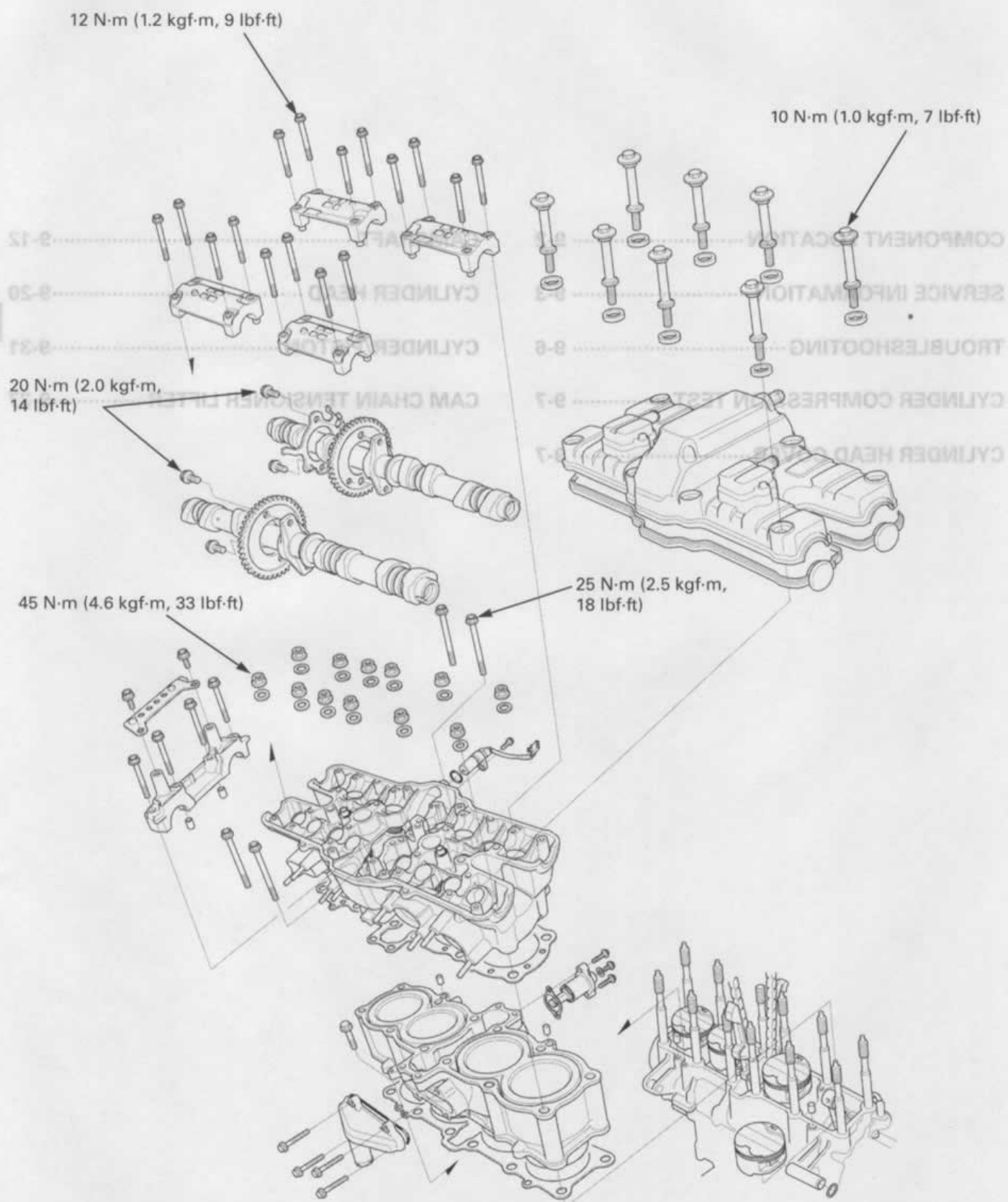


9. CYLINDER HEAD/CYLINDER/PISTON

COMPONENT LOCATION

COMPONENT LOCATION	9-2	CAMSHAFT	9-12
SERVICE INFORMATION	9-3	CYLINDER HEAD	9-20
TROUBLESHOOTING	9-6	CYLINDER/PISTON	9-31
CYLINDER COMPRESSION TEST	9-7	CAM CHAIN TENSIONER LIFTER	9-37
CYLINDER HEAD COVER	9-7		

COMPONENT LOCATION



SERVICE INFORMATION

GENERAL

- This section covers service of the cylinder head, cylinder and piston.
- The camshaft, cylinder head and piston services can be done with the engine installed in the frame.
- 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 lubricating oil is fed through oil passages in the cylinder head and cylinder. Clean the oil passages before assembling cylinder head and cylinder.
- Be careful not to damage the mating surfaces when removing the cylinder head cover, cylinder head and cylinder.

SPECIFICATIONS










Unit: mm (in)

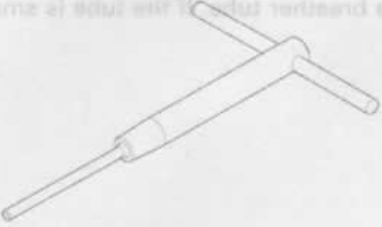




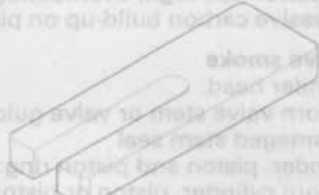


ITEM			STANDARD	SERVICE LIMIT
Cylinder compression			1,324 kPa (13.5 kgf/cm ² , 192 psi) at 240 min ⁻¹ (rpm)	—
Valve clearance		IN	0.16 ± 0.03 (0.006 ± 0.001)	—
		EX	0.22 ± 0.03 (0.009 ± 0.001)	—
Camshaft	Cam lobe height	IN	37.54 – 37.78 (1.4779 – 1.4874)	37.50 (1.476)
		EX	37.40 – 37.64 (1.4724 – 1.4818)	37.36 (1.471)
Runout		—	0.05 (0.002)	
Oil clearance		0.030 – 0.072 (0.0012 – 0.0028)	0.10 (0.004)	
Valve lifter	Valve lifter O.D.	25.978 – 25.993 (1.0228 – 1.0233)	25.97 (1.022)	
	Valve lifter bore I.D.	26.010 – 26.026 (1.0240 – 1.0246)	26.04 (1.025)	
Valve, valve guide	Valve stem O.D.	IN	4.975 – 4.990 (0.1959 – 0.1965)	4.965 (0.1955)
		EX	4.960 – 4.975 (0.1953 – 0.1959)	4.950 (0.1949)
	Valve guide I.D.	IN/EX	5.000 – 5.012 (0.1969 – 0.1973)	5.040 (0.1984)
	Stem-to-guide clearance	IN	0.010 – 0.037 (0.0004 – 0.0015)	—
		EX	0.025 – 0.052 (0.0010 – 0.0020)	—
	Valve guide projection above cylinder head	IN	15.6 – 15.8 (0.61 – 0.62)	—
		EX	15.6 – 15.8 (0.61 – 0.62)	—
Valve seat width		IN/EX	0.90 – 1.10 (0.035 – 0.043)	1.5 (0.06)
Valve spring free length		IN	44.85 (1.766)	43.95 (1.730)
		EX	44.85 (1.766)	43.95 (1.730)
Cylinder head warpage			—	0.10 (0.004)
Piston, piston rings	Piston O.D. at 15 (0.6) from bottom		77.970 – 77.990 (3.0697 – 3.0705)	77.87 (3.066)
	Piston pin bore I.D.		19.002 – 19.008 (0.7481 – 0.7483)	19.06 (0.750)
	Piston pin O.D.		18.994 – 19.000 (0.7478 – 0.7480)	18.98 (0.747)
	Piston -to piston pin clearance		0.002 – 0.014 (0.0001 – 0.0006)	0.04 (0.002)
	Piston ring end gap	Top	0.25 – 0.40 (0.010 – 0.016)	0.58 (0.023)
		Sec- ond	0.32 – 0.47 (0.013 – 0.019)	0.65 (0.026)
		Oil (side rail)	0.20 – 0.70 (0.008 – 0.026)	0.85 (0.033)
	Piston ring-to-ring groove clearance	Top	0.015 – 0.050 (0.0006 – 0.0020)	0.09 (0.004)
		Sec- ond	0.015 – 0.050 (0.0006 – 0.0020)	0.09 (0.004)
Cylinder	I.D.		78.000 – 78.015 (3.0709 – 3.0715)	78.10 (3.075)
	Out of round		—	0.05 (0.002)
	Taper		—	0.05 (0.002)
	Warpage		—	0.05 (0.002)
Cylinder-to piston clearance			0.010 – 0.045 (0.0004 – 0.0018)	—
Connecting rod small end I.D.			19.030 – 19.051 (0.7492 – 0.7500)	19.061 (0.7504)
Connecting rod-to-piston pin clearance			0.030 – 0.057 (0.0012 – 0.0022)	—

TORQUE VALUES

Cylinder head mounting flange nut	45 N·m (4.6 kgf·m, 33 lbf·ft)	Apply oil to the threads and seating surface
Cylinder head mounting flange bolt	25 N·m (2.5 kgf·m, 18 lbf·ft)	Apply oil to the threads and seating surface
Cylinder head sealing bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)	Apply a locking agent to the threads
Camshaft holder flange bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)	Apply oil to the threads and seating surface
Cylinder head cover bolt	10 N·m (1.0 kgf·m, 7 lbf·ft)	
PAIR reed valve cover SH bolt	13 N·m (1.3 kgf·m, 9 lbf·ft)	CT bolt
Intake cam sprocket/cam pulse generator rotor UBS bolt	20 N·m (2.0 kgf·m, 14 lbf·ft)	Apply a locking agent to the threads
Exhaust cam sprocket flange dowel bolt	20 N·m (2.0 kgf·m, 14 lbf·ft)	Apply a locking agent to the threads
Cam chain guide bolt/washer	12 N·m (1.2 kgf·m, 9 lbf·ft)	
Cylinder head stud bolt (exhaust pipe stud bolt)	See page 1-16	
Cylinder stud bolt	See page 1-15	

TOOLS

<p>Valve guide remover, 5 mm 07942-MA60000</p> 	<p>Valve guide driver 07743-0020000</p> 	<p>Valve spring compressor 07757-0010000</p> 
<p>Flat cutter, 33 mm (IN 32°) 07780-0012900</p> 	<p>Flat cutter, 28 mm (EX 32°) 07780-0012100</p> 	<p>Seat cutter, 33 mm (IN 45°) 07780-0010800</p> 
<p>Seat cutter, 27.5 mm (EX 45°) 07780-0010200</p> 	<p>Interior cutter, 30 mm (IN 60°) 07780-0014000</p> 	<p>Interior cutter, 26 mm (EX 60°) 07780-0014500</p> 

<p>Cutter holder, 5 mm 07781-0010400</p> 	<p>Valve guide reamer 07984-MA60001</p> 	<p>Tapet hole protector 07HMG-MR70002</p> 
<p>Tensioner stopper 07NMG-MY90101</p> 	<p>Compression gauge 07RMJ-MY50100</p>  <p>or equivalent commercially available</p>	<p>Piston base 07958-2500001</p> 
<p>Piston ring compressor 07PME-MZ20100</p> 	<p>Valve spring compressor attachment 07959-KM30101</p> 	<p>Excessive noise</p> <ul style="list-style-type: none"> • Cylindrical head • Excessive smoke • Worn valve stem or valve guide • Damaged stem seal • Cylindrical head and piston ring • Worn cylinder, piston or piston ring • Improper installation of piston rings • Scored or scratched piston or cylinder wall <p>Rough idle</p> <ul style="list-style-type: none"> • Low cylinder compression <p>Abnormal noise</p> <ul style="list-style-type: none"> • Worn piston pin or piston pin hole • Worn connecting rod small end • Worn cylinder, piston or piston rings

TROUBLESHOOTING

- Engine top-end problems usually affect engine performance. These problem can be diagnosed by a compression test or by tracing engine noises to the top-end with a sounding rod stethoscope.
- If the performance is poor at low speeds, check for white smoke in the crankcase breather tube. If the tube is smoky, check for a seized piston ring.

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

- Valves:
 - Incorrect valve adjustment
 - Burned or bent valve
 - Incorrect valve timing
 - Broken valve spring
 - Uneven valve seating
- Cylinder head:
 - Leaking or damaged head gasket
 - Warped or cracked cylinder head
- Worn cylinder, piston or piston rings

Compression too high, overheating or knocking

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

Excessive smoke

- Cylinder head:
 - Worn valve stem or valve guide
 - Damaged stem seal
- Cylinder, piston and piston ring:
 - Worn cylinder, piston or piston ring
 - Improper installation of piston rings
 - Scored or scratched piston or cylinder wall

Excessive noise

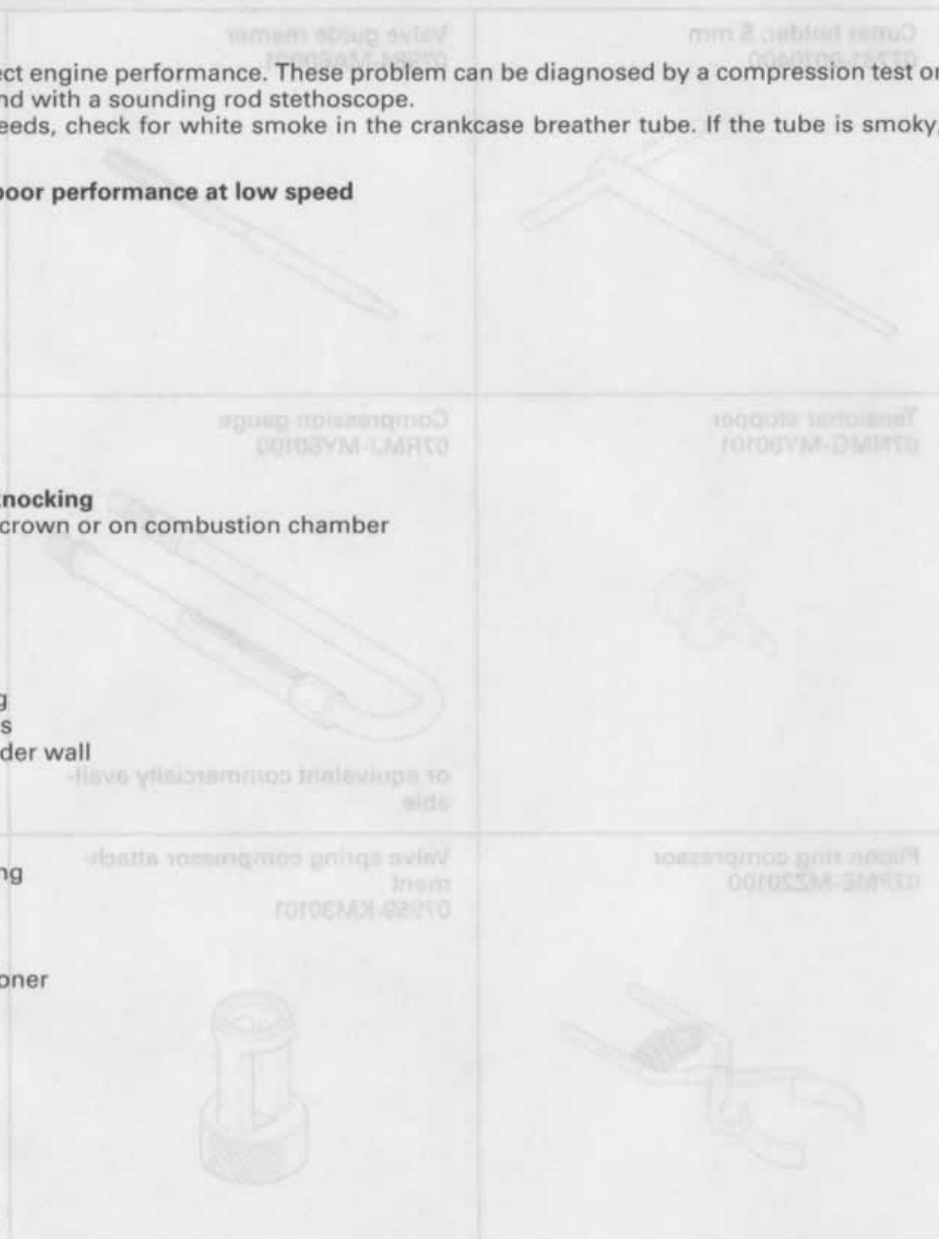
- Cylinder head:
 - Incorrect valve adjustment
 - Sticking valve or broken valve spring
 - Damaged or worn camshaft
 - Loose or worn cam chain
 - Worn or damaged cam chain
 - Worn or damaged cam chain tensioner
 - Worn cam sprocket teeth
- Worn cylinder, piston or piston rings

Rough idle

- Low cylinder compression

Abnormal noise

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



CYLINDER COMPRESSION TEST

Warm up the engine to normal operating temperature.

Stop the engine and remove the all plug caps and spark plugs (page 4-8).

Open and support the front end of fuel tank (page 4-5).

Disconnect the fuel pump 2P (Black) connector.



2P (BLACK) CONNECTOR

Install a compression gauge into the spark plug hole.

TOOL:

Compression gauge

07RMJ-MY50100
(Equivalent commercially available)

Open the throttle all the way and crank the engine with the starter motor until the gauge reading stops rising.

The maximum reading is usually reached within 4 – 7 seconds.

Compression pressure:

1,324 kPa (13.5 kgf/cm², 192 psi) at 240 min⁻¹ (rpm)

Low compression can be caused by:

- Blown cylinder head gasket
- Improper valve adjustment
- Valve leakage
- Worn piston ring or cylinder

High compression can be caused by:

- Carbon deposits in combustion chamber or on piston head



COMPRESSION GAUGE

To avoid discharging the battery, do not operate the starter motor for more than seven seconds.

CYLINDER HEAD COVER

REMOVAL

Remove the following:

- Thermostat housing (page 7-8)
- Ignition coil assembly (page 17-7)
- PAIR control valve assembly (page 6-86)

Remove the crankcase breather hose.

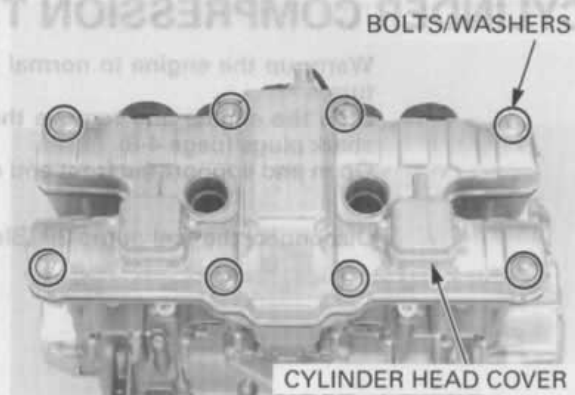


CRANKCASE BREATHER HOSE

CYLINDER HEAD/CYLINDER/PISTON

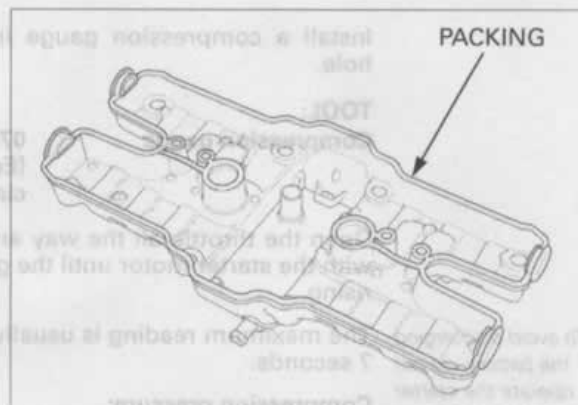
Remove the cylinder head cover bolts and washers.

Remove the cylinder head cover rearward.

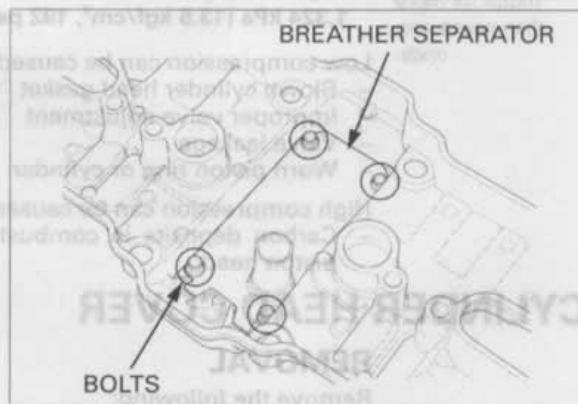


DISASSEMBLY

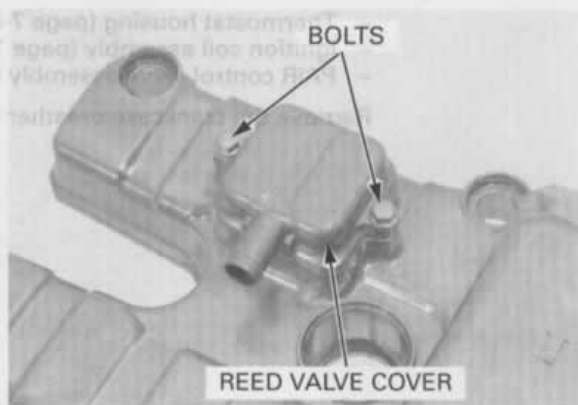
Remove the cylinder head cover packing.



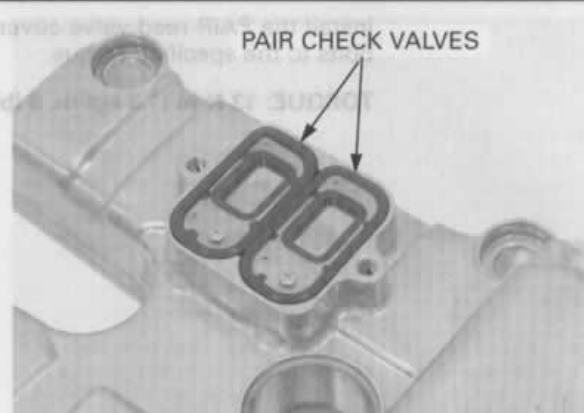
Do not remove bolts and breather separator.



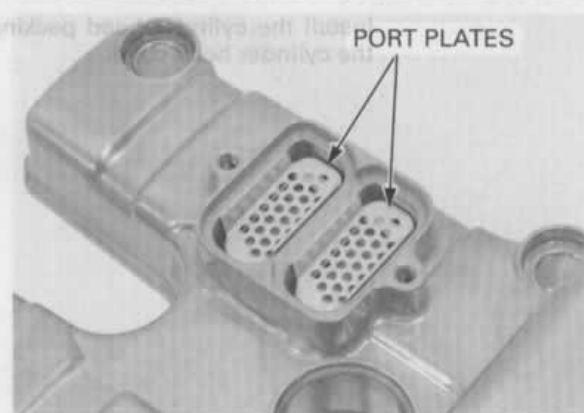
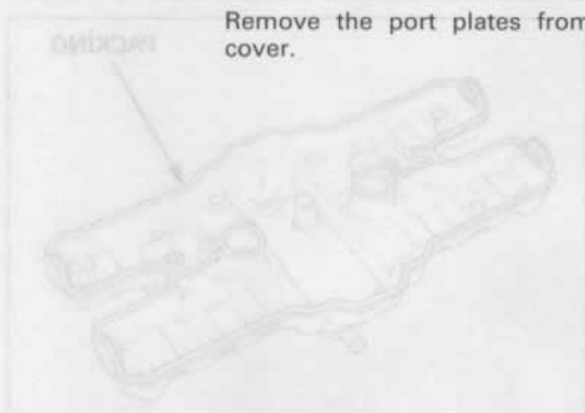
Remove bolts and PAIR reed valve cover.



Remove the PAIR check valve.
Check the PAIR check valve for wear or damage,
replace if necessary.

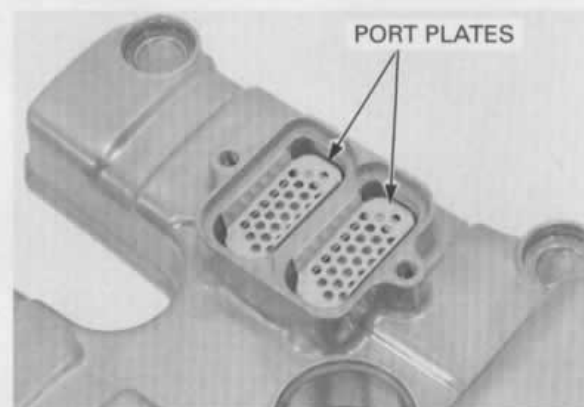


Remove the port plates from the cylinder head
cover.

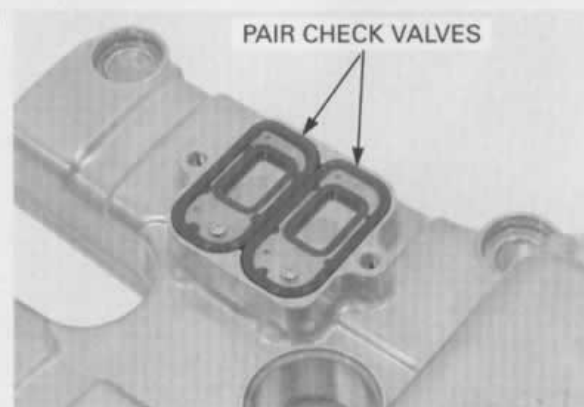


ASSEMBLY

Install the PAIR check valve port plates into the cyl-
inder head cover.



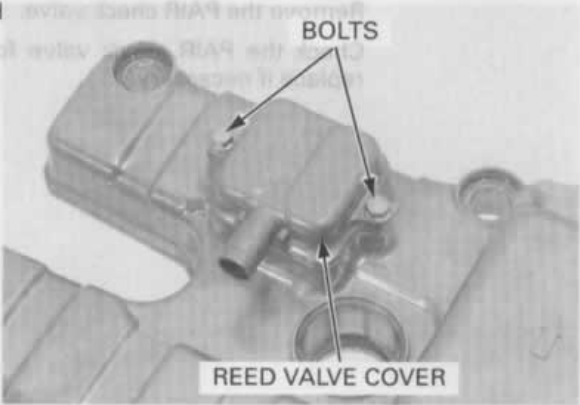
Install the PAIR check valves into the cylinder head
cover.



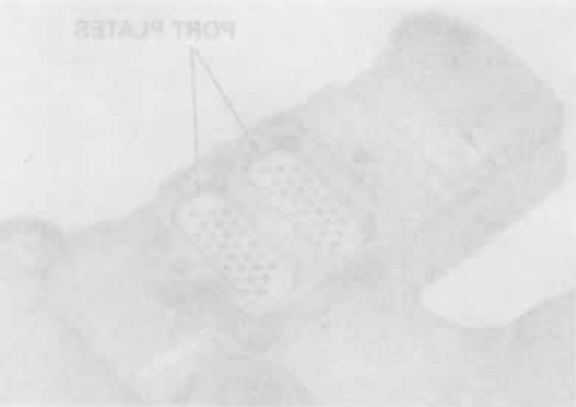
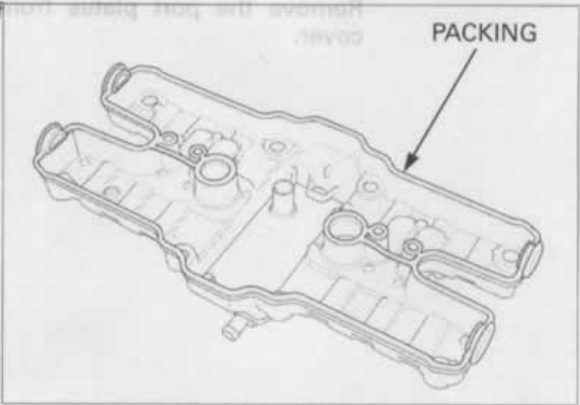
CYLINDER HEAD/CYLINDER/PISTON

Install the PAIR reed valve covers and tighten the SH bolts to the specified torque.

TORQUE: 13 N·m (1.3 kgf·m, 9 lbf·ft)



Install the cylinder head packing into the groove of the cylinder head cover.

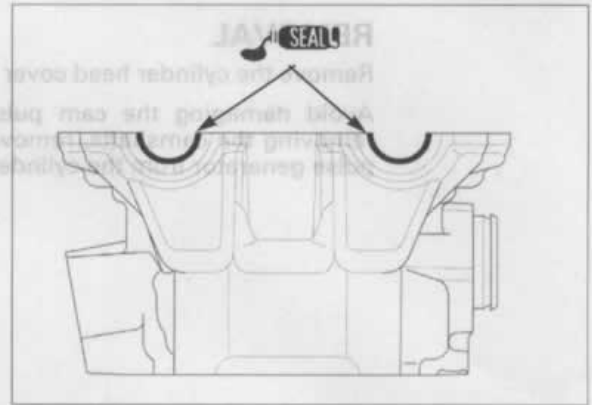


Install the PAIR check valve port plate into the cylinder head cover.

Install the PAIR check valves into the cylinder head cover.

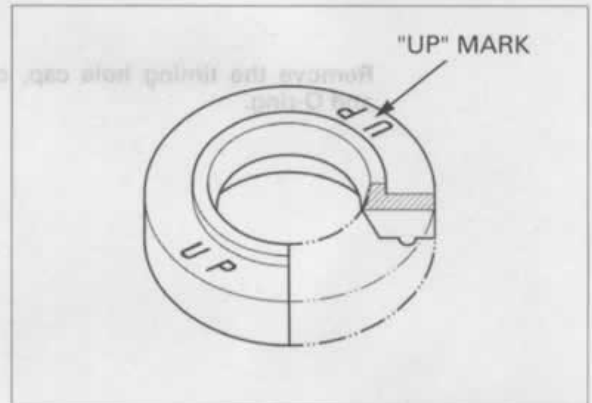
INSTALLATION

Apply sealant to the cylinder head semi-circular cut-outs as shown.



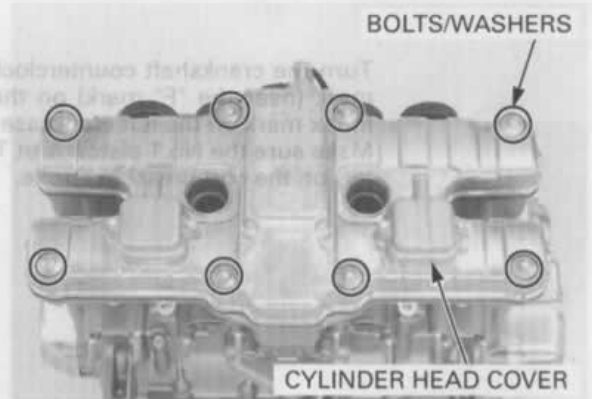
Install the cylinder head cover onto the cylinder head.

Install the washers with their "UP" mark facing up.



Install and tighten the cylinder head cover special bolts to the specified torque.

TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)



Connect the crankcase breather hose.

Install the following:

- Thermostat housing (page 7-9)
- Ignition coil assembly (page 17-7)
- PAIR control valve assembly (page 6-86)

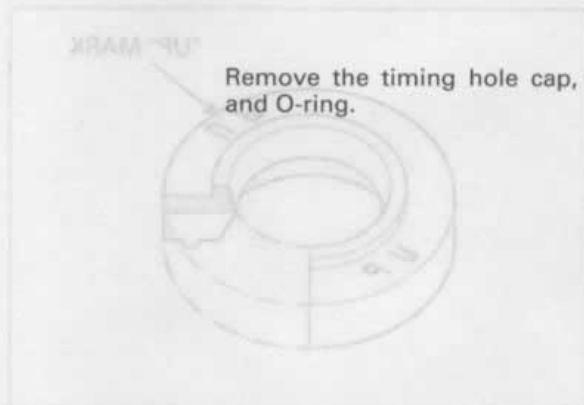
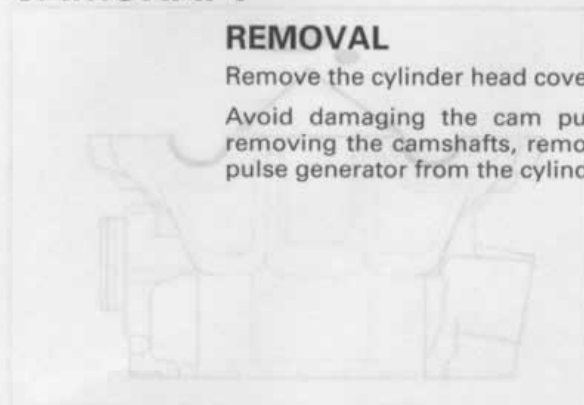


CAMSHAFT

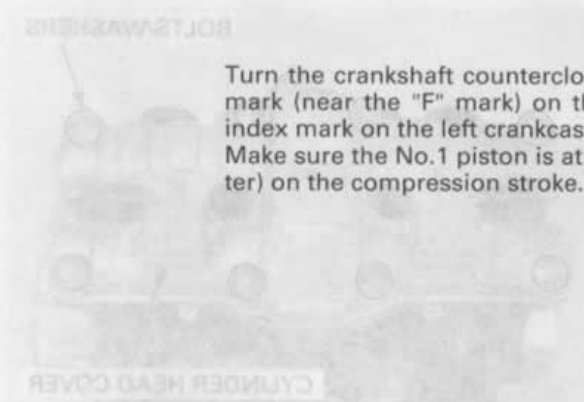
REMOVAL

Remove the cylinder head cover (page 9-7).

Avoid damaging the cam pulse generator while removing the camshafts, remove the bolt and cam pulse generator from the cylinder head.



Remove the timing hole cap, crankshaft hole cap and O-ring.



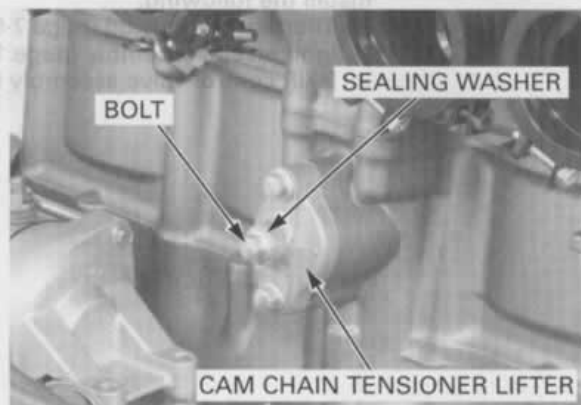
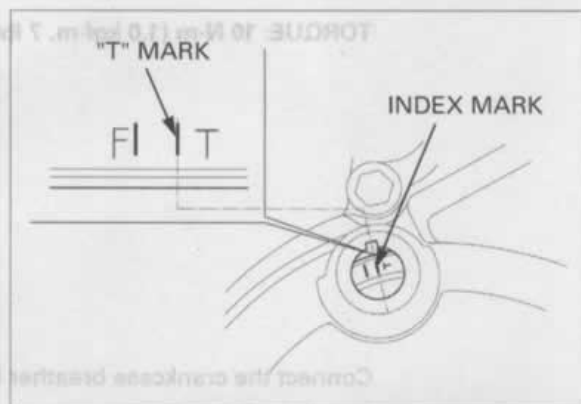
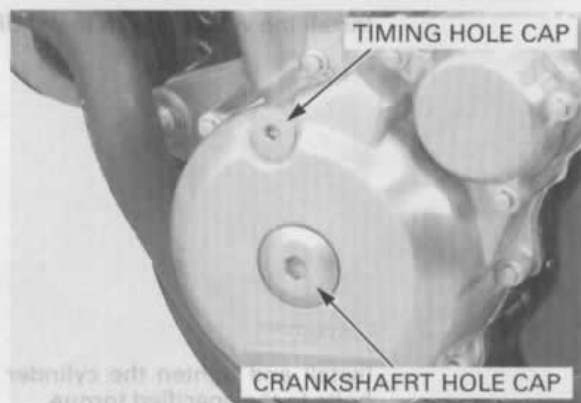
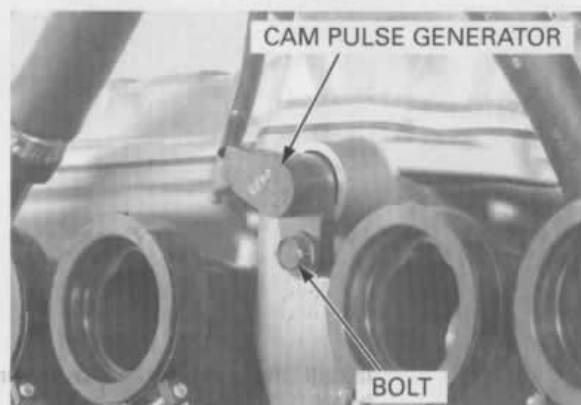
Turn the crankshaft counterclockwise, align the "T" mark (near the "F" mark) on the flywheel with the index mark on the left crankcase cover. Make sure the No.1 piston is at TDC (Top Dead Center) on the compression stroke.



Remove the cam chain tensioner lifter sealing bolt and sealing washer.

INSTALLATION

Apply sealant to the cylinder head semi-circular cutouts as shown.



Turn the tensioner lifter shaft fully in (clockwise) and secure it using the stopper tool.

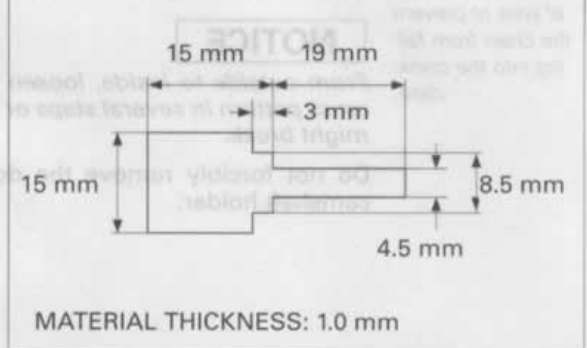
TOOL:

Tensioner stopper

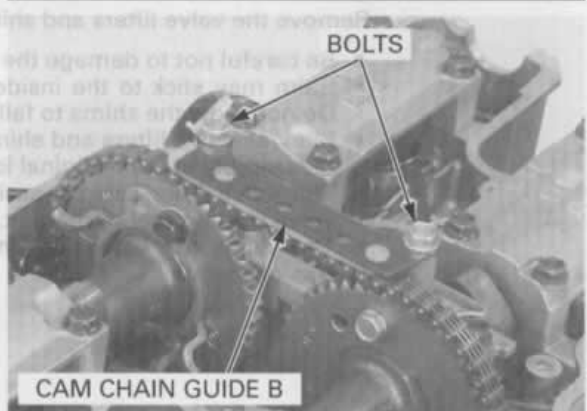
07NMG-MY90101



This tool can easily be made from a thin (1 mm thickness) piece of steel.

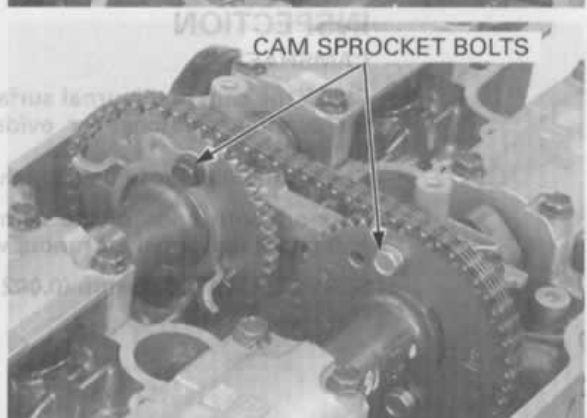


Remove the bolts and cam chain guide B.



Be careful not to drop the cam sprocket bolts into the crankcase.

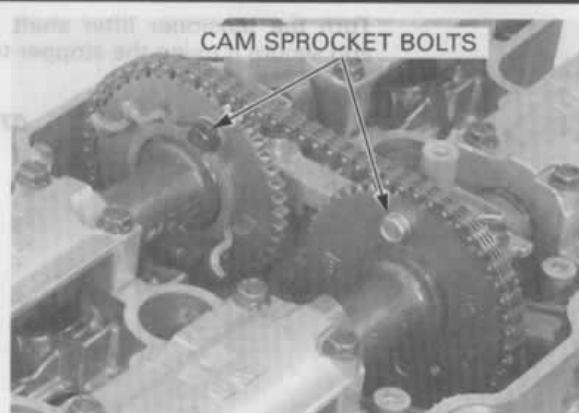
Remove the cam sprocket bolts from intake and exhaust camshafts.



CYLINDER HEAD/CYLINDER/PISTON

Turn the crankshaft one full turn (360°), remove the other cam sprocket bolts from the camshafts.

Remove the cam sprocket and cam pulse generator rotor from the camshaft.



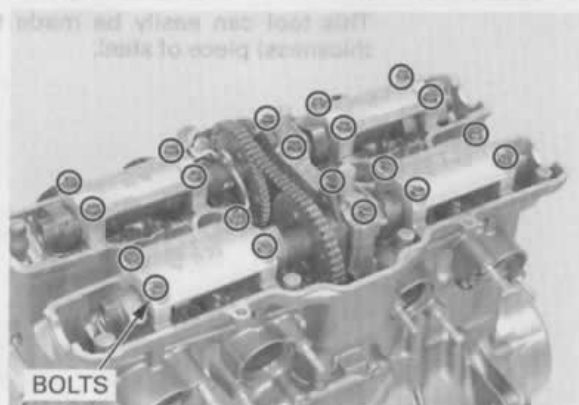
Suspend the cam chain with a piece of wire to prevent the chain from falling into the crankcase.

Loosen and remove the camshaft holder bolts, then remove the camshaft holders and camshaft.

NOTICE

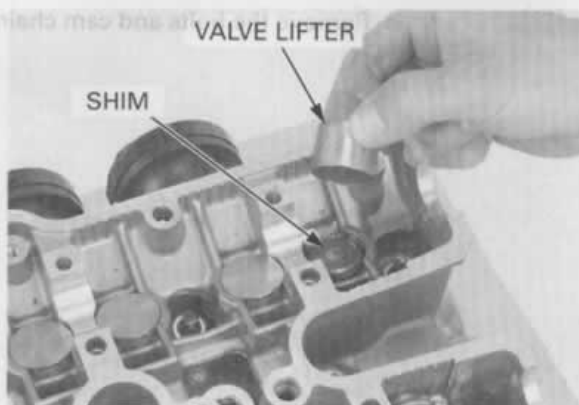
From outside to inside, loosen the bolts in a criss-cross pattern in several steps or the camshaft holder might break.

Do not forcibly remove the dowel pins from the camshaft holder.



Remove the valve lifters and shims.

- Be careful not to damage the valve lifter bore.
- Shim may stick to the inside of the valve lifter. Do not allow the shims to fall into the crankcase.
- Mark all valve lifters and shims to ensure correct reassembly in their original locations.
- The valve lifter can be easily removed with a valve lapping tool or magnet.
- The shims can be easily removed with a tweezers or magnet.



INSPECTION

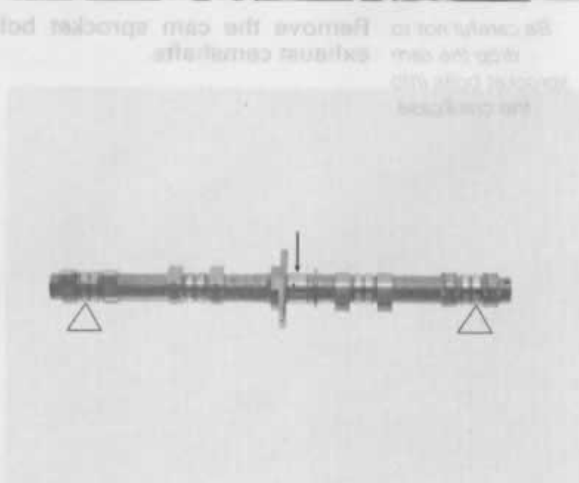
CAMSHAFT

Check the cam and journal surfaces of the camshaft for scoring, scratches or evidence of insufficient lubrication.

Check the oil holes in the camshaft for clogging.

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

SERVICE LIMIT: 0.05 mm (0.002 in)



Using a micrometer, measure each cam lobe height.

SERVICE LIMITS:

IN: 37.50 mm (1.476 in)

EX: 37.36 mm (1.471 in)



CAMSHAFT HOLDER

Inspect the bearing surface of camshaft holder for scoring, scratches, or evidence of insufficient lubrication.

Inspect the oil orifices of the holders for clogging.



CAM CHAIN GUIDE B

Inspect the cam chain slipper surface of the cam chain guide for wear or damage.

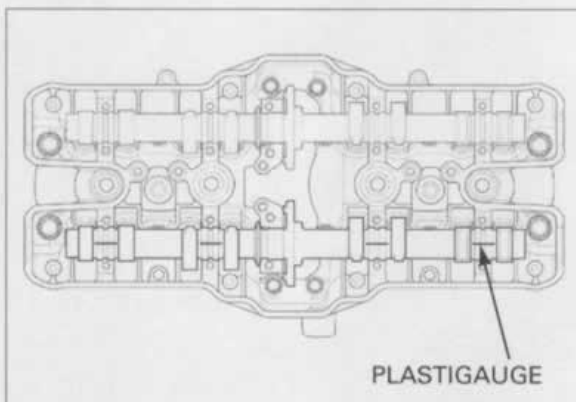


CAMSHAFT OIL CLEARANCE

Remove the cylinder head and valves (page 9-20).

Wipe any oil from the journals of the camshaft, cylinder head and camshaft holders.

Lay a strip of plastigauge lengthwise on top of each camshaft journal.

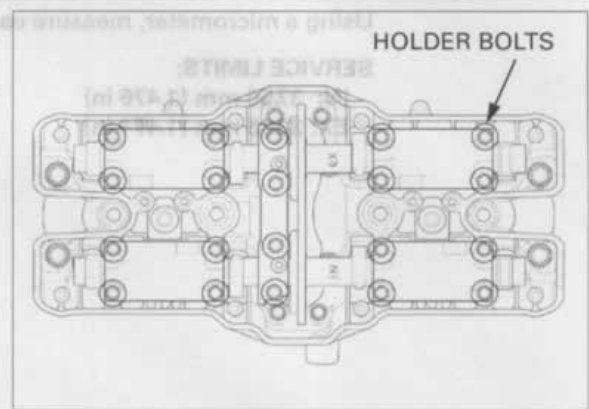


CYLINDER HEAD/CYLINDER/PISTON

Do not rotate the camshaft when using plastigauge

Install the camshaft holder onto the camshafts.
Apply engine oil to the threads and seating surfaces of the camshaft holder bolts.
Tighten the camshaft holder bolts in a from inside to out side gradually in 2 or 3 steps.

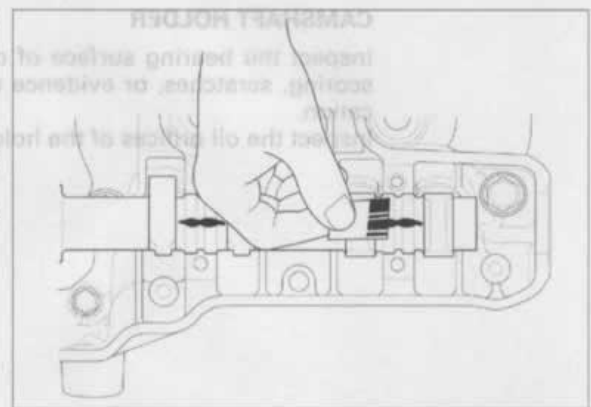
TORQUE: 12 N·m (1.2 kgf-m, 9 lbf-ft)



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

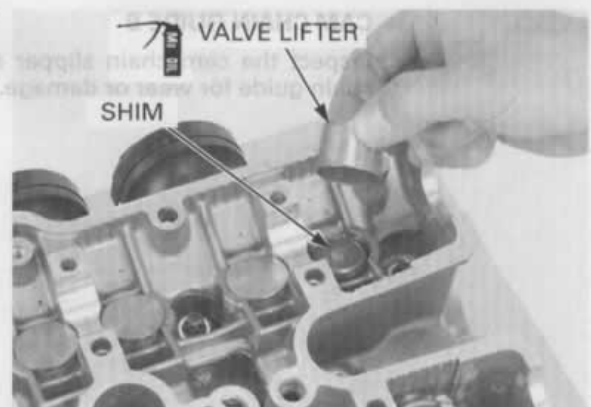
SERVICE LIMIT: 0.10 mm (0.004 in)

When the service limits are exceeded, replace the camshaft and recheck the oil clearance.
Replace the cylinder head and camshaft holders as a set if the clearance still exceeds the service limit.



INSTALLATION

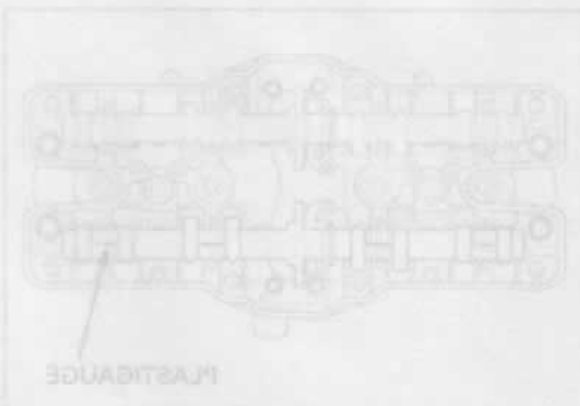
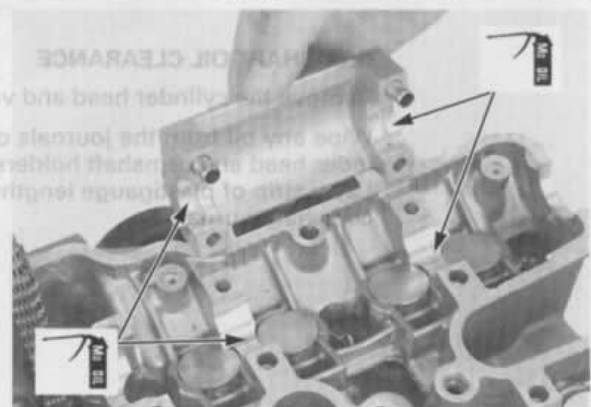
Apply molybdenum oil solution to the outer surface of the each valve lifter.



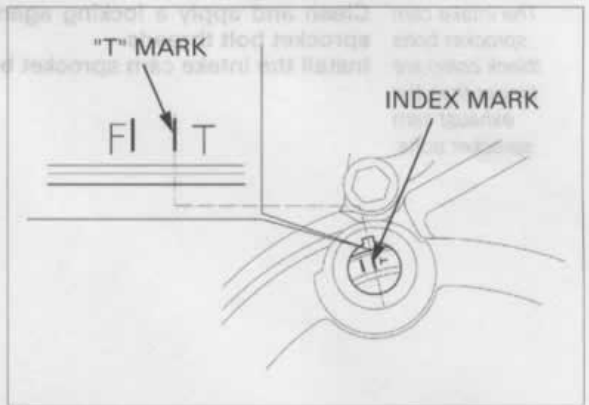
Install the shims and valve lifters in their original locations.

Install the shims and valve lifters into the valve lifter bores.

Apply molybdenum oil solution to the camshaft journals of the cylinder head and camshaft holder.



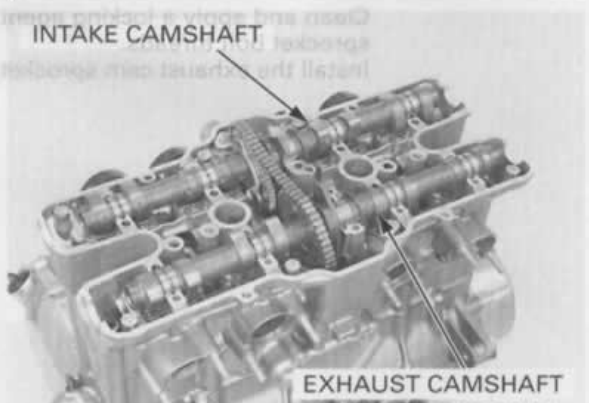
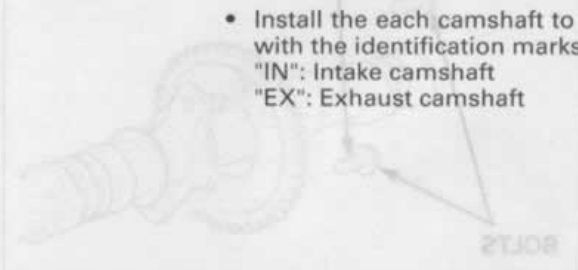
Turn the crankshaft counterclockwise and align the "T" mark (near the "F" mark) on the flywheel with the index mark on the left crankcase cover.



Install the cam sprockets and cam pulse generator rotor onto the each camshaft.

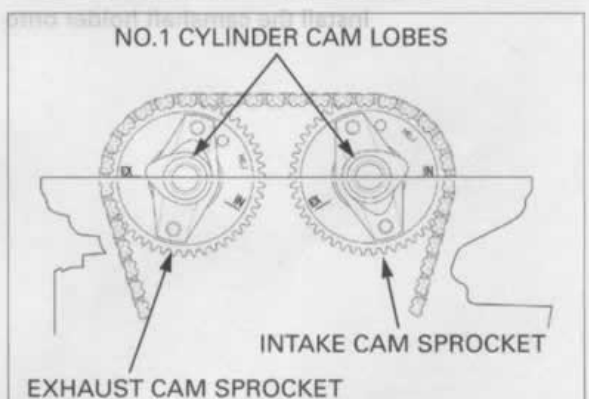
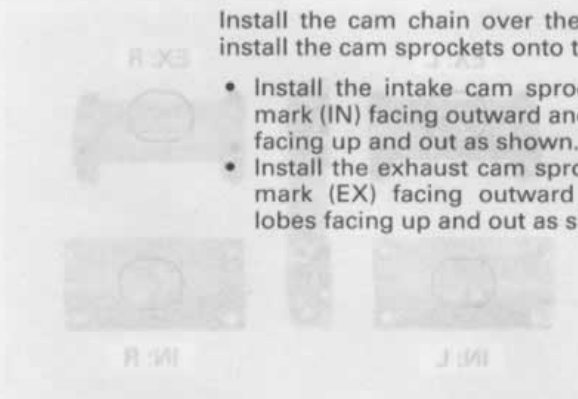
Install the intake and exhaust camshafts onto the cylinder head.

- Install the each camshaft to the correct locations with the identification marks.
"IN": Intake camshaft
"EX": Exhaust camshaft

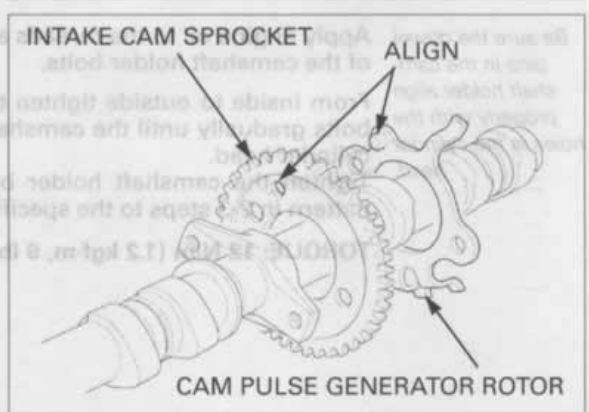


Install the cam chain over the sprockets and then install the cam sprockets onto the camshaft flanges.

- Install the intake cam sprocket with the timing mark (IN) facing outward and the No.1 cam lobes facing up and out as shown.
- Install the exhaust cam sprocket with the timing mark (EX) facing outward and the No.1 cam lobes facing up and out as shown.



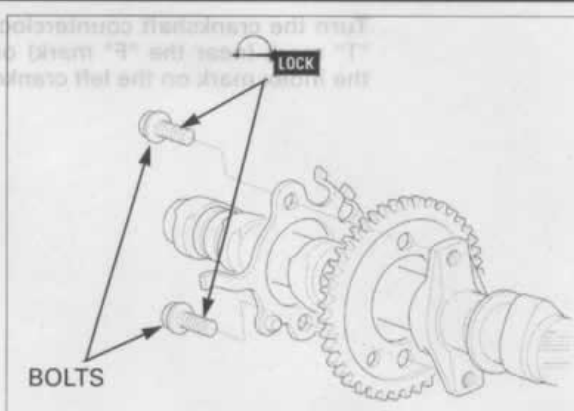
Install the cam pulse generator rotor while aligning its boss with the intake cam sprocket hole.



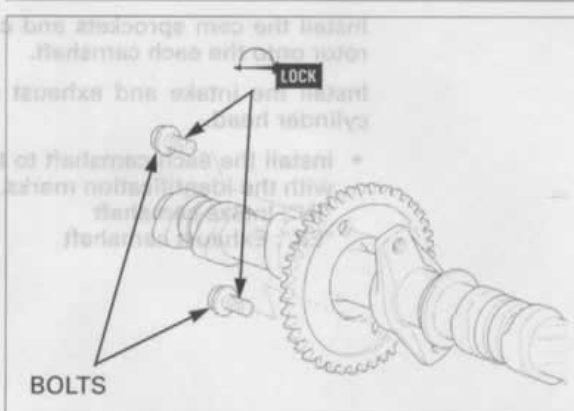
CYLINDER HEAD/CYLINDER/PISTON

The intake cam sprocket bolts (black color) are longer than the exhaust cam sprocket bolts.

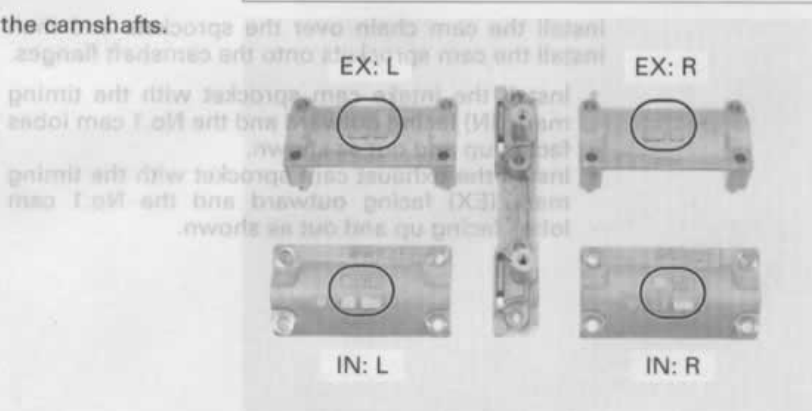
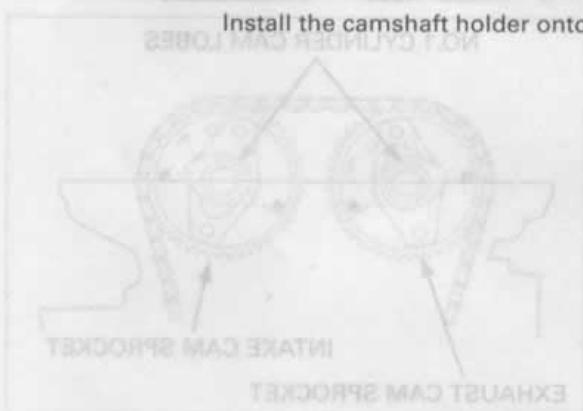
Clean and apply a locking agent to the intake cam sprocket bolt threads.
Install the intake cam sprocket bolts.



Clean and apply a locking agent to the exhaust cam sprocket bolt threads.
Install the exhaust cam sprocket bolts.



Install the camshaft holder onto the camshafts.



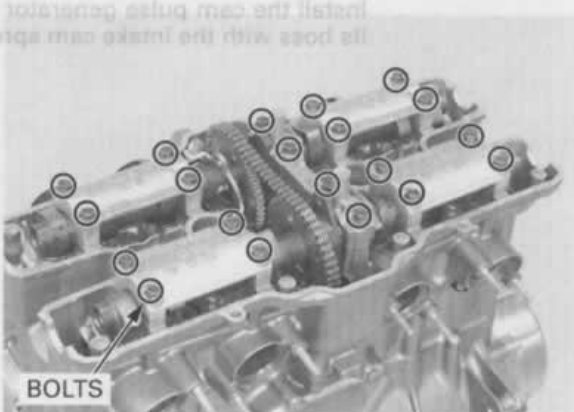
Be sure the dowel pins in the camshaft holder align properly with the holes in the cylinder head.

Apply engine oil to the threads and seating surfaces of the camshaft holder bolts.

From inside to outside tighten the camshaft holder bolts gradually until the camshaft holders seats the cylinder head.

Tighten the camshaft holder bolts in a crisscross pattern in 2-3 steps to the specified torque.

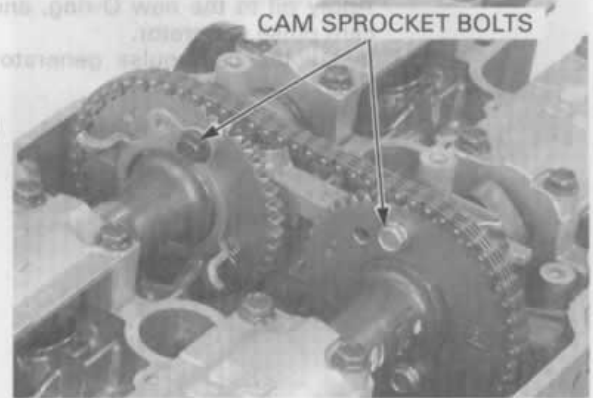
TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



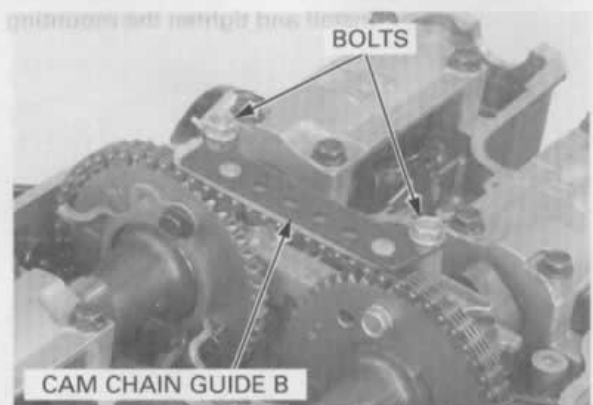
In case the cam sprockets were removed, tighten the cam sprocket bolts to the specified torque.

TORQUE: 20 N·m (2.0 kgf·m, 14 lbf·ft)

Turn the crankshaft counterclockwise one full turn (360°) and tighten the other cam sprocket bolts.



Install the cam chain guide B, and tighten the bolts.

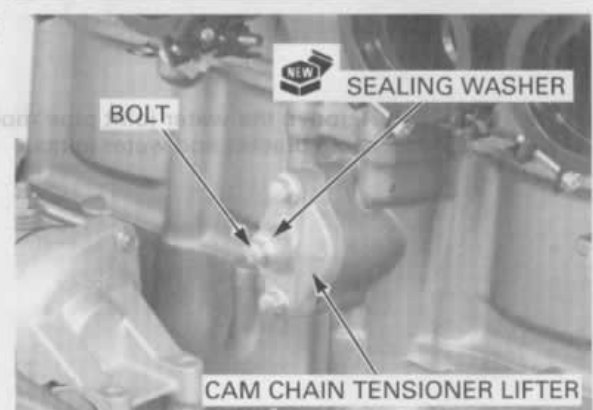


Remove the stopper tool from the cam chain tensioner lifter.



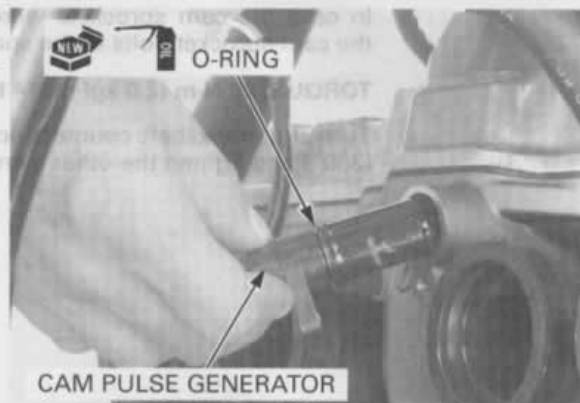
Install a new sealing washer and tighten the sealing bolt.

Recheck the valve timing.

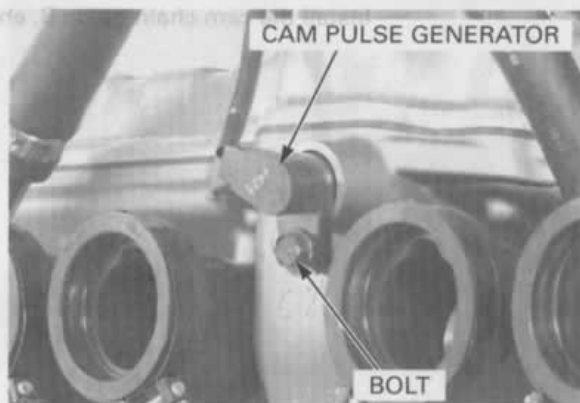


CYLINDER HEAD/CYLINDER/PISTON

Apply oil to the new O-ring, and install it onto the cam pulse generator. Install the cam pulse generator into the cylinder head.



Install and tighten the mounting bolt securely.



CYLINDER HEAD

REMOVAL

Drain the coolant (page 7-6).

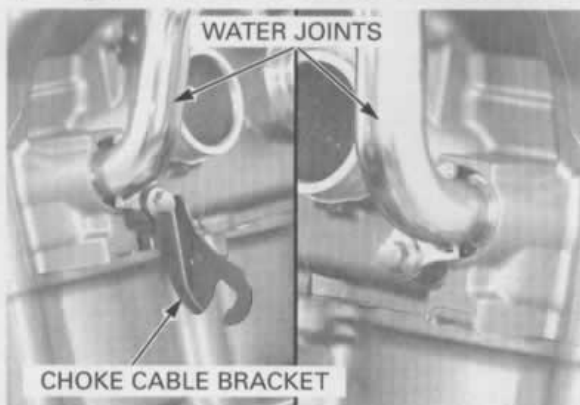
Remove the following:

- Camshaft (page 9-12)
- Throttle body (page 6-57)
- Exhaust pipe (page 3-12)

Remove the radiator heat insulator.

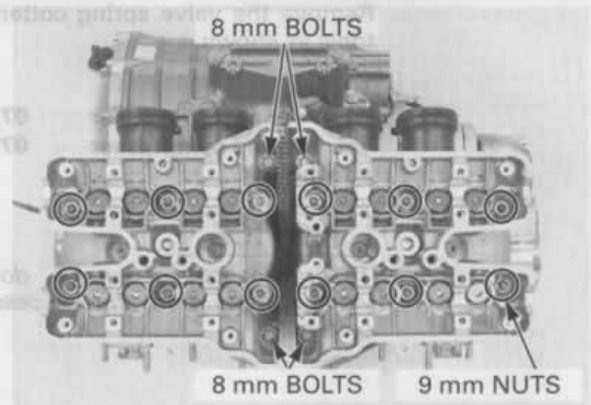


Remove the water joint pipe mounting bolts, choke cable bracket and water joints.

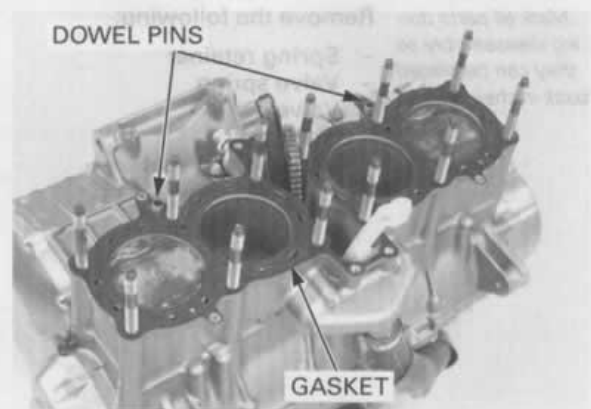


Loosen the 9 mm nuts in a crisscross pattern in 2 - 3 steps.

Remove the four 8 mm flange bolts.
Remove the ten 9 mm nuts and sealing washers.
Remove the cylinder head.



Remove the gasket and dowel pins.



DISASSEMBLY

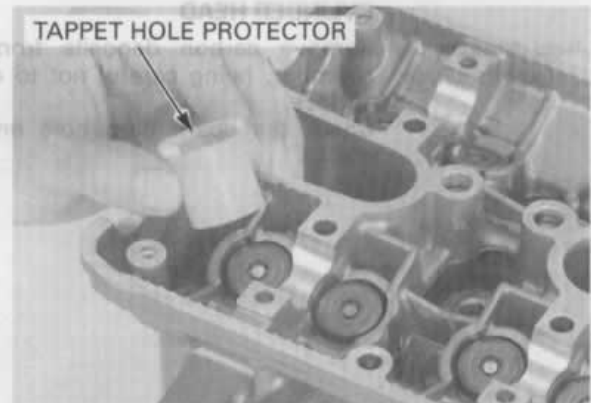
Remove the spark plugs from the cylinder head.

Install the tappet hole protector into the valve lifter bore.

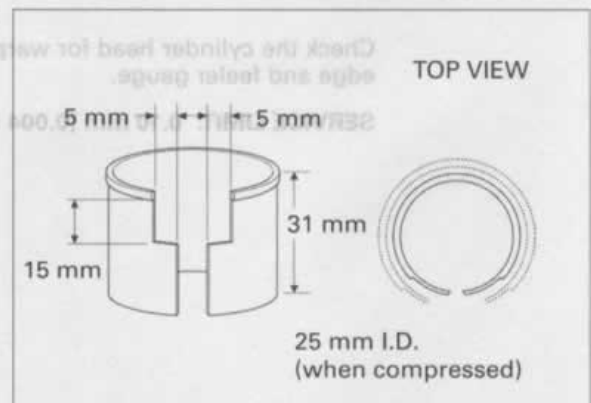
TOOL:

Tappet hole protector

07HMG-MR70002



An equivalent tool can easily be made from a plastic 35 mm film container as shown.



CYLINDER HEAD/CYLINDER/PISTON

Remove the valve spring cotters using the special tools as shown.

TOOLS:

Valve spring compressor
Valve spring compressor
attachment

07757-0010000
07959-KM30101

NOTICE

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

VALVE SPRING COMPRESSOR

ATTACHMENT

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

Remove the following:

- Spring retainer
- Valve spring
- Valve
- Stem seal
- Valve spring seat

INSPECTION

CYLINDER HEAD

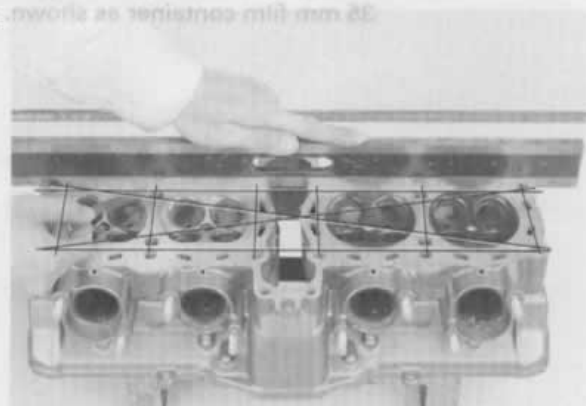
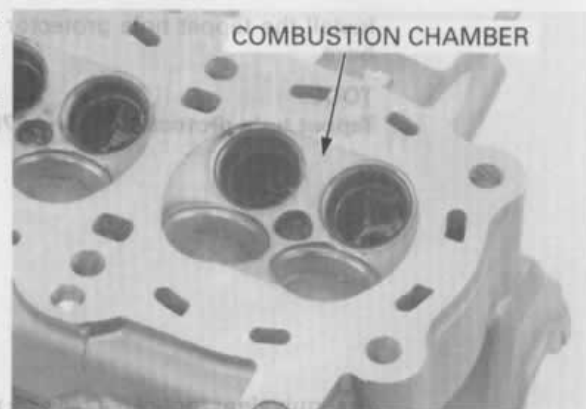
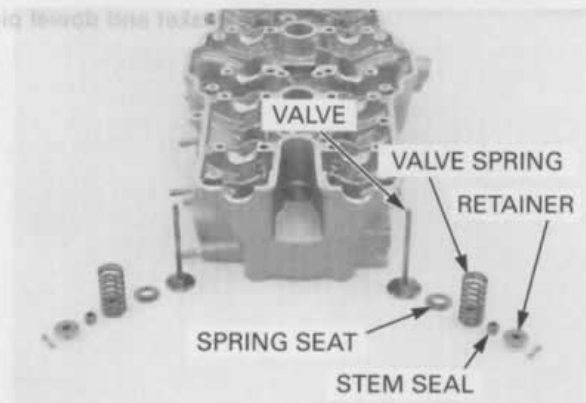
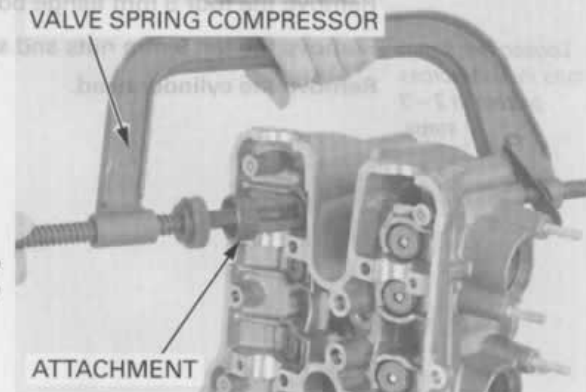
Avoid damaging the gasket surface.

Remove carbon deposits from the combustion chamber, being careful not to damage the gasket surface. Check the spark plug hole and valve areas for cracks.

COMBUSTION CHAMBER

Check the cylinder head for warpage with a straight edge and feeler gauge.

SERVICE LIMIT: 0.10 mm (0.004 in)



VALVE LIFTER BORE

Inspect each valve lifter bore for scratches or abnormal wear.

Measure the each valve lifter bore I.D.

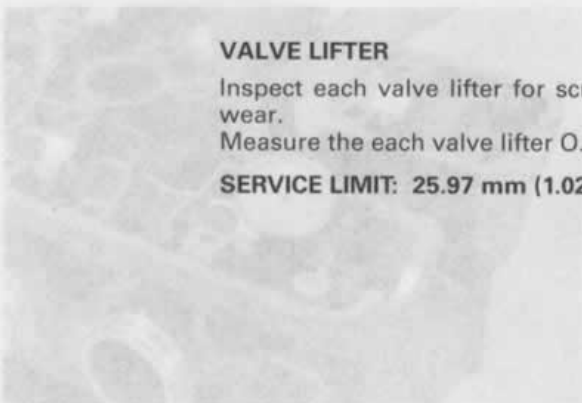
SERVICE LIMIT: 26.04 mm (1.025 in)

**VALVE LIFTER**

Inspect each valve lifter for scratches or abnormal wear.

Measure the each valve lifter O.D.

SERVICE LIMIT: 25.97 mm (1.022 in)

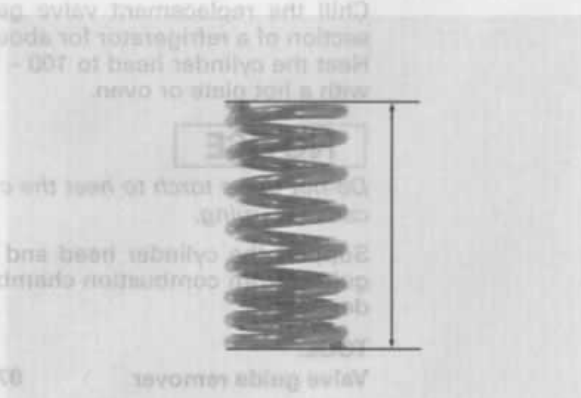
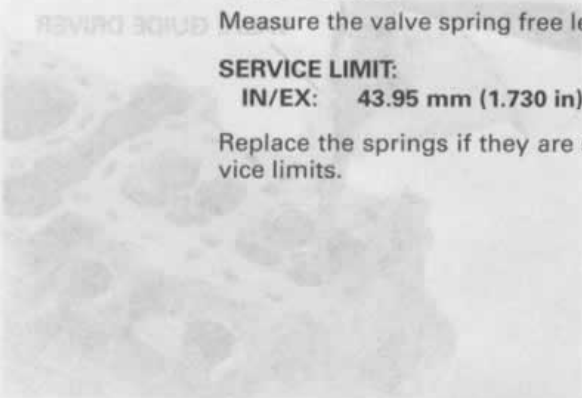
**VALVE SPRING**

Measure the valve spring free length.

SERVICE LIMIT:

IN/EX: 43.95 mm (1.730 in)

Replace the springs if they are shorter than the service limits.

**VALVE/VALVE GUIDE**

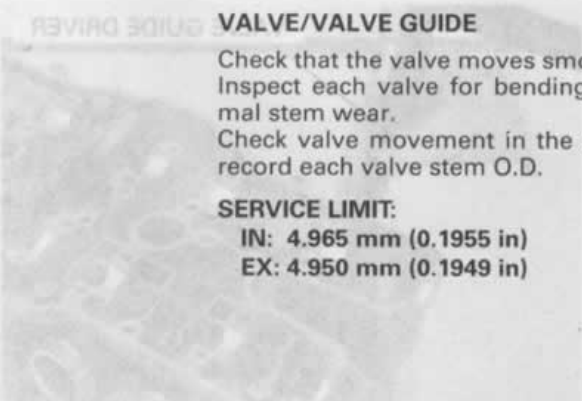
Check that the valve moves smoothly in the guide. Inspect each valve for bending, burning or abnormal stem wear.

Check valve movement in the guide, measure and record each valve stem O.D.

SERVICE LIMIT:

IN: 4.965 mm (0.1955 in)

EX: 4.950 mm (0.1949 in)



CYLINDER HEAD/CYLINDER/PISTON

Ream the guides to remove any carbon deposits before checking clearances. Insert the reamer from the combustion chamber side of the head and always rotate the reamer clockwise.

TOOL:

Valve guide reamer, 5 mm 07984-MA60001



Measure and record each valve guide I.D.

SERVICE LIMIT: IN/EX: 5.040 mm (0.1984 in)

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

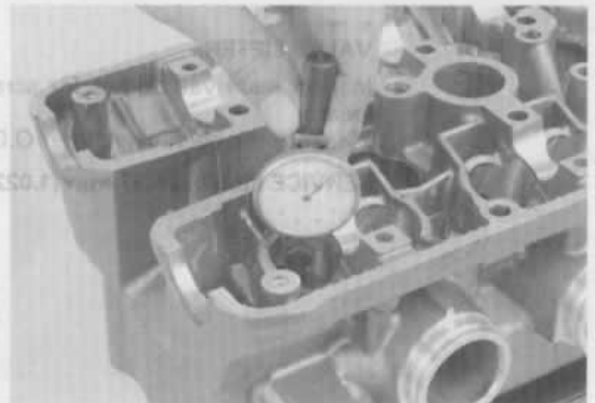
STANDARD:

IN: 0.010 – 0.037 mm (0.0004 – 0.0015 in)

EX: 0.025 – 0.052 mm (0.0010 – 0.0020 in)

Reface the valve seats whenever the valve guides are replaced (page 9-26).

If the stem-to-guide clearance is out of standard, determine if a new guide with standard dimensions would bring the clearance within tolerance. If so, replace any guides as necessary and ream to fit. If the stem-to-guide clearance is out of standard with the new guides, replace the valves and guides.



VALVE GUIDE REPLACEMENT

Chill the replacement valve guides in the freezer section of a refrigerator for about an hour. Heat the cylinder head to 100 – 150°C (212 – 300°F) with a hot plate or oven.

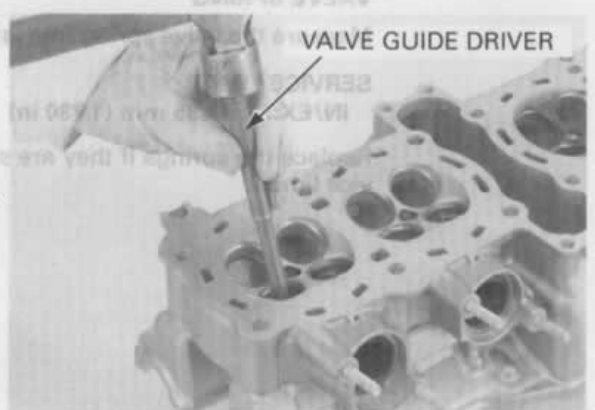
NOTICE

Do not use a torch to heat the cylinder head; it may cause warping.

Support the cylinder head and drive out the valve guides from combustion chamber side of the cylinder head.

TOOL:

Valve guide remover 07942-MA60000



Drive in the guide to the specified depth from the top of the cylinder head.

SPECIFIED DEPTH:

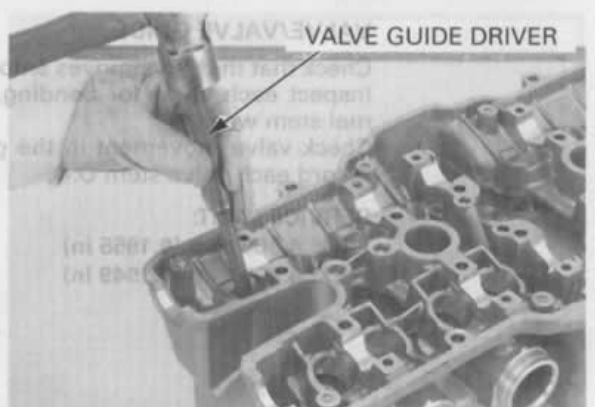
IN: 15.6 – 15.8 mm (0.61 – 0.62 in)

EX: 15.6 – 15.8 mm (0.61 – 0.62 in)

TOOL:

Valve guide driver 07743-0020000

Let the cylinder head cool to room temperature.



Use cutting oil on the reamer during this operation

Ream the new valve guide after installation. Insert the reamer from the combustion chamber side of the head and also always rotate the reamer clockwise.

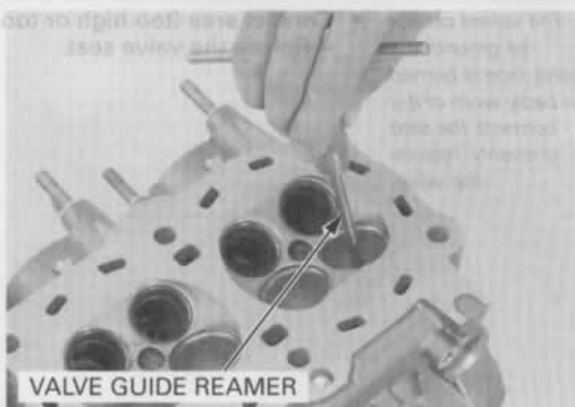
TOOL:

Valve guide reamer

07984-MA60001

Clean the cylinder head thoroughly to remove any metal particles.

Reface the valve seat (page 9-26).



VALVE SEAT INSPECTION/REFACING

Clean the intake and exhaust valves thoroughly to remove carbon deposits.

Apply a light coating of Prussian Blue to the valve seats.

Tap the valves and seats using a rubber hose or other hand-lapping tool.

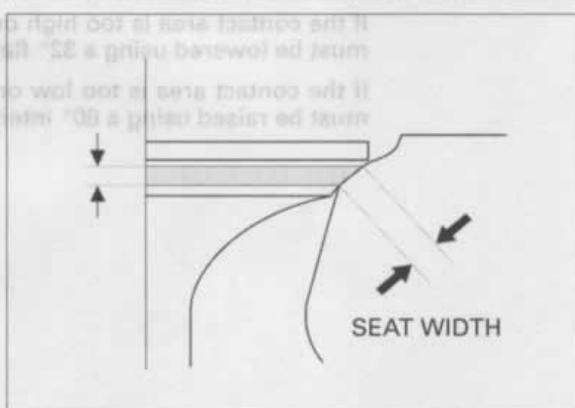


Remove the valve and inspect the valve seat face. The valve seat contact should be within the specified width and even all around the circumference.

STANDARD: 0.90 – 1.10 mm (0.035 – 0.043 in)

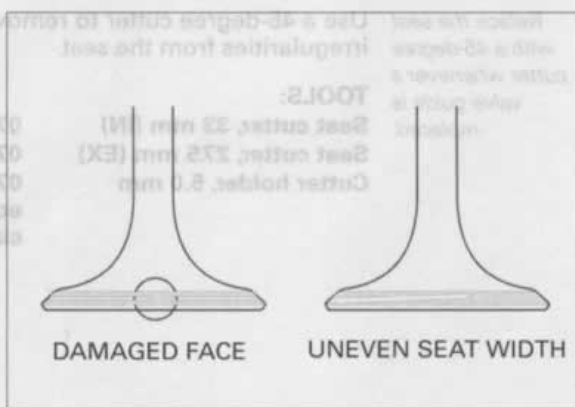
SERVICE LIMIT: 1.5 mm (0.06 in)

If the seat width is not within specification, reface the valve seat (page 9-26).



Inspect the valve seat face for:

- Uneven seat width:
 - Replace the valve and reface the valve seat.
- Damaged face:
 - Replace the valve and reface the valve seat.



CYLINDER HEAD/CYLINDER/PISTON

The valves cannot be ground. If a valve face is burned or badly worn or if it contacts the seat unevenly, replace the valve.

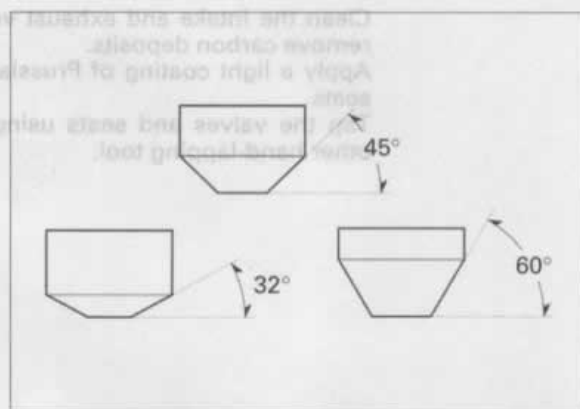
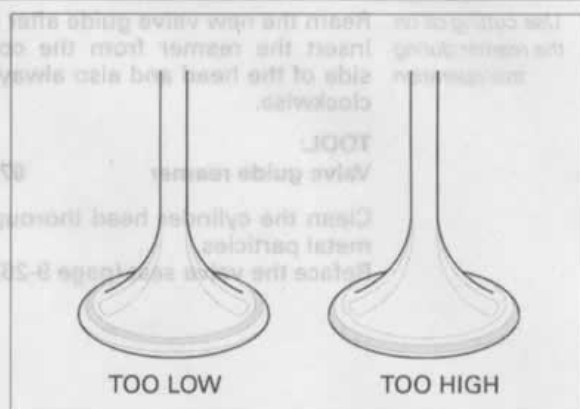
- Contact area (too high or too low) – Reface the valve seat.



VALVE SEAT REFACING

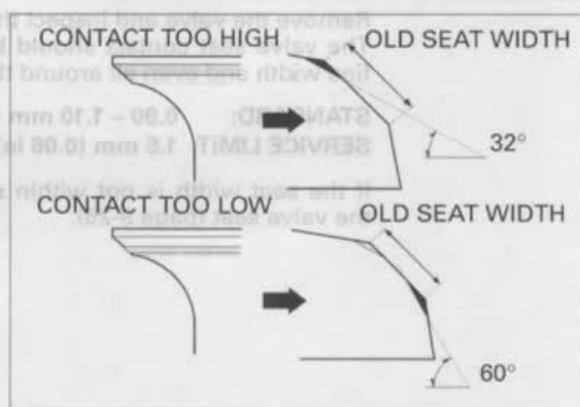
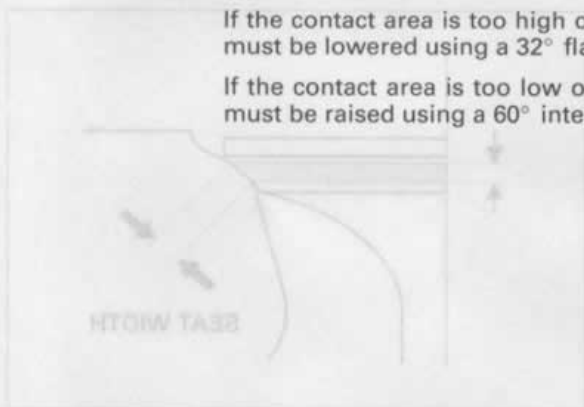
Follow the refacing manufacturer's operating instructions.

Valve seat cutters/grinders or equivalent valve seat refacing equipment are recommended to correct worn valve seats.



If the contact area is too high on the valve, the seat must be lowered using a 32° flat cutter.

If the contact area is too low on the valve, the seat must be raised using a 60° interior cutter.



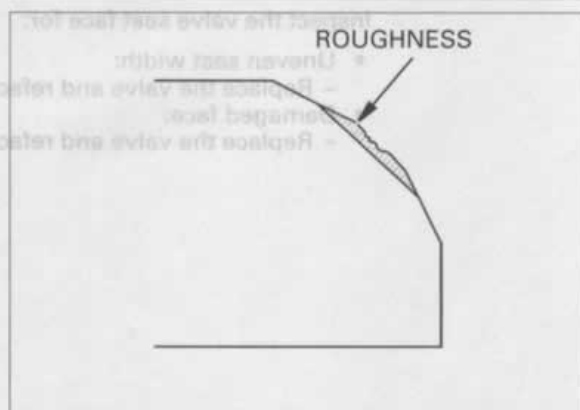
Reface the seat with a 45-degree cutter whenever a valve guide is replaced.

Use a 45-degree cutter to remove any roughness or irregularities from the seat.

TOOLS:

- Seat cutter, 33 mm (IN)
- Seat cutter, 27.5 mm (EX)
- Cutter holder, 5.0 mm

07780-0010800
07780-0010200
07781-0010400 or
equivalent commercially available



Use a 32-degree cutter to remove the top 1/4 of the existing valve seat material.

TOOLS:

Flat cutter, 33 mm (IN)

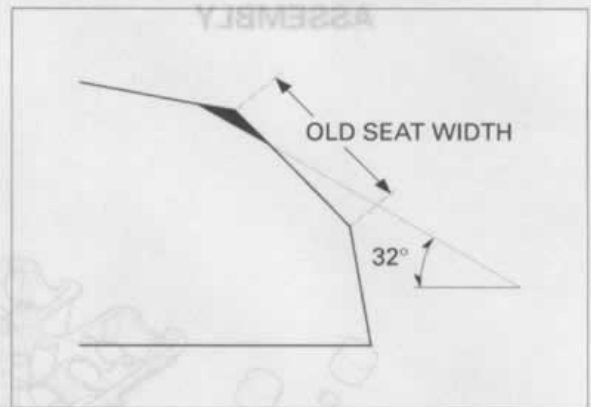
Flat cutter, 28 mm (EX)

Cutter holder, 5.0 mm

07780-0012900

07780-0012100

07781-0010400 or
equivalent commercially available



Use a 60-degree cutter to remove the bottom 1/4 of the old seat.

TOOLS:

Interior cutter, 30 mm (IN)

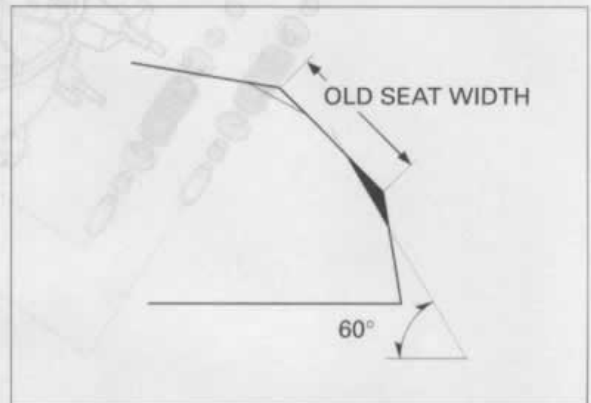
Interior cutter, 26 mm (EX)

Cutter holder, 5.0 mm

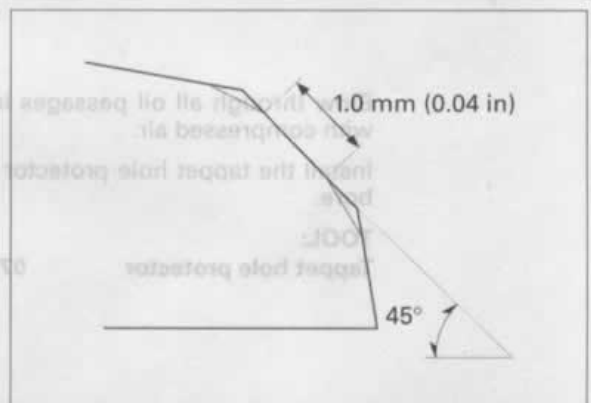
07780-0014000

07780-0014500

07781-0010400 or
equivalent commercially available



Using a 45° seat cutter, cut the seat to the proper width.
Make sure that all pitting and irregularities are removed.
Refinish if necessary.



After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure.

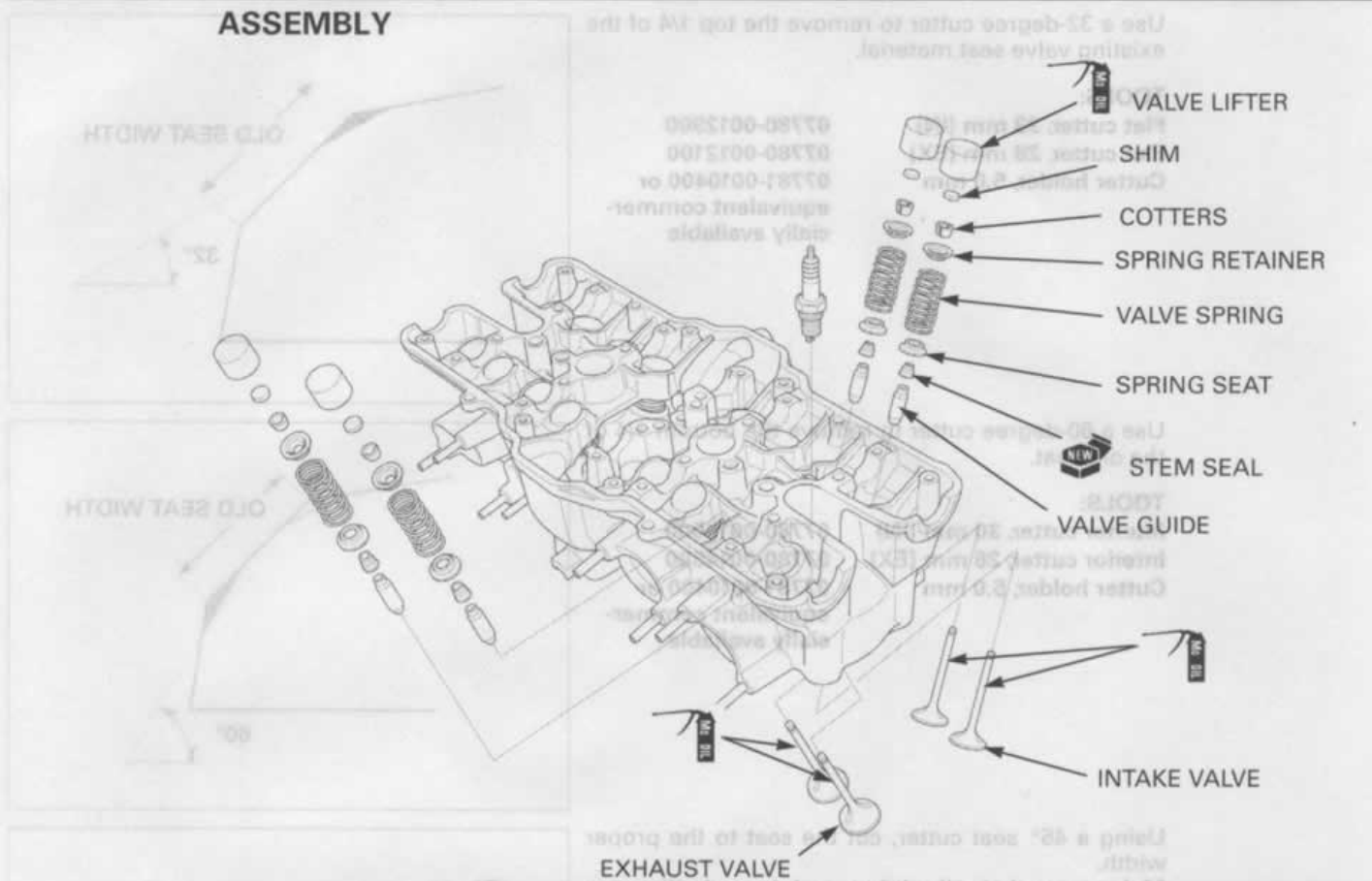
NOTICE

- Excessive lapping pressure may deform or damage the seat.
- Change the angle of lapping tool frequently to prevent uneven seat wear.
- Do not allow lapping compound to enter the guides.

After lapping, wash all residual compound off the cylinder head and valve.



ASSEMBLY



Blow through all oil passages in the cylinder head with compressed air.

Install the tappet hole protector into the valve lifter bore.

TOOL:

Tappet hole protector

07HMG-MR70002

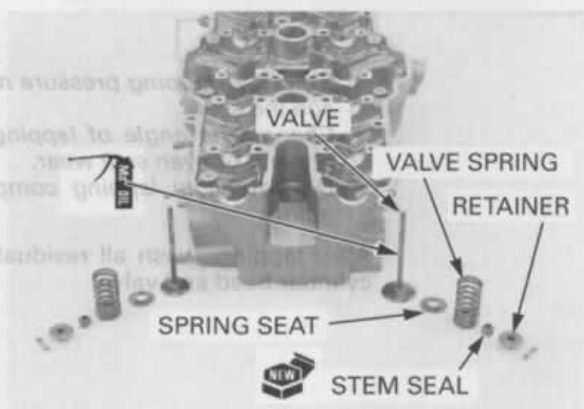
TAPPET HOLE PROTECTOR



Install the valve spring seats.
Install the new stem seals.

Lubricate the valve stems with molybdenum oil solution.

Insert the valve into the valve guide while turning it slowly to avoid damage to the stem seal.



Install the valve spring with the tightly wound coils facing the combustion chamber.
Install the valve spring retainer.



Grease the cotter pins to ease installation.

Install the valve cotter pins using the special tool as shown.

NOTICE

To prevent loss of tension, do not compress the valve spring more than necessary.

TOOLS:

Valve spring compressor

07757-0010000

Valve spring compressor attachment

07959-KM30101

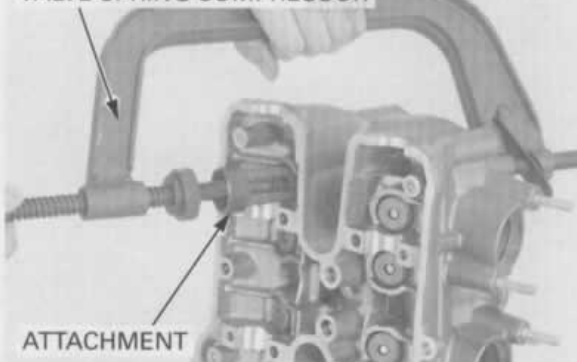
Support the cylinder head above the work bench surface to prevent possible valve damage.

Tap the valve stems gently with two plastic hammers as shown to seat the cotter pins firmly.

Install and tighten the spark plugs.

TORQUE: 15 N·m (1.5 kgf·m, 11 lbf·ft)

VALVE SPRING COMPRESSOR



ATTACHMENT

PLASTIC HAMMERS



INSTALLATION

Install the dowel pins and a new cylinder head gasket as shown.

DOWEL PINS



GASKET

CYLINDER HEAD/CYLINDER/PISTON

Install the cylinder head onto the cylinder block.

Apply oil to the threads and seating surface of the 9 mm nuts and install the washers and nuts.

Apply oil to the threads and seating surface of the 8 mm flange bolts and install them.

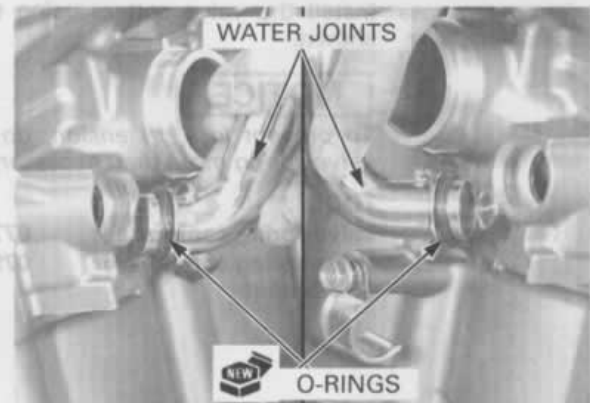
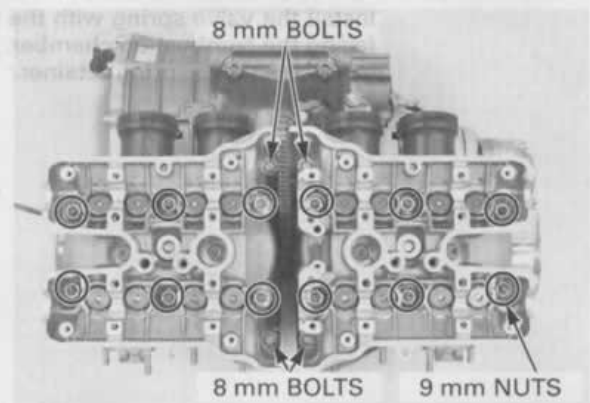
Tighten the 9 mm nuts in a crisscross pattern in 2 – 3 steps to the specified torque.

TORQUE: 45 N·m (4.6 kgf·m, 33 lbf·ft)

Tighten the 8 mm flange bolts to the specified torque.

TORQUE: 25 N·m (2.5 kgf·m, 18 lbf·ft)

Install new O-rings onto the flange of the water joints.

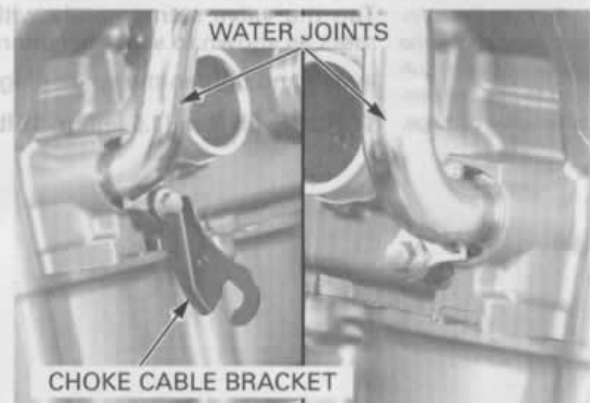


Install the choke cable bracket and water joints to the cylinder head and tighten the bolts.

Fill the recommended coolant up to proper level (page 7-6).

Install the following:

- Camshaft (page 9-16)
- Throttle body (page 6-57)
- Exhaust pipe (page 9-37)



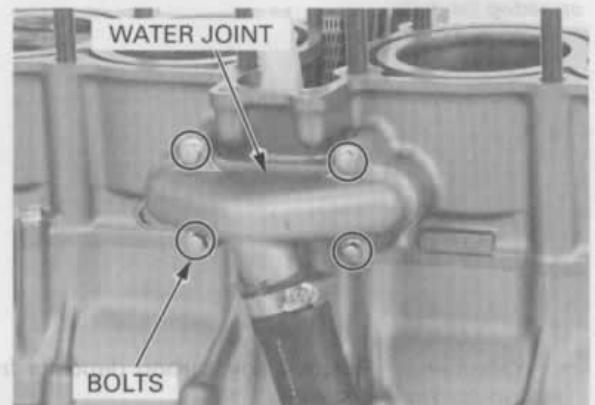
Install the radiator heat insulator while aligning its bosses with the cylinder head holes.



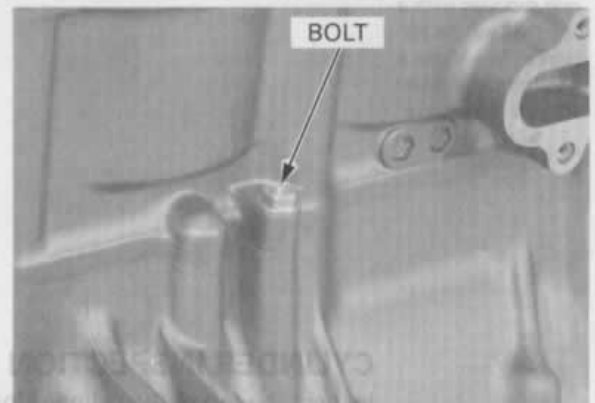
CYLINDER/PISTON

REMOVAL

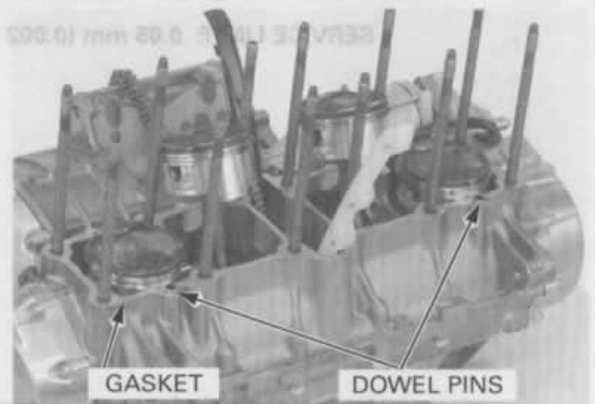
Remove the bolts and water joint.



Remove the cylinder mounting bolt.
Remove the cylinder.



Remove the gasket and dowel pins.



Mark the all the parts as you remove them to indicate the correct cylinder for reassembly.

Avoid falling the piston pin clips, cover the crankcase opening with a shop towel or equivalent.

Remove the piston pin clip with pliers.
Push the piston pin out of the piston and connecting rod, and remove the piston.

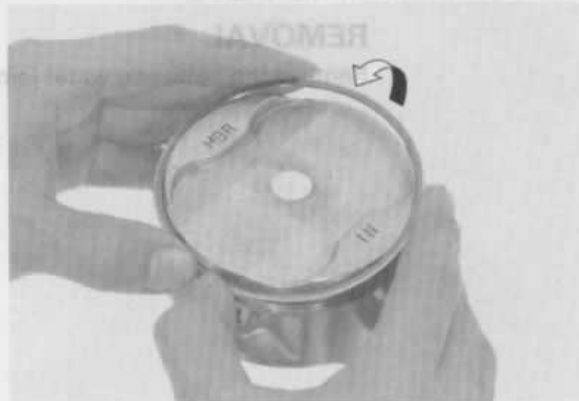


CYLINDER HEAD/CYLINDER/PISTON

DISASSEMBLY

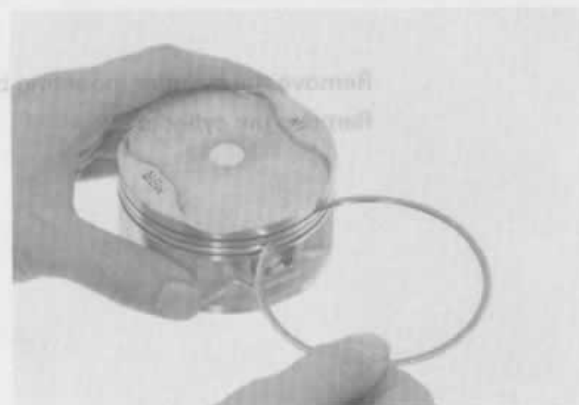
Do not damage the piston ring by spreading the ends too far.

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



Clean carbon deposits from the ring grooves with a ring that will be discarded. Never use a wire brush; it will scratch the groove.

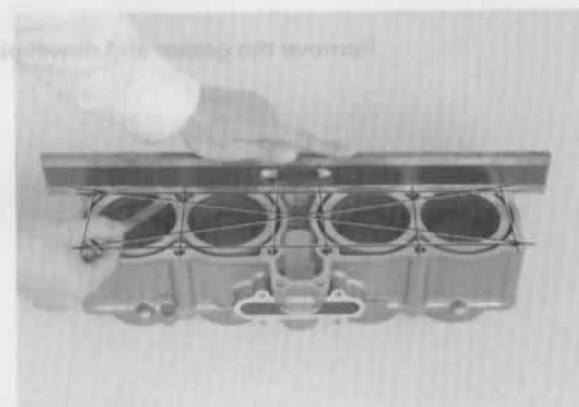
Remove any carbon deposits from the piston ring grooves.



CYLINDER INSPECTION

Inspect the top of the cylinder for warpage.

SERVICE LIMIT: 0.05 mm (0.002 in)

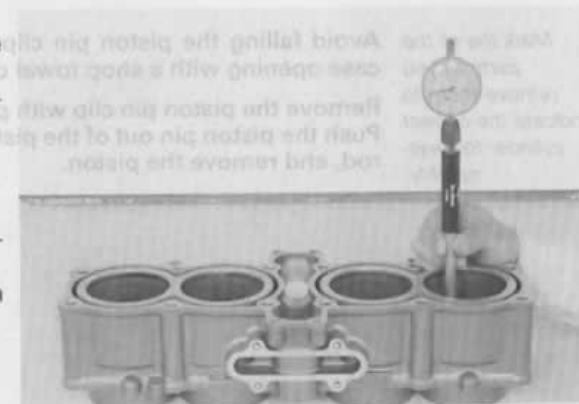


Inspect the cylinder bore for wear or damage. Measure the cylinder I.D. in X and Y axis at three levels. Take the maximum reading to determine the cylinder wear.

SERVICE LIMIT: 78.10 mm (3.075 in)

Calculate the piston-to-cylinder clearance. Take a maximum reading to determine the clearance. Refer procedures for measurement of the piston O.D (page 9-33).

STANDARD: 0.010 - 0.045 mm (0.0004 - 0.0018 in)



Calculate the taper and out of round at three levels in X and Y axis, Take the maximum reading to determine them.

SERVICE LIMITS:

Taper: 0.05 mm (0.002 in)

Out of round: 0.05 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)

0.50 mm (0.020 in)

The piston to cylinder clearance for the oversize piston must be: 0.015 – 0.050 mm (0.0006 – 0.0020 in).

PISTON INSPECTION

Temporarily install the piston rings to their proper position with the mark facing up.

Measure the piston ring-to-ring groove clearance with the rings pushed into the grooves.

SERVICE LIMITS:

Top: 0.09 mm (0.004 in)

Second: 0.09 mm (0.004 in)

Insert the piston ring squarely into the bottom of the cylinder and measure the ring end gap.

SERVICE LIMITS:

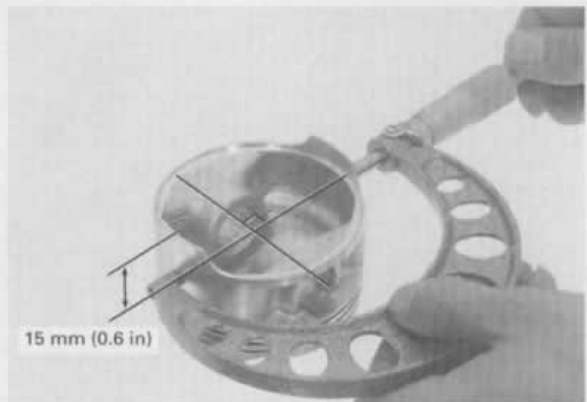
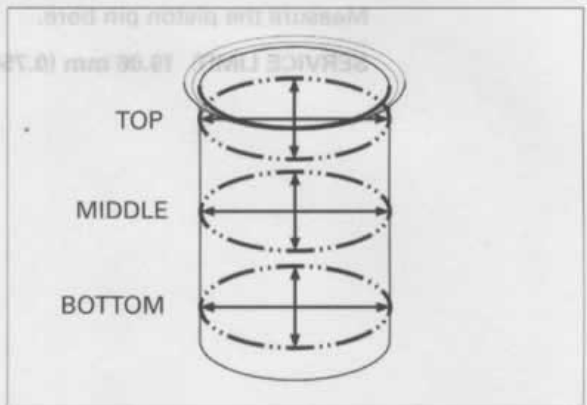
Top: 0.58 mm (0.023 in)

Second: 0.65 mm (0.026 in)

Oil (side rail): 0.85 mm (0.033 in)

Measure the diameter of the piston at 15 mm (0.6 in) from the bottom and 90 degrees to the piston pin hole.

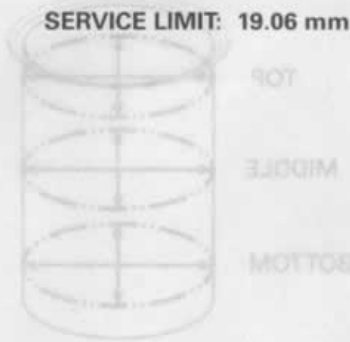
SERVICE LIMIT: 77.87 mm (3.066 in)



CYLINDER HEAD/CYLINDER/PISTON

Measure the piston pin bore.

SERVICE LIMIT: 19.06 mm (0.750 in)

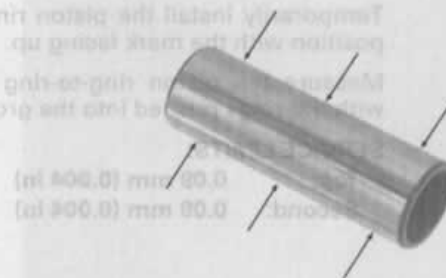


Measure the O.D. of the piston pin.

SERVICE LIMIT: 18.98 mm (0.747 in)

Calculate the piston-to-piston pin clearance.

SERVICE LIMIT: 0.04 mm (0.002 in)



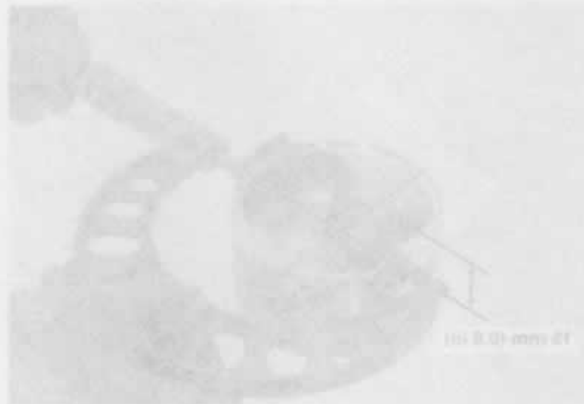
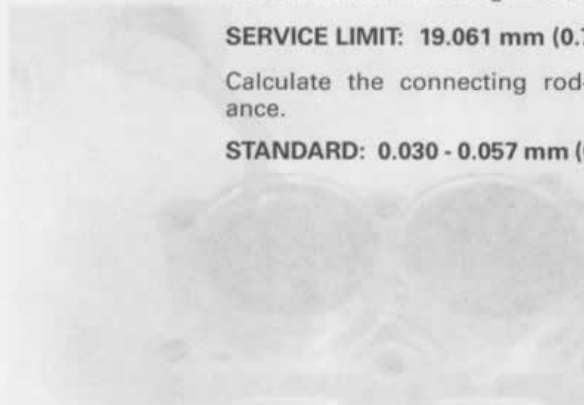
CONNECTING ROD INSPECTION

Measure the connecting rod small end I.D.

SERVICE LIMIT: 19.061 mm (0.7504 in)

Calculate the connecting rod-to-piston pin clearance.

STANDARD: 0.030 - 0.057 mm (0.0012 - 0.0022 in)



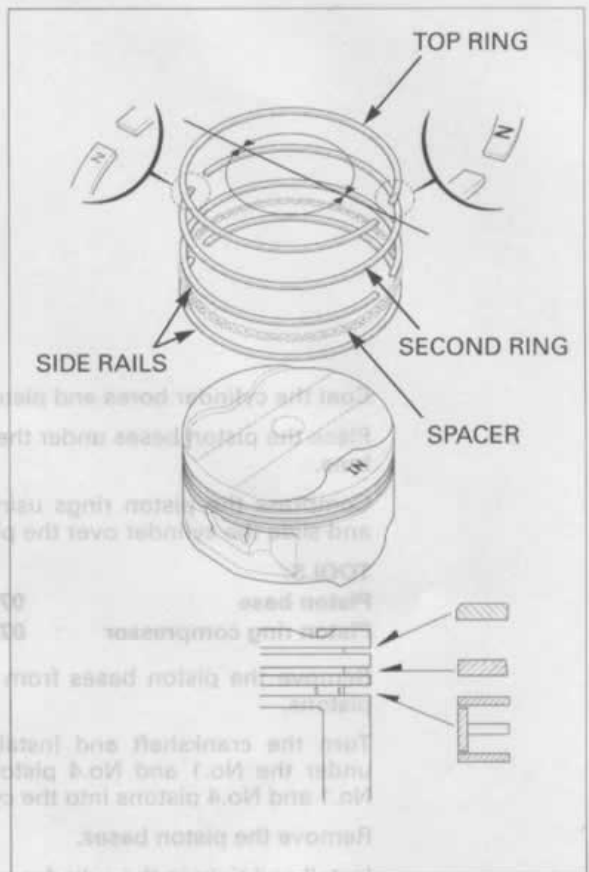
PISTON ASSEMBLY

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

- Apply oil to the piston rings.
- Avoid piston and piston ring damage during installation.
- Install the piston rings with the marking (N) facing up.
- Do not mix the top and second rings; top ring is narrower than the second ring in width.

Stagger the piston ring end gaps 180° apart from each other.

Stagger the side rail end gaps as shown.



INSTALLATION

Be careful not to damage the gasket mating surface.

Clean any gasket material from the cylinder base and crankcase upper surface.



Apply molybdenum disulfide oil to the piston pin outer surface.

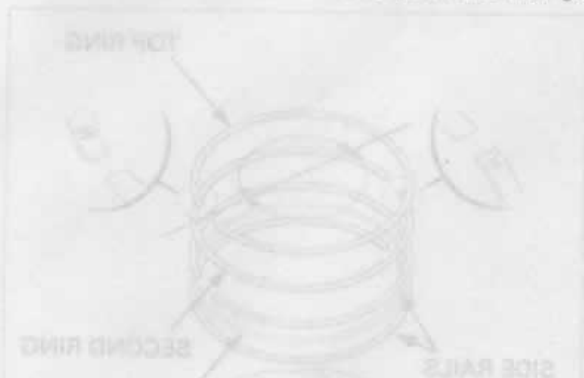
Install the piston pin, and secure it using a new piston pin clips.

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



CYLINDER HEAD/CYLINDER/PISTON

Install a dowel pins and new gasket.



Coat the cylinder bores and pistons with engine oil.
Place the piston bases under the No.2 and No.3 pistons.

Compress the piston rings using the special tools and slide the cylinder over the pistons.

TOOLS:

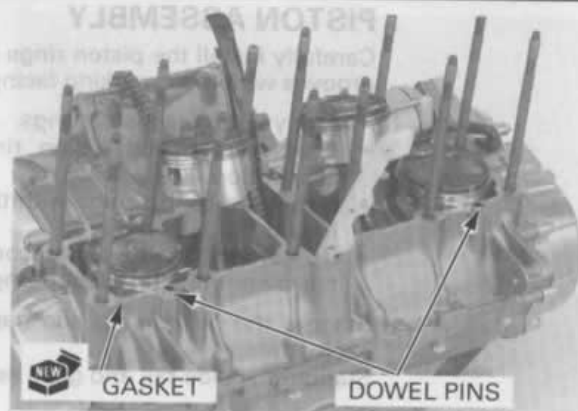
Piston base 07958-2500001
Piston ring compressor 07PME-MZ20100

Remove the piston bases from the No.2 and No.3 pistons.

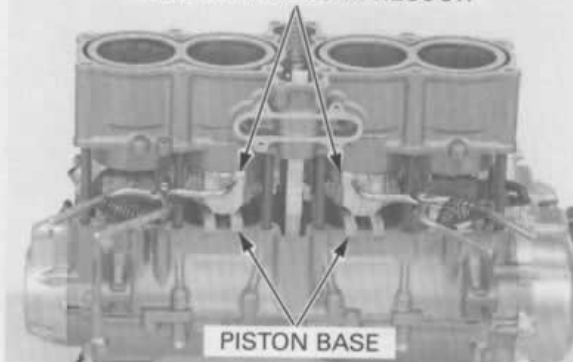
Turn the crankshaft and install the piston bases under the No.1 and No.4 pistons, then install the No.1 and No.4 pistons into the cylinder.

Remove the piston bases.

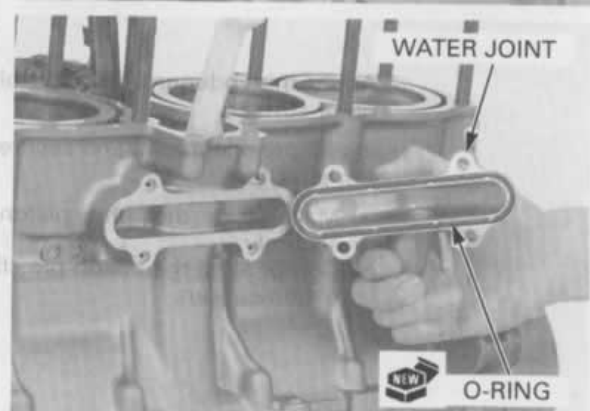
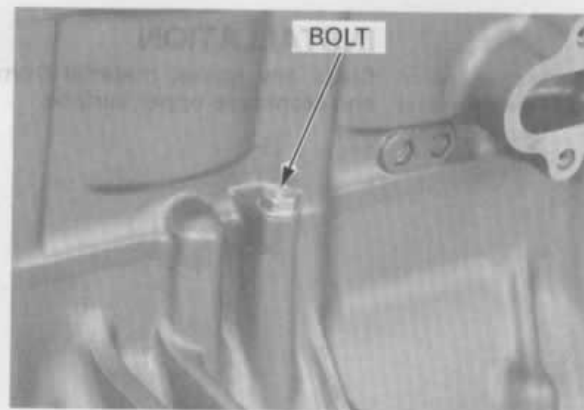
Install and tighten the cylinder mounting bolt.



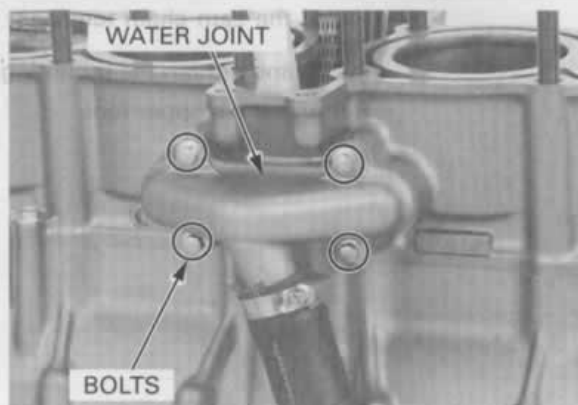
PISTON RING COMPRESSOR



Install new O-ring into the groove of the water joint.



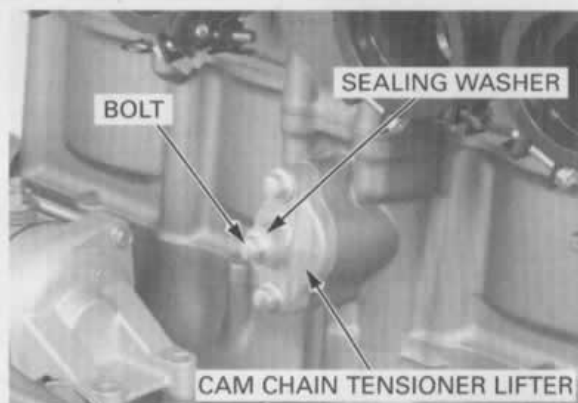
Install the water joint onto the cylinder and tighten the bolts securely.



CAM CHAIN TENSIONER LIFTER

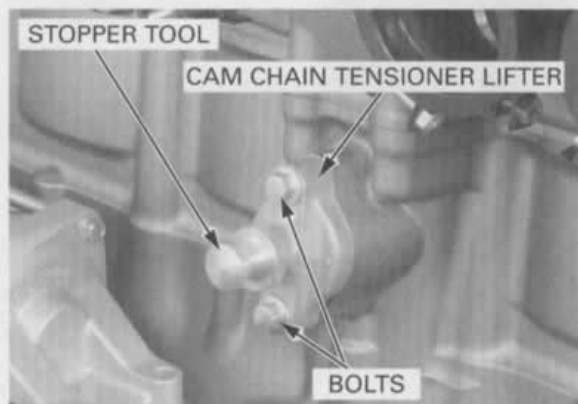
REMOVAL

Remove the cam chain tensioner sealing bolt and sealing washer.



Turn the tensioner shaft fully in (clockwise) and secure it using the stopper tool (page 9-13) to prevent damaging the cam chain.

Remove the bolts and cam chain tensioner lifter. Remove the gasket.



INSTALLATION

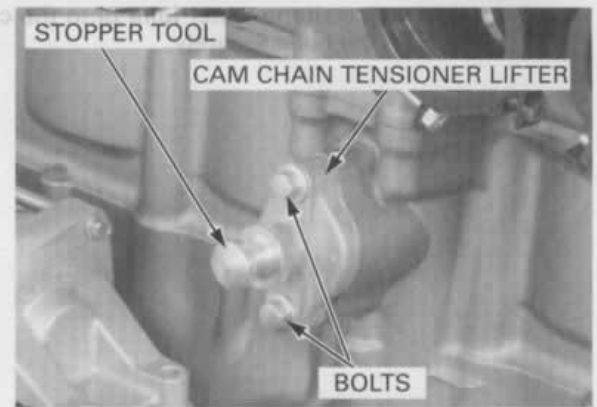
Note the installation direction of the gasket.

Install the new gasket onto the cam chain tensioner lifter.



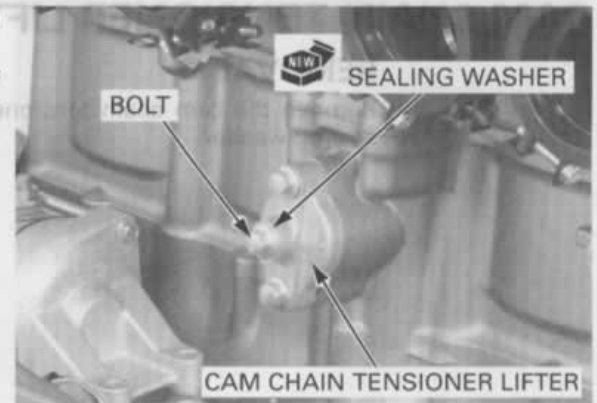
CYLINDER HEAD/CYLINDER/PISTON

Install the cam chain tensioner lifter into the cylinder.
Install and tighten the mounting bolts.
Remove the stopper tool.



Install a new sealing washer and tighten the sealing bolt securely.

Install the removed parts in the reverse order of removal.



Turn the tensioner shaft fully in (clockwise) and secure it using the stopper tool (page 9-13) to prevent damaging the cam chain.
Remove the bolts and cam chain tensioner lifter.
Remove the gasket.

INSTALLATION

Install the new gasket onto the cam chain tensioner.
Install the cam chain tensioner lifter.
Tighten the mounting bolts.