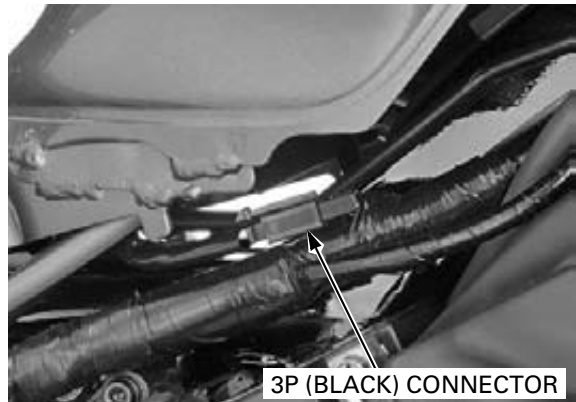


## CYLINDER HEAD/VALVES

### CYLINDER COMPRESSION TEST

Warm the engine to normal operating temperature.  
Stop the engine and remove the all spark plug caps and spark plugs (page 4-8).  
Lift and support the fuel tank (page 4-5).  
Disconnect the fuel pump unit 3P (Black) connector.



Install a compression gauge into the spark plug hole.

**TOOL:**

**Compression gauge attachment**

**07RMJ-MY50100 or 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:**

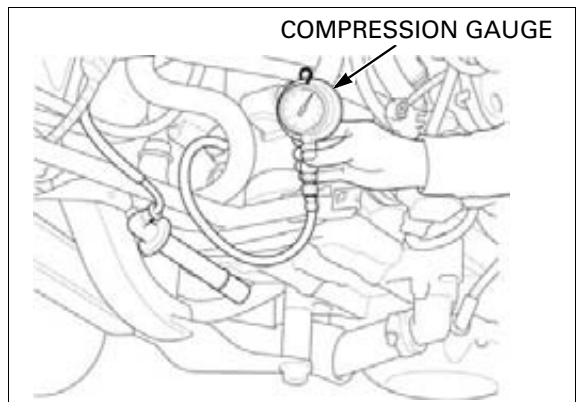
**1,098 kPa (11.2 kgf/cm<sup>2</sup>, 159 psi) at 350 min<sup>-1</sup> (rpm)**

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:

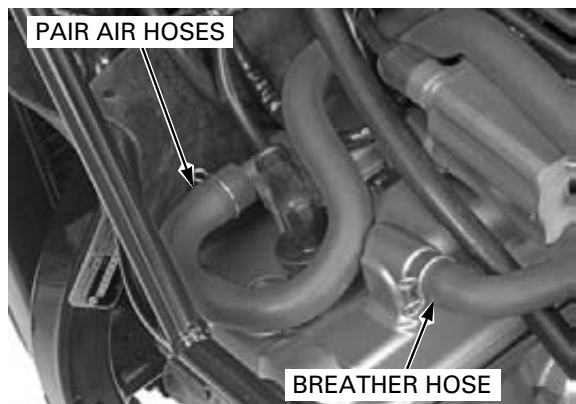
- Carbon deposits in combustion chamber or on piston head



### CYLINDER HEAD COVER REMOVAL

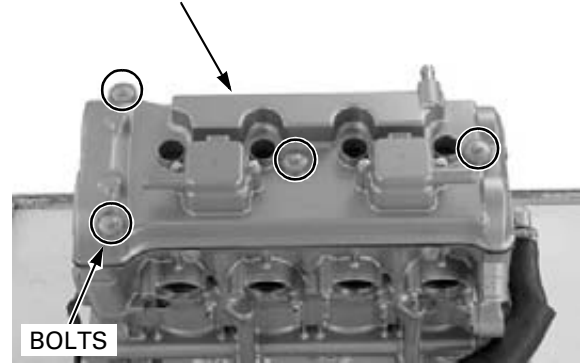
Remove the fuel tank (page 6-57).  
Disconnect the spark plug caps (page 4-8).

Remove the crankcase breather hose.  
Disconnect the PAIR air hoses from the cylinder head cover and remove the PAIR control solenoid valve (page 6-84).



Remove the cylinder head cover bolts.  
Remove the cylinder head cover from the cylinder head.

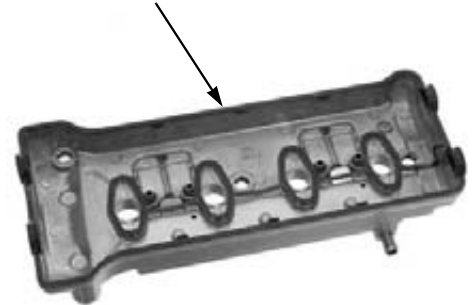
CYLINDER HEAD COVER



### CYLINDER HEAD COVER DISASSEMBLY

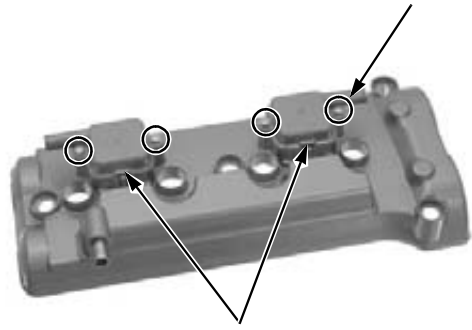
Remove the cylinder head cover packing.

HEAD COVER PACKING



Remove the bolts and PAIR check valve cover.

BOLTS

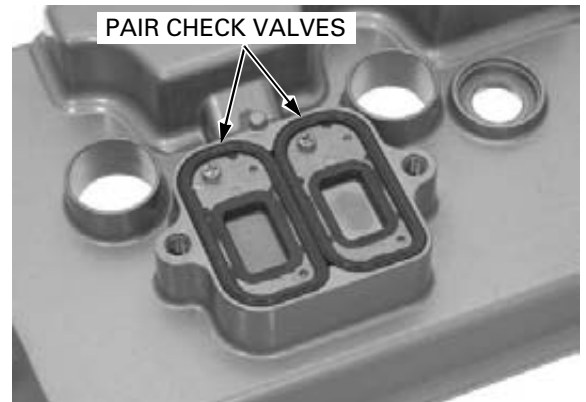


PAIR CHECK VALVE COVERS

Remove the PAIR check valves from the cylinder head cover.

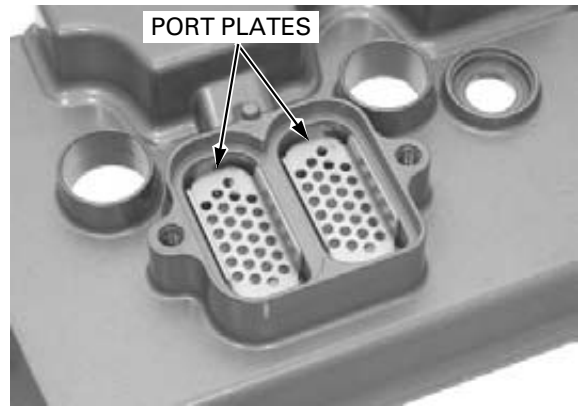
Check the PAIR check valve for wear or damage, replace if necessary.

PAIR CHECK VALVES



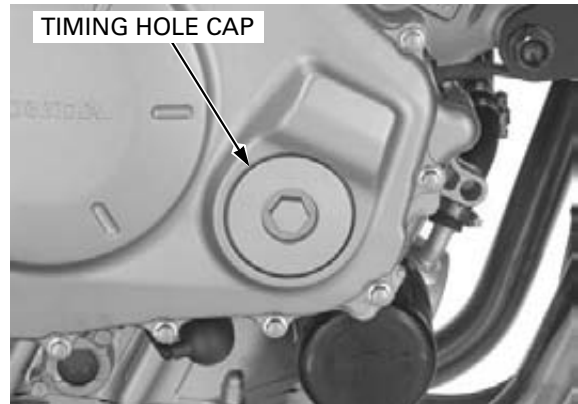
## CYLINDER HEAD/VALVES

Remove the port plates from the cylinder head cover.

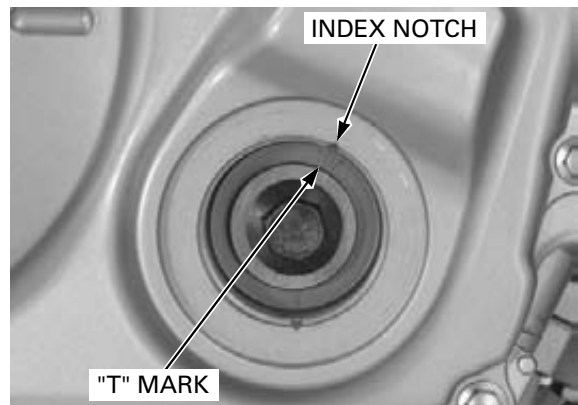


## CAMSHAFT REMOVAL

Remove the cylinder head cover (page 9-6).  
Remove the timing hole cap and O-ring.

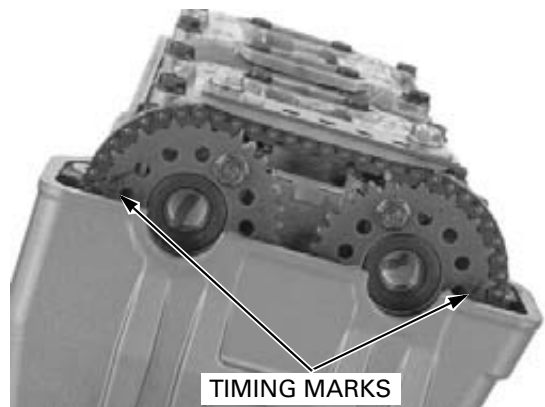


Turn the crankshaft clockwise, align the "T" mark on the starter clutch outer with the index notch on the right crankcase cover.

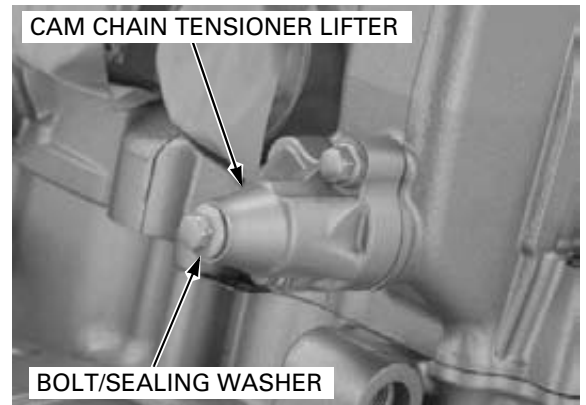


The timing marks ("IN" and "EX") on the cam sprockets must be flush with the cylinder head surface and facing outward as shown.

If the timing marks on the cam sprocket are facing inward, turn the crankshaft clockwise one full turn (360°) and realign the timing marks with the cylinder head surface so they are facing outward.



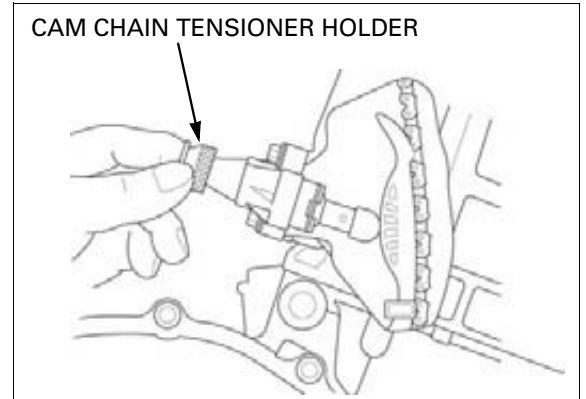
Remove the cam chain tensioner lifter sealing bolt and sealing washer.



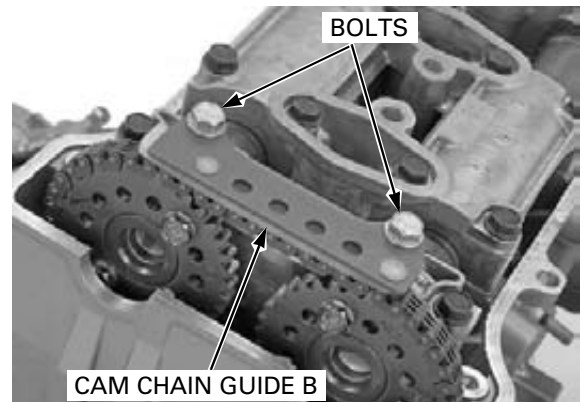
Turn the tensioner lifter shaft fully in (clockwise) and secure it using the special tool to prevent damaging the cam chain.

**TOOL:**

**Cam chain tensioner holder 07ZMG-MCAA400**



Remove the bolts and cam chain guide B.

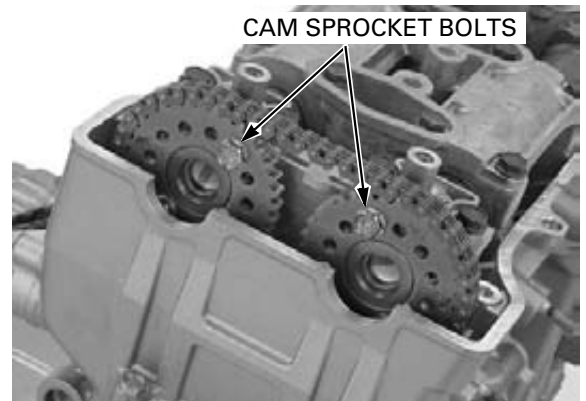


*It is not necessary to remove the cam sprocket from the camshaft except when replacing the camshaft and/or cam sprocket.*

If you plan to replace the camshaft and/or cam sprocket, loosen and remove the cam sprocket bolts as follows:

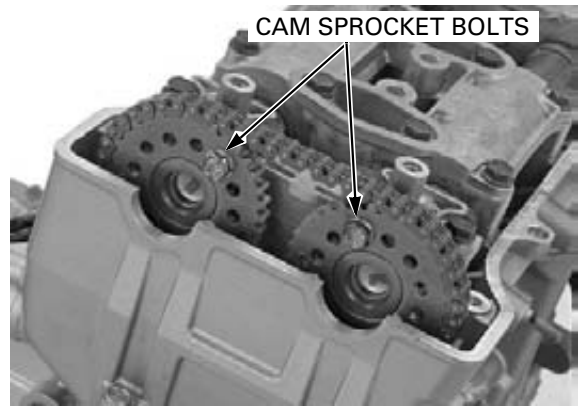
*Be careful not to drop the cam sprocket bolts and cam sprocket into the crankcase.*

- Remove the cam sprocket bolts from the intake and exhaust camshafts.



## CYLINDER HEAD/VALVES

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



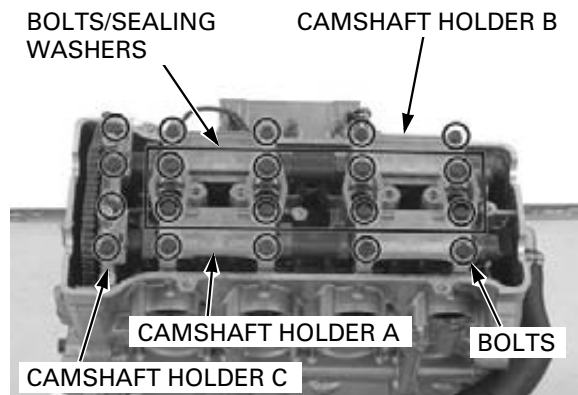
*Suspend the cam chain with a piece of wire to prevent the chain from falling into the crankcase.*

Loosen and remove the camshaft holder bolts/washers, then remove the camshaft holders and camshafts.

### NOTE:

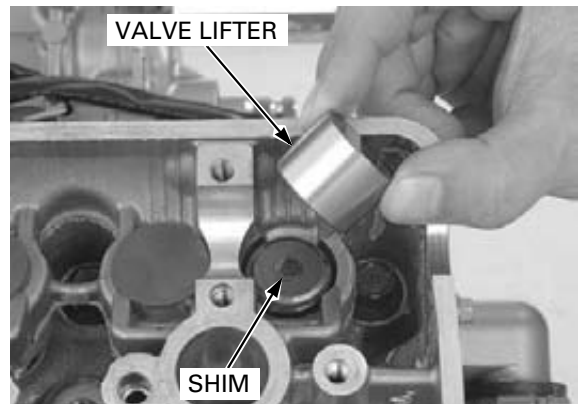
From outside to inside, loosen the bolts in a criss-cross pattern in several steps or the camshaft holder might break.

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



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 sides of the camshaft (at journals) with V-blocks and check the camshaft run out with a dial gauge.

**SERVICE LIMIT: 0.05 mm (0.002 in)**



Using a micrometer, measure each cam lobe height.

## SERVICE LIMITS:

IN: 34.60 mm (1.362 in)

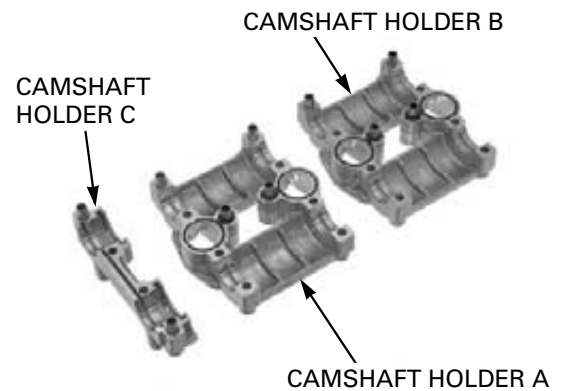
EX: 34.56 mm (1.361 in)



## CAMSHAFT HOLDERS

Inspect the journals of the each camshaft holder for scoring, scratches, or evidence of insufficient lubrication.

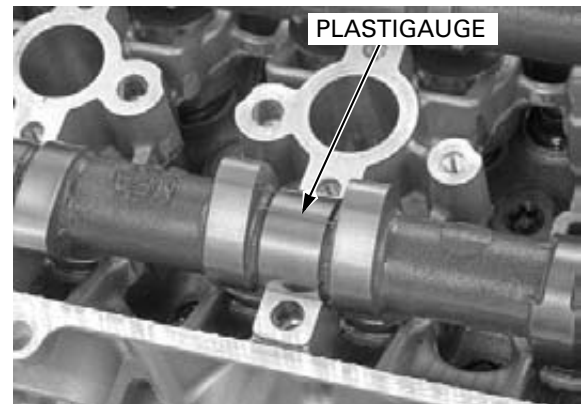
Inspect the oil orifices of the holders for clogging.



## CAMSHAFT OIL CLEARANCE

*Do not rotate the camshaft when using plastigauge.*

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.



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

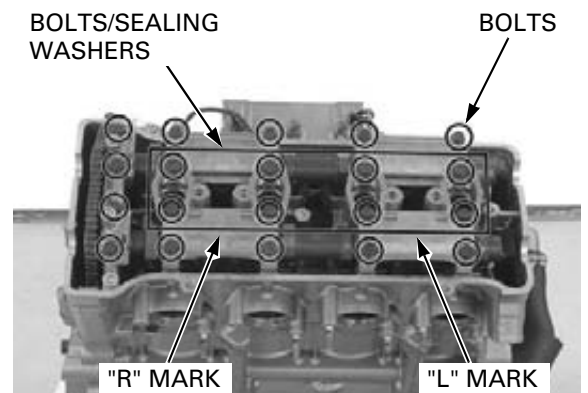
Install the each camshaft holder to the correct locations with the identification marks.

- "R" mark: center camshaft holder (Holder A)
- "L" mark: left camshaft holder (Holder B)

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

Install the twenty holder bolts with the eight sealing washers.

Finger tighten the bolts.



## CYLINDER HEAD/VALVES

First gradually tighten the four bolts (No.1 – No.2 – No.7 – No.8) in the numerical order cast on the camshaft holders.

Gradually tighten the other camshaft holder bolts until the camshaft holders lightly contact the cylinder head surface.

### NOTICE

*Failure to tighten the camshaft holder in a crisscross pattern might cause a camshaft holder to break.*

Tighten all camshaft holder bolts in the numerical order cast on the camshaft holders.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

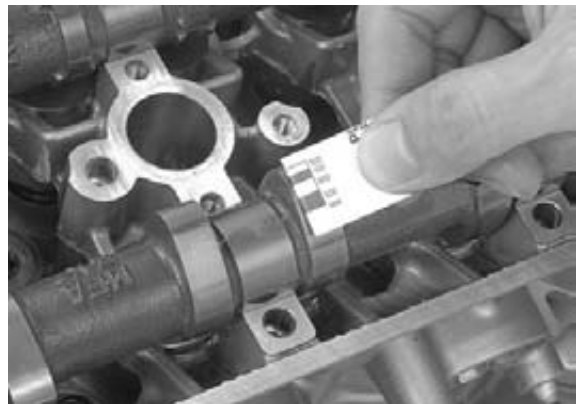
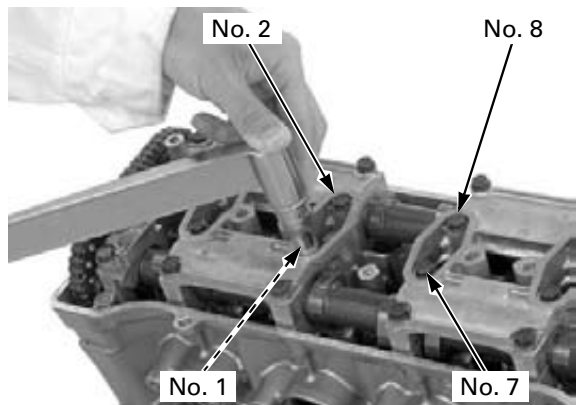
Remove the camshaft holders and measure the width of each plastigauge.

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.



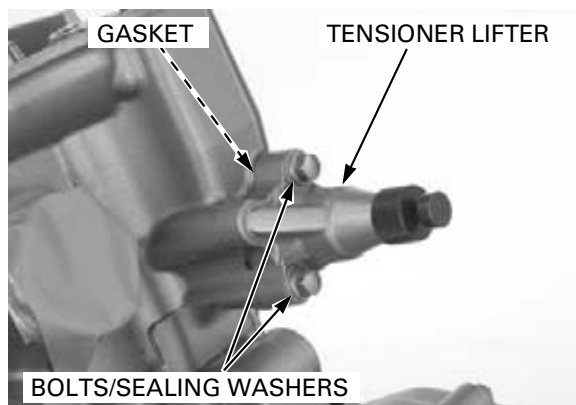
## CYLINDER HEAD REMOVAL

Remove the engine from the frame (page 8-4).

Remove the camshafts (page 9-8).

Tilt the engine and drain the coolant from the cylinder head and cylinder.

Remove the bolts, sealing washers, cam chain tensioner lifter and gasket.

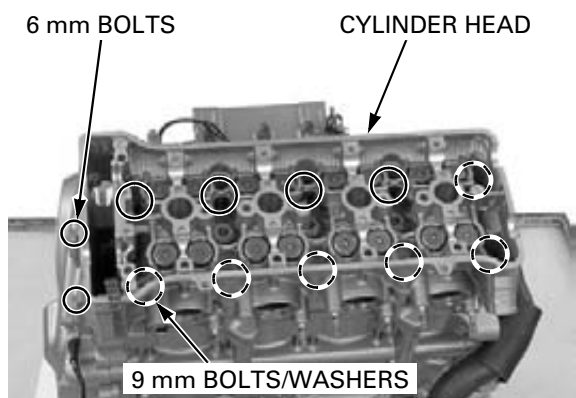


Remove the two 6 mm bolts.

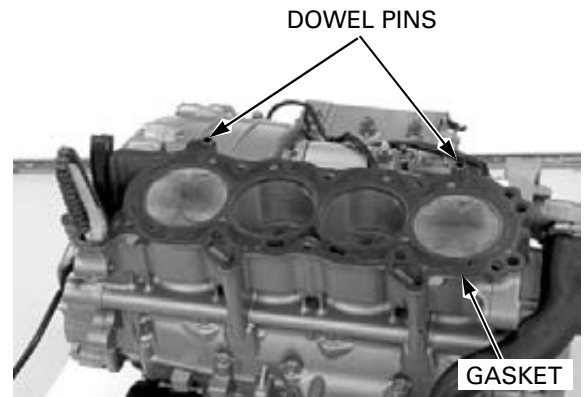
Remove the ten 9 mm bolts/washers.

Remove the cylinder head.

*Loosen the 9 mm bolts in a crisscross pattern in two or three steps.*



Remove the gasket and dowel pins.

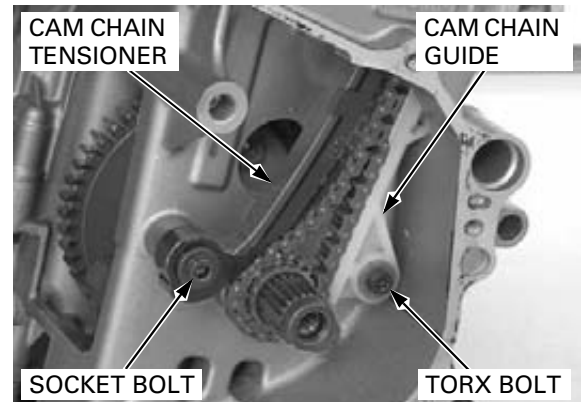


Remove the following:

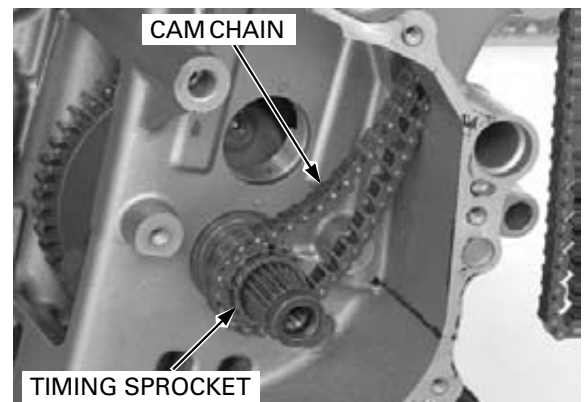
- Right crankcase cover (page 10-15)
- Starter clutch (page 10-28)

Remove the torx bolt, washer, cam chain guide and pivot collar.

Remove the socket bolt, cam chain tensioner and washer.



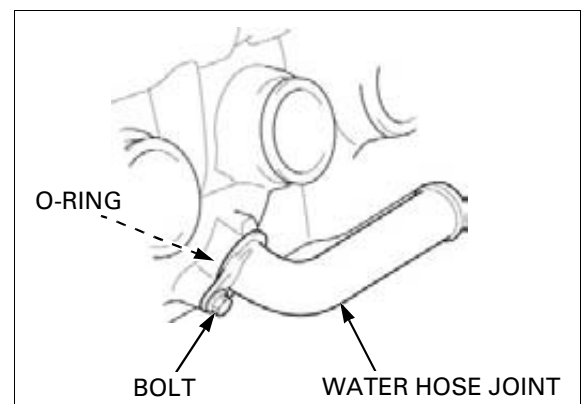
Remove the cam chain and timing sprocket from the crankshaft.



## CYLINDER HEAD DISASSEMBLY

Remove the bolt and water hose joint from the cylinder head.

Remove the O-ring from the water hose joint.





## CYLINDER HEAD/VALVES

Remove the cylinder head (page 9-12).

Remove the spark plugs from the cylinder head.

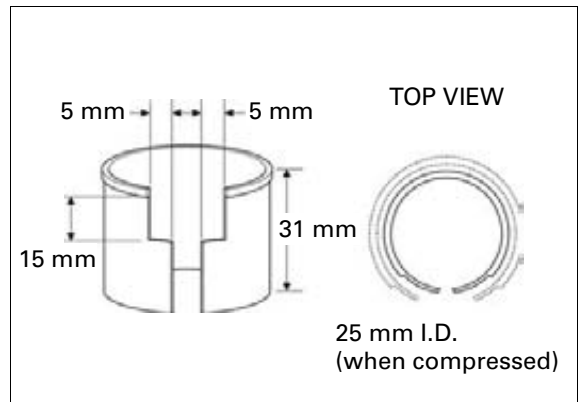
Install the tappet hole protector into the valve lifter bore.

**TOOL:**

**Tappet hole protector**                      **07HMG-MR70002**



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



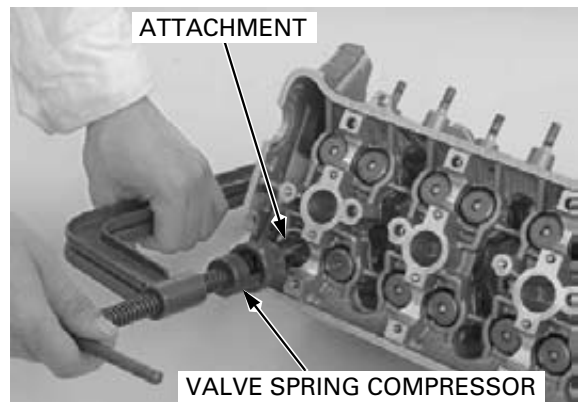
*To prevent loss of tension, do not compress the valve springs more than necessary to remove the cotters.*

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

**TOOLS:**

**Valve spring compressor**                      **07757-0010000**

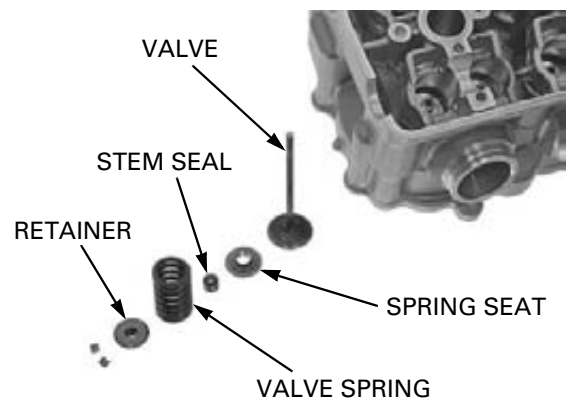
**Valve spring compressor attachment**                      **07959-KM30101**



*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

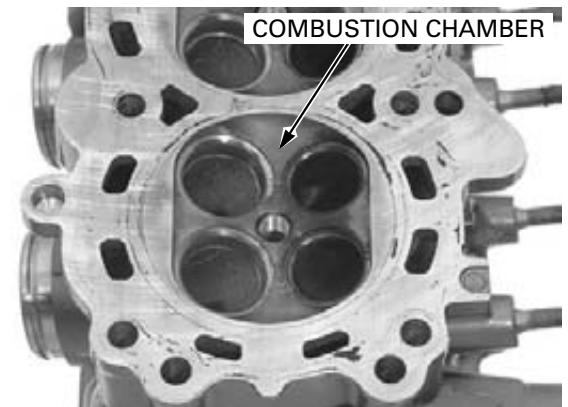


## CYLINDER HEAD INSPECTION

### CYLINDER HEAD

*Avoid damaging the gasket surface.*

Remove carbon deposits from the combustion chambers.  
Check the spark plug hole and valve areas for cracks.



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

**SERVICE LIMIT: 0.10 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)**



## CYLINDER HEAD/VALVES

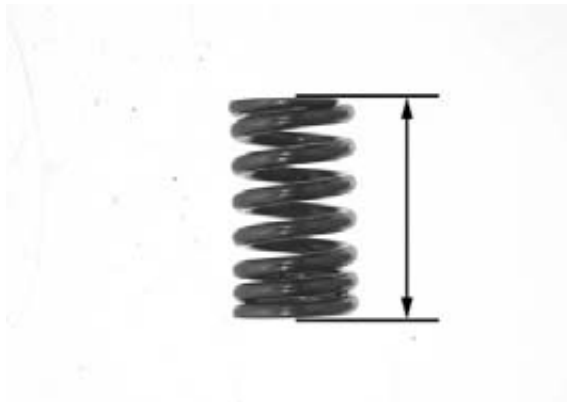
### VALVE SPRING

Measure the free length of the valve springs.

#### SERVICE LIMITS:

IN/EX: 38.76 mm (1.526 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.

Measure and record each valve stem O.D.

#### SERVICE LIMITS:

IN: 4.465 mm (0.1758 in)

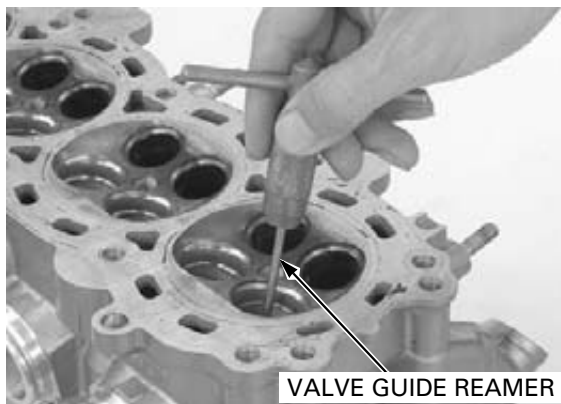
EX: 4.455 mm (0.1754 in)



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

#### TOOL:

Valve guide reamer, 4.5 mm      07HMH-ML00101



Measure and record each valve guide I.D.

**SERVICE LIMIT: IN/EX: 4.540 mm (0.1787 in)**

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

#### SERVICE LIMIT:

IN: 0.075 mm (0.0030 in)

EX: 0.085 mm (0.0033 in)



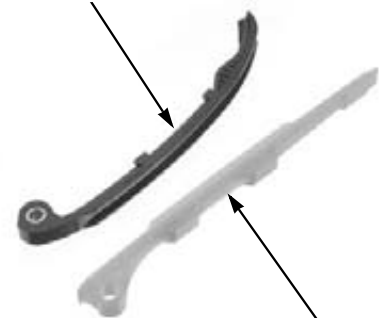
*Reface the valve seats whenever the valve guides are replaced (page 9-19).*

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 exceeds the service limit with the new guides, replace the valves and guides.

## CAM CHAIN TENSIONER/CAM CHAIN GUIDE

Inspect the cam chain tensioner and cam chain guide for excessive wear or damage, replace them if necessary.

CAM CHAIN TENSIONER



CAM CHAIN GUIDE

Inspect the cam chain tensioner B for excessive wear or damage, replace it if necessary.

CAM CHAIN TENSIONER B



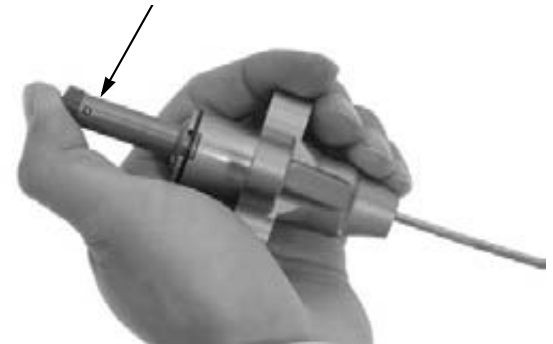
## CAM CHAIN TENSIONER LIFTER

Check the cam chain tensioner lifter operation as follows.

The tensioner shaft should not go into the body when it is pushed.

When it is turned clockwise with the cam chain tensioner holder or a screwdriver, the tensioner shaft should be pulled into the body. The shaft spring out of the body as soon as the stopper tool is released.

SHAFT



## VALVE GUIDE REPLACEMENT

Chill the replacement valve guides in the freezer section of a refrigerator for about an hour.

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

Heat the cylinder head to 100 – 150°C (212 – 300°F) with a hot plate or oven.

To avoid burns, wear heavy gloves when handling the heated cylinder head.

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

### TOOL:

Valve guide driver

07HMD-ML00101



## CYLINDER HEAD/VALVES

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

**TOOL:**

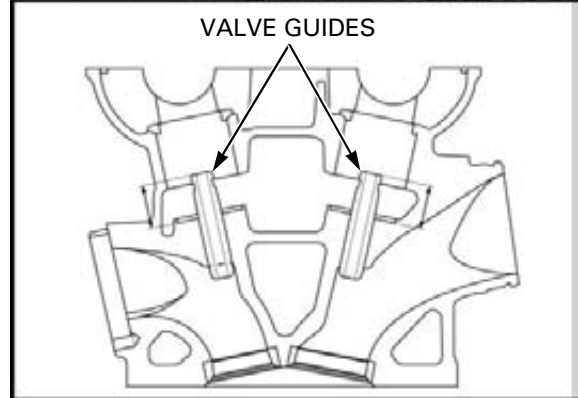
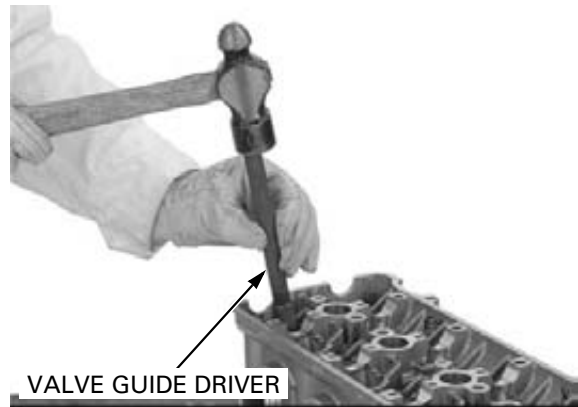
Valve guide driver

07743-0020000

**SPECIFIED DEPTH:**

IN/EX: 16.0 – 16.3 mm (0.63 – 0.64 in)

Let the cylinder head cool to room temperature.



*Use cutting oil on the reamer during this operation.*

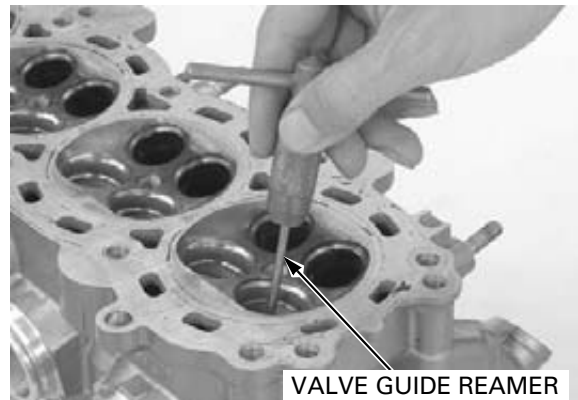
Ream the new valve guides after installation. Insert the reamer from the combustion chamber side of the head and also always rotate the reamer clockwise.

**TOOL:**

Valve guide reamer, 4.5 mm

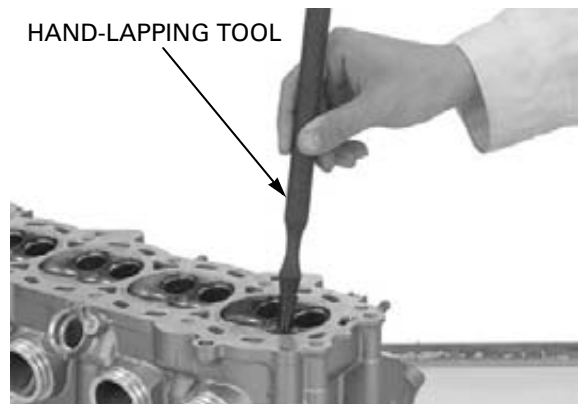
07HMH-ML00101

Clean the cylinder head thoroughly to remove any metal particles.  
Reface the valve seat (page 9-19).



## 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.

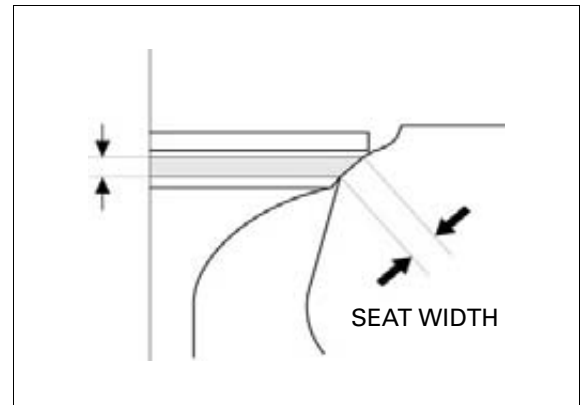
**STANDARD:**

**IN/EX: 0.90 – 1.10 mm (0.035 – 0.043 in)**

**SERVICE LIMIT:**

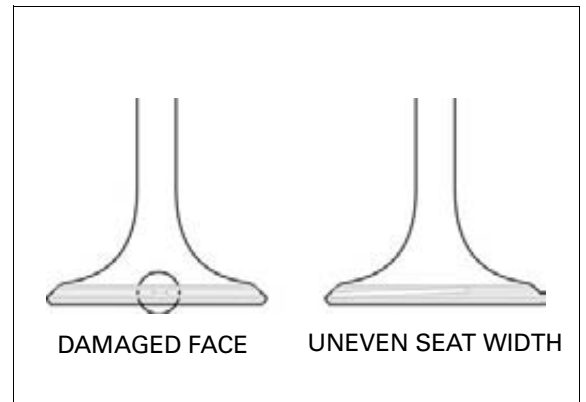
**IN/EX: 1.5 mm (0.06 in)**

If the seat width is not within specification, reface the valve seat (page 9-19).



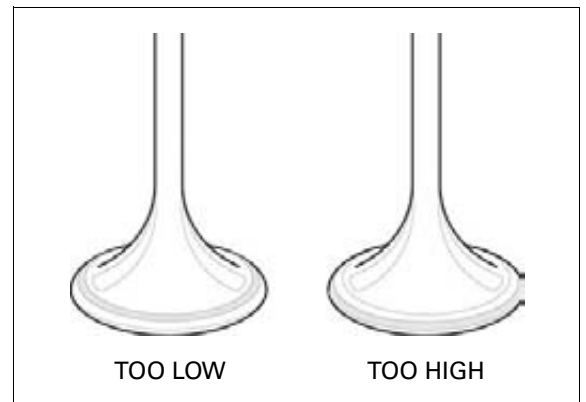
Inspect the valve seat face for:

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



*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.

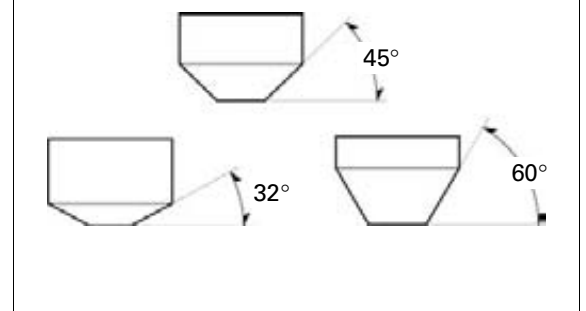


## VALVE SEAT REFACING

*Follow the refacing manufacturer's operating instructions.*

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

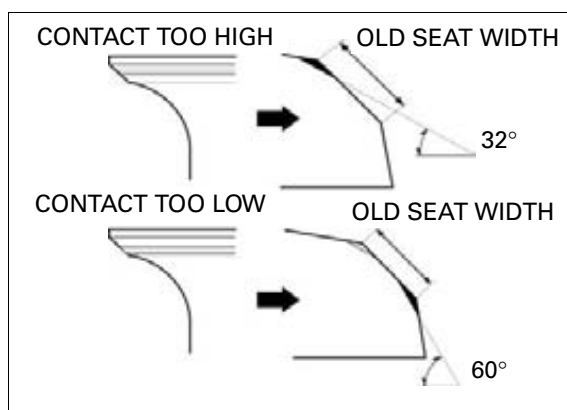
### VALVE SEAT CUTTERS:



## CYLINDER HEAD/VALVES

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

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

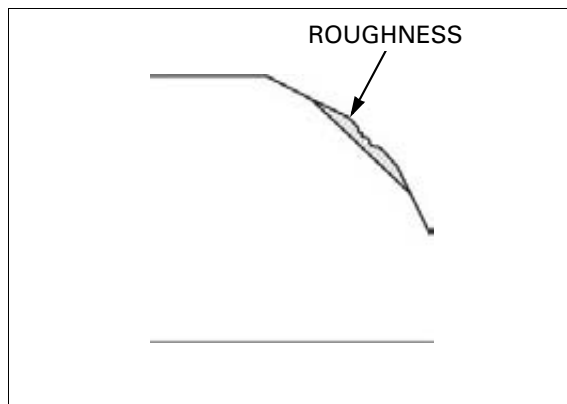


*Reface the seat with a 45-degree cutter whenever a valve guide is replaced.*

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

### TOOLS:

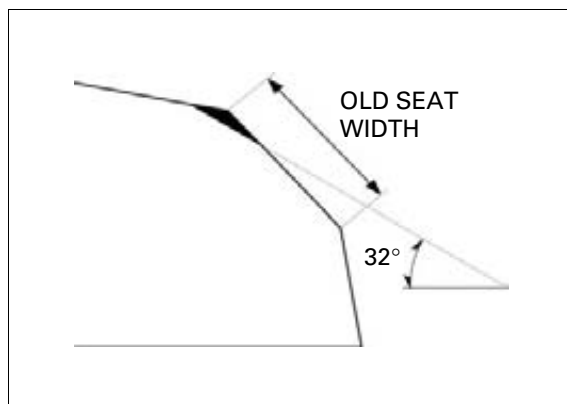
**Seat cutter, 29 mm (IN)** 07780-0010300  
**Seat cutter, 24.5 mm (EX)** 07780-0010100  
**Cutter holder, 4.5 mm** 07781-0010600  
or equivalent commercially available



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

### TOOLS:

**Flat cutter, 30 mm (IN)** 07780-0012200  
**Flat cutter, 27 mm (EX)** 07780-0013300  
**Cutter holder** 07781-0010600  
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)** 07780-0014000  
**Interior cutter, 26 mm (EX)** 07780-0014500  
**Cutter holder** 07781-0010600  
or equivalent commercially available

