

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:

95D31 R and 95D31L

1.27-1.29 when fully charged at 20°C (68°F)

ex. (95D31 R and 95D31L)

1.25-1.27 when fully charged at 20°C (68°F)

INSPECTION OF AIR FILTER

(Paper Filter Type)

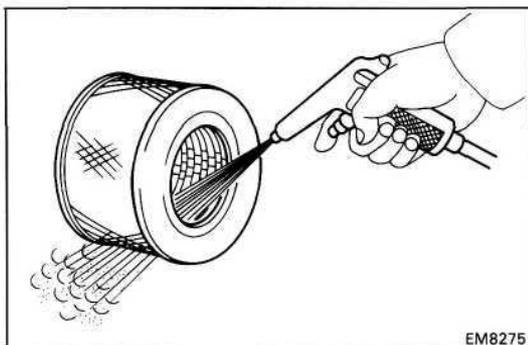
1. INSPECT AIR FILTER

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.



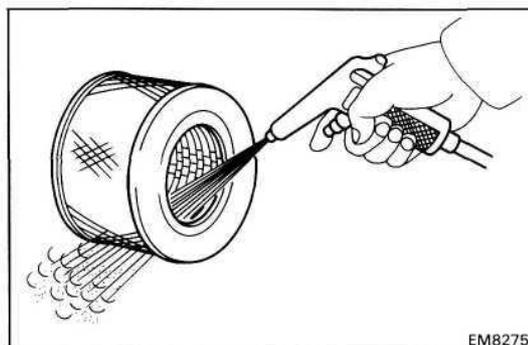
(Washable Type)

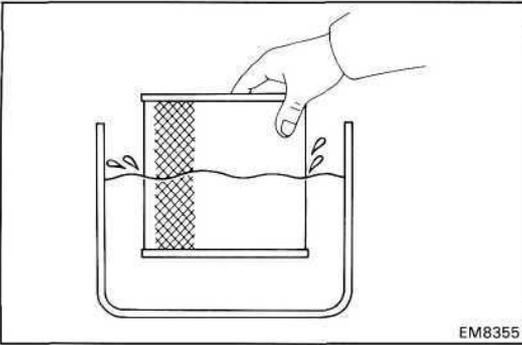
1. INSPECT AIR FILTER

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

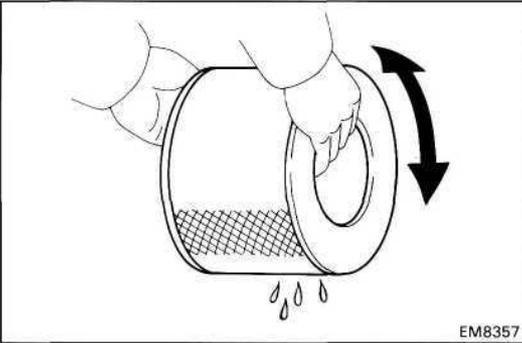
2. CLEAN AIR FILTER

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





EM8355



EM8357

- (b) Submerge the filter element in the water and agitate it up and down more than ten times.
- (c) Repeat rinsing in clean water until 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

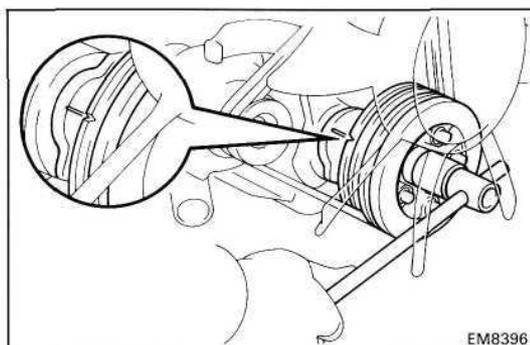
INSPECTION OF GLOW PLUGS

(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) (1 HZ 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.

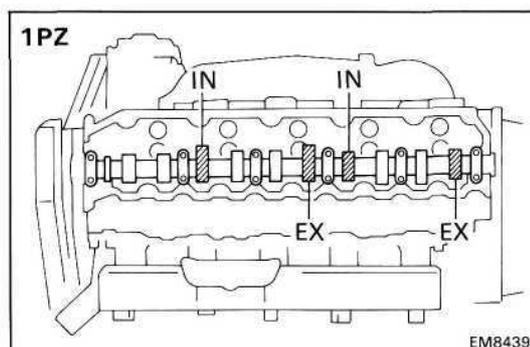
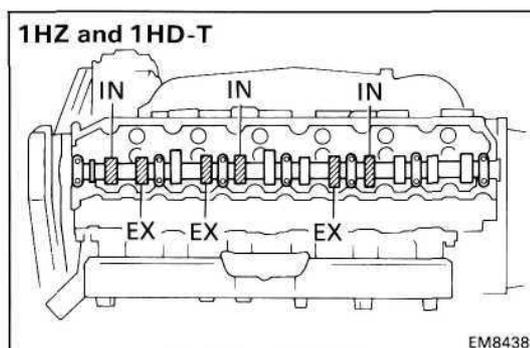
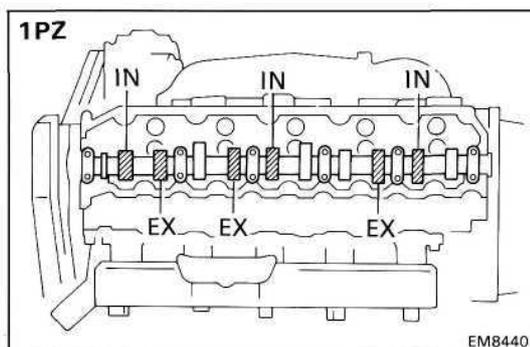
If not, turn the crankshaft one revolution (360°) and align the mark as above.

4. **ADJUST VALVE CLEARANCE**

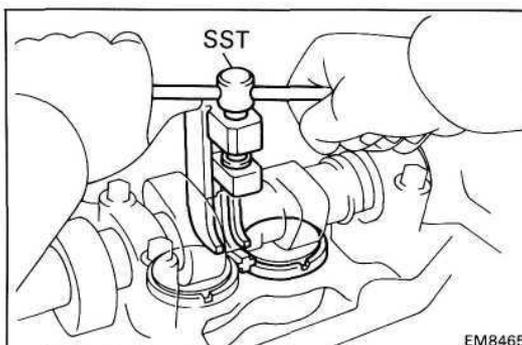
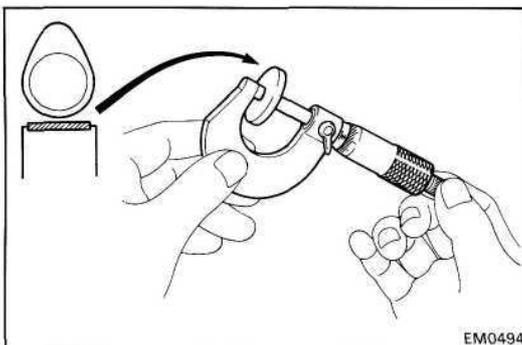
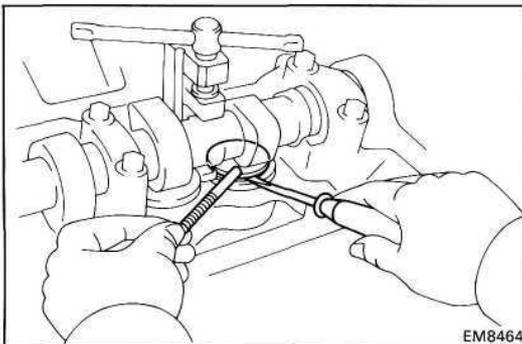
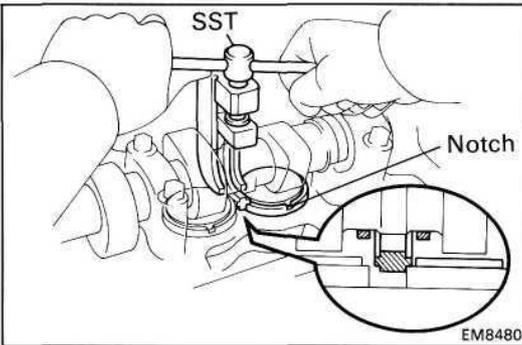
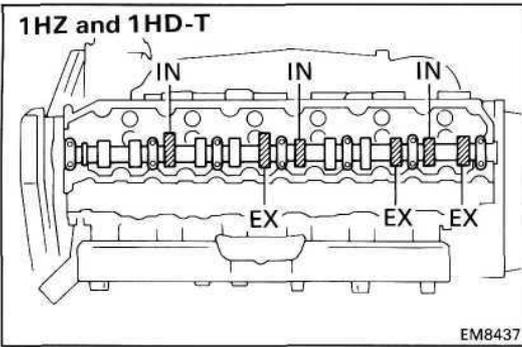
- (a) Check only those valves indicated in the illustration.
 - Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
 - Record the valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.

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.

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

Exhaust $N = T + (A - 0.40 \text{ mm (0.016 in.)})$

- 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.)

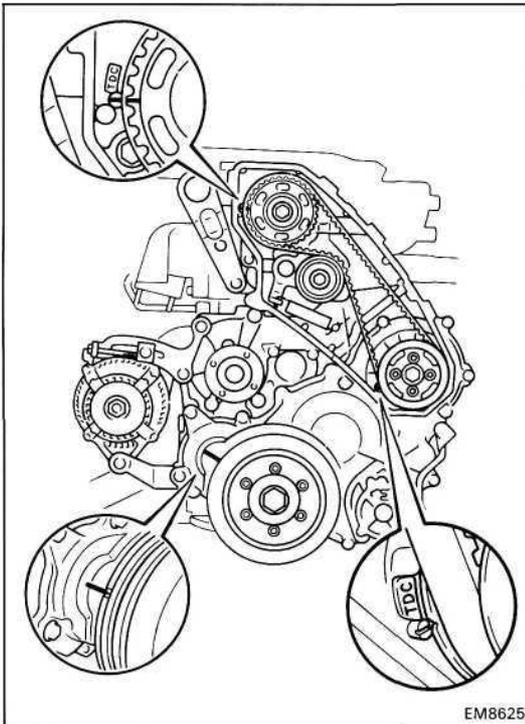
- (f) Install a new adjusting shim.
- Place a new adjusting shim on the valve lifter.
 - Remove SST.

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- (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)



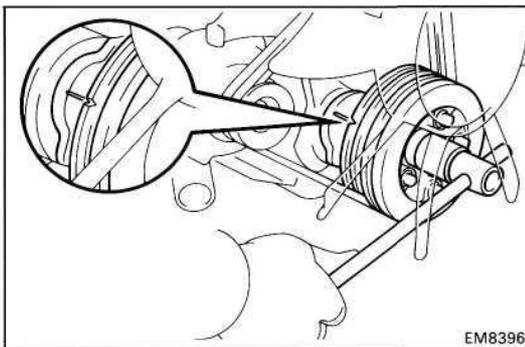
EM8625

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.

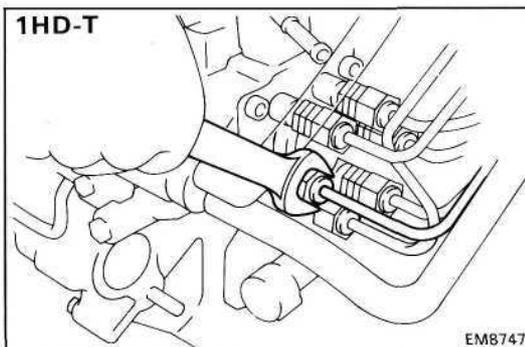


EM8396

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.

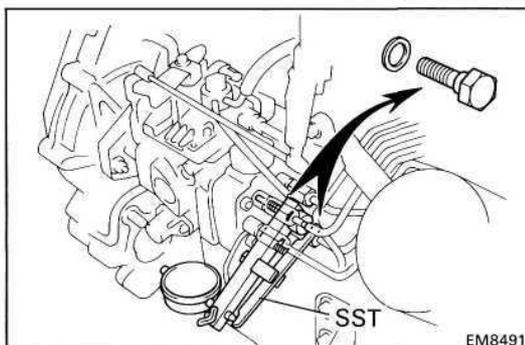
4. (1HD-T w/BACS)
REMOVE AIR CONTROL VALVE (ACV)



EM8747

5. **INSTALL SST AND DIAL INDICATOR**

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

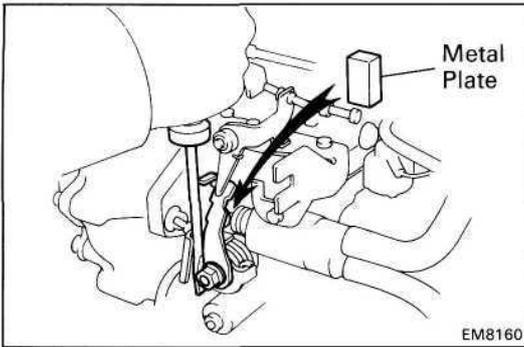


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- (b) Remove the plug bolt from the distributive head plug of the injection pump.

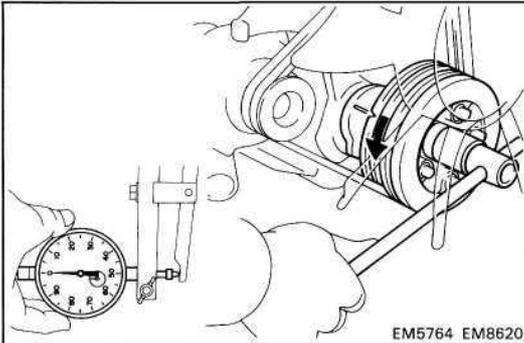
- (c) Install SST (plunger stroke measuring tool) and a dial indicator to the plug bolt hole of distributive head plug.

SST 09275-54011



6. (w/ACSD) RELEASE ACSD ADVANCE

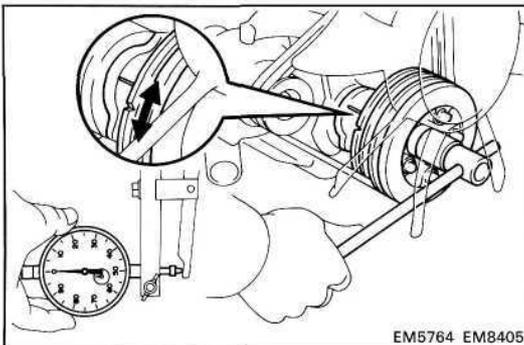
- (a) Using a screwdriver, turn the cold starting lever counterclockwise approx. 20°.
- (b) Put a metal plate (thickness of 3.5-7.5 mm (0.135-0.295 in.)) between the cold starting lever and thermo wax plunger.



7. ADJUST INJECTION TIMING

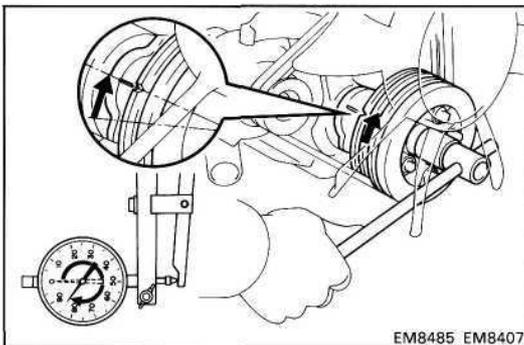
- (a) Slowly rotate the crankshaft pulley counterclockwise and set the dial indicator at 0 mm (0 in.) when the dial indicator reaches the minimum value.

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.).



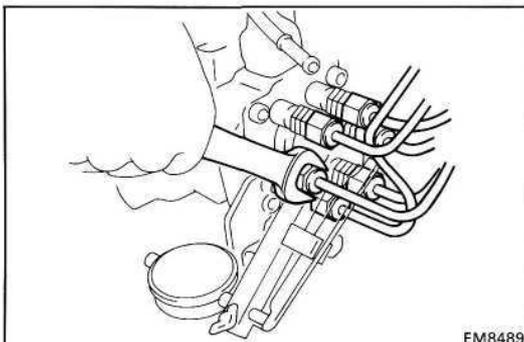
- (c) Slowly rotate the crankshaft pulley clockwise until pulley groove is aligned with the timing gear cover groove.

- (d) Measure the plunger stroke.

Plunger stroke:

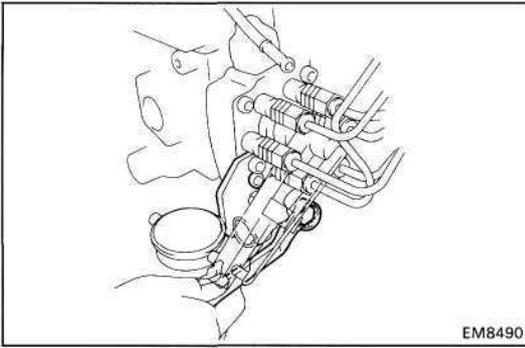
1PZ	0.82-0.88 mm (0.0323-0.0346 in.)
1HZ	1.03-1.09 mm (0.0406-0.0429 in.)
1HD-T	1.29-1.35 mm (0.0508-0.0531 in.)

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

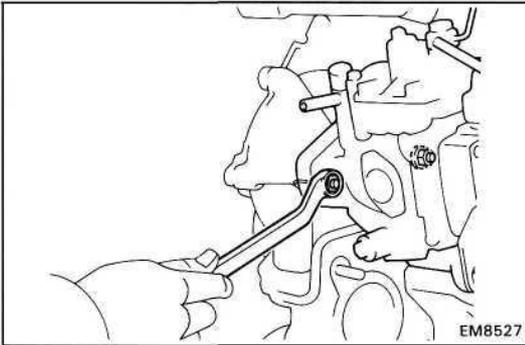


- (f) Loosen the following nuts and bolt:

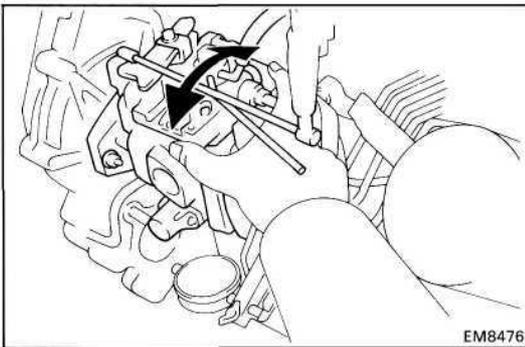
- (1) (1PZ)
Five union nuts of injection pipes at injection pump side.
- (2) (1HZ)
Six union nuts of injection pipes at injection pump side.
- (3) (1HD-T)
Five remaining union nuts of injection pipes at injection pump side.



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



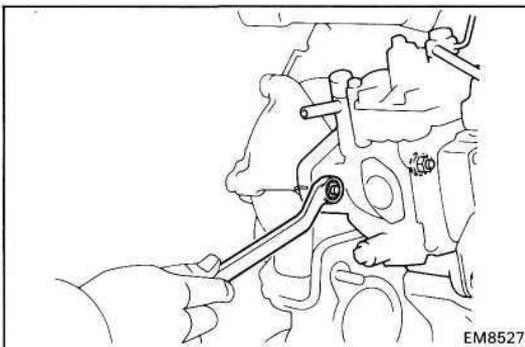
- (5) Two nuts holding injection pump to timing gear case.



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

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

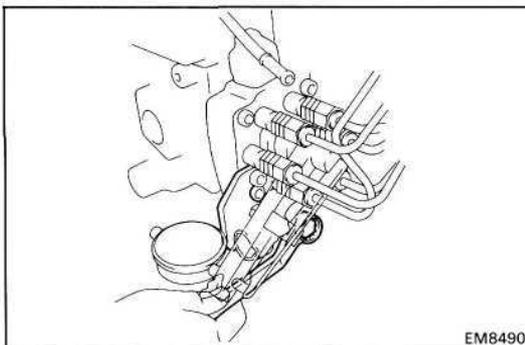
If the stroke is greater than specification, tilt the pump away from the engine.



- (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)

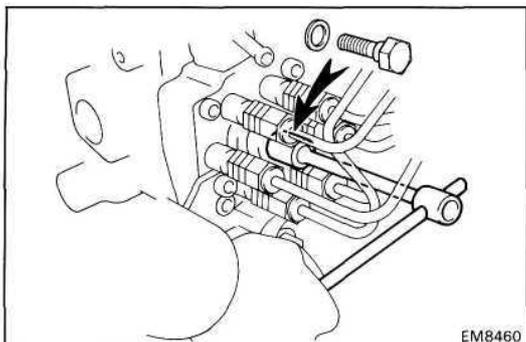


- (2) Bolt holding injection pump to injection pump stay.

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.

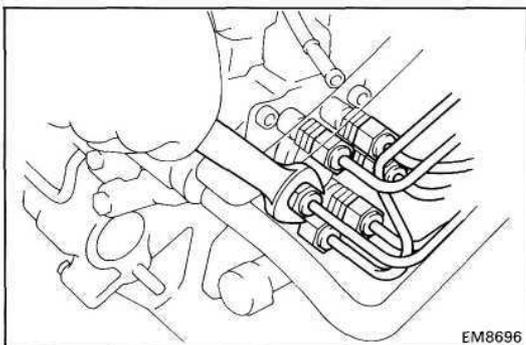
SST 09275-54011

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

Torque:

IPZ and 1HZ 170 kg-cm (12 ft-lb, 17 Nm)

1HD-T 260kg-cm (19 ft-lb, 25 Nm)

**10. TORQUE UNION NUTS OF INJECTION PIPES**

Torque:

1PZ and 1HZ 150kg-cm (11 ft-lb, 15 Nm)

1HD-T 250kg-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

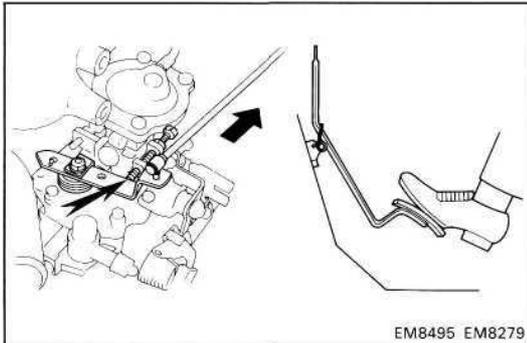
- (a) Engine at reach normal operating temperature
- (b) Air cleaner installed
- (c) All accessories switched OFF
- (d) All vacuum lines properly connected
- (e) Valve clearance set correctly
- (f) Injection timing set correctly
- (g) Transmission in N range

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:

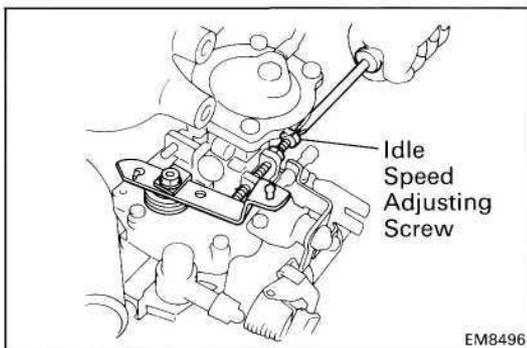
1PZ	600-700 rpm
1HZ M/T	600-700 rpm
1HZ A/T	660-760 rpm
1HD-T M/T	600-700 rpm
1HD-T A/T	750-850 rpm

- (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

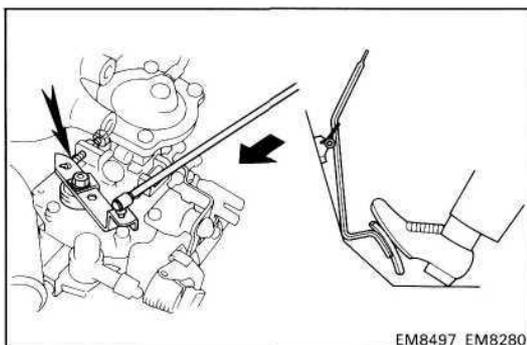
- Securely tighten the lock nut, and recheck the idle speed.
- Reconnect the accelerator linkage.
- After adjustment, adjust the accelerator linkage.



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 1 HZ 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.

SST 09275-54020

- (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:

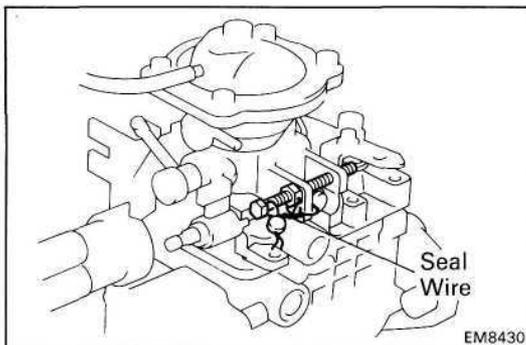
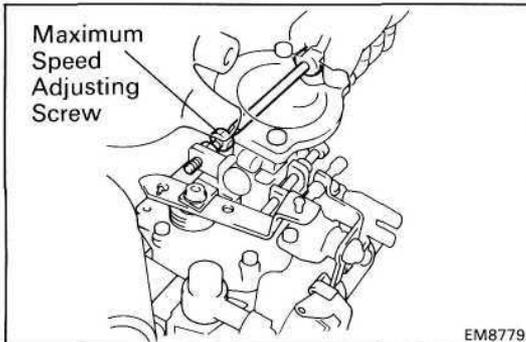
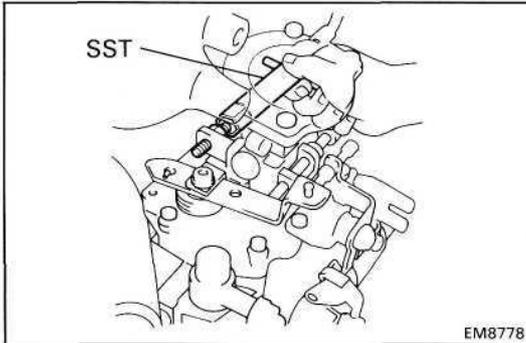
1 PZ and 1 HZ 4,600 rpm
1HD-T 4,400 rpm

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

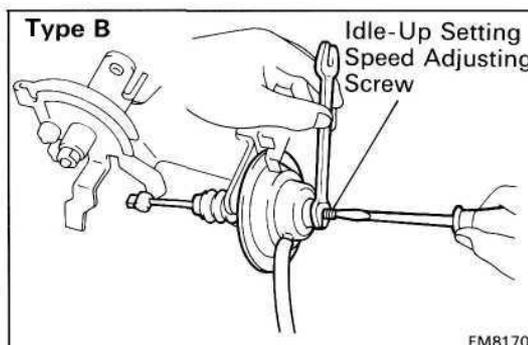
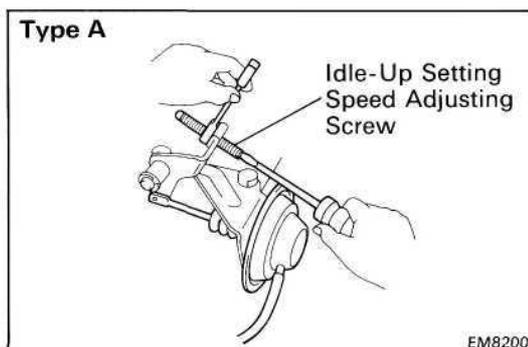
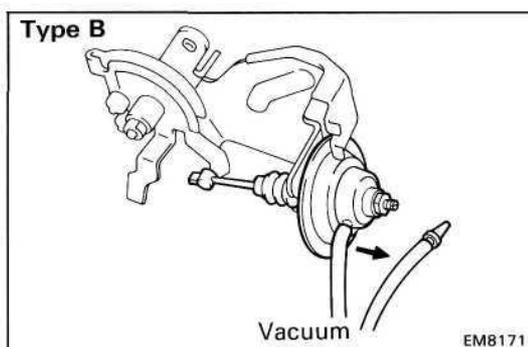
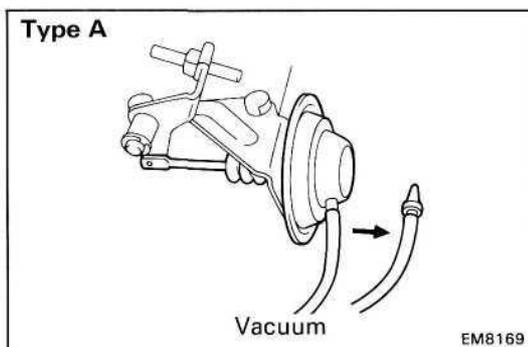
- (a) Engine at reach normal operating temperature
- (b) Air cleaner installed
- (c) All vacuum lines properly connected
- (d) Valve clearance set correctly
- (e) Injection timing set correctly
- (f) Transmission in N range
- (g) Idle speed set correctly

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.

COMPRESSION CHECK

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

1. WARM UP AND STOP ENGINE

Allow the engine to reach normal operating temperature.

2. DISCONNECT INJECTION PUMP (FUEL CUT SOLENOID) CONNECTOR

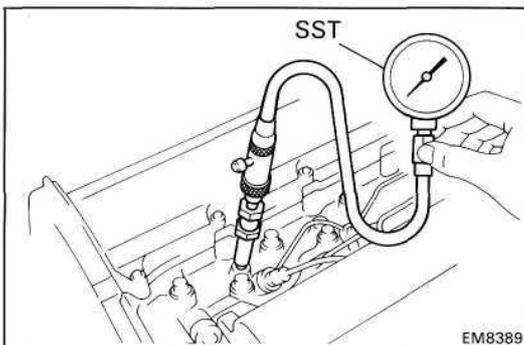
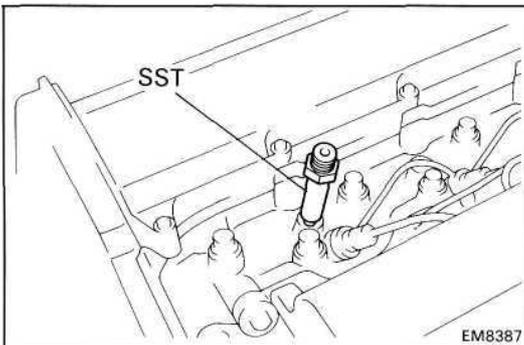
3. REMOVE GLOW PLUGS (See step 9 on page EM-57)

4. CHECK CYLINDER COMPRESSION PRESSURE

(a) Install SST (attachment) to the glow plug hole.
SST 09992-00024 (09992-00160)

(b) Connect SST (compression gauge) to SST (attachment).

SST 09992-00024 (09992-00160, 09992-00211)



- (c) Fully open the throttle valve.
- (d) While cranking the engine, measure the compression pressure.

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

- (e) Repeat steps (a) through (d) for each cylinder.

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

Compression pressure:

IPZ and 1HZ

37.0 kg/cm² (526 psi, 3,628 kPa) or more

1HD-T

35.0 kg/cm² (498 psi, 3,432 kPa) or more

Minimum pressure:

IPZ and 1HZ

27.0 kg/cm² (384 psi, 2,648 kPa) or more

1HD-T

25.0 kg/cm² (356 psi, 2,452 kPa) or more

Difference between each cylinder:

5.0 kg/cm² (71 psi, 490 kPa) or less

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

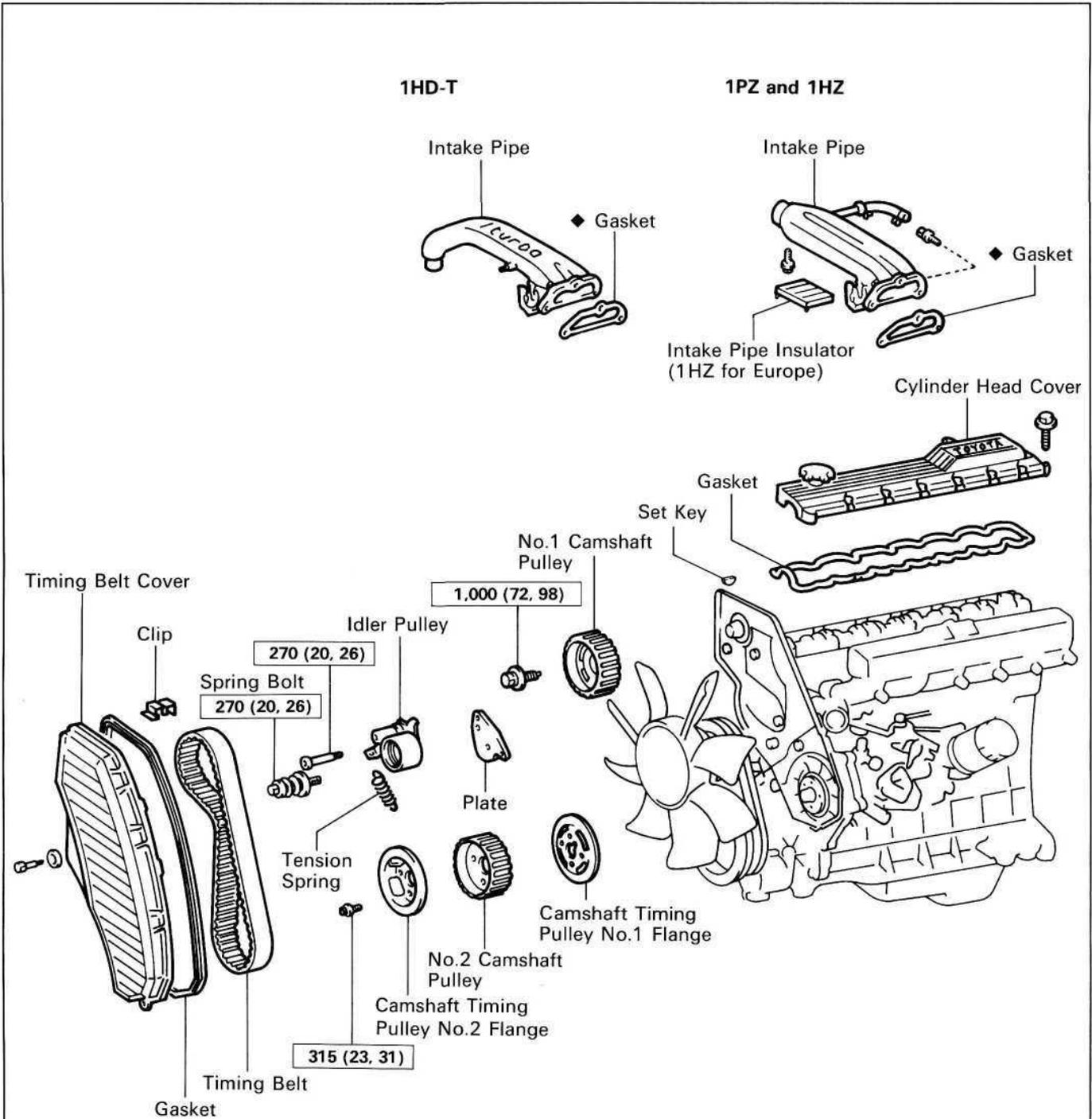
**5. REINSTALL GLOW PLUGS
(See step 11 on page EM-81)**

6. RECONNECT INJECTION PUMP (FUEL CUT SOLENOID) CONNECTOR

TIMING BELT

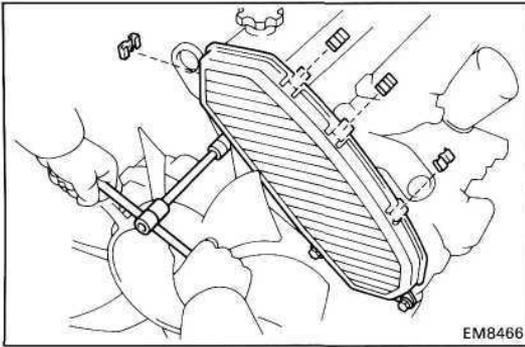
HINT: If replacing the timing belt before the timing belt warning light comes on, (light comes on after 100,000 km of driving), be sure to reset the timing belt counter of the speedometer to zero.

COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

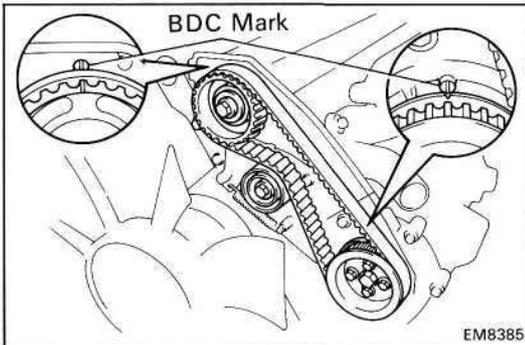


REMOVAL OF TIMING BELT

(See page EM-32)

1. REMOVE TIMING BELT COVER

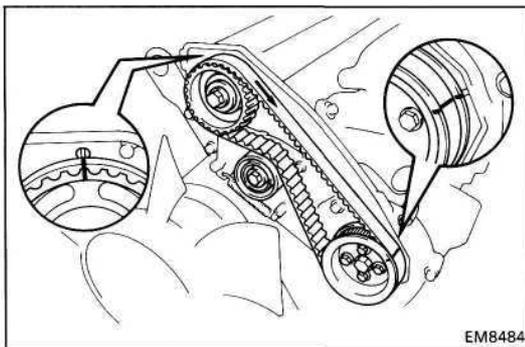
Remove the three seal washer, bolts, four clips, timing belt cover and gasket.



2. SET NO.1 CYLINDER TO BDC

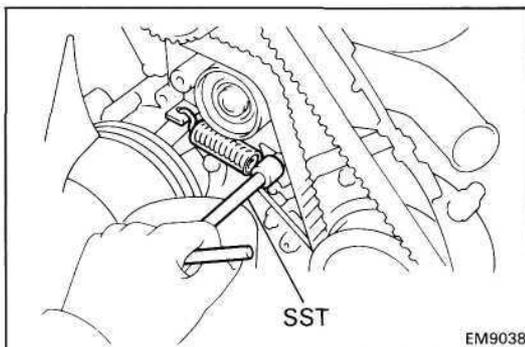
Turn the crankshaft pulley clockwise, set the No.1 and No.2 camshaft pulley grooves at each position (BDC mark).

HINT: By positioning the No.1 cylinder at BDC, interference between the valve and piston is avoided, even if the camshaft rotates.

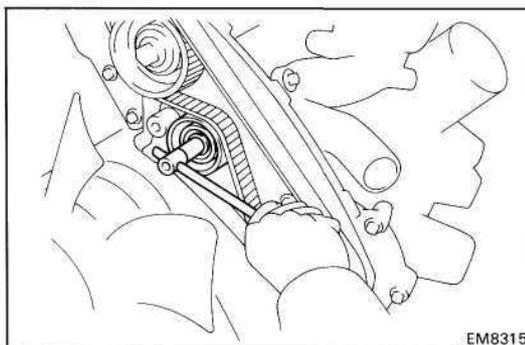


3. REMOVE TIMING BELT

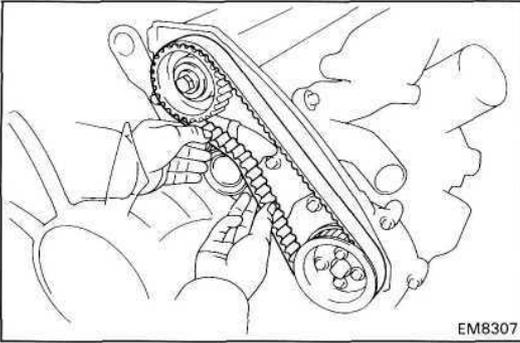
HINT: If re-using the timing belt, draw a direction arrow on the timing belt (in direction of engine revolution), and place matchmarks on the pulleys and timing belt.



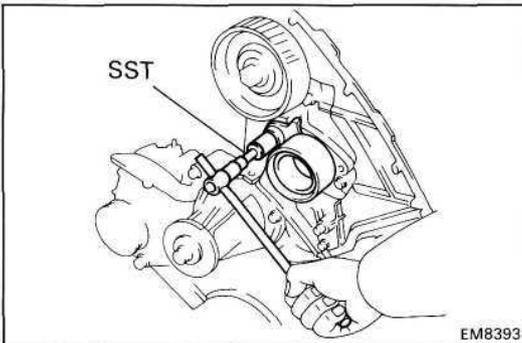
- (a) Using SST, remove the tension spring.
SST 09717-20010



- (b) Remove the spring bolt of the timing belt idler.



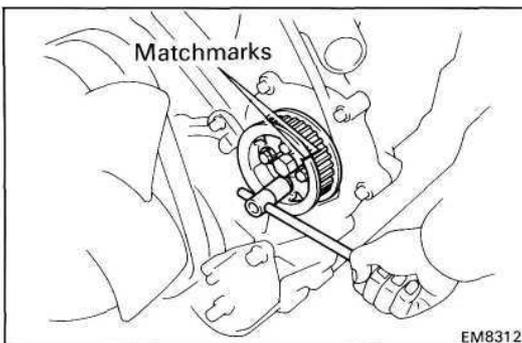
(c) Remove the timing belt.



4. REMOVE TIMING BELT IDLER PULLEY

Using SST, remove the bolt, timing belt idler pulley and plate.

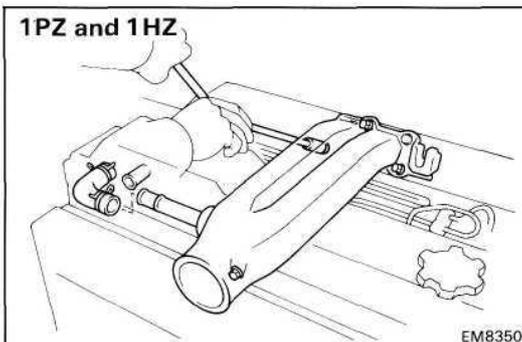
SST 09923-00020



5. REMOVE NO.2 CAMSHAFT TIMING PULLEY

(a) Place matchmarks on the camshaft timing pulley No.2 flange and No.2 camshaft timing pulley.

(b) Remove the four bolts, camshaft timing pulley No.2 flange, No.2 camshaft timing pulley and camshaft timing pulley No.1 flange.



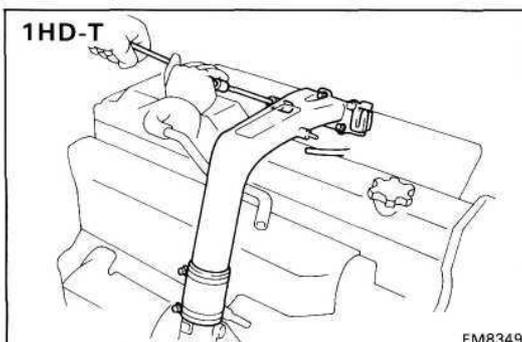
6. REMOVE INTAKE PIPE (IPZancMHZ)

(a) Disconnect the PCV hose.

(b) Remove the four bolts, intake pipe and gasket.

(c) (1HZ (Eourop))

Remove the intake pipe insulator.

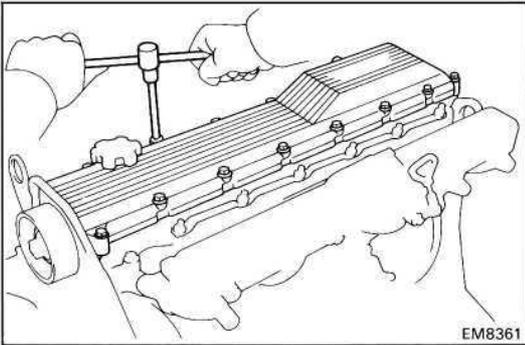


(1HD-T)

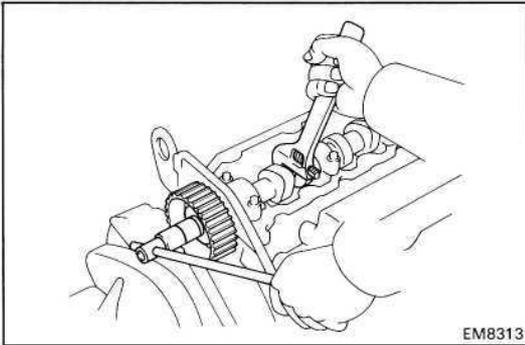
(a) Disconnect the turbo vacuum hose.

(b) Loosen the air hose clamp bolt.

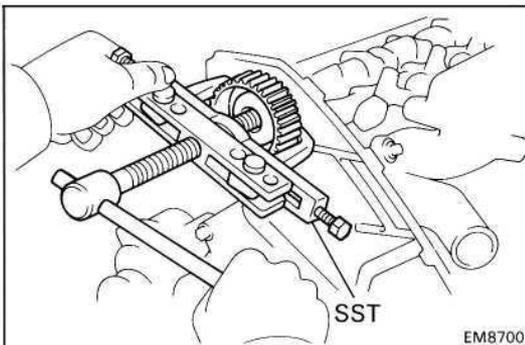
(c) Remove the three bolts, intake pipe and gasket.

**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

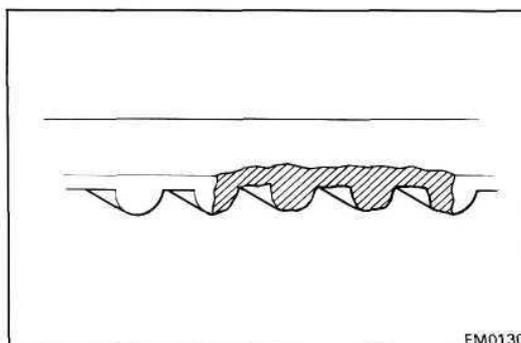
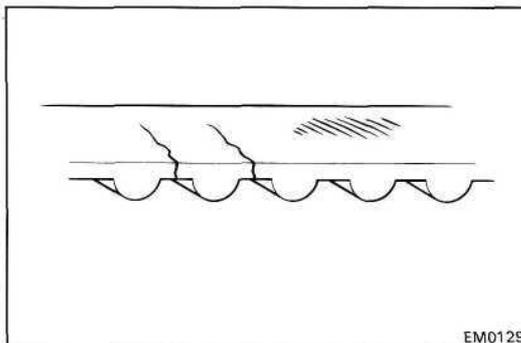
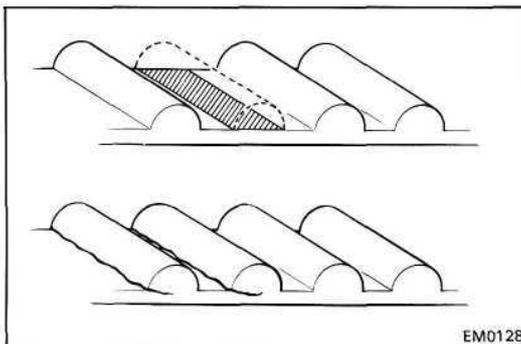
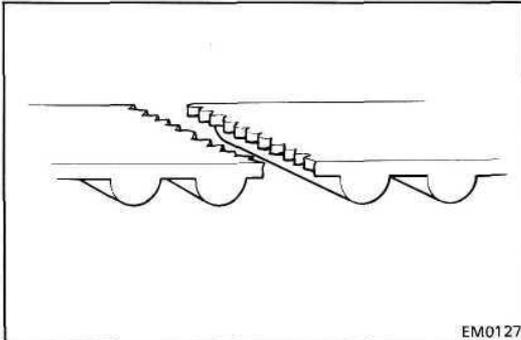
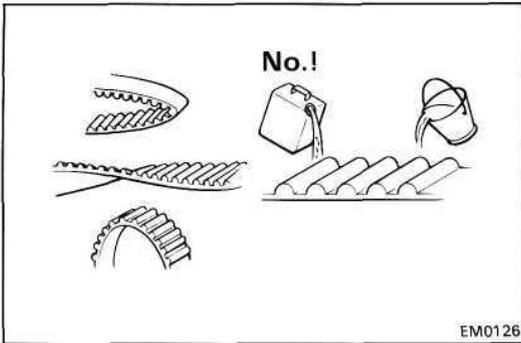
(c) Remove the set key.

INSPECTION OF TIMING BELT COMPONENTS

1. INSPECT TIMING BELT

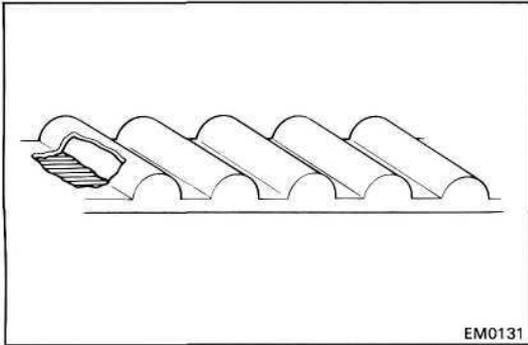
NOTICE:

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



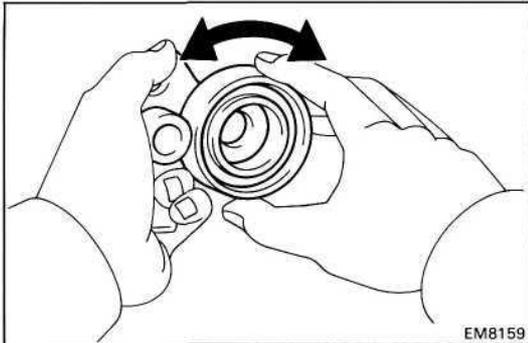
If there are any defects as shown in the illustration, check the following points:

- (a) Premature parting
 - Check for proper installation.
 - Check the timing belt cover gasket for damage and, check for proper installation.
- (b) If the belt teeth are cracked or damaged, check to see if the camshaft is locked.
- (c) If there are cracks or noticeable wear on the belt face, check to see if there are nicks on one side of the idler pulley lock.
- (d) If there is wear or damage on only one side of the belt, check the alignment of the each pulley.



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

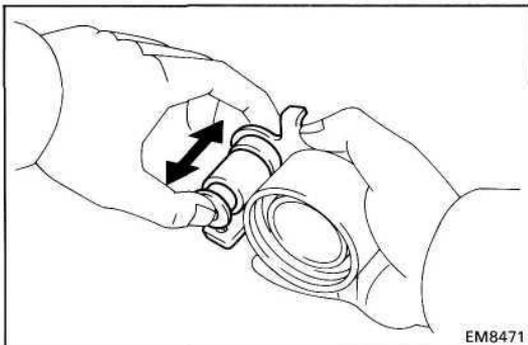
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEY

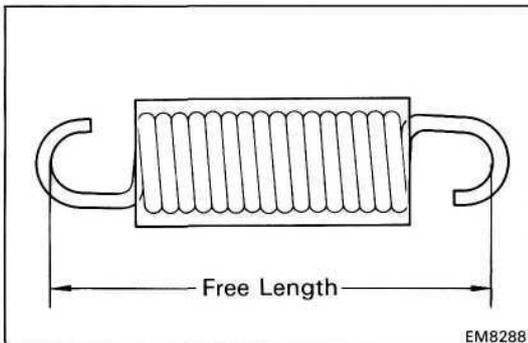
- (a) Check the turning smoothness of the idler pulley.

If necessary, replace the idler pulley.



- (b) Check that the idler pulley and the pulley bolt slide smoothly.

If necessary, replace the idler pulley.



3. INSPECT TENSION SPRING

- (a) Measure the free length of the tension spring.

Free length: 72.7 mm (2.862 in.)

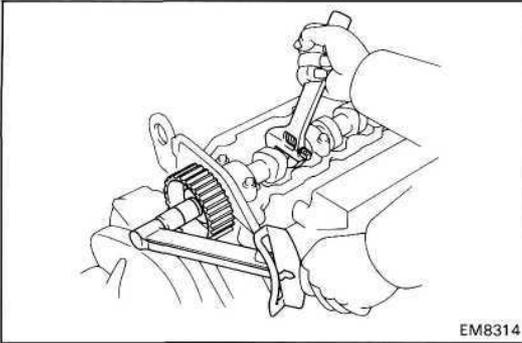
If the free length is not as specified, replace the tension spring.

- (b) Measure the tension of the tension spring at the specified installed length.

Installed tension:

23-28 kg (50.7-61.7 lb, 225-275 Nm)
at 90.1 mm (3.547 in.)

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



EM8314

INSTALLATION OF TIMING BELT

(See page EM-32)

1. INSTALL NO.1 CAMSHAFT TIMING PULLEY

- (a) Install the set key to the key groove of the camshaft.
- (b) Align the pulley set key with the key groove of the No.1 camshaft timing pulley, slide the No.1 camshaft timing pulley.
- (c) Temporarily install the No.1 timing pulley bolt.
- (d) Hold the hexagonal wrench head portion of the camshaft with a wrench, and tighten the No.1 camshaft timing bolt.

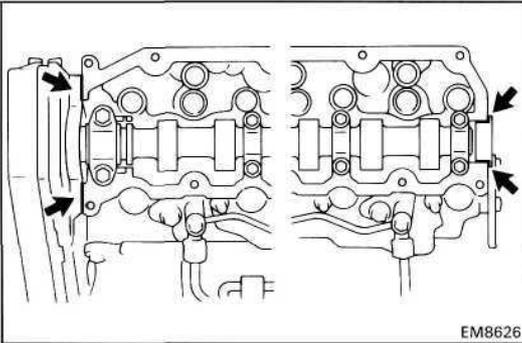
Torque: 1,000 kg-cm (72 ft-lb, 98 Nm)

2. INSTALL CYLINDER HEAD COVER

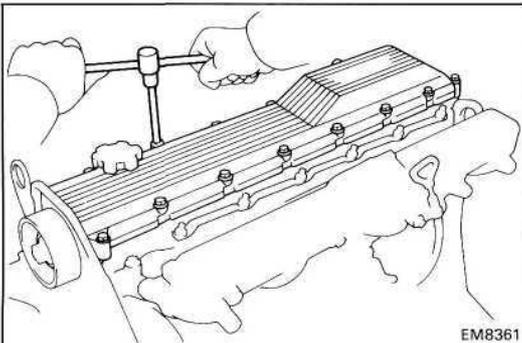
- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No.08826-00080 or equivalent

- (c) Install the gasket to the cylinder head cover.
- (d) Install the cylinder head cover with the twelve bolts (1PZ) or fourteen bolts (1HZ and 1HD-T) and two nuts.



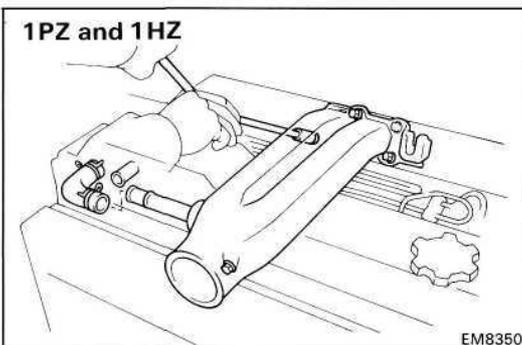
EM8626



EM8361

3. INSTALL INTAKE PIPE (1PZ and 1HZ)

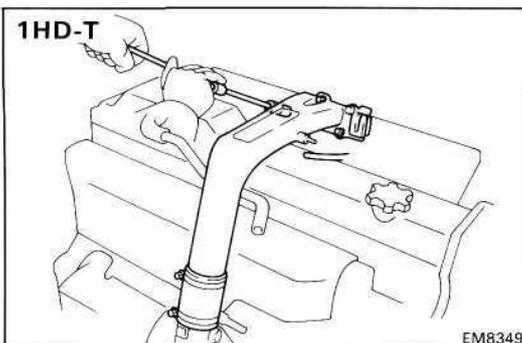
- (a) (1HZ (Europe))
Place the intake pipe insulator on the cylinder head cover.
- (b) Install a new gasket and intake pipe with the four bolts.
- (c) Connect the PCV hose.



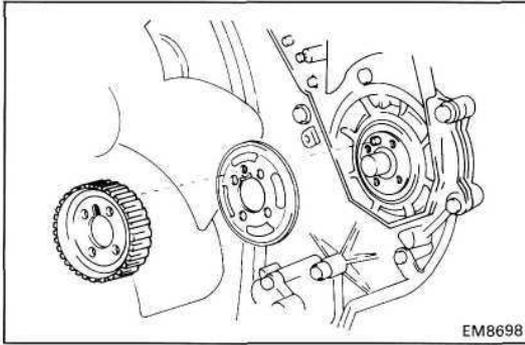
EM8350

(1HD-T)

- (a) Install a new gasket and intake pipe with the three bolts.
- (b) Connect the air hose and tighten the hose clamp.
- (c) Connect the turbo vacuum hose.

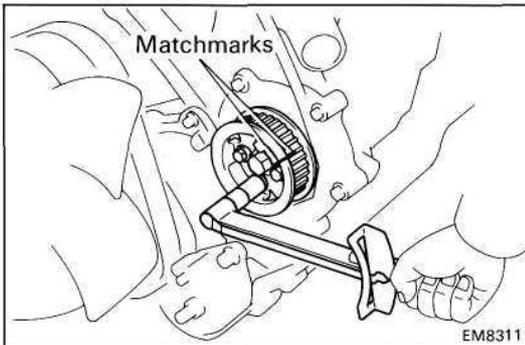


EM8349



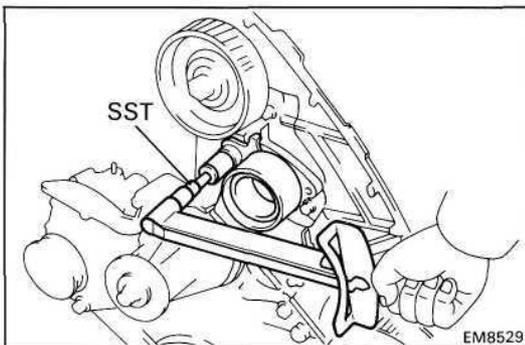
4. INSTALL NO.2 CAMSHAFT TIMING PULLEY

- (a) Align the knock pin of the injection pump drive gear with the knock pin hole of the camshaft timing pulley No.1 flange and cutout portion of the No.2 camshaft timing pulley.



- (b) Align the matchmarks of the No.2 camshaft timing pulley and camshaft timing pulley No.2 flange, and install and tighten the four bolts.

Torque: 315 kg-cm (23 ft-lb, 31 N-m)

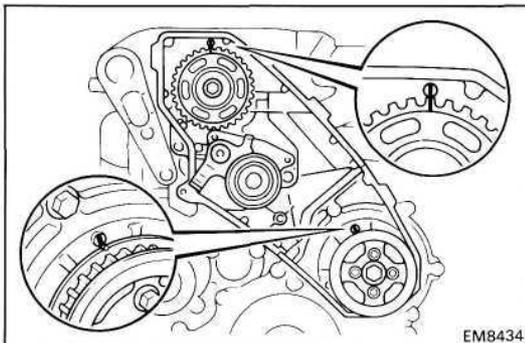


5. INSTALL TIMING BELT IDLER PULLEY

Using SST, install the plate and timing belt idler pulley with the bolt.

SST 09923-00020

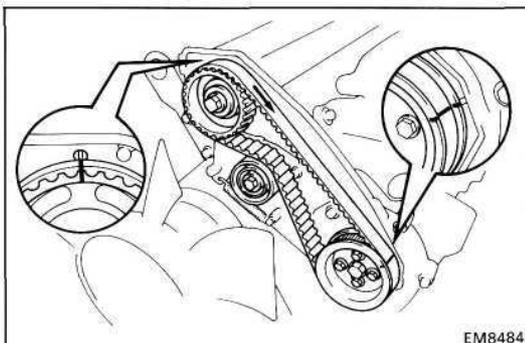
Torque: 270 kg-cm (20 ft-lb, 26 N·m)



6. SET NO.1 CYLINDER TO BDC

Set the timing pulleys at each position.

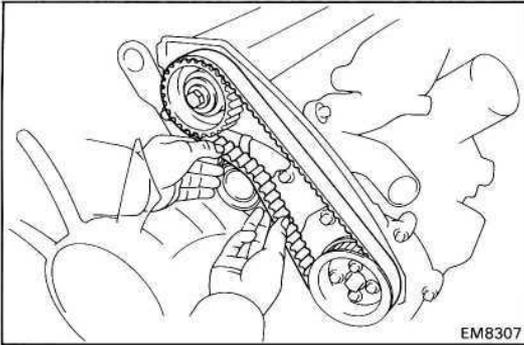
NOTICE: When turning the crankshaft, the valve heads will hit against the piston top. So do not turn it more than necessary.



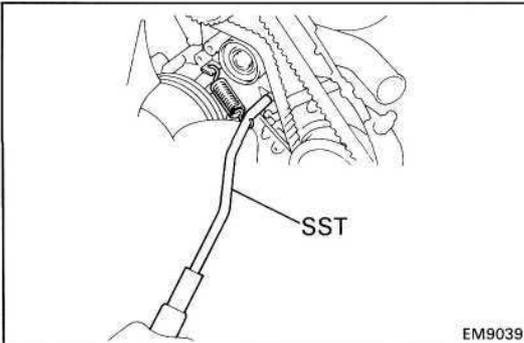
7. INSTALL TIMING BELT

NOTICE: The engine should be cold.

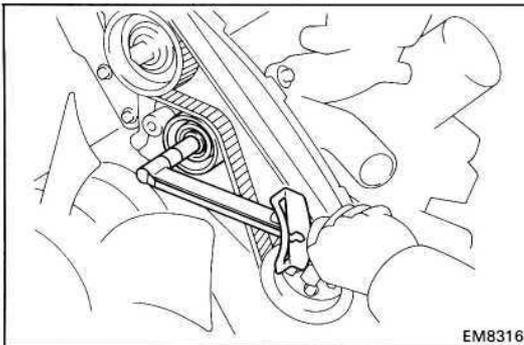
HINT: If re-using the timing belt, align the points marked during removal, and install the timing belt with the arrow pointing in the direction of engine revolution.



- (a) Remove any oil or water on each pulley, and keep them clean.
- (b) Install the timing belt in following order:
 - (1) No.2 camshaft timing pulley
 - (2) No.1 camshaft timing pulley
 - (3) Timing belt idler pulley

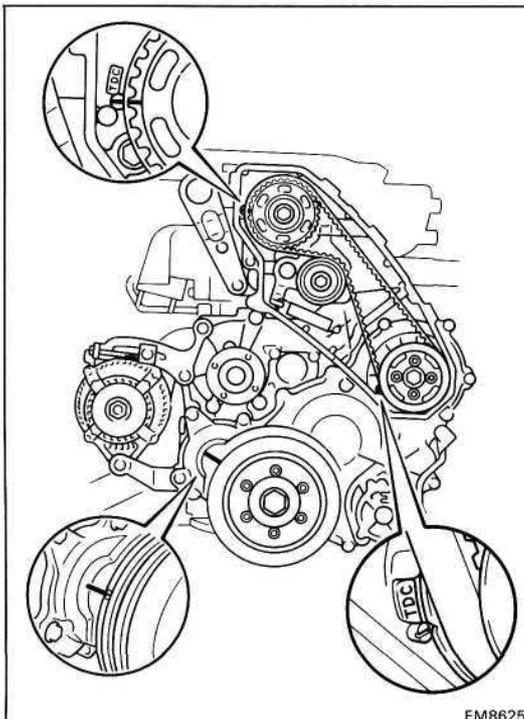


- (c) Using SST, install the tension spring.
SST 09718-20010



- (d) Install and torque the spring bolt of the timing belt idler.

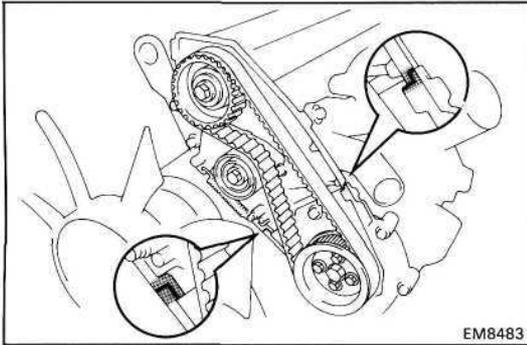
Torque: 270 kg-cm (20 ft-lb, 26 Nm)



8. CHECK VALVE TIMING

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

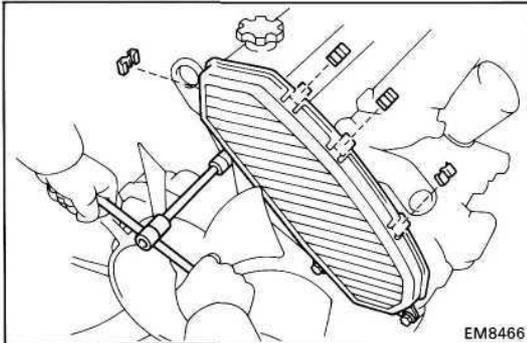
If the marks do not align, remove the timing belt and reinstall it.



9. INSTALL TIMING BELT COVER

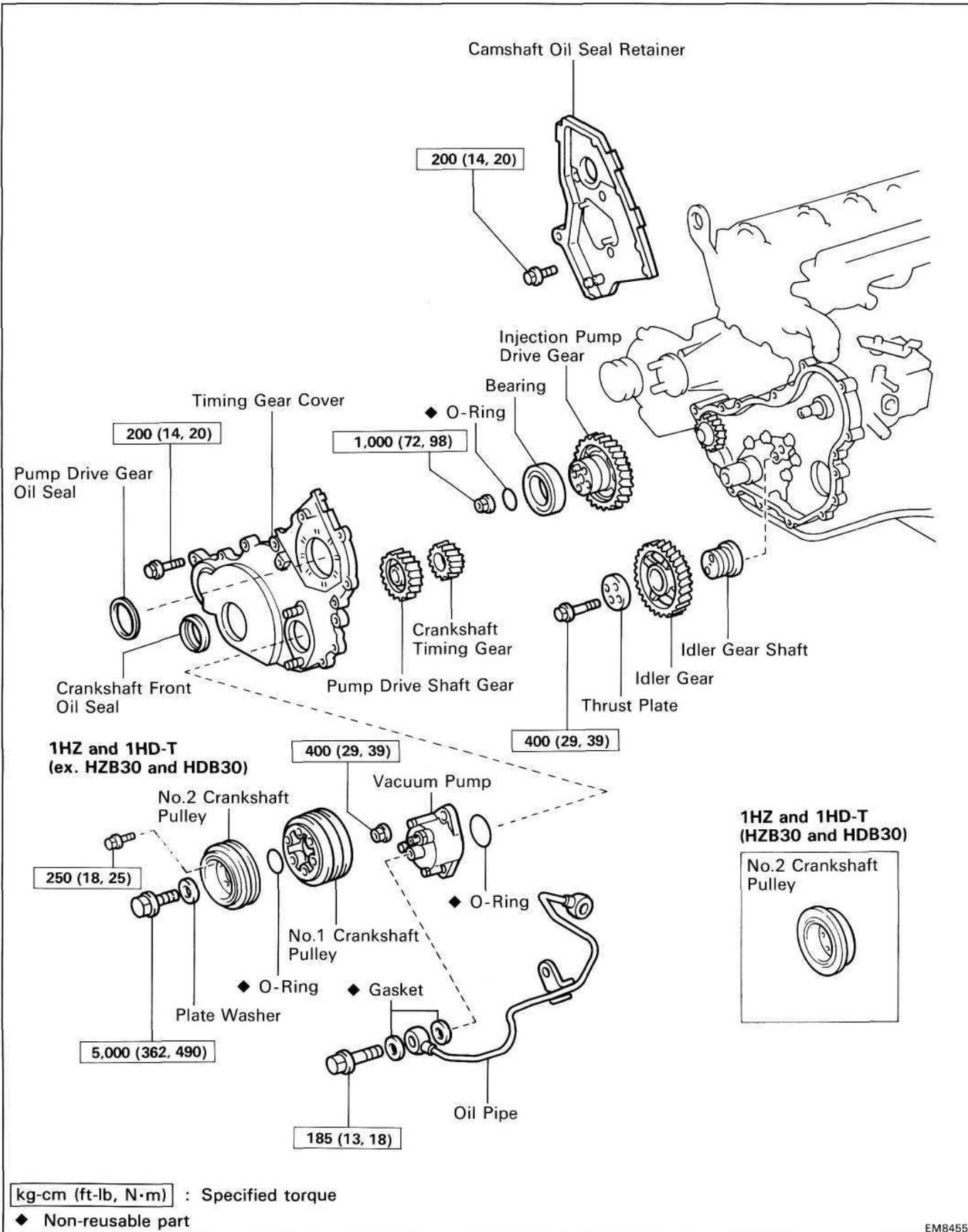
- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the camshaft oil seal retainer and timing gear cover as shown in the illustration.

Seal packing: Part No.08826-00080 or equivalent



- (c) Install the gasket to the timing belt cover.
- (d) Install the timing belt cover with the three seal washers, three bolts and four clips.

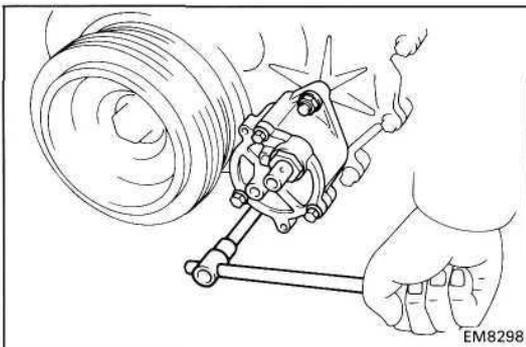
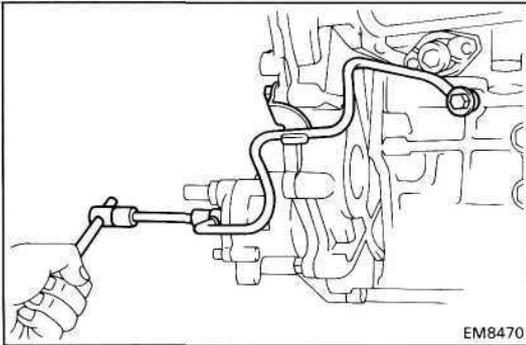
TIMING GEARS COMPONENTS



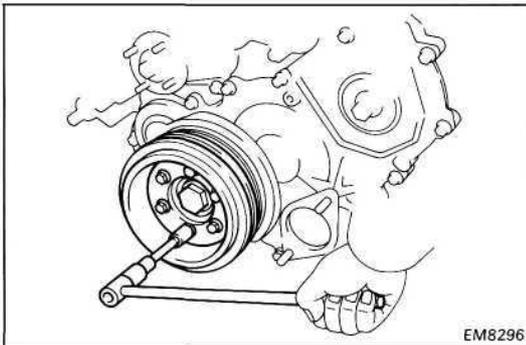
REMOVAL OF TIMING GEARS

(See page EM-42)

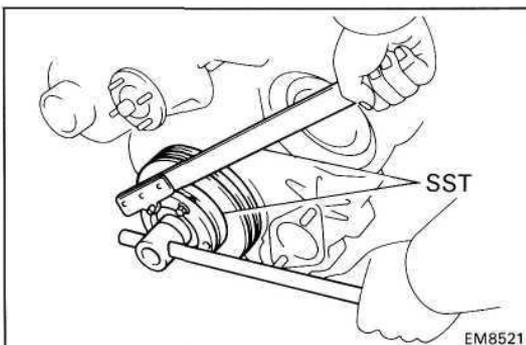
1. **REMOVE DRIVE BELT, FAN AND WATER PUMP PULLEY**
(See step 2 on page CO-7)
2. **REMOVE TIMING BELT AND PULLEYS**
(See page EM-32)
3. **REMOVE CAMSHAFT OIL SEAL RETAINER**
(See step 14 on page EM-59)
4. **REMOVE OIL PIPE**
 - (a) Remove the two union bolts and four gaskets.
 - (b) Remove the bolt and oil pipe.



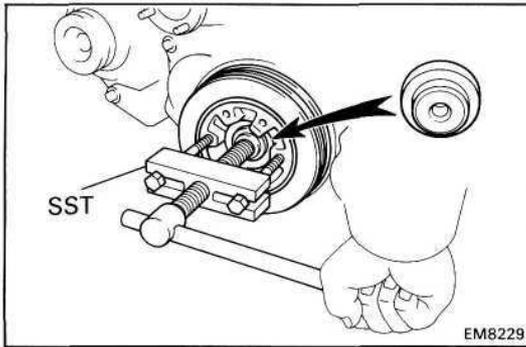
5. **REMOVE VACUUM PUMP**
 - (a) Remove the two nuts and vacuum pump.
 - (b) Remove the O-ring.



6. **(IHZ and iHD-T)**
REMOVE NO.2 CRANKSHAFT PULLEY
Remove the six bolts and No.2 crankshaft pulley.



7. **REMOVE NO.1 CRANKSHAFT PULLEY**
 - (a) Using SST, remove the pulley bolt and plate.
SST 0921 3-58011 and 09330-00021

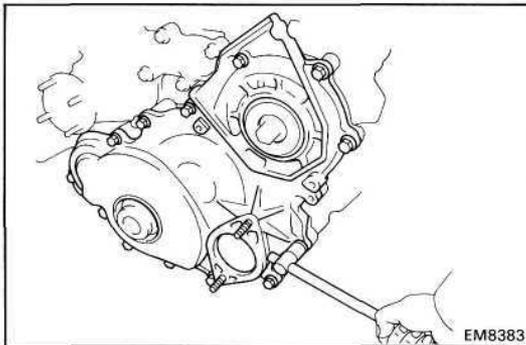


(b) Using SST, remove the No.1 crankshaft pulley.
SST 09213-60017 (09213-00020, 09213-00030, 09213-00060) and 09950-20017

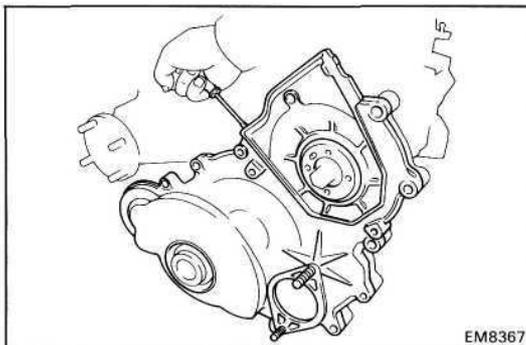
(c) Remove the O-ring from the No.1 crankshaft pulley.

8. REMOVE TIMING GEAR COVER

(a) Remove the fourteen bolts.



(b) Pry out the timing gear cover.



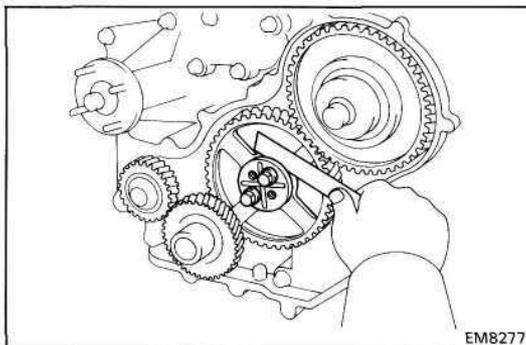
9. CHECK THRUST CLEARANCE OF IDLER GEAR

Using a thickness gauge, measure the thrust clearance.

Standard thrust clearance: 0.05-0.15 mm
(0.0020-0.059 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

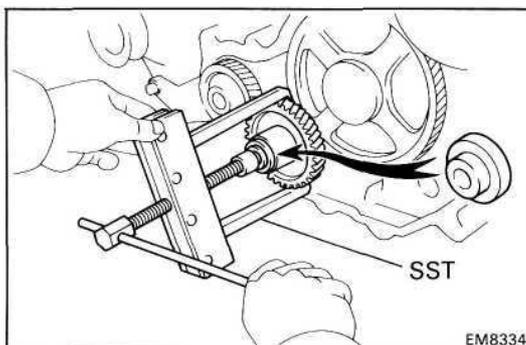
If the thrust clearance is greater than maximum, replace the thrust plate. If necessary, replace the idler gear and/or idler gear shaft.

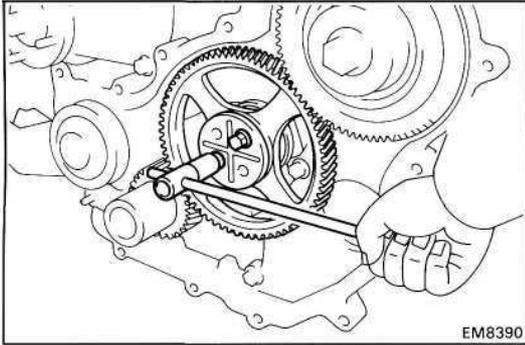


10. REMOVE PUMP DRIVE SHAFT GEAR

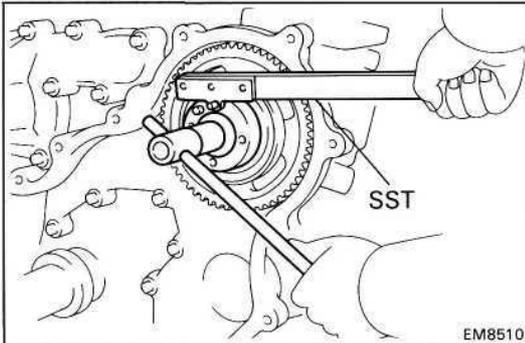
Using SST, remove the pump drive shaft gear.

SST 09213-36020 and 09950-20017



**11. REMOVE IDLER GEAR**

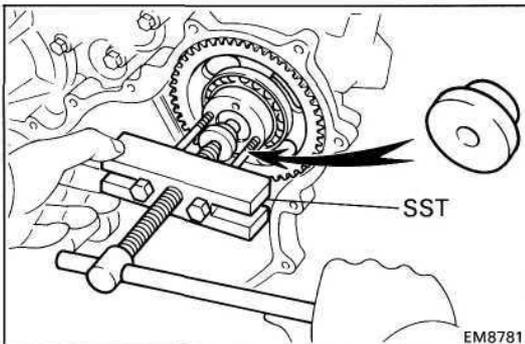
Remove the two bolts, thrust plate, idler gear and idler gear shaft.

**12. REMOVE INJECTION PUMP DRIVE GEAR**

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

SST 09330-00021

(b) Remove the O-ring.

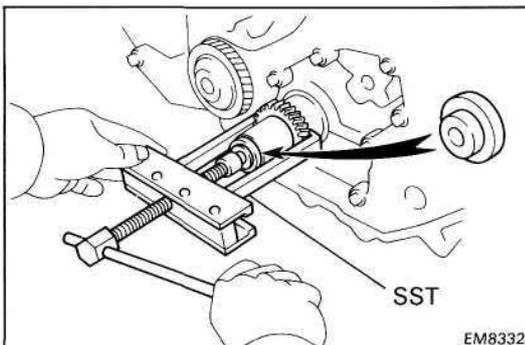


(c) Using SST, remove the injection pump drive gear.

SST 09213-60017 (09213-00020, 09213-00030, 09213-00060) and 09950-20017

NOTICE:

- Tighten the two bolts of SST more than 8 mm (0.31 in.)
- Set the SST so that it is balanced.

**13. REMOVE CRANKSHAFT TIMING GEAR**

Using SST, remove the crankshaft timing gear.

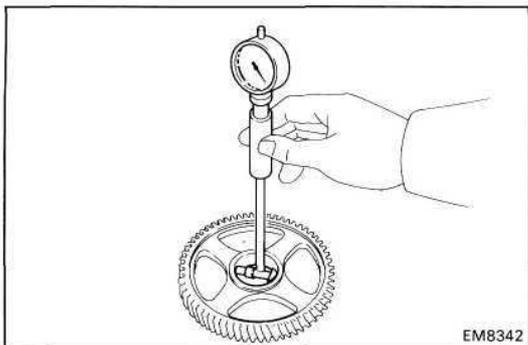
SST 09213-36020 and 09950-20017

INSPECTION OF TIMING GEARS

1. INSPECT IDLER GEAR

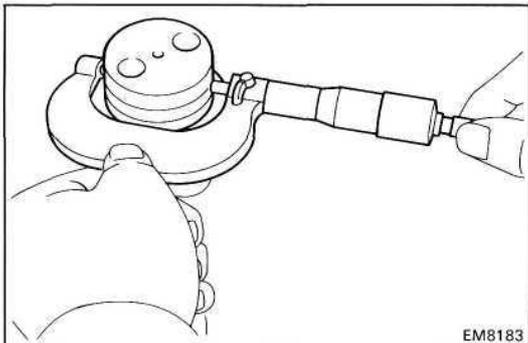
- (a) Using a cylinder gauge, measure the inside diameter of the idler gear.

**Idler gear inside diameter: 45.000-45.025 mm
(1.7717-1.7726 in.)**



- (b) Using a micrometer, measure the diameter of the idler gear shaft.

**Idler gear shaft diameter: 44.950-44.975 mm
(1.7697-1.7707 in.)**



- (c) Subtract the idler gear shaft diameter measurement from the idler gear inside diameter measurement.

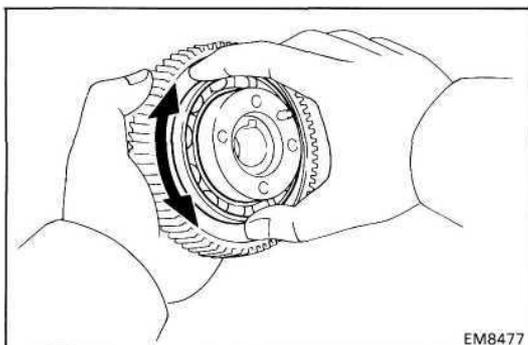
**Standard oil clearance: 0.025-0.075 mm
(0.0010-0.0030 in.)**

Maximum oil clearance: 0.20 mm (0.0079 in.)

If the clearance is greater than maximum, replace the gear and shaft.

2. INSPECT INJECTION PUMP DRIVE GEAR BEARING

Check that bearing is not rough or worn.

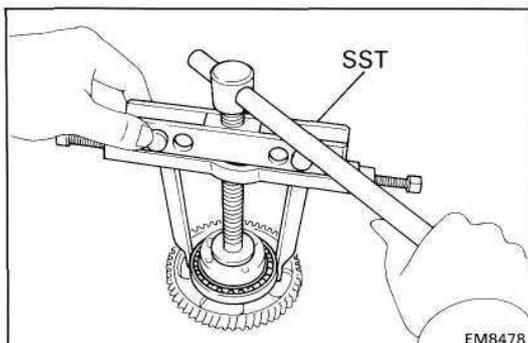


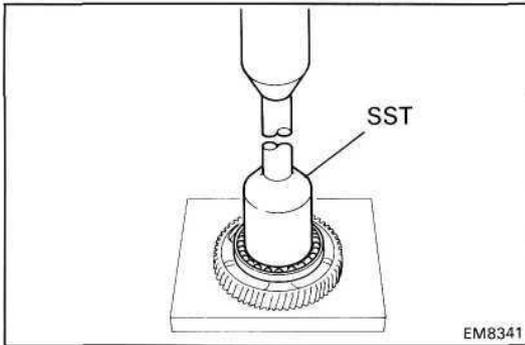
3. IF NECESSARY, REPLACE INJECTION PUMP DRIVE GEAR BEARING

A. Remove bearing

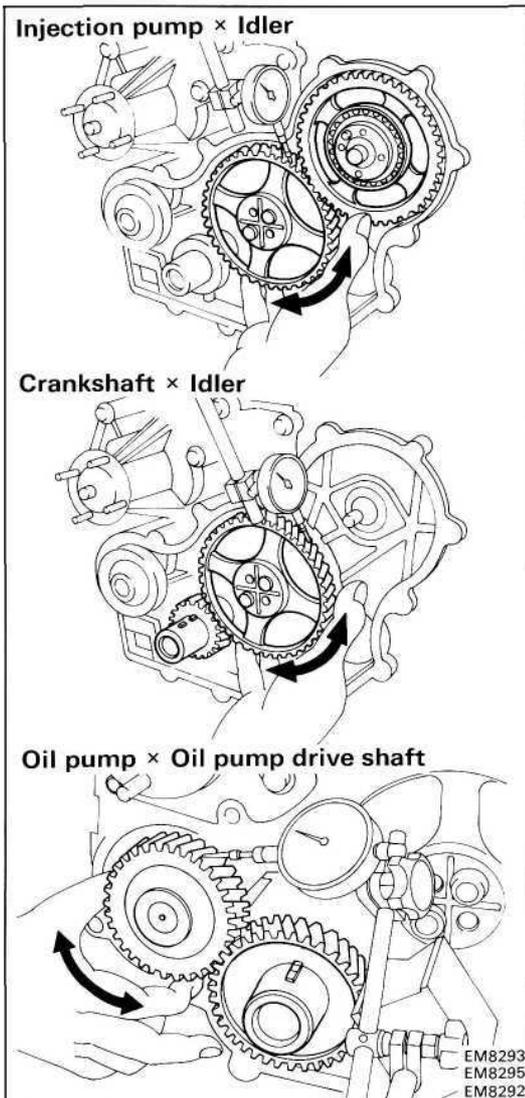
Using SST, remove the bearing.

SST 09950-20017



**B. Install bearing**

Using SST and a press, press in a new bearing.
SST 09214-76011

**4. CHECK BACKLASH OF TIMING GEARS**

Using a dial indicator, measure the backlash.

Standard gear backlash: 0.05-0.15 mm
(0.0020-0.0060 in.)

Maximum gear backlash: 0.30 mm (0.0118 in.)

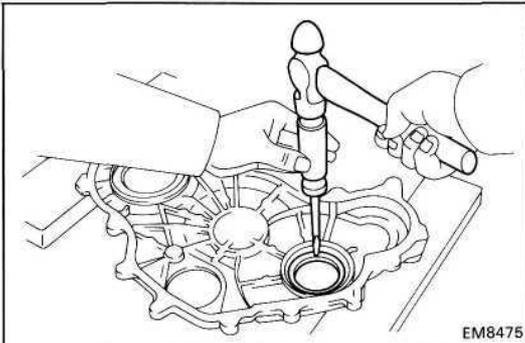
If the gear backlash is greater than maximum, replace the gears as a set.

REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

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

REPLACE CRANKSHAFT FRONT OIL SEAL

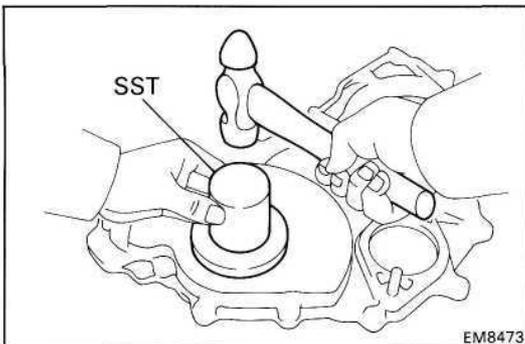
- A. If timing gear cover is removed from cylinder block:**
- (a) Using a screwdriver and hammer, tap out the oil seal.



- (b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing gear cover edge.

SST 09223-78010

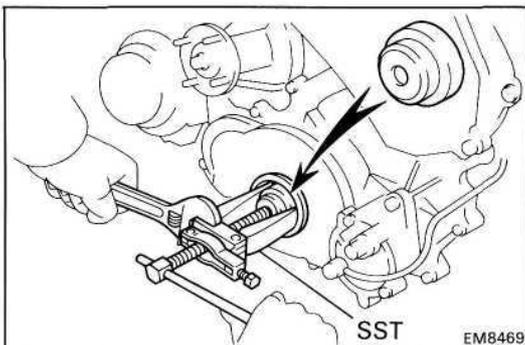
- (c) Apply MP grease to the oil seal lip.



- B. If timing gear cover is installed to the cylinder block:**

- (a) Using SST, remove the oil seal.

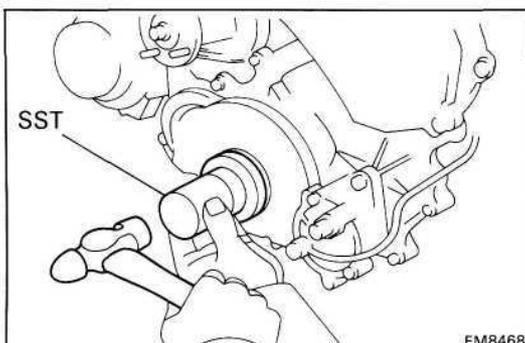
SST 09308-10010 and 09950-20017



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

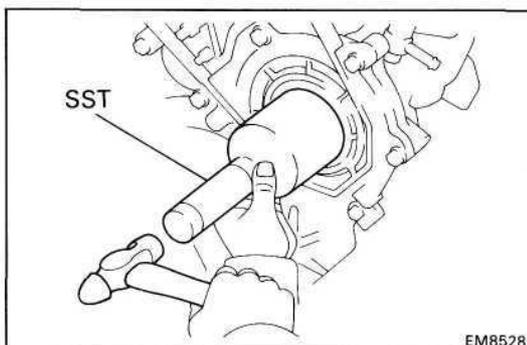
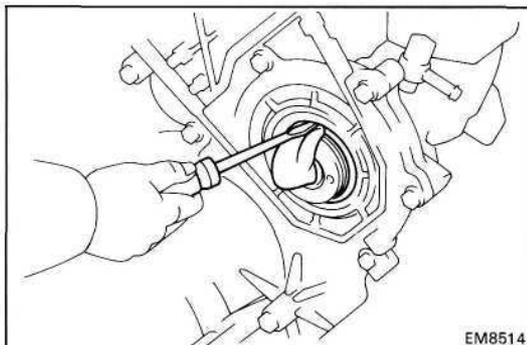
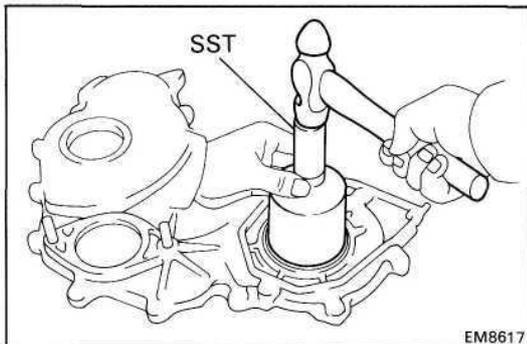
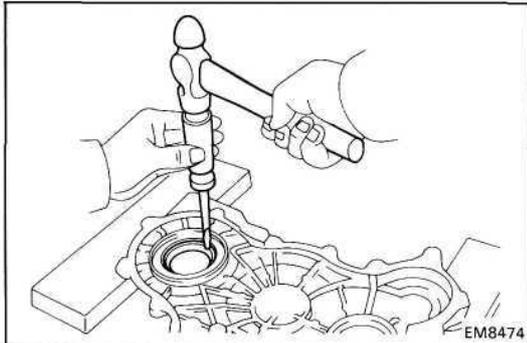
- (c) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing gear cover edge.

SST 09223-78010



REPLACEMENT OF INJECTION PUMP DRIVE GEAR OIL SEAL

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



REPLACE INJECTION PUMP DRIVE GEAR OIL SEAL

- A. If timing gear cover is removed from cylinder block:**
- Using a screwdriver and hammer, tap out the oil seal.

- Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing gear cover edge.

SST 09214-76011

- Apply MP grease to the oil seal lip.

- B. If timing gear cover is installed to the cylinder block:**

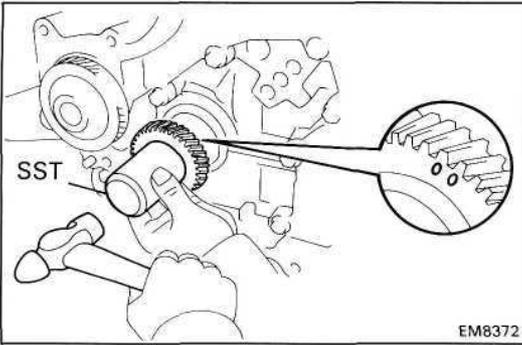
- Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the injection pump drive gear. Tape the screwdriver tip.

- Apply MP grease to the oil seal lip.

- Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing gear cover edge.

SST 09214-76011

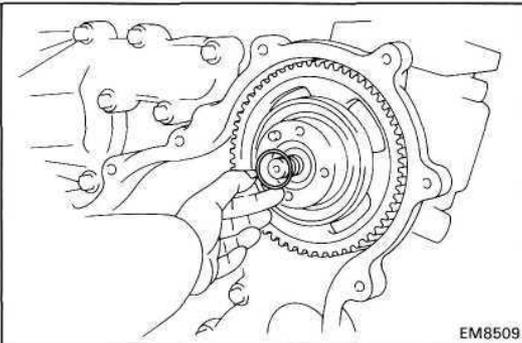


INSTALLATION OF TIMING GEARS

(See page EM-42)

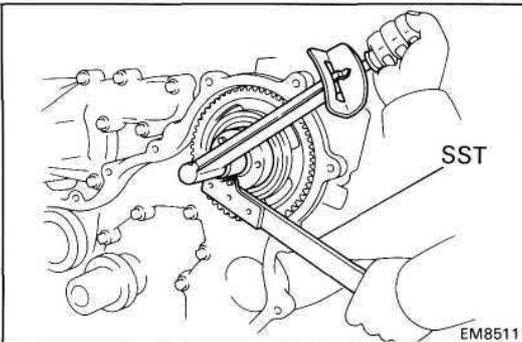
1. INSTALL CRANKSHAFT TIMING GEAR

- (a) Put the timing crankshaft timing gear with the timing mark facing forward.
- (b) Align the timing gear set key with the key groove of the timing gear.
- (c) Using SST and a hammer, tap in the timing gear.
SST 09223-00010



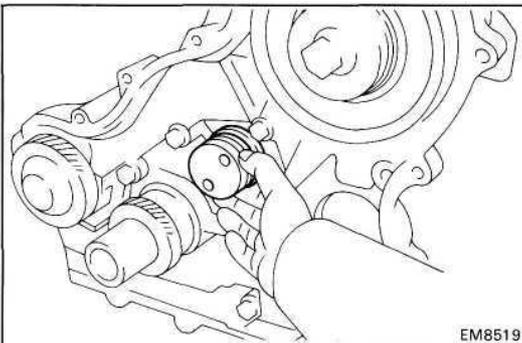
2. INSTALL INJECTION PUMP DRIVE GEAR

- (a) Install the set key to the groove of the injection pump drive shaft.
- (b) Align the set key with the key groove of the injection pump drive gear and install the drive gear.
- (c) Install a new O-ring to the drive gear.



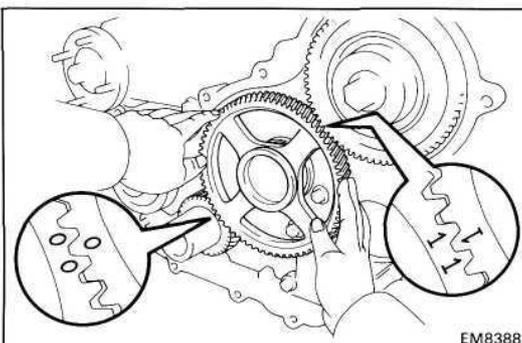
- (d) Install the injection pump drive gear set nut.
- (e) Using SST, torque the nut.
SST 09330-00021

Torque: 1,000 kg-cm (72 ft-lb, 98 N-m)

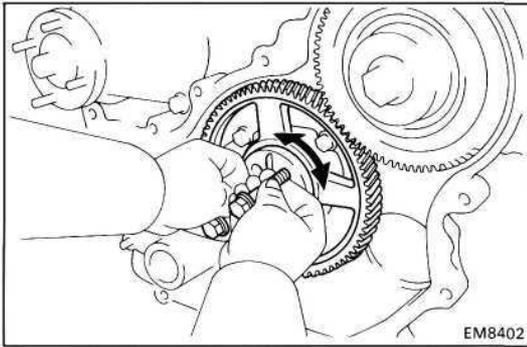


3. INSTALL IDLER GEAR

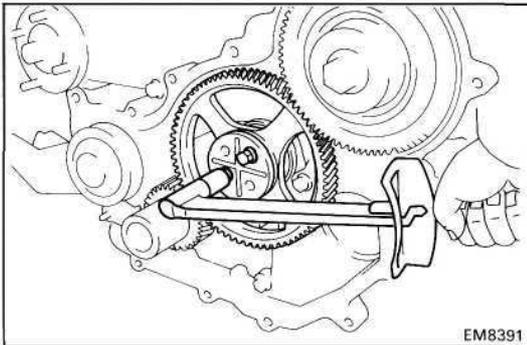
- (a) Install the idler gear shaft.



- (b) Align the idler gear timing marks "0" and "1" with the crankshaft timing gear mark "0" and injection pump drive gear timing mark "1" respectively, and mesh the gears.

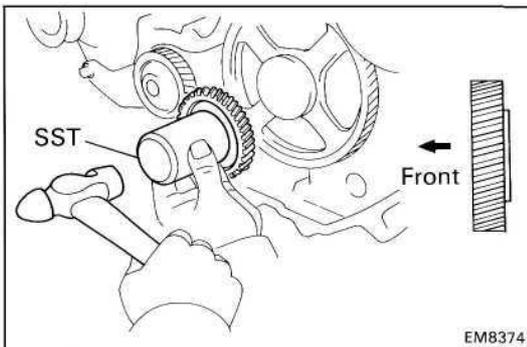


- (c) Align the thrust plate set bolt holes.



- (d) Install the thrust plate with the two bolts. Torque the bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



4. INSTALL PUMP DRIVE SHAFT GEAR

- (a) Align the pump drive shaft gear set key with the key groove of the drive shaft gear.
- (b) Using SST and a hammer, tap in the pump drive shaft gear.

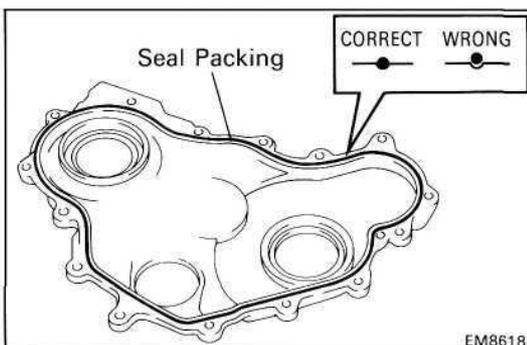
SST 09223-00010

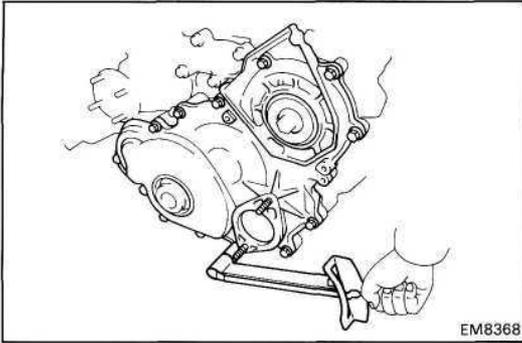
5. INSTALL TIMING GEAR COVER

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing gear cover and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.
- (b) Apply seal packing to the timing gear cover as shown in the illustration.

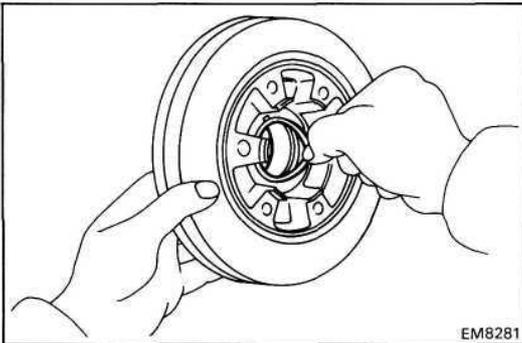
Seal packing: Part No.08826-00080 or equivalent

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



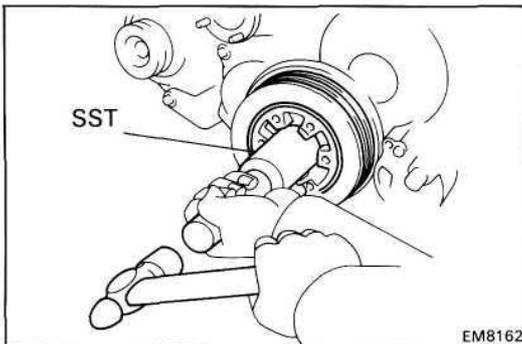


- (c) Install the timing gear cover with the fourteen bolts.
Torque: 200 kg-cm (14 ft-lb, 20 N·m)

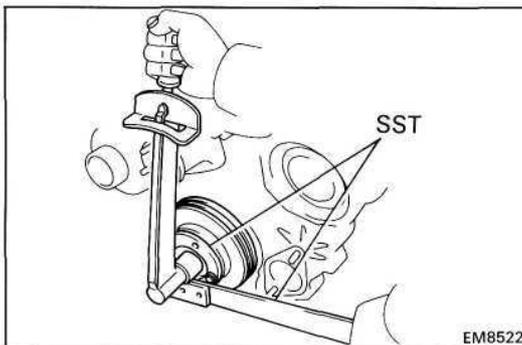


6. INSTALL NO.1 CRANKSHAFT PULLEY

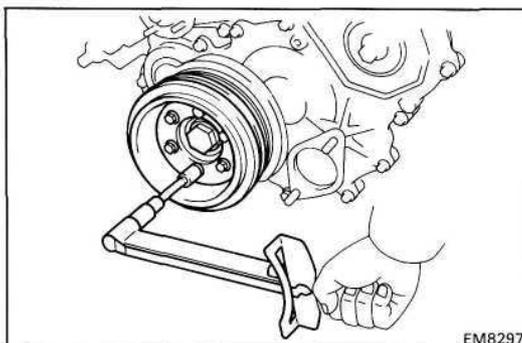
- (a) Install a new O-ring in the No.1 crankshaft pulley groove.



- (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



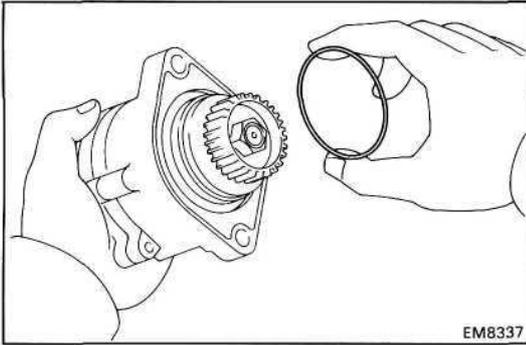
- (d) Using SST, install and torque the plate and bolt.
Torque: 5,000 kg-cm (362 ft-lb, 490 N·m)



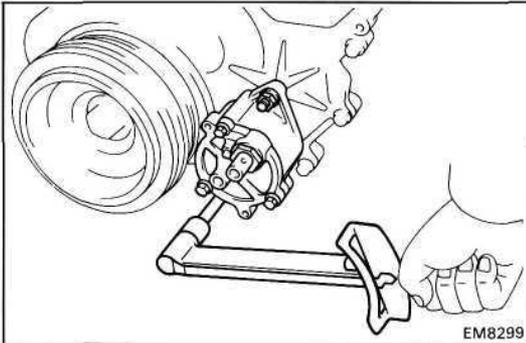
7. (1HZand1HD-T)

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)

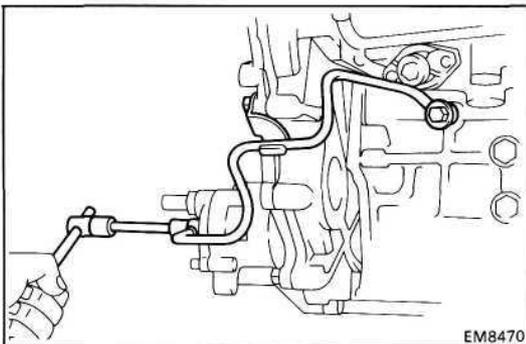
**8. INSTALL VACUUM PUMP**

(a) Install a new O-ring to the vacuum pump.



(b) Install the vacuum pump with the two nuts.

Torque: 400 kg-cm (29 ft-lb, 39 Nm)

**9. INSTALL OIL PIPE**

Install the oil pipe with the bolt, two union bolts and four new gaskets.

Torque: Bolt 200 kg-cm (14 ft-lb, 20 Nm)
Union bolt 185 kg-cm (13 ft-lb, 18 Nm)

10. INSTALL CAMSHAFT OIL SEAL RETAINER
(See step 6 on page EM-79)**11. INSTALL PULLEYS AND TIMING BELT**
(See page EM -38)**12. INSTALL WATER PUMP PULLEY, FAN AND DRIVE BELT**
(See step 5 on page CO-9)