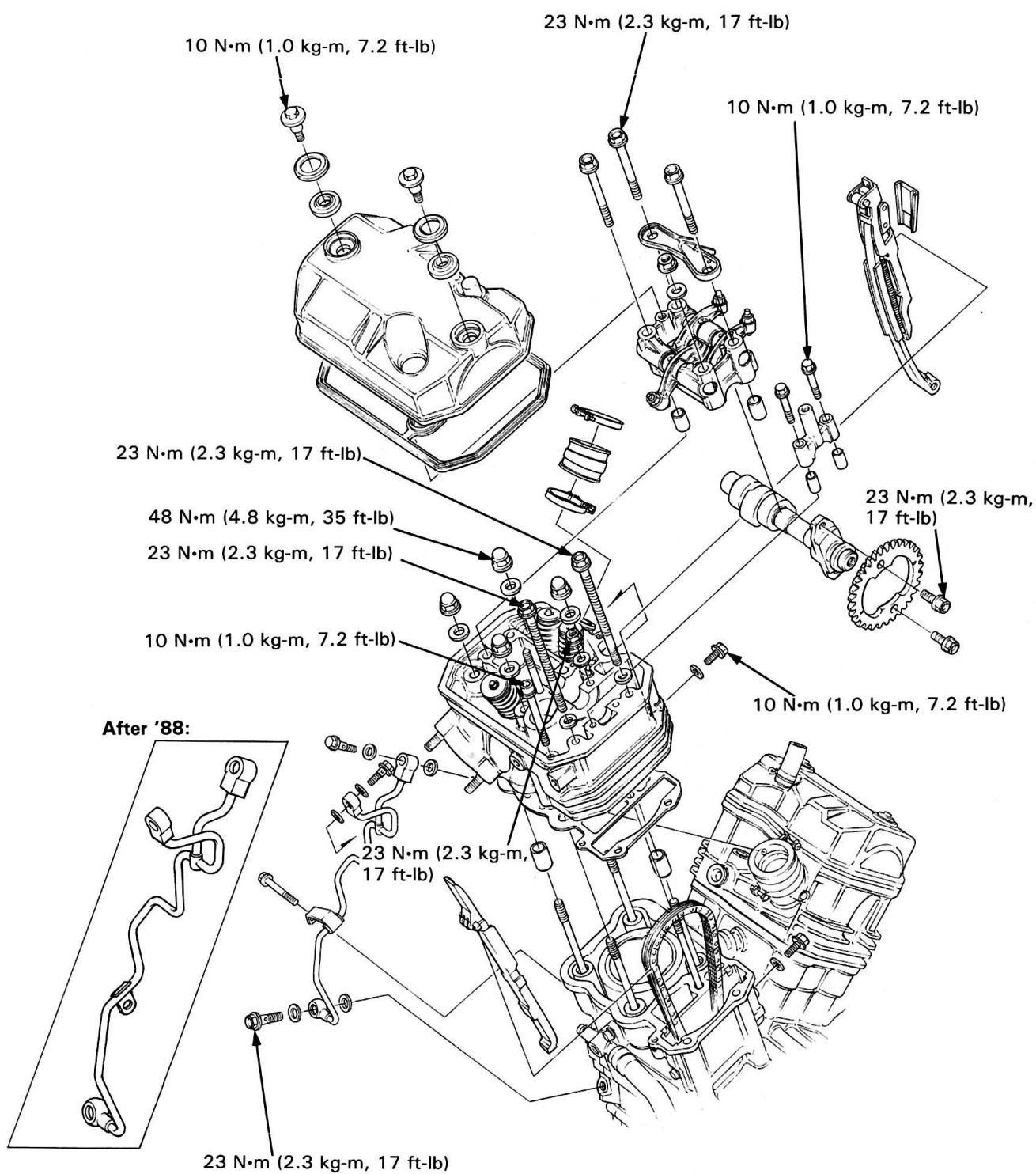


CYLINDER HEAD/VALVES

'88 Shown:



9. CYLINDER HEAD/VALVES

SERVICE INFORMATION	9-1	VALVE SEAT INSPECTION/REFACING	9-12
TROUBLESHOOTING	9-2	CYLINDER HEAD ASSEMBLY	9-14
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CYLINDER HEADS	9-7	CYLINDER HEAD COVER INSTALLATION	9-20
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SERVICE INFORMATION

GENERAL

- The cylinder heads can be removed without removing the engine.
- Camshaft lubricating oil is fed through an oil pass pipe. Be sure the holes in the oil pass bolts are not clogged.
- During assembly apply MoS2 paste grease to the camshaft holders, camshaft journals of the cylinder head, rocker arm shafts, rocker arm slipper faces and valve stems to provide initial lubrication.

SPECIFICATIONS

Unit: mm (in)

ITEM				STANDARD		SERVICE LIMIT
Compression pressure				1,324 ± 196 kPa (13.5 ± 2.0 kg/cm ² , 192 ± 28 psi)		—
Camshaft	Cam lobe height	IN		38.189 (1.5035)		38.17 (1.503)
		EX		38.213 (1.5044)		38.19 (1.504)
	Journal O.D.		21.959—21.980 (0.8645—0.8654)		21.95 (0.864)	
	Runout		0.030 (0.0012)		0.05 (0.002)	
	Oil clearance		0.040—0.093 (0.0015—0.0037)		0.11 (0.004)	
Rocker arm	Rocker arm I.D.	IN/EX		12.000—12.018 (0.4724—0.4731)		12.03 (0.474)
	Rocker arm shaft O.D.	IN/EX		11.966—11.984 (0.4711—0.4718)		11.96 (0.471)
Valve and valve guide	Valve stem O.D.	IN		5.475—5.490 (0.2156—0.2161)		5.47 (0.215)
		EX		6.555—6.570 (0.2580—0.2587)		6.55 (0.258)
	Valve guide I.D.	IN		5.500—5.512 (0.2165—0.2170)		5.53 (0.218)
		EX		6.600—6.615 (0.2598—0.2604)		6.66 (0.262)
	Stem-to-guide clearance	IN		0.010—0.037 (0.0004—0.0015)		0.07 (0.003)
		EX		0.030—0.060 (0.0014—0.0024)		0.11 (0.004)
	Valve seat width		0.9—1.1 (0.035—0.043)		1.5 (0.06)	
	Valve guide pro- jection height	IN		19.4—19.6 (0.76—0.77)		—
EX		17.9—18.1 (0.70—0.71)		—		
Valve spring	Free length	OUTER	IN	42.14 (1.659)		40.58 (1.598)
			EX	42.83 (1.686)		41.25 (1.624)
		INNER	IN	38.11 (1.500)		36.47 (1.436)
			EX	38.81 (1.765)		37.51 (1.477)
Cylinder head warpage				—		0.10 (0.004)

CYLINDER HEAD/VALVES

TORQUE VALUES

Cylinder head cover bolt		10 N•m (1.0 kg-m, 7.2 ft-lb)
Camshaft holder	8 mm bolt	23 N•m (2.3 kg-m, 17 ft-lb)
	8 mm nut	23 N•m (2.3 kg-m, 17 ft-lb)
	6 mm bolt	10 N•m (1.0 kg-m, 7.2 ft-lb)
Cylinder head	10 mm nut	48 N•m (4.8 kg-m, 35 ft-lb)
	8 mm bolt	23 N•m (2.3 kg-m, 17 ft-lb)
	8 mm nut	23 N•m (2.3 kg-m, 17 ft-lb)
	6 mm bolt	10 N•m (1.0 kg-m, 7.2 ft-lb)
Camshaft sprocket bolt		23 N•m (2.3 kg-m, 17 ft-lb)
Cam chain tensioner bolt		10 N•m (1.0 kg-m, 7.2 ft-lb)
Oil pass pipe	7 mm bolt	10 N•m (1.0 kg-m, 7.2 ft-lb)
	8 mm bolt	23 N•m (2.3 kg-m, 17 ft-lb)

TOOLS

Special

Valve guide reamer (IN)	07984-2000001 or 07984-200000B	U.S.A. only
Valve guide reamer (EX)	07984-ZE20001 or 07984-ZE2000B	
Valve guide driver attachment (IN)	07943-MF50100	
Valve guide driver attachment (EX)	07943-MF50200	

Common

Valve guide driver, 5.5 mm (IN)	07742-0010100	
Valve guide driver, 6.6 mm (EX)	07742-0010200 or 07942-6570100	U.S.A. only
Valve spring compressor	07757-0010000 or 07957-3290001	

Valve seat cutter (Not available in U.S.A.)

Cutter holder	IN 5.5 mm	07781-0010101
	EX 6.6 mm	07781-0010201
Flat cutter	IN 28 mm (32°)	07780-0012100
	EX 35 mm (32°)	07780-0012300
Interior cutter	IN 30 mm (60°)	07780-0014000
	EX 37.5 mm (60°)	07780-0014100
Seat cutter	IN 27.5 mm (45°)	07780-0010200
	EX 35 mm (45°)	07780-0010400

TROUBLESHOOTING

Engine top-end problems are usually performance-related and can usually be diagnosed by a compression test. Engine noises can usually be traced to the top-end with a sounding rod or stethoscope.

Uneven or 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)

High compression

- Excessive carbon build-up on piston crown or combustion chamber

Excessive noise

- Incorrect valve adjustment
- Sticking valve or broken valve spring
- Damaged or worn rocker arm or camshaft
- Loose or worn cam chain
- Worn or damaged cam chain tensioner
- Worn cam sprocket teeth

Poor idling

- Compression too low

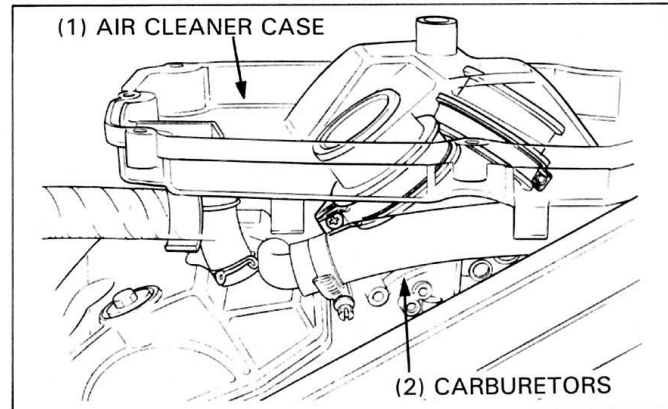
CYLINDER HEAD COVER REMOVAL

Remove the following parts:

- seat
- fuel tank (page 4-3)
- air cleaner case (page 4-4)
- thermostat bolts
- radiator mounting bolts, and swing the radiator forward

NOTE

- If you will be servicing the inner cylinder head cover components, remove the carburetors (page 4-4) at this time.



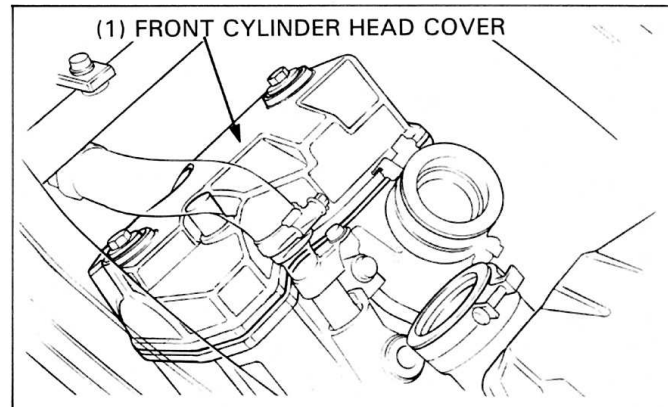
FRONT:

Disconnect the spark plug caps.

Remove the cylinder head cover bolts and cover.

NOTE

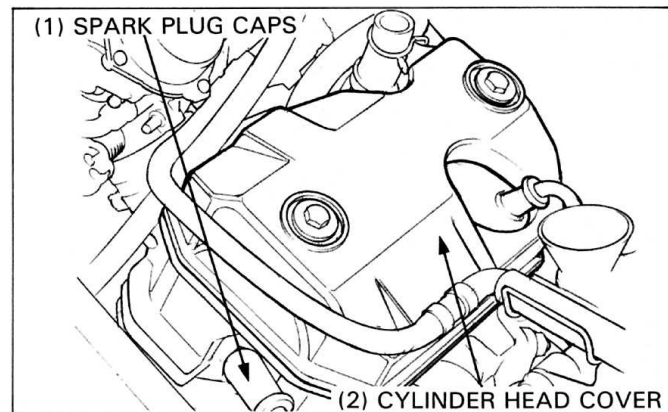
- If the cylinder head cover is difficult to remove:
Remove the radiator mounting bolts and release the radiator from the frame grommets. Suspend the radiator with a piece of rope or something suitable. (refer to 9-8 page).



REAR:

Disconnect the spark plug caps.

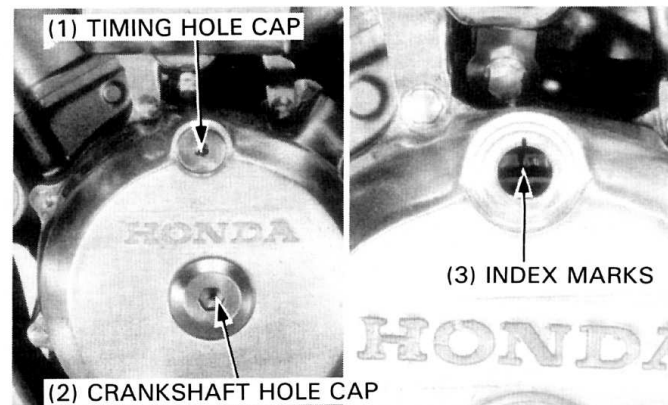
Remove the cylinder head cover bolts and cover.



CAMSHAFT REMOVAL

Remove the cylinder head covers and carburetors (page 4-4). Remove the timing hole cap and crankshaft hole cap from the left crankcase cover.

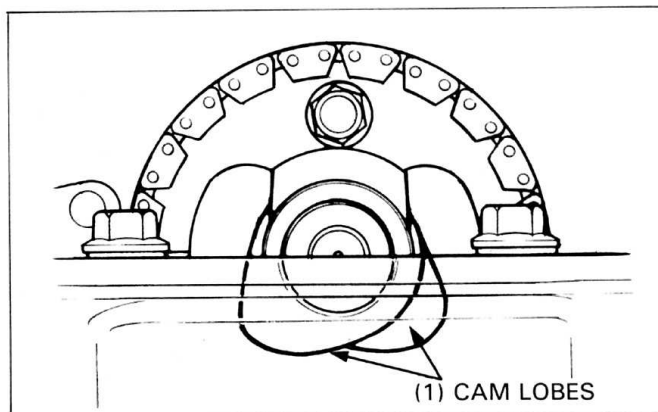
Align the FT mark (rear: RT mark) on the flywheel with the index mark on the left crankcase cover timing hole by turning the crankshaft counterclockwise.



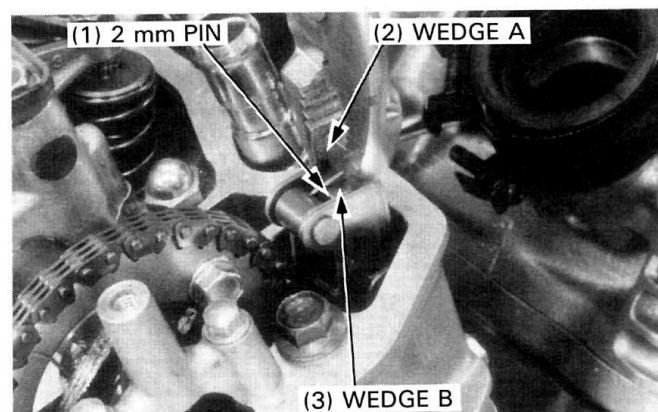
CYLINDER HEAD/VALVES

Make sure the piston is at TDC (TOP DEAD CENTER) on the compression stroke with cam lobes are all facing down.

If the cam lobe is facing up at TDC, turn the crankshaft 360° counterclockwise, and re-align the mark and notch.



Pull wedge A straight up while holding wedge B down. Secure wedge A with a 2 mm pin as shown.



Remove the camshaft holder on the cam sprocket side by removing the two mounting bolts.

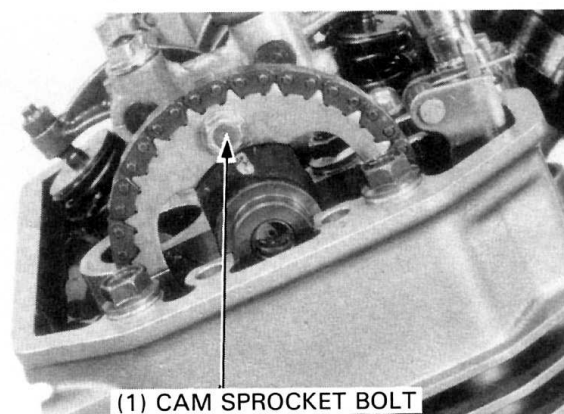


Remove the cam sprocket bolt, rotate the crankshaft counterclockwise one turn (360°) and remove the other cam sprocket bolt.

NOTE

- Be careful not to let the cam sprocket bolts fall into the crankcase.

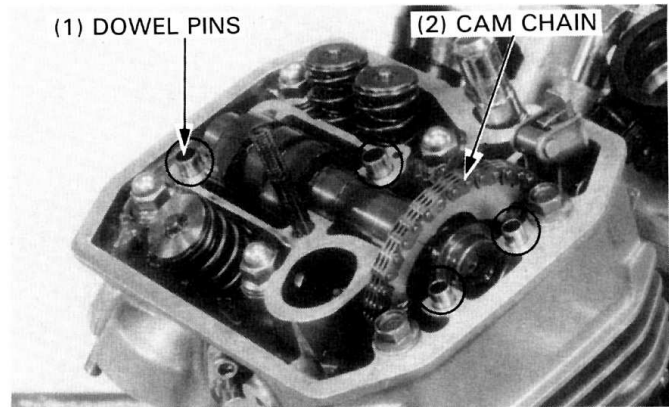
Remove the three camshaft holder mounting bolts and the nut, the oil plate and the holder.



Remove the dowel pins.

Hang the cam chain on the camshaft behind the camshaft flange and remove the cam sprocket while lifting the camshaft out.

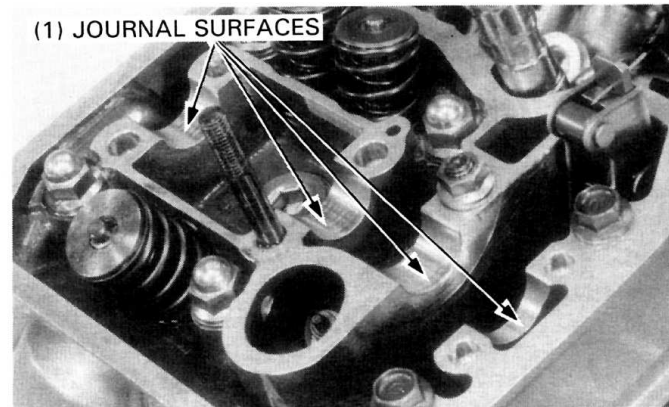
Attach a piece of wire to the cam chain to prevent it from being dropped into the crankcase.



INSPECTION

Cylinder head

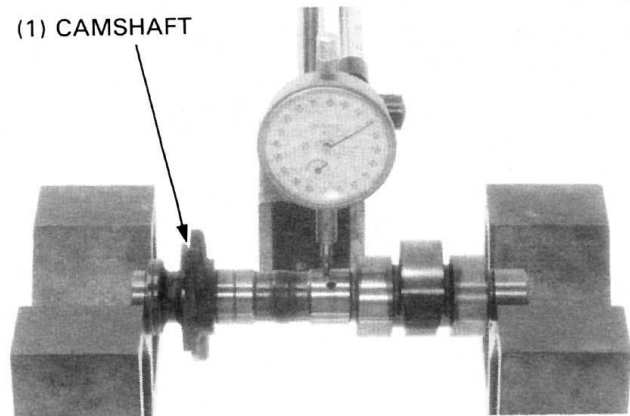
Inspect the camshaft holder and cylinder head journal surfaces for scoring or evidence of insufficient lubrication.



Camshaft runout

Support both ends of the camshaft with V-blocks and check the camshaft runout with a dial indicator.

SERVICE LIMIT: 0.05 mm (0.002 in)



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

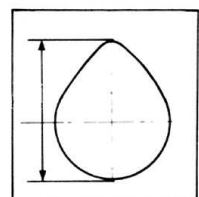
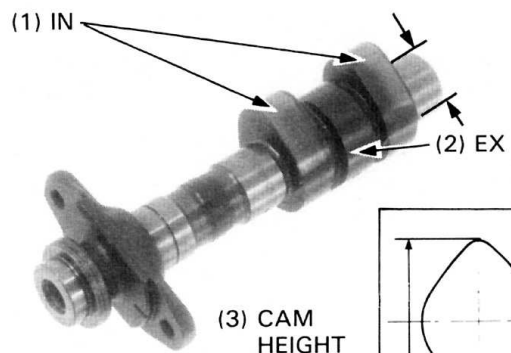
SERVICE LIMIT:

IN: 38.17 mm (1.503 in)

EX: 38.19 mm (1.504 in)

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

SERVICE LIMIT: 21.95 mm (0.864 in)



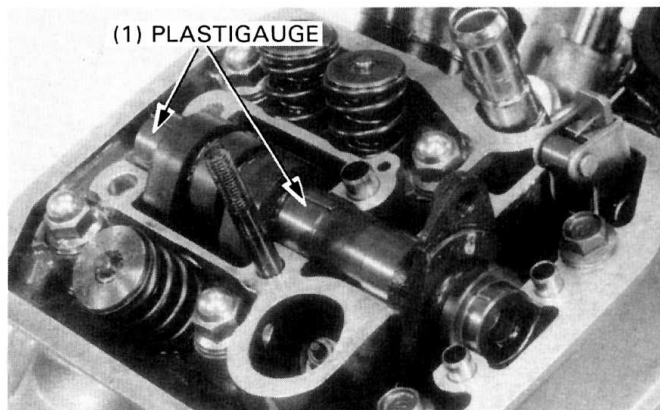
CYLINDER HEAD/VALVES

Camshaft bearing oil clearance

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

NOTE

- Avoid placing plastigauge over the oil hole.



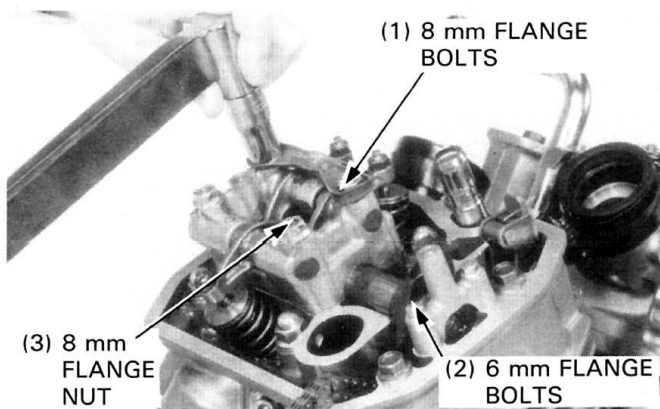
Install the camshaft holders and tighten the mounting bolts in a crisscross pattern in 2 or 3 steps.

NOTE

- Do not rotate the camshaft when using plastigauge.

TORQUE:

- 6 mm flange bolt: 12 N·m (1.2 kg-m, 9 ft-lb)
- 8 mm flange bolt: 23 N·m (2.3 kg-m, 17 ft-lb)
- 8 mm flange nut: 23 N·m (2.3 kg-m, 17 ft-lb)

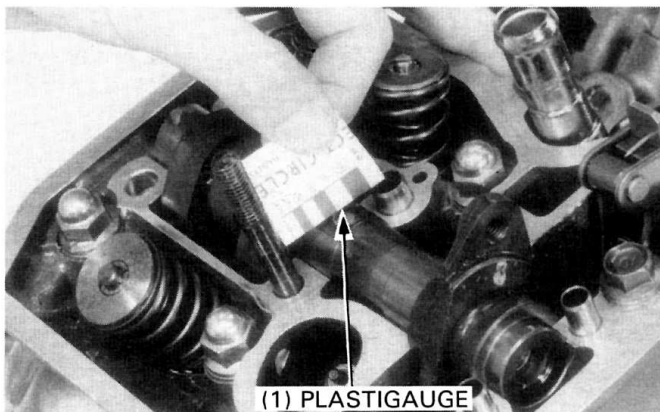


Remove the camshaft holder and measure the width of each plastigauge. The widest thickness determines the oil clearance.

SERVICE LIMIT: 0.11 mm (0.004 in)

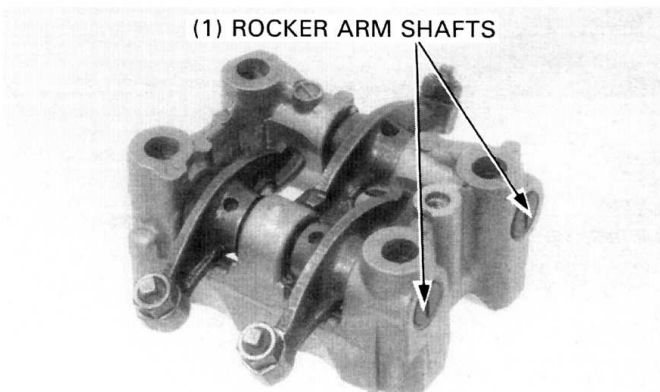
When the service limit is exceeded, replace the camshaft and recheck the oil clearance.

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

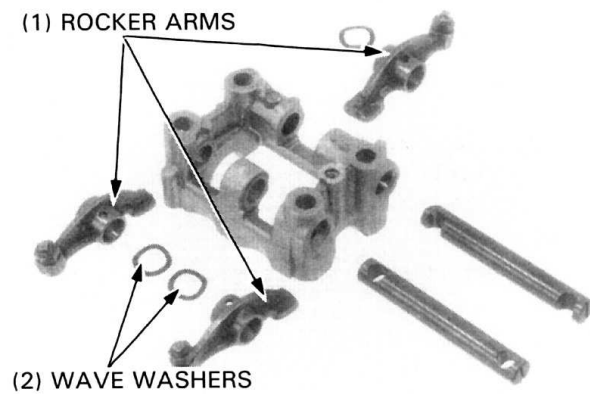


Camshaft holder/Rocker arm shaft/Rocker arm

Remove the rocker arm shafts by tapping the holder with a soft hammer.



Remove the rocker arms and wave washers from the shafts.



Inspect the rocker arm shafts and rocker arms for wear or damage.

Check the rocker arms for clogged oil holes.

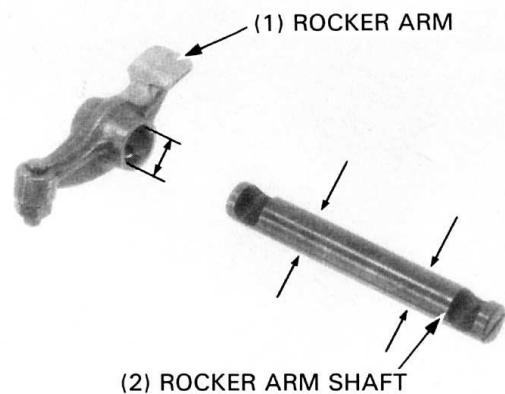
Measure the O.D. of each rocker arm shaft.

SERVICE LIMIT:

IN/EX: 11.96 mm (0.471 in)

Measure the I.D. of each rocker arm.

SERVICE LIMIT: 12.03 mm (0.474 in)



CYLINDER HEAD

REMOVAL

NOTE

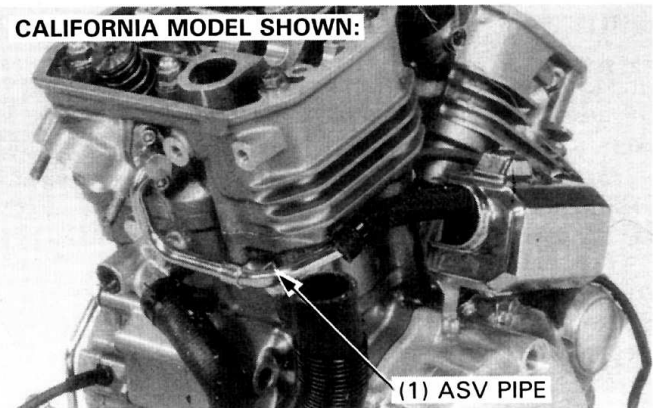
- The cylinder head can be removed with the engine installed.

Drain the coolant (page 5-3) and remove the following:

- camshaft (page 9-3)
- exhaust pipes

California model only:

Remove the ASV pipes from the cylinder head.



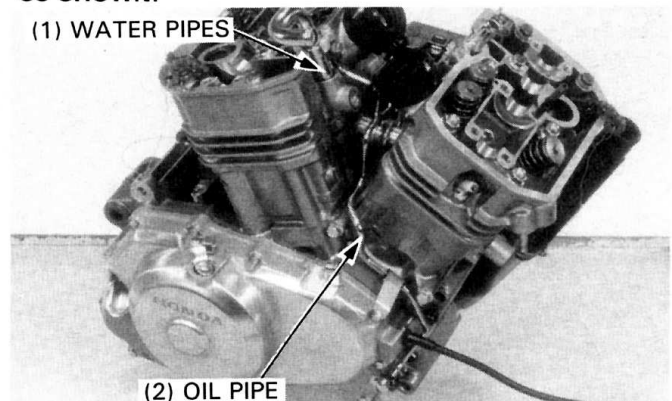
Disconnect the clutch cable from the clutch lifter arm by removing the clutch cable holder bolt.
Remove the oil pipe from the engine.

NOTE

- Do not bend the oil pipe during removal.

Remove the water pipes.

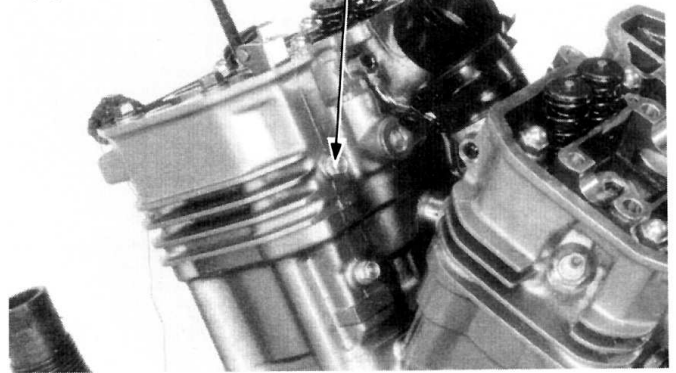
'88 SHOWN:



CYLINDER HEAD/VALVES

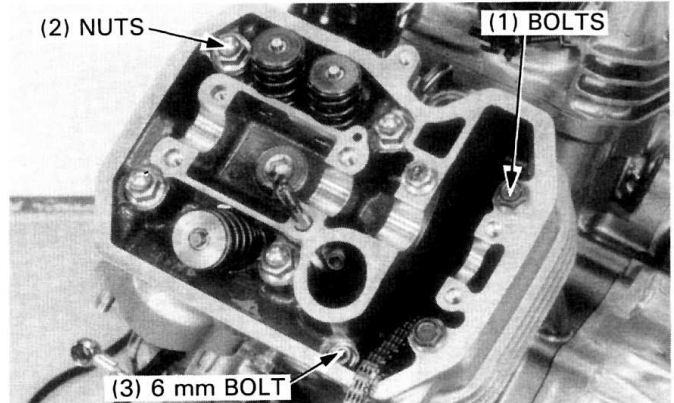
Remove the cam chain tensioner mounting bolts and washers from the cylinder head and cylinder.

(1) CAM CHAIN TENSIONER BOLTS/WASHERS



Loosen the 6 mm bolt, 8 mm bolts, 8 mm nut and 10 mm nuts/washers in a criss-cross pattern in 2 or 3 steps. Remove the bolts and nuts.

(2) NUTS (1) BOLTS



(3) 6 mm BOLT

FRONT:

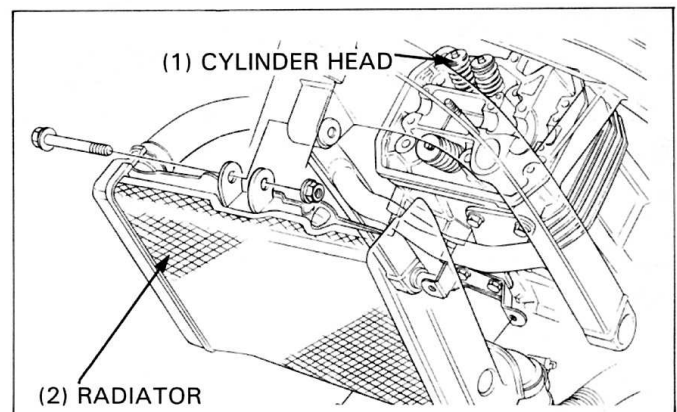
Remove the radiator mounting bolts.
Release the radiator from the frame grommets and suspend it with a piece of rope or something suitable.
Remove the upper exhaust port stud to allow frame clearance for cylinder head removal.
Lock two 8 mm nuts together on the stud to aid in removal.

Remove the front cylinder head.

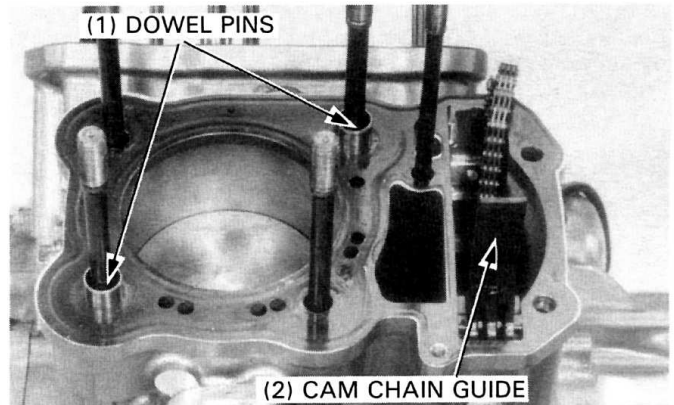
REAR:

Remove the rear cylinder head.

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



(1) DOWEL PINS



(2) CAM CHAIN GUIDE

DISASSEMBLY/INSPECTION

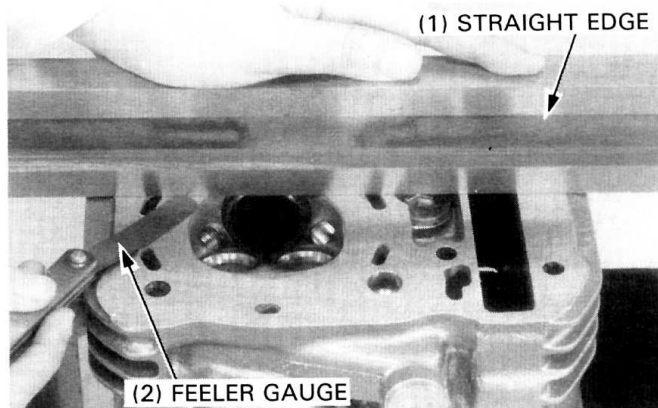
Cylinder head

CAUTION

- *Avoid damaging the gasket surfaces.*

Check the spark plug hole and valve areas for cracks. Check the cylinder head for warpage with the straight edge and feeler gauge.

SERVICE LIMIT: 0.10 mm (0.004 in)



Remove the valve spring cotters, retainers, springs, and valves using a Valve Spring Compressor.

TOOL:

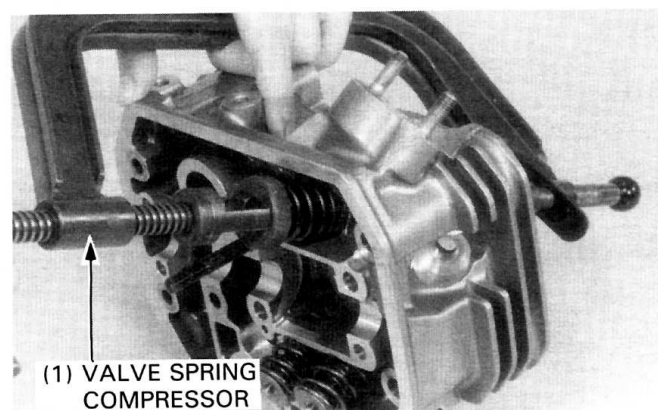
Valve spring compressor 07757-0010000 or
07957-3290001

CAUTION

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

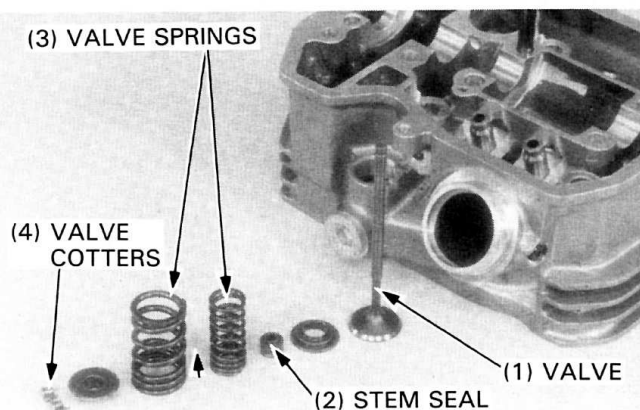
NOTE

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



Remove the valve stem seals and valve spring seats.

Remove carbon deposits from the combustion chamber.



Valve springs

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

SERVICE LIMITS:

INNER (IN): 36.47 mm (1.436 in)
(EX): 37.51 mm (1.477 in)
OUTER (IN): 40.58 mm (1.598 in)
(EX): 41.25 mm (1.624 in)

Replace the springs as a set if they are shorter than the service limits.

