

# ENGINE (FE DOHC)

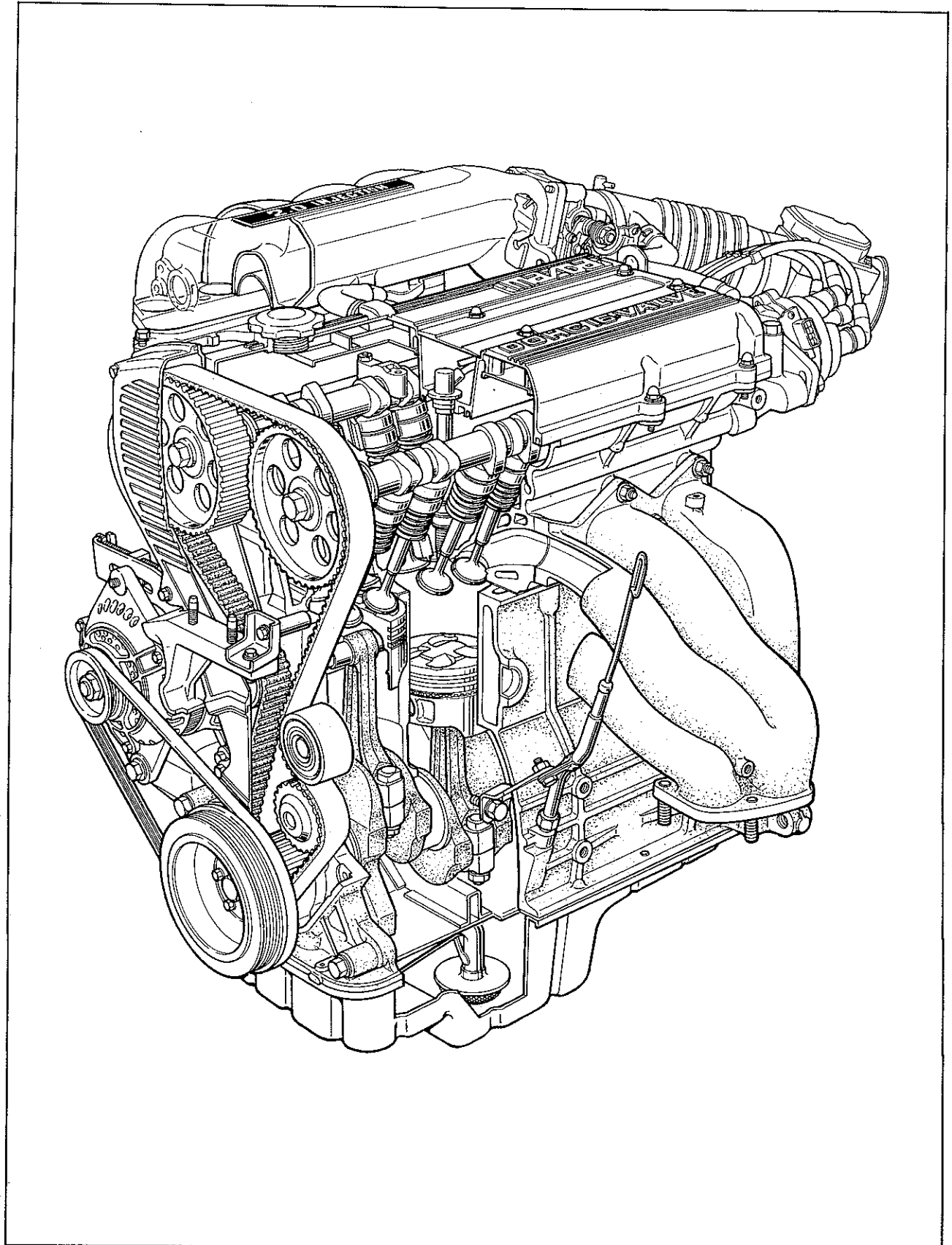
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76F01B-001

# 1B OUTLINE

## OUTLINE

### STRUCTURAL VIEW



4BG01A-002

# TROUBLESHOOTING GUIDE 1B

## SPECIFICATIONS

Item		Engine model	FE DOHC
Type			Gasoline, 4 cycle
Cylinder arrangement and number			In line, 4 cylinders
Combustion chamber			Pentroof
Valve system			OHC, belt driven
Displacement		cc (cu in)	1,998 (121.9)
Bore and stroke		mm (in)	86.0 x 86.0 (3.39 x 3.39)
Compression ratio			10.0 : 1
Compression pressure kPa (kg/cm <sup>2</sup> , psi)-rpm		Standard	1,422 (14.5, 206)—290
		Minimum	996 (10.2, 144)—290
Valve timing	IN	Open BTDC	10°
		Close ABDC	60°
	EX	Open BBDC	60°
		Close ATDC	10°
Valve clearance	mm (in)	IN	0; Maintenance-free
		EX	0; Maintenance-free
Idle speed		rpm	750 ± 50
Ignition timing		BTDC	12° ± 1°
Firing order			1—3—4—2

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## TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
<b>Difficult starting</b>	<b>Malfunction of engine-related components</b> Burned valve Worn piston, piston ring, or cylinder Failed cylinder head gasket	Replace Replace or repair Replace	1B—35 1B—43 1B—16
	<b>Malfunction of fuel system</b>	Refer to Section 4B	
	<b>Malfunction of electrical system</b>	Refer to Section 5	
<b>Poor idling</b>	<b>Malfunction of engine-related components</b> Malfunction of HLA Poor valve to valve seat contact Failed cylinder head gasket	Replace Repair or replace Replace	1B—60 1B—37 1B—16
	<b>Malfunction of fuel system</b>	Refer to Section 4B	
<b>Excessive oil consumption</b>	<b>Oil working up</b> Worn piston ring groove or sticking piston ring Worn piston or cylinder	Replace Replace or repair	1B—43 1B—43
	<b>Oil working down</b> Worn valve seal Worn valve stem or guide	Replace Replace	— 1B—35
	<b>Oil leakage</b>	Refer to Section 2	

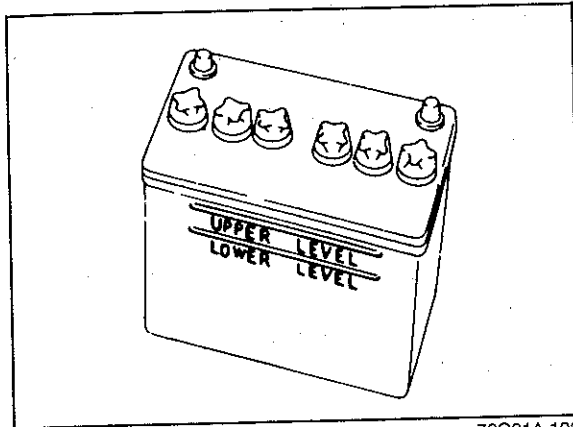
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# 1B TROUBLESHOOTING GUIDE

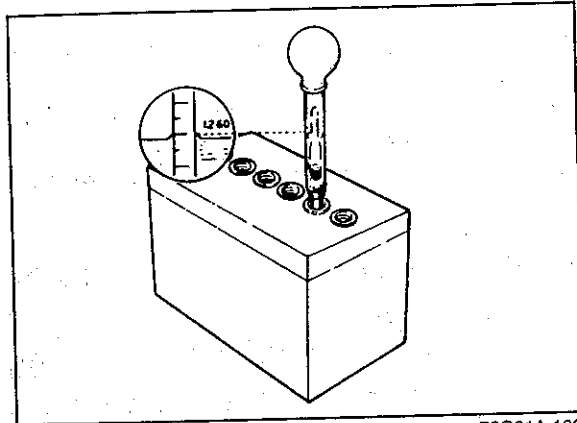
Problem	Possible Cause	Remedy	Page
Insufficient power	<b>Insufficient compression</b> Malfunction of HLA Compression leakage from valve seat Seized valve stem Weak or broken valve spring Failed cylinder head gasket Cracked or distorted cylinder head Sticking, damaged, or worn piston ring Cracked or worn piston	Replace Repair Replace Replace Replace Replace Replace Replace	1B-60 1B-37 1B-35 1B-38 1B-16 1B-34 1B-43 1B-43
	<b>Malfunction of fuel system</b>	Refer to Section 4B	
	<b>Others</b> Slipping clutch Dragging brakes Wrong size tires	Refer to Section 6 Refer to Section 11 Refer to Section 12	
Abnormal combustion	<b>Malfunction of engine-related components</b> Malfunction of HLA Sticking or burned valve Weak or broken valve spring Carbon accumulation in combustion chamber	Replace Replace Replace Eliminate carbon	1B-60 1B-35 1B-38 —
	<b>Malfunction of fuel system</b>	Refer to Section 4B	
Engine noise	<b>Crankshaft or bearing related parts</b> Excessive main bearing oil clearance Main bearing seized or heat-damaged Excessive crankshaft end play Excessive connecting rod bearing oil clearance Connecting rod bearing seized or heat-damaged	Replace or repair Replace Replace or repair Replace or repair Replace	1B-51 1B-51 1B-52 1B-53 1B-53
	<b>Piston related parts</b> Worn cylinder Worn piston or piston pin Seized piston Damaged piston ring Bent connecting rod	Replace or repair Replace Replace Replace Replace	1B-41 1B-44 1B-43 1B-43 1B-44
	<b>Valves or timing related parts</b> Malfunction of HLA* Broken valve spring Excessive valve guide clearance Malfunction of timing belt tensioner	Replace Replace Replace Replace	1B-60 1B-38 1B-35 1B-47
	<b>Malfunction of cooling system</b>	Refer to Section 3	
	<b>Malfunction of fuel system</b>	Refer to Section 4B	
	<b>Others</b> Malfunction of water pump bearing Improper drive belt tension Malfunction of alternator bearing Exhaust gas leakage	Replace Adjust Replace Repair	— 1B-6 — 1B-34

\* Tappet noise may occur if the engine is not operated for an extended period of time. The noise should stop after the engine has reached normal operating temperature.

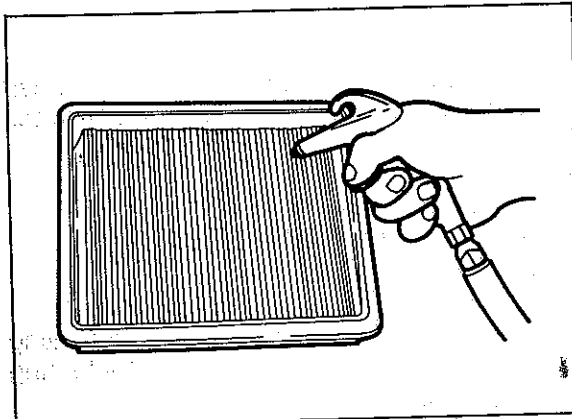
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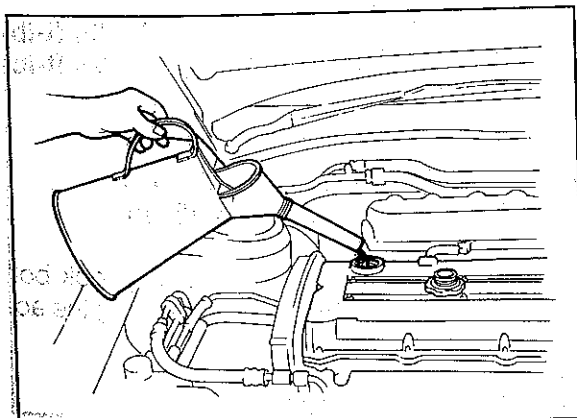
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76G01A-103



76G01B-005



4BG01A-010

## TUNE-UP PROCEDURE

Tune the engine according to the procedures described below.

### Battery

1. Check for corrosion on the terminals, or loose cable connections.  
If necessary, clean the clamps and tighten firmly.
2. Check that the electrolyte level is between the UPPER and LOWER marks.  
Add distilled water if necessary.

3. Check the specific gravity by using a hydrometer.  
If the specific gravity reading is 1.200 or less, recharge the battery. (Refer to Section 5.)

### Air Cleaner Element

Visually check the air cleaner element for excessive dirt, damage, or oil. Clean or replace if necessary.

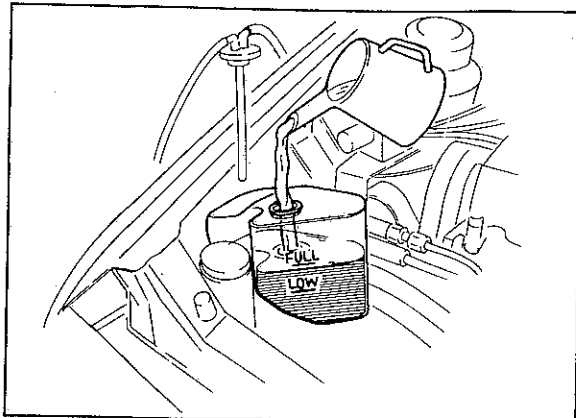
### Caution

**When cleaning the air cleaner element, blow dust off from the inside completely first, then blow from the outside.**

### Engine Oil

Check the engine oil level and condition with the oil level gauge.  
Add oil, or change it, if necessary.

# 1B TUNE-UP PROCEDURE



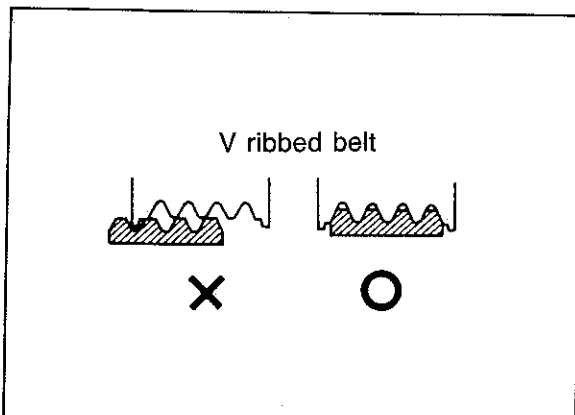
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## Coolant Level (Cold engine)

1. Check that the coolant level is near the radiator inlet port.
2. Check that the level in the coolant reservoir is between the FULL and LOW marks. Add coolant if necessary.

### Warning

- a) Never remove the radiator cap while the engine is hot.
- b) Wrap a thick cloth around the cap and carefully remove it.



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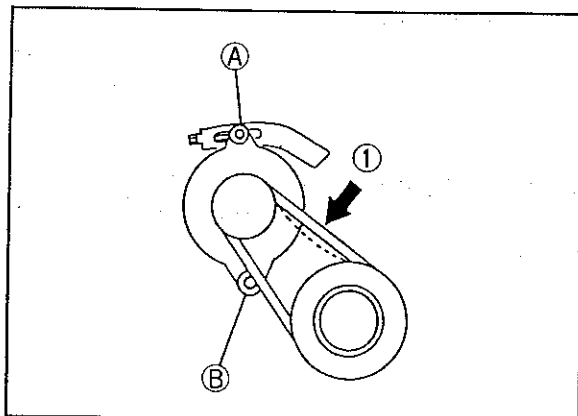
## Drive Belt

1. Check that the drive belt is positioned in the pulley groove.
2. Check the drive belt for wear, cracks, or fraying. Replace if necessary.
3. Check the drive belt tension by using the tension gauge.

### Standard belt tension

N (kg, lb)

Belt	New	Used
Alternator	589-785 (60-80, 132-176)	491-687 (50-70, 110-154)
P/S	687-883 (70-90, 154-198)	589-785 (60-80, 132-176)
A/C	687-883 (70-90, 154-198)	589-785 (60-80, 132-176)



76G01B-007

4. Check the drive belt deflection by applying moderate pressure (**98 N, 10 kg, 22 lb**) midway between the pulleys.

### (1) Alternator belt deflection

**New : 6-8 mm (0.24-0.31 in)**  
**Used: 7-9 mm (0.27-0.35 in)**

If necessary, loosen the alternator mounting bolts and adjust the belt deflection by turning the adjusting bolt.

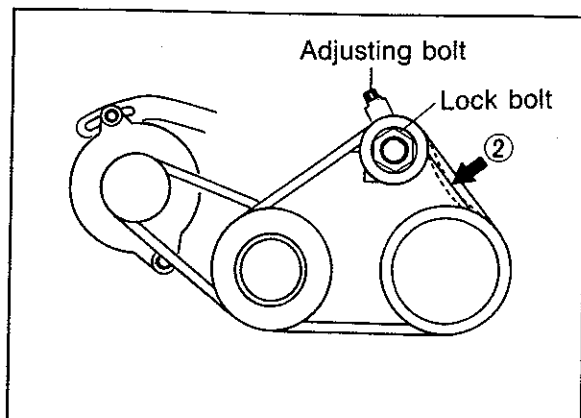
### Tightening torque

**(A) : 31-46 N·m (3.2-4.7 m·kg, 23-34 ft·lb)**  
**(B) : 37-52 N·m (3.8-5.3 m·kg, 27-38 ft·lb)**

### (2) P/S belt deflection

**New : 8-10 mm (0.31-0.39 in)**  
**Used: 9-11 mm (0.35-0.43 in)**

If necessary, loosen the idler pulley lock bolt and adjust the belt deflection by turning the adjusting bolt.

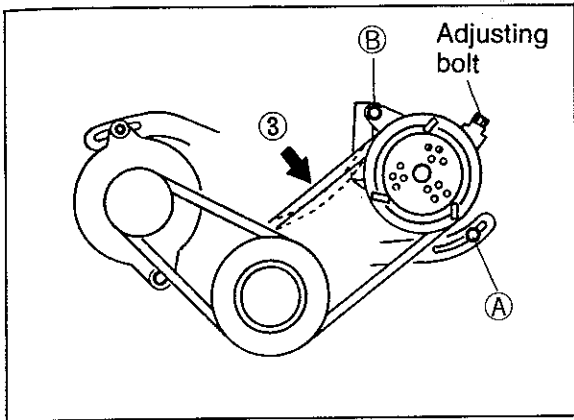


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### Tightening torque of lock bolt:

**37-52 N·m (3.8-5.3 m·kg, 27-38 ft·lb)**

## TUNE-UP PROCEDURE 1B



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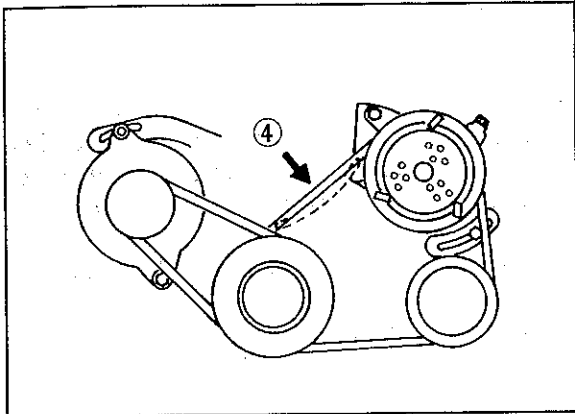
### (3) A/C belt deflection

**New : 7—9 mm (0.27—0.35 in)**  
**Used: 8—10 mm (0.31—0.39 in)**

If necessary, loosen the A/C mounting bolts and adjust the belt deflection by turning the adjusting bolt.

### Tightening torque

**(A): 37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)**  
**(B): 37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)**

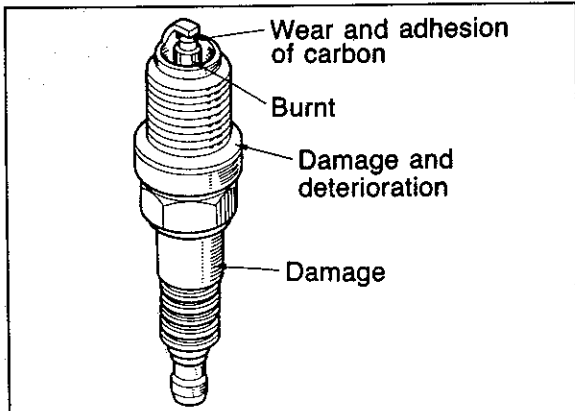


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### (4) P/S and A/C belt deflection

**New : 7—9 mm (0.27—0.35 in)**  
**Used: 8—10 mm (0.31—0.39 in)**

If necessary, adjust the belt deflection using the same procedure as used for the A/C belt deflection.



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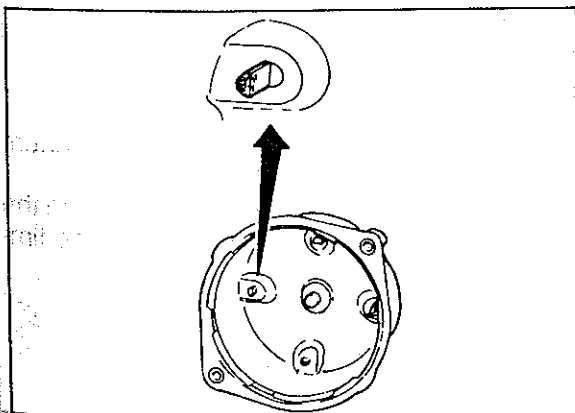
### Spark Plug

Check the following points. Clean or replace if necessary.

1. Damaged insulation
2. Worn electrodes
3. Carbon deposits
4. Damaged gasket
5. Burnt spark insulator
6. Plug gap

### Plug gap:

**0.7—0.8 mm (0.028—0.031 in)**



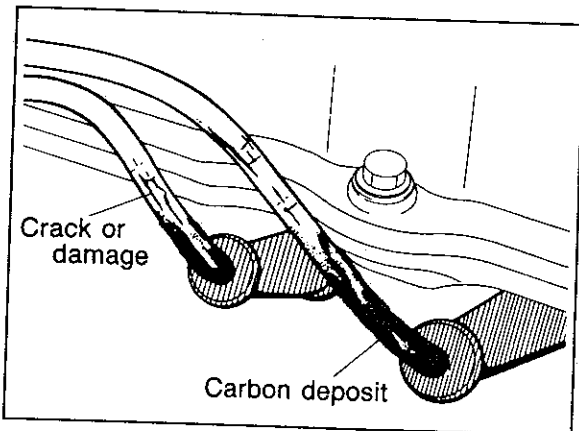
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### Distributor Cap

Check the following points. Replace if necessary.

1. Cracks or carbon deposits
2. Burnt or corroded terminals
3. Worn distributor center contact

# 1B TUNE-UP PROCEDURE

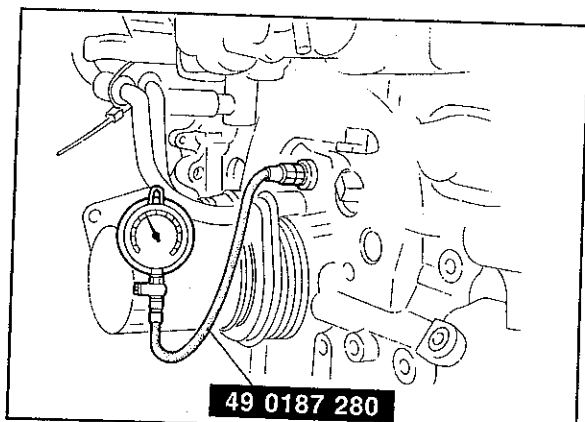


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## High-Tension Lead

Check the following points. Clean or replace if necessary.

1. Damaged lead
2. Carbon deposits



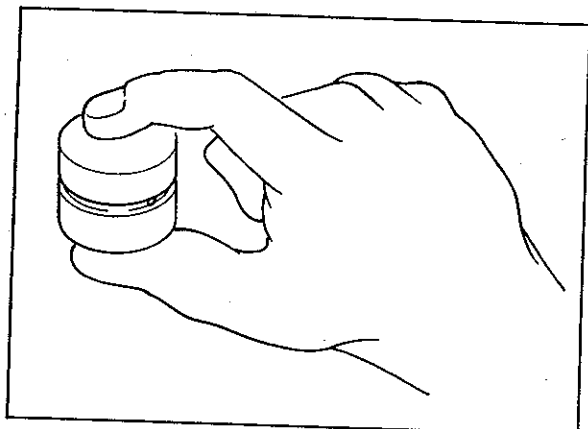
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## Hydraulic Lash Adjuster (HLA)

### Note

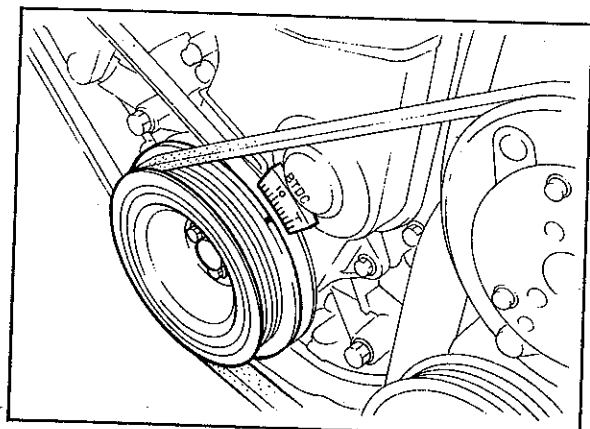
Tappet noise may occur if the engine is not operated for an extended period of time. The noise should stop after the engine has reached normal operating temperature.

1. Check for tappet noise. If noise exists, check the following points.
  - (1) Engine oil condition and level
  - (2) Engine oil pressure (Refer to Section 2)



76G01B-012

2. If the noise does not stop, check for movement of each HLA by pushing it during disassembly.
3. If the HLA moves, replace the HLA. (Refer to page 1B-60.)



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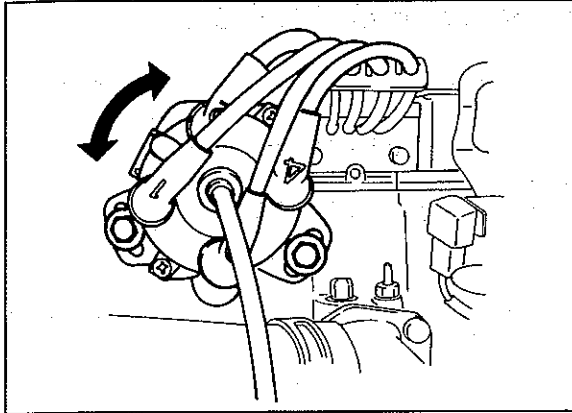
## Ignition Timing

1. Warm up the engine and run it at idle.
2. Turn all electric loads OFF.
3. Connect a timing light tester.
4. Disconnect the vacuum hose from the vacuum control, and plug the hose.
5. Check that the ignition timing mark (yellow) on the crankshaft pulley and the timing mark on the timing belt cover are aligned.

**Ignition timing:  $12^{\circ} \pm 1^{\circ}$  BTDC  
(at idle speed)**

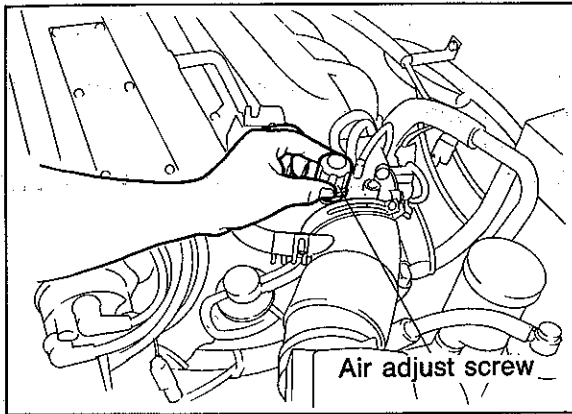


## TUNE-UP PROCEDURE 1B



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6. If necessary, adjust the ignition timing by turning the distributor.



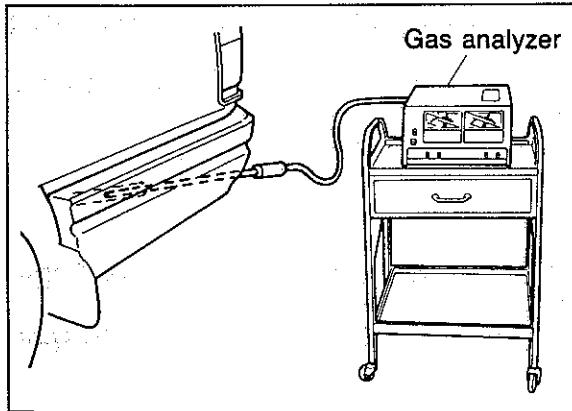
76G01B-014

### Idle Speed

1. Ground the test connector to the vehicle with a jumper wire.
2. Connect a tachometer to the engine.
3. Check the idle speed.

**Idle speed:  $750 \pm 50$  rpm**

4. If necessary, remove the blind cap from the throttle body and adjust by turning the air adjust screw.
5. Install the blind cap and disconnect the jumper wire from the test connector.



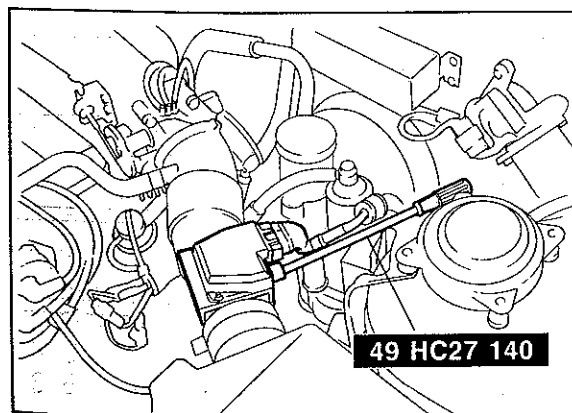
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### Idle Mixture

1. Connect an exhaust gas analyzer to the vehicle.
2. Measure the CO and HC concentration.

**CO concentration:  $1.5 \pm 0.5\%$**

**HC concentration: Less than 1,000 ppm**

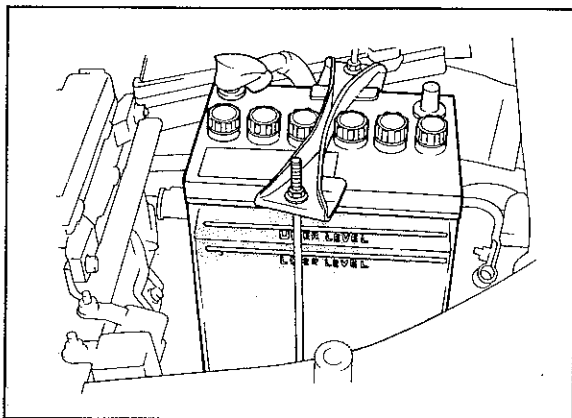


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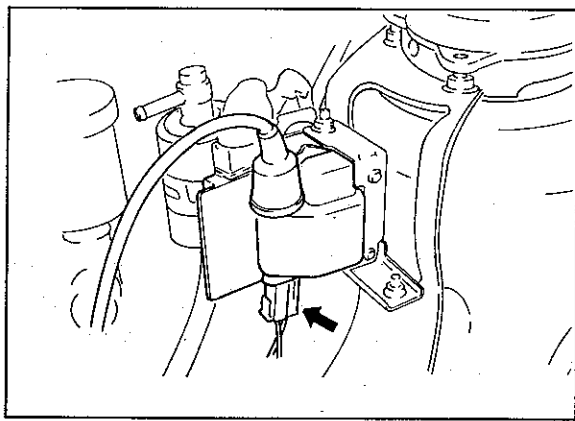
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3. If necessary, remove the blind cap from the air flow meter and adjust by turning the bypass air adjust screw with **SST**.
4. Install the blind cap to the air flow meter and disconnect the jumper wire from the test connector.

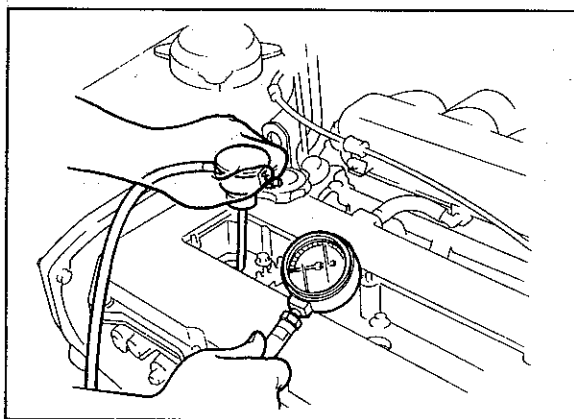
# 1B ON-VEHICLE INSPECTION



76F01B-006



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76F01B-007

## ON-VEHICLE INSPECTION

If the engine exhibits low power, poor fuel economy, or poor idle, check the following points.

1. Ignition system (Refer to Section 5)
2. Compression
3. Fuel system (Refer to Section 4B)

### COMPRESSION

1. Check that the battery is fully charged. Recharge if necessary.
2. Warm up the engine to the normal operating temperature.
3. Turn it off for about 10 minutes to allow the exhaust manifold to cool.
4. Remove all spark plugs.
5. Disconnect the primary wire connector from the ignition coil.
6. Connect a compression gauge to No.1 spark plug hole.
7. Fully depress the accelerator pedal and crank the engine.
8. Note the maximum gauge reading.
9. Check each cylinder.

#### Compression:

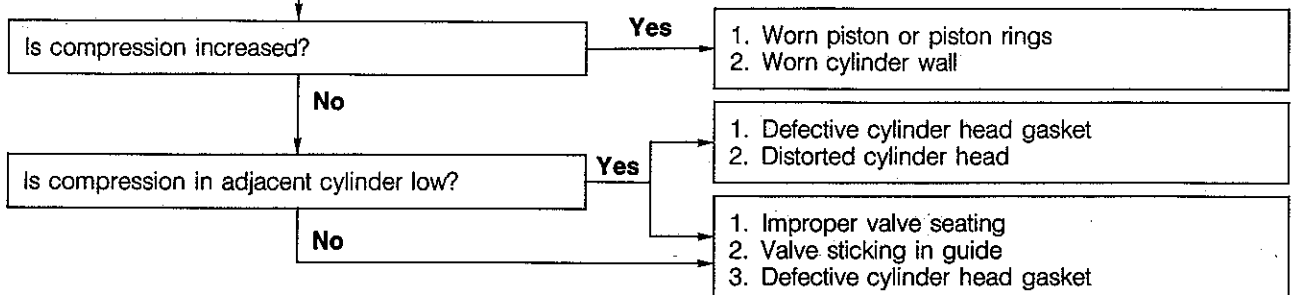
**1,422 kPa (14.5 kg/cm<sup>2</sup>, 206 psi)—290 rpm**

#### Minimum:

**996 kPa (10.2 kg/cm<sup>2</sup>, 144 psi)—290 rpm**

### Possible Cause

If compression is low, pour heavy oil into the cylinder and turn the crankshaft several times  
Check compression once more



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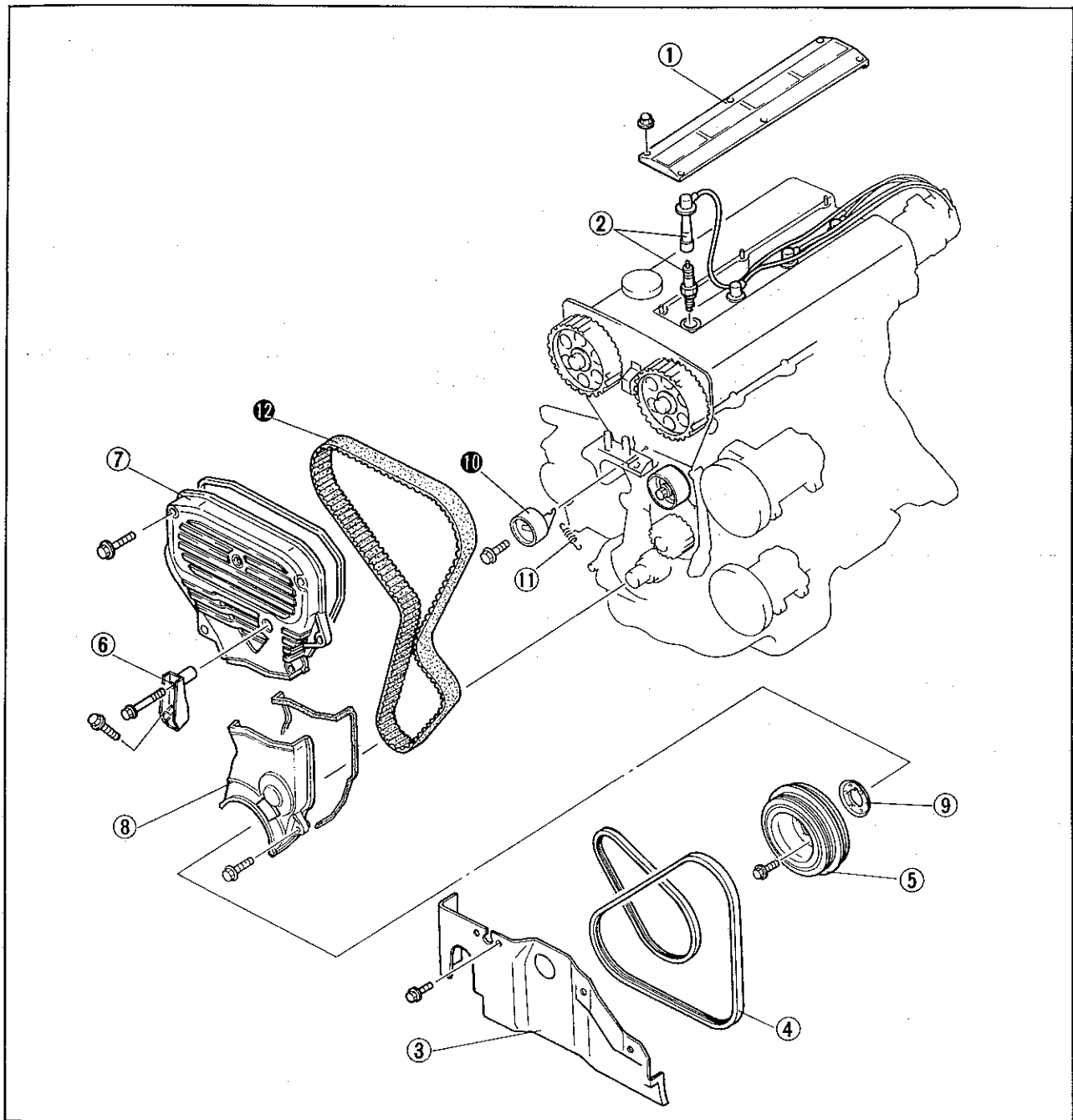
## ON-VEHICLE MAINTENANCE

### TIMING BELT

#### Removal

1. Disconnect the negative battery cable.
2. Remove in the sequence shown in the figure referring to the removal note for specially marked parts.

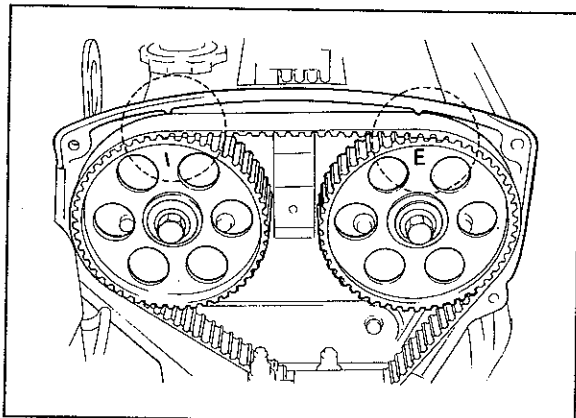
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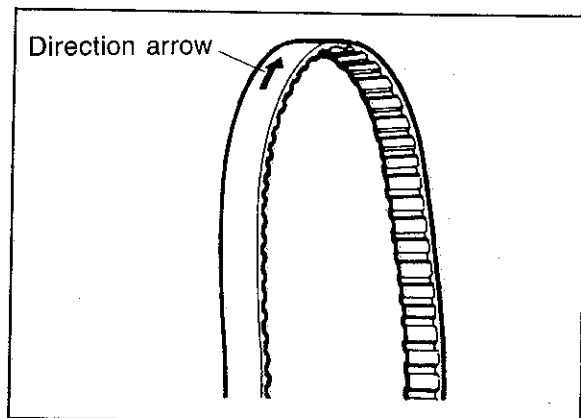
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- |                                     |                                  |
|-------------------------------------|----------------------------------|
| 1. Center cover                     | 7. Upper timing belt cover       |
| 2. High-tension lead and spark plug | 8. Lower timing belt cover       |
| 3. Engine side cover                | 9. Baffle plate                  |
| 4. Drive belt                       | 10. Timing belt tensioner        |
| 5. Crankshaft pulley                | 11. Timing belt tensioner spring |
| 6. Engine mount bracket             | 12. Timing belt                  |

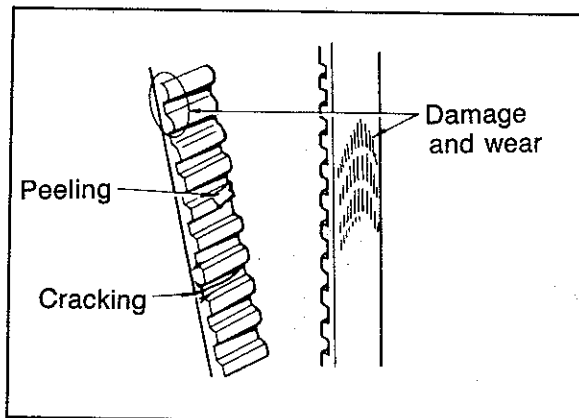
# 1B ON-VEHICLE MAINTENANCE (TIMING BELT)



76G01B-021



88U01X-024



76G01B-022

## Removal note

### Timing belt tensioner

1. Turn the crankshaft to align the mating marks of the camshaft pulleys.

### Note

For intake side camshaft pulley, align "I" mark.

For exhaust side camshaft pulley, align "E" mark.

2. Remove the tensioner.

## Timing belt

Mark the timing belt rotation for proper reinstallation if it is reused.

### Caution

Be careful not to allow oil, grease, or water on the belt.

## Inspection

Inspect the following parts. (Refer to page 1B—46, 47.)

1. Timing belt
2. Timing belt tensioner and spring
3. Timing belt idler pulley
4. Timing belt pulley
5. Camshaft pulley

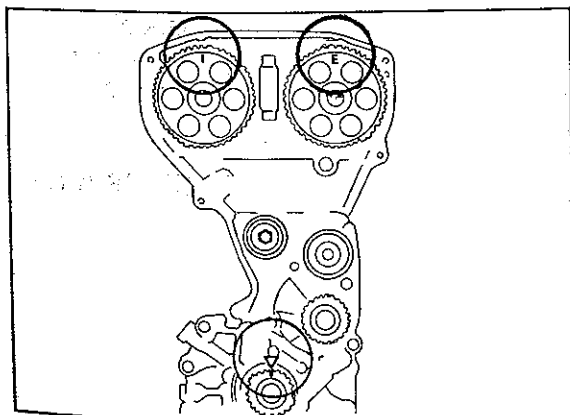
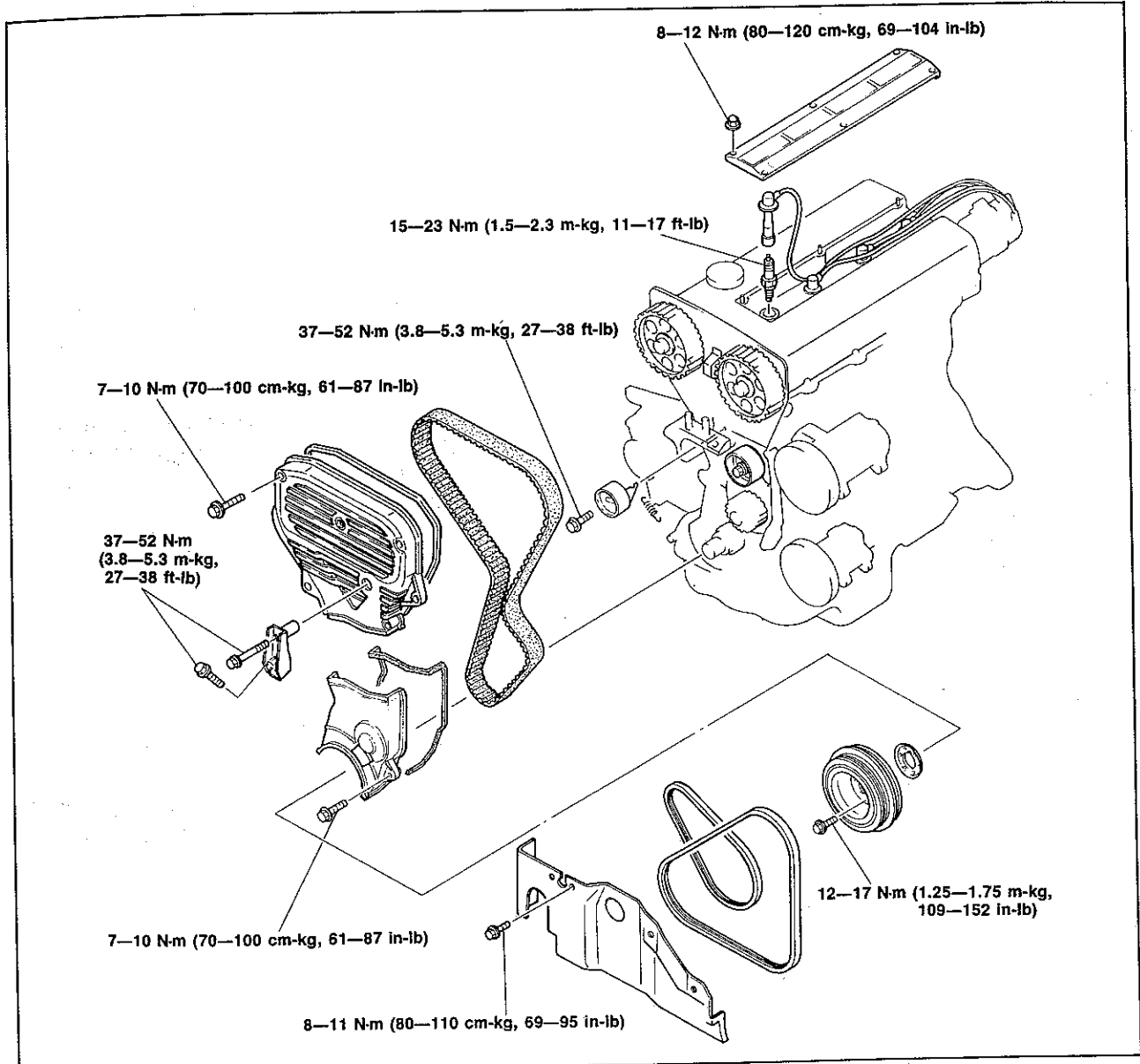
# ON-VEHICLE MAINTENANCE (TIMING BELT) 1B

## Installation

Install in the reverse order of removal referring to the installation note.

## Torque Specifications

76G01A-109



76G01B-023

## Installation note

### Timing belt

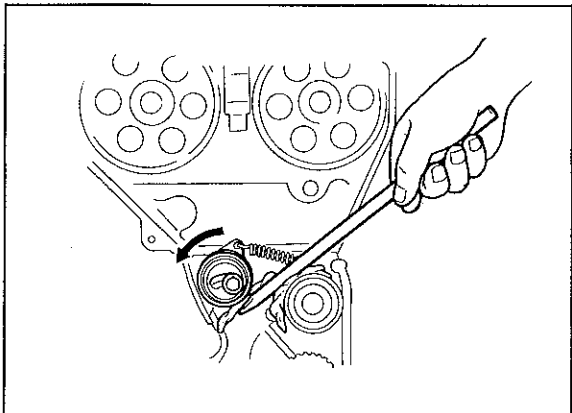
1. Check that the mark on the timing belt pulley is aligned with the mating mark.
2. Check that the mating mark of the camshaft pulleys are aligned with the seal plate mating marks.

### Note

For intake side camshaft pulley, align "I" mark.

For exhaust side camshaft pulley, align "E" mark.

# 1B ON-VEHICLE MAINTENANCE (TIMING BELT)

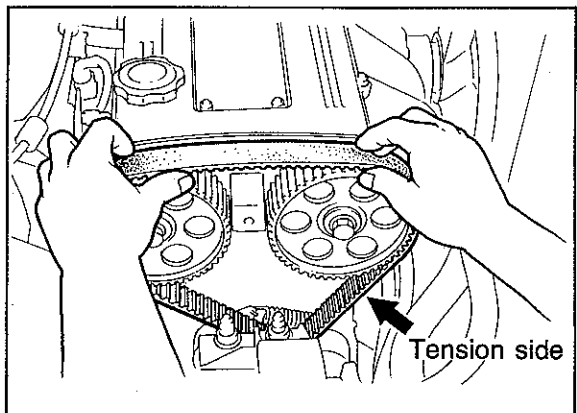


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3. Install the timing belt tensioner and spring. Temporarily secure it with the spring fully extended.

**Caution**

**Do not damage the pulleys when securing the tensioner pulley.**

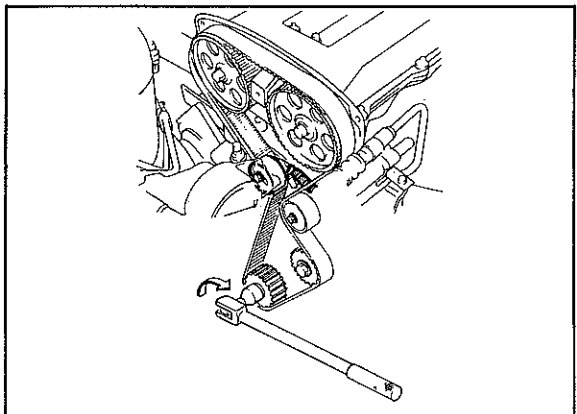


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4. Install the timing belt so that there is no looseness at the tension side, and at the two camshaft pulleys.

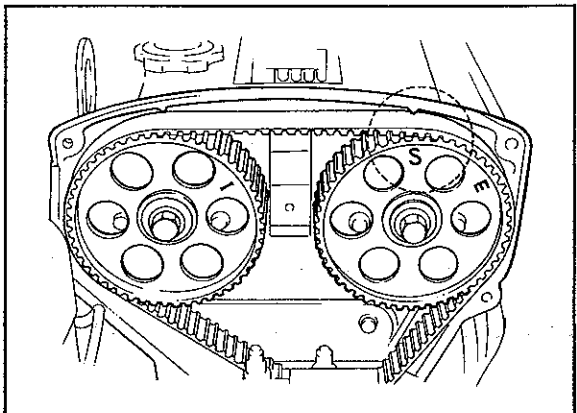
**Caution**

- a) If the timing belt is being reused, it must be reinstalled to rotate in the original direction.
- b) Check that there is no oil, grease, or dirt on the timing belt.



69G01B-027

5. Loosen the tensioner lock bolt.
6. Turn the crankshaft twice in the direction of rotation, and align the mating marks.
7. Check that the timing marks are correctly aligned. If not aligned, remove the timing belt tensioner and timing belt, and repeat steps 1—6.



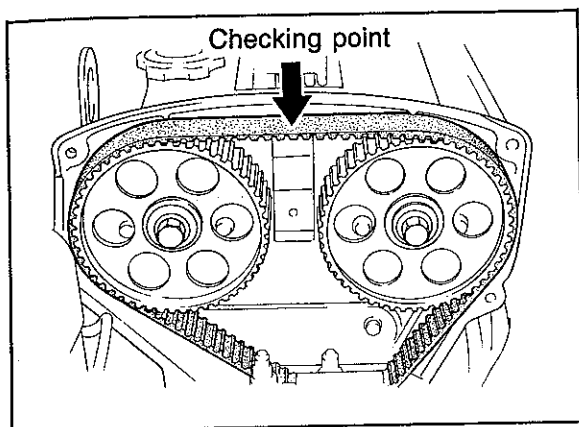
76F01B-008

8. Turn the crankshaft to align the **S** mark of the right side camshaft pulley with seal plate mating mark.
9. Tighten the timing belt tensioner lock bolt.

**Tightening torque:**

**37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)**

## ON-VEHICLE MAINTENANCE (TIMING BELT) 1B



76F01B-009

10. Then turn the crankshaft and align the mating marks. Check the timing belt deflection. If the deflection is not correct, repeat the adjustment from step 5 above.

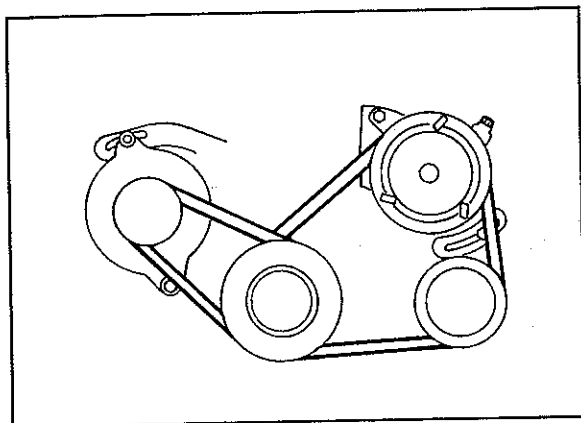
**Timing belt deflection (98 N, 10 kg, 22 lb)**

**New : 8.5—9.5 mm (0.33—0.37 in)**

**Used: 9.0—10.0 mm (0.35—0.39 in)**

### Caution

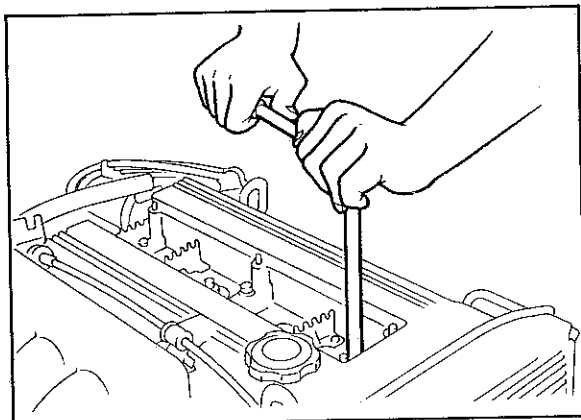
Be sure not to apply tension other than that of the tensioner spring.



76G01B-028

### Drive belt

Install each drive belt, and check the belt deflection. (Refer to page 1B—6.)



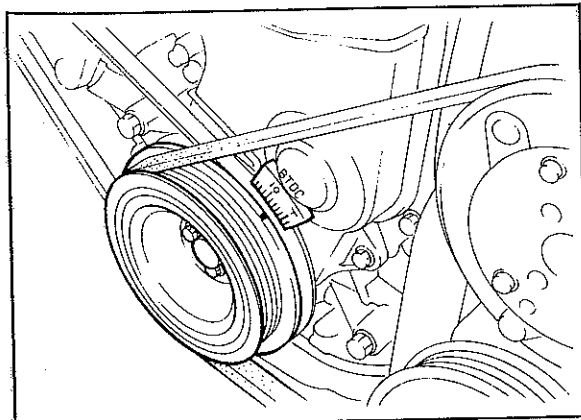
79G01C-021

### Spark plug

1. Apply anti-seize compound or molybdenum-based lubricant to the spark plug threads.
2. Install the spark plugs.

### Tightening torque:

**15—23 N·m (1.5—2.3 m·kg, 11—17 ft·lb)**



86U01X-029

### Steps After Installation

Perform the necessary engine adjustment. (Refer to TUNE-UP PROCEDURE.)

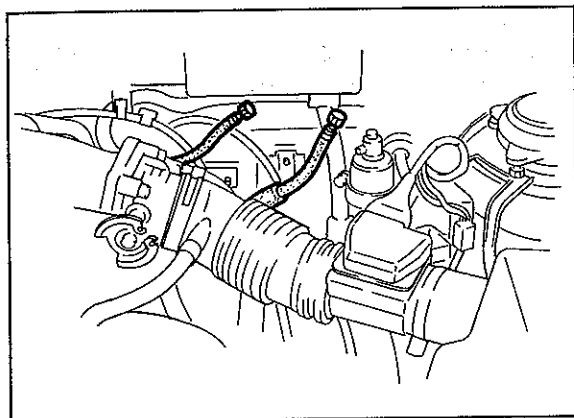




## ON-VEHICLE MAINTENANCE (CYLINDER HEAD) 1B

1. Center cover
2. High-tension lead and spark plug
3. Accelerator cable
4. Air intake pipe assembly
5. Fuel hose
6. Upper radiator hose
7. Heater hose
8. Brake vacuum hose
9. Engine harness connector and ground
10. A/C compressor and bracket
11. Exhaust manifold insulator
12. Exhaust pipe
13. Exhaust manifold
14. Intake manifold bracket
15. Intake manifold assembly
16. Distributor
17. Engine mount stay
18. Upper timing belt cover
19. Timing belt tensioner spring
20. Timing belt
21. Cylinder head cover
22. Cylinder head and gasket

76F01B-011



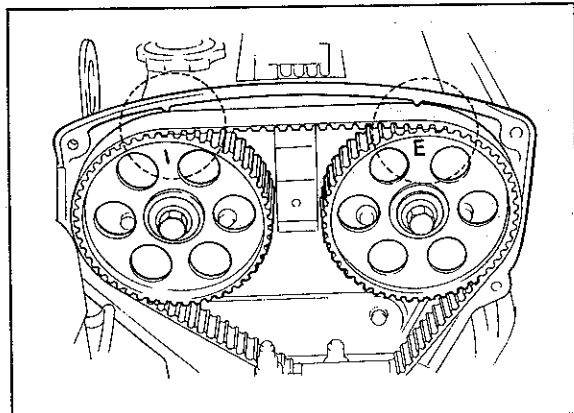
86U01X-032

### Removal note Fuel hose

#### Warning

- a) Cover the hose with a rag because fuel will spray out when disconnecting.
- b) Keep sparks and open flame away from the fuel area.

Plug the disconnected hoses to avoid fuel leakage.



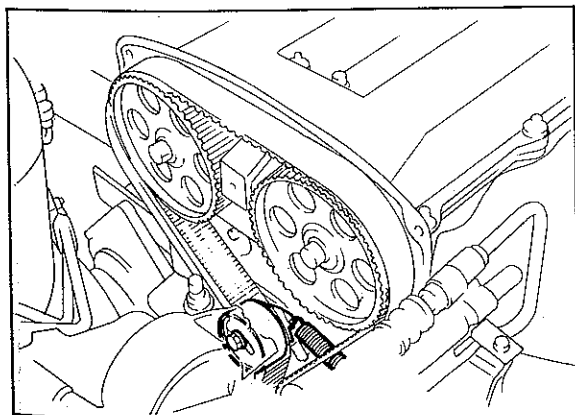
76G01B-031

### Timing belt

1. Before removing the timing belt, turn the crankshaft to align the mating marks of the camshaft pulleys with the seal plate timing mark.

#### Note

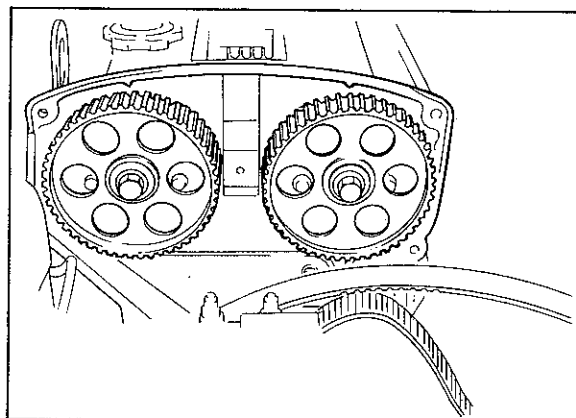
- For intake side camshaft pulley, align "I" mark.
- For exhaust side camshaft pulley, align "E" mark.



69G01B-036

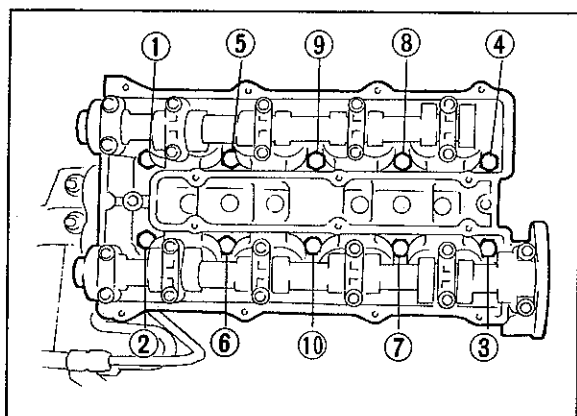
2. Loosen the timing belt tensioner lock bolt.
3. Shift the tensioner outward as far as possible, then temporarily tighten it.

# 1B ON-VEHICLE MAINTENANCE (CYLINDER HEAD)



69G01B-037

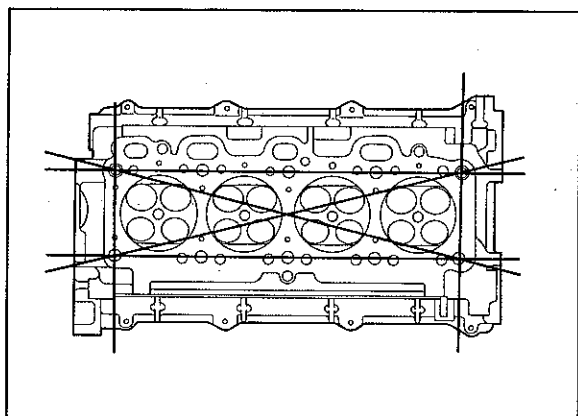
4. Remove the timing belt and secure it out of the way to prevent damage during removal and installation of the cylinder head.



76G01A-111

### Cylinder head bolt

Loosen the cylinder head bolts in two or three steps in the order shown in the figure.



76G01B-032

### Disassembly of Cylinder Head

Refer to page 1B—28.

### Inspection of Cylinder Head

Refer to page 1B—34.

### Assembly of Cylinder Head

Refer to page 1B—59.

# ON-VEHICLE MAINTENANCE (CYLINDER HEAD) 1B

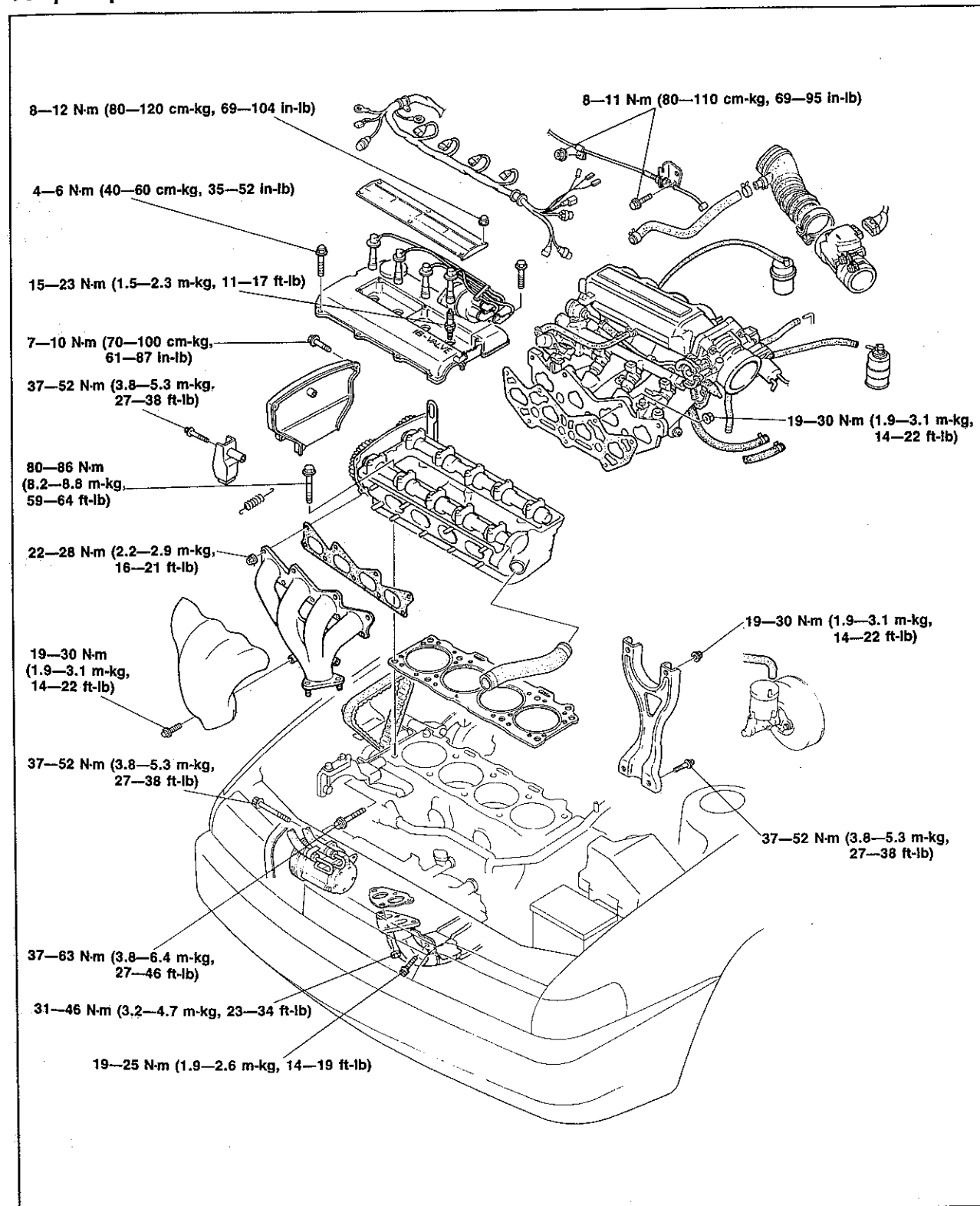
## Installation

Install in the reverse order of removal referring to the installation note.

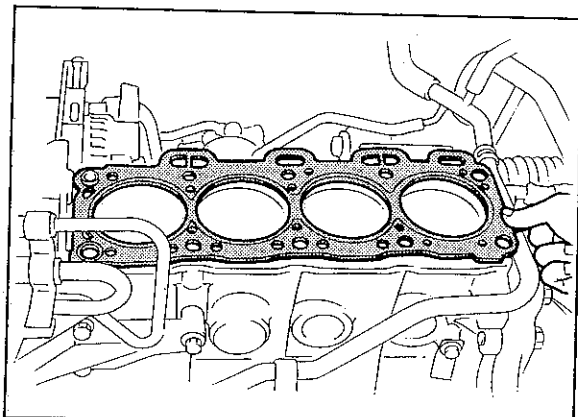
### Note

- a) Position the hose clamp in the original location on the hose.
- b) Squeeze the clamp lightly with large pliers to ensure a good fit.

## Torque Specifications



# 1B ON-VEHICLE MAINTENANCE (CYLINDER HEAD)

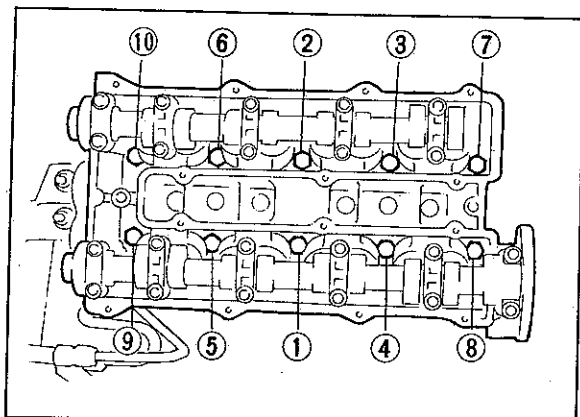


86U01X-035

## Installation note

### Cylinder head

1. Thoroughly remove all dirt and oil from the top of the cylinder block with a rag.
2. Place a new cylinder head gasket in position.

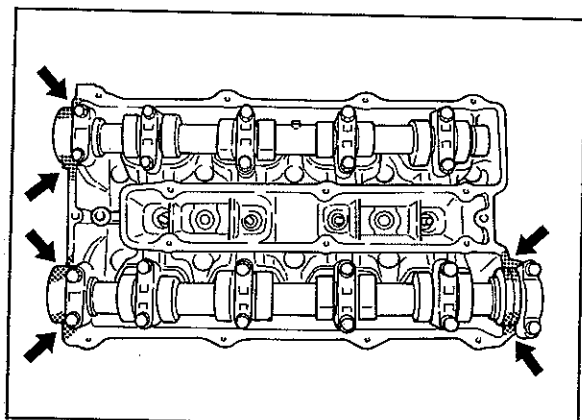


86U01X-036

3. Set the cylinder head in place.
4. Apply engine oil to the bolt threads and seat faces.
5. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

### Tightening torque:

80—86 N·m (8.2—8.8 m·kg, 59—64 ft·lb)



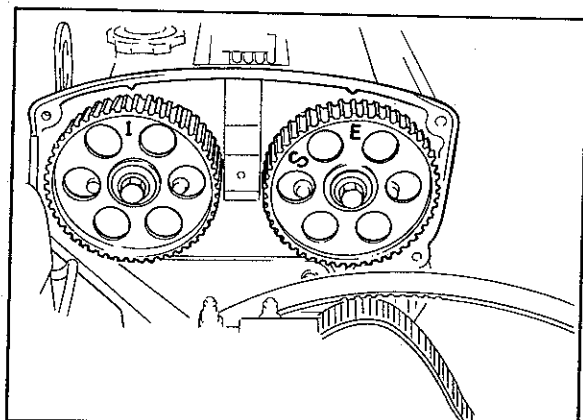
76G01B-033

### Cylinder head cover

1. Apply silicon sealant to the shaded area as shown in the figure.
2. Install the cylinder head cover and gasket.

### Tightening torque:

4—6 N·m (40—60 cm·kg, 35—52 in·lb)



76G01B-034

### Timing belt

1. Align the mating marks of the camshaft pulleys with the seal plate timing mark.

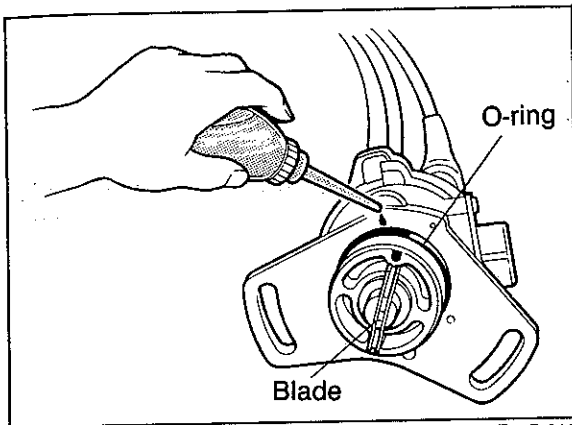
### Note

For intake side camshaft pulley, align "I" mark.

For exhaust side camshaft pulley, align "E" mark.

2. Install the timing belt. (Refer to TIMING BELT of ON-VEHICLE MAINTENANCE.)

## ON-VEHICLE MAINTENANCE (CYLINDER HEAD) 1B



### Distributor

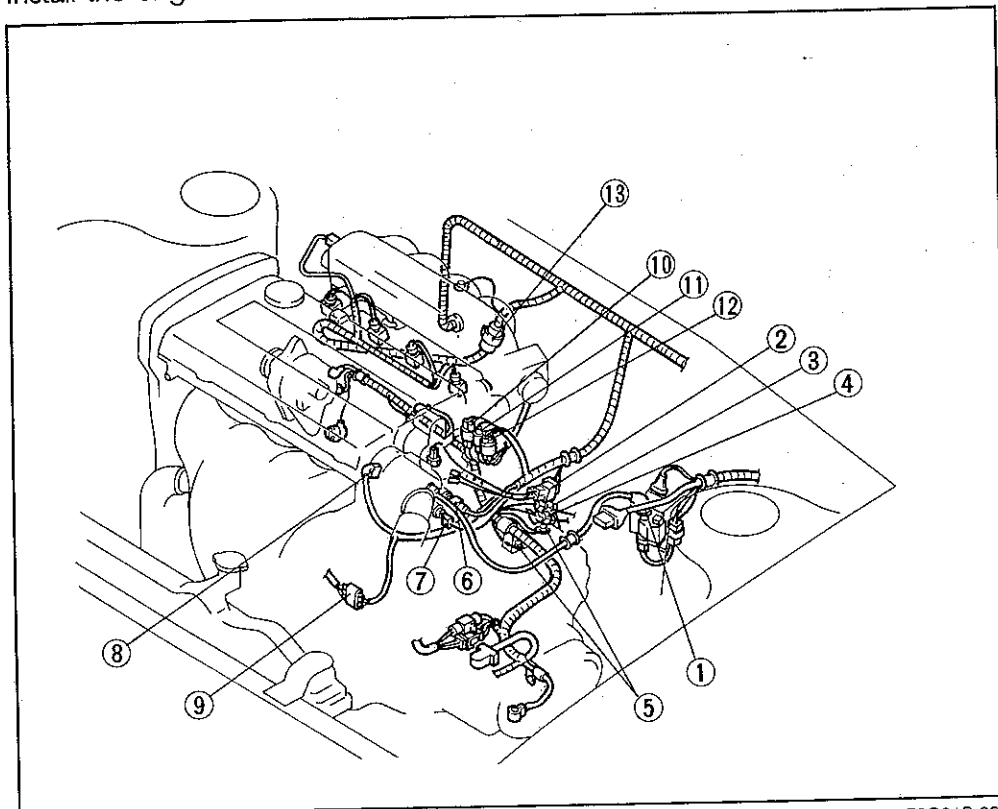
1. Apply engine oil to the O-ring, and position it on the distributor.
2. Apply engine oil to the blade.
3. Install the distributor.
4. Loosely tighten the distributor mounting bolt.

### Note

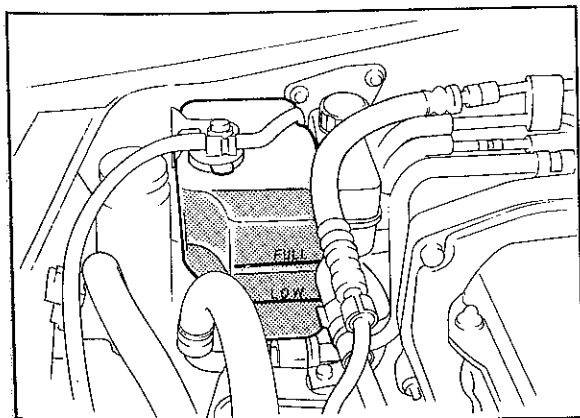
The distributor blade and the distributor drive groove are offset to prevent mistake installation.

### Engine harness connector

Install the engine harness connectors.



1. IG coil
2. Heat gauge unit
3. Speed sensor
4. P/S switch
5. Engine ground
6. Water temperature sensor
7. Water thermo switch
8. Crank angle sensor
9. Oxygen sensor
10. Linear solenoid
11. Solenoid valve (idle speed control)
12. Throttle position sensor
13. Injection harness



### Steps After Installation

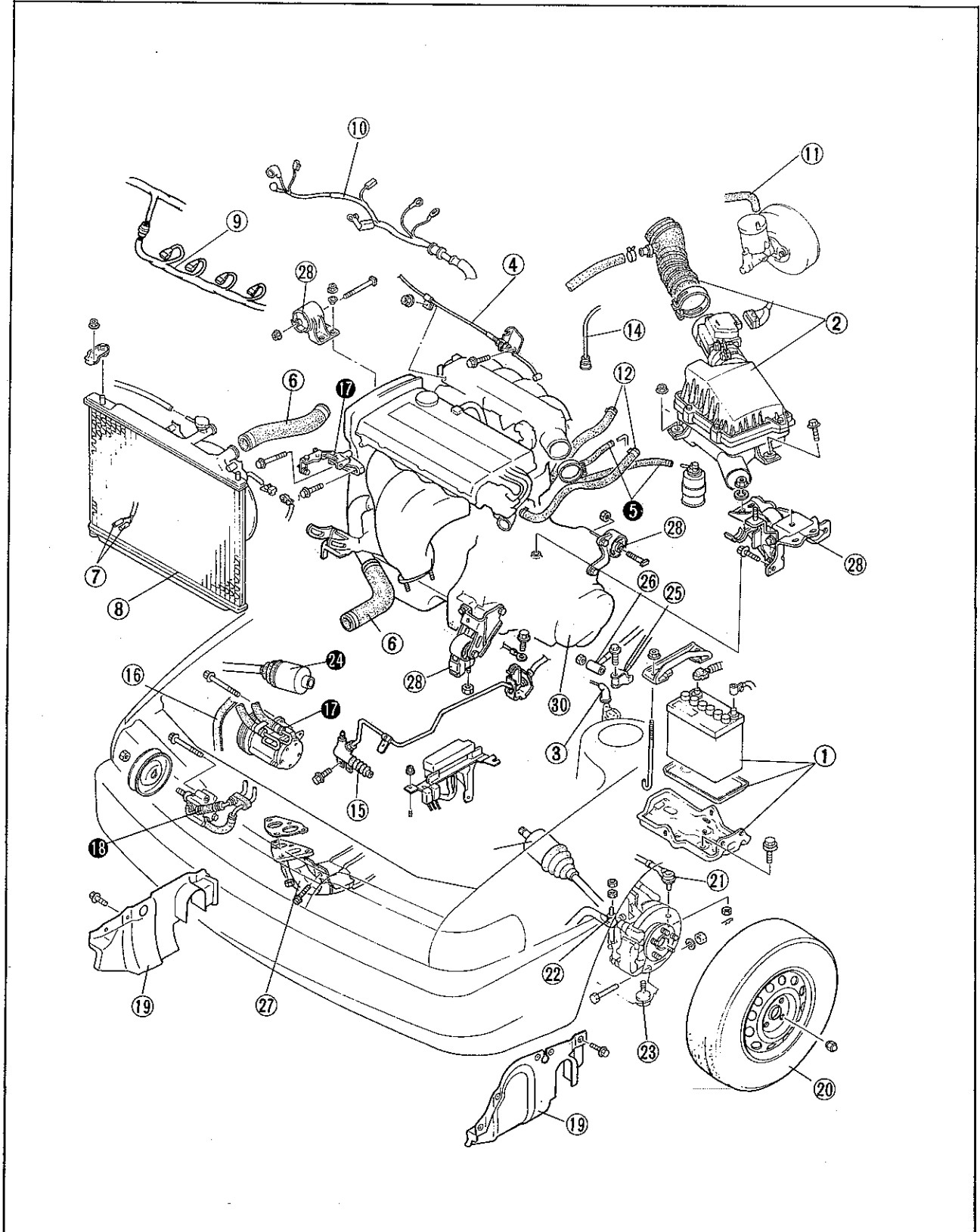
1. Fill the radiator with the specified amount and type of coolant.
2. Perform the necessary engine adjustments. (Refer to TUNE-UP PROCEDURE.)

# 1B REMOVAL

## REMOVAL

**Warning: Release the fuel pressure. (Refer to Section 4B.)**

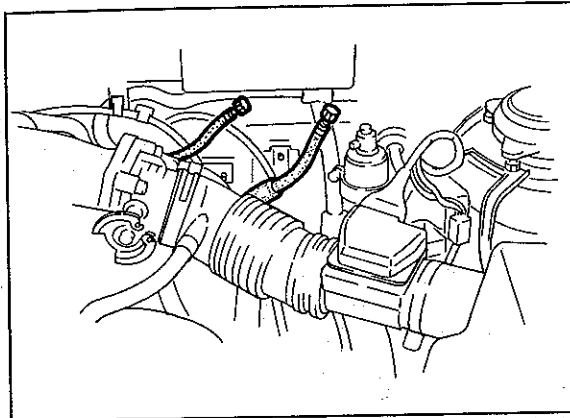
1. Disconnect the negative battery cable.
2. Drain the engine oil and coolant.
3. Remove in the sequence shown in the figure referring to the removal note for specially marked parts.



76F01B-013

- |                                |                                |                            |
|--------------------------------|--------------------------------|----------------------------|
| 1. Battery and battery carrier | 12. Heater hose                | 21. Tie-rod end            |
| 2. Air cleaner assembly        | 13. Transaxle harness          | 22. Stabilizer control rod |
| 3. High-tension lead           | 14. Speedometer cable          | 23. Lower arm bushing      |
| 4. Accelerator cable           | 15. Clutch release cylinder    | 24. Driveshaft             |
| 5. Fuel hose                   | 16. Drive belt                 | 25. Change rod             |
| 6. Radiator hose               | 17. A/C compressor and bracket | 26. Extension bar          |
| 7. Radiator harness            | 18. P/S oil pump               | 27. Exhaust pipe           |
| 8. Radiator and cooling fan    | 19. Engine side cover          | 28. Engine mount           |
| 9. EGI harness                 | 20. Front wheel                | 29. Engine and transaxle   |
| 10. Engine harness             |                                | 30. Transaxle              |
| 11. Brake vacuum hose          |                                |                            |

76F01B-014



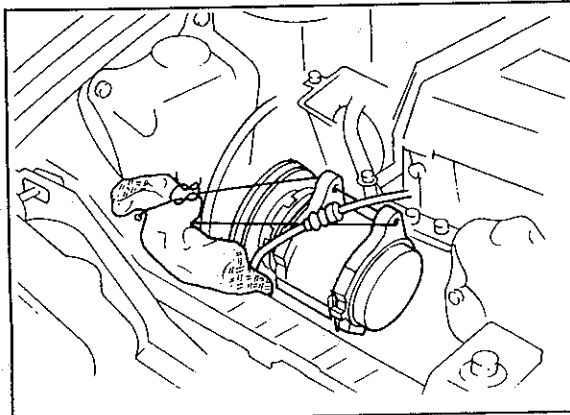
76G01A-118

### Removal Note Fuel hose

#### Warning

- Cover the hose with a rag because fuel will spray out when disconnecting.
- Keep sparks and open flame away from the fuel area.

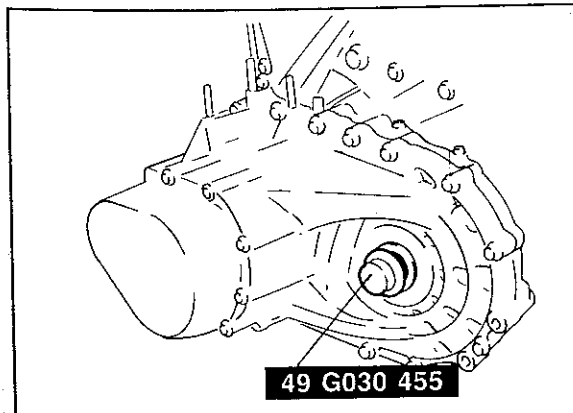
Plug the disconnected hoses to avoid fuel leakage.



67U01X-029

### P/S pump, A/C compressor

Remove the P/S pump and A/C compressor with the hoses still connected to them, secure the pump and compressor as shown in the figure.



49 G030 455

86U01X-060

### Driveshaft

Remove the driveshafts. (Refer to Section 9.) Slide the **SST** into the transaxle.

# 1B DISASSEMBLY (AUXILIARY PARTS)

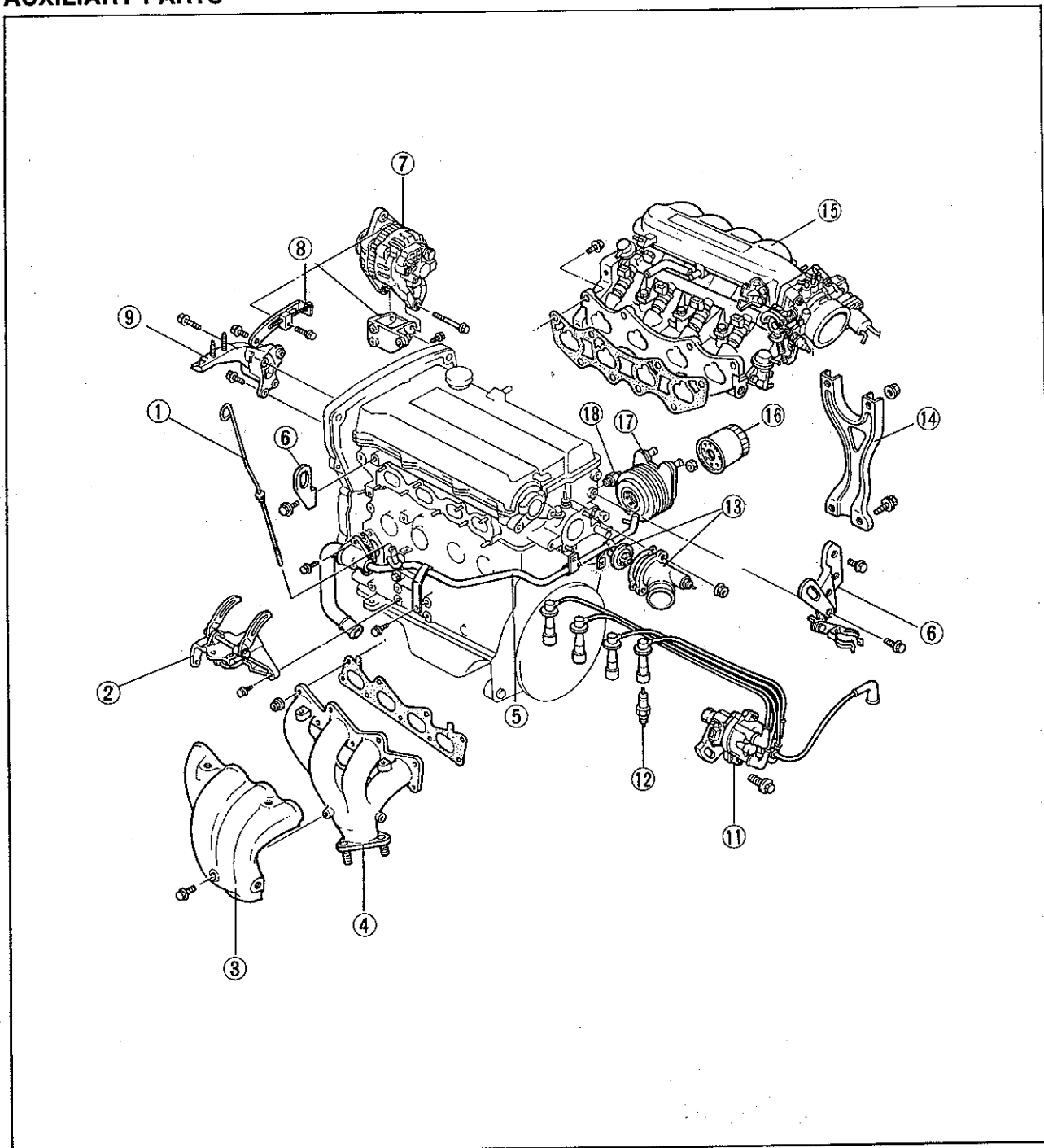
## DISASSEMBLY

1. Remove in the sequence shown in the figure referring to the disassembly note for specially marked parts.
2. Code all identical parts (such as pistons, piston rings, connecting rods, and valve springs) so that they can be reinstalled in the cylinder from which they were removed.
3. Clean the parts with steam, blow off any remaining water with compressed air.

### Note

Care should be taken during the disassembly of any part or system to study its order of assembly. Any deformation, wear, or damage should also be noted.

## AUXILIARY PARTS



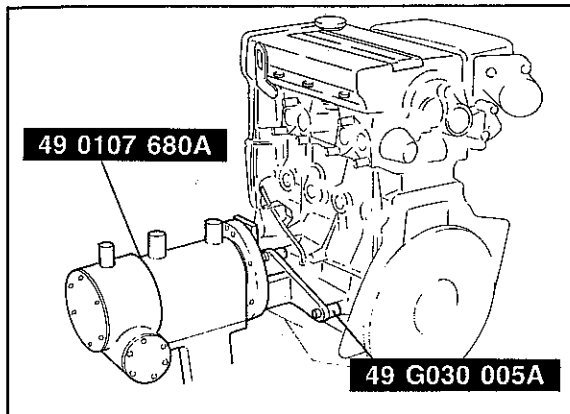
76G01A-119



## DISASSEMBLY (AUXILIARY PARTS) 1B

1. Oil level gauge
2. P/S oil pump bracket
3. Exhaust manifold insulator
4. Exhaust manifold assembly
5. Coolant inlet pipe and bypass pipe
6. Engine hanger
7. Alternator
8. Alternator strap and bracket
9. Engine mount bracket
10. Center cover
11. Distributor and high-tension lead
12. Spark plug
13. Thermostat and thermostat cover
14. Intake manifold bracket
15. Intake manifold assembly
16. Oil filter
17. Oil cooler
18. Oil pressure switch

76F01B-015

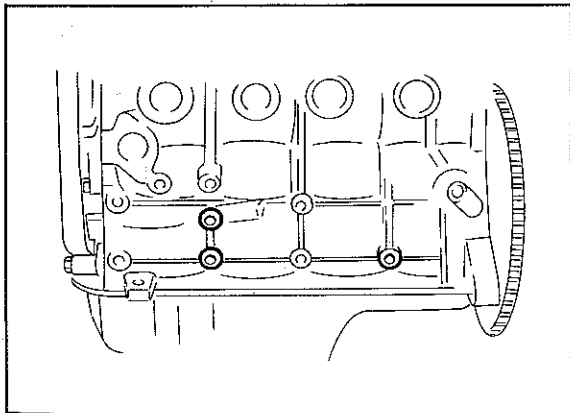


76G01A-120

### Disassembly Note

#### Engine hanger

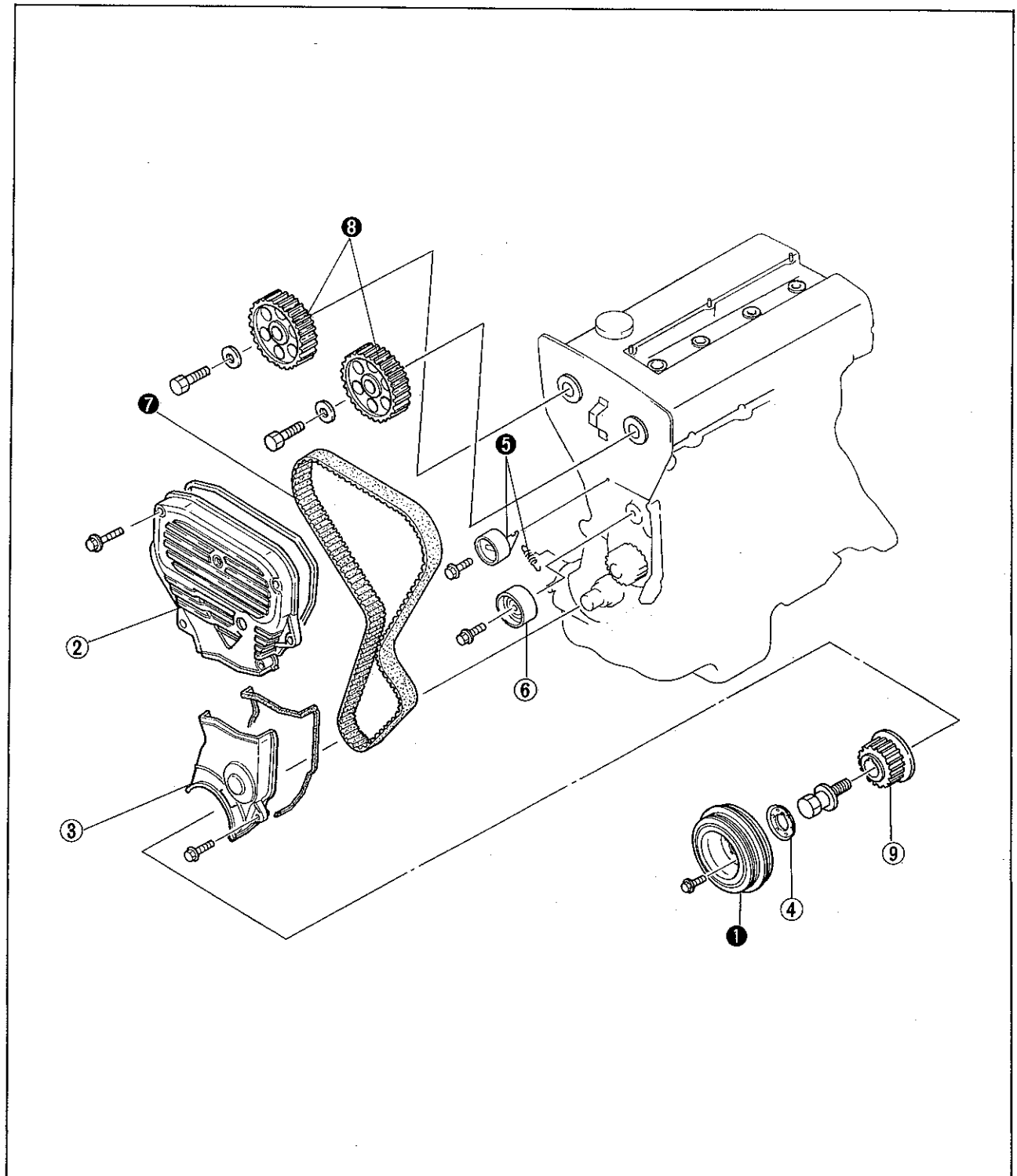
Remove the exhaust manifold; then connect the **SST** to the engine.



69G01X-000

# 1B DISASSEMBLY (TIMING BELT)

## TIMING BELT

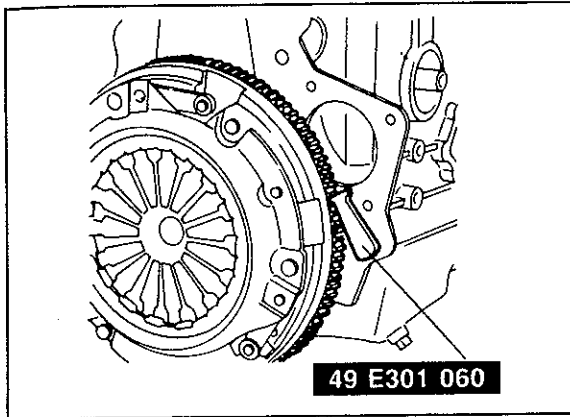


69G01B-072

1. Crankshaft pulley
2. Upper timing belt cover
3. Lower timing belt cover
4. Baffle plate
5. Timing belt tensioner and spring

6. Timing belt idler pulley
7. Timing belt
8. Camshaft pulley
9. Timing belt pulley

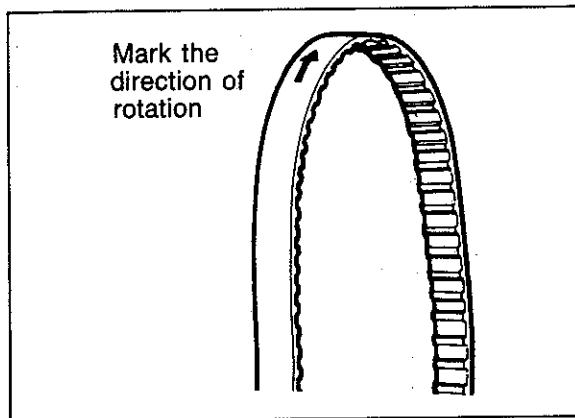
## DISASSEMBLY (TIMING BELT) 1B



76G01A-121

### Disassembly Note Crankshaft pulley

1. Set the **SST** against the flywheel.
2. Remove the crankshaft pulley.



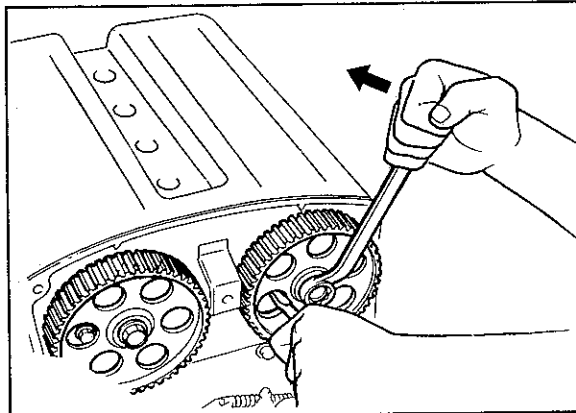
76G01B-119

### Timing belt

1. Loosen the tensioner lock bolt, and remove the tensioner spring.
2. Mark the timing belt rotation for proper reinstallation if it is reused.
3. Remove the timing belt.

### Caution

Be careful not to allow oil or grease on the belt.

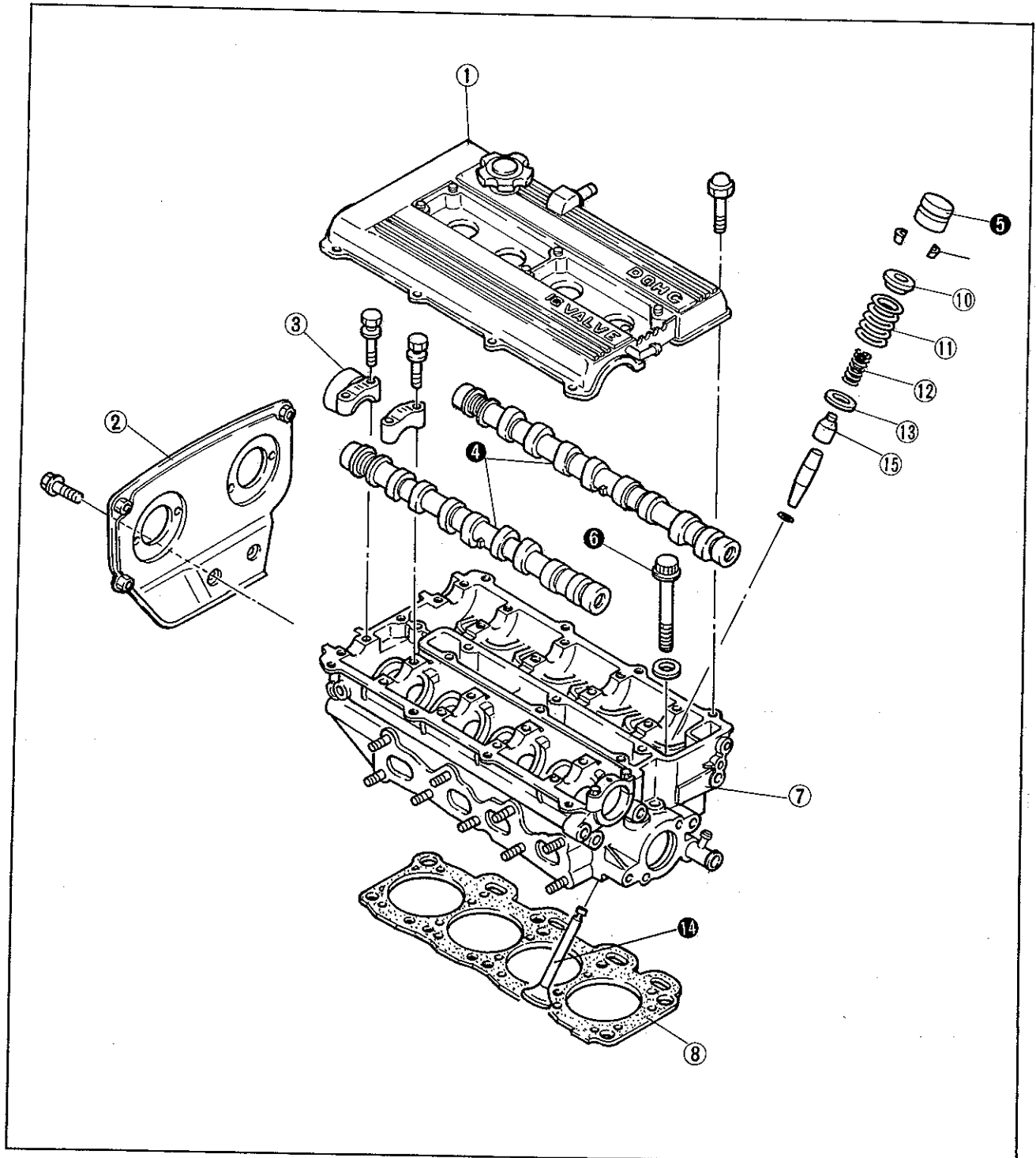


### Camshaft pulley

Remove the pulley lock bolt using a screw driver to prevent the camshaft from turning.

# 1B DISASSEMBLY (CYLINDER HEAD)

## CYLINDER HEAD

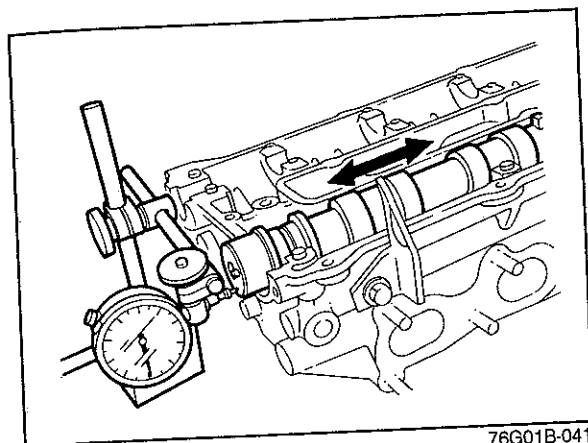


76G01B-040

1. Cylinder head cover
2. Seal plate
3. Camshaft cap
4. Camshaft
5. Hydraulic lash adjuster
6. Cylinder head bolt
7. Cylinder head
8. Cylinder head gasket

9. Valve keeper
10. Upper spring seat
11. Outer valve spring
12. Inner valve spring
13. Lower spring seat
14. Valve
15. Valve seal

# DISASSEMBLY (CYLINDER HEAD) 1B

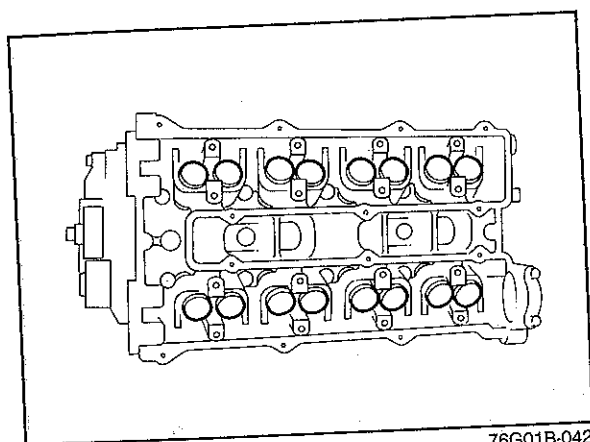


76G01B-041

## Disassembly Note Camshaft

Before removing the camshaft, clean the bearings and journals, and measure the following points.

1. Camshaft end play. (Refer to page 1B—41.)
2. Camshaft journal oil clearance. (Refer to page 1B—40.)



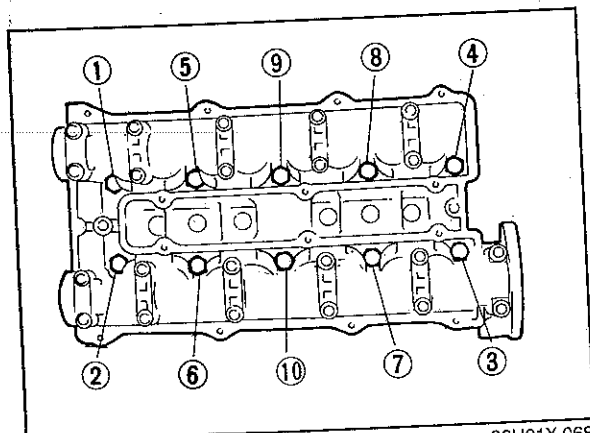
76G01B-042

## Hydraulic lash adjuster (HLA)

Remove the HLA from the cylinder head.

### Note

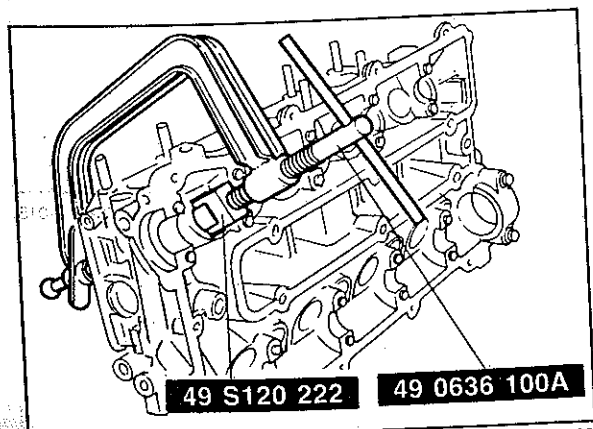
Mark each HLA so that they can be reinstalled in the position from which they were removed.



86U01X-068

## Cylinder head bolt

Loosen the cylinder head bolts in two or three steps in the order shown in the figure.



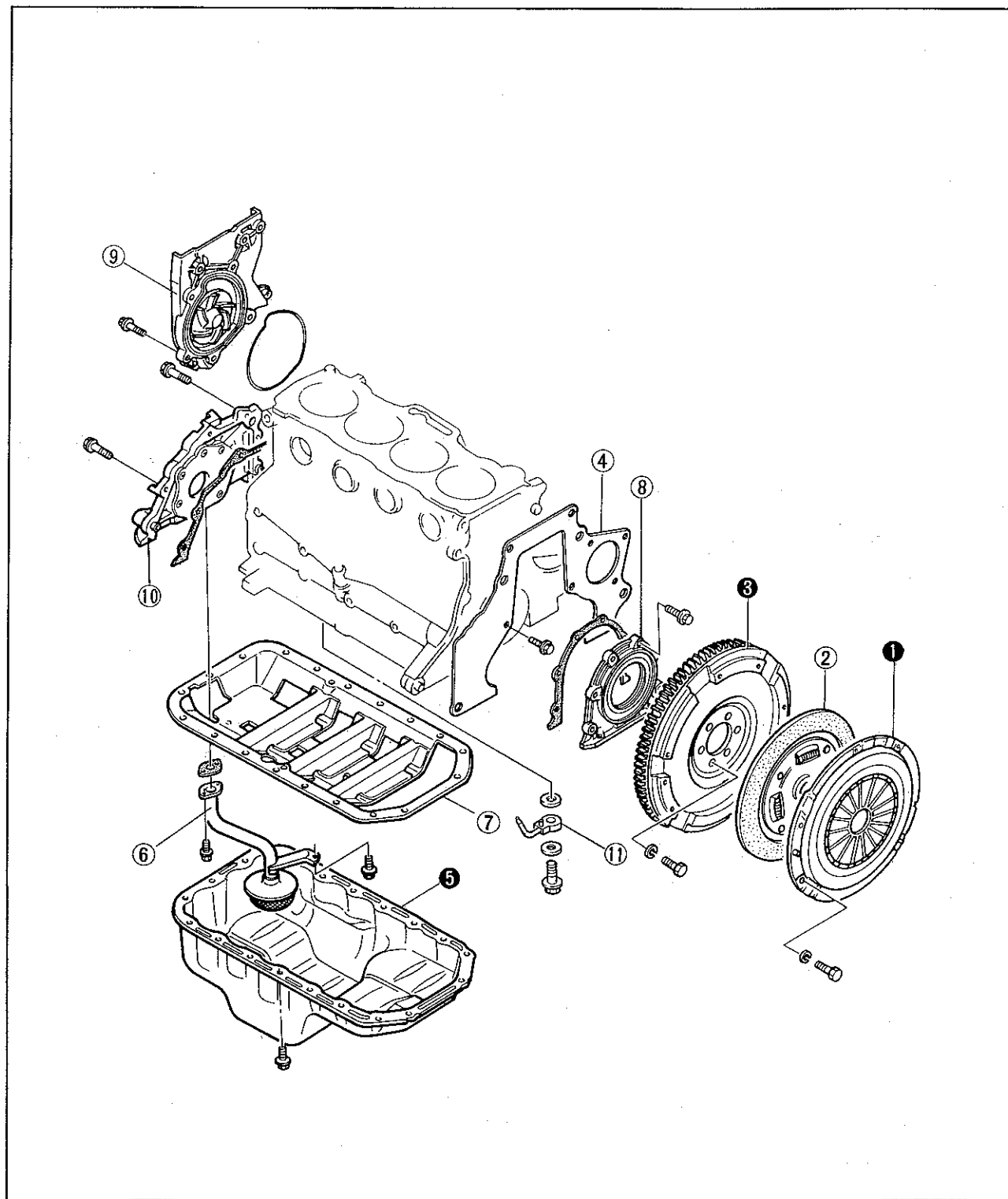
86U01X-069

## Valve

Remove the valves from the cylinder head with the SST.

# 1B DISASSEMBLY (CYLINDER BLOCK)

## CYLINDER BLOCK-I

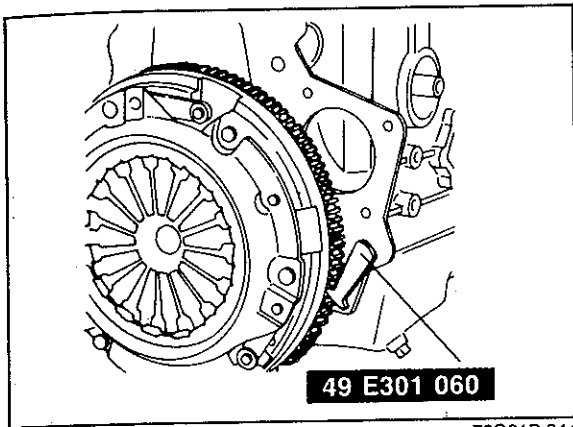


76F01B-016

1. Clutch cover
2. Clutch disc
3. Flywheel
4. End plate
5. Oil pan
6. Oil strainer

7. Stiffener
8. Rear cover
9. Water pump assembly
10. Oil pump assembly
11. Oil jet

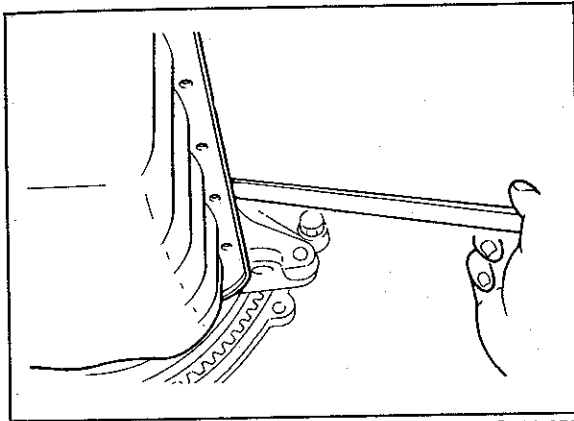
## DISASSEMBLY (CYLINDER BLOCK) 1B



### Disassembly Note

#### Clutch cover and flywheel

Remove the clutch cover and flywheel with the SST.



### Oil pan

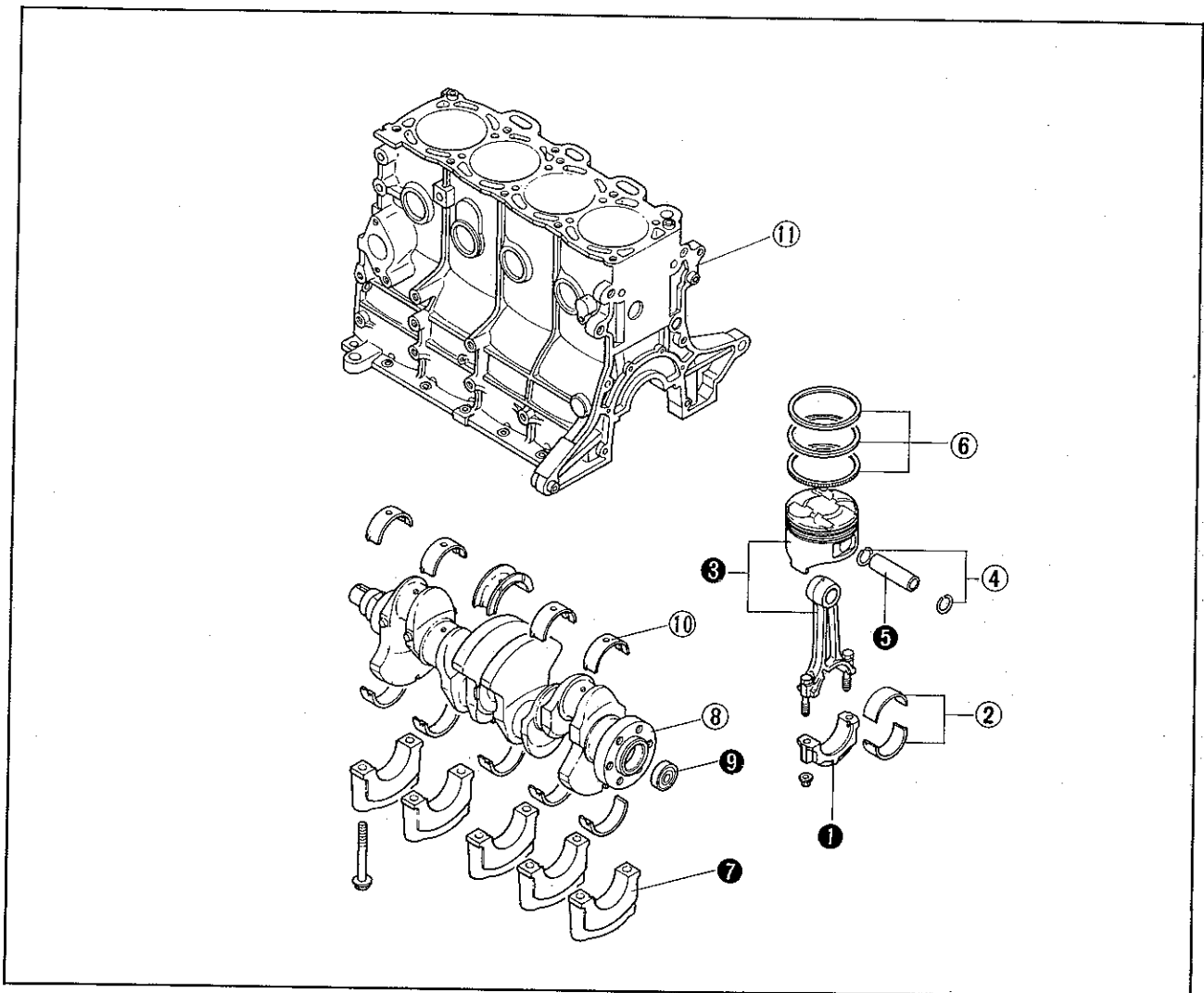
1. Remove the oil pan mounting bolts.
2. Insert a scraper or a suitable tool between the oil pan and the stiffener or the cylinder block to separate them.
3. Remove the oil pan.

### Caution

Do not bend the oil pan when prying loose.

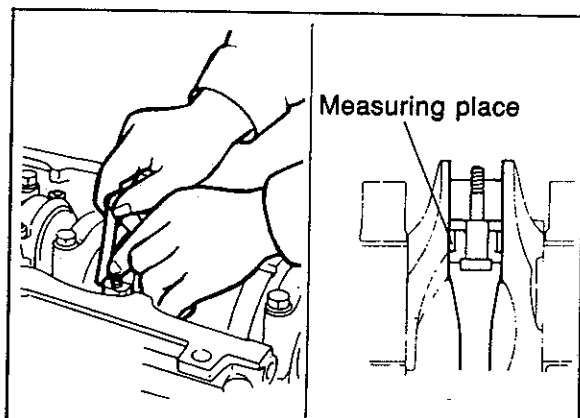
# 1B DISASSEMBLY (CYLINDER BLOCK)

## CYLINDER BLOCK-II



76G01B-046

1. Connecting rod cap
2. Connecting rod bearing
3. Connecting rod and piston
4. Clip
5. Piston pin
6. Piston ring
7. Main bearing cap
8. Crankshaft
9. Pilot bearing
10. Main bearing
11. Cylinder block



76G01B-047

### Disassembly Note

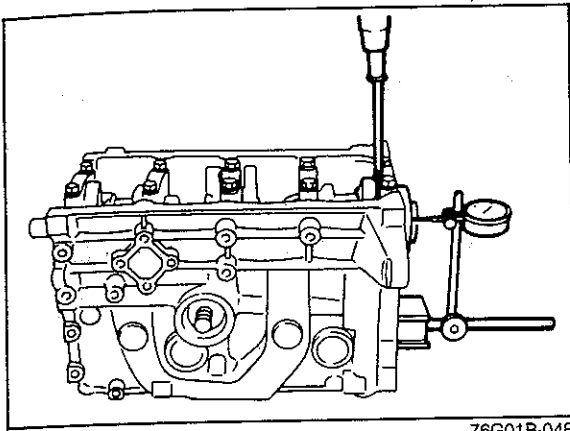
#### Connecting rod and cap

Before removing the connecting rod, clean the bearing, connecting rod, and crank pin, and measure the following points.

1. Connecting rod side clearance. (Refer to page 1B—53.)
2. Crankpin oil clearance. (Refer to page 1B—53.)



# DISASSEMBLY (CYLINDER BLOCK) 1B

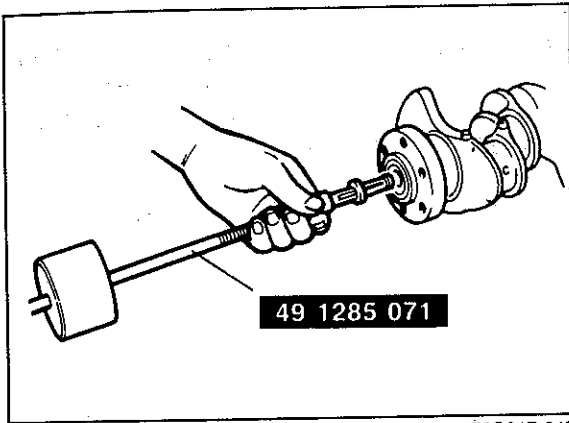


76G01B-048

## Main bearing cap

Before removing the main bearing caps, clean the bearings, main journals, and caps, and measure the following points.

1. Crankshaft end play. (Refer to page 1B—52.)
2. Main journal oil clearance. (Refer to page 1B—51.)

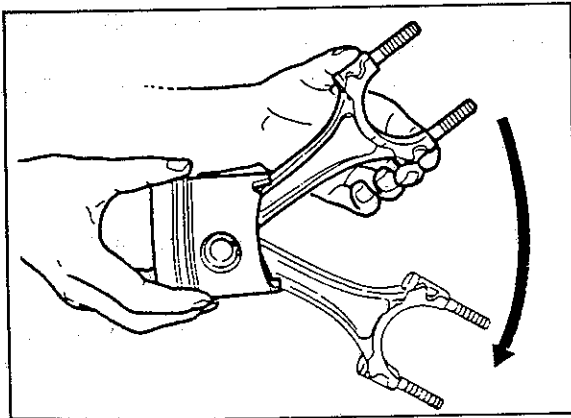


49 1285 071

76G01B-049

## Pilot bearing

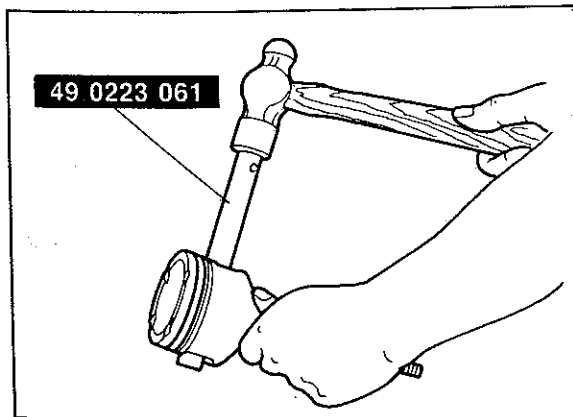
Remove the pilot bearing from the crankshaft with the SST.



79G01C-050

## Piston and connecting rod

1. Before disassembling the piston and connecting rod, check the oscillation torque as shown in the figure.  
If the large end does not drop by its own weight, replace the piston or the piston pin.



49 0223 061

76G01B-050

2. Remove the piston pin with the SST.

# 1B INSPECTION AND REPAIR

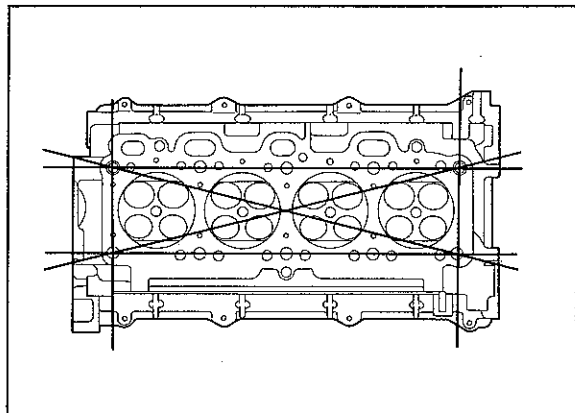
## INSPECTION AND REPAIR

1. Clean all parts, taking care to remove any gasket fragments, dirt, oil or grease, carbon, moisture residue, or other foreign materials.
2. Inspect and repair must be performed in the order specified.

### Caution

Be careful not to damage the joints or friction surfaces of aluminum alloy components (such as the cylinder head or pistons).

86U01X-077

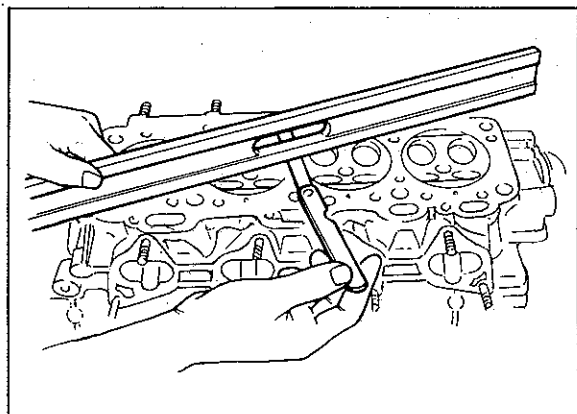


79G01C-106

### Cylinder Head

1. Inspect the cylinder head for damage, cracks, and leakage of water or oil. Replace if necessary.
2. Measure the cylinder head distortion in the six directions shown in the figure.

**Distortion: 0.15 mm (0.006 in) max.**



76G01B-051

3. If the cylinder head distortion exceeds specification, grind the cylinder head surface. If the cylinder head height is not within specification, replace it.

### Height:

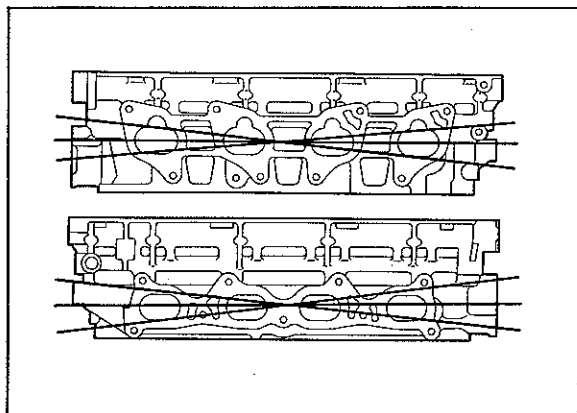
**133.95—134.05 mm (5.274—5.278 in)**

**Grinding limit: 0.20 mm (0.008 in) max.**

### Note

Before grinding the cylinder head, first check the following. Replace if necessary.

- Sinking of valve seat
- Damage of manifold contact surface
- Camshaft oil clearance and end play

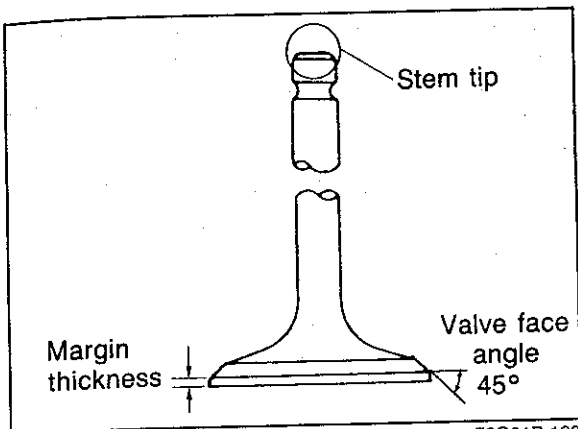


79G01C-053

4. Measure the manifold contact surface distortion in the six directions shown in the figure.

**Distortion: 0.15 mm (0.006 in) max.**

5. If distortion exceeds specification grind the surface or replace the cylinder head.



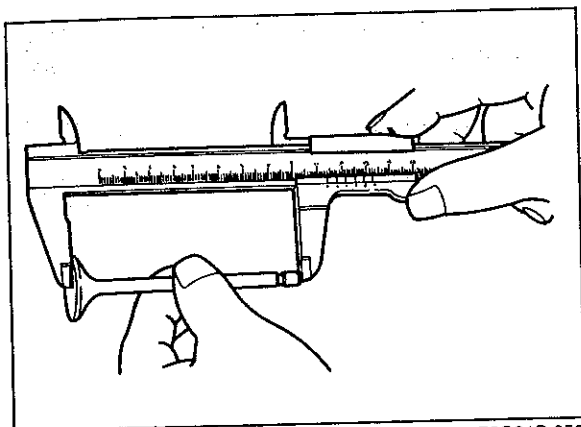
## Valve and Valve Guide

1. Inspect each valve for the following. Replace or resurface if necessary.
  - (1) Damaged or bent stem
  - (2) Roughness or damage to face
  - (3) Damage or uneven wear of stem tip
2. Check the valve head margin thickness. Replace if necessary

### Margin thickness

IN : 0.85 mm (0.033 in) min.

EX: 0.9 mm (0.035 in) min.

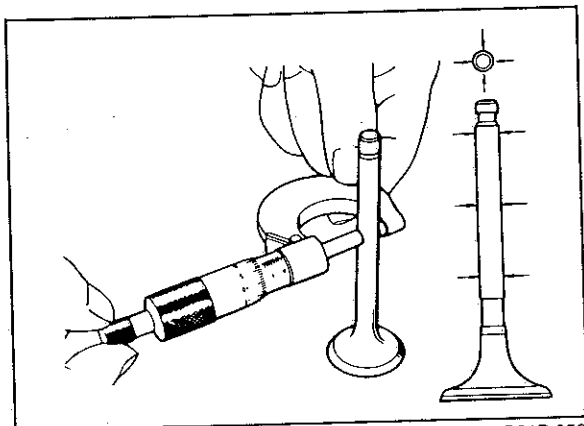


3. Measure the valve length.

### Length

IN : 103.18 mm (4.0622 in)

EX: 103.94 mm (4.0921 in)

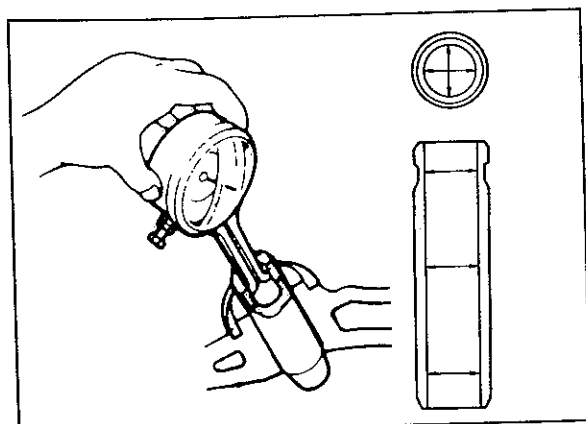


4. Measure the valve stem diameter.

### Diameter

IN : 5.970—5.985 mm (0.2350—0.2356 in)

EX: 5.965—5.980 mm (0.2348—0.2354 in)



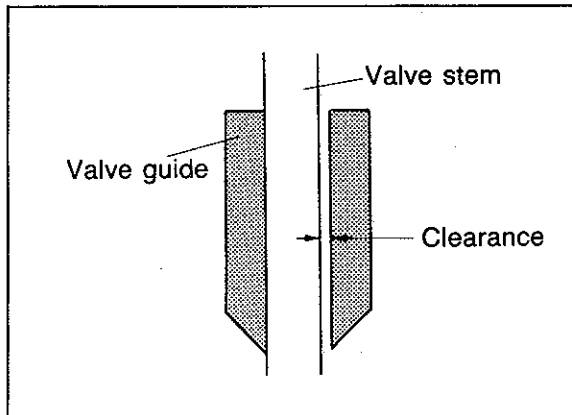
5. Measure the valve guide inner diameter.

### Inner diameter

IN : 6.01—6.03 mm (0.2366—0.2374 in)

EX: 6.01—6.03 mm (0.2366—0.2374 in)

# 1B INSPECTION AND REPAIR



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6. Measure the valve stem to guide clearance by subtract the outer diameter of the valve stem from the inner diameter of the corresponding valve guide.

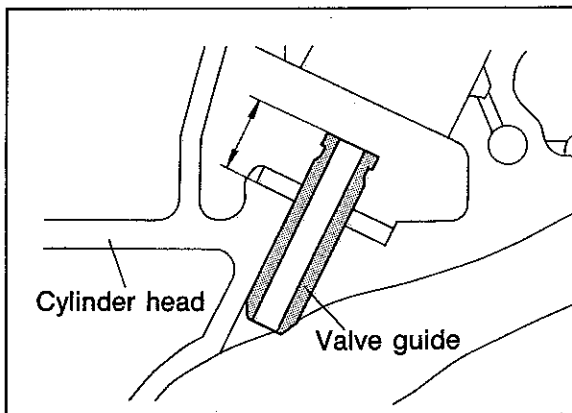
### Clearance

IN : 0.025—0.060 mm (0.0010—0.0024 in)

EX : 0.030—0.065 mm (0.0012—0.0026 in)

Maximum: 0.20 mm (0.0079 in)

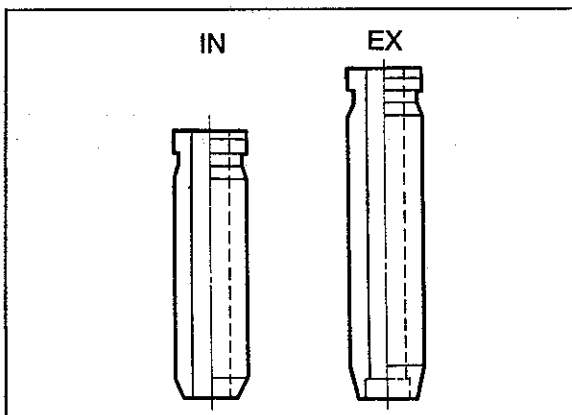
7. If the clearance exceeds the maximum, replace the valve and/or valve guide.



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8. Check that the valve guide projection height (dimension A in the figure). Replace if necessary.

Height: 11.4—11.9 mm (0.449—0.469 in)

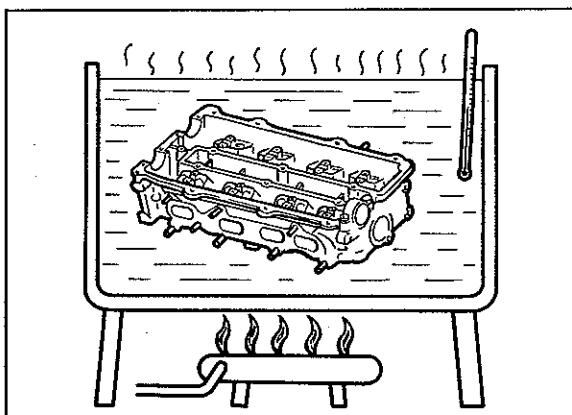


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### Replacement of valve guide

#### Note

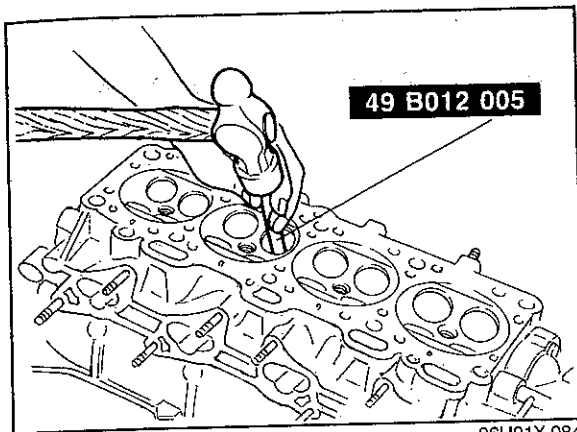
Although the shapes of the intake and exhaust valve guides are different.



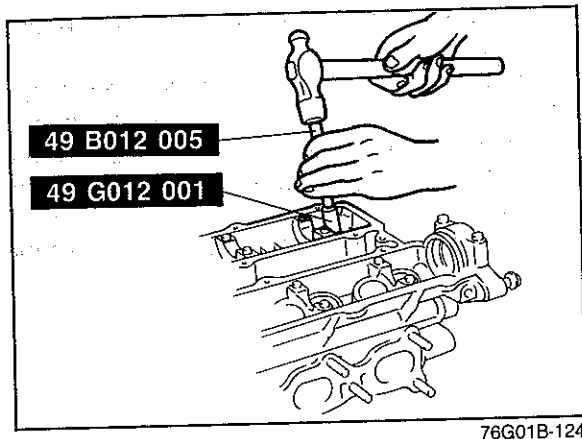
### Removal

1. Gradually heat the cylinder head in water to approx. 90°C (194°F).

# INSPECTION AND REPAIR 1B

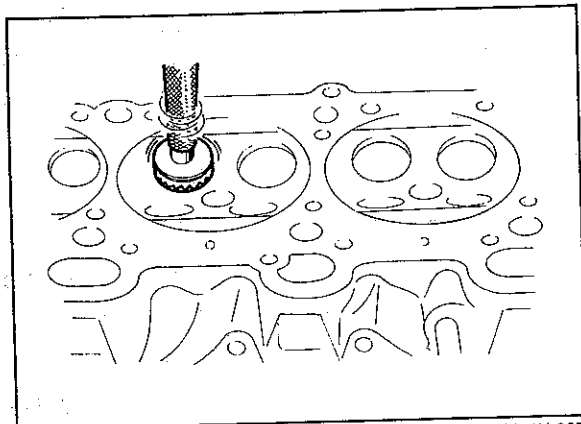


2. Remove the valve guide from the side opposite the combustion chamber with the **SST**.



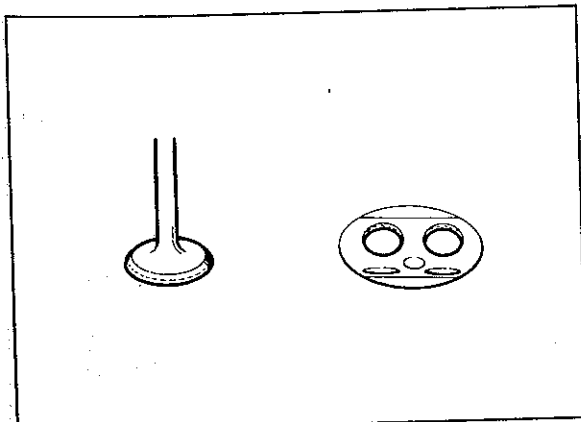
### Installation

1. Gradually heat the cylinder head in water to **approx. 90°C (194°F)**.
2. Tap the valve guide in from the side opposite the combustion chamber with the **SST** until the projection height is as specified.



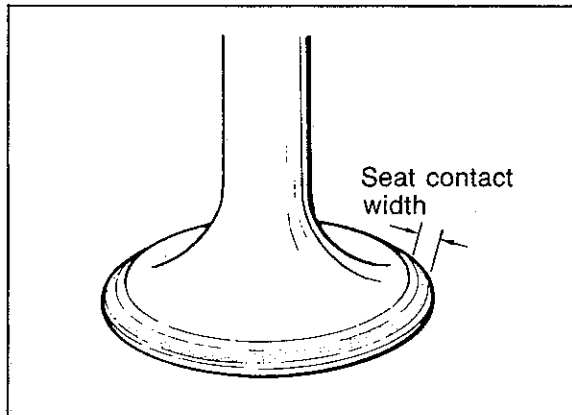
### Valve Seat

1. Inspect the contact surface of the valve seat and valve face for the following.
  - (1) Roughness
  - (2) Damage
2. If necessary, resurface the valve seat with a **45°** valve seat cutter and/or resurface the valve face.

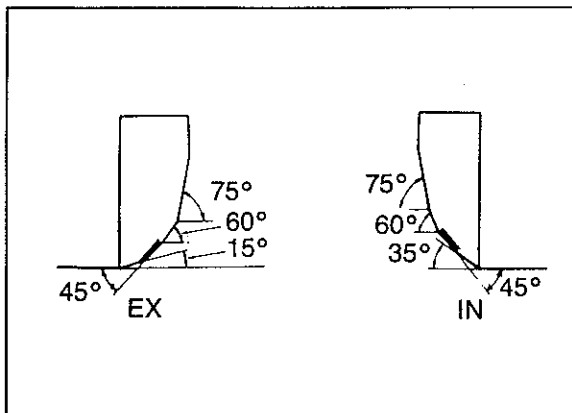


3. Apply a thin coat of prussian blue to the valve face.
4. Check the valve seating by rotating the valve against the seat.
  - (1) If blue does not appear 360° around the valve face, replace the valve.
  - (2) If blue does not appear 360° around the valve seat, resurface the seat.

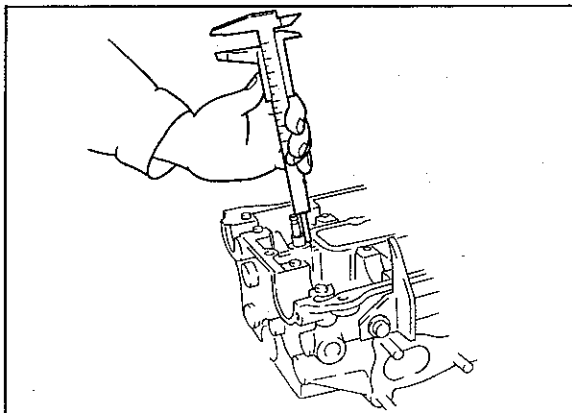
# 1B INSPECTION AND REPAIR



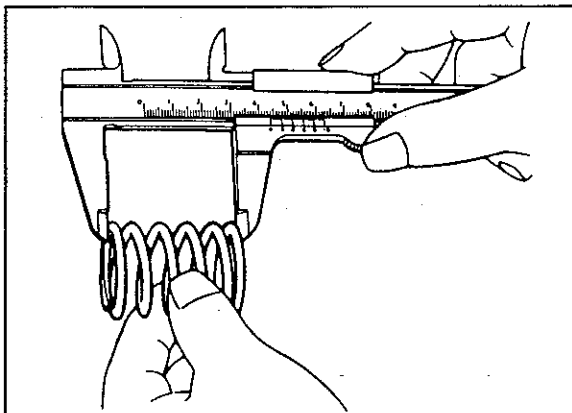
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86U01X-088



76G01B-055



76G01B-038

5. Check the seat contact width.

**Width: 1.2—1.6 mm (0.047—0.063 in)**

6. Check that the valve seating position is at the center of the valve face.

(1) If the seating position is too high, correct the valve seat with a **60°** cutter and a **45°** cutter.

(2) If the seating position is too low, correct the valve seat with a **35° (IN)** or **15° (EX)** cutter and a **45°** cutter.

7. Seat the valve to the valve seat with a lapping compound.

8. Check the sinking of the valve seat.

Measure protruding length (dimension L) of each valve stem.

**Dimension L: 36.8 mm (1.449 in)**

(1) If L is as below, it can be used as it is.

**36.8—37.6 mm (1.449—1.480 in)**

(2) If L is as below, insert a spacer between the spring seat and cylinder head to adjust.

**37.6—38.3 mm (1.480—1.508 in)**

(3) If L is more than as below, replace the cylinder head.

**38.3 mm (1.508 in) or more**

## Valve Spring

1. Inspect each valve spring for cracks or damage.

2. Check the free length and angle. Replace if necessary.

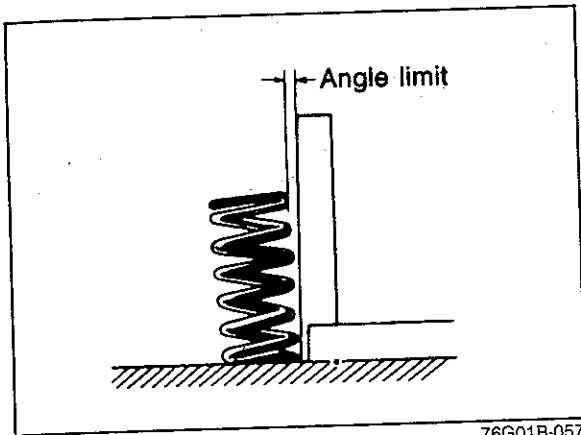
## Free length

**Outer Standard: 39.1 mm (1.539 in)**

**Minimum: 38.7 mm (1.524 in)**

**Inner Standard: 38.0 mm (1.496 in)**

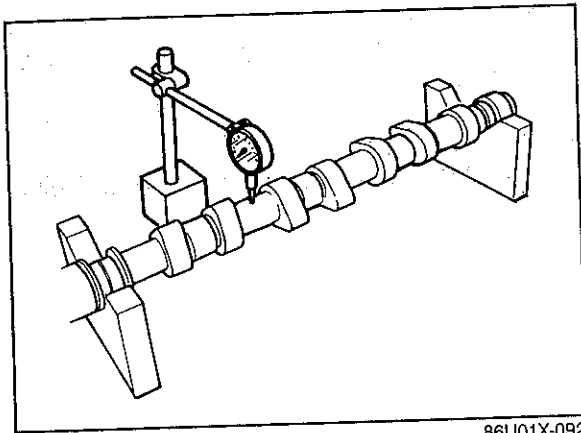
**Minimum: 37.7 mm (1.484 in)**



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### Angle

Outer: 1.4 mm (0.055 in) max.  
 Inner: 1.3 mm (0.051 in) max.

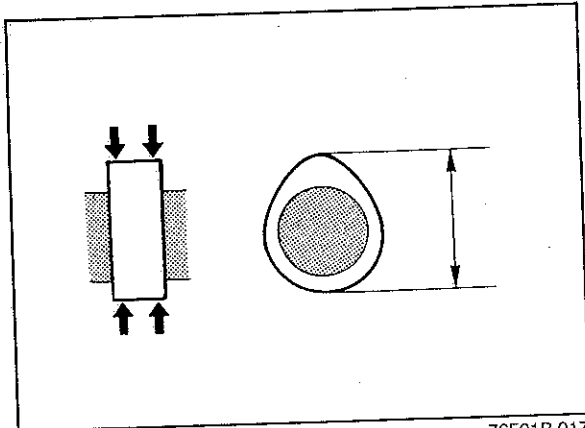


86U01X-092

### Camshaft

1. Set the front and rear journals on V-blocks. Check the camshaft runout. Replace if necessary.

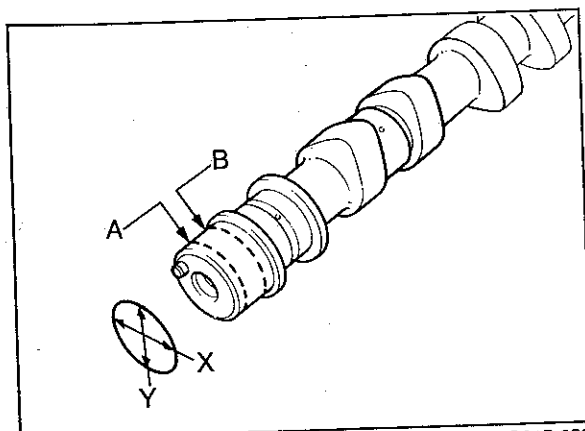
**Runout: 0.03 mm (0.0012 in) max.**



76F01B-017

2. Check the cam for wear or damage. Replace if necessary.
3. Check the cam lobe height at the two points as shown in the figure.

**Height : 45.055 mm (1.7738 in)**  
**Minimum: 44.855 mm (1.7659 in)**



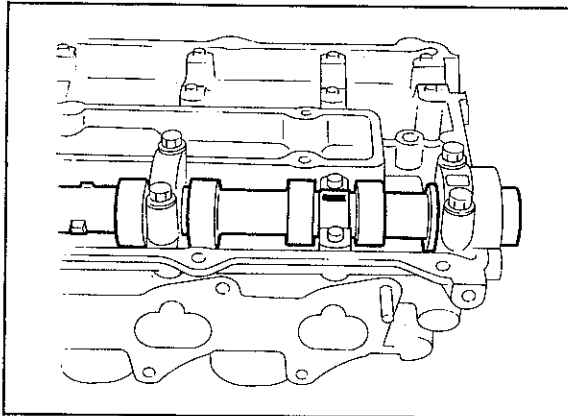
76G01B-059

4. Measure wear of the journals in X and Y directions at the two points as shown in the figure.

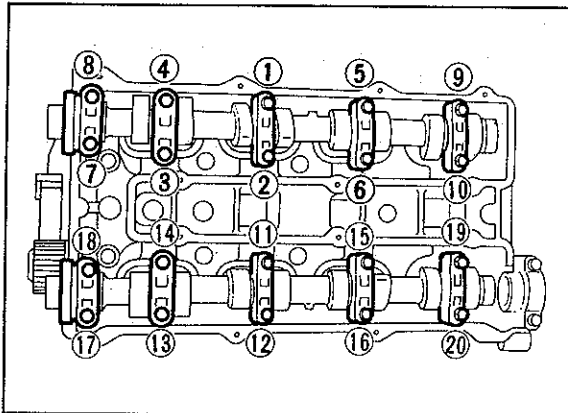
**Diameter:**  
**29.940—29.965 mm (1.1787—1.1797 in)**

**Out-of-round: 0.05 mm (0.002 in) max.**

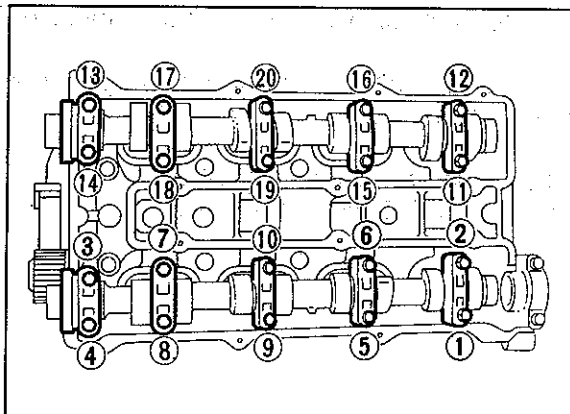
# 1B INSPECTION AND REPAIR



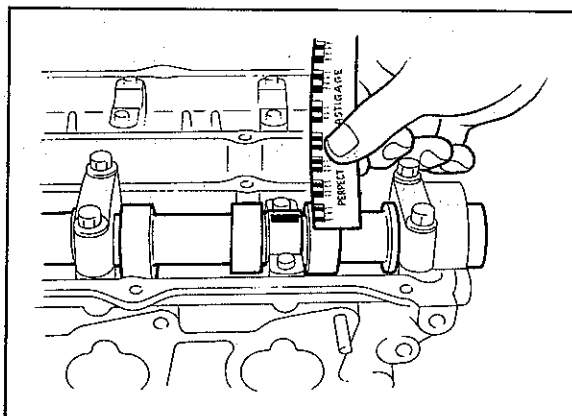
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76G01B-061



76G01B-062



76G01B-063

5. Measure the oil clearance of the camshaft and camshaft caps.

- (1) Remove any oil or dirt from the journals and bearing surface.
- (2) Set the camshaft onto the cylinder head.
- (3) Position plasti-gauge on top of the journals in the axial direction.

- (4) Place the camshaft caps according the cap number and arrow, and tighten them in the order shown in the figure.

**Tightening torque:**

**18—26 N·m (1.8—2.7 m·kg, 13—20 ft·lb)**

- (5) Loosen the camshaft cap bolts in the order shown in the figure.

- (6) Measure the oil clearance at each cap.

**Oil clearance:**

**0.035—0.085 mm (0.0014—0.0033 in)**

**Maximum: 0.15 mm (0.0059 in)**

- (7) If the oil clearance exceeds the maximum, replace the camshaft and/ or the cylinder head.