ENGINE TUNE-UP

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page CO-4)

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page LU-5)

INSPECTION OF BATTERY

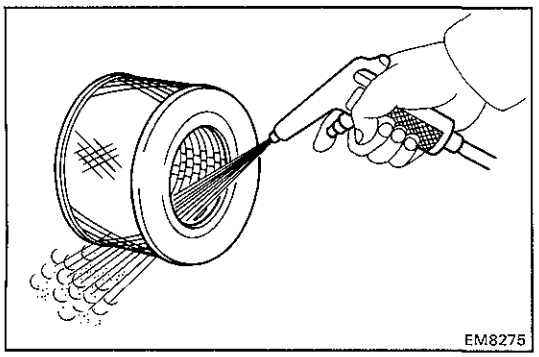
(See pages 1 and 2 on page CH-5)

Standard specific gravity:
95D31R and 95D31L
1.27–1.29 when fully charged at 20°C (68°F)
ex. (95D31R and 95D31L)
1.25–1.27 when fully charged at 20°C (68°F)

INSPECTION OF AIR FILTER (Paper Filter Type)

1. **INSPECT AIR FILTER**

   Visually check that the filter element is not excessively dirty, damaged or oily.



2. **CLEAN AIR FILTER**

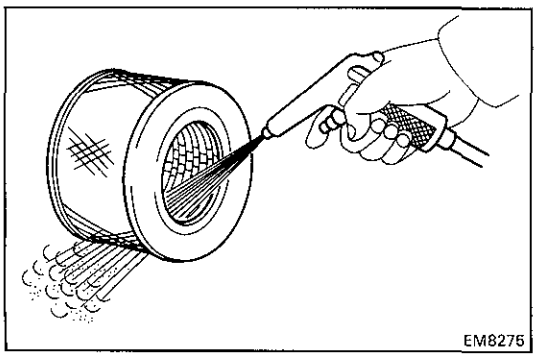
   Clean the filter element with compressed air.

   First blow from the inside thoroughly. Then blow off the outside of the filter element.

(Washable Type)

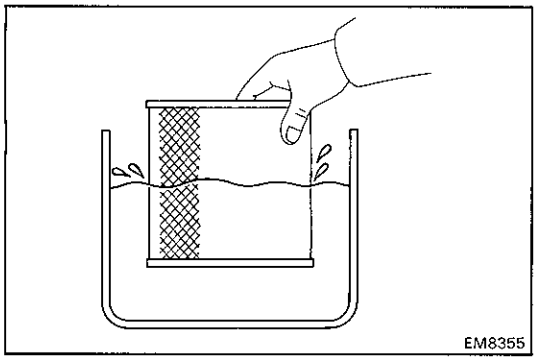
1. **INSPECT AIR FILTER**

   Visually check that the filter element is not excessively dirty, damaged or oily.



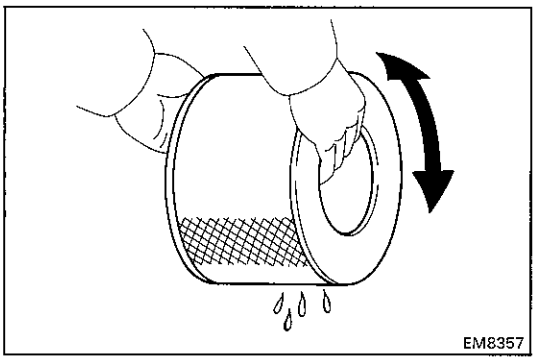
2. **CLEAN AIR FILTER**

   (a) Blow dirt off in the filter element with compressed air.



(b) Submerge the filter element in the water and agitate it up and down more than ten times.

(c) Repeat rinsing in clean water unitil rinse water is clear.



(d) Remove excess water by shaking the filter element or blowing with compressed air.

NOTICE: Do not beat or drop filter element.

(e) Wipe off dust on the air cleaner case interior.

INSPECTION OF ALTERNATOR DRIVE BELT

(See step 3 on page CH-5)

Drive belt deflection:

New belt	6 – 7 mm (0.24 – 0.28 in.)
Used belt	8 – 11 mm (0.31 – 0.43 in.)

Drive belt tension (Reference):

New belt	45 – 55 kg
Used belt	20 – 35 kg

INSPECTION OF GLOW PLUGS

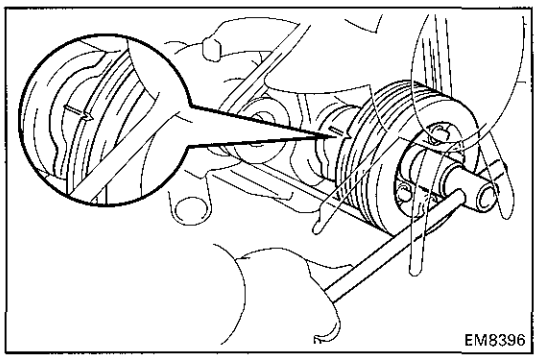
(See page ST-7)

ADJUSTMENT OF VALVE CLEARANCE

HINT: Adjust the valve clearance while the engine is cold.

1. **REMOVE INTAKE PIPE**
(See step 6 on page EM-34)

2. **REMOVE CYLINDER HEAD COVER**
(See step 7 on page EM-35)



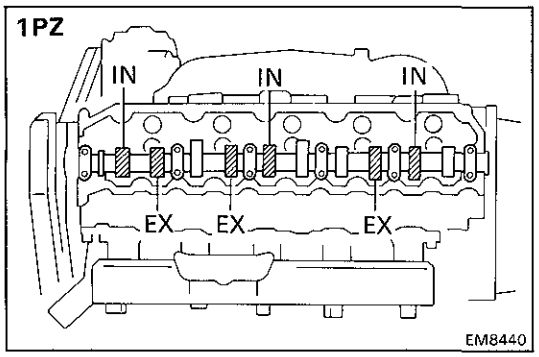
3. **SET NO.1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley clockwise, and align its groove with the timing gear cover groove.

(b) (1PZ)
Check that the valve lifters on the No.1 cylinder are loose and exhaust valve lifter on the No.5 cylinder is tight.

(c) (1HZ and 1HD-T)
Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.6 cylinder are tight.

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



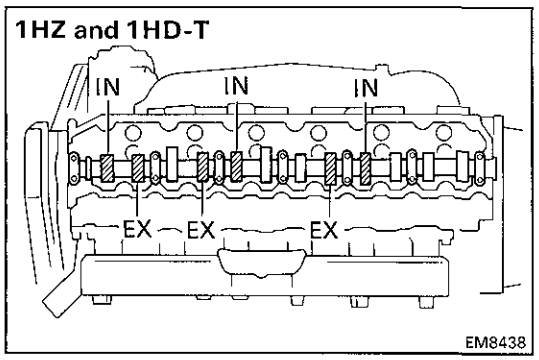
4. **ADJUST VALVE CLEARANCE**

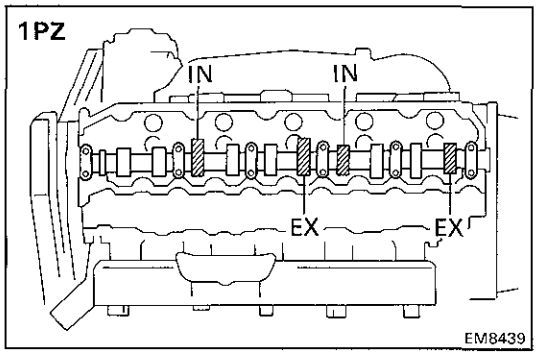
(a) Check only those valves indicated in the illustration.

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

Valve clearance (Cold):

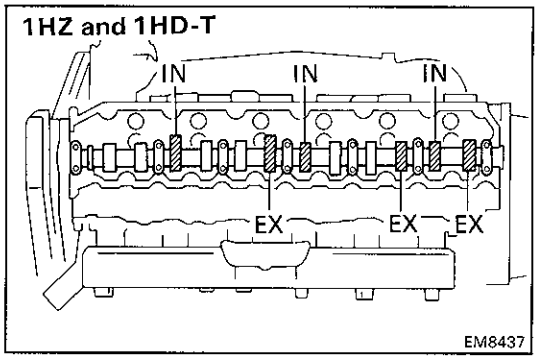
Intake	**0.15 – 0.25 mm (0.006 – 0.010 in.)**
Exhaust	**0.35 – 0.45 mm (0.014 – 0.018 in.)**

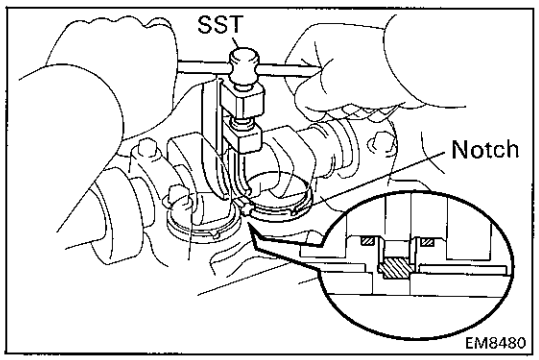




(b) Turn the crankshaft one revolution (360°), and align the mark as above (See procedure step 3).

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



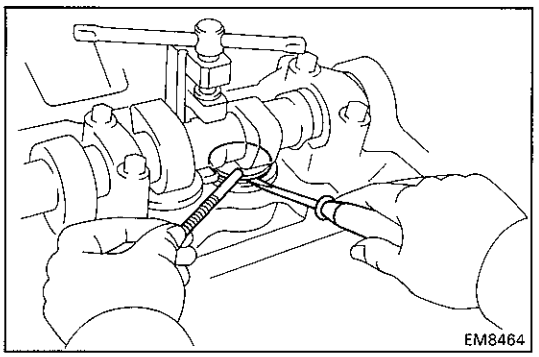


(d) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Using SST, press down the valve lifter.

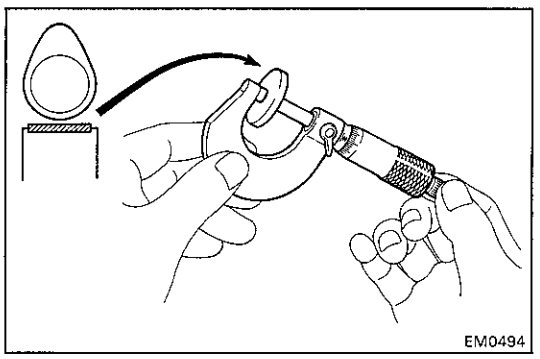
SST 09248-64011

HINT: Before pressing down the valve lifter, position the notch on the exhaust manifold side.



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

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



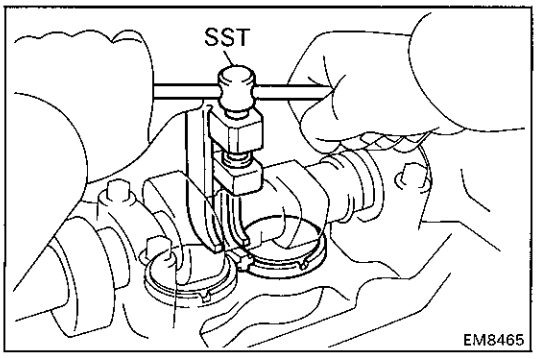
- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of the new shim so the valve clearance comes within specified value.

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

Intake N = T + (A – 0.20 mm (0.008 in.))
Exhaust N = T + (A – 0.40 mm (0.016 in.))

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

HINT: Shims are available in twenty sizes in increments of 0.05 mm (0.0020 in.), from 2.35 mm (0.0925 in.) to 3.30 mm (0.1299 in.)



(f) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Remove SST.

SST 09248-64011

(g) Recheck the valve clearance.

5. **REINSTALL CYLINDER HEAD COVER**
(See step 2 on page EM-38)

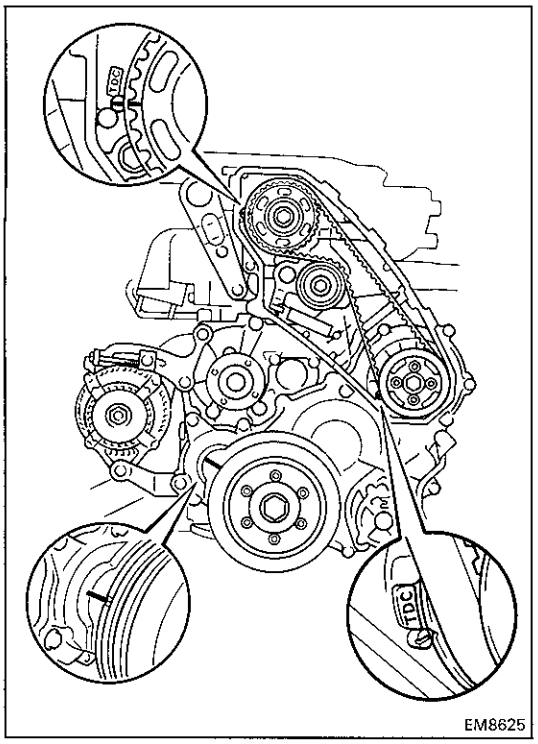
6. **REINSTALL INTAKE PIPE**
(See step 3 on page EM-38)

Adjusting Shim Selection Using Chart (Intake)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.340 (0.0921)	2.360 (0.0925)	2.380 (0.0929)	2.380 (0.0937)	2.400 (0.0945)	2.420 (0.0953)	2.440 (0.0961)	2.450 (0.0965)	2.460 (0.0969)	2.480 (0.0976)	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)	2.680 (0.1055)	2.700 (0.1063)	2.720 (0.1071)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.780 (0.1094)	2.800 (0.1102)	2.820 (0.1110)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.880 (0.1134)	2.900 (0.1142)	2.920 (0.1150)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.980 (0.1173)	3.000 (0.1181)	3.020 (0.1189)	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)										709	709	709	709	709	704	704	710	710	710	710	01	01	42	42	42	42	06	06	43	43	43	11	11	44	44	44	44	16	16	45	45	45	45	21	21	46	46	46	46	26	26	47	47	47	47	31	31
0.021 – 0.040 (0.0008 – 0.0016)										709	709	709	709	704	704	704	710	710	710	01	01	01	42	42	42	42	06	06	43	43	43	11	11	11	44	44	44	44	16	16	16	45	45	45	21	21	21	46	46	46	26	26	26	47	47	47	31	31	31	48
0.041 – 0.060 (0.0016 – 0.0024)									709	709	709	709	704	704	704	710	710	710	01	01	01	01	42	42	42	42	06	06	06	43	43	43	43	11	11	11	44	44	44	44	16	16	16	45	45	45	21	21	21	46	46	46	26	26	26	47	47	47	31	31	31	48	48
0.061 – 0.080 (0.0024 – 0.0031)								709	709	709	709	709	704	704	704	710	710	710	01	01	01	01	42	42	42	42	06	06	06	43	43	43	43	11	11	11	44	44	44	44	16	16	16	45	45	45	21	21	21	46	46	46	26	26	26	47	47	47	31	31	31	48	48	48
0.081 – 0.100 (0.0032 – 0.0039)							709	709	709	709	709	704	704	710	710	710	710	01	01	01	42	42	42	42	06	06	06	43	43	43	43	11	11	11	44	44	44	44	16	16	16	45	45	45	45	21	21	21	46	46	46	46	26	26	26	47	47	47	47	31	31	31	48	48	48	48	36
0.101 – 0.120 (0.0040 – 0.0047)						709	709	709	709	709	704	704	710	710	710	710	01	01	01	42	42	42	42	06	06	43	43	43	43	43	11	11	11	44	44	44	44	16	16	16	45	45	45	45	21	21	21	46	46	46	46	26	26	26	47	47	47	47	31	31	31	48	48	48	48	36	36
0.121 – 0.140 (0.0048 – 0.0055)				709	709	709	709	704	704	704	710	710	710	01	01	01	01	42	42	42	06	06	06	43	43	43	11	11	11	44	44	44	44	16	16	16	45	45	45	45	21	21	21	46	46	46	46	26	26	26	47	47	47	47	31	31	31	48	48	48	48	36	36	49
0.141 – 0.149 (0.0056 – 0.0059)			709	709	709	709	704	704	704	710	710	01	01	01	01	01	42	42	06	06	06	43	43	11	11	11	11	44	44	16	16	16	16	45	45	21	21	21	46	46	26	26	26	47	47	31	31	31	48	48	36	36	36	49
0.150 – 0.250 (0.0059 – 0.0098)									

Adjusting Shim Selection Using Chart (Exhaust)

| Measured clearance mm (in.) \ Installed shim thickness mm (in.) | 2.340 (0.0921) | 2.350 (0.0925) | 2.360 (0.0929) | 2.380 (0.0937) | 2.400 (0.0945) | 2.420 (0.0953) | 2.440 (0.0961) | 2.450 (0.0965) | 2.460 (0.0969) | 2.480 (0.0976) | 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) | 2.680 (0.1055) | 2.700 (0.1063) | 2.720 (0.1071) | 2.740 (0.1079) | 2.750 (0.1083) | 2.760 (0.1087) | 2.780 (0.1094) | 2.800 (0.1102) | 2.820 (0.1110) | 2.840 (0.1118) | 2.850 (0.1122) | 2.860 (0.1126) | 2.880 (0.1134) | 2.900 (0.1142) | 2.920 (0.1150) | 2.940 (0.1157) | 2.950 (0.1161) | 2.960 (0.1165) | 2.980 (0.1173) | 3.000 (0.1181) | 3.020 (0.1189) | 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) |
|---|---|---

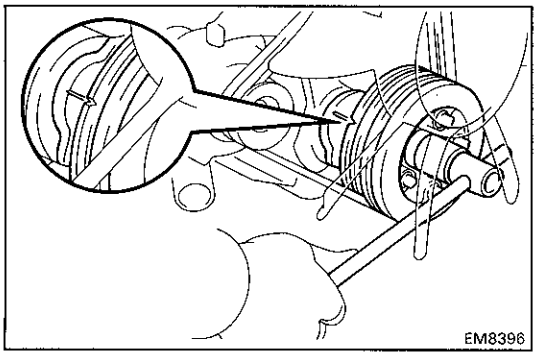


ADJUSTMENT OF INJECTION TIMING

1. **(1PZ)**
REMOVE TIMING BELT COVER
(See step 1 on page EM-33)

2. **(1PZ)**
SET NO.1 CYLINDER TO TDC/COMPRESSION

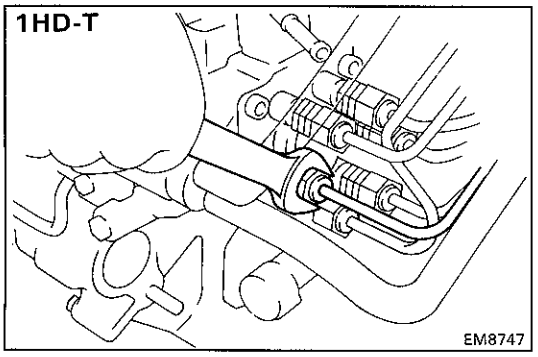
Turn the crankshaft pulley clockwise, and align each pulley groove with the timing marks (TDC mark) as shown in the illustration.



3. **(1HZ and 1HD-T)**
SET NO.1 OR NO.6 CYLINDER TO TDC/COMPRESSION

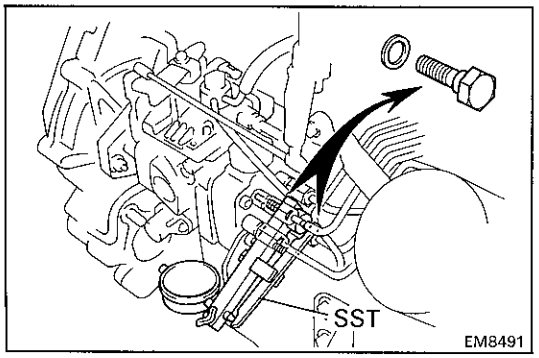
Turn the crankshaft pulley clockwise, and align its groove with the timing gear cover groove.

4. **(1HD-T w/ BACS)**
REMOVE AIR CONTROL VALVE (ACV)



5. **INSTALL SST AND DIAL INDICATOR**

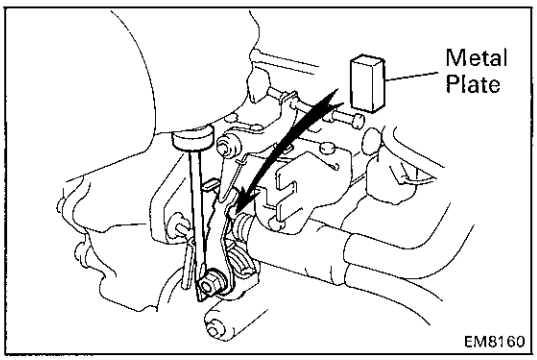
(a) (1HD-T)
Loosen the union nut of the No.5 cylinder injection pipe.



(b) Remove the plug bolt from the distributive head plug of the injection pump.

(c) Install SST (plunger stroke measuring tool) and a dial indicator to the plug bolt hole of distributive head plug.

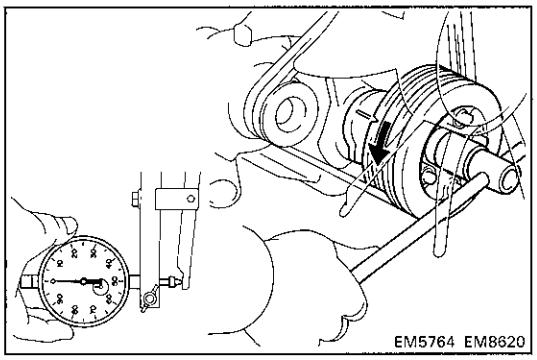
SST 09275-54011



6. (w/ ACSD)
RELEASE ACSD ADVANCE

(a) Using a screwdriver, turn the cold starting lever counterclockwise approx. 20°.

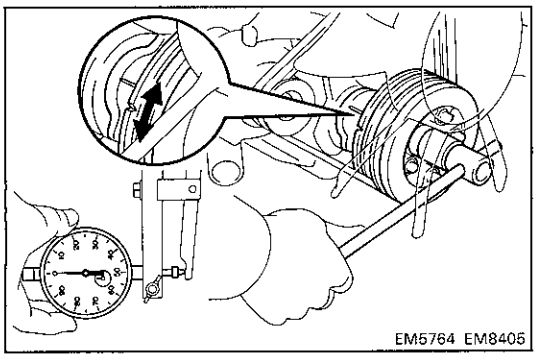
(b) Put a metal plate (thickness of 3.5 – 7.5 mm (0.135 – 0.295 in.)) between the cold starting lever and thermo wax plunger.



7. **ADJUST INJECTION TIMING**

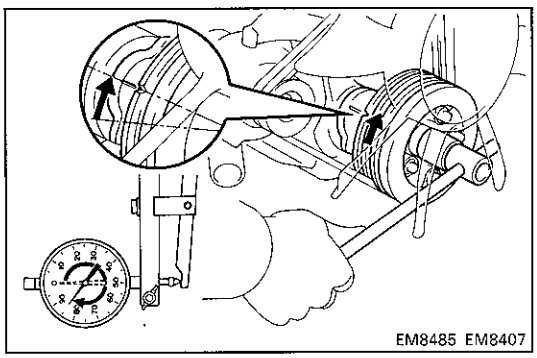
(a) Slowly rotate the crankshaft pulley counterclockwise and set the dial indicator at 0 mm (0 in.) when the dial indicator reaches the minimum value.

NOTICE: Compared with previous four cylinder engines, the 0 mm (0 in.) position (crank angle) is reduced, so perform the operation carefully. (ex. 1PZ)



(b) Turn the crankshaft to the left and right and check that the dial indicator shows the minimum value.

NOTICE: Make sure that the minimum value is set at 0 mm (0 in.).



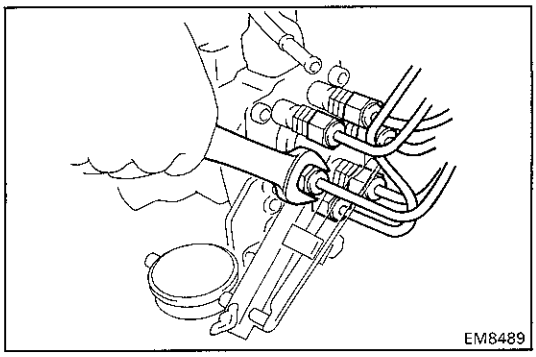
(c) Slowly rotate the crankshaft pulley clockwise until pulley groove is aligned with the timing gear cover groove.

(d) Measure the plunger stroke.

Plunger stroke:

1PZ	**0.82 – 0.88 mm (0.0323 – 0.0346 in.)**
1HZ	**1.03 – 1.09 mm (0.0406 – 0.0429 in.)**
1HD-T	**1.29 – 1.35 mm (0.0508 – 0.0531 in.)**

(e) Repeat steps (a) to (c) several times.

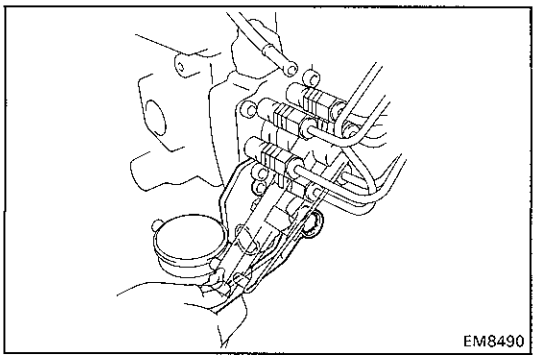


(f) Loosen the following nuts and bolt:

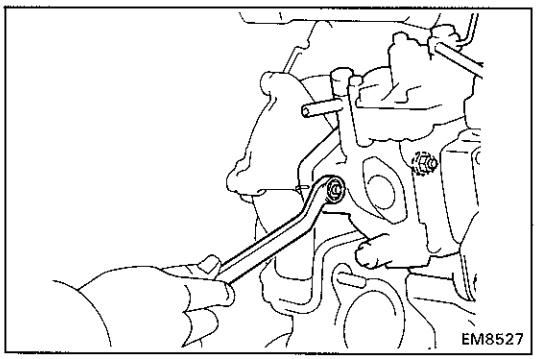
(1) (1PZ)
Five union nuts of injection pipes at injection pump side.

(2) (1HZ)
Six union nuts of injection pipes at injection pump side.

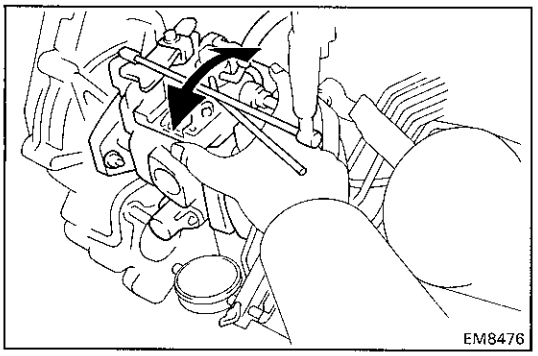
(3) (1HD-T)
Five remaining union nuts of injection pipes at injection pump side.



(4) Bolt holding injection pump to injection pump stay.



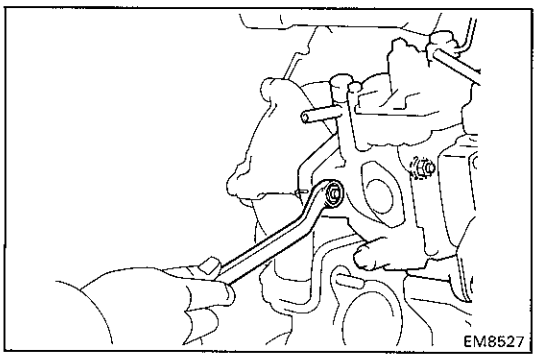
(5) Two nuts holding injection pump to timing gear case.



(g) Adjust plunger stroke by slightly tilting the injection pump body.

If the stroke is less than specification, tilt the pump toward the engine.

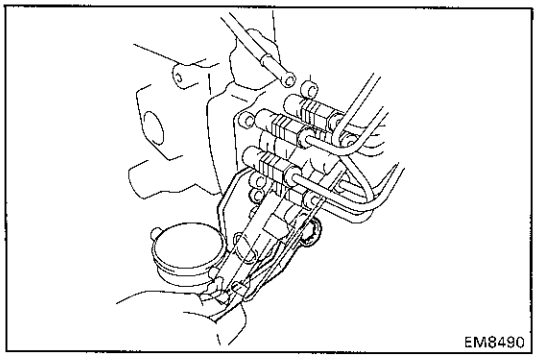
If the stroke is greater than specification, tilt the pump away from the engine.



(h) Tighten the following nuts and bolt:

(1) Two nuts holding injection pump to timing gear case.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

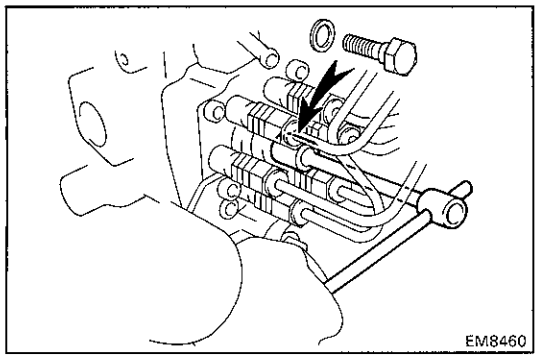


(2) Bolt holding injection pump to injection pump stay.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

- Recheck the plunger stroke.

8. **(w/ ACSD)**
REMOVE METAL PLATE



9. REMOVE SST AND DIAL INDICATOR

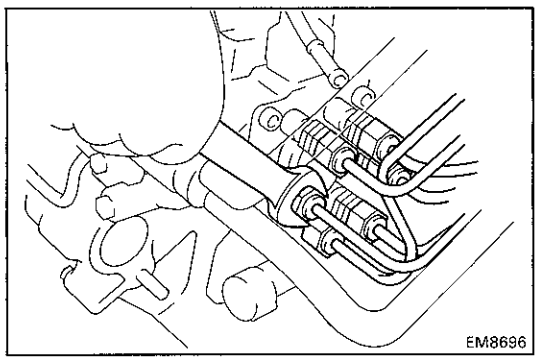
(a) Remove SST and the dial indicator.

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(b) Install a new gasket and the plug bolt of the distributive head plug.

Torque:

1PZ and 1HZ	**170 kg-cm (12 ft-lb, 17 N·m)**
1HD-T	**260 kg-cm (19 ft-lb, 25 N·m)**



10. TORQUE UNION NUTS OF INJECTION PIPES

Torque:

1PZ and 1HZ	**150 kg-cm (11 ft-lb, 15 N·m)**
1HD-T	**250 kg-cm (18 ft-lb, 25 N·m)**

11. (1HD-T w/ BACS)
INSTALL AIR CONTROL VALVE (ACV)

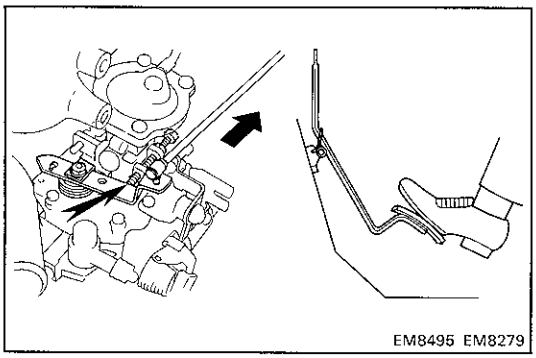
12. INSTALL TIMING BELT COVER
(See step 9 on page EM-41)

13. START ENGINE AND CHECK FOR LEAKS

ADJUSTMENT OF IDLE SPEED AND MAXIMUM SPEED

1. INITIAL CONDITIONS

(a) Engine at reach normal operating temperature
(b) Air cleaner installed
(c) All accessories switched OFF
(d) All vacuum lines properly connected
(e) Valve clearance set correctly
(f) Injection timing set correctly
(g) Transmission in N range



2. CONNECT TACHOMETER

3. ADJUST IDLE SPEED

(a) Check that the adjusting lever touches the idle speed adjusting screw when the accelerator pedal is released.

If not, adjust the accelerator linkage.

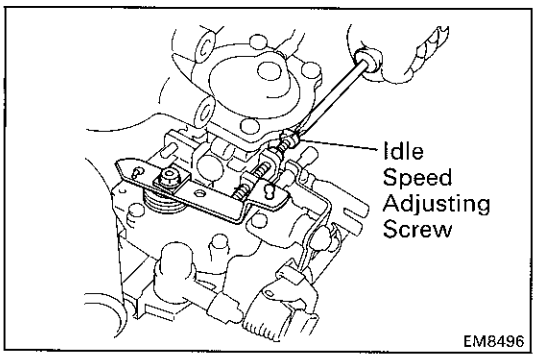
(b) Start the engine.
(c) Check the idle speed.

Idle speed:

1PZ	**600 – 700 rpm**
1HZ M/T	**600 – 700 rpm**
1HZ A/T	**660 – 760 rpm**
1HD-T M/T	**600 – 700 rpm**
1HD-T A/T	**750 – 850 rpm**

(d) Adjust the idle speed.

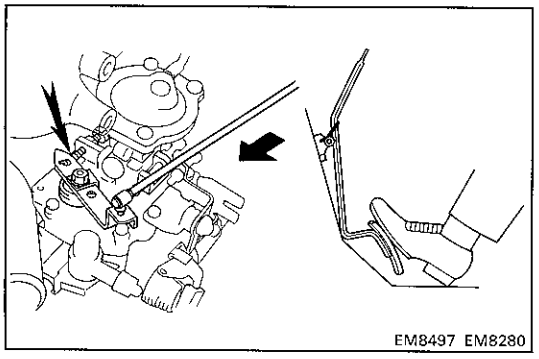
- Disconnect the accelerator linkage.
- Loosen the lock nut of the idle speed adjusting screw.
- Adjust the idle speed by turning the IDLE SPEED ADJUSTING SCREW.



Idle speed:

1PZ	**650 rpm**
1HZ M/T	**650 rpm**
1HZ A/T	**710 rpm**
1HD-T M/T	**650 rpm**
1HD-T A/T	**800 rpm**

- Securely tighten the lock nut, and recheck the idle speed.
- Reconnect the accelerator linkage.
- After adjustment, adjust the accelerator linkage.



4. ADJUST MAXIMUM SPEED

(a) Check that the adjusting lever touches the maximum speed adjusting screw when the accelerator pedal is depressed all the way.

If not, adjust the accelerator linkage.

(b) Start the engine.

(c) Depress the accelerator pedal all the way.

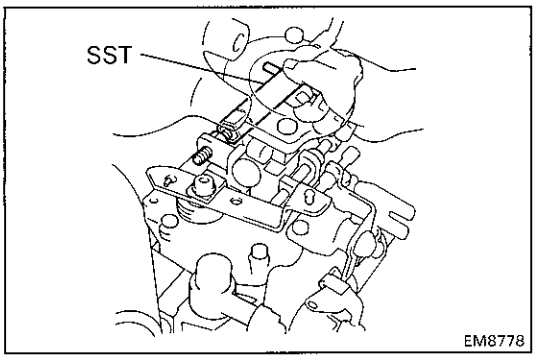
(d) Check the maximum speed.

Maximum speed:

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

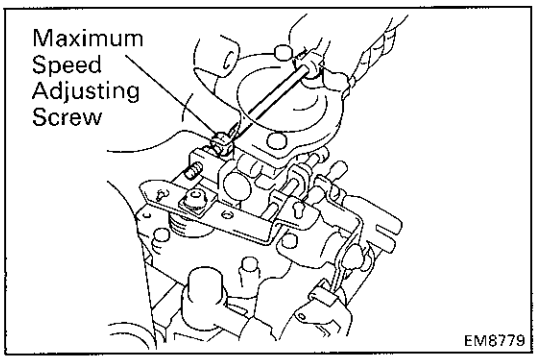
(e) Adjust the maximum speed.

- Disconnect the accelerator linkage.
- Cut out the seal wire of the maximum speed adjusting screw.
- (w/ HAC and 1HD-T)
  Using SST, loosen the lock nut of the maximum speed adjusting screw.



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- (w/o HAC)
  Loosen the lock nut of the maximum speed adjusting screw.



- Adjust the maximum speed by turning the MAXIMUM SPEED ADJUSTING SCREW.

Maximum speed:

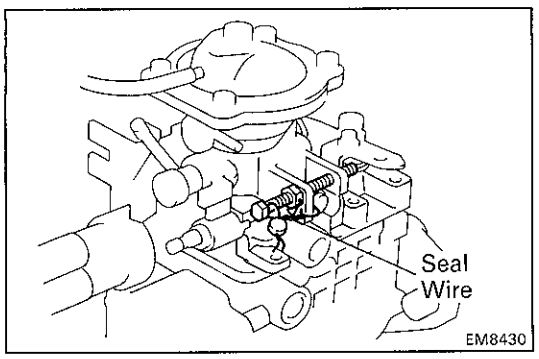
1PZ and 1HZ	**4,600 rpm**
1HD-T	**4,400 rpm**

HINT: Adjust at idle speed. Then, raise engine speed and recheck the maximum speed.

- (w/ HAC and 1HD-T)
  Using SST, securely tighten the lock nut.

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- (w/o HAC)
  Securely tighten the lock nut.
- Recheck the maximum speed.
- Reconnect the accelerator linkage.
- After adjustment, adjust the accelerator linkage.
- Seal the maximum speed adjusting screw with a new seal wire.



ADJUSTMENT OF AIR CONDITIONER IDLE-UP SETTING SPEED

1. INITIAL CONDITIONS

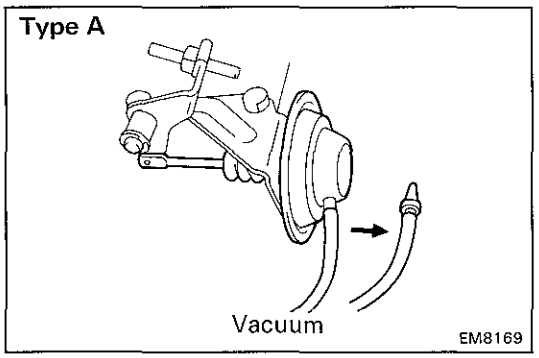
(a) Engine at reach normal operating temperature
(b) Air cleaner installed
(c) All vacuum lines properly connected
(d) Valve clearance set correctly
(e) Injection timing set correctly
(f) Transmission in N range
(g) Idle speed set correctly

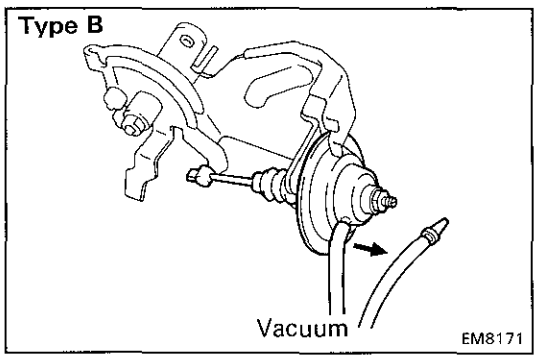
2. CONNECT TACHOMETER

3. ADJUST AIR CONDITIONER IDLE-UP SETTING SPEED

(a) Start the engine.
(b) A/C switches ON.
(c) Disconnect the vacuum hose from the idle-up actuator.
(d) Apply vacuum to the idle-up actuator.
(e) Race the engine to 2,500 rpm for a few seconds, release the throttle and check the idle-up setting speed.

A/C idle-up setting speed: 950 rpm





(f) Adjust the idle-up setting speed by turning the IDLE-UP SETTING SPEED ADJUSTING SCREW.
(g) Race the engine to 2,500 rpm for a few seconds, release the throttle and recheck the A/C idle-up setting speed.
(h) Reconnect the vacuum hose to the idle-up actuator.

