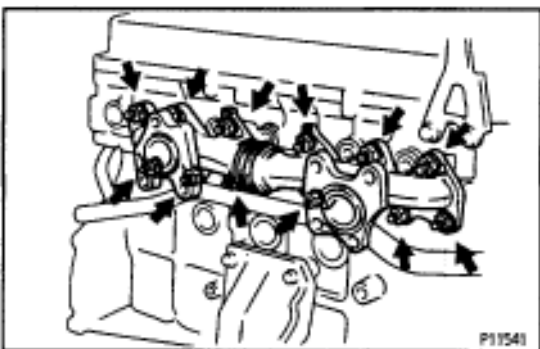


37. REMOVE CYLINDER HEAD

- (a) Using a 10 mm bi-hexagon wrench, uniformly loosen and remove the 14 cylinder head bolts, in several passes, in the sequence shown.
NOTICE: Cylinder head warpage or cracking could result from removing in incorrect order.
- (b) Remove the 14 plate washers.

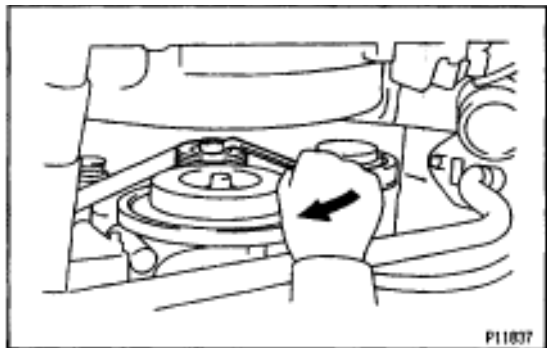


- (c) Lift the cylinder head from the dowels on the cylinder block.
- (d) Place the head on wooden blocks on a bench.
If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block projection.
NOTICE: Be careful not to damage the contact surfaces of the cylinder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



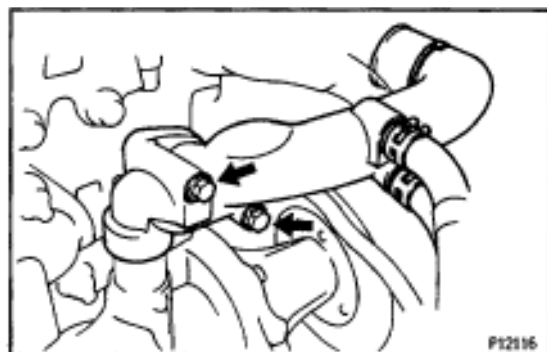
CYLINDER HEAD REMOVAL (2JZ-GTE)

1. **REMOVE TURBOCHARGER**
(See turbocharger removal in Turbocharger System)
2. **REMOVE EXHAUST MANIFOLD**
Remove the 12 nuts, exhaust manifold and 2 gaskets.
3. **M/T:**
REMOVE DRIVE BELT TENSIONER DAMPER
(See step 2 in timing belt removal)



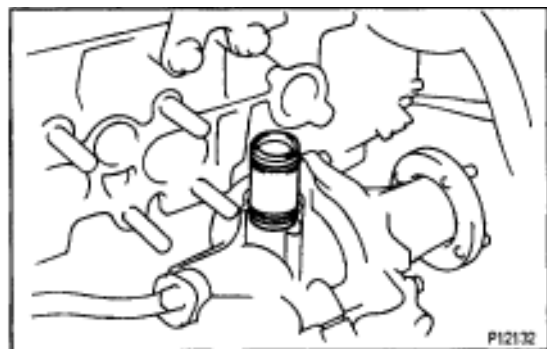
4. REMOVE DRIVE BELT

Loosen the drive belt tension by turning the drive belt tensioner clockwise, and remove the drive belt.

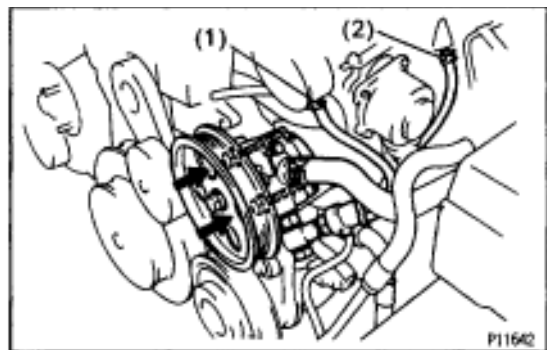


5. REMOVE WATER OUTLET AND NO.1 WATER BYPASS PIPE

- (a) Disconnect the upper radiator hose from the water outlet.
- (b) Disconnect the ECT sensor and sender gauge connectors.
- (c) Remove the 2 bolts, water outlet and gasket.

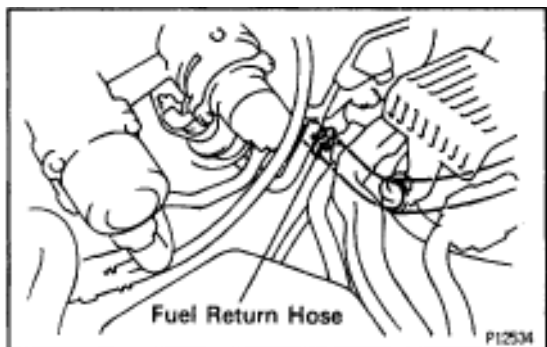


- (d) Remove the No.1 water bypass pipe and 2 O-rings.



6. DISCONNECT PS PUMP WITHOUT DISCONNECTING HOSES

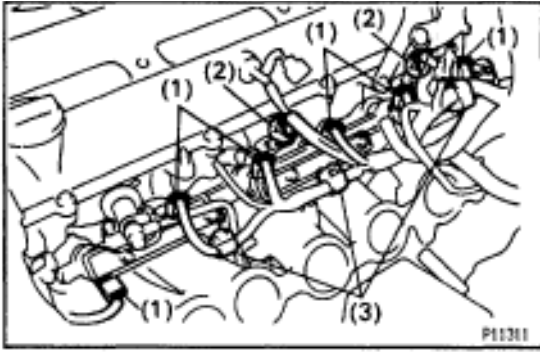
- (a) Disconnect these hoses:
 - (1) Air hose from throttle body
 - (2) Air hose from air intake chamber
 - (b) Remove the 2 bolts, and disconnect the pump housing from the pump bracket.
- HINT: Put aside the pump housing, and suspend it securely.



7. DISCONNECT FUEL RETURN HOSE

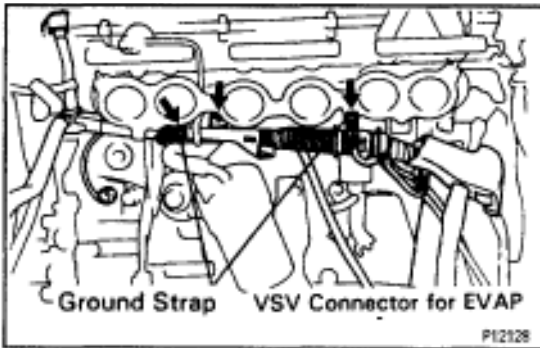
Disconnect the fuel return hose from the fuel return pipe. Plug the hose end.

8. REMOVE AIR INTAKE CHAMBER ASSEMBLY (See injector removal in SFI System)



9. DISCONNECT ENGINE WIRE

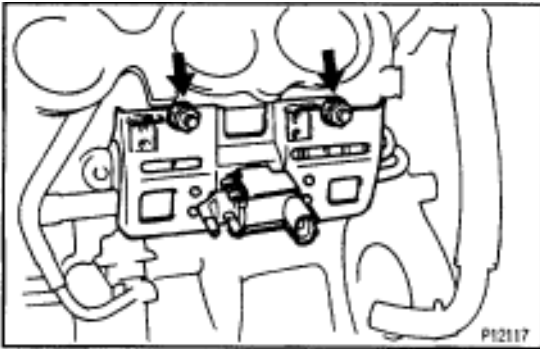
- (a) Disconnect these connectors and clamps:
 - (1) 6 injectors connectors
 - (2) 2 camshaft position sensor connectors
 - (3) 3 engine wire clamps from injector holders



- (4) VSV connector for EVAP
- (b) Remove the 2 bolts, and disconnect the 2 ground straps from the intake manifold.
- (c) Remove the nut, and disconnect the engine wire protector from the intake manifold.

10. REMOVE STARTER

(See starter removal in Starting System)

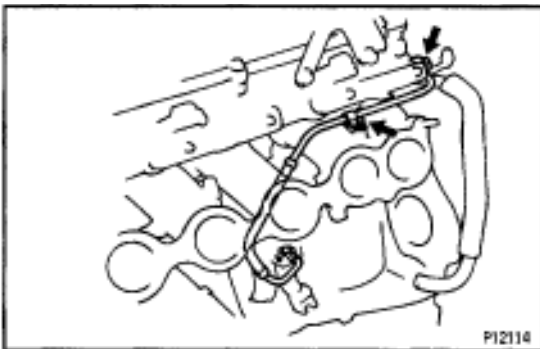


11. REMOVE PRESSURE TANK AND VSV ASSEMBLY

- (a) Disconnect the 2 vacuum hoses from the pressure tank.
- (b) Remove the 2 nuts and pressure tank and VSV assembly.

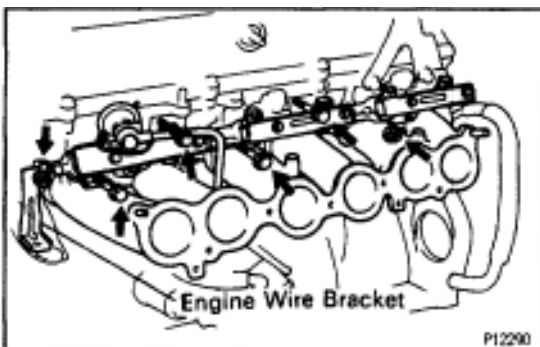
12. REMOVE FUEL PRESSURE PULSATION DAMPER

(See step 2 in fuel pressure pulsation damper in SFI System)



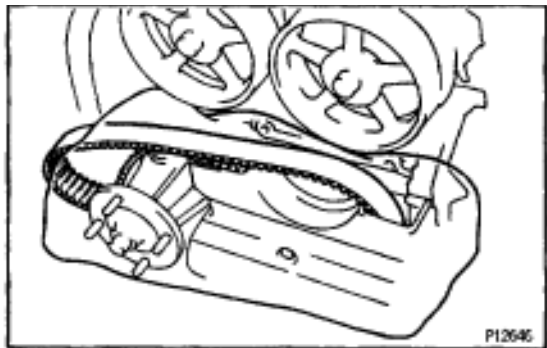
13. REMOVE FUEL INLET PIPE

Remove the union bolt, 2 gaskets, clamp bolt and fuel inlet pipe.



14. REMOVE INTAKE MANIFOLD AND DELIVERY PIPE ASSEMBLY

Remove the 4 bolts, 2 nuts, engine wire bracket, the intake manifold, delivery pipe assembly and gasket.



15. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS

(See steps 5 to 8 in timing belt removal)

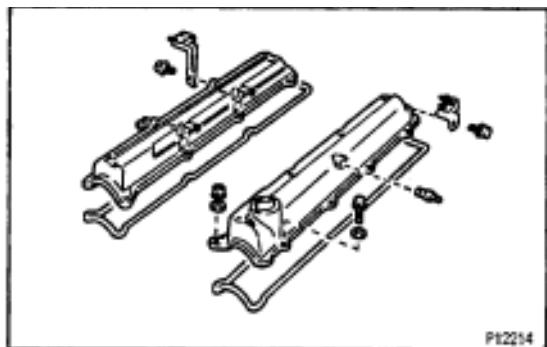
NOTICE:

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

16. REMOVE IGNITION COILS ASSEMBLIES

(See steps 2 to 5 in ignition coils removal in Ignition System)

17. REMOVE SPARK PLUGS



18. REMOVE NO.1 AND NO.2 CYLINDER HEAD COVERS

- Remove the 2 bolts, cruise control actuator cable bracket and IAC valve pipe clamp.
- Remove the PCV valve.
- Remove the 6 bolts, 2 nuts, 8 seal washers and No.1 cylinder head cover and gasket.
- Remove the 6 bolts, 2 nuts, 8 seal washers and No.2 cylinder head cover and gasket.

19. REMOVE CAMSHAFT TIMING PULLEYS

(See step 34 cylinder head removal (2JZ-GE))

20. REMOVE NO.4 TIMING BELT COVER

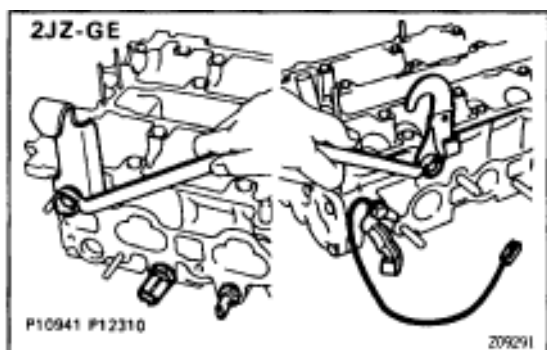
(See step 35 cylinder head removal (2JZ-GE))

21. REMOVE CAMSHAFTS

(See step 36 cylinder head removal (2JZ-GE))

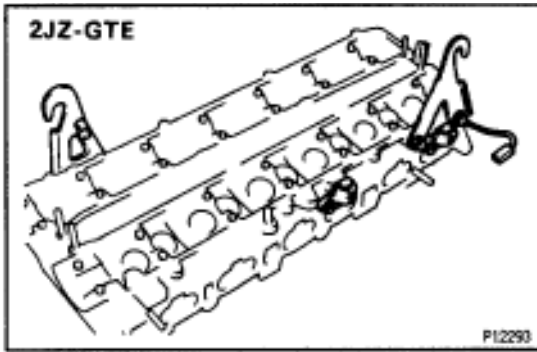
22. REMOVE CYLINDER HEAD

(See step 37 cylinder head removal (2JZ-GE))

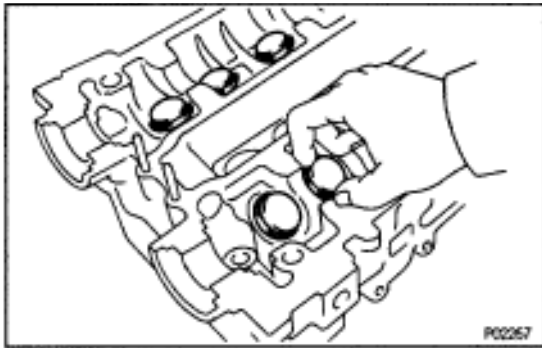


CYLINDER HEAD DISASSEMBLY

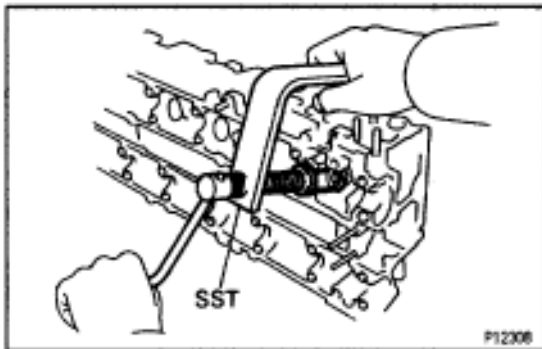
- 2JZ-GE:
REMOVE ENGINE HANGERS
- 2JZ-GE:
REMOVE ECT SENSOR AND SENDER GAUGE
- 2JZ-GE:
REMOVE THROTTLE CABLE BRACKET AND GROUND STRAP



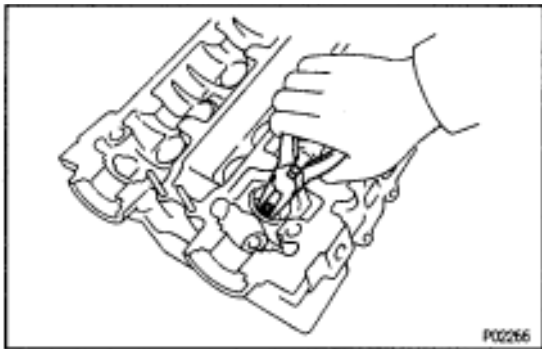
4. **2JZ-GTE:**
REMOVE ENGINE HANGERS AND GROUND STRAP
5. **2JZ-GTE:**
REMOVE CAMSHAFT POSITION SENSORS
6. **REMOVE EGR COOLER**



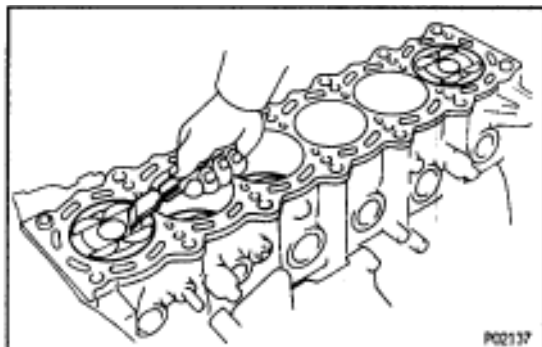
7. **REMOVE VALVE LIFTERS AND SHIMS**
HINT: Store the valve lifters and shims in correct order.



8. **REMOVE VALVES**
 - (a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202-70010
 - (b) Remove the spring retainer, valve spring, valve and spring seat.
HINT: Store the valves, valve springs, spring seats and spring retainers in correct order.

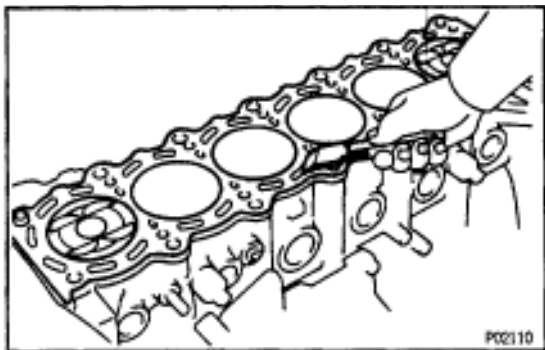


- (c) Using needle-nose pliers, remove the oil seal.



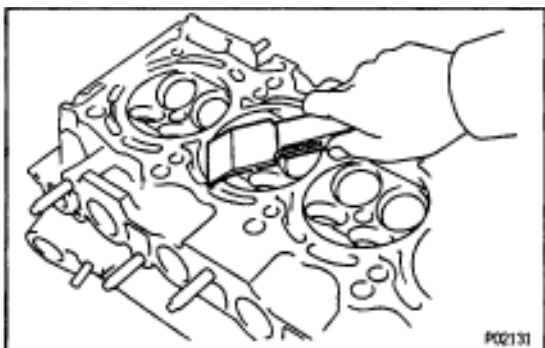
CYLINDER HEAD COMPONENTS INSPECTION AND REPAIR

1. **CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK**
 - (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



- (b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (c) Using compressed air, blow carbon and oil from the bolt holes.

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

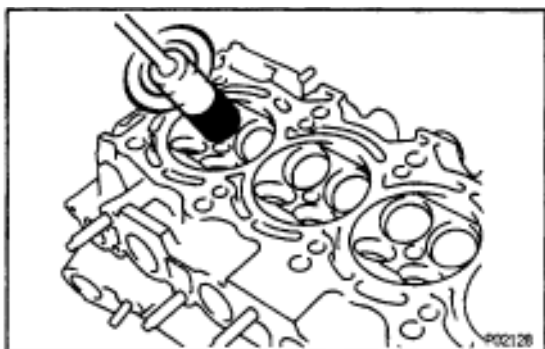


2. CLEAN CYLINDER HEAD

A. Remove gasket material

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

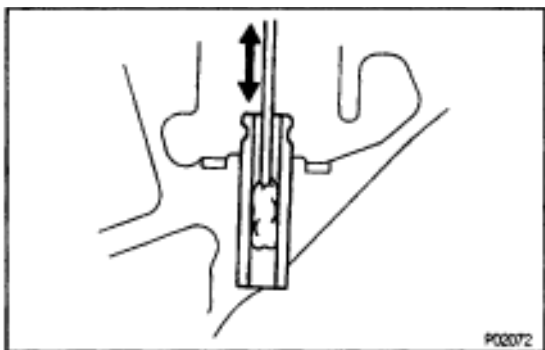
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

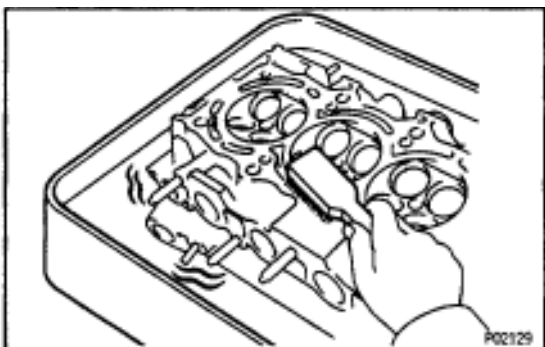
Using a wire brush, remove all the carbon from the combustion chambers.

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



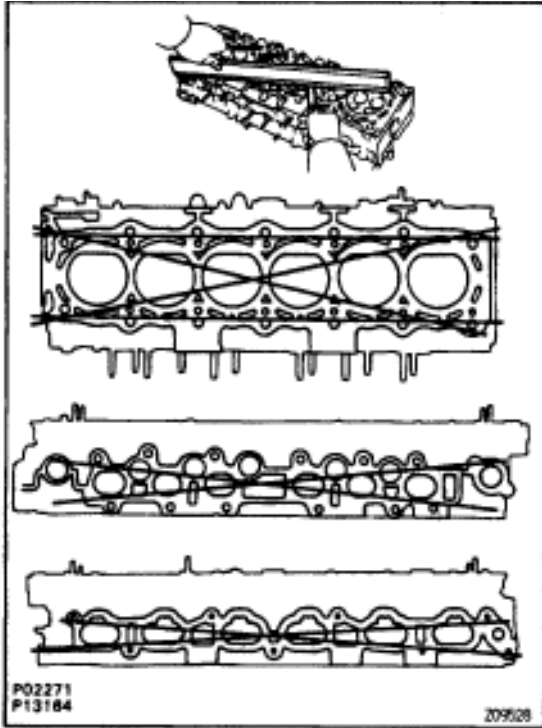
C. Clean valve guide bushings

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



D. Clean cylinder head

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



3. INSPECT CYLINDER HEAD

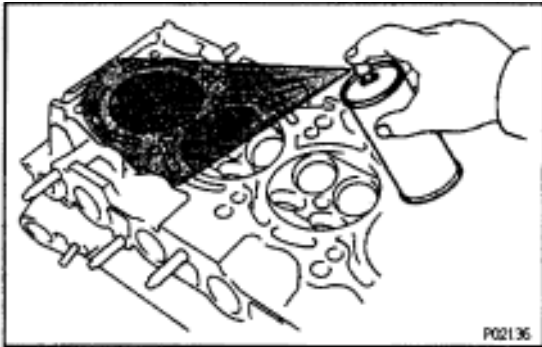
A. Inspect for flatness

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

Maximum warpage:

0.10 mm (0.0039 in.)

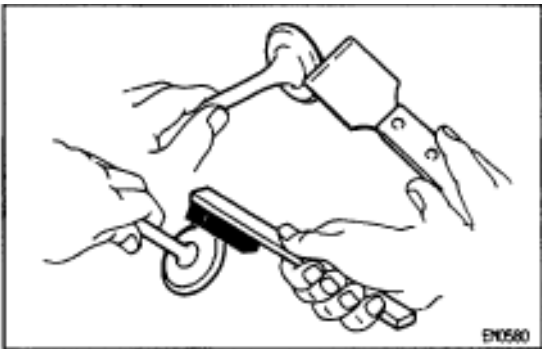
If warpage is greater than maximum, replace the cylinder head.



B. Inspect for cracks

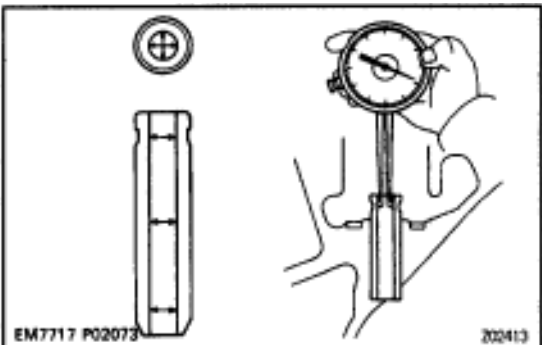
Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



4. CLEAN VALVES

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

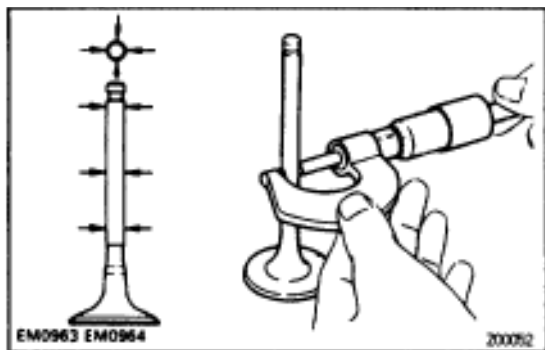


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Bushing inside diameter:

6.010–6.030 mm (0.2366–0.2374 in.)



- (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

.025–0.060 mm (0.0010–0.0024 in.)

Exhaust

.030–0.065 mm (0.0012–0.0026 in.)

Maximum oil clearance:

Intake

.08 mm (0.0031 in.)

Exhaust

.10 mm (0.0039 in.)

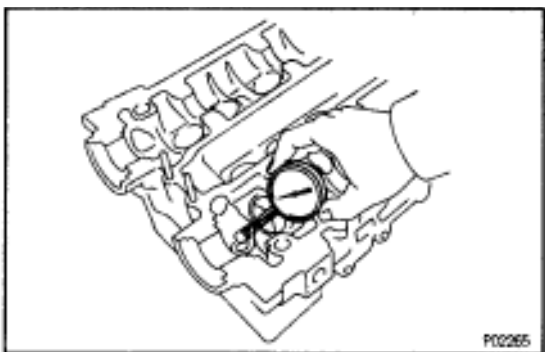
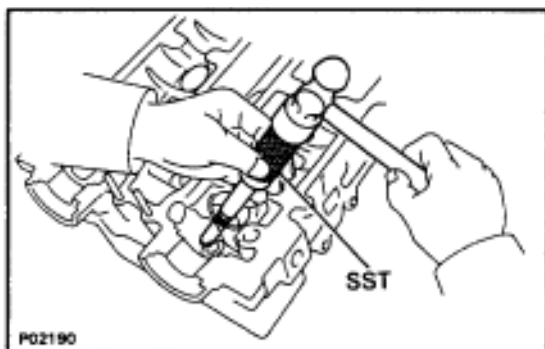
If the clearance is greater than maximum, replace the valve and guide bushing.

6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

- (a) Using SST and a hammer, tap out the guide bushing.

SST 09201–10000 (09201–01060).

09608–30022 (09608–05010)



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

Both intake and exhaust

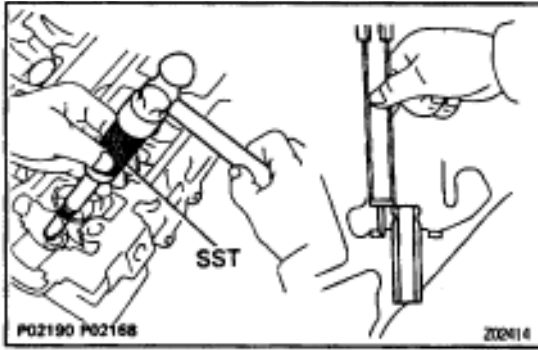
Bushing bore diameter mm (in.)	Bushing size
10.985–11.006 mm (0.4325–0.4333 in.)	Use STD
11.035–11.056 mm (0.4344–0.4353 in.)	Use O/S 0.05

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

If the bushing bore diameter of the cylinder head is greater than 11.006 mm (0.4333 in.), machine the bushing bore to the following dimension:

11.035–11.056 mm (0.4344–0.4353 in.)

If the bushing bore diameter of the cylinder head is greater than 11.056 mm (0.4353 in.), replace the cylinder head.



- (d) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.

SST 09201-10000 (09201-01060), 09608-30022
(09608-05010)

Protrusion height:

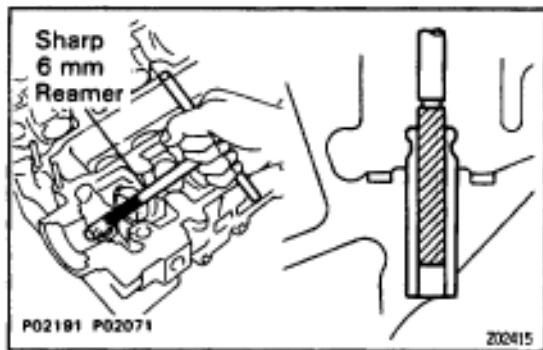
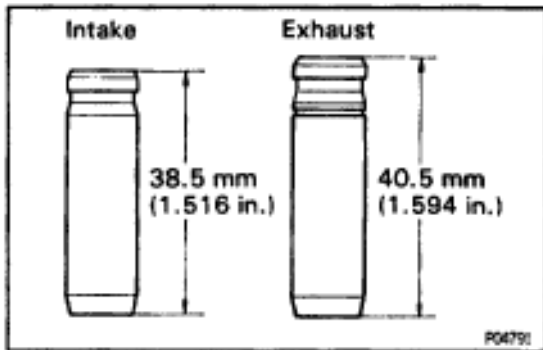
Intake

12.3–12.7 mm (0.484–0.500 in.)

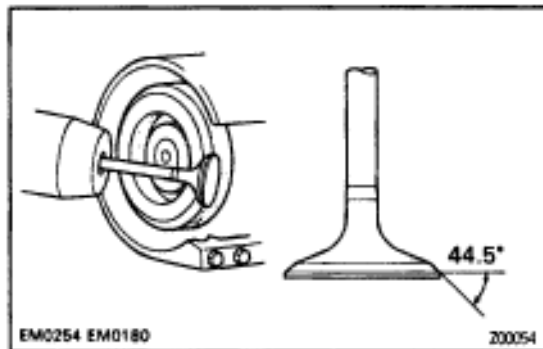
Exhaust

11.4–11.8 mm (0.449–0.465 in.)

HINT: Different bushings are used for the intake and exhaust.



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

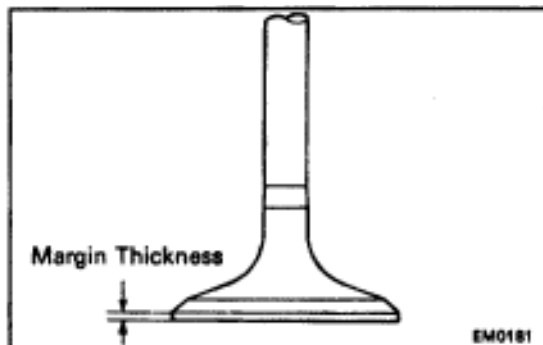


7. INSPECT AND GRIND VALVES

- (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.

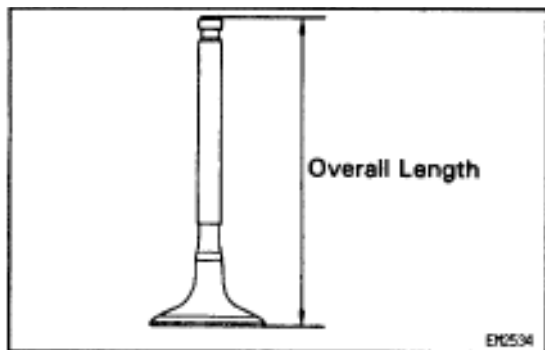
Standard margin thickness:

0.8–1.2 mm (0.031–0.047 in.)

Minimum margin thickness:

0.5 mm (0.020 in.)

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



- (d) Check the valve overall length.

Standard overall length:

Intake

98.29–98.79 mm (3.8697–3.8894 in.)

Exhaust

98.84–99.34 mm (3.8913–3.9110 in.)

Minimum overall length:

Intake

98.19 mm (3.8657 in.)

Exhaust

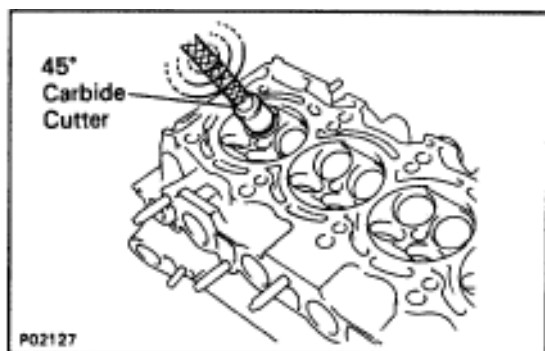
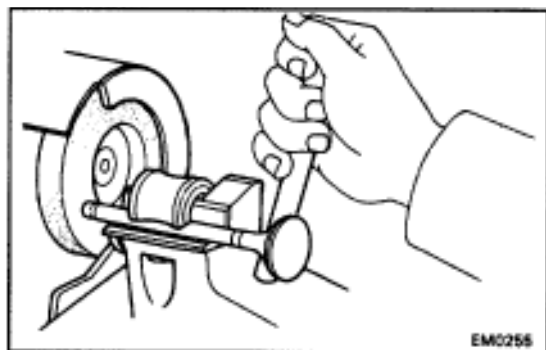
98.74 mm (3.8874 in.)

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

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

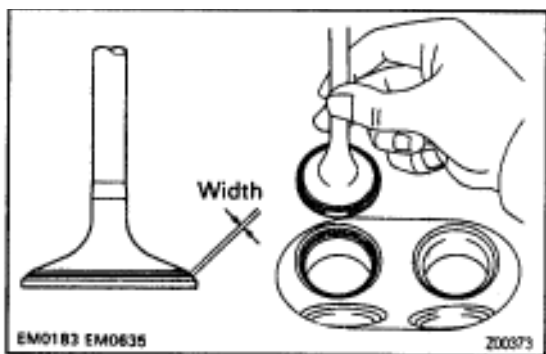
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than the minimum overall length.



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 the following width:

Intake

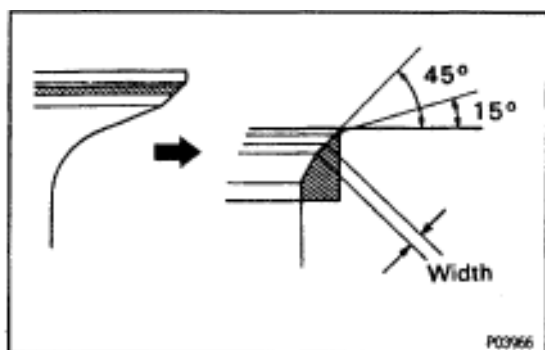
1.0–1.4 mm (0.039–0.055 in.)

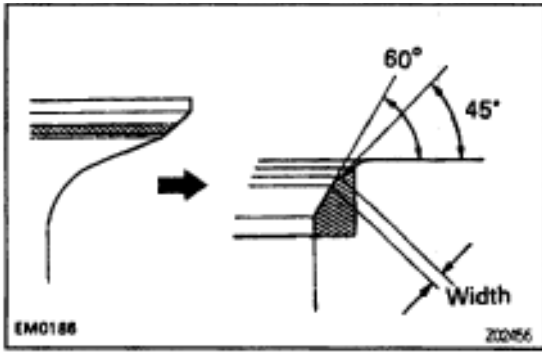
Exhaust

1.2–1.6 mm (0.047–0.063 in.)

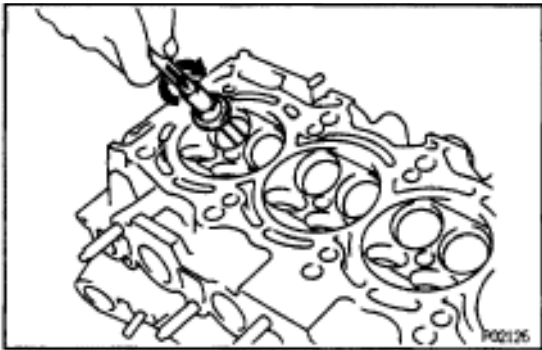
If not, correct the valve seats as follows:

- If the seating is too high on the valve face, use 15° and 45° cutters to correct the seat.

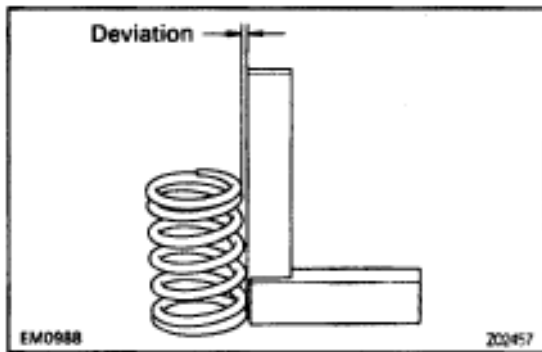




- If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



- Hand-lap the valve and valve seat with an abrasive compound.
- After hand-lapping, clean the valve and valve seat.



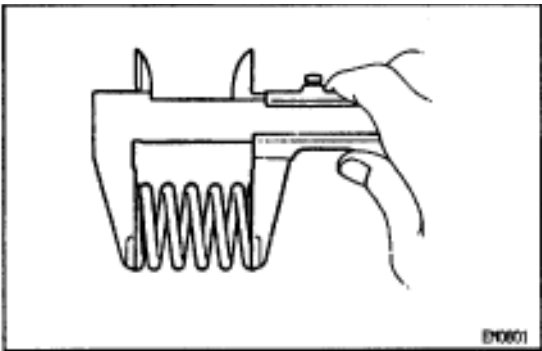
9. INSPECT VALVE SPRINGS

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

Maximum deviation:

2.0 mm (0.079 in.)

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



- Using vernier calipers, measure the free length of the valve spring.

Free length:

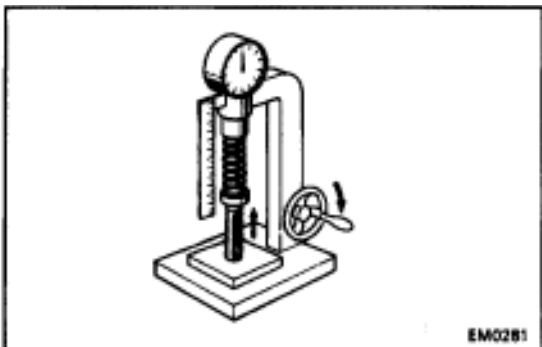
Blue painted mark

41.74 mm (1.6433 in.)

Yellow painted mark

41.70 mm (1.6417 in.)

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

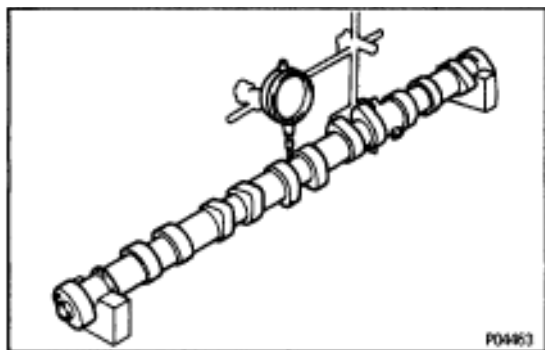


- Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

186–206 N (19.0–21.0 kgf, 42–46 lbf) at 34.5 mm (1.358 in.)

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



10. INSPECT CAMSHAFTS AND BEARINGS

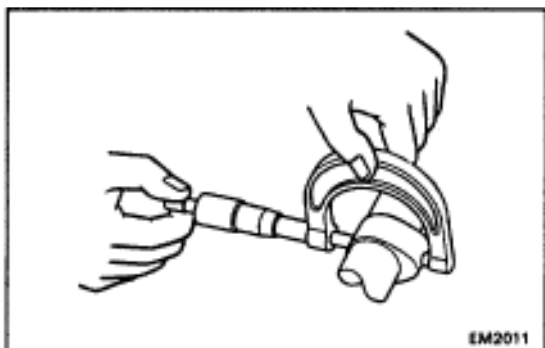
A. Inspect camshaft for runout

- Place the camshaft on V-blocks.
- Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.08 mm (0.0031 in.)

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



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake

44.570–44.670 mm (1.7547–1.7587 in.)

Exhaust

44.770–44.870 mm (1.7626–1.7665 in.)

Maximum cam lobe height:

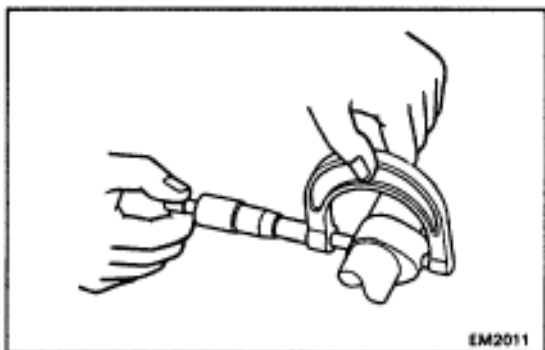
Intake

44.42 mm (1.7488 in.)

Exhaust

44.62 mm (1.7567 in.)

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



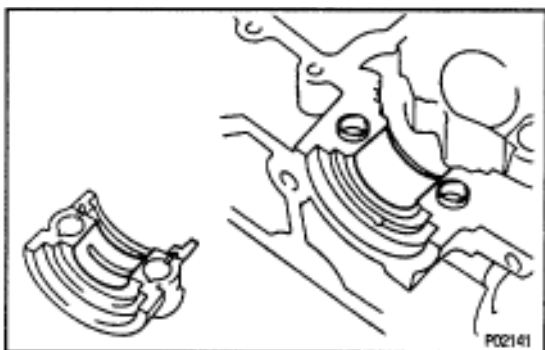
C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter:

28.949–28.965 mm (1.1397–1.1404 in.)

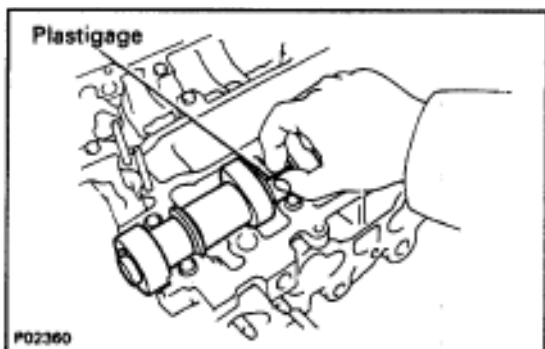
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

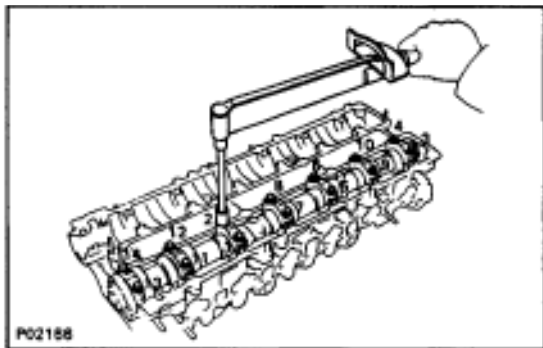
Check the bearings for flaking and scoring.

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

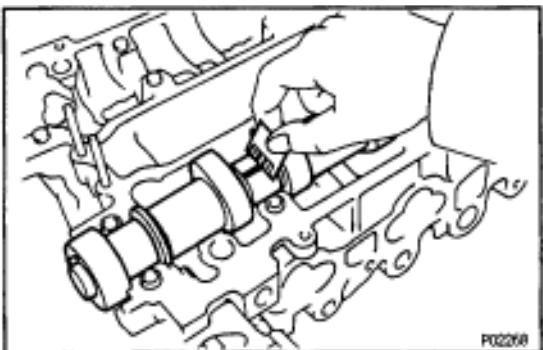


E. Inspect camshaft journal oil clearance

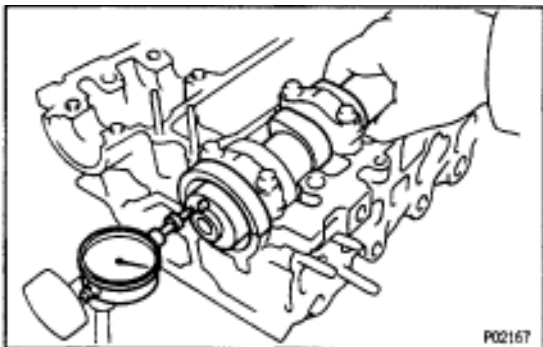
- Clean the bearing caps and camshaft journals.
- Place the camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journals.



- (d) Install the bearing caps.
(See step 2 in cylinder head installation (2JZ-GE))
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
NOTICE: Do not turn the camshaft.
- (e) Remove the bearing caps.



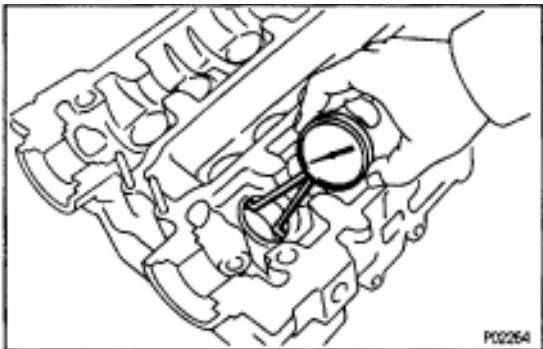
- (f) Measure the Plastigage at its widest point.
Standard oil clearance:
0.035–0.072 mm (0.0014–0.0028 in.)
Maximum oil clearance:
0.10 mm (0.0039 in.)
If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.
- (g) Completely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



F. Inspect camshaft thrust clearance

- (a) Install the camshafts.
(See step 2 in cylinder head installation (2JZ-GE))
- (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.080–0.190 mm (0.0031–0.0075 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

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



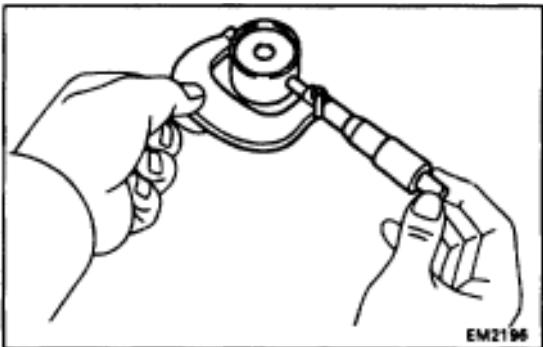
11. INSPECT VALVE LIFTERS AND LIFTER BORES

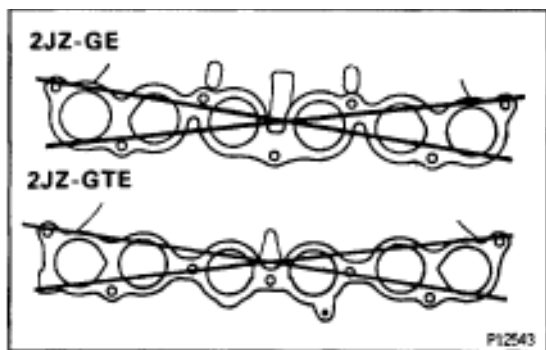
- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000–31.016 mm (1.2205–1.2211 in.)
- (b) Using a micrometer, measure the lifter diameter.

Lifter diameter:
30.966–30.976 mm (1.2191–1.2195 in.)

- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024–0.050 mm (0.0009–0.0020 in.)
Maximum oil clearance:
0.07 mm (0.0028 in.)

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



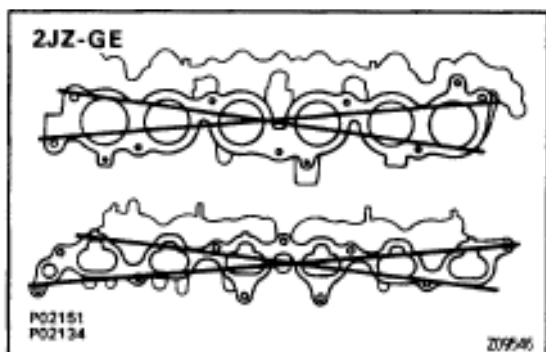
**12. INSPECT AIR INTAKE CHAMBER**

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

Maximum warpage:

0.15 mm (0.0059 in.)

If warpage is greater than maximum, replace the chamber.

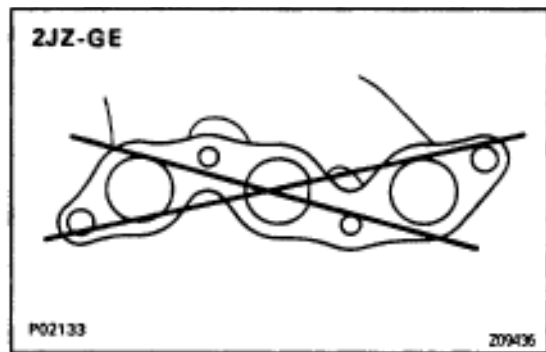
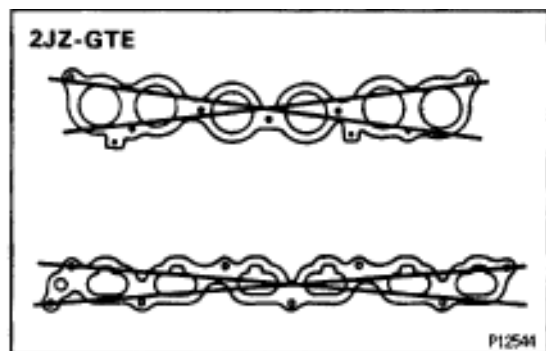
**13. INSPECT INTAKE MANIFOLD**

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

Maximum warpage:

0.15 mm (0.0059 in.)

If warpage is greater than maximum, replace the manifold.

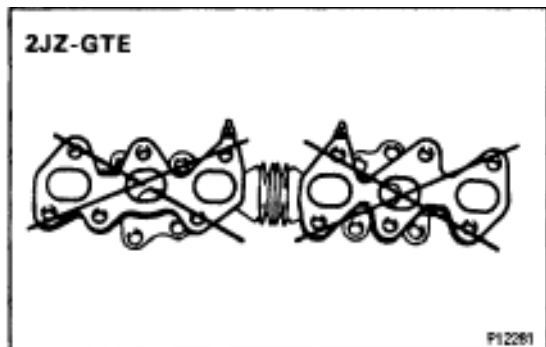
**14. 2JZ-GE:****INSPECT EXHAUST MANIFOLDS**

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

Maximum warpage:

0.50 mm (0.0196 in.)

If warpage is greater than maximum, replace the manifold.

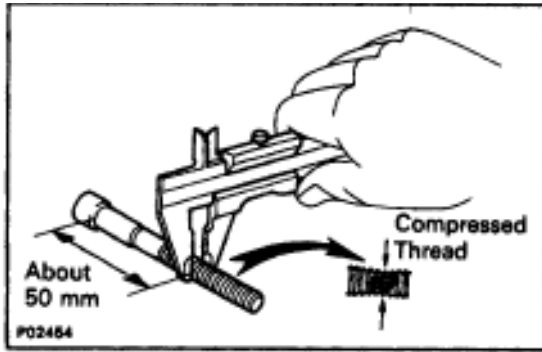
**15. 2JZ-GTE:****INSPECT EXHAUST MANIFOLD**

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

Maximum warpage:

0.80 mm (0.0315 in.)

If warpage is greater than maximum, replace the manifold.



16. INSPECT CYLINDER HEAD BOLTS

Using a vernier caliper, measure the thread outside diameter of the bolt.

Standard outside diameter:

10.8–11.0 mm (0.425–0.433 in.)

Minimum outside diameter:

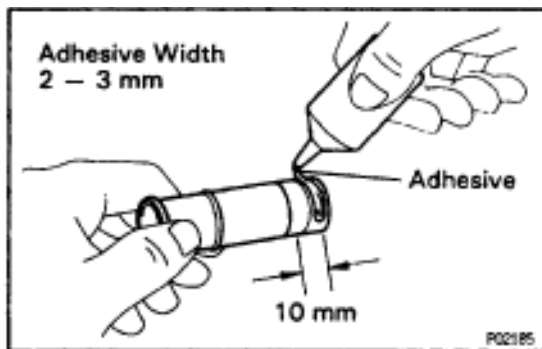
10.7 mm (0.421 in.)

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

CYLINDER HEAD ASSEMBLY

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.



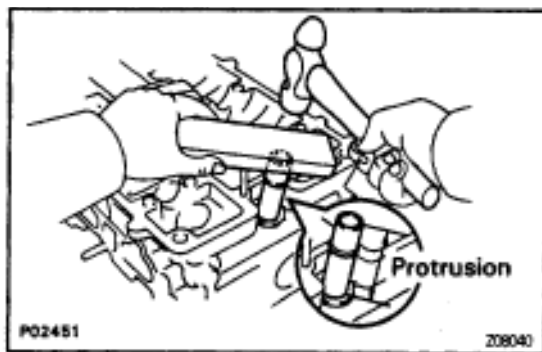
1. INSTALL HEATER UNION

HINT: When using a new cylinder head, a new heater union must be installed.

- (a) Apply adhesive to the end of the heater union as shown in the illustration.

Adhesive:

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



- (b) Using a wooden block and hammer, tap in a new heater union, leaving standard position protruding from the cylinder head.

Standard protrusion:

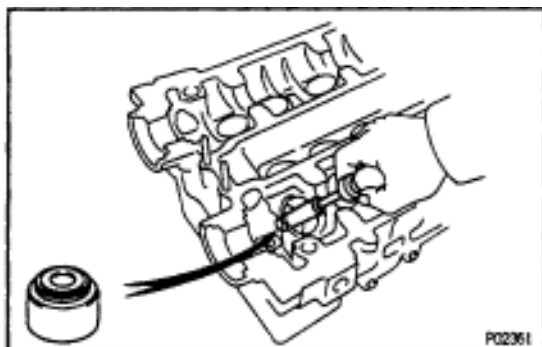
2JZ-GE

48 mm (1.89 in.)

2JZ-GTE

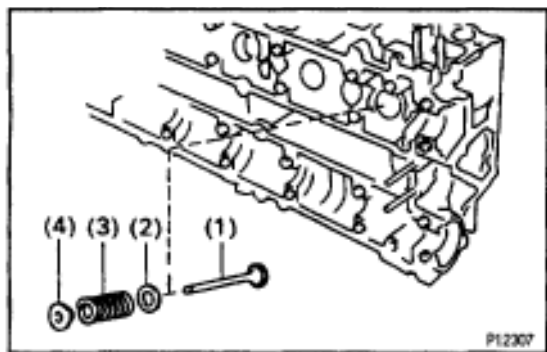
73 mm (2.87 in.)

NOTICE: Do not tap it in too far.

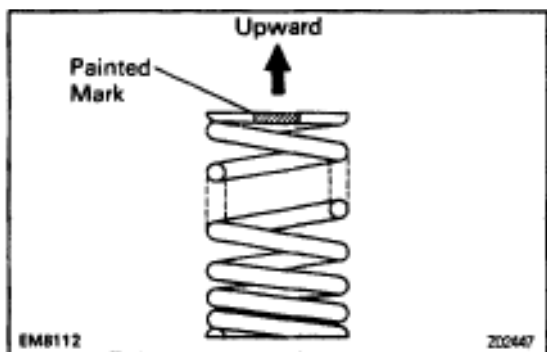


2. INSTALL VALVES

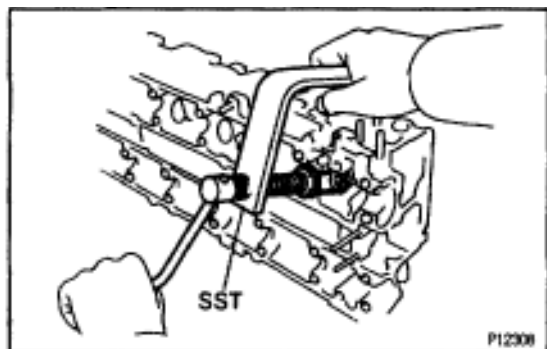
- (a) Install a new oil seal on the valve guide bushing.



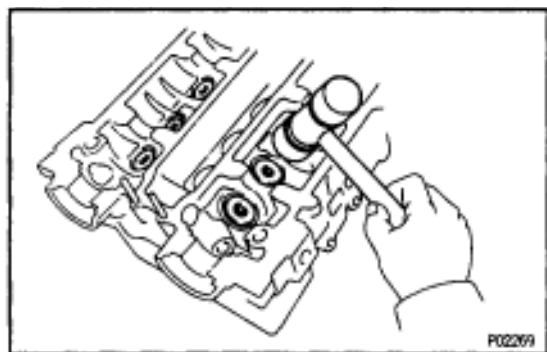
- (b) Install these parts:
- (1) Valve
 - (2) Spring seat
 - (3) Valve spring
 - (4) Spring retainer



HINT: Install the valve spring, facing the painted mark upward.



- (c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202-70010



- (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 EGR COOLER

Install a new gasket and the EGR cooler with the 8 bolts.
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)

5. 2JZ-GE:

INSTALL ECT SENSOR AND SENDER GAUGE

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

6. 2JZ-GE:

INSTALL GROUND STRAP AND THROTTLE CABLE BRACKET

7. 2JZ-GE:

INSTALL ENGINE HANGERS

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

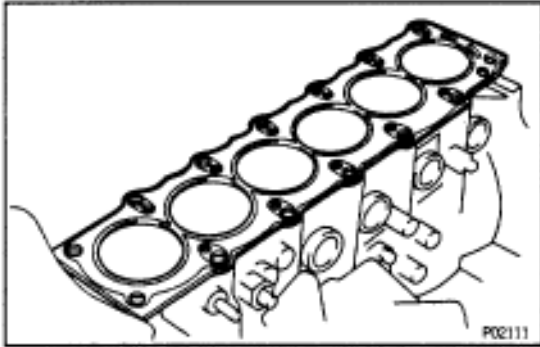
8. 2JZ-GTE:**INSTALL CAMSHAFT POSITION SENSORS**

Install the gasket and sensor with the 2 bolts.

Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)

9. 2JZ-GTE:**INSTALL ENGINE HANGERS AND GROUND STRAP**

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



CYLINDER HEAD INSTALLATION (2JZ-GE)

1. INSTALL CYLINDER HEAD**A. Place cylinder head on cylinder block**

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

NOTICE: Be sure to install it correctly.

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

B. Install cylinder head bolts

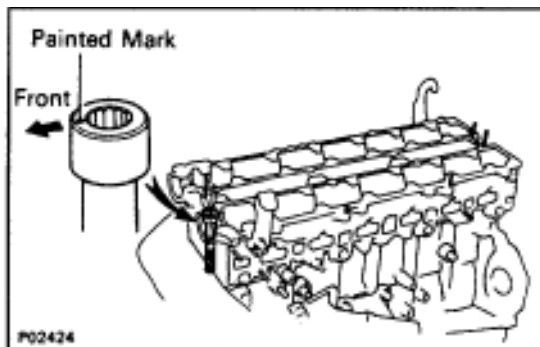
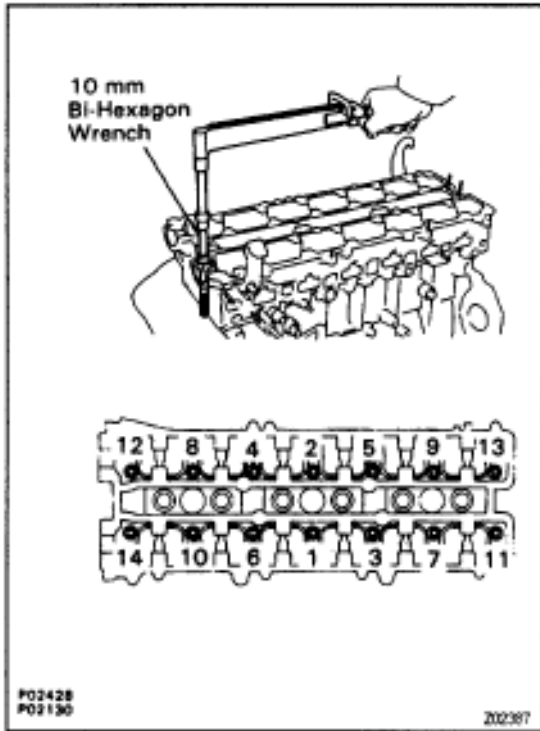
HINT:

- The cylinder head bolts are tightened in 2 progressive steps (steps (c) and (f)).
- If any of bolts break or deform, replace them.

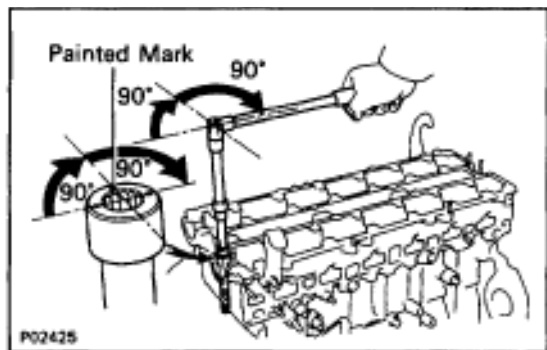
- (a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (b) Install the 14 plate washers to each cylinder head bolt.
- (c) Using a 10 mm bi-hexagon wrench, uniformly tighten the cylinder head bolts, in several passes, in the sequence shown.

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

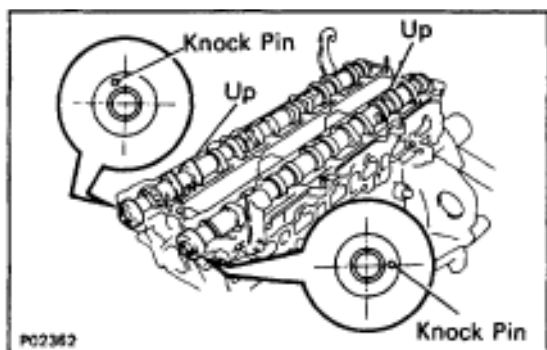
If any of the bolts do not meet the torque specification, replace the bolt.



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

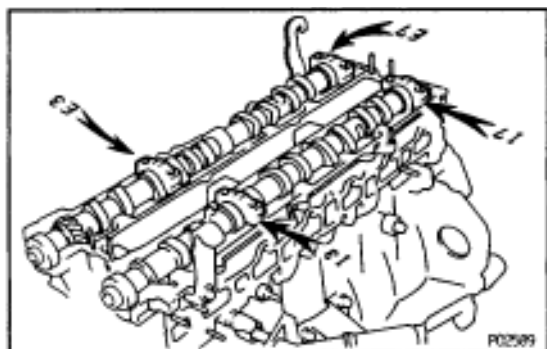


- (e) Retighten the cylinder head bolts by 90° in the numerical order shown in the illustration on previous page.
- (f) Retighten cylinder head bolts by an additional 90° shown in the illustration on previous page.
- (g) Check that the painted mark is now turned to the rear.

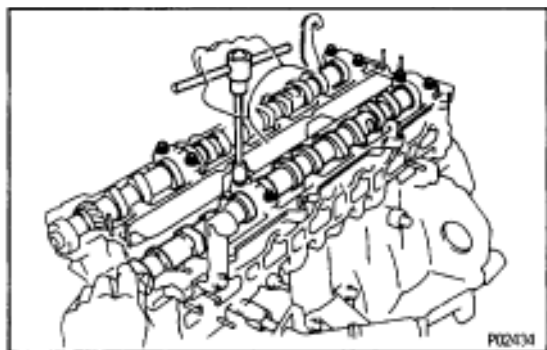


2. INSTALL CAMSHAFTS

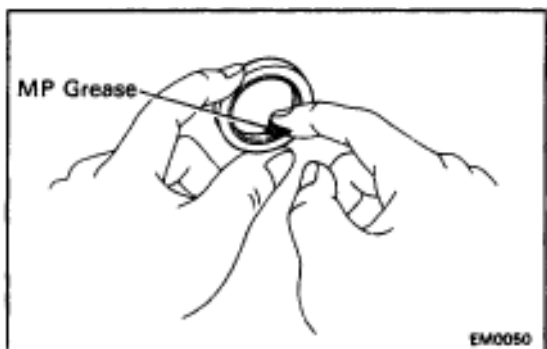
- (a) Apply engine oil to the thrust portion of the camshaft.
- (b) Place the camshaft on the cylinder head with the cam lobe facing up as shown.



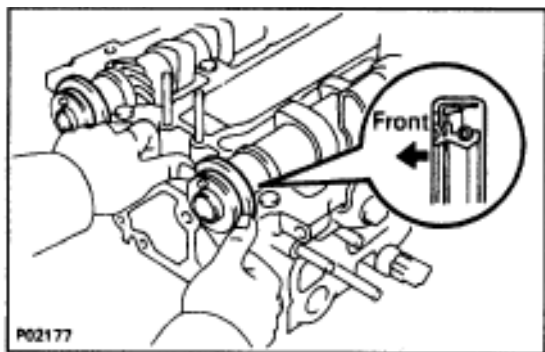
- (c) Place the No.3 and No.7 bearing caps in their proper location.



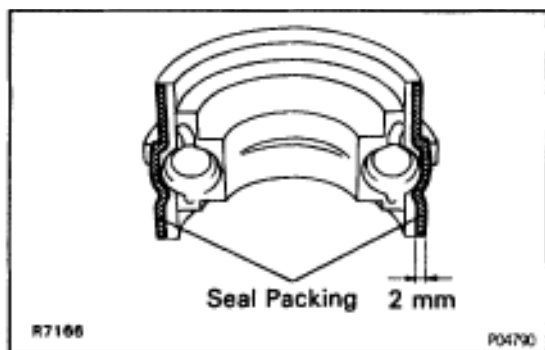
- (d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
- (e) Temporarily tighten these bearing cap bolts uniformly and alternately, in several passes, until the bearing caps are snug with the cylinder head.



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



- (g) Install the 2 oil seals to the camshafts.

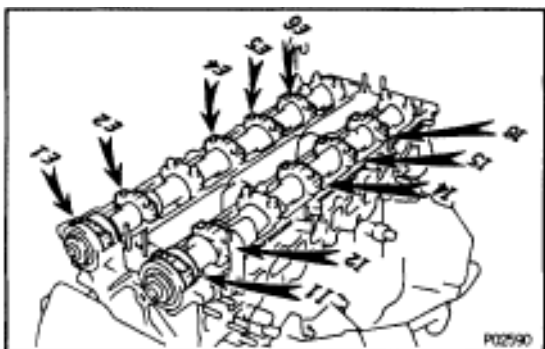


- (h) Clean the installed surfaces of the No.1 bearing cap and cylinder head with cleaner.

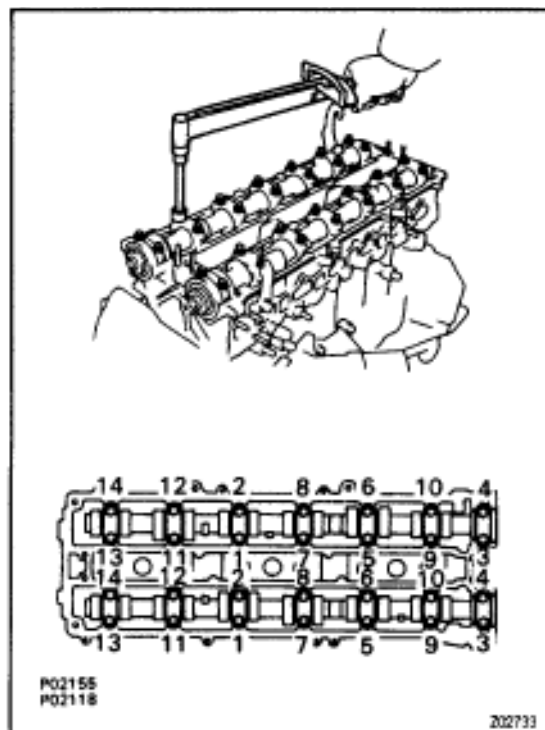
- (i) Apply seal packing to the No.1 bearing cap as shown.

Seal packing:

Part No. 08826-00080 or equivalent



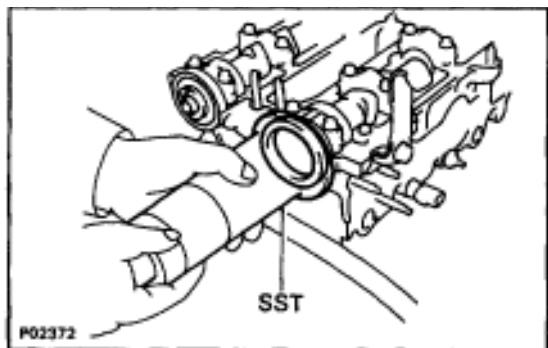
- (j) Install the No.1, No.2, No.4, No.5 and No.6 bearing caps in their proper locations.



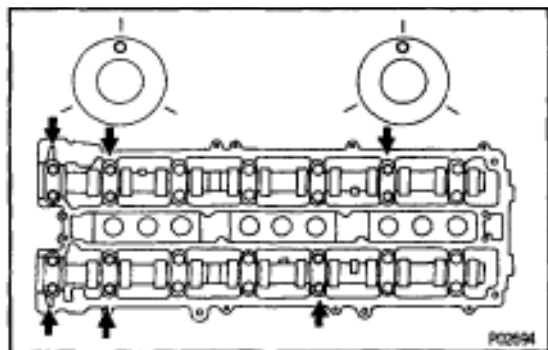
- (k) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

- (l) Install and uniformly tighten the 14 bearing cap bolts on one side, in several passes, in the sequence shown.

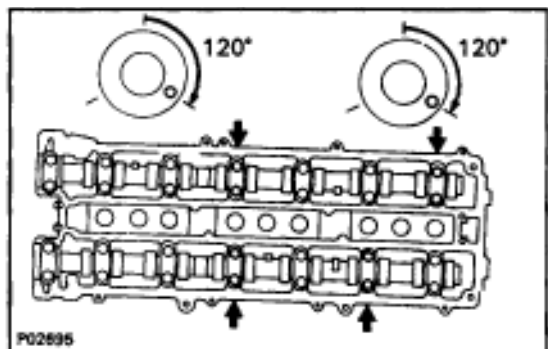
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



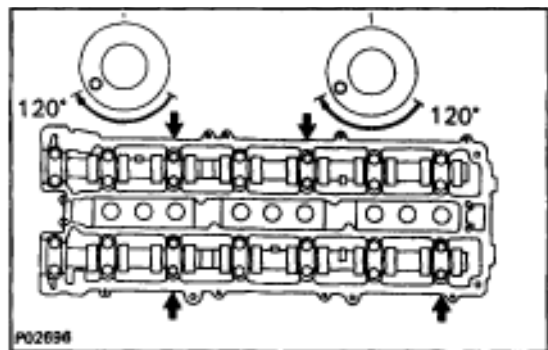
- (m) Using SST, push the 2 oil seals in as far as they can go.
SST 09316-60010 (09316-00010, 09316-00050)



- (n) Rotate the camshaft with a wrench at the hexagon position, bring the forward straight pin up.
(o) Loosen the 3 bearing cap bolts as shown, until they can be turned by hand; retighten, in several passes.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



- (p) Turn the camshaft 1/3 of revolution.
(q) Loosen the 2 bearing cap bolts as shown, until they can be turned by hand; retighten, in several passes.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

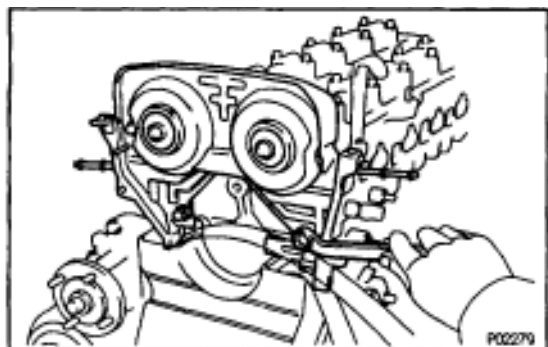


- (r) Turn the camshaft a further 1/3 of a revolution.
(s) Loosen the 2 bearing cap bolts as shown, until they can be turned by hand; retighten, in several passes.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

3. CHECK AND ADJUST VALVE CLEARANCE

(See steps 5 to 6 in valve clearance inspection and adjustment)

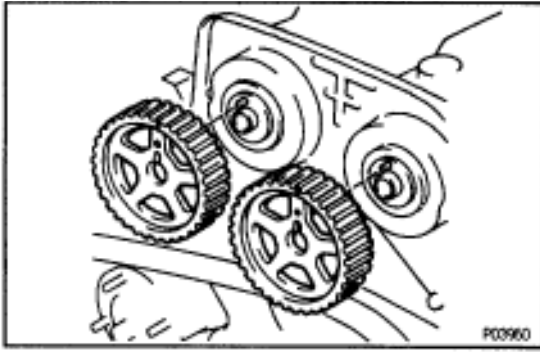
Turn the camshaft, and position the cam lobe upward, check and adjust the valve clearance.



4. INSTALL NO.4 TIMING BELT COVER

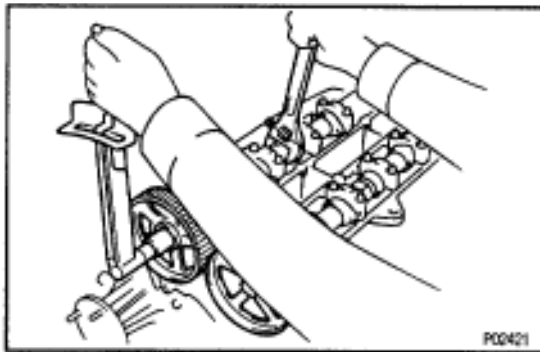
Install the timing belt cover with 4 bolts.

Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)



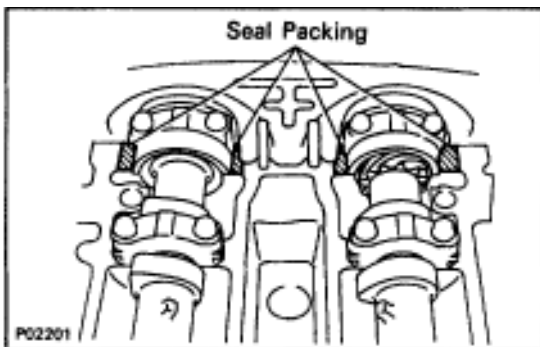
5. INSTALL CAMSHAFT TIMING PULLEYS

- (a) Align the camshaft knock pin with the groove in the pulley, and slide on the pulley.
- (b) Temporarily install the timing pulley bolt.



- (c) Hold the hexagon portion of the camshaft with a wrench, and tighten the timing pulley bolt.

Torque: 79 N·m (810 kgf·cm, 59 ft·lbf)



6. INSTALL NO.3, NO.1 AND NO.2 CYLINDER HEAD COVERS

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

- (c) Install the gaskets to the No.1 and No.2 cylinder head covers.
- (d) Install the No.2 cylinder head cover with the 4 bolts.

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

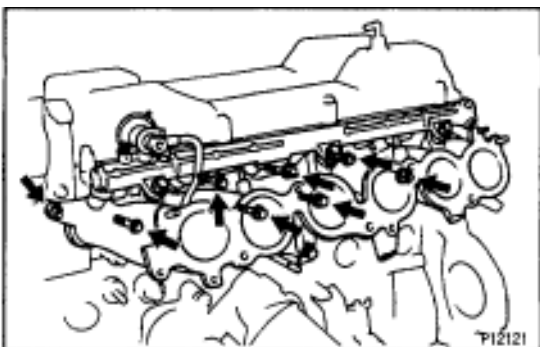
- (e) Install the No.1 cylinder head cover with the 4 bolts.

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

- (f) Install the No.3 cylinder head cover with the 4 bolts and 4 nuts.

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

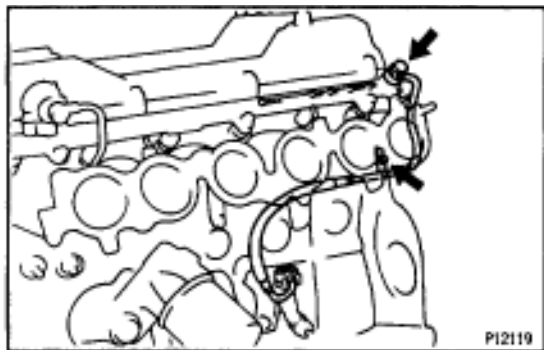
- (g) Install the PCV valve.



7. INSTALL INTAKE MANIFOLD AND DELIVERY PIPE ASSEMBLY

Install a new gasket, the intake manifold and delivery pipe assembly with the 6 bolts and 2 nuts.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

**8. INSTALL FUEL INLET PIPE**

- (a) Connect the fuel inlet pipe with 2 new gaskets and the union bolt.

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

- (b) Install the clamp bolt to the intake manifold.

9. INSTALL FUEL PRESSURE PULSATION DAMPER

(See fuel pressure pulsation damper installation in SFI System)

10. INSTALL INTAKE MANIFOLD STAY

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

11. INSTALL WATER OUTLET AND NO.1 BYPASS HOSE ASSEMBLY**12. CONNECT ENGINE WIRE**

- (a) Install the engine wire protector to the intake manifold with the 3 nuts.

- (b) Connect these connectors:

- 6 injector connectors

HINT: The No.1, No.3 and No.5 injector connectors are dark gray, and the No.2, No.4 and No.6 injector connectors are gray.

- ECT sensor connector
- ECT sender gauge connector

- (c) Install the 2 wire clamps to the intake manifold with the bolts.

- (d) Install the 2 ground straps to the intake manifold with the bolts.

- (e) Install the engine wire bracket to the water pump with the bolt.

13. INSTALL VACUUM CONTROL VALVE SET

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

14. INSTALL AIR INTAKE CHAMBER

- (a) Install a new gasket and the intake chamber with the 5 bolts and nut.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

- (b) Install the bolt holding the engine wire protector to the air intake chamber.

- (c) Except California:

Connect the vacuum sensing hose to the fuel pressure regulator.

15. INSTALL STARTER

(See starter removal in Starting System)

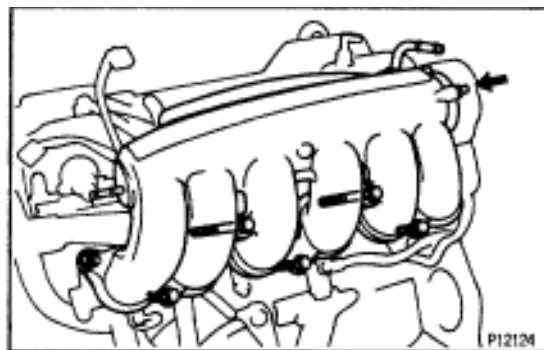
16. INSTALL OIL DIPSTICK GUIDES FOR ENGINE AND TRANSMISSION

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

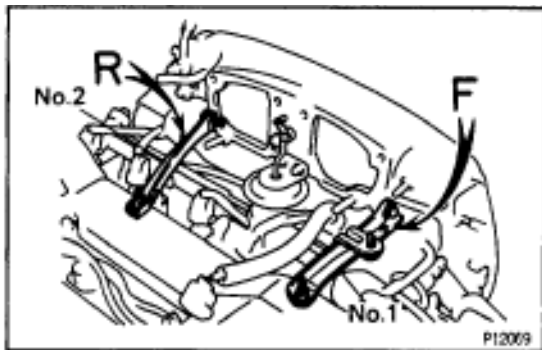
- (b) Apply soapy water to the O-ring.

- (c) Connect the dipstick guide end to the oil pan.

- (d) Install the 2 dipstick guides with the 2 bolts.

17. INSTALL ENGINE WIRE BRACKET**18. CONNECT FUEL RETURN HOSE**

19. **INSTALL WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE**
(See step 3 in water pump installation in Cooling System)
20. **INSTALL TIMING BELT**
(See steps 11 to 17 in timing belt removal)
21. **INSTALL SPARK PLUGS**
22. **INSTALL DISTRIBUTOR AND CORDS ASSEMBLY**
(See steps 2, 3 and 5 in distributor installation in Ignition System)
23. **CONNECT HIGH-TENSION CORDS TO CYLINDER HEAD COVERS**
(See step 1 in high-tension cords and cord clamps installation in Ignition System)
24. **INSTALL NO.3 TIMING BELT COVER**
25. **INSTALL CYLINDER HEAD REAR COVER**
26. **INSTALL NO.2 VACUUM PIPE AND VSV ASSEMBLY**



27. **INSTALL AIR INTAKE CHAMBER STAYS**
HINT: The No.1 stay is marked with "F", and No.2 stay is marked with "R".

- (a) Install the No.1 stay with the bolt and nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
- (a) Install the No.2 stay with the bolt and nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

28. **INSTALL THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY**
(See in injector removal in SFI System)

29. **CONNECT EVAP HOSE**

30. **CONNECT BRAKE BOOSTER VACUUM HOSE**

31. **INSTALL PS PUMP**

- (a) Install the pump rear stay with the 2 bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
- (b) Install the pump housing with the 2 bolts.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)
- (c) Connect these hoses:
 - Air hose to No.4 timing belt cover
 - Air hose to air intake chamber

32. **INSTALL EXHAUST MANIFOLDS**

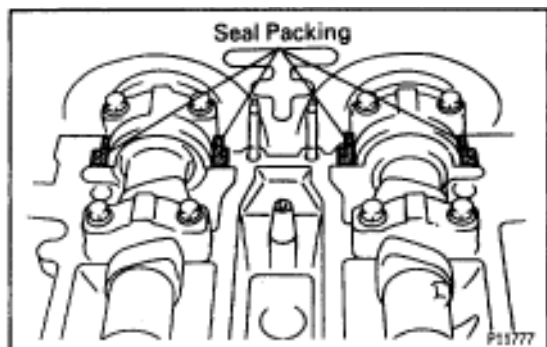
- (a) Install a new gasket and the exhaust manifold with 4 new nuts. Install the No.1 and No.2 exhaust manifolds.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
- (b) Connect the 2 (main heated) oxygen sensor connectors.
- (c) Except California:
Install the manifold heat insulator with the 4 nuts.



33. **INSTALL NO.2 FRONT EXHAUST PIPE**
(See step 6 in engine installation in Engine Mechanical)
34. **INSTALL DRIVE BELT**
35. **INSTALL AIR CLEANER, VAF METER AND INTAKE AIR CONNECTOR PIPE ASSEMBLY**
(See step 22 in engine installation in Engine Mechanical)
36. **INSTALL AIR CLEANER DUCT**
37. **FILL WITH ENGINE COOLANT**
38. **START ENGINE AND CHECK FOR LEAKS**
39. **CHECK IGNITION TIMING**
(See steps 8 to 12 in distributor installation in Ignition System)
40. **INSTALL ENGINE UNDER COVER**
41. **PERFORM ROAD TEST**
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
42. **RECHECK ENGINE COOLANT LEVEL**

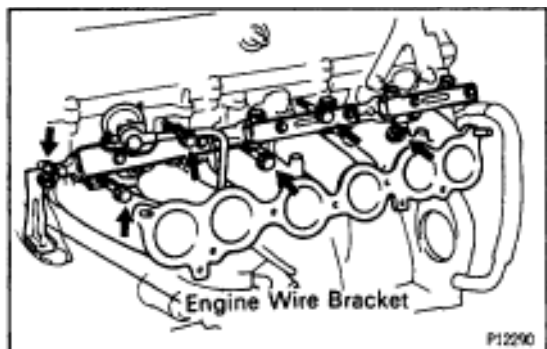
CYLINDER HEAD INSTALLATION (2JZ-GTE)

1. **INSTALL CYLINDER HEAD**
(See step 1 in cylinder head installation (2JZ-GE))
2. **INSTALL CAMSHAFTS**
(See step 2 ((a) to (m)) in cylinder head installation (2JZ-GE))
3. **CHECK AND ADJUST VALVE CLEARANCE**
(See steps 5 to 6 in valve clearance inspection and adjustment)
Turn the camshaft, and position the cam lobe upward, check and adjust the valve clearance.
4. **INSTALL NO.4 TIMING BELT COVER**
(See step 4 in cylinder head installation (2JZ-GE))
5. **INSTALL CAMSHAFT TIMING PULLEYS**
(See step 5 in cylinder head installation (2JZ-GE))



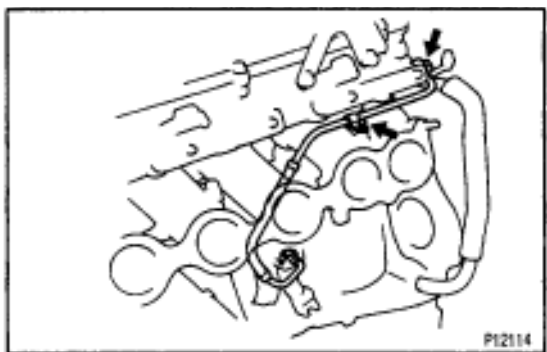
6. **INSTALL NO.1 AND NO.2 CYLINDER HEAD COVERS**
 - (a) Remove any old packing (FIPG) material.
 - (b) Apply seal packing to the cylinder head as shown in the illustration.
Seal packing:
Part No. 08826-00080 or equivalent
 - (c) Install the gaskets to the No.1 and No.2 cylinder head covers.

- (d) Install the seal washers to the mounting bolts.
 - (e) Install the No.2 cylinder head cover with the 4 seal washers and 4 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)
 - (f) Install the No.1 cylinder head cover with the 4 seal washers and 4 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)
 - (g) Install the PCV valve.
 - (h) Install the cruise control actuator cable bracket and IAC valve pipe clamp with the 2 bolts.
- 7. **INSTALL SPARK PLUGS**
 - 8. **INSTALL IGNITION COILS ASSEMBLIES**
(See ignition coils installation in Ignition System)
 - 9. **INSTALL TIMING BELT**
(See steps 11 to 17 in timing belt installation)



10. **INSTALL INTAKE MANIFOLD AND DELIVERY PIPE ASSEMBLY**

Install a new gasket, the intake manifold, delivery pipe assembly and engine wire bracket with the 4 bolts and 2 nuts.
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)



11. **INSTALL FUEL INLET PIPE**

- (a) Connect the fuel inlet pipe with 2 new gaskets and the union bolt.

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

- (b) Install the clamp bolt to the intake manifold.

12. **INSTALL FUEL PRESSURE PULSATION DAMPER**
(See fuel pressure pulsation damper installation in SFI System)

13. **INSTALL PRESSURE TANK AND VSV ASSEMBLY**

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

14. **INSTALL STATER**

(See starter installation in Starting System)

15. **CONNECT ENGINE WIRE**

- (a) Install the engine wire protector to the intake manifold with the nut.
- (b) Install the 2 ground straps to the intake manifold with the bolts.
- (c) Connect these connectors and clamps:
 - VSV connector to EVAP

- 6 injector connectors

HINT: The No.1, No.3 and No.5 injector connectors are dark gray, and the No.2, No.4 and No.6 injector connectors are gray.

- 2 camshaft position sensor connectors
- 3 engine wire clamps to injector holders

16. INSTALL AIR INTAKE CHAMBER ASSEMBLY

(See injector installation in SFI System)

17. CONNECT FUEL RETURN HOSE

18. INSTALL PS PUMP

Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

19. INSTALL WATER OUTLET AND NO.1 WATER BYPASS PIPE

- Install 2 new O-rings to the No.1 water bypass pipe.
- Apply soapy water to the O-rings.
- Install the No.1 water bypass pipe to the water pump.
- Install a new gasket and the water outlet with the 2 bolts.

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

- Connect the ECT sensor and sender gauge connectors.
- Connect the upper radiator hose to the water outlet.

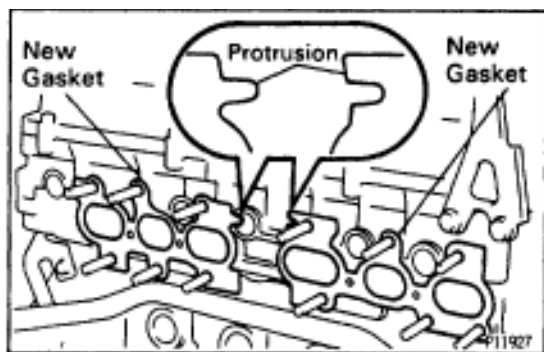
20. INSTALL DRIVE BELT

Install the drive belt by turning the drive belt tensioner clockwise.

21. M/T:

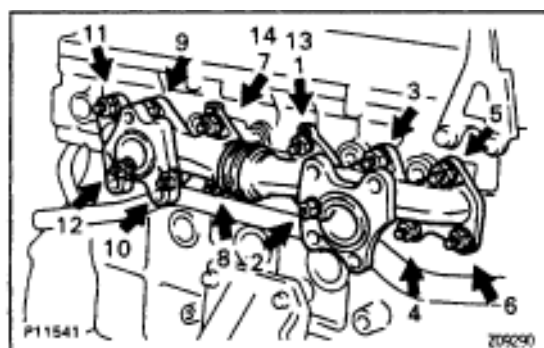
INSTALL DRIVE BELT TENSIONER DAMPER

(See step 19 in timing belt installation)



22. INSTALL EXHAUST MANIFOLD

- Place 2 new gaskets to the cylinder head facing the protrusion as shown.



- Install the exhaust manifold with 12 new nuts, in several passes, in the sequence shown.

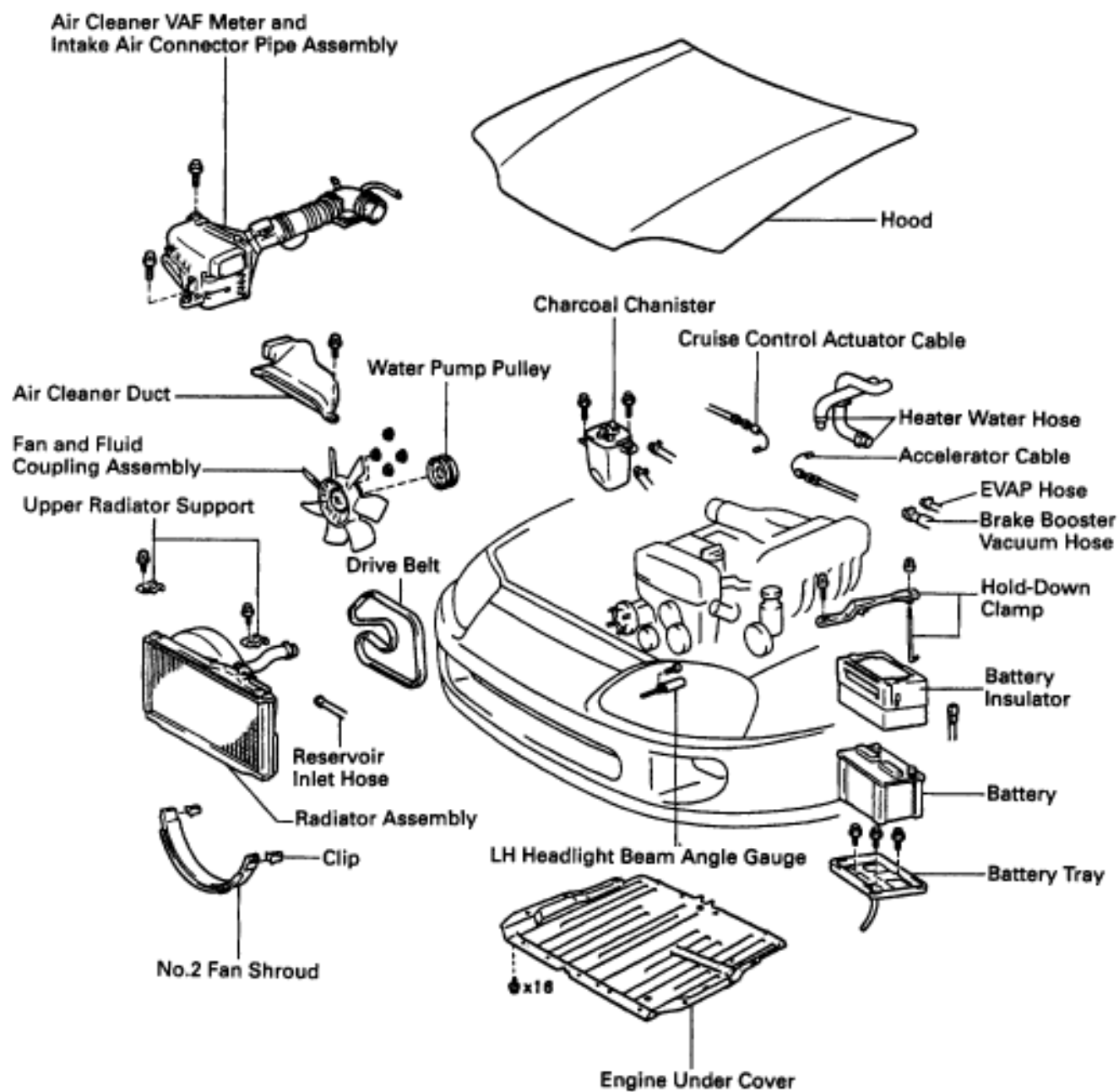
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

23. INSTALL TURBOCHARGER

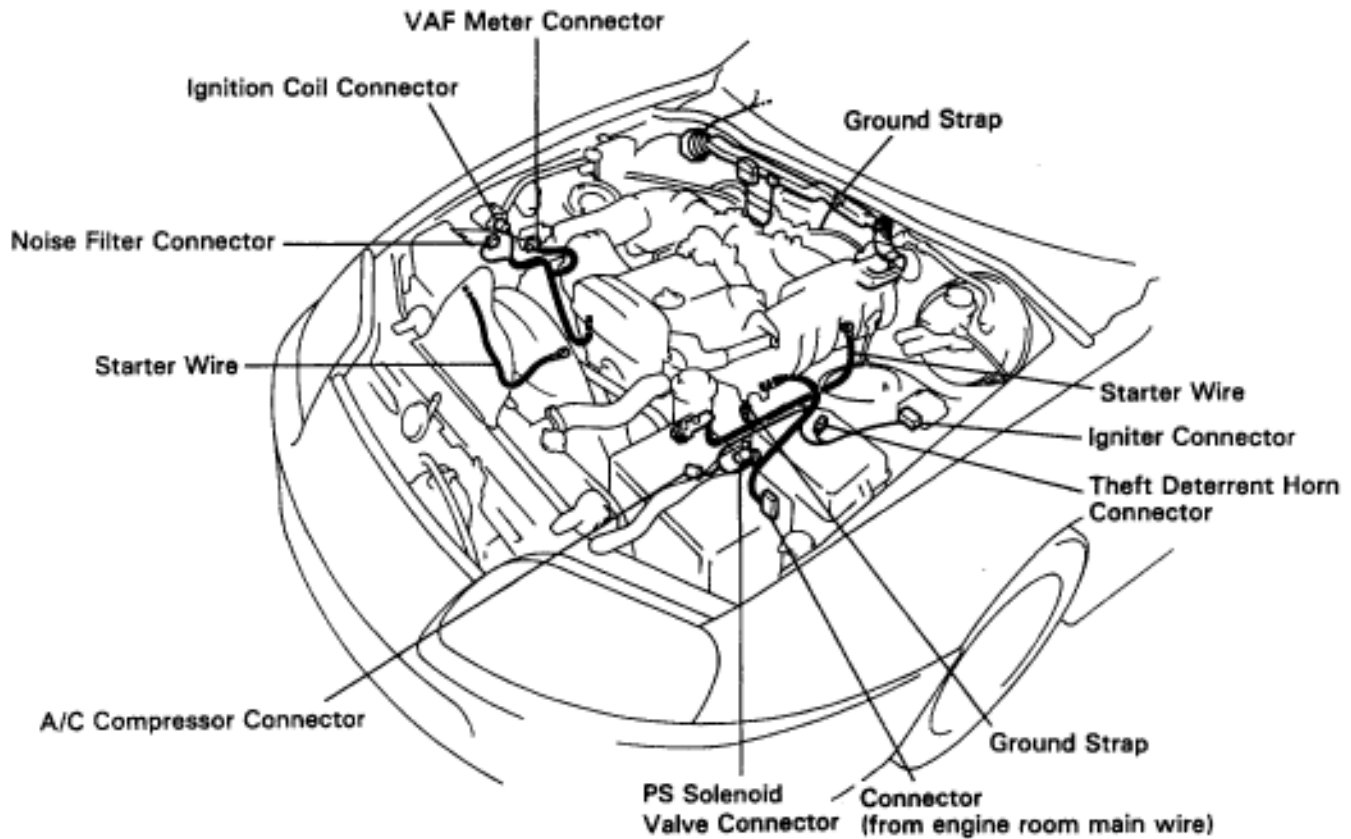
(See turbocharger installation in Turbocharger System)

CYLINDER BLOCK COMPONENTS FOR ENGINE REMOVAL AND INSTALLATION

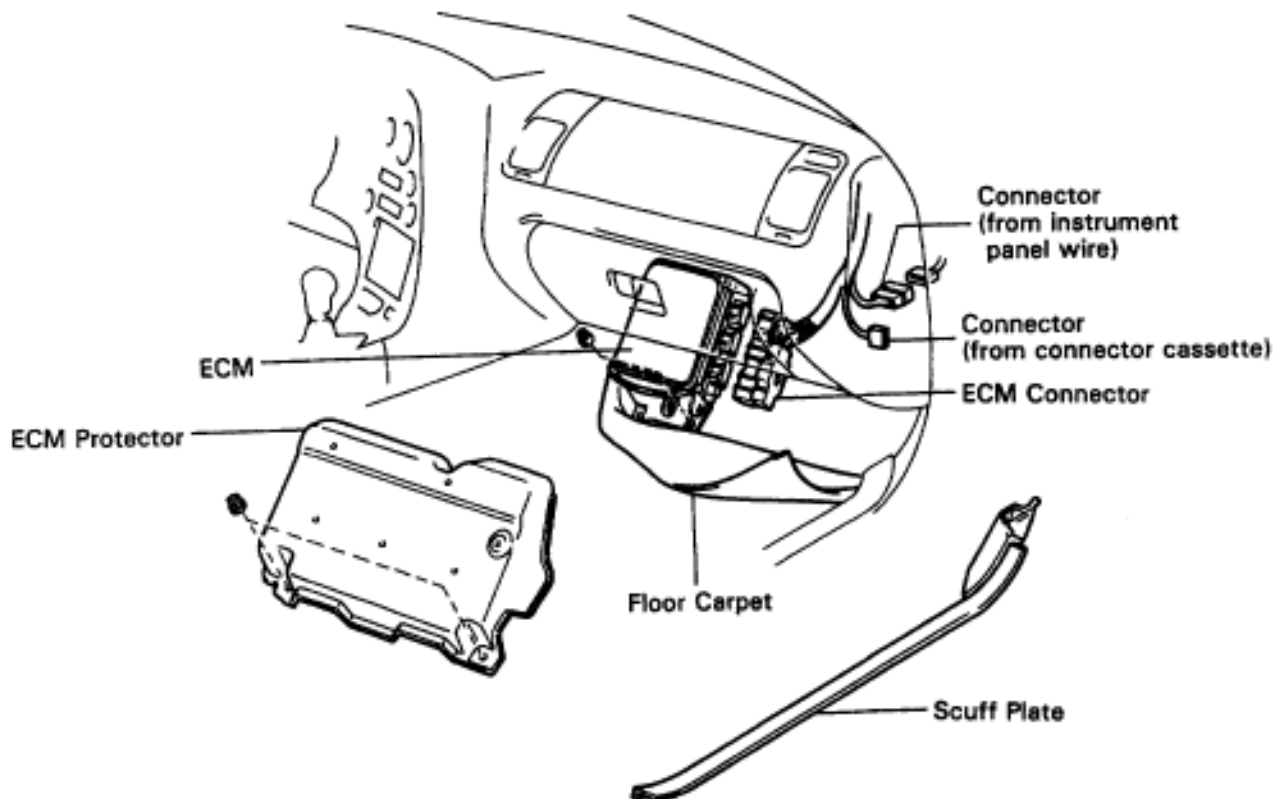
2JZ-GE



2JZ-GE



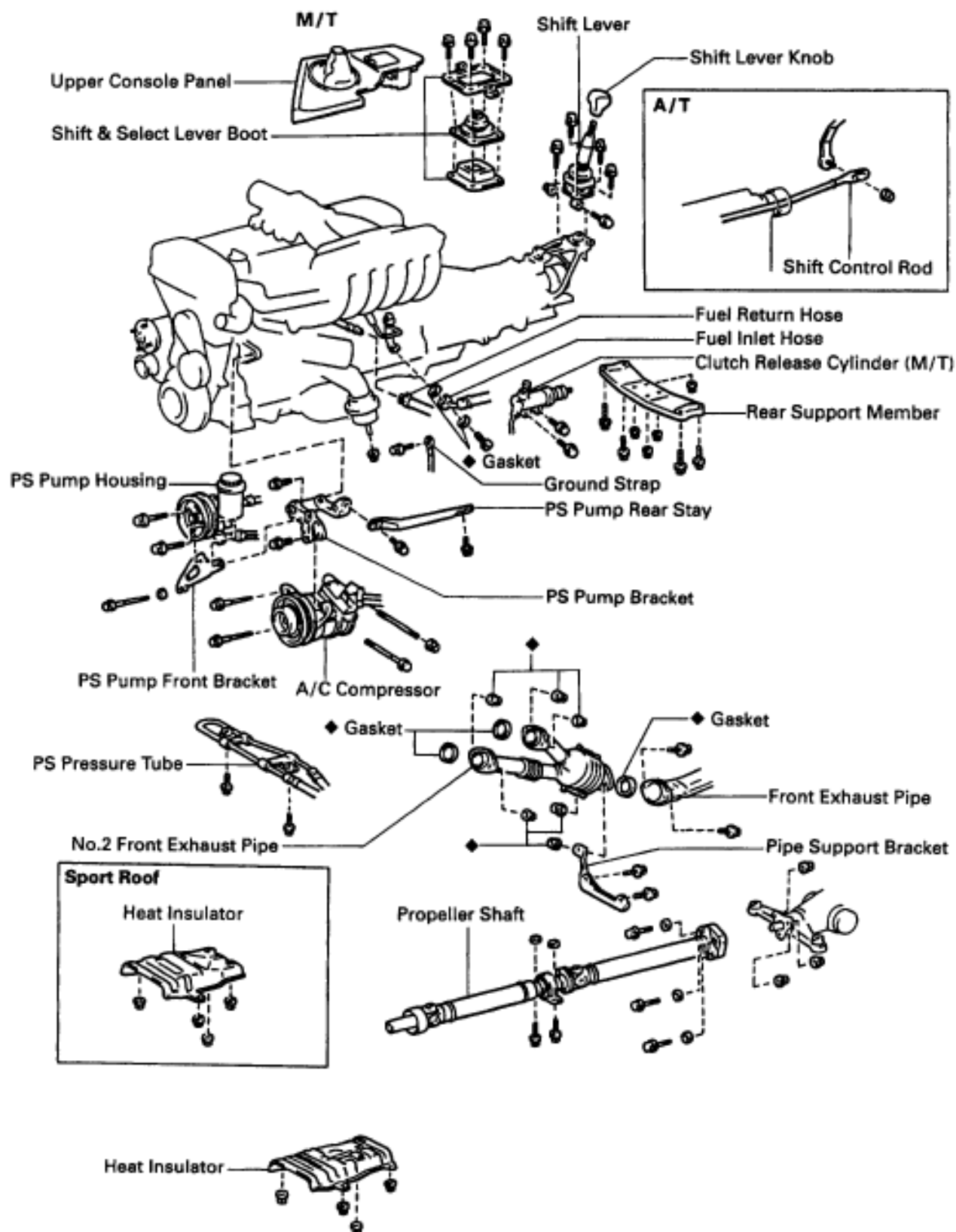
P13077



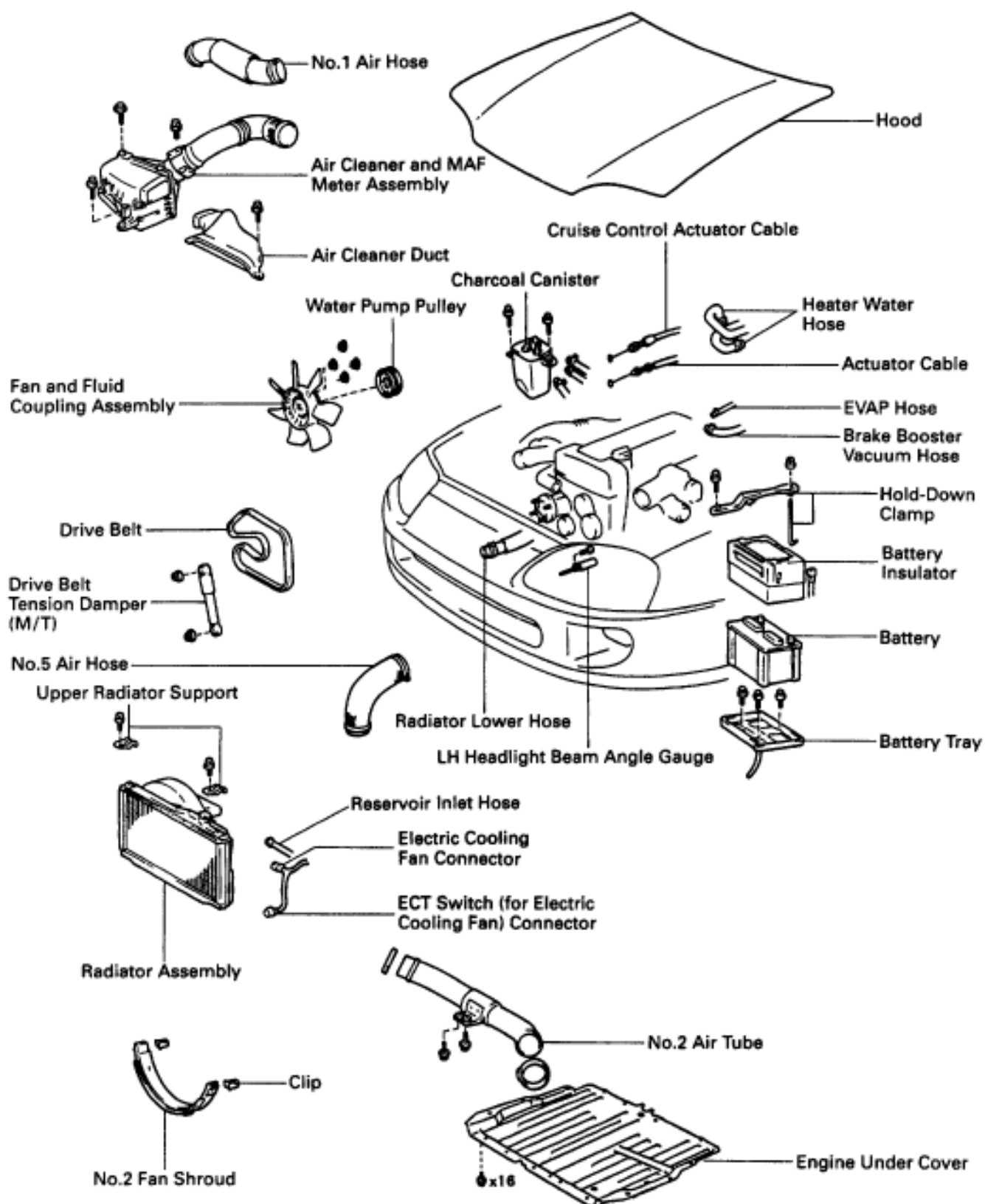
P13166

203206

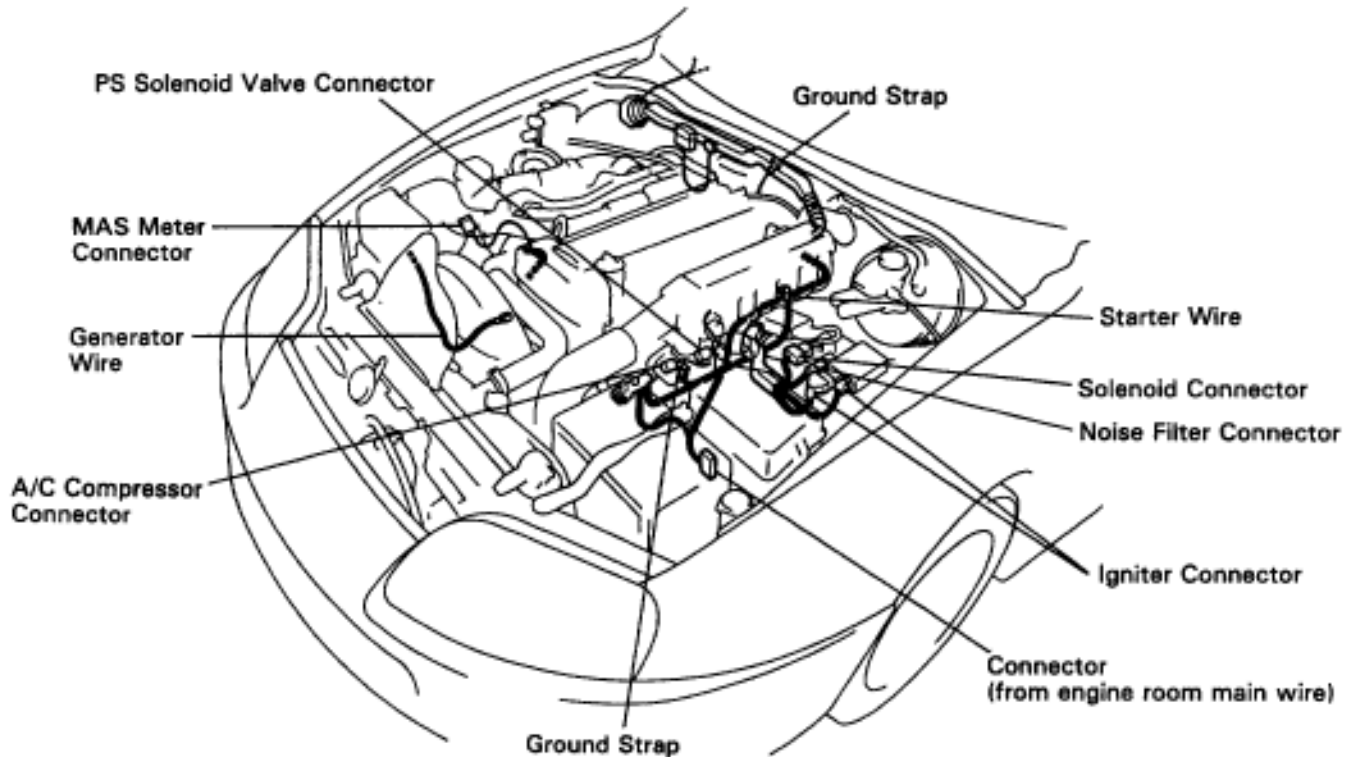
2JZ-GE



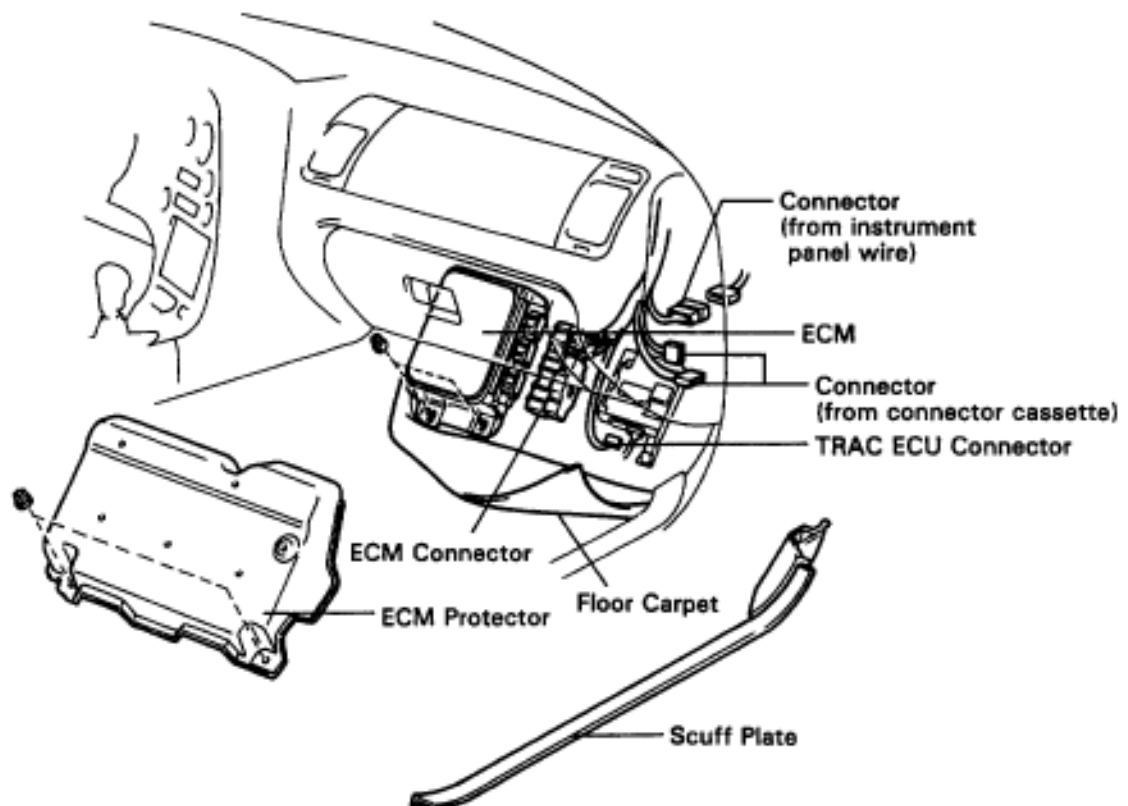
2JZ-GTE



2JZ-GTE

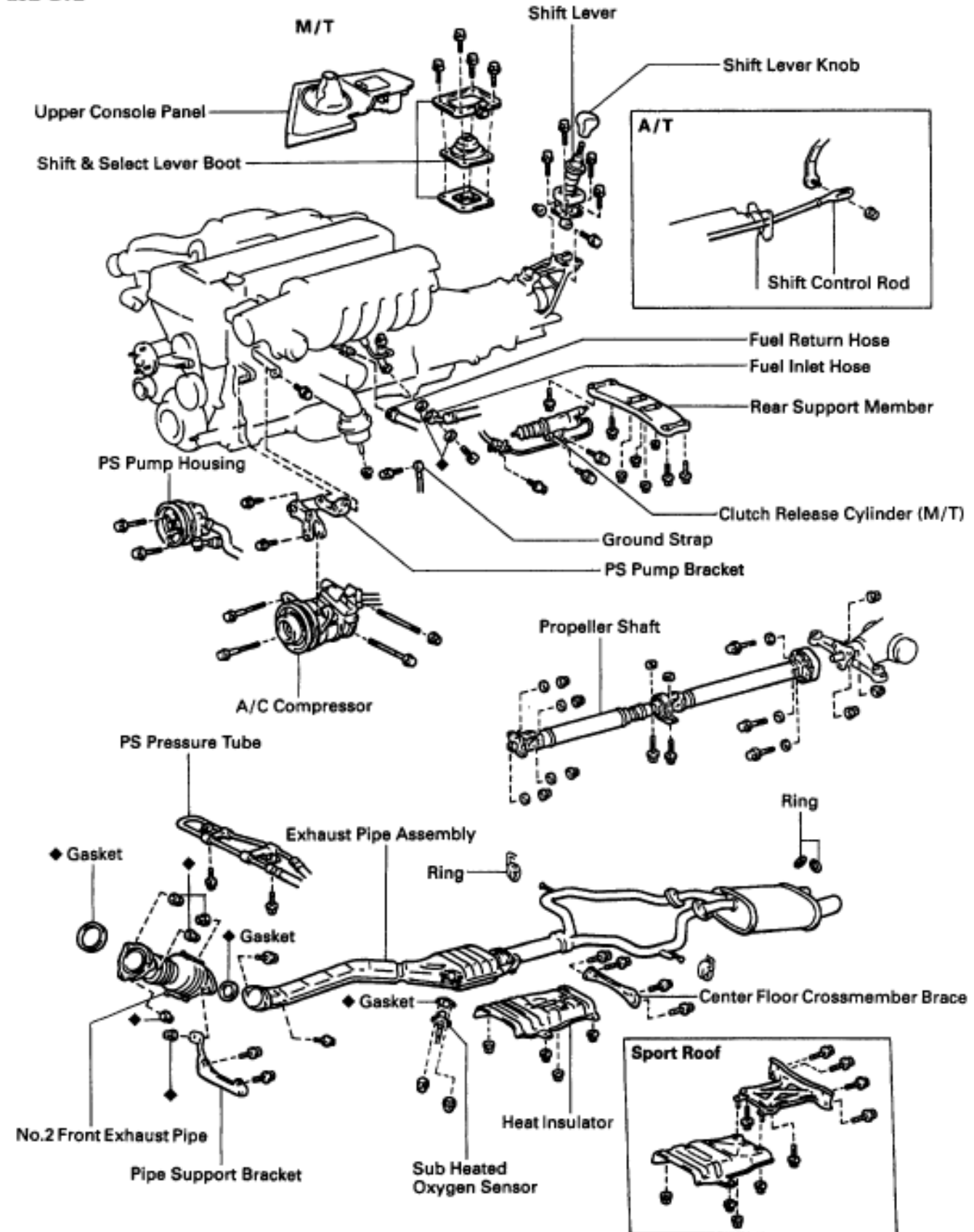


P13078



P13167

2JZ-GTE

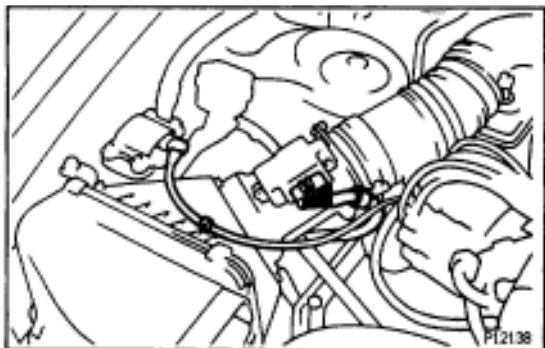


ENGINE REMOVAL (2JZ-GE)

1. REMOVE HOOD
2. REMOVE RADIATOR ASSEMBLY
(See radiator removal in Cooling System)
3. DRAIN ENGINE OIL
4. DRAIN FUEL FROM FUEL TANK
5. DISCONNECT CONTROL CABLES FROM THROTTLE BODY

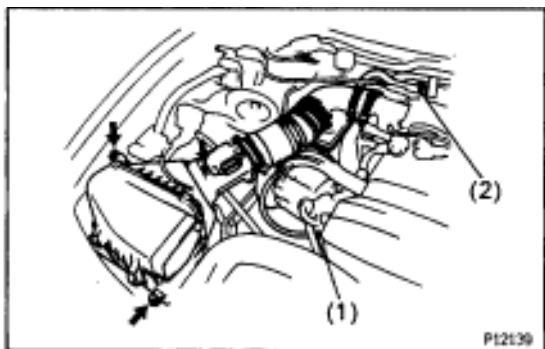
Disconnect these cables:

- Accelerator cable
- Cruise control actuator cable



6. REMOVE AIR CLEANER, VAF METER AND INTAKE AIR CONNECTOR PIPE ASSEMBLY

- (a) Disconnect the high-tension cord from the ignition coil.
- (b) Disconnect the high-tension cord from the clamp on the air cleaner.
- (c) Disconnect the VAF meter connector.
- (d) Disconnect the engine wire from the VAF meter.
- (e) Disconnect these hoses:
 - (1) PS air hose from No.4 timing belt cover
 - (2) PCV hose from No.2 cylinder head cover
- (f) Loosen the hose clamp bolt holding the intake air connector pipe to the throttle body.
- (g) Remove the 3 bolts, air cleaner, VAF meter and intake air connector pipe assembly.



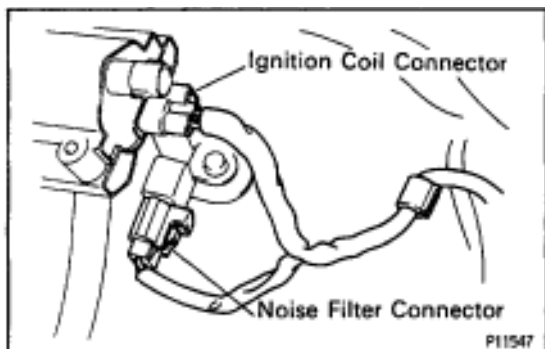
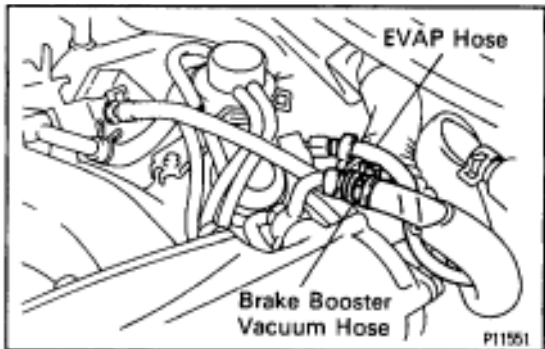
7. REMOVE DRIVE BELT, FAN, FLUID COUPLING ASSEMBLY AND WATER PUMP PULLEY
(See step 6 in water pump removal in Cooling System)

8. REMOVE CHARCOAL CANISTER

9. DISCONNECT HEATER WATER HOSES

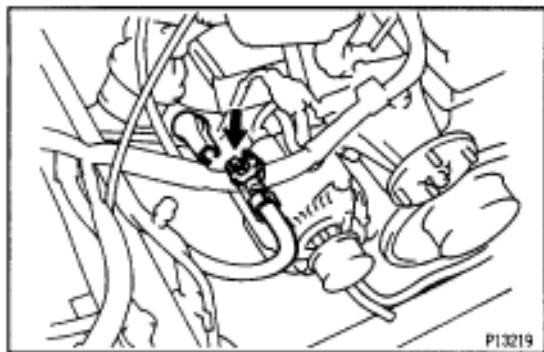
10. DISCONNECT BRAKE BOOSTER VACUUM HOSE

11. DISCONNECT EVAP HOSE

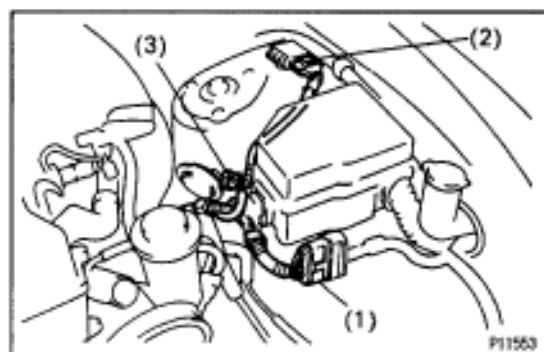


12. DISCONNECT WIRES AND CONNECTORS

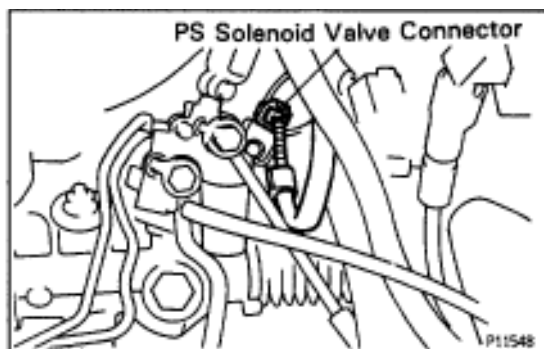
- (a) Disconnect the noise filter connector.
- (b) Disconnect the ignition coil connector.
- (c) Disconnect the engine wire from the wire clamp.



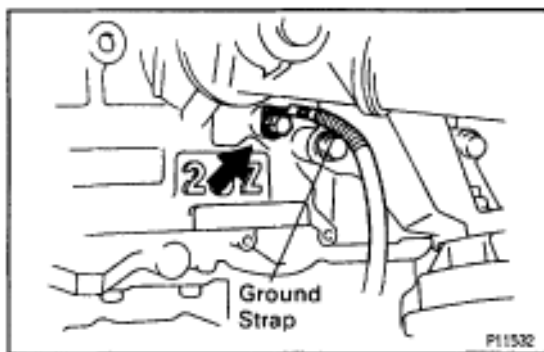
- (d) Remove the rubber cap and nut, and disconnect the generator wire.



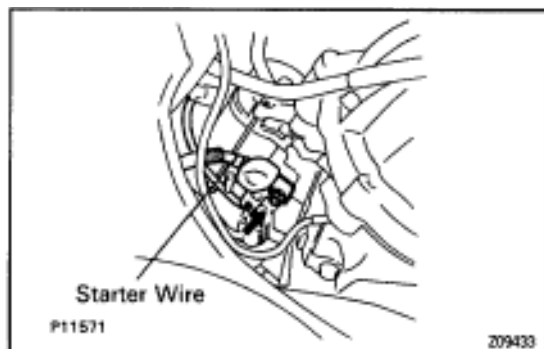
- (e) Disconnect these connectors:
(1) Connector from engine room main wire
(2) Igniter connector
(3) Theft deterrent horn connector
(f) Disconnect the engine wire from the 2 wire clamps.



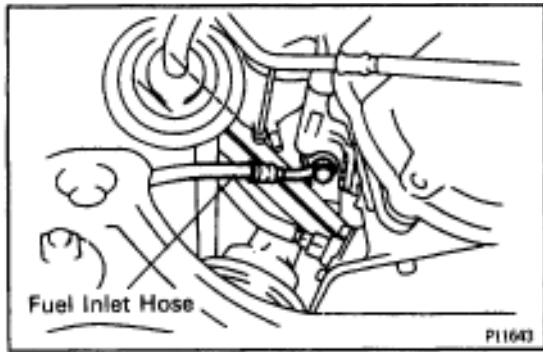
- (g) Disconnect the wire clamp and PS solenoid valve connector.



- (h) Remove the bolt, and disconnect the ground strap from the cylinder block.



- (i) Remove the rubber cap and nut, and disconnect the starter wire.



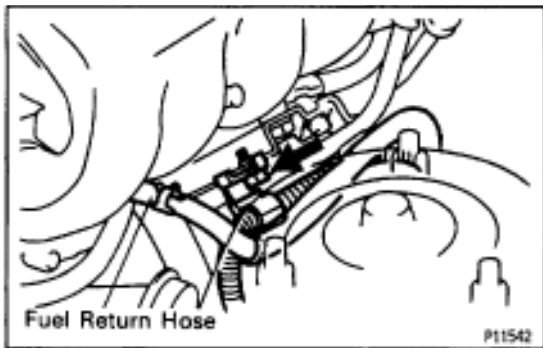
13. DISCONNECT FUEL HOSES

- (a) Remove the union bolt and 2 gaskets, disconnect the fuel inlet hose.

HINT:

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

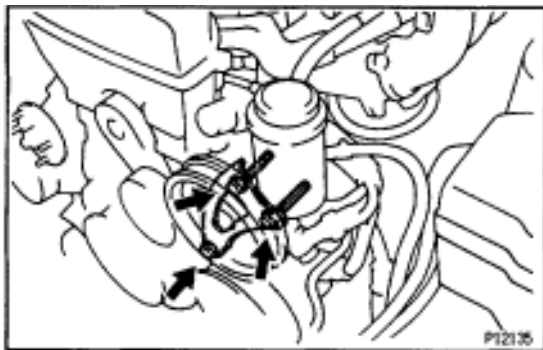
- (b) Suspend the hose union end upward.



- (c) Disconnect the fuel return hose from the oil dipstick guide.
 (d) Disconnect the fuel return hose from the fuel return hose. Plug the hose end.

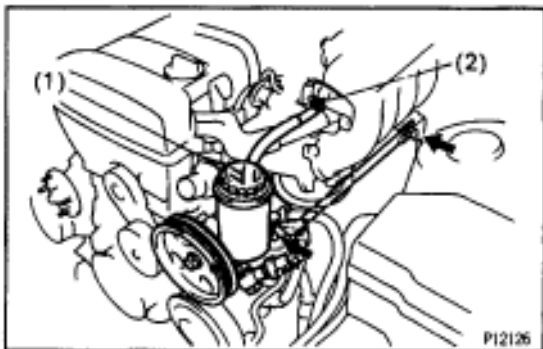
14. REMOVE ENGINE WIRE BRACKET

Remove the bolt and bracket, and disconnect the engine wire from the intake manifold stay.

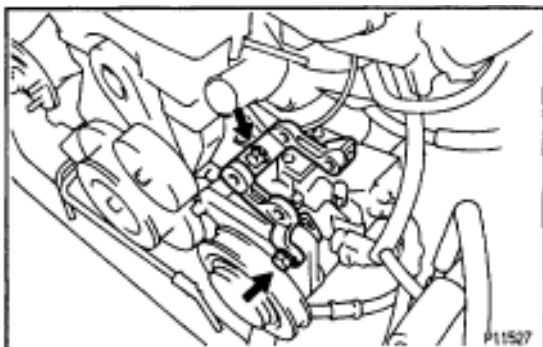


15. DISCONNECT PS PUMP WITHOUT DISCONNECTING HOSES

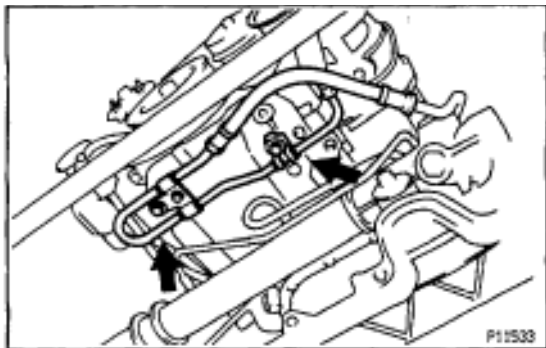
- (a) Remove the 3 bolts, plate washer and pump front bracket.



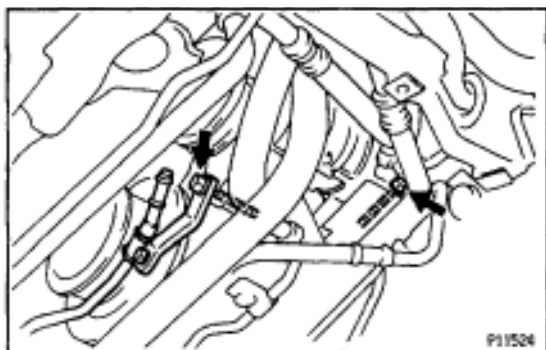
- (b) Disconnect these hoses:
 (1) Air hose from No.4 timing belt cover
 (2) Air hose from air intake chamber
 (c) Disconnect the pump housing from the pump bracket.
 HINT: Put aside the pump housing, and suspend it.
 (d) Remove the 2 bolts and pump rear stay.



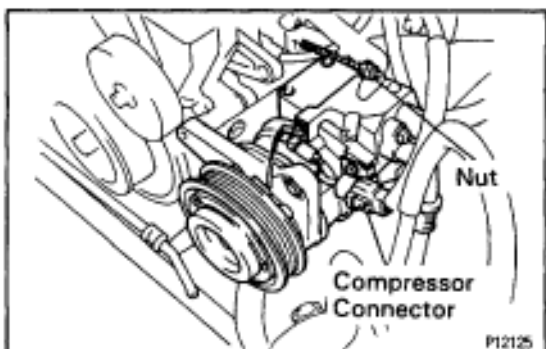
- (e) Remove the 2 bolts and pump bracket.

**16. DISCONNECT PS PRESSURE TUBE FROM ENGINE**

Remove the 2 clamp bolts, and disconnect the pressure tube.

**17. DISCONNECT A/C COMPRESSOR WITHOUT DISCONNECTING HOSES**

(a) Remove the 2 bolts.

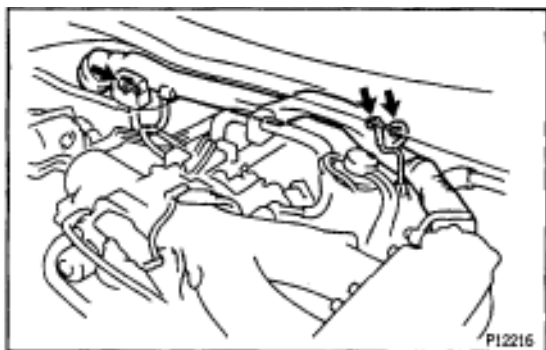


(b) Disconnect the compressor connector.

(c) Remove the nut.

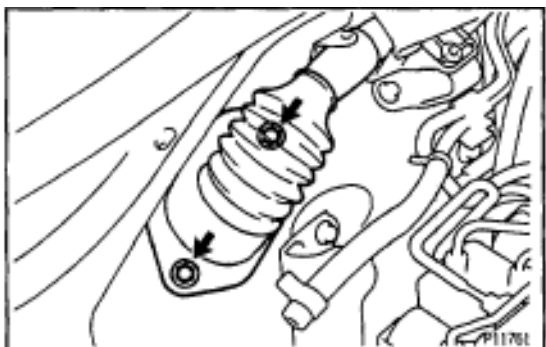
(d) Using a torx socket (E10), remove the stud bolt, and disconnect the compressor from the engine.

HINT: Put aside the compressor, and suspend it securely.

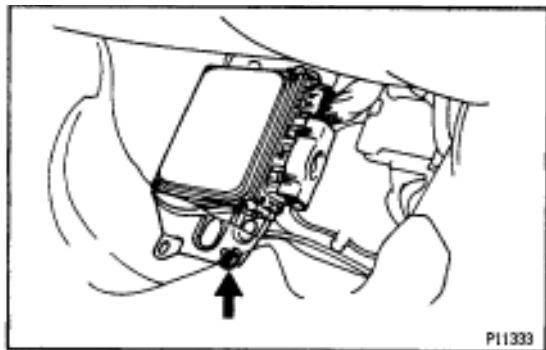
**18. DISCONNECT ENGINE WIRE FROM COWL PANEL**

(a) Remove the bolt, and disconnect the ground strap.

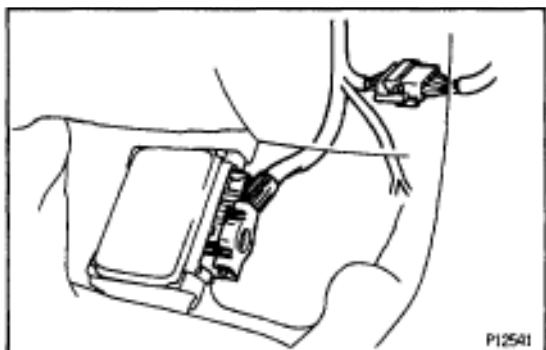
(b) Remove the 2 bolt, and disconnect the engine wire protector.



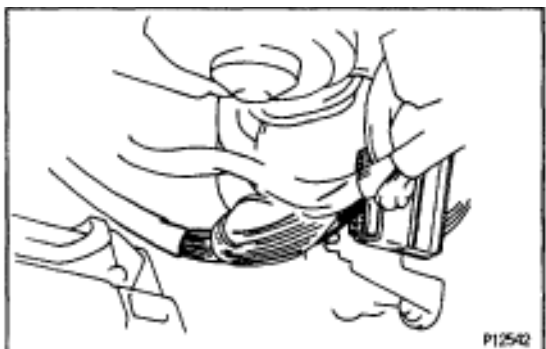
(c) Remove the 2 bolts holding the engine wire retainer to the cowl panel.

**19. DISCONNECT ENGINE WIRE FROM CABIN**

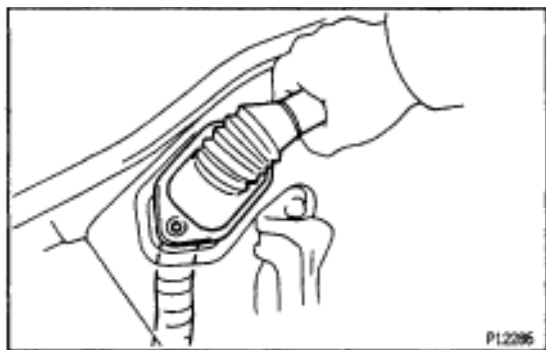
- (a) Remove the scuff plate.
- (b) Take out the front side of the floor carpet.
- (c) Remove the 2 nuts and ECM protector.
- (d) Remove the nut, and disconnect the ECM from the floor panel.



- (e) Disconnect the 2 connectors from the ECM.
- (f) Disconnect the connector from the instrument panel wire.



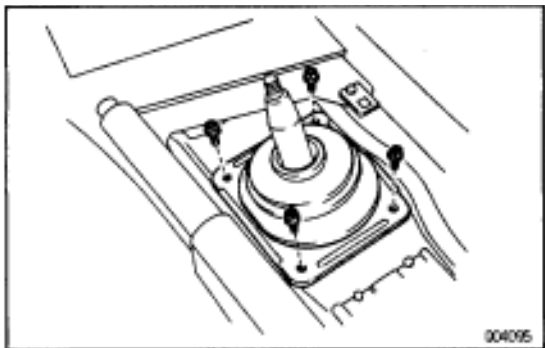
- (g) Disconnect the connector from the connector cassette.



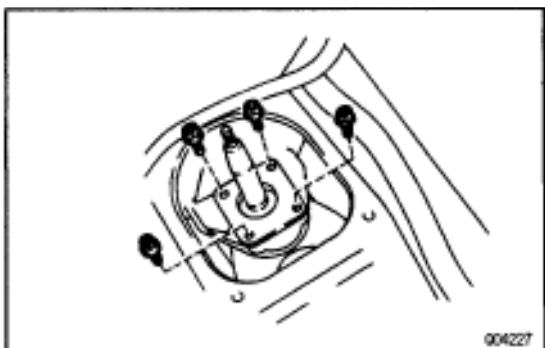
- (h) Pull out the engine wire from the cabin.

**20. M/T:
REMOVE UPPER CONSOLE PANEL, SHIFT LEVER
BOOTS AND HOLDING BOLTS**

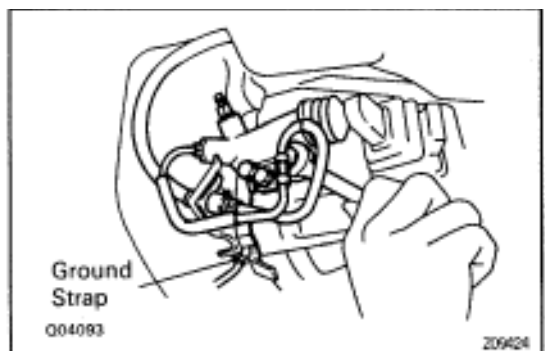
- (a) Remove the shift lever knob.
- (b) Using a screwdriver, pry out the upper console panel.



- (c) Remove the 4 bolts holding the lever boot to the transmission cover.
- (d) Remove the shift and select lever boots.

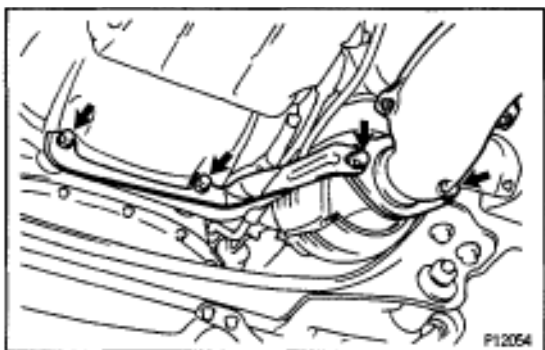


- (e) Remove the 4 bolts holding the shift lever to the shift lever retainer.



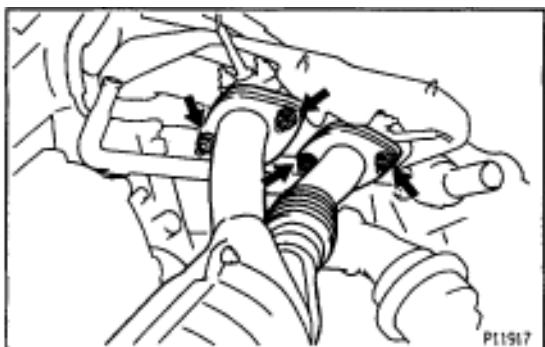
21. M/T:
DISCONNECT CLUTCH RELEASE CYLINDER AND GROUND STRAP FROM TRANSMISSION

- (a) Remove the 2 bolts and clutch release cylinder.
- (b) Remove the bolt, and disconnect the ground strap.



22. REMOVE NO.2 EXHAUST PIPE

- (a) Remove the 2 bolts and nuts holding the No.2 front exhaust pipe to the front exhaust pipe.
- (b) Remove the 2 bolts and pipe support bracket.
- (c) Remove the gasket, and disconnect the front exhaust pipe.

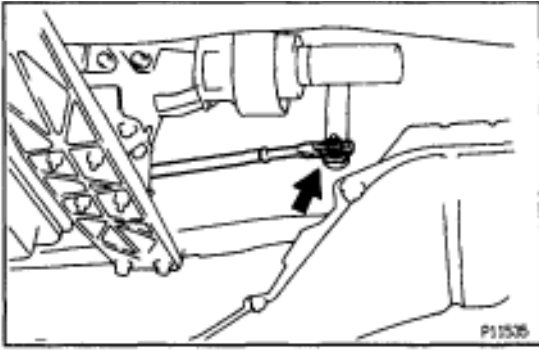


- (d) Remove the 4 nuts, No.2 front exhaust pipe and 2 gaskets.

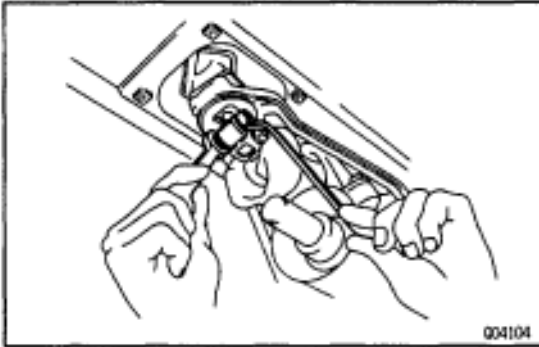
23. REMOVE EXHAUST PIPE HEAT INSULATOR

24. REMOVE PROPELLER SHAFT

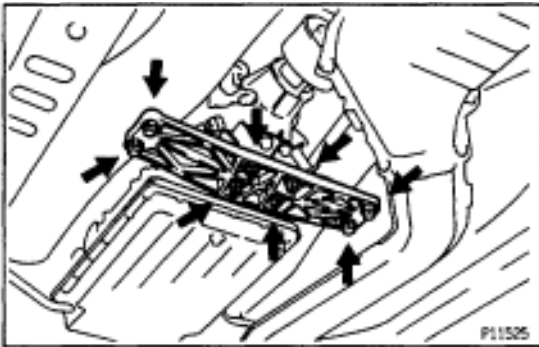
(See propeller shaft removal in Propeller Shaft)



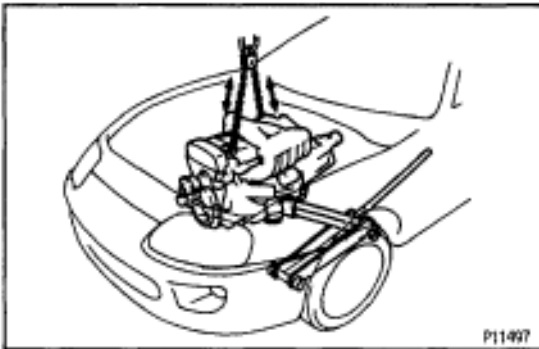
- 25. A/T:**
DISCONNECT TRANSMISSION CONTROL ROD
 Remove the nut, and disconnect the control rod from the shift lever.



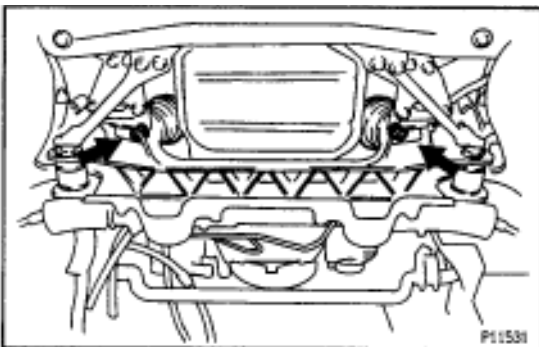
- 26. M/T:**
REMOVE TRANSMISSION SHIFT LEVER
 (a) Remove the bolt and nut.
 (b) Remove the transmission shift lever, inside of vehicle.
- 27. PLACE JACK UNDER TRANSMISSION**
NOTICE (A/T): Be sure to put a wooden block between the jack and the transmission oil pan to prevent damage.



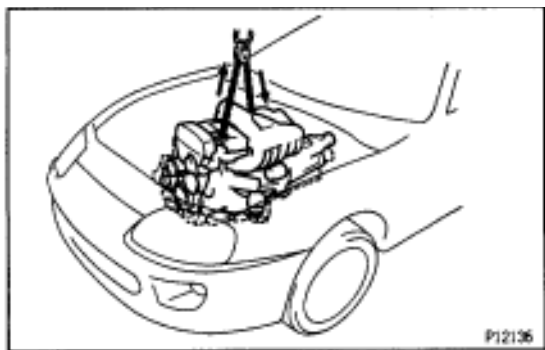
- 28. REMOVE REAR SUPPORT MEMBER**
 (a) Remove the 4 nuts holding the member to the engine rear mounting insulator.
 (b) Remove the 4 bolts and rear support member.



- 29. REMOVE ENGINE AND TRANSMISSION ASSEMBLY FROM VEHICLE**
 (a) Attach the engine hoist chain to the 2 engine hangers.



- (b) Remove the 2 nuts holding the engine front mounting insulators to the front suspension crossmember.



- (c) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Remove the engine and transmission assembly carefully without damaging the shift lever retainer (M/ T), A/C compressor or PS solenoid valve.
- (d) Make sure the engine is clear of all wiring, hoses and cables.
- (e) Place the engine and transmission assembly onto the stand.

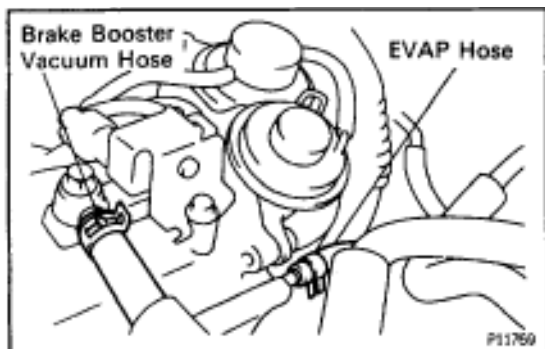
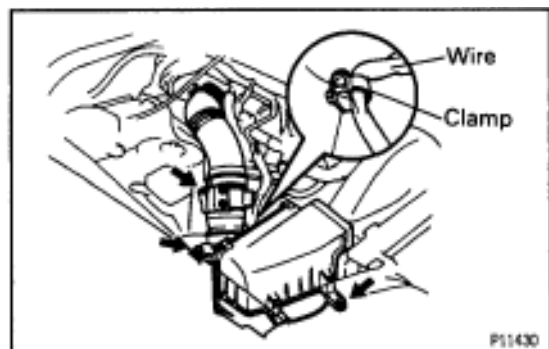
ENGINE REMOVAL (2JZ-GTE)

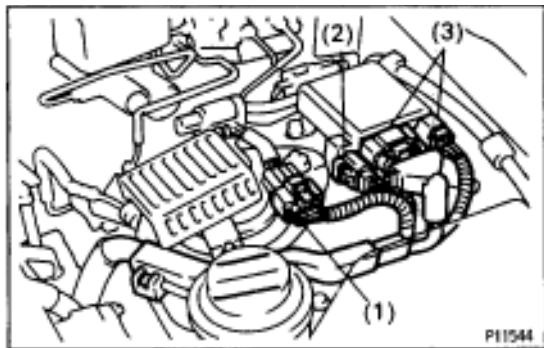
1. REMOVE HOOD
2. REMOVE RADIATOR ASSEMBLY
(See radiator removal in Cooling System)
3. DRAIN ENGINE OIL
4. DRAIN FUEL FROM FUEL TANK
5. REMOVE NO.1 AIR HOSE
6. DISCONNECT CONTROL CABLES FROM THROTTLE BODY

Disconnect these cables:

- Accelerator cable
- Cruise control actuator cable

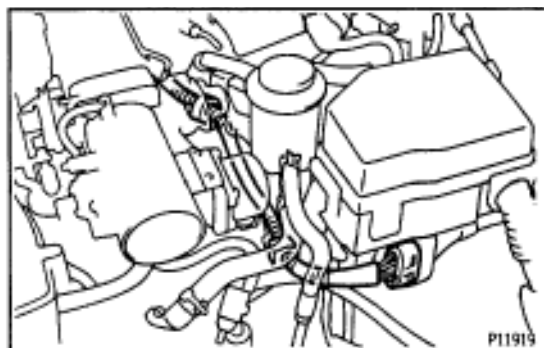
7. REMOVE AIR CLEANER AND MAF METER ASSEMBLY
 - (a) Remove the 3 bolts.
 - (b) Loosen the hose clamp, disconnect the air hose from the intake air connector.
 - (c) Disconnect the MAF meter wire from the clamp on the air cleaner case.
 - (d) Disconnect the MAF meter connector, and remove the air cleaner and MAF meter assembly.
8. M/T:
 - REMOVE DRIVE BELT TENSIONER DAMPER
(See step 2 in timing belt removal)
9. REMOVE DRIVE BELT, FAN, FLUID COUPLING ASSEMBLY AND WATER PUMP PULLEY
(See step 6 in water pump removal in Cooling System)
10. REMOVE CHARCOAL CANISTER
11. DISCONNECT HEATER WATER HOSES
12. DISCONNECT BRAKE BOOSTER VACUUM HOSE
13. DISCONNECT EVAP HOSE



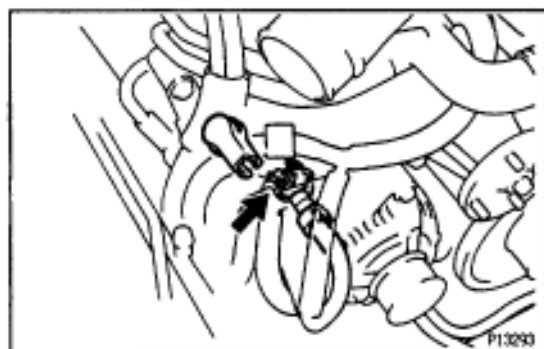


14. DISCONNECT WIRES AND CONNECTORS

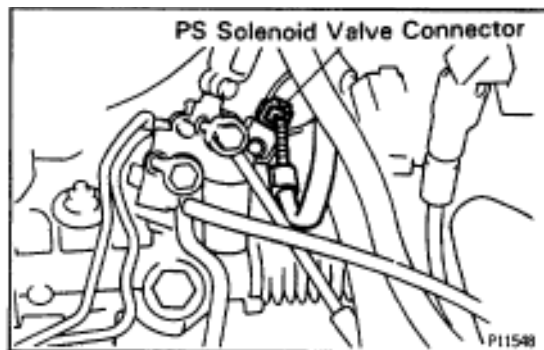
- (a) Disconnect these connectors:
 - (1) Solenoid resistor connector
 - (2) Noise filter connector
 - (3) Igniter connectors
- (b) Disconnect the engine wire from the PS reservoir tank protector.



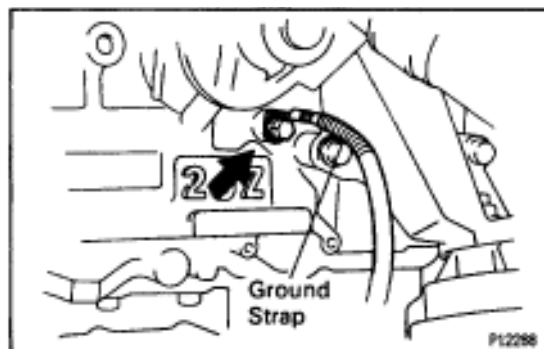
- (c) Disconnect the connector from the engine room main wire.
- (d) Disconnect the engine wire from the 2 wire clamps.



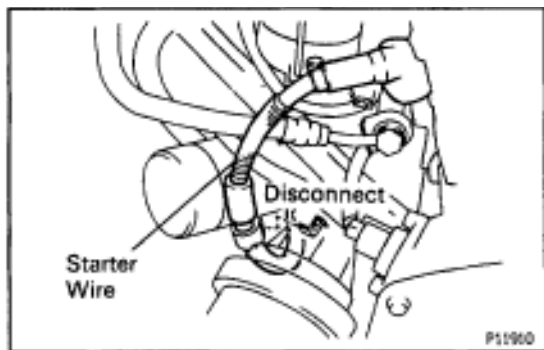
- (e) Remove the rubber cap and nut, and disconnect the generator wire.



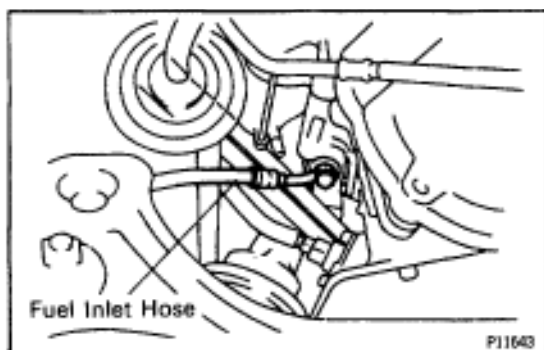
- (f) Disconnect the wire clamp and PS solenoid valve connector.



- (g) Remove the bolt and disconnect the ground strap from the cylinder block.



- (h) Disconnect the starter wire from the LH engine mounting bracket.
- (i) Remove the rubber cap and nut, and disconnect the starter wire.

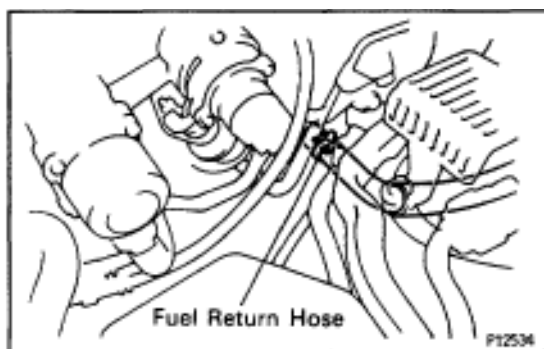


15. DISCONNECT FUEL HOSES

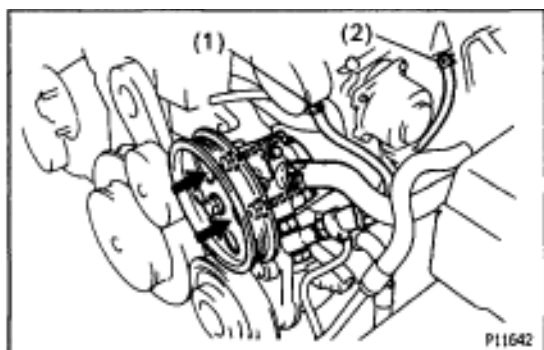
- (a) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose.

HINT:

- Put a suitable container or shop rag under the fuel pipe support.
 - Slowly loosen the union bolt.
- (b) Suspend the hose union end upward.



- (c) Disconnect the fuel return hose from the clamp of the dipstick guide.
- (d) Disconnect the fuel return hose from the fuel return pipe. Plug the hose end.



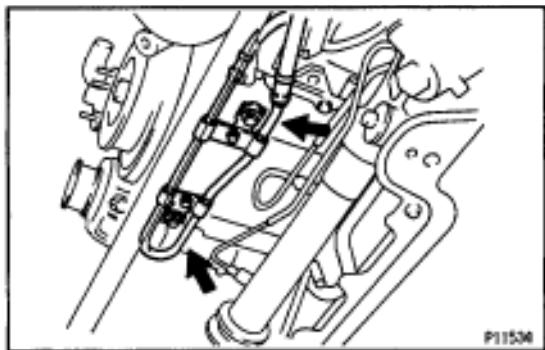
16. DISCONNECT PS PUMP WITHOUT DISCONNECTING HOSES

- (a) Disconnect these hoses:
 - (1) Air hose from throttle body
 - (2) Air hose from air intake chamber
- (b) Remove the 2 bolts, and disconnect the pump housing from the pump bracket.

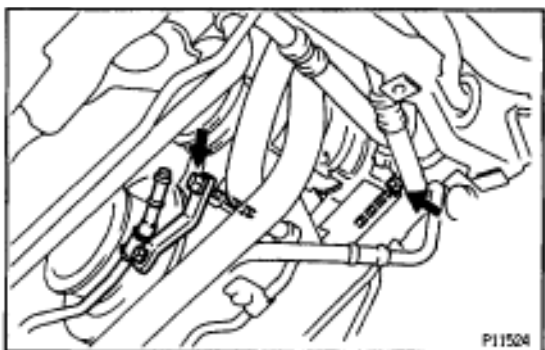
HINT: Put aside the pump housing, and suspend it securely.



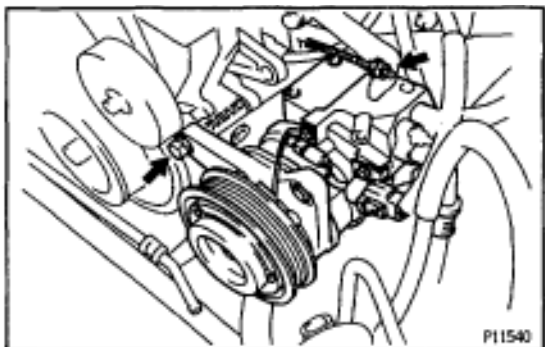
- (c) Remove the 3 bolts and pump bracket.

**17. DISCONNECT PS PRESSURE TUBE FROM ENGINE**

Remove the 2 clamp bolts and disconnect the pressure tube.

**18. DISCONNECT A/C COMPRESSOR WITHOUT DISCONNECTING HOSES**

(a) Remove the 2 bolts.

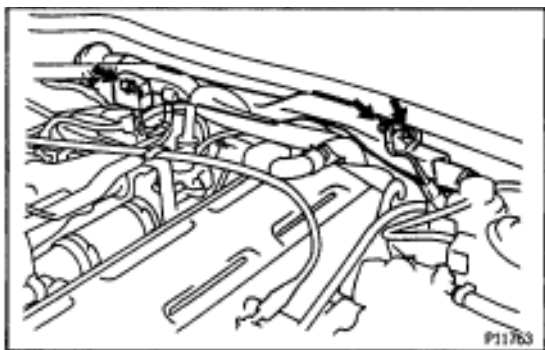


(b) Disconnect the compressor connector.

(c) Remove the bolt and nut.

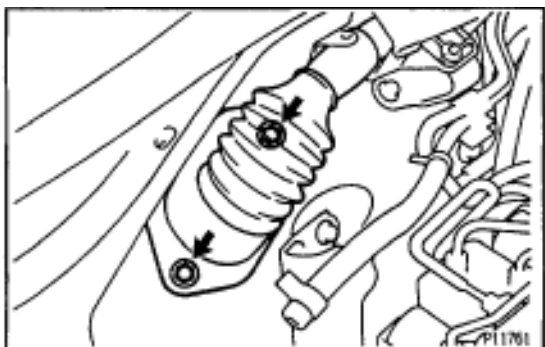
(d) Using a torx socket (E10), remove the stud bolt, and disconnect the compressor from the engine.

HINT: Put aside the compressor, and suspend it securely.

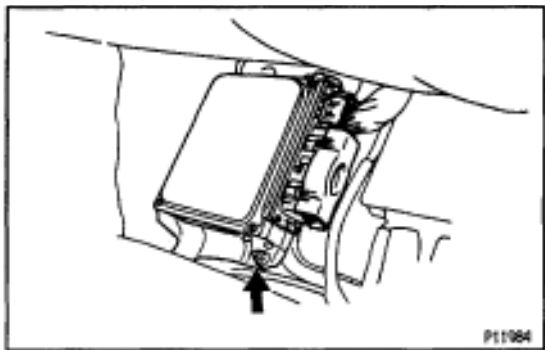
**19. DISCONNECT ENGINE WIRE FROM COWL PANEL**

(a) Remove the bolt, and disconnect the ground strap.

(b) Remove the 2 bolts, and disconnect the engine wire protector.

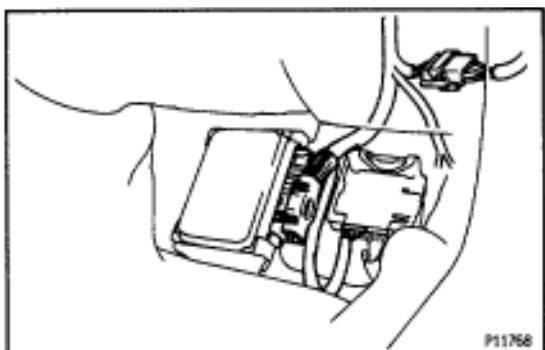


(c) Remove the 2 bolts holding the engine wire retainer to the cowl panel.

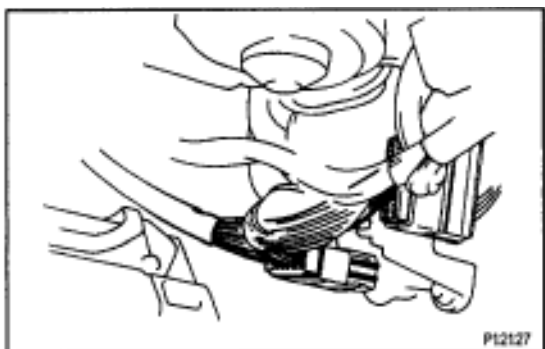


20. DISCONNECT ENGINE WIRE FROM CABIN

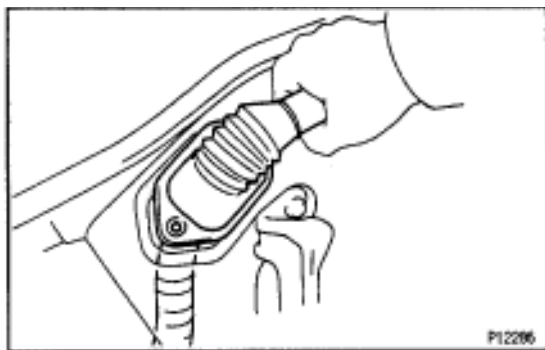
- (a) Remove the scuff plate.
- (b) Take out the front side of the floor carpet.
- (c) Remove the 2 nuts and ECM protector.
- (d) Remove the nut, and disconnect the ECM from the floor panel.



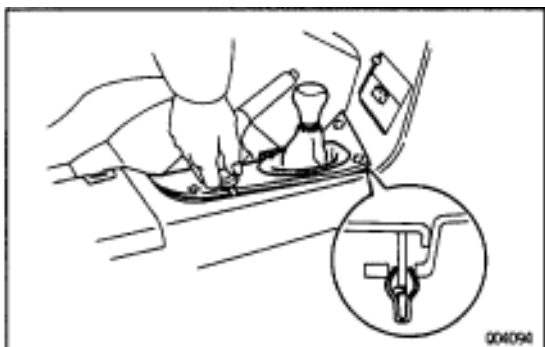
- (e) Disconnect the 2 connectors from the ECM.
- (f) Disconnect the connector from the TRAC ECU.
- (g) Disconnect the connector from the instrument panel wire.



- (h) Disconnect the connectors from the connector cassette.



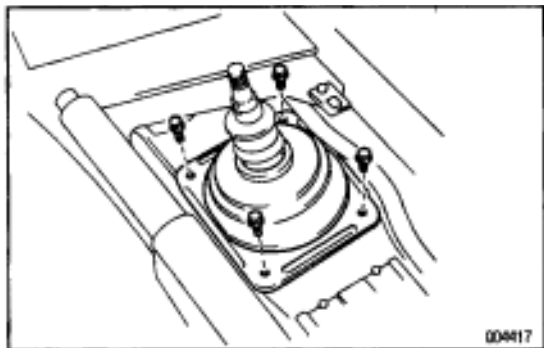
- (i) Pull out the engine wire from the cabin.



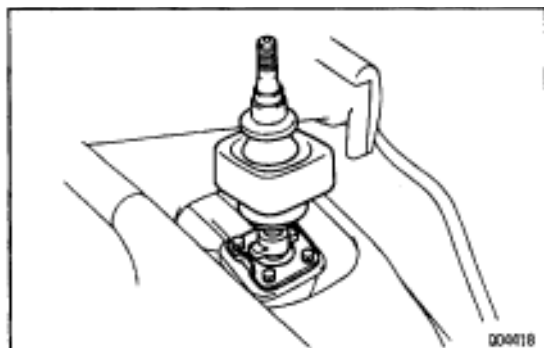
21. M/T:

REMOVE UPPER CONSOLE PANEL, SHIFT LEVER BOOTS AND HOLDING BOLTS

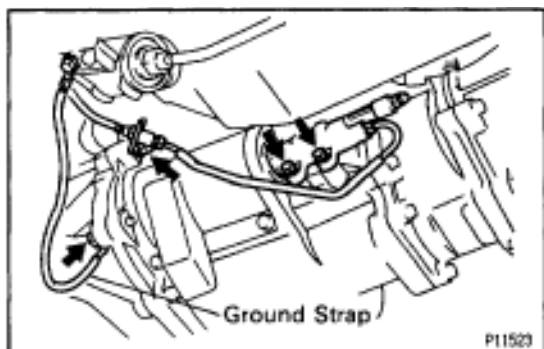
- (a) Remove the shift lever knob.
- (b) Using a screwdriver, pry out the upper console panel.



- (c) Remove the 4 bolts holding the lever boot to the transmission cover.
- (d) Remove the shift & select lever boots.

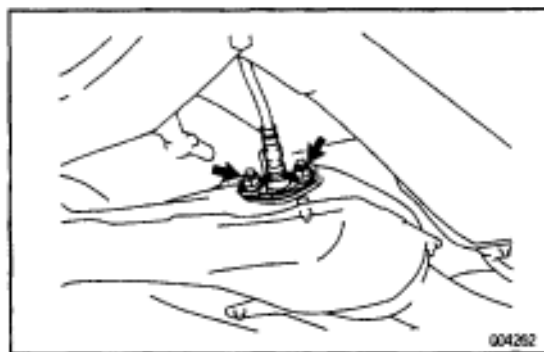


- (e) Remove the 4 bolts holding the shift lever to the shift lever retainer.



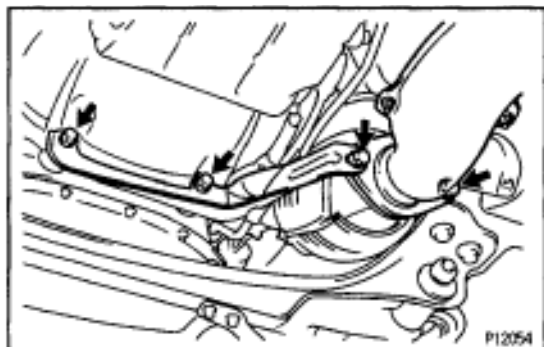
22. M/T:
DISCONNECT CLUTCH RELEASE CYLINDER AND GROUND STRAP FROM TRANSMISSION

- (a) Remove the 2 bolts, and disconnect clutch release cylinder.
- (b) Remove the bolt, and disconnect the clutch line tube.
- (c) Remove the bolt, and disconnect ground strap.



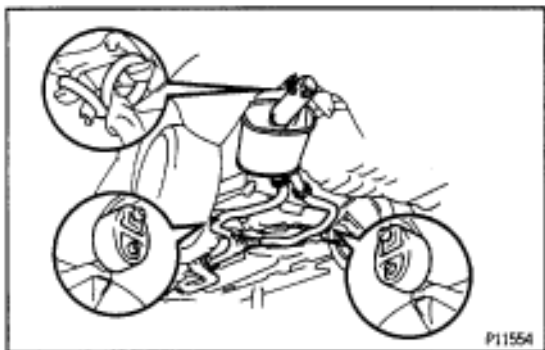
23. DISCONNECT SUB HEATED OXYGEN SENSOR FROM FRONT EXHAUST PIPE

Remove the 2 nuts and sensor cover, and disconnect oxygen sensor and gasket.



24. REMOVE EXHAUST PIPE ASSEMBLY

- (a) Remove the 2 bolts and nuts holding the front exhaust pipe to the No.2 front exhaust pipe.
- (b) Remove the 2 bolts and pipe support bracket.
- (c) Remove the gasket, and disconnect the front exhaust pipe.

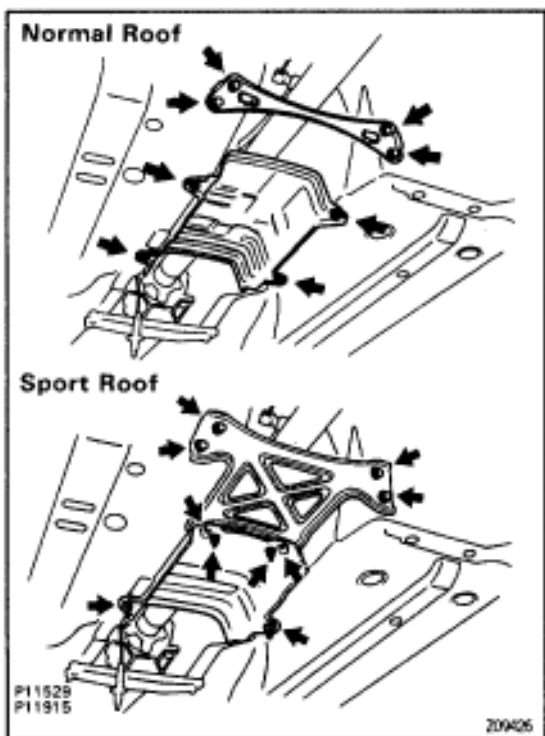


- (d) Disconnect the hook of the tailpipe from the 2 rings.
- (e) Disconnect the 2 rings on the exhaust pipe from the exhaust pipe brackets, and remove the exhaust pipe assembly.



25. REMOVE NO.2 FRONT EXHAUST PIPE

Remove the 3 nuts, front exhaust pipe and gasket.



26. REMOVE EXHAUST PIPE HEAT INSULATOR

Remove the 4 nuts and heat insulator.

27. REMOVE REAR CENTER FLOOR CROSSMEMBER BRACE

Remove the 4 bolts (Normal roof) or 6 bolts (Sport Roof) and crossmember brace.

28. REMOVE PROPELLER SHAFT

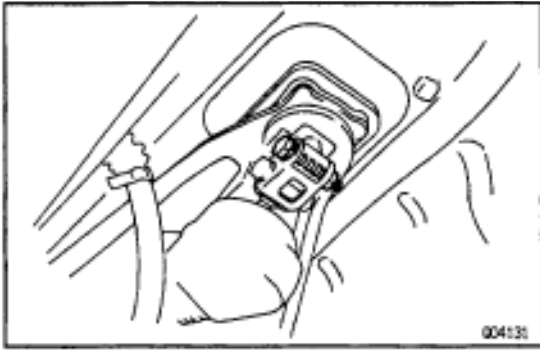
(See propeller shaft removal in Propeller Shaft)



29. A/T:

DISCONNECT TRANSMISSION CONTROL ROD

Remove the nut, and disconnect the control rod from the shift lever.

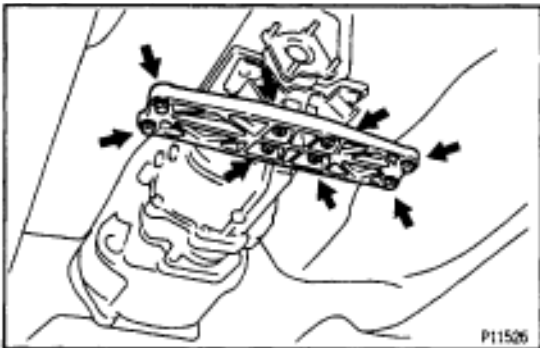


30. M/T:
REMOVE TRANSMISSION SHIFT LEVER

- (a) Remove the bolt and nut.
- (b) Remove the transmission shift lever, inside of vehicle.

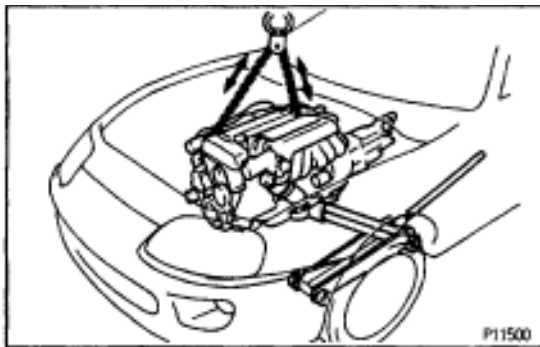
31. PLACE JACK UNDER TRANSMISSION

NOTICE (A/T): Be sure to put a wooden block between the jack and the transmission oil pan to prevent damage.



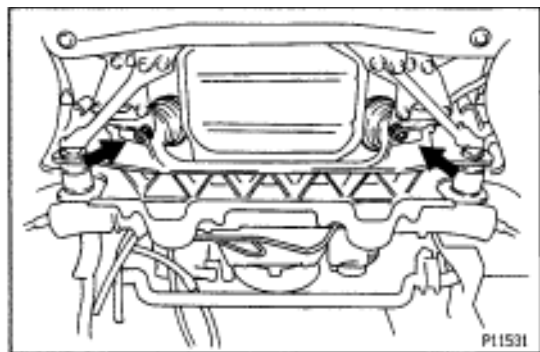
32. REMOVE REAR SUPPORT MEMBER

- (a) Remove the 4 nuts holding the member to the engine rear mounting insulator.
- (b) Remove the 4 bolts and rear support member.

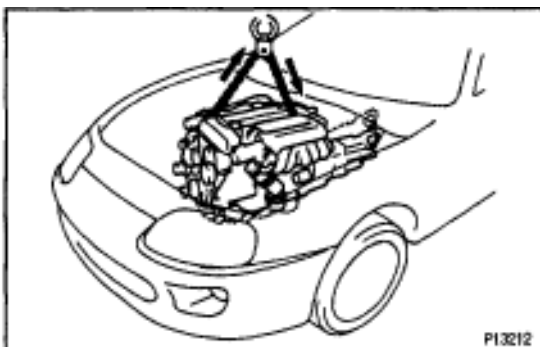


33. REMOVE ENGINE AND TRANSMISSION ASSEMBLY FROM VEHICLE

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



- (b) Remove the 2 nuts holding the engine front mounting insulators to the front suspension crossmember.

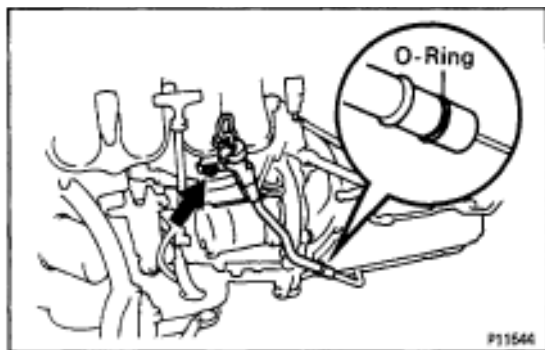


- (c) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Remove the engine and transmission assembly carefully without damaging the shift lever retainer (M/ T), A/C compressor or PS solenoid valve
- (d) Make sure the engine is clear of all wiring, hoses and cables.
- (e) Place the engine and transmission assembly onto the stand.

M/T 2JZ-GE

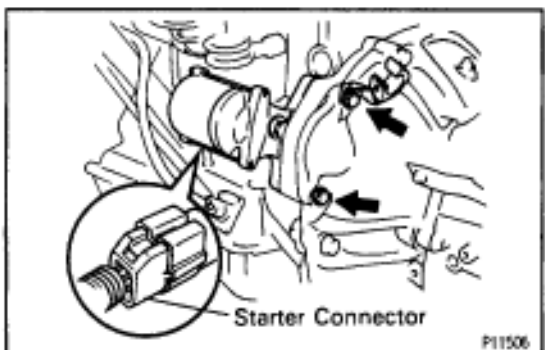


ENGINE & TRANSMISSION SEPARATION



1. A/T: REMOVE OIL DIPSTICK GUIDE FOR TRANSMISSION

- (a) Remove the bolt.
- (b) Pull out the dipstick and guide from the transmission.
- (c) Remove the O-ring from the dipstick guide.

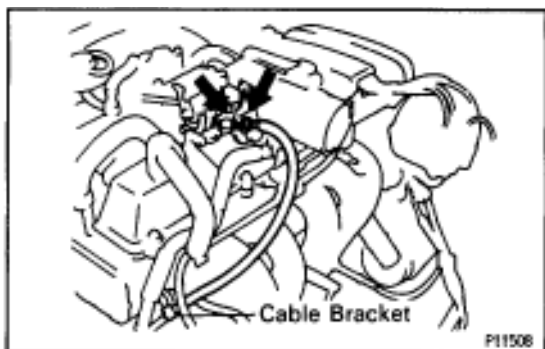


2. DISCONNECT ENGINE WIRE FROM TRANSMISSION

- (a) Disconnect the connectors.
- (b) Disconnect the wire clamps from the brackets.

3. REMOVE STARTER

- (a) Disconnect the starter connector.
- (b) Remove the 2 bolts, engine wire bracket and starter.



4. 2JZ-GE A/T:

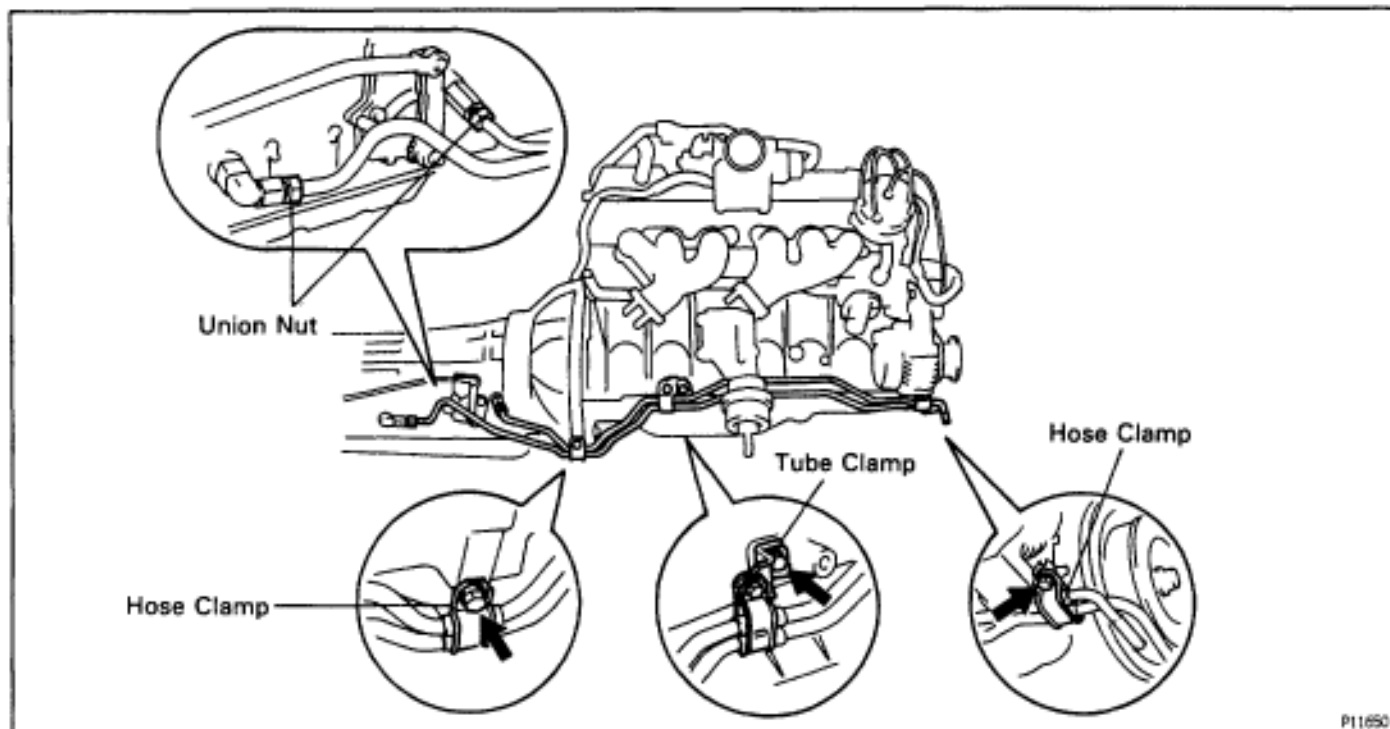
DISCONNECT THROTTLE CABLE

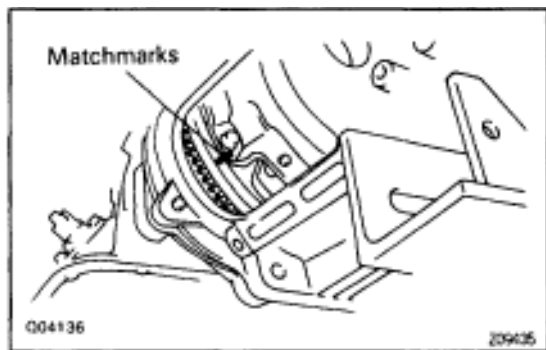
- (a) Disconnect the throttle cable from the throttle body.
- (b) Disconnect the throttle cable from the cable bracket on the cylinder head.

5. A/T:

REMOVE OIL COOLER TUBES FOR TRANSMISSION

- (a) Remove the 2 hose clamp bolts and tube clamp bolt.
- (b) Loosen the 2 union nuts, and remove the oil cooler tubes.

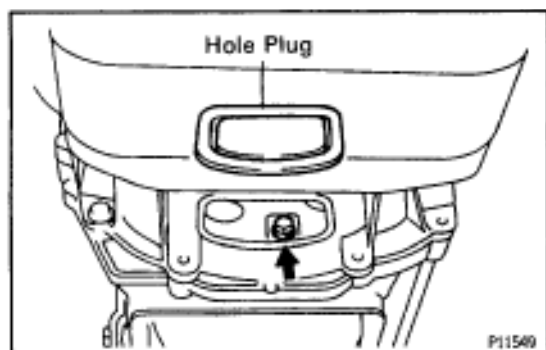




6. 2JZ-GTE M/T:

REMOVE CLUTCH COVER SET BOLTS

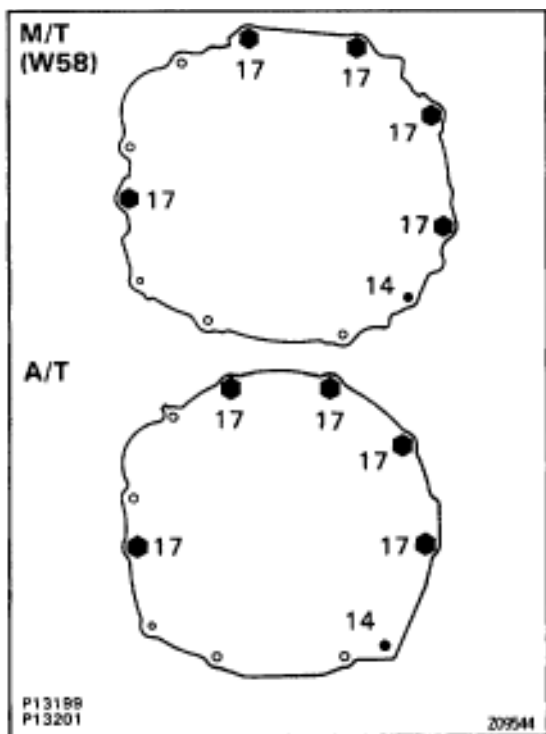
- Remove the 2 bolts and service hole cover.
- Place the matchmarks on the flywheel and clutch cover.
- Remove the 6 bolts.



7. A/T:

REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLTS

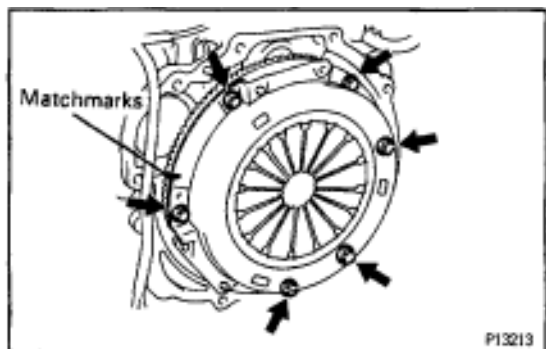
- Remove the hole plug.
- Turn the crankshaft to gain access to each bolt. Remove the 6 bolts.



8. SEPARATE ENGINE AND TRANSMISSION

Remove the 6 bolts and transmission.

HINT: The "17" is 17 mm head bolt, and "14" is 14 mm head bolt.



9. 2JZ-GE M/T:

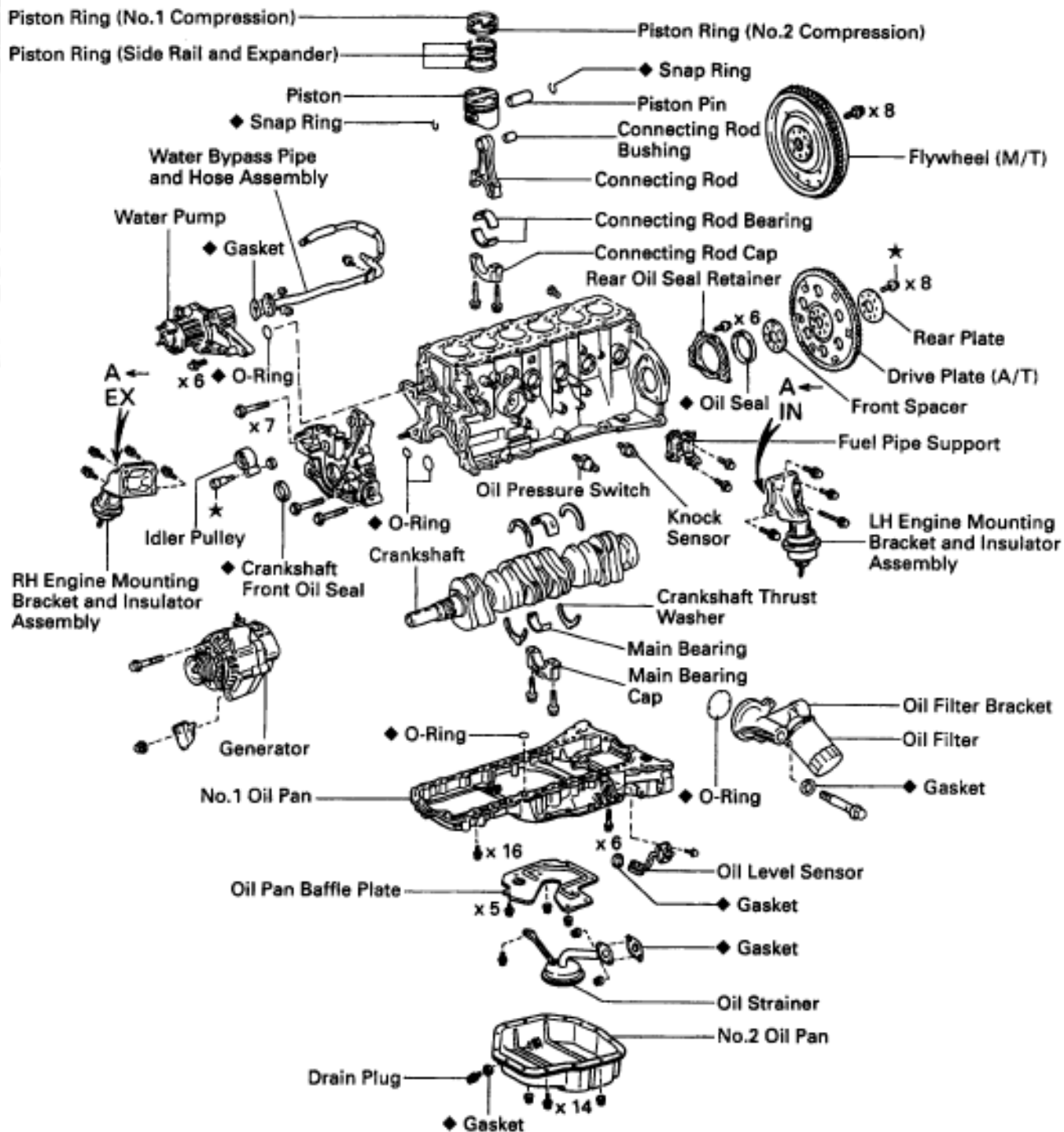
REMOVE CLUTCH COVER AND DISC

- Place matchmarks on the flywheel and clutch cover.
- Loosen each bolt one turn at a time until spring tension is released.
- Remove the bolts, and pull off the clutch cover with the clutch disc.

NOTICE: Do not drop the clutch disc.

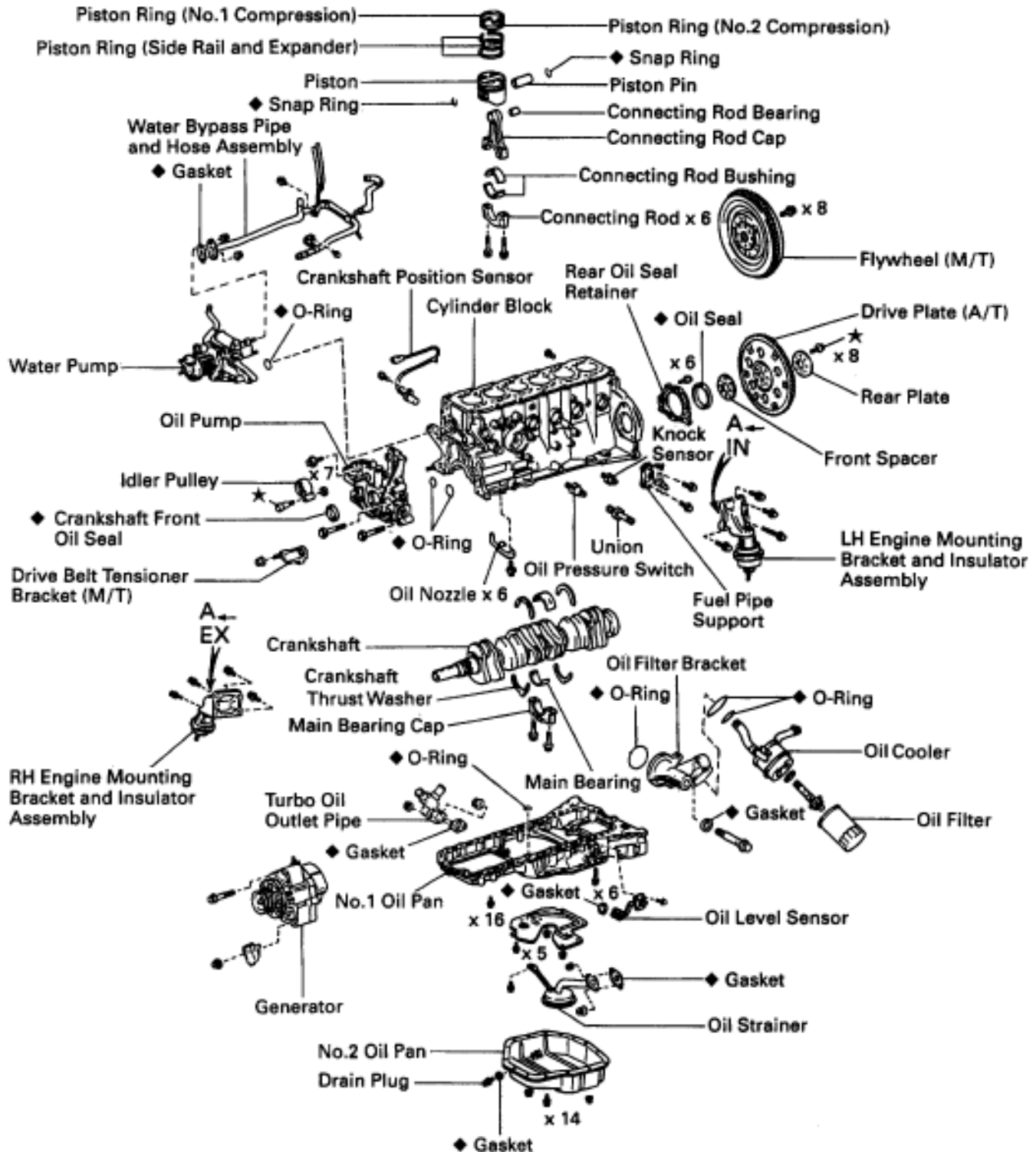
COMPONENTS FOR CYLINDER BLOCK DISASSEMBLY AND ASSEMBLY

2JZ-GE



◆ Non-reusable part
★ Precoated part

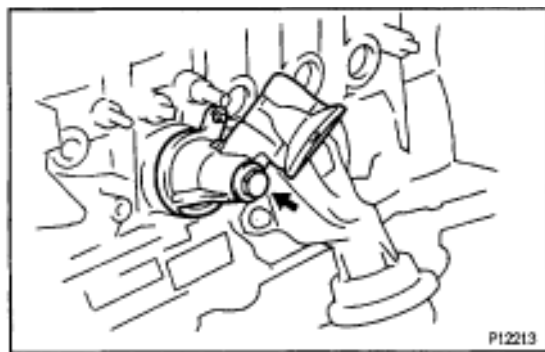
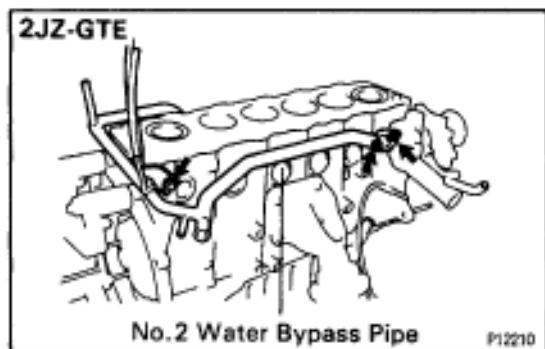
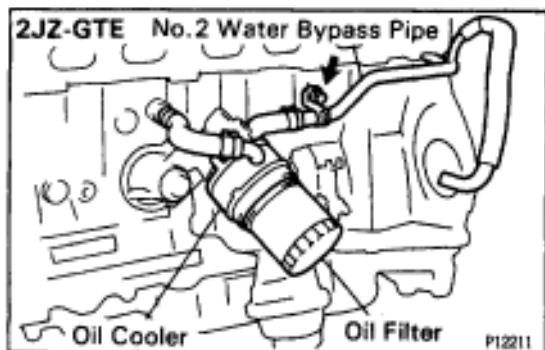
2JZ-GTE



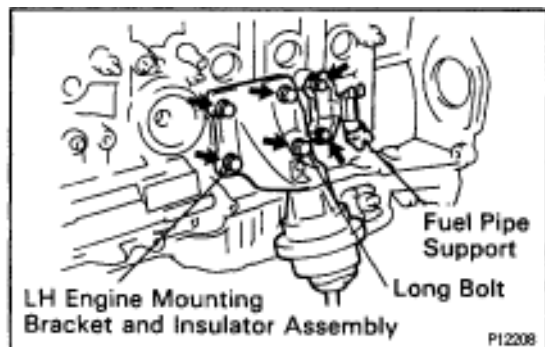
◆ Non-reusable part
★ Precoated part

PREPARATION FOR DISASSEMBLY

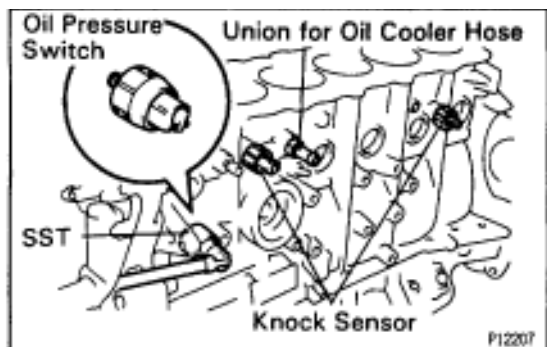
1. M/T:
REMOVE FLYWHEEL
2. A/T:
REMOVE DRIVE PLATE
3. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
4. REMOVE GENERATOR
5. REMOVE TIMING BELT AND PULLEYS
(See timing belt removal)
6. REMOVE CYLINDER HEAD
(See cylinder head removal)
7. REMOVE OIL FILTER
(See oil and filter replacement in Lubrication System)
8. 2JZ-GTE:
REMOVE OIL COOLER
(See oil cooler removal in Lubrication System)
9. REMOVE NO.2 WATER BYPASS PIPE
 - (a) 2JZ-GE:
Remove the bolt, 2 nuts, water bypass pipe and gasket.
 - (b) 2JZ-GTE:
Remove the 2 bolts, 2 nuts, water bypass pipe and gasket.



10. REMOVE OIL FILTER BRACKET
Remove the union bolt, gasket, oil filter bracket and O-ring.



11. REMOVE LH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY
12. REMOVE FUEL PIPE SUPPORT



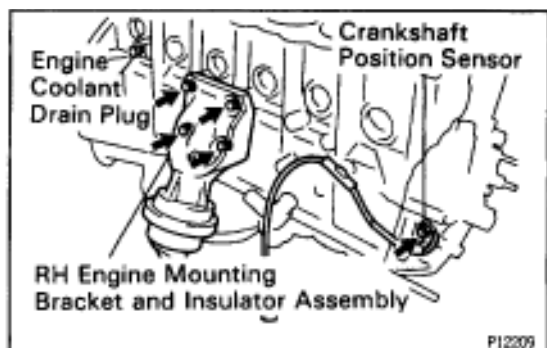
13. REMOVE OIL PRESSURE SWITCH AND KNOCK SENSORS

Using SST, remove the switch and sensors.

SST 09816-30010

14. 2JZ-GTE:

REMOVE UNION FOR OIL COOLER HOSE



15. REMOVE ENGINE COOLANT DRAIN PLUG

16. REMOVE RH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

17. 2JZ-GTE:

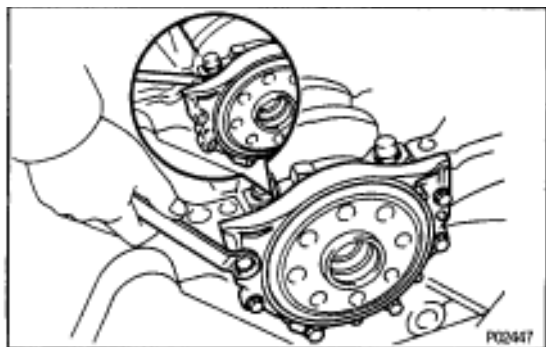
REMOVE CRANKSHAFT POSITION SENSOR

18. REMOVE WATER PUMP

(See water pump removal in Cooling System)

19. REMOVE OIL PUMP

(See oil pump removal in Lubrication System)

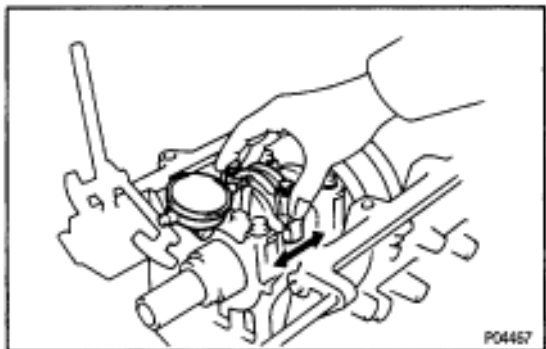


CYLINDER BLOCK DISASSEMBLY

1. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts.

(b) Remove the oil seal retainer by prying the area between the oil seal retainer and main bearing cap with a screwdriver.



2. CHECK CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:

0.250-0.402 mm (0.0098-0.0158 in.)

Maximum thrust clearance:

0.50 mm (0.0197 in.)

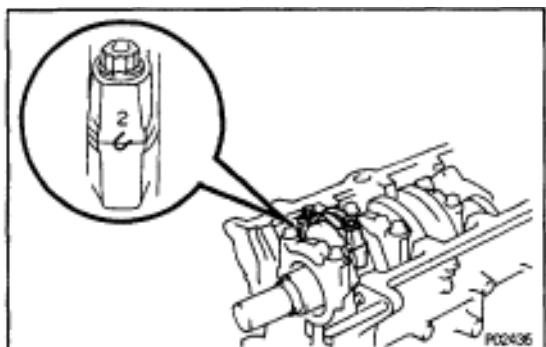
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

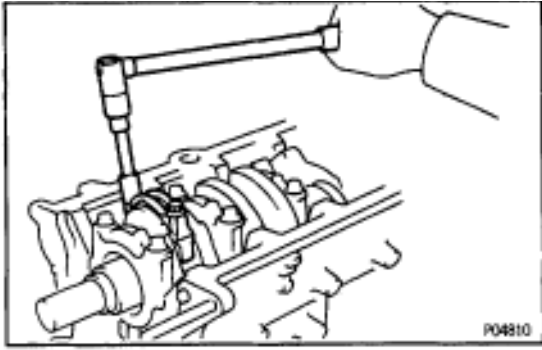
Connecting rod thickness:

25.898-25.950 mm (1.0196-1.0217 in.)

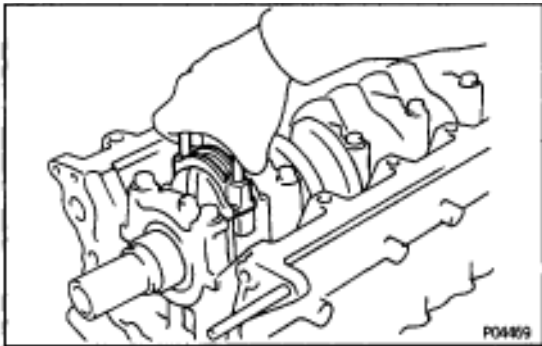
3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

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

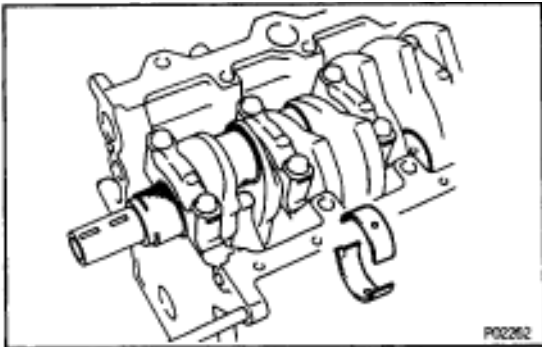




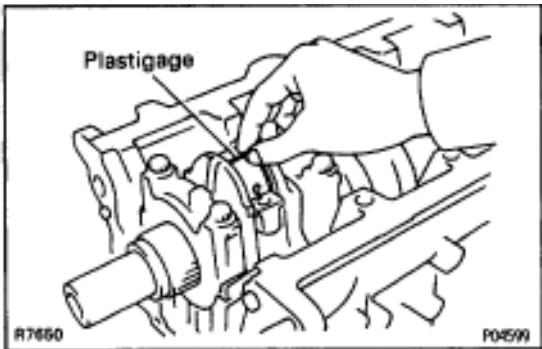
- (b) Remove the connecting rod cap bolts.



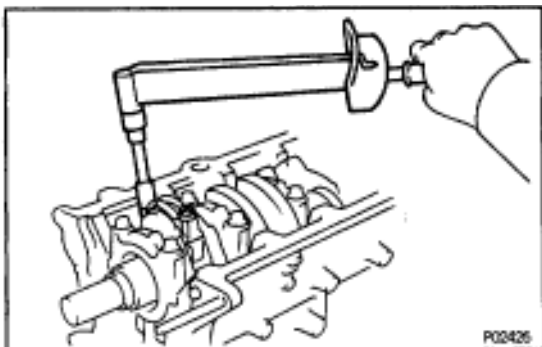
- (c) Using the 2 removed connecting rod bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.
HINT: Keep the lower bearing inserted with the connecting rod cap.



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



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



- (g) Install the connecting rod cap with the 2 bolts. (See step 8 in cylinder block assembly)

Torque:

1st

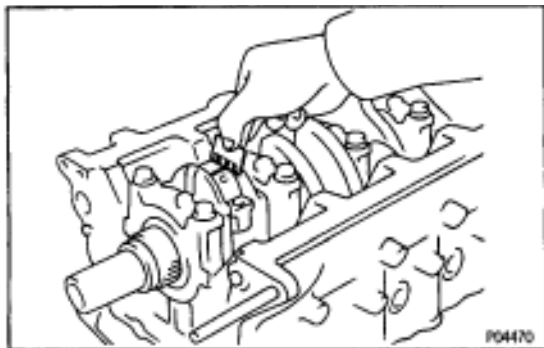
29 N·m (300 kgf·cm, 22 ft·lbf)

2nd

Turn 90°

NOTICE: Do not turn the crankshaft.

- (h) Remove the 2 bolts, connecting rod cap and lower bearing. (See procedure (b) and (c) above)



- (i) Measure the Plastigage at its widest point.

Standard oil clearance:

STD

.035–0.053 mm (0.0014–0.0021 in.)

U/S 0.25

.040–0.078 mm (0.0016–0.0031 in.)

Maximum oil clearance.

STD

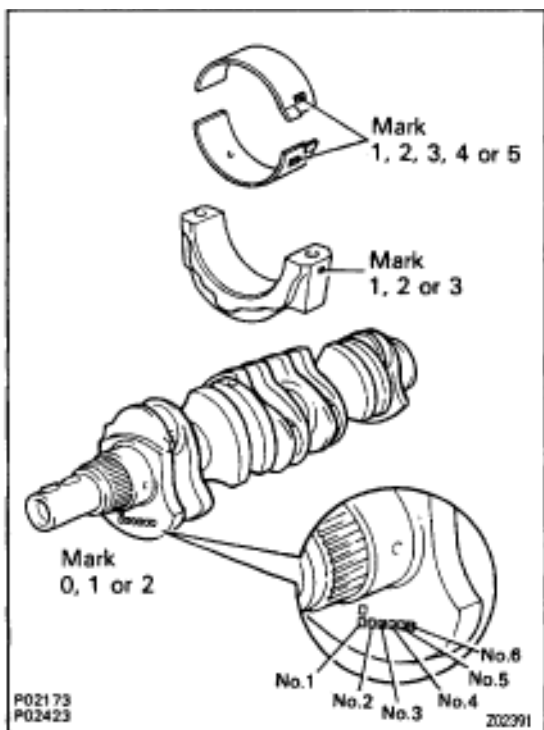
.08 mm (0.0031 in.)

U/S 0.25

.09 mm (0.0035 in.)

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

HINT: If using a standard bearing, replace with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the connecting rod cap 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 mark								
Connecting rod cap	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: Connecting rod cap "3" +Crankshaft "1" = Total number 4 (Use bearing "4")

Reference:

Connecting rod big end inside diameter:

Mark "1"

55.025–55.031 mm (2.1663–2.1666 in.)

Mark "2"

55.031–55.037 mm (2.1666–2.1668 in.)

Mark "3"

55.037–55.043 mm (2.1668–2.1670 in.)

Crankshaft crank pin diameter:

Mark "0"

51.994–52.000 mm (2.0470–2.0472 in.)

Mark "1"

51.988–51.994 mm (2.0468–2.0470 in.)

Mark "2"

51.982–51.988 mm (2.0465–2.0468 in.)

Bearing center wall thickness:**Mark "1"**

1.492–1.495 mm (0.0587–0.0589 in.)

Mark "2"

1.495–1.498 mm (0.0589–0.0590 in.)

Mark "3"

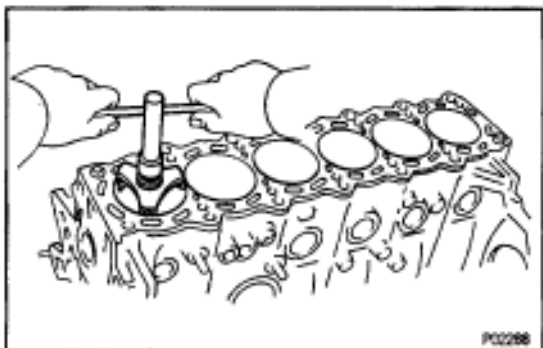
1.498–1.501 mm (0.0590–0.0591 in.)

Mark "4"

1.501–1.504 mm (0.0591–0.0592 in.)

Mark "5"

1.504–1.507 mm (0.0592–0.0593 in.)



- (j) Completely remove the Plastigage.

4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

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

HINT:

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

5. CHECK CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:

0.020–0.220 mm (0.0008–0.0087 in.)

Maximum thrust clearance:

0.30 mm (0.0118 in.)

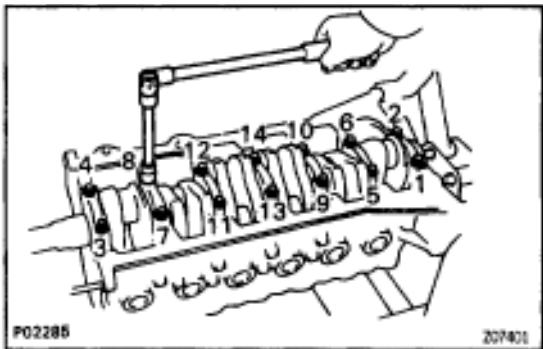
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:

1.940–1.990 mm (0.0764–0.0783 in.)

6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

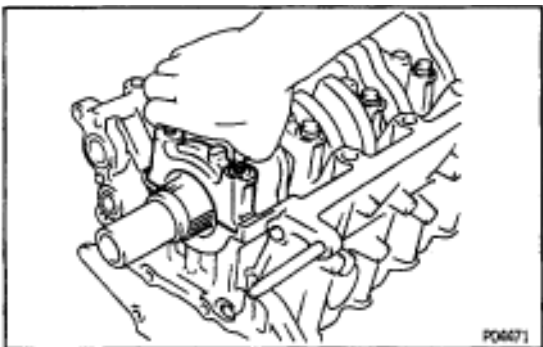
- (a) Uniformly loosen and remove the 14 main bearing cap bolts, in several passes, in the sequence shown.

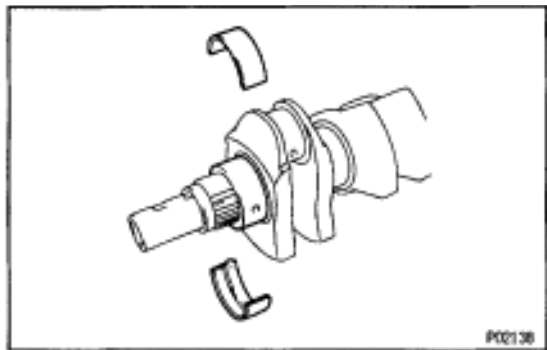


- (b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers (No.4 main bearing cap only).

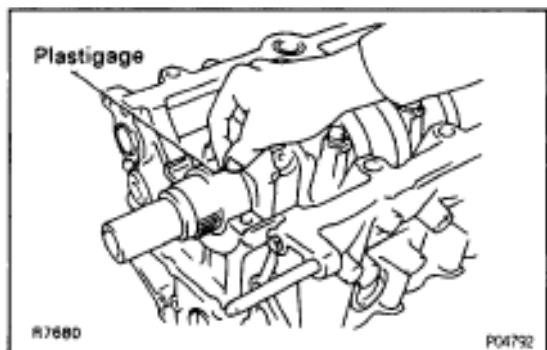
HINT:

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

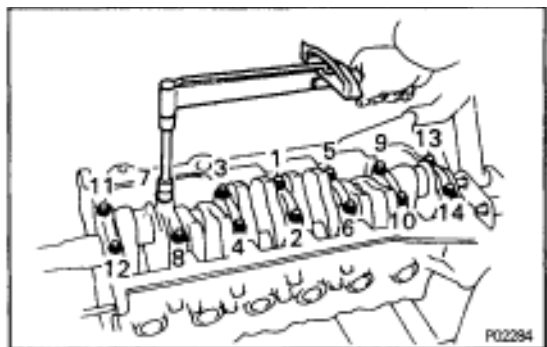




- (c) Lift out the crankshaft.
HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.
- (d) Clean each main journal and bearing.
- (e) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



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



- (h) Install the main bearing caps.
(See step 5 in cylinder block installation)

Torque:

1st

44 N·m (450 kgf·cm, 33 ft·lbf)

2nd

Turn 90°

NOTICE: Do not turn the crankshaft.

- (i) Remove the main bearing caps.
(See procedures (a) and (b) above)
- (j) Measure the Plastigage at its widest point.

Standard clearance:

STD

.026–0.040 mm (0.0010–0.0016 in.)

U/S 0.25

.025–0.061 mm (0.0010–0.0024 in.)

Maximum clearance:

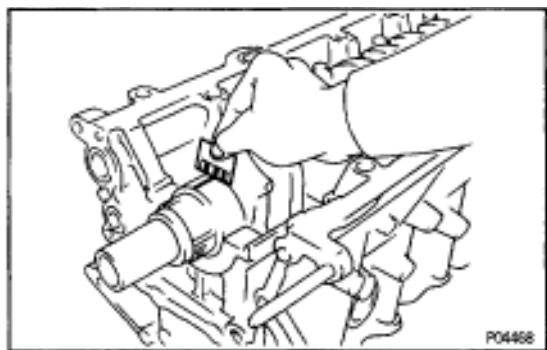
STD

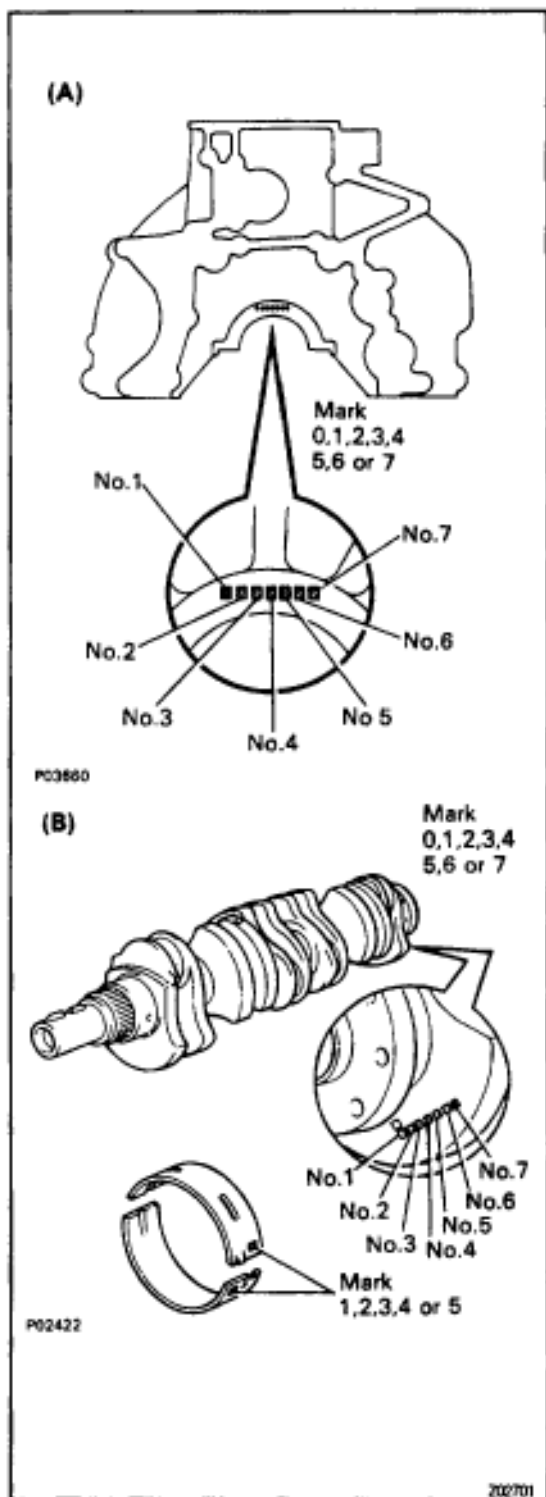
.06 mm (0.0024 in.)

U/S 0.25

.08 mm (0.0031 in.)

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





HINT: If using a standard bearing, replace with one having the same number. 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 refer to the table below for the appropriate bearing number. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

	Total number " " : Number mark				
Cylinder block (A) + Crankshaft (B) =	0-2	3-5	6-8	9-11	12-14
Use bearing	"1"	"2"	"3"	"4"	"5"

EXAMPLE: Cylinder block "3" (A)
+ Crankshaft "4" (B)
= Total number 7 (Use bearing "3")

Reference:

Cylinder block main journal bore diameter (A):

- Mark "0"
66.020-66.022 mm (2.59922-2.59929 in.)
- Mark "1"
66.022-66.024 mm (2.59929-2.59936 in.)
- Mark "2"
66.024-66.026 mm (2.59936-2.59944 in.)
- Mark "3"
66.026-66.028 mm (2.59944-2.59952 in.)
- Mark "4"
66.028-66.030 mm (2.59952-2.59960 in.)
- Mark "5"
66.030-66.032 mm (2.59960-2.59968 in.)
- Mark "6"
66.032-66.034 mm (2.59968-2.59976 in.)
- Mark "7"
66.034-66.036 mm (2.59976-2.59984 in.)

Crankshaft main journal diameter (B):

- Mark "0"
61.998-62.000 mm (2.44086-2.44094 in.)
- Mark "1"
61.996-61.998 mm (2.44078-2.44086 in.)
- Mark "2"
61.994-61.996 mm (2.44070-2.44078 in.)
- Mark "3"
61.992-61.994 mm (2.44063-2.44070 in.)
- Mark "4"
61.990-61.992 mm (2.44055-2.44063 in.)
- Mark "5"
61.988-61.990 mm (2.44047-2.44055 in.)

Mark "6"

61.986–61.988 mm (2.44039–2.44047 in.)

Mark "7"

61.984–61.986 mm (2.44031–2.44039 in.)

Bearing center wall thickness:

Mark "1"

1.994–1.997 mm (0.0785–0.0786 in.)

Mark "2"

1.997–2.000 mm (0.0786–0.0787 in.)

Mark "3"

2.000–2.003 mm (0.0787–0.0789 in.)

Mark "4"

2.003–2.006 mm (0.0789–0.0790 in.)

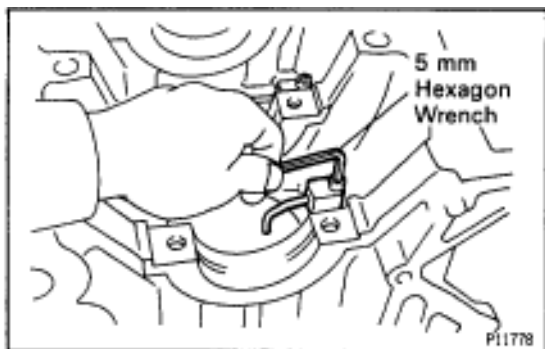
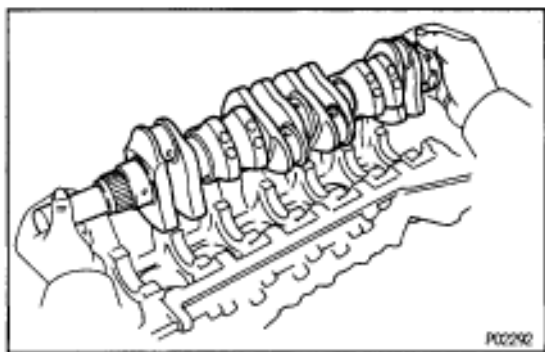
Mark "5"

2.006–2.009 mm (0.0790–0.0791 in.)

Standard sized Bearing Selection chart

Crankshaft number mark	Cylinder block number mark							
	0	1	2	3	4	5	6	7
0	1	1	1	2	2	2	3	3
1	1	1	2	2	2	3	3	3
2	1	2	2	2	3	3	3	4
3	2	2	2	3	3	3	4	4
4	2	2	3	3	3	4	4	4
5	2	3	3	3	4	4	5	5
6	3	3	3	4	4	5	5	5
7	3	3	4	4	5	5	5	5

EXAMPLE: Cylinder block "3" Crankshaft "4"
= Use bearing "3"



(k) Completely remove the Plastigage.

7. REMOVE CRANKSHAFT

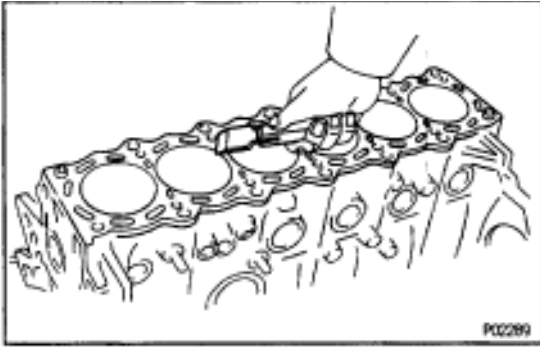
- Lift out the crankshaft
- Remove the upper bearings and upper thrust washers from the cylinder block.

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

8. 2JZ-GTE:

REMOVE OIL NOZZLES (WITH RELIEF VALVES)

Using a 5 mm hexagon wrench, remove the bolt and oil nozzle. Remove the 6 oil nozzles.



CYLINDER BLOCK INSPECTION

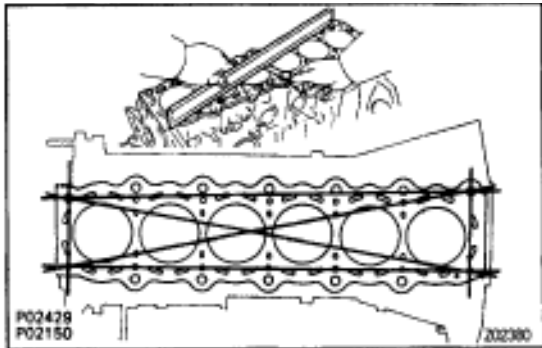
1. CLEAN CYLINDER BLOCK

A. Remove gasket material

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

B. Clean cylinder block

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



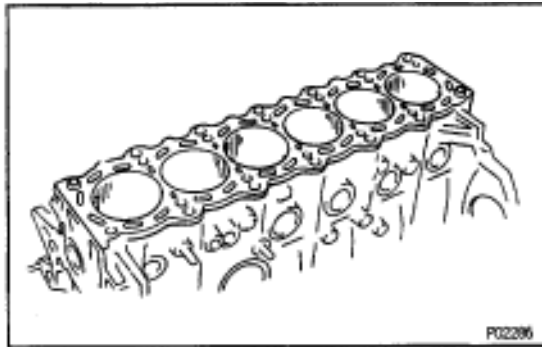
2. INSPECT CYLINDER BLOCK SURFACE FOR FLATNESS

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

Maximum warpage:

0.07 mm (0.0028 in.)

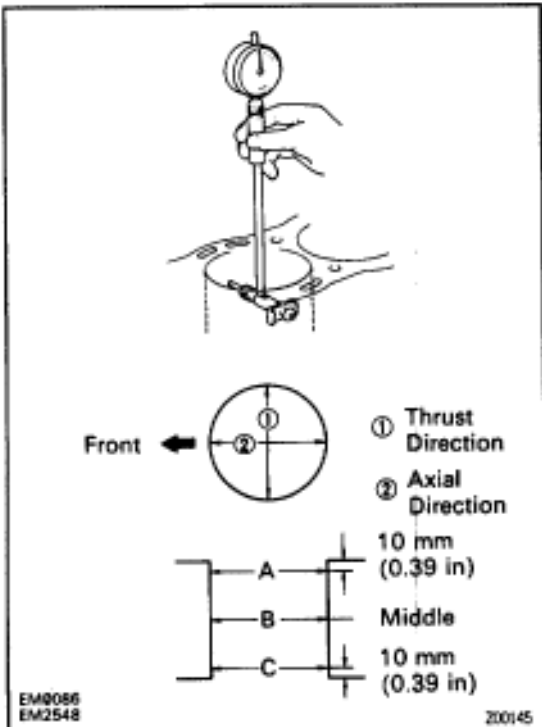
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

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

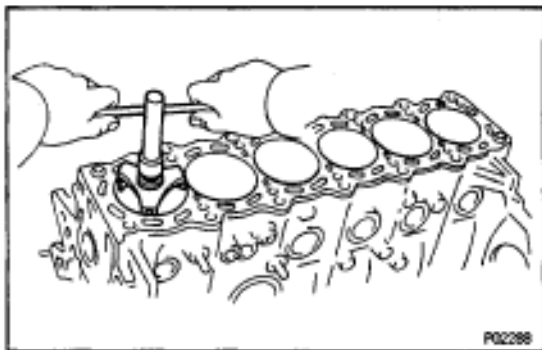
Standard diameter:

86.000–86.013 mm (3.3858–3.3863 in.)

Maximum diameter:

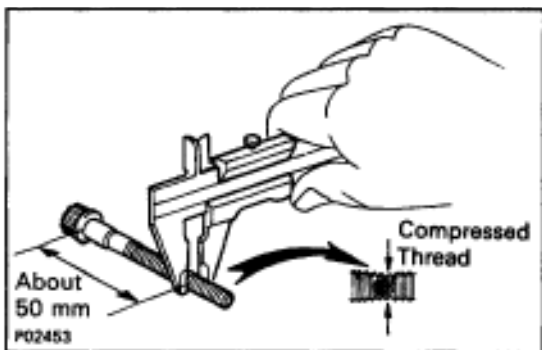
86.02 mm (3.3866 in.)

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



5. REMOVE CYLINDER RIDGE

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



6. INSPECT MAIN BEARING CAP BOLTS

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

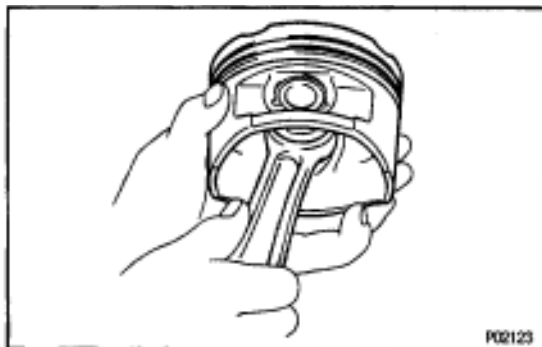
Standard diameter:

9.96–9.97 mm (0.3921–0.3925 in.)

Minimum diameter:

9.7 mm (0.382 in.)

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

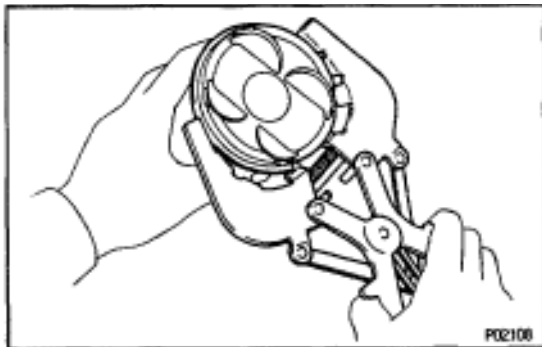


PISTON AND CONNECTING ROD DISASSEMBLY

1. CHECK FIT BETWEEN PISTON AND PISTON PIN

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

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

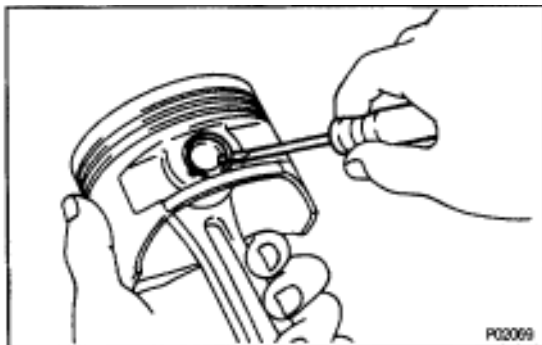


2. REMOVE PISTON RINGS

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

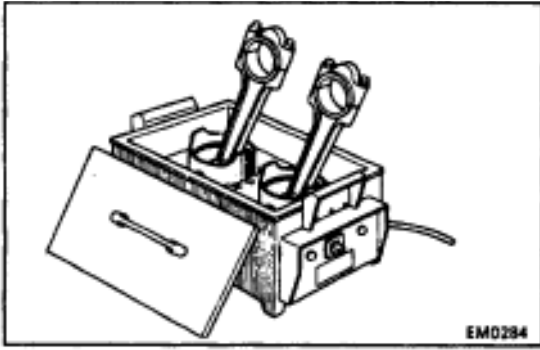
(b) Remove the 2 side rails and oil ring expander by hand.

HINT: Arrange the piston rings in correct order only.

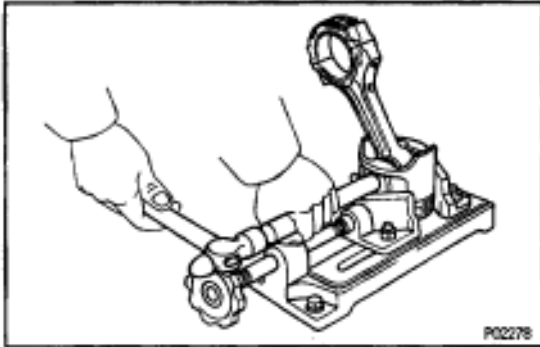


3. DISCONNECT CONNECTING ROD FROM PISTON

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



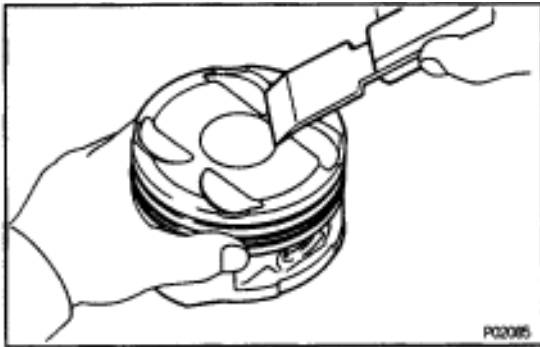
- (b) Gradually heat the piston to about 80°C (176°F).



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

HINT:

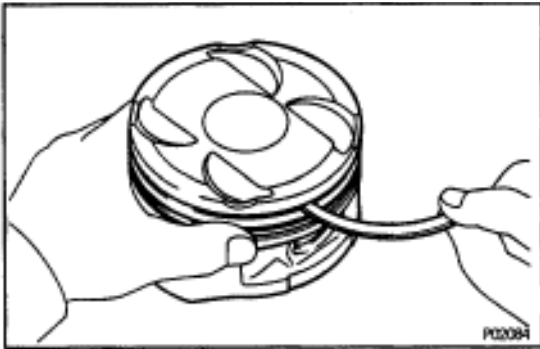
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.



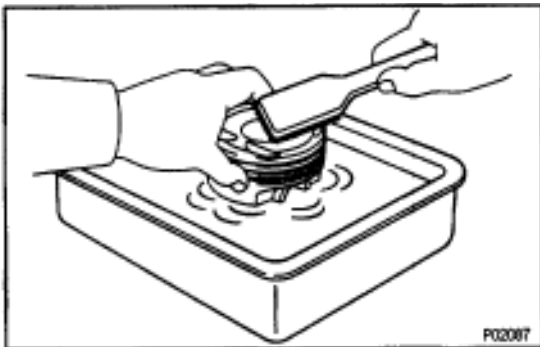
PISTON AND CONNECTING ROD INSPECTION

1. CLEAN PISTON

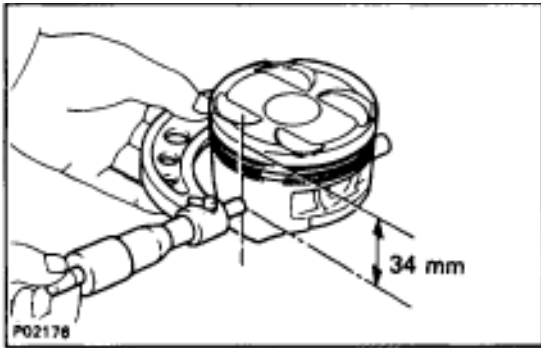
- (a) Using a gasket scraper, remove the carbon from the piston top.



- (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

- (a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 34 mm (1.34 in.) from the piston head.

Piston diameter:

2JZ-GE

85.935–85.945 mm (3.3833–3.3837 in.)

2JZ-GTE

85.917–85.927 mm (3.3826–3.3830 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:

2JZ-GE

.055–0.078 mm (0.0022–0.0031 in.)

2JZ-GTE

.073–0.096 mm (0.0029–0.0038 in.)

Maximum oil clearance:

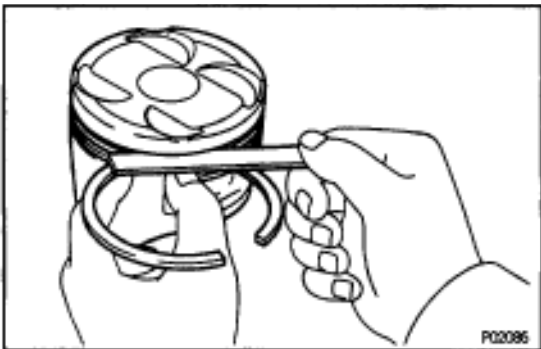
2JZ-GE

.10 mm (0.0039 in.)

2JZ-GTE

.12 mm (0.0047 in.)

If the oil clearance is greater than maximum, replace all the 6 pistons. If necessary, replace 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.

Ring groove clearance:

No.1

2JZ-GE

0.011–0.070 mm (0.0004–0.0028 in.)

2JZ-GTE

0.040–0.080 mm (0.0016–0.0031 in.)

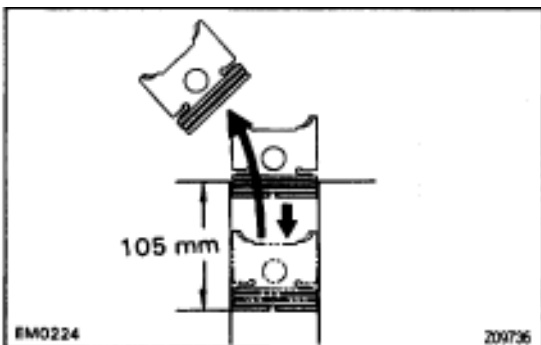
No.2

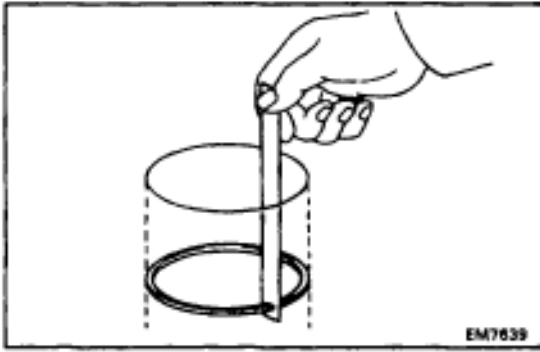
.030–0.070 mm (0.0012–0.0028 in.)

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, 105 mm (4.13 in.) from the top of the cylinder block.





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

Standard ring end gap:

No.1

2JZ-GE

0.300–0.470 mm (0.0118–0.0185 in.)

2JZ-GTE

0.300–0.400 mm (0.0118–0.0157 in.)

No.2

2JZ-GE

0.350–0.520 mm (0.0138–0.0205 in.)

2JZ-GTE

0.350–0.450 mm (0.0138–0.0178 in.)

Oil (Side rail)

2JZ-GE

0.130–0.450 mm (0.0051–0.0177 in.)

2JZ-GTE

0.130–0.380 mm (0.0051–0.0150 in.)

Maximum ring end gap:

No.1

2JZ-GE

1.07 mm (0.0421 in.)

2JZ-GTE

1.00 mm (0.0394 in.)

No.2

2JZ-GE

1.12 mm (0.0441 in.)

2JZ-GTE

1.05 mm (0.0413 in.)

Oil (Side rail)

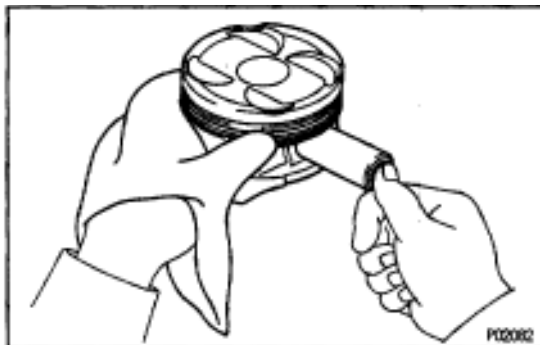
2JZ-GE

1.05 mm (0.0413 in.)

2JZ-GTE

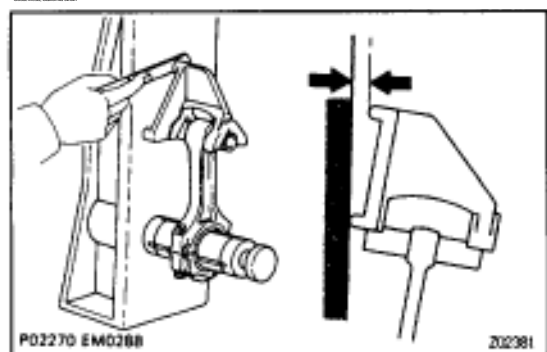
0.98 mm (0.0386 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



D. Inspect piston pin fit

At 80°C (176°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 feeler gauge and rod aligner, check the connecting rod alignment.

- Check for out-of-alignment

Maximum out-of-alignment:

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

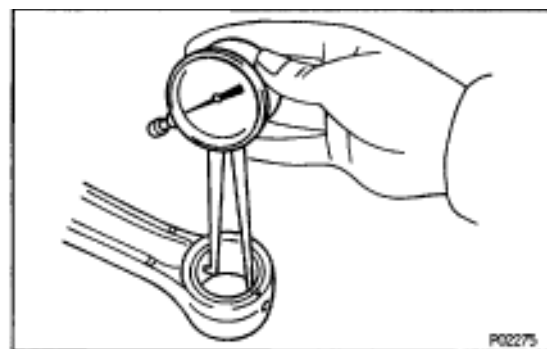
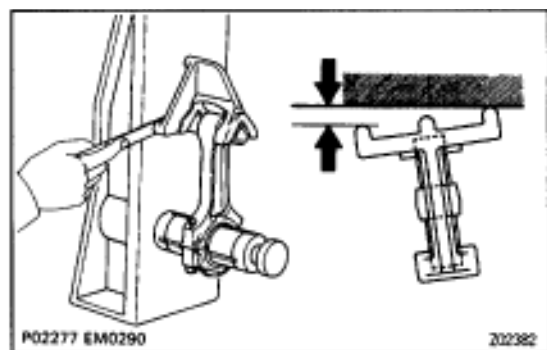
If out-of-alignment is greater than maximum, replace the connecting rod assembly.

- Check for twist

Maximum twist:

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

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

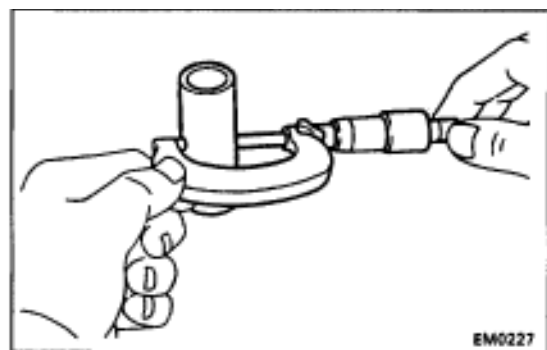


B. Inspect piston pin oil clearance

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

Bushing inside diameter:

22.005–22.014 mm (0.8663–0.8667 in.)



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

Piston pin diameter:

21.997–22.006 mm (0.8660–0.8664 in.)

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

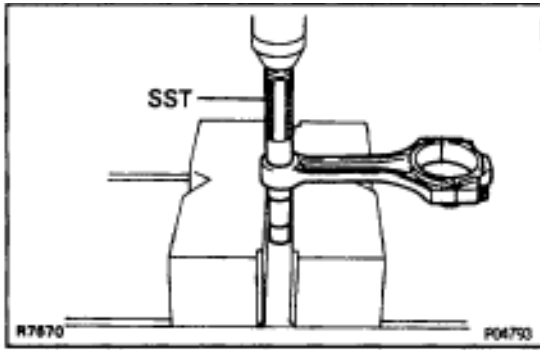
Standard oil clearance:

0.005–0.011 mm (0.0002–0.0004 in.)

Maximum oil clearance:

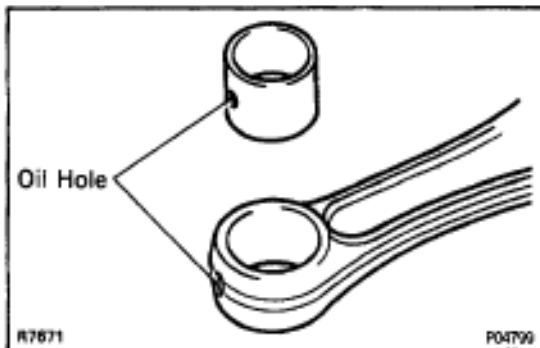
0.05 mm (0.0020 in.)

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

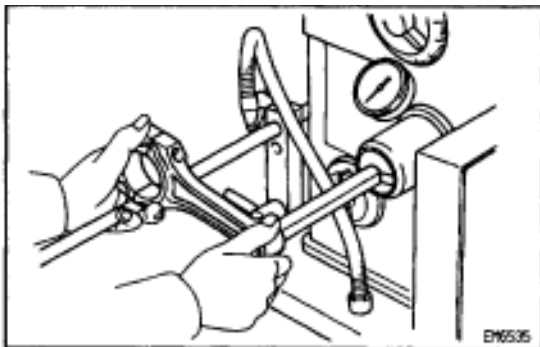


C. If necessary, replace connecting rod bushing

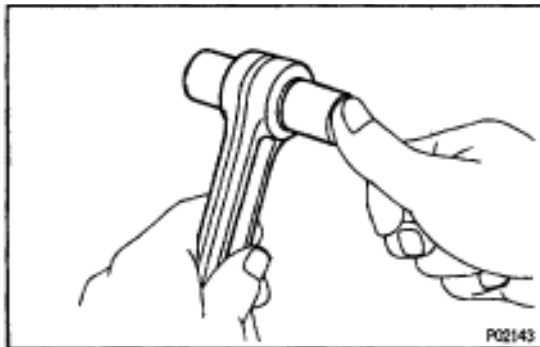
- (a) Using SST and a press, press out the bushing.
SST 09222-30010



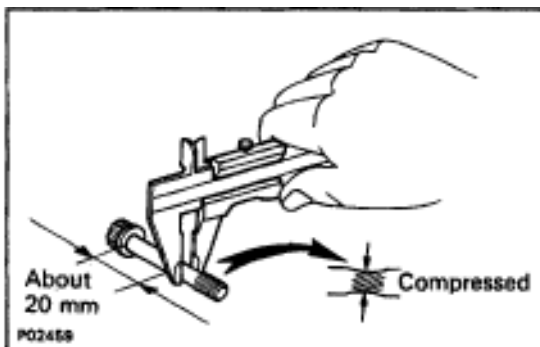
- (b) Align the oil holes of a new bushing and the connecting rod.
(c) Using SST and a press, press in the bushing.
SST 09222-30010



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



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



D. Inspect connecting rod bolts

Using vernier calipers, measure the minimum diameter of the compressed bolt at the measuring point.

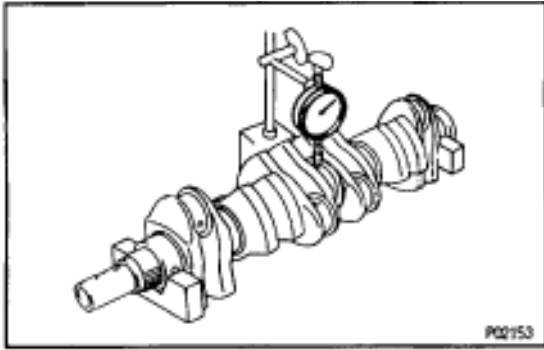
Standard diameter:

8.1–8.3 mm (0.319–0.327 in.)

Minimum diameter:

8.0 mm (0.315 in.)

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



CRANKSHAFT INSPECTION

1. INSPECT CRANKSHAFT FOR RUNOUT

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

Maximum circle runout:

0.06 mm (0.0024 in.)

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

2. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter:

STD

61.984–62.000 mm (2.4403–2.4409 in.)

U/S 0.25

61.745–61.755 mm (2.4309–2.4313 in.)

Crank pin diameter:

STD

51.982–52.000 mm (2.0465–2.0472 in.)

U/S 0.25

51.745–51.755 mm (2.0372–2.0376 in.)

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:

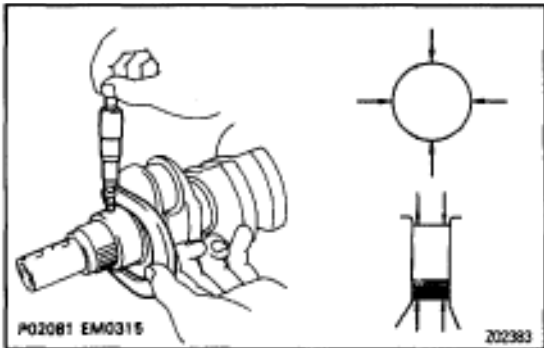
0.02 mm (0.0008 in.)

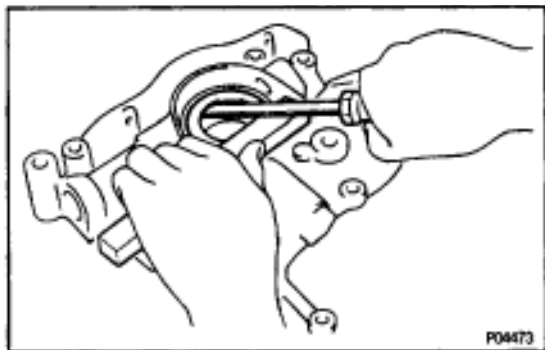
If the taper or out-of-round is greater than maximum, grind or replace the crankshaft.

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.





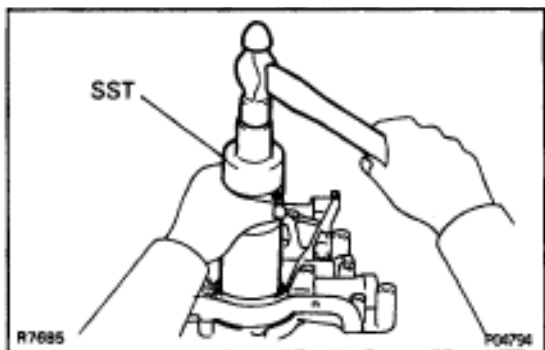
CRANKSHAFT OIL SEALS REPLACEMENT

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

1. REPLACE CRANKSHAFT FRONT OIL SEAL

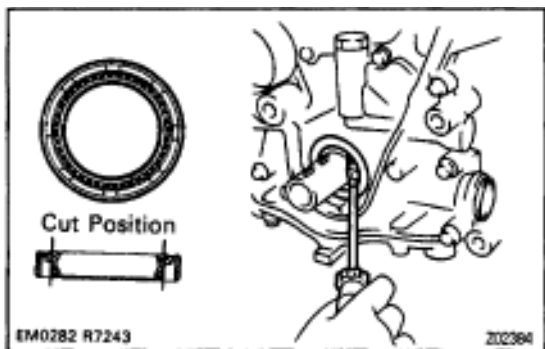
A. If oil pump is removed from cylinder block:

- (a) Using a screwdriver, pry out the oil seal.
- (b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09316-60010 (09316-00010)
- (c) Apply MP grease to the oil seal lip.

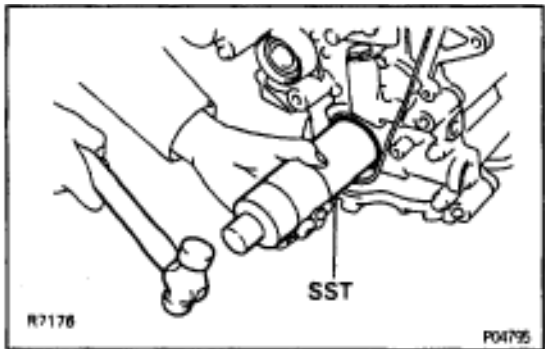


B. If oil pump is installed on cylinder block:

- (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.



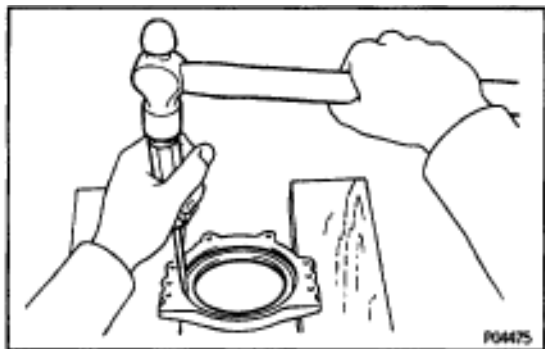
- (c) Apply MP grease to a new oil seal lip.
- (d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09316-60010 (09316-00010)

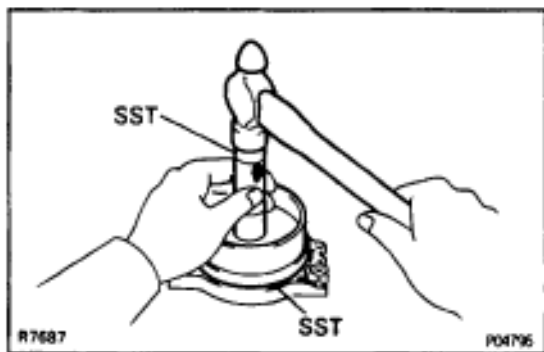


2. REPLACE CRANKSHAFT REAR OIL SEAL

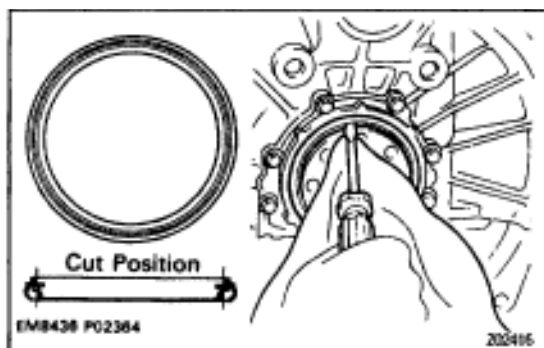
A. If rear oil seal retainer is removed from cylinder block:

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



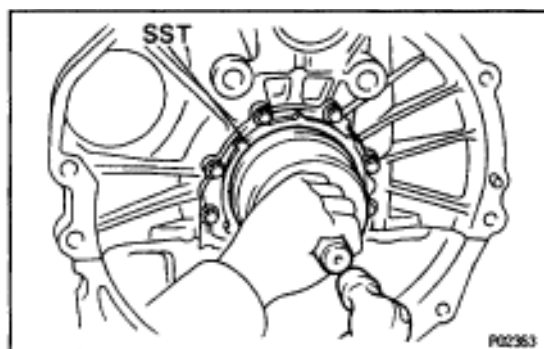


- (b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09608-30022 (09608-05010)
- (c) Apply MP grease to the oil seal lip.



B. If rear oil seal retainer is installed on 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.



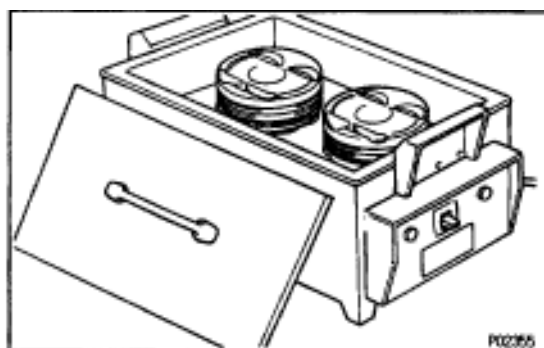
- (c) Apply MP grease to a new oil seal lip.
- (d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09608-30022 (09608-05010)



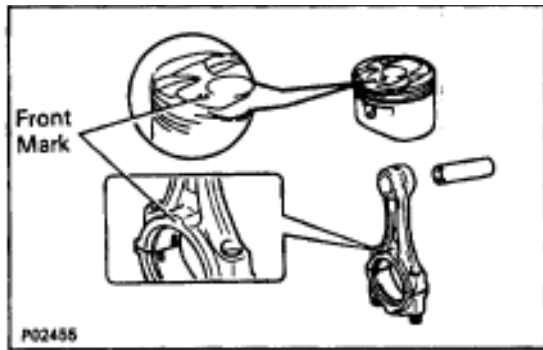
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

- (a) 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.



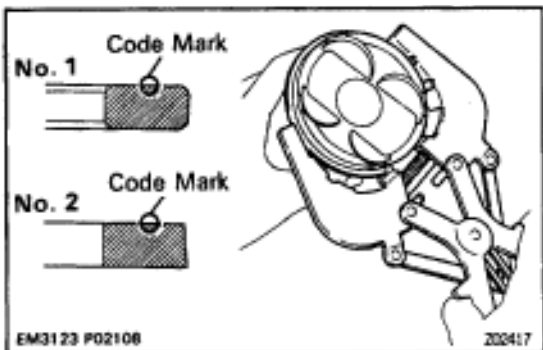
- (b) Gradually heat the piston to about 80°C (176°F).



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



- (e) Install a new snap ring at 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 up.

Code mark:

2JZ-GE

No.1 1T

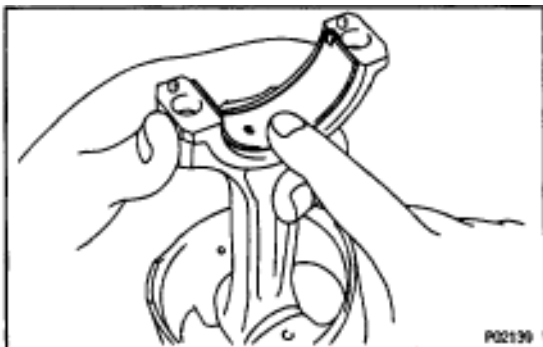
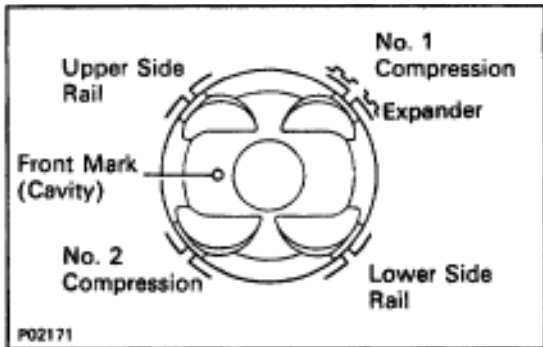
No.2 2T

2JZ-GTE

No.1 1N

No.2 2N

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



3. INSTALL BEARINGS

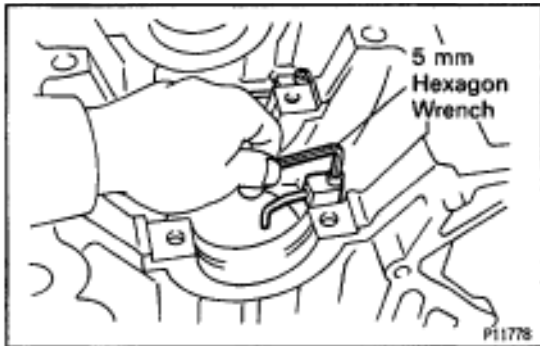
- (a) Align the bearing claw with the groove of the connecting rod and connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

CYLINDER BLOCK ASSEMBLY

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.

NOTICE: Apply a generous amount of oil on the sliding surface of the bearing, and not on the back of it or on the surface to which it is installed.

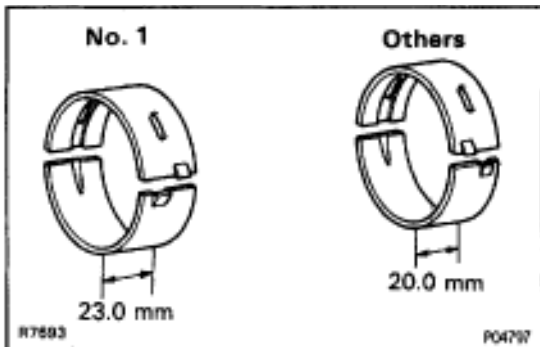


1. 2JZ-GTE:

INSTALL OIL NOZZLES (WITH RELIEF VALVES)

Using a 5 mm hexagon wrench, install the oil nozzle with the bolt. Install the 6 oil nozzles.

Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)



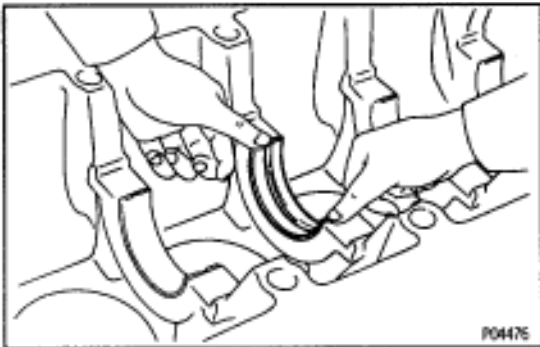
2. INSTALL MAIN BEARINGS

HINT:

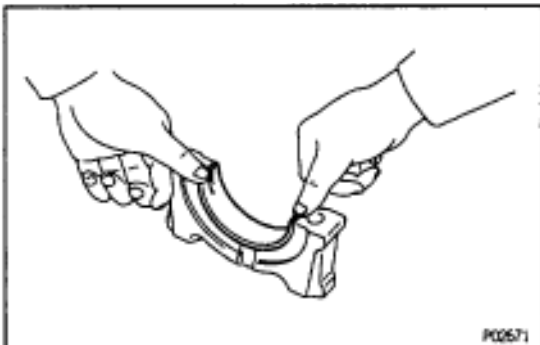
- Main bearings come in widths of 20.0 mm (0.787 in.) and 23.0 mm (0.906 in.). Install the 23.0 mm bearings in the No.1 cylinder block journal position with the main bearing cap. Install the 20.0 mm bearings in the other positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.

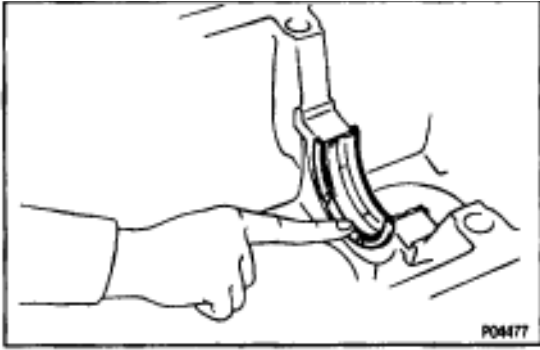
- (a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.

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



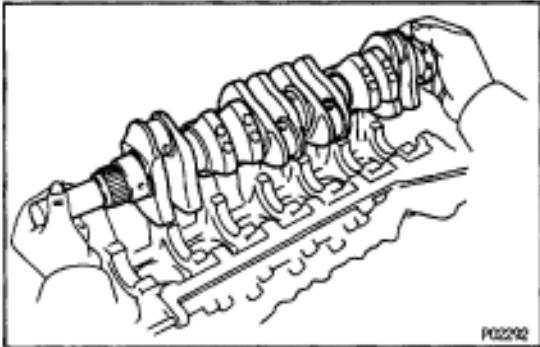
- (b) Install the bearings in the cylinder block and main bearing caps.



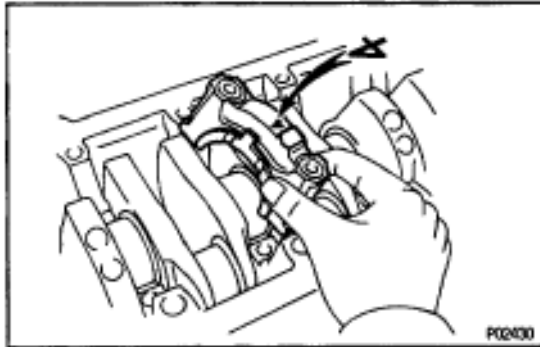


3. INSTALL UPPER THRUST WASHERS

Install the 2 thrust washers under the No.4 main journal position of the cylinder block with the oil grooves facing outward.



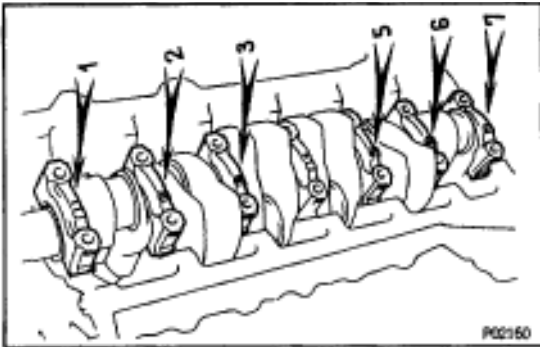
4. PLACE CRANKSHAFT ON CYLINDER BLOCK



5. INSTALL MAIN BEARING CAP AND LOWER THRUST WASHERS

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

- (a) Install the lower thrust washers on the No.4 main bearing with the grooves facing outward.

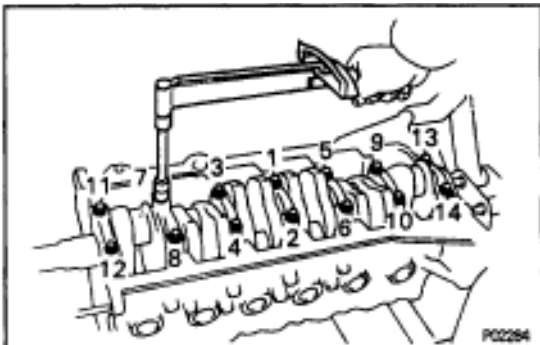


- (b) Install the main bearing caps in numerical order with the arrows facing forward.

B. Install main bearing cap bolts

HINT:

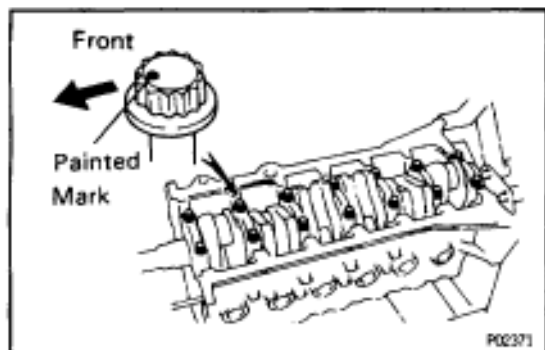
- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the main bearing bolts break or deform, replace them.



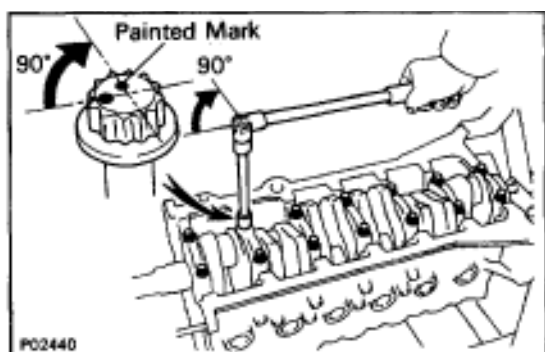
- (a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.
- (b) Install and uniformly tighten the 14 main bearing cap bolts, in several passes, in the sequence shown.

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

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



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

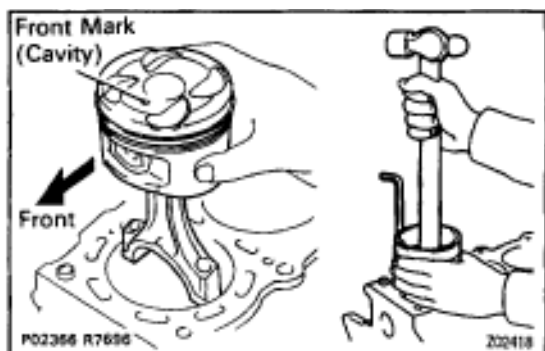


- (d) Retighten the main bearing cap bolts 90° in the numerical order shown above.

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

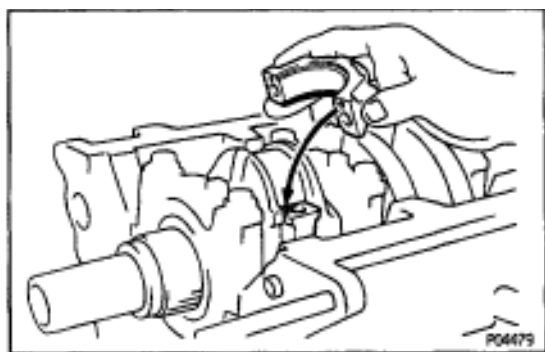
- (f) Check that the crankshaft turns smoothly.

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



7. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

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.



8. 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 by aligning the dowel pin to the corresponding hole.

B. Install connecting rod cap bolts

HINT:

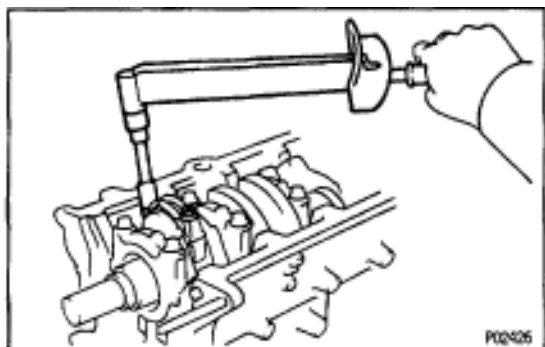
- The connecting rod cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the connecting rod bolts break or deform, replace them.

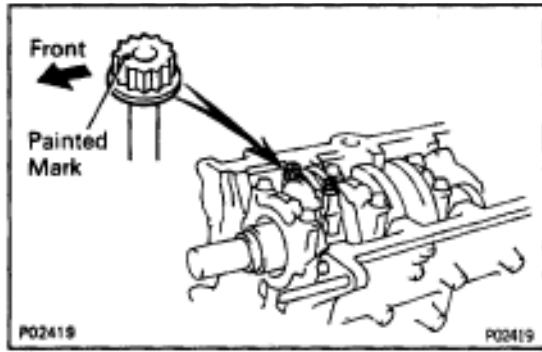
- (a) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.

- (b) At first, install and alternately tighten the bolts of the connecting rod cap in several passes.

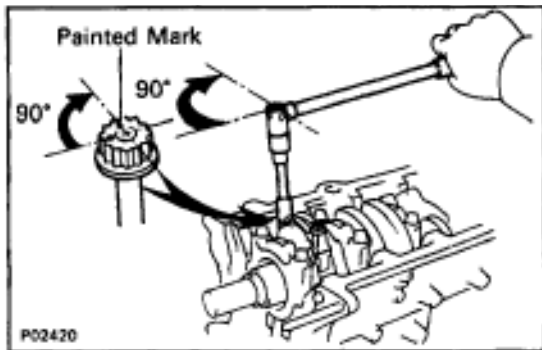
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

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





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

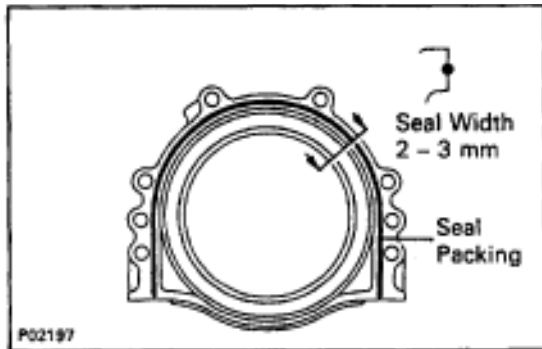


- (d) Retighten the connecting rod cap bolts 90° in the numerical order shown.
 (e) Check that the painted mark is now at a 90° angle to the front.
 (f) Check that the crankshaft turns smoothly.

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

10. INSTALL REAR OIL SEAL RETAINER

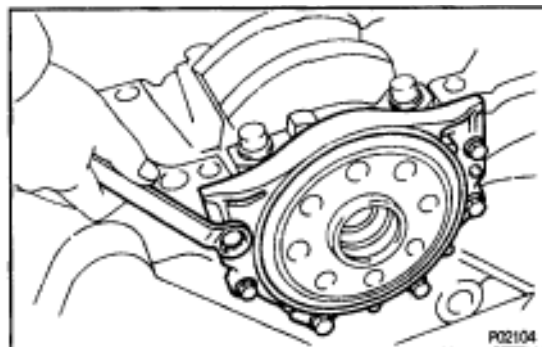
- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
 - Thoroughly clean all components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



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

Part No. 08826-00080 or equivalent

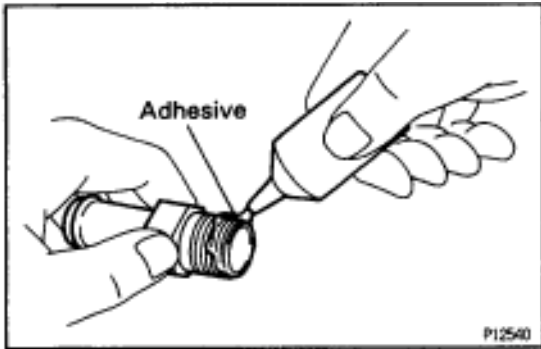
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



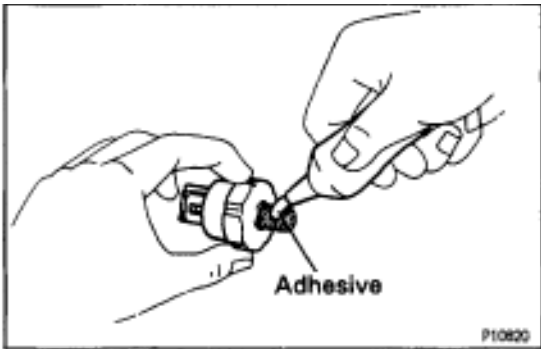
- (c) Install the retainer with the 6 bolts.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

AFTER ASSEMBLY

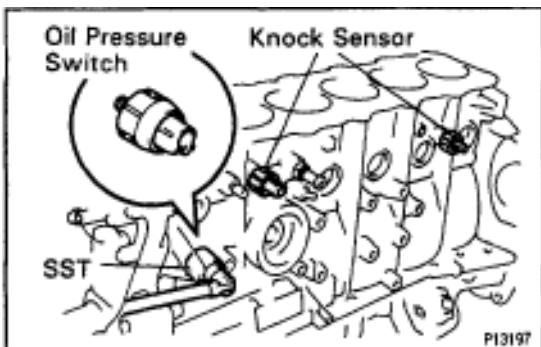
1. **INSTALL OIL PUMP**
(See oil pump installation in Lubrication System)
2. **INSTALL WATER PUMP**
(See water pump installation in Cooling System)
3. **2JZ-GTE:**
INSTALL CRANKSHAFT POSITION SENSOR
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
4. **INSTALL RH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY**
HINT: The RH mounting bracket is marked "A ← EX".
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)
5. **INSTALL ENGINE COOLANT DRAIN PLUG**
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



6. **2JZ-GTE:**
INSTALL UNION FOR OIL COOLER HOSE
 - (a) Apply adhesive to 2 or 3 threads of the union.
Adhesive:
Part No. 08833-00070, THREE BOND 1324, or equivalent
 - (b) Install the union.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



7. **INSTALL KNOCK SENSORS AND 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 2 knock sensors and oil pressure switch.
SST 09816-30010
Torque:
Knock sensor
44 N·m (450 kgf·cm, 33 ft·lbf)
Oil pressure switch
14 N·m (150 kgf·cm, 11 ft·lbf)

8. INSTALL FUEL PIPE SUPPORT

Torque: 14 N·m (145 kgf·cm, 10 ft·lbf)

9. INSTALL LH ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

HINT: LH mounting bracket is marked "A ← IN".

Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

10. INSTALL OIL FILTER BRACKET

- (a) Check and clean the oil filter bracket installation.
- (b) Place a new O-ring in position on the oil filter bracket.
- (c) Apply clean engine oil to the O-ring.
- (d) Install a new gasket to the union bolt.
- (e) Install the oil filter bracket with the union bolt.

Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)

11. INSTALL NO.2 WATER BYPASS PIPE

- (a) Install a new gasket to the water pump.

- (b) 2JZ-GE:

Install the water bypass pipe with the bolt and 2 nuts.

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

- (c) 2JZ-GTE:

Install the water bypass pipe with the 2 bolts and 2 nuts.

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

12. 2JZ-GTE:**INSTALL OIL COOLER**

(See oil cooler installation in Lubrication System)

13. INSTALL OIL FILTER

(See oil and filter replacement in Lubrication System)

14. INSTALL CYLINDER HEAD

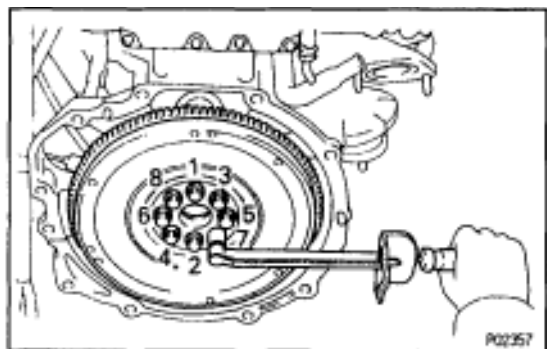
(See cylinder head installation)

15. INSTALL TIMING PULLEYS AND BELT

(See timing belt installation)

16. INSTALL GENERATOR

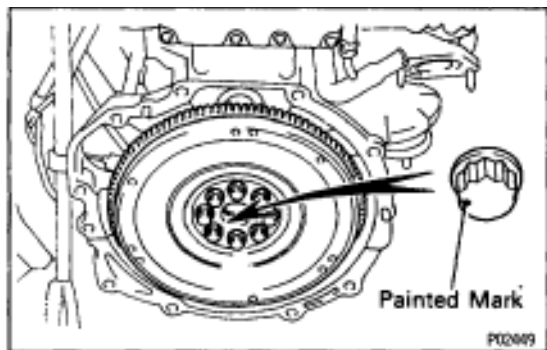
(See generator installation in Charging System)

17. REMOVE ENGINE STAND FROM ENGINE**18. M/T:****INSTALL FLYWHEEL**

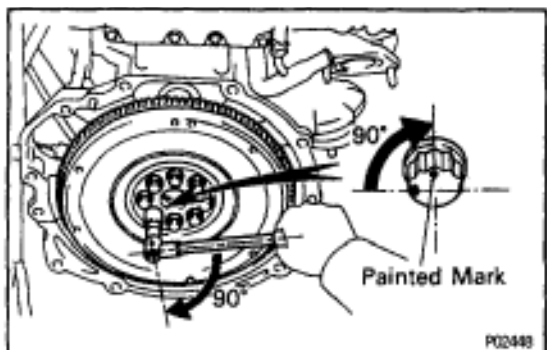
HINT: The flywheel bolts are tightened in 2 progressive step, (b) and (d).

- (a) Install the flywheel on the crankshaft.
- (b) Install and uniformly tighten the 8 bolts, in several passes, in the sequence shown.

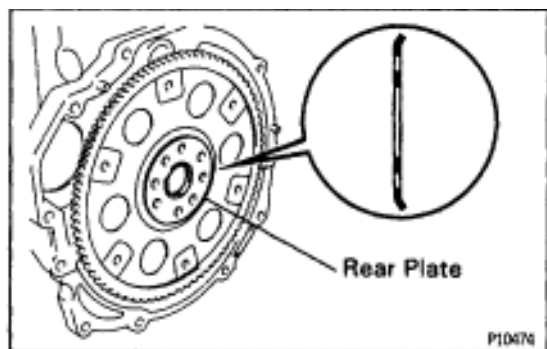
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



- (c) Mark the flywheel bolt with paint.



- (d) Retighten the flywheel bolts by an additional 90°.
 (e) Check that the painted mark is now at a 90° angle to (d).

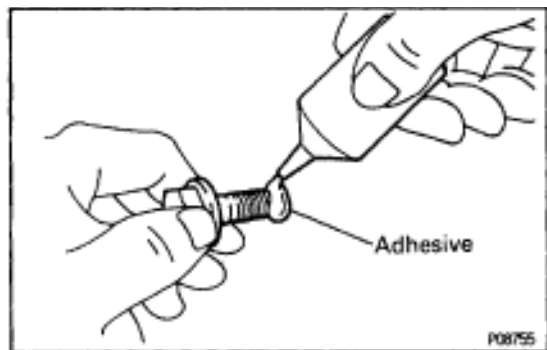


19. A/T:
INSTALL DRIVE PLATE

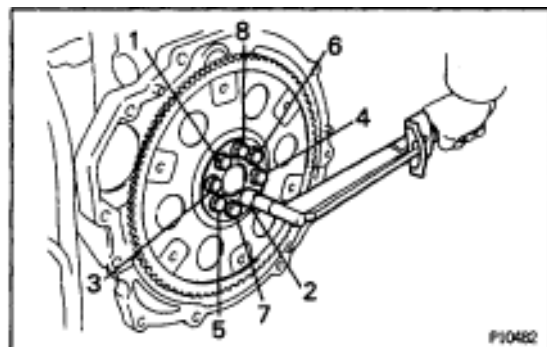
- (a) Install the front spacer, drive plate and rear plate on the crankshaft.

Adhesive:

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

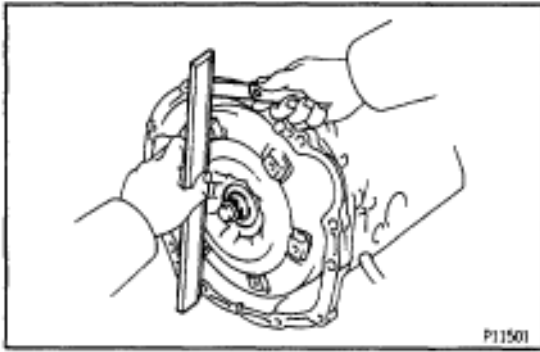


- (b) Apply adhesive to 2 or 3 threads of the mounting bolt end.



- (c) Install and uniformly tighten the 8 bolts, in several passes, in the sequence shown.

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



ENGINE & TRANSMISSION ASSEMBLY

1. A/T:

CHECK TORQUE CONVERTER CLUTCH INSTALLATION
Using calipers and straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission.

Correct distance:

Less than 0.1 mm (0.004 in.)

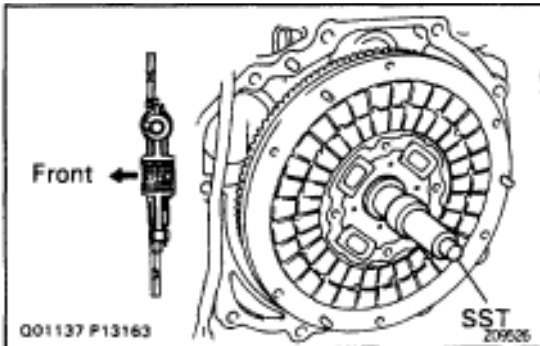
If the distance is not as specified, check for an improper installation.

2. 2JZ-GE M/T:

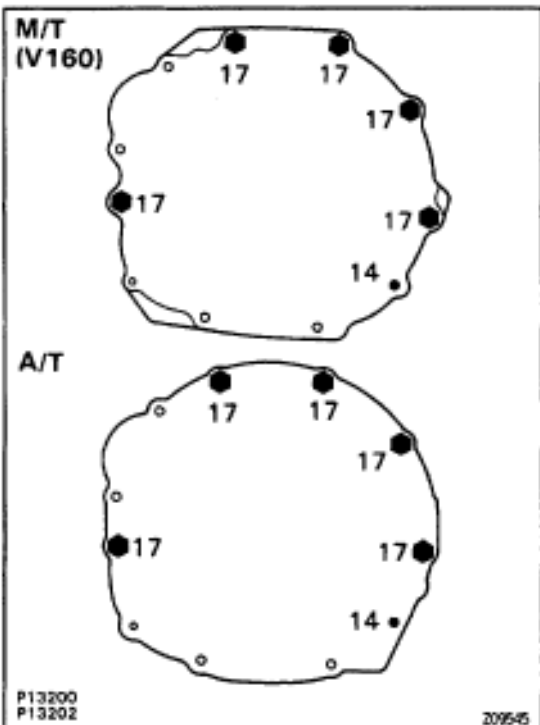
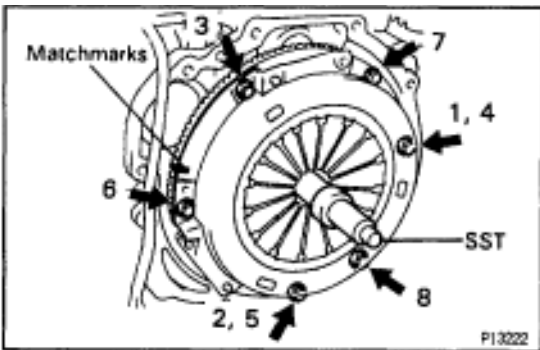
INSTALL CLUTCH DISC AND COVER

- (a) Insert SST in the clutch disc, and then set them and the cover in position.

SST 09301-00110



- (b) Align the matchmarks on the clutch cover and flywheel.
(c) Tighten the bolts evenly and gradually while pushing SST. Make several passes around the cover until it is snug. SST 09301-00110
(d) Torque the bolts on the clutch cover in the order shown.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



3. ASSEMBLE ENGINE AND TRANSMISSION

- (a) M/T:

Align the input spline with the clutch disc and install the transmission to the engine.

- (b) Align the 2 knock pins on the cylinder block with the pin holes of the clutch housing.

- (c) Install the transmission with the 6 bolts.

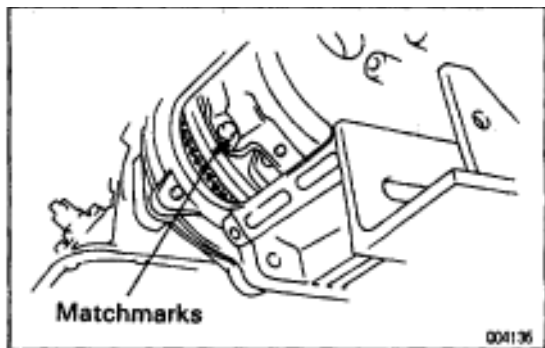
Torque:

14 mm head

39 N·m (400 kgf·cm, 29 ft·lbf)

17 mm head

72 N·m (730 kgf·cm, 43 ft·lbf)



4. 2JZ-GTE M/T:

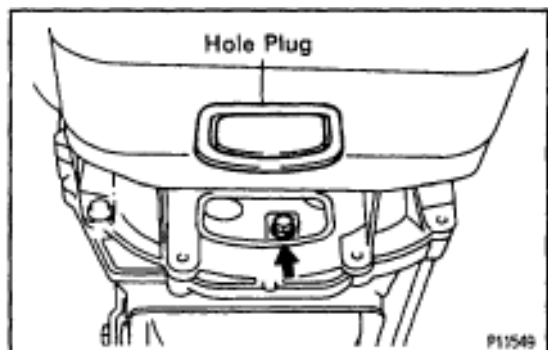
INSTALL CLUTCH COVER SET BOLTS

- (a) Align the matchmarks.
- (b) Install the 6 bolts while turning the crankshaft to gain access. Tighten the bolts evenly.

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

- (c) Install the service hole cover with the 2 bolts.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



5. A/T:

INSTALL TORQUE CONVERTER CLUTCH MOUNTING BOLTS

- (a) First, install the gray bolt. Then install 5 black bolts while turning the crankshaft to gain access. Tighten the bolts evenly.

Torque: 33 N·m (340 kgf·cm, 25 ft·lbf)

- (b) Install the hole plug.

6. 2JZ-GE A/T:

CONNECT THROTTLE CABLE

7. A/T:

INSTALL OIL COOLER TUBES FOR TRANSMISSION

- (a) Temporarily install the 2 oil cooler tubes, 2 hose clamps and tube clamp with 3 clamp bolts.
- (b) Connect the 2 oil cooler tubes to the unions on the transmission. Tighten the union nuts.

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

- (c) Tighten the 3 clamp bolts.

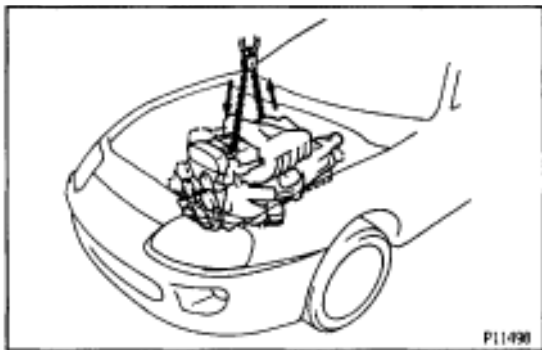
8. INSTALL STARTER

9. CONNECT ENGINE WIRE TO TRANSMISSION

10. A/T:

INSTALL OIL DIPSTICK GUIDE AND DIPSTICK FOR TRANSMISSION

- (a) Install a new O-ring to the dipstick guide.
- (b) Apply soapy water to the O-ring.
- (c) Connect the dipstick guide end to the dipstick tube of the oil pan.
- (d) Install the dipstick guide with the bolt.
- (e) Install the dipstick.

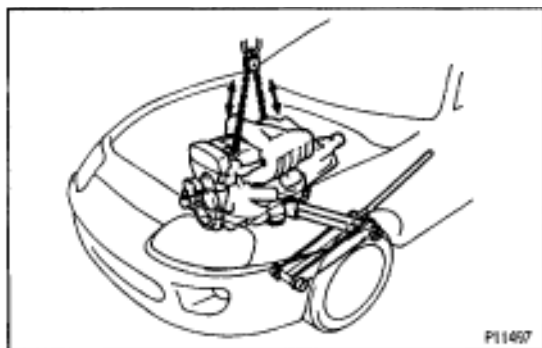


ENGINE INSTALLATION (2JZ-GE)

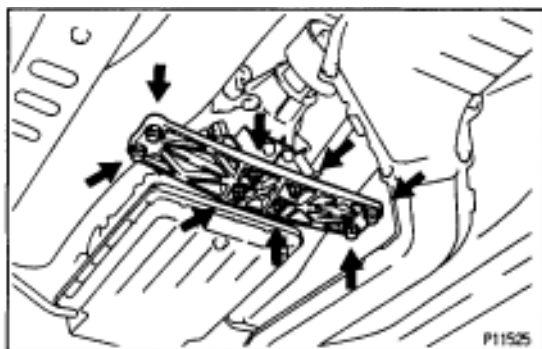
1. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

- (a) Attach the engine hoist chain to the engine hangers.
- (b) Lower the engine and transmission assembly into the engine compartment.

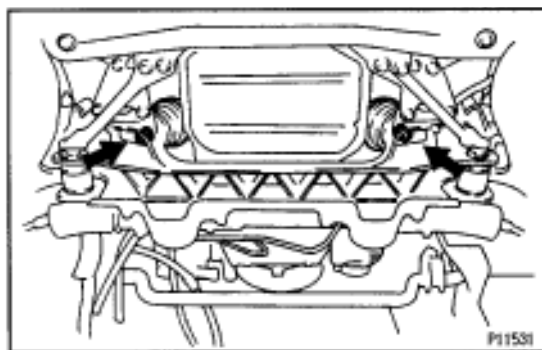
NOTICE: Install the engine and transmission assembly carefully without damaging the shift lever retainer (M/T), A/C compressor and PS solenoid valve.



- (c) Insert the stud bolts of the front engine mounting insulators into the stud bolt holes of the front suspension crossmember.
- (d) Temporarily install the 2 nuts holding the engine front mounting insulators to the front suspension crossmember.
- (e) Keep the engine level with a jack.
- (f) Remove the hoist chain.



- (g) Temporarily install the support member to the engine rear mounting insulator with the 4 nuts.
- (h) Install the 4 bolts holding the support member to the body.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)
- (i) Tighten the 4 nuts holding the support member to the engine rear mounting insulator.
Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)



- (j) Tighten the 2 nuts holding the engine front mounting insulators to the front suspension crossmember.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

2. M/T:

INSTALL TRANSMISSION SHIFT LEVER

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

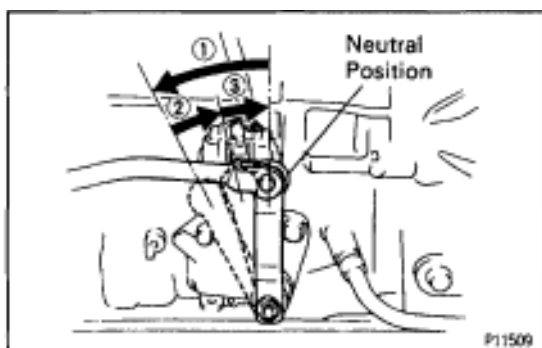
3. INSTALL PROPELLER SHAFT

(See propeller shaft installation in Propeller Shaft)

4. A/T:

CONNECT TRANSMISSION CONTROL ROD

- (a) Shift the shift lever to N position.
- (b) Fully turn the control shaft lever back and return 2 notches. It is now in neutral position.
- (c) Connect the control rod to the shift lever with the nut.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



5. INSTALL EXHAUST PIPE HEAT INSULATOR**6. INSTALL NO.2 FRONT EXHAUST PIPE**

- (a) Install 2 new gaskets and the No.2 front exhaust pipe to the exhaust manifold with 4 new nuts.

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

- (b) Install the pipe support bracket with the 2 bolts.

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

- (c) Install a new gasket and the No.2 front exhaust pipe to the front exhaust pipe with the 2 bolts and 2 new nuts.

Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

7. M/T:**INSTALL CLUTCH RELEASE CYLINDER AND GROUND STRAP**

- (a) Install the clutch release cylinder with the 2 bolts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (b) Install the ground strap with the bolt.

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

8. M/T:**INSTALL UPPER CONSOLE PANEL, SHIFT LEVER BOOTS AND HOLDING BOLTS****9. CONNECT ENGINE WIRE TO CABIN**

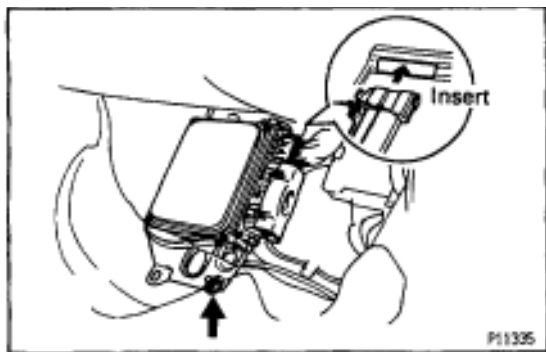
- (a) Push in the engine wire through the cowl panel.

NOTICE: Be careful not to damage the engine wire.

- (b) Connect the connector to the connector cassette.

- (c) Connect the connector to the instrument panel wire connector.

- (d) Connect the 2 connectors to the ECM.



- (e) Insert the ECM bracket into the stay on the floor panel.

- (f) Install the ECM with the nut.

- (g) Install the ECM protector with the 2 nuts.

- (h) Install the floor carpet.

- (i) Install the scuff plate.

10. CONNECT ENGINE WIRE TO COWL PANEL**11. INSTALL A/C COMPRESSOR**

- (a) Using a torx socket (E10), install the stud bolt and compressor.

Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

- (b) Connect the compressor connector.

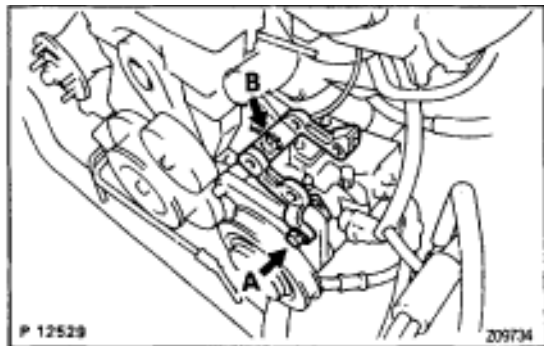
- (c) Temporarily install the compressor with the nut and 2 bolts.

- (d) Alternately tighten the nut and 2 bolts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

12. INSTALL PS PRESSURE TUBE

Install the pressure tube with the 2 clamp bolts.



13. INSTALL PS PUMP

- (a) Install the pump bracket with the 2 bolts.

Torque:

A 58 N·m (590 kgf·cm, 43 ft·lbf)

B 39 N·m (400 kgf·cm, 29 ft·lbf)

- (b) Install the pump rear stay with the 2 bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
- (c) Install the pump housing to the pump bracket.
- (d) Connect the following hoses:
- Air hose to No.4 timing belt cover
 - Air hose to air intake chamber
- (e) Install the front pump bracket with the 2 bolts (A).
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)
- (f) Install the plate washer and bolt (B) to the oil pump.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

14. INSTALL ENGINE WIRE BRACKET

15. CONNECT FUEL HOSES

- (a) Connect the fuel return hose to the fuel return pipe.
- (b) Install the fuel return hose to the clamp of the oil dipstick guide.
- (c) Install the fuel inlet hose with 2 new gaskets and the union bolt.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

16. CONNECT WIRES AND CONNECTORS

17. CONNECT EVAP HOSE

18. CONNECT BRAKE BOOSTER VACUUM HOSE

19. CONNECT HEATER HOSES

20. INSTALL CHARCOAL CANISTER

21. INSTALL WATER PUMP PULLEY, FAN, FLUID COUPLING ASSEMBLY AND DRIVE BELT

(See step 10 in water pump installation in Cooling System)

22. INSTALL AIR CLEANER, VAF METER AND INTAKE AIR CONNECTOR PIPE ASSEMBLY

23. CONNECT CONTROL CABLES TO THROTTLE BODY

24. FILL WITH FUEL

25. FILL WITH ENGINE OIL

26. CHECK IGNITION TIMING

(See ignition timing inspection and adjustment)

27. INSTALL RADIATOR ASSEMBLY

(See radiator installation in Cooling System)

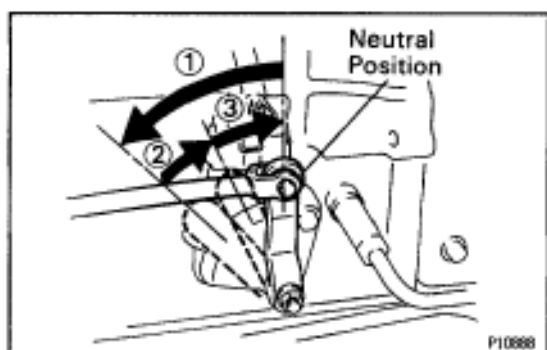
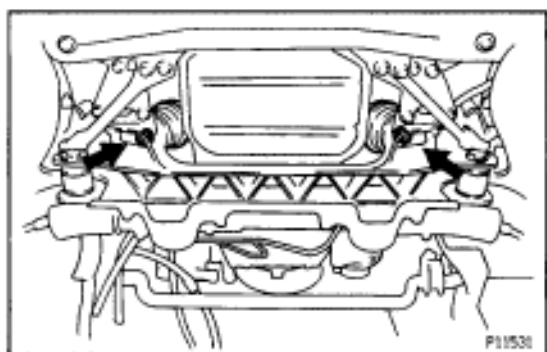
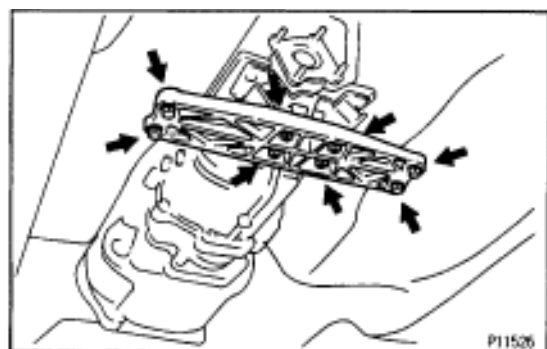
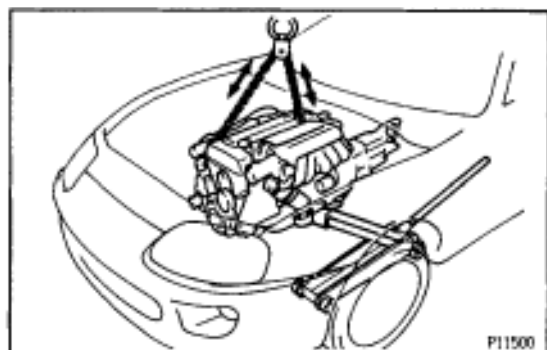
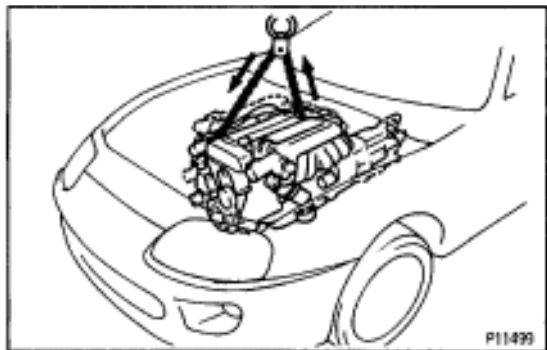
28. START ENGINE AND CHECK FOR LEAKS

29. INSTALL HOOD

30. ROAD TEST VEHICLE

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

31. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS



ENGINE INSTALLATION (2JZ-GTE)

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.

NOTICE: Install the engine and transmission assembly carefully without damaging the shift lever retainer (M/T), A/C compressor and PS solenoid valve.

- (c) Insert the stud bolts of the front engine mounting insulators into the stud bolt holes of the front suspension crossmember.
- (d) Temporarily install the 2 nuts holding the engine front mounting insulators to the front suspension crossmember.
- (e) Keep the engine level with a jack.
- (f) Remove the hoist chain.

- (g) Temporarily install the support member to the engine rear mounting insulator with the 4 nuts.

- (h) Install the 4 bolts holding the support member to the body.

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

- (i) Tighten the 4 nuts holding the support member to the engine rear mounting insulator.

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

- (j) Tighten the 2 nuts holding the engine front mounting insulators to the front suspension crossmember.

Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

2. M/T:

INSTALL TRANSMISSION SHIFT LEVER

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

3. A/T:

CONNECT TRANSMISSION CONTROL ROD

- (a) Shift the shift lever to N position.
- (b) Fully turn the control shaft lever back and return 2 notches. It is now in neutral position.
- (c) Connect the control rod to the shift lever with the nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

4. INSTALL PROPELLER SHAFT

(See propeller shaft installation in Propeller Shaft)

5. INSTALL REAR CENTER FLOOR CROSSMEMBER BRACE

Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)

6. INSTALL EXHAUST PIPE HEAT INSULATOR**7. INSTALL NO.2 FRONT EXHAUST PIPE**

Install a new gasket and the front exhaust pipe with 3 new nuts.

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

8. INSTALL EXHAUST PIPE ASSEMBLY

(a) Install the hook of the tailpipe to the 2 rings on the tailpipe bracket.

(b) Install the hook of the exhaust pipe to the 2 rings on the exhaust pipe brackets.

(c) Install the pipe support bracket with the 2 bolts.

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

(d) Install a new gasket and the No.2 front exhaust pipe to the front exhaust pipe with the 2 bolts and 2 new nuts.

Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

9. INSTALL SUB HEATED OXYGEN SENSOR

Install a new gasket, the oxygen sensor and sensor cover with the 2 nuts.

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

10. M/T:**INSTALL CLUTCH RELEASE CYLINDER AND GROUND STRAP**

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

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) Connect the clutch line tube with the bolt.

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

(c) Install the ground strap with the bolt.

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

11. CONNECT ENGINE WIRE TO CABIN

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

NOTICE: Be careful not to damage the engine wire.

(b) Connect the 2 connectors to the connector cassette.

(c) Connect the connector to the instrument panel wire connector.

(d) Connect the 2 connectors to the ECM.

(e) Connect the connector to the TRAC ECU.

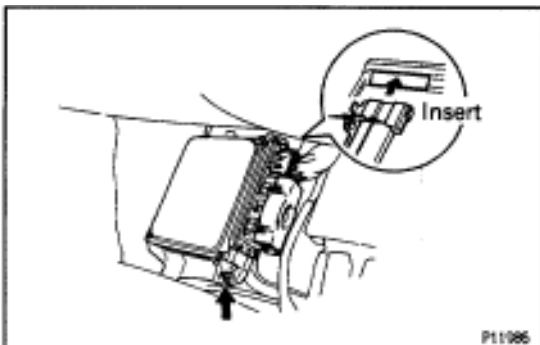
(f) Insert the ECM bracket into the stay on the floor panel.

(g) Install the ECM with the nut.

(h) Install the ECM protector with the 2 nuts.

(i) Install the floor carpet.

(j) Install the scuff plate.

12. M/T:**INSTALL UPPER CONSOLE PANEL, SHIFT LEVER BOOTS AND HOLDING BOLTS**

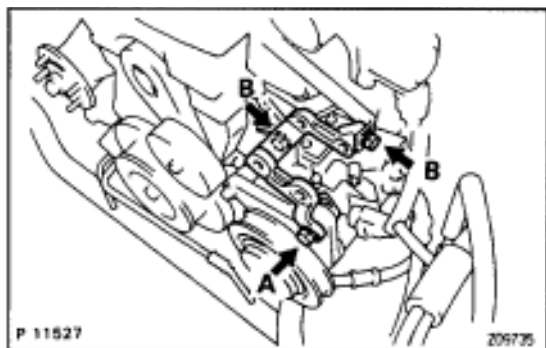
13. CONNECT ENGINE WIRE TO COWL PANEL**14. INSTALL A/C COMPRESSOR**

- (a) Using a torx socket (E10), install the stud bolt and and compressor.

Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

- (b) Connect the compressor connector.
 (c) Temporarily install the compressor with nut and 3 bolts.
 (d) Alternately tighten the bolt and nut.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

**15. INSTALL PS PRESSURE TUBE****16. INSTALL PS PUMP**

- (a) Install the pump bracket with the 3 bolts.

Torque:

A 58 N·m (590 kgf·cm, 43 ft·lbf)

B 39 N·m (400 kgf·cm, 29 ft·lbf)

- (b) Install the pump housing with the 2 bolts.

Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

- (c) Connect these hoses:

- Air hose to throttle body
- Air hose to air intake chamber

17. CONNECT FUEL HOSES

- (a) Connect the fuel return hose to the fuel return pipe.
 (b) Install the fuel return hose to the clamp of the dipstick guide.
 (c) Install the fuel inlet hose with 2 new gaskets and the union bolt.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

18. CONNECT WIRES AND CONNECTORS**19. CONNECT EVAP HOSE****20. CONNECT BRAKE BOOSTER VACUUM HOSE****21. CONNECT HEATER WATER HOSES****22. INSTALL CHARCOAL CANISTER****23. INSTALL WATER PUMP PULLEY, FAN, FLUID COUPLING ASSEMBLY AND DRIVE BELT**

(See step 10 in water pump installation in Cooling System)

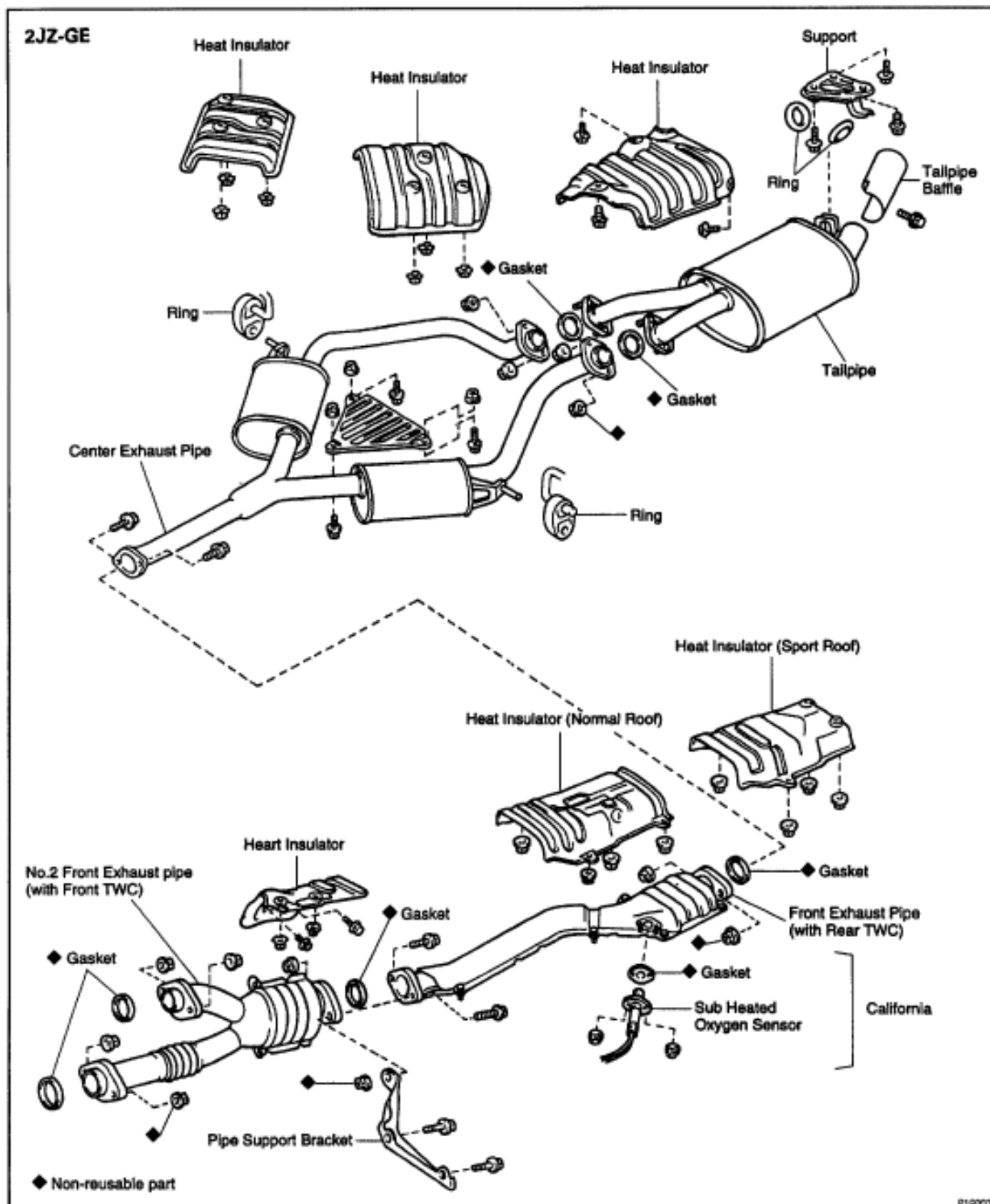
24. M/T:**INSTALL DRIVE BELT TENSIONER DAMPER**

(See step 19 timing belt installation)

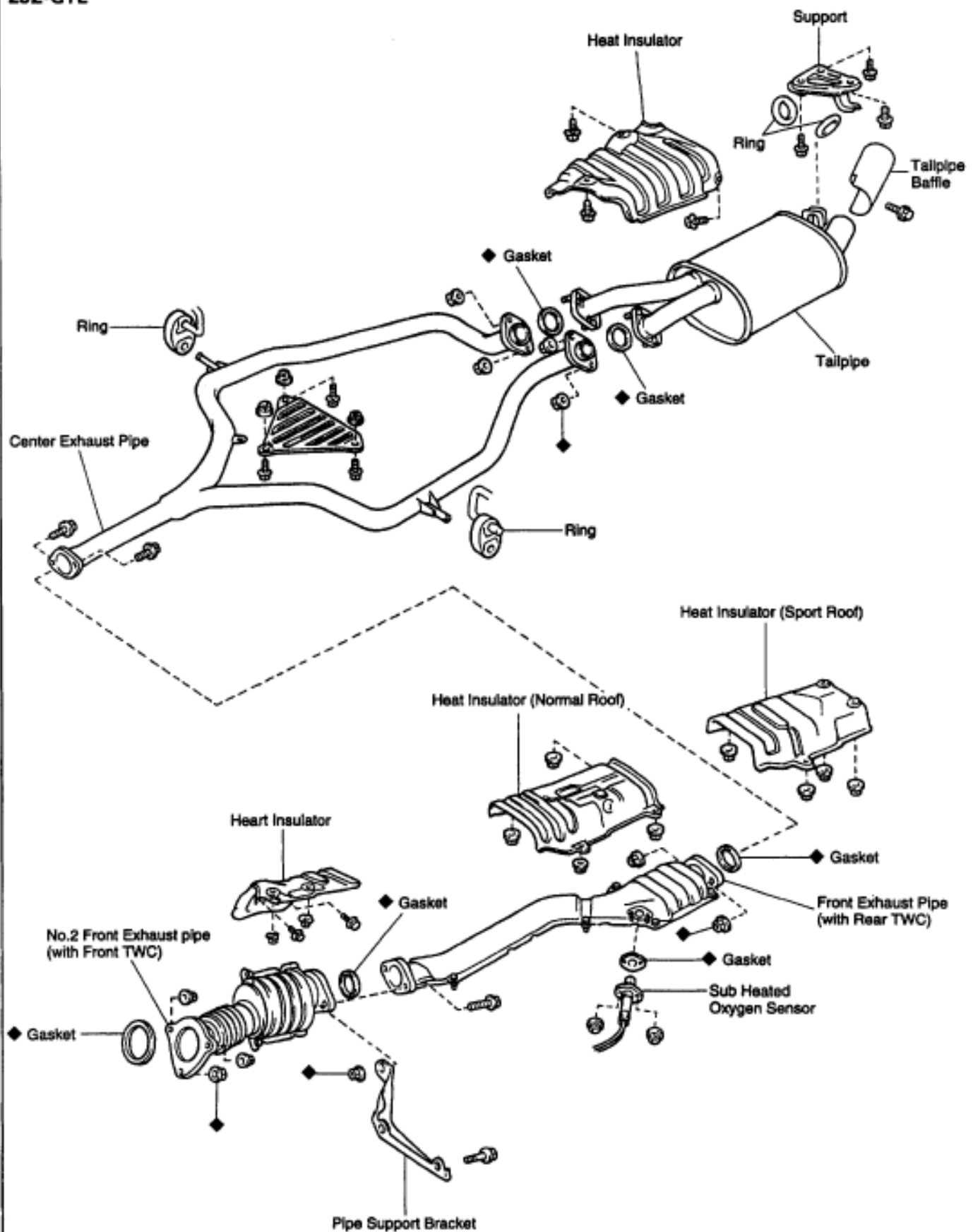
25. INSTALL AIR CLEANER AND MAF METER ASSEMBLY**26. INSTALL NO.1 AIR HOSE****27. CONNECT CONTROL CABLES TO THROTTLE BODY****28. FILL WITH FUEL****29. FILL WITH ENGINE OIL****30. START ENGINE AND CHECK FOR LEAKS**

- 31. CHECK IGNITION TIMING**
(See ignition timing inspection)
- 32. INSTALL RADIATOR ASSEMBLY**
(See radiator installation in Cooling System)
- 33. INSTALL HOOD**
- 34. ROAD TEST VEHICLE**
Check for abnormal noise, shock slippage, correct shift points and smooth operation.
- 35. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS**

EXHAUST SYSTEM COMPONENTS



2JZ-GTE



SERVICE SPECIFICATIONS

SERVICE DATA

Compression pressure	at 250 rpm STD 2JZ-GE 2JZ-GTE Minimum 2JZ-GE 2JZ-GTE Difference of pressure between each cylinder	1,275 kPa (13.0 kgf/cm ² , 185 psi) or more 1,079 kPa (11.0 kgf/cm ² , 156 psi) or more 1,079 kPa (11.0 kgf/cm ² , 156 psi) 883 kPa (9.0 kgf/cm ² , 128 psi) 98 kPa (1.0 kgf/cm ² , 14 psi) or less
Valve clearance	at cold Intake Exhaust Adjusting shim (for repair part) Mark 2500 Mark 2.550 Mark 2.600 Mark 2.650 Mark 2.700 Mark 2.750 Mark 2.800 Mark 2.850 Mark 2.900 Mark 2.950 Mark 3.000 Mark 3.050 Mark 3.100 Mark 3.150 Mark 3.200 Mark 3.250 Mark 3.300	0.15–0.25 mm (0.006–0.010 in.) 0.25–0.35 mm (0.010–0.014 in.) 2.500 mm (0.0984 in.) 2.550 mm (0.1004 in.) 2.600 mm (0.1024 in.) 2.650 mm (0.1043 in.) 2.700 mm (0.1063 in.) 2.750 mm (0.1083 in.) 2.800 mm (0.1102 in.) 2.850 mm (0.1122 in.) 2.900 mm (0.1142 in.) 2.950 mm (0.1161 in.) 3.000 mm (0.1181 in.) 3.050 mm (0.1201 in.) 3.100 mm (0.1220 in.) 3.150 mm (0.1240 in.) 3.200 mm (0.1260 in.) 3.250 mm (0.1280 in.) 3.300 mm (0.1299 in.)
Ignition timing	w/ Terminals TE1 and E1 connected of DLC1	10° BTDC @ idle
Idle speed	2JZ-GE 2JZ-GTE	700 ± 50 rpm 650 ± 50 rpm
Intake Manifold Vacuum	at idle speed 2JZ-GE 2JZ-GTE	66.6 kPa (500 mmHg, 19.7 in.Hg) or more 60 kPa (450 mmHg, 17.7 in.Hg) or more
Timing belt Tensioner	Protrusion (from housing side)	8.0–8.8 mm (0.315–0.346 in.)
Cylinder head	Warpage Cylinder block side Intake manifold side Exhaust manifold side Valve guide bore diameter Valve seat Refacing angle Contacting angle Contacting width Cylinder head bolt diameter	Maximum Maximum Maximum STD O/S 0.05 15°, 45°, 60° 45° Intake Exhaust STD Minimum
		0.10 mm (0.0039 in.) 0.10 mm (0.0039 in.) 0.10 mm (0.0039 in.) 10.985–11.006 mm (0.4325–0.4333 in.) 11.035–11.056 mm (0.4344–0.4353 in.) 1.0–1.4 mm (0.039–0.055 in.) 1.2–1.6 mm (0.047–0.063 in.) 10.8–11.0 mm (0.425–0.433 in.) 10.7 mm (0.421 in.)

Valve guide Bushing	Inside diameter Outside diameter (for repair part)	STD	6.010–6.030 mm (0.2366–0.2374 in.)
		O/S 0.05	11.033–11.044 mm (0.4344–0.4348 in.)
			11.083–11.094 mm (0.4363–0.4368 in.)
Valve	Valve overall length	STD Intake	98.29–98.79 mm (3.8697–3.8894 in.)
		Exhaust	98.84–99.34 mm (3.8913–3.9110 in.)
		Minimum Intake	98.19 mm (3.8657 in.)
		Exhaust	98.74 mm (3.8874 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	0.8–1.2 mm (0.031–0.047 in.)
		Minimum	0.5 mm (0.020 in.)
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)
	Free length	Blue painted mark	41.74 mm (1.6433 in.)
		Yellow painted mark	41.70 mm (1.6417 in.)
	Installed tension at 34.5 mm (1.358 in.)		186–206 N (19.0–21.0 kgf, 42–46 lbf)
Valve lifter	Lifter diameter		30.966–30.976 mm (1.2191–1.2195 in.)
	Lifter bore diameter		31.000–31.016 mm (1.2205–1.2211 in.)
	Oil clearance	STD	0.024–0.050 mm (0.0009–0.0020 in.)
		Maximum	0.07 mm (0.0028 in.)
Camshaft	Thrust clearance	STD	0.080–0.190 mm (0.0031–0.0075 in.)
		Maximum	0.30 mm (0.0118 in.)
	Cam lobe height	STD Intake	44.570–44.670 mm (1.7547–1.7587 in.)
		Exhaust	44.770–44.870 mm (1.7626–1.7665 in.)
		Maximum Intake	44.42 mm (1.7488 in.)
		Exhaust	44.62 mm (1.7567 in.)
	Journal diameter		28.949–28.965 mm (1.1397–1.1404 in.)
	Journal oil clearance	STD	0.035–0.072 mm (0.0014–0.0028 in.)
		Maximum	0.10 mm (0.0039 in.)
	Circle runout	Maximum	0.08 mm (0.0031 in.)
Air intake chamber	Warpage	Maximum	0.15 mm (0.0059 in.)
Manifold	Warpage	Maximum Intake	0.15 mm (0.0059 in.)
		Exhaust 2JZ–GE	0.50 mm (0.0196 in.)
		2JZ–GTE	0.80 mm (0.0315 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.07 mm (0.0028 in.)
	Cylinder bore diameter	STD	86.000–86.013 mm (3.3858–3.3863 in.)
		Maximum	86.02 mm (3.3866 in.)
	Main bearing bolt diameter	STD	9.96–9.97 mm (0.3921–0.3925 in.)
		Minimum	9.7 mm (0.382 in.)
Connecting Rod	Thrust clearance	STD	0.250–0.402 mm (0.0098–0.0158 in.)
		Maximum	0.50 mm (0.0197 in.)
	Connecting bolt diameter	STD	8.1–8.3 mm (0.319–0.327 in.)
		Minimum	8.0 mm (0.315 in.)

Connecting rod (cont'd)	Connecting rod oil clearance	STD	0.035–0.053 mm (0.0014–0.0021 in.)
		U/S 0.25	0.040–0.078 mm (0.0016–0.0031 in.)
		Maximum	0.08 mm (0.0031 in.)
		U/S 0.25	0.09 mm (0.0035 in.)
	Connecting rod bearing center wall thickness (Reference)	STD Mark 1	1.492–1.495 mm (0.0587–0.0589 in.)
		Mark 2	1.495–1.498 mm (0.0589–0.0590 in.)
		Mark 3	1.498–1.501 mm (0.0590–0.0591 in.)
		Mark 4	1.501–1.504 mm (0.0591–0.0592 in.)
		Mark 5	1.504–1.507 mm (0.0592–0.0593 in.)
	Bushing inside diameter		22.005–22.014 mm (0.8663–0.8667 in.)
	Piston pin diameter		21.997–22.006 mm (0.8660–0.8664 in.)
	Piston pin oil clearance	STD	0.005–0.011 mm (0.0002–0.0004 in.)
		Maximum	0.05 mm (0.0020 in.)
	Rod bent	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.)
Piston and Piston ring (2JZ–GE)	Piston diameter		85.935–85.945 mm (3.3833–3.3837 in.)
	Piston oil clearance	STD	0.055–0.078 mm (0.0022–0.0031 in.)
		Maximum	0.10 mm (0.0039 in.)
	Piston ring groove clearance	No.1	0.011–0.070 mm (0.0004–0.0028 in.)
		No.2	0.030–0.070 mm (0.0012–0.0028 in.)
	Piston ring end gap	STD No.1	0.300–0.470 mm (0.0118–0.0185 in.)
		No.2	0.350–0.520 mm (0.0138–0.0205 in.)
		Oil	0.130–0.450 mm (0.0051–0.0177 in.)
		Maximum No.1	1.07 mm (0.0421 in.)
		No.2	1.12 mm (0.0441 in.)
		Oil	1.05 mm (0.0413 in.)
Piston and Piston ring (2JZ–GTE)	Piston diameter		85.917–85.927 mm (3.3826–3.3830 in.)
	Piston oil clearance	STD	0.073–0.096 mm (0.0029–0.0038 in.)
		Maximum	0.12 mm (0.0047 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	0.300–0.400 mm (0.0118–0.0157 in.)
		No.2	0.350–0.450 mm (0.0138–0.0178 in.)
		Oil	0.130–0.380 mm (0.0051–0.0150 in.)
		Maximum No.1	1.00 mm (0.0394 in.)
		No.2	1.05 mm (0.0413 in.)
		Oil	0.98 mm (0.0386 in.)
Crankshaft	Thrust clearance	STD	0.020–0.220 mm (0.0008–0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness	STD	1.940–1.990 mm (0.0764–0.0783 in.)
	Main journal oil clearance	STD	0.026–0.040 mm (0.0010–0.0016 in.)
		U/S 0.25	0.025–0.061 mm (0.0010–0.0024 in.)
		Maximum	0.06 mm (0.0024 in.)
		U/S 0.25	0.08 mm (0.0031 in.)
	Main journal diameter	STD	61.984–62.000 mm (2.4403–2.4409 in.)
		U/S 0.25	61.745–61.755 mm (2.4309–2.4313 in.)

Crankshaft (cont'd)	Main bearing center wall thickness (Reference)	
	Mark 1	1.994–1.997 mm (0.0785–0.0786 in.)
	Mark 2	1.997–2.000 mm (0.0786–0.0787 in.)
	Mark 3	2.000–2.003 mm (0.0787–0.0789 in.)
	Mark 4	2.003–2.006 mm (0.0789–0.0790 in.)
	Mark 5	2.006–2.009 mm (0.0790–0.0791 in.)
	Crank pin diameter	STD
		51.982–52.000 mm (2.0465–2.0472 in.)
	U/S 0.25	51.745–51.755 mm (2.0372–2.0376 in.)
	Circle runout	Maximum
Main journal taper and out-of-round	Maximum	0.06 mm (0.0024 in.)
	Maximum	0.02 mm (0.0008 in.)
	Maximum	0.02 mm (0.0008 in.)

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Timing belt plate X Oil pump (2JZ–GTE)		7.8	80	69 in·lbf
Idle pulley X Oil pump		34	350	25
Crankshaft pulley X Crankshaft		324	3,300	239
Camshaft timing pulley X Camshaft		79	810	59
Timing belt tensioner X Oil pump		26	270	20
Drive belt tensioner X Cylinder head		21	210	15
Drive belt tensioner damper X Tensioner arm (2JZ–GTE M/T)		20	200	14
Drive belt tensioner damper X Tensioner bracket (2JZ–GTE M/T)		20	200	14
EGR cooler X Cylinder head		8.8	90	78 in·lbf
ECT sensor X Cylinder head (2JZ–GE)		20	200	14
ECT sender gauge X Cylinder head (2JZ–GE)		20	200	14
Engine hanger X Cylinder head		39	400	29
Camshaft position sensor X Cylinder head (2JZ–GTE)		8.8	90	78 in·lbf
Cylinder head X Cylinder block	1st	34	350	25
	2nd	Turn 90°		
	3rd	Turn 90°		
Camshaft bearing cap X Cylinder head		20	200	14
No.4 timing belt cover X Cylinder head		8.8	90	78 in·lbf
Cylinder head cover X Cylinder head	2JZ–GE	8.3	85	74 in·lbf
	2JZ–GTE	5.4	55	48 in·lbf
Intake manifold X Cylinder head	2JZ–GE	27	280	20
	2JZ–GTE	27	280	20
Fuel inlet pipe X Delivery pipe		42	420	30
Intake manifold stay X Intake manifold		39	400	29
Intake manifold stay X Cylinder block		39	400	29
Water outlet X Cylinder head (2JZ–GTE)		21	210	15
Vacuum control valve set X Intake manifold (2JZ–GE)		21	210	15
Air intake chamber X Intake manifold	2JZ–GE	27	280	20
	2JZ–GTE	27	280	20
Air intake chamber stay X Cylinder head (2JZ–GE)		18	185	13
Air intake chamber stay X Air intake chamber (2JZ–GE)		18	185	13
Exhaust manifold X Cylinder head		39	400	29
Pressure tank X Intake manifold (2JZ–GTE)		21	210	15
Main bearing cap X Cylinder block	1st	44	450	33
	2nd	Turn 90°		

Connecting rod cap X Connecting rod	1st 2nd	29 Turn 90°	300	22
Oil nozzle X Crankshaft (2JZ–GTE)		8.8	90	78 in.·lbf
Rear oil seal retainer X Cylinder block		5.9	60	52 in.·lbf
Crankshaft position sensor X Cylinder block (2JZ–GTE)		8.8	90	78 in.·lbf
Engine mounting bracket X Cylinder block		58	590	43
Engine coolant drain plug X Cylinder block		29	300	22
Union for oil cooler X Cylinder block (2JZ–GTE)		39	400	29
Knock sensor X Cylinder block		44	450	33
Oil pressure switch X Cylinder block		14	150	11
Fuel pipe support X Cylinder block		14	145	10
Oil filter bracket X Cylinder block		88	900	65
No.2 water bypass pipe X Water pump		21	210	15
No.2 water bypass pipe X Cylinder block		21	210	15
Flywheel X Crankshaft (M/T)	1st 2nd	49 Turn 90°	500	36
Drive plate X Crankshaft (A/T)		83	850	61
Clutch cover X Flywheel (M/T)		19	195	14
Cylinder block X Transmission	14 mm head 17 mm head	39 72	400 730	29 43
Clutch service hole cover X Clutch housing (2JZ–GTE M/T)		12	120	9
Drive plate X Torque converter clutch (A/T)		33	340	25
Oil cooler tube X Union for transmission (A/T)		34	350	25
Rear support member X Body		25	260	19
Rear support member X Engine rear mounting insulator		13	135	10
Front suspension crossmember X Engine mounting insulator		59	600	43
Transmission shift lever X Shift lever retainer (M/T)		19	195	14
Transmission control rod X Shift lever (A/T)		13	130	9
Clutch release cylinder X Transmission (M/T)		13	130	9
Clutch line tube X No.1 oil pan		37	380	27
Ground strap X Transmission (M/T)		37	380	27
Fuel inlet hose X Fuel pipe support		29	300	22
A/C compressor X Cylinder block	for stud bolt for bolt and nut	26 52	265 530	19 38
PS pump front bracket X Cylinder block (2JZ–GE)		58	590	43
PS pump front bracket X Oil pump (2JZ–GE)		52	530	38
PS pump housing X PS pump bracket		58	590	43
PS pump bracket X A/C compressor		58	590	43
PS pump bracket X Cylinder block		39	400	29
PS pump rear stay X PS pump bracket		39	400	29
PS pump rear stay X Intake manifold stay (2JZ–GE)		39	400	29
Rear center floor crossmember brace X Body (2JZ–GTE)		28	290	21
No.2 front exhaust pipe X Exhaust manifold		62	630	46
No.2 front exhaust pipe X Front exhaust pipe		58	590	43
Pipe support bracket X Transmission		43	440	32
Front exhaust pipe X Center exhaust pipe		58	590	43
Center exhaust pipe X Tailpipe		19	195	14
Sub heated oxygen sensor x Front exhaust pipe (2JZ–GE (California), 2JZ–GTE)		20	200	14

SFI SYSTEM (2JZ–GE)

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09205-76030 Cylinder Head Setting Bolt Tightening Adaptor	ECT sensor
	09268-41045 Injection Measuring Tool Set	
	(09268-41070) No.4 Union	
	(09268-41090) No.7 Union	
	(90405-09015) No.1 Union	
	09268-45012 EFI Fuel Pressure Gauge	
	09612-24014 Steering Gear Housing Overhaul Tool Set	
	(09617-24011) Steering Rack Wrench	Fuel pressure pulsation damper
	09631-22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09808-14010 Fuel Sender Gauge Tool Assy	
	09816-30010 Oil Pressure Switch Socket	Knock sensor
	09842-30070 Wiring "F" EFI Inspection	Injector

	09843-18020 Diagnostic Check Wire	
	09990-01000 Engine Control Computer Check Harness "A"	

RECOMMENDED TOOLS

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

EQUIPMENT

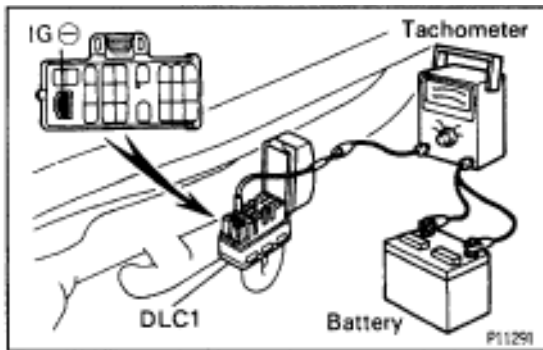
Carburetor cleaner	
Graduated cylinder	Injector
Soft brush	
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	

COOLANT

Item		Capacity	Classification
Engine coolant (w/ Heater)	M/T	7.3 liters (7.7 US qts, 6.4 Imp. qts)	Ethylene-glycol base
	A/T	8.3 liters (8.8 US qts, 7.3 Imp. qts)	

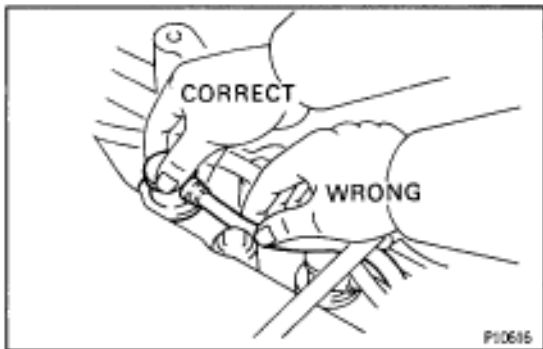
PRECAUTION

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

1. **PRECAUTION WHEN CONNECTING GAUGE**
 - (a) Use battery as the power source for the timing light, tachometer, etc.
 - (b) Connect the tester probe of a tachometer to the terminal IG × of the DLC1.
2. **IN EVENT OF ENGINE MISFIRE, FOLLOWING PRECAUTIONS SHOULD BE TAKEN**
 - (a) Check proper connection of battery terminals, etc.
 - (b) Handle high-tension cords carefully.
 - (c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
 - (d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.
3. **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 MOBIL RADIO SYSTEM (HAM, CB, ETC.)

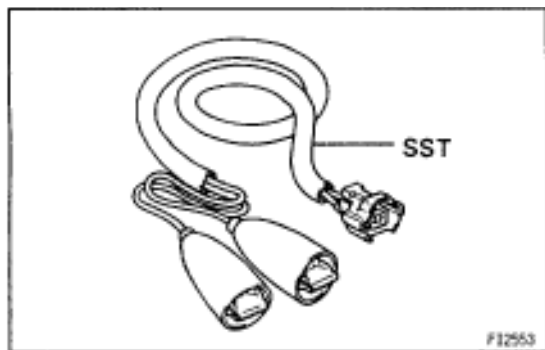
If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

AIR INDUCTION SYSTEM

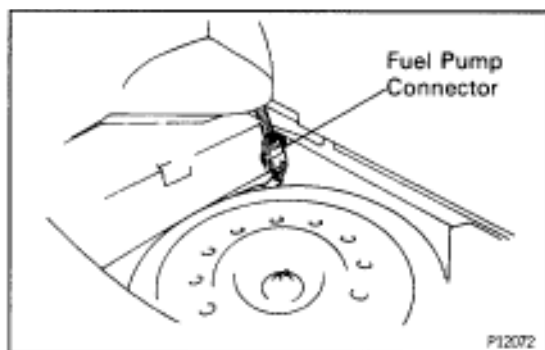
1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will cause air suction and cause the engine to run out of tune.

ELECTRONIC CONTROL SYSTEM

1. Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF 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. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
7. Parts should be replaced as an assembly.
8. Care is required when pulling out and inserting wiring connectors.
 - (a) Release the lock and pull out the connector, pulling on the connectors.
 - (b) Fully insert the connector and check that it is locked.

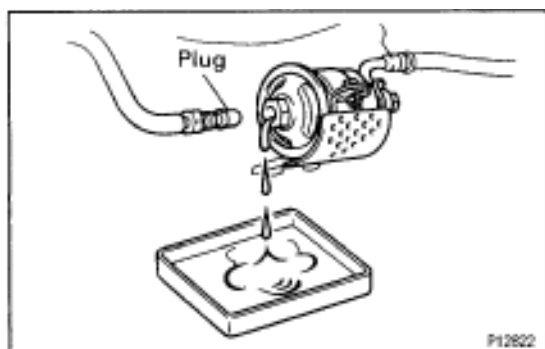


9. Use SST for inspection or test of the injector or its wiring connector.
SST 09842-30070

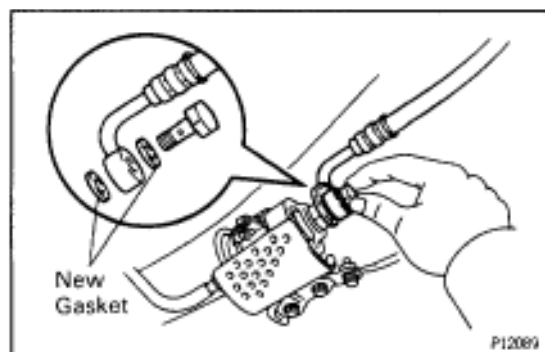


FUEL SYSTEM

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



- (c) Put a container under the connection.
 - (d) Slowly loosen the connection.
 - (e) Disconnect the connection.
 - (f) Plug the connection with a rubber plug.
 - (g) Reconnect the fuel pump connector.



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

Union Bolt Type:

- (a) Always use a new gasket.
 - (b) Tighten the union bolt by hand.
 - (c) Tighten the union bolt to the specified torque.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

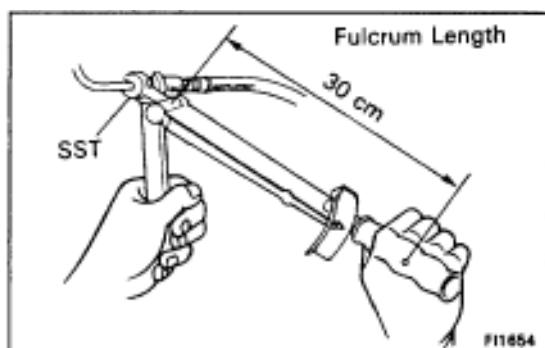
Flare Nut Type:

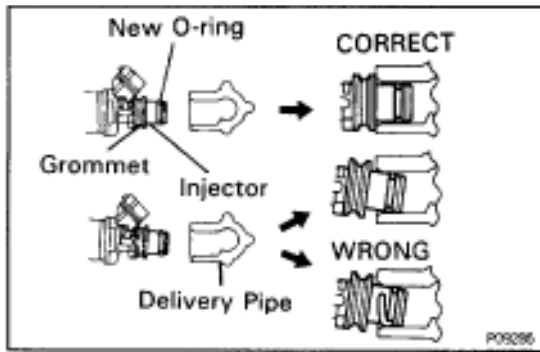
- (a) Apply a light coat of engine oil to the flare nut, and tighten the flare nut by hand.
 - (b) Using SST, tighten the flare nut to specified torque.

SST 09631-22020

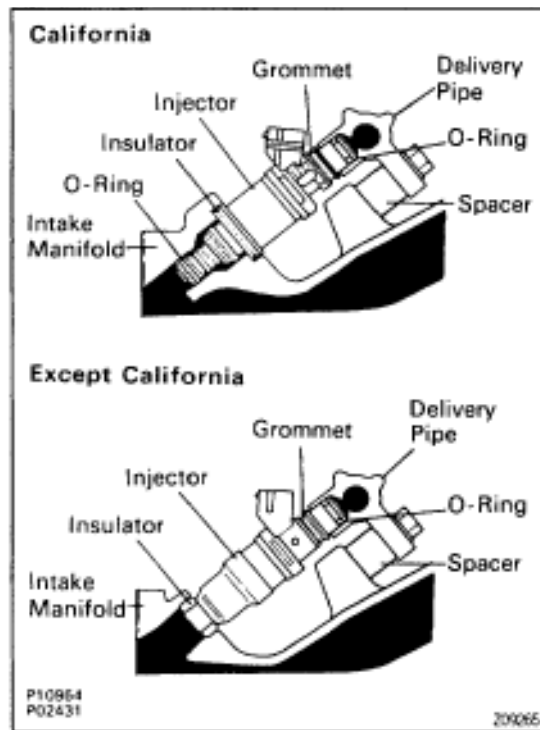
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

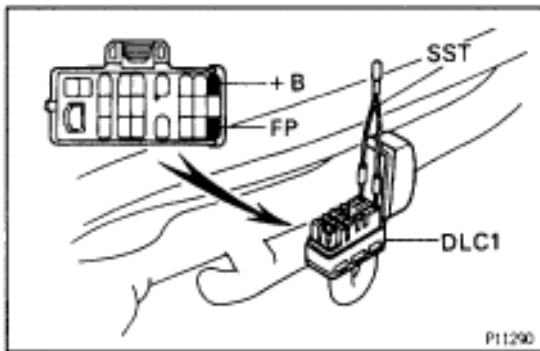




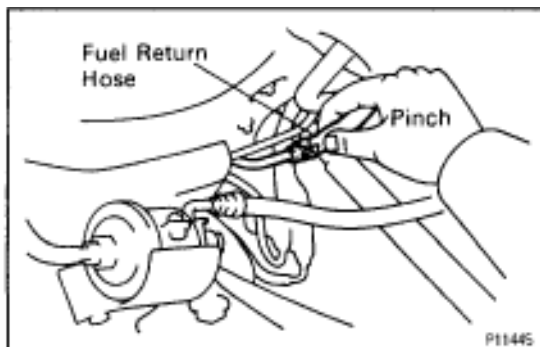
3. Observe the following precautions when removing and installing the injectors.
 - (a) Never reuse the O-ring.
 - (b) When placing a new O-ring on the injector, take care not to damage it in any way.
 - (c) Coat a new O-ring with spindle oil or gasoline before installing—never use engine, gear or brake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



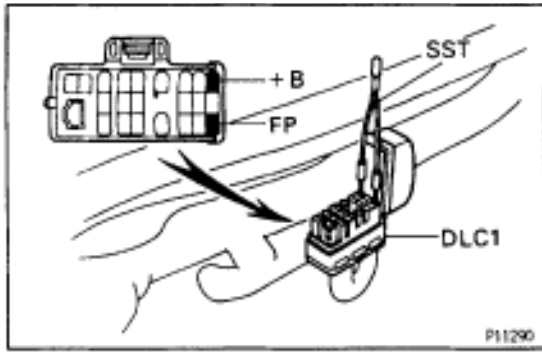
4. Install the injector to the delivery pipe and intake manifold as shown in the illustration.



5. Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
 - (a) Using SST, connect terminals +B and FP of the DLC 1. SST 09843-18020
 - (b) With engine stopped, turn the ignition switch ON.



- (c) Pinch the fuel return hose.
The pressure in the high pressure line will rise to approx. 392 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.
 - (d) Turn the ignition switch OFF.
 - (e) Remove the SST from the DLC1. SST 09843-18020



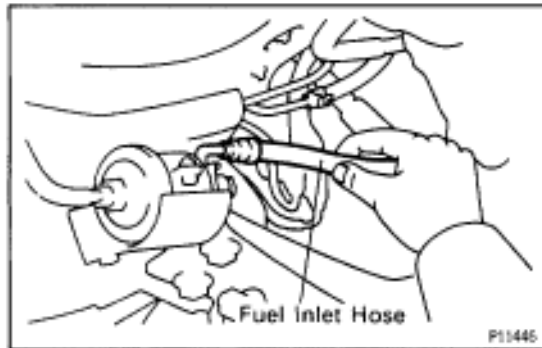
FUEL PUMP ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

- (a) Using SST, connect terminals +B and FP of the DLC 1.
SST 09843–18020

- (b) Turn the ignition switch ON.

NOTICE: Do not start the engine.



- (c) 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 the following parts:

- Fuse
- EFI main relay
- Fuel pump
- ECM
- Wiring connections

- (d) Turn the ignition switch OFF.

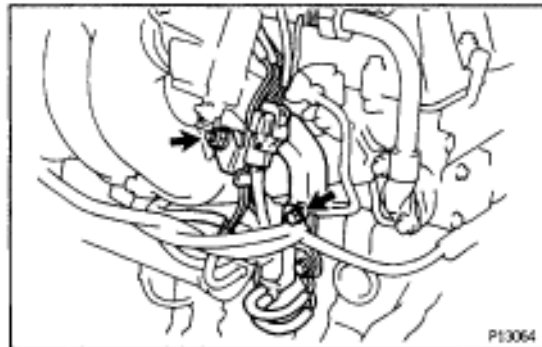
- (e) Remove the SST from the DLC1.
SST 09843–18020

2. CHECK FUEL PRESSURE

- (a) Check the battery voltage is above 12 V.

- (b) Disconnect the negative (–) terminals cable from the battery.

- (c) Remove the 2 nuts, and disconnect the No.2 vacuum pipe from the air intake chamber and intake manifold.



- (d) Remove the union bolt and 2 gaskets, disconnect the fuel inlet pipe from the delivery pipe.

CAUTION:

Put a shop towel under the delivery pipe.

Slowly loosen the union bolt.

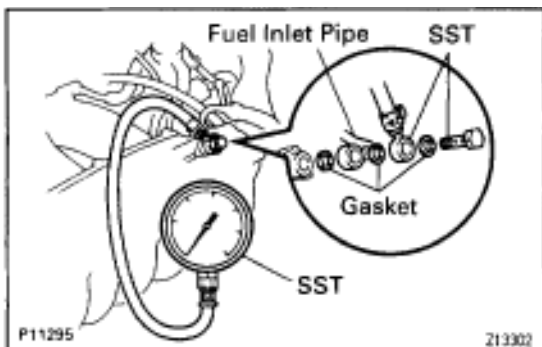


- (e) Install the fuel inlet pipe and SST (pressure gauge) to the delivery pipe with the 3 gaskets and SST (union bolt).
SST 09268–45012

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

- (f) Wipe off any splattered gasoline.

- (g) Using SST, connect terminals +B and FP of the DLC 1.
SST 09843–18020



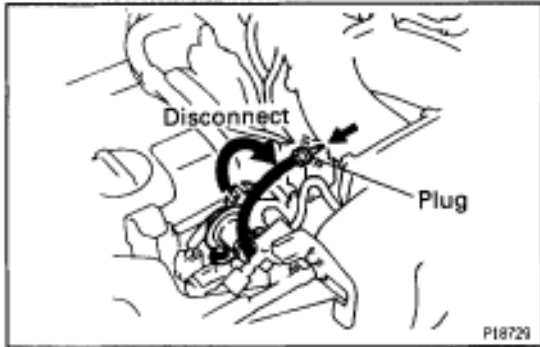
- (h) Reconnect the negative (–) terminal cable to the battery.
- (i) Turn the ignition switch ON.
- (j) Measure the fuel pressure.

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 the following parts:

- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator



- (k) Remove the SST from the DLC1.
SST 09843–18020
- (l) Start the engine.
- (m) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.
- (n) Measure the fuel pressure at idle.

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

- (o) Reconnect the vacuum sensing hose to the fuel pressure regulator.
- (p) Measure the fuel pressure at idle.

Fuel pressure:**196–235 kPa (2.0–2.4 kgf/cm², 28–34 psi)**

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

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

Fuel pressure:**147 kPa (1.5 kgf/cm², 21 psi) or more**

If pressure is not as specified, check the fuel pump, pressure regulator and/or injectors.

- (s) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully remove the SST to prevent gasoline from splashing.
SST 09268–45012

- (t) Install the fuel inlet pipe to the delivery pipe with 2 new gaskets and the union bolt.

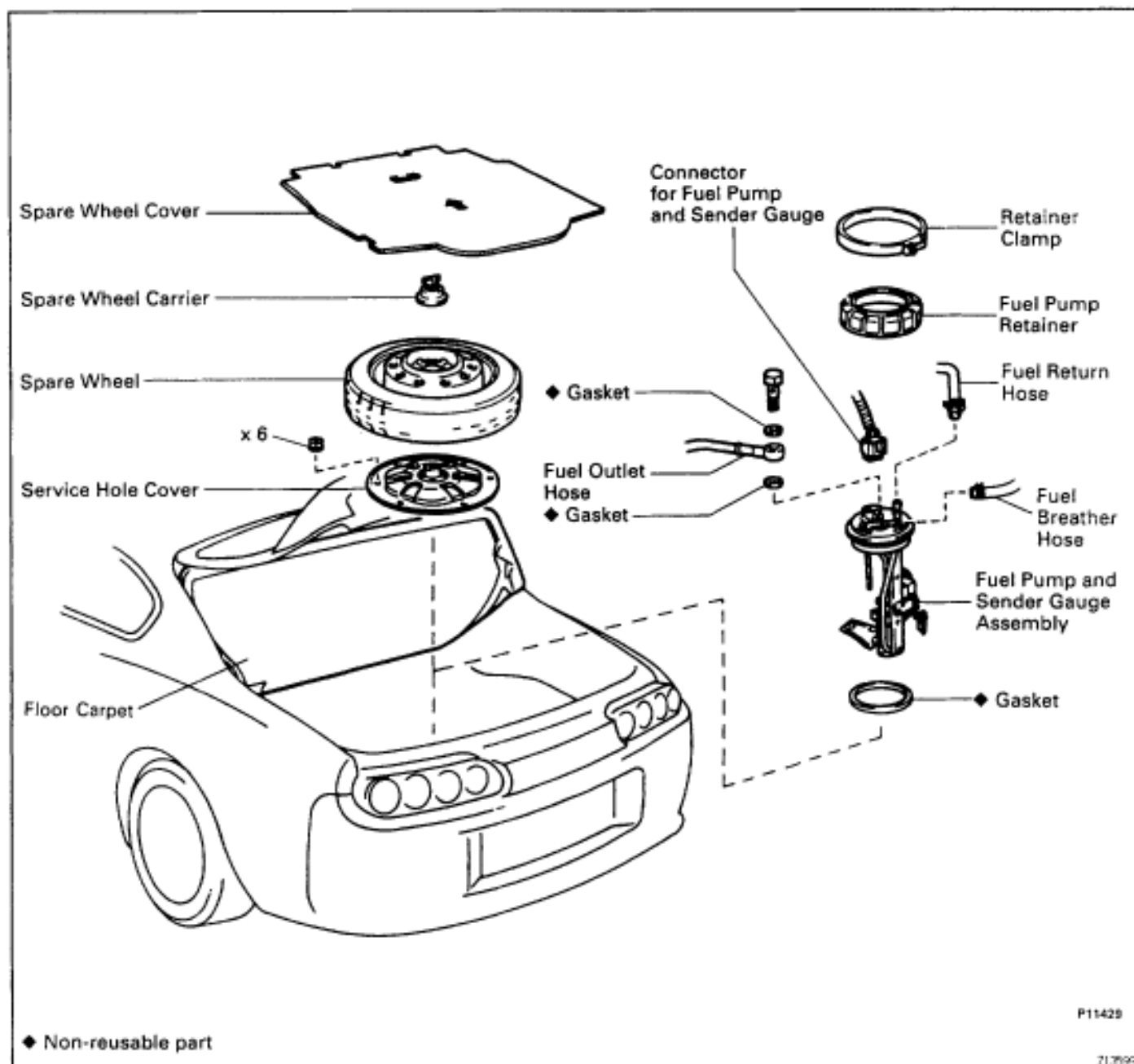
Torque: 42 N·m (420 kgf·cm², 30 ft·lbf)

- (u) Install the No.2 vacuum pipe with the 2 nuts.

Torque: 27 N·m (270 kgf·cm², 20 ft·lbf)

- (v) Reconnect the negative (–) terminal cable to the battery.
- (w) Check for fuel leaks.
(See item 5 in fuel system in precaution)

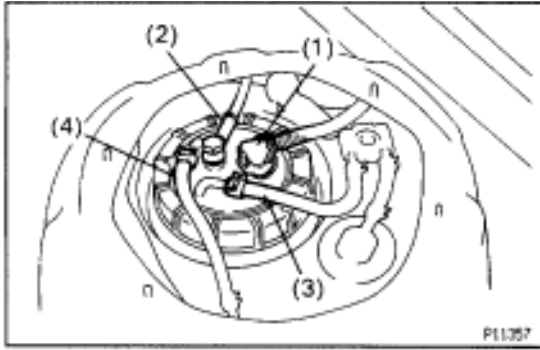
COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PUMP REMOVAL

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

1. TAKE OUT FLOOR CARPET
2. REMOVE SPARE WHEEL COVER
3. REMOVE SPARE WHEEL
4. REMOVE SERVICE HOLE COVER



5. REMOVE FUEL PUMP AND SENDER GAUGE ASSEMBLY

- (a) Disconnect the connector and hoses from the fuel pump bracket:

(1) Fuel pump connector

(2) Fuel outlet hose

Remove the union bolt and 2 gaskets, and disconnect the outlet hose.

(3) Fuel return hose

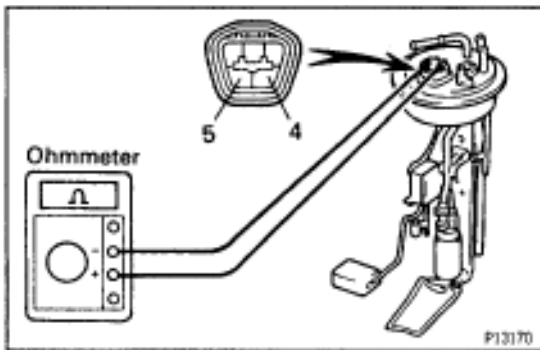
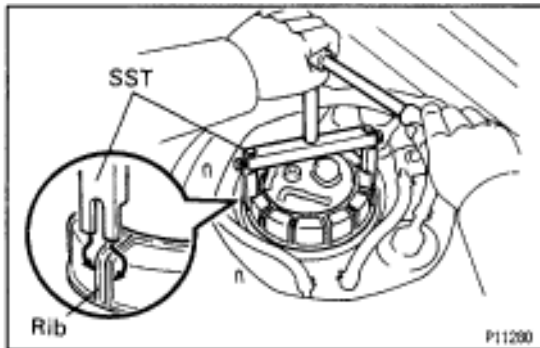
(4) Fuel breather hose

- (b) Remove the retainer clamp.

- (c) Using SST, loosen the retainer.

SST 09808-14010

- (d) Remove the retainer, the fuel pump, sender gauge assembly and gasket.



FUEL PUMP INSPECTION

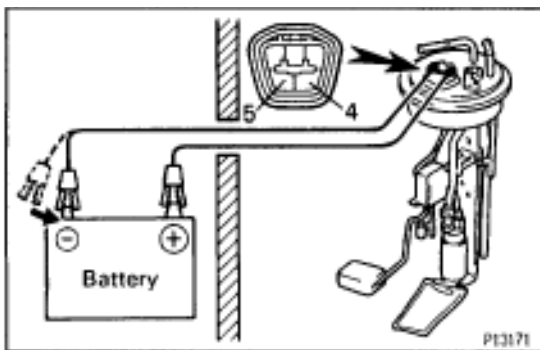
1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between terminals 4 and 5.

Resistance:

0.2–3.0 Ω at 20°C (68°F)

If the resistance is not as specified, replace the fuel pump, lead wire or fuel pump bracket.



2. INSPECT FUEL PUMP OPERATION

Connect a tester lead from terminal 4 of the connector to the positive (+) terminal of the battery; connect another tester lead from terminal 5 of the connector to the negative (–) terminal of the battery.

NOTICE:

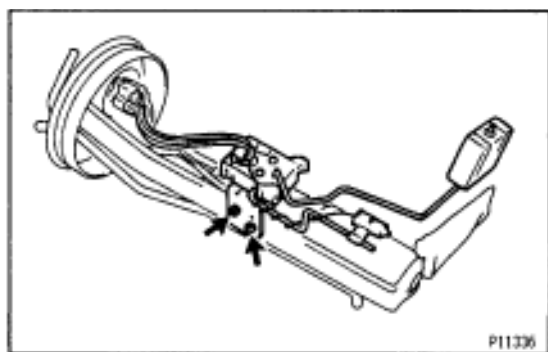
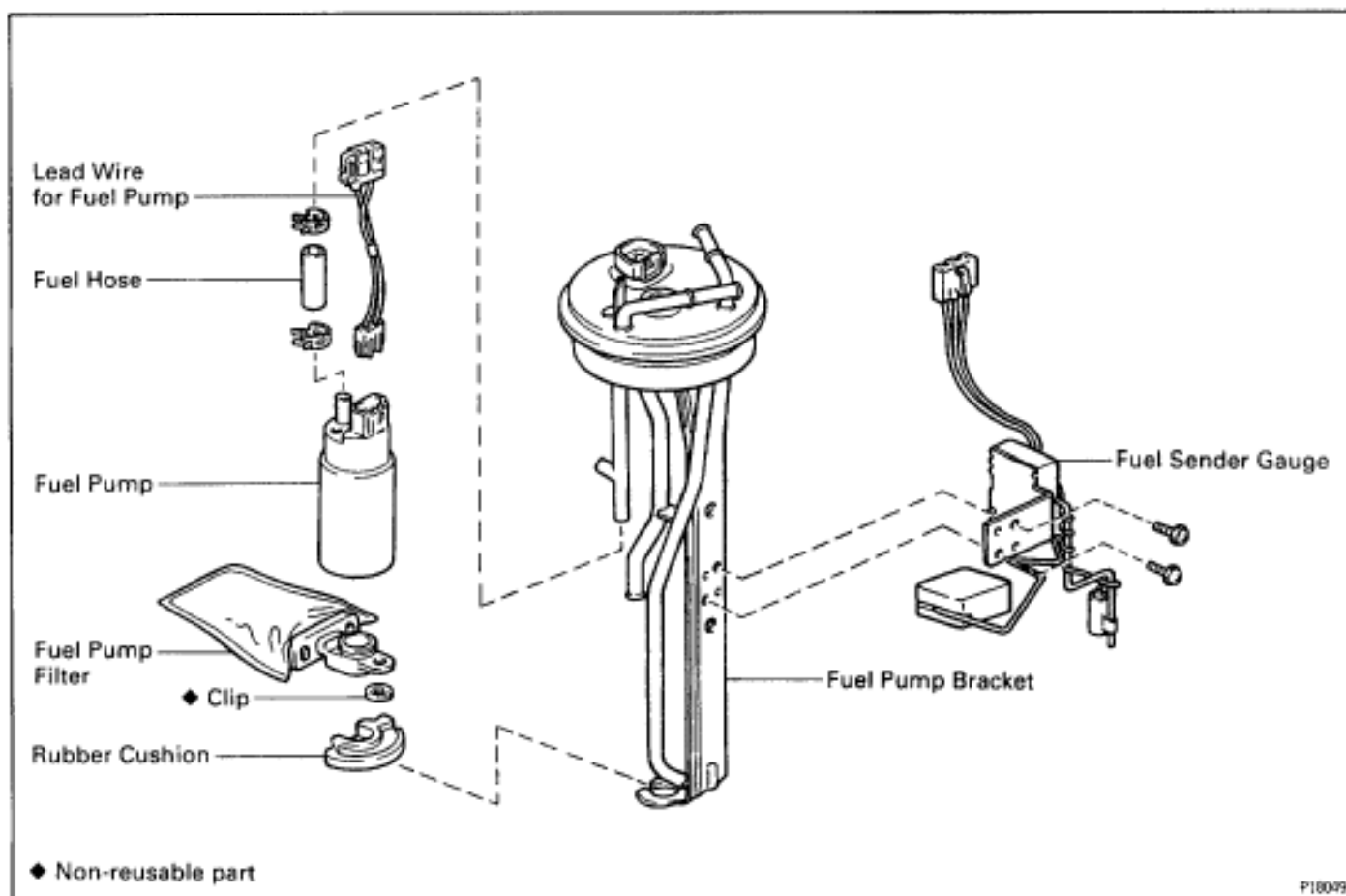
These tests must be performed quickly (within 10 seconds) to prevent the coil from burning out.

Keep the fuel pump as far away from the battery as possible.

Always connect or disconnect at the battery.

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

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

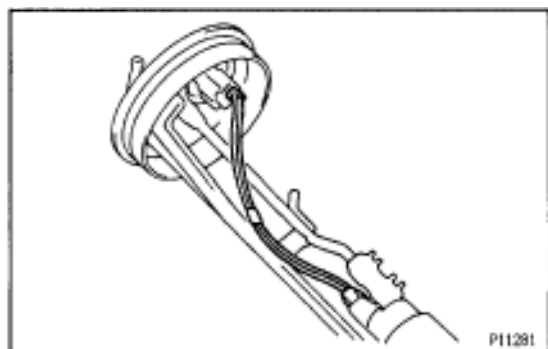


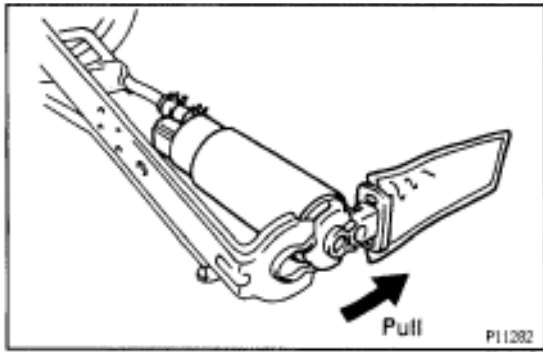
FUEL PUMP DISASSEMBLY

Assembly is in the reverse order of disassembly.

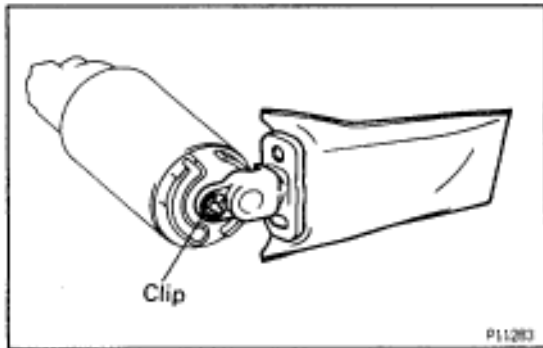
1. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

- Disconnect the connector from the fuel pump bracket.
- Remove the 2 screws and sender gauge.



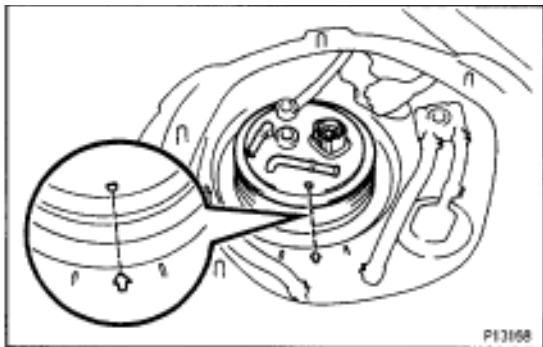


- (b) Pull out the lower side of the fuel pump from the pump bracket.
- (c) Remove the rubber cushion from the fuel pump.
- (d) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.



3. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

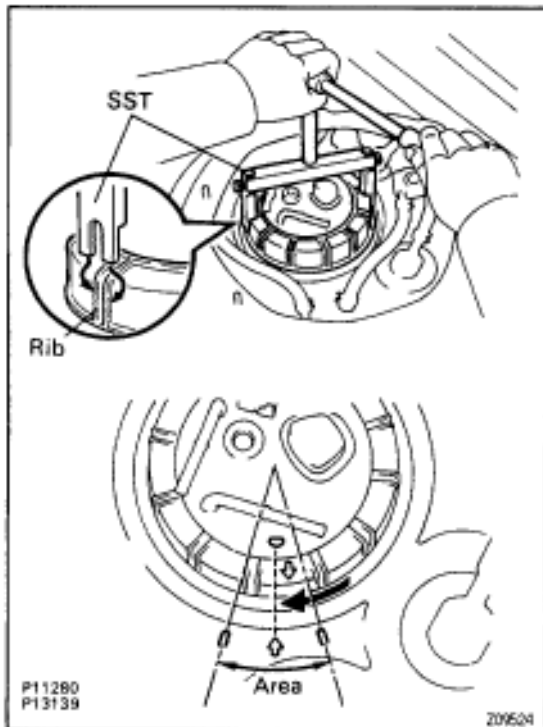
- (a) Using a small screwdriver, remove the clip.
INSTALLATION HINT: Use a new clip.
- (b) Pull out the pump filter.



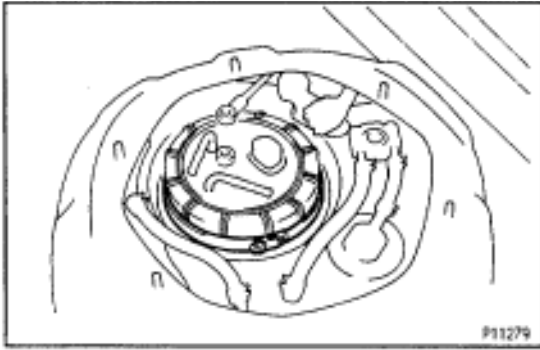
FUEL PUMP INSTALLATION

1. INSTALL FUEL PUMP AND SENDER GAUGE ASSEMBLY

- (a) Install a new gasket to the fuel tank.
- (b) Insert fuel pump and sender gauge assembly into the fuel tank.
- (c) Align the arrow marks of the fuel pump bracket and fuel tank.



- (d) Temporarily install the retainer.
- (e) Using SST, tighten the retainer until the arrow mark on the retainer is within the lines on the fuel tank.
SST 09808-14010
- (f) Check that the arrow marks of the fuel pump bracket and fuel tank are aligned.

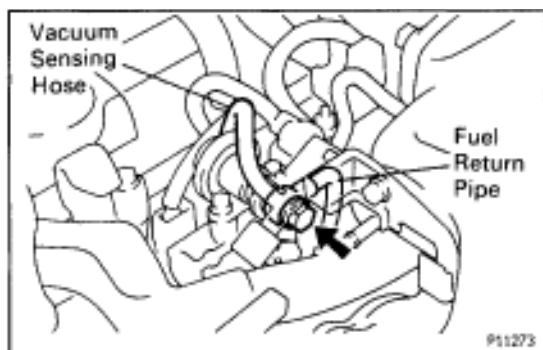
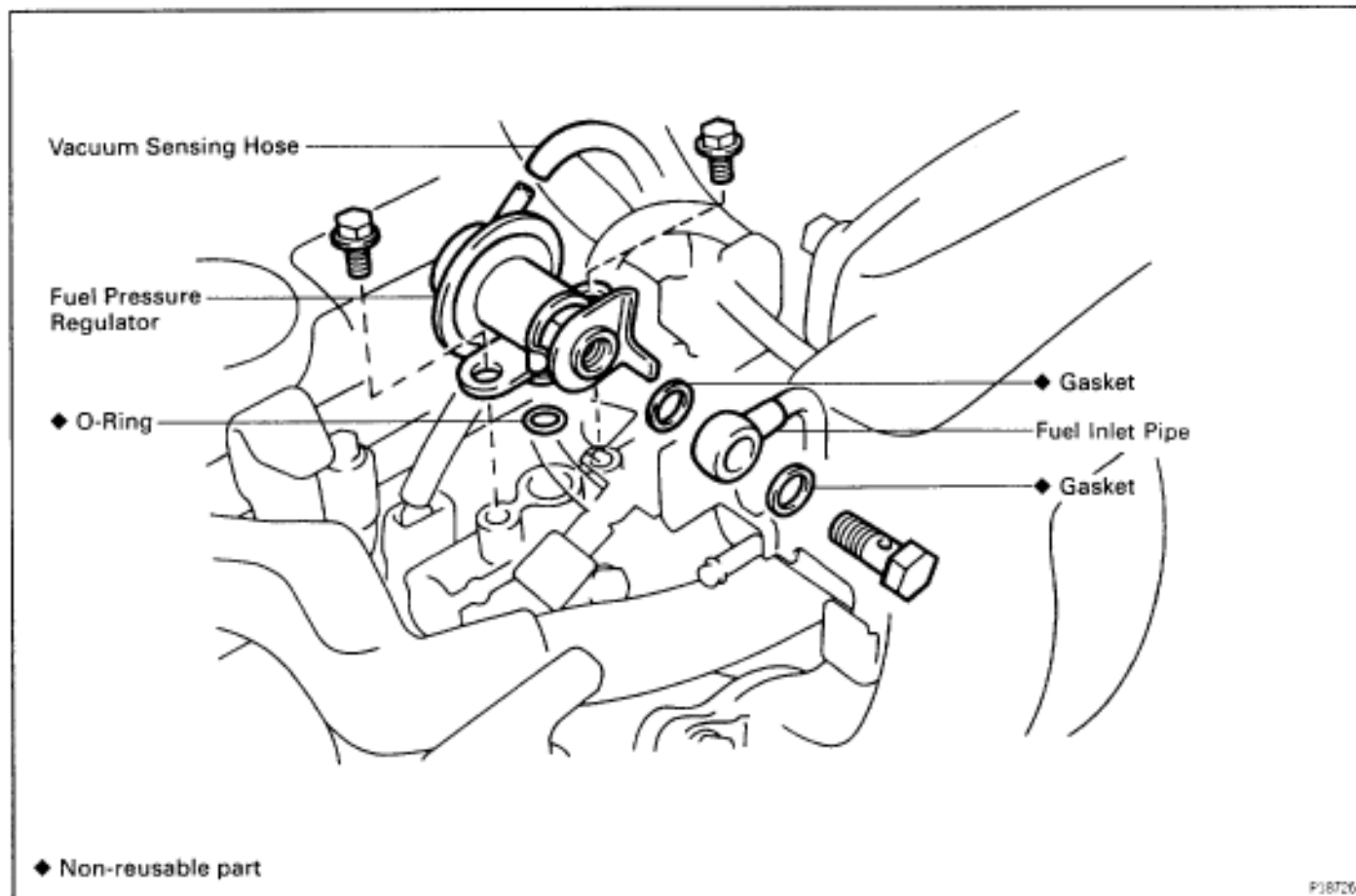


- (g) Install the retainer clamp.
- (h) Connect the connector and hoses to the fuel pump bracket:
 - Fuel pump connector
 - Fuel outlet hoseConnect the outlet hose with 2 new gaskets and the union bolt.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

- Fuel return hose
 - Fuel breather hose
2. **REMOVE SERVICE HOLE COVER**
 3. **REMOVE SPARE WHEEL**
 4. **REMOVE SPARE WHEEL COVER**
 5. **TAKE OUT FLOOR CARPET**
 6. **CHECK FOR FUEL LEAKS**
(See item 5 in fuel system in precaution)

FUEL PRESSURE REGULATOR COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PRESSURE REGULATOR REMOVAL

1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR
2. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR

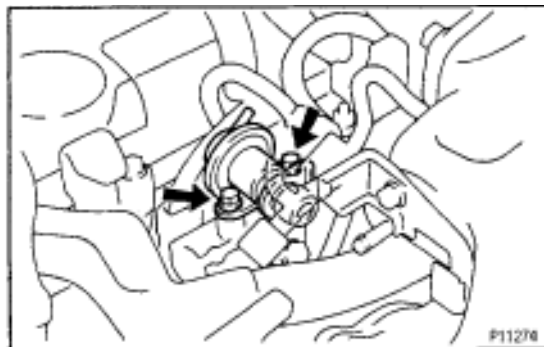
Remove the union bolt and 2 gaskets, and disconnect the return pipe from the pressure regulator.

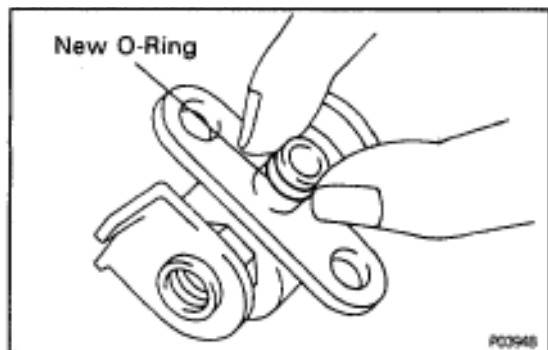
CAUTION:

Put a shop rag under the pressure regulator.

Slowly loosen the union bolt.

3. REMOVE FUEL PRESSURE REGULATOR
 - (a) Remove the 2 bolts, and pull out the pressure regulator.
 - (b) Remove the O-ring from the pressure regulator.





FUEL PRESSURE REGULATOR INSTALLATION

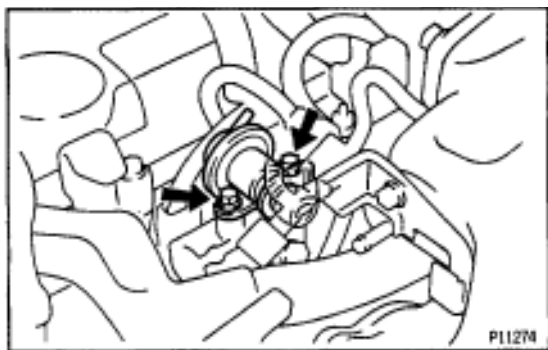
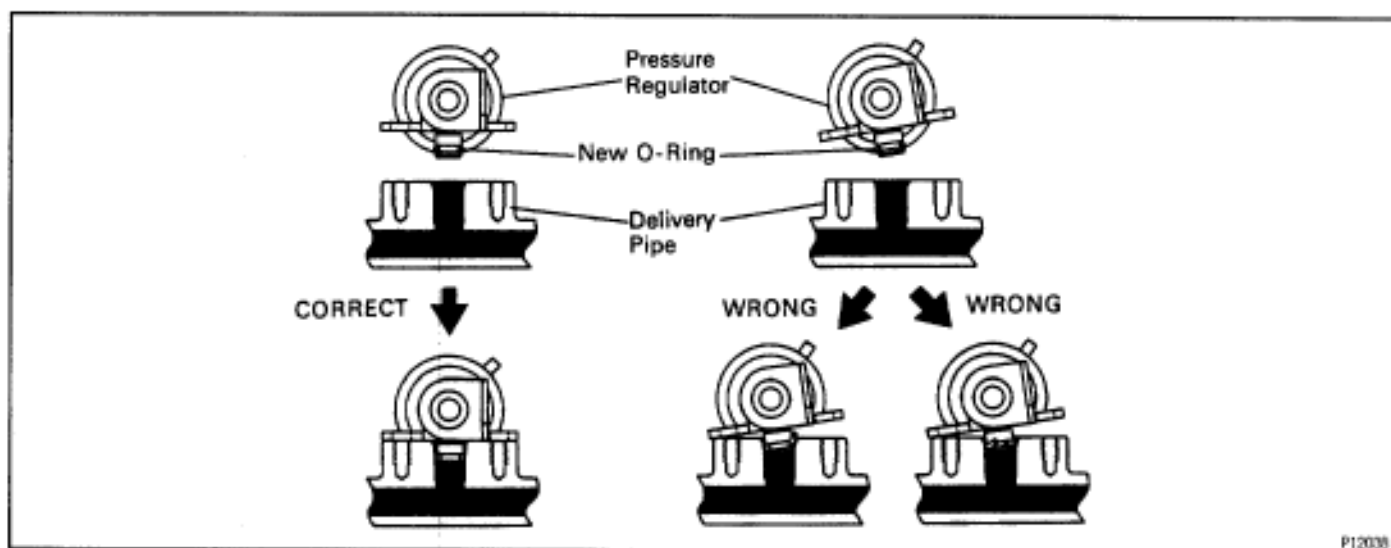
1. INSTALL FUEL PRESSURE REGULATOR

- (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 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 do steps (b) and (c) above again.



- (d) Install the pressure regulator with the 2 bolts.

Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)

2. CONNECT FUEL RETURN PIPE TO FUEL PRESSURE REGULATOR

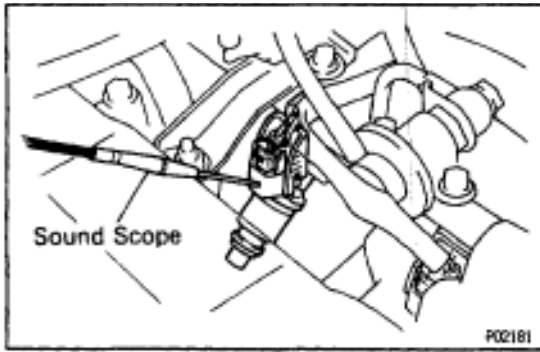
Install the return pipe with 2 new gaskets and the union bolt.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR

4. CHECK FOR FUEL LEAKS

(See item 5 in fuel system in precaution)



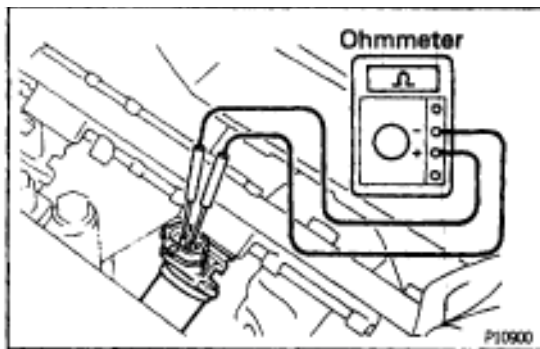
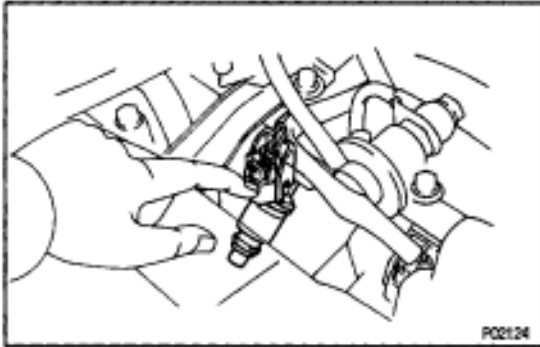
INJECTOR

ON-VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

- (a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.
- (b) If you have no sound scope, you can check the injector transmission operation with your finger.
If no sound is heard or unusual vibration is felt, check the wiring connector, injector or injection signal from the ECM.



2. INSPECT INJECTOR RESISTANCE

- (a) Remove the throttle body together with the intake air connector. (See steps 1 to 9 in injector removal)
- (b) Disconnect the 6 injector connectors.
- (c) Using an ohmmeter, measure the resistance between the injector terminals.

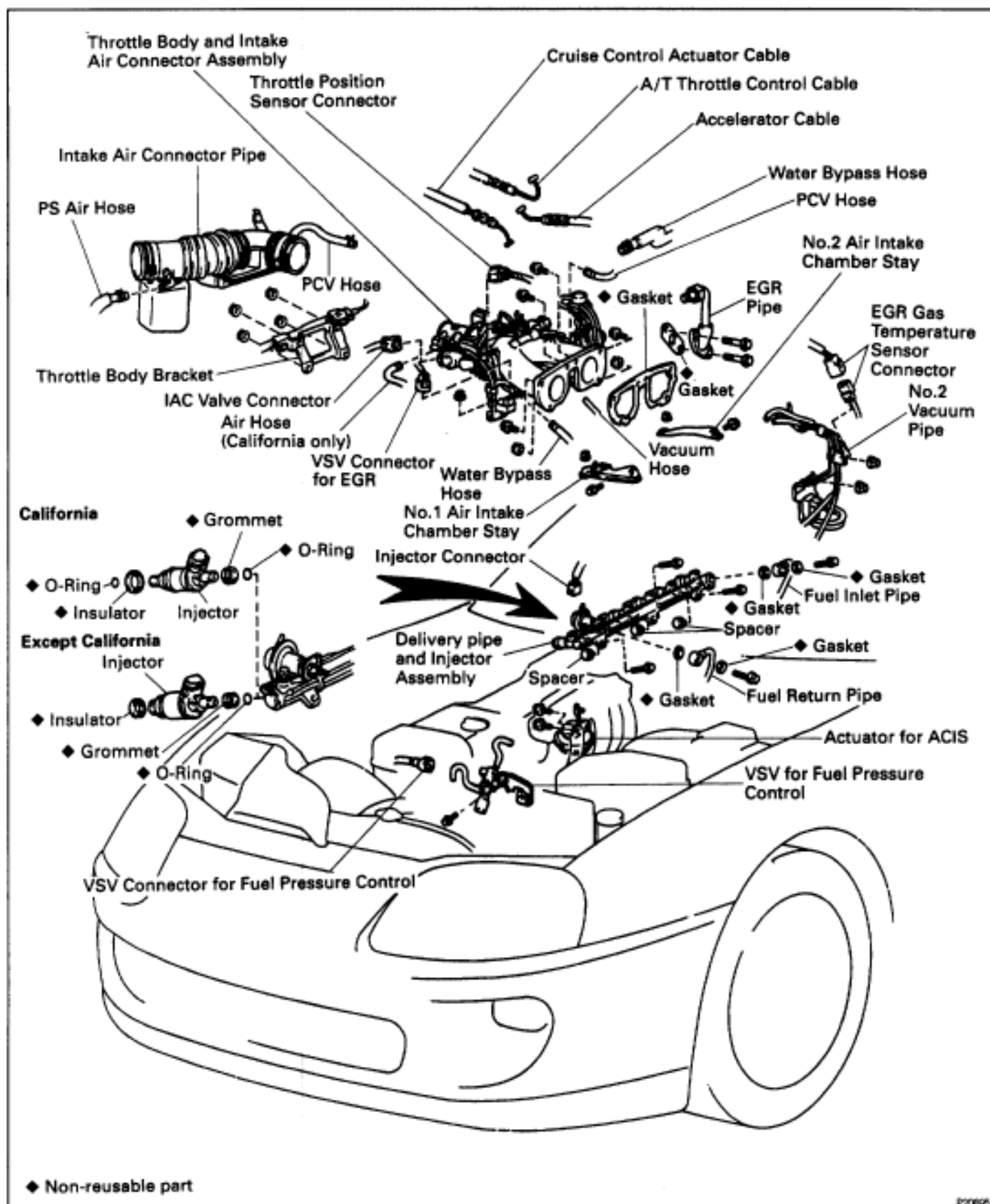
Resistance:

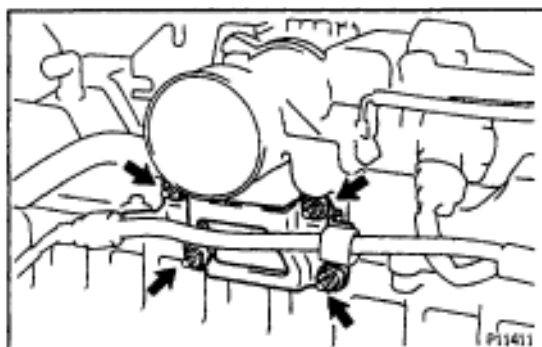
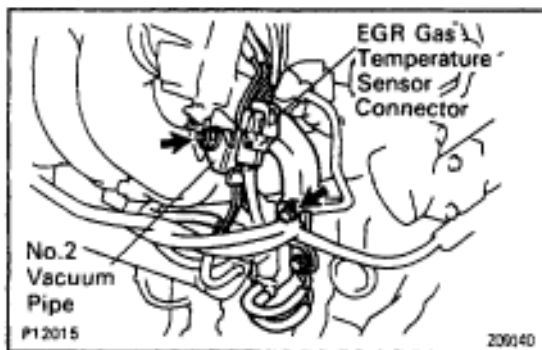
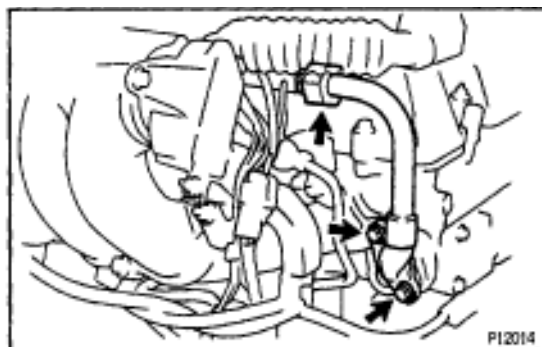
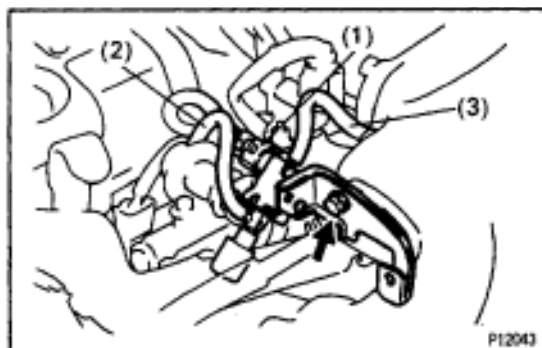
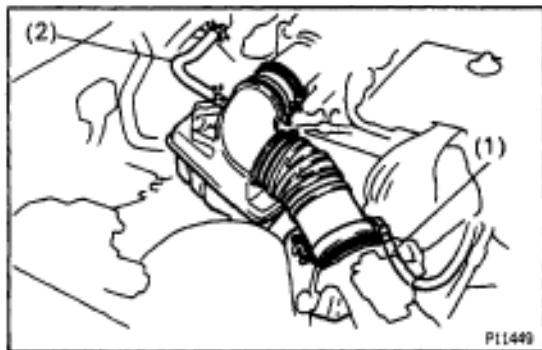
At 20°C (68°F) 13.4–14.2 Ω

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

- (d) Reconnect the 6 injector connectors.
- (e) Reinstall the throttle body together with the intake air connector. (See steps 8 to 16 in injector installation)

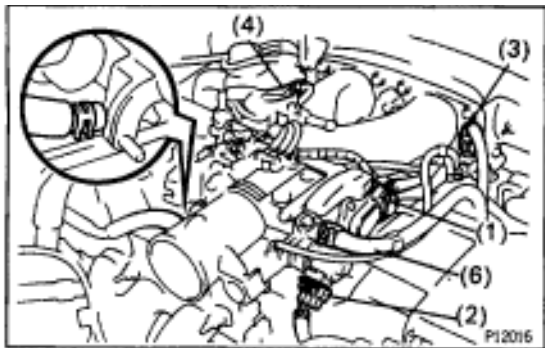
COMPONENTS FOR REMOVAL AND INSTALLATION





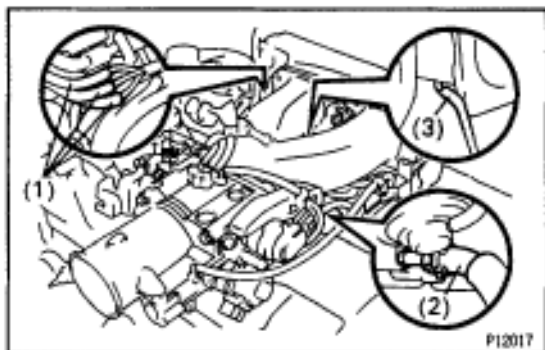
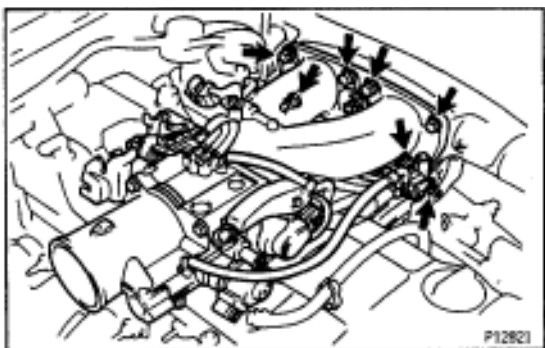
INJECTORS REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **DISCONNECT CONTROL CABLES FROM THROTTLE BODY**
3. **REMOVE INTAKE AIR CONNECTOR PIPE**
 - (a) Disconnect these hoses:
 - (1) PS air hose from air connector pipe
 - (2) PCV hose from No.2 cylinder head cover
 - (b) Loosen the 2 hose clamps, and remove the air connector pipe together with the hoses.
4. **California only:**
REMOVE VSV FOR FUEL PRESSURE CONTROL
 - (a) Disconnect the connector and hoses:
 - (1) VSV connector
 - (2) Vacuum sensing hose from fuel pressure control
 - (3) Vacuum sensing hose from air intake chamber
 - (b) Remove the bolt and VSV.
5. **REMOVE EGR PIPE**
 - (a) Loosen the union nut of the EGR pipe.
 - (b) Remove the 2 bolts, EGR pipe and gasket.
6. **DISCONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR**
 - (a) Disconnect the connector from the No.2 vacuum pipe.
 - (b) Disconnect the sensor connector from the wiring connector.
7. **DISCONNECT NO.2 VACUUM PIPE FROM AIR INTAKE CHAMBER AND INTAKE MANIFOLD**
 Remove the 2 nuts, and disconnect the vacuum pipe from the air intake chamber and intake manifold.
8. **DISCONNECT THROTTLE BODY BRACKET FROM THROTTLE BODY AND CYLINDER HEAD**
 Remove the 4 nuts, and disconnect the throttle body bracket from the throttle body and cylinder head.

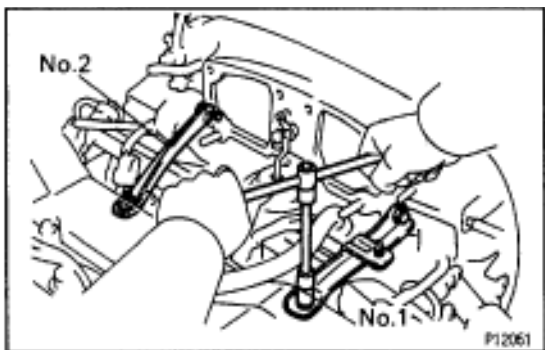


9. REMOVE THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY

- (a) Disconnect these connectors and hoses:
 - (1) Throttle position sensor connector
 - (2) IAC valve connector
 - (3) VSV connector for EGR
 - (4) PCV hose from intake air connector
 - (5) Water bypass hose (from No.2 water bypass pipe) from throttle body
 - (6) California only:
Air hose from IAC valve
- (b) Remove the nut holding the VSV for the ACIS to the air intake chamber.
- (c) Remove the 4 bolts and 2 nuts holding the intake air connector to the air intake chamber.

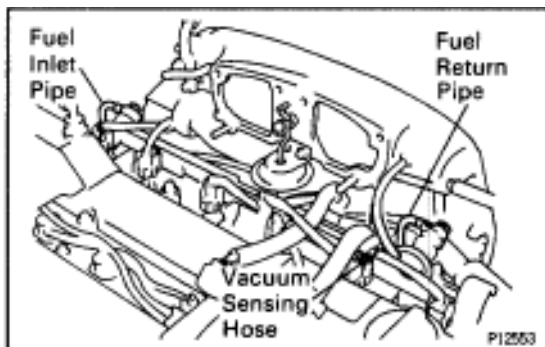


- (d) Disconnect these hoses, and remove the throttle body, intake air connector assembly and gasket.
 - (1) 3 vacuum hoses (from No.2 vacuum pipe) from No.1 vacuum pipe
 - (2) Water bypass hose (from water outlet) from throttle body
 - (3) Vacuum hose (from actuator for ACIS) from No.1 vacuum pipe



10. REMOVE AIR INTAKE CHAMBER STAYS

- (a) Remove the bolt, nut and No.1 stay.
- (b) Remove the bolt, nut and No.2 stay.



11. Except California:

DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

12. DISCONNECT FUEL INLET PIPE FROM DELIVERY PIPE

Remove the union bolt and 2 gaskets, and disconnect the inlet pipe from the delivery pipe.

CAUTION:

- Put a shop towel under the delivery pipe.

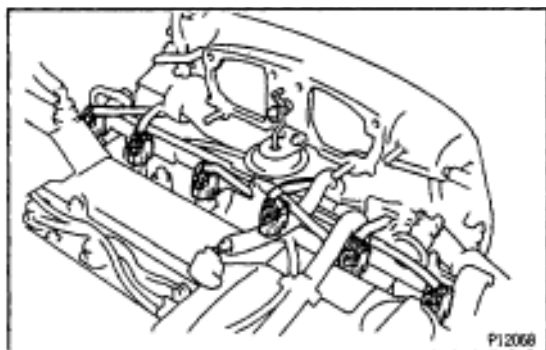
- Slowly loosen the union bolt.

13. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR

Remove the union bolt and 2 gaskets, and disconnect the fuel pipe from the pressure regulator.

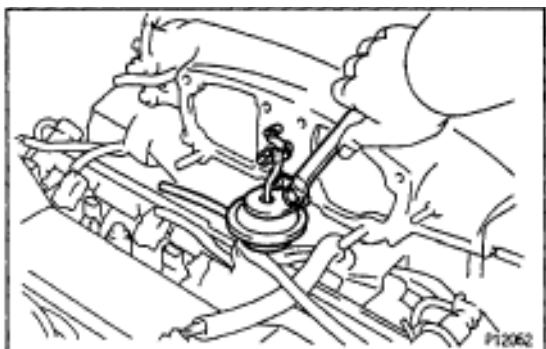
CAUTION:

- Put a shop towel under the pressure regulator.
- Slowly loosen the union bolt.



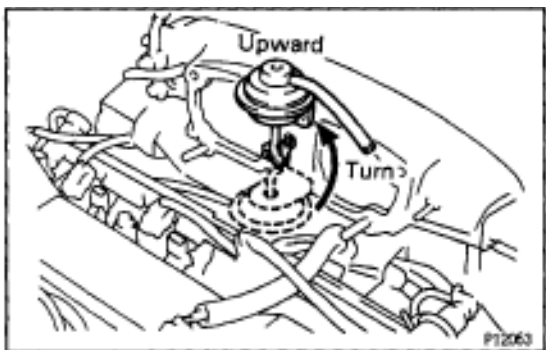
14. DISCONNECT INJECTOR CONNECTORS

Disconnect the 6 injector connectors.



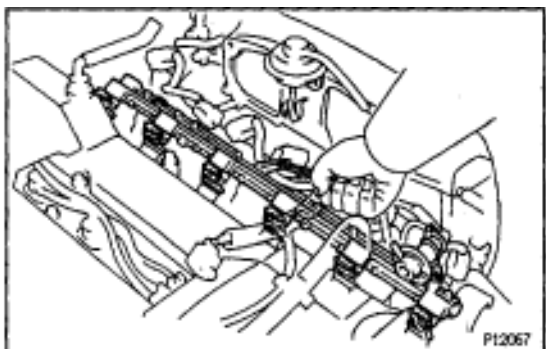
15. DISCONNECT ACTUATOR FOR ACIS FROM AIR INTAKE CHAMBER

- (a) Remove the 2 bolts, and disconnect the actuator from the air intake chamber.



- (b) Wrap the actuator with adhesive tape and attach it to the intake chamber.

NOTICE: Do not apply any force on the actuator rod and prevent the rod clip from detaching.

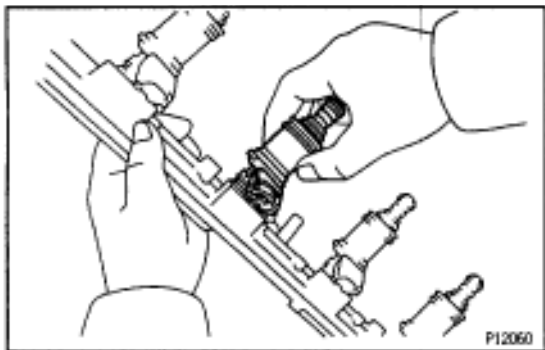


16. REMOVE DELIVERY PIPE AND INJECTORS

- (a) Remove the 3 bolts and delivery pipe together with the 6 injectors.

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

- (b) Remove the 6 insulators (Except California) and 3 spacers from the intake manifold.

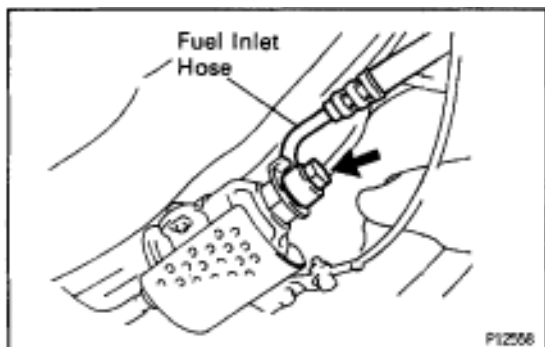
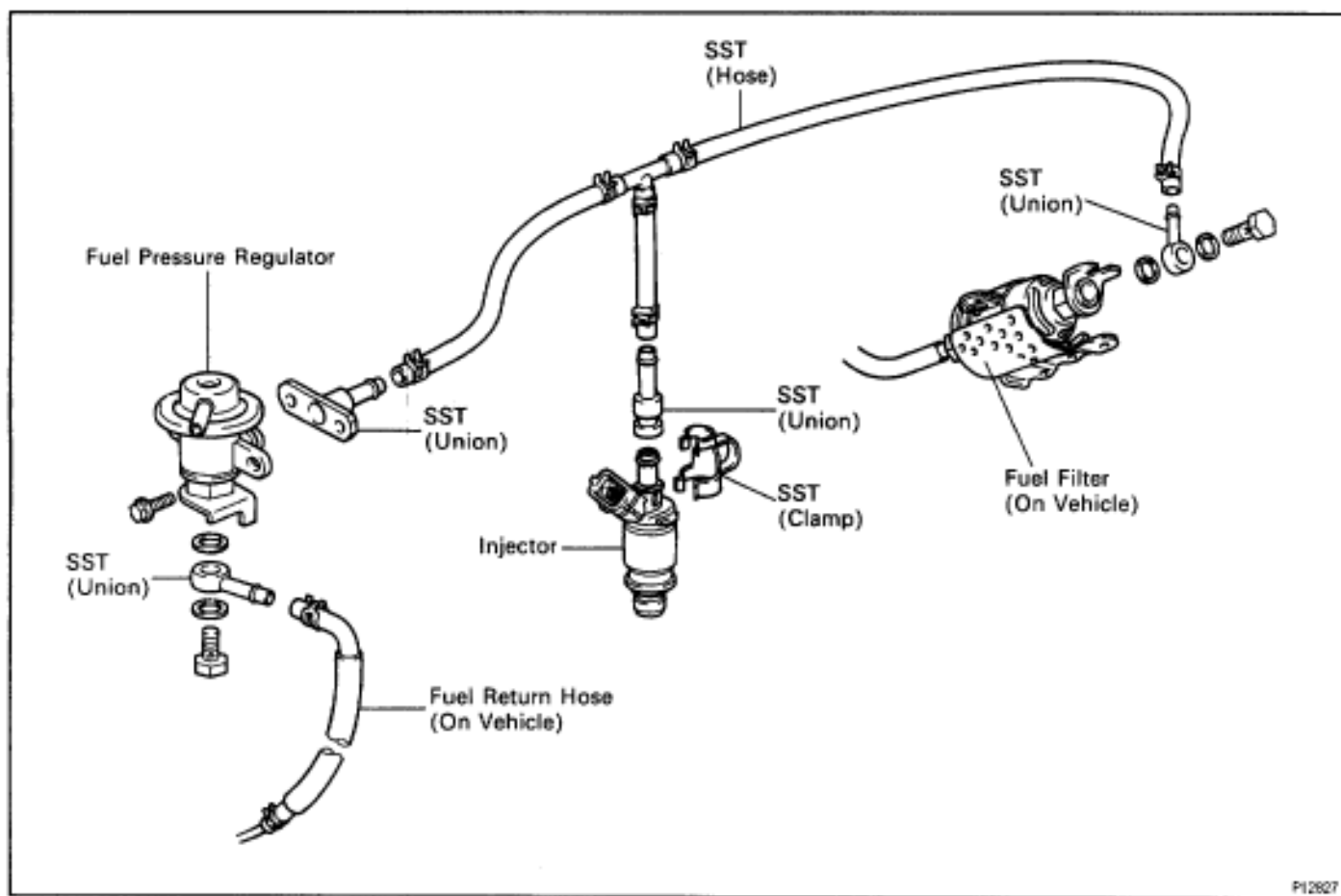


- (c) Pull out the 6 injectors from the delivery pipe.
- (d) California:
Remove the 2 O-rings, insulator and grommet from each injector.
- (e) Except California:
Remove the O-ring and grommet from each injector.

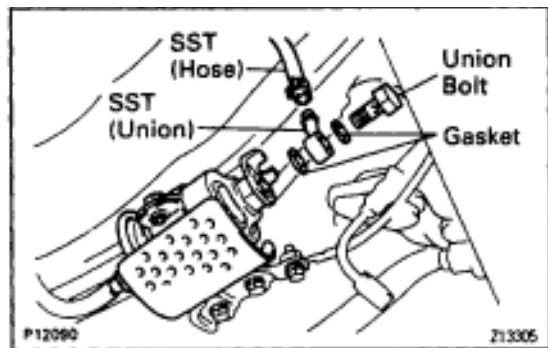
INJECTORS INSPECTION

1. INSPECT INJECTOR INJECTION

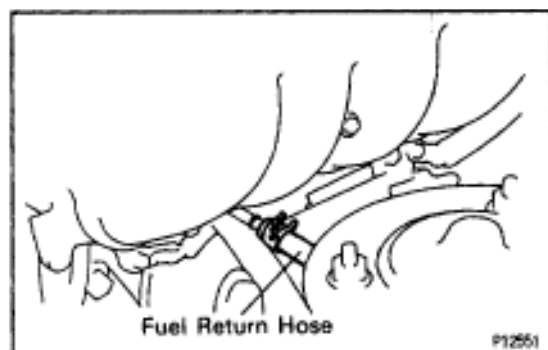
CAUTION: Keep injector clear of sparks during the test.



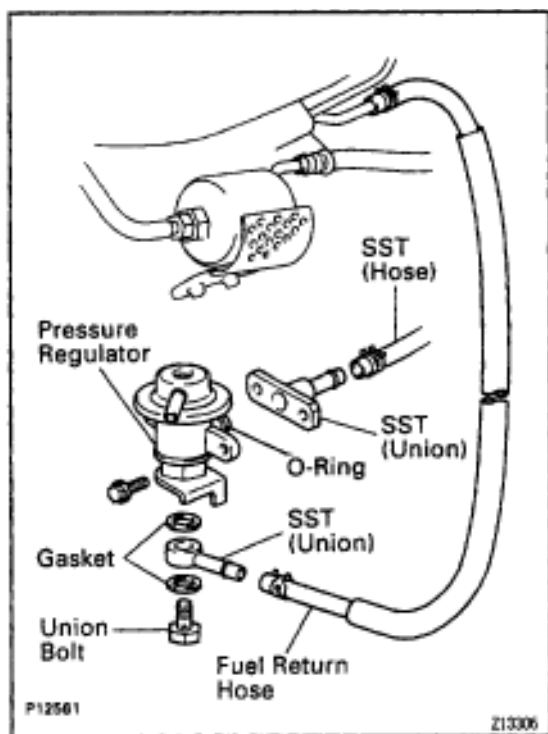
- (a) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.



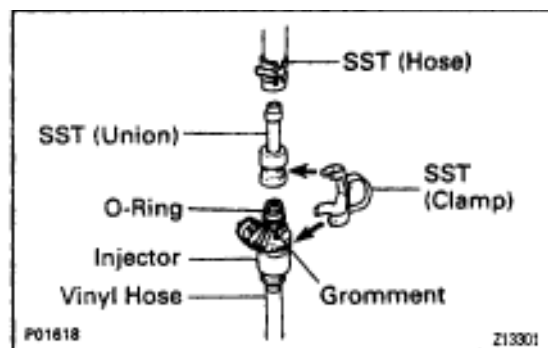
- (b) Connect SST (hose) to the fuel filter outlet with SST (union), the 2 gaskets and union bolt.
 SST 09268-41045 (90405-09015)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



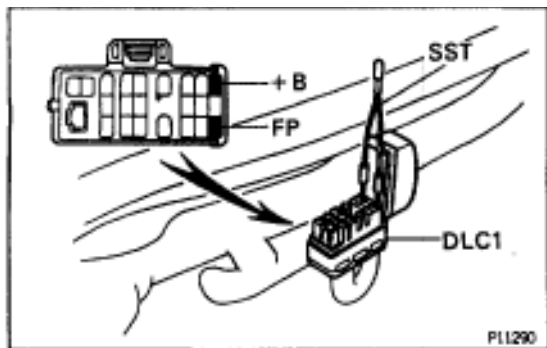
- (c) Disconnect the fuel return hose from the fuel return pipe.
 (d) Remove the fuel pressure regulator from the delivery pipe.
 (See step 3 in fuel pressure regulator removal)



- (e) Install the O-ring to the fuel inlet of the pressure regulator.
 (f) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the 2 bolts.
 SST 09268-41045 (09268-41090)
 (g) Connect the fuel return hose to the fuel outlet of the pressure regulator with SST (union), the 2 gaskets and union bolt.
 SST 09268-41045 (09268-41070)

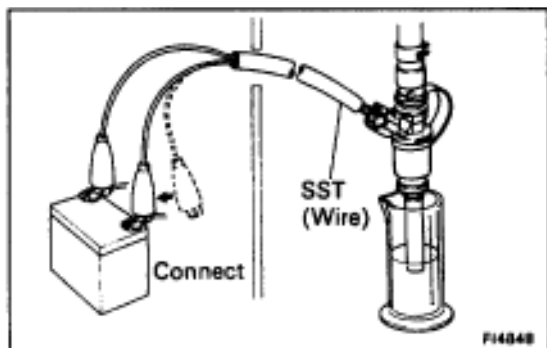


- (h) Install the grommet and O-ring to the injector.
 (i) Connect SST (hose) to the injector with SST (union), and hold the injector and union with SST (clamp).
 SST 09268-41045
 (j) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.



- (k) Using SST, connect terminals +B and FP of the DLC 1.
SST 09843-18020
- (l) Reconnect the negative (-) terminal cable to the battery.
- (m) Turn the ignition switch ON.

NOTICE: Do not start the engine.



- (n) 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

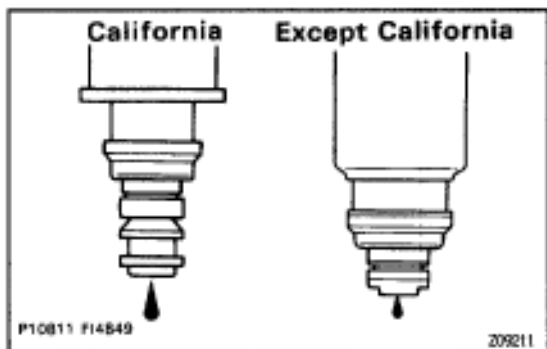
Injection volume:

70-88 cm³ (4.3-5.4 cu in.) per 15 sec.

Difference between each injector:

9 cm³ (0.5 cu in.) or less

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



2. INSPECT LEAKAGE

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

SST 09842-30070

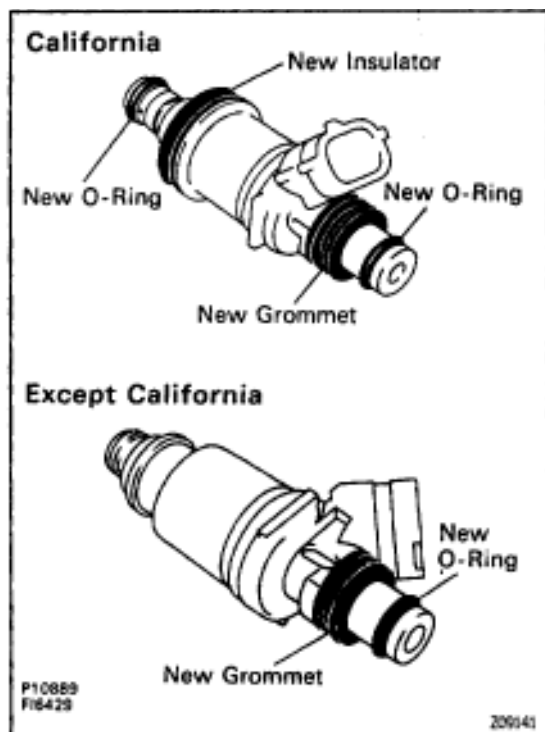
Fuel drop:

One drop or less per minute

- (b) Disconnect the negative (-) terminal cable from the battery.
- (c) Remove the SST.
SST 09268-41045 and 09843-18020
- (d) Reconnect the fuel inlet hose to the fuel filter with 2 new gaskets and union bolt.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

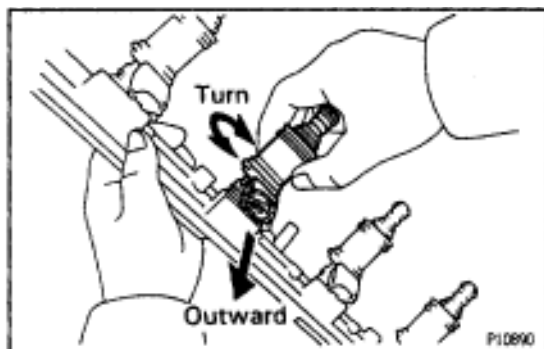
- (e) Reconnect the fuel return hose to the fuel return pipe.
- (f) Reinstall the fuel pressure regulator to the delivery pipe. (See step 1 in fuel pressure regulator installation)



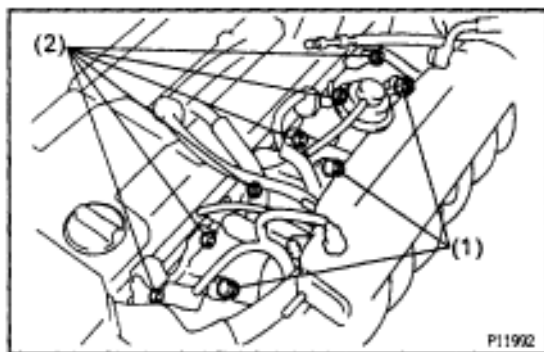
INJECTORS INSTALLATION

1. INSTALL INJECTORS AND DELIVERY PIPE

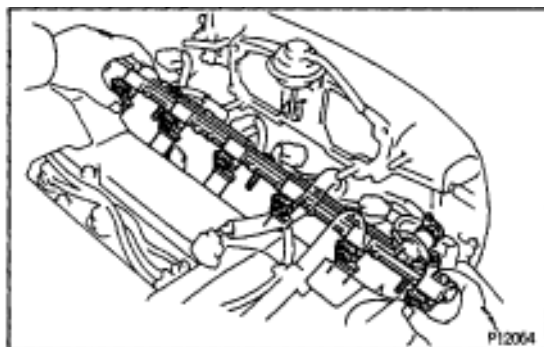
- (a) California:
Install new insulator and grommet to each injector.
- (b) Except California:
Install a new grommet to each injector.
- (c) California:
Apply a light coat of gasoline to 2 new O-rings, and install them to each injector.
- (d) Except California:
Apply a light coat of gasoline to a new O-ring, and install it to each injector.



- (e) While turning the injector clockwise and counterclockwise, push it to the delivery pipe. Install the 6 injectors.
- (f) Position the injector connector outward.



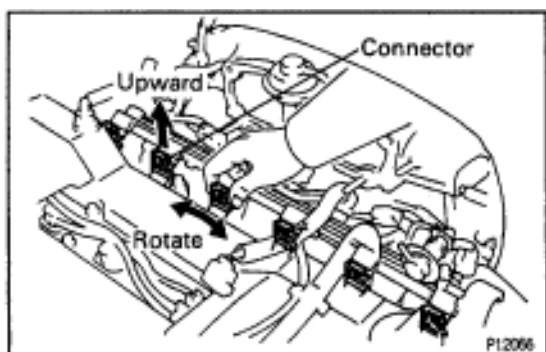
- (g) Install these parts to the intake manifold:
 - (1) 3 spacers
 - (2) Except California:
6 new insulators



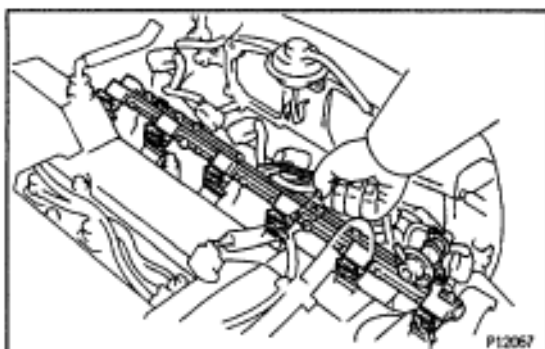
- (h) Install the 3 bolts to the delivery pipe.
- (i) California:
Apply a light coat of gasoline to O-ring on each injector.
- (j) Attach the 6 injectors together with the delivery pipe to the intake manifold.



- (k) Temporarily install the 3 bolts holding the delivery pipe to the intake manifold.



- (l) 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.
(m) Position the injector connector upward.

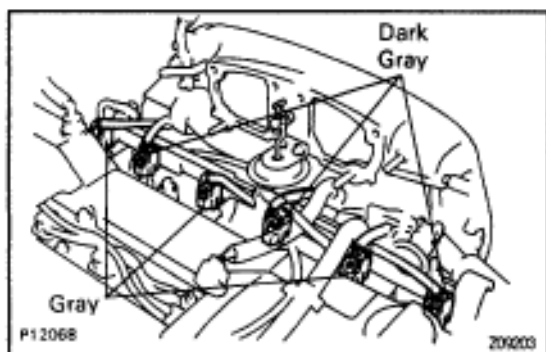


- (n) Tighten the 3 bolts holding the delivery pipe to the intake manifold.

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

2. INSTALL ACTUATOR FOR ACIS

- (a) Install the actuator with the 2 bolts.
Torque: 6.8 N·m (70 kgf·cm, 61 in·lbf)
(b) Inspect the intake air control valve.
(See intake air control valve inspection in ACIS)



3. CONNECT INJECTOR CONNECTORS

Connect the 6 injector connectors.

HINT: The No.1, No.3 and No.5 injector connectors are dark gray, and the No.2, No.4 and No.6 injector connectors are gray.

4. CONNECT FUEL INLET PIPE TO DELIVERY PIPE

Connect the inlet pipe with 2 new gaskets and the union bolt.

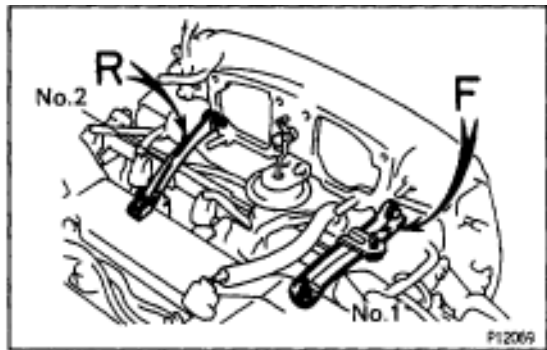
Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)

5. CONNECT FUEL RETURN PIPE TO FUEL PRESSURE REGULATOR

Connect the return pipe with 2 new gaskets and the union bolt.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

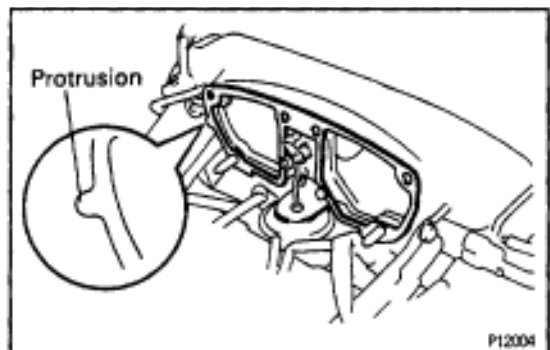
6. Except California:
CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR



7. INSTALL AIR INTAKE CHAMBER STAYS

HINT: The No.1 stay is marked with "F", and No.2 stay is marked with "R".

- (a) Install the No.1 stay with the bolt and nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
- (b) Install the No.2 stay with the bolt and nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



8. INSTALL THROTTLE BODY AND INTAKE AIR CONNECTOR ASSEMBLY

- (a) Install a new gasket to the air intake chamber, facing the protrusion rearward.
- (b) Place the throttle body and intake air connector assembly on the cylinder head.
- (c) Connect these hoses:
 - 3 vacuum hoses (from No.2 vacuum pipe) to No.1 vacuum pipe
 - Water bypass hose (from water outlet) to throttle body
 - Vacuum hose (from actuator for ACIS) to No.1 vacuum pipe
- (d) Install the 4 bolts and 2 nuts holding the intake air connector to the air intake chamber.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)
- (e) Install the nut holding the VSV for the ACIS to the air intake chamber.
- (f) Connect these connectors and hoses:
 - Throttle position sensor connector
 - IAC valve connector
 - VSV connector for EGR
 - PCV hose to intake air connector
 - Water bypass hose (from No.2 water bypass pipe) to throttle body
 - California only:
Air hose to IAC valve

9. INSTALL THROTTLE BODY BRACKET

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

10. INSTALL NO.2 VACUUM PIPE

Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)

11. CONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR

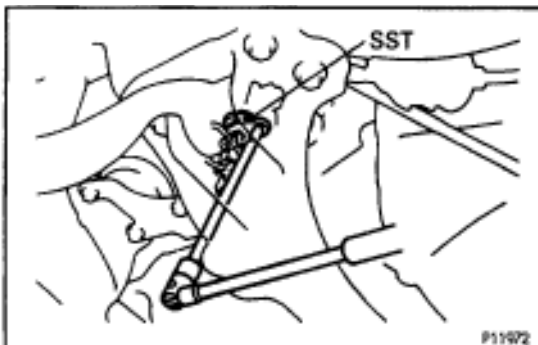
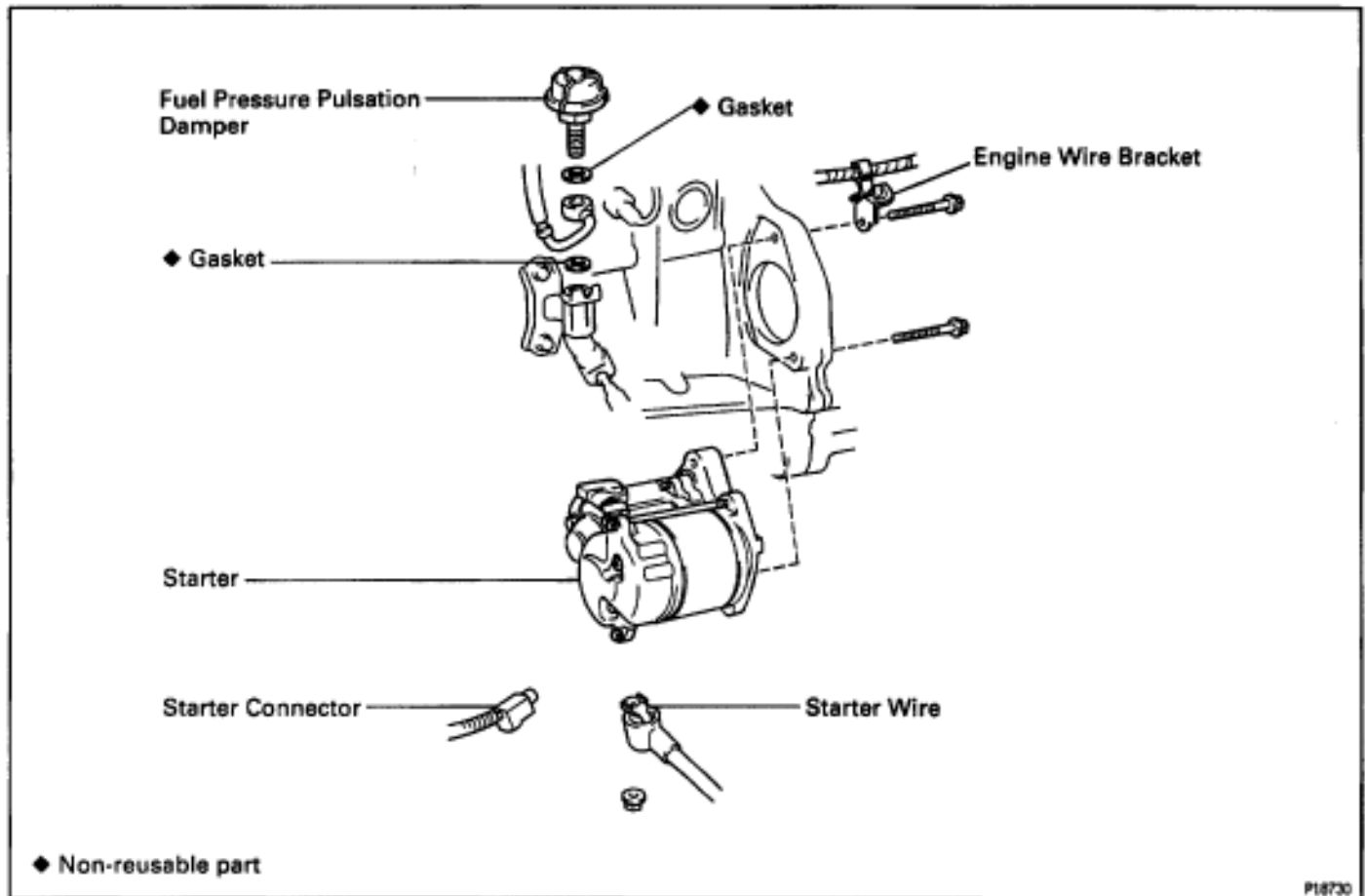
12. INSTALL EGR PIPE

- (a) Temporarily install the union nut of the EGR pipe.
- (b) Install a new gasket and the EGR pipe to the cylinder head with the 2 bolts.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)
- (c) Tighten the union nut of the EGR pipe.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

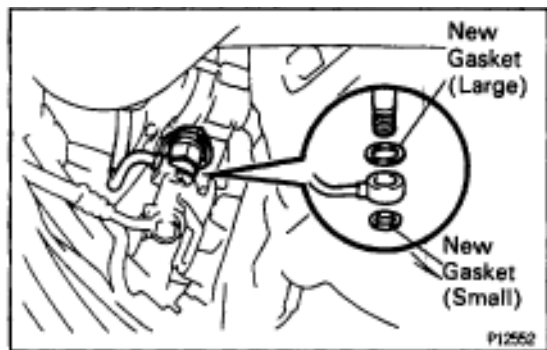
13. California only:
INSTALL VSV FOR FUEL PRESSURE CONTROL
14. INSTALL INTAKE AIR CONNECTOR PIPE
15. CONNECT CONTROL CABLES TO THROTTLE BODY
16. FILL WITH ENGINE COOLANT
17. CHECK FOR FUEL LEAKS
(See item 5 in fuel system in precaution)

FUEL PRESSURE PULSATION DAMPER COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PRESSURE PULSATION DAMPER REMOVAL

1. REMOVE STARTER
(See starter removal in Starting System)
2. REMOVE FUEL PRESSURE PULSATION DAMPER
 - (a) Remove the pulsation damper and upper gasket.
 - (b) Disconnect the fuel inlet pipe from the fuel pipe support, and remove the lower gasket.

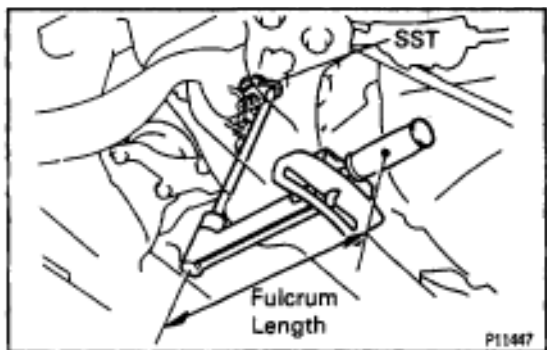


FUEL PRESSURE PULSATION DAMPER INSTALLATION

1. INSTALL FUEL PRESSURE PULSATION DAMPER

- (a) Install the fuel inlet pipe and pulsation damper with 2 new gaskets.

HINT: Different sized gaskets are used for the upper (large size) and lower (small size).



- (b) Using SST, tighten the pulsation damper.

SST 09612-24014 (09617-24011)

Torque:

41 N·m (420 kgf·cm, 30 ft·lbf)

35 N·m (350 kgf·cm, 25 ft·lbf) for SST

HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

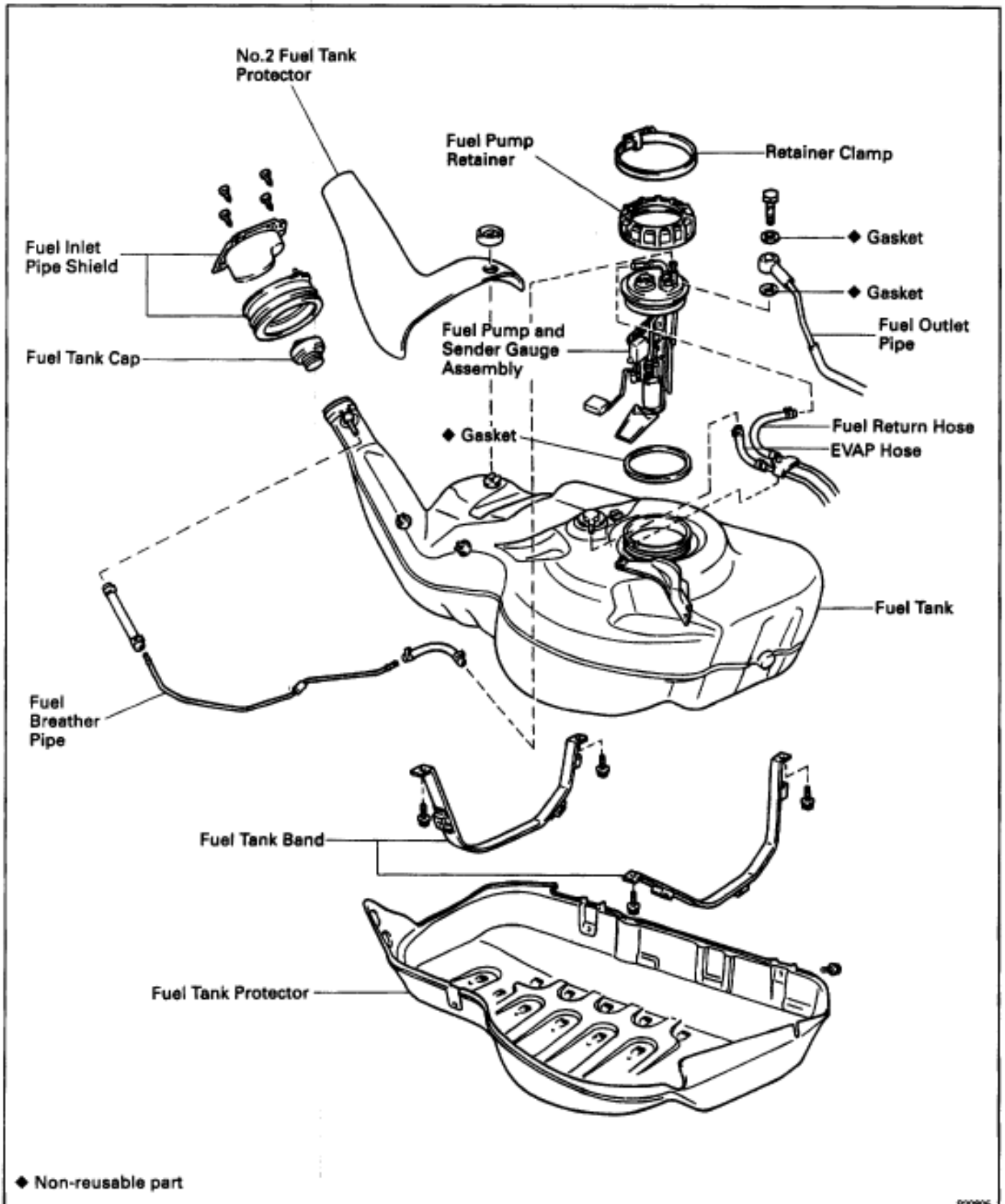
2. INSTALL STARTER

(See starter installation in Starting System)

4. CHECK FOR FUEL LEAKS

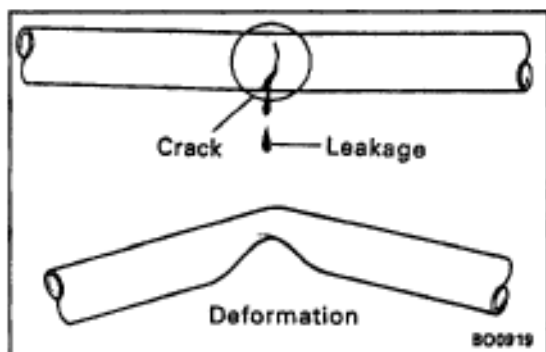
(See item 5 in fuel system in precaution)

FUEL TANK AND LINE COMPONENTS



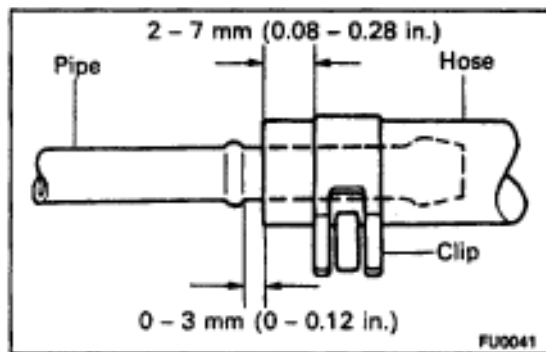
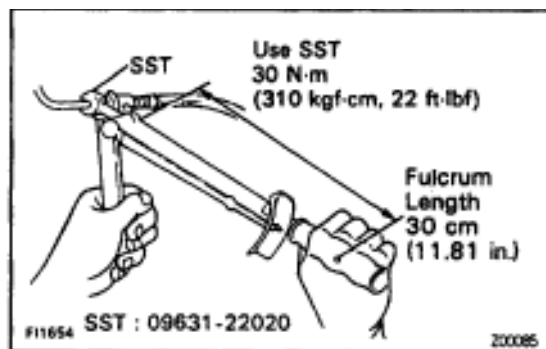
PRECAUTIONS

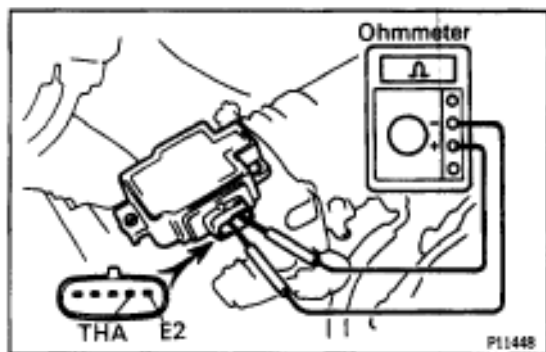
1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.



FUEL LINES AND CONNECTIONS INSPECTION

- (a) Check the fuel lines for cracks or leakage, and all connections for deformation.
- (b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
- (c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
- (d) Check the filler neck for damage or fuel leakage.
- (e) Hose and tube connections are as shown in the illustration. If a problem is found, repair or replace the part as necessary.





VOLUME AIR FLOW (VAF) METER ON-VEHICLE INSPECTION

INSPECT VAF METER RESISTANCE

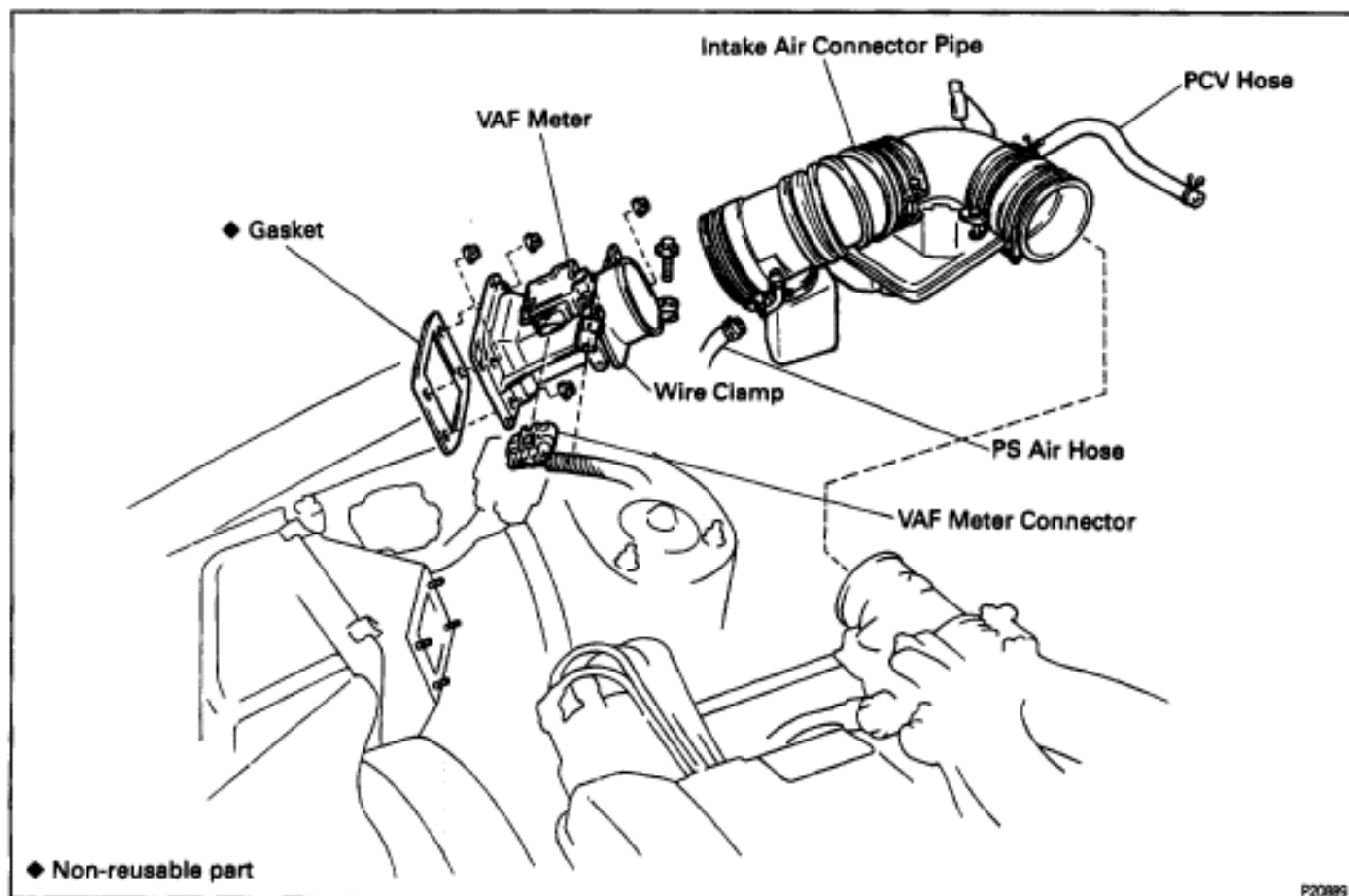
- Disconnect the VAF meter connector.
- Using an ohmmeter, measure the resistance between terminals THA and E2.

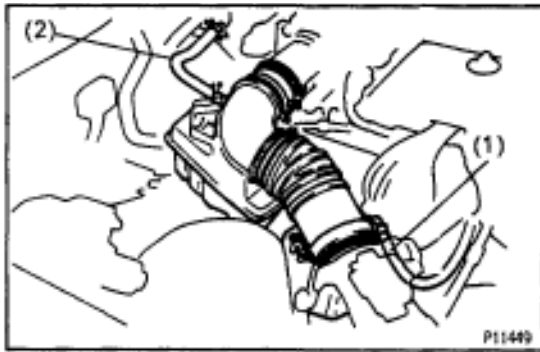
Between terminals	Resistance	Temperature
THA-E2	10-20 k Ω	-20°C (-4°F)
THA-E2	4-7 k Ω	0°C (32°F)
THA-E2	2-3 k Ω	20°C (68°F)
THA-E2	0.9-1.3 k Ω	40°C (104°F)
THA-E2	0.4-0.7 k Ω	60°C (140°F)

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

- Reconnect the VAF meter connector.

COMPONENTS FOR REMOVAL AND INSTALLATION



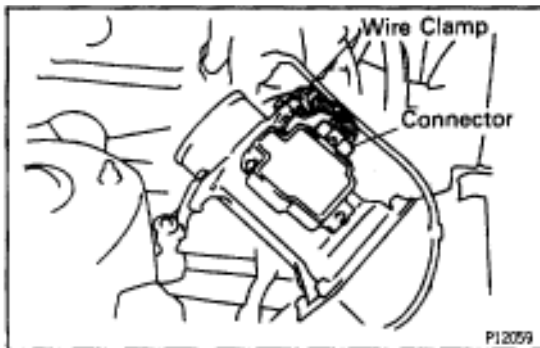


VAF METER REMOVAL

Installation is in the reverse order of removal.

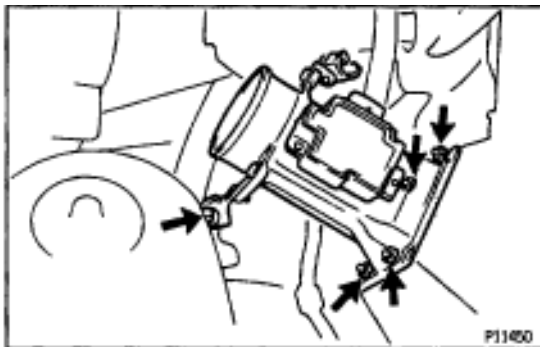
1. REMOVE INTAKE AIR CONNECTOR PIPE

- (a) Disconnect these hoses:
 - (1) PS air hose from air connector pipe
 - (2) PCV hose from No.2 cylinder head cover
- (b) Loosen the 2 hose clamps, and remove the air connector pipe together with the hoses.

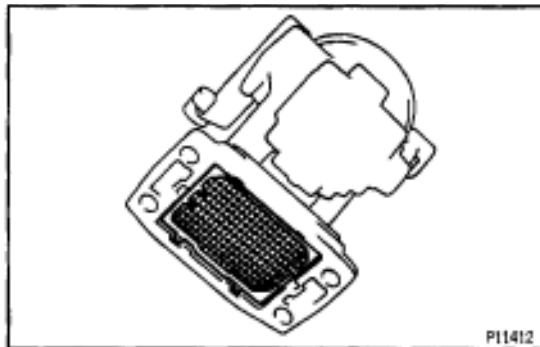


2. REMOVE VAF METER

- (a) Disconnect the VAF meter connector.
- (b) Disconnect the VAF meter wire from the wire clamp on the bracket.



- (c) Remove the 4 nuts, bolt, VAF meter and gasket.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

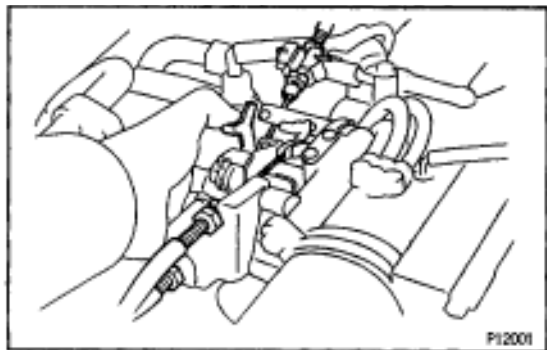


VAF METER INSPECTION

INSPECT VAF METER

Check that the honeycomb is neither deformed nor damaged.

If necessary, replace the VAF meter.

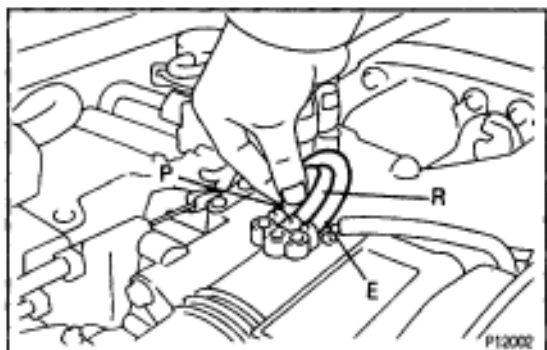


THROTTLE BODY ON-VEHICLE INSPECTION

Throttle Body

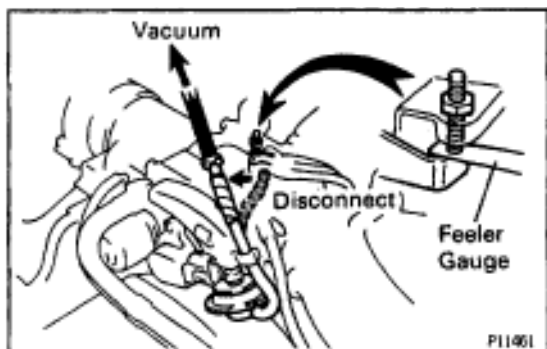
INSPECT THROTTLE BODY

- (a) Check that the throttle linkage moves smoothly.



- (b) Check the vacuum at each port.
- Start the engine.
 - Check the vacuum with your finger.

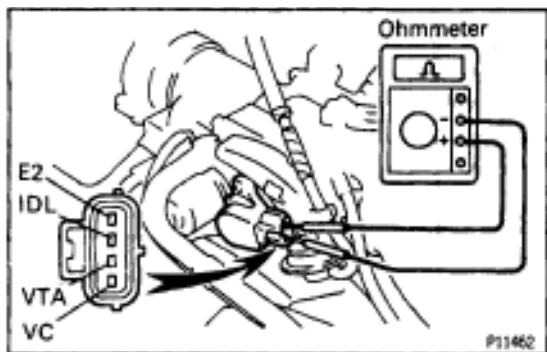
Port name	At idle	At 3,000 rpm
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum



Throttle Position Sensor

INSPECT THROTTLE POSITION SENSOR

- (a) Disconnect the throttle position sensor connector.
 (b) Disconnect the throttle opener vacuum hose from the throttle body.
 (c) Apply vacuum to the throttle opener.
 (d) Insert a feeler gauge between the throttle stop screw and stop lever.



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

Clearance between Lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA-E2	0.34–6.3 kΩ
0.40 mm (0.016 in.)	IDL-E2	0.5 kΩ or less
0.60 mm (0.024 in.)	IDL-E2	Infinity
Throttle valve fully Open	VTA-E2	2.4–11.2 kΩ
–	VC-E2	3.1–7.2 kΩ

- (f) Reconnect the throttle position sensor connector.
 (g) Reconnect the throttle opener vacuum hose to the throttle body.

Dashpot

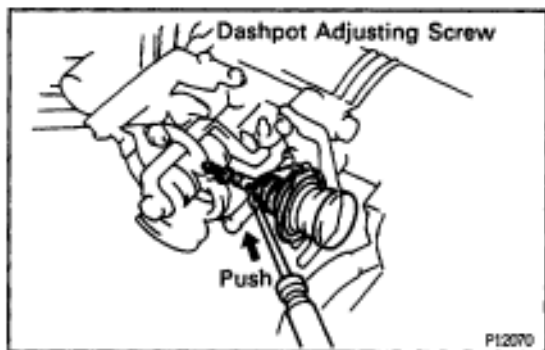
1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CHECK IDLE SPEED

Idle speed (Transmission in neutral position):

700 ± 50 rpm



3. CHECK AND ADJUST DASHPOT SETTING SPEED

- Disconnect the control cables from the throttle body.
- Push the dashpot push rod all the way with a screwdriver.
- Check that the dashpot is set.

Dashpot setting speed:

M/T

$2,600 \pm 400$

A/T

$1,800 \pm 400$ rpm

- Adjust the dashpot setting speed by turning the dashpot adjusting screw.
- Reconnect the control cables to the throttle body.

4. CHECK VTV OPERATION

- Maintain the engine speed at 3,500 rpm.
- Release the throttle valve, and check that the engine returns to idle in a few seconds.

Throttle Opener

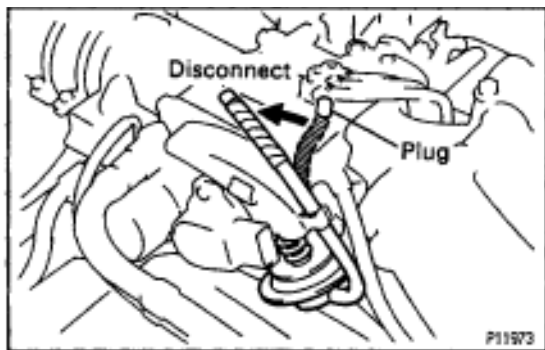
1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CHECK IDLE SPEED

Idle speed (Transmission in neutral position):

700 ± 50 rpm



3. CHECK THROTTLE OPENER SETTING SPEED

- Disconnect the throttle opener vacuum hose from the throttle body, and plug the throttle body port.
- Maintain the engine speed at 2,500 rpm.
- Release the throttle valve.
- Check that the throttle opener is set.

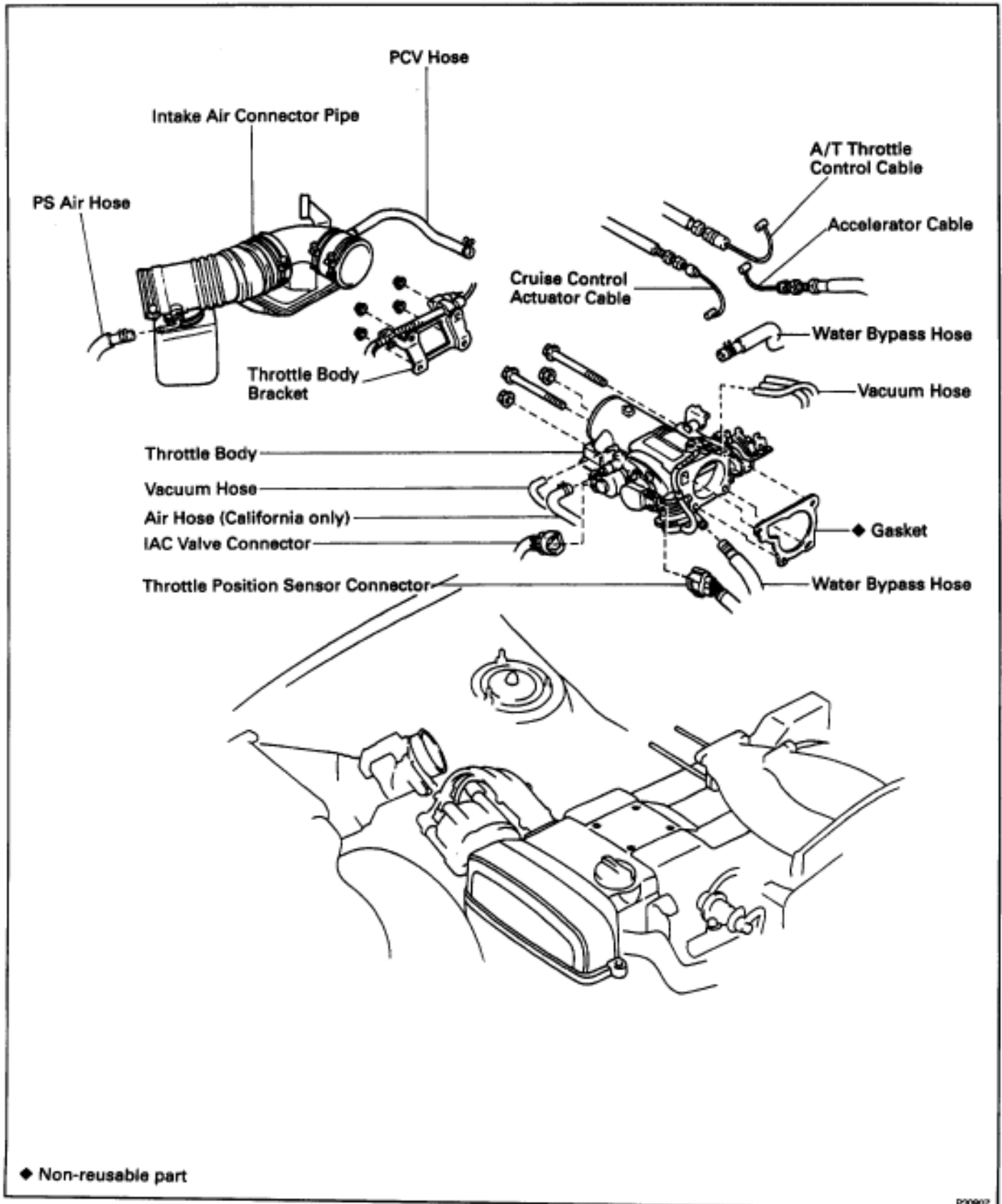
Throttle opener setting speed:

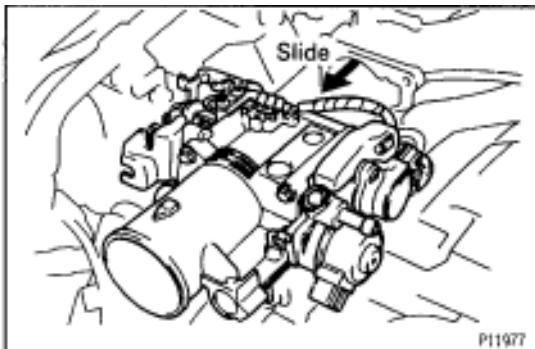
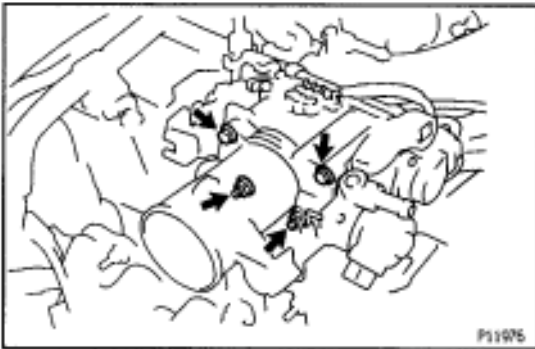
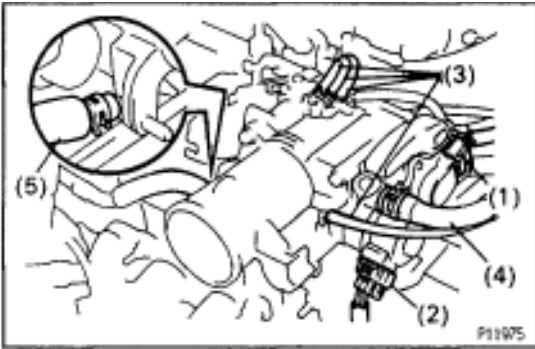
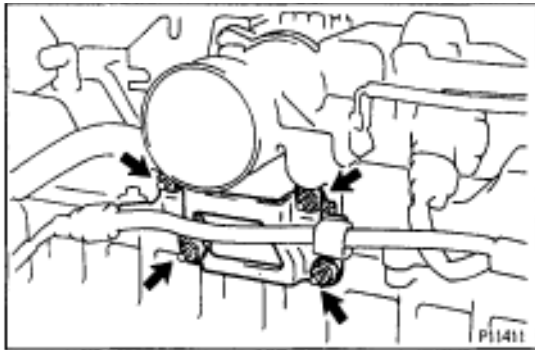
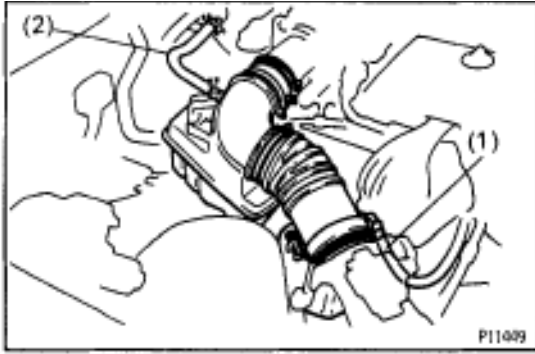
$1,500 \pm 400$ rpm

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

- Reconnect the throttle opener vacuum hose to the throttle body.

COMPONENTS FOR REMOVAL AND INSTALLATION





THROTTLE BODY REMOVAL

Installation is in the reverse order of removal.

1. **DRAIN ENGINE COOLANT**
2. **DISCONNECT CONTROL CABLES FROM THROTTLE BODY**
3. **REMOVE INTAKE AIR CONNECTOR PIPE**
 - (a) Disconnect these hoses:
 - (1) PS air hose from air connector pipe
 - (2) PCV hose from No.2 cylinder head cover
 - (b) Loosen the 2 hose clamps, and remove the air connector pipe together with the hoses.
4. **DISCONNECT THROTTLE BODY BRACKET FROM THROTTLE BODY AND CYLINDER HEAD**

Remove the 4 nuts, and disconnect the throttle body bracket from the throttle body and cylinder head.

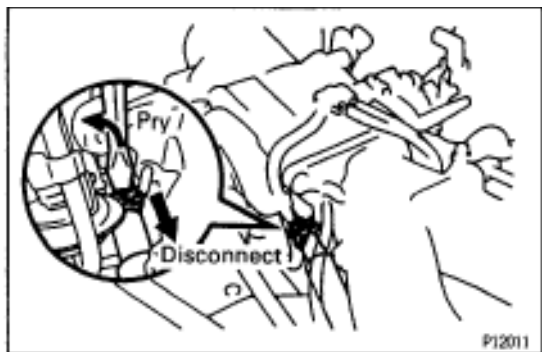
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

5. REMOVE THROTTLE BODY

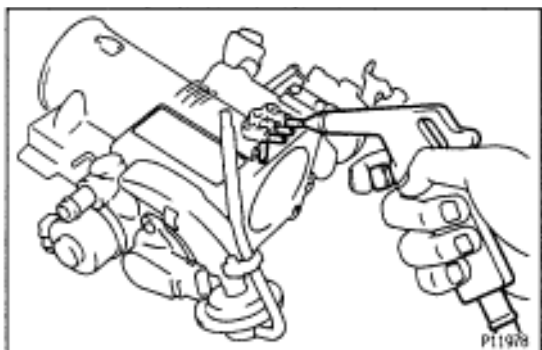
- (a) Disconnect these connectors and hoses from the throttle body:
 - (1) Throttle position sensor connector
 - (2) IAC valve connector
 - (3) 4 vacuum hoses
 - (4) California only:

Air hose (from intake manifold)
 - (5) Water bypass hose (from No.2 water bypass pipe)
- (b) Remove the 2 bolts and 2 nuts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
- (c) Slightly slide the throttle body away from the intake air connector.



- (d) Disconnect the water bypass hose (from the water outlet) from the throttle body.
- (e) Remove the throttle body and gasket.
INSTALLATION HINT: Use a new gasket.

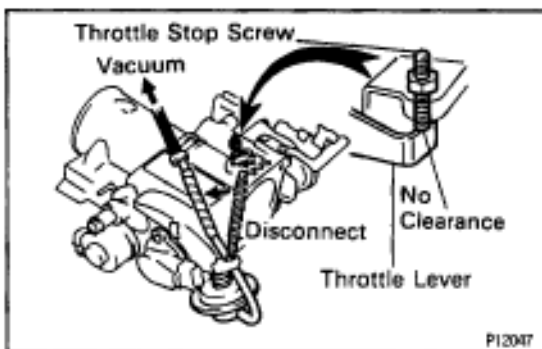


INSPECTION OF THROTTLE BODY

Throttle Body

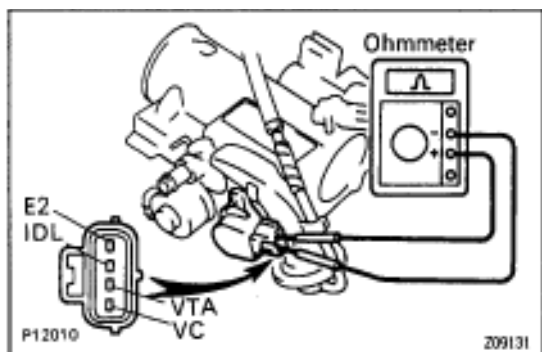
1. CLEAN THROTTLE BODY

- (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, dashpot and throttle opener.



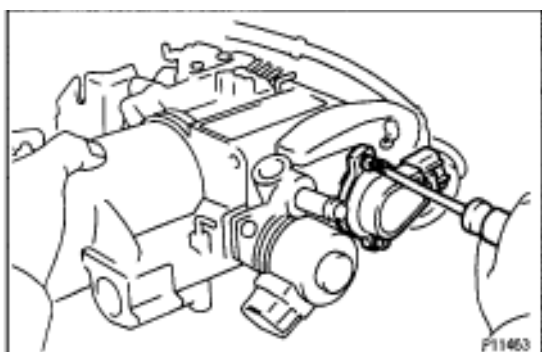
2. INSPECT THROTTLE VALVE

- (a) Disconnect the throttle opener vacuum hose from the throttle body.
- (b) Apply vacuum to the throttle opener.
- (c) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.
- (d) Reconnect the throttle opener vacuum hose to the throttle body.



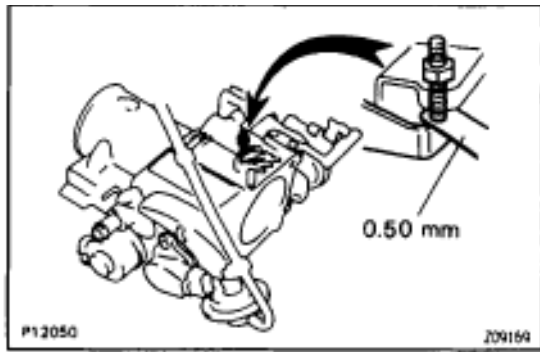
Throttle Position Sensor

1. INSPECT THROTTLE POSITION SENSOR (See on-vehicle inspection)

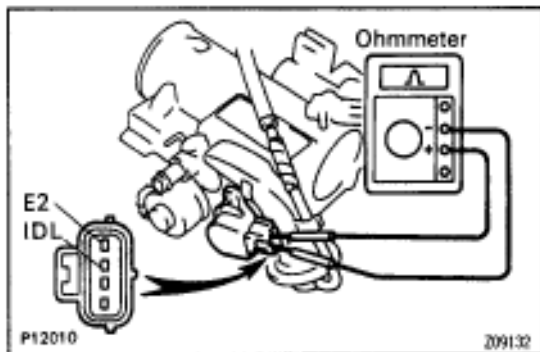


2. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

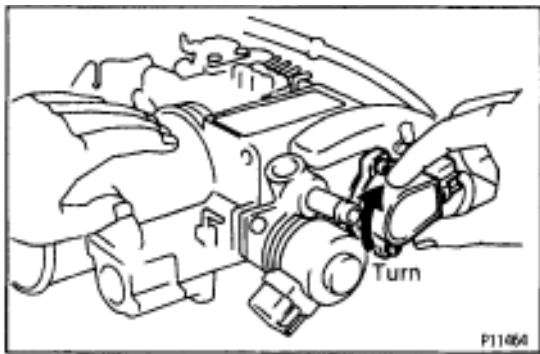
- (a) Loosen the 2 set screws of the sensor.



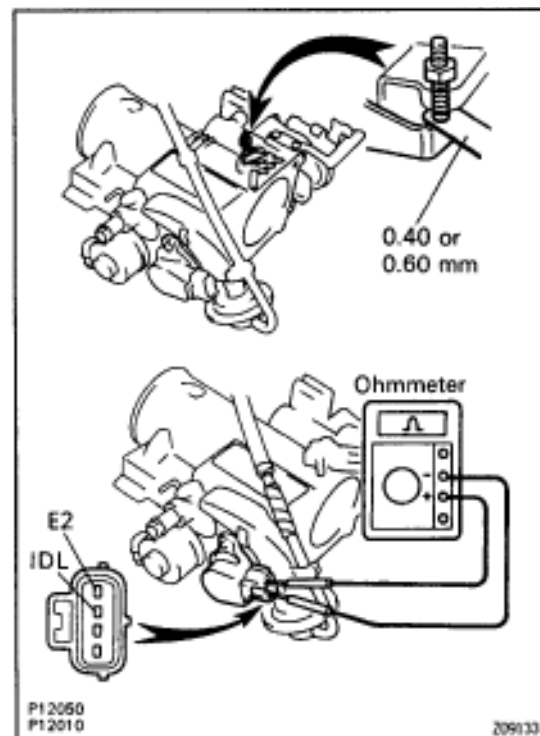
- (b) Insert a 0.50 mm (0.020 in.) feeler gauge between the throttle stop screw and stop lever.



- (c) Connect the tester probe of an ohmmeter to the terminals IDL and E2 of the sensor.

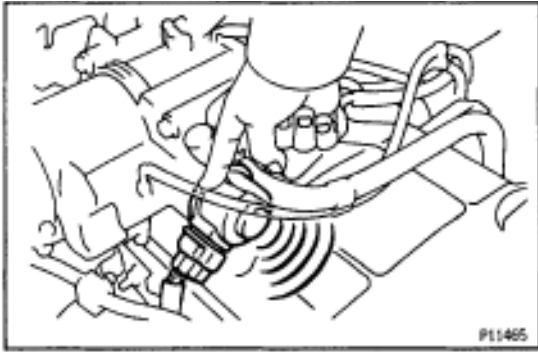


- (d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.



- (e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL–E2)
0.40 mm (0.016 in.)	Continuity
0.60 mm (0.024 in.)	No continuity



IDLE AIR CONTROL (IAC) VALVE ON-VEHICLE INSPECTION

1. INSPECT IAC VALVE FOR OPERATING SOUND

Check that there is a clicking sound immediately after stopping the engine.

If operation is not as specified, check the IAC valve, wiring and ECM.

2. California only: INSPECT AIR ASSIST SYSTEM

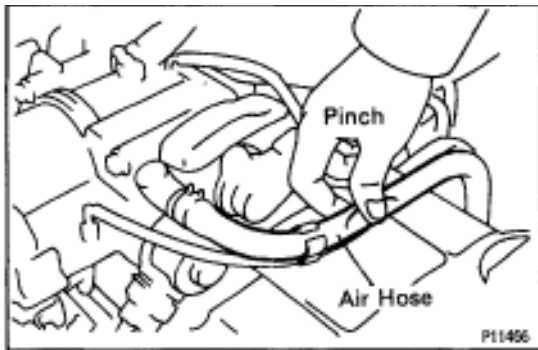
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed (Transmission in neutral position):

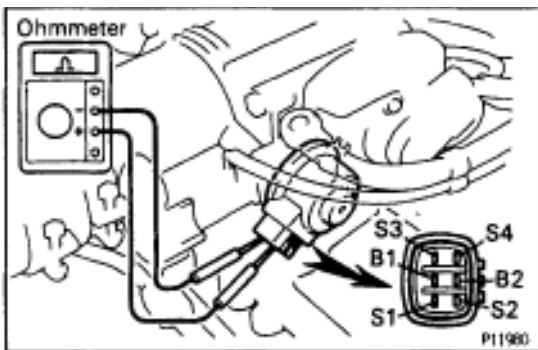
700 ± 50 rpm



C. Check IAC valve operation

With engine idling, pinch the air hose and check that engine speed drops, and then returns back up to idle speed.

If operation is not as specified, check the IAC valve, wiring and ECM.



3. INSPECT IAC VALVE RESISTANCE

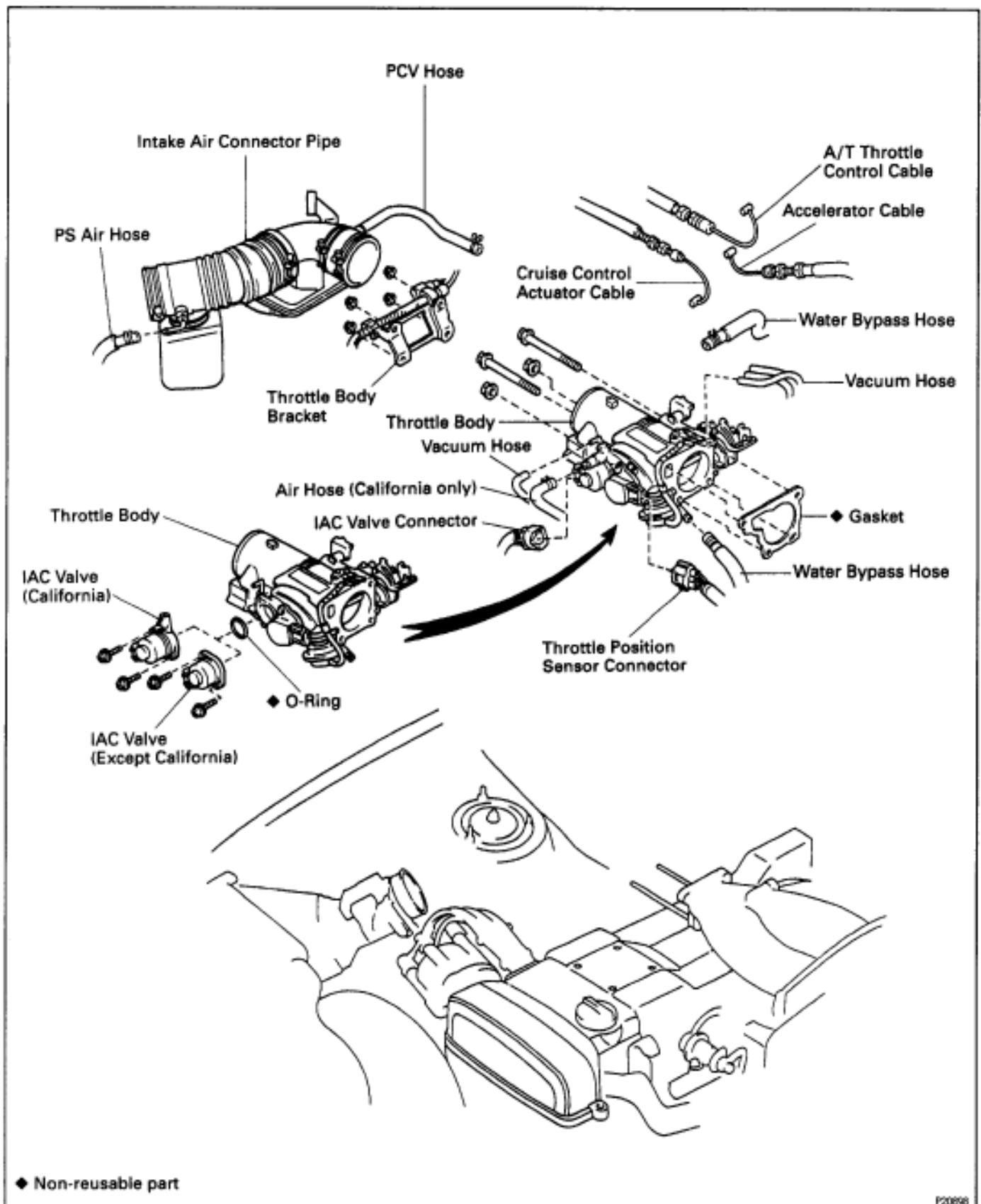
Using an ohmmeter, measure the resistance between the terminals (B1 (or B2) to others).

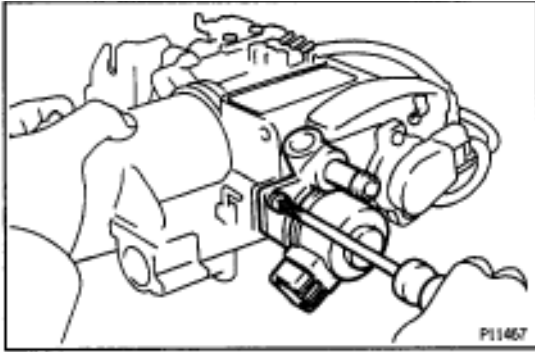
Resistance:

At 20°C (68°F) 18-22 Ω

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

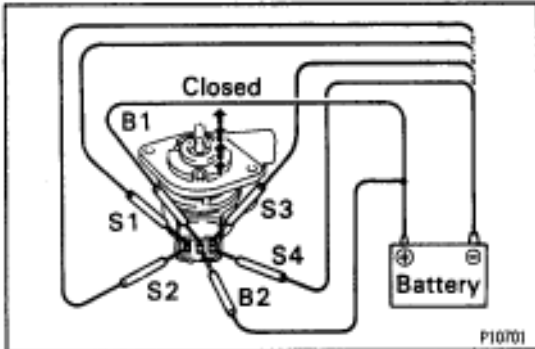
COMPONENTS FOR REMOVAL AND INSTALLATION





IAC VALVE REMOVAL

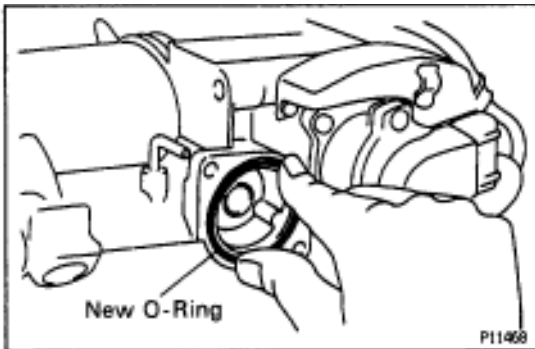
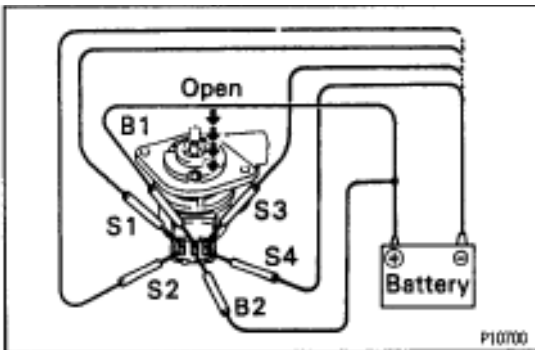
1. **REMOVE THROTTLE BODY**
(See throttle body removal)
2. **REMOVE IAC VALVE FROM THROTTLE BODY**
Remove the 2 screws, IAC valve and O-ring.



IAC VALVE INSPECTION

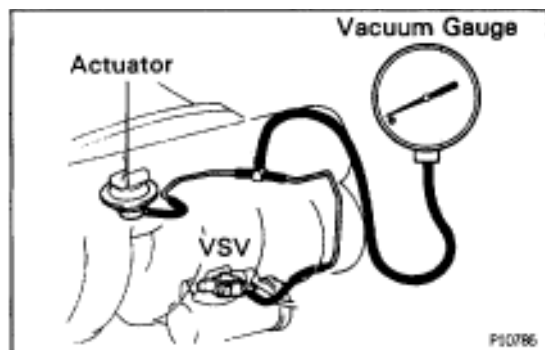
INSPECT IAC VALVE OPERATION

- (a) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S1–S2–S3–S4–S 1 in sequence, and check that the valve moves toward the closed position.
- (b) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S4–S3–S2–S1–S 4 in sequence, check that the valve moves toward the open position.
If operation is not as specified, replace the IAC valve.



IAC VALVE INSTALLATION

1. **INSTALL IAC VALVE TO THROTTLE BODY**
 - (a) Install a new O-ring on the throttle body.
 - (b) Install the IAC valve with the 2 screws.
2. **INSTALL THROTTLE BODY**
(See throttle body installation)



ACOUSTIC CONTROL INDUCTION SYSTEM (ACIS) ON-VEHICLE INSPECTION

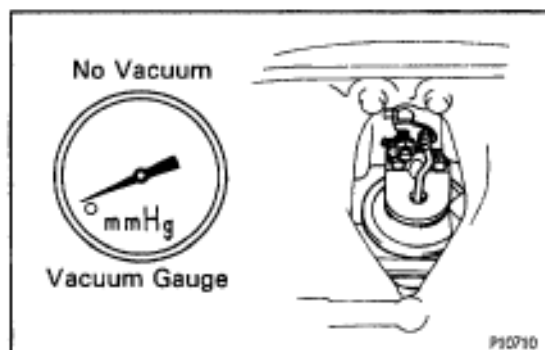
1. CONNECT VACUUM GAUGE

Using a 3-way connector, connect vacuum gauge to the vacuum hose between the actuator and VSV.

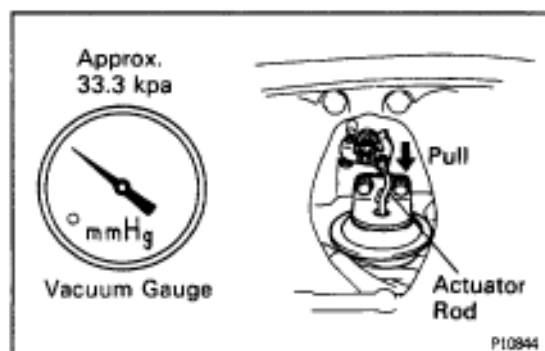
2. START ENGINE

3. INSPECT ACIS

(a) While the engine is idling, check that the vacuum gauge needle does not move.



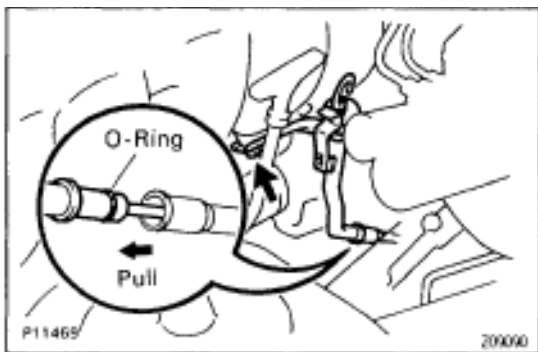
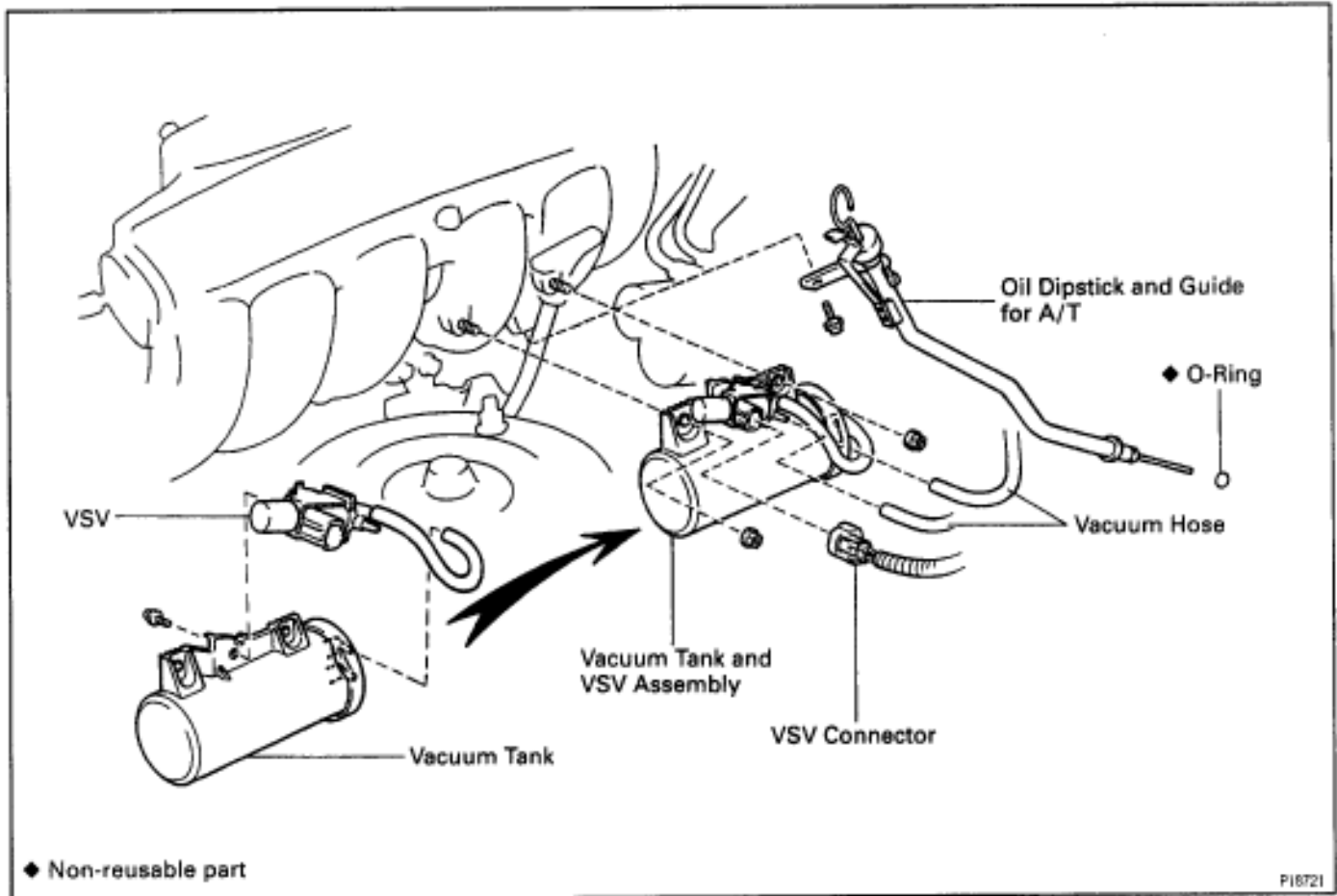
(b) Rapidly depress the accelerator pedal to fully open position and check that the vacuum gauge needle momentarily fluctuates approx. 33.3 kPa (250 mmHg, 9.84 in.Hg) or more. (The actuator rod is pulled down.) If operation is not as specified, check each part.



4. REMOVE VACUUM GAUGE

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

Vacuum Tank COMPONENTS FOR REMOVAL AND INSTALLATION



VACUUM TANK REMOVAL

Installation is in the reverse order of removal.

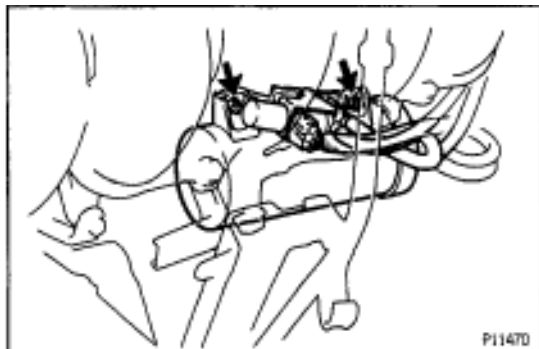
1. REMOVE OIL DIPSTICK AND GUIDE FOR A/T

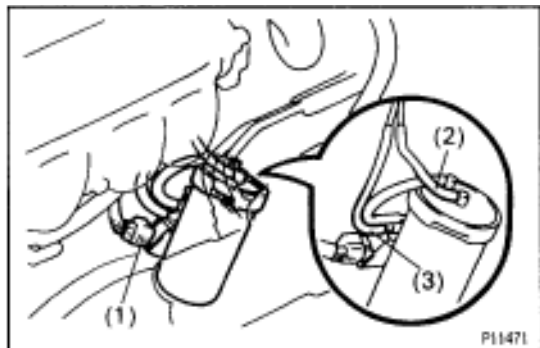
- Remove the bolt.
- Pull out the dipstick guide together with the dipstick.
INSTALLATION HINT: Apply soapy water to the O-ring, and push in the dipstick guide.
- Remove the O-ring from the dipstick guide.
INSTALLATION HINT: Use a new O-ring.

2. REMOVE VACUUM TANK AND VSV ASSEMBLY

- Remove the 2 nuts, and disconnect the vacuum tank from the intake manifold.

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





- (b) Disconnect the connector and hoses, and remove the vacuum tank and VSV assembly:

- (1) VSV connector
- (2) Vacuum hose (from air intake chamber) from port B of vacuum tank
- (3) Vacuum hose (from actuator) from VSV

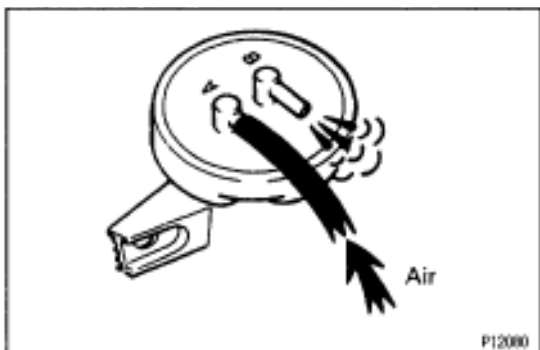
3. REMOVE VSV FROM VACUUM TANK

- (a) Disconnect the vacuum hose from port A of the vacuum tank.
- (b) Remove the screw and VSV.

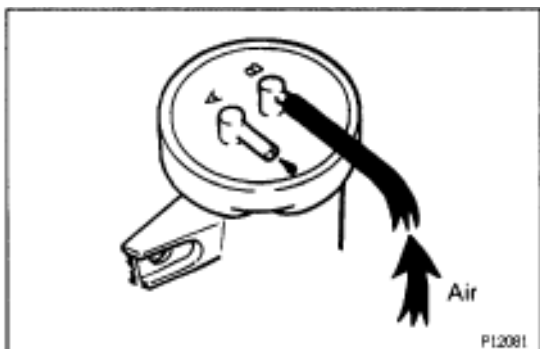
VACUUM TANK INSPECTION

INSPECT VACUUM TANK

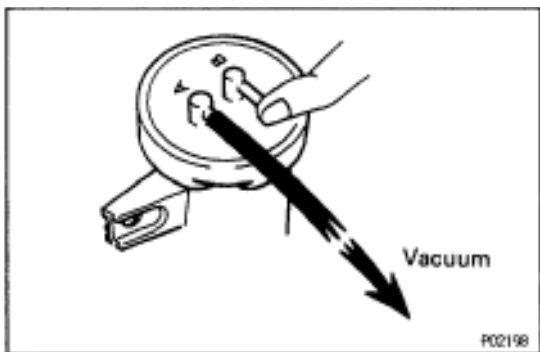
- (a) Check that air flows from port A to B.



- (b) Check that air does not flow from port B to A.



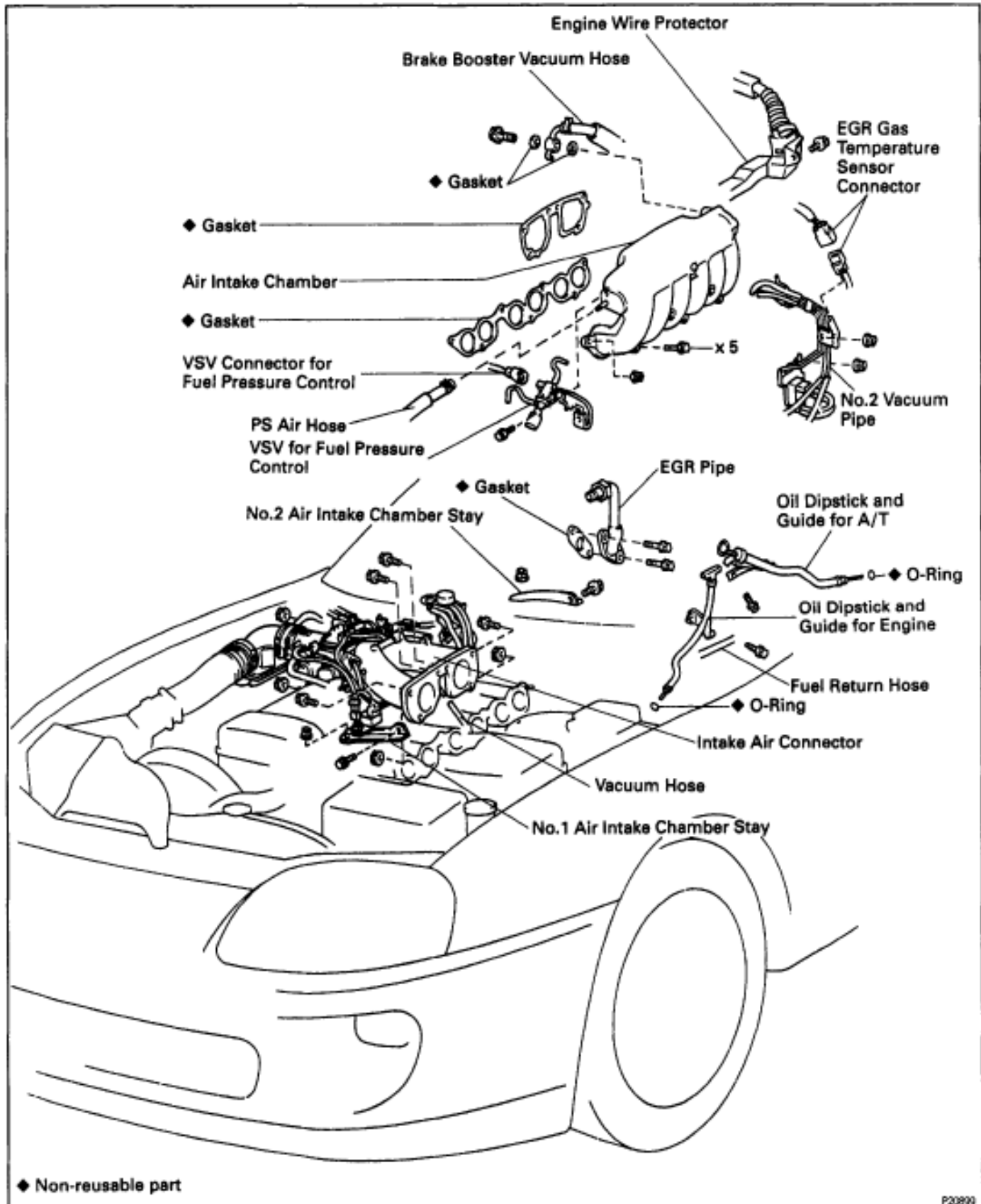
- (c) Plug port B with your finger, and apply 53.3 kPa (400 mmHg, 15.75 in.Hg) of vacuum to port A, and check that there is no change in vacuum after 1 minute.
If operation is not as specified, replace the vacuum tank.

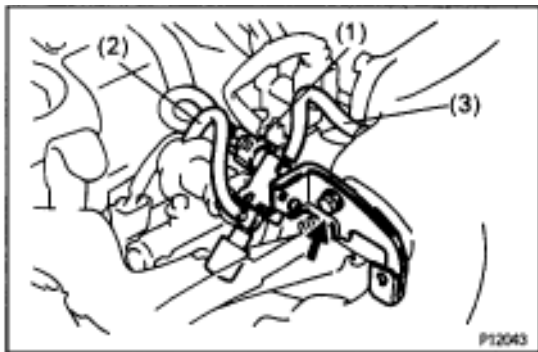


VSV INSPECTION

(See VSV for ACIS)

Intake Air Control Valve COMPONENTS FOR REMOVAL AND INSTALLATION



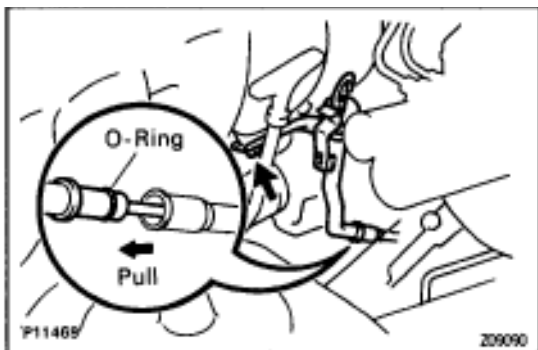


INTAKE AIR CONTROL VALVE REMOVAL

Installation is in the reverse order of removal.

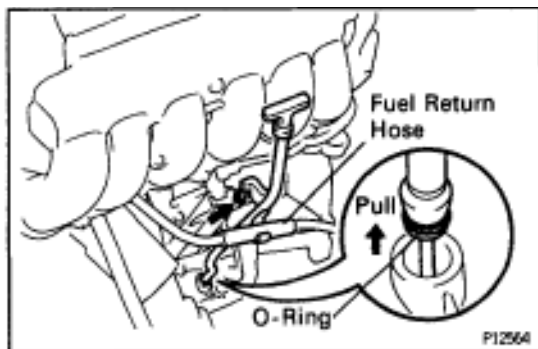
1. REMOVE VSV FOR FUEL PRESSURE CONTROL

- (a) Disconnect the connector and hoses:
 - (1) VSV connector
 - (2) Vacuum sensing hose from fuel pressure control
 - (3) Vacuum sensing hose from air intake chamber



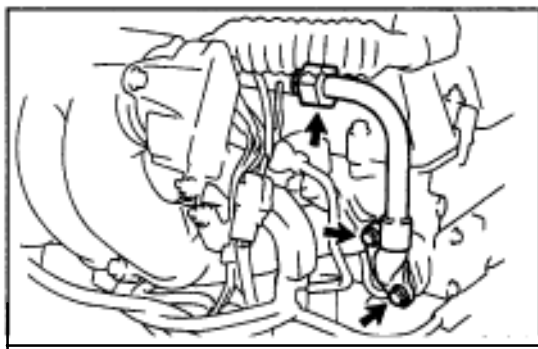
2. REMOVE OIL DIPSTICK AND GUIDE FOR A/T

- (a) Remove the bolt.
- (b) Pull out the dipstick guide together with the dipstick.
INSTALLATION HINT: Apply soapy water to the O-ring, and push in the dipstick guide.
- (c) Remove the O-ring from the dipstick guide.
INSTALLATION HINT: Use a new O-ring.



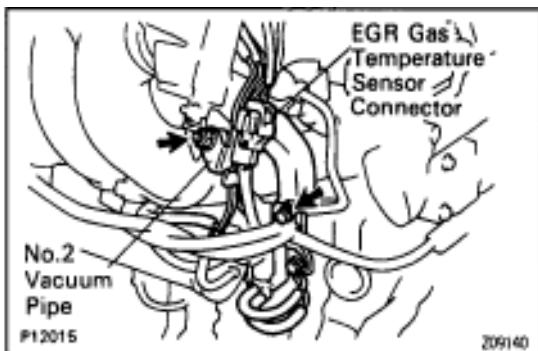
3. REMOVE OIL DIPSTICK AND GUIDE FOR ENGINE

- (a) Disconnect the fuel return hose from the clamp of the dipstick guide.
- (b) Remove the bolt.
- (c) Pull out the dipstick guide together with the dipstick.
INSTALLATION HINT: Apply soapy water to the O-ring, and push in the dipstick guide.
- (d) Remove the O-ring from the dipstick guide.
INSTALLATION HINT: Use a new O-ring.



4. REMOVE EGR PIPE

- (a) Loosen the union nut of the EGR pipe.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)
- (b) Remove the 2 bolts, EGR pipe and gasket.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)



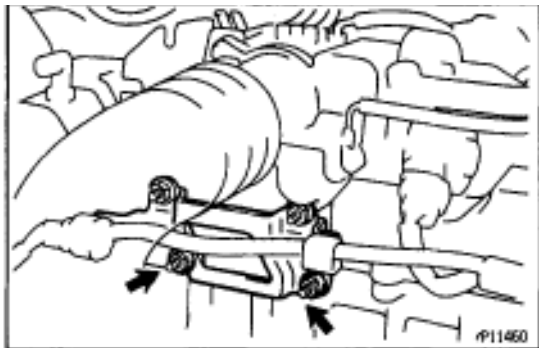
5. DISCONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR

- (a) Disconnect the connector from the No.2 vacuum pipe.
- (b) Disconnect the sensor connector from the wiring connector.

6. DISCONNECT NO.2 VACUUM PIPE FROM AIR INTAKE CHAMBER AND INTAKE MANIFOLD

Remove the 2 nuts, and disconnect the vacuum pipe from the air intake chamber and intake manifold.

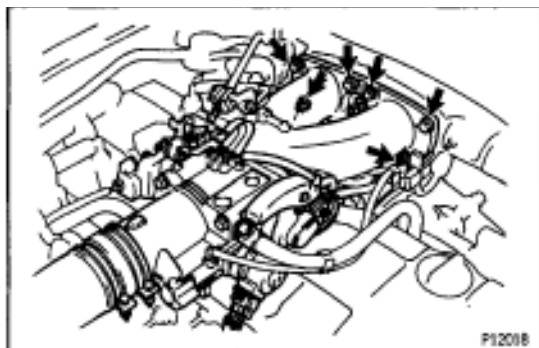
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)



7. REMOVE AIR INTAKE CHAMBER (WITH INTAKE AIR CONTROL VALVE)

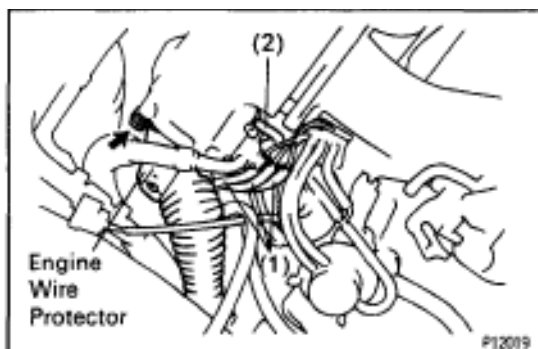
- (a) Remove the 2 nuts holding the throttle body bracket to the cylinder head.

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



- (b) Remove the 4 bolts and 2 nuts holding the intake air connector to the air intake chamber.

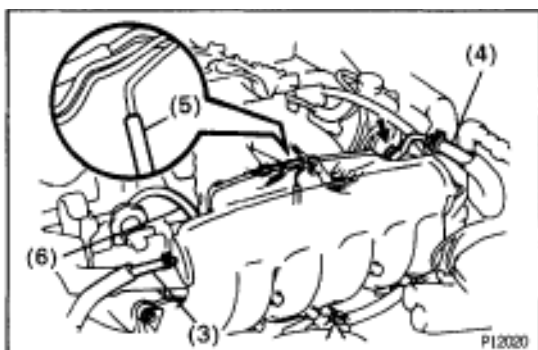
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)



- (c) Remove the bolt, and disconnect the engine wire protector from the air intake chamber.

- (d) Disconnect these hoses:

- (1) 3 vacuum hoses (from No.2 vacuum pipe) from No.1 vacuum pipe
- (2) Vacuum hose (from No.2 vacuum pipe) from air intake chamber



- (3) PS air hose from air intake chamber
 - (4) Brake booster vacuum hose from air intake chamber
- Remove the union bolt and 2 gaskets, and disconnect the vacuum hose.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

- (5) Vacuum hose (from actuator for ACIS) from No.1 vacuum pipe
- (6) Except California:
Vacuum sensing hose (from fuel pressure regulator) from air intake chamber

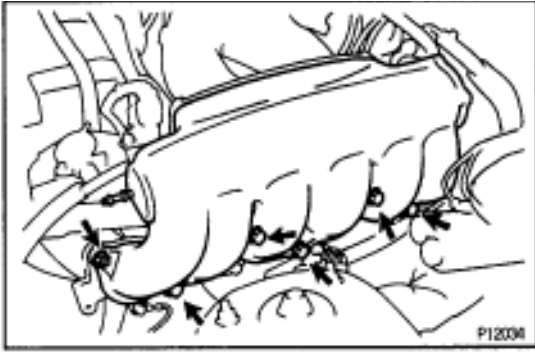


- (e) Loosen the 2 nuts holding the air intake chamber stays to the cylinder head.

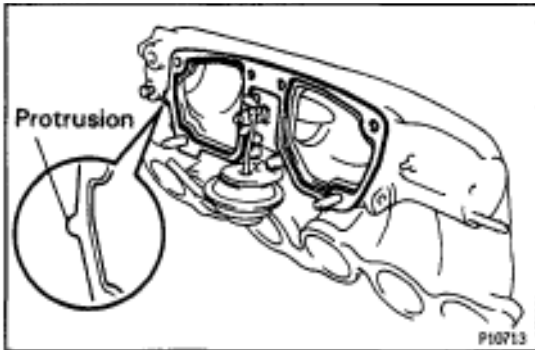
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

- (f) Remove the 2 bolts, and disconnect the 2 air intake chamber stays from the air intake chamber.

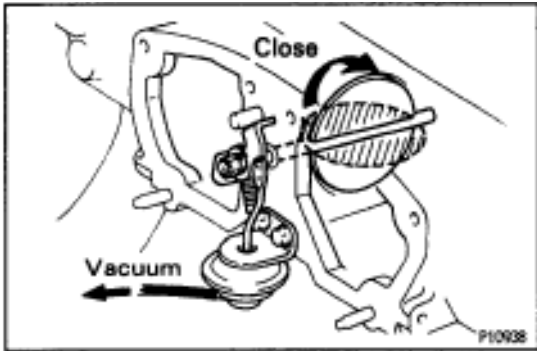
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



- (g) Remove the 5 bolts, nut, air intake chamber and 2 gaskets.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)



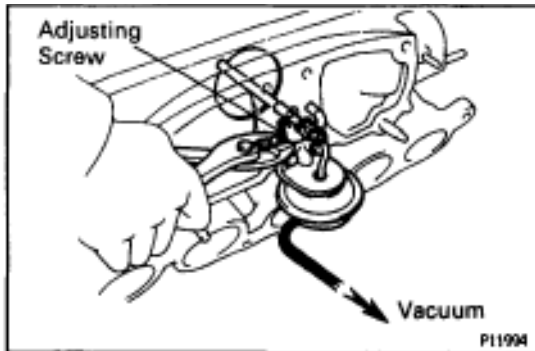
INSTALLATION HINT: Install a new gasket to the air intake chamber, facing the protrusion rearward.



INTAKE AIR CONTROL VALVE INSPECTION

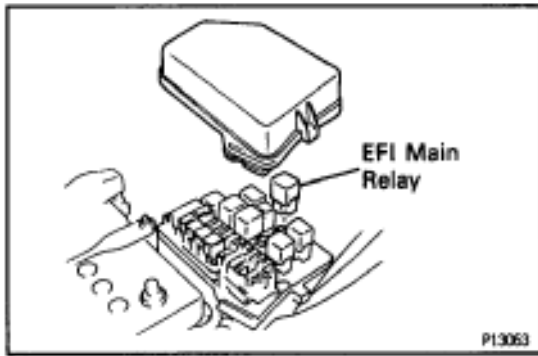
INSPECT INTAKE AIR CONTROL VALVE

- (a) With 53.3 kPa (400 mmHg, 15.75 in.Hg) of vacuum applied to the actuator, check that the actuator rod moves.



If operation is not as specified, turn the adjusting screw.

- (b) 1 minute after applying the vacuum in (a), check that the actuator rod does not return.

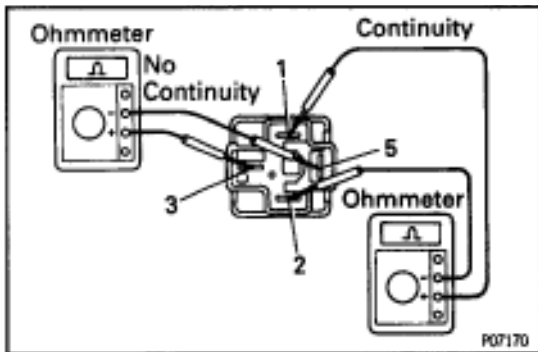


EFI MAIN RELAY

EFI MAIN RELAY INSPECTION

1. REMOVE EFI MAIN RELAY

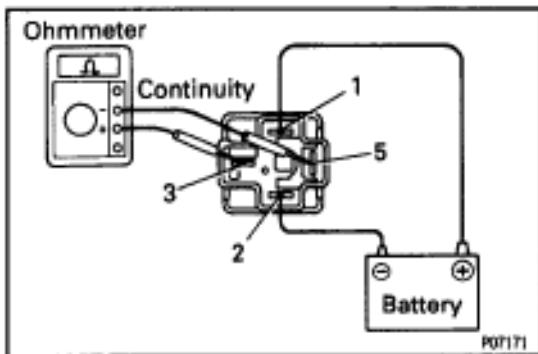
LOCATION: In the engine compartment relay box.



2. INSPECT EFI MAIN RELAY

A. Inspect relay continuity

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
- (b) Check that there is no continuity between terminals 3 and 5. If continuity is not as specified, replace the relay.

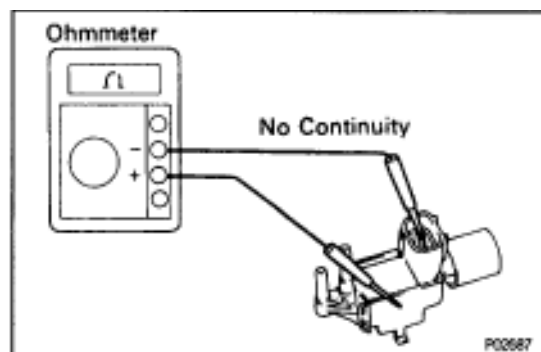
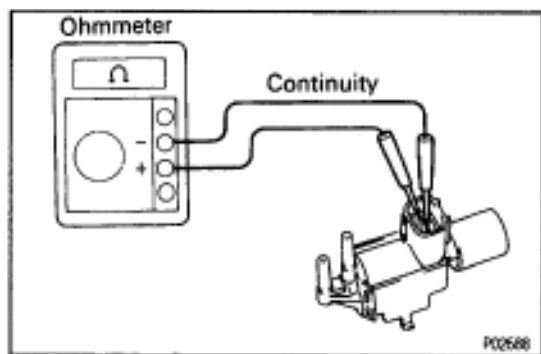
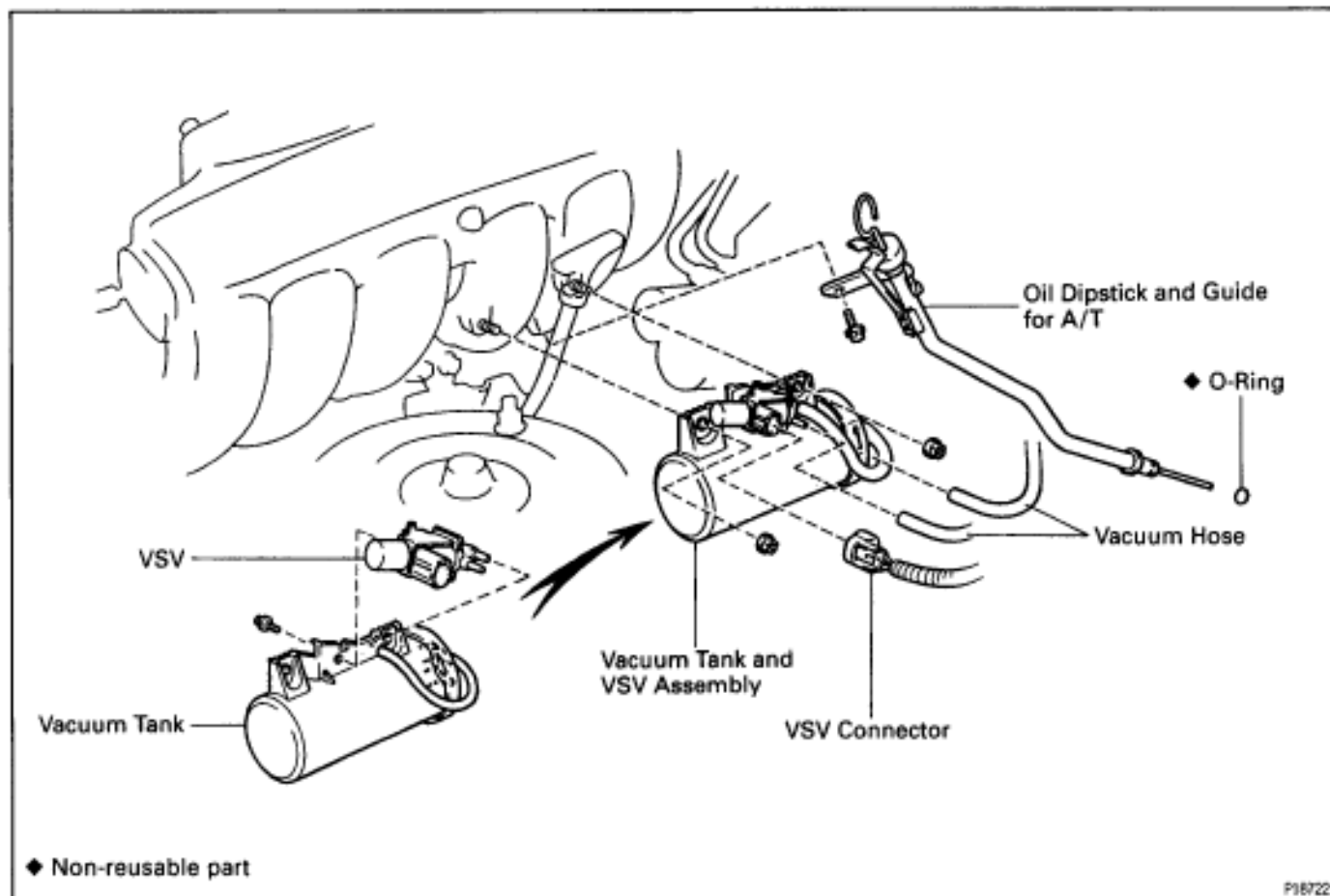


B. Inspect relay operation

- (a) Apply battery 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

VSV FOR ACIS COMPONENTS FOR REMOVAL AND INSTALLATION



VSV INSPECTION

1. REMOVE VSV

2. INSPECT VSV

A. Inspect VSV for open circuit

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

Resistance:

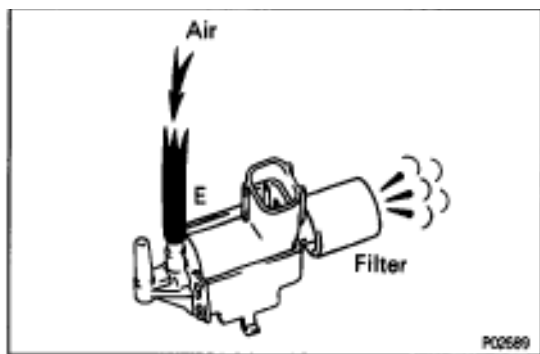
At 20°C (68°F) 38.5–44.5 Ω

If there is no continuity, replace the VSV.

B. Inspect VSV for ground

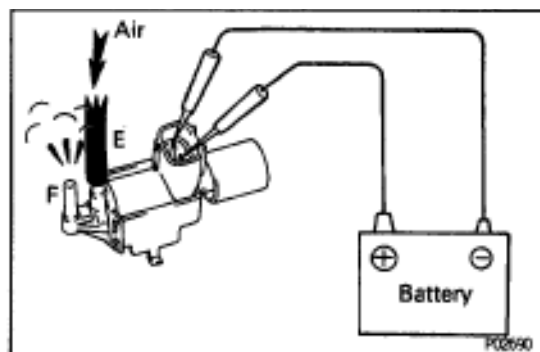
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

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

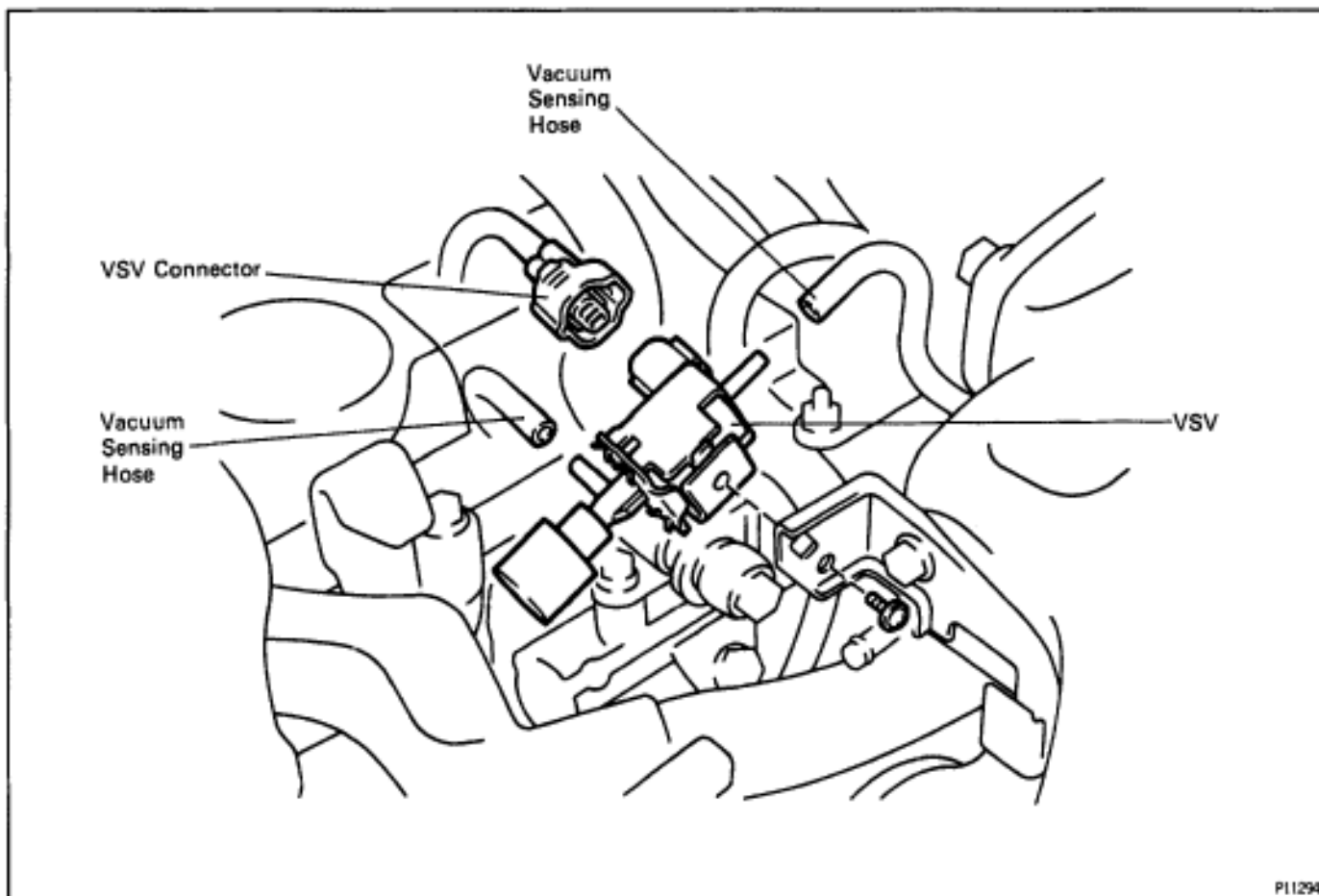


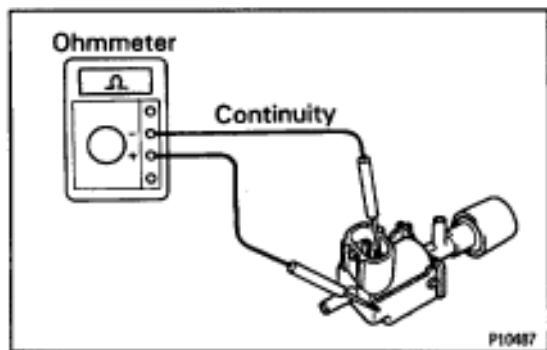
- (b) Apply battery voltage across the terminals.

- (c) Check that air flows from port E to F.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

VSV FOR FUEL PRESSURE CONTROL (California only) COMPONENTS FOR REMOVAL AND INSTALLATION





VSV INSPECTION

1. REMOVE VSV

2. INSPECT VSV

A. Inspect VSV for open circuit

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

Resistance:

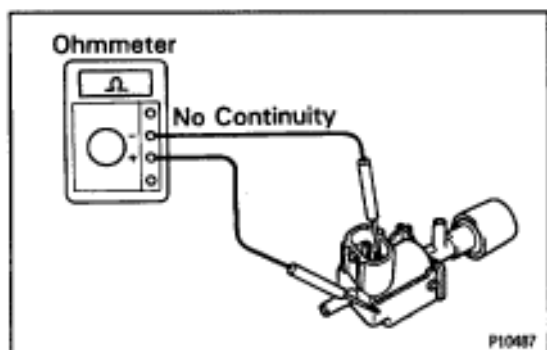
At 20°C (68°F) 33–39 Ω

If there is no continuity, replace the VSV.

B. Inspect VSV for ground

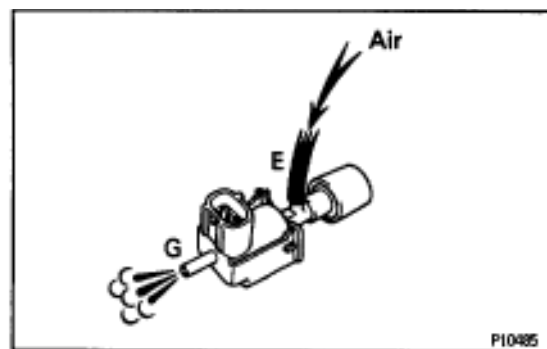
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

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

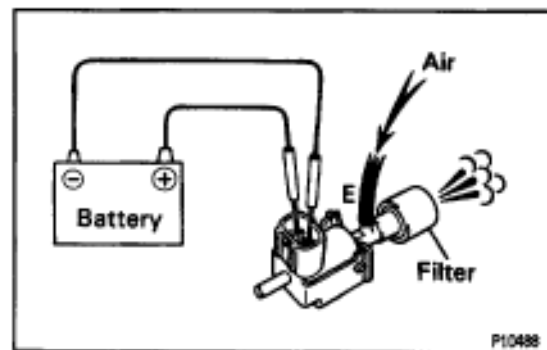


(b) Apply battery voltage across the terminals.

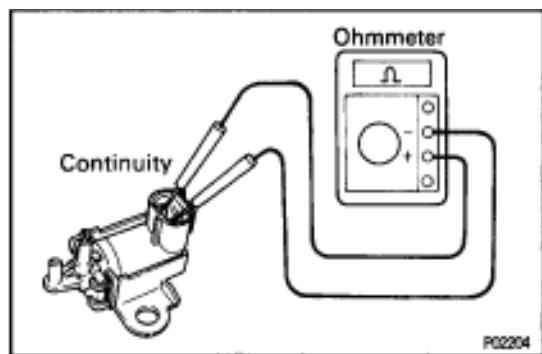
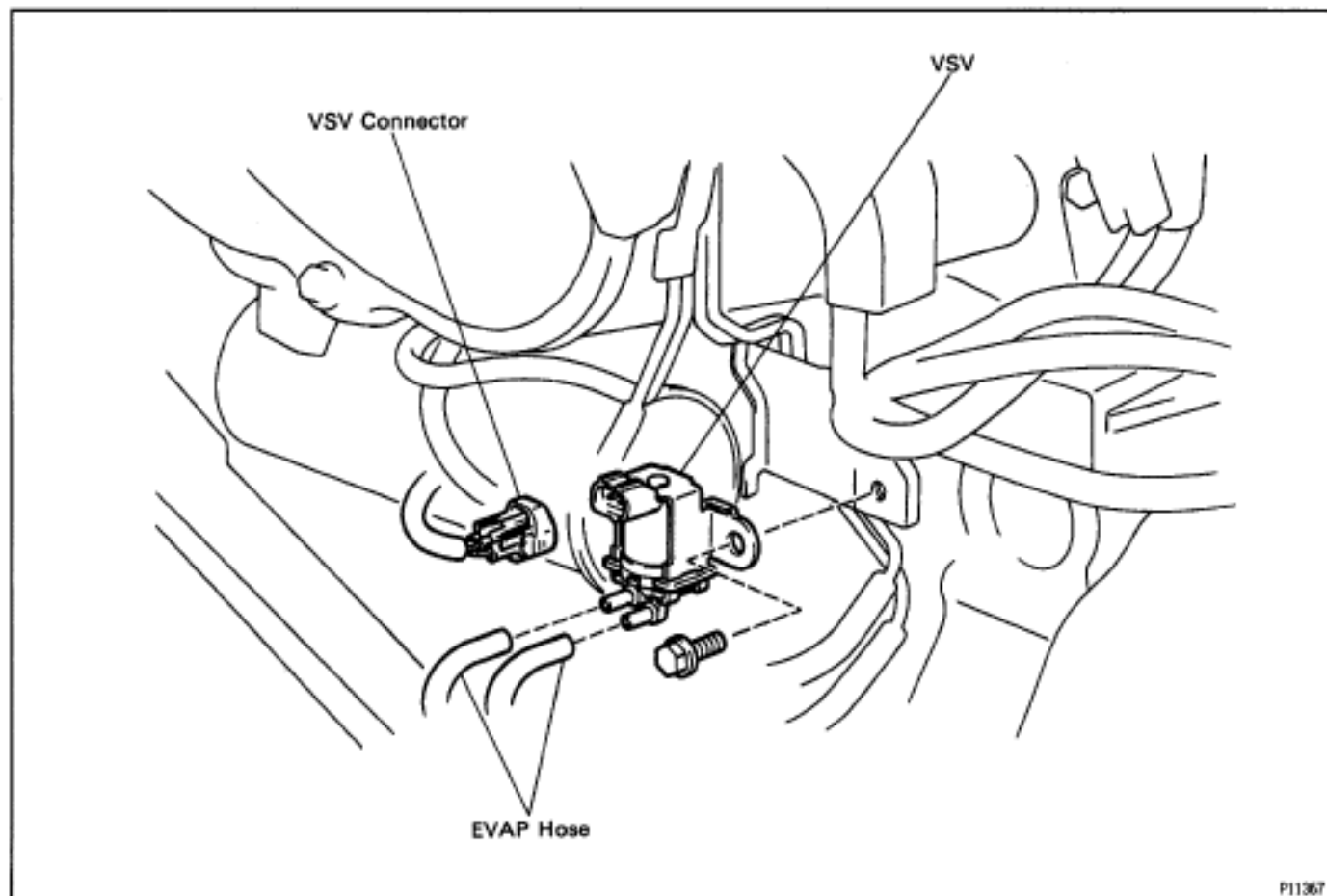
(c) Check that air flows from port E to the filter.

If operation is not as specified, replace the VSV.

3. REINSTALL VSV



VSV FOR EVAP COMPONENTS FOR REMOVAL AND INSTALLATION



VSV INSPECTION

1. REMOVE VSV
2. INSPECT VSV
 - A. Inspect VSV for open circuit

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

Resistance:

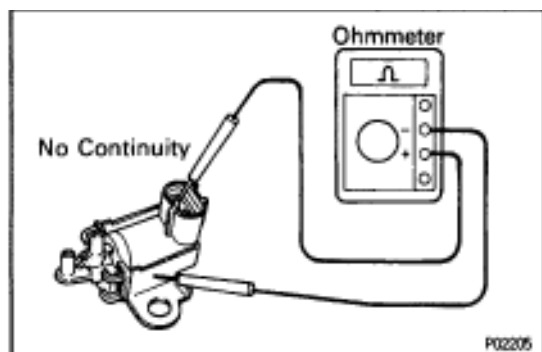
At 20°C (68°F) 27–33 Ω

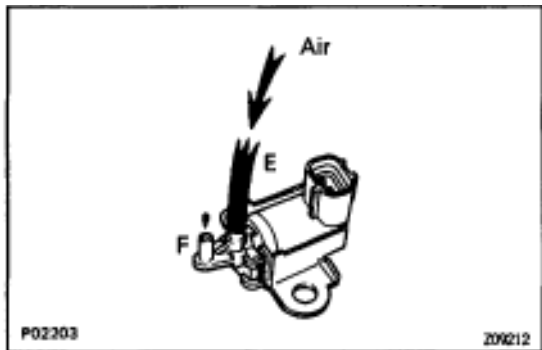
If there is no continuity, replace the VSV.

- B. Inspect VSV for ground

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

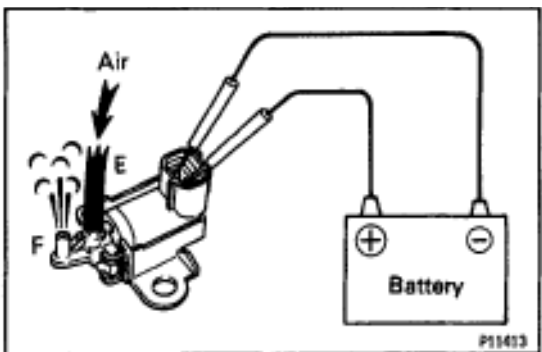
If there is continuity, replace the VSV.





C. Inspect VSV operation

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

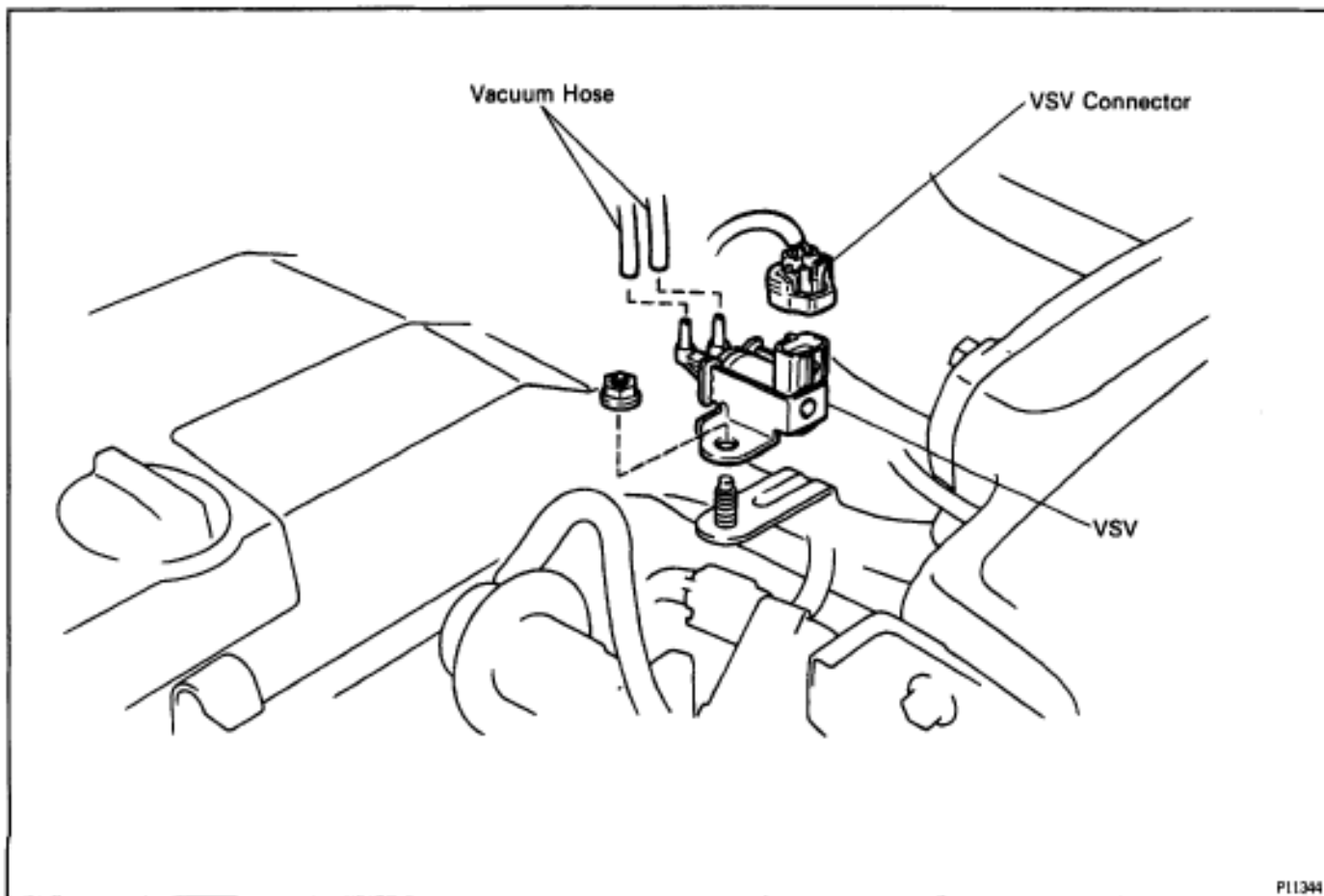


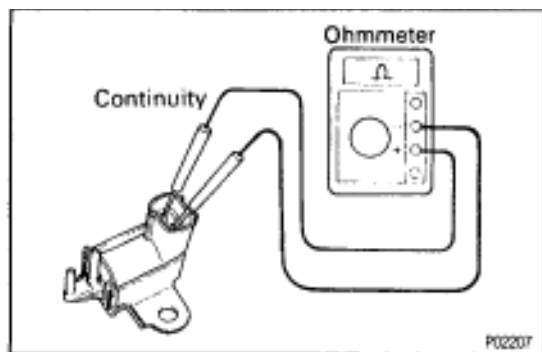
- (b) Apply battery voltage across the terminals.

- (c) Check that air flows from port E to F.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

VSV FOR EGR COMPONENTS FOR REMOVAL AND INSTALLATION





VSV INSPECTION

1. REMOVE VSV

2. INSPECT VSV

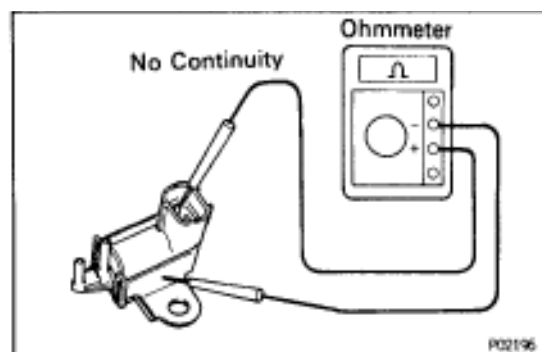
A. Inspect VSV for open circuit

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

Resistance:

At 20°C (68°F) 38.5–44.5 Ω

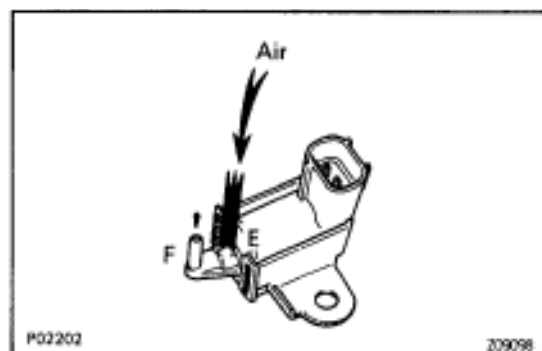
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

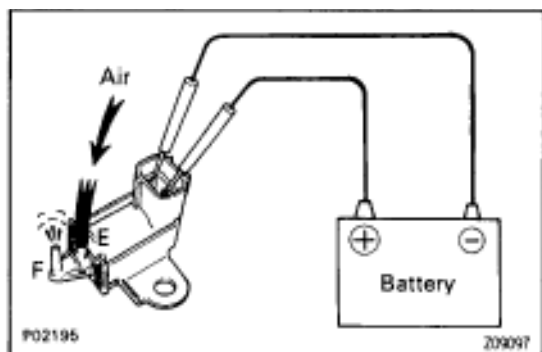
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

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



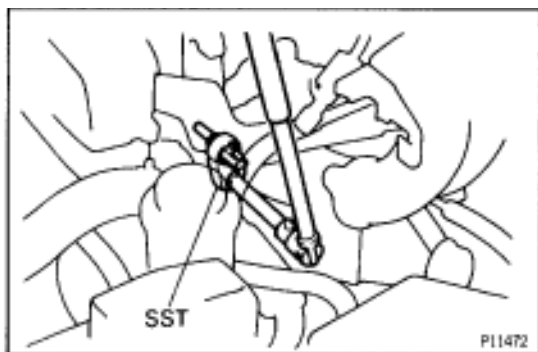
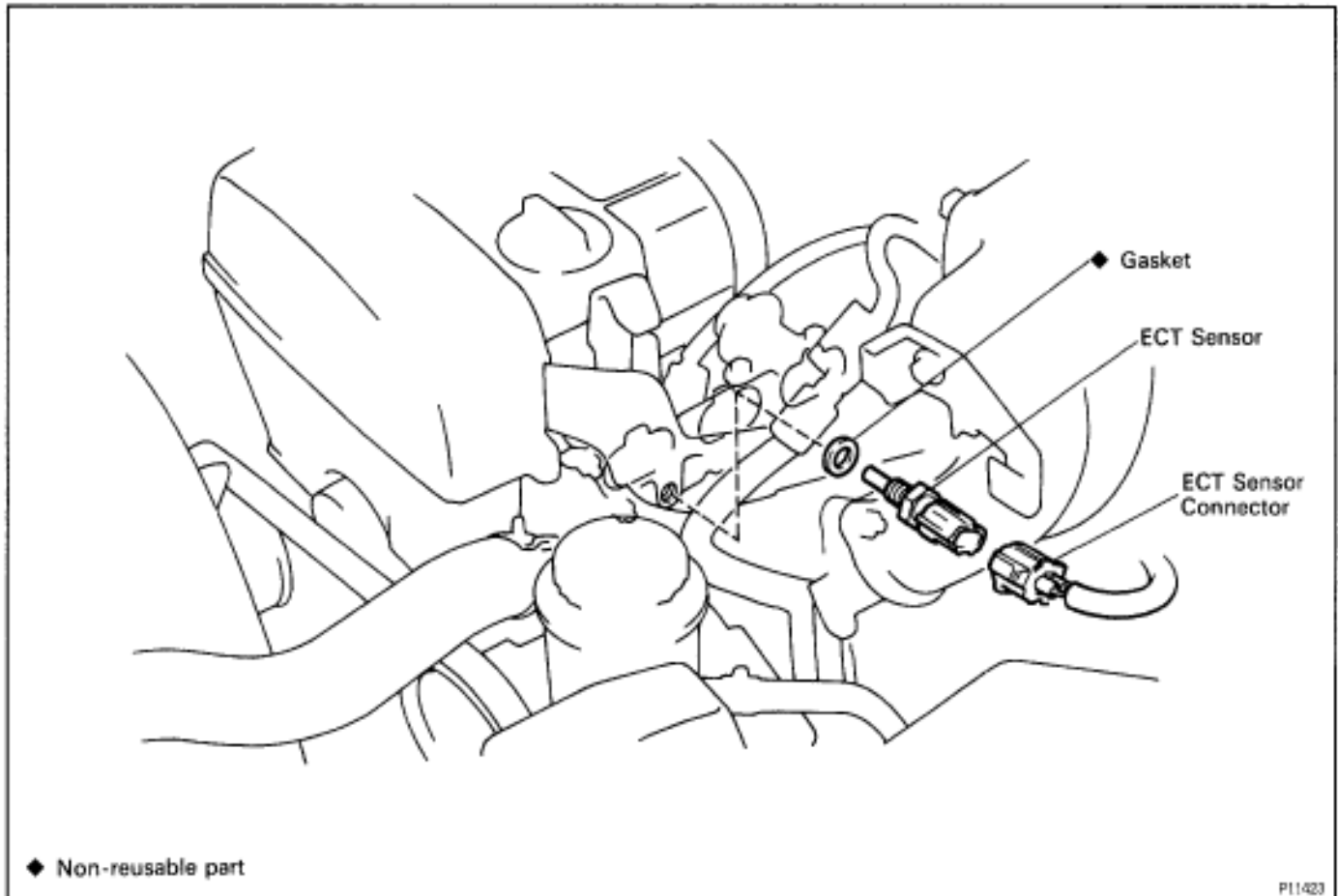
(b) Apply battery voltage across the terminals.

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

If operation is not as specified, replace the VSV.

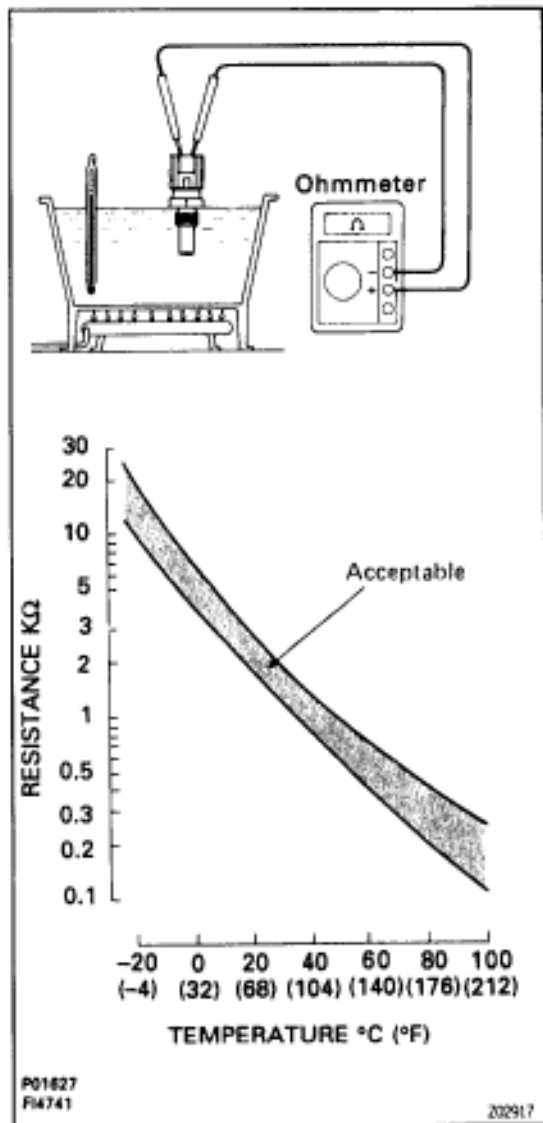
3. REINSTALL VSV

ENGINE COOLANT TEMPERATURE (ECT) SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION



ECT SENSOR INSPECTION

1. DRAIN ENGINE COOLANT
2. REMOVE ECT SENSOR
 - (a) Disconnect the ECT sensor connector.
 - (b) Using SST, remove the ECT sensor and gasket.
SST 09205-76030



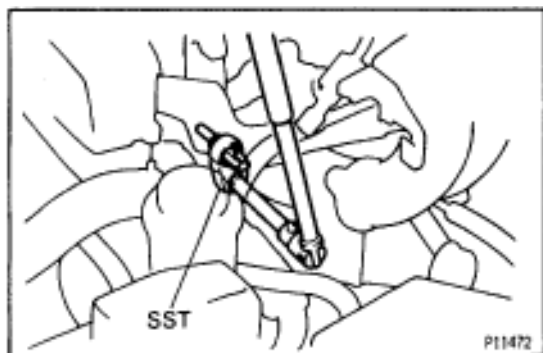
3. INSPECT ECT SENSOR

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.

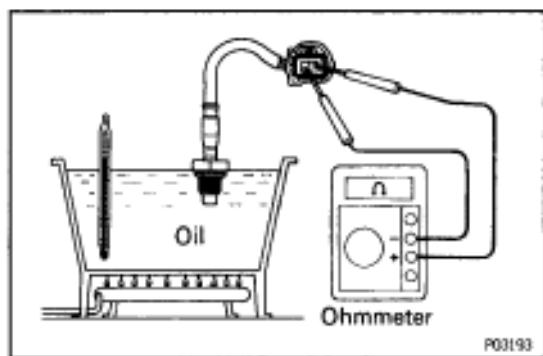
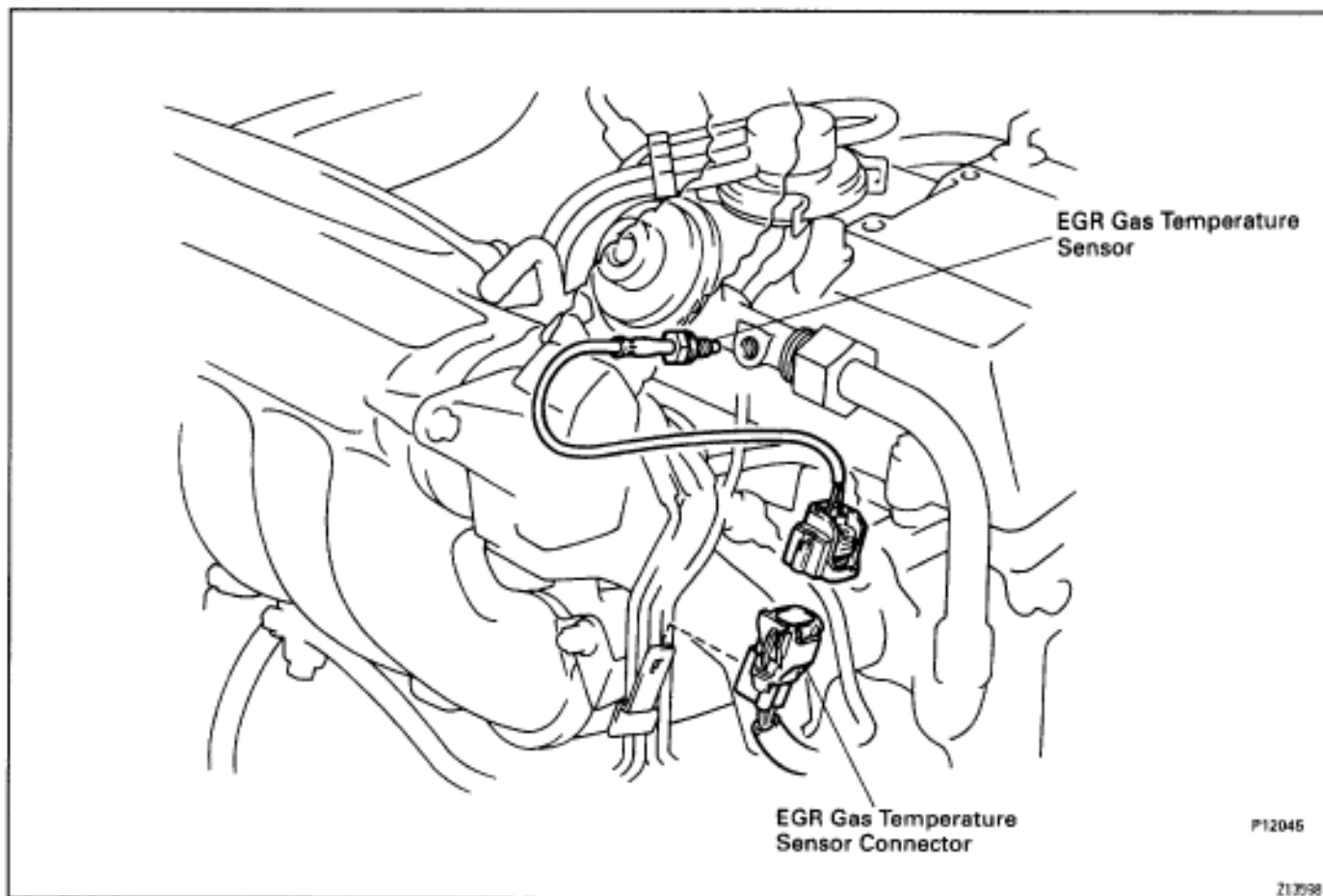


4. REINSTALL ECT SENSOR

- Install a new gasket to the ECT sensor.
- Using SST, install the ECT sensor.
SST 09205-76030
- Connect the ECT sensor connector.

5. REFILL WITH ENGINE COOLANT

EGR GAS TEMPERATURE SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION



EGR GAS TEMPERATURE SENSOR INSPECTION

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 (112°F)

64–97 kΩ

At 100°C (212°F)

11–16 kΩ

At 150°C (302°F)

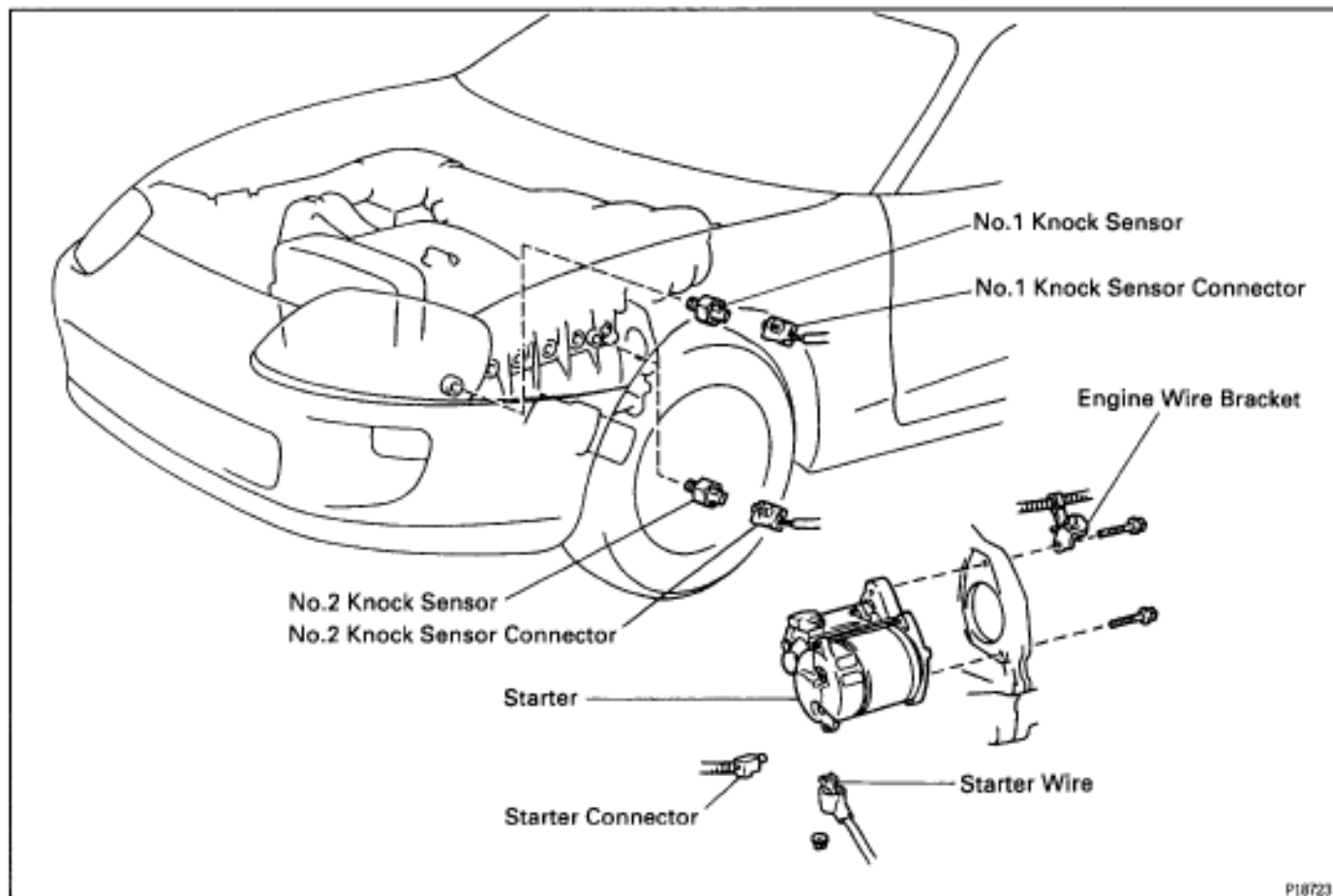
2–4 kΩ

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

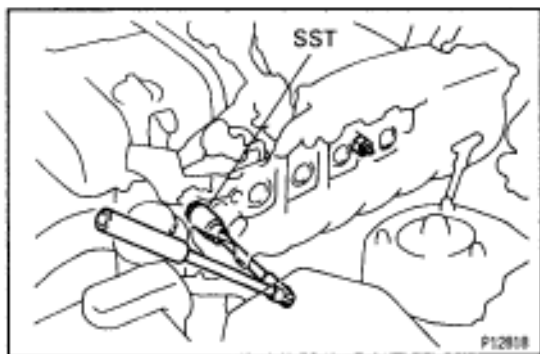
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

3. REINSTALL EGR GAS TEMPERATURE SENSOR

KNOCK SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION

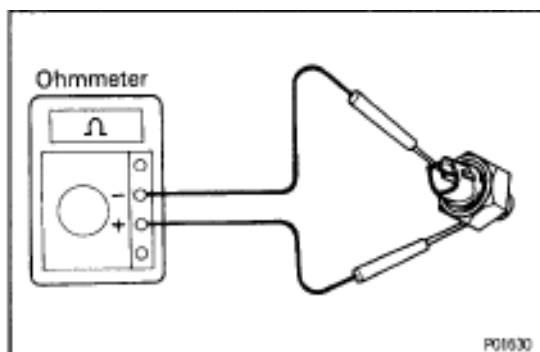


P18723



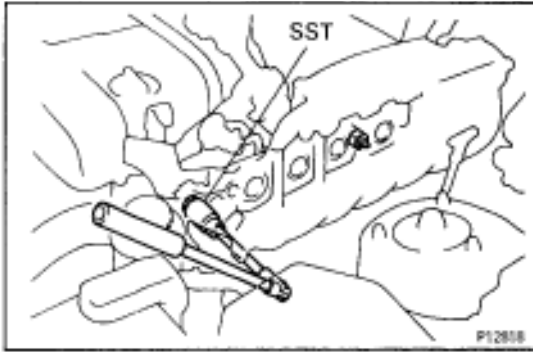
KNOCK SENSORS INSPECTION

1. **REMOVE STARTER**
(See starter removal in Starting System)
2. **REMOVE KNOCK SENSORS**
 - (a) Disconnect the knock sensor connector.
 - (b) Using SST, remove the knock sensor.
SST 09816-30010



3. **INSPECT KNOCK SENSORS**

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



4. REINSTALL KNOCK SENSORS

- (a) Using SST, install the knock sensor.

SST 09816-30010

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

- (b) Connect the knock sensor connector.

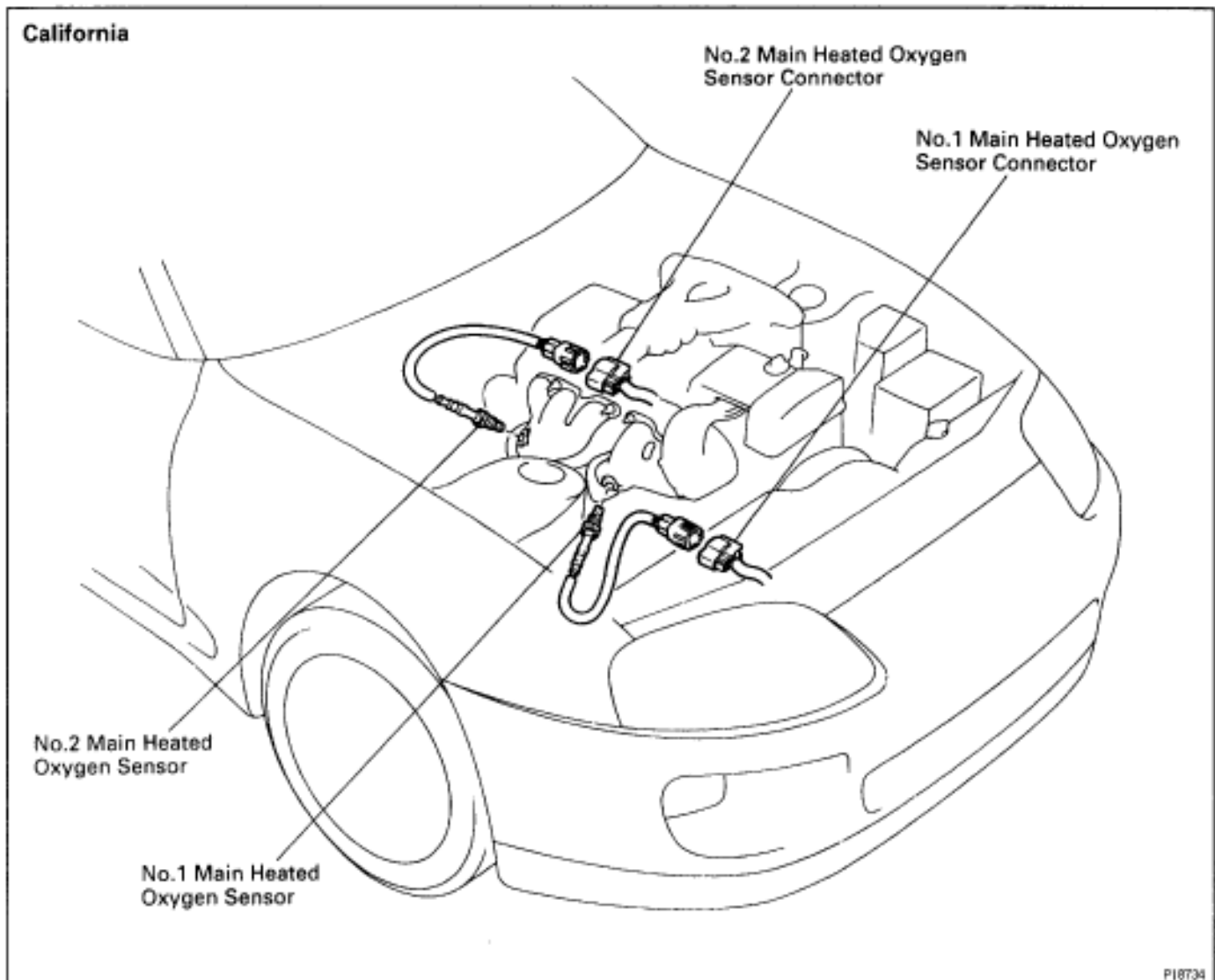
5. REINSTALL STARTER

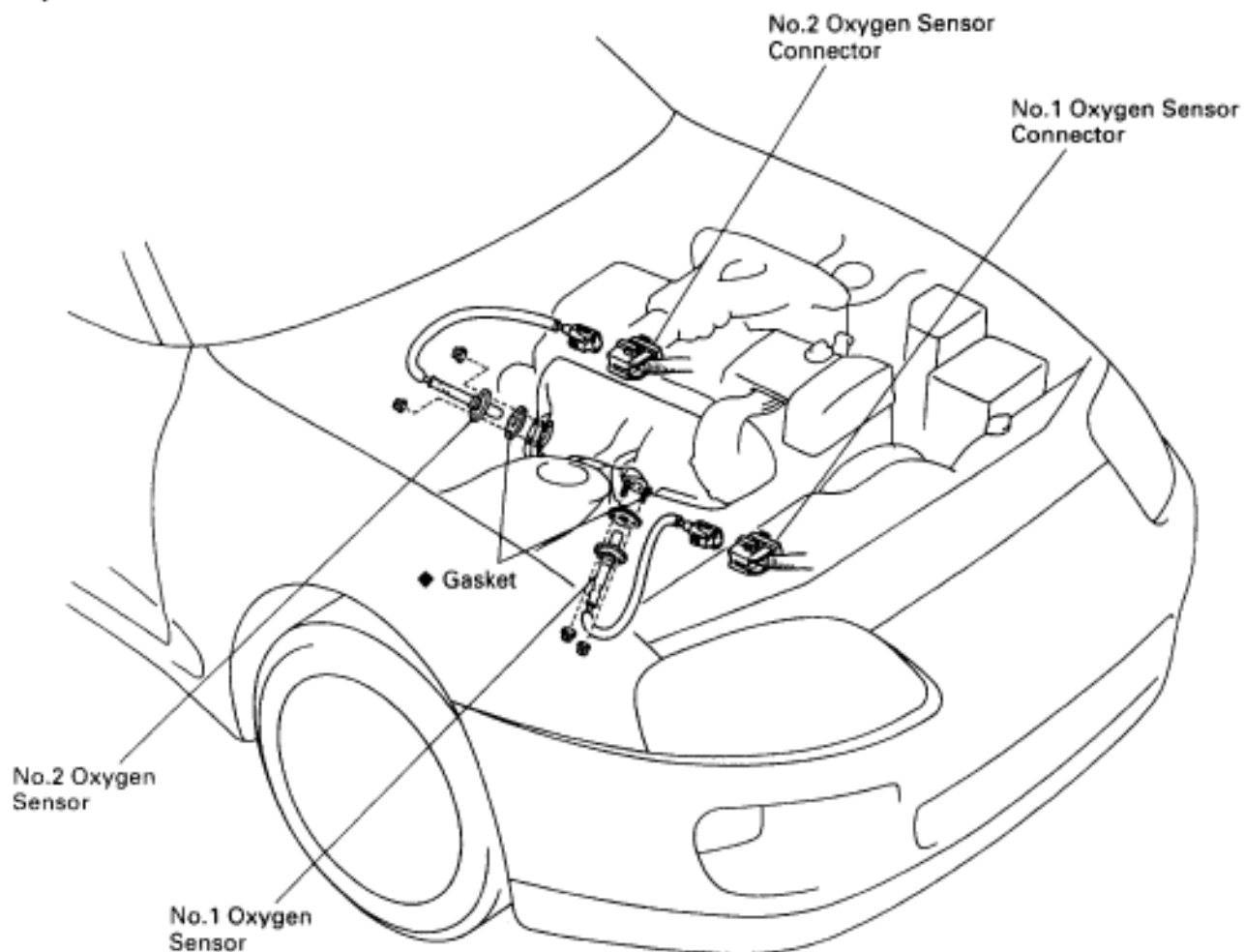
(See starter installation in Starting System)

OXYGEN SENSOR

Main Heated Oxygen Sensors
(California) or Oxygen Sensors (Except
California)

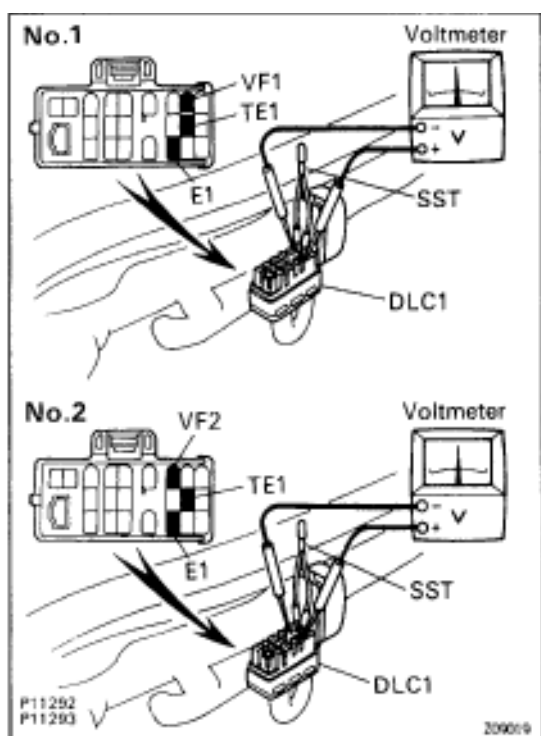
COMPONENTS FOR REMOVAL AND INSTALLATION



Except California

◆ Non-reusable part

P16733



OXYGEN SENSORS INSPECTION

1. WARM UP ENGINE

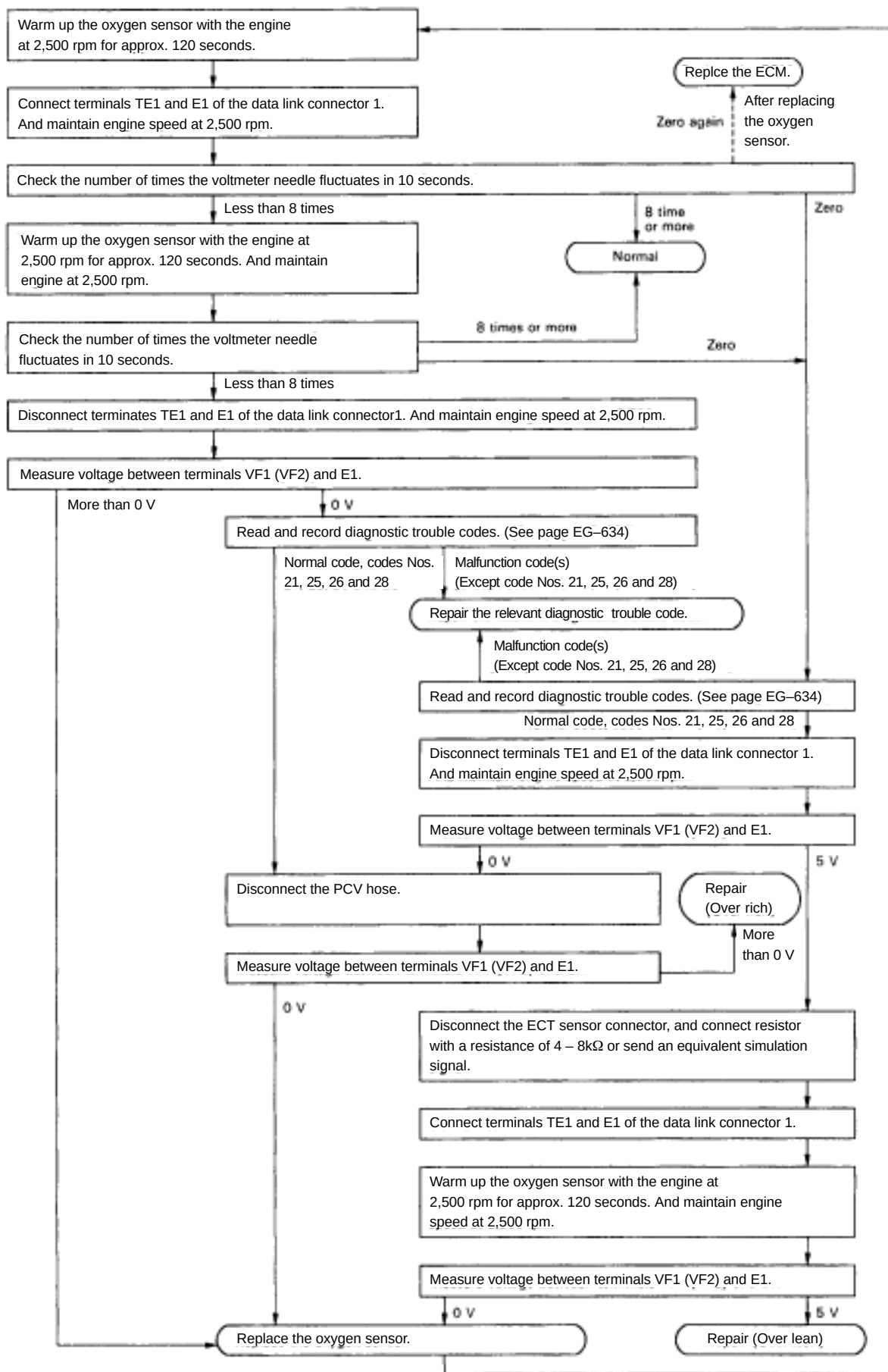
Allow the engine to warm up to normal operating temperature.

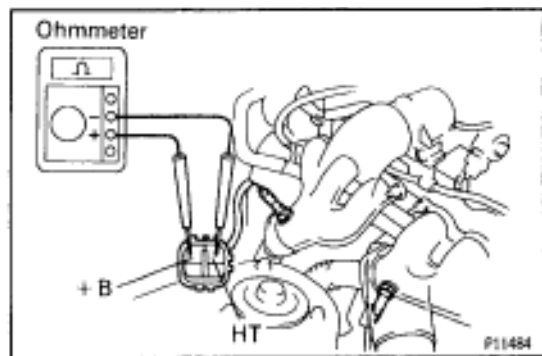
2. INSPECT FEEDBACK VOLTAGE

Connect the positive (+) tester probe of a voltmeter to terminal VF1 (for No.1) or VF2 (for No.2) of the DLC 1, and negative (-) tester probe to terminal E1. Do the test as described on the next page.

HINT: Use SST when connecting between terminals TE1 and E1 of the DLC1.

SST 09843-18020





3. California only:
INSPECT HEATER RESISTANCE OF MAIN HEATED OXY-GEN SENSORS

- (a) Disconnect the oxygen sensor connectors.
- (b) Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance:

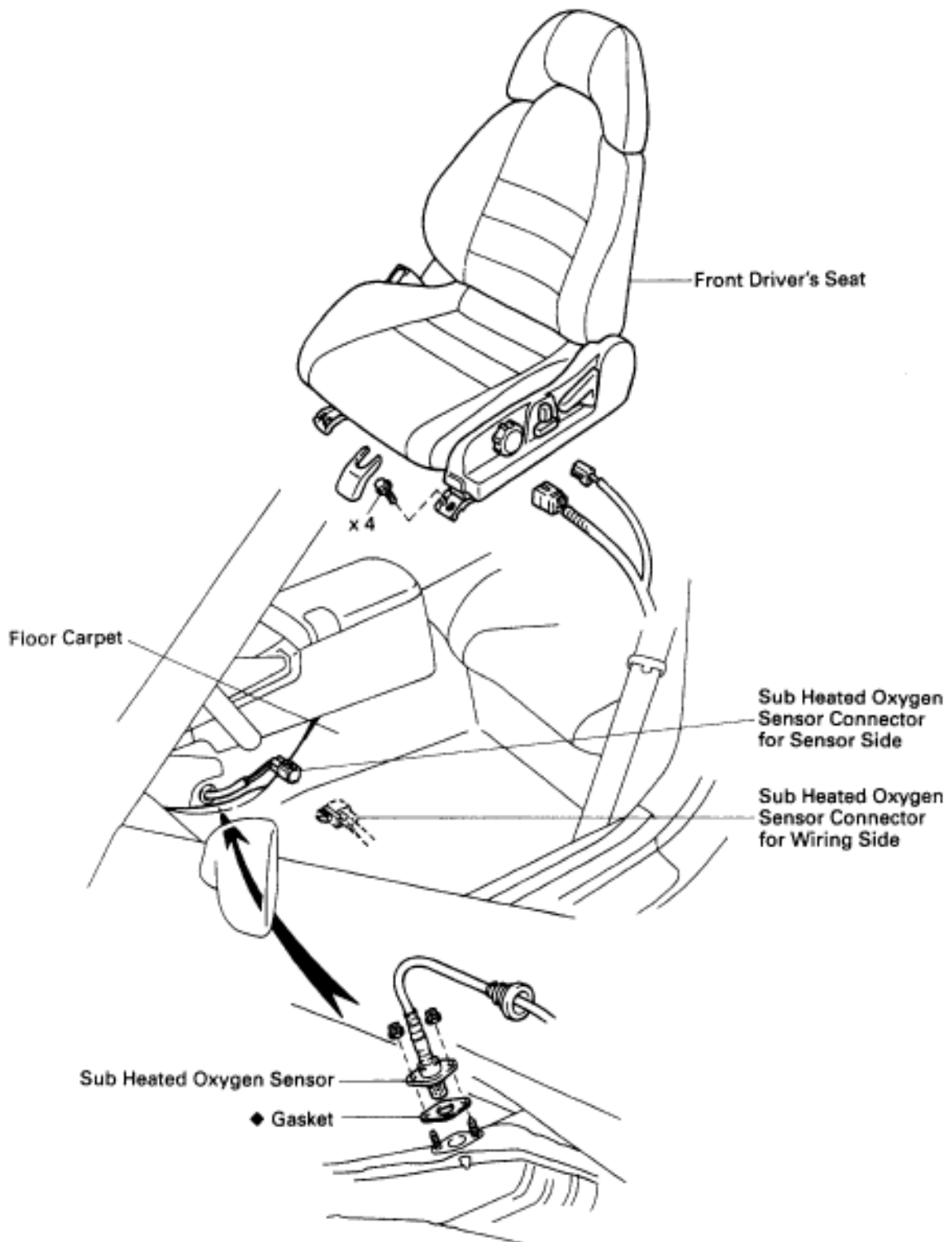
At 20°C (68°F) 11–16 Ω

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

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

- (c) Reconnect the oxygen sensor connectors.

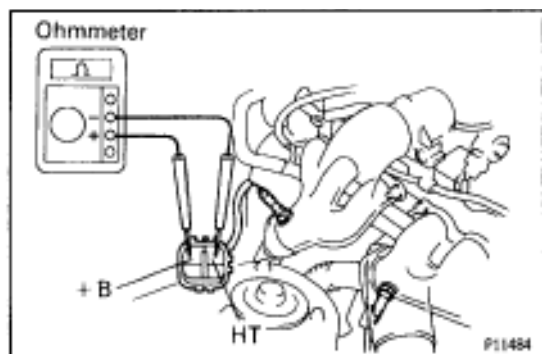
Sub Heated Oxygen Sensor (California only) COMPONENTS FOR REMOVAL AND INSTALLATION



OXYGEN SENSOR INSPECTION

1. INSPECT OPERATION OF SUB HEATED OXYGEN SENSOR

(See circuit inspection in Engine Troubleshooting)



2. INSPECT HEATER RESISTANCE OF SUB HEATED OXYGEN SENSOR

- Remove the driver's seat.
- Take out the console box side of the floor carpet.
- Disconnect the oxygen sensor connector.
- Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance:

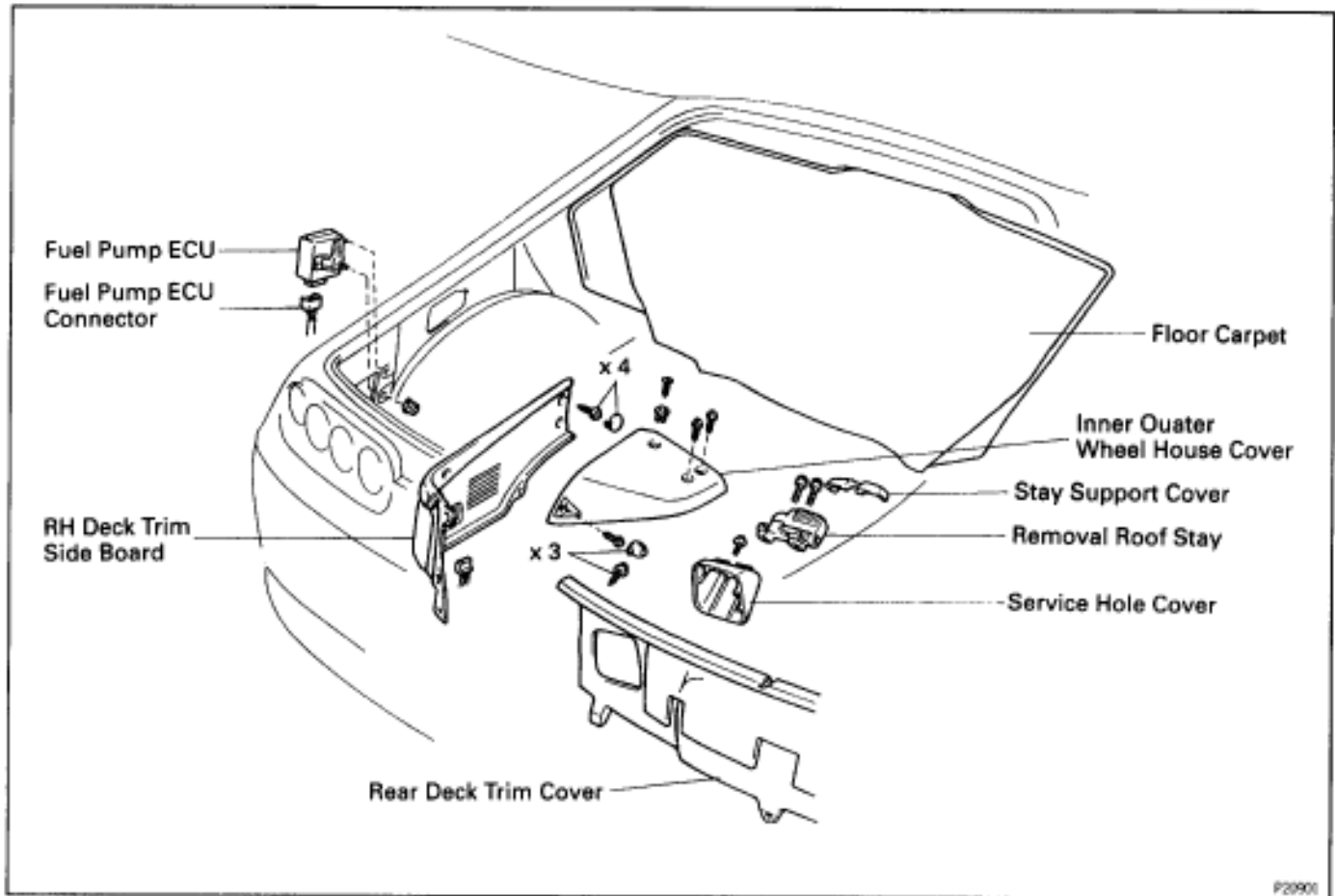
At 20°C (68°F) 11–16 Ω

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

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

- Reconnect the oxygen sensor connector.
- Reinstall the floor carpet.
- Reinstall the driver's seat.

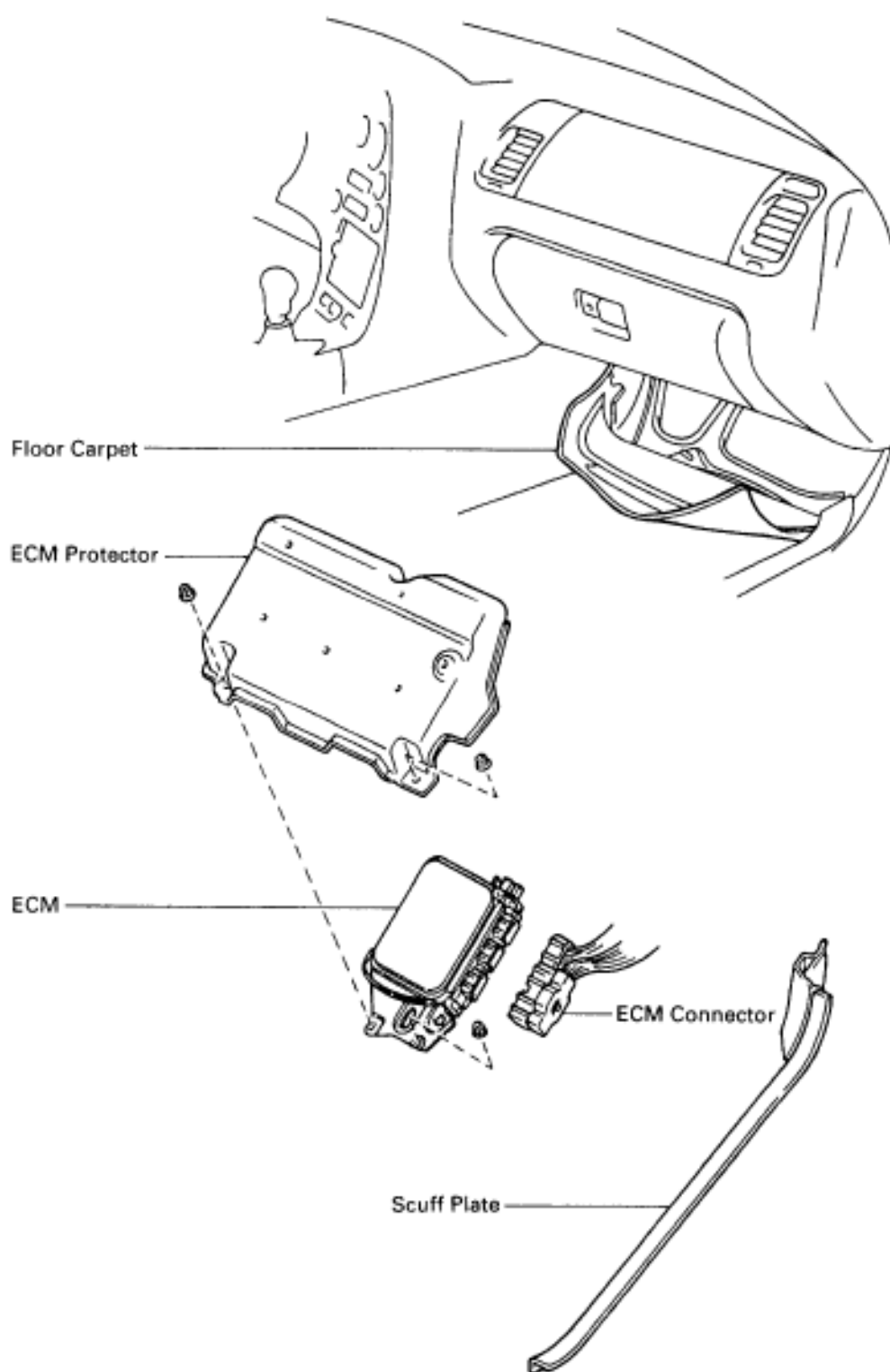
FUEL PUMP ECU COMPONENTS FOR REMOVAL AND INSTALLATION

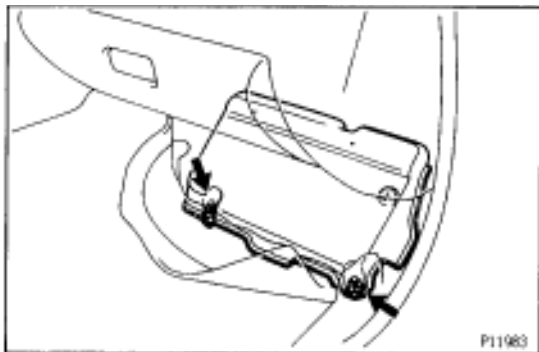


FUEL PUMP ECU INSPECTION

1. REMOVE FUEL PUMP ECU
2. INSPECT FUEL PUMP ECU
(See circuit inspection in Engine Troubleshooting)
3. REINSTALL FUEL PUMP ECU

ENGINE CONTROL MODULE (ECM) COMPONENTS FOR REMOVAL AND INSTALLATION





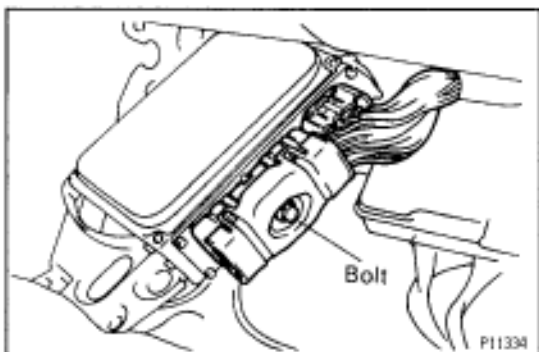
ECM INSPECTION

1. DISCONNECT NEGATIVE (-) TERMINAL CABLE FROM BATTERY

2. REMOVE SCUFF PLATE

3. REMOVE ECM PROTECTOR

- (a) Take out the front side of the floor carpet.
- (b) Remove the 2 nuts and ECM protector.

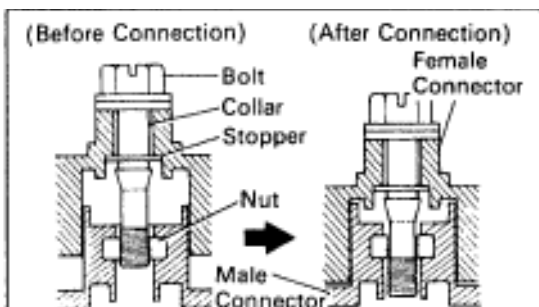


4. REMOVE ECM

- (a) Remove the nut, and disconnect the ECM from the floor panel.
- (b) Fully loosen the bolt and disconnect the 2 ECM connectors, and remove the ECM.

5. INSPECT ECM

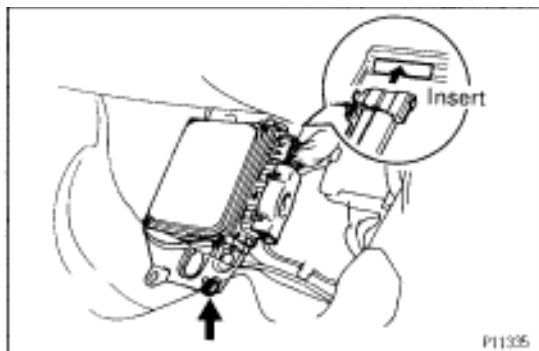
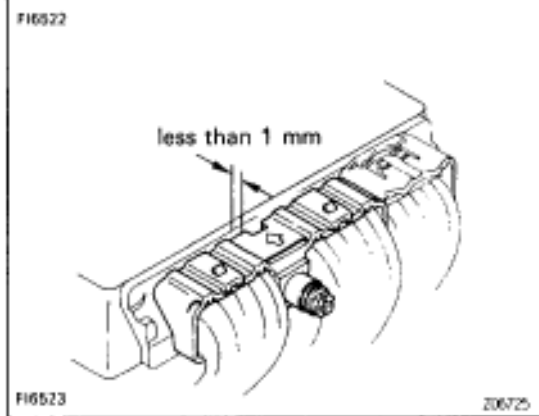
(See standard value of ECM terminals in Engine Troubleshooting)



6. REINSTALL ECM

- (a) Connect the 2 ECM connectors.
 - Match the male connector correctly with the female connector, then press them together.
 - Tighten the bolt.

Make sure the connector is completely connected by tightening the bolt until there is a clearance of less than 1 mm (0.04 in.) between the bottom of the male connector and the end of the female connector.



- (b) Insert the ECM bracket into the stay on the floor panel.
- (c) Install the ECM with the nut.

7. REINSTALL ECM PROTECTOR

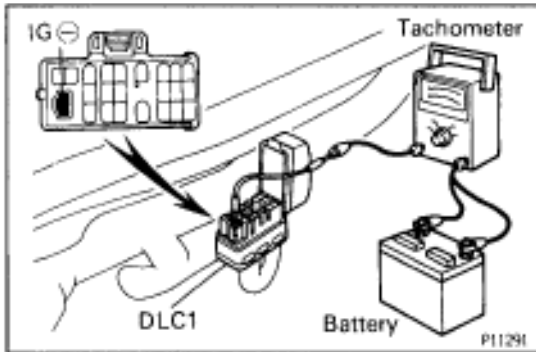
8. REINSTALL SCUFF PLATE

9. RECONNECT NEGATIVE (-) TERMINAL CABLE TO BATTERY

FUEL CUT RPM FUEL CUT RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TACHOMETER TO ENGINE

Connect the tester probe of a tachometer to terminal IG × of the DLC1.

NOTICE:

- Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.

3. INSPECT FUEL CUTOFF OPERATION

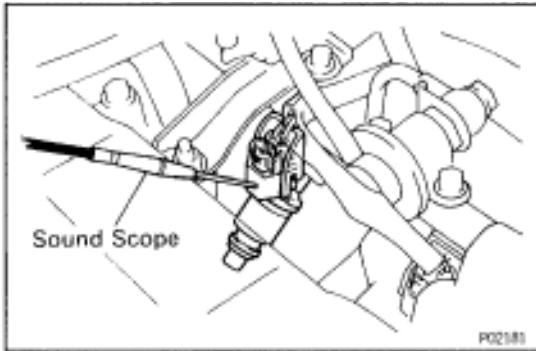
- (a) Increase the engine speed to at least 3,000 rpm.
- (b) Check for injector operating noise.
- (c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT: Measure with the A/C OFF.

Fuel return speed:

1,400 rpm

4. DISCONNECT TACHOMETER



SERVICE SPECIFICATIONS

SERVICE DATA

Fuel pressure regulator	Fuel pressure at no vacuum	265–304 kPa (2.7–3.1 kgf/cm ² , 38–44 psi)
Fuel pump	Resistance at 20°C (68°F)	0.2–3.0 Ω
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage	13.4–14.2 Ω 70–88 cm ³ (4.3–5.4 cu in.) per 15 sec. 9 cm ³ (0.5 cu in.) or less One drop or less per minute
VAF meter	Resistance (THA–E2) at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F)	10–20 kΩ 4–7 kΩ 2–3 kΩ 0.9–1.3 kΩ 0.4–0.7 kΩ
Throttle body	Throttle body fully closed angle Dashpot setting speed M/T A/T Throttle opener setting speed	6° 2,600 ± 400 rpm 1,800 ± 400 rpm 1,500 ± 400 rpm
Throttle position sensor	Clearance between stop screw and lever 0 mm (0 in.) VTA–E2 0.40 mm (0.016 in.) IDL–E2 0.60 mm (0.024 in.) IDL–E2 Throttle valve fully open VTA–E2 – VC–E2	0.34–6.3 kΩ 0.5 kΩ or less Infinity 2.4–11.2 kΩ 3.1–7.2 kΩ
IAC valve	Resistance B1 (or B2)–Others	18–22 Ω
VSV for ACIS	Resistance at 20°C (68°F)	38.5–44.5 Ω
VSV for Fuel pressure control (California only)	Resistance at 20°C (68°F)	33–39 Ω
VSV for EVAP	Resistance at 20°C (68°F)	27–33 Ω
VSV for EGR	Resistance at 20°C (68°F)	38.5–44.5 Ω
ECT sensor	Resistance at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10–20 kΩ 4–7 kΩ 2–3 kΩ 0.9–1.3 kΩ 0.4–0.7 kΩ 0.2–0.4 kΩ
EGR gas temperature sensor	Resistance at 50°C (122°F) at 100°C (212°F) at 150°C (302°F)	64–97 kΩ 11–16 kΩ 2–4 kΩ
Main heated oxygen sensor (California)	Heater coil resistance at 20°C (68°F)	11–16 Ω

Sub heated oxygen sensor (California only)	Heater coil resistance at 20°C (68°F)	11–16 Ω
Fuel cut rpm	Fuel return rpm	1,400 rpm

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Fuel line	29	300	22
for union bolt	30	310	22
for flare nut			
Fuel pressure regulator x Delivery pipe	8.8	90	78 in.·lbf
Delivery pipe x Intake manifold	21	210	15
Actuator for ACIS x Air intake chamber	6.8	70	61 in.·lbf
Fuel inlet pipe x Delivery pipe	41	420	30
Fuel return pipe x Fuel pressure regulator	27	280	20
Air intake chamber stay x Cylinder head	18	185	13
Air intake chamber stay x Air intake chamber	18	185	13
Intake air connector x Air intake chamber	27	270	20
Throttle body bracket x Throttle body	21	210	15
Throttle body bracket x Cylinder head	21	210	15
No.2 vacuum pipe x Intake manifold	27	270	20
EGR pipe x Cylinder head	27	270	20
EGR pipe x EGR valve	64	650	47
Fuel pressure pulsation damper x Fuel pipe support	41	420	30
for SST	35	350	25
Starter x Transmission	39	400	29
Fuel tank band x Body	39	400	29
VAF meter x Air cleaner case	10	100	7
Throttle body x Intake air connector	21	210	15
Vacuum tank x Intake manifold	21	210	15
Brake booster union x Air intake chamber	29	300	22
Air intake chamber x Intake manifold	27	270	20
EGR gas temperature sensor x EGR valve	20	200	14
Knock sensor x Cylinder block	44	450	33
Oxygen sensor (Except California) x Exhaust manifold	20	200	14
Main heated oxygen sensor (California) x Exhaust manifold	44	450	33
Sub heated oxygen sensor (California only) x Center exhaust pipe	20	200	14

SFI SYSTEM (2JZ-GTE)

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09205-76030 Cylinder Head Setting Bolt Tightening Adaptor	ECT sensor
	09268-41045 Injection Measuring Tool Set	
	(09268-41070) No.4 Union	
	(90405-09015) No.1 Union	
	09268-45012 EFI Fuel Pressure Gauge	
	09612-24014 Steering Gear Housing Overhaul Tool Set	
	(09617-24011) Steering Rack Wrench	Fuel pressure pulsation damper
	09631-22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09808-14010 Fuel Sender Gauge Tool Assy	
	09816-30010 Oil Pressure Switch Socket	Knock sensor
	09842-30080 Wiring "E" EFI Inspection	Injector
	09843-18020 Diagnosis Check Wire	

	09990–01000 Engine Control Computer Check Harness “A”	

RECOMMENDED TOOLS

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

EQUIPMENT

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

COOLANT

Item		Capacity	Classification
Engine coolant (w/ Heater)	M/T A/T	9.5 liters (10.0 US qts, 8.4 Imp. qts) 9.4 liters (9.9 US qts, 8.3 Imp. qts)	Ethylene–glycol base

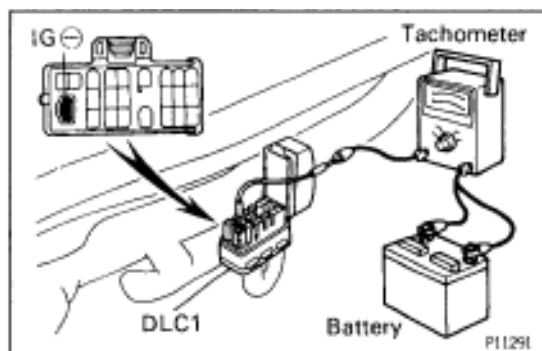
PRECAUTION

1. **Before working on the fuel system, disconnect the negative (–) terminal cable from the battery.**

HINT: Any diagnostic trouble code retained by the computer will be erased when the negative (–) terminal cable is disconnected.

Therefore, if necessary, read the diagnosis before disconnecting 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

1. PRECAUTION WHEN CONNECTING GAUGE

- (a) Use battery as the power source for the timing light, tachometer, etc.
- (b) Connect the tester probe of a tachometer to the terminal IG × of the DLC1.

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

- (a) Check proper connection of 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.

3. 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.)

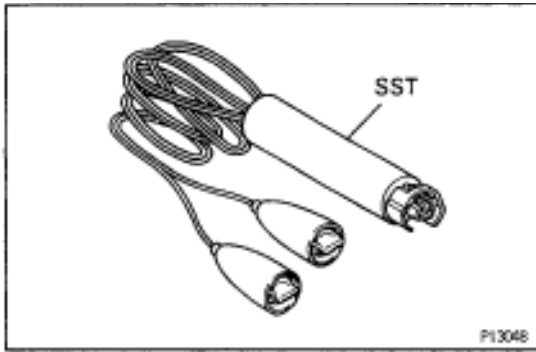
If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

AIR INDUCTION SYSTEM

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

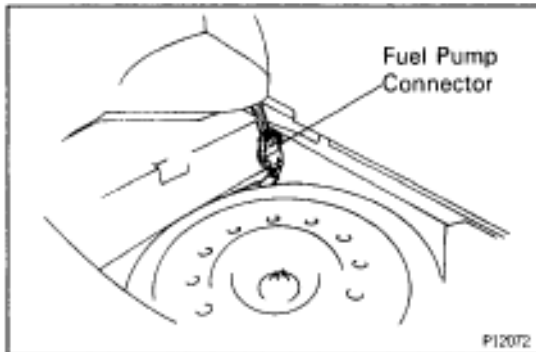
ELECTRONIC CONTROL SYSTEM

1. Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF 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. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
7. Parts should be replaced as an assembly.
8. Care is required when pulling out and inserting wiring connectors.
 - (a) Release the lock and pull out the connector, pulling on the connectors.
 - (b) Fully insert the connector and check that it is locked.

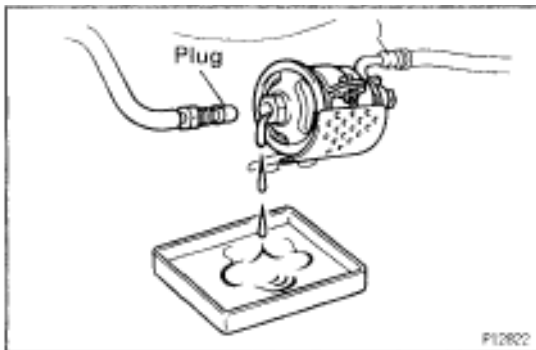


9. Use SST for inspection or test of the injector or its wiring connector.
SST 09842-30060

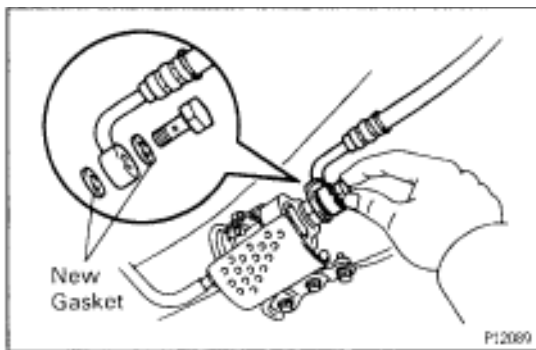
FUEL SYSTEM



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



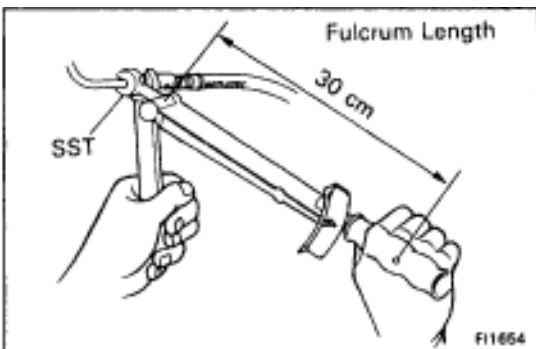
- (c) Put a container under the connection.
 - (d) Slowly loosen the connection.
 - (e) Disconnect the connection.
 - (f) Plug the connection with a rubber plug.
 - (g) Reconnect the fuel pump connector.



2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedures:
Union Bolt Type:

- (a) Always use a new gasket.
 - (b) Tighten the union bolt by hand.
 - (c) Tighten the union bolt to the specified torque.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



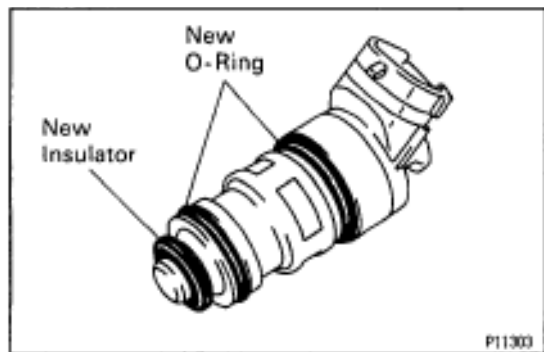
Flare Nut Type:

- (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.

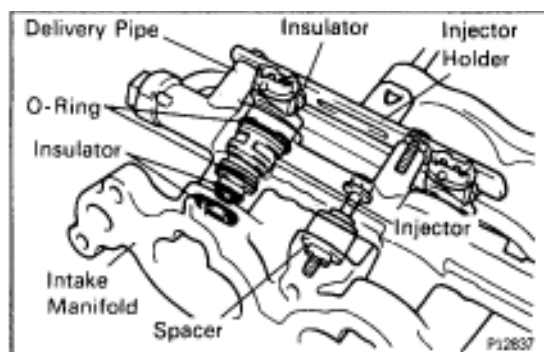
SST 09631-22020

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

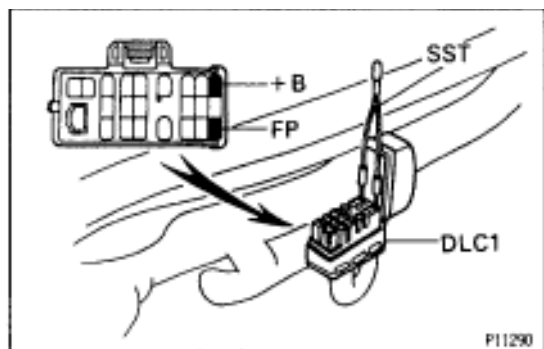
HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).



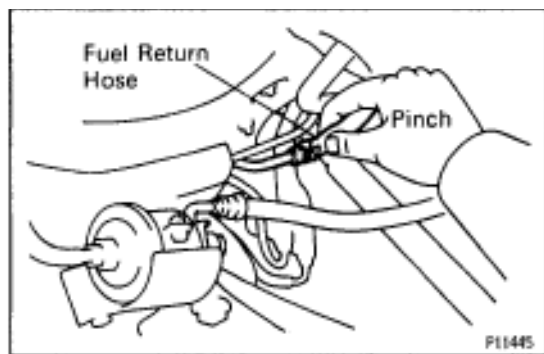
3. Observe the following precautions when removing and installing the injectors.
 - (a) Never reuse the O-ring.
 - (b) When placing a new O-ring on the injector, take care not to damage it in any way.
 - (c) Coat a new O-ring with spindle oil or gasoline before installing—never use engine, gear or brake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



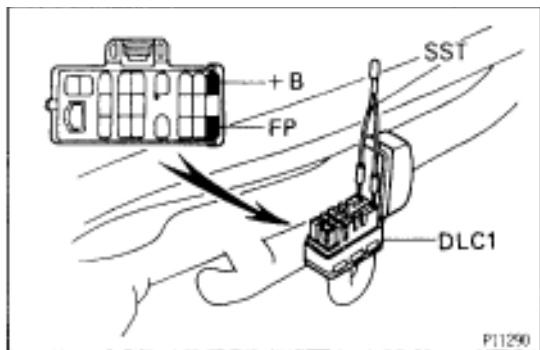
4. Install the injector to the delivery pipe and intake manifold as shown in the illustration.



5. Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
 - (a) Using SST, connect terminals +B and FP of the DLC 1. SST 09843-18020
 - (b) With engine stopped, turn the ignition switch ON.



- (c) Pinch the fuel return hose.
The pressure in the high pressure line will rise to approx. 392 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.
 - (d) Turn the ignition switch OFF.
 - (e) Remove the SST from the DLC1. SST 09843-18020

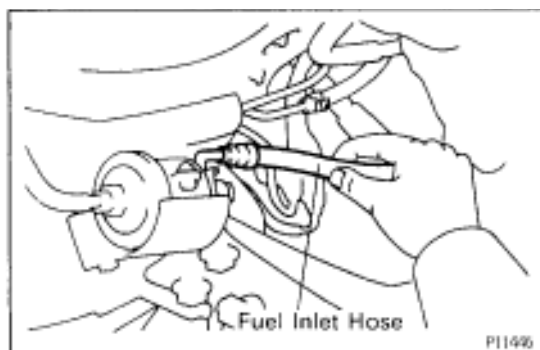


FUEL PUMP ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

- Using SST, connect terminals +B and FP of the DLC 1.
SST 09843-18020
- Turn the ignition switch ON.

NOTICE: Do not start the engine.



- 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.

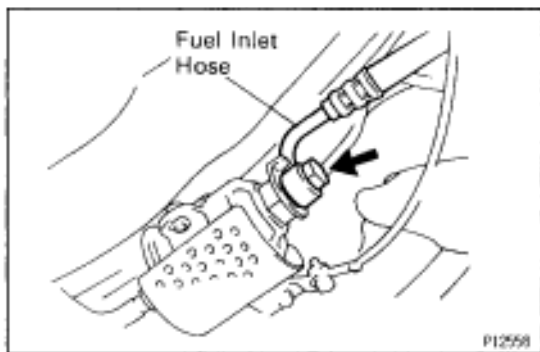
If there is no pressure, check the following parts:

- Fuses
- EFI No.2 relay
- Fuel pump
- ECM
- Wiring connections

- Turn the ignition switch OFF
- Remove the SST from the DLC1.
SST 09843-18020

2. CHECK FUEL PRESSURE

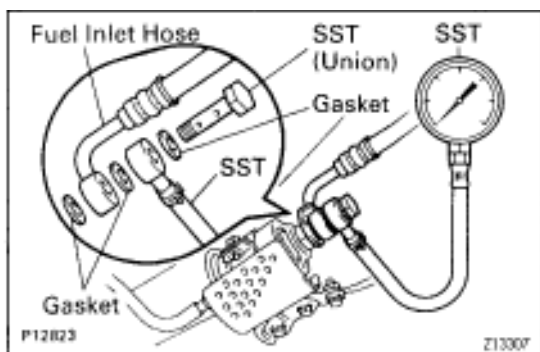
- Check the battery voltage is above 12 V.
- Disconnect the negative (-) terminal cable from the battery.



- Remove the union bolt and 2 gaskets, disconnect the fuel inlet hose from the fuel filter.

CAUTION:

- Put a suitable container or shop towel under the fuel filter.
- Slowly loosen the union bolt.



- Install the fuel inlet hose and SST (pressure gauge) to the fuel filter with the 3 gaskets and SST (union bolt).

SST 09268-45012

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

- Wipe off any splattered gasoline.
- Using SST, connect terminals +B and FP of the DLC 1.
SST 09843-18020

- (g) Reconnect the negative (–) terminal cable to the battery.
- (h) Turn the ignition switch ON.
- (i) Measure the fuel pressure.

Fuel pressure:**226–275 kPa (2.3–2.8 kgf/cm², 33–40 psi)**

If pressure is high, replace the fuel pressure regulator.

If pressure is low, check the following parts:

- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator

- (j) Remove the SST from the DLC1.
SST 09843–18020

- (k) Start the engine.

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

- (m) Measure the fuel pressure at idle.

Fuel pressure:**226–275 kPa (2.3–2.8 kgf/cm², 33–40 psi)**

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

- (o) Measure the fuel pressure at idle.

Fuel pressure:**167–216 kPa (1.7–2.2 kgf/cm², 24–31 psi)**

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

- (p) Stop the engine.

- (q) 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.

- (r) 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

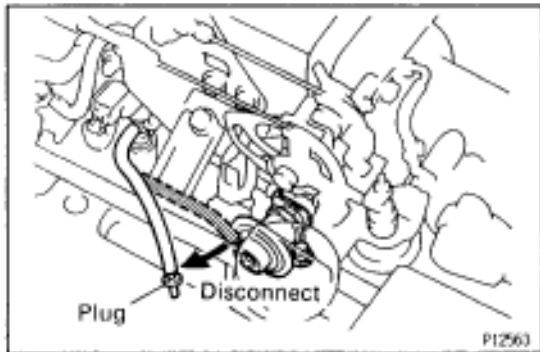
- (s) Reinstall the fuel inlet hose to the fuel filter with 2 new gaskets and the union bolt.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

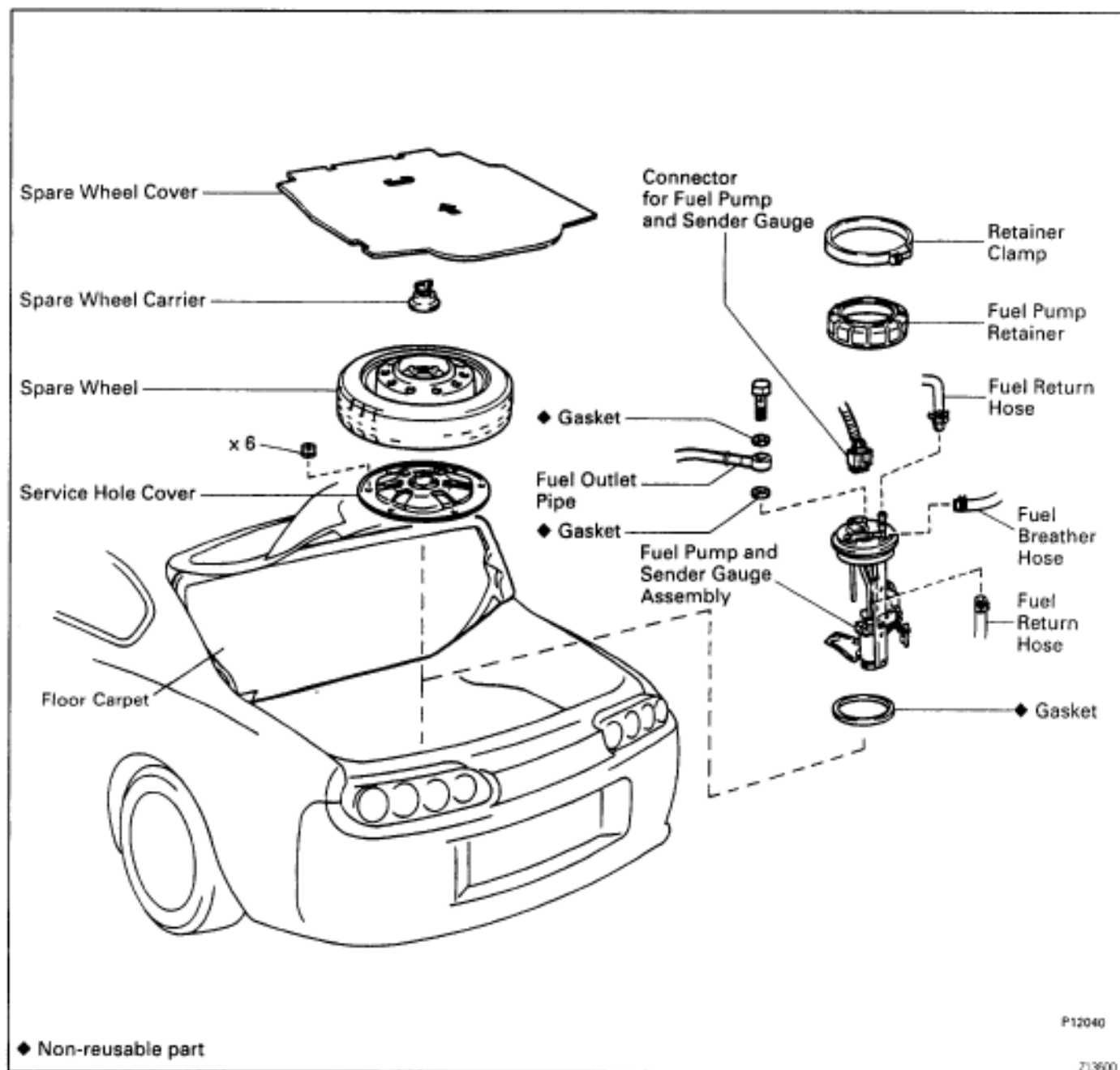
- (t) Reconnect the negative (–) terminal cable to the battery.

- (u) Check for fuel leaks.

(See item 5 in fuel system in precaution)



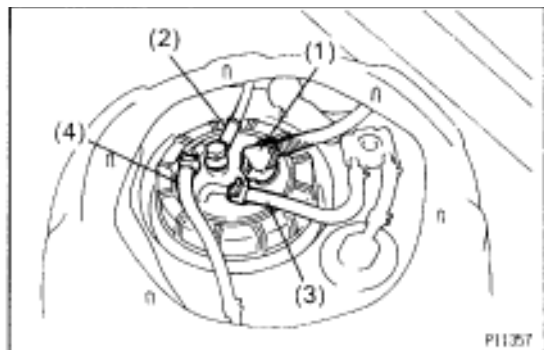
COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PUMP REMOVAL

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

1. TAKE OUT FLOOR CARPET
2. REMOVE SPARE WHEEL COVER
3. REMOVE SPARE WHEEL
4. REMOVE SERVICE HOLE COVER



5. REMOVE FUEL PUMP AND SENDER GAUGE ASSEMBLY

- (a) Disconnect the connector and hoses from the fuel pump bracket:

(1) Fuel pump connector

(2) Fuel outlet hose

Remove the union bolt and 2 gaskets, and disconnect the outlet hose.

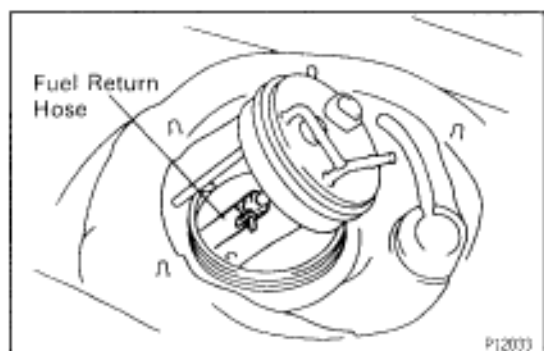
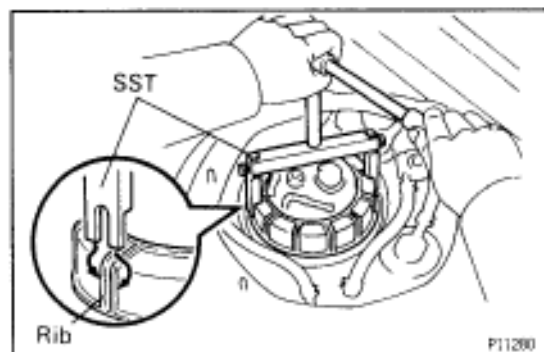
(3) Fuel return hose

(4) Fuel breather hose

- (b) Remove the retainer clamp.

- (c) Using SST, loosen the retainer.

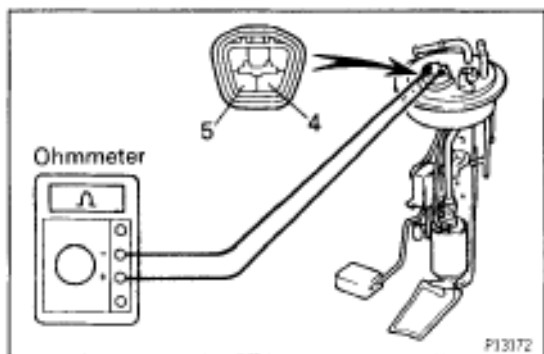
SST 09808-14010



- (d) Remove the retainer, and disconnect the fuel pump and sender gauge assembly from the fuel tank.

- (e) Disconnect the fuel return hose from the return port of the fuel pump bracket.

- (f) Remove the fuel pump, sender gauge assembly and gasket.



FUEL PUMP INSPECTION

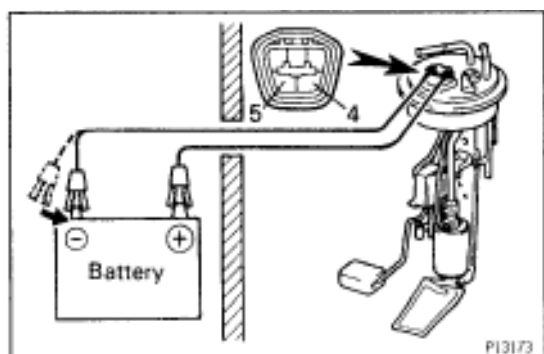
1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between terminals 4 and 5.

Resistance:

0.1–3.0 Ω at 20°C (68°F)

If the resistance is not as specified, replace the fuel pump, lead wire or fuel pump bracket.



2. INSPECT FUEL PUMP OPERATION

Connect a tester lead from terminal 4 of the connector to the positive (+) terminal of the battery; connect another tester lead from terminal 5 of the connector to the negative (–) terminal of the battery.

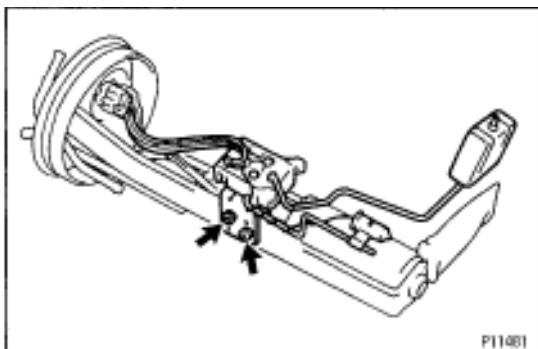
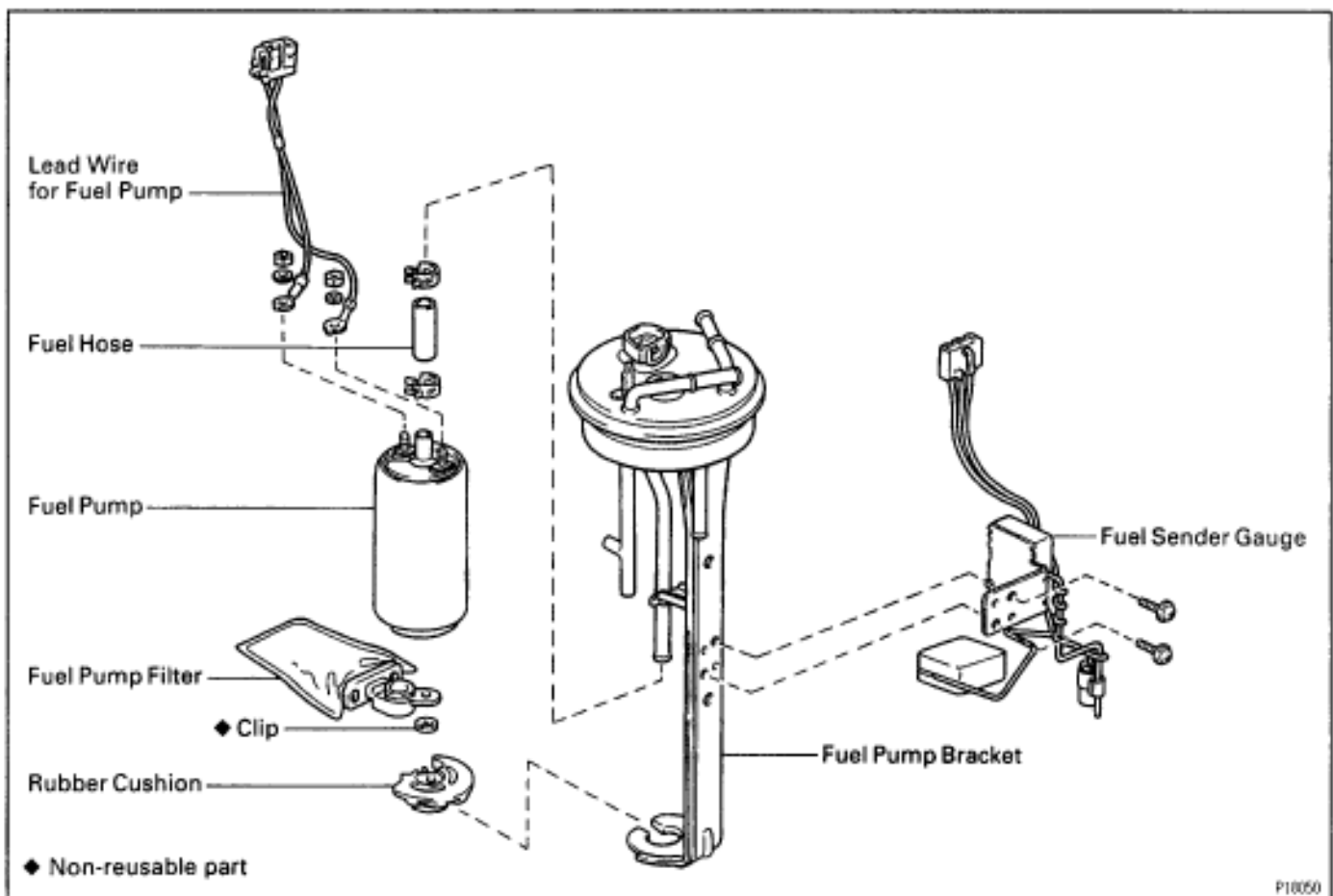
NOTICE:

- These tests must be performed quickly (within 10 seconds) to prevent the coil from burning out.

- Keep the fuel pump as far away from the battery as possible.
- Always connect or disconnect at the battery.

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

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

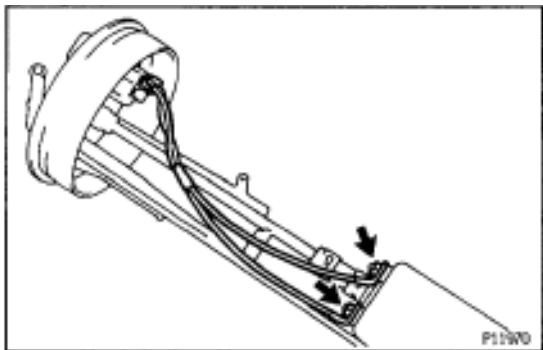


FUEL PUMP DISASSEMBLY

Assembly is in the reverse order of disassembly.

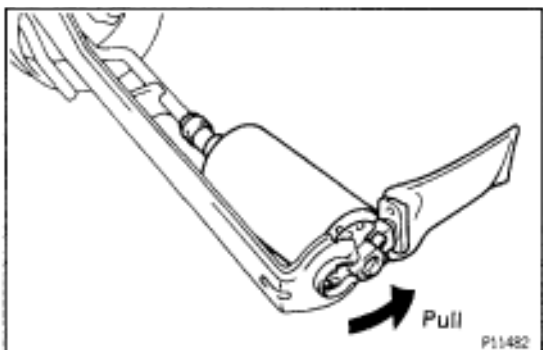
1. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

- Disconnect the connector from the fuel pump bracket.
- Remove the 2 screws and sender gauge.

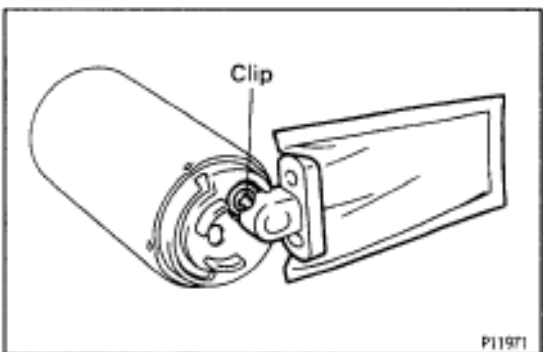


2. REMOVE FUEL PUMP FROM PUMP BRACKET

- (a) Remove the 2 nuts and spring washers, and disconnect the lead wire from the fuel pump.
- (b) Disconnect the connector from the fuel pump bracket, and remove the lead wire.

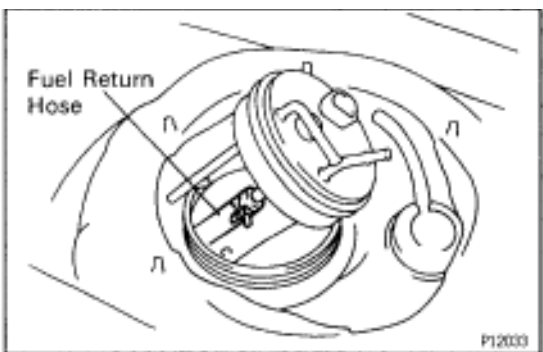


- (c) Pull out the lower side of the fuel pump from the pump bracket.
- (d) Remove the rubber cushion from the fuel pump.
- (e) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.



3. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

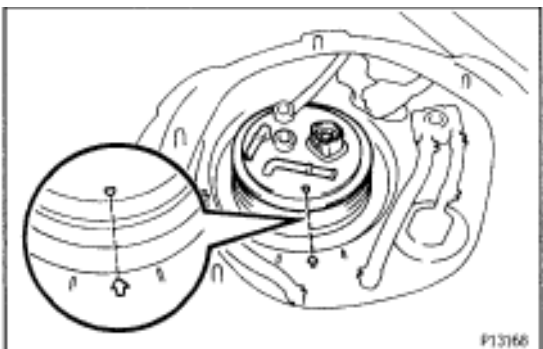
- (a) Using a small screwdriver, remove the clip.
INSTALLATION HINT: Use a new clip.
- (b) Pull out the pump filter.

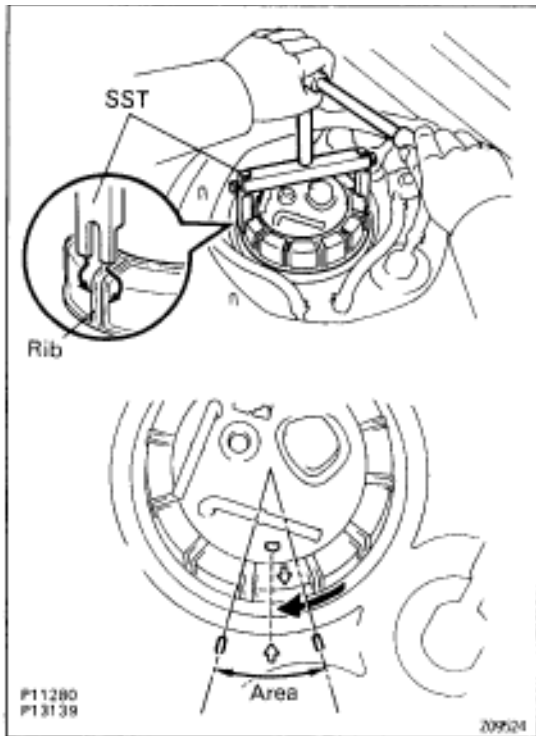


FUEL PUMP INSTALLATION

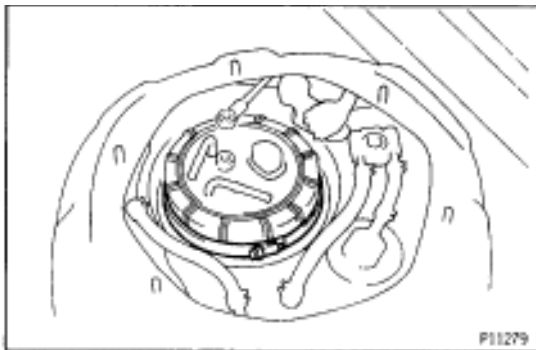
1. INSTALL FUEL PUMP AND SENDER GAUGE ASSEMBLY

- (a) Install a new gasket to the fuel tank.
- (b) Insert fuel pump and sender gauge assembly into the fuel tank.
- (c) Connect the fuel return hose to the return port of the fuel pump bracket.
- (d) Align the arrow marks of the fuel pump bracket and fuel tank.





- (e) Temporarily install the retainer.
- (f) Using SST, tighten the retainer until the arrow mark on retainer is within the lines on the fuel tank.
SST 09808-14010
- (g) Check that the arrow marks of the fuel pump bracket and fuel tank are aligned.



- (h) Install the retainer clamp.
- (i) Connect the connector and hoses to the fuel pump bracket:
 - Fuel pump connector
 - Fuel outlet hose
 Connect the outlet hose with 2 new gaskets and the union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
 - Fuel return hose
 - Fuel breather hose

2. INSTALL SERVICE HOLE COVER

3. INSTALL SPARE WHEEL

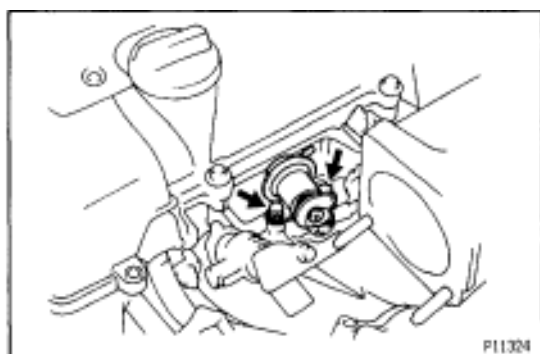
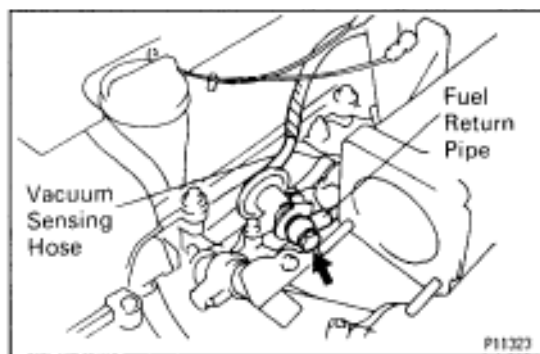
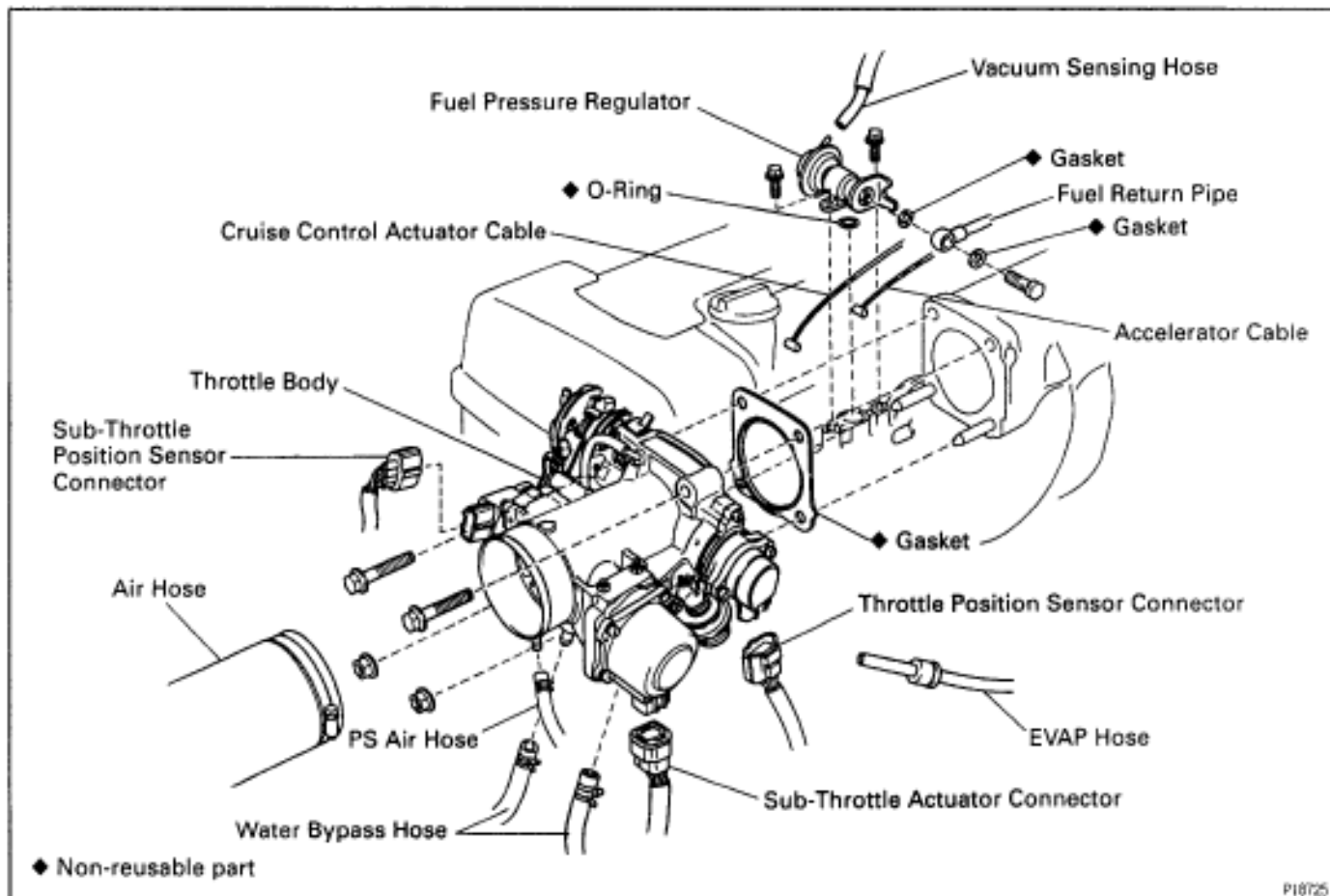
4. INSTALL SPARE WHEEL COVER

5. INSTALL FLOOR CARPET

6. CHECK FOR FUEL LEAKS

(See item 5 in fuel system in precaution)

FUEL PRESSURE REGULATOR COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PRESSURE REGULATOR REMOVAL

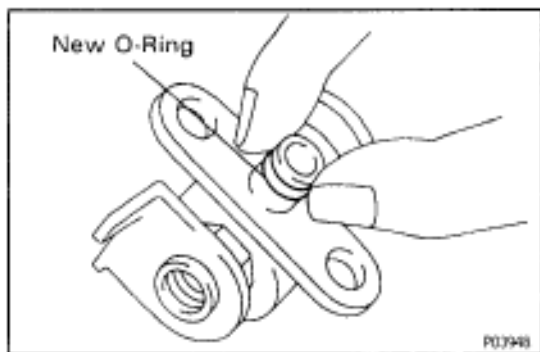
1. REMOVE THROTTLE BODY
(See throttle body removal)
2. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR
3. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR

Remove the union bolt and 2 gaskets, and disconnect the return pipe from the pressure regulator.

CAUTION:

- Put a shop rag under the pressure regulator.
- Slowly loosen the union bolt.

4. REMOVE FUEL PRESSURE REGULATOR
 - (a) Remove the 2 bolts, and pull out the pressure regulator.
 - (b) Remove the O-ring from the pressure regulator.



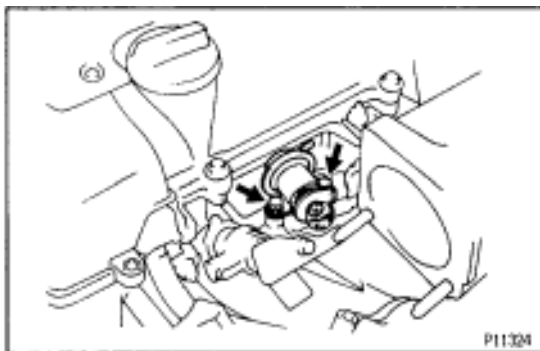
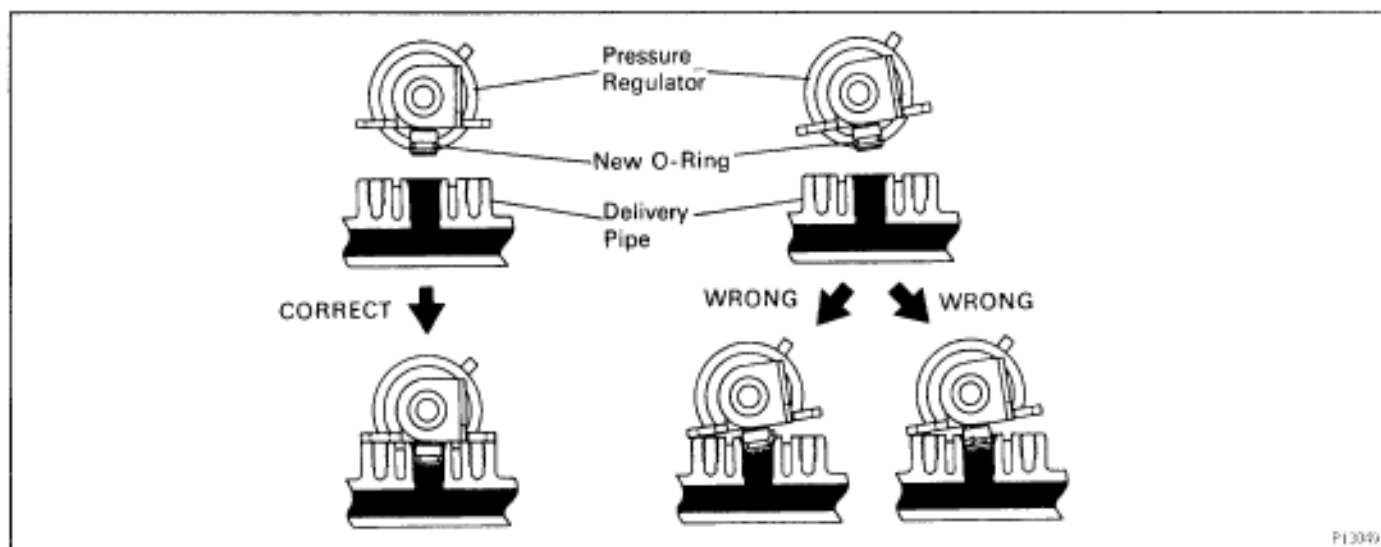
FUEL PRESSURE REGULATOR INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

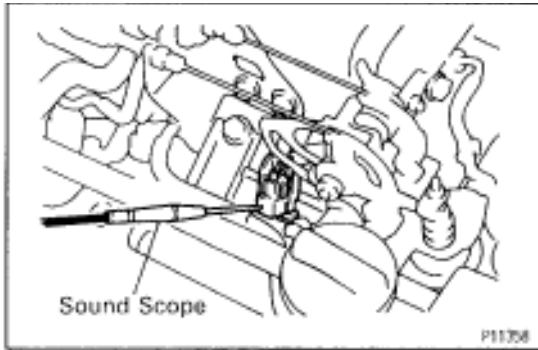
- (a) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.

- (b) Attach the pressure regulator to the 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 do steps (b) and (c) above again.



- (d) Install the pressure regulator with the 2 bolts.
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
2. **CONNECT FUEL RETURN PIPE TO FUEL PRESSURE REGULATOR**
Install the return pipe with 2 new gaskets and the union bolt.
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)
3. **CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR**
4. **INSTALL THROTTLE BODY**
(See throttle body installation)
5. **CHECK FOR FUEL LEAKS**
(See item 5 in fuel system in precaution)

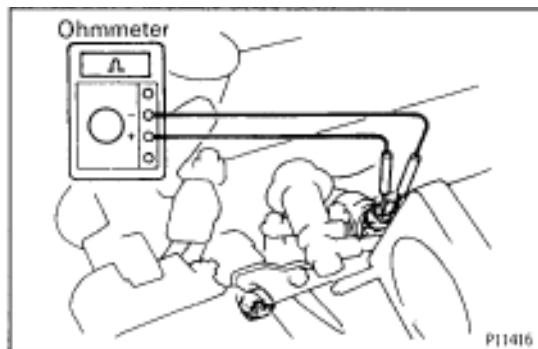
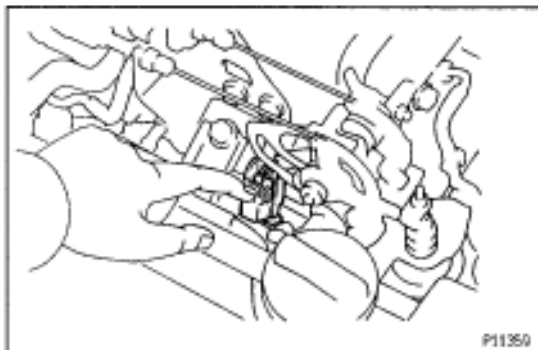


INJECTOR ON-VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

- (a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.
- (b) If you have no sound scope, you can check the injector transmission operation with your finger.
If no sound is heard or unusual vibration is felt, check the wiring connector, injector or injection signal from the ECM.



2. INSPECT INJECTOR RESISTANCE

- (a) Disconnect the throttle body without disconnecting the water bypass hoses from the air intake chamber.
(See throttle body removal)
- (b) Disconnect the 6 injector connectors.
- (c) Using an ohmmeter, measure the resistance between the injector terminals.

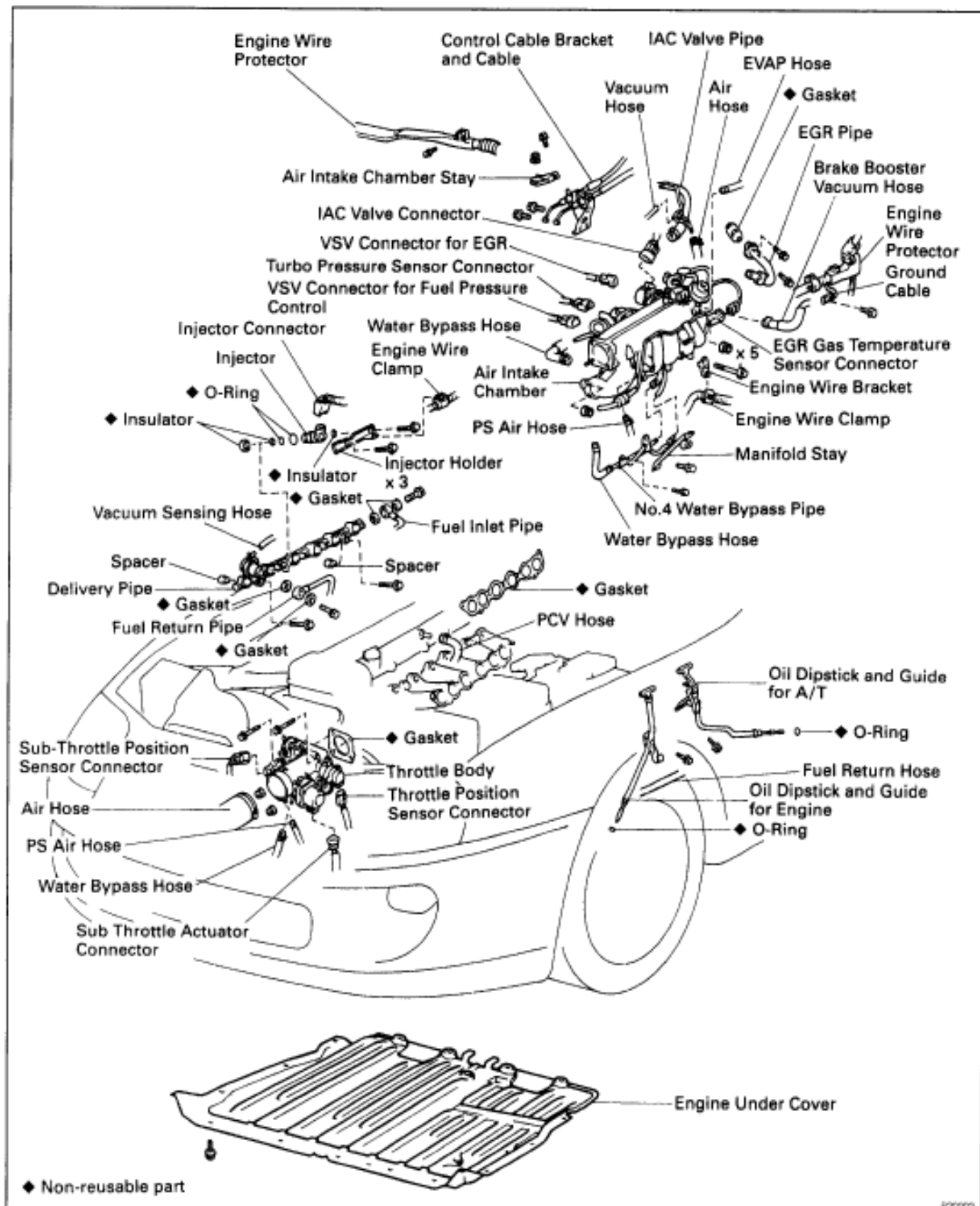
Resistance:

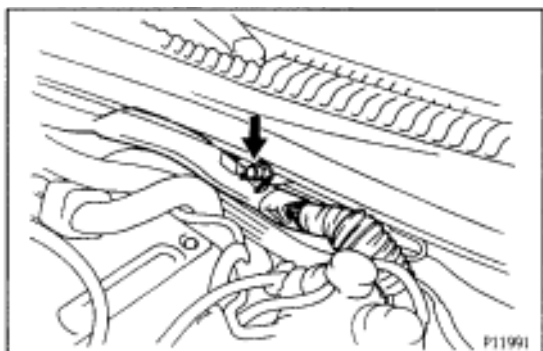
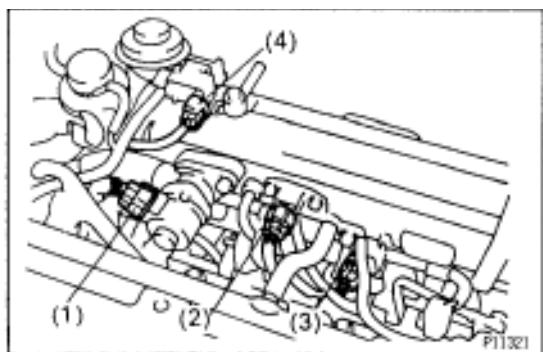
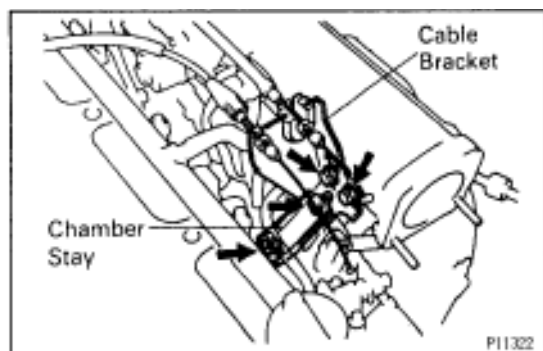
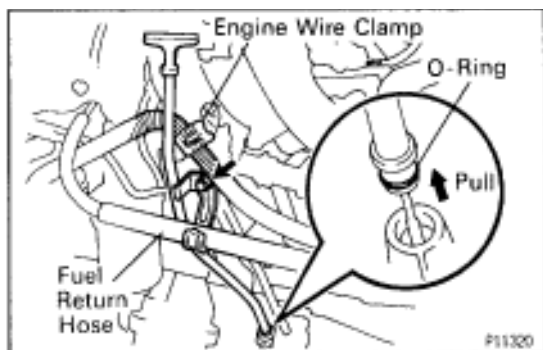
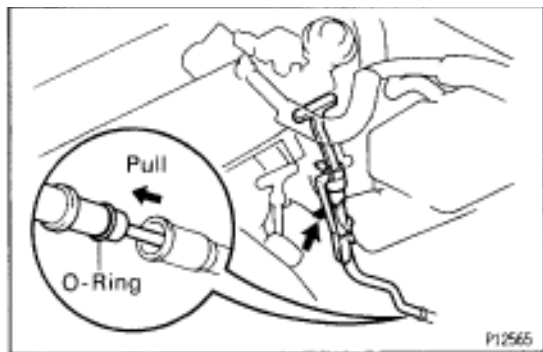
At 20°C (68°F) Approx. 1.95 Ω

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

- (d) Reconnect the 6 injector connectors.
- (e) Reinstall the throttle body to the air intake chamber.
(See throttle body installation)

COMPONENTS FOR REMOVAL AND INSTALLATION

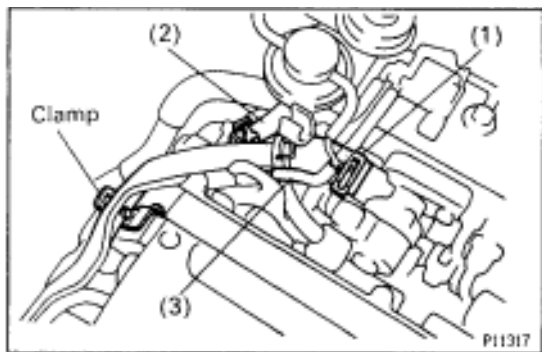




INJECTORS REMOVAL

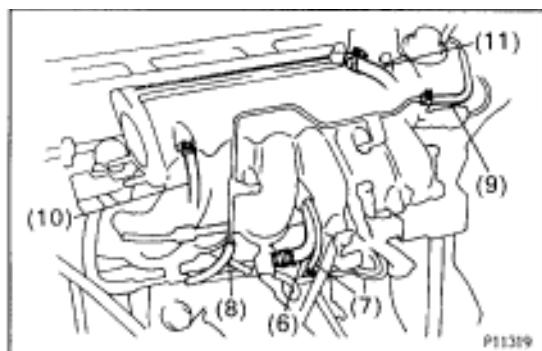
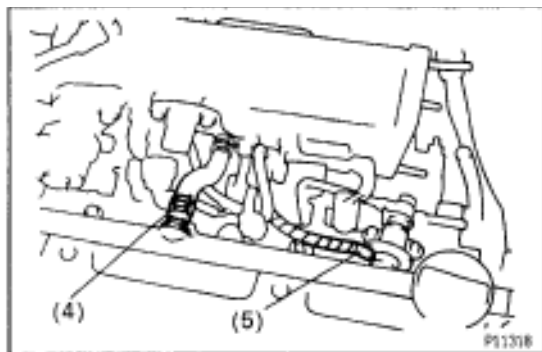
Installation is in the reverse order of removal.

1. **REMOVE ENGINE UNDER COVER**
2. **REMOVE THROTTLE BODY**
(See throttle body removal)
3. **REMOVE OIL DIPSTICK AND GUIDE FOR A/T**
 - (a) Remove the bolt.
 - (b) Pull out the dipstick guide together with the dipstick.
INSTALLATION HINT: Apply soapy water to the O-ring, and push in the dipstick guide.
 - (c) Remove the O-ring from the dipstick guide.
INSTALLATION HINT: Use a new O-ring.
4. **REMOVE OIL DIPSTICK AND GUIDE FOR ENGINE**
 - (a) Disconnect the fuel return hose from the clamp of the dipstick guide.
 - (b) Remove the bolt.
 - (c) Pull out the dipstick guide together with the dipstick.
INSTALLATION HINT: Apply soapy water to the O-ring, and push in the dipstick guide.
 - (d) Remove the O-ring from the dipstick guide.
INSTALLATION HINT: Use a new O-ring.
5. **REMOVE AIR INTAKE CHAMBER STAY**
Remove the bolt, nut and chamber stay.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)
6. **DISCONNECT CONTROL CABLE BRACKET FROM AIR INTAKE CHAMBER**
Remove the 2 bolts, and disconnect the cable bracket from the air intake chamber.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)
7. **DISCONNECT CONNECTORS AND HOSES**
 - (a) Disconnect these connectors:
 - (1) IAC valve connector
 - (2) Turbo pressure sensor connector
 - (3) VSV connector for fuel pressure control
 - (4) VSV connector for EGR
 - (b) Remove the bolt, and disconnect the engine wire protector from the body.



(c) Disconnect these hoses:

- (1) Air hose from IAC valve
Disconnect the IAC valve pipe from the clamp on the cylinder head cover, and disconnect the air hose from the IAC valve.
- (2) Air hose (from air intake chamber) from vacuum pipe on IAC valve pipe
- (3) Air hose for EGR from valve pipe
- (4) PCV hose from PCV valve
- (5) Vacuum sensing hose from fuel pressure regulator



- (6) Water bypass hose (from IAC valve) from No.4 water bypass pipe
- (7) EVAP hose (from air intake chamber) from vacuum pipe on manifold stay
- (8) EVAP hose (from vacuum pipe on No.4 water bypass pipe) from No.2 vacuum pipe
- (9) EVAP hose (from charcoal canister) from No.2 vacuum pipe
- (10) PS air hose from air intake chamber
- (11) Brake booster vacuum hose from union on air intake chamber

8. DISCONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR

- (a) Disconnect the connector from the No.2 vacuum pipe.
- (b) Disconnect the sensor connector from the wiring connector.

9. REMOVE EGR PIPE

- (a) Remove the union bolt holding the EGR pipe to the EGR valve.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

- (b) Remove the 2 bolts, EGR pipe and gasket.
INSTALLATION HINT: Use a new gasket.

Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)

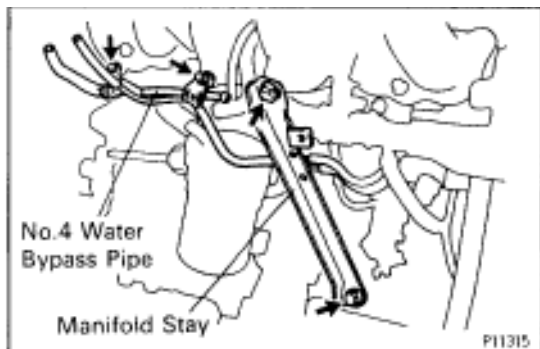
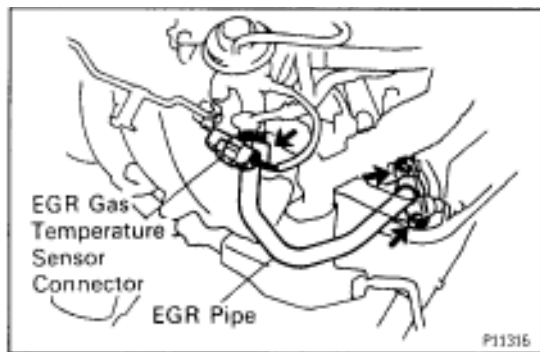
10. REMOVE NO.4 WATER BYPASS PIPE

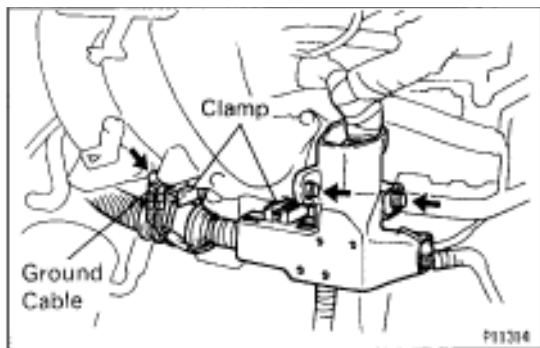
Remove the 2 bolts and water bypass pipe.

11. REMOVE MANIFOLD STAY

Remove the 2 bolts and manifold stay.

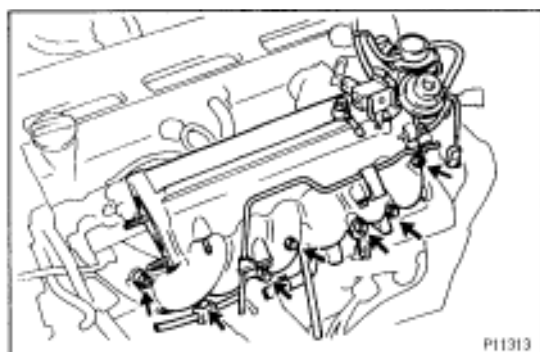
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)





12. REMOVE AIR INTAKE CHAMBER ASSEMBLY

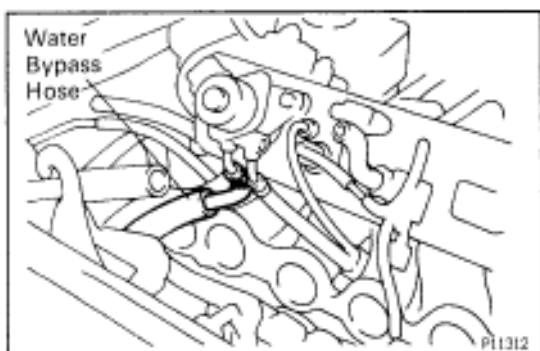
- Remove the bolt, and disconnect the ground cable from the intake manifold.
- Remove the 2 bolts holding the engine wire protector to the intake manifold.
- Disconnect the 2 clamps of the engine wire protector from the brackets.



- Remove the 5 bolts, 2 nuts and engine wire bracket, and disconnect the air intake chamber assembly from the intake manifold.

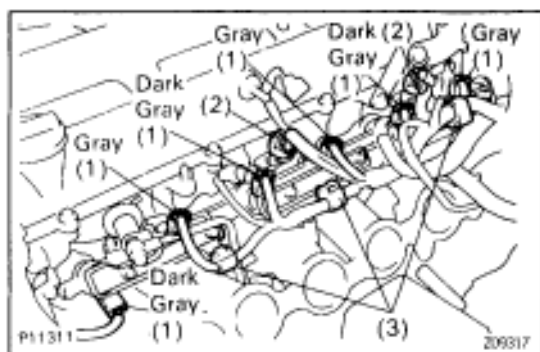
INSTALLATION HINT: Uniformly tighten the bolts and nuts in several passes.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)



- Disconnect the water bypass hose from the IAC valve.
- Remove the gasket.

INSTALLATION HINT: Use a new gasket.



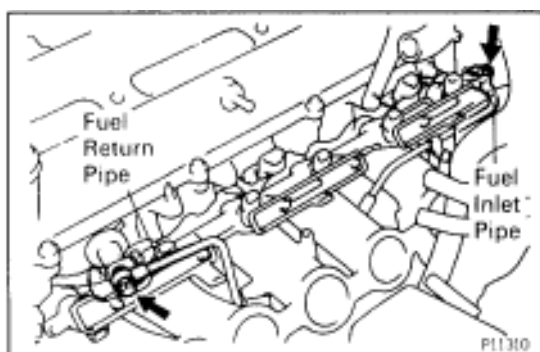
13. DISCONNECT WIRE CLAMPS AND CONNECTORS

Disconnect these connectors and clamps:

- 6 injectors connectors

INSTALLATION HINT: The No.1, No.3 and No.5 injector connectors are dark gray, and the No.2, No.4 and No.6 injector connectors are gray.

- 2 camshaft position sensor connectors
- 3 engine wire clamps from injector holders



14. DISCONNECT FUEL INLET PIPE FROM DELIVERY PIPE

Remove the union bolt and 2 gaskets, and disconnect the inlet pipe from the delivery pipe.

INSTALLATION HINT: Use 2 new gaskets.

Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)

CAUTION:

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

15. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR

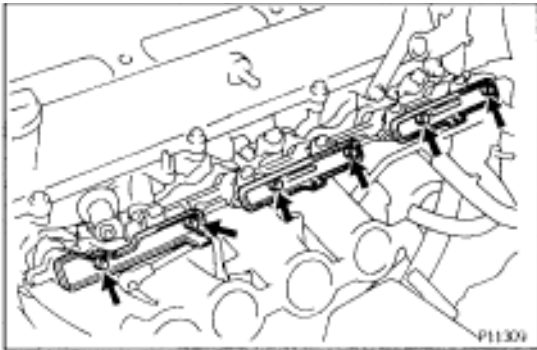
Remove the union bolt and 2 gaskets, and disconnect the fuel pipe from the pressure regulator.

INSTALLATION HINT: Use 2 new gaskets.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

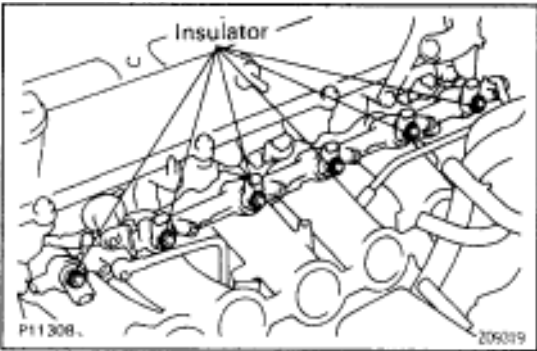
CAUTION:

- Put a shop towel under the pressure regulator.
- Slowly loosen the union bolt.

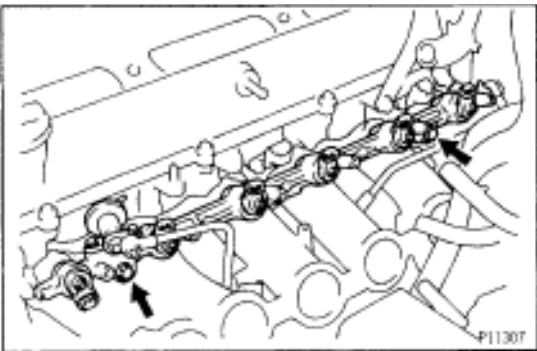
**16. REMOVE DELIVERY PIPE AND INJECTORS**

- (a) Remove the 6 bolts and 3 injector holders.

Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)

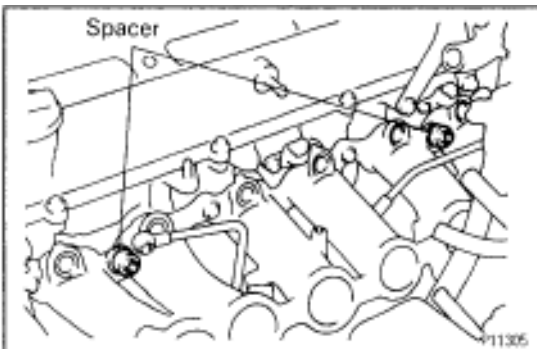


- (b) Remove the 6 insulators from the injectors.
INSTALLATION HINT: Use 6 new insulators.

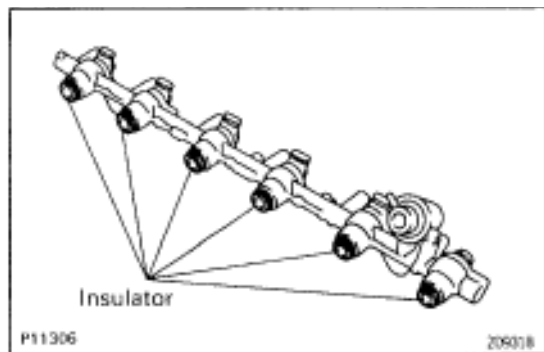


- (c) Remove the 2 bolts, the delivery pipe and 6 injectors assembly.

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



- (d) Remove the 2 spacers from the intake manifold.

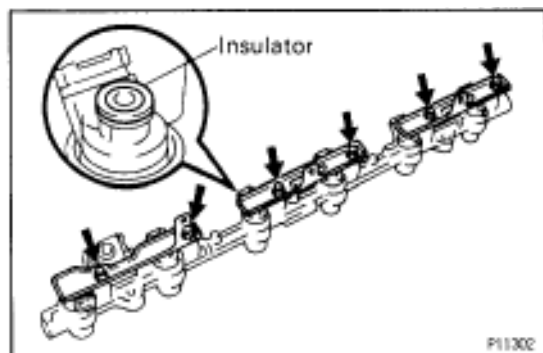
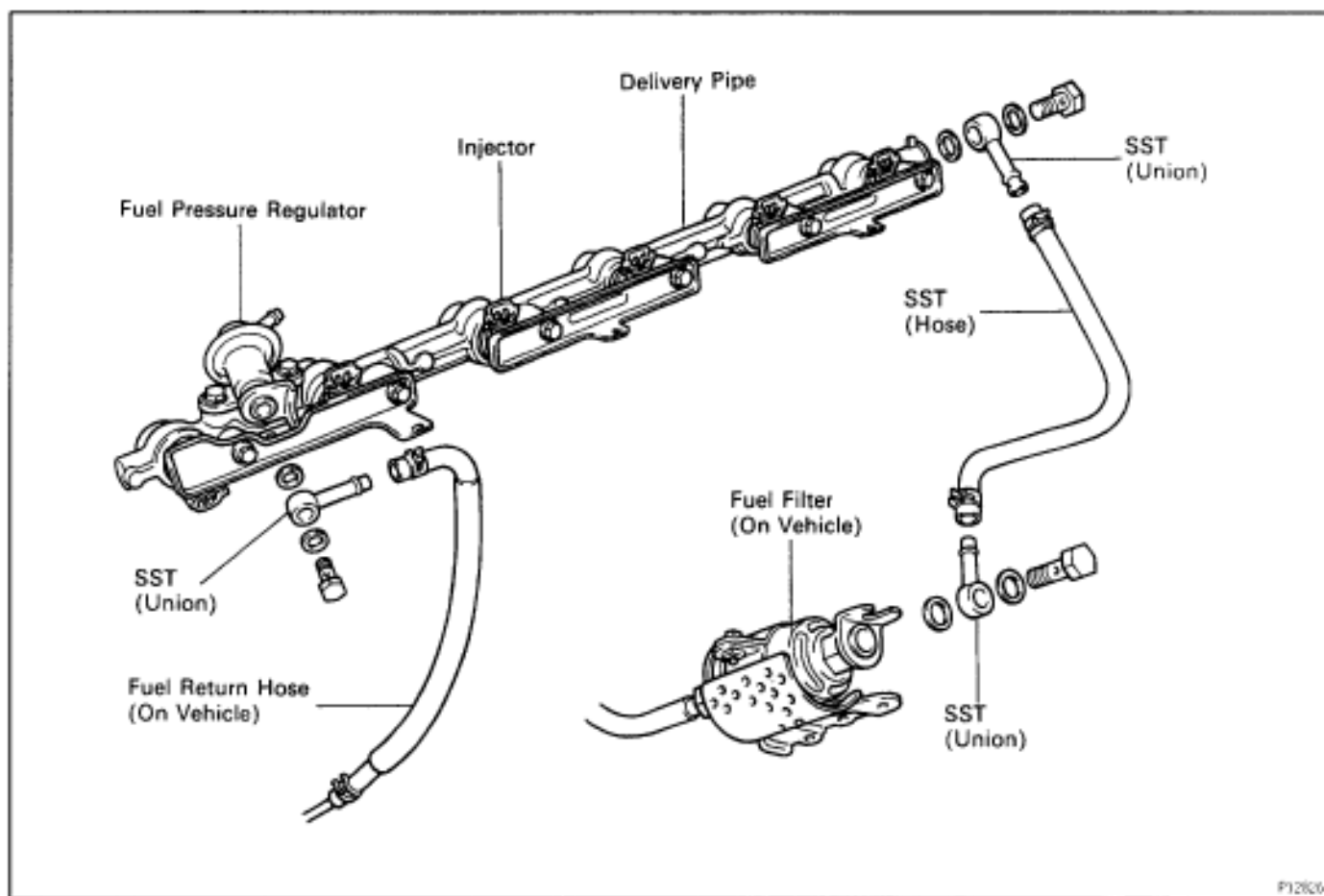


- (e) Remove the 6 insulators from the delivery pipe.
 INSTALLATION HINT: Use 6 new insulators.

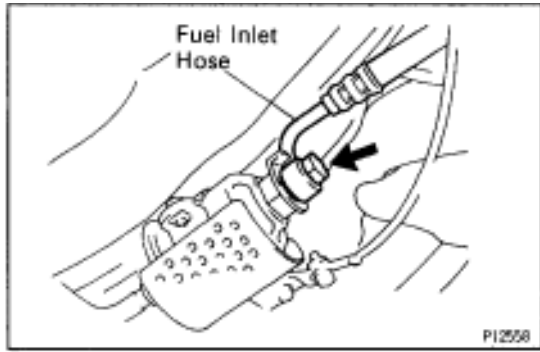
INJECTORS INSPECTION

1. INSPECT INJECTOR INJECTION

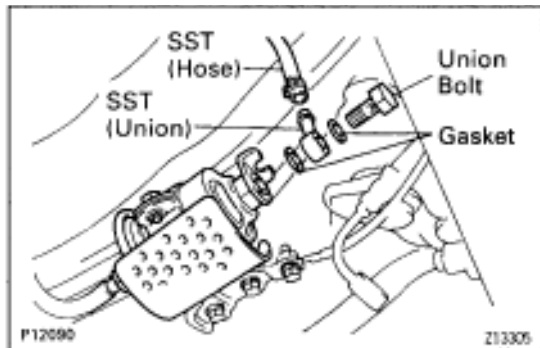
CAUTION: Keep injector clear of sparks during the test.



- (a) Install the insulator to each injector.
 (b) Install the 3 injector holders with the 6 bolts.
 Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)



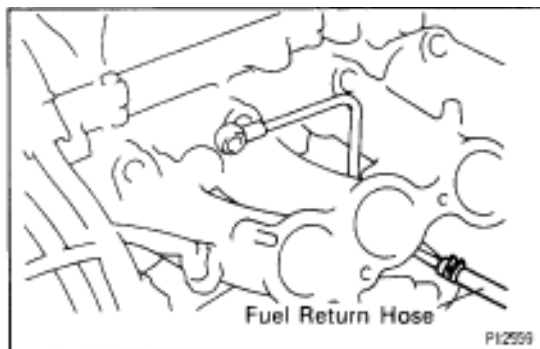
- (c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.



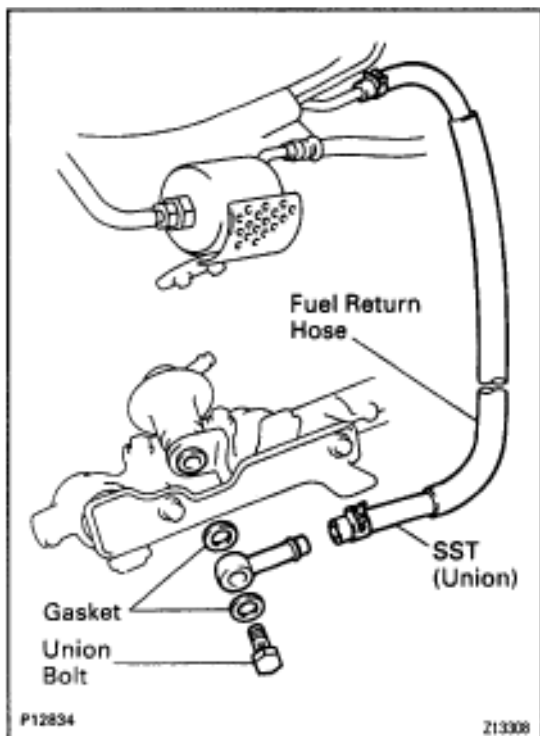
- (d) Connect SST (hose) to the fuel filter outlet with SST (union), the 2 gaskets and union bolt.

SST 09268-41045 (90405-09015)

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

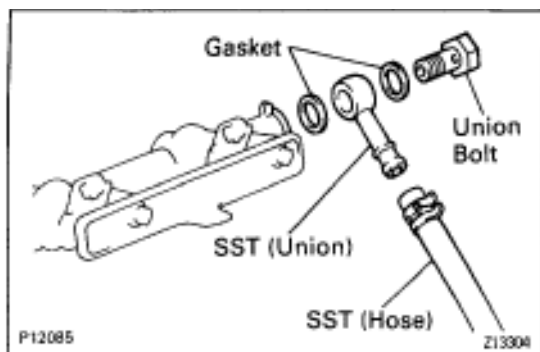


- (e) Disconnect the fuel return hose from the fuel return pipe.

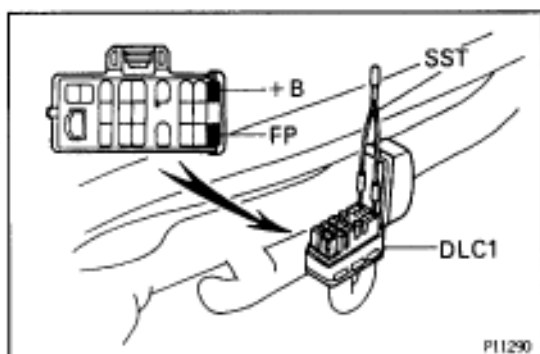


- (f) Connect the fuel return hose to the fuel outlet of the pressure regulator on the delivery pipe with SST (union), the 2 gaskets and union bolt.

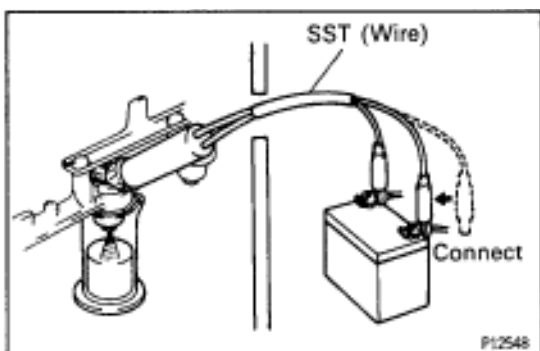
SST 09268-41045 (09268-41070)



- (g) Connect SST (hose) to the fuel inlet of the delivery pipe with SST (union), the 2 gaskets and union bolt.
SST 09268-41045 (90405-09015)
- (h) Put the injector into the graduated cylinder.



- (i) Using SST, connect terminals +B and FP of the DLC 1.
SST 09843-18020
- (j) Reconnect the negative (-) terminal cable to the battery.
- (k) Turn the ignition switch ON.
NOTICE: Do not start the engine.



- (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 09842-30060

Injection volume:

124-144 cm³ (7.6-8.8 cu in.) per 15 sec.

Difference between each injector:

10 cm³ (0.6 cu in.) or less

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

2. INSPECT LEAKAGE

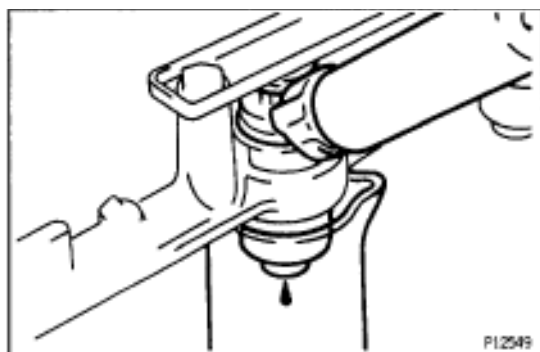
- (a) In the condition above, disconnect the tester probes of SST (wire) from the battery and check the fuel leakage from the injector.

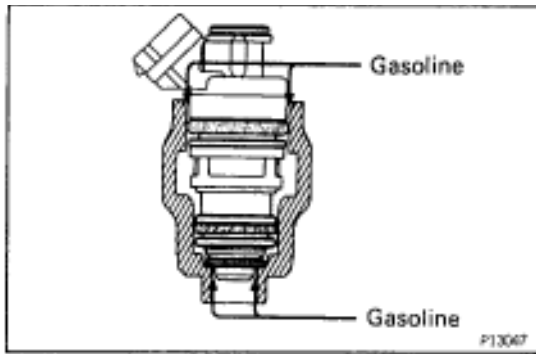
SST 09842-30060

Fuel drop:

One drop or less per minute

- (b) Disconnect the negative (-) terminal cable from the battery.
- (c) Remove the SST.
SST 09268-41045 and 09843-18020
- (d) Reconnect the fuel inlet hose to the fuel filter with 2 new gaskets and the union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
- (e) Reconnect the fuel return hose to the fuel return pipe.
- (f) Remove the 6 bolts, 3 injector holders and 6 insulators.

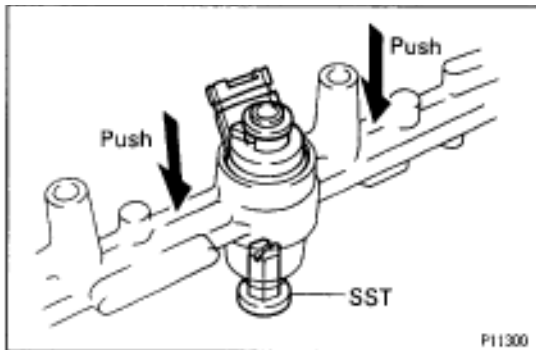




INJECTORS REPLACEMENT

1. REMOVE INJECTORS

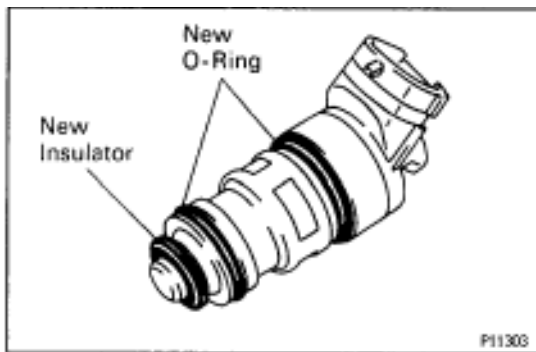
- (a) Apply gasoline between the delivery pipe and injectors.



- (b) Using SST, lift up the 6 injectors.

SST 09268-74010

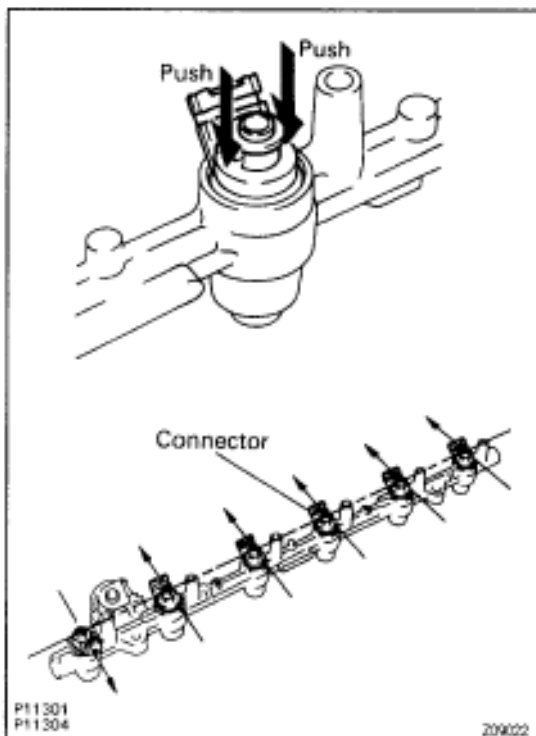
- (c) Remove the insulator and 2 O-rings from each injector.



2. REINSTALL INJECTORS

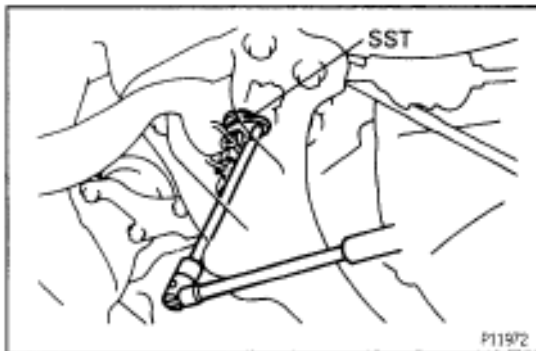
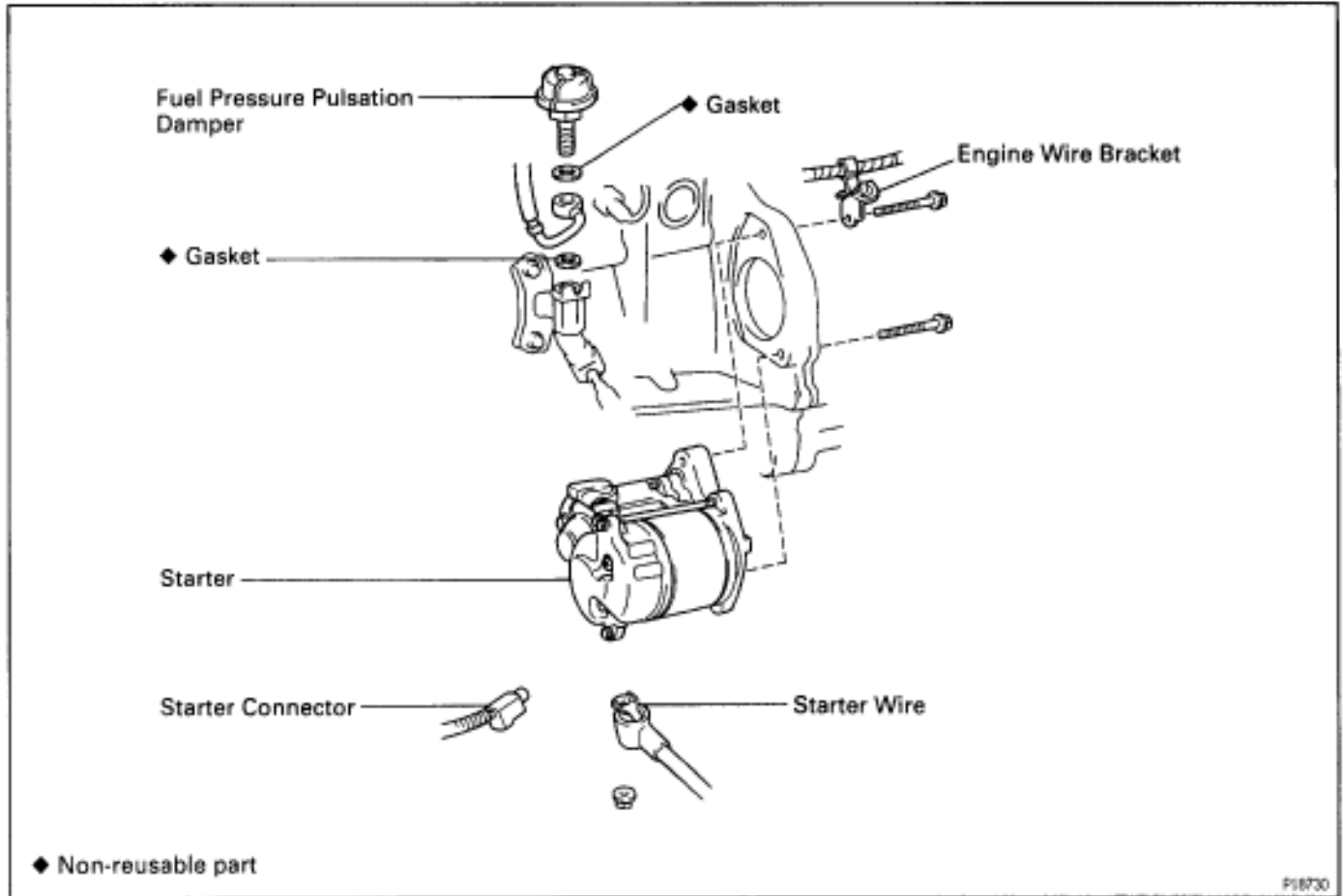
- (a) Apply a light coat of gasoline to 2 new O-rings.

- (b) Install the 2 O-rings and new insulator to each injector.



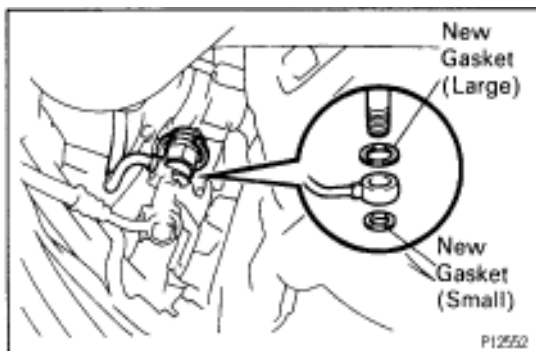
- (c) Push in the 6 injectors so that the injector connectors are positioned as shown in the illustration.

FUEL PRESSURE PULSATION DAMPER COMPONENTS FOR REMOVAL AND INSTALLATION



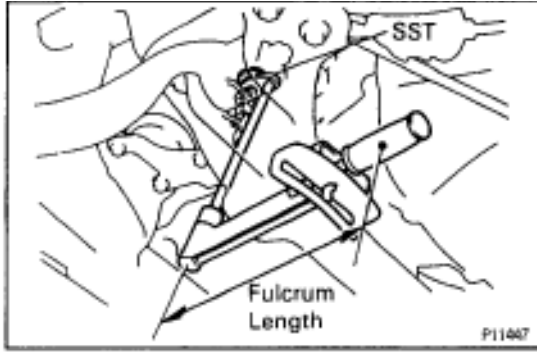
FUEL PRESSURE PULSATION DAMPER REMOVAL

1. REMOVE STARTER
(See starter removal in Starting System)
2. REMOVE FUEL PRESSURE PULSATION DAMPER
 - (a) Remove the pulsation damper and upper gasket.
 - (b) Disconnect the fuel inlet pipe from the fuel pipe support, and remove the lower gasket.



FUEL PRESSURE PULSATION DAMPER INSTALLATION

1. INSTALL FUEL PRESSURE PULSATION DAMPER
 - (a) Install the fuel inlet pipe and pulsation damper with 2 new gaskets.
HINT: Different sized gaskets are used for the upper (large size) and lower (small size).



- (b) Using SST, tighten the pulsation damper.
SST 09612-24014 (09617-24011)

Torque:

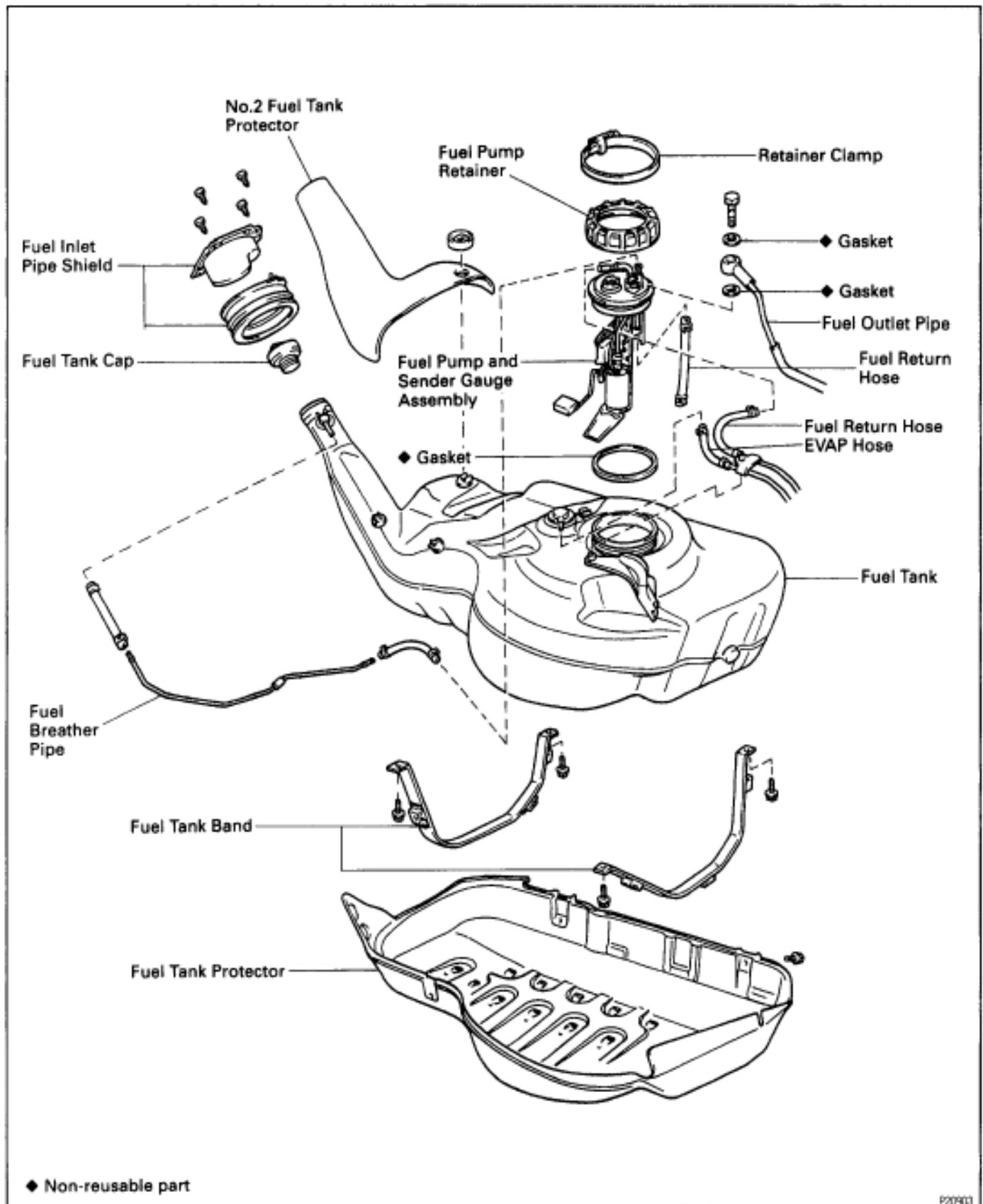
41 N·m (420 kgf·cm, 30 ft·lbf)

35 N·m (350 kgf·cm, 25 ft·lbf) for SST

HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

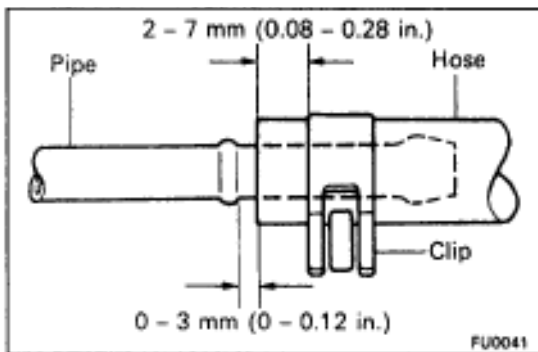
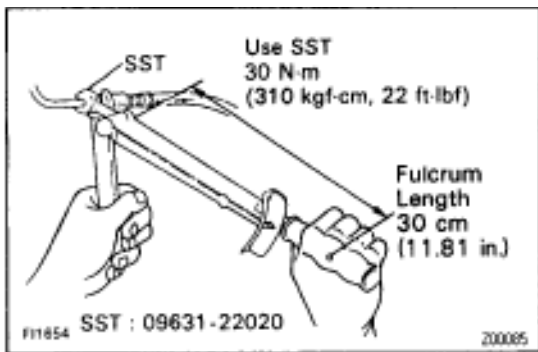
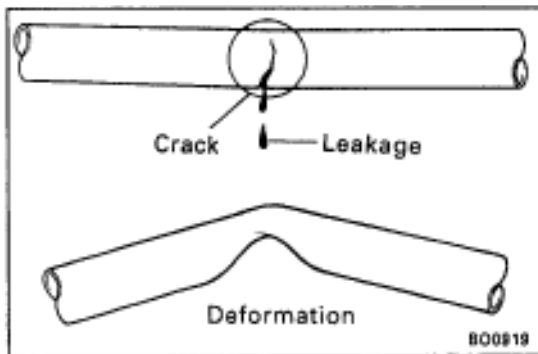
2. **INSTALL STARTER**
(See starter installation in Starting System)
4. **CHECK FOR FUEL LEAKS**
(See item 5 in fuel system in precaution)

FUEL TANK AND LINE COMPONENTS



PRECAUTIONS

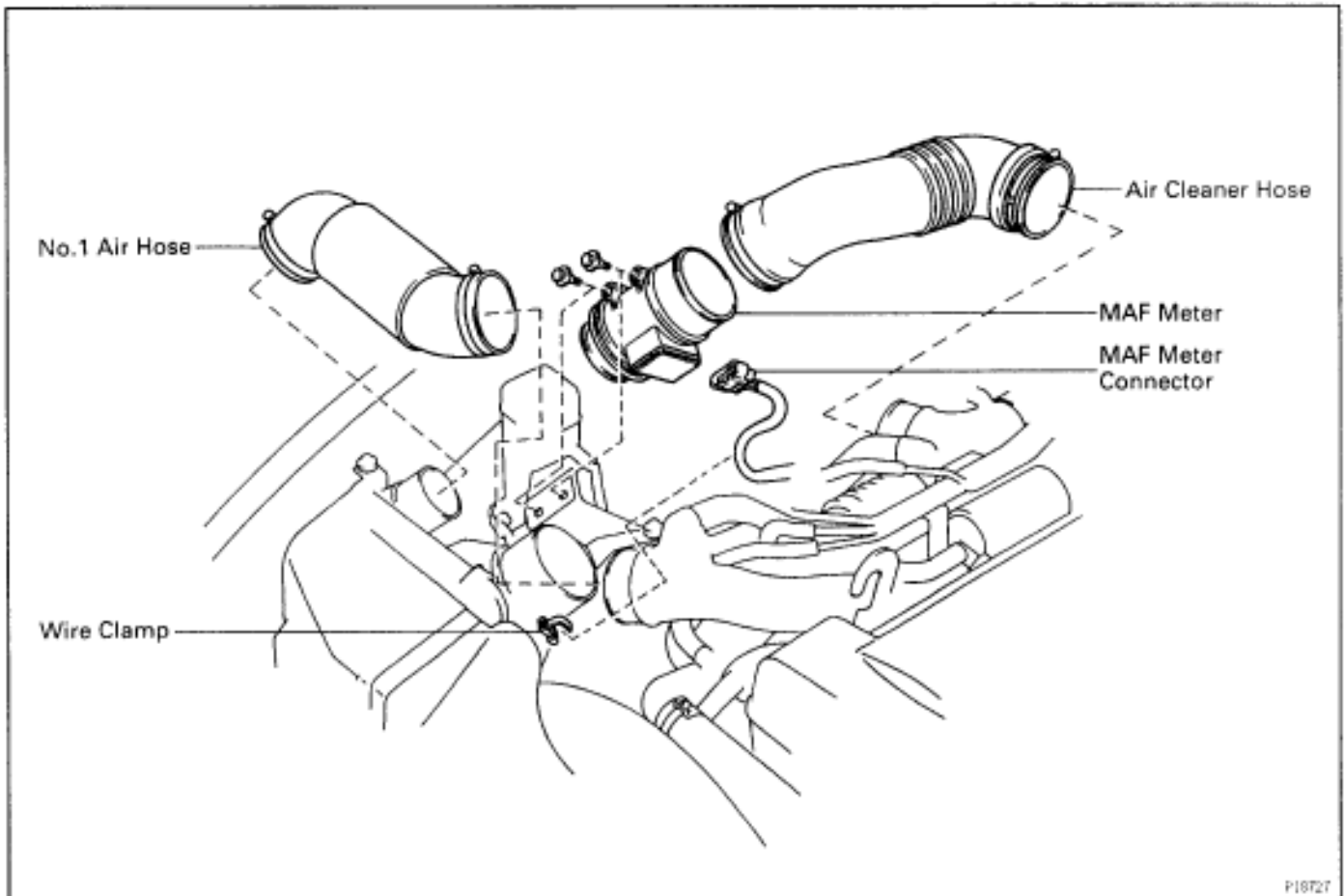
1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.



FUEL LINES AND CONNECTIONS INSPECTION

- (a) Check the fuel lines for cracks or leakage, and all connections for deformation.
- (b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
- (c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
- (d) Check the filler neck for damage or fuel leakage.
- (e) Hose and tube connections are as shown in the illustration. If a problem is found, repair or replace the part as necessary.

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



MAF METER REMOVAL

Installation is in the reverse order of removal.

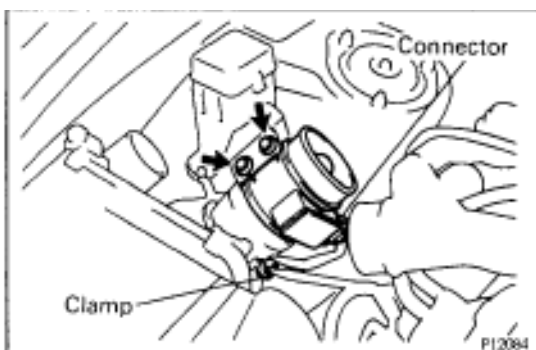
1. REMOVE NO.1 AIR HOSE
2. REMOVE AIR CLEANER HOSE

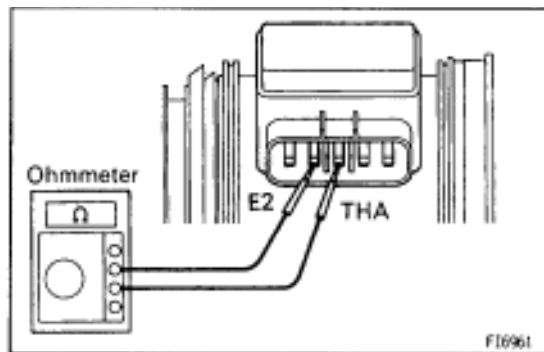
3. REMOVE MAF METER

- (a) Remove the 2 bolts, and disconnect the MAF meter from the air cleaner case.

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

- (b) Disconnect the MAF meter wire from the wire clamp on the air cleaner case.
- (c) Disconnect the MAF meter connector, and remove the MAF meter.





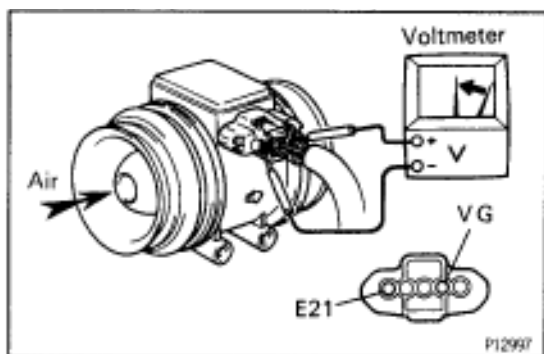
MAF METER INSPECTION

1. INSPECT MAF METER RESISTANCE

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

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

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

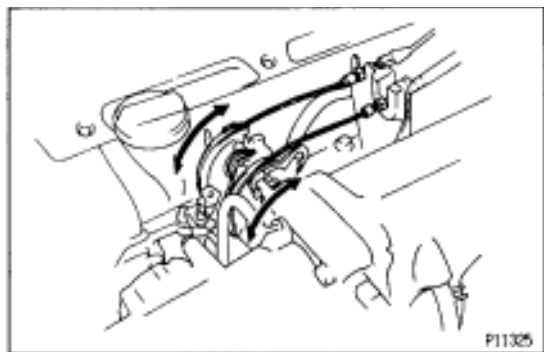


2. INSPECT MAF METER OPERATION

- Connect the MAF meter connector.
- Connect the negative (–) terminal cable to the battery.
- Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E21.
- Turn the ignition switch ON.
- Blow air into the MAF meter, and check that the voltage fluctuates.

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

- Turn the ignition switch OFF.
- Disconnect the negative (–) terminal cable from the battery.
- Disconnect the MAF meter connector.

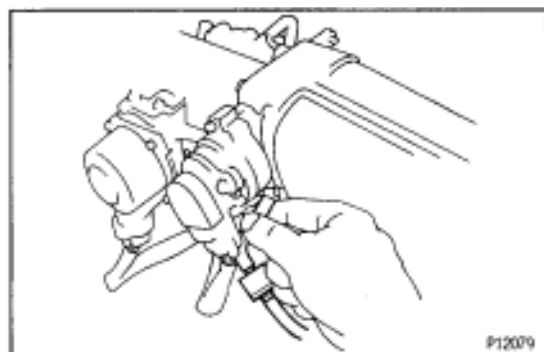


THROTTLE BODY ON-VEHICLE INSPECTION

Throttle Body

INSPECT THROTTLE BODY

- (a) Check that the throttle linkage moves smoothly.



- (b) Check the vacuum at the purge port.
- Start the engine.
 - Check the vacuum with your finger.

Port name	At idle	At 3,000 rpm
Purge	No vacuum	Vacuum

Dashpot

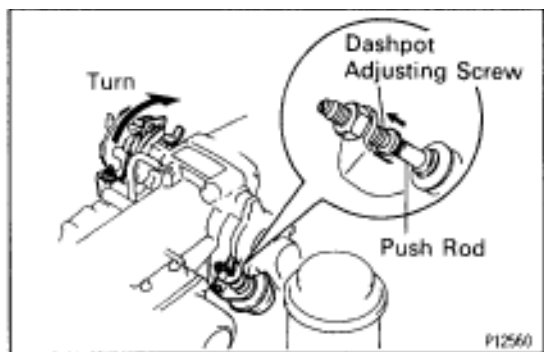
1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CHECK IDLE SPEED

Idle speed (Transmission in neutral position):

650 ± 50 rpm



3. CHECK AND ADJUST DASHPOT SETTING SPEED

- (a) Disconnect the control cables from the throttle body.
- (b) Turn the throttle linkage until the dashpot adjusting screw starts to separate from the push rod. Then keep the throttle linkage at that position.
- (c) Check that the dashpot is set.

Dashpot setting speed:

$2,300 \pm 400$ rpm

- (d) Reconnect the control cables to the throttle body.

4. CHECK VTV OPERATION

- (a) Maintain the engine speed at 3,500 rpm.
- (b) Release the throttle valve, and check that the engine returns to idle in a few seconds.

Throttle Opener

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CHECK IDLE SPEED

Idle speed (Transmission in neutral position):

650 ± 50 rpm

3. CHECK THROTTLE OPENER SETTING SPEED

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

(b) Maintain the engine speed at 2,500 rpm.

(c) Release the throttle valve.

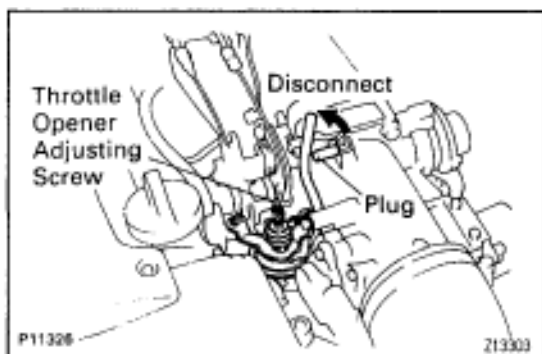
(d) Check that the throttle opener is set.

Throttle opener setting speed:

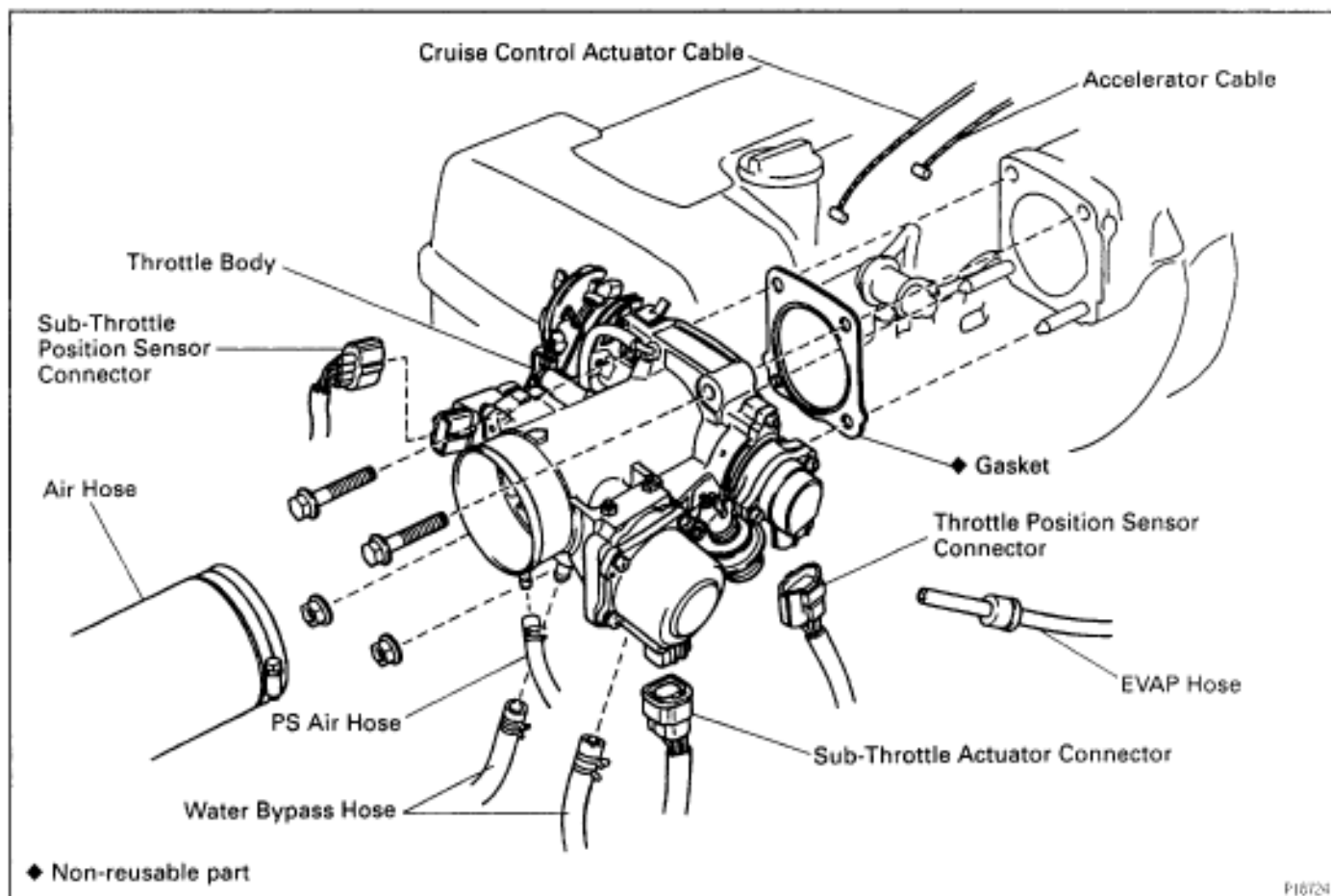
$1,500 \pm 200$ rpm

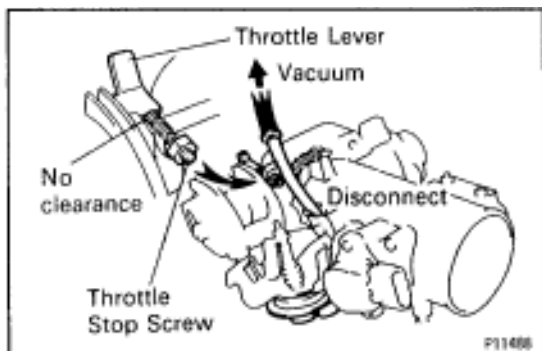
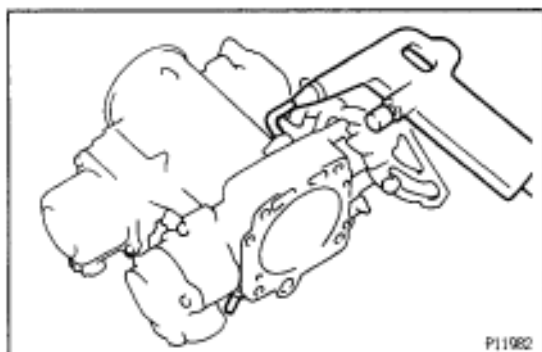
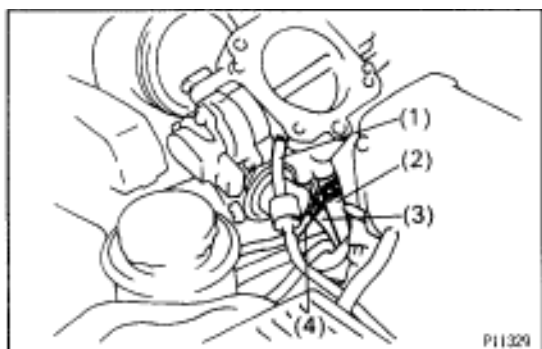
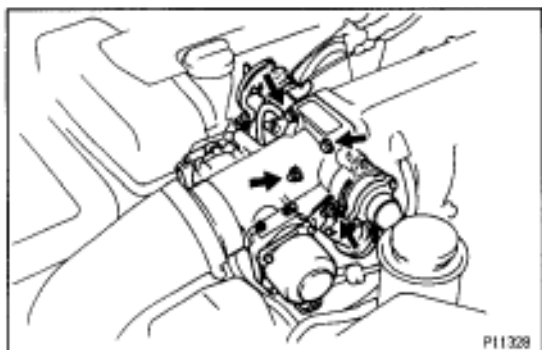
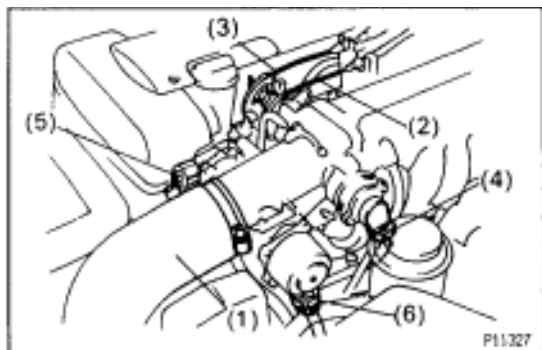
(e) Adjust the throttle opener setting speed by turning the throttle opener adjusting screw.

(f) Reconnect the throttle opener vacuum hose to the throttle body.



COMPONENTS FOR REMOVAL AND INSTALLATION





THROTTLE BODY REMOVAL

Installation is in the reverse order of removal.

1. DRAIN ENGINE COOLANT

2. REMOVE THROTTLE BODY

- (a) Disconnect the hose, cables and connectors from the throttle body:

- (1) Air hose
- (2) Accelerator cable
- (3) Cruise control actuator cable
- (4) Throttle position sensor connector
- (5) Sub-throttle position sensor connector
- (6) Sub-throttle actuator connector

- (b) Remove the 2 bolts and 2 nuts, and disconnect the throttle body from the air intake chamber.

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

- (c) Remove the gasket.

INSTALLATION HINT: Use a new gasket.

- (d) Disconnect these hoses from the throttle body, and remove the throttle body:

- (1) EVAP hose
- (2) Water bypass hose (from No.4 water bypass pipe)
- (3) Water bypass hose (from cylinder head)
- (4) PS air hose

THROTTLE BODY INSPECTION

Throttle Body

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 sensors, actuator, dashpot and throttle opener.

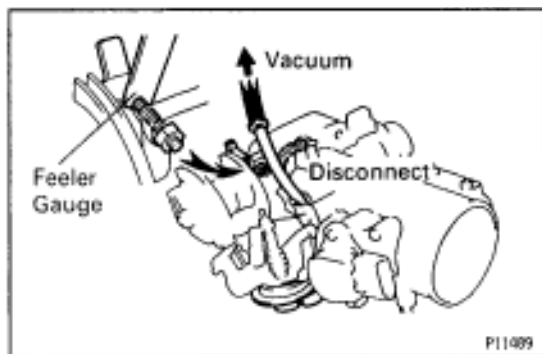
2. INSPECT THROTTLE VALVE

- (a) Disconnect the throttle opener vacuum hose from the throttle body.

- (b) Apply vacuum to the throttle opener.

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

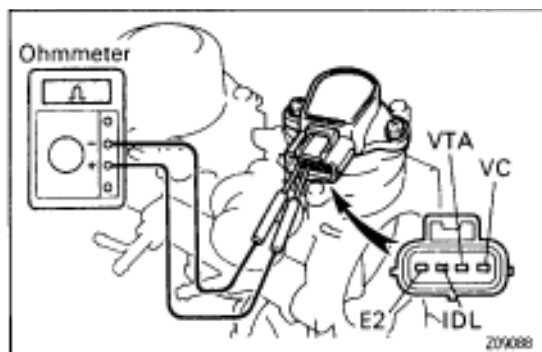
- (d) Reconnect the vacuum hose to the throttle body.



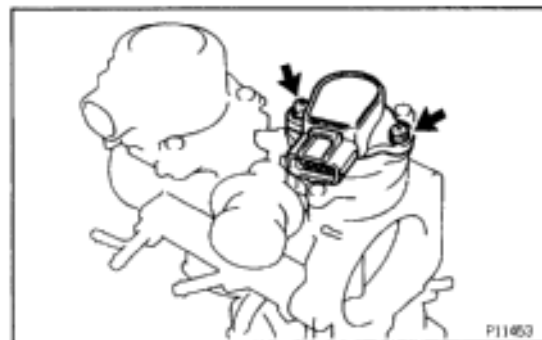
Throttle Position Sensor

1. INSPECT THROTTLE POSITION SENSOR

- (a) Disconnect the throttle opener vacuum hose from the throttle body.
- (b) Apply vacuum to the throttle opener.
- (c) Insert a 0.54 mm (0.021 in.) or 0.70 mm (0.028 in.) feeler gauge between the throttle stop screw and stop lever.
- (d) Using an ohmmeter, measure the resistance between each terminal.

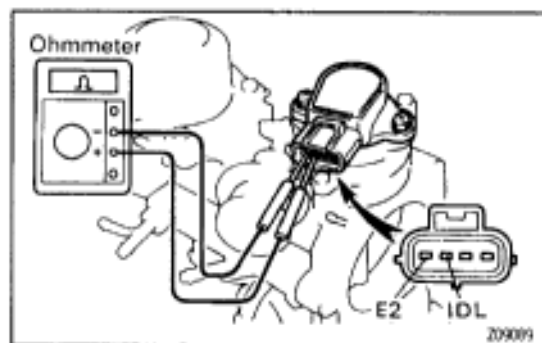
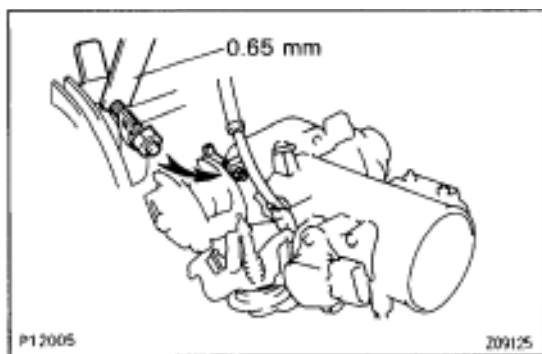


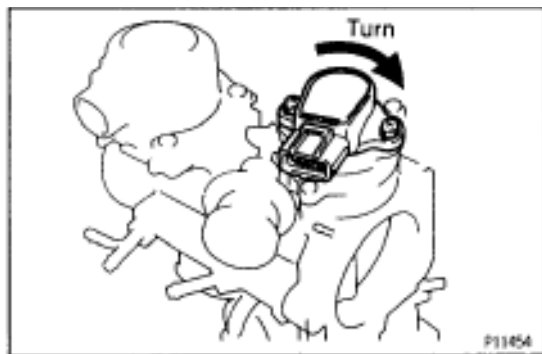
Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA-E2	0.34–6.3 Ω
0.54 mm (0.021 in.)	IDL-E2	0.5 k Ω or less
0.70 mm (0.028 in.)	IDL-E2	Infinity
Throttle valve fully Open	VTA-E2	2.4–11.2 k Ω
–	VC-E2	3.1–7.2 k Ω



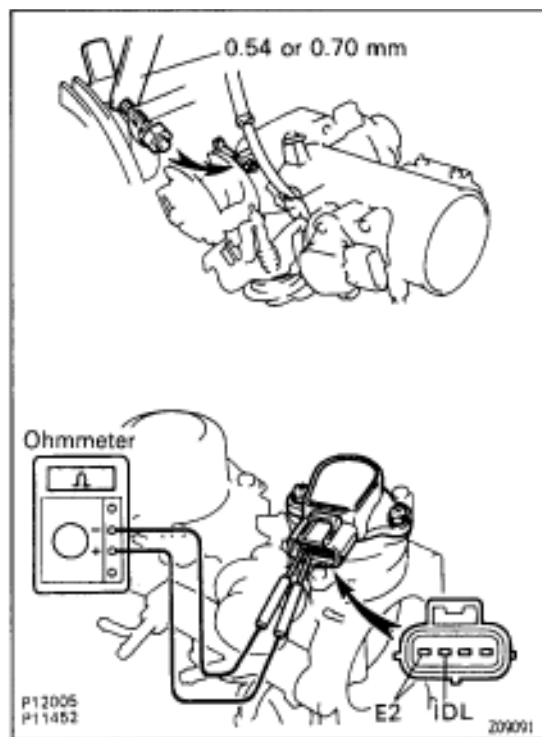
2. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

- (a) Loosen the 2 set screws of the sensor.
- (b) Insert a 0.65 mm (0.026 in.) feeler gauge between the throttle stop screw and stop lever.
- (c) Connect the tester probe of an ohmmeter to the terminals IDL and E2 of the sensor.





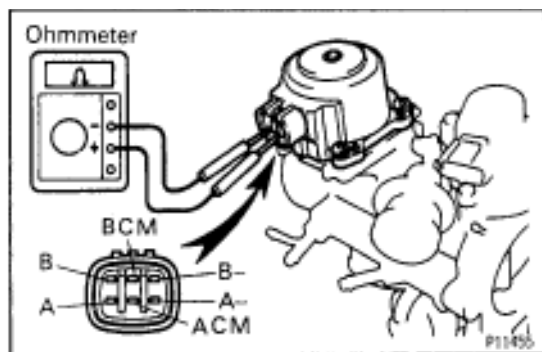
- (d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.



- (e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL-E2)
0.54 mm (0.021 in.)	Continuity
0.70 mm (0.028 in.)	No continuity

- (f) Reconnect the vacuum hose to the throttle body.



Sub-Throttle Actuator, Sub-Throttle Valve and Throttle Position Sensor

1. INSPECT SUB-THROTTLE ACTUATOR

Using an ohmmeter, measure the resistance between the terminals (ACM to A and A-, BCM to B and B-).

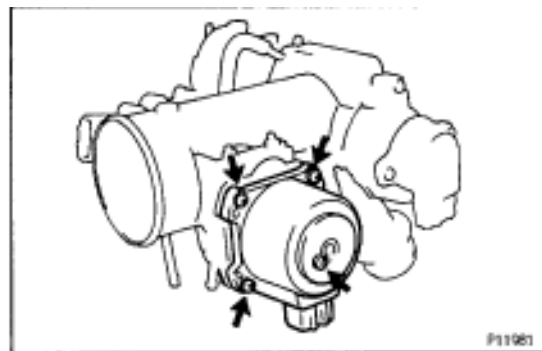
Resistance:

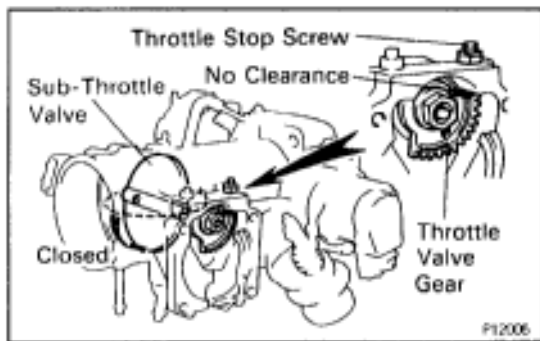
0.82–0.98 Ω at 20°C (68°F)

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

2. REMOVE SUB-THROTTLE ACTUATOR

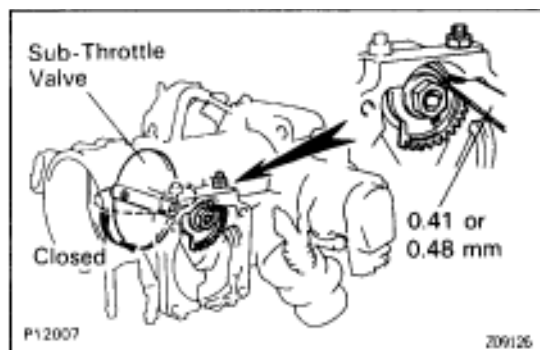
Remove the 4 screws and sub-throttle actuator.





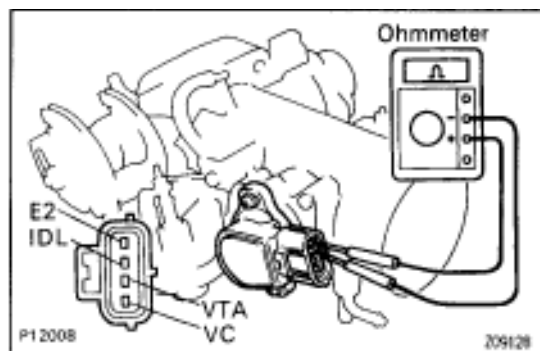
3. INSPECT SUB-THROTTLE VALVE

Check that there is no clearance between the throttle stop screw and throttle valve gear when the subthrottle valve is fully closed.



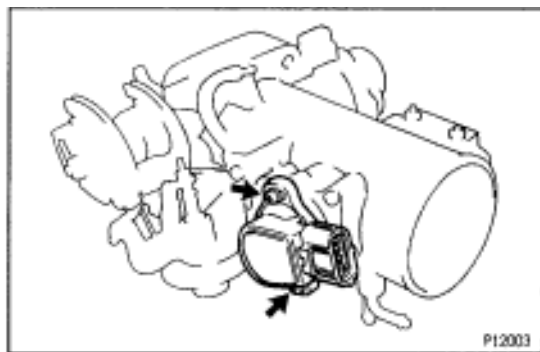
4. INSPECT SUB-THROTTLE POSITION SENSOR

- Set the sub-throttle valve to fully closed position.
- Insert a 0.41 mm (0.016 in.) or 0.48 mm (0.019 in.) feeler gauge between the throttle stop screw and throttle valve gear.



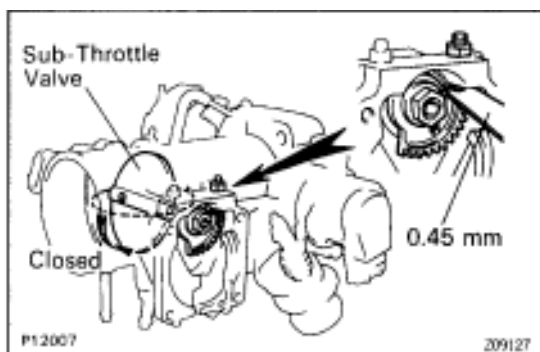
- Using an ohmmeter, measure the resistance between terminals.

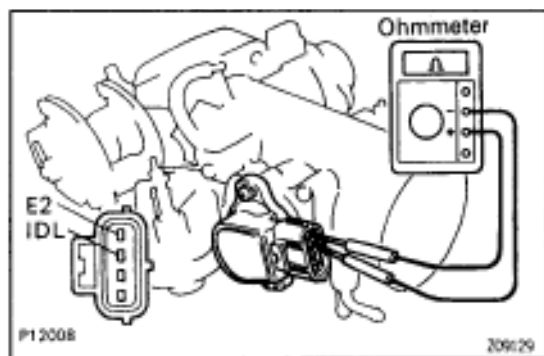
Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA-E2	0.3–6.3 kΩ
0.41 mm (0.016 in.)	IDL-E2	0.5 kΩ or less
0.48 mm (0.019 in.)	IDL-E2	Infinity
Throttle valve fully open	VTA-E2	2.0–10.8 kΩ
–	VC-E2	3.5–6.5 kΩ



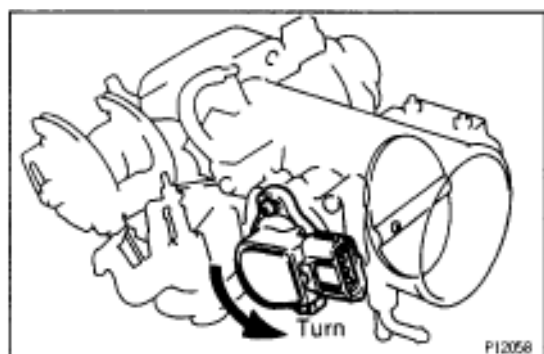
5. IF NECESSARY, ADJUST SUB-THROTTLE POSITION SENSOR

- Loosen the 2 set screws of the sensor.
- Set the sub-throttle valve to fully closed position.
- Insert a 0.45 mm (0.018 in.) feeler gauge, between the throttle stop screw and throttle valve gear.

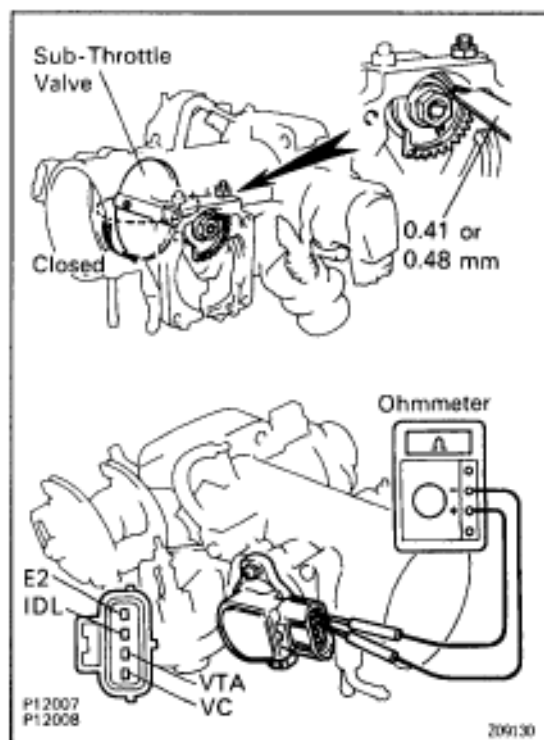




- (d) Connect the tester probe of an ohmmeter to the terminals IDL and E2 of the sensor.

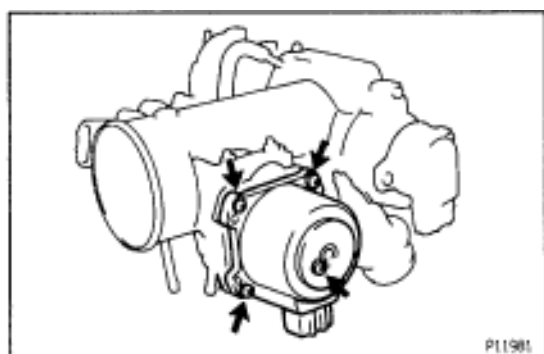


- (e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.



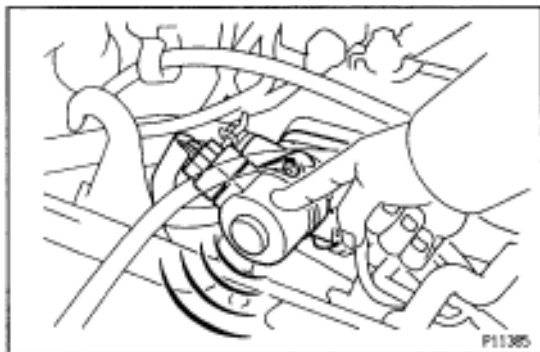
- (f) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL-E2)
0.41 mm (0.016 in.)	Continuity
0.48 mm (0.019 in.)	No continuity



6. REINSTALL SUB-THROTTLE ACTUATOR

Install the sub-throttle actuator with the 4 screws.



IDLE AIR CONTROL (IAC) VALVE ON-VEHICLE INSPECTION

1. INSPECT IAC VALVE FOR OPERATING SOUND

Check that there is a clicking sound immediately after stopping the engine.

If operation is not as specified, check the IAC valve, wiring and ECM.

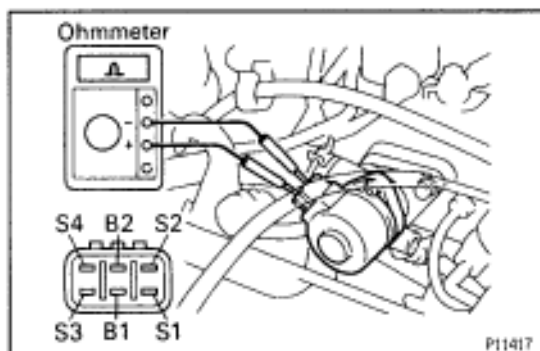
2. INSPECT IAC VALVE RESISTANCE

Using an ohmmeter, measure the resistance between the terminals (B1 (or B2) to others).

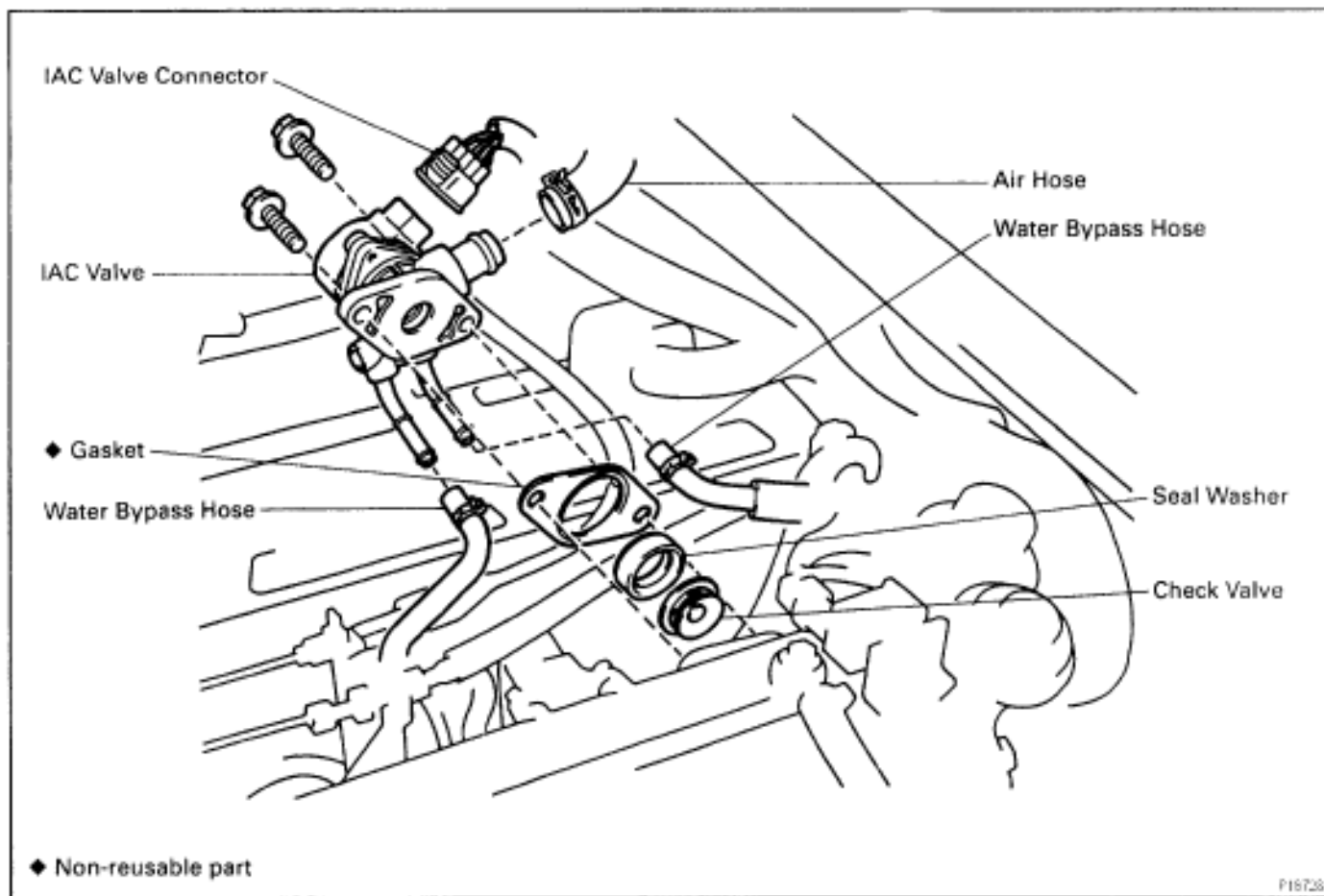
Resistance:

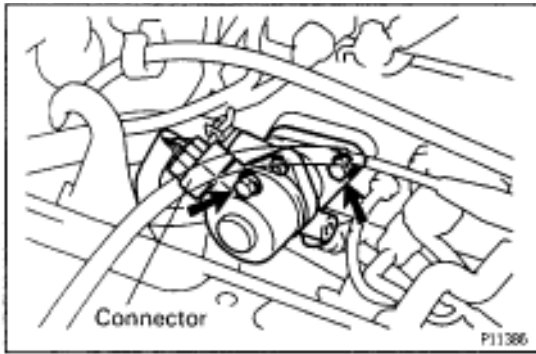
At 20°C (68°F) 18–24 Ω

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



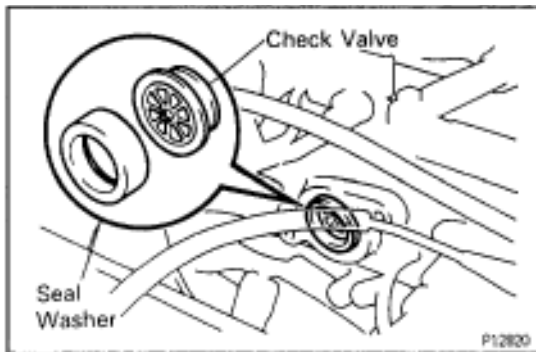
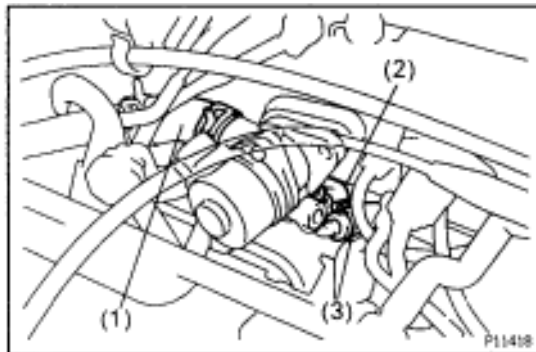
COMPONENTS FOR REMOVAL AND INSTALLATION





IAC VALVE REMOVAL

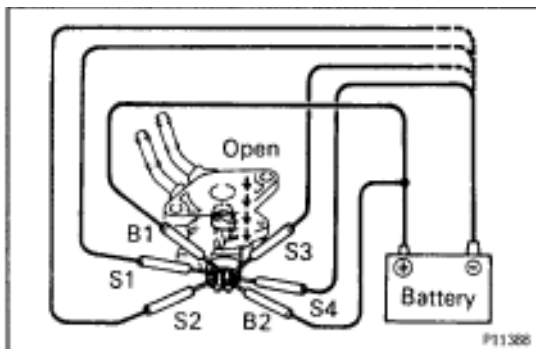
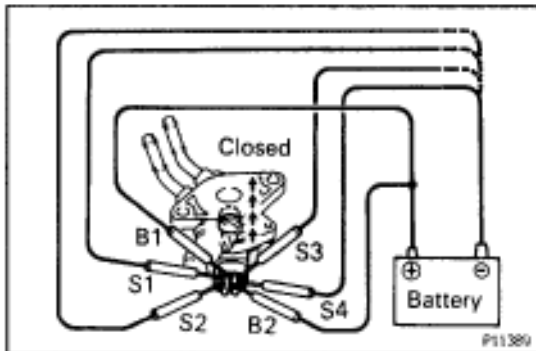
1. **DRAIN ENGINE COOLANT**
2. **DISCONNECT IAC VAVE CONNECTOR**
3. **REMOVE IAC VALVE**
 - (a) Remove the 2 bolts, and disconnect the IAC valve from the air intake chamber.
 - (b) Remove the gasket.
- (c) Disconnect these hoses from the IAC valve, and remove the IAC valve:
 - (1) Air hose
 - (2) Water bypass hose (from No.2 water bypass pipe)
 - (3) Water bypass hose (from No.4 water bypass pipe)
- (d) Remove the seal washer and check valve.

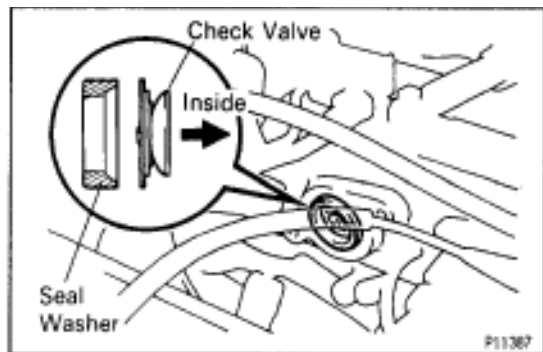


IAC VALVE INSPECTION

INSPECT IAC VALVE OPERATION

- (a) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S1-S2-S3-S4-S 1 in sequence, and check that the valve moves toward the closed position.
- (b) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S4-S3-S2-S1-S 4 in sequence, check that the valve moves toward the open position.
If operation is not as specified, replace the IAC valve.





IAC VALVE INSTALLATION

1. INSTALL IAC VALVE

- (a) Install the check valve and seal washer.

NOTICE: Be careful of the check valve and seal washer installation direction.

- (b) Connect these hoses:

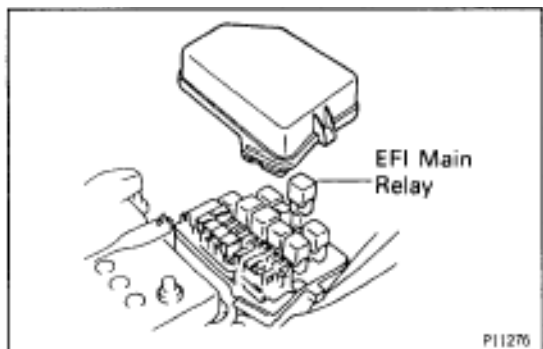
- Air hose
- Water bypass hose (from No.2 water bypass pipe)
- Water bypass hose (from No.4 water bypass pipe)

- (c) Install a new gasket and the IAC valve with the 2 bolts.

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

2. CONNECT IAC VALVE CONNECTOR

3. FILL WITH ENGINE COOLANT

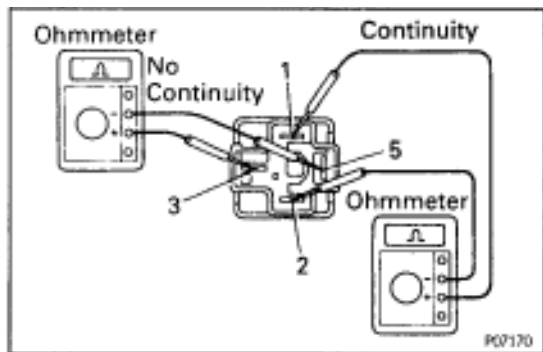


EFI MAIN RELAY

EFI MAIN RELAY INSPECTION

1. REMOVE EFI MAIN RELAY

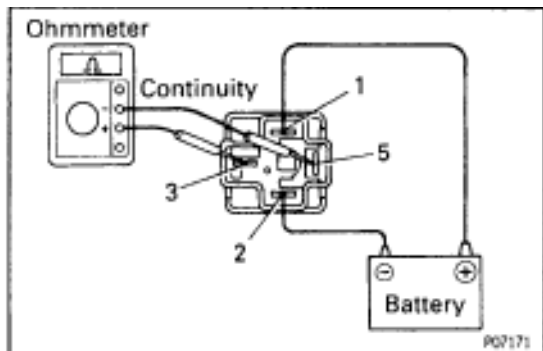
LOCATION: In the engine compartment relay box.



2. INSPECT EFI MAIN RELAY

A. Inspect relay continuity

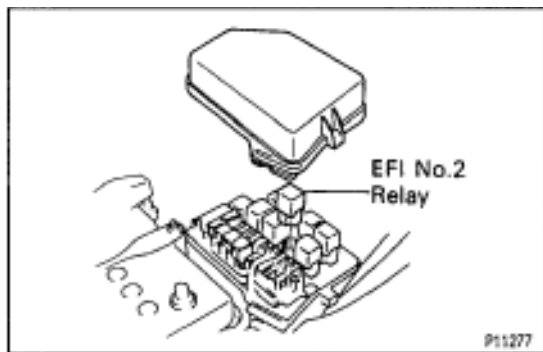
- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
- (b) Check that there is no continuity between terminals 3 and 5. If continuity is not as specified, replace the relay.



B. Inspect relay operation

- (a) Apply battery 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

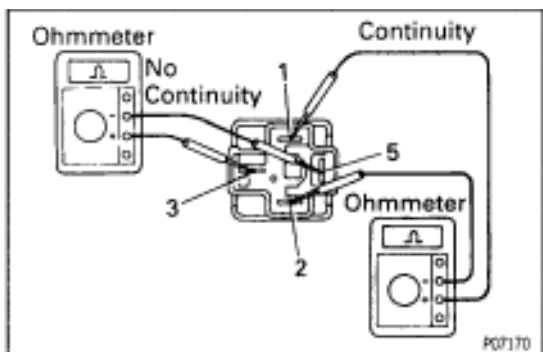


EFI NO.2 RELAY

EFI NO.2 RELAY INSPECTION

1. REMOVE EFI NO.2 RELAY

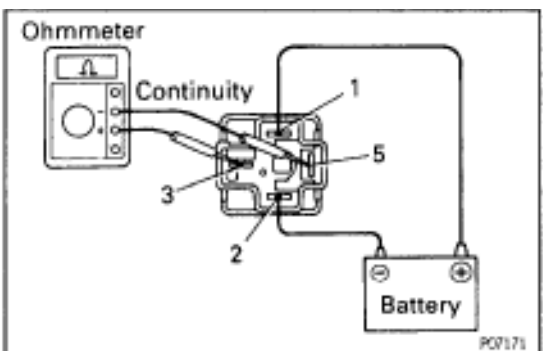
LOCATION: In the engine compartment relay box.



2. INSPECT EFI NO.2 RELAY

A. Inspect relay continuity

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
- (b) Check that there is no continuity between terminals 3 and 5. If continuity is not as specified, replace the relay.

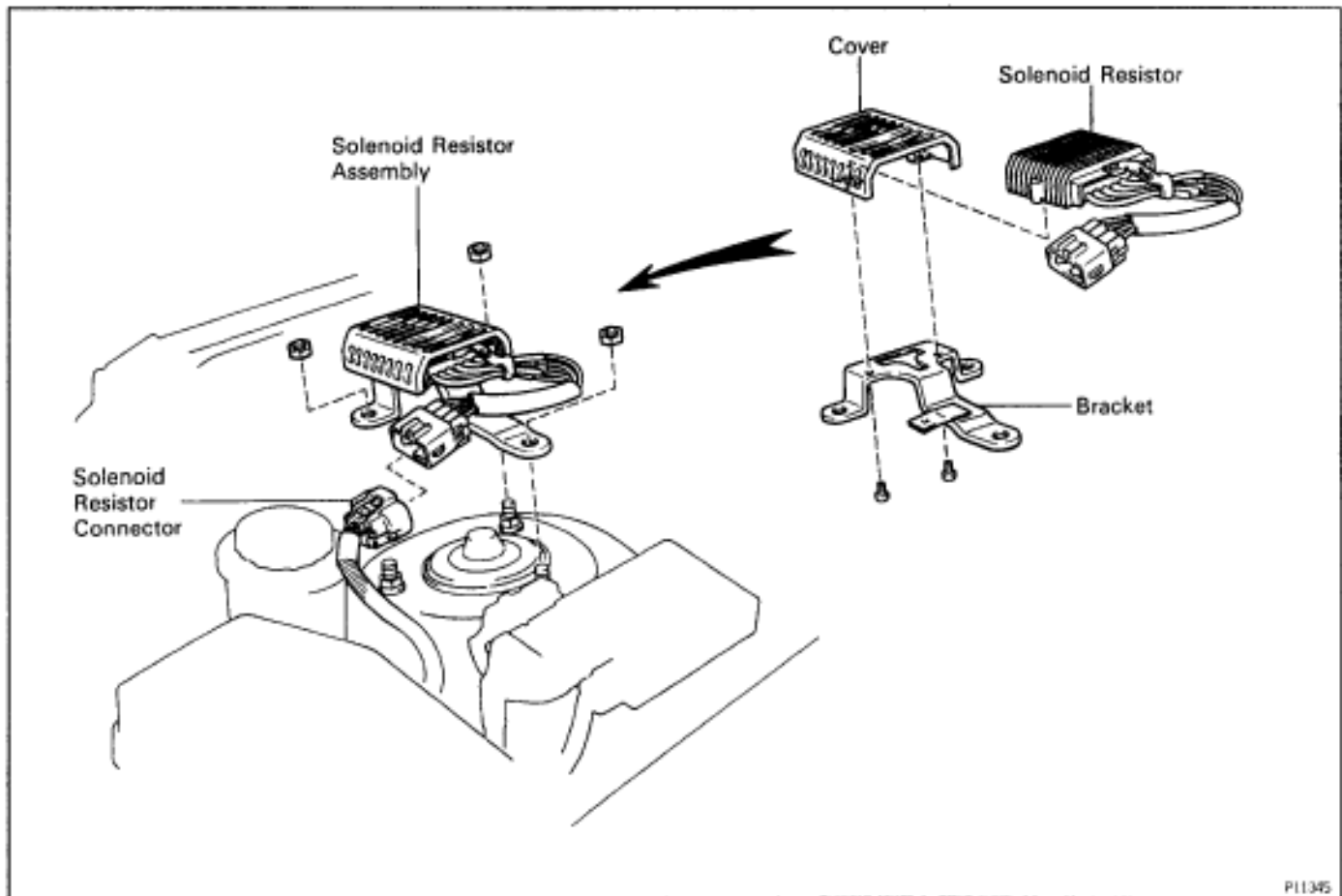


B. Inspect relay operation

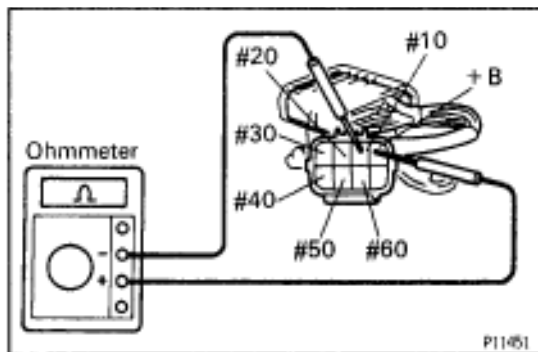
- (a) Apply battery voltage across terminals 1 and 2.
- (b) Using an ohmmeter, check that there is continuity between terminals 3 and 5. If operation is not as specified, replace the relay.

3. REINSTALL EFI NO.2 RELAY

SOLENOID RESISTOR COMPONENTS FOR REMOVAL AND INSTALLATION



P11345



P11451

SOLENOID RESISTOR INSPECTION

1. DISCONNECT SOLENOID RESISTOR CONNECTOR
2. INSPECT SOLENOID RESISTOR

Using an ohmmeter, measure the resistance between terminal +B and other terminals.

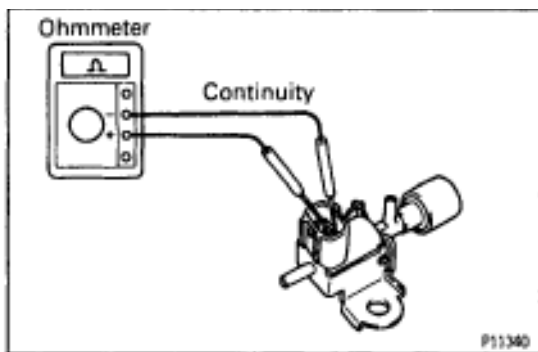
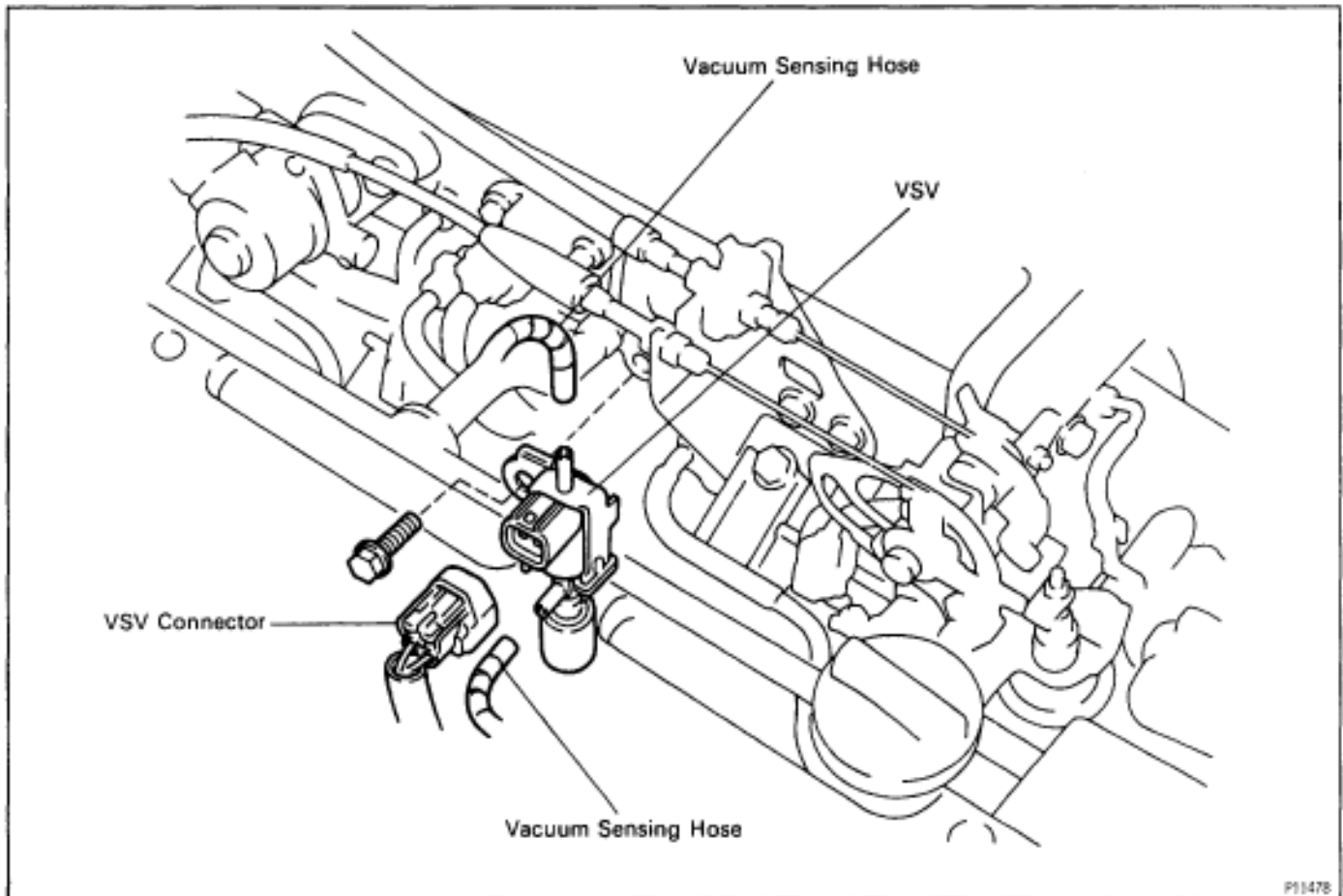
Resistance:

At 20°C (68°F) Approx. 6 Ω

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

3. RECONNECT SOLENOID RESISTOR CONNECTOR

VSV FOR FUEL PRESSURE CONTROL COMPONENTS FOR REMOVAL AND INSTALLATION



VSV INSPECTION

1. REMOVE VSV

2. INSPECT VSV

A. Inspect VSV for open circuit

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

Resistance:

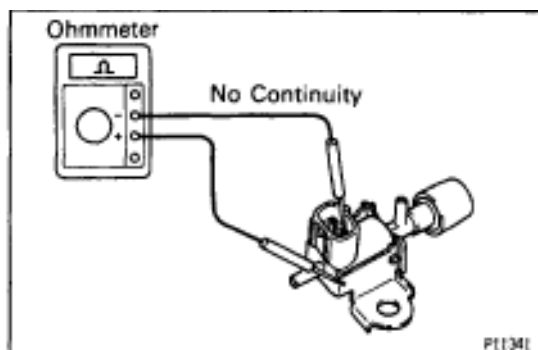
At 20°C (68°F) 33–39 Ω

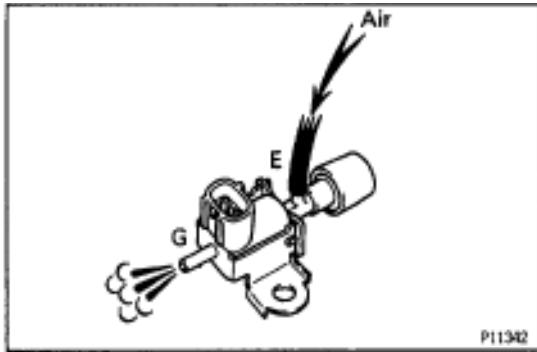
If there is no continuity, replace the VSV.

B. Inspect VSV for ground

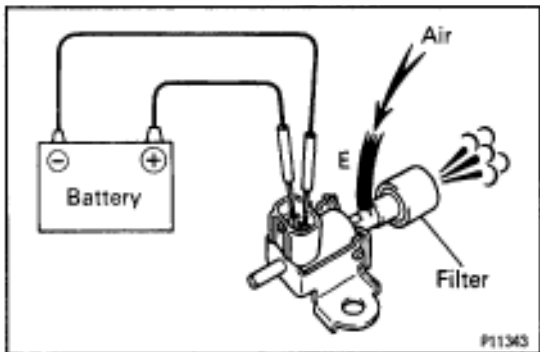
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



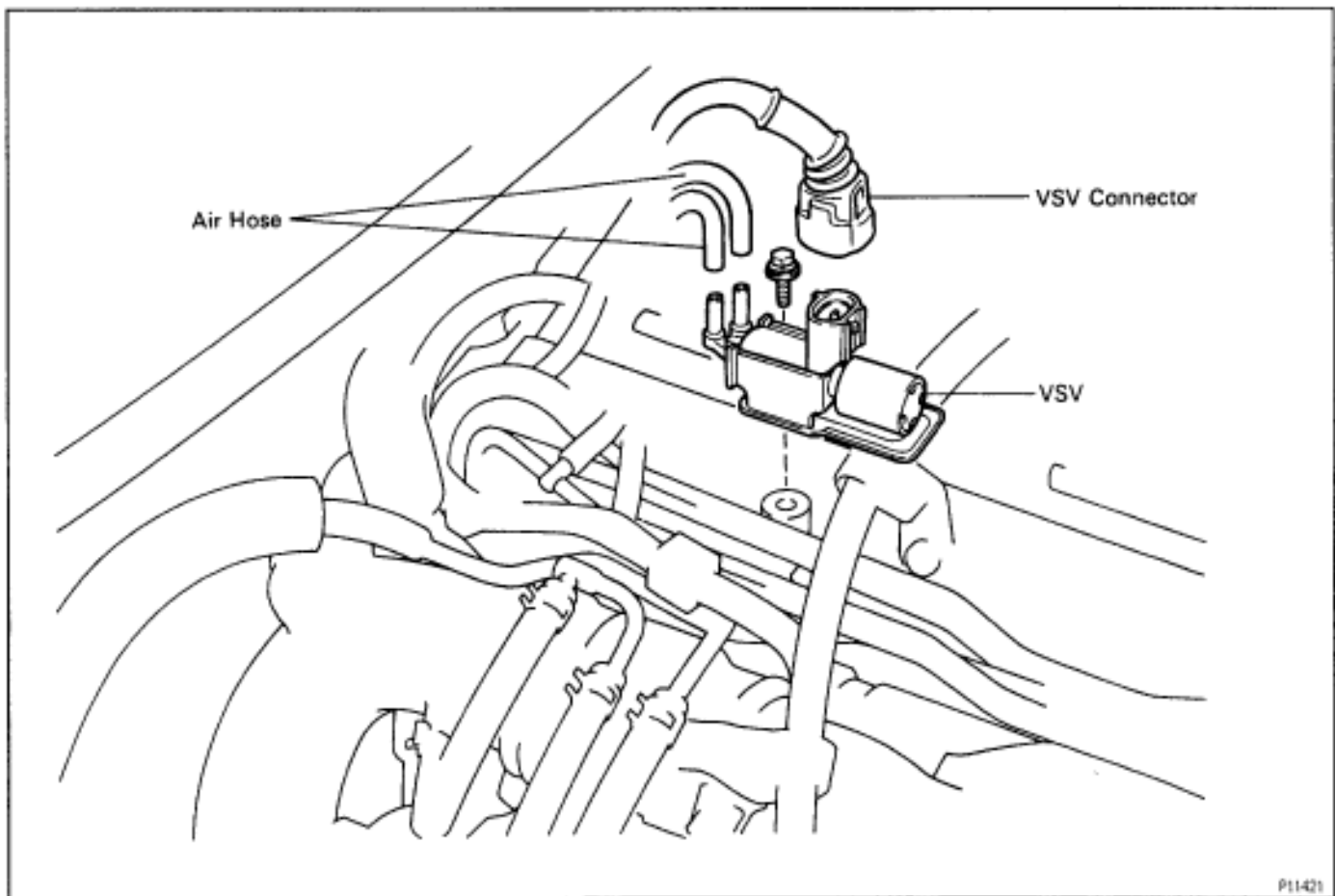
**C. Inspect VSV operation**

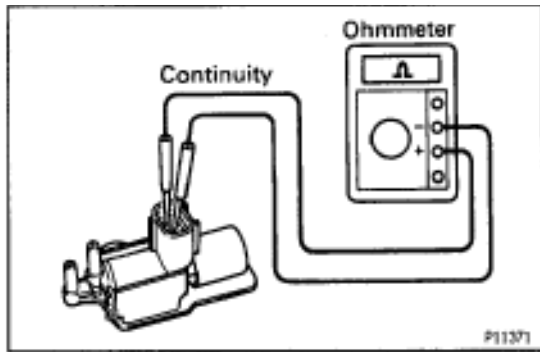
- (a) Check that air flows from port E to G.



- (b) Apply battery 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**VSV FOR INTAKE AIR CONTROL VALVE
COMPONENTS FOR REMOVAL AND
INSTALLATION**



VSV INSPECTION

1. REMOVE VSV

2. INSPECT VSV

A. Inspect VSV for open circuit

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

Resistance:

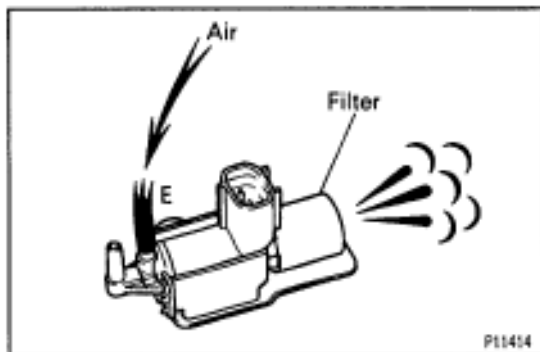
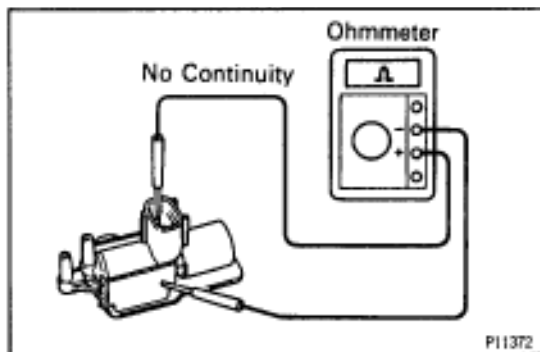
At 20°C (68°F) 38.5–44.5 Ω

If there is no continuity, replace the VSV.

B. Inspect VSV for ground

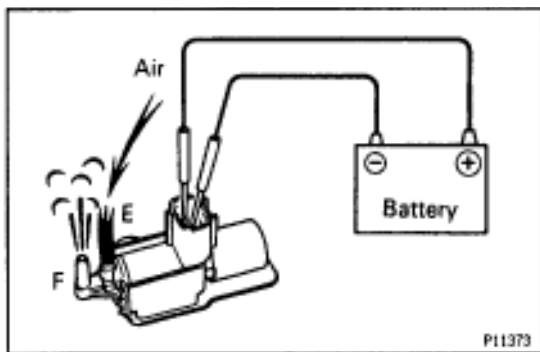
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

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



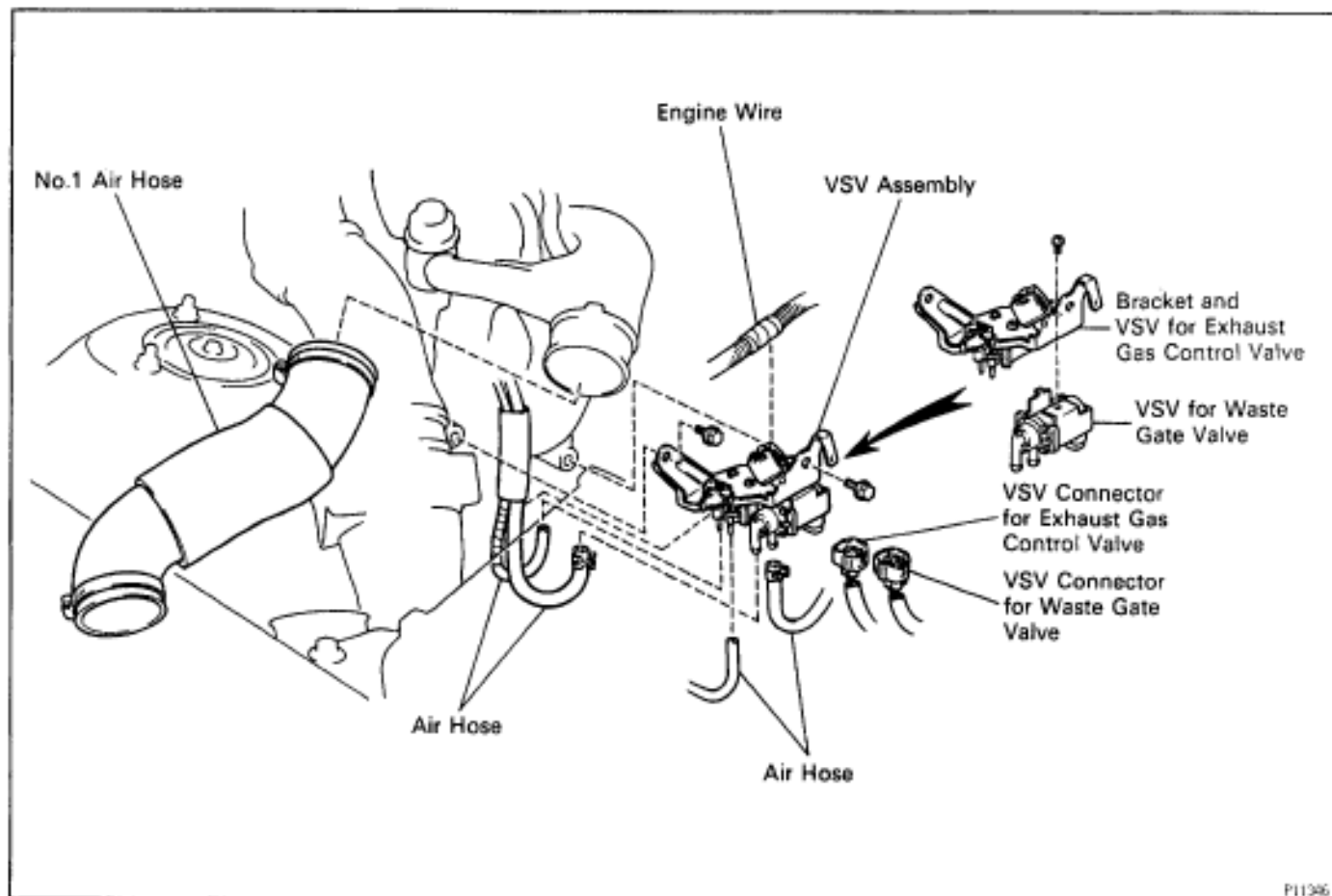
(b) Apply battery voltage across the terminals.

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

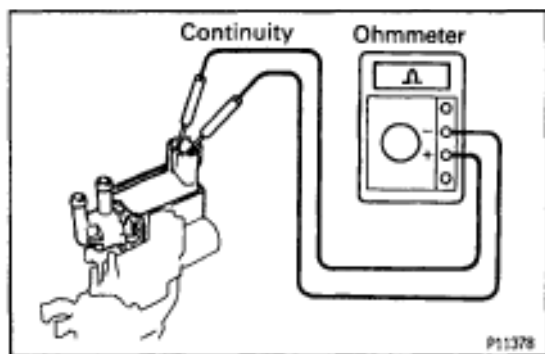
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

VSV FOR WASTE GATE VALVE COMPONENTS FOR REMOVAL AND INSTALLATION



P11396



P11378

VSV INSPECTION

1. REMOVE VSV ASSEMBLY
2. INSPECT VSV

A. Inspect VSV for open circuit

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

Resistance:

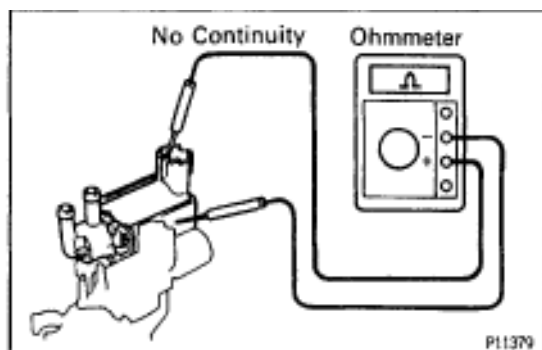
At 20°C (68°F) 22–26 Ω

If there is no continuity, replace the VSV.

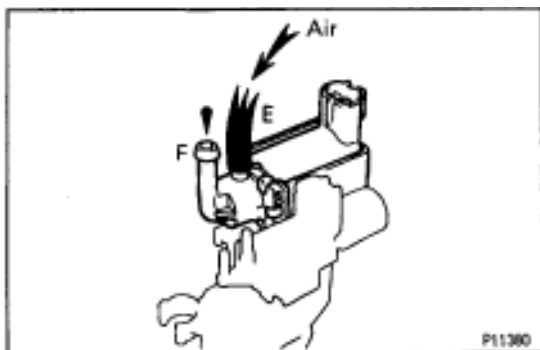
B. Inspect VSV for ground

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

If there is continuity, replace the VSV.

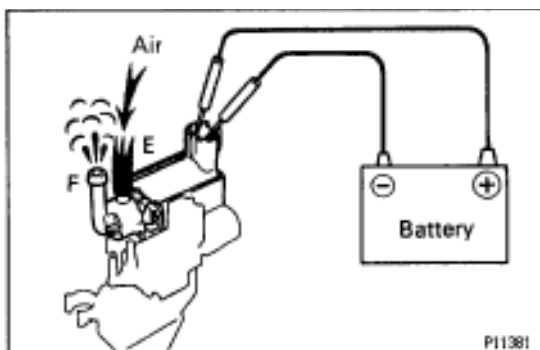


P11379



C. Inspect VSV operation

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

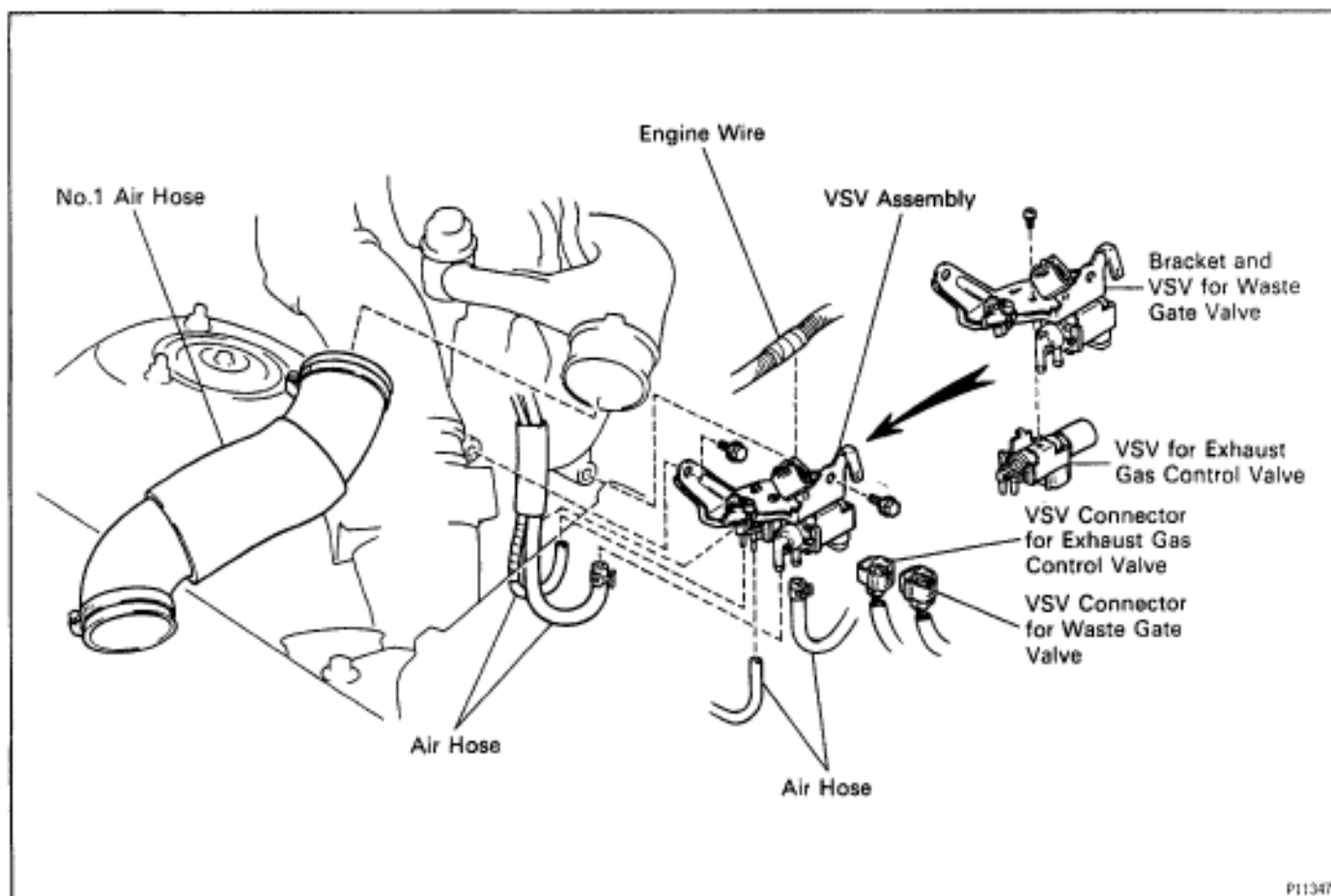


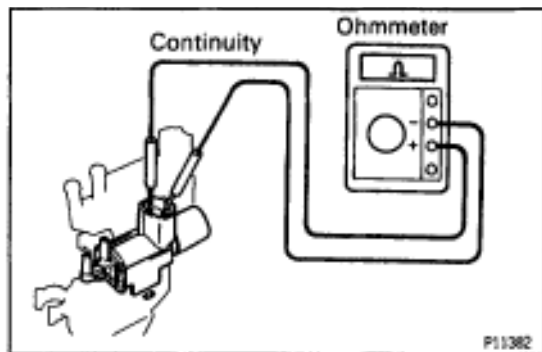
- (b) Apply battery voltage across the terminals.

- (c) Check that air flows from port E to F.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV ASSEMBLY

VSV FOR EXHAUST GAS CONTROL VALVE COMPONENTS FOR REMOVAL AND INSTALLATION





VSV INSPECTION

1. REMOVE VSV ASSEMBLY

2. INSPECT VSV

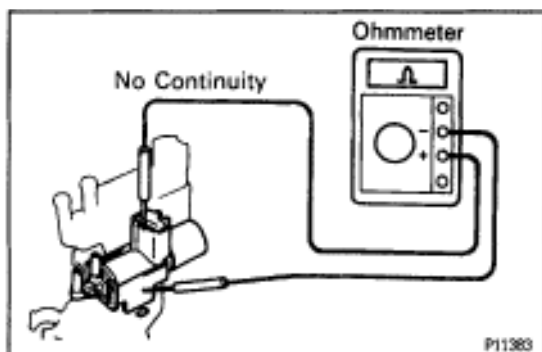
A. Inspect VSV for open circuit

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

Resistance:

At 20°C (68°F) 38.5–44.5 Ω

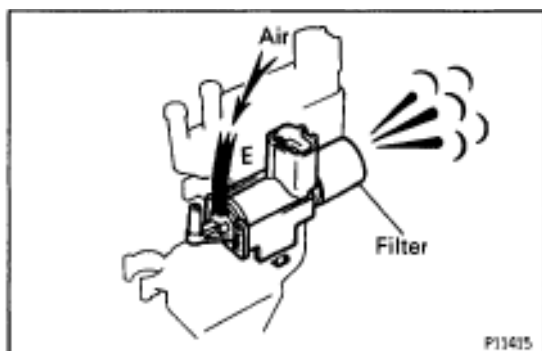
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

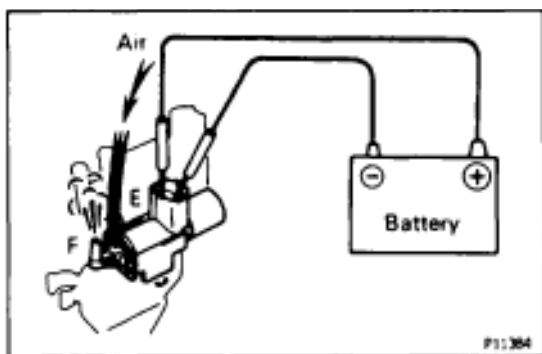
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

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



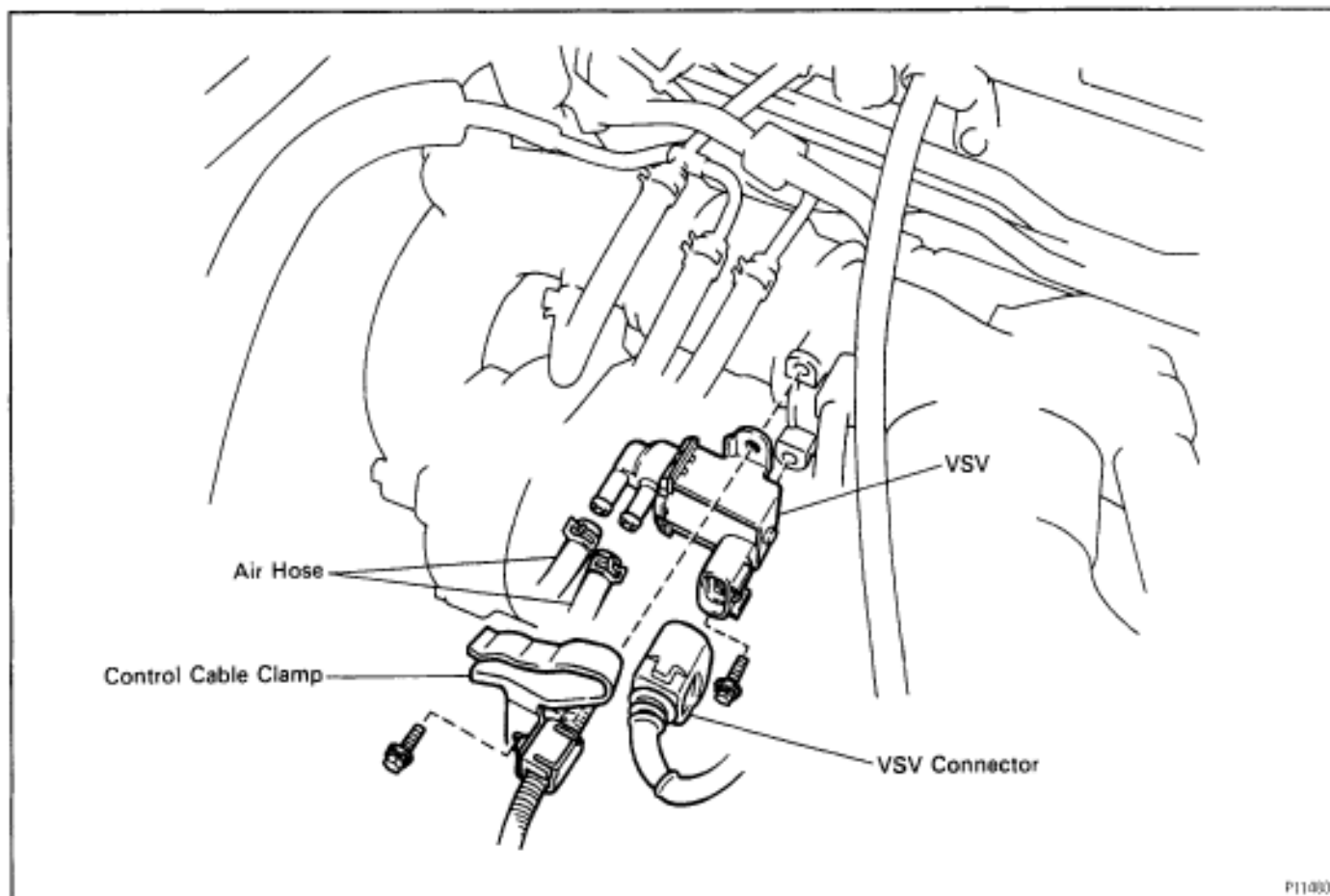
(b) Apply battery voltage across the terminals.

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

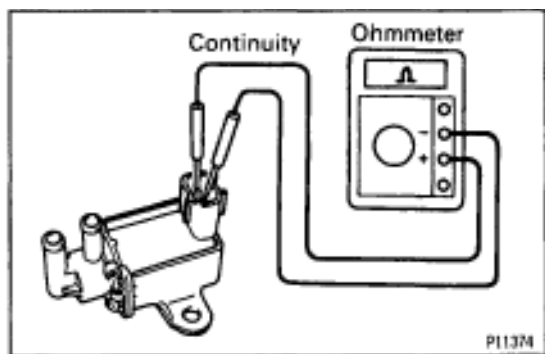
If operation is not as specified, replace the VSV.

3. REINSTALL VSV ASSEMBLY

VSV FOR EXHAUST BYPASS VALVE COMPONENTS FOR REMOVAL AND INSTALLATION



P11480



P11374

VSV INSPECTION

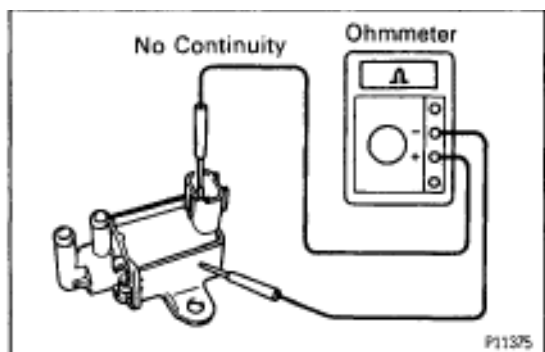
1. REMOVE VSV
2. INSPECT VSV
- A. Inspect VSV for open circuit

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

Resistance:

At 20°C (68°F) 22–26 Ω

If there is no continuity, replace the VSV.

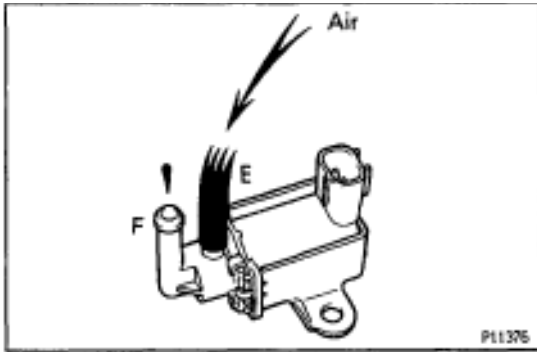


P11375

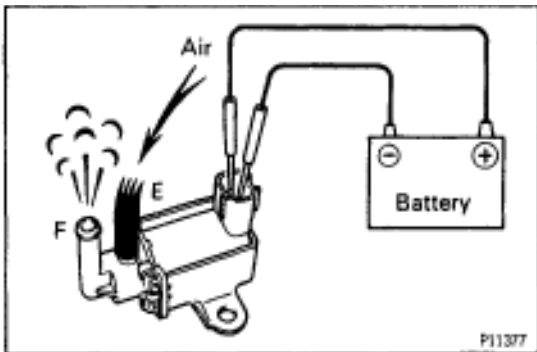
- B. Inspect VSV for ground

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 F.

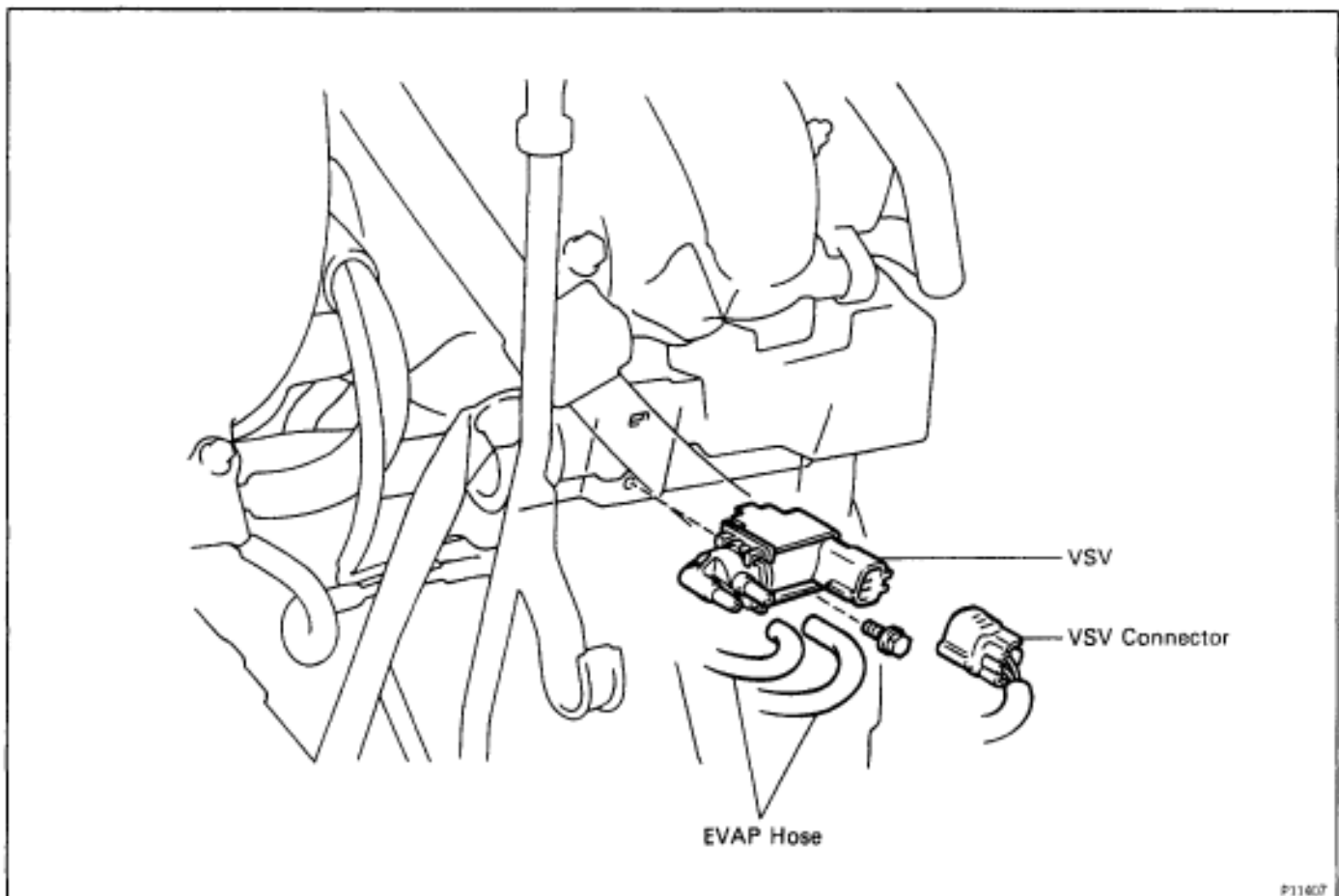


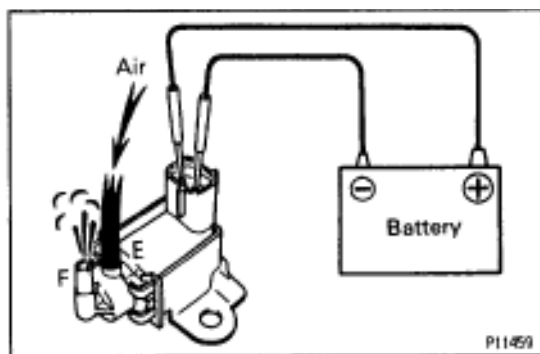
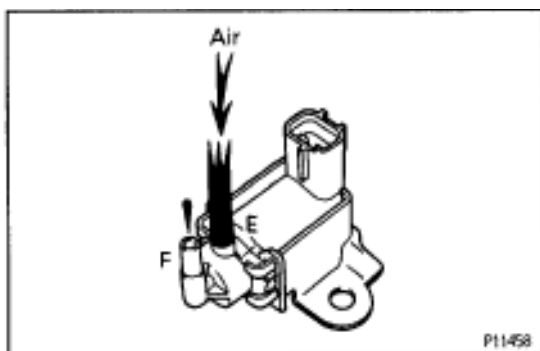
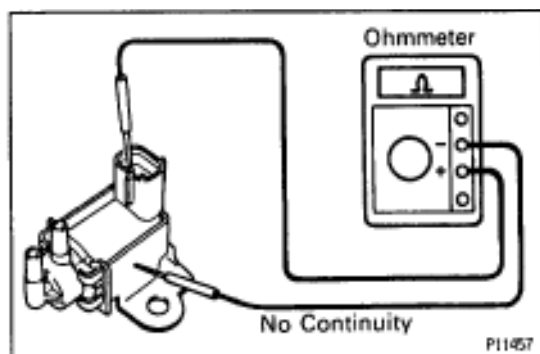
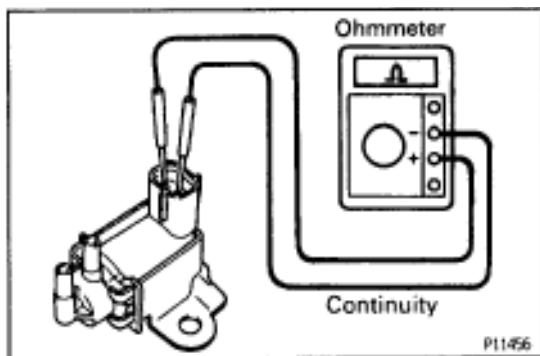
- (b) Apply battery voltage across the terminals.

- (c) Check that air flows from port E to F.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

VSV FOR EVAP COMPONENTS FOR REMOVAL AND INSTALLATION





VSV INSPECTION

1. REMOVE 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 F.

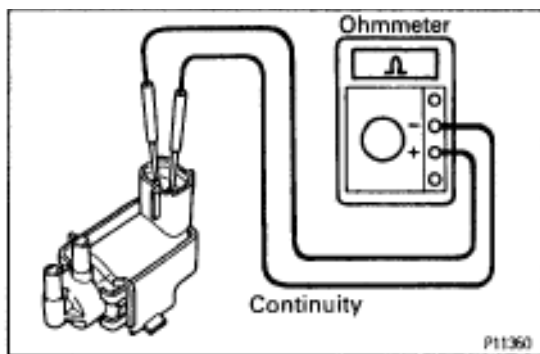
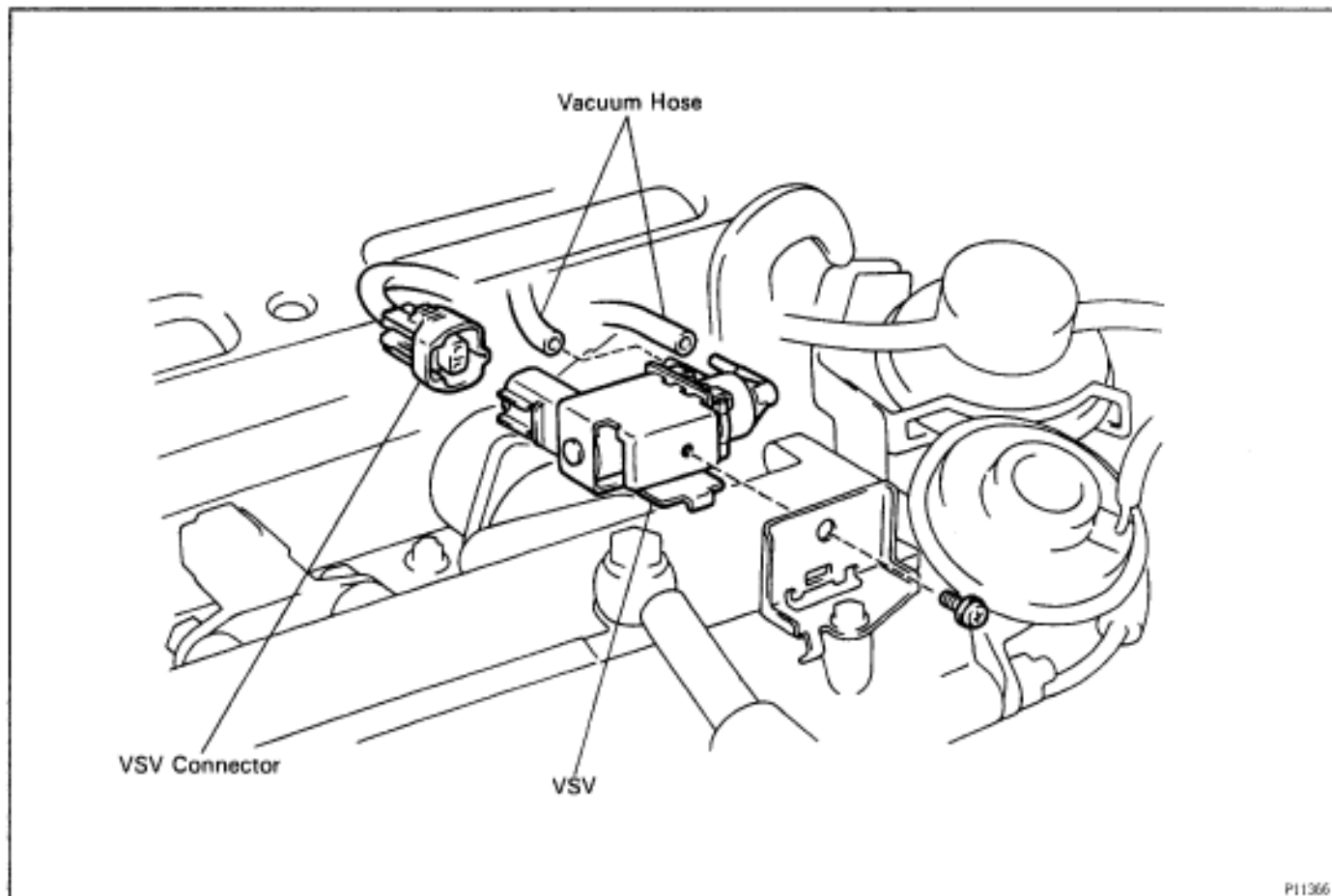
(b) Apply battery voltage across the terminals.

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

If operation is not as specified, replace the VSV.

3. REINSTALL VSV

VSV FOR EGR COMPONENTS FOR REMOVAL AND INSTALLATION



VSV INSPECTION

1. REMOVE VSV

2. INSPECT VSV

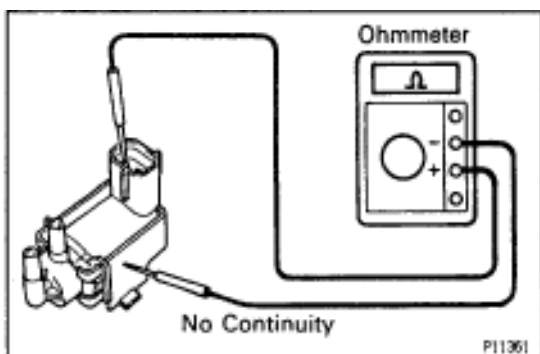
A. Inspect VSV for open circuit

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

Resistance:

At 20°C (68°F) 30–34 Ω

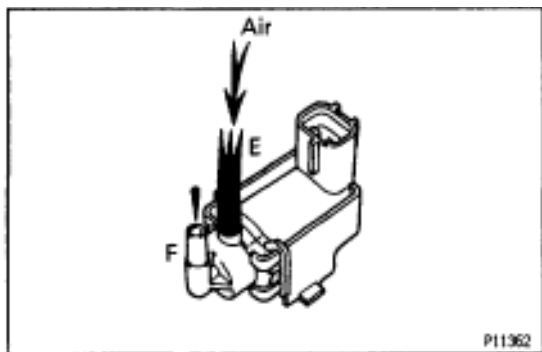
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

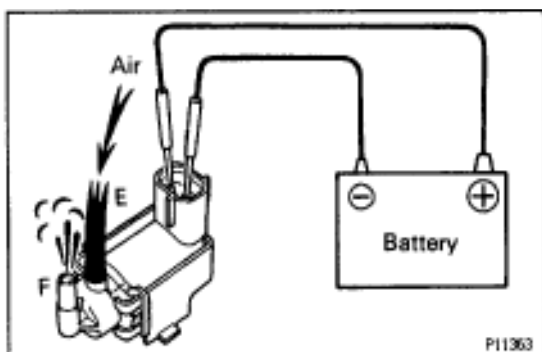
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

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

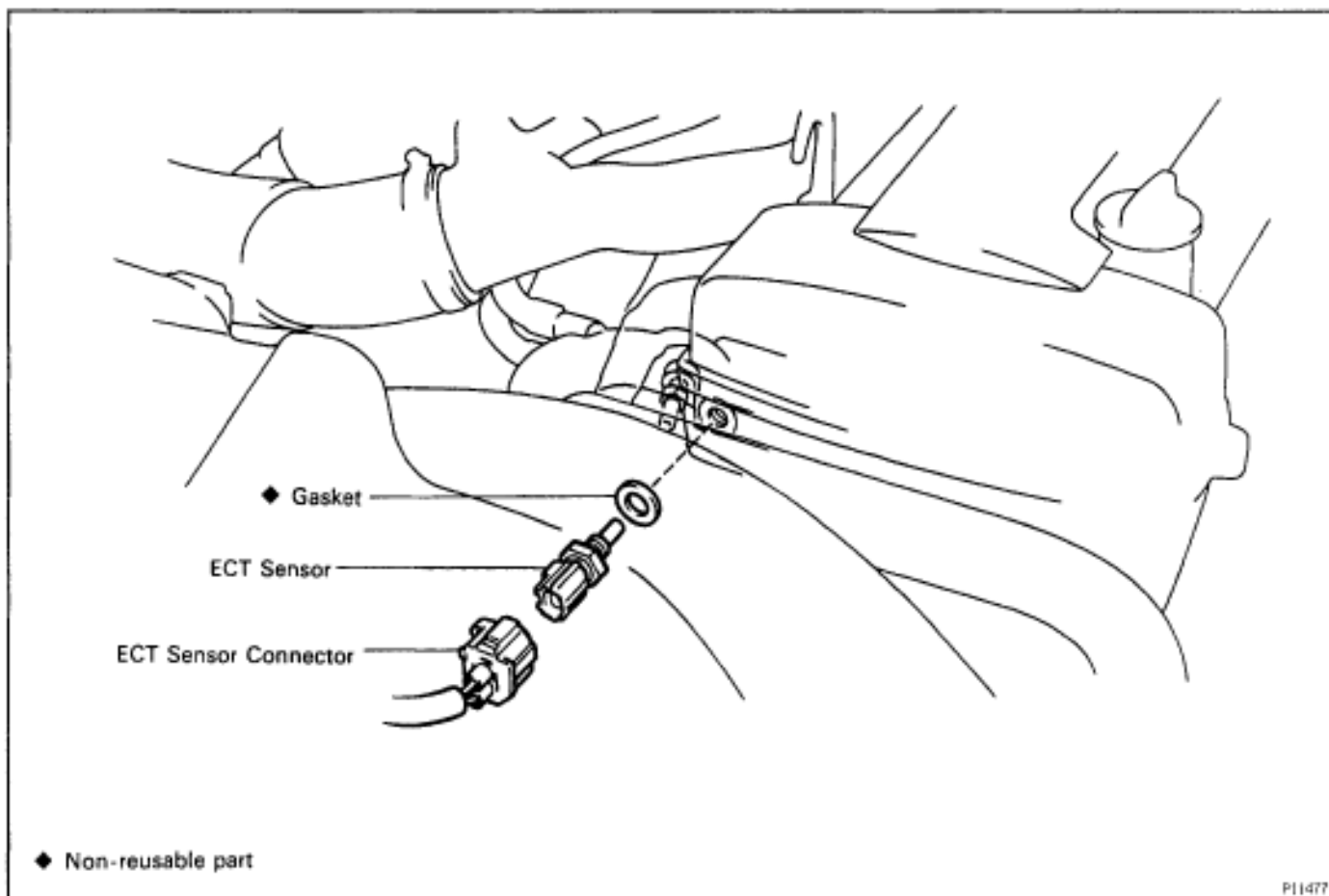


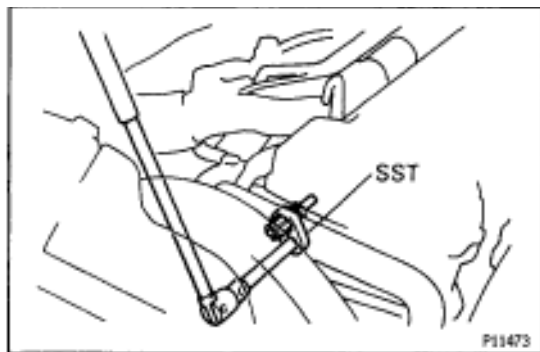
- (b) Apply battery voltage across the terminals.

- (c) Check that air flows from port E to F.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

ENGINE COOLANT TEMPERATURE (ECT) SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION





ECT SENSOR INSPECTION

1. DRAIN ENGINE COOLANT

2. REMOVE ECT SENSOR

- (a) Disconnect the ECT sensor connector.
- (b) Using SST, remove the ECT sensor and gasket.
SST 09205-76030

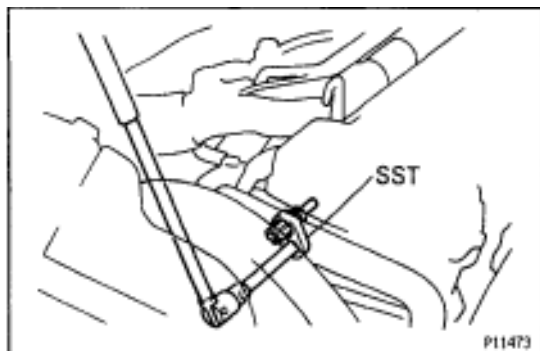
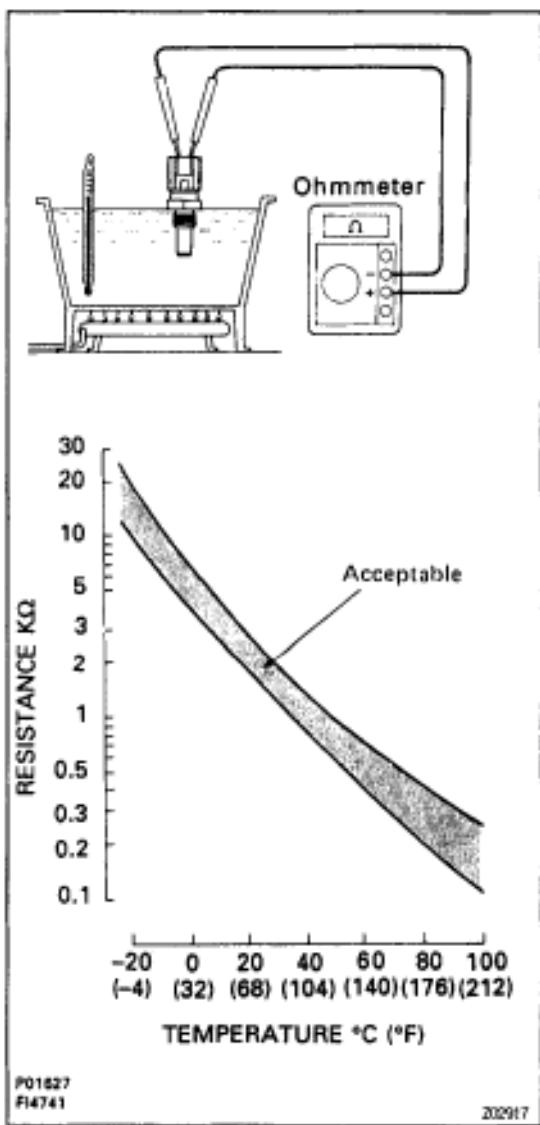
3. INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Refer to the graph

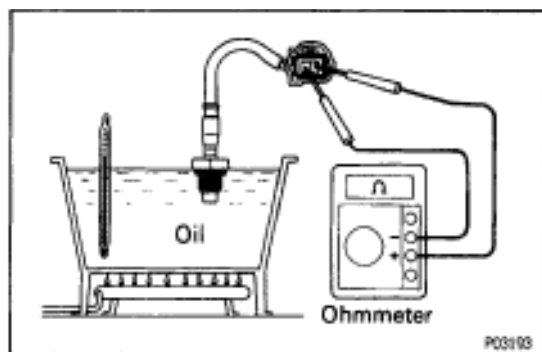
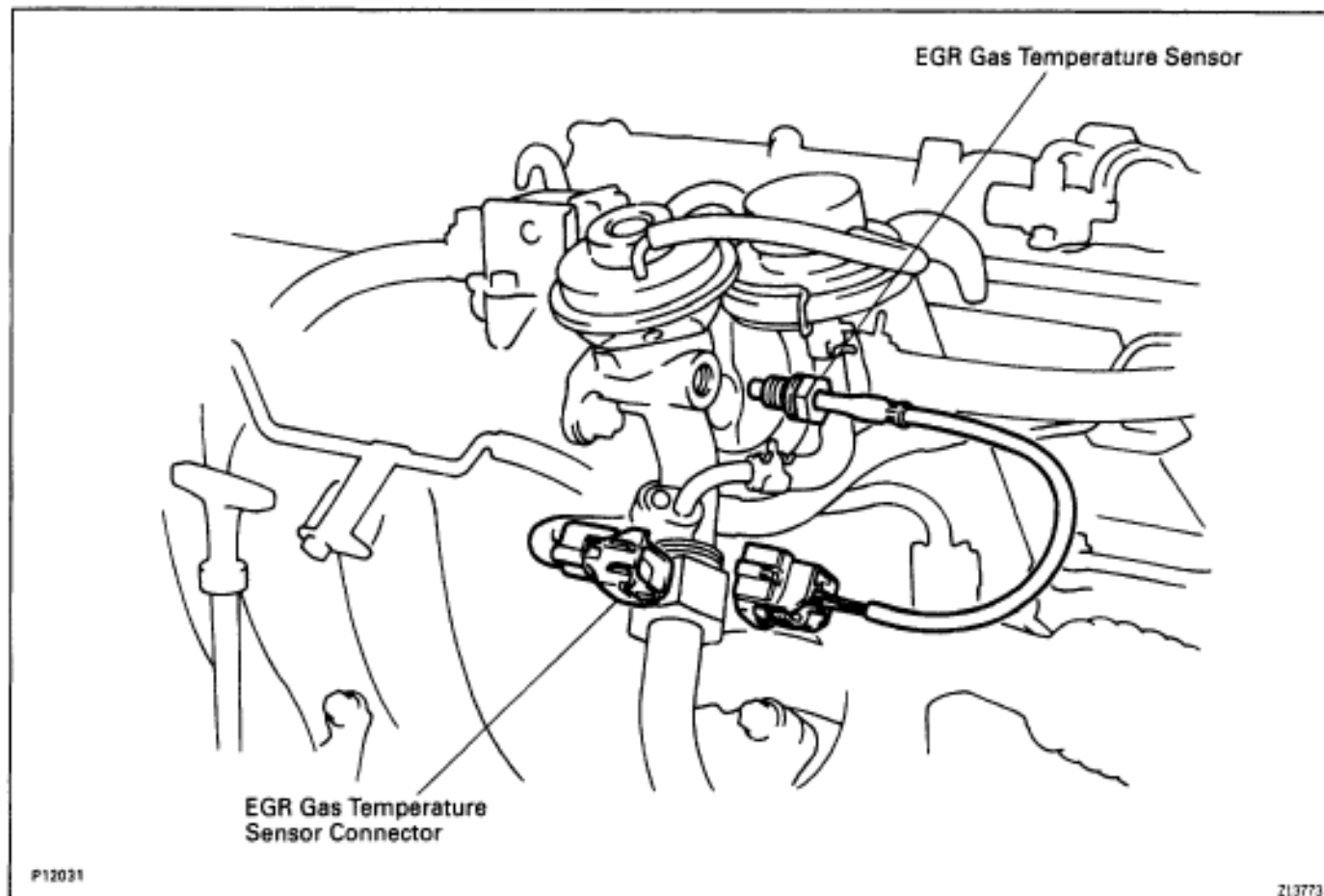
If the resistance is not as specified, replace the ECT sensor.



4. REINSTALL ECT SENSOR

- (a) Install a new gasket to the ECT sensor.
 - (b) Using SST, install the ECT sensor.
SST 09205-76030
 - (c) Connect the ECT sensor connector.
- ### 5. REFILL WITH ENGINE COOLANT

EGR GAS TEMPERATURE SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION



EGR GAS TEMPERATURE SENSOR INSPECTION

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 (112°F)

64–97 k Ω

At 100°C (212°F)

11–16 k Ω

At 150°C (302°F)

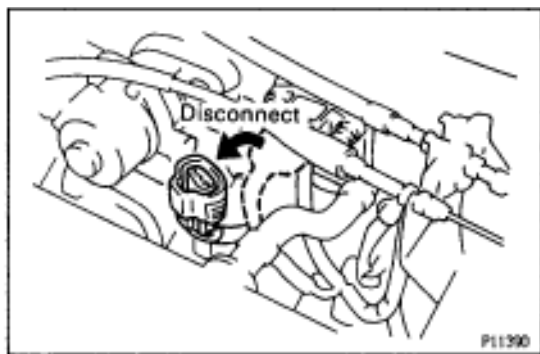
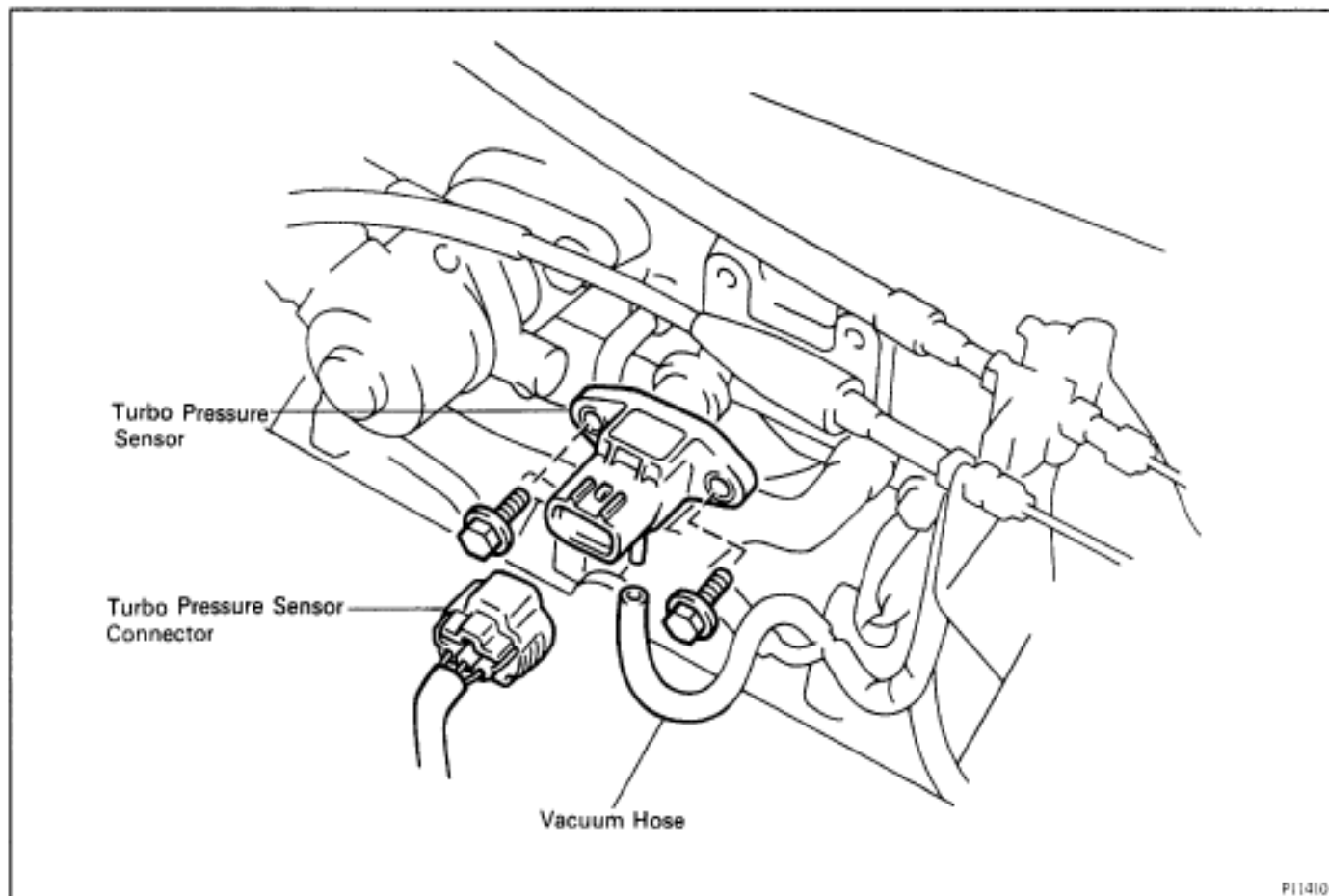
2–4 k Ω

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

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

3. REINSTALL EGR GAS TEMPERATURE SENSOR

TURBO PRESSURE SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION



TURBO PRESSURE SENSOR INSPECTION

1. INSPECT POWER SOURCE VOLTAGE OF TURBO PRESSURE SENSOR

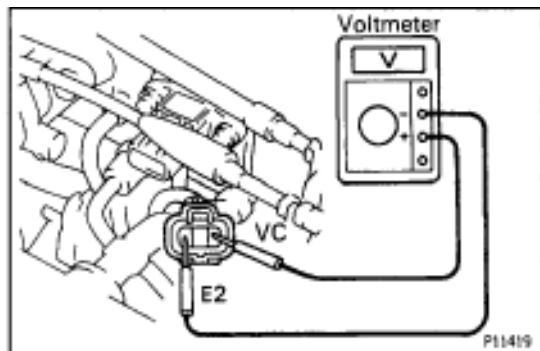
- Disconnect the turbo pressure sensor connector.
- Turn the ignition switch ON.

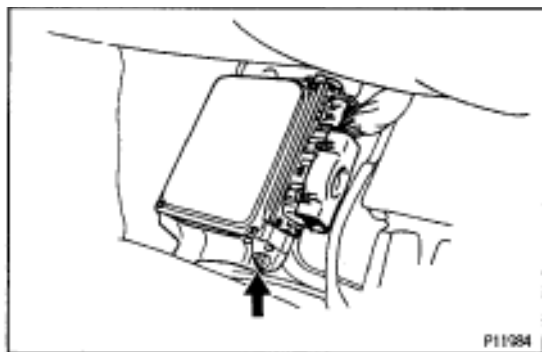
- Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.

Voltage:

4.5–5.5 V

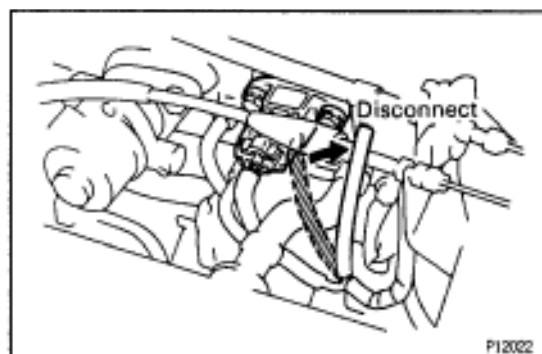
- Turn the ignition switch OFF.
- Reconnect the turbo pressure sensor connector.





2. INSPECT SUPPLY POWER OF TURBO PRESSURE SENSOR

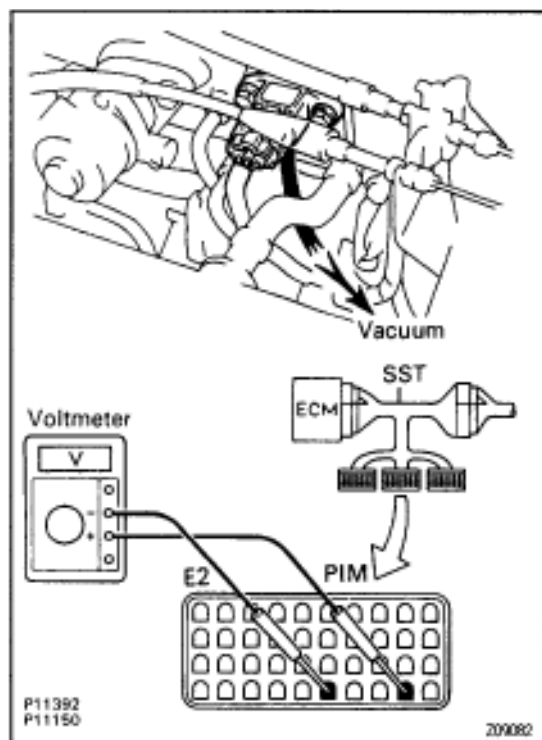
- (a) Disconnect the ECM from the ECU bracket.
(See steps 1 to 4 in ECM)
- (b) Install SST (check harness) between the ECM and wiring connectors.
(See standard value of ECM terminals in Engine Troubleshooting)
SST 09990-01000
- (c) Turn the ignition switch ON.
- (d) Disconnect the vacuum hose from the turbo pressure sensor.



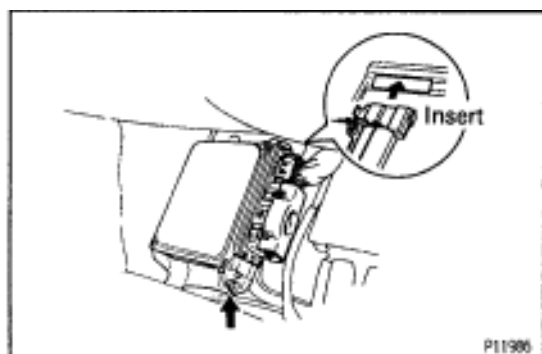
- (e) Connect a voltmeter to terminals PIM and E2 of the ECM, and measure the output voltage under ambient atmospheric pressure.
- (f) Apply vacuum to the turbo pressure sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 66.7 kPa (500 mmHg, 19.69 in.Hg).
- (g) Measure the voltage drop from step (c) above for each segment.

Voltage drop

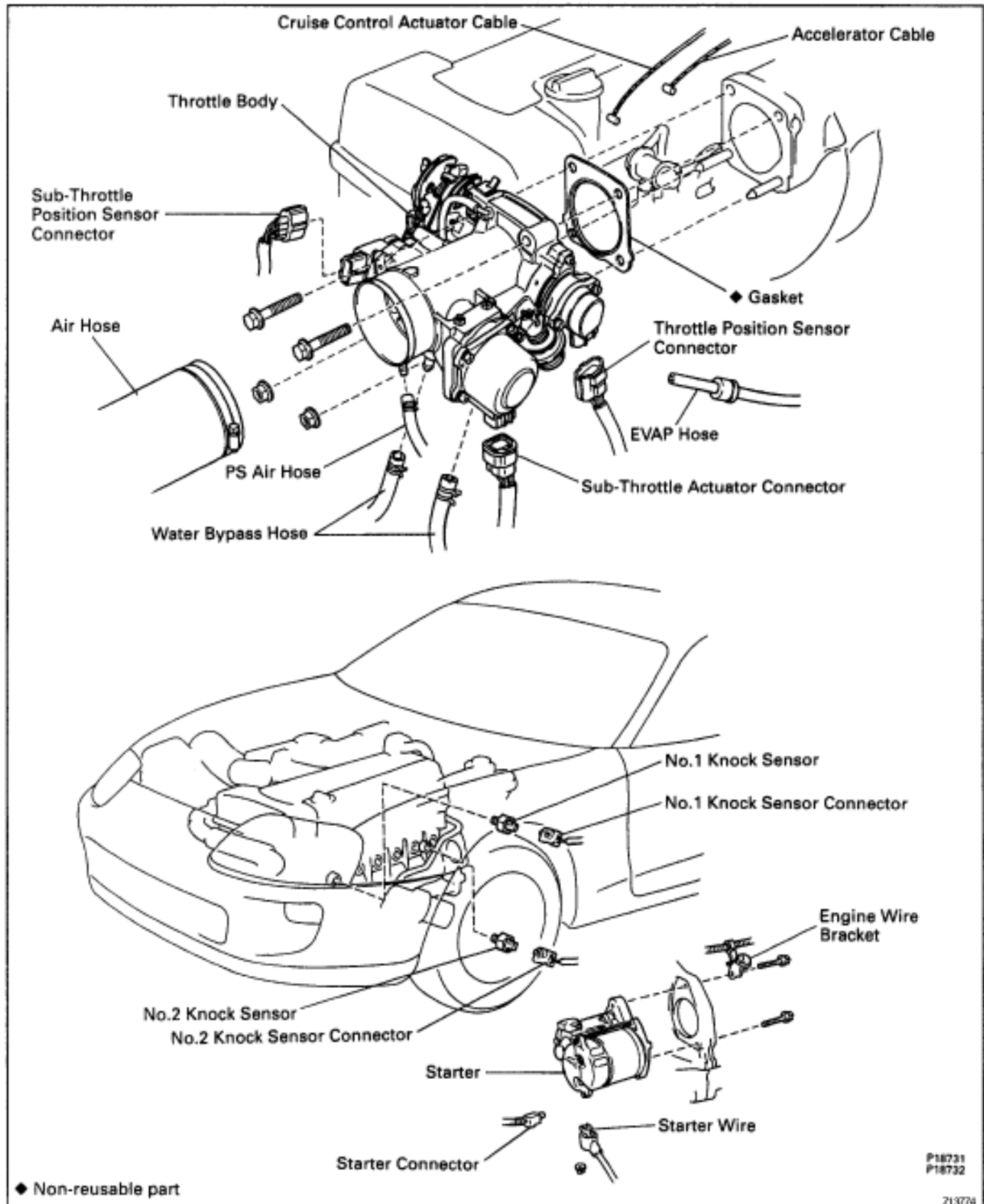
Applied Vacuum kPa (mmHg) (in.Hg.)	13.3 (100) (3.94)	26.7 (200) (7.87)	40.0 (300) (11.81)	53.3 (400) (15.75)	66.7 (500) (19.69)
Voltage drop V	0.15– 0.35	0.4– 0.6	0.65– 0.85	0.9– 1.1	1.15– 1.35



- (h) Remove the SST.
SST 09990-01000
- (i) Reinstall the ECM. (See steps 6 to 9 in ECM)
- (j) Reconnect the vacuum hose to the turbo pressure sensor.

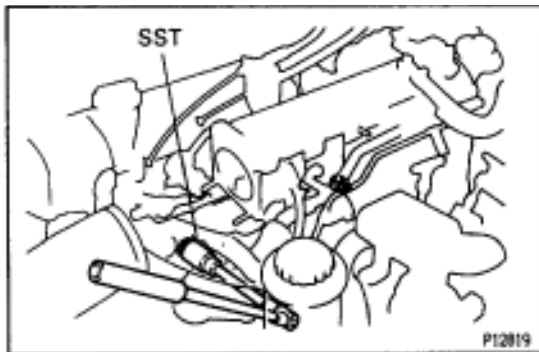


KNOCK SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION

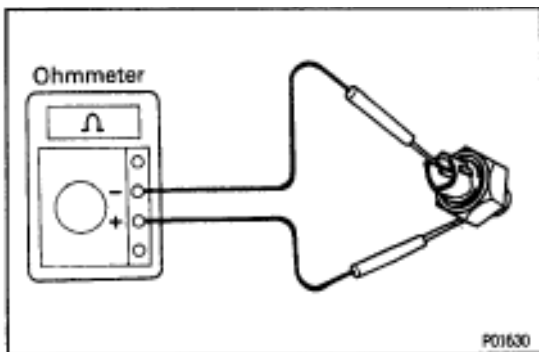


KNOCK SENSORS INSPECTION

1. **REMOVE THROTTLE BODY**
(See throttle body removal)
2. **REMOVE STARTER**
(See starter removal in Starting System)

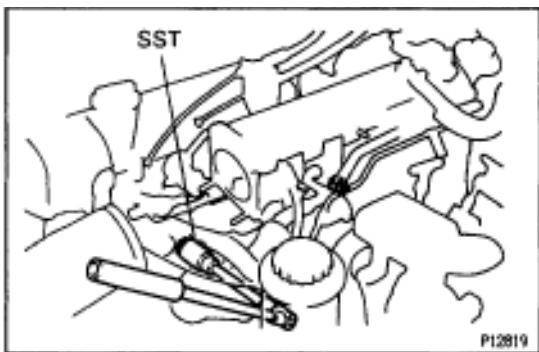


3. **REMOVE KNOCK SENSORS**
 - (a) Disconnect the knock sensor connector.
 - (b) Using SST, remove the knock sensor.
SST 09816-30010



4. **INSPECT KNOCK SENSORS**

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

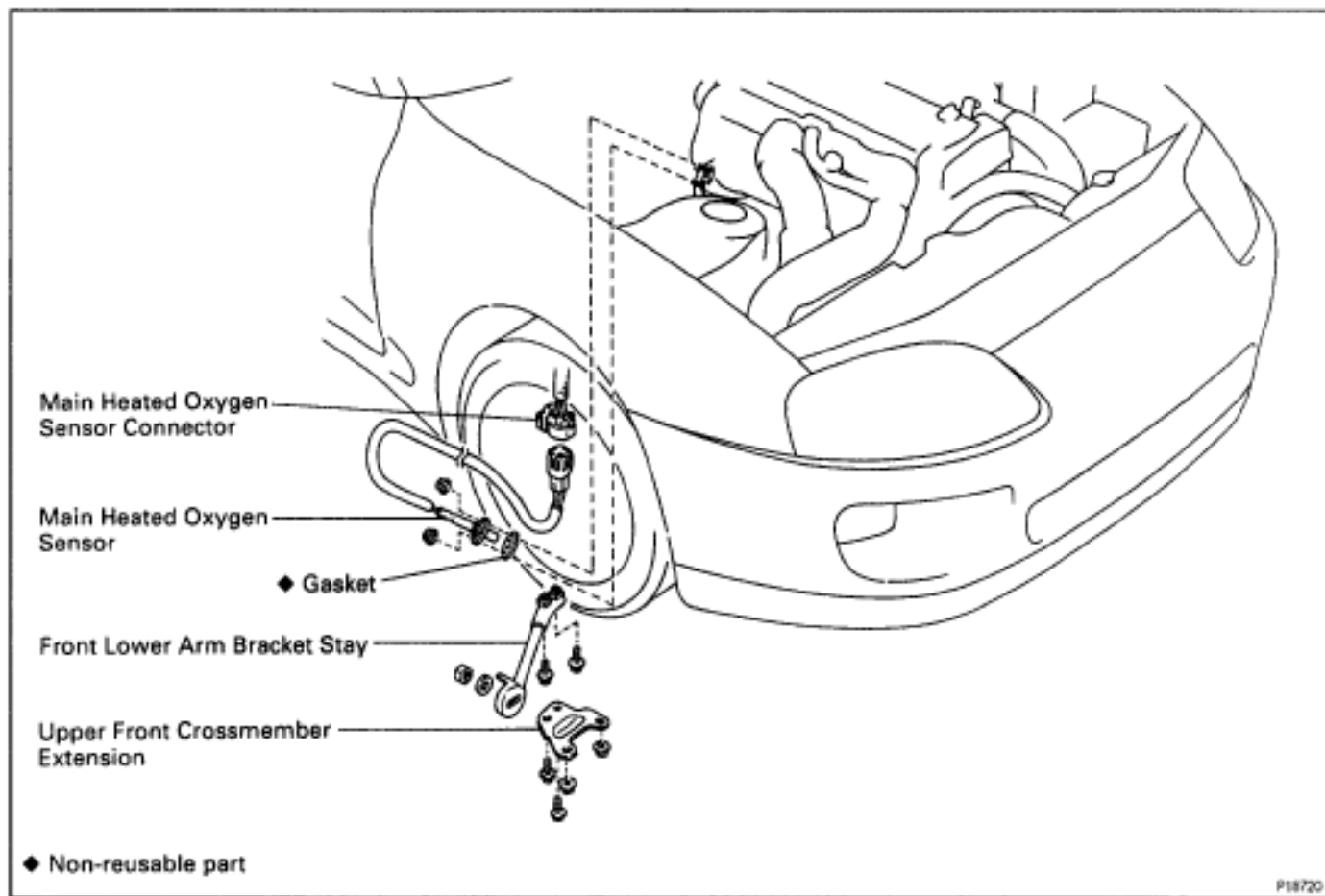


5. **REINSTALL KNOCK SENSORS**
 - (a) Using SST, install the knock sensor.
SST 09816-30010
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)
 - (b) Connect the knock sensor connector.
6. **REINSTALL STARTER**
(See starter installation in Starting System)
7. **REINSTALL THROTTLE BODY**
(See throttle body installation)

OXYGEN SENSOR

Main Heated Oxygen Sensor

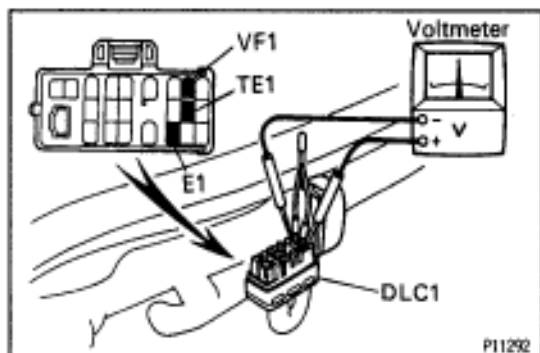
COMPONENTS FOR REMOVAL AND INSTALLATION



OXYGEN SENSOR INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

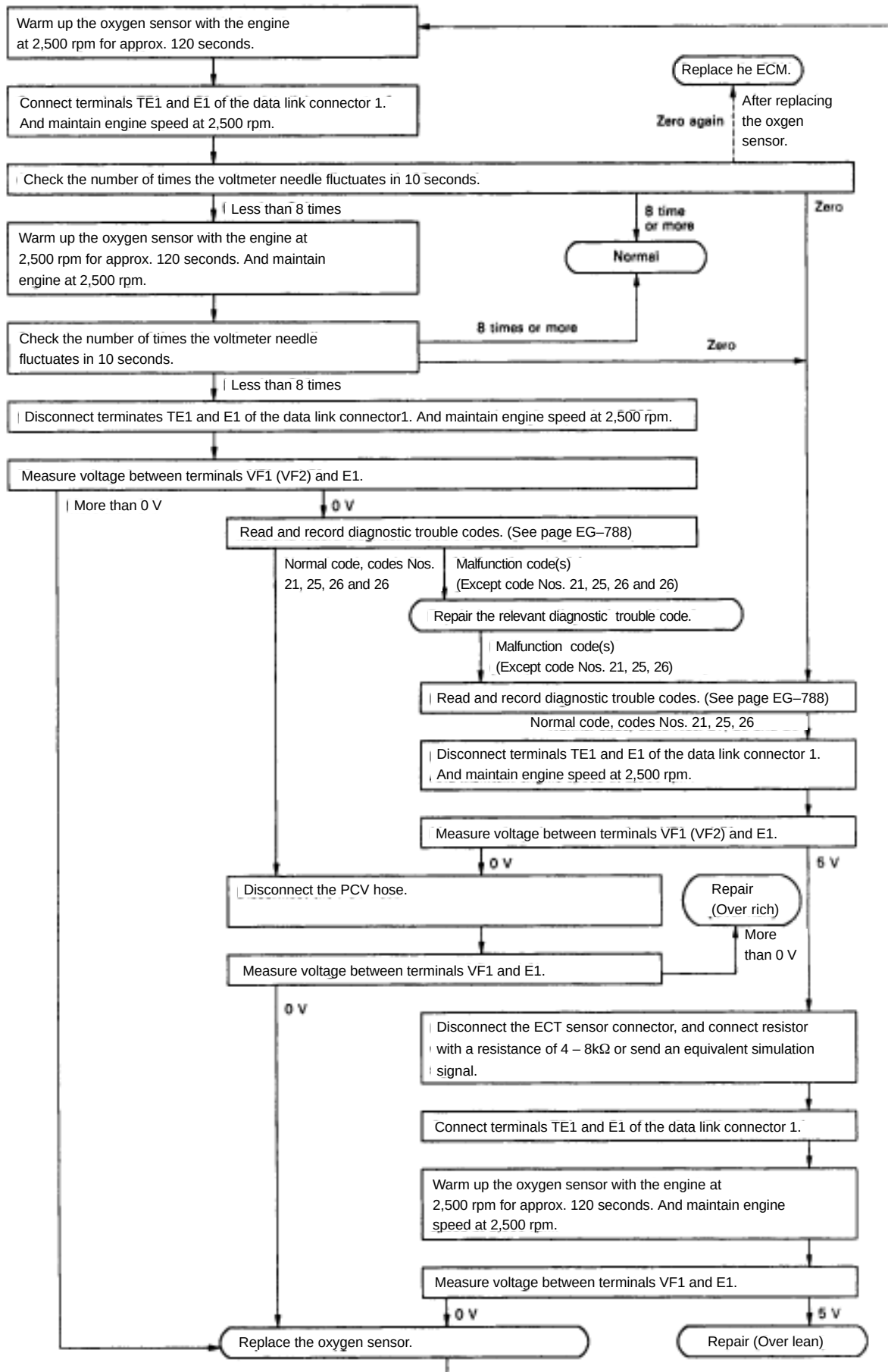


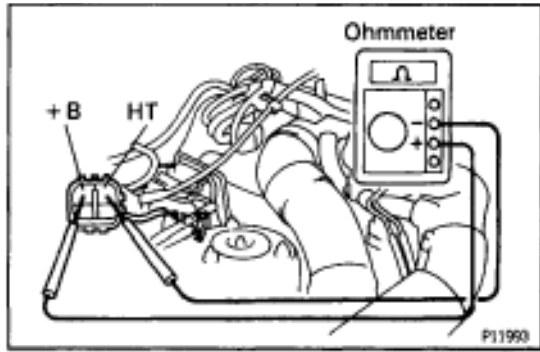
2. INSPECT FEEDBACK VOLTAGE

Connect the positive (+) tester probe of a voltmeter to terminal VF1 of the DLC1, and negative (-) tester probe to terminal E1. Do the test as described on the next page.

HINT: Use SST when connecting between terminals TE1 and E1 of the DLC1.

SST 09843-18020





3. INSPECT HEATER RESISTANCE OF MAIN HEATED OXYGEN SENSOR

- (a) Disconnect the oxygen sensor connector.
- (b) Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance:

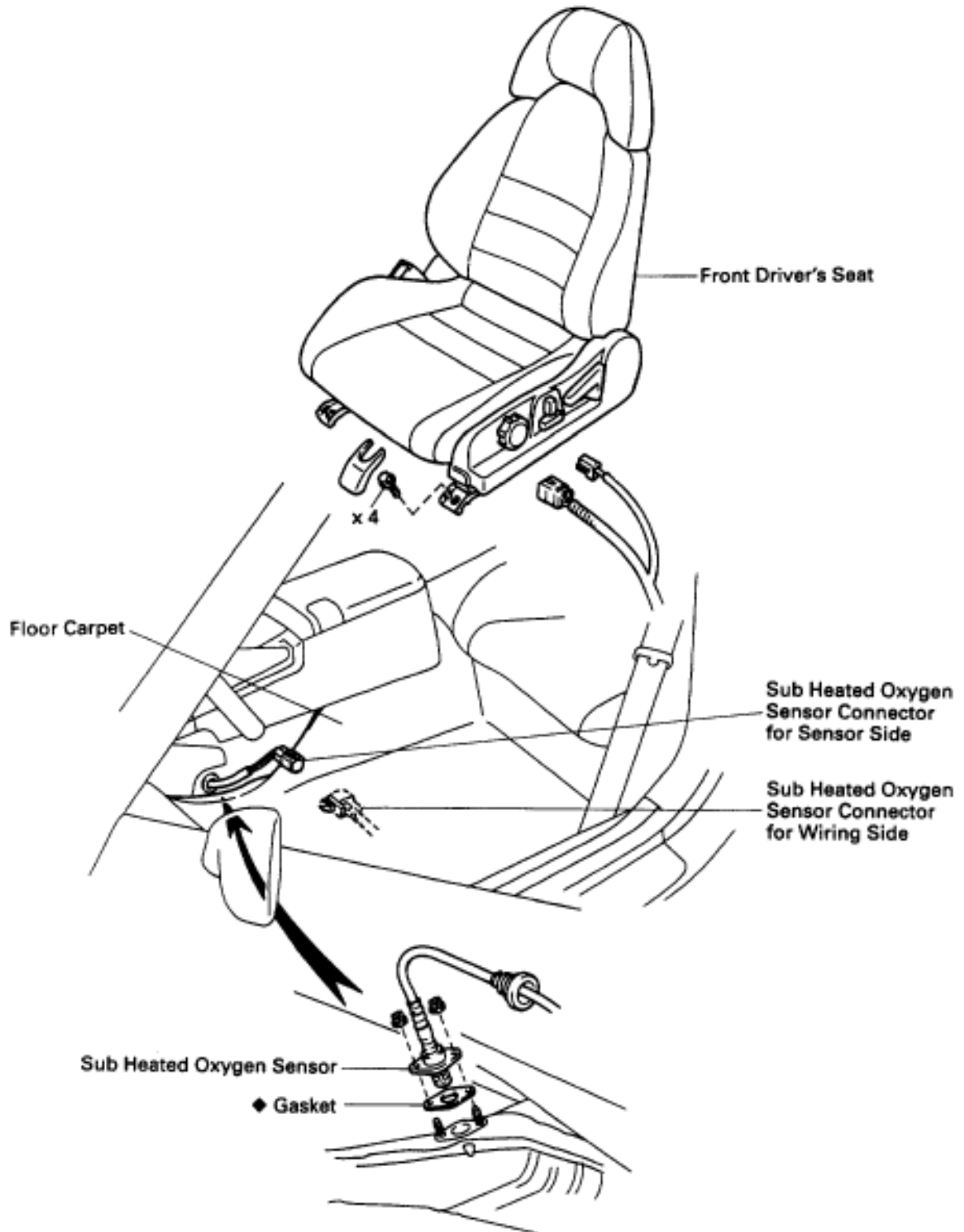
At 20°C (68°F) 11–16 Ω

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.

Sub Heated Oxygen Sensor COMPONENTS FOR REMOVAL AND INSTALLATION

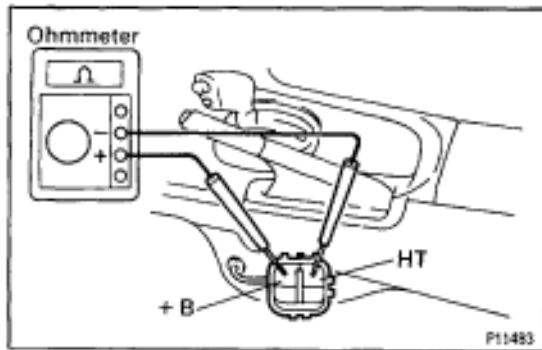


◆ Non-reusable part

OXYGEN SENSOR INSPECTION

1. INSPECT OPERATION OF SUB HEATED OXYGEN SENSOR

(See circuit inspection in Engine Troubleshooting)



2. INSPECT HEATER RESISTANCE OF SUB HEATED OXYGEN SENSOR

- (a) Remove the driver's seat.
- (b) Take out the console box side of the floor carpet.
- (c) Disconnect the oxygen sensor connector.
- (d) Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance:

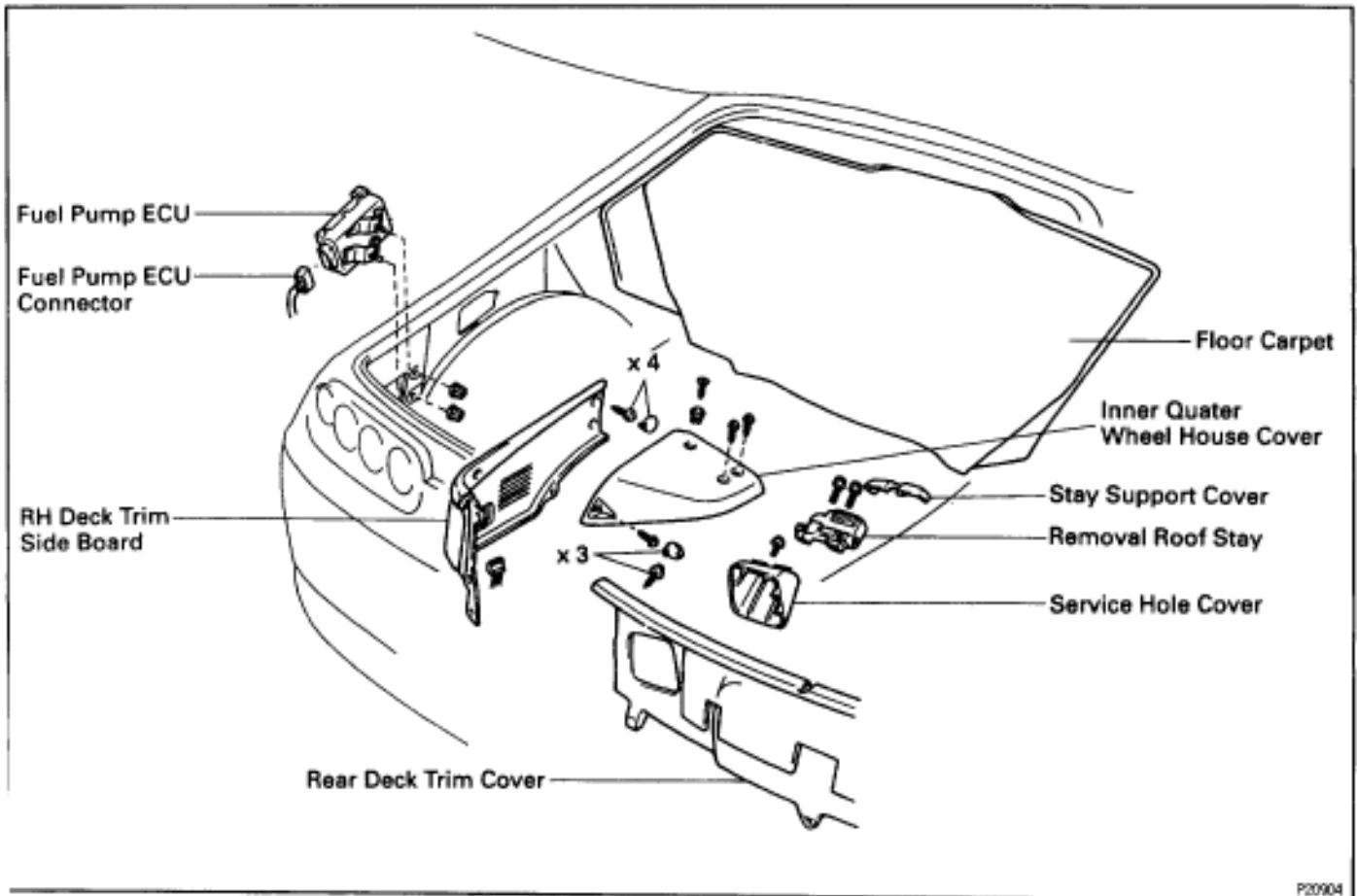
At 20°C (68°F) 11–16 Ω

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

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

- (e) Reconnect the oxygen sensor connector.
- (f) Reinstall the floor carpet.
- (g) Reinstall the driver's seat.

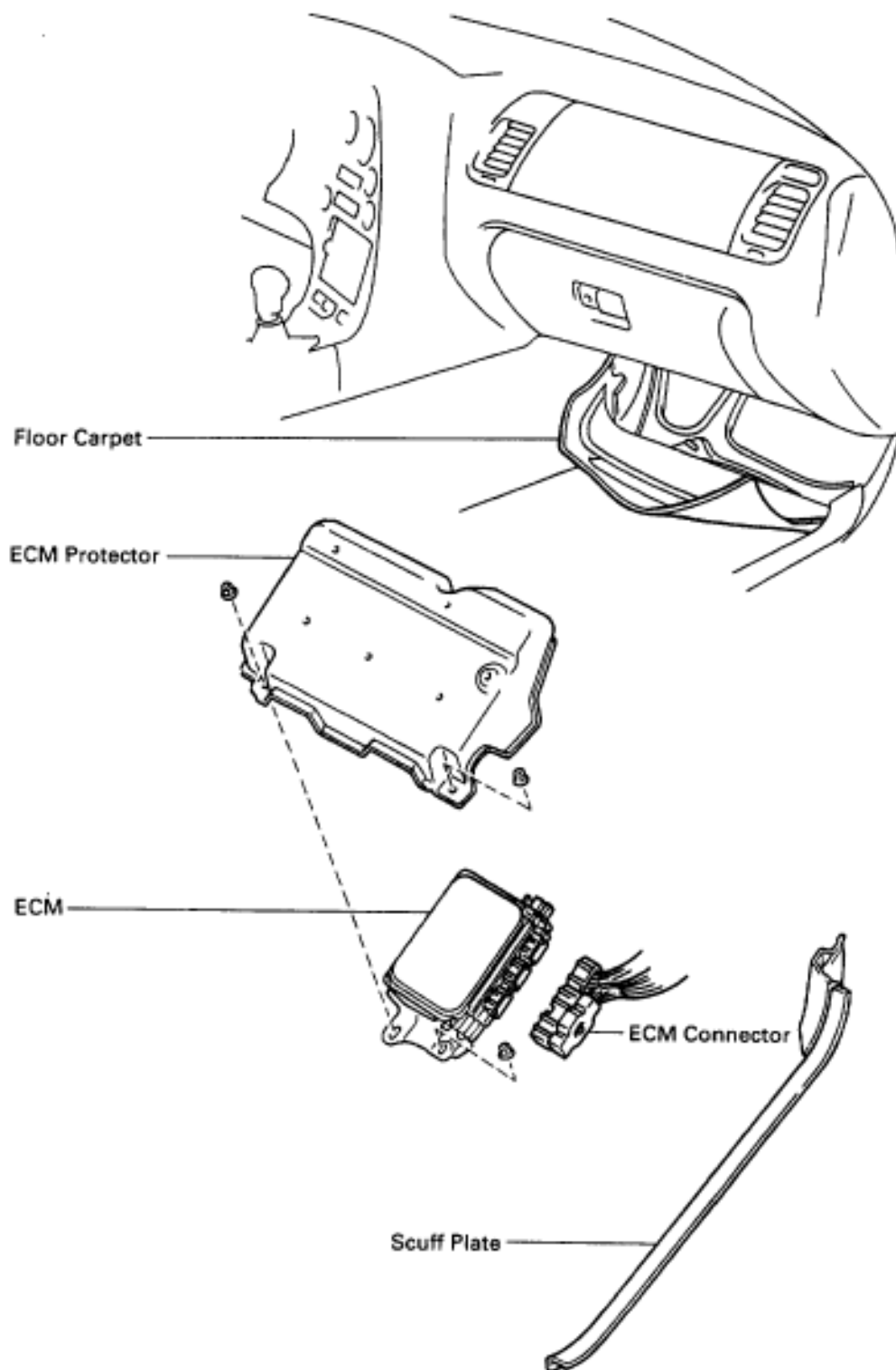
FUEL PUMP ECU COMPONENTS FOR REMOVAL AND INSTALLATION

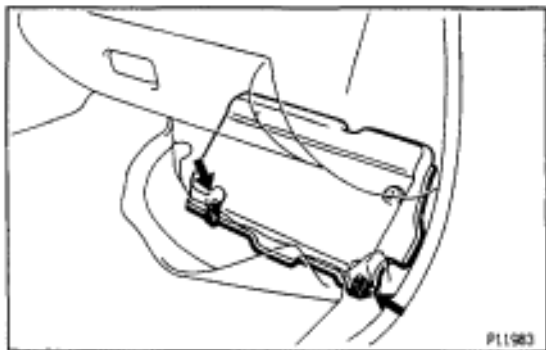


FUEL PUMP ECU INSPECTION

1. REMOVE FUEL PUMP ECU
2. INSPECT FUEL PUMP ECU
(See circuit inspection in Engine Troubleshooting)
3. REINSTALL FUEL PUMP ECU

ENGINE CONTROL MODULE (ECM) COMPONENTS FOR REMOVAL AND INSTALLATION





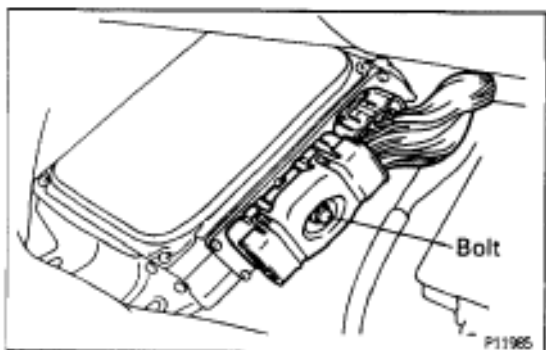
ECM INSPECTION

1. DISCONNECT NEGATIVE (-) TERMINAL CABLE FROM BATTERY

2. REMOVE SCUFF PLATE

3. REMOVE ECM PROTECTOR

- (a) Take out the front side of the floor carpet.
- (b) Remove the 2 nuts and ECM protector.

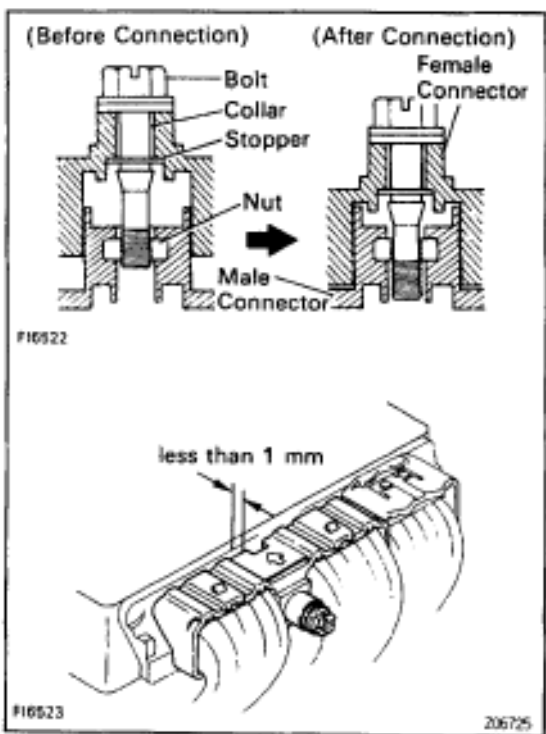


4. REMOVE ECM

- (a) Remove the nut, and disconnect the ECM from the floor panel.
- (b) Fully loosen the bolt and disconnect the 2 ECM connectors, and remove the ECM.

5. INSPECT ECM

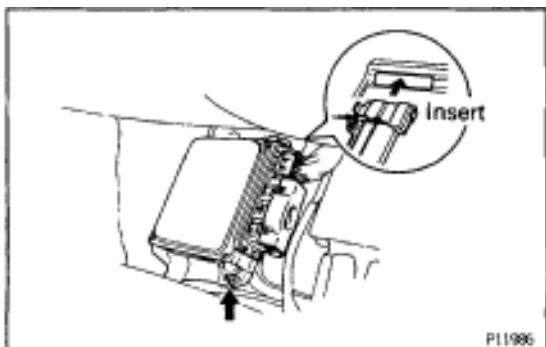
(See standard value of ECM terminals in Engine Troubleshooting)



6. REINSTALL ECM

- (a) Connect the 2 ECM connectors.
 - Match the male connector correctly with the female connector, then press them together.
 - Tighten the bolt.

Make sure the connector is completely connected by tightening the bolt until there is a clearance of less than 1 mm (0.04 in.) between the bottom of the male connector and the end of the female connector.



- (b) Install the ECM with the nut.

7. REINSTALL ECM PROTECTOR

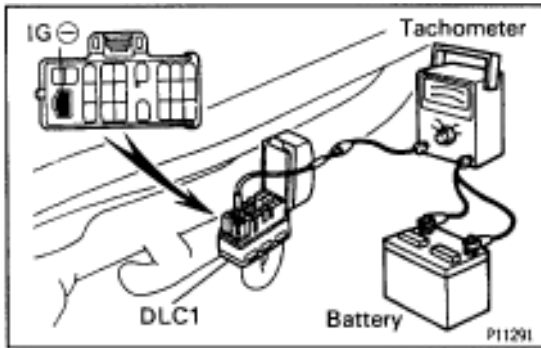
8. REINSTALL SCUFF PLATE

9. RECONNECT NEGATIVE (-) TERMINAL CABLE TO BATTERY

FUEL CUT RPM FUEL CUT RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

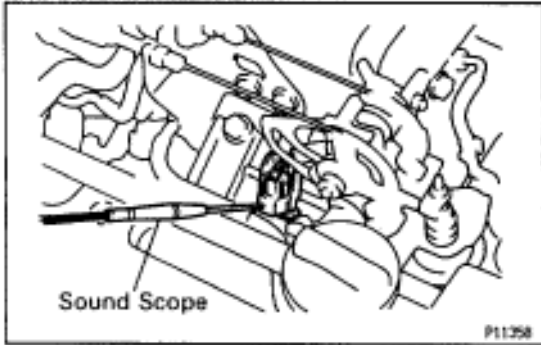


2. CONNECT TACHOMETER TO ENGINE

Connect the tester probe of a tachometer to terminal IG × of the DLC1.

NOTICE:

- Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.



3. INSPECT FUEL CUTOFF OPERATION

- (a) Increase the engine speed to at least 3,000 rpm.
- (b) 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 speed:

1,400 rpm

(Vehicle speed less than 25 km/h (16mph), with brake OFF)

4. DISCONNECT TACHOMETER

SERVICE SPECIFICATIONS

SERVICE DATA

Fuel pressure regulator	Fuel pressure at no vacuum	226–275 kPa (2.3–2.8 kgf/cm ² , 33–40 psi)
Fuel pump	Resistance at 20°C (68°F)	0.1–3.0 Ω
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage	Approx. 1.95 Ω 124–144 cm ³ (7.6–8.8 cu in.) per 15 sec. 10 cm ³ (0.6 cu in.) or less One drop or less per minute
MAF meter	Resistance (THA–E2) at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F)	10–20 kΩ 4–7 kΩ 2–3 kΩ 0.9–1.3 kΩ 0.4–0.7 kΩ
Throttle body	Throttle body fully closed angle Dashpot setting speed Throttle opener setting speed	10° 2,300 ± 400 rpm 1,500 ± 200 rpm
Throttle position sensor	Clearance between stop screw and lever 0 mm (0 in.) VTA–E2 0.40 mm (0.016 in.) IDL–E2 0.60 mm (0.024 in.) IDL–E2 Throttle valve fully open VTA–E2 – VC–E2	0.34–6.3 kΩ 0.5 kΩ or less Infinity 2.4–11.2 kΩ 3.1–7.2 kΩ
Sub-throttle position sensor	Clearance between stop screw and lever 0 mm (0 in.) VTA–E2 0.30 mm (0.012 in.) IDL–E2 0.50 mm (0.020 in.) IDL–E2 Throttle valve fully open VTA–E2 – VC–E2	0.3–6.3 kΩ 0.5 kΩ or less Infinity 2.0–10.8 kΩ 3.5–6.5 kΩ
Sub-throttle actuator	Resistance ACM–A and A–, BCM–B and B–	0.82–0.98 Ω
IAC valve	Resistance B1 (or B2)–Others	18–24 Ω
Solenoid resistor	Resistance +B–Others	Approx. 6 Ω
VSV for Fuel pressure control	Resistance at 20°C (68°F)	33–39 Ω
VSV for intake air control valve	Resistance at 20°C (68°F)	38.5–44.5 Ω
VSV for exhaust gas control valve	Resistance at 20°C (68°F)	38.5–44.5 Ω
VSV for waste gate valve	Resistance at 20°C (68°F)	22–26 Ω
VSV for exhaust bypass valve	Resistance at 20°C (68°F)	22–26 Ω

VSV for EVAP	Resistance	at 20°C (68°F)	30–34 Ω
VSV for EGR	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	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
Main heated oxygen sensor	Heater coil resistance	at 20°C (68°F)	11–16 Ω
Sub heated oxygen sensor	Heater coil resistance	at 20°C (68°F)	11–16 Ω
Fuel cut rpm	Fuel return rpm		1,100 rpm

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Fuel line for	union bolt	29	300	22
	for flare nut	30	310	22
Fuel pressure regulator x Delivery pipe		8.8	90	78 in.·lbf
Delivery pipe x Intake manifold		21	210	15
Injector holder x Delivery pipe		7.8	80	69 in.·lbf
Fuel inlet pipe x Delivery pipe		41	420	30
Fuel return pipe x Fuel pressure regulator		27	280	20
Air intake chamber x Intake manifold		27	280	20
Manifold stay x Air intake chamber		39	400	29
Manifold stay x Cylinder head		39	400	29
EGR pipe x Cylinder head		27	270	20
EGR pipe x EGR valve		64	650	47
Control cable bracket x Air intake chamber		19	195	14
Air intake chamber stay x Intake manifold		19	195	14
Air intake chamber stay x Control cable bracket		19	195	14
Fuel pressure pulsation damper x Fuel pipe support		41	420	30
	for SST	35	350	25
Fuel tank band x Body		39	400	29
MAF meter x Air cleaner case		6.9	70	61 in.·lbf
Throttle body x Air intake chamber		21	210	15
IAC valve x Air intake chamber		21	210	15
EGR gas temperature sensor x EGR valve		20	200	14
Knock sensor x Cylinder block		44	450	33
Main heated oxygen sensor x Exhaust manifold		20	200	14
Sub heated oxygen sensor x Center exhaust pipe		20	200	14
Upper front crossmember extension x Front suspension	Bolt	29	300	22
	Nut	33	340	25
Front lower arm bracket stay x Front suspension	Bolt	44	450	33
	Nut	59	600	43

EMISSION CONTROL SYSTEMS (2JZ–GTE)

SYSTEM PURPOSE

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

The function of each system is shown in the following table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces 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 this manual.

PREPARATION

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Tachometer	
Torque wrench	
Vacuum gauge	

EMISSION CONTROL SYSTEMS (2JZ–GTE)

SYSTEM PURPOSE

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

The function of each system is shown in the following table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces 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 this manual.

PREPARATION

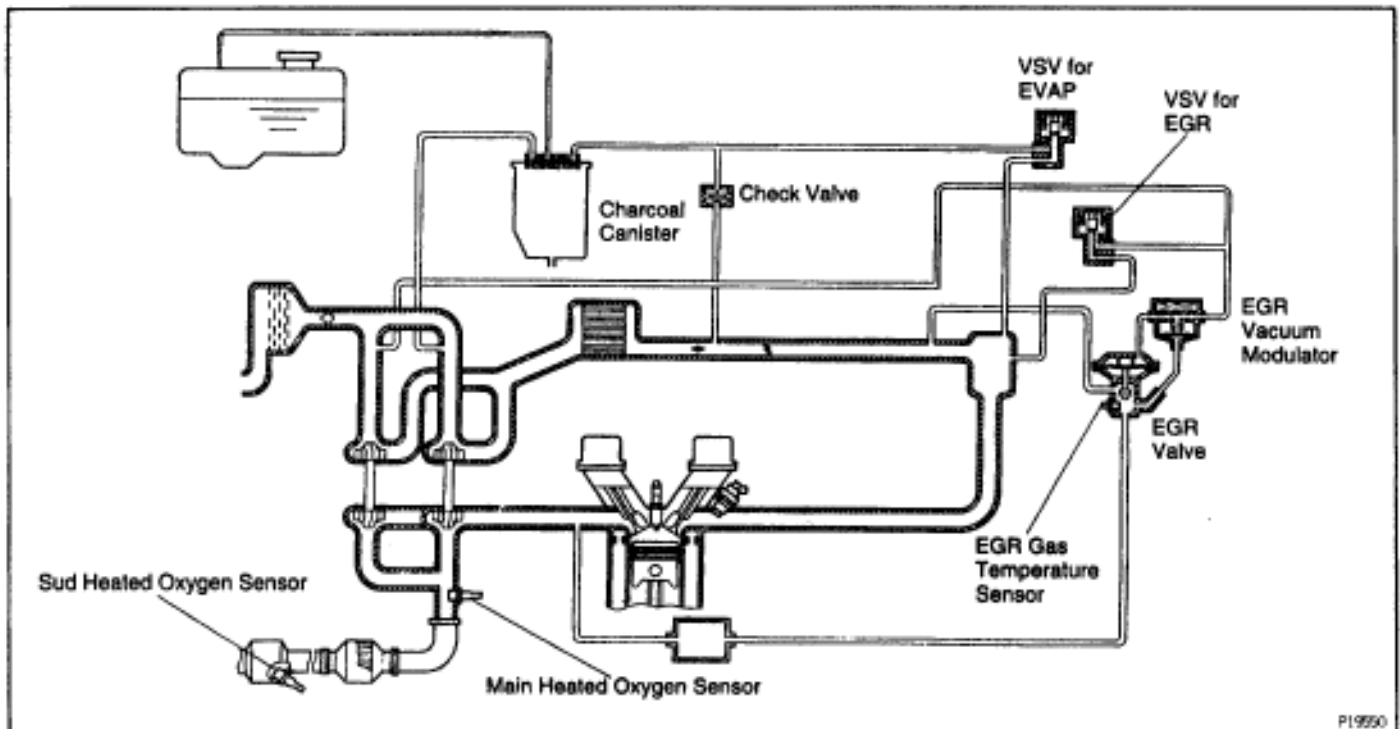
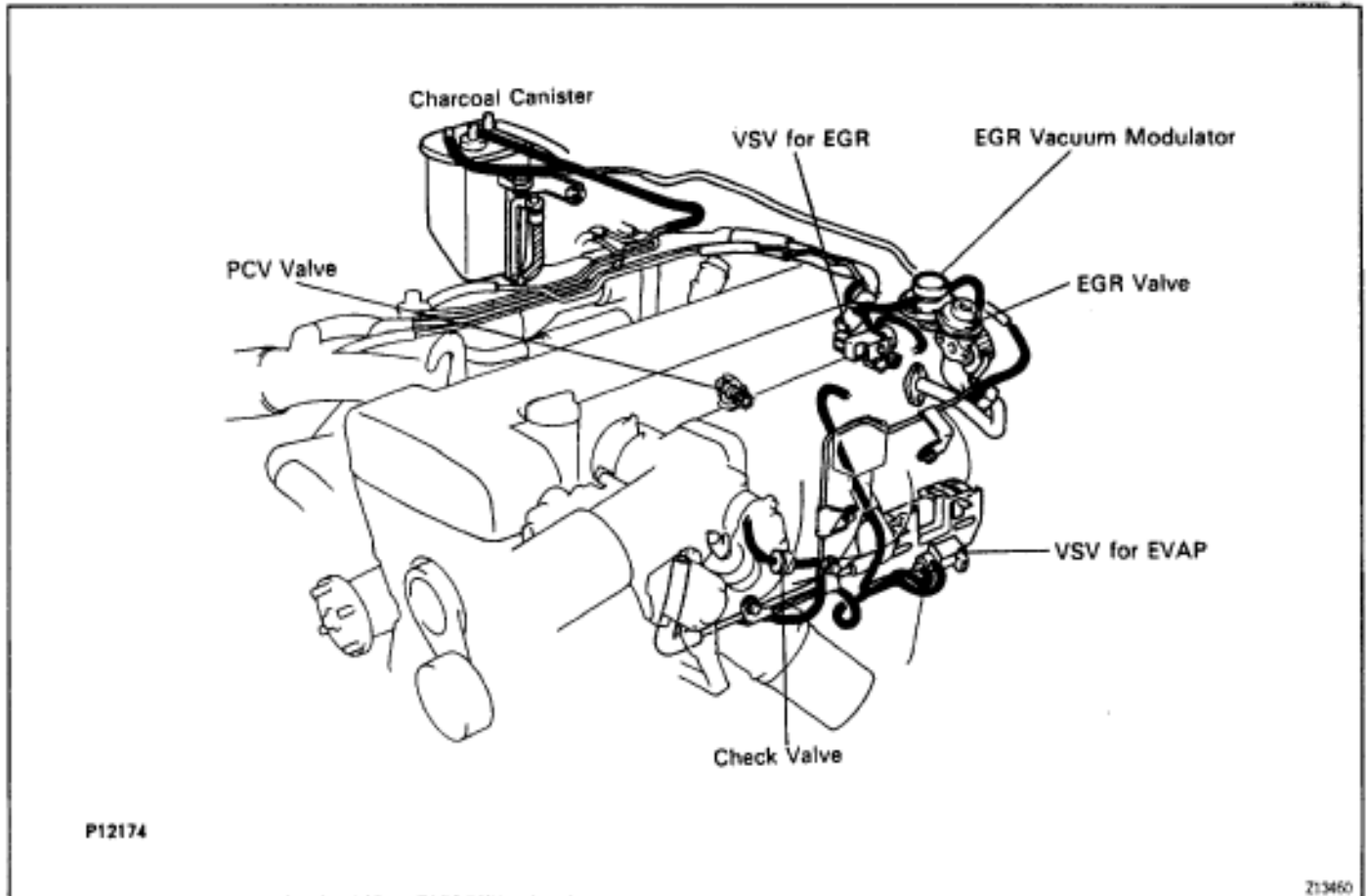
RECOMMENDED TOOLS

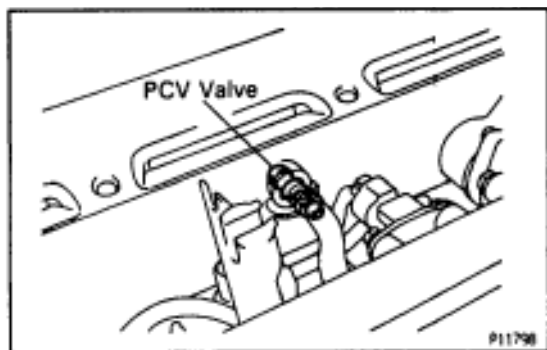
	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Tachometer	
Torque wrench	
Vacuum gauge	

LAYOUT AND SCHEMATIC DRAWING



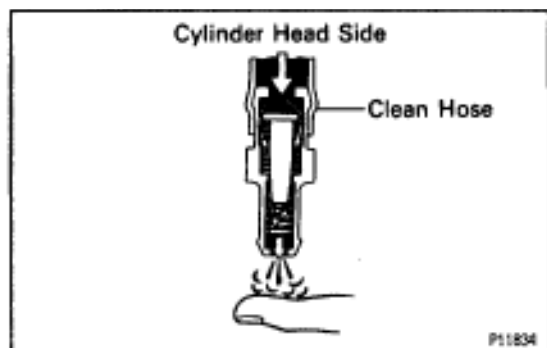


POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

PCV VALVE INSPECTION

1. REMOVE PCV VALVE

- (a) Disconnect the PCV hose from the PCV valve.
- (b) Remove the PCV valve.

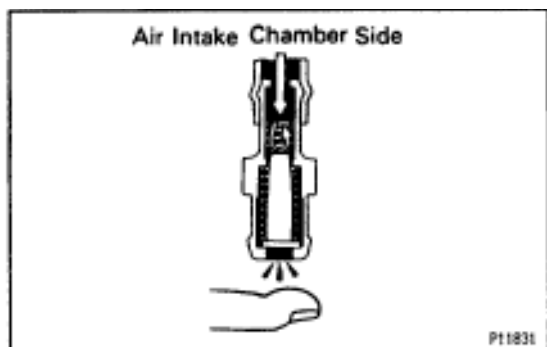


2. INSTALL CLEAN HOSE TO PCV VALVE

3. INSPECT PCV VALVE OPERATION

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

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

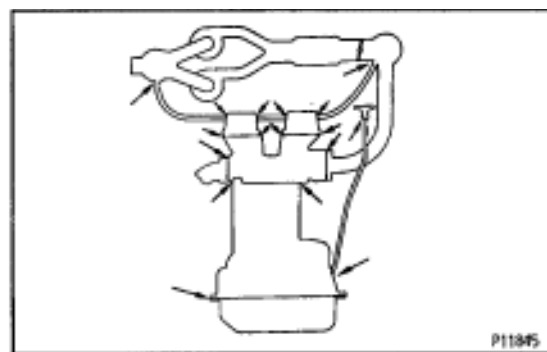


- (b) Blow air into the air intake chamber side, and check that air passes through with difficulty.

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

4. REMOVE CLEAN HOSE FROM PCV VALVE

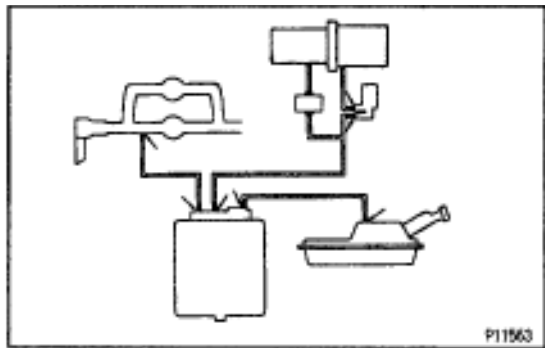
5. REINSTALL PCV VALVE



PCV HOSES AND CONNECTORS INSPECTION

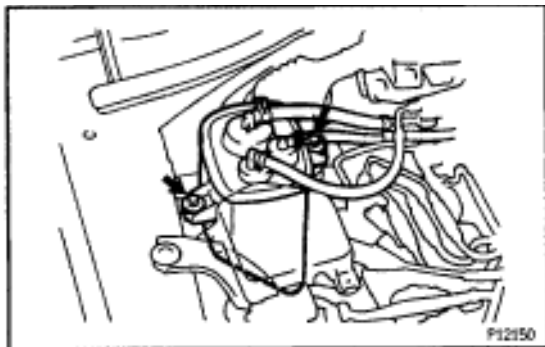
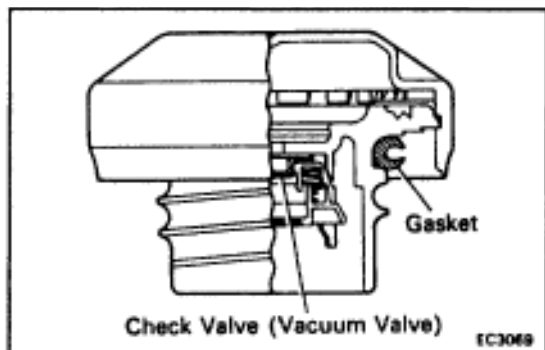
VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.



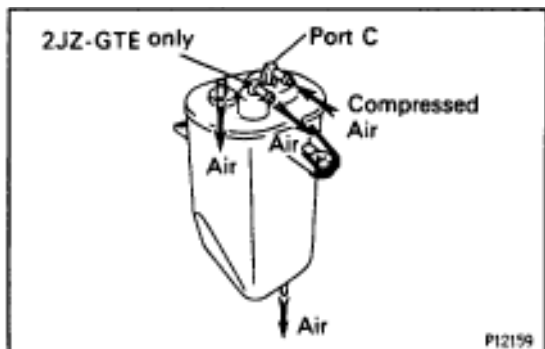
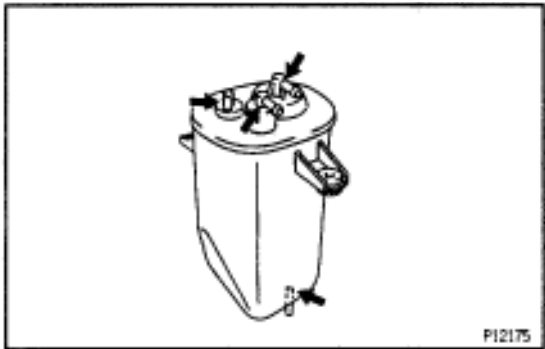
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM FUEL VAPOR LINES, FUEL TANK AND TANK CAP INSPECTION

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.

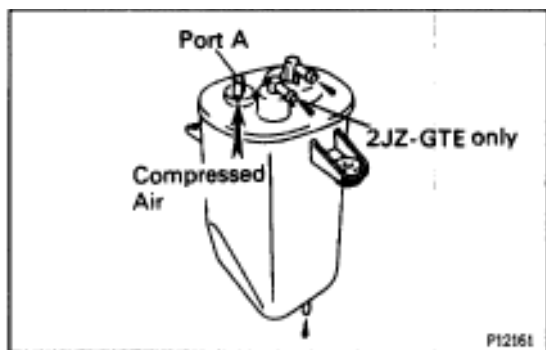


CHARCOAL CANISTER INSPECTION

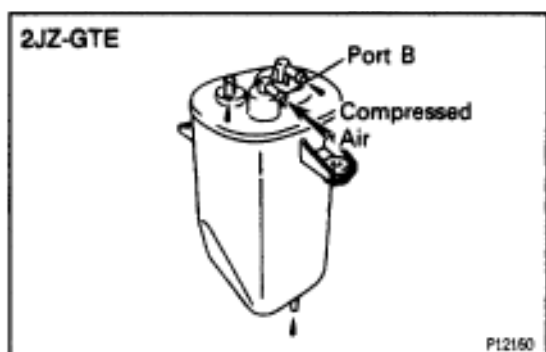
1. **REMOVE CHARCOAL CANISTER**
2. **VISUALLY INSPECT CHARCOAL CANISTER**
Look for cracks or damage.



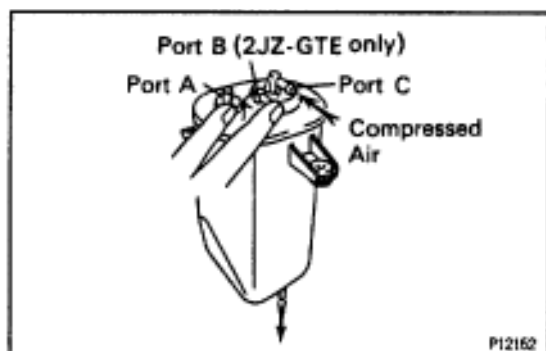
3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**
 - (a) Using low pressure compressed air (4.71 kPa (0.048 kgf/cm², 0.68 psi)), blow into port C and check that air flows without resistance from the other ports.



- (b) Blow air (4.71 kPa (0.048 kgf/cm², 0.68 psi)) into port A, and check that air does not flow from the other ports.



- (c) Blow air (4.71 kPa (0.048 kgf/cm², 0.68 psi)) into port B, and check that air does not flow from the other ports.
If operation is not as specified, replace the charcoal canister.



4. CLEAN FILTER IN CANISTER

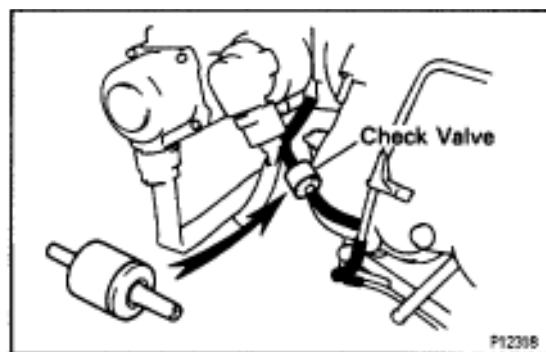
Clean the filter by blowing 294 kPa (3 kgf/cm², 43 psi) of compressed air into port C while holding port A and B closed.

NOTICE:

Do not attempt to wash the canister.

No activated carbon should come out.

5. REINSTALL CHARCOAL CANISTER



VSV INSPECTION

(See VSV for EVAP in SFI System)

CHECK VALVE INSPECTION

1. REMOVE CHECK VALVE

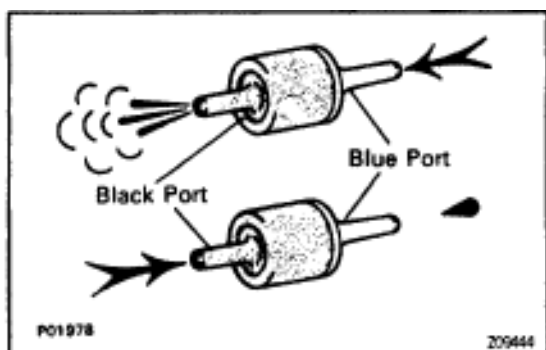
2. INSPECT CHECK VALVE

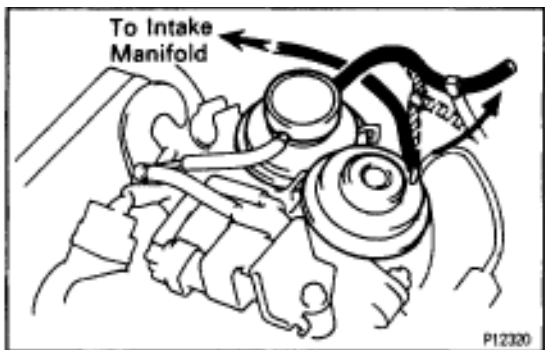
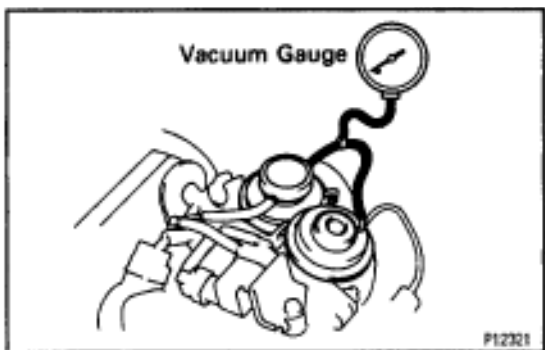
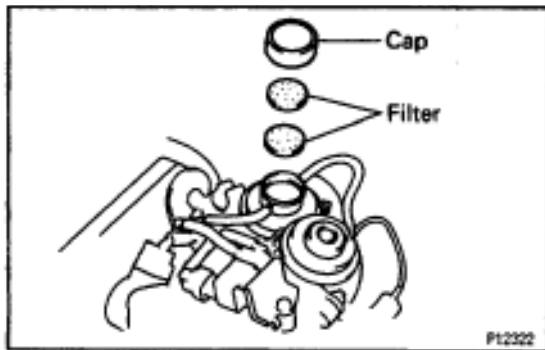
- (a) Check that air flows from the blue port to the black port.
(b) Check that air does not flow from the black port to the blue port.

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

3. REINSTALL CHECK VALVE

HINT: Install the check valve with the black port facing the purge port side of the throttle body.





EXHAUST GAS RECIRCULATION (EGR) SYSTEM

EGR SYSTEM INSPECTION

1. INSPECT AND CLEAN FILTER IN EGR VACUUM MODULATOR

- Remove the cap and 2 filters.
- Check the filter for contamination or damage.
- Using compressed air, clean the filter.
- Reinstall the 2 filters and cap.

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

2. INSTALL VACUUM GAUGE

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

3. INSPECT SEATING OF EGR VALVE

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

4. INSPECT VSV OPERATION WITH COLD ENGINE

- The coolant temperature should be below 50°C (122°F).
- From idle, race the engine to 3,500–4,000 rpm (throttle valve opening angle to about 1/3 of maximum).
- Check that the EGR pipe is not hot.
- Check that the vacuum gauge indicates zero.

5. INSPECT VSV OPERATION WITH HOT ENGINE

- Warm up the engine to above 50°C (122°F)
- From idle, race the engine to 3,500–4,000 rpm (throttle valve opening angle to about 1/3 of maximum).
- Check that the vacuum gauge indicates low vacuum.

6. REMOVE VACUUM GAUGE

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

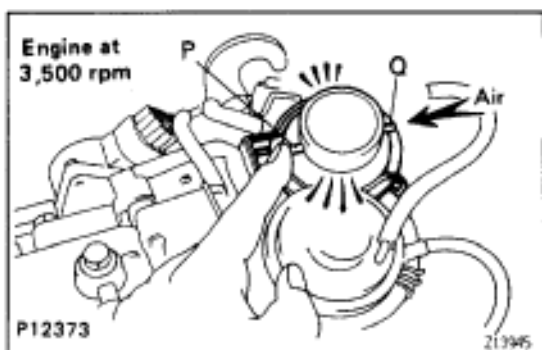
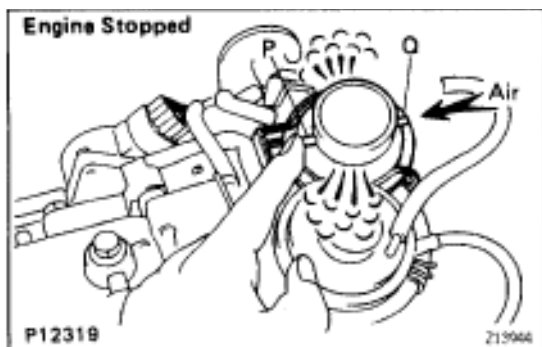
7. INSPECT EGR VALVE

- Apply vacuum directly to the EGR valve with the engine idling.
- Check that the engine runs rough or dies.
- Reconnect the vacuum hoses to the proper locations.

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

VSV INSPECTION

(See VSV for EGR in SFI System)



EGR VACUUM MODULATOR INSPECTION

1. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR

Disconnect the 2 vacuum hoses from ports P and Q of the EGR vacuum modulator.

2. INSPECT EGR VACUUM MODULATOR OPERATION

- Block port P with your finger.
- Blow air into port Q, and check that the air passes through to the air filter side freely.
- Start the engine, and maintain speed at 3,500 rpm.
- Repeat the above test. Check that there is a strong resistance to air flow.

3. RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR

Reconnect the 2 vacuum hoses to the proper locations.

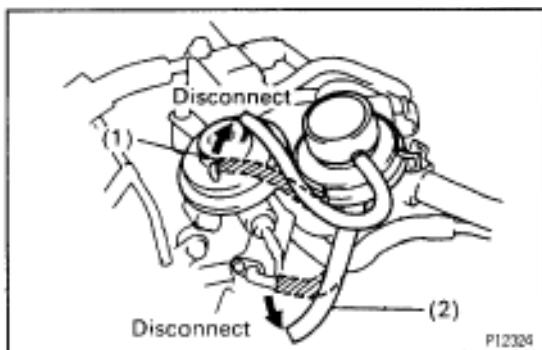


EGR VALVE INSPECTION

1. REMOVE EGR PIPE

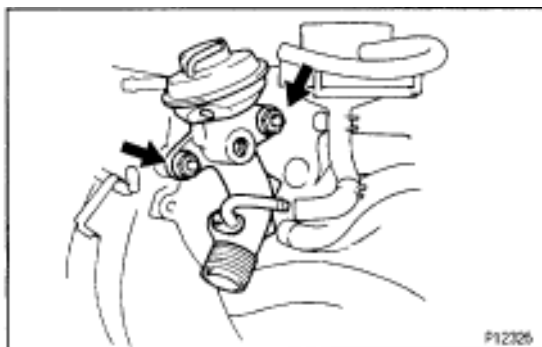
- Loosen the union nut of the EGR pipe.
- Remove the 2 bolts, EGR pipe and gasket.

2. REMOVE EGR GAS TEMPERATURE SENSOR

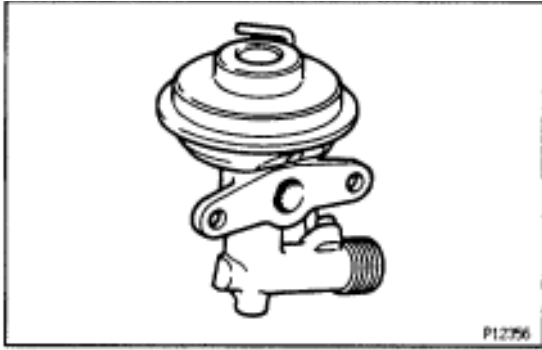


3. REMOVE EGR VALVE

- Disconnect these hoses from the EGR valve:
 - Vacuum hose
 - Pressure hose



- Remove the 2 nuts, EGR valve and gasket.

**4. INSPECT EGR VALVE**

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

5. REINSTALL EGR VALVE

(a) Place a new gasket on the air intake chamber.

(b) Install the EGR valve with the 2 nuts.

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

(c) Reconnect the following hoses to the EGR valve:

- Vacuum hose
- Pressure hose

6. REINSTALL EGR GAS TEMPERATURE SENSOR

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

7. REINSTALL EGR PIPE

(a) Temporarily install the union nut of the EGR pipe.

(b) Install a new gasket and the EGR pipe with the 2 bolts.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

(c) Tighten the union nut of the EGR pipe.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

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

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

TWC INSPECTION

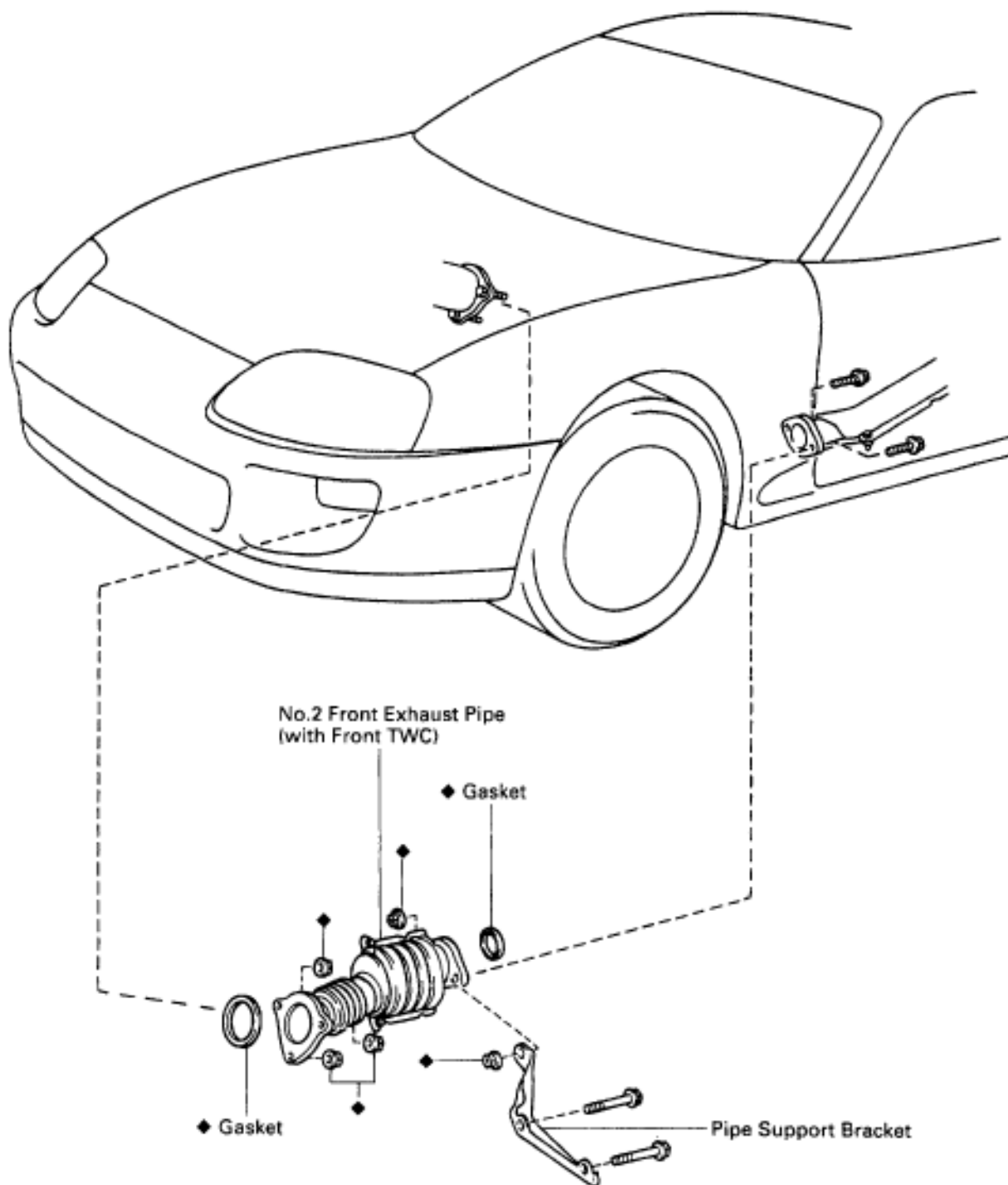
CHECK FOR DENTS OR DAMAGE

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

HEAT INSULATOR INSPECTION

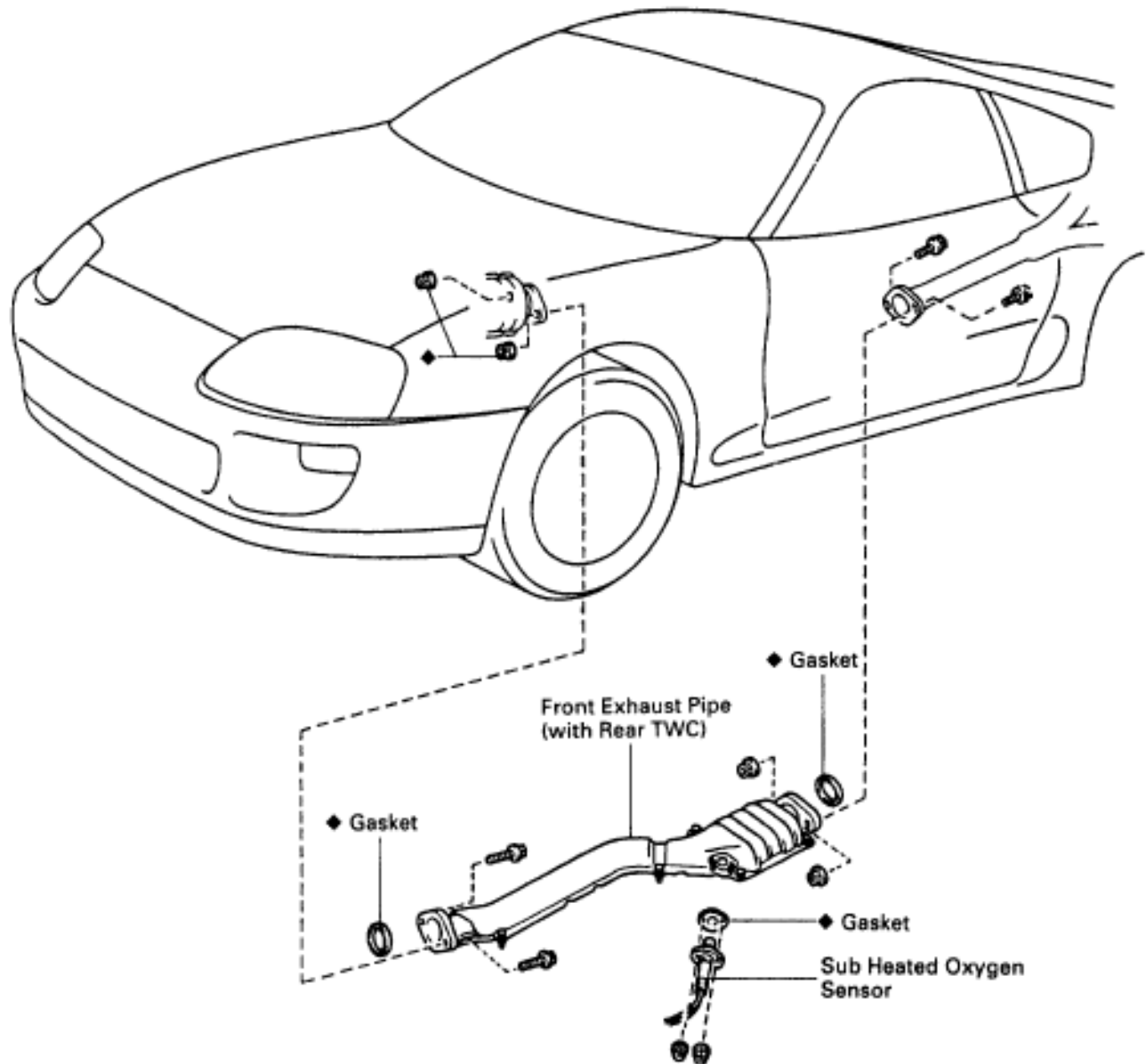
- 1. CHECK HEAT INSULATOR FOR DAMAGE**
- 2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR**

COMPONENTS FOR FRONT TWC REPLACEMENT



◆ Non-reusable part

COMPONENTS FOR REAR TWC REPLACEMENT



P18591

- ◆ Non-reusable part

21/06/06

SERVICE SPECIFICATIONS

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
EGR valve x Air Intake chamber	21	210	15
EGR gas temperature sensor x EGR valve	20	200	14
EGR pipe x Cylinder head	27	280	20
EGR valve x EGR pipe	64	650	47
No.2 front exhaust pipe (Front TWC) x Exhaust manifold	62	630	46
Pipe support bracket x Transmission	43	440	32
No.2 front exhaust pipe (Front TWC) x Front exhaust pipe (Rear TWC)	43	440	32
Front exhaust pipe (Rear TWC) x Center exhaust pipe	43	440	32
Sub heated oxygen sensor x Front exhaust pipe	20	200	14

EMISSION CONTROL SYSTEMS (2JZ–GE)

SYSTEM PURPOSE

The emission control systems are installed to reduce the amount of CO, HC and NO_x 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 the following table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces HC
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Exhaust Gas Recirculation	EGR	Reduces NO _x
(4) Three–Way Catalytic Converter	TWC	Reduces CO, HC and NO _x
(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 this manual.

PREPARATION

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Tachometer	
Torque wrench	
Vacuum gauge	

EMISSION CONTROL SYSTEMS (2JZ–GE)

SYSTEM PURPOSE

The emission control systems are installed to reduce the amount of CO, HC and NO_x 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 the following table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces HC
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Exhaust Gas Recirculation	EGR	Reduces NO _x
(4) Three–Way Catalytic Converter	TWC	Reduces CO, HC and NO _x
(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 this manual.

PREPARATION

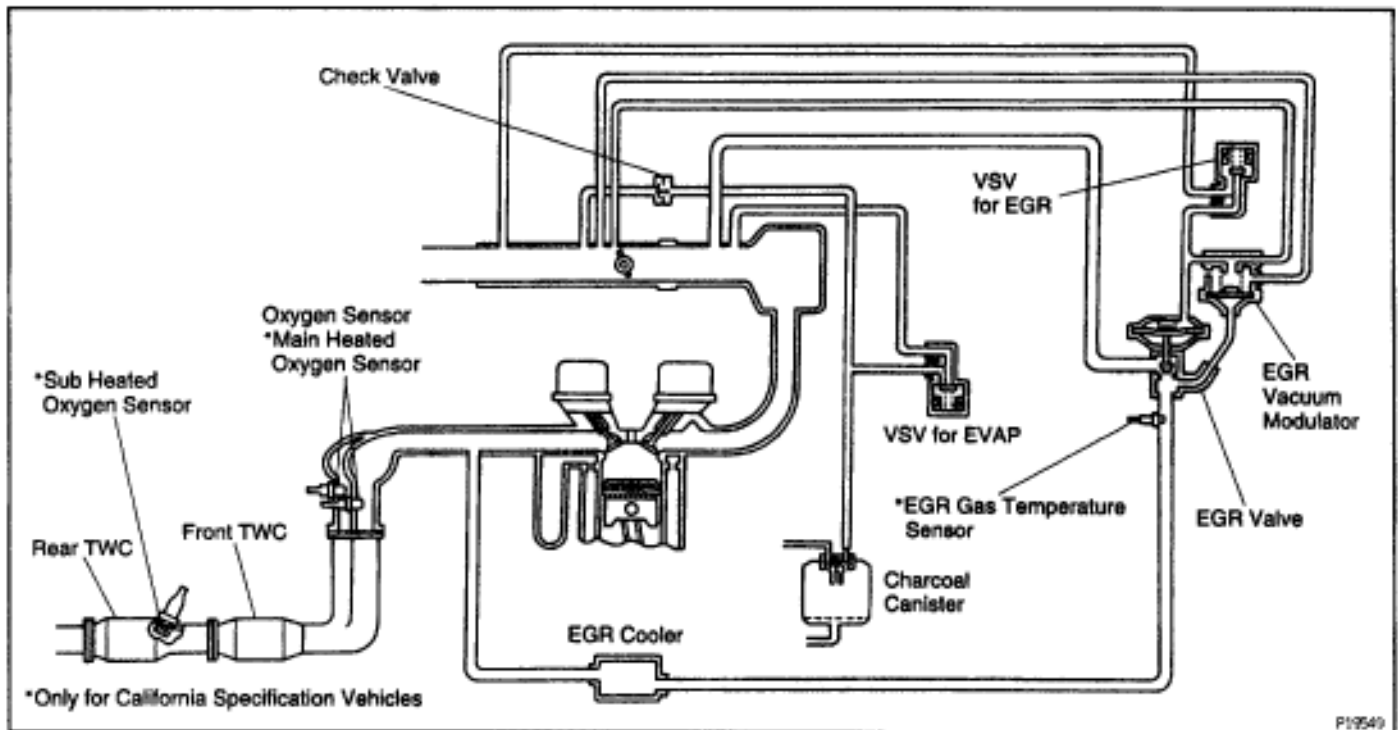
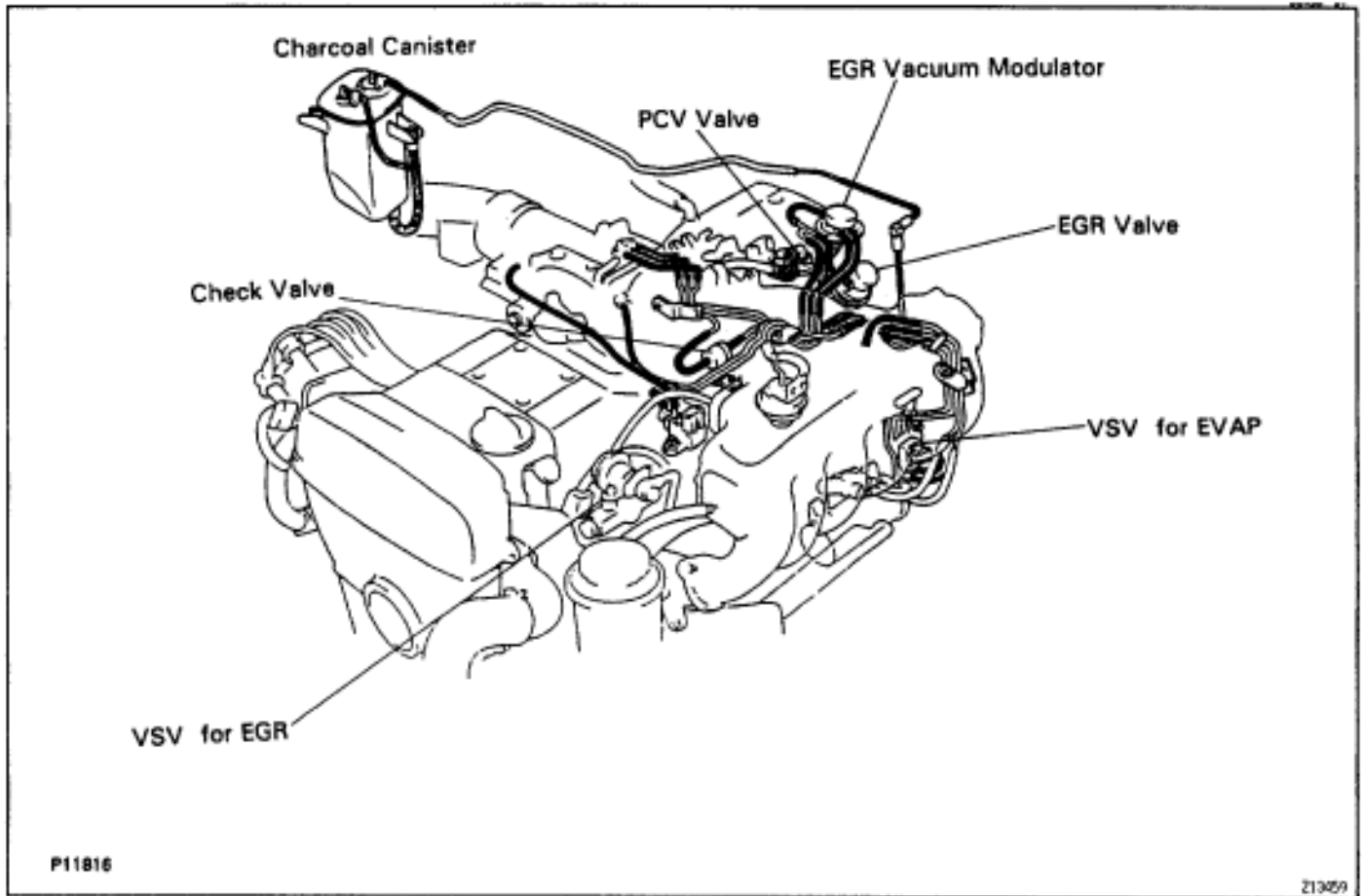
RECOMMENDED TOOLS

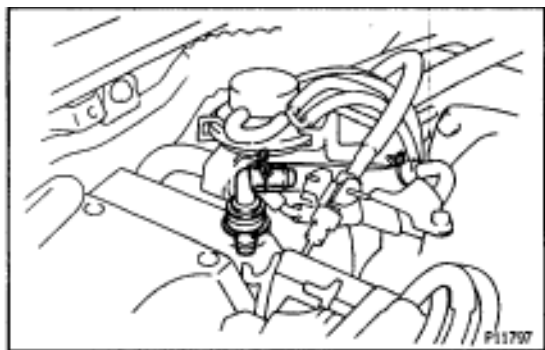
	09082–00050 TOYOTA Electrical Tester Set 	

EQUIPMENT

Tachometer	
Torque wrench	
Vacuum gauge	

LAYOUT AND SCHEMATIC DRAWING



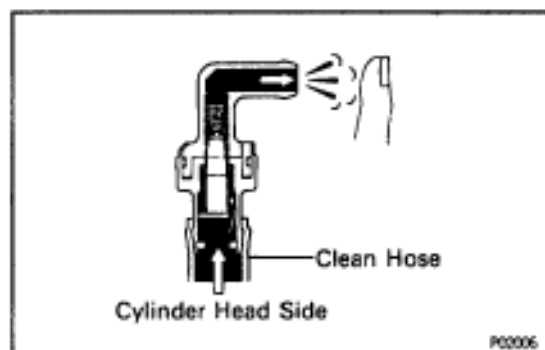


POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

PCV VALVE INSPECTION

1. REMOVE PCV VALVE

- (a) Disconnect the PCV hose from the PCV valve.
- (b) Remove the PCV valve.

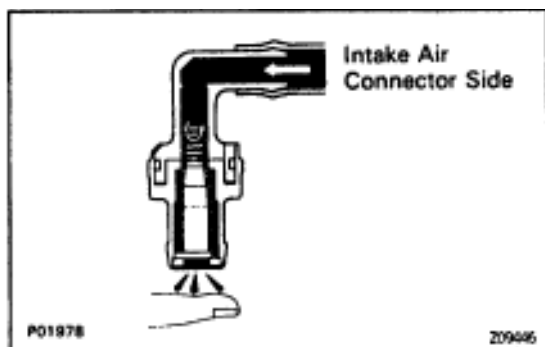


2. INSTALL CLEAN HOSE TO PCV VALVE

3. INSPECT PCV VALVE OPERATION

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

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

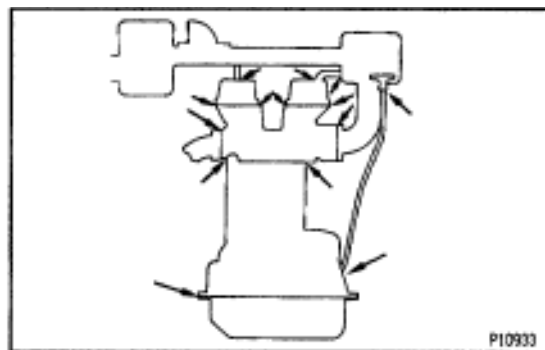


- (b) Blow air into the intake air connector side, and check that air passes through with difficulty.

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

4. REMOVE CLEAN HOSE FROM PCV VALVE

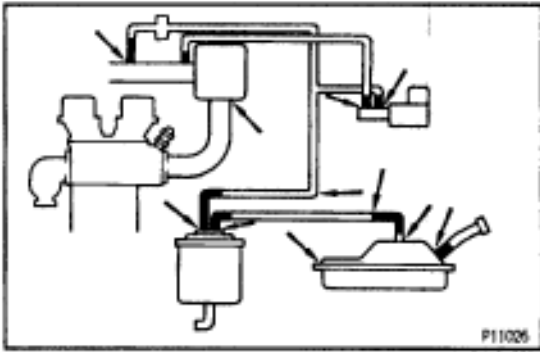
5. REINSTALL PCV VALVE



PCV HOSES AND CONNECTORS INSPECTION

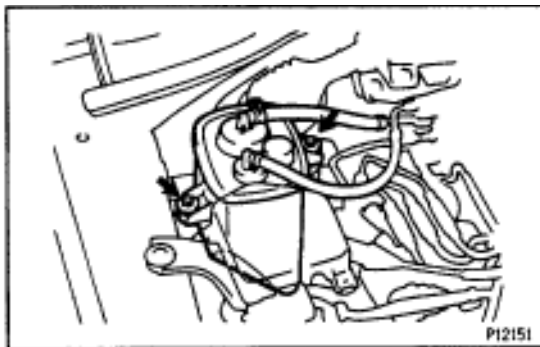
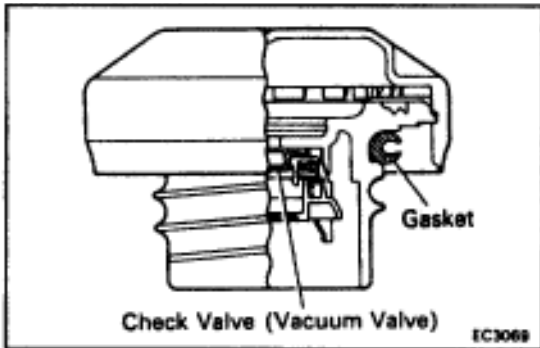
VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.



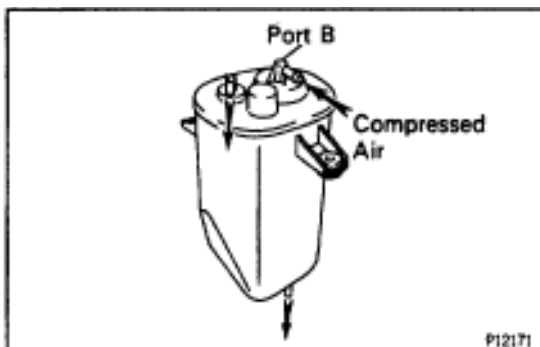
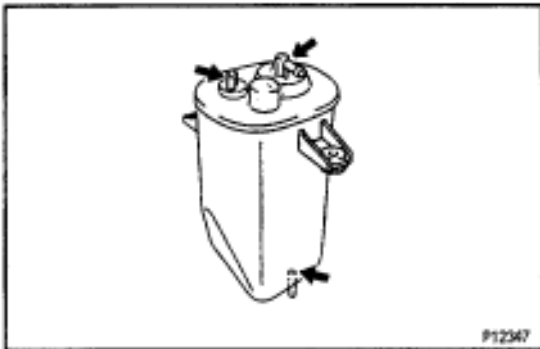
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM FUEL VAPOR LINES, FUEL TANK AND TANK CAP INSPECTION

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.

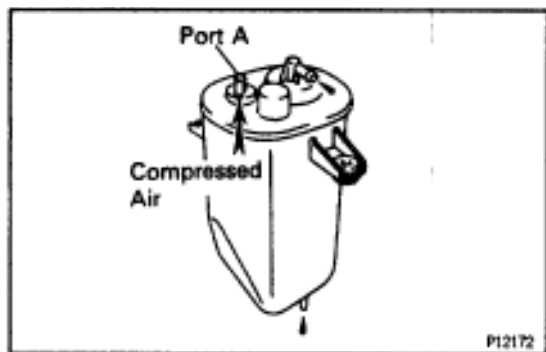


CHARCOAL CANISTER INSPECTION

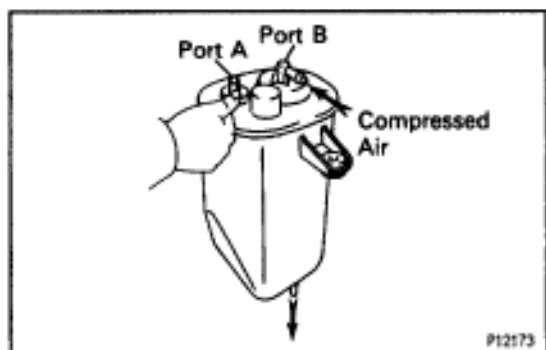
1. **REMOVE CHARCOAL CANISTER**
2. **VISUALLY INSPECT CHARCOAL CANISTER**
Look for cracks or damage.



3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**
 - (a) Using low pressure compressed air (4.71 kPa (0.048 kgf/cm², 0.68 psi)), blow into port B and check that air flows without resistance from the other ports.



- (b) Blow air (4.71 kPa (0.048 kgf/cm², 0.68 psi)) into port A, and check that air does not flow from the other ports.
If operation is not as specified, replace the charcoal canister.



4. CLEAN FILTER IN CANISTER

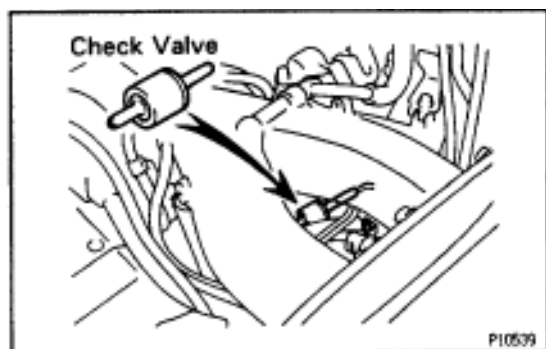
Clean the filter by blowing 294 kPa (3 kgf/cm², 43 psi) of compressed air into port B while holding port A closed.

NOTICE:

Do not attempt to wash the canister.

No activated carbon should come out.

5. REINSTALL CHARCOAL CANISTER



VSV INSPECTION

(See VSV for EVAP in SFI System)

CHECK VALVE INSPECTION

1. REMOVE CHECK VALVE

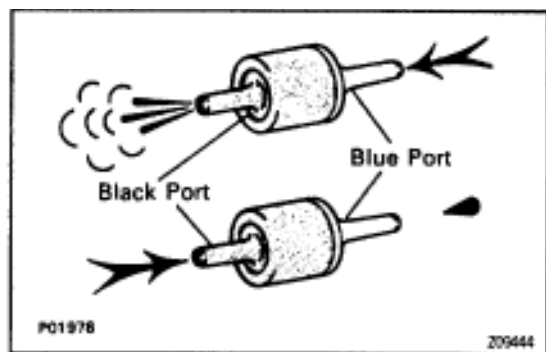
2. INSPECT CHECK VALVE

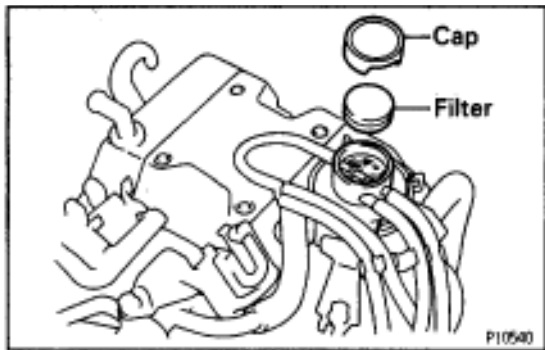
- Check that air flows from the blue port to the black port.
- Check that air does not flow from the black port to the blue port.

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

3. REINSTALL CHECK VALVE

HINT: Install the check valve with the black port facing the port P side of the throttle body.





EXHAUST GAS RECIRCULATION (EGR) SYSTEM

EGR SYSTEM INSPECTION

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

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

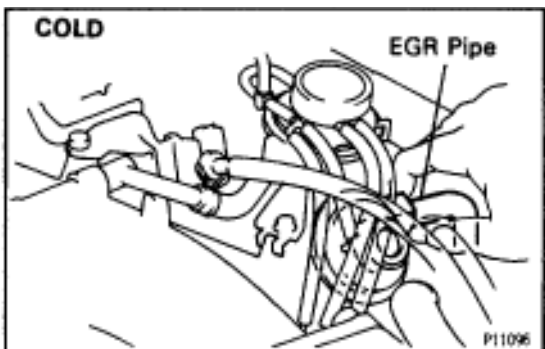
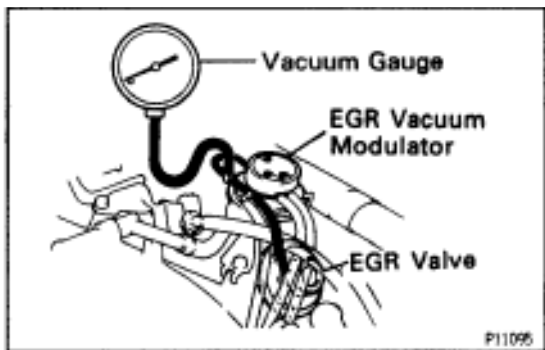
HINT: Install the filter with the coarser surface facing the atmospheric side outward.

2. INSTALL VACUUM GAUGE

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

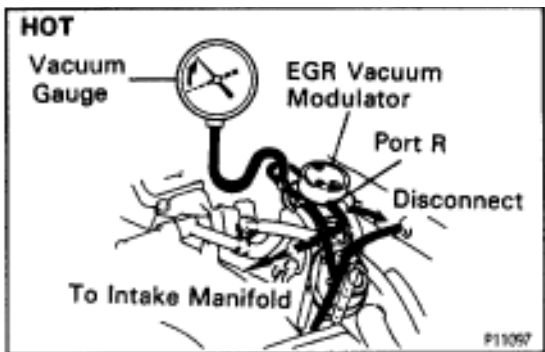
3. INSPECT SEATING OF EGR VALVE

Check that the engine starts and runs at idle.



4. INSPECT VSV OPERATION WITH COLD ENGINE

- The engine coolant temperature should be below 45°C (113°F).
- Check that the vacuum gauge indicates zero at 2,500 rpm.
- Check that the EGR pipe is not hot.



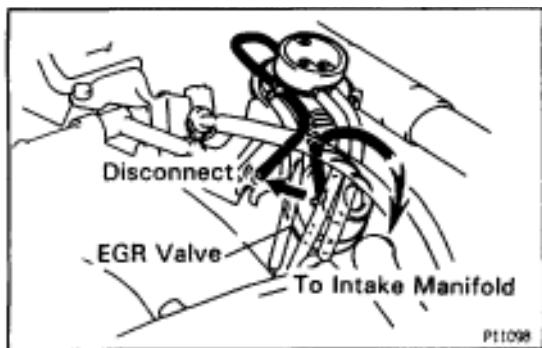
5. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

- Warm up the engine to above 50°C (122°F).
- Check that the vacuum gauge indicates low vacuum at 3,500 rpm.
- Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the air intake chamber with another hose.
- 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.

6. REMOVE VACUUM GAUGE

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



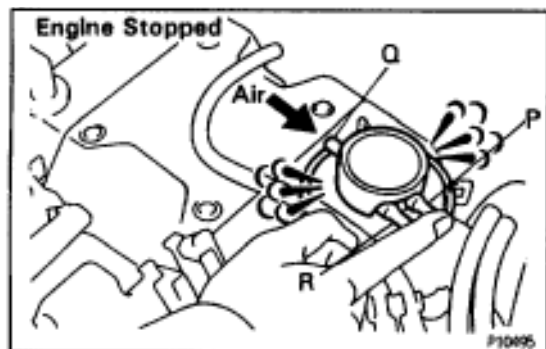
7. INSPECT EGR VALVE

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

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

VSV INSPECTION

(See VSV for EGR in SFI System)



EGR VACUUM MODULATOR INSPECTION

1. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR

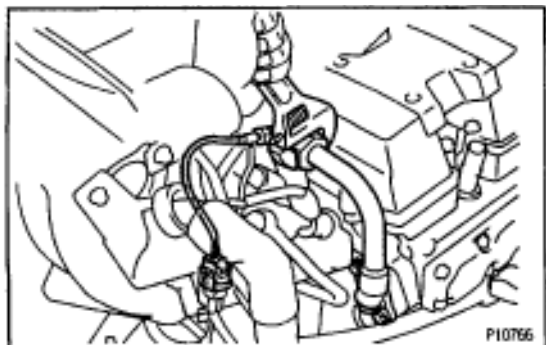
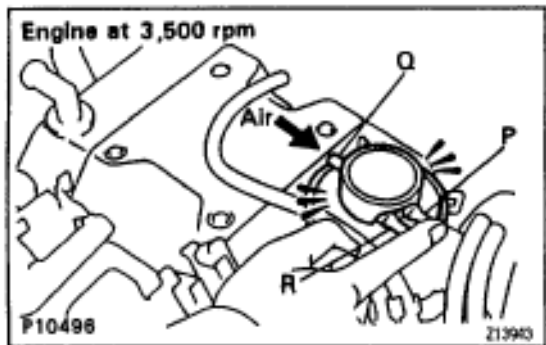
Disconnect the 3 vacuum hoses from ports P, Q and R of the EGR vacuum modulator.

2. INSPECT EGR VACUUM MODULATOR OPERATION

- (a) Block ports P and R with your finger.
- (b) Blow air into port Q, and check that 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 the 3 vacuum hoses to the proper locations.

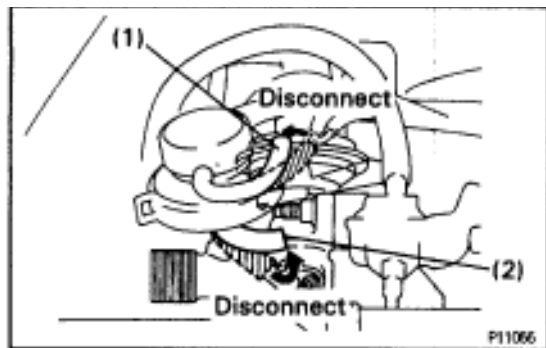


EGR VALVE INSPECTION

1. REMOVE EGR PIPE

- (a) Loosen the union nut of the EGR pipe.
- (b) Remove the 2 bolts, EGR pipe and gasket.

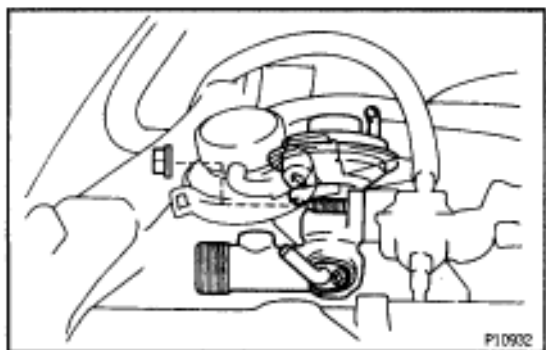
2. REMOVE EGR GAS TEMPERATURE SENSOR



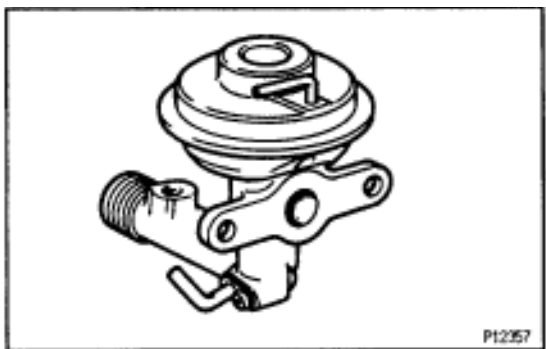
3. REMOVE EGR VALVE

(a) Disconnect these hoses from the EGR valve:

- (1) Vacuum hose
- (2) Pressure hose



(b) Remove the 2 nuts, EGR valve and gasket.



4. INSPECT EGR VALVE

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

5. REINSTALL EGR VALVE

- (a) Place a new gasket on the intake air connector.
- (b) Install the EGR valve with the 2 nuts.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

(c) Reconnect the following hoses to the EGR valve:

- Vacuum hose
- Pressure hose

6. REINSTALL EGR GAS TEMPERATURE SENSOR

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

7. REINSTALL EGR PIPE

- (a) Temporarily install the union nut of the EGR pipe.
- (b) Install a new gasket and the EGR pipe with the 2 bolts.

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

(c) Tighten the union nut of the EGR pipe.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

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

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

TWC INSPECTION

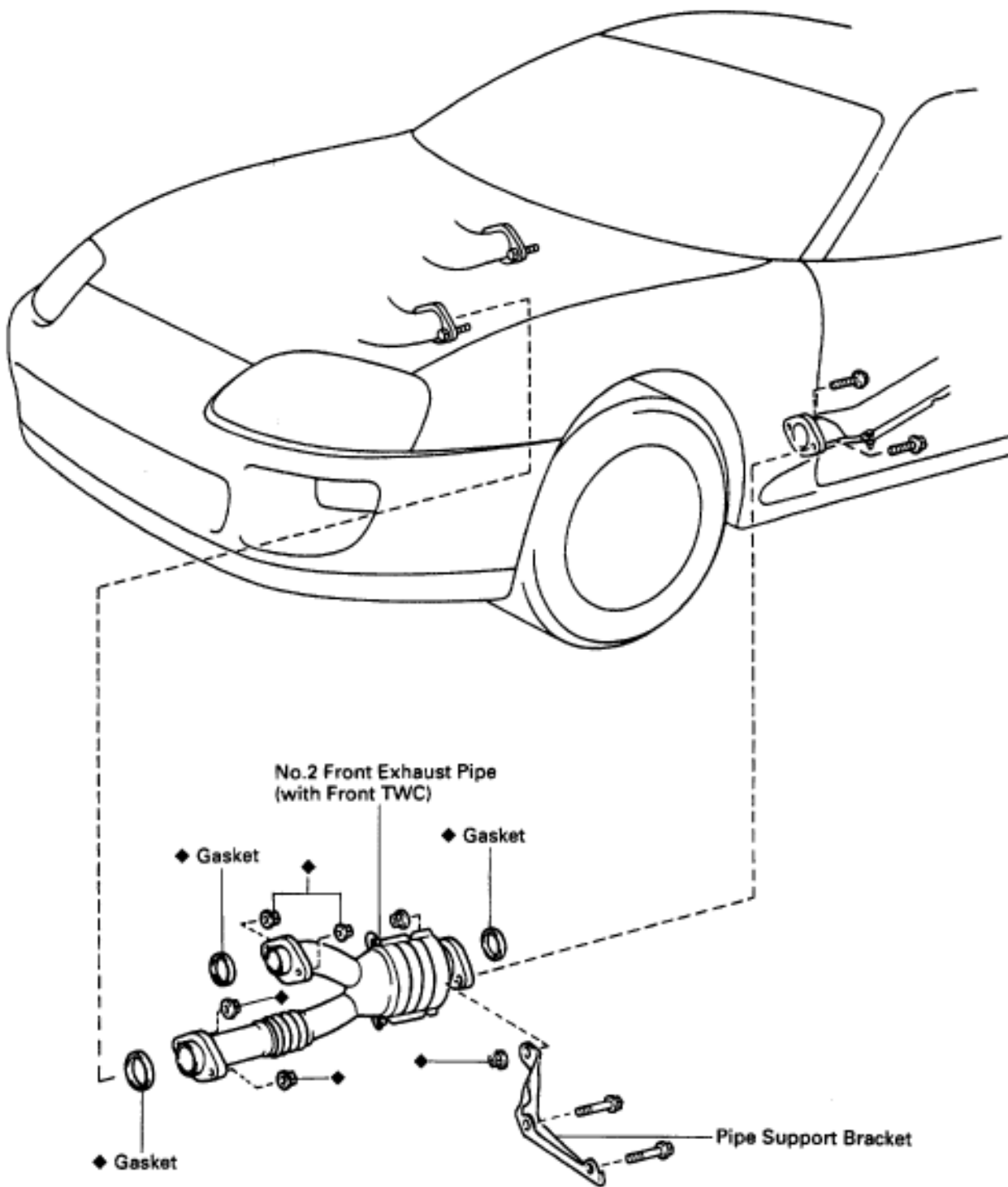
CHECK FOR DENTS OR DAMAGE

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

HEAT INSULATOR INSPECTION

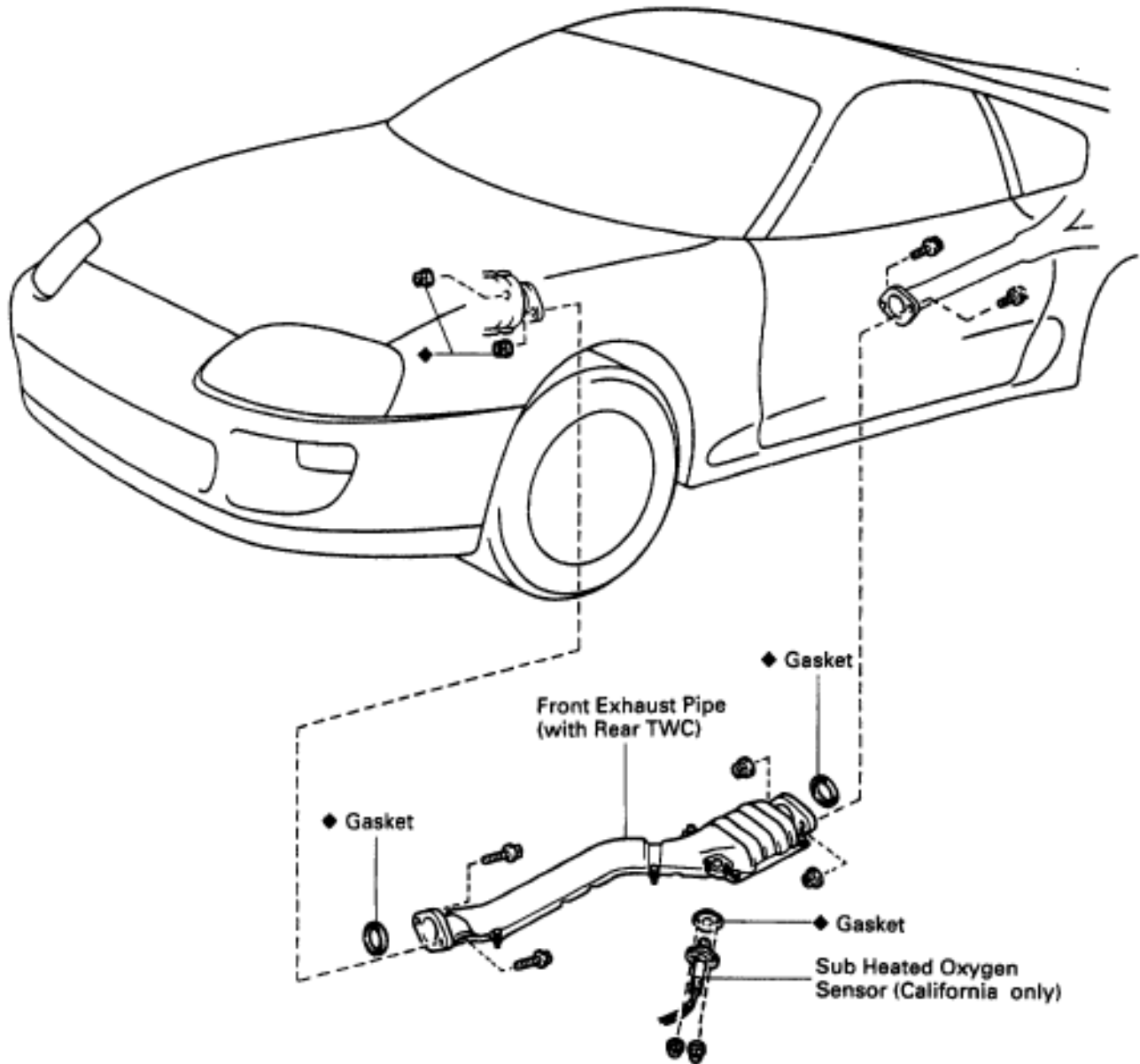
- 1. CHECK HEAT INSULATOR FOR DAMAGE**
- 2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR**

COMPONENTS FOR FRONT TWC REMOVAL AND INSTALLATION



◆ Non-reusable part

COMPONENTS FOR REAR TWC REMOVAL AND INSTALLATION



◆ Non-reusable part

SERVICE SPECIFICATIONS

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
EGR valve x Intake air connector	21	210	15
EGR gas temperature sensor x EGR valve	20	200	14
EGR pipe x Cylinder head	27	280	20
EGR valve x EGR pipe	64	650	47
No.2 front exhaust pipe (Front TWC) x Exhaust manifold	62	630	46
Pipe support bracket x Transmission	43	440	32
No.2 front exhaust pipe (Front TWC) x Front exhaust pipe (Rear TWC)	43	440	32
Front exhaust pipe (Rear TWC) x Center exhaust pipe	43	440	32
Sub heated oxygen sensor (California only) x Front exhaust pipe	20	200	14

TURBOCHARGER SYSTEM (2JZ-GTE)

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09992-00241 Turbocharger Pressure Gauge	

EQUIPMENT

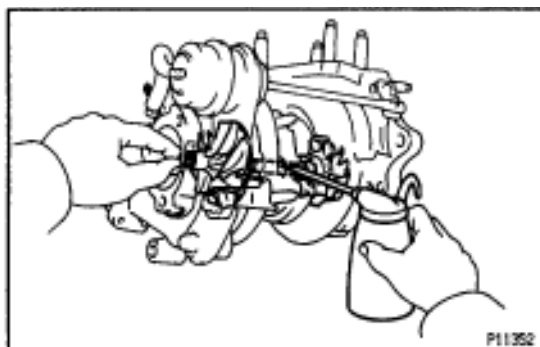
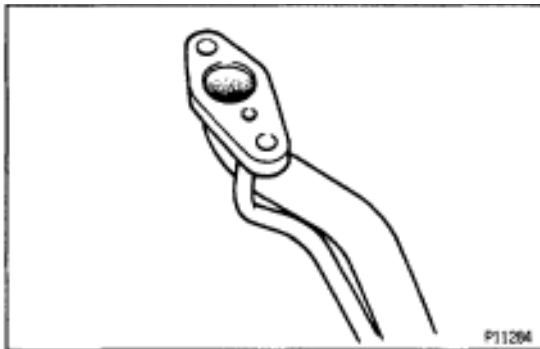
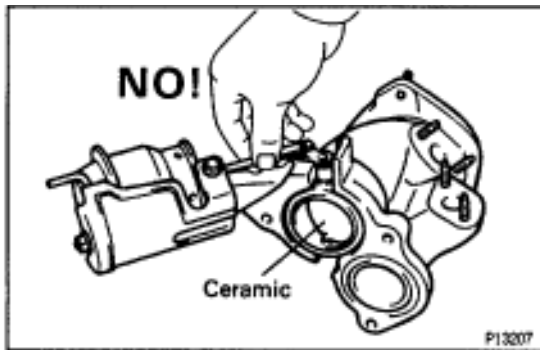
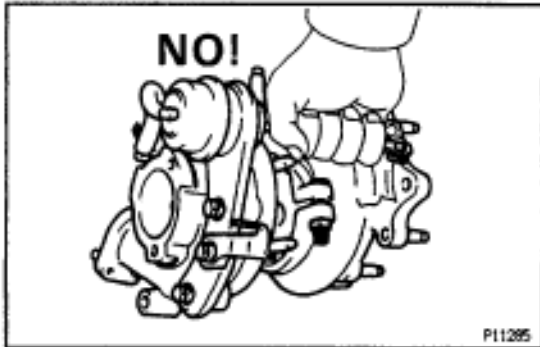
Dial indicator	Impeller wheel
Torque wrench	

COOLANT

Item		Capacity	Classification
Engine coolant (w/ Heater)	M/T	9.5 liters (10.0 US qts. 8.4 Imp. qts)	Ethylene-glycol base
	A/T	9.4 liters (9.9 US qts, 8.3 Imp. qts)	

PRECAUTION

1. Do not stop the engine immediately after pulling a trailer or after high speed or uphill driving. Idle the engine for 20–120 seconds, depending on how hard the vehicle has been driven.
2. Avoid sudden acceleration or racing immediately after starting a cold engine.
3. Do not run the engine with air cleaner removed, as this may cause foreign material to enter and damage the impeller wheel operating at high speed.
4. If a turbocharger is found to be defective and must be replaced, check for the cause, and repair or replace the following items as necessary:
 - Engine oil level and quality
 - Conditions under which the turbocharger was used
 - Oil lines leading to the turbocharger
5. Use caution when removing and reinstalling the turbocharger assembly. Do not drop it or knock it against anything or grasp it by easily-deformed parts, such as the actuator or rod, when moving it.
6. Use caution when removing and reinstalling the exhaust gas control valve assembly. Do not drop it or knock it against anything or grasp it by easily-deformed parts, such as the actuator or rod, when moving it. The control valve is ceramic.
7. Before removing the turbocharger, plug the intake and exhaust ports and oil inlet to prevent entry of dirt or other foreign material.
8. If replacing the turbocharger, check for accumulation of sludge particles in the oil pipes, and if necessary, replace the oil pipes.
9. Completely remove the gasket adhered to the lubrication oil pipe flange and turbocharger oil flange.
10. When replacing bolt or nuts, use only authorized replacement parts to prevent breakage or deformation.
11. If replacing the turbocharger, pour approx. 20 cm³ (1.2 cu in.) of fresh oil into the turbocharger oil inlet and turn the impeller wheel by hand to spread oil to the bearing.
12. If overhauling or replacing the engine, cut the fuel supply after reassembly and crank the engine for 30 seconds to distribute oil throughout the engine. Then allow the engine to idle for 60 seconds.



TROUBLESHOOTING

HINT: Before troubleshooting the turbocharger, first check the engine itself. (Valve clearance, engine compression, ignition timing etc.)

INSUFFICIENT ACCELERATION, LACK OF POWER OR EXCESSIVE FUEL CONSUMPTION

(Possible Cause)

Check Procedure and Correction Method

1. TURBOCHARGING PRESSURE TOO LOW

Check turbocharging pressure. (See page [EG-144](#))

Turbocharging pressure:

61–75 kPa

(0.62–0.76 kgf/cm², 8.8–10.8 psi)

If the pressure is below specifications, begin diagnosis from item 2.

2. RESTRICTED INTAKE SYSTEM

Check intake air system, and repair or replace parts as necessary. (See page [EG-144](#))

3. LEAK IN INTAKE AIR SYSTEM

Check intake air system, and repair or replace parts as necessary. (See page [EG-144](#))

4. RESTRICTED EXHAUST SYSTEM

Check intake air system, and repair or replace parts as necessary. (See page [EG-144](#))

5. LEAK IN EXHAUST SYSTEM

Check intake air system, and repair or replace parts as necessary. (See page [EG-144](#))

6. ERRATIC TURBOCHARGER OPERATION

Check rotation of turbine shaft. If it does not turn or turns with a heavy drag, replace the turbocharger assembly.

Check axial and radial play of turbine shaft.

(See page [EG-158](#))

Maximum axial play : 0.110 mm (0.0045 in.)

Maximum radial play : 0.162 mm (0.0064 in.)

If the play is greater than maximum, replace the turbocharger assembly.

ABNORMAL NOISE

(Possible Cause)	(Check Procedure and Correction Method)
1. TURBOCHARGING HEAT INSULATOR RESONANCE	Check for loose, improperly installed or deformed insulator mounting bolts, and repair or replace as necessary.
2. EXHAUST PIPE LEAKING OR VIBRATING	Check for deformed exhaust pipe, loose mounting bolts or damaged gasket, and repair or replace as necessary.
3. ERRATIC TURBOCHARGER OPERATION	Refer to item 6 of INSUFFICIENT ACCELERATION, LACK OF POWER OR EXCESSIVE FUEL CONSUMPTION.

EXCESSIVE OIL CONSUMPTION OR WHITE EXHAUST

(Possible Cause)	(Check Procedure and Correction Method)
FAULTY TURBOCHARGER SEAL	Check for oil leakage in exhaust system. - Remove the turbine elbow from the turbocharger and check for excessive carbon deposits on the turbine wheel. Excessive carbon deposits indicate a faulty turbocharger. Check for oil leakage in intake air system. - Check for axial and radial play of turbine shaft and replace the turbocharger if necessary. (See page EG-158) Maximum axial play : 0.110 mm (0.0045 in.) Maximum radial play : 0.162 mm (0.0064 in.) NOTICE: Some oil mist in the blowby from the PCV is normal. Do not mistake it for an oil leak from the turbocharger.

TURBOCHARGER

On-Vehicle Inspection

1. INSPECT INTAKE AIR SYSTEM

Check for leakage or clogging between the air cleaner and turbocharger inlet and between the turbocharger outlet and cylinder head.

- Clogged air cleaner Clean or replace air filter
- Hoses collapsed or deformed Repair or replace
- Leakage from connections Check each connection and repair
- Cracks in components Check and replace

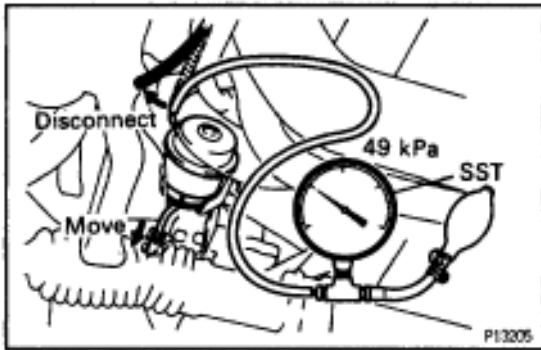
2. INSPECT EXHAUST SYSTEM

Check for leakage or clogging between the cylinder head and turbocharger inlet and between the turbocharger outlet and exhaust pipe.

- Deformed components Repair or replace
- Foreign material in passages Remove
- Leakage from components Repair or replace
- Cracks in components Check and replace

3. INSPECT EXHAUST EXHAUST GAS CONTROL VALVE OPERATION

- Disconnect the air hose from the actuator.
 - Using SST, apply approx. 49 kPa (0.50 kgf/cm², 7.1 psi) of pressure to the actuator.
SST 09992-00241
 - Check that the actuator push rod moves.
 - Reconnect the air hose to the actuator.
- If operation is not as specified, replace the control valve assembly.



4. INSPECT TURBOCHARGING PRESSURE

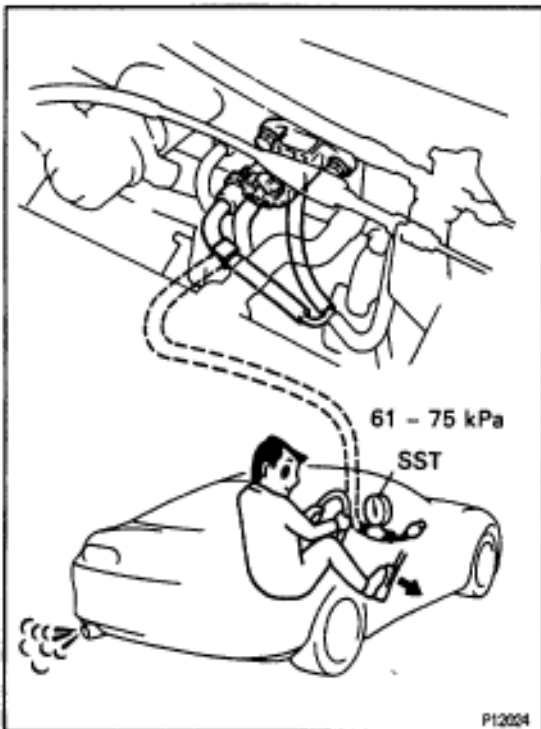
- Using a 3-way connector, connect SST (turbocharger pressure gauge) to the hose between the gas filter and turbo pressure sensor.
SST 09992-00241
- While driving with the engine running at 5,600 rpm or more with the throttle valve fully open in the 1st gear/ L range, check the turbocharging pressure.

Standard pressure:

61–75 kPa (0.62–0.76 kgf/cm², 8.8–10.8 psi)

If the pressure is less than that specified, check the intake and exhaust systems for leakage. If there is no leakage, replace the turbocharger assembly.

If the pressure is above specification, check if the actuator hose is disconnected or cracked. If not, replace the turbocharger assembly.



VSV for Intake Air Control Valve

(See SFI System)

VSV for Waste Gate Valve

(See SFI System)

VSV for Exhaust Gas Control Valve

(See SFI System)

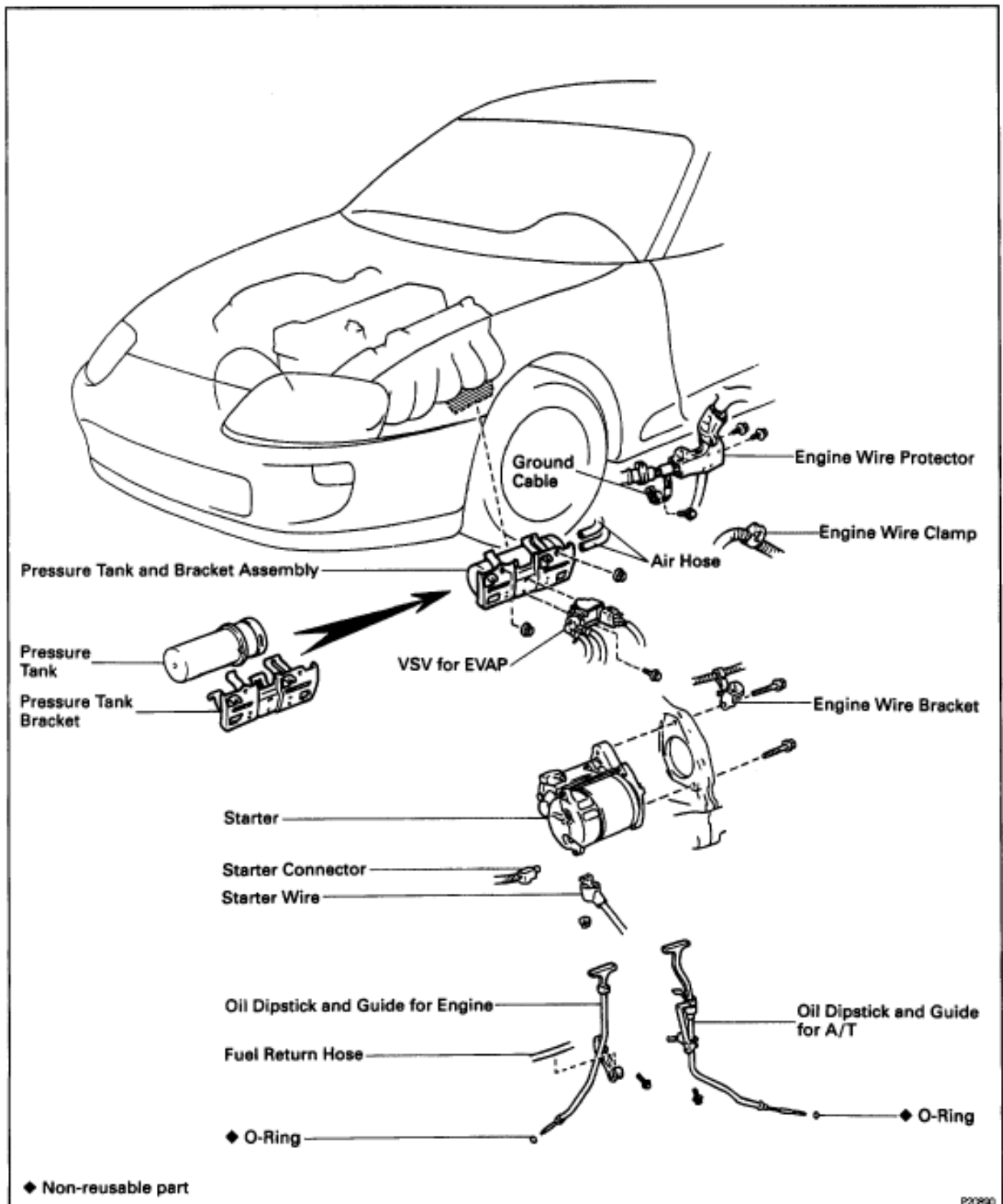
VSV for Exhaust Bypass Valve

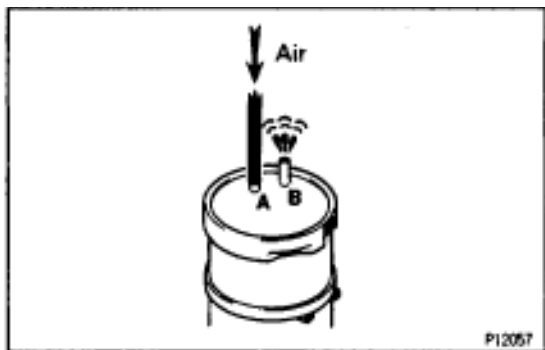
(See SFI System)

Turbo Pressure Sensor

(See SFI System)

Pressure Tank COMPONENTS FOR REMOVAL AND INSTALLATION



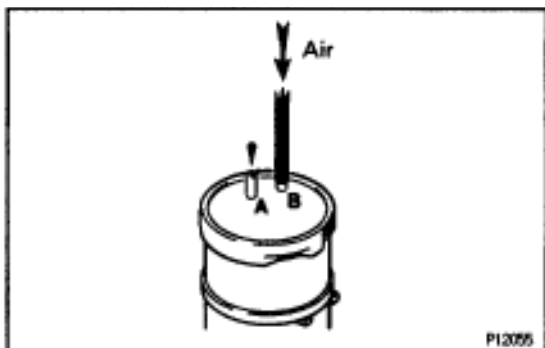


PRESSURE TANK INSPECTION

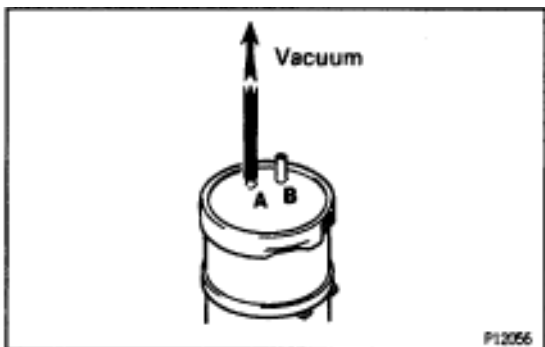
1. REMOVE PRESSURE TANK

2. INSPECT PRESSURE TANK

(a) Check that air flows from port A to B.



(b) Check that air does not flow from port B to A.

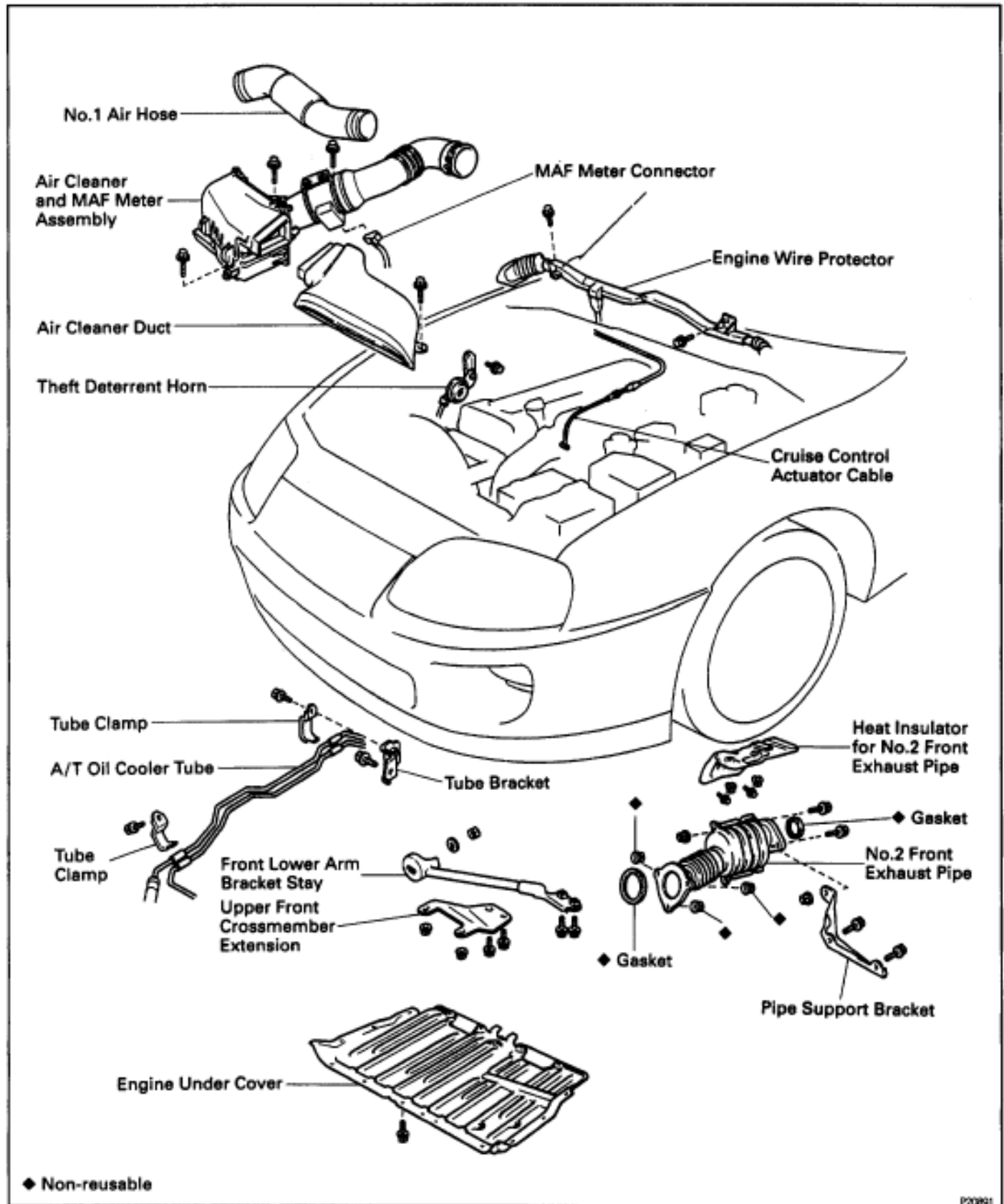


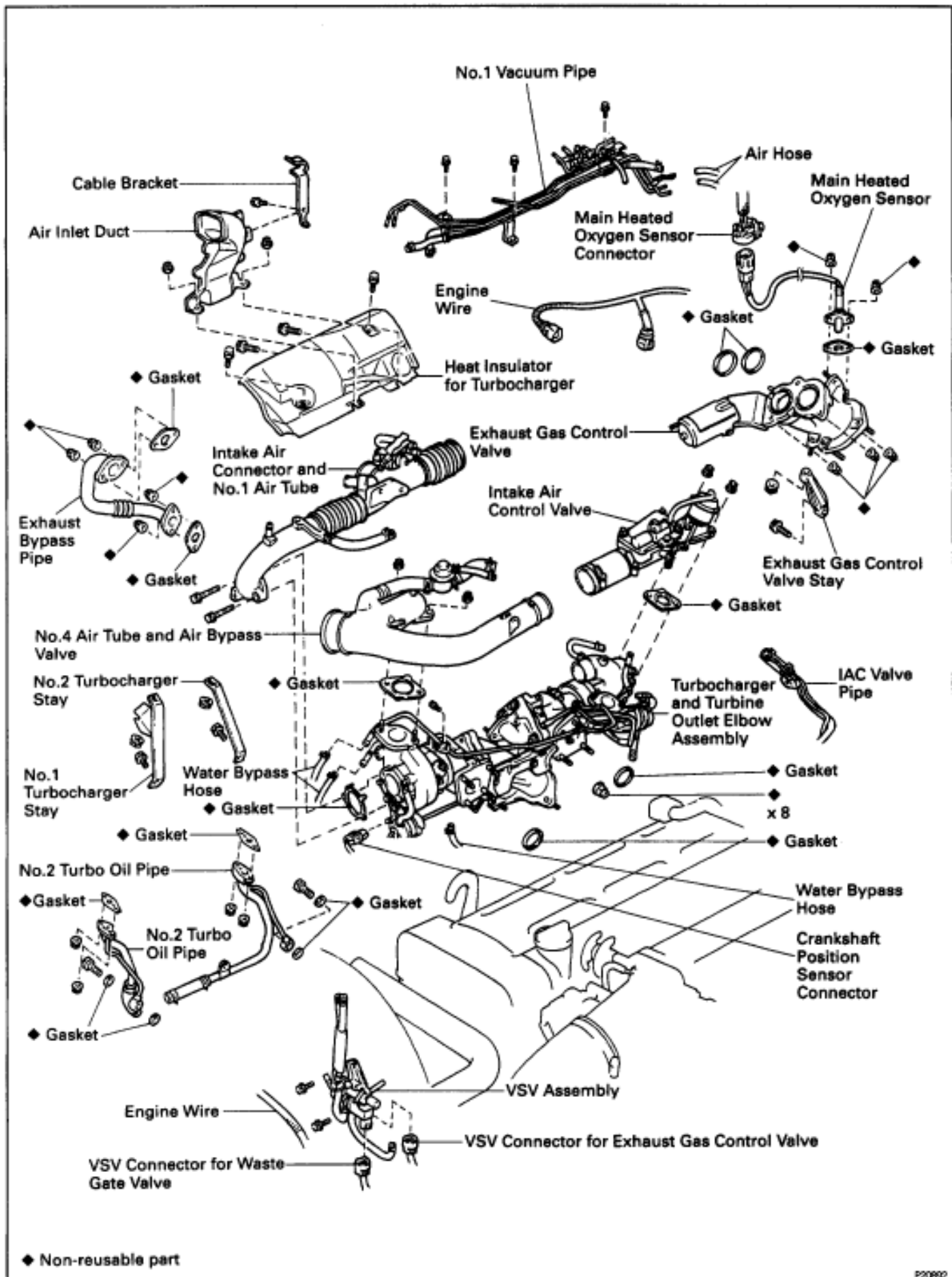
(c) Apply 60.0 kPa (450 mmHg, 17.72 in.Hg) of vacuum to port A, and check that there is no change in vacuum after 1 minute.

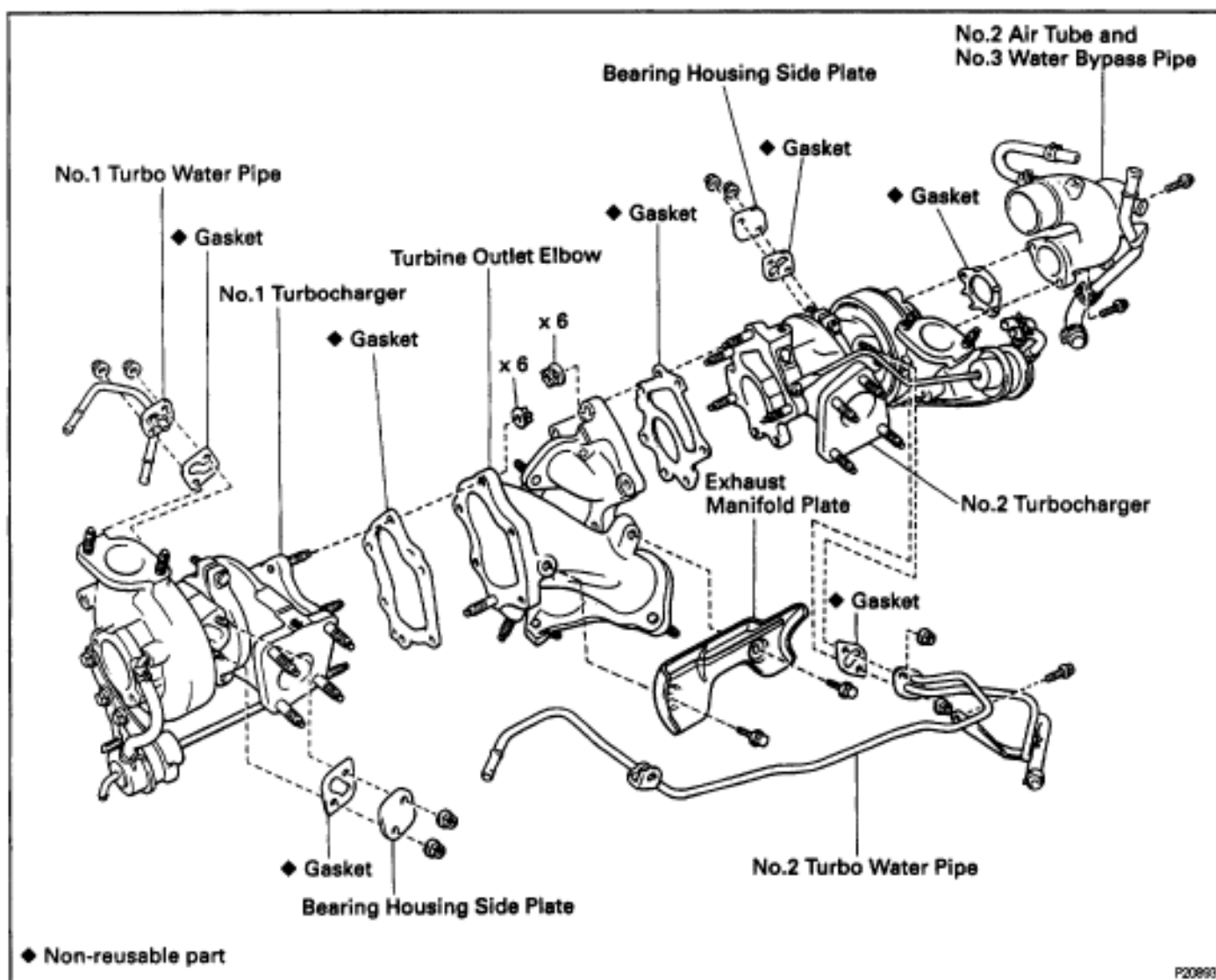
If operation is not as specified, replace the pressure tank.

3. REINSTALL PRESSURE TANK

Turbocharger COMPONENTS FOR REMOVAL AND INSTALLATION



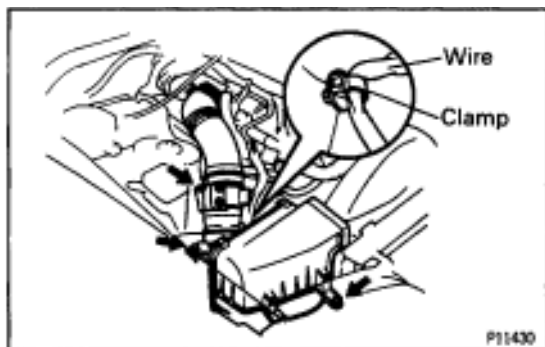




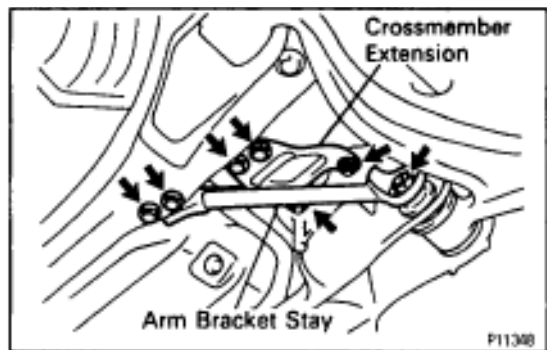
TURBOCHARGER REMOVAL

Installation is in the reverse order of removal.

1. DRAIN ENGINE COOLANT
2. REMOVE ENGINE UNDER COVER
3. DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY
4. REMOVE NO.1 AIR HOSE
5. REMOVE AIR CLEANER DUCT



6. REMOVE AIR CLEANER AND MAF METER ASSEMBLY
 - (a) Remove the 3 bolts.
 - (b) Loosen the hose clamp, disconnect the air hose from the intake air connector.
 - (c) Disconnect the MAF meter wire from the clamp on the air cleaner case.
 - (d) Disconnect the MAF meter connector, and remove the air cleaner and MAF meter assembly.



7. **DISCONNECT THEFT DETERRENT HORN FROM BODY**
8. **REMOVE FRONT LOWER ARM BRACKET STAY**
Remove the 2 bolts, nut, plate washer and arm bracket stay.

Torque:

Bolts

44 N·m (450 kgf·cm, 33 ft·lbf)

Nut

59 N·m (600 kgf·cm, 43 ft·lbf)

9. **REMOVE UPPER FRONT CROSSMEMBER EXTENSION**
Remove the 2 bolts, 2 nuts and crossmember extension.

Torque:

Bolts

29 N·m (300 kgf·cm, 22 ft·lbf)

Nuts

33 N·m (340 kgf·cm, 25 ft·lbf)



10. **REMOVE NO.2 FRONT EXHAUST PIPE**

- (a) Remove the 2 bolts and nuts holding the front exhaust pipe to the No.2 front exhaust pipe.

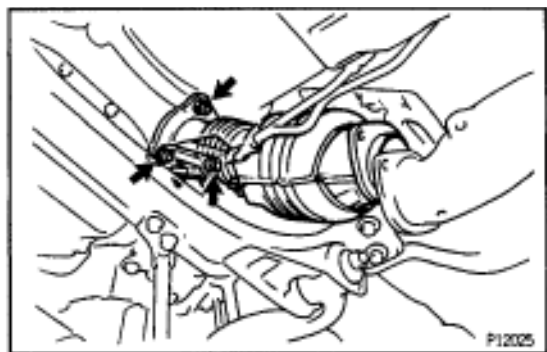
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

- (b) Remove the 2 bolts and pipe support bracket.

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

- (c) Disconnect the front exhaust pipe from the No.2 exhaust pipe. Remove the gasket.

INSTALLATION HINT: Use a new gasket.



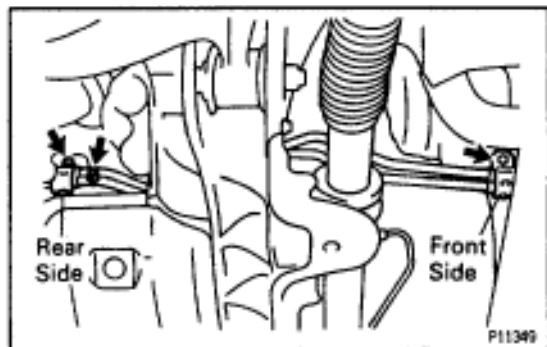
- (d) Remove the 3 nuts, No.2 front exhaust pipe and gasket.

INSTALLATION HINT: Use a new gasket and 3 new nuts.

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

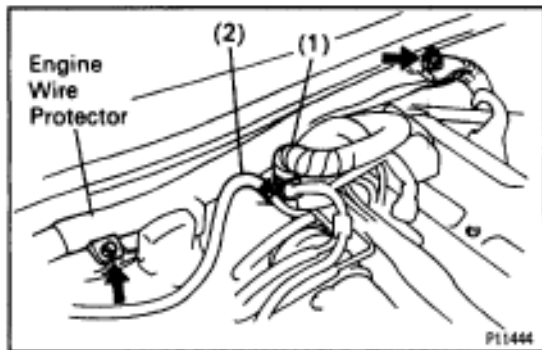
11. **REMOVE HEAT INSULATOR FOR NO.2 FRONT EXHAUST PIPE**

Remove the 2 bolts, 2 nuts and heat insulator.



12. **DISCONNECT A/T OIL COOLER TUBES FROM ENGINE**

- (a) Remove the bolt and tube clamp, and disconnect the oil cooler tubes from the bracket (front side) on the generator.
- (b) Remove the bolt and tube clamp, and disconnect the oil cooler tubes from the bracket (rear side) on the cylinder block.
- (c) Remove the bolt and tube bracket (rear side) from the cylinder block.

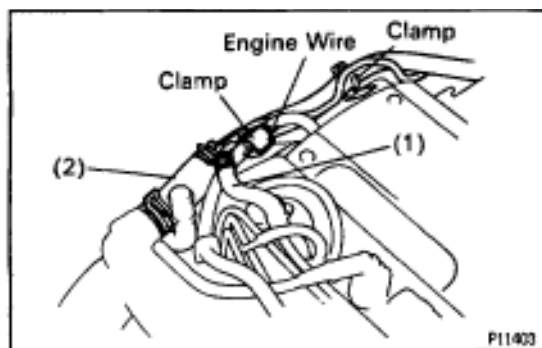


- 13. DISCONNECT ENGINE WIRE PROTECTOR FROM BODY**
Remove the 2 bolts, and disconnect the wire protector from the body.

14. DISCONNECT HOSES

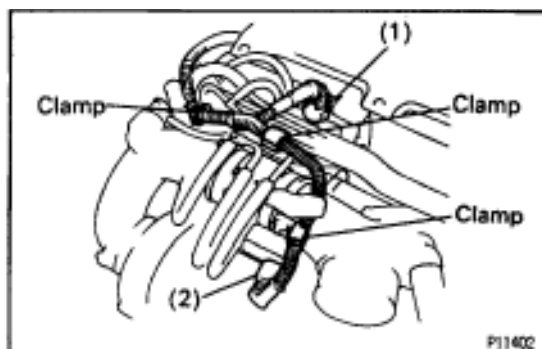
Disconnect these hoses:

- (1) Heater hose from No.3 water bypass pipe
- (2) EVAP hose from No.1 vacuum pipe



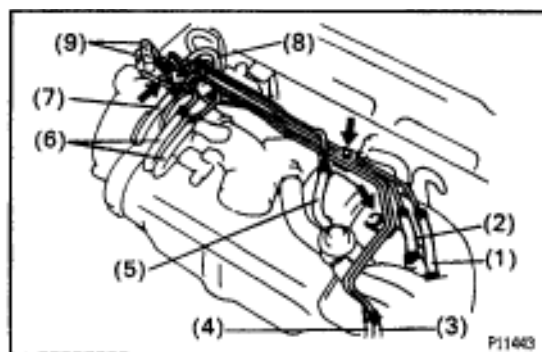
15. DISCONNECT IAC VALVE PIPE FROM NO.2 AIR TUBE

- (a) Disconnect the engine wire from the clamp.
- (b) Disconnect these hoses:
 - (1) Air hose (from No.1 vacuum pipe) from IAC valve pipe
 - (2) Air hose from No.2 air tube
- (c) Disconnect the IAC valve pipe from the clamp.

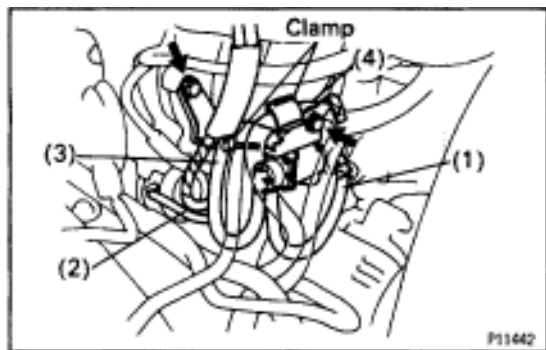


16. DISCONNECT NO.1 VACUUM PIPE FROM AIR TUBES

- (a) Disconnect these connectors:
 - (1) VSV connector for intake air control valve
 - (2) VSV connector for exhaust bypass valve
- (b) Disconnect the engine wire from the 3 clamps.

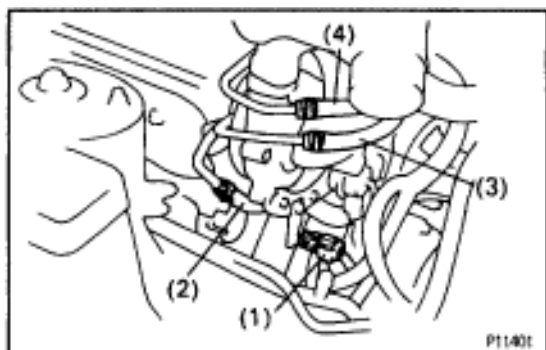


- (c) Disconnect these hoses:
 - (1) Air hose from No.4 air tube
 - (2) Air hose from No.1 air tube
 - (3) Air hose (from VSV for waste gate valve) from vacuum pipe
 - (4) Air hose (from VSV for exhaust gas control valve) from vacuum pipe
 - (5) Vacuum hose (from air bypass valve) from No.1 air tube
 - (6) 2 air hoses (from VSV for exhaust bypass valve) from vacuum pipe
 - (7) Air hose (from No.2 air tube) from vacuum pipe
 - (8) Air hose from VSV for intake air control valve
 - (9) 2 air hoses (from pressure tank) from vacuum pipe
- (d) Remove the 3 bolts, and disconnect the vacuum pipe from the air tubes.



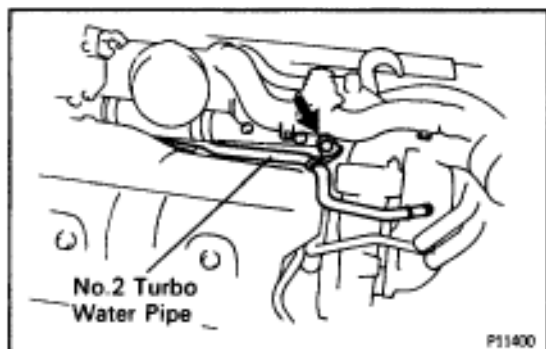
17. REMOVE VSV ASSEMBLY

- (a) Disconnect these hoses:
 - (1) Air hose from actuator for waste gate valve
 - (2) Air hose from actuator for exhaust gas control valve
 - (3) Air hose from hose clamp
 - (4) Engine wire from wire clamp
- (b) Remove the 2 bolts.
- (c) Disconnect the 2 VSV connectors, and remove the VSV assembly.

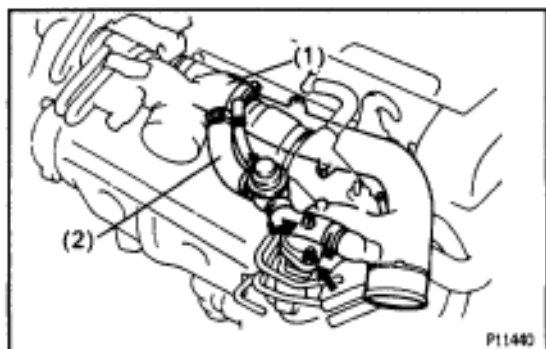


18. REMOVE AIR TUBES AND INTAKE AIR CONNECTOR

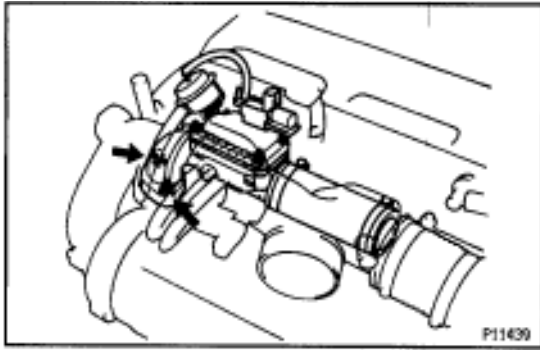
- (a) Disconnect the connector and hoses:
 - (1) Crankshaft position sensor connector from clamp
 - (2) Water bypass hose (from water pump) from No.1 turbo water pipe
 - (3) Water bypass hose (from water outlet) from No.1 turbo water pipe
 - (4) Water bypass hose (from water outlet) from No.2 turbo water pipe
- (b) Remove the bolt, and disconnect the No.2 turbo water pipe from the No.4 air tube.



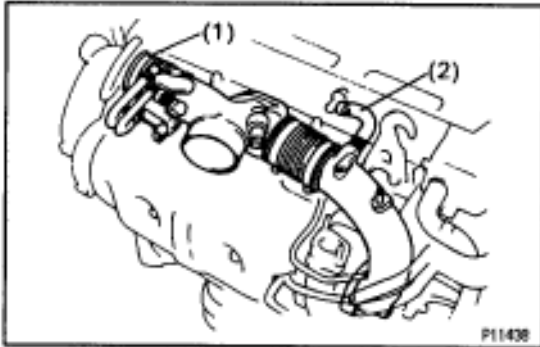
- (c) Remove the 2 bolts, and disconnect the No.1 air tube from the No.1 turbocharger. Remove the gasket.
INSTALLATION HINT: Use a new gasket.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



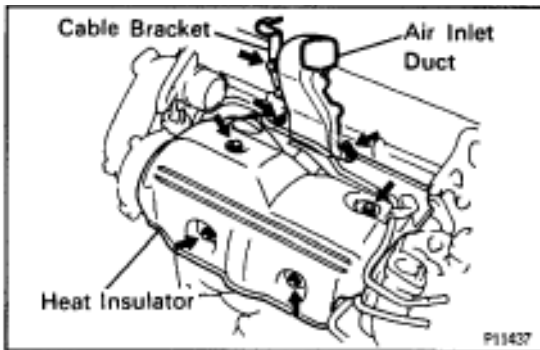
- (d) Remove the 2 bolts holding the No.4 air tube to the No.1 turbocharger. Remove the gasket.
INSTALLATION HINT: Use a new gasket.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
- (e) Disconnect these hoses, and remove the No.4 air tube and air bypass valve assembly.
 - (1) Air hose from No.4 air tube
 - (2) Air hose from intake air connector



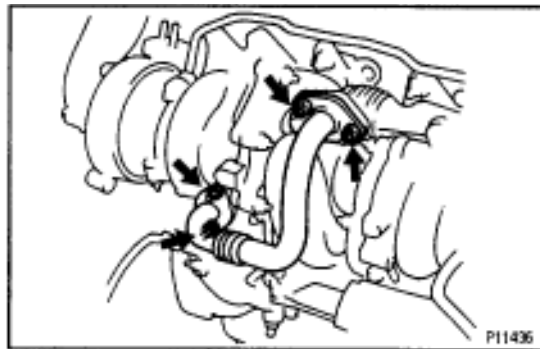
- (f) Remove the 2 nuts, intake air control valve and gasket.
INSTALLATION HINT: Use a new gasket.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



- (g) Disconnect these hoses, and remove the intake air connector and No.1 air tube assembly.
 (1) Air hose from No.2 air tube
 (2) PCV hose from No.2 cylinder head cover



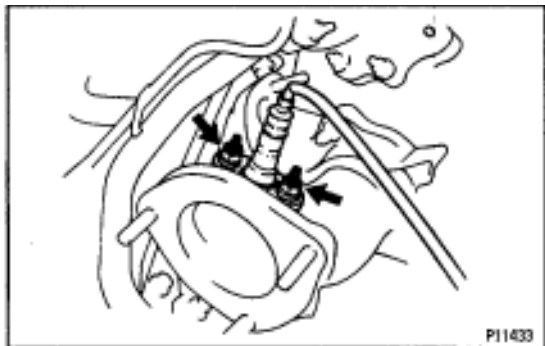
- 19. REMOVE AIR INLET DUCT**
 Remove the bolt, 2 nuts, cable bracket and air inlet duct.
20. REMOVE HEAT INSULATOR FOR TURBOCHARGER
 Remove the 4 bolts and heat insulator.



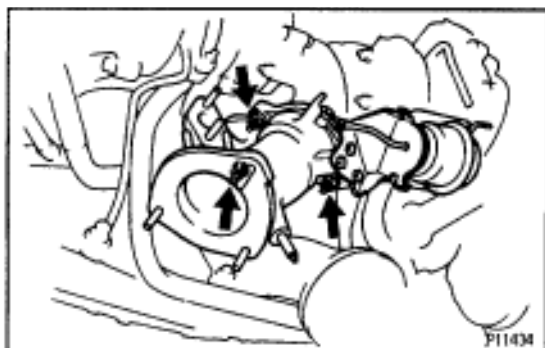
- 21. REMOVE EXHAUST BYPASS PIPE**
 Remove the 4 nuts, bypass pipe and 2 gaskets.
INSTALLATION HINT: Use 2 new gaskets and 4 new nuts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



- 22. REMOVE EXHAUST GAS CONTROL VALVE STAY**
 Remove the bolt, nut and valve stay.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

**23. REMOVE MAIN HEATED OXYGEN SENSOR**

- (a) Disconnect the oxygen sensor connector.
 - (b) Remove the 2 nuts, oxygen sensor and gasket.
- INSTALLATION HINT:** Use a new gasket and 2 new nuts.
- Torque:** 20 N·m (200 kgf·cm, 14 ft·lbf)

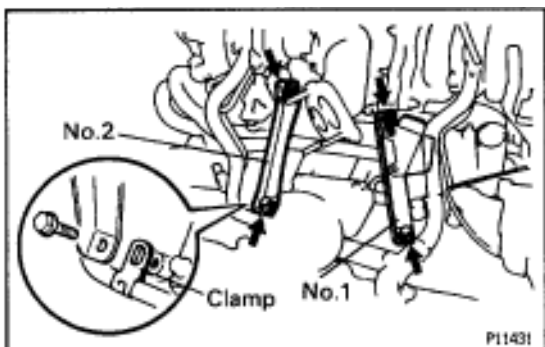
**24. REMOVE EXHAUST GAS CONTROL VALVE**

Remove the 3 nuts, control valve and 2 gaskets.

NOTICE: The control valve is ceramic. Do not drop or knock the control valve.

INSTALLATION HINT: Use 2 new gaskets and 3 new nuts.

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

**25. REMOVE NO.1 TURBOCHARGER STAY**

Remove the bolt, nut and turbocharger stay.

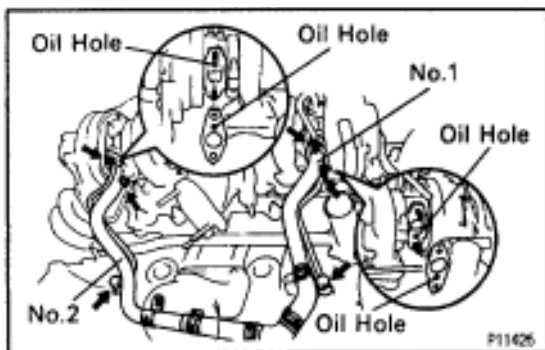
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

26. REMOVE NO.2 TURBOCHARGER STAY

Remove the bolt, nut and turbocharger stay.

INSTALLATION HINT: Install the turbocharger stay and No.1 turbo oil pipe clamp with the bolt and nut.

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

**27. REMOVE NO.1 TURBO OIL PIPE**

- (a) Remove the union bolt holding the turbo oil pipe to the cylinder block. Remove the 2 gaskets.

INSTALLATION HINT: Use 2 new gaskets.

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

- (b) Remove the 2 nuts, and disconnect the turbo oil pipe from turbocharger. Remove the gasket.

INSTALLATION HINT:

- Use a new gasket.
- Align the oil holes of the gasket and turbocharger housing.

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

- (c) Disconnect the turbo oil hose from the turbo oil outlet on the No.1 oil pan, and remove the turbo oil pipe.

28. REMOVE NO.2 TURBO OIL PIPE

- (a) Remove the union bolt holding the turbo oil pipe to the cylinder block. Remove the 2 gaskets.

INSTALLATION HINT: Use 2 new gaskets.

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

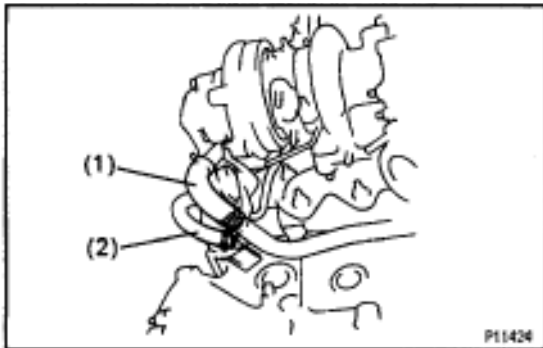
- (b) Remove the 2 nuts, and disconnect the turbo oil pipe from turbocharger. Remove the gasket.

INSTALLATION HINT:

- Use a new gasket.
- Align the oil holes of the gasket and turbocharger housing.

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

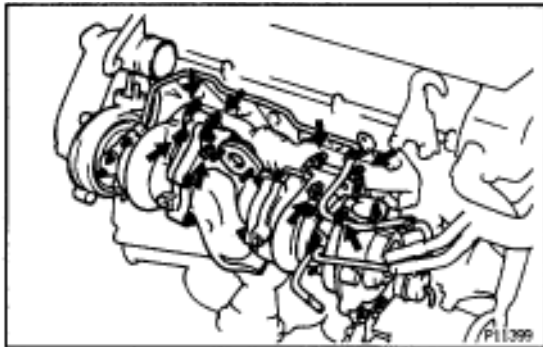
- (c) Disconnect the turbo oil hose from the turbo oil outlet on the No.1 oil pan, and remove the turbo oil pipe.



29. REMOVE TURBOCHARGERS AND TURBINE OUTLET ELBOW ASSEMBLY

- (a) Disconnect these hoses:

- (1) Heater hose (from No.3 water bypass pipe) from No.2 water bypass pipe
- (2) Water bypass hose (from No.2 turbo water pipe) from No.2 water bypass pipe



- (b) Remove the 8 nuts holding the turbochargers to the exhaust manifold.

INSTALLATION HINT:

- Use 8 new nuts.
- Uniformly tighten the nuts in several passes.

Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)

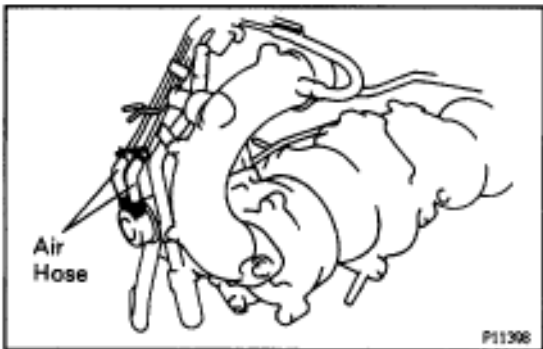
- (c) Remove the 2 turbochargers and turbine outlet elbow assembly.

- (d) Remove the 2 gaskets.

INSTALLATION HINT: Use 2 new gaskets.

30. REMOVE NO.1 VACUUM PIPE FROM NO.2 TURBOCHARGER

Disconnect the 2 air hoses from the actuator for the exhaust bypass valve, and remove the vacuum pipe.

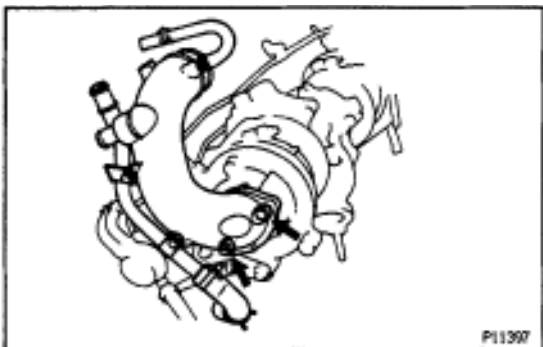


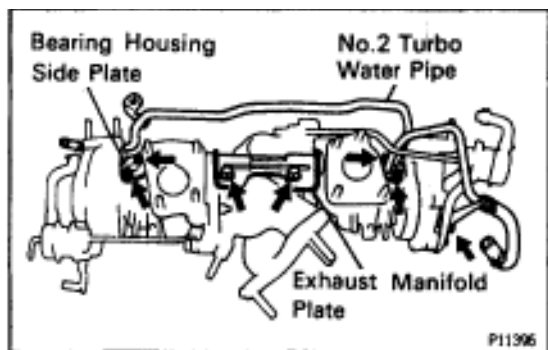
31. REMOVE NO.2 AIR TUBE AND NO.3 WATER BYPASS PIPE ASSEMBLY FROM NO.2 TURBOCHARGER

Remove the 2 bolts, the air tube, bypass pipe assembly and gasket.

INSTALLATION HINT: Use a new gasket.

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





32. REMOVE EXHAUST MANIFOLD PLATE FROM TURBINE OUTLET ELBOW

Remove the 2 bolts and manifold plate.

33. REMOVE NO.2 TURBO WATER PIPE FROM NO.2 TURBOCHARGER

Remove the 2 nuts, water pipe and gasket.

INSTALLATION HINT: Use a new gasket.

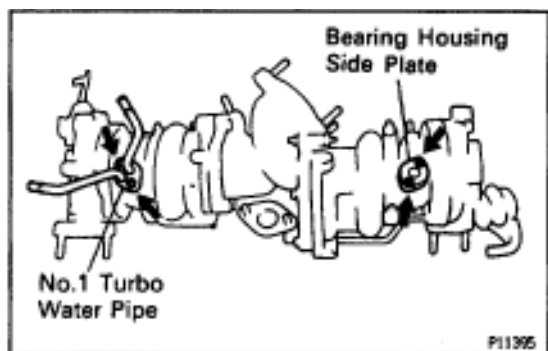
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)

34. REMOVE BEARING HOUSING SIDE PLATE FROM NO.1 TURBOCHARGER

Remove the 2 nuts, housing plate and gasket.

INSTALLATION HINT: Use a new gasket.

Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)



35. REMOVE NO.1 TURBO WATER PIPE FROM NO.1 TURBOCHARGER

Remove the 2 nuts, water pipe and gasket.

INSTALLATION HINT: Use a new gasket.

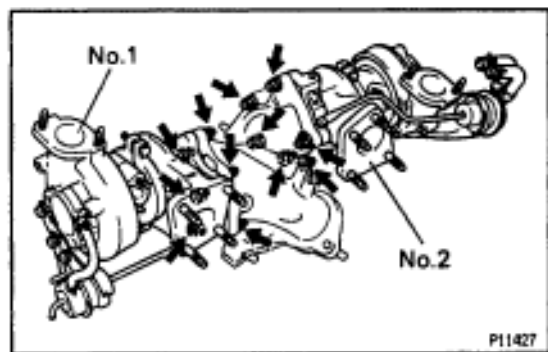
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)

36. REMOVE BEARING HOUSING SIDE PLATE FROM NO.2 TURBOCHARGER

Remove the 2 nuts, housing plate and gasket.

INSTALLATION HINT: Use a new gasket.

Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)



37. REMOVE NO.1 TURBOCHARGER FROM TURBINE OUTLET ELBOW

Remove the 6 nuts, turbocharger and gasket.

INSTALLATION HINT:

- Use a new gasket and 6 new nuts.
- Uniformly tighten the nuts in several passes.

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

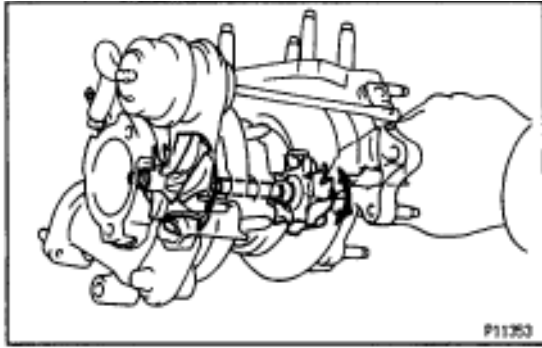
38. REMOVE NO.2 TURBOCHARGER FROM TURBINE OUTLET ELBOW

Remove the 6 nuts, turbocharger and gasket.

INSTALLATION HINT:

- Use a new gasket and 6 new nuts.
- Uniformly tighten the nuts in several passes.

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



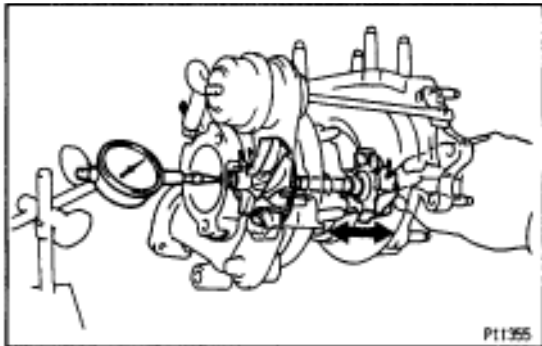
TURBOCHARGER COMPONENTS INSPECTION

Turbochargers

1. INSPECT TURBINE SHAFT ROTATION

Grasp the edge of the turbine wheel and turn it. Check that the impeller wheel turns smoothly.

If the impeller wheel does not turn or if it turns with a drag, replace the turbocharger assembly.



2. INSPECT AXIAL PLAY OF TURBINE SHAFT

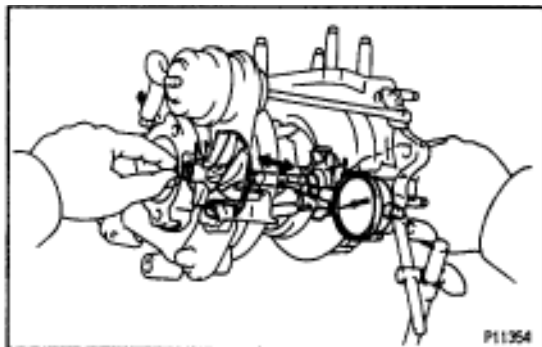
(a) Using a dial indicator, insert the needle of the dial indicator into the air tube side.

(b) Move the turbine shaft in an axial direction, measure the axial play of the turbine shaft.

Maximum axial play:

0.110 mm (0.0045 in.)

If the axial play is greater than maximum, replace the turbocharger assembly.



3. INSPECT RADIAL PLAY OF TURBINE SHAFT

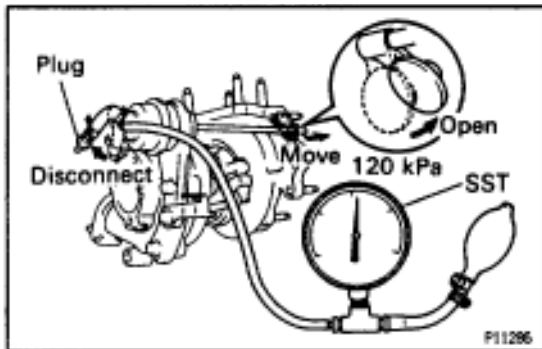
(a) Using a dial indicator, insert the needle of the dial indicator into the oil outlet hole and set it in the center of the turbine shaft.

(b) Move the turbine shaft in a radial direction, measure the radial play of the turbine shaft.

Maximum radial play:

0.162 mm (0.0064 in.)

If the axial play is greater than maximum, replace the turbocharger assembly.



4. INSPECT WASTE GATE VALVE OPERATION

(a) Disconnect the actuator air hose from the housing, and plug the hose end.

(b) Using SST, apply approx. 120 kPa (1.22 kgf/cm², 17.4 psi) of pressure to the actuator.

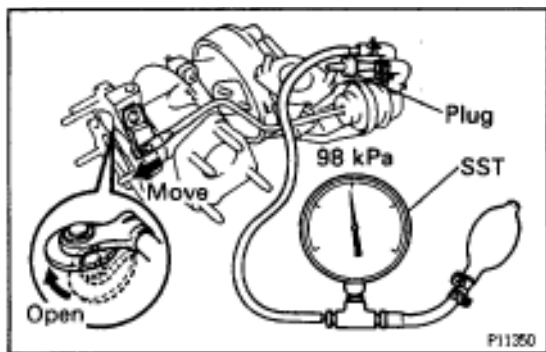
SST 09992-00241

(c) Move the actuator push rod, and check that the waste gate valve is open.

If operation is not as specified, replace the No.1 turbocharger assembly.

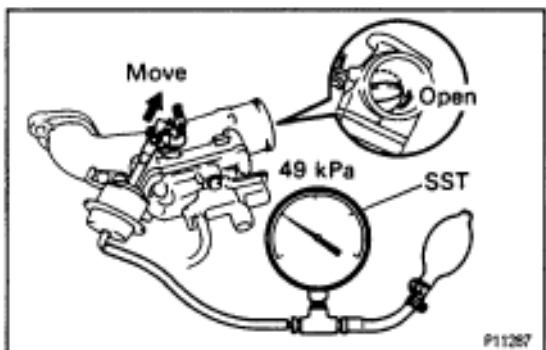
NOTICE: Never apply more than 187 kPa (1.91 kgf/cm², 27.2 psi) of pressure to the actuator.

(d) Reconnect the actuator air hose to the housing.



5. INSPECT EXHAUST BYPASS VALVE OPERATION

- Plug one side of the actuator air hose end.
 - Using SST, apply approx. 98 kPa (1.00 kgf/cm², 14.2 psi) of pressure to the actuator.
SST 09992-00241
 - Move the actuator push rod, and check that the exhaust bypass valve is open.
If operation is not as specified, replace the No.2 turbocharger assembly.
- NOTICE:** Never apply more than 187 kPa (1.91 kgf/cm², 27.2 psi) of pressure to the actuator.
- Remove the plug from the actuator air hose end.

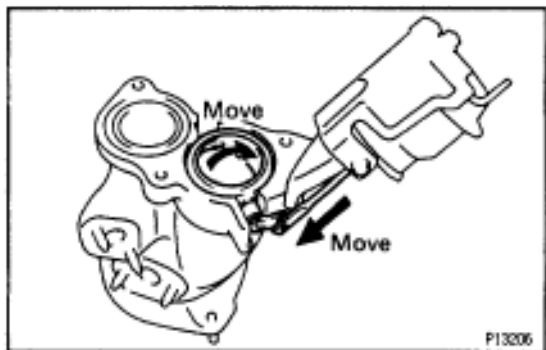


Intake Air Control Valve

INSPECT CONTROL VALVE OPERATION

- Using SST, apply approx. 49 kPa (0.50 kgf/cm², 7.1 psi) of pressure to the actuator.
SST 09992-00241
- Move the actuator push rod, and check that the control valve is open.

If operation is not as specified, replace the control valve assembly.

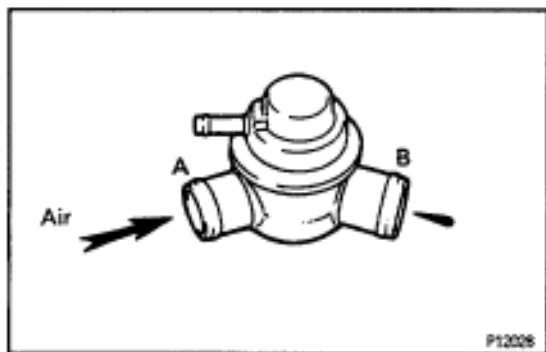


Exhaust Gas Control Valve

INSPECT CONTROL VALVE FOR DAMAGE

Move the actuator push rod and control valve, and check the control valve for damage.

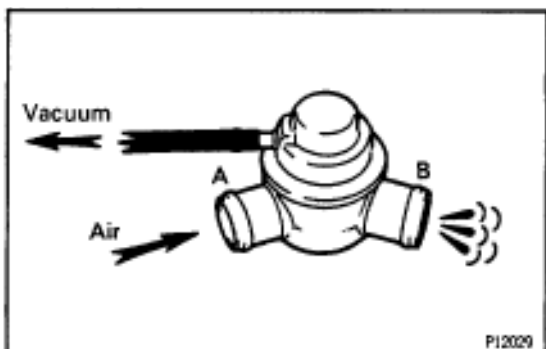
If the valve is damaged, replace the control valve assembly.



Air Bypass Valve

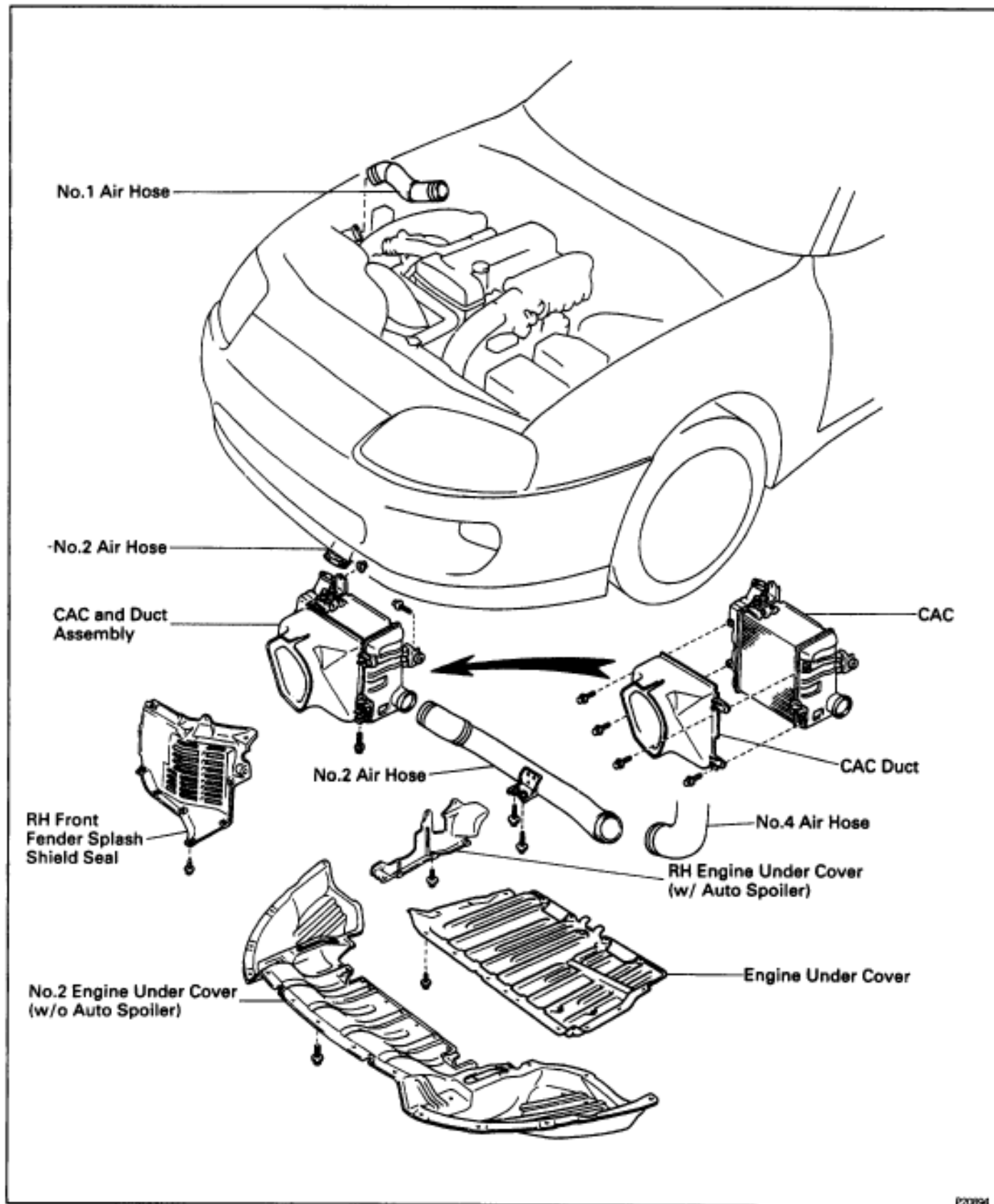
INSPECT AIR BYPASS VALVE OPERATION

- Check that air does not flow from port A to B.



- Apply vacuum to the actuator.
- Check that air flows from port A to B.
If operation is not as specified, replace the valve.

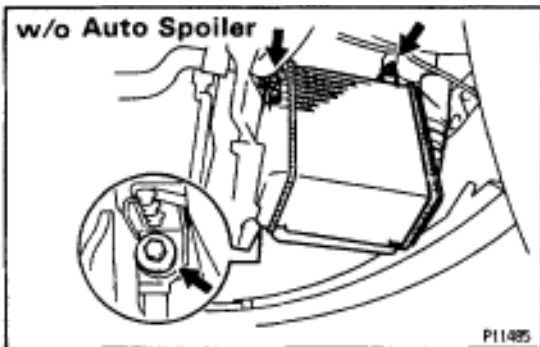
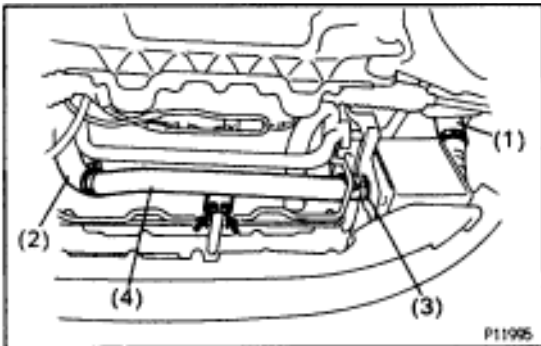
CHARGE AIR COOLER (CAC) COMPONENTS FOR REMOVAL AND INSTALLATION



CAC REMOVAL

Installation is in the reverse order of removal.

1. REMOVE NO.1 AIR HOSE
2. REMOVE ENGINE UNDER COVER
3. w/o Auto Spoiler:
REMOVE NO.2 ENGINE UNDER COVER
4. REMOVE RH FRONT FENDER SPLASH SHIELD SEAL
5. w/ Auto Spoiler:
REMOVE RH ENGINE UNDER COVER
6. DISCONNECT AIR HOSE FROM CAC
 - (a) Remove the 2 bolts holding the No.2 air tube (3) to the body.
 - (b) Disconnect these hoses:
 - (1) No.2 air hose from CAC
 - (2) No.4 air hose from No.2 air tube
 - (3) No.3 air hose from CAC
 - (c) Remove the No.2 air tube (4).

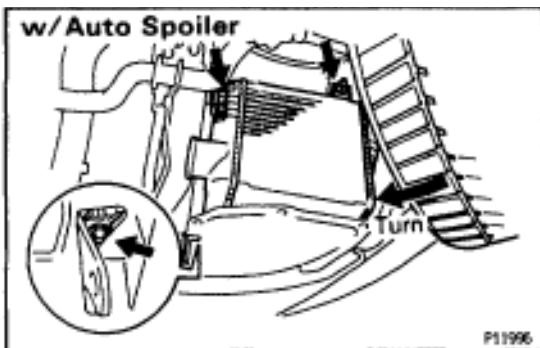


7. REMOVE CAC AND CAC DUCT ASSEMBLY

w/o Auto Spoiler:

Remove the nut, 2 bolts and CAC.

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

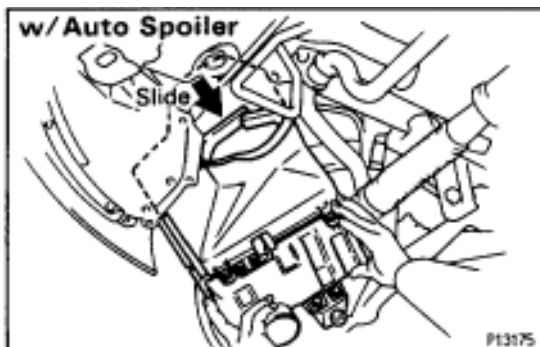


w/ Auto Spoiler:

(a) Fully turn the tire in the illustration direction.

(b) Remove the nut, 2 bolts and CAC.

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)



HINT: Remove the CAC between the suspension and body at the illustrated angle of the CAC.

8. REMOVE CAC DUCT FROM CAC

Remove the 4 bolts and CAC duct.

Torque: 4.9 N·m (50 kgf·cm, 43 in·lbf)

SERVICE SPECIFICATIONS

SERVICE DATA

Turbocharger	Turbocharging pressure		61–75 kPa (0.62–0.76 kgf/cm ² , 8.8–10.8 psi)
	Impeller wheel axial play	Limit	0.162 mm (0.0064 in.)
	Impeller wheel radial play	Limit	0.110 mm (0.0045 in.)

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Turbocharger x Turbine outlet elbow		25	250	18
Turbo water pipe x Turbocharger		8.8	90	78 in.·lbf
Side bearing housing plate x Turbocharger		8.8	90	78 in.·lbf
No.2 air tube x No.2 turbocharger		21	210	15
Turbocharger x Exhaust manifold		54	550	40
Turbo oil pipe x Turbocharger		21	210	15
Turbo oil pipe x Cylinder block		39	400	29
Turbocharger stay x Turbocharger		43	440	32
Turbocharger stay x Cylinder block		43	440	32
Exhaust gas control valve x Turbine outlet elbow		69	700	51
Main heated oxygen sensor x Exhaust gas control valve		20	200	14
Exhaust gas control valve stay x Exhaust gas control valve		43	440	32
Exhaust gas control valve stay x Cylinder block		43	440	32
Exhaust bypass pipe x Turbine outlet elbow		25	250	18
Exhaust bypass pipe x Exhaust gas control valve		25	250	18
Intake air control valve x No.2 turbocharger		21	210	15
No.4 air tube x No.1 turbocharger		21	210	15
No.1 air tube x No.1 turbocharger		21	210	15
No.2 front exhaust pipe x Exhaust gas control valve		62	630	46
Front exhaust pipe x No.2 front exhaust pipe		58	590	43
Pipe support bracket x Transmission		43	440	32
Upper front crossmember extension x Front suspension	Bolt	29	300	22
	Nut	33	340	25
Front lower arm bracket stay x Front suspension	Bolt	44	450	33
	Nut	59	600	43
CAC duct x CAC		4.9	50	43 in.·lbf
CAC x Body		13	135	10

COOLING SYSTEM

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09230-01010 Radiator Service Tool Set	
	09231-14010 Punch	2JZ-GE only (Aluminum type)

RECOMMENDED TOOLS

	09040-00010 Hexagon Wrench Set ◆	
	09082-00050 TOYOTA Electrical Tester Set ◆	
	09258-00030 Hose Plug Set ◆	

EQUIPMENT

Radiator cap tester	
Heater	Thermostat ECT switch (2JZ-GTE)
Thermometer	Thermostat ECT switch (2JZ-GTE)
Torque wrench	

COOLANT

Item	Capacity	Classification
Engine coolant (w/ Heater)		Ethylene-glycol base
2JZ-GE M/T	7.3 liters (7.7 US qts, 6.4 Imp. qts)	
A/T	8.3 liters (8.8 US qts, 7.3 Imp. qts)	
2JZ-GTE M/T	9.5 liters (10.0 US qts, 8.4 Imp. qts)	
A/T	9.4 liters (9.9 US qts, 8.3 Imp. qts)	

COOLANT CHECK

1. CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR

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.

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 excessively dirty, replace the coolant.

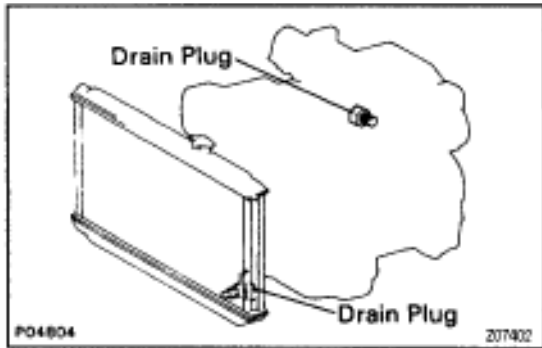
- (c) Reinstall the radiator cap.

COOLANT REPLACEMENT

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 2 drain plugs (for the engine and radiator), and drain the coolant.

- (c) Close the drain plugs.

Torque:

Engine drain plug

29 N·m (300 kgf·cm, 22 ft·lbf)

2. FILL ENGINE COOLANT

- (a) Slowly fill the system with coolant.

- Use a good brand of ethylene–glycol base coolant and mix it according to the manufacturer's directions.
- Using coolant which includes more than 50 % ethylene–glycol (but not more than 70 %) is recommended.

NOTICE:

- Do not use an alcohol type coolant.
- The coolant should be mixed with demineralized water or distilled water.

Capacity (w/ Heater):

2JZ–GE

M/T

7.3 liters (7.7 US qts, 6.4 Imp. qts)

A/T

8.3 liters (8.8 US qts, 7.3 Imp. qts)

2JZ–GTE

M/T

9.5 liters (10.0 US qts, 8.4 Imp. qts)

A/T

9.4 liters (9.9 US qts, 8.3 Imp. qts)

- (b) Install the radiator cap.

- (c) Start the engine, and bleed the cooling system.

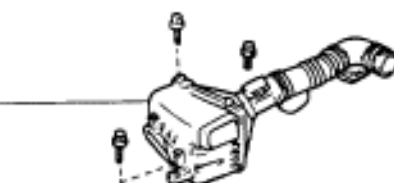
- (d) Refill the reservoir with coolant until it reaches the "FULL" line.

3. CHECK ENGINE COOLANT FOR LEAKS

WATER PUMP COMPONENTS FOR REMOVAL AND INSTALLATION

2JZ-GE

Air Cleaner, VAF Meter and
Intake Air Connector Pipe
Assembly



Oil Filler Cap

No.3 Timing Belt Cover

Air Cleaner Duct

Drive Belt
Tensioner

Gasket

No.2 Timing Belt Cover

Timing Belt

Upper Radiator
Support

Fan and Fluid
Coupling Assembly

Water Pump
Pulley

Radiator Assembly

Oil Cooler
Tube (A/T)

Reservoir Inlet Hose

Gasket

Timing Belt Guide

No.1 Timing Belt Cover

Hose Clamp (A/T)

No.2 Fan Shroud

Drive Belt

Crankshaft Pulley

Clip

Exhaust Manifold Heat Insulator
(Except California)

No.2 Water Bypass Pipe

Hold-Down
Clamp

Battery
Insulator

Water Bypass Outlet

No.1 Water Bypass Pipe

Engine Wire
Bracket

Water Pump

Battery

Battery Tray

Idler Pulley

Plate Washer

Thermostat

Gasket

Water Inlet and Lower Radiator Hose Assembly

PS Pump Front Bracket

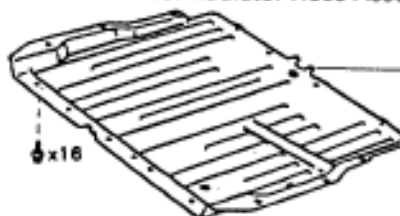
LH Headlight
Beam Angle
Gauge

Dust Cover

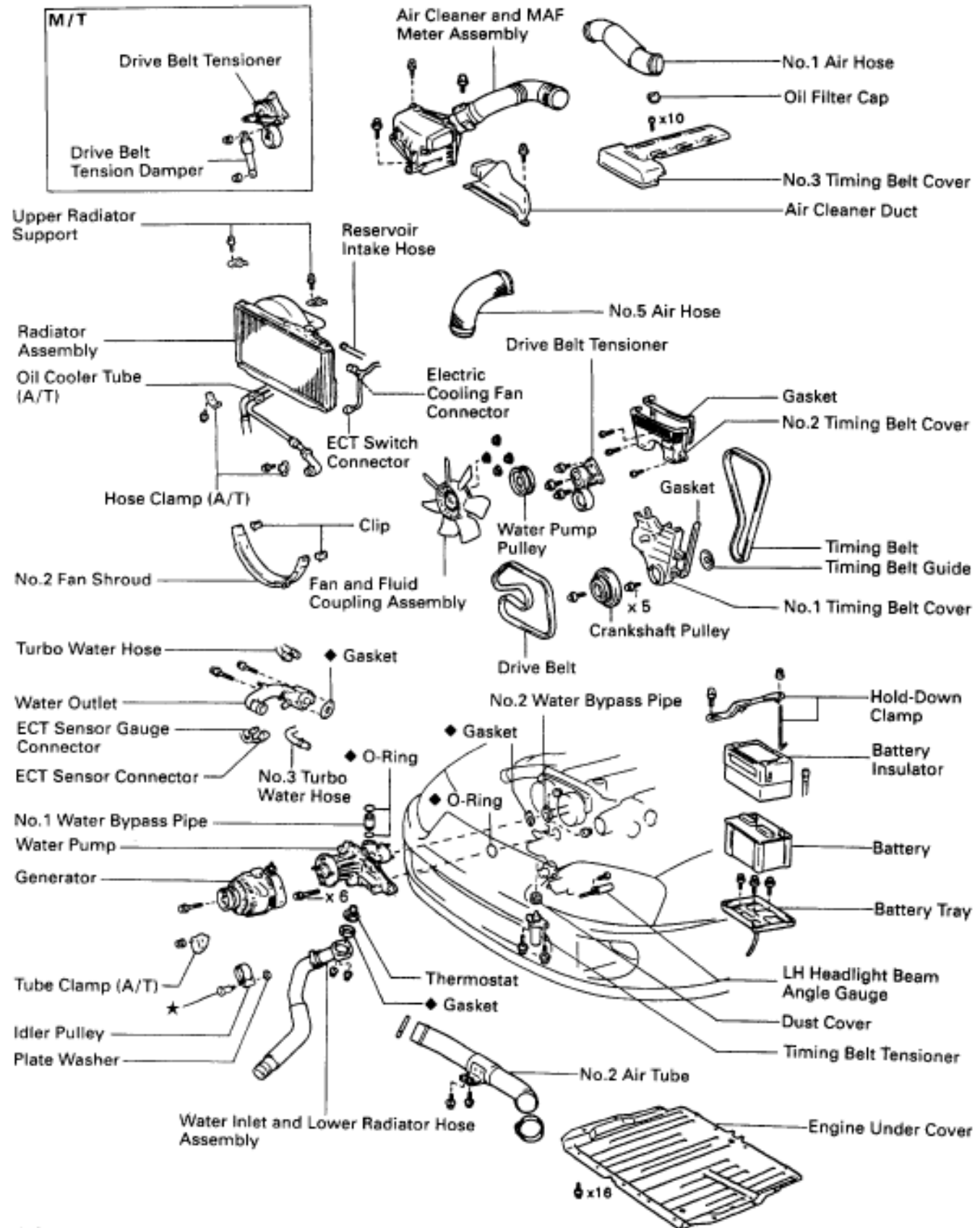
Timing Belt Tensioner

Engine Under Cover

◆ Non-reusable part
★ Precoated part



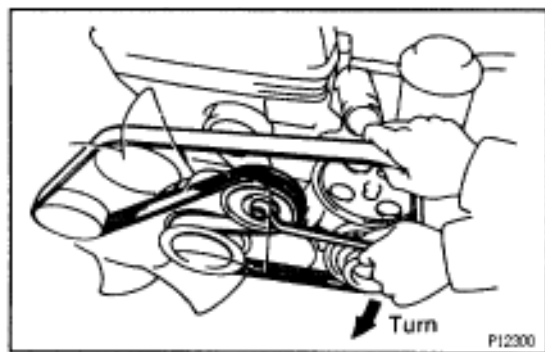
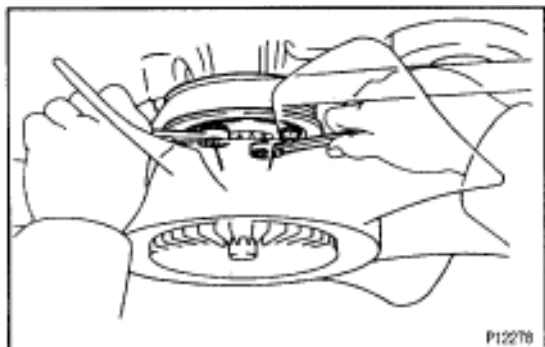
2JZ-GTE

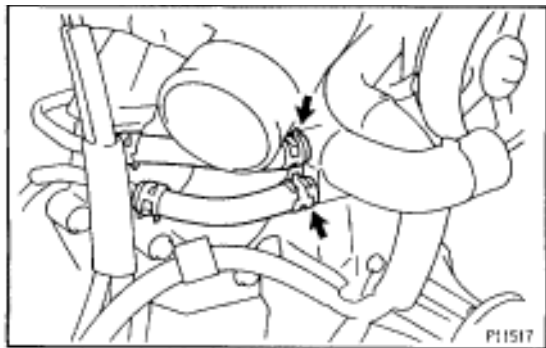


- ◆ Non-reusable part
- ★ Precoated part

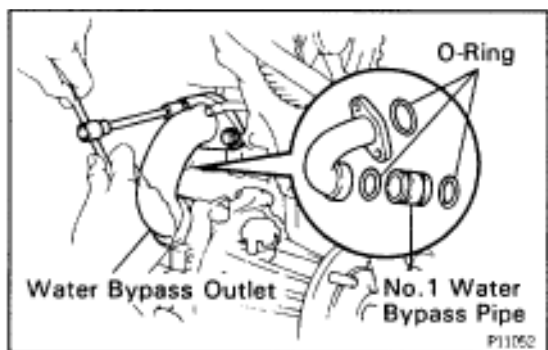
WATER PUMP REMOVAL

1. 2JZ-GTE:
REMOVE NO.1 AIR HOSE
2. 2JZ-GE:
REMOVE AIR CLEANER, VAF METER AND INTAKE AIR CONNECTOR PIPE ASSEMBLY
(See step 6 in engine removal in Engine Mechanical)
3. 2JZ-GTE:
REMOVE AIR CLEANER AND MAF METER ASSEMBLY
(See step 7 in engine removal in Engine Mechanical)
4. REMOVE RADIATOR ASSEMBLY
(See radiator removal)
5. 2JZ-GTE M/T:
REMOVE DRIVE BELT TENSIONER DAMPER
(See step 2 in timing belt removal in Engine Mechanical)
6. REMOVE DRIVE BELT, FAN, FLUID COUPLING ASSEMBLY AND WATER PUMP PULLEY
 - (a) Loosen the 4 nuts holding the fluid coupling to the water pump.
 - (b) Loosen the drive belt tension by turning the drive belt tensioner clockwise, and remove the drive belt.
 - (c) Remove the 4 nuts, the fan, fluid coupling assembly and water pump pulley.
7. REMOVE WATER INLET, LOWER RADIATOR HOSE ASSEMBLY AND THERMOSTAT
(See step 2 to 4 in thermostat removal)
8. REMOVE TIMING BELT
(See steps 4 to 15 in timing belt removal in Engine Mechanical)
9. 2JZ-GTE:
REMOVE GENERATOR
(See step 6 in generator removal in Charging System)
10. 2JZ-GE Except California:
REMOVE EXHAUST MANIFOLD HEAT INSULATOR

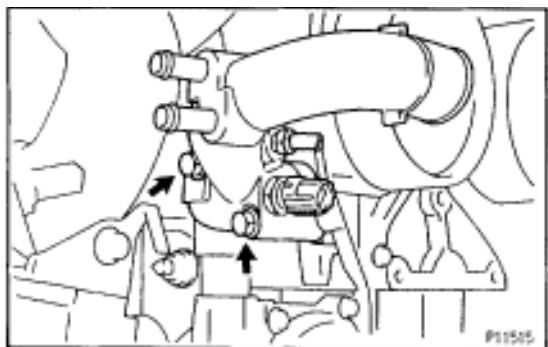




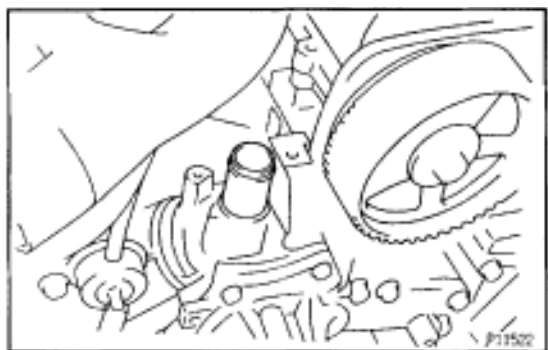
- 11. 2JZ-GTE:**
DISCONNECT TURBO WATER HOSES FROM WATER OUTLET



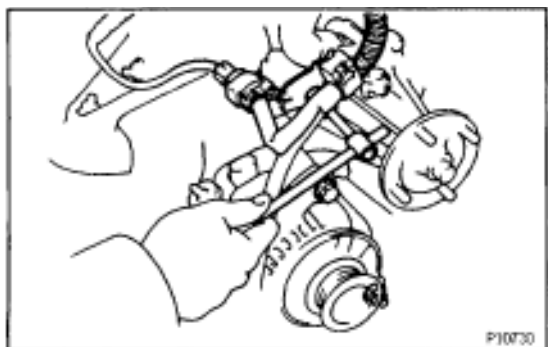
- 12. 2JZ-GE:**
REMOVE WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE
- (a) Remove the 2 bolts, water bypass outlet and No.1 water bypass pipe.
 - (b) Remove the 3 O-rings from the water bypass outlet and No.1 water bypass pipe.



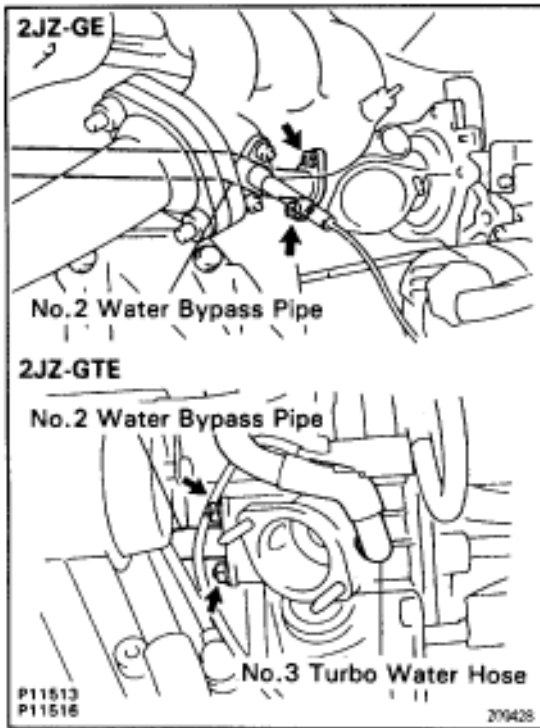
- 13. 2JZ-GTE:**
REMOVE WATER OUTLET AND NO.1 WATER BYPASS PIPE
- (a) Disconnect the ECT sensor and sender gauge connectors.
 - (b) Remove the 2 bolts, water outlet and gasket.



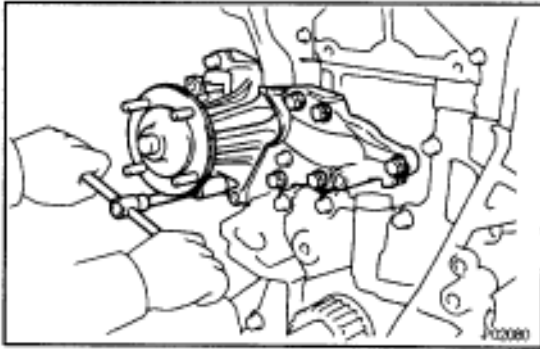
- (c) Remove the No.1 water bypass pipe and 2 O-rings.
- 14. REMOVE IDLER PULLEY**
(See steps 16 in timing belt removal in Engine Mechanical)



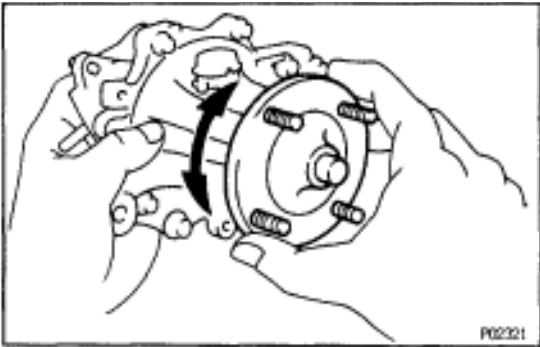
- 15. REMOVE WATER PUMP**
- (a) 2JZ-GE:
Remove the mounting bolt, and disconnect the engine wire bracket.
 - (b) 2JZ-GE:
Loosen the generator mounting nut.
 - (c) 2JZ-GE:
Remove the generator mounting bolt, and disconnect the generator from the water pump.



- (d) Remove the 2 nuts, and disconnect the No.2 water bypass pipe from the water pump.
- (e) 2JZ-GTE:
Disconnect the No.3 turbo water hose from the water pump.



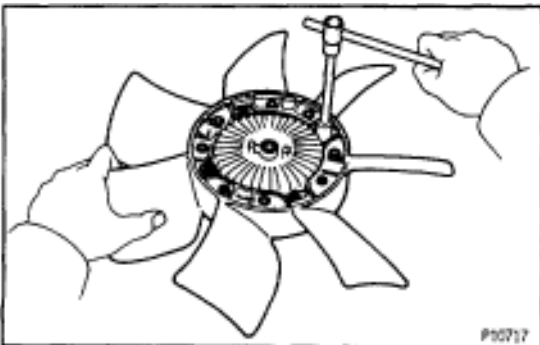
- (f) Remove the 6 bolts, water pump and gasket.
- (g) Remove the O-ring from the cylinder block.



WATER PUMP COMPONENTS INSPECTION

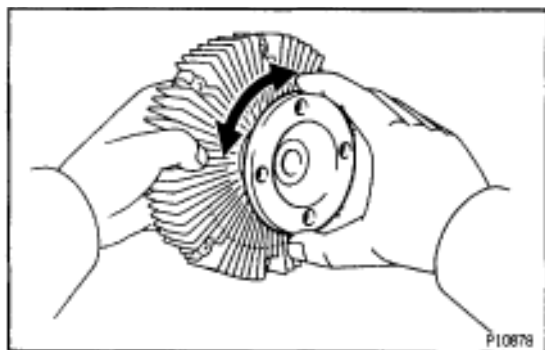
1. INSPECT WATER PUMP

Turn the pulley seat, and check that the water pump bearing is not rough or noisy.
If necessary, replace the water pump.

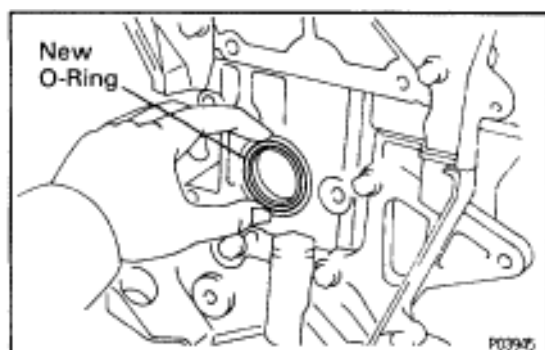


2. INSPECT FLUID COUPLING

- (a) Remove the 4 nuts and fan from the fluid coupling.



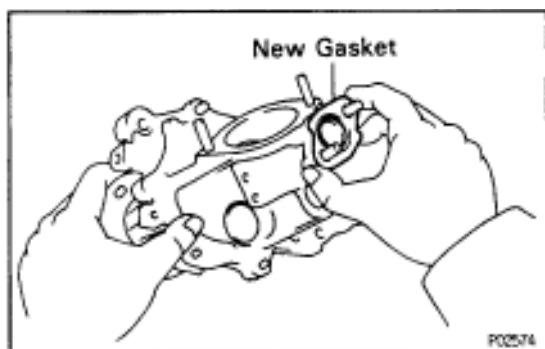
- (b) Check that the fluid coupling is not damaged and that no silicon oil leaks.
If necessary, replace the fluid coupling.
- (c) Reinstall the fan to the fluid coupling with the 4 nuts.
Torque: 7.4 N·m (75 kgf·cm, 65 in·lbf)



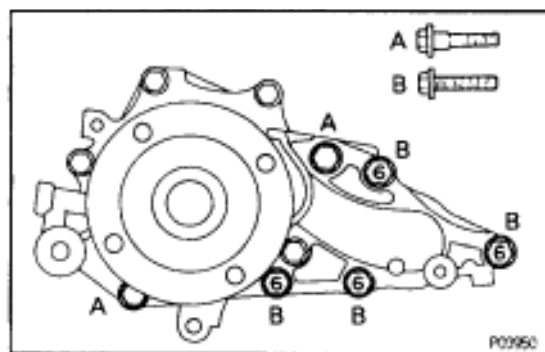
WATER PUMP INSTALLATION

1. INSTALL WATER PUMP

- (a) Install a new O-ring to the cylinder block.

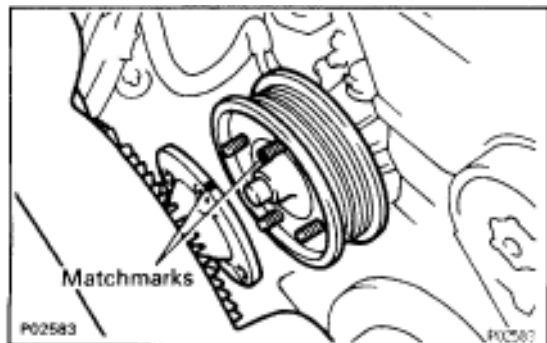


- (b) Install a new gasket to the water pump.
- (c) Connect the water pump to the water bypass pipe. Do not install the nut yet.



- (d) Install the water pump with the 2 bolts (A) and 4 bolts (B).
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
HINT: Hand tighten the (A) bolts first.
- (e) Install the 2 nuts holding the No.2 water bypass pipe to the water pump.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
- (f) 2JZ-GTE:
Connect the No.3 turbo water hose to the water pump.
- (g) 2JZ-GE:
Install the generator mounting bolt.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)
- (h) 2JZ-GE:
Tighten the generator mounting nut.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)
- (i) 2JZ-GE:
Install the engine wire bracket with the bolt.

2. **INSTALL IDLER PULLEY**
(See step 2 in timing belt installation in Engine Mechanical)
3. **2JZ-GTE:**
INSTALL WATER OUTLET AND NO.1 WATER BYPASS PIPE
 - (a) Install 2 new O-rings to the No.1 water bypass pipe.
 - (b) Apply soapy water to the O-rings.
 - (c) Install the No.1 water pass pipe to the water pump.
 - (d) Install a new gasket and the water outlet with the 2 bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
 - (e) Connect the ECT sensor and sender gauge connectors.
4. **2JZ-GE:**
INSTALL WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE
 - (a) Install 2 new O-rings to the No.1 water bypass pipe.
 - (b) Install a new O-ring and the water bypass outlet with the 2 bolts.
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
5. **2JZ-GTE:**
CONNECT TURBO WATER HOSES TO WATER OUTLET
6. **2JZ-GE Except California:**
INSTALL EXHAUST MANIFOLD HEAT INSULATOR
7. **2JZ-GTE:**
INSTALL GENERATOR
(See generator installation in Charging System)
8. **INSTALL TIMING BELT**
(See steps 10 to 14 in timing belt installation in Engine Mechanical)
9. **INSTALL WATER INLET AND LOWER RADIATOR HOSE ASSEMBLY**
(See thermostat installation)

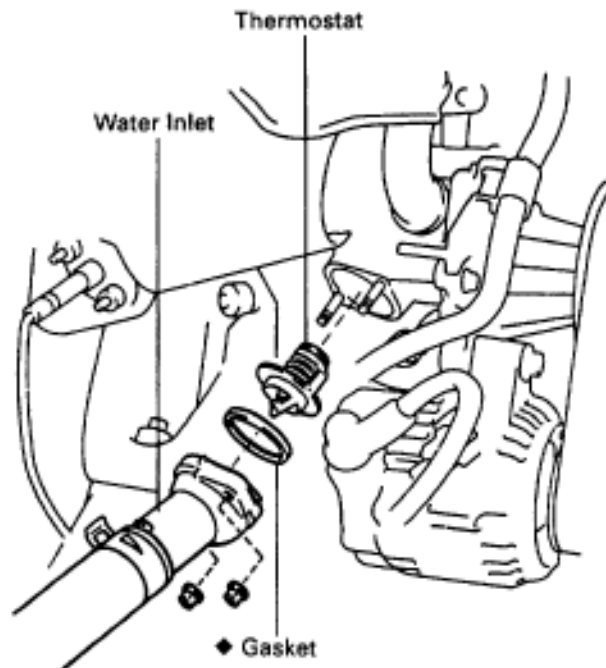


10. **INSTALL WATER PUMP PULLEY, FAN, FLUID COUPLING ASSEMBLY AND DRIVE BELT**
 - (a) Align the matchmarks, and install the water pump pulley, the fan and fluid coupling assembly with the 4 nuts.
 - (b) Install the drive belt by turning the drive belt tensioner clockwise.
 - (c) Stretch the belt tight, and tighten the 4 nuts.
Torque: 16 N·m (165 kgf·cm, 12 ft·lbf)

11. 2JZ-GTE M/T:
INSTALL DRIVE BELT TENSIONER DAMPER
12. INSTALL RADIATOR ASSEMBLY
(See radiator installation)
13. 2JZ-GE:
INSTALL AIR CLEANER, VAF METER AND INTAKE AIR
CONNECTOR PIPE ASSEMBLY
14. 2JZ-GTE:
INSTALL AIR CLEANER AND MAF METER ASSEMBLY
15. 2JZ-GTE:
INSTALL NO.1 AIR HOSE
16. ROAD TEST VEHICLE
Check for abnormal noise, shock, slippage, correct shift
points and smooth operation.

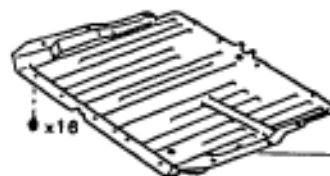
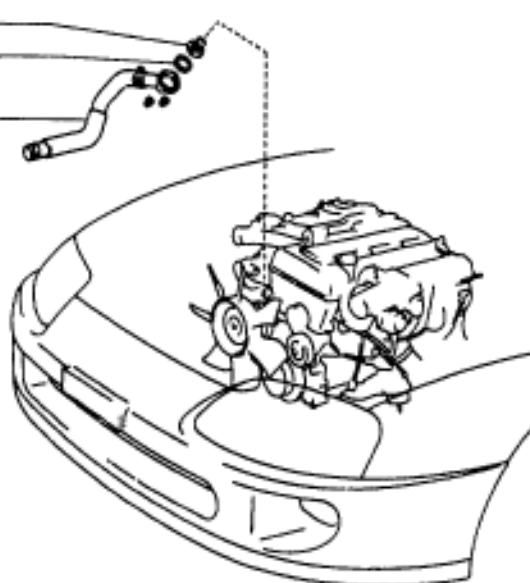
THERMOSTAT COMPONENTS FOR REMOVAL AND INSTALLATION

2JZ-GE



2JZ-GTE

Thermostat
◆ Gasket
Water Inlet and
Lower Radiator
Hose Assembly



Engine Under Cover

◆ Non-reusable part

THERMOSTAT REMOVAL

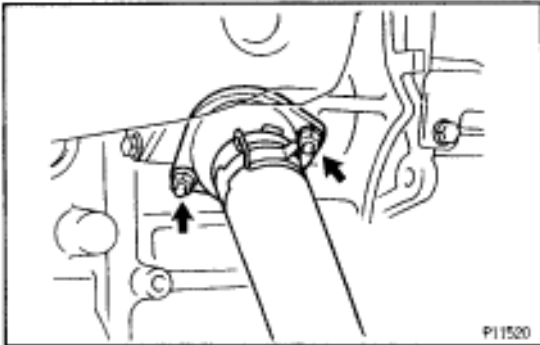
HINT: Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency.

Do not remove the thermostat, even if the engine tends to overheat.

1. 2JZ-GTE:

REMOVE ENGINE UNDER COVER

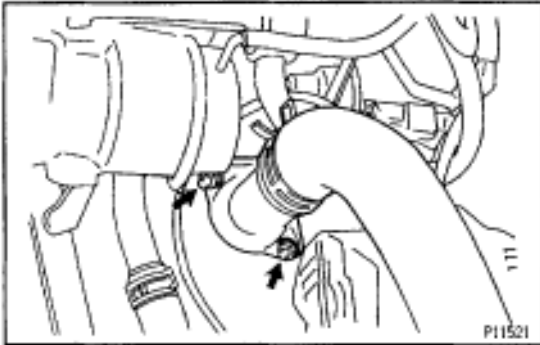
2. DRAIN ENGINE COOLANT



3. 2JZ-GE:

DISCONNECT WATER INLET FROM WATER PUMP, AND REMOVE THERMOSTAT

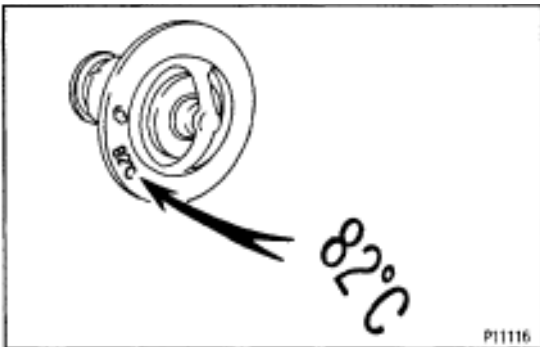
- Remove the 2 nuts holding the water inlet to the water pump, and disconnect the water inlet from the water pump.
- Remove the thermostat.
- Remove the gasket from the thermostat.



4. 2JZ-GTE:

REMOVE WATER INLET, LOWER RADIATOR HOSE ASSEMBLY AND THERMOSTAT

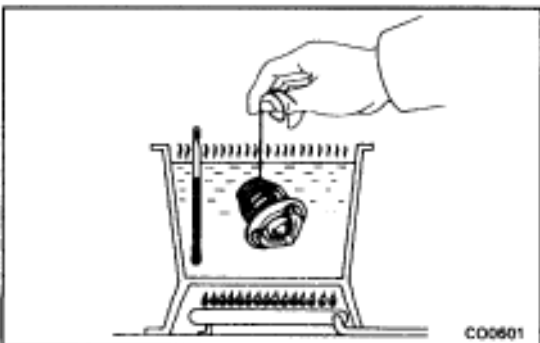
- Disconnect the lower radiator hose from the radiator.
- Remove the 2 nuts holding the water inlet to the water pump, and disconnect the water inlet and lower radiator hose from the water pump.
- Remove the thermostat.
- Remove the gasket from the thermostat.



THERMOSTAT INSPECTION

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.

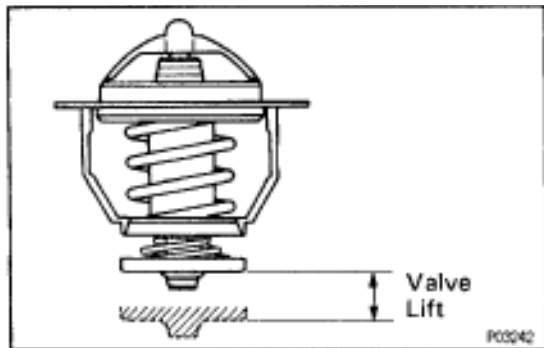


- Immerse the thermostat in water and gradually heat the water.
- Check the valve opening temperature.

Valve opening temperature:

80–84°C (176–183°F)

If the valve opening temperature is not as specified, replace the thermostat.



- (c) Check the valve lift.

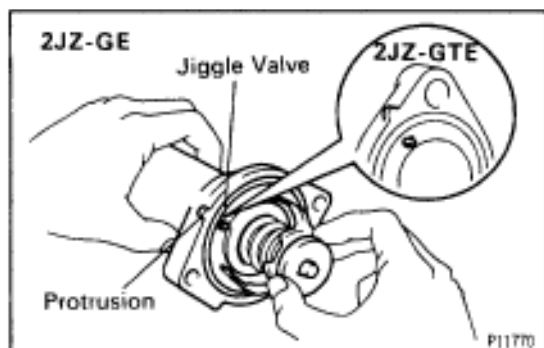
Valve lift:

8.5 mm (0.335 in.) or more at 95°C (203°F)

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

- (d) Check that the valve spring is tight when the thermostat is fully closed.

If not closed, replace the thermostat.



THERMOSTAT INSTALLATION

1. PLACE THERMOSTAT IN WATER INLET

- (a) Install a new gasket to the thermostat.
- (b) Align the jiggle valve of the thermostat with the protrusion of the water inlet.

2. INSTALL WATER INLET

- (a) Install the water inlet with the 2 nuts.

Torque:

2JZ-GE

8.8 N·m (90 kgf·cm, 78 in.-lbf)

2JZ-GTE

21 N·m (210 kgf·cm, 15 ft-lbf)

- (b) 2JZ-GTE:

Connect the lower radiator hose to the radiator.

3. 2JZ-GTE:

INSTALL ENGINE UNDER COVER

4. FILL WITH ENGINE COOLANT

5. START ENGINE AND CHECK FOR COOLANT LEAKS

RADIATOR

RADIATOR CLEANING

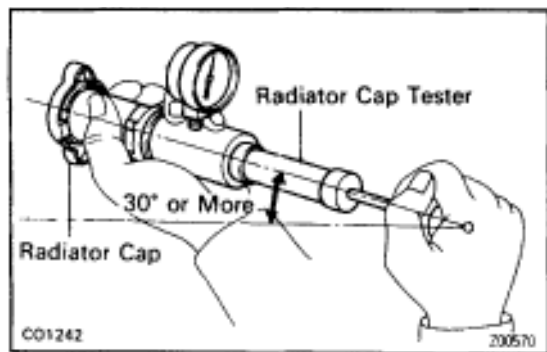
Using water or a steam cleaner, remove any mud and dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure is 2,942–3,432 kPa (30–35 kgf/cm², 427–498 psi), keep a distance of at least 40 cm (15.75 in.) between the radiator core and cleaner nozzle.

RADIATOR INSPECTION

1. REMOVE RADIATOR CAP

CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



2. INSPECT RADIATOR CAP

NOTICE: When performing steps (a) and (b) below, keep the radiator pump tester at an angle of over 30° above the horizontal.

- (a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the relief valve.

Pump speed:

1 push/3 seconds or more

NOTICE: Push the pump at a constant speed.

If air is not coming from the relief valve, replace the radiator cap.

- (b) Pump the tester several times and measure the relief valve opening pressure.

Pump speed:

1st time

1 push/1 second or less

2nd time or more

Any speed

Standard opening pressure:

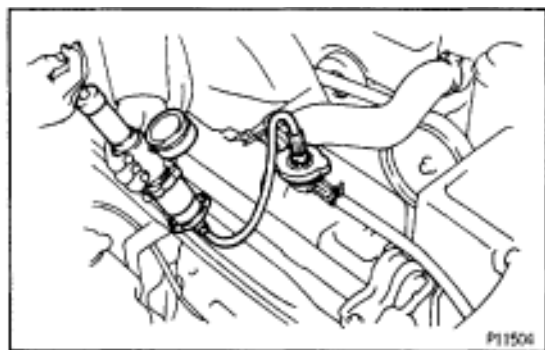
93–123 kPa

(0.95–1.25 kgf/cm², 13.5–17.8 psi)

Minimum opening pressure:

78 kPa (0.8 kgf/cm², 11.4 psi)

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



3. INSPECT COOLING SYSTEM FOR LEAKS

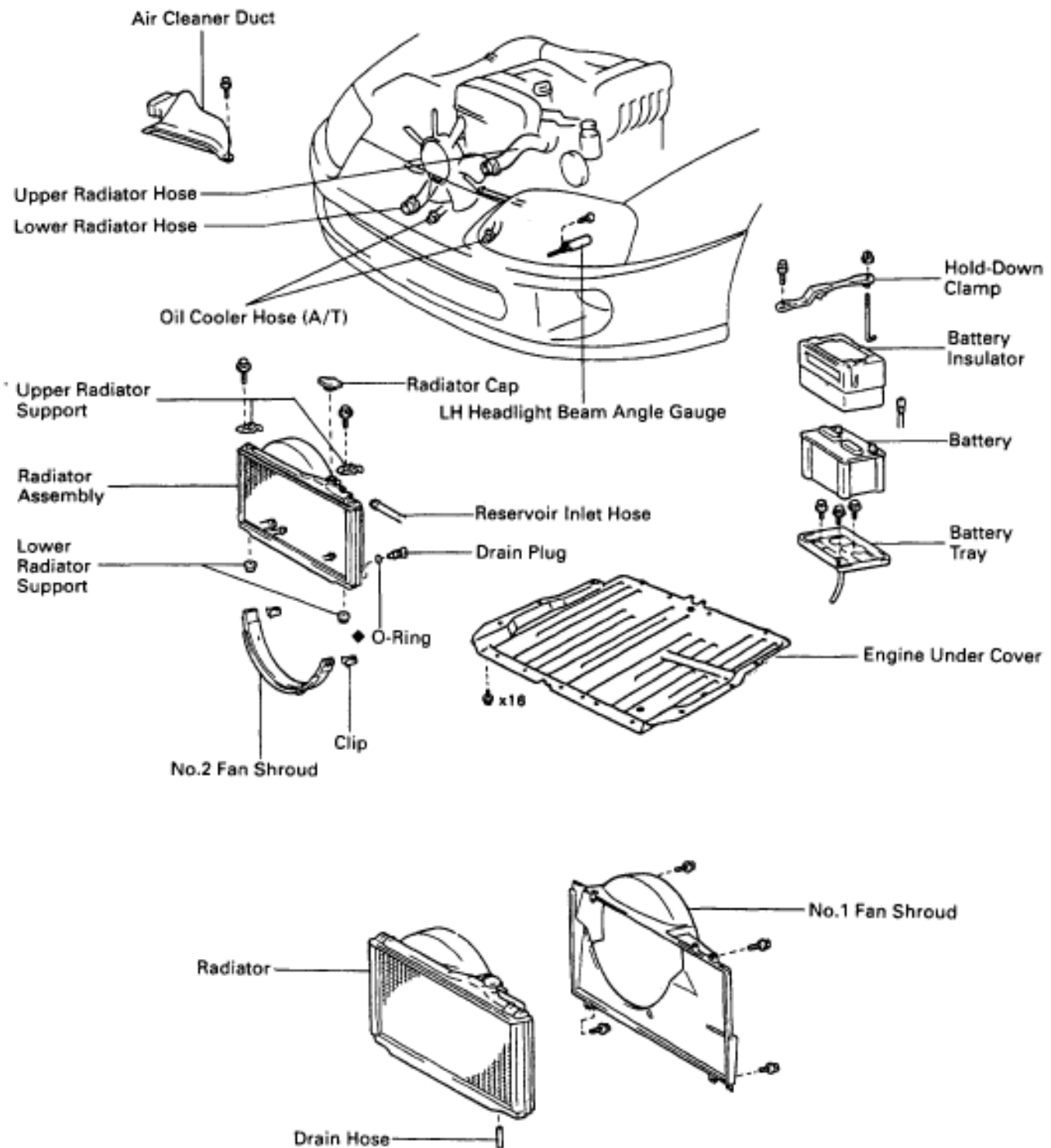
- (a) Fill the radiator with coolant, and attach a radiator cap tester.
 (b) Warm up the engine.
 (c) Pump it to 147 kPa (1.5 kgf/cm², 21.3 psi), and check that the pressure does not drop.

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 cylinder head.

4. REINSTALL RADIATOR CAP

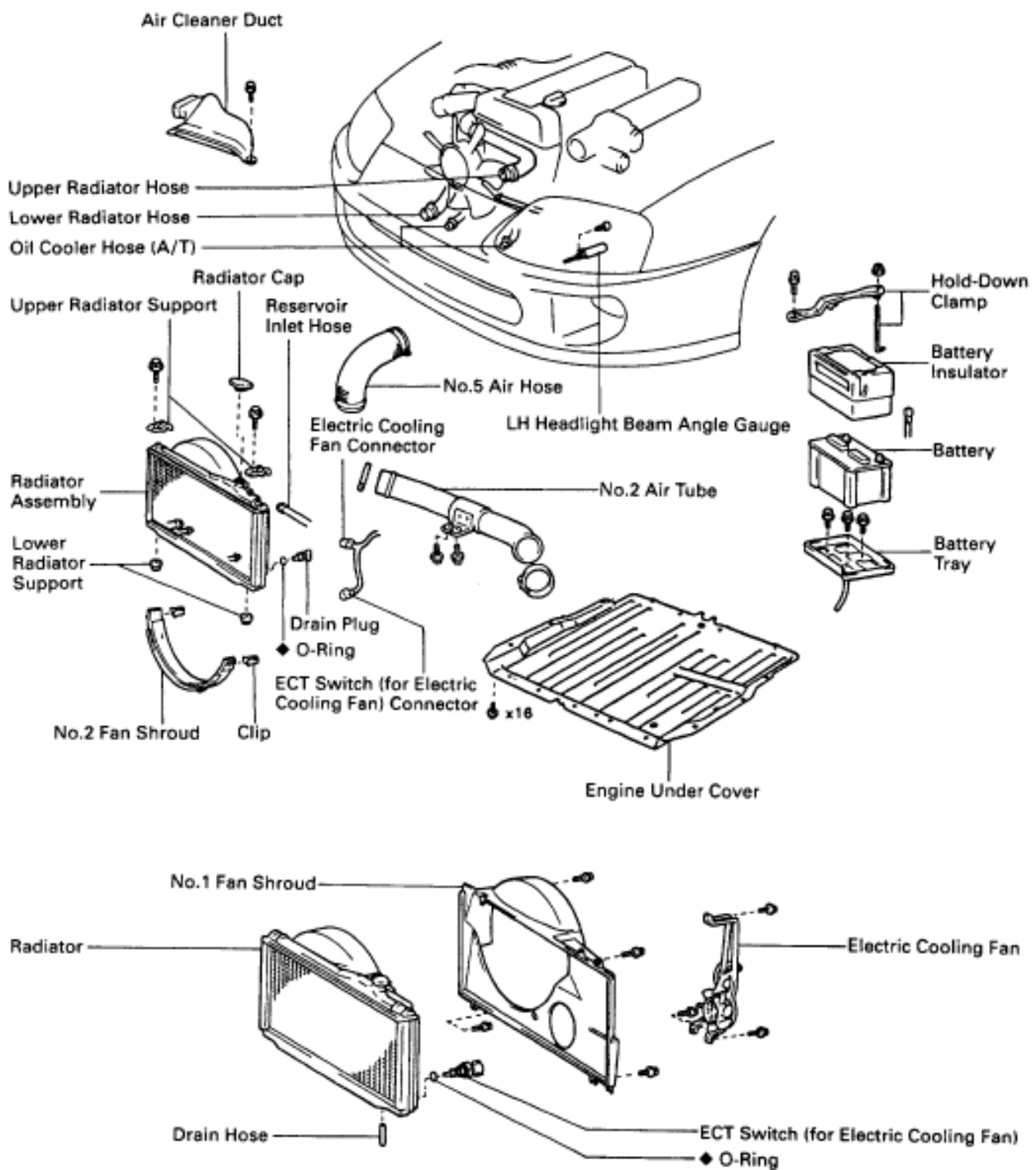
COMPONENTS FOR REMOVAL AND INSTALLATION

2JZ-GE



◆ Non-reusable part

2JZ-GTE



◆ Non-reusable part

RADIATOR REMOVAL

Installation is in the reverse order of removal.

1. REMOVE ENGINE UNDER COVER

INSTALLATION HINT: Start the engine, and check for coolant and A/T fluid leaks.

2. REMOVE BATTERY AND BATTERY TRAY

3. DRAIN ENGINE COOLANT

4. 2JZ-GTE:

REMOVE NO.2 AIR TUBE

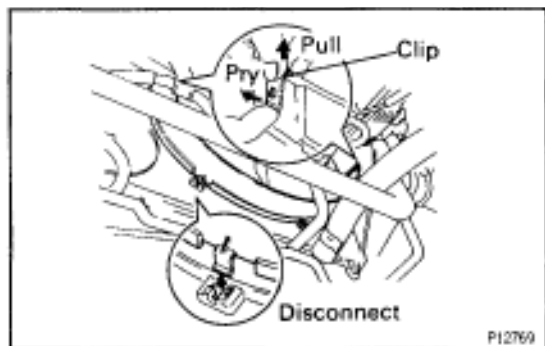
5. REMOVE NO.2 FAN SHROUD

- Remove the 2 clips.
- Disconnect the claw of the No.2 fan shroud from the hook of the No.1 fan shroud, and remove the No.2 fan shroud.

6. REMOVE AIR CLEANER DUCT

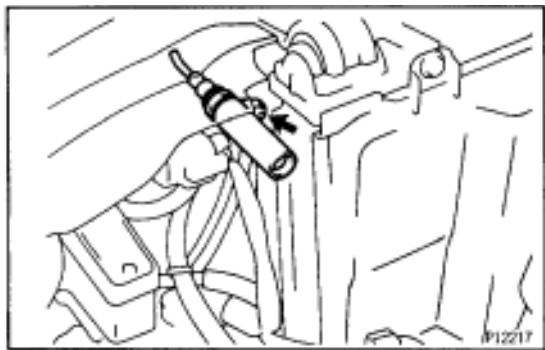
7. 2JZ-GTE:

REMOVE NO.5 AIR HOSE



8. REMOVE LH HEADLIGHT BEAM ANGLE GAUGE

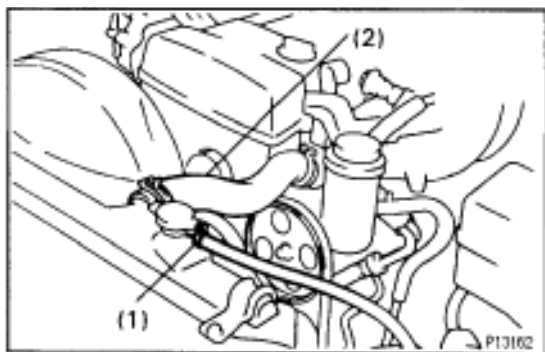
Remove the screw and beam angle gauge.



9. DISCONNECT HOSES FROM RADIATOR

Disconnect these hoses from the radiator:

- Reservoir inlet hose
- Upper radiator hose



- Lower radiator hose

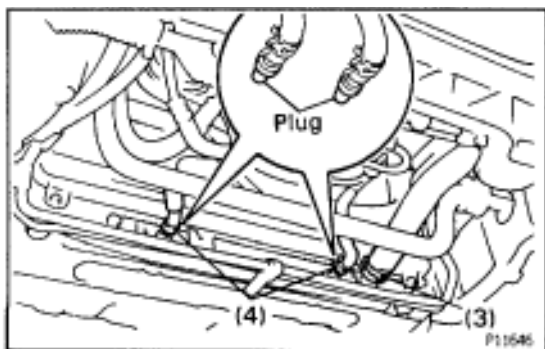
- A/T:

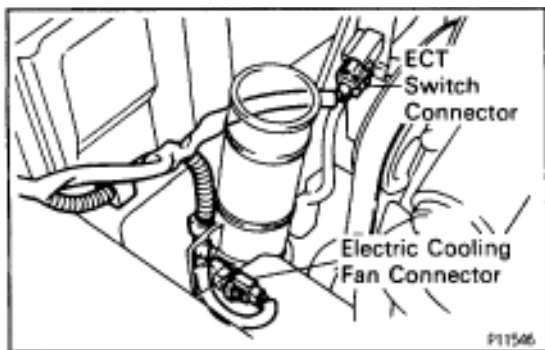
2 oil cooler hoses

Plug the hose ends.

INSTALLATION HINT: Check the A/T fluid level.

(See item 21 in Maintenance)





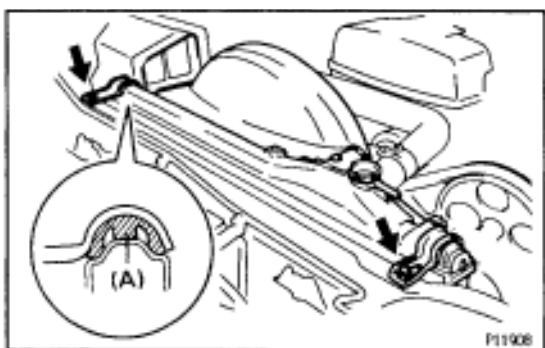
10. REMOVE RADIATOR ASSEMBLY

(a) 2JZ-GTE:

Disconnect the ECT switch (for electric cooling fan connector) and wire harness.

(b) 2JZ-GTE:

Disconnect the electric cooling fan connector and wire harness.



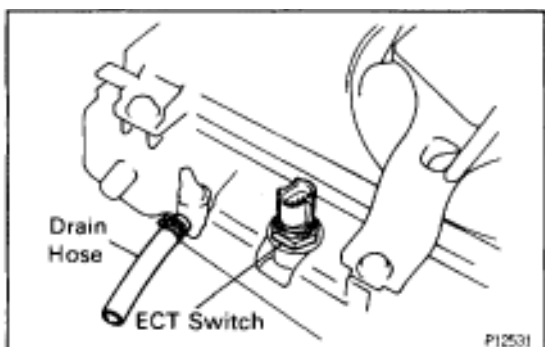
(c) Remove the bolt and upper radiator support. Remove the 2 upper radiator supports.

INSTALLATION HINT: After installation, check that the rubber cushion (A) of the support is not depressed.

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

(d) Lift out the radiator assembly.

(e) Remove the 2 lower radiator supports.



11. REMOVE DRAIN HOSE FROM RADIATOR

12. 2JZ-GTE:

REMOVE ENGINE COOLANT TEMPERATURE (ECT) SWITCH FROM RADIATOR

(a) Remove the ECT switch.

INSTALLATION HINT: Apply soapy water to the O-ring, and install the ECT switch.

Torque: 7.4 N·m (75 kgf·cm, 65 in·lbf)

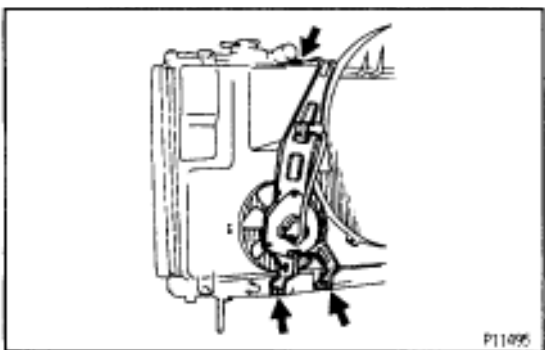
(b) Remove the O-ring from the ECT switch.

INSTALLATION HINT: Use a new O-ring.

13. 2JZ-GTE:

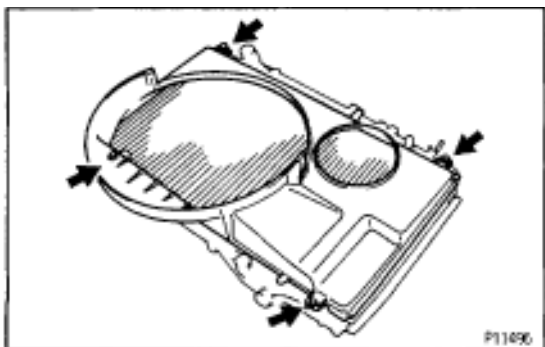
REMOVE ELECTRIC COOLING FAN FROM RADIATOR

Remove the 3 bolts and cooling fan.

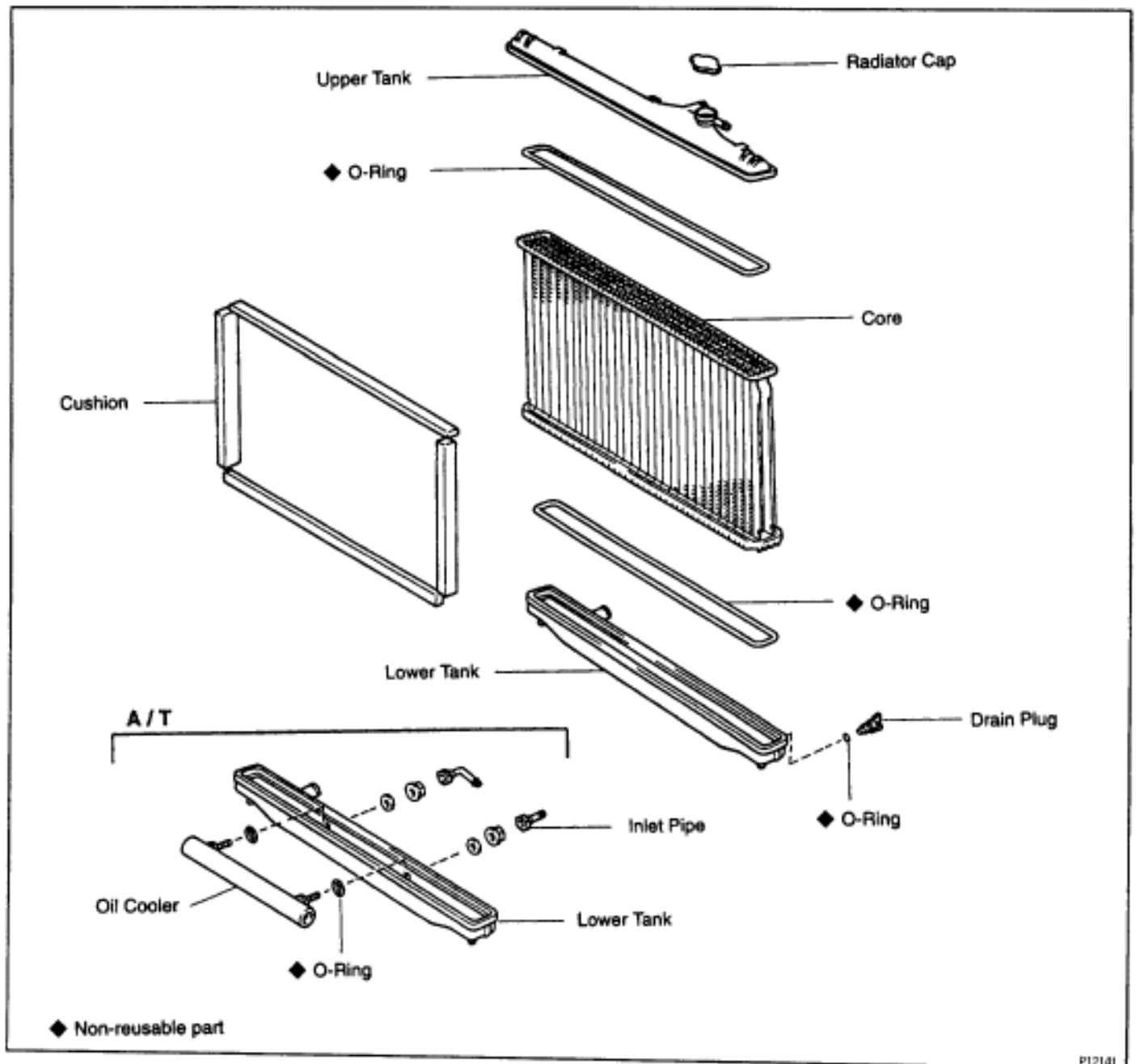


14. REMOVE NO.1 FAN SHROUD FROM RADIATOR

Remove the 4 bolts and No.1 fan shroud.

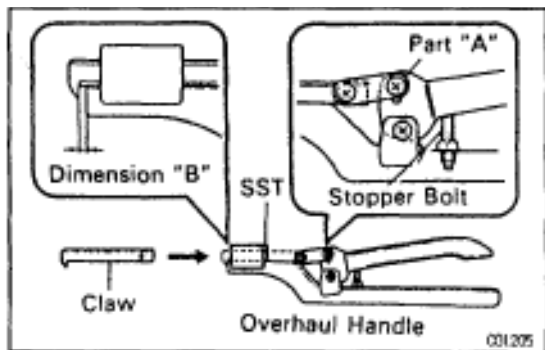


COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



RADIATOR DISASSEMBLY

1. REMOVE CUSHIONS FROM RADIATOR

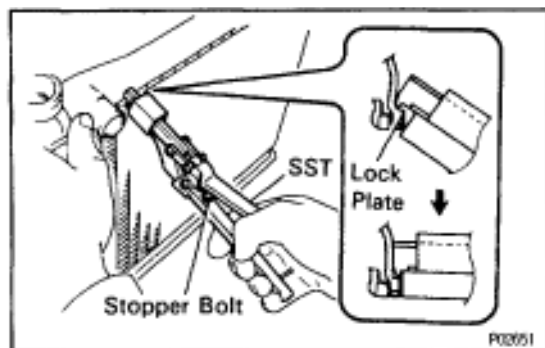


2. ASSEMBLE SST

SST 09230-01010

- Install the claw to the overhaul handle, inserting it in the hole in part "A" as shown in the installation.
- While gripping the handle, adjust the stopper bolt so that dimension "B" shown in the diagram is 0.2–0.5 mm (0.008–0.020 in.).

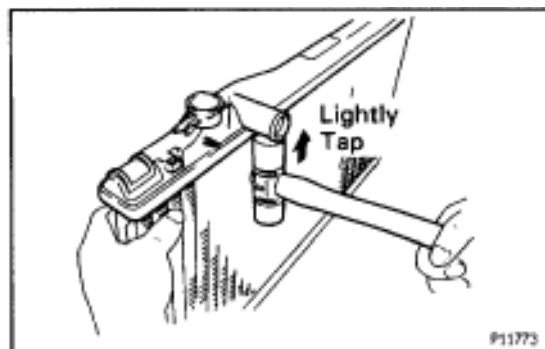
NOTICE: If this adjustment is not done, the claw may be damaged.



3. UNCAULK LOCK PLATES

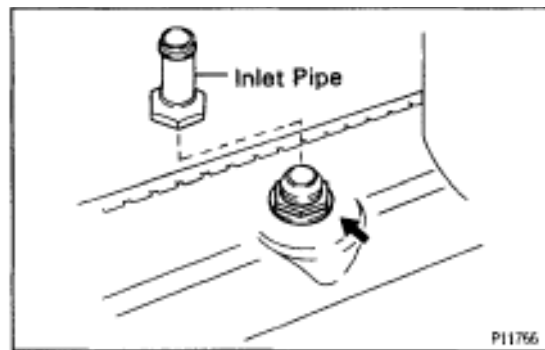
Using SST to release the caulking, squeeze the handle until stopped by the stopper bolt.

SST 09230-01010



4. REMOVE TANKS AND O-RINGS

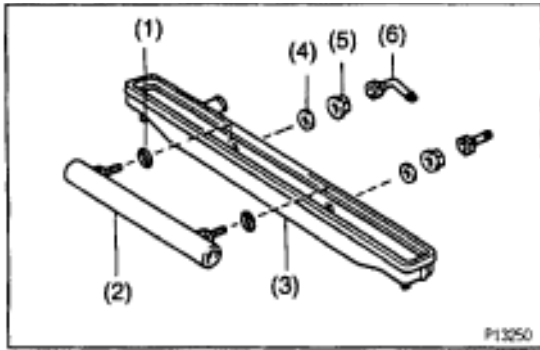
- Lightly tap the radiator hose inlet (or outlet) with a soft-faced hammer and remove the tank.
- Remove the O-ring.



5. A/T:

REMOVE OIL COOLER FROM LOWER TANK

- Remove the inlet pipes.
HINT: Make a note of the direction to face the pipes.
- Remove the nuts, plate washers and oil cooler.
- Remove the O-rings from the oil cooler.



RADIATOR ASSEMBLY

1. A/T:

INSTALL OIL COOLER TO LOWER TANK

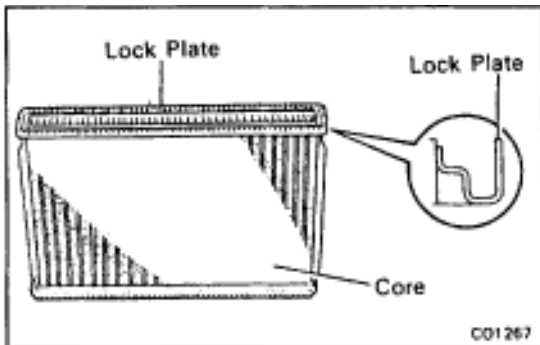
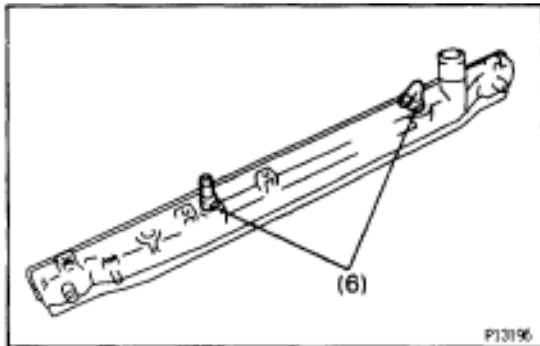
- (a) Clean the O-ring contact surface of the lower tank and oil cooler.
- (b) Install new O-ring (1) to the oil cooler (2).
- (c) Install the oil cooler (2) to the lower tank (3).
- (d) Install the plate washers (4), and nuts (5).

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

- (e) Install the inlet pipes (6).

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

HINT: Face the inlet pipes in the same direction they were before disassembly.

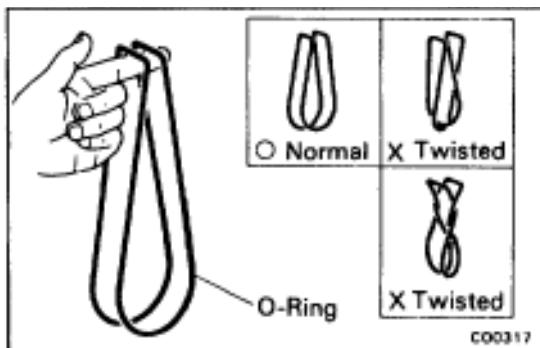


2. INSPECT LOCK PLATE

Inspect the lock plate for damage.

HINT:

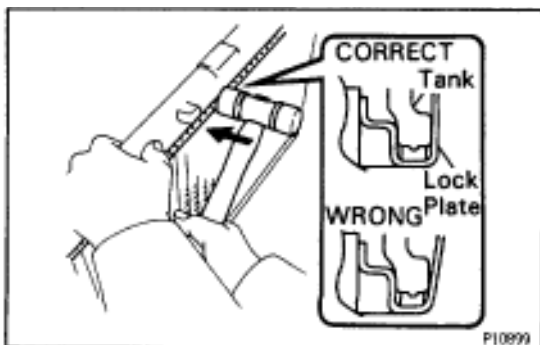
- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.
- Therefore, first correct any deformation with pliers or similar object. Water leakage will result if the bottom of the lock plate groove is damaged or dented. Therefore, repair or replace if necessary.



3. INSTALL NEW O-RINGS AND TANKS

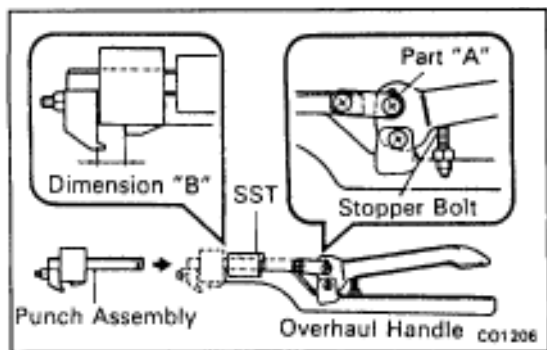
- (a) After checking that there are no foreign objects in the lock plate groove, install the new O-ring without twisting it.

HINT: When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.



- (b) Install the tank without damaging the O-ring.

- (c) Tap the lock plate with a soft-faced hammer so that there is no gap between it and the tank.



4. ASSEMBLE SST

SST 09230-01010,

09231-14010 (Punch (2JZ-GE only))

- Install the punch assembly to the overhaul handle, inserting it in the hole in part "A" as shown in the illustration.
- While gripping the handle, adjust the stopper bolt so that dimension "B" shown in the diagram.

Dimension "B":

2JZ-GE

8.4 mm (0.34 in)

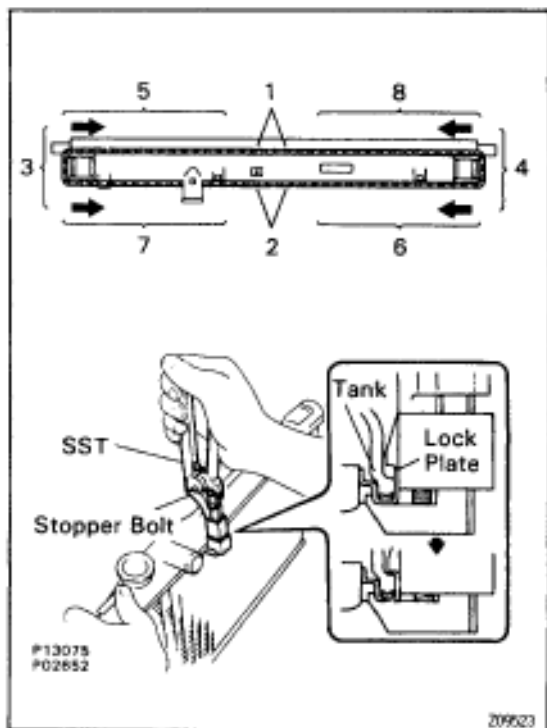
2JZ-GTE

7.7 mm (0.31 in)

5. CAULK LOCK PLATE

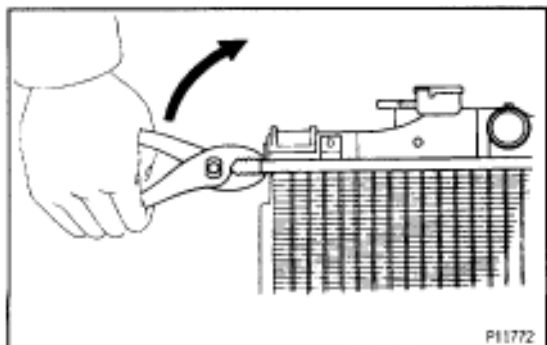
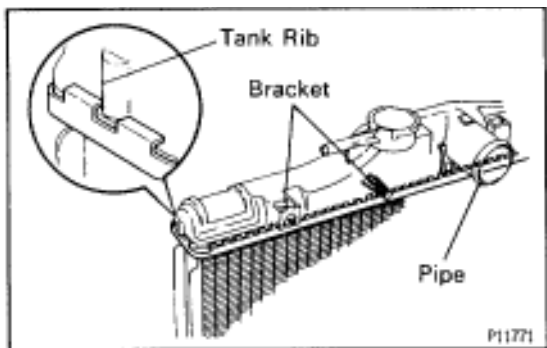
- Lightly press SST against the lock plate in the order shown in the illustration. After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopper plate.

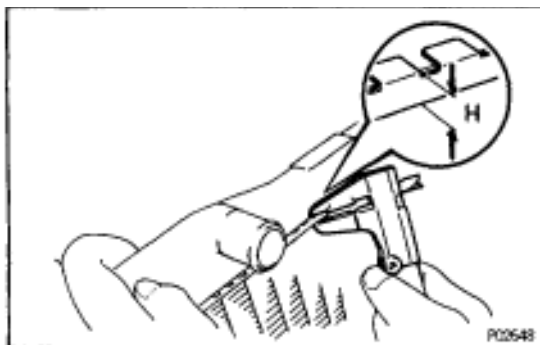
SST 09230-01010



HINT:

- Do not stake the areas protruding around the pipes, brackets or tank ribs.
- The points shown in the rib sides and oil cooler near here cannot be staked with SST. Use a plier or similar object and be careful not to damage the core plates.





- (b) Check the lock plate height (H) after completing the caulking.

Plate height:

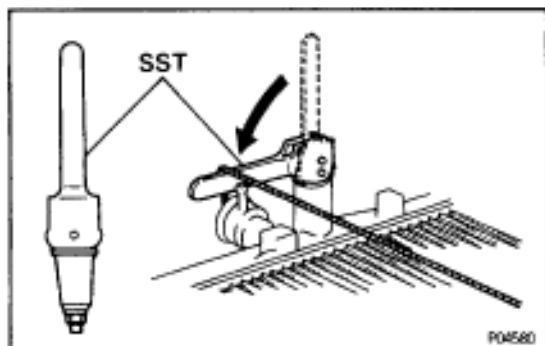
2JZ-GE

7.40–7.80 mm (0.2959–0.3119 in)

2JZ-GTE

7.76–8.24 mm (0.3055–0.3244 in.)

If not within the specified height, adjust the stopper bolt of the handle again and caulk again.

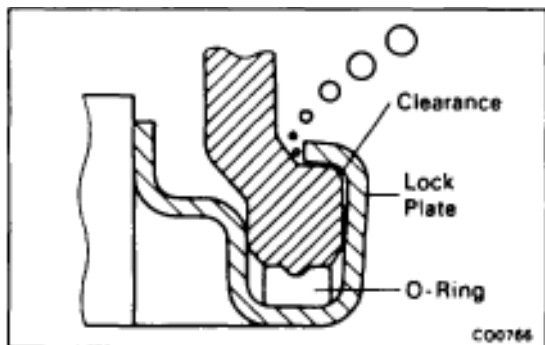


6. INSPECT FOR WATER LEAKS

- (a) Tighten the drain plug.
- (b) Plug the inlet and outlet pipes of the radiator with SST.
- (c) Using a radiator cap tester, apply pressure to the radiator.

Test pressure:

177 kPa (1.8 kgf/cm², 26 psi)



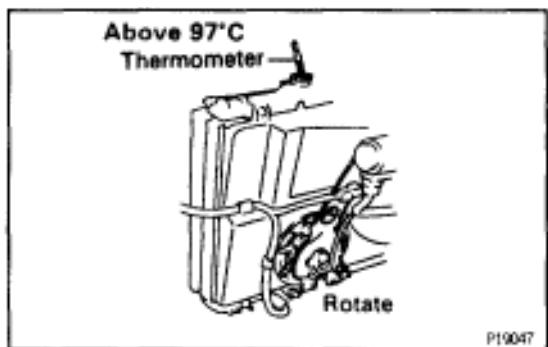
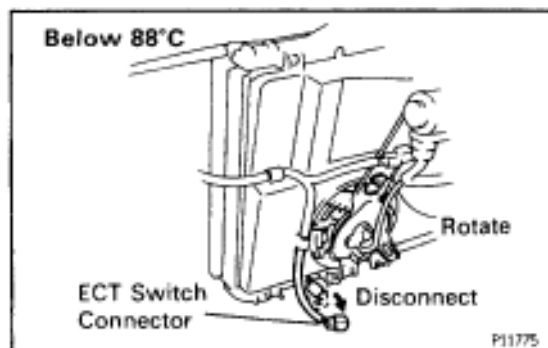
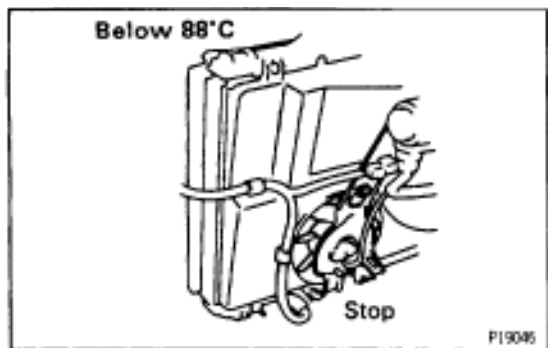
- (d) Inspect for water leaks.

HINT: On radiators with resin tanks, there is a clearance between the tank and lock plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before doing the water leak test, move the radiator around in the water until all air bubbles disappear.

7. PAINT LOCK PLATES

HINT: If the water leak test checks out okay, allow the radiator to completely dry and then paint the lock plates.

8. INSTALL CUSHIONS TO RADIATOR



ELECTRIC COOLING FAN (2JZ-GTE) On-Vehicle Inspection

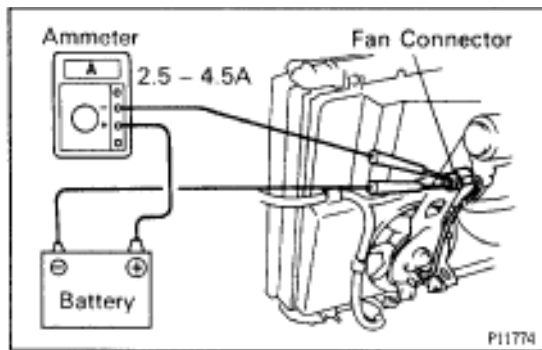
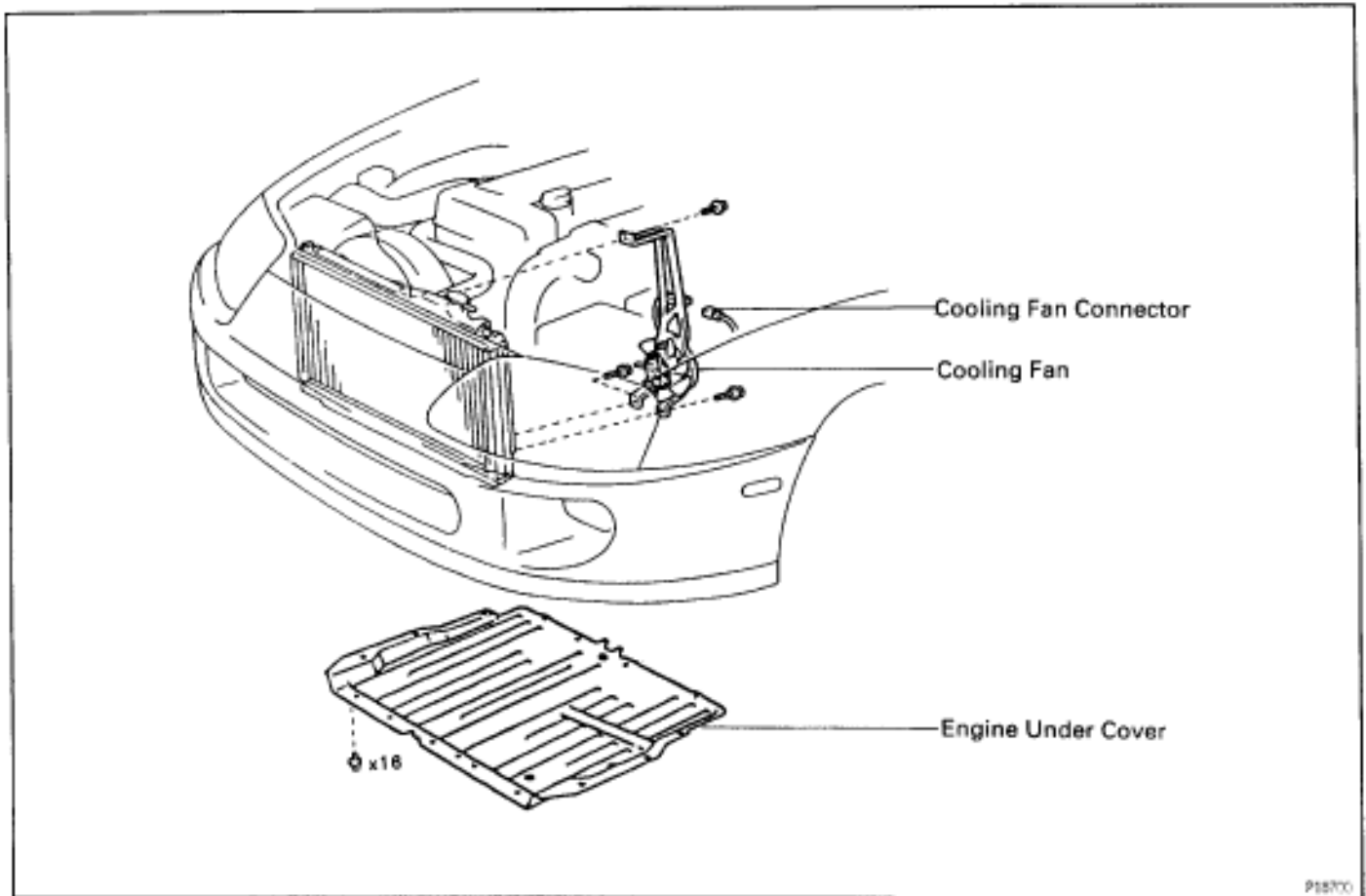
1. CHECK COOLING FAN OPERATION WITH LOW TEMPERATURE (Below 88°C (190°F))

- (a) Turn the ignition switch ON.
- (b) Check that the cooling fan stops.
If not, check the cooling fan relay and ECT switch, and check for a separated connector or severed wire between the No.1 radiator fan relay and ECT switch.
- (c) Disconnect the ECT switch connector.
- (d) Check that the cooling fan rotates.
If not, check the No.1 radiator relay, No.2 radiator fan relay, cooling fan, fuses, and check for short circuit between the No.1 radiator fan relay and ECT switch.
- (e) Reconnect the ECT switch connector.

2. CHECK COOLING FAN OPERATION WITH HIGH TEMPERATURE (Above 97°C (207°F))

- (a) Start the engine, and raise coolant temperature to above 97°C (207°F).
- (b) Check that the cooling fan rotates.
If not, replace the ECT switch.

Cooling Fan COMPONENTS FOR REMOVAL AND INSTALLATION



COOLING FAN INSPECTION

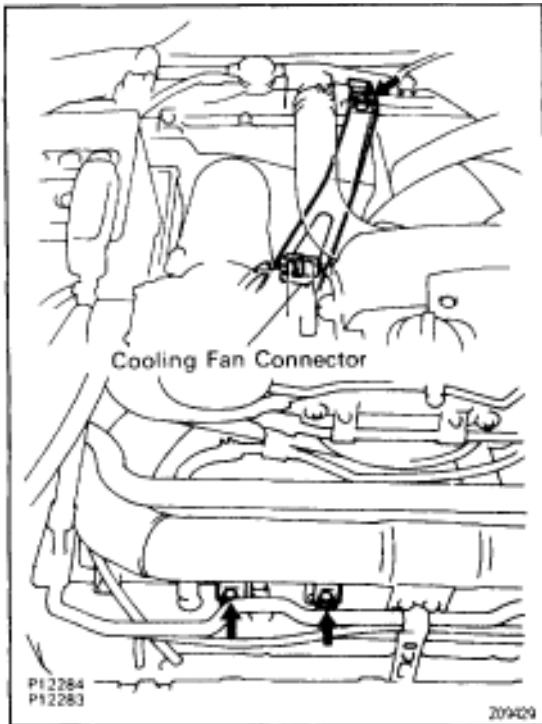
INSPECT COOLING FAN

- Disconnect the fan connector.
- Connect battery and ammeter to the cooling fan connector.
- Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

Standard amperage:

2.5–4.5 A

- Reconnect the fan connector.

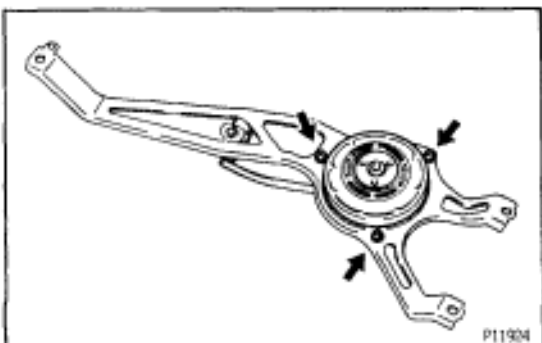
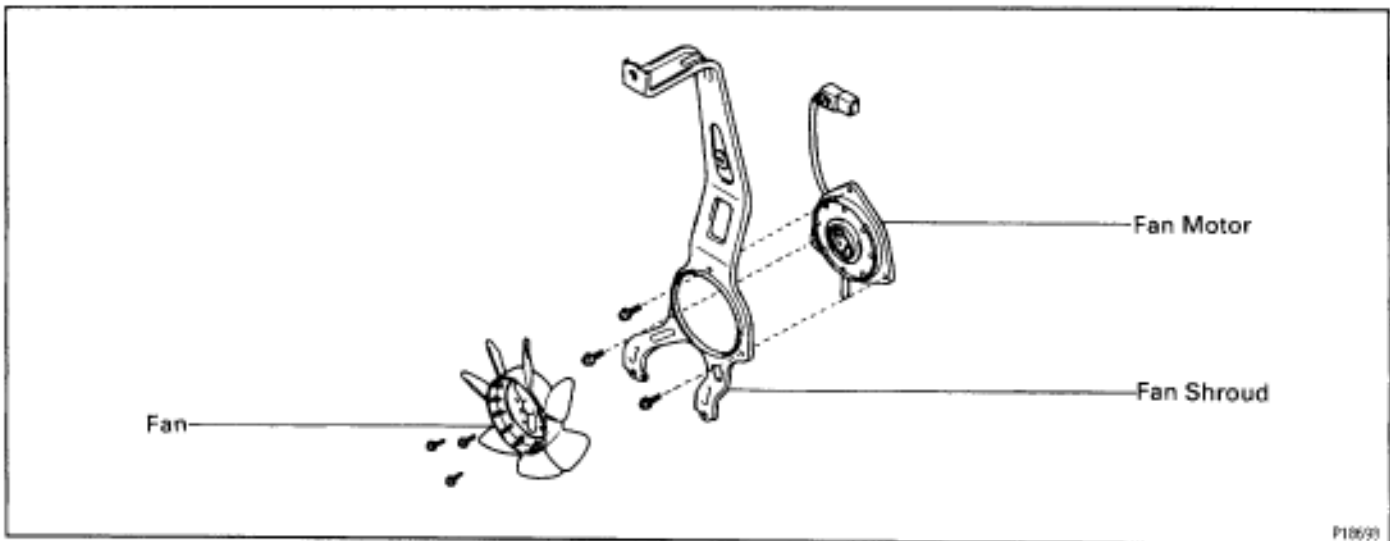


COOLING FAN REMOVAL

Installation is in the reverse order of removal.

1. **REMOVE ENGINE UNDER COVER**
2. **REMOVE COOLING FAN**
 - (a) Disconnect the cooling fan connector.
 - (b) Remove the 3 bolts and cooling fan.

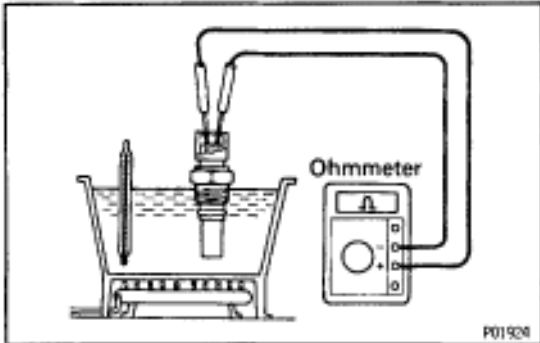
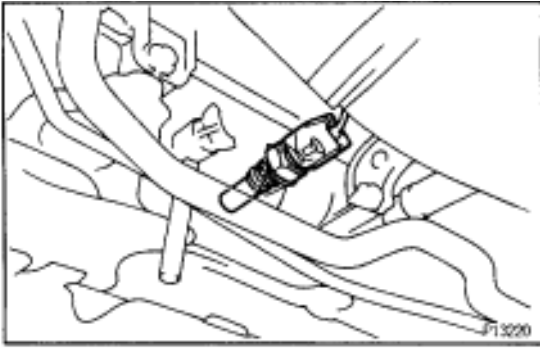
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



COOLING FAN DISASSEMBLY

Assembly is in the reverse order of disassembly.

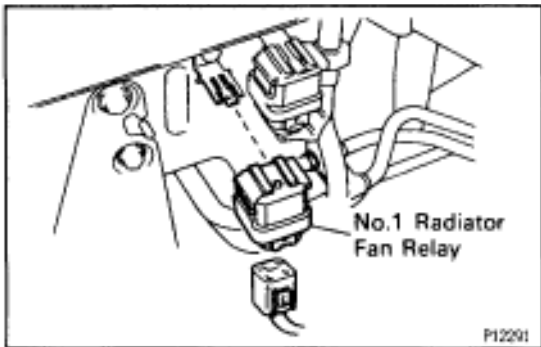
1. **REMOVE FAN**
Remove the 3 screws and fan.
2. **REMOVE FAN MOTOR**
 - (a) Disconnect the connector from the fan shroud.
 - (b) Remove the 3 screws and fan motor.



Engine Coolant Temperature (ECT) Switch

ECT SWITCH INSPECTION

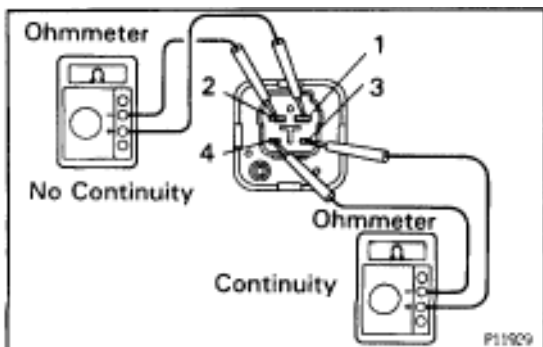
1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **REMOVE ECT SWITCH**
 - (a) Disconnect the ECT switch connector.
 - (b) Remove the ECT switch.
 - (c) Remove the O-ring from the ECT switch.
4. **INSPECT ECT SWITCH**
 - (a) Using an ohmmeter, check that there is no continuity between the terminals when the coolant temperature is above 97°C (207°F).
 - (b) Using an ohmmeter, check that there is continuity between the terminals when the coolant temperature is below 88°C (190°F).
If continuity is not as specified, replace the switch.
5. **REINSTALL ECT SWITCH**
 - (a) Install a new O-ring to the ECT switch.
 - (b) Apply soapy water to the O-ring.
 - (c) Install the ECT switch.
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)
 - (d) Connect the ECT switch connector.
6. **REFILL WITH ENGINE COOLANT**
7. **START ENGINE AND CHECK FOR LEAKS**
8. **REINSTALL ENGINE UNDER COVER**

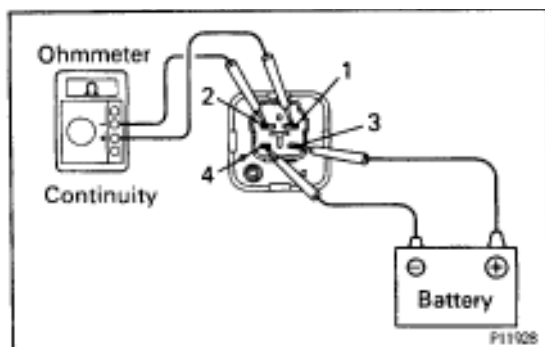


No.1 Radiator Fan Relay ("RADIATOR FAN RELAY")

RADIATOR FAN RELAY INSPECTION

1. **w/ Auto Spoiler:**
REMOVE LH HEADLIGHT
2. **w/o Auto Spoiler:**
REMOVE ENGINE UNDER COVER
3. **REMOVE RADIATOR FAN RELAY**
4. **INSPECT RADIATOR FAN RELAY**
 - A. **Inspect relay continuity**
 - (a) Using an ohmmeter, check that there is continuity between terminals 3 and 4.
 - (b) Check that there is no continuity between terminals 1 and 2.
If continuity is as specified, replace the relay.





B. Inspect relay operation

- (a) Apply battery voltage across terminals 3 and 4.
- (b) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If operation is not as specified, replace the relay.

5. REINSTALL RADIATOR FAN RELAY

6. w/ Auto Spoiler:

REINSTALL LH HEADLIGHT

7. w/o Auto Spoiler:

REINSTALL ENGINE UNDER COVER

No.2 Radiator Fan Relay ("A.B.S. (TRAC) RELAY")

RADIATOR FAN RELAY INSPECTION

1. w/ Auto Spoiler:

REMOVE LH HEADLIGHT

2. w/o Auto Spoiler:

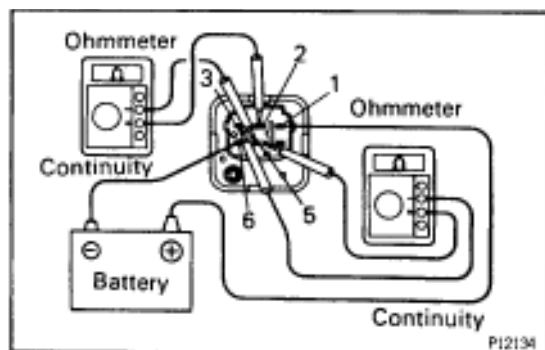
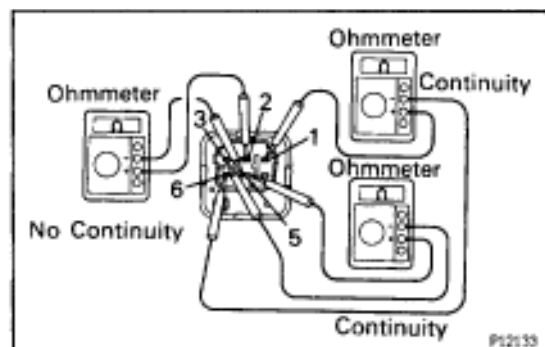
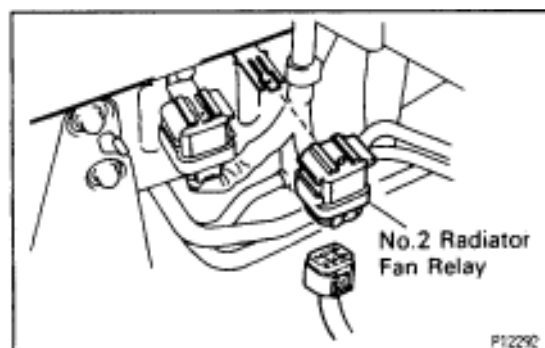
REMOVE ENGINE UNDER COVER

3. REMOVE RADIATOR FAN RELAY

4. INSPECT RADIATOR FAN RELAY

A. Inspect relay continuity

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 6.
 - (b) Check that there is continuity between terminals 3 and 5.
 - (c) Check that there is no continuity between terminals 2 and 5.
- If continuity is not as specified, replace the relay.



B. Inspect relay operation

- (a) Apply battery voltage across terminals 1 and 6.
 - (b) Using an ohmmeter, check that there is no continuity between terminals 3 and 5.
 - (c) Check that there is continuity between terminals 2 and 5.
- If operation is not as specified, replace the relay.

5. REINSTALL RADIATOR FAN RELAY

6. w/ Auto Spoiler:

REINSTALL LH HEADLIGHT

7. w/o Auto Spoiler:

REINSTALL ENGINE UNDER COVER

SERVICE SPECIFICATIONS

SERVICE DATA

Thermostat	Valve opening temperature Valve lift at 95°C (203°F)	80–84°C (176–183°F) 8.5 mm (0.335 in.) or more
Radiator cap	Relief valve opening pressure STD Minimum	93–123 kPa (0.95–1.25 kgf/cm ² , 13.5–17.8 psi) 78 kPa (0.8 kgf/cm ² , 11.4 psi)
Electric cooling fan	Rotating amperage	2.5–4.5 A

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Engine drain plug x Cylinder block	29	300	22
Fan x Fluid coupling	7.4	75	65 in.·lbf
Water pump x Cylinder block	21	210	15
Water pump x No.2 water bypass pipe	21	210	15
Generator x Water pump	37	380	27
Generator x Cylinder block	37	380	27
Water bypass outlet x Cylinder head (2JZ–GE)	8.8	90	78 in.·lbf
Water outlet x Cylinder head (2JZ–GTE)	21	210	15
Water inlet x Water pump (2JZ–GE)	8.8	90	78 in.·lbf
Water inlet x Water pump (2JZ–GTE)	21	210	15
Upper radiator support x Body	15	155	11
ECT switch x Radiator (2JZ–GTE)	7.4	75	65 in.·lbf
Fluid coupling x Water pump	16	165	12
Oil cooler x Radiator lower tank (A/T)	8.3	85	74 in.·lbf
Oil cooler x Oil cooler pipe (A/T)	15	150	11

LUBRICATION SYSTEM

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09032-00100 Oil Pan Seal Cutter	No.2 oil pan
	09228-07500 Oil Filter Wrench	
	09316-60010 Transmission & Transfer Bearing Replacer	
	(09316-00010) Replacer Pipe	Crankshaft front oil seal
	09816-30010 Oil Pressure Switch Socket	

RECOMMENDED TOOLS

	09040-00010 Hexagon Wrench Set ◆	
	09040-00020 Torx Socket E10 ◆	A/C compressor stud bolt
	09200-00010 Engine Adjust Kit ◆	

EQUIPMENT

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

LUBRICANT

Item	Capacity	Classification
Engine oil (2JZ-GE) Dry fill Drain and refill w/ Oil filter change w/o Oil filter change	6.5 liters (6.9 US qts, 5.7 Imp. qts) 5.3 liters (5.6 US qts, 4.7 Imp. qts) 4.9 liters (5.2 US qts, 4.3 Imp. qts)	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
Engine oil (2JZ-GTE) Dry fill Drain and refill w/ Oil filter change w/o Oil filter change	6.5 liters (6.9 US qts, 5.7 Imp. qts) 5.0 liters (5.3 US qts, 4.4 Imp. qts) 4.7 liters (5.0 US qts, 4.1 Imp. qts)	API grade SH, Energy-Conserving II multigrade engine oil or ILSAC multigrade engine oil and recommended viscosity oil

SSM (SPECIAL SERVICE MATERIALS)

08826-00080	Seal Packing Black or equivalent (FIPG)	Oil pump No.1 oil pan No.2 oil pan
08833-00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch Idler pulley pivot bolt

OIL PRESSURE CHECK

1. CHECK OIL QUALITY

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

If oil quality is visibly poor, replace the oil.

2. CHECK ENGINE OIL LEVEL

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

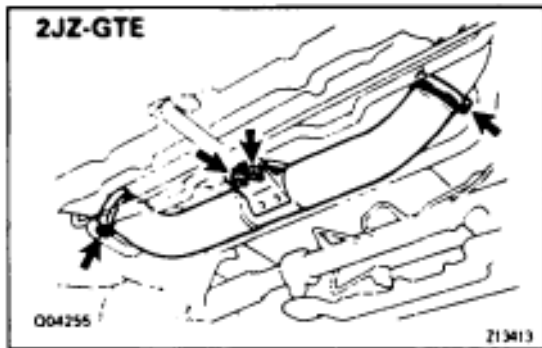
If low, check for the leakage and add oil up to "F" mark.

3. REMOVE ENGINE UNDER COVER

4. 2JZ-GTE:

REMOVE NO.2 AIR TUBE

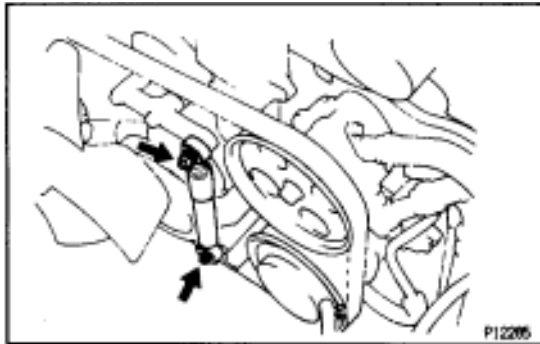
Loosen the 2 hose clamps, and remove 2 bolts and air tube.



5. 2JZ-GTE M/T:

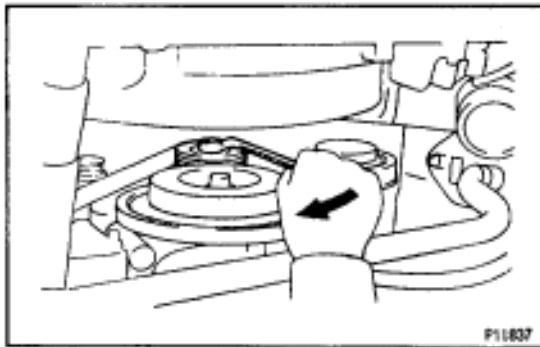
REMOVE DRIVE BELT TENSIONER DAMPER

Remove the 2 nuts and tensioner damper.



6. DISCONNECT A/C COMPRESSOR FROM ENGINE

(a) Loosen the drive belt tension by turning the drive belt tensioner clockwise, and remove the drive belt.

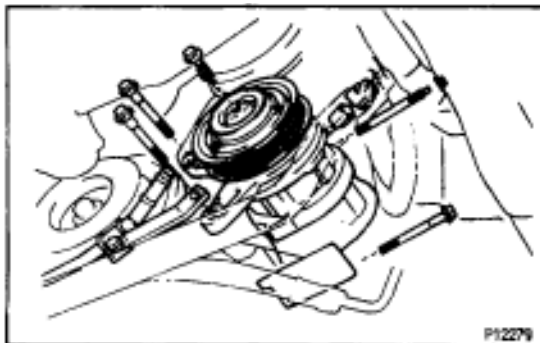


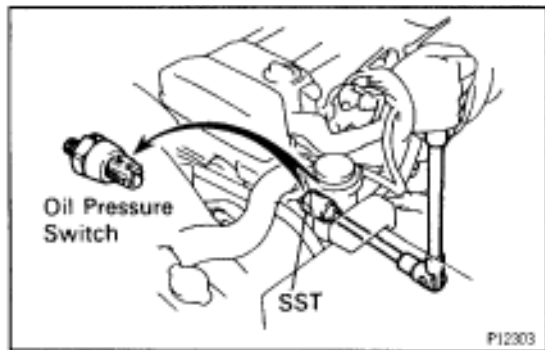
(b) Remove the 4 bolts and nut.

(c) Using a torx socket (E10), remove the stud bolt.

(d) Disconnect the compressor connector.

(e) Remove 4 bolts and pull the compressor downward.





7. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

- (a) Disconnect the oil pressure switch connector.
- (b) Using SST, remove the oil pressure switch.
SST 09816-30010

- (c) Install an oil pressure gauge.

8. REINSTALL A/C COMPRESSOR

- (a) Temporarily install the A/C compressor with the 4 bolts.
- (b) Connect the compressor connector.
- (c) Install the compressor with the stud bolt, 4 bolts and nut.

Torque:

Stud bolt

26 N·m (265 kgf·cm, 19 ft·lbf)

Bolt and nut

52 N·m (530 kgf·cm, 38 ft·lbf)

- (d) Install the drive belt.

9. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

10. CHECK OIL PRESSURE

Oil pressure:

At idle

49 kPa (0.5 kgf/cm², 7.1 psi) or more

At 3,000 rpm (2JZ-GE) or 4,000 rpm (2JZ-GTE)

324-579 kPa

(3.3-5.9 kgf/cm², 47-84 psi)

11. DISCONNECT A/C COMPRESSOR FROM ENGINE

12. REMOVE OIL PRESSURE GAUGE, AND REINSTALL OIL PRESSURE SWITCH

- (a) Remove the oil pressure gauge.
- (b) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:

Part No. 08833-00080, THREE BOND 1344,

LOCTITE 242 or equivalent

- (c) Using SST, install the oil pressure switch.
SST 09816-30010

Torque: 14 N·m (150 kgf·cm, 11 ft·lbf)

- (d) Connect the oil pressure switch connector.

13. REINSTALL A/C COMPRESSOR

14. START ENGINE AND CHECK FOR LEAKS

15. 2JZ-GTE M/T:

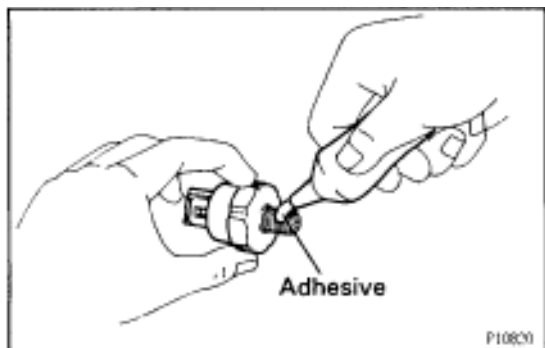
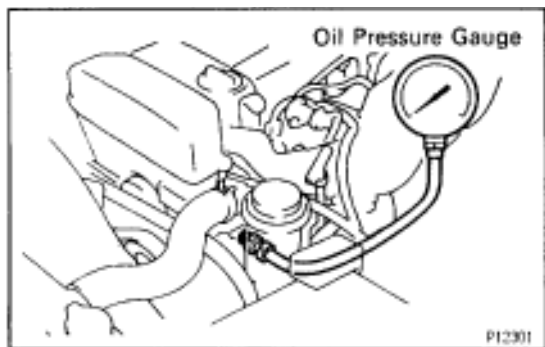
INSTALL DRIVE BELT TENSIONER DAMPER

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

16. 2JZ-GTE:

REINSTALL NO.2 AIR TUBE

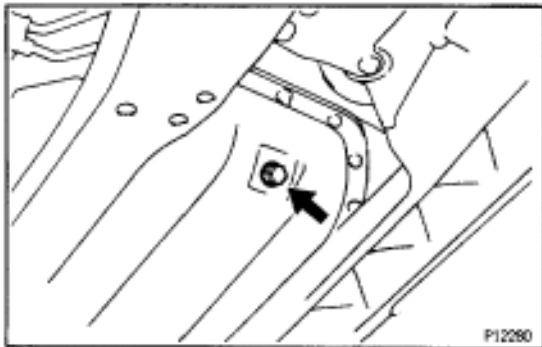
17. REINSTALL ENGINE UNDER COVER



OIL AND FILTER REPLACEMENT

CAUTION:

- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.



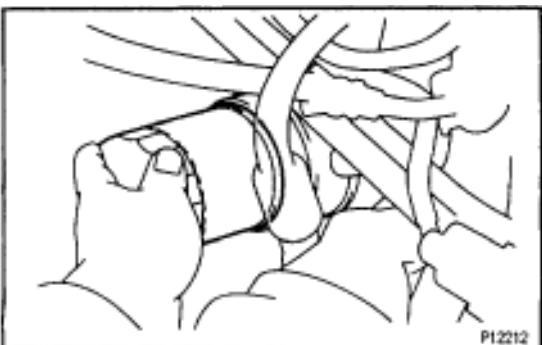
1. DRAIN ENGINE OIL

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

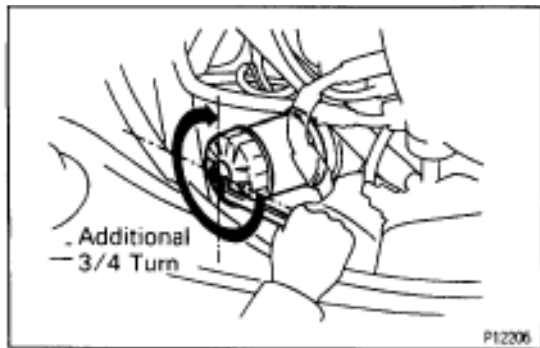


2. REPLACE OIL FILTER

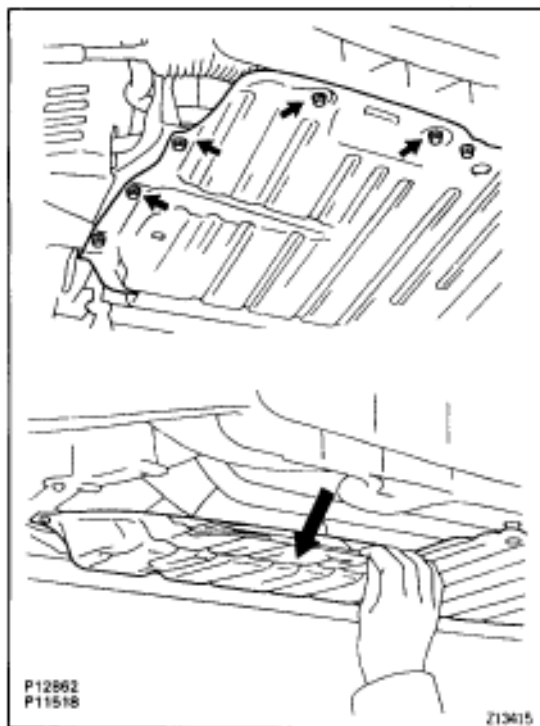
- (a) Using SST, remove the oil filter.
SST 09228-07500
- (b) Check and clean the oil filter installation surface.
- (c) Apply clean engine oil to the gasket of a new oil filter.



- (d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.



- (e) Using SST, tighten it an additional 3/4 turn.
SST 09228-07500



3. REFILL WITH ENGINE OIL

- (a) To wipe off oil that has dripped onto the engine under cover, remove the 4 screws and bend the under cover downward.

NOTICE:

- To avoid damaging the silencer, do not bend the engine under cover more than 150 mm.
- If oil gets on the silencer, wipe it off with a dry rag.

- (b) Clean and install the oil drain plug with a new gasket.
Torque: 38 N·m (375 kgf·cm, 27 ft·lbf)

- (c) Fill with fresh engine oil.

Capacity:

2JZ-GE

Drain and refill

w/ Oil filter change

5.3 liters (5.6 US qts, 4.7 Imp. qts)

w/o Oil filter change

4.9 liters (5.2 US qts, 4.3 Imp. qts)

Dry fill

6.5 liters (6.9 US qts, 5.7 Imp. qts)

2JZ-GTE

Drain and refill

w/ Oil filter change

5.0 liters (5.3 US qts, 4.4 Imp. qts)

w/o Oil filter change

4.7 liters (5.0 US qts, 4.1 Imp. qts)

Dry fill

6.5 liters (6.9 US qts, 5.7 Imp. qts)

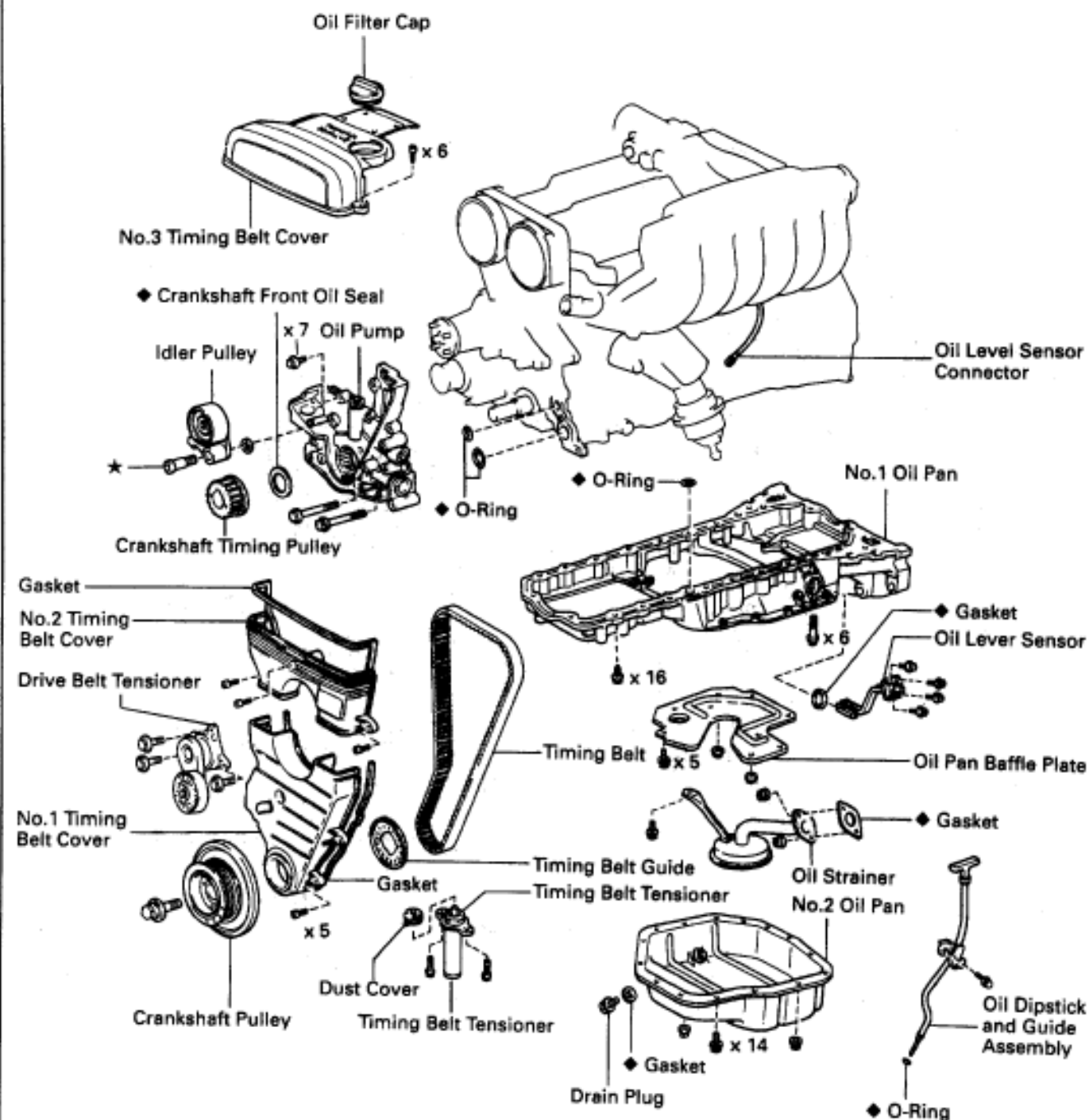
- (d) Reinstall the oil filler cap.

4. START ENGINE AND CHECK FOR OIL LEAKS

5. RECHECK ENGINE OIL LEVEL

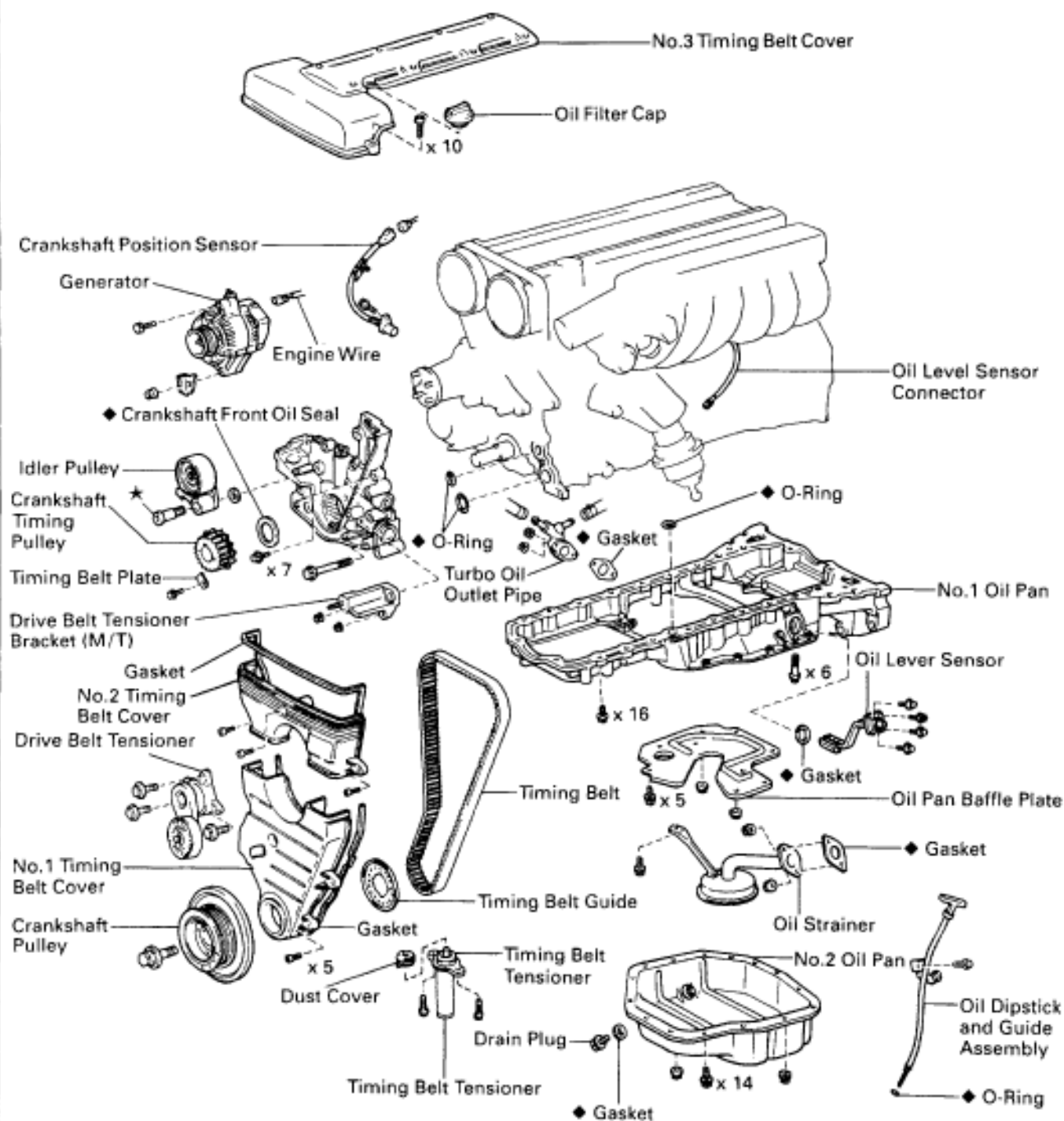
OIL PUMP COMPONENTS FOR REMOVAL AND INSTALLATION

2JZ-GE



- ◆ Non-reusable part
- ★ Precoated part

2JZ-GTE

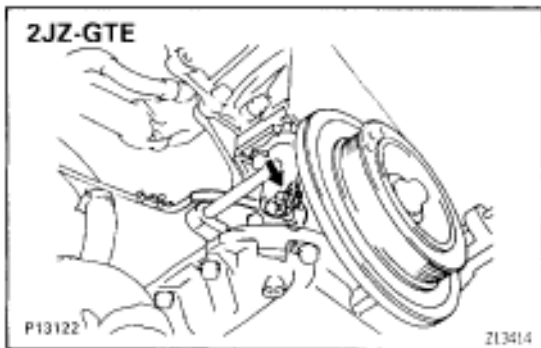


◆ Non-reusable part
 ★ Precoated part

OIL PUMP REMOVAL

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. **REMOVE ENGINE WITH TRANSMISSION**
(See components for engine removal and installation)
2. **SEPARATE ENGINE AND TRANSMISSION**
(See components for engine & transmission separation and assembly)

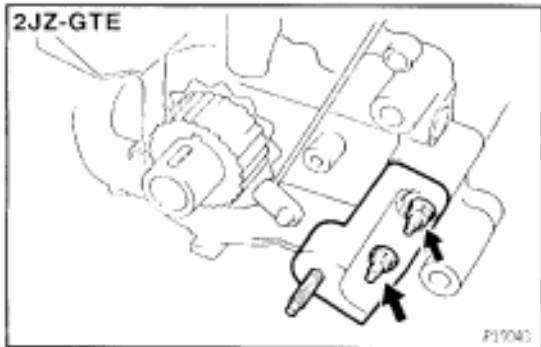


3. **INSTALL ENGINE TO ENGINE STAND FOR REMOVAL**

4. **2JZ-GTE:**
REMOVE GENERATOR

5. **2JZ-GTE:**
REMOVE CRANKSHAFT POSITION SENSOR

- (a) Disconnect the sensor connector from the bracket.
- (b) Disconnect the sensor connector from the wiring connector.
- (c) Disconnect the wire clamp from the cylinder block.
- (d) Remove the bolt and position sensor.



6. **REMOVE TIMING BELT**

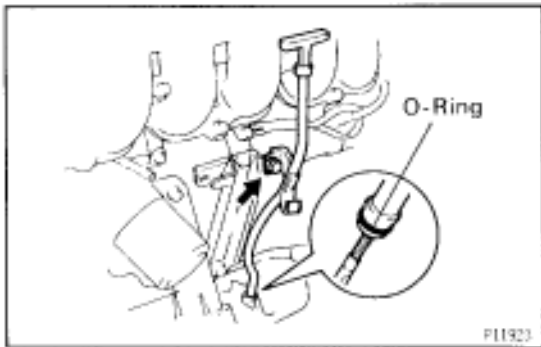
(See steps 4 to 8 in timing belt removal in Engine Mechanical)

7. **2JZ-GTE M/T:**
REMOVE DRIVE BELT TENSIONER BRACKET

Remove the 2 nuts and tensioner bracket.

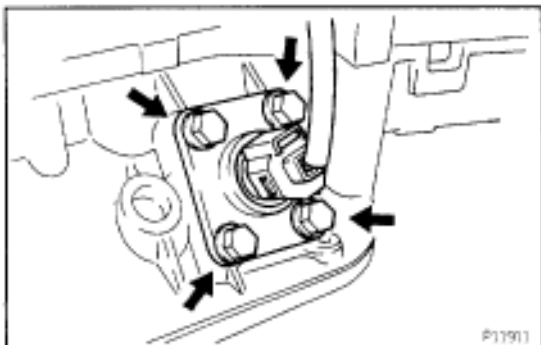
8. **REMOVE IDLER PULLEY**
(See step 15 in timing belt removal in Engine Mechanical)

9. **REMOVE CRANKSHAFT TIMING PULLEY**
(See step 17 in timing belt removal in Engine Mechanical)



10. **REMOVE OIL DIPSTICK AND GUIDE ASSEMBLY**

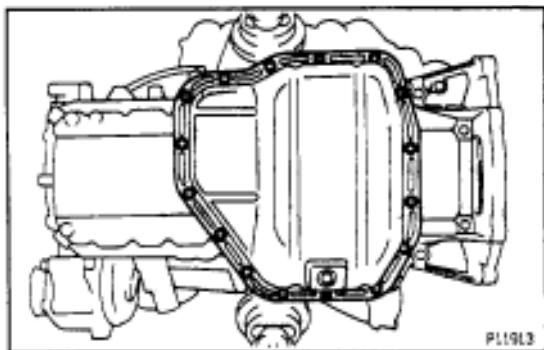
- (a) Remove the bolt.
- (b) Pull out the dipstick guide together with the dipstick.
- (c) Remove the O-ring from the dipstick guide.



11. **REMOVE OIL LEVEL SENSOR**

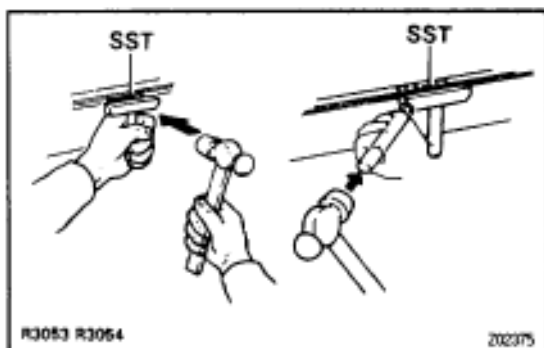
- (a) Disconnect the level sensor connector.
- (b) Remove the 4 bolts and level sensor.
- (c) Remove the gasket from the level sensor.

NOTICE: Be careful not to drop the oil level sensor when removing it.



12. REMOVE NO.2 OIL PAN

- (a) Remove the 14 bolts and 2 nuts.

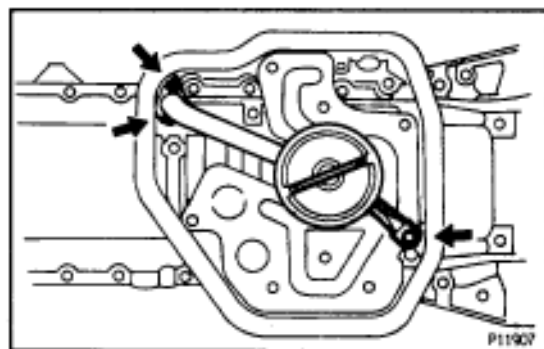


- (b) Insert the blade of SST between the No.1 and No.2 oil pan, break the seal of the applied sealer and remove the No.2 oil pan.

SST 09032-00100

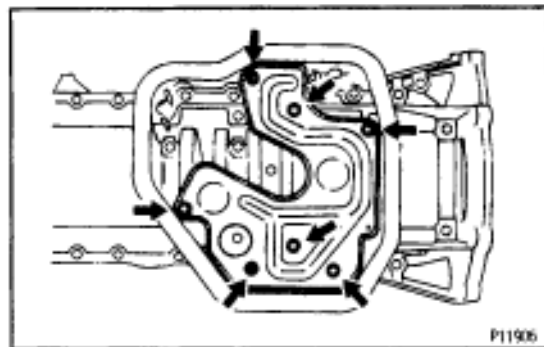
NOTICE:

- Be careful not to damage the No.2 oil pan contact surface of the No.1 oil pan.
- Be careful not to damage the oil pan flange.



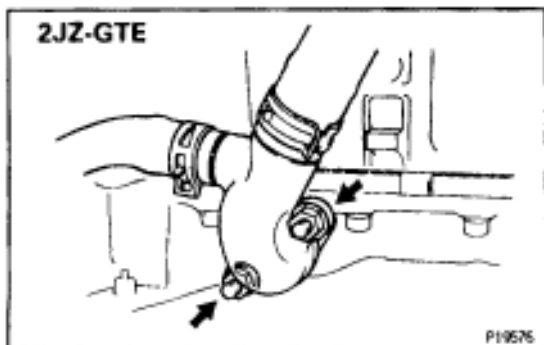
13. REMOVE OIL STRAINER

Remove the bolt, 2 nuts, oil strainer and gasket.



14. REMOVE OIL PAN BAFFLE PLATE

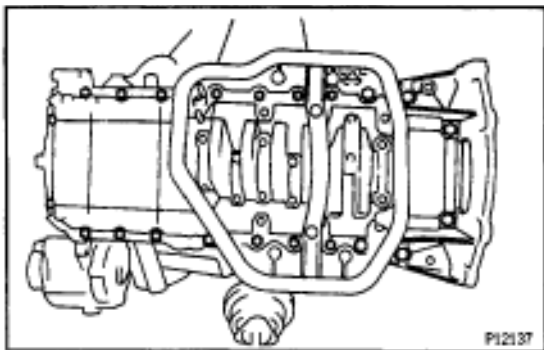
Remove the 5 bolts, 2 nuts and baffle plate.



15. 2JZ-GTE:

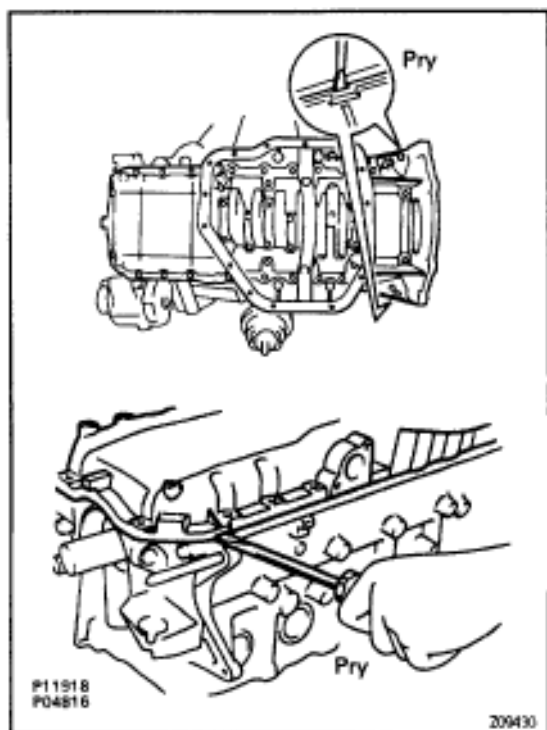
REMOVE TURBO OIL OUTLET PIPE

- (a) Disconnect the 2 turbo oil outlet hoses.
(b) Remove the 2 nuts, oil outlet pipe and gasket.



16. REMOVE NO.1 OIL PAN

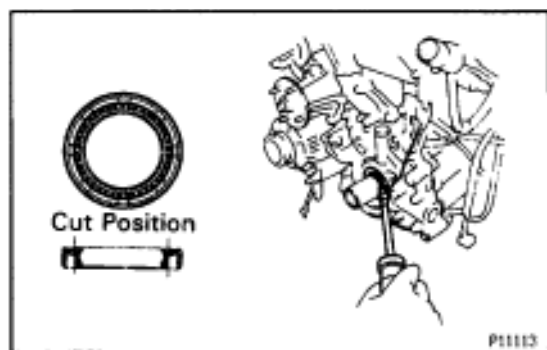
- (a) Remove the 22 bolts.



- (b) Remove the No.1 oil pan by prying the portions between the cylinder block and No.1 oil pan with a screwdriver.

NOTICE: Be careful not to damage the contact surfaces of the cylinder block and No.1 oil pan.

- (c) Remove the O-ring from the cylinder block.

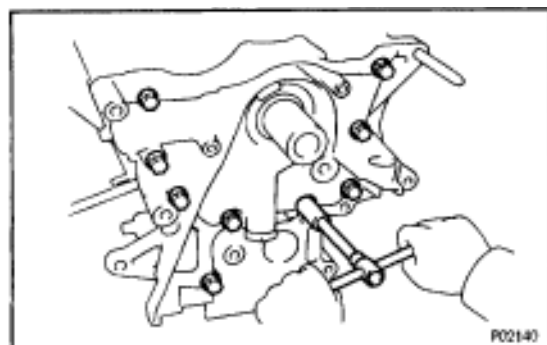


17. REMOVE CRANKSHAFT FRONT OIL SEAL

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

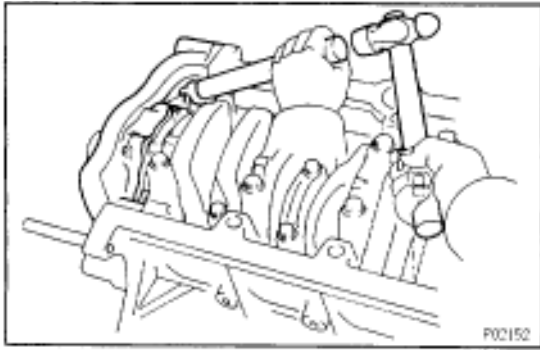
- (b) Using a screwdriver, pry out the oil seal.

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



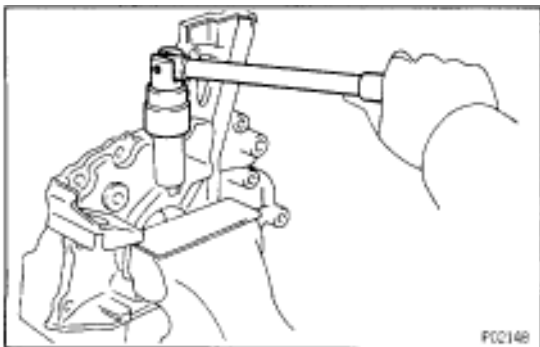
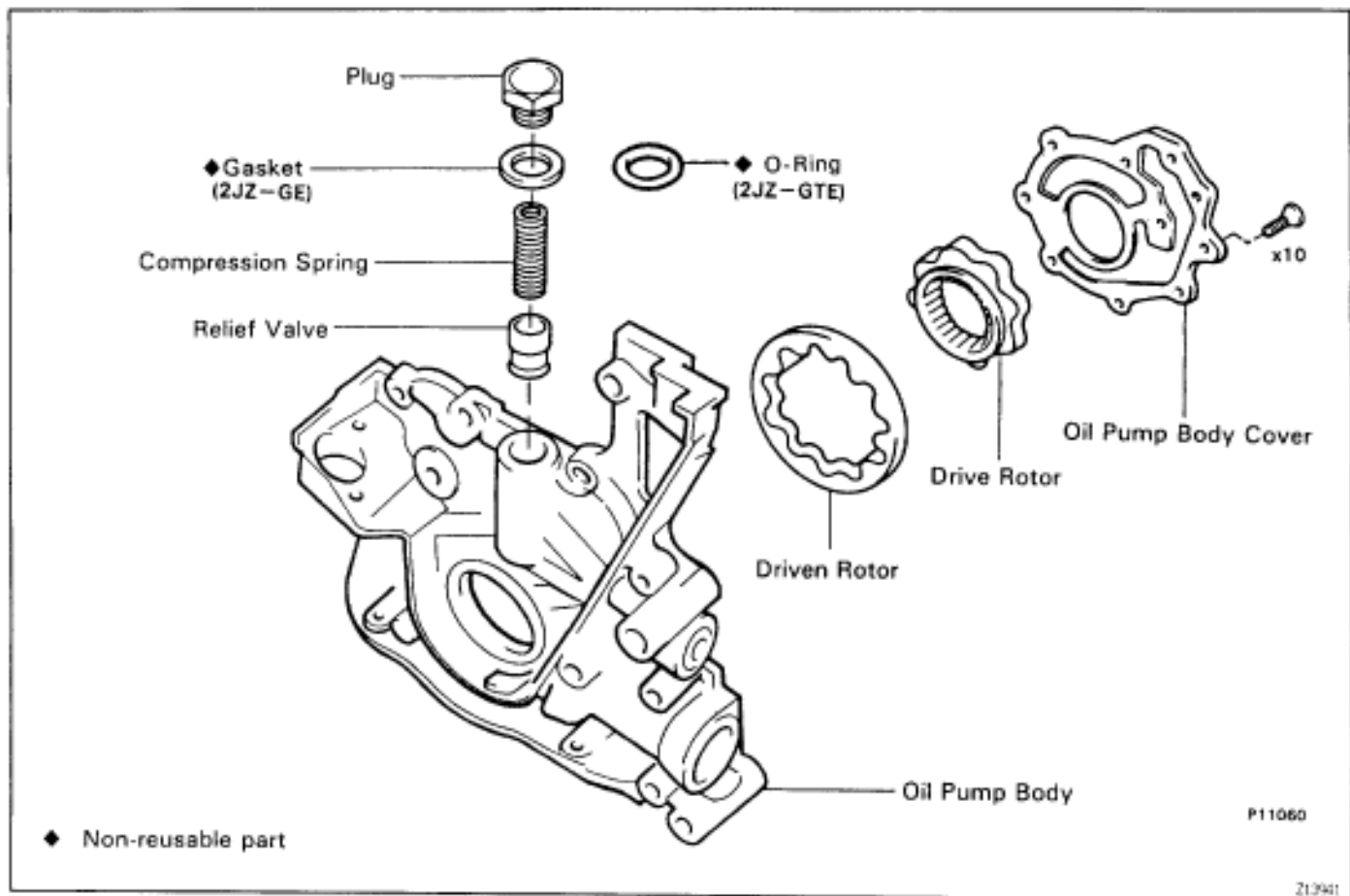
18. REMOVE OIL PUMP

- (a) Remove the 9 bolts.



- (b) Using a hammer and brass bar, remove the oil pump by carefully tapping the oil pump body.
- (c) Remove the 2 O-rings from the cylinder block.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



OIL PUMP DISASSEMBLY

Assembly is in the reverse order of disassembly.

1. REMOVE RELIEF VALVE

- (a) Slightly mount the pump body in a vise.
NOTICE: Be careful not to damage the pump body.
- (b) Remove the plug, gasket (2JZ-GE), O-ring (2JZ-GTE), compression spring and relief valve.

INSTALLATION HINT:

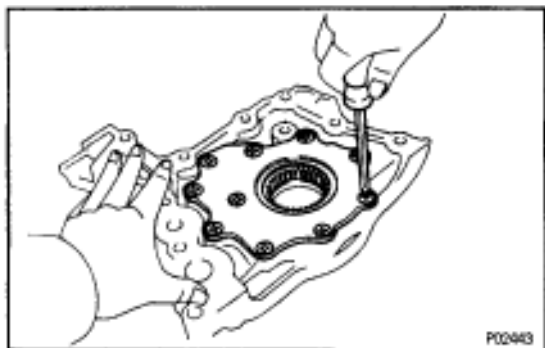
Use a new gasket (2JZ-GE) or O-ring (2JZ-GTE).

Torque:**2JZ-GE**

49 N·m (500 kgf·cm, 36 ft·lbf)

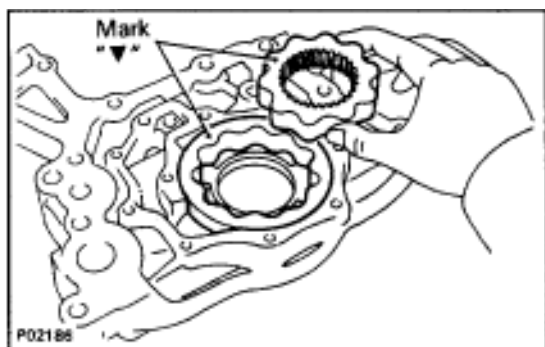
2JZ-GTE

29 N·m (300 kgf·cm, 22 ft·lbf)

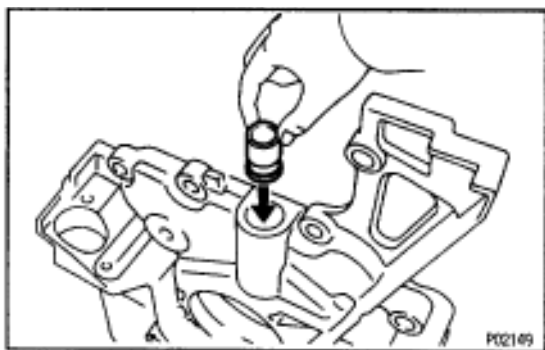
**2. REMOVE DRIVE AND DRIVEN ROTORS**

Remove the 10 screws, pump body cover, the drive and driven rotors.

Torque: 10 N·m (105 kgf·cm, 8.0 ft·lbf)

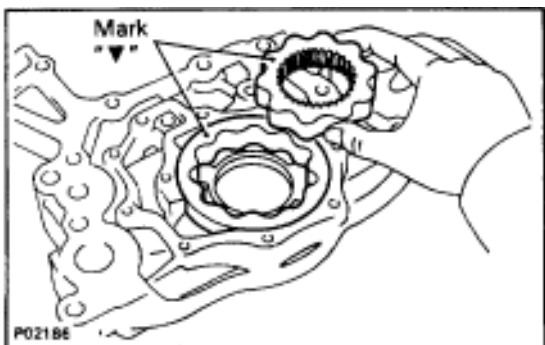


ASSEMBLY HINT: Place the drive and driven rotors into the oil pump body with the mark facing upward.

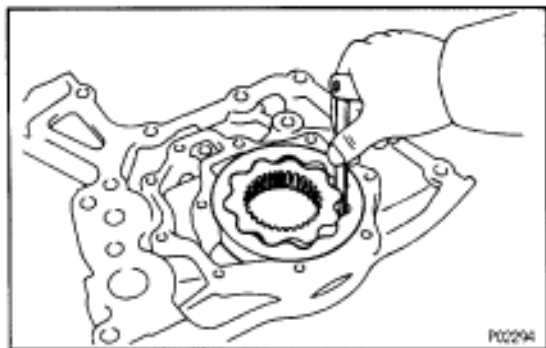
**OIL PUMP INSPECTION****1. INSPECT RELIEF VALVE**

Coat the valve with engine oil and check that it falls smoothly into the valve hole under its own weight.

If it doesn't, replace the relief valve. If necessary, replace the oil pump assembly.

**2. INSPECT DRIVE AND DRIVEN ROTORS****A. Place drive and driven rotors into oil pump body**

ASSEMBLY HINT: Place the drive and driven rotors into the oil pump body with the mark facing upward.

**B. Inspect rotor tip clearance**

Using a feeler gauge, measure the clearance between the drive and driven rotors.

Standard tip clearance:

2JZ-GE

0.310–0.490 mm (0.0122–0.0193 in.)

2JZ-GTE

0.056–0.326 mm (0.0022–0.0128 in.)

Maximum tip clearance:

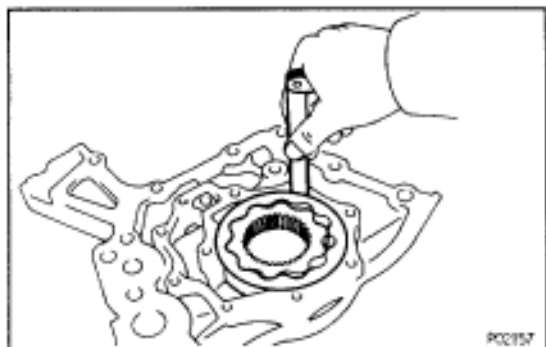
2JZ-GE

0.53 mm (0.0209 in.)

2JZ-GTE

0.40 mm (0.0157 in.)

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

**C. Inspect rotor body clearance**

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

Standard body clearance:

2JZ-GE

0.100–0.175 mm (0.0039–0.0069 in.)

2JZ-GTE

0.080–0.135 mm (0.0031–0.0053 in.)

Maximum body clearance:

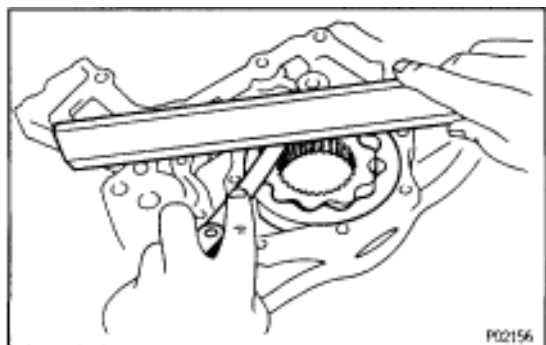
2JZ-GE

0.20 mm (0.0079 in.)

2JZ-GTE

0.16 mm (0.0063 in.)

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

**D. Inspect rotor side clearance**

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

Standard side clearance:

2JZ-GE

0.030–0.090 mm (0.0012–0.0035 in.)

2JZ-GTE

0.020–0.065 mm (0.0007–0.0026 in.)

Maximum side clearance:**2JZ-GE**

0.12 mm (0.0047 in.)

2JZ-GTE

0.10 mm (0.0039 in.)

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

E. Remove drive and driven rotors**OIL PUMP INSTALLATION****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 gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the debris.
- Using a non-residue solvent, clean both sealing surfaces.

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

Seal packing:**Part No. 08826-00080 or equivalent**

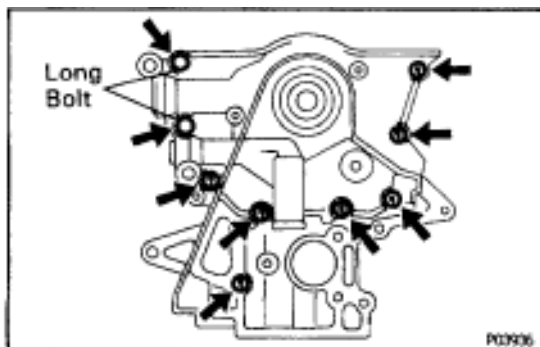
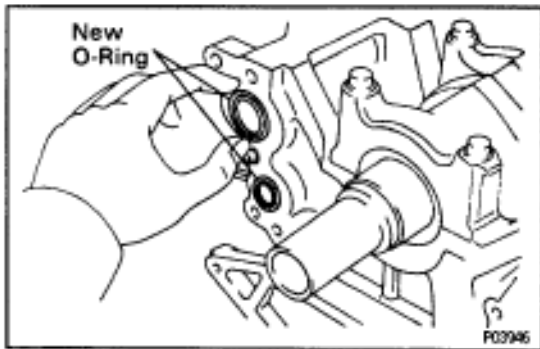
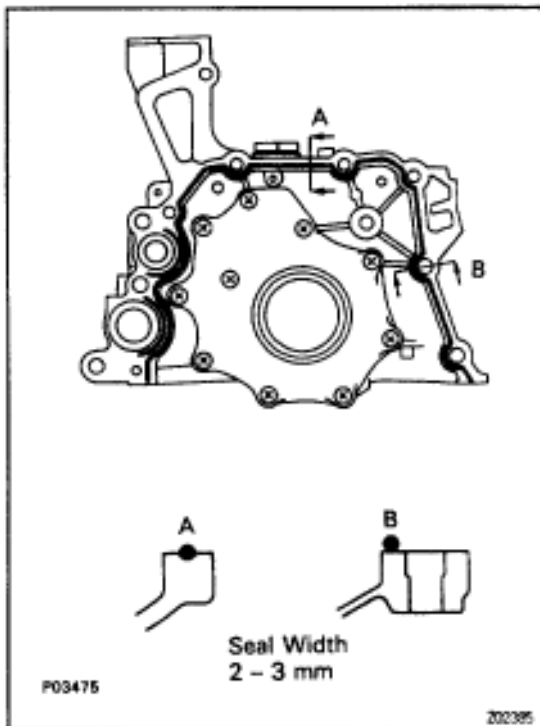
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.

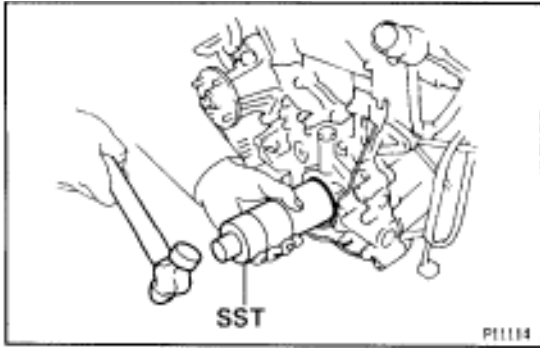
HINT: Avoid applying an excessive amount to the surface. Be particularly careful near oil passages.

- 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 2 new O-rings in position on the cylinder block.

- (d) Install the oil pump with the 9 bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)





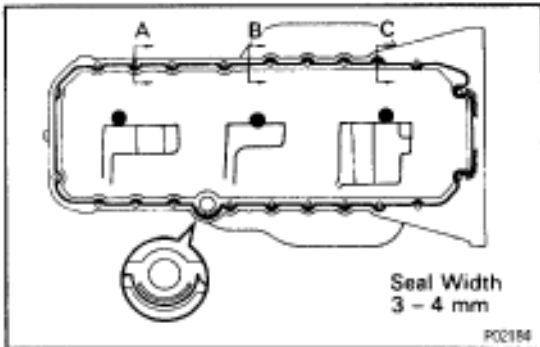
2. INSTALL CRANKSHAFT FRONT OIL SEAL

- (a) Apply MP grease to a new oil seal lip.
- (b) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09316-60010 (09316-00010)

3. INSTALL NO.1 OIL PAN

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the No.1 oil pan and cylinder block.
 - Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
 - Thoroughly clean all components to remove all the debris.
 - Using a non-residue solvent, clean both sealing surfaces.

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



- (b) Apply seal packing to the No.1 oil pan as shown in the illustration.

Seal packing:

Parts No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 3-4 mm (0.12-0.16 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

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

- (c) Place a new O-ring in the position on the cylinder block.
- (d) Install the No.1 oil pan with the 22 bolts.

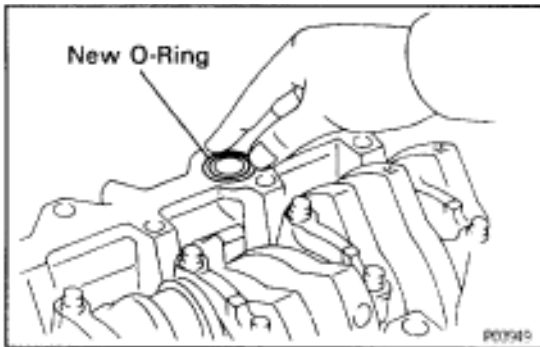
Torque:

12 mm head

21 N·m (210 kgf·cm, 15 ft·lbf)

14 mm head

39 N·m (400 kgf·cm, 29 ft·lbf)



4. 2JZ-GTE:

INSTALL TURBO OIL OUTLET PIPE

- (a) Install a new gasket and the oil outlet pipe with the 2 nuts.
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)
- (b) Connect the 2 turbo oil outlet hoses.

5. INSTALL OIL PAN BAFFLE PLATE

Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)

6. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and 2 nuts.

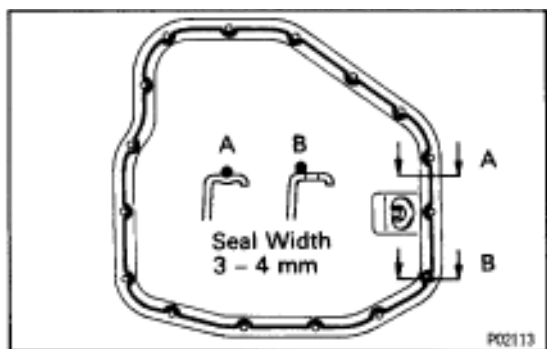
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

7. INSTALL NO.2 OIL PAN

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the No.1 and No.2 oil pans.

- 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 debris.
- Using a non-residue solvent, clean both sealing surfaces.

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



- (b) Apply seal packing to the No.2 oil pan as shown in the illustration.

Seal packing:

Part No.08826-00080 or equivalent

- Install a nozzle that has been cut to a 3–4 mm (0.12–0.16 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

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

- (c) Install the No.2 oil pan with the 14 bolts and 2 nuts.

Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

8. INSTALL OIL LEVEL SENSOR

- (a) Install a new gasket to the level sensor.

- (b) Install the level sensor with the 4 bolts.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

- (c) Connect the level sensor connector.

9. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK

- (a) Install a new O-ring on the dipstick guide.

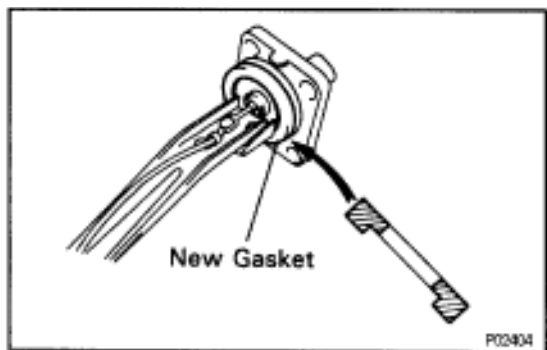
- (b) Install the guide with the bolt.

10. INSTALL CRANKSHAFT TIMING PULLEY

(See step 1 in timing belt installation in Engine Mechanical)

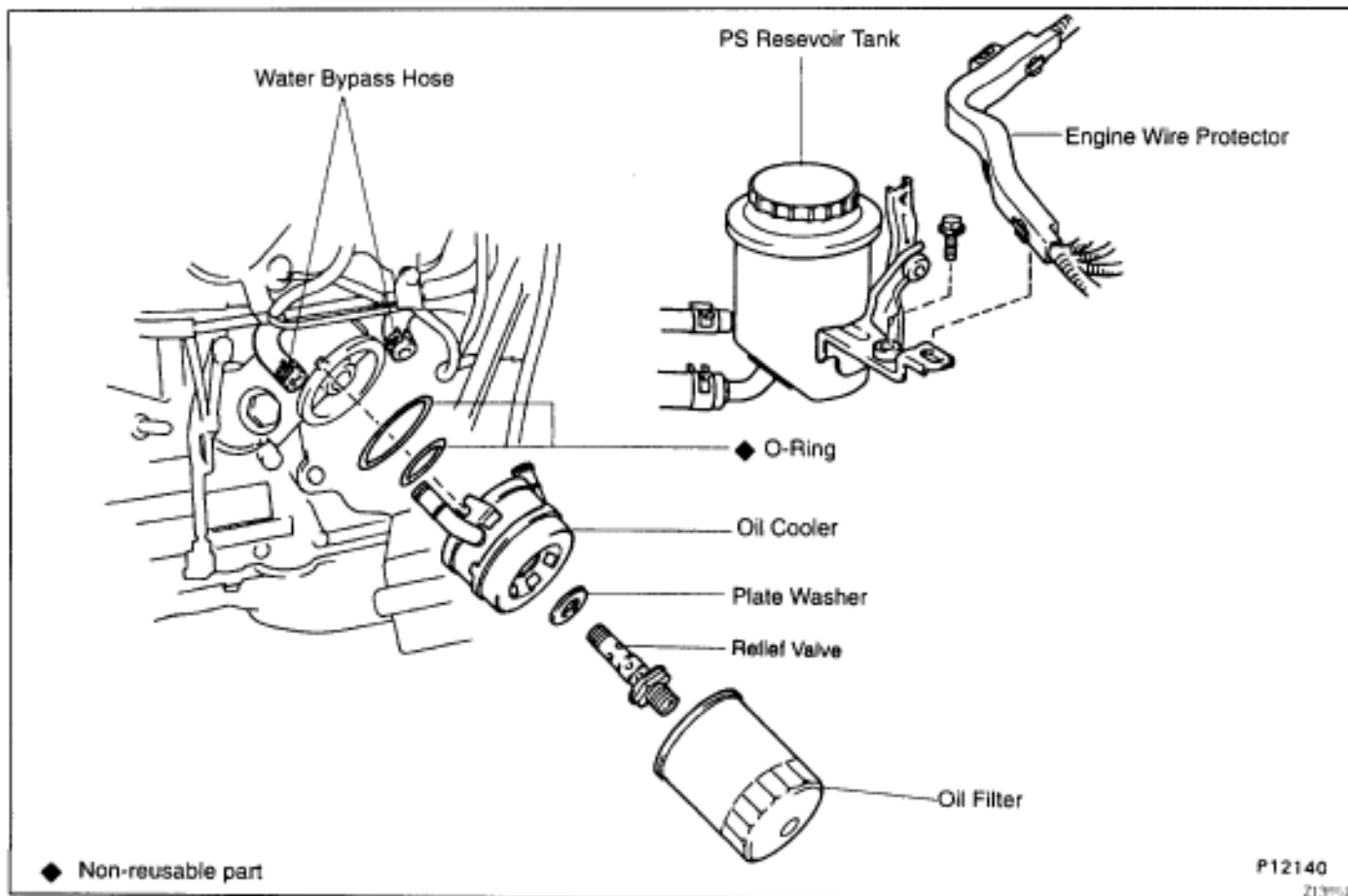
11. INSTALL IDLER PULLEY

(See step 2 in timing belt installation in Engine Mechanical)



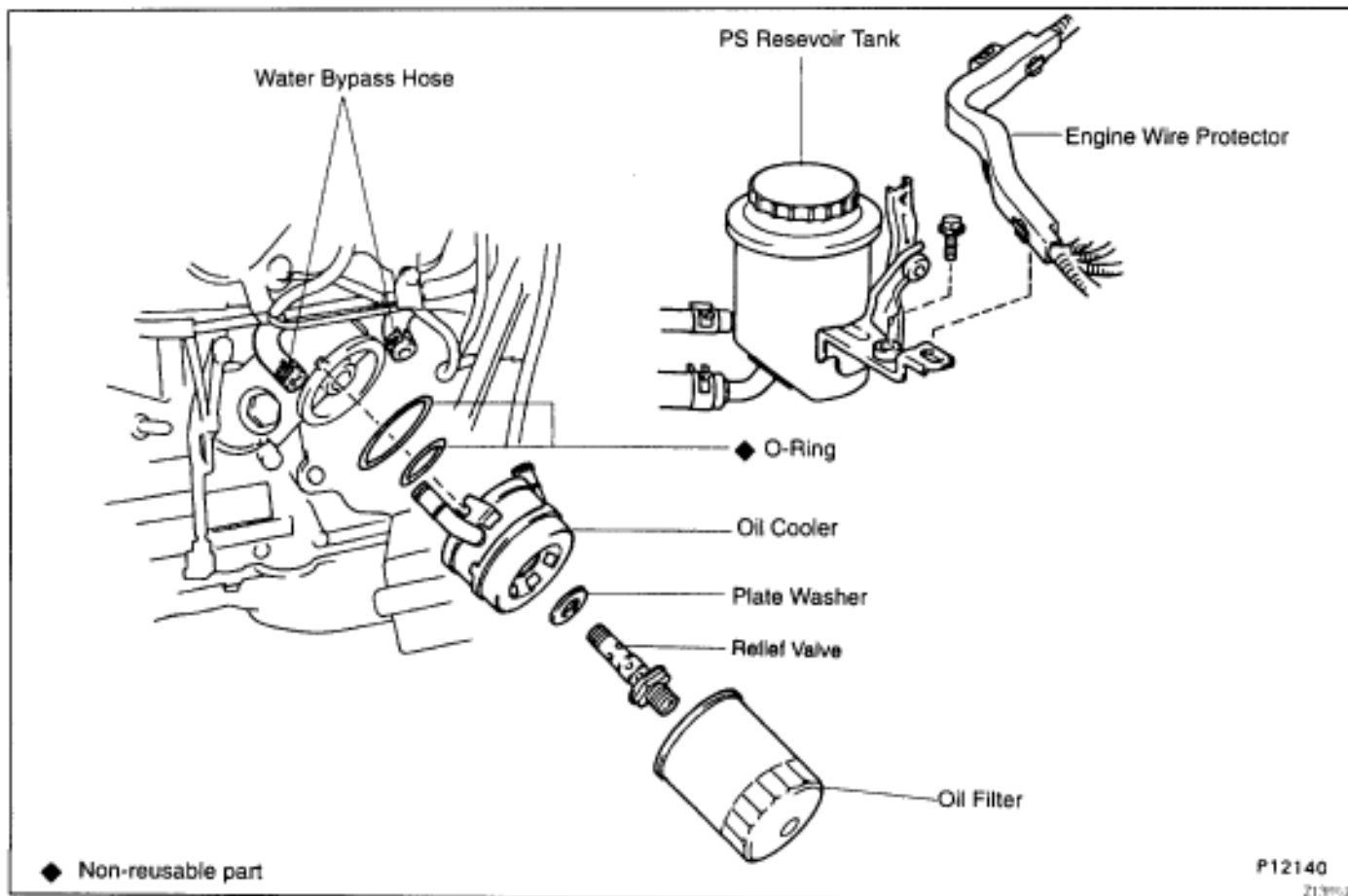
12. 2JZ-GTE M/T:
INSTALL DRIVE BELT TENSIONER BRACKET
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)
13. INSTALL TIMING BELT
(See step 3 in timing belt installation in Engine Mechanical)
14. 2JZ-GTE:
INSTALL CRANKSHAFT POSITION SENSOR
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
15. 2JZ-GTE:
INSTALL GENERATOR
16. REMOVE ENGINE STAND FROM ENGINE
17. ASSEMBLY ENGINE AND TRANSMISSION
(See components for engine removal & transmission separation and assembly)
18. INSTALL ENGINE WITH TRANSMISSION
(See components for engine removal and installation)

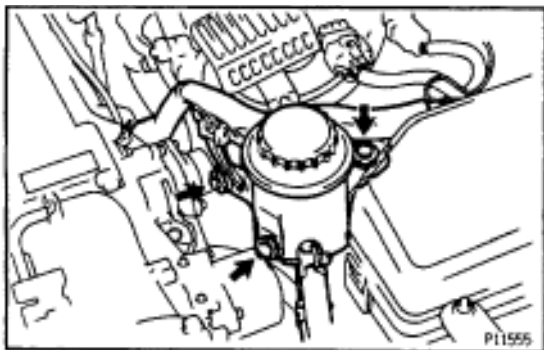
OIL COOLER (2JZ-GTE) COMPONENTS FOR REMOVAL AND INSTALLATION



12. 2JZ-GTE M/T:
INSTALL DRIVE BELT TENSIONER BRACKET
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)
13. INSTALL TIMING BELT
(See step 3 in timing belt installation in Engine Mechanical)
14. 2JZ-GTE:
INSTALL CRANKSHAFT POSITION SENSOR
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
15. 2JZ-GTE:
INSTALL GENERATOR
16. REMOVE ENGINE STAND FROM ENGINE
17. ASSEMBLY ENGINE AND TRANSMISSION
(See components for engine removal & transmission separation and assembly)
18. INSTALL ENGINE WITH TRANSMISSION
(See components for engine removal and installation)

OIL COOLER (2JZ-GTE) COMPONENTS FOR REMOVAL AND INSTALLATION





OIL COOLER REMOVAL

1. DISCONNECT PS RESERVOIR TANK WITHOUT DISCONNECTING HOSES

- (a) Disconnect the 2 clamps of the engine wire protector from the bracket.
- (b) Remove the 3 bolts and disconnect the reservoir tank.

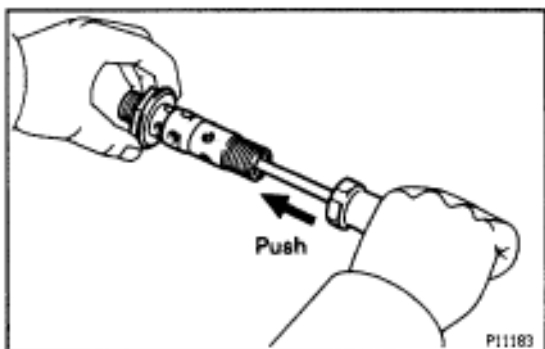
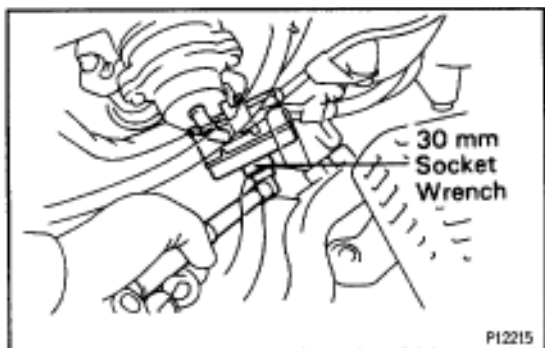
2. DRAIN ENGINE COOLANT

3. REMOVE OIL FILTER

4. DISCONNECT WATER BYPASS HOSES FROM OIL COOLER

5. REMOVE OIL COOLER

- (a) Remove the relief valve, plate washer and oil cooler.
- (b) Remove the 2 O-rings from the oil cooler.



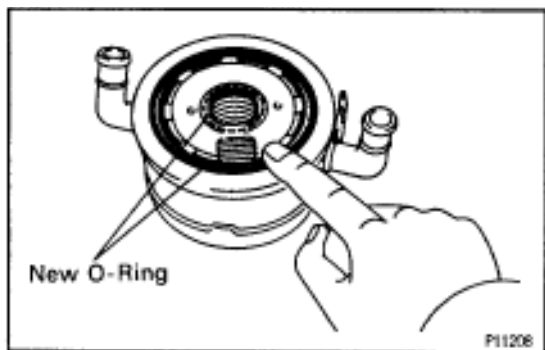
OIL COOLER INSPECTION

1. INSPECT RELIEF VALVE

Push the valve with a wooden stick to check if it is stuck. If stuck, replace the relief valve.

2. INSPECT OIL COOLER

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



OIL COOLER INSTALLATION

1. INSTALL OIL COOLER

- (a) Install 2 new O-rings to the oil cooler.
- (b) Apply a light coat of engine oil on the threads and under the head of the relief valve.
- (c) Temporarily install the oil cooler with the plate washer and relief valve.
- (d) Tighten the relief valve.

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

2. CONNECT WATER BYPASS HOSES TO OIL COOLER

3. CONNECT PS RESERVOIR TANK

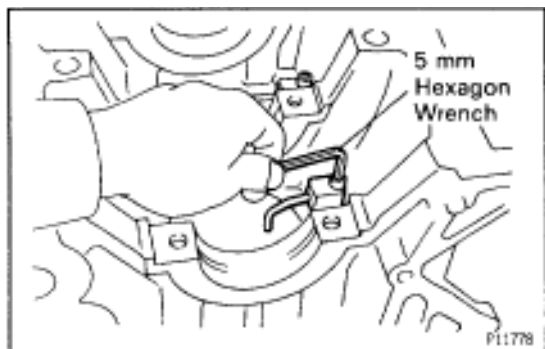
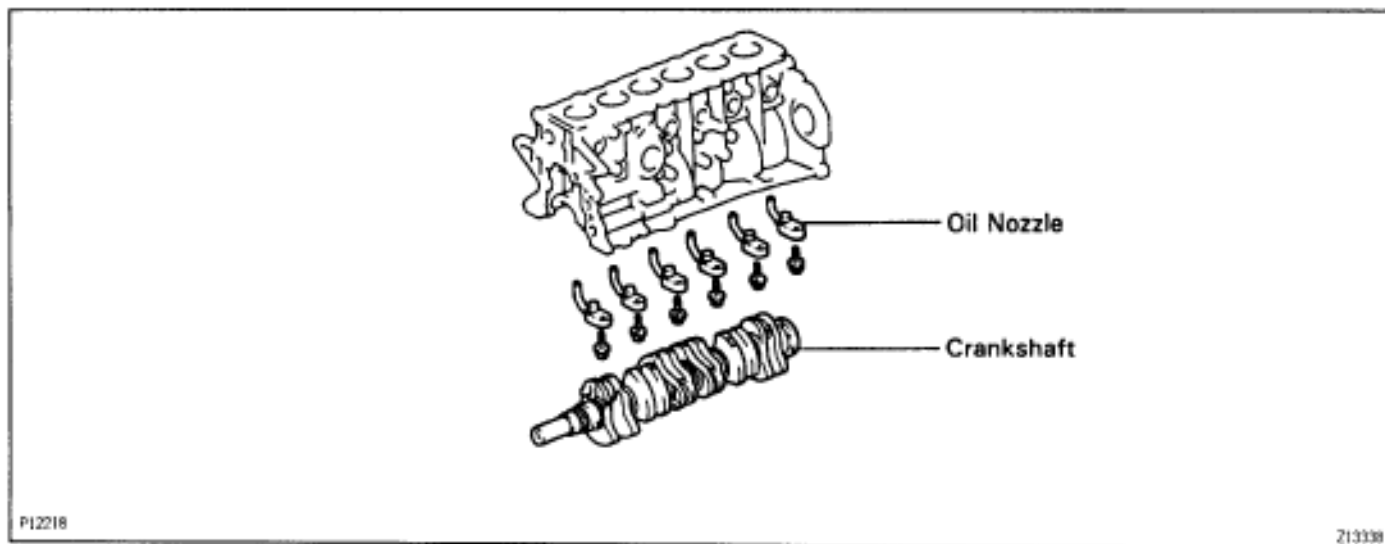
4. INSTALL OIL FILTER

5. FILL WITH ENGINE COOLANT

6. START ENGINE AND CHECK FOR LEAKS

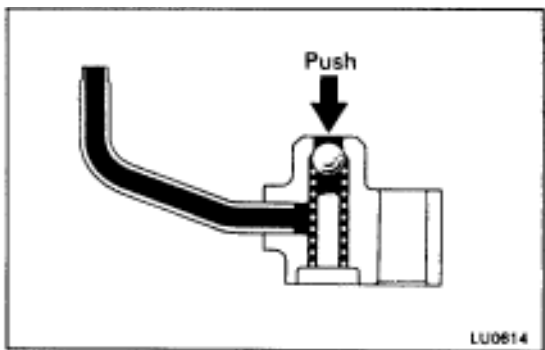
7. CHECK ENGINE OIL LEVEL

OIL NOZZLE (2JZ-GTE) COMPONENTS



OIL NOZZLES REMOVAL

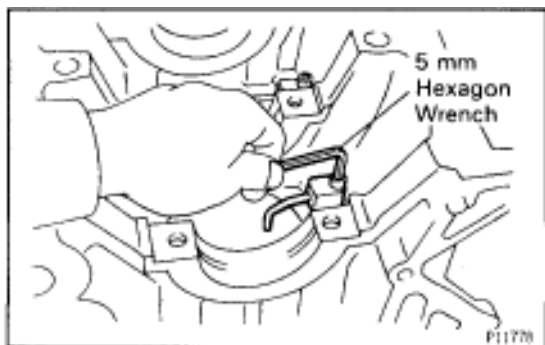
1. **REMOVE CRANKSHAFT**
(See step 6 in cylinder block disassembly in Engine Mechanical)
2. **REMOVE OIL NOZZLES (WITH RELIEF VALVES)**
Using a 5 mm hexagon wrench, remove the bolt and oil nozzle. Remove the 6 oil nozzles.



OIL NOZZLES INSPECTION

INSPECT RELIEF VALVES (OIL NOZZLES)

Push the valve with a wooden stick to check if it is stuck. If stuck, replace the relief valve.



OIL NOZZLES INSTALLATION

1. **INSTALL OIL NOZZLES (WITH RELIEF VALVES)**
Using a 5 mm hexagon wrench, install the oil nozzle with the bolt. Install the 6 oil nozzles.
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
2. **INSTALL CRANKSHAFT**
(See step 8 in cylinder block assembly in Engine Mechanical)

SERVICE SPECIFICATIONS

SERVICE DATA

Oil pressure	at idle speed at 3,000 rpm (2JZ-GE) or 4,000 rpm (2JZ-GTE)		49 kPa (0.5 kgf/cm ² , 7.1 psi) or more 324–579 kPa (3.3–5.9 kgf/cm ² , 49–84 psi)
Oil pump (2JZ-GE)	Tip clearance	STD	0.310–0.490 mm (0.0122–0.0193 in.)
		Maximum	0.53 mm (0.0209 in.)
	Body clearance	STD	0.100–0.175 mm (0.0039–0.0069 in.)
		Maximum	0.20 mm (0.0079 in.)
	Side clearance	STD	0.030–0.090 mm (0.0012–0.0035 in.)
		Maximum	0.12 mm (0.0047 in.)
Oil pump (2JZ-GTE)	Tip clearance	STD	0.056–0.326 mm (0.0022–0.0128 in.)
		Maximum	0.40 mm (0.0157 in.)
	Body clearance	STD	0.080–0.135 mm (0.0031–0.0053 in.)
		Maximum	0.16 mm (0.0063 in.)
	Side clearance	STD	0.020–0.065 mm (0.0007–0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)

TORQUE SPECIFICATIONS

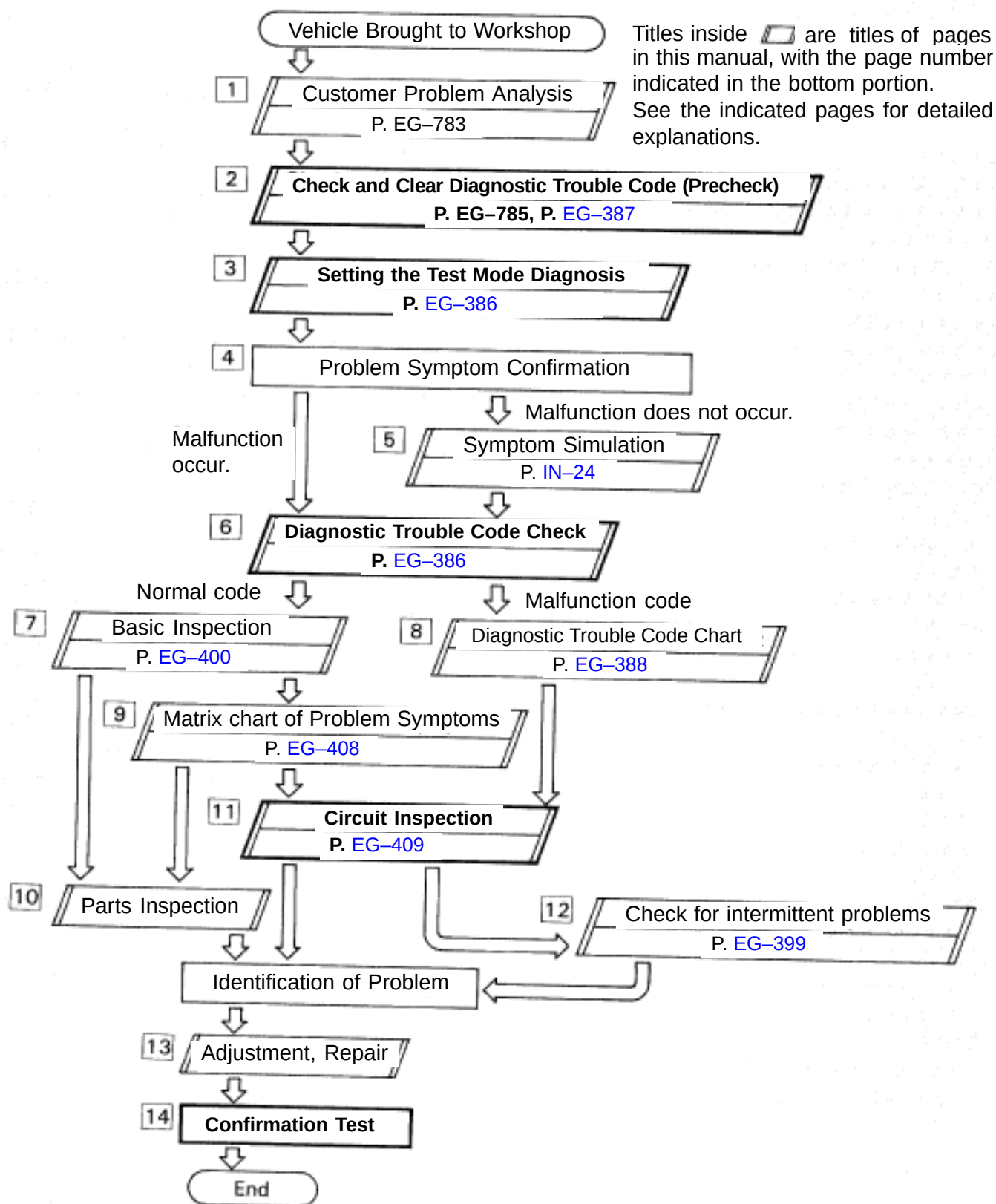
Part tightened	N·m	kgf·cm	ft·lbf
A/C compressor x Cylinder block	for stud bolt	26	19
	for bolt and nut	52	38
Oil pressure switch x Cylinder block	14	150	11
Drive belt tensioner damper x Tensioner arm (2JZ-GTE M/T)	20	200	14
Oil drain plug x No.2 oil pan	38	375	27
Oil pump body cover x Oil pump body	10	105	8
Plug x Oil pump body	2JZ-GE	49	36
	2JZ-GTE	29	22
Oil pump x Cylinder block	21	210	15
No.1 oil pan x Cylinder block	12 mm head	21	15
	14 mm head	39	29
Turbo oil outlet pipe x No.1 oil pan (2JZ-GTE)	27	280	20
Oil pan baffle plate x No.1 oil pan	8.8	90	78 in.·lbf
Oil strainer x No.1 oil pan	8.8	90	78 in.·lbf
No.2 oil pan x No.1 oil pan	8.8	90	78 in.·lbf
Oil level sensor x No.1 oil pan	5.4	55	48 in.·lbf
Drive belt tensioner bracket x Oil pump (2JZ-GTE)	27	280	20
Crankshaft position sensor x Oil pump (2JZ-GTE)	8.8	90	78 in.·lbf
Oil cooler x Oil filter bracket (2JZ-GTE)	78	800	58
Oil nozzle x Cylinder block (2JZ-GTE)	8.8	90	78 in.·lbf

-MEMO-

2JZ-GE ENGINE TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.



CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet

Inspector's
Name .

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In		Odometer Reading	km Miles

Date Problem Occurred		
Frequency Problem Occurs		☐ 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 ☐ Hill (☐ Up, ☐ Down) ☐ Rough road ☐ Other ()
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other ()
	Engine Operation	☐ Starting ☐ Just after starting ☐ Idling ☐ Racing without load ☐ Driving (☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other ()

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other ()
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal [☐ High ☐ Low (rpm)] ☐ Rough idling ☐ Other ()
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after fire) ☐ Surging ☐ Knocking ☐ Other ()
	☐ Engine Stall	☐ Engine stall soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ When N to D shift ☐ Other ()
	☐ Others	

Condition of Malfunction Indicator Lamp		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
Diagnostic Trouble Code Inspection	Normal Mode (Precheck)	☐ Normal code ☐ Malfunction code (code)
	Test Mode	☐ Normal code ☐ Malfunction code (code)



DIAGNOSIS SYSTEM

DESCRIPTION

The ECM contains a built-in self-diagnosis system by which troubles with the engine signal network are detected and a Malfunction Indicator Lamp on the instrument panel lights up.

By analyzing various signals as shown in a later table (See page [EG-388](#)) the Engine Control Module (ECM) detects system malfunctions relating to the sensors or actuators.

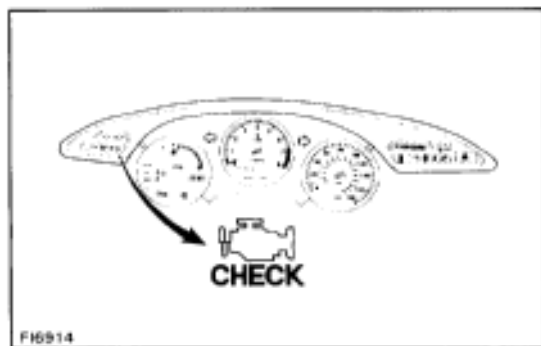
In the normal mode, the self-diagnosis system monitors 18 (California specification vehicles) or 17 (except for California and Canadian specification) items, indicated by code No. as shown in [EG-388](#). A malfunction indicator lamp informs the driver that a malfunction has been detected. The lamp goes off automatically when the malfunction has been repaired, but the diagnostic trouble code(s) remains stored in the ECM memory (except for code Nos. 16 and 53). The ECM stores the code(s) until it is cleared by removing the EFI No. 1 fuse with the ignition switch OFF.

The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when TE1 and E1 terminals on the data link connector 1 or 2 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.

In the test mode, 12 (California specification vehicles) or 11 (except for California and Canadian specification vehicles) items, indicated by code No. as shown in [EG-388](#) are monitored. If a malfunction is detected in any one of the systems indicated by code Nos. 13, 21, 22, 24, 25, 26, 27, 28, 35, 41, 71 and 78 (California specification vehicles) or 13, 21, 22, 24, 25, 28, 35, 41, 71 and 78 (except for California and Canadian specification vehicles) the ECM lights the malfunction indicator lamp to warn the technician that a malfunction has been detected. In this case, TE2 and E1 terminals on the data link connector 2 should be connected as shown later. (See page [EG-386](#)).

In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECM memory even when the ignition switch OFF (except code Nos. 43 and 51). This also applies in the normal mode. The diagnostic trouble mode (normal or test) and the output of the malfunction indicator lamp can be selected by connecting the TE1, TE2 and E1 terminals on the data link connector 2, as shown later.

A test mode function has been added to the functions of the self-diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self-diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page [EG-386](#))

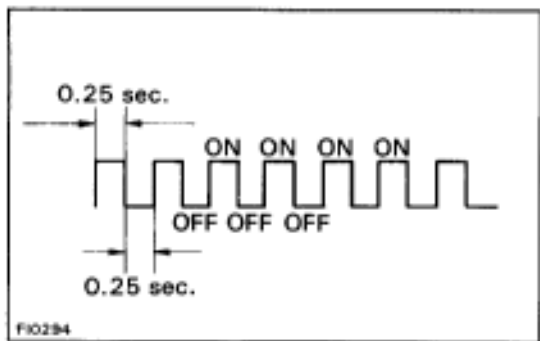
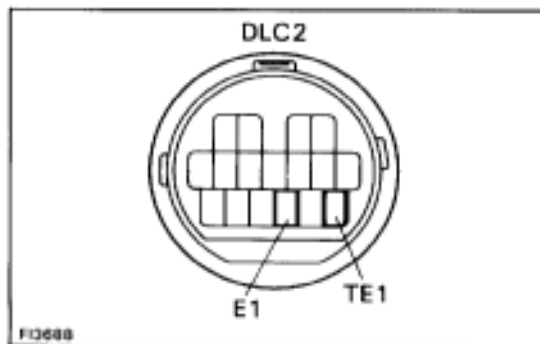
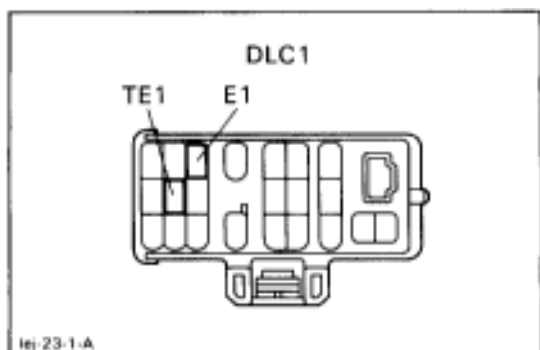


Diagnosis Inspection (Normal Mode) MALFUNCTION INDICATOR LAMP CHECK

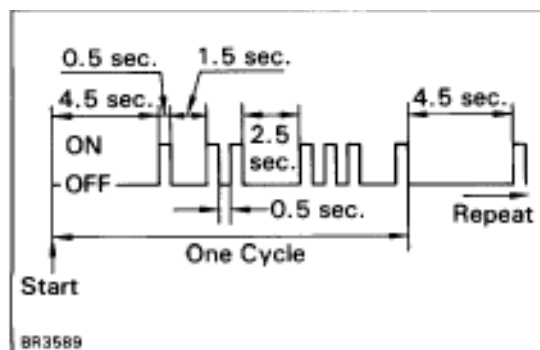
1. The Malfunction Indicator Lamp will come on when the ignition switch is turned ON and the engine is not running.
HINT: If the malfunction indicator lamp does not light up, proceed to troubleshooting of the telltale light RH (See page [BE-48](#)).
2. When the engine is started, the malfunction indicator lamp should go off.
If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODE CHECK

1. Turn ignition switch ON.
2. Using SST, connect terminals between TE1 and E1 of data link connector 1 or 2.
SST 09843-18020



3. Read the diagnostic trouble code from malfunction indicator lamp.
HINT: If a diagnostic trouble code is not output, check the TE1 terminal circuit (See page [EG-484](#)).



4. As an example, the blinking patterns for codes; normal, 12 and 31 are as shown on the illustration.
4. Check the details of the malfunction using the diagnostic trouble code table on page [EG-388](#).
5. After completing the check, disconnect terminals TE1 and E1, and turn off the display.
HINT: In the event of 2 or more malfunction codes, indication will begin from the smaller numbered code and continue in order to the larger.

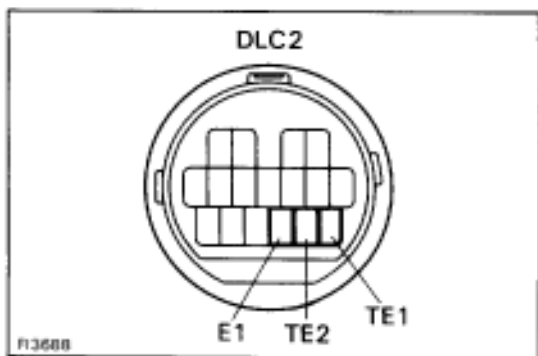
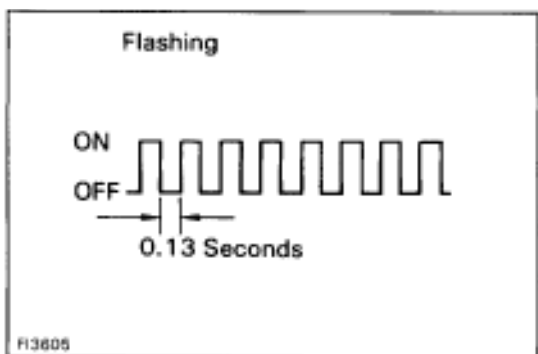
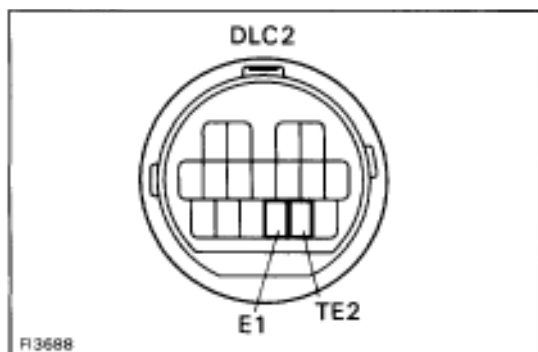
Diagnosis Inspection (Test Mode)

Compared to the normal mode, the test mode has an increased sensing ability to detect malfunctions.

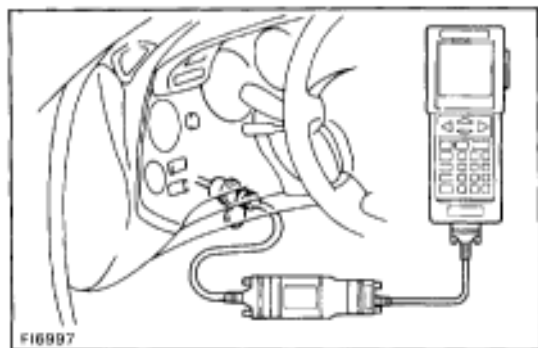
It can also detect malfunctions in the starter signal circuit, the IDL contact signal of the throttle position sensor, air conditioning signal and park/neutral position switch signal.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

DIAGNOSTIC TROUBLE CODE CHECK



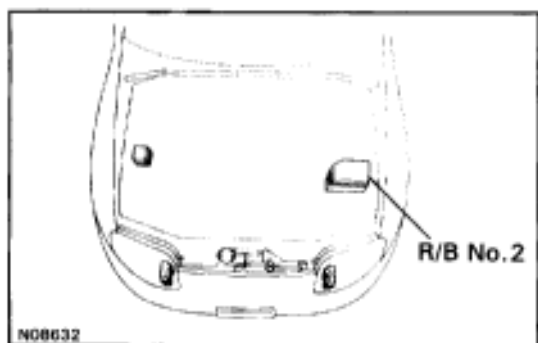
1. Initial conditions.
 - (a) Battery voltage 11 V or more
 - (b) Throttle valve fully closed
 - (c) Transmission in neutral position
 - (d) Air conditioning switched OFF
2. Turn ignition switch OFF
3. Using SST, connect terminals TE2 and E1 of the data link connector 2.
SST 09843-18020
4. Turn ignition switch ON.
HINT:
 - To confirm that the test mode is operating, check that the malfunction indicator lamp flashes when the ignition switch is turned to ON.
 - If the malfunction indicator lamp does not flash, proceed to troubleshooting of the TE2 terminal circuit on page [EG-484](#).
5. Start the engine.
6. Simulate the conditions of the malfunction described by the customer.
7. After the road test, using SST, connect terminals TE1 and E1 of the data link connector 2.
SST 09843-18020
8. Read the diagnostic trouble code on malfunction indicator lamp on the telltale light RH (See page [EG-385](#)).
9. After completing the check, disconnect terminals TE1, TE2 and E1, and turn off the display.
HINT:
 - The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned ON.
 - When the engine is not cranked, diagnostic trouble codes "43" (Starter signal) output, but this is not abnormal.
 - When the automatic transmission shift lever is in the "D", "2", "L" or "R" shift position, or when the air conditioning is on or when the accelerator pedal is depressed, code "51" (Switch condition signal) is output, but this is not abnormal.



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND-HELD TESTER

1. Hook up the TOYOTA hand-held tester to the DLC2.
2. Read the diagnostic trouble codes by following the prompts on the tester screen.

Please refer to the TOYOTA hand-held tester operation's manual for further details.



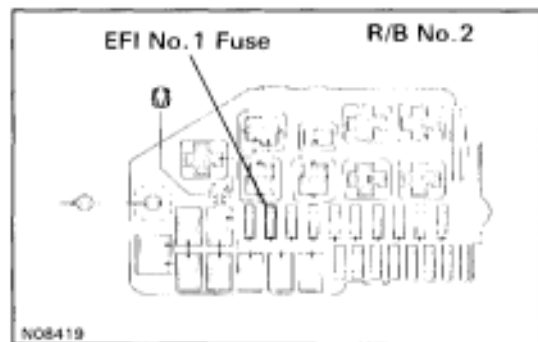
DIAGNOSTIC TROUBLE CODE CLEARANCE

1. After repair of the trouble areas, the diagnostic trouble code retained in the ECM memory must be cleared out by removing the EFI No.1 fuse (30A) from R/B No.2 for 10 seconds or more, with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the negative (-) terminal cable from the battery, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If it is necessary to work on engine components requiring removal of the negative (-) terminal cable from the battery, a check must first be made to see if a diagnostic trouble code has been recorded.

2. After cancellation, road test the vehicle to check that a normal code is now read on the malfunction indicator lamp. If the same diagnostic trouble code appears, it indicates that the trouble area has not been repaired thoroughly.

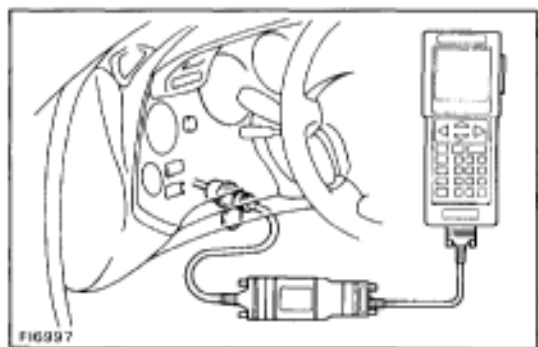


ECM DATA MONITOR USING TOYOTA HAND-HELD TESTER

1. Hook up the TOYOTA hand-held tester to the DLC2.
2. Monitor the ECM data by following the prompts on the tester screen.

HINT: TOYOTA hand-held tester has a "Snapshot" function which records the monitored data.

Please refer to TOYOTA hand-held tester operator's manual for further details.

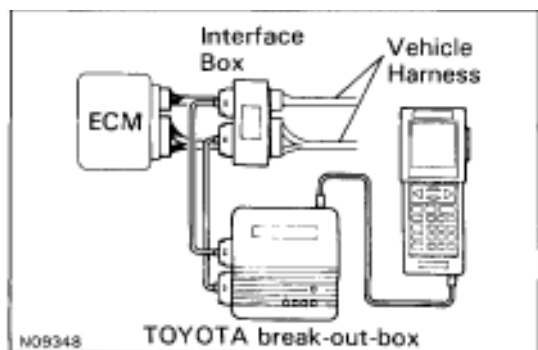


ECM TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK-OUT-BOX AND TOYOTA HAND-HELD TESTER

1. Hook up the TOYOTA break-out-box and TOYOTA handheld tester to the vehicle.
2. Read the ECM input/output values by following the prompts on the tester screen.

HINT: TOYOTA hand-held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.

Please refer to TOYOTA hand-held tester/TOYOTA break-out box operator's manual for further details.



DIAGNOSTIC TROUBLE CODE CHART

HINT: Parameters listed in the chart may not be exactly the same as your reading due to type of the instruments or other factors.

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
—	 BE3931	Normal	No code is recorded.
12	 BE3931	G, NE Signal (No.1)	No NE or G1 and G2 signal to ECM for 2 sec. or more after cranking
			Open in "G ⊕" circuit
13	 BE3931	G, NE Signal (No.2)	No NE signal to ECM for 0.1 sec. or more at 1,000 rpm or more
			NE signal does not pulse 12 times to ECM during the interval between G1 and G2 pulses
14	 BE3931	Ignition Signal	No IGF signal to ECM for 6 consecutive IGT signals
16	 BE3931	A/T Control Signal	Fault in communications between the engine CPU and A/T CPU in the ECM
21	 BE3932	(Main heated * ³) Oxygen Sensor Signal (Fr)	(1)* ³ Open or short in heater circuit of main heated oxygen sensor (Fr) for 0.5 sec. or more
			(2) (Main heated* ³) oxygen sensor (Fr) signal voltage is reduced to between 0.35 V and 0.70 V for 90 sec. under conditions (a) ~ (d): (2 trip detection logic)* ⁴ (a) Engine coolant temp.: Between 80°C (176°F) and 95°C (203°F) (b) Engine speed: 1,500 rpm or more (c) Load driving (example A/T in in Overdrive, (5th for M/T), A/C ON, Flat road, 80 km/H (50 mph)) (d) (Main heated* ³) oxygen sensor (Fr) signal voltage: Alternating above and below 0.45 V

*3, 4: See page [EG-396](#), 397.

If a malfunction code is displayed during the diagnostic trouble code check in test mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
_____	—	—	—	—
Open or short in NE, G circuit Distributor Open or short in STA circuit ECM	ON	N.A.	○	EG-409
Open or short in NE circuit Distributor ECM	ON	N.A.	○	EG-412
Open or short in NE circuit Distributor ECM	N.A.	ON		
Open or short in IGT or IGT circuit from igniter to ECM Igniter ECM	ON	N.A.	○	EG-413
ECM	ON	N.A.	×	EG-418
Open or short in heater circuit of main heated oxygen sensor (Fr) Main heated oxygen sensor (Fr) heater ECM	ON	N.A.	○	EG-419
(Main heated*3) oxygen sensor (Fr) circuit (Main heated*3) oxygen sensor (Fr)	ON	ON		

*1, 2, 3: See page [EG-396](#)

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
22	 BE3932	Engine Coolant Temp. Sensor Circuit	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more
24	 BE3932	Intake Air Temp. Sensor Signal	Open or short in intake air temp. sensor circuit for 0.5 sec. or more
25	 BE3932	Air-Fuel Ratio Lean Malfunction	(1) (Main heated^{*3}) oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b): (2 trip detection logic)^{*4} (a) Engine speed: 1,500 rpm or more (b) Engine coolant temp.: 70°C (158°F) or more (2)^{*3} Difference of air-fuel ratio feedback compensation value between front (no.1 ~ 3 cylinders) and rear (No.4 ~ 6 cylinders) is more than 15 percentage for 20 sec. or more under conditions (a) and (b): (2 trip detection logic)^{*4} (a) Engine speed: 2,000 rpm or more (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F) (3)^{*3} Engine speed varies by more than 15 rpm over the preceding crank angle period during a period of 20 sec. or more under conditions (a) and (b): (2 trip detection logic)^{*4} (a) Engine speed: Idling (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F)

*3, 4: See page [EG-396](#) 397.

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
Open or short in engine coolant temp. sensor circuit Engine coolant temp. sensor ECM	ON	ON	○	EG-424
Open or short in intake air temp. sensor circuit Intake air temp. sensor ECM	ON	ON	○	EG-426
Open or short in (main heated*3) oxygen sensor circuit (Main heated*3) oxygen sensor Ignition system ECM	ON	ON	○	EG-428
Open or short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Volume air flow meter (air intake) ECM				
Open or short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Volume air flow meter (air intake) ECM				

*1, 2, 3: See page [EG-396](#).

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
26		Air-Fuel Ratio Rich Malfunction	(1) Difference of air-fuel ratio feedback compensation value between front (No.1 ~ 3 cylinders) and rear (No.4 ~ 6 cylinders) is more than 15 percentage for 20 sec. or more under conditions(a) and (b): (2 trip detection logic)*4 (a) Engine speed: 2,000 rpm or more (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F)
			(2) Engine speed varies by more than 15 rpm over the preceding crank angle period during a period of 20 sec. or more under conditions (a) and (b): (2 trip detection logic)*4 (a) Engine speed: 2,000 rpm or more (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F)
27*3		Sub Heated Oxygen Sensor Signal	(1) Open or short in heater circuit of sub heated oxygen sensor for 0.5 sec. or more
			(2) Main heated oxygen sensor signal is 0.45 V or more and sub oxygen sensor signal is 0.45 V or less under conditions (a) ~ (c): (2 trip detection logic)*4 (a) Engine coolant temp.: 80°C (176°F) or more (b) Engine speed: 1,500 rpm or more (c) Accel. pedal: Fully depressed for 2 sec. or more
28		(Main heated*3) Oxygen Sensor Signal (Rr)	(1)*3 Open or short in heater circuit of main heated oxygen sensor (Rr) for 0.5 sec. or more
			(2) (Main heated*3) oxygen sensor (Rr) signal voltage is reduced to between 0.35 V and 0.70 V for 90 sec. under conditions (a) ~ (d) (2 trip detection logic)*4 (b) Engine coolant temp.: Between 80°C (176°F) and 95°C (203°F) (b) Engine speed: 1,500 rpm or more. (c) Load driving (Example A/T in Overdrive (5th for M/T), A/C ON, Flat road, 80 km/h (50 mph)) (d) (Main heated*3) oxygen sensor (Rr) signal voltage: Alternating above and below 0.45 V

*3, 4: See page EG-396, 397

Trouble Area	Malfunction Indicator Lamp* ¹		Memory* ²	See page
	Normal Mode	Test Mode		
Open or short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Volume air flow meter (air intake) ECM	ON	ON	○	EG–428
Open or short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Volume air flow meter (air intake) ECM				
Open or short in heater circuit of sub heated oxygen sensor Sub heated oxygen sensor ECM	ON	N.A.	○	EG–434
Open or short in sub heated oxygen sensor circuit Sub heated oxygen sensor ECM	ON	ON		
Open or short in heater circuit of main heated oxygen sensor (Rr) Main heated oxygen sensor (Rr) heater ECM	ON	N.A.	○	EG–419
(Main heated* ³) oxygen sensor (Rr) circuit (Main heated* ³) oxygen sensor (Rr)	ON	ON		

*1, 2, 3: See page [EG–396](#).

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
31	 BE3933	Volume Air Flow Meter Signal	All conditions below are detected: (a) No volume air flow meter signal to ECM for 2 sec. when engine speed is above 300 rpm (b) Engine stall
35	 BE3933	Barometric Pressure Sensor Signal	Open or short in BARO sensor circuit for 0.5 sec. or more
41	 BE3934	Throttle Position Sensor Signal	Open or short in throttle position sensor circuit for 0.5 sec. or more
42	 BE3934	No.1 Vehicle Speed Sensor Signal (for A/T)	All conditions below are detected continuously for 8 sec. or more: (a) No.1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: 3,000 rpm or more (c) Park/neutral position switch: OFF (d) Stop Light switch: OFF
		No.1 Vehicle Speed Sensor Signal (for A/T)	All conditions below are detected continuously for 8 sec. or more: (a) No.1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: 2,000 rpm and 5,000 rpm (c) Engine coolant temp.: 80°C (176°F) or more (d) Load driving
43	 BE3934	Starter Signal	No starter signal to ECM
52	 BE3935	Knock Sensor Signal (front side)	No. No.1 knock sensor signal to ECM for 4 crank revolutions with engine speed between 1,600 rpm and 5,200 rpm
53	 BE3935	Knock Control Signal	Engine control computer (for knock control) malfunction at engine speed between 650 rpm and 5,200 rpm
55	 BE3935	Knock Sensor Signal (rear side)	No No.2 knock sensor signal to ECM for 4 crank revolutions with engine speed between 1,600 rpm and 5,200 rpm

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
Open or short in volume air flow meter circuit Volume air flow meter ECM	ON	N.A.	○	EG–438
ECM	ON	ON	○	EG–441
Open or short in throttle position sensor circuit Throttle position sensor ECM	ON	ON	○	EG–442
No.1 vehicle speed sensor Telltale light RH Open or short in No.1 vehicle speed sensor circuit ECM	OFF	OFF	○	EG–445
Open or short in starter signal circuit Open or short in ignition switch or starter relay circuit ECM	N.A.	OFF	X	EG–448
Open or short in No.1 knock sensor circuit No.1 knock sensor (looseness) ECM	ON	N.A.	○	EG–450
ECM	ON	N.A.	X	EG–450
Open or short in No.2 knock sensor circuit No.2 knock sensor (looseness) ECM	ON	N.A.	○	EG–450

*1, 2: See page [EG–396](#).

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
71	 BE3937	EGR System Malfunction	EGR gas temp. is 70°C (158°F) or less for 1 — 4 min. under conditions (a) and (b): (2 trip detection logic)*4 (a) Engine Coolant temp.: 63°C (145°F) or more (b) EGR operation possible (Example A/T in 3rd speed (5th for M/T), A/C ON, 96 km/h (60 mph), Flat road)
78	 BE3937	Fuel Pump Control Signal	(1) Open or short in fuel pump circuit for 1 sec. or more with engine speed 1,000 rpm or less (2 trip detection logic)*4 (2) Open in input circuit of fuel pump ECU (FPC) with engine speed 1,000 rpm or less (2 trip detection logic)*4 (3) Open or short in diagnostic signal line (DI) of fuel pump ECU with engine speed 1,000 rpm or less (2 trip detection logic)*4
51	 BE3935	Switch Condition Signal	(1) 3 sec. or more after engine starts, with closed throttle position switch OFF (IDL1) (2) Park/neutral position switch: OFF (Shift position in "R", "D", "2", or "L" position) (3) A/C switch ON

*1: "ON" displayed in the diagnostic mode column indicates that the Malfunction Indicator Lamp is lit up when a malfunction is detected. "OFF" indicates that the "CHECK" does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

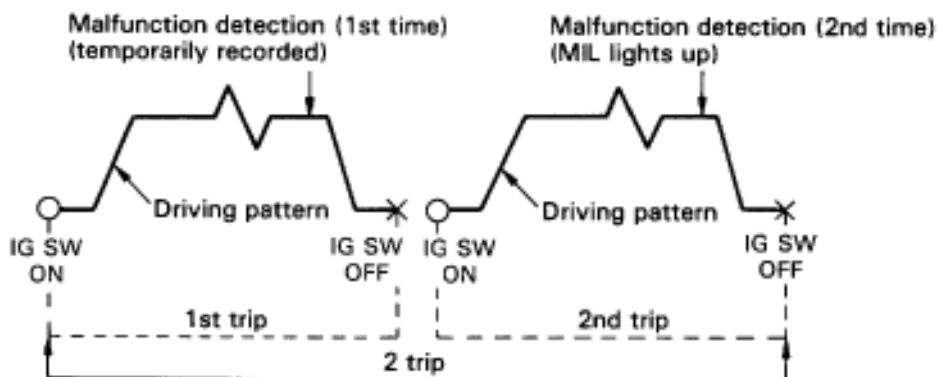
*2: "○" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "x" indicates that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is done with the IG switch ON.

*3: Only for California specification vehicles.

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
Open in EGR gas temp. sensor circuit Short in VSV circuit for EGR EGR hose disconnected, valve stuck Clogged EGR gas passage ECM	ON	ON	○	EG-453
Open or short in fuel pump ECU circuit Fuel pump ECU Fuel pump ECM power source circuit ECM	OFF	ON	○	EG-457
A/C switch circuit Throttle position sensor IDL circuit Park/neutral position switch circuit Accelerator pedal and cable ECM	N.A.	OFF	X	EG-460

*4: This indicates items for which "2 trip detection logic" is used. With this logic, when a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the Malfunction Indicator Lamp to light up. The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip).

In the Test Mode, the Malfunction Indicator Lamp lights up the 1st trip a malfunction is detected.



FAIL-SAFE CHART

If any of the following codes is detected, the ECM enters fail-safe mode.

DTC No.	Fail-Safe Operation	Fail-Safe Deactivation Conditions
14	Fuel cut	1 IGF detected in 3 consecutive ignitions
16	Torque control prohibited	Returned to normal condition
22	THW is fixed at 80°C (176°F)	Returned to normal condition
24	THA is fixed at 20°C (68°F)	Returned to normal condition
31	Ignition timing fixed at 10° BTDC Injection time fixed: (Starting....9 msec. (IDL ON....3.6 msec. (IDL OFF....6.7 msec.	KS input 15 times/sec. or more
35	Atmospheric pressure is fixed at 101.3 kPa (760 mmHg, 29.92 in.Hg)	Returned to normal condition
41	VTA1 is fixed at 0°	The following must each be repeated at least 2 Times consecutively: 0.25 V ⊕ VTA ⊕ 0.95 V IDL: ON
52	Max. timing retardation	IG switch OFF
53	Max. timing retardation	Returned to normal condition
55	Max. timing retardation	IG switch OFF

Back-Up Function

If there is trouble with the program in the ECM and the ignition signals (IGT) are not output 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 throttle position signal (IDL). Also, the ignition timing is fixed at the initial ignition timing, 10° BTDC, without relation to the engine speed.

HINT: if the engine is controlled by the back-up function, the malfunction indicator lamp lights up to warn the driver of the malfunction but the diagnostic trouble code is not output.

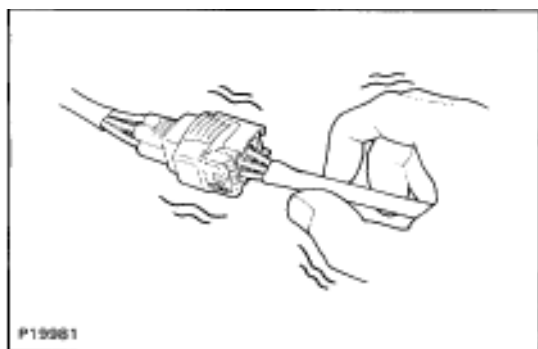
CHECK FOR INTERMITTENT PROBLEMS

As described in the preceding paragraph, abnormality detection ability in the test mode is increased compared to that in the normal mode, so that when intermittent problems occur in the ECM signal circuits (G1, G2, NE, THW, THA, VTA1) shown in the table below, the appropriate diagnostic trouble code is output.

Accordingly, when the diagnostic trouble codes shown in the table opposite (13, 22, 24, 41) are output during the diagnostic trouble code check, and inspection of the appropriate circuits reveals no abnormality, check for intermittent problems as described below.

By checking for intermittent problems, the place where intermittent problems are occurring due to poor contacts can be isolated.

DTC	Circuit
13	G, NE signal circuit (No.2)
22	Engine coolant temp. sensor circuit
24	Intake air temp. sensor circuit
41	Throttle position sensor circuit

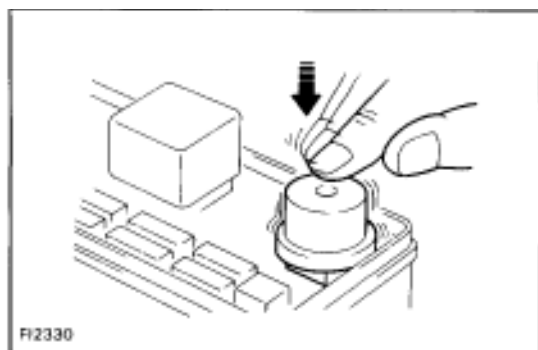


CLEAR DIAGNOSTIC TROUBLE CODES

See page [EG-387](#).

SET TEST MODE

1. With the ignition switch OFF, using SST, connect the terminals TE2 and E1 of the data link connector 2.
SST 09843-18020
2. Start the engine and check to see the malfunction indicator lamp goes off.



PERFORM A SIMULATION TEST

Using the symptom simulation (See page [IN-24](#)), apply vibration to and pull lightly on the wire harness, connector or terminals in the circuit indicated by the malfunction code.

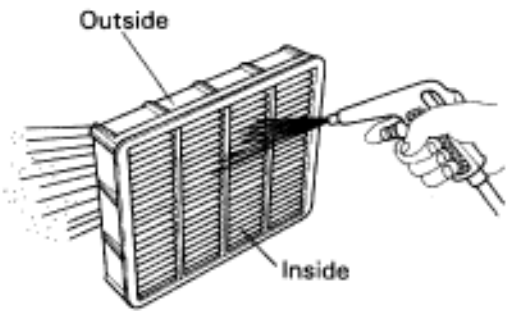
In this test, if the malfunction indicator lamp lights up, it indicates that the place where the wire harness, connector or terminals being pulled or vibrated has a faulty contact. Check that point for loose connections, dirt on the terminals, poor fit or other problems and repair as necessary.

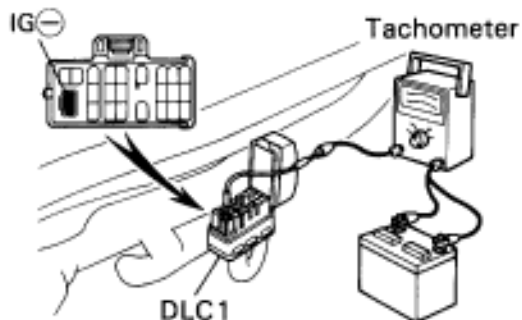
HINT: After cancelling out the diagnostic trouble code in memory and set the test mode, if the malfunction indicator lamp does not go off after the engine is started, check thoroughly for faulty contacts, etc., then try the check again. If the malfunction indicator lamp still does not go off, check and replace ECM.

BASIC INSPECTION

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.

If there is a problem, and a normal code is displayed, proceed to the matrix chart of problem symptoms on page [EG-408](#). Make sure that every likely cause of the problem is checked.

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 matrix chart of problem symptoms on page EG-408 .
3	Does engine start?
YES	NO Go to step 7 .
4	Check air filter.
 MA0688	P Remove air filter. C Visually check that the air filter is not excessive dirty or oily. Hint If necessary, clean the air filter with compressed air. First blow from inside thoroughly, then blow from outside of the air filter.
OK	NG Repair or replace.

5**Check idle speed.**

P11291

P

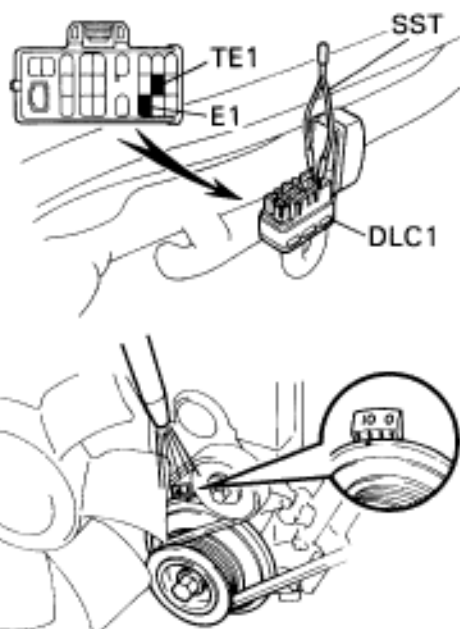
- (1) Shift transmission into "N" position.
- (2) Warm up engine to normal operating temperature.
- (3) Switch OFF all accessories.
- (4) Switch OFF air conditioning.
- (5) Connect tachometer test probe to terminal IG $\pm$ of data link connector 1.

C

Check idle speed.

OKIdle speed: 700×50 rpm**Caution**

- NEVER allow tachometer test probe to touch ground as it could result in damage to igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm compatibility of your unit before use.

OK**NG**Proceed to matrix chart of problem symptoms on page [EG-408](#).**6****Check ignition timing.**P11288
P02630**P**

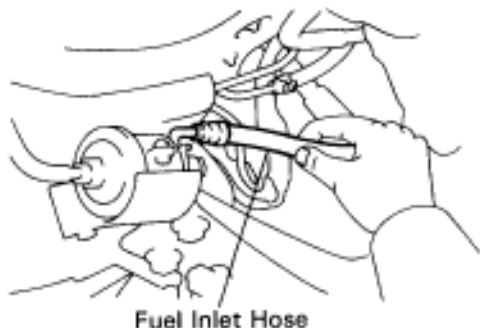
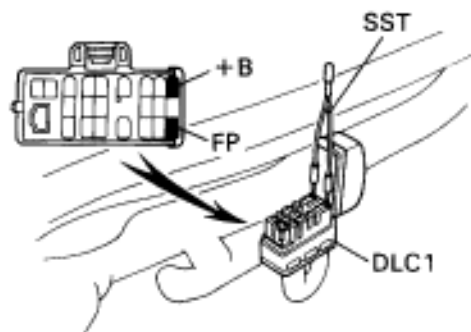
- (1) Shift transmission into "N" position.
 - (2) Warm up engine to normal operating temperature.
 - (3) Keep the engine speed at idle.
 - (4) Using SST, connect terminals TE1 and E1 of data link connector 1.
- SST 09843-18020
- (5) Connect a timing light probe to No.1 high-tension cord.

C

Check ignition timing.

OKIgnition timing: $10 \times 2^\circ$ BTDC @ idle**OK****NG**Proceed to page [EG-18](#) and continue to troubleshoot.

Proceed to matrix chart of problem symptoms on page [EG-408](#).

7**Check fuel pressure.**

A80119
P11290
P11446

P

- (1) Be sure that there is enough fuel in the tank.
 - (2) Turn ignition switch ON.
 - (3) Using SST, connect terminals FP and +B of data link connector 1.
- SST 09834-18020

C

Check that there is pressure in the hose from the fuel filter.

Hint

If there is fuel pressure, you will hear the sound of fuel flowing.

Caution

Never make a mistake with the terminal connection position as this will cause a malfunction.

OK**NG**

Proceed to page [EG-193](#) and continue to troubleshoot.

8**Check for spark.****C**

Disconnect the high-tension cord from the distributor and hold the end about 12.5 mm (1/2") from the ground. See if spark occurs while the engine is being cranked.

Hint

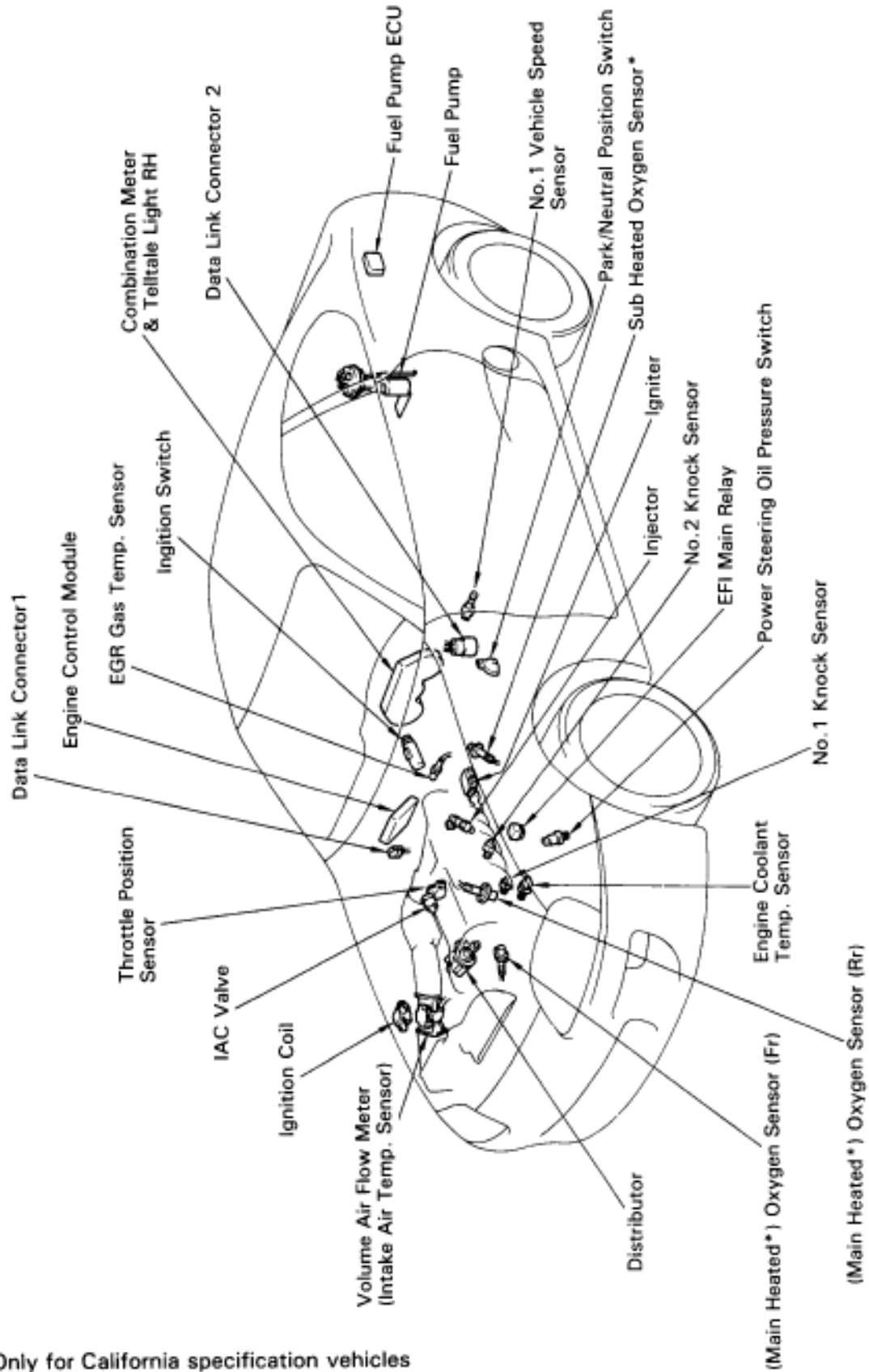
To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 1 — 2 seconds at a time.

OK**NG**

Proceed to page [IG-4](#) and continue to troubleshoot.

Proceed to matrix chart of problem symptoms on page [EG-408](#).

PARTS LOCATION



F16968

*: Only for California specification vehicles

STANDARD VALUE OF ECM TERMINALS

Connectors of the engine control module are waterproof and are the bolt type.

For waterproof type connectors, in order to measure the voltage of ECM terminals and the resistance of connected parts, connect the inspection sub wire harness between the ECM and vehicle wire harness, then do the inspection.

The inspection method of inserting a tester probe from the other side of connector significantly reduces the waterproof performance.

Disconnect the connector by fully loosening the bolt.

PREPARATION

1. Turn the ignition switch OFF.
2. Turn up the passenger side floor carpet.
(See page [EG-253](#))
3. Remove the ECM protector.
4. Disconnect the connector from the ECM.

After completely loosening the bolt, the 2 parts of the connector can be separated.

NOTICE:

- Do not pull the wire harness when disconnecting the connector.
- When disconnecting the connector, the ECM's back-up power source is cut off, so the malfunction codes, etc. recorded in the ECM memory are cancelled.
- Never insert a tester probe or male terminal used for inspection purposes into the female terminal of the vehicle wire harness. Otherwise, the female terminal may be widened, which can result in faulty connection.

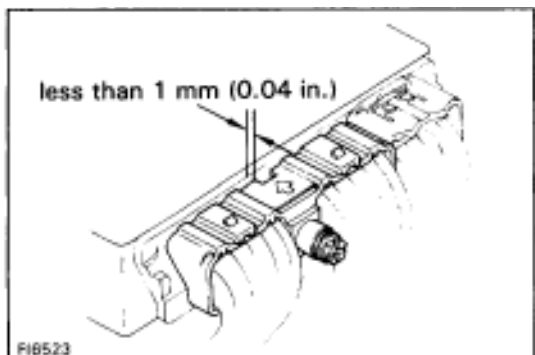
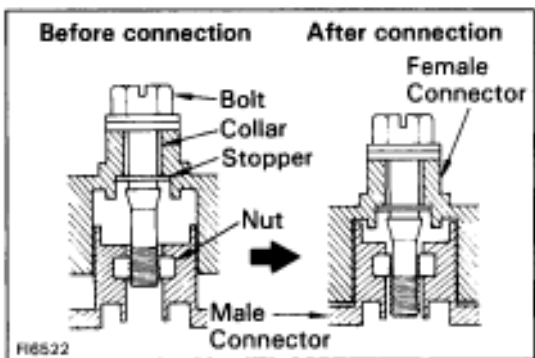
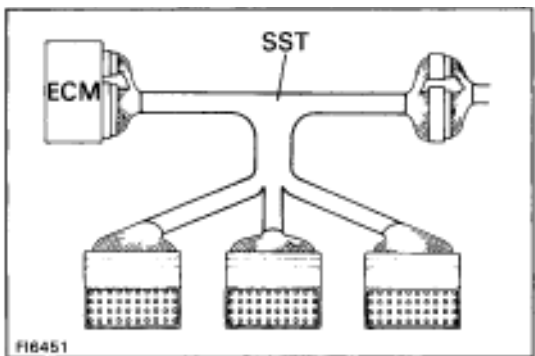
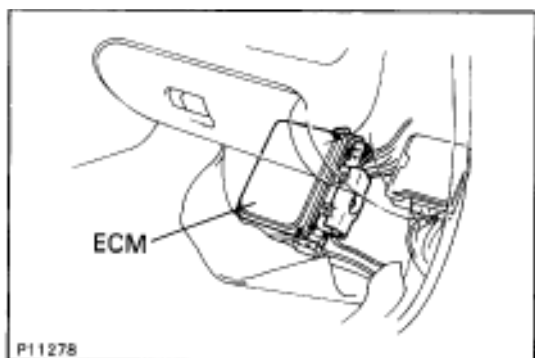
5. Connect SST (check harness "A") between the ECM and connector of the vehicle wire harness.

SST 09990-01000

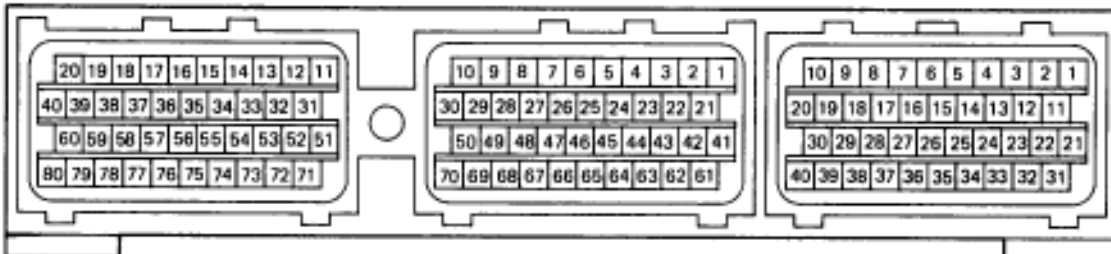
HINT: The arrangement of the check connector terminals are the same as those of the ECM.

See page [EG-405](#).

6. Disconnect the SST.
SST 09990-01000
7. Reconnect the connector to the ECM.
 - (a) Match the male connector correctly with the female connector, then press them together.
 - (b) Tighten the bolt.
Make sure the connector is completely connected by tightening the bolt until there is a clearance of less than 1 mm (0.04 in.) between the bottom of the male connector and the end of the female connector.
8. Install the ECM protector and floor carpet.



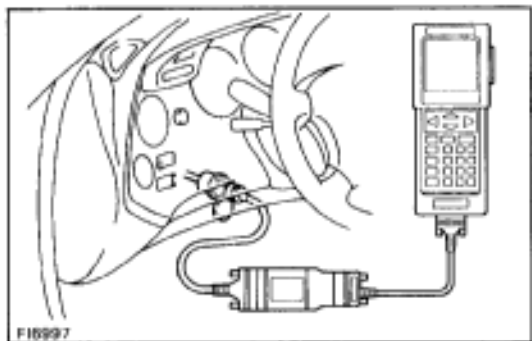
STANDARD VALUE OF ECM TERMINALS

ECM Terminals		
		
Symbols (Terminals No.)	STD Voltage (V)	Condition
BATT (A33) — E1 (B69)	9 ~ 14	Always
IGSW (A1)] — E1 (B69) + B (A31)	9 ~ 14	IG switch ON
VCC (B41) — E2 (B65)	4.5 ~ 5.5	IG switch ON
IDL1 (B64) — E2 (B65)	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 opened
VTA1 (B43) — E2 (B65)	0.3 ~ 0.8	IG switch ON Throttle valve fully closed
	3.2 ~ 4.9	IG switch ON Throttle valve fully opened
KS (B66) — E1 (B69)	Pulse generation (See page EG-439)	Idling
THA (B45) — E2 (B65)	0.5 ~ 3.4	Idling, Intake air temp. 0°C (32°F) to 80°C (176°F)
THW (B44) — E2 (B65)	0.2 ~ 1.0	Idling, Engine coolant temp. 60°C (140°F) to 120°C (248°F)
STA (B77) — E1 (B69)	6.0 or more	Cranking
# 10 (B20), # 20 (B19) # 30 (B18), # 40 (B17) — E01 (B80) # 50 (B16), # 60 (B15)	9 ~ 14	IG switch ON
	Pulse generation (See page EG-472)	Idling
IGT (B57) — E1 (B69)	Pulse generation (See page EG-415)	Idling
IGF (B58) — E1 (B69)	Below 2.0	IG switch ON
	Pulse generation (See page EG-415)	Idling
G1 (B26), G2 (B25) — G ⊖ (B7)	Pulse generation (See page EG-410)	Idling
NE (B27) — G ⊖ (B7)	Pulse generation (See page EG-410)	Idling
M-REL (A24) — E1 (B69)	9 ~ 14	IG switch ON
FPC (A22) — E1 (B69)	Below 1.5	IG switch ON
	Pulse generation (4.5 ~ 5.5)	Idling
DI (A21) — E1 (B69)	7.0 or more	Idling

Symbols (Terminals No.)	STD Voltage (V)	Condition
ACIS (B39)–E01 (B80)	9 ~ 14	IG switch ON
EVAP (B74)–E01 (B80)	9 ~ 14	IG switch ON
EGR (B75)–E01 (B80)	Below 2.0	Idling
	9 ~ 14	Engine speed at 3,500 rpm
ISC1 (B35), ISC2 (B34) ISC3 (B33), ISC4 (B32) –E01 (B80)	Pulse generation (See page EG-475)	Idling, when A/C switch ON or OFF
VF1 (B29), VF2 (B28)–E1 (B69)	1.8 ~ 3.2	Maintain engine speed at 2,500 rpm for 2 minutes after warming up then return to Idling
OX1 (B48), OX2 (B47)–E1 (B69) OX3 (A30)*	Pulse generation (See page EG-423)	Maintain engine speed at 2,500 rpm for 2 minutes after warming up
HT1 (B73)*, HT2 (B72)*–E01 (B80) HT3 (A36)*	Below 3.0	Idling
	9 ~ 14	IG switch ON
KNK1 (B50), KNK2 (B49)–E1 (B69)	Pulse generation (See page EG-452)	Idling
NSW (B76)–E1 (B69)	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 (A2)–E1 (B69)	Pulse generation (See page EG-445)	IG switch ON Rotate driving wheel slowly
TE1 (A20)–E1 (B69)	9 ~ 14	IG switch ON
TE2 (A19)–E1 (B69)	9 ~ 14	IG switch ON
W (A6)–E1 (B69)	9 ~ 14	Idling
	0 ~ 3.0	IG switch ON
OD1 (A12)–E1 (B69)	9 ~ 14	IG switch ON
A/C (A34)–E1 (B69)	7.5 ~ 14	A/C switch OFF
	0 ~ 1.5	A/C switch ON (At idling)
ACMG (A23)–E1 (B69)	0 ~ 3.0	A/C switch ON (At idling)
	9 ~ 14	A/C switch OFF
FPU (B36)*–E01 (B80)	9 ~ 14	IG switch ON
	Below 2.0	Restarting at high engine coolant temp.
ELS (A15)–E1 (B69)	7.5 ~ 14	Defogger switch and taillight switch ON
	0 ~ 1.5	Defogger switch and taillight switch OFF

*: Only for California specification vehicles

REFERENCE VALUE OF ECM DATA



HINT: ECM data can be monitored by TOYOTA hand-held tester.

1. Hook up the TOYOTA hand-held tester to DLC2.
2. Monitor ECM data by following the prompts on the tester screen.

Please refer to the TOYOTA hand-held tester operator's manual for further details.

REFERENCE VALUE

Item	Inspection condition	Reference value
INJECTOR	Engine cold to hot Engine idling at normal operating temp.* ¹	Gradually decreases Approx. 2.0 msec.
IGNITION	Increase engine speed	Gradually increases
IAC STEP #	Engine idling at normal operating temp.* ¹ A/C switch ON A/T shifting in "D" position Ignition switch ON (Engine off)	20 ~ 25 steps Step increases Step increases Approx. 125 steps
ENGINE SPEED	RPM kept stable (Comparison with tachometer)	No great changes
VAF	Engine idling at normal operating temp.* ¹ Increase engine speed	Approx. 35 ms Gradually decreases
ECT	Engine at normal operating temp.	75–95°C (185–203°F)* ²
THROTTLE	Closed throttle position Wide open throttle From closed throttle position to wide open throttle	Below 5° Above 70° Gradually increases
VEHICLE SPD	During driving (Comparison with speedometer)	No large differences
TARGET A/FL* ⁵	Engine idling at normal operating temp.	2.50 ± 1.25 V* ³
TARGET A/FR* ⁶	Engine idling at normal operating temp.	2.50 ± 1.25 V* ³
A/F FB LEFT* ⁵	RPM stable at 2500 rpm with normal operating temp.	ON
A/F FB RIGHT* ⁶	RPM stable at 2500 rpm with normal operating temp.	ON
KNOCK FB	Depress throttle pedal suddenly during idling	ON
STA SIGNAL	During cranking	ON
CTP SIGNAL	Closed throttle position	ON
A/C SIGNAL	A/C switch ON	ON
PNP SIGNAL* ⁴	When shifting from "P" or "N" position into a position other than "P" or "N"	GEAR
O X L* ⁵	RPM stable at 2500 rpm with normal operating temp.	RICH LEAN is repeated
O X R* ⁶	RPM stable at 2500 rpm with normal operating temp.	RICH LEAN is repeated

*¹: If the engine coolant temp. sensor circuit is open or shorted, the ECM assumes an engine coolant temp. value of 80°C (176°F).

*²: When feedback control is forbidden, 0 V is displayed.

*³: A/T only

*⁴: Oxygen sensor (Front)

*⁵: Oxygen sensor (Rear)

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, proceed to this matrix chart and troubleshoot according to the numbered order given below.

	Symptom	Suspect area	See page
Does not start	Engine does not crank		EG-438
	No initial combustion		EG-438
	No complete combustion		EG-453
Difficult to start	Engine cranks normally		EG-460
	Cold engine		EG-463
	Hot engine		EG-465
Poor Idling	Incorrect first idle		EG-470
	High engine idle speed		EG-472
	Low engine idle speed		EG-475
	Rough idling		EG-457
	Hunting		EG-481
Poor Driveability	Hesitation/Poor acceleration		AC-62
	Muffler explosion (after fire)		ST-3, 12
	Surging		IG-4
Engine Stall	Soon after starting		IG-5
	After accelerator pedal depressed		IG-7
	After accelerator pedal released		IG-7
	During A/C operation		EG-9
	When shifting N to D		AT2-81

CIRCUIT INSPECTION

DTC 12 G NE Signal Circuit (No.1)

CIRCUIT DESCRIPTION

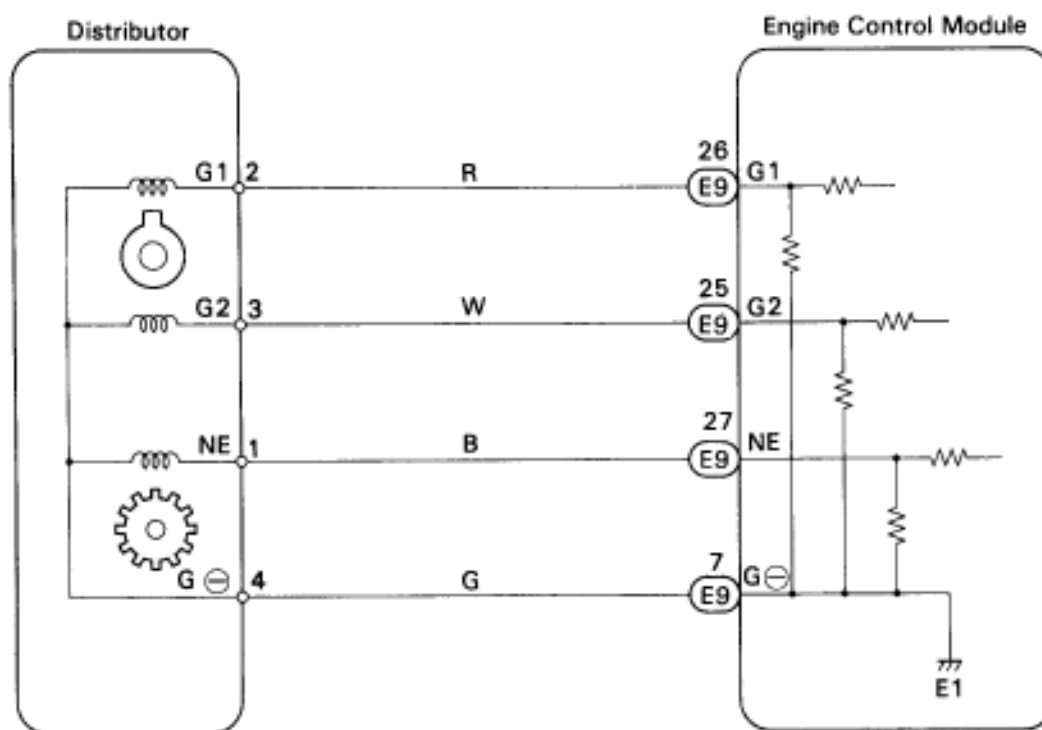
The distributor in the Engine Control System contains 3 pick-up coils (G1, G2 and NE).

The G1, G2 signals inform the ECM of the standard crankshaft angle.

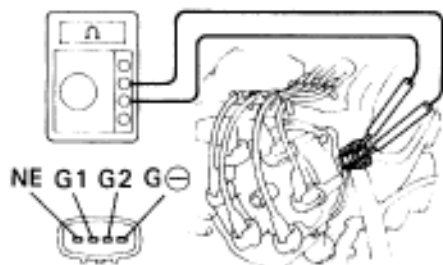
The NE signals inform the ECM of the crankshaft angle and the engine speed.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
12	No "NE" or "G1" and "G2" signal to ECM for 2 sec. or more after cranking	Open or short in NE, G circuit Distributor
	Open in "G ×" circuit	Open or short in STA circuit ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1**Check resistance of each pickup coils in distributor.****P**

Disconnect distributor connector.

C

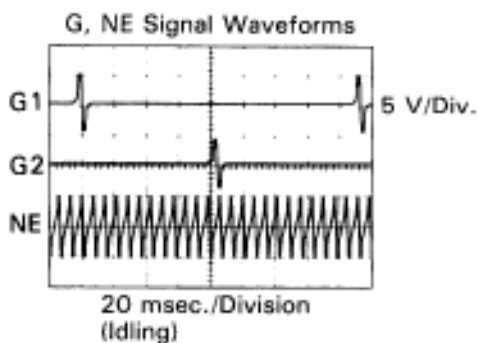
Measure resistance between each terminal shown in the table below.

OK

		Resistance
G1 pickup coil (G1-G $\times$)	Cold	125 ~ 200 Ω
	Hot	160 ~ 235 Ω
G2 pickup coil (G2-G $\times$)	Cold	125 ~ 200 Ω
	Hot	160 ~ 235 Ω
NE pickup coil (NE-G $\times$)	Cold	155 ~ 250 Ω
	Hot	190 ~ 290 Ω

"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).

FI6531

Reference**INSPECTION USING OSCILLOSCOPE**

FI6519

- During cranking or idling, check waveforms between terminals G1, G2, NE and G $\times$ of engine control module

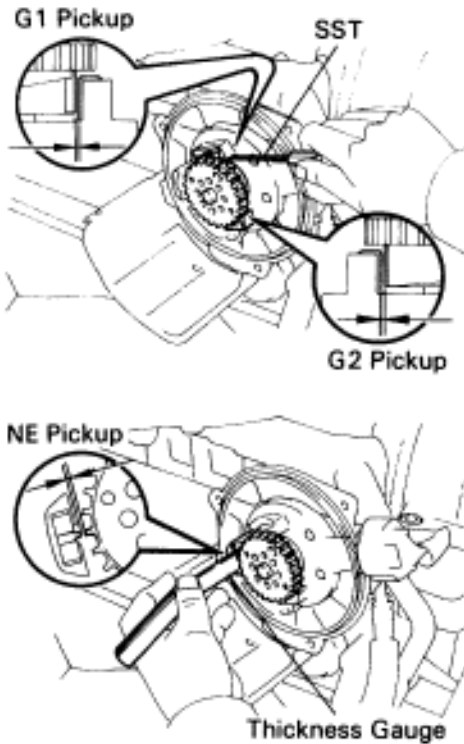
HINT: The correct waveforms are as shown.

OK**NG**

Replace Distributor

2**Check for open and short in harness and connector between engine control module and distributor (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector

3**Check air gap.**P10579
P10580**P**

Remove distributor cap & rotor.

C

Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the air gap between the signal rotor and pickup coil projection.

SST 09240-00020 for G1 and G2 pickups

OK

Air gap: 0.2 — 0.5 mm (0.008 — 0.020 in.)

OK**NG**

Replace distributor housing assembly

Check and replace engine control module.

DTC 13 G NE Signal Circuit (No.2)

CIRCUIT DESCRIPTION

See G, NE signal circuit (No. 1) on page [EG-409](#).

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
13	No NE signal to ECM for 0.1 sec. or more at 1,000 rpm or more	Open or short in NE circuit Distributor ECM
	NE signal does not pulse 12 times to ECM during the interval between G1 and G2 pulses	

DIAGNOSIS

This code indicates that a intermittent problems of the G, NE signal from the distributor to the ECM has occurred, but that it has returned to normal. Note that although this problem may not necessarily appear at the time of inspection, it cannot be ignored because this diagnostic trouble code is output, indicating that there is or was a malfunction in the G, NE signal circuit; this "malfunction" is usually a loose connector.

The distributor connector and the NE terminal of the ECM connector must therefore be checked for the following:

1. Loose connectors
2. Dirty connector terminals
3. Loose connector terminals

DTC 14 Ignition Signal Circuit

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr₁ at a predetermined angle (°CA) before the desired ignition timing and outputs an ignition signal (IGT) "1" to the igniter.

Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr_2 turns on.

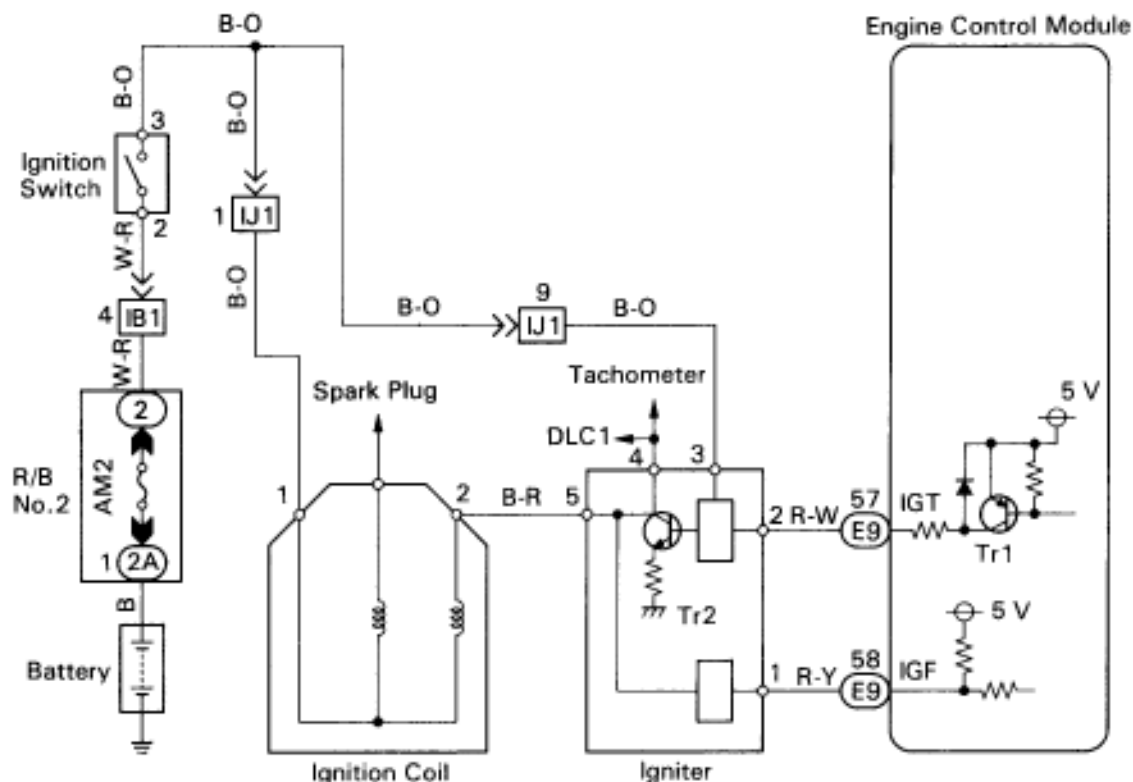
When it reaches the ignition timing, the ECM turns Tr_1 off and outputs the IGT signal "O".

This turns Tr₂ off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM.

The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
14	No IGF signal to ECM for 6 consecutive IGT signals	Open or short in IGF OR IGT circuit from igniter to ECM Igniter ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1

Check for spark.

C

Disconnect the high-tension cord from the distributor, hold its end about 12.5 mm (1/2") from the ground, see if spark occurs while the engine is being cranked.

OK

Spark should be generated.

Notice

To prevent excess fuel being injected from the injectors during this check. Don't crank the engine for more than 1 — 2 seconds at a time.

OK
NG

Go to step **4**.

2

Check for open and short in harness and connector in IGF signal circuit between engine control module and igniter (see page [IN-30](#)).

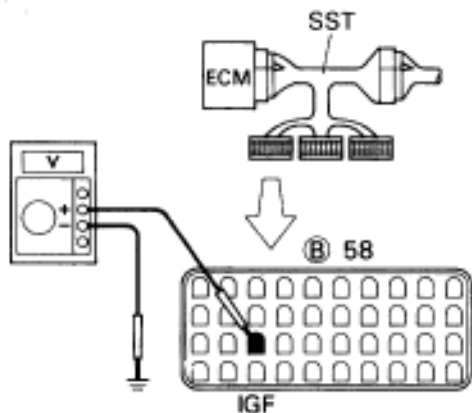
OK
NG

Repair or replace harness or connector.

3

Disconnect igniter connector and check voltage between terminal IGF of engine control module connector and body ground.

ON



BE0653 FI6621

P

- (1) Disconnect igniter connector.
- (2) Connect SST (check harness "A").
See page [EG-404](#)
- SST 09990-01000
- (3) Turn ignition switch ON.

C

Measure voltage between terminal IGF of engine control module connector and body ground.

OK

Voltage: 4.5 ~ 5.5 V

NG
OK

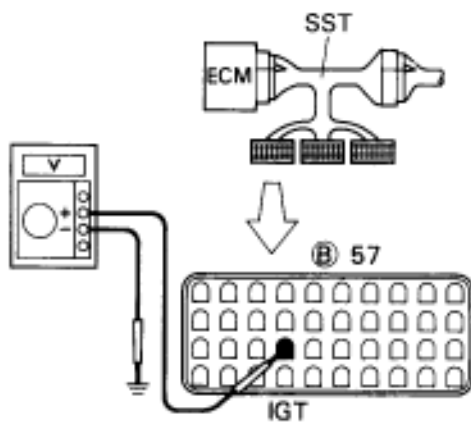
Replace igniter.

Check and replace engine control module.

4

Check voltage between terminal IGT of engine control module connector and body ground.

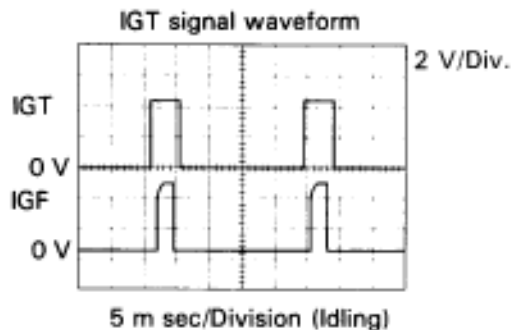
START

BE6653
FI6614

P Connect SST (check harness "A").
See page [EG-404](#)
SST 09990-01000

C Measure voltage between terminal IGF of engine control module connector and body ground when engine is cranked.

OK Voltage: 0.5 — 1.0 V
(Neither 0 V nor 5 V)

Reference**INSPECTION USING OSCILLOSCOPE**

FI6605

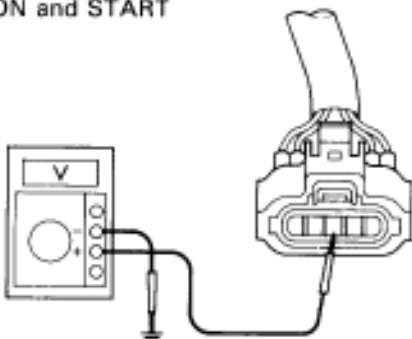
During cranking or idling, check waveforms between terminal IGT and E1 of engine control module.

HINT: The correct rectangular waveforms are as shown.

OK**NG** Go to step **8**.**5**

Check voltage between terminal 3 of igniter connector and body ground.

ON and START

BE6653
FI6438

P Disconnect igniter connector.

C Measure voltage between terminal 3 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.

6

Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page [IN-30](#)).

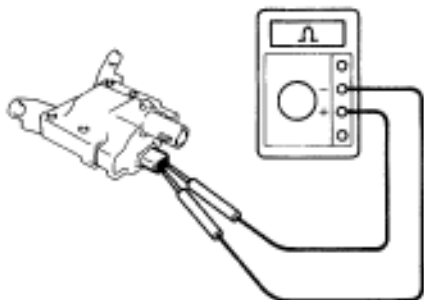
OK**NG**

Repair or replace harness or connector.

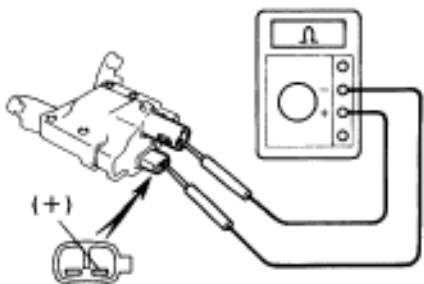
7

Check ignition coil.

Primary Coil



Secondary Coil



P11567
P11573

P

Disconnect ignition coil connector.

C

(1) Check primary coil.

Measure resistance between terminals of ignition coil connector.

(2) Check secondary coil.

Measure resistance between terminal $\oplus$ of ignition coil connector and high-tension terminal.

OK

		Resistance
(a) Primary Coil	Cold	0.36 ~ 0.55 Ω
	Hot	0.45 ~ 0.65 Ω
(b) Secondary Coil	Cold	9.0 ~ 11.1 k Ω
	Hot	11.4 ~ 18.1 k Ω

"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).

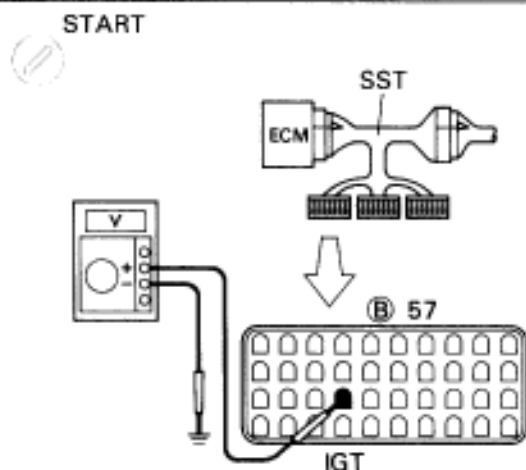
OK**NG**

Replace ignition coil.

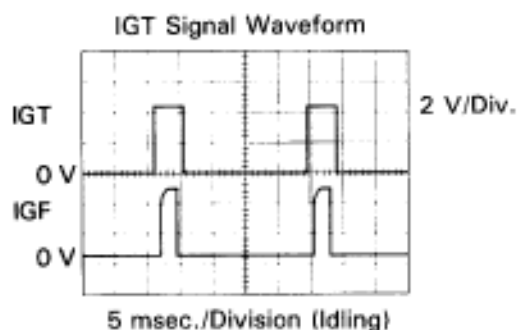
Replace igniter.

8

Disconnect igniter connector and check voltage between terminal IGT of engine control module connector and body ground.

BE6653
FI6614

- P** Disconnect igniter connector.
- C** Measure voltage between terminal IGT of engine control module connector and body ground when engine is cranked.
- OK** Voltage: 0.5 — 1.0 V
(Neither 0 V nor 5 V)

Reference**INSPECTION USING OSCILLOSCOPE**

FI6605

During cranking or idling, check waveforms between terminal IGT and E1 of engine control module.
HINT: The correct rectangular waveforms are as shown.

NG**OK**

Replace igniter.

9

Check for open and short in harness and connector in IGT signal circuit between engine control module and igniter (See page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

Check and replace engine control module.

DTC 16 A T Control Signal Malfunction

CIRCUIT DESCRIPTION

The signal from the A/T CPU retards the ignition timing of the engine during A/T gear shifting, thus momentarily reducing torque output of the engine for smooth clutch operation inside the transmission and reduced shift shock.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
16	Fault in communications between the engine CPU and A/T CPU in the ECM	ECM

If the ECM detects the diagnostic trouble code "16" in memory, it prohibits the torque control of the A/T which performs smooth gear shifting.

INSPECTION PROCEDURE

1	Are there any other codes (besides Code 16) being output?
NO	YES Go to relevant diagnostic trouble code chart.
Repair engine control module.	

DTC 21 28 (Main Heated*1) Oxygen Sensor Circuit

CIRCUIT DESCRIPTION

To obtain a high purification rate for the Co, Hc and NOx components of the exhaust gas, a three-way catalytic converter is used, but for 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.

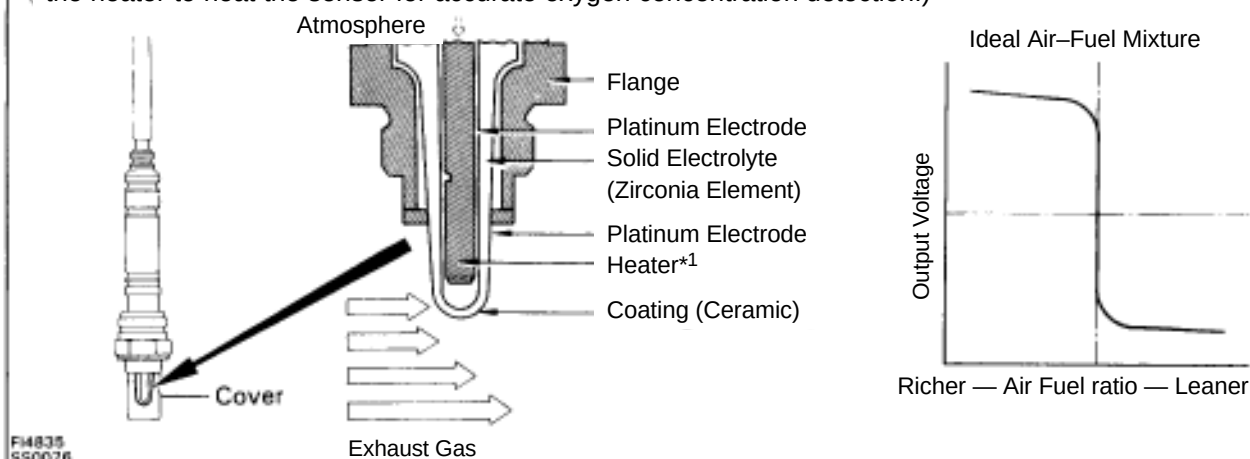
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air-fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air fuel ratio.

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: 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 duration accordingly. However, if malfunction of the oxygen sensor causes an output of abnormal electromotive force, the ECM is unable to perform accurate air-fuel ratio control.

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



F14835
880076

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
21 • 28	(1)*1 Open or short in heater circuit of main heated oxygen sensor for 0.5 sec. or more.	Open or short in heater circuit of main heated oxygen sensor Main heated oxygen sensor heater ECM
	(2) (Main heated*1) oxygen sensor signal voltage is reduced to between 0.35 V and 0.70 V for 60 sec. under conditions (a) ~ (d): (2) trip detection logic)*2 (a) Engine coolant temp.: Between 80°C (176°F and 95°C (203°F) (b) Engine speed: 1,500 rpm or more (c) Load driving (Example A/T in Overdrive (5th for M/T), A/C ON, Flat road, 80 km/h (50 mph)) (d) (Main heated*1) oxygen sensor signal voltage: Alternating above and below 0.45 V	(Main heated*1) oxygen sensor circuit (Main heated*1) oxygen sensor

HINT: Diagnostic trouble code "21" is for the (main heated*1) oxygen sensor (Fr) circuit.
Diagnostic trouble code "28" is for the (main heated*1) oxygen sensor (Rr) circuit.

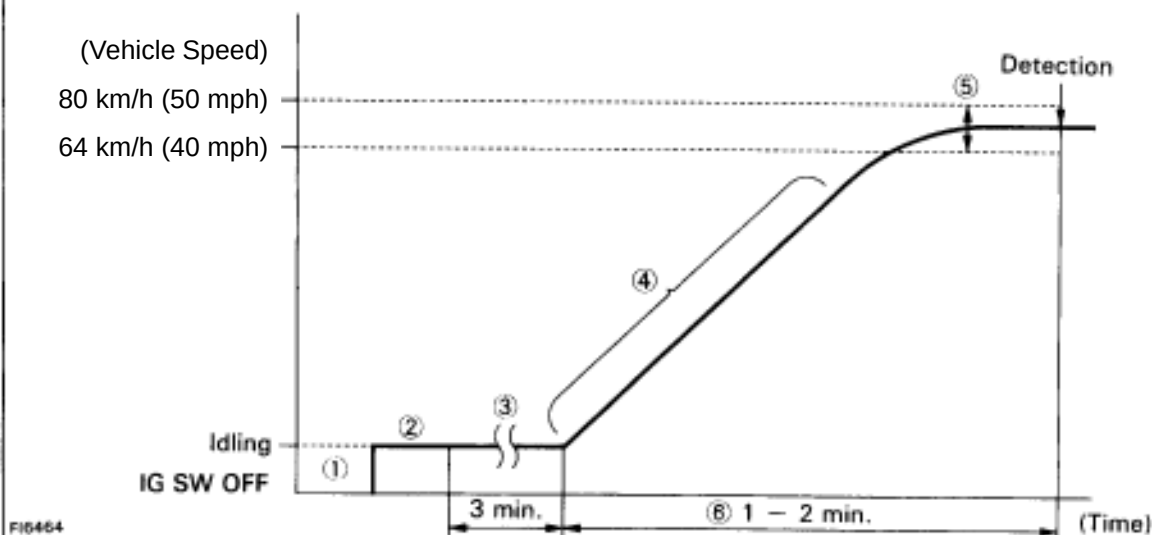
*1: Main heated oxygen sensor ONLY for California specification vehicles.

*2: See page [EG-397](#).

CIRCUIT DESCRIPTION (Cont'd)**DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN**

Purpose of the driving pattern.

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

Malfunction: (Main heated()) Oxygen Sensor Detection

It is vital that this test routine is adhered to detect the malfunction:

- (1) Disconnect the EFI No.1 fuse (30 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up with all ACC switched OFF.
- (3) Idle the engine for 3 min.
- (4) Accelerate gradually within the range 1,300 ~ 1,700 rpm (centered around 1,500 rpm) with the A/C switched ON and D position for A/T (5th for M/T).

HINT: Ensure engine rpm does NOT fall below 1200 rpm.
Gradually depress the accelerator pedal at a suitable rate to comply with the test requirements on the above graph.

Never allow engine rpm to drop at any time during the test.

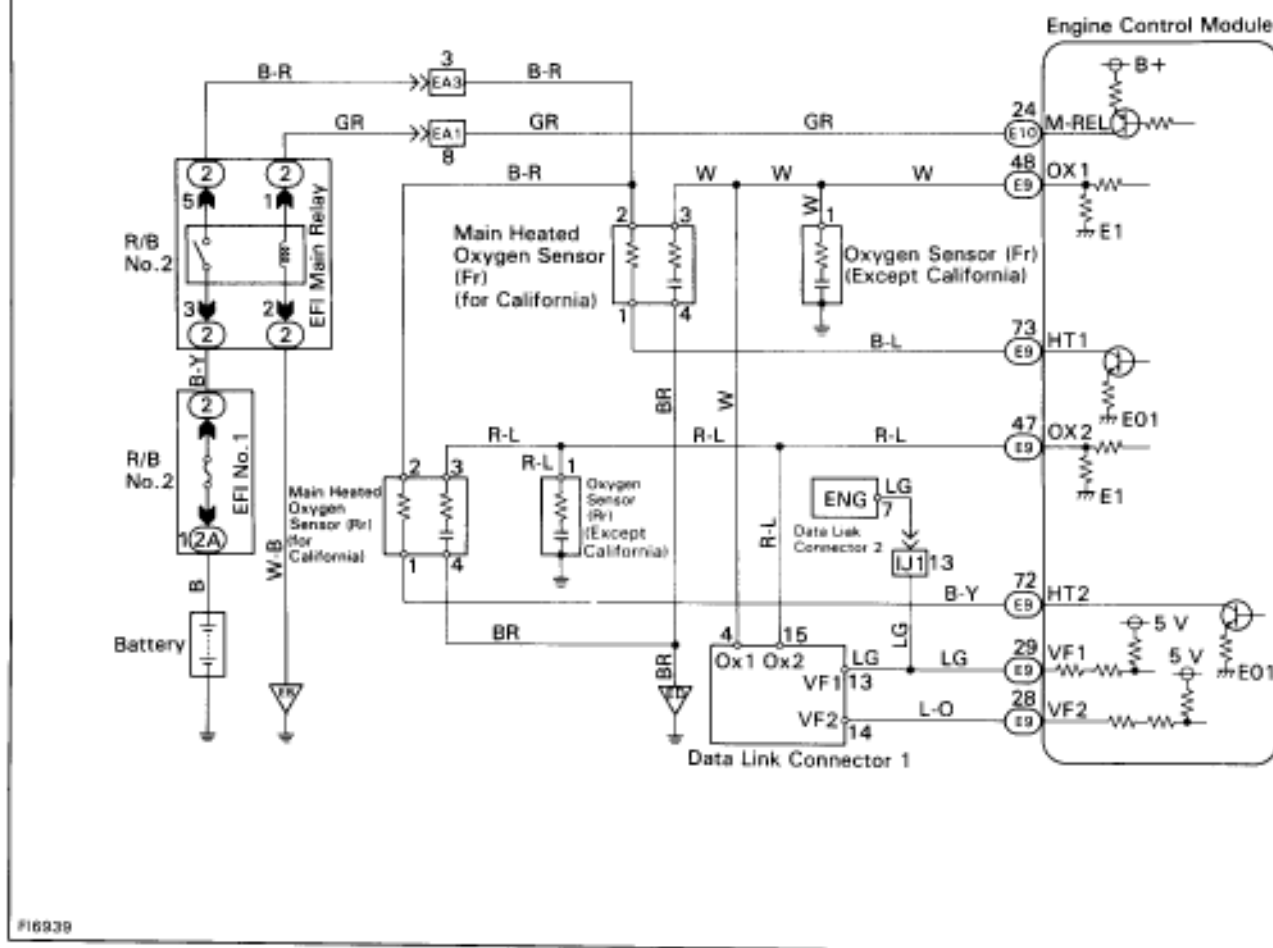
- (5) Maintain the vehicle speed at 64 — 80 km/h (40 — 50 mph).
- (6) Keep the vehicle running for — 2 min. after starting acceleration.

HINT: If a malfunction exists, the Malfunction Indicator Lamp will light up after approx. 60 sec. from the start of acceleration.

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

*: Main heated oxygen sensor only for California specification vehicles

WIRING DIAGRAM



INSPECTION PROCEDURE (Except California specification vehicles)

HINT: If diagnostic trouble code "21" is output, replace oxygen sensor (Fr).

If diagnostic trouble code "28" is output, replace oxygen sensor (Rr).

1

Are there any other codes (besides code 21 or 28) being output?

NO

YES

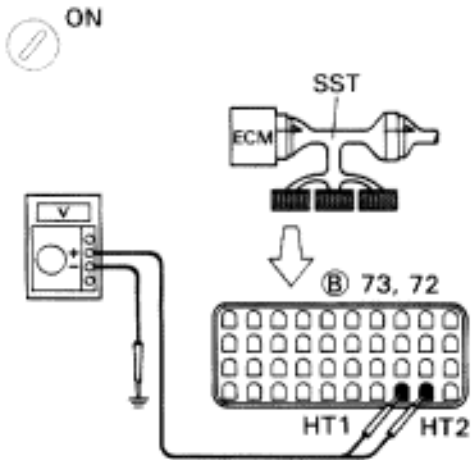
Go to relevant diagnostic trouble code chart.

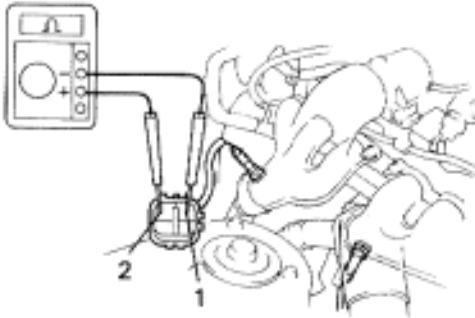
Replace oxygen sensor.

INSPECTION PROCEDURE (Only for California specification vehicles)

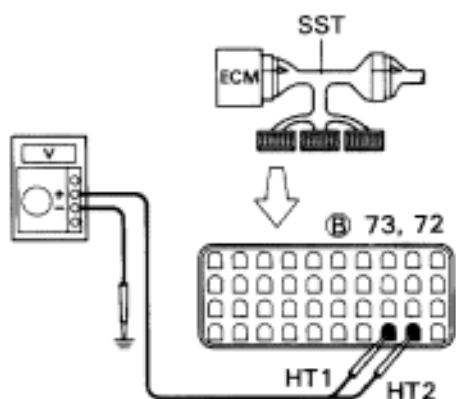
HINT: If diagnostic trouble code "21" is output, check the main heated oxygen sensor (Fr) circuit.

If diagnostic trouble code "28" is output, check the main heated oxygen sensor (Rr) circuit.

1 Check voltage between terminals HT1, HT2 of engine control module connector and body ground.	P Connect SST (check harness "A"). See page EG-404 SST 09990-01000 C Measure voltage between terminals HT1, HT2 of engine control module connector and body ground. OK Voltage: 9 — 14 V
 BE0653 F16890	NG OK Go to step 3.

2 Check main heated oxygen sensor heater.	P Disconnect main heated oxygen sensor connector. C Measure resistance between terminals 1 and 2 of main heated oxygen sensor connector. OK Resistance: 11 — 16 at 20°C (68°F)
 P114B4	OK NG Replace main heated oxygen sensor.

Check and repair harness or connector between main relay and main heated oxygen sensor, main heated oxygen sensor and engine control module.

3**Check voltage between terminals HT1, HT2 of engine control module connector and body ground.**

FI6890

P

Warm up engine to normal operating temperature.

C

Measure voltage between terminals HT1, HT2 of engine control module connector and body ground when engine is idling and racing at 4,000 rpm.

OK

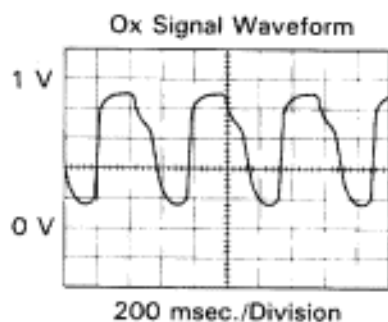
	Voltage
Idling	0 V
Racing at 4,000 rpm	9 - 14 V

Hint

In the 4,000 rpm racing check, continue engine racing at 4,000 rpm for approx. 20 seconds or more.

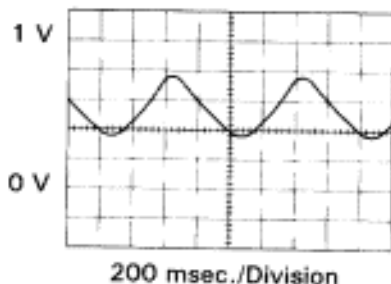
NG**OK****Replace main heated oxygen sensor.*****Check and replace engine control module.**

*: It is probable the oxygen sensor has deteriorated. Usually, this cannot be confirmed by visual inspection.

Reference**INSPECTION USING OSCILLOSCOPE**

With the engine racing (4,000 rpm) measure waveform between terminals OX1, OX2 and E1 of engine control module.

HINT: The correct waveform is as shown, oscillating between approx. 0.1 V and 0.9 V



If the oxygen sensor has deteriorated, the amplitude of the voltage will be reduced as shown on the left.

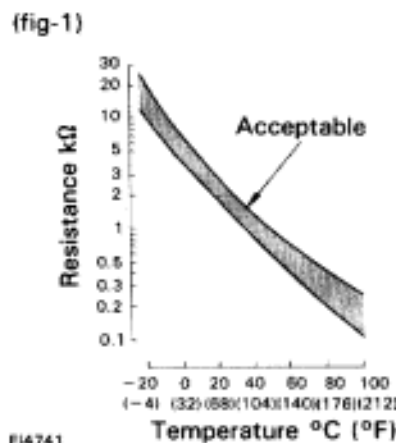
 FI6514
 FI6515

DTC 22 Engine Coolant Temp. Sensor Circuit

CIRCUIT DESCRIPTION

The engine coolant temperature sensor senses the coolant temperature. A thermistor built in the sensor changes its resistance value according to the coolant temperature. The lower the coolant temperature, the greater the thermistor resistance value, and the higher the coolant temperature, the lower thermistor resistance value (See Fig. 1.).

The engine coolant temperature sensor is connected to the ECM (See wiring diagram). The 5 V power source voltage in the ECM is applied to the engine coolant temperature sensor from the terminal THW via a resistor R. That is, the resistor R and the engine coolant temperature sensor are connected in series. When the resistance value of the engine coolant temperature sensor changes in accordance with the changes in the coolant temperature the potential at the terminal THW 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 diagnostic trouble code 22, it operates the fail safe function in which the engine coolant temperature is assumed to be 80°C (176°F).

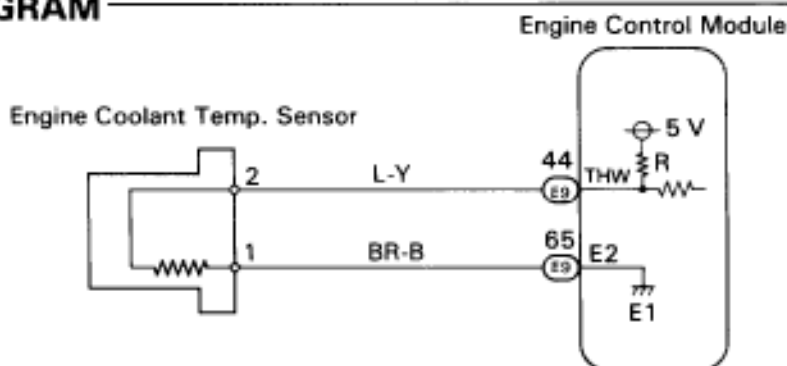


Reference

Engine Coolant 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)	0.2	0.3

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
22	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more	Open or short in engine coolant temp. sensor circuit Engine coolant temp. sensor ECM

WIRING DIAGRAM

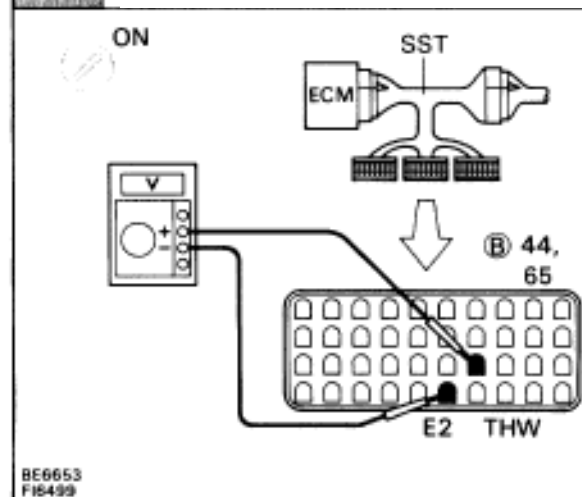


INSPECTION PROCEDURE

HINT: If diagnostic trouble codes "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1

Check voltage between terminals THW and E2 of engine control module connector.



- P** (1) Connect SST (check harness "A").
(See page [EG-404](#))
(2) Turn ignition switch ON.

C Measure voltage between terminals THW and E2 of engine control module connector.

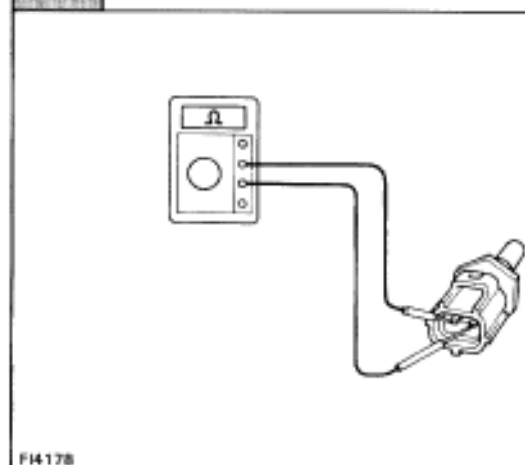
Engine Coolant Temp. °C (°F)	Voltage
20 (68) (Engine is cool)	0.5 - 3.4 V
80 (176) (Engine is hot)	0.2 - 1.0 V

NG

OK Check for intermittent problems.
(See page [EG-399](#))

2

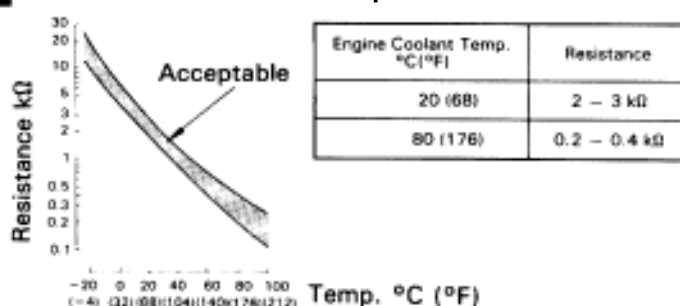
Check engine coolant temp. sensor.



P Disconnect the engine coolant temp. sensor connector.

C Measure voltage between terminals.

OK Resistance is within Acceptable Zone on chart.



OK

NG Replace engine coolant temp. sensor.

3

Check for open and short in harness and connector between engine control module and engine coolant temp. sensor (see page [IN-30](#)).

OK

NG Repair or replace harness or connector.

Check and replace engine control module.

DTC 24 Intake Air Temp. Sensor Circuit

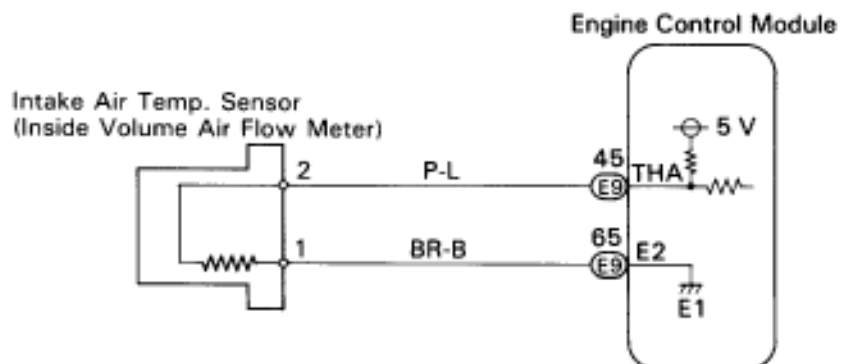
CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the volume air flow meter and senses the intake air temperature. The structure of the sensor and connection to the ECM is the same as in the engine coolant temp. sensor shown on page [EG-424](#).

If the ECM detects the diagnostic trouble code "24", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F).

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
24	Open or short in intake air temp. sensor circuit for 0.5 sec. or more	Open or short in intake air temp. sensor circuit Intake air temp. sensor ECM

WIRING DIAGRAM



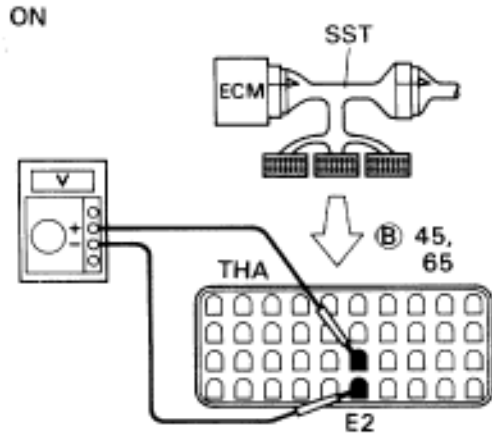
F1644B

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1

Check voltage between terminals THA and E2 of engine control module connector.



NG

P

- (1) Connect SST (check harness "A").
(See page [EG-404](#))
SST 09990-01000
- (2) Turn ignition switch ON.

C

Measure voltage between terminals THW and E2 of engine control module connector.

OK

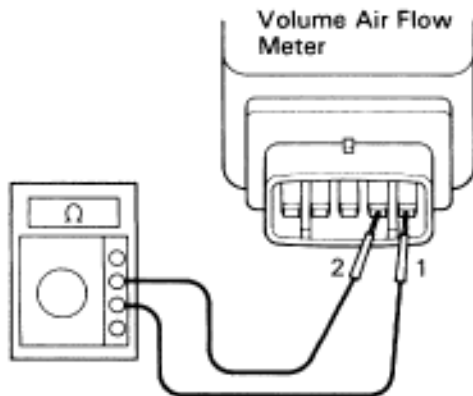
Intake air temp. °C (°F)	Voltage
20 (68)	0.5 - 3.4 V
60 (140)	0.2 - 1.0 V

OK

Check for intermittent problems.
(See page [EG-399](#))

2

Check intake air temp. sensor.



OK

P

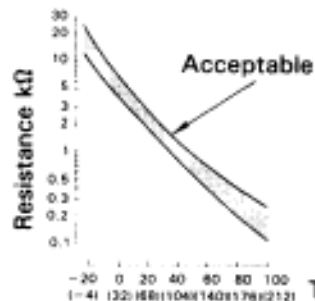
Disconnect the volume air flow meter connector.

C

Measure voltage between terminals 1 and 2 of volume air flow meter connector.

OK

Resistance is within Acceptable Zone on chart.



Intake air temp. °C (°F)	Resistance
20 (68)	2 - 3 kΩ
60 (14)	0.4 - 0.7 kΩ

NG

Replace intake air temp. sensor (Replace volume air flow meter).

3

Check for open and short in harness and connector between engine control module and intake air temp. sensor (See page [IN-30](#)).

OK

NG

Repair or replace harness or connector.

Check and replace engine control module.

DTC 25 26 Air-Fuel Ratio Lean Rich Malfunction

CIRCUIT DESCRIPTION

See page [EG-419](#) for the circuit description

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
25	(1) (Main heated* ¹) oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b): (2 trip detection logic)* ² (a) Engine coolant temp.: 70°C (158°F) or more (b) Engine speed: 1,500 rpm or more	• Open or short in (main heated*¹) oxygen sensor circuit • (Main heated*¹) oxygen sensor • Ignition system • ECM
	(2)* ¹ Difference of air-fuel ratio feedback compensation value between front (No. 1 ~ 3 cylinders) and rear (No. 4 ~ 6 cylinders) is more than 15 percentage for 20 sec. or more under conditions (a) and (b): (2 trip detection logic)* ² (a) Engine speed: 2,000 rpm or more (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F)	• Open and short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Volume air flow meter (air intake) • ECM
	(3)* ¹ Engine speed varies by more than 15 rpm over the preceding crank angle period during a period of 20 sec. or more under conditions (a) and (b): (2 trip detection logic)* ² (a) Engine speed: Idling (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F)	• Open and short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Volume air flow meter (air intake) • ECM
26	(1)* ¹ Difference of air-fuel ratio feedback compensation value between front (No. 1 ~ 3 cylinders) and rear (No. 4 ~ 6 cylinders) is more than 15 percentage for 20 sec. or more under conditions (a) and (b): (2 trip detection logic)* ² (a) Engine speed: 2,000 rpm or more (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F)	• Open and short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Volume air flow meter (air intake) • ECM
	(2) Engine speed varies by more than 15 rpm over the preceding crank angle period during a period of 20 sec. or more under conditions (a) and (b): (2 trip detection logic)* ² (a) Engine speed: Idling (b) Engine coolant temp.: Between 60°C (140°F) and 95°C (203°F)	• Open and short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Volume air flow meter (air intake) • ECM

*1: Only for California specification vehicles

*2: See page [EG-397](#).

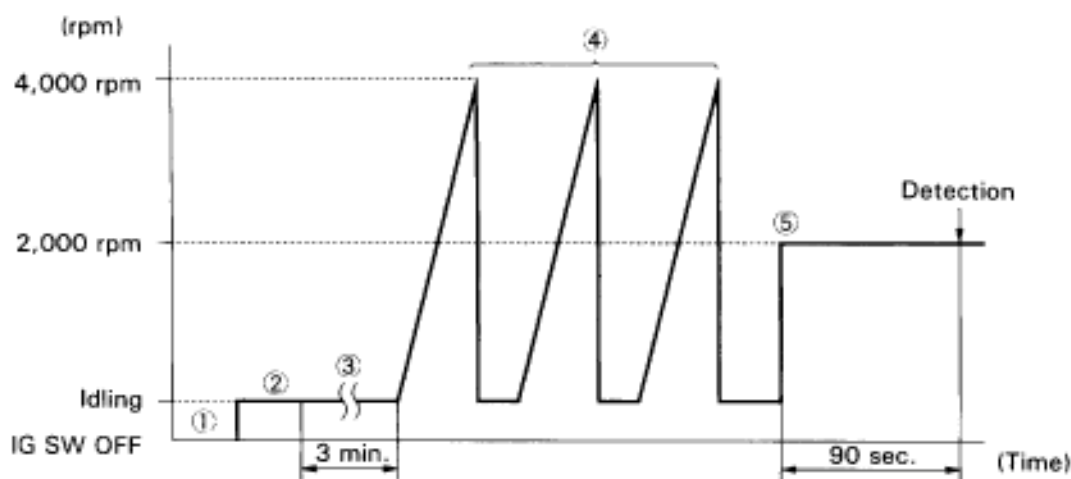
CIRCUIT DESCRIPTION (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

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

Malfunction: Open or Short in (Main Heated*) Oxygen Sensor



F16465

HINT: Before this test, check the feedback voltage for oxygen sensor.

- (1) Disconnect the EFI No.1 fuse (30 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up.
- (3) Idle the engine for 3 min.
- (4) Race the engine at 2,000 rpm for 90 sec.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (4).

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

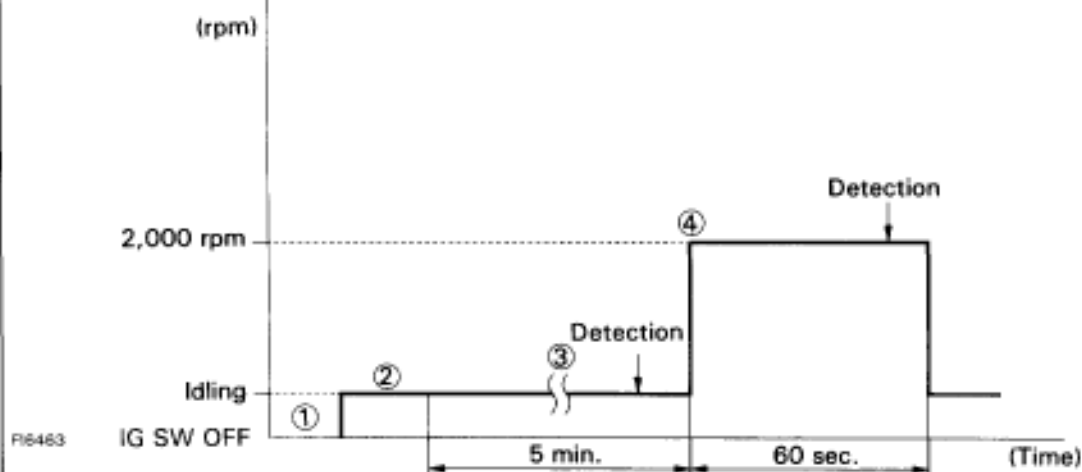
*: Only for California specification vehicles

CIRCUIT DESCRIPTION (Cont'd)**DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN**

Purpose of the driving pattern.

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

Malfunction: Open or Short in Injector circuit, Injector Leak or Blockage.



- (1) Disconnect the EFI No.1 fuse (30A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up with all ACC switched OFF.
- (3) Idle the engine for 5 min.
(After the engine is started, do not depress the accelerator pedal.)
- (4) If the malfunction is not detected during idling, racing the engine without any load at approx. 2,000 rpm for 60 sec.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during the 5 min. idling period or within 60 sec. of starting racing.

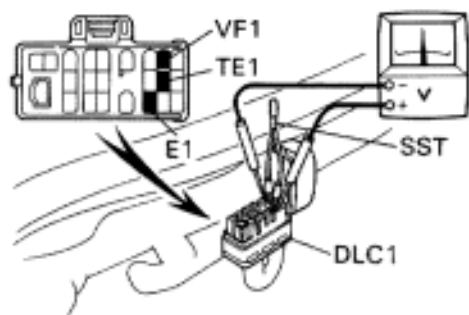
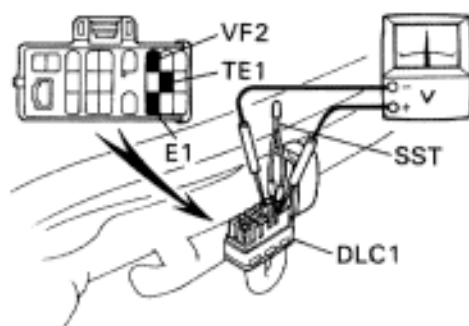
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

WIRING DIAGRAM

See page **EG-421** for the WIRING DIAGRAM.

*: Only for California specification vehicles

INSPECTION PROCEDURE

1**Check voltage between terminals VF1, VF2 and E1 of data link connector 1.****Front Side****Rear Side**P11292
P11293**P**

- (1) Warm up engine to normal operating temperature.
- (2) Using SST, connect terminal TE1 and E1 of data link connector 1.

SST 09843-18020

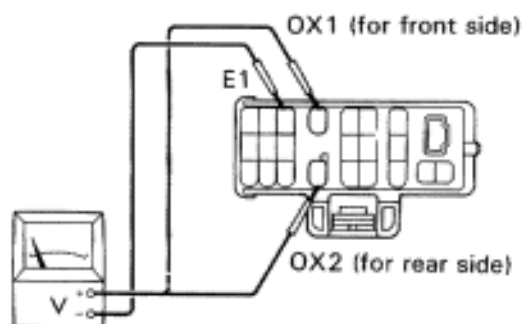
- (3) Connect positive probe to terminal VF1, VF2 and negative probe to terminal E1 of data link connector 1.

C

- (1) Warm up the oxygen sensor by racing engine at 2,500 rpm for about 2 minutes.
- (2) Then, still maintaining engine at 2,500 rpm, count how many times voltmeter fluctuates needle between 0 and 5 V.

Result

Result	
Needle fluctuates 8 times or more for every ten seconds	OK
Continue at 0 V	NG Type I
Continue at 5 V	NG Type II

NG
Type ING
Type IIGo to step **7**.**2****Check voltage between terminals OX1, OX2 and E1 of data link connector 1.**

F15595

P

Warm up engine to normal operating temperature

C

Measure voltage between terminals OX1, OX2 and E1 of data link connector 1 when engine is suddenly raced to full throttle.

OK**The voltage should be 0.5 V or higher at least once.****Hint**

Inspection should not take longer 1 second.

NG

OK

Go to step **7**.

3

Check for open and short in harness and connector between engine control module and (main heated*) oxygen sensor, engine control module and data link connector 1 (see page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

4

Check each item found to be a possible cause of problem.

Check each circuit found to be a possible cause of trouble according to the results of the check in **1** or **2**. The numbers in the table below show the order in which the checks should be done.

(Main heated*) oxygen sensor signal from either side continues at 0 V	(Main heated*) oxygen sensor signal from both sides continues at 0 V	Possible Cause	See page
1		Faulty sensor installation	—
3		Injector circuit	EG-47
2	3	Misfire	IG-4
4		Valve timing	EG-33
	1	Air leakage	EG-190
	2	Fuel system	EG-457
	6	Characteristics deviation in volume air flow meter	EG-438
	4	Characteristics deviation in engine coolant temp. sensor	EG-424
	5	Characteristics deviation in intake air temp. sensor	EG-426

OK**NG**

Repair or replace.

5

Check compression (See page [EG-9](#)).

OK**NG**

Repair or replace.

6

Does malfunction disappear when a good (main heated*) oxygen sensor is installed?

NG**YES**

Replace (main heated*) oxygen sensor.

Check and replace engine control module.

*: Only for California specification vehicles

7**Check each item found to be a possible cause of problem.**

Check each circuit found to be a possible cause of trouble according to the results of the check in **1**. The numbers in the table below show the order in which the checks should be done.

(Main heated*) oxygen sensor signal from either side continues at 5.0 V	(Main heated*) oxygen sensor signal from both sides continues at 5.0 V	(Main heated*) oxygen sensor signals from both sides are normal	Possible Cause	See page
1		7	Injector circuit	EG-4
		3	Misfire	IG-4
2		4	Valve timing	EG-33
		1	Air leakage	EG-19
	1	2	Fuel system	EG-457
	4	8	Characteristics deviation in volume air flow meter	EG-438
	2	5	Characteristics deviation engine coolant temp. sensor	EG-424
	3	6	Characteristics deviation in intake air temp. sensor	EG-426

OK**NG**

Repair or replace.

8**Check compression (See page EG-9).****OK****NG**

Repair or replace.

9**Does malfunction disappear when a good (main heated*) oxygen sensor is installed?****NG****YES**

Replace (main heated*) oxygen sensor.

Check and replace engine control module.

*: Only for California specification vehicles

DTC 27 Sub Heated Oxygen Sensor Circuit (Only for California spec.)

CIRCUIT DESCRIPTION

The sub heated oxygen sensor is installed on the exhaust pipe. Its construction and operation is the same as the main heated oxygen sensor on page [EG-419](#).

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
27	(1) Open or short in heater circuit of sub heated oxygen sensor for 0.5 sec. or more	Open or short in heater circuit of sub heated oxygen sensor Sub heated oxygen sensor heater ECM
	(2) Main heated oxygen sensor signal is 0.45 V or more and sub heated oxygen sensor signal is 0.45 V or less under conditions (a) ~ (c): (2 trip detection logic)* (a) Engine coolant temp.: 80°C (176°F) or more (b) Engine speed: 1,500 rpm or more (c) Accel. pedal: Fully depressed for 2 sec. or more	Open or short in sub heated oxygen sensor circuit Sub heated oxygen sensor ECM

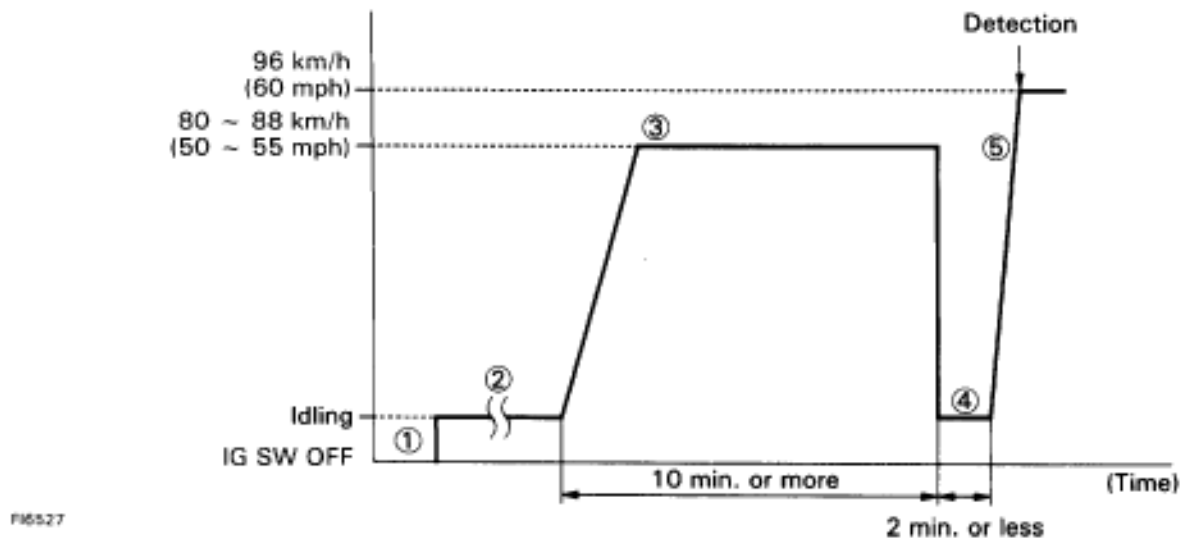
*: See page [EG-397](#).

CIRCUIT DESCRIPTION (Cont'd)**DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN**

Purpose of the driving pattern.

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

Malfunction: Open or Short in Sub Heated Oxygen Sensor

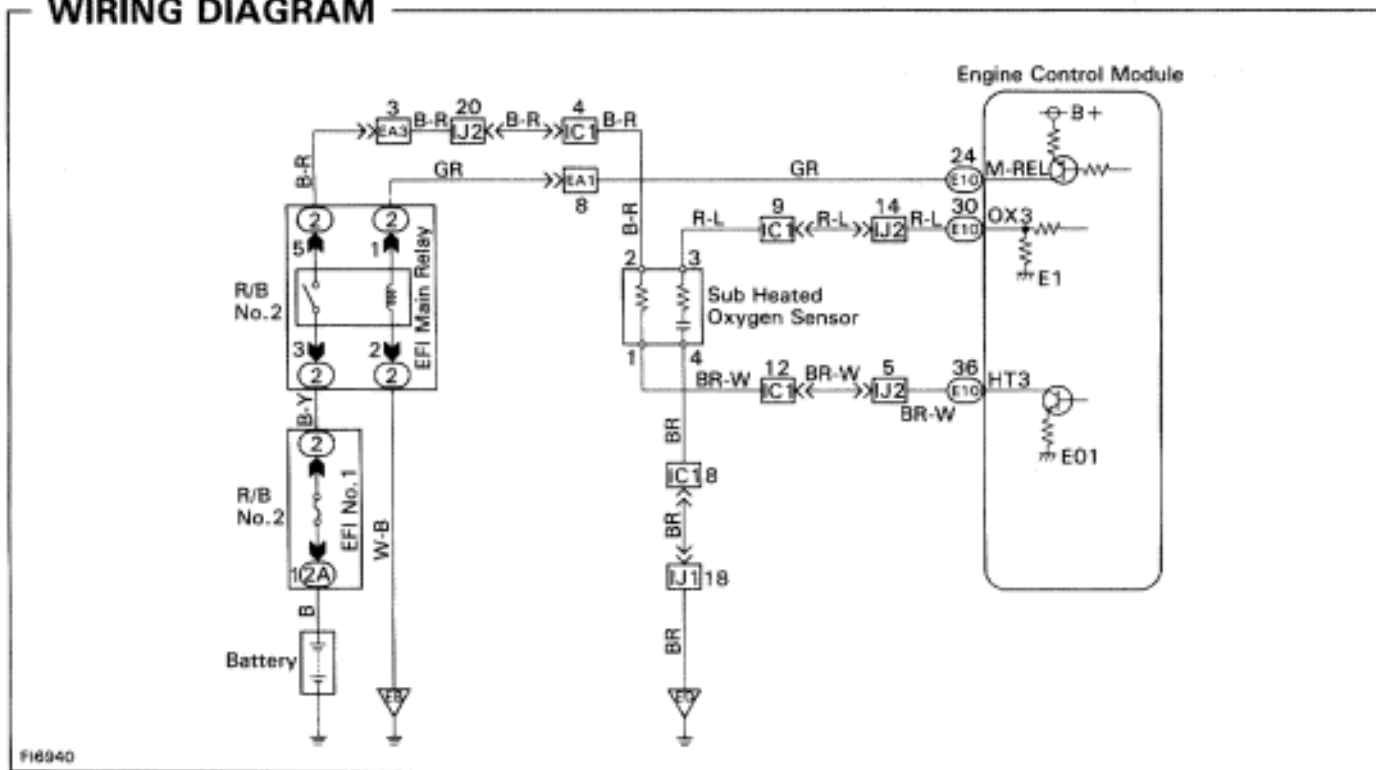


- (1) Disconnect the EFI No.1 fuse (30A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up with all ACC switch OFF.
- (3) Drive the vehicle at 80 ~ 88 km/h (50 ~ 55 mph) for 10 min. or more.
- (4) Stop at a safe place and idle the engine for 2 min. or less.
- (5) Accelerate to 96 km/h (60 mph) with the throttle valve fully open.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (5).

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

WIRING DIAGRAM

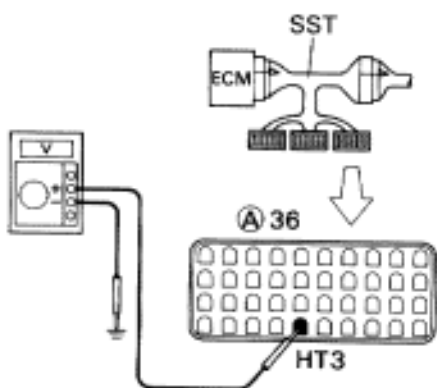


INSPECTION PROCEDURE

HINT: When other codes are output in addition to 27 at the same time, check the circuits for other codes first.

1

Check voltage between terminal HT3 of engine control module connector and body ground.



- P** (1) Connect SST (check harness "A").
(See page [EG-404](#))
SST 09990-01000
(2) Turn ignition switch ON.

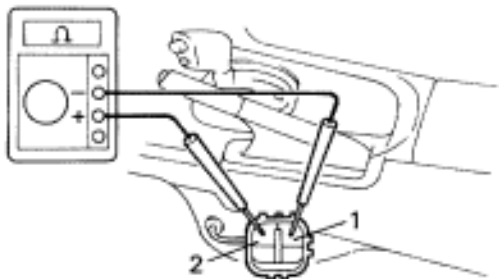
C Measure voltage between terminal HT3 of engine control module connector and body ground.

OK Voltage: 9 — 14 V

NG

OK

Go to step **4**.

2**Check sub heated oxygen sensor heater.**

P11483

- P** Disconnect sub heated oxygen sensor connector. (See page [EG-250](#))
- C** Measure resistance between terminals 1 and 2 of sub heated oxygen sensor connector.
- OK** Resistance: 11 — 16 at 20°C (68°F)

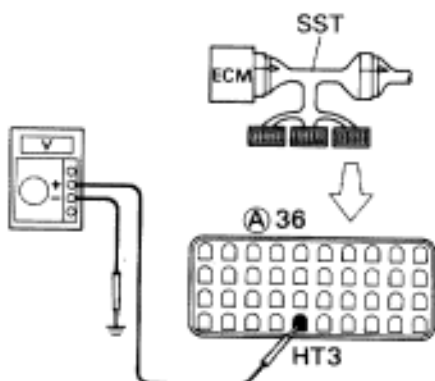
OK**NG**

Replace sub heated oxygen sensor.

3**Check for open and short in harness and connector between EFI main relay and engine control module (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

4**Check voltage between terminal HT3 of engine control module connector and body ground.**

FI6891

- P** Warm up engine to normal operating temperature.
- C** Measure voltage between terminal HT3 of engine control module connector and body ground, when engine is idling and racing at 3,500 rpm.

OK

	Voltage
Idling	0 V
Racing at 3,500 rpm	9 — 14 V

NG**OK**

Replace sub heated oxygen sensor.

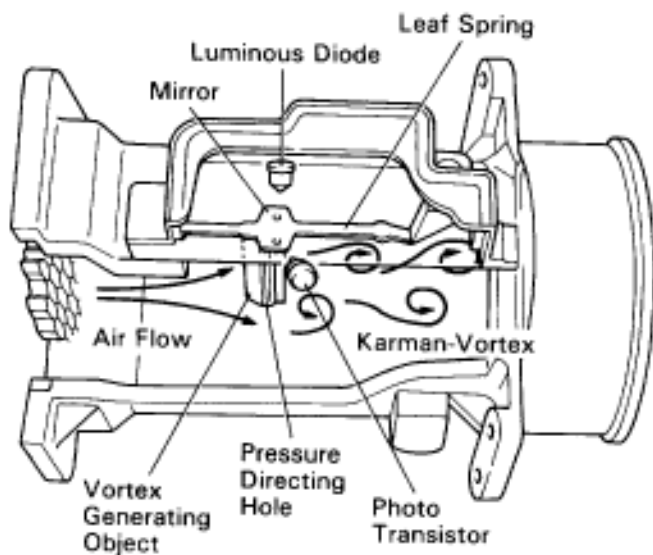
Check and replace engine control module.

*: It is probable the oxygen sensor has deteriorated. Usually, this cannot be confirmed by visual inspection.

DTC 31 Volume Air Flow Meter Circuit

CIRCUIT DESCRIPTION

As shown in the figure at right, when a pillar (Vortex generating body) is placed in the path of a uniform flow, vortices called Karman-Vortex are generated downstream of the object. Using this principle, a vortex generator is placed inside the volume air flow meter. By measuring the frequency of the vortices generated, the ECM can determine the volume of air flowing through the volume air flow meter. The vortices are detected by their exerting pressure on thin metal foil mirror) surfaces and a light emitting element and light receptor (LED and photo transistor) positioned opposite the mirror which optically senses the vibrations in the mirror. The ECM uses these signals mainly for calculation of the basic injection volume and the basic ignition advance angle.

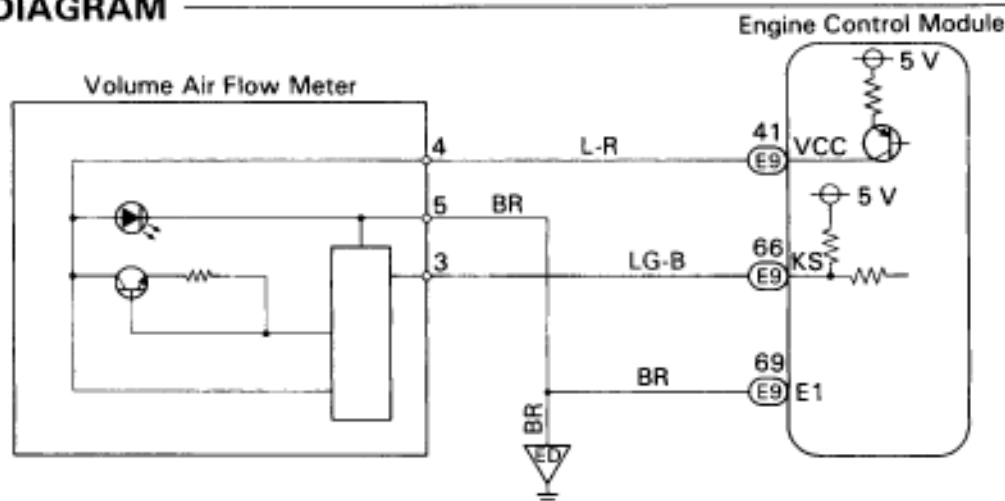


Karman-Vortex

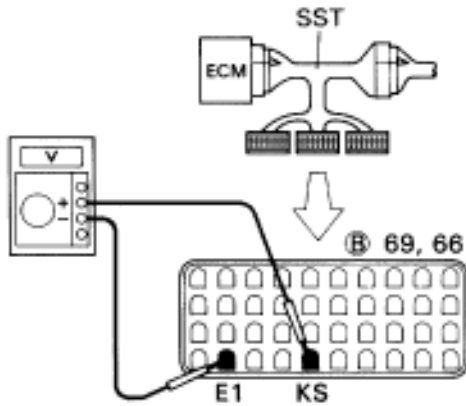
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
31	All conditions below are detected: (a) No volume air flow meter signal to ECM for 2 sec. when engine speed is above 300 rpm (b) Engine stall	Open or short in volume air flow meter circuit Volume air flow meter ECM

If the ECM detects diagnostic trouble code "31", it operates the fail safe function, keeping the ignition timing and fuel injection volume constant and making it possible to drive the vehicle.

WIRING DIAGRAM



INSPECTION PROCEDURE

1**Check voltage between terminals KS and E1 of engine control module connector.****START**WE6653
FI6502**P**

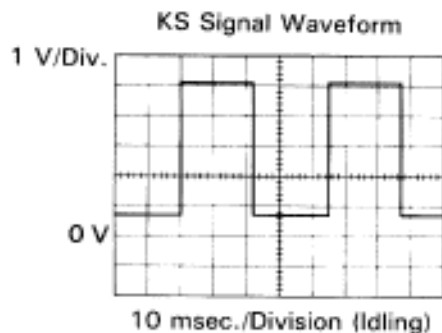
Connect SST (check harness "A").
(See page [EG-404](#))
SST 09990-01000

C

Measure voltage between terminals KS and E1 of engine control module connector while engine is cranked.

OK

Voltage: 2.0 — 4.0 V
(Neither 0 V nor 5 V)

Reference**INSPECTION USING OSCILLOSCOPE**

FI6512

During cranking or idling, measure waveform between terminals KS and E1 of engine control module.

HINT: The correct waveform is as shown.

NG**OK**

When diagnostic trouble code 31 is displayed, check and replace engine control module.

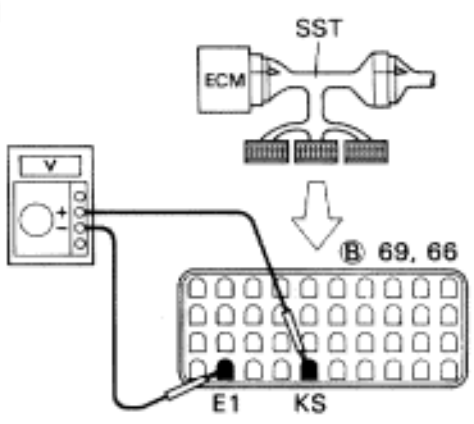
2**Check for open and short in harness and connector between engine control module and volume air flow meter (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

3

Disconnect volume air flow meter connector and check voltage between terminals KS and E1 of engine control module connector.

ON



- P** (1) Disconnect the volume air flow meter connector.
(2) Turn ignition switch ON.

C Measure voltage between terminals KS and E1 of engine control module connector.

OK Voltage: 4.5 — 5.5 V

OK

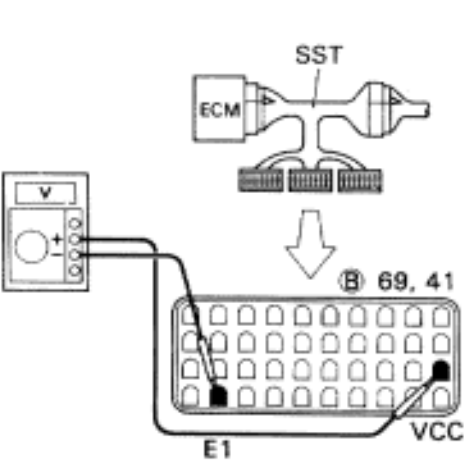
NG

Check and replace engine control module.

4

Disconnect volume air flow meter connector and check voltage between terminals VCC and E1 of engine control module connector.

ON



- P** (1) Disconnect the volume air flow meter connector.
(2) Turn ignition switch ON.

C Measure voltage between terminals VCC and E1 of engine control module connector.

OK Voltage: 4.5 — 5.5 V

NG

OK

Replace volume air flow meter.

Check and replace engine control module.

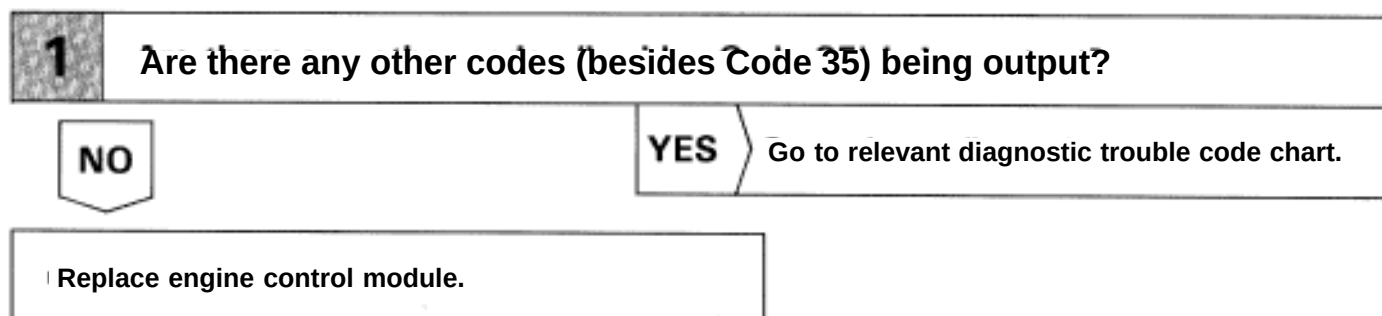
DTC 35 Barometric Pressure Sensor Circuit

CIRCUIT DESCRIPTION

The BARO sensor is built into the ECM. This is a semiconductor pressure sensor with properties which cause its electrical resistance to change when stress is applied to the sensor's crystal (silicon) (piezoelectric effect). This sensor is used to detect the atmospheric (absolute) pressure and outputs corresponding electrical signals. Fluctuations in the air pressure cause changes in the intake air density, which can cause deviations in the air-fuel ratio. The signals from BARO sensor are used to make corrections for these fluctuations. If the ECM detects diagnostic trouble code "35", the fail safe function operates and the atmospheric pressure is set at a constant 101.3 kPa (760 mmHg, 29.92 in.Hg).

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
35	Open or short in BARO sensor circuit for 0.5 sec. or more	ECM

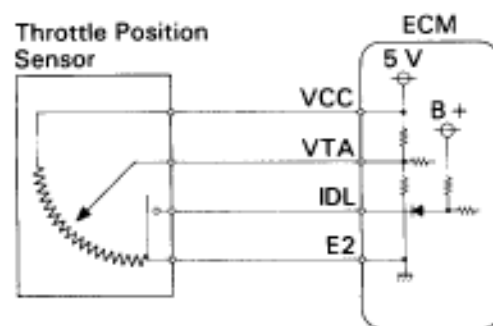
INSPECTION PROCEDURE



DTC 41 Throttle Position Sensor Circuit

CIRCUIT DESCRIPTION

The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, the IDL contacts in the throttle position sensor are on, so the voltage at the terminal IDL of the ECM becomes 0 V. At this time, a voltage of approximately 0.7 V is applied to the terminal VTA of the ECM. When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal IDL of the ECM. The voltage applied to the terminal VTA of the ECM increases in the proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicles driving conditions from these signals input from the terminals VTA and IDL, and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.



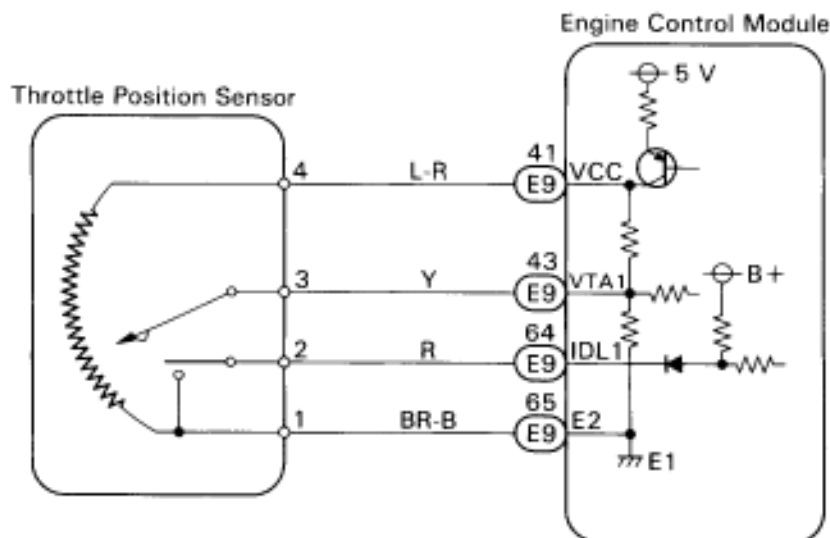
F16571

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
41	Open or short in throttle position sensor circuit for 0.5 sec. or more	Open or short in throttle position sensor circuit Throttle position sensor ECM

HINT:

When the connector for the throttle position sensor is disconnected, diagnostic trouble code 41 is not displayed. Diagnostic trouble code 41 is displayed only when there is an open or short in the VTA signal circuit of the throttle position sensor.

WIRING DIAGRAM



F16941

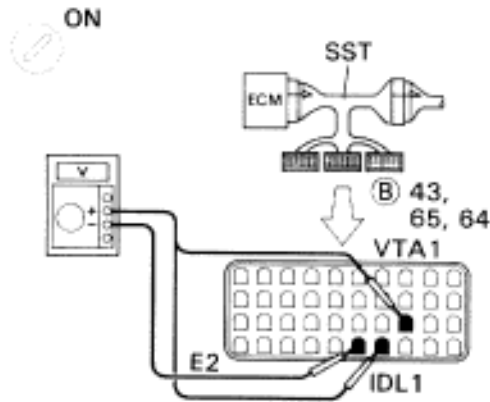
INSPECTION PROCEDURE

HINT:

- If diagnostic trouble code "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1

Check voltage between VTA1, IDL1 and E2 of engine control module connector.



P

(1) Connect SST (check harness "A").

(See page [EG-404](#))

SST 09990-01000

(2) Turn ignition switch ON.

(3) Disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener. (See page [EG-219](#))

C

Measure voltage between terminals VTA1, IDL1 and E2 of engine control module connector when the throttle valve is opened gradually from the closed condition.

OK

Terminal	VTA1 – E2	IDL1 – E2
Throttle Valve		
Fully Closed	0.3 – 0.8 V	0 – 3.0 V
Fully Open	3.2 – 4.9 V	9 – 14 V

Hint

The voltage should increase steadily in proportion to the throttle valve opening angle.

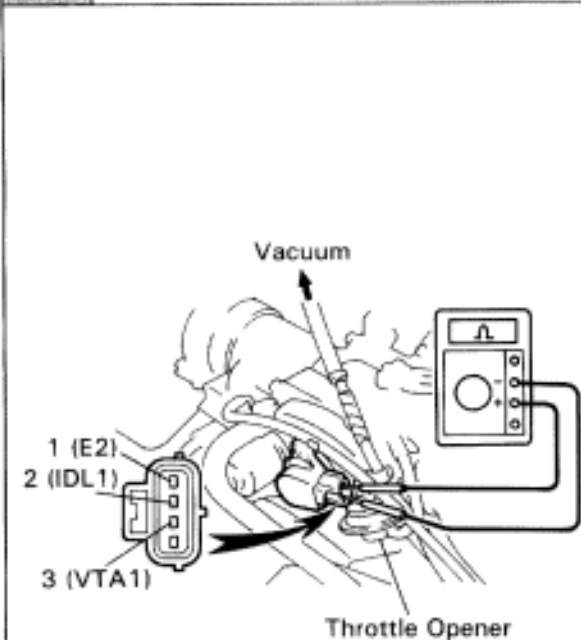
NG

OK

Check for intermittent problems.
(See page [EG-399](#))

2

Check throttle position sensor



P11462

P

- (1) Disconnect throttle position sensor connector.
- (2) Disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener. (See page [EG-219](#))

C

Measure resistance between terminals 3 (VTA1), 2 (IDL1) and 1 (E2) of throttle position sensor connector when the throttle valve is opened gradually from the closed condition.

OK

Terminal	3 (VTA1) – 1 (E2)	2 (IDL1) – 1 (E2)
Throttle Valve		
Fully Closed	0.3 – 6.3 kΩ	Less than 0.5 kΩ
Fully Open	2.4 – 11.2 kΩ	1 MΩ or higher

Hint

Resistance between terminals 3 (VTA1) and 1 (E2) should increase gradually in accordance with the throttle valve opening angle.

OK

NG

Adjust or replace throttle position sensor. (see page [EG-223](#))

3

Check for open and short in harness and connector between engine control module and throttle position sensor (See page [IN30](#)).

OK

NG

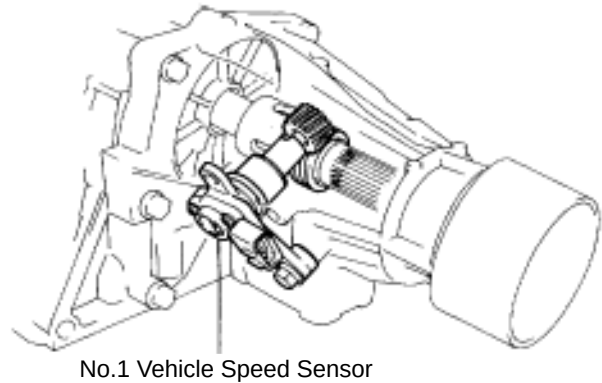
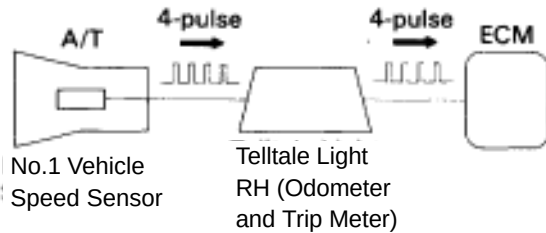
Repair or replace harness or connector.

Check and replace engine control module.

DTC 42 No.1 Vehicle Speed Sensor Signal Circuit

CIRCUIT DESCRIPTION

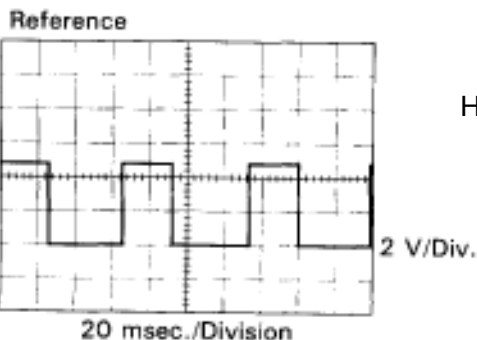
The No.1 vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the odometer and trip meter, it is then transmitted to the engine control module. The ECM determines the vehicle speed based on the frequency of these pulse signals.



F6643 F6644

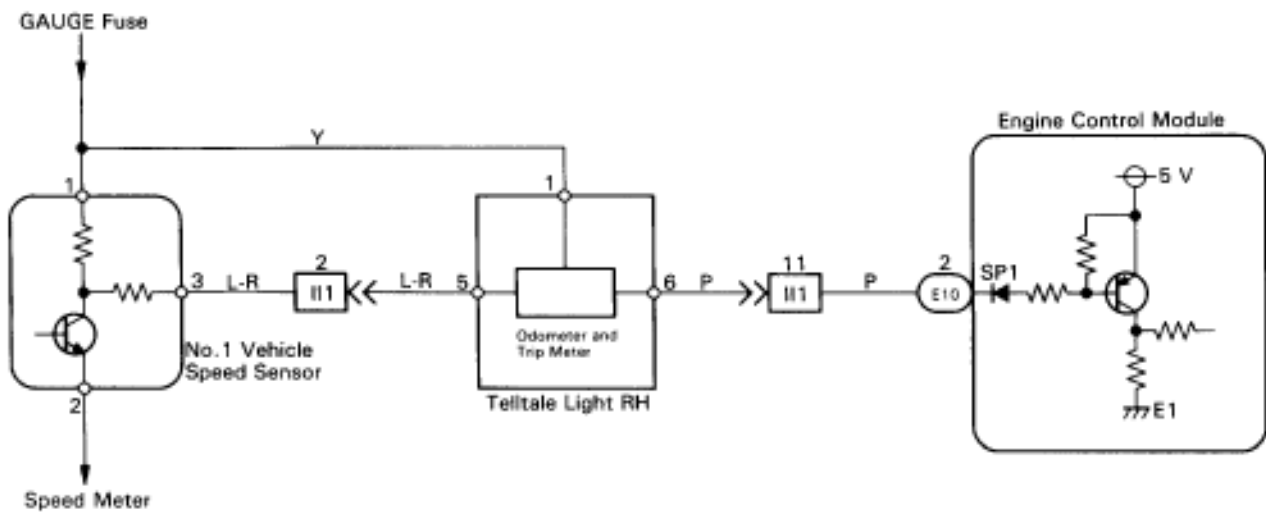
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
42	For A/T All conditions below are detected continuously for 8 sec. or more: (a) No.1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: 3,000 rpm or more (c) Park/neutral position switch: OFF (d) Stop light switch: OFF	No.1 Vehicle speed sensor Telltale light RH (Odometer and trip meter) Open or short in No.1 vehicle speed sensor circuit ECM
	For A/T All conditions below are detected continuously for 8 sec. or more: (a) No.1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: Between 2,000 rpm and 5,000 rpm (c) Engine coolant temp.: 80°C (176°F) or more (d) Load driving	

HINT: In test mode, diagnostic trouble code 42 is output when vehicle speed is 5 km/h (3 mph) or below.



Waveform between terminals SP1 and E1 when vehicle speed is approx. 20 km/h (12mph).

HINT: As the vehicle speed increases, the number of signals from SP1 increases.

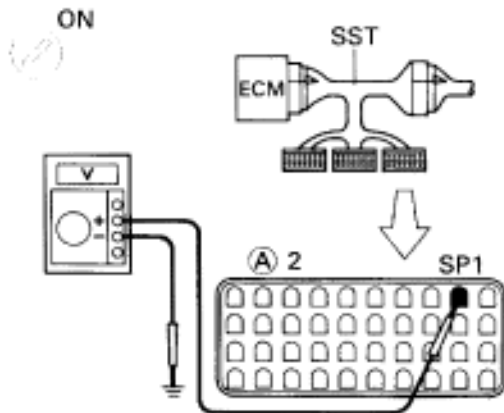
WIRING DIAGRAM

F16931

INSPECTION PROCEDURE

1

Check voltage between terminal SP1 of engine control module connector and body ground.

BE6653
FI6504**P**

- (1) Shift the shift lever to N position.
- (2) Jack up one of the rear wheel.
- (3) Connect SST (check harness "A").
(See page EG-404)

SST 09990-01000

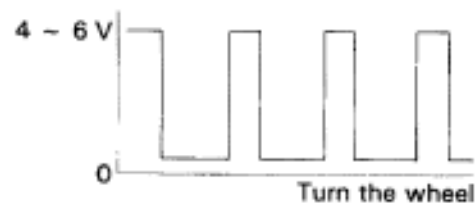
- (4) Disconnect power steering ECU connector and cruise control ECU connector.
- (5) Turn ignition switch ON.

C

Measure voltage between terminal SP1 of engine control module connector and body ground when the wheel is turned slowly.

OK

Voltage is generated intermittently.



AT7509

NG**OK**

Check and replace engine control module.

2

Check operation of odometer and trip meter (telltale light RH (See page BE-48)).

NG**OK**

Repair or replace harness or connector between ECM and telltale light RH.

3

Check operation of No.1 vehicle speed sensor (See page BE-46).

NG**OK**

Repair or replace harness or connector between telltale light RH and No.1 vehicle speed sensor.

Replace No.1 vehicle speed sensor.

INSPECTION PROCEDURE

HINT: This diagnostic chart is based on the premise that the engine is being cranked under normal conditions.

If the engine does not crank, proceed to the matrix chart of problem symptoms on page [EG–408](#).

1	Check output condition of diagnostic trouble code 43.	
 CHECK FI6914	P Setting the test mode. (1) Turn ignition switch OFF. (2) Connect terminals TE2 and E1 of DLC2. (3) Turn ignition switch ON. (Don't start the engine) (4) Connect terminals TE1 and E1 of DLC2. C Check if code "43" is output by the malfunction indicator lamp. OK Code "43" is output. C Start the engine. Check if code "43" disappears. OK Code "43" is not output.	
	NG	
OK Proceed to next circuit inspection shown on matrix chart (See page EG–408).		
2	Check for open in harness and connector between engine control module and starter relay (See page IN–30).	
OK	NG	Repair or replace harness or connector.
		Check and replace engine control module.

DTC 52 53 55 Knock Sensor Circuit

CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the front and rear of the left side 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.

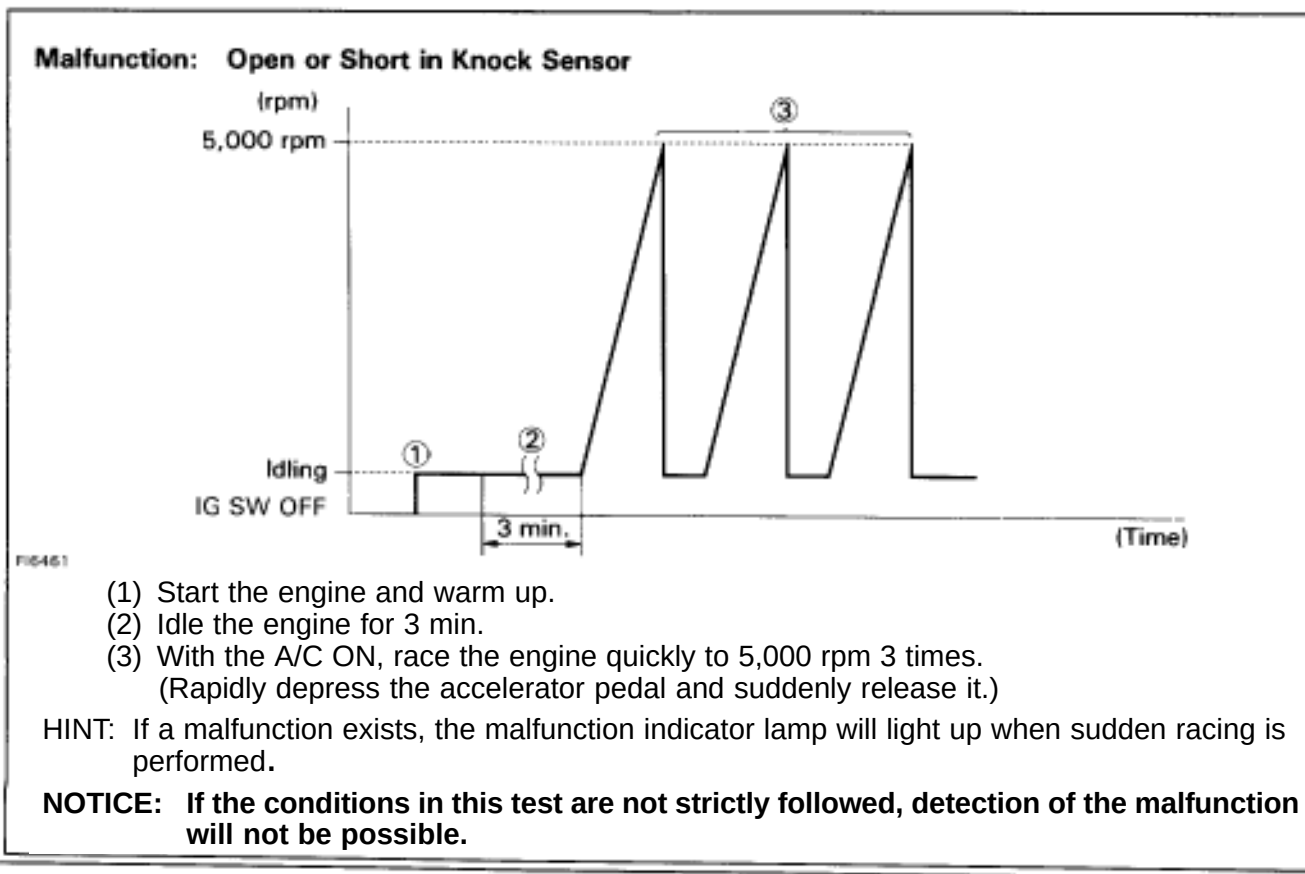
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
52	No No.1 knock sensor signal to ECM for 4 crank revolutions with engine speed between 1,600 rpm and 5,200 rpm	Open or short in No.1 knock sensor circuit No.1 knock sensor (looseness) ECM
53	Engine control computer (for knock control) malfunction at engine speed between 650 rpm and 5,200 rpm	ECM
55	No No.2 knock sensor signal to ECM for 4 crank revolutions with engine speed between 1,600 rpm and 5,200 rpm	Open or short in No.2 knock sensor circuit No.2 knock sensor (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.

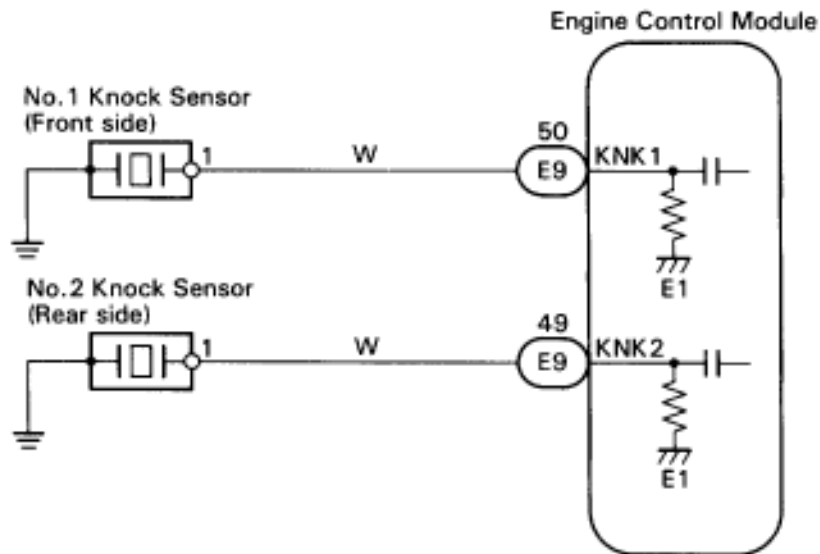
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

- To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- To check that the malfunction is corrected when the repair is completed by confirming that diagnostic trouble code is no longer detected.



WIRING DIAGRAM



FI6541

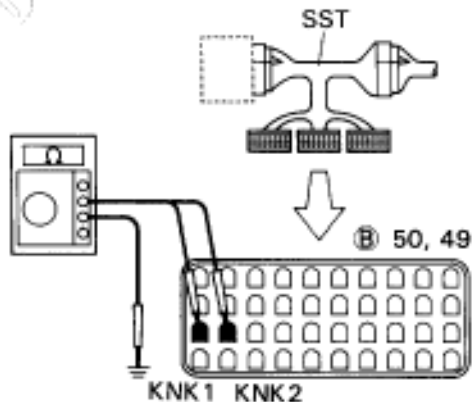
INSPECTION PROCEDURE

HINT: If diagnostic trouble code 52 is displayed, check No.1 knock sensor (for front side) circuit.
 If diagnostic trouble code 55 is displayed, check No.2 knock sensor (for rear side) circuit.
 If diagnostic trouble code 53 is displayed, replace engine control module.

1

Check continuity between terminals KNK1, KNK2 of engine control module connector and body ground.

LOCK

816653
FI6506

P

(1) Connect SST (check harness "A").
 (See page [EG-404](#))
 SST 09990-01000

(2) Disconnect the engine control module connectors.

C

Measure resistance between terminals KNK1, KNK2 of engine control module connector and body ground.

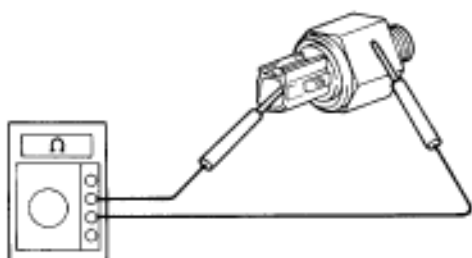
OK

Resistance: 1 M or higher

NG

OK

Go to step **3**.

2**Check knock sensor.**

FI6630

OK**P**

Disconnect knock sensor connector.

C

Measure resistance between the knock sensor terminal and body.

OK**Resistance: 1 M or higher****NG**Replace knock sensor. (See page [EG-245](#))**3****Check for open and short in harness and connector between engine control module and knock sensor (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

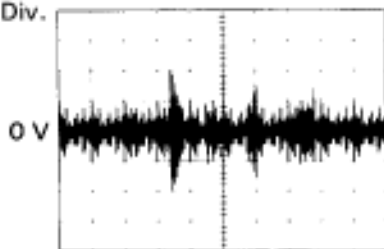
4**Does malfunction disappear when a good knock sensor is installed?****NO****YES**Replace knock sensor. (See page [EG-245](#))

Check and replace engine control module.

Reference**INSPECTION USING OSCILLOSCOPE**

KNK Signal Waveform

0.5 V/Div.

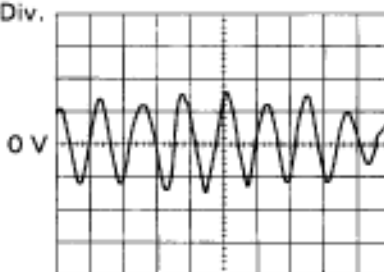


5 msec./Division

With the engine racing (4,000 rpm) measure waveform between terminals KNK1, KNK2 of engine control module and body ground.

HINT: The correct waveform is as shown.

0.5 V/Div.



100 Ωsec./Division

Spread the time on the horizontal axis, and confirm that the period of the wave is 123 Ωsec. (Normal mode vibration frequency of knock sensor: 8.1 KHz).

HINT: If normal mode vibration frequency is not 8.1 KHz, the sensor is malfunctioning.

FI6510
FI6642

DTC 71 EGR System Malfunction

CIRCUIT DESCRIPTION

The EGR system is designed to recirculate the exhaust gas, controlled according to the driving conditions, back into the intake air-fuel mixture. It helps to slow down combustion in the cylinder and thus lower the combustion temperature which, in turn, reduces the amount of NOx emission. The amount of EGR is regulated by the EGR vacuum modulator according to the 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).

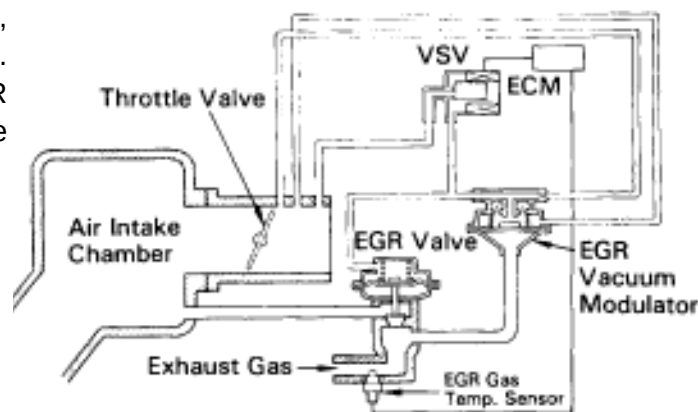
Engine coolant temp. below 50°C (122°F)

During deceleration (Throttle valve closed)

Light engine load (amount of intake air very small).

Engine speed over 5,200 rpm

Traction control is operating



F16895

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
71	EGR gas temp. is 70°C (158°F) or less for 1 ~ 4 min. under conditions (a) and (b): (2) trip detection logic)* (a) Engine coolant temp.: 63°C (145°F) or more (b) EGR operation possible (Example A/T in 3rd speed (5th for M/T), A/C ON, 96 km/h (60 mph), Flat road)	Open in EGR gas temp. sensor circuit Short in VSV circuit for EGR EGR hose disconnected, valve stuck Clogged EGR gas passage ECM

(See page [EG-397](#)).

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

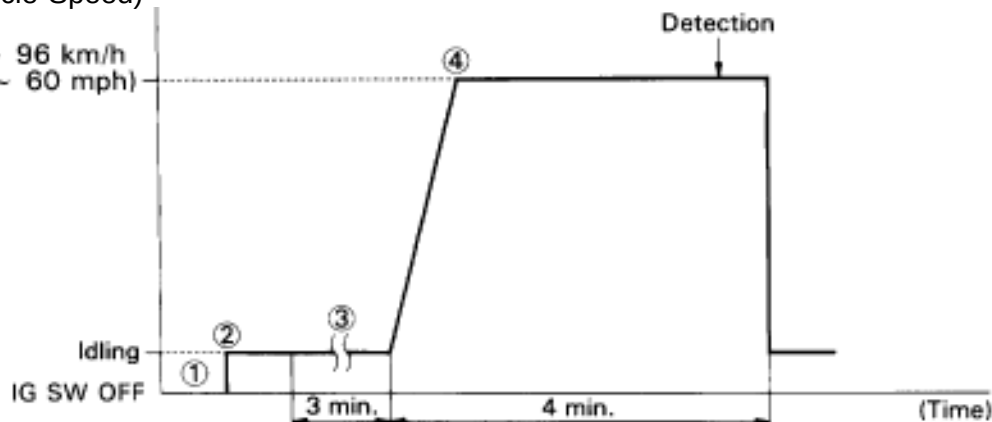
Purpose of the driving pattern.

- To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- To check that the malfunction is corrected when the repair is completed by confirming that diagnostic trouble code is no longer detected.

CIRCUIT DESCRIPTION (Cont'd)

Malfunction: Open in EGR Gas Temp. Sensor Circuit

(Vehicle Speed)

88 ~ 96 km/h
(55 ~ 60 mph)

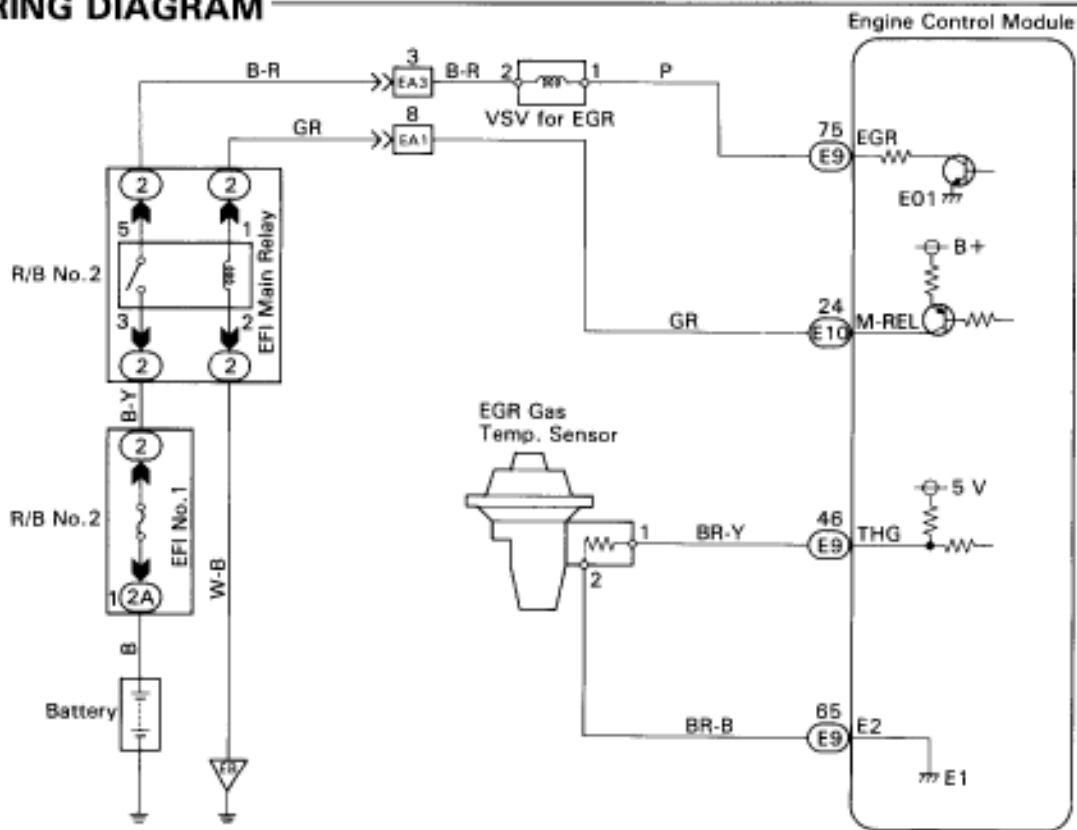
F16528

- (1) Disconnect the EFI No.1 fuse (30A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start engine and warm up.
- (3) Idle the engine for 3 min.
- (4) With the A/C ON and transmission in 5th position (A/T in 3rd speed) drive at 88 ~ 96 km/h (55 ~ 60 mph) for 4 min. or less.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (4).

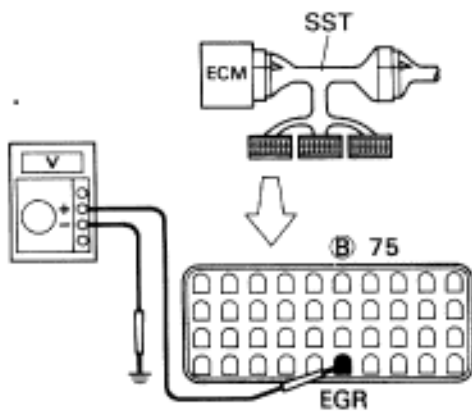
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

WIRING DIAGRAM



F16949

INSPECTION PROCEDURE

1**Check voltage between terminal EGR of engine control module connector and body ground.**

F16620

P

(1) Connect SST (check harness "A").

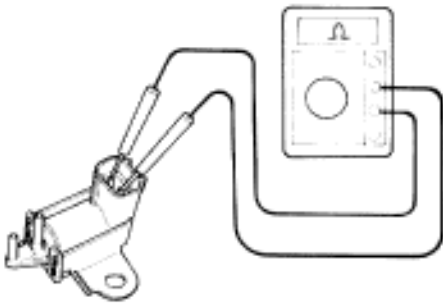
(See page [EG-404](#))

SST 09990-0100

(2) Warm up engine to normal operating temperature.

C

Measure voltage between terminal EGR of engine control module connector and body ground.

OK**Voltage: 9 — 14 V****NG****OK**Go to step **4**.**2****Check resistance between terminals of VSV for EGR.**

F16632

PRemove VSV for EGR. (See page [EG-240](#))**C**

Measure resistance between terminals of VSV for EGR.

OK**Resistance: 38.5 — 44.5 at 20°C (68°F)****OK****NG**

Replace VSV for EGR.

3**Check for open and short in harness and connector between EFI main relay and VSV for EGR, VSV for EGR and engine control module. (See page [IN-30](#))****OK****NG**

Repair or replace harness of connector.

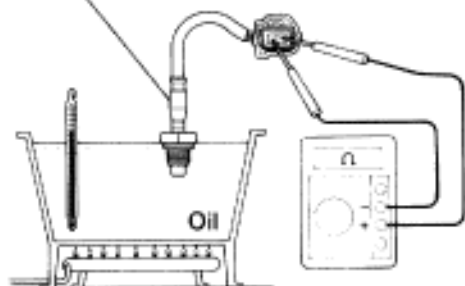
Check and replace engine control module.

4**Check EGR system (See page Eg-168).****OK****NG**

Repair EGR system.

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

EGR Gas Temp. Sensor



P03193

P

Remove EGR gas temp. sensor.

C

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

OK

Resistance: 64 — 97 k at 50°C (122°F)
11 — 16 k at 100°C (212°F)
2 — 4 k at 150°C (302°F)

OK**NG**

Replace EGR gas temp. sensor.

6**Check for open in harness and connector between EGR gas temp. sensor and engine control module. (See page IN-30)****OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

DTC 78 Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

The fuel pump speed is controlled at 2 steps (high speed, low speed) by the condition of the engine (starting, light load, heavy load), when the engine starts (STA ON), the engine control module sends a Hi signal (battery positive voltage) to the fuel pump ECU (FPC terminal).

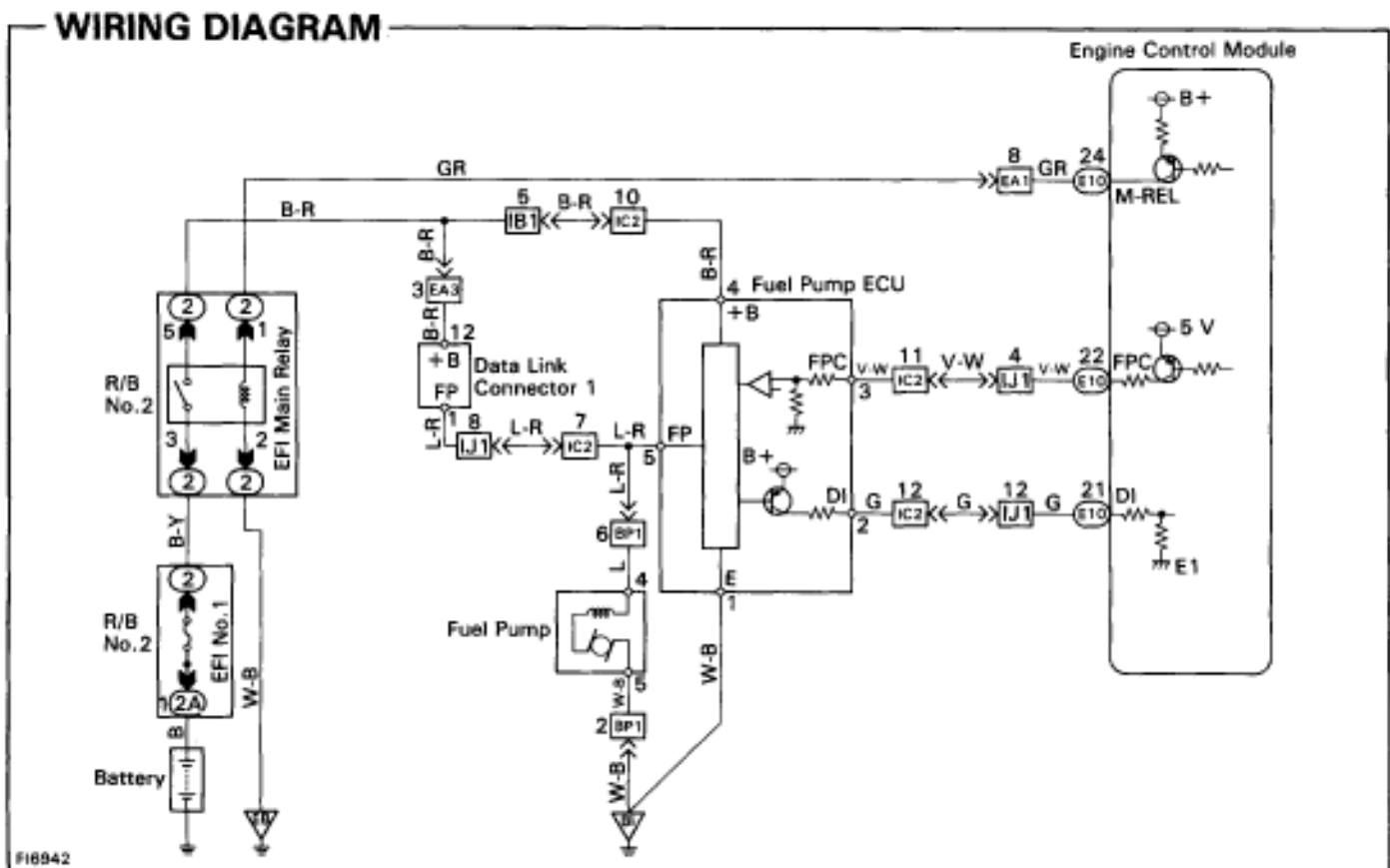
The fuel pump ECU then outputs Hi voltage (battery positive voltage) to the fuel pump so that the fuel pump operates at high speed.

After the engine starts, during idling or light loads, the engine control module outputs a Low signal (about 9 V) to the fuel pump ECU, the fuel pump ECU outputs Lo battery voltage (about 9 V) to the fuel pump and causes the fuel pump to operate at low speed.

If the intake air volume increases (high engine load), the engine control module sends a Hi signal to the fuel pump ECU and causes the fuel pump to operate at high speed.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
78	(1) Open or short in fuel pump circuit for 1 sec. Or more with engine speed 1,000 rpm or less (2 trip detection logic)*	Open or short in fuel pump ECU circuit Fuel pump ECU Engine control module power source circuit Fuel pump Engine control module
	(2) Open in input circuit of fuel pump ECU (FPC) with engine speed 1,000 rpm or less (2 trip detection logic)*	
	(3) Open or short in diagnostic signal line (DI) of fuel pump ECU with engine speed 1,000 rpm or less (2 trip detection logic)*	

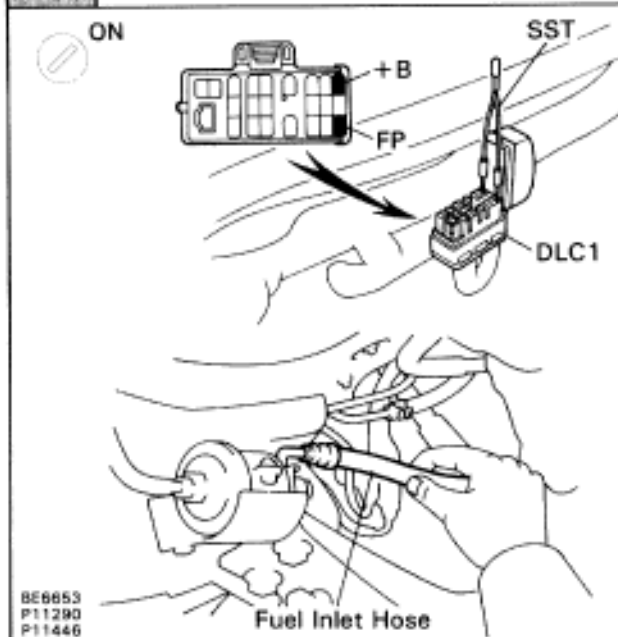
*: See page [EG-397](#).



INSPECTION PROCEDURE

1

Check fuel pump operation.


P

- (1) Turn ignition switch ON.
- (2) Using SST, connect terminals +B and FP of data link connector1.
SST 09843-18020

C

Check that there is pressure in the hose from the fuel filter.

OK

Fuel pressure can be felt.

OK
NG

Go to step **3**.

2

Check for open and short in harness and connector between terminals +B ↔ +B, FP ↔ FP of the data link connector 1 and fuel pump ECU (See page [IN-30](#)).

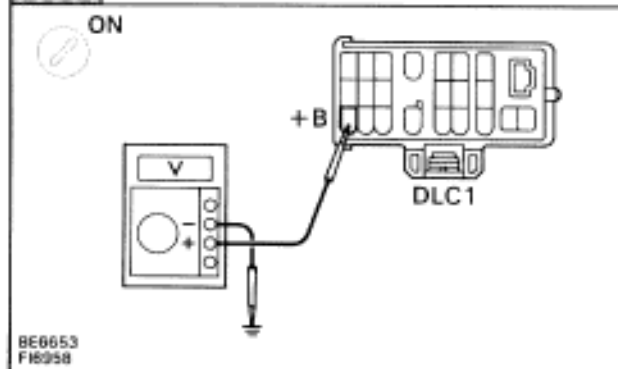
NG
OK

Go to step **5**.

Repair or replace harness or connector.

3

Check voltage of terminal +B of data link connector 1.


P

Turn ignition switch ON.

C

Measure voltage between terminal +B of data link connector 1 and body ground.

OK

Fuel pressure can be felt.

OK
NG

Check for ECM power source circuit (See page [EG-465](#)), and check for open in harness and connector between terminal +B of data link connector 1 and main relay.

4

Check for open and short in harness and connector between terminal FP of data link connector 1, fuel pump and body ground (see page IN-30).

NG**OK**

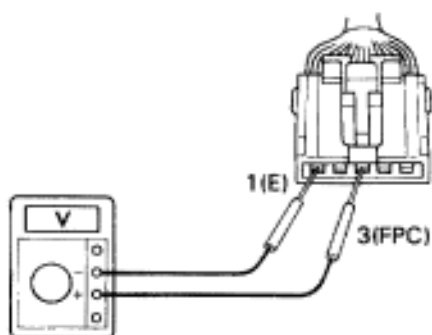
Repair or replace fuel pump.

Repair or replace harness or connector.

5

Check voltage between terminals 3 (FPC) and 1 (E) of fuel pump ECU connector.

START

856653
F16468**P**

- (1) Remove the LH quarter trim panel.
(See page EG-252)
- (2) Disconnect fuel pump ECU connector.

C

Measure voltage between terminals 3 (FPC) and 1 (E) of fuel pump ECU connector when ignition switch is turned to START.

OK

Voltage: 4.5 — 5.5 V

NG**OK**

Replace fuel pump ECU.

6

Check for open in harness and connector between terminal FPC of engine control module and terminal 3 (FPC) of fuel pump ECU, terminal 1 (E) of fuel pump ECU and body ground (See page IN-30).

OK**NG**

Repair or replace harness or connector.

7

Check for open and short in harness and connector between terminal DI of engine control module and terminal 2 (DI) of fuel pump ECU (See page IN-30).

OK**NG**

Repair or replace harness or connector.

Check and replace engine control module.

DTC 51 Switch Condition Signal Circuit

CIRCUIT DESCRIPTION

Park/Neutral Position Switch

The ECM uses the signals from the park/neutral position switch to determine whether the transmission is in park or neutral, or in some other position.

Air Conditioning Switch Signal

The ECM uses the output from the air conditioning switch to determine whether or not the air conditioning is operating so that it can increase the idling speed of the engine if necessary.

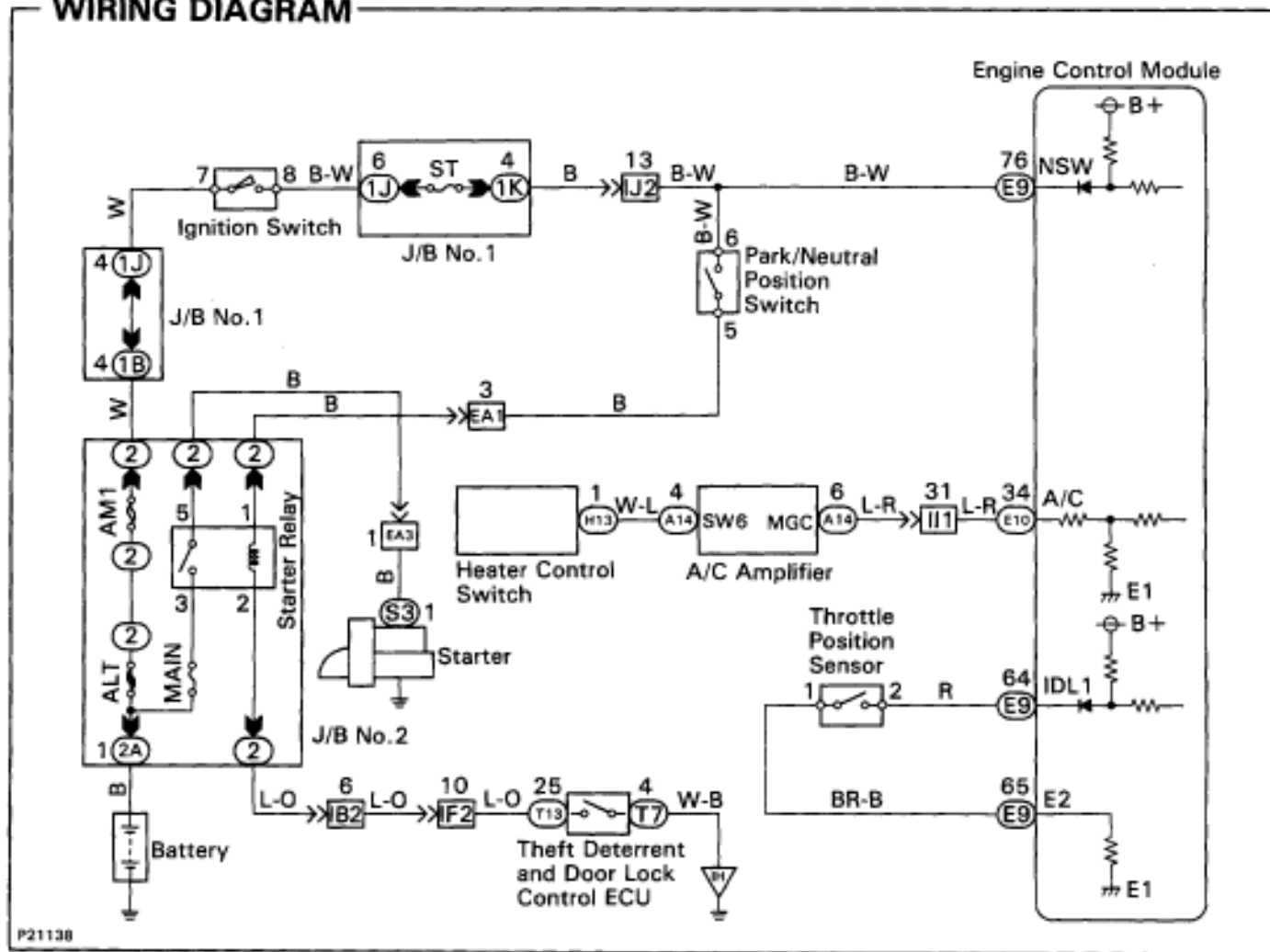
Throttle Position Sensor IDL Signal

The IDL contacts are mounted in the throttle position sensor, and detects the idle condition.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
51	(1) 3 sec. or more after engine starts with closed throttle position switch OFF (IDL1) (2) Park/neutral position switch: OFF (Shift position in "R", "D", "2" or "L" position.) (3) A/C switch ON	Throttle position sensor IDL circuit Accelerator pedal and cable Park/neutral position switch A/C switch circuit ECM

HINT: In this circuit, diagnoses can only be made in the test mode.

WIRING DIAGRAM



INSPECTION PROCEDURE

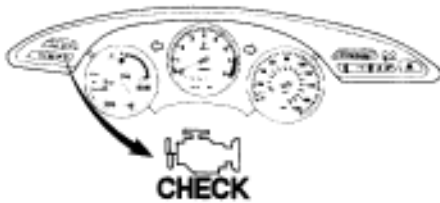
1**Check output condition of diagnostic trouble code 51.**

FIG 814

P

Setting the test mode.

- (1) Turn ignition switch OFF.
- (2) Connect terminals TE2 and E1 of DLC2.
- (3) Turn ignition switch ON.
(For checking terminal IDL, disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener (See page [EG-219](#))).
(For checking terminal A/C, start the engine.)
- (4) Connect terminals TE1 and E1 of DLC1 or DLC2.

C

Check if code "51" is output by the malfunction indicator lamp.

OK

	Condition	Code
Park/Neutral Position Switch (PNP)	P or N position	Normal*
	R, D, 2 or L position	51*
Throttle Position Sensor (IDL1)	Accelerator pedal released	Normal*
	Accelerator pedal depressed	51*
A/C Switch (A/C)	A/C SW ON	51
	A/C SW OFF	Normal

*: Before the STA signal is input (ST is not ON), diagnostic trouble code 43 is also output.

Hint

Diagnostic trouble code 42 is output with vehicle speed 5 km/h (3 mph) or below.

OK**NG**

IDL1...Go to step [2].
PNP....Go to page [EG-463](#).
A/C....Go to step [3].

Proceed to next circuit inspection shown on matrix chart (See page [EG-408](#)).

2**Check throttle position sensor.**

P11482

OK**P**

- (1) Disconnect throttle position sensor connector.
- (2) Disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener (See page EG-219).

C

Measure resistance between terminals 2 (IDL1) and 1 (E2) of throttle position sensor connector.

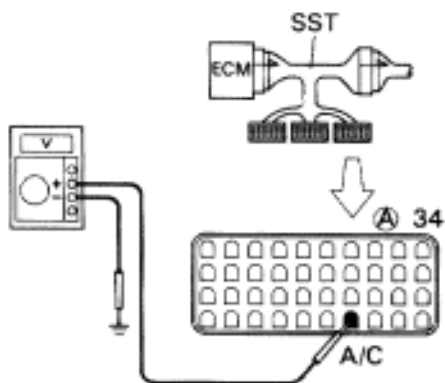
OK

Throttle Valve	Resistance
Fully closed	Less than 0.5 kΩ
Opened	1 MΩ or higher

NG

Adjust or replace throttle position sensor.
(See page EG-223)

Check and repair harness or connector between engine control module and throttle position sensor.

3**Check voltage between terminal A/C of engine control module connector and body ground.**

F16893

OK**P**

- (1) Connect SST (check harness "A").
(See page EG-404)
SST 09990-01000
- (2) Start the engine.

C

Measure voltage between terminal A/C of engine control module and body ground.

OK

A/C Switch	Voltage
OFF	7.5 - 14 V
ON	0 - 1.5 V

NG

Check A/C compressor circuit.
(See page AC-62)

Check and replace engine control module.

Park Neutral Position Switch Circuit

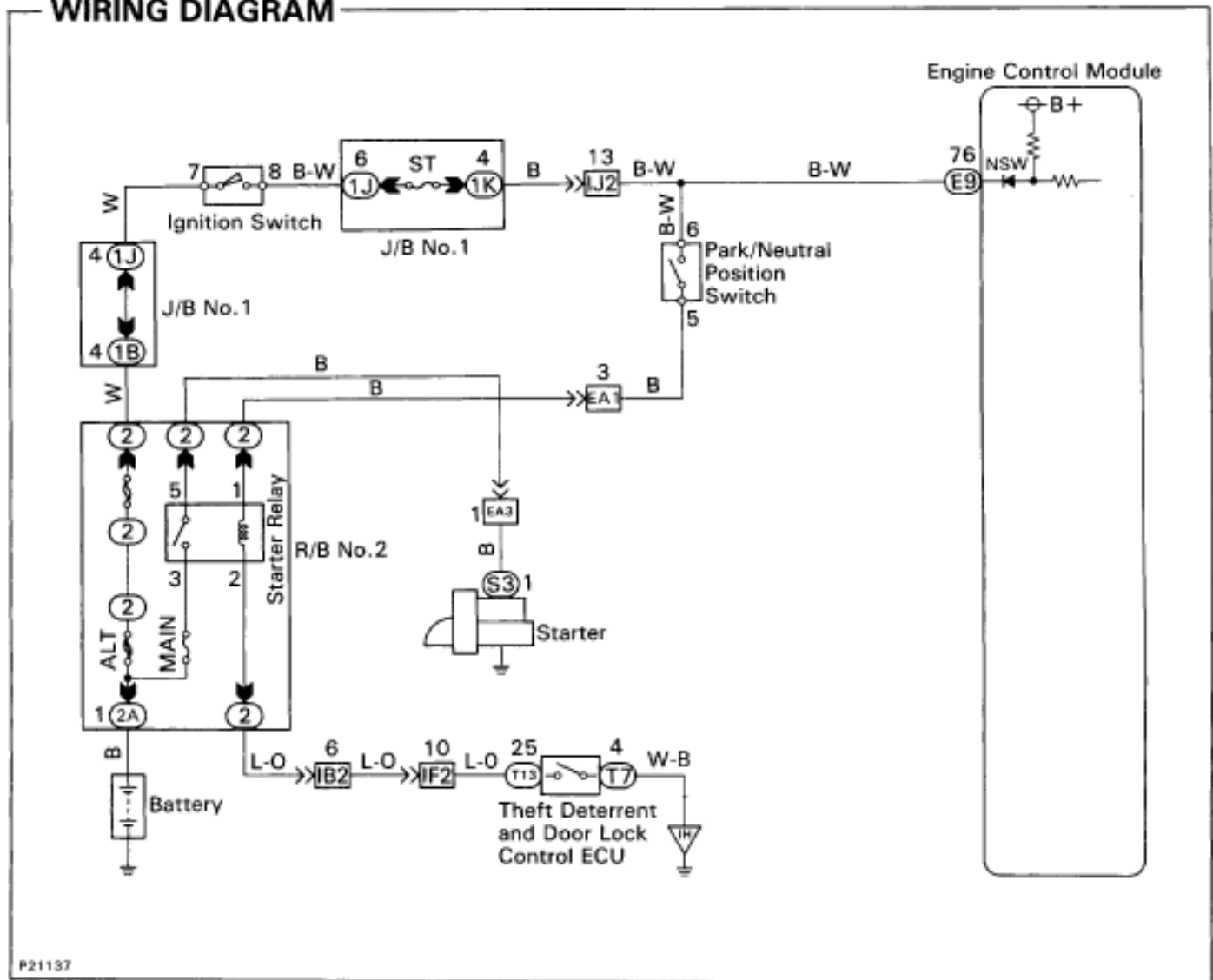
CIRCUIT DESCRIPTION

The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on the terminal NSW of the ECM is grounded to body ground via the starter relay and theft deterrent ECU, 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 positive battery voltage, the voltage of the ECM internal power source.

If the shift lever is moved from the N position to the D position, this signal is used for air-fuel ratio correction and for idle speed control (estimated control), etc.

When the park/neutral position switch is off, code "51" is output in the test mode diagnosis. (This is not abnormal.)

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT: This diagnostic chart is based on the premise that the engine is being cranked under normal conditions.
If the engine does not crank, proceed to the matrix chart of problem symptoms on page [EG-408](#).

1

Check output condition of diagnostic trouble code 51



F16914

P

(1) Connect terminals TE2 and E1 of DLC2.
(2) Turn ignition switch ON.
(3) Crank the engine.
(4) Connect terminals TE1 and E1 of DLC2.

C

Check if diagnostic trouble code "51" is output when the shift lever is in the P and D shift positions.

Result

Shift Position	Result		
	OK	NG Type I	NG Type II
"P"	Normal Code	Code 51	Normal Code
"D"	Code 51	Code 51	Normal Code

OK

NG Type I

Go to step 2.

NG Type II

Go to step 3.

Proceed to next circuit inspection shown on matrix chart (See page [Eg-408](#)).

2

Check for open in harness and connector between engine control module and park/neutral position switch (See page [IN-30](#)).

NG

OK

Check and replace engine control module.

Repair or replace harness or connector.

3

Check park/neutral position switch (See page [AT1-81](#)).

OK

NG

Replace park/neutral position switch.

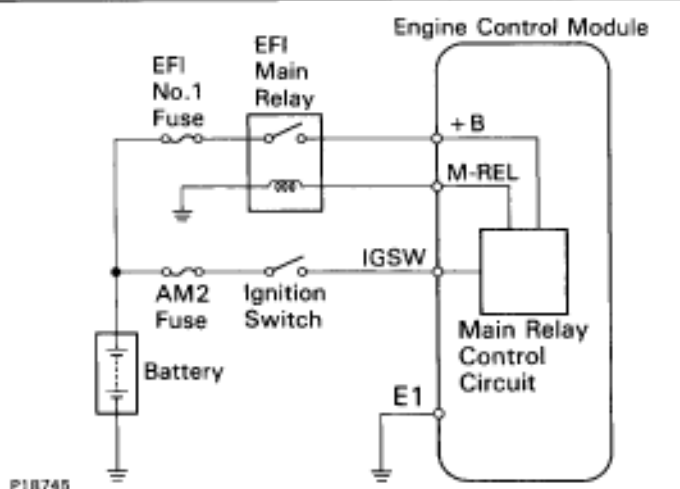
Check and replace engine control module.

ECM Power Source Circuit

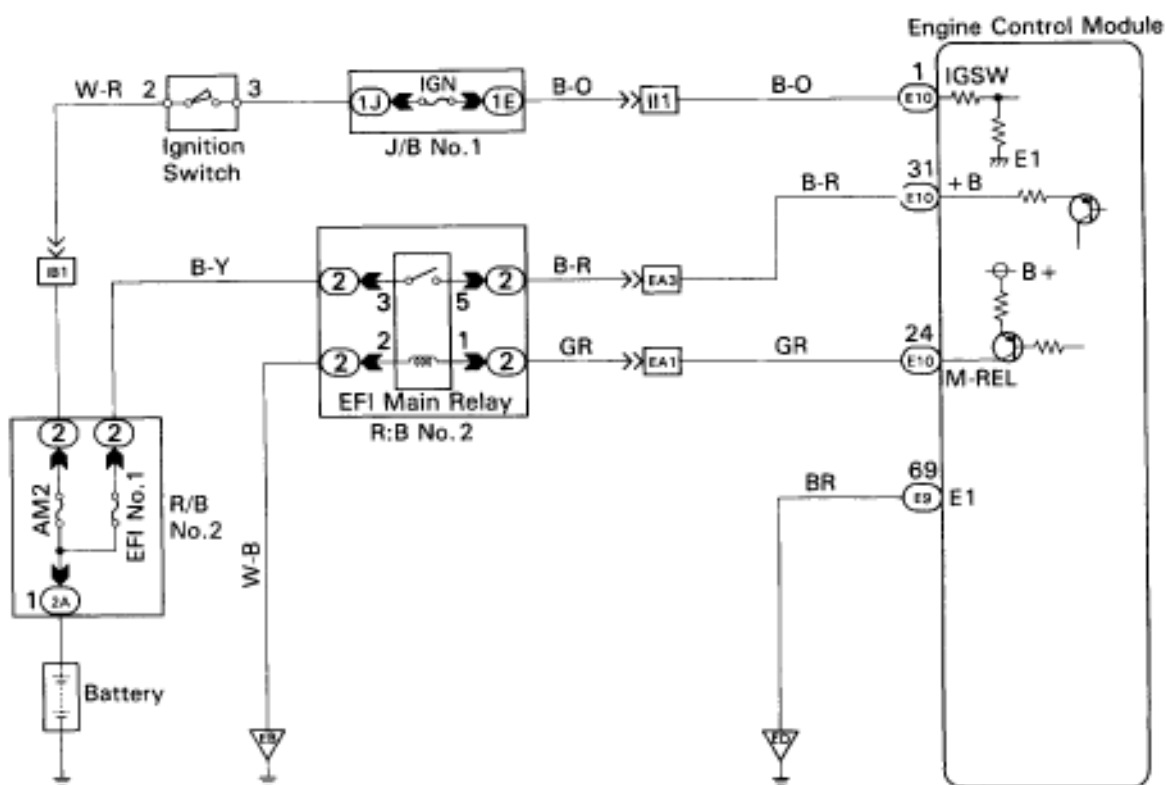
CIRCUIT DESCRIPTION

When the ignition switch is turned on, battery voltage is applied to the terminals IGSW of the ECM, and the main relay control circuit in the ECM sends a signal to the terminal M-REL of the ECM, switching on the main relay. This signal causes current to flow to the coil, closing the contacts of the main relay and supplying power to the terminal +B of the ECM.

If the ignition switch is turned off, the ECM continues to switch on the main relay for a maximum of 2 seconds for the initial setting of the IAC valve.

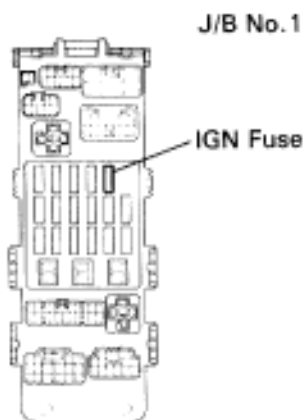


WIRING DIAGRAM



INSPECTION PROCEDURE

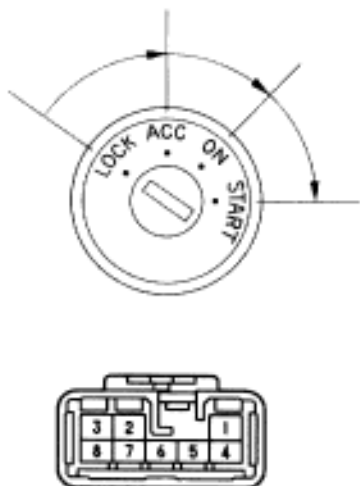
1	Check voltage between terminal +B and E1 of engine control module connector.
ON ECM SST 31 69 E1 +B BE6653 P16305	P (1) Connect SST (check harness "A"). (See page Eg-404) SST 09990-01000 (2) Turn ignition switch ON. C Measure voltage between terminal +B and E1 of engine control module connector. OK Voltage: 9 — 14 V
NG	OK Proceed to next circuit inspection shown on matrix chart (See page EG-408).
2	Check for open in harness and connector between terminal E1 of engine control module and body ground (See page IN-30).
OK	NG Repair or replace harness or connector.
3	Check voltage between terminal IGSV Check and replace engine control module connector and body ground.
ON ECM SST 1 IGSW BE6653 F16493	P Turn ignition switch ON. C Measure voltage between terminal IGSW of engine control module connector and body ground. OK Voltage: 9 — 14 V
NG	OK Go to step 6.

4**Check IGN fuse.**

NOB417

P Remove IGN fuse from J/B No.1.**C** Check continuity of IGN fuse.**OK** Continuity**OK****NG**

Check for short in the harness and all the components connected to IGN fuse (See Electrical Wiring Diagram).

5**Check ignition switch.**BE3582
g-8-2

- P** (1) Remove finish lower panel and finish lower panel LH.
(2) Remove heater to register duct No.2.

C Check continuity between terminals.**OK**

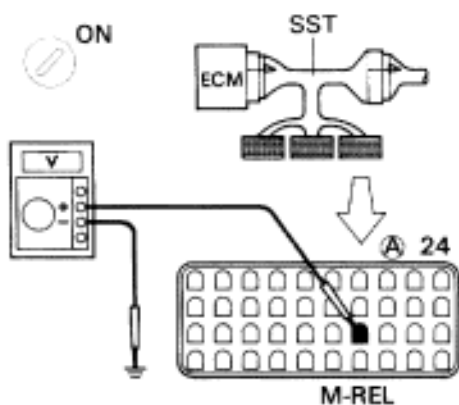
○—○ continuity

Terminal Switch position	1	2	3	4	5	7	8
LOCK							
ACC					○—○		
ON		○—○	○—○	○—○	○—○	○—○	
START	○—○	○—○	○—○	○—○	○—○	○—○	○—○

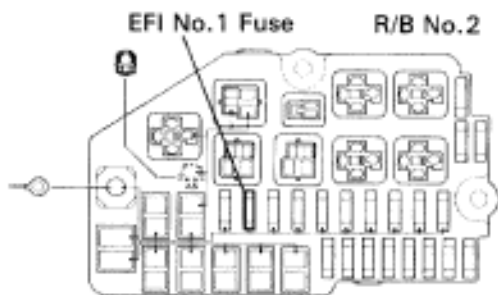
OK**NG**

Replace ignition switch.

Check and repair harness and connector between battery and ignition switch, ignition switch and engine control module.

6**Check voltage between terminal M-REL of engine control module connector and body ground.**BE6653
F16491

- P** Turn ignition switch ON.
- C** Measure voltage between terminal M-REL of engine control module connector and body ground.
- OK** Voltage: 9 — 14 V

OK**NG** Check and replace engine control module.**7****Check EFI No.1 Fuse.**

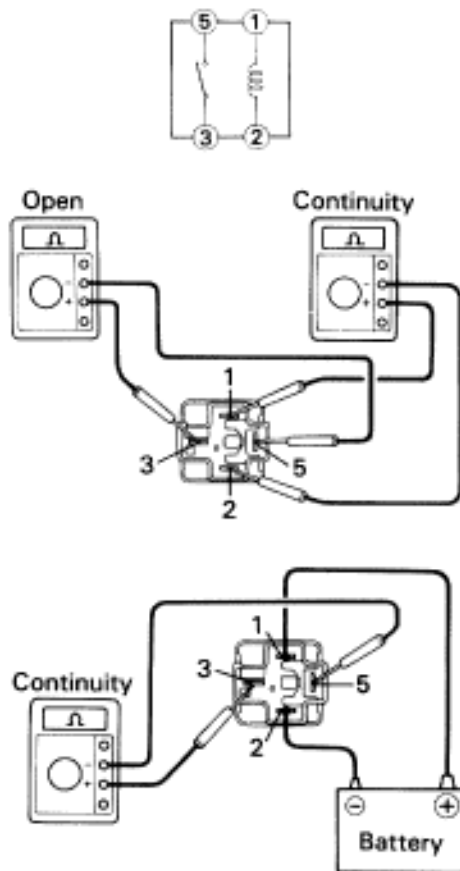
N08419

- P** Remove EFI No.1 fuse from R/B No.2.
- C** Check continuity of EFI No.1 fuse.
- OK** Continuity

OK**NG** Check for short in the harness and all the components connected to EFI No.1 fuse (See Electrical Wiring Diagram).

8

Check EFI main relay.



BE1B41
P04590
P04591

P Remove EFI main relay from R/B No.2.

C Check continuity between terminals of EFI main relay shown below.

OK

Terminals 3 and 5	Open
Terminals 1 and 2	Continuity (Reference value 72 Ω)

C (1) Apply battery voltage between terminals 1 and 2.
(2) Check continuity between terminals 3 and 5.

OK

Terminals 3 and 5	Continuity

OK

NG

Replace EFI main relay.

9

Check for open and short in harness and connector between terminal M-REL of engine control module and body ground(See page [IN-30](#)).

OK

NG

Repair or replace harness or connector.

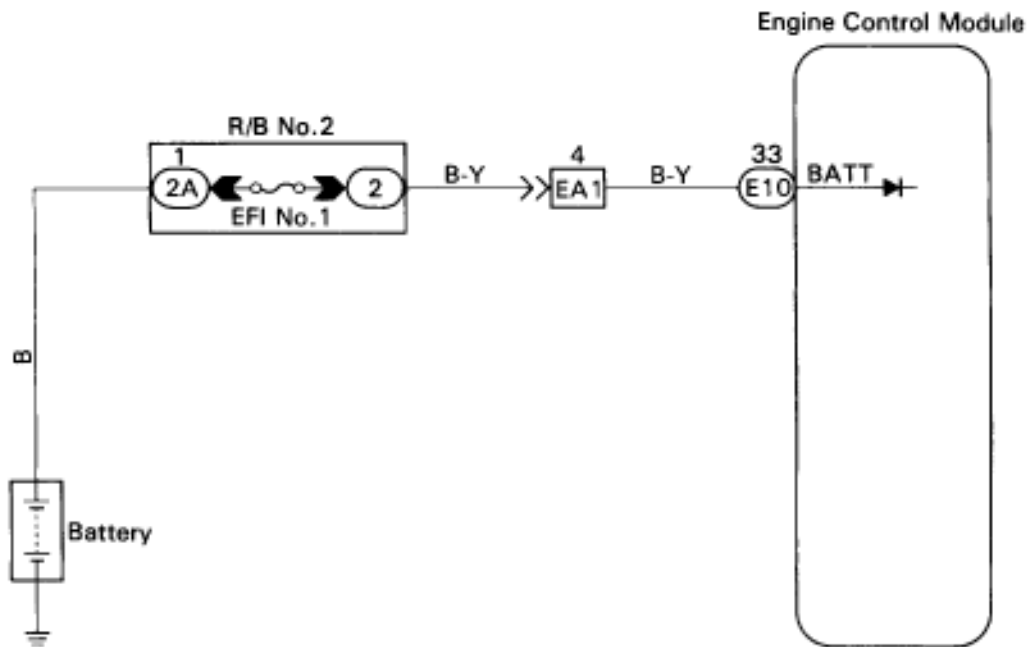
Check and repair harness or connector between EFI No.1 fuse and battery.

Back Up Power Source Circuit

CIRCUIT DESCRIPTION

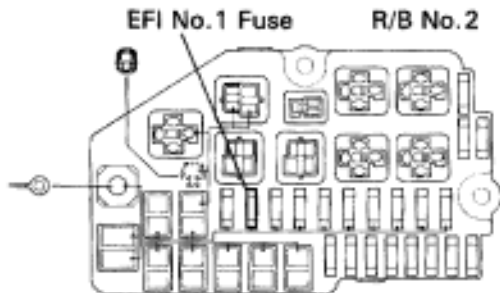
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is off for use by the diagnostic trouble code memory and air-fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



F16878

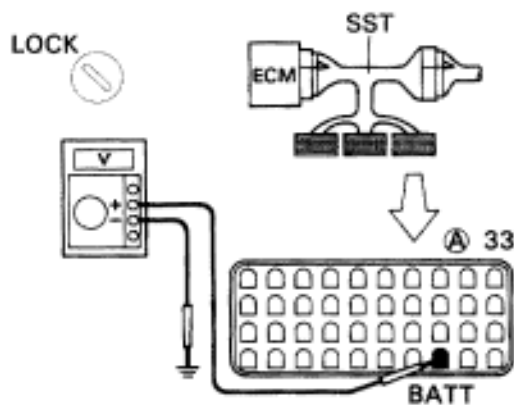
INSPECTION PROCEDURE

1**Check EFI No.1 Fuse.**

- P** Remove EFI No.1 fuse from R/B No.2.
- C** Check continuity of EFI No.1 fuse.
- OK** Continuity

OK**NG**

Check for short in the harness and all the components connected to EFI No.1 fuse (See Electrical Wiring Diagram).

2**Check voltage between terminal BATT of engine control module connector and body ground.**

- P** Connect SST (check harness "A").
(See page [EG-404](#))
SST 09990-01000
- C** Measure voltage between terminal BATT of engine control module connector and body ground.
- OK** Voltage: 9 — 14 V

OK**NG**

Check and repair harness or connector between engine control module and EFI No.1 fuse, EFI No.1 fuse and battery.

3**Are the diagnostic trouble codes still in the memory when the ignition switch is turned OFF?****YES****NO**

Check and replace engine control module.

Proceed to next circuit inspection shown on matrix chart (See page [EG-408](#)).

Injector Circuit

CIRCUIT DESCRIPTION

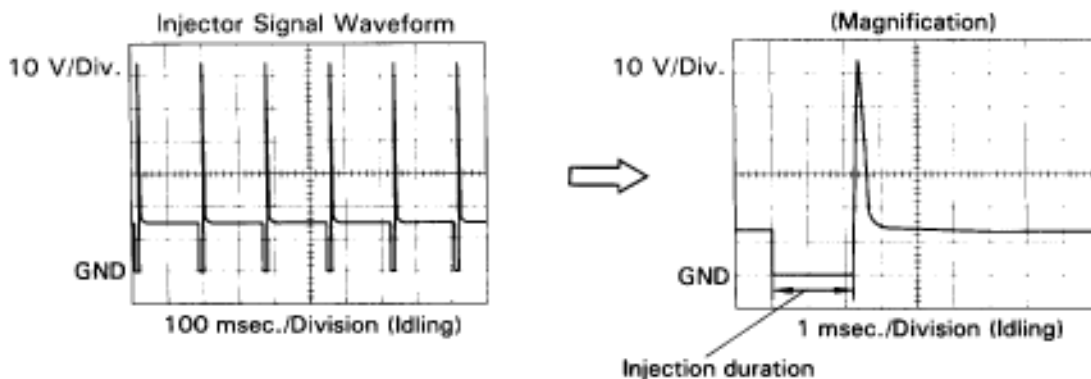
The injectors are located in the intake manifold. They inject fuel into the cylinders based on the signals from the engine control module.

Reference

INSPECTION USING OSCILLOSCOPE

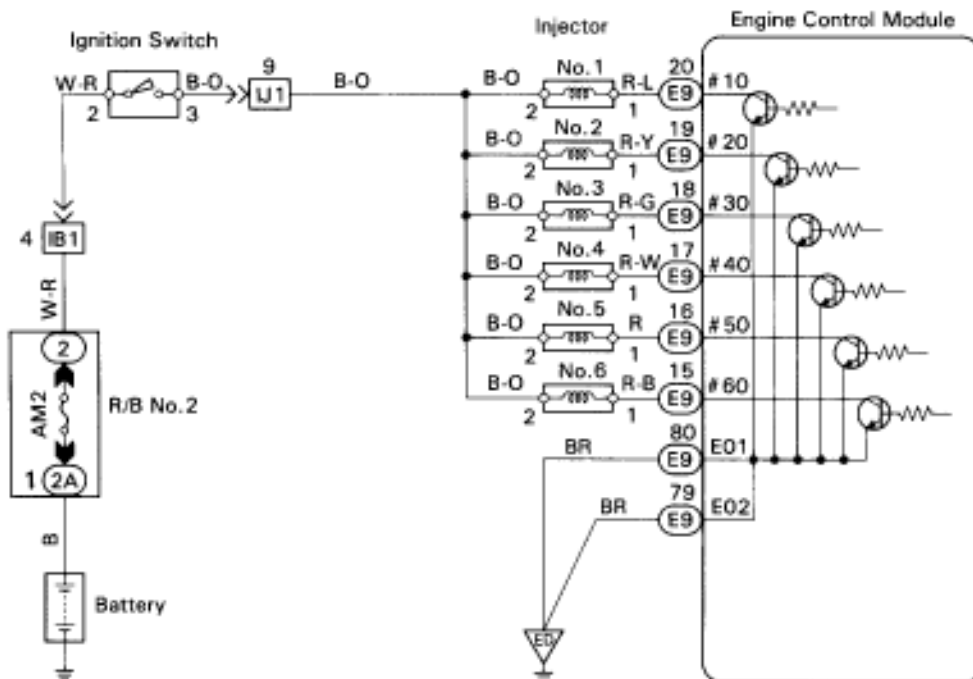
With the engine idling measure waveform between terminals #10 ~ 60 and E01 of engine control module.

HINT: The correct waveform is as shown.



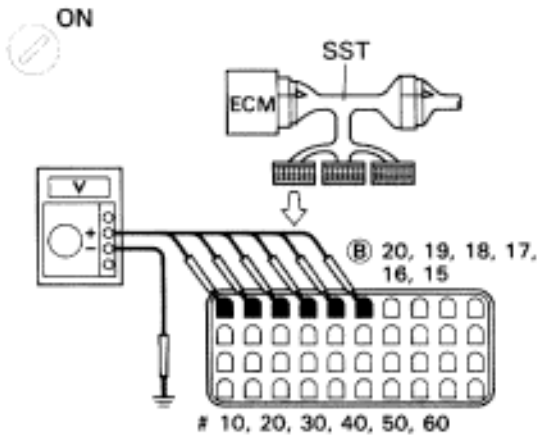
FI6588 FI6538

WIRING DIAGRAM



FI6944

INSPECTION PROCEDURE

1**Check voltage between terminals # 10 ~ 60 of engine control module and body ground.****P**

(1) Connect SST check harness "A".

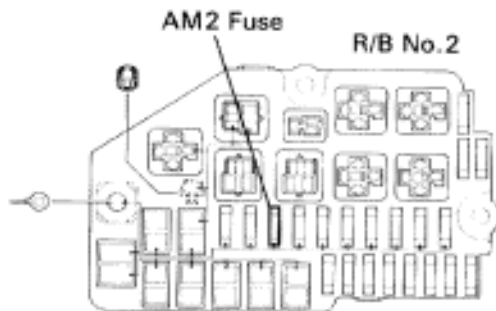
(See page [EG-404](#))

SST 09990-01000

(2) Turn ignition switch ON.

C

Measure voltage between terminals #10 ~ 60 of engine control module and body ground.

OK**Voltage: 9 — 14 V****NG****OK**Go to step **3**.**2****Check AM2 Fuse.****P**

Remove AM2 fuse from R/B No.2.

C

Check continuity of AM2 fuse.

OK**Continuity****OK****NG**

Check for short in the harness and all the components connected to AM2 fuse.

Check and repair harness or connector between engine control module and battery.

3

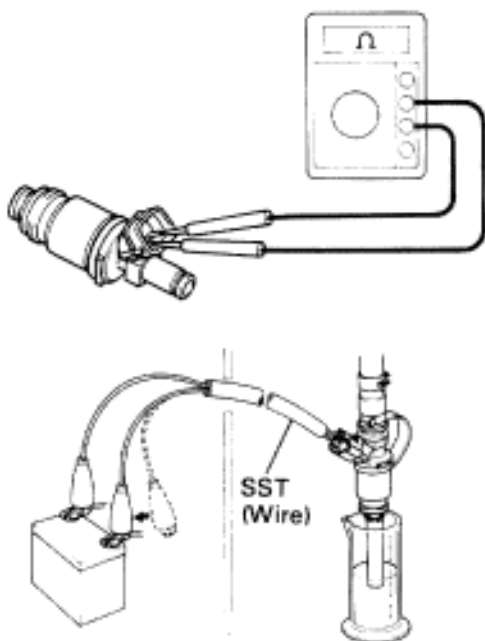
Check for open in harness and connector between terminal E)1, EO2 of ECM connector and body ground (See page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

4

Check injectors.

F16784
F14848**P**Disconnect injector connector. (See page [EG-202](#))**C**

Measure resistance of injector.

OK**Resistance: 13.4 — 14.2 at 20°C (68°F)****C**Check injector volume of injector.
(See page [EG-207](#))**OK****Injection volume**

70 — 88 cc/15 sec.

(4.3 — 5.4 cu in./15 sec.)

Difference between each injector:

Less than 9 cc (0.5 cu in.)

Leakage**Fuel drop: One drip or less per minute****OK****NG**

Replace injector.

Check and replace engine control module.

IAC Valve Circuit

CIRCUIT DESCRIPTION

The IAC valve is situated on the intake chamber. Intake air bypassing the throttle valve is directed to the IAC valve through a passage.

A step motor is built into the IAC valve. It consists of 4 coils, a magnetic rotor, valve shaft and valve.

When current flows to the coils due to signals from the ECM, the rotor turns and moves the valve shaft forward or backward, changing the clearance between the valve and the valve seat.

In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.

There are 125 possible positions to which the valve can be opened.

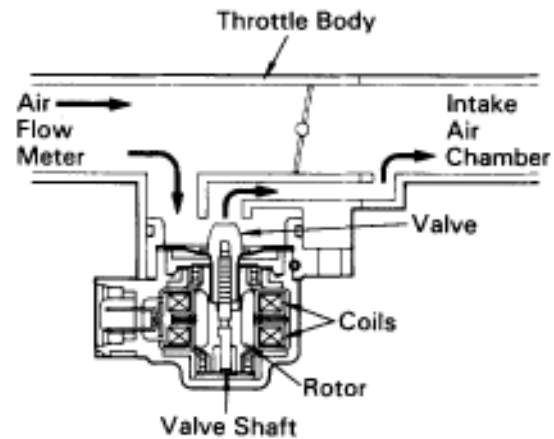
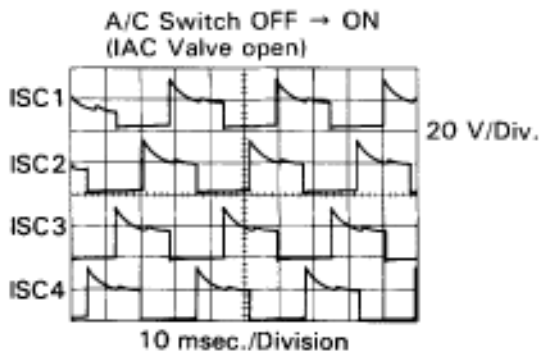


FIG611

Reference

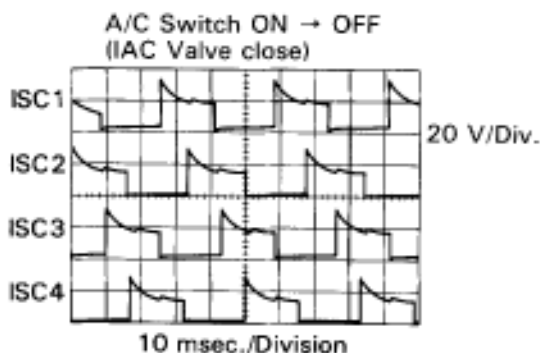
INSPECTION USING OSCILLOSCOPE



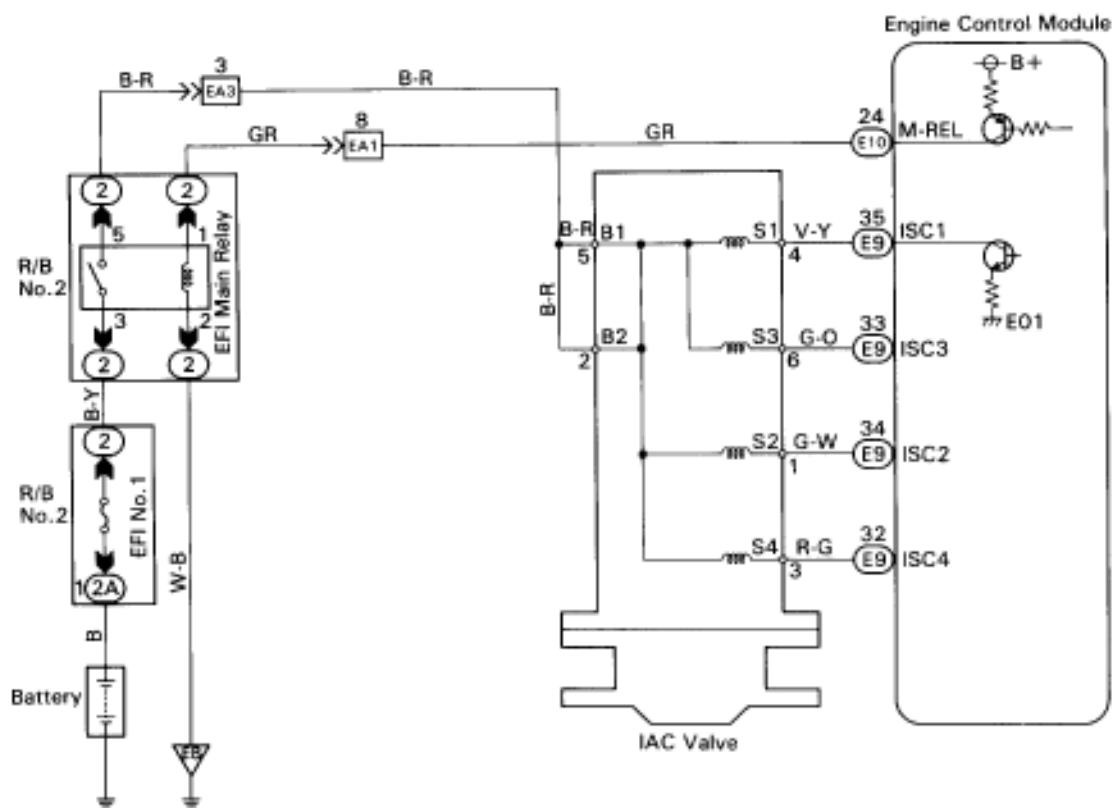
With the engine idling measure wave forms between terminals ISC1, ISC2, ISC3, ISC4 and E01 of engine control module when A/C switch ON or OFF.

HINT:

The correct waveforms are as shown.

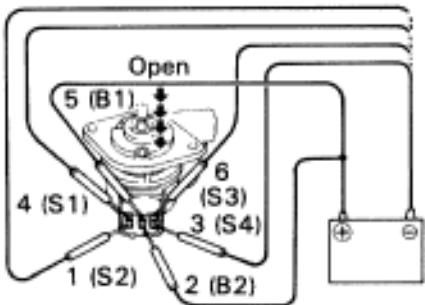
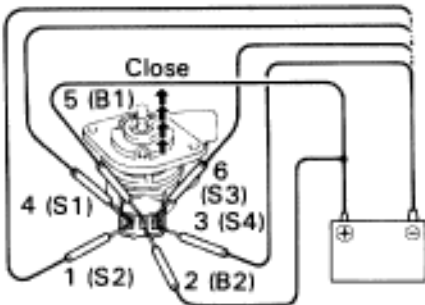
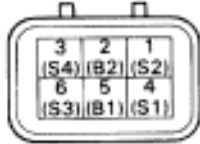


WIRING DIAGRAM



F16935

INSPECTION PROCEDURE

1**Check IAC valve.**F11694
P10701
P10700**P**

Disconnect IAC valve connector.

C

Measure resistance between terminals shown below.

OK

Terminal	Resistance
5 (B1) - 4 (S1)	10 Ω - 30 Ω
5 (B1) - 6 (S3)	10 Ω - 30 Ω
2 (B2) - 1 (S2)	10 Ω - 30 Ω
2 (B2) - 3 (S4)	10 Ω - 30 Ω

P

Remove IAC valve.

C

- (1) Connect the battery positive lead to terminals 5 (B1) and 2 (B2), and the negative lead to terminals 4(S1)—1(S2)—6(S3)—3(S4) in that order.
- (2) Connect the battery positive lead to terminals 5 (B1) and 2 (B2), and the negative lead to terminals 3(S4)—6(S3)—1(S2)—4(S1) in that order.

OK

- (1) The valve moves in the closing direction.
- (1) The valve moves in the opening direction.

OK**NG**

Replace IAC valve.

2**Check for open and short in harness and connector between EFI main relay and IAC valve, IAC valve and engine control module(See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

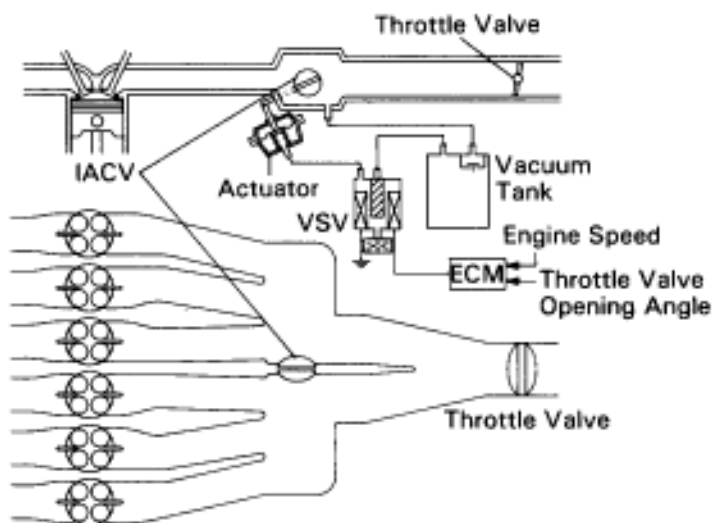
Proceed to next circuit inspection shown on matrix chart (See page [EG-408](#)).

VSV Circuit for ACIS

CIRCUIT DESCRIPTION

The circuit opens and closes the IACV (Intake Air Control Valve) in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Induction System).

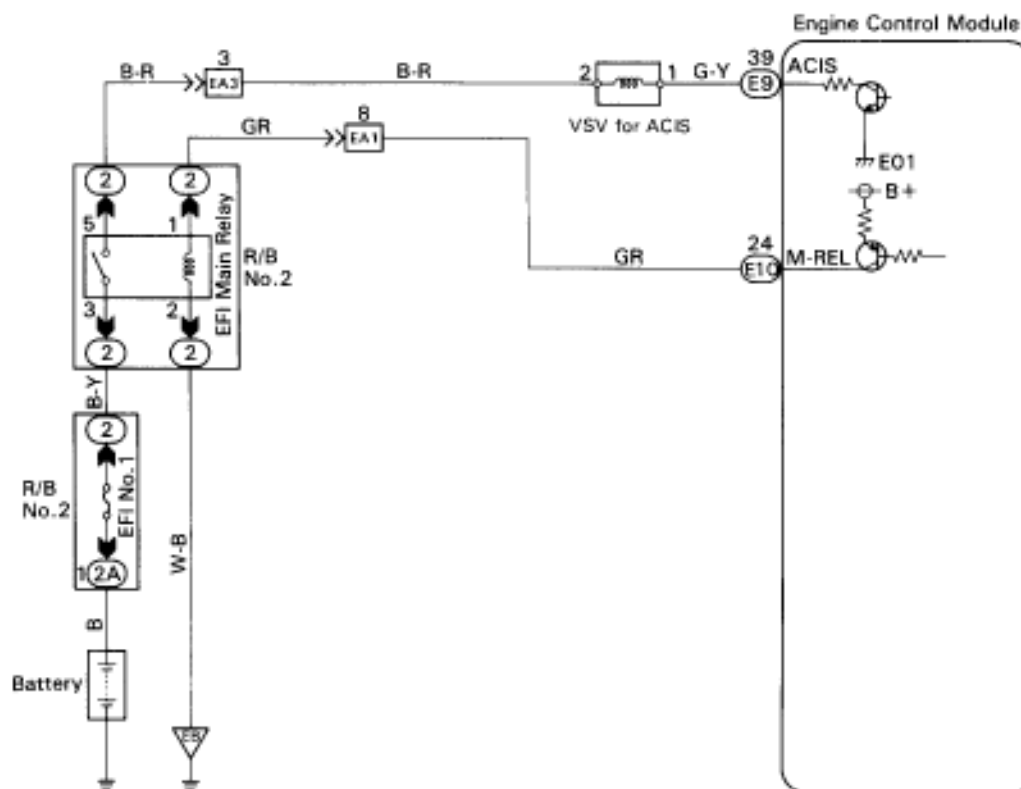
When the engine speed is 4,500 rpm or less and throttle valve opening angle is 30° or more, or engine speed is 4,500 rpm or more and throttle valve opening angle is 30° or less, the engine control module turns the VSV ON and closes the IACV. At all other times, the VSV is OFF, so the IACV is open.



VSV	IACV
ON	closed
OFF	open

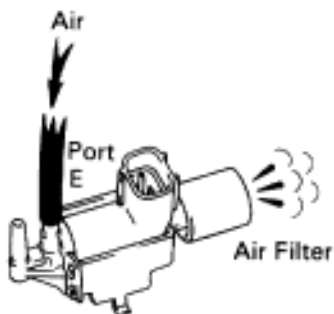
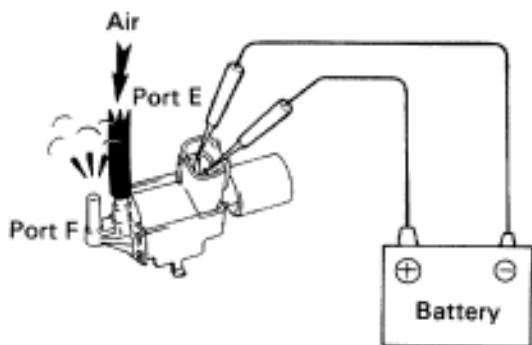
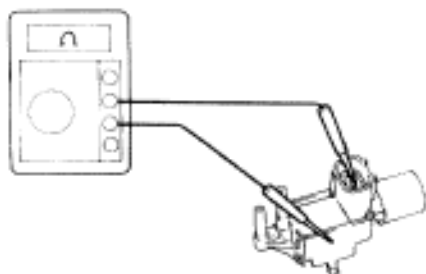
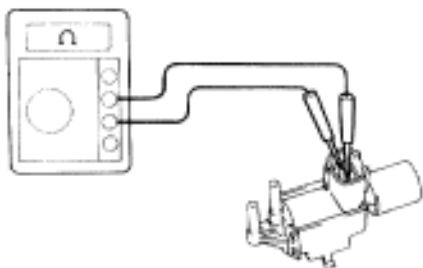
F16612

WIRING DIAGRAM



F16350

INSPECTION PROCEDURE

1**Check VSV for ACIS.**

F16645
F16646
P02690
P02689

P

- (1) Remove VSV.
- (2) Disconnect VSV connector.

C

- (1) Measure resistance between terminals.
- (2) Measure resistance between each terminal and the body.

OK

- (1) Resistance: 38.5 — 44.5 at 20°C (68°F)
- (2) Resistance: 1 M or higher

C

Check operation of VSV when battery positive voltage is applied and released to the VSV terminals.

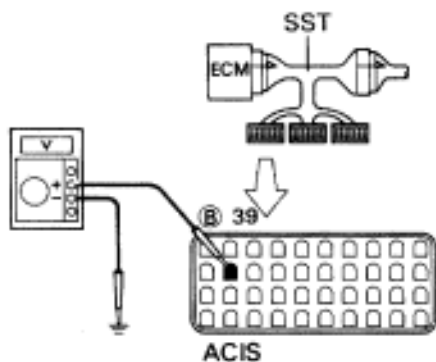
OK

Battery positive voltage is applied:
Air from port E is flowing out through port F.

Battery positive voltage is not applied:
Air from port E is flowing out through the air filter.

OK**NG**

Replace VSV for ACIS.

2**Check voltage between terminal ACIS of engine control module connector and body ground.** ONBT6553
F16896**P**

- (1) Connect SST (check harness "A").
(See page [EG-404](#))
SST 09990-01000
(2) Turn ignition switch ON.

C

Measure voltage between terminal ACIS of engine control module connector and body ground.

OK

Voltage: 9 — 14 V

NG**OK**

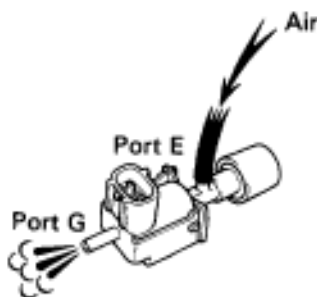
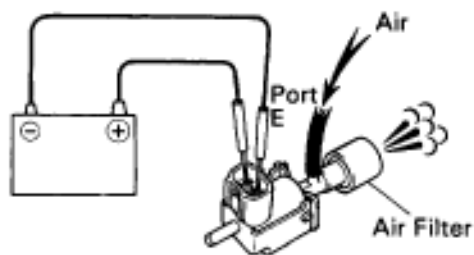
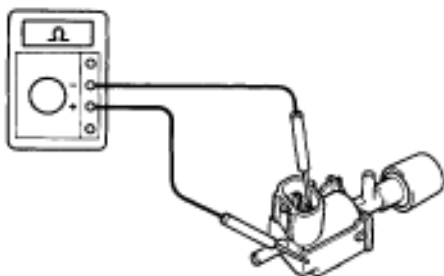
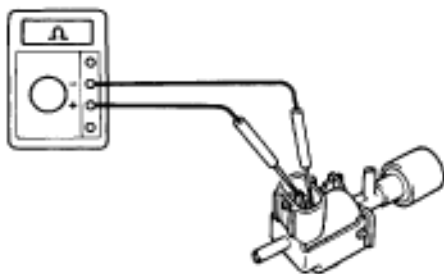
Check for vacuum tank. (See page [EG-230](#))

3**Check for open and short in harness and connector between EFI main relay and engine control module (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

INSPECTION PROCEDURE

1**Check VSV for fuel pressure control.**

P10486
P10487
P10488
P10485

P

- (1) Remove VSV.
- (2) Disconnect VSV connector.

C

- (1) Measure resistance between terminals.
- (2) Measure resistance between each terminal and the body.

OK

- (1) Resistance: 33 — 39 at 20°C (68°F)
- (2) Resistance: 1 M or higher

C

Check operation of VSV when battery positive voltage is applied and released to the VSV terminals.

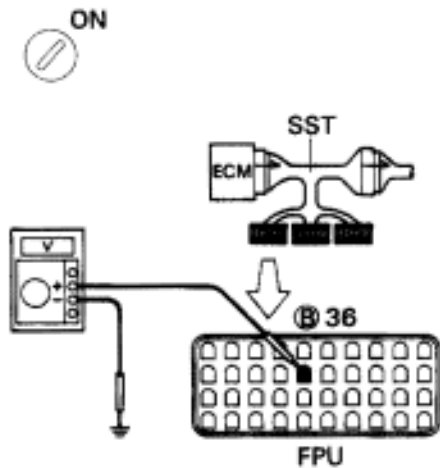
OK

Battery positive voltage is applied:
Air from port E is flowing out through the air filter.

Battery positive voltage is not applied:
Air from port E is flowing out through port G.

OK**NG**

Replace VSV for fuel pressure control.

2**Check voltage between terminal FPU of engine control module connector and body ground.**BE6653
FI6892

- P** (1) Connect SST (check harness "A").
(See page [EG-404](#))
SST 09990-01000
(2) Turn ignition switch ON.

- C** Measure voltage between terminal FPU of engine control module connector and body ground.

- OK** Voltage: 9 — 14 V

NG**OK**

Proceed to next circuit inspection shown on matrix chart (See page [EG-408](#)).

3**Check for open and short in harness and connector between engine control module and VSV, VSV and EFI main relay (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

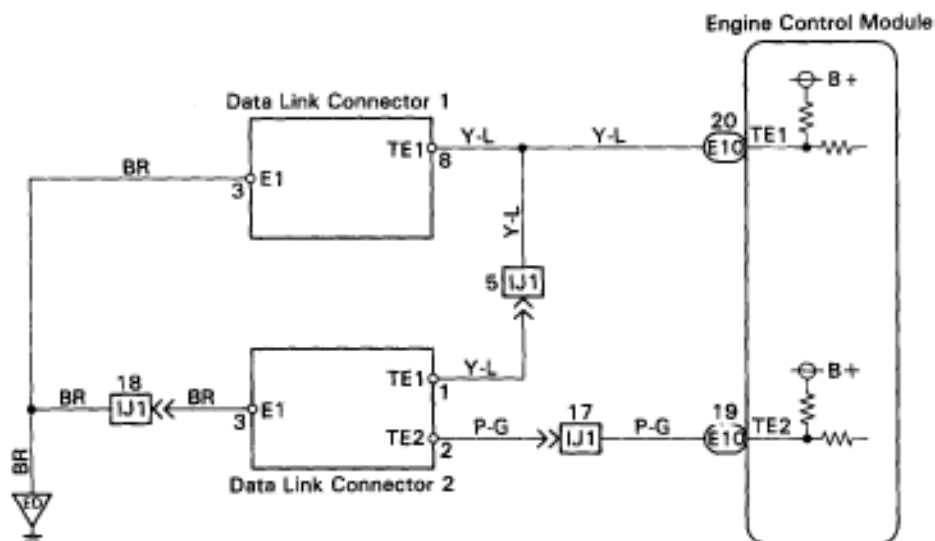
TE1 TE2 Terminal Circuit

CIRCUIT DESCRIPTION

Terminal TE1 is located in data link connectors 1 and 2. Terminal TE2 is located ONLY in data link connector 2.

The data link connector 1 is located in the engine compartment and the data link connector 2 is located in the cabin. When these terminals are connected with the E1 terminal, diagnostic trouble codes in normal mode or test mode can be read from the malfunction indicator lamp on the telltale light RH.

WIRING DIAGRAM



F16951

INSPECTION PROCEDURE

HINT: If terminals TE1 and TE2 are connected with terminal E1, diagnostic trouble code is not output or test mode is not activated.

Even though terminal TE1 is not connected with terminal E1, the malfunction indicator lamp blinks.

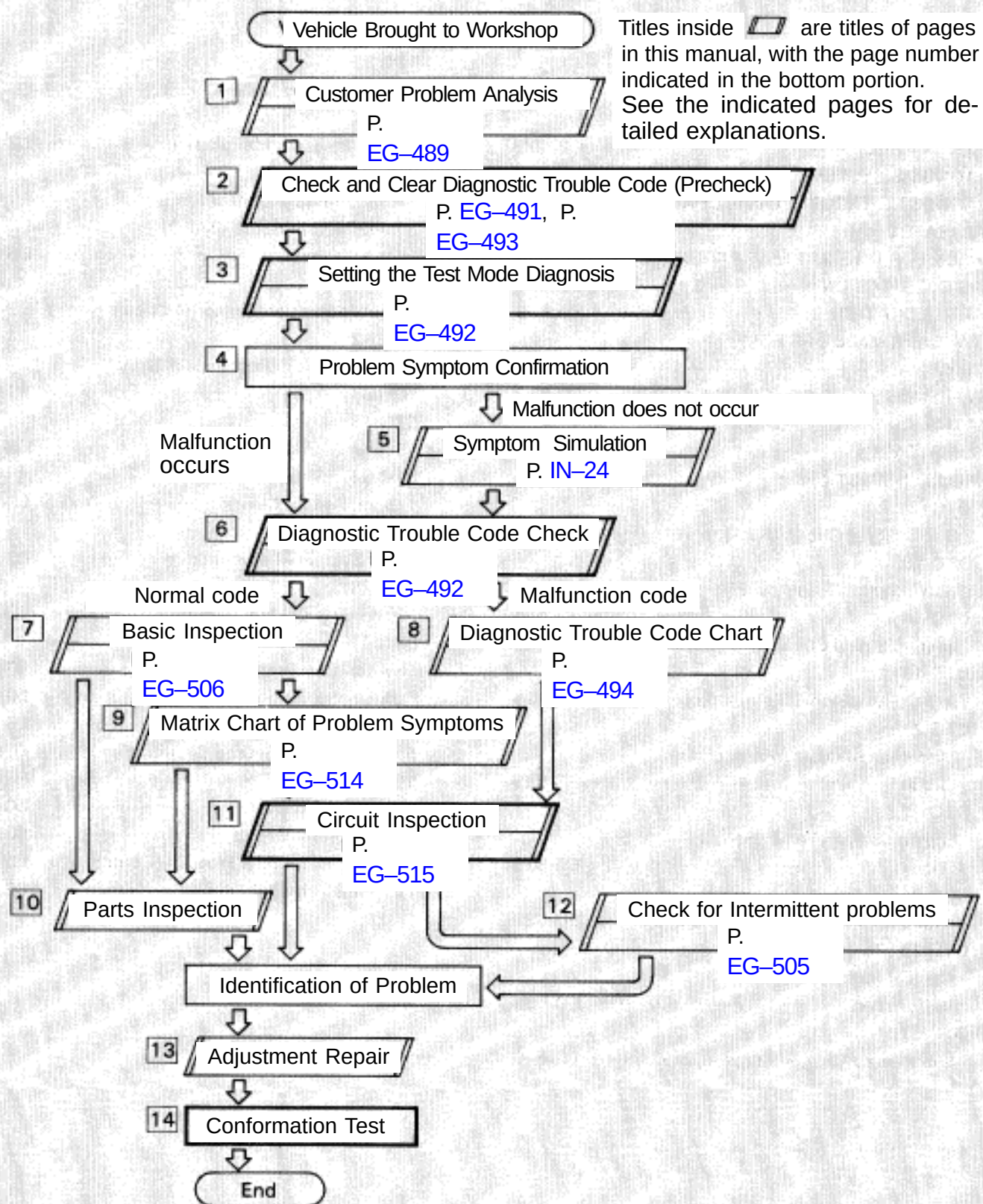
For the above phenomenon, the likely cause is an open or short in the wire harness, or malfunction inside the ECM.

1	Check voltage between terminals TE1, TE2 and E1 of data link connectors 1 and 2.
ON BE6853 F16366 F14412	P Turn ignition switch ON. C (1) For DLC1, measure voltage between terminal TE1 and E1. (2) For DLC2, measure voltage between terminals TE1, TE2 and E1. OK Voltage: 9 — 14 V
NG	OK Check and replace engine control module.
2	Check continuity between terminal E1 of data link connectors1, 2 and body ground.
OK	NG Repair or replace harness or connector.
3	Check for open and short in harness and connector between engine control module and data link connectors1, 2 (See page IN-30).
OK	NG Repair or replace harness or connector.
Check and replace engine control module.	

2JZ-GTE ENGINE TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.



Step **2, 3, 6, 11, 14**: Diagnostic steps permitting the use of the TOYOTA hand-held tester or TOYOTA break-out box.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet

Inspector's
Name .

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In		Odometer Reading	km Miles

Date Problem Occurred		
Frequency Problem Occurs		☐ 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 ☐ Hill (☐ Up, ☐ Down) ☐ Rough road ☐ Other ()
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other ()
	Engine Operation	☐ Starting ☐ Just after starting ☐ Idling ☐ Racing without load ☐ Driving (☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other ())

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other ()
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal (☐ High ☐ Low (rpm)) ☐ Rough idling ☐ Other ()
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after fire) ☐ Surging ☐ Knocking ☐ Other ()
	☐ Engine Stall	☐ Engine stall soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ When N to D shift ☐ Other ()
	☐ Others	

Condition of Malfunction Indicator Lamp		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
Diagnostic Trouble Code Inspection	Normal Mode (Precheck)	☐ Normal code ☐ Malfunction code (code)
	Test Mode	☐ Normal code ☐ Malfunction code (code)



FI0534

DIAGNOSIS SYSTEM DESCRIPTION

The ECM contains a built-in self-diagnosis system by which troubles with the engine signal network are detected and a Malfunction Indicator Lamp on the instrument panel lights up.

By analyzing various signals as shown in a later table (See page [EG-494](#)) the Engine Control Module (ECM) detects system malfunctions relating to the sensors or actuators.

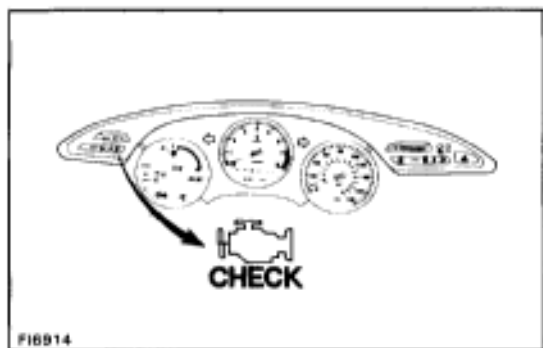
In the normal mode, the self-diagnosis system monitors 19 items, indicated by code No. as shown in [EG-494](#). A malfunction indicator lamp informs the driver that a malfunction has been detected. The lamp goes off automatically when the malfunction has been repaired, but the diagnostic trouble code(s) remains stored in the ECM memory (except for code Nos. 16 and 53). The ECM stores the code(s) until it is cleared by removing the EFI No. 1 fuse with the ignition switch OFF.

The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when TE1 and E1 terminals on the data link connector 1 or 2 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.

In the test mode, 13 items, indicated by code No. as shown in [EG-494](#) are monitored. If a malfunction is detected in any one of the systems indicated by code Nos. 13, 21, 22, 24, 25, 26, 27, 35, 41, 47, 71 and 78 the ECM lights the malfunction indicator lamp to warn the technician that a malfunction has been detected. In this case, TE2 and E1 terminals on the data link connector 2 should be connected as shown later. (See page [EG-492](#)).

In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECM memory even when the ignition switch OFF (except code Nos. 43 and 51). The also applies in the normal mode. The diagnostic trouble mode (normal or test) and the output of the malfunction indicator lamp can be selected by connecting the TE1, TE2 and E1 terminals on the data link connector 2, as shown later.

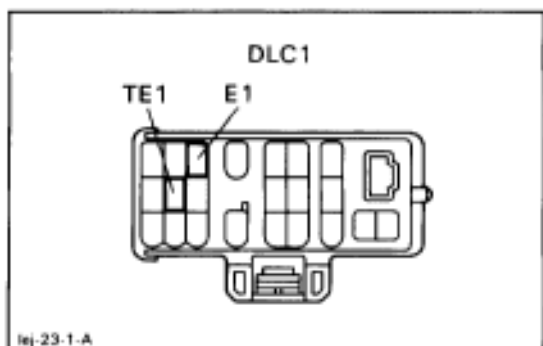
A test mode function has been added to the functions of the self-diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self-diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page [EG-492](#))



Diagnosis Inspection (Normal Mode)

MALFUNCTION INDICATOR LAMP CHECK

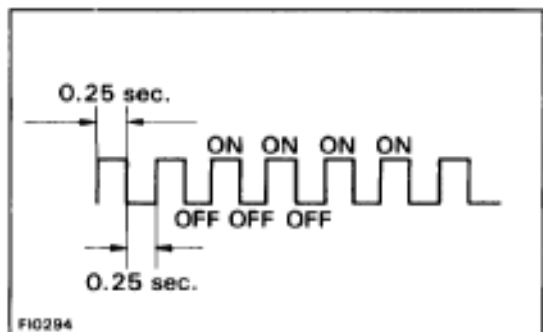
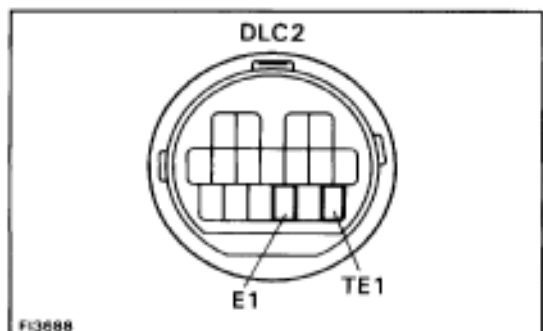
1. The Malfunction Indicator Lamp will come on when the ignition switch is turned ON and the engine is not running.
HINT: If the malfunction indicator lamp does not light up, proceed to troubleshooting of the telltale light RH (See page [BE-48](#)).



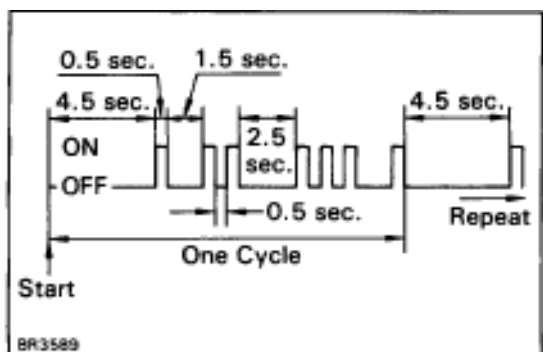
2. When the engine is started, the malfunction indicator lamp should go off.
If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODE CHECK

1. Turn ignition switch ON.
2. Using SST, connect terminals between TE1 and E1 of data link connector 1 or 2.
SST 09843-18020



3. Read the diagnostic trouble code from malfunction indicator lamp.
HINT: If a diagnostic trouble code is not output, check the TE1 terminal circuit (See page [EG-598](#)).



4. As an example, the blinking patterns for codes; normal, 12 and 31 are as shown on the illustration.
4. Check the details of the malfunction using the diagnostic trouble code table on page [EG-494](#).
5. After completing the check, disconnect terminals TE1 and E1, and turn off the display.
HINT: In the event of 2 or more malfunction codes, indication will begin from the smaller numbered code and continue in order to the larger.

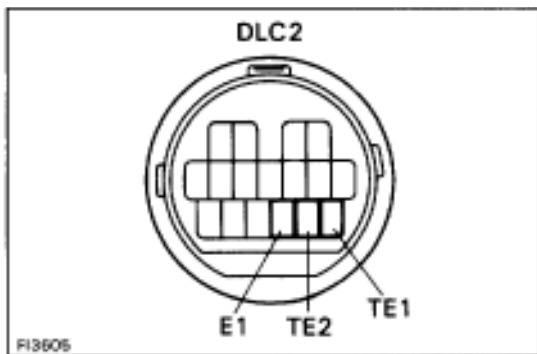
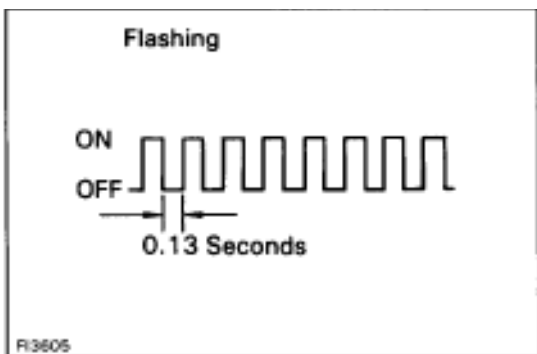
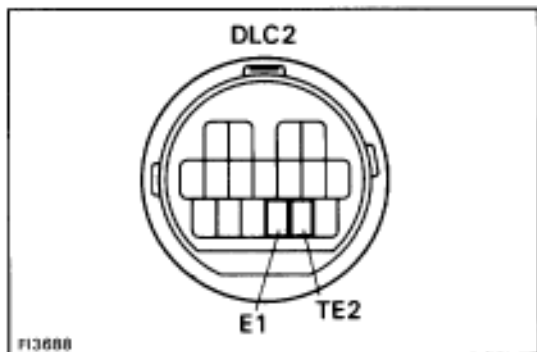
Diagnosis Inspection (Test Mode)

Compared to the normal mode, the test mode has an increased sensing ability to detect malfunctions.

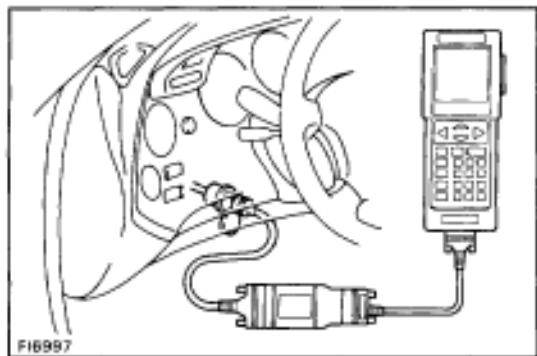
It can also detect malfunctions in the starter signal circuit, the IDL contact signal of the throttle position sensor, air conditioning signal and park/neutral position switch signal.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

DIAGNOSTIC TROUBLE CODE CHECK



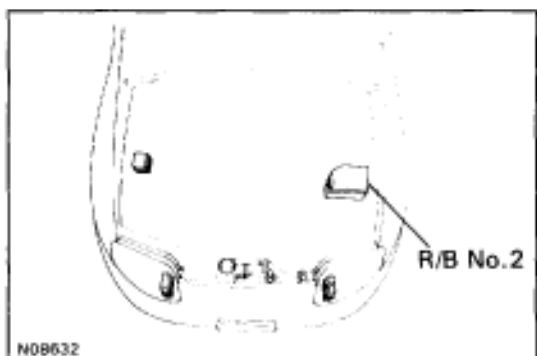
1. Initial conditions.
 - (a) Battery voltage 11 V or more
 - (b) Throttle valve fully closed
 - (c) Transmission in neutral position
 - (d) Air conditioning switched OFF
2. Turn ignition switch OFF
3. Using SST, connect terminals TE2 and E1 of the data link connector 2.
SST 09843-18020
4. Turn ignition switch ON.
HINT:
 - To confirm that the test mode is operating, check that the malfunction indicator lamp flashes when the ignition switch is turned to ON.
 - If the malfunction indicator lamp does not flash, proceed to troubleshooting of the TE2 terminal circuit on page [EG-598](#).
5. Start the engine.
6. Simulate the conditions of the malfunction described by the customer.
7. After the road test, using SST, connect terminals TE1 and E1 of the data link connector 2.
SST 09843-18020
8. Read the diagnostic trouble code on malfunction indicator lamp on the telltale light RH (See page [EG-491](#)).
9. After completing the check, disconnect terminals TE1, TE2 and E1, and turn off the display.
HINT:
 - The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned ON.
 - When the engine is not cranked, diagnostic trouble codes "43" (Starter signal) output, but this is not abnormal.
 - When the automatic transmission shift lever is in the "D", "2", "L" or "R" shift position, or when the air conditioning is on or when the accelerator pedal is depressed, code "51" (Switch condition signal) is output, but this is not abnormal.



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND-HELD TESTER

1. Hook up the TOYOTA hand-held tester to the DLC2.
2. Read the diagnostic trouble codes by following the prompts on the tester screen.

Please refer to the TOYOTA hand-held tester operation's manual for further details.



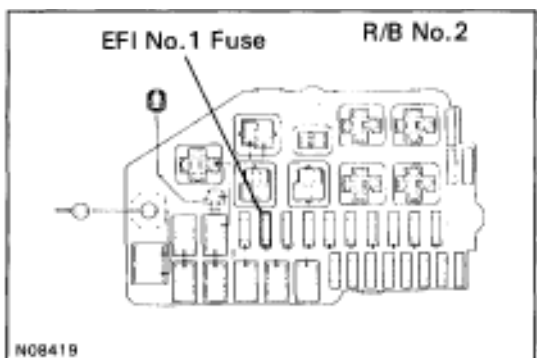
DIAGNOSTIC TROUBLE CODE CLEARANCE

1. After repair of the trouble areas, the diagnostic trouble code retained in the ECM memory must be cleared out by removing the EFI No.1 fuse (30A) from R/B No.2 for 10 seconds or more, with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the negative (-) terminal cable from the battery, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If it is necessary to work on engine components requiring removal of the negative (-) terminal cable from the battery, a check must first be made to see if a diagnostic trouble code has been recorded.

2. After cancellation, road test the vehicle to check that a normal code is now read on the malfunction indicator lamp. If the same diagnostic trouble code appears, it indicates that the trouble area has not been repaired thoroughly.

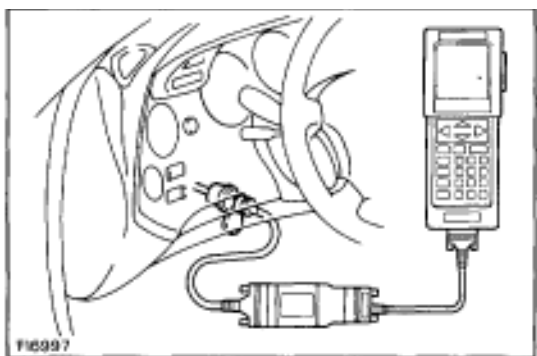


ECM DATA MONITOR USING TOYOTA HAND-HELD TESTER

1. Hook up the TOYOTA hand-held tester to the DLC2.
2. Monitor the ECM data by following the prompts on the tester screen.

HINT: TOYOTA hand-held tester has a "Snapshot" function which records the monitored data.

Please refer to TOYOTA hand-held tester operator's manual for further details.

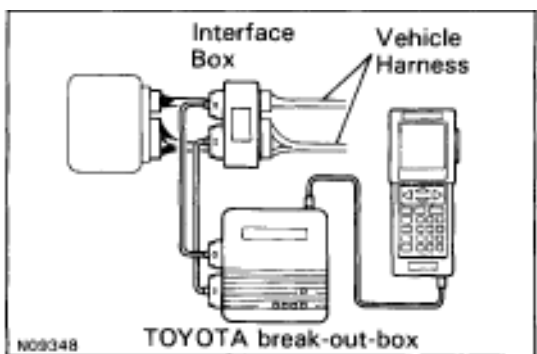


ECM TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK-OUT-BOX AND TOYOTA HAND-HELD TESTER

1. Hook up the TOYOTA break-out-box and TOYOTA handheld tester to the vehicle.
2. Read the ECM input/output values by following the prompts on the tester screen.

HINT: TOYOTA hand-held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.

Please refer to TOYOTA hand-held tester/TOYOTA break-out-box operator's manual for further details.



DIAGNOSTIC TROUBLE CODE CHART

HINT: Parameters listed in the chart may not be exactly the same as your reading due to type of the instruments or other factors.

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
—	 BE3931	Normal	No code is recorded
12	 BE3931	G, NE Signal (No.1)	No "NE" or "G1" and "G2" signal to ECM for 2 sec. or more after cranking
13	 BE3931	G, NE Signal (No.2)	No NE signal to ECM for 0.1 sec. or more at 1,000 rpm or more
			NE signal does not pulse 12 times to ECM during the interval between G1 and G2 pulses
			Deviation in G (G1, G2) and NE signal continues for 3 sec. during idling (throttle fully closed) after engine warmed up
14	 BE3931	Ignition Signal	No IGF signal to ECM for 4~7 consecutive IGT signals with engine speed less than 3,000 rpm
16	 BE3931	A/T Control Signal	Fault in communications between the engine CPU and A/T CPU in the ECM

If a malfunction code is displayed during the diagnostic trouble code check in test mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
—	—	—	—	—
Open or short in crankshaft position sensor, camshaft position sensor No.1, No.2 circuit Crankshaft position sensor Camshaft position sensor No.1, No.2 Starter ECM	ON	N.A.	○	EG-515
Open or short in crankshaft position sensor circuit Crankshaft position sensor ECM	ON	N.A.	○	EG-518
Open or short in crankshaft position sensor circuit Mechanical system malfunction (skipping teeth of timing belt, belt stretched) Crankshaft position sensor ECM	N.A.	ON		
Mechanical system malfunction (skipping teeth of timing belt, belt stretched) Camshaft position sensor No.1, No.2 ECM	ON	N.A.		
Open or short in IGF circuit from igniter to ECM Igniter ECM	ON	N.A.	○	EG-519
ECM	ON	N.A.	X	EG-524

*1, 2: See page [EG-502](#).

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
21		Main Heated Oxygen Sensor Signal	(1) Open or short in heater circuit of main heated oxygen sensor (Fr) for 0.5 sec. or more.
			(2) Main heated oxygen sensor (Fr) signal voltage is reduced to between 0.35 V and 0.70 V for 90 sec. under conditions (a) ~ (d): (2 trip detection logic)* ³ (a) Engine coolant temp.: Between 80°C (176°F) and 95°C (203°F) (b) Engine speed: 1,500 rpm or more (c) Load driving (Example A/T in Overdrive, (5th for M/T), A/C ON, Flat road, 80 km/h (50 mph)) (d) Main heated oxygen sensor signal voltage: Alternating above and below 0.45 V
22		Engine Coolant Temp. Sensor Circuit	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more
24		Intake Air Temp. Sensor Signal	Open or short in intake air temp. sensor circuit for 0.5 sec. or more
25		Air-Fuel Ratio Lean Malfunction	(1) Main heated oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b): (2 trip detection logic)* ³ (a) Engine speed: 1,500 rpm or more (b) Engine coolant temp.: 70°C or more
			(2) Engine speed varies by more than 20 rpm over the preceding crank angle period during a period of 20 sec. or more under conditions (a) and (b): (2 trip detection logic)* ⁴ (a) Engine speed: Below 950 rpm (b) Engine coolant temp.: 80°C (176°F) or more

*³: See page EG-503.

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
Open or short in heater circuit of main heated oxygen sensor Main heated oxygen sensor heater ECM	ON	N.A.	○	EG-525
Main heated oxygen sensor circuit Main heated oxygen sensor	ON	ON		
Open or short in engine coolant temp. sensor circuit Engine coolant temp. sensor ECM	ON	ON	○	EG-530
Open or short in intake air temp. sensor circuit Intake air temp. sensor ECM	ON	ON	○	EG-532
Open or short in Main heated oxygen sensor circuit Main heated oxygen sensor Ignition system ECM	ON	ON	○	EG-534
Open or short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Mass air flow meter (air intake) ECM				

*1, 2: See page [EG-502](#)

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
26	 BE3932	Air-Fuel Ratio Rich Malfunction	- Engine speed varies by more than 20 rpm over the preceding crank angle period during a period of 25 sec. or more under conditions (a) and (b): (2 trip detection logic)*3 (a) Engine speed: Below 950 rpm (b) Engine coolant temp.: 80°C (176°F) or more
27	 BE3932	Sub Heated Oxygen Sensor Signal	(1) Open or short in heater circuit of sub heated oxygen sensor for 0.5 sec. or more (2) Main heated oxygen sensor signal is 0.45 V or more and sub heated oxygen sensor signal is 0.45 V or less under conditions (a) ~ (c): (2 trip detection logic)*3 (a) Engine coolant temp.: 80°C (176°F) or more (b) Engine speed: 1,5000 rpm or more (c) Accel. pedal: Fully depressed for 2 sec. or more
31	 BE3933	Mass Air Flow Meter Circuit	Open or short in mass air flow meter circuit for 3 sec. or more with engine speed less than 3,000 rpm
34	 BE3933	Turbo Pressure Malfunction	All conditions below are detected continuously for 2 sec. or more: (a) Mainfold absolute pressure: 200 kPa (2.0 kgf/cm², 29 psi) or more (b) Thottle valve opening angle: 20° or more (c) Engine speed: 2,4000 rpm or more
35	 BE3933	Turbo Pressure Sensor Circuit	Open or short in turbo pressure sensor circuit for 0.5 sec. or more
35	 BE3933	Barometric Pressure Sensor Circuit	Open or short in BARO sensor circuit for 0.5 sec. or more

*3: See page [EG-503](#).

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
Open or short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Mass air flow meter (air intake) ECM	ON	ON	○	EG-534
Open or short in heater circuit of sub heated oxygen sensor. Sub heated oxygen sensor ECM	ON	N.A.	○	EG-540
Open or short in sub heated oxygen sensor circuit Sub heated oxygen sensor ECM	ON	ON		
Open or short in mass air flow meter circuit Mass air flow meter ECM	ON	N.A.	○	EG-544
Actuator (for waste gate valve) Short in VSV for waste gate valve circuit ECM	ON	N.A.	○	EG-546
Open or short in turbo pressure sensor circuit Turbo pressure sensor ECM	ON	ON	○	EG-549
ECM	ON	ON	○	EG-549

*1, 2: See page [EG-502](#).

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
41	 BE3934	Throttle Position Sensor Signal	Open or short in throttle position sensor circuit for 0.5 sec. or more
42	 BE3934	No. 1 Vehicle Speed Sensor Signal (for A/T)	All conditions below are detected continuously for 8 sec. or more: (a) No. 1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: 3,000 or more (c) Park/neutral position switch: OFF (d) Stop light switch: OFF
		No. 1 Vehicle Speed Sensor Signal (for M/T)	All conditions below are detected continuously for 8 sec. or more: (a) No. 1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: Between 1,500 rpm and 4,000 rpm (c) Engine coolant temp.: 80°C (176°F) or more (d) Load driving
43	 BE3934	Starter Signal	No starter signal to ECM
47	 BE3934	Sub-Throttle Position Sensor Signal	Open or short in sub-throttle position sensor circuit for 0.5 sec. or more
52	 BE3935	Knock Sensor Signal (front side)	No No.1 knock sensor signal to ECM for 4 crank revolutions with engine speed between 2,050 rpm and 5,950 rpm
53	 BE3935	Knock Control Signal	Engine control computer (for knock control) malfunction at engine speed between 650 rpm and 5,200 rpm
55	 BE3935	Knock Sensor Signal (rear side)	No No.2 knock sensor signal to ECM for 4 crank revolutions with engine speed between 2,050 rpm and 5,950 rpm

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
Open or short in throttle position sensor circuit Throttle position sensor ECM	ON	ON	○	EG-552
No.1 vehicle speed sensor Telltale light RH Open or short in No.1 vehicle speed sensor circuit ECM	OFF	OFF	○	EG-556
Open or short in starter signal circuit Open or short in ignition switch or starter relay circuit ECM	N.A	OFF	X	EG-559
Open or short sub-throttle position sensor circuit Sub-throttle position sensor ECM	OFF	ON	○	EG-552
Open or short in No.1 knock sensor circuit No.1 Knock sensor (looseness) ECM	ON	N.A	○	EG-561
ECM	ON	N.A	X	EG-561
Open or short in No.2 knock sensor circuit No.2 Knock sensor (looseness) ECM	ON	N.A	○	EG-561

*1, 2: See page [EG-502](#).

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
71	 BE3937	EGR System Malfunction	EGR gas temp. and intake air temp. are 60°C (140°F) or less for A/T, 55°C (131°F) or less for 1 ~ 4 min. under conditions (a) and (b): (2 trip detection logic)*³ (a) Engine coolant temp.: 60°C (140°F) or more (b) EGR operation possible (Example A/T in 3rd speed (5th for M/T), A/C ON, 96 km/h (60 mph), Flat road)
78	 BE3937	Fuel Pump Control Signal	(1) Open or short in fuel pump circuit for 1 sec. or more with engine speed 1,000 rpm or less (2 trip detection logic)*³ (2) Open in input circuit for 1 sec. or more with engine speed 1,000 rpm or less (2 trip detection logic)*³ (3) Open or short in diagnostic signal line (DI) fuel pump ECU with engine speed 1,000 rpm or less (2 trip detection logic)*³
51	 BE3935	Switch Condition Signal	(1) 3 sec. or more after engine starts, with closed throttle position switch OFF (IDL1) (2) Park/neutral position switch: OFF (Shift position in "R", "D", "2", or "L" position) (3) A/C switch ON

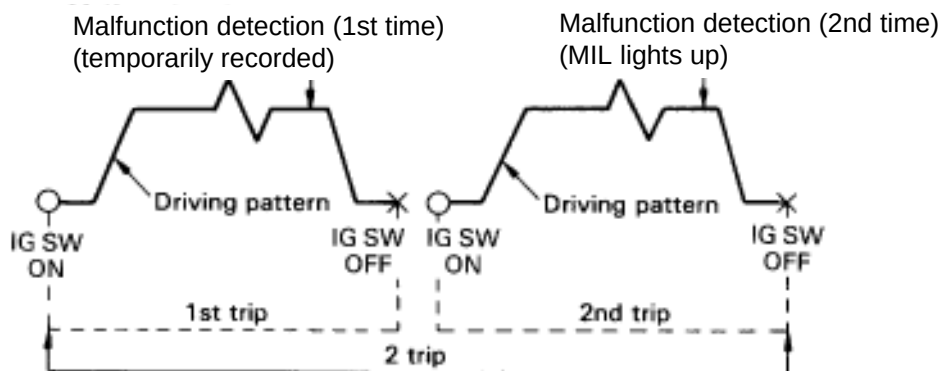
*1: "ON" displayed in the diagnostic mode column indicates that the Malfunction Indicator Lamp is lit up when a malfunction is detected. "OFF" indicates that the "CHECK" does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

*2: "○" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "X" indicates that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is done with the IG switch ON.

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See page
	Normal Mode	Test Mode		
Open in EGR gas temp. sensor circuit Short in VSV circuit for EGR EGR hose disconnected, valve stuck Clogged EGR gas passage ECM	ON	ON	○	EG-564
Open or short in fuel pump ECU circuit Fuel pump ECU Fuel pump ECM power source circuit ECM	OFF	ON	○	EG-568
A/C switch circuit Throttle position sensor IDL circuit Park/neutral position switch circuit Accelerator pedal and cable ECM	N.A.	OFF	X	EG-571

*3: This indicates items for which "2 trip detection logic" is used. With this logic, when a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the Malfunction Indicator Lamp to light up. The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip).

In the Test Mode, the Malfunction Indicator Lamp lights up the 1st trip a malfunction is detected.



FAIL-SAFE CHART

If any of the following codes is detected, the ECM enters fail-safe mode.

DTC No.	Fail-Safe Operation		Fail-Safe Deactivation Conditions
14	Fuel cut		6 IGF signals detected in 6 consecutive ignitions
16	Torque control prohibited		Returned to normal condition
22	THW is fixed at 80°C (176°F)		Returned to normal condition
24	THA is fixed at 20°C (68°F)		Returned to normal condition
31	Volume of air flowing is measured by turbo pressure Sensor to determine injection volume and ignition Timing		Returned to normal condition
34	Fuel cut		Returned to normal condition
35	Turbo Pressure Sensor	Fuel cut	Returned to normal condition
	BARO Sensor	Atmospheric pressure is fixed at 101.3 kPa (760 mmHg, 29.92 in·Hg)	Returned to normal condition
41	VTA1 is fixed at closed throttle position		The following must each be repeated at least 2 times consecutively: 0.1 V × VTA1 × 0.95 V IDL: ON
47	VTA2 is fixed at wide open throttle Position		The following must be repeated at least 2 times consecutively 0.1 V × VTA2 × 0.95 V
52	Max. timing retardation		IG switch OFF
53	Max. timing retardation		Returned to normal condition
55	Max. timing retardation		IG switch OFF

Back-Up Function

If there is trouble with the program in the ECM and the ignition signals (IGT) are not output 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 throttle position signal (IDL). Also, the ignition timing is fixed at the initial ignition timing, 10° BTDC, without relation to the engine speed.

HINT: If the engine is controlled by the back-up function, the malfunction indicator lamp lights up to warn the driver of the malfunction but the diagnostic trouble code is not output.

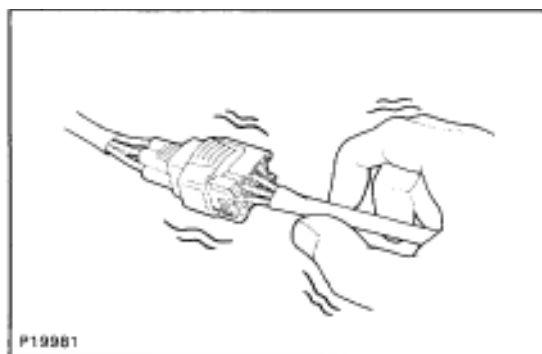
CHECK FOR INTERMITTENT PROBLEMS

As described in the preceding paragraph, abnormality detection ability in the test mode is increased compared to that in the normal mode, so that when intermittent problems occur in the ECM signal circuits (G1, G2, NE, THW, THA, VTA1, VTA2) shown in the table below, the appropriate diagnostic trouble code is output.

Accordingly, when the diagnostic trouble codes shown in the table opposite (13, 22, 24, 41, 47) are output during the diagnostic trouble code check, and inspection of the appropriate circuits reveals no abnormality, check for intermittent problems as described below.

By checking for intermittent problems, the place where intermittent problems are occurring due to poor contacts can be isolated.

DTC	Circuit
13	G, NE signal circuit (No.2)
22	Engine coolant temp. sensor circuit
24	Intake air temp. sensor circuit
41	Throttle position sensor circuit
47	Sub-throttle position sensor circuit

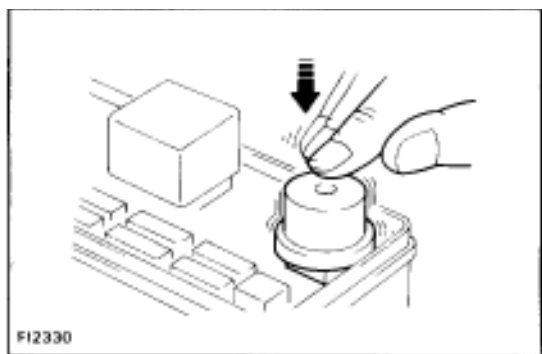


CLEAR DIAGNOSTIC TROUBLE CODES

See page EG-493.

SET TEST MODE

1. With the ignition switch OFF, using SST, connect the terminals TE2 and E1 of the data link connector 2.
SST 09843-18020
2. Start the engine and check to see the malfunction indicator lamp goes off.



PERFORM A SIMULATION TEST

Using the symptom simulation (See page IN-24), apply vibration to and pull lightly on the wire harness, connector or terminals in the circuit indicated by the malfunction code.

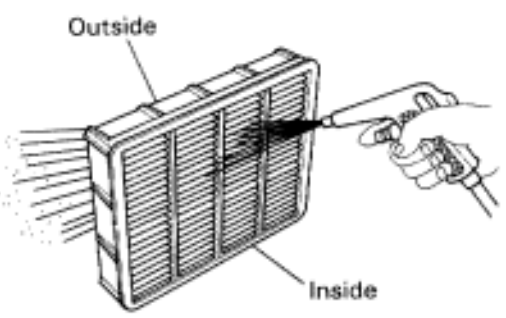
In this test, if the malfunction indicator lamp lights up, it indicates that the place where the wire harness, connector or terminals being pulled or vibrated has faulty contact. Check that point for loose connections, dirt on the terminals, poor fit or other problems and repair as necessary.

HINT: After cancelling out the diagnostic trouble code in memory and set the test mode, if the malfunction indicator lamp does not go off after the engine is started, check thoroughly for faulty contacts, etc., then try the check again, if the malfunction indicator lamp still does not go off, check and replace ECM.

BASIC INSPECTION

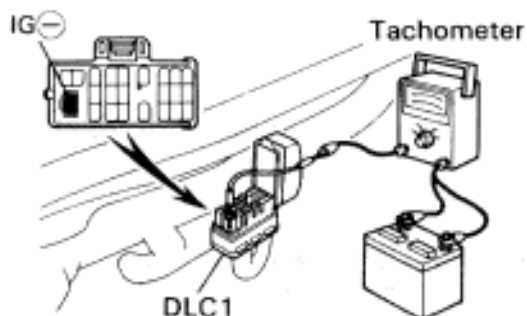
In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

If there is a problem, and a normal code is displayed, proceed to the matrix chart of problem symptoms on page [EG-514](#). Make sure that every likely cause of the problem is checked.

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 matrix chart of problem symptom on page EG-514.
3	Does engine start?
YES	NO Go to step 7.
4	Check air filter.
 MA0688	P Remove air filter. C Visually check that the air filter is not excessively dirty or oily. Hint If necessary, clean the air filter with compressed air. First blow from inside thoroughly, then blow from outside of the air filter.
OK	NG Repair or replace.

5

Check idle speed.



P11291

P

- (1) Shift transmission into "N" position.
- (2) Warm up engine to normal operating temperature.
- (3) Switch OFF all accessories.
- (4) Switch OFF air conditioning.
- (5) Connect tachometer test probe to terminal IG of data link connector 1.

C

Check Idle speed.

OK

Idle speed: 650 ± 50 rpm

Caution

Never allow tachometer test probe to touch ground as it could result in damage to igniter and/or ignition coil.

As some tachometers are not compatible with this ignition system, we recommended that you confirm the compatibility of your unit before use.

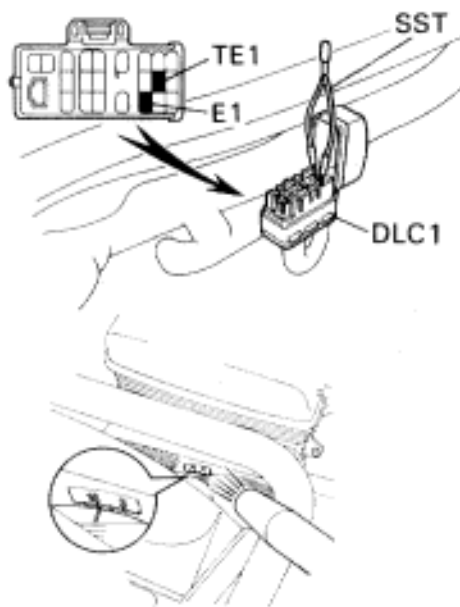
OK

NG

Proceed to matrix chart of problem symptoms on page [EG-514](#).

6

Check ignition timing.

P11288
P11833

P

- (1) Shift transmission into "N" position.
 - (2) Warm up engine to normal operating temperature.
 - (3) Keep the engine speed at idle.
 - (4) Using SST, connect terminals TE1 and E1 of data link connector 1.
- SST 09843-18020
- (5) Connect a timing light clip to the check wire.
(See page [EG-20](#))

C

Check ignition timing.

OK

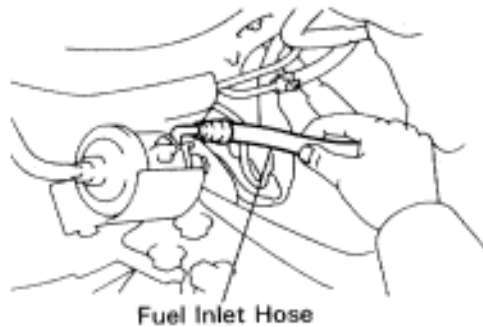
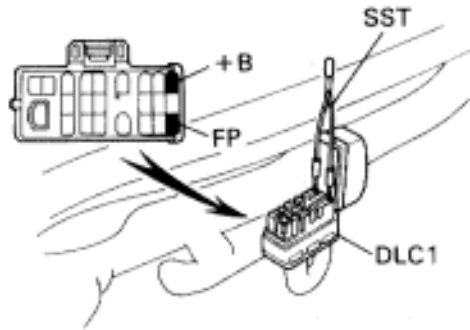
Ignition timing: $10 \pm 2^\circ$ BTDC @ idle

OK

NG

Proceed to page [EG-518](#) and continue to troubleshoot.

Proceed to matrix chart of problem symptoms on page [EG-514](#).

7**Check fuel pressure.**

AB0119
P11290
P11446

P

- (1) Be sure that there is enough fuel in the tank.
- (2) Turn ignition switch ON.
- (3) Using SST, connect terminals FP and +B of data link connector 1.
SST 09843-18020

C

Check that there is pressure in the hose from the fuel filter.

Hint

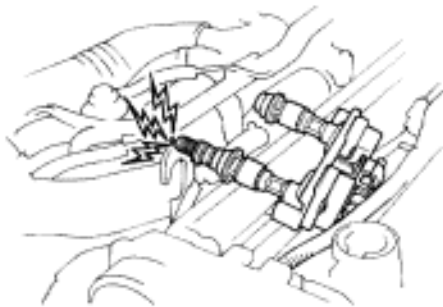
If there is fuel pressure, you will hear the sound of fuel flowing.

Caution

Never make a mistake with the terminal connection position as this will cause a malfunction.

OK**NG**

Proceed to page [EG-264](#) and continue to troubleshoot.

8**Check for spark.**

P11799

P

- (1) Remove ignition coil (See page [IG-26](#))
- (2) Remove spark plug.
- (3) Install the spark plug to the ignition coil, and connect the ignition coil connector.
- (4) Ground the spark plug.

C

Check if spark occurs while engine is being cranked.

Hint

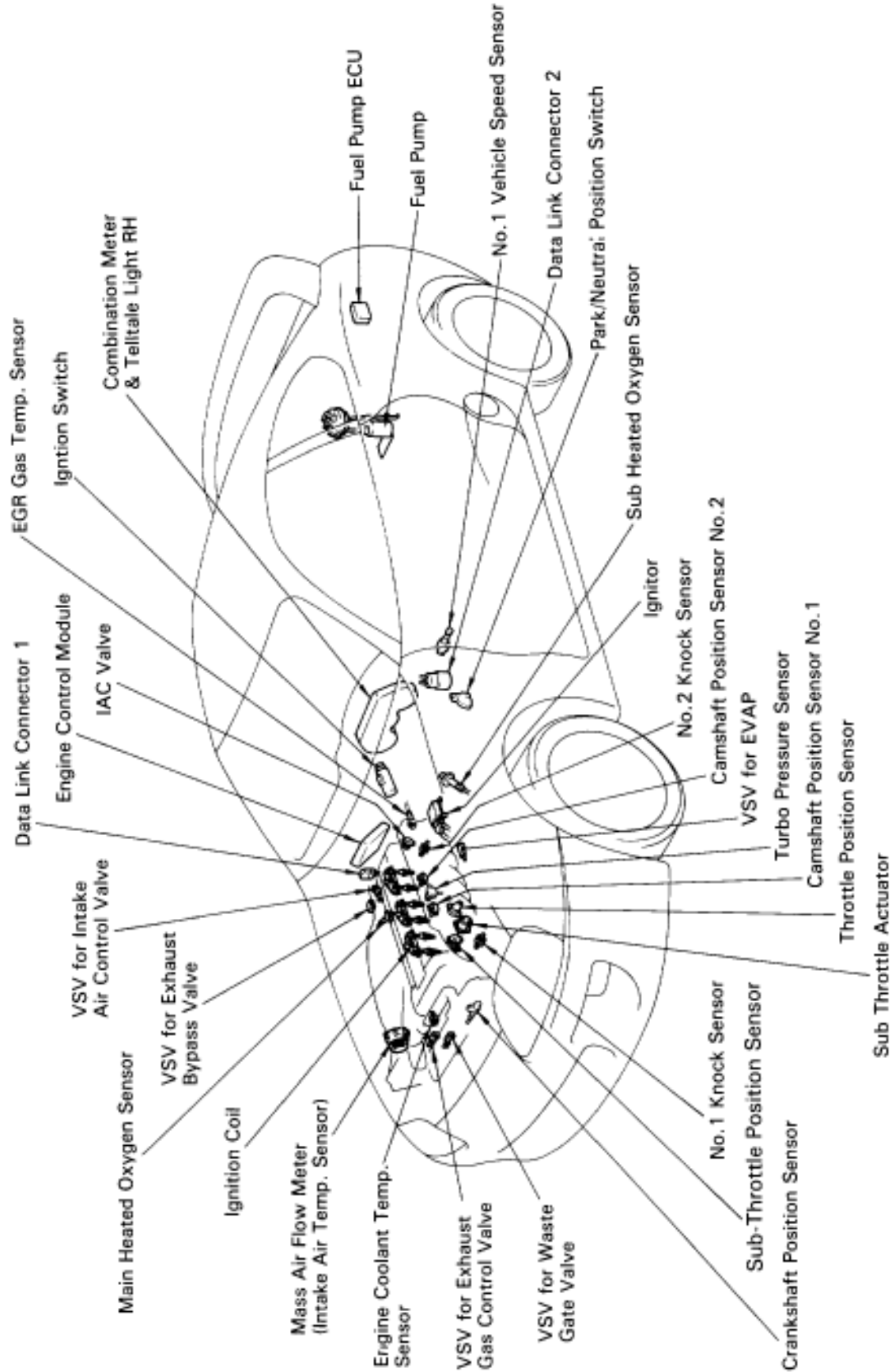
To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 1 — 2 seconds at a time.

OK**NG**

Proceed to page [IG-21](#) and continue to troubleshoot.

Proceed to matrix chart of problem symptoms on page [EG-514](#).

PARTS LOCATION



STANDARD VALUE OF ECM TERMINALS

Connectors of the engine control module are waterproof and are the bolt type.

For waterproof type connectors, in order to measure the voltage of ECM terminals and the resistance of connected parts, connect the inspection sub wire harness between the ECM and vehicle wire harness, then do the inspection.

The inspection method of inserting a tester probe from the other side of connector significantly reduces the waterproof performance.

Disconnect the connector by fully loosening the bolt.

PREPARATION

1. Turn the ignition switch OFF.
2. Turn up the passenger side floor carpet.
(See page [EG-324](#))
3. Remove the ECM protector.
4. Disconnect the connector from the ECM.

After completely loosening the bolt, the 2 parts of the connector can be separated.

NOTICE:

- Do not pull the wire harness when disconnecting the connector.
- When disconnecting the connector, the ECM's back-up power source is cut off, so the malfunction codes, etc. recorded in the ECM memory are cancelled.
- Never insert a tester probe or male terminal used for inspection purposes into the female terminal of the vehicle wire harness. Otherwise, the female terminal may be widened, which can result in faulty connection.

5. Connect SST (check harness "A") between the ECM and connector of the vehicle wire harness.

SST 09990-01000

HINT: The arrangement of the check connector terminals are the same as those of the ECM.

See page [EG-511](#).

6. Disconnect the SST.

SST 09990-01000

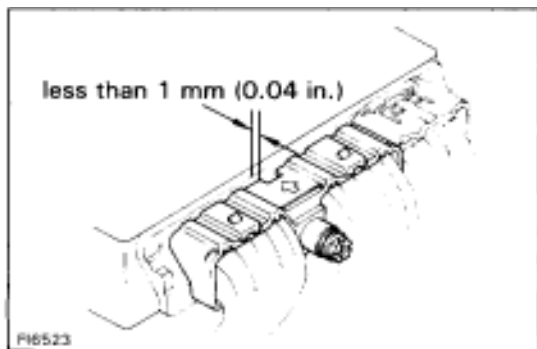
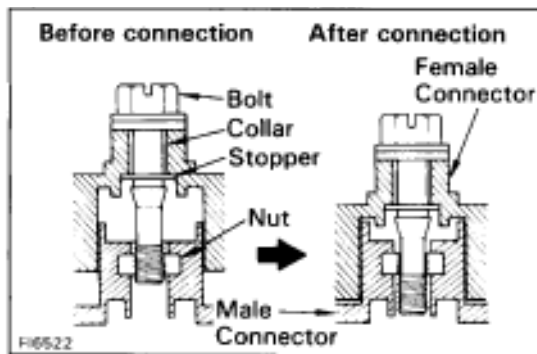
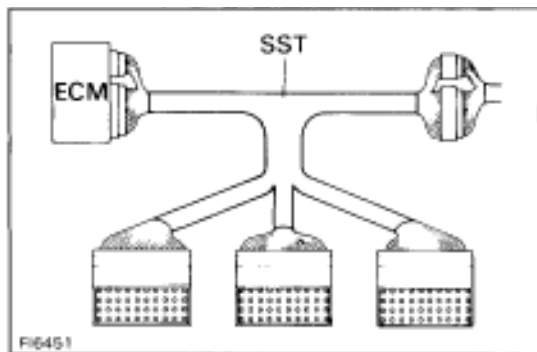
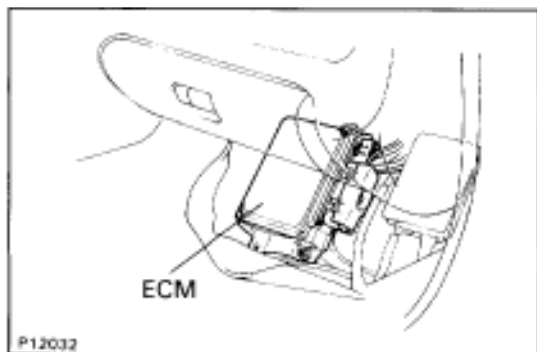
7. Reconnect the connector to the ECM.

- (a) Match the male connector correctly with the female connector, then press them together.

- (b) Tighten the bolt.

Make sure the connector is completely connected by tightening the bolt until there is a clearance of less than 1 mm (0.04 in.) between the bottom of the male connector and the end of the female connector.

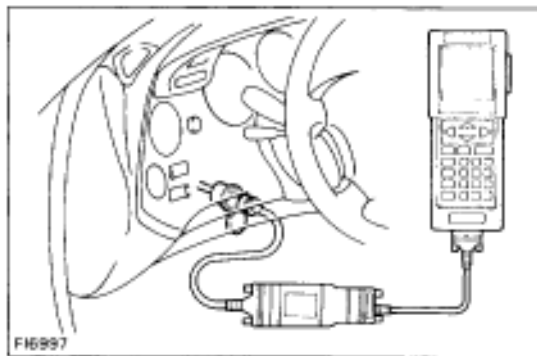
8. Install the ECM protector and floor carpet.



STANDARD VALUE OF ECM TERMINALS

ECM Terminals		
Symbols (Terminals No.)	STD Voltage (V)	Condition
BATT (A33) — E1 (B69)	9 ~ 14	Always
IGSW (A1) + B (A31) — E1 (B69)	9 ~ 14	IG switch ON
VCC (B41) — E2 (B65)	4.5 ~ 5.5	IG switch ON
IDL1 (B64) — E2 (B65)	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
IDL2 (B63) — E2 (B65)	0 ~ 3.0	IG switch ON Sub-throttle valve fully closed
	9 ~ 14	IG switch ON Sub-throttle valve fully open
VTA1 (B43) VTA2 (B42) — E2 (B65)	0.3 ~ 0.8	IG switch ON Main or sub-throttle valve fully closed
	3.2 ~ 4.9	IG switch ON Main or sub-throttle valve fully open
THA (B45) — E2 (B65)	0.5 ~ 3.4	Idling, Intake air temp. 0°C (32°F) to 80°C (176°F)
THW (B44) — E2 (B65)	0.2 ~ 1.0	Idling, Engine coolant temp. 60°C (140°F) to 120°C (248°F)
STA (B77) — E1 (B69)	6.0 or more	Cranking
#10 (B20), #20 (B19) #30 (B18), #40 (B17) #50 (B16), #60 (B15) — E01 (B80)	9 ~ 14	IG switch ON
	Pulse generation (See page EG-583)	Idling
IGT1 (B57), IGT2 (B56) IGT3 (B55), IGT4 (B54) IGT5 (B53), IGT6 (B52) — E1 (B69)	9 ~ 14	IG switch ON
	Pulse generation (See page EG-521)	Idling
IGF (B58) — E1 (B69)	4.5 ~ 5.5	IG switch ON
	Pulse generation (See page EG-521)	Idling
G1 (B26) — G1 ⊖ (B6) G2 (B25) — G2 ⊖ (B5) NE (B27) — NE ⊖ (B7)	Pulse generation (See page EG-517)	Idling
M-REL (A24) — E1 (B69)	9 ~ 14	IG switch ON
FPC (A22) — E1 (B69)	Below 1.5	IG switch ON
	Pulse generation (4.5 ~ 5.5)	Idling
DI (A21) — E1 (B69)	7.0 or more	Idling
EVAP (B74) — E01 (B80)	9 ~ 14	IG switch ON

Symbols (Terminals No.)	STD Voltage (V)	Condition
EGR (B75)–E01 (B80)	Below 2.0	Idling
	9 ~ 14	Engine speed at 3,500 rpm
VG (B66)–E21 (B28)	0.7 ~ 1.7	Idling
ISC1 (B35), ISC2 (B34) — E01 (B80) ISC3 (B33), ISC4 (B32)	Pulse generation (See page EG-586)	Idling when A/C switch ON or OFF
VF1 (B29)–E1 (B69)	1.8 ~ 3.2	Maintain engine speed at 2,500 rpm for 2 minutes after warming up then return to Idling
OX1 (B48), OX2 (B47)–E1 (B69)	Pulse generation (See page EG-529)	Maintain engine speed at 2,500 rpm for 2 minutes after warming up
HT1 (B71), HT2 (B72)–E01 (B80)	Below 3.0	Idling
	9 ~ 14	IG switch ON
KNK1 (B50), KNK2 (B49)–E1 (B69)	Pulse generation (See page EG-563)	Idling
NSW (B76)–E1 (B69)	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 (A2)–E1 (B69)	Pulse generation (See page EG-556)	IG switch ON Rotate driving wheel slowly
TE1 (A20)–E1 (B69)	9 ~ 14	IG switch ON
TE2 (A19)–E1 (B69)	9 ~ 14	IG switch ON
W (A6)–E1 (B69)	9 ~ 14	Idling
	0 ~ 3.0	IG switch ON
OD1 (A12)–E1 (B69)	9 ~ 14	IG switch ON
A/C (A34)–E1 (B69)	7.5 ~ 14	A/C switch OFF
	0 ~ 1.5	A/C switch ON (At idling)
ACMG (A23)–E1 (B69)	0 ~ 3.0	A/C switch ON (At idling)
	9 ~ 14	A/C switch OFF
FPU (B73)–E01 (B80)	9 ~ 14	IG switch ON
	Below 2.0	Restarting at high engine coolant temp.
ELS (A15)–E1 (B69)	7.5 ~ 14	Defogger switch and taillight switch ON
	0 ~ 1.5	Defogger's switch and taillight switch OFF
VSV1 (B40)–E1 (B69)	Below 3.0	Immediately after racing
	9 ~ 14	Idling
VSV2 (B39)–E1 (B69)	Below 3.0	For 2 sec. after IG switch ON to OFF
	9 ~ 14	Idling
VSV3 (B38)–E1 (B69)	9 ~ 14	Idling
PMC (B60)–E1 (B69)	Below 3.0	Idling (for M/T) Idling and shift position "P", "N" position (for AT)
	9 ~ 14	Idling and other shift position "P", "N" position (for A/T))
PM1 (B62)–E2 (A65)	2.3 ~ 3.0	IG switch ON
	1.8 ~ 2.4	IG switch ON and apply vacuum 26.7 kPa (200 mmHg, 7.9 in Hg)



REFERENCE VALUE OF ECM DATA

HINT: ECM data can be monitored by TOYOTA hand-held tester.

1. Hook up the TOYOTA hand-held tester to DLC2.
2. Monitor ECM data by following the prompts on the tester screen.

Please refer to the TOYOTA hand-held tester operator's manual for further details.

REFERENCE VALUE

Item	Inspection condition	Reference value
INJECTOR	Engine cold to hot Engine idling at normal operating temp.*1	Gradually decreases Approx. 1.8 msec.
IGNITION	Increase engine speed	Gradually increases
IAC STEP #	Engine idling at normal operating temp..*1 A/C switch ON A/T shifting in "D" position Ignition switch ON (Engine off)	20 ~ 30 steps Step increases Step increases Approx. 125 steps'
ENGINE SPEED	RPM kept stable (Comparison with tachometer)	No great changes
MAF	Engine idling at normal operating temp..*1 Increase engine speed	Approx. 3.8 g/s Gradually increases
ECT	Engine at normal operating temp.	75–95°C (185–203°F).*2
THROTTLE	Closed throttle position Wide open throttle From closed throttle position to wide open throttle	Below 5° Above 70° Gradually increases
VEHICLE SPD	During driving (Comparison with speedometer)	No large differences
TARGET A/FL	Engine idling at normal operating temp.	2.50 ± 1.25 V*3
A/F FB LEFT	RPM stable at 2,500 rpm with normal operating temp.	ON
KNOCK FB	Depress throttle pedal suddenly during idling	ON
STA SIGNAL	During cranking	ON
CTP SIGNAL	Closed throttle position	ON
A/C SIGNAL	A/C switch ON	ON
PNP SIGNAL.*4	When shifting from "P" or "N" position into a position other than "P" or "N"	GEAR
OxL	RPM stable at 2,500 rpm with normal operating temp.	RICH LEAN is repeated

*1: All accessories and A/C switched OFF

*2: If the engine coolant temp. sensor circuit is open or shorted, the ECM assumes an engine coolant temp. value of 80°C (176°F).

*3: When feedback control is forbidden, 0 V is displayed.

*4: A/T only

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, proceed to this matrix chart and troubleshoot according to the numbered order given below.

		Symptom	Suspect area		See page	
Does not start	Engine does not crank		Mass air flow meter circuit	EG-544		
	No initial combustion		Starter signal circuit	EG-559		
	No complete combustion		EGR system	EG-564		
Difficult to start	Engine cranks normally	1	Switch condition signal circuit	EG-571	2	
	Cold engine	1	Park/neutral position switch circuit	EG-574	1	
	Hot engine	1	ECM power source circuit	EG-576	5	
Poor Idling	Incorrect first idle		Back up power source circuit	EG-581	5	
	High engine idle speed		Injector circuit	EG-583	2	
	Low engine idle speed	7	IAC valve circuit	EG-586	7	2
	Rough idling	3	Fuel pump control circuit	EG-568	4	3
	Hunting	3	VSV circuit for fuel Pressure Control	EG-595	5	4
Poor Driveability	Hesitation/Poor acceleration	2	Turbo control circuit	EG-589	8	
	Muffler explosion (after fire)		A/C signal circuit (Compressor circuit)	AC-62		
	Surging		Starter and Starter relay	ST-3		
Engine Stall	Soon after starting	2	Ignition signal circuit (Spark test)	IG-21	2	
	After accelerator pedal depressed	2	Spark plug	IG-22	4	
	After accelerator pedal released		Ignition coil	IG-23	3	
	During A/C operation		Compression	EG-9	2	
	When shifting N to D		A/T faulty	AT2-101		
			Theft deterrent ECU	BE-123	3	
			Engine control module (ECM)	IN-35		

CIRCUIT INSPECTION

DTC 12 G NE Signal Circuit (No.1)

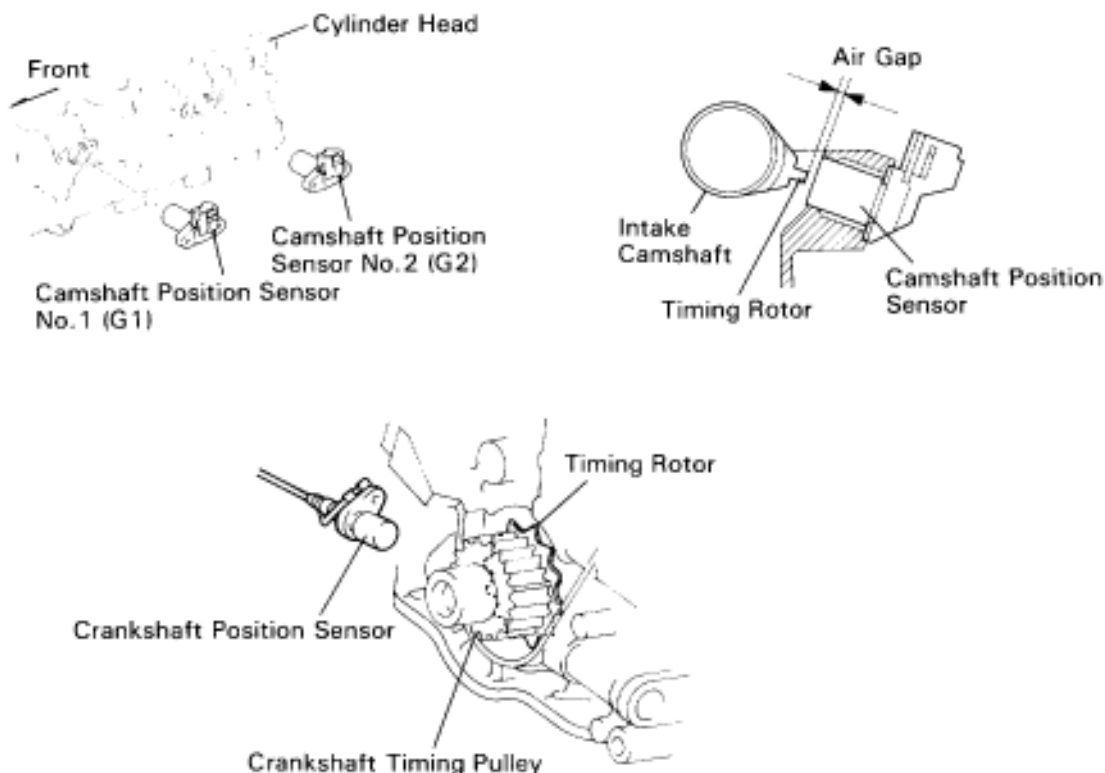
CIRCUIT DESCRIPTION

Camshaft position sensors (G1 and G2 signals) are mounted on the intake side of the cylinder head and the crankshaft position sensor (NE signal) is mounted on the oil pump body. These sensors consist of a timing rotor and pick up coil.

The G1, G2 timing rotors have 1 tooth each on their outer circumference and are mounted on the intake camshaft.

When the intake camshaft rotates, the protrusion on the timing rotors 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.

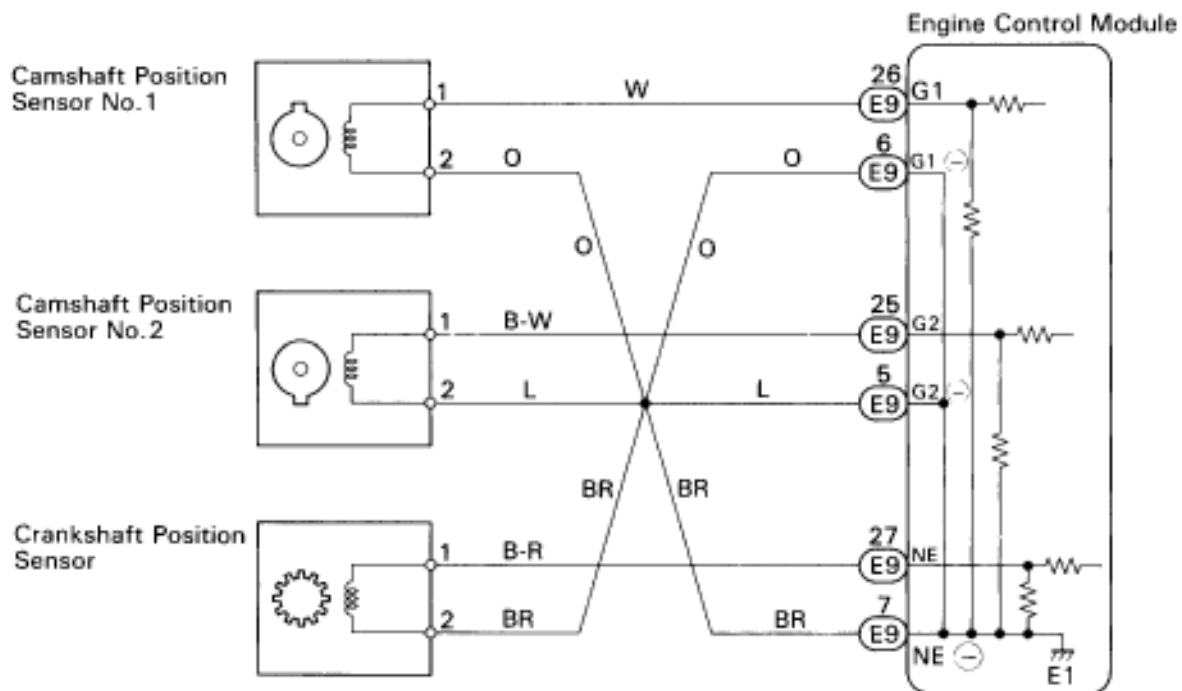
The NE timing rotor has 12 teeth and is mounted on the crankshaft. The NE signal sensor generates 12 NE signals per engine revolution. The ECM detects the standard crankshaft angle based on the G1, G2 signals, and the actual crankshaft angle and the engine speed by the NE signals.



FI6920 FI6921
FI6922

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
12	No "NE" or "G1" and "G2" signal to ECM for 2 sec. or more after cranking	Open or short in crankshaft position sensor, camshaft position sensor No.1, No.2 circuit Crankshaft position sensor Camshaft position sensor No.1, No.2 Starter ECM

WIRING DIAGRAM



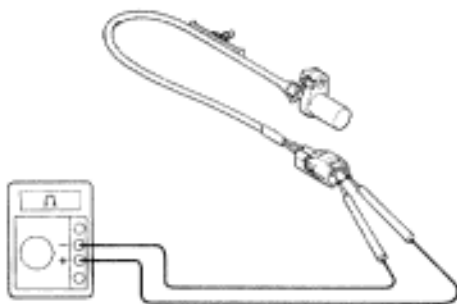
F16917

INSPECTION PROCEDURE

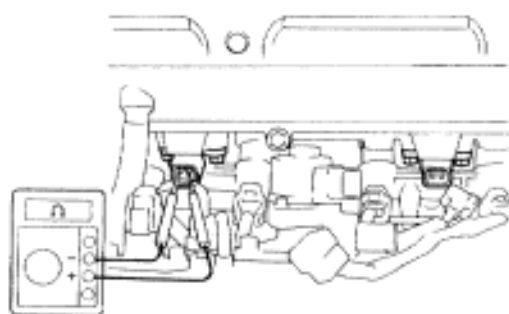
1

Check crankshaft position sensor, camshaft position sensors No.1, No.2.

For Crankshaft Position Sensor



For Camshaft Position Sensor No.1, No.2

P12341
P12177

P

For crankshaft position sensor, remove crankshaft position sensor (See page IG-30).

For camshaft position sensor No.1, No.2, disconnect camshaft position sensor No.1 No.2 connectors.

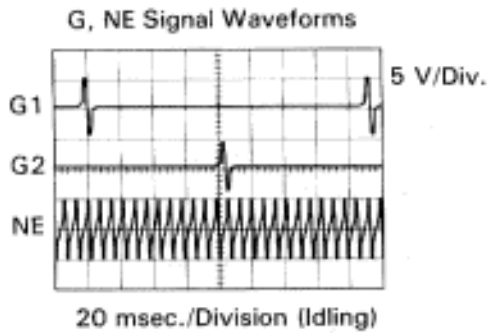
C

Measure resistance of crankshaft position sensor, camshaft position sensor No.1 and No.2.

OK

		Resistance	
Camshaft Position Sensor	Cold	835 ~ 1,400 Ω	ND
		985 ~ 1,600 Ω	Aisan
	Hot	1,060 ~ 1,645 Ω	ND
		1,265 ~ 1,890 Ω	Aisan
Camshaft Position Sensor No.1 and No.2	Cold	835 ~ 1,400 Ω	ND
		985 ~ 1,600 Ω	Aisan
	Hot	1,060 ~ 1,645 Ω	ND
		1,265 ~ 1,890 Ω	Aisan

"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).

Reference**INSPECTION USING OSCILLOSCOPE**

During cranking or idling, check waveforms between terminals G1, G2 and G1 ×, G2 ×, NE and NE × of engine control module.

HINT: The correct waveforms are as shown.

FI6519

OK**NG**

Replace crankshaft position sensor, camshaft position sensor No.1, No.2.

2

Check for open and short in harness and connector between engine control module and each sensor (See page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

3

Inspect sensor installation and teeth of timing rotor.

OK**NG**

Tighten the sensor. Replace timing rotor (Intake camshaft, crankshaft timing pulley).

Check and replace engine control module.

DTC 13 G NE Signal Circuit (No.2)

CIRCUIT DESCRIPTION

Refer to G, NE signal circuit (No.1) on page [EG-515](#)

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
13	No NE signal to ECM for 0.1 sec. or more at 1,000 rpm or more	Open or short in crankshaft position sensor circuit Crankshaft position sensor ECM
	NE signal does not pulse 12 times to ECM during the interval between G1 and G2 pulses	Open or short in crankshaft position sensor circuit Mechanical system malfunction (skipping teeth of timing belt, belt stretched) Crankshaft position sensor ECM
	Deviation in G (G1, G2) and NE signal Continues for 3 sec. during idling throttle fully closed after engine warmed up	Mechanical system malfunction (skipping teeth of timing belt, belt stretched) Camshaft position sensor No. 1, No.2 ECM

INSPECTION PROCEDURE

1	Inspect sensor installation. Check if any teeth of NE signal plate are broken.	
OK	NG	Tighten sensor. Replace timing rotor.
2	Check valve timing (Check for loose and jumping teeth of timing belt (See page EG-33)).	
OK	NG	Adjust valve timing (repair or replace timing belt).
Check for intermittent problems. (See page EG-505)		

DTC 14 Ignition Signal Circuit

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr_1 at a predetermined angle ($^{\circ}$ CA) before the desired ignition timing and outputs an ignition signal (IGT) "1" to the igniter.

Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr_2 turns on.

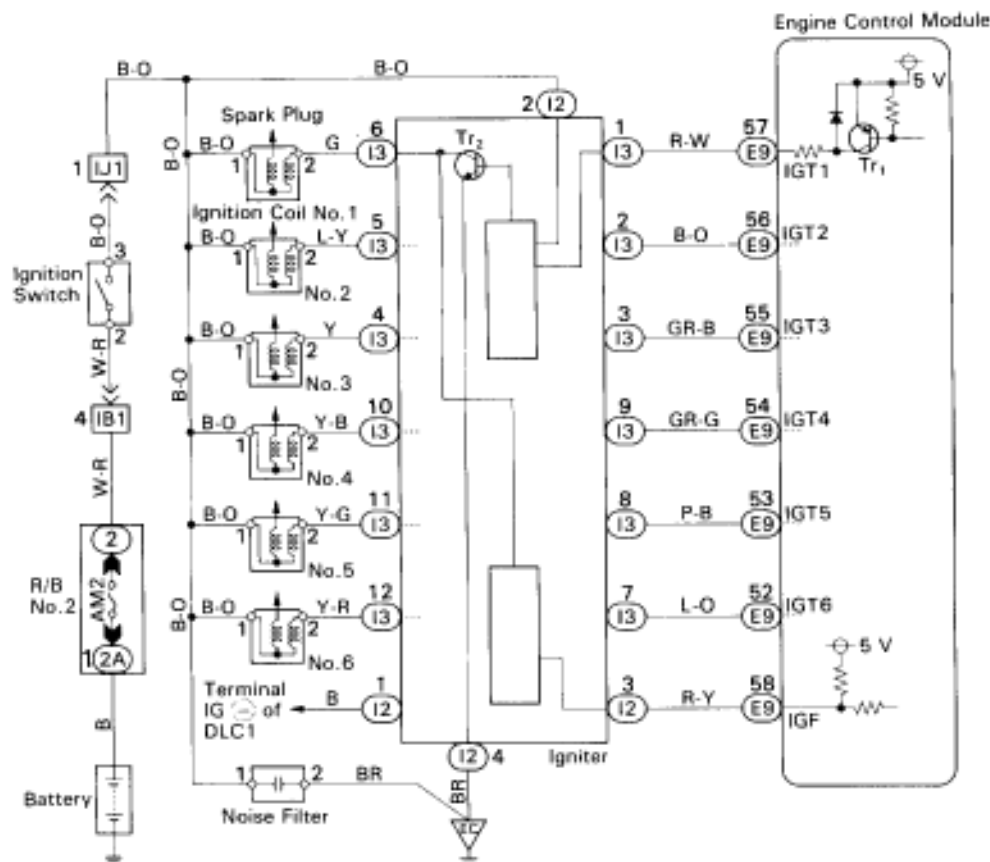
When it reaches the ignition timing, the ECM turns Tr_1 off and outputs the IGT signal "O".

This turns Tr_2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM.

The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
14	No IGF signal to ECM for 4 ~ 7 consecutive IGT signals with engine speed less than 3,000 rpm	Open or short in IGF circuit from igniter to ECM Igniter ECM

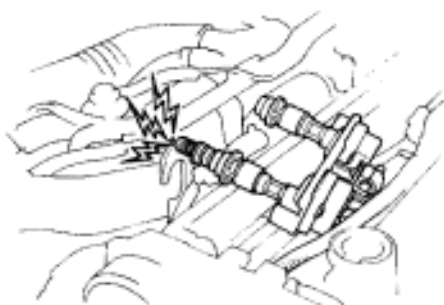
WIRING DIAGRAM



INSPECTION PROCEDURE

1

Check for spark.



P11799

P

- (1) Remove ignition coil. (See page [IG-26](#))
- (2) Remove spark plug.
- (3) Install the spark plug to the ignition coil, and connect the ignition coil connector.
- (4) Ground the spark plug.

C

Check if spark occurs while engine is being cranked.

Hint

To prevent excess fuel being injected from injectors during this test, don't crank the engine for more than 1—2 seconds at a time.

OK

NG

Go to step **4**.

2

Check for open and short in harness and connector in IGF signal circuit between engine control module and igniter (See page [IN-30](#)).

OK

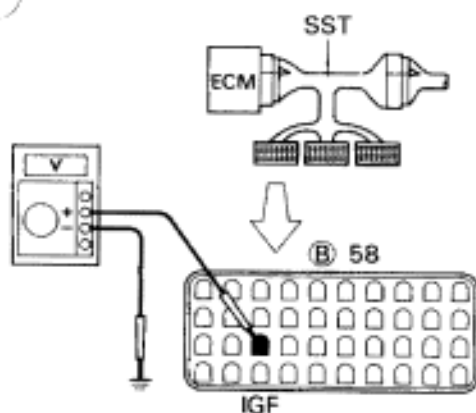
NG

Repair or replace harness or connector.

3

Disconnect igniter connector and check voltage between terminal IGF of engine control module connector and body ground.

ON



BE0653 FI6821

P

- (1) Disconnect igniter connector.
- (2) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
- (3) Turn ignition switch ON.

C

Measure voltage between terminal IGF of engine control module connector and body ground.

OK

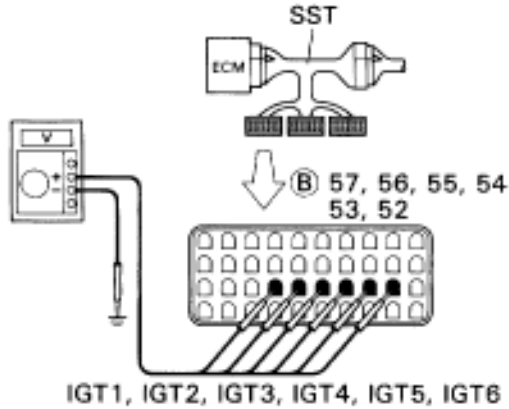
Voltage: 4.5 — 5.5 V

NG

OK

Replace igniter.

Check and replace engine control module.

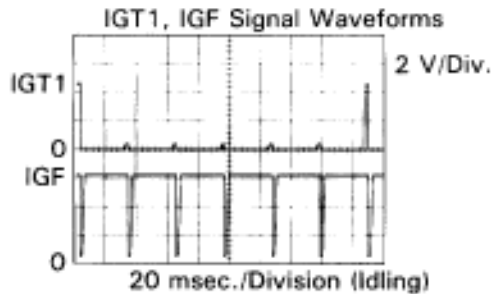
4**Check voltage between terminal IGT (1 ~ 6) of engine control module connector and body ground.****START**BE6653
F16946

P Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000

C Measure voltage between terminal IGT (1 ~ 6) of engine control module connector and body ground when engine is cranked.

OK Voltage: 0.5 — 1.0 V
(Neither 0 V nor 5 V)

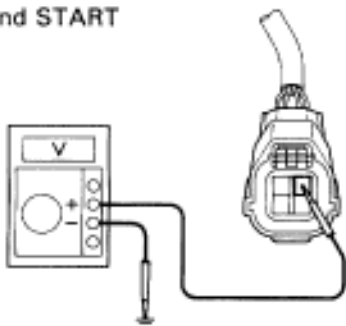
Reference

INSPECTION USING OSCILLOSCOPE

F16952

During idling, check waveforms between terminals IGT1, IGF and E1 of engine control module.

HINT: The correct rectangular waveforms are as shown, IGT2, IGT3, IGT4, IGT5 and IGT6 signal waveforms are same as IGT1 signal waveform.

OK**NG**Go to step **8**.**5****Check voltage between terminal 2 of igniter connector (I2) and body ground.****ON and START**BE6653
F16960

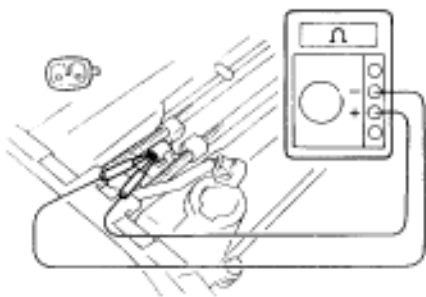
P Disconnect igniter connector.

C Measure voltage between terminal 2 of igniter connector (I2) 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.

6**Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page [IN-30](#)).****OK****NG****Repair or replace harness or connector.****7****Check ignition coil.**

P11795

P**Disconnect ignition coil connector.**
(See page [IG-23](#))**C****Measure resistance between terminals of ignition coil connector.****OK**

Resistance	
Cold	0.54 – 0.84 Ω
Hot	0.68 – 0.98 Ω

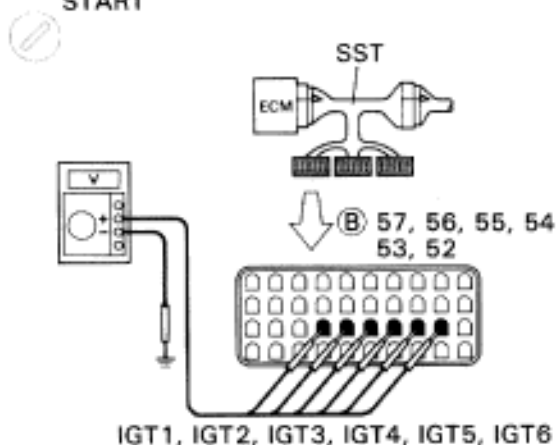
“Cold” is from — 10°C (14°F) to 50°C (122°F) and “Hot” is from 50°C (122°F) to 100°C (212°F).

OK**NG****Replace ignition coil.****Replace igniter.**

8

Disconnect igniter connector and check voltage between terminal IGT (1 ~ 6) of engine control module connector and body ground.

START

BE6653
FI0946**P**

Disconnect igniter connector.

C

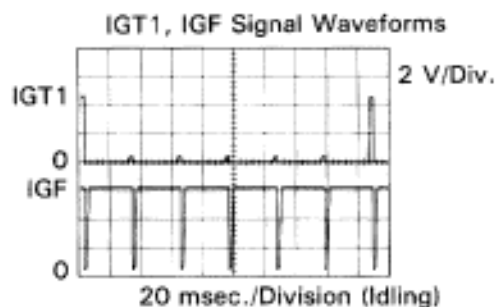
Measure voltage between terminal IGT (1 ~ 6) of engine control module connector and body ground when engine is cranked.

OK

Voltage: 0.5 — 1.0 V
(Neither 0 V nor 5 V)

Reference

INSPECTION USING OSCILLOSCOPE



FI6952

During idling, check waveforms between terminals IGF1, IGF and E1 of engine control module.

HINT: The correct rectangular waveforms are as shown, IGT2, IGT3, IGT4, IGT5 and IGT6 signal waveforms are same as IGT1 signal waveform.

NG**OK**

Replace igniter.

9

Check for open and short in harness and connector in IGT (1 ~ 6) signal circuit between engine control module and igniter (See page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

Check and replace engine control module.

DTC 16 A T Control Signal Malfunction

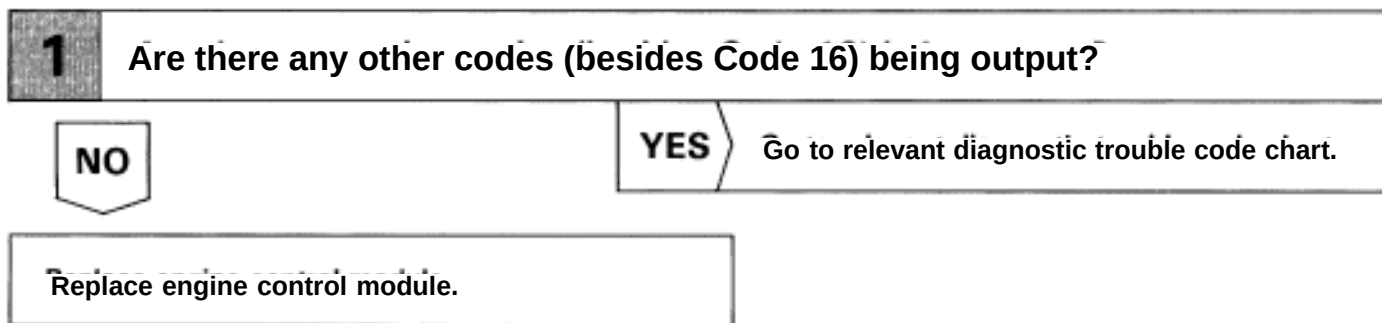
CIRCUIT DESCRIPTION

The signal from the A/T CPU retards the ignition timing of the engine during A/T gear shifting, thus momentarily reducing torque output of the engine for smooth clutch operation inside the transmission and reduced shift shock.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
16	Fault in communications between the engine CPU and A/T CPU in the ECM	ECM

If the ECM detects the diagnostic trouble code "16" in memory, it prohibits the torque control of the A/T which performs smooth gear shifting.

INSPECTION PROCEDURE



DTC 21 Main Heated Oxygen Sensor Circuit

CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NO_x components of the exhaust gas, a three-way catalytic converter is used, but for 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.

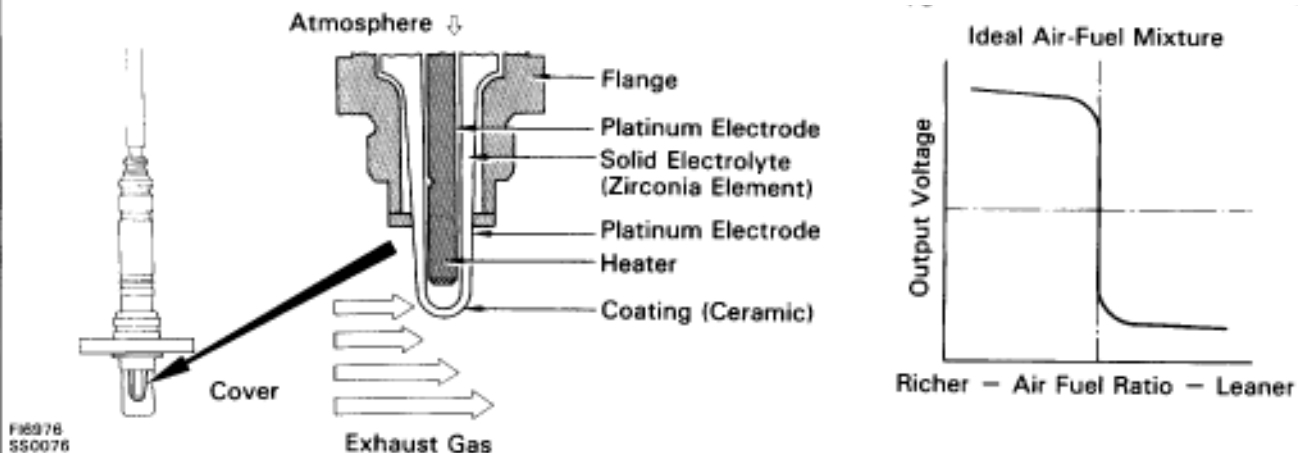
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air-fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air-fuel ratio.

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 duration accordingly. However, if malfunction of the oxygen sensor causes an output of abnormal electromotive force, the ECM is unable to perform accurate air-fuel ratio control.

The main heated oxygen sensor includes 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.)



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
21	(1) Open or short in heater circuit of main heated oxygen sensor for 0.5 sec. or more.	Open or short in heater circuit of main heated oxygen sensor Main heated oxygen sensor heater ECM
	(2) Main heated oxygen sensor signal voltage is reduced to be 0.35 V and 0.70V for 60 sec. under condition (a) ~ (d): (2 trip detection logic)*1 (a) Engine coolant temp.: Between 80°C (176°F) and 95°C (203°F) (b) Engine speed: 1,500 rpm or more (c) Load driving (Example A/T in overdrive (5th for M/T), A/C ON, Flat road, 80 km/h (50 mph)) (d) Main heated oxygen sensor signal voltage: Alternating above and below 0.45V	Main heated oxygen sensor circuit Main heated oxygen sensor

*1: See page [EG-503](#).

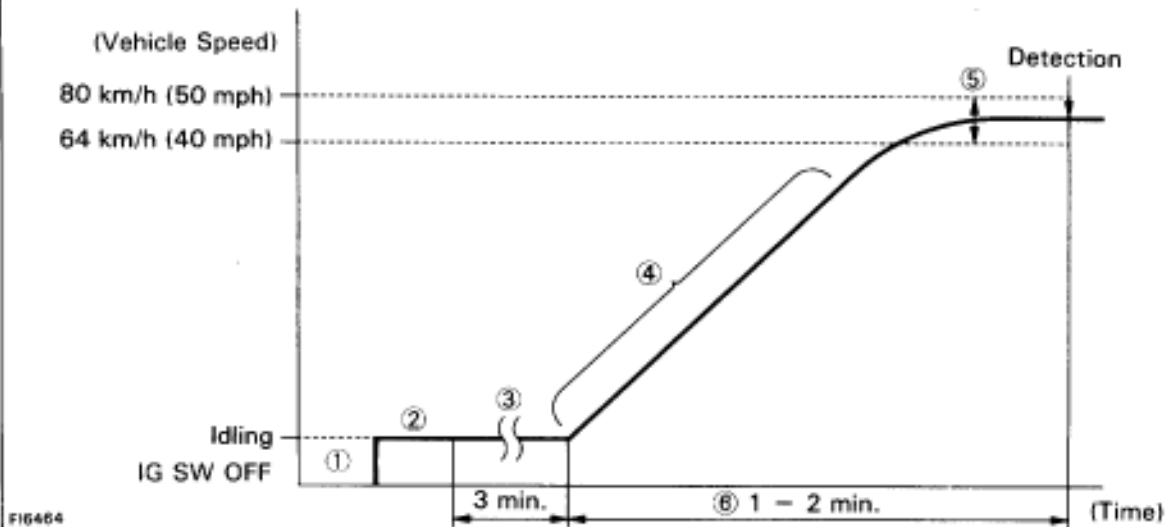
CIRCUIT DESCRIPTION (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

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

Malfunction: Main Heated Oxygen Sensor Deterioration



It is vital that this test routine is adhered to detect the malfunction:

- (1) Disconnect the EFI No.1 fuse (30 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up with all ACC switch OFF.
- (3) Idle the engine for 3 min.
- (4) Accelerate gradually within the range 1,300 ~ 1,7700 rpm (centered around 1,500 rpm) with the A/C switch ON and D position for A/T (5th for M/T).

HINT: Ensure engine rpm does NOT fall below 1200 rpm.

Gradually depress the accelerator pedal at a suitable rate to comply with the test requirements on the above graph.

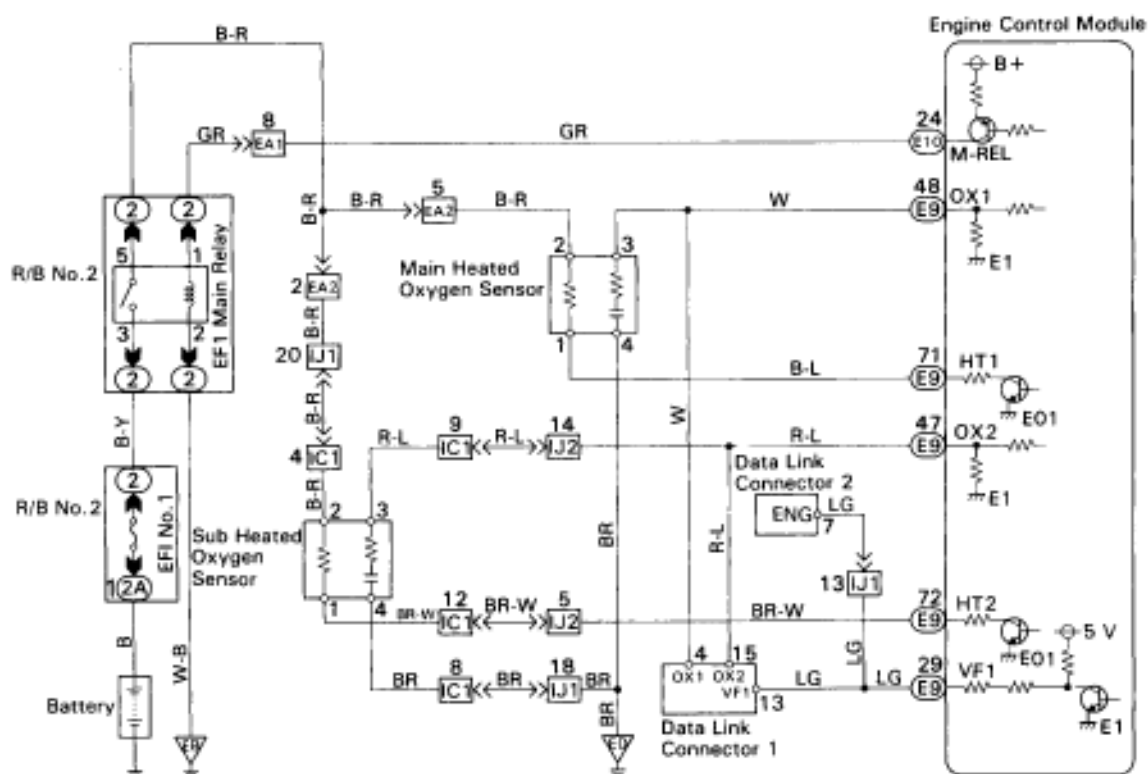
Never allow engine rpm to drop at any time during the test.

- (5) Maintain the vehicle speed at 64 — 80 km/h (40 — 50 mph).
- (6) Keep the vehicle running for — 2 min. after starting acceleration.

HINT: If a malfunction exists, the Malfunction Indicator Lamp will light up after approx. 60 sec. from the start of acceleration.

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

WIRING DIAGRAM

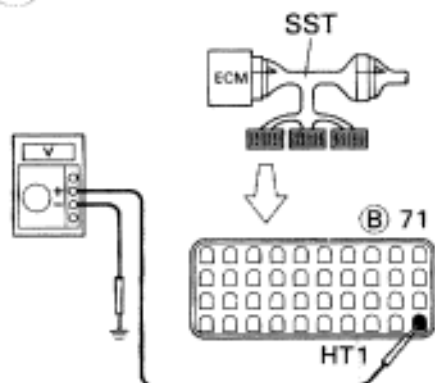


F16918

INSPECTION PROCEDURE

1

Check voltage between terminals HT1 of engine control module connector and body ground.



P

Connect SST (check harness "A").

(See page [EG-510](#))

SST 09990-01000

C

Measure voltage between terminals HT1 of engine control module connector and body ground.

OK

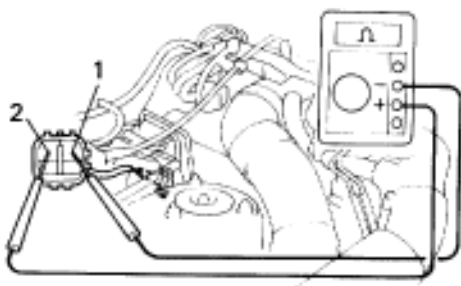
Voltage: 9 — 14 V

BE6653
F16945

NG

OK

Go to step **3**.

2**Check main heated oxygen sensor heater.**

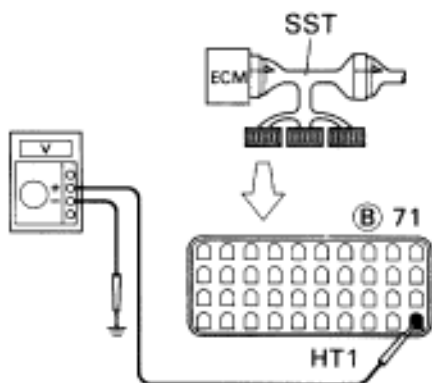
P11993

- P** Disconnect main heated oxygen sensor connector.
- C** Measure resistance between terminals 1 and 2 of main heated oxygen sensor connector.
- OK** Resistance: 11 — 16 at 20°C (68°F)

OK**NG**

Replace main heated oxygen sensor.

Check and repair harness or connector between main relay and main heated oxygen sensor, main heated oxygen sensor and engine control module.

3**Check voltage between terminals HT1 of engine control module connector and body ground.**

F16945

- P** Warm up engine to normal operating temperature.
- C** Measure voltage between terminals HT1 of engine control module connector and body ground, when engine is idling and racing at 4,000 rpm.

OK

	Voltage
Idling	0 V
Racing at 4,000 rpm	9 — 14 V

Hint

In the 4,000 rpm racing check, continue engine racing at 4,000 rpm for approx. 20 seconds or more.

NG**OK**

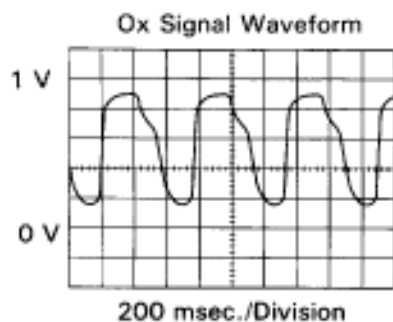
Replace main heated oxygen sensor.*

Check and replace engine control module.

*: It is probable the oxygen sensor has deteriorated. Usually, this cannot be confirmed by visual inspection.

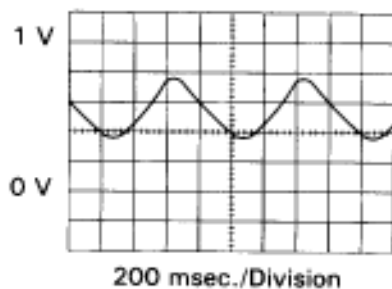
Reference

INSPECTION USING OSCILLOSCOPE



With the engine racing (4,000 rpm) measure waveform between terminals OX1 and E1 of engine control module.

HINT: The correct waveform is as shown oscillating between approx. 0.1 V and 0.9 V



If the oxygen sensor has deteriorated, the amplitude of the voltage will be reduced as shown on the left.

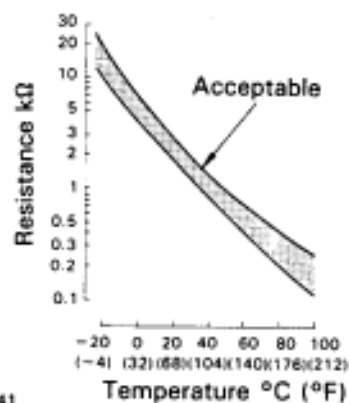
DTC 22 Engine Coolant Temp. Sensor Circuit

CIRCUIT DESCRIPTION

The engine coolant temperature sensor senses the coolant temperature. A thermistor built in the sensor changes its resistance value according to the coolant temperature. The lower the coolant temperature, the greater the thermistor resistance value, and the higher the coolant temperature, the lower the thermistor resistance value (See Fig. 1).

The engine coolant temperature sensor is connected to the ECM (See wiring diagram). The 5 V power source voltage in the ECM is applied to the engine coolant temperature sensor from the terminal THW via a resistor R. That is, the resistor R and the engine coolant temperature sensor are connected in series. When the resistance value of the engine coolant temperature sensor changes in accordance with changes in the coolant temperature, the potential at the terminal THW also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation. If the ECM records the diagnostic trouble code 22, it operates the fail safe function in which the engine coolant temperature is assumed to be 80°C (176°F).

(Fig. 1)



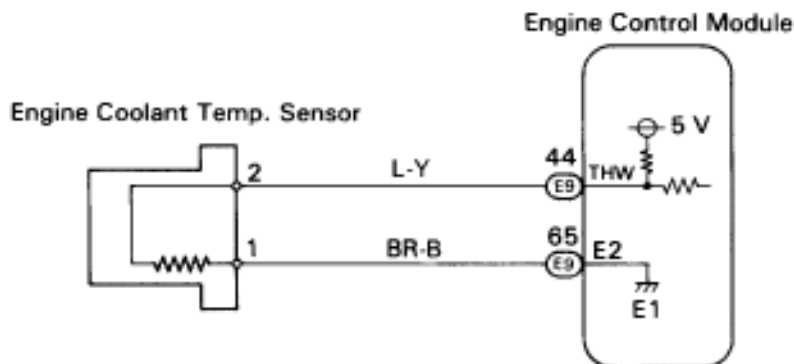
FI4741

Reference

Engine Coolant Temp. °C (°F)	Resistance (kΩ)	Voltage (V)
-20 (-4)	15.0	4.2
0 (32)	5.7	3.4
20 (68)	2.5	2.4
40 (104)	1.2	1.5
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.2	0.3

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
22	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more	Open or short in engine coolant temp. sensor circuit Engine coolant temp. sensor ECM

WIRING DIAGRAM



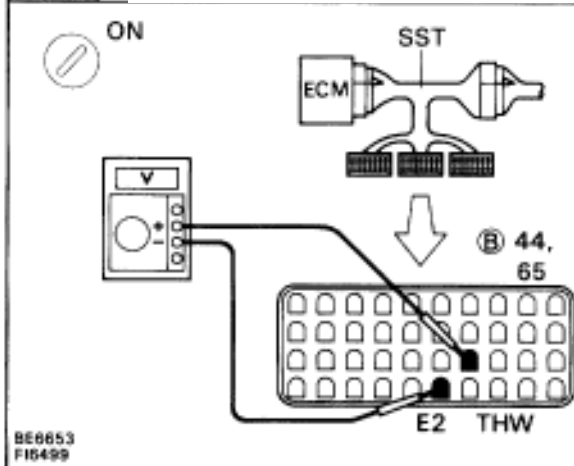
FI6448

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1

Check voltage between terminals THW and E2 of engine control module connector.



- P** (1) Connect SST (check harness "A").
(See page [EG-510](#))
(2) Turn ignition switch ON

C Measure voltage between terminals THW and E2 of engine control module connector.

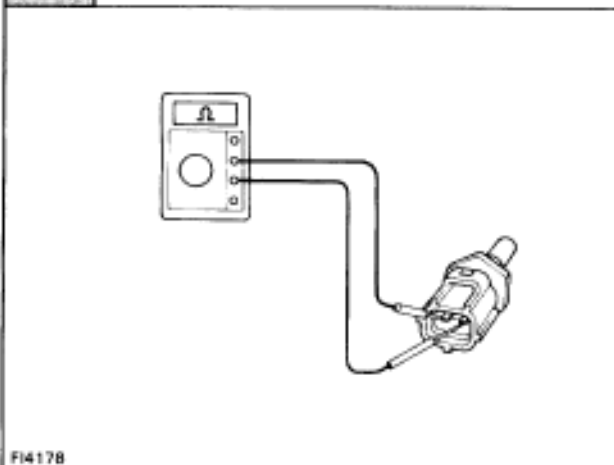
Engine Coolant Temp. °C (°F)	Voltage
20 (68) (Engine is cool)	0.5 ~ 3.4 V
80 (176) (Engine is hot)	0.2 ~ 1.0 V

NG

OK Check for intermittent problems.
(See page [EG-505](#))

2

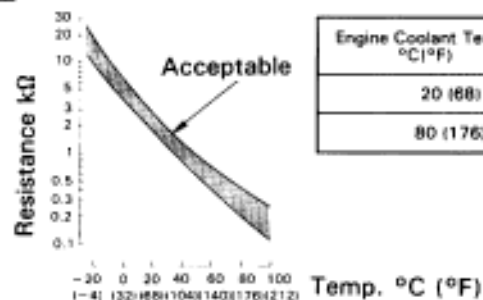
Check engine coolant temp. sensor.



P Disconnect the engine coolant temp. sensor connector.

C Measure resistance between terminals.

OK Resistance is within Acceptable Zone on chart.



OK

NG Replace engine coolant temp. sensor.

3

Check for open and short in harness and connector between engine control module and engine coolant temp. sensor (See page [IN-30](#)).

OK

NG Repair or replace harness or connector.

Check and replace engine control module.

DTC 24 Intake Air Temp. Sensor Circuit

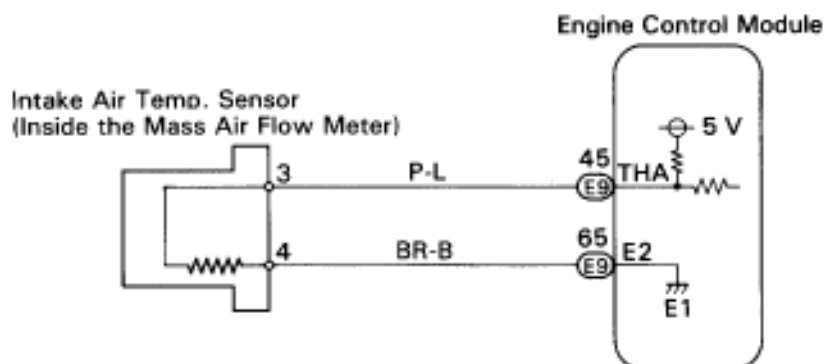
CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the mass air flow meter and senses the intake air temperature. The structure of the sensor and connection to the ECM is the same as in the engine coolant temp. sensor shown on page [EG-530](#).

If the ECM detects the diagnostic trouble code "24", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F).

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
24	Open or short in intake air temp. sensor circuit for 0.5 sec. or more	Open or short in intake air temp. sensor Circuit Intake air temp. sensor ECM

WIRING DIAGRAM



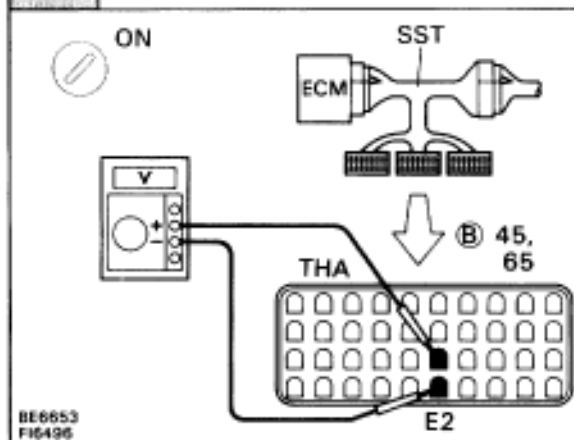
F16448

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1

Check voltage between terminals THA and E2 of engine control module connector.



- P** (1) Connect SST (check harness "A").
(See page EG-510)
SST 09990-01000
(2) Turn ignition switch ON

C Measure voltage between terminals THW and E2 of engine control module connector.

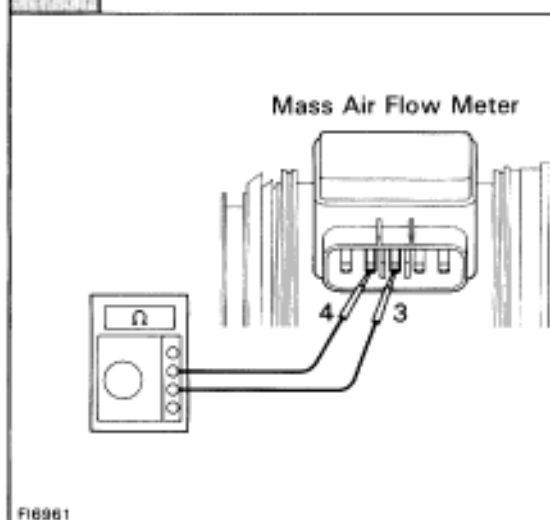
Intake air temp. °C (°F)	Voltage
20 (68)	0.5 - 3.4 V
60 (140)	0.2 - 1.0 V

NG

OK Check for intermittent problems.
(See page EG-505)

2

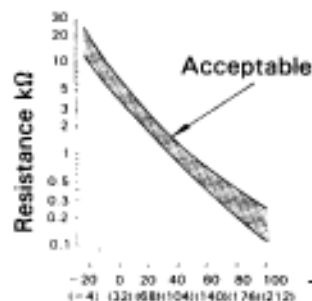
Check intake air temp. sensor.



P Disconnect the mass air flow meter connector.

C Measure resistance between terminals 3 and 4 of mass air flow meter connector.

OK Resistance is within Acceptable Zone on chart.



Intake air temp. °C (°F)	Resistance
20 (68)	2 - 3 kΩ
60 (14)	0.4 - 0.7 kΩ

OK

NG Replace intake air temp. sensor (Replace mass air flow meter).

3

Check for open and short in harness and connector between engine control module and intake air temp. sensor (See page IN-30)

OK

NG Repair or replace harness or connector.

Check and replace engine control module.

DTC 25 26 Air-Fuel Ratio Lean Rich Malfunction

CIRCUIT DESCRIPTION

See [EG-525](#) for the circuit description.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
25	(1) Main heated oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b): (2 trip detection logic)* ² (a) Engine coolant temp.: 70°C (158°F) or more (b) Engine speed: 1,500 rpm or more	Open or short in main heated oxygen sensor circuit Main heated oxygen sensor Ignition system ECM
	(2) Engine speed varies by more than 20 rpm over the preceding crank angle period during a period of 25 sec. or more under conditions (a) and (b): (2 trip detection logic).* (a) Engine speed: Below 950 rpm (b) Engine coolant temp.: 80°C (176°F) or more	Open and short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Mass air flow meter (air intake) ECM
26	Engine speed varies by more than 20 rpm over The preceding crank angle period during a Period of 25 sec. or more under conditions (a) And (b): (2 trip detection logic).* (a) Engine speed: Below 950 rpm (b) Engine coolant temp.: 80°C (176°F) or more	Open and short in injector circuit Fuel line pressure (injector leak, blockage) Mechanical system malfunction (skipping teeth of timing belt) Ignition system Compression pressure (foreign object caught in valve) Mass air flow meter (air intake) ECM

*: See page [EG-503](#).

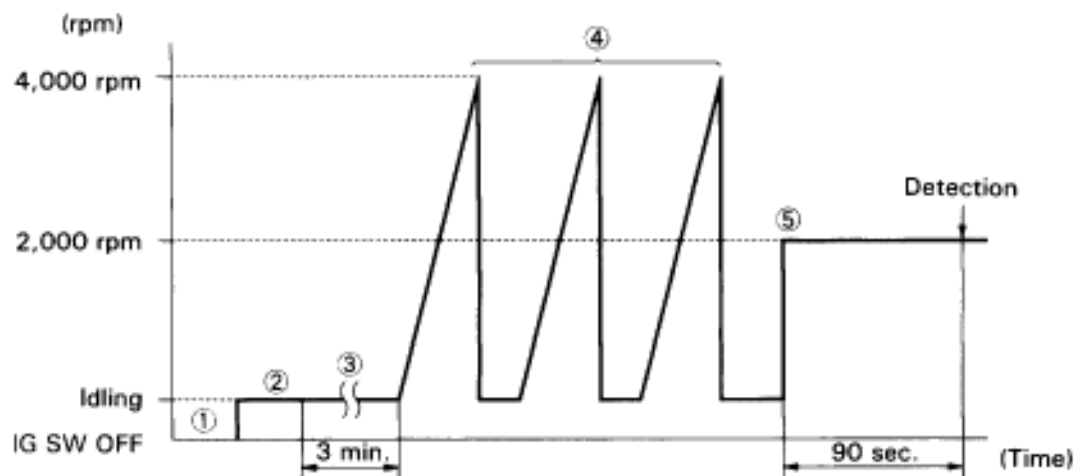
CIRCUIT DESCRIPTION (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

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

Malfunction: Open or Short in Main Heated Oxygen Sensor



FI8465

HINT: Before this test, check the feedback voltage for oxygen sensor.

- (1) Disconnect the EFI No.1 fuse (30A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up.
- (3) Idle the engine for 3 min.
- (4) Race the engine quickly to 4,000 rpm 3 times using the accelerator pedal.
- (5) Race the engine to 2,000 rpm for 90 sec.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (4).

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

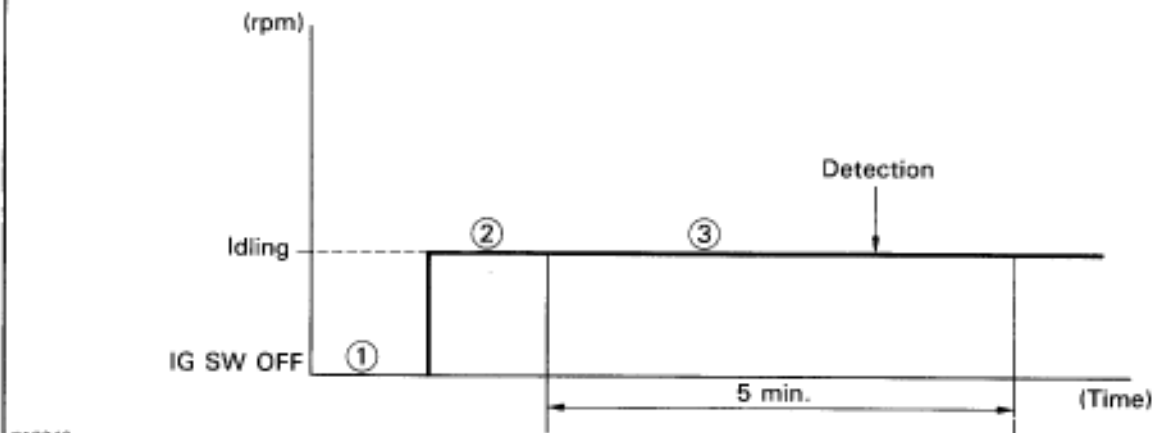
CIRCUIT DESCRIPTION (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

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

Malfunction: Open or Short in Injector circuit, Injector Leak or Blockage



- (1) Disconnect the EFI No.1 fuse (30A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up with all ACC switched OFF.
- (3) Idle the engine for 5 min.
(After the engine is started, do not depress the accelerator pedal.)

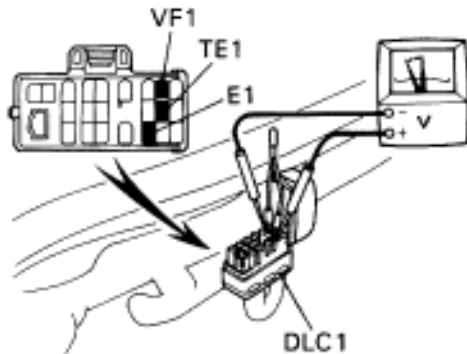
HINT: If a malfunction exists, the malfunction indicator lamp will light up during the 5 min. idling period.

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

WIRING DIAGRAM

See page [EG-527](#) for the WIRING DIAGRAM

INSPECTION PROCEDURE

1**Check voltage between terminals VF1 and E1 of data link connector .**

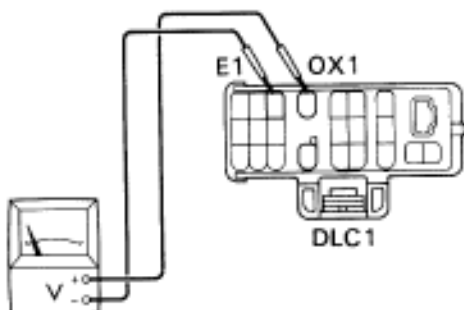
P11364

- P** (1) Warm up engine to normal operating temperature.
 (2) Connect terminals TE1 and E1 of data link connector 1.
 (3) Connect positive probe to terminal VF1 and negative probe to terminal E1 of data link connector 1.

- C** (1) warm up the oxygen sensor by racing engine at 2,500 rpm for about 2 minutes.
 (2) Then, still maintaining engine at 2,500 rpm, count how many times voltmeter fluctuates need between 0 and 5 V.

Result

Result	
Needle fluctuates 8 times or more for every ten seconds	OK
Continue at 0 V	NG Type I
Continue at 5 V	NG Type II

NG
Type ING
Type IIGo to step **7** .**2****Check voltage between terminals OX1 and E1 data link connector 1.**

FI6652

- P** Warm up engine to normal operating temperature.

- C** Measure voltage between terminals OX1 and E1 of data link connector 1 when engine is suddenly raced to full throttle.

- OK** The voltage should be 0.5 V or higher at least once.

- Hint** Inspection should not take longer than 1 second.

NG

OK

Go to step **7** .

3

Check for open and short in harness and connector between engine control module and main heated oxygen sensor, engine control module and data link connector 1 (See page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

4

Check each item found to be a possible cause of problem.

Check each circuit found to be a possible cause of trouble according to the results of the check in **1** or **2**. The numbers in the table below show the order in which the checks should be done.

Main heater oxygen sensor signal continues at 0 V	Possible Cause	See page
1	Faulty sensor installation	—
2	Air leakage	EG-261
3	Misfire	IG-21
4	Fuel system	EG-568
5	Injector circuit	EG-583
6	Characteristics deviation in engine coolant temp. sensor	EG-530
7	Characteristics deviation in intake air temp. sensor	EG-532
8	Characteristics deviation in mass air flow meter	EG-544
9	Valve timing	EG-33

OK**NG**

Repair or replace.

5

Check compression (See page [EG-9](#)).

OK**NG**

Repair or replace.

6

Does malfunction disappear when a good main heated oxygen sensor is installed?

NG**YES**

Replace main heated oxygen sensor.

Check and replace engine control module.

7**Check each item found to be a possible cause of problem.**

Check each circuit found to be a possible cause of trouble according to the results of the check in **1**. The numbers in the table below show the order in which the checks should be done.

Main heater oxygen sensor signal continues at 5.0 V	Main heater oxygen sensor signal is normal	Possible Cause	See page
2	7	Injector circuit	EG-583
	3	Misfire	IG-21
6	4	Valve timing	EG-33
	1	Air leakage	EG-261
1	2	Fuel system	EG-568
5	8	Characteristics deviation in mass air flow meter	EG-544
3	5	Characteristics deviation in engine coolant temp. sensor	EG-530
4	6	Characteristics deviation in intake air temp. sensor	EG-532

OK**NG**

Repair or replace.

8**Check compression (See page [EG-9](#)).****OK****NG**

Repair or replace.

9**Does malfunction disappear when a good main heated oxygen sensor is installed?****NG****YES**

Repair main heated oxygen sensor.

Check and replace engine control module.

DTC 27 Sub Heated Oxygen Sensor Circuit

CIRCUIT DESCRIPTION

The sub heated oxygen sensor is installed on the exhaust pipe. Its construction and operation is the same as the main heated oxygen sensor on page [EG-525](#).

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
27	(1) Open or short in heater circuit of sub heated oxygen sensor for 0.5 sec. or more	Open or short in heater circuit of sub heated oxygen sensor Sub heated oxygen sensor heater ECM
	(2) Main heated oxygen sensor signal is 0.45 V or more and sub heated oxygen sensor signal is 0.45 V or less under conditions (a) ~ (c): (2 trip detection logic).* (a) Engine coolant temp.: 80°C (176°F) or more (b) Engine speed: 1,500 rpm or more (c) Accel. pedal: Fully depressed for 2 sec. or more	Open or short in sub heated oxygen sensor circuit Sub heated oxygen sensor ECM

*: See page [EG-503](#).

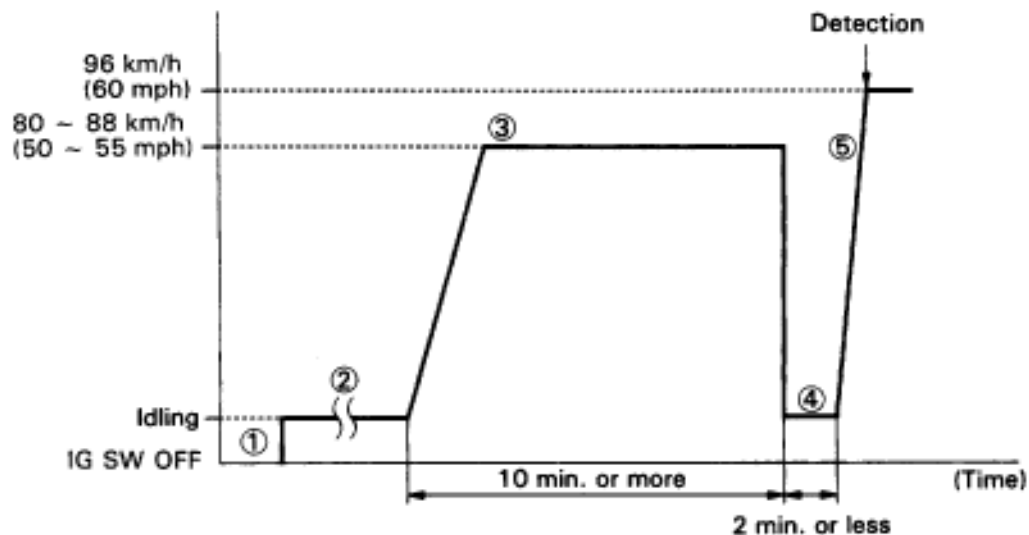
CIRCUIT DESCRIPTION (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

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

Malfunction: Open or Short in Sub Heated Oxygen Sensor



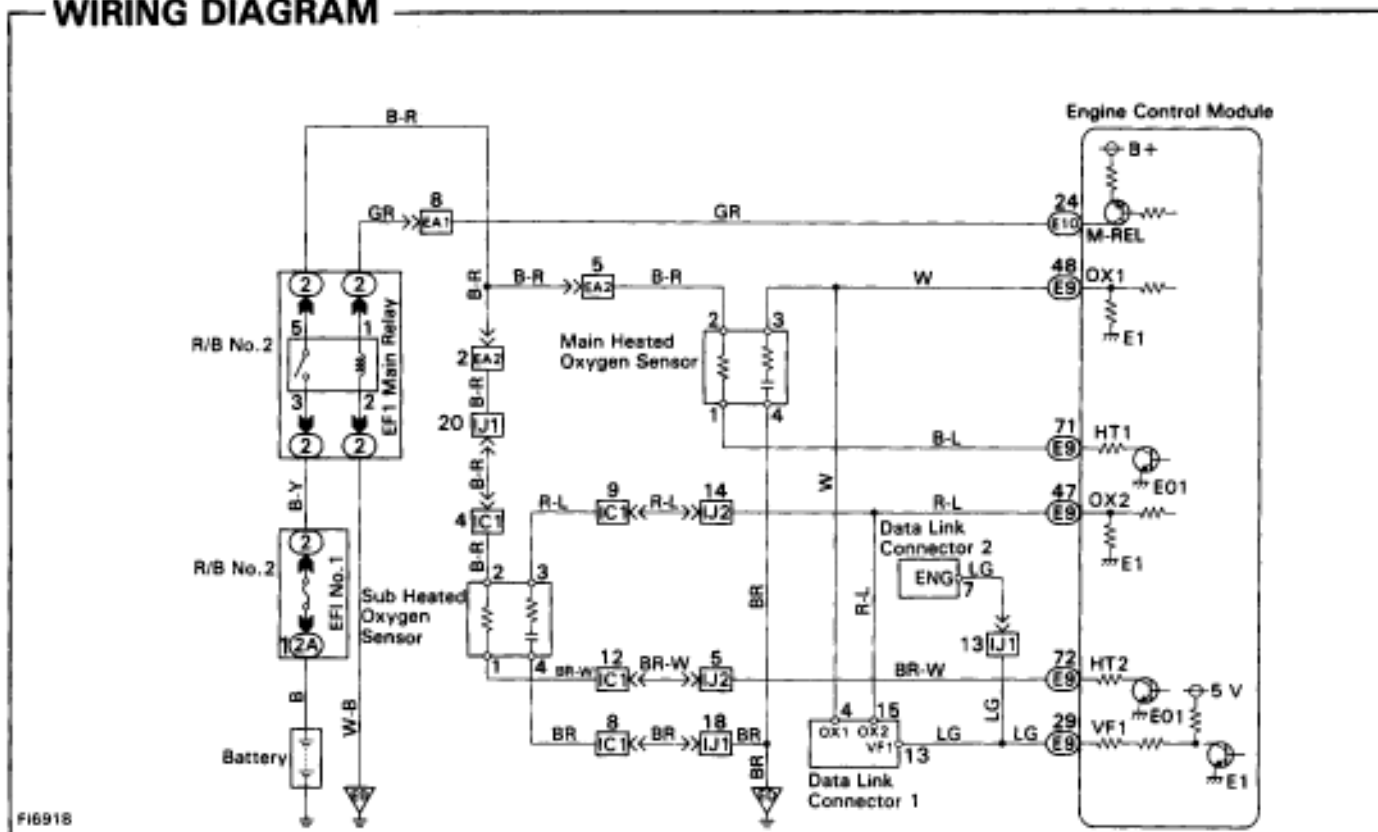
FI8527

- (1) Disconnect the EFI No.1 fuse (30A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up with all ACC switched OFF.
- (3) Drive the vehicle at 80 ~ 88 km/h (50 ~ 55 mph) for 10 min. or more.
- (4) Stop at a safe place and idle the engine for 2 min. or less.
- (5) Accelerate to 96 km/h (60 mph) with the throttle valve fully open.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (5).

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

WIRING DIAGRAM



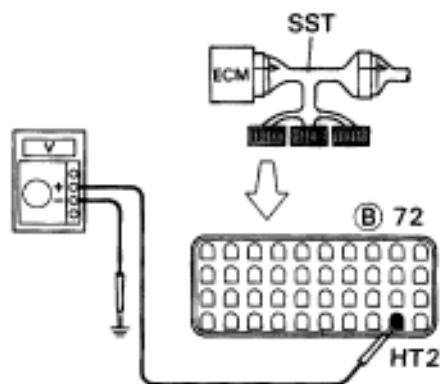
INSPECTION PROCEDURE

HINT: When other codes are output in addition to 27 at the same time, check the circuits for other codes first.

1

Check voltage between terminal HT2 of engine control module connector and body ground.

ON

BE6653
FI6948

P

- (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
- (2) Turn ignition switch ON.

C

Measure voltage between terminal HT2 of engine control module connector and body ground.

OK

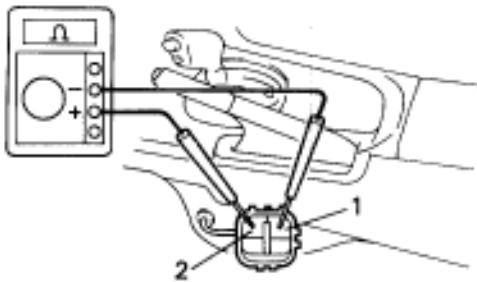
Voltage: 9 — 14 V

NG

OK

Go to step **4**.

2 Check sub heated oxygen sensor heater.



P11483

P Disconnect sub heated oxygen sensor connector. (See page [EG-321](#))

C Measure resistance between terminals 1 and 2 of sub heated oxygen sensor connector.

OK Resistance: 11 — 16 at 20°C (68°F)

OK

NG Replace sub heated oxygen sensor.

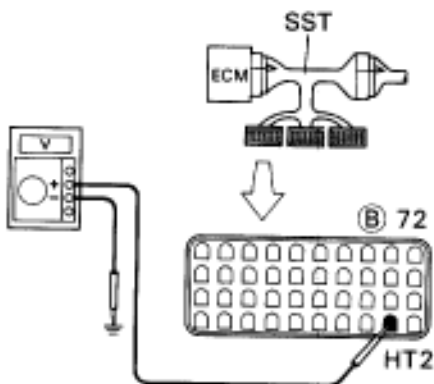
3 Check for open and short in harness and connector between EFI main replay and engine control module (See page [IN-30](#)).

OK

NG Repair or replace harness or connector.

Check and replace engine control module.

4 Check voltage between terminal HT2 of engine control module connector and body ground.



FI6948

P Warm up engine to normal operating temperature.

C Measure voltage between terminal HT2 of engine control module connector and body ground, when engine is idling and racing at 3,500 rpm.

OK

	Voltage
Idling	0 V
Racing at 3,500 rpm	9 — 14 V

NG

OK Replace sub heated oxygen sensor.*

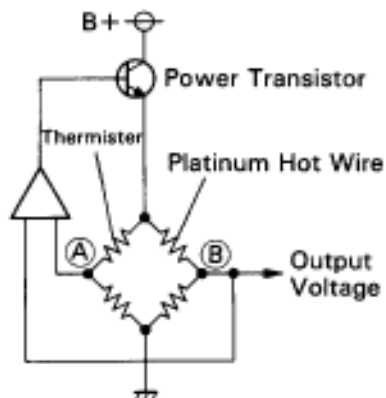
Check and replace engine control module.

*: It is probable the oxygen sensor has deteriorated. Usually, this cannot be confirmed by visual inspection.

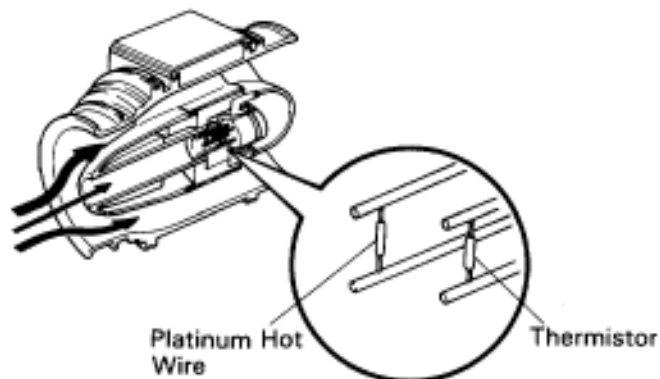
DTC 31 Mass Air Flow Meter Circuit

CIRCUIT DESCRIPTION

The mass air flow meter is an air flow meter which uses a platinum hot wire. The hot wire air flow meter works on the principle that when the electrically heated platinum hot wire is positioned inside the intake air bypass, the intake air volume can be calculated according to the change in the hot wire temperature. This change in temperature is measured by the thermistor at the rear of the hot wire. And feedback from the circuit maintains the hot wire at a set temperature by controlling the current flowing through the hot wire. This current flow is then measured as the output voltage of the air flow meter. The circuit is constructed so that the platinum hot wire and the thermistor provide a bridge circuit, with the power transistor controlled so that the potential of (A) or (B) remains equal to maintain the set temperature.



F16929

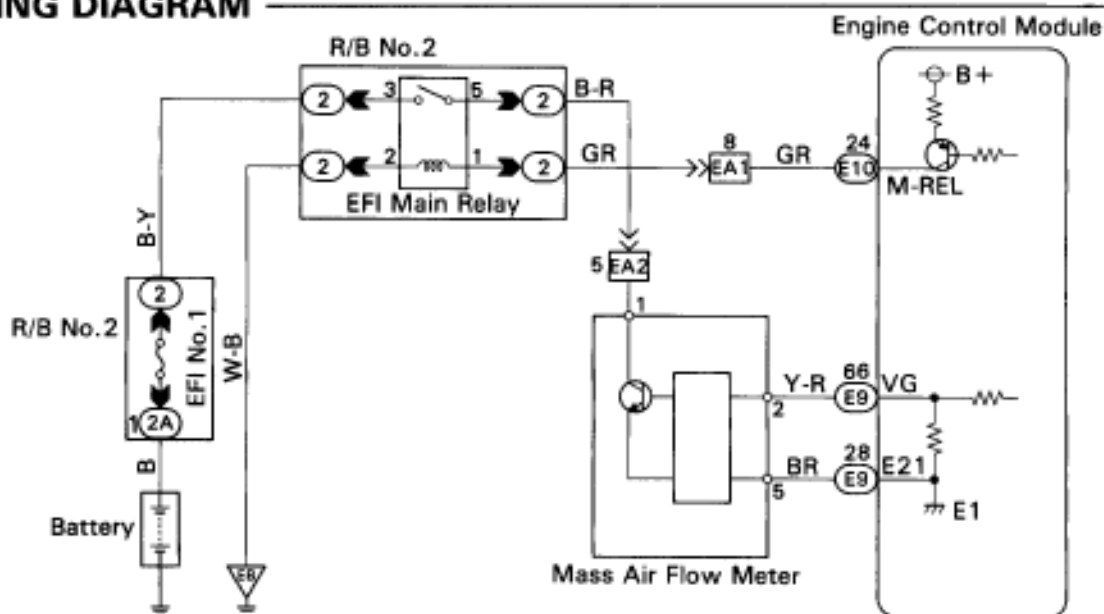


F16972

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
31	Open or short in mass air flow meter circuit for 3 sec. or more with engine speed less than 3,000 rpm	Open or short in mass air flow master circuit Mass air flow meter ECM

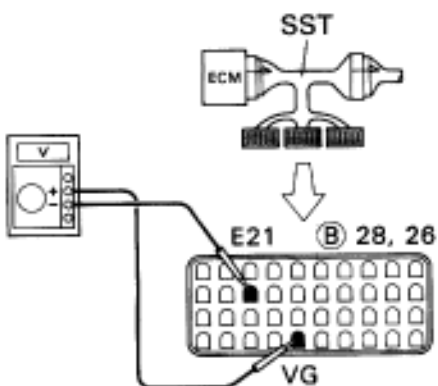
If the ECM detects diagnostic trouble code "31", it operates the fail safe function whereby the turbo pressure sensor is used, making it possible to continue to drive the vehicle.

WIRING DIAGRAM



F16930

INSPECTION PROCEDURE

1**Check voltage between terminals VG and E21 of engine control module connector.**

F16959

P

- (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
(2) Start engine.

C

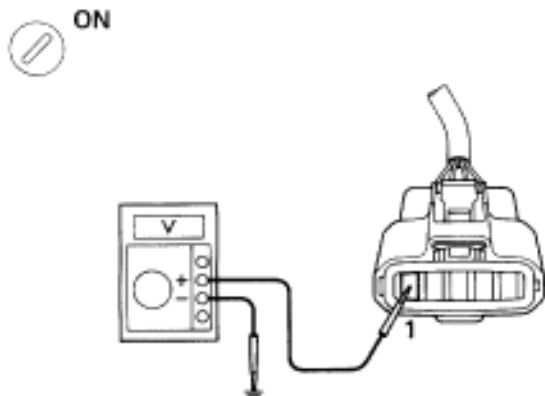
Measure voltage between terminals VG and E21 of engine control module connector while engine rpm at idling.

OK

Voltage: 0.7 — 1.7 V

NG**OK**

Check and replace engine control module

2**Check voltage between terminal 1 of mass air flow meter connector and body ground.**BE6653
F16962**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 and repair mass air flow meter power source circuit.

3**Check for open and short in harness and connector between engine control module and mass air flow meter (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

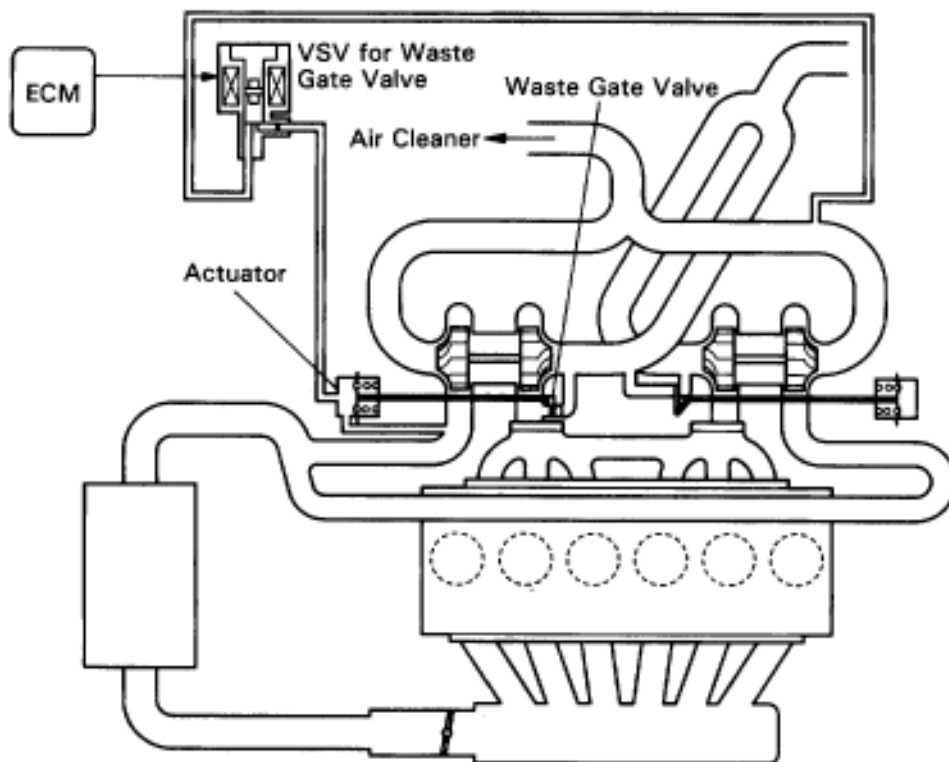
Replace mass air flow meter.

DTC 34 Turbo Pressure Malfunction

CIRCUIT DESCRIPTION

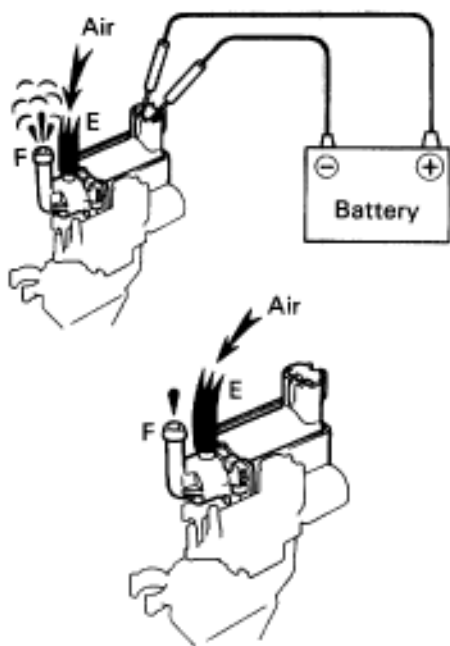
To control maximum turbocharging pressure the turbocharger system includes a waste gate valve controlled by an actuator. The actuator is controlled by the manifold pressure which is duty controlled by the VSV based on signals from the ECM.

If the ECM detects the below diagnosis conditions, it operates the fail safe function in which the ECM stops fuel injection.



F16974

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
34	All conditions below are detected continuously for 2 sec. or more: (a) Manifold absolute pressure: 200 kPa (2.0 kgf/cm², 29 psi) or more (b) Throttle valve opening angle: 20° or more (c) Engine speed: 2,400 rpm or more	Actuator (for waste gate valve) Short in VSV for waste gate valve circuit ECM

2**Check operation of VSV for waste gate valve.**P11381
P11380

- P** (1) Remove VSV.
(2) Disconnect VSV connector.

- C** Check operation of VSV for waste gate valve when battery positive voltage is applied and released to the VSV terminals.

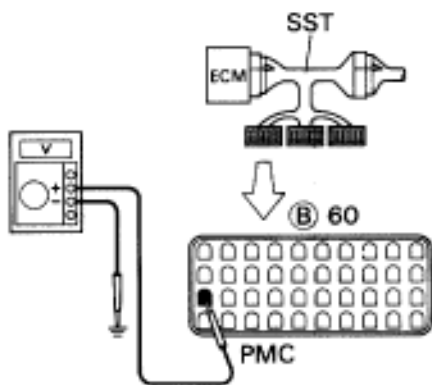
- OK** Battery positive voltage is applied:
Air from port E is flowing out through port F.
Battery positive voltage is released:
Closed air passage from E to F.

OK**NG**

Replace VSV for waste gate valve.

3**Check voltage terminals PMC of engine control module connector and body ground.**

ON

8E6653
F6653

- P** (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
(2) Turn ignition switch ON.

- C** Measure voltage between terminals PMC of engine control module and ground.

- OK** Voltage: 9 — 14 V

OK**NG**

Check and repair harness and connector between VSV for waste gate valve and engine control module.

Check and replace engine control module.

DTC 35 Turbo Pressure Sensor Circuit Barometric Pressure (BARO) Sensor Circuit

CIRCUIT DESCRIPTION

HINT DTC 35 is used to indicate malfunctions in the turbo pressure sensor circuit or BARO sensor circuit.

1. TURBO PRESSURE SENSOR

This sensor detects the air intake chamber pressure and converts the pressure reading into a voltage which is used to control the turbo pressure by the ECM.

If the ECM detects the below diagnosis conditions, it operates the fail safe function in which the ECM stops fuel injection at engine speed 2,400 rpm or more and throttle opening angle 20° or more.

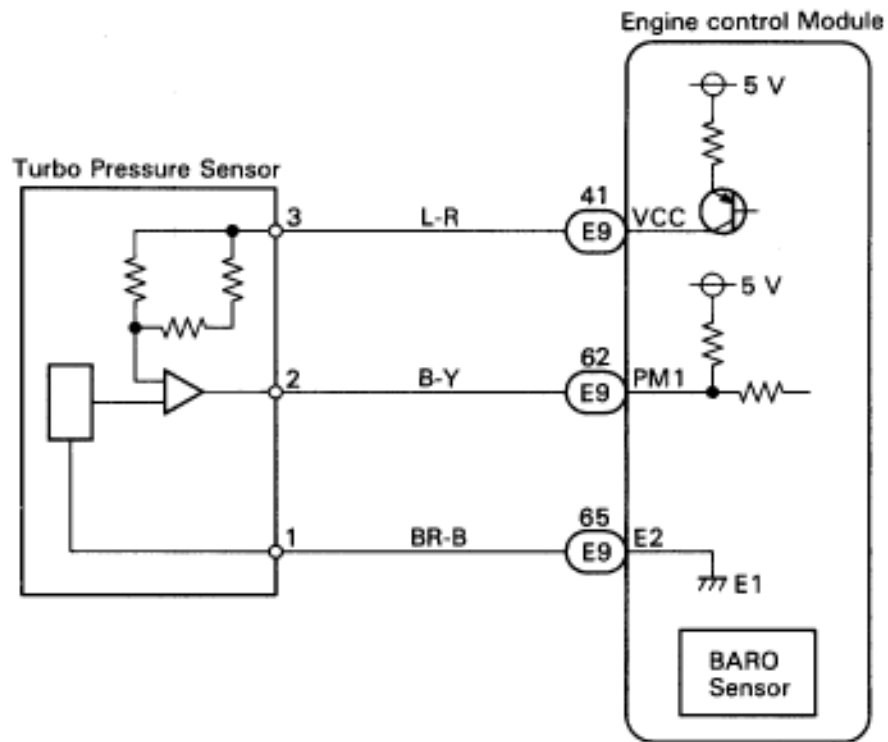
DTC No.	Circuit	Diagnostic Trouble Code Detecting Condition	Trouble Area
35	Turbo Pressure Sensor	Open or short in turbo pressure sensor circuit for 0.5 sec. or more	Open or short in turbo pressure sensor circuit Turbo pressure sensor ECM

2. BARO SENSOR

This sensor is built into the ECM. It is used to detect the atmospheric (absolute) pressure and outputs corresponding electrical signals. Fluctuations in the air pressure cause changes in the intake air density which can cause deviations in the air–fuel ratio. The signals from BARO sensor are used to make corrections for the fluctuations. If the ECM detects the below diagnosis conditions, it operates the fail safe function in which the atmospheric pressure is assumed to be 101.3 kPa (1.03 kgf/cm², 14.7 psi).

DTC No.	Circuit	Diagnostic Trouble Code Detecting Condition	Trouble Area
35	BARO Sensor	Open or short in BARO sensor circuit for 0.5 sec. or more	ECM

WIRING DIAGRAM



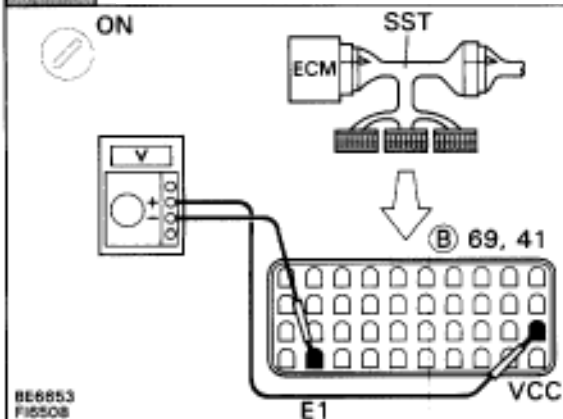
F16963

INSPECTION PROCEDURE

HINT: DTC 35 indicates trouble in the BARO sensor circuit or turbo pressure sensor circuit. Because all functions of the BARO sensor circuit are built into the ECM, it is not possible to check this circuit. However, if no problem is found in the turbo pressure sensor circuit, it can be concluded that the problem is in the BARO sensor circuit.

1

Check voltage between terminals VCC and E1 of engine control module connector.

BE6853
F16508
P

- (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
- (2) Turn ignition switch ON.

C

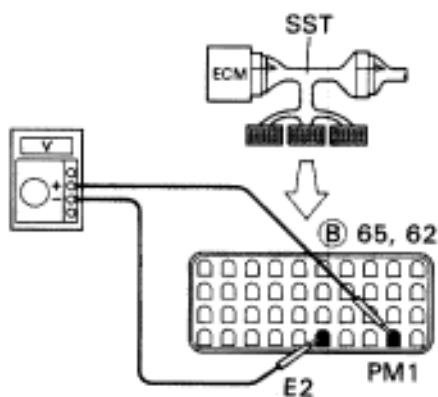
Measure voltage between terminals VCC and E1 of engine control module.

OK

Voltage: 4.5 — 5.5 V

OK
NG

Check and replace engine control module.

2**Check voltage between terminals PM1 and E2 of engine control module.**BE6653
F16914

- P** Turn ignition switch ON.
- C** Measure voltage between terminals PM1 and E2 of engine control module.
- OK** Voltage: 2.3 — 3.0 V

NG**OK**

Check and replace engine control module.

3**Check for open and short in harness and connector between engine control module and turbo pressure sensor (See page [IN-30](#)).****OK****NG**

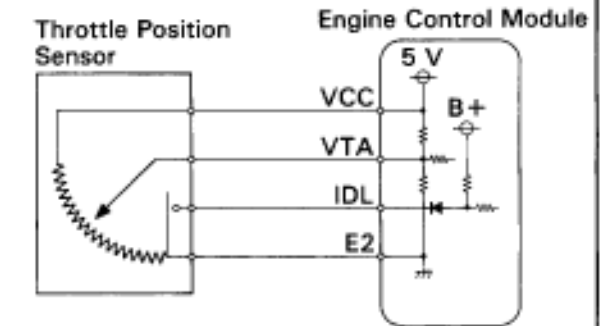
Repair or replace harness or connector.

Replace turbo pressure sensor.

DTC 41 47 Throttle Position Sensor(s) Circuit

CIRCUIT DESCRIPTION

The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, the IDL contacts in the throttle position sensor are on, so the voltage at the terminal IDL of the ECM becomes 0 V. At this time, a voltage of approximately 0.7 V is applied to the terminal VTA of the ECM. When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal IDL of the ECM. The voltage applied to the terminal VTA of the ECM increases in the proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from the terminals VTA and IDL, and uses them as one of the conditions for deciding the air-fuel ratio correction, power increase corrections and fuel-cut control etc. The sub-throttle position sensor is built and operates in the same way as the main throttle position sensor. This sensor is used for traction control. The sub-throttle valve is opened and closed by the sub-throttle actuator according to signals from the TRAC ECU to control the engine output.



F154B0

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
41	Open or short in throttle position sensor circuit for 0.5 sec. or more	Open or short in throttle position sensor circuit Throttle position sensor ECM
47	Open or short in sub-throttle position sensor circuit for 0.5 sec. or more	Open or short in sub-throttle position sensor circuit Sub-throttle position sensor ECM

HINT:

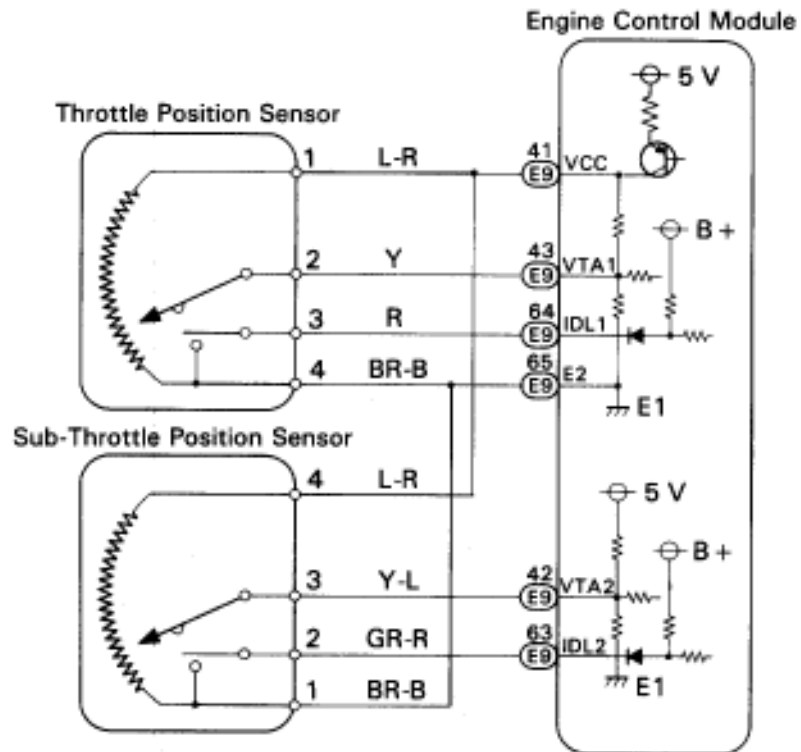
Diagnostic trouble code 41 is for the throttle position sensor circuit.

Diagnostic trouble code 47 is for the sub-throttle position sensor circuit.

When the connector for the throttle position sensor(s) is disconnected, diagnostic trouble code 41 or 47 is not displayed. Diagnostic trouble code 41 or 47 is displayed only when there is an open or short in the VTA signal circuit of the throttle position sensor(s).

Signals from the throttle position sensor(s) are also input to the TRAC ECU, so when a malfunction occurs on the TRAC side, code 41 or 47 may be displayed.

WIRING DIAGRAM



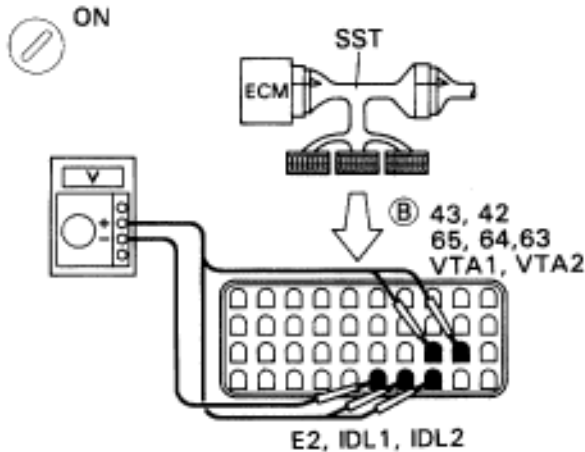
FI6879

INSPECTION PROCEDURE

HINT:

- If diagnostic trouble code 41 is displayed, check throttle position sensor circuit. If diagnostic trouble code 47 is displayed, check sub-throttle position sensor circuit.
- If diagnostic trouble code "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously. E2 (sensor ground) may be open.

Check voltage between terminals VTA1, 2, IDL1, 2 and E2 of engine control module connector.



- P**
- (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
 - (2) Turn ignition switch ON.
 - (3) For throttle position sensor, disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener.
(See page [EG-292](#))
 - (4) For sub-throttle position sensor, remove intake air duct and disconnect sub-throttle valve step motor connector.

- C**
- Measure voltage between terminals VTA1, 2, IDL1, 2 and E2 of engine control module connector when the (sub-) throttle valve is opened gradually from the closed condition.

OK

Terminal	VTA1 - E2	IDL1 - E2
Throttle Valve	VTA2 - E2	IDL2 - E2
Fully Closed	0.3 - 0.8 V	0 - 3.0 V
Fully Open	3.2 - 4.9 V	9 - 14 V

- Hint**
- The voltage should increase steadily in proportion to the throttle valve opening angle.

BE6653 F16507

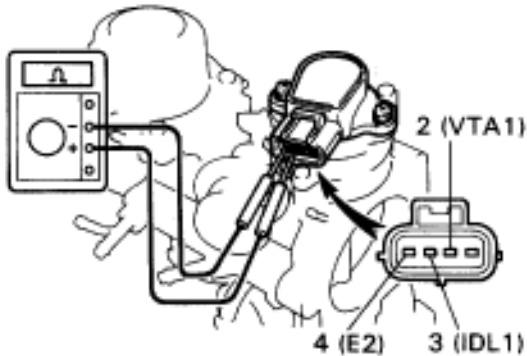
NG

OK

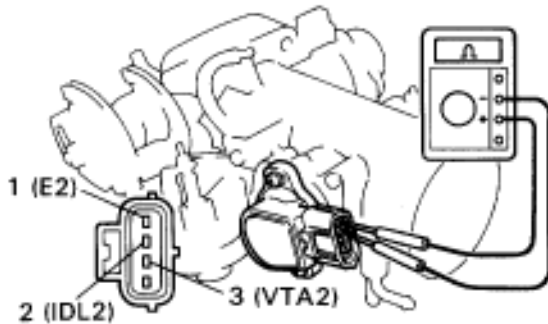
Check for intermittent problems.
(See page [EG-505](#))

2**Check throttle position sensor(s).**

For Throttle Position Sensor



For Sub-Throttle Position Sensor

P11452
P12008**P**

- (1) Remove throttle body. (See page [EG-291](#))
- (2) For throttle position sensor, apply vacuum to throttle opener. (See page [EG-292](#))

C

Measure resistance of each terminal as below table when the throttle valve is opened gradually from the closed condition.

OK

Throttle Valve		Fully Closed	Fully Opened
Terminal			
Throttle Position Sensor	2 (VTA1) – 4 (E2)	0.3 ~ 6.3 kΩ	2.4 ~ 11.2 kΩ
	3 (IDL1) – 4 (E2)	Less than 0.5 kΩ	1 MΩ or higher
Sub throttle Position Sensor	3 (VTA2) – 1 (E2)	0.3 ~ 6.3 kΩ	2.0 ~ 10.8 kΩ
	2 (IDL2) – 1 (E2)	Less than 0.5 kΩ	1 MΩ or higher

Hint

Resistance between terminals 2,3 (VTA1,2) and 4,1 (E2) should increase gradually in accordance with the throttle valve opening angle.

OK**NG**

Adjust or replace throttle position sensor(s).
(See page [EG-292](#))

3**Check for open and short in harness and connector between engine control module and throttle position sensors(s) (See page [IN-30](#)).****OK****NG**

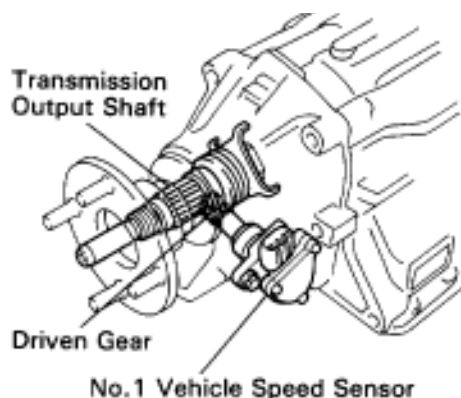
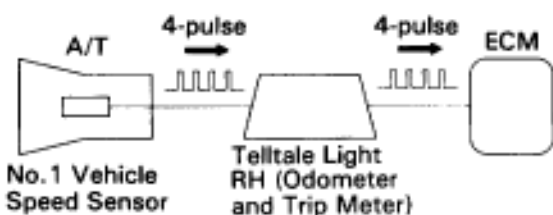
Repair or replace harness or connector.

Check and replace engine control module.

DTC 42 No. 1 Vehicle Speed Sensor Signal Circuit

CIRCUIT DESCRIPTION

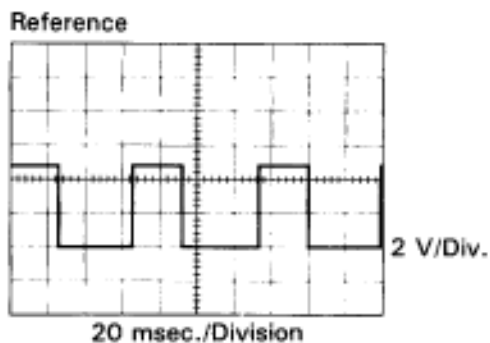
The No.1 vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the odometer and trip meter, it is then transmitted to the engine control module. The ECM determines the vehicle speed based on the frequency of these pulse signals.



F16643 Q04361

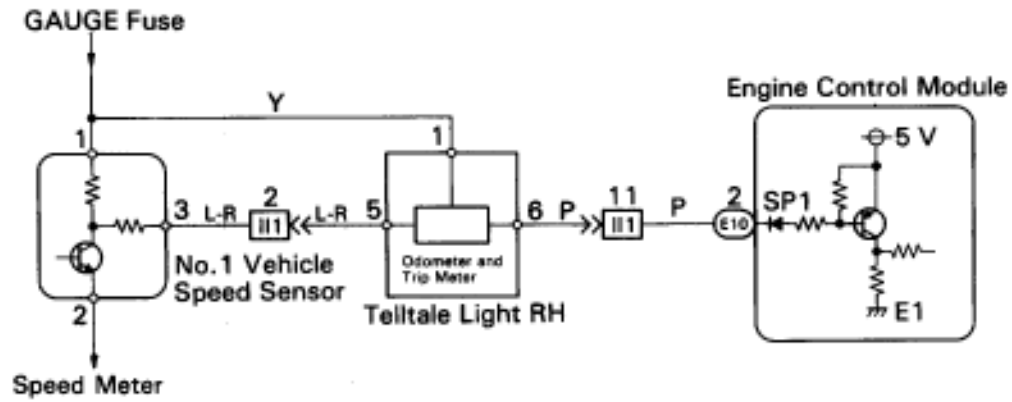
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
42	For A/T All conditions below are detected Continuously for 8 sec. or more: (a) No.1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: 3,000 rpm or more (c) Park/neutral position switch: OFF (d) Stop light switch: OFF	No.1 vehicle speed sensor Telltale light RH (Odometer and trip meter) Open or short in No.1 vehicle speed sensor circuit ECM
	For A/T All conditions below are detected Continuously for 8 sec. or more: (a) No.1 vehicle speed signal: 0 km/h (mph) (b) Engine speed: Between 1,500 rpm and 4,000 rpm (c) Engine coolant temp.: 80°C (176°F) or more (d) Load driving	

HINT: In test mode, diagnostic trouble code 42 is output when vehicle speed is 5 km/h (3 mph) or below.

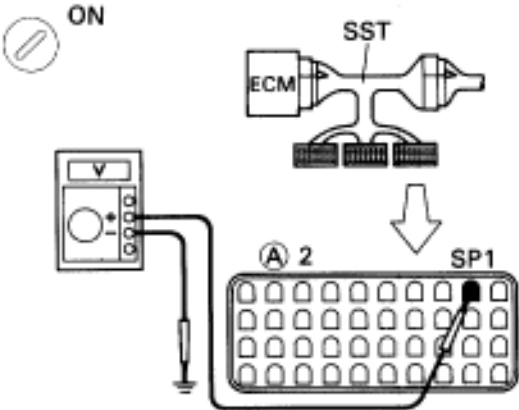
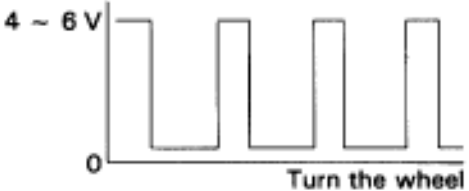


Waveform between terminals SP1 and E1 when vehicle speed is approx. 20 km/h (12mph).

HINT: As the vehicle speed increases, the number of signals from SP1 increases.

WIRING DIAGRAM

INSPECTION PROCEDURE

1	Check voltage between terminal SP1 of engine control module connector and body ground.
 8E6653 F18504	P (1) Shift the shift lever to N position. (2) Jack up one of the rear wheels. (3) Connect SST (check harness "A"). (See page EG-510) (4) Disconnect power steering ECU connector and cruise control ECU connector. (5) Turn ignition switch ON. C Measure voltage between terminal SP1 of engine control module connector and body ground when the wheel is turned slowly. OK Voltage is generated intermittently.  4 ~ 6 V 0 Turn the wheel AT7809
NG	OK Check and replace engine control module.
2	Check operation of odometer and trip meter (telltale light RH (See page Be-48)).
NG	OK Repair or replace harness or connector between ECM and telltale light RH.
3	Check operation of No.1 vehicle speed sensor (See page BE-46).
NG	OK Repair or replace harness or connector between telltale light RH and No.1 vehicle speed sensor.
Replace No.1 vehicle speed sensor.	

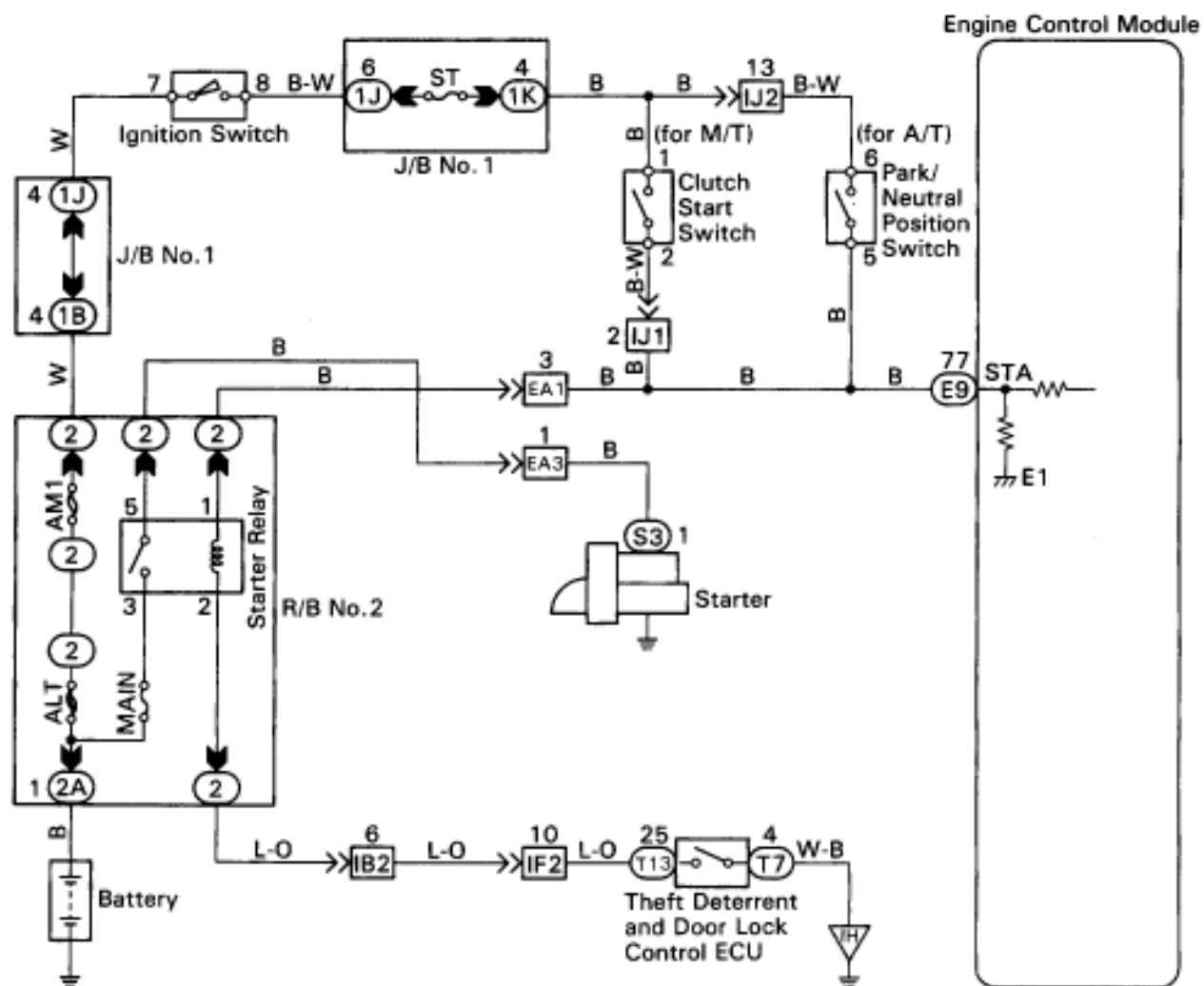
DTC 43 Starter Signal Circuit

CIRCUIT DESCRIPTION

When the engine is being 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.	Diagnostic Trouble Code Detecting Condition	Trouble Area
43	No starter signal to ECM	Open or short in starter signal circuit Open or short in ignition switch or starter relay circuit ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT: This diagnostic chart is based on the premise that the engine is being cranked under normal conditions.
If the engine does not crank, proceed to the matrix chart of problem symptoms on page [EG-514](#).

Check output condition of diagnostic trouble code 43.



F16914

- P** Setting the test mode.
 - (1) Turn ignition switch OFF.
 - (2) Connect terminals TE2 and E1 of DLC2.
 - (3) Turn ignition switch ON.
(Don't start the engine)
 - (4) Connect terminal TE1 and E1 of DLC2.
- C** Check if code "43" is output by the malfunction indicator lamp.
- OK** Code "43" is output.
- C** Start the engine.
Check if code "43" disappears.
- OK** Code "43" is not output.

NG

OK

Proceed to next circuit inspection shown on matrix chart (See page Eg-514.)

Check for open in harness and connector between engine control module and starter relay (See page [IN-30](#)).

OK

NG

Repair or replace harness or connector.

Check and replace engine control module.

DTC 52 53 55 Knock Sensor Circuit

CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the front and rear of the left side 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 retarding to suppress it.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
52	No No.1 knock sensor signal to ECM for 4 crank revolutions with engine speed between 2,050 rpm and 5,950 rpm	Open or short in No.1 knock sensor circuit No.1 knock sensor (Looseness) ECM
53	Engine control computer (for knock control) malfunction at engine speed between 650 rpm and 5,200 rpm	ECM
55	No No.2 knock sensor signal to ECM for 4 crank revolutions with engine speed between 2,050 rpm and 5,950 rpm	Open or short No.2 knock sensor circuit No.2 knock sensor (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.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

- To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- To check that the malfunction is corrected when the repair is completed by confirming that diagnostic trouble code is no longer detected.

Malfunction: Open or short in Knock Sensor

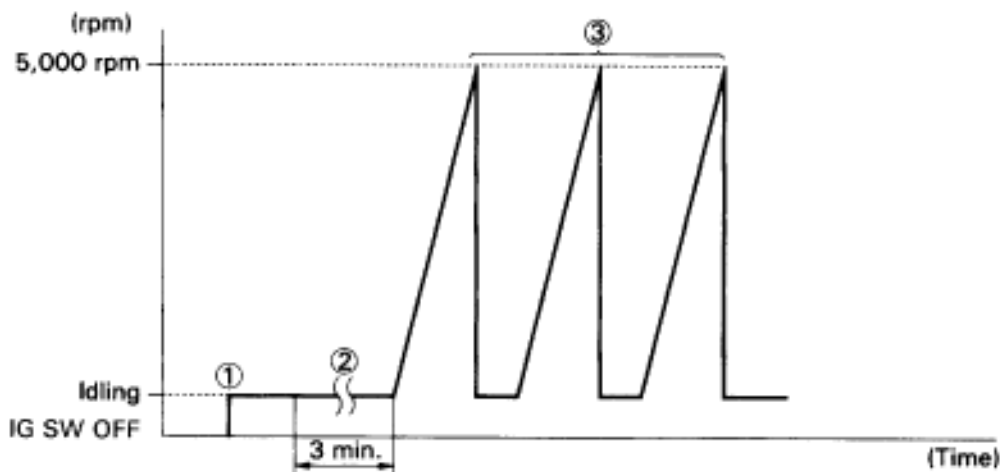
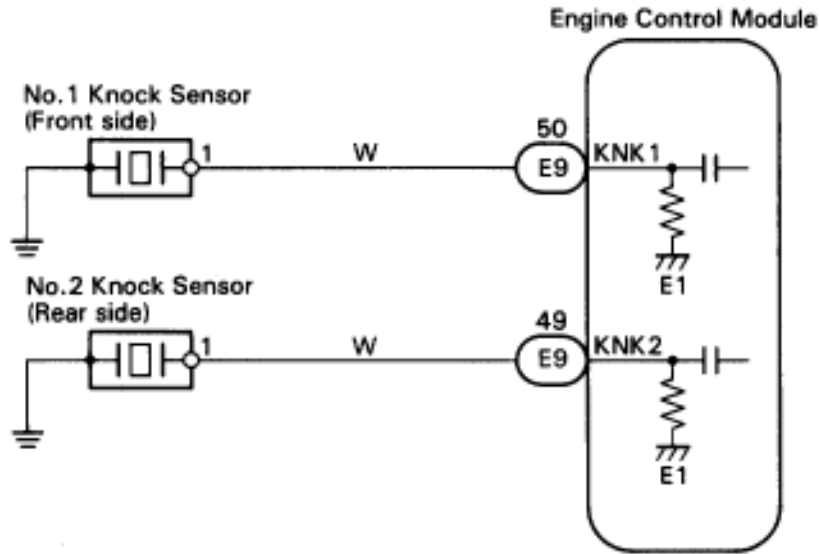


FIG461

- (1) Start the engine and warm up.
- (2) Idle the engine for 3 min.
- (3) With the A/C ON, race the engine quickly to 5,000 rpm 3 times.
(Rapidly depress the accelerator pedal and suddenly release it.)

HINT: If a malfunction exists, the malfunction indicator lamp will light up when sudden racing is performed.

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

WIRING DIAGRAM

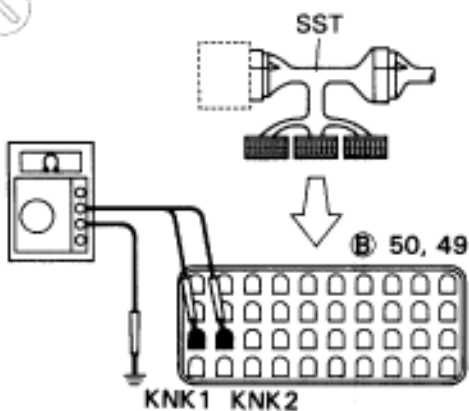
F18541

INSPECTION PROCEDURE

HINT: If diagnostic trouble code 52 is displayed, check No.1 knock sensor (for front side) circuit.
 If diagnostic trouble code 55 is displayed, check No.2 knock sensor (for rear side) circuit.
 If diagnostic trouble code 53 is displayed, replace engine control module.

1

Check continuity between terminals KNK1, KNK2 of engine control module connector and body ground.

LOCK886653
F18506**P**

(1) Connect SST (check harness "A").
 (See page [EG-510](#))

SST 09990-01000

(2) Disconnect the engine control module connectors.

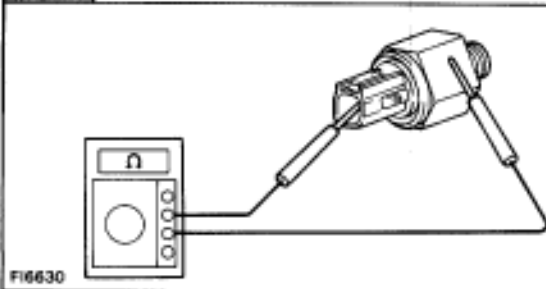
C

Measure resistance between terminals KNK1, KNK2 of engine control module connector and body ground.

OK

Resistance: 1 M or higher

NG**OK**Go to step **3**

2**Check knock sensor.**

- P** Disconnect knock sensor connector.
- C** Measure resistance between the knock sensor terminal and body.
- OK** Resistance: 1 M or higher

OK**NG**

Replace knock sensor (See page EG-316)

3**Check for open and short in harness and connector between engine control module and knock sensor (See page IN-30).****OK****NG**

Repair or replace harness or connector.

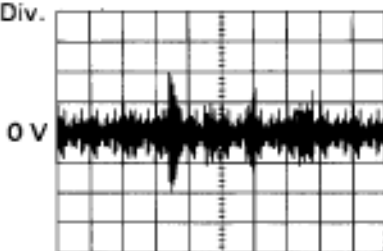
4**Does malfunction disappear when a good knock sensor is installed?****NO****YES**

Replace knock sensor. (See page EG-316)

Check and replace engine control module.

Reference**INSPECTION USING OSCILLOSCOPE****KNK Signal Waveform**

0.5 V/Div.

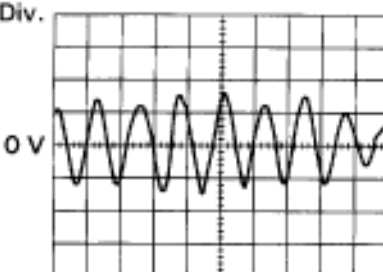


5 msec./Division

With the engine racing (4,000 rpm) measure waveform between terminals KNK1, KNK2 of engine control module and body ground.

HINT: The correct waveform is as shown.

0.5 V/Div.



100 μ sec./Division

Spread the time on the horizontal axis, and confirm that the period of the wave is 123 μsec. (Normal mode vibration frequency of knock sensor: 8.1 KHz).

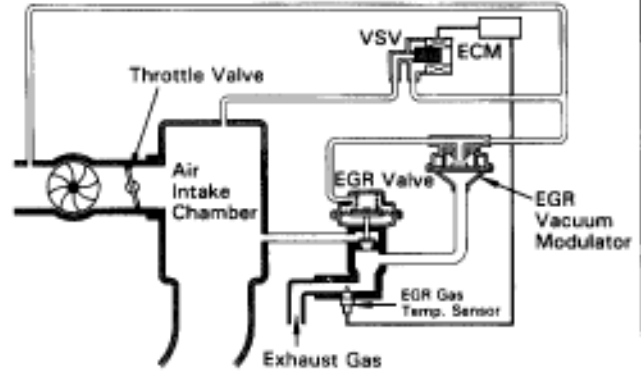
HINT: If normal mode vibration frequency is not 8.1 KHz, the sensor is malfunctioning.

DTC 71 EGR System Malfunction

CIRCUIT DESCRIPTION

The EGR system is designed to recirculate the exhaust gas, controlled according to the driving conditions back into the intake air–fuel mixture. It helps to slow down combustion in the cylinder and thus lower the combustion temperature which, in turn, reduces the amount of NO_x emission. 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).



- Engine coolant temp. below 50°C (122°F)
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine speed over 4,800 rpm
- Manifold absolute pressure more than 120 kPa (1.2 kgf/cm², 17.4 psi)

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
71	EGR gas temp. and intake air temp. are 60°C(140°F) or less for A/T, 55°C (131°F) or less for M/T for 1 ~ 4 min. under conditions (a) and (b): (2 trip detection logic)* (a) Engine coolant temp.: 60°C (140°F) or more (b) EGR operation possible (Example A/T in 3rd speed (5th for M/T), A/C ON, 96 km/h (60 mph), Flat road)	Open EGR gas temp. sensor circuit Short in VSV circuit for EGR EGR hose disconnected, valve stuck Clogged EGR gas passage ECM

*: See page [EG-503](#).

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

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

CIRCUIT DESCRIPTION (Cont'd)

Malfunction: Open in EGR Gas Temp. Sensor Circuit

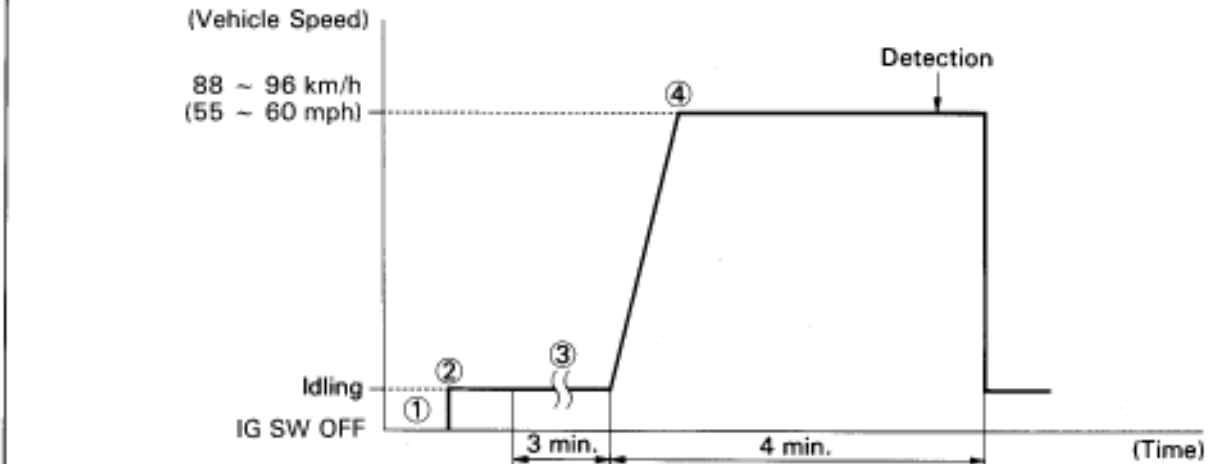


FIG528

- (1) Disconnect the EFI No.1 fuse (30A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 2 with IG switch OFF).
- (2) Start the engine and warm up.
- (3) Idle the engine for 3 min.
- (4) With the A/C ON and transmission in 5th position (A/T in 3rd speed) drive at 88 ~ 96 km/h (55 ~ 60 mph) for 4 min or less.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (4).

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

WIRING DIAGRAM

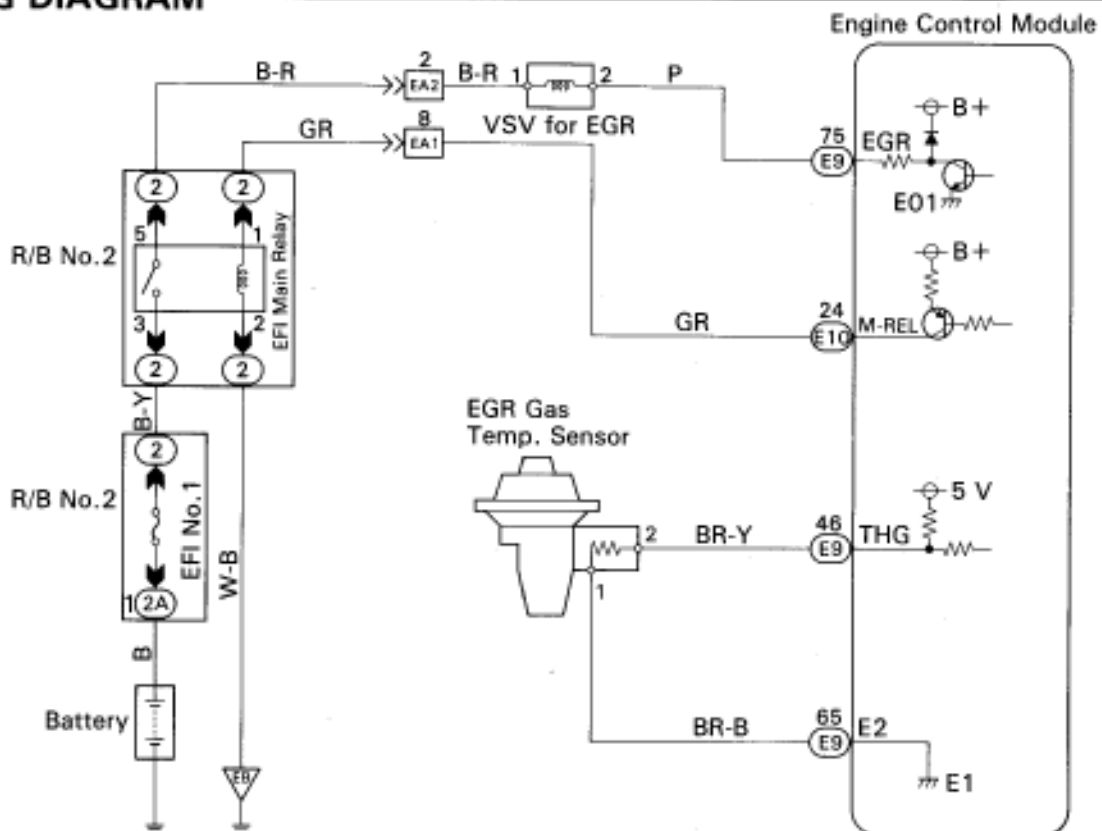
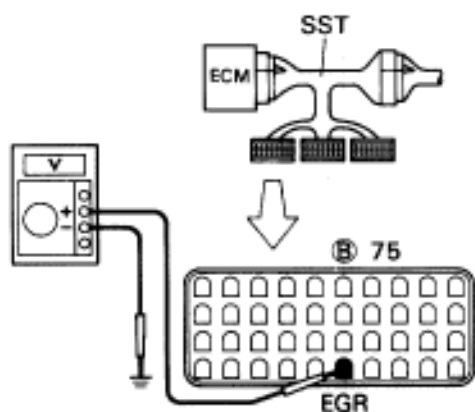


FIG932

INSPECTION PROCEDURE

1**Check voltage between terminal EGR of engine control module connector and body ground.**

FI6620

P

- (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
(2) Warm up engine to normal operating temperature.

C

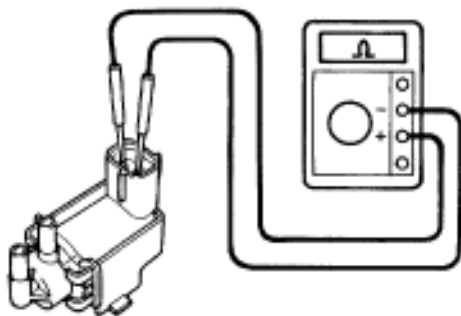
Measure voltage between terminal EGR of engine control module connector and body ground.

OK

Voltage: 9 — 14 V

NG**OK**

Go to step **4**.

2**Check resistance between terminals of VSV for EGR.**

P11360

P

Remove VSV for EGR. (See page [EG-310](#))

C

Measure resistance between terminals of VSV for EGR.

OK

Resistance: 30 — 34 Ω at 20°C (68°F)

OK**NG**

Replace VSV for EGR.

3**Check for open and short in harness and connector between EFI main relay and VSV for EGR, VSV for EGR and engine control module (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

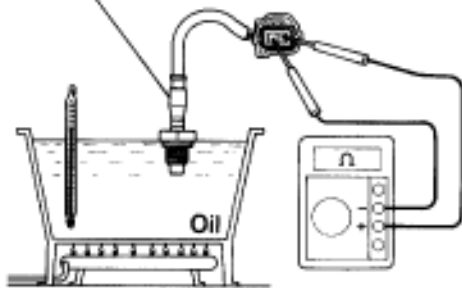
4Check EGR system (See page [EG-180](#)).**OK****NG**

Repair EGR system.

5

Check resistance of EGR gas temp. sensor.

EGR Gas Temp. Sensor



P03193

P

Remove EGR gas temp. sensor.

C

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

OK

Resistance: 64 — 973 k at 50°C (122°F)
11 — 163 k at 100°C (212°F)
2 — 3 k at 150°C (302°F)

OK**NG**

Replace EGR gas temp. sensor.

6Check for open in harness and connector between EGR gas temp. sensor and engine control module. (See page [IN-30](#)).**OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

DTC 78 Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

The fuel pump speed is controlled at 2 steps (high speed, low speed) by the condition of the engine (starting, light load, heavy load), when the engine starts (STA ON), the engine control module sends a Hi signal (battery positive voltage) to the fuel pump ECU (FPC terminal).

The fuel pump ECU then outputs Hi voltage (battery positive voltage) to the fuel pump so that the fuel pump operates at high speed.

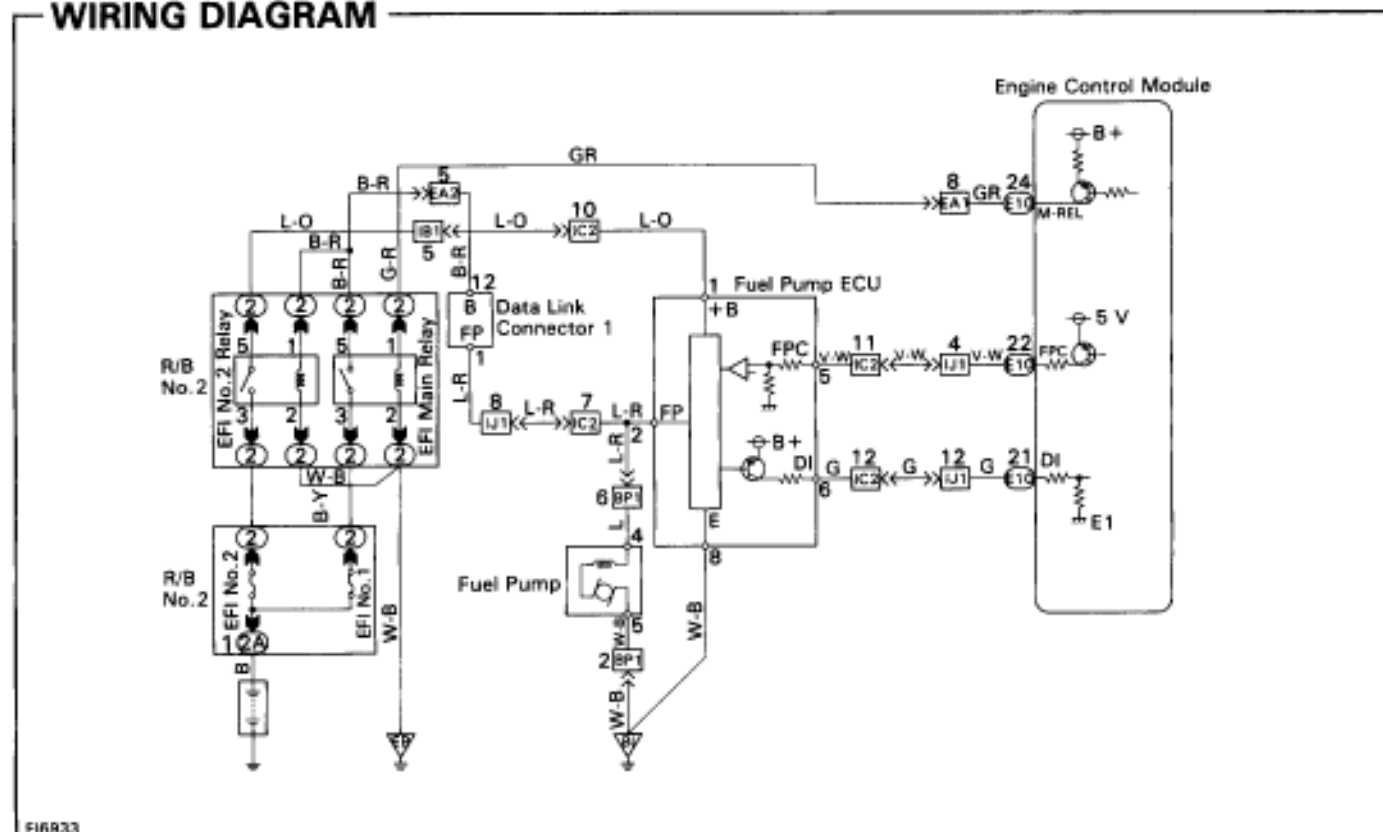
After the engine starts, during idling or light loads, the engine control module outputs a Low signal (about 9 V) to the fuel pump ECU, the fuel pump ECU outputs Low battery voltage (about 9 V) to the fuel pump and causes the fuel pump to operate at low speed.

If the intake air volume increases (high engine load), the engine control module sends a Hi signal to the fuel pump ECU and causes the fuel pump to operate at high speed.

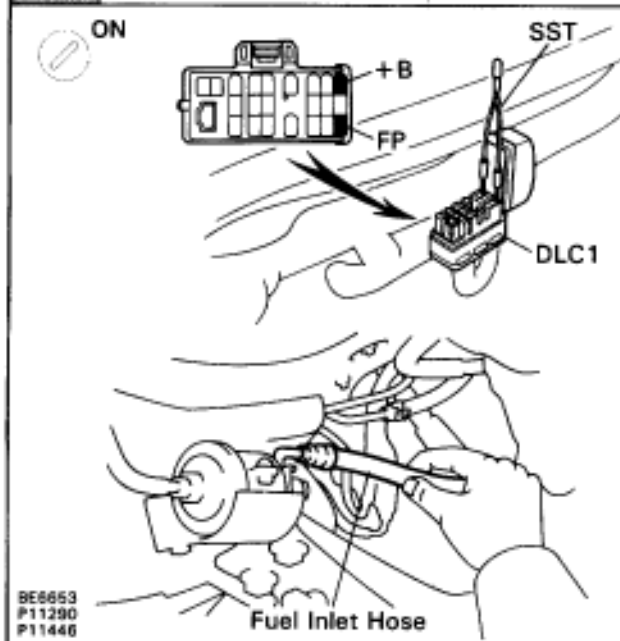
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
78	(1) Open or short in fuel pump circuit for 1 sec. Or more with engine speed 1,000 rpm or less (2 trip detection logic)*	Open or short in fuel pump ECU circuit Fuel pump ECU Engine control module power source circuit Fuel pump Engine control module
	(2) Open in input circuit of fuel pump ECU (FPC) with engine speed 1,000 rpm or less (2 trip detection logic)*	
	(3) Open or short in diagnostic signal line (DI) of fuel pump ECU with engine speed 1,000 rpm or less (2 trip detection logic)*	

*: See page [EG-503](#).

WIRING DIAGRAM



INSPECTION PROCEDURE

1**Check fuel pump operation.****P**

- (1) Turn ignition switch ON.
- (2) Using SST, connect terminals +B and FP of data link connector 1.
SST 09843-18020

C

Check that there is pressure in the hose from the fuel filter.

OK

Fuel pressure can be felt.

OK**NG**

Go to step **3**.

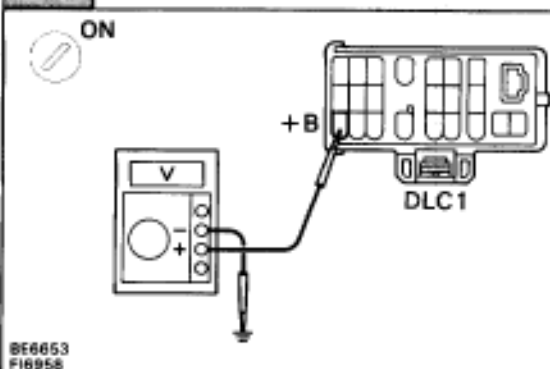
2

Check for open and short in harness and connector between terminals +B ↔ +B, FP ↔ FP of the data link connector 1 and fuel pump ECU (See page IN-30).

NG**OK**

Go to step **5**.

Repair or replace harness or connector.

3**Check voltage of terminal +B of data link connector 1.****P**

Turn ignition switch ON.

C

Measure voltage between terminal +B of data link connector 1 and body ground.

OK

Voltage: 9 — 14 V

OK**NG**

Check for ECM power source circuit (See page EG-576), and check for open in harness and connector between terminal +B of data link connector 1 and main relay.

4

Check for open and short in harness and connector between terminal FP of data link connector 1, fuel pump and body ground) See page [IN-30](#)).

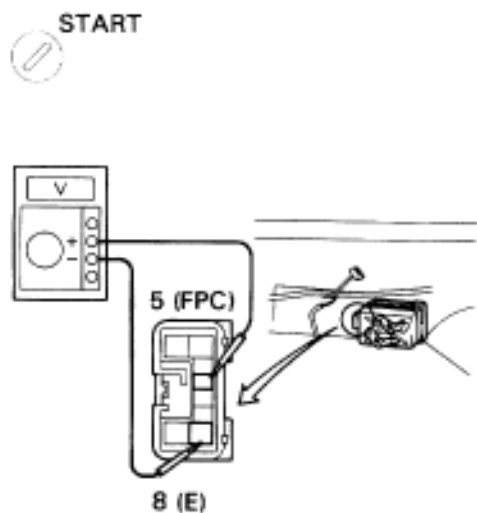
NG**OK**

Repair or replace fuel pump.

Repair or replace harness or connector.

5

Check voltage between terminals 5 (FPC) and 8 (E) of fuel pump ECU connector.

**P**

- (1) Remove the LH quarter trim panel. (See page [EG-323](#))
- (2) Disconnect fuel pump ECU connector.

C

Measure voltage between terminals 5 (FPC) and 8 (E) of fuel pump ECU connector when ignition switch is turned to START.

OK

Voltage: 4.5 — 5.5 V

NG**OK**

Replace fuel pump ECU.

6

Check for open in harness and connector between terminal FPC of engine control module and terminal 5 (FPC) of fuel pump ECU, terminal 8 (E) of fuel pump ECU and body ground (See page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

7

Check for open and short in harness and connector between terminal DI of engine control module and terminal 6 (DI) of fuel pump ECU (See page [IN-30](#)).

OK**NG**

Repair or replace harness or connector.

Check and replace engine control module.

DTC 51 Switch Condition Signal Circuit

CIRCUIT DESCRIPTION

Park/Neutral Position Switch

The ECM uses the signals from the park/neutral position switch to determine whether the transmission is in park or neutral, or in some other position.

Air Conditioning Switch Signal

The ECM uses the output from the air conditioning switch to determine whether or not the air conditioning is operating so that it can increase the idling speed of the engine if necessary.

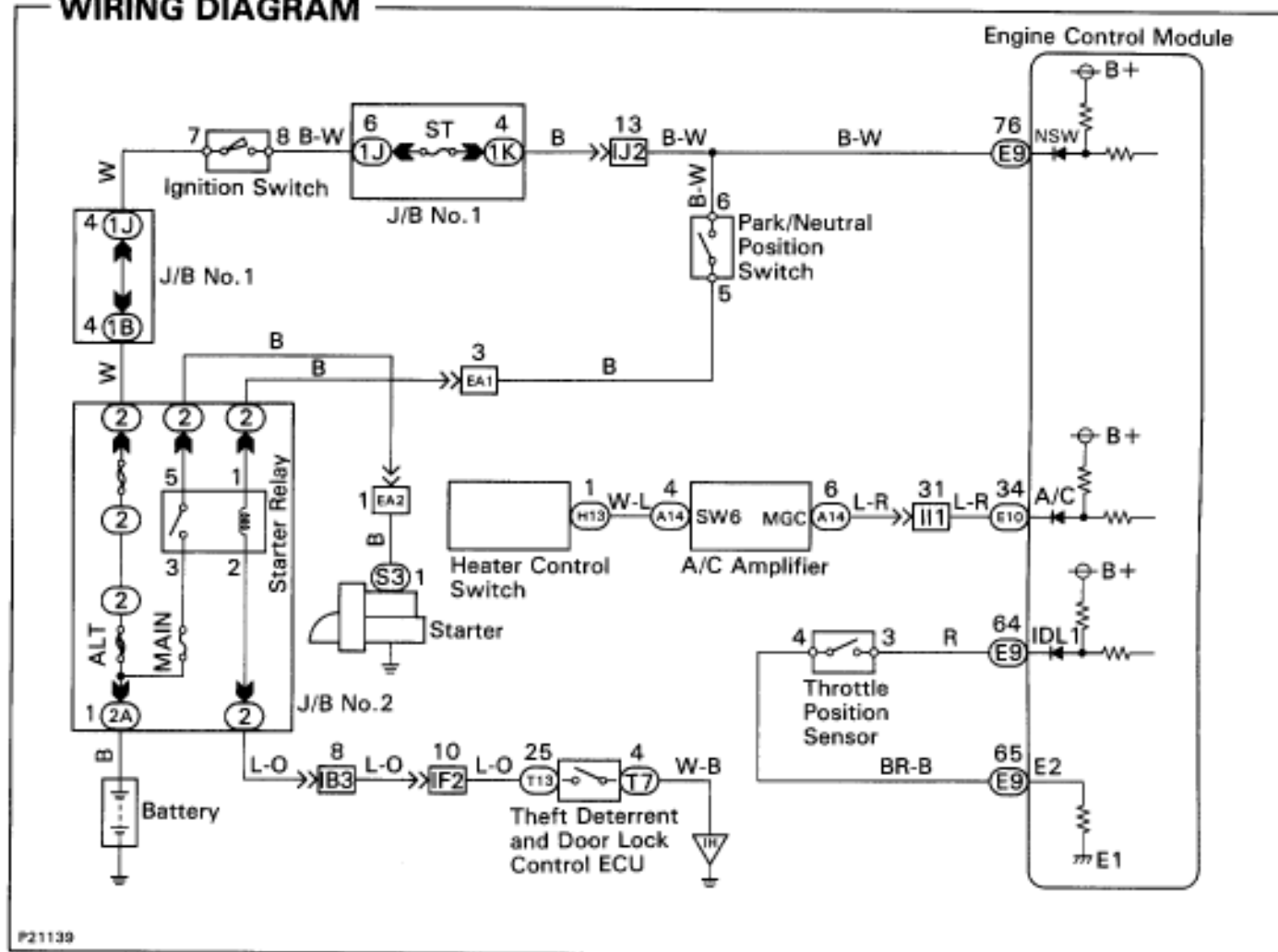
Throttle Position Sensor IDL Signal

The IDL contacts are mounted in the throttle position sensor, and detects the idle condition.

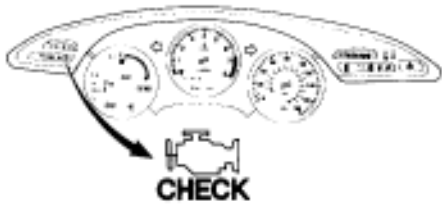
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
51	(1) 3 sec. or more after engine starts with closed throttle position switch OFF (IDL1) (2) Park/neutral position switch: OFF (Shift position in "R", "D", "2" or "1" position.) (3) A/C switch ON	Throttle position sensor IDL circuit Accelerator pedal and cable Park/neutral position switch A/C switch circuit ECM

HINT: In this circuit, diagnosis can only be made in the test mode.

WIRING DIAGRAM



INSPECTION PROCEDURE

1**Check output condition of diagnostic trouble code 51.**

FI8914

OK**P**

Setting the test mode.

- (1) Turn ignition switch OFF.
- (2) Connect terminals TE2 and E1 of DLC2.
- (3) Turn ignition switch ON.
(For checking terminal IDL, disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener (See page [EG-292](#))).
(For checking terminal A/C, start the engine.)
- (4) connect terminals TE1 and E1 of DLC2.

C

Check if code "51" is output by the malfunction indicator lamp.

OK

	Condition	Code
Park/Neutral Position Switch (PNP)	P or N position	Normal *
	R, D, 2 or L position	51 *
Throttle Position Sensor (IDL1)	Accelerator pedal released	Normal *
	Accelerator pedal depressed	51 *
A/C Switch (A/C)	A/C SW ON	51
	A/C SW OFF	Normal

*: Before the STA signal is input (ST is not ON), diagnostic trouble code 43 is also output.

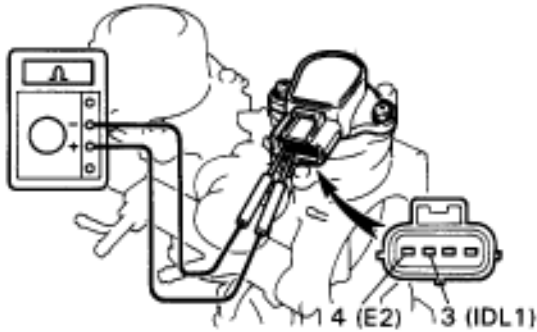
Hint

Diagnostic trouble code 42 is output with vehicle speed 5 km/h (3 mph) or below.

NG

IDL1...Go to step [2].
PNP....Go to page Eg-574.
A/C....Go to step [3].

Proceed to next circuit inspection shown on matrix chart (See page Eg-514).

2**Check throttle position sensor.**

PI1452

OK**P**

- (1) Remove throttle body.
(See page EG 291)
- (2) Apply vacuum to throttle opener.
(See page EG-292)

C

Measure resistance between terminals 3 (IDL1) and 4 (E2) of throttle position sensor connector.

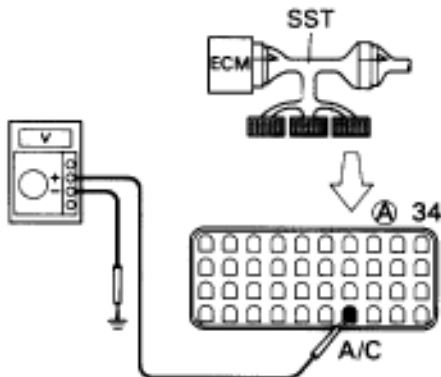
OK

Throttle Valve	Resistance
Fully closed	Less than 0.5 kΩ
Opened	1 MΩ or higher

NG

Adjust or replace throttle position sensor.
(See page EG-292)

Check and repair harness or connector between engine control module and throttle position sensor.

3**Check voltage between terminal A/C of engine control module connector and body ground.**

FI6893

OK**P**

- (1) Connect SST (check harness "A").
(See page EG-510)
SST 09990-01000
- (2) Start the engine.

C

Measure voltage between terminal A/C of engine control module and body ground.

OK

A/C Switch	Voltage
OFF	7.5 – 14 V
ON	0 – 1.5 V

NG

Check A/C compressor circuit.
(See page EG-62)

Check and replace engine control module.

Park Neutral Position Switch Circuit

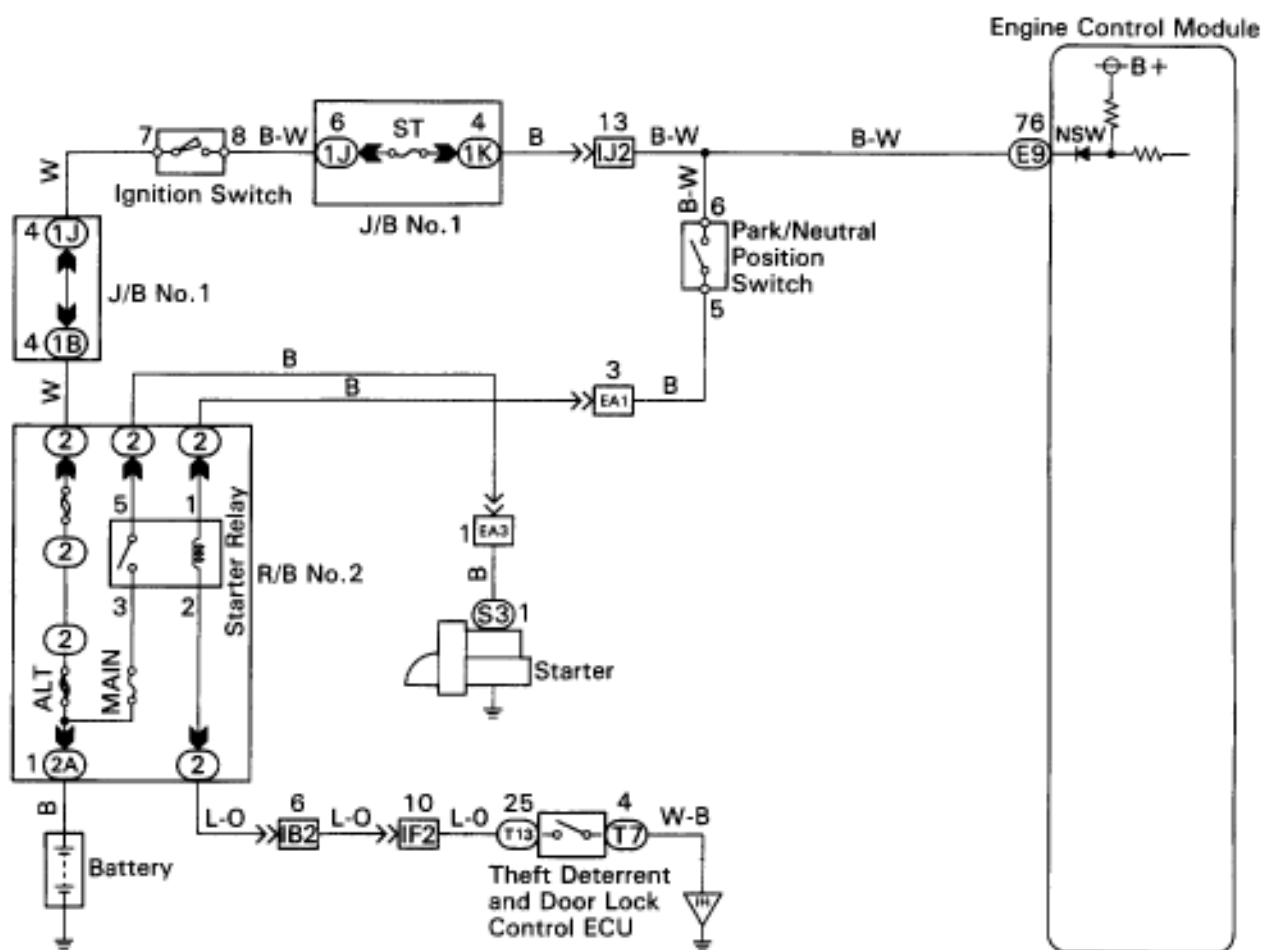
CIRCUIT DESCRIPTION

The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on the terminal NSW of the ECM is grounded to body ground via the starter relay and theft deterrent ECU, 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 positive battery voltage, the voltage of the ECM internal power source.

If the shift lever is moved from the N position to the D position, this signal is used for air-fuel ratio correction and for idle speed control (estimated control), etc.

When the park/neutral position switch is off, code "51" is output in the test mode diagnosis. (This is not abnormal.)

WIRING DIAGRAM



P21137

INSPECTION PROCEDURE

HINT: This diagnosis chart is based on the premise that the engine is being cranked under normal conditions.
If the engine does not crank, proceed to the matrix chart of problem symptoms on page [EG-514](#).

1 Check output condition of diagnostic trouble code 51.																
 FIG814	P (1) Connect terminals TE2 and E1 of DLC2. (2) Turn ignition switch ON. (3) Crank the engine. (4) Connect terminals TE1 and E1 of DLC2. C Check if diagnostic trouble code "51" is output when the shift lever is in the P and D shift positions. Result <table border="1"> <thead> <tr> <th rowspan="2">Shift Position</th> <th colspan="3">Result</th> </tr> <tr> <th>OK</th> <th>NG Type I</th> <th>NG Type II</th> </tr> </thead> <tbody> <tr> <td>"P"</td> <td>Normal Code</td> <td>Code 51</td> <td>Normal Code</td> </tr> <tr> <td>"D"</td> <td>Code 51</td> <td>Code 51</td> <td>Normal Code</td> </tr> </tbody> </table>	Shift Position	Result			OK	NG Type I	NG Type II	"P"	Normal Code	Code 51	Normal Code	"D"	Code 51	Code 51	Normal Code
	Shift Position		Result													
		OK	NG Type I	NG Type II												
	"P"	Normal Code	Code 51	Normal Code												
"D"	Code 51	Code 51	Normal Code													
OK																
NG Type I	Go to step 2 .															
NG Type II	Go to step 3 .															

Proceed to next circuit inspection shown on matrix chart (See page [EG-514](#)).

2 Check for open in harness and connector between engine control module and park/neutral position switch (See page IN-30).	
NG	OK Check and replace engine control module.

Repair or replace harness or connector.

3 Check park/neutral position switch (See page AT2-101).	
OK	NG Replace park/neutral position switch.

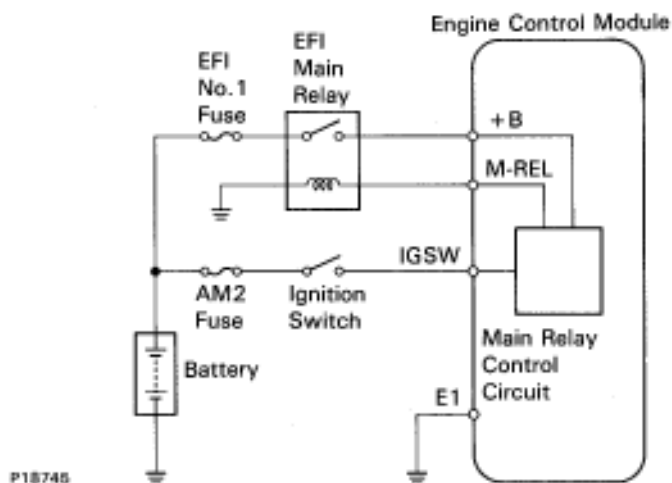
Check and replace engine control module.

ECM Power Source Circuit

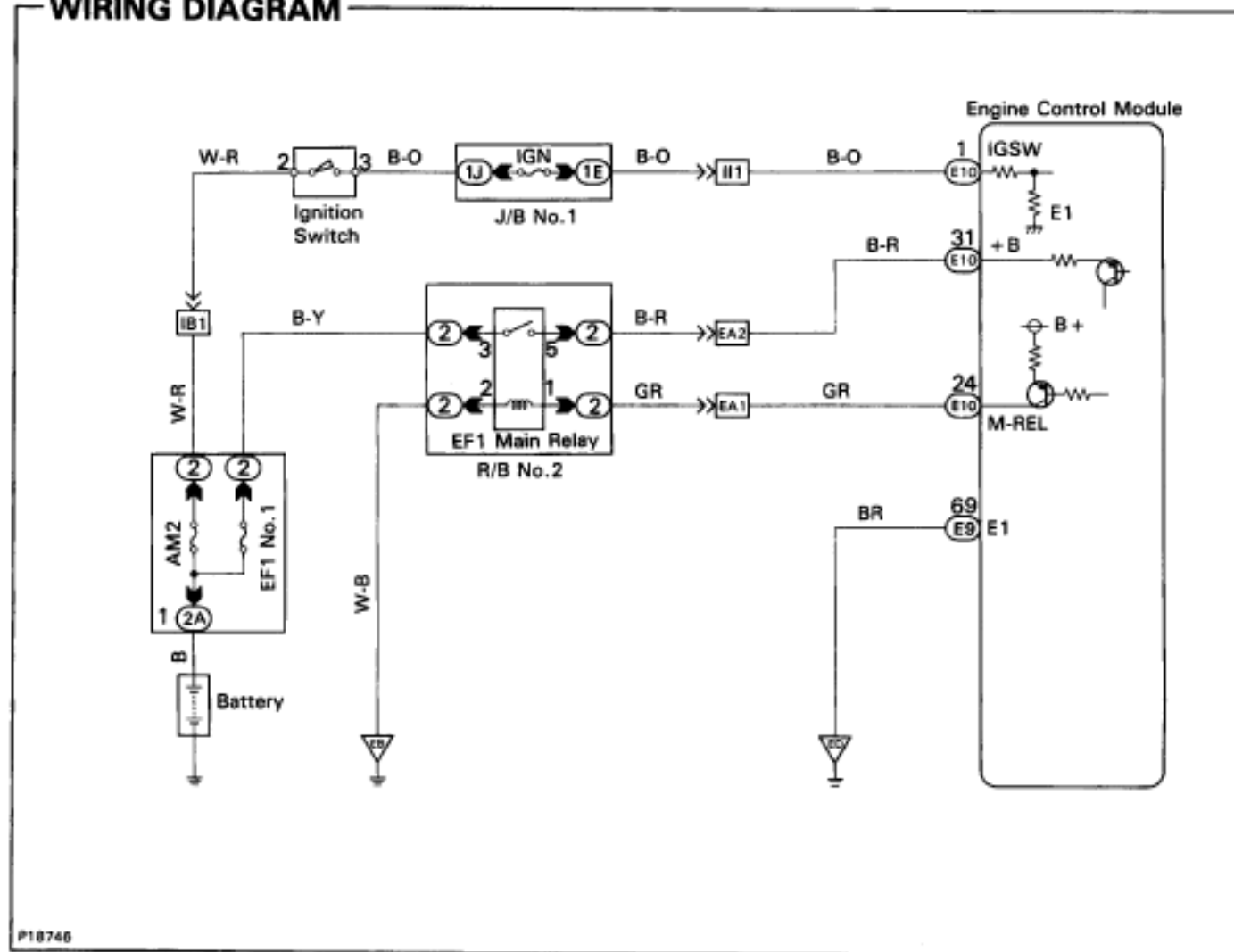
CIRCUIT DESCRIPTION

When the ignition switch is turned on, battery voltage is applied to the terminal IGSW of the ECM, and the main relay control circuit in the ECM sends a signal to the terminal M-REL of the ECM, switching on the main relay. This signal causes current to flow to the coil, closing the contacts of the main relay and supplying power to the terminal + B of the ECM.

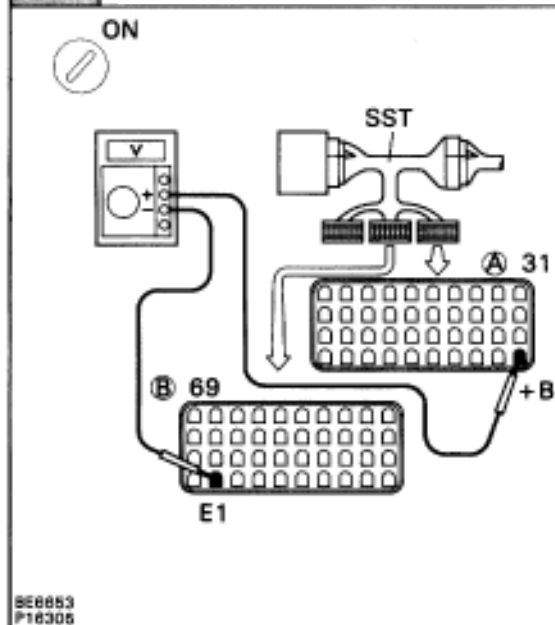
If the ignition switch is turned off, the ECM continues to switch on the main relay for a maximum of 2 seconds for the initial setting of the IAC valve.



WIRING DIAGRAM



INSPECTION PROCEDURE

1**Check voltage between terminal +B and E1 of engine control module connector.****P**

- (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
(2) Turn ignition switch ON.

C

Measure voltage between terminal +B and E1 of engine control module connector.

OK

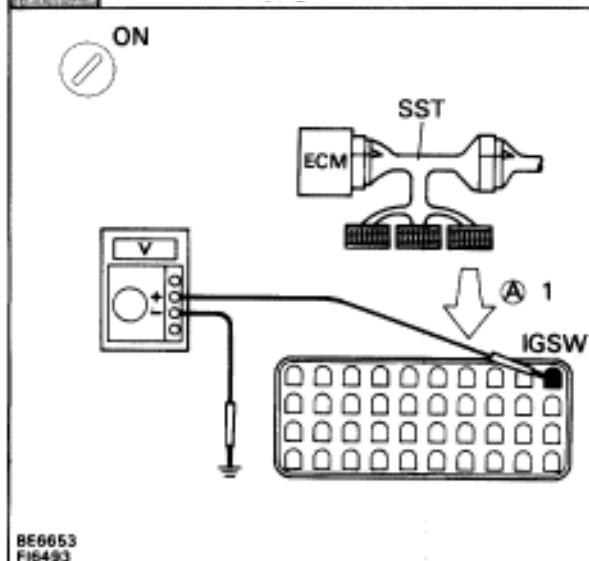
Voltage: 9 — 14 V

NG**OK**

Proceed to next circuit inspection shown on matrix chart (See page [EG-514](#)).

2**Check for open in harness and connector between terminal E1 of engine control module and body ground (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

3**Check voltage between terminal IGSW of engine control module connector and body ground.****P**

Turn ignition switch ON.

C

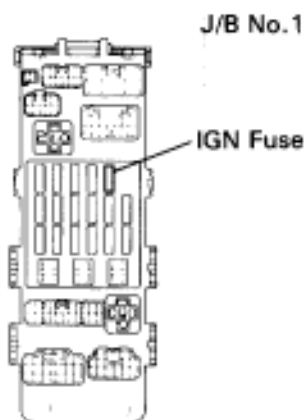
Measure voltage between terminal IGSW of engine control module connector and body ground.

OK

Voltage: 9 — 14 V

NG**OK**

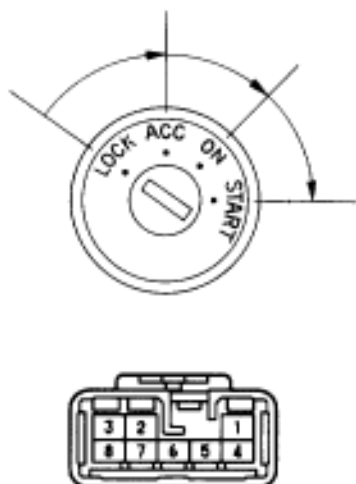
Go to step **6**.

4**Check IGN fuse.**

NO8417

P Remove IGN fuse from J/B No.1.**C** Check continuity of IGN fuse.**OK** Continuity**OK****NG**

Check for short in the harness and all the components connected to IGN fuse (See Electrical Wiring Diagram).

5**Check ignition switch.**BE3582
g-8-2**P** (1) Remove finish lower panel and finish lower panel LH.
(2) Remove heater to register duct No.2.**C** Check continuity between terminals.**OK**

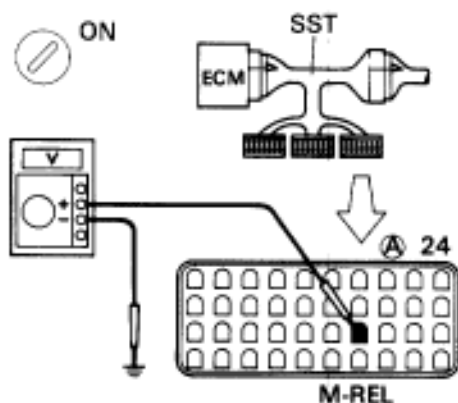
continuity

Terminal	1	2	3	4	5	7	8
Switch position							
LOCK							
ACC					○—○		
ON		○—○		○—○	○—○		
START	○—○	○—○	○—○	○—○		○—○	○—○

OK**NG**

Replace ignition switch.

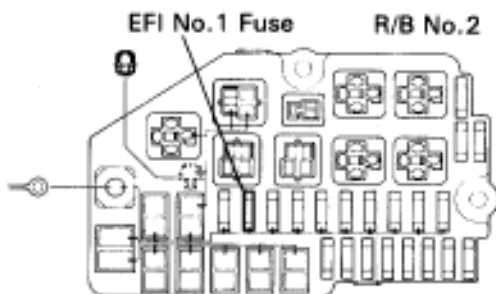
Check and repair harness and connector between battery and ignition switch, ignition switch and engine control module.

6**Check voltage between terminal M-REL of engine control module connector and body ground**BE6653
F16491

- P** Turn ignition switch ON.
- C** Measure voltage between terminal M-REL of engine control module connector and body ground.
- OK** Voltage: 9 — 14 V

OK**NG**

Check and replace engine control module.

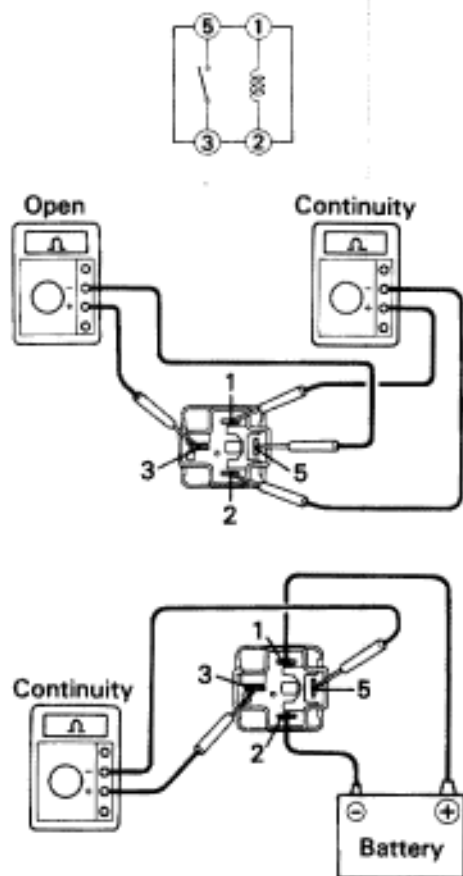
7**Check EFI No.1 Fuse.**

N08419

- P** Remove EFI No.1 fuse from R/B No.2.
- C** Check continuity of EFI No.1 fuse.
- OK** Continuity

OK**NG**

Check for short in the harness and all the components connected to EFI No.1 fuse (See Electrical Wiring Diagram).

8**Check EFI main relay.**BE1841
P04590
P04591**P** Remove EFI main relay from R/B No.2.**C** Check continuity between terminals of EFI main relay shown below.**OK**

Terminals 3 and 5

Open

Terminals 1 and 2

Continuity
(Reference value 72 Ω)**C**

(1) Apply battery positive voltage between terminals 1 and 2.

(2) Check continuity between terminals 3 and 5.

OK

Terminals 3 and 6

Continuity

OK**NG**

Replace EFI main relay.

9**Check for open and short in harness and connector between terminals M-REL of engine control module and body ground (See page IN-30).****OK****NG**

Repair or replace harness or connector.

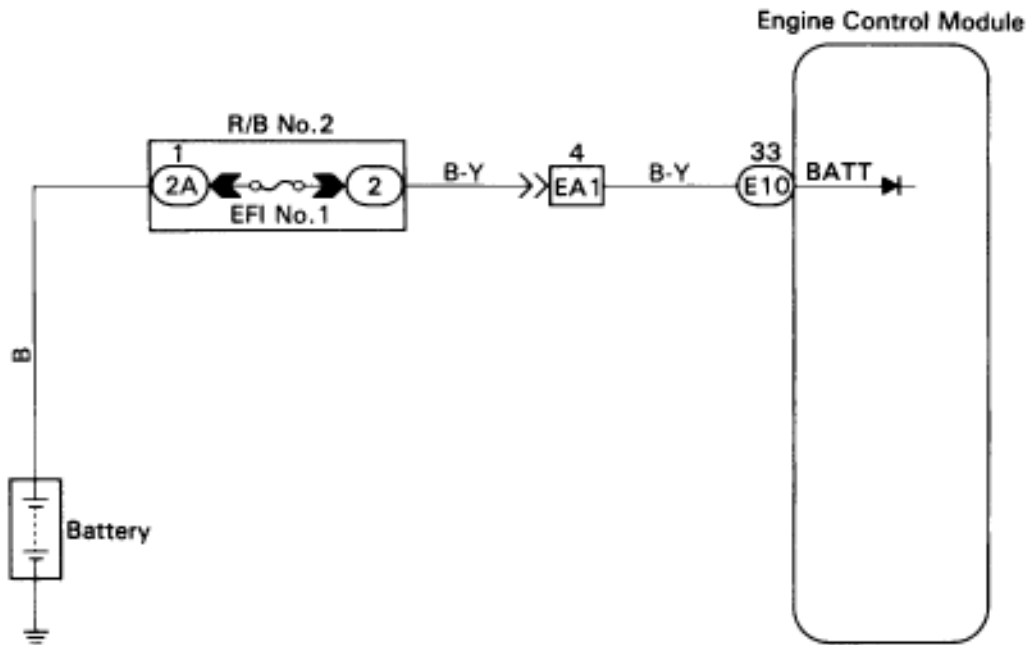
Check and repair harness or connector between EFI
No.1 fuse and battery.

Back Up Power Source Circuit

CIRCUIT DESCRIPTION

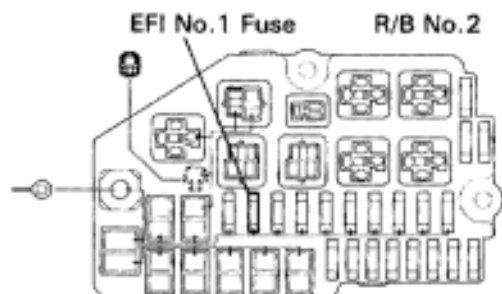
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is off for use by the diagnostic trouble code memory and air-fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



FI6878

INSPECTION PROCEDURE

1**Check EFI No.1 Fuse.**

NOB419

P

Remove EFI No.1 fuse from R/B No.2.

C

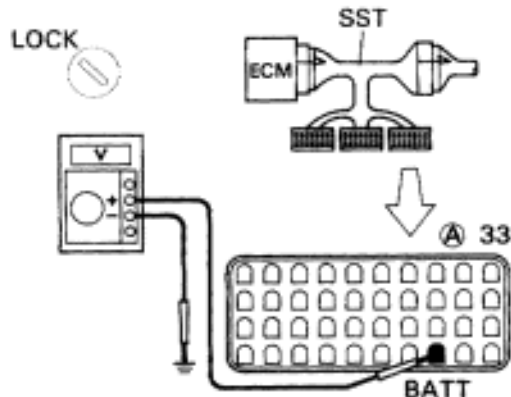
Check continuity of EFI No.1 fuse.

OK

Continuity

OK**NG**

Check for short in the harness and all the components connected to EFI No.1 fuse (See attached wiring diagram).

2**Check voltage between terminal BATT of engine control module connector and body ground.**BE6653
F1B490**P**Connect SST (check harness "A").
See page [EG-510](#)
SST 09990-01000**C**

Measure voltage between terminal BATT of engine control module connector and body ground.

OK

Voltage: 9 — 14 V

OK**NG**

Check and repair harness or connector between engine control module and EFI No.1 fuse, EFI No.1 fuse and battery.

3**Are the diagnostic trouble codes still in the memory when the ignition switch is turned OFF?****YES****NO**

Check and replace engine control module.

Proceed to next circuit inspection shown on matrix chart (See page [EG-514](#)).

Injector Circuit

CIRCUIT DESCRIPTION

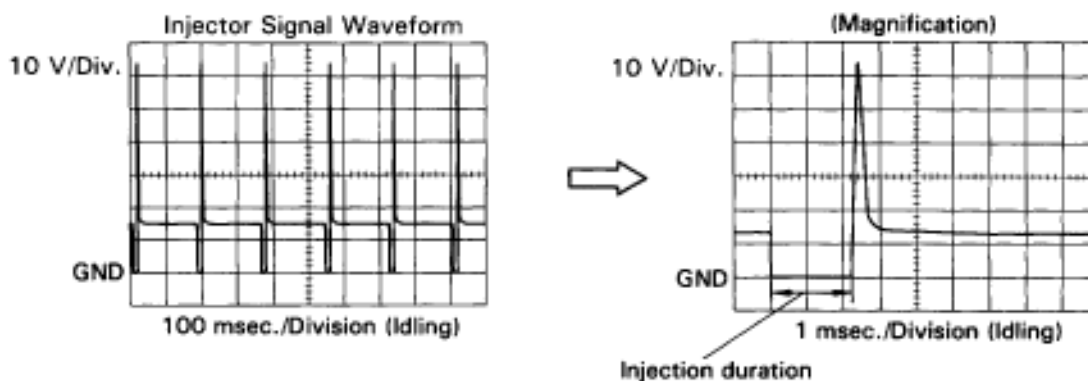
The injectors are located in the intake manifold. They inject fuel into the cylinders based on the signals from the engine control module.

Reference

INSPECTION USING OSCILLOSCOPE

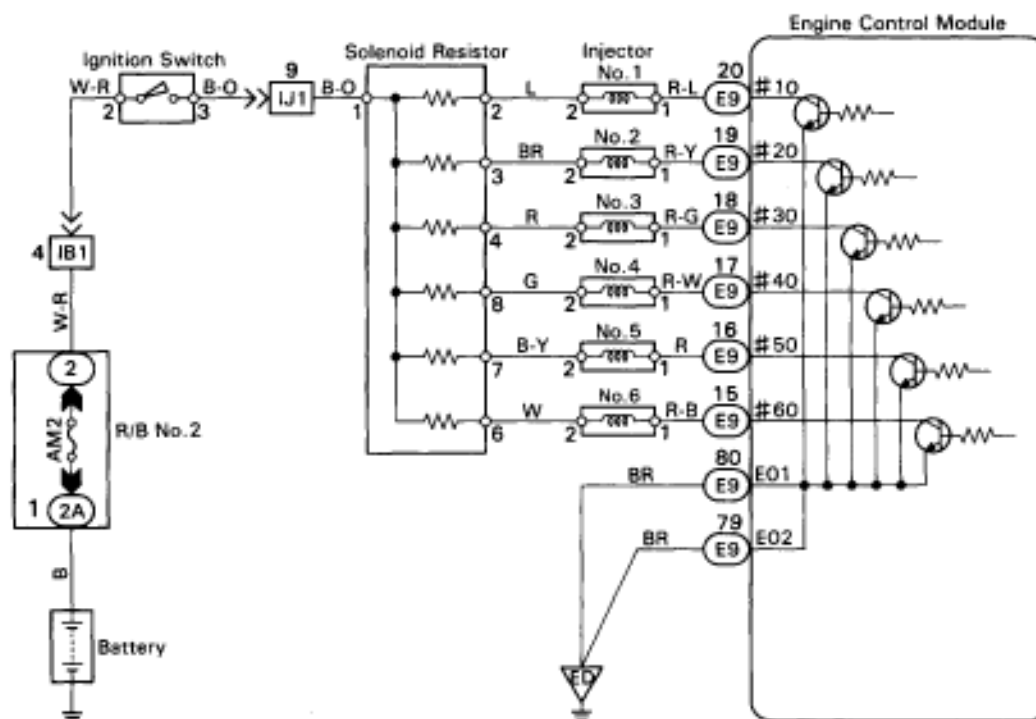
With engine idling measure waveform between terminals # 10 ~ 60 and E01 of engine control module.

HINT: The correct waveform is as shown.



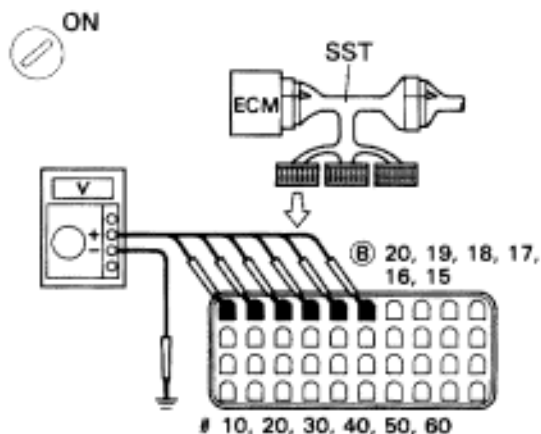
FI6588 FI6538

WIRING DIAGRAM



FI6934

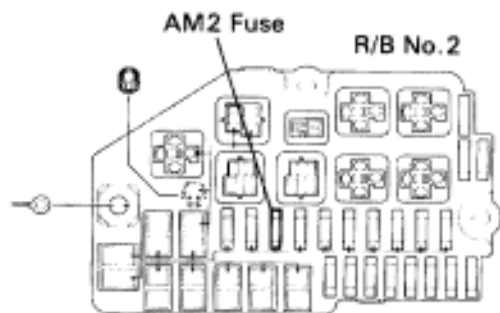
INSPECTION PROCEDURE

1**Check voltage between terminals # 10 ~ 60 of engine control module and body ground.**BE6653
F18B19

- P** (1) Connect SST (check harness "A").
See page [EG-510](#)
SST 09990-01000
(2) Turn ignition switch ON.

C Measure voltage between terminals # 10 ~ 60 of engine control module and body ground.

OK Voltage: 9 — 14 V

NG**OK** Go to step **4**.**2****Check AM2 fuse.**

N08419

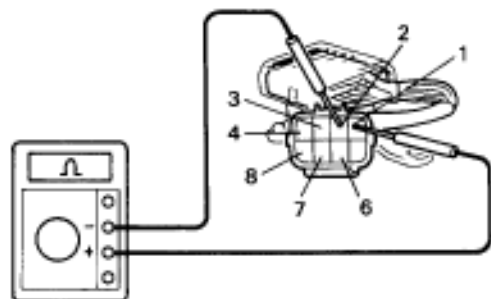
- P** Remove AM2 fuse from R/B No.2.

C Check continuity of AM2 fuse.

OK Continuity

OK**NG**

Check for short in the harness and all the components connected to AM2 fuse.

3**Check resistance between terminals 1 and 2 ~ 4, 6 ~ 8 of solenoid resistor connector.**

P11451

- P** Disconnect solenoid resistor connector.
- C** Measure resistance between terminals 1 and 2 ~ 4, 6 ~ 8 of solenoid resistor connector.
- OK** Resistance: Approx. 6 at 20°C (68°F)

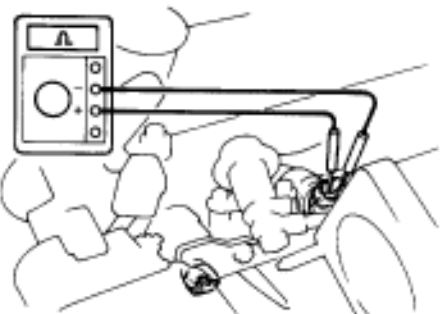
OK**NG**

Replace solenoid resistor.

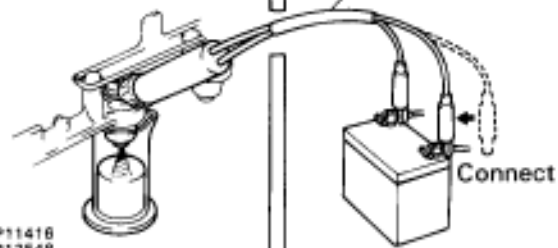
Check and repair harness and connector between engine control module and battery.

4**Check for open in harness and connector between terminal E01, E02 of ECM connector and body ground (See page IN-30).****OK****NG**

Repair or replace harness or connector.

5**Check injectors.**

SST (Wire)

P11416
P12548

- P** Disconnect injector connector.
See page EG-273)
- C** Measure resistance of injector.
- OK** Resistance: Approx. 1.95 at 20°C (68°F)
- C** Check injection volume of injector.
(See page EG-279)
- OK** Injection volume
124 ~ cm³/15 sec.
(7.6 — 8.8 cu in./15 sec.)
Difference between each injector:
Less than 10 cm³ (0.6 cu in.)
Leakage
Fuel drop: One drop or less per minute

OK**NG**

Replace injector.

Check and replace engine control module.

IAC Valve Circuit

CIRCUIT DESCRIPTION

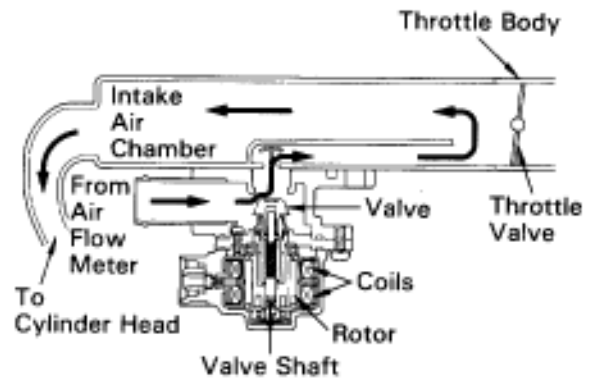
The IAC valve is situated on the intake air chamber. Intake air bypassing the throttle valve is directed to the IAC valve through a passage.

A step motor is built into the IAC valve. It consists of 4 coils, a magnetic rotor, valve shaft and a valve.

When the current flows to the coils due to signals from the ECM, the rotor turns and moves the valve shaft forward or backward, changing the clearance between the valve and the valve seat.

In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.

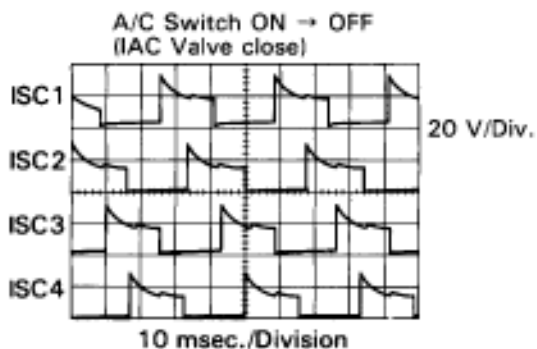
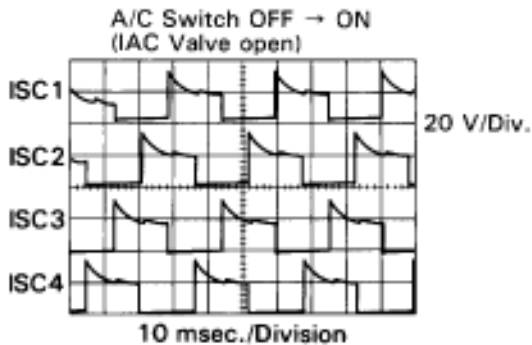
There are 125 possible positions to which the valve can be opened.



FI6973

Reference

INSPECTION USING OSCILLOSCOPE

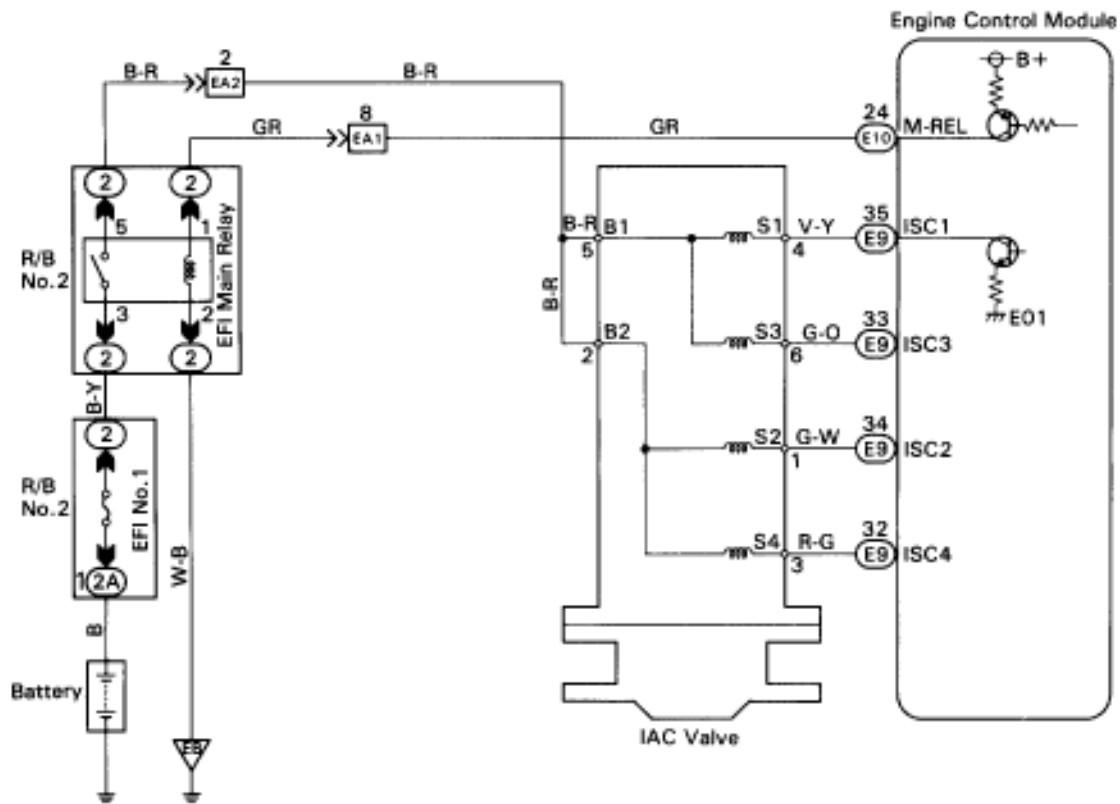


With the engine idling measure wave forms between terminals ISC1, ISC2, ISC3, ISC4 and E01 of engine control module when A/C switch ON or OFF.

HINT:

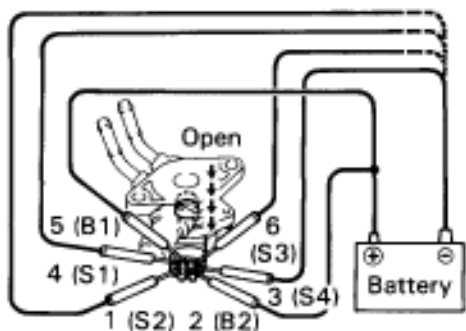
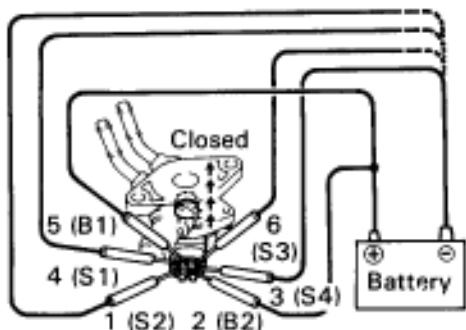
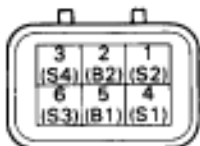
The correct waveforms are as shown.

WIRING DIAGRAM



F16935

INSPECTION PROCEDURE

1**Check IAC valve.**F11694
P11389
P11388**P**

Disconnect IAC valve connector.

C

Measure resistance between terminals shown below.

OK

Terminal	Resistance
5 (B1) - 4 (S1)	10 Ω - 30 Ω
5 (B1) - 6 (S3)	10 Ω - 30 Ω
2 (B2) - 1 (S2)	10 Ω - 30 Ω
2 (B2) - 3 (S4)	10 Ω - 30 Ω

P

Remove IAC Valve.

C

- (1) Connect the battery positive lead to terminals 5 (B1) and 2 (B2), and the negative lead to terminals 4(S1)—1(S2)—6(S3)—3(S4) in that order.
- (2) Connect the battery positive lead to terminals 5 (B1) and 2 (B2) and the negative lead to terminals 3(S4)—6(S3)—1(S2)—4(S1) in that order.

OK

- (1) The valve moves in the closing direction
- (2) The valve moves in the opening direction.

OK**NG**

Replace IAC valve.

2**Check for open and short in harness and connector between EFI main relay and IAC valve, IAC valve and engine control module (See page IN-30).****OK****NG**

Repair or replace harness or connector.

Proceed to next circuit inspection shown on matrix chart (See page EG-514).

Turbo Control Circuit

CIRCUIT DESCRIPTION

[HINT] This turbocharger system has 3 control valves (Exhaust Bypass Valve, Exhaust Gas Control Valve, Intake Air control Valve). Each valve is controlled by turbo pressure which is controlled by VSV based on signals from ECM.

1. EXHAUST BYPASS VALVE

This valve controls the opening or closing of the exhaust bypass passage to ensure a smooth transition from 1 turbo operation to 2 turbo operation.

2. EXHAUST GAS CONTROL VALVE

This valve controls the opening or closing of the No.2 exhaust passage in order to operate No.2 turbocharger.

3. INTAKE AIR CONTROL VALVE

This valve controls the opening or closing of the No.2 intake air passage in order to pass the charged air from No.2 turbocharger.

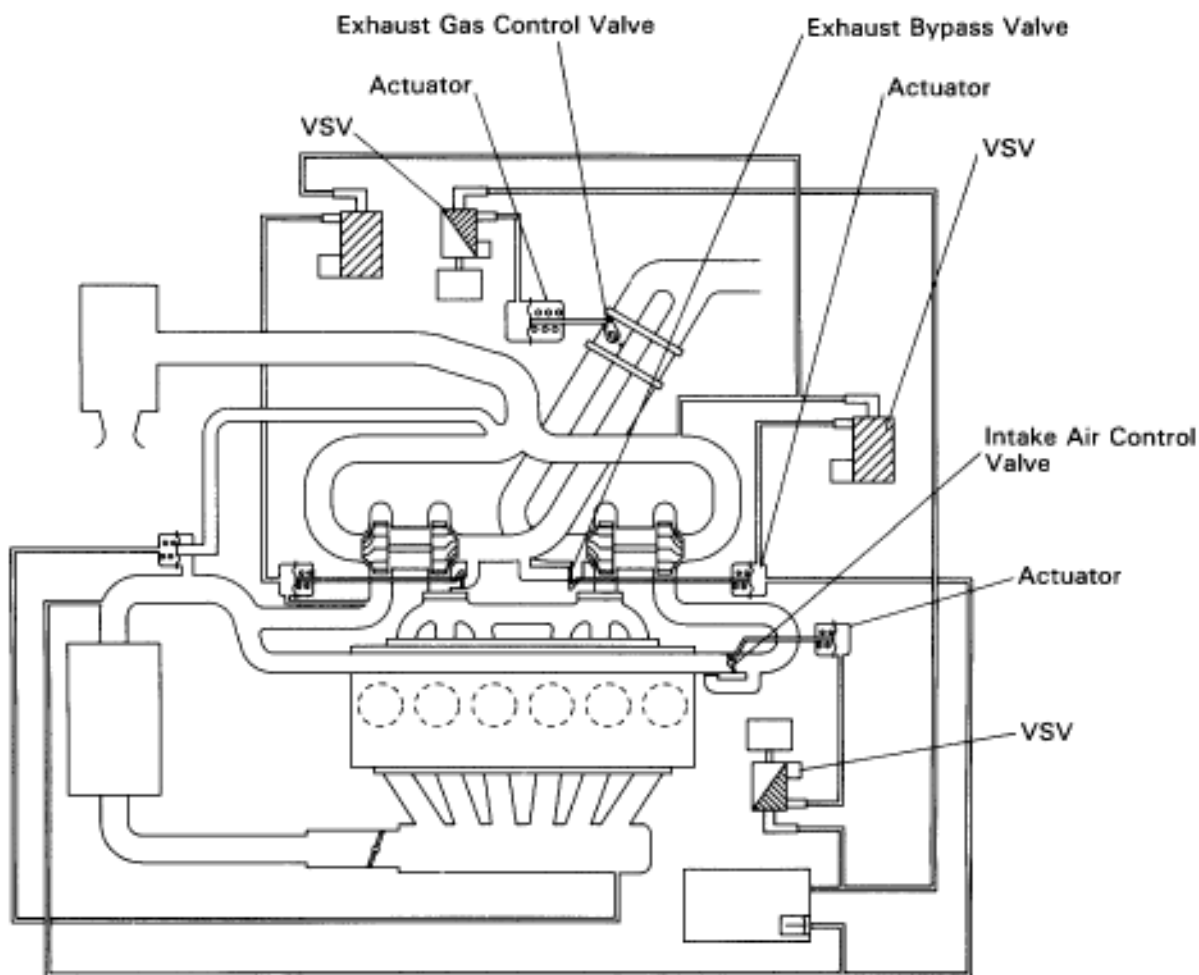
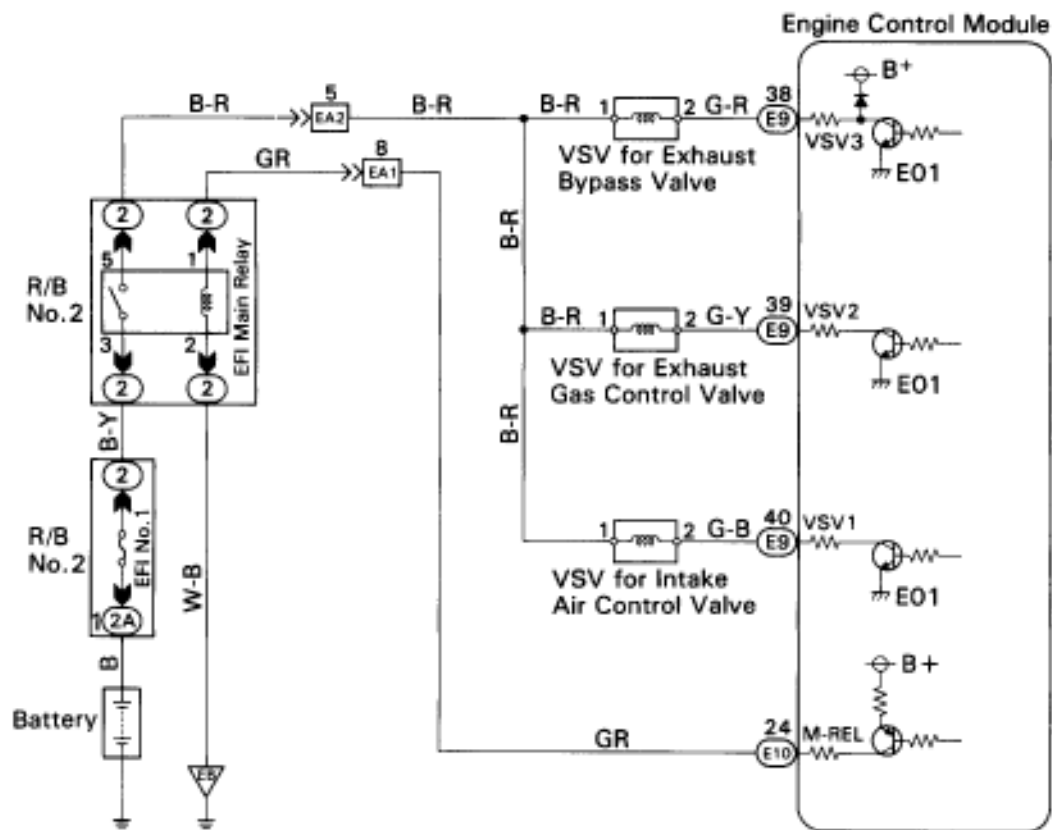
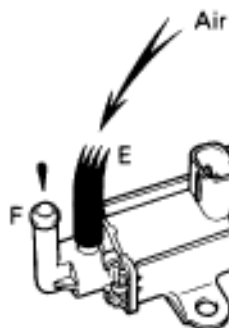
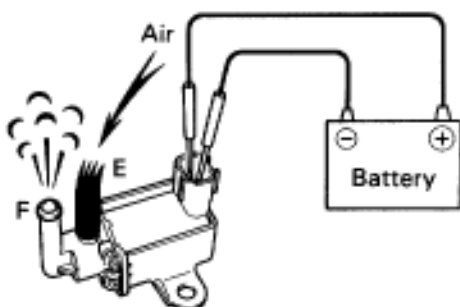
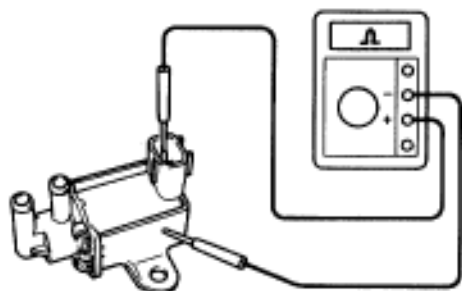
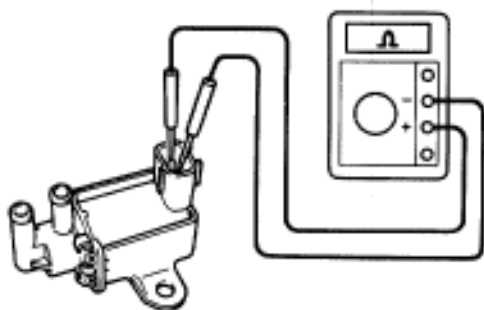


FIG965

WIRING DIAGRAM

FI6967

INSPECTION PROCEDURE

1**Check VSV for Exhaust Bypass Valve****P**

- (1) Remove VSV.
- (2) Disconnect VSV connector.

C

- (1) Measure resistance between terminals.
- (2) Measure resistance between each terminal and the body.

OK

- (1) Resistance: 22 —26 at 20°C (68°F)
- (2) Resistance: 1 M or higher

C

Check operation of VSV when battery positive voltage is applied and released to the VSV terminals.

OK

Battery positive voltage is applied:
Air from port E is flowing out through port F.

Battery positive voltage is not applied:
Closed air passage from port E to F.

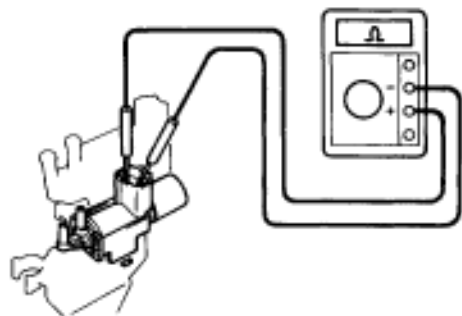
P11374
P11375
P11377
P11376

OK**NG**

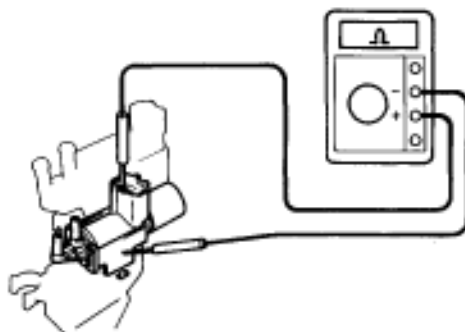
Replace VSV for exhaust bypass valve.

2

Check VSV for Exhaust Gas Control Valve

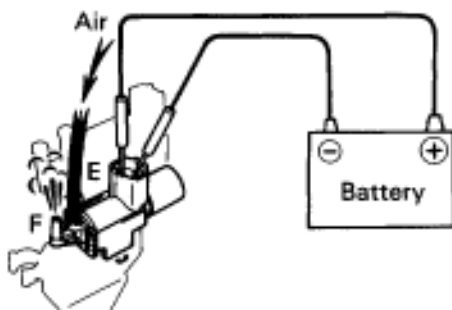


- P** (1) Remove VSV.
(2) Disconnect VSV connector.



- C** (1) Measure resistance between terminals.
(2) Measure resistance between each terminal and the body.

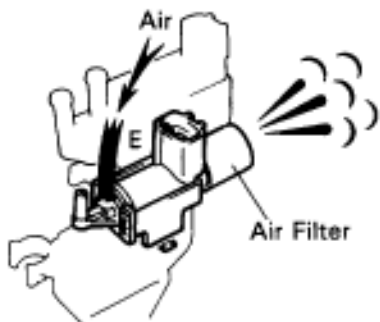
- OK** (1) Resistance: 38 — 44 at 20°C (68°F)
(2) Resistance: 1 M or higher



- C** Check operation of VSV when battery positive voltage is applied and released to the VSV terminals.

- OK** Battery positive voltage is applied:
Air from port E is flowing out through port F.

Battery positive voltage is not applied:
Air from port E is flowing out through the air filter.

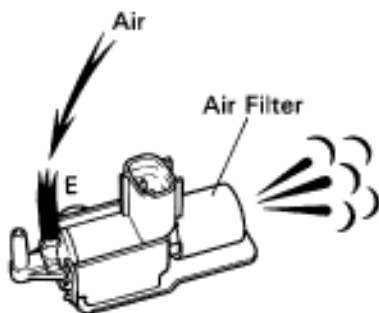
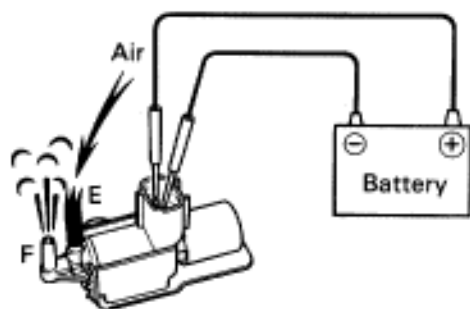
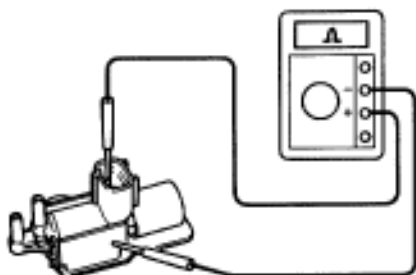
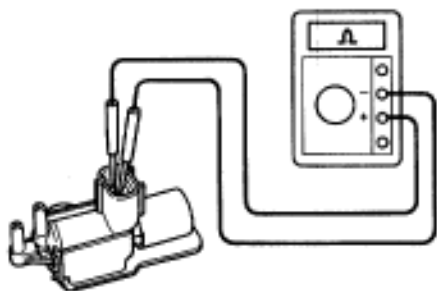


P11382
P11383
P11384
P11415

OK

NG

Replace VSV for exhaust gas control valve.

3**Check VSV for Intake Air Control Valve**

P11371
P11372
P11373
P11414

OK**P**

- (1) Remove VSV.
- (2) Disconnect VSV connector.

C

- (1) Measure resistance between terminals.
- (2) Measure resistance between each terminal and the body.

OK

- (1) Resistance: 38.5 — 44.5 at 20°C (68°F)
- (2) Resistance: 1 M or higher

C

Check operation of VSV when battery positive voltage is applied and released to the VSV terminals.

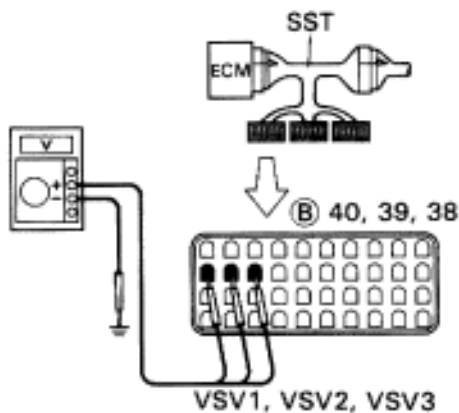
OK

Battery positive voltage is applied:
Air from port E is flowing out through port F.

Battery positive voltage is not applied:
Air from port E is flowing out through the air filter.

NG

Replace VSV for intake gas control valve.

4**Check voltage between terminal VSV1, VSV2, VSV3 of engine control module connector and body ground.** ONBE6653
FI6971**P**

- (1) Connect SST (check harness "A").
(See page [EG-510](#))
- (2) Turn ignition switch ON.

C

Measure voltage between terminal VSV1, VSV2, VSV3 of engine control module connector and body ground.

Voltage: 9 — 14 V

OK**NG****OK**

Check actuator. (See page [EG-144](#), [158](#))

5**Check for open and short in harness and connector between EFI main relay and engine control module (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

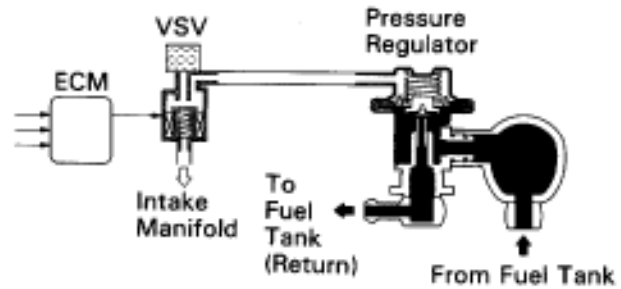
VSV Circuit for Fuel Pressure Control

CIRCUIT DESCRIPTION

The ECM turns on a VSV (Vacuum Switching Valve) to draw air into the diaphragm chamber of the pressure regulator if it detects that the temperature of the engine coolant is too high during engine starting.

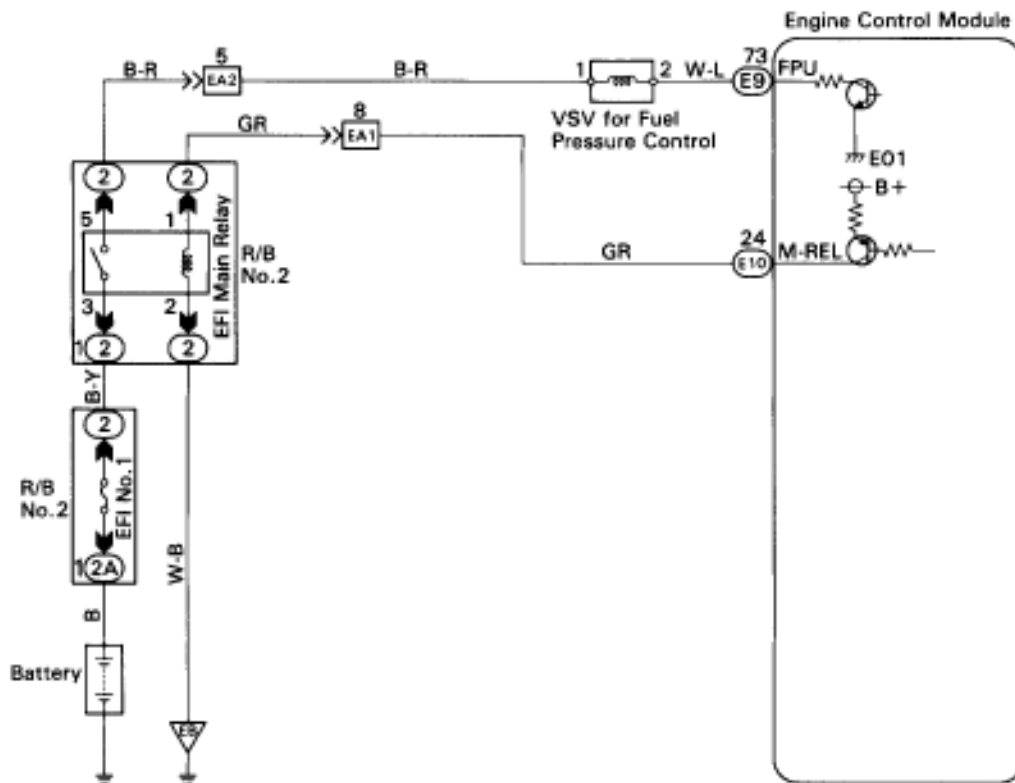
The air drawn into the chamber increases the fuel pressure to prevent fuel vapor lock at high engine temperature in order to help the engine start when it is warm.

Fuel pressure control ends approx. 120 sec. after the engine is started.



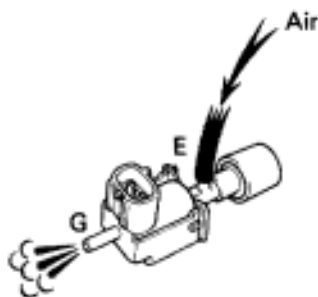
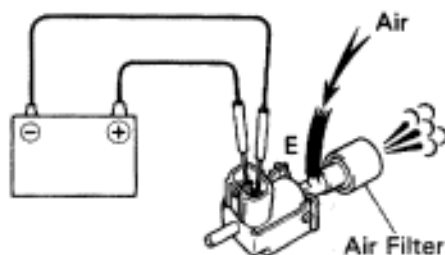
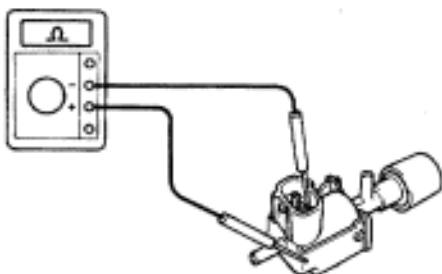
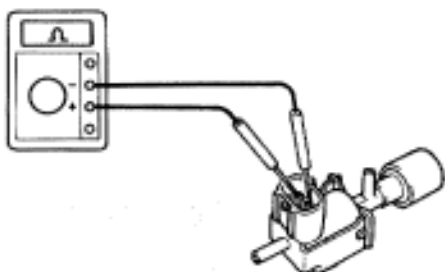
F18969

WIRING DIAGRAM



F18936

INSPECTION PROCEDURE

1**Check VSV for fuel pressure control.**

P11340
P11341
P11343
P11342

P

- (1) Remove VSV.
- (2) Disconnect VSV connector.

C

- (1) Measure resistance between terminals.
- (2) Measure resistance between each terminal and the body.

OK

- (1) **Resistance: 33 — 39 at 20°C (68°F)**
- (2) **Resistance: 1 M or higher**

C

Check operation of VSV when battery positive voltage is applied and released to the VSV terminals.

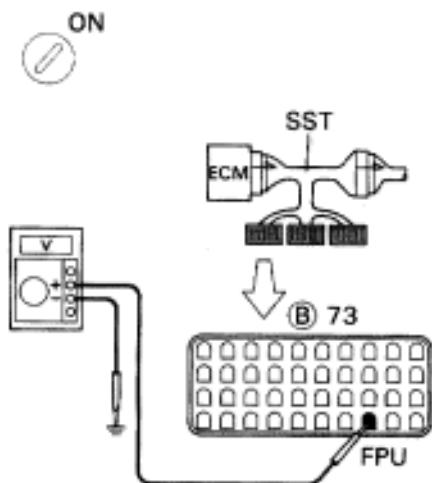
OK

Battery positive voltage is applied:
Air from port E is flowing out through the air filter.

Battery positive voltage is not applied:
Air from port E is flowing out through port G.

OK**NG**

Replace VSV for fuel pressure control.

2**Check voltage between terminal FPU of engine control module connector and body ground.**968653
F10847**P**

- (1) Connect SST (check harness "A").
(See page [EG-510](#))
SST 09990-01000
(2) Turn ignition switch ON.

C

Measure voltage between terminal FPU of engine control module connector and body ground.

OK

Voltage: 9 — 14 V

NG**OK**

Proceed to next circuit inspection shown on matrix chart (See page Eg-514).

3**Check for open and short in harness and connector between engine control module and VSV, VSV and EFI main relay (See page [IN-30](#)).****OK****NG**

Repair or replace harness or connector.

Check and replace engine control module.

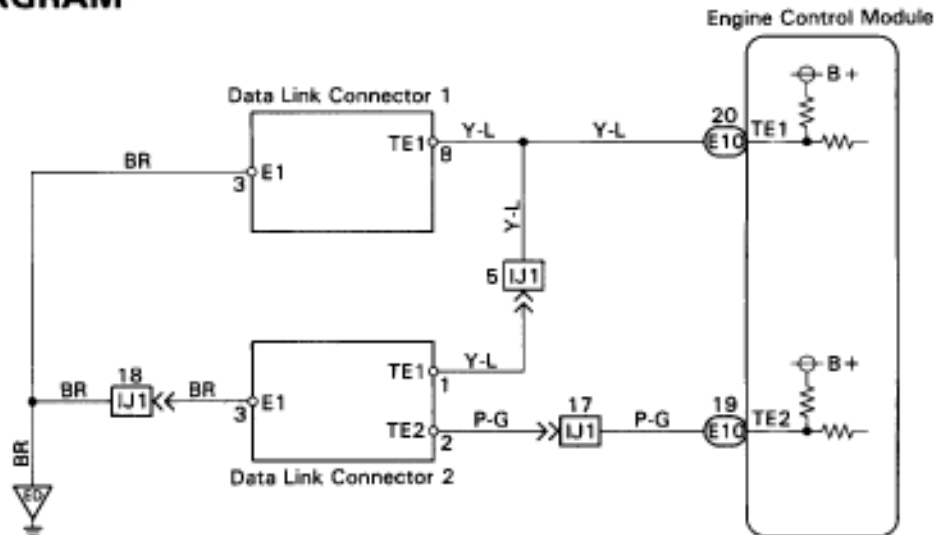
TE1 TE2 Terminal Circuit

CIRCUIT DESCRIPTION

Terminal TE1 is located in data link connectors 1 and 2. Terminal TE2 is located ONLY in data link connector 2.

The data link connector 1 is located in the engine compartment and the data link connector 2 is located in the cabin. When these terminals are connected with the E1 terminal, diagnostic trouble codes in normal mode or test mode can be read from the malfunction indicator lamp on the telltale light RH.

WIRING DIAGRAM



FI8937

INSPECTION PROCEDURE

HINT: If terminals TE1 and TE2 are connected with terminal E1, diagnostic trouble code is not output or test mode is not activated.

Even though terminal TE1 is not connected with terminal E1, the malfunction indicator lamp blinks.

For the above phenomenon, the likely cause is an open or short in the wire harness, or malfunction inside the ECM.

1	Check voltage between terminals TE1, TE2 and E1 of data link connectors 1 and 2.
ON IG ON DLC1 E1 TE1 DLC2 TE2 E1 TE1 BE6653 F16966 F14412	P Turn ignition switch ON. C (1) For DLC1, measure voltage between terminal TE1 and E1. (2) For DLC2 measure voltage between terminals TE1, TE2 and E1. OK Voltage: 9 — 14 V
NG	OK Check and replace engine control module.
2	Check continuity between terminal E1 of data link connectors 1, 2 and body ground.
OK	NG Repair or replace harness or connector.
3	Check for open and short in harness and connector between engine control module and data link connectors 1, 2 (See page IN-30).
OK	NG Repair or replace harness or connector.
Check and replace engine control module.	