

# 7. CYLINDER HEAD/VALVES

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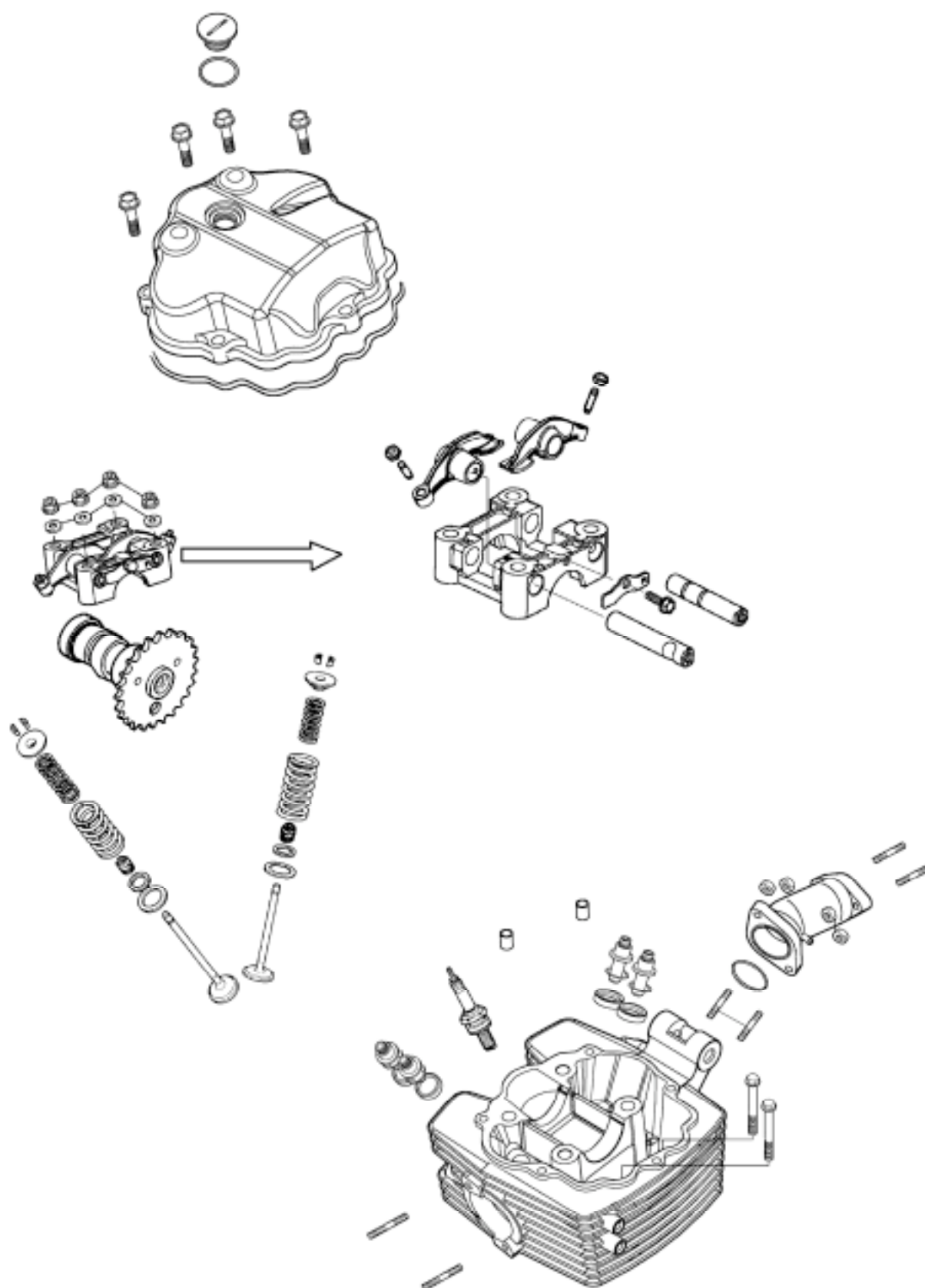
## CYLINDER HEAD/VALVES

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## 7. CYLINDER HEAD/VALVES



## 7. CYLINDER HEAD/VALVES

### SERVICE INFORMATION

#### GENERAL INSTRUCTIONS

- The cylinder head can be serviced with the engine installed in the frame.
- When assembling, apply molybdenum disulfide grease or engine oil to the valve guide movable parts, valve arm and camshaft sliding surfaces for initial lubrication.
- The camshaft is lubricated by engine oil through the cylinder head engine oil passages. Clean and unclog the oil passages before assembling the cylinder head.
- After disassembly, clean the removed parts and dry them with compressed air before inspection.
- After removal, mark and arrange the removed parts in order. When assembling, install them in the reverse order of removal.

#### SPECIFICATIONS

Item		Standard (mm)		Service Limit (mm)
Valve clearance (cold)	IN	0.06		□
	EX	0.06		□
Cylinder head compression pressure		16kg/cm <sub>2</sub>		
Cylinder head warpage		□		0.05
Camshaft cam height	IN	31.8		31.4
	EX	31.53		31.13
Valve rocker arm to shaft clearance		0.09	0.034	0.1
Valve stem-to-guide clearance	IN	0.010	0.037	0.06
	EX	0.025	0.052	0.08
Valve spring free length	IN	39.4		□
	EX	45.5		□
Valve spring compressed force	IN	7.7	8.9kg(at 33.7mm)	□
	EX	19.5	22.5kg(at	□
Valve spring tilt	IN	1.7		□
	EX	1.95		□

## 7. CYLINDER HEAD/VALVES

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### TORQUE VALUES

Cylinder head nut	1.8_	2.2kgf-m	Apply engine oil to threads
Valve clearance adjusting nut	1.4_	1.8kgf-m	Apply engine oil to threads
Stud bolt	0.7_	1.1kgf-m	

### SPECIAL TOOLS

Valve spring compressor	E040
Tappet adjuster	E012

### TROUBLESHOOTING

- The poor cylinder head operation can be diagnosed by a compression test or by tracing engine top-end noises.

#### Poor performance at idle speed

- Compression too low

#### Compression too low

- Incorrect valve clearance adjustment
- Burned or bend valves
- Incorrect valve timing
- Broken valve spring
- Poor valve and seat contact
- Leaking cylinder head gasket
- Warped or cracked cylinder head
- Poorly installed spark plug

#### Compression too high

- Excessive carbon build-up in combustion chamber

#### White smoke from exhaust muffler

- Worn valve stem or valve guide
- Damaged valve stem seal

#### Abnormal noise

- Incorrect valve clearance adjustment
- Sticking valve or broken valve spring
- Damaged or worn camshaft
- Worn cam chain guide
- Worn camshaft and rocker arm

## 7. CYLINDER HEAD/VALVES

### CAMSHAFT REMOVAL

Remove seat, front cover, center cover.  
Front fender, fuel tank and exhaust pipe.

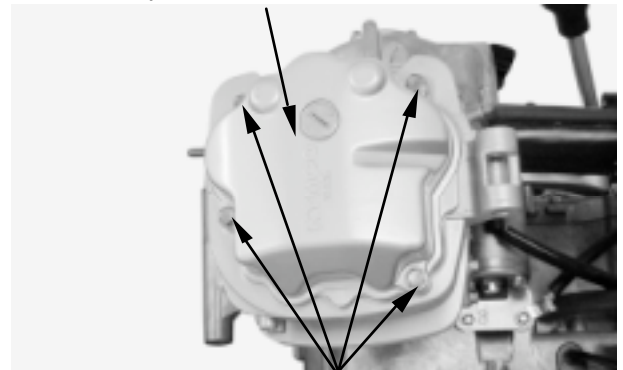
Remove the four cylinder head cover bolts  
to remove the cylinder head cover.

Remove the cam chain tensioner cap bolt  
and the O-ring.

Turn the cam chain tensioner screw  
clockwise to tighten it.

Turn the flywheel counterclockwise so that  
the "T" mark on the flywheel aligns with  
the index mark on the crankcase to bring the  
round hole on the camshaft gear facing up to  
the top dead center on the compression  
stroke.

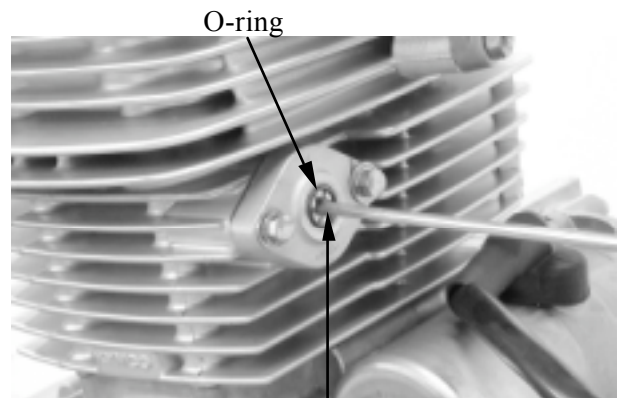
Cylinder Head Cover



Bolts

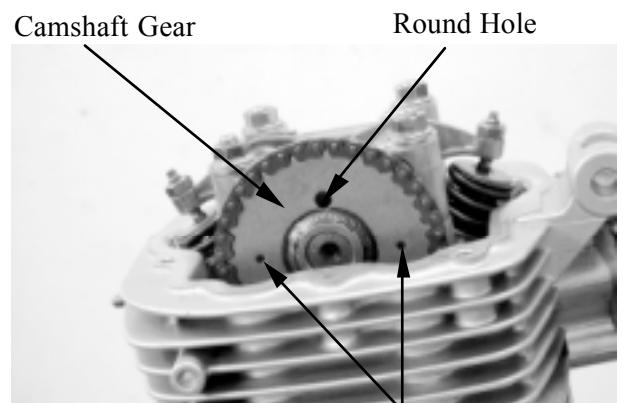


Bolt



O-ring

Tensioner Screw



Camshaft Gear

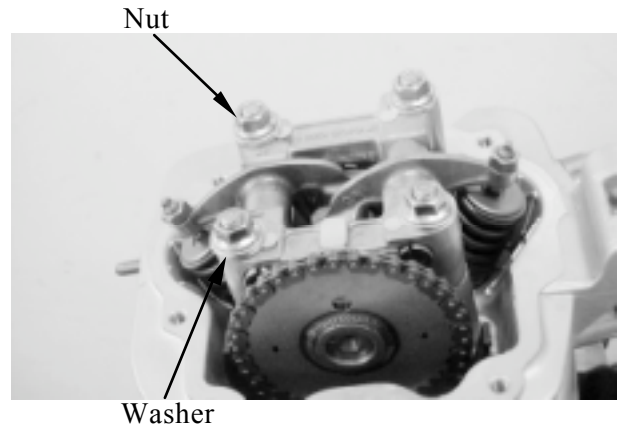
Round Hole

Punch Marks

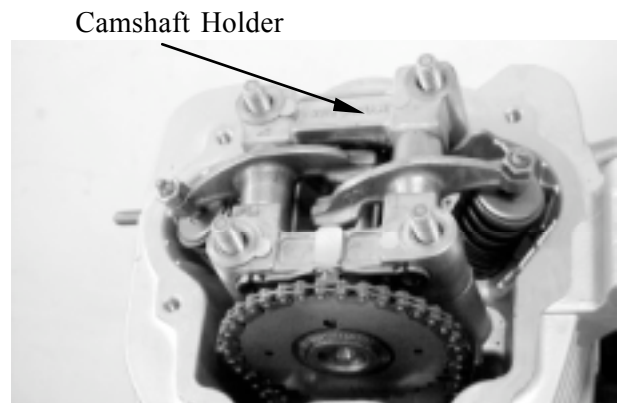
## 7. CYLINDER HEAD/VALVES

Remove the four cylinder head nuts and washers.

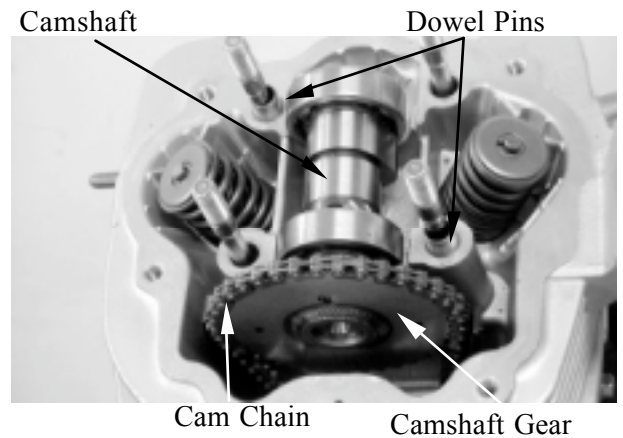
- \* Diagonally loosen the cylinder head nuts in 2 or 3 times.



Remove the camshaft holder and dowel pins.



Remove the camshaft gear from the cam chain and remove the camshaft.



### CAMSHAFT INSPECTION

Check each cam lobe for wear or damage.  
Measure the cam lobe height.

#### Service Limits:

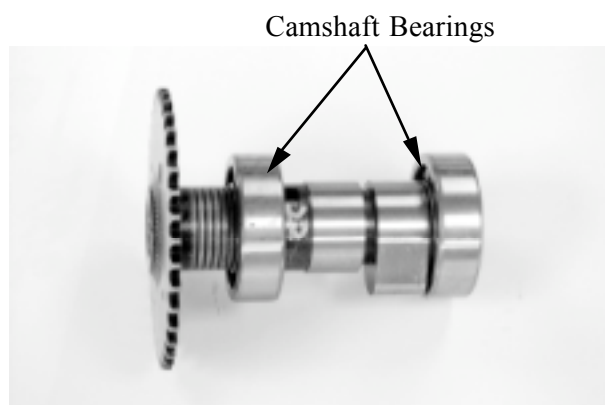
IN : 31.40mm replace if below

EX: 31.13mm replace if below



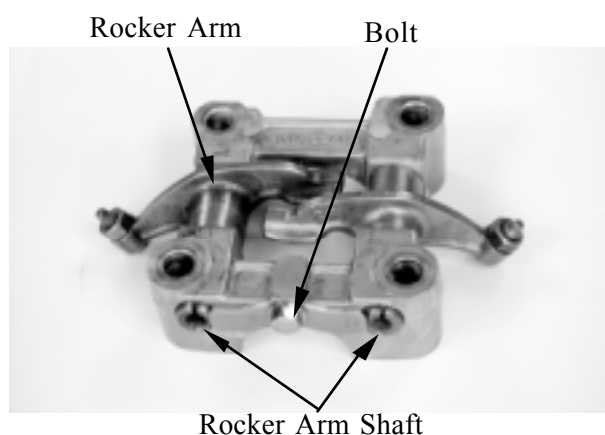
## 7. CYLINDER HEAD/VALVES

Check each camshaft bearing for play or damage. Replace the camshaft assembly with a new one if the bearings are noisy or have excessive play.



### CAMSHAFT HOLDER DISASSEMBLY

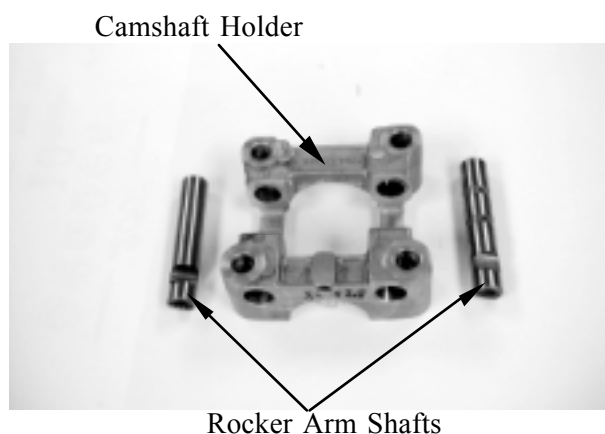
Remove the bolt attaching the stop plate.  
Take out the valve rocker arm shafts using a 5mm bolt.  
Remove the valve rocker arms.



### CAMSHAFT HOLDER INSPECTION

Inspect the camshaft holder, valve rocker arms and rocker arm shafts for wear or damage.

- \* If the valve rocker arm contact surface is worn, check each cam lobe for wear or damage.



Measure the I.D. of each valve rocker arm.  
Measure each rocker arm shaft O.D.  
Measure arm to shaft clearance.  
Replace as a set if out of specification.  
**Service limits:** 0.10mm

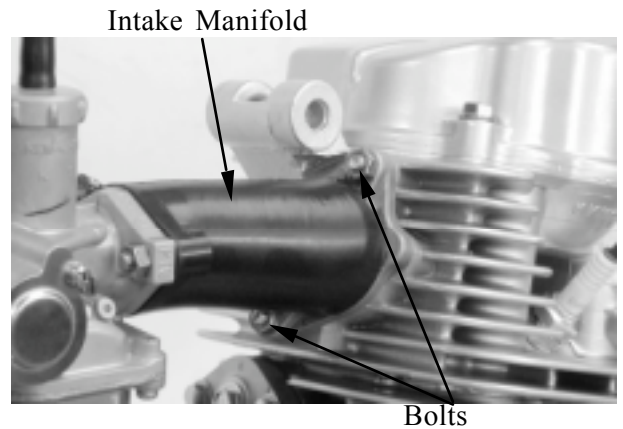




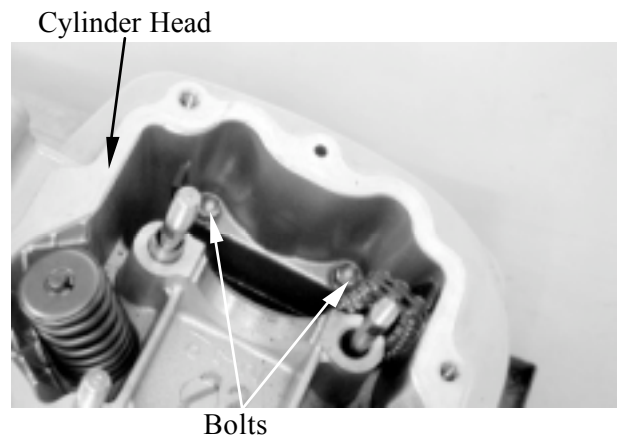
## 7. CYLINDER HEAD/VALVES

### CYLINDER HEAD REMOVE

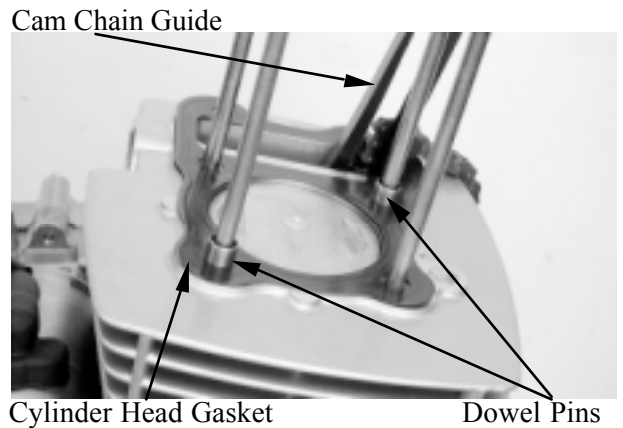
Remove the camshaft.  
Remove the carburetor.  
Remove the exhaust muffler.  
Remove the carburetor intake manifold.



Remove the two cylinder head bolts.  
Remove the cylinder head.

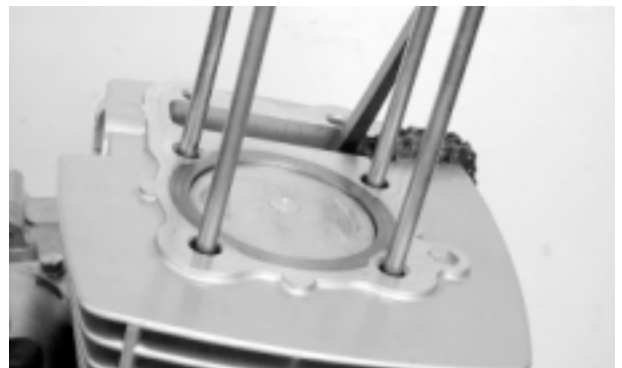


Remove the dowel pins and cylinder head gasket.  
Remove the cam chain guide.



Remove all gasket material from the cylinder mating surface.

- \* Avoid damaging the cylinder mating surface.
- \* Be careful not to drop any gasket material into the engine.





## 7. CYLINDER HEAD/VALVES

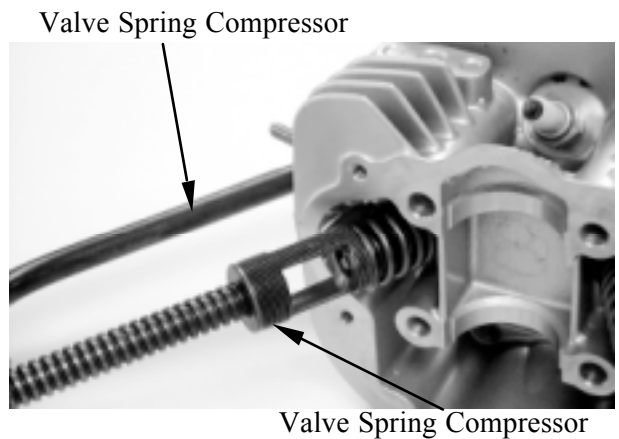
### CYLINDER HEAD DISASSEMBLY

Remove the valve spring cotters, retainers, springs, spring seats and valve stem seals using a valve spring compressor.

- \*
  - Be sure to compress the valve springs with a valve spring compressor.
  - Mark all disassembled parts to ensure correct reassembly.

Special

Valve Spring Compressor E040



Remove carbon deposits from the combustion chamber.  
Clean off any gasket material from the cylinder head mating surface.

- \* Be careful not to damage the cylinder head mating surface.



### INSPECTION

#### CYLINDER HEAD

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:** 0.05mm repair or replace if over

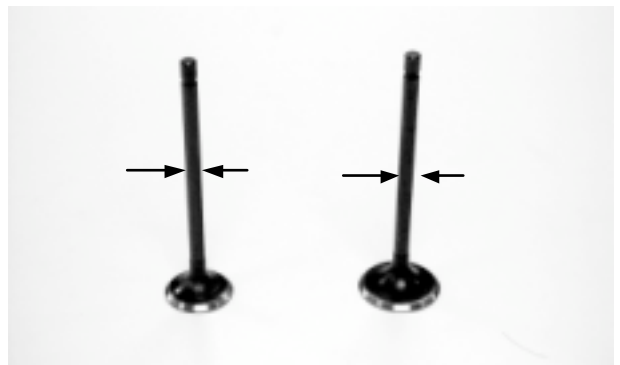


#### VALVE /VALVE GUIDE

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

Check valve movement in the guide.

Measure each valve stem O.D.



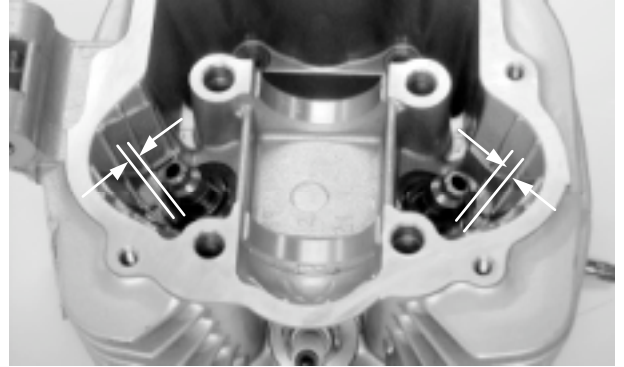
## 7. CYLINDER HEAD/VALVES

Measure each valve guide I.D.

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

**Service limits:** IN : 0.06mm replace if over  
EX: 0.08mm replace if over

\* If the stem-to-guide clearance exceeds the service limits, replace the cylinder head as necessary.

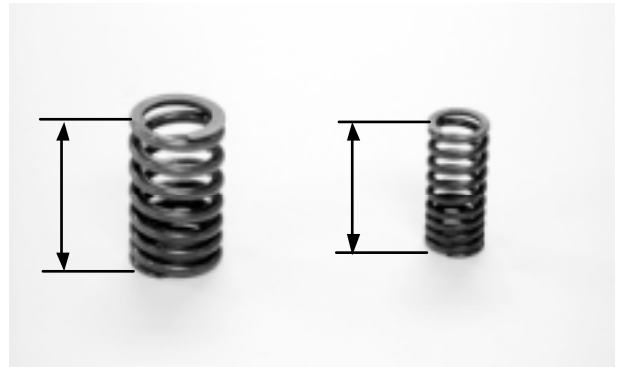


### VALVE SPRING FREE LENGTH

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

Inner : 39.4mm replace if below

Outer: 45.5mm replace if below



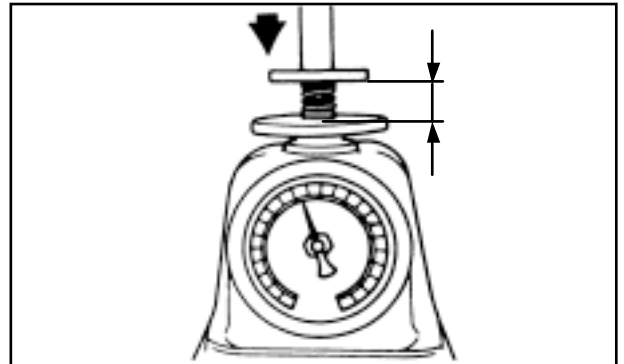
Measure compressed force (valve spring) and installed length.

Replace if out of specification.

**Service limits:**

IN : 7.7\_ 8.9kg (at 33.7mm)

EX : 19.5\_ 22.5kg (at 38.4mm)

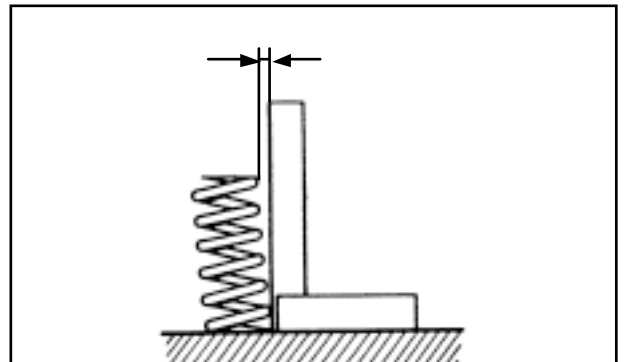


Measure the spring tilt.

Replace if out of specification.

**Service limits:** IN : 1.7mm

EX : 1.95mm



## 7. CYLINDER HEAD/VALVES

### CYLINDER HEAD ASSEMBLY

Install the valve spring seats and valve stem seals.

- \* Be sure to install new valve stem seals.

Lubricate each valve stem with engine oil and insert the valves into the valve guides. Install the valve springs and retainers.



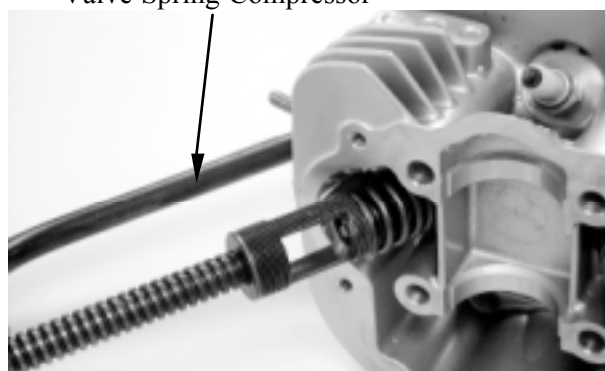
Compress the valve springs using the valve spring compressor, then install the valve cotters.

- \* When assembling, a valve spring compressor must be used.
- Install the cotters with the pointed ends facing down from the upper side of the cylinder head.

**Special**

Valve Spring Compressor E040

Valve Spring Compressor



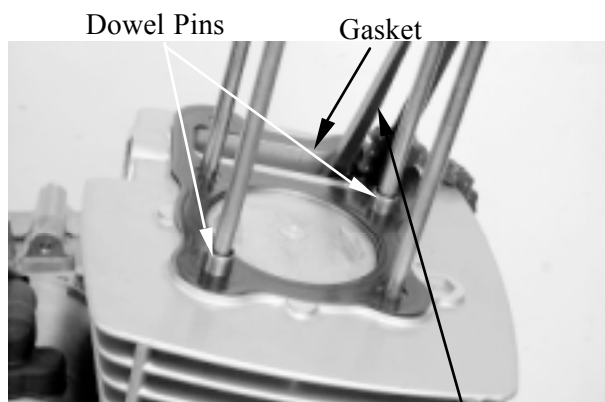
Tap the valve stems gently with a plastic hammer for 2\_ 3 times to firmly seat the cotters.

- \* Be careful not to damage the valves.



### CYLINDER HEAD INSTALLATION

Install the dowel pins and a new cylinder head gasket. Install the cam chain guide.



Dowel Pins

Gasket

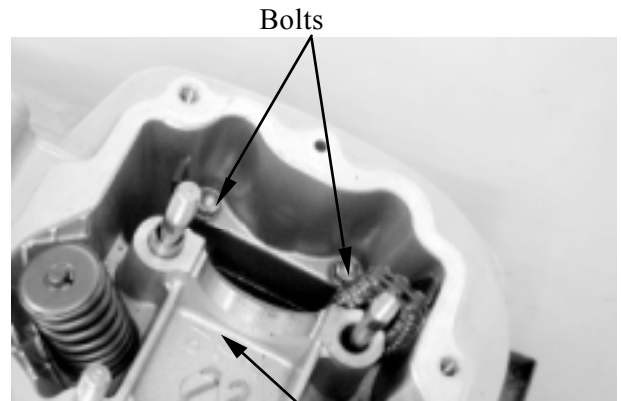
Cam Chain Guide

## 7. CYLINDER HEAD/VALVES

Install two cylinder head bolts do not tighten completely.

Install the cylinder head.

**Torque:** Stud Bolts :0.8\_ 1.2kgf-m



Cylinder Head

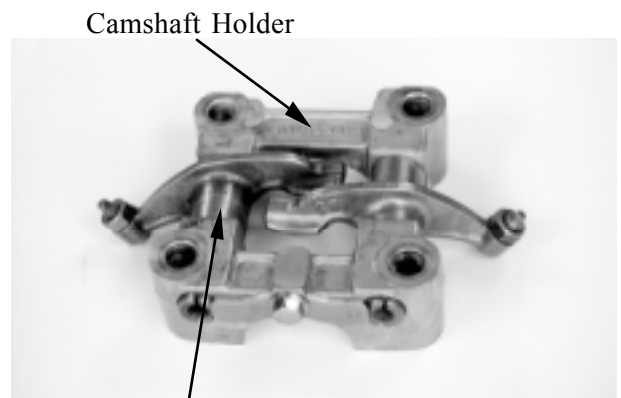
### CAMSHAFT HOLDER ASSEMBLY

Install the exhaust valve rocker arm to the "EX" mark side of the camshaft holder.

Install the intake valve rocker arm and the rocker arm shafts.

Tighten the bolt attaching stop plate.

- \*
  - Align the cutout on the front end of the intake valve rocker arm shaft with the bolt of the camshaft holder.
  - Align the cross cutout on the exhaust valve rocker arm shaft with the bolt of the camshaft holder.



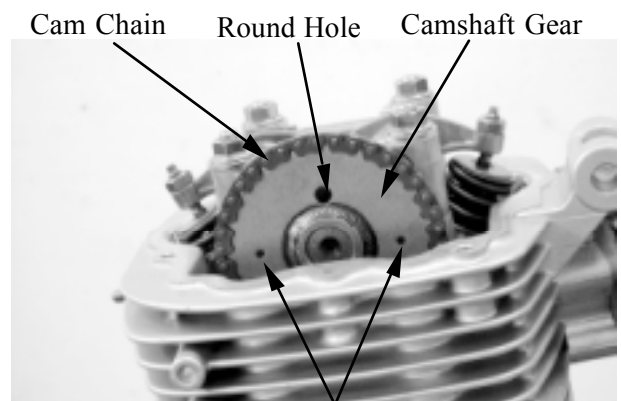
Valve Rocker Arm

### CAMSHAFT INSTALLATION

Turn the flywheel so that the "T" mark on the flywheel aligns with the index mark on the crankcase.

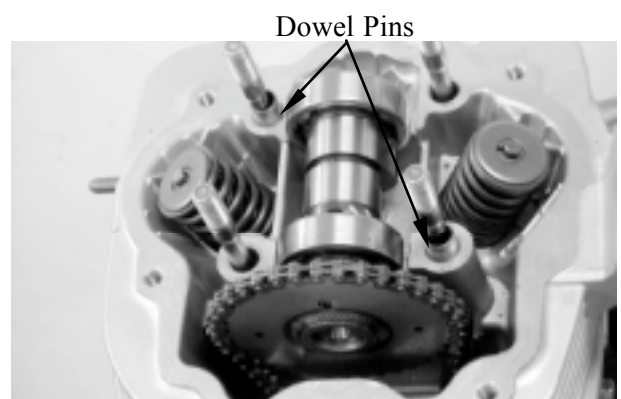
Keep the round hole on the camshaft gear facing up and align the punch marks on the camshaft gear with the cylinder head surface (Position the intake and exhaust cam lobes down.) and install the camshaft onto the cylinder head.

Install the cam chain over the camshaft gear.



Punch Marks

Install the dowel pins.

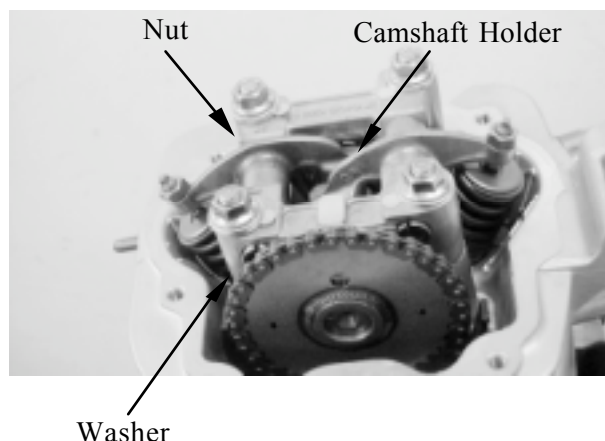


## 7. CYLINDER HEAD/VALVES

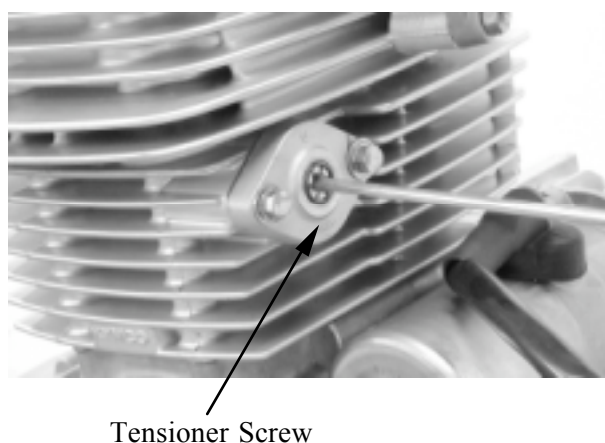
Install the camshaft holder, washers and nuts on the cylinder head.  
Tighten the four cylinder head nuts, then tighten two cylinder head bolts completely.

**Torque:** Cylinder head nut: 1.8\_ 2.2kgf-m

- \*
  - Apply engine oil to the threads of the cylinder head nuts.
  - Diagonally tighten the cylinder head nuts in 2\_ 3 times.

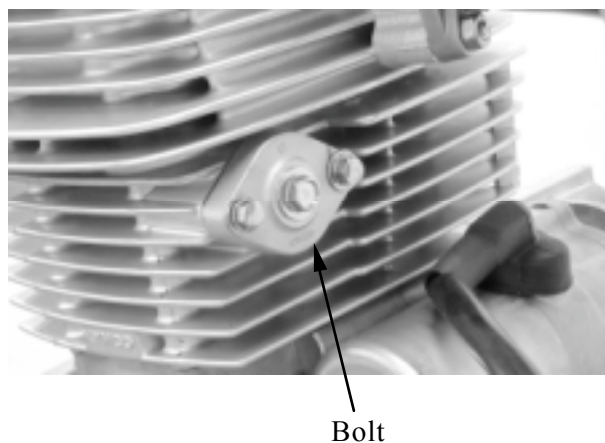


Adjust the valve clearance.  
Turn the cam chain tensioner screw counter-clockwise to release it.



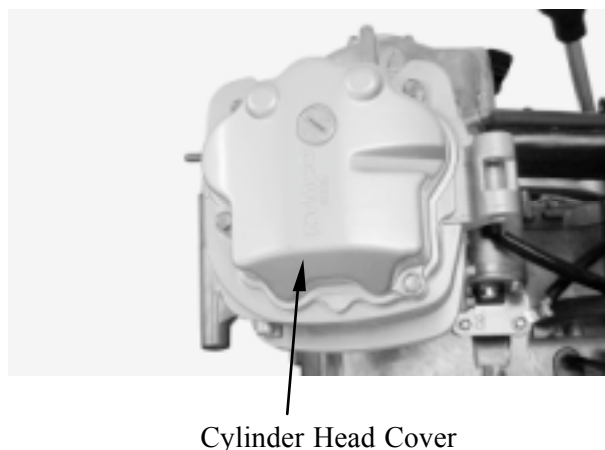
Apply engine oil to a new O-ring and install it.  
Tighten the cam chain tensioner cap bolt.

- \* Be sure to install the O-ring into the groove properly.



Install a new cylinder head cover O-ring and install the cylinder head cover.  
Install and tighten the cylinder head cover bolts.

- \* Be sure to install the O-ring into the groove properly.



Cylinder Head Cover