

# DAIHATSU

# G202

EM

CB-Engine

## ENGINE MECHANICALS

<b>ENGINE TUNE-UP</b> .....	EM- 2	CYLINDER BORING .....	EM- 76
<b>TIMING BELT</b> .....	EM- 8	CRANKSHAFT INSPECTION .....	EM- 77
COMPONENTS .....	EM- 8	DISASSEMBLY OF BALANCE	
<b>CYLINDER HEAD</b> .....	EM- 20	SHAFT .....	EM- 79
COMPONENT .....	EM- 20	INSPECTION OF BALANCE SHAFT	
DISASSEMBLY OF CYLINDER		GEAR AND RELATED PARTS .....	EM- 79
HEAD .....	EM- 24	ASSEMBLY OF BALANCE	
INSPECTION, CLEANING AND		SHAFT-RELATED PARTS .....	EM- 80
REPAIRS OF CYLINDER HEAD		REPLACEMENT OF REAR OIL	
COMPONENTS .....	EM- 26	SEAL .....	EM- 80
ASSEMBLY OF CYLINDER HEAD .....	EM- 41	REPLACEMENT OF FRONT OIL	
INSTALLATION OF CYLINDER		SEAL .....	EM- 80
HEAD .....	EM- 43	ASSEMBLY OF BALANCE SHAFT	
<b>CYLINDER BLOCK</b> .....	EM- 48	DRIVE GEAR .....	EM- 81
COMPONENTS .....	EM- 48	CRANKSHAFT INSTALLATION .....	EM- 82
INSTRUCTION PRIOR TO		ASSEMBLY OF PISTON AND	
OPERATION .....	EM- 49	CONNECTING ROD .....	EM- 83
ENGINE REMOVAL .....	EM- 49	ASSEMBLY OF PISTON AND	
PREPARATION FOR		CONNECTING ROD ASSEMBLIES	
DISASSEMBLY .....	EM- 55	TO CYLINDER .....	EM- 85
DISASSEMBLY OF CYLINDER		ASSEMBLY OF BALANCE SHAFT .....	EM- 86
BLOCK .....	EM- 59	ASSEMBLY OF ENGINE .....	EM- 87
INSPECTION OF CYLINDER		INSTALLATION OF ENGINE .....	EM- 92
BLOCK .....	EM- 70	<b>SSTs</b> .....	EM- 99
DISASSEMBLY OF PISTON AND		<b>SERVICE SPECIFICATIONS</b> .....	EM-101
CONNECTING ROD ASSEMBLY .....	EM- 71	<b>TIGHTENING TORQUE</b> .....	EM-104
INSPECTION OF PISTONS AND			
CONNECTING RODS .....	EM- 72		

G2EM00001-00000

NO. 9188

## ENGINE TUNE-UP

1. Inspection of engine coolant level  
(Refer to the MA section of the service manual.)
2. Inspection of engine oil  
(Refer to the MA section of the service manual.)
3. Inspection of air cleaner element  
(Refer to the MA section of the service manual.)
4. Inspection of spark plug cords and distributor cap  
(Refer to the MA section of the service manual.)
5. Inspection of battery  
(Refer to the MA section of the service manual.)
6. Inspection of spark plugs  
(Refer to the MA section of the service manual.)
7. Inspection of drive belt  
(Refer to the MA section of the service manual.)
8. Inspection and adjustment of valve clearance  
(Refer to the MA section of the service manual.)
9. Inspection of ignition timing  
(Refer to the MA section of the service manual.)
10. Inspection and adjustment of idle speed  
(Refer to the MA section of the service manual.)
11. Inspection and adjustment of fast idle speed

## Preparation prior to idle speed adjustment

- Check and adjust the ignition timing.
- Apply the parking brake fully.
- Warm up the engine thoroughly. (Continue engine warm-up for another 10 minutes after the fan motor has started its operation.)
- Turn OFF all accessory switches.
- Ensure that the air cleaner element is installed.
- Ensure that all vacuum hoses are connected.
- Ensure that the intake system exhibits no air leakage.
- Ensure that the exhaust system exhibits no air leakage.
- The shift lever is placed in the neutral position.
- Ensure that the choke valve is open fully.

## NOTE:

- Do not perform the engine idle speed adjustment while the fan motor is functioning.
- Use the SST (09243-00020-000) to adjust the idle mixture adjusting screw.

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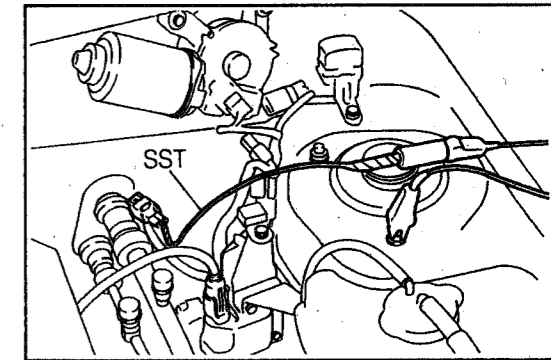
- (1) Connection of tachometer  
Connect the tachometer to the ignition coil.

## CAUTION:

- Never allow the tachometer terminal to touch ground as it could result in damage to the ignitor and/or ignition coil.
- As some tachometers are not compatible with this ignition system, it is imperative to confirm the compatibility of your tachometer before it is used.

## NOTE:

- The ignition coil has no external terminal connection. Hence, insert an adequate jumper cord from the back side of the connector attached to the ignition coil. Then, connect the other end of the jumper cord to the measuring terminal of the tachometer if your tachometer measuring terminal is a connection type.



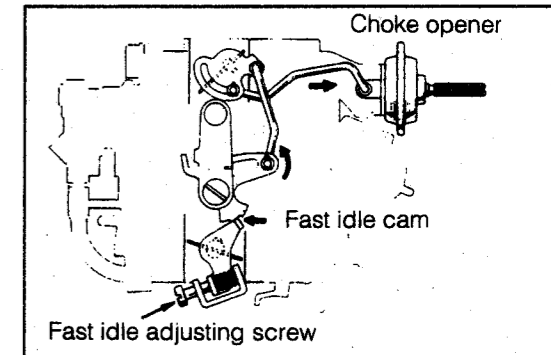
G2EM00003-99999

- The following SST is available for the purpose of connecting a tachometer to the ignition coil.  
SST: 09991-87604-000

However, this SST is not necessary, if your tachometer measuring terminal is a clamp-on type.

- (2) Pull out the choke lever up to the full position.
- (3) Depress the accelerator pedal once.
- (4) Start the engine. Adjust the fast idle adjusting screw so that the engine fast idle speed may become the specified value.

Engine Fast Idle Speed: 2000 ± 200 rpm



G2EM00004-99999

## REFERENCE:

## Engine tachometer

- In the case of a tachometer which picks up signals from the primary circuit and is not provided with a 3-cylinder range, take a reading of the revolution speed on a 6-cylinder range. Then, multiply this reading by 2. This value is the actual revolution speed for the 3-cylinder engine.

12. Inspection and adjustment of dashpot  
(Refer to the MA section of the service manual.)

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## 13. Check of choke opener

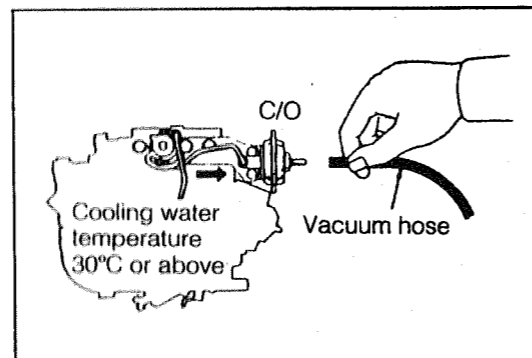
While the engine is idling, disconnect the vacuum hose connected to the choke opener. If the link functions in the way as described in the table below, it represents that the choke opener is functioning properly.

Cooling water (coolant) temperature 30°C (86°F) or above.	When hose is reconnected (negative pressure is applied), link moves.
-----------------------------------------------------------	----------------------------------------------------------------------

If the link will not move, check the BVSV and/or choke opener.

Replace them, as required.

(Refer to the EC section of the manual.)



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14. Inspection and adjustment of CO/HC concentrations  
(Refer to the MA section of the service manual.)15. Inspection of charcoal canister  
(Refer to the MA section of the service manual.)16. Inspection of fuel line and connection  
(Refer to the MA section of the service manual.)

G2EM0007-00000

## 17. Compression check

## NOTE:

- After completion of the engine tune-up, if the engine exhibits lack of power, excessive oil consumption or poor fuel economy, measure the cylinder compression pressure.

(1) Warm up the engine thoroughly.

(2) Turn OFF the ignition key switch.

G2EM0008-00000

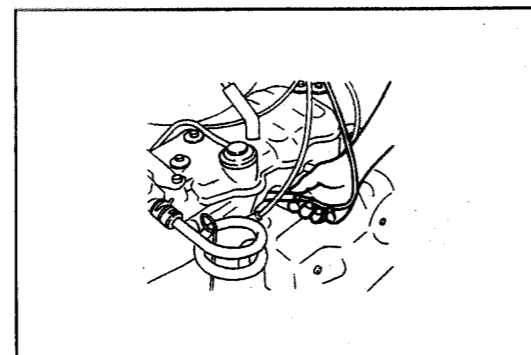
## (3) Removal of spark plugs.

① Remove the resistive cords from the clamp.

② Disconnect the resistive cord at spark plug side.

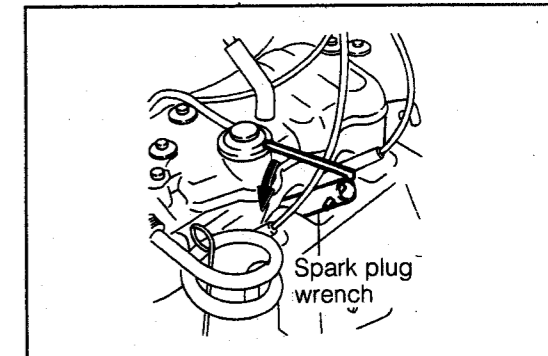
## NOTE:

- Be sure to hold the rubber boot during the resistive cord disconnection. Never remove the resistive cord, holding the cord portion.



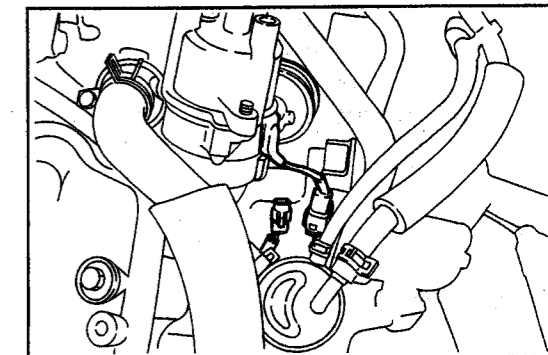
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## ③ Remove the spark plugs.



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## ④ Disconnect the distributor connector.



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## ⑤ Measurement of cylinder compression pressure

## NOTE:

- The choke valve should be fully opened.

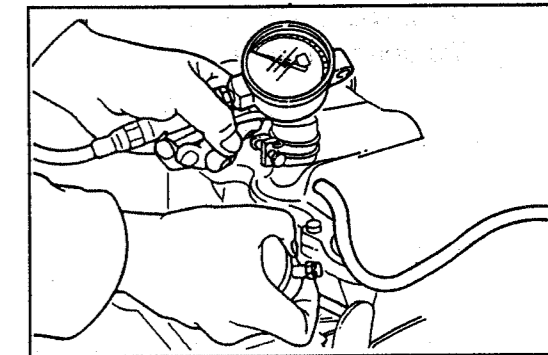
1) Insert a compression gauge into the spark plug hole.

2) Depress the accelerator pedal fully.

3) While cranking the engine, measure the compression pressure.

## NOTE:

- Always use a fully charged battery so that at least a revolution speed of 300 rpm is attained.



G2EM0012-99999

4) Repeat the steps 1) through 3) for each cylinder.

## NOTE:

- Perform the measurement in the shortest possible time.

- Crank the engine for the same duration for each cylinder.

## Compression Pressure:

1225.83 kPa/at 350 rpm

(12.5 kgf/cm<sup>2</sup>/at 350 rpm 177.89 psi/at 350 rpm)

## Minimum Pressure:

1035.98 kPa/at 350 rpm

(10.5 kgf/cm<sup>2</sup>/at 350 rpm 149.34 psi/at 350 rpm)

## Difference Between Cylinders:

147.10 kPa/at 350 rpm

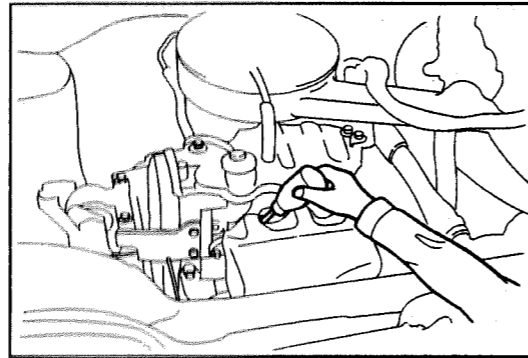
(1.5 kgf/cm<sup>2</sup>/at 350 rpm 21.3 psi/at 350 rpm)

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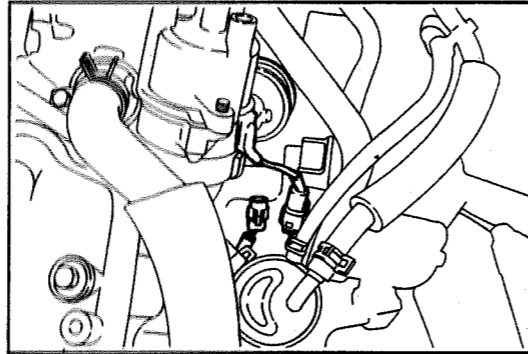
5) If the compression of one or more cylinders is low, pour a small amount of engine oil into that cylinder through the spark plug hole and repeat the steps 1) through 4) for the cylinder with low compression.

- If adding oil helps the compression to improve, chances are that the piston rings and/or cylinder bores are worn or damaged.
- If the pressure remains low after the operation described in the step 5) has been performed, the valve may be sticking or seated improperly, or there may be leakage past the gasket.

⑥ Connect the distributor connector.



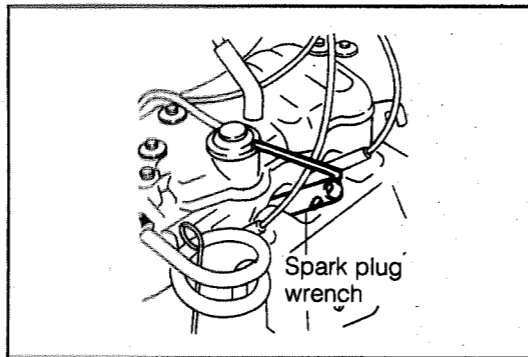
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⑦ Install the spark plugs.

Tightening Torque: 14.7 - 21.6 N·m  
(1.5 - 2.2 kgf·m, 10.9 - 15.9 ft·lb)



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⑧ Connect the resistive cord.

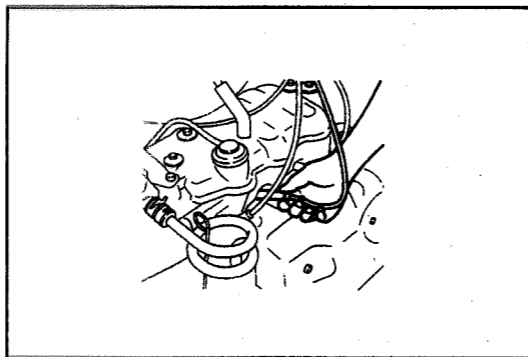
**NOTE:**

- Be sure that the resistive cords are connected securely to each spark plug.
- Care should be exercised not to damage the resistive cord with the spark plug tube.
- Be sure to refer to the GI section of the service manual before connecting the resistive cord.

⑨ Attach the resistive cord to the clamp.

**NOTE:**

- Be sure to refer to the GI section of the service manual before connecting the resistive cord.



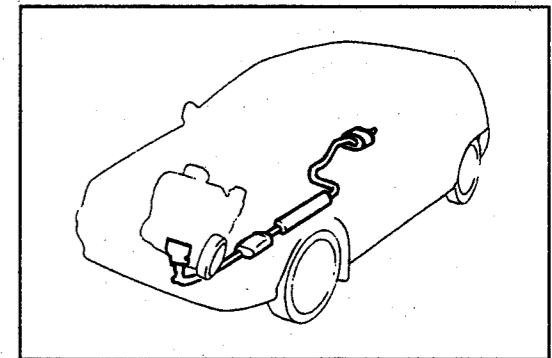
G2EM00017-99999

18. Inspection of charcoal canister  
(Refer to the MA section of the service manual.)

19. Inspection of fuel line and connection  
(Refer to the MA section of the service manual.)

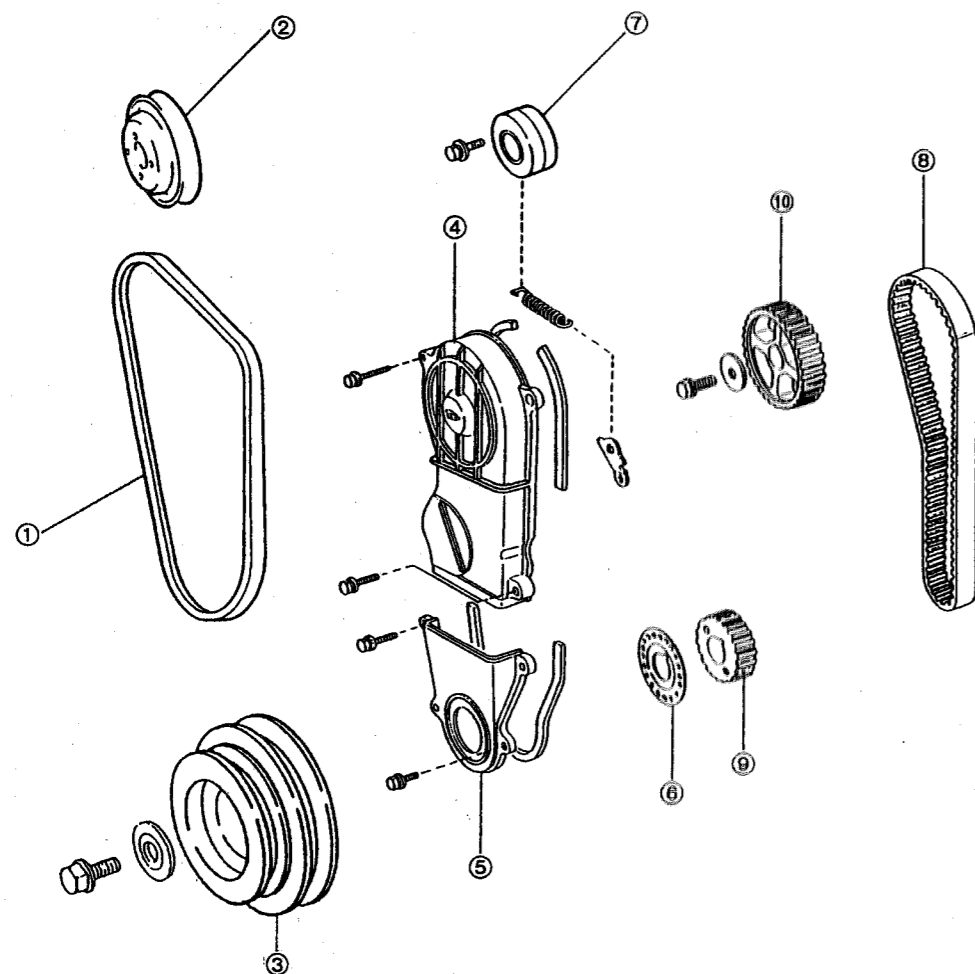
G2EM00018-00000

20. Inspection of exhaust pipe and mountings  
Visually inspect the pipes, hangers and connections for severe corrosion, leakage or damage.  
Repair any faulty parts.



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## TIMING BELT COMPONENTS

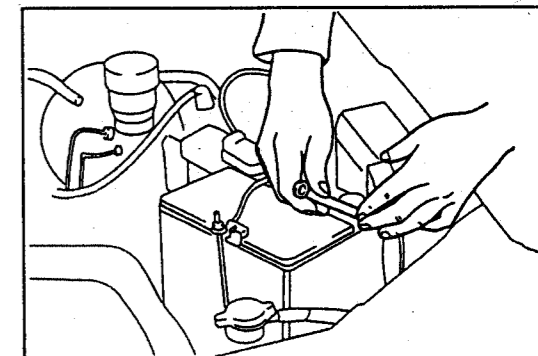


- ① V-belt
- ② Water pump pulley
- ③ Crank shaft pulley
- ④ Timing belt upper cover
- ⑤ Timing belt lower cover
- ⑥ Crankshaft timing belt pulley flange
- ⑦ Timing belt tensiometer
- ⑧ Timing belt
- ⑨ Crankshaft timing belt pulley
- ⑩ Crankshaft timing belt pulley

G2EM00020-99999

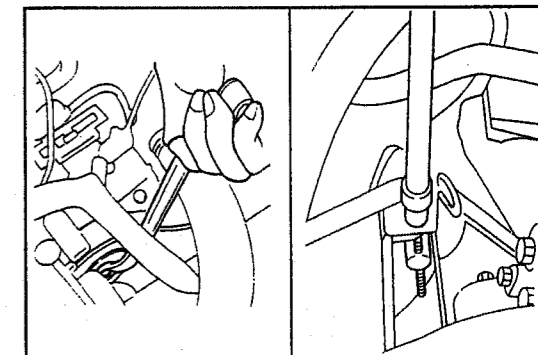
### Replacement of timing belt

- (1) Ensure that the ignition switch turned OFF.
- (2) Disconnect the ground cable terminal from the negative terminal of the battery.



G2EM00021-99999

- (3) Removal of air conditioner belt  
(Air conditioner-equipped vehicle only)
  - ① Loosen the idler pulley mount nut.
  - ② Loosen the adjusting bolt.
  - ③ Remove the drive belt.

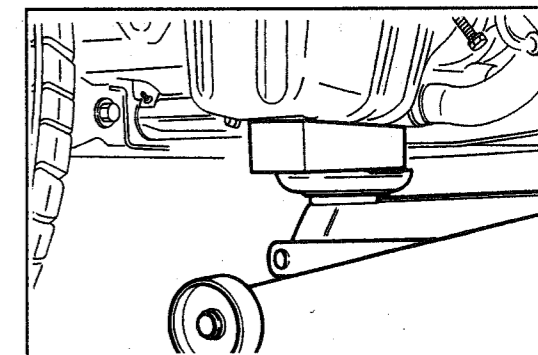


G2EM00022-99999

- (4) Slightly jack up the engine with the supporting pad of a garage jack placed underneath the oil pan.

#### NOTE:

- Place a suitable object, such as a wooden piece, between the oil pan and the supporting pad of the garage jack so as not to deform the oil pan.
- Care must be exercised to ensure that the interposed object is not interfering with the oil drain plug. Failure to observe this note may incur a damaged drain plug.

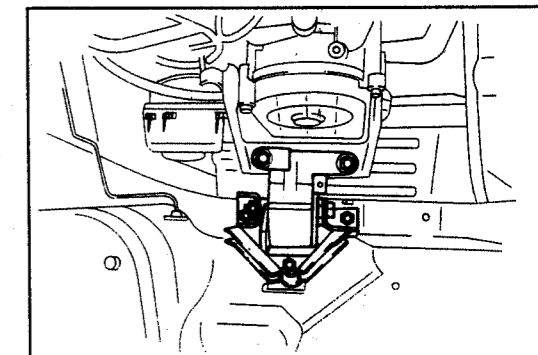


G2EM00023-99999

- (5) Remove the engine mounting front insulator with engine mounting right bracket by removing the five bolts and one nut with resistance stay.

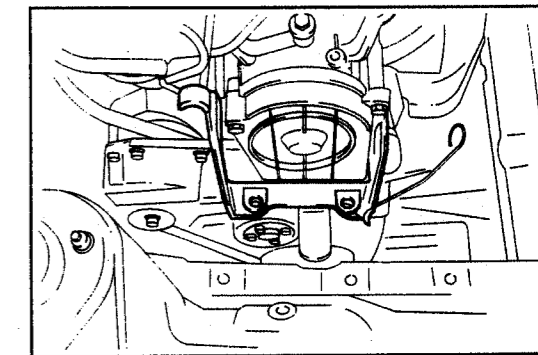
#### CAUTION:

- Ensure that the engine is supported by the garage jack and no load are applied to the attaching bolt of the engine mounting front insulator and engine mounting right bracket.



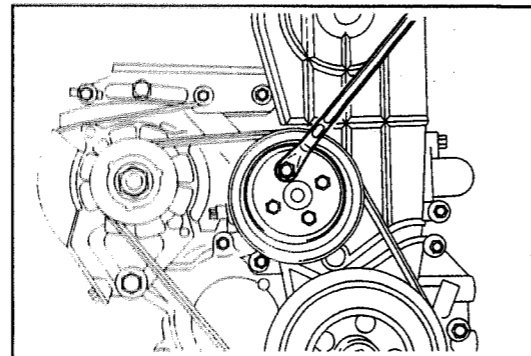
G2EM00024-99999

- (6) Remove the attaching bolts of the engine RH front mounting No. 2.



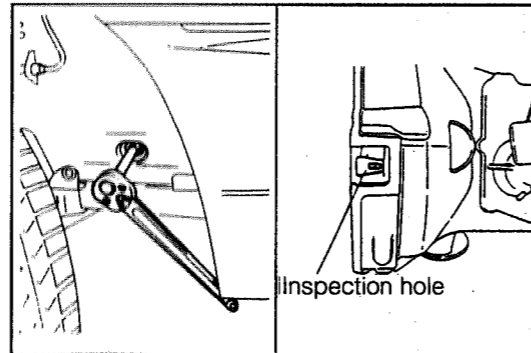
G2EM00025-99999

- (7) Loosen the all attaching bolt of the water pump pulley, utilizing the tension of the V-ribbed belt.
- (8) Loosen the alternator attaching bolts.
- (9) Remove the alternator drive belt.
- (10) Remove the water pump pulley.



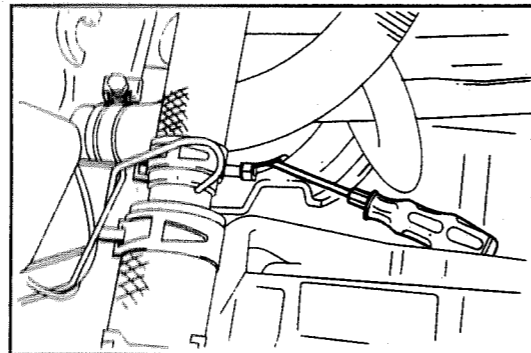
G2EM00026-99999

- (11) Set the piston No. 1 to the top dead center under the compression stroke.  
Turn the crankshaft until the ignition timing mark on the flywheel is aligned with the mating mark on the bell housing. Remove the oil filler cap. Check that the valve rocker arm of the exhaust valve of the cylinder No. 1 is completely free. If the exhaust valve is pushed up, turn the crankshaft 360 degrees. Again align the ignition timing mark on the flywheel with the mating mark on the bell housing.



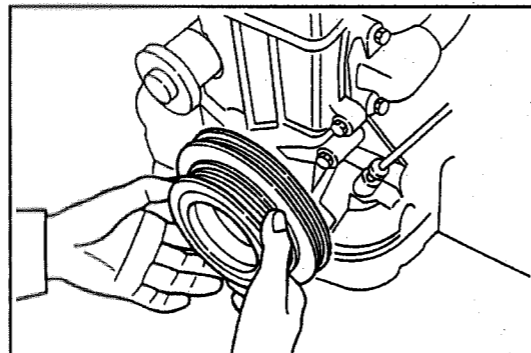
G2EM00027-99999

- (12) While preventing the ring gear from turning, using a screwdriver, remove the crankshaft pulley bolt.



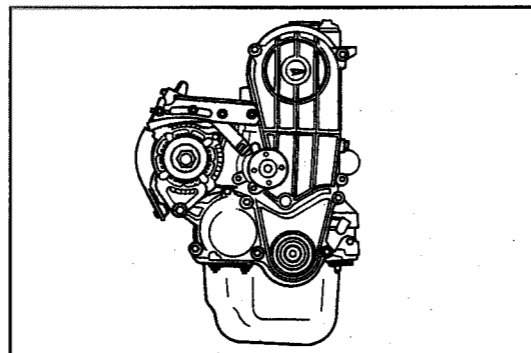
G2EM00028-99999

- (13) Remove the crankshaft pulley.



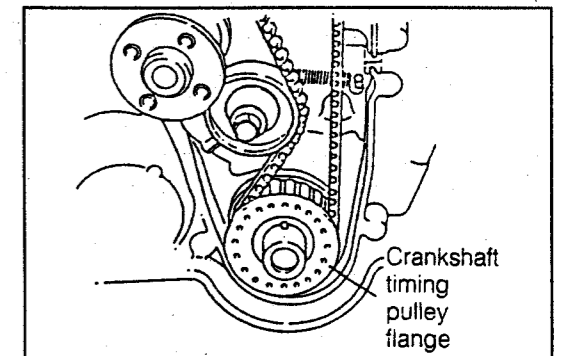
G2EM00029-99999

- (14) Remove the attaching bolts of the timing belt cover.
- (15) Remove the timing belt upper cover.
- (16) Remove the timing belt lower cover.



G2EM00030-99999

- (17) Remove the crankshaft timing belt pulley flange.

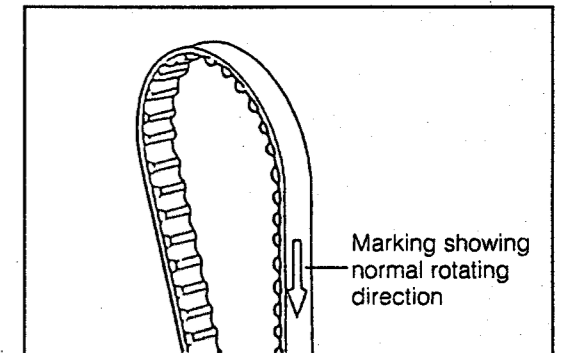


G2EM00031-99999

- (18) Removal of timing belt

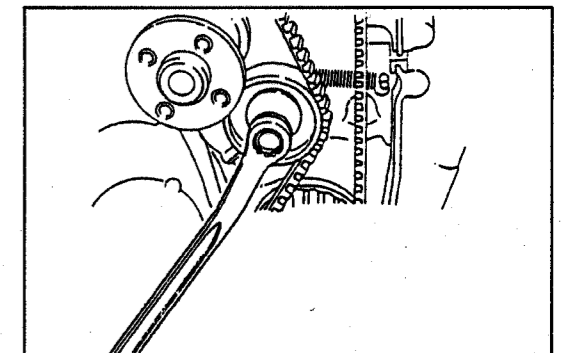
**NOTE:**

- If the timing belt is reused, an arrow mark indicating the engine rotation direction should be put on the belt, using chalk.



G2EM00032-99999

- ① Loosen the timing belt tensioner bolt. Push the bolt to the left as far as it will go and then temporarily tighten it.

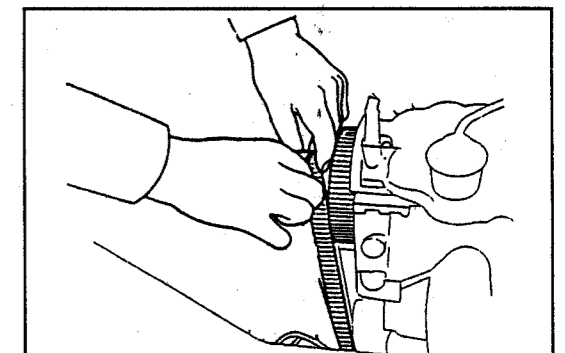


G2EM00033-99999

- ② Remove the belt.

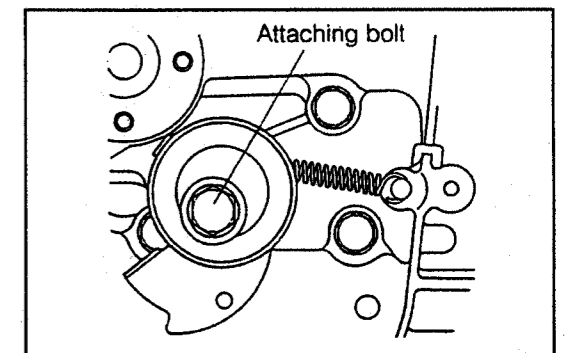
**CAUTION:**

- Do no bend, twist or turn the belt inside out.
- Do not allow the belt to come into contact with oil or water.
- Do not try to pry the timing belt with a screwdriver or the like during the removal or installation.
- Do not utilize the belt tension when installing or removing the set bolt of the camshaft timing belt pulley.



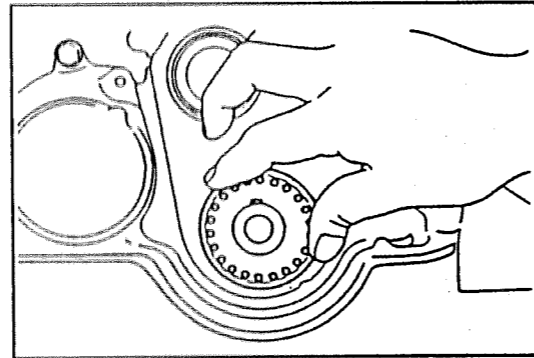
G2EM00034-99999

- (19) Remove the timing belt tensioner and spring.
- (20) Remove the crankshaft timing belt pulley.



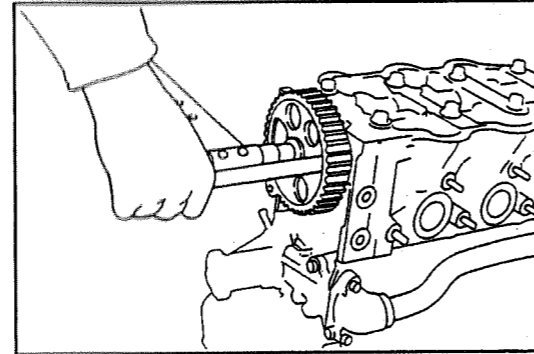
G2EM00035-99999

- (21) Remove the crankshaft timing belt pulley.
- (22) Remove the crankshaft timing belt pulley flange.



G2EM00036-99999

- (23) Removal of camshaft timing belt pulley
  - ① Remove the camshaft timing belt pulley bolt. During the removal of the camshaft timing belt pulley bolt, prevent the rotation of the pulley by inserting an iron rod into the pulley hole, utilizing the rib at the cylinder head side.
  - ② Remove the camshaft timing belt pulley.

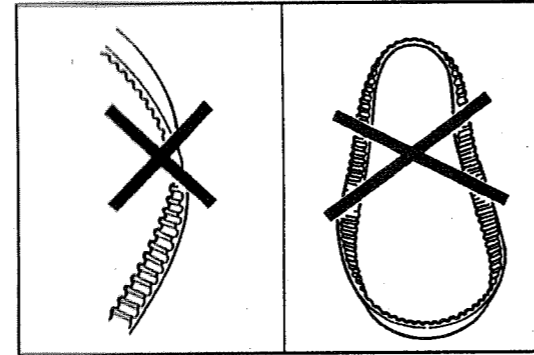


G2EM00037-99999

(24) Inspection of the timing belt.

CAUTION:

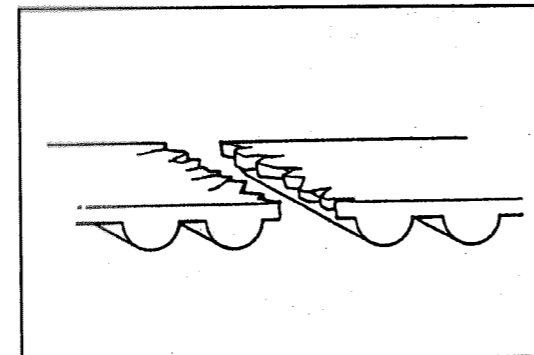
- Do not bend, twist or turn the belt inside out.
- Do not allow the belt to come into contact with oil, water or steam.



G2EM00038-99999

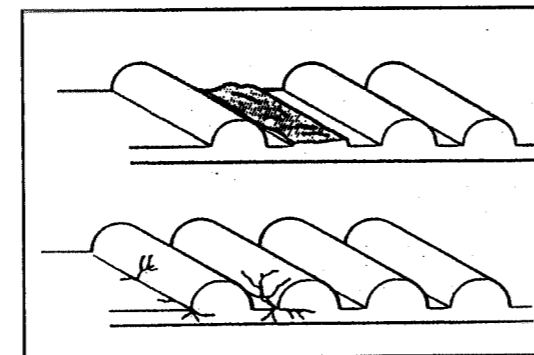
If there are defects, as shown in the figures, check the following points and replace the timing belt, if necessary.

- ① Premature separation
  - Check for proper installation.
  - Check the timing gear cover cover gaskets for damage and check for correct installation.



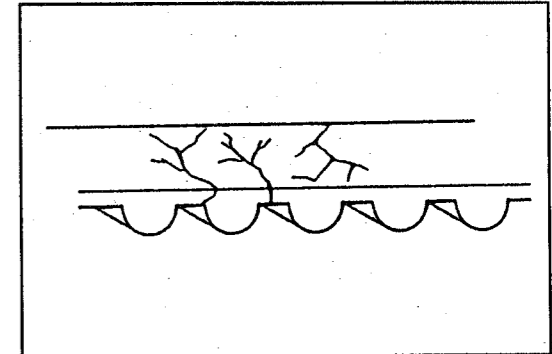
G2EM00039-99999

- ② If the belt teeth are cracked or damaged, check to see if the camshaft is seized.



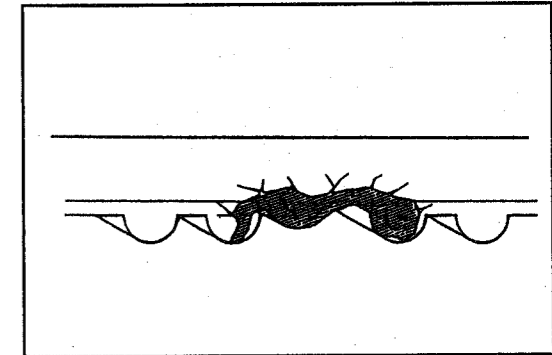
G2EM00040-99999

- ③ If there is noticeable wear or cracks on the belt surface, check to see if there are nicks on one side of the idler pulley lock.



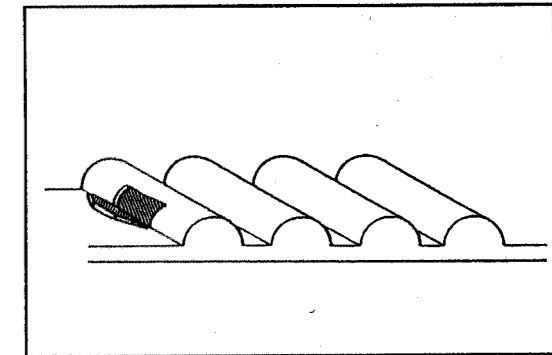
G2EM00041-99999

- ④ If there is wear or damage on only one side of the belt, check the pulley flange.



G2EM00042-99999

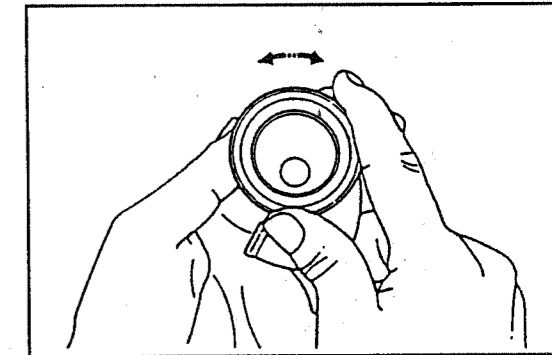
- ⑤ If there is noticeable wear on the belt teeth, check the timing cover gasket for damage and check for correct gasket installation. Check for foreign material on the pulley teeth.



G2EM00043-99999

(25) Inspection of the timing belt tensioner

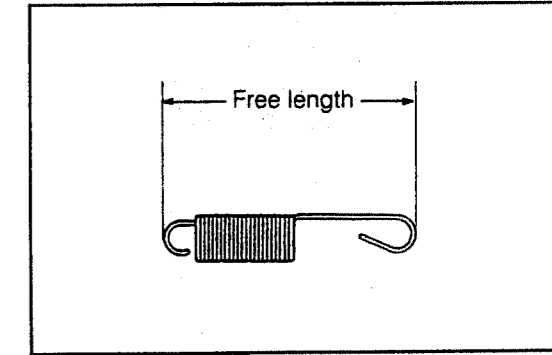
- ① Check the timing belt tensioner for smooth turning.
- ② Check the timing belt attaching surface for damage. If any malfunction or damage is present, replace the timing belt tensioner with new one.



G2EM00044-99999

(26) Inspect tension spring

- ① Check the free length of the spring.  
Free Length: 54.0 mm (2.13 inch)
- ② Check the tension of the spring at the specified installation length.  
Tension as Installed: 16.28 N at 65.0 mm (1.66 kg at 65.0 mm, 3.66 lb at 2.56 inch)



G2EM00045-99999

If the tension does not conform to the specification, replace the spring.

- (27) Visually inspect the timing belt pulley for damage.  
If necessary, replace the timing belt pulley.

(28) Inspection of timing belt pulley

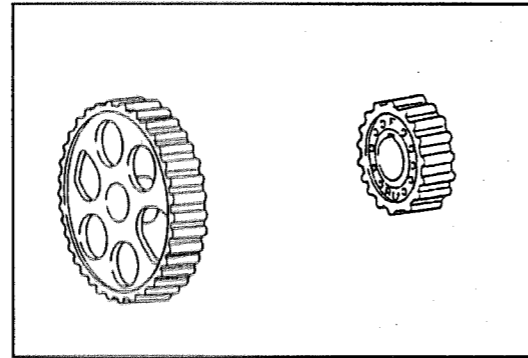
- ① Measure the maximum width of the timing belt pulley, using vernier calipers.

**Wear Limit of Timing Belt Pulley:**

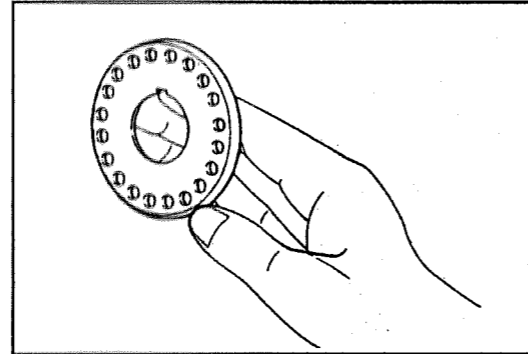
Camshaft timing belt pulley: 119.9 mm (4.720 inch)

Crankshaft timing belt pulley: 59.3 mm (2.335 inch)

If the measured value is less than the specified value, replace the timing belt pulley.



G2EM00046-99999



G2EM00047-99999

(29) Inspection of crankshaft timing belt pulley flange

- ① Check the crankshaft timing belt pulley flange for bend, damage and wear.  
If necessary, replace the crankshaft timing belt pulley flange.

**NOTE:**

- Do not allow the timing belt pulley flange to come into contact with oil, water or dust.

(30) Inspection of water pump leakage

Visually inspect the water pump for leakage.  
Repair it if any water leakage is presented.

(31) Inspection of the oil leakage

Ensure the no water leakage is presented.  
Repair it if any water leakage is presented.

(32) Installation of timing belt

**CAUTION:**

- Do not try to pry the timing belt with a screwdriver or the like during the removal or installation.
- Do not allow the belt to come into contact with oil, water or dust.
- Do not bend the belt at a sharp angle or turn the belt inside out.
- Do not utilize the tension of the timing belt when tightening the set bolts of the camshaft timing belt pulley and crankshaft.
- The adjustment of the belt tension should be made when the cylinder block and its ambient temperatures are in between 5 - 50°C (41 - 122°F).
- Perform the engine turning operation at the crankshaft side.
- Do not turn the crankshaft or camshaft alone.
- When the timing belt is reused, install the timing belt in such way that the direction of the arrow mark put during the removal may much with the engine rotation direction.

G2EM00048-00000

(33) Installation of camshaft timing belt pulley

- ① Assemble the camshaft timing belt pulley by aligning its key groove with the woodruff key of the camshaft.

**NOTE:**

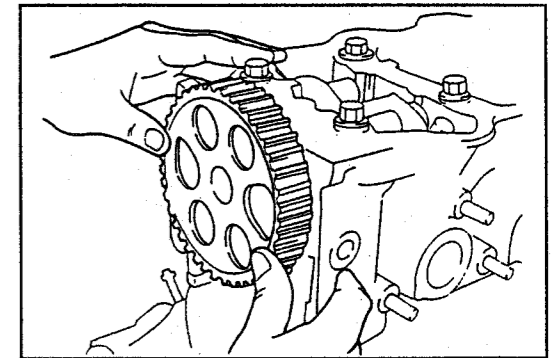
- Remove any oil or water from the camshaft timing belt pulley. Keep the pulley clean.
- If the camshaft timing belt pulley can not be inserted by hand, for easier insertion, lightly tap it from the front using a plastic hammer.

During the installation, care must be exercised to ensure that the woodruff key is not displaced.

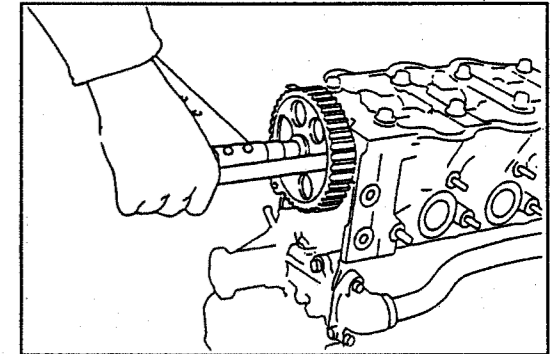
- ② Tighten the attaching bolt of the camshaft timing belt pulley.

During this operation, prevent the pulley rotation by inserting an iron rod into the hole of the pulley, utilizing the rib at the cylinder head side.

Tightening Torque: 29.4 - 44.1 N·m  
(3.0 - 4.5 kgf·m, 21.7 - 32.5 ft·lb)



G2EM00049-99999



G2EM00050-99999

(34) Installation of crankshaft timing belt pulley flange

Install the crankshaft timing belt pulley flange with its recessed side facing toward the cylinder block.

**NOTE:**

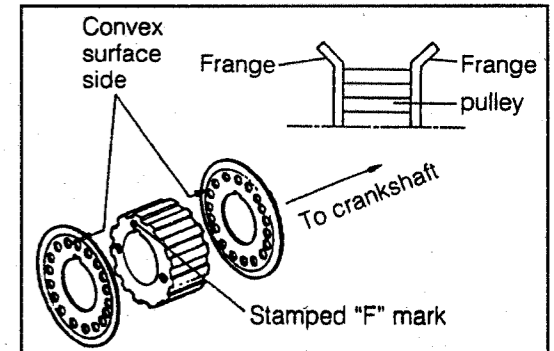
- Remove any oil or water from the pulley flange.  
Keep the pulley flange clean.

(35) Installation of crankshaft timing belt pulley

Assemble the crankshaft timing belt pulley by aligning its key groove with the woodruff key of the crankshaft.

**NOTE:**

- Remove any oil or water from the idler pulley.  
Keep the idler pulley clean.



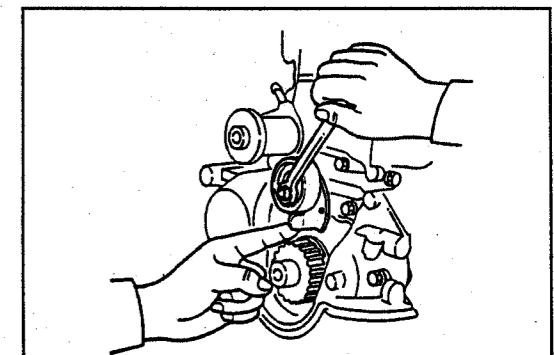
G2EM00051-99999

(36) Installation of idler pulley and return spring

- ① Temporarily install the timing belt idler pulley with the mount bolt.  
② Install the tension spring.  
③ With the idler pulley fully pushed to the left, temporarily tighten it.

**NOTE:**

- Remove any oil or water from the idler pulley.  
Keep the idler pulley clean.

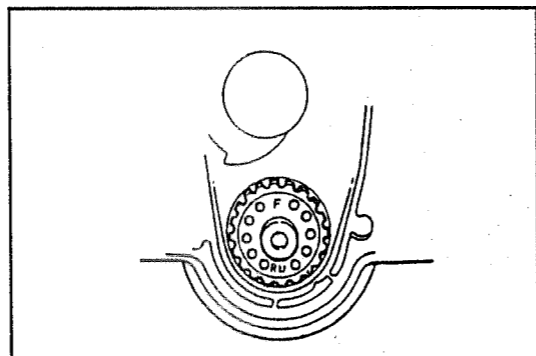


G2EM00052-99999

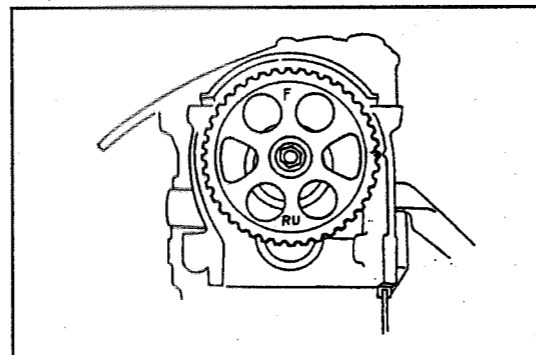


## (37) Timing belt installation

- ① Ensure that the mating mark of the crankshaft timing belt pulley is aligned with the mating mark on the cylinder head.
  - If the timing marks are not aligned with each other, align them. However, keep rotation of the timing belt pulley at a minimum so that the piston may not interfere with the valve.
  - Turn the crankshaft by applying a stubby screwdriver to the ring gear.
- ② Ensure that the mating mark of the camshaft timing belt pulley is aligned with the mating mark on the balance shaft gear cover.
  - If the timing marks are not aligned with each other, align them. However, keep rotation of the timing belt pulley at a minimum so that the piston may not interfere with the valve.



G2EM00053-99999

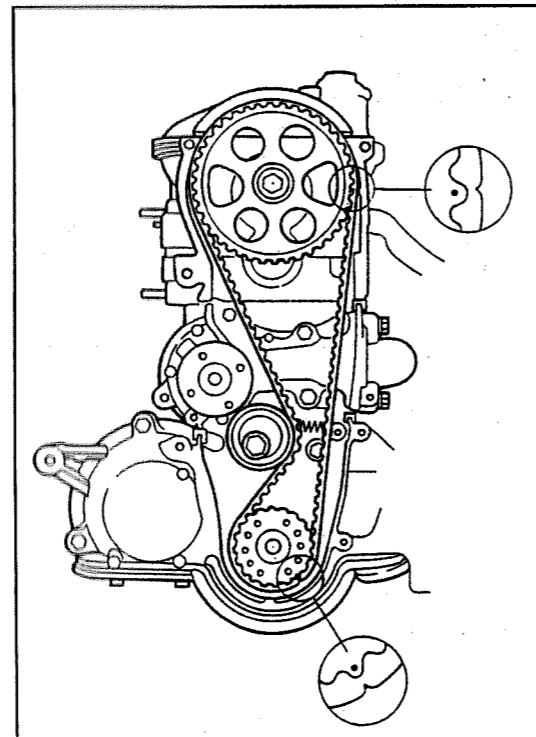


G2EM00054-99999

- ③ Assemble the timing belt such way that there exist 32 teeth of the belt between the drilled marks of crankshaft timing belt pulley and camshaft timing belt pulley.

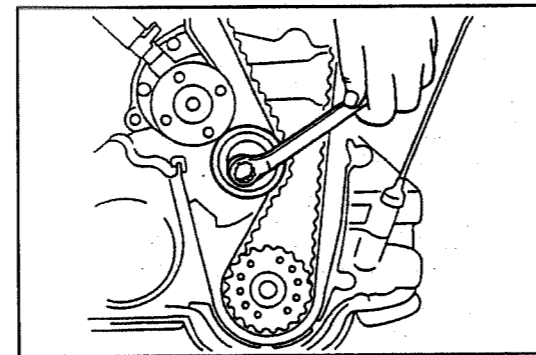
## NOTE:

- When the timing belt is reused, install the timing belt in such way that the direction of the arrow mark put during the removal may much with the engine rotation direction.



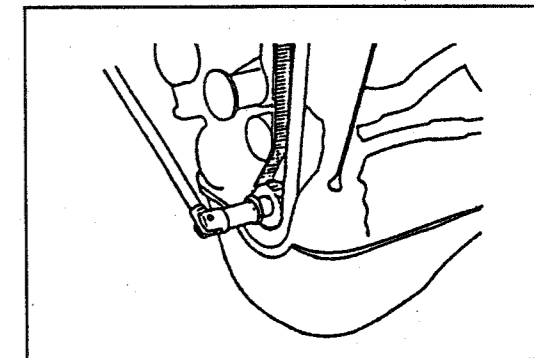
G2EM00055-99999

- ④ Loosen the attaching bolt of the idler pulley. Apply tension to the timing belt by means of the tension spring. Then, temporarily tighten the attaching bolt again.



G2EM00056-99999

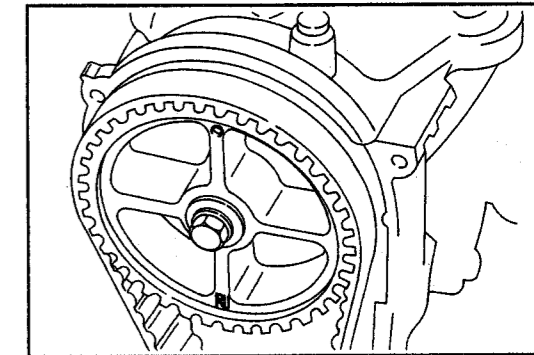
- ⑤ Screw in the crankshaft pulley bolt to the crankshaft. Turn the crankshaft two turns and stop it when the piston No. 1 reaches the top dead center. During this operation, never turn the crankshaft reversely. If the crankshaft is reversed, turn the crankshaft two turns again. Then, stop the crankshaft when the piston No. 1 reaches the top dead center.



G2EM00057-99999

## NOTE:

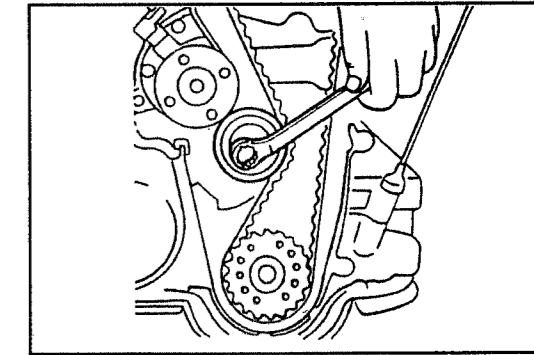
- When the "O" mark comes just at the top position, the piston No. 1 is also at the top dead center.



G2EM00058-99999

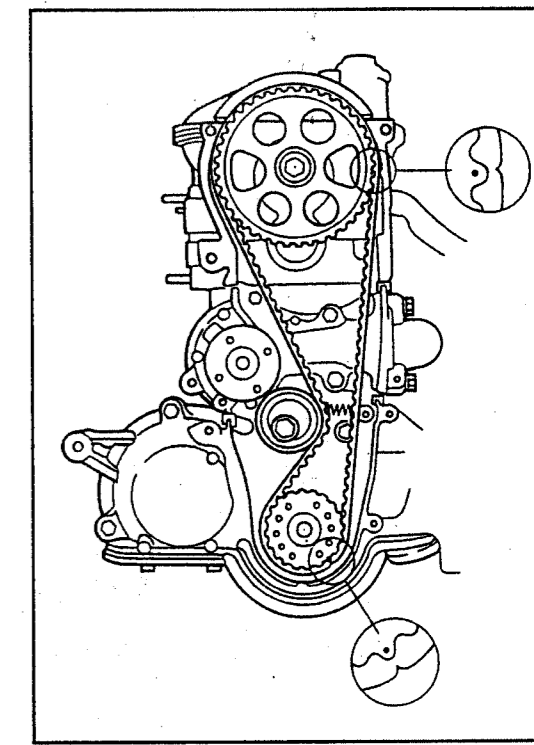
- ⑥ Loosen the attaching bolt of the idler pulley. Apply tension to the timing belt by means of the tension spring. Tighten the attaching bolt again.

Tightening Torque: 33.3 - 44.1 N·m  
(3.0 - 4.5 kgf·m, 24.6 - 32.5 ft·lb)



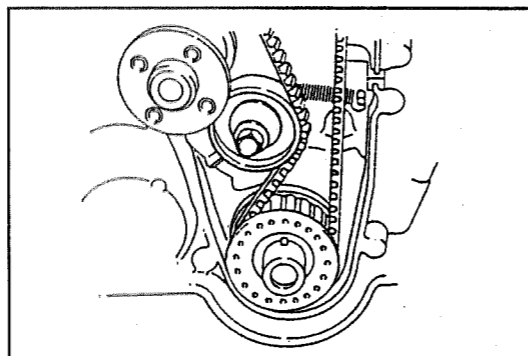
G2EM00059-99999

- ⑦ Ensure that the mating marks on the crankshaft and camshaft timing belt pulleys are aligned with the corresponding mating marks on the timing belt. If they are not aligned, remove the timing belt again and perform the operations starting from Step (1).



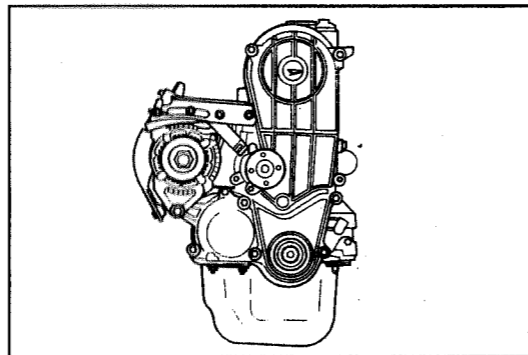
G2EM00060-99999

- (38) Installation of crankshaft timing belt pulley flange  
Install the crankshaft timing belt pulley flange with the protruding side facing toward the crankshaft timing belt pulley.



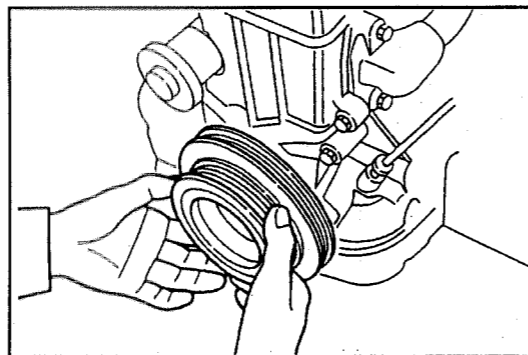
G2EM00061-99999

- (39) Install the timing belt lower cover with its gasket.  
Tightening Torque: 2.0 - 3.9 N·m  
(0.2 - 0.4 kgf-m, 1.4 - 2.9 ft-lb)



G2EM00062-99999

- (40) Install the timing belt upper cover with the gasket interposed.  
Tightening Torque: 2.0 - 3.9 N·m  
(0.2 - 0.4 kgf-m, 1.4 - 2.9 ft-lb)



G2EM00063-99999

- (41) Installation of crankshaft pulley  
① Insert the crankshaft pulley with the key groove on the crankshaft pulley aligned with the crankshaft key.  
② Tighten the crankshaft pulley bolt.  
Tightening Torque: 88.3 - 98.0 N·m  
(9.0 - 10.0 kgf-m, 65.1 - 72.0 ft-lb)

**NOTE:**

- When installing the crankshaft pulley bolt, both the bolt and bolt hole of the crankshaft pulley should be dry.
- During the bolt tightening, prevent the ring gear from turning, using a stubby screwdriver.

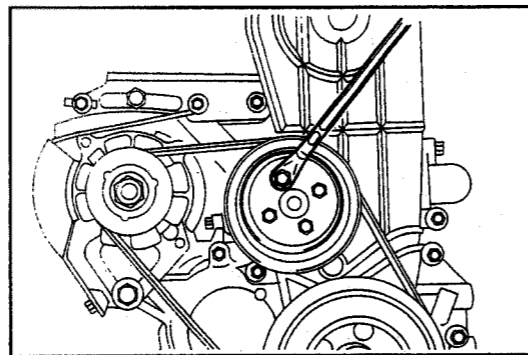
- (42) Install the water pump pulley to the water pump pulley temporarily tighten the attaching bolt by hand.

- (43) Install the alternator drive belt (V-ribbed belt).

**NOTE:**

- Make sure that the drive belt (V-ribbed belt) is fitted properly in the groove of each pulley.

- (44) Adjustment of alternator drive belt tension.



G2EM00064-99999

- (45) Tighten the attaching bolts of the water pump pulley by utilizing the tension of V-ribbed belt.

Tightening Torque: 5.9 - 8.8 N·m  
(0.6 - 0.9 kgf-m, 4.3 - 6.5 ft-lb)

- (46) Ensure that the drive belt deflection meets with the specified value when the midpoint between the water pump pulley and the alternator drive pulley is pushed with a force of 98.1 N·m (10 kgf, 22 lb).

(See the step 4)

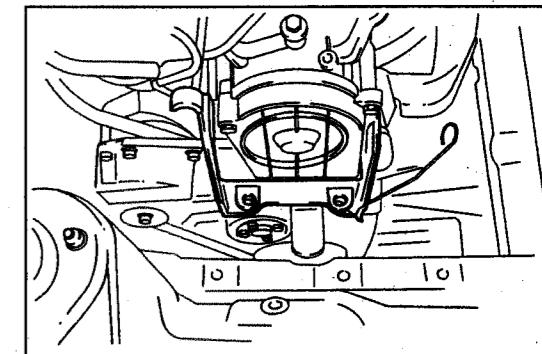
If the deflection dose not confirm to the specification, perform the adjustment so that the specification may be satisfied.

- (47) Install the engine RH front mounting No. 2.

Tightening Torque:

M10 29.4 - 44.1 N·m  
(3.0 - 4.5 kgf-m, 21.7 - 32.5 ft-lb)

M12 49.0 - 68.6 N·m  
(5.0 - 7.0 kgf-m, 36.2 - 50.6 ft-lb)



G2EM00065-99999

- (48) Install the engine mounting front insulator with the engine mounting right bracket by five attaching bolts and one nut.

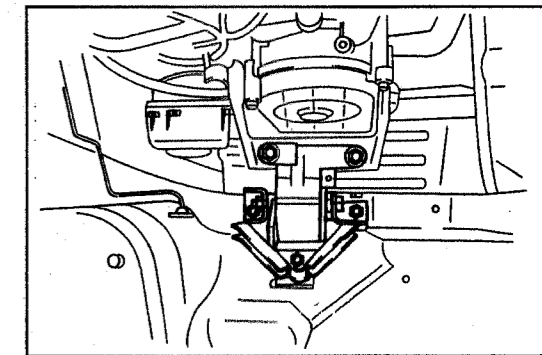
Tightening Torque:

Insulator 39.2 - 53.9 N·m  
(4.0 - 5.5 kgf-m, 28.9 - 39.8 ft-lb)

Bracket

Bolts 39.2 - 53.9 N·m  
(4.0 - 5.5 kgf-m, 28.9 - 39.8 ft-lb)

Nut 14.7 - 22.6 N·m  
(1.5 - 2.3 kgf-m, 10.8 - 16.6 ft-lb)



G2EM00066-99999

- (49) Remove the garage jack from under the oil pan.

- (50) Installation and adjustment of air conditioner compressor drive belt.

① Install the air conditioner compressor drive belt.

② Adjust the belt tension by idler pulley adjusting bolt.

③ Tighten the idler pulley attaching nut.

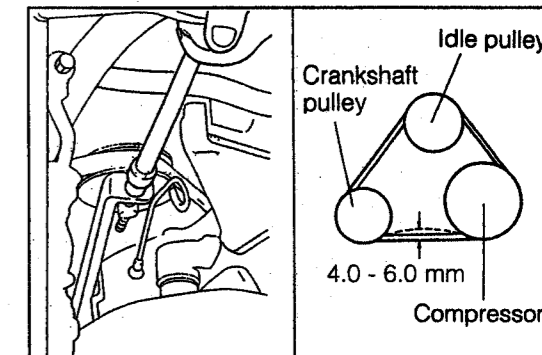
Tightening Torque: 31.4 - 47.1 N·m  
(3.2 - 4.8 kgf-m, 23.1 - 34.7 ft-lb)

- (51) Install and adjust the power steering drive belt and its tension (See the SR section of the service manual.)

- (52) Connect the bonding wire to the engine mounting bracket.

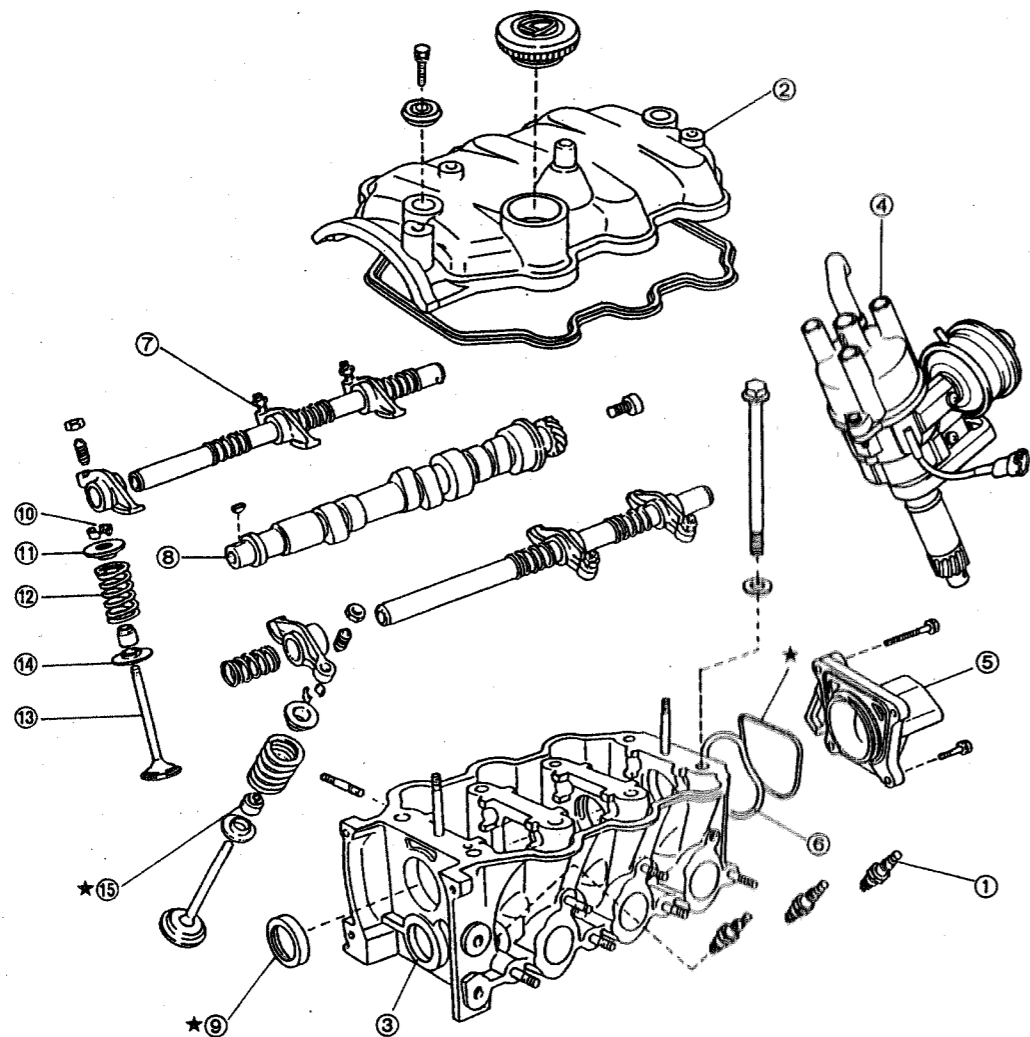
- (53) Connect the engine ground cable terminal to the negative terminal of the battery.

- (54) Start the engine and no abnormal noise emitted.



G2EM00067-99999

## CYLINDER HEAD COMPONENT

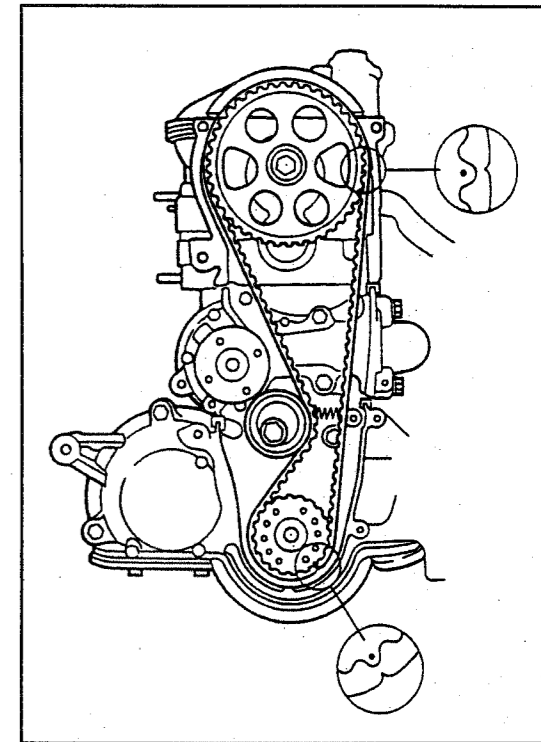


★ : Non-reusable parts

- |                                                                                     |                                  |
|-------------------------------------------------------------------------------------|----------------------------------|
| ① Spark plug                                                                        | ⑧ Camshaft                       |
| ② Cylinder head cover                                                               | ⑨ Oil seal                       |
| ③ Cylinder head assembly                                                            | ⑩ Valve spring retainer lock     |
| ④ Distributor                                                                       | ⑪ Valve spring retainer          |
| ⑤ Distributor housing                                                               | ⑫ Compression spring (for valve) |
| ⑥ Wave washer                                                                       | ⑬ Valve                          |
| ⑦ Valve rocker shaft<br>Valve rocker arm<br>Compression spring (Valve rocker shaft) | ⑭ Valve spring seat              |
|                                                                                     | ⑮ Valve stem oil seal            |

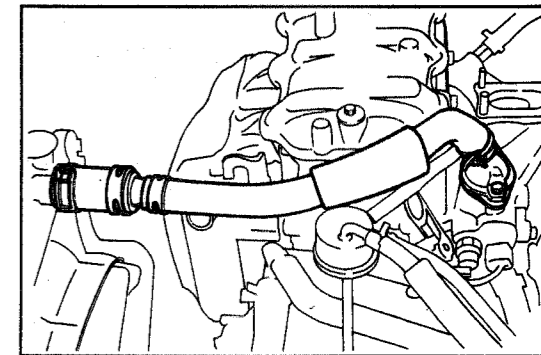
G2EM00068-99999

- (1) Turn OFF the ignition switch.
- (2) Disconnect the battery ground cable terminal from the negative terminal of the battery.
- (3) Remove the resistive cords.
- (4) Removal of air cleaner
  - ① Disconnect the air inlet from the clamp.
  - ② Disconnect the hot air intake duct from the exhaust manifold cover.
  - ③ Disconnect the ventilation hose from the air cleaner.
  - ④ Remove the bolt attaching the air cleaner to the cylinder head.
  - ⑤ Remove the wing nut attaching the air cleaner.
  - ⑥ Disconnect the rubber hoses.
  - ⑦ Remove the air cleaner.
- (5) Remove the timing belt.  
(Refer to the page EM-9 to EM-12.)
- (6) Drain the coolant.  
(Refer to the CO section of the service manual.)



G2EM00069-99999

- (7) Remove the carburetor.  
(Refer to the FU section of the service manual.)
- (8) Removal of distributor  
(Refer to the IG section of the service manual.)
- (9) Removal of water outlet
  - ① Removal of radiator upper hose.
  - ② Remove the water outlet attaching bolts.
  - ③ Detach the water outlet from the cylinder head.
  - ④ Remove the thermostat.

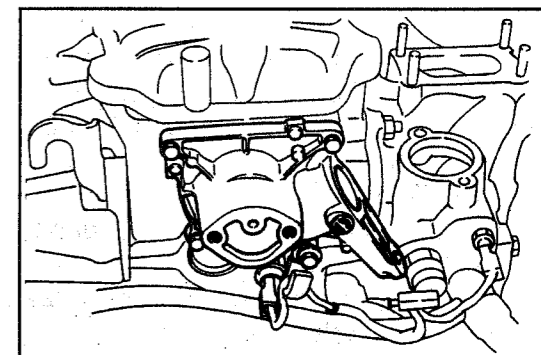


G2EM00070-99999

- (10) Disconnection of heater inlet hose and by-pass hose from cylinder head side.
  - ① Detach the hose bands from the cylinder head side heater inlet hose and by-pass hose.
  - ② Disconnect the hoses from the cylinder head.
  - ③ Remove the hose bands from the hoses.

G2EM00071-00000

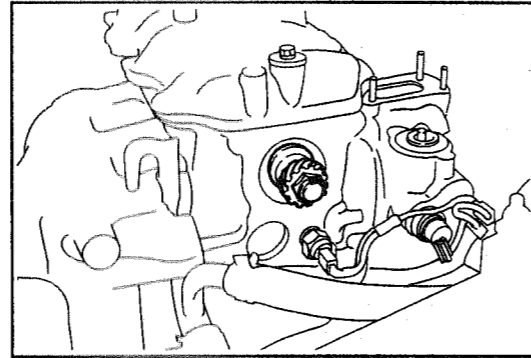
- (11) Removal of fuel pump  
(Refer to the FU section of the service manual.)
- (12) Removal of distributor housing
  - ① Disconnect the engine wire from the clamp.
  - ② Remove the distributor housing by removing the attaching bolts.
  - ③ Remove the O-ring from the distributor housing.
  - ④ Remove the wave washer.



G2EM00072-99999

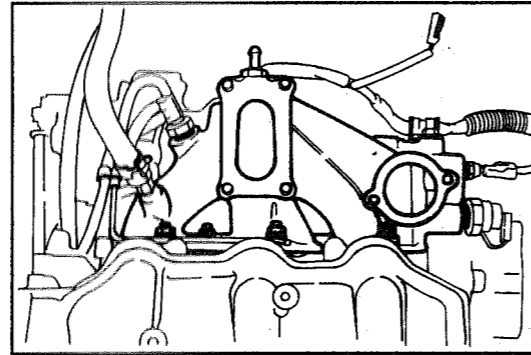
## (13) Removal of intake manifold

- ① Disconnect the radiator thermo control switch connector.
- ② Disconnect the water temperature sender gage connector.
- ③ Disconnect the engine wire clamp by removing its attaching bolt from the intake manifold.



G2EM00073-99999

- ④ Disconnect the booster hose from the intake manifold.
- ⑤ Disconnect the rubber hose from the BVSV.
- ⑥ Loosen the intake manifold attaching bolts.
- ⑦ Remove the intake manifold by removing the attaching bolts.
- ⑧ Remove the intake manifold gasket.



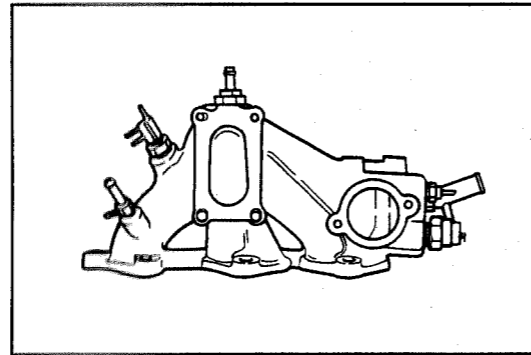
G2EM00074-99999

## (14) Removal of intake manifold related parts

Remove the following parts from the intake manifold.

(Only as required)

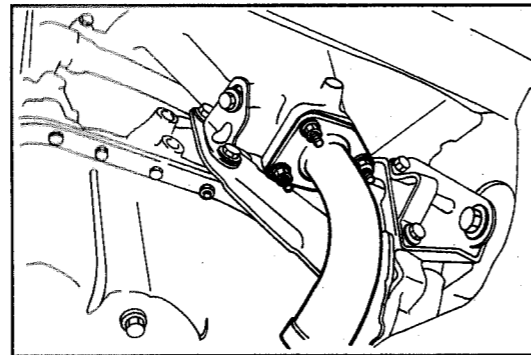
- ① Radiator thermo control switch
- ② Water temperature sender gage
- ③ Stud bolts
- ④ Union bolts
- ⑤ Plug screw
- ⑥ BVSV



G2EM00075-99999

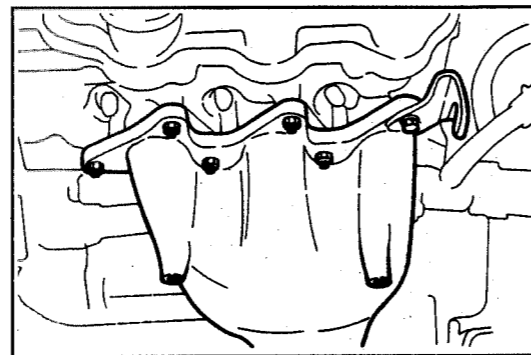
## (15) Removal of exhaust manifold

- ① Remove the exhaust manifold cover by removing its attaching bolts.
- ② Disconnect the exhaust front pipe from the exhaust manifold.
- ③ Remove the exhaust pipe gasket from the exhaust manifold.
- ④ Remove the exhaust manifold stay by removing the attaching bolts.



G2EM00076-99999

- ⑤ Loosen the exhaust manifold attaching bolt and nuts evenly over two or three stages in the sequence indicated in the right figure.
- ⑥ Remove the exhaust manifold by removing the attaching bolts.



G2EM00077-99999

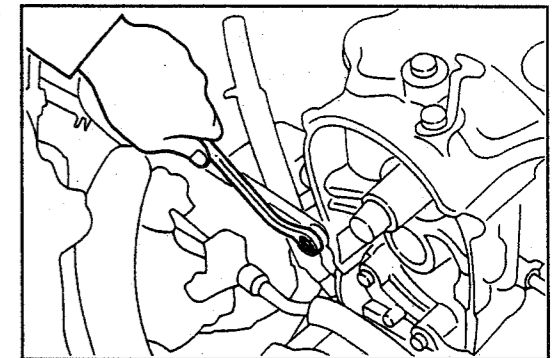
**CAUTION:**

- Do not interfere with other parts.

- ⑦ Remove the exhaust manifold gasket from the cylinder head.

## (16) Removal of cylinder head

- ① Remove the spark plugs, using a spark plug wrench (20.6 mm).
- ② Remove the alternator bracket from the cylinder head.

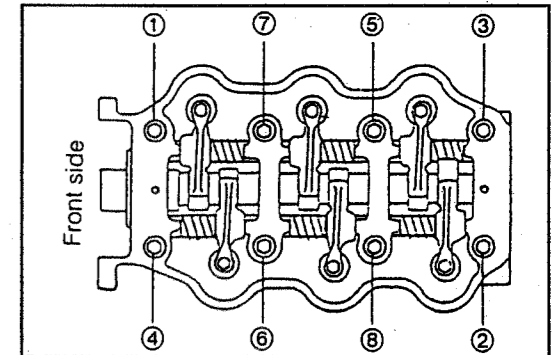


G2EM00078-99999

- ③ Remove the cylinder head cover by removing the attaching bolts.
- ④ Loosen the cylinder head bolts over two or three stages in the sequence shown in the right figure. Then, pull out the bolts.

**CAUTION:**

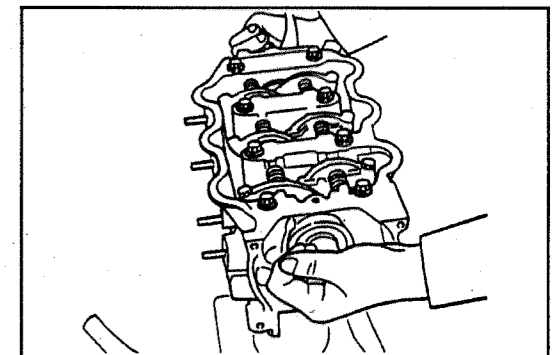
- Head warpage or cracking could result from removing the cylinder head bolts in improper sequence.



G2EM00079-99999

- ⑤ Remove the cylinder head.

Lift the cylinder head from the dowels on the cylinder block and place the cylinder head on a wooden block on the bench.

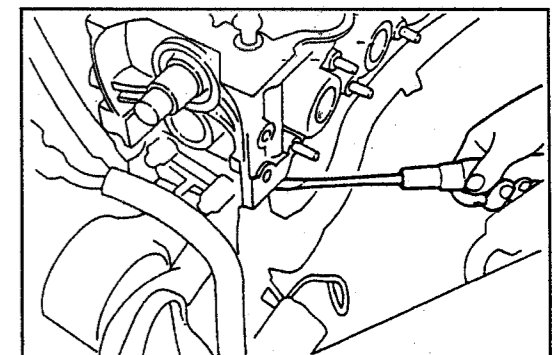


G2EM00080-99999

If any difficulty is encountered in lifting the cylinder head, pry with a screwdriver between the cylinder head and the cylinder block projection.

**CAUTION:**

- Be careful not to damage the gasket surfaces of the cylinder block and cylinder head.



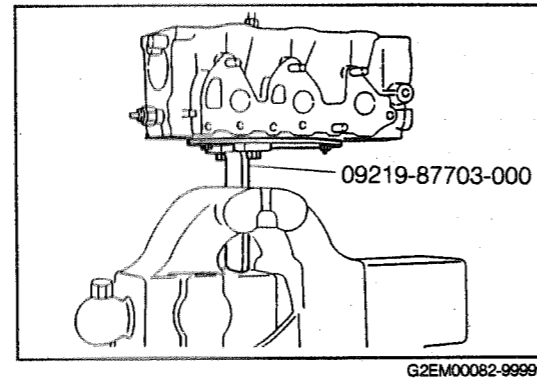
G2EM00081-99999

**DISASSEMBLY OF CYLINDER HEAD**

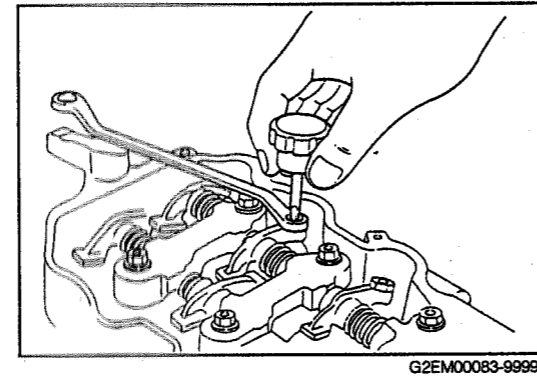
1. Install the cylinder head on the following SST. Then, clamp the SST in a vise.  
SST: 09219-87703-000

**CAUTION:**

- Be careful not to scratch the gasket surface of the cylinder head.



2. Loosen the adjusting screw of each valve rocker arm.  
**NOTE:**
  - When loosening the adjusting screw at the inlet side, use an adequate stubby screwdriver.



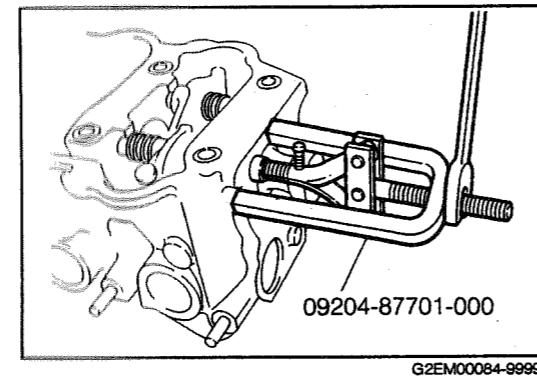
3. Remove the valve rocker shaft, using the following SST  
SST: 09204-87701-000

**CAUTION:**

- At this time, remove the valve rocker arm compression springs one by one by hand so that they may not jump out.

**NOTE:**

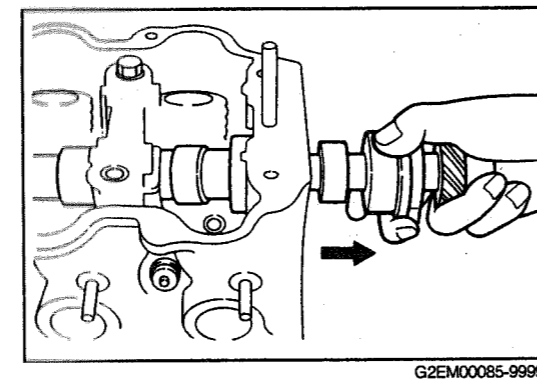
- Arrange the removed parts in correct order so that their installation positions may be known readily.



4. Removal of camshaft  
Pull out the camshaft toward the rear side of the cylinder head.

**NOTE:**

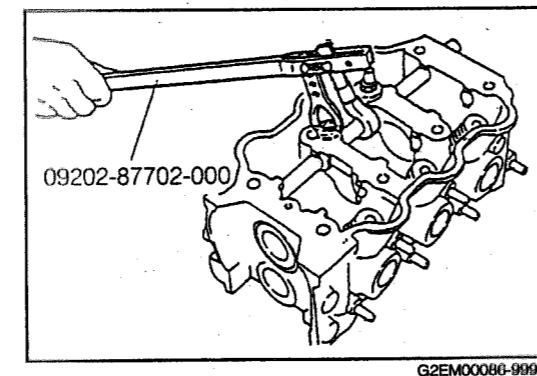
- Be careful not to damage the camshaft bearing bores of the cylinder head during this operation.



5. Removal of valve spring retainer locks
  - (1) Insert the valve rocker shaft into position.
  - (2) Remove the valve spring retainer lock, using the following SST.  
SST: 09202-87702-000

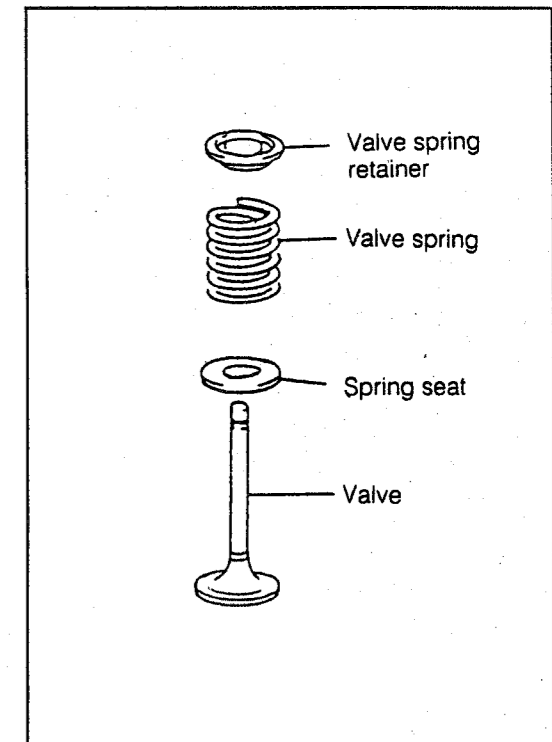
**CAUTION:**

- When removing the valve spring retainer locks, be careful not to allow the retainer locks to jump out.
- Protect your eyes during this operation.



For those parts removed in Steps 8 through 12, group the parts according to the kinds of valves or cylinders so that the installation positions of the removed parts may be known readily.

6. Remove the valve spring retainers.
7. Remove the valve springs.
8. Remove the cylinder head from the SST. Remove the valves.

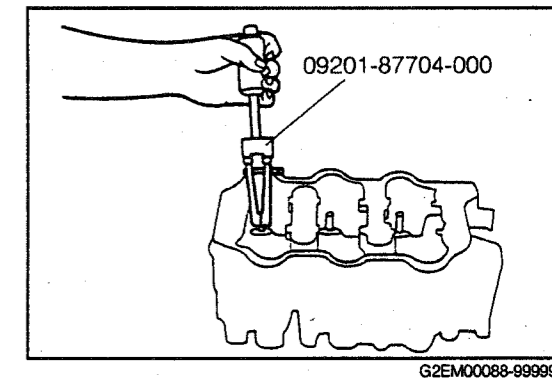


9. Removal of valve stem oil seals  
Remove the valve stem oil seal, using the following SST.  
SST: 09201-87704-000

10. Remove the valve spring seats.

**NOTE:**

- Wash the removed parts in a cleaning solvent and blow them with compressed air.



## INSPECTION, CLEANING AND REPAIRS OF CYLINDER HEAD COMPONENTS

- Cleaning of top of each piston and cylinder block
  - Turn the crankshaft until each piston is brought to the top dead center.  
Using a gasket scraper, remove all carbon deposits from the piston tops.
  - Using a gasket scraper, remove any remaining gasket material from the top of the cylinder block.  
Blow carbon deposits and oil from the bolt holes.

### WARNING:

- Protect your eyes during the cleaning operation using compressed air.

### CAUTION:

- Do not scratch the gasket surfaces of the piston and cylinder block.

- Set the piston No. 1 to the top dead center.

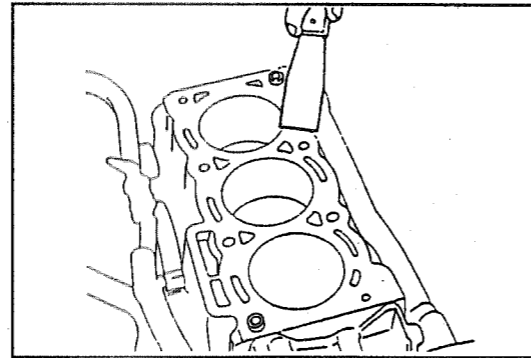
- Removal of gasket material  
Using a gasket scraper, remove any remaining gasket material from the cylinder head and manifold surfaces.

- Cleaning of combustion chamber  
Using a wire brush, remove all carbon deposits from the combustion chambers.

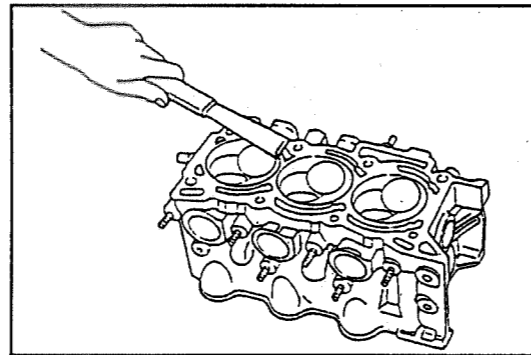
### CAUTION:

- Be careful not to scratch the cylinder head gasket contact surfaces.

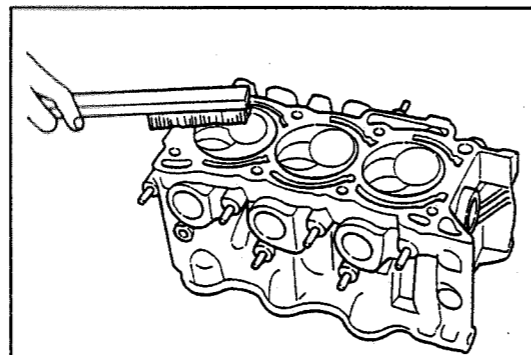
- Cleaning of valve guide bushings  
Using a valve guide brush and solvent, clean all the valve guide bushings.



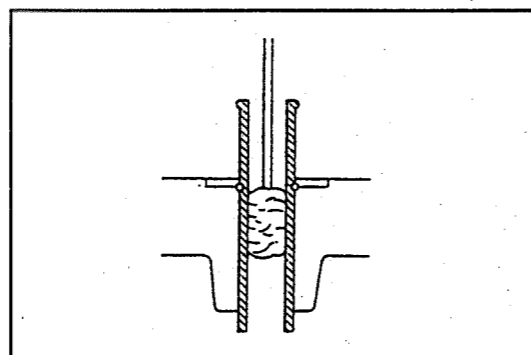
G2EM00089-99999



G2EM00090-99999

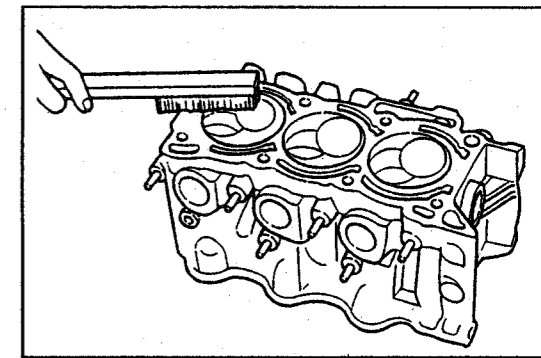


G2EM00091-99999



G2EM00092-99999

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



G2EM00093-99999

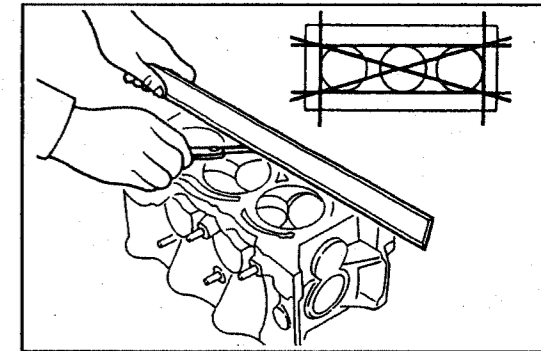
- Inspection of cylinder head for flatness  
Using a precision straight edge and a feeler gauge, check the gasket surfaces contacting the cylinder block and manifolds for warpage.

### Maximum Surface Warpage

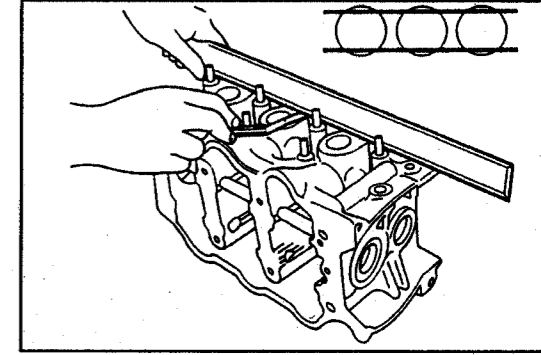
Cylinder Block Side: 0.10 mm (0.0039 inch)

Intake Manifold Side: 0.10 mm (0.0039 inch)

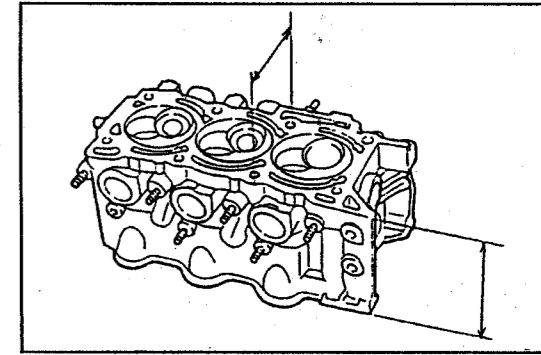
Exhaust Manifold Side: 0.10 mm (0.0039 inch)



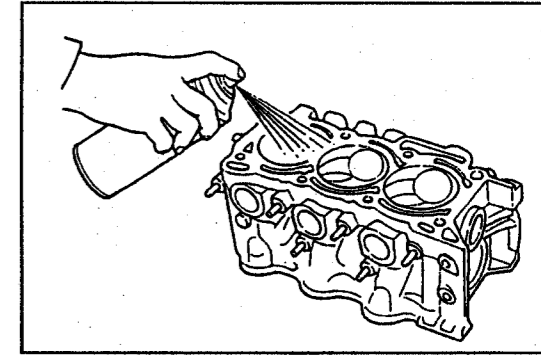
G2EM00094-99999



G2EM00000-99999



G2EM00095-99999



G2EM00096-99999

- Inspection of cylinder head for cracks  
Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and top of the head for cracks.  
If a crack is found, replace the cylinder head.

If surface warpage of the cylinder block side exceeds the maximum limit, correct surface by a cylinder head refacer, making sure not to exceed the minimum height limit of 4.9488 inches (125.7 mm), or replace the cylinder head, if necessary.

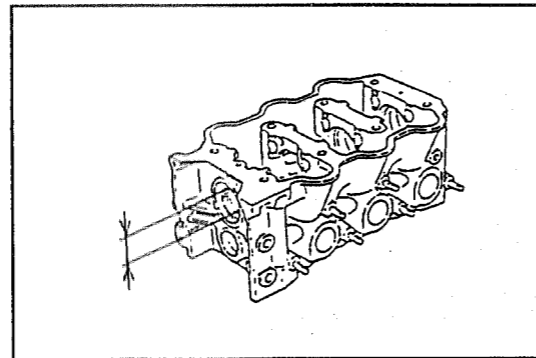
If the surface warpage of the intake manifold or the exhaust manifold attaching surface exceeds the maximum limit, correct the surface by a cylinder head refacer, making sure that the cylinder head width between the intake manifold and exhaust manifold attaching surfaces will not exceed the minimum width limit of 6.2756 inches (159.4 mm), or replace the cylinder head, if necessary.

8. Inspection of camshaft oil clearance

- (1) Measure the inner diameters of bearing bores of the cylinder head at three points of front, center and rear sections.

This bore measurement for each section should be conducted in two direction, 90 degrees apart from each other.

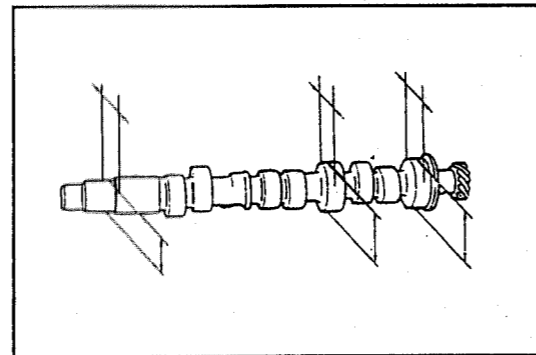
Record the measured values.



G2EM00097-99999

- (2) Measure the outer diameter of the journal section of the camshaft. This journal measurement for each section should be conducted in two direction, 90 degrees apart from each other.

Record the measured values.



G2EM00098-99999

- (3) Calculation of oil clearance

Calculate the oil clearance from the measurement results obtained in Steps (1) and (2).

**Camshaft Oil Clearance:**

Front	0.04 - 0.14 mm (0.0016 - 0.0055 inch)
Center	0.09 - 0.19 mm (0.0035 - 0.0075 inch)
Rear	0.06 - 0.16 mm (0.0024 - 0.0063 inch)

G2EM00099-00000

- (4) If the oil clearance exceeds the specified valve, replace the parts, as required, so that the oil clearance may meet the specifications, referring to the following specified dimensions of the camshaft journal sections and the camshaft bearing bores of the cylinder head.

**Specified Dimensions:**

	Front	Center	Rear
Outer diameter of camshaft journal section	31.960 - 31.980 mm (1.2583 - 1.2591 inch)	47.385 - 47.410 mm (1.8655 - 1.8665 inch)	48.415 - 48.440 mm (1.9061 - 1.9071 inch)
Inner diameter of camshaft bearing bore of cylinder head	32.020 - 32.045 mm (1.2606 - 1.2616 inch)	47.500 - 47.525 mm (1.8701 - 1.8711 inch)	48.500 - 48.525 mm (1.9094 - 1.9104 inch)

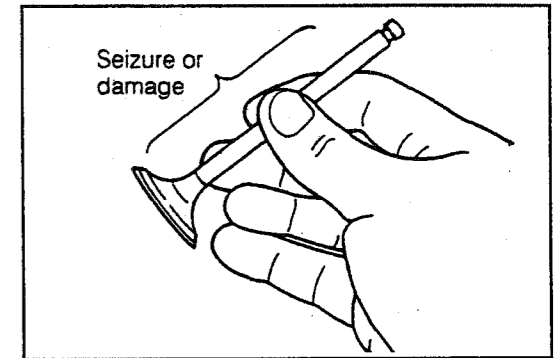
G2EM00100-00000

9. Inspection and grinding of valves

- (1) Visually inspect the valve stem for seizure or damage.

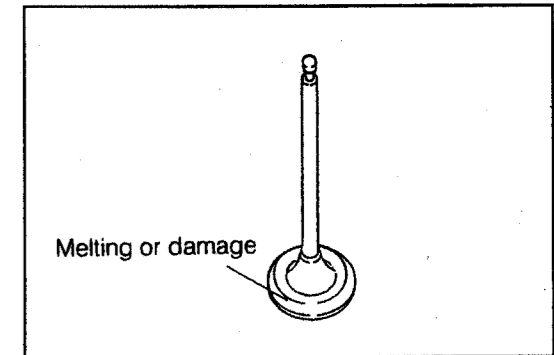
**NOTE:**

- If seizure or damage is found, replace the valve and valve guide bushing as a set.
- When any valve guide bush is replaced, be certain to perform this replacement only after the valve seat has been checked.
- If the valve guide bushing has been already replaced by the replacement part equipped with a ring, replace the cylinder head.



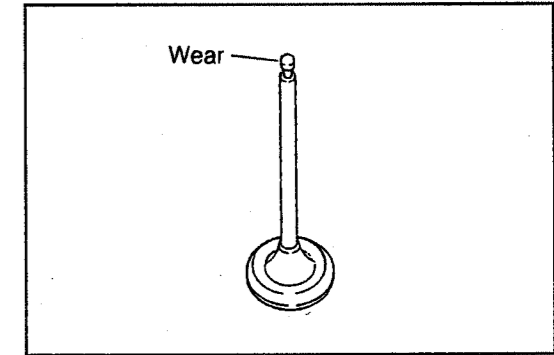
G2EM00101-99999

- (2) Visually inspect the valve head for melting or damage. If the valve head exhibits any melting or damage, replace the valve.



G2EM00102-99999

- (3) Visually inspect the valve stem end for abnormal wear.

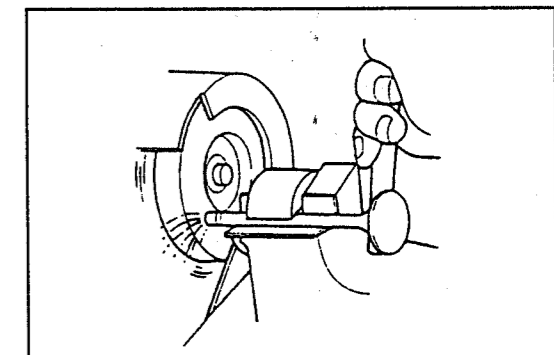


G2EM00103-99999

If the valve stem end exhibits abnormal wear, correct the stem end with a valve refacer

**NOTE:**

- Make sure that the valve has a minimum valve overall length of 100.85 mm (3.97 inches).

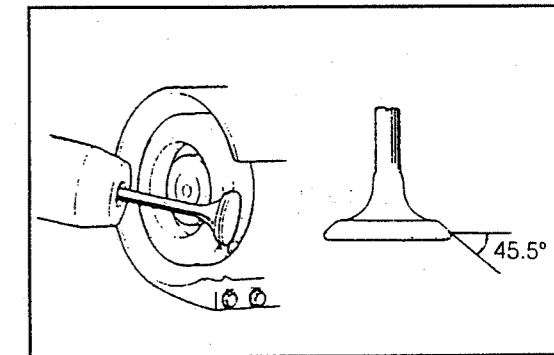


G2EM00104-99999

- (4) Grind the valves only enough to obtain a smooth contact surface with the valve seat.  
Valve Face Angle: 45.5°

**NOTE:**

- Make sure the valves are ground to the correct valve face angle.



G2EM00105-99999

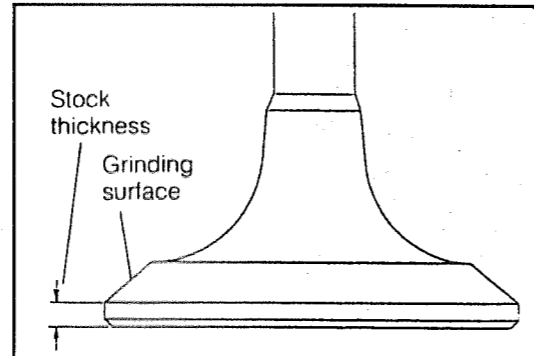
(5) Inspect the valve head for its stock thickness.

**Minimum Stock Thickness**

Intake Valve: 0.8 mm (0.0315 inch)

Exhaust Valve: 1.0 mm (0.0394 inch)

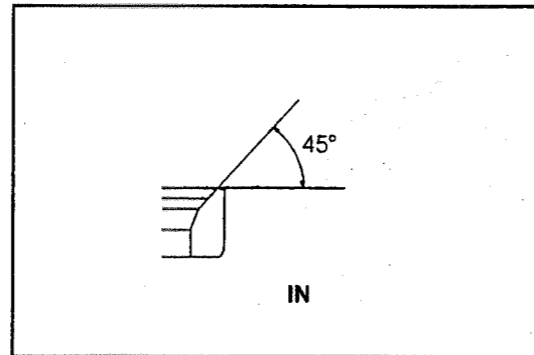
If the stock thickness of the valve head is less than the minimum stock thickness, replace it with a new one.



G2EM00106-99999

**10. Inspection and cleaning of valve seats**

(1) Using a 45 degree valve seat cutter, reface the valve seats. Remove only enough metal stock to clean the seats.



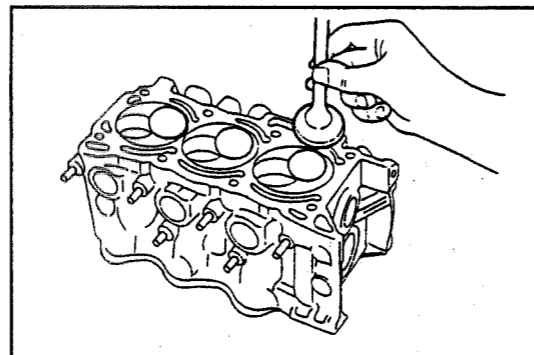
G2EM00107-99999

- (2) Apply a thin film of red lead (or white lead) to the valve seat.
- (3) Let the valve drop by its own weight onto the valve seat two or three times.
- (4) Take out the valve.

G2EM00108-00000

(5) Inspect the valve face and seat for the following items.

- ① Ensure that the valve seat contact surface of the valve is continuous over the whole circumference. If not, replace the valve.
- ② Ensure that the valve contact surface of the valve seat is continuous over the whole circumference. If not, reface the valve seat.

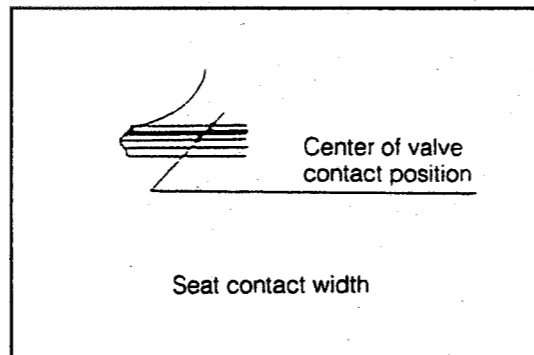


G2EM00109-99999

③ Measure the width of the contact surface of valve seat.

**Contact Surface of Valve Seat: 1.0 - 1.8 mm (0.039 - 0.071 inch)**

If not, reface the valve seat.

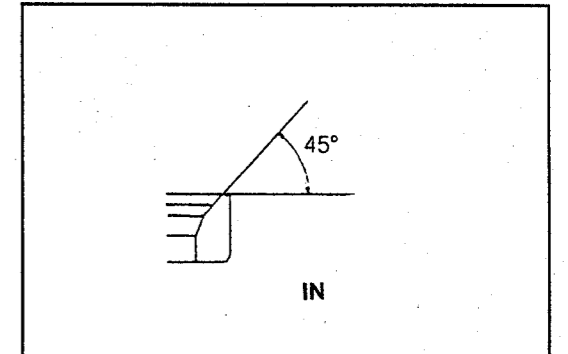


G2EM00110-99999

**11. Refacing of valve seat**

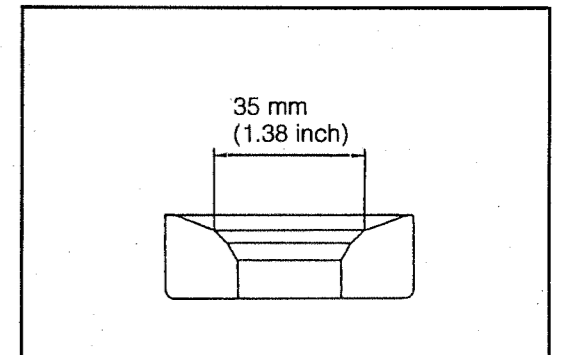
(1) Refacing procedure for intake valve seats

① Using a 45 degree cutter, recondition the roughness on the valve-to-valve seat contact surface, only enough to obtain a smooth surface.



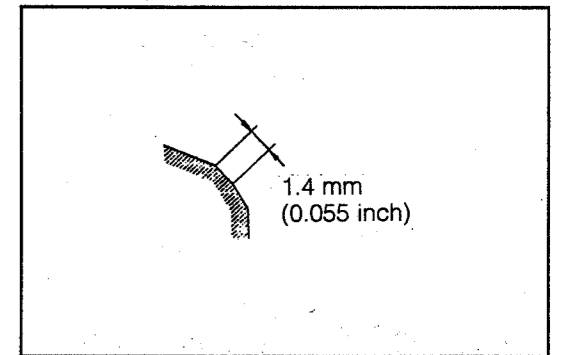
G2EM00111-99999

② Using a 30 degree cutter, cut the valve seat in such way that the circumference of the surface refaced by the 45 degree cutter may become 35 ± 0.1 mm (1.38 ± 0.004 inches).



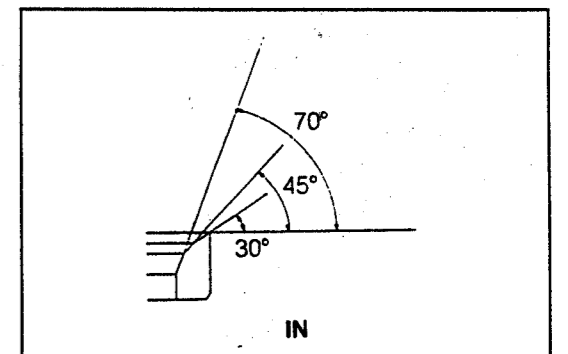
G2EM00112-99999

③ Using a 70 degree cutter, cut the seat in such way that the width, of the surface refaced by the 45 degree cutter may became 1.4 mm (0.055 inch).



G2EM00113-99999

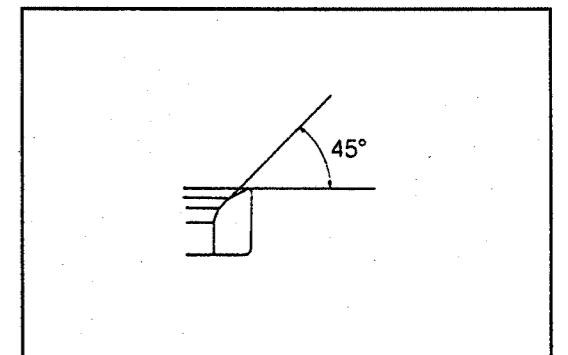
④ Using the 45 degree cutter, remove burrs produced during the refacing by the 30 degree and 70 degree cutters.



G2EM00114-99999

(2) Refacing procedure for exhaust valve seats

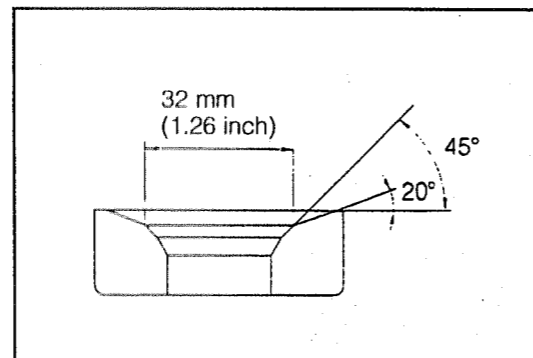
① Using a 45 degree cutter, recondition the roughness on the valve-to-valve seat contact surface, only enough to obtain a smooth surface.



G2EM00115-99999

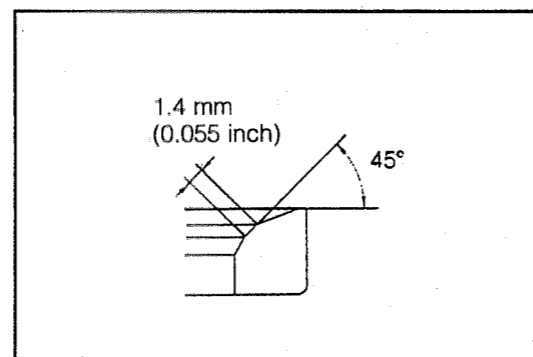


- ② Using a 20 degree cutter, cut the valve seat in such a way that the circumference of the surface refaced by the 45 degree cutter may become 32 mm (1.26 inches).



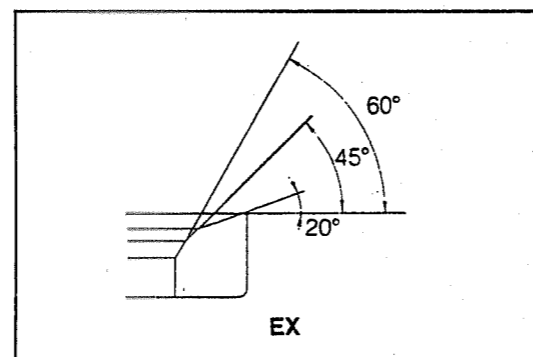
G2EM00116-99999

- ③ Using a 60 degree cutter, cut the valve seat in such a way that the width of the surface refaced by the 45 degree cutter may become 1.4 mm (0.055 inch).



G2EM00117-99999

- ④ Using the 45 degree cutter, remove burrs produced during the refacing by the 20 degree and 60 degree cutters.



G2EM00118-99999

12. Hand lapping of valves

- (1) Perform hand lapping of the valves and valve seats, using an abrasive compound.
- (2) Clean the valves and valve seats after the hand lapping of the valves.

G2EM00119-00000

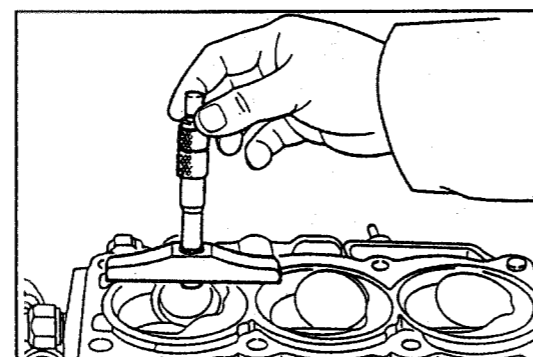
13. Inspection of valve recession

After the valve seat has been refaced, install the new valve. Measure the distance between the cylinder attaching surface of the cylinder head (attaching surface of the cylinder head gasket) and the upper most section of the valve. Ensure that the distance does not exceed the following maximum limit.

Maximum Limit

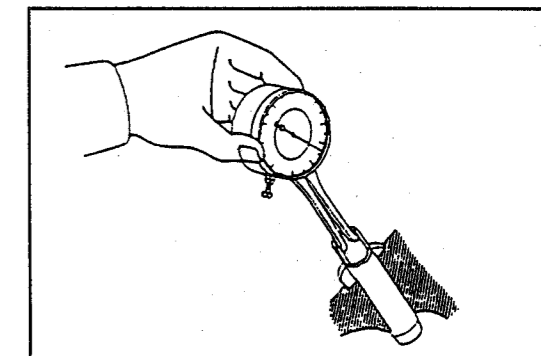
- Intake Valve: 1.886 mm (0.0743 inch)
- Exhaust Valve: 2.807 mm (0.1105 inch)

If the recession exceeds the maximum limit, replace the cylinder head.



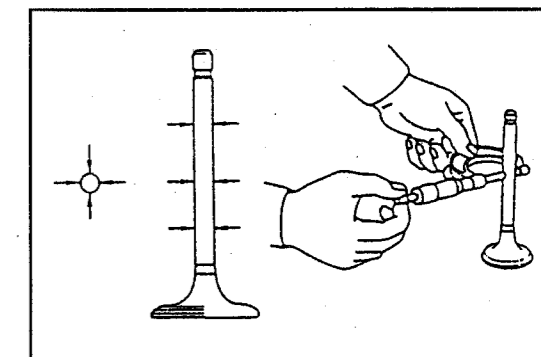
G2EM00120-99999

14. Inspection of valve stem-to-guide bushing oil clearance
- (1) Using a caliper gauge, measure the inner diameter of the valve guide at six points. Record the measured values.



G2EM00121-99999

- (2) Using a micrometer, measure the diameter of the valve stem at six points. Record the measured values.



G2EM00122-99999

- (3) Calculation of oil clearance
- Calculate the oil clearance of each valve according to the following formula.

$$\text{Oil clearance} = \text{Inner diameter of valve stem guide} - \text{Outer diameter of valve stem}$$

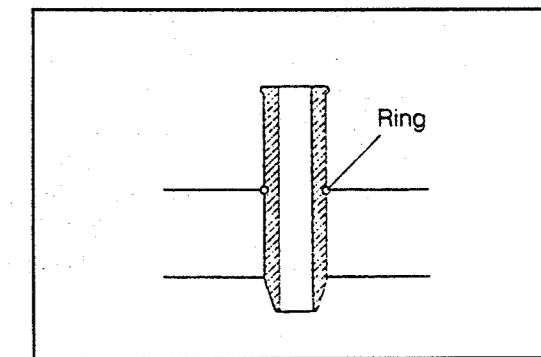
Specified Oil Clearance

- Intake Valve Side: 0.040 - 0.090 mm (0.0016 - 0.0035 inch)
- Exhaust Valve Side: 0.045 - 0.100 mm (0.0018 - 0.0039 inch)

- If the calculated oil clearance exceeds the specified oil clearance, replace the valve guide bushing and the valve as a set.

G2EM00123-00000

- If the valve guide bushing has been already installed with a locating ring (replacement part), replace the cylinder head.



G2EM00124-99999

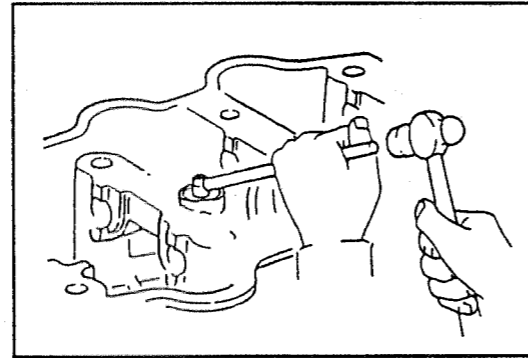
15. Replace the valve guide bushing, if necessary.

(1) Exhaust side

① Break the valve guide bushing, using a brass bar.

CAUTION:

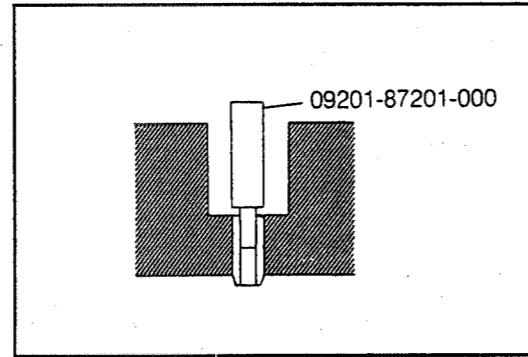
- Do not damage the cylinder head.



G2EM00125-99999

② Drive out the valve guide bushing toward the combustion chamber side, using the following SST.

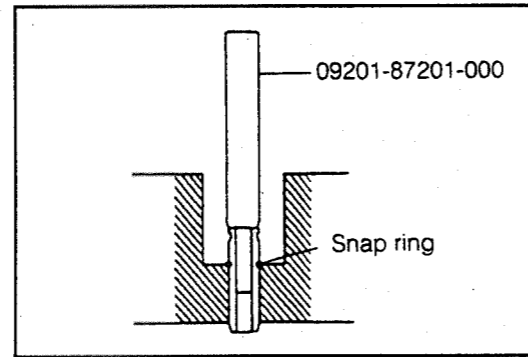
SST: 09201-87201-000



G2EM00126-99999

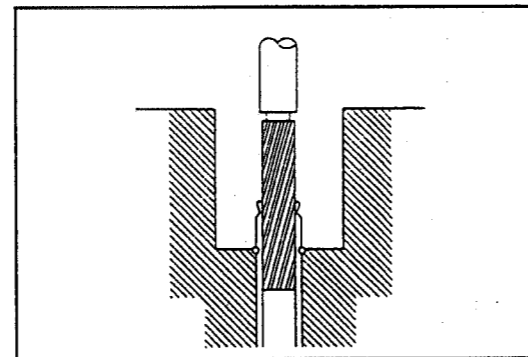
③ Drive a new valve guide bushing into position, until the snap ring contacts the cylinder head, using the following SST.

SST: 09201-87201-000



G2EM00127-99999

④ Using an adjustable reamer, ream the valve guide bushing to remove any burr or the like.

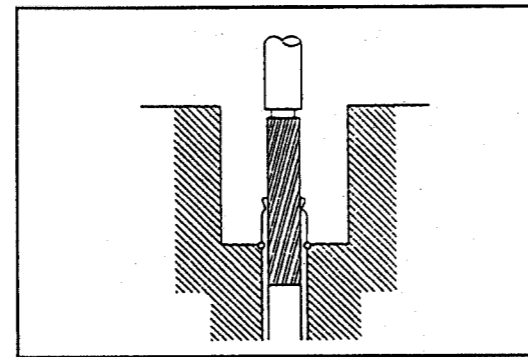


G2EM00128-99999

⑤ Inspection and correction of oil clearance  
Check to see if the oil clearance meets the specification.

If the oil clearance does not meet the specification, ream the valve guide bushing, using an adjustable reamer, to meet the specification.

Specified Oil Clearance: 0.045 - 0.075 mm  
(0.0018 - 0.0029 inch)

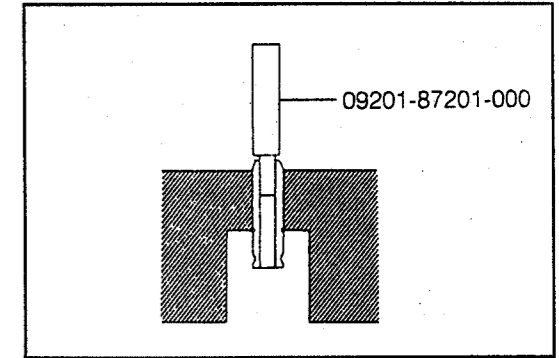


G2EM00129-99999

(2) Intake side

① Drive out the valve guide bushing from the combustion chamber side, using the following SST.

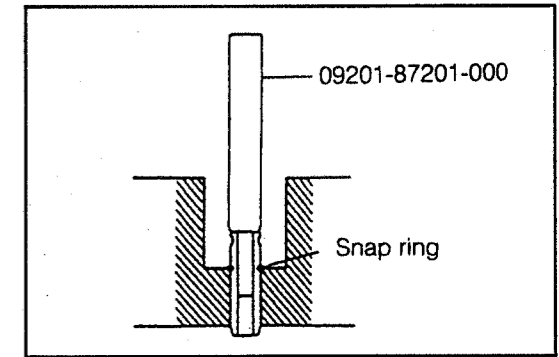
SST: 09201-87201-000



G2EM00130-99999

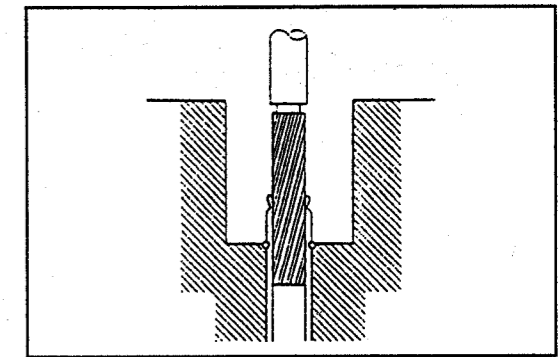
② Drive a new valve guide bushing into position, until the snap ring contacts the cylinder head, using the following SST.

SST: 09201-87201-000



G2EM00131-99999

③ Using an adjustable reamer, ream the valve guide bushing to remove any burr or the like.

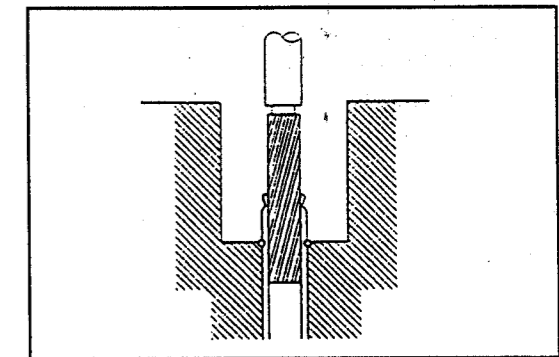


G2EM00132-99999

④ Inspection and correction of oil clearance  
Check to see if the oil clearance meets the specification.

If the oil clearance does not meet the specification, ream the valve guide bushing, using an adjustable reamer, to meet the specification.

Specified Oil Clearance: 0.040 - 0.070 mm  
(0.0016 - 0.0028 inch)



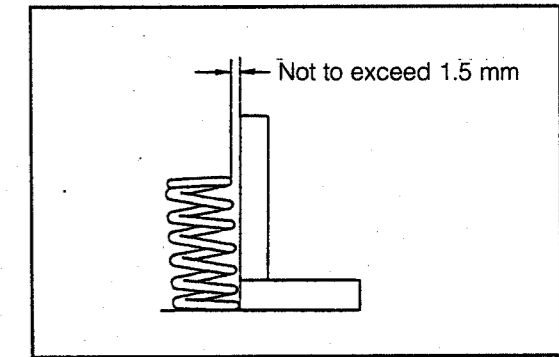
G2EM00133-99999

16. Inspection of valve springs

(1) Check the valve spring for squareness, using a steel square.

Maximum Squareness: 1.5 mm (0.059 inch)

If the squareness exceeds the maximum limit, replace the valve spring.



G2EM00134-99999

(2) Measure the valve spring for free length and spring tension, using a spring tester.

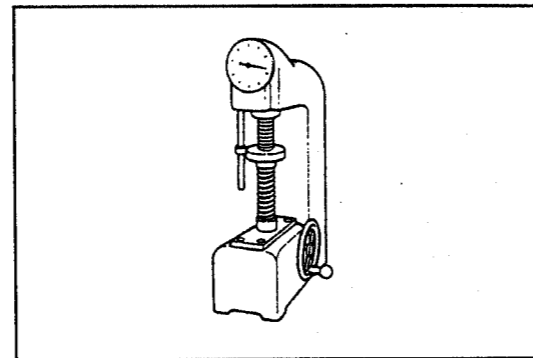
Minimum Free Length: 42.0 mm (1.654 inches)

Minimum Tension/Installation Height:

222.6 N/34.9 mm

(22.7 kg/34.9 mm, 50.1 lb/1.374 inches)

If the minimum free length and/or minimum tension is less than the minimum limit, replace the valve spring.

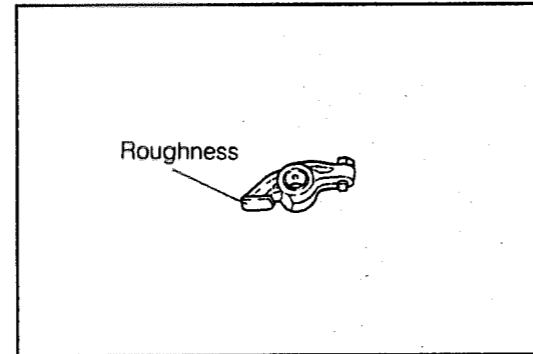


G2EM00135-99999

17. Inspection of valve rocker arms and valve rocker shaft

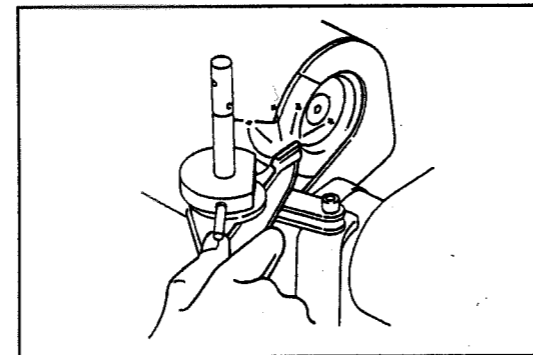
(1) Visually inspect the valve rocker arm for cracks, seizure or wear.

Replace the valve rocker arm, if necessary.



G2EM00136-99999

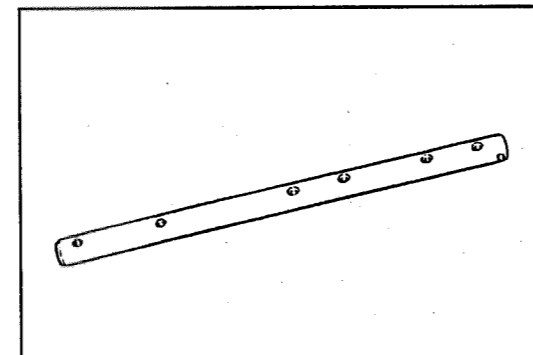
(2) If the valve rocker arm-to-cam contact surface is worn excessively, grind or replace the rocker arm.



G2EM00137-99999

(3) Visually inspect the valve rocker shaft for cracks, seizure or wear.

Replace the valve rocker shaft, if necessary.



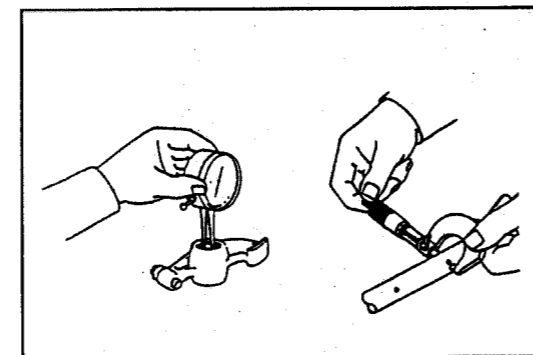
G2EM00138-99999

(4) Valve rocker shaft-to-valve rocker arm

- Using a dial gauge, measure the inner diameter of the valve rocker arm in two directions, 90 degrees apart from each other.
- Using a micrometer, measure the outer diameter of the valve rocker arm attaching position of the camshaft in two directions, 90 degrees apart from each other.
- Calculate the oil clearance by subtracting the rocker shaft diameter from the rocker arm diameter.

Oil Clearance: 0.016 - 0.09 mm

(0.00063 - 0.0035 inch)



G2EM00139-99999

If the oil clearance does not meet the specifications, replace the parts with new ones, as required, referring to the specified values of the inner diameter of the valve rocker arm and the outer diameter of the valve rocker shaft.

Inner diameter of valve rocker arm (New)	16.000 - 16.018 mm (0.6299 - 0.6306 inch)
Outer diameter of valve rocker shaft (New)	15.958 - 15.984 mm (0.6283 - 0.6293 inch)

[Reference]

Oil clearance at time when the valve rocker shaft and valve rocker arm have been replaced with new one.

0.016 - 0.060 mm (0.0006 - 0.0024 inch)

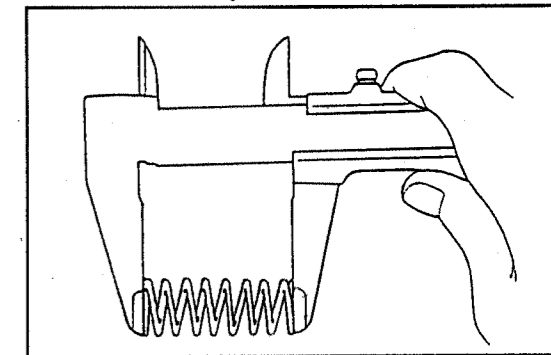
G2EM00140-00000

18. Inspection of valve rocker shaft compression spring

(1) Measure the free length of the compression spring, using vernier calipers.

Minimum Free Length: 33 mm (1.3 inch)

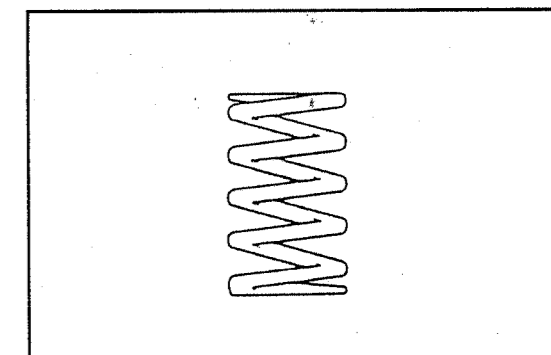
If the free length is less than the specified value, replace the compression spring.



G2EM00141-99999

(2) Visually inspect the compression spring for abnormal tilt or bend.

Replace the compression spring, if necessary.

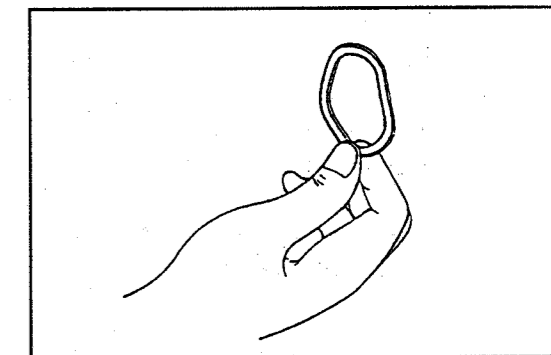


G2EM00142-99999

19. Inspection of wave washer

(1) Visually inspect the wave washer for flattened condition or damage.

Replace the wave washer, if necessary.



G2EM00143-99999

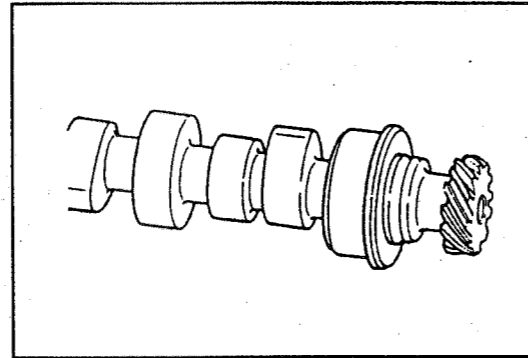
## 20. Camshaft inspection

- (1) Visually inspect the distributor drive gear for cracks or abnormal wear.

If the distributor drive gear exhibits cracks or abnormal wear, replace the camshaft.

**NOTE:**

- If the distributor drive gear exhibits any abnormal wear, check the distributor driven gear, too.



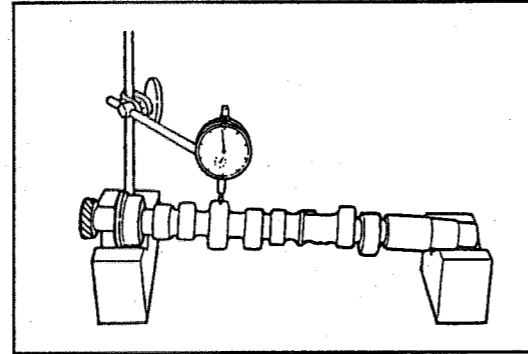
G2EM00144-99999

- (2) Checking camshaft for runout

Support the camshaft at its both ends with V-shaped blocks. Set a dial gauge to the mid-point of the center journal section of the camshaft. Turn the camshaft one turn, making sure that the camshaft will not move in the axial direction. Take a reading on the dial gauge during the turning. Calculate the maximum runout, i.e. the difference between the maximum and minimum readings.

**Maximum Runout: 0.03 mm (0.0012 inch)**

If the runout exceeds the maximum limit, replace the camshaft.

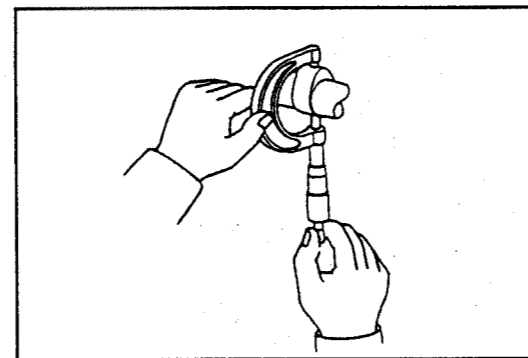


G2EM00145-99999

- (3) Measurement of cam lobe height

Measure the cam lobe height, using a micrometer.

**Minimum Cam Height: 39.8 mm (1.5669 inch)**



G2EM00146-99999

## 21. Inspection of manifold

- (1) Check the cylinder head attaching surface of the exhaust manifold for warpage, using a straight edge and a thickness gauge.

**Maximum Warpage: 0.1 mm (0.0039 inch)**

If the warpage exceeds the maximum limit, replace the exhaust manifold.

G2EM00147-00000

- (2) Check the cylinder head attaching surface of the intake manifold for warpage, using a surface plate and a thickness gauge.

**Maximum Warpage: 0.1 mm (0.0039 inch)**

If the warpage exceeds the maximum limit, replace the intake manifold.

G2EM00148-00000

## 22. Replacement of camshaft oil seal

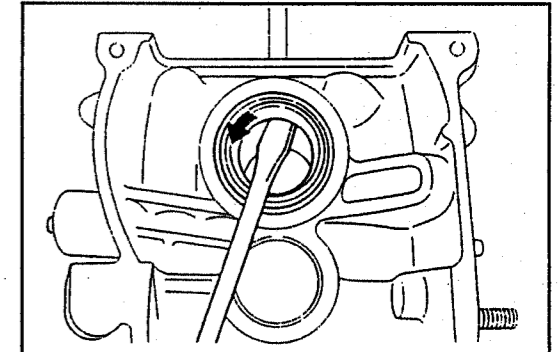
**REMOVAL**

- (1) Remove the camshaft oil seal, using a screwdriver or the like.

**NOTE:**

- Care must be exercised not to damage the oil seal installing surface.
- The oil seal is a non-reusable part.

- (2) When the camshaft oil seal is to be drawn with the camshaft assembled in the cylinder head: Remove the camshaft oil seal, using the following SST.
- SST: 09223-87702-000**

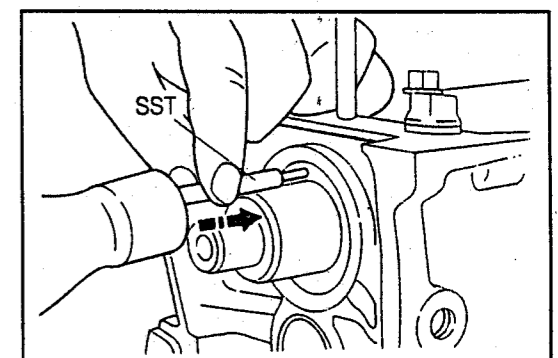


G2EM00149-99999

- ① Make a hole on the oil seal surface, using the drift of the SST.

**NOTE:**

- Be very careful not to damage the camshaft and cylinder head.

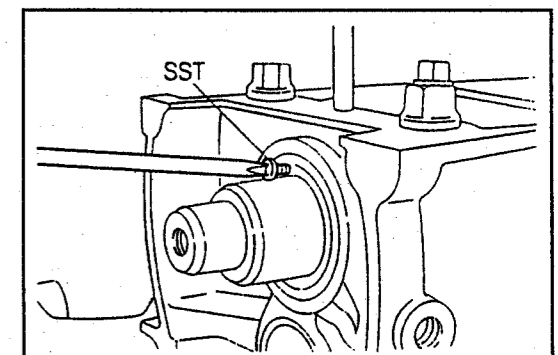


G2EM00150-99999

- ② Screw in the tapping screw of the SST into the hole provided on the oil seal surface in the preceding step.

**NOTE:**

- Be very careful not to damage the camshaft and cylinder head.

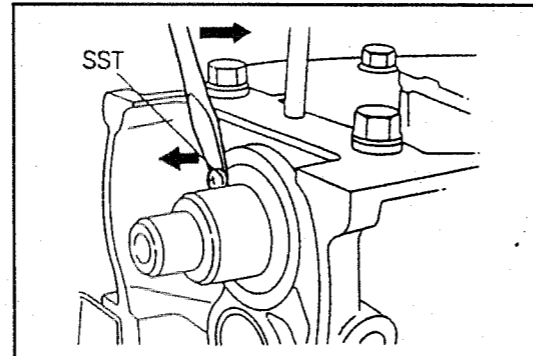


G2EM00151-99999

③ Pry off the oil seal with a screwdriver or the like.

## NOTE:

- Be very careful not to damage the camshaft and cylinder head.



G2EM00152-99999

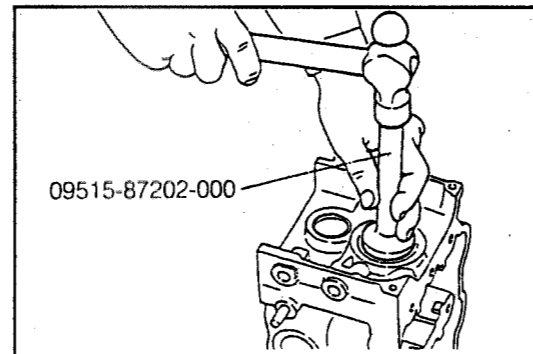
## INSTALLATION

Install a new oil seal on the cylinder head, using the following SST.

SST: 09515-87202-000

## NOTE:

- After the oil seal has been installed, apply engine oil to the oil seal lip section.



G2EM00153-99999

## ASSEMBLY OF CYLINDER HEAD

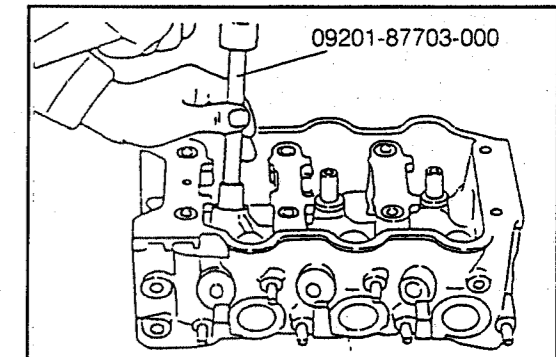
## NOTE:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.

1. Install the valve spring seats.

G2EM00154-00000

2. Installation of valve stem oil seal
- (1) Apply engine oil to the valve stem oil seal.
  - (2) Drive the new valve stem oil seal into the valve stem guide, using the following SST.  
SST: 09201-87703-000



G2EM00155-99999

## NOTE:

- Be careful not to damage the valve stem guide bushing.

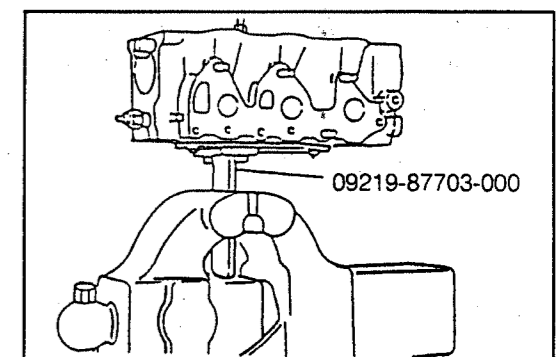
3. Installation of valves
- (1) Apply engine oil to the valve stem.
  - (2) Insert the corresponding valve into position from the combustion chamber, being very careful not to damage the valve stem oil seal.

## NOTE:

- Once the valve has been inserted, never pull it out from position.
- If the valve should be pulled out, replace the valve stem oil seal with a new one.

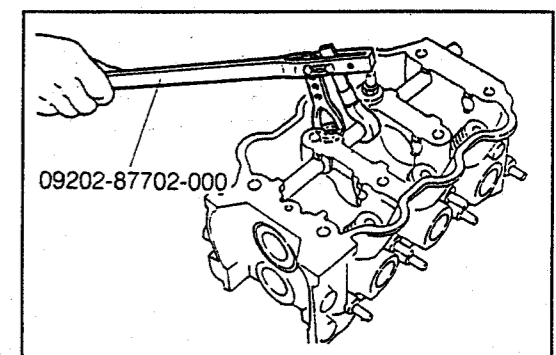
4. Installation of SST to cylinder head
- (1) Install the SST to the cylinder head to prevent the valve from disengaging from position.  
SST: 09219-87703-000

(2) Clamp the SST in a vise securely.



G2EM00156-99999

5. Install the valve springs.
6. Installation of valve spring retainers
- (1) Insert the valve rocker shaft into position. Install the valve spring retainer lock, using the following SST.  
SST: 09202-87702-000



G2EM00157-99999

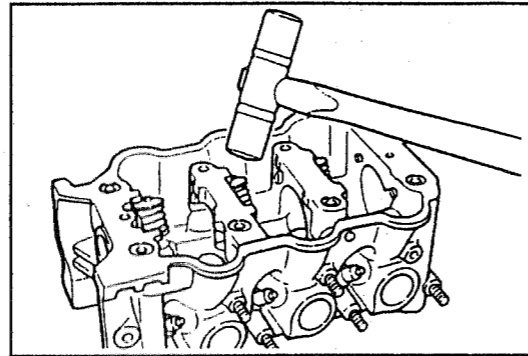
## NOTE:

- When installing the valve rocker shaft, apply engine oil to the rocker shafts and the rocker shaft attaching holes of the cylinder head.

(2) After each valve spring retainer lock has been installed, lightly tap the valve retainer lock to install it securely.

**WARNING:**

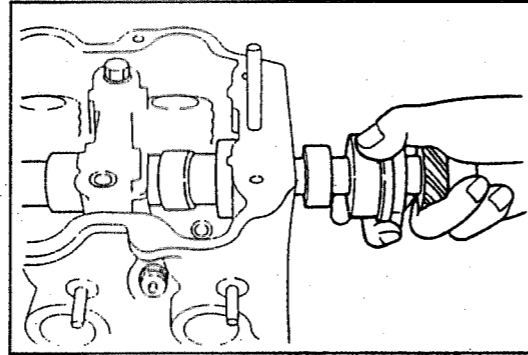
- During this operation, care must be exercised to ensure that the valve spring retainer or lock retainer may not be jumped out.
- Protect your eyes during the operation.



G2EM00158-99999

**7. Installation of camshaft.**

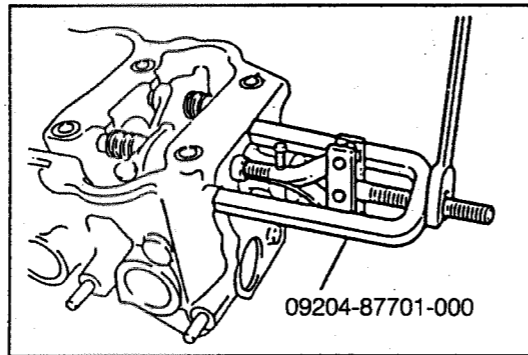
- (1) Apply engine oil to the camshaft bearing bores of the cylinder head.
- (2) Apply engine oil to the camshaft journal sections.
- (3) Install the camshaft to the cylinder head, being very careful not to damage the camshaft bearing bores of the cylinder head.



G2EM00159-99999

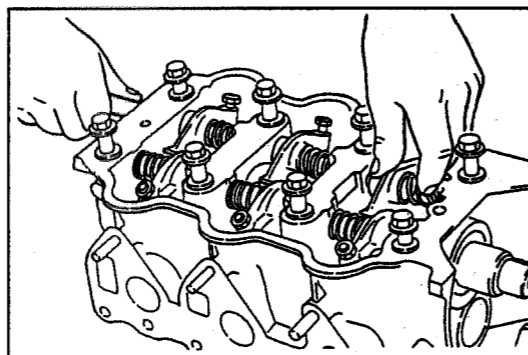
**8. Installation of valve rocker shafts, valve rocker arms and compression springs for valve rocker shafts.**

- (1) Remove the valve rocker shaft, using the following SST.  
SST: 09204-87701-000
- (2) Apply engine oil to the valve rocker shaft, valve rocker arm, compression spring and valve rocker shaft hole of the cylinder block.



G2EM00160-99999

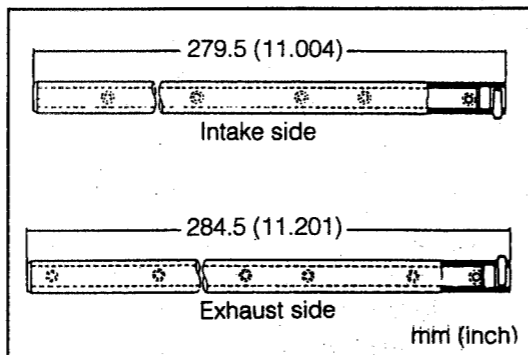
- (3) While inserting the valve rocker shaft into position, assemble the valve rocker arm and compression spring.



G2EM00161-99999

**NOTE:**

- The valve rocker shaft differs in length between the exhaust side and the intake side. Refer to the right figure during the assembly of the valve rocker shafts.



G2EM00162-99999

**INSTALLATION OF CYLINDER HEAD**

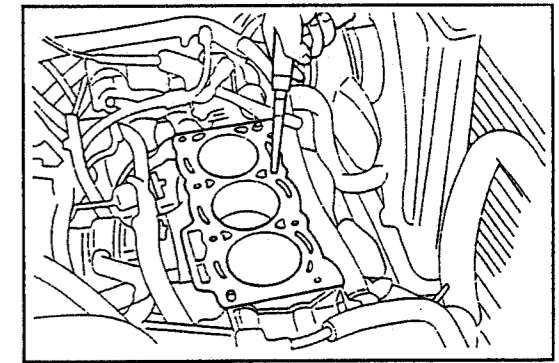
1. Dry the cylinder head attaching bolt holes of the cylinder block by compressed air.

**WARNING:**

- Protect your eyes during this operation.

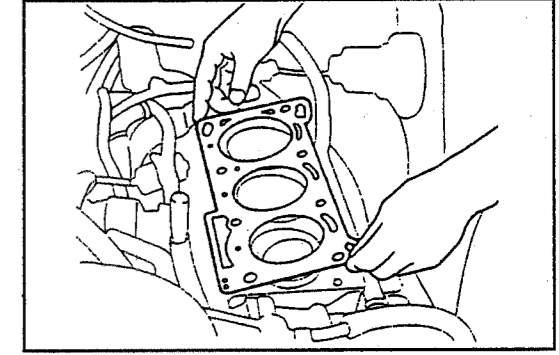
**CAUTION:**

- If the attaching bolt holes are wet with water or oil, the head bolts can not be tightened to the specified torque.



G2EM00163-99999

2. Place a new cylinder head gasket on the top surface of the cylinder block.

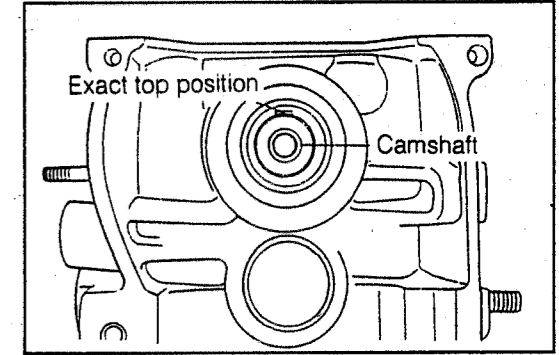


G2EM00164-99999

3. Turn the camshaft until the key groove comes just at the top position.

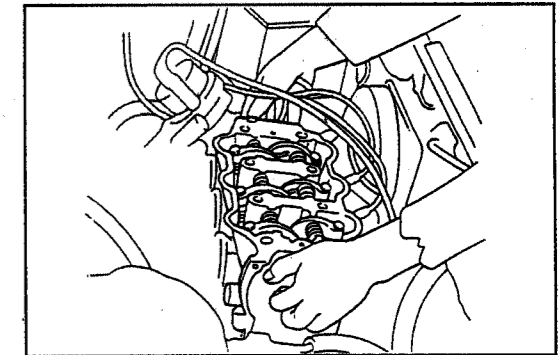
**CAUTION:**

- If the camshaft key groove does not come just at the top position, the valves interfere with the piston, possibly causing damage to the valves and piston.



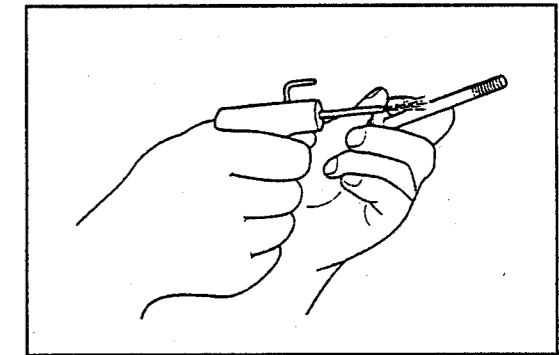
G2EM00165-99999

4. Place the cylinder head on the top surface of the cylinder head gasket.



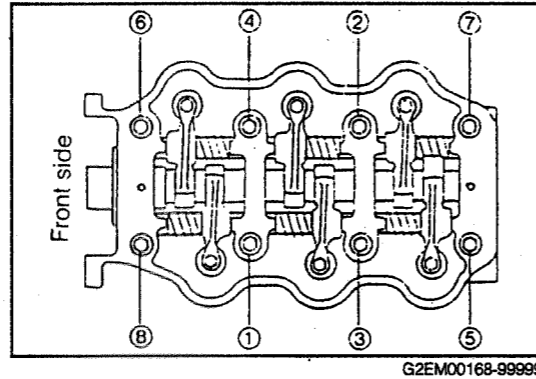
G2EM00166-99999

5. Dry the threaded portion of each cylinder head bolt by compressed air. Then, screw in the cylinder head bolts into the bolt hole.



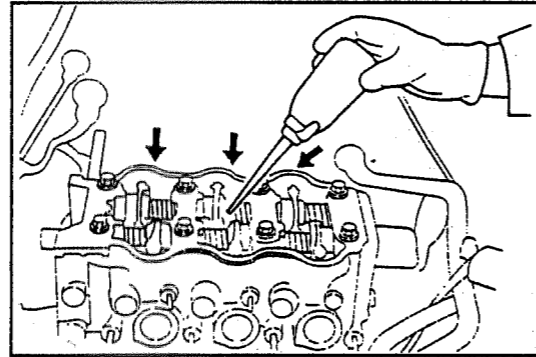
G2EM00167-99999

6. Using a torque wrench, gradually tighten the head bolts over three stages in the sequence shown. Tighten the bolts to the specified torque in the final stage.  
**Tightening Torque: 53.9 - 63.7 N·m**  
 (5.5 - 6.5 kgf-m, 39.8 - 47 ft-lb)



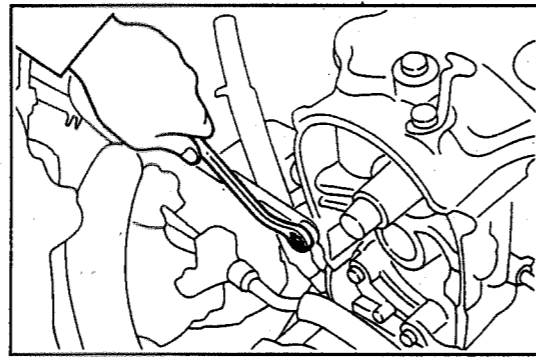
G2EM00168-99999

7. Filling oil to cylinder head  
 (1) Fill the oil into the camshaft chamber of each cylinder of the cylinder head.  
**Oil Amount: 30 cc**



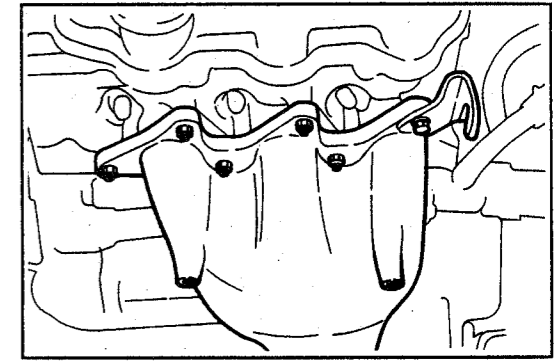
G2EM00169-99999

8. Install the spark plugs, using a spark plug wrench (20.6 mm).  
 9. Install the alternator bracket to cylinder head.  
**Tightening Torque: 9.8 - 15.7 N·m**  
 (1.0 - 1.6 kgf-m, 7.2 - 11.6 ft-lb)



G2EM00170-99999

10. Installation of exhaust manifold  
 (1) Installation of exhaust manifold  
 Install the exhaust manifold with a new exhaust manifold gasket interposed.  
**Tightening Torque: 14.7 - 21.6 N·m**  
 (1.5 - 2.2 kgf-m, 10.8 - 15.9 ft-lb)



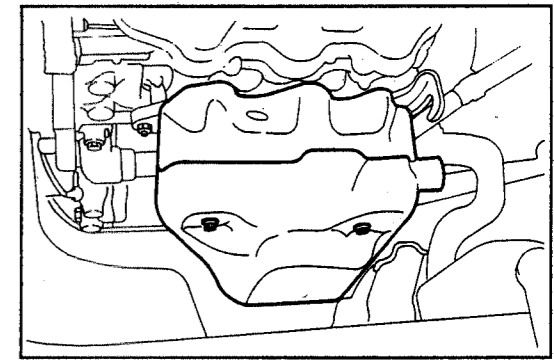
G2EM00171-99999

- (2) Install the exhaust manifold stay.  
**Tightening Torque: 29.4 - 44.1 N·m**  
 (3.0 - 4.5 kgf-m, 21.7 - 32.5 ft-lb)

- (3) Install the exhaust pipe with a new exhaust pipe gasket interposed.  
**Tightening Torque: 49.0 - 74.5 N·m**  
 (5.0 - 7.6 kgf-m, 36.2 - 55.0 ft-lb)

G2EM00172-00000

- (4) Install the exhaust manifold cover.  
**Tightening Torque: 5.9 - 8.8 N·m**  
 (0.6 - 0.9 kgf-m, 4.3 - 6.5 ft-lb)

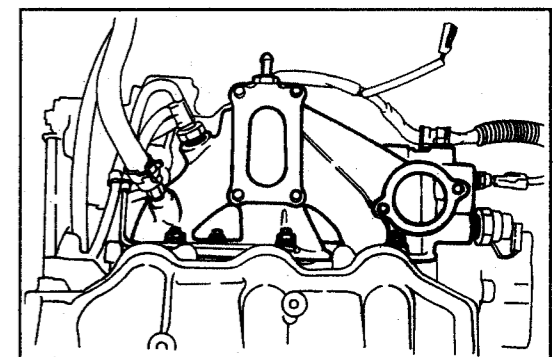


G2EM00173-99999

11. Installation of intake manifold related parts install the following parts to the intake manifold.  
 (1) Radiator thermo control switch  
 (2) Water temperature sender gage  
 (3) Stud bolts  
 (4) Union bolts  
 (5) Plug screw  
 (6) BVSV

G2EM00174-00000

12. Installation of intake manifold  
 (1) Install the intake manifold to the cylinder head with a new intake manifold gasket interposed.  
 (2) Tighten the bolt and nuts to the specified torque.  
**Tightening Torque: 14.7 - 21.6 N·m**  
 (1.5 - 2.2 kgf-m, 10.8 - 15.9 ft-lb)



G2EM00175-99999

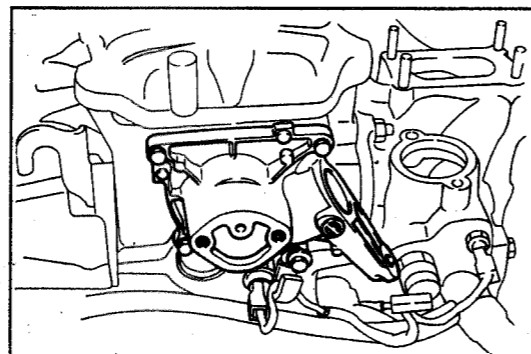
- (3) Connect the rubber hose to the BVSV.
- (4) Connect the booster hose to the intake manifold.
- (5) Connect the engine wire clamp to the intake manifold.
- (6) Connect the connector of the water temperature sender gage.
- (7) Connect the connector of the radiator thermo control switch.

G2EM00176-00000

## 13. Installation of distributor housing

- (1) Install the wave washer.
  - (2) Install the new O-ring to the distributor housing.
  - (3) Install the distributor housing to the cylinder head and tighten the attaching bolt.
- Tightening Torque:** 3.9 - 6.9 N·m  
(0.4 - 0.7 kgf-m, 2.9 - 5.1 ft-lb)

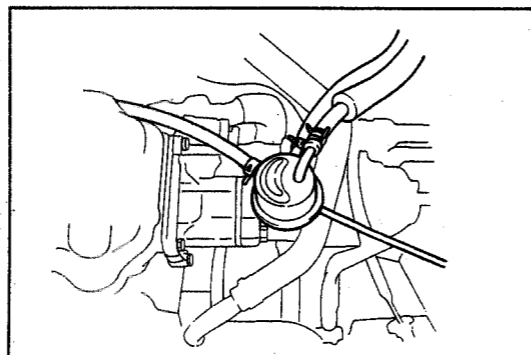
- (4) Connect the engine wire to the clamp.



G2EM00177-99999

## 14. Installation of fuel pump

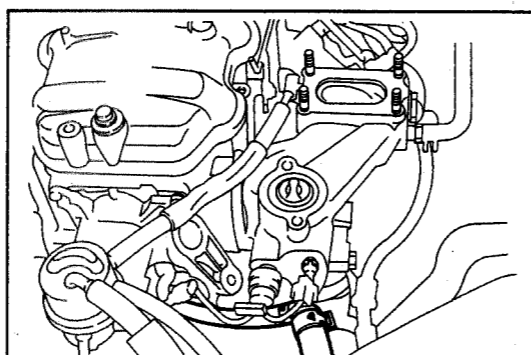
(Refer to the FU section of the service manual.)



G2EM00178-99999

## 15. Connection of heater inlet hose and by-pass hose to the cylinder head side

- (1) Install the hose bands to the hoses.
- (2) Connect the hoses to the cylinder head.



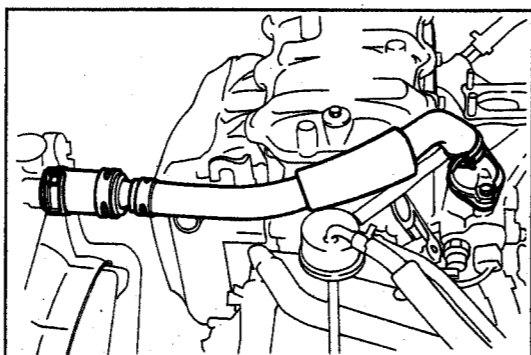
G2EM00179-99999

## 16. Installation of water outlet

- (1) Install the thermostat.
- (2) Install the water outlet.
- (3) Connect the radiator upper hose.

## 17. Installation of distributor

(Refer to the IG section of service manual.)



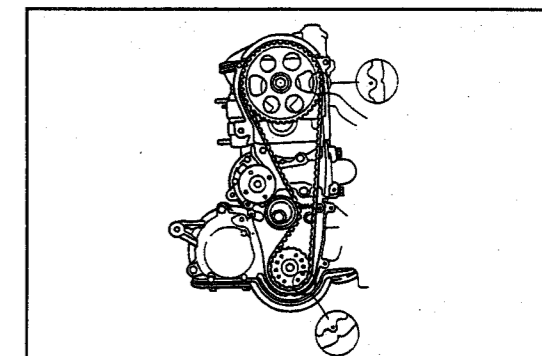
G2EM00180-99999

18. Installation of carburetor  
(Refer to the FU section of service manual.)
19. Installation of timing belt  
(Refer to the page EM-15 to EM-19.)
20. Adjust the valve clearance  
(Refer to the MA section of service manual.)

Install the cylinder head cover.

**CAUTION:**

- Be sure to install a new cylinder head cover gasket.
- Tightening Torque:** 7.8 - 11.8 N·m  
(0.8 - 1.2 kgf-m, 5.8 - 8.7 ft-lb)



G2EM00181-99999

## 21. Installation of air cleaner

- (1) Install the air cleaner
- (2) Connect the ventilation hose.
- (3) Connect the hot air intake duct to the exhaust manifold cover.

- (4) Connect the air inlet to the clamp.

## 22. Connect the ground cable terminal to the negative terminal of the battery.

## 23. Fill the coolant.

(Refer to the CO section of the service manual.)

## 24. Check the oil level

(Refer to the MA section of the service manual.)

**NOTE:**

- Replace the engine oil, if the coolant enters the oil pan, during the removal of the cylinder head.

## 25. Start the engine and warm-up thoroughly.

## 26. Check the coolant and oil leakage while engine is operating.

If any leakage is present, repair it if necessary.

## 27. Stop the engine.

## 28. Recheck the oil level after two or three minutes.

If oil level is lower than the F level of the oil level gauge, add the engine oil to the F level.

## 29. Allow the temperature of the engine to drop to the ambient temperature.

Check the water level is sufficient. Replenish the coolant, if necessary.

(Refer to the CO section of the service manual.)

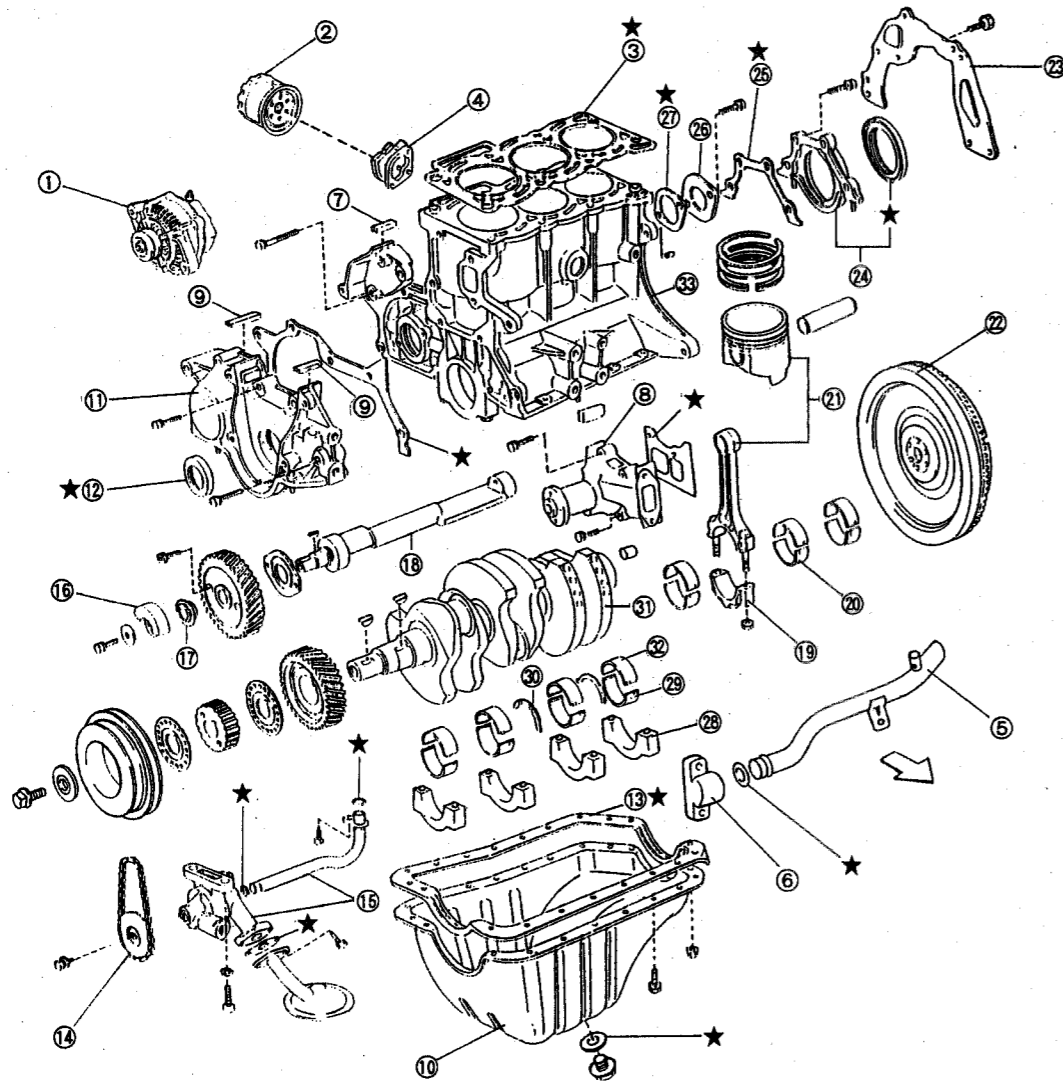
## 30. Perform the engine tune-up.

(Refer to the Engine tune-up section of the service manual.)

G2EM00182-00000



## CYLINDER BLOCK COMPONENTS



- ① Alternator assembly
- ② Oil cleaner element
- ③ Cylinder head gasket
- ④ Oil filter bracket
- ⑤ Water inlet pipe
- ⑥ Water inlet
- ⑦ Dust seal
- ⑧ Water pump assembly
- ⑨ Dust seal
- ⑩ Oil pan
- ⑪ Balance shaft gear cover
- ⑫ Oil seal
- ⑬ Gasket
- ⑭ Oil pump drive sprocket & drive chain
- ⑮ Oil pump outlet pipe with oil pump
- ⑯ Balance weight
- ⑰ Oil pump sprocket

- ⑱ Balance shaft
- ⑲ Connecting rod cap
- ⑳ Connecting rod bearing
- ㉑ Connecting rod with piston
- ㉒ Flywheel
- ㉓ Rear end plate
- ㉔ Oil seal retainer with oil seal
- ㉕ Gasket
- ㉖ Balance shaft rear cover
- ㉗ Balance shaft rear cover gasket
- ㉘ Crankshaft bearing cap
- ㉙ Crankshaft bearing (lower)
- ㉚ Crankshaft
- ㉛ Thrust washer
- ㉜ Crankshaft bearing (upper)
- ㉝ Cylinder block

\* : Non-reusable parts

G2EM00183-99999

## INSTRUCTION PRIOR TO OPERATION

- Install the fender cover to the fenders so that no scratch may be made to the fenders.
- Be sure to read the general information section of the service manual.

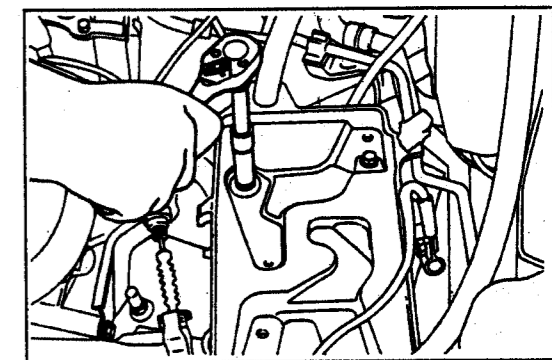
G2EM00184-00000

## ENGINE REMOVAL

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Removal of engine hood
  - (1) Disconnect the windshield washer hose from the joint section.
  - (2) Remove the hose from the clamp of the engine hood.
  - (3) Remove the hood, being very careful not to scratch the body and hood.
3. Disconnect the wires of the positive (+) terminal from the battery positive terminal.
4. Drain the coolant.  
(Refer to the CO section of the service manual.)
5. Drain the engine oil.  
(Refer to the LU section of the service manual.)
6. Drain the transmission oil.  
(Refer to the MT section of the service manual.)

G2EM00185-00000

7. Removal of battery
  - (1) Remove the battery hold down clamp by removing the two attaching nuts.
  - (2) Remove the battery from the battery carrier.
  - (3) Disconnect the engine wire harness clamp from the battery carrier.
  - (4) Remove the battery carrier by removing the four attaching bolts.

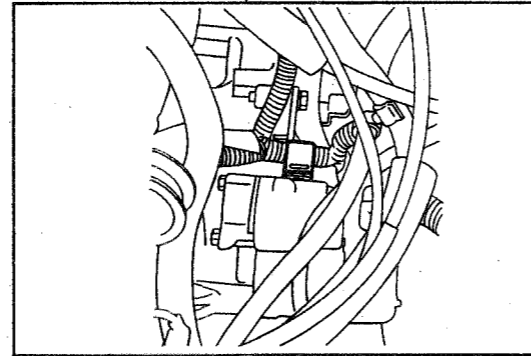


G2EM00186-99999

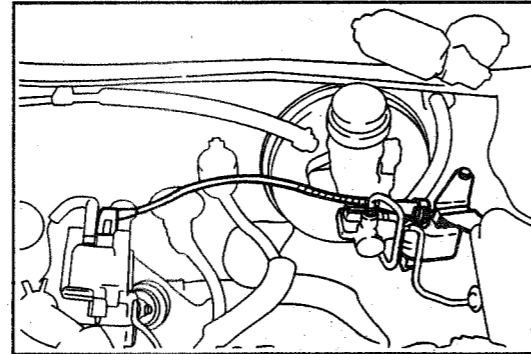
8. Removal of air cleaner case from engine  
Remove the air cleaner case.  
(Refer to the procedure for the air cleaner removal described in the preparation prior to cylinder head removal in this manual.)

G2EM00187-00000

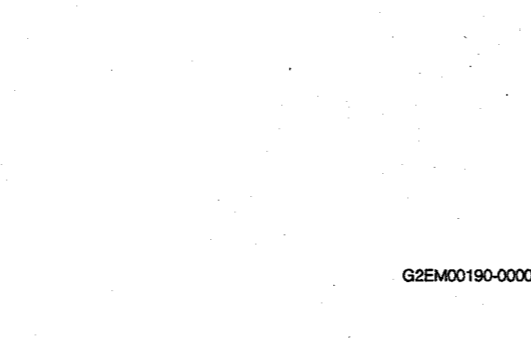
9. Disconnection of engine wire from the engine
- (1) Disconnect the connector from the following parts.
    - ① Starter
    - ② Alternator
    - ③ Carburetor solenoid valves
    - ④ Distributor
    - ⑤ Radiator thermo control switch
    - ⑥ Water temperature sender gage
    - ⑦ Oil pressure switch
    - ⑧ Water thermo switch
    - ⑨ Back-up lamp switch
  - (2) Disconnect the engine wire clamp from the clamp holder.
10. Disconnect the resistive cord which is connected between the ignition coil and the distributor from the distributor cap by unlocking the lock provided at the distributor cap side of the resistive cord.
11. Disconnection of fuel hoses from fuel pump
- (1) Open the fuel filler cap.
  - (2) Place a suitable cloth or the like under the fuel hoses connected section so that no fuel may get to resin, rubber or electrical parts.
  - (3) Detach the hose bands.
  - (4) Disconnect the fuel hoses from the fuel pump.
12. Disconnection of heater hoses from heater
- (1) Detach the hose bands of the heater hoses.
  - (2) Disconnect the heater hoses from the heater.
- CAUTION:**
- Be careful not to deform the heater inlet and outlet pipes during disconnection. The heater core and pipe are made of copper.
- NOTE:**
- Place a suitable container under the heater hose connecting section, for the coolant may flow out.
13. Disconnect the clutch cable from the transmission.
14. Disconnect the speedometer cable from the transmission.
15. Disconnect the outer vent hose from the carburetor.



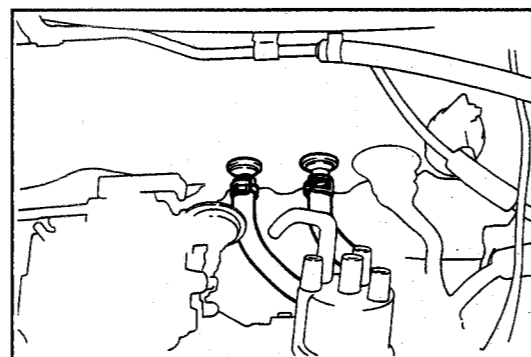
G2EM00188-99999



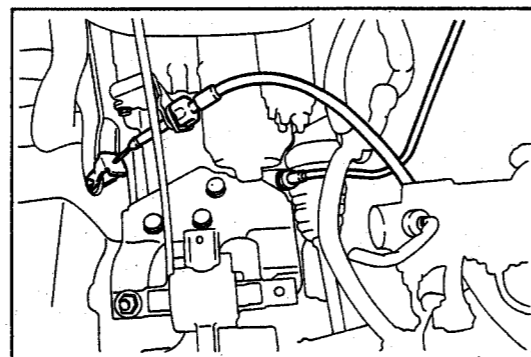
G2EM00189-99999



G2EM00190-00000



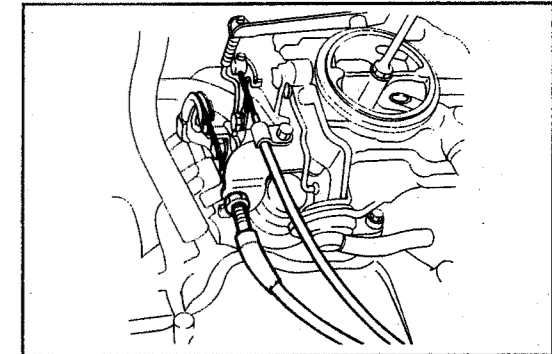
G2EM00191-99999



G2EM00192-99999

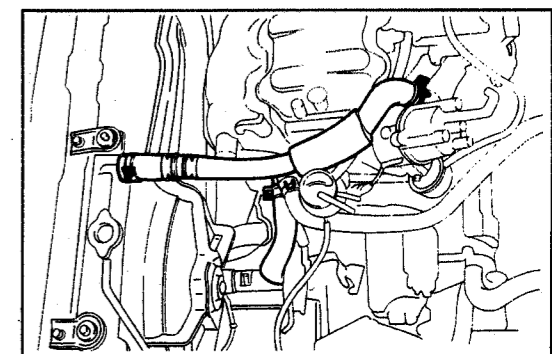
16. Disconnection of brake booster hose from intake manifold
- (1) Detach the hose clamp.
  - (2) Disconnect the brake booster hose from the intake manifold.
- WARNING:**
- Never reuse the hose bands.
17. Disconnect the choke cable from the carburetor.
18. Disconnect the accelerator cable from the carburetor.
19. Disconnect the air conditioner idle-up vacuum hoses.

G2EM00193-00000



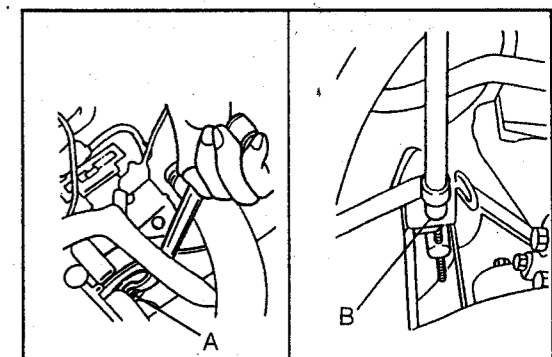
G2EM00194-99999

20. Removal of radiator hoses
- (1) Detach the hose band of the radiator upper hose.
  - (2) Disconnect the radiator upper hose.
  - (3) Detach the hose band of the radiator lower hose.
  - (4) Disconnect the radiator lower hose.



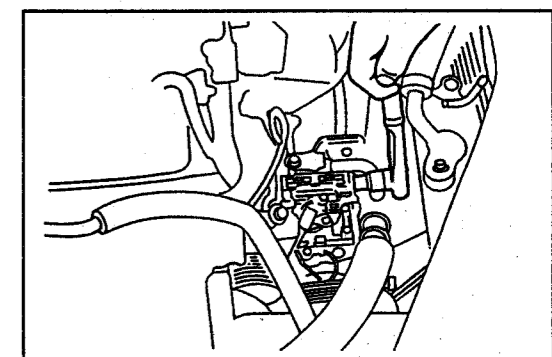
G2EM00195-99999

21. Removal of air conditioner compressor from engine  
(Air conditioner equipped vehicle only)
- (1) Loosen the attaching bolt A of the air conditioner.
  - (2) Remove the drive belt of the air conditioner by loosening the drive belt tension adjusting bolt B.



G2EM00196-99999

- (3) Remove the air conditioner compressor attaching bolts.
- (4) Suspend the removed vane pump at the body side, using an adequate rope.



G2EM00197-99999

## 22. Removal of front exhaust pipe

- (1) Remove the lower arm bracket connecting rod by removing the attaching bolts.  
Remove the engine lower mounting member No. 2 by removing the attaching bolts.
- (2) Remove the attaching nuts of the exhaust front pipe to the exhaust manifold.

**CAUTION:**

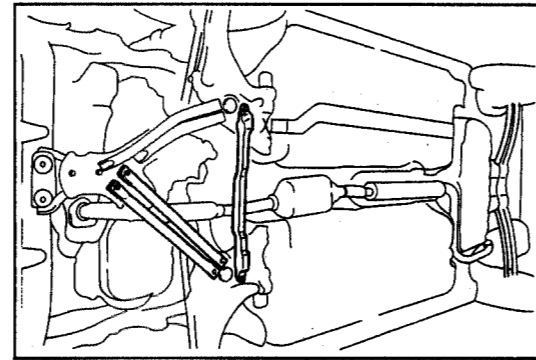
- Do not reuse the exhaust manifold gasket.

- (3) Remove the attaching nuts of the front exhaust pipe to the rear exhaust pipe.

**WARNING:**

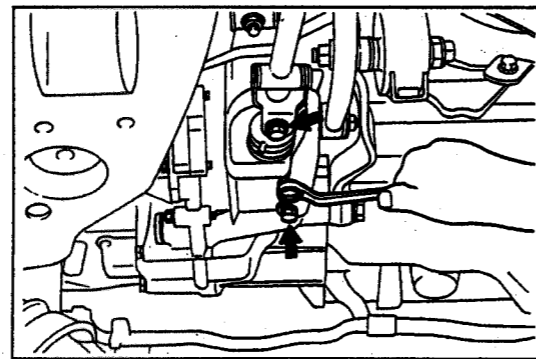
- Be sure to hold the exhaust front pipe during the removal. Otherwise the exhaust front pipe will fall on you.

- (4) Remove the exhaust front pipe from the exhaust muffler support.



G2EM00198-99999

## 23. Disconnect the transmission control rods by removing the attaching bolts.



G2EM00199-99999

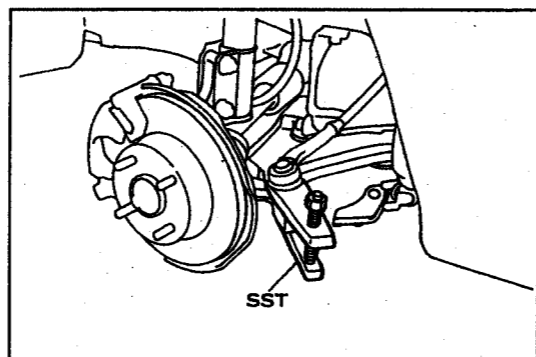
## 24. Disconnect the ground cable from the transmission.

G2EM00200-00000

## 25. Disconnection of drive shaft

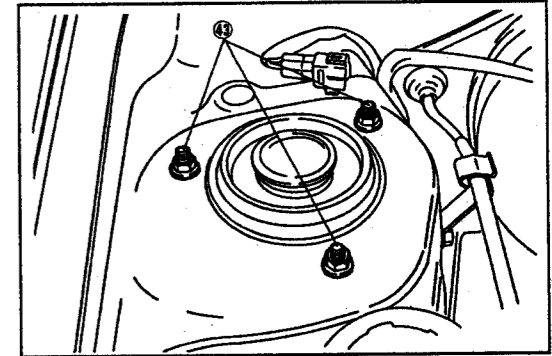
- (1) Remove the front tires.
- (2) Disconnect the ball joint from the steering knuckle, using the following SST.

SST: 09611-87701-000



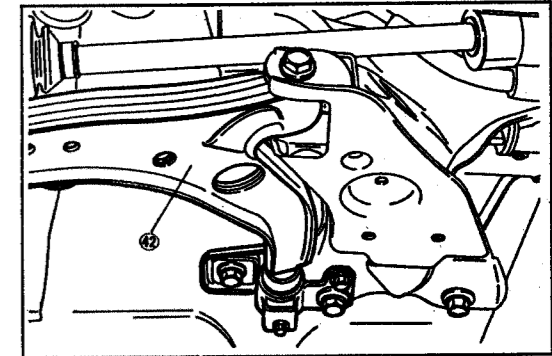
G2EM00201-99999

- (3) Loosen the front suspension support attaching nut, until the suspension support side bolts end face to the upper end of the attaching nuts.



G2EM00202-99999

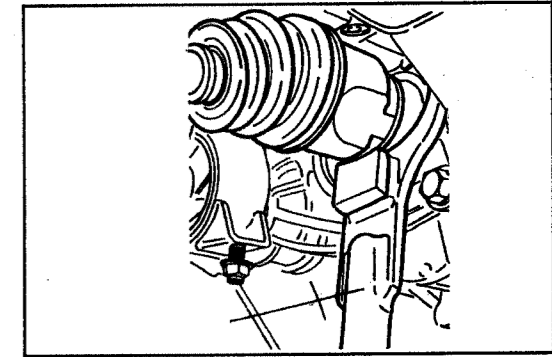
- (4) Remove the suspension lower arm subassemblies by removing its attaching bolts.



G2EM00203-99999

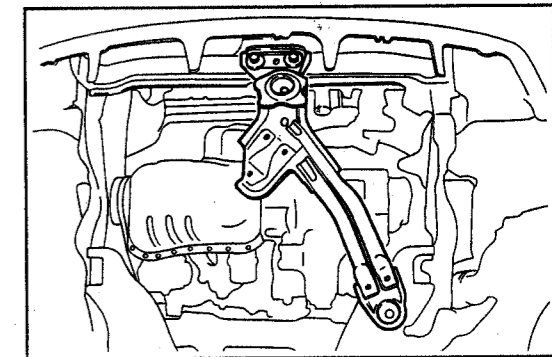
- (5) Disconnect the front drive shaft from the transmission, using the following SST or an suitable lever.

SST: 09648-87201-000



G2EM00204-99999

26. Remove the engine mounting rear bracket by removing the attaching bolts.

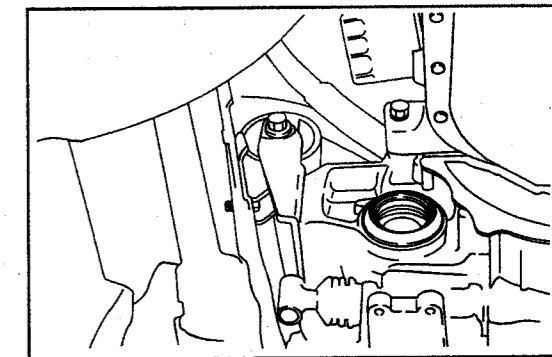


G2EM00205-99999

- (1) Remove the attaching bolts of the engine lower member subassembly.

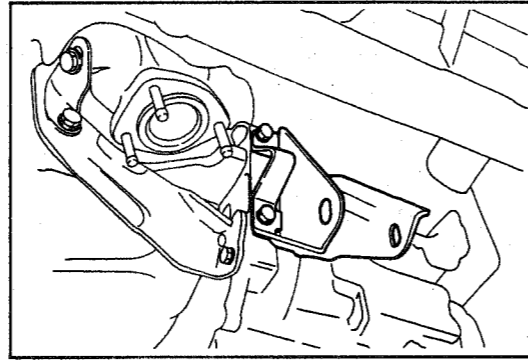
**CAUTION:**

- Ensure that no load applies to the engine lower member subassembly before removing the engine lower member subassembly.



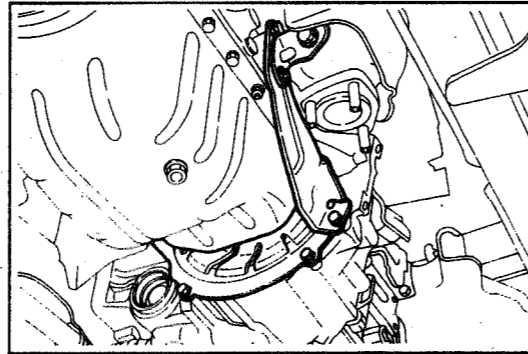
G2EM00206-99999

27. Remove the engine front stopper bracket by removing the attaching bolts.



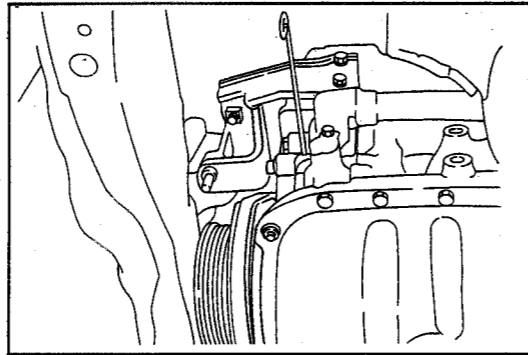
G2EM00207-99999

28. Remove the exhaust manifold stay by removing the attaching bolts.
29. Remove the stiffener front plate by removing the attaching bolts.  
Remove the clutch housing under cover by removing the attaching bolts.



G2EM00208-99999

30. From the lower side of the mounting, remove the nut connecting the engine mounting right insulator subassembly to the engine mounting front bracket.

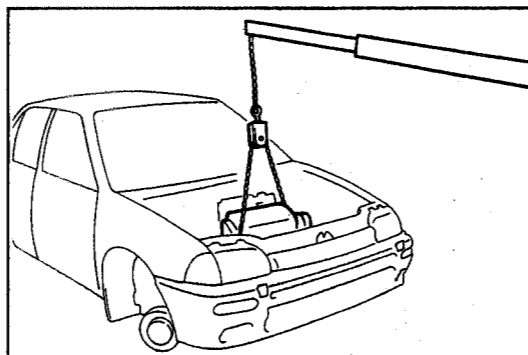


G2EM00209-99999

31. Sling the engine, using a chain block and following SST.  
SST: 09090-04010-000

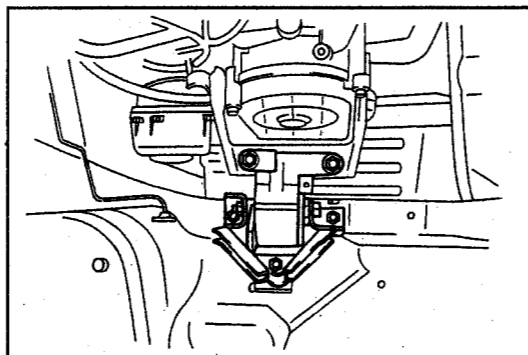
**CAUTION:**

- Be sure to adjust the length of the sling in such a way that the engine may become horizontal.



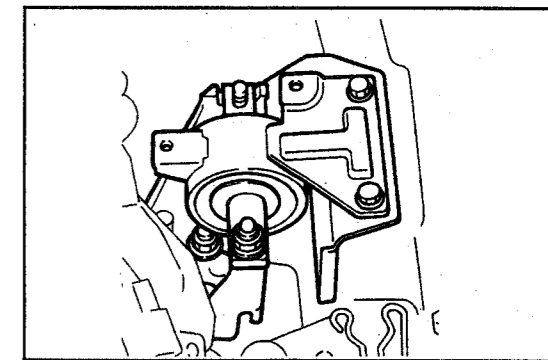
G2EM00210-99999

32. Remove the bolts attaching the engine mounting right insulator subassembly to the engine mounting front bracket.



G2EM00211-99999

33. Remove the bolts connecting the engine mounting left insulator subassembly to the engine mounting upper left bracket.



G2EM00212-99999

34. Take out the engine from the vehicle.  
**CAUTION:**

- Be very careful not to allow the engine to hit to the vehicle body and other parts.
- If the engine is taken out from the upper side of the vehicle, special care must be exercised not to interfere with the brake master cylinder or air conditioner compressor, etc.
- The removal of the vehicle side engine mountings may be required before the engine removal, if the engine is removed from the upper side of the vehicle.

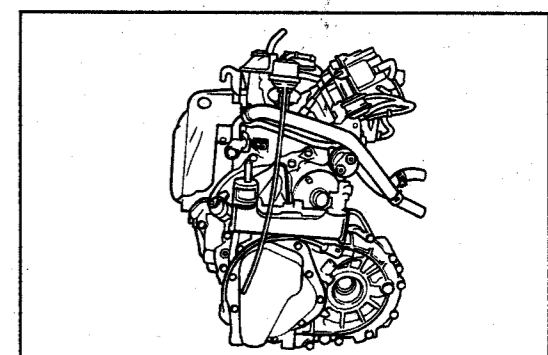
**NOTE:**

- The engine can be taken out either from the upper side or from the lower side. However, it is easier to take it out from the lower side of the vehicle than to take out from the upper side.

G2EM00213-00000

**PREPARATION FOR DISASSEMBLY**

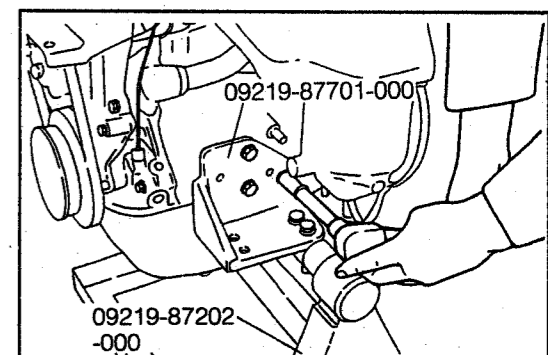
1. Remove the starter motor.
2. Disconnect the heater hoses from the engine by detaching the hose band.
3. Disconnect the transmission from the engine by removing the attaching bolts.
4. Remove the clutch cover and clutch disc.



G2EM00214-99999

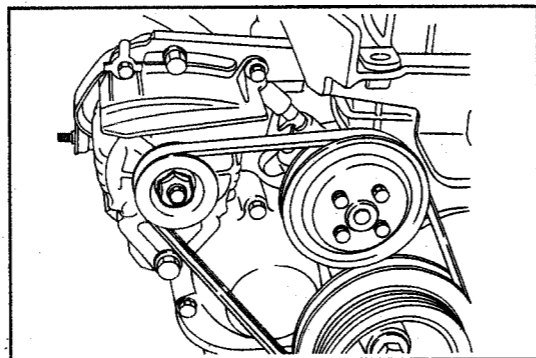
5. Attach the SST to the engine mounting front bracket installing section of the cylinder block.

SST: 09219-87701-000  
09219-87202-000



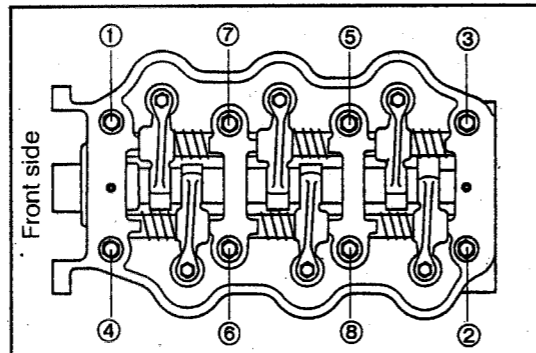
G2EM00215-99999

6. Remove the alternator and adjusting bar from the engine.



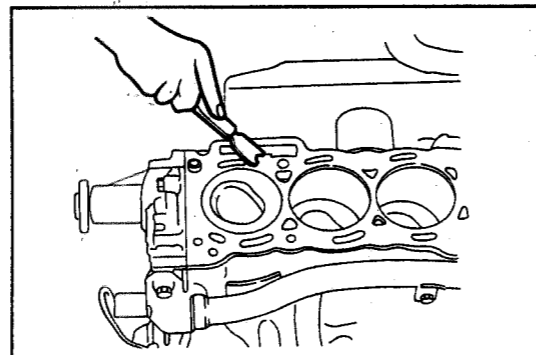
G2EM00216-99999

7. Remove the cylinder head.  
(Refer to the cylinder head section of the service manual.)



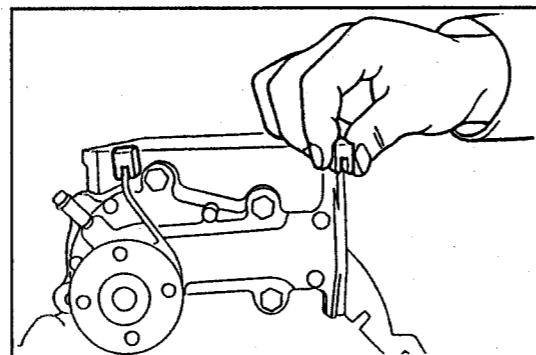
G2EM00217-99999

8. Remove the cylinder head from the cylinder block.  
9. Remove the cylinder head gasket.  
10. Remove any remaining gasket material from the gasket surfaces of the cylinder head and cylinder block, using the gasket scraper.



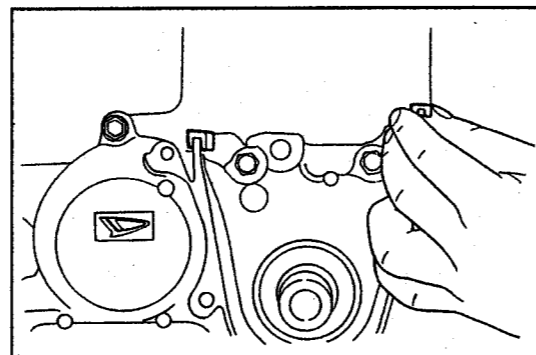
G2EM00218-99999

11. Remove the two dust seals.  
12. Remove the water pump.



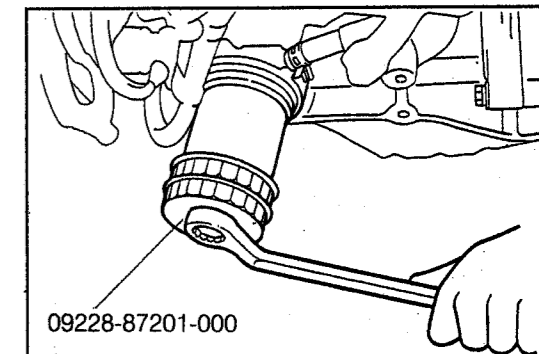
G2EM00219-99999

13. Remove the two dust seals.



G2EM00220-99999

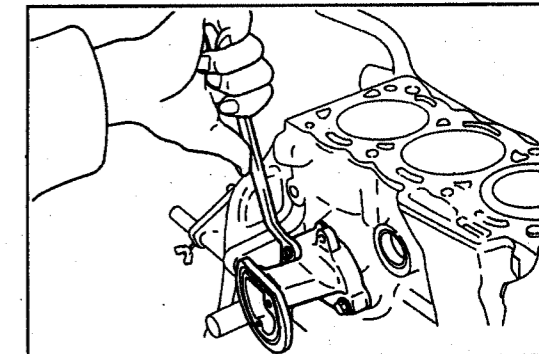
14. Remove the oil filter element.  
SST: 09228-87201-000



09228-87201-000

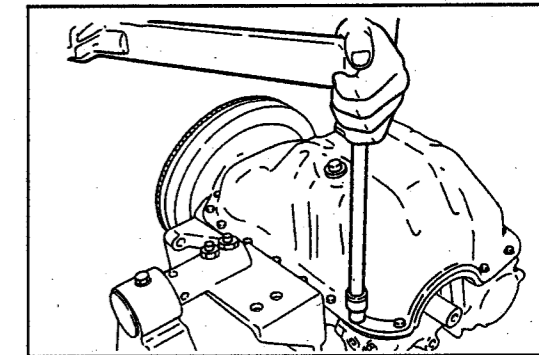
G2EM00221-99999

15. Remove the oil filter bracket.



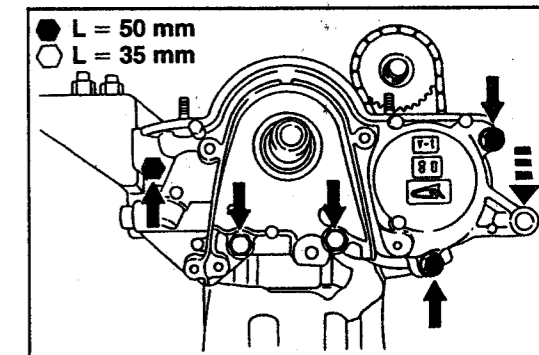
G2EM00222-99999

16. Remove the oil pan and gasket.



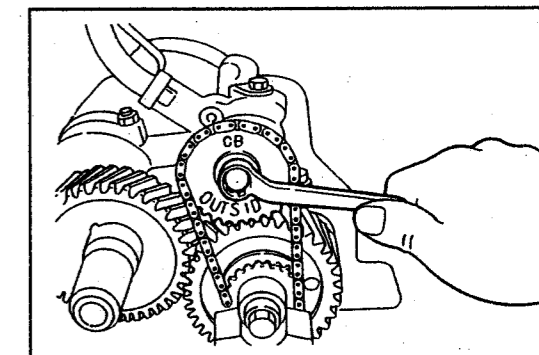
G2EM00223-99999

17. Remove the balance shaft gear cover and gasket.



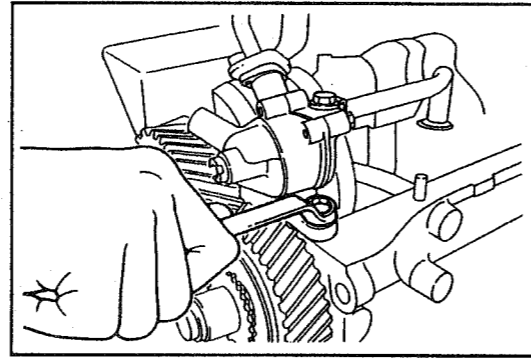
G2EM00224-99999

18. Remove the oil pump driven sprocket and drive chain.



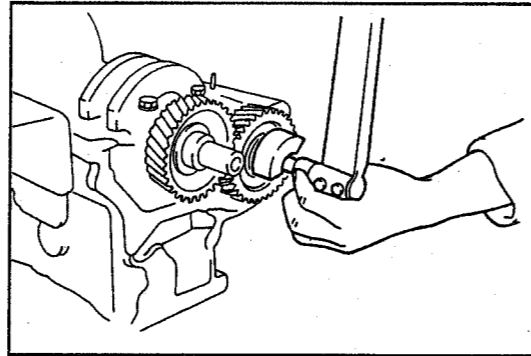
G2EM00225-99999

19. Remove the oil pump and oil pump outlet pipe.



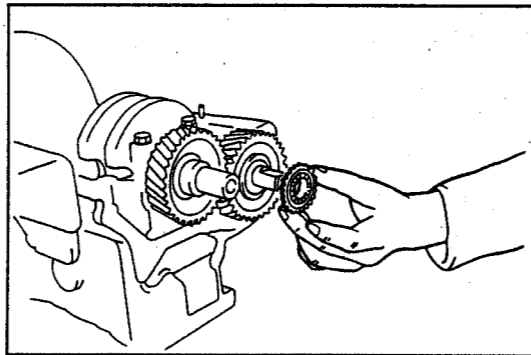
G2EM00226-99999

20. Remove the balance weight.



G2EM00227-99999

21. Remove the oil pump sprocket and driven chain.



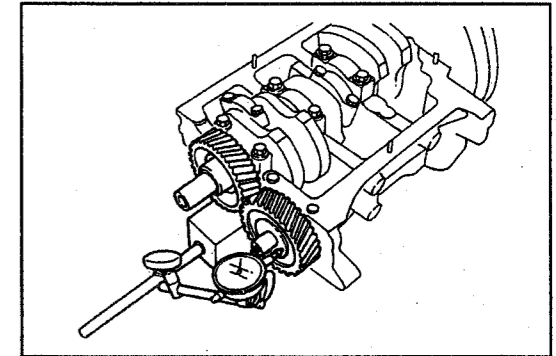
G2EM00228-99999

**DISASSEMBLY OF CYLINDER BLOCK**

(See page EM-83.)

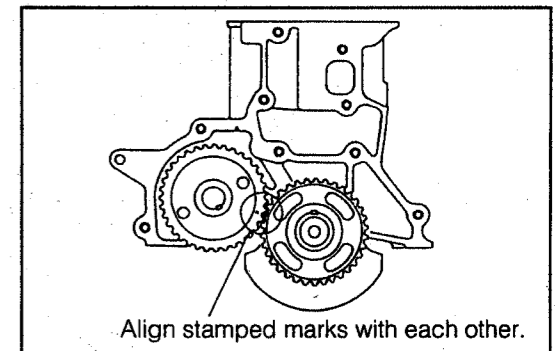
1. Measurement of Balance Shaft Thrust Clearance
  - (1) With a dial gauge attached at the forward end of the balance shaft gear side, measure the thrust clearance of the balance shaft.  
 Thrust Clearance: 0.03 - 0.20 mm  
 (0.0012 - 0.0079 inch)

If the thrust clearance exceeds the specified value, replace the thrust washer with a new one. Then measure the thrust clearance again. If the thrust clearance still exceeds the specified value even after the new thrust washer has been assembled, replace the balance shaft with a new one.



G2EM00229-99999

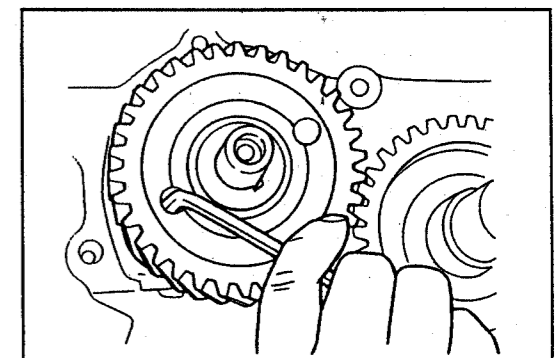
2. Removal of Balance Shaft
  - (1) Align the stamped mark on the crankshaft gear with the stamped mark on the balance shaft gear.



Align stamped marks with each other.

G2EM00230-99999

- (2) Remove the hexagon socket head cap bolt, using a hexagon wrench key (5 mm).



G2EM00231-99999

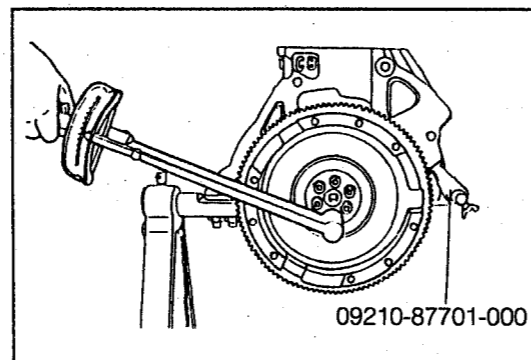
- (3) Pull out the balance shaft toward the front side of the cylinder block.

**NOTE:**

- Be very careful not to scratch the bush during the operation.

G2EM00232-00000

(4) Remove the flywheel.



G2EM00233-99999

**NOTE:**

- Using the following SST, lock the flywheel to prevent the crankshaft from turning.  
SST: 09210-87701-000

(5) Remove the balance shaft rear cover.

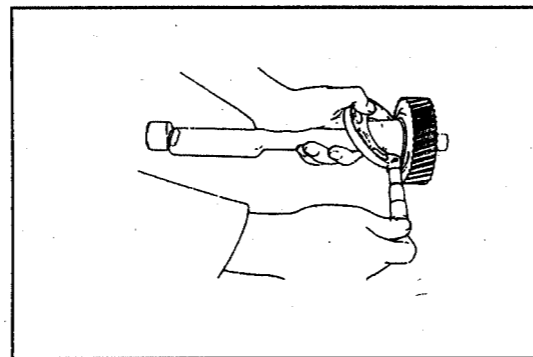
G2EM00234-00000

### 3. Measurement of Balance Shaft Oil Clearance

- Clean the balance shaft and balance shaft bearings.
- Measure the outer diameter of the front and rear bearing journals of the balance shaft, using a micrometer.

**NOTE:**

- The measurement should be performed at the mid point of each of the front and rear journals, in the two directions, 90 degrees apart from each other.
- The maximum value in the measurement is regarded as the outer diameter.

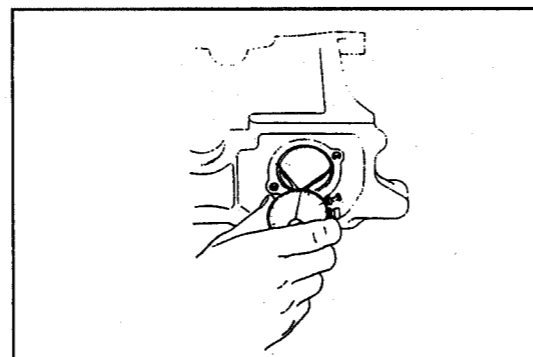


G2EM00235-99999

(3) Measure the inner diameters of the bearing bores of the balance shaft.

**NOTE:**

- The measurement should be performed at the mid point of each of the front and rear bearing bores, in the two directions, 90 degrees apart from each other.
- The maximum value in the measurement is regarded as the inner diameter.



G2EM00236-99999

(4) Calculate the oil clearance as follows:

Establish the oil clearance by subtracting the outer diameter of the balance shaft from the bearing inner diameter.

Oil Clearance: 0.025 - 0.1 mm (0.0010 - 0.0039 inch)

If the oil clearance exceeds the specified value, replace the balance shaft bearing, or grind or replace the balance shaft so that the oil clearance may meet the specification, referring to the diameters of the balance shaft bearings given next page.

G2EM00237-00000

### Balance shaft bearing inner diameter

mm (inch)

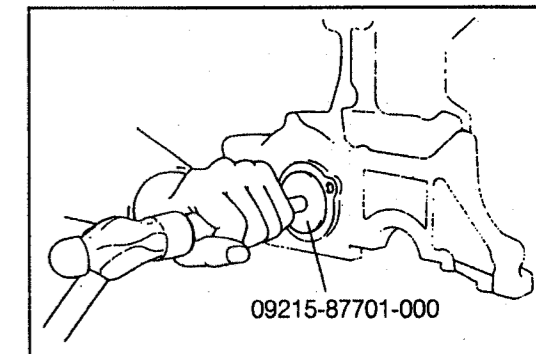
Bearing size	Front	Rear
Repair standard	45.000 - 45.025 (1.7717 - 1.7726)	34.000 - 34.025 (1.3386 - 1.3396)
U/S 0.5	45.500 - 45.525 (1.7913 - 1.7923)	34.500 - 34.525 (1.3583 - 1.3592)

G2EM00238-00000

(5) Replace the balance shaft bearings, if necessary.

- Pull out the balance shaft bearing, using the following SST.

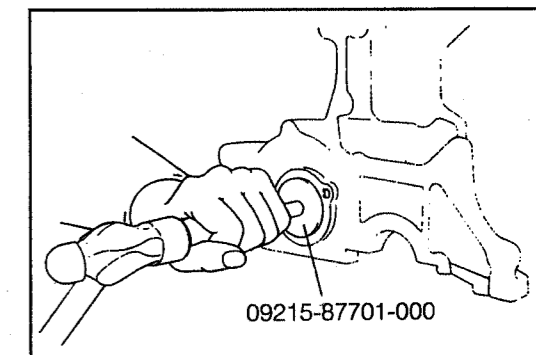
SST: 09215-87701-000



G2EM00239-99999

- Install the balance shaft bearing, using the following SST.

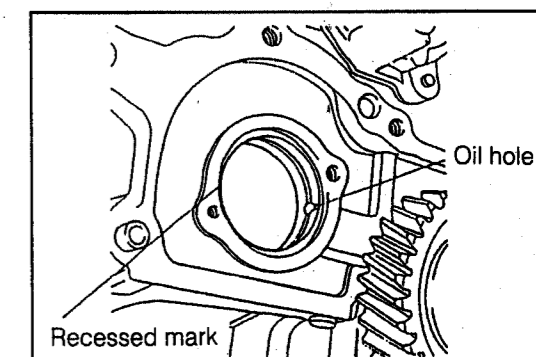
SST: 09215-87701-000



G2EM00240-99999

**NOTE:**

- When installing the bearing, be sure to drive the bearing using the SST in such a way that the recessed side of the bearing faces toward the outside of the cylinder block so as to align the oil holes with each other.



G2EM00241-99999

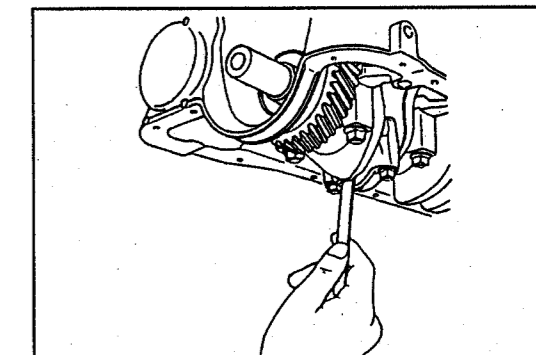
### 4. Measurement of Connecting Rod Thrust Clearance

Measure the thrust clearance between the connecting rod and the crankshaft, using a thickness gauge.

Thrust Clearance: 0.15 - 0.38 mm  
(0.0059 - 0.015 inch)

**NOTE:**

- The thrust clearance should be measured while the connecting rod is being pushed against either side of the crankshaft in the axial direction. Measure the thrust clearance at the opposite side.




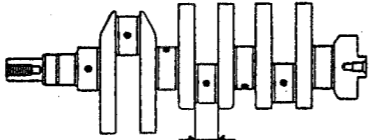
G2EM00242-99999

If the clearance exceeds the specified value, replace the connecting rod or the crankshaft, or both of them, referring to the width of the big end of the connecting rod in the thrust direction and the side width of the crankpin journal.

G2EM00243-00000

[Reference]

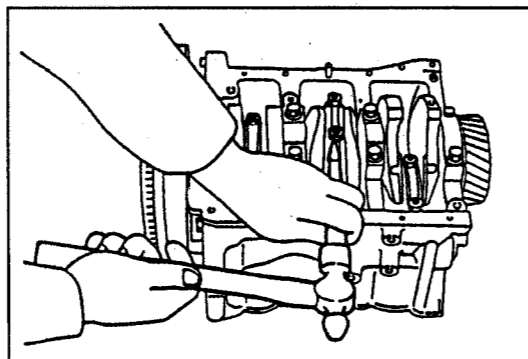
mm (inch)

Width of big end of connecting rod in thrust direction	Side width of crankpin
21.80 - 21.85 (0.858 - 0.860)	22.00 - 22.13 (0.866 - 0.871)
	

G2EM00244-99999

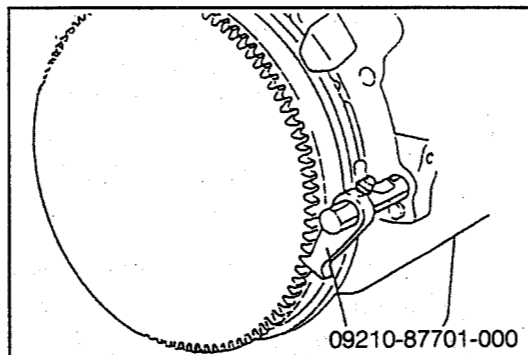
5. Measurement of crankpin journal oil clearance

- (1) Install the flywheel temporarily.
- (2) Using a punch or a numbering stamp, put a mating mark on the connecting rod bearing cap to ensure correct reassembly.
- (3) Turn the crankshaft, until the connecting rod bearing cap to be removed comes at the oil pan side.



G2EM00245-99999

- (4) Using the following SST, lock the flywheel to prevent the crankshaft from turning.  
SST: 09210-87701-000

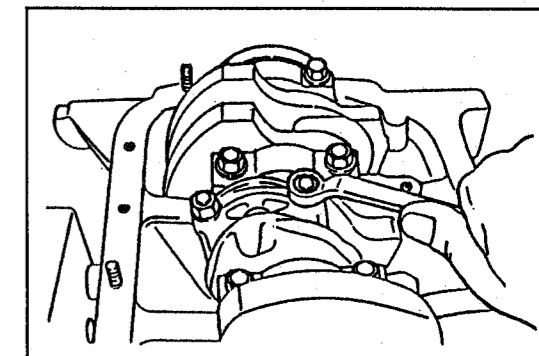


G2EM00246-99999

- (5) Loosen the connecting rod bearing cap nuts evenly over two or three stages. Then, remove the connecting rod bearing cap nuts.

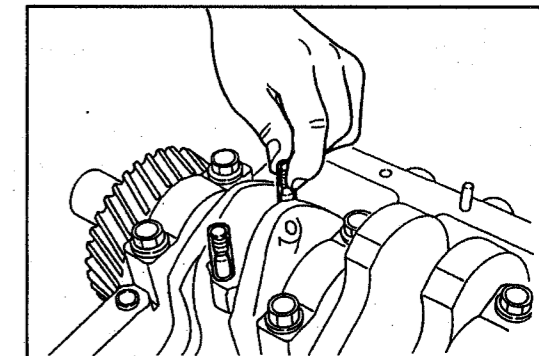
NOTE:

- Keep the lower bearing fitted to the connecting rod bearing cap.



G2EM00247-99999

- (6) Cover each connecting rod bolt with a short piece of hose to protect the crankpin journal from damage.



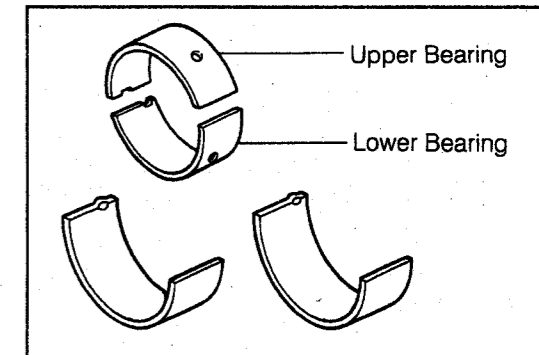
G2EM00248-99999

- (7) Clean and check the crankpin journal and bearings for pitting or scratch.

If the bearings exhibit damage, besides the bearing replacement, grind or replace the crankshaft.

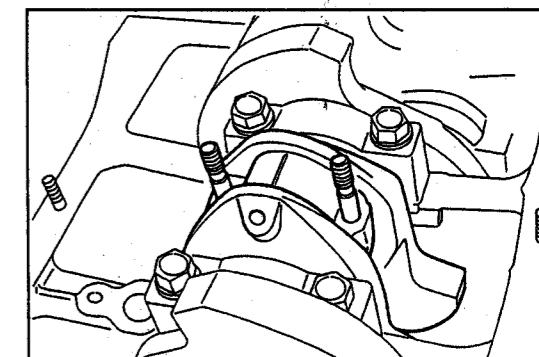
NOTE:

- The upper and lower bearings have the same shape.



G2EM00249-99999

- (8) Lay a strip of plastigage across the crankpin journal.

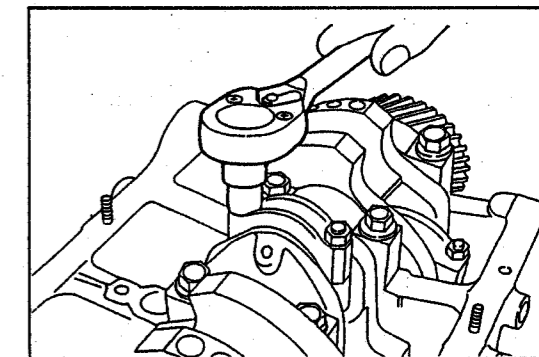


G2EM00250-99999

- (9) Align the punched marks on the connecting rod and bearing cap with each other.

Install the connecting rod bearing cap nuts and tighten them alternately over two or three stages.

Tightening Torque: 23.5 - 30.4 N·m  
(2.4 - 3.1 kgf·m, 17.4 - 22.4 ft·lb)

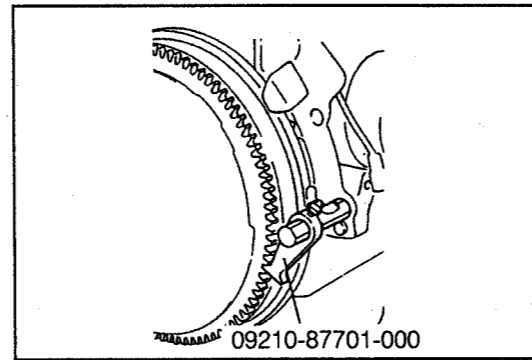


G2EM00251-99999



NOTE:

- Using the following SST, lock the flywheel to prevent the crankshaft from turning.  
SST: 09210-87701-000

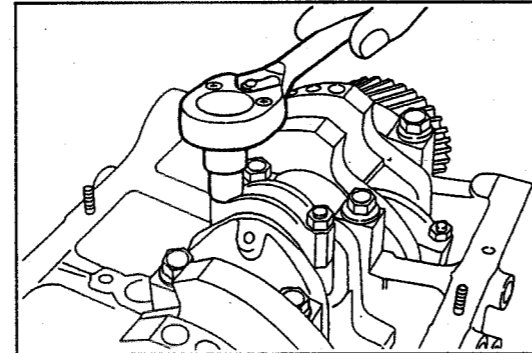


G2EM00252-99999

- (10) Loosen the connecting rod bearing cap nuts evenly over two or three stages. Then, remove the connecting rod bearing cap.

NOTE:

- Prevent the crankshaft from turning, using the SST.  
SST: 09210-87701-000



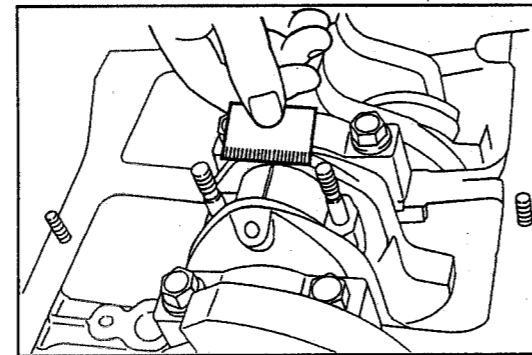
G2EM00253-99999

- (11) Measure the plastigage width at its widest point.  
Oil Clearance: 0.020 - 0.070 mm  
(0.0008 - 0.0028 inch)

If the oil clearance exceeds the specified value, replace the bearing or, if necessary, grind the crankpin journals of the crankshaft so that a proper oil clearance may be obtained using oversized bearings, referring to the table.

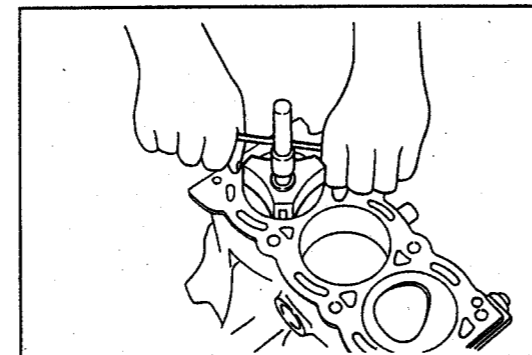
mm (inch)

Bearing size	Crankpin journal diameter
Repair standard	39.958 - 39.992 (1.5731 - 1.5745)
U/S 0.25	39.734 - 39.742 (1.5643 - 1.5646)
U/S 0.50	39.484 - 39.492 (1.5545 - 1.5548)



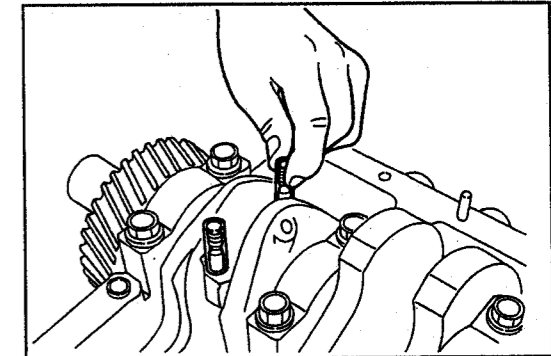
G2EM00254-99999

- (12) Remove the plastigage from the crankpin journal.  
6. Piston Removal  
(1) Remove all carbon deposits from the piston ring ridges.



G2EM00255-99999

- (2) Cover each connecting rod bolt with a short piece of hose to protect the crankpin journal from damage.



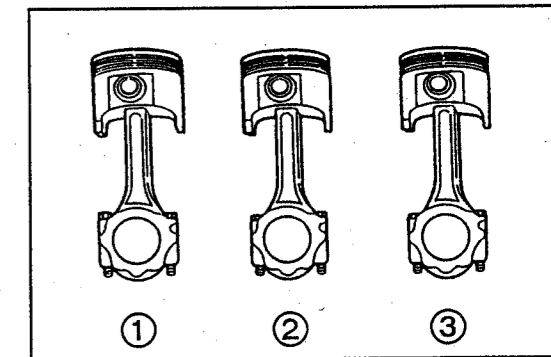
G2EM00256-99999

- (3) Push out the piston and connecting rod assembly and the upper bearing through the top of the cylinder block.

G2EM00257-00000

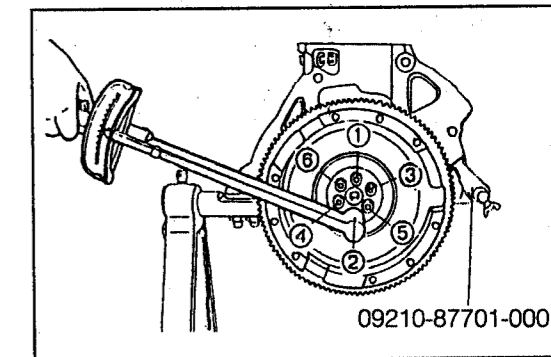
NOTE:

- Arrange the disassembled pistons and piston pins in order so that their installation positions may be known readily.



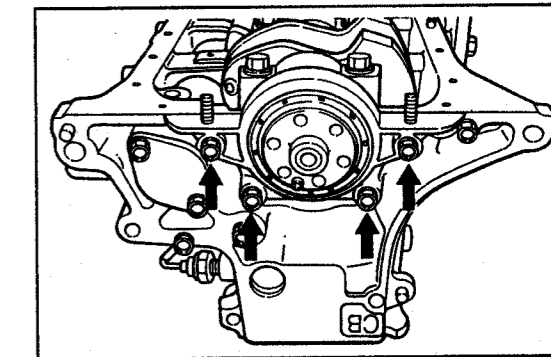
G2EM00258-99999

7. Remove the flywheel.



G2EM00259-99999

8. Remove the oil seal retainer.



G2EM00260-99999

9. Check of crankshaft thrust clearance  
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.  
Thrust Clearance: 0.02 - 0.30 mm  
(0.0008 - 0.0118 inch)

If the thrust clearance exceeds the specified value, remove the thrust washer and measure its thickness. Determine whether the thrust washer alone should be replaced or both the crankshaft and thrust washer should be replaced.  
Record the measured value.

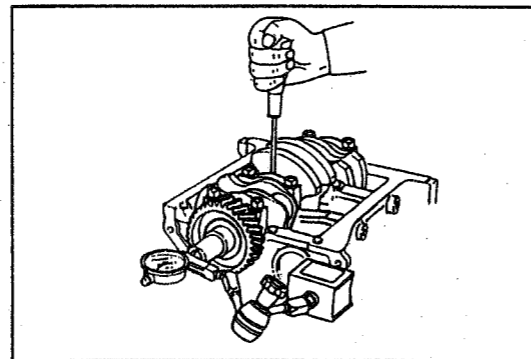
10. Measurement of oil clearance of main bearing journals of crankshaft  
(1) Gradually loosen the main bearing cap bolts over three stages in the numerical sequence shown in the figure. Remove the bearing cap bolts.

- (2) With the main bearing cap bolts inserted into the bolt holes of the main bearing cap, wiggle the bearing cap back and forth. Remove the bearing cap together with the lower bearing.

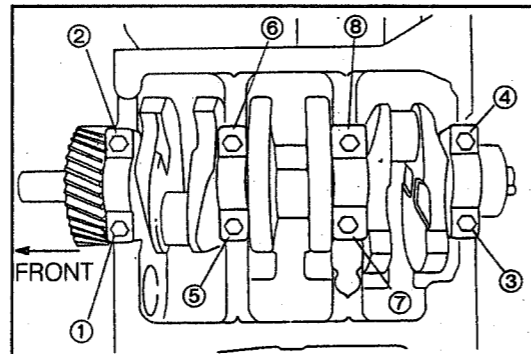
**NOTE:**  
• Keep the lower bearing fitted to the main bearing cap. Arrange the removed main bearing caps in order.

- (3) Lift off the crankshaft.  
**NOTE:**  
• Keep the upper main bearings and thrust washers of the No. 3 journal fitted in the cylinder block.

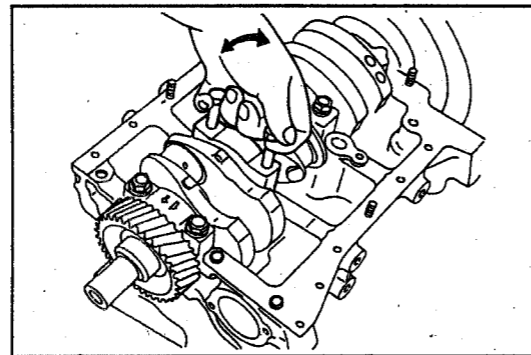
- (4) Clean the main journals and bearings, using cleaning solvent. Blow them with compressed air.  
**CAUTION:**  
• Protect your eyes with protective glasses during the cleaning operation.



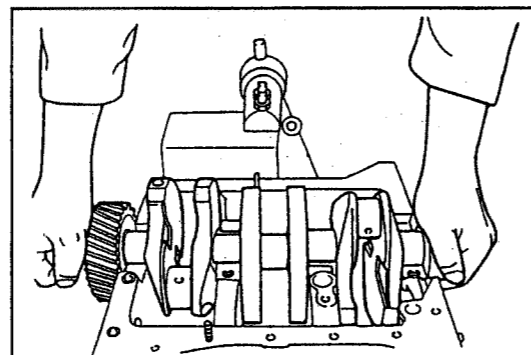
G2EM00261-99999



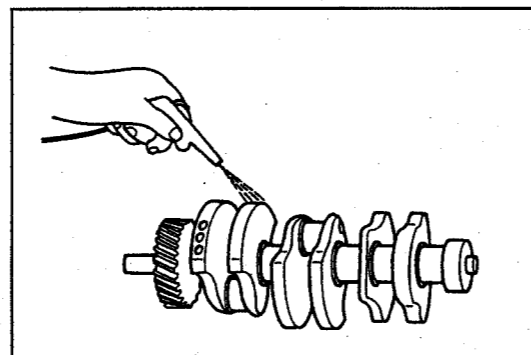
G2EM00262-99999



G2EM00263-99999



G2EM00264-99999



G2EM00265-99999

- (5) Check the main journals and bearing for pitting or scratches.  
If the main journals or bearings are damaged, grind or replace the crankshaft and/or bearings.

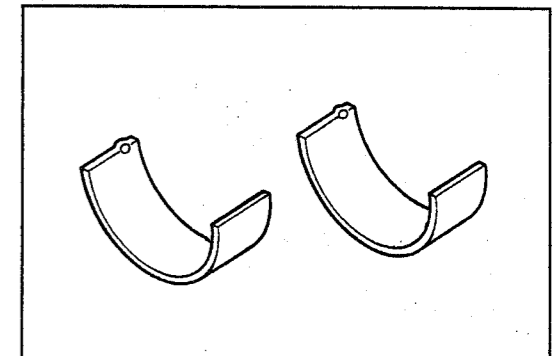
- (6) Place the crankshaft in the cylinder block.

- (7) Lay a strip of plastigage across each journal.

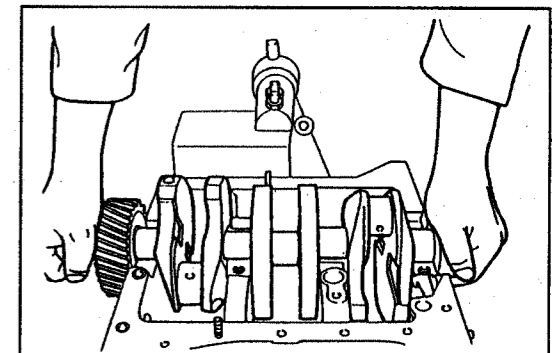
- (8) Install the main bearing caps in the numerical sequence with their arrow marks facing forward.

- (9) Gradually tighten the main bearing cap bolts over two or three stages and in the sequence shown in the figure.  
Tightening Torque: 53.0 - 64.7 N·m  
(5.4 - 6.6 kgf·m, 40 - 48 ft·lb)

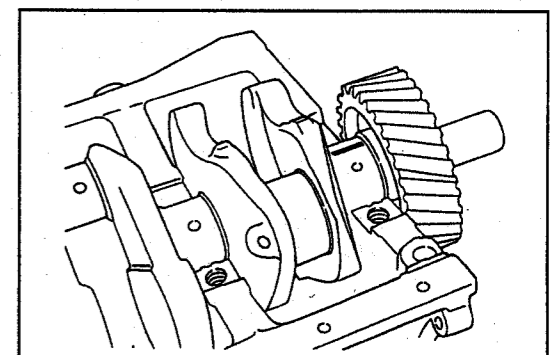
**NOTE:**  
• Do not turn the crankshaft during this operation.



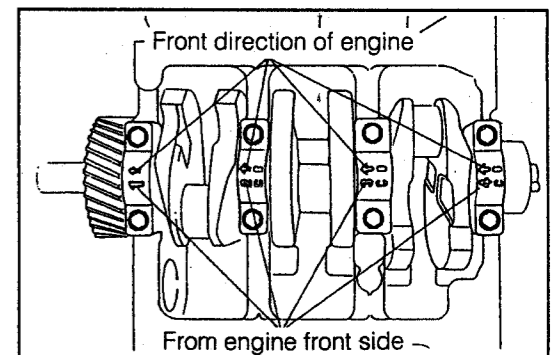
G2EM00266-99999



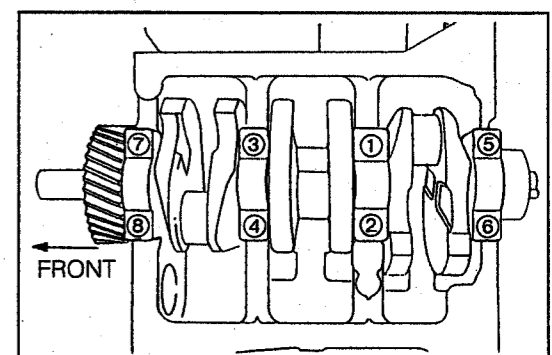
G2EM00267-99999



G2EM00268-99999

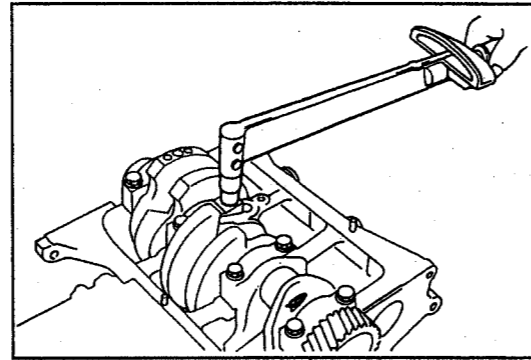


G2EM00269-99999



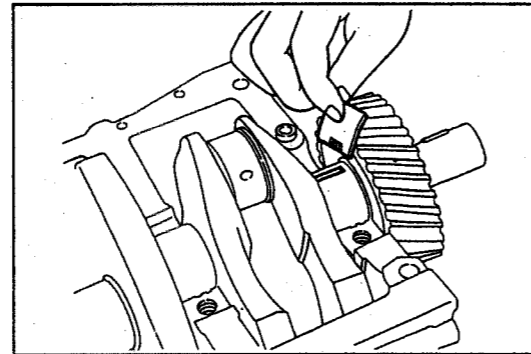
G2EM00270-99999

(10) Remove the main bearing caps with the lower bearings fitted on them.



G2EM00271-99999

(11) Measure the plastigage width at its widest point.  
Oil Clearance: 0.020 - 0.070 mm  
(0.0008 - 0.0028 inch)



G2EM00272-99999

If the oil clearance exceeds the specified value, grind or replace the crankshaft so that the oil clearance may meet the specifications, referring to the diameters of the main bearing journals given below.

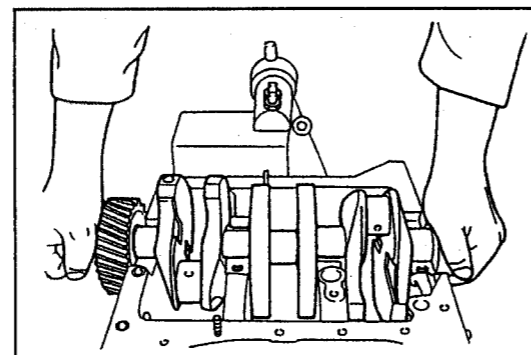
mm (inch)

Bearing size	Repair standard	U/S 0.25	U/S 0.50
Crankshaft main journal diameter	41.958 - 41.992 (1.652 - 1.653)	41.734 - 41.742 (1.6431 - 1.6434)	41.484 - 41.492 (1.633 - 1.634)

(12) Remove the plastigages from the crankshaft.

G2EM00273-00000

(13) Lift off the crankshaft from the cylinder block.

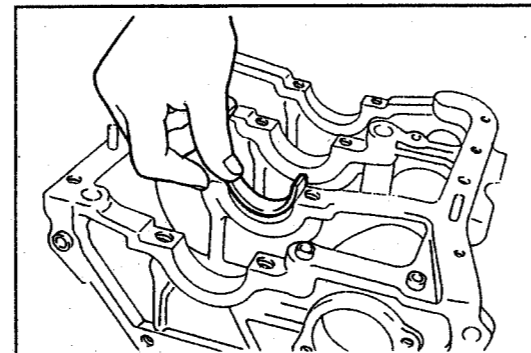


G2EM00274-99999

(14) Remove the upper bearings and thrust washers from the cylinder block.

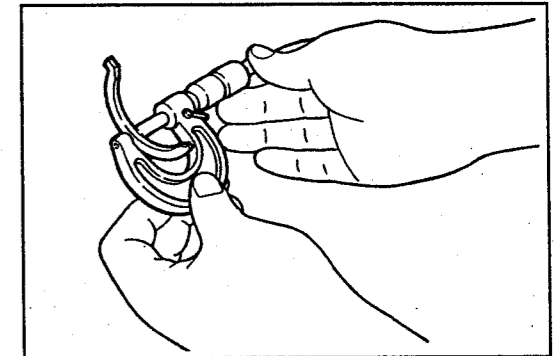
**NOTE:**

- Each upper bearing is provided with an oil groove.



G2EM00275-99999

11. Calculation of crankshaft thrust clearance  
(Only cases where crankshaft thrust clearance exceeds specified value)  
(1) Measure the thickness of the two thrust washers.



G2EM00276-99999

(2) Determine the required thickness of the crankshaft thrust washer, using the following formula given below.

Measured Thrust Clearance: A  
Sum of Thickness of Thrust Washers: B  
Specified Thrust Clearance: C  
Required Thrust Washer Thickness: D

$$D = \{(A + B) - C\} \div 2$$

Based on the thus-calculated value, D, select a suitable thrust washer from among those in the table below

mm (inch)

Thrust washer size	Thrust washer thickness	Remarks
Standard	1.940 - 1.990 (0.0764 - 0.0783)	To be used when the maximum value of D is 1.990 or less.
O/S 0.125	2.065 - 2.115 (0.0813 - 0.0833)	To be used when the maximum value of D exceeds 1.990.
O/S 0.25	2.190 - 2.240 (0.0862 - 0.0882)	To be used when maximum value of D exceeds 2.115.

**[Example]**

Measured Thrust Clearance: A = 0.53 mm  
Sum of Thicknesses of Thrust Washers at Right and Left Sides: B = 3.80 mm  
Specified Thrust Clearance: C = 0.02 to 0.30  
Required Thrust Washer Thickness: D = ?

$$D = \{(0.53 + 3.80) - C\} \div 2$$

$$= 2.015 \text{ to } 2.155$$

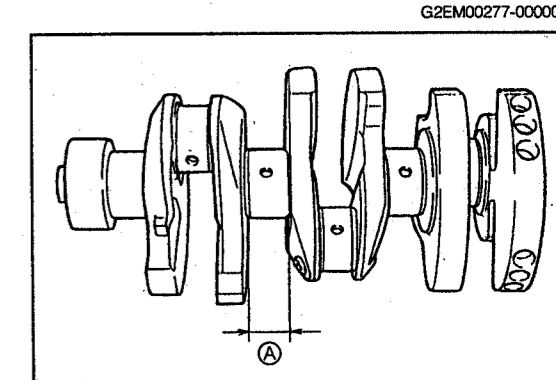
In this case, use a O/S 0.125 mm thrust washer.  
If the minimum value of D exceeds 2.241 mm (0.0882 inch) replace the crankshaft and standard size thrust washer in a set.

**[Reference]**

Such determination can also be made by measuring the width of the thrust bearing contact surface of the crankshaft.

mm (inch)

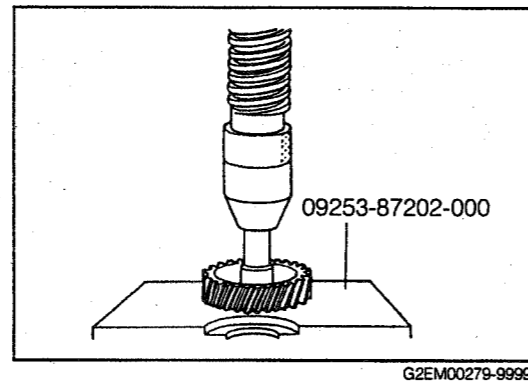
	Measurement value (A)
Standard	23.000 - 23.130 (0.905 - 0.911)
O/S 0.125	23.125 - 23.255 (0.910 - 0.916)
O/S 0.25	23.25 - 23.38 (0.915 - 0.920)
Replace crankshaft	23.38 (0.920) or more



G2EM00277-00000

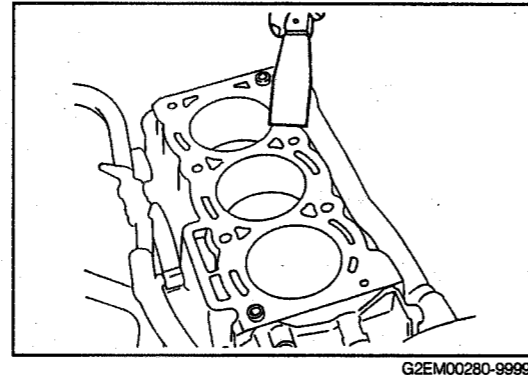
G2EM00278-99999

12. Removal of Balance Shaft Drive Gear  
Remove the balance shaft gear from the crankshaft, using a hydraulic press in conjunction with the following SST.  
SST: 09253-87202-000

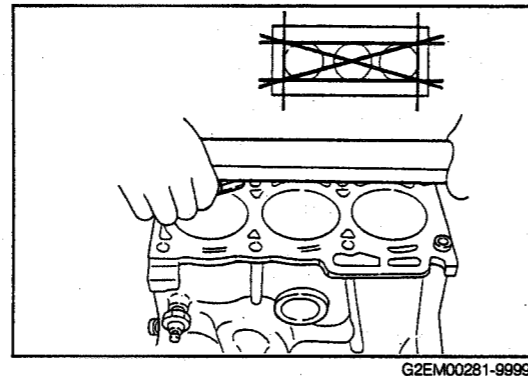


**INSPECTION OF CYLINDER BLOCK**

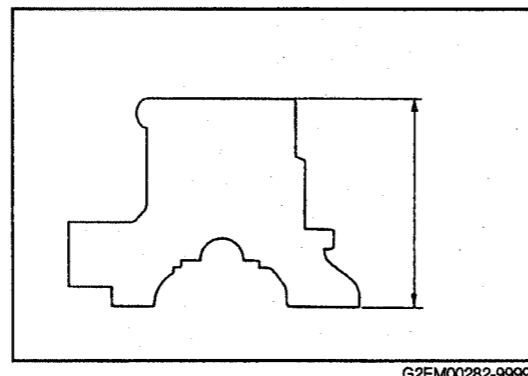
1. Removal of gasket material  
Remove all gasket materials from the cylinder block surface.



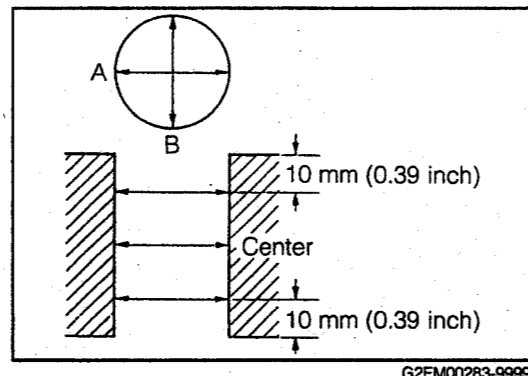
2. Cleaning of cylinder block  
Clean the cylinder block, using a soft brush and cleaning solvent.
3. Inspection of top of cylinder block  
Using a precision straight edge and a feeler gauge, check the surface contacting the cylinder head gasket for warpage in the six directions as shown in the figure.  
Maximum Warpage: 0.10 mm (0.0039 inch)



If the warpage exceeds the maximum limit, recondition the surface.  
However, this reconditioning should not be performed beyond the grinding limit of 0.3 mm (0.012 inch).  
Furthermore, make sure that the width between the cylinder head gasket contact surface and the oil pan gasket attaching surface is at least 200.55 mm (7.8957 inch).

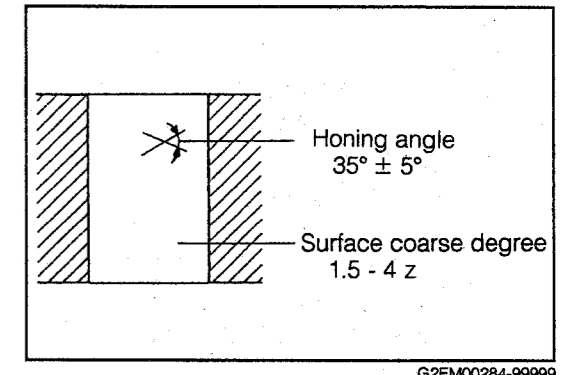


4. Measurement of cylinder bores  
(1) Measure the bore diameter of each cylinder.  
The measurement should be made at the six points shown in the figure.  
(2) Ensure that the difference between the maximum and minimum bore diameters of each cylinder is within 0.10 mm (0.0039 inch).



If the difference between the maximum and minimum values exceeds the specified value (0.1 mm or 0.0039 inch), perform boring and/or honing for the cylinder so that the piston-to-cylinder bore clearance may become within an operating range.

**Piston-to-Cylinder Bore Clearance**  
Specified Value: 0.03 - 0.12 mm  
(0.0012 - 0.0047 inch)  
Maximum Limit: 0.12 mm (0.0047 inch)

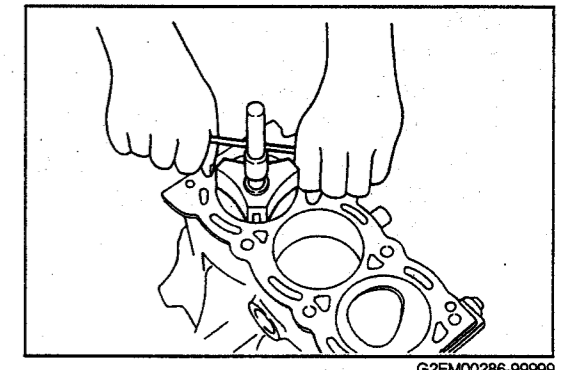


[Reference]  
When the piston is replaced, the cylinder bore diameter should be finished to the dimension given in the table below.

Kind of piston	Repair standard	mm (inch)	
		O/S 0.25	O/S 0.50
Cylinder bore diameter	76.00 - 76.03 (2.992 - 2.993)	76.25 - 76.28 (3.002 - 3.003)	76.50 - 76.53 (3.012 - 3.013)

G2EM00285-00000

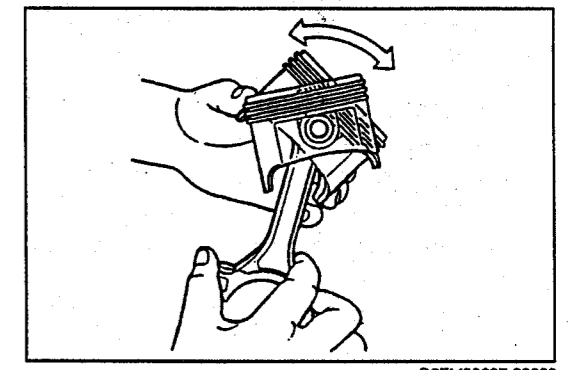
5. Removal of cylinder ridges  
If ridges are formed at the upper parts of the cylinder bores, use a ridge reamer to remove the ridges.



**DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY**

1. Inspection of fit between piston and piston pin  
Try to move the piston back and forth on the piston pin.  
If any movement is felt replace the piston and piston pin as a set.

**NOTE:**  
• When the piston is moved back and forth on the piston pin, you may encounter hard movement. However, if the piston moves smoothly without any binding, this fitting of the piston is normal.



2. Removal of piston rings

NOTE:

- Arrange the removed piston rings in order so that their installation positions may be known readily.
- Do not expand the piston ring unnecessarily beyond the required extent.

- (1) Remove the piston rings No. 1 and No. 2, using a piston ring expander.
- (2) Remove the oil ring upper side rails by hand.
- (3) Remove the oil ring lower side rails by hand.
- (4) Remove the oil ring expander by hand.

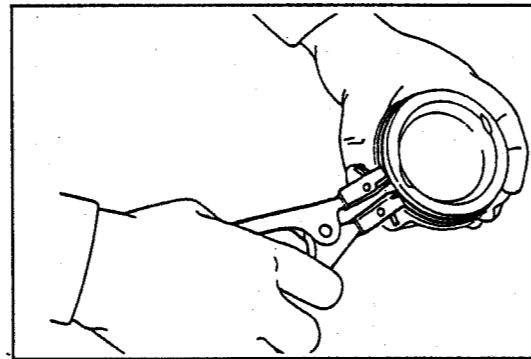
3. Disconnection of connecting rod from piston

Press off the piston pin from the piston, using the following SSTs and hydraulic press.

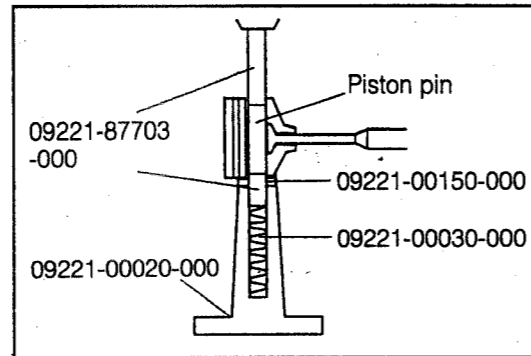
- SST: 09221-87703-000  
 09221-00020-000  
 09221-00030-000  
 09221-00150-000

NOTE:

- Arrange the pistons, piston pins, piston rings, connecting rods and bearings in correct order.
- The piston and piston pin should be kept as a matched set so that the direction in which the piston pin was installed may known readily. The piston and piston pin are a matched set.



G2EM00288-99999



G2EM00289-99999

INSPECTION OF PISTONS AND CONNECTING RODS

1. Cleaning of pistons

- (1) Remove the carbon deposits from the piston top, using a gasket scraper or the like.

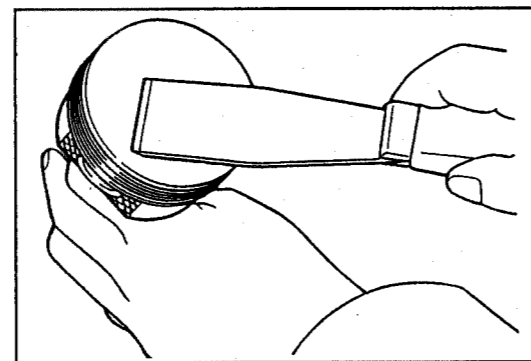
NOTE:

- Be very careful not to scratch the piston.

- (2) Clean the piston grooves with a broken piston ring or a groove cleaning tool.

NOTE:

- Be very careful not to scratch the piston.



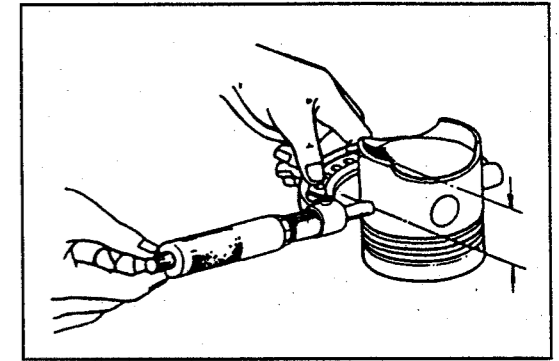
G2EM00291-99999

2. Inspection of pistons

Visually inspect the piston for cracks, damage or seizure. Replace the piston, if necessary.

3. Measurement of piston diameter

- (1) Measure the piston outer diameter horizontally at a point 15 mm (0.59 inch) from the lower end of the piston at right angles to the piston pin.



G2EM00292-99999

- (2) Measure the cylinder bore diameter.

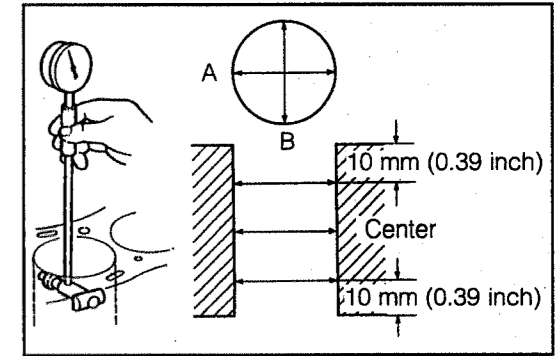
Subtract the measured piston outer diameter from the measured cylinder bore diameter.

Piston-to-Cylinder Bore Clearance:

0.03 - 0.12 mm (0.0012 - 0.0047 inch)

If the piston-to-cylinder bore clearance does not conform to the specified value, replace the piston and/or perform boring and honing for the cylinder so that the piston-to-cylinder bore clearance may become the specified value, referring to the dimensions given below.

However, when the cylinder bore diameter exceeds 76.53 mm (3.013 inch), replace the cylinder block.



G2EM00293-99999

Kind of piston	Repair standard	mm (inch)	
		O/S 0.25	O/S 0.50
Cylinder bore diameter	76.00 - 76.03 (2.992 - 2.993)	76.25 - 76.28 (3.001 - 3.003)	76.50 - 76.53 (3.012 - 3.013)

G2EM00294-00000

4. Inspection of connecting rods

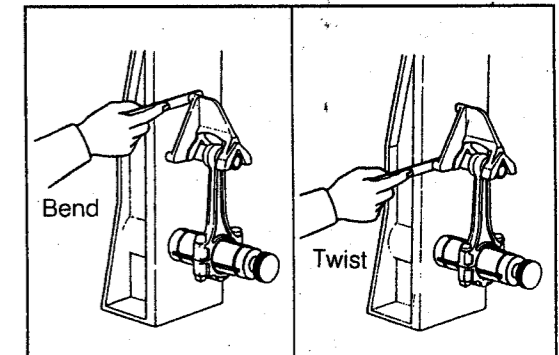
- (1) Visually inspect the connecting rods for damage or cracks.

- (2) Check the connecting rod for bend and twist, using a connecting rod aligner.

Maximum Bend: 0.05 mm (0.0020 inch)

Maximum Twist: 0.05 mm (0.0020 inch)

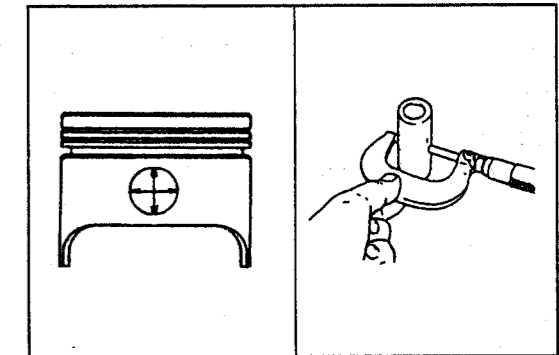
If the bend and/or twist is greater than the maximum limit, replace the connecting rod assembly.



G2EM00295-99999

5. Inspection of piston pin oil clearance

- (1) Measure the outer diameter of the piston pin contacting the piston, using a micrometer.



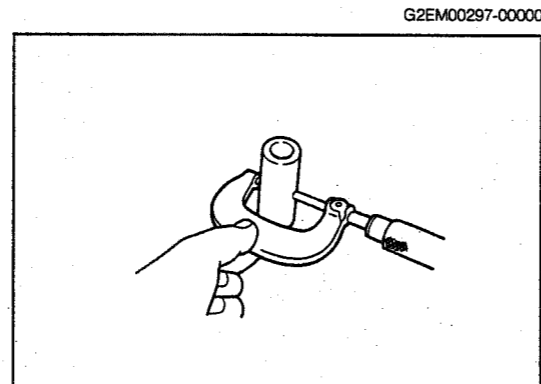
G2EM00296-99999

- (2) Measure the inner diameter of the piston pin hole, using a caliper gauge. Subtract the measured outer diameter of the piston pin from the measured inner diameter of the piston pin hole.

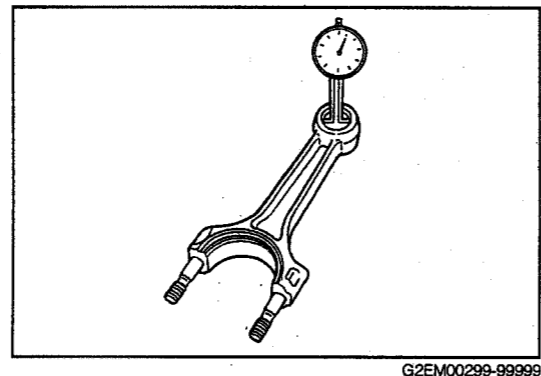
**Maximum Piston Pin-to-Piston Bore Oil Clearance:**  
0.03 mm (0.0012 inch)

If the piston-to-piston pin oil clearance exceeds the maximum limit, replace the piston and piston pin as a set.

6. Inspection of piston pin-to-connecting rod interference fit  
(1) Measure the outer diameter of the piston pin contacting with the connecting rod, using a micrometer.



- (2) Measure the inner diameter of the connecting rod, using a bore dial gauge.



- (3) Determine the interference fit by subtracting the inner diameter of the connecting rod from the outer diameter of the piston pin.

**Interference Fit:**  
0.016 - 0.043 mm (0.0006 - 0.0017 inch)

If the interference fit does not conform to the specification, replace the connecting rod or the piston with piston pin, referring to the table below.

**Standard dimensions of piston pin and connecting rod**  
mm (inch)

Outer diameter of piston pin	17.991 - 18.000 (7.0831 - 7.0866)
Inner diameter of connecting rod's small end	17.957 - 17.975 (7.0697 - 7.0768)

G2EM00300-00000

7. Inspection of piston ring groove clearance  
Check the piston ring groove clearance over the entire periphery of each groove, using a filler gauge or a thickness gauge.  
The maximum value in the measurement is regarded as the groove clearance.

**Groove clearance** mm (inch)

Compression ring No. 1	Compression ring No. 2
0.03 - 0.12 (0.0012 - 0.0047)	0.02 - 0.12 (0.0008 - 0.0047)

If the measured side clearance exceeds the specified value, measure the piston ring thickness with a micrometer. To make side clearance meet the specifications replace the piston ring or the piston, or both of them, referring to the piston ring standard thicknesses given below.

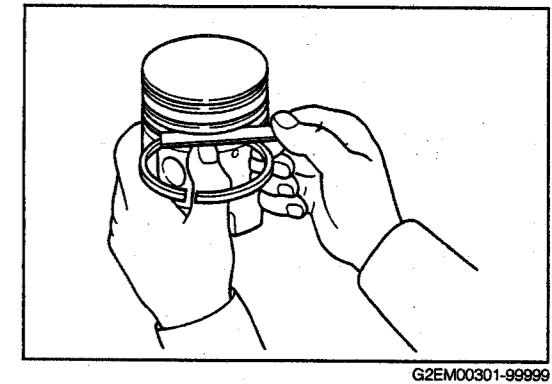
**Piston ring standard thickness** mm (inch)

Compression ring No. 1	Compression ring No. 2
1.47 - 1.49 (0.0579 - 0.0587)	1.47 - 1.49 (0.0579 - 0.0587)

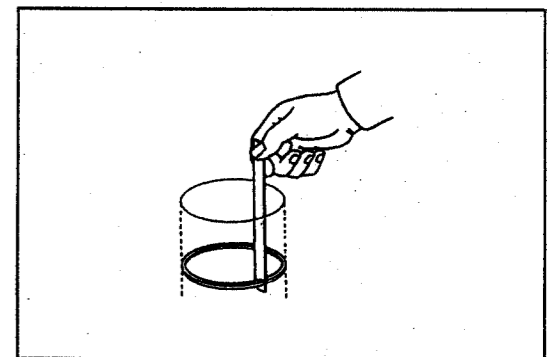
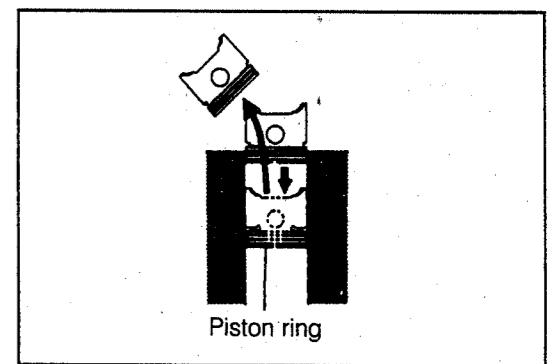
**NOTE:**

- If any piston ring is defective, make sure to replace a set of piston rings for one cylinder, which is composed of the compression rings No. 1 and No. 2 and oil ring.

8. Inspection of piston ring end gap  
(1) Apply engine oil to the piston ring and cylinder wall.  
(2) Insert the piston ring into the cylinder bore.  
(3) Using a piston, push down the piston ring to a point about 110 mm (4.33 inches) measured from the cylinder head gasket attaching surface.



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



## Piston ring end gap

mm (inch)

Compression ring No. 1	Compression ring No. 2	Oil ring
0.20 - 0.70 (0.0079 - 0.0276)	0.20 - 0.70 (0.0079 - 0.0276)	0.20 - 1.10 (0.0079 - 0.0433)

If the end gap exceeds the specification, replace the piston ring.

G2EM00304-00000

## CYLINDER BORING

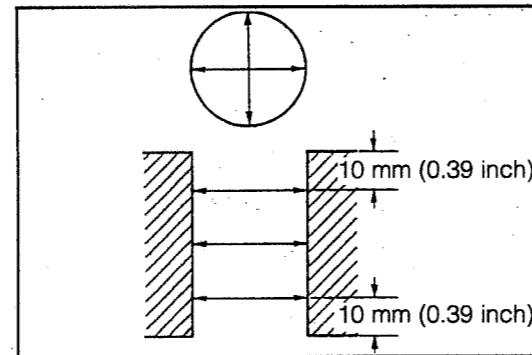
### NOTE:

- When the engine is rebored, all of the three cylinders should be bored at the same time.
- When replacing the piston rings, be sure to use those rings matching with the pistons.

G2EM00305-00000

### 1. Selection of oversized piston

- (1) Measure the diameter of the cylinder bore.
- (2) Select an oversized piston whose outer diameter is larger than the measured bore diameter of the cylinder, and the nearest thereto.



G2EM00306-99999

### 2. Calculation of finishing diameter of cylinders to be bored

- (1) Measure the piston outer diameter horizontally at a point 15 mm (0.59 inch) from the lower end of the piston at right angles to the piston pin.

- (2) Calculate the finishing diameter of each cylinder to be rebored, as follows:

Piston Diameter: A

Piston-to-Cylinder Bore Clearance:

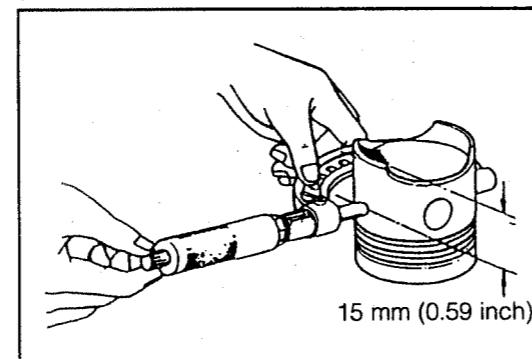
B = 0.03 - 0.12 mm (0.0012 - 0.0047 inch)

Honing Allowance:

C = Less than 0.02 mm (0.0008 inch)

Finishing Diameter: D

$$D = A + B - C$$



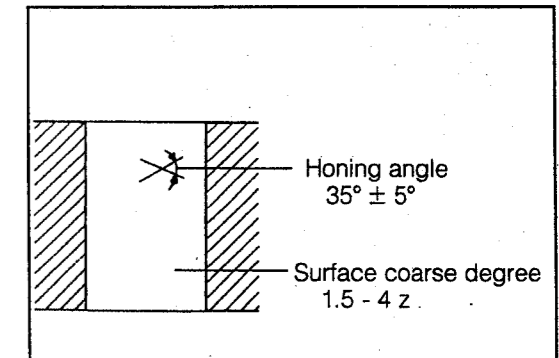
G2EM00307-99999

### 3. Boring and honing of cylinders to calculated diameter

Amount of Honing: 0.02 mm (0.0008 inch)

Honing Angle:  $35^\circ \pm 5^\circ$

Surface Coarse Degree: 1.5 - 4 z



G2EM00308-99999

### [Reference]

Cylinder bore diameter after completion of honing when replacement piston is used

mm (inch)

Kind of piston	Repair standard	O/S 0.25	O/S 0.50
Cylinder bore diameter	76.00 - 76.03 (2.992 - 2.993)	76.25 - 76.28 (3.002 - 3.003)	76.50 - 76.53 (3.012 - 3.013)

G2EM00309-00000

## CRANKSHAFT INSPECTION

### 1. Check of crankshaft for runout

- (1) Apply engine oil to the crankshaft support sections of the V-shaped block.
- (2) Place the crankshaft on the V-shaped block.
- (3) Measure the crankshaft runout at the main bearing journal No. 3.

Maximum Runout: 0.06 mm (0.0024 inch)

### NOTE:

- Be very careful not to scratch the crankshaft journals.

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

### 2. Check of main and crankpin journals

- (1) Measure the outer diameter at four points of each of the main and crankpin journals.

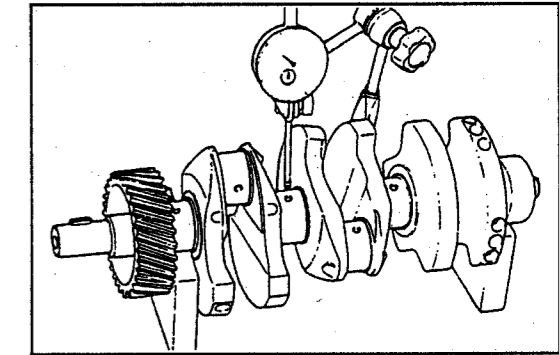
This measurement should be conducted over entire periphery of each of the main and crankpin journals, avoiding the oil holes provided on the journals.

- (2) Calculate the difference between the maximum value and minimum value for each measurement of the main and crankpin journals.

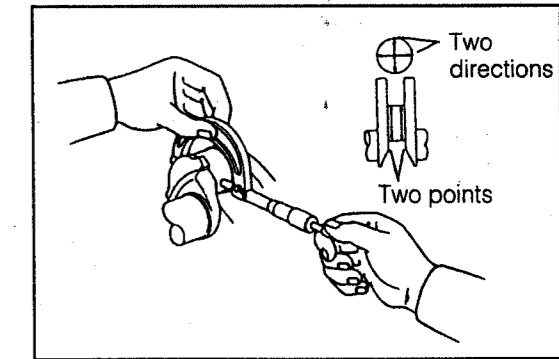
Out-of-Roundness and Taper Limit:

0.01 mm (0.0004 inch)

If necessary, grind the crankpins and/or main journals.



G2EM00310-99999



G2EM00311-99999

- Grinding of crankpin and/or main journals, if necessary  
Grind the crankpin and/or main journals to the undersized finished diameter.  
Install undersized bearings for the crankpin and main journals.

mm (inch)

Bearing size	O/S 0.25	O/S 0.50	Reference Repair standard
Main journal	41.734 - 41.742 (1.6431 - 1.6434)	41.484 - 41.492 (1.6332 - 1.6335)	41.958 - 41.992 (1.6519- 1.6532)
Crankpin journal	39.734 - 39.742 (1.5643 - 1.5646)	39.484 - 39.492 (1.5545 - 1.5548)	39.958 - 39.992 (1.5731 - 1.574)

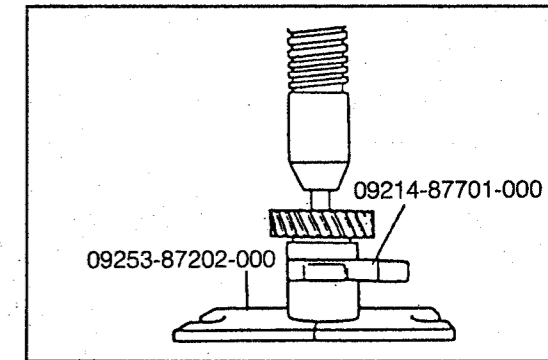
**CAUTION:**

- When grinding the crankshaft, the crankpin and main journals should be finished so that their radius at the corner becomes 0.25 mm (0.0098 inch).

G2EM00312-00000

**DISASSEMBLY OF BALANCE SHAFT**

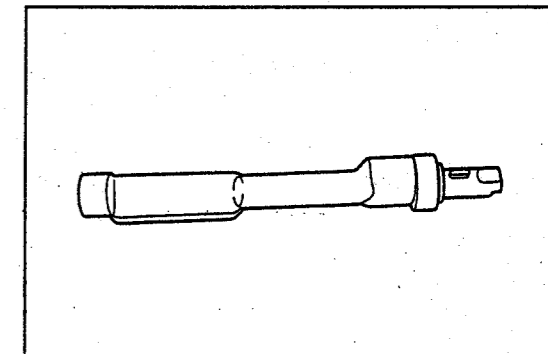
- Disassembly of balance shaft and balance shaft gear
  - Remove the balance shaft gear from the balance shaft, using a hydraulic press in combination with the following SSTs.  
SSTs: 09214-87701-000  
09253-87202-000
  - Remove the balance shaft thrust plate.
  - Remove the woodruff key.



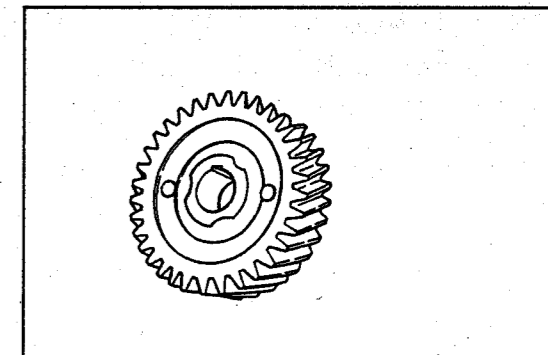
G2EM00313-99999

**INSPECTION OF BALANCE SHAFT GEAR AND RELATED PARTS**

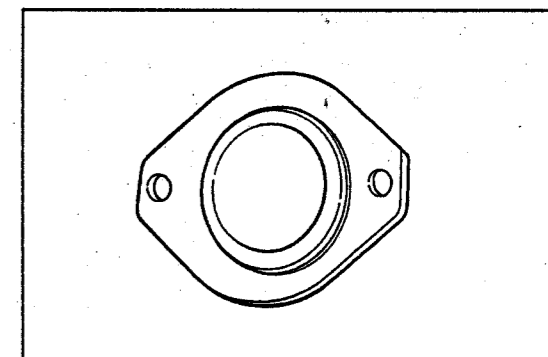
- Inspection of balance shaft  
Visually inspect the balance shaft for damage, cracks or wear.  
Replace the balance shaft, if necessary.
- Inspection of balance shaft gear  
Visually inspect the balance shaft gear for damage, cracks or wear.  
Replace the balance shaft gear, if necessary.
- Inspection of thrust plate  
Visually inspect the balance shaft thrust plate for damage, crack or wear.  
Replace the thrust plate, if necessary.  
**NOTE:**
  - If thrust clearance exceeds the maximum replace the thrust plate
- Check the woodruff key for damage.  
Replace the woodruff key, if necessary.



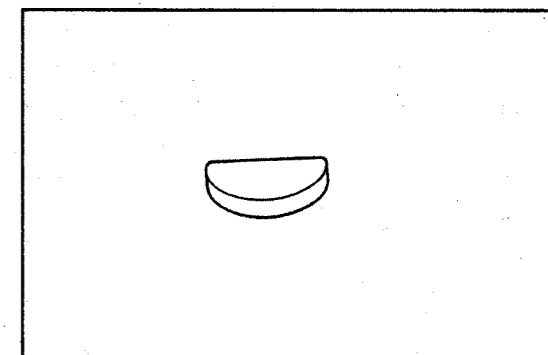
G2EM00314-99999



G2EM00315-99999



G2EM00316-99999

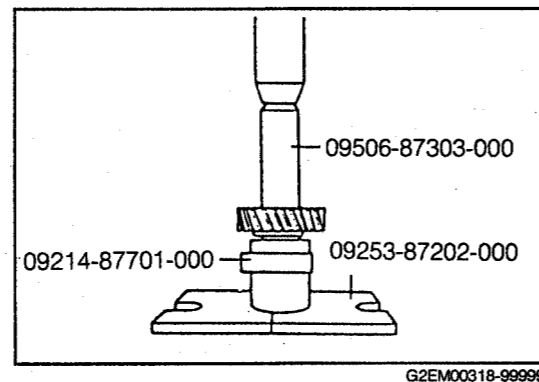


G2EM00317-99999



## ASSEMBLY OF BALANCE SHAFT-RELATED PARTS

1. Installation of thrust plate  
Assemble the thrust plate to the balance shaft.
2. Install the woodruff key.
3. Assembly of balance shaft gear
  - (1) Install the balance shaft gear with its punch mark facing toward the outside.
  - (2) Assemble the balance shaft gear, using a hydraulic press in combination with the following SSTs.  
SSTs: 09214-87701-000  
09253-87202-000  
09506-87303-000



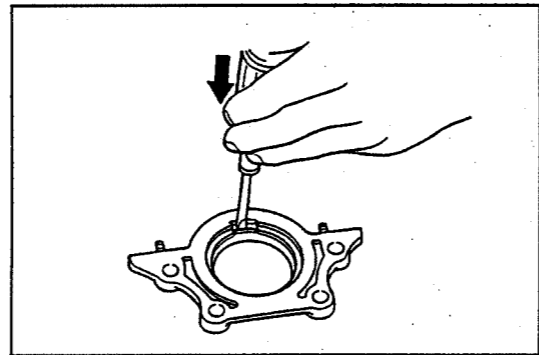
G2EM00318-99999

### NOTE:

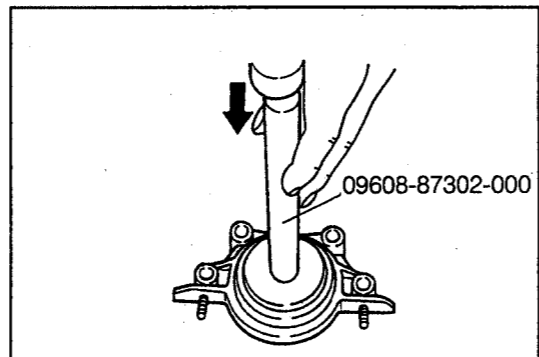
- Be careful not to allow the thrust plate to be caught in.

## REPLACEMENT OF REAR OIL SEAL

1. Removal of oil seal from oil seal retainer  
Remove the oil seal from the oil seal retainer, using a screwdriver.
2. Installation of new oil seal on oil seal retainer  
Install a new oil seal, using the following SST.  
SST: 09608-87302-000



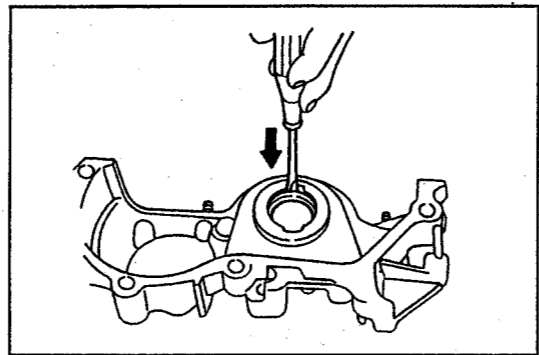
G2EM00319-99999



G2EM00320-99999

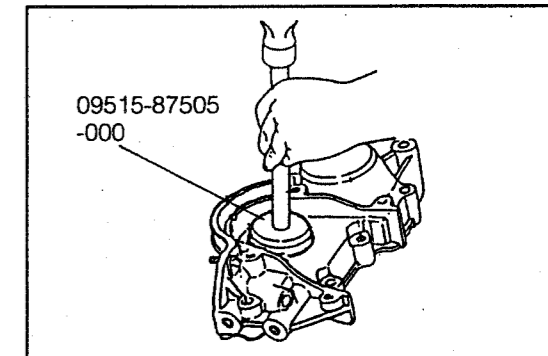
## REPLACEMENT OF FRONT OIL SEAL

1. Removal of oil seal from balance shaft gear cover  
Remove the oil seal from the balance shaft gear cover, using a screwdriver.



G2EM00321-99999

2. Installation of new oil seal on balance shaft gear cover  
Install a new oil seal on the balance shaft gear cover, using the following SST.  
SST: 09515-87202-000
3. When the balance shaft gear cover is installed on the cylinder block:  
Remove or install the front oil seal, using the following SST.  
SST: 09223-87702-000

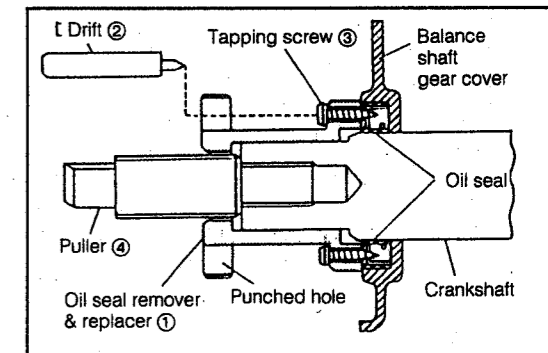


G2EM00322-99999

G2EM00323-00000

## REMOVAL

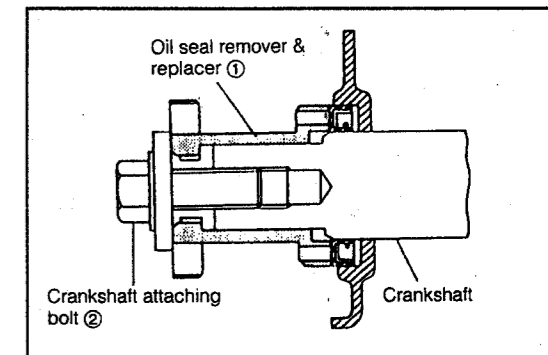
- (1) With the oil seal removal & replacer ① placed against the oil seal, drive a drift into the oil seal so as to make a hole.
- (2) Thread a tapping screw into the thus-produced hole in the oil seal.
- (3) Screw the puller ④ so as to remove the oil seal.



G2EM00324-99999

## INSTALLATION

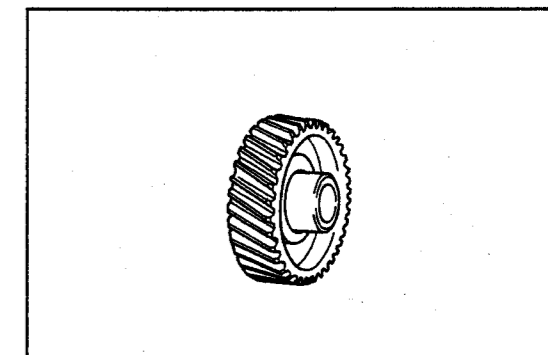
- (1) Apply engine oil to the lip section of the oil seal.
- (2) Place the oil seal remover & replacer ① against the oil seal.
- (3) Place the crankshaft attaching bolt ② against the remover & replacer ①. Then, proceed to install the oil seal into position by turning the crankshaft attaching bolt ②.



G2EM00325-99999

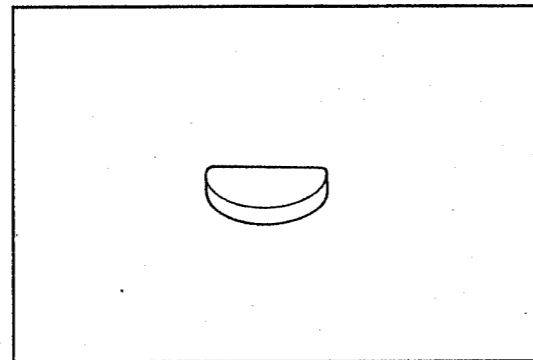
## ASSEMBLY OF BALANCE SHAFT DRIVE GEAR

1. Check of balance shaft drive gear  
Visually inspect the balance shaft drive gear for wear or damage.  
Replace the balance shaft drive gear, if necessary.



G2EM00326-99999

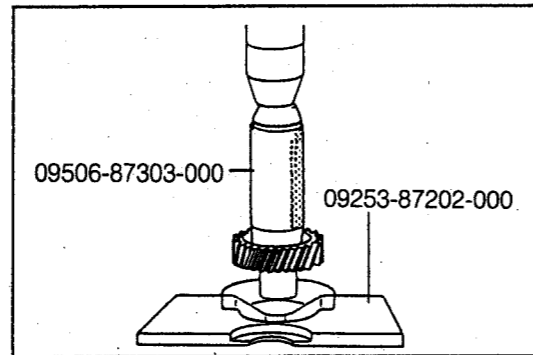
2. Visually inspect the woodruff key for damage.  
Replace the balance shaft drive gear, if necessary.



G2EM00327-99999

3. Assembly of balance shaft drive gear
  - (1) Install the woodruff key to the crankshaft.
  - (2) Assemble the balance shaft to the crankshaft in such a way that the punch mark of the balance shaft drive gear faces toward the outside of the crankshaft, using a hydraulic press in combination with the following SSTs.

SST: 09506-87303-000  
09253-87202-000



G2EM00328-99999

**NOTE:**

- Care must be exercised not to drop the woodruff key.

**CRANKSHAFT INSTALLATION**

**NOTE:**

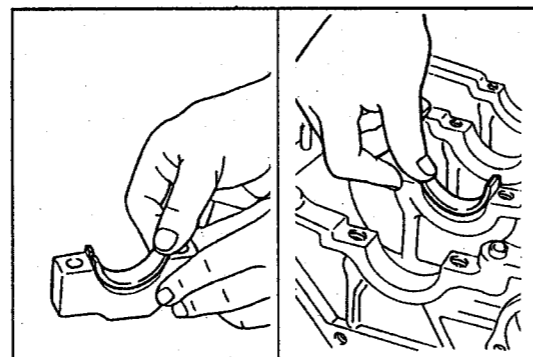
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

G2EM00329-00000

1. Installation of crankshaft bearings
  - (1) Install the bearing to the cylinder block and bearing caps, being careful not to touch the bearing surface.

**CAUTION:**

  - It should be noted that the upper bearing has an oil groove, while the lower bearing has no oil groove.
  - (2) Lubricate the surfaces of each bearing with engine oil.



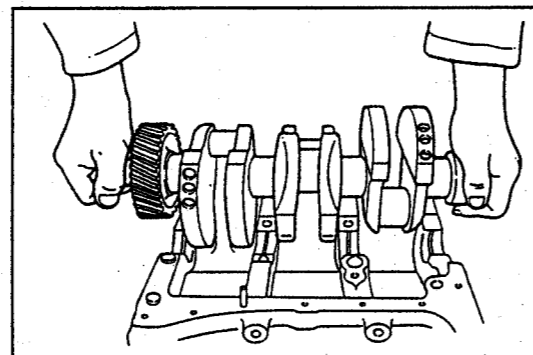
G2EM00330-99999

2. Assembly of crankshaft in cylinder block
 

Apply engine oil to the crankshaft main journals.  
Assemble the crankshaft in the cylinder block.

**NOTE:**

- Be very careful not to scratch each of the crankshaft journals during the assembly.



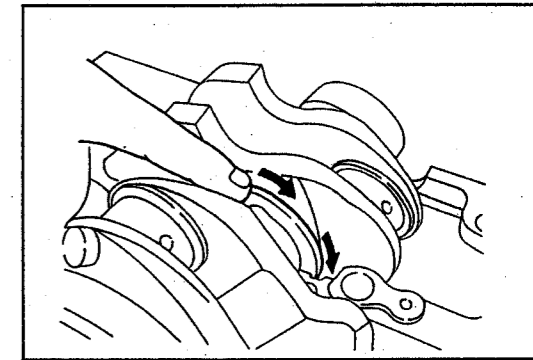
G2EM00331-99999

3. Assembly of thrust washers
 

Apply engine oil to the thrust washers. With the side having the oil groove facing toward the crankshaft, insert each thrust washer between the cylinder block and the crankshaft.

**NOTE:**

- The insertion position is the crankshaft main bearing journal No. 3 at the cylinder block side.



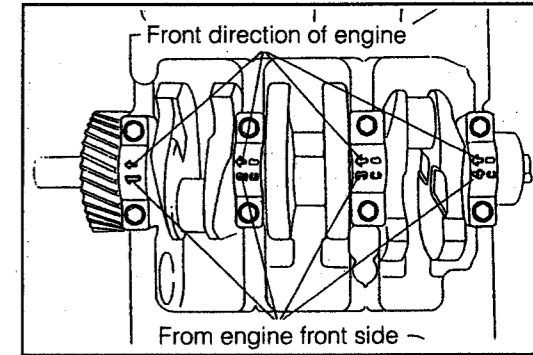
G2EM00332-99999

4. Installation of main bearing caps

**NOTE:**

- Each bearing cap bears a number and an arrow mark which shows the front direction.

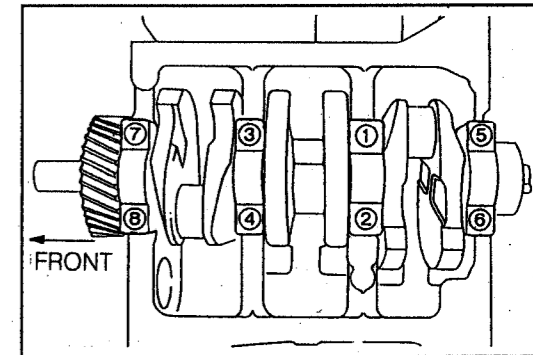
- (1) Lubricate bearing face with engine oil.
  - (2) Install the bearing caps in the numerical sequence with the arrow marks facing forward.
  - (3) Tighten the crankshaft bearing cap first to the temporal tightening torque in the sequence shown in the figure.
- Tightening Torque:** 24.5 - 34.3 N·m  
(2.5 - 3.5 kgf·m, 18.1 - 25.3 ft·lb)



G2EM00333-99999

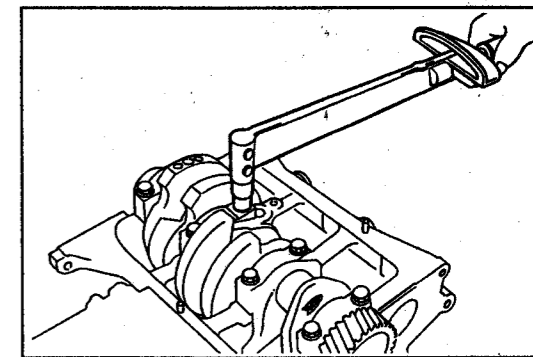
**NOTE:**

- When tightening the bolts, ensure that the bolts and bolt holes are dry.



G2EM00334-99999

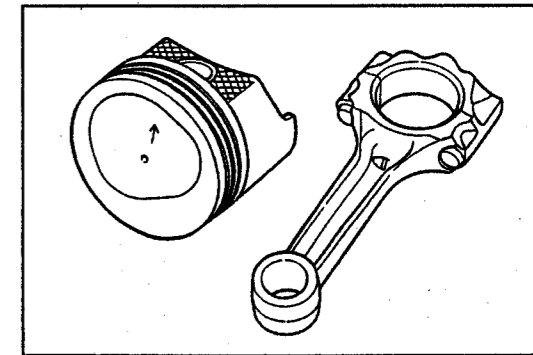
- (4) Tighten the crankshaft bearing cap to the specified tightening torque in the sequence shown in the figure.
- Tightening Torque:** 53.0 - 64.7 N·m  
(5.4 - 6.6 kgf·m, 39.1 - 47.7 ft·lb)



G2EM00335-99999

**ASSEMBLY OF PISTON AND CONNECTING ROD**

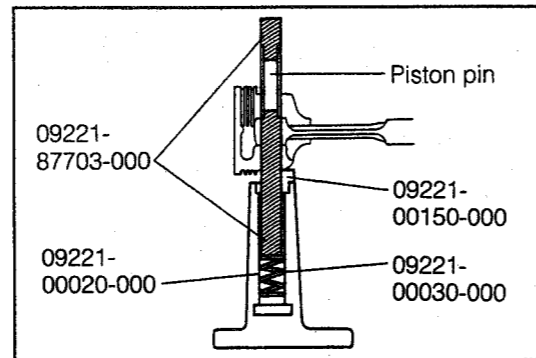
1. Assembly of piston and connecting rod
  - (1) Align the front mark of the piston with the front mark of the connecting rod.



G2EM00336-99999

- (2) Apply engine oil to the piston pin and piston pin hole.
- (3) Press the piston pin into position, using the following SSTs.

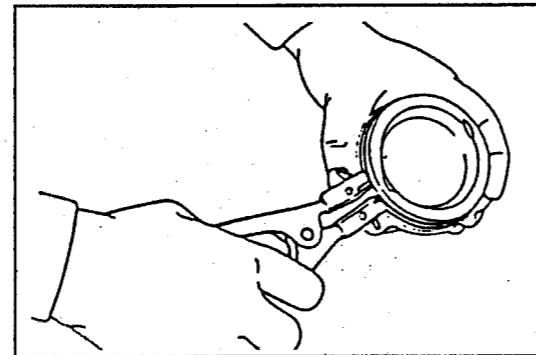
SSTs: 09221-87703-000  
 09221-00020-000  
 09221-00030-000  
 09221-00150-000



G2EM00337-99999

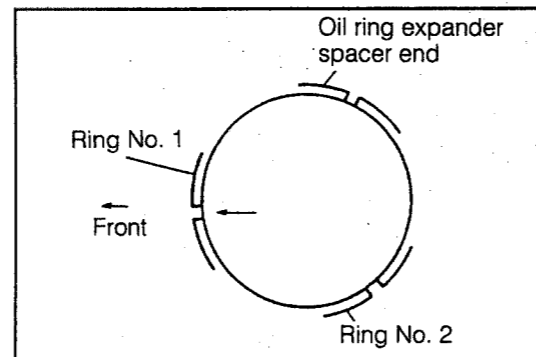
2. Installation of piston rings

- (1) Install the oil ring expander and two side rails by hand.
- (2) Install the two compression rings with code marks facing upward, using a piston ring expander.



G2EM00338-99999

- (3) Position the piston rings so that each ring end may come at the respective point as shown in the figure.



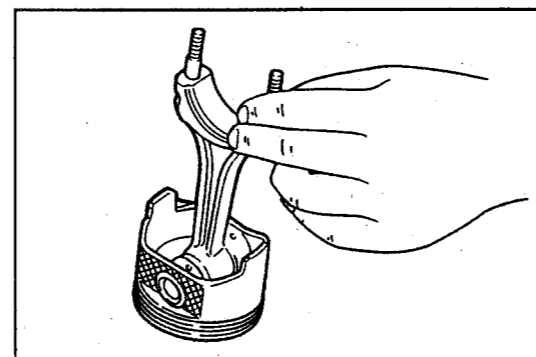
G2EM00339-99999

3. Installation of bearings

- (1) Install the connecting rod upper and lower bearings.

NOTE:

- When installing the bearings be careful not to touch the front and back surfaces of the bearings.



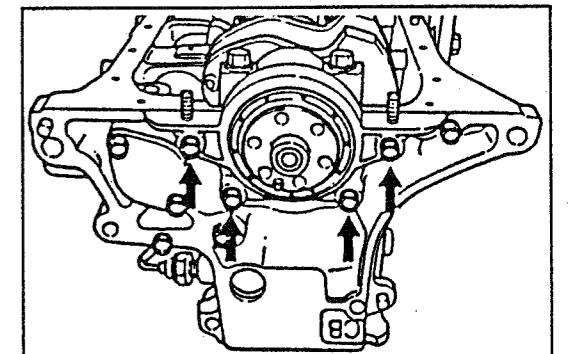
G2EM00340-99999

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES TO CYLINDER

1. Installation of oil seal retainer
  - (1) Apply engine oil to the oil seal. Install the oil seal to the oil seal retainer with a new gasket interposed.

NOTE:

- Care must be exercised to ensure that no portion of the gasket is displaced toward the oil pan installation surface.



G2EM00341-99999

2. Install the balance shaft rear cover to the cylinder block with a new gasket interposed. Install the rear end plate.

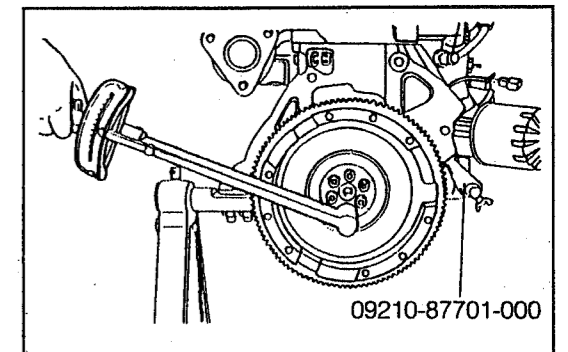
3. Installation of flywheel

- (1) Install the flywheel with the locating pins aligned.
- (2) Tighten the bolts evenly over two or three stages in the sequence shown in the figure.

Tightening Torque: 39.2 - 49.0 N·m  
 (4.0 - 5.0 kgf·m, 28.9 - 36.2 ft·lb)

NOTE:

- When tightening the bolts, prevent the flywheel from turning, using the SST.
- SST: 09210-87701-000



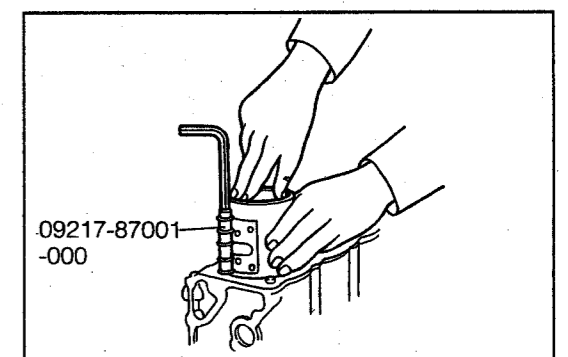
09210-87701-000

G2EM00342-99999

4. Lubricate the side wall of the piston, piston rings and piston ring grooves with engine oil.

NOTE:

- Make sure that none of the ring ends move during this operation.



09217-87001-000

G2EM00343-99999

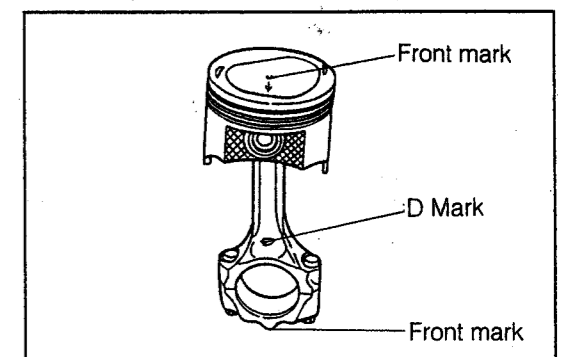
5. Lubricate the cylinder side wall with engine oil.

6. Compress the piston rings, using a piston ring compressor. Assemble the piston into the cylinder bore with the front mark facing toward the front of the engine.

SST: 09217-87001-000

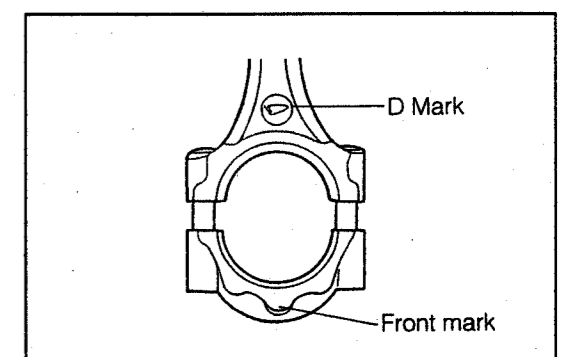
NOTE:

- Be sure to install the piston in the correct direction, referring to the position of the front mark.
- Make sure that none of the ring ends move during the installation.
- Care must be exercised to ensure that the crankshaft journal is not scratched by the connecting rod.



G2EM00344-99999

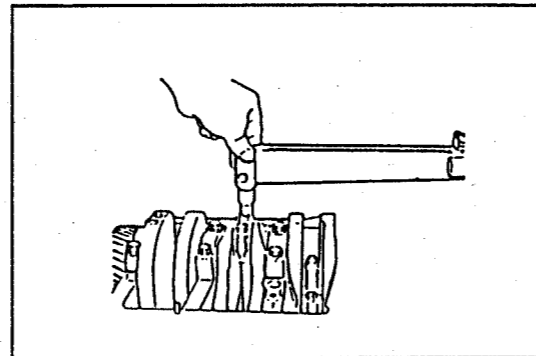
7. Lubricate the connecting rod lower bearing with engine oil.
8. Install the connecting rod cap, with the front mark facing toward the front of the engine.



G2EM00345-99999

9. Tighten the connecting rod cap to the specified torque over two or three stages.

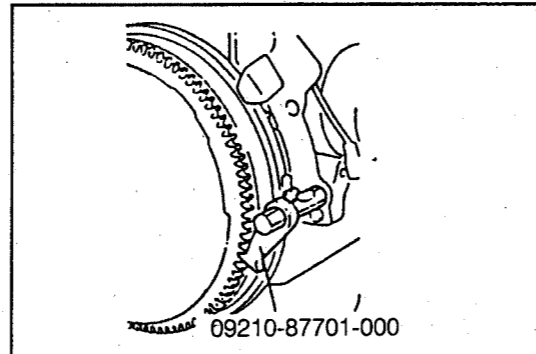
Tightening Torque: 23.5 - 38.2 N·m  
(2.4 - 3.9 kgf·m, 17.4 - 28.2 ft·lb)



G2EM00346-99999

**NOTE:**

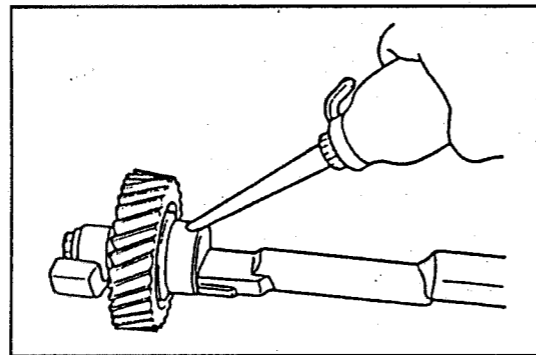
- When tightening the connecting rod bearing cap, use the SST to prevent the crankshaft from turning.  
SST: 09210-87701-000



G2EM00347-99999

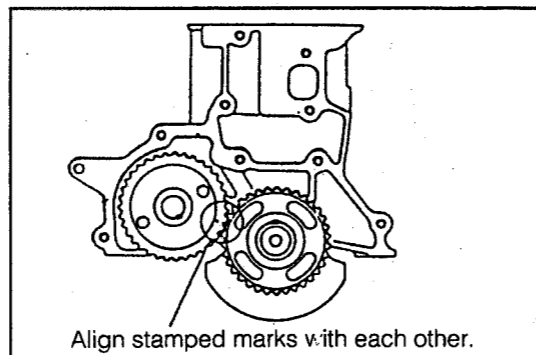
**ASSEMBLY OF BALANCE SHAFT**

1. Apply engine oil to the balance shaft bearing of the cylinder block.
2. Apply engine oil to the balance shaft bearing journals and thrust washer sections.



G2EM00348-99999

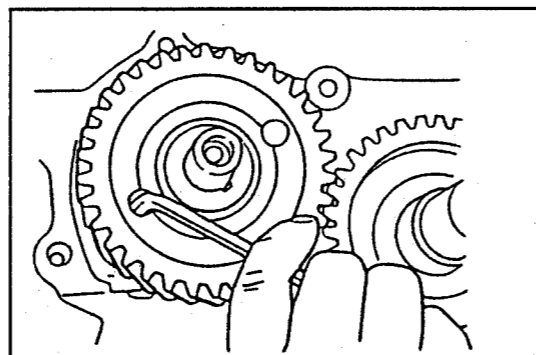
3. Turn the crankshaft until the stamped mark of the balance shaft drive gear is aligned with that of the balance shaft gear. Assemble the balance shaft.



G2EM00349-99999

4. Secure the thrust plate of the balance shaft by tightening the hexagonal bolt.

Tightening Torque: 9.8 - 14.7 N·m  
(1.0 - 1.5 kgf·m, 7.2 - 10.8 ft·lb)

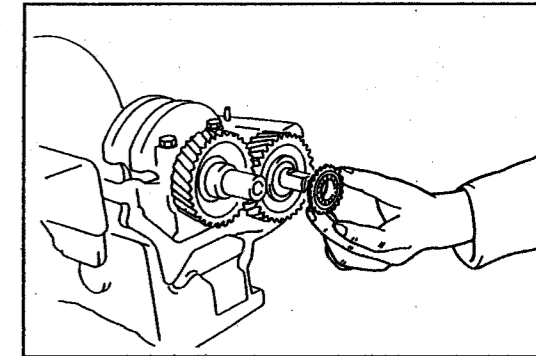


G2EM00350-99999

**ASSEMBLY OF ENGINE**

1. Installation of oil pump

- (1) Install the oil pump drive sprocket to the balance shaft.

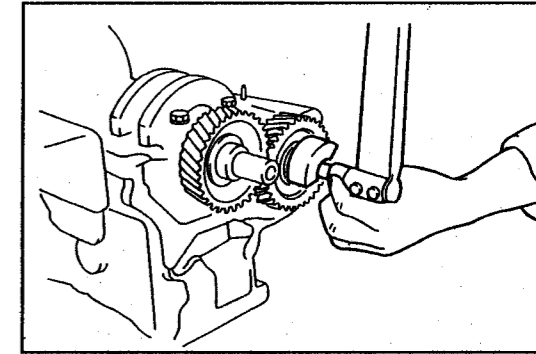


G2EM00351-99999

- (2) Install the balance weight to the balance shaft with the key groove aligned.

Insert the washer into position. Tighten the bolt.

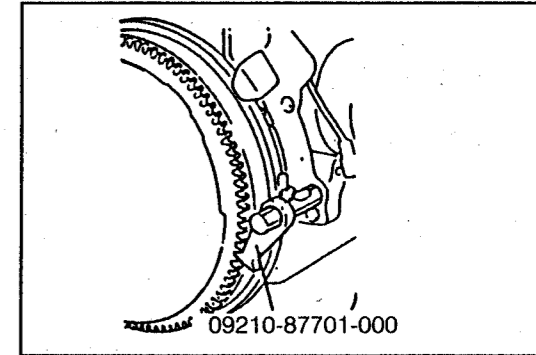
Tightening Torque: 29.4 - 44.1 N·m  
(3.0 - 4.5 kgf·m, 21.7 - 32.5 ft·lb)



G2EM00352-99999

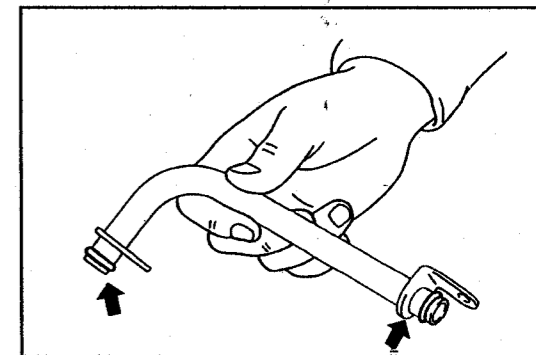
**NOTE:**

- When tightening the bolt, prevent the crankshaft from turning, using the SST at the flywheel side.



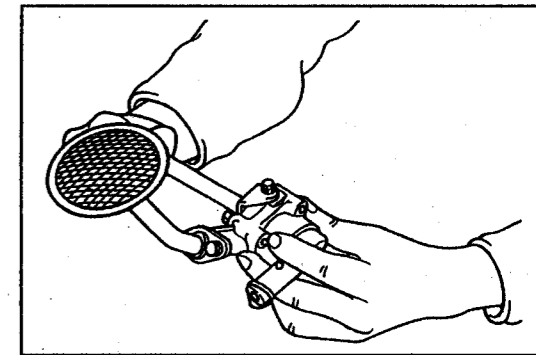
G2EM00353-99999

- (3) Replace the O-ring of the oil pump outlet pipe with a new one. Apply engine oil to the new O-ring.



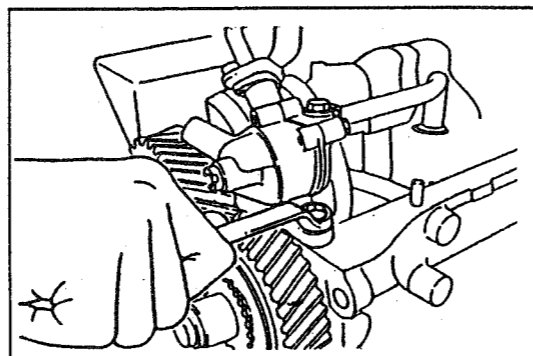
G2EM00354-99999

- (4) Connect the outlet pipe to the oil pump by tightening the bolts temporarily.



G2EM00355-99999

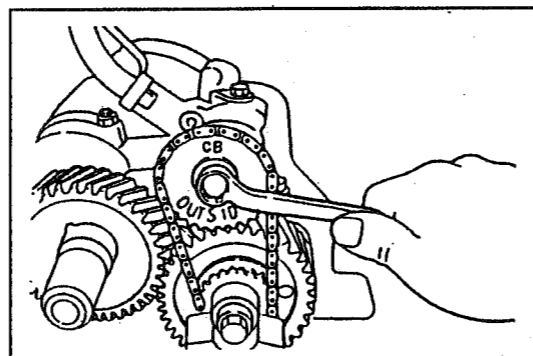
- (5) Install the oil pump with the outlet pipe to the cylinder block by tightening the attaching bolts.



G2EM00356-99999

- (6) Install the oil pump drive chain to the oil pump sprocket at the balance shaft side.

- (7) With the side having the "CB OUTSIDE" stamped mark facing toward the front of the engine, install the oil pump drive sprocket to the oil pump with the drive chain installed in place. Tighten the attaching bolt.

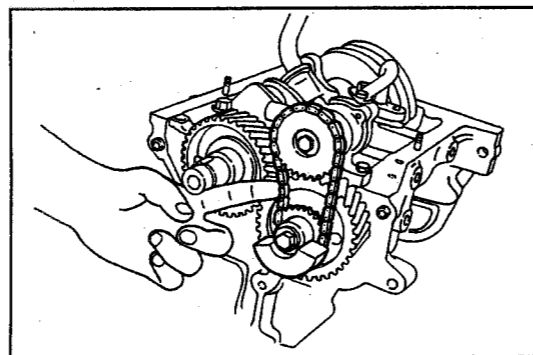


G2EM00357-99999

- (8) Measure the deflection of the oil pump drive chain when the midpoint of the drive chain between the sprockets is pushed by finger.

**Deflection Limit:** 7.0 mm (0.275 inch)

If the deflection exceeds the limit, replace the drive chain and sprockets.



G2EM00358-99999

2. Installation of balance shaft gear cover

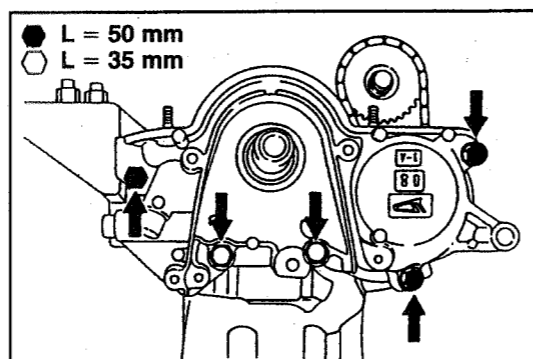
- (1) Lubricate the oil seal with engine oil.  
 (2) Install the balance shaft gear cover with a new gasket interposed.

- (3) Tighten the attaching bolts to the specified torque.

**Tightening Torque:** 9.8 - 15.7 N·m  
 (1.0 - 1.6 kgf-m, 7.2 - 11.6 ft-lb)

**NOTE:**

- Make sure that no portion of the gasket is displaced from the oil pan installation surface.

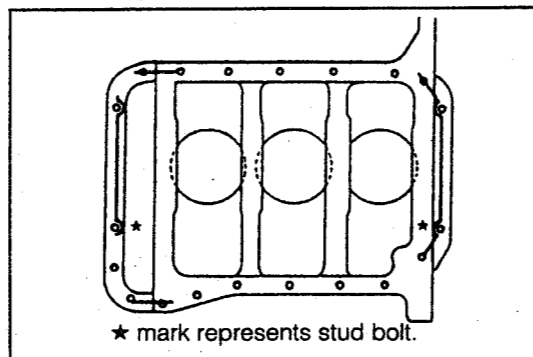


G2EM00359-99999

3. Installation of oil pan

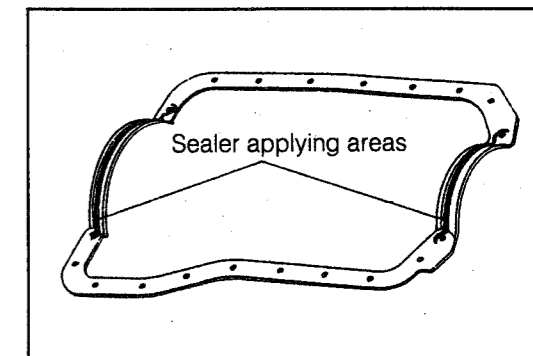
- (1) Apply silicon bond to the cylinder block at the points indicated in the right figure.

**Sealer to Be Used:** Silicon bond



G2EM00360-99999

- (2) Apply silicon bond to the new oil pan gasket at the points indicated in the right figure.  
**Sealer to Be Used:** Silicon bond



G2EM00361-99999

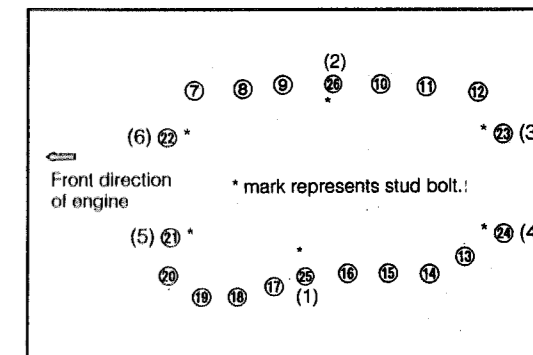
- (3) Install the oil pan gasket applied with silicon bond to the cylinder block, aligning with the stud bolts at the cylinder block.

- (4) Install the oil pan bolts and nuts in the sequence indicated in the right figure.

**Tightening Torque:** 3.9 - 6.9 N·m  
 (0.4 - 0.7 kgf-m, 2.9 - 5.1 ft-lb)

**NOTE:**

- The numerals in ( ) in the right figure denote the sequence of the temporal tightening for stud bolt nuts.

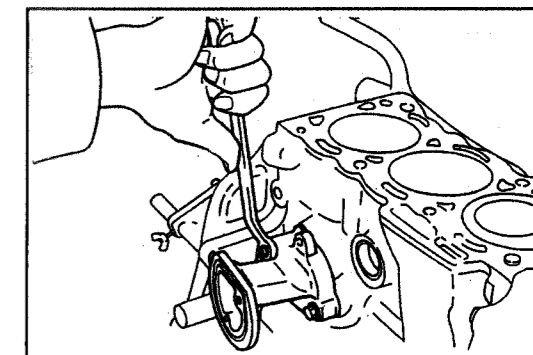


G2EM00362-99999

4. Installation of oil filter bracket

- Install the oil filter bracket with a new gasket interposed.

**Tightening Torque:** 9.8 - 15.7 N·m  
 (1.0 - 1.6 kgf-m, 7.2 - 11.6 ft-lb)

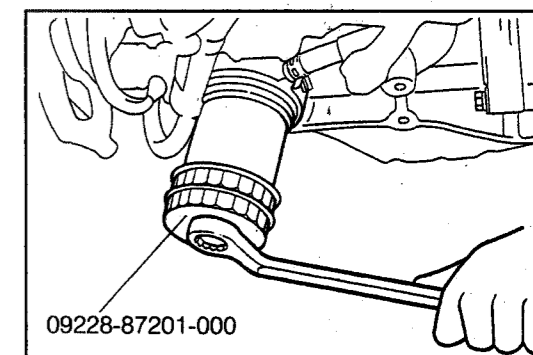


G2EM00363-99999

5. Installation of oil filter

- (1) Apply engine oil to the O-ring of the filter.  
 (2) Lightly screw in the oil filter until the O-ring contacts the oil cooler.

- (3) Screw in the oil filter further one turn, using the SST.  
**SST:** 09228-87201-000

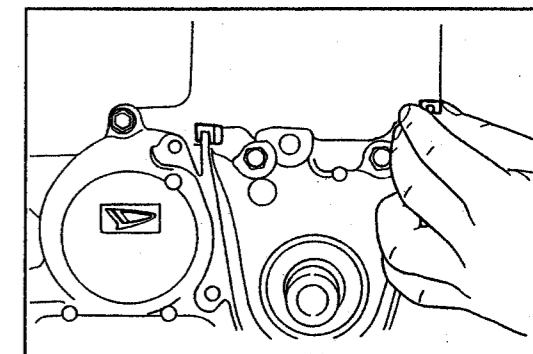


G2EM00365-99999

6. Installation of water pump

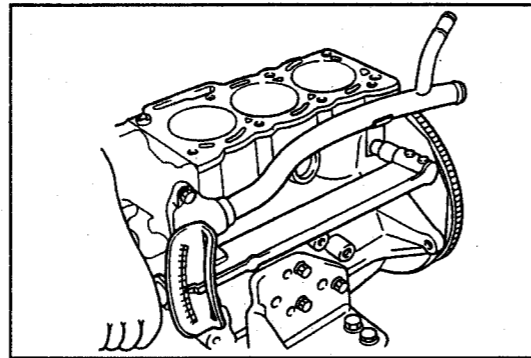
- (1) Install the dust seal to the balance shaft gear cover.  
 (2) Install the water pump to the cylinder block with a new gasket interposed.

**Tightening Torque:** 14.7 - 21.6 N·m  
 (1.5 - 2.2 kgf-m, 10.8 - 15.9 ft-lb)



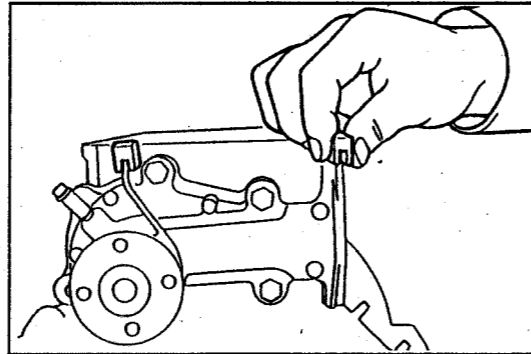
G2EM00366-99999

7. Installation of water inlet pipe  
 Replace the O-ring with a new one. Install the water inlet pipe to the water pump. Install the water pump to the cylinder block by tightening the attaching bolts.



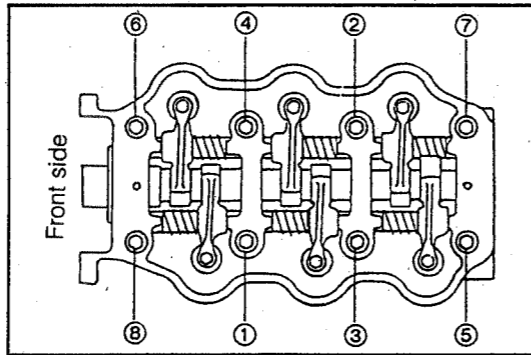
G2EM00367-99999

8. Installation of dust seals  
 Install the two dust seals to the water pump.



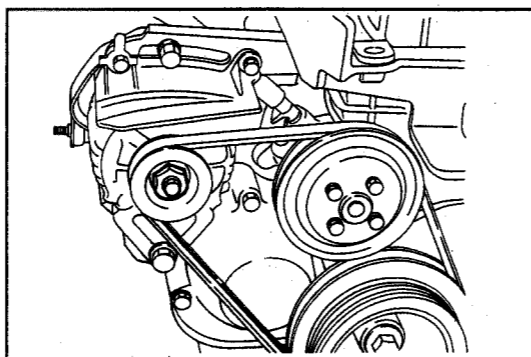
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9. Install the cylinder head.  
 (Refer to the cylinder head section of the service manual.)



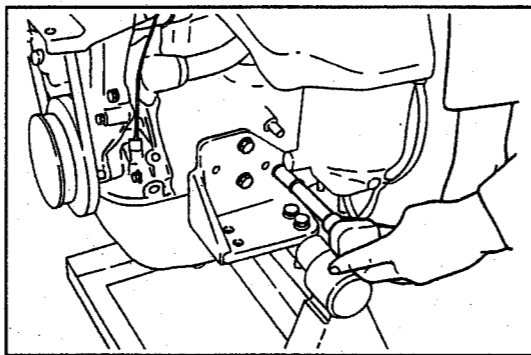
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10. Install the alternator and adjusting bar to the engine.



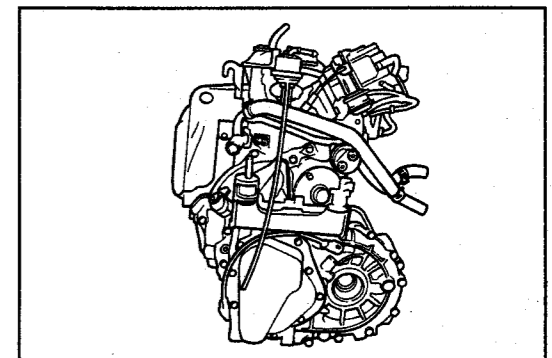
G2EM00370-99999

11. Install the clutch cover and clutch disc.  
 (Refer to the CL section of the service manual.)
12. SST removal  
 (1) Slightly sling the engine, using a chain block.  
 (2) Remove the SST from the cylinder block.



G2EM00371-99999

13. Install the transmission to the engine.  
 Tightening Torque: 49.0 - 68.6 N·m  
 (5.0 - 7.0 kgf-m, 36.2 - 50.6 ft-lb)



G2EM00372-99999

14. Connect the heater hoses to the engine.  
 15. Install the starter motor.  
 Tightening Torque: 49.0 - 68.6 N·m  
 (5.0 - 7.0 kgf-m, 36.2 - 50.6 ft-lb)

G2EM00373-00000

## INSTALLATION OF ENGINE

1. Place the engine on a suitable engine stand.
2. Insert the engine under the engine room.

## NOTE:

- If the engine is installed from the upper side of the vehicle, first remove the vehicle side engine mountings.

3. Sling the engine by a chain block and following SST.  
SST: 09090-04010-000

## NOTE:

- Be very careful not to allow the engine to hit to the vehicle body and other parts.

4. Joint the engine mounting left insulator subassembly to the engine mounting upper left bracket with the chain block.
5. Install and tighten the attaching bolts.

## Tightening Torque:

Bolt 48.1 - 89.2 N·m  
(4.9 - 9.1 kgf-m, 35.4 - 65.8 ft-lb)

Nut 72.1 - 133.9 N·m  
(7.35 - 13.65 kgf-m, 53.17 - 98.75 ft-lb)

6. Joint the engine mounting right insulator subassembly to the engine mounting front bracket with the chain block.

## NOTE:

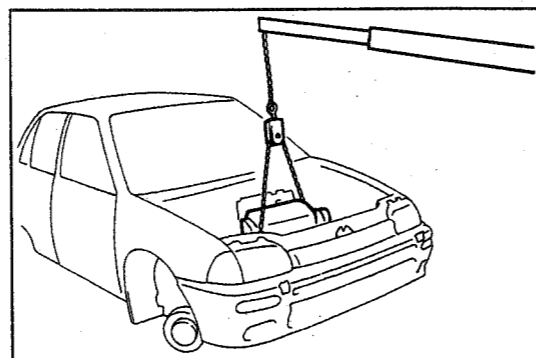
- Be very careful not to damage the stud bolt installed at the engine mounting right insulator subassembly during jointing operation.

7. Place the stay on the engine mounting right insulator subassembly.
8. Install and tighten the attaching bolts.  
Tightening Torque: 39.2 - 53.9 N·m  
(4.0 - 5.5 kgf-m, 28.9 - 39.8 ft-lb)

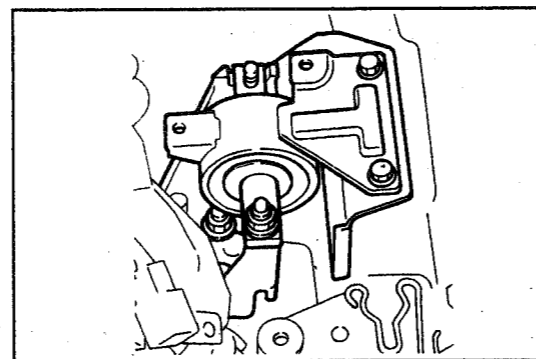
9. Remove the chain block and SST from the engine.
10. Install and tighten the nut from the lower side of the engine right mountings.  
Tightening Torque: 14.7 - 22.6 N·m  
(1.5 - 2.3 kgf-m, 10.8 - 16.6 ft-lb)

11. Install the clutch housing undercover to the transmission.  
Tightening Torque: 14.7 - 21.6 N·m  
(1.5 - 2.2 kgf-m, 10.8 - 47.0 ft-lb)

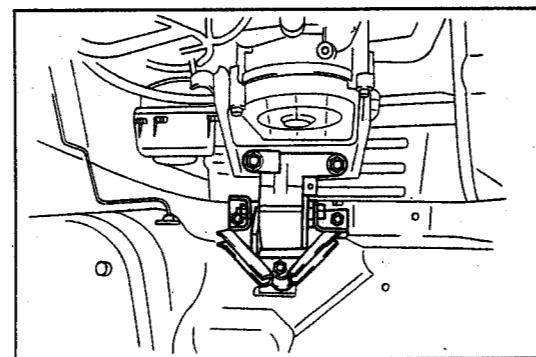
12. Install the stiffener front plate and exhaust manifold stay.  
Tightening Torque: 29.4 - 44.1 N·m  
(3.0 - 4.5 kgf-m, 21.7 - 32.5 ft-lb)



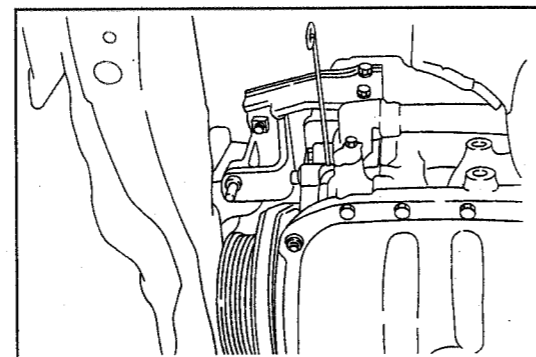
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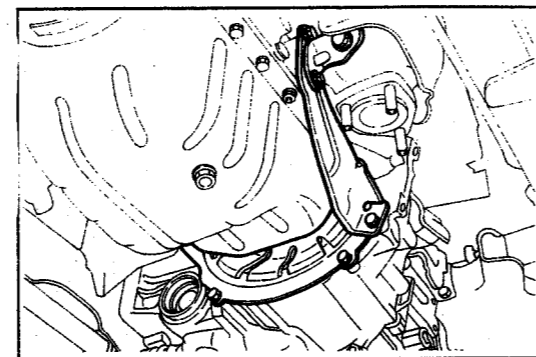
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G2EM00376-99999



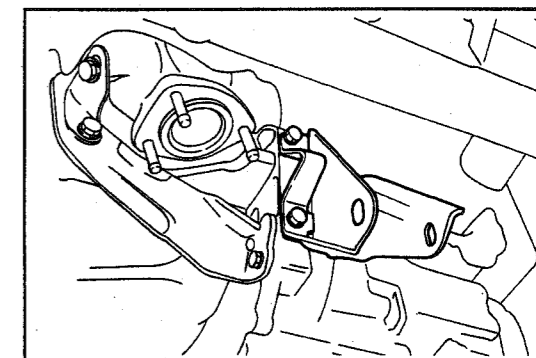
G2EM00377-99999



G2EM00378-99999

13. Install the engine front stopper bracket to the transmission with the attaching bolts.

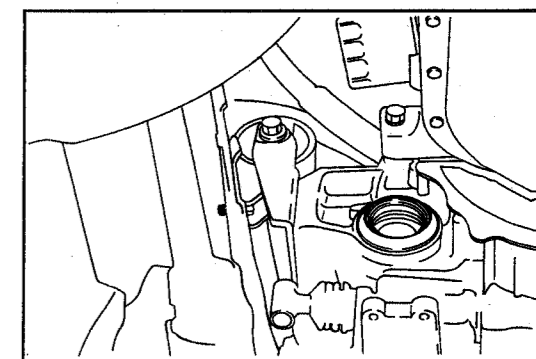
14. Tighten the attaching bolt to the specified torque.  
Tightening Torque: 29.4 - 44.1 N·m  
(3.0 - 4.5 kgf-m, 21.7 - 32.5 ft-lb)



G2EM00379-99999

15. Install the engine mounting rear bracket with the attaching bolts.

16. Tighten the attaching bolt to the specified torque.  
Tightening Torque: 29.4 - 44.1 N·m  
(3.0 - 4.5 kgf-m, 21.7 - 32.5 ft-lb)

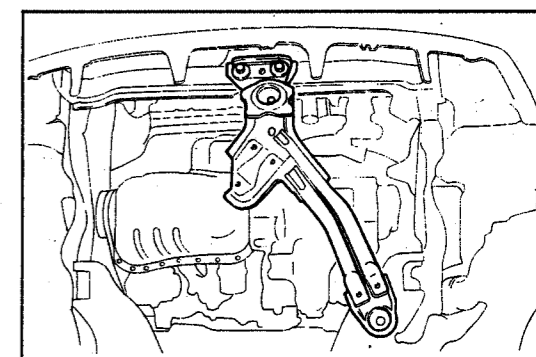


G2EM00380-99999

17. Install the engine mounting rear insulator to the engine mounting rear bracket.

18. Install the engine mounting rear stay with the nut and bolt.

19. Tighten the attaching bolt to the specified torque.  
Tightening Torque: 72.1 - 133.9 N·m  
(7.35 - 13.65 kgf-m,  
53.2 - 98.7 ft-lb)



G2EM00381-99999

20. Installation of engine lower member subassembly  
(1) Install the rubber grommets to the engine lower member subassembly.

- (2) Insert the spacers to the rubber grommets.

- (3) Install the lower member subassembly to the vehicle with the attaching bolts.

- (4) Tighten the attaching bolt to the specified torque.

Tightening Torque: 48.1 - 89.2 N·m  
(4.9 - 9.1 kgf-m, 35.4 - 65.8 ft-lb)

- (5) Install the engine mounting front insulator to the engine front stopper bracket.

- (6) Tighten the attaching bolt to the specified torque.

Tightening Torque: 72.1 - 133.9 N·m  
(7.35 - 13.65 kgf-m,  
53.2 - 98.7 ft-lb)

G2EM00382-00000

21. Connection of drive shafts to transmission
- (1) Replace the expansion rings of the drive shaft with new ones.
  - (2) Ensure that no damage nor oil leakage is present on the drive shaft oil seals of the transmission.  
(Replace the oil seal(s) with a new one, if any evidence of oil seal for damage or oil leakage is found. For the oil seal replacement procedure, see the MT section.)
  - (3) Connect the drive shaft to the transmission.

**NOTE:**

- Slightly turn the drive shaft, if any difficulty is encountered.

22. Install the suspension lower arm subassembly with the attaching bolts.
23. Tighten the attaching bolts of the suspension lower arm subassembly to the specified torque.

**Tightening Torque:**

M10 bolt	14.2 - 32.9 N·m
	(1.44 - 3.93 kgf-m, 10.47 - 24.26 ft-lb)
M14 bolt	167.0 - 245.0 N·m
	(17.0 - 25.0 kgf-m, 123 - 180 ft-lb)

24. Tighten the front suspension support nuts to the specified torque, using new nuts.

**Tightening Torque:** 28.4 - 42.2 N·m  
(2.9 - 4.3 kgf-m, 21.0 - 31.1 ft-lb)

25. Connect the ball joint to the steering knuckle with the attaching nuts.

**CAUTION:**

- Be sure to degrease the conical section of the ball joint and steering knuckle.

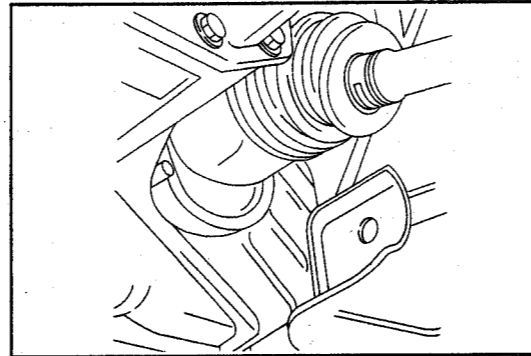
26. Tighten the attaching nuts to the specified tightening torque.

**Tightening Torque:** 26.0 - 38.7 N·m  
(2.65 - 3.95 kgf-m,  
19.2 - 28.5 ft-lb)

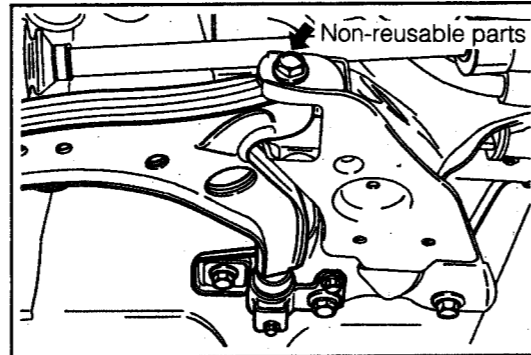
27. Install the lock pins as shown in the right figure.

28. Install the tires to the vehicle.

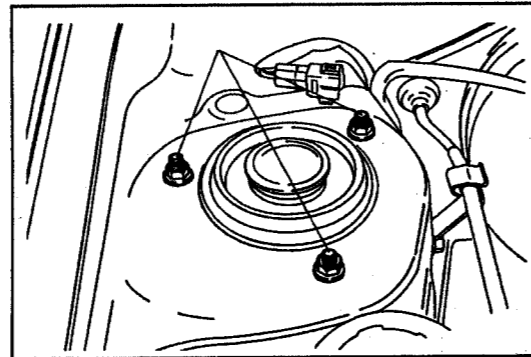
29. Connect the ground cable terminal to the transmission.



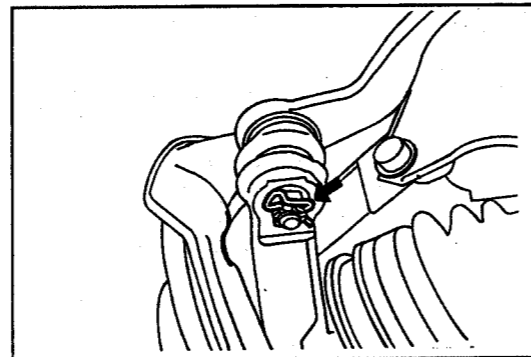
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G2EM00386-99999

G2EM00387-00000

30. Connect the transmission control rods with the attaching bolts.

31. Tighten the attaching bolt to the specified torque.

**Tightening Torque:** 16.7 - 30.4 N·m  
(1.7 - 3.1 kgf-m, 12.3 - 22.4 ft-lb)

32. Installation of exhaust front pipe

- (1) Connect the exhaust front pipe to the exhaust manifold with a new gasket interposed.

**CAUTION:**

- Do not reuse the used gasket.

- (2) Tighten the attaching bolts to the specified torque.

**Tightening Torque:** 49.0 - 74.5 N·m  
(5.0 - 7.6 kgf-m, 36.2 - 55.0 ft-lb)

- (3) Connect the exhaust front pipe to the exhaust muffler support.

- (4) Connect the front exhaust pipe to the rear exhaust pipe with a new gasket interposed.

- (5) Tighten the attaching nuts to the specified torque. (using new nuts.)

**Tightening Torque:** 15.7 - 22.6 N·m  
(1.6 - 2.3 kgf-m, 11.6 - 16.6 ft-lb)

33. Installation of engine lower arm bracket connecting rod with its attaching bolts

34. Tighten the attaching bolts to the specified torque.

**Tightening Torque:** 39.2 - 92.2 N·m  
(4.0 - 9.4 kgf-m, 28.9 - 68.0 ft-lb)

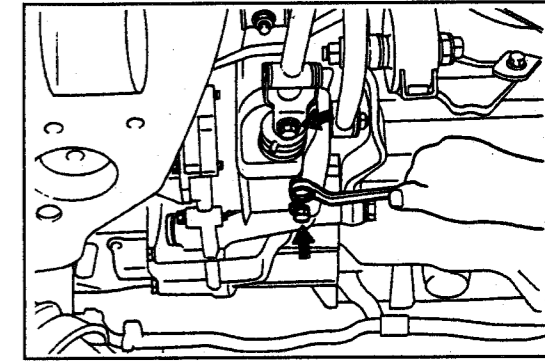
35. Install the engine lower mounting member No. 2 with its attaching bolts.

36. Tighten the attaching bolts to the specified torque.

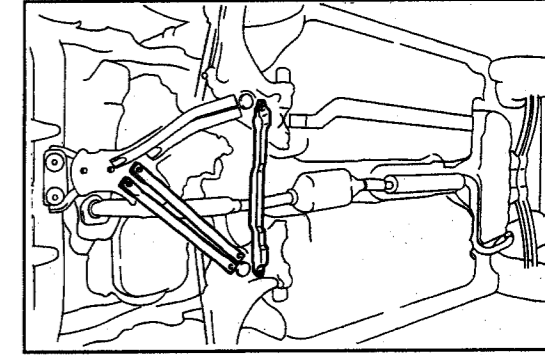
**Tightening Torque:**

M10 48.1 - 89.2 N·m  
(4.9 - 9.1 kgf-m, 35.4 - 65.8 ft-lb)

M12 29.4 - 44.1 N·m  
(3.0 - 4.5 kgf-m, 21.7 - 32.5 ft-lb)



G2EM00388-99999



G2EM00389-99999

G2EM00390-00000



37. Install the air conditioner compressor to the engine with the four attaching bolts.

Tightening Torque: 24.6 N·m  
(2.5 kgf-m, 18.1 ft-lb)

38. Install the air conditioner compressor drive belt.

**NOTE:**

- Ensure that the drive belt is properly engaged in the groove of each pulley.

39. Adjust the tension of the compressor drive belt by means of the adjusting bolt.

40. Tighten the idle pulley attaching nut to the specified tightening torque.

Tightening Torque: 31.4 - 47.1 N·m  
(3.2 - 4.8 kgf-m, 23.1 - 34.7 ft-lb)

41. Ensure that the drive belt tension meets the specification.

42. Connect the radiator hoses to the radiator.

**NOTE:**

- Connect new radiator hose bands to the radiator hoses before connecting the radiator hose to the radiator.

43. Attach new hose bands.

**NOTE:**

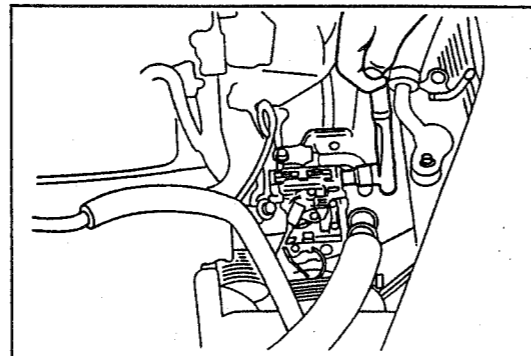
- Be sure to connect the hose bands in such a way that the claw section of the hose band may not face the upper or lower side of the radiator hoses.

44. Connect the the air conditioner idle-up vacuum hose to the actuator(s).

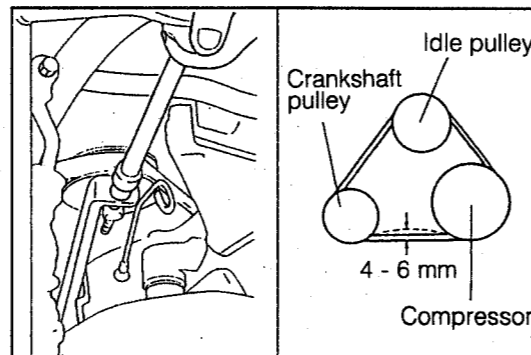
45. Connect the choke cable to the carburetor.

46. Connect the choke cable to the cable clamp.

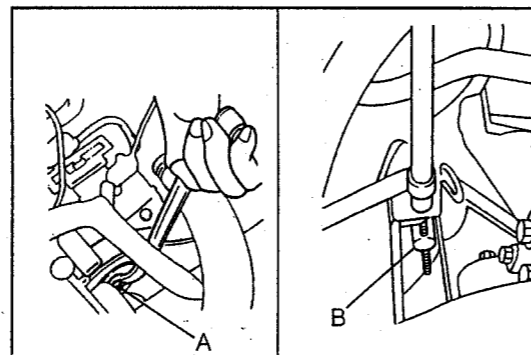
47. Connect the accelerator cable to the carburetor.



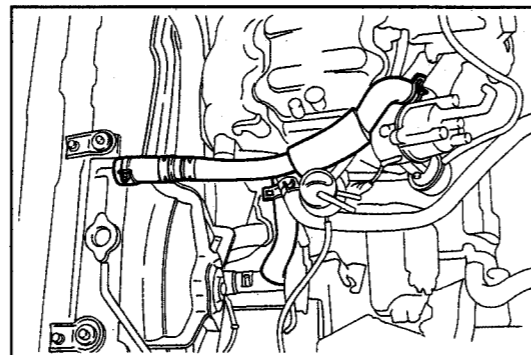
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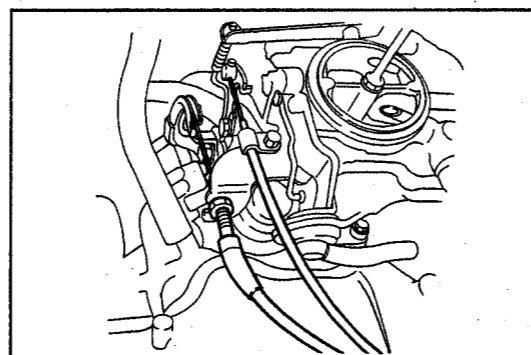
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G2EM00394-99999



G2EM00395-99999

48. Connection of brake booster hose  
Connect the brake booster hose to the intake manifold in such a direction that the arrow mark faces toward the intake manifold side.

49. Connect the outer vent hose to the carburetor.

**NOTE:**

- Be sure to insert the outer vent hose band to the outer vent hose, before connecting it to the carburetor.

50. Attach a new outer vent hose band.

51. Connect the clutch cable to the transmission.

52. Connect the heater hoses to the heater.

**NOTE:**

- Be sure to insert heater hose bands to the heater hose, before connecting the heater hose to the heater.

53. Attach the new hose band to the heater hoses.

54. Connect the fuel hoses to the fuel pump.

55. Attach the new hose bands to the fuel hoses.

56. Connect the resistive cord to the ignition coil from the distributor.

**NOTE:**

- Ensure that the resistive cord lock provided at the distributor is engaged properly.

57. Connection of engine wire to the engine

- (1) Connect the engine wire clamp to the clamp holder.

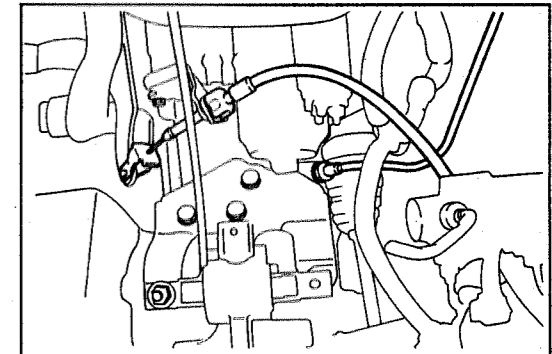
- (2) Connect the connector to the following parts.

- ① Starter
- ② Alternator
- ③ Carburetor solenoid valves.
- ④ Distributor
- ⑤ Radiator thermo control switch
- ⑥ Water temperature sender gage
- ⑦ Oil pressure switch
- ⑧ Water thermo switch
- ⑨ Back-up lamp switch

58. Installation of air cleaner case

- Install the air cleaner case to the engine.

(Refer to the procedure for the air cleaner installation described at the assembling of the cylinder head in this manual.)

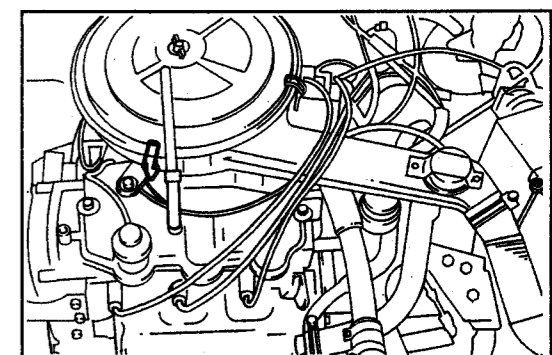


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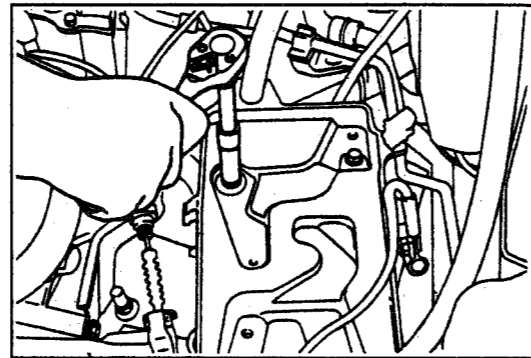
G2EM00400-99999

59. Installation of battery
- (1) Install the battery carrier by removing the four attaching bolts.
  - (2) Connect the engine wire harness clamp to the battery carrier.
  - (3) Place the battery on the battery carrier.

**NOTE:**

- Ensure that the battery polarity is correct, before connecting each terminal.

- (4) Install the battery hold down clamp to the battery carrier.
- (5) Secure the battery hold down clamp with the attaching nut.



G2EM00401-99999

60. Fill transmission oil to the transmission.
61. Fill engine oil to the engine.  
(Refer to the LU section of the service manual.)
62. Fill coolant.  
(Refer to the CO section of the service manual.)
63. Connect the positive terminal to the positive terminal of the battery.
64. Installation of engine hood
  - (1) Install the engine hood to the vehicle with the four attaching bolts.
  - (2) Adjust the body alignment.  
(Refer to the BO section of the service manual.)
65. Connect the battery ground cable terminal to the negative terminal of the battery.

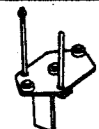
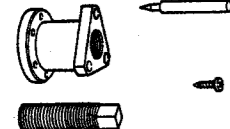
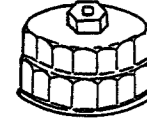
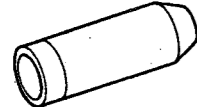

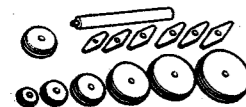

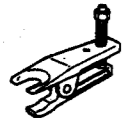
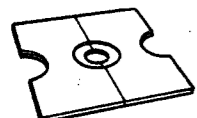
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66. Perform the engine tune-up.  
(Refer to the engine tune-up section of the service manual.)
67. Check and adjust the front alignment.  
(Refer to the FS section of the service manual.)

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**SSTs**

Shape	Part No. and Name	Purpose	Remarks
	09090-04010-000 Engine sling device	Removal and installation of engine	
	09201-87201-000 Valve guide remover & replacer	Removal and installation of valve guide	
	09201-87703-000 Valve stem oil seal replacer	Installation of valve stem oil seal	
	09201-87704-000 Valve stem oil seal cover	Removal of valve stem oil seals	
	09202-87702-000 Valve spring replacer	Removal and installation of valve	
	09204-87701-000 Valve rocker shaft puller	Removal of valve rocker shaft	
	09210-87701-000 Flywheel holder	Preventing crankshaft from turning	
	09214-87701-000 Balance shaft gear arvil	Removal and installation of balance shaft gear	
	09215-87701-000 Balance shaft bearing remover & replacer	Removal and installation of balance shaft bearing	
	09217-87001-000 Piston replacing guide	Guiding piston during insertion	
	09219-87202-000 Engine overhaul stand	Stand for engine overhaul	This stand is to be used in combination with engine overhaul attachment.
	09219-87701-000 Engine overhaul attachment	Attching engine to overhaul stand	This attachment is to be used in combination with engine overhaul stand.

Shape	Part No. and Name	Purpose	Remarks
	09219-87703-000 Cylinder head holder	Stand for cylinder head overhaul	
	09223-87702-000 Oil seal remover & replacer set	Removal and installation of front oil seal	
	09228-87201-000 Oil filter wrench	Removal and installation of oil filter	
	09506-87303-000 Differential drive pinion bearing cone replacer	Installation of balance shaft gear	
	09515-87202-000 Rear axle inner bearing replacer	Installation of camshaft oil seal	
	09608-87302-000 Axle hub & pinion bearing tool set	Installation of rear oil seat	
	09648-87201-000 Drive shaft replacer	Disconnecting drive shafts	
	09611-87701-000 Tie rod end puller	Disconnecting tie rod end	
	09253-87202-000 Water pump bearing anvil	Removal and installation of balance shaft drive gear	

G2EM00450-99999

SERVICE SPECIFICATIONS

Coolant capacity		3.8 ℓ	
Oil capacity	Without oil filter	2.7 ℓ	
	With oil filter	3.0 ℓ	
Valve clearances (HOT)	Intake	0.2 ± 0.05 mm/0.0078 ± 0.002 inch	
	Exhaust	0.2 ± 0.05 mm/0.0078 ± 0.002 inch	
Spark plug gap	NGK	NIPPONDENSO	
	BP(R)5EY	W16EX(R)-U	
	0.8 - 0.9 mm (0.031 - 0.035 inch)	0.7 - 0.8 mm (0.028 - 0.031 inch)	
Ignition timing BTDC		5° ± 2°	
Idle speed		850 ± 50 rpm	
CO/HC concentrations	CO concentration	1.0 ± 0.5 %	
	HC concentration	Not to exceed 1000 ppm	
Compression pressure 350 rpm	STD	1.22 MPa (12.5 kgf/cm <sup>2</sup> )	
	Minimum	1.03 MPa (10.5 kgf/cm <sup>2</sup> )	
	Difference between cylinders	0.147 MPa (1.5 kgf/cm <sup>2</sup> )	
Timing belt pulley	Wear limit (Minimum limit)	Camshaft 119.9 mm (4.270 inch) Crankshaft 59.2 mm (2.331 inch)	
	Oil clearance	Front STD 0.04 - 0.14 mm (0.0016 - 0.0055 inch) Center STD 0.09 - 0.19 mm (0.0035 - 0.0075 inch) Rear STD 0.06 - 0.16 mm (0.0024 - 0.0063 inch)	
Camshaft	Reference Journal diameter	Front 31.960 - 31.980 mm (1.2583 - 1.2591 inch) Center 47.385 - 47.410 mm (1.8656 - 1.8665 inch) Rear 48.415 - 48.440 mm (1.9061 - 1.9071 inch)	
	Cam lobe height	Intake Minimum limit 39.8 mm (1.5669 inch)	
		Exhaust Minimum limit 39.8 mm (1.5669 inch)	
Runout [Bend]		0.03 mm (0.0012 inch)	
Uneven wear of camshaft journal	Maximum limit	0.02 mm (0.0008 inch)	
Cylinder head	Flatness	Cylinder block side	0.1 mm
		Intake manifold side	
		Exhaust manifold side	
Valve seat angel	Intake	45°	
	Exhaust		
Valve guide bushes	Oil clearance	Intake	0.040 - 0.090 mm (0.0016 - 0.0035 inch)
		Exhaust	0.045 - 0.100 mm (0.0018 - 0.0039 inch)

Valves	Contact width with valve seat		1.0 - 1.8 mm (0.0394 - 0.0709 inch)
	Valve face angle		45.5°
	Valve stock thickness	Intake	0.9 - 1.5 mm (0.035 - 0.059 inch)
		Exhaust	1.2 - 1.8 mm (0.047 - 0.071 inch)
	Valve stem outer diameter	Intake	6.945 - 6.960 mm (0.2734 - 0.2740 inch)
		Exhaust	6.940 - 6.955 mm (0.2732 - 0.2738 inch)
Overall length	Intake	101.65 mm (4.002 inch)	
	Exhaust	101.65 mm (4.002 inch)	
Valve spring	Free length		43.3 mm (1.7047 inch)
	Installed tension at 34.9 mm	STD	29.9 kg
		Minimum limit	22.7 kg
Valve rocker arm and valve rocker shaft	Oil clearance between rocker arm and rocker shaft		0.016 - 0.09 mm (0.0006 - 0.0035 inch)
	Valve rocker arm inner diameter		16.000 - 16.018 mm (0.6299 - 0.6306 inch)
	Valve rocker shaft outer diameter		15.958 - 15.984 mm (0.6283 - 0.6293 inch)
Valve rocker arm spring	Minimum free length		33 mm (1.299 inch)
Cylinder block	Flatness cylinder head gasket attaching surface	STD	0.1 mm (0.0039 inch)
		Maximum limit	
Cylinder	Oil clearance between piston-to-cylinder	STD	0.03 - 0.12 mm (0.0012 - 0.0047 inch)
		Maximum limit	0.12 mm (0.0047 inch)
	Cylinder bore diameter (When over size piston is used)	STD	76.00 - 76.03 mm (2.9921 - 2.9933 inch)
		O/S 0.25	76.25 - 76.28 mm (3.0020 - 3.0031 inch)
O/S 0.50		76.50 - 76.53 mm (3.0118 - 3.013 inch)	
Piston, piston pin and piston rings	Piston ring groove-to-piston ring side clearance	No. 1	0.03 - 0.12 mm (0.0012 - 0.0047 inch)
		No. 2	0.02 - 0.12 mm (0.0008 - 0.0047 inch)
	Piston ring thickness	No. 1	1.47 - 1.49 mm (0.0579 - 0.0587 inch)
		NO. 2	1.47 - 1.49 mm (0.0579 - 0.0587 inch)
	Piston ring end gap	No. 1	0.20 - 0.70 mm (0.008 - 0.028 inch)
		NO. 2	0.20 - 0.70 mm (0.008 - 0.028 inch)
Oil		0.20 - 1.10 mm (0.008 - 0.043 inch)	
Piston, piston pin and piston rings	Piston-to-piston pin oil clearance Maximum limit		0.03 mm (0.0012 inch)
	Piston pin-to-connecting rod interference fit		0.016 - 0.043 mm (0.0006 - 0.0017 inch)
Connecting rod	Big end thrust clearance		0.150 - 0.30 mm (0.0059 - 0.0118 inch)
	Maximum bend		0.05 mm (0.0020 inch)
	Maximum twist		0.05 mm (0.0020 inch)
Crankshaft	Crankshaft bend		0.06 mm (0.0024 inch)
	Uneven wear of main journal and crankpin journal		0.01 mm (0.0004 inch)
	Main and crankpin journal oil clearance		0.020 - 0.070 mm (0.0008 - 0.0027 inch)
	Crankshaft thrust clearance		0.02 - 0.30 mm (0.0008 - 0.0118 inch)

Balance shaft	Balance shaft thrust clearance		0.03 - 0.20 mm (0.0012 - 0.0078 inch)
	Balance shaft bearing oil clearance		0.025 - 0.1 mm (0.0010 - 0.0039 inch)
Timing belt pulley	Camshaft timing belt pulley outer diameter Minimum limit		119.9 mm (4.270 inch)
	Crankshaft timing belt pulley outer diameter Minimum limit		59.2 mm (2.331 inch)
Fly wheel	Run out	Maximum limit	0.10 mm (0.0039 inch)
Crankshaft main journal bearing	Bearing center thickness		39.958 - 39.992 mm (1.5731 - 1.5745 inch) 39.734 - 39.742 mm (1.5643 - 1.5646 inch) 39.484 - 39.492 mm (1.5545 - 1.5548 inch)
	Replacement STD bearing		
	Undersize 0.25 bearing		
Crankpin journal bearing (Connecting rod bearing)	Bearing center thickness		41.976 - 42.000 mm (1.6526 - 1.6535 inch) 41.726 - 41.750 mm (1.6428 - 1.6437 inch) 41.476 - 41.500 mm (1.6329 - 1.6339 inch)
	Replacement STD bearing		
	Undersize 0.25 bearing		
Crankshaft thrust bearing	Bearing center thickness		1.940 - 1.990 mm (0.0764 - 0.0783 inch) 2.065 - 2.115 mm (0.0813 - 0.0833 inch) 2.190 - 2.240 mm (0.0862 - 0.0882 inch)
	STD		
	Oversize 0.250		

## TIGHTENING TORQUE

Tightening components	Tightening torque		
	N-m	kgf-m	ft-lb
Cylinder head x Spark plug	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9
Cylinder head x Cylinder block	53.9 - 63.7	5.5 - 6.5	39.8 - 42.0
Cylinder head cover x Cylinder head	7.8 - 11.8	0.8 - 1.2	5.8 - 8.7
Timing belt cover	2.0 - 3.9	0.2 - 0.4	1.4 - 2.9
Crankshaft bearing cap x Cylinder block	53.0 - 64.7	5.4 - 6.6	39.1 - 47.7
Cylinder block x Oil pan	3.9 - 6.9	0.4 - 0.7	2.9 - 5.1
Cylinder block x Balance shaft thrust plate	9.8 - 14.7	1.0 - 1.5	7.2 - 10.8
Connecting rod x Connecting rod cap	23.5 - 38.2	2.4 - 3.9	17.4 - 28.2
Flywheel x Crank shaft	39.2 - 49.0	4.0 - 5.0	28.9 - 36.2
Crankshaft pulley x Crankshaft	88.3 - 98.0	9.0 - 10.0	65.1 - 72.0
Camshaft timing belt pulley x Camshaft	29.4 - 44.1	3.0 - 4.5	21.7 - 32.5
Timing belt tensioner x Balance gear cover	33.3 - 44.1	3.0 - 4.5	21.7 - 32.5
Cylinder block x Oil pump	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9
Water pump x Water pump pulley	5.9 - 8.8	0.6 - 0.9	4.3 - 6.5
Cylinder head x Intake manifold	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9
Cylinder head x Exhaust manifold	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9
Balance shaft gear cover x Cylinder block	9.8 - 15.7	1.0 - 1.6	7.2 - 11.6
Balance shaft weight x Balance shaft	29.4 - 44.1	3.0 - 4.5	21.7 - 32.5