

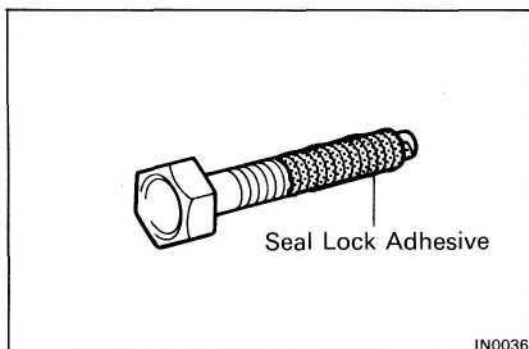
IDENTIFICATION INFORMATION

ENGINE SERIAL NUMBER

The engine serial number is stamped on the left side of the cylinder block.

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in order to facilitate reassembly.
3. Observe the following:
 - (a) Before performing electrical work, disconnect the negative (—) cable from the battery terminal.
 - (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (—) terminal which is grounded to the vehicle body.
 - (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
 - (d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive object.
 - (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.
 - (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non-reusable parts
 - (a) Always replace cotter pins gaskets, O-rings, oil seals, etc. with new ones.
 - (b) Non-reusable parts are indicated in the component illustrations by the "•" symbol.



6. Precoated Parts

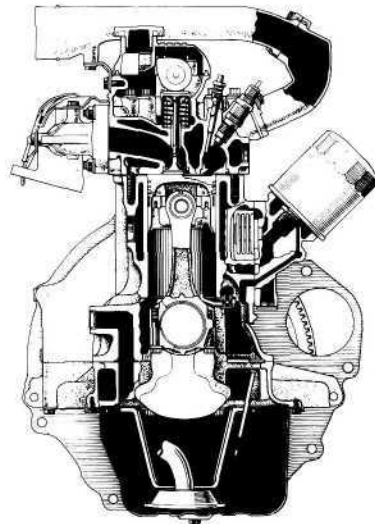
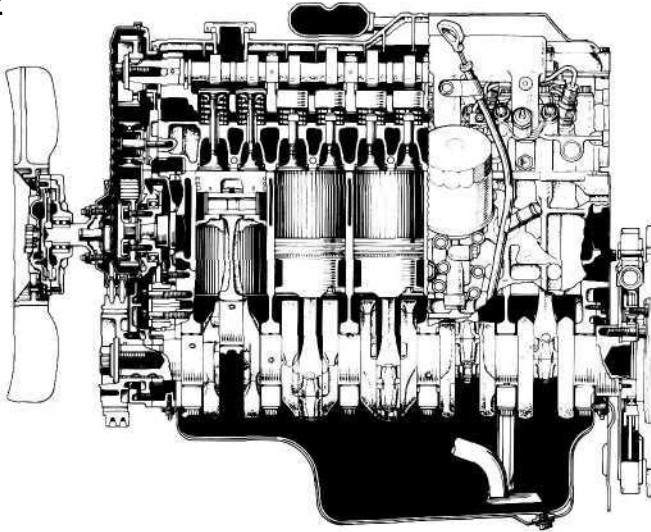
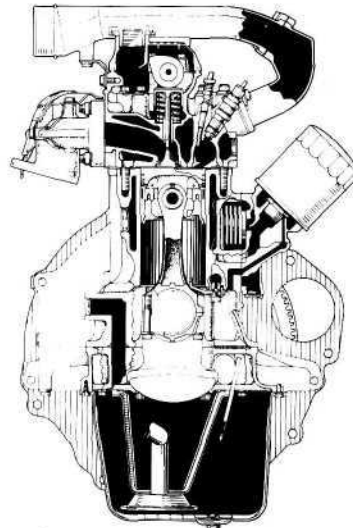
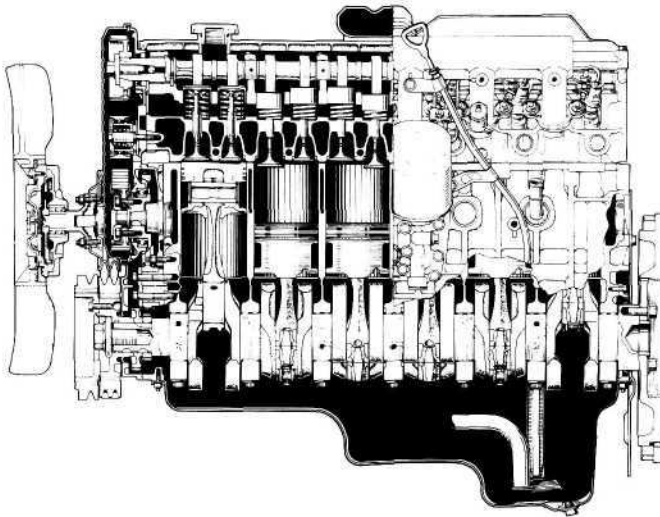
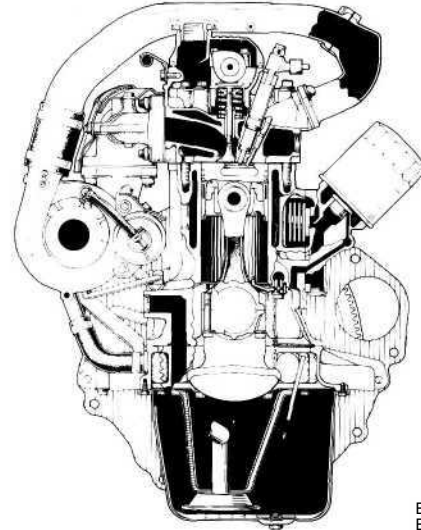
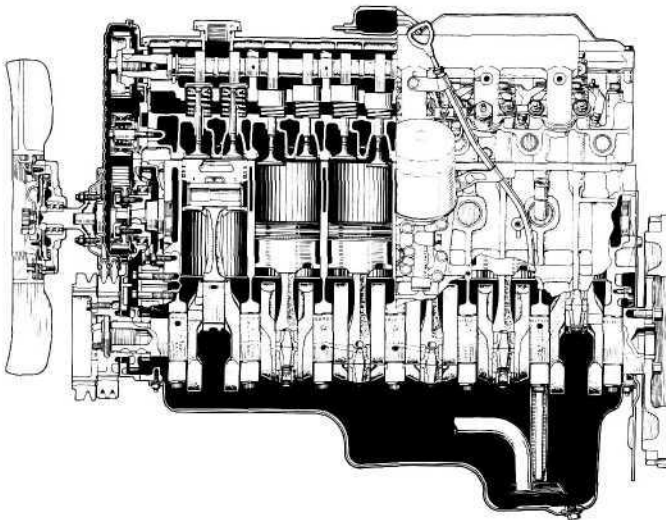
Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.

- (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

DESCRIPTION

The 1 PZ engine is an in-line 5-cylinder 3.5 liter OHC engine.

The 1 HZ and 1 HD-T engines are an in-line 6-cylinder 4.2 liter OHC engine.

1PZ**1HZ****1HD-T**

EXCESSIVE FUEL CONSUMPTION

HINT: Check whether clutch slipping, brakes grabbing, tires wrong size or air filter clogged.

(Possible Cause)**(Check Procedure and Correction Method)****1. FUEL LEAKAGE**

Refer to step 3 of ROUGH IDLE WITH WARM ENGINE.

2. IDLE SPEED TOO HIGH

After sufficiently warming up engine, check idle speed. (See page EM-27)

Idle speed:

1PZ	600-700 rpm
1HZM/T	600-700 rpm
1HZA/T	660-760 rpm
1HD-T M/T	600-700 rpm
1HD-T A/T	750 - 850 rpm

If not as above, adjust with idle speed adjusting screw.

3. MAXIMUM SPEED TOO HIGH

Check maximum speed. (See page EM-27)

Maximum speed:

1PZ and 1 HZ	4,500 - 4,700 rpm
1HD-T	4,300 - 4,500 rpm

If not as above, adjust with maximum speed adjusting screw.

4. IMPROPER INJECTION TIMING

Refer to step 7 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

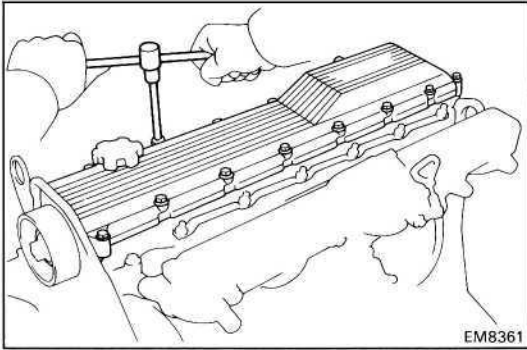
5. FAULTY INJECTION NOZZLES

Refer to step 9 of ENGINE CRANKS NORMALLY BUT WILL NOT START.

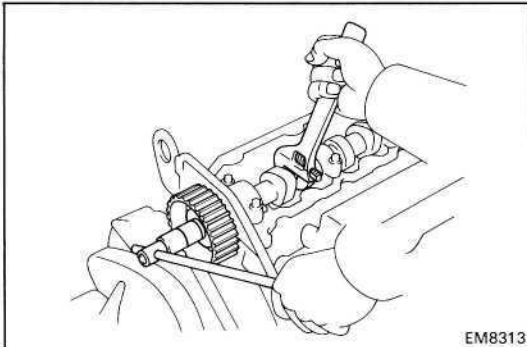
Measured clearance mm (in.)	Installed shim thickness mm (in.)		New shim thickness		mm (in.)	
	Shim No.	Thickness	Shim No.	Thickness	Shim No.	Thickness
0.00 - 0.020 (0.000 - 0.008)	709	2.35 (0.0925)	45	2.85 (0.1122)		
0.021 - 0.040 (0.008 - 0.016)	704	2.40 (0.0945)	21	2.90 (0.1142)		
0.041 - 0.060 (0.016 - 0.024)	710	2.45 (0.0965)	46	2.95 (0.1161)		
0.061 - 0.080 (0.024 - 0.031)	01	2.50 (0.0984)	26	3.00 (0.1181)		
0.081 - 0.100 (0.032 - 0.040)	42	2.55 (0.1004)	47	3.05 (0.1201)		
0.101 - 0.120 (0.040 - 0.047)	06	2.60 (0.1024)	31	3.10 (0.1220)		
0.121 - 0.140 (0.048 - 0.055)	43	2.65 (0.1043)	48	3.15 (0.1240)		
0.141 - 0.160 (0.056 - 0.063)	11	2.70 (0.1063)	36	3.20 (0.1260)		
0.161 - 0.180 (0.063 - 0.071)	44	2.75 (0.1083)	49	3.25 (0.1280)		
0.181 - 0.200 (0.071 - 0.079)	16	2.80 (0.1102)	41	3.30 (0.1291)		
0.201 - 0.220 (0.079 - 0.087)						
0.221 - 0.240 (0.087 - 0.094)						
0.241 - 0.260 (0.095 - 0.102)						
0.261 - 0.280 (0.103 - 0.110)						
0.281 - 0.300 (0.111 - 0.118)						
0.301 - 0.320 (0.119 - 0.126)						
0.321 - 0.340 (0.126 - 0.134)						
0.341 - 0.349 (0.134 - 0.137)						
0.350 - 0.450 (0.138 - 0.179)						

0.35-0.45 mm (0.014-0.018 in.)

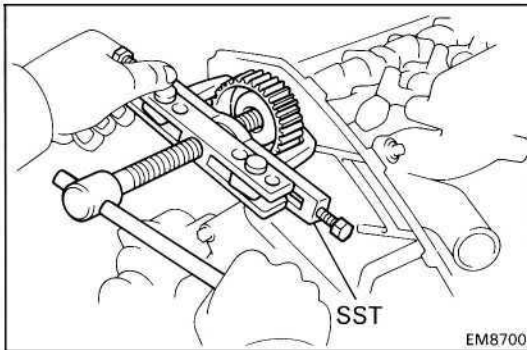
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and the measured clearance is 0.300 mm (0.0118 in.). Replace the 2.800 mm (0.1102 in.) shim with a No.11 shim.

**7. REMOVE CYLINDER HEAD COVER**

Remove the twelve bolts (1PZ) or fourteen bolts (1HZ and 1HD-T), two nuts, cylinder head cover and gasket.

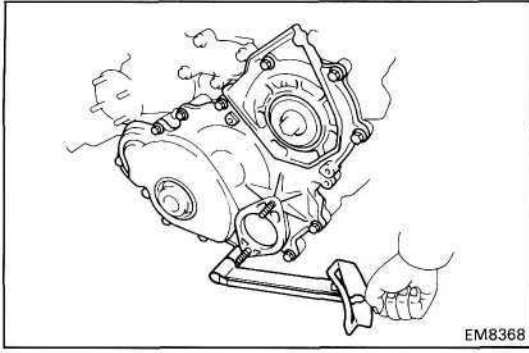
**8. REMOVE NO.1 CAMSHAFT TIMING PULLEY**

(a) Hold the hexagonal wrench head portion of the camshaft with a wrench, and remove the No.1 camshaft timing pulley bolt.

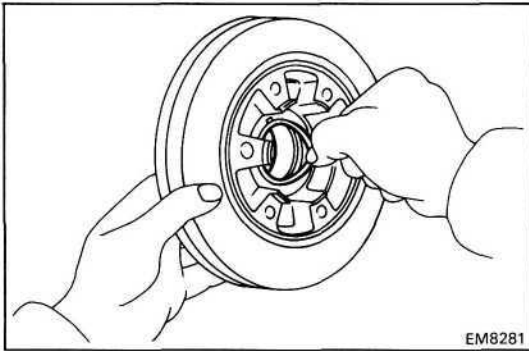


(b) Using SST, remove the No.1 camshaft timing pulley.
SST 09950-20017

(c) Remove the set key.

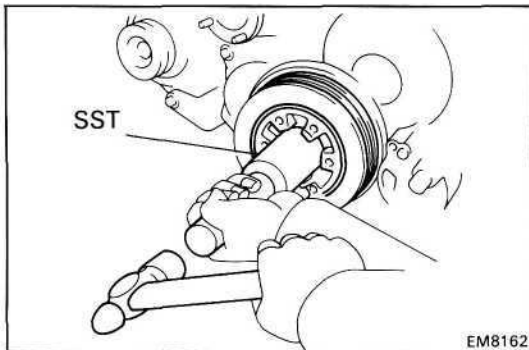


- (c) Install the timing gear cover with the fourteen bolts.
Torque: 200 kg-cm (14 ft-lb, 20 N·m)

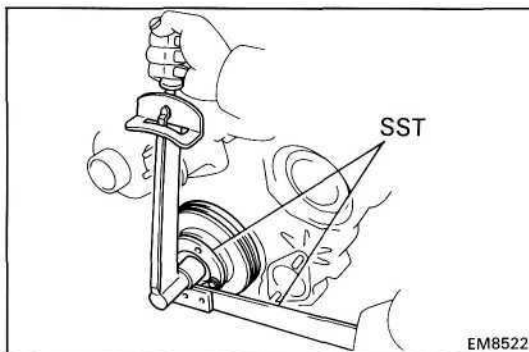


6. INSTALL NO.1 CRANKSHAFT PULLEY

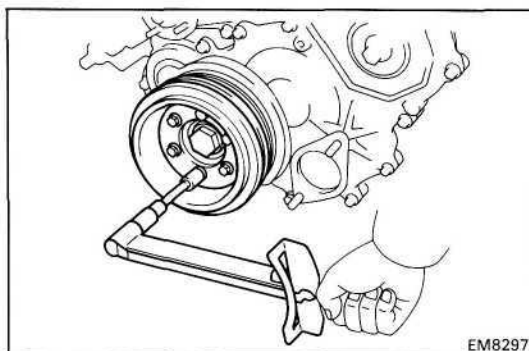
- (a) Install a new O-ring in the No.1 crankshaft pulley groove.



- (b) Align the pulley set key with the key groove of the pulley.
(c) Using SST and a hammer, tap in the pulley.
SST 09214-60010

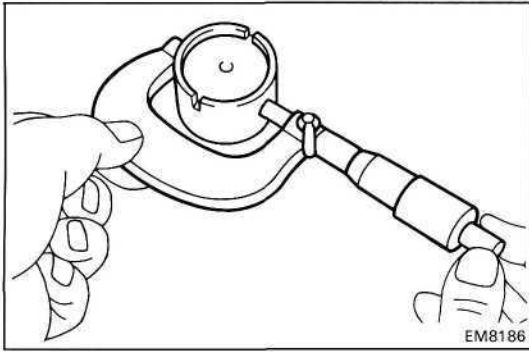


- (d) Using SST, install and torque the plate and bolt.
Torque: 5,000 kg-cm (362 ft-lb, 490 N·m)



7. (1HZand1HD-T) INSTALL NO.2 CRANKSHAFT PULLEY

- Install the No.2 crankshaft pulley with the six bolts.
Torque: 250 kg-cm (18 ft-lb, 25 N·m)



(b) Using a micrometer, measure the lifter diameter.

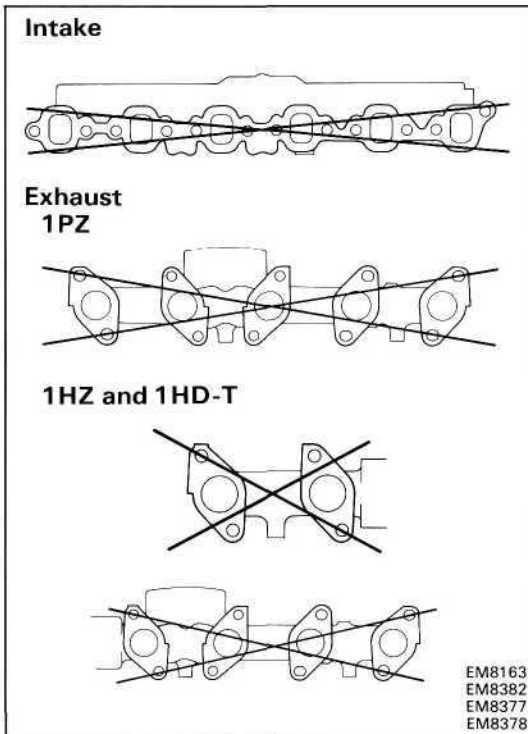
**Lifter diameter: 40.892-40.902 mm
(1.6099-1.6103 in.)**

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

**Standard oil clearance: 0.058-0.083 mm
(0.0023-0.0033 in.)**

Maximum oil clearance: 0.10 mm (0.0039 in.)

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

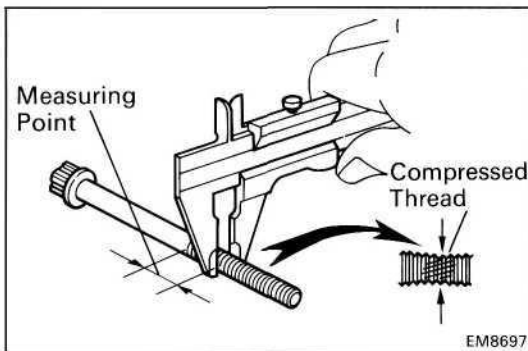


16. INSPECT INTAKE AND EXHAUST MANIFOLDS

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

Maximum warpage: 0.40 mm (0.0157 in.)

If warpage is greater than maximum, replace the manifold.



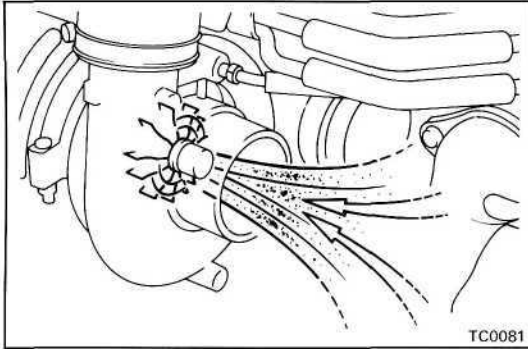
17. INSPECT CYLINDER HEAD BOLTS

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

**Standard outer diameter: 10.800-11.000 mm
(0.4646-0.4724 in.)**

Minimum outer diameter: 10.55 mm (0.4154 in.)

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



11. If the engine is running with the air cleaner, case cover and hose removed, foreign particles entering will damage the wheels which run at extremely high speed.

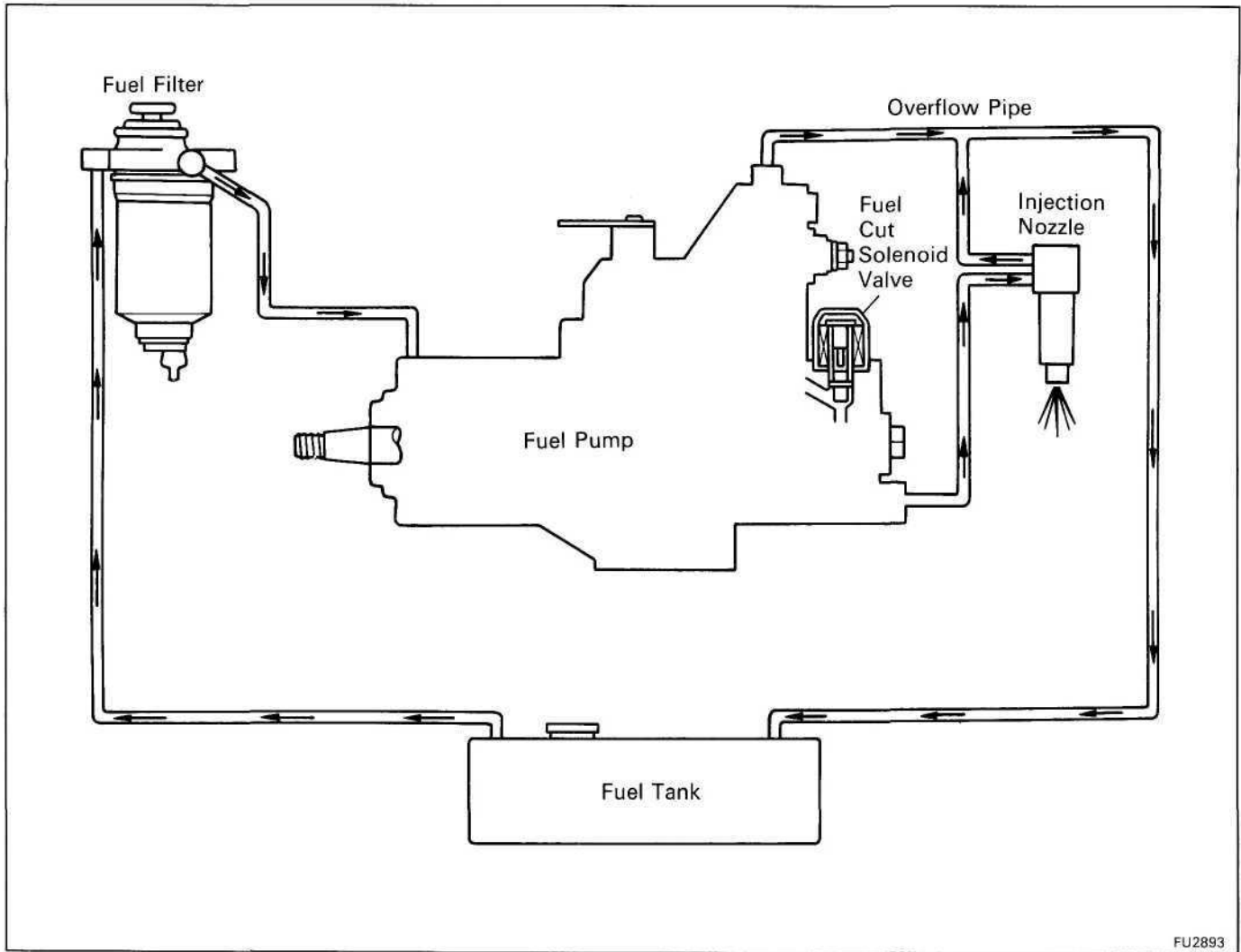
TROUBLESHOOTING

HINT: Before troubleshooting the turbocharger, first check the engine itself. (Valve clearance, engine compression, injection timing etc.)

INSUFFICIENT ACCELERATION, LACK OF POWER OR EXCESSIVE FUEL CONSUMPTION

(Possible Cause)	(Check Procedure and Correction Method)
1. TURBOCHARGING PRESSURE TOO LOW	<p>Check turbocharging pressure. (See page TC-8)</p> <p>Turbocharging pressure: $0.50 - 0.65 \text{ kg/cm}^2$ $(7.1 - 9.2 \text{ psi}, 49 - 64 \text{ kPa})$</p> <p>If the pressure is below specification, begin diagnosis from item 2.</p>
2. RESTRICTED INTAKE AIR SYSTEM	<p>Check intake air system, and repair or replace parts as necessary. (See page TC-8)</p>
3. LEAK IN INTAKE AIR SYSTEM	<p>Check intake air system, and repair or replace parts as necessary. (See page TC-8)</p>
4. RESTRICTED EXHAUST SYSTEM	<p>Check exhaust system, and repair or replace parts as necessary. (See page TC-8)</p>
5. LEAK IN EXHAUST SYSTEM	<p>Check exhaust system, and repair or replace parts as necessary. (See page TC-8)</p>
6. ERRATIC TURBOCHARGER OPERATION	<p>Check rotation of impeller wheel. If it does not turn or turns with a heavy drag, replace the turbocharger assembly.</p> <p>Check plays of turbine shaft. (See page TC-12)</p> <p>Axial play: $0.13 \text{ mm (0.0051 in.)}$ or less Radial play: $0.18 \text{ mm (0.0071 in.)}$ or less</p> <p>If not within specification, replace the turbocharger assembly.</p>

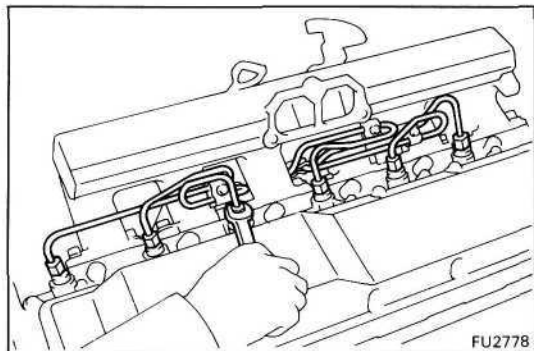
DESCRIPTION



FU2893

FUEL SYSTEM

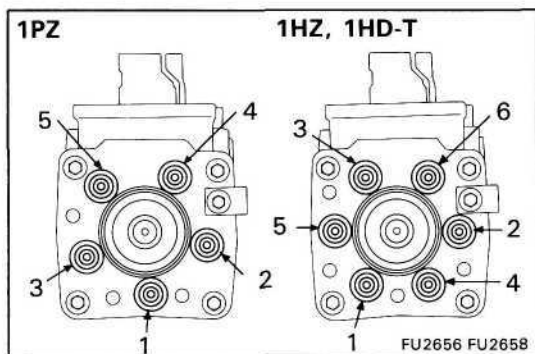
Fuel is drawn up from the fuel tank through the fuel filter (sedimenter) by the feed pump built into the injection pump. The fuel drawn up is then sent into the pump housing. Fuel compressed in the pump housing is distributed to the injection nozzles according to the injection order, and injected at high pressure into the combustion chamber. Excess fuel in the pump housing flows through the overflow valve and along the overflow pipe and returns to the fuel tank. The fuel cycle provides both cooling and lubrication for the pump. The cycling of fuel through the pump chamber warms the fuel so that it is prevented from becoming wax-like at cold temperatures.



3. INSTALL INJECTION PIPES

- (a) Place the two clamps on the intake manifold.
- (b) Connect the injection pipes to injection nozzle.

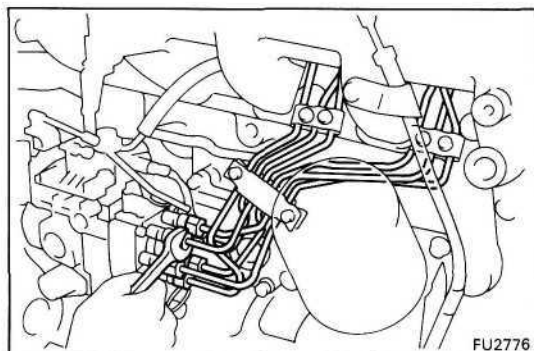
Torque: 150 kg-cm (11 ft-lb, 15 Nm)



- (c) Connect the injection pipes to injection pump.

Torque: 150 kg-cm (11 ft-lb, 15 Nm)

- (d) Secure the injection pipes with clamps and bolts.

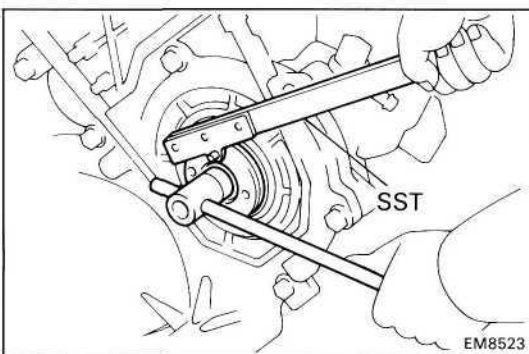


4. INSTALL INTAKE PIPE

(See step 3 on page EM-38)

5. START ENGINE AND CHECK FOR FUEL LEAKS

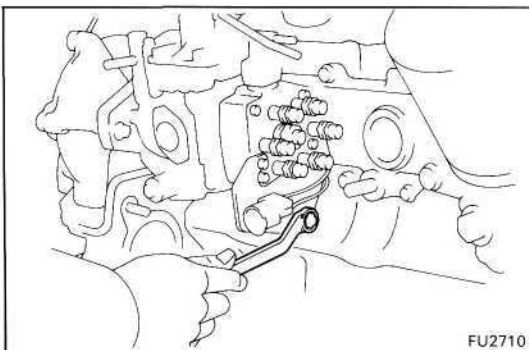
1. (w/ACSD)
DRAIN COOLANT (See page CO-5)
2. REMOVE TIMING BELT
(See steps 1 to 3 on pages EM-33 to 34)
3. REMOVE NO.2 CAMSHAFT TIMING PULLEY
(See step 5 on pages EM-34)
4. DISCONNECT ACCELERATOR CONNECTING ROD
5. (A/T)
DISCONNECT THROTTLE CABLE
6. (w/ A/C)
DISCONNECT A/C IDLE-UP VACUUM HOSE
7. (w/ ACSD)
DISCONNECT WATER BY-PASS HOSES FROM THERMO WAX
8. DISCONNECT INJECTION PUMP CONNECTOR
9. DISCONNECT FUEL HOSES FROM INJECTION PUMP
10. (1HD-T)
DISCONNECT BOOST COMPENSATOR HOSE
11. (w/PCS)
DISCONNECT PCS VACUUM HOSE
12. (w/BACS)
DISCONNECT BACS VACUUM HOSE
13. REMOVE INJECTION PIPES
(See step 2 on page FU-9)



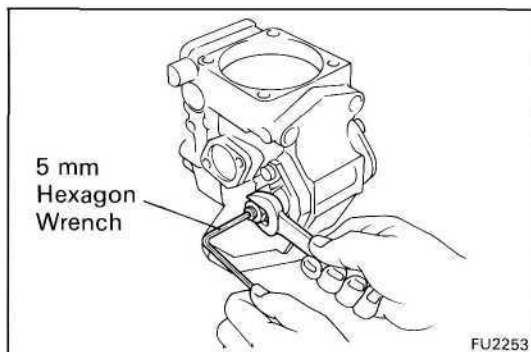
14. REMOVE INJECTION PUMP

- (a) Using SST, remove the injection pump drive gear set nut.

SST 09330-00021



- (b) Remove the bolt holding the injection pump to pump stay.



- (b) Using a 5 mm hexagon wrench, adjust the protrusion of the adjusting screw from the timer cover.

10. ADJUST PLUNGER SPRING SHIM

- (a) Install the following parts to the distributive head:

- (1) Two plunger spring guides
- (2) Two upper spring seats
- (3) Two plunger springs
- (4) Lower spring seat
- (5) Upper plunger plate
- (6) Lower plunger plate
- (7) Pump plunger

HINT: Do not assemble the plunger spring shims at this time.

- (b) Using vernier calipers, measure clearance A indicated in the illustration.
- (c) Determine the plunger spring shim size by using the following formula and chart.

IPZ and 1HZ

New plunger spring shim thickness = $5.8 - A$

1HD-T

New plunger spring shim thickness = $5.1 - A$

A Measured plunger position

Plunger spring shim selection chart for 1 PZ and 1 HZ

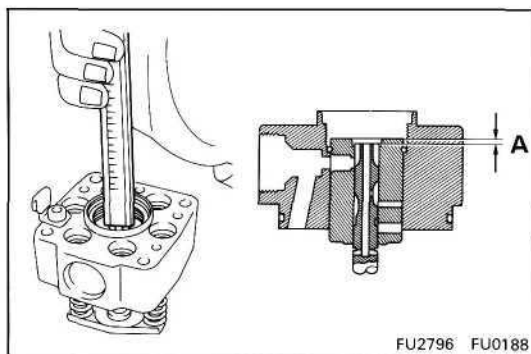
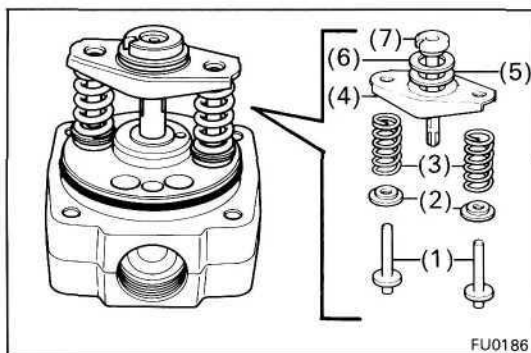
mm (in.)

Measured clearance	Shim thickness	Measured clearance	Shim thickness
More than 5.3 (0.209)	0.5 (0.020)	4.3 – 4.5 (0.169 – 0.177)	1.5 (0.059)
5.0 – 5.2 (0.196 – 0.205)	0.8 (0.031)	4.0 – 4.2 (0.157 – 0.165)	1.8 (0.071)
4.8 – 4.9 (0.189 – 0.193)	1.0 (0.039)	Less than 3.9 (0.154)	2.0 (0.079)
4.6 – 4.7 (0.181 – 0.185)	1.2 (0.047)	–	–

Plunger spring shim selection chart for 1 HD-T

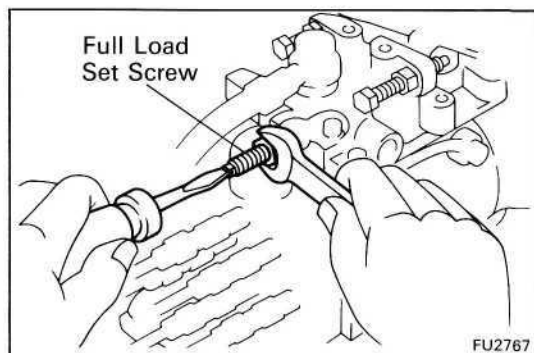
mm (in.)

Measured clearance	Shim thickness	Measured clearance	Shim thickness
More than 4.6 (0.181)	0.5 (0.020)	3.6 – 3.8 (0.142 – 0.150)	1.5 (0.059)
4.3 – 4.5 (0.169 – 0.177)	0.8 (0.031)	3.3 – 3.5 (0.130 – 0.138)	1.8 (0.071)
4.1 – 4.2 (0.161 – 0.165)	1.0 (0.039)	Less than 3.2 (0.126)	2.0 (0.079)
3.9 – 4.0 (0.154 – 0.157)	1.2 (0.047)	–	–



- (b) (1 PZ (w/ HAC) and 1 HZ (w/ HAC))
Apply 760 ± 1.5 mmHg (29.92 ± 0.06 in.Hg, 101.3 ± 0.2 kPa) absolute pressure.
- (c) (1HD-T (w/o BACS))
Apply 0.81 kg/cm^2 (11.5 psi, 79 kPa) of pressure to the boost compensator.
- (d) (1HD-T (w/ BACS))
Apply 1.29 kg/cm^2 (18.3 psi, 127 kPa) of pressure to the boost compensator.
- (e) (1HD-T (w/ PCS))
Apply vacuum to the PCS actuator.
- (f) Measure the full load injection volume.

Item	Adjusting lever angle	Pump rpm	No. of measuring strokes	Injection volume cc (cc in.)
1PZ	Plus 21 – 31°	1,200	200	11.78 – 12.18 (0.72 – 0.74)
1HZ	Plus 21 – 31°	1,200	200	11.80 – 12.20 (0.72 – 0.74)
1HD-T (w/o BACS)	Plus 21 – 31°	1,100	200	13.58 – 14.18 (0.83 – 0.87)
1HD-T (w/ BACS)	Plus 21 – 31°	1,100	200	13.14 – 13.74 (0.80 – 1.84)

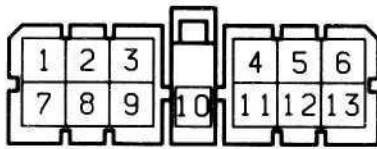


- (g) Adjust by turning the full load set screw.
HINT: The injection volume will increase about 3 cc (0.18 cu in.) with each 1/2 turn of the screw.

- (h) (1HD-T (w/ PCS))
Release the vacuum to the PCS actuator.
- (i) (1HD-T (w/PCS))
Measure the injection volume.

Pump rpm	No. of measuring strokes	Injection volume cc (cu in.)
1,100	200	11.0 – 12.2 (0.67 – 0.74)

Wire Harness Side



K-13-1

INSPECTION OF COMPONENTS

Pre-Heating Timer

LOCATION:

PZJ, HZJ, HDJ

Under the instrument panel on the passenger side.

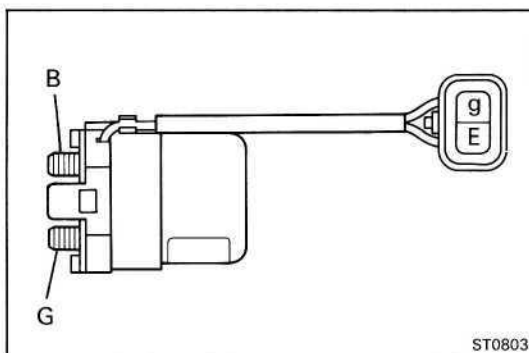
HZB, HDB

Under the instrument panel center.

INSPECT PREHEATING TIMER CIRCUIT

Disconnect the connector from the pre-heating timer, and check the connector on the wire harness side as shown in the following chart.

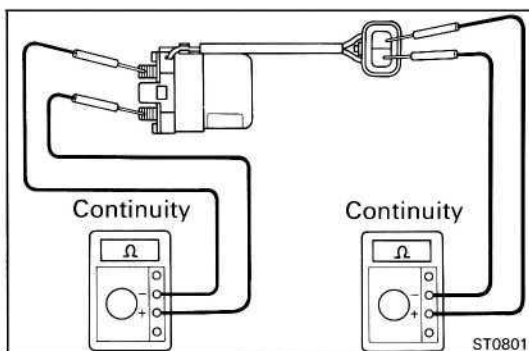
Check for	Tester connection	Condition	Specified value
Continuity	1 – Ground	–	Continuity
Voltage	3 – Ground	Turn starter switch OFF	No voltage
		Turn starter switch ON	Battery voltage
Voltage	4 – Ground	Turn starter switch OFF	No voltage
		Turn starter switch ON	Battery voltage
Continuity	5 – Ground	–	Continuity
Continuity	6 – Ground	–	Continuity
Continuity	7 – Ground	–	Continuity
Continuity	10 – Ground	–	Continuity
Voltage	11 – Ground	Turn starter switch OFF	No voltage
		Turn starter switch START	Battery voltage



ST0803

No. 1 Glow Plug Relay

LOCATION: In the engine compartment on the left side.



ST0801

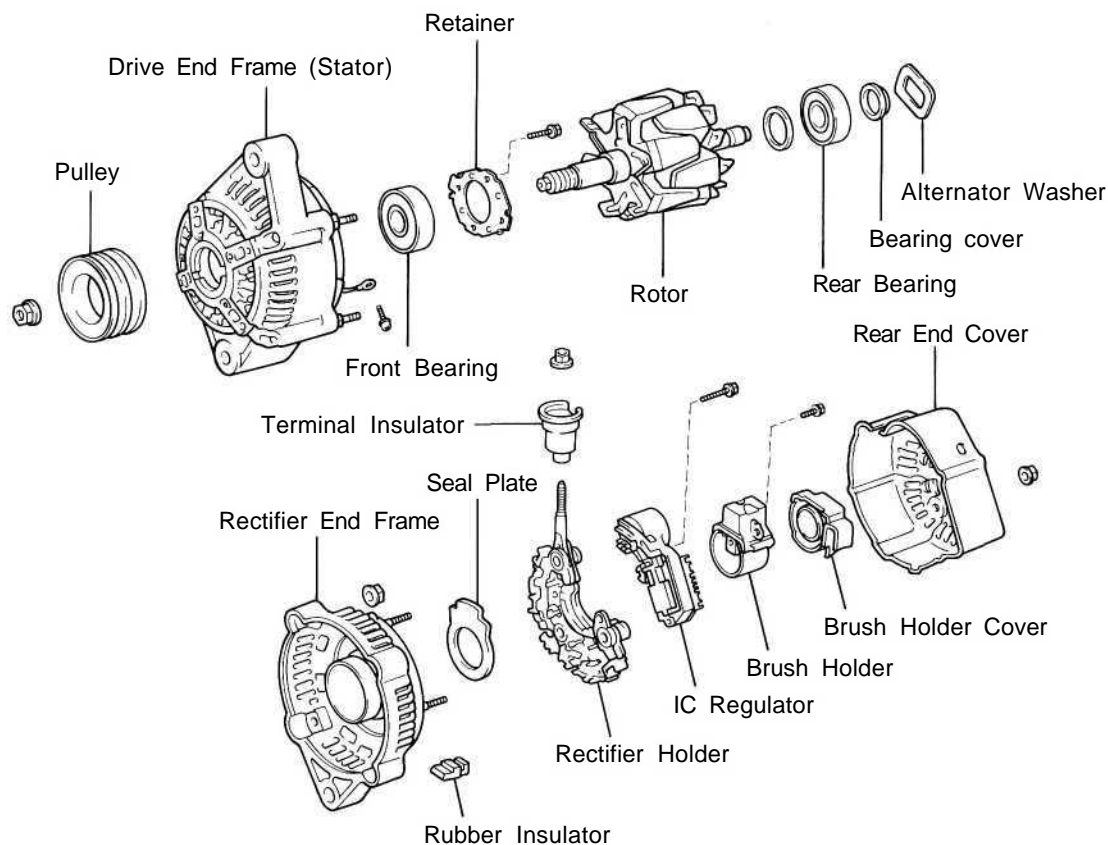
1. INSPECT RELAY CONTINUITY

- Using an ohmmeter, check that there is continuity between terminals E and g.
- Check that there is no continuity between terminals B and G.

If continuity is not as specified, replace the relay.

ALTERNATOR COMPONENTS

Type A



Type B

