

Service Information.....	8 - 1	Piston removal.....	8 - 4
Troubleshooting.....	8 - 2	Piston installation.....	8 - 7
Cylinder removal.....	8 - 3	Cylinder installation.....	8 - 8

◆ Service Information

• General

- Dismount the engine from the frame for service works in this section.
- Do not damage the interior surface of the cylinder and exterior surface of the piston.
- All parts are to be cleaned with compressed air and dried after inspection / measurement.
- Mark all removed parts so that they can be re-installed to the original position.

• Specifications

Item		Standard	Service limit	
Cylinder	Bore	65.500 – 65.510mm	65.6mm	
	Out – of – round	-	0.10mm	
	Taper	-	0.10mm	
	Top warpage	-	0.10mm	
Piston, Piston pin and Piston ring	Install direction mark	"IN" to the inlet	-	
	External diameter measuring position	10mm from the bottom end of the skirt	-	
	External diameter	65.470 – 65.490mm	65.40mm	
	Piston pin hole bore	15.002 – 15.008mm	15.04mm	
	Piston – cylinder clearance	0.010 – 0.040mm	0.20mm	
	Piston pin external diameter	14.994 – 15.000mm	14.96mm	
	Piston – piston pin clearance	0.002 – 0.014mm	0.02mm	
	Piston pin – connecting rod end clearance	0.010 – 0.034mm	0.10mm	
	Piston ring end gap	Top	0.20 – 0.35mm	0.5mm
		Second	0.35 – 0.50mm	0.5mm
		Oil (side rail)	0.20 – 0.70mm	0.90mm
	Ring – to – ring groove clearance	Top	0.010 – 0.045mm	0.09mm
		Second	0.015 – 0.045mm	0.09mm
	Piston ring mark	Top	Mark to the top	-
		second	Mark to the top	-
Connecting rod small end bore		15.010 – 15.028mm	15.06mm	

- **Troubleshooting**

Low compression

- Worn cylinder head gasket
- Worn / broken piston ring
- Cylinder / piston wear

High compression

- Carbon built up in combustion chamber / piston

Excessive noise from the piston

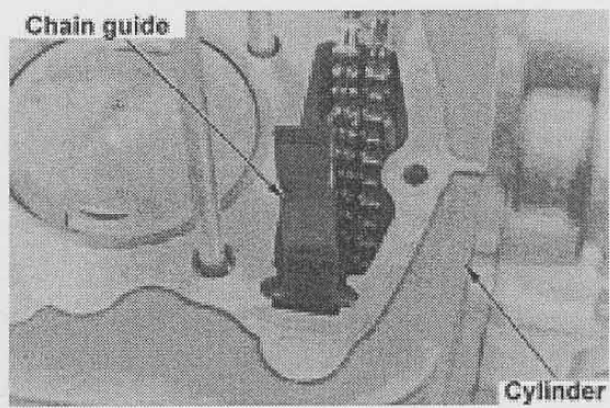
- Worn cylinder / piston / piston ring
- Worn piston pin / piston pin hole
- Worn connecting rod small end

Abnormal noise

- Damaged cylinder / piston

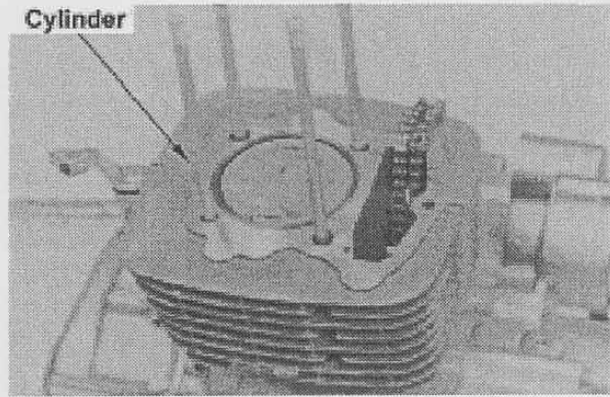
- **Cylinder removal**

Remove a cylinder head (7-5).
Remove a cam chain guide from the cylinder.

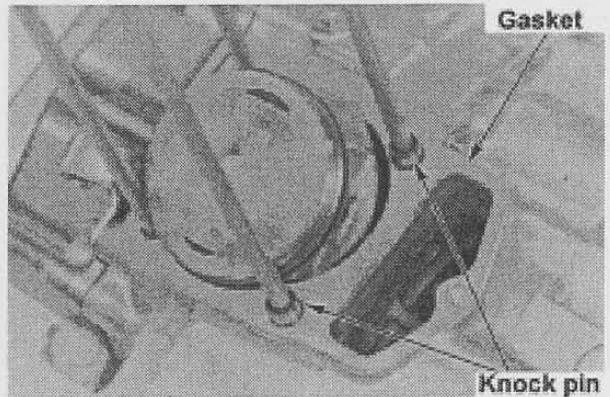


Remove the cylinder.

Note:
Do not scratch the mating surface with a screwdriver when removing the cylinder.



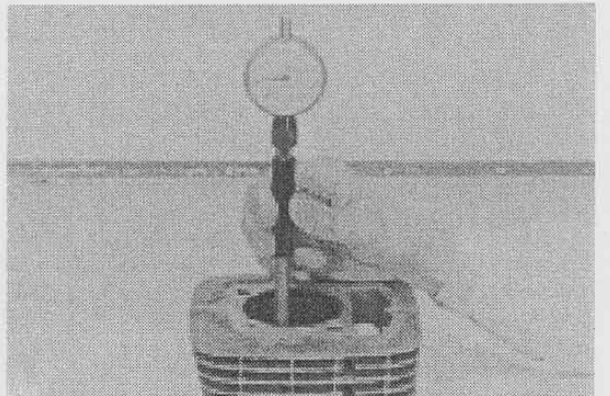
Remove a gasket and knockpins.



- **Cylinder inspection**

Inspect the cylinder interior surface for wear and damage.
Measure the cylinder bore at three levels in X and Y axis each.
Take the maximum reading to determine the cylinder bore (wear).

Service limit: 65.6mm or above → replace



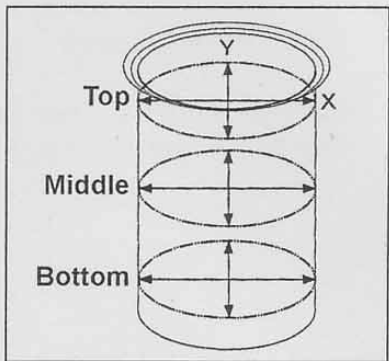
Calculate the cylinder taper at three levels in an X and Y axis (calculate the difference between X and Y values at the same level).

Calculate out-of-round (difference of bore between three levels in X and Y axis).

Take maximum values.

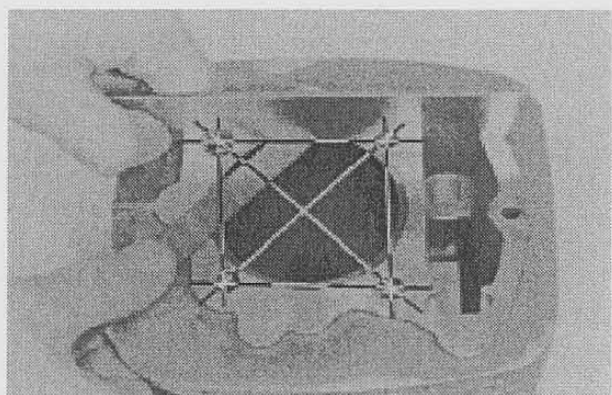
Service limit: Taper 0.10mm or above → replace

Out-of-round 0.10mm or above → replace



Measure the cylinder top warpage by using a straight edge and a thickness gauge.

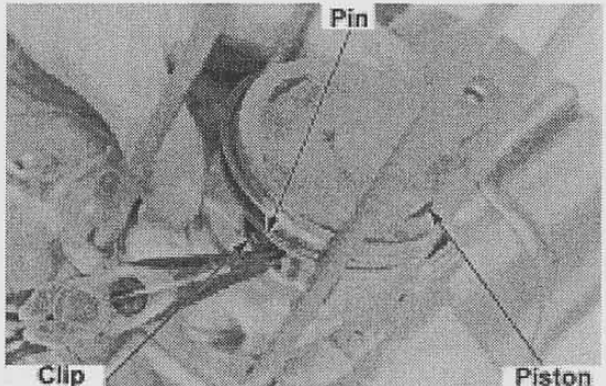
Service limit: 0.10mm or above → replace



Piston removal

Note:
Cover the crankcase opening with a cloth to prevent a piston pin clip falling into the crankcase.

Remove a piston pin clip to pull out the pin.
Remove the piston.

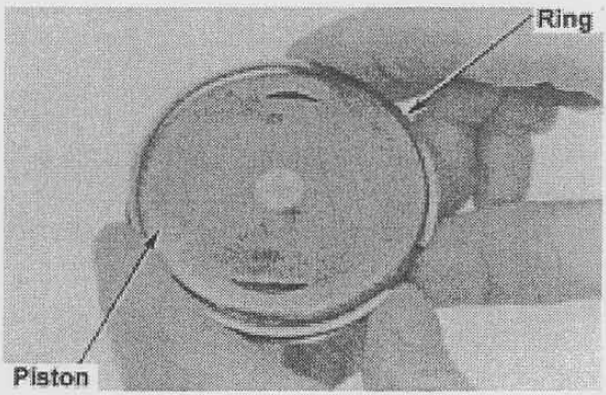


Piston and piston rings inspection

Widen the ring and gap of the piston ring and detach it from the opposite side of the gap.



- Do not overstress the ring.
- Do not damage the piston with the ring.



Remove built up carbon from the piston. Carbon on the piston ring groove can be removed by using an old piston ring.



- Do not scratch the ring groove.
- Do not use a wire brush as it may scratch the groove.

Inspect the piston for damage / crack and abnormal wear of the groove. Install the piston ring to the ring groove and push the ring into the piston until the ring surface matches the piston surface. Measure the ring – groove clearance with thickness gauges.

Service limit:

Top: 0.09mm or above → replace

Second 0.09mm or above → replace

Insert each piston ring to the cylinder by using a piston head so as to set rings level. Measure the ring and gaps with thickness gauges.

Service limit:

Top: 0.5mm or above → replace

Second: 0.5mm or above → replace

Oil: 0.90mm or above → replace

Measure and record the piston external diameter.

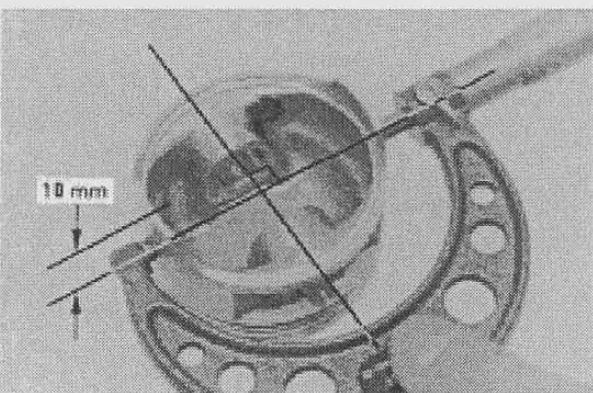
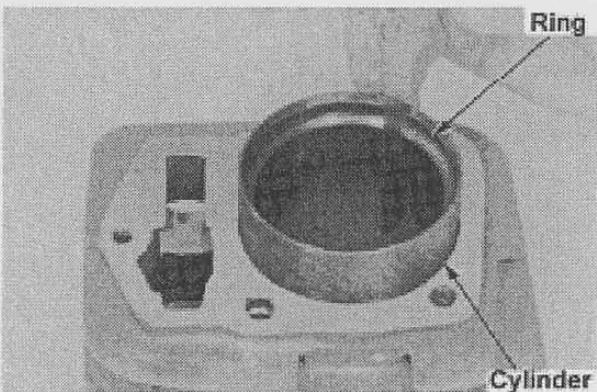
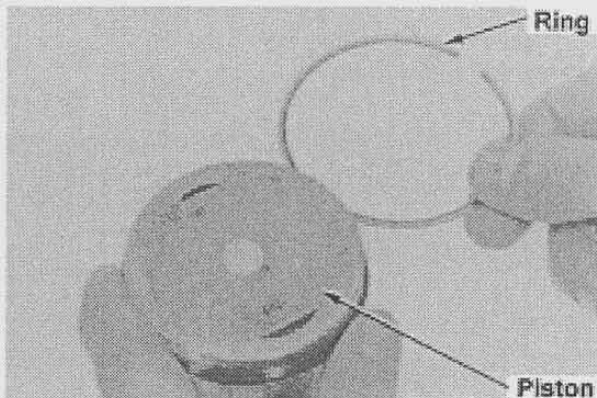
Service limit: 65.40mm or less → replace

Note:

Measure at 10mm from the skirt bottom end and perpendicular to the piston pinhole.

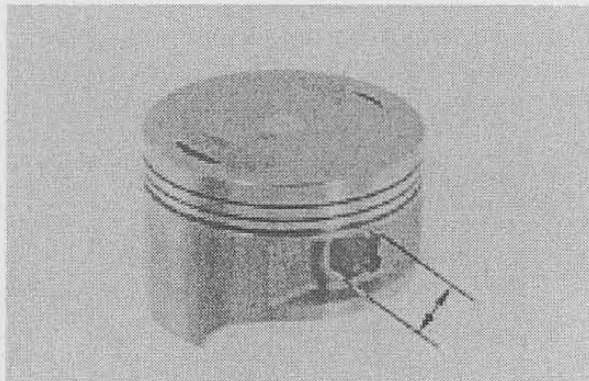
Measure the clearance between the piston and the cylinder.

Service limit: 0.10mm



Measure and record the piston pin hole bore for X and Y axis.

Service limit: 15.04mm or above → replace

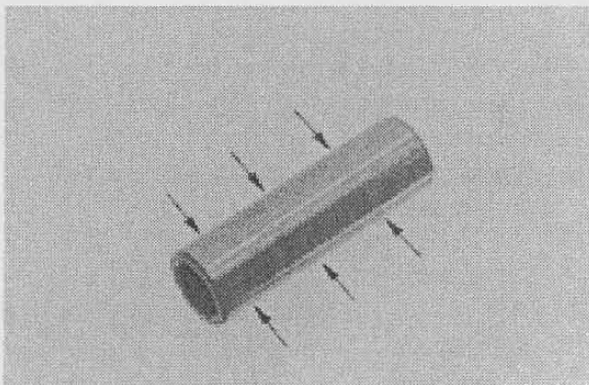


Measure the external diameter of the piston pin at the contact areas with the piston and the connecting rod.

Service limit: 14.96mm or less → replace

Calculate the piston – piston pin clearance.

Service limit: 0.02mm



• Connecting rod small end inspection

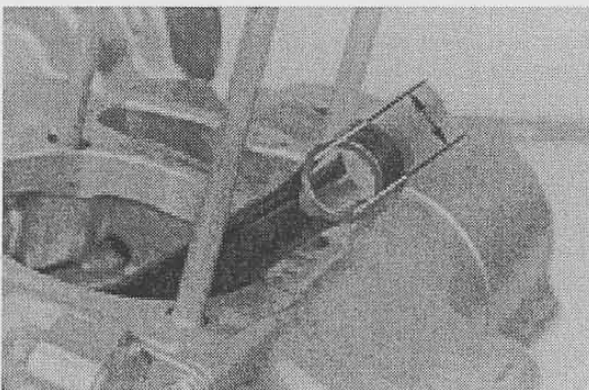
Measure the bore of the small end.

Service limit: 15.06mm or above → replace

Calculate the connecting rod small end and piston pin clearance.

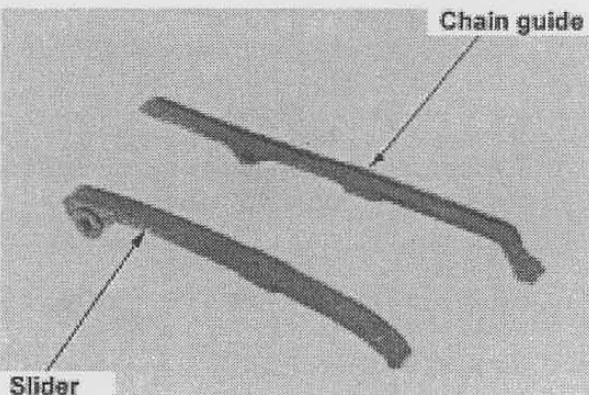
Service limit: 0.10mm

If the clearance is above the limit, replace the piston pin.



• Cam chain guide and slider inspection

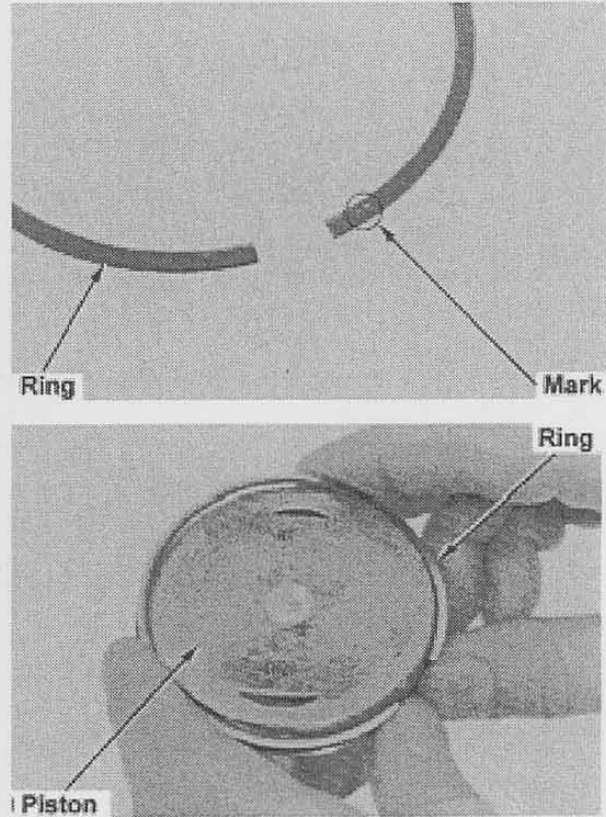
Inspect the cam chain guide and cam chain tensioner slider rubber surfaces for excessive wear and damage.



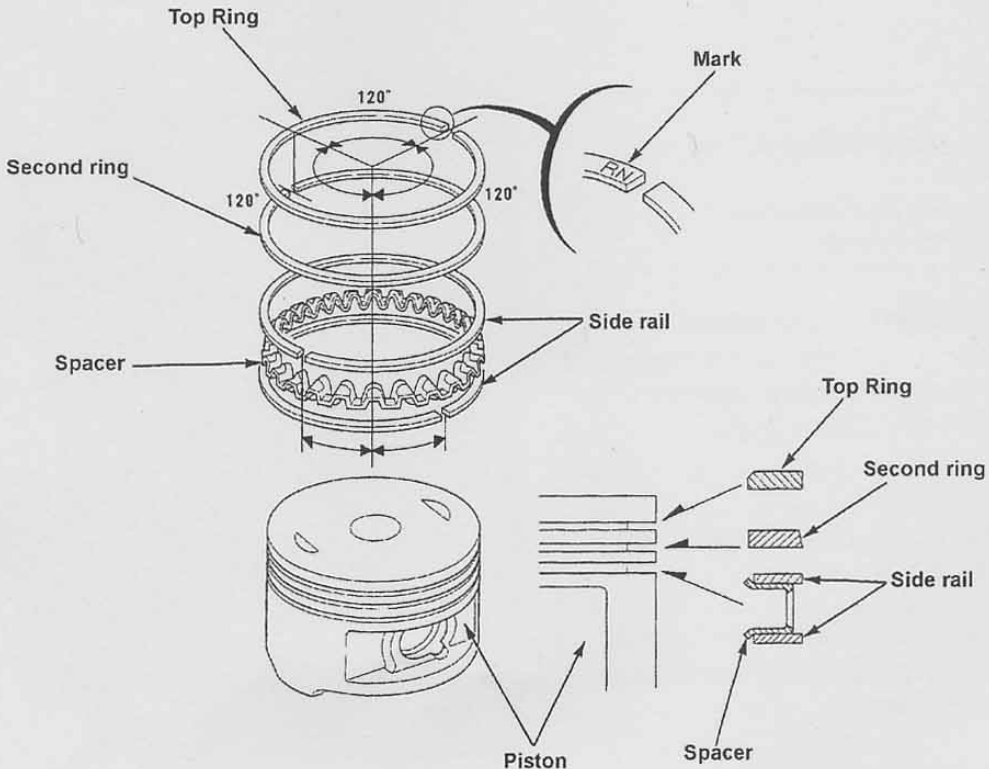
- Piston installation
- Piston pin installation

Apply engine oil to the piston rings and set them to the ring grooves.

- Notes:
- Do not damage the piston and piston rings.
- Marks on the rings should face upwards.
- Stagger the ring end gaps 120°.
- Do not set the rings to have the end gaps to the piston pin direction or perpendicular to the pin direction.
- Side rails should be set so as to have their end gaps on each side of the spacer end gap.



Check smooth rotation of the rings after installation.



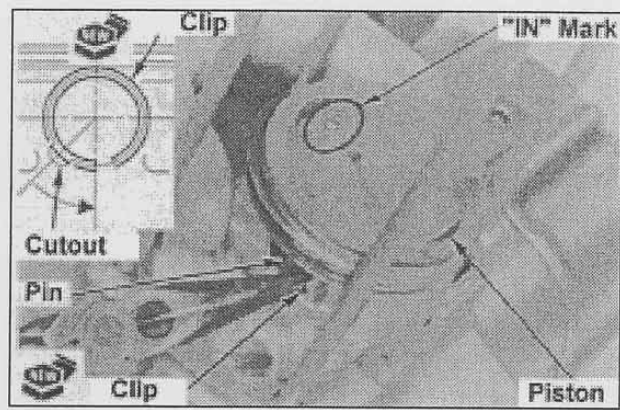
Note:

Wrap the open area of the crankcase to prevent a piston pin clip falling into the crankcase.

Apply engine oil to the piston pin, connecting rod small end and the piston pin hole.

Face the IN mark to the intake side to set the piston to the conrod.

Install a new piston pin clip.

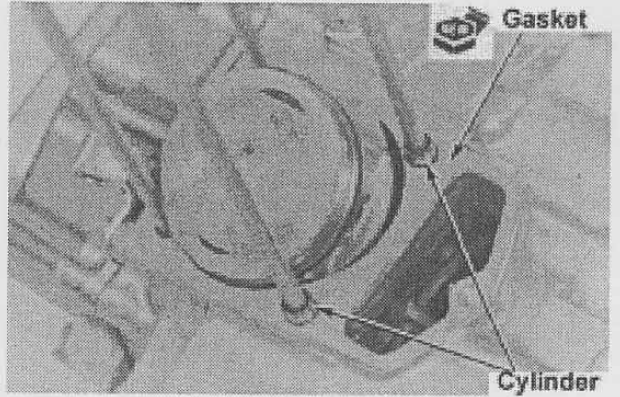


Note:

- Firmly set the clip to the groove.
- Avoid installing the clip end gap aligning with the piston cut-out.

• Cylinder installation

Clean the cylinder installation surface of the crankcase.

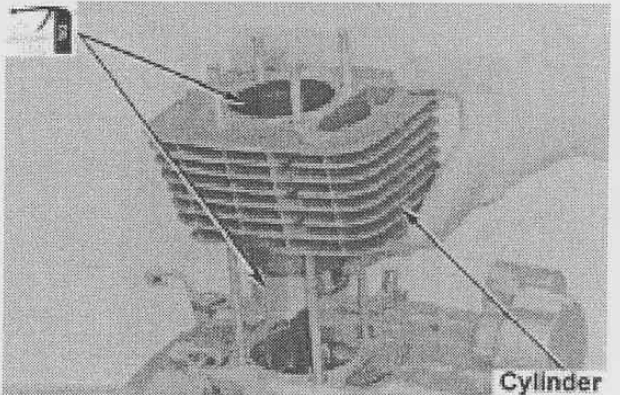


Note:

- Prevent gasket falling into the crankcase.
- Do not damage the cylinder installation surface.

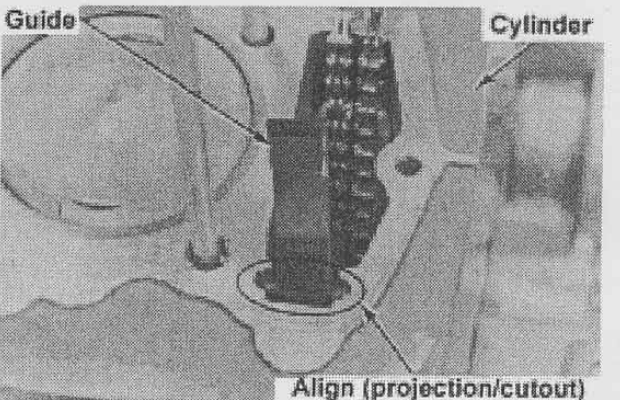
Install knockpins and a new gasket.

Before installing a cylinder, apply engine oil to the piston exterior surface, cylinder interior surface and piston rings.



Do not damage the piston rings and the cylinder interior surface.

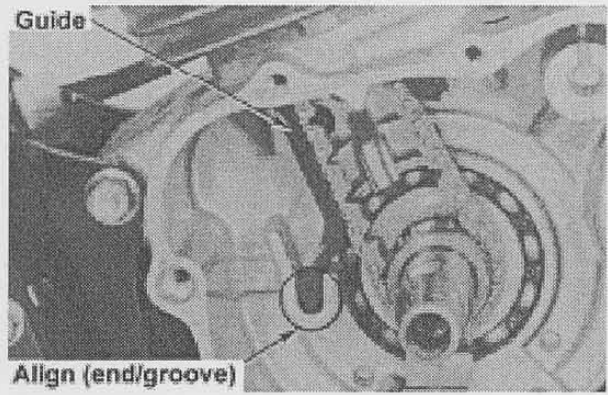
Route the cam chain through the cylinder and install the cylinder by compressing the piston rings with fingers.



Install a cam chain guide.

Note:

Align the cam chain guide end to the crankcase groove, the projection to the cylinder cutout.



Install the cylinder head (7-18).

Dave's Tests and Articles.