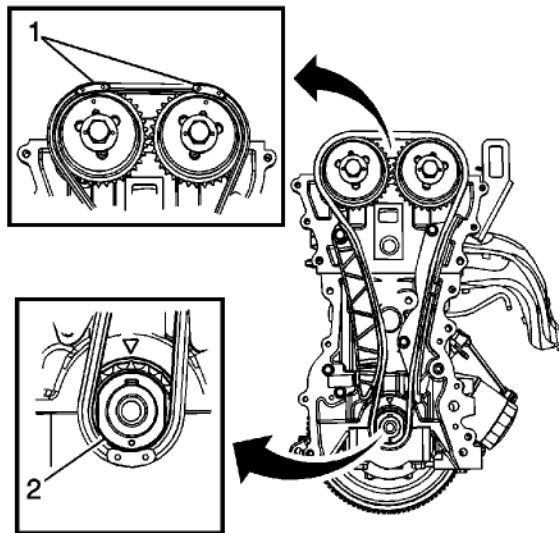


Valve Timing Inspection and Adjustment

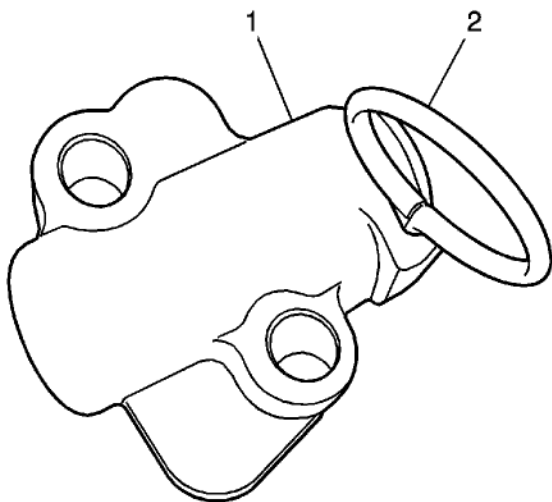
Special Tools

EN-49073 Timing Chain Tensioner

Removal Procedure



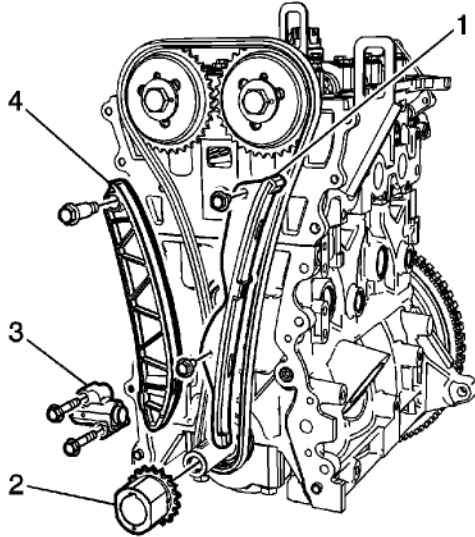
1. Install the timing chain after aligning both the mark (1) on the camshaft sprocket and on the timing chain.
2. Align both the timing mark (2) on the crankshaft sprocket and on the timing chain.





3. Push the timing chain tensioner lever and fix the lever by installing the tensioner pin EN-49073 (2).

Caution: Refer to [Fastener Caution](#) in the Preface section.



4. Assemble the timing chain guide (1).

Tighten

Tighten the timing chain guide retaining bolts to 10 N·m (7.4 lb in).

5. Assemble the timing chain lever (4).

Tighten

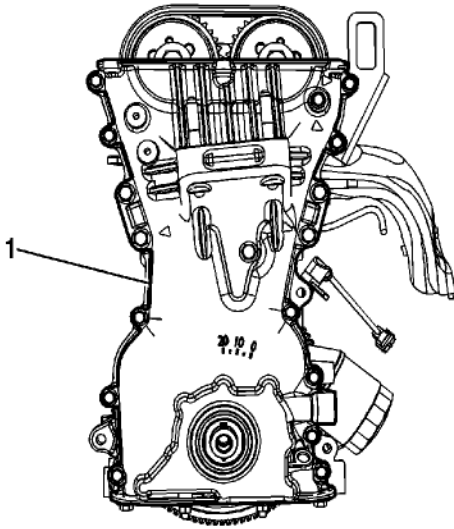
Tighten the timing chain lever retaining bolts to 10 N·m (7.4 lb in).

6. Assemble the timing chain tensioner (3).

Tighten

Tighten the timing chain tensioner retaining bolts to 12 N·m (8.8 lb in).

Installation Procedure



Install the timing chain cover (1).

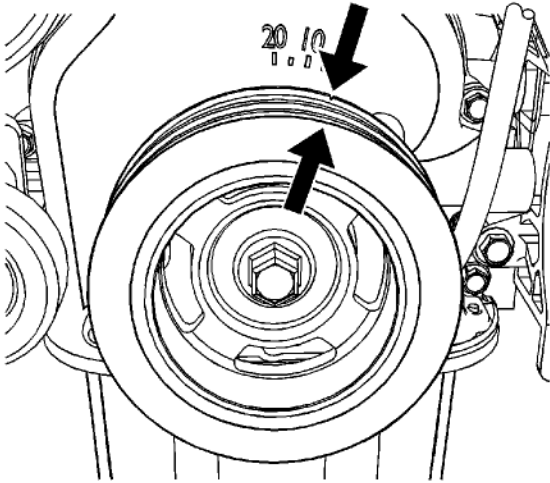
Tighten

- Tighten the timing chain cover retaining bolts (M6 x 1.0) to 10.5 N·m (7.7 lb in).
- Tighten the timing chain cover retaining bolts (M8 x 1.25) to 20 N·m (14.7 lb ft).

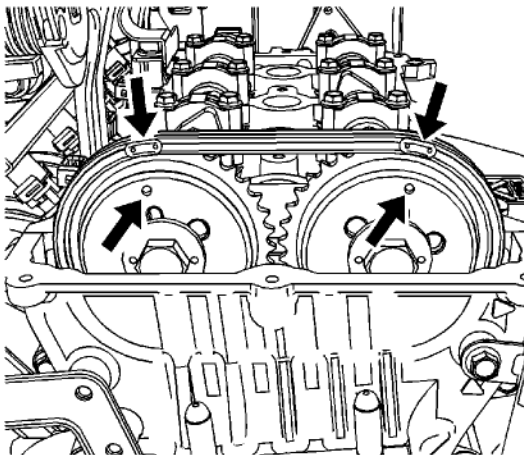
Valve Clearance Adjustment

Measurement

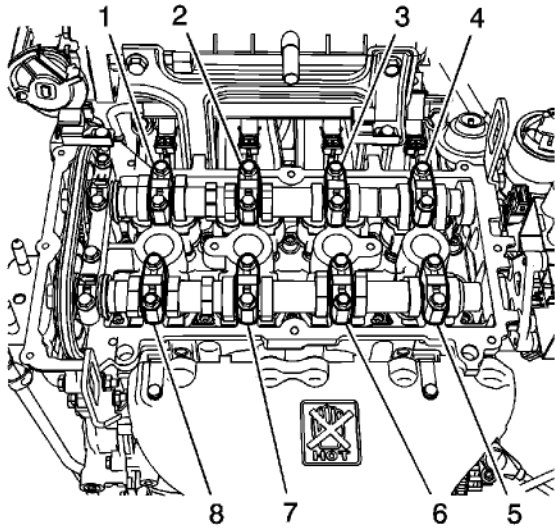
1. Remove the valve rocker arm cover. Refer to [Valve Rocker Arm Cover Replacement](#).



2. Rotate the crankshaft pulley clockwise, aligning the pulley groove with the 0 point on the cover.



3. Check that the camshaft sprocket and timing chain are aligned.

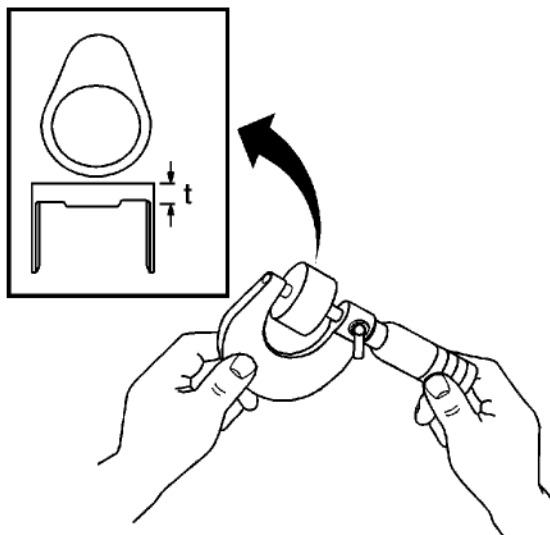


4. Measure the valve clearance at positions (1), (2), (6) and (8). Rotate the crankshaft pulley clockwise 360 degrees.
5. Measure the valve clearance at positions (3), (4), (5) and (7).
6. If the measured values are not within specifications, replace the valve tappets.

Specifications

- Intake Side: 0.075-0.125 mm
 - Exhaust Side: 0.245-0.305 mm
7. Determine the tappet size. Refer to Determining Replacement Tappet Size.
 8. Replace the valve tappets if necessary. Refer to [Valve Stem Oil Seal and Valve Spring Replacement](#).

Determine Replacement Tappet Size





1. Remove the old tappet.
2. Measure the old tappet.
3. Perform the following calculation to determine the replacement tappet size.

Intake: value of removed tappet + measured clearance - 0.1 mm = new tappet size

Exhaust: value of removed tappet + measured clearance - 0.27 mm = new tappet size

Example:

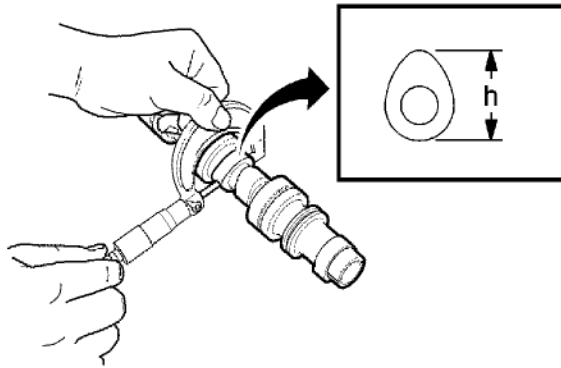
- Old tappet = 3.20 mm, clearance was 0.30 mm, Intake clearance value is 0.1 mm
- $3.20 \text{ mm} + 0.30 \text{ mm} - 0.1 \text{ mm} = 3.40 \text{ mm}$
- 3.40 mm = 96449615 (part number)

Tappet Selection

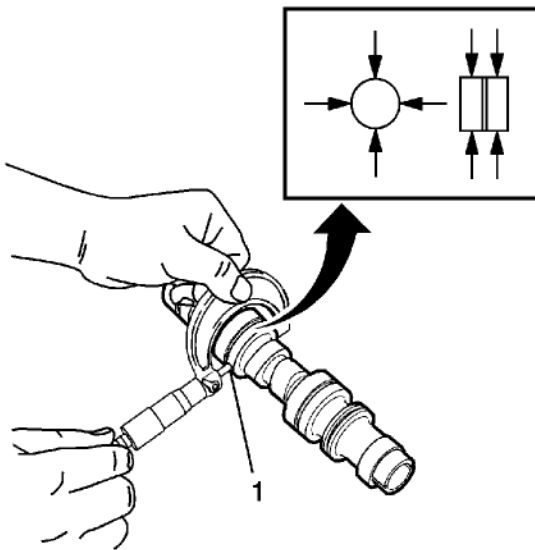
Part Number	ID Number	Value (mm)
96449601	312	3.12±0.01
96449602	314	3.14±0.01
96449603	316	3.16±0.01
96449604	318	3.18±0.01
96449605	320	3.20±0.01
96449606	322	3.22±0.01
96449607	324	3.24±0.01
96449608	326	3.26±0.01
96449609	328	3.28±0.01
96449610	330	3.30±0.01
96449611	332	3.32±0.01
96449612	334	3.34±0.01
96449613	336	3.36±0.01
96449614	338	3.38±0.01
96449615	340	3.40±0.01
96449616	342	3.42±0.01
96449617	344	3.44±0.01
96449618	346	3.46±0.01
96449619	348	3.48±0.01
96449620	350	3.50±0.01
96449621	352	3.52±0.01
96449622	354	3.54±0.01
96449623	356	3.56±0.01
96449624	358	3.58±0.01
96449625	360	3.60±0.01

96449626	362	3.62±0.01
96449627	364	3.64±0.01
96449628	366	3.66±0.01
96449629	368	3.68±0.01
96449630	370	3.70±0.01
96449631	372	3.72±0.01
96449632	374	3.74±0.01
96449633	376	3.76±0.01
96449634	378	3.78±0.01
96449635	380	3.80±0.01
96449636	382	3.82±0.01
96449637	384	3.84±0.01
96449638	386	3.86±0.01
96449639	388	3.88±0.01
96449640	390	3.90±0.01

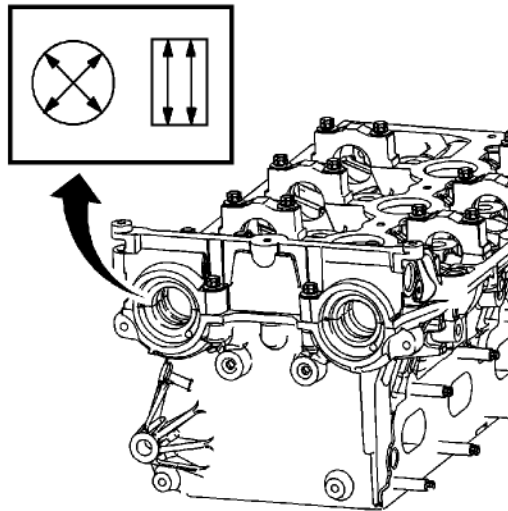
Camshaft Cleaning and Inspection



1. Measure the camshaft lift. Refer to [Engine Mechanical Specifications](#).
2. Replace the camshaft if the measured value is not as specified.



3. Measure the outer diameter of each journal at the 4 different places. Refer to [Engine Mechanical Specifications](#).
4. Replace the camshaft if the measured value is not as specified.

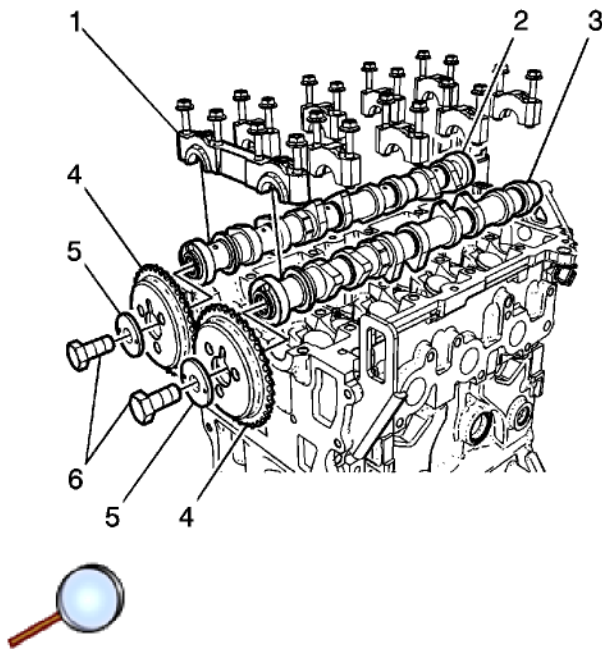


5. Measure the inner diameter of the cylinder head journal at the 2 places. Refer to [Engine Mechanical Specifications](#).
6. If necessary, replace the cylinder head.

Cylinder Head Disassemble

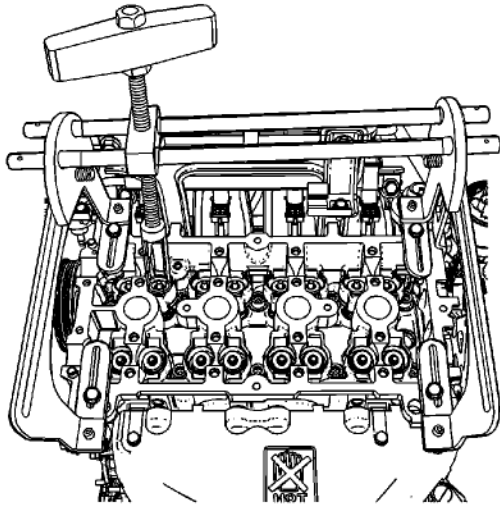
Special Tools

- EN-49074 Universal Valve Spring Compressor
- EN-49075 Valve Spring Compressing Adapter

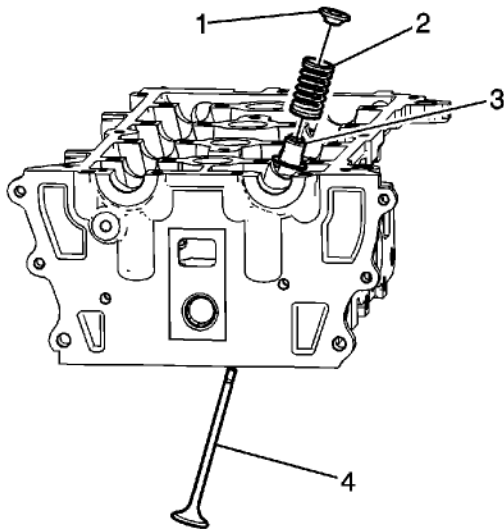


Note: Take extreme care to prevent any scratches, nicks or damage to the camshaft surfaces.

1. Remove the camshaft sprocket.
2. Remove the camshaft cap bolts in this sequence (1)-(4)-(2)-(3).
3. Remove the camshaft caps.
4. Remove the camshafts and oil seal rings.
5. Remove the valve tappet.



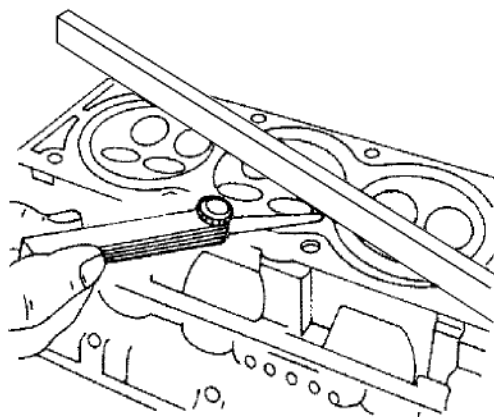
6. Install the *EN-49074* compressor and *EN-49075* adapter .
7. Remove the valve key.



8. Remove the valves, springs (2), retainers (1), and seals (3).

Cylinder Head Cleaning and Inspection

Inspection Procedure

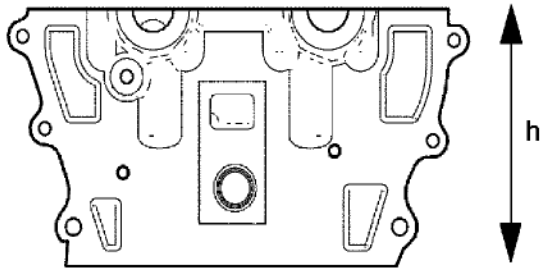


Note: Take extreme care to prevent any scratches, nicks or damage to the cylinder head surface.

1. Clean the sealing surfaces.
2. Inspect the cylinder head for the following:
 - Cracks, damage or pitting in the combustion chambers.
 - Debris in the oil galleries. Continue to clean the galleries until all debris is removed.
 - Coolant leaks or damage to the deck face sealing surface.
 - Damage to any gasket surfaces.
 - Damage to any threaded bolt holes.
 - Burnt or eroded areas in the combustion chamber.
 - Cracks in the exhaust ports and combustion chambers.
 - External cracks in the water passages.
 - Restrictions in the intake or exhaust passages.
 - Restrictions in the cooling system passages.
 - Rusted, damaged or leaking core plugs.
3. If the cylinder head is cracked or damaged, it must be replaced. No welding or patching of the cylinder head is recommended.
4. Measure the clearance between the straight-edge and the cylinder head deck face using a feeler gauge at four points along the straight-edge.
5. Check the sealing surfaces for deformation and warpage. The cylinder head sealing surfaces

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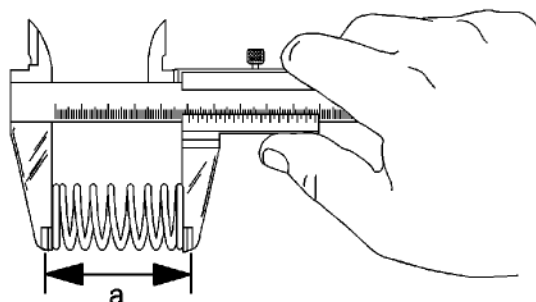
(include the intake and exhaust sealing surfaces) must be flat within the specification. Refer to [Engine Mechanical Specifications](#).



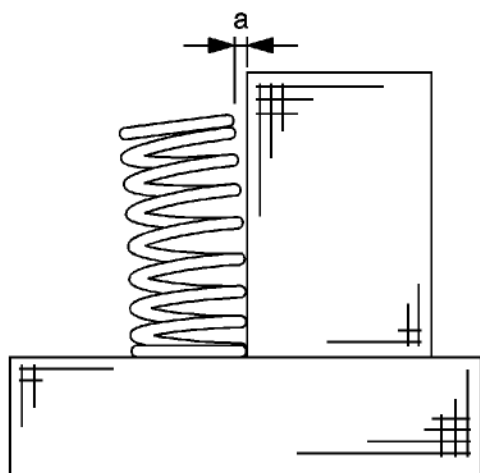
6. Measure the height of the cylinder head from sealing surface to sealing surface. The cylinder head height should be within specifications. Replace the cylinder head. If the cylinder head height is out of specifications, replace the cylinder head. Refer to [Engine Mechanical Specifications](#).

Valve Spring Inspection and Measurement

1. Inspect the valve springs. If the valve spring ends are not parallel, replace the valve spring.
2. Inspect the valve spring seating surface of the valve rotators for wear or gouges. Replace as required.



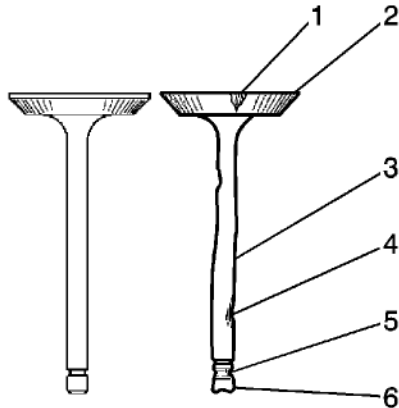
3. Measure the valve spring free length. If it is out of specification, replace it. Refer to [Engine Mechanical Specifications](#).



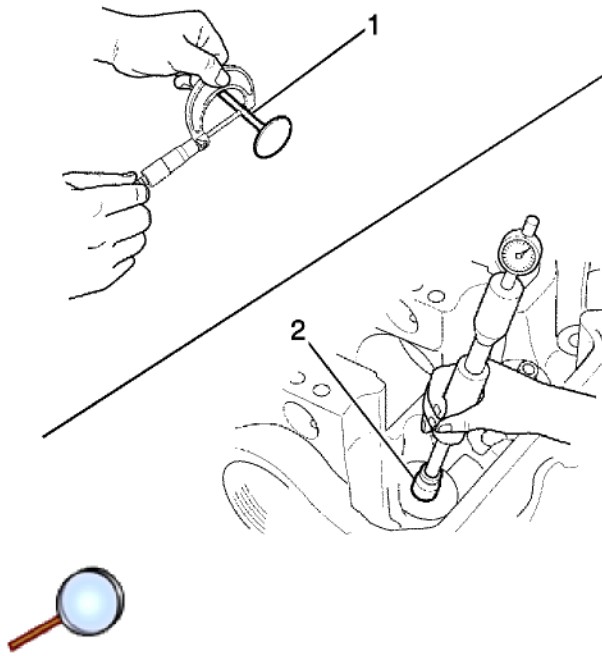
4. Measure the valve spring right angles. If it is out of specification, replace it. Refer to [Engine Mechanical Specifications](#).

Valve Stem and Valve Guide Clearance Inspection

Valve Inspection Procedure



1. Inspect the valve for damage from the head to tip for the following conditions:
 - pitting in the valve seat area (1)
 - lack of valve margin (2)
 - bending in the valve stem (3)
 - pitting or excessive wear in the stem (4)
 - worn valve key grooves (5)
 - worn valve tip (6)
2. Replace the valve if any of these conditions exist.



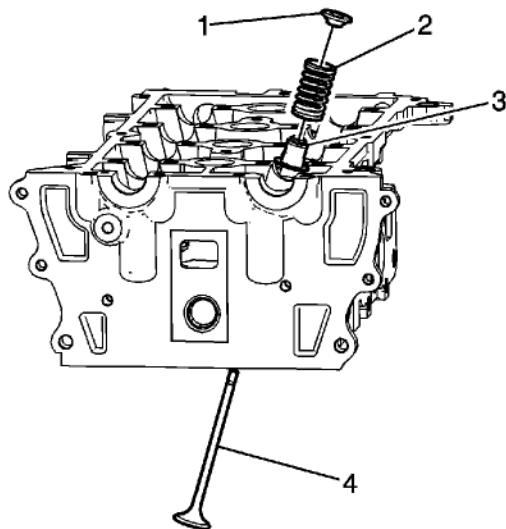
Note: Valve guide is not removable. Replace the cylinder head if it is out of specification.

3. Measure the valve stem diameter (1) and valve guide inside diameter. If it is out of specification, replace it. Refer to [Engine Mechanical Specifications](#).

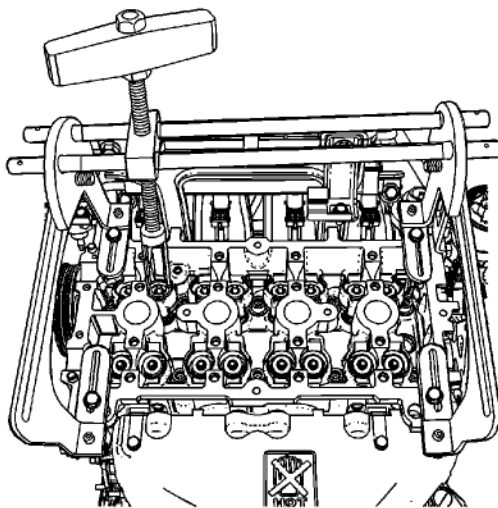
Cylinder Head Assemble

Special Tools

- EN-49074 Universal Valve Spring Compressor
- EN-49075 Valve Spring Compressing Adapter

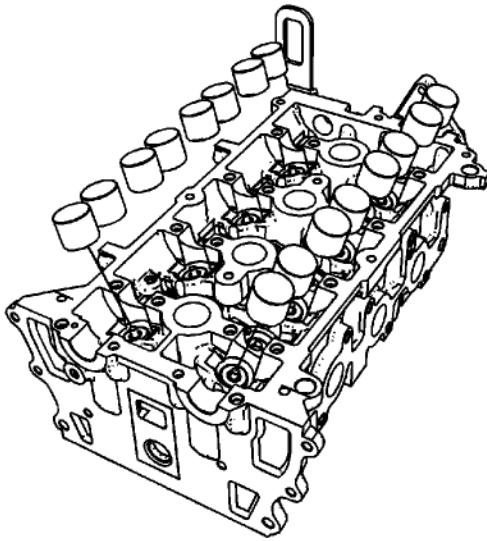


1. Install the valves, springs (2), retainers (1), and seals (3).



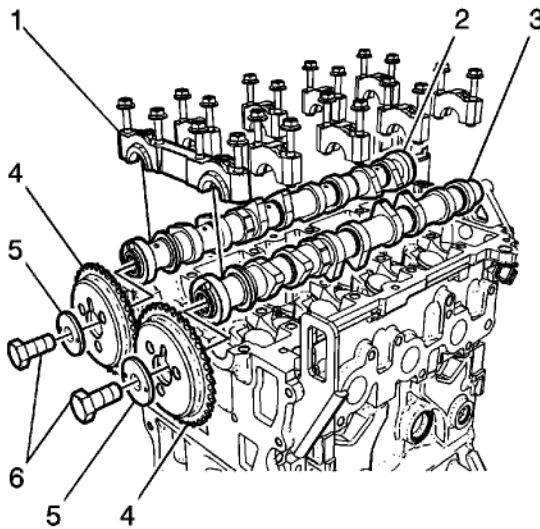
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2. Install the *EN-49074* compressor and *EN-49075* adapter .
3. Install the valve key.



Note: Do not scratch the valve tappet. Do not use gloves or tools, except special service tools.

4. Install the valve tappet.
5. Coat and lubricate the camshaft bearing and camshaft surfaces with clean engine oil.



6. Install the camshafts (2, 3) on the cylinder head.
7. Install the camshaft bearing caps (1).

Caution: Refer to [Fastener Caution](#) in the Preface section.

8. Install the camshaft bearing cap bolts and tighten in this sequence (2)-(3)-(1)-(4).

Tighten

Tighten the camshaft bearing cap bolts to 10 N·m (89 lb in).

9. Install the camshaft sprocket (4) and bolt (6)

Tighten

Tighten the camshaft sprocket bolt to 60 N·m (44 lb ft).