

10. CYLINDER/PISTON

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SERVICE INFORMATION

GENERAL

- This section covers service of the cylinder and piston.
- The engine must be removed to service to cylinder/piston.
- To service the crankcase stud bolts, refer to page 11-13.

SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder	I.D.		79.000–79.015 (3.1102–3.1108)	79.05 (3.112)
	Warpage across top		—	0.10 (0.004)
	Taper		—	0.06 (0.002)
	Out-of-round		—	0.06 (0.002)
Piston, piston rings and piston pin	Piston ring-to-ring groove clearance	TOP	0.025–0.055 (0.001–0.002)	0.11 (0.004)
		SECOND	0.015–0.045 (0.0006–0.0018)	0.10 (0.004)
	Ring end gap	TOP	0.20–0.35 (0.008–0.014)	0.65 (0.026)
		SECOND	0.35–0.50 (0.014–0.020)	0.65 (0.026)
		OIL	0.20–0.80 (0.008–0.031)	0.95 (0.037)
	Piston O.D.		78.970–78.990 (3.1086–3.1098)	78.92 (3.107)
	Piston pin bore		20.002–20.008 (0.7874–0.7877)	20.018 (0.7881)
	Connecting rod small end I.D.		20.016–20.034 (0.7880–0.7887)	20.04 (0.789)
	Piston pin O.D.		19.994–20.000 (0.7871–0.7874)	19.984 (0.7867)
	Piston-to-piston pin clearance		0.002–0.014 (0.0001–0.0006)	0.034 (0.0013)
	Cylinder-to-piston clearance		0.010–0.035 (0.0004–0.0014)	0.13 (0.005)
	Piston pin-to-connecting rod small end clearance		0.016–0.040 (0.0006–0.0016)	0.060 (0.0024)

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TROUBLESHOOTING

Low or uneven compression

- Worn cylinder or piston rings.
- Leaking head gasket.
- Incorrect valve timing.

Piston noise

- Worn cylinder and piston.
- Excessive carbon deposits.

Excessive smoke

- Worn cylinder and piston rings.
- Improperly installed piston rings.
- Damaged piston or cylinder.

Overheating

- Excessive carbon deposits on piston or combustion chamber.
- Faulty water pump.

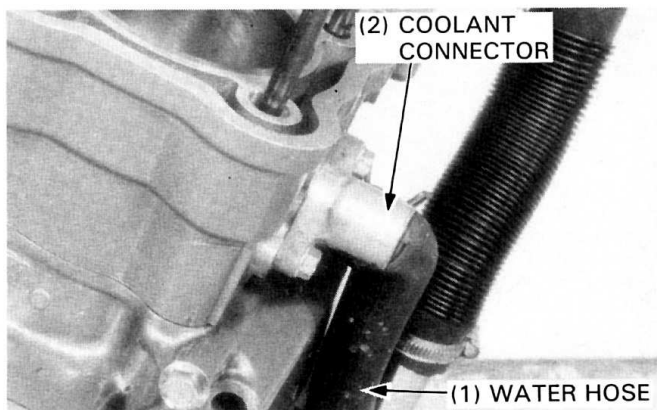
CYLINDER

REMOVAL

Remove the following:

- engine from the frame (page 5-2).
- cylinder head cover (page 9-3)
- cylinder head (page 9-7)
- gaskets, dowel pins, and cam chain guides.

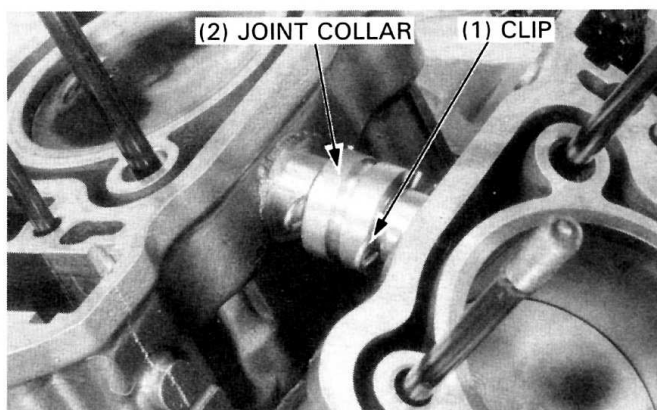
Disconnect the water hose from the coolant connector.



Remove the clip and slide the cylinder joint collar toward either the front or rear cylinder.

Remove the cylinder to be serviced.

Remove the cylinder gasket and dowel pins from the crankcase.



INSPECTION

Clean the top of each cylinder thoroughly.

Inspect the cylinder walls for scratches and wear.

Measure and record the cylinder I.D. at three levels in both an X and Y axis. Take the maximum reading to determine the cylinder wear.

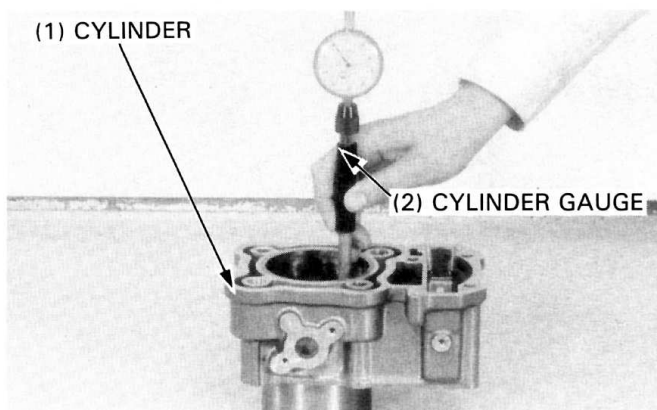
SERVICE LIMIT: 79.05 mm (3.112 in)

Calculate the piston-to-cylinder clearance. Take the maximum reading to determine the clearance.

SERVICE LIMIT: 0.13 mm (0.005 in)

Calculate the cylinder for taper at three levels in an X and Y axis. Take the maximum reading to determine the taper.

SERVICE LIMIT: 0.06 mm (0.002 in)



Calculate the cylinder for out-of-round at three levels in an X and Y axis. Take the maximum reading to determine the out-of-round.

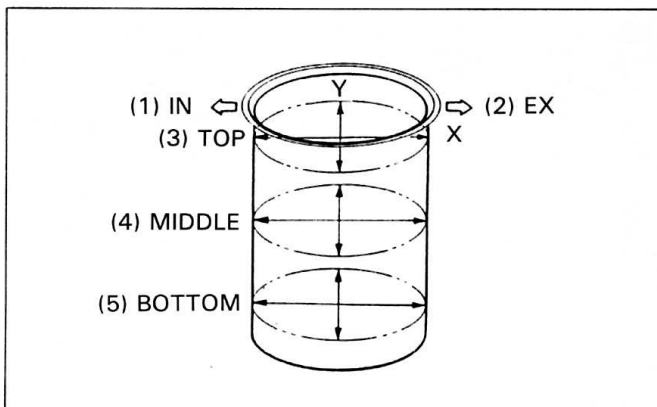
SERVICE LIMIT: 0.06 mm (0.002 in)

The cylinder must be rebored and an oversize piston fitted if the service limits are exceeded.

The following oversize pistons are available:

0.25 mm (0.010 in) and 0.50 mm (0.020 in)

The cylinder must be rebored so that the clearance to an oversize piston is 0.010–0.035 mm (0.0004–0.0014 in).

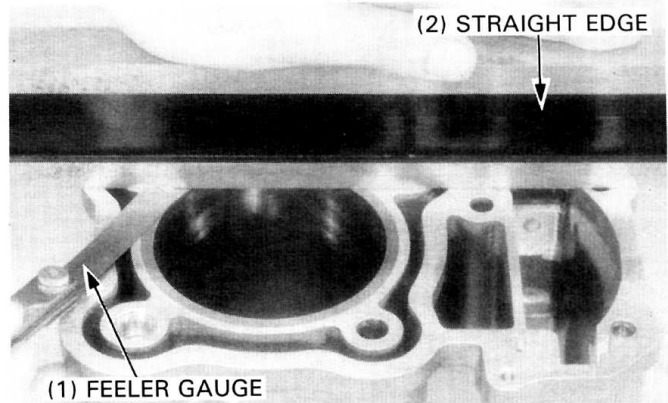


Inspect the cylinders for transverse warp across the top.

NOTE

- Measure warp using a straight edge and feeler gauge as shown.

SERVICE LIMIT: 0.10 mm (0.004 in)



PISTON

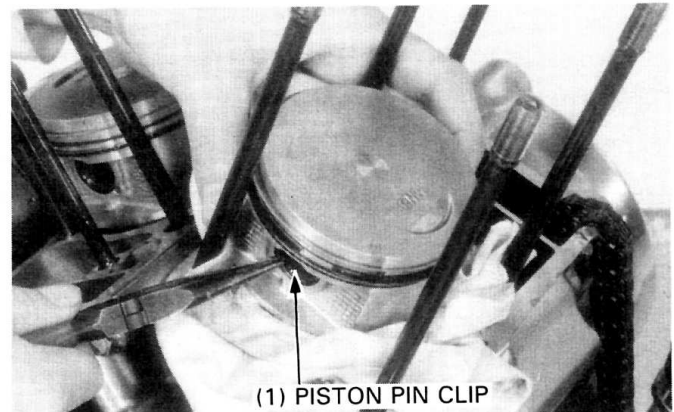
REMOVAL

Place a shop towel into the crankcase and remove the piston pin clips.

NOTE

- Do not let the clips fall into the crankcase.

Push the piston pin out and remove the piston.



INSPECTION

Clean the piston domes, ring lands and skirts.

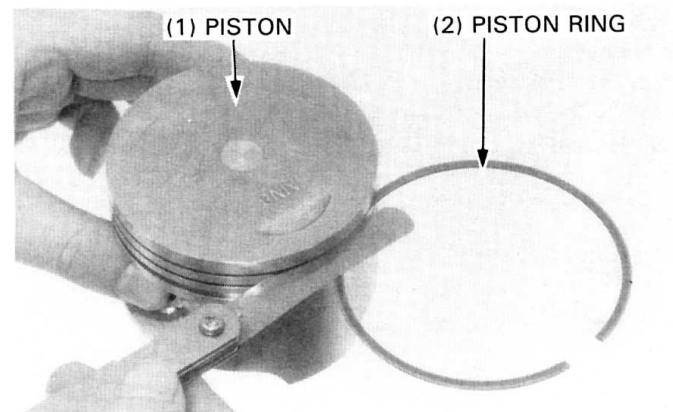
Measure the piston ring-to-groove clearance.

SERVICE LIMITS:

Top: 0.11 mm (0.004 in)

Second: 0.10 mm (0.004 in)

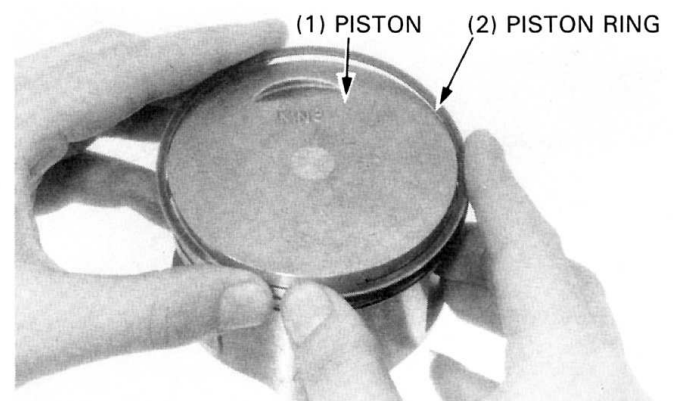
If clearance is excessive, replace the piston ring.



Remove the piston rings and mark them to indicate the correct cylinder and piston position for reassembly.

NOTE

- Do not damage the piston rings when removing them.



CYLINDER/PISTON

Measure the piston O.D.

NOTE

- Take measurements 10 mm (0.4 in) from the bottom, and 90° to the piston pin hole.

SERVICE LIMIT: 78.92 mm (3.107 in)

Calculate the piston-to-cylinder clearance by subtracting the piston O.D. from the cylinder I.D. (page 10-2).

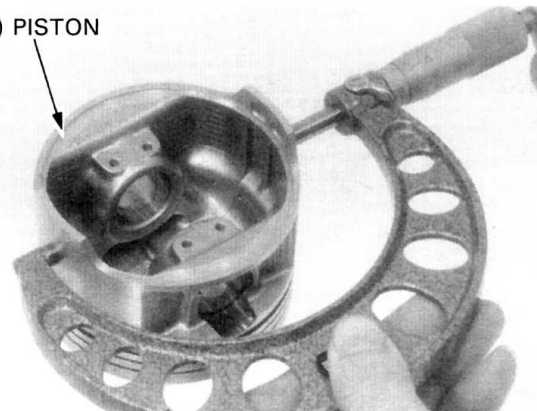
SERVICE LIMIT: 0.13 mm (0.005 in)

Measure the top and second piston ring end gaps: using a piston, push the ring into the cylinder squarely and make the measurement.

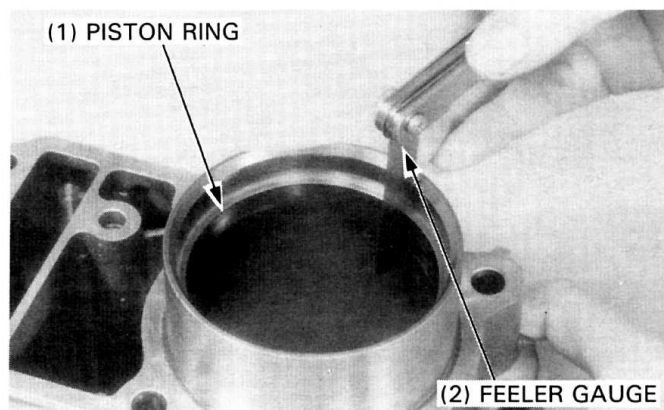
SERVICE LIMITS:

Top: 0.65 mm (0.026 in)
Second: 0.65 mm (0.026 in)
Oil: 0.95 mm (0.037 in)

(1) PISTON



(1) PISTON RING



Measure each piston pin bore.

SERVICE LIMIT: 20.018 mm (0.7881 in)

Measure each piston pin O.D.

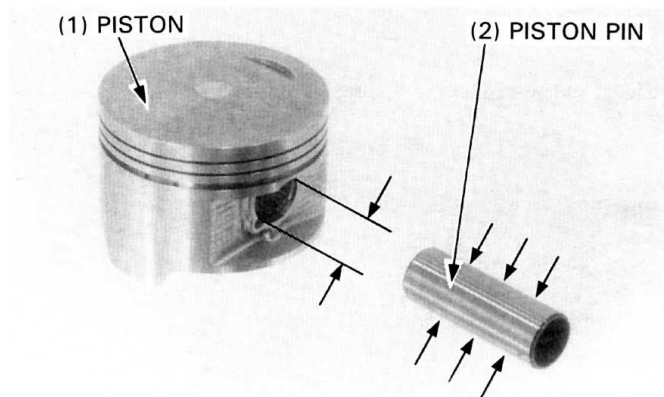
SERVICE LIMIT: 19.984 mm (0.7867 in)

Calculate the piston pin-to-piston clearance.

SERVICE LIMIT: 0.034 mm (0.0013 in)

(1) PISTON

(2) PISTON PIN



Measure the I.D. of the connecting rod small end.

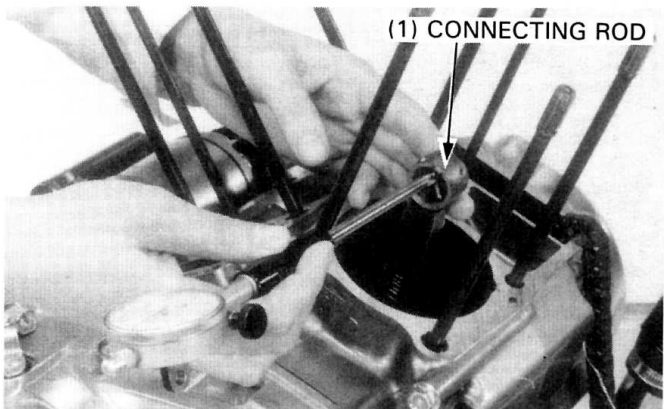
SERVICE LIMIT: 20.04 mm (0.789 in)

Calculate the piston pin-to-connecting rod clearance.

SERVICE LIMIT: 0.060 mm (0.0024 in)

Refer to section 11 for connecting rod replacement.

(1) CONNECTING ROD



PISTON RING INSTALLATION

NOTE

- Insert the outside surface of the ring into the proper ring groove and roll the ring around in the groove to make sure that the ring has a free fit around the piston's circumference.

Carefully install the piston rings onto the piston with the markings facing up.

NOTE

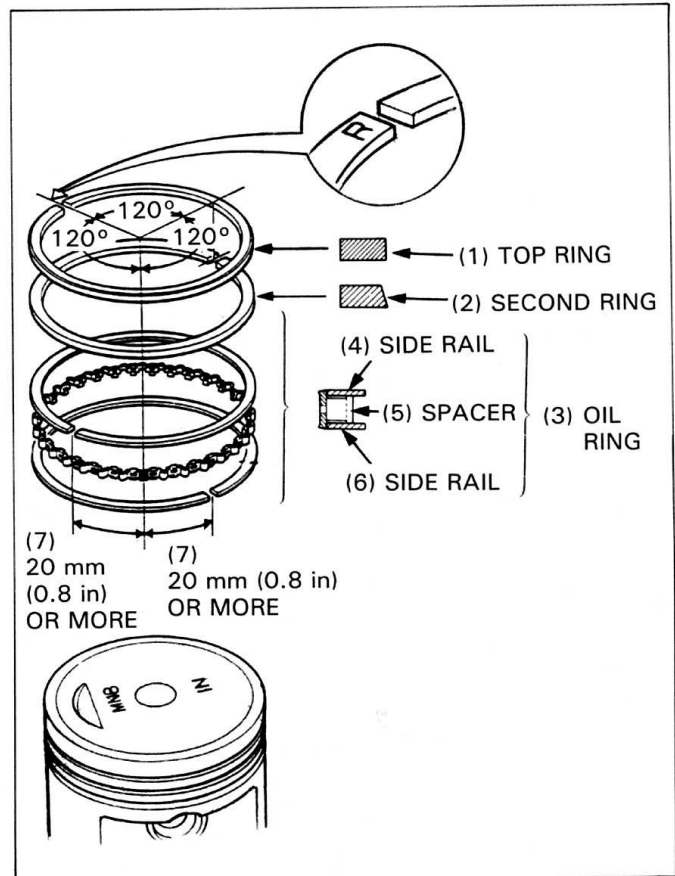
- Be careful not to damage the piston and piston rings during assembly.

Stagger the ring end gaps 120° apart from each other as shown.

NOTE

- To install the oil ring, install the spacer first, then install the side rails.

After installing the rings, check that they rotate freely without sticking.

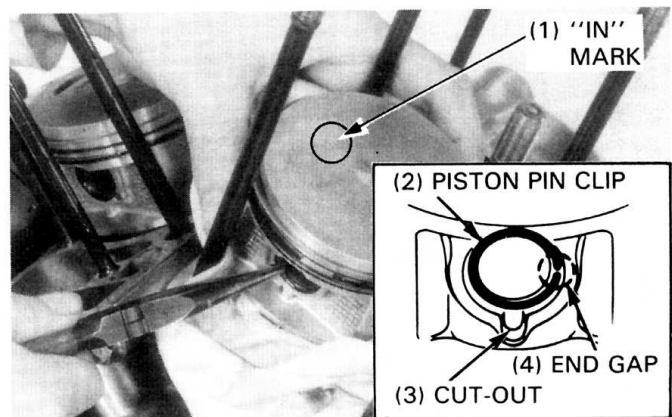


PISTON INSTALLATION

Place a shop towel into the crankcase. Coat the rod small end with molybdenum disulfide grease. Assemble the piston and connecting rod with the piston and piston pin clips as shown.

NOTE

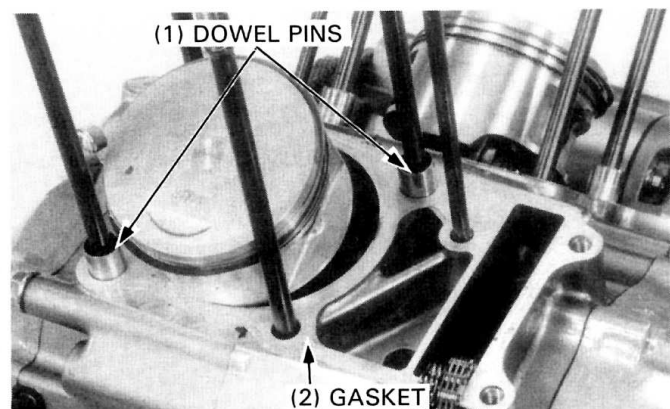
- Install the pistons with the mark "IN" facing towards the intake side.
- After installing the piston pin clips, make sure that they are seated properly and the end gaps are not aligned with the cut-out in the piston.
- Do not let the piston pin clips fall into the crankcase.



CYLINDER INSTALLATION

Clean the cylinder gasket surface.

Install the dowel pins and new gasket.



CYLINDER/PISTON

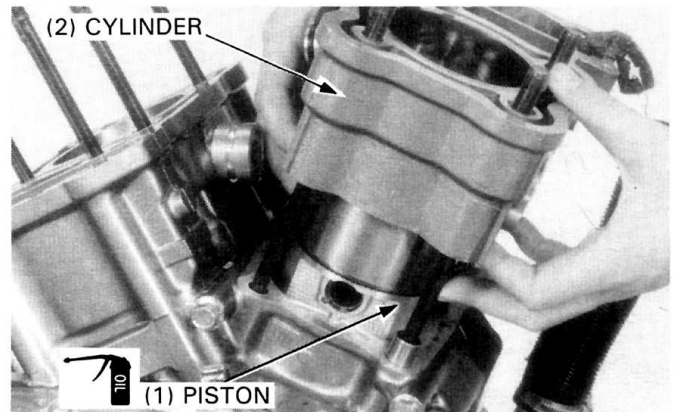
Coat the cylinder, piston rings/grooves and piston with clean engine oil.

Install the piston assembly into the cylinder from the top of the crankcase while compressing the piston rings with your fingers.

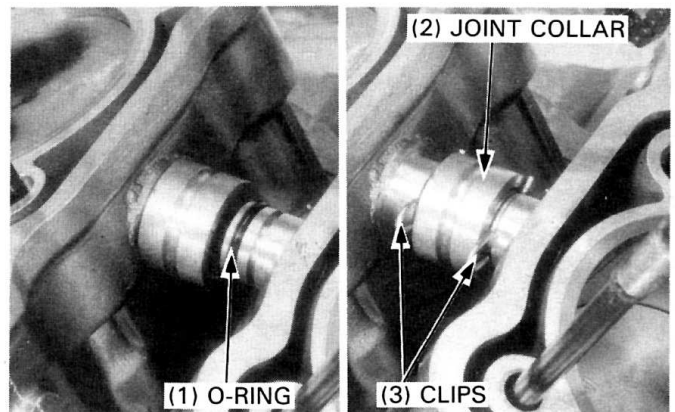
Be sure each assembly is returned to its original position as noted during removal.

NOTE

- Be careful not to damage the piston rings during assembly.
- When the cylinder is halfway over the piston, route the cam chain through the cylinder.

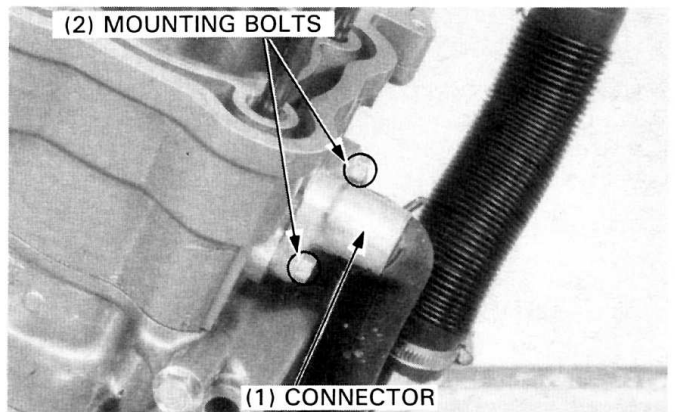


Install a new O-ring onto the cylinder joint and install the cylinder joint collar by sliding the collar toward either cylinder. Install the clips securely.



Install a new O-ring into the connector and install and tighten the connector mounting bolts, if the connector was removed.

If only the water hose was removed, connect the hose with the clamp.



Clean the cylinder gasket surface.

NOTE

- Avoid damaging the gasket surface.

Install the cam chain guide.

NOTE

- Align the guide boss with the groove in the cylinder.
- Make sure that the end of the guide is inserted into place in the crankcase.

Install the dowel pins and a new gasket. Install the cylinder heads and covers (Section 9).

