ENGINE

TECHNICAL DEPARTMENT
CONTROLLED DOCUMENT
DO NOT REMOVE

ENGINE MECHANICAL ..... EG– 2
PREPARATION ..... EG– 2
IDLE CO/HC CHECK (w/ TWC) ..... EG– 5
IDLE CO CHECK AND ADJUST (w/o TWC) ..... EG– 6
COMPRESSION CHECK ..... EG– 8
VALVE CLEARANCE INSPECTION AND ADJUSTMENT ..... EG– 9
IGNITION TIMING INSPECTION AND ADJUSTMENT ..... EG– 15
IDLE SPEED INSPECTION ..... EG– 16
TIMING BELT ..... EG– 17
CYLINDER HEAD ..... EG– 28
CYLINDER BLOCK ..... EG– 34
SERVICE SPECIFICATIONS ..... EG– 40
EFI SYSTEM ..... EG– 45
PREPARATION ..... EG– 45
DIAGNOSIS SYSTEM ..... EG– 45
TROUBLESHOOTING w/ VOLT, OHMMETER ..... EG– 56
REFERENCE VALUE OF ENGINE ECU DATA ..... EG– 75
ISC VALVE ..... EG– 76
EFI MAIN RELAY ..... EG– 77
OXYGEN SENSOR ..... EG– 77
ENGINE ECU ..... EG– 78
SERVICE SPECIFICATIONS ..... EG– 81
COOLING SYSTEM ..... EG– 84
PREPARATION ..... EG– 84
COOLANT CHECK ..... EG– 84
COOLANT REPLACEMENT ..... EG– 85
WATER PUMP ..... EG– 86
THERMOSTAT ..... EG– 87
RADIATOR ..... EG– 88
ELECTRIC COOLING FAN ..... EG– 89
SERVICE SPECIFICATIONS ..... EG– 90
LUBRICATION SYSTEM ..... EG– 91
PREPARATION ..... EG– 91
OIL PRESSURE CHECK ..... EG– 92
OIL AND FILTER REPLACEMENT ..... EG– 93
OIL PUMP ..... EG– 95
OIL COOLER ..... EG– 96
SERVICE SPECIFICATIONS ..... EG– 97

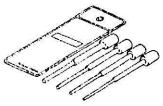
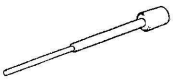
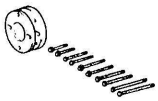
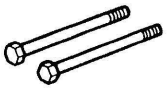
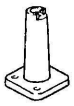
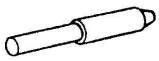
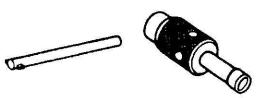
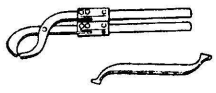
ENGINE MECHANICAL

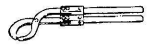
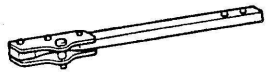
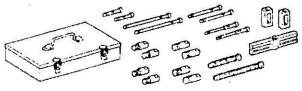
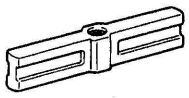
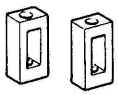
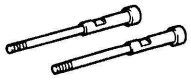
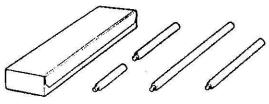
PREPARATION

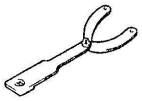
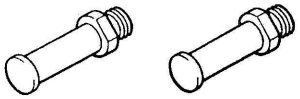
SST (SPECIAL SERVICE TOOLS)

EG0AY-2D

EG

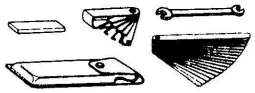
	09201-10000 Valve Guide Bushing Remover & Replacer Set	
	(09201-01060) Valve Guide Bushing Remover & Replacer 6	
	09213-54015 Crankshaft Pulley Holding Tool	
	(09214-00030) Bolt	
	09221-25026 Piston Pin Remover & Replacer	
	(09221-00021) Body	
	(09221-00030) Spring	
	(09221-00040) Bushing "A"	
	(09221-00071) Guide "A"	
	(09221-00081) Guide "B"	
	09243-00020 Idle Adjusting Screw Wrench	
	09248-55040 Valve Clearance Adjust Tool Set	

	(09248–05410) Valve Lifter Press	
	(09248–05420) Valve Lifter Stopper	
	09249–63010 Torque Wrench Adaptor	
	09330–00021 Companion Flange Holding Tool	Crankshaft pulley
	09843–18020 Diagnosis Check Wire	
	09950–50010 Puller C Set	
	(09951–05010) Hanger 150	Crankshaft pulley
	(09952–05010) Slide Arm	Crankshaft pulley
	(09953–05010) Center Bolt 100	Crankshaft pulley
	(09953–05020) Center Bolt 150	Crankshaft pulley
	(09954–05010) Claw No.1	Crankshaft pulley
	09950–70010 Handle Set	
	(09951–07100) Handle 100	Valve guide bushing
	09960–10010 Variable Pin Wrench Set	

	(09962–01000) Variable Pin Wrench Arm Assy	Camshaft timing pulley Oil pump pulley
	(09963–00600) Pin 6	Oil pump pulley
	(09963–01000) Pin 10	Camshaft timing pulley

RECOMMENDED TOOLS

EG0AZ–10

	09200–00010 Engine Adjust Kit .	

EQUIPMENT

EG0B0–18

CO/HC meter	
Compression gauge	
Connecting rod aligner	
Gasket scraper	
Micrometer	
Piston ring expander	
Soft brush	
Tachometer	
Torque wrench	

COOLANT

EG12X–0V

Item		Capacity	Classification
Engine coolant			Ethylene–glycol base
w/o Heater	M/T	5.8 liters (6.1 US qts, 5.1 Imp. qts)	
	A/T	5.7 liters (6.0 US qts, 5.0 Imp. qts)	
w/ Heater	M/T	6.6 liters (7.0 US qts, 5.8 Imp. qts)	
	A/T	6.5 liters (6.9 US qts, 5.7 Imp. qts)	

LUBRICANT

EG14X–1H

Item	Capacity	Classification
Engine oil		API grade SG, SH or ILSAC multigrade engine oil and recommended viscosity oil
Dry fill		
w/ Oil cooler	4.4 liters (4.7 US qts, 3.9 Imp. qts)	
w/o Oil cooler	4.3 liters (4.5 US qts, 3.8 Imp. qts)	
Drain and refill		
w/ Oil filter change	3.9 liters (4.1 US qts, 3.4 Imp. qts)	
w/o Oil filter change	3.7 liters (3.9 US qts, 3.3 Imp. qts)	

IDLE CO/HC CHECK (w/ TWC)

EG732–01

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

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
HINT: All vacuum hoses for EGR system, etc. should be properly connected.
(f) EFI 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

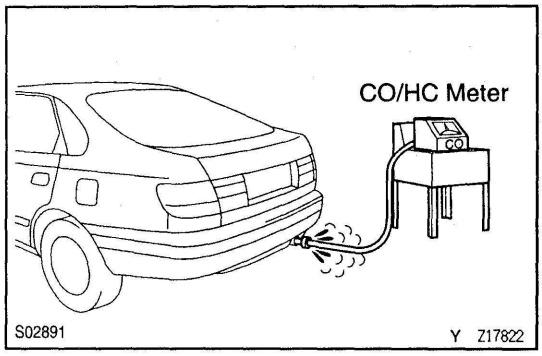
5. CHECK CO/HC CONCENTRATION AT IDLE

Idle CO concentration:

0 – 0.5 %

Idle HC concentration:

Applicable local regulation



Troubleshooting

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

(a) Check oxygen sensor operation.
(See oxygen sensor inspection under EFI System in Pub. No. RM395E)
(b) See the table for possible causes, and then inspect and correct the applicable causes if necessary.

HC	CO	Symptom	Causes
High	Normal	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high-tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hose • EGR valve • Intake manifold • Throttle body • ISC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough Idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty EFI systems: • Faulty pressure regulator • Clogged fuel return line • Defective water temp. sensor • Faulty ECU • Faulty injector • Faulty throttle position sensor • Faulty vacuum sensor

V05182

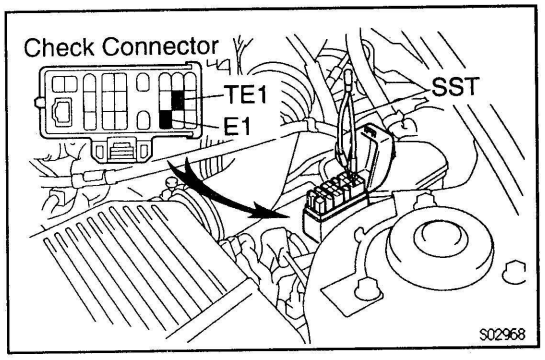
IDLE CO CHECK AND ADJUST (w/o TWC)

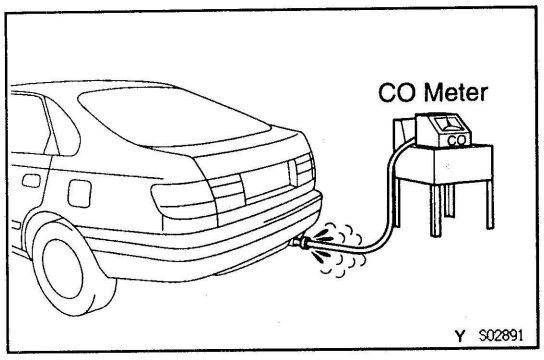
EG74A-01

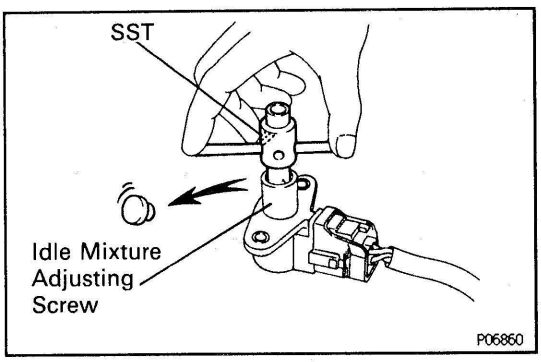
HINT: This check is used only to determine whether or not the idle CO complies with regulations.

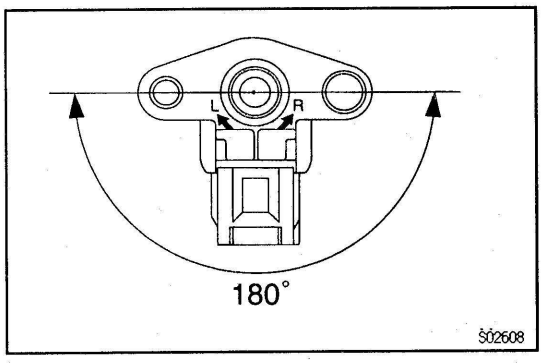
1. INITIAL CONDITIONS

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









2. CHECK AND ADJUST CO CONCENTRATION AT IDLE

NOTICE: Always use a CO meter when adjusting the idle mixture. It is not necessary to adjust with the idle mixture screw in most vehicles if they are in good condition. If a CO meter is not available, DO NOT ATTEMPT TO ADJUST IDLE MIXTURE.

(a) Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843—18020

(b) Race the engine at 2,500 rpm for approx. 180 seconds.

(c) Insert a tester probe at least 40 cm (1.3 ft) into the tailpipe.

(d) Wait at least 1 minute before measuring to allow the concentration to stabilize. Complete the measuring within 3 minutes.
Idle CO concentration (w/ Cooling fan OFF):
1.5 ± 0.5 %

If the CO concentration does not conform to regulations, adjust by turning the IDLE MIXTURE ADJUSTING SCREW in the variable resistor with SST.
SST 09243—00020

HINT: The idle mixture adjusting screw can be tightened through on angle of 180°.

- If the CO concentration is within specification, this adjustment is complete.
- If the CO concentration cannot be corrected by idle mixture adjustment, see the table on the page EG—6 for other possible causes.

(e) Remove the SST.
SST 09843—18020

COMPRESSION CHECK

EG6CE–03

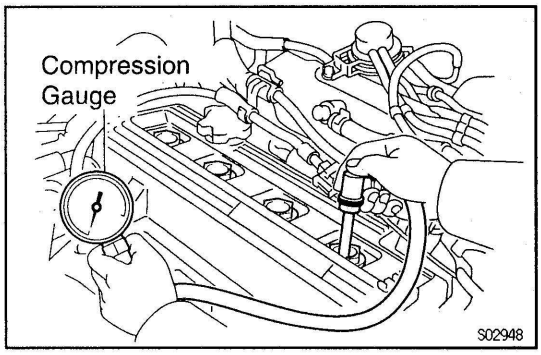
HINT: If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. **WARM UP AND STOP ENGINE**
   Allow the engine to warm up to normal operating temperature.
2. **DISCONNECT DISTRIBUTOR CONNECTORS**
3. **DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS**
4. **REMOVE SPARK PLUGS**
5. **CHECK CYLINDER COMPRESSION PRESSURE**

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

(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.
HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.



(d) Repeat steps (a) through (c) for each cylinder.
NOTICE: This measurement must be done in as short a time as possible.
Compression pressure:
w/ TWC:
1,275 kPa (13.0 kgf/cm², 185 psi) or more
w/o TWC:
1,226 kPa (12.5 kgf/cm², 178 psi) or more
Minimum pressure:
w/ TWC:
932 kPa (9.5 kgf/cm², 135 psi)
w/o TWC:
883 kPa (9.0 kgf/cm², 128 psi)
Difference between each cylinder:
98 kPa (1.0 kgf/cm², 14 psi) or less

(e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.
- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

6. **REINSTALL SPARK PLUGS**
7. **RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS**
8. **RECONNECT DISTRIBUTOR CONNECTORS**

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

EG749-01

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

1. REMOVE CYLINDER HEAD COVER

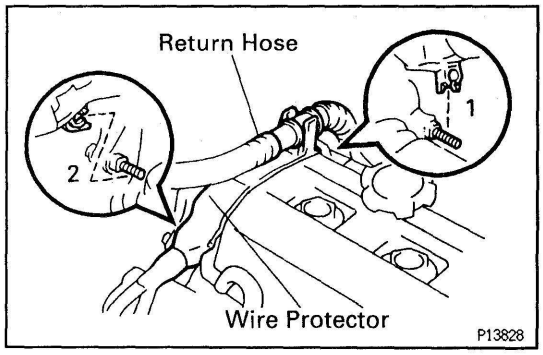
(a) Disconnect the control cable(s) from the throttle linkage.

(b) Remove the 2 bolts and accelerator cable bracket.

(c) Disconnect the 4 high–tension cords from the clamp on the cylinder head cover.

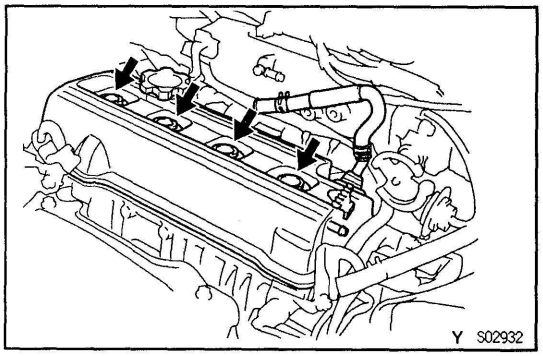
(d) Disconnect the 4 high–tension cords from the spark plugs.

(e) Disconnect the 2 PCV hoses from the intake manifold and cylinder head.



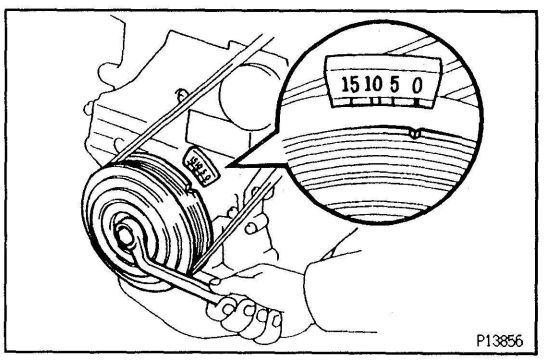
(f) Disconnect the PS oil reservoir return hose from the engine wire protector.

(g) Disconnect the engine wire protector from the 2 mounting bolts of the No.2 timing belt cover in the sequence shown.



(h) Remove the 4 nuts, grommets, cylinder head cover and gasket.

HINT: Arrange the grommets in the correct order, so that they can be reinstalled into their original positions. This minimizes any possibility of oil leakage due to reuse of the grommets in different positions.

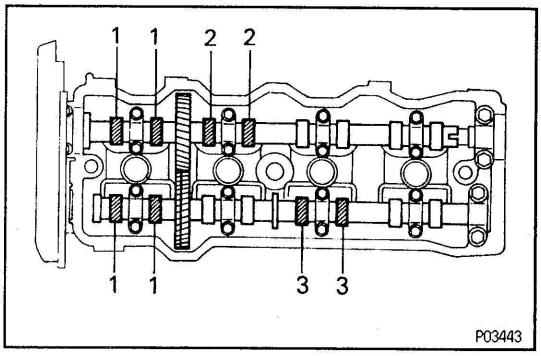


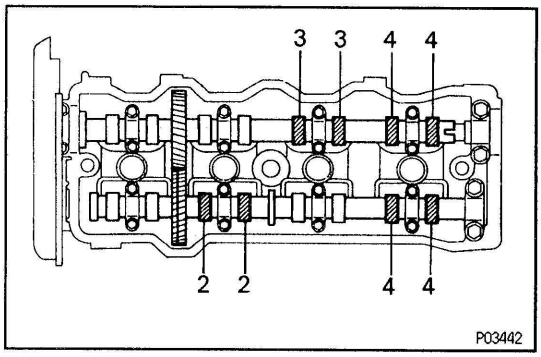
2. SET NO.1 CYLINDER TO TDC/COMPRESSION

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

(b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.

If not, turn the crankshaft 1 revolution (360°) and align the mark as above.





3. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

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

Valve clearance (Cold):

Intake

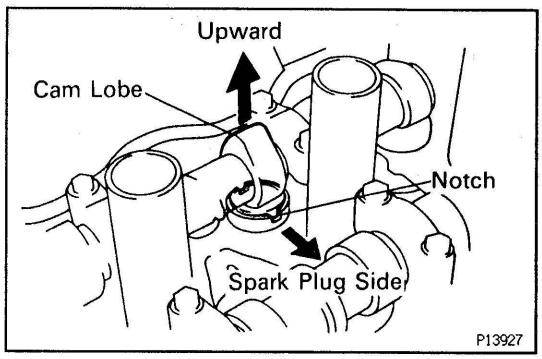
0.19 – 0.29 mm (0.007 – 0.011 in.)

Exhaust

0.28 – 0.38 mm (0.011 – 0.015 in.)

(b) Turn the crankshaft 1 revolution (360°) and align the mark as above. (See procedure in step 3)

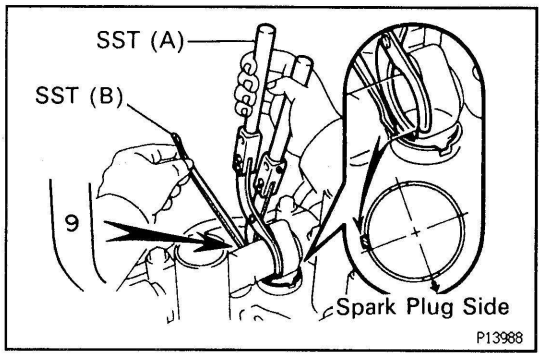
(c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



4. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

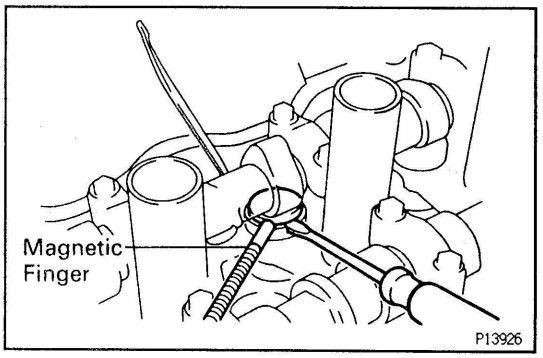
- Turn the crankshaft so that the cam lobe of the camshaft on the adjusting valve points upward.
- Position the notch of the valve lifter facing the spark plug side.



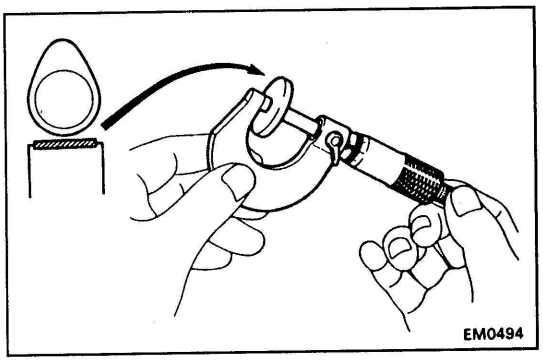
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

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

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



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



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

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

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

Intake:

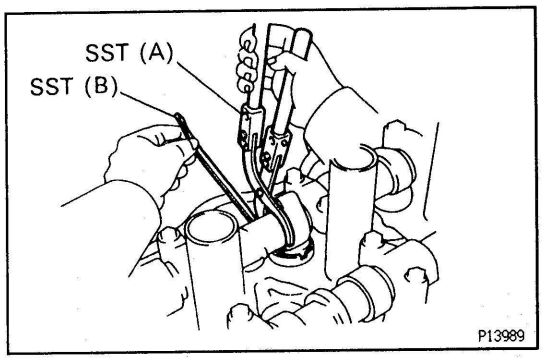
N = T + (A − 0.24 mm (0.009 in.))

Exhaust:

N = T + (A − 0.33 mm (0.013 in.))

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

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



(c) Install a new adjusting shim.

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

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

(d) Recheck the valve clearance.

EG

Adjusting Shim Selection Chart (Intake)

Installed shim thickness mm (in.) / Measured clearance mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.670 (0.1051)	2.680 (0.1055)	2.690 (0.1059)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.020 (0.0000 – 0.0008)														1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12
0.021 – 0.040 (0.0008 – 0.0016)												1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	9	9	10	10	10	10	11	11	12	12	12	12	13
0.041 – 0.060 (0.0016 – 0.0024)										1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	10	10	10	10	11	11	12	12	12	12	13	13
0.061 – 0.080 (0.0024 – 0.0031)									1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14
0.081 – 0.100 (0.0032 – 0.0039)								1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14
0.101 – 0.120 (0.0040 – 0.0047)							1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14
0.121 – 0.140 (0.0048 – 0.0055)						1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15
0.141 – 0.160 (0.0056 – 0.0063)				1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15	15
0.161 – 0.180 (0.0063 – 0.0071)			1	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16
0.181 – 0.189 (0.0071 – 0.0074)			1	1	1	1	1	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	13	13	13	13	14	14	15	15	15	15	16
0.190 – 0.290 (0.0075 – 0.0114)																																																																	
0.291 – 0.300 (0.0115 – 0.0118)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	15	15	15	15	16	16	17	17	17	17	17	
0.301 – 0.320 (0.0119 – 0.0126)	2	3	3	3	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	17	17	
0.321 – 0.340 (0.0126 – 0.0134)	3	3	4	4	4	4	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17		
0.341 – 0.360 (0.0134 – 0.0142)	3	4	4	4	4	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	16	16	16	16	17	17	17	17				
0.361 – 0.380 (0.0142 – 0.0150)	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17	17					
0.381 – 0.400 (0.0150 – 0.0157)	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17	17						
0.401 – 0.420 (0.0158 – 0.0165)	4	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17	17							
0.421 – 0.440 (0.0166 – 0.0173)	5	5	6	6	6	6	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17	17	17								
0.441 – 0.460 (0.0174 – 0.0181)	5	6	6	6	6	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17										
0.461 – 0.480 (0.0181 – 0.0189)	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17											
0.481 – 0.500 (0.0189 – 0.0197)	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17												
0.501 – 0.520 (0.0197 – 0.0205)	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17													
0.521 – 0.540 (0.0205 – 0.0213)	7	7	8	8	8	8	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17														
0.541 – 0.560 (0.0213 – 0.0220)	7	8	8	8	8	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																
0.561 – 0.580 (0.0221 – 0.0228)	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																		
0.581 – 0.600 (0.0229 – 0.0236)	8	8	9	9	9	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																				
0.601 – 0.620 (0.0237 – 0.0244)	8	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																						
0.621 – 0.640 (0.0244 – 0.0252)	9	9	10	10	10	10	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																								
0.641 – 0.660 (0.0252 – 0.0260)	9	10	10	10	10	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																										
0.661 – 0.680 (0.0260 – 0.0268)	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																												
0.681 – 0.700 (0.0268 – 0.0276)	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																															
0.701 – 0.720 (0.0276 – 0.0283)	10	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																
0.721 – 0.740 (0.0284 – 0.0291)	11	11	12	12	12	12	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																		
0.741 – 0.760 (0.0292 – 0.0299)	11	12	12	12	12	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																				
0.761 – 0.780 (0.0300 – 0.0307)	12	12	12	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																						
0.781 – 0.800 (0.0307 – 0.0315)	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																								
0.801 – 0.820 (0.0315 – 0.0323)	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																										
0.821 – 0.840 (0.0323 – 0.0331)	13	13	14	14	14	14	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																												
0.841 – 0.860 (0.0331 – 0.0339)	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17	17	17	17																																														
0.861 – 0.880 (0.0339 – 0.0346)	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17	17																																																
0.881 – 0.900 (0.0347 – 0.0354)	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17																																																		
0.901 – 0.920 (0.0355 – 0.0362)	14	15	15	15	16	16	16	17	17	17	17	17	17																																																				
0.921 – 0.940 (0.0363 – 0.0370)	15	15	16	16	16	16	17	17	17	17	17																																																						
0.941 – 0.960 (0.0370 – 0.0378)	15	16	16	16	16	17	17	17	17																																																								
0.961 – 0.980 (0.0378 – 0.0386)	16	16	16	17	17	17	17	17																																																									
0.981 – 1.000 (0.0386 – 0.0394)	16	16	17	17	17	17	17																																																										
1.001 – 1.020 (0.0394 – 0.0402)	16	17	17	17	17	17																																																											
1.021 – 1.040 (0.0402 – 0.0409)	17	17	17	17	17																																																												
1.041 – 1.060 (0.0410 – 0.0417)	17	17	17																																																														
1.061 – 1.080 (0.0418 – 0.0425)	17	17																																																															
1.081 – 1.090 (0.0426 – 0.0429)	17																																																																

P03440

Intake valve clearance (Cold):
0.19 – 0.29 mm (0.007 – 0.011 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No.11 shim.

New shim thickness mm (in.)

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

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

V00867

Adjusting Shim Selection Chart (Exhaust)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.670 (0.1051)	2.680 (0.1056)	2.690 (0.1059)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.020 (0.0000 – 0.0008)																						1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11
0.021 – 0.040 (0.0008 – 0.0016)																				1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11
0.041 – 0.060 (0.0016 – 0.0024)																		1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11
0.061 – 0.080 (0.0024 – 0.0031)																1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	8	8	9	9	9	9	10	10	11	11	11	11	12
0.081 – 0.100 (0.0032 – 0.0039)														1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	9	9	9	9	10	10	11	11	11	11	12	12
0.101 – 0.120 (0.0040 – 0.0047)												1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13
0.121 – 0.140 (0.0048 – 0.0055)										1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13
0.141 – 0.160 (0.0056 – 0.0063)									1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13
0.161 – 0.180 (0.0063 – 0.0071)								1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	11	11	11	11	12	12	13	13	13	13	14
0.181 – 0.200 (0.0071 – 0.0079)							1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	11	11	11	11	12	12	13	13	13	13	14	14
0.201 – 0.220 (0.0079 – 0.0087)						1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15
0.221 – 0.240 (0.0087 – 0.0094)				1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15
0.241 – 0.260 (0.0095 – 0.0102)			1	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15
0.261 – 0.279 (0.0103 – 0.0110)		1	1	1	1	1	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	13	13	13	13	14	14	15	15	15	15	16
0.280 – 0.380 (0.0110 – 0.0150)																																																																	
0.381 – 0.400 (0.0150 – 0.0157)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	15	15	15	15	16	16	17	17	17	17	17	
0.401 – 0.420 (0.0158 – 0.0165)	3	3	3	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	17	17		
0.421 – 0.440 (0.0166 – 0.0173)	3	3	4	4	4	5	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	15	15	15	16	16	16	17	17	17	17	17			
0.441 – 0.460 (0.0174 – 0.0181)	3	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17					
0.461 – 0.480 (0.0181 – 0.0189)	4	4	5	5	5	5	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	17	17	17	17	17						
0.481 – 0.500 (0.0189 – 0.0197)	4	5	5	5	5	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	17	17	17	17	17							
0.501 – 0.520 (0.0197 – 0.0205)	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17	17								
0.521 – 0.540 (0.0205 – 0.0213)	5	5	6	6	6	7	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17	17	17									
0.541 – 0.560 (0.0213 – 0.0220)	5	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17											
0.561 – 0.580 (0.0221 – 0.0228)	6	6	7	7	7	7	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17												
0.581 – 0.600 (0.0229 – 0.0236)	6	7	7	7	7	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17													
0.601 – 0.620 (0.0237 – 0.0244)	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17														
0.621 – 0.640 (0.0244 – 0.0252)	7	7	8	8	8	9	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17															
0.641 – 0.660 (0.0252 – 0.0260)	7	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																	
0.661 – 0.680 (0.0260 – 0.0268)	8	8	9	9	9	9	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																			
0.681 – 0.700 (0.0268 – 0.0276)	8	9	9	9	9	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																					
0.701 – 0.720 (0.0276 – 0.0283)	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																							
0.721 – 0.740 (0.0284 – 0.0291)	9	9	10	10	10	11	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																									
0.741 – 0.760 (0.0292 – 0.0299)	9	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																											
0.761 – 0.780 (0.0300 – 0.0307)	10	10	11	11	11	11	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																													
0.781 – 0.800 (0.0307 – 0.0315)	10	11	11	11	11	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																															
0.801 – 0.820 (0.0315 – 0.0323)	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																	
0.821 – 0.840 (0.0323 – 0.0331)	11	11	12	12	12	13	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																			
0.841 – 0.860 (0.0331 – 0.0339)	11	12	12	12	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																					
0.861 – 0.880 (0.0339 – 0.0346)	12	12	13	13	13	13	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																							
0.881 – 0.900 (0.0347 – 0.0354)	12	13	13	13	13	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																									
0.901 – 0.920 (0.0355 – 0.0362)	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	17																																											
0.921 – 0.940 (0.0363 – 0.0370)	13	13	14	14	14	15	15	15	16	16	16	16	17	17	17	17	17	17	17	17																																													
0.941 – 0.960 (0.0370 – 0.0378)	13	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17	17																																															
0.961 – 0.980 (0.0378 – 0.0386)	14	14	15	15	15	15	16	16	17	17	17	17	17	17	17	17																																																	
0.981 – 1.000 (0.0386 – 0.0394)	14	15	15	15	15	16	16	17	17	17	17	17	17	17																																																			
1.001 – 1.020 (0.0394 – 0.0402)	15	15	15	16	16	16	17	17	17	17	17	17																																																					
1.021 – 1.040 (0.0402 – 0.0409)	15	15	16	16	16	17	17	17	17	17																																																							
1.041 – 1.060 (0.0410 – 0.0417)	15	16	16	16	17	17	17	17																																																									
1.061 – 1.080 (0.0418 – 0.0425)	16	16	17	17	17	17	17																																																										
1.081 – 1.100 (0.0426 – 0.0433)	16	17	17	17	17	17																																																											
1.101 – 1.120 (0.0433 – 0.0441)	17	17	17	17	17																																																												
1.121 – 1.140 (0.0441 – 0.0449)	17	17	17	17																																																													
1.141 – 1.160 (0.0449 – 0.0457)	17	17																																																															
1.161 – 1.180 (0.0457 – 0.0465)	17																																																																

P03441

Exhaust valve clearance (Cold):
0.28 – 0.38 mm (0.011 – 0.015 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No.9 shim.

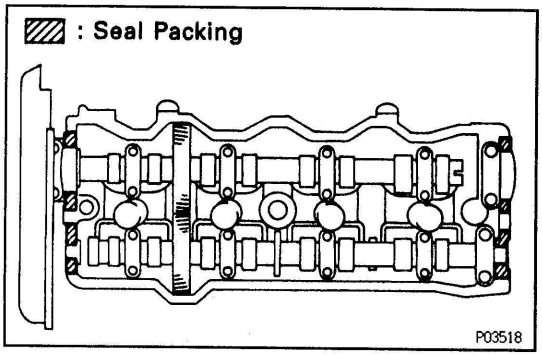
New shim thickness mm (in.)

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

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

V00868

EG



EG

5. REINSTALL CYLINDER HEAD COVER

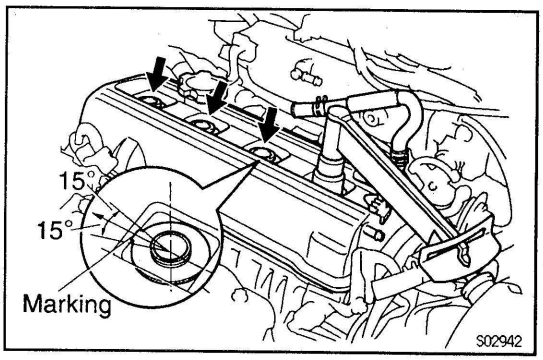
(a) Remove any old packing (FIPG) material.

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

Seal packing:

Part No. 08826–00080 or equivalent

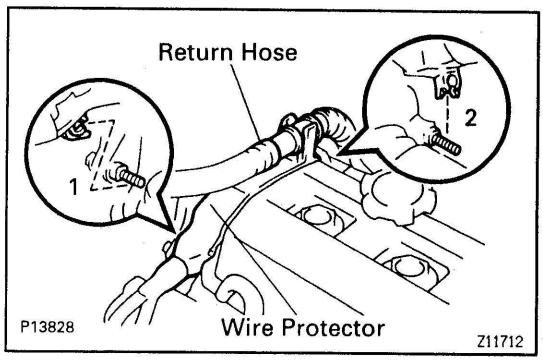
(c) Install the gasket to the cylinder head cover.



(d) Install the head cover with the 4 grommets and nuts. Uniformly tighten the nuts in several passes.

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

HINT: Install the grommets so that their markings are as shown in the illustration.



(e) Install the engine wire protector to the 2 mounting bolts of the No.2 timing belt cover in the sequence shown.

(f) Install the PS oil reservoir return hose to the engine wire protector.

(g) Connect the 2 PCV hoses to the intake manifold and cylinder head.

(h) Connect the 4 high–tension cords to the spark plugs.

(i) Install the 4 high–tension cords to the clamp on the cylinder head cover.

(j) Install the accelerator cable bracket with the 2 bolts.

(k) Connect the control cable(s) to the throttle linkage.

IGNITION TIMING INSPECTION AND ADJUSTMENT

EG748-01

1. WARM UP ENGINE

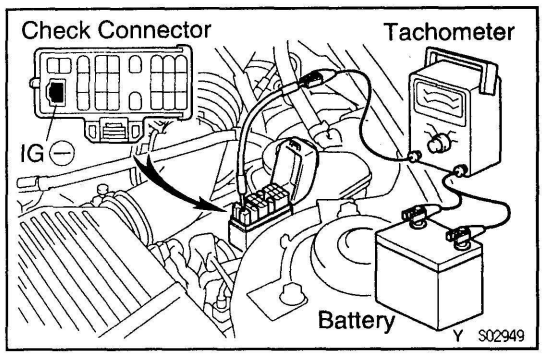
Allow the engine to warm up to normal operating temperature.

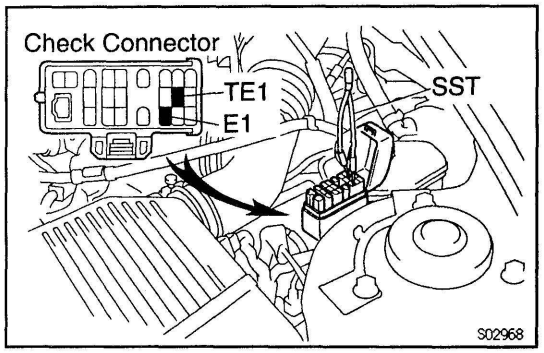
2. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the tester probe of a tachometer to terminal IG⊖ of the check connector.

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.**



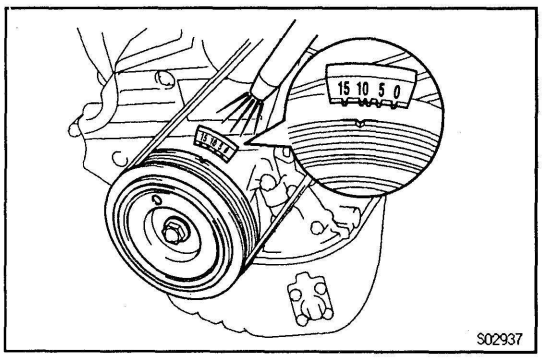


3. INSPECT AND ADJUST IGNITION TIMING

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

SST 09843-18020

HINT: After engine rpm is kept at 1,000 — 1,300 rpm for 5 seconds, check that it returns to idle speed.

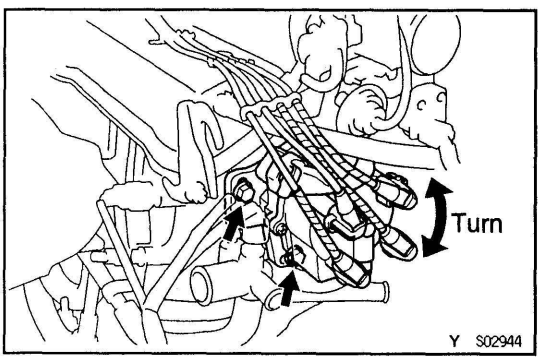


(b) Using a timing light, check the ignition timing.

Ignition timing:

10° BTDC @ idle

(Transmission in neutral position)



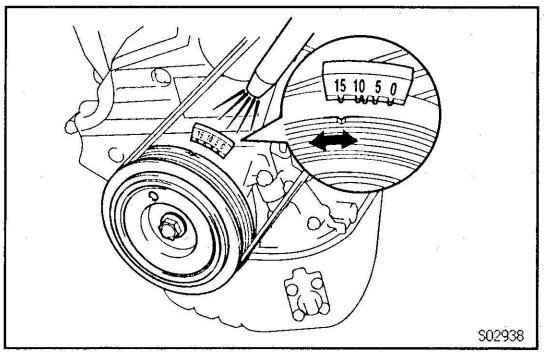
(c) Loosen the 2 bolts, and adjust by turning the distributor.

(d) Tighten the 2 bolts, and recheck the ignition timing.

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

(e) Remove the SST from the check connector.

SST 09843-18020



4. RECHECK IGNITION TIMING

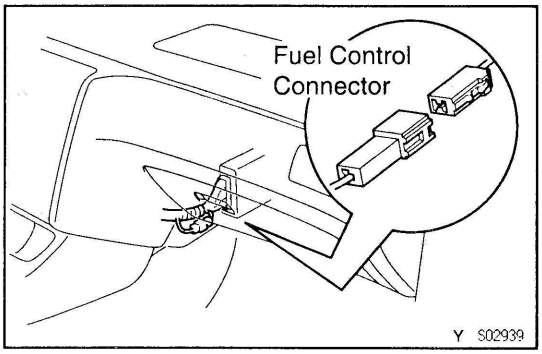
Ignition timing:

10 – 20° BTDC @ idle

(Transmission in neutral position)

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

5. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE



Reference for w/o TWC:

When the fuel control connector is unplugged, use gasoline of 95 RON or higher.

When the fuel control connector is plugged together, use gasoline from 90 up to 94 RON.

HINT: The fuel control connector is located behind the glove compartment door.

IDLE SPEED INSPECTION

EG6CH-03

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 vacuum lines properly connected
(e) EFI system wiring connectors fully plugged
(f) All operating accessories switched OFF
(g) Ignition timing check correctly
(h) Transmission in neutral position
(i) Air conditioning switched OFF

2. CONNECT TACHOMETER

(See step 2 in ignition timing inspection and adjustment)

3. INSPECT IDLE SPEED

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

Idle speed (w/ Cooling fan OFF):

700 ± 50 rpm

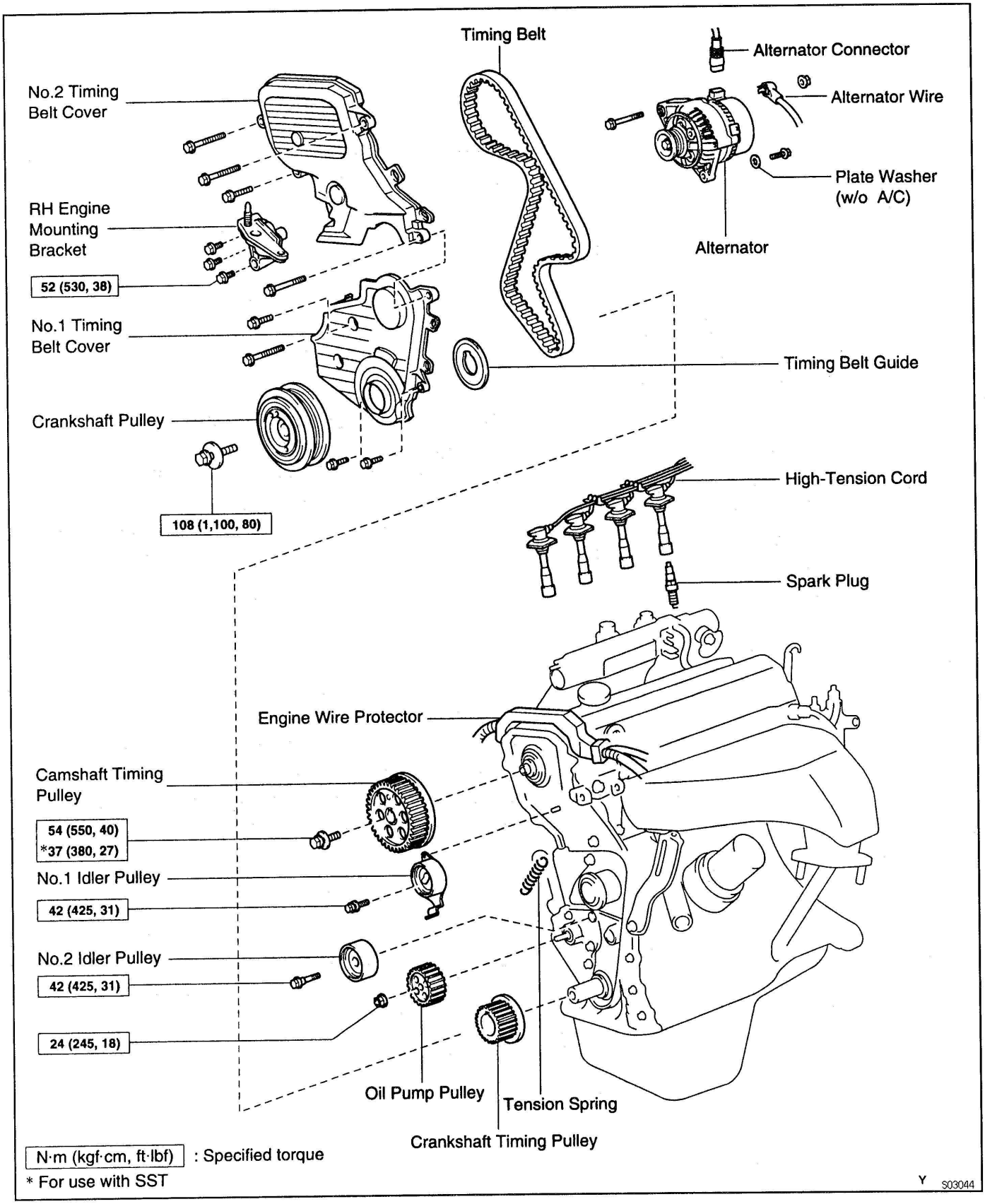
If the idle speed is not as specified, check the ISC system.

4. DISCONNECT TACHOMETER

TIMING BELT

EQ745–01

COMPONENTS FOR REMOVAL AND INSTALLATION



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

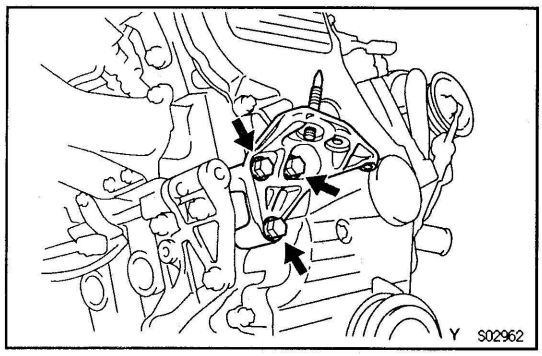
* For use with SST

Y S03044

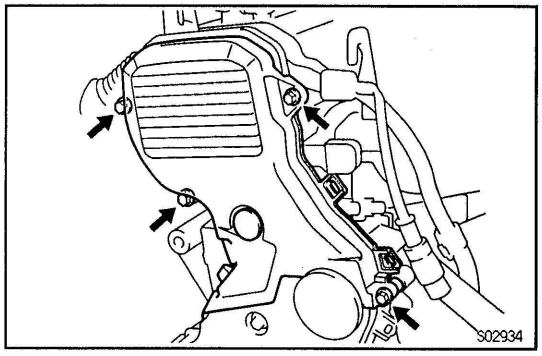
EG

EG746-01

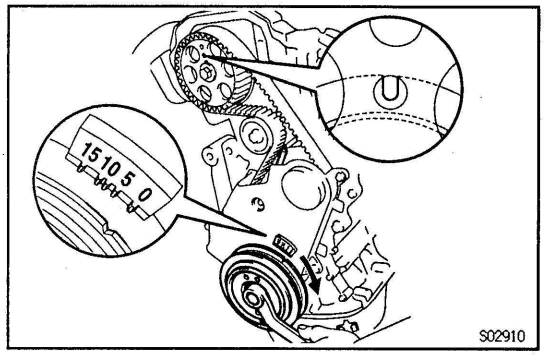
TIMING BELT REMOVAL



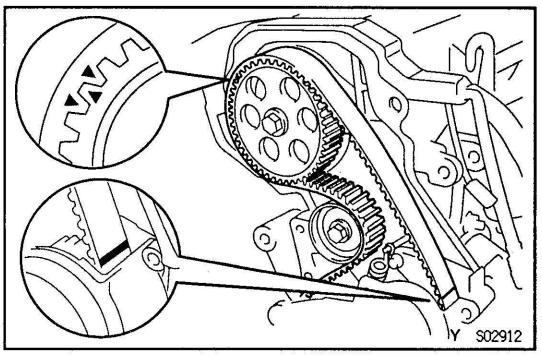
1. **REMOVE RH ENGINE MOUNTING BRACKET**
   Remove the 3 bolts and mounting bracket.
2. **REMOVE ALTERNATOR**
3. **REMOVE SPARK PLUGS**



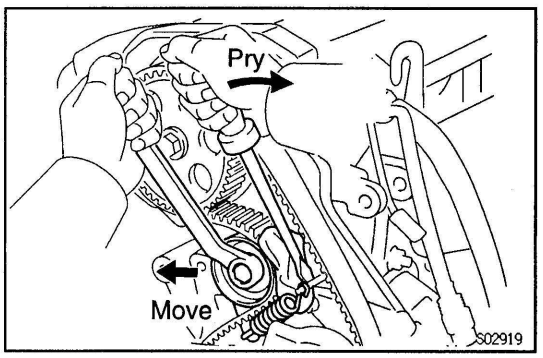
4. **REMOVE NO.2 TIMING BELT COVER**
   Remove the 4 bolts and timing belt cover.



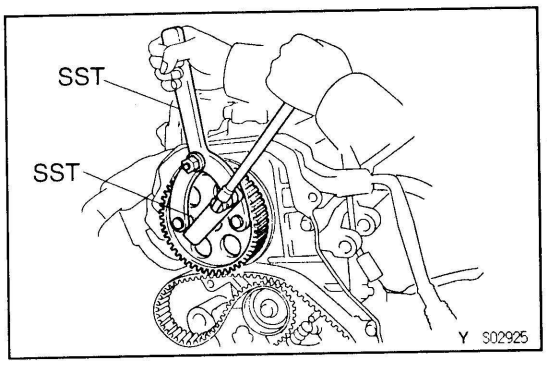
5. **SET NO.1 CYLINDER TO TDC/COMPRESSION**
   (a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.
   (b) Check that the hole of the camshaft timing pulley is aligned with the timing mark of the bearing cap.
   If not, turn the crankshaft 1 revolution (360°).



6. **REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY**
   HINT (When re–using timing belt): Place the matchmarks on the timing belt and camshaft timing pulley, and place matchmark on timing belt to match the end of the No.1 timing belt cover.



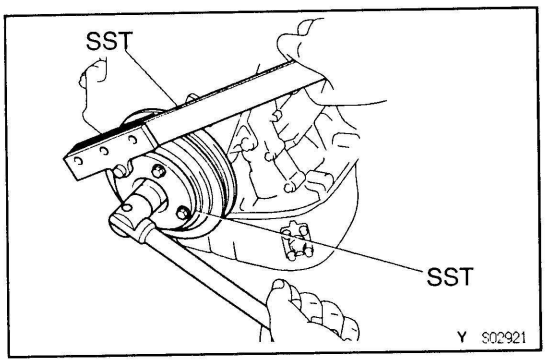
(a) Loosen the mounting bolt of the No.1 idler pulley and shift the pulley toward the left as far as it will go, and temporarily tighten it.
(b) Remove the timing belt from the camshaft timing pulley.



7. REMOVE CAMSHAFT TIMING PULLEY

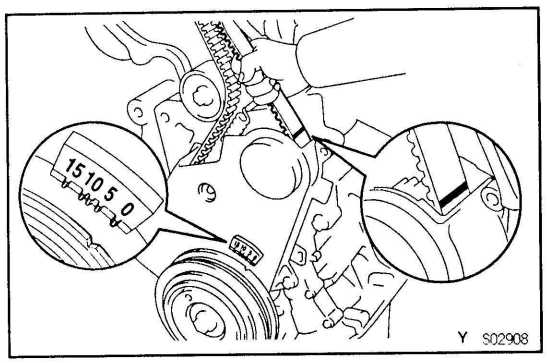
(a) Using SST, loosen the pulley bolt.
SST 09249–63010, 09960–10010 (09962–01000, 09963–01000)

(b) Remove the bolt and timing pulley.

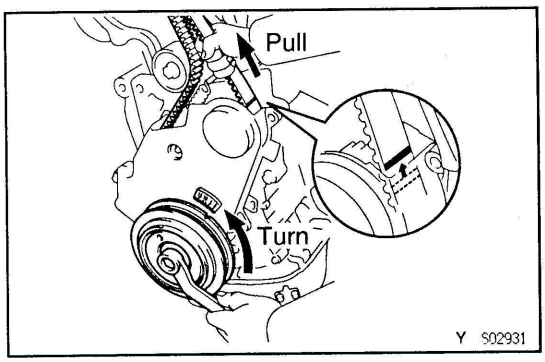


8. REMOVE CRANKSHAFT PULLEY

(a) Using SST, loosen the pulley bolt.
SST 09213–54015 (09214–00030), 09330–00021

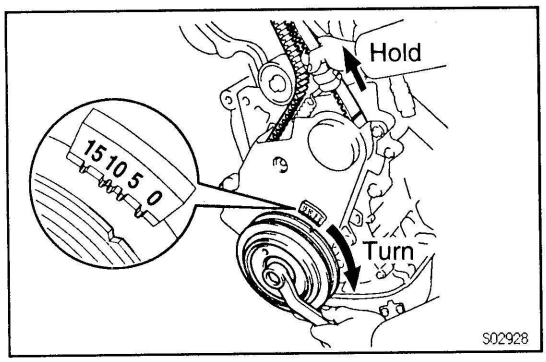


HINT (When re–using timing belt): After loosening the crankshaft pulley bolt, check that the timing belt matchmark aligns with the end of the No.1 timing belt cover when the crankshaft pulley groove is aligned with the timing mark "0" of the No.1 timing belt cover. If the matchmark does not align, align as follows:

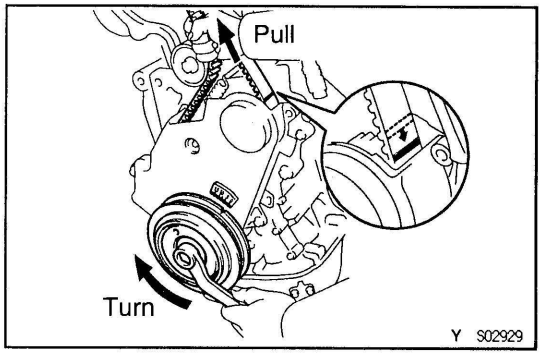


When matchmark is misaligned clockwise:

- Align the matchmark by pulling the timing belt up on the water pump pulley side while turning the crankshaft pulley counterclockwise.

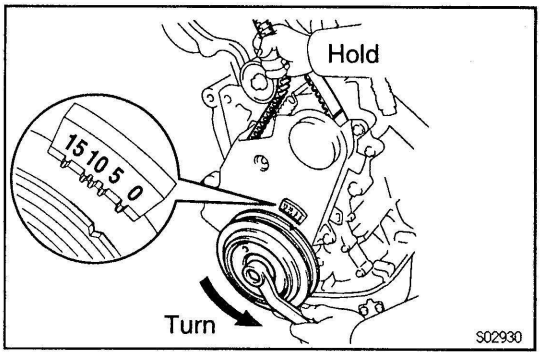


- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley clockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.



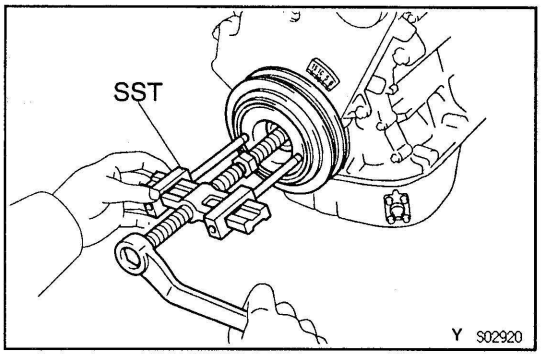
When matchmark is misaligned counterclockwise:

- Align the matchmark by pulling the timing belt up on the No.1 idler pulley side while turning the crankshaft pulley clockwise.

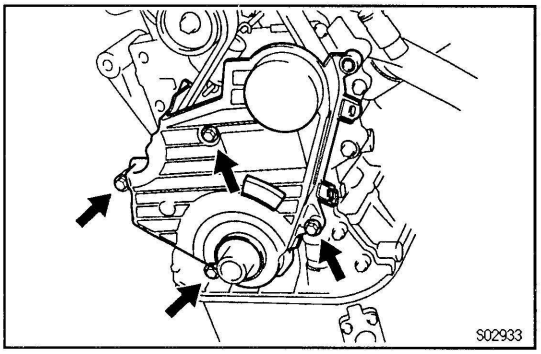


- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley counterclockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.

(b) Remove the pulley bolt.

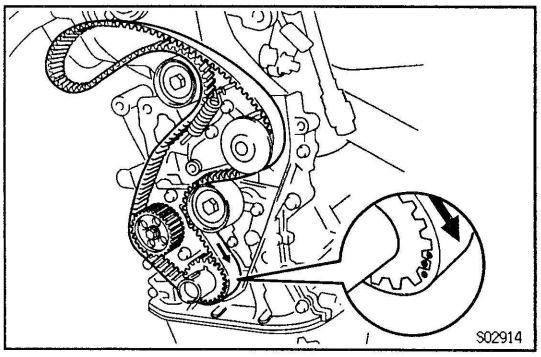


(c) Using SST, remove the pulley.
SST 09950–50010 (09951–05010, 09952–05010, 09953–05010, 09953–05020, 09954–05010)
HINT (When re–using timing belt): Remove the pulley without turning it.



9. REMOVE NO.1 TIMING BELT COVER
Remove the 4 bolts and timing belt cover.

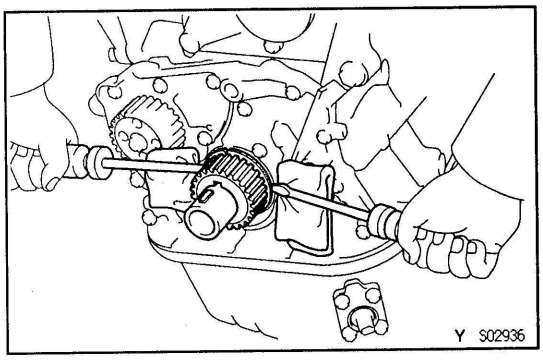
10. REMOVE TIMING BELT GUIDE



11. REMOVE TIMING BELT
HINT (When re–using timing belt): Draw a direction arrow on the timing belt (in the direction of engine revolution), and place matchmarks on the timing belt and crankshaft timing pulley.

12. REMOVE NO.1 IDLER PULLEY AND TENSION SPRING

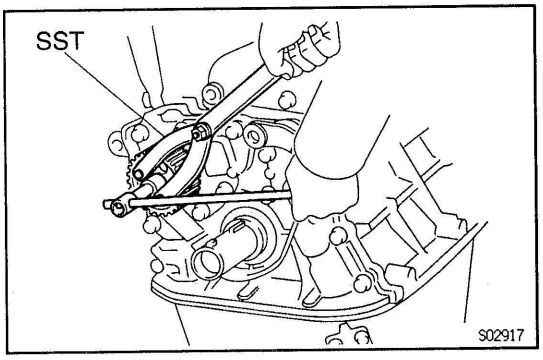
13. REMOVE NO.2 IDLER PULLEY



14. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use 2 screwdrivers.

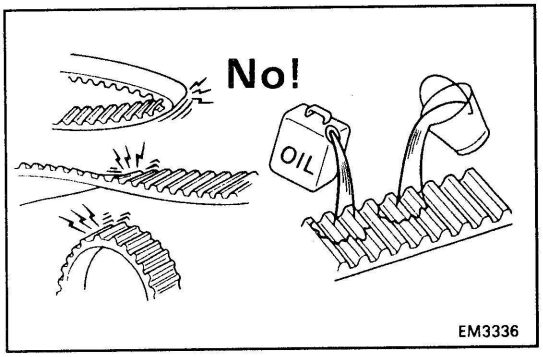
HINT: Position shop rags as shown to prevent damage.



15. REMOVE OIL PUMP PULLEY

(a) Using SST, loosen the pulley nut.
SST 09960–10010 (09962–01000, 09963–00600)

(b) Remove the nut and pulley.



TIMING BELT COMPONENTS INSPECTION EG481–03

1. INSPECT TIMING BELT

NOTICE:

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

If there are any defects as shown in the illustration, check the following points:

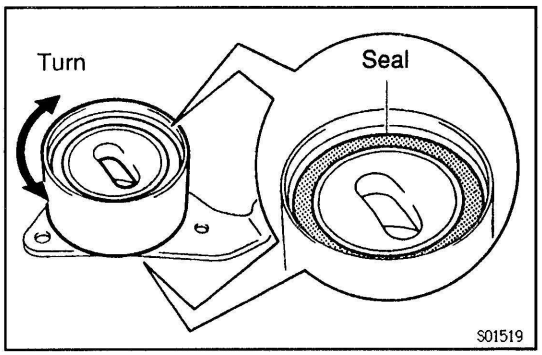
(a) Premature parting
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

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

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

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

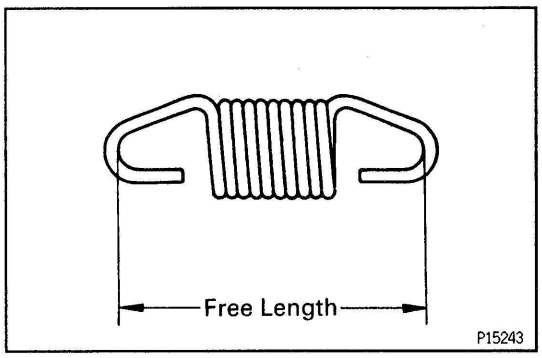
(e) If there is noticeable wear on the belt teeth, check the timing cover for damage and check gasket has been installed correctly and for foreign material on the pulley teeth.
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

(a) Visually check the seal portion of the idler pulley for oil leakage.
If leakage is found, replace the idler pulley.

(b) Check that the idler pulley turns smoothly.
If necessary, replace the idler pulley.



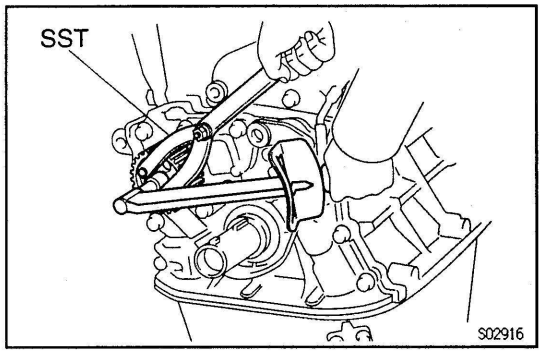
3. INSPECT TENSION SPRING

(a) Measure the free length of tension spring.
Free length:
46.0 mm (1.811 in.)
If the free length is not as specified, replace the tension spring.

(b) Measure the tension of the tension spring at the specified installed length.
Installed tension (at 50.5 mm (1.988 in.)):
22 – 27 N (2.25 – 2.75 kgf, 5.0 – 6.1 lbf)
If the installed tension is not as specified, replace the tension spring.

EG747-01

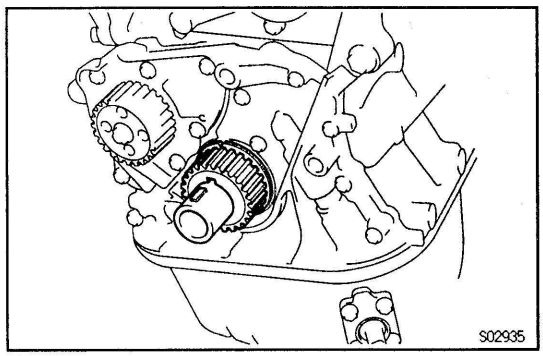
TIMING BELT INSTALLATION



1. INSTALL OIL PUMP PULLEY

(a) Align the cutouts of the pulley and shaft, and slide on the pulley.

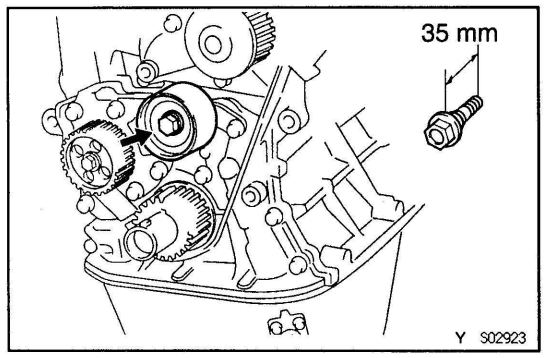
(b) Using SST, install the pulley nut.
SST 09960–10010 (09962–01000, 09963–00500)
Torque: 24 N·m (245 kgf·cm, 18 ft·lbf)



2. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the timing pulley set key with the key groove of the pulley.

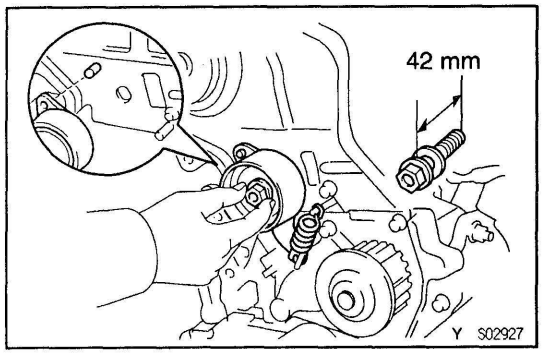
(b) Slide on the timing pulley, facing the flange side inward.



3. INSTALL NO.2 IDLER PULLEY

(a) Install the pulley with the bolt.
Torque: 42 N·m (425 kgf·cm, 31 ft·lbf)
HINT: Use the 35 mm (1.38 in.) long bolt.

(b) Check that the idler pulley moves smoothly.

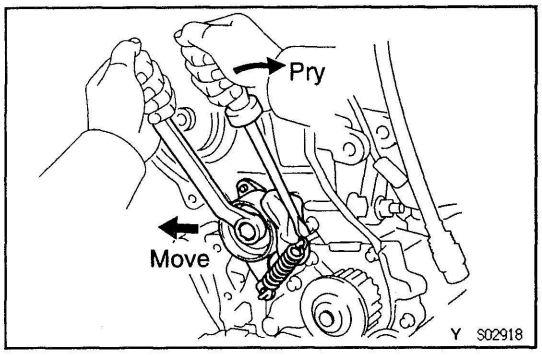


4. TEMPORARILY INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

(a) Align the bracket pin hole with the pivot pin.

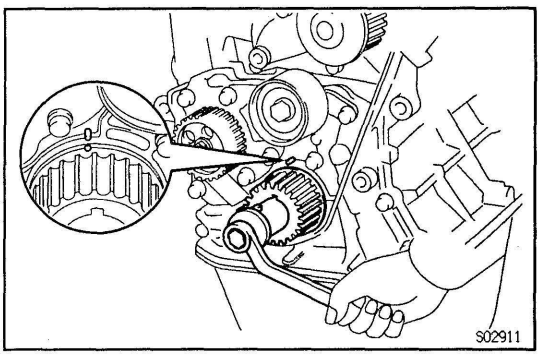
(b) Install the pulley with the bolt. Do not tighten the bolt yet.
HINT: Use the 42 mm (1.65 in.) long bolt.

(c) Install the tension spring.



(d) Pry the pulley toward the left as far as it will go, and tighten the bolt.

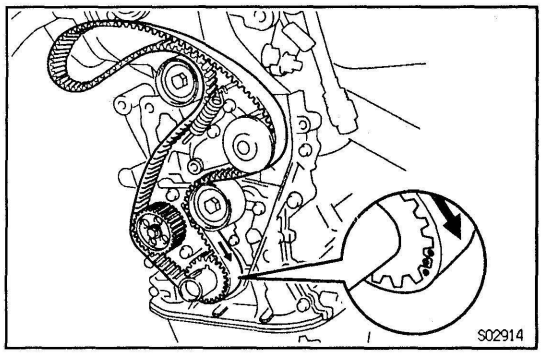
(e) Check that the idler pulley moves smoothly.



5. TEMPORARILY INSTALL TIMING BELT

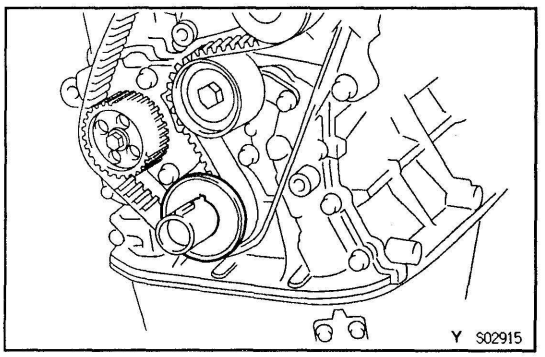
NOTICE: The engine should be cold.

(a) Using the crankshaft pulley bolt, turn the crankshaft and align the timing marks of the crankshaft timing pulley and oil pump body.



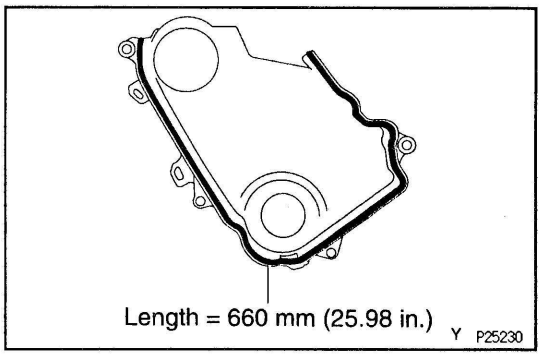
(b) Remove any oil or water on the crankshaft pulley, oil pump pulley, water pump pulley, No.1 idler pulley and No.2 idler pulley, and keep them clean.

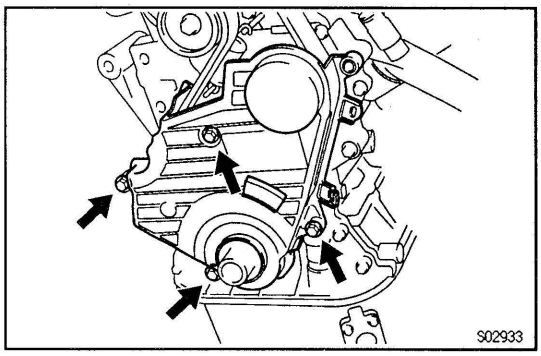
(c) Install the timing belt on the crankshaft timing pulley, oil pump pulley, No.1 idler pulley, water pump pulley and No.2 idler pulley.
HINT (When re–using timing belt): Align the points marked during removal, and install the belt with the arrow pointing in the direction of engine revolution.



6. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.





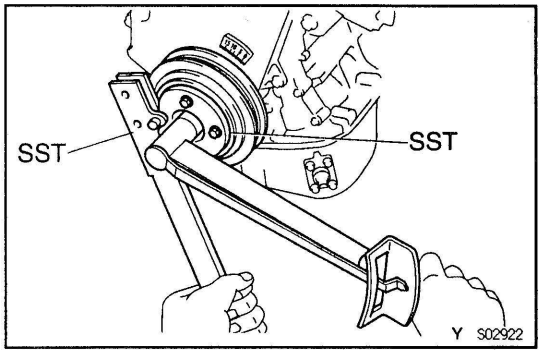
7. INSTALL NO.1 TIMING BELT COVER

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

If the gasket has cracks or peeling, etc., replace it using these steps:

- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.
- Remove the backing paper from a new gasket and install the gasket evenly to the part of the timing belt cover shaded black in the illustration.
- After installing the gasket, press down on it so that the adhesive firmly sticks to the timing belt cover.

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



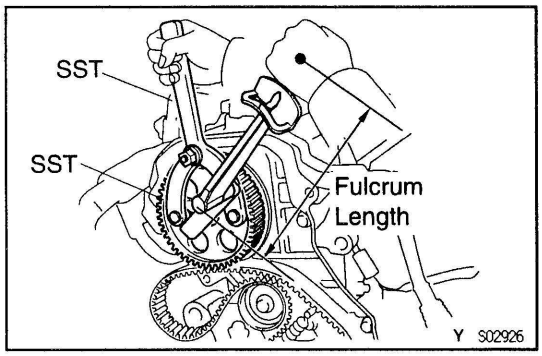
8. INSTALL CRANKSHAFT PULLEY

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

(b) Using SST, install the pulley bolt.

SST 09213–54015 (09214–00030), 09330–00021

Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)



9. INSTALL CAMSHAFT TIMING PULLEY

(a) Align the camshaft knock pin with the knock pin groove of the pulley, and slide on the timing pulley.

(b) Using SST, install the pulley bolt.

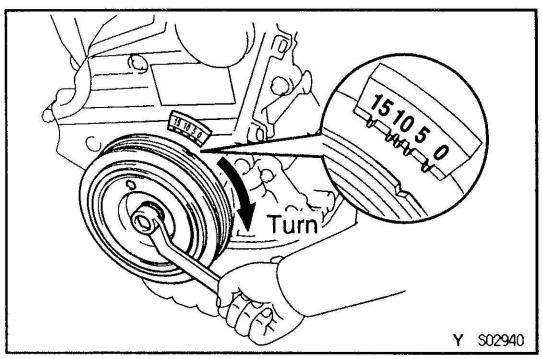
SST 09249–63010, 09960–10010 (09962–01000, 09963–01000)

Torque:

54 N·m (550 kgf·cm, 40 ft·lbf)

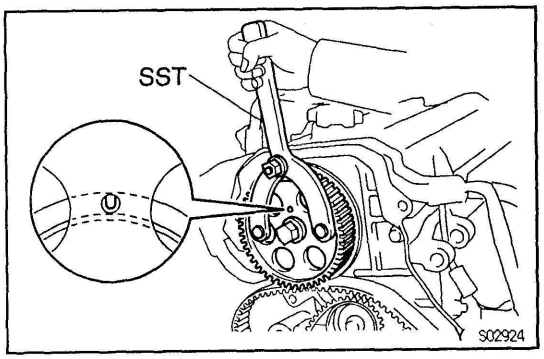
37 N·m (380 kgf·cm, 27 ft·lbf) for SST

HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

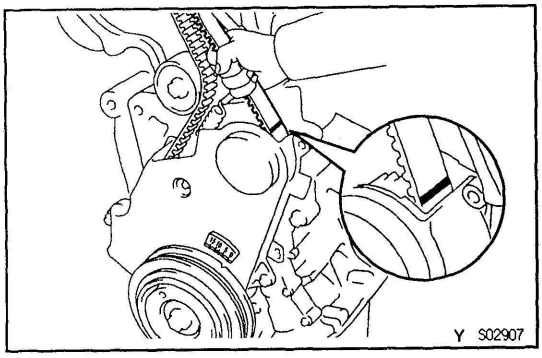


10. SET NO.1 CYLINDER TO TDC/COMPRESSION

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



(b) Using SST, turn the camshaft, and align the hole of the camshaft timing pulley with the timing mark of the bearing cap.
SST 09960—10010 (09962—01000, 09963—01000)

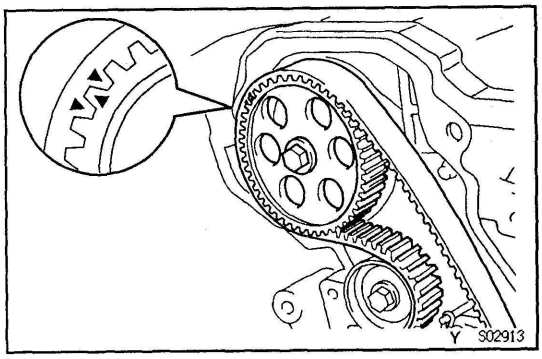


11. CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEY

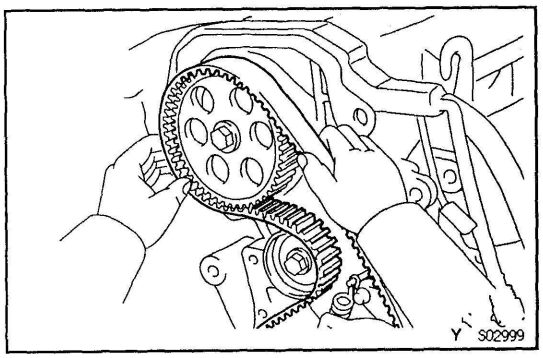
HINT (When re—using timing belt):

- Check that the matchmark on the timing belt matches portion A of the No.1 timing belt cover.

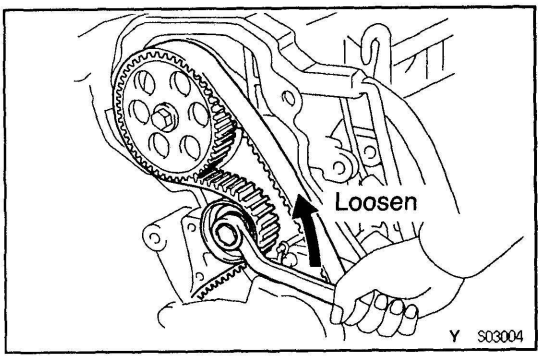
If the matchmark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align. (See step 8 in timing belt removal)



- Align the matchmarks of the timing belt and camshaft timing pulley.

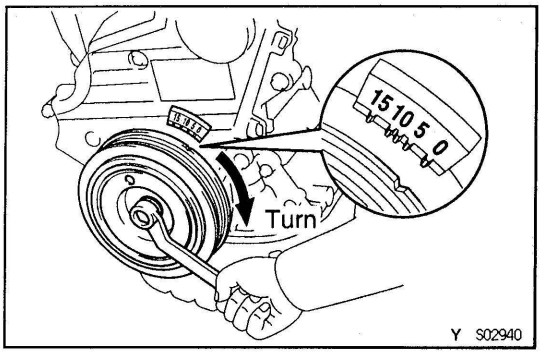


(a) Remove any oil or water on the camshaft timing pulley, and keep it clean.
(b) Connect the timing belt to the camshaft timing pulley, and checking the tension between the crankshaft timing pulley and camshaft timing pulley.

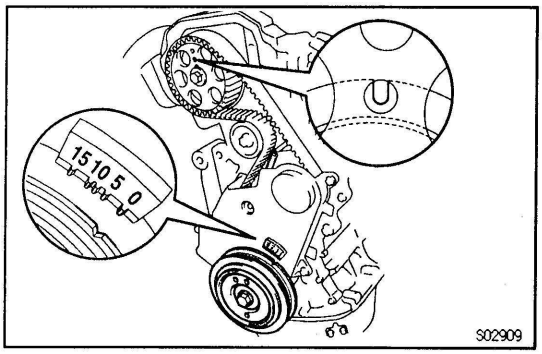


12. CHECK VALVE TIMING

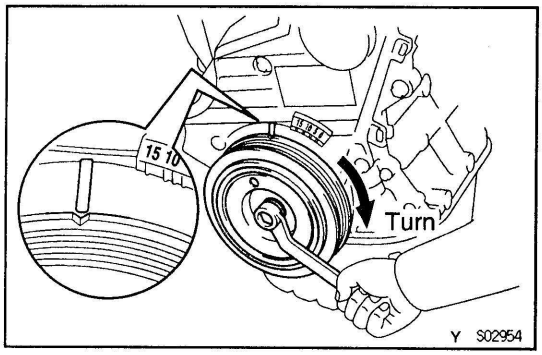
(a) Loosen the No.1 idler pulley bolt 1/2 turn.



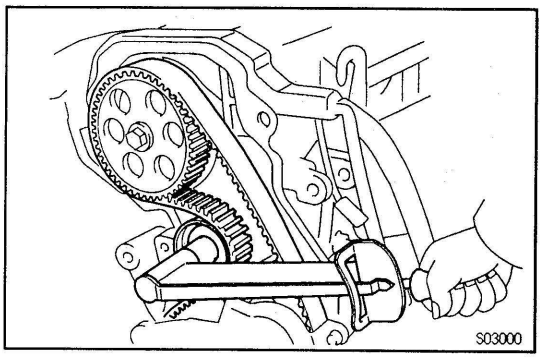
(b) Slowly turn the crankshaft pulley 2 revolutions TDC to TDC.
NOTICE: Always turn the crankshaft pulley clockwise.



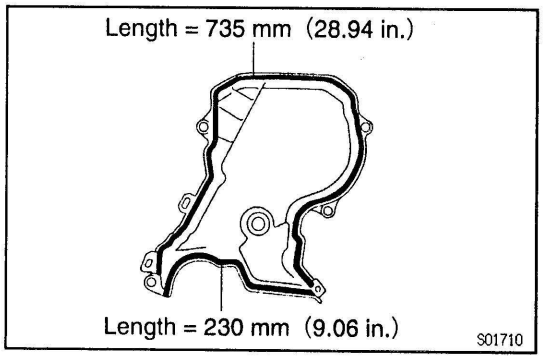
(c) Check that each pulley aligns with the timing marks as shown in the illustration.
If the timing marks do not align, remove the timing belt and reinstall it.



(d) Slowly turn the crankshaft pulley 1 and 7/8 revolutions, and align its groove with the mark at 45° BTDC (for No.1 cylinder) of the No.1 timing belt cover.
NOTICE: Always turn the crankshaft pulley clockwise.



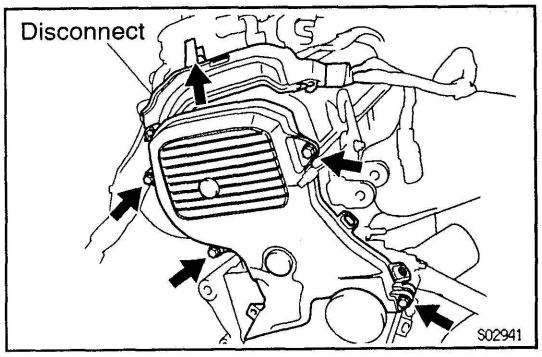
(e) Tighten the mounting bolt of the No.1 idler pulley.
Torque: 42 N·m (425 kgf·cm, 31 ft·lbf)



13. INSTALL NO.2 TIMING BELT COVER

(a) Check that the timing belt cover gaskets have no cracks or peeling, etc.
If the gasket has cracks or peeling, etc., replace it using these steps:

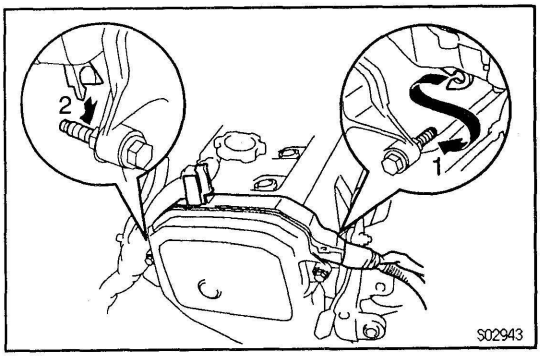
- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.



- Remove the backing paper from a new gasket and install the gasket evenly to the part of the timing belt cover shaded black in the illustration.
- After installing the gasket, press down on it so that the adhesive firmly sticks to the timing belt cover.

(b) Disconnect the engine wire protector between the cylinder head cover and No.3 timing belt cover.

(c) Install the belt cover with the 4 bolts.

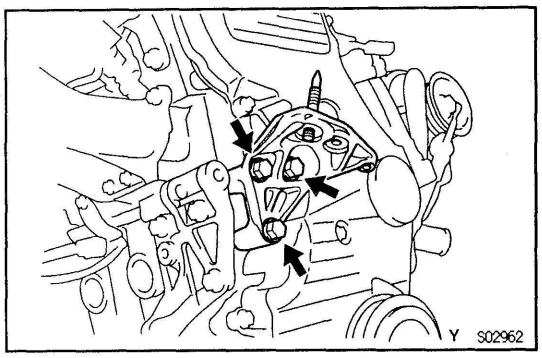


(d) Install the engine wire protector to the 2 mounting bolts of the No.2 timing belt cover in the sequence shown.

(e) Install the engine wire protector to the generator bracket and adjusting bar with the 2 bolts.

14. INSTALL SPARK PLUGS

15. INSTALL ALTERNATOR



16. INSTALL RH ENGINE MOUNTING BRACKET

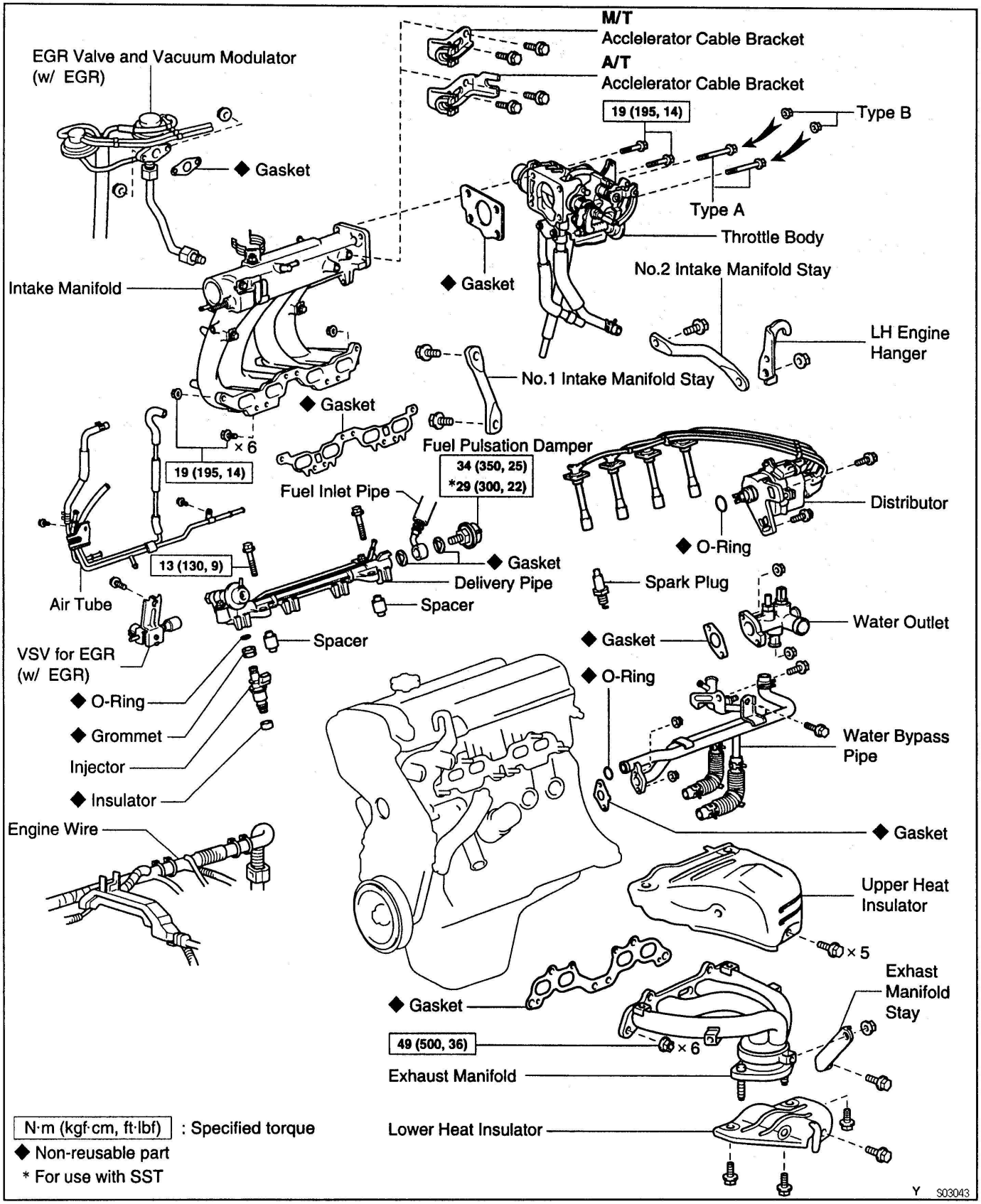
Install the mounting bracket with the 3 bolts.

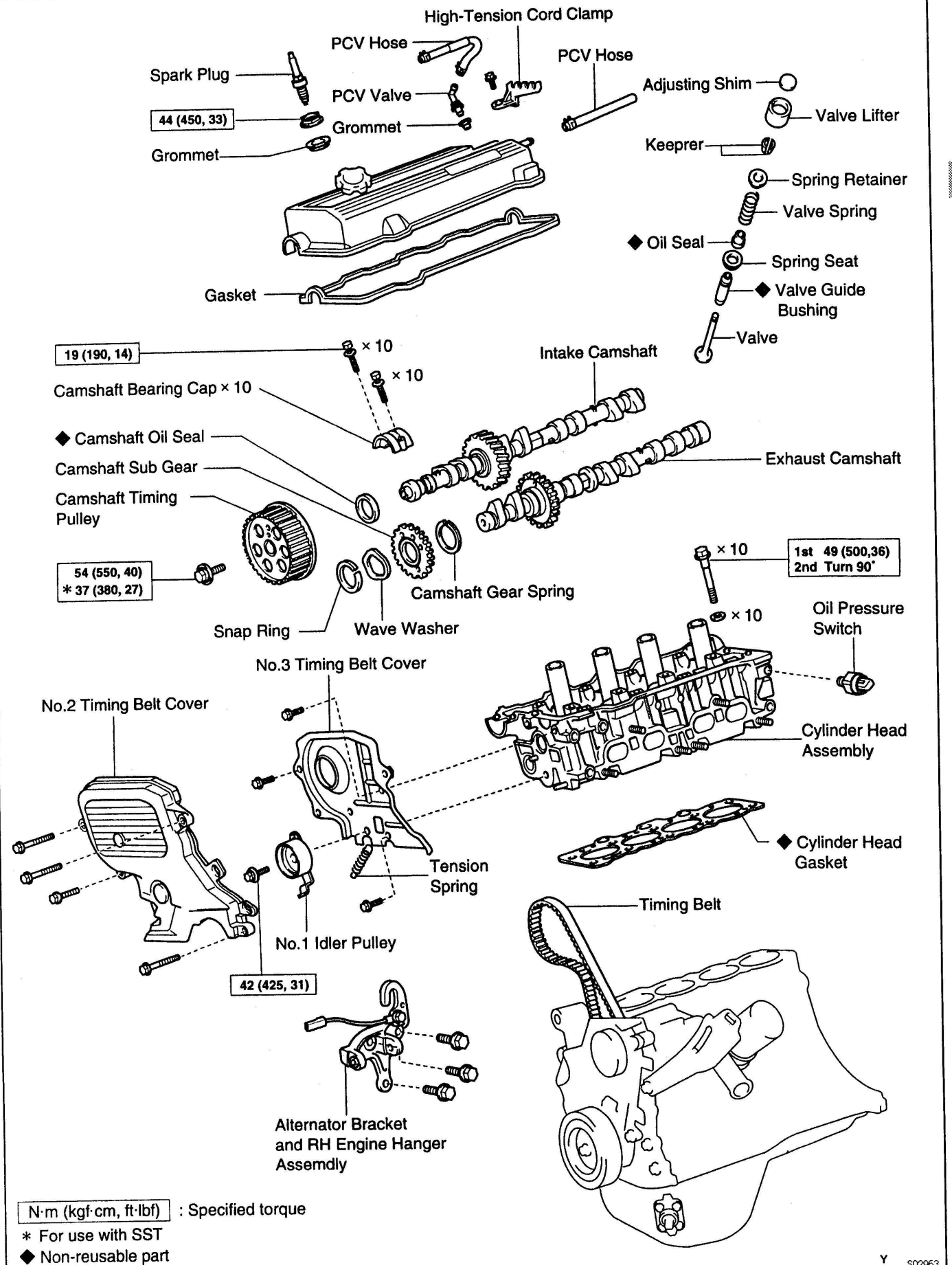
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

CYLINDER HEAD

COMPONENTS FOR REMOVAL AND INSTALLATION

EG743–01



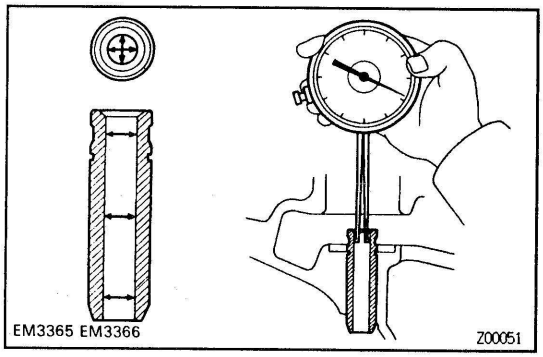


N·m (kgf·cm, ft·lbf) : Specified torque
* For use with SST
◆ Non-reusable part

Y S02963

EG744-01

CYLINDER HEAD COMPONENTS INSPECTION, CLEANING AND REPAIR

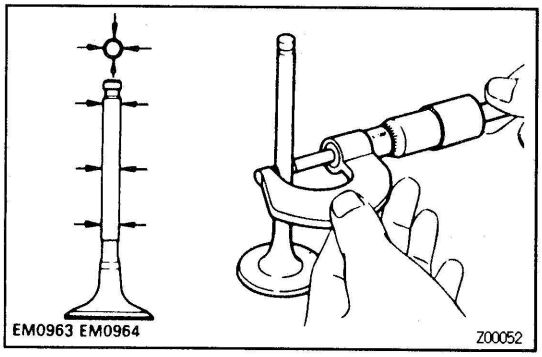


1. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Bushing inside diameter:

6.010 — 6.030 mm (0.2366 — 0.2374 in.)



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

Valve stem diameter:

Intake

5.970 — 5.985 mm (0.2350 — 0.2356 in.)

Exhaust

5.965 — 5.980 mm (0.2348 — 0.2354 in.)

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

Standard oil clearance:

Intake

0.025 — 0.060 mm (0.0010 — 0.0024 in.)

Exhaust

0.030 — 0.065 mm (0.0012 — 0.0026 in.)

Maximum oil clearance:

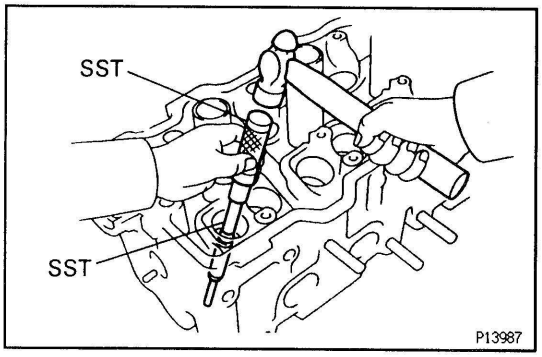
Intake

0.08 mm (0.0031 in.)

Exhaust

0.10 mm (0.0039 in.)

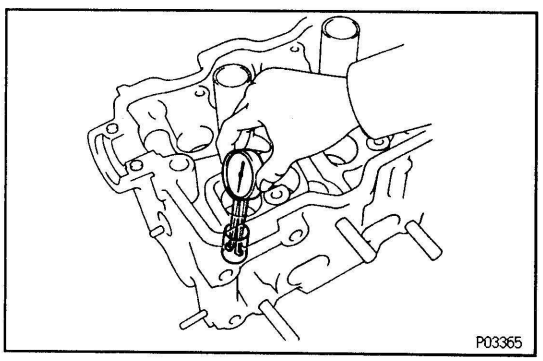
If the clearance is greater than maximum, replace the valve and guide bushing.



2. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

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

(b) Using SST and a hammer, tap out the guide bushing.
SST 09201—10000 (09201—01060),
09950—70010 (09951—07100)



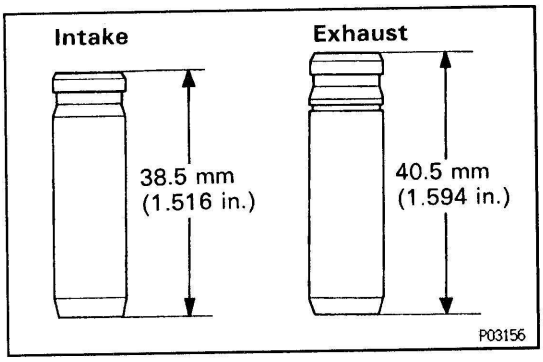
(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
10.985 – 11.012 (0.4325 – 0.4335)	Use STD
11.035 – 11.062 (0.4344 – 0.4355)	Use O/S 0.05

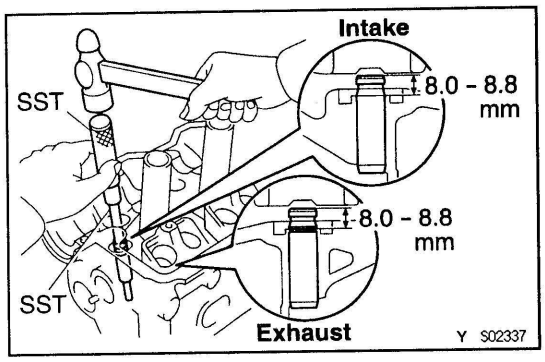
V05053

(d) Select a new guide bushing (STD size or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 11.012 mm (0.4335 in.), machine the bushing bore to the following dimension:
11.035 – 11.062 mm (0.4344 – 0.4355 in.)
If the bushing bore diameter of the cylinder head is greater than 11.062 mm (0.4355 in.), replace the cylinder head.

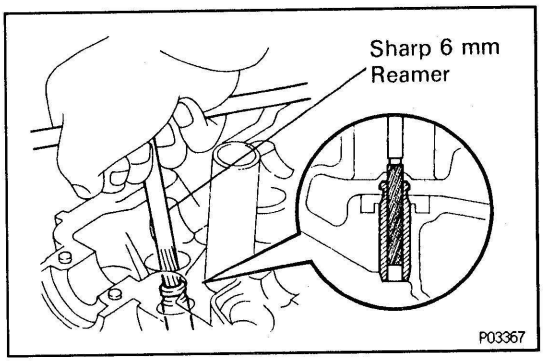


HINT: Different bushings are used for the intake and exhaust.

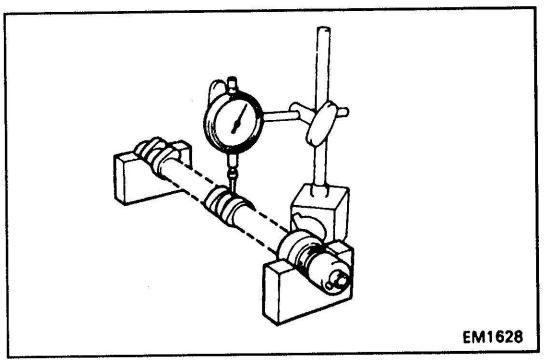
(e) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



(f) Using SST and a hammer, tap in a new guide bushing until the there is 8.0 – 8.8 mm (0.315 – 0.346 in.) protruding from the cylinder head.
SST 09201 – 10000 (09201 – 01060),
09950 – 70010 (09951 – 07100)



(g) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See step 1 above) between the guide bushing and valve stem.

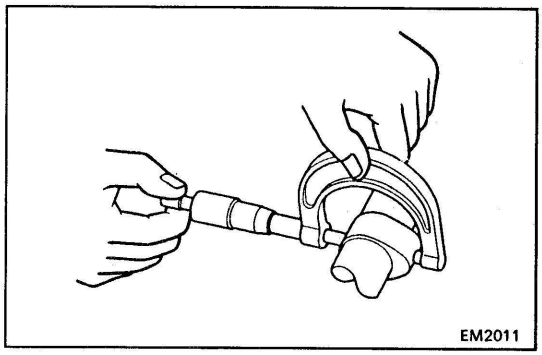


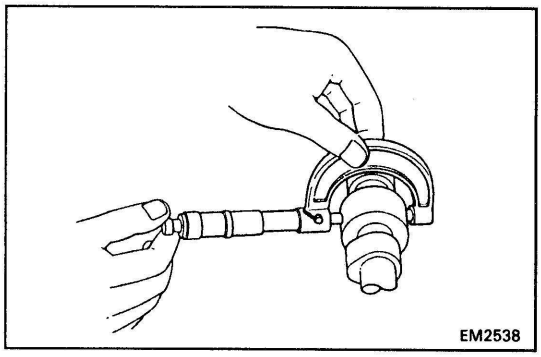
3. INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

(a) Place the camshaft on V – blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.
Maximum circle runout:
0.04 mm (0.0016 in.)
If the circle runout is greater than maximum, replace the camshaft.


EM2011


EM2538

B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake

42.01 – 42.11 mm (1.6539 – 1.6579 in.)

Exhaust

40.06 – 40.16 mm (1.5772 – 1.5811 in.)

Minimum cam lobe height:

Intake

41.90 mm (1.6496 in.)

Exhaust

39.95 mm (1.5728 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:

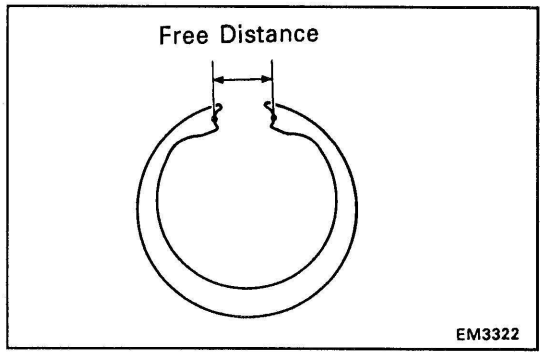
26.959 – 26.975 mm (1.0614 – 1.0620 in.)

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

D. Inspect camshaft bearings

Check that bearings for flaking and scoring.

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



EM3322

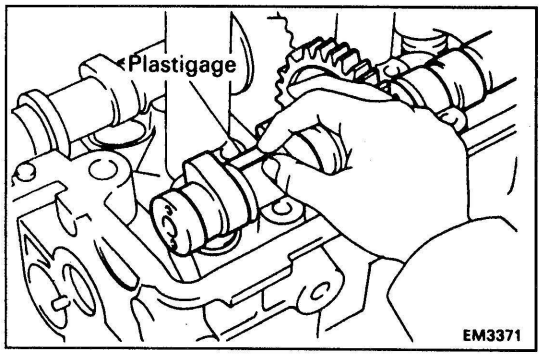
E. Inspect camshaft gear spring

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

Free distance:

22.5 – 22.9 mm (0.886 – 0.902 in.)

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



EM3371

F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

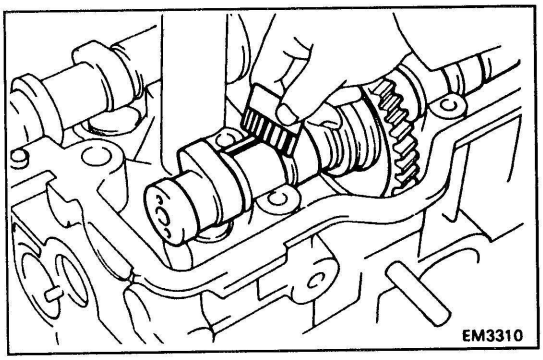
(c) Lay a strip of Plastigage across each of the camshaft journals.

(d) Install the bearing caps.

Torque: 19 N·m (190 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:

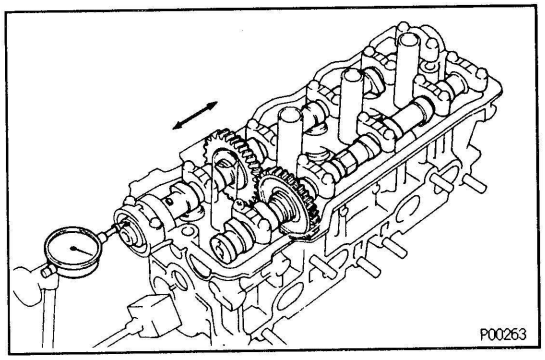
0.025 – 0.062 mm (0.0010 – 0.0024 in.)

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.



G. Inspect camshaft thrust clearance

(a) Install the camshaft.

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

Standard thrust clearance:

Intake

0.045 – 0.100 mm (0.0018 – 0.0039 in.)

Exhaust

0.030 – 0.085 mm (0.0012 – 0.0033 in.)

Maximum thrust clearance:

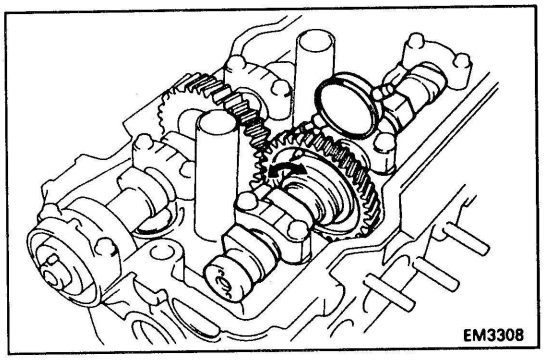
Intake

0.12 mm (0.0047 in.)

Exhaust

0.10 mm (0.0039 in.)

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



H. Inspect camshaft gear backlash

(a) Install the camshafts without installing the exhaust cam sub gear.

(b) Using a dial indicator, measure the backlash.

Standard backlash:

0.020 – 0.200 mm (0.0008 – 0.0079 in.)

Maximum backlash:

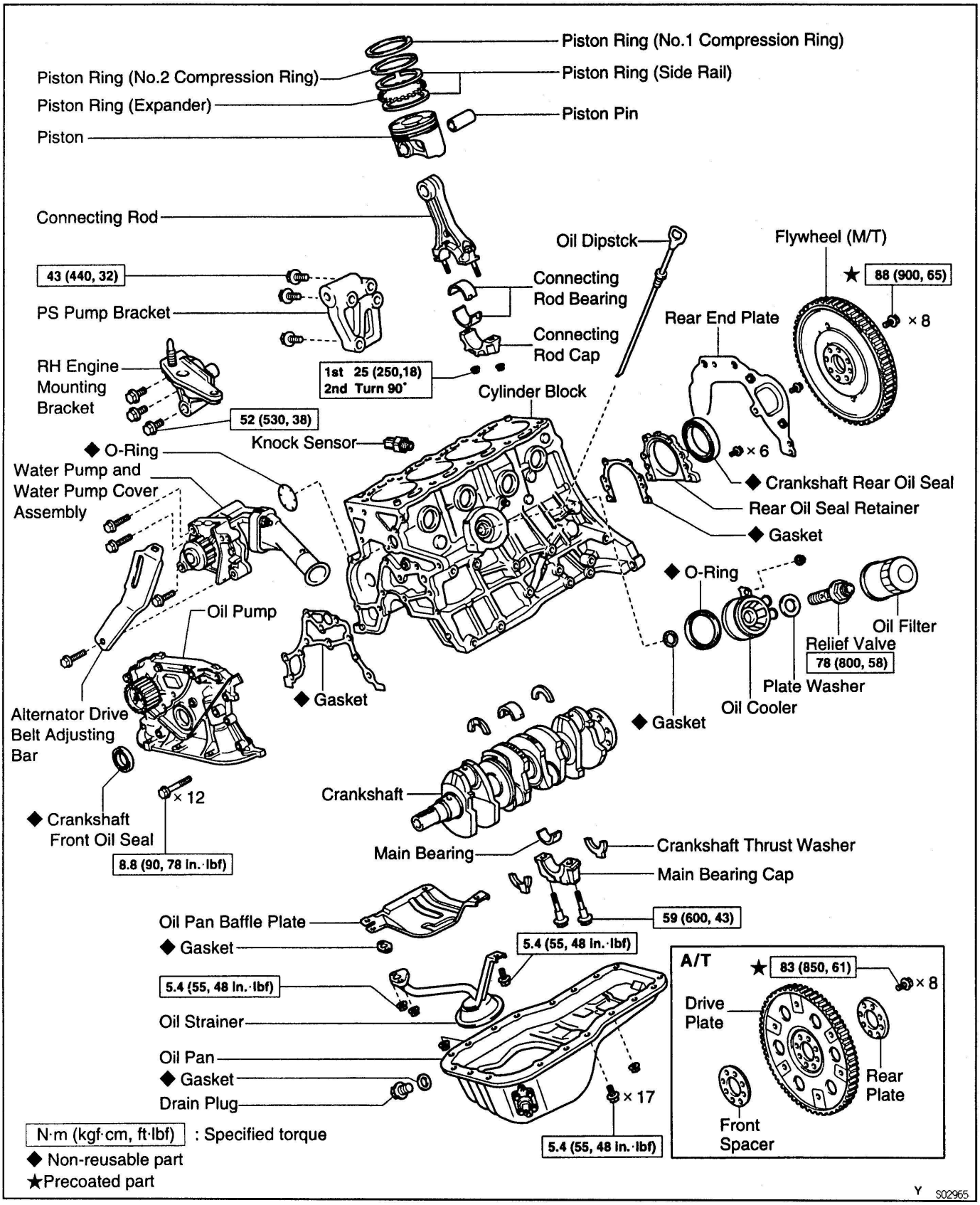
0.30 mm (0.0188 in.)

If the backlash is greater then maximum, replace the camshafts.

CYLINDER BLOCK

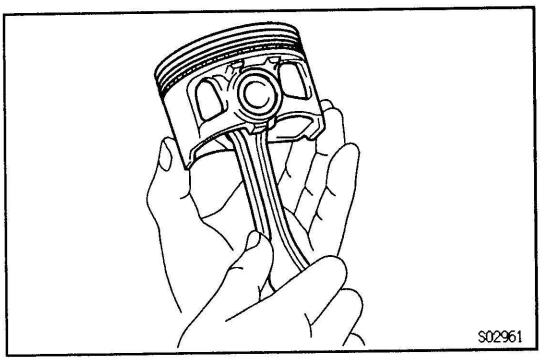
COMPONENTS FOR CYLINDER BLOCK DISASSEMBLY AND ASSEMBLY

EG0BS-2B



EG740-01

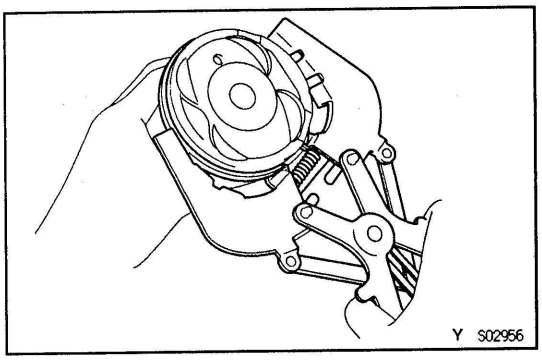
PISTON AND CONNECTING ROD DISASSEMBLY



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.

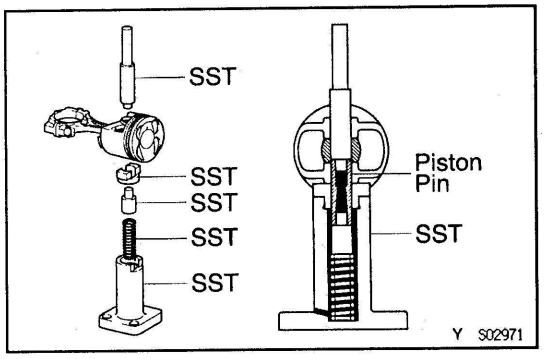


2. REMOVE PISTON RINGS

(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

Using SST, press out the piston pin from the piston. Remove the connecting rod.

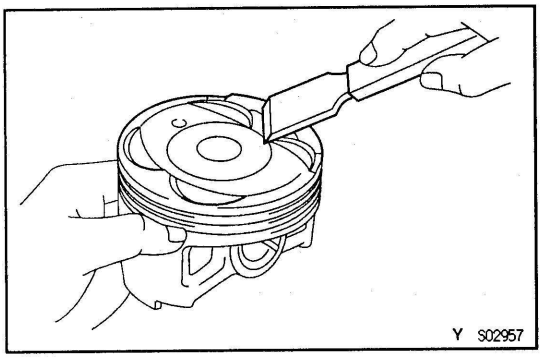
SST 09221–25026 (09221–00021, 09221–00030, 09221–00040, 09221–00071, 09221–00081)

HINT:

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

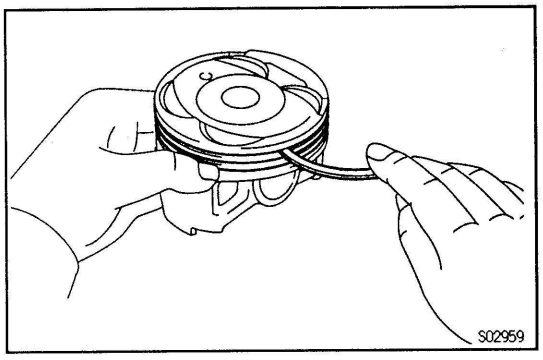
EG741-01

PISTON AND CONNECTING ROD INSPECTION

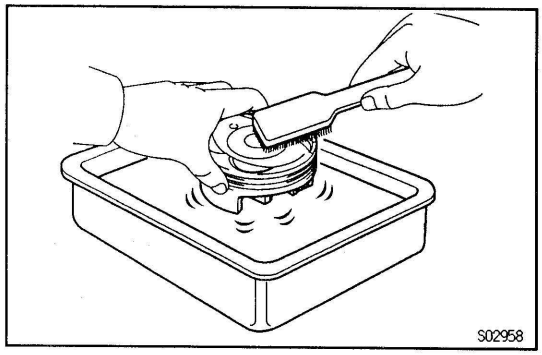


1. CLEAN PISTON

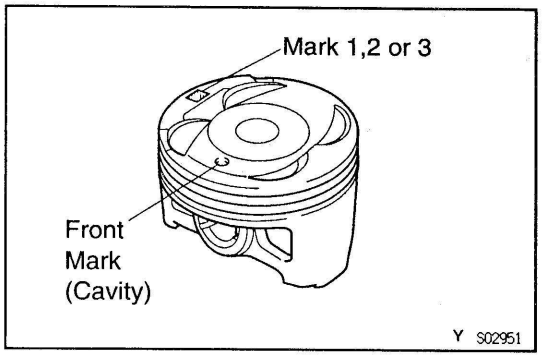
(a) Using a gasket scraper, remove the carbon from the piston top.



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



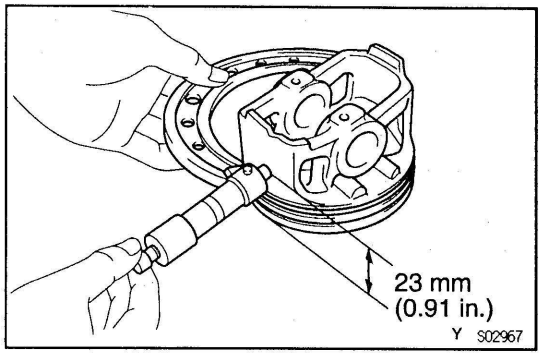
(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



2. INSPECT PISTON

A. Inspect piston oil clearance

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



(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 23 mm (0.91 in.) from the piston head.

Piston diameter:

STD

Mark "1"

85.837 – 85.847 mm (3.3794 – 3.3798 in.)

Mark "2"

85.847 – 85.857 mm (3.3798 – 3.3802 in.)

Mark "3"

85.857 – 85.867 mm (3.3802 – 3.3806 in.)

O/S 0.50

86.337 – 86.367 mm (3.3991 – 3.4003 in.)

(b) Measure the cylinder bore diameter in the thrust directions. (See inspection of cylinder block in Pub. No. RM395E).

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

Standard oil clearance:

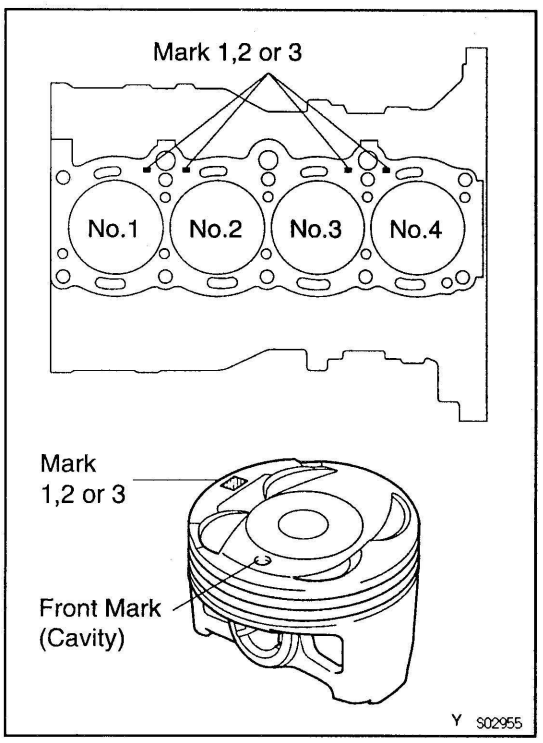
0.153 – 0.173 mm (0.0060 – 0.0068 in.)

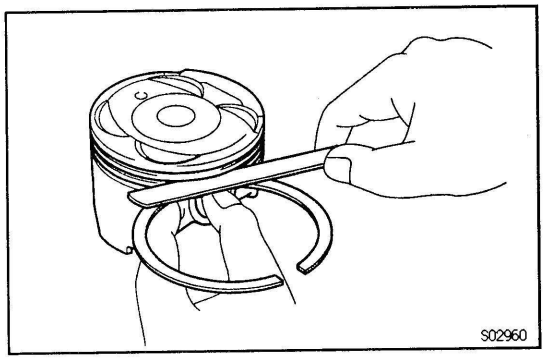
Maximum oil clearance:

0.19 mm (0.0075 in.)

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

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





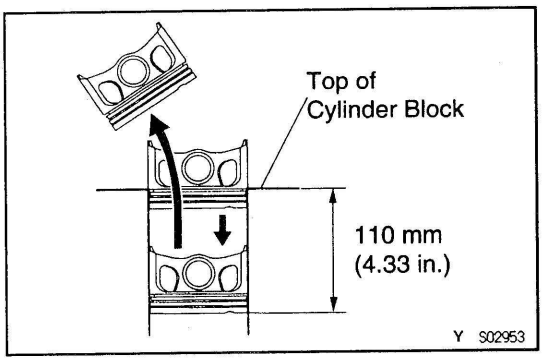
B. Inspect piston ring groove clearance

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

Ring groove clearance:

0.030 – 0.070 mm (0.0012 – 0.0028 in.)

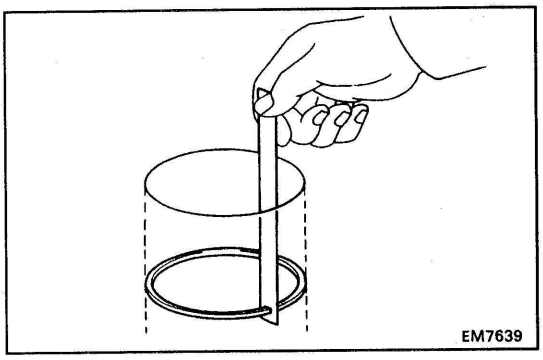
If the clearance is greater than maximum, replace the piston.



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, 110 mm (4.33 in.) from the top of the cylinder block.



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

Standard end gap:

No.1

0.270 – 0.470 mm (0.0106 – 0.0185 in.)

No.2

0.450 – 0.650 mm (0.0177 – 0.0256 in.)

Oil (Side rail)

0.100 – 0.450 mm (0.0039 – 0.0177 in.)

Maximum end gap:

No.1

1.07 mm (0.0421 in.)

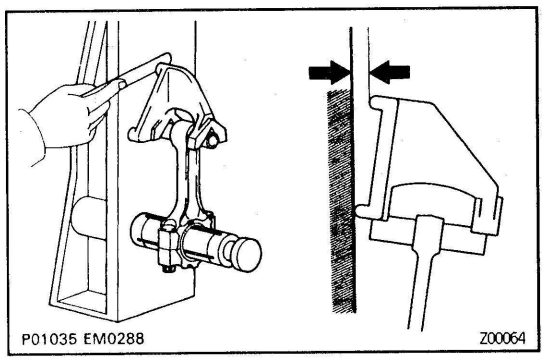
No.2

1.25 mm (0.0492 in.)

Oil (Side rail)

1.05 mm (0.0413 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, rebore all the 4 cylinders or replace the cylinder block.



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

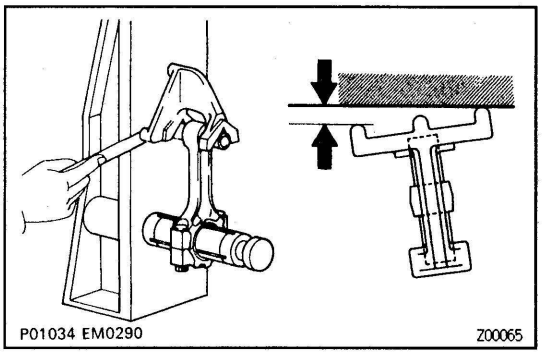
Using a rod aligner and feeler gauge, check the connecting rod alignment.

- Check for out–of–alignment

Maximum out–of–alignment:

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

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

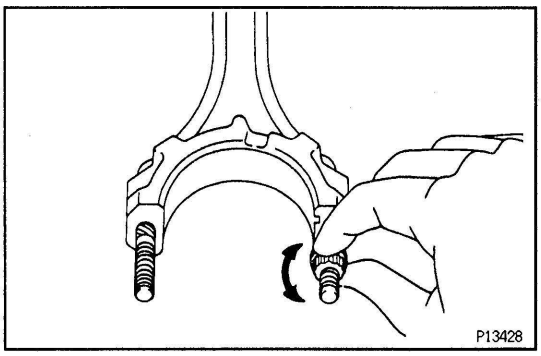


- Check for twist

Maximum twist:

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

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



B. Inspect connecting rod bolts

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

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

Standard diameter:

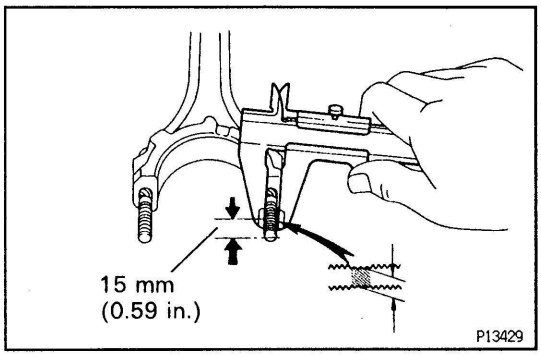
7.860 – 8.000 mm (0.3094 – 0.3150 in.)

Minimum diameter:

7.60 mm (0.2992 in.)

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

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



CYLINDER BORING

EG11M-07

HINT:

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

1. KEEP OVERSIZED PISTONS

Oversized piston diameter:

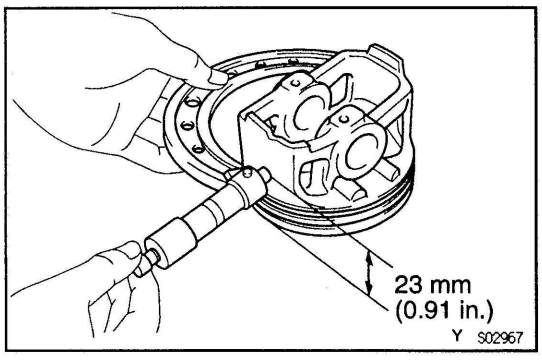
O/S 0.50

86.337 – 86.367 mm (3.3991 – 3.4003 in.)

2. CALCULATE AMOUNT TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 23 mm (0.91 in.) from the piston head.

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



Size to be rebored = P + C – H

P = Piston diameter

C = Piston oil clearance

0.153 – 0.173 mm (0.0060 – 0.0068 in.)

H = Allowance for honing

0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

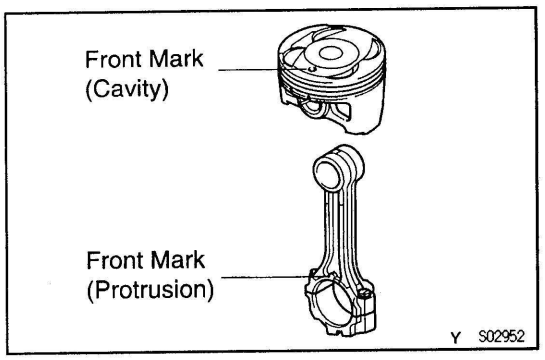
Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.

EG742-01

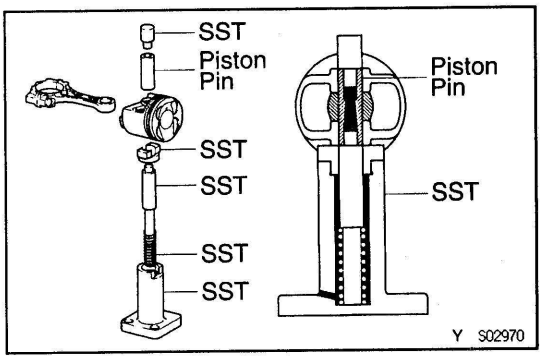
PISTON AND CONNECTING ROD ASSEMBLY



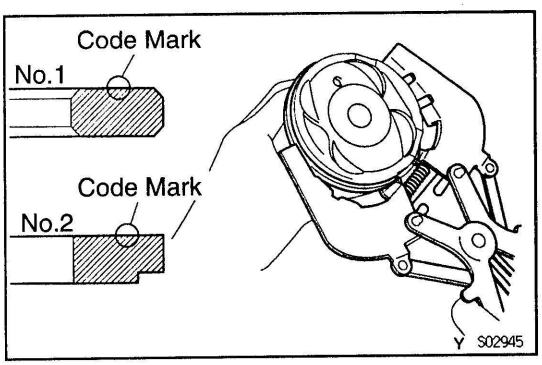
1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Coat the piston pin and pin holes of the piston with engine oil.

(b) Align the cavity on the piston with the protrusion on the connecting rod.



(c) Using SST, press in the piston pin.
SST 09221–25026 (09221–00021, 09221–00030, 09221–00040, 09221–00071, 09221–00081)



2. INSTALL PISTON RINGS

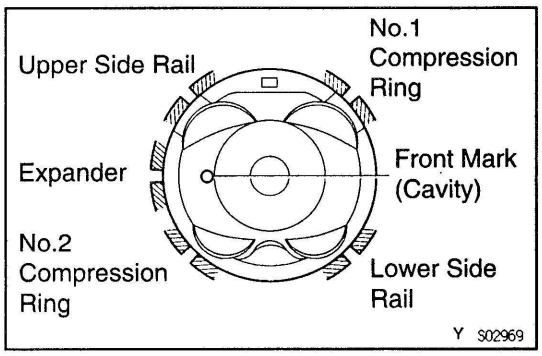
(a) Install the oil ring expander and 2 side rails by hand.

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

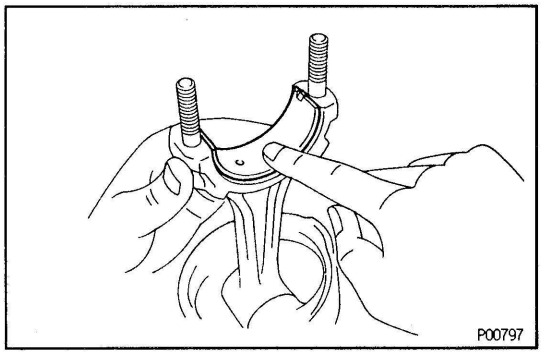
Code mark:

No.1: 1N or T

No.2: 2N or T



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



3. INSTALL BEARINGS

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

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

SERVICE SPECIFICATIONS

SERVICE DATA

EG0C5-1R

Idle CO (w/ TWC)	Concentration		0 – 0.5 %
Idle CO (w/o TWC)	Concentration		1.5 ± 0.5 %
Compression pressure	at 250 rpm (w/ TWC)	STD	1,275 kPa (13.0 kgf/cm², 185 psi) or more
		Limit	932 kPa (9.5 kgf/cm², 135 psi)
	at 250 rpm (w/o TWC)	STD	1,226 kPa (12.5 kgf/cm², 178 psi) or more
		Limit	883 kPa (9.0 kgf/cm², 128 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm², 14 psi) or less
Valve clearance		at cold Intake	0.19 – 0.29 mm (0.007 – 0.011 in.)
		Exhaust	0.28 – 0.38 mm (0.011 – 0.015 in.)
	Adjusting shim (for repair part)	Mark 2.500	2.500 mm (0.0984 in.)
		Mark 2.550	2.550 mm (0.1004 in.)
		Mark 2.600	2.600 mm (0.1024 in.)
		Mark 2.650	2.650 mm (0.1043 in.)
		Mark 2.700	2.700 mm (0.1063 in.)
		Mark 2.750	2.750 mm (0.1083 in.)
		Mark 2.800	2.800 mm (0.1102 in.)
		Mark 2.850	2.850 mm (0.1122 in.)
		Mark 2.900	2.900 mm (0.1142 in.)
		Mark 2.950	2.950 mm (0.1161 in.)
		Mark 3.000	3.000 mm (0.1181 in.)
		Mark 3.050	3.050 mm (0.1201 in.)
		Mark 3.100	3.100 mm (0.1220 in.)
		Mark 3.150	3.150 mm (0.1240 in.)

Valve clearance (cont'd)	Adjusting shim (for repair part) (cont'd)	Mark 3.200	3.200 mm (0.1260 in.)
		Mark 3.250	3.250 mm (0.1280 in.)
		Mark 3.300	3.300 mm (0.1299 in.)
Ignition timing	w/ Terminals TE1 and E1 connected		10° BTDC @ idle
Idle speed	—		700 ± 50 rpm
Intake manifold vacuum		at idle speed	60 kPa (450 mmHg, 17.7 in.Hg)
Idler pulley tension spring	Free length		46.0 mm (1.811 in.)
	Installed load at 50.5 mm (1.988 in.)		22 — 27 N (2.25 — 2.75 kgf, 5.0 — 6.1 lbf)
Cylinder head	Warpage		
	Cylinder block side	Maximum	0.05 mm (0.0020 in.)
	Manifold side	Maximum	0.08 mm (0.0031 in.)
	Valve seat		
	Refacing angle		30°, 45°, 75°
	Contacting angle		45°
	Contacting width		1.0 — 1.4 mm (0.039 — 0.055 in.)
Valve guide bushing	Inside diameter		6.010 — 6.030 mm (0.2366 — 0.2374 in.)
	Outside diameter (for repair part)	STD	10.985 — 11.012 mm (0.4325 — 0.4335 in.)
		O/S 0.05	11.035 — 11.062 mm (0.4344 — 0.4355 in.)
Valve	Valve overall length	STD Intake	97.60 mm (3.8425 in.)
		Exhaust	98.45 mm (3.8760 in.)
		Minimum Intake	97.1 mm (3.823 in.)
		Exhaust	98.0 mm (3.858 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		41.96— 41.99 mm (1.6520 — 1.6531 in.)
	Installed tension at 34.7 mm (1.366 in.)		164 — 189 N (16.7 — 19.3 kgf, 36.8 — 42.5 lbf)
Valve lifter	Lifter diameter		30.966 — 30.976 mm (1.2191 — 1.2195 in.)
	Lifter bore diameter		31.000 — 31.018 mm (1.2205 — 1.2212 in.)
	Oil clearance	STD	0.024 — 0.052 mm (0.0009 — 0.0020 in.)
		Maximum	0.07 mm (0.0028 in.)
Manifold	Warpage	Maximum	0.30 mm (0.0118 in.)

EG

EG

Camshaft	Thrust clearance	STD Intake	0.045 — 0.100 mm (0.0018 — 0.0039 in.)
		Exhaust	0.030 — 0.085 mm (0.0012 — 0.0033 in.)
		Maximum Intake	0.12 mm (0.0047 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Journal oil clearance	STD	0.025 — 0.062 mm (0.0010 — 0.0024 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter		26.959 — 26.975 mm (1.0614 — 1.0620 in.)
	Circle runout	Maximum	0.04 mm (0.0016 in.)
	Cam lobe height	STD Intake	42.01 — 42.11 mm (1.6539 — 1.6579 in.)
		Exhaust	40.06 — 40.16 mm (1.5772 — 1.5811 in.)
		Minimum Intake	41.90 mm (1.6496 in.)
		Exhaust	39.95 mm (1.5728 in.)
	Camshaft gear backlash	STD	0.020 — 0.200 mm (0.0008 — 0.0079 in.)
		Maximum	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance		22.5 — 22.9 mm (0.886 — 0.902 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD Mark 1	86.000 — 86.010 mm (3.3858 — 3.3862 in.)
		Mark 2	86.010 — 86.020 mm (3.3862 — 3.3866 in.)
		Mark 3	86.020 — 86.030 mm (3.3866 — 3.3870 in.)
		Maximum STD	86.23 mm (3.3949 in.)
		O/S 0.50	86.73 mm (3.4146 in.)
Piston and piston ring	Piston diameter	STD Mark 1	85.837 — 85.847 mm (3.3794 — 3.3798 in.)
		Mark 2	85.847 — 85.857 mm (3.3798 — 3.3802 in.)
		Mark 3	85.857 — 85.867 mm (3.3802 — 3.3806 in.)
		O/S 0.50	86.337 — 86.367 mm (3.9914 — 3.4003 in.)
	Piston oil clearance	STD	0.153 — 0.173 mm (0.0060 — 0.0068 in.)
		Maximum	0.19 mm (0.0075 in.)
	Piston ring groove clearance	No.1	0.030 — 0.070 mm (0.0012 — 0.0028 in.)
		No.2	0.030 — 0.070 mm (0.0012 — 0.0028 in.)
	Piston ring end gap	STD No.1	0.270 — 0.470 mm (0.0106 — 0.0185 in.)
		No.2	0.450 — 0.650 mm (0.0177 — 0.0256 in.)
		Oil	0.100 — 0.450 mm (0.0039 — 0.0177 in.)
		Maximum No.1	1.07 mm (0.0421 in.)
		No.2	1.25 mm (0.0492 in.)
		Oil	1.05 mm (0.0413 in.)
Connecting rod	Thrust clearance	STD	0.160 — 0.312 mm (0.0063 — 0.0123 in.)
		Maximum	0.35 mm (0.0138 in.)
	Connecting rod bearing center wall thickness		
	Reference	STD Mark 1	1.484 — 1.488 mm (0.0584 — 0.0586 in.)
		Mark 2	1.488 — 1.492 mm (0.0586 — 0.0587 in.)
		Mark 3	1.492 — 1.496 mm (0.0587 — 0.0589 in.)
	Connecting rod oil clearance	STD STD	0.024 — 0.055 mm (0.0009 — 0.0022 in.)
		U/S 0.25	0.023 — 0.069 mm (0.0009 — 0.0027 in.)
		Maximum	0.08 mm (0.0031 in.)
	Rod out—of—alignment		
		Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Connecting rod bolt outside diameter	STD	7.860 — 8.000 mm (0.3094 — 0.3150 in.)
		Minimum	7.60 mm (0.2992 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		2.440 — 2.490 mm (0.0961 — 0.0980 in.)
	Main journal oil clearance STD No.3	STD	0.025 — 0.044 mm (0.0010 — 0.0017 in.)
		U/S 0.25	0.027 — 0.067 mm (0.0011 — 0.0026 in.)
		Others STD	0.015 — 0.034 mm (0.0006 — 0.0013 in.)
		U/S 0.25	0.019 — 0.059 mm (0.0007 — 0.0023 in.)
		Maximum	0.08 mm (0.0031 in.)
	Main journal diameter	STD	54.988 — 55.003 mm (2.1653 — 2.1655 in.)
		U/S 0.25	54.745 — 54.755 mm (2.1553 — 2.1557 in.)
	Main bearing center wall thickness (Reference)		
	STD No.3	Mark 1	1.992 — 1.995 mm (0.0784 — 0.0785 in.)
		Mark 2	1.995 — 1.998 mm (0.0785 — 0.0787 in.)
		Mark 3	1.998 — 2.001 mm (0.0787 — 0.0788 in.)
		Mark 4	2.001 — 2.004 mm (0.0788 — 0.0789 in.)
		Mark 5	2.004 — 2.007 mm (0.0789 — 0.0790 in.)
	Others	Mark 1	1.997 — 2.000 mm (0.0786 — 0.0787 in.)
		Mark 2	2.000 — 2.003 mm (0.0787 — 0.0789 in.)
		Mark 3	2.003 — 2.006 mm (0.0789 — 0.0790 in.)
		Mark 4	2.006 — 2.009 mm (0.0790 — 0.0791 in.)
		Mark 5	2.009 — 2.012 mm (0.0791 — 0.0792 in.)
	Crank pin diameter	STD	51.985 — 52.000 mm (2.0466 — 2.0472 in.)
		U/S 0.25	51.745 — 51.755 mm (2.0372 — 2.0376 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Main journal taper and out—of—round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out—of—round	Maximum	0.02 mm (0.0008 in.)

EG0C8—1S

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head cover x Cylinder head	44	450	33
Oil pump pulley x Oil pump drive shaft	24	245	18
No.2 idler pulley x Cylinder block	42	425	31
Crankshaft pulley x Crankshaft	108	1,100	80
Camshaft timing pulley x Camshaft	54	550	40
for SST	37	380	27
No.1 idler pulley x Cylinder head	42	425	31
RH engine mounting bracket x Cylinder block	52	530	38
Cylinder head x Cylinder block 1st	49	500	36
2nd	Turn 90°	Turn 90°	Turn 90°
Spark plug tube x Cylinder head	39	400	29
Camshaft bearing cap x Cylinder head	19	190	14
Alternator bracket x Cylinder head	42	425	31
No.3 timing belt cover x Cylinder head	7.8	80	69 in.·lbf
Delivery pipe x Cylinder head	13	130	9
Intake manifold x Cylinder head	19	195	14
Fuel pulsation damper x Delivery pipe	34	350	25
for SST	29	300	22
No.1 intake manifold stay x Intake manifold	42	425	31
No.1 intake manifold stay x Cylinder head	42	425	31

EGR valve x Intake manifold		13	130	9
EGR pipe x Cyllinder head		59	600	43
No.2 intake manifold stay x Intake manifold		42	425	31
No.2 intake manifold stay x Cylinder head		42	425	31
Throttle body x Intake manifold		19	195	14
Water bypass pipe x Water pump cover		9.3	95	82 in.·lbf
Water bypass pipe x Cylinder head		19	195	14
Water outlet x Cylinder head		15	150	11
Exhaust manifold x Cylinder head		49	500	36
Exhaust manifold stay x Exhaust manifold		42	425	31
Exhaust manifold stay x Cylinder block		42	425	31
Main bearing cap x Cylinder block		59	600	43
Connecting rod cap x Connecting rod	1st	25	250	18
	2nd	Turn 90°	Turn 90°	Turn 90°
Rear oil seal retainer x Cylinder block		13	130	9
Knock sensor x Cylinder block		37	380	27
Oil cooler x Cylinder block	Relief valve	78	800	58
	Nut	8.8	90	78 in.·lbf
Water pump x Cylinder block		8.8	90	78 in.·lbf
Alternator drive belt adjusting bar x Cylinder block		22	220	16
PS pump bracket x Cylinder block		43	440	32
Rear end plate x Cylinder block		9.3	95	82 in.·lbf
Flywheel x Crankshaft (M/T)		88	900	65
Drive plate x Crankshaft (A/T)		83	850	61

EFI SYSTEM

PREPARATION

EG0CF-1Y

SST (SPECIAL SERVICE TOOLS)

	09843–18020 Diagnosis Check Wire	

EG0CG-1C

RECOMMENDED TOOLS

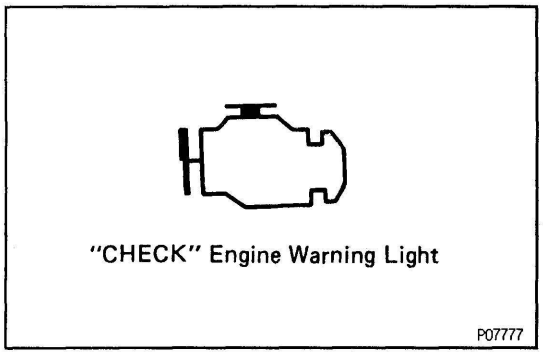
	09082–00050 TOYOTA Electrical Tester Set.	

DIAGNOSIS SYSTEM

EG43L-09

DESCRIPTION

The ECU contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and the check engine warning light on the combination meter lights up.
By analyzing various signals as shown in the later table (See diagnostic codes) the ECU detects system malfunctions relating to the sensors or actuators.
The self–diagnosis system has 2 modes, a normal mode and a test mode.
If a malfunction is detected when in the normal mode, the ECU lights up the check engine warning light to inform the driver of the occurrence of a malfunction. (For some codes the light does not come on.) The light goes OFF automatically when the malfunction has been repaired. But the diagnostic code(s) remains stored in the ECU memory (except for code No.16). The ECU stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch OFF.
The diagnostic code can be read by the number of blinks of the check engine warning light when TE1 and E1 terminals on the check connector are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.
If a malfunction is detected when in the test mode, the ECU lights up the check engine warning light to inform the technician of the occurrence of a malfunction (except for code Nos. 43 and 51). In this case, TE2 and E1 terminals on the check connector should be connected as shown later. (See diagnostic codes output (test mode))
In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECU memory even when the ignition switch is OFF (except code Nos. 43 and 51). This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the check engine warning light can be selected by connecting the TE1, TE2 and E1 terminals on the check connector, as shown later. (See diagnostic codes output)
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 diagnostic codes output (test mode))



EG

CHECK ENGINE WARNING LIGHT CHECK

EG5JE-07

1. The check engine warning light will come on when the ignition switch is at ON and the engine is not running.
2. When the engine is started, the check engine warning light should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

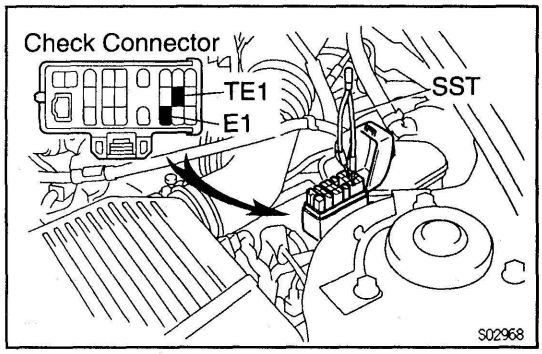
DIAGNOSTIC CODES OUTPUT

EG5T8-07

Normal mode:

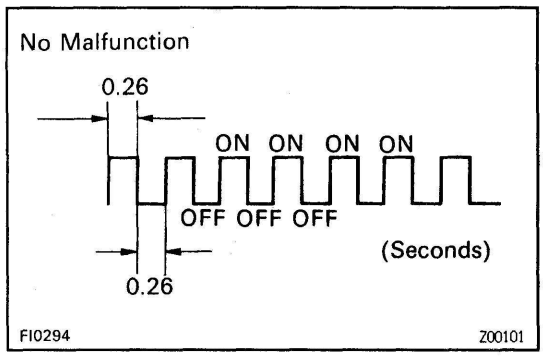
To obtain an output of diagnostic codes, proceed as follows:

1. Initial conditions
(a) Battery voltage 11 V or more
(b) Throttle valve fully closed (throttle position sensor IDL points closed)
(c) Accessories switched OFF
(d) Engine at normal operating temperature
2. Turn the ignition switch ON.
CAUTION: Do not start the engine.
3. Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020
4. Read the diagnostic code as indicated by the number of flashes of the check engine warning light.

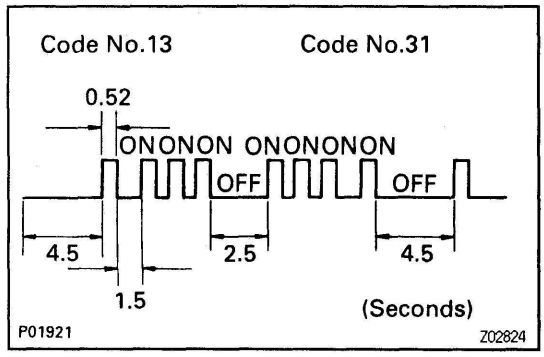


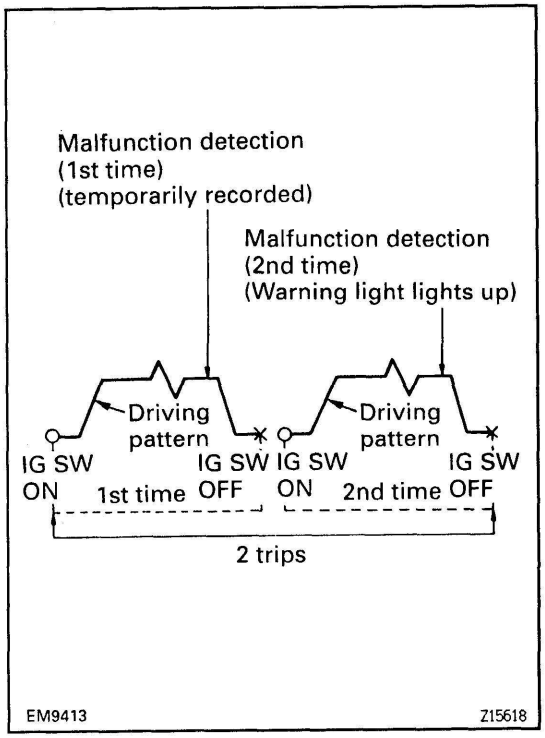
Diagnostic Codes

(a) Normal System Operation (no malfunction)
- The light will alternately blink ON and OFF at 0.26 second intervals.



(b) Malfunction Code Indication
- In the event of a malfunction, the light will blink every 0.52 seconds. The 1st number of blinks will equal the 1st digit of a 2 digit diagnostic code, and after a 1.5 second pause, the 2nd number of blinks will equal the second digit. If there are 2 or more codes, there will be a 2.5 second pause between each code.





- After all the codes have been output, there will be a 4.5 second pause and they will all be repeated as long the terminals TE1 and E1 of the check connector are connected.

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

(c) 2 trip detection logic:
Diagnostic code 21 and 25 use "2 trip detection logic". With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the ECU memory. If the same case is detected again during the second drive test, this second detection causes the warning light to light up.
The 2 trip repeats the same mode a 2nd time. (However, the ignition switch must be turned OFF between the 1st time and 2nd time.) In the Test Mode, the check engine warning light lights up the 1st time a malfunction is detected.

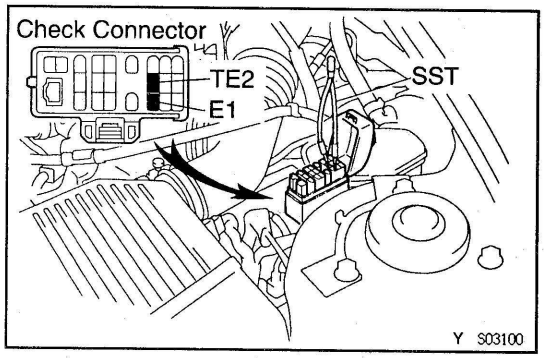
5. After the diagnosis check, remove the SST from the check connector.
SST 09843–18020

Test mode:

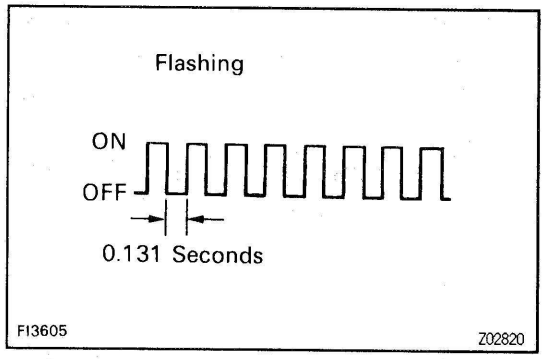
HINT:
- Compared to the normal mode, the test mode has an increased sensing ability to detect malfunctions.
- It can also detect malfunctions in the starter signal circuit, air conditioning signal.
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

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

1. Initial conditions
(a) Battery voltage 11 V or more
(b) Throttle valve fully closed (throttle position sensor IDL points closed)
(c) Accessories switched OFF
2. Turn the ignition switch OFF.

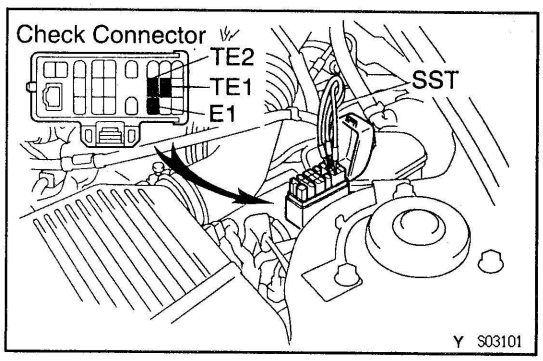


3. First, using SST, connect terminals TE2 and E1 of the check connector.
   SST 09843–18020
4. Turn the ignition switch ON to begin the diagnosis in the test mode.

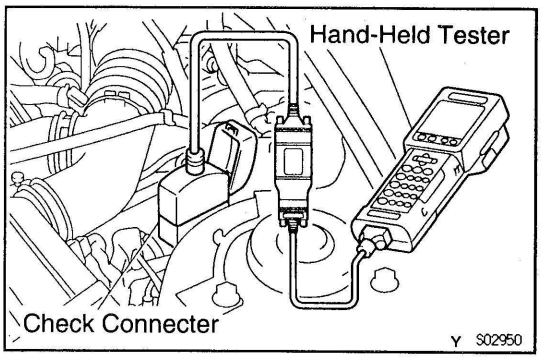


HINT: To confirm that the test mode is operating, check that the check engine warning light flashes when the ignition switch is turned ON.

5. Start the engine and drive the vehicle at a speed of 10 km/h (6 mph) or higher.
6. Simulate the conditions of the malfunction described by the customer.

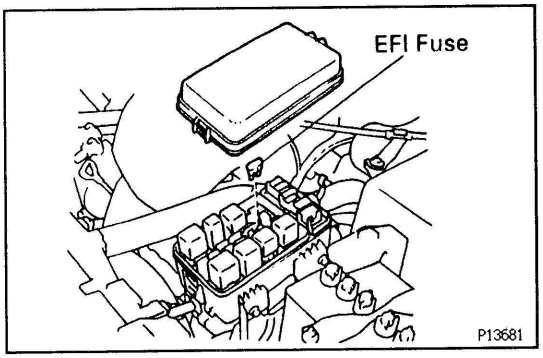


7. Using SST, connect terminals TE1 and E1 of the check connector.
   SST 09843–18020
8. Read the diagnostic code as indicated by the number of flashes of the check engine warning light.
9. After the diagnosis check, remove the SST from the check connector.
   SST 09843–18020
   HINT:
   - The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned ON.
   - The starter signal and vehicle speed signal will be diagnosed by the ECU as malfunctions, and code Nos. 42, and 43 will be output, if the operation in step 5 is not done.
   - 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 CODE CHECK USING HAND–HELD TESTER EG36V-0P

1. Hook up the hand–held tester to the check connector.
2. Read the diagnostic codes by following the prompts on the tester screen.
   Please refer to the hand–held tester operator's manual for further details.



DIAGNOSTIC CODE CANCELLATION

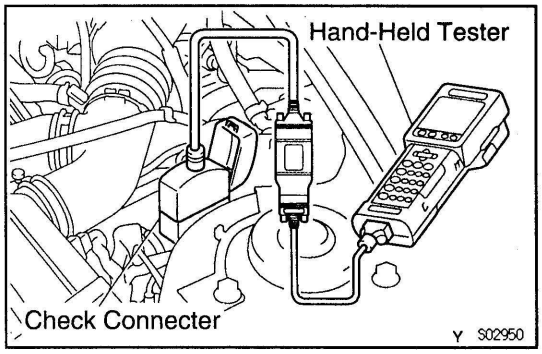
EG4ZT-08

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the EFI fuse (15A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.
   HINT:
   - Cancellation can also be done by removing the negative (−) terminal cable from the battery, but in this case, other memory systems (clock, etc.) will also cancelled out.
   - If the diagnostic code is not cancelled out, it will be retained by the ECU and appear along with a new code in the event of future trouble.
   - If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code has been recorded.
2. After cancellation, road test the vehicle to check that a normal code is now read on the check engine warning light.
   If the same diagnostic code appears, it indicates that the trouble area has not been repaired thoroughly.

DIAGNOSIS INDICATION

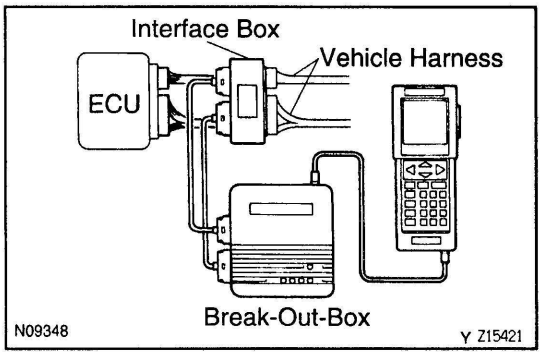
EG124-0F

1. When 2 or more codes are indicated, the lowest number (code) will appear first.
2. All detected diagnostic codes, except code Nos. 16, 43 and 51, will be retained in memory by the ECU from the time of detection until cancelled out.
3. Once malfunction is cleared, the check engine warning light in the combination meter will go off but the diagnostic code(s) remains stored in ECU memory (except for codes Nos. 16, 43 and 51).



ECU DATA MONITOR USING HAND–HELD TESTER EG30X-0H

1. Hook up the hand–held tester to the check connector.
2. Monitor the ECU data by following the prompts on the tester screen.
   HINT: Hand–held tester has a "Snapshot" function which records the monitored data.
   Please refer to the hand–held tester operator's manual for further details.



ECU TERMINAL VALUES MEASUREMENT USING BREAK–OUT–BOX AND HAND–HELD TESTER EG30Y-0D

1. Hook up the break–out–box and hand–held tester to the vehicle.
2. Read the ECU input/output values by following the prompts on the tester screen.
   HINT: Hand–held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.
   Please refer to the hand–held tester/break–out–box operator's manual for further details.

EG3VY–02

DIAGNOSTIC CODES

HINT:

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

Code No.	Number of blinks of Check Engine Warning Light	System	Check Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2	See page
			Normal Mode	Test Mode				
–	 FI1401	Normal	–	–	Output when no other code is recorded.	–	–	–
12	 FI1606	RPM Signal	ON	N.A.	NE signal is not input to ECU for 2 secs. or more after STA turns ON. G signal is not input to ECU for 3 sec. or more.	• Open or short in NE, G circuit • Distributor • Open or short in STA circuit • ECU	○	–
13	 FI1607	RPM Signal	ON	ON	NE signal is not input to ECU for 300 msec. or more when engine speed is 1,500 rpm or more.	• Open or short in NE circuit • Distributor • ECU	○	–
14	 FI1608	Ignition Signal	ON	N.A.	IGF signal from igniter is not input to ECU for 4 – 5 consecutive ignitions.	• Open or short in IGF or IGT circuit from igniter to ECU • Igniter • ECU	○	–
*3 16	 FI3600	ECU Control Signal	ON	N.A.	Normal signal is not output from ECU CPU.	• ECU	X	–
*4 21	 FI1609	Oxygen Sensor Circuit	OFF	N.A.	(1) Open or short in heater circuit of oxygen sensor for 500 msec. or more. (HT) (2) At normal driving speed (below 100 km/h (60 mph) and engine speed is above 1,500 rpm), amplitude of oxygen sensor signal (OX1) is reduced to between 0.35 – 0.70 V continuously for 60 sec. or more. *5 (2 trip detection logic) (only for (2))	• Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • ECU • Open or short in oxygen sensor circuit • Oxygen sensor • ECU	○	EG-74
22	 FI1610	Water Temp. Sensor Signal	ON	ON	Open or short in water temp. sensor circuit for 500 msec. or more. (THW)	• Open or short in water temp. sensor circuit • Water temp. sensor • ECU	○	EG-69
24	 FI1611	Intake Air Temp. Sensor Signal	OFF	ON	Open or short in intake air temp. sensor circuit for 500 msec. or more. (THA)	• Open or short in intake air temp. circuit • Intake air temp. sensor • ECU	○	EG-68
*4 25	 FI2562	Air-Fuel Ratio Lean Malfunction	OFF	ON	Oxygen sensor output is less than 0.45 V for at least 90 secs. for others when oxygen sensor is warmed up (racing at 2,000 rpm) *5 (2 trip detection logic)	• Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (Injector blockage, etc.) • Open or short in oxygen sensor circuit • oxygen sensor • Ignition system	○	EG-74

V07732

DIAGNOSTIC CODES (Cont'd)

Code No.	Number of blinks of Check Engine Warning Light	System	Check Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2	See page
			Normal Mode	Test Mode				
31	 FI1612	Vacuum Sensor Signal	ON	ON	Open or short detected continuously for 500 msec. or more in vacuum sensor sensor circuit. (PIM)	• Open or short in vacuum sensor circuit • Vacuum sensor • ECU	○	EG-66
33	 BE3933	Idle Speed Control Valve System	ON	ON	Open or short in idle speed control valve circuit.	• Open or short in idle speed control valve circuit • ISC Valve	○	EG-72
41	 FI1614	Throttle Position Sensor Signal	OFF	ON	Open or short detected continuously for 500 msec. or more in throttle position sensor (VTA) circuit.	• Open or short in throttle Position sensor circuit • Throttle position sensor • ECU	○	EG-64
×6 42	 FI1615	Vehicle Speed Sensor Signal	OFF	OFF	SPD signal is not input to ECU for at least 8 seconds during high load driving with engine speed 3,000 rpm or more.	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECU	○	–
43	 FI1616	Starter Signal	N.A.	OFF	Starter signal (STA) is not input to ECU.	• Open or short in starter signal circuit • Open or short in IG SW or main relay circuit • ECU	X	EG-70
52	 FI1618	Knock Sensor Signal	ON	N.A.	With engine speed between 2,000 rpm and 6,000 rpm, signal from knock sensor is not input to ECU for 6 revolutions. (KNK)	• Open or short in knock sensor circuit • Knock sensor (looseness, etc.) • ECU	○	–
99	 P25117	Engine Immobiliser System	OFF	OFF	Open or short detected in engine immobiliser system circuit.	• Open or short in engine immobiliser system circuit • Transponder key amplifier • Transponder key coil • Transponder key computer • ECU	○	*7
51	FI1617	Switch Condition Signal	N.A.	OFF	Displayed when A/C is ON, IDL contact OFF or shift position in "R", "D", "2", or "1" ranges with the check terminals E1 and TE1 connected.	• A/C switch system • Throttle position sensor IDL circuit • Neutral start switch circuit • Accelerator pedal, cable • ECU	X	EG-64

V07733

REMARKS:

*1: "ON" displayed in the diagnosis mode column indicates that the check engine warning light is lighted up when a malfunction is detected. "OFF" indicates that the check engine warning light 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 code is recorded in the ECU memory when a malfunction occurs. "X" indicates that a diagnostic code is not recorded in the ECU memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the ignition switch ON.

*3: A/T only

*4: w/ Oxygen Sensor only

*5: "2 trip detection logic". (See step 4 (c) in trouble codes output (normal mode))

*6: M/T only

*7: See BE section of Repair Manual for Chassis and Body of applicable model.

DIAGNOSTIC CODE DETECTION DRIVING PATTERN

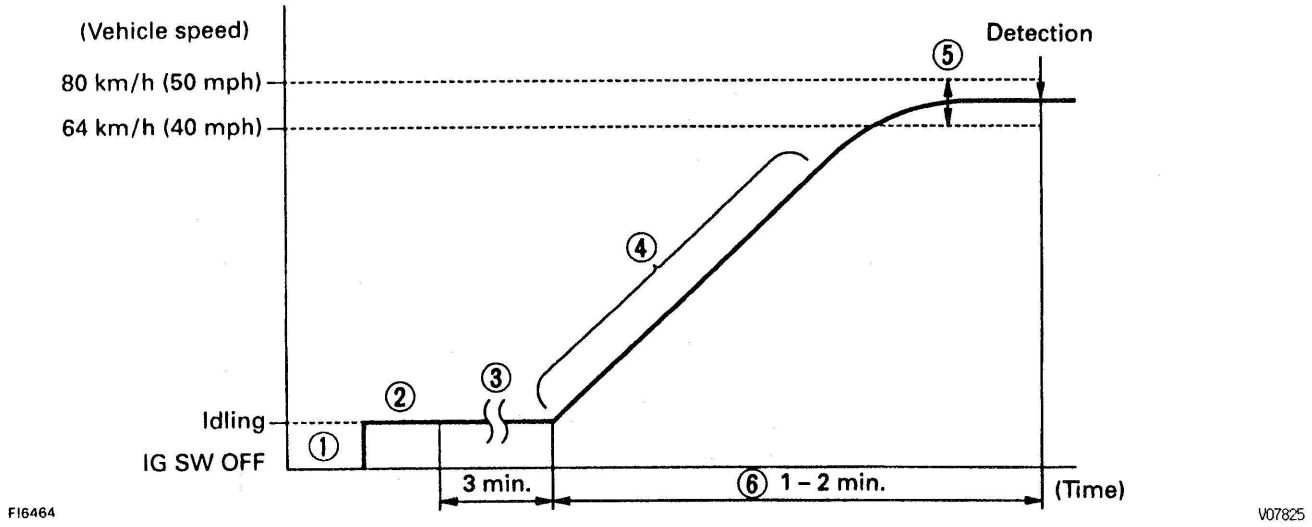
Purpose of the driving pattern.

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

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

Code No.21 Oxygen Sensor Circuit

Malfunction: Deterioration of Oxygen Sensor



It is vital that test routine is adhered to detect the malfunction:

① Disconnect the EFI fuse (15A) for 10 seconds or more with the ignition switch OFF.
Initiate test mode. (Connect terminals TE2 and E1 of the check connector with the ignition switch OFF.)

② Start the engine, and warm it up with all the accessories switched OFF.

③ Let the engine idle for 3 minutes.

④ With A/C switched ON, A/T in D range (M/T in 5th gear), accelerate gradually within the range 1,300 – 1,700 rpm centered around 1,500 rpm.
HINT:

- Ensure engine speed does NOT fall below 1,200 rpm.
- Gradually depress the accelerator pedal at a suitable rate to comply with the test requirements on the above graph.
- Never allow engine speed to drop at any time during the test.

⑤ Maintain the vehicle speed at 64 – 80 km (40 – 50 mph).

⑥ Keep the vehicle running for 1 – 2 minutes after starting acceleration.
HINT: If a malfunction exists, the check engine warning light will light up after approx. 60 seconds from the start of acceleration.

NOTICE:

- **Be sure to confirm the heater resistance of the oxygen sensor according to the procedure at page EG–77 before this test.**
- **If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.**

DIAGNOSTIC CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern

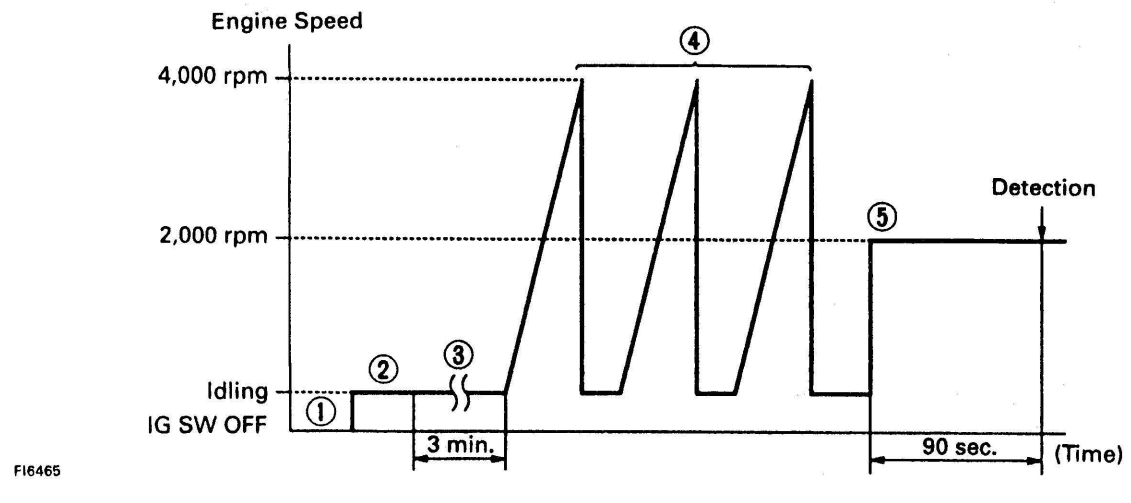
(a) To simulate diagnostic code detecting condition after diagnostic code is recorded.

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

EG

Code No.25 Air–Fuel Ratio Lean Malfunction

Malfunction: Open or Short in Oxygen Sensor



HINT: Before this test, check the feedback voltage for the oxygen sensor.

① Disconnect the EFI fuse (15A) for 10 seconds or more with the ignition switch OFF.
Initiate test mode. (Connect terminals TE2 and E1 of the check connector with the ignition switch OFF.)

② Start the engine, and warm it up with all the accessories switched OFF.

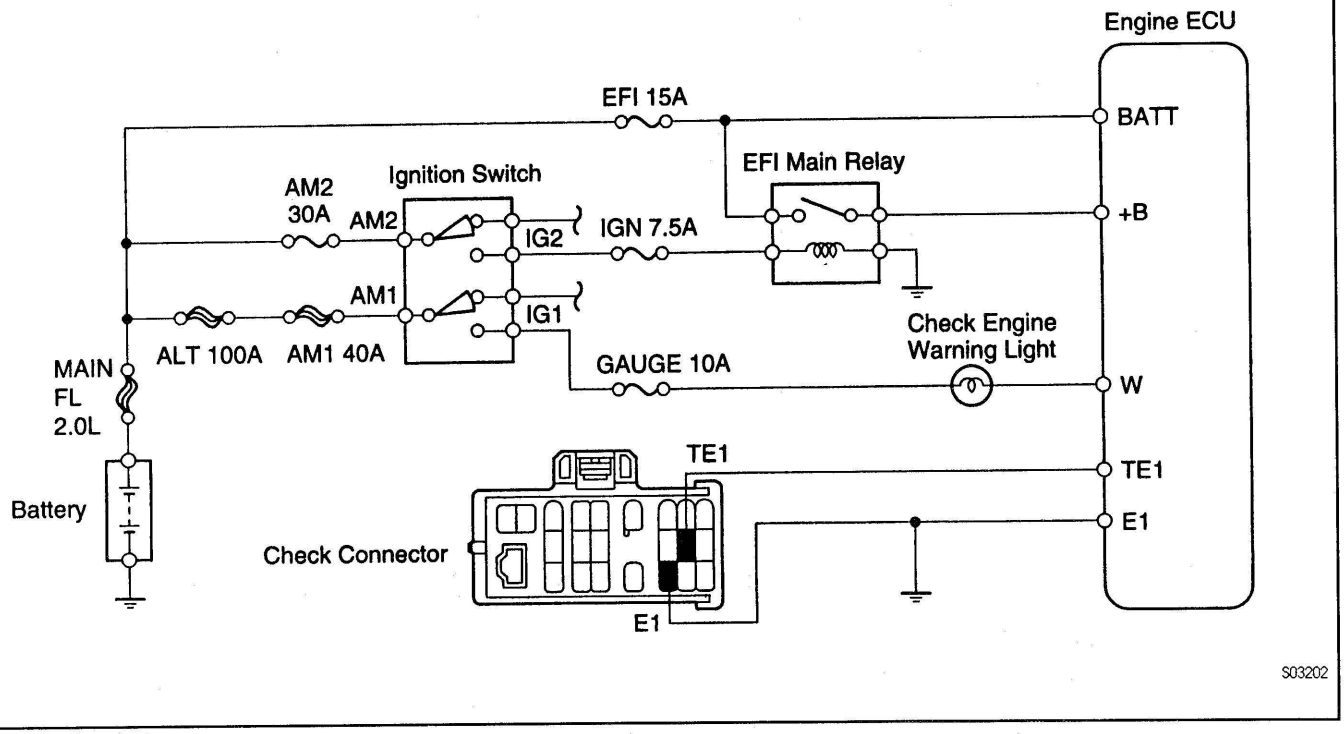
③ Let the engine idle for 3 minutes.

④ Accelerate rapidly to 4,000 rpm 3 times.

⑤ Maintain 2,000 rpm for 90 seconds.
HINT: If any malfunction is detected, the check engine warning light 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.

EG73V–01

DIAGNOSIS CIRCUIT INSPECTION



1. Does check engine warning light come on when ignition switch is at ON?
   - YES → System normal.
   - NO → Does check engine warning light come on when engine ECU terminal W is grounded to the body?
     - YES → Check wiring between engine ECU terminal E1 and body ground.
       - OK → Try another engine ECU.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse and wiring between engine ECU and ignition switch.
       - BAD → Repair or replace.

2. Does check engine warning light go off when the engine is started?
   - YES → System normal.
   - NO → Check wiring between engine ECU and check engine warning light.
     - BAD → Repair.
     - OK → Is there diagnostic code output when check connector terminals TE1 and E1 connected?
       - NO → Check wiring between engine ECU terminal TE1 and check connector terminal TE1, and engine ECU terminal E1 and check connector terminal E1.
         - OK → Try another engine ECU.
       - YES → Does check engine warning light go off after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System OK → Cancel out diagnostic code.

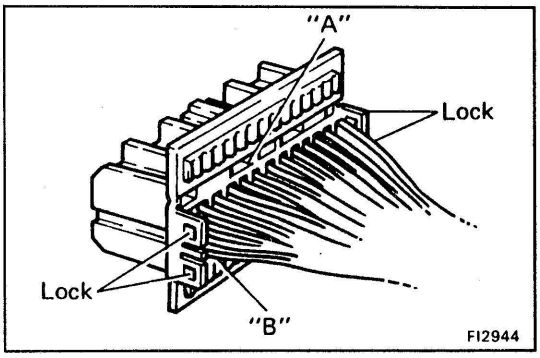
V06410

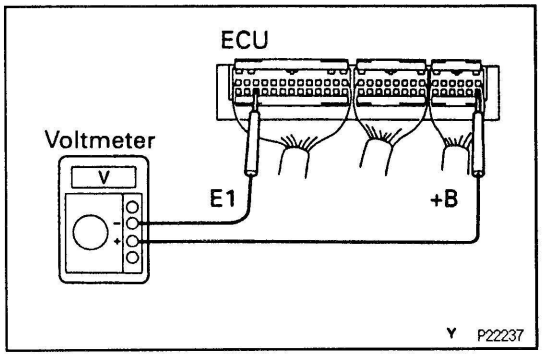
TROUBLESHOOTING w/ VOLT, OHMMETER

EG129-0C

HINT:

- The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat. However, troubleshooting should be performed while referring to the inspection methods described in this manual.
- Before beginning inspection, it is best to first make a simple check of the fuses, fusible link and the condition of the connectors.
- The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit within the computer.
- If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECU is faulty and should be replaced.





EFI SYSTEM CHECK PROCEDURE

EG73W-01

PREPARATION

(a) Disconnect the connectors from the ECU.

(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.

NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

(c) Reconnect the connectors to the ECU.

HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in the "ON" position.

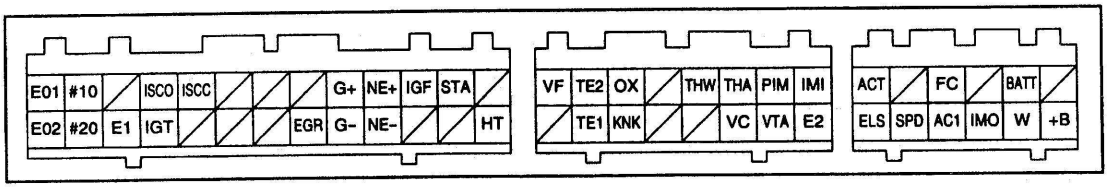
Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

NOTICE: The ECU shown in the illustrations for measuring the voltage at each terminal of the wiring connectors, on pages EG–62 to EG–74, is the ECU used for the M/T. For the ECU of the A/T, refer to EG–59, EG–60 or EG–61.

ECU Terminals
(M/T w/o Variable Resistor)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	NE+	DISTRIBUTOR	THA	INTAKE AIR TEMP. SENSOR
E02	POWER GROUND	NE-	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR
#10	INJECTOR	IGF	IGNITER	PIM	VACUUM SENSOR
#20	INJECTOR		—	VTA	THROTTLE POSITION SENSOR
	—	STA	STARTER RELAY	IMI *	TRANSPONDER KEY COMPUTER
E1	ENGINE GROUND		—	E2	SENSOR GROUND
ISCO	ISC VALVE		—	ACT	A/C AMPLIFIER
IGT	IGNITER	HT	OXYGEN SENSOR HEATER	ELS	TAILLIGHT RELAY, DEFOGGER SWITCH
ISCC	ISC VALVE	VF	CHECK CONNECTOR		—
	—		—	SPD	SPEED SENSOR
	—	TE2	CHECK CONNECTOR	FC	CIRCUIT OPENING RELAY
	—	TE1	CHECK CONNECTOR	AC1	A/C AMPLIFIER
	—	OX	OXYGEN SENSOR		—
	—	KNK	KNOCK SENSOR	IMO*	TRANSPONDER KEY COMPUTER
	—		—	BATT	BATTERY
EGR	EGR VSV		—	W	WARNING LIGHT
G+	DISTRIBUTOR	THW	WATER TEMP. SENSOR		—
G-	DISTRIBUTOR		—	+B	EFI MAIN RELAY

ECU Terminals



P01821

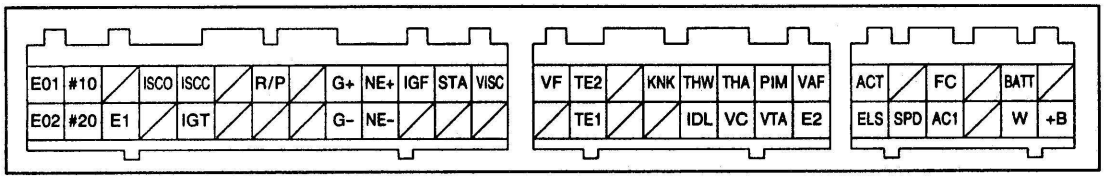
* Europe

ECU Terminals (Cont'd)
(M/T w/ Variable Resistor)

EG

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	NE+	DISTRIBUTOR	THA	INTAKE AIR TEMP. SENSOR
E02	POWER GROUND	NE-	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR
#10	INJECTOR	IGF	IGNITER	PIM	VACUUM SENSOR
#20	INJECTOR		—	VTA	THROTTLE POSITION SENSOR
	—	STA	STARTER RELAY	VAF	VARIABLE RESISTOR
E1	ENGINE GROUND		—	E2	SENSOR GROUND
ISCO	ISC VALVE	VISC	A/C IDLE-UP VSV	ACT	A/C AMPLIFIER
	—		—	ELS	TAILLIGHT RELAY, DEFOGGER SWITCH
ISCC	ISC VALVE	VF	CHECK CONNECTOR		—
IGT	IGNITER		—	SPD	SPEED SENSOR
	—	TE2	CHECK CONNECTOR	FC	CIRCUIT OPENING RELAY
	—	TE1	CHECK CONNECTOR	AC1	A/C AMPLIFIER
R/P	FUEL CONTROL CONNECTOR		—		—
	—		—		—
	—	KNK	KNOCK SENSOR	BATT	BATTERY
	—		—	W	WARNING LIGHT
G+	DISTRIBUTOR	THW	WATER TEMP. SENSOR		—
G-	DISTRIBUTOR	IDL	THROTTLE POSITION SENSOR	+B	EFI MAIN RELAY

ECU Terminals

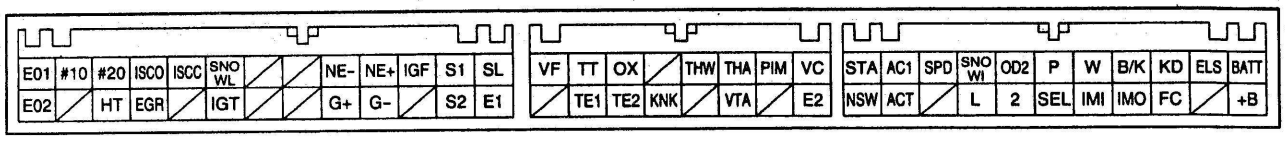


P01821

ECU Terminals (Cont'd)
(A/T w/o Variable Resistor)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	S1	ECT SOLENOID	AC1	A/C AMPLIFIER
E02	POWER GROUND	S2	ECT SOLENOID	ACT	A/C AMPLIFIER
#10	INJECTOR	SL	ECT SOLENOID	SPD	SPEED SENSOR
	—	E1	ENGINE GROUND		—
#20	INJECTOR	VF	CHECK CONNECTOR	SNOWI	SNOW MODE SWITCH
HT	OXYGEN SENSOR HEATER		—	L	NEUTRAL START SWITCH
ISCO	ISC VALVE	TT	CHECK CONNECTOR	OD2	O/D SWITCH
EGR	EGR VSV	TE1	CHECK CONNECTOR	2	NEUTRAL START SWITCH
ISCC	ISC VALVE	OX	OXYGEN SENSOR	P	ECT PATTERN SELECT SWITCH
	—	TE2	CHECK CONNECTOR	SEL*	SELECT SWITCH
SNOWL	SNOW MODE LIGHT		—	W	WARNING LIGHT
IGT	IGNITER	KNK	KNOCK SENSOR	IMI *	TRANSPONDER KEY COMPUTER
	—	THW	WATER TEMP. SENSOR	B/K	STOP LIGHT SWITCH
	—		—	IMO *	TRANSPONDER KEY COMPUTER
	—	THA	INTAKE AIR TEMP. SENSOR	KD *	KICK-DOWN SWITCH
	—	VTA	THROTTLE POSITION SENSOR	FC	CIRCUIT OPENING RELAY
NE–	DISTRIBUTOR	PIM	VACUUM SENSOR	ELS	TAILLIGHT RELAY, DEFOGGER RELAY
G+	DISTRIBUTOR		—		—
NE+	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR	BATT	BATTERY
G–	DISTRIBUTOR	E2	SENSOR GROUND	+B	EFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH		
	—	NSW	NEUTRAL START SWITCH		

ECU Terminals



FI2796

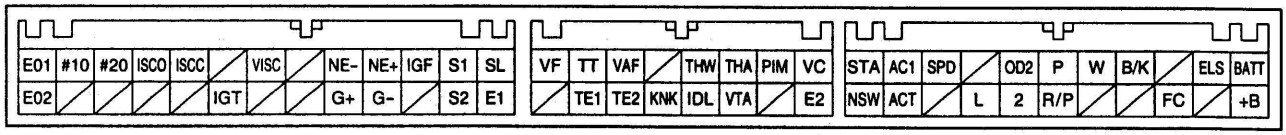
* Europe

EG

ECU Terminals (Cont'd)
(A/T w/ Variable Resistor)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	S1	ECT SOLENOID	AC1	A/C AMPLIFIER
E02	POWER GROUND	S2	ECT SOLENOID	ACT	A/C AMPLIFIER
#10	INJECTOR	SL	ECT SOLENOID	SPD	SPEED SENSOR
	—	E1	ENGINE GROUND		—
#20	INJECTOR	VF	CHECK CONNECTOR		—
	—		—	L	NEUTRAL START SWITCH
ISCO	ISC VALVE	TT	CHECK CONNECTOR	OD2	O/D SWITCH
	—	TE1	CHECK CONNECTOR	2	NEUTRAL START SWITCH
ISCC	ISC VALVE	VAF	VARIABLE RESISTOR	P	ECT PATTERN SELECT SWITCH
	—	TE2	CHECK CONNECTOR	R/P	FUEL CONTROL CONNECTOR
	—		—	W	WARNING LIGHT
IGT	IGNITER	KNK	KNOCK SENSOR		—
VISC	A/C IDLE-UP VSV	THW	WATER TEMP. SENSOR	B/K	STOP LIGHT SWITCH
	—	IDL	THROTTLE POSITION SENSOR		—
	—	THA	INTAKE AIR TEMP. SENSOR		—
	—	VTA	THROTTLE POSITION SENSOR	FC	CIRCUIT OPENING RELAY
NE-	DISTRIBUTOR	PIM	VACUUM SENSOR	ELS	TAILLIGHT RELAY, DEFOGGER RELAY
G+	DISTRIBUTOR		—		—
NE+	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR	BATT	BATTERY
G-	DISTRIBUTOR	E2	SENSOR GROUND	+B	EFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH		
	—	NSW	NEUTRAL START SWITCH		

ECU Terminals



FI2796

Y V07775

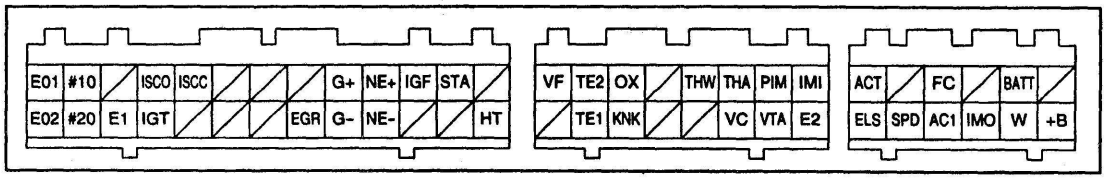
ECU Wiring Connectors Voltage

No.	Terminals	Condition		STD voltage (V)	See page
1	+B, +B1 - E1	IG SW ON		9 - 14	EG-62
2	BATT - E1	—		9 - 14	EG-63
3	IDL - E2 *	IG SW ON	Throttle valve open	9 - 14	EG-64
	VC - E2		—	4.5 - 5.5	
	VTA - E2		Throttle valve fully closed	0.3 - 0.8	
			Throttle valve fully open	3.2 - 4.9	
4	PIM - E2	IG SW ON		3.3 - 3.9	EG-66
	VC - E2			4.5 - 5.5	
5	#10, #20 - E01, E02			9 - 14	EG-67
6	THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	0.5 - 3.4	EG-68
7	THW - E2		Coolant temp. 80°C (176°F)	0.2 - 1.0	EG-69
8	STA - E1	Cranking		6 or more	EG-70
9	IGT - E1	Cranking or idling		Pulse generation	EG-71
10	ISCC, ISCO - E1	IG SW ON	ECU connectors disconnected	9 - 14	EG-72
11	W - E1	No trouble (Check engine warning light off) and engine running		9 - 14	EG-73

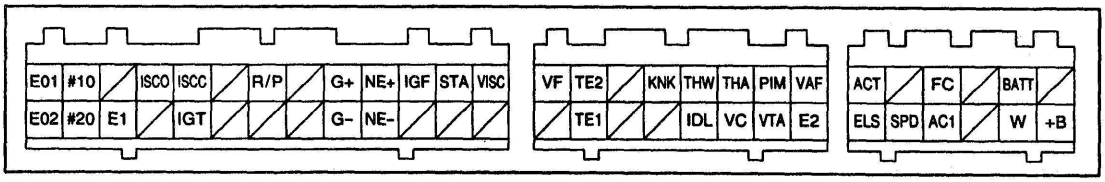
* w/ Variable resistor only

ECU Terminals

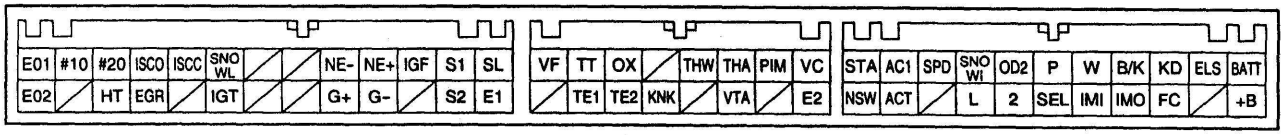
M/T w/o VARIABLE RESISTOR



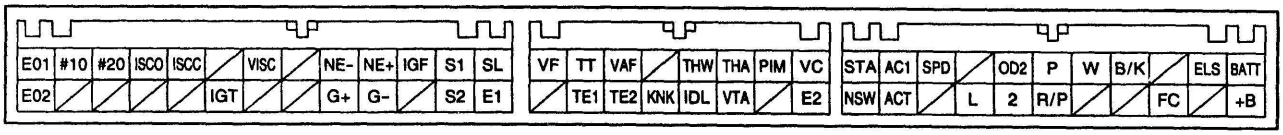
M/T w/ VARIABLE RESISTOR



A/T w/o VARIABLE RESISTOR



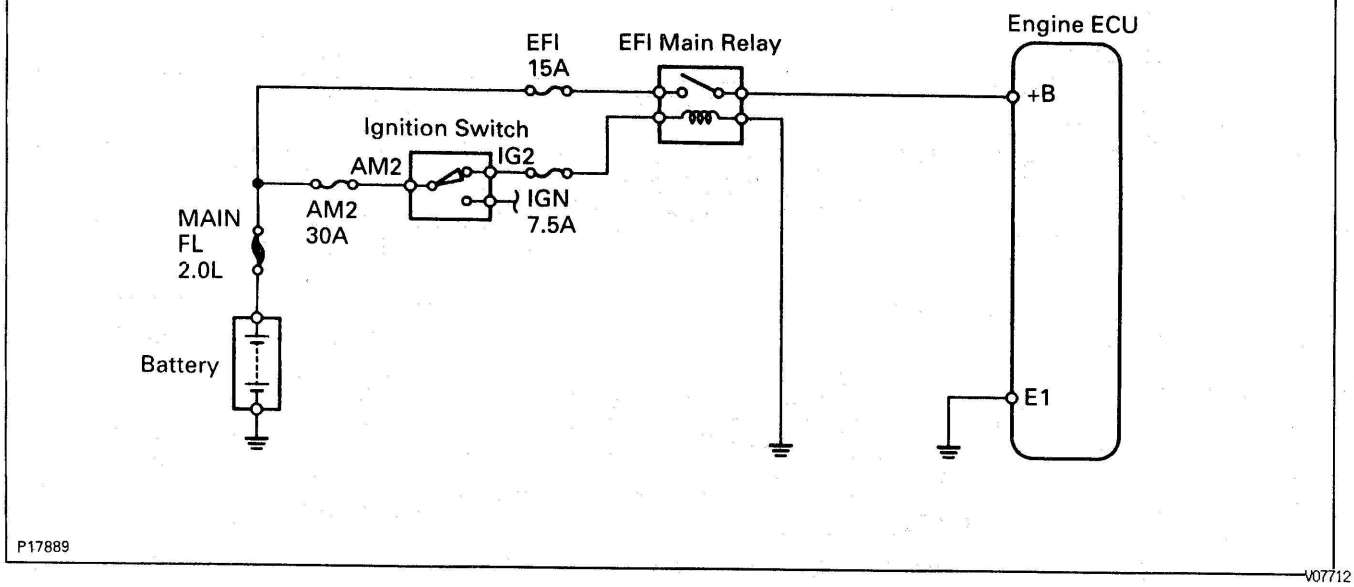
A/T w/ VARIABLE RESISTOR



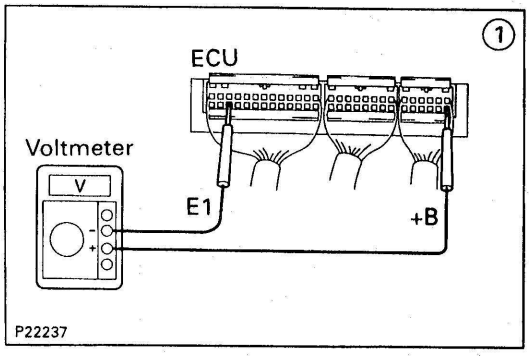
P01821
FI2796
P01821
FI2796

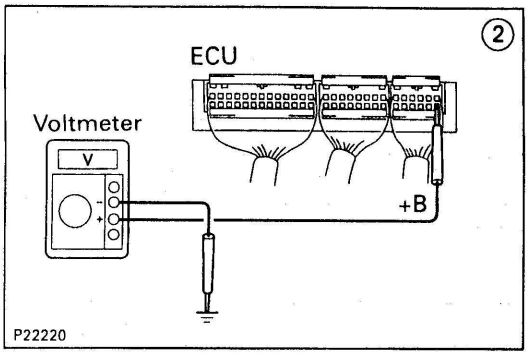
Y V07776

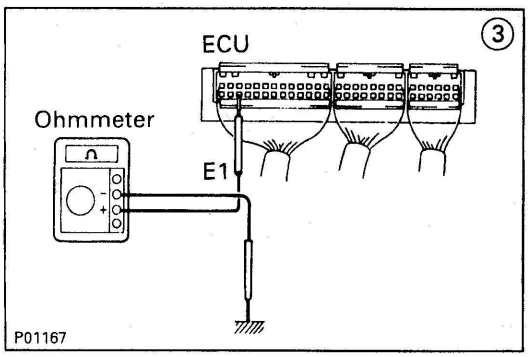
No.	Terminals	Trouble	Condition	STD voltage
1	+B – E1	No voltage	IG SW ON	9 – 14 V



V07712







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

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

NO → ③ Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

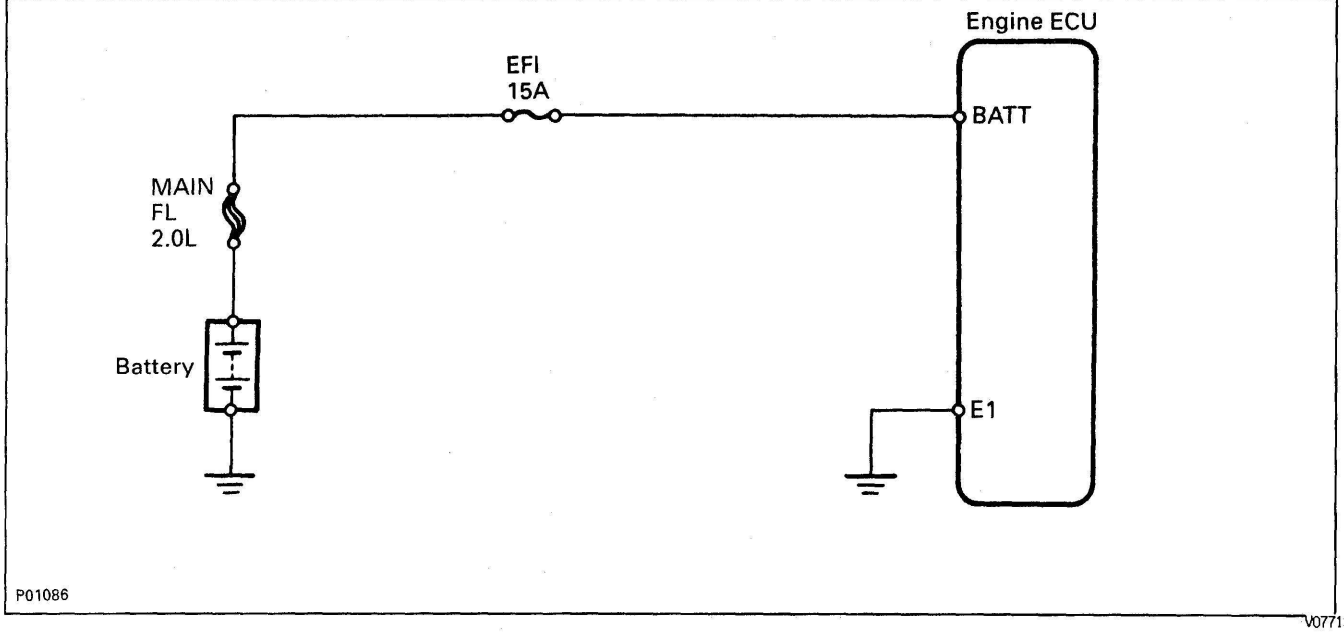
OK → Check fuses, fusible link and ignition switch.
- BAD → Repair or replace.

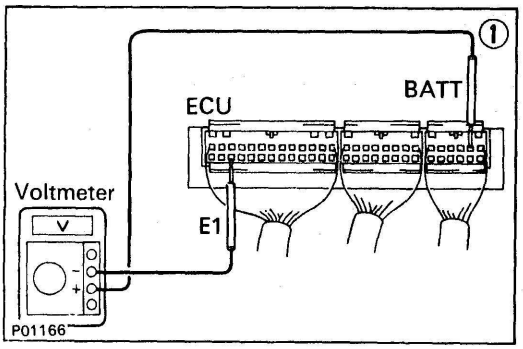
OK → Check EFI main relay. (See page EG-77)
- BAD → Replace.

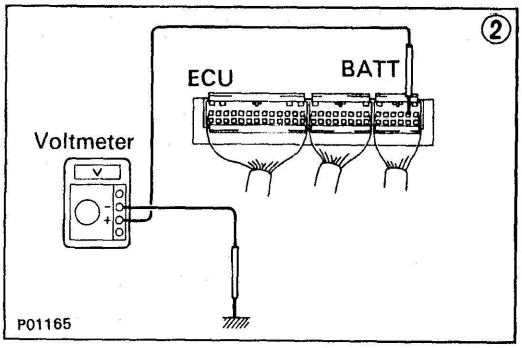
OK → Check wiring between EFI main relay and battery.
- BAD → Repair or replace.

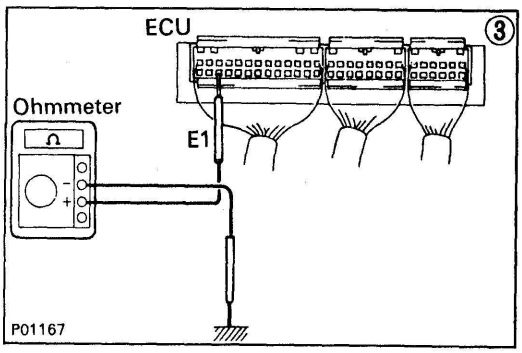
V07719

No.	Terminals	Trouble	Condition	STD voltage
2	BATT – E1	No voltage	–	9 – 14 V









① There is no voltage between ECU terminals BATT and E1.

② Check that there is voltage between ECU terminal BATT and body ground.

NO

OK

③ Check wiring between ECU terminal E1 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

BAD

Check fuse and fusible link.

Replace.

OK

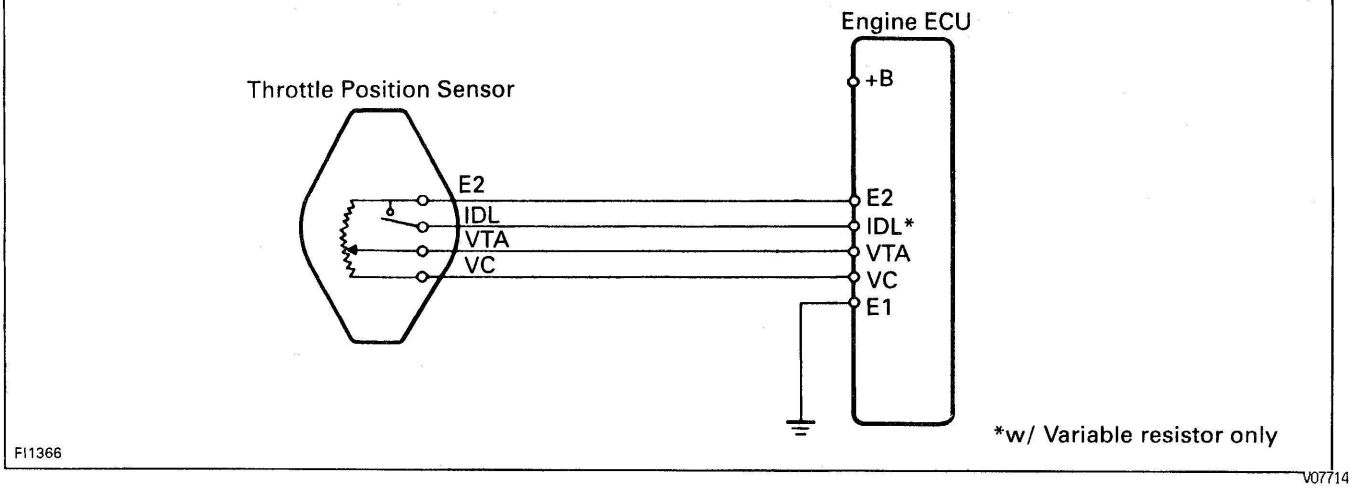
Check wiring between ECU terminal and battery.

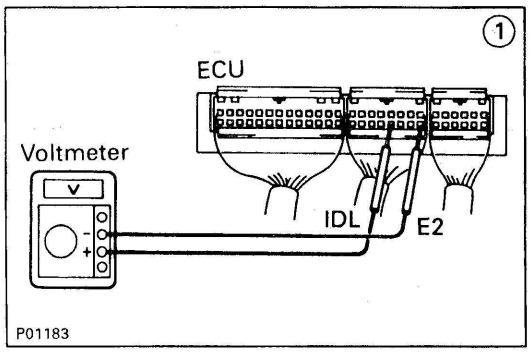
BAD

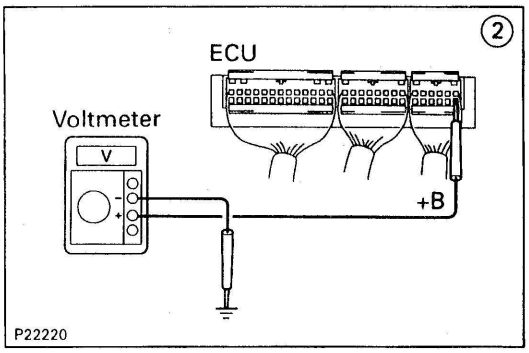
Repair or replace.

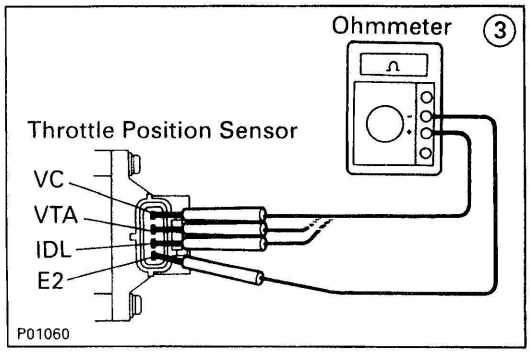
V01157

No.	Terminals	Trouble	Condition		STD voltage
3	IDL – E2*	No voltage	Ignition switch ON	Throttle valve open	9 – 14 V
	VC – E2			–	4.5 – 5.5 V
	VTA – E2			Throttle valve fully closed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









- **IDL – E2 (w/ Variable resistor only)**

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

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

NO → Refer to No.1. (See page EG-62)

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

OK → Try another ECU.

BAD → Repair or replace.

Refer to No.1. (See page EG-62) → BAD → Repair or replace.

OK → ③ Check throttle position sensor.

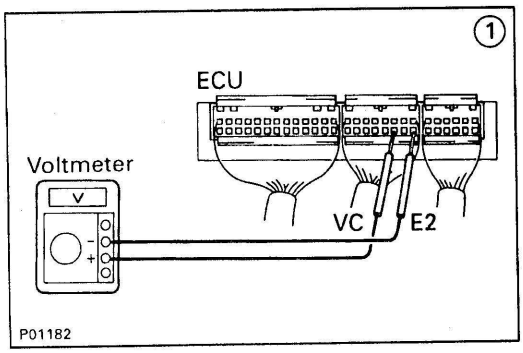
OK → Repair or replace throttle position sensor.

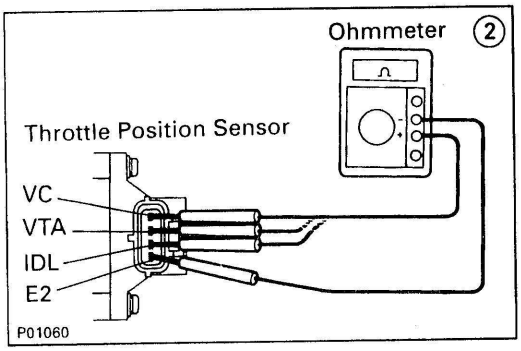
OK → Check wiring between ECU and throttle position sensor.

BAD → Repair or replace.

OK → Try another ECU.

V07720





- **VC – E2**

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

↓

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

↓ NO → Refer to No.1. (See page EG-62)

↓

② Check throttle position sensor.

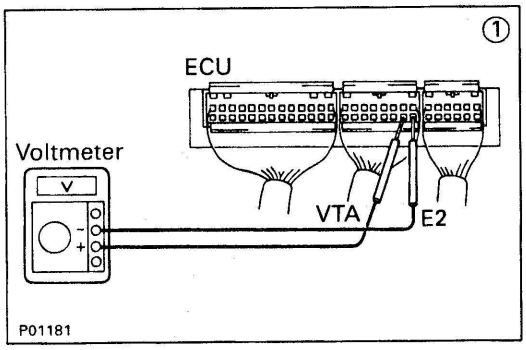
↓ BAD → Repair or replace.

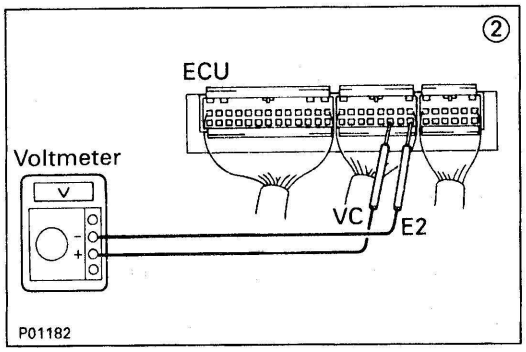
↓ OK → Check wiring between ECU and throttle position sensor.

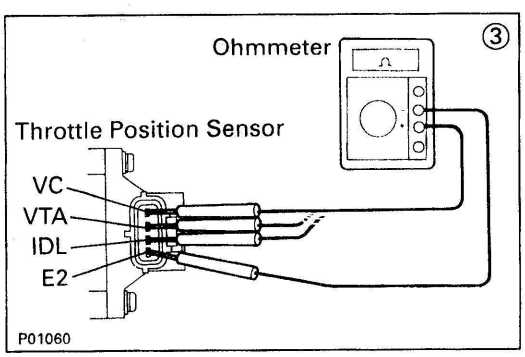
↓ OK → Try another ECU.

↓ BAD → Repair or replace wiring.

V07724







- **VTA – E2**

① There is no specified voltage at ECU terminals VTA and E2. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminals VC and E2. **(IG SW ON)**

↓ NO → Refer to VC – E2 trouble section.

↓ OK

↓ OK

③ Check throttle position sensor. → BAD → Repair or replace.

↓ OK

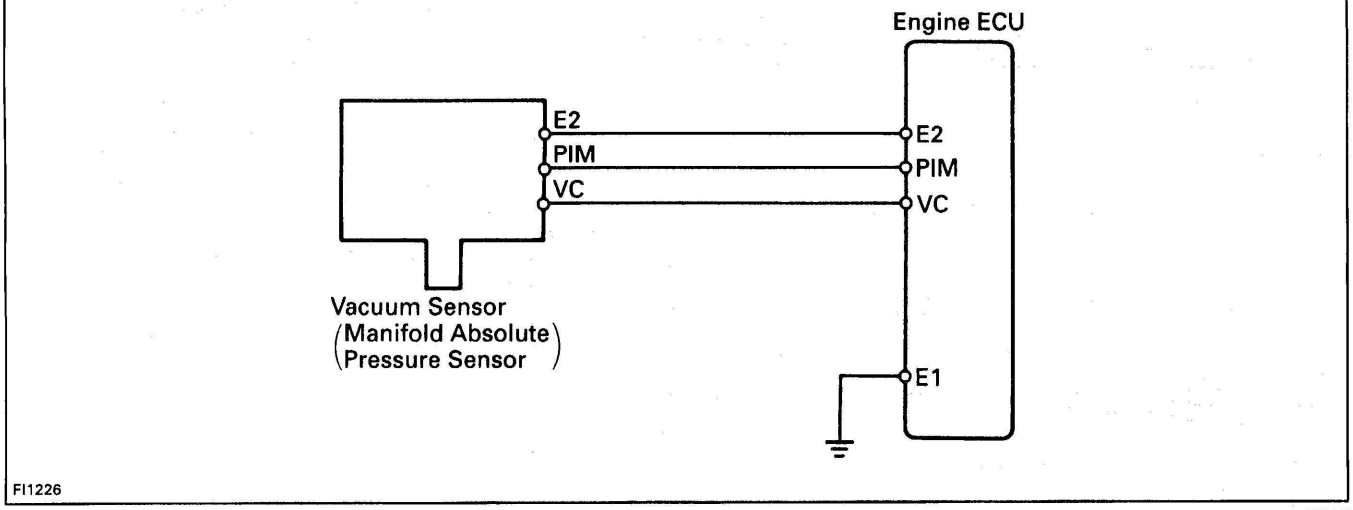
Check wiring between ECU and throttle position sensor. → BAD → Repair or replace.

↓ OK

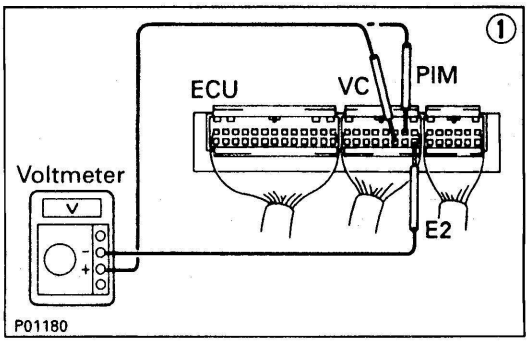
Try another ECU.

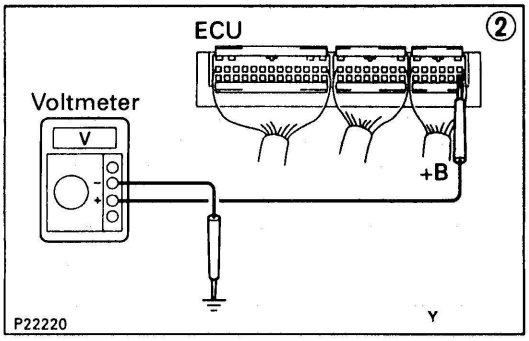
V06694

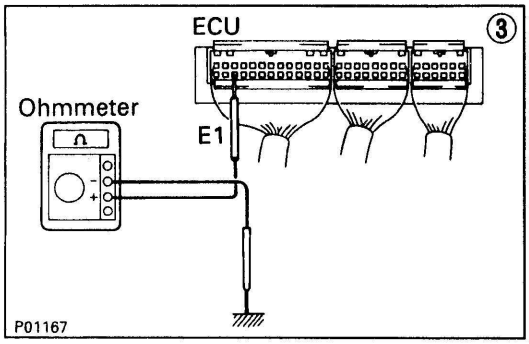
No.	Terminals	Trouble	Condition	STD voltage
4	PIM – E2	No voltage	IG SW ON	3.3 – 3.9 V
	VC – E2			4.5 – 5.5 V



V06419







① There is no voltage between ECU terminals PIM or VC and E2. **(IG SW ON)**

↓

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

OK ↓ / NO → Refer to No.1. (See page EG-62)

↓

③ Check wiring between ECU terminal E1 and body ground.

OK ↓ / BAD → Repair or replace.

Check vacuum sensor.

BAD ↓ / OK →

Replace vacuum sensor.

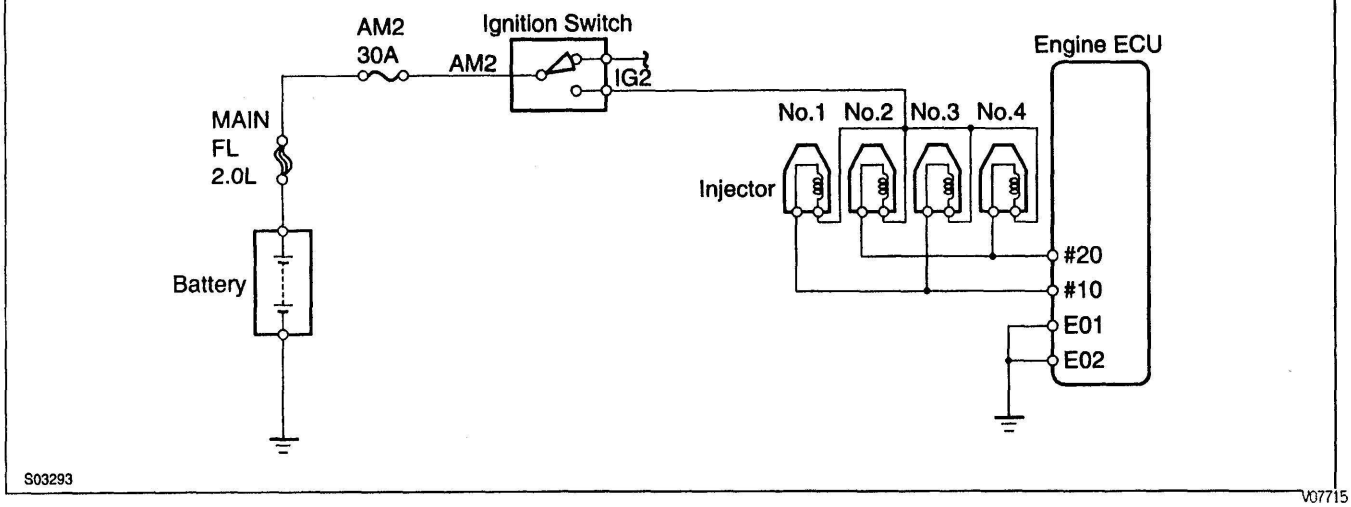
Check wiring between ECU and vacuum sensor.

OK ↓ / BAD → Repair or replace.

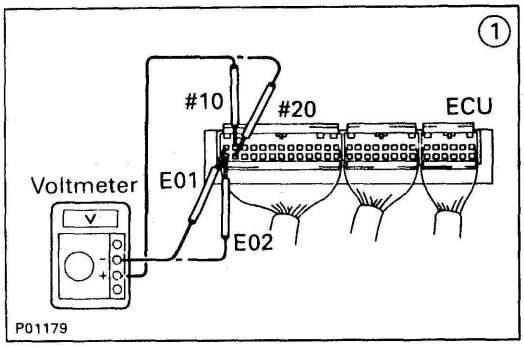
Try another ECU.

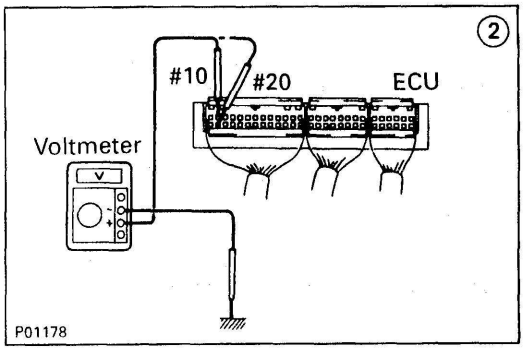
V06418

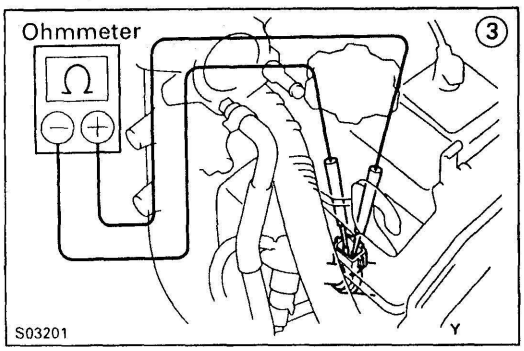
No.	Terminals	Trouble	Condition	STD voltage
5	#10 – E01 #20 – E02	No voltage	IG SW ON	9 – 14



V07715







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

② Check that there is voltage between ECU terminal #10 and/or #20 and body ground.

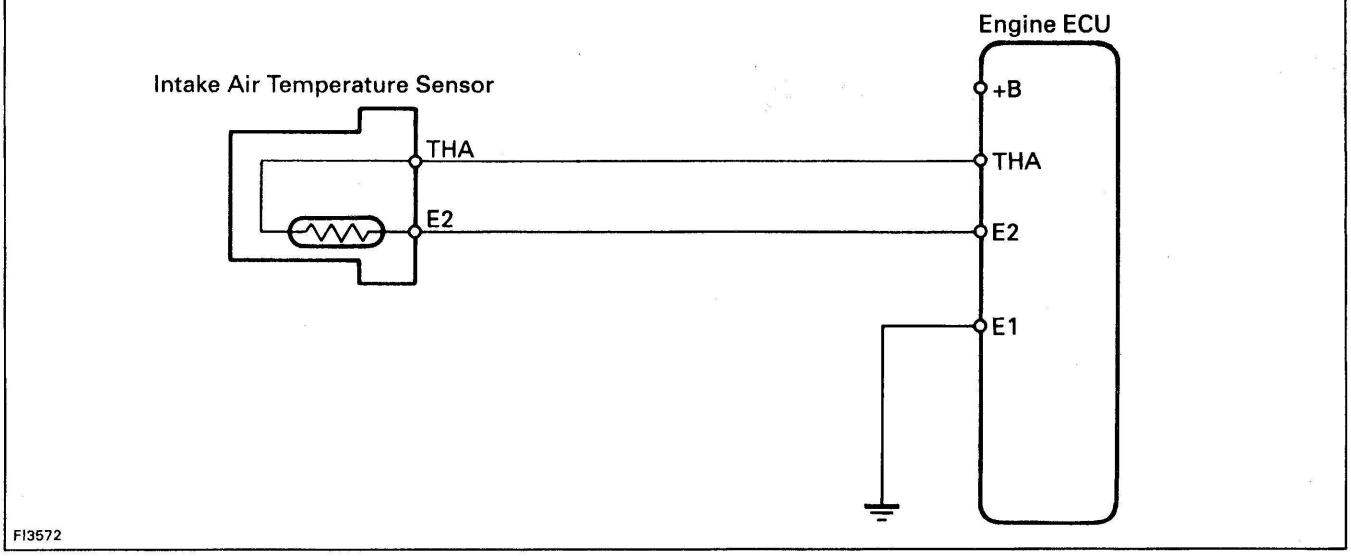
NO → Check wiring between ECU terminal E01 and/or E02 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

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

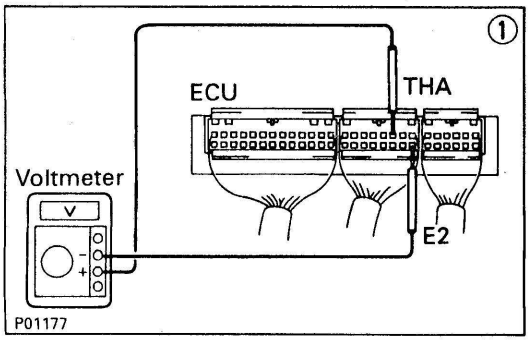
OK → ③ Check resistance of each injector.
STD resistance: 13.4 – 14.2 Ω
- OK → Check wiring between ECU terminal #10 and/or #20 and battery.
  - BAD → Repair or replace.
- OK → Replace injector.

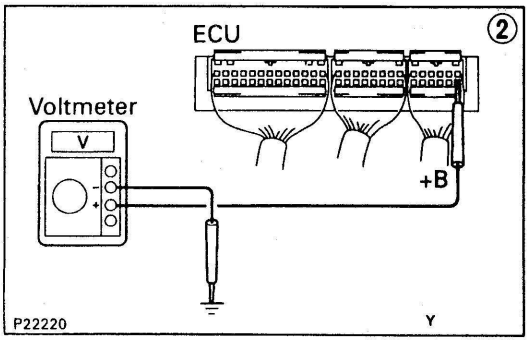
V07721

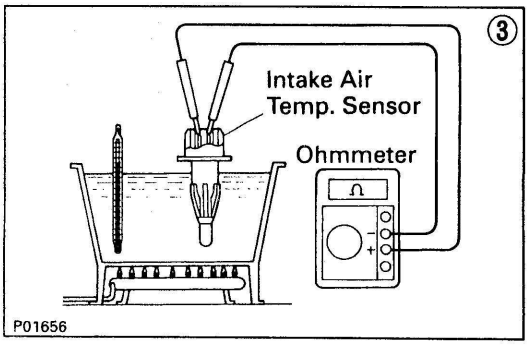
No.	Terminals	Trouble	Condition		STD voltage
6	THA – E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	0.5 – 3.4 V



V06422







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

↓

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

OK ↓

NO → Refer to No.1. (See page EG-62)

↓

Check wiring between ECU terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

↓

③ Check intake air temp. sensor.

BAD ↓

Replace intake air temp. sensor.

OK ↓

Check wiring between ECU and air temp. sensor.

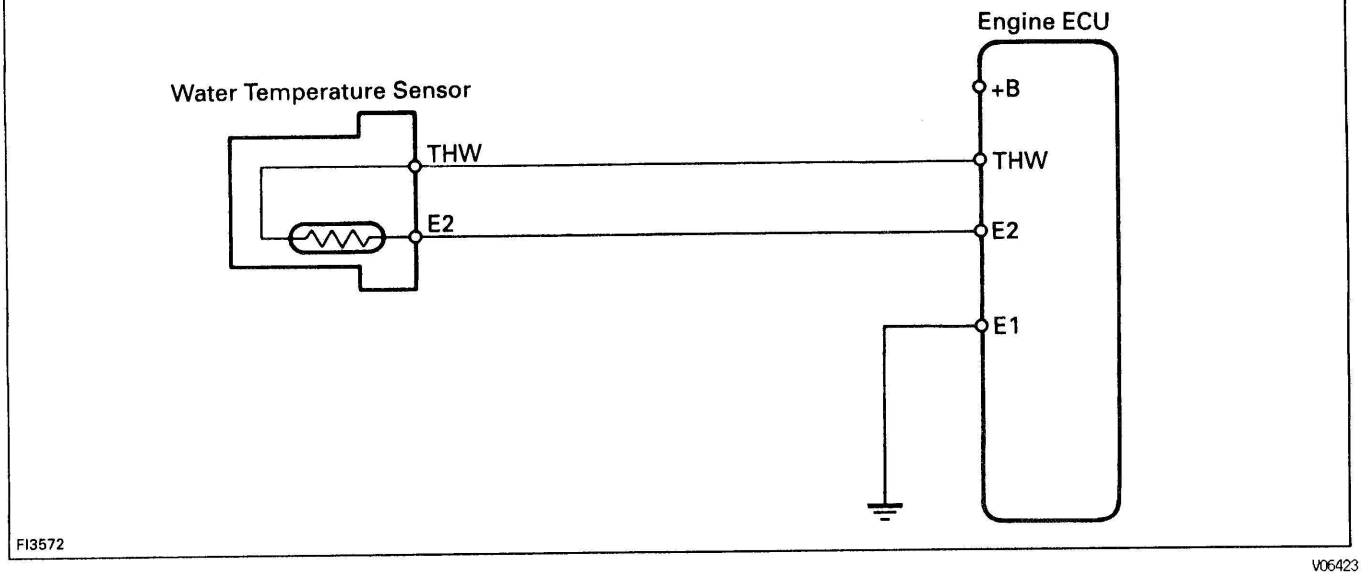
OK ↓

Try another ECU.

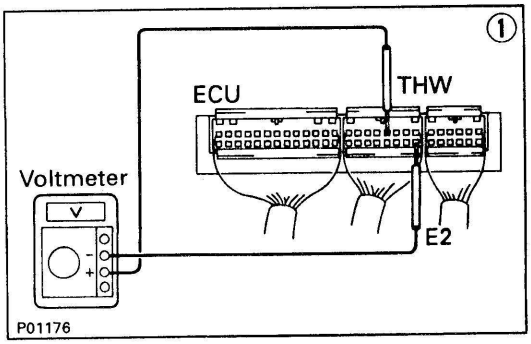
BAD → Repair or replace.

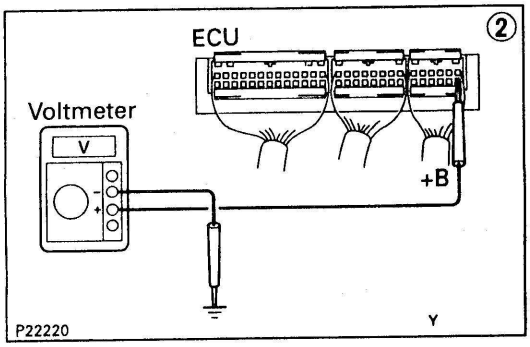
V06425

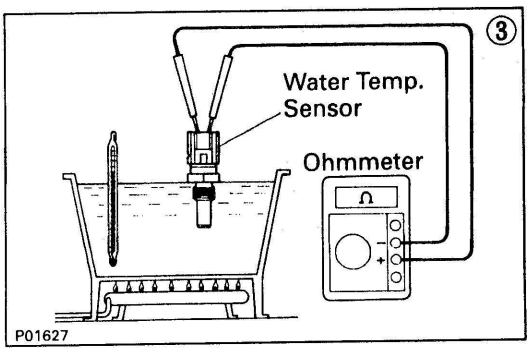
No.	Terminals	Trouble	Condition		STD voltage
7	THW – E2	No voltage	IG SW ON	Coolant temperature 80°C (176°F)	0.2 – 1.0 V



V06423







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

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

OK

NO → Refer to No.1. (See page EG-62)

Check wiring between ECU terminal E1 and body ground.

OK

BAD → Repair or replace.

③ Check water temp. sensor.

BAD → Replace water temp. sensor.

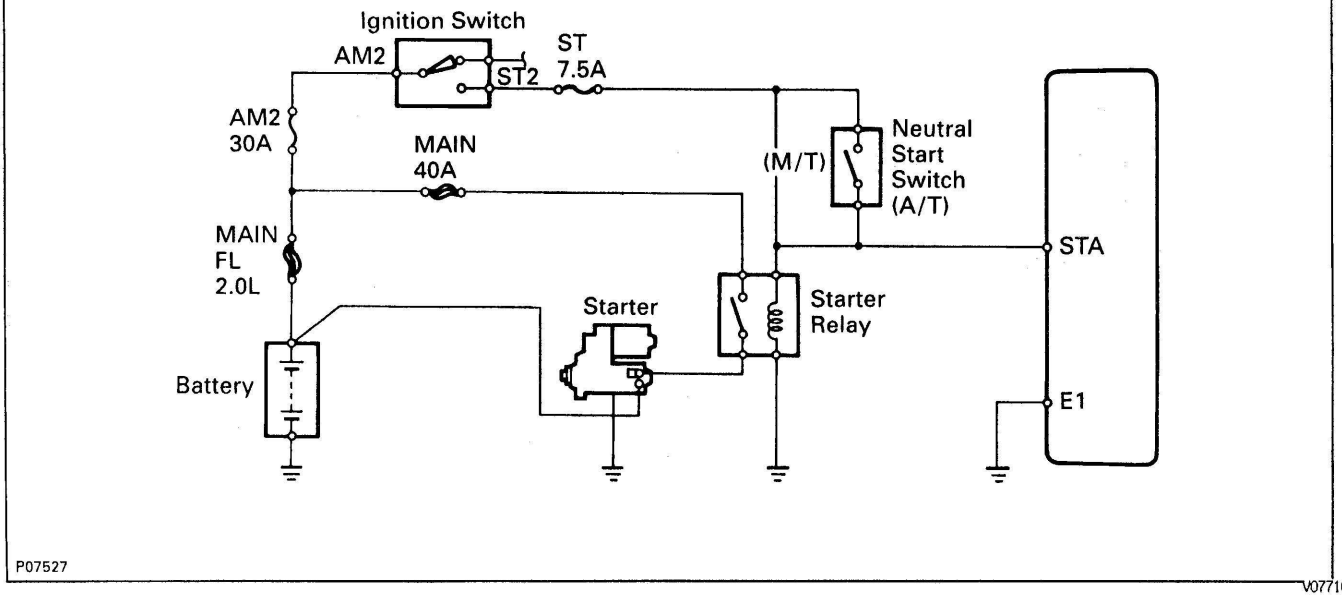
OK → Check wiring between ECU and water temp. sensor.

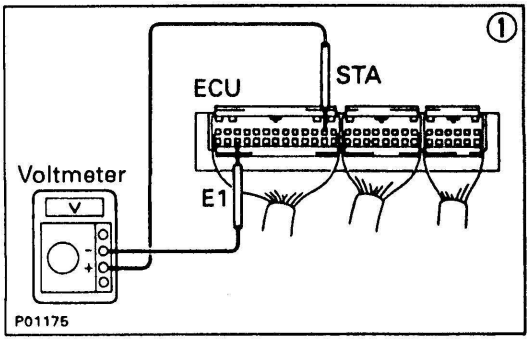
OK → Try another ECU.

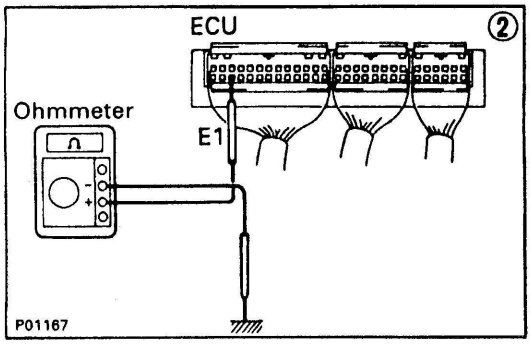
BAD → Repair or replace.

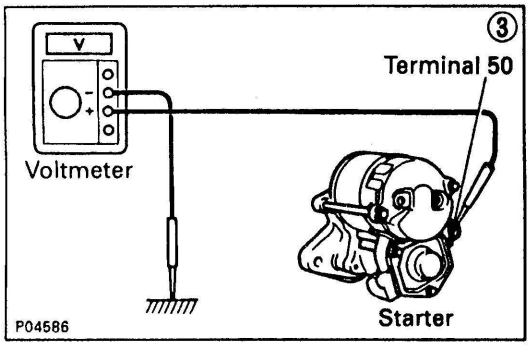
V06424

No.	Terminals	Trouble	Condition	STD voltage
8	STA – E1	No voltage	Cranking	6 V or more









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

Check starter operation. — OK → Check wiring between ECU terminal STA and ignition switch terminal ST2. — OK → ② Check wiring between ECU terminal E1 and body ground. — OK → Try another ECU. / BAD → Repair or replace.

ST2 — BAD → Repair or replace.

BAD → Check H-fuses, fusible link, battery, wiring, ignition switch and starter relay. — BAD → Repair or replace.

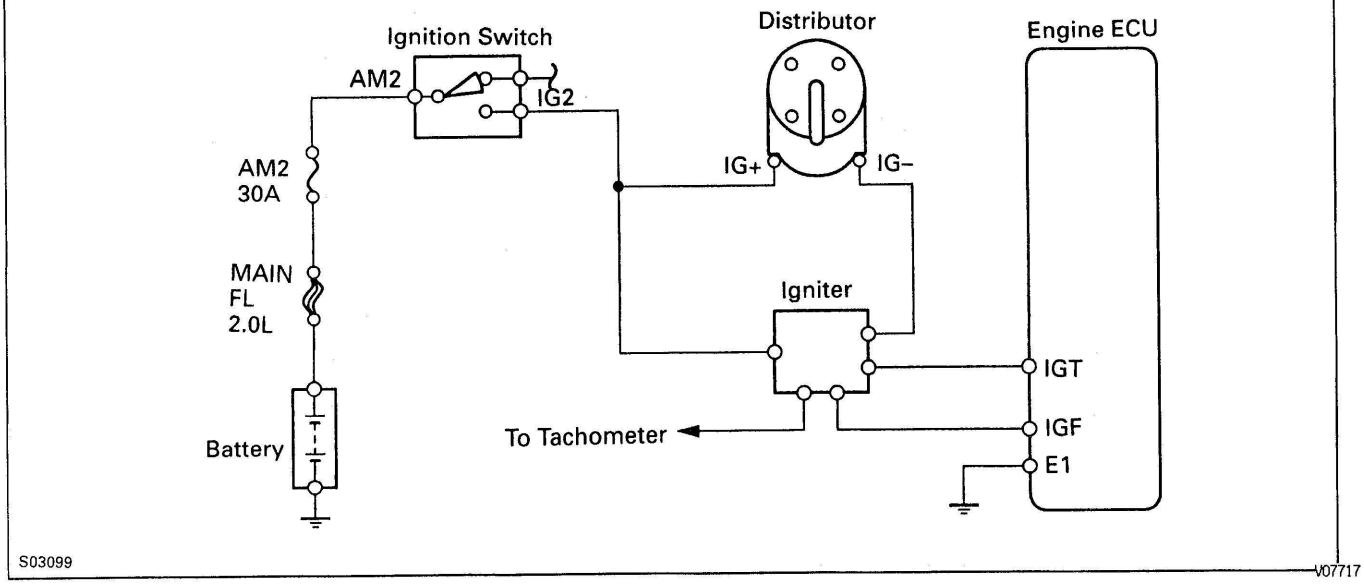
OK → ③ Check that there is voltage at starter terminal 50. **(IG SW START) STD voltage: 6 – 14 V**

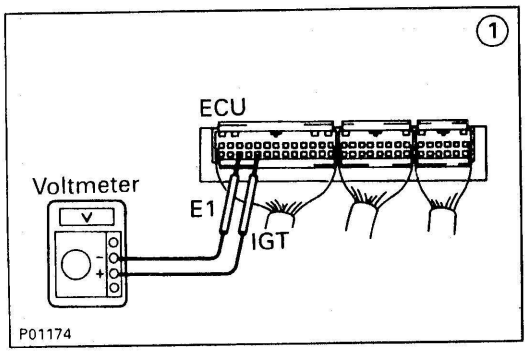
OK → Check starter.

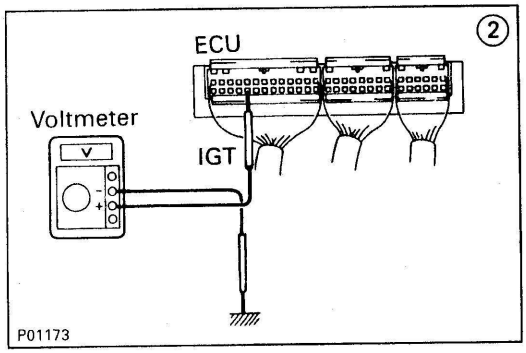
NO → Check wiring between ignition switch terminal ST2 and starter terminal 50.

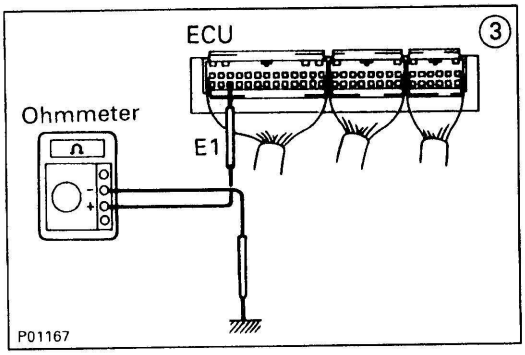
V06427

No.	Terminals	Trouble	Condition	STD voltage
9	IGT – E1	No voltage	Idling	Pulse generation









① There is no voltage between ECU terminals IGT and E1.

↓

② Check that there is voltage between ECU terminal IGT and body ground.

NO ← ② → OK

OK → ③ Check wiring between ECU terminal E1 and body ground. → BAD → Repair or replace.

③ → OK → Try another ECU.

↓

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

↓ OK

Check distributor. → BAD → Repair or replace.

↓ OK

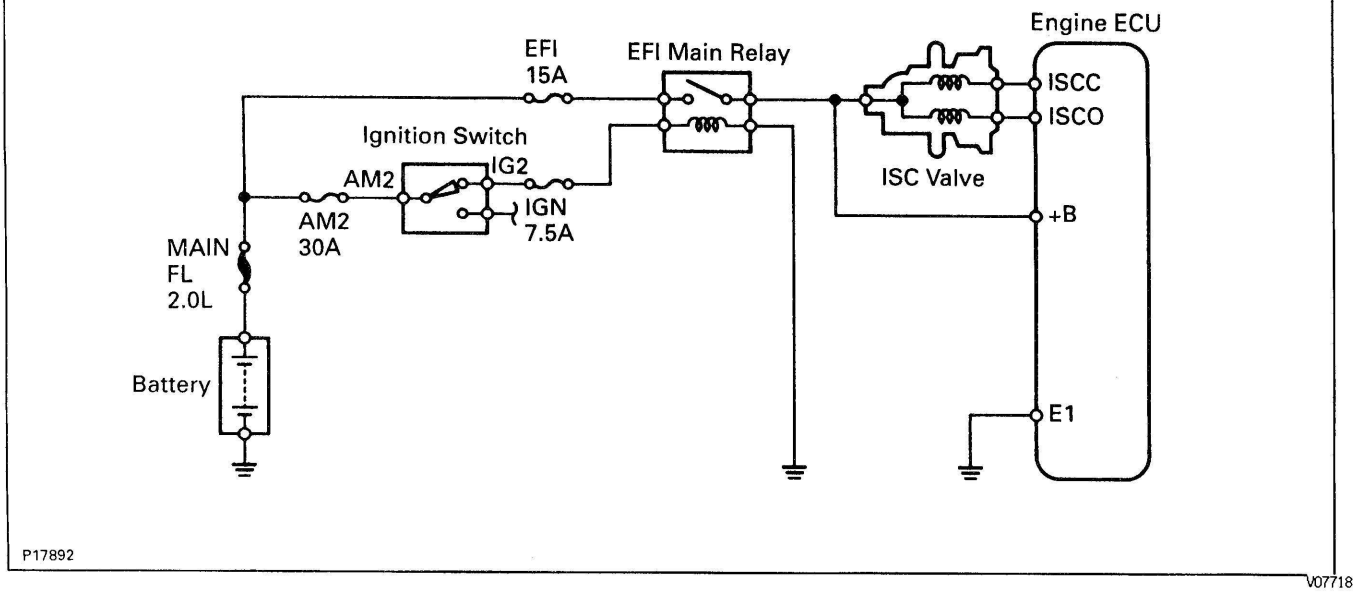
Check wiring between ECU and battery. → BAD → Repair or replace.

↓ OK

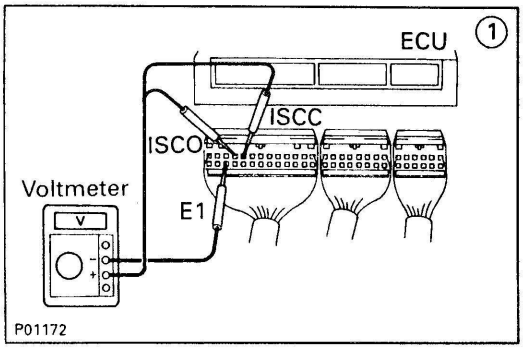
Check igniter. → BAD → Repair or replace.

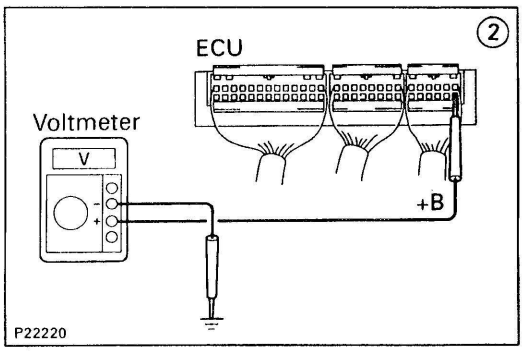
V07722

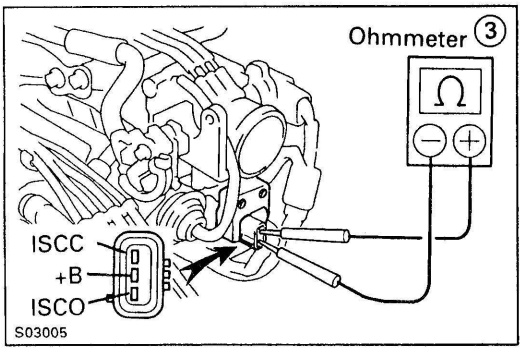
No.	Terminals	Trouble	Condition		STD voltage
10	ISCC – E1 ISCO	No voltage	IG SW ON	Engine ECU connecters disconnected	9 – 14 V



V07718







① There is no voltage between terminals ISCC or ISCO and E1 or ECU connector.
(IG SW ON, Engine ECU connectors disconnected)

↓

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

OK ↓ / BAD → Refer to No.1. (See page EG-62)

↓ OK

③ Check resistance between ISC valve terminals +B and ISCC or ISCO.
STD resistance:
Cold: 17.0 – 24.5 Ω
Hot: 21.5 – 28.5 Ω

BAD → Replace ISC valve.

↓ OK

Check wiring between ECU and ISC valve.

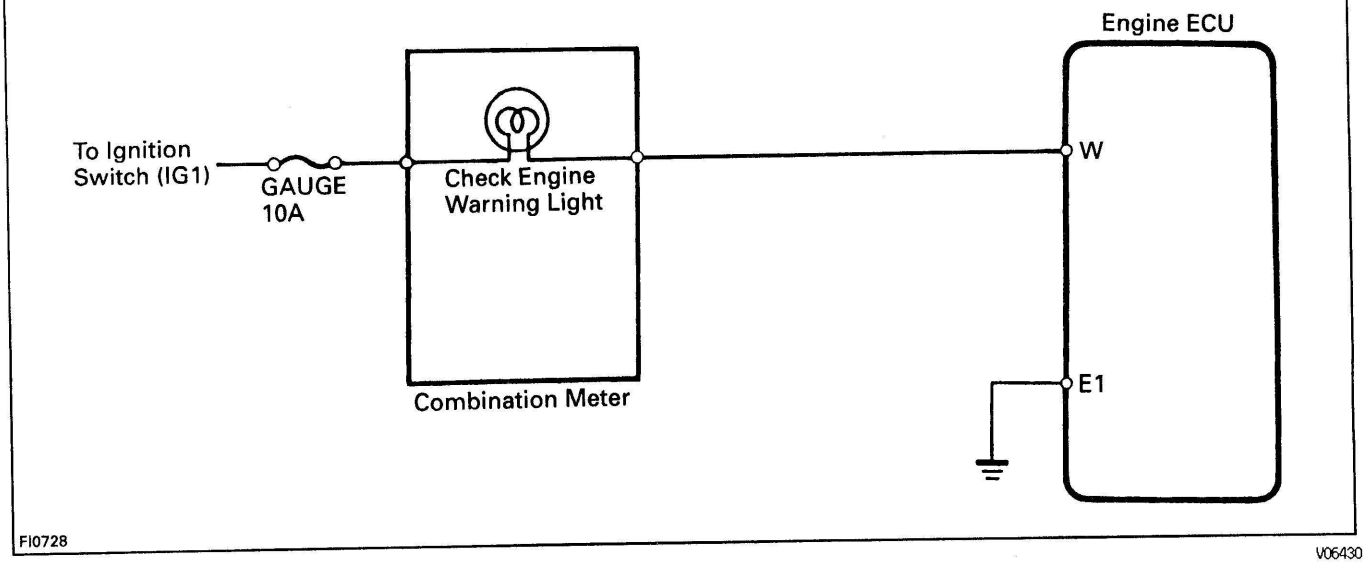
BAD → Repair or Replace wiring.

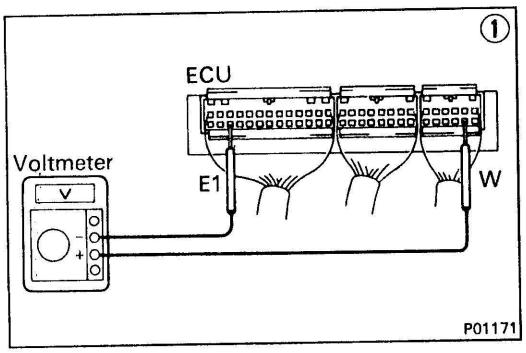
↓ OK

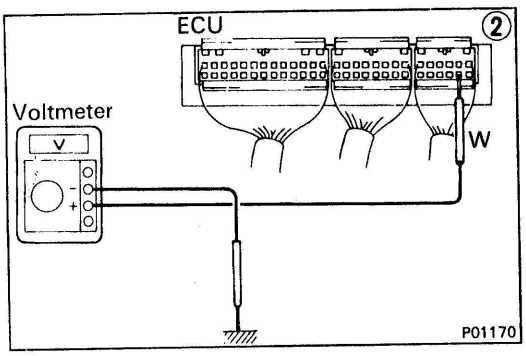
Try another ECU.

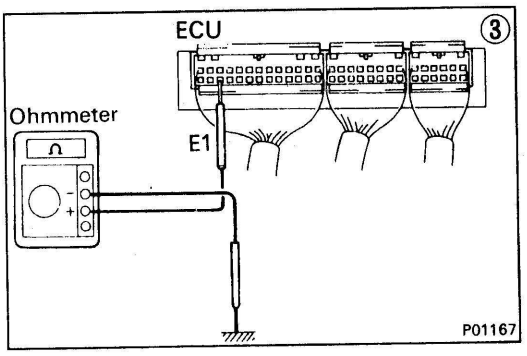
V07723

No.	Terminals	Trouble	Condition	STD voltage
11	W – E1	No voltage	No trouble (Check engine warning light off) and engine running.	9 – 14 V









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

↓

② Check that there is voltage between ECU terminal W and body ground.

NO ← ② → OK

OK → ③ Check wiring between ECU terminal E1 and body ground.

③ → OK → Try another ECU.

③ → BAD → Repair or replace.

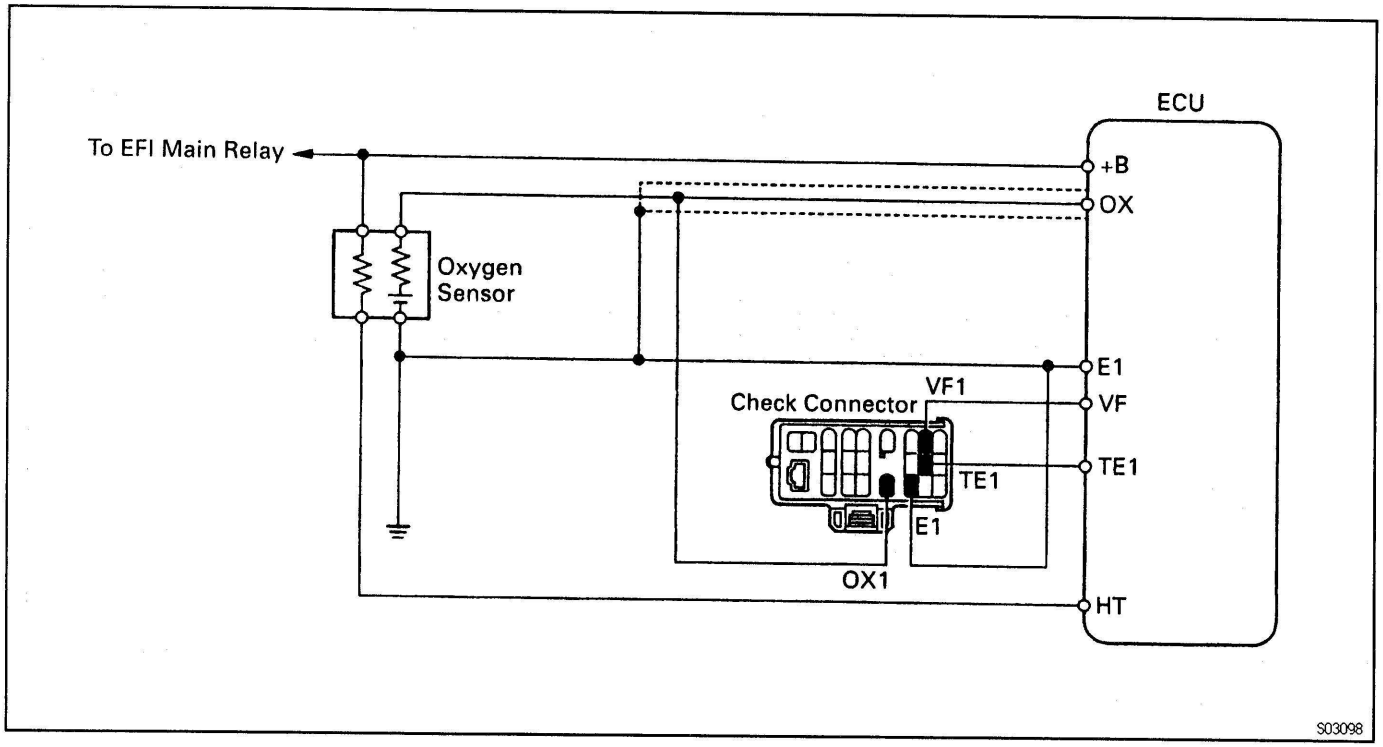
NO → Check GAUGE fuse (10A) and check engine warning light.

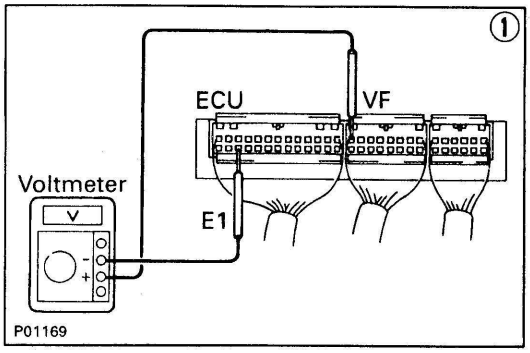
OK → BAD → Repair or replace.

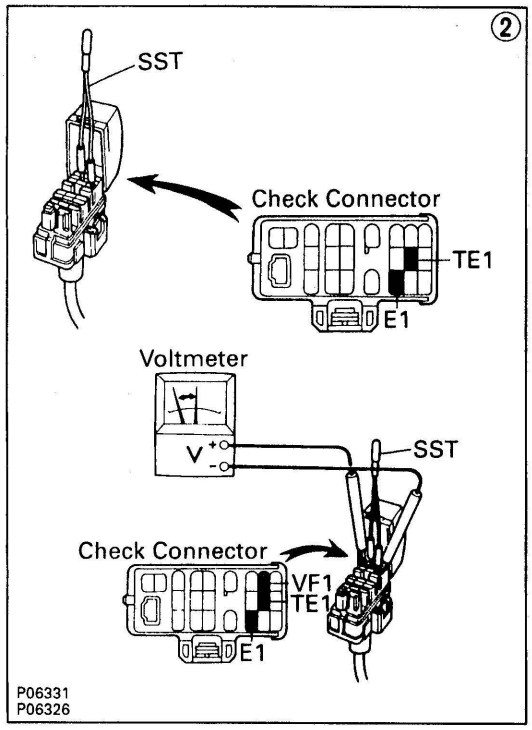
Fuse blows again → Check wiring between ECU terminal W and fuse.

BAD → Repair or replace.

V01155







① There is no voltage between ECU terminals VF and E1.

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

NO → OK: Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check for suction of air into exhaust system. BAD → Repair or replace.

OK

Check for air leak from air intake system. BAD → Repair or replace.

OK

Check spark plugs. BAD → Repair or replace.

OK

Check ignition system. BAD → Repair or replace.

OK

Check fuel pressure. BAD → Repair or replace.

OK

Check injectors. BAD → Repair or replace.

OK

Check vacuum sensor. BAD → Repair or replace.

OK

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

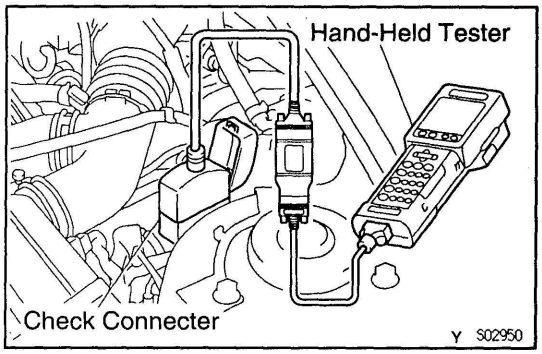
BAD

Check wiring between oxygen sensor and ECU connectors. BAD → Repair wiring.

OK

Repair oxygen sensor.

V06741



REFERENCE VALUE OF ENGINE ECU DATA

EG39Z–0L

HINT: Engine ECU data can be monitored by hand–held tester.

1. Hook up the hand–held tester to the check connector.
2. Monitor engine ECU data by following the prompts on the tester screen.
   Please refer to the hand–held tester operator's manual for further details.

REFERENCE VALUE FOR ENGINE ECU DATA
(Engine at normal operating temp.)

EG8ZG–04

Item	Inspection condition	Reference value
INJECTOR	Engine cold to hot Engine idling at normal operating temp.*1	Gradually decreases Approx. 2 – 4 msecs
IGNITION	Increase engine speed	Gradually increases
ISC DUTY	Engine idling at normal operating temp.*1 A/C switch ON A/T shifting in "D" position	Approx. 32 – 42 % Duty ratio increases Duty ratio increases
ENGINE SPD	RPM kept stable (Comparison with tachometer)	No great changes
INTAKE MAN.	Engine idling at normal operating temp.*1 Increase engine speed	Approx. 160 – 350 mmHg Gradually increases
COOLANT TEMP.	Engine at normal operating temp.	75 – 95°C (167 – 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/F L*3	Engine idling at normal operating temp.	2.50 ± 0.7 V *4
A/F FB LEFT *3	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
IDL SIGNAL	Closed throttle position	ON
A/C SIGNAL	A/C switch ON	ON
NSW SIGNAL *5	When shifting from "P" or "N" position into a position other than "P" or "N"	GEAR
Ox L*3	RPM stable at 2,500 rpm with normal operating temp.	RICH LEAN is repeated

*1: All accessories and A/C are switch OFF.
*2: If the water temperature sensor circuit is open or shorted, the engine ECU assumes an engine coolant temp. value of 80°C (176°F).
*3: w/ oxygen sensor only.
*4: When feedback control is forbidden, 0 V is displayed.
*5: A/T only.

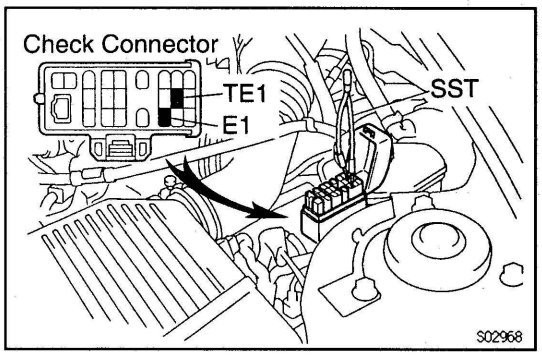
ISC VALVE

ON–VEHICLE INSPECTION

EQ54T–04

1. INSPECT ISC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position



(b) Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020

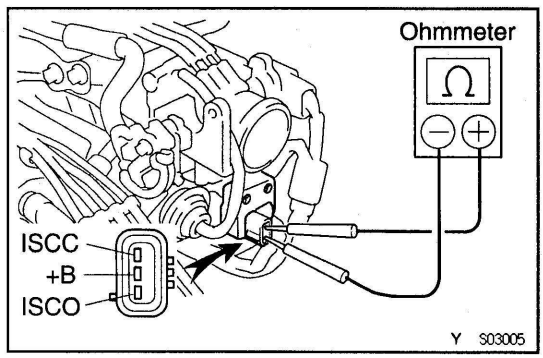
(c) After engine speed are kept at 900 – 1,300 rpm for 5 seconds, check that they return to idle speed.
If the rpm operation is not as specified, check the ISC valve, wiring and ECU.

(d) Remove the SST from the check connector.
SST 09843–18020

2. INSPECT ISC VALVE RESISTANCE

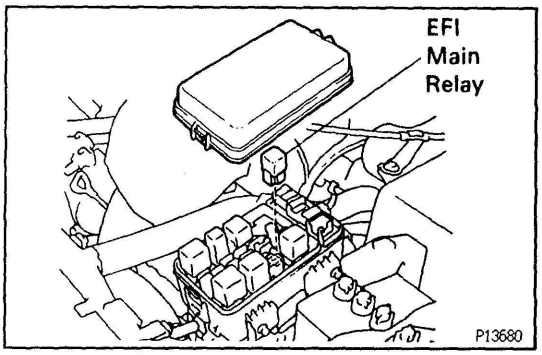
NOTICE: "Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

(a) Disconnect the ISC valve connector.



(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (ISCC, ISCO).
Resistance:
Cold: 17.0 – 24.5 Ω
Hot: 21.5 – 28.5 Ω
If resistance is not as specified, replace the ISC valve.

(c) Reconnect the ISC valve connector.



EFI MAIN RELAY

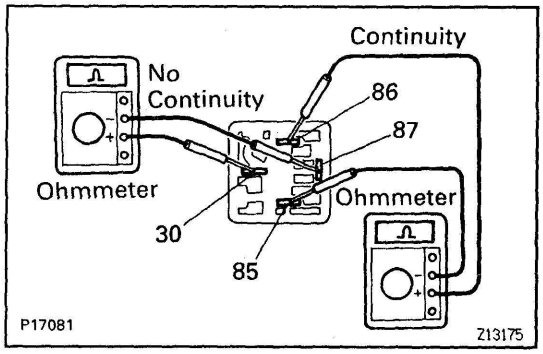
EFI MAIN RELAY (Marking: EFI)

EG13W-0W

INSPECTION

1. **REMOVE EFI MAIN RELAY**

LOCATION: In the engine compartment relay box.

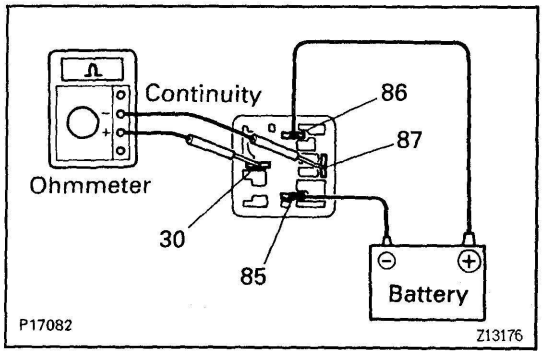


2. **INSPECT EFI MAIN RELAY**

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 86 and 85.
If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 87 and 30.
If there is continuity, replace the relay.

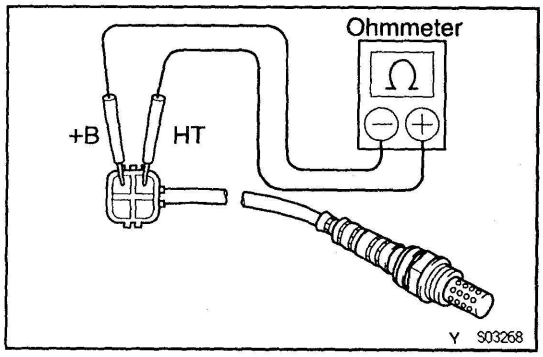


B. Inspect relay operation

(a) Apply battery voltage across terminals 86 and 85.

(b) Using an ohmmeter, check that there is continuity between terminals 87 and 30.
If there is no continuity, replace the relay.

3. **REINSTALL EFI MAIN RELAY**



OXYGEN SENSOR

OXYGEN SENSOR INSPECTION

EG72X-01

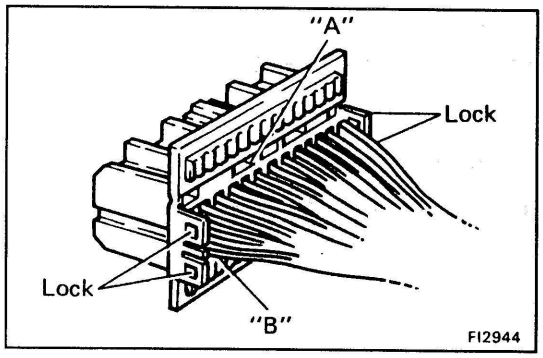
INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

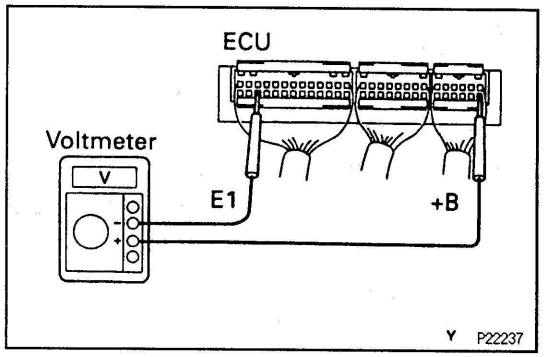
Using an ohmmeter, measure the resistance between terminals +B and HT.

Resistance:

At 20°C (68°F): 11 – 16 Ω

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





ENGINE ECU

ENGINE ECU INSPECTION

EG78Y–01

HINT: The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors ofthe ECU.

1. PREPARATION

(a) Disconnect the three connectors from the ECU.

(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.

NOTICE: Pay attention to sections A and B in the illustration which can easily broken.

(c) Reconnect the three connectors to the ECU.

2. INSPECT VOLTAGE OF ECU

(a) Turn the ignition switch ON.

(b) Measure the voltage between each terminal of the wiring connectors.

HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

ECU Wiring terminals

M/T w/o VARIABLE RESISTOR

E01	#10		ISCO	ISCC				G+	NE+	IGF	STA	
E02	#20	E1	IGT				EGR	G-	NE-			HT

VF	TE2	OX		THW	THA	PIM	IMI
	TE1	KNK			VC	VTA	E2

ACT		FC		BATT	
ELS	SPD	AC1	IMO	W	+B

P01821

M/T w/ VARIABLE RESISTOR

E01	#10		ISCO	ISCC		R/P		G+	NE+	IGF	STA	VISC
E02	#20	E1		IGT				G-	NE-			

VF	TE2		KNK	THW	THA	PIM	VAF
	TE1			IDL	VC	VTA	E2

ACT		FC		BATT	
ELS	SPD	AC1		W	+B

P01821

A/T w/o VARIABLE RESISTOR

E01	#10	#20	ISCO	ISCC	SNO WL			NE-	NE+	IGF	S1	SL
E02		HT	EGR		IGT			G+	G-		S2	E1

VF	TT	OX		THW	THA	PIM	VC
	TE1	TE2	KNK		VTA		E2

STA	AC1	SPD	SNO WL	OD2	P	W	B/K	KD	ELS	BATT
NSW	ACT		L	2	SEL	IMI	IMO	FC		+B

A/T w/ VARIABLE RESISTOR

FI2796

E01	#10	#20	ISCO	ISCC		VISC		NE-	NE+	IGF	S1	SL
E02					IGT			G+	G-		S2	E1

VF	TT	VAF		THW	THA	PIM	VC
	TE1	TE2	KNK	IDL	VTA		E2

STA	AC1	SPD		OD2	P	W	B/K		ELS	BATT
NSW	ACT		L	2	R/P			FC		+B

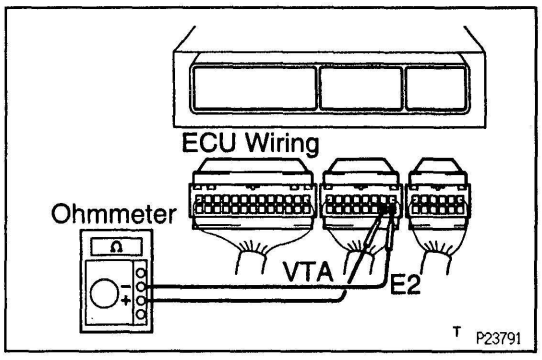
FI2796

Z18010

ECU Wiring Connectors Voltage

Terminals	Condition	STD voltage (V)
+B – E1	IG SW ON	9 – 14
BATT – E1	–	9 – 14
IDL – E2 *1	IG SW ON (Throttle valve open)	9 – 14
VTA – E2	IG SW ON (Throttle valve fully closed)	0.3 – 0.8
VTA – E2	IG SW ON (Throttle valve fully open)	3.2 – 4.9
PIM – E2	IG SW ON	3.3 – 3.9
VC – E2	IG SW ON	4.5 – 5.5
#10 – E01, E02	IG SW ON	9 – 14
#20 – E01, E02	IG SW ON	9 – 14
THA – E2	IG SW ON (Intake air temp. 20°C (68°F))	0.5 – 3.4
THW – E2	IG SW ON (Engine coolant temp. 80°C (176°F))	0.2 – 1.0
STA – E1	Cranking	6 or more
IGT – E1	IG SW ON (Igniter connector disconnected)	4.5 – 5.5
ISCC – E1	IG SW ON (ECU connectors disconnected)	9 – 14
ISCO – E1	IG SW ON (ECU connectors disconnected)	9 – 14
W – E1	No trouble (Check engine warning light off) and engine running	9 – 14
NSW – E1 *2	IG SW ON (Other shift position in "P" or "N")	9 – 14
NSW – E1 *2	IG SW ON (Shift position in "P" or "N")	0 – 3
TE1 – E1	IG SW ON (Check connector TE1 – E1 not connected)	9 – 14
TE1 – E1	IG SW ON (Check connector TE1 – E1 connected)	3 or less
TE2 – E1	IG SW ON (Check connector TE2 – E1 not connected)	9 – 14
TE2 – E1	IG SW ON (Check connector TE2 – E1 connected)	3 or less
IMI – E1 *3	Several seconds after engine starting	Pulse generation
IMO – E1 *3	Several seconds after engine starting	Pulse generation

*1: w/ Variable resistor only
*2: w/ A/T only
*3: w/ Engine immobiliser system



3. INSPECT RESISTANCE OF ECU

(a) Turn the ignition switch OFF.
(b) Disconnect the 3 connectors from the ECU.
(c) Measure the resistance between each terminal of the wiring connectors.

NOTICE:

- **Do not touch the ECU terminals.**
- **The tester probe should be inserted in the wiring connector from the wiring side.**

ECU Wiring Connectors Resistance

Terminals	Condition	STD resistance (Ω)
IDL – E2 *	Throttle valve fully open	Infinity
IDL – E2 *	Throttle valve fully closed (Throttle opener must be cancelled first)	2,300 or less
VTA – E2	Throttle valve fully open	2,000 – 10,200
VTA – E2	Throttle valve fully closed (Throttle opener must be cancelled first)	200 – 5,700
VC – E2	–	2,500 – 5,900
THA – E2	Intake air temp. 20°C (68°F)	2,000 – 3,000
THW – E2	Coolant temp. 80°C (176°F)	200 – 400
G+ – G–	Cold (–10°C (14°F) to 50°C (122°F))	185 – 275
G+ – G–	Hot (50°C (122°F) to 100°C (212°F))	240 – 325
NE – NE–	Cold (–10°C (14°F) to 50°C (122°F))	370 – 550
NE – NE–	Hot (50°C (122°F) to 100°C (122°F))	475 – 650
ISCC – +B	Cold (–10°C (14°F to 50°C (122°F))	17.0 – 24.5
ISCC – +B	Hot (50°C (122°F to 100°C (212°F))	21.5 – 28.5
ISCO – +B	Cold (–10°C (14°F to 50°C (122°F))	17.0 – 24.5
ISCO – +B	Hot (50°C (122°F to 100°C (212°F))	21.5 – 28.5
EGR – +B	–	33 – 39

*: w/ Variable resistor only

SERVICE SPECIFICATIONS

SERVICE DATA

EGOZA–10

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)
Fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Injector	Resistance		13.4 – 14.2 Ω
	Injection volume		49 – 59 cm³ (3.0 – 3.6 cu in.) per 15 sec.
	Difference between each cylinder		5 cm³ (0.3 cu in.) or less
	Fuel leakage		One drop or less per minute
Throttle body	Throttle body fully closed angle		6°
	Throttle opener setting speed		1,300 – 1,500 rpm (w/ Cooling fan OFF)
Throttle position sensor	Clearance between stop screw and lever		
	0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
	0.50 mm (0.020 in.)	IDL – E2	2.3 kΩ or less
	0.70 mm (0.028 in.)	IDL – E2	Infinity
	Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
	–	VC – E2	2.5 – 5.9 kΩ
ISC valve	Resistance (+B – ISCC or ISCO)		
	at cold (–10°C (14°F) to 50°C (122°F))		17.0 – 24.5 Ω
	at hot (50°C (122°F) to 100°C (212°F))		21.5 – 28.5 Ω
VSV for EGR	Resistance		33 – 39 Ω
A/C idle–up valve	Resistance		30 – 34 Ω
Water Temp. 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
Intake Air Temp. 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
Oxygen sensor	Heater coil resistance		11 – 16 Ω
Fuel cut rpm	Fuel return rpm		1,500 rpm

SERVICE DATA (Cont'd)

ECU	Voltage		
	+B — E1	IG SW ON	9 — 14 V
	BATT — E1		9 — 14 V
	IDL — E2	IG SW ON (Throttle valve open)	9 — 14 V
	VTA — E2	IG SW ON (Throttle valve fully closed)	0.3 — 0.8 V
		IG SW ON (Throttle valve fully open)	3.2 — 4.9 V
	PIM — E2	IG SW ON	3.3 — 3.9 V
	VC — E2	IG SW ON	4.5 — 5.5 V
	#10 or #20 — E01	IG SW ON	9 — 14 V
	#10 or #20 — E02	IG SW ON	9 — 14 V
	THA — E2	IG SW ON (Intake air temp. 20°C (68°F))	0.5 — 3.4 V
	THW — E2	IG SW ON (Coolant temp. 80°C (176°F))	0.2 — 1.0 V
	STA — E1	Cranking	6 V or more
	IGT — E1	Idling	Pulse generation
	ISCC — E1	IG SW ON (ECU connectors disconnected)	9 — 14 V
	ISCO — E1	IG SW ON (ECU connectors disconnected)	9 — 14 V
	W — E1	No trouble (Check engine warning light off) and engine running	9 — 14 V
	TE1 — E1	IG SW ON (Check connector terminals TE1 — E1 not connected)	9 — 14 V
		IG SW ON (Check connector terminals TE1 — E1 connected)	0 — 3 V
	IMI — E1	Several seconds after engine starting	Pulse generation
	IMO — E1	Several seconds after engine starting	Pulse generation
	Resistance		
	IDL — E2	at throttle valve open	Infinity
		at throttle valve fully closed	2,300 Ω or less
	VTA — E2	at throttle valve fully open	2,000 — 10,200 Ω
		at throttle valve fully closed	200 — 5,700 Ω
	VC — E2		2,500 — 5,900 Ω
	THA — E2	at intake air temp. 20°C (68°F)	2,000 — 3,000 Ω
	THW — E2	at coolant temp. 80°C (176°F)	200 — 400 Ω
	G+ — G−	at cold (−10°C (14°F) to 50°C (122°F))	185 — 275 Ω
		at hot (50°C (122°F) to 100°C (212°F))	240 — 325 Ω
	NE+ — NE−	at cold (−10°C (14°F) to 50°C (122°F))	370 — 550 Ω
		at hot (50°C (122°F) to 100°C (212°F))	475 — 650 Ω
	+B — ISCC or ISCO	at cold (−10°C (14°F) to 50°C (122°F))	17.0 — 24.5 Ω
		at hot (50°C (122°F) to 100°C (212°F))	21.5 — 28.5 Ω

EQOEE–28

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Fuel line				
Union bolt type		29	300	22
Flare nut type	for SST	30	310	22
Fuel pump x Fuel tank		4.0	40	35 in.·lbf
Fuel pressure regulator x Delivery pipe		5.4	55	48 in.·lbf
Fuel return pipe x Fuel pressure regulator		19	195	14
Delivery pipe x Cylinder head		13	130	9
Cylinder head x Grommet		44	450	33
Fuel inlet pipe x Delivery pipe		34	350	25
Pulsation damper x Delivery pipe		34	350	25
	for SST	29	300	22
Throttle body x Intake manifold		19	195	14
No.1 Intake manifold stay x Intake manifold		42	425	31
No.2 Intake manifold stay x Cylinder head		42	425	31
EGR valve x Intake manifold	for Nut	13	130	9
	for Union nut	59	600	43
Knock sensor x Cylinder block		44	450	33
Oxygen sensor x Exhaust manifold		44	450	33

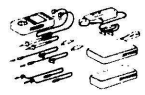
COOLING SYSTEM

PREPARATION

RECOMMENDED TOOLS

EG12V–0K

EG

	09082–00050 TOYOTA Electrical Tester Set.	

EQUIPMENT

EG12W–0N

Heater	Thermostat
Thermometer	Thermostat
Radiator cap tester	
Torque wrench	

COOLANT

EG12X–0U

Item		Capacity	Classification
Engine coolant			Ethylene–glycol base
w/o Heater	M/T	5.8 liters (6.1 US qts, 5.1 Imp. qts)	
	A/T	5.7 liters (6.0 US qts, 5.0 Imp. qts)	
w/ Heater	M/T	6.6 liters (7.0 US qts, 5.8 Imp. qts)	
	A/T	6.5 liters (6.9 US qts, 5.7 Imp. qts)	

COOLANT CHECK

EG738–01

1. CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR

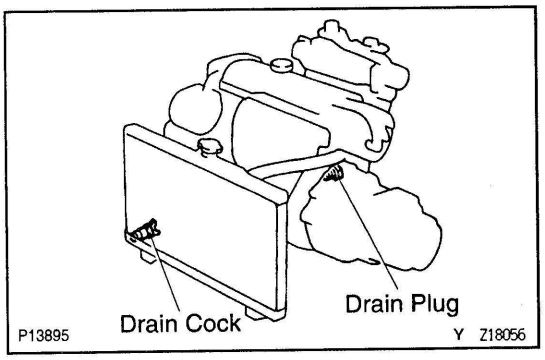
The engine coolant level should be between the "LOW" and "FULL" lines, when engine is cold.
If low, check for leaks and add engine coolant up to the "FULL" line.

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

EG73T-01

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 radiator drain cock (on the left side of the radiator lower tank) and engine drain plug (on the left rear of the cylinder block), and drain the coolant.

(c) Close the drain cock and drain plug.

Torque: Engine drain plug

25 N·m (250 kgf·cm, 18 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/o Heater

M/T: 5.8 liters (6.1 US qts, 5.1 Imp. qts)

A/T: 5.7 liters (6.0 US qts, 5.0 Imp. qts)

w/ Heater

M/T: 6.6 liters (7.0 US qts, 5.8 Imp. qts)

A/T: 6.5 liters (6.9 US qts, 5.7 Imp. qts)

(b) Install the radiator cap.

(c) Start the engine, and bleed the cooling system.

(d) Refill the radiator reservoir with coolant until it reaches the "FULL" line.

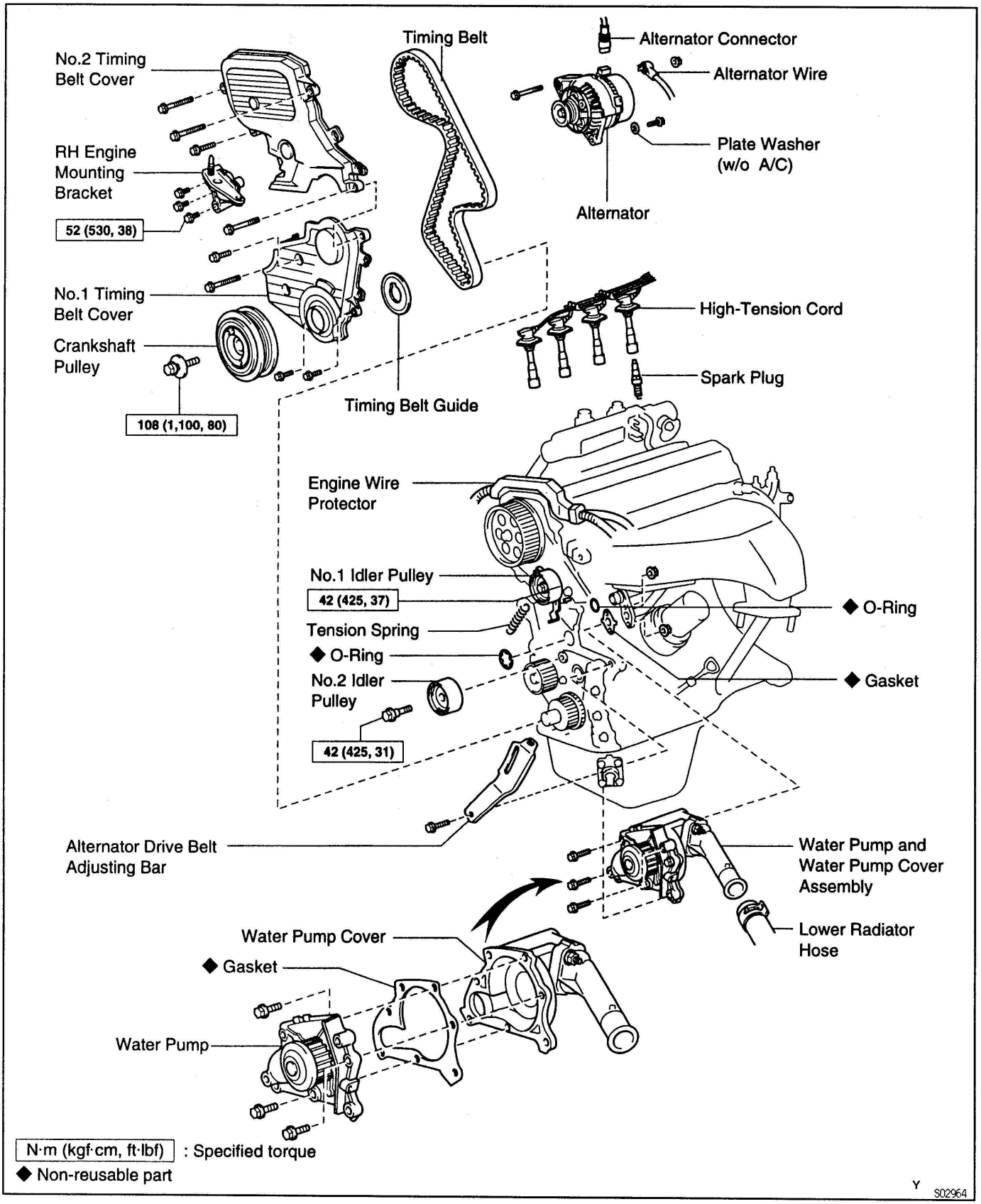
3. CHECK ENGINE COOLANT FOR LEAKS

EG

WATER PUMP

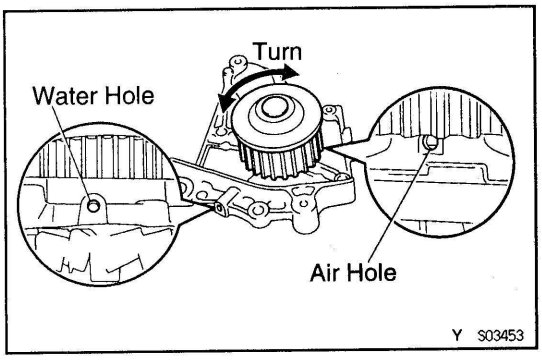
COMPONENTS FOR REMOVAL AND INSTALLATION

EG3VE–02



EG13A–0Q

WATER PUMP INSPECTION



INSPECT WATER PUMP

(a) Visually check the air hole and water hole for coolant leakage.
If leakage is found, replace the water pump.
If engine coolant has leaked onto the timing belt, replace the timing belt.

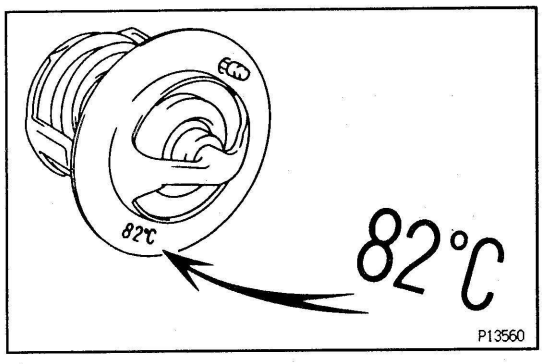
(b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.
If necessary, replace the water pump.

EG

EG6F2–04

TIMING BELT COMPONENTS INSPECTION

(See timing belt in Engine Mechanical)



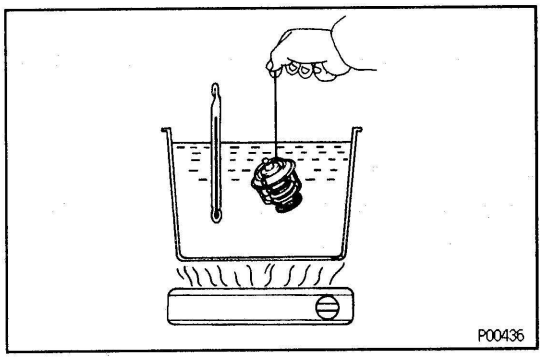
EG13H–0M

THERMOSTAT

THERMOSTAT INSPECTION

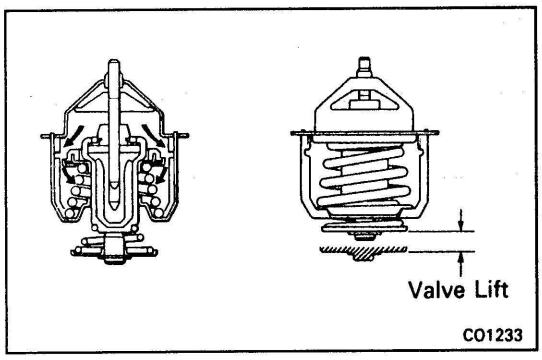
INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.



(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.
Valve opening temperature:
80 – 84°C (176 – 183°F)
If the valve opening temperature is not as specified, replace the thermostat.



(c) Check the valve lift.
Valve lift:
At 95°C (203°F): 8 mm (0.31 in.) or more
If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F)).
If not closed, replace the thermostat.

RADIATOR

RADIATOR CLEANING

EQ074–0K

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle and radiator core.)

EG

RADIATOR INSPECTION

EQ73U–01

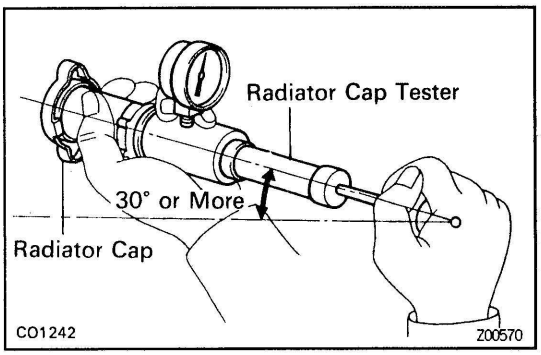
1. REMOVE RADIATOR CAP

CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

2. INSPECT RADIATOR CAP

NOTICE:

- **If the radiator cap has contaminations, always rinse it with water.**
- **When performing steps (a) and (b) below, keep the radiator cap 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 vacuum valve.

Pump speed:

1 push/(3 seconds or more)

NOTICE: Push the pump at a constant speed.

If air is not coming from the vacuum valve, replace the radiator cap.

(b) Pump the tester and measure the relief valve opening pressure.

Pump speed:

1 push within 1 second

NOTICE: This pump speed is for the first pump only (in order to close the vacuum valve). After this, the pump speed can be reduced.

Standard opening pressure:

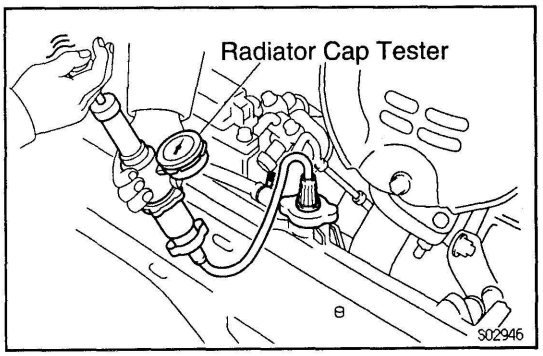
74–103 kPa (0.75–1.05 kgf/cm², 10.7 – 14.9 psi)

Minimum opening pressure:

59 kPa (0.6 kgf/cm², 8.5 psi)

HINT: Use the tester's maximum reading as the opening pressure.

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



3. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

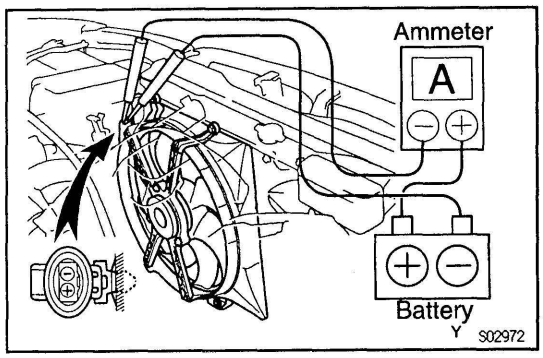
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP

ELECTRIC COOLING FAN

EG4QM-07

No.1 Cooling Fan



NO.1 COOLING FAN INSPECTION

INSPECT NO.1 COOLING FAN

(a) Disconnect the cooling fan connector.

(b) Connect battery and ammeter to the connector.

(c) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

Standard amperage (BOSCH):

2.9 – 4.1 A

Standard amperage (NIPPONDENSO):

M/T

6.0 – 7.4 A

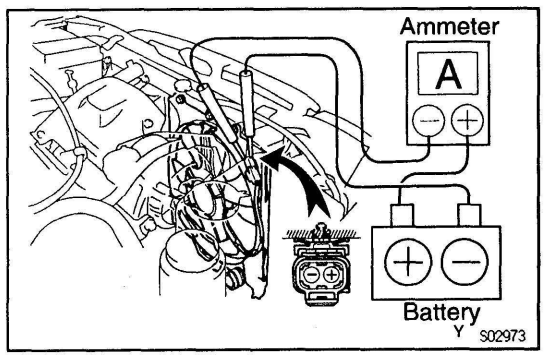
A/T

8.8 – 10.8

(d) Reconnect the cooling fan connector.

EG4QP-06

No.2 Cooling Fan (w/ A/C)



NO.2 COOLING FAN INSPECTION

INSPECT NO.2 COOLING FAN

(a) Disconnect the cooling fan connector.

(b) Connect battery and ammeter to the connector.

(c) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

Standard amperage:

6.0 – 7.4 A

(d) Reconnect the cooling fan connector.

SERVICE SPECIFICATIONS

SERVICE DATA

EG07L–1V

Thermostat	Valve opening temperature		80 – 84°C (176 – 183°F)
	Valve lift	at 95°C (203°F)	8 mm (0.31 in.) or more
Radiator cap	Relief valve opening pressure	STD	74 – 103 kPa (0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)
		Limit	59 kPa (0.6 kgf/cm², 8.5 psi)
No.1 electric cooling fan	Rotating amperage (BOSCH)		2.9 – 4.1 A
	Rotating amperage (NIPPONDENSO)	M/T	6.0 – 7.4 A
		A/T	8.8 – 10.8 A
No.2 electric cooling fan	Rotating amperage		6.0 – 7.4 A

TORQUE SPECIFICATIONS

EG07M–1Y

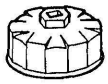
Part tightened	N·m	kgf·cm	ft·lbf
Cylinder block x Drain plug	25	250	18
Water pump x Water pump cover	8.8	90	78 in.·lbf
Water pump x Cylinder block	8.8	90	78 in.·lbf
Water bypass pipe x Water pump cover	9.3	95	82 in.·lbf
Alternator drive belt adjusting bar x Cylinder block	22	220	16
No.2 idler pulley x Cylinder block	42	425	31
Water inlet x Water pump cover	8.8	90	78 in.·lbf

LUBRICATION SYSTEM

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EG07P-0U

	09228-06501 Oil Filter Wrench	

EG

EQUIPMENT

EG07R-0Q

Oil pressure gauge	
Torque wrench	

LUBRICANT

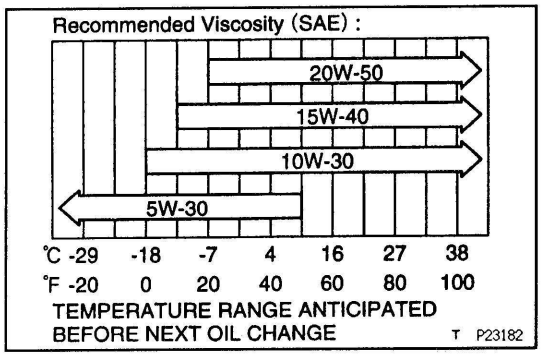
EG14X-1G

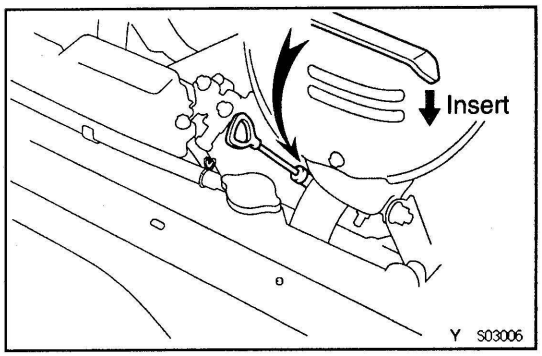
Item	Capacity	Classification
Engine oil		API grade SG, SH or ILSAC multigrade engine oil and recommended viscosity oil
Dry fill		
w/ Oil cooler	4.4 liters (4.7 US qts, 3.9 Imp. qts)	
w/o Oil cooler	4.3 liters (4.5 US qts, 3.8 Imp. qts)	
Drain and refill		
w/ Oil filter change	3.9 liters (4.1 US qts, 3.4 Imp. qts)	
w/o Oil filter change	3.7 liters (3.9 US qts, 3.3 Imp. qts)	

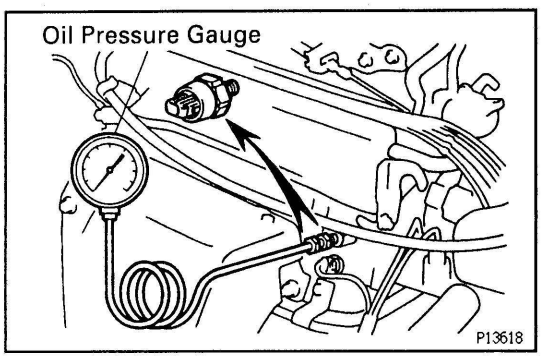
SSM (SPECIAL SERVICE MATERIALS)

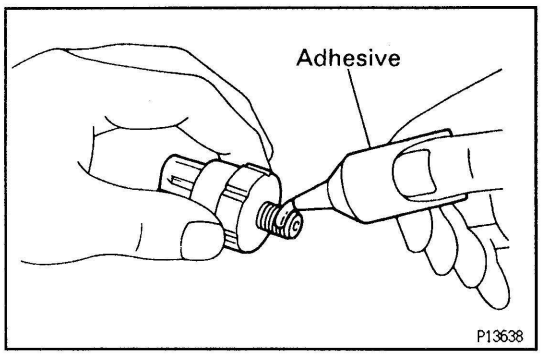
EG07T-0G

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









OIL PRESSURE CHECK

EG73Q–01

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

API grade SG, SH or ILSAC multigrade engine oil. Recommended viscosity is as shown in the illustration.

2. CHECK ENGINE OIL LEVEL

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

If low, check for leakage and add oil up to "F" mark.

NOTICE:

- **When inserting the oil dipstick, insert the curved tip of the dipstick facing the same direction as the curve of the guide.**
- **If the dipstick gets caught while inserting it, do not force it in. Reconfirm the direction of the dipstick.**

3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

Oil pressure:

At idle

29 kPa (0.3 kgf/cm², 4.3 psi) or more

At 3,000 rpm

245 – 490 kPa

(2.5 – 5.0 kgf/cm², 36 – 71 psi)

6. 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) Reinstall the oil pressure switch.

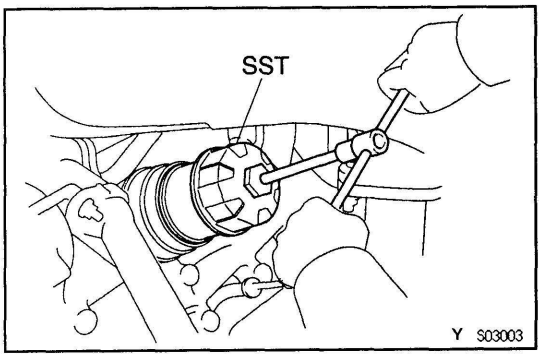
7. START ENGINE, AND CHECK FOR OIL LEAKS

OIL AND FILTER REPLACEMENT

EG6YQ-02

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.**
- **Care should be taken, therefore, when changing engine oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use water–less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.**



1. DRAIN ENGINE OIL

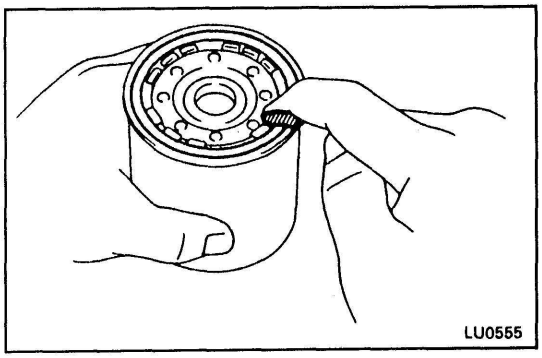
(a) Remove the oil filler cap.

(b) Remove the oil drain plug, and drain the oil into a container.

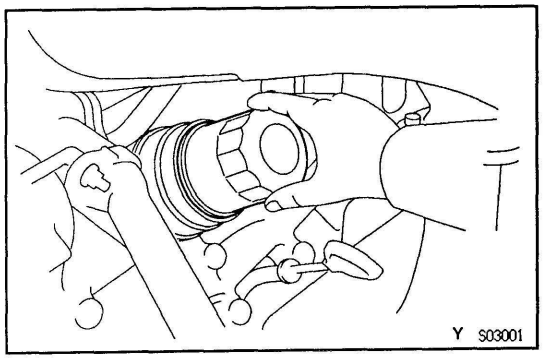
2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.
SST 09228–06501

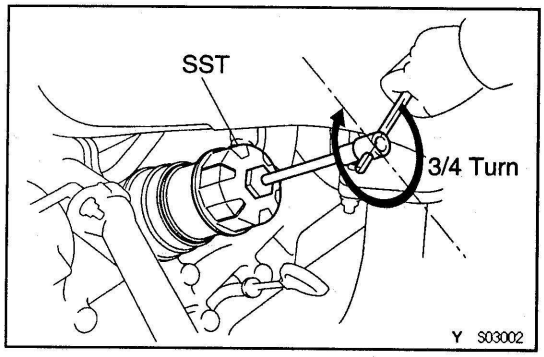
(b) Check and clean the oil filter installation surface.



(c) Lubricate the filter rubber gasket with clean engine oil.



(d) Lightly tighten the oil filter by hand until the rubber gasket contacts the seat of the filter mounting.



(e) Using SST, give it an additional 3/4 turn to seat the filter.
SST 09228–06501

3. FILL WITH ENGINE OIL

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

(b) Fill with new engine oil.
Capacity:
Drain and refill
w/ Oil filter change
3.9 liters (4.1 US qts, 3.4 Imp. qts)
w/o Oil filter change
3.7 liters (3.9 US qts, 3.3 Imp. qts)
Dry fill
w/ Oil cooler
4.4 liters (4.7 US qts, 3.9 Imp. qts)
w/o Oil cooler
4.3 liters (4.5 US qts, 3.8 Imp. qts)

(c) Reinstall the oil filler cap.

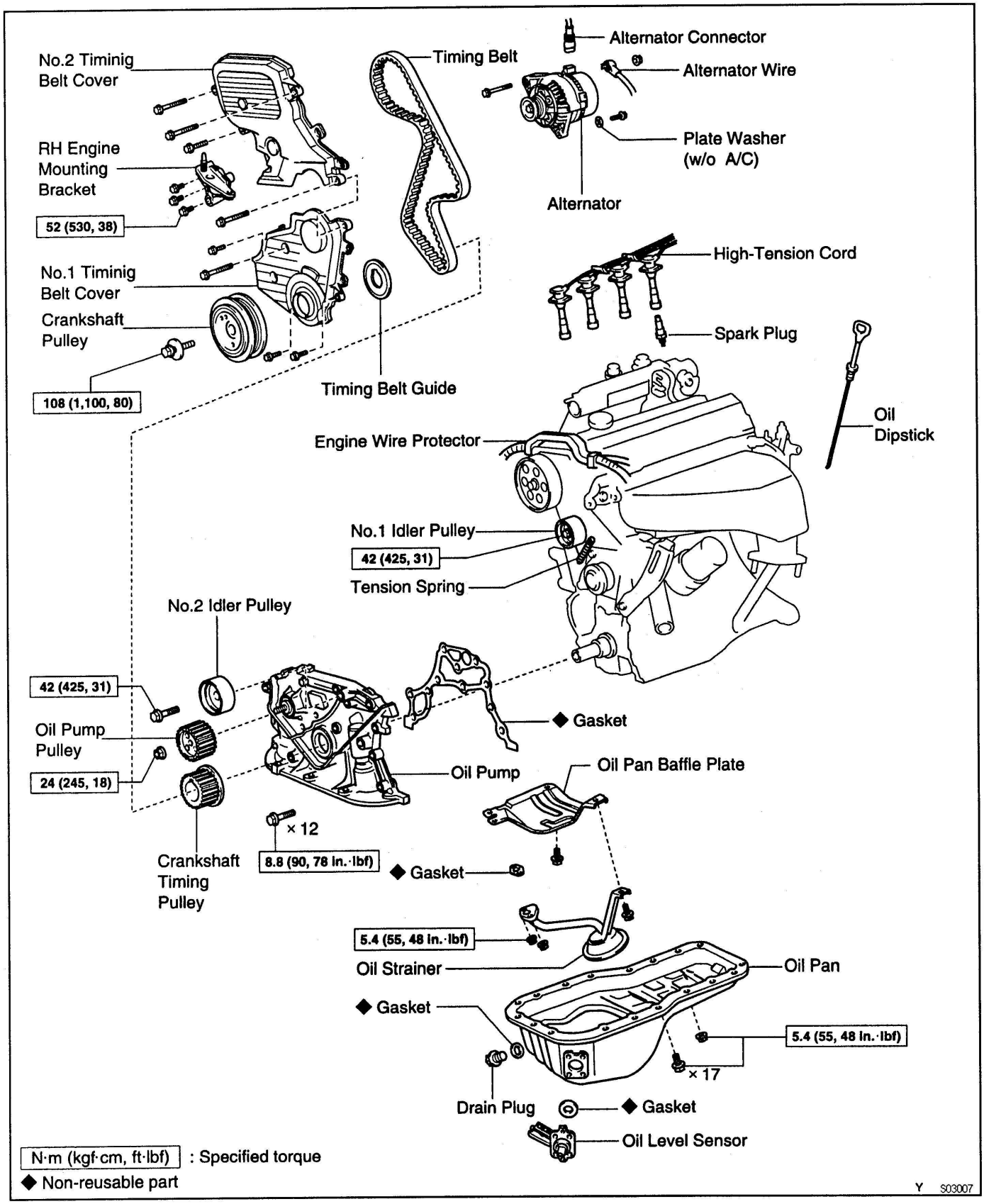
4. START ENGINE AND CHECK FOR OIL LEAKS

5. RECHECK ENGINE OIL LEVEL

OIL PUMP

COMPONENTS FOR REMOVAL AND INSTALLATION

EQ73R-01



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

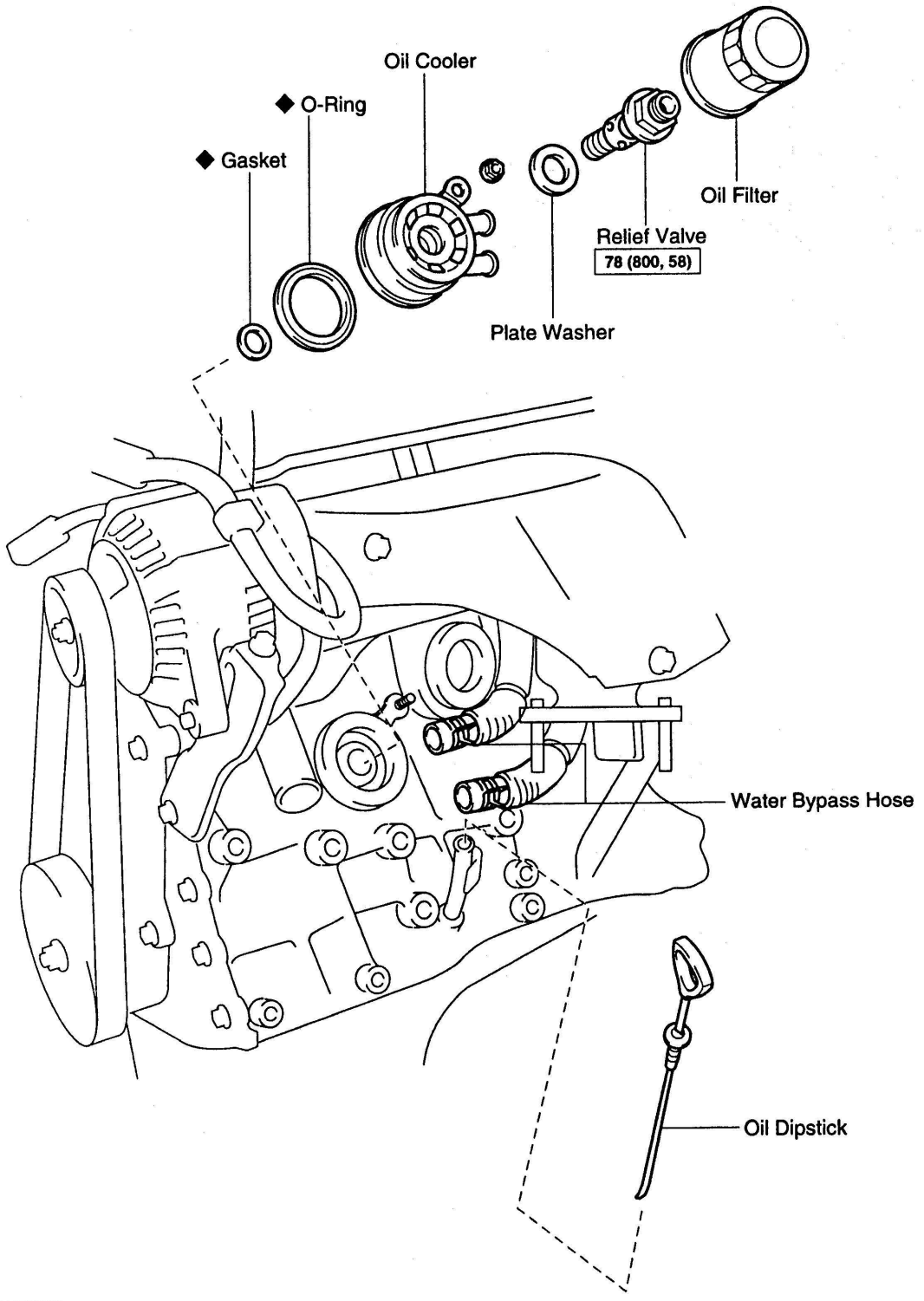
◆ Non-reusable part

Y S03007

OIL COOLER

EG0084-08

COMPONENTS FOR REMOVAL AND INSTALLATION



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

Y S02966

SERVICE SPECIFICATIONS

SERVICE DATA

EG065–08

Oil pressure		at idle speed	29 kPa (0.3 kgf/cm², 4.3 psi) or more
		at 3,000 rpm	245 – 490 kPa (2.5 – 5.0 kgf/cm², 36 – 71 psi)
Oil pump	Body clearance	STD	0.10 – 0.16 mm (0.0039 – 0.0063 in.)
		Maximum	0.20 mm (0.0079 in.)
	Tip clearance	STD	0.04 – 0.16 mm (0.0016 – 0.0063in.)
		Maximum	0.20 mm (0.0079 in.)

EG069–0D

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Oil pan x Drain plug		37	375	27
Oil pump body cover x Oil pump body		8.8	90	78 in.·lbf
Oil pump x Cylinder block		8.8	90	78 in.·lbf
Oil pump pulley x Oil pump drive rotor		24	245	18
No.2 idler pulley x Oil pump		42	425	31
Oil strainer x Cylinder block		5.4	55	48 in.·lbf
Oil strainer x Oil pump		5.4	55	48 in.·lbf
Oil pan x Cylinder block		5.4	55	48 in.·lbf
Oil pan x Oil pump		5.4	55	48 in.·lbf
Oil cooler x Cylinder block	Relief valve	78	800	58
	Nut	8.8	90	78 in.·lbf