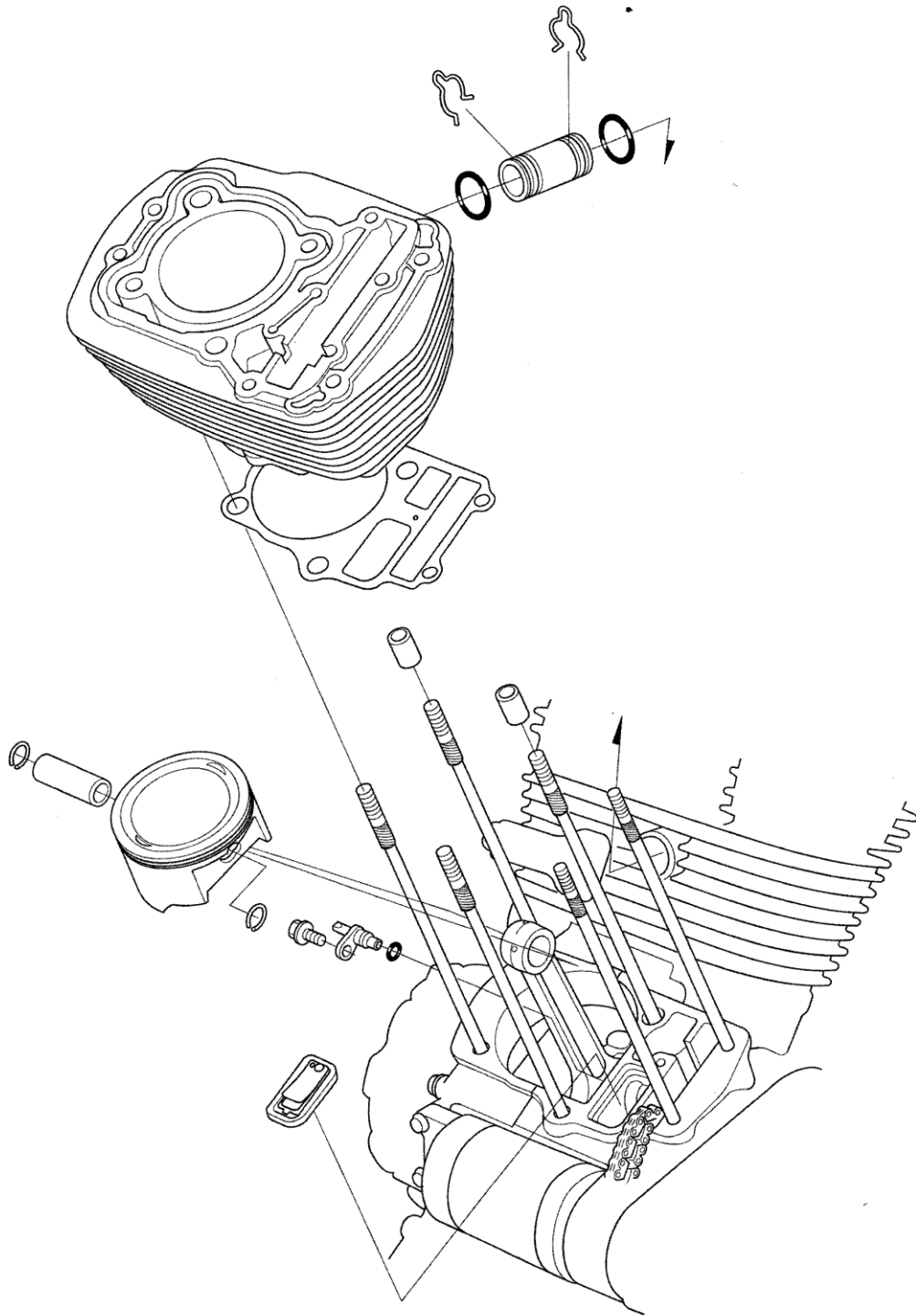


10. CYLINDER/PISTON

COMPONENT LOCATION	10-2	PISTON REMOVAL	10-6
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TROUBLESHOOTING	10-3	CYLINDER INSTALLATION	10-10
CYLINDER REMOVAL	10-4		

COMPONENT LOCATION



SERVICE INFORMATION

GENERAL

- This section covers service of the pistons and cylinders. To service the rear cylinder, the engine must be removed from the frame.
- Take care not to damage the cylinder walls and pistons.
- Be careful not to damage the mating surfaces when removing the cylinders. Do not strike the cylinders too hard during removal.
- When disassembling, mark and store the disassembled parts to ensure that they are reinstalled in their original locations.
- Clean all disassembled parts with cleaning solvent and dry them by blowing them off with compressed air before inspection.
- Camshaft and rocker arm lubricating oil is fed through oil passages in the cylinder. Clean the oil passages before installing the cylinder.

SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT	
Cylinder	I.D.	89.500 – 89.515 (3.5236 – 3.5242)	89.55 (3.326)	
	Out-of-round	–	0.10 (0.004)	
	Taper	–	0.10 (0.004)	
	Warpage	–	0.10 (0.004)	
Piston, piston pin, piston rings	Piston O.D. at 15 mm (0.6 in) from bottom	89.470 – 89.490 (3.5224 – 3.5232)	89.41 (3.520)	
	Piston pin hole I.D.	20.002 – 20.008 (0.7875 – 0.7877)	20.018 (0.7881)	
	Piston pin O.D.	19.994 – 20.000 (0.7872 – 0.7874)	19.984 (0.7868)	
	Piston-to-piston pin clearance		0.002 – 0.014 (0.0001 – 0.0006)	0.034 (0.0013)
	Piston ring end gap	Top	0.200 – 0.300 (0.0079 – 0.0118)	0.45 (0.018)
		Second	0.300 – 0.400 (0.0118 – 0.0157)	0.55 (0.022)
		Oil (side rail)	0.200 – 0.700 (0.0079 – 0.0276)	0.90 (0.035)
	Piston ring-to-ring groove clearance	Top	0.015 – 0.050 (0.0006 – 0.0020)	0.070 (0.0028)
		Second	0.015 – 0.045 (0.0006 – 0.0018)	0.065 (0.0026)
Cylinder-to-piston clearance		0.010 – 0.045 (0.0004 – 0.0018)	0.32 (0.013)	
Connecting rod small end I.D.		20.016 – 20.034 (0.7880 – 0.7887)	20.044 (0.7891)	
Connecting rod-to-piston pin clearance		0.016 – 0.040 (0.0006 – 0.0016)	0.063 (0.0025)	

TORQUE VALUE

Cylinder stud bolt (8 mm)	–	See page 10-8
Cylinder stud bolt (10 mm)	–	See page 10-8

TROUBLESHOOTING

Compression too low, hard starting or poor performance at low speed

- Leaking cylinder head gasket
- Worn, stuck or broken piston ring
- Worn or damaged cylinder and piston

Compression too high, overheating or knocking

- Excessive carbon built-up on piston head or combustion chamber

Excessive smoke

- Worn cylinder, piston or piston ring
- Improper installation of piston ring
- Scored or scratched piston or cylinder wall

Abnormal noise

- Worn piston pin or piston pin hole
- Worn cylinder, piston or piston ring
- Worn connecting rod small end

CYLINDER/PISTON

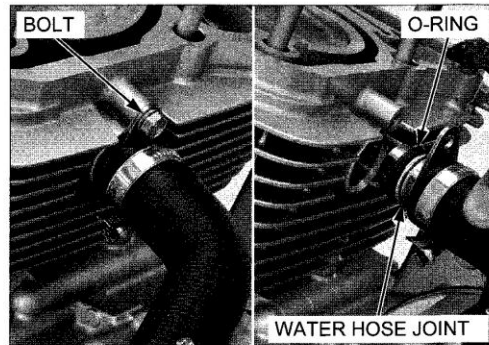
CYLINDER REMOVAL

NOTE:

- When removing the rear cylinder, the engine must be removed from the frame.
- The front cylinder uses the same service procedure as the rear cylinder.

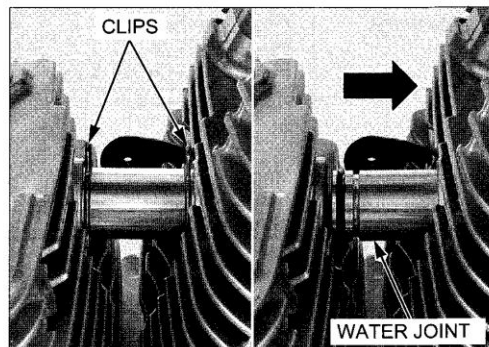
Remove the cylinder head (page 9-15).

Rear only: Remove the bolt, water hose joint and O-ring.



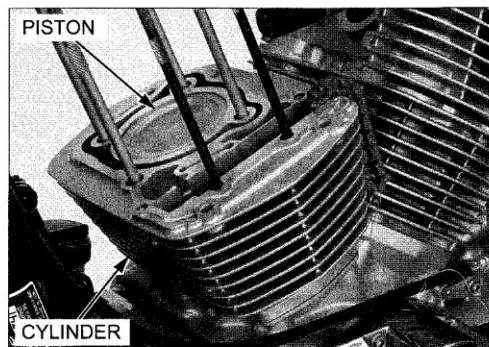
Remove the retaining clips.

Slide the water joint toward the removal side cylinder.



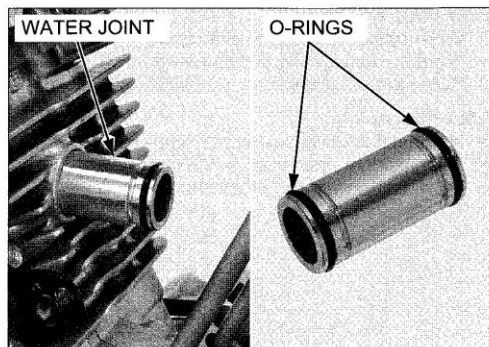
Do not strike the cylinder too hard and do not damage the mating surface with any tool used for leverage.

Lift the cylinder and remove it, being careful not to damage the piston with the stud bolts.

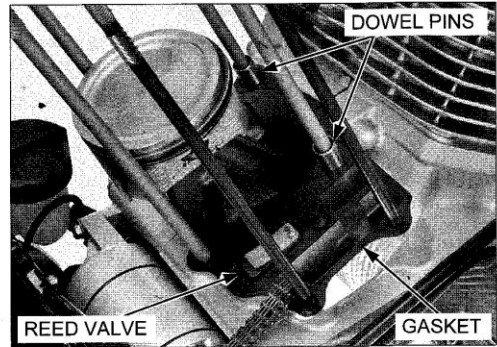


Remove the water joint from the cylinder.

Remove the O-rings.



Remove the dowel pins, gasket and reed valve.



INSPECTION

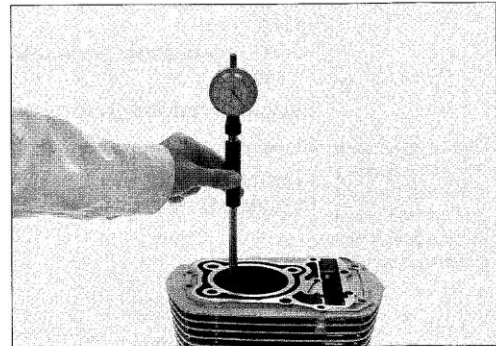
CYLINDER

Inspect the cylinder wall for scratches or wear.

Measure the cylinder I.D. at three levels on the X and Y axes. Take the maximum reading to determine the cylinder wear.

SERVICE LIMIT: 89.55 mm (3.326 in)

Calculate the cylinder-to-piston clearance (page 10-7).



Calculate the cylinder taper and out-of-round at three levels on the X and Y axes. Take the maximum reading to determine the taper and out-of-round.

SERVICE LIMITS:

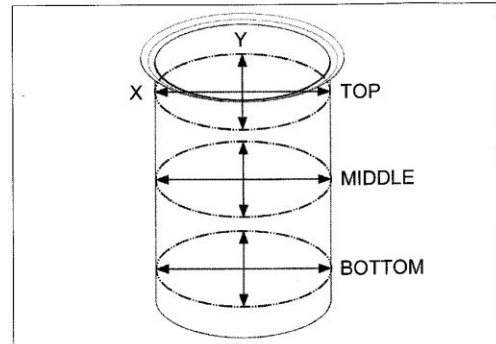
Taper: 0.10 mm (0.004 in)

Out-of-round: 0.10 mm (0.004 in)

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

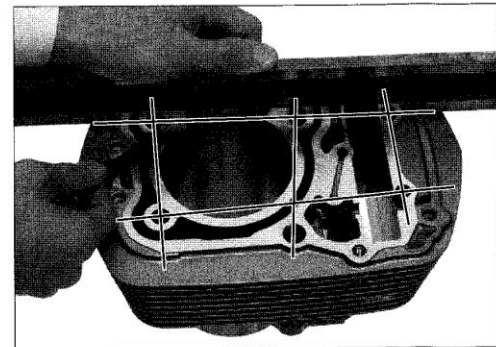
The 0.25 mm (0.010 in) oversize piston is available.

The cylinder must be rebored so the clearance for an oversize piston is 0.010 – 0.045 mm (0.0004 – 0.0018 in).



Check the top of the cylinder for warpage with a straight edge and feeler gauge across the stud holes.

SERVICE LIMIT: 0.10 mm (0.004 in)

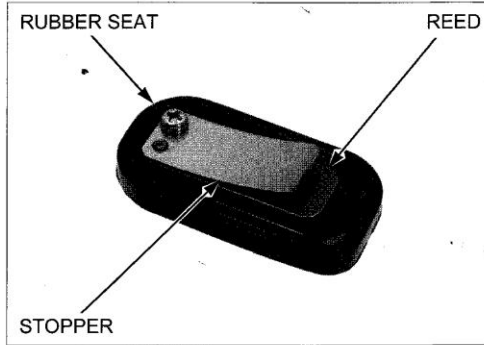


CYLINDER/PISTON

REED VALVE

Check the reed and stopper for damage or fatigue, replace the reed valve if necessary.

Replace the reed valve if the rubber seat is cracked, deteriorated or damaged, or if there is clearance between the reed and seat.



PISTON REMOVAL

NOTE:

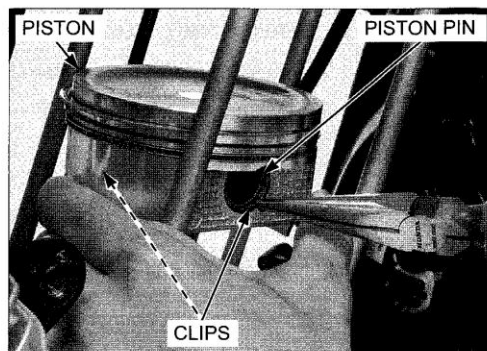
- The front and rear piston service procedures are the same.

Remove the cylinder (page 10-4).

Place a clean shop towel at the opening of the crankcase to prevent the piston pin clips from falling into the crankcase.

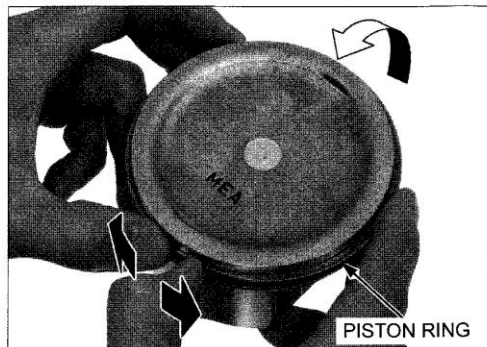
Remove the piston pin clips with pliers.

Push the piston pin out of the piston and connecting rod then remove the piston.



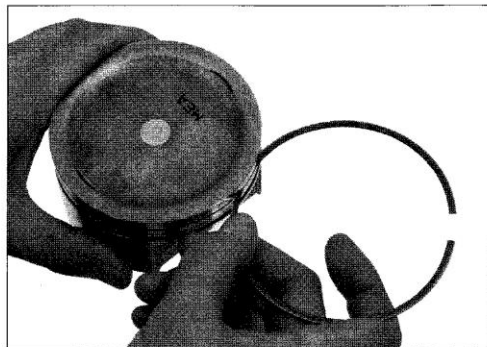
Do not damage the piston ring by spreading the ends too far.

Spread each piston ring and remove it by lifting up at a point opposite the gap.



Never use a wire brush; it will scratch the groove.

Clean carbon deposits from the ring grooves with a used piston ring that will be discarded.



INSPECTION

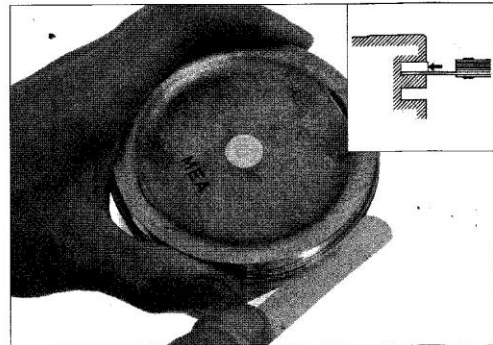
PISTON RING

Inspect the piston rings for free movement by rotating them in their grooves. The rings should be able to move freely without catching.

Push the ring until the outer surface of the piston ring is nearly flush with the piston and measure the ring-to-ring groove clearance.

SERVICE LIMITS:

- Top: 0.070 mm (0.0028 in)
- Second: 0.065 mm (0.0026 in)

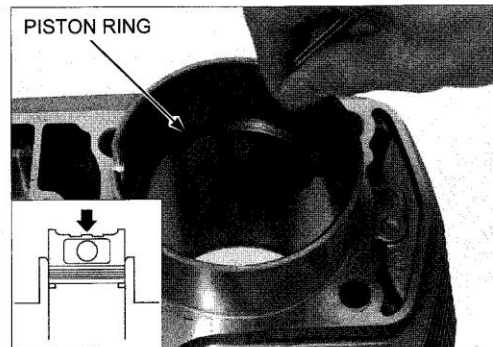


Insert the piston ring into the bottom of the cylinder squarely using the piston crown.

Measure the ring end gap.

SERVICE LIMITS:

- Top: 0.45 mm (0.018 in)
- Second: 0.55 mm (0.022 in)
- Oil (side rail): 0.90 mm (0.035 in)



PISTON

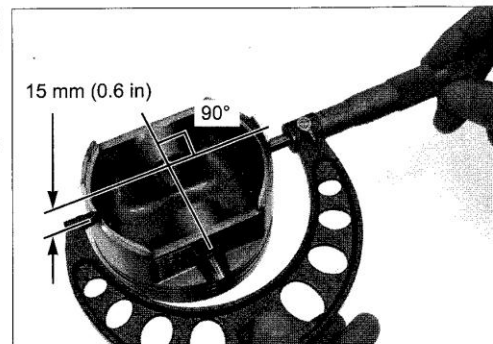
Measure the piston O.D. at a point 15 mm (0.6 in) from the bottom of the piston skirt and 90° to the piston pin hole.

SERVICE LIMIT: 89.41 mm (3.520 in)

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

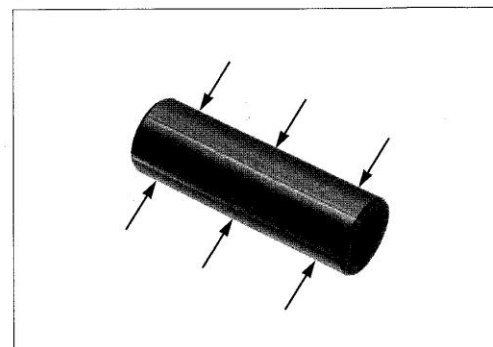
For cylinder I.D. (page 10-5).

SERVICE LIMIT: 0.32 mm (0.013 in)



Measure the piston pin O.D. at three points.

SERVICE LIMIT: 19.984 mm (0.7868 in)



CYLINDER/PISTON

Measure the piston pin hole I.D.

SERVICE LIMIT: 20.018 mm (0.7881 in)

Calculate the piston-to-piston pin clearance.

SERVICE LIMIT: 0.034 mm (0.0013 in)



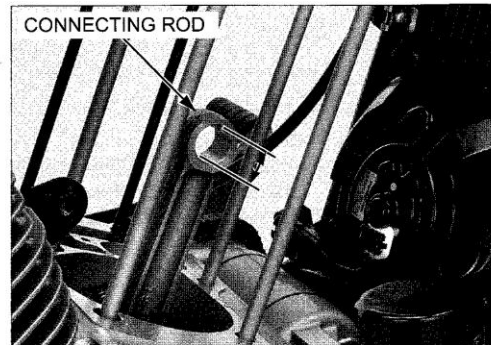
CONNECTING ROD

Measure the connecting rod small end I.D.

SERVICE LIMIT: 20.044 mm (0.7891 in)

Calculate the connecting rod-to-piston pin clearance.

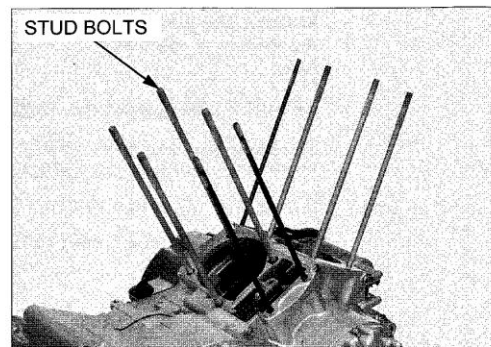
SERVICE LIMIT: 0.063 mm (0.0025 in)



CYLINDER STUD BOLT REPLACEMENT

Remove the piston if necessary (page 10-6).

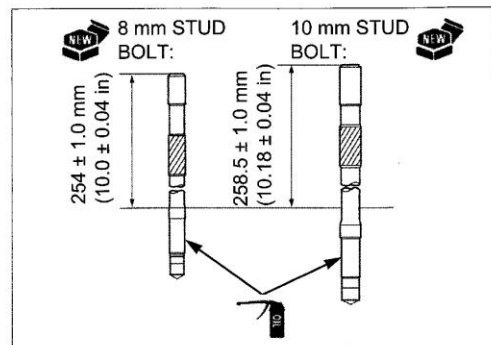
Thread two nuts onto the stud and tighten them together, and use a wrench on them to turn the stud bolt out.



Apply engine oil to the lower threads of new stud bolts and install them in the direction as shown.

Be sure to verify the stud height from the crankcase surface.

Adjust the height if necessary.



PISTON INSTALLATION

Apply engine oil to the piston ring outer surface.

Be careful not to damage the piston and rings.

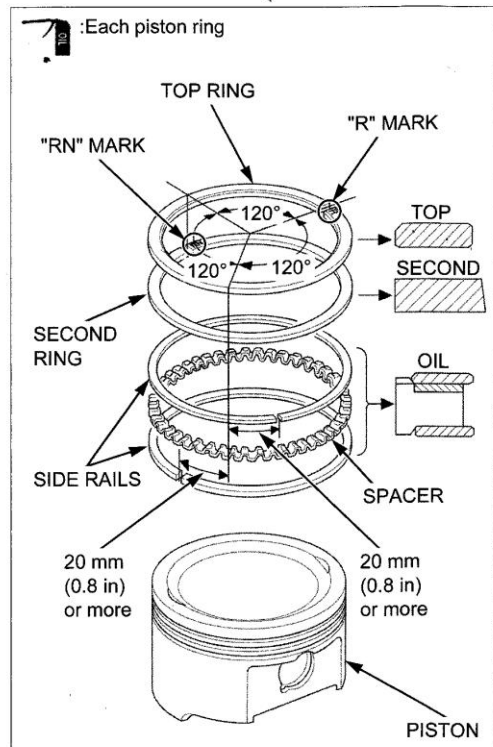
Carefully install the piston rings into the piston ring grooves with the markings facing up.

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

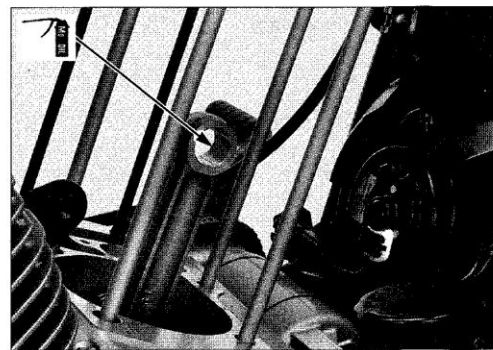
NOTE:

- Do not confuse the top and second rings.
- To install the oil ring, install the spacer first, then install the side rails.

After installation, the piston rings should be free to rotate in the groove.



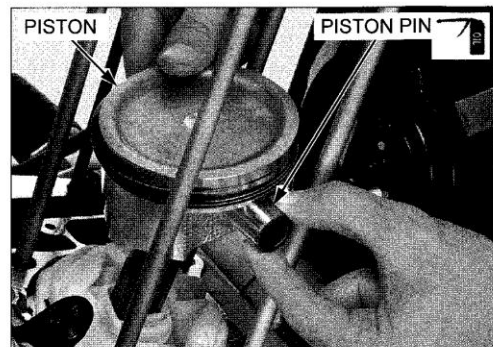
Apply molybdenum oil solution to the connecting rod small end inner surface.



Before piston installation, place a shop towel into the crankcase opening to prevent dust or dirt from entering the engine.

Apply engine oil to the piston pin outer surface.

Install the piston and insert the piston pin through the piston and connecting rod.

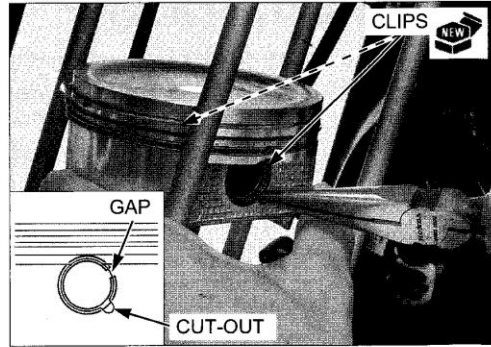


CYLINDER/PISTON

Install new piston pin clips into the grooves in the piston pin hole.

NOTE:

- Make sure the piston pin clips are seated securely.
- Do not align the piston pin clip end gap with the piston cut-out.

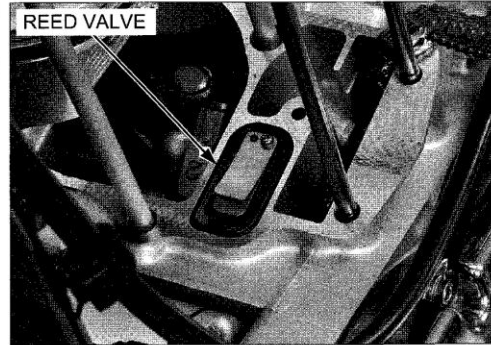


CYLINDER INSTALLATION

The front cylinder uses the same service procedure as the rear cylinder.

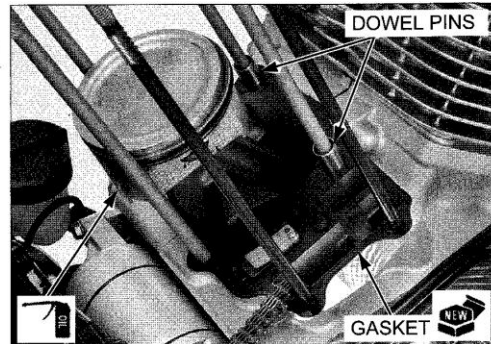
Clean the gasket surfaces of the cylinder and crankcase thoroughly, being careful not to damage them.

Install the reed valve onto the crankcase in the direction as shown.



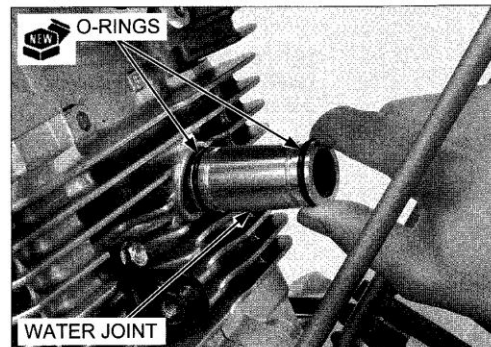
Install the dowel pins and new gasket.

Apply engine oil to the piston and piston ring outer surface.



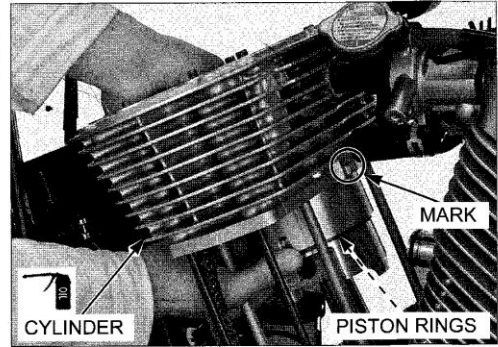
Install new O-rings to the water joint grooves.

Install the water joint to the cylinder.



The cylinders have the following identification marks:
 - "FR": front
 - "RR": rear
 Be careful not to damage the piston rings and cylinder wall.

Apply engine oil to the cylinder wall.
 Route the cam chain through the cylinder and install the cylinder over the piston while compressing the piston rings with your fingers.

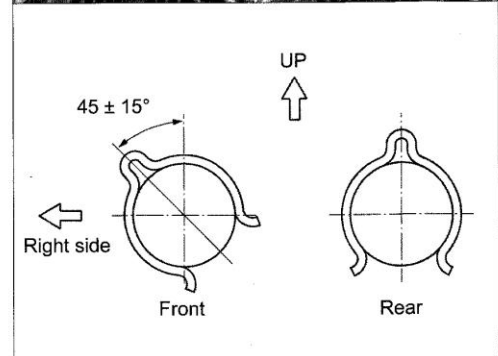
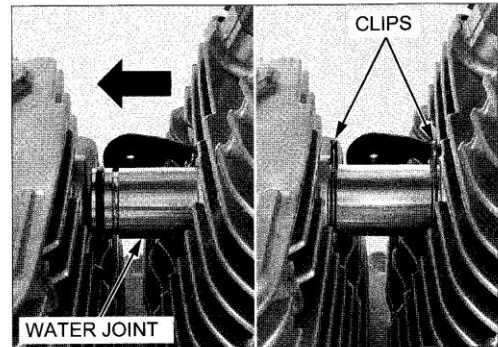


Slide the water joint into the hole in the cylinder and connect it.

Install the retaining clips to the water joint grooves.

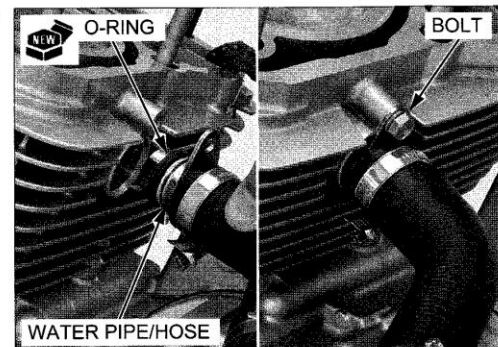
NOTE:

- When installing the retaining clip, be careful about the direction as shown.



Rear only: Install a new O-ring to the water pipe and connect the water pipe with water hose into the rear cylinder. Install and tighten the bolt.

Install the cylinder head (page 9-24).



MEMO

