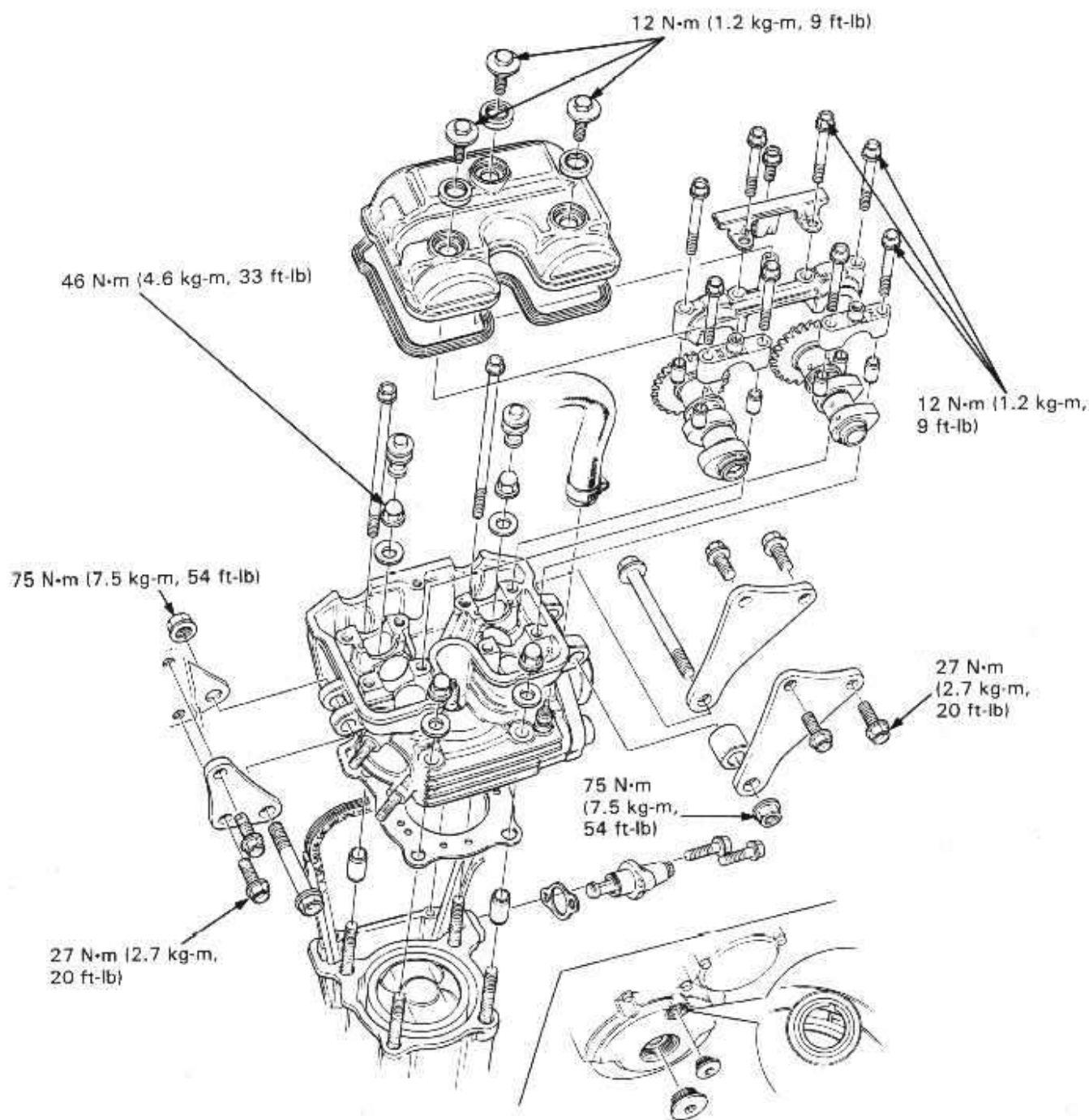


**CYLINDER HEAD/VALVE**

**CULASSE/SOUPAPE**

**ZYLINDERKOPE/VENTILE**



## CYLINDER HEAD/VALVES

SERVICE INFORMATION	9-1	VALVE SEAT INSPECTION/REFACING	9-11
TROUBLESHOOTING	9-2	CYLINDER HEAD ASSEMBLY	9-13
CYLINDER HEAD COVER REMOVAL	9-3	CYLINDER HEAD INSTALLATION	9-15
CAMSHAFT/CAM CHAIN TENSIONER REMOVAL	9-3	CAMSHAFT/CAM CHAIN TENSIONER INSTALLATION	9-16
CYLINDER HEAD REMOVAL	9-6	CYLINDER HEAD COVER INSTALLATION	9-19
CYLINDER HEAD DISASSEMBLY	9-7		
VALVE GUIDE REPLACEMENT	9-10		

## SERVICE INFORMATION

### GENERAL

- This section covers cylinder head, valves, camshaft and cam chain tensioner services.  
These services can be performed with the engine installed in the frame.
- See Section 3 for valve clearance inspection and adjustment procedures.
- Lubricate the camshaft journal and cam lobes with molybdenum disulfide grease for initial lubrication.

### SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder compression			1,569 ± 96 kPa (16.0 ± 1.0 kg/cm <sup>2</sup> , 228 ± 14 psi)	—
Camshaft	Cam lobe height	IN	38.21–38.45 (1.504–1.514)	38.150 (1.5020)
		EX	37.61–37.85 (1.481–1.490)	37.550 (1.4783)
	Journal	O.D.	24.959–24.980 (0.9826–0.9835)	24.940 (0.9819)
		Oil clearance	0.020–0.040 (0.0008–0.0016)	0.070 (0.0028)
Valve spring	Free length	Inner	34.41 (1.355)	33.0 (1.30)
		Outer	38.0 (1.50)	36.2 (1.43)
Valve, Valve guide	Valve stem O.D.	IN	4.475–4.490 (0.1762–0.1768)	4.47 (0.176)
		EX	4.455–4.470 (0.1754–0.1759)	4.45 (0.175)
	Valve guide I.D.	IN	4.500–4.512 (0.1772–0.1776)	4.55 (0.179)
		EX	4.500–4.512 (0.1772–0.1776)	4.55 (0.179)
	Stem-to-guide clearance	IN	0.010–0.037 (0.0004–0.0015)	0.08 (0.003)
		EX	0.030–0.057 (0.0012–0.0022)	0.10 (0.004)
Valve seat width			0.8–1.2 (0.03–0.05)	1.5 (0.06)
Valve guide projection height (IN/EX)			13 (0.51)	—
Valve lifter O.D.			25.978–25.993 (1.0228–1.0234)	25.97 (1.022)
Valve lifter bore (at cylinder head) I.D.			25.990–26.026 (1.0232–1.0246)	26.04 (1.039)
Cylinder head warpage			—	0.01 (0.0004)

**TORQUE VALUES**

Camshaft holder bolt	12 N·m (1.2 kg-m, 9 ft-lb)
Engine bracket bolt (8 mm)	27 N·m (2.7 kg-m, 20 ft-lb)
Engine mounting bolt (10 mm)	75 N·m (7.5 kg-m, 54 ft-lb)
Cylinder head cover bolt	12 N·m (1.2 kg-m, 9 ft-lb)
Cylinder head cap nut	46 N·m (4.6 kg-m, 33 ft-lb)

**TOOLS**

**Special**

Valve guide reamer, 4.5 mm	07HMH-ML00100
Valve hole protector	07HMG-MR70001
Valve compressor attachment	07959-KM30101
Valve guide driver	07HMD-ML00100

**Common**

Valve spring compressor	07757-0010000
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**VALVE SEAT CUTTER**

Valve seat cutter 24.5 mm (45°EX)	07780-0010100
Valve seat cutter 27.5 mm (45°IN)	07780-0010200
Valve flat cutter 25 mm (32°EX)	07780-0012000
Valve flat cutter 28 mm (32°IN)	07780-0012100
Valve interior cutter 30 mm (60°IN)	07780-0014000
Valve interior cutter 26 mm (60°EX)	07780-0014500
Valve seat cutter holder 4.5 mm	07781-0010600

**TROUBLESHOOTING**

Engine top-end problems usually affect engine performance. These can be diagnosed by a compression test, or by tracing noises with a sounding rod or stethoscope.

**Low compression**

- Valves
  - Incorrect valve adjustment
  - Burned or bent valves
  - Incorrect valve timing
  - Broken valve spring
- Cylinder head
  - Leaking or damaged head gasket
  - Warped or cracked cylinder head
- Cylinder and piston (Refer to Section 10)

**Compression too high**

- Excessive carbon build-up on piston or combustion chamber

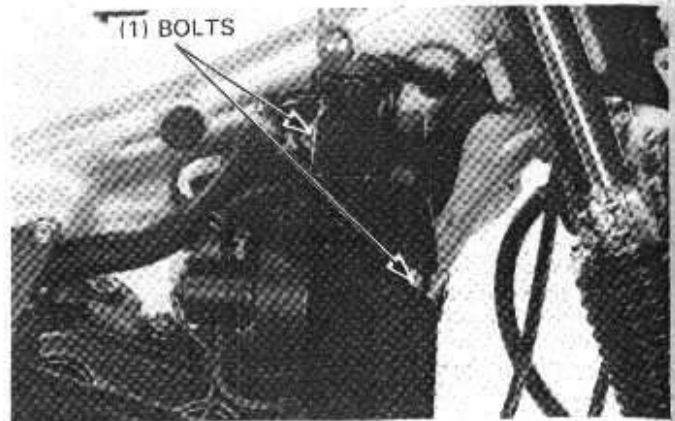
**Compression too high**

- Excessive carbon build-up on piston or combustion chamber

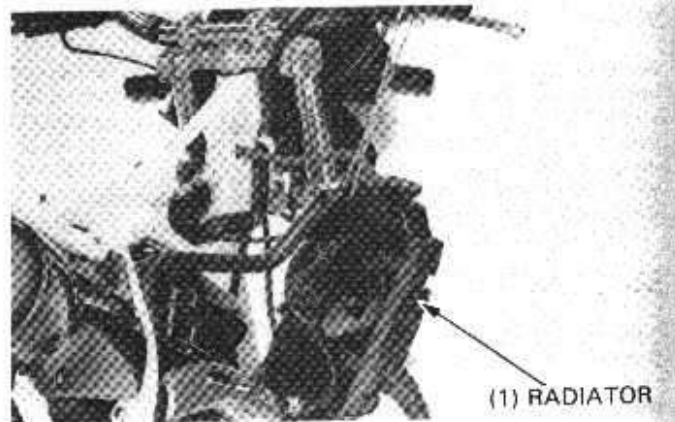
## CYLINDER HEAD/VALVES

### CYLINDER HEAD COVER REMOVAL

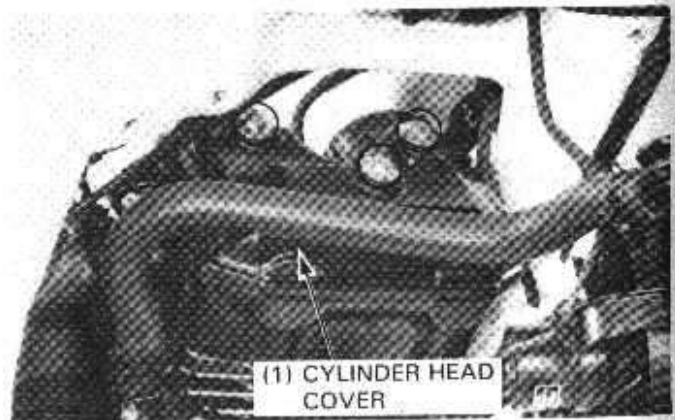
- Remove the following:
- fuel tank (page 4-3).
  - radiator mounting bolts.
  - upper engine brackets.



Remove the radiator from the frame and suspend the radiator with a piece of wire.

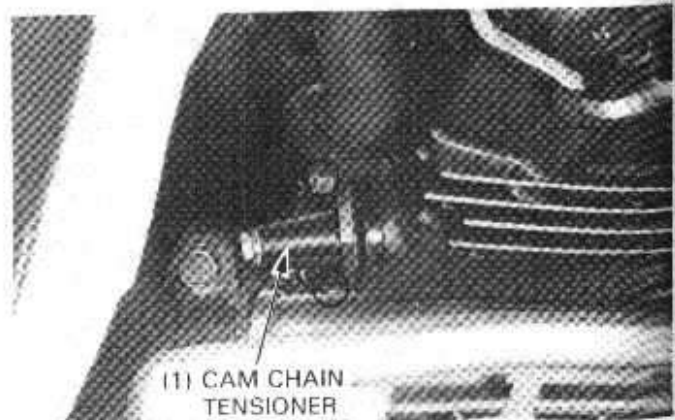


Remove the three bolts and cylinder head cover.



### CAMSHAFT/CAM CHAIN TENSIONER REMOVAL

Remove the two bolts and cam chain tensioner.

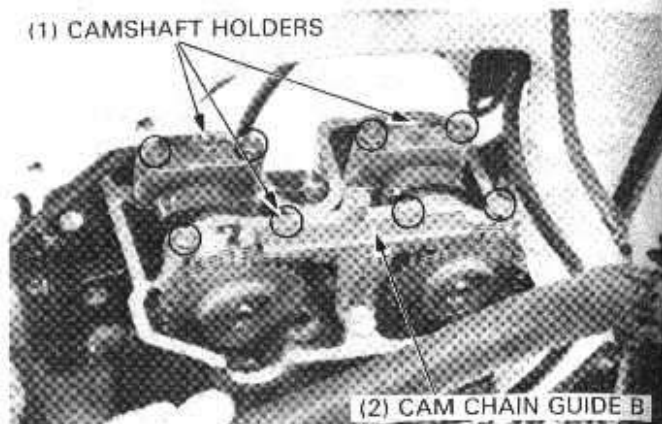


## CYLINDER HEAD/VALVES

Remove the following:

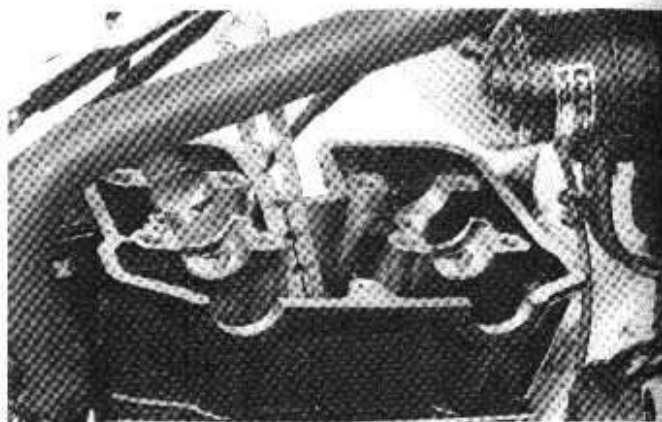
- camshaft holders.
- cam chain guide B.
- camshafts.

(1) CAMSHAFT HOLDERS



Suspend the cam chain with a piece of wire to prevent it from falling into the crankcase.

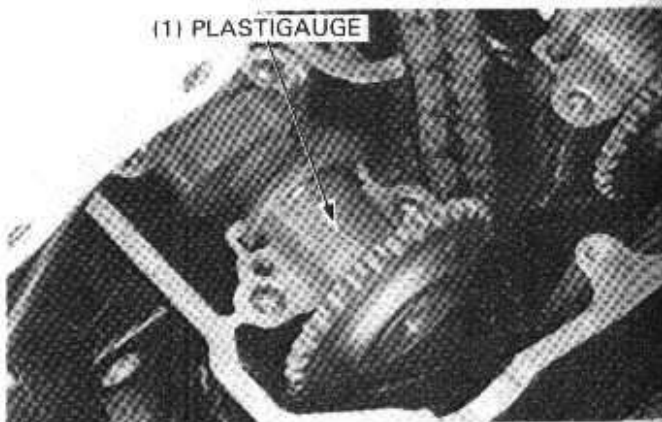
Inspect the camshaft holder and cylinder head journal surfaces for scoring or evidence of insufficient lubrication.



### Camshaft bearing oil clearance

Wipe any oil from the journals. Lay a stripe of plastigauge lengthwise on top of each camshaft journal.

(1) PLASTIGAUGE

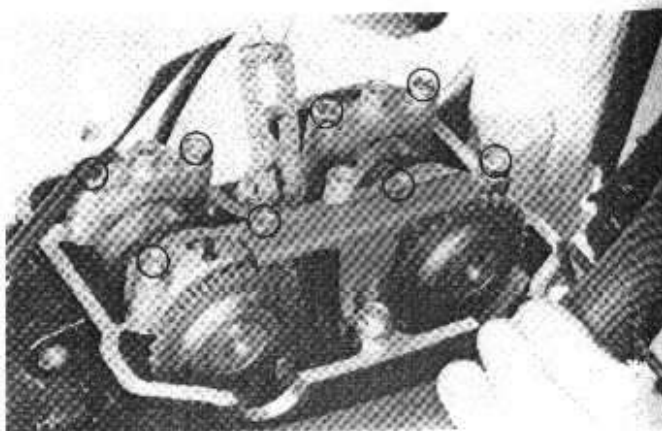


Install the camshaft holders and tighten the bolts in a crisscross pattern in 2 or 3 steps.

### NOTE

- Do not rotate the camshaft when using plastigauge.

TORQUE: 12 N·m (1.2 kg-m, 9 ft-lb)



## CYLINDER HEAD/VALVES

Remove the camshaft holders and measure the width of the plastigauge. The widest thickness determines the oil clearance.

**SERVICE LIMITS: 0.070 mm (0.0028 in)**

When the service limits are exceeded, measure the camshaft journals O.D. (below):

- If the journals are beyond the service limit, replace the camshaft and recheck the oil clearance.
- If the camshaft journals are O.K., replace the cylinder head and the camshaft holders.

### NOTE

- The cylinder head and holders are a set.

Replace the camshaft holder and cylinder head if the clearance still exceeds the service limits.

### Cam journal

Check the camshaft journals for wear or damage. Measure each camshaft journal O.D.

**SERVICE LIMIT: 24.940 mm (0.9819 in)**

### Cam lobe height

Using a micrometer, measure the height of each cam lobe.

**SERVICE LIMITS: IN: 38.150 mm (1.5020 in)**

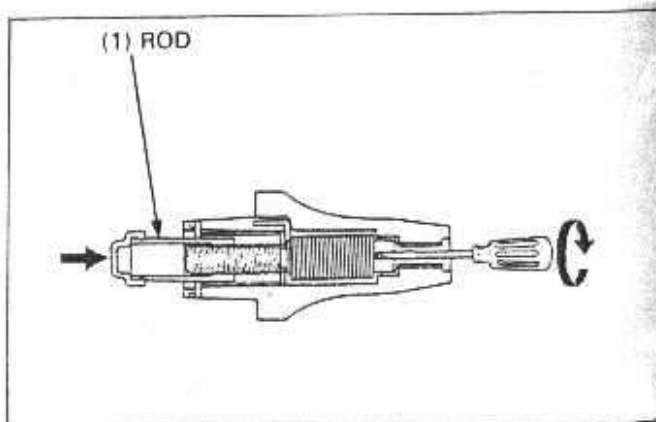
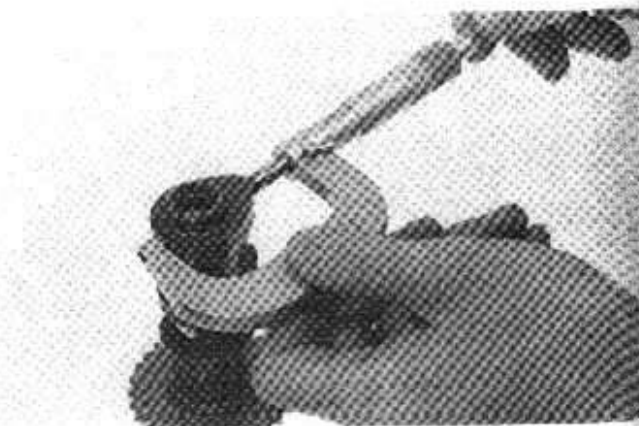
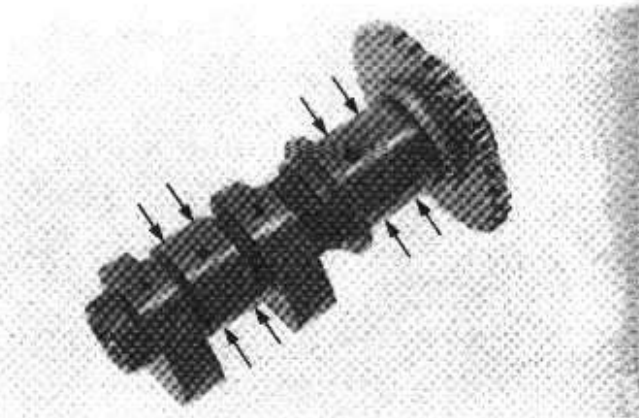
**EX: 37.550 mm (1.4783 in)**

### Cam chain tensioner

Remove the cam chain tensioner lifter sealing bolt. Discard the gasket.

Check the lifter operation:

- the tensioner rod should not go into the body when it is pushed straight in.
- when it is turned clockwise with a screwdriver, the tensioner rod goes pulled into the body. The rod should spring out of the body after being turned clockwise 2 or 3 turns and leased.

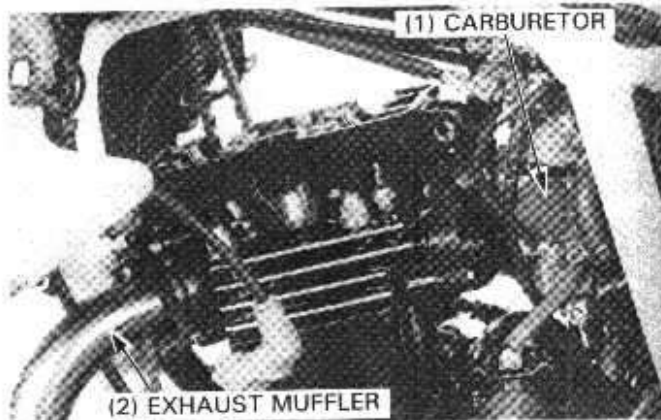


## CYLINDER HEAD/VALVES

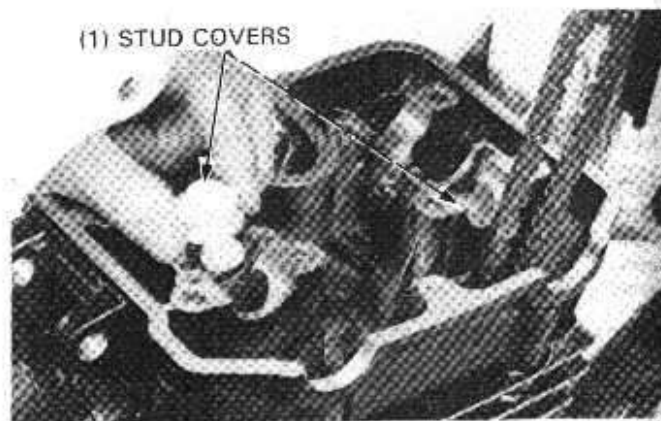
### CYLINDER HEAD REMOVAL

Remove the following:

- exhaust muffler (page 15-1).
- carburetor (page 4-5).



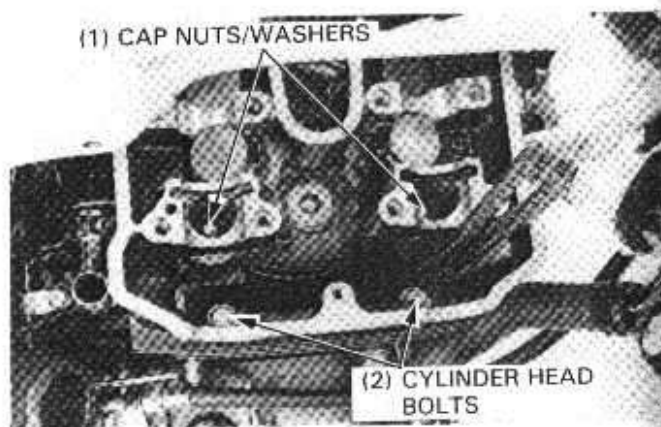
Remove the two plastic stud covers.



Remove the stud cap nuts and washers, and the two cylinder head bolts.

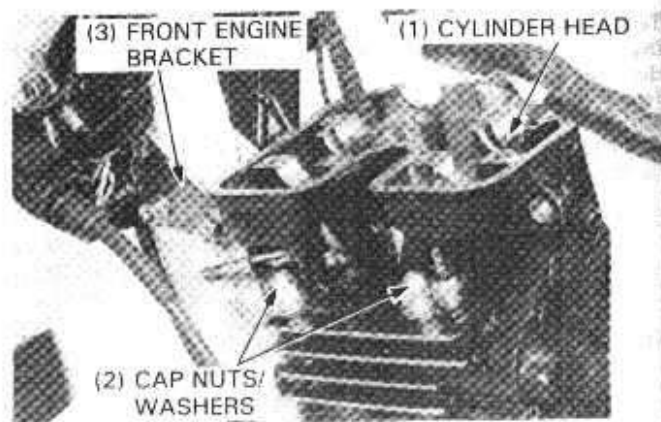
#### NOTE

- Do not let the washers fall into the crankcase.



Remove the front engine bracket.

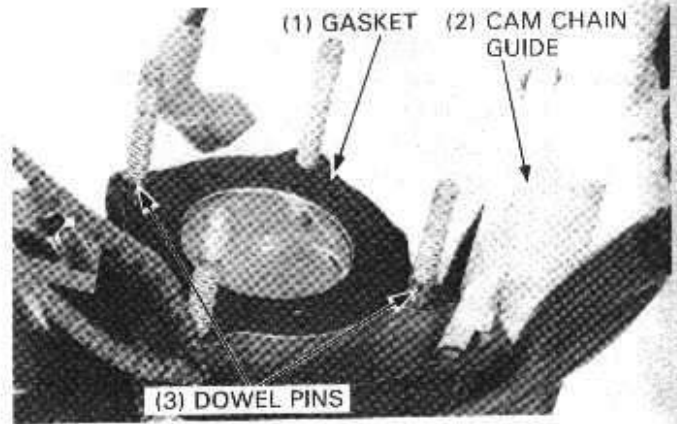
Remove the remaining stud cap nuts and washers, and remove the cylinder head.





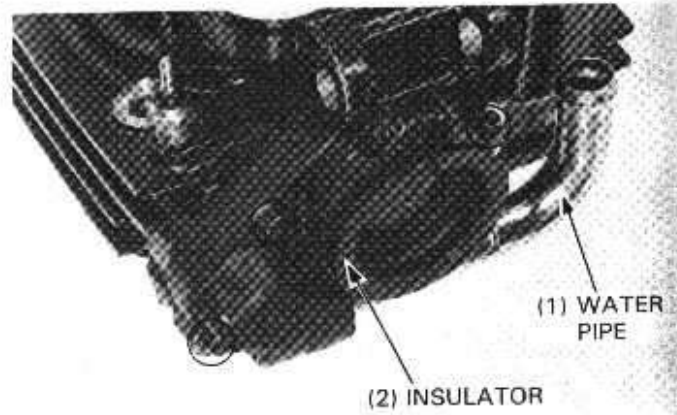
## CYLINDER HEAD/VALVES

Remove the cylinder head gasket, dowel pins and cam chain guide.

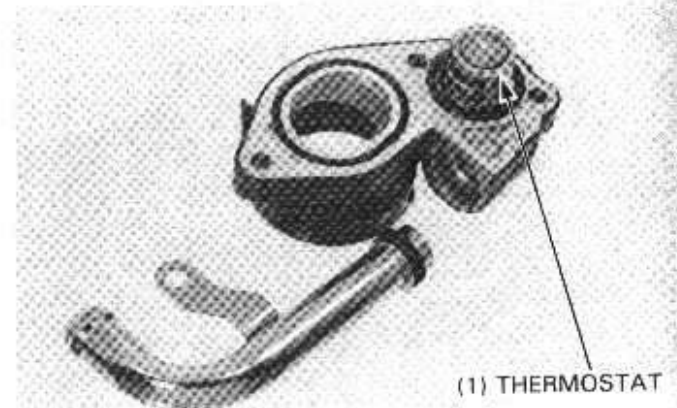


## CYLINDER HEAD DISASSEMBLY

Remove the insulator and water pipe.



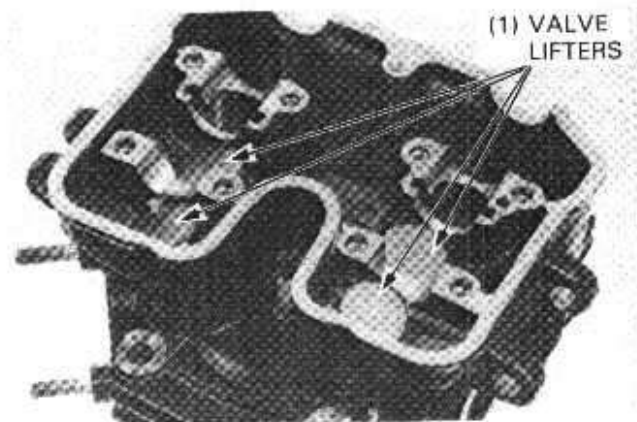
Remove the thermostat from the cylinder head.



Remove the valve lifters and shims.

### NOTE

- Be careful not to damage the lifters during removal.
- Mark the lifters and shims to ensure correct reassembly.

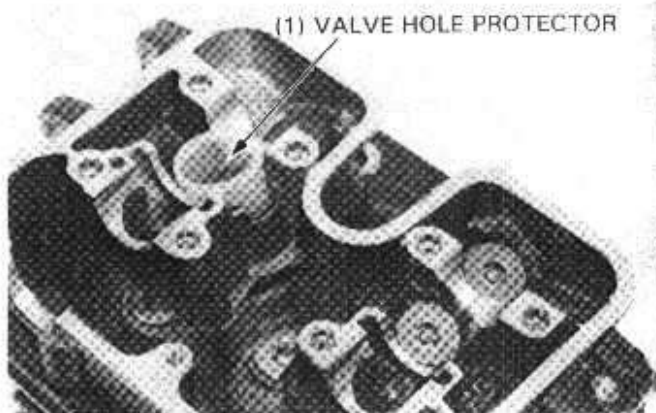


## CYLINDER HEAD/VALVES

Install the valve hole protector as shown.

### TOOL:

Valve hole protector 07HMG—MR70001



Install the valve compressor attachment in the valve spring compressor.

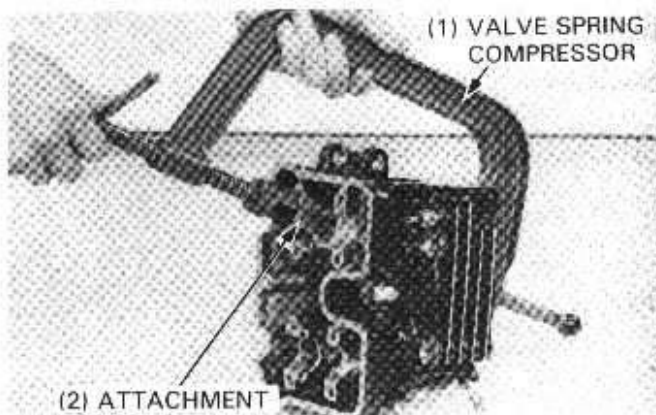
### TOOLS:

Valve spring compressor 07757—0010000  
Valve compressor attachment 07959—KM30101

Remove the valve spring cotters, retainers, springs and valves with the valve spring compressor as shown.

### CAUTION

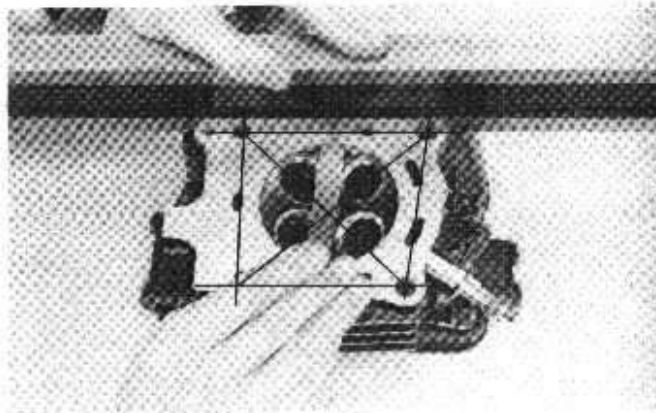
- To prevent loss of tension, do not compress the valve springs more than necessary to remove the cotters.



### NOTE

- Mark all parts during disassembly so they can be placed back in their original locations.

Remove the valve stem seals and spring seats.



## INSPECTION

### ● Cylinder head

Remove carbon deposits from the combustion chamber. Check the spark plug hole and valve areas for cracks. Check the cylinder head for warpage with a straight edge and feeler gauge.

**SERVICE LIMIT: 0.01 mm (0.0004 in)**

### ● Valve lifter

Check the valve lifter for wear or damage and measure the O.D. of each valve lifter.

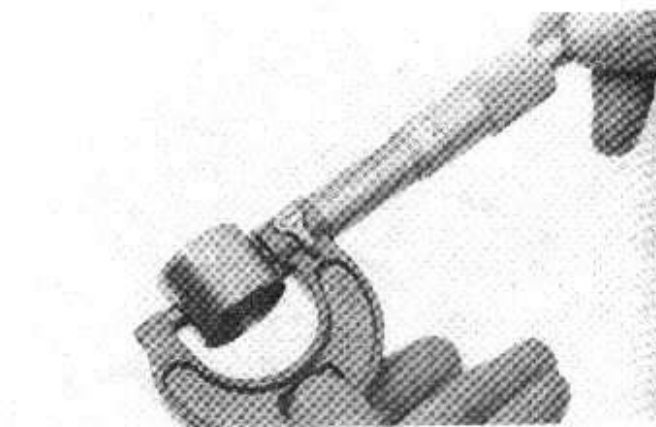
**SERVICE LIMIT: 25.97 mm (1.022 in)**

### NOTE

- If a lifter is replaced for any reason, be sure to check its valve's clearance after installing the cylinder head.

Measure the I.D. of the valve hole in the cylinder head.

**SERVICE LIMIT: 26.04 mm (1.039 in)**



## CYLINDER HEAD/VALVES

### ● Valve spring free length

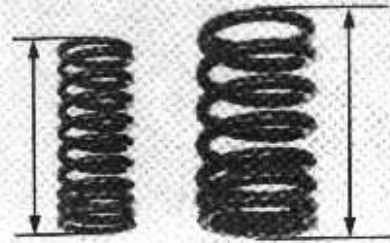
Measure the free length of the inner and outer valve springs.

#### SERVICE LIMITS:

Inner: 33.0 mm (1.30 in)

Outer: 36.2 mm (1.43 in)

Replace the springs if they are shorter than the service limits.



### ● Valve stem-to-guide clearance

Inspect each valve for bending, burning or abnormal stem wear.

Check valve movement in the guide, measure and record each valve stem O.D.

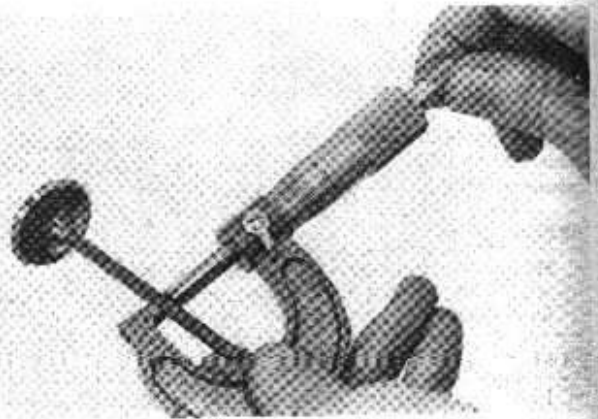
#### SERVICE LIMITS:

IN: 4.47 mm (0.176 in)

EX: 4.45 mm (0.175 in)

#### NOTE

- Ream the guides to remove any carbon deposits before checking clearances.
- Insert the reamer from the top of the head and also always rotate the reamer in the same direction.



#### TOOL:

Valve guide reamer 4.5 mm      07HMH-ML00100

Measure and record each valve guide I.D.

SERVICE LIMIT (IN/EX): 4.55 mm (0.179 in)

Subtract each valve stem O.D. from the corresponding guide I.D. to obtain the stem-to-guide clearance.

#### SERVICE LIMITS:

IN: 0.08 mm (0.003 in)

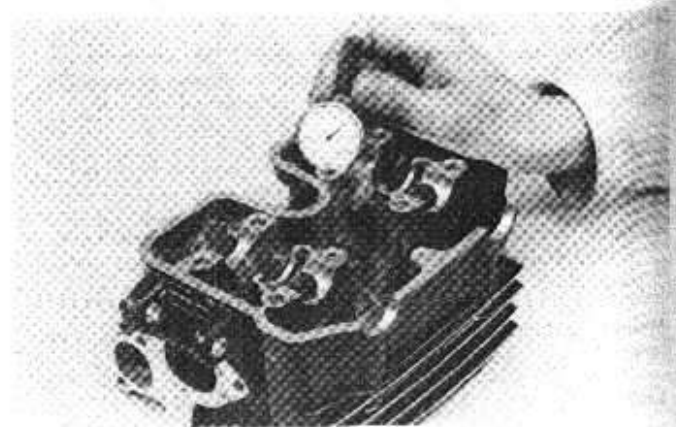
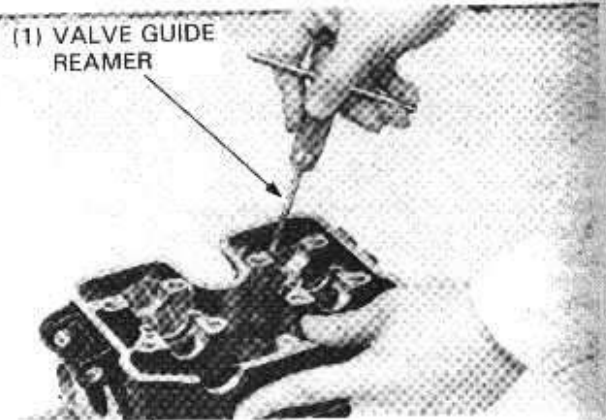
EX: 0.10 mm (0.004 in)

If the stem-to-guide clearance exceeds the service limits, determine if a new guide with standard dimensions would bring the clearance within tolerance. If so, replace any guides as necessary and ream to fit.

If the stem-to-guide clearance exceeds the service limits with new guides also, replace the valves and guides.

#### NOTE

- Reface the valve seats whenever the valve guides are replaced (page 9-11).



## CYLINDER HEAD/VALVES

### VALVE GUIDE REPLACEMENT

Chill the valve guides in the freezer section of a refrigerator for about an hour.

Heat the cylinder head to 212°–300°F (100°–150°C) with a hot plate or oven.

#### ⚠ WARNING

- *To avoid burns, wear heavy gloves when handling the heated cylinder head.*

#### CAUTION

- *Do not use a torch to heat the cylinder head; it may cause warping.*

Support the cylinder head and drive out the old guides from the combustion chamber side of the cylinder head.

#### TOOL:

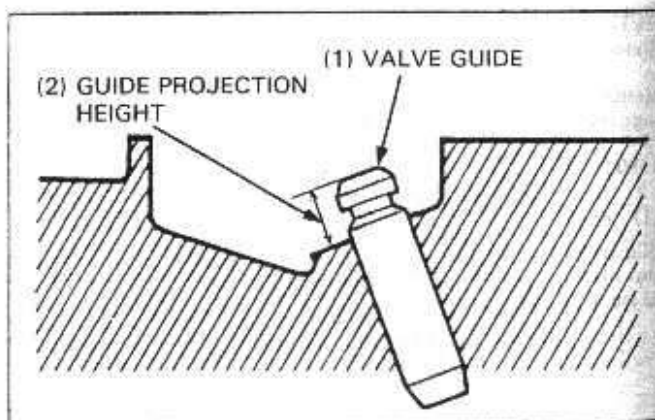
Valve guide driver                      07HMD-ML00100

#### CAUTION

- *Avoid damaging the cylinder head.*

#### VALVE GUIDE PROJECTION HEIGHT:

IN/EX: 13 mm (0.51 in)



Make note of the valve guide projection specifications (above), then drive in new guides from the camshaft side of the cylinder head.

#### TOOL:

Valve guide driver                      07HMD-ML00100



## CYLINDER HEAD/VALVES

Let the cylinder head cool to room temperature.  
Inspect the valve guide for damage.

Ream the new valve guide after installation.

### TOOL:

Valve guide reamer, 4.5 mm      07HMH-ML00100

### NOTE

- Insert the reamer from the top of the head and also always rotate the reamer in the same direction.

Clean the cylinder head thoroughly to remove any metal particles.

Reface the valve seat (see below).

## VALVE SEAT INSPECTION/REFACING

Clean the intake and exhaust valves thoroughly to remove carbon deposits.

Apply a light coating of Prussian Blue to the valve seats. Lap the valves and seats using a rubber hose or other hand-lapping tool.

Removal and inspect the valves.

### CAUTION

- *The valves cannot be ground. If a valve face is burned or badly worn or if it contacts the seat unevenly, replace the valve.*

Inspect the width of each valve seat.

**STANDARD:** 0.8–1.2 mm (0.03–0.05 in)  
**SERVICE LIMIT:** 1.5 mm (0.06 in)

If the seat is too wide, too narrow or has low spots, the seat must be ground.

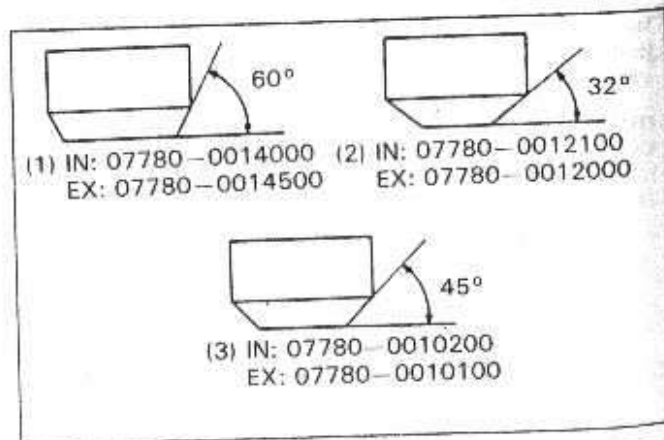
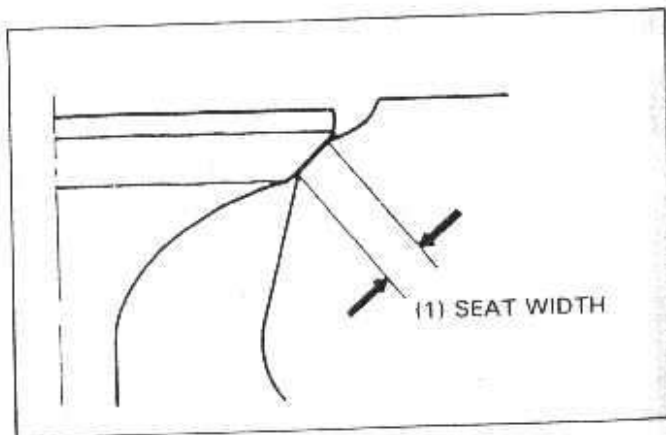
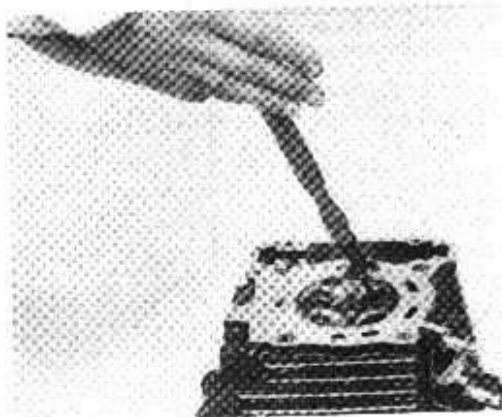
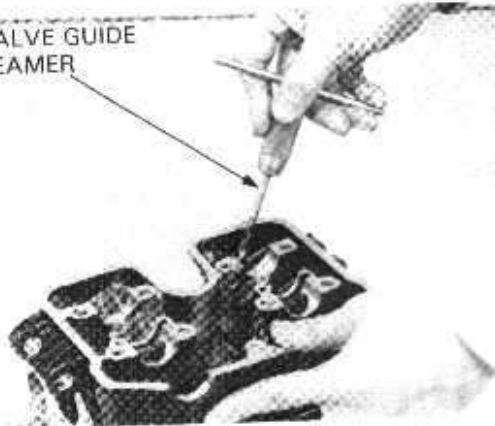
## VALVE SEAT CUTTERS

Honda Valve Seat Cutters, grinder or equivalent valve seat refacing equipment are recommended to correct a worn valve seat.

### NOTE

- Follow the refacer manufacturer's operating instructions.

(1) VALVE GUIDE REAMER



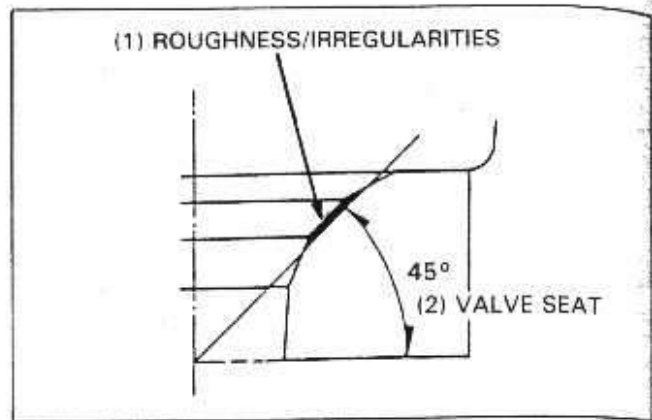
## CYLINDER HEAD/VALVES

### VALVE SEAT REFACING

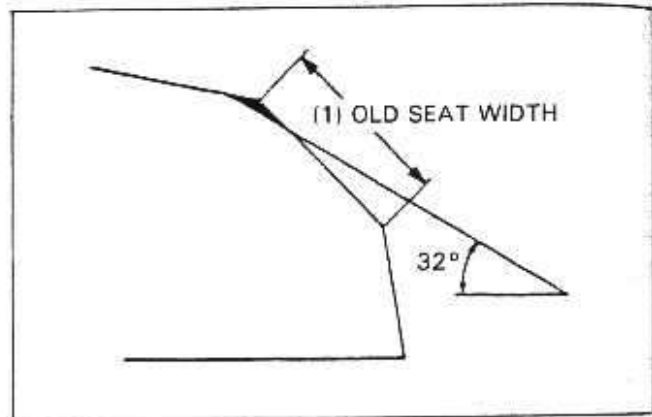
Use a 45 degree cutter to remove any roughness or irregularities from the seat.

#### NOTE

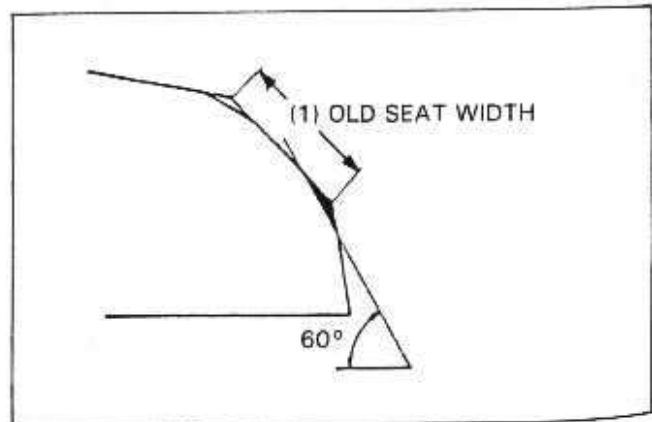
- Reface the seat with a 45 degree cutter when a valve guide is replaced.



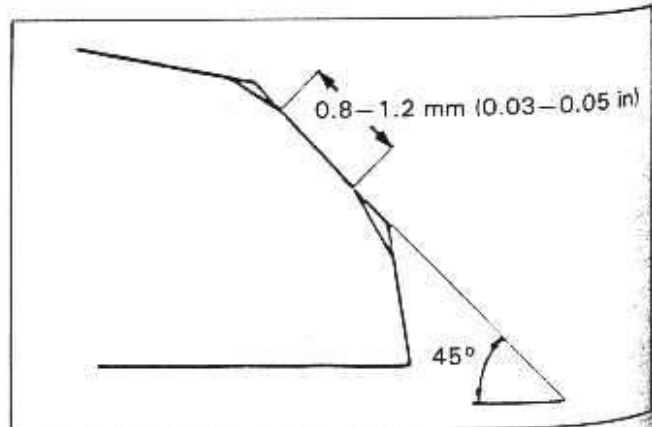
Use a 32 degree cutter to remove the top 1/4 of the existing valve seat material.



Use a 60 degree cutter to remove the bottom 1/4 of the old seat. Remove the cutter and inspect the area you have refaced.



Install a 45 degree finish cutter and cut the seat to the proper width. Make sure that all pitting and irregularities are removed. Refinish if necessary.



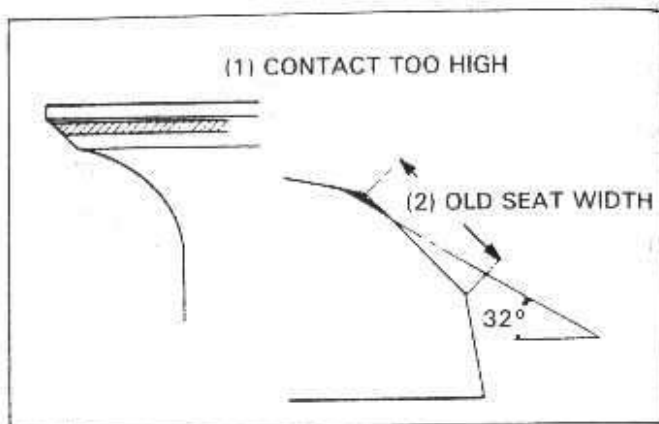
## CYLINDER HEAD/VALVES

Apply a thin coating of Prussian Blue to the valve seat. Press the valve through the valve guide and onto the seat to make a clear pattern.

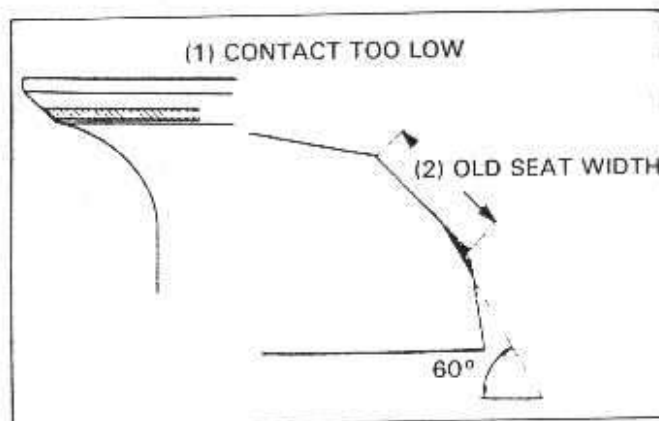
### NOTE

- The location of the valve seat in relation to the valve face is very important for good sealing.

If the contact area is too high on the valve, the seat must be lowered using a 32 degree flat cutter.



If the contact area is too low on the valve, the seat must be raised using a 60 degree inner cutter.



Refinish the seat to specifications, using a 45 degree finish cutter.

After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure.

After lapping, wash all residual compound off the cylinder head and valve.

### NOTE

- Do not allow lapping compound to enter the guides.



## CYLINDER HEAD ASSEMBLY

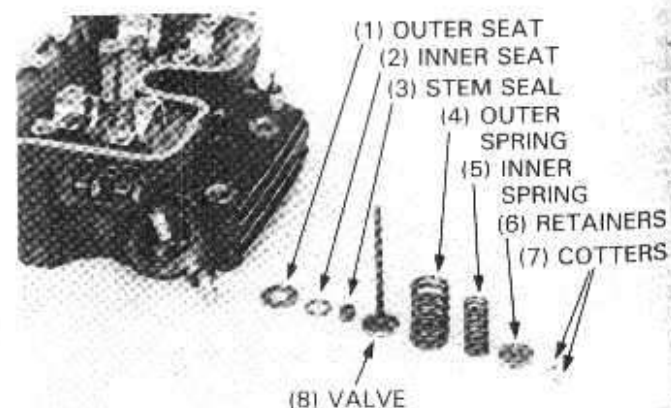
Install the valve spring outer and inner seats and a new stem seal.

Lubricate the valve stems with molybdenum disulfide grease and insert the valve into the valve guide.

To avoid damage to the stem seal, turn the valve slowly when inserting.

Install the valve springs with the tightly wound coils facing the cylinder head.

Install the valve spring retainers.



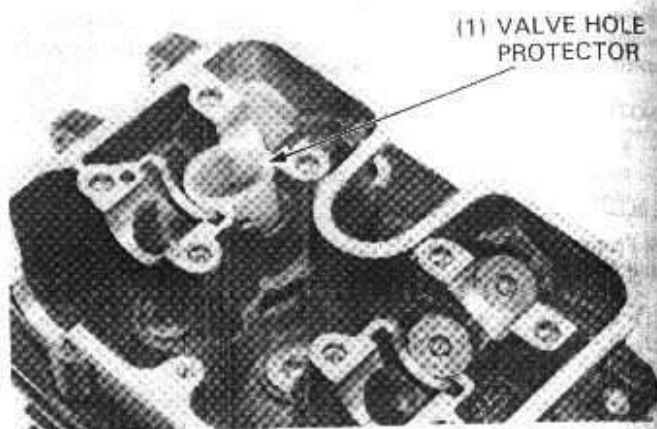
## CYLINDER HEAD/VALVES

Install the valve hole protector as shown.

### TOOLS:

Valve hole protector

07HMG-MR70001



Compress the springs and install the cotters.

### TOOL:

Valve spring compressor

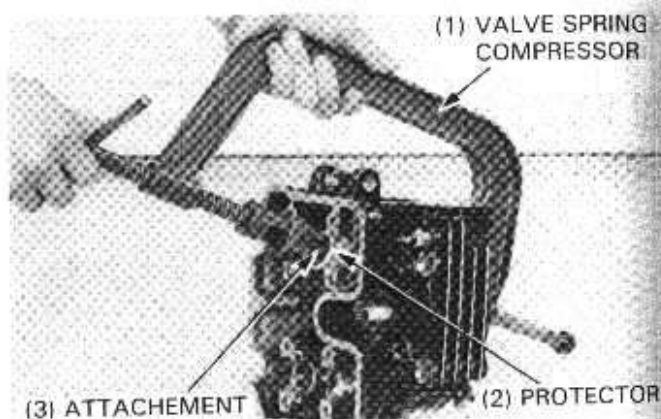
07757-0010000

Valve compressor attachment

07959-KM30101

### CAUTION

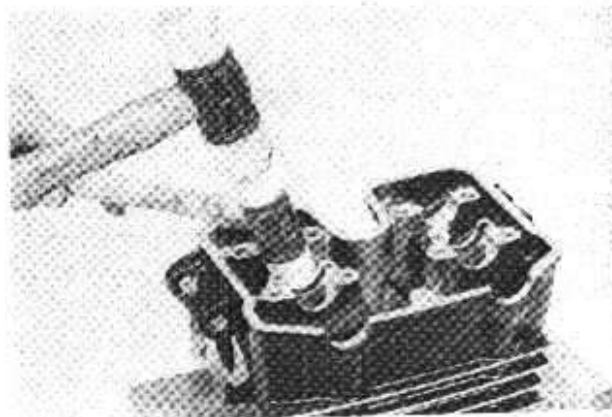
- To prevent loss of tension, do not compress the valve spring more than necessary.



Tap the valve stems gently with a plastic hammer to seat the cotters firmly.

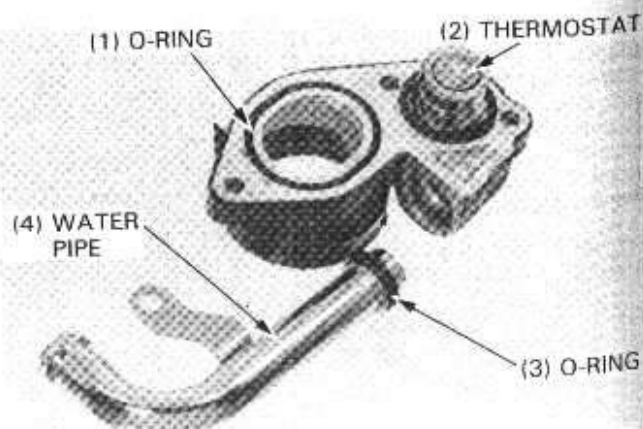
### CAUTION

- Support the cylinder head above the work bench surface to prevent possible valve damage.



Install a new O-ring in the carburetor insulator groove and on the thermostat.

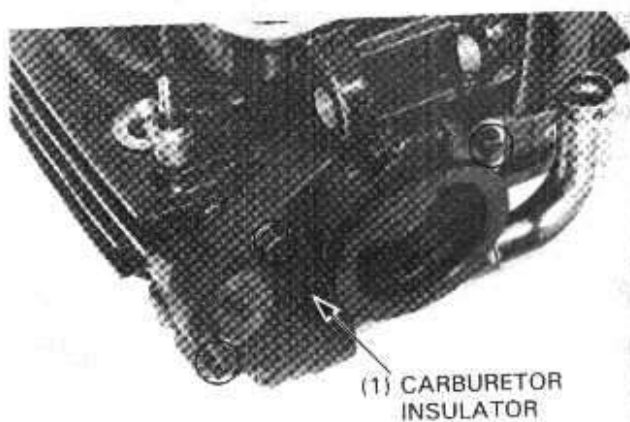
Install a new O-ring on the water pipe, with the tapered side facing in and install the water pipe in the insulator.





## CYLINDER HEAD/VALVES

Install the carburetor insulator and tighten the bolts.

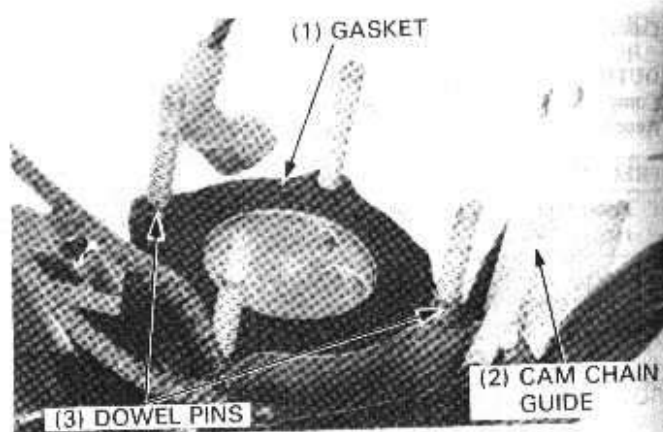


## CYLINDER HEAD INSTALLATION

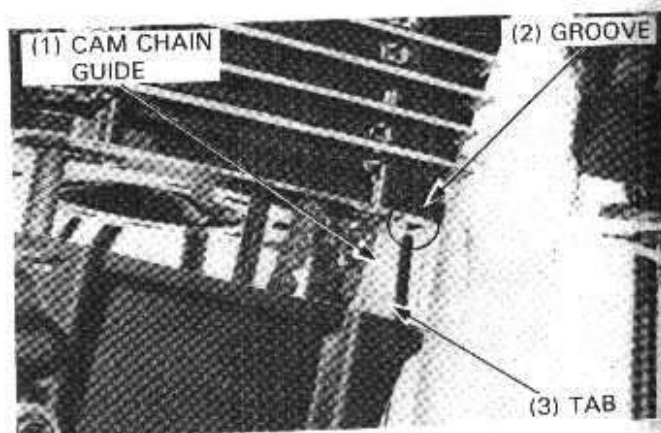
Install a new gasket and dowel pins.  
Install the cam chain guide, placing the bottom end of the guide into the groove in the right crankcase.

### NOTE

- Make sure that the cam chain is properly installed on the crankshaft drive gear.



Install the cylinder head over the cam chain and align the groove in the cylinder head lower surface with the tab on the cam chain guide.

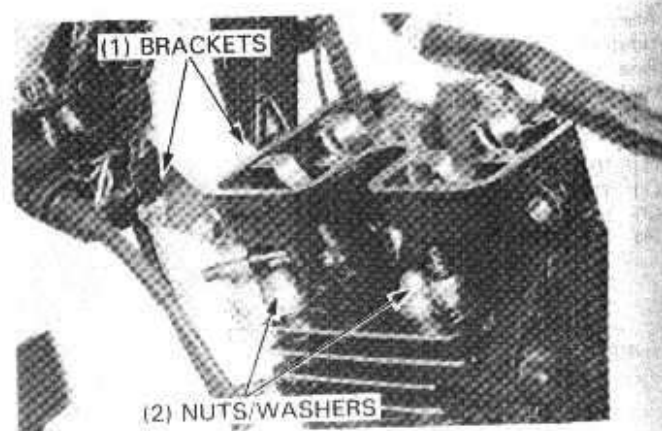


Install the outside washers and stud cap nuts.

Install the front engine brackets.

Tighten the bracket bolts and engine mounting bolt.

**TORQUE:** 8 mm bolt: 27 N·m (2.7 kg·m, 20 ft·lb)  
10 mm bolt: 75 N·m (7.5 kg·m, 54 ft·lb)



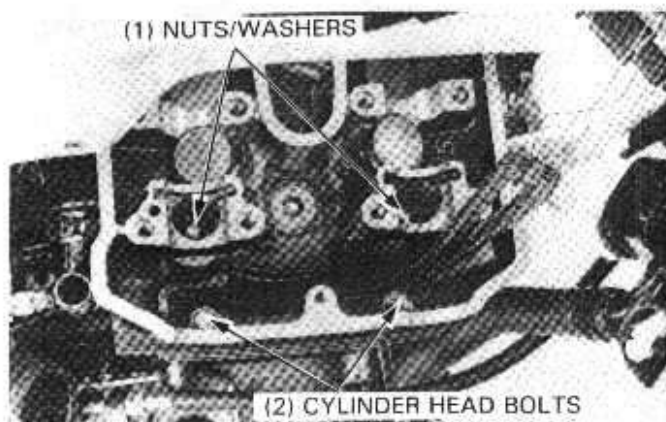
## CYLINDER HEAD/VALVES

Install the cylinder head bolts, washers and stud cap nuts.

Tighten the cylinder head cap nuts in 2–3 steps in a criss-cross pattern.

**TORQUE: 46 N·m (4.6 kg·m, 33 ft·lb)**

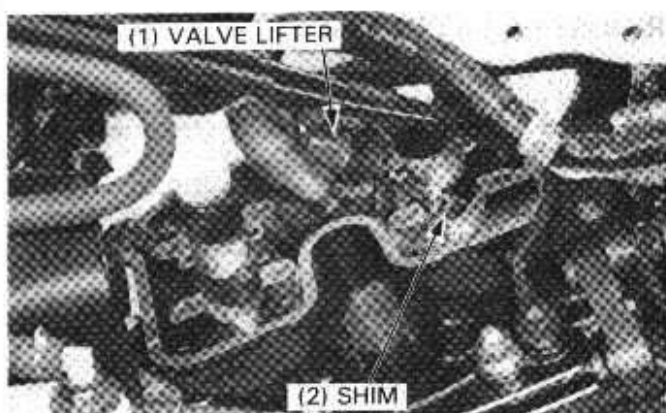
Tighten the cylinder head bolts.



Install the shims and valve lifters on their original positions.

### NOTE

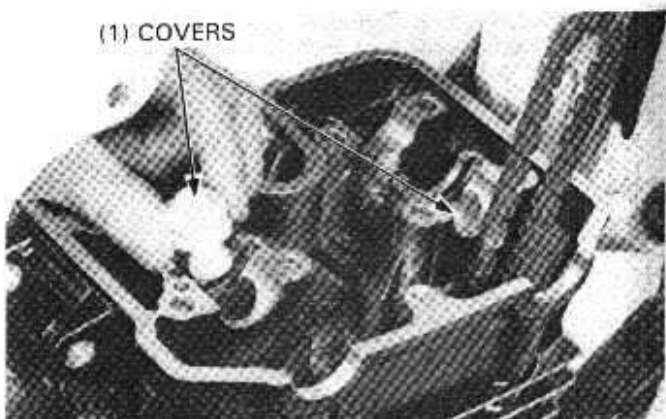
- If a lifter was replaced for any reason, be sure to check its valve clearance (page 3-6). Replacement lifters come in four different thicknesses.
- Be sure the shim and valve lifter are installed in their correct locations as noted during removal.
- Do not allow the shims to fall into the crankcase.



Install the stud covers as shown.

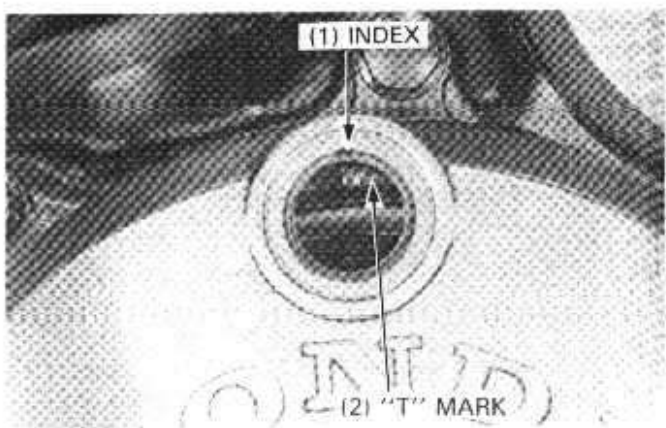
### CAUTION

- *Do not forget to install the covers. If they are not in place, the top end may not receive adequate lubrication.*



## CAMSHAFT/CAM CHAIN TENSIONER INSTALLATION

Align the "T" mark on the flywheel with the index mark on the left crankcase cover by turning the crankshaft counterclockwise.



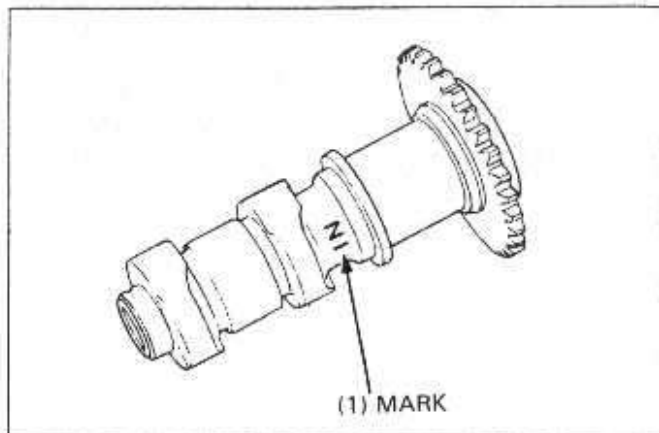
## CYLINDER HEAD/VALVES

Check the camshaft marks so that you install each camshaft in its correct location.

Mark	Mean
IN	Intake camshaft
EX	Exhaust camshaft

Apply molybdenum disulfide grease to the camshaft journals and cam lobes.

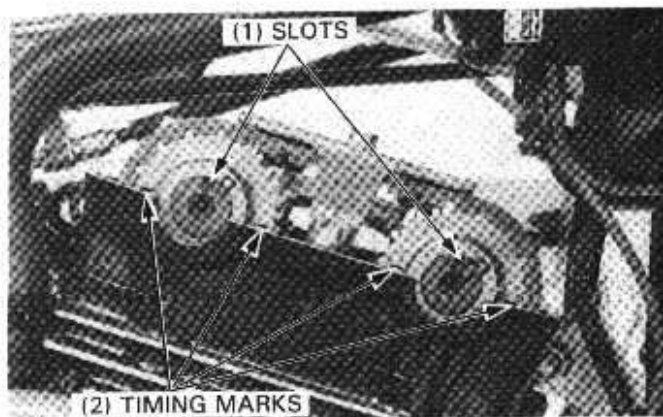
Install the camshafts in the cylinder head with the slots on the shaft ends facing up, aligning the sprocket timing marks with the upper surface of the cylinder head.



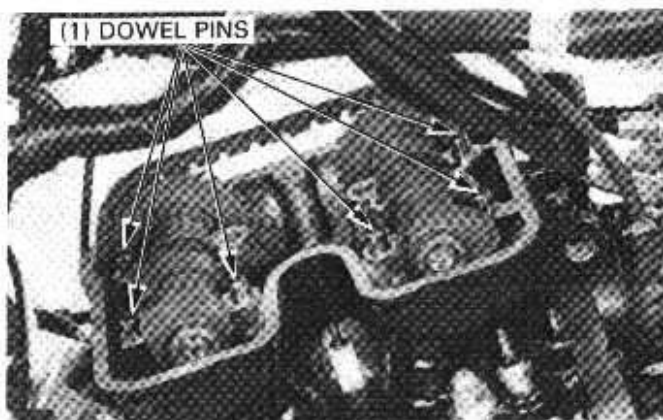
Install the cam chain over the camshaft sprockets.

### NOTE

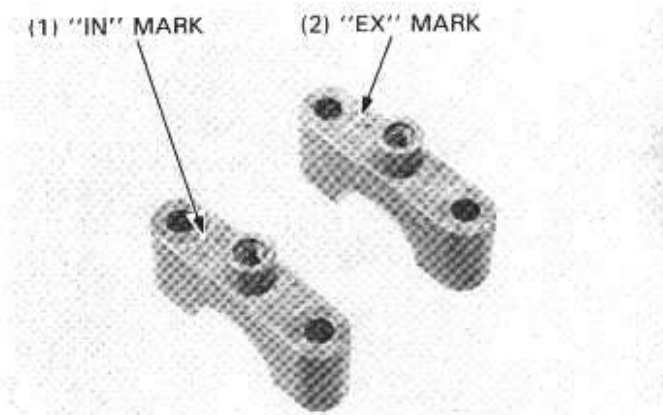
- Do not rotate the crankshaft from the "T" position when installing the camshafts.



Install the dowel pins.



Check the identification marks and install the camshaft holders over the corresponding camshafts.

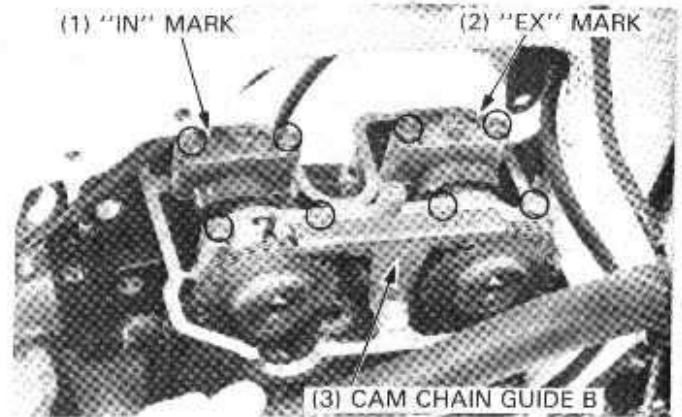


## CYLINDER HEAD/VALVES

Install the holders with the "IN" and "EX" marks facing out. Tighten the camshaft holder bolts.

**TORQUE: 12 N·m (1.2 kg-m, 9 ft-lb)**

Install the cam chain guide B.

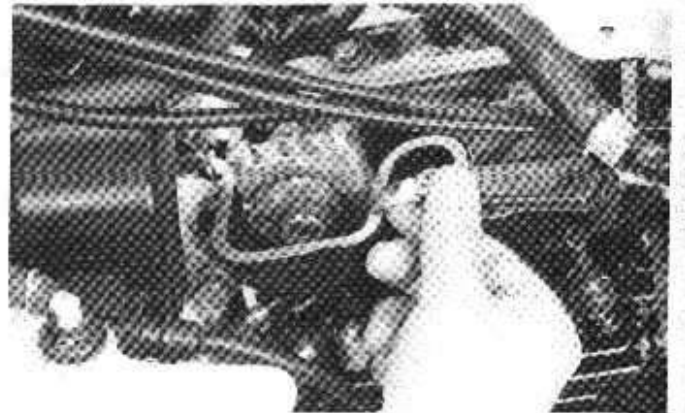


Measure and record the valve clearance for each valve (page 3-7).

If necessary, remove the camshaft holders and camshafts, then remove the valve lifters and shims.

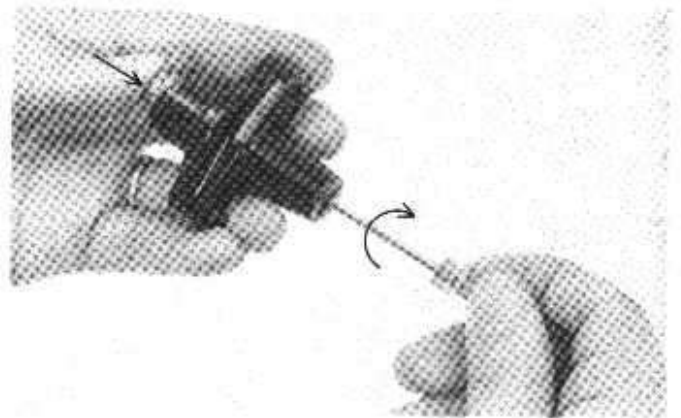
Select and install a new shims (page 3-7).

Install the removed parts in the reverse order of removal. Recheck the valve clearances.



To hold the tensioner rod, turn the screw in the cam chain tensioner with a screwdriver clockwise until the rod stops moving.

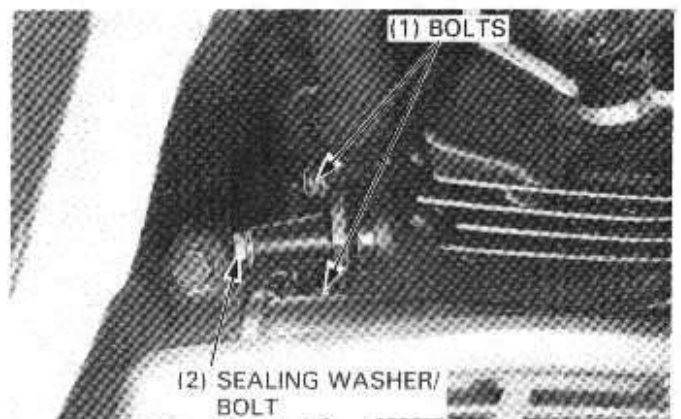
Turn the screw clockwise about 1/8 turn more until the rod locks in the retracted position.



Install a new gasket and cam chain tensioner in the cylinder and tighten the two mounting bolts.

Install a sealing washer and bolt.

Hit the tensioner body with the screwdriver grip then check the cam chain tension.

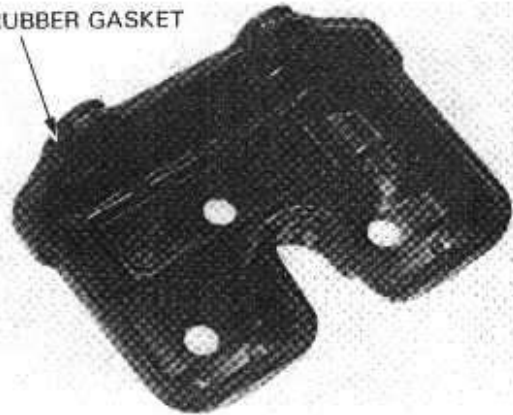


## CYLINDER HEAD/VALVES

### CYLINDER HEAD COVER INSTALLATION

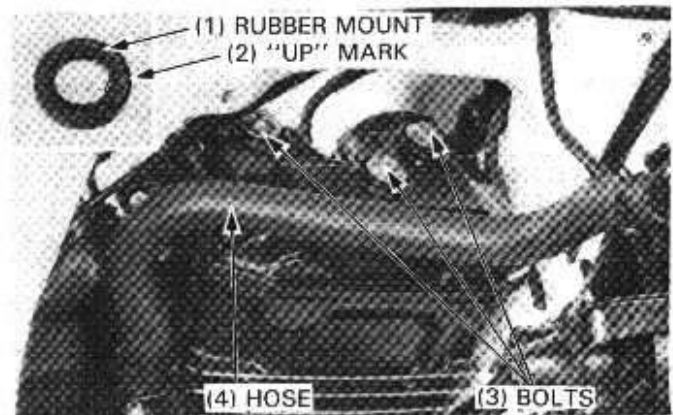
Apply a sealant to the cylinder head cover and install the rubber gasket.

(1) RUBBER GASKET



Install the rubber mounts with the UP mark facing up.

Install the bolts and tighten them securely.



Connect the upper radiator hose to the water pipe.

Install the following:

- radiator (page 5-5).
- carburetor (page 4-14).
- upper engine brackets.
- exhaust muffler (page 15-1).

Fill the cooling system (page 5-4).

Check the following:

- throttle grip free play (page 3-4).
- electrical equipment.
- oil level (page 2-2).
- coolant leaks.