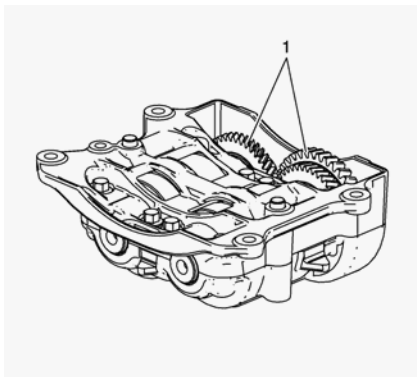


2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:

Fuel Delivery: | Fuel:

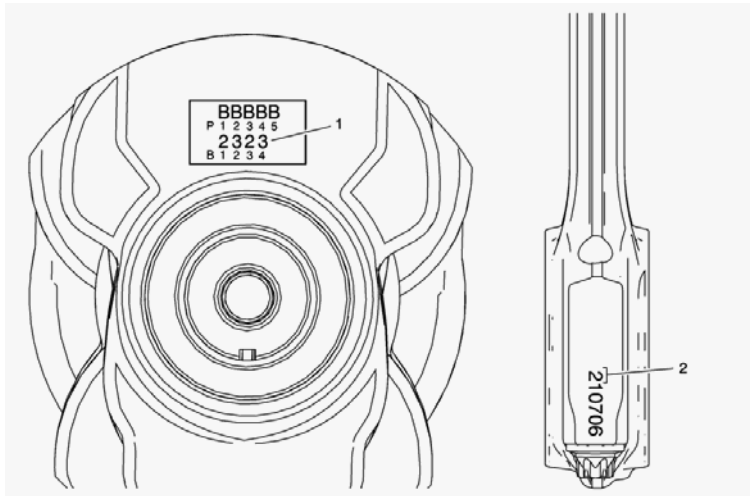


1. Inspect the balance shaft gears (1) for wear or damage. Replace the balance shaft assembly if any damage is found.
2. Rotate the balance shaft. Replace the balance shaft assembly if any sticking, binding, or roughness is found.

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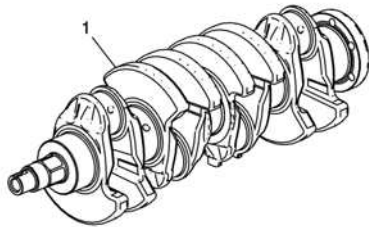


- (1) Bearing Grade Specification
- (2) Connecting Rod Bore Specification

Connecting Rod Large End Bore Diameter		Crankshaft Pin Diameter			
		4	3	2	1
		53.929–53.936	53.936–53.942	53.942–53.948	53.948–53.955
Use This Bearing Color					
1 57.563–57.568	Upper Bearing	Blue	Blue	Red	Red
	Lower Bearing	Yellow	Blue	Blue	Red
2 57.568–57.573	Upper Bearing	Yellow	Blue	Blue	Red
	Lower Bearing	Yellow	Yellow	Blue	Blue
3 57.573–57.578	Upper Bearing	Yellow	Yellow	Blue	Blue
	Lower Bearing	Green	Yellow	Yellow	Blue
4 57.578–57.583	Upper Bearing	Green	Yellow	Yellow	Blue
	Lower Bearing	Green	Green	Yellow	Yellow

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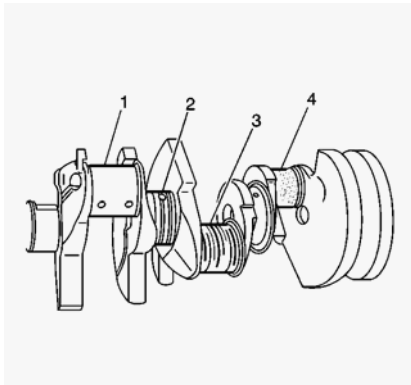


Note: Use care when handling the crankshaft. Avoid damage to the bearing surfaces.

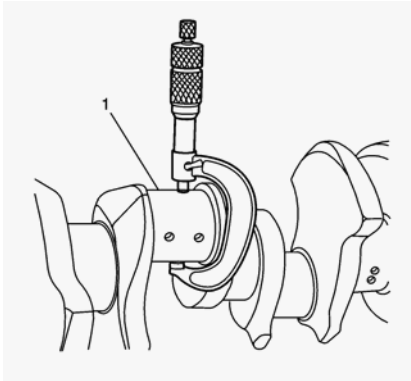
1. Clean the crankshaft (1) with solvent.
2. Thoroughly clean all oil passages and inspect for restrictions or burrs.

Warning: Refer to Safety Glasses Warning.

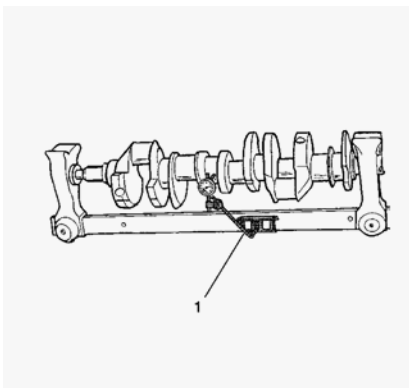
3. Dry the crankshaft with compressed air.
4. Perform a visual inspection of the crankshaft for damage.



5. Inspect the crankshaft journals for wear (1). The journals should be smooth, with no signs of scoring, wear, or damage.
6. Inspect the crankshaft journals for grooves or scoring (2).
7. Inspect the crankshaft journals for scratches or wear (3).
8. Inspect the crankshaft journals for pitting or imbedded bearing material (4).



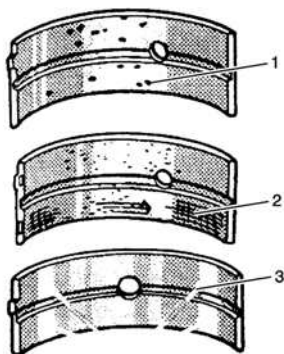
9. Measure the crankshaft journals (1) for out-of-round.
10. Measure the crankshaft journals for taper.



11. Measure the crankshaft runout.

Using wooden V-blocks, support the crankshaft on the front and rear journals.

12. Use the dial indicator (1) in order to measure the crankshaft runout at the front and rear intermediate journals.
13. Use the dial indicator in order to measure the runout of the crankshaft rear flange.
14. Replace the crankshaft if the measurements are not within specifications. Refer to Engine Mechanical Specifications.



15. Inspect crankshaft bearings for craters or pockets (1). Flattened sections on the bearing halves also indicate fatigue.
16. Inspect the crankshaft bearings for excessive scoring or discoloration (2).
17. Inspect the crankshaft bearings for dirt or debris imbedded into the bearing material.
18. Inspect the crankshaft bearings for improper seating indicated by bright, polished sections of the bearing (3).

If the lower half of the bearing is worn or damaged, both upper and lower halves should be replaced.

Generally, if the lower half is suitable for use, the upper half should also be suitable for use.

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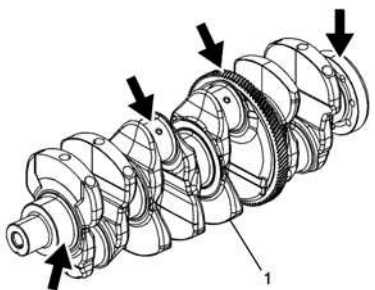
Submodel: | **Engine Type:** | **Liters:**

Fuel Delivery: | **Fuel:**

Special Tools

J 7872 Magnetic Base Dial Indicator Set

For equivalent regional tools, refer to Special Tools

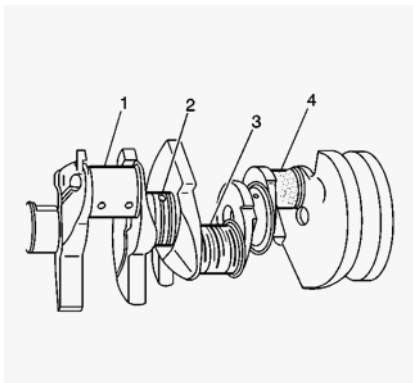


Note: Use care when handling the crankshaft.

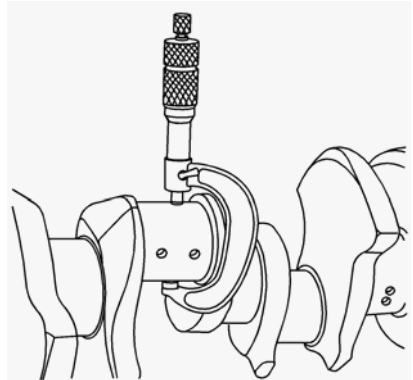
1. Clean the crankshaft (1) with solvent.
2. Thoroughly clean all oil passages and inspect for restrictions or burrs.

Warning: Refer to Safety Glasses Warning.

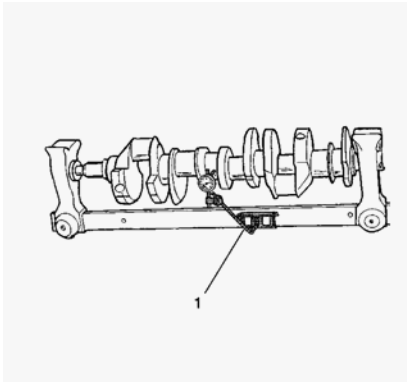
3. Dry the crankshaft with compressed air.
4. Perform a visual inspection of the crankshaft for damage.



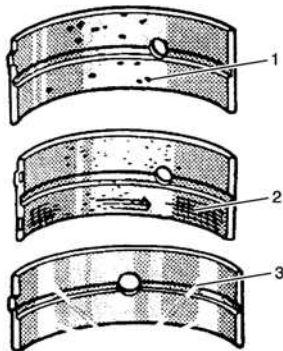
5. Inspect the crankshaft journals for wear (1). The journals should be smooth, with no signs of scoring, wear, or damage.
6. Inspect the crankshaft journals for grooves or scoring (2).
7. Inspect the crankshaft journals for scratches or wear (3).
8. Inspect the crankshaft journals for pitting or imbedded bearing material (4).



9. Measure the crankshaft journals for out-of-round.
10. Measure the crankshaft journals for taper.



11. Measure the crankshaft runout. Using wooden V-blocks, support the crankshaft on the front and rear journals.
12. Use the J 7872 indicator (1) in order to measure the crankshaft runout at the front and rear intermediate journals.
13. Use the J 7872 indicator in order to measure the runout of the crankshaft rear flange.
14. Replace the crankshaft if the measurements are not within specifications.



15. Inspect crankshaft bearings for craters or pockets (1). Flattened sections on the bearing halves also indicate fatigue.
16. Inspect the crankshaft bearings for excessive scoring or discoloration (2).
17. Inspect the crankshaft bearings for dirt or debris imbedded into the bearing material.
18. Inspect the crankshaft bearings for improper seating indicated by bright, polished sections of the bearing (3). If the lower half of the bearing is worn or damaged, both upper and lower halves should be replaced. Generally, if the lower half is suitable for use, the upper half should also be suitable for use.

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[Cleaning Procedure](#)

1. Clean the following components in solvent:

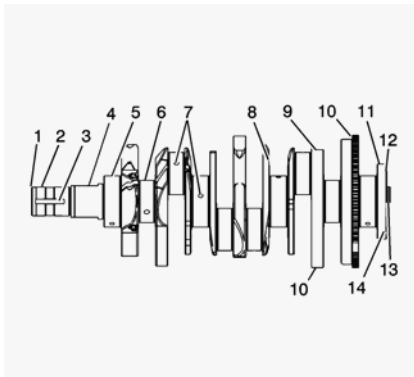
- Crankshaft bearings
- Connecting rod bearings
- Crankshaft journals
- Crankpin journals
- Crankshaft oil passages
- Crankshaft threaded holes

Warning: Refer to Safety Glasses Warning

• Dry the following components with compressed air:

- Crankshaft bearings
- Connecting rod bearings
- Crankshaft journals
- Crankpin journals
- Crankshaft oil passages
- Crankshaft threaded holes

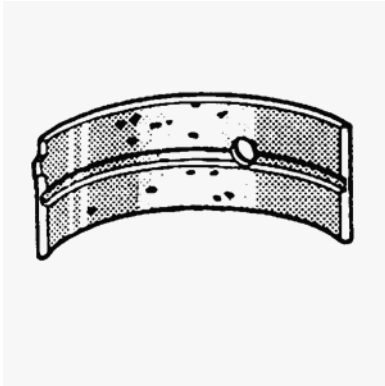
[Visual Inspection](#)



1. Perform the following visual inspections:

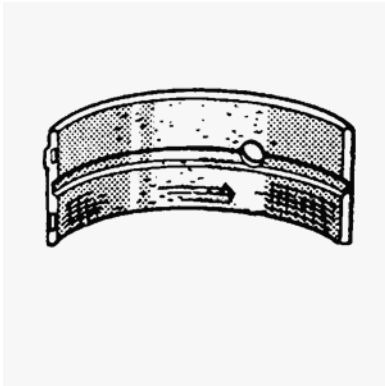
- Inspect the crankshaft balancer bolt hole (1) for thread damage.
- Inspect the crankshaft balancer mounting area (2) for damage.
- Inspect the crankshaft keyway (3) for damage.
- Inspect the oil pump drive flats (4) for damage.
- Inspect the crankshaft main journals (5) for damage.
- Inspect the crankshaft connecting rod journals (6) for damage.
- Inspect the crankshaft oil passages (7) for obstructions.
- Inspect the crankshaft main bearing thrust wall surfaces (8) for damage.
- Inspect the crankshaft counterweights (9) for damage.
- Inspect the crankshaft reluctor ring teeth (10) for damage.
- Inspect the crankshaft rear main oil seal surface (11) for damage.
- Inspect the crankshaft engine flywheel mounting surface (12) for damage.
- Inspect the crankshaft pilot hole (13) for damage.
- Inspect the crankshaft engine flywheel bolt holes (14) for thread damage.
- Repair or replace the crankshaft as necessary.

[Crankshaft Bearing Inspection](#)



Note:

- All connecting rod and main journal bearings that have been used in a running engine must be replaced. Never re-use the crankshaft or connecting rod bearings.
 - The following bearing wear conditions should be used to diagnose engine operating conditions or root cause of a condition.
1. Inspect for fatigue indicated by craters or pockets. Flattened sections on the bearing halves also indicate fatigue.



2. Inspect for excessive scoring or discoloration on both front and back of the bearing halves.
3. Inspect the main bearings for dirt embedded into the bearing material.



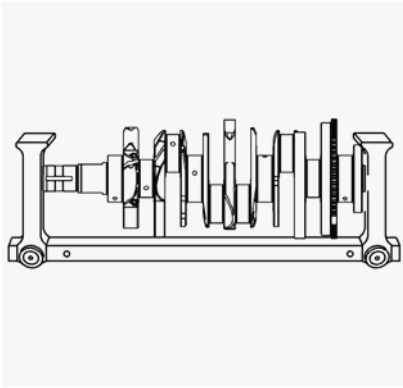
4. Inspect for improper seating indicated by bright, polished sections.

[Crankshaft Measurement](#)

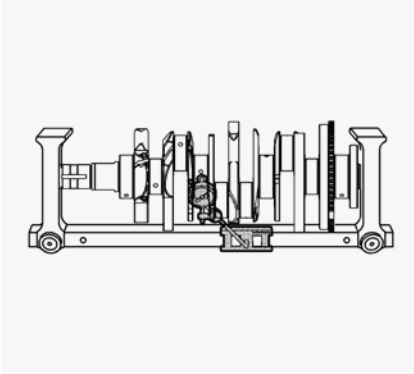
Special Tools

J 7872 Magnetic Base Dial Indicator

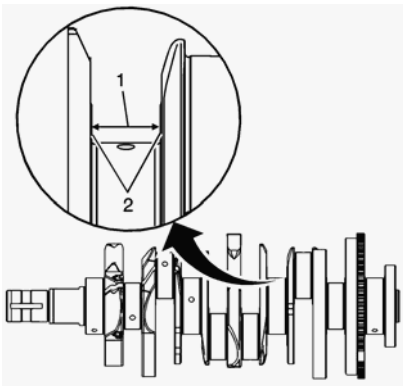
For equivalent regional tools, refer to Special Tools.



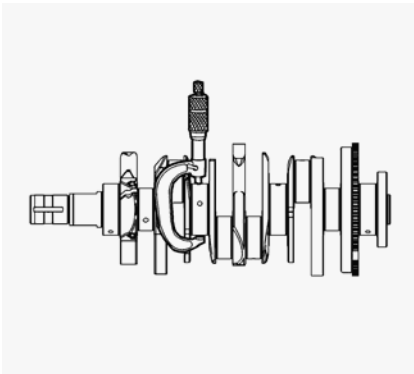
1. Using a suitable fixture, support the crankshaft.



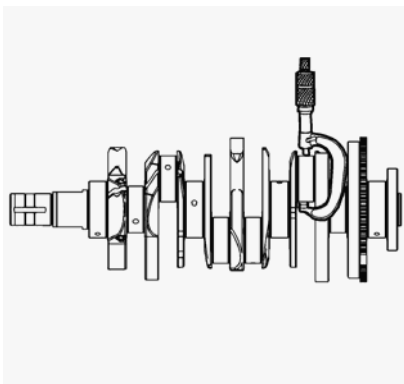
2. Install the J 7872 indicator.
3. Measure the crankshaft runout using the J 7872 indicator. Refer to Engine Mechanical Specifications.



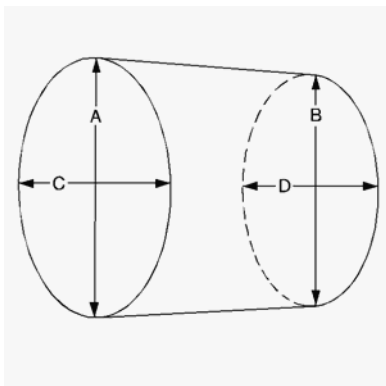
4. Measure the crankshaft thrust wall width (1) for wear using an inside micrometer. Refer to Engine Mechanical Specifications.
5. Measure the crankshaft thrust wall surface (2) for runout using the J 7872 indicator. Refer to Engine Mechanical Specifications.
6. If the crankshaft journals are damaged or worn beyond specifications, the crankshaft may be ground 0.25 mm (0.010 in). There is only 1 size of oversized main bearings available for service.



7. Inspect the crankshaft main journals for undersize, using an outside micrometer.



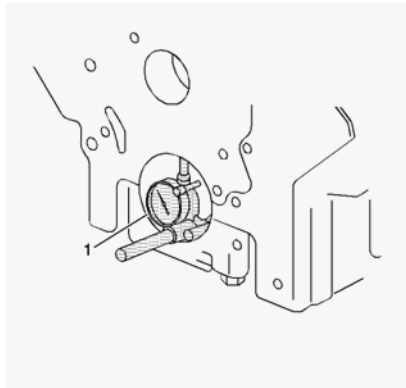
8. Inspect the crankpins for undersize using an outside micrometer.
9. Compare your measurements with those listed in the Engine Mechanical Specifications. If the crankpin journals are worn beyond the specifications, the crankshaft may be ground 0.25 mm (0.010 in). There is only 1 size of oversized connecting rod bearings available for service.



10. Measure the main bearing and crankpin journals for out-of-round using the following procedure:
 1. Using an outside micrometer, measure the journal at the extreme front and rear locations on the journal. Call these points A and B.
 2. Measure the journal in 2 new locations exactly 90 degrees from the first points. Call these points C and D.
 3. Subtract A from C and B from D. The differences will indicate journal out-of-round.
 4. The out-of-round should not exceed 0.004 mm (0.00016 in) maximum.
 5. If the journals are worn beyond the specifications, the crankshaft may be ground 0.25 mm (0.010 in). There is only 1 size of oversized crankshaft and connecting rod bearings available for service.
11. Measure the main bearing and crankpin journals for taper using the following procedure:
 1. Using an outside micrometer, measure the journal at the extreme front (A) and rear (B) of the journal parallel to the crankshaft centerline.
 2. Subtract the smallest from the largest measurement. The result will be the journal taper.
 3. If the main bearing journal taper exceeds 0.004 mm (0.00016 in), replace the crankshaft.
 4. If the journals are worn beyond the specifications, the crankshaft may be ground 0.25 mm (0.010 in). There is only 1 size of oversized crankshaft and connecting rod bearings available for service.

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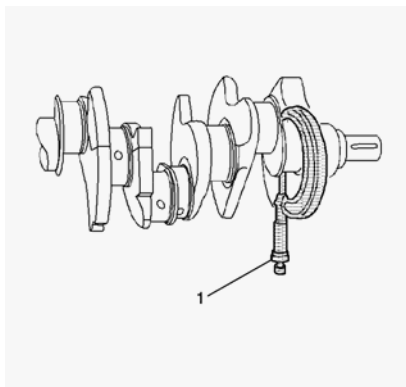
Note: If crankshaft bearing failure is due to other than normal wear, investigate the cause. Inspect the crankshaft or connecting rod bearing bores. Inspect the connecting rod bearing bores or crankshaft main bearing bores using the following procedure:

- Tighten the crankshaft bearing caps to specification using the angle meter.
- Measure the bearing bore for taper and out-of-round using the cylinder bore checking (1).
- No taper or out-of-round should exist.

Bearing Selection

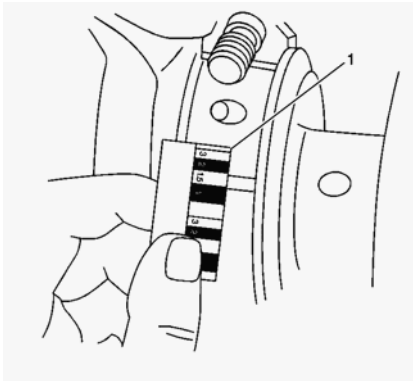
1. Measure the bearing clearance to determine the correct replacement bearing insert size. There are 2 methods to measure bearing clearance. Method A gives more reliable results and is preferred.

- Method A yields measurement from which the bearing clearance can be computed.
- Method B yields the bearing clearance directly. Method B does not give any indication of bearing run-out.



Note: Do not mix inserts of different nominal size in the same bearing bore.

- To measure bearing clearance using Method A, use the following procedure:
 1. Measure the crankshaft bearing journal diameter with a micrometer (1) in several places, 90 degrees apart. Average the measurements.
 2. Measure the crankshaft bearing journal taper and runout.
 3. Install the crankshaft bearing caps and tighten the bearing cap bolts to specification.
 4. Measure bearing inside diameter (ID), using the cylinder bore checking, in several places 90 degrees apart, average measurements.
 5. Subtract journal measurement from bearing ID measurement to determine clearance.
 6. Determine whether clearance is within specification.
 7. If out of specification, choose different inserts.
 8. Measure the connecting rod inside diameter in the same direction as the length of the rod with an inside micrometer.
 9. Measure the crankshaft main bearing inside diameter with an inside micrometer.



- To measure bearing clearance using Method B, use the following procedure:

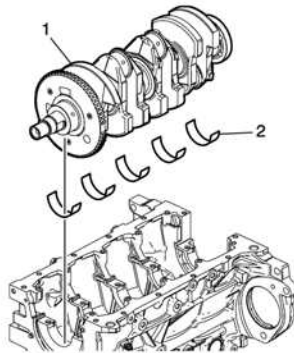
1. Clean the used bearing inserts.
2. Install the used bearing inserts.
3. Place a piece of gaging plastic across the entire bearing width.
4. Install the bearing caps.

Caution: In order to prevent the possibility of cylinder block or crankshaft bearing cap damage, the crankshaft bearing caps are tapped into the cylinder block cavity using a brass, lead, or a leather mallet before the attaching bolts are installed. Do not use attaching bolts to pull the crankshaft bearing caps into the seats. Failure to use this process may damage a cylinder block or a bearing cap.

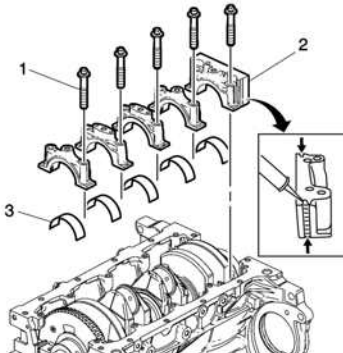
5. Install the crankshaft bearing cap bolts to specification, **50 Y (37 lb ft) plus 45° plus an additional 15°**.

Note: Do not rotate the crankshaft.

6. Remove the bearing cap, leaving the gaging plastic in place. It does not matter whether the gaging plastic adheres to the journal or to the bearing cap.
7. Measure the gaging plastic at its widest point with the scale (1) printed on the gaging plastic package.
8. Determine correct bearings to install. Refer to Engine Mechanical Specifications.
9. Remove the gaging plastic.



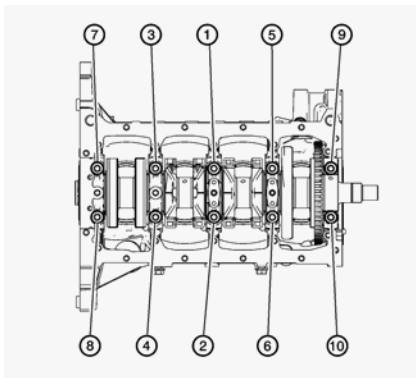
- Install the upper crankshaft bearings (2) and lubricate bearing surfaces with engine oil.
- Install the crankshaft (1) on the journals.



Caution: Refer to Fastener Caution.

- Install the new lower bearings (3).
- Install the crankshaft bearing caps (2).
- Fill bearing cap (2) holes as shown with sealer. Refer to Adhesives, Fluids, Lubricants, and Sealers then install bearing cap.

Crankshaft and Bearing Installation



Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

- Install the NEW crankshaft bearing bolts in sequence finger tight.
 1. Tighten the crankshaft bearing bolts in sequence to **50 Y (37 lb ft)**.
 2. Tighten the crankshaft bearing bolts in sequence using the angle meter an additional **45° plus an additional 15°**.

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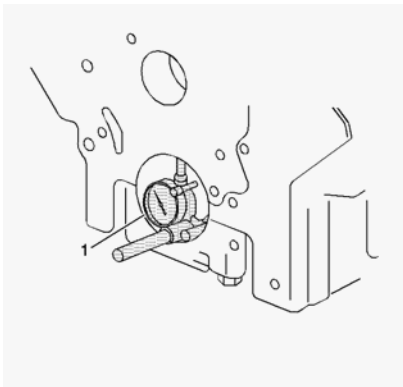
Submodel: | Engine Type: | Liters:
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Special Tools

- EN 8087 Cylinder Bore Checking Gauge
- J 45059 Angle Meter

For equivalent regional tools, refer to Special Tools

[Crankshaft and Bearing Installation](#)



Note: If crankshaft bearing failure is due to other than normal wear, investigate the cause. Inspect the crankshaft or connecting rod bearing bores. Inspect the connecting rod bearing bores or crankshaft main bearing bores using the following procedure:

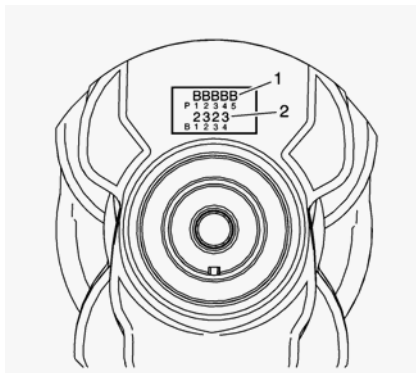
- Tighten the bedplate to specification using the J 45059 meter.
- Measure the bearing bore for taper and out-of-round using the EN 8087 gauge (1).
- No taper or out-of-round should exist.

[Bearing Selection](#)

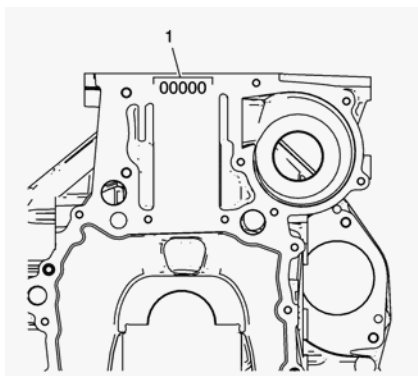
There are 3 methods to determine the correct replacement bearing size.

- Connecting Rod Bearing Grade Chart Method uses production markings on the crankshaft and the connecting rod to determine original bearing size.
- Micrometer method uses measurements of the crankshaft rod bearing journal and the connecting rod large end bore to determine the correct bearing size.
- Plastic gauging method is a way to verify the bearing clearance once the bearings are installed.

[Connecting Rod Bearing Grade Chart Method](#)



1. Inspect the bearing grade specifications located on the front crankshaft counterweight (1).

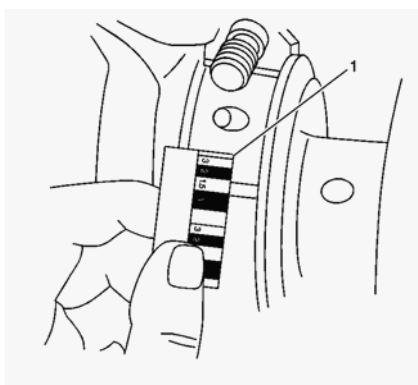


2. Inspect the main bearing bore specification located on the front of the engine block (1).
3. Determine the correct bearing grade. Refer to Connecting Rod Bearings Selection Specifications.
4. Verify that the bearing clearance is within specification using the Plastic Gauging Method.

Micrometer Method

1. Install the main bearing caps and tighten the main bearing cap bolts to specification.
2. Measure the main bearing bore inside diameter in several places, 90 degrees apart, and average the measurements for each bore.
3. Measure the crankshaft main bearing journal diameter in several places, 90 degrees apart, and average the measurements for each journal.
4. Select the correct crankshaft bearings for each journal. Refer to Crankshaft Bearing Selection Specifications.

Plastic Gauging Method



1. Clean the used bearing inserts.
2. Install the used bearing inserts.
3. Place a piece of gaging plastic across the entire bearing width.
4. Install the bearing caps.

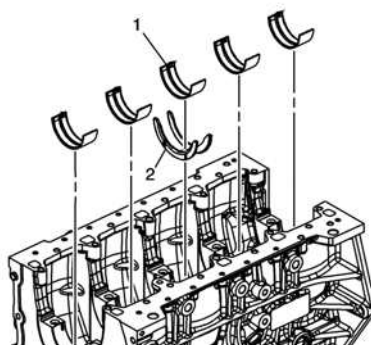
Caution: In order to prevent the possibility of cylinder block or crankshaft bearing cap damage, the crankshaft bearing caps are tapped into the cylinder block cavity using a brass, lead, or a leather mallet before the attaching bolts are installed. Do not use attaching bolts to pull the crankshaft bearing caps into the seats. Failure to use this process may damage a cylinder block or a bearing cap.

5. Install the bearing cap bolts to specification.

Note: Do not rotate the crankshaft.

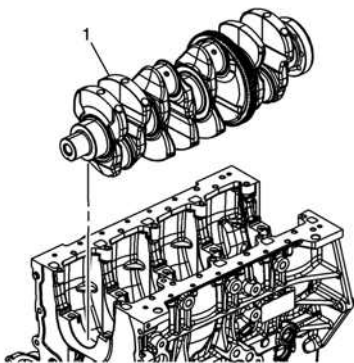
6. Remove the bearing cap, leaving the gaging plastic in place. It does not matter whether the gaging plastic adheres to the journal or to the bearing cap.
7. Measure the gaging plastic at its widest point with the scale (1) printed on the gaging plastic package.
8. Remove the gaging plastic.
9. Select the correct crankshaft bearings, refer to Connecting Rod Bearings Selection Specifications.

Crankshaft and Bearing Installation

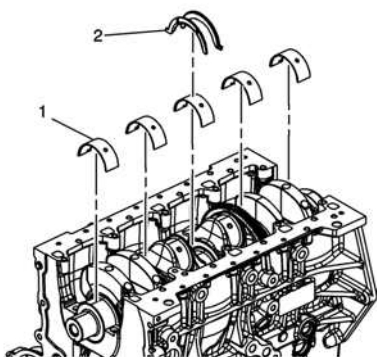


Note: The crankshaft bearings must be installed with the oil channels against the crankshaft and not the block or cap.

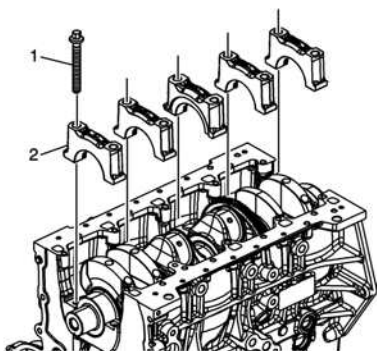
1. Install the upper crankshaft bearings (1 and 2) and lubricate bearing surfaces with engine oil.



2. Install the crankshaft (1) on the journals.

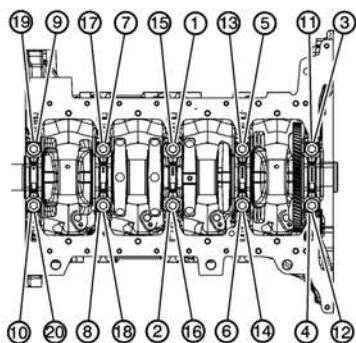


3. Install the lower bearing halves (1 and 2). Apply oil to bearing surfaces.



Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

4. Install the crankshaft bearing caps (2) and NEW crankshaft bearing cap bolts (1) finger tight.



Caution: Refer to Fastener Caution.

5. Tighten the NEW crankshaft bearing bolts:

1. First pass: tighten the NEW bolts in sequence **50 Y (36 lb ft)**
2. Final pass: Using *J 45059* meter, tighten the bolts in sequence 90 degrees

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Special Tools

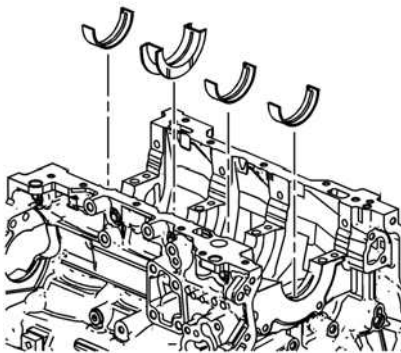
- EN J 6125-1B Slide Hammer Adapter
- EN 45059 Angle Meter
- EN 49102 Crankshaft Bearing Cap Remover

For equivalent regional tools, refer to Special Tools.

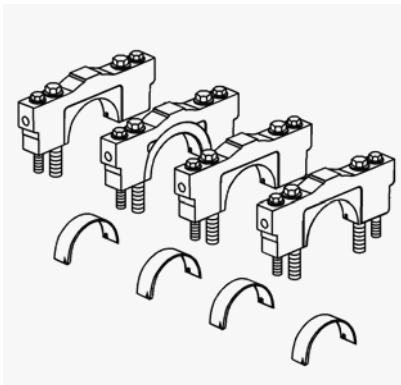
[Crankshaft Bearing Installation Procedure](#)

Note: If the crankshaft bearings have been used in a running engine, you must replace them with NEW crankshaft bearings for reassembly.

1. Clean the crankcase crank bore with a lint-free cloth.
2. Clean all the oil from the backside of new bearing halves.

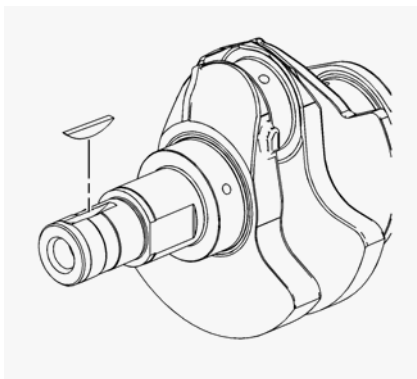


3. Install the NEW upper crankshaft bearings into position. The thrust bearing belongs in the number 3 journal. Ensure that the upper bearing insert contains the oil transfer hole and groove. Roll the bearing into position so that the lock tang engages the crank slot. The bearing must fit flush with the upper crankcase.

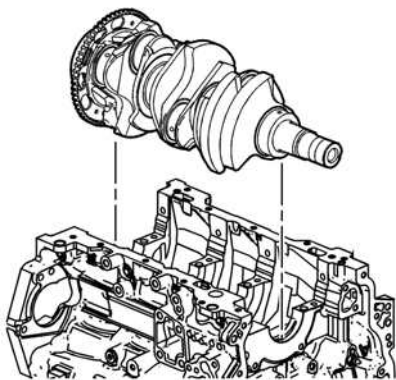


4. Install the NEW lower crankshaft bearings into position in the main bearing caps. The lower crankshaft bearings are identified by NO grooves or holes. The bearings must fit flush with the crankshaft bearing caps.

[Crankshaft Installation Procedure](#)

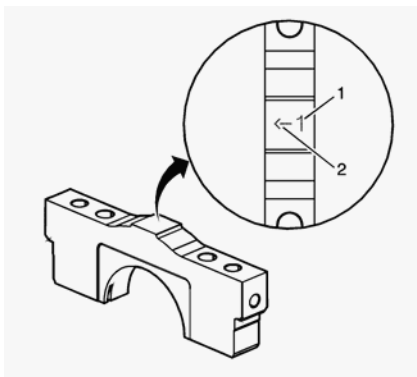


1. If removed, install the crankshaft key. Lightly tap the key in place with a small soft face, bronze/plastic, hammer until it bottoms in the keyway.

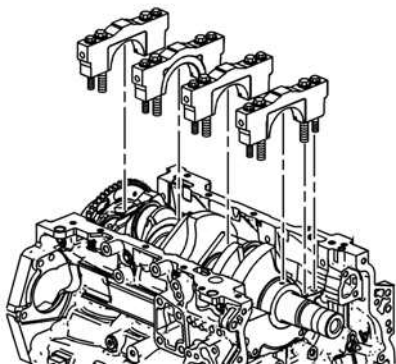


2. Gently lower the crankshaft into position in the cylinder block.

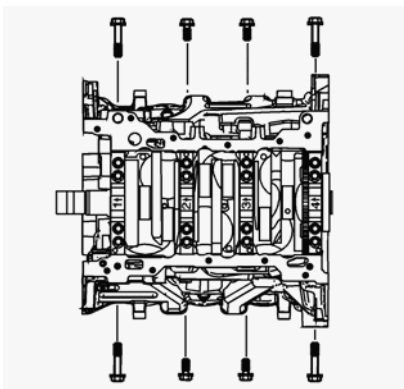
Crankshaft Bearing Clearance Measurement Procedure



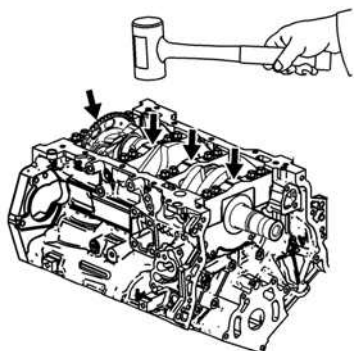
1. Place a length of fresh, room temperature plastic gaging material all the way across all the crankshaft bearing journals.
2. Identify the proper order of the main bearing caps. The main bearing caps are numbered 1 (1) through 4, with the front main bearing cap marked with the number 1. The arrow (2) is to be oriented to the front of the engine.



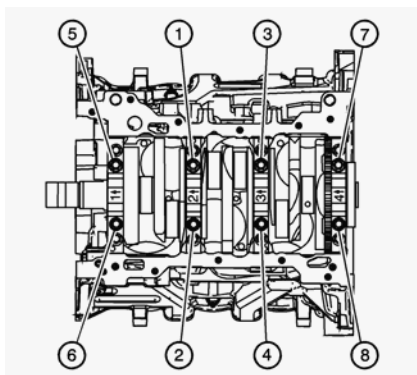
3. Install the crankshaft main bearing caps.
4. Loosely install the original inner main cap bolts.
5. Loosely install the original outer main cap bolts.



6. Loosely install the original short/inner side main cap bolts.
7. Loosely install the original long/outer side main cap bolts.



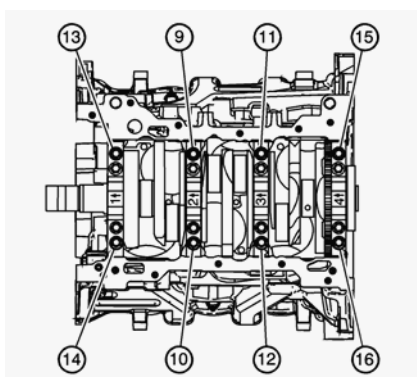
8. Tap the crankshaft main bearing caps with a soft-faced hammer.



9. Tighten the main caps bolts using the *EN 45059* meter in the following sequence:

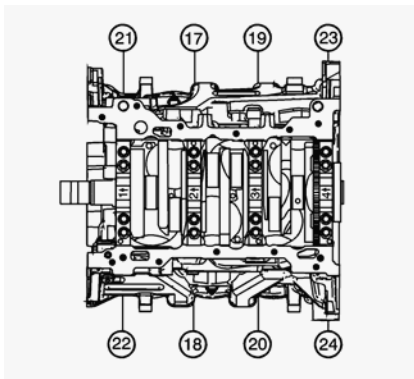
Caution: Refer to Fastener Caution.

10. Tighten the inboard bolts (1–8) first, in two passes.
 1. Tighten the inboard bolts to **20 Y (15 lb ft)** on the first pass.
 2. Tighten the inboard bolts (1–8) an additional **80 degrees** on the 2nd pass.



11. Tighten the outboard bolts (9–16) second, in two passes.
 1. Tighten the outboard bolts to **15 Y (11 lb ft)** on the first pass.

2. Tighten the outboard bolts (9–16) an additional **110 degrees** on the 2nd pass.



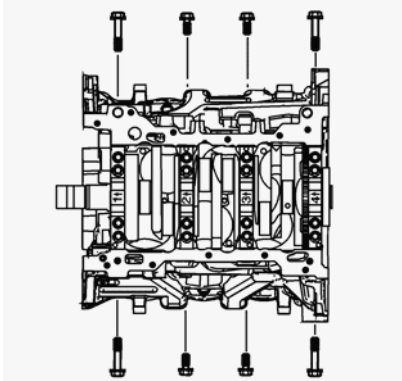
12. Tighten the short/inner bolts (17–20) third, in two passes.

1. Tighten the short/inner bolts to **30 Y (22 lb ft)** on the first pass.
2. Tighten the short/inner bolts (17–20) an additional **60 degrees** on the 2nd pass.
13. Tighten the long/outer bolts (21–24) fourth, in two passes.

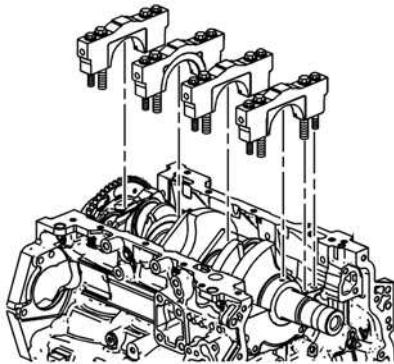
1. Tighten the long/outer bolts to **30 Y (22 lb ft)** on the first pass.
2. Tighten the long/outer bolts (21–24) an additional **60 degrees** on the 2nd pass.

Note: Do not rotate the crankshaft.

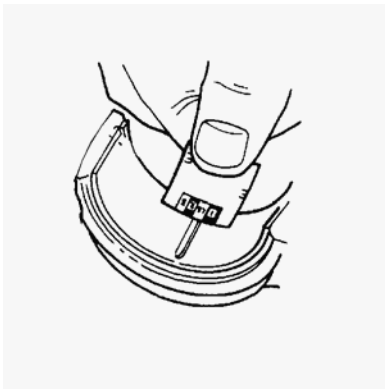
14. After reaching final torque, allow the assembly to sit for 2 minutes.



15. Remove the crankshaft bearing cap side bolts.



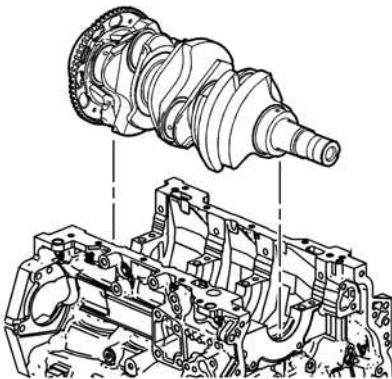
16. Remove the crankshaft bearing cap outer bolts.
17. Remove the crankshaft bearing cap inner bolts.
18. Remove the crankshaft bearing caps using the *EN J 6125-1B* adapter and *EN 49102* remover.



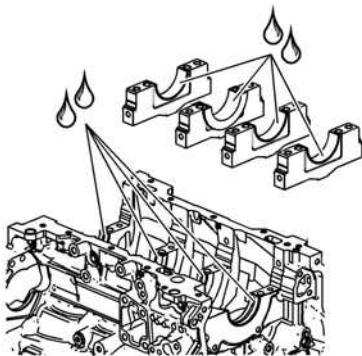
19. Determine the crankshaft bearing clearance by comparing the width of the flattened plastic gaging material at its widest point with the graduation on the gaging material container.

Note: The crankshaft bearings CAN be reused after checking the clearance if the bearings have never been used in a running engine.

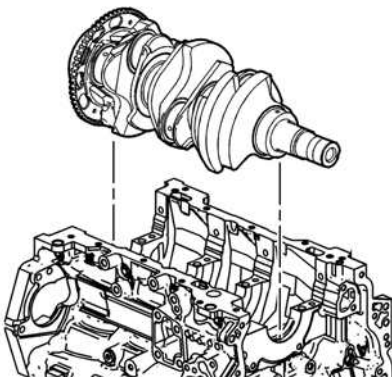
20. Compare your measurements with the Engine Mechanical Specifications. If the new bearings do not provide the proper crankshaft to bearing clearance, inspect the following:
1. Re-measure the crankshaft journals for the correct specified size and ensure the proper new bearings are being installed. If the crankshaft journals are incorrectly sized, replace or regrind the crankshaft. Crankshaft machining is permitted and undersized bearings are available.
 2. Re-measure the engine block crankshaft bearing bore diameter to ensure proper size. The engine block crankshaft bearing bore is not machinable and the block must be replaced if out of specification.
21. Clean the plastic gaging material from the crankshaft bearing journals with a soft, lint-free cloth.



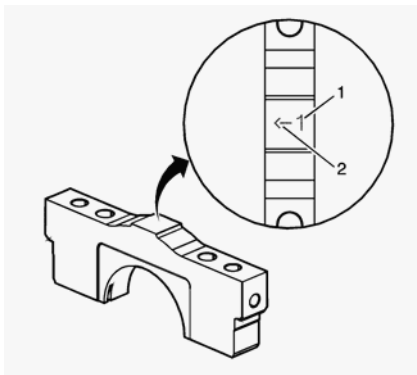
22. Lift the crankshaft out of the cylinder block.



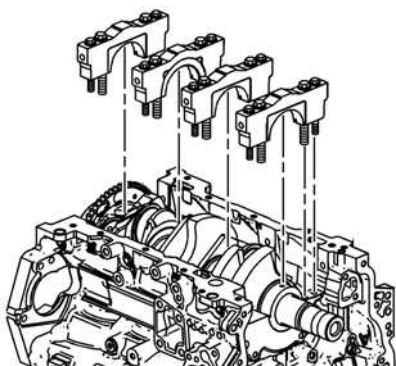
23. Apply a liberal amount of crankshaft prelube GM P/N 1052367 (Canadian P/N 992869) or clean engine oil GM P/N 12345501 (Canadian P/N 992704) to the upper and lower bearing surfaces.



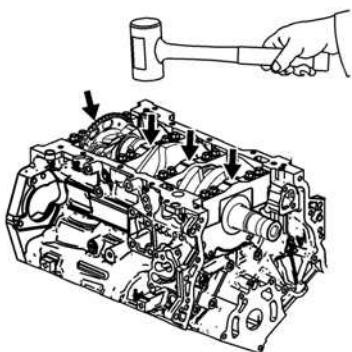
24. Gently lower the crankshaft into position in the cylinder block.



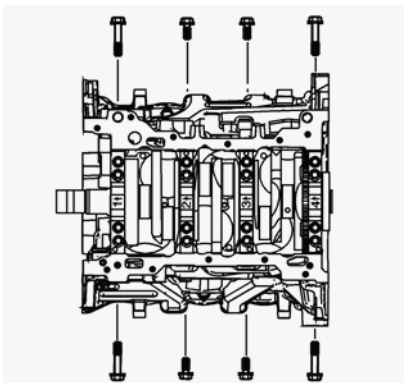
25. Identify the proper order of the main bearing caps. The main bearing caps are numbered 1 (1) through 4, with the front main bearing cap marked with the number 1. The arrow (2) is to be oriented to the front of the engine.



26. Install the crankshaft main bearing caps.
27. Loosely install the NEW inner main cap bolts.
28. Loosely install the NEW outer main cap bolts.



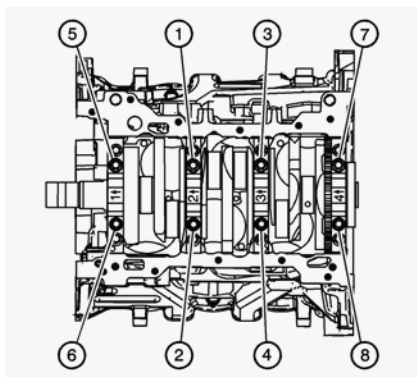
29. Tap the crankshaft main bearing caps with a soft-faced hammer.



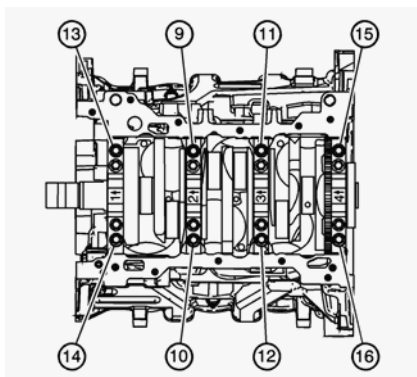
Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

Note: The side main cap bolts originally have a sealant on the flange of the bolt head. NEW bolts must be used. If NEW bolts are not used, oil can leak from the crankcase past the bolts.

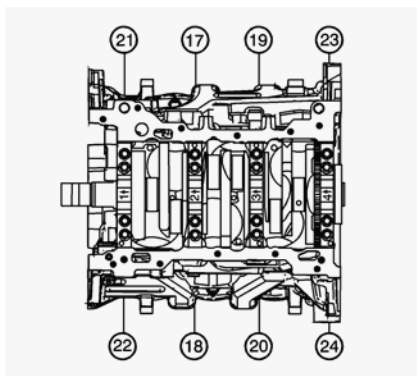
30. Loosely install the NEW short/inner side main cap bolts.
31. Loosely install the NEW long/outer side main cap bolts.



32. Tighten the main cap bolts using the *EN 45059* meter in the following sequence:
33. Tighten the inboard bolts (1–8) first, in two passes.
 1. Tighten the inboard bolts to **20 Y (15 lb ft)** on the first pass.
 2. Tighten the inboard bolts (1–8) an additional **80 degrees** on the 2nd pass.



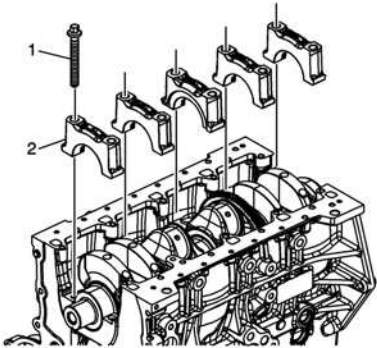
34. Tighten the outboard bolts (9–16) second, in two passes.
 1. Tighten the outboard bolts to **15 Y (11 lb ft)** on the first pass.
 2. Tighten the outboard bolts (9–16) an additional **110 degrees** on the 2nd pass.



35. Tighten the short/inner bolts (17–20) third, in two passes.
 1. Tighten the short/inner bolts to **30 Y (22 lb ft)** on the first pass.
 2. Tighten the short/inner bolts (17–20) an additional **60 degrees** on the 2nd pass.
36. Tighten the long/outer bolts (21–24) fourth, in two passes.
 1. Tighten the long/outer bolts to **30 Y (22 lb ft)** on the first pass.
 2. Tighten the long/outer bolts (21–24) an additional **60 degrees** on the 2nd pass.
37. Ensure that the crankshaft turns without binding or noise.

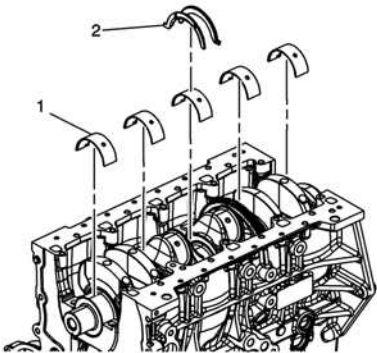
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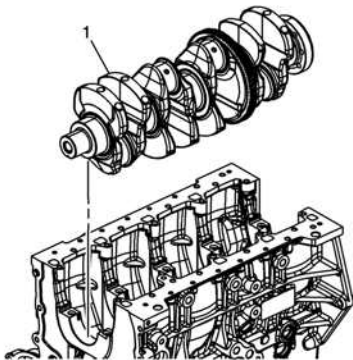


Note: The number 3 main bearing cap can be loosened by installing a drift punch to the main cap bolt bore and working back and forth toward the left and right sides of the engine.

1. Remove the crankshaft bearing cap bolts (1) and caps (2).

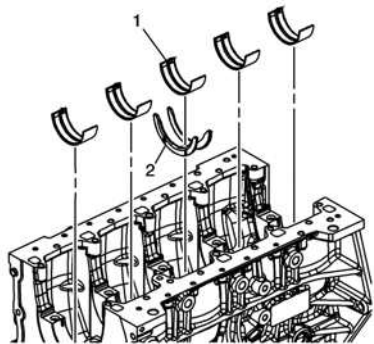


2. Remove the lower thrust bearings (2).
3. Remove the lower crankshaft bearings (1).



4. Remove the crankshaft (1).

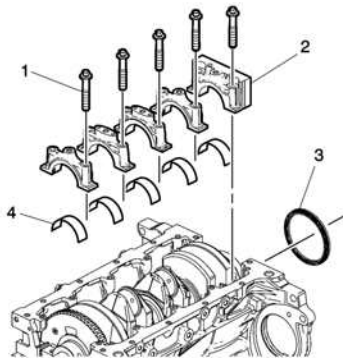
Crankshaft and Bearing Removal



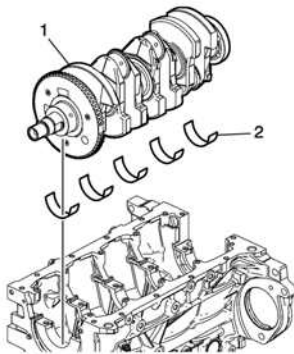
5. Remove the upper crankshaft bearings (1) and thrust bearings (2).

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1. Remove the crankshaft bearing cap bolts (1).
2. Remove the crankshaft bearing caps (2).
3. Remove the crankshaft lower bearings (4).
4. Remove the crankshaft rear oil seal (3) from the block.



5. Remove the crankshaft (1) from the block.
6. Remove the upper crankshaft bearings (2).
7. Clean the oil, sludge, and carbon.
8. Inspect the oil passages for obstructions.
9. Inspect the threads.
10. Inspect the bearing journals and the thrust surfaces for the following conditions:

- Cracks
- Chips
- Gouges
- Roughness
- Grooves
- Overheating (discoloration)
- Inspect the corresponding bearing inserts for imbedded foreign material. If foreign material exists find the cause and repair it.

Note: Replace the crankshaft if cracks, severe gouges or burned spots are found. Slight roughness may be removed with a fine polishing cloth soaked in clean engine oil. Burrs may be removed with a fine oil stone.

- Measure the crankshaft journals. Use a micrometer or dial indicator to measure the taper and runout. Note the result for the later selection of bearing inserts. Refer to Engine Mechanical Specifications. If not within limits the crankshaft must be replaced. Refer to Engine Mechanical Specifications.

Note the location of the main bearing high spots. If they are not in line, the crankshaft is bent and must be replaced.

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Special Tools

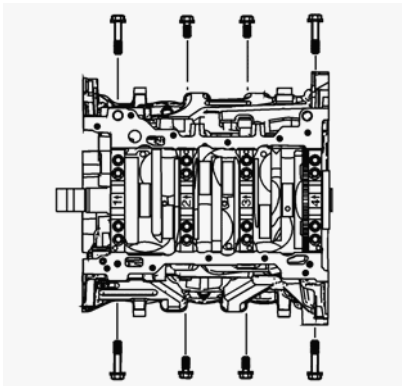
- *EN J 6125-1B* Slide Hammer Adapter
- *EN 49102* Crankshaft Bearing Cap Remover

For equivalent regional tools, refer to Special Tools.

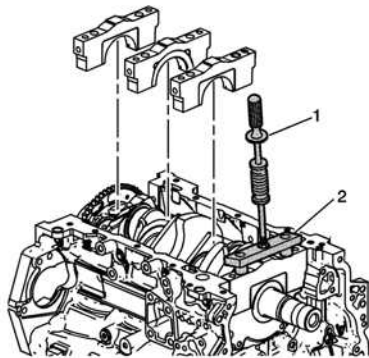
[Crankshaft End Play Measurement](#)

1. Place a dial indicator at the crankshaft nose.
2. Gently force the crankshaft to the extreme front and rear positions with a pry tool while monitoring the movement of the dial indicator.
3. The crankshaft end play should not exceed specifications. Refer to Engine Mechanical Specifications.
4. If the specifications are exceeded inspect the thrust bearing thrust OD and the crankshaft thrust wall for wear and/or excessive runout. Refer to Engine Mechanical Specifications.
5. Replace the thrust bearing or crankshaft as necessary.

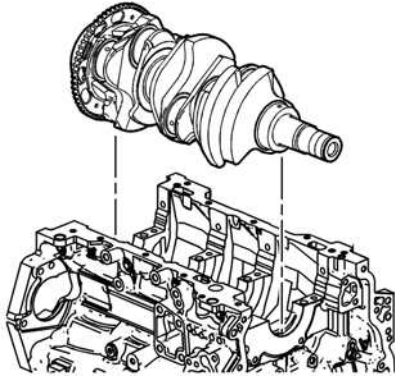
[Crankshaft Removal](#)



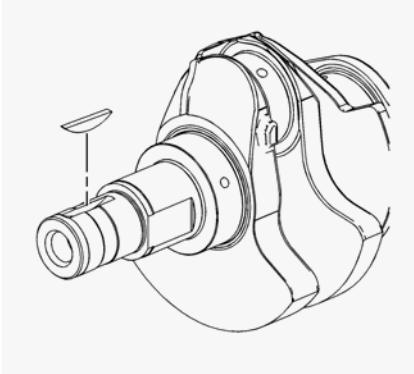
1. Remove the crankshaft bearing cap side bolts.
2. Remove the crankshaft bearing cap outer bolts.
3. Remove the crankshaft bearing cap inner bolts.



4. Remove the crankshaft bearing caps using the *EN J 6125-1B* adapter (1) and *EN 49102* remover (2).



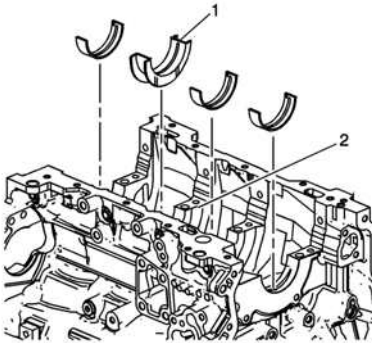
5. Using two hands, lift the crankshaft straight up from the engine block.
6. Place the crankshaft in a secure place.



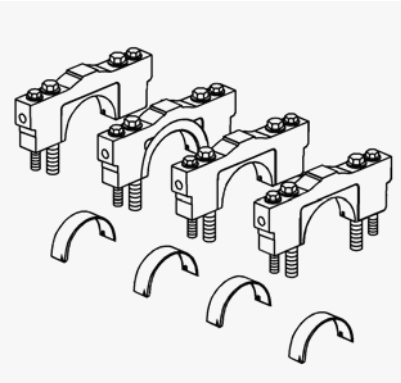
7. Remove the crankshaft key from the nose of the crankshaft, if damaged.

Crankshaft Bearing Removal

1. Prepare a piece of cardboard or equivalent, numbered 1–4 for bearing identification. Main bearing journals are numbered from the front of the engine.



2. Remove the crankshaft upper bearing halves from the cylinder block. Note the position of the thrust bearing (1) at the number 3 journal (2).
3. Place the crankshaft upper bearing halves on the cardboard in the correct positions. Note that the number 3 bearing is the thrust bearing.



4. Remove the crankshaft lower bearing halves from the crankshaft bearing caps.
5. Place the crankshaft lower bearing halves in the correct positions on the cardboard.

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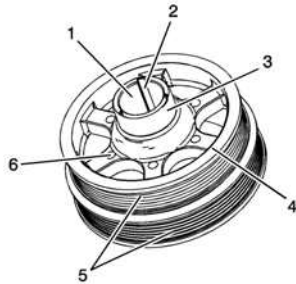
Cleaning Procedure

1. Clean the crankshaft balancer in solvent that is compatible with the rubber.

Warning: Refer to Safety Glasses Warning.

2. Dry the crankshaft balancer with compressed air.

Inspection Procedure

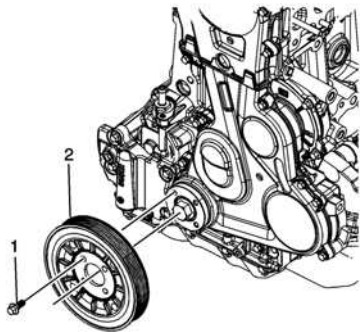


1. Inspect the crankshaft balancer for the following:

- Worn or damaged hub-to-crankshaft surface (1)
- Damage to the keyway (2)
- Worn, grooved or damaged hub seal surface (3) — A crankshaft balancer hub seal surface with excessive scoring, grooves, rust or other damage must be replaced.
- Worn, chunking or deteriorated rubber between the hub and pulley (4)
- Damaged drive belt ribs (5)
- Damaged threaded holes (6)
- Repair or replace the crankshaft balancer as necessary.

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1. Install the crankshaft balancer (2).

Caution: Refer to Fastener Caution.

2. Install the crankshaft balancer bolts (1) and tighten to **32 Y (23 lb ft)**

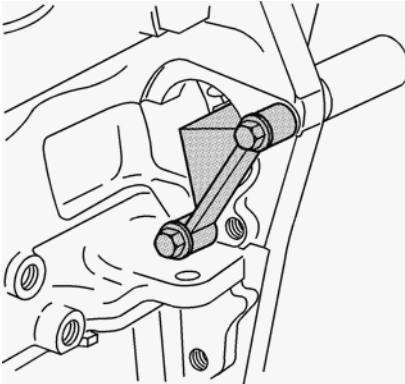
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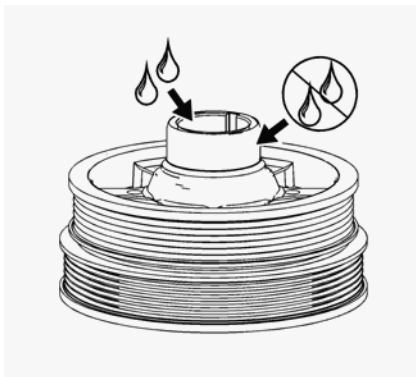
Special Tools

- EN 41998-B Crankshaft Balancer Installer
- EN 45059 Angle Meter
- EN 46106 Engine Flywheel Holding Tool

For equivalent regional tools, refer to Special Tools.

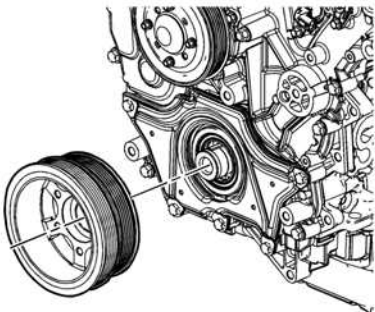


1. The EN 46106 tool must be installed onto the flywheel.
2. Use the EN 41998-B installer, nut, bearing and washer to install the crankshaft balancer.



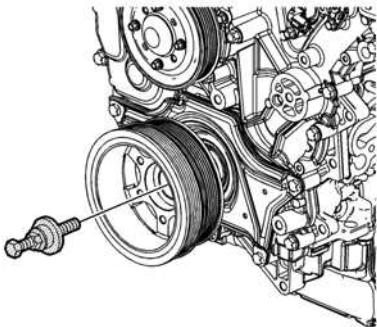
Note: Do not lubricate the crankshaft front oil seal or crankshaft balancer sealing surfaces. The crankshaft balancer is installed into a dry seal.

3. Apply lubricant to the inside of the crankshaft balancer hub bore.

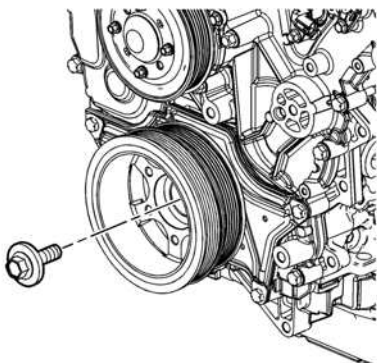


Note: Ensure the crankshaft balancer keyway is aligned with the crankshaft key.

4. Place the crankshaft balancer in position on the crankshaft.



5. Thread the *EN 41998-B* installer in the crankshaft. Ensure you engage at least 10 threads of the *EN 41998-B* installer before pressing the crankshaft balancer in place.
6. Push the crankshaft balancer into position by tightening the nut on the *EN 41998-B* installer until the large washer bottoms out on the crankshaft end.
7. Remove the *EN 41998-B* installer.



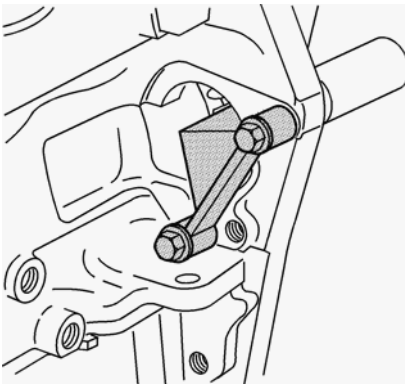
Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

8. Install the NEW crankshaft balancer bolt.

Caution: Refer to Fastener Caution.

9. Tighten the crankshaft balancer bolt.

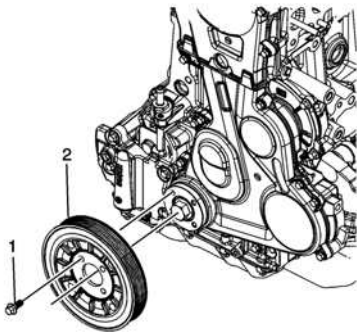
1. Tighten the crankshaft balancer bolt to **100 Y (74 lb ft)**.
2. Tighten the crankshaft balancer bolt an additional **150 degrees** using the *EN 45059* meter.



10. Remove the *EN 46106* tool.

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Remove the crankshaft balancer mounting bolts (1) and the crankshaft balancer (2).

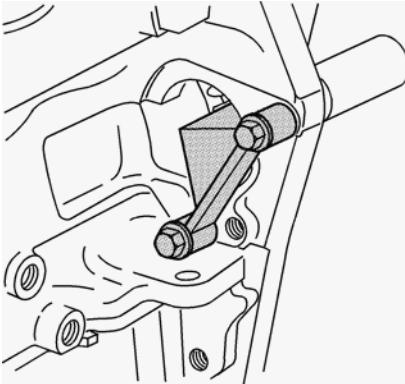
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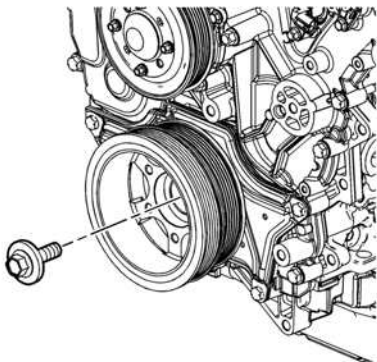
Special Tools

- EN 38416-2 Crankshaft Button
- EN 46106 Flywheel Holding Tool
- EN 47982 Harmonic Balancer Puller

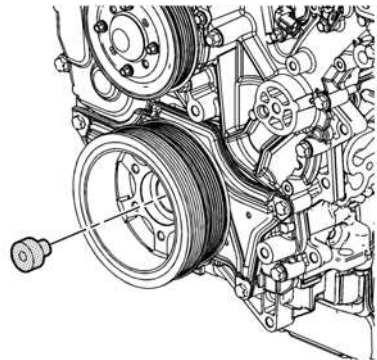
For equivalent regional tools, refer to Special Tools.



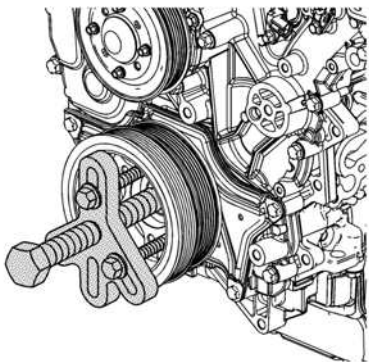
1. Install the EN 46106 tool through the starter mounting hole.



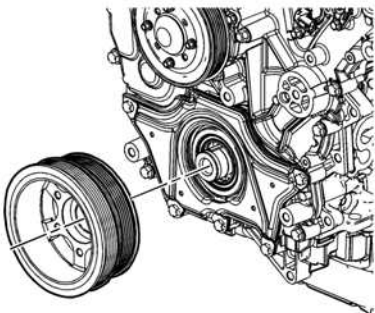
2. Remove and discard the crankshaft balancer bolt.



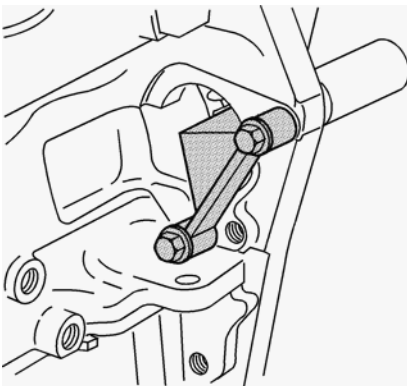
3. Install the EN 38416-2 button in the nose of the crankshaft.



4. Install the *EN 47982* puller in order to remove the crankshaft balancer.



5. Pull the crankshaft balancer off by tightening the center bolt on the *EN 47982* puller until the crankshaft balancer pulls off of the crankshaft end.
6. Remove the *EN 47982* puller from the crankshaft balancer.



7. Remove the *EN 46106* tool.

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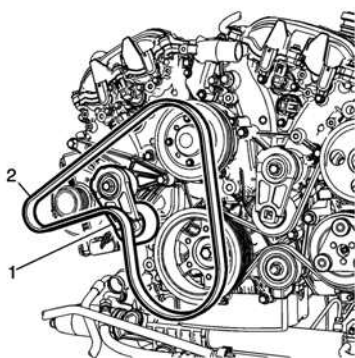
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

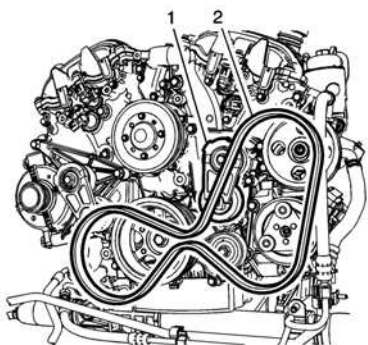
- *EN 38416-2* Crankshaft Button
- *EN 41816* Crankshaft Balancer Remover
- *EN 46106* Flywheel Holding Tool
- *EN 41998-B* Crankshaft Balancer Installer

For equivalent regional tools, refer to Special Tools.

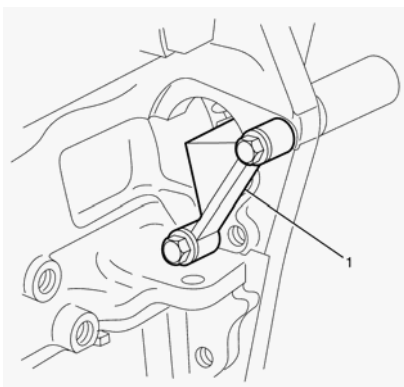
[Removal Procedure](#)



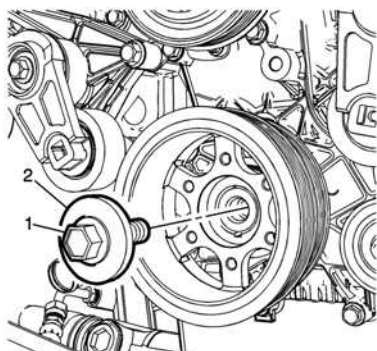
1. Remove the water pump and generator belt (2). Refer to Water Pump and Generator Belt Replacement.



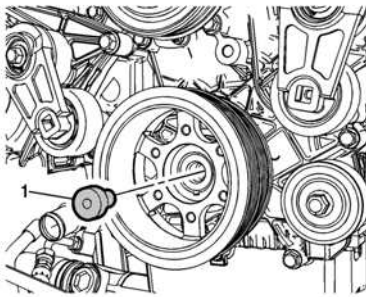
2. Remove the air conditioning compressor and power steering pump belt (2). Refer to Air Conditioning Compressor and Power Steering Pump Belt Replacement.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
4. Remove the starter motor. Refer to Starter Replacement.



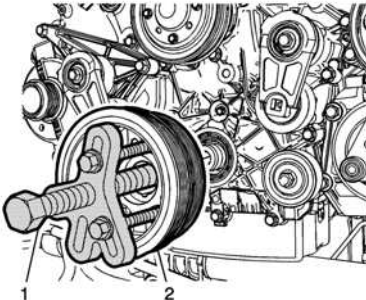
5. Install the EN 46106 holding tool (1) through the starter mounting hole.
6. Lower the vehicle.



7. Remove and discard the crankshaft balancer to crankshaft retaining bolt (1) and washer (2).



8. Install the *EN 38416-2* button (1) in the nose of the crankshaft.



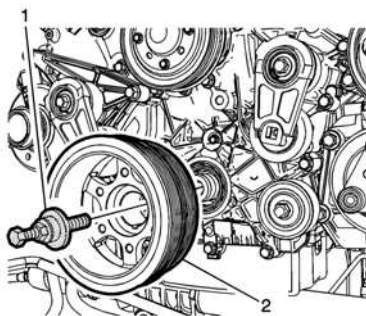
9. Install the *EN 41816* remover (2) in order to remove the crankshaft balancer (1).
10. Tighten the center bolt of the *EN 41816* remover in order to pull the crankshaft balancer off of the crankshaft.
11. Remove the *EN 41816* remover from the crankshaft balancer.

[Installation Procedure](#)



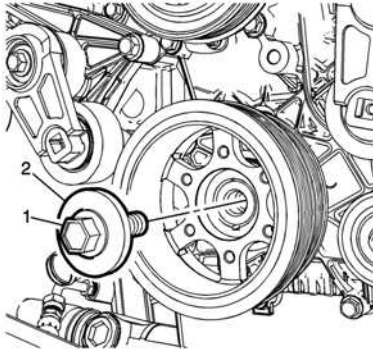
Note: Do not lubricate the crankshaft front oil seal or crankshaft balancer sealing surfaces. The crankshaft balancer is installed into a dry seal.

1. Apply lubricant to the inside of the crankshaft balancer hub bore.



2. Place the crankshaft balancer (2) in position on the crankshaft (3).
3. Thread the *EN 41998-B* installer (1) in the crankshaft. Ensure you engage at least 10 threads of the *EN 41998-B* installer before pressing the crankshaft balancer in place.

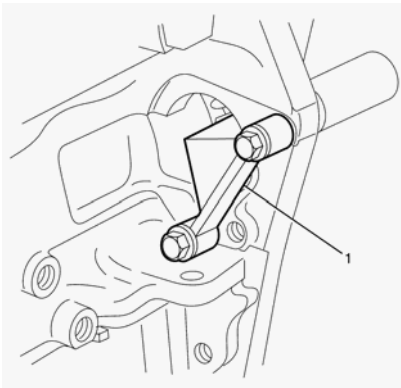
4. Push the crankshaft balancer into position by tightening the nut on the *J 41998-B* installer until the large washer bottoms out on the crankshaft end.
5. Remove the *EN 41998-B* installer .



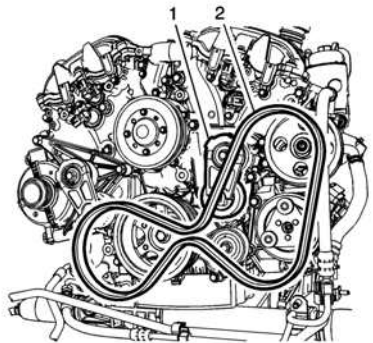
6. Install the NEW crankshaft balancer bolt (1) and washer (2).

Caution: Refer to Fastener Caution.

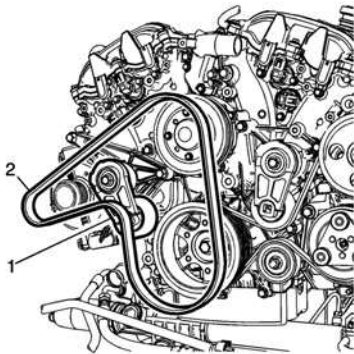
7. Tighten the crankshaft balancer bolt.
 1. Tighten the crankshaft balancer bolt to **100 Y (74 lb ft)**.
 2. Tighten the crankshaft balancer bolt an additional **150 degrees** using the *EN 45059* meter .
8. Raise the vehicle.



9. Remove the *EN 46106* tool (1).
10. Install the starter motor. Refer to Starter Replacement.
11. Lower the vehicle.



12. Install the air conditioning compressor and power steering pump belt (2). Refer to Air Conditioning Compressor and Power Steering Pump Belt Replacement.



13. Install the water pump and generator belt (2). Refer to Water Pump and Generator Belt Replacement.

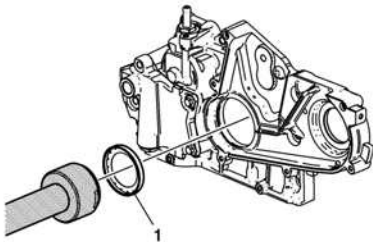
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- *EN-50718* Crankshaft Front Seal Installer
- *EN-42183* Driver Handle

For equivalent regional tools, refer to Special Tools



Note: The cutout section of the installer aligns with the timing boss on the front cover.

1. Lubricate the oil pump drive gear with engine oil.
2. Using *EN-50718* installer, install the crankshaft front oil seal (1).

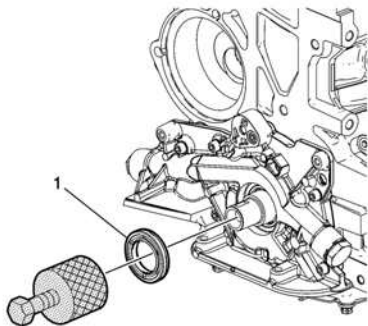
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

J-810604 Crankshaft Front Seal Installer

For equivalent regional tools, refer to Special Tools.



Caution: Refer to Fastener Caution.

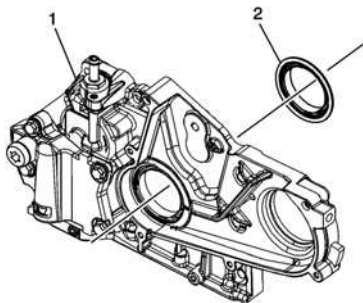
Note: Apply silicone No. 2 lithium soap based grease to the crankshaft front oil seal (1) before installation. Refer to Adhesives, Fluids, Lubricants, and Sealers.

Using the *J-810604* seal installer install the front oil seal (1).

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:

Fuel Delivery: | Fuel:

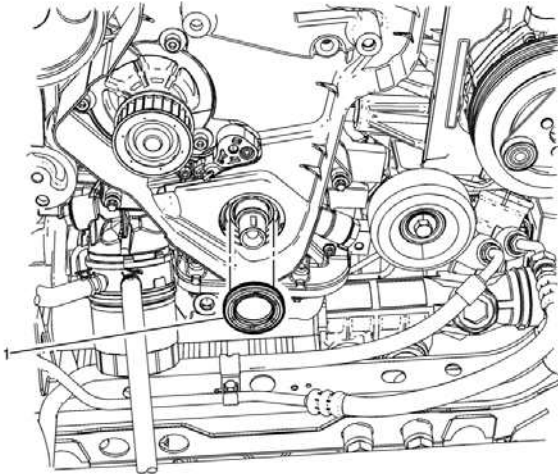


Remove the crankshaft front oil seal (2) from the engine front cover (1).

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:

Fuel Delivery: | Fuel:



Crankshaft Front Oil Seal Replacement

Callout

Component Name

Preliminary Procedure

Remove the crankshaft sprocket. Refer to Crankshaft Sprocket Replacement.

Crankshaft front oil seal.

Caution: Refer to Fastener Caution.

Note: Apply silicone No. 2 lithium soap based grease to the crankshaft front oil seal (1) before installation. Refer to Adhesives, Fluids, Lubricants, and Sealers

1

Procedure

use a flat bladed to remove the crankshaft front oil seal.

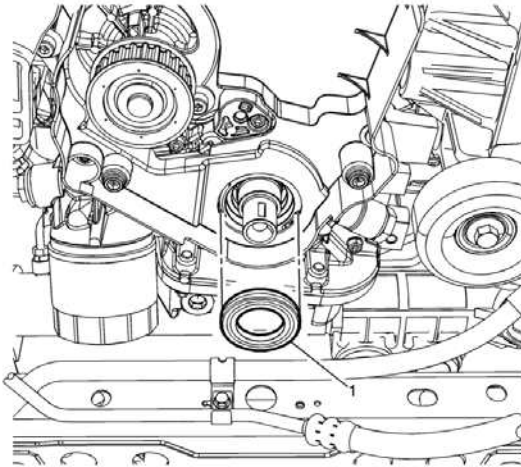
Special Tools

Use the *EN-50891* Crankshaft Front Seal Installerto install the front seal.

For equivalent regional tools, refer to Special Tools.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Crankshaft Front Oil Seal Replacement

Callout

Component Name

Preliminary Procedure

Remove the crankshaft sprocket. Refer to Crankshaft Sprocket Replacement.

Crankshaft front oil seal.

Note: Apply silicone No. 2 lithium soap based grease to the crankshaft front oil seal (1) before installation. Refer to Adhesives, Fluids, Lubricants, and Sealers.

Procedure

1

1. Use a flat bladed tool to remove the crankshaft front oil seal.
2. Use the J-810604 Crankshaft Front Seal Installer to install the front seal.

Special Tools

J-810604 Crankshaft Front Seal Installer .

For equivalent regional tools, refer to Special Tools.

2013 Chevrolet Colorado

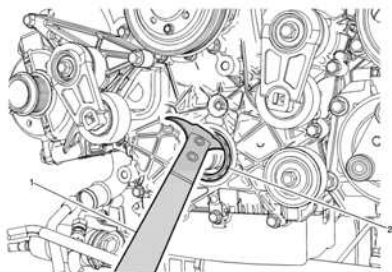
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- EN-29184 Oil Seal Installer
- EN-45000 Seal Remover

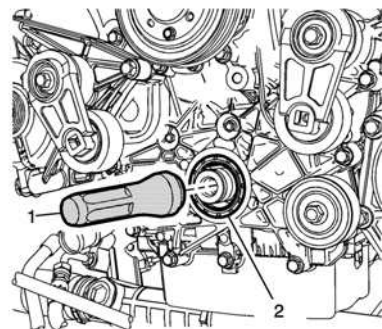
For equivalent regional tools, refer to Special Tools.

[Removal Procedure](#)



1. Remove the crankshaft balancer. Refer to Crankshaft Balancer Replacement.
2. Using EN-45000 Seal Remover (1) remove the crankshaft oil seal (2).

[Installation Procedure](#)

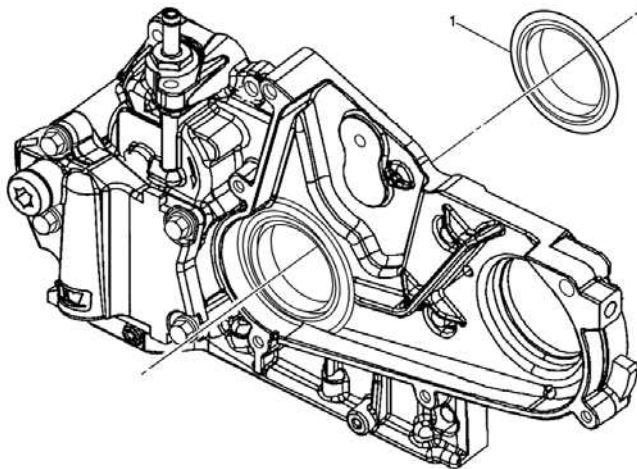


Note: Do not lubricate the crankshaft front oil seal or the crankshaft balancer sealing surfaces.

1. Use the EN-29184 installer (1) or equivalent to install the crankshaft front oil seal (2).
2. Install the crankshaft balancer. Refer to Crankshaft Balancer Replacement.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Crankshaft Front Oil Seal Replacement

Callout

Component Name

Preliminary Procedure

Remove the front engine cover. Refer to Engine Front Cover Replacement.

Crankshaft Front Oil Seal

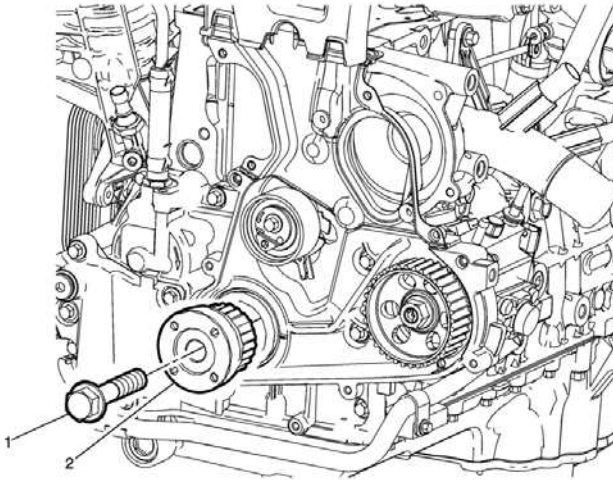
Procedure

1

1. Ensure the face of the seal is facing in.
2. Use *EN-50719* seal removal to remove the seal.
3. Use *EN-50718* seal installer to install the seal.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Crankshaft Gear Replacement

Callout

Component Name

Note: The crankshaft timing gear bolt (1) has a left hand thread.

Preliminary Procedure

Remove the timing belt. Refer to Timing Belt Replacement.

Crankshaft Gear Fastener

Caution: Refer to Fastener Caution.

Note: The crankshaft timing gear bolt is left hand thread. The keyway in the crankshaft should match up with the timing pulley and result in 90° ATDC.

1

Procedure

Ensure to use a NEW bolt whenever removing the crankshaft gear.

Tighten

100 Y (74 lb ft) plus 120 Degrees.

2

Crankshaft Gear

2013 Chevrolet Colorado

Submodel: | **Engine Type:** | **Liters:**
Fuel Delivery: | **Fuel:**

Note: If the crankshaft position variation learn procedure has not learned, a false misfire could be detected and DTC P0300 00 may set. If sent here from DTC P0300 00, proceed with the crankshaft position variation learn procedure.

1. Install a scan tool.
2. Monitor the ECM for DTCs with a scan tool. If other DTCs are set, except DTC P0300 00, or DTC P0315 00, refer to Diagnostic Trouble Code (DTC) List - Vehicle for the applicable DTC that set.
3. With a scan tool, select the Crankshaft Position Variation Learn procedure and perform the following:

1. Observe the fuel cut-off for the applicable engine.
2. Block the drive wheels.
3. Set the parking brake.
4. Place the vehicle transmission in Park or Neutral.
5. Turn the air conditioning (A/C) off.
6. Cycle the ignition from off to on.
7. Apply and hold the brake pedal for the duration of the procedure.
8. Start and idle the engine.

Note: While the learn procedure is in progress, release the throttle immediately when the engine starts to decelerate. The engine control is returned to the operator and the engine responds to throttle position after the learn procedure is complete.

9. Accelerate to wide open throttle (WOT). The engine should not accelerate beyond the calibrated fuel cut-off RPM value noted in step 3.1. Release the throttle immediately if the value is exceeded.
10. Release the throttle when fuel cut-off occurs.
4. The scan tool displays Learn Status: Learned this Ignition. If the scan tool indicates that DTC P0315 00 ran and passed, the crankshaft position sensor variation learn procedure is complete. If the scan tool indicates DTC P0315 00 failed or did not run, refer to DTC P0315. If any other DTCs set, refer to Diagnostic Trouble Code (DTC) List - Vehicle for the applicable DTC that set.
5. Turn OFF the ignition for 30 s after the learn procedure is completed successfully.

The crankshaft position variation learn procedure is also required when the following service procedures have been performed, regardless of whether or not DTC P0315 00 is set:

- An engine replacement
- An ECM replacement
- A crankshaft balancer replacement
- A crankshaft replacement
- A crankshaft position sensor replacement
- Any engine repairs which disturb the crankshaft to crankshaft position sensor relationship

2013 Chevrolet Colorado

Submodel: | **Engine Type:** | **Liters:**
Fuel Delivery: | **Fuel:**

Note: The Crankshaft Position System Variation Learn procedure is also required when the following service procedures have been performed, regardless of whether DTC P0315 is set:

- An engine replacement
- A engine control module (ECM) or body control module (BCM) replacement
- A crankshaft balancer replacement
- A crankshaft removal and/or replacement
- A crankshaft position sensor disturbance/removal and/or replacement
- Any engine repairs which disturb the crankshaft to crankshaft position sensor relationship.

Note: The ECM monitors certain component signals to determine if all the conditions are met to continue with the crankshaft position System Variation Learn Procedure. The scan tool only displays the condition that inhibits the procedure. The scan tool displays the signals of the following components:

- Crankshaft position sensors activity—If there is a crankshaft position sensor condition, refer to the applicable DTC that set.
- Camshaft position sensor signal activity—If there is a camshaft position sensor signal condition, refer to the applicable DTC that set.
- Engine coolant temperature (ECT)—If the engine coolant temperature is not warm enough, idle the engine until the engine coolant temperature reaches the correct temperature.

Note: The ECM monitors certain component signals to determine if all the conditions are met to continue with the Crankshaft Position Variation Learn procedure.

1. Ignition ON, observe the DTC information with a scan tool. Verify no other DTCs are set, except DTCs P0300–P0306, or P0315.

- If DTCs are set, except DTCs P0300–P0306, or P0315, refer to Diagnostic Trouble Code (DTC) List - Vehicle for further diagnosis.
- Select the Crankshaft Position Variation Learn Procedure with a scan tool and follow the on screen instructions:
- Verify DTC P0315 does not set.
- *If DTC P0315 set, or another DTC is present* refer to Diagnostic Trouble Code (DTC) List - Vehicle for the applicable DTC that set.
- *If the DTC does not set*
- All OK.

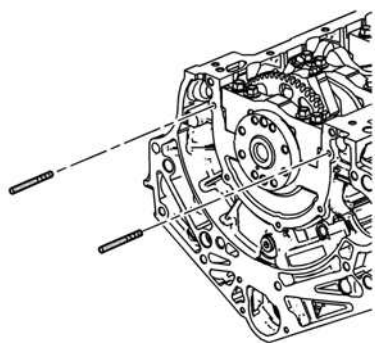
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

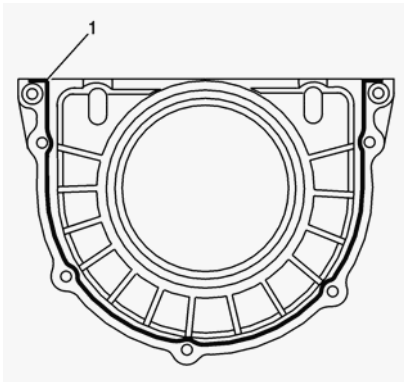
Special Tools

- EN 42183 Handle
- EN 46109 Guide Pin Set
- EN 47839 Crankshaft Rear Oil Seal Installation Tool

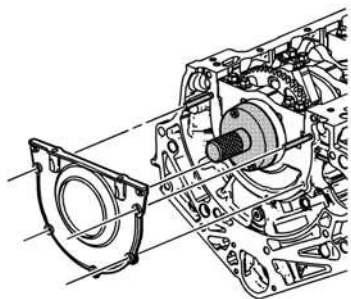
For equivalent regional tools, refer to Special Tools.



1. Install the 6 mm (0.236 in) guides from the EN 46109 pin set into the 2 crankshaft rear oil seal housing corner bolt holes of the engine block.

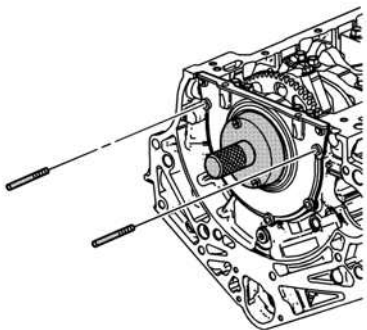


2. Install the EN 47839 tool with the EN 42183 handle (1, 2) onto the rear of the crankshaft flange.
3. Place a 3 mm (0.118 in) bead of RTV sealant, to the NEW crankshaft rear oil seal housing as shown (1). Refer to Adhesives, Fluids, Lubricants, and Sealers.

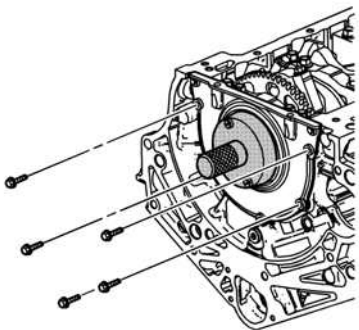


Note: DO NOT allow any engine oil on the area where the crankshaft rear oil seal housing is to be installed.

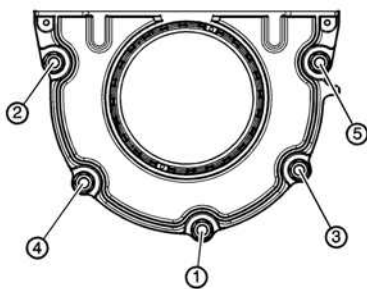
4. Install the crankshaft rear oil seal housing to the engine block.



5. Remove the *EN 46109* pin set 6 mm (0.236 in) guides from the engine block.

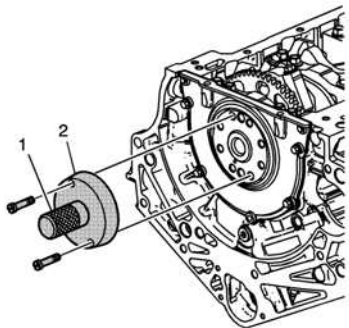


6. Install the crankshaft rear oil seal housing bolts.



Caution: Refer to Fastener Caution.

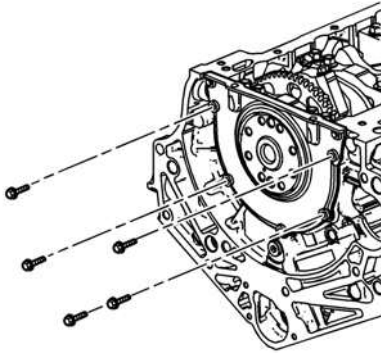
7. Tighten the crankshaft rear oil seal housing bolts in sequence and tighten to **10 Y (89 lb in)**.



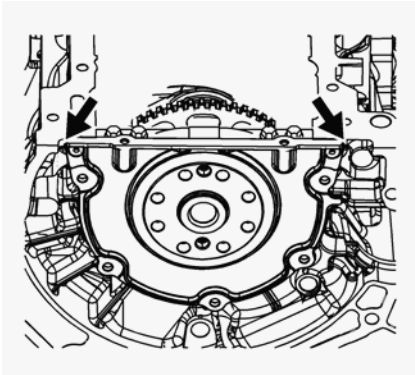
8. Remove the *EN 47839* tool and *EN 42183* handle (1, 2) from the crankshaft flange.

2013 Chevrolet Colorado

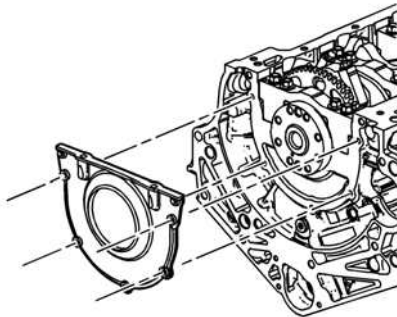
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



1. Remove the crankshaft rear oil seal housing bolts.



2. Use the pry points located at the edge of the crankshaft rear oil seal housing to separate the RTV sealant.



3. Remove and discard the crankshaft rear oil seal housing.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

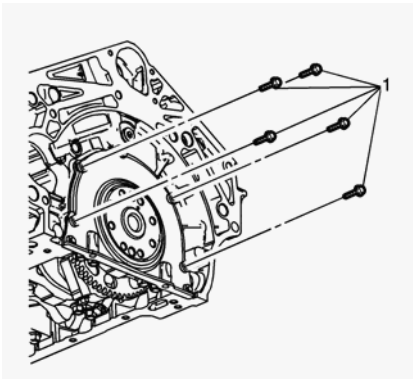
Special Tools

- EN-42183 Handle
- EN-46109 Guide Pin Set
- EN-47839 Crankshaft Rear Oil Seal Installation Tool

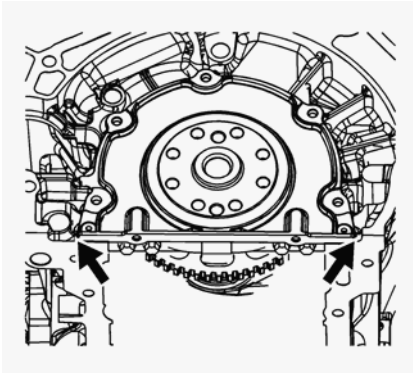
For equivalent regional tools, refer to Special Tools.

Removal Procedure

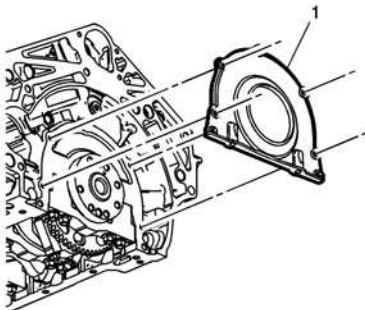
1. If equipped with an automatic transmission, remove the flex plate. Refer to Automatic Transmission Flex Plate Replacement.
2. If equipped with a manual transmission, remove the flywheel. Refer to Engine Flywheel Replacement
3. Remove the oil pan. Refer to Oil Pan Replacement.



4. Remove the crankshaft rear oil seal and housing bolts (1).

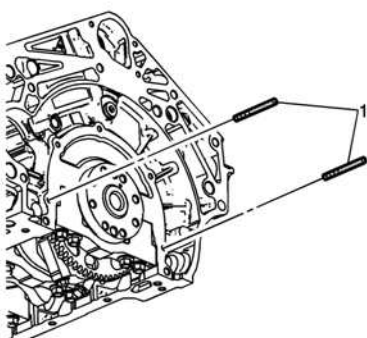


5. Use the pry points located at the edge of the crankshaft rear oil seal housing to separate the RTV sealant.

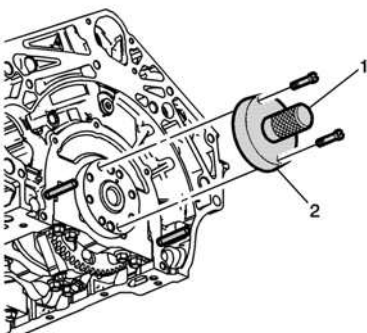


6. Remove and discard the crankshaft rear oil seal and housing (1). Refer to Crankshaft Rear Oil Seal and Housing Removal.

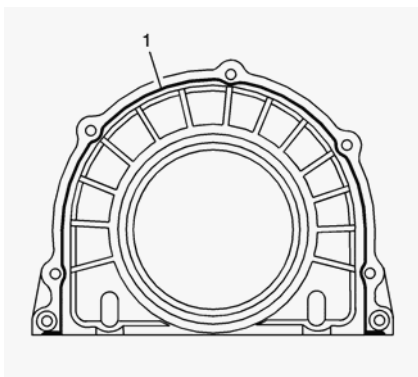
Installation Procedure



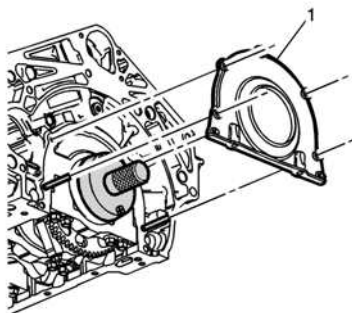
1. Install the 6 mm (0.236 in) guides from the EN-46109 pin set into the 2 crankshaft rear oil seal housing corner bolt holes of the engine block



2. Install the EN-47839 tool with the EN-42183 handle (1, 2) onto the rear of the crankshaft flange.

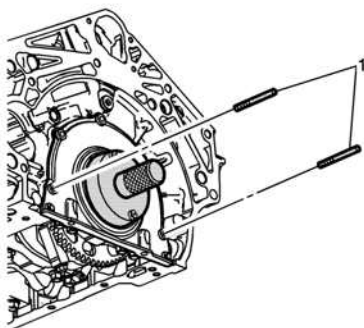


3. Place a 3 mm (0.118 in) bead of RTV sealant (1) to the NEW crankshaft rear oil seal housing as shown (1). Refer to Adhesives, Fluids, Lubricants, and Sealers, for recommended sealant.

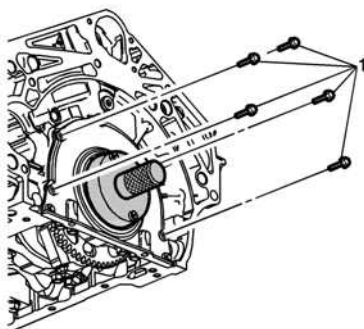


Note: DO NOT allow any engine oil on the area where the crankshaft rear oil seal housing is to be installed.

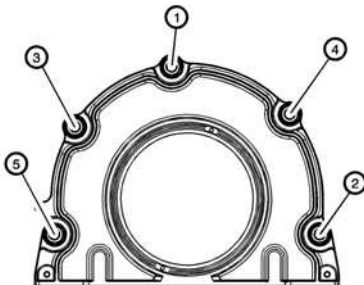
4. Install the crankshaft rear oil seal housing (1) to the engine block.



5. Remove the EN-46109 pin set 6 mm (0.236 in) guides (1) from the engine block.

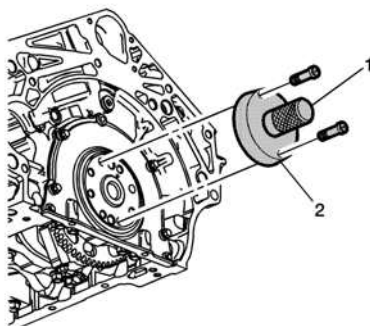


6. Install the crankshaft rear oil seal housing bolts (1).



Caution: Refer to Fastener Caution.

7. Tighten the crankshaft rear oil seal housing bolts in sequence and tighten to **10 Y (89 lb in)**.



8. Remove the EN-47839 tool and EN-42183 handle (1, 2) from the crankshaft flange.
9. Install the oil pan. Refer to Oil Pan Replacement.
10. If equipped with an automatic transmission, install the flex plate. Refer to Automatic Transmission Flex Plate Replacement.
11. If equipped with a manual transmission, install the flywheel. Refer to Engine Flywheel Replacement

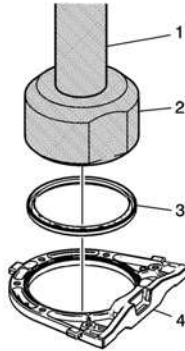
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

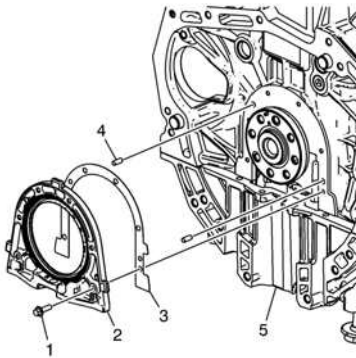
- EN-50026 Rear Main Seal Installer
- GE-8092 Driver Handle

For equivalent regional tools, refer to Special Tools



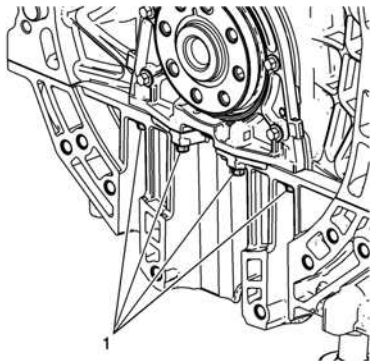
Note:

- The crankshaft rear oil seal must be installed with the cupped side of the seal facing the tool.
 - The bottom edge of the crankshaft rear oil seal housing must hang off the edge of the bench to allow it to lay flat.
1. Install the NEW crankshaft rear oil seal (3) into the crankshaft rear oil seal housing (4) using the EN-50026 installer (2) and GE-8092 handle (1) until the seal bottoms out on the housing.



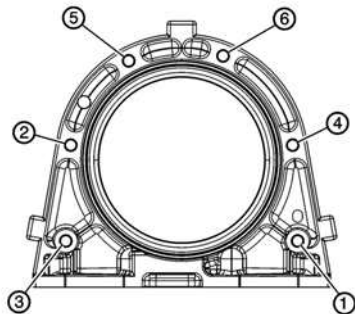
2. Temporarily install the upper oil pan (5) with enough bolts to hold it in place and without the gasket.
3. Install the rear oil seal housing locating pin (4).
4. Install the rear oil seal housing gasket (3).
5. Lubricate the crankshaft sealing surface with engine oil.
6. Install the rear oil seal housing (2) and bolts (1) finger tight.

Crankshaft Rear Oil Seal Housing Installation



Caution: Refer to Fastener Caution.

7. Install the upper oil pan to crankshaft rear oil seal housing bolts (1) and tighten to **15 Y (11 lb ft)**.



8. Tighten the crankshaft rear oil seal housing bolts in sequence to **15 Y (11 lb ft)**.
9. Remove the upper oil pan.

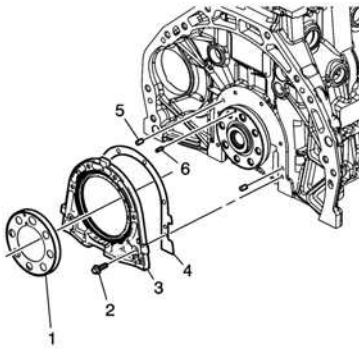
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

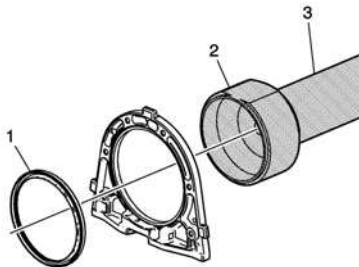
Special Tools

- EN-50026 Rear Main Seal Installer
- GE-8092 Driver Handle

For equivalent regional tools, refer to Special Tools



1. Remove the crankshaft position sensor excitor ring (1) and locating pin (6).
2. Remove the rear oil seal housing bolts (2) and seal housing (3).
3. Remove the rear oil seal housing gasket (4).
4. Remove the rear oil seal housing locating pins (5).



Note: The crankshaft rear oil seal must be driven out from the engine block side of the housing.

5. Remove the crankshaft rear oil seal (1) using the EN-50026 installer (2) and GE-8092 handle (3).

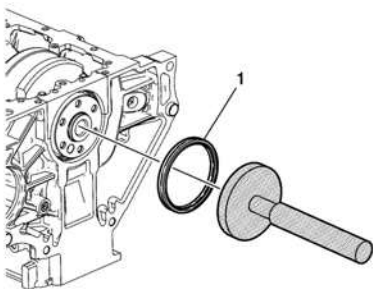
2013 Chevrolet Colorado

Submodel: | **Engine Type:** | **Liters:**
Fuel Delivery: | **Fuel:**

Special Tools

3-0006775 Rear Main Seal Installer

For equivalent regional tools, refer to Special Tools.



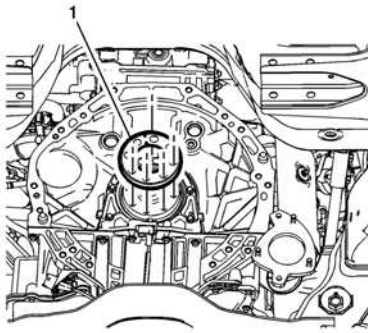
1. Remove excess sealer from seal recess.
2. Lubricate the outside diameter of the new crankshaft seal (1) with clean engine oil.
3. Using the 3-0006775 seal installer, press the new crankshaft seal into the housing. The 3-0006775 also establishes the depth of the seal in the crankshaft seal bore.

2013 Chevrolet Colorado

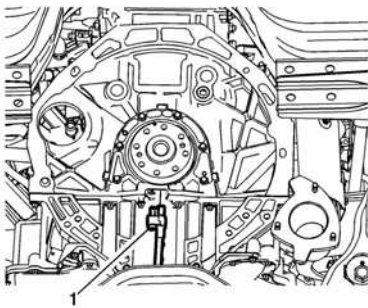
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

[Removal Procedure](#)

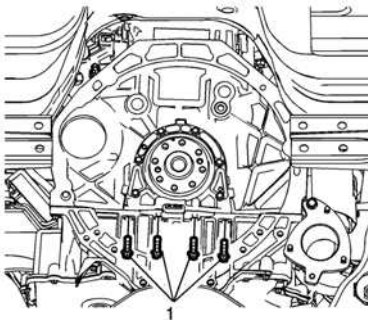
1. If equipped with manual transmission remove the engine flywheel. Refer to Clutch Assembly Replacement.
2. If equipped with automatic transmission remove the automatic flex plate. Refer to Automatic Transmission Flex Plate Replacement.



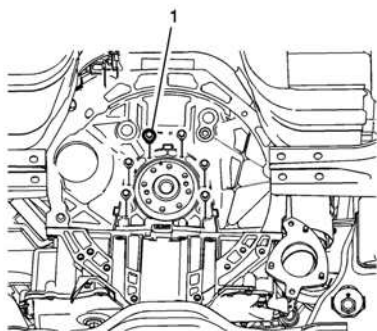
3. Remove the crankshaft position sensor excitor ring (1) .



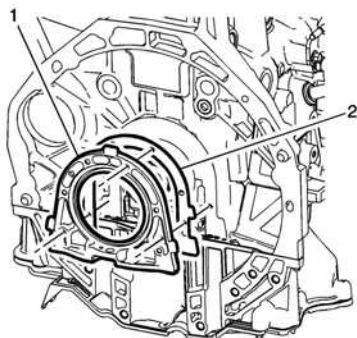
4. Remove the crankshaft position sensor (1). Refer to Crankshaft Position Sensor Replacement.



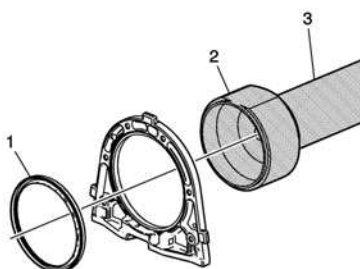
5. Remove the upper oil pan to crankshaft rear oil seal housing bolts (1).



6. Remove the rear oil seal housing bolts (1).



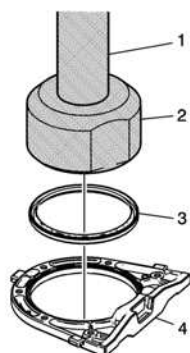
7. Remove the rear oil seal housing (1) and gasket (2).



Note: The crankshaft rear oil seal must be driven out from the engine block side of the housing.

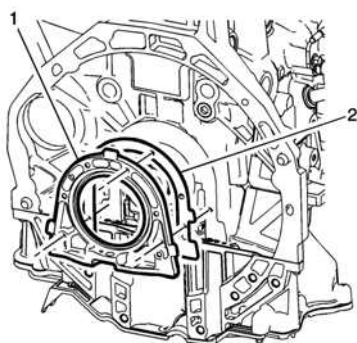
8. Remove the crankshaft rear oil seal (1) using the *EN-50026* installer (2) and *GE-8092* handle (3).

[Installation Procedure](#)

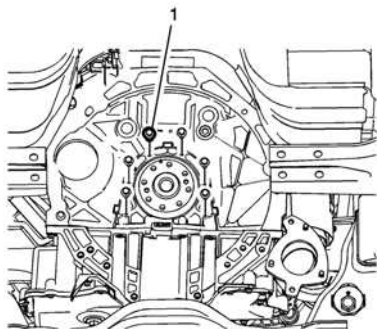


Note:

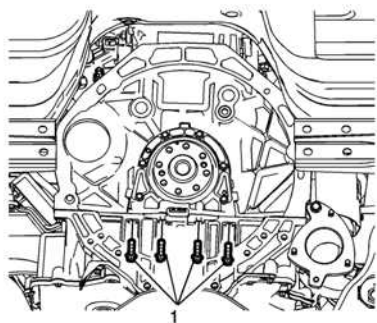
- The crankshaft rear oil seal must be installed with the cupped side of the seal facing the tool.
 - The bottom edge of the crankshaft rear oil seal housing must hang off the edge of the bench to allow it to lay flat.
1. Install the NEW crankshaft rear oil seal (3) into the crankshaft rear oil seal housing (4) using the *EN-50026* installer (2) and *GE-8092* handle (1) until the seal bottoms out on the housing.



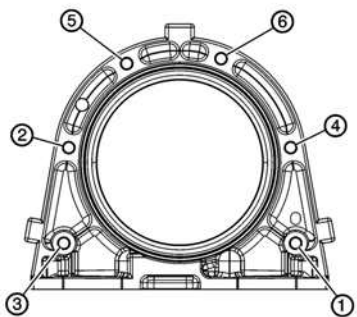
2. Install the rear oil seal housing gasket (2) and housing (1).



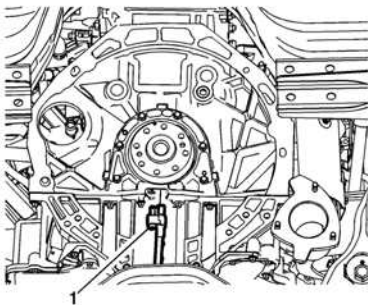
3. Install the rear oil seal housing bolts (1) and finger tight.



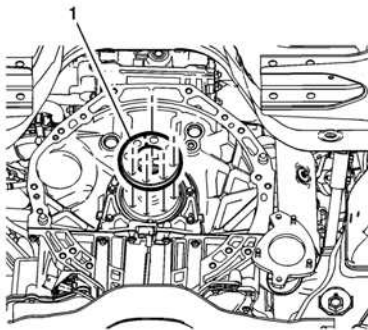
4. Install the upper oil pan to crankshaft rear oil seal housing bolts (1) and tighten to **15 Y (11 lb ft)**.



5. Tighten the crankshaft rear oil seal housing bolts in sequence to **15 Y (11 lb ft)**.



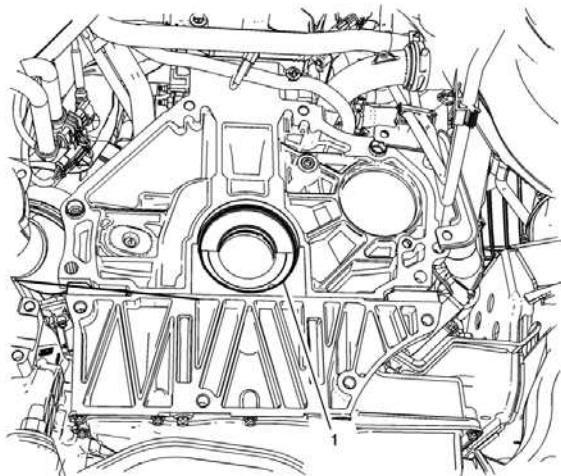
6. Install the crankshaft position sensor (1). Refer to Crankshaft Position Sensor Replacement.



7. Install the crankshaft position sensor excitor ring (1) .
8. If equipped with automatic transmission install the automatic flex plate. Refer to Automatic Transmission Flex Plate Replacement.
9. If equipped with manual transmission install the engine flywheel. Refer to Clutch Assembly Replacement.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Crankshaft Rear Oil Seal Replacement

Callout

Component Name

Preliminary Procedure

Remove the engine flywheel. Refer to Engine Flywheel Replacement.

Special Tools

3-0006775 Rear Main Seal Installer.

For equivalent regional tools, refer to Special Tools.

Crankshaft Rear Oil Seal

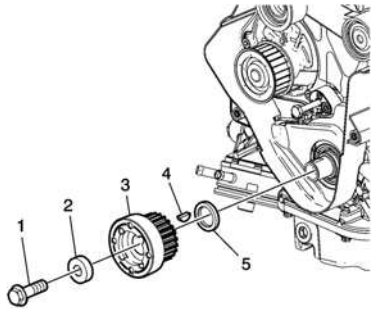
Procedure

1

1. use a suitable tool to remove the crankshaft rear oil seal (1).
2. Use 3-0006775 to install rear main seal.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Caution: Refer to Fastener Caution.

Note: Use care to properly align the keyway with the sprocket (3).

1. Install the crankshaft sprocket spacer (5) and key (4) onto the crankshaft.
 2. Install the crankshaft sprocket (3) onto the crankshaft.
 3. Install the crankshaft sprocket bolt (1) and washer (2).
 4. Tighten to **135 Y (99 lb ft)**
- Tighten the bolt an additional 30°
 - Tighten the bolt an additional 15°

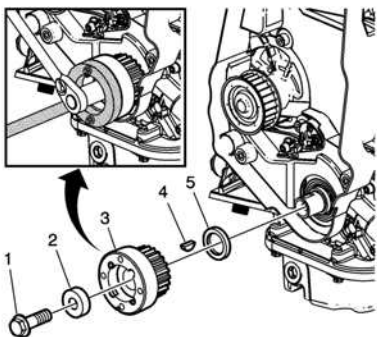
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

3-0006772 Sprocket Holder

For equivalent regional tools, refer to Special Tools.



Note: Use care to properly align the keyway with the sprocket (3).

1. Install the crankshaft sprocket spacer (5) and key (4) onto the crankshaft.
2. Install the crankshaft sprocket (3) onto the crankshaft.
3. Using the 3-0006772 holder, install the crankshaft sprocket bolt (1) and washer (2).

Caution: Refer to Fastener Caution.

4. Tighten to **135 Y (99 lb ft)**

- Tighten the bolt an additional 30°
- Tighten the bolt an additional 15°

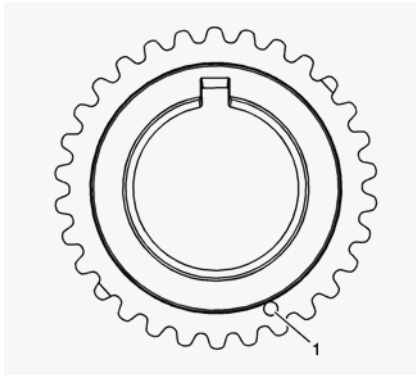
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

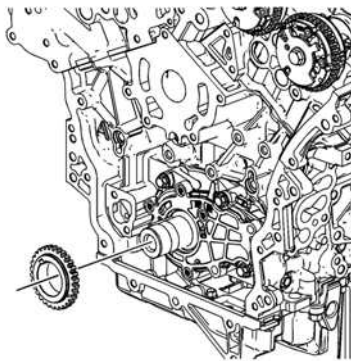
Special Tools

EN-48589 Crankshaft Rotation Socket

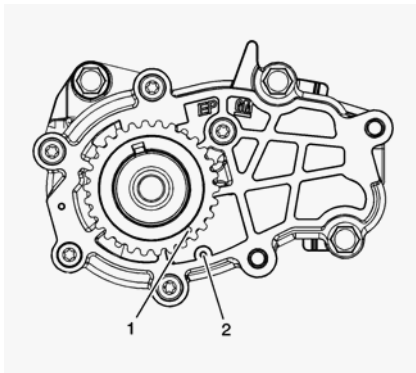
For equivalent regional tools, refer to Special Tools.



1. Ensure the crankshaft sprocket is installed with the timing mark (1) visible.



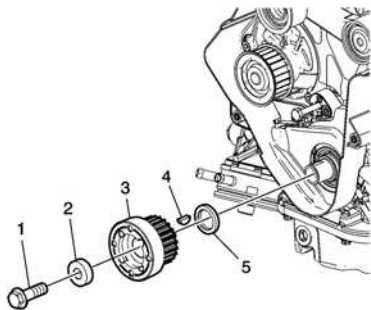
2. Install the crankshaft sprocket onto the nose of the crankshaft.
3. Align the notch in the crankshaft sprocket with the pin in the crankshaft.
4. Slide the crankshaft sprocket on the crankshaft nose until the crankshaft sprocket contacts the step in the crankshaft.



5. Ensure the crankshaft is in the stage one timing position with the crankshaft sprocket timing mark (1) aligned to the stage one timing mark on the oil pump cover (2) using the EN-48589 socket . Refer to Timing Chain Alignment Diagram.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



1. Remove the crankshaft sprocket bolt (1) and washer (2).
2. Remove the crankshaft sprocket (3).
3. Remove the crankshaft sprocket key (4) and spacer (5).

2013 Chevrolet Colorado

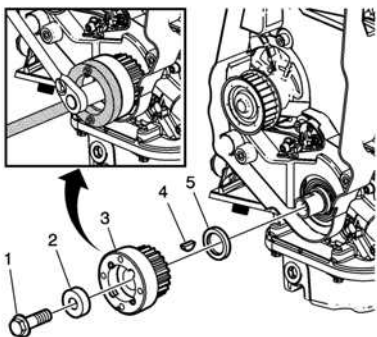
Submodel: | Engine Type: | Liters:

Fuel Delivery: | Fuel:

Special Tools

3-0006772 Sprocket Holder

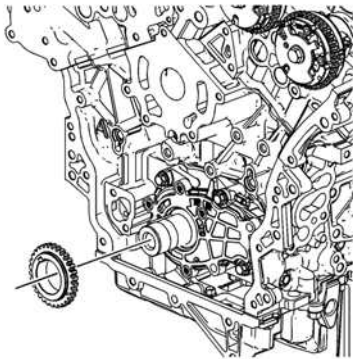
For equivalent regional tools, refer to Special Tools.



1. Using the 3-0006772 holder, remove the crankshaft sprocket bolt (1) and washer (2).
2. Remove the crankshaft sprocket (3).
3. Remove the crankshaft sprocket key (4) and spacer (5).

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



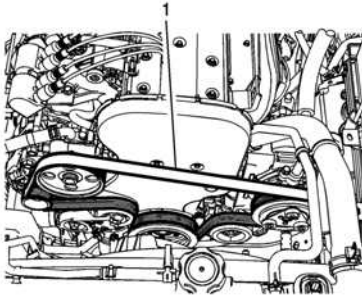
Remove the crankshaft sprocket from the nose of the crankshaft.

2013 Chevrolet Colorado

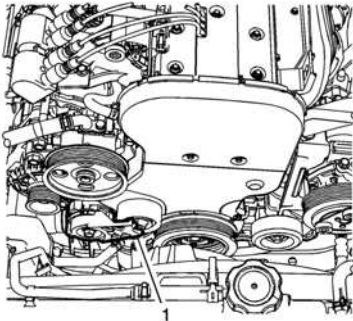
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

[Removal Procedure](#)

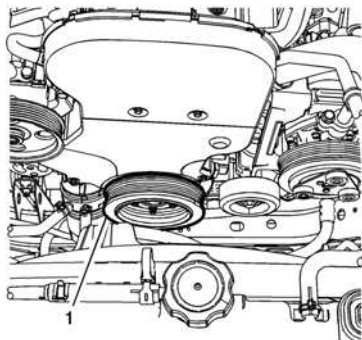
1. Remove the air cleaner outlet duct. Refer to Air Cleaner Outlet Duct Replacement



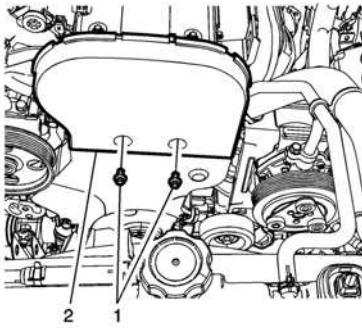
2. Remove the drive belt (1). Refer to Drive Belt Replacement.



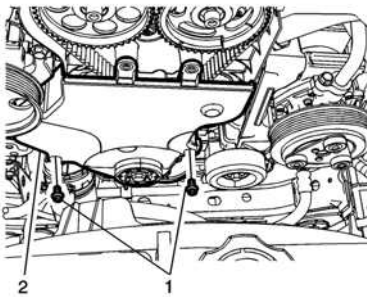
3. Remove the drive belt tensioner (1). Refer to Drive Belt Tensioner Replacement.



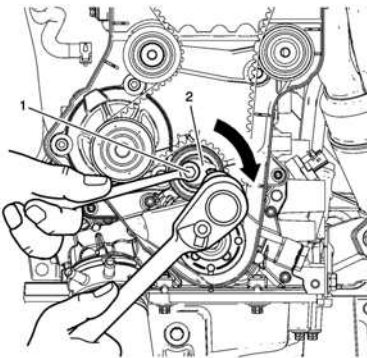
4. Remove the crankshaft pulley (1). Refer to Crankshaft Pulley Replacement.



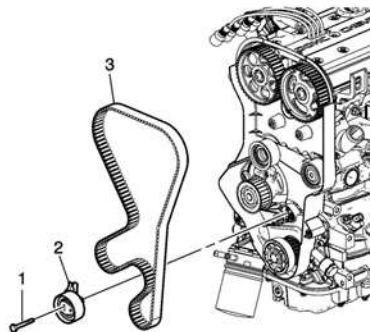
5. Remove the front upper timing cover fastener (1).
6. Remove the front upper timing cover (2)



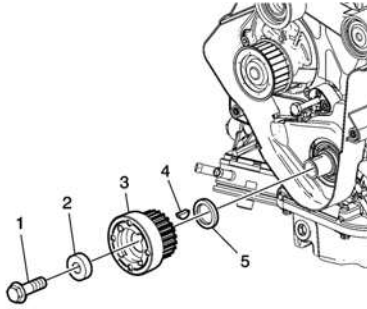
7. Remove the front lower timing cover fastener (1).
8. Remove the front lower timing cover (2).



9. Hold the tensioner adjustment lever (2), while loosening the timing belt tensioner bolt (1).
10. Slowly rotate the tensioner clockwise to remove tension from the belt.

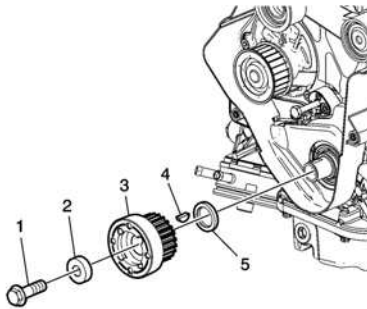


11. Remove the timing belt (3).
12. Remove the tensioner bolt (1) and tensioner (2).



13. Remove the crankshaft sprocket bolt (1) and washer (2).
14. Remove the crankshaft sprocket (3).
15. Remove the crankshaft sprocket key (4) and spacer (5).

[Installation Procedure](#)



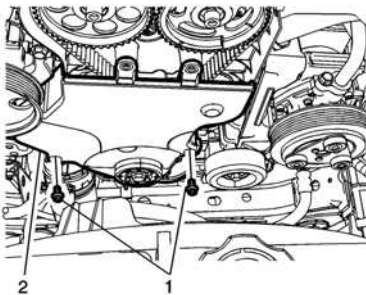
Note: Use care to properly align the keyway with the sprocket (3).

1. Install the crankshaft sprocket spacer (5) and key (4) onto the crankshaft.
2. Install the crankshaft sprocket (3) onto the crankshaft.
3. Install the crankshaft sprocket bolt (1) and washer (2).

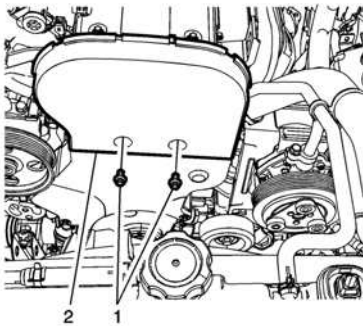
Caution: Refer to Fastener Caution.

4. Tighten to fastener the following.

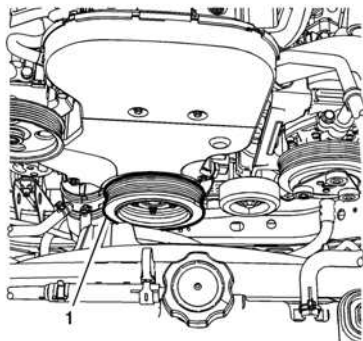
- First pass **135 Y (99 lb ft)**.
- Second pass additional 30°.
- Final pass additional 15°.
- For timing belt installation. Refer to Timing Belt Installation.



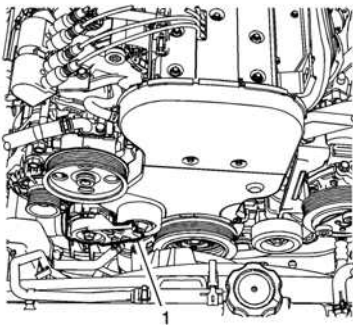
- Install the front lower timing cover (2).
- Install the front lower timing cover fastener (1) and tighten to **6 Y (53 lb in)**.



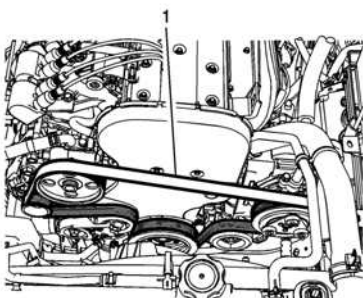
- Install front upper timing cover (2).
- Install front upper timing cover fastener (1) and tighten to **6 Y (53 lb in)**.



- Install the crank pulley (1). Refer to Crankshaft Pulley Replacement.



- Install the drive belt tensioner (1). Refer to Drive Belt Tensioner Replacement



- Install drive belt (1). Refer to Drive Belt Replacement.
- Install the air cleaner outlet duct. Refer to Air Cleaner Outlet Duct Replacement

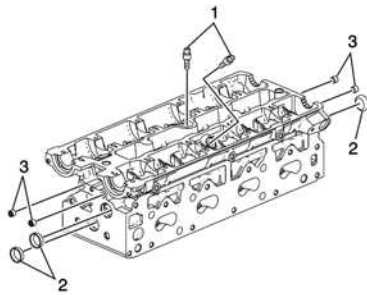
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- EN-70006798 Valve Spring Compressor
- EN-0606050 Device to Remove and Install the Valve Springs
- EN-0606052 Valve Seals Installer
- EN-730651 Spark Plug Wrench

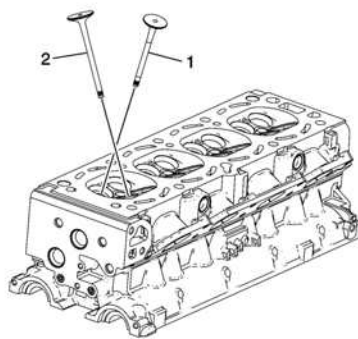
For equivalent regional tools, refer to Special Tools.



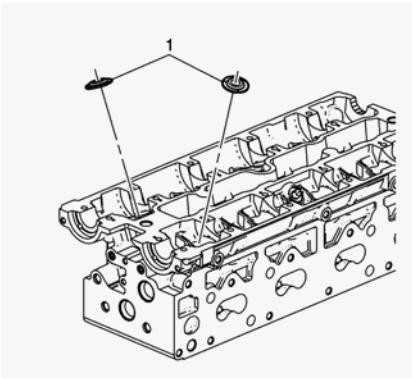
Caution: In order to avoid damage, install the spark plugs after the cylinder head has been installed on the engine.

1. Install NEW cylinder head oil gallery air bleed orifices (1) and tighten to **20 Y (15 lb ft)**.
2. Install NEW Core hole plugs (2), and oil gallery plugs (3). Coat the plugs with sealer. Refer to Adhesives, Fluids, Lubricants, and Sealers.
3. Inspect the valve springs for the following conditions:

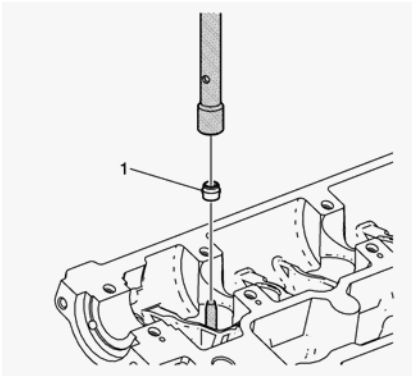
- Expanded height
- Unparallel spring ends
- Spring tension
- Any distorted springs should be replaced



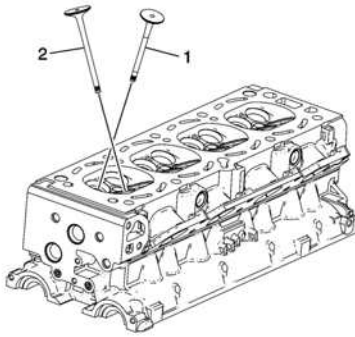
- Assemble the valves (1) and (2).
- Use the following steps to measure valve runout:
 1. Apply a dab of Prussian blue on the entire valve face. Seat the valve but do not rotate it. The Prussian blue traces transferred to the valve seat are an indication of concentricity of the valve seat.
 2. Clean all traces of Prussian blue.
 3. Apply a dab of Prussian blue on the valve seat and repeat the check. The traces of Prussian blue transferred to the valve face indicates valve face concentricity.
- Replace the valves (1) and (2), if required.



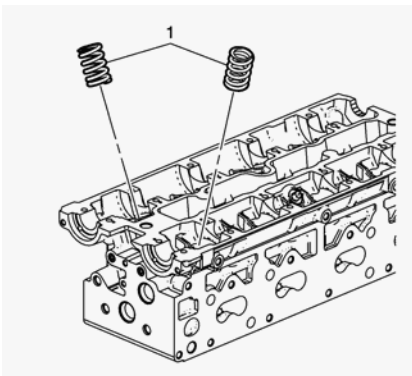
- Install the valve spring seats (1)



- Install the new valve seals (1) using the EN-0606052 installer. Fully seat the seals on the valve guides.

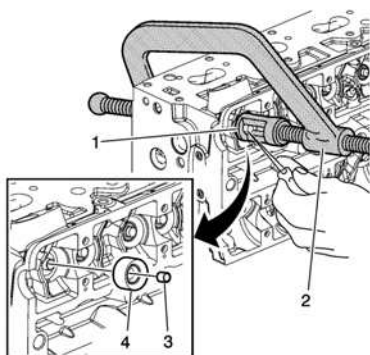


- Install the valves (1 and 2)

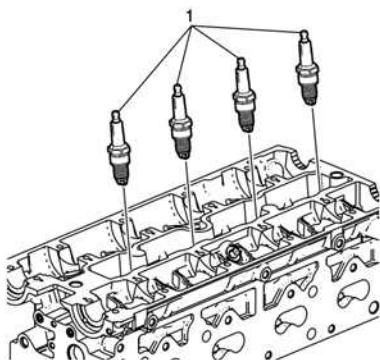


- Install the springs (1).

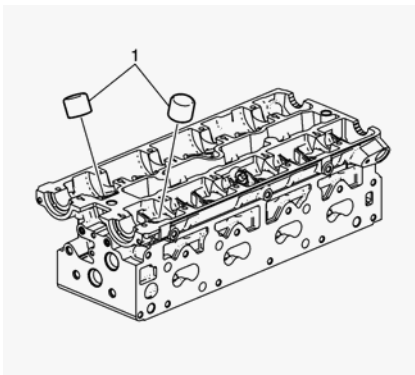
Cylinder Head Assemble (LE6)



- Install the retainers (4).
- Using the *EN-70006798* compressor (2) and the *EN-0606050* remover (1), compress the valve spring.
- Install the valve keys (3).
- Slowly release the *7-0006798* compressor and the *X-0606050* remover from the valve/spring assembly.
- Inspect for proper valve key seating.



- Install the spark plugs (1) into the cylinder head and tighten to **25 Y (18 lb ft)**. Use *EN-730651* Spark Plug Wrench.



Note:

- Do not stroke/cycle the stationary hydraulic lash adjuster plunger without oil in the lower pressure chamber.
- Do not allow the stationary hydraulic lash adjuster to tip over, plunger down, after the oil fill.
- Install the valve lifters (1) into their bores in the cylinder head. Lubricate the valve lifters. Refer to *Adhesives, Fluids, Lubricants, and Sealers*.

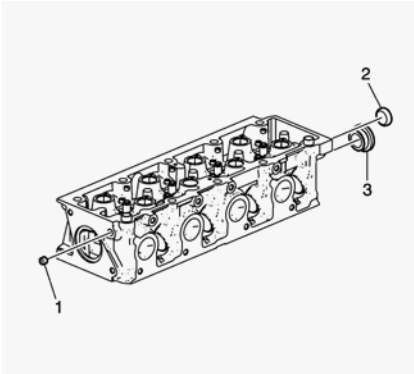
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- 7-0006798 Valve Spring Compressor
- X-0606050 Device to Remove and Install the Valve Springs
- X-0606052 Valve Seals Installer

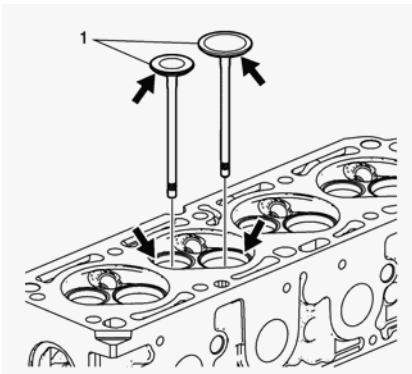
For equivalent regional tools, refer to Adhesives, Fluids, Lubricants, and Sealers.



Caution: In order to avoid damage, install the spark plugs after the cylinder head has been installed on the engine.

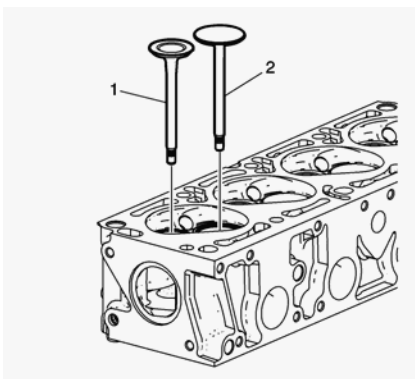
1. Install NEW cylinder head oil gallery plugs (1) and core hole plugs (2 and 3). Coat the plugs with sealer. Refer to Adhesives, Fluids, Lubricants, and Sealers.
2. Inspect the valve springs for the following conditions:

- Expanded height
- Unparallel spring ends
- Spring tension
- Any distorted springs should be replaced

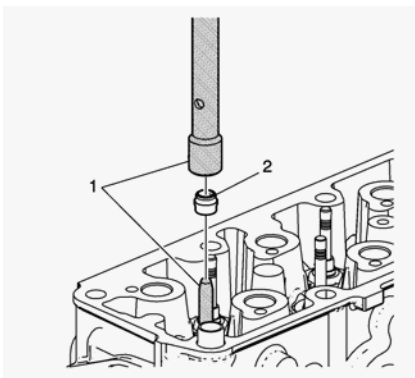


- Assemble the valves (1).
- Use the following steps to measure valve runout:

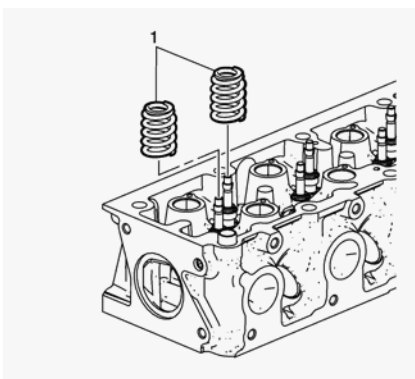
1. Apply a dab of Prussian blue on the entire valve face. Seat the valve but do not rotate it. The Prussian blue traces transferred to the valve seat are an indication of concentricity of the valve seat.
2. Clean all traces of Prussian blue.
3. Apply a dab of Prussian blue on the valve seat and repeat the check. The traces of Prussian blue transferred to the valve face indicates valve face concentricity.



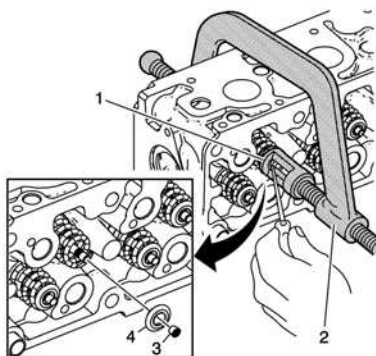
- Replace the valves (1) and (2), if required.



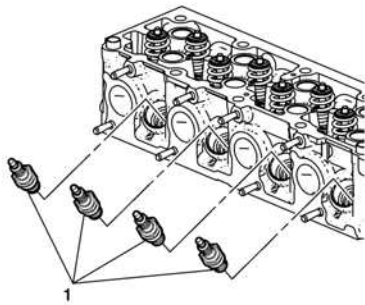
- Install the new valve seals (2) using the X-0606052 installer (1). Fully seat the seals on the valve guides.



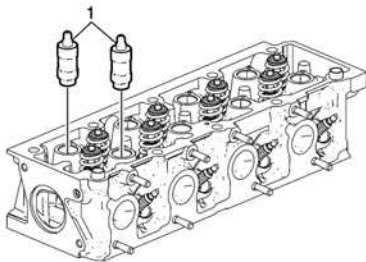
- Install the springs (1).



- Install the retainers (4).
- Using the 7-0006798 compressor (2) and the X-0606050 remover (1), compress the valve spring.
- Install the valve keys (3).
- Slowly release the 7-0006798 compressor and the X-0606050 remover from the valve/spring assembly.
- Inspect for proper valve key seating.

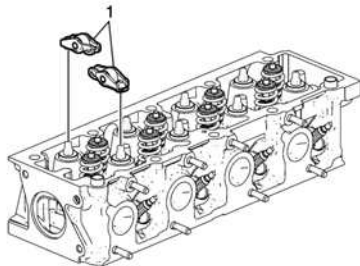


- Install the spark plugs (1) into the cylinder head and tighten to **25 Y (18.4 lb ft)**.



Note:

- Do not stroke/cycle the stationary hydraulic lash adjuster plunger without oil in the lower pressure chamber.
- Do not allow the stationary hydraulic lash adjuster to tip over, plunger down, after the oil fill.
- Install the valve lifters (SHLAs) (1) into their bores in the cylinder head. Lubricate the valve lifters. Refer to Adhesives, Fluids, Lubricants, and Sealers.



Note: Used valve lifter rollers must be returned to the original position on the camshaft. If the camshaft is being replaced, the valve lifter rollers must also be replaced.

- Install the valve lifter rollers (1). Position the valve lifter rollers on the tip of the valve stem and on the valve lifter. Lubricate the valve lifter rollers. Refer to Adhesives, Fluids, Lubricants, and Sealers.

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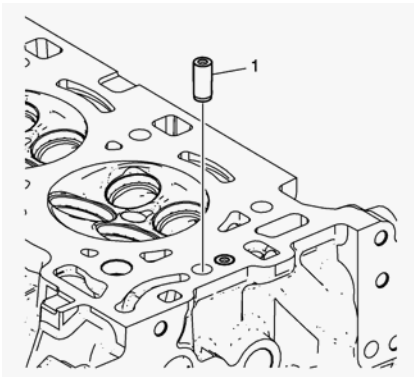
Submodel: | Engine Type: | Liters:

Fuel Delivery: | Fuel:

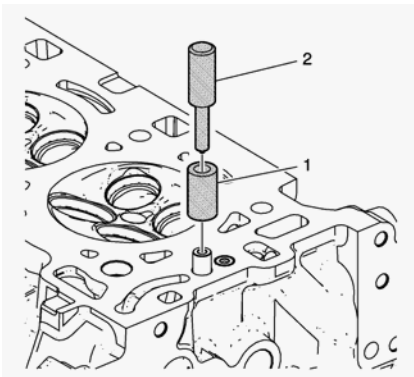
Special Tools

- EN 8062 Valve Spring Compressor – Head Off
- EN 46116 Valve Stem Seal Remover/Installer
- EN 46117 Valve Stem Key Remover/Installer
- EN 46119 Off-Vehicle Valve Spring Compressor Adapter
- EN 46122 Camshaft Position Actuator Check-Ball Valve Remover/Installer

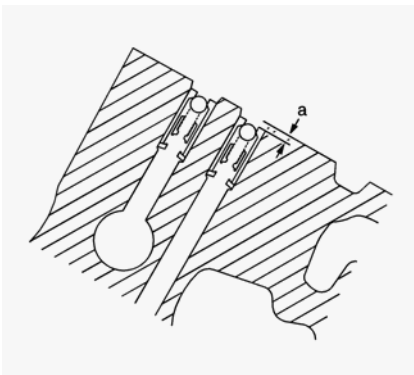
For equivalent regional tools, refer to Special Tools.



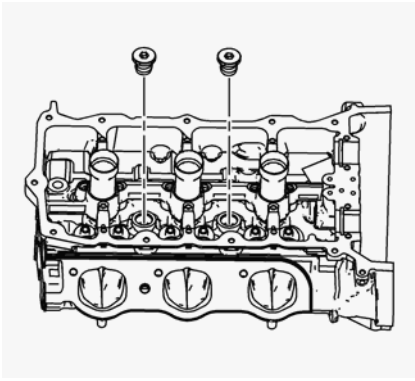
1. Use lubricant included with EN 46122 remover/installer to lubricate outside of new check valve (1).
2. With the check ball end of the check valve facing UP, away from the head, insert the NEW check valve into the check valve bore in the cylinder head.



3. Place collar EN 46122-2 (1) over the new check valve with the slightly-larger inside diameter of the collar DOWN toward the cylinder head.
4. Using the driver EN 46122-1 (2), lightly tap the new check valve into place until the driver stops against the top of the collar.

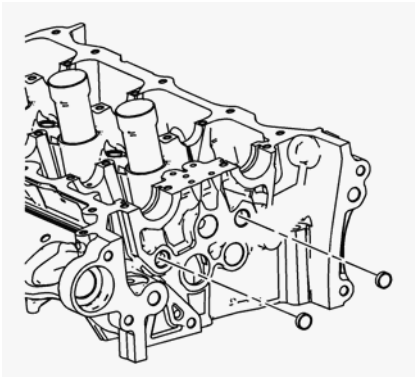


5. Inspect the camshaft position actuator oil feed check valves in order to ensure they are properly installed in the cylinder head. The camshaft position actuator oil feed check valve should be flush to 2 mm (0.0787 in) below the cylinder head deck surface (a).

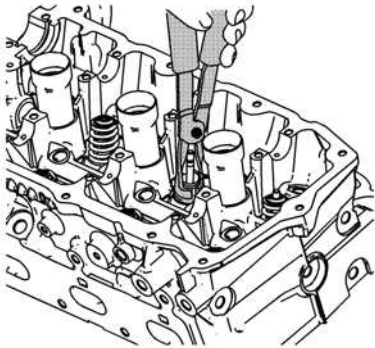


Caution: Refer to Fastener Caution.

6. Install the cylinder head coolant threaded plugs and tighten to 31 Y (23 lb ft).



7. Install the NEW cylinder head oil gallery expansion plugs.



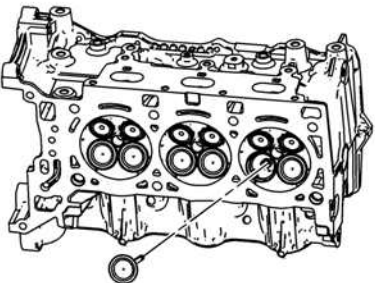
8. Place the valve stem oil seals onto the guides.

Note: NEVER reuse a valve stem oil seal. Always use new seals when assembling the cylinder head.

9. Mount a new valve stem oil seal using the EN 46116 remover/installer .

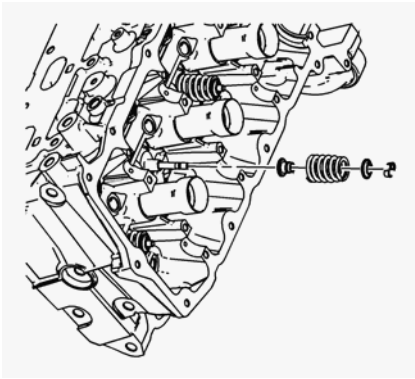
Note: Force should only be applied to the valve spring contact area of the new valve stem oil seal during installation.

10. Push and twist the valve stem oil seal into position on the valve guide until the seal positively locks on the guide using the EN 46116 remover/installer .
11. Lubricate the valve stem and valve guide ID with clean engine oil GM P/N 12345501 (Canadian P/N 992704) or equivalent.

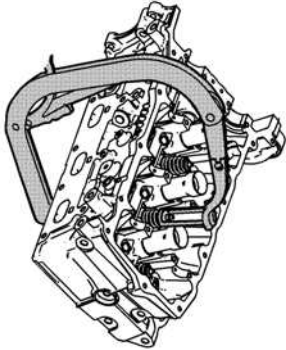


Note: The valve stem oil seal must not come loose from the valve guide when the valve is installed.

12. Insert the valve into the valve guide until it bottoms on the valve seat.



13. Position the valve spring on the spring seat.
14. Place the valve spring retainer onto the valve spring.



Warning: Compressed valve springs have high tension against the valve spring compressor. Valve springs that are not properly compressed by or released from the valve spring compressor can be ejected from the valve spring compressor with intense force. Use care when compressing or releasing the valve spring with the valve spring compressor and when removing or installing the valve stem keys. Failing to use care may cause personal injury.

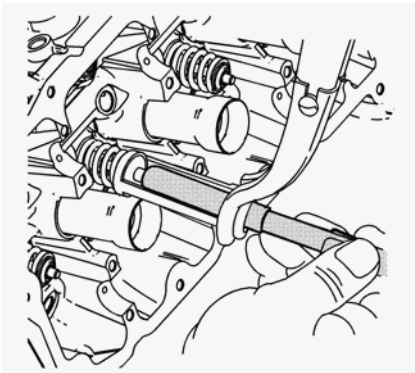
Caution: Do not compress the valve springs to less than 24.0 mm (0.943 in). Contact between the valve spring retainer and the valve stem oil seal can cause potential valve stem oil seal damage.

15. Compress the valve spring using the *EN 8062* compressor and the *EN 46119* adapter .



Note: Ensure proper directional placement of valve keepers in the *EN 46117* remover/installer . The valve keepers must be installed with the tapered end towards the valve stem seal.

16. With the spring compressed, install the valve keepers into the *EN 46117* remover/installer .



Cylinder Head Assemble (LY7, LP1 or LWR)

17. Place the keepers into position by pushing the tool downward and releasing tension on the *EN 46119* adapter and the *J 8062* compressor .
18. Verify that the valve keepers are installed by placing a rag over the valve tip and tapping with a dead-blow hammer. The valve keepers and the spring should remain in place.

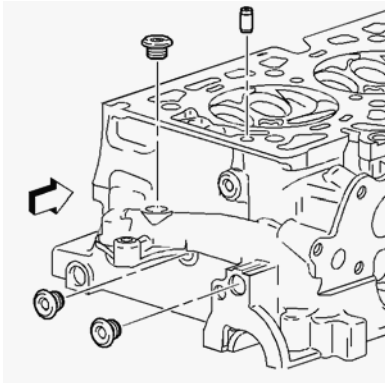
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

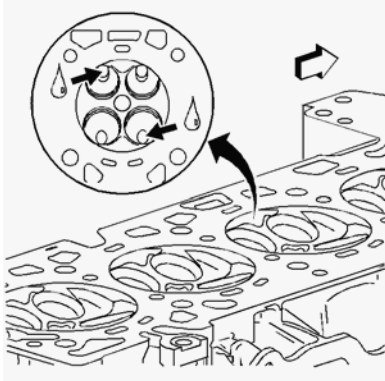
Special Tools

- J 8062 Valve Spring Compressor
- J 9666 Valve Spring Tester
- EN 50031 Valve Spring Compressor (off-vehicle)
- EN 50723 Valve Seal Installer

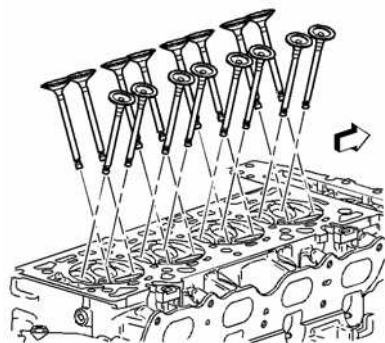
For equivalent regional tools, refer to Special Tools



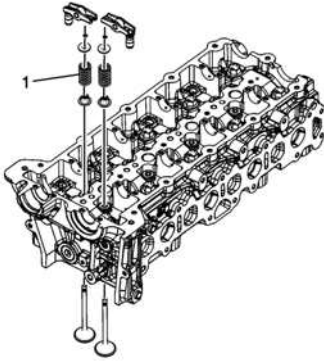
1. Install NEW cylinder head plugs. Coat the plugs with sealer GM P/N 12345382 (Canadian P/N 10953489) or equivalent.



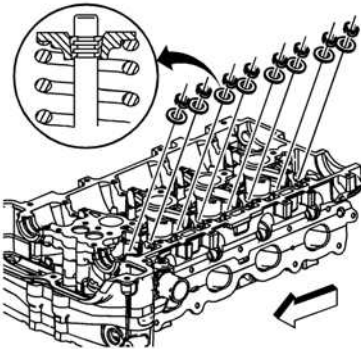
2. Assemble the valves.
3. Use the following steps to measure valve runout:
 1. Apply a dab of Prussian blue on the entire valve face. Seat the valve but do not rotate it. The Prussian blue traces transferred to the valve seat are an indication of concentricity of the valve seat.
 2. Clean all traces of Prussian blue.
 3. Apply a dab of Prussian blue on the valve seat and repeat the check. The traces of Prussian blue transferred to the valve face indicates valve face concentricity.



4. Replace the valves, if required.



5. Install the NEW valve seals using the *EN 50723* installer . Fully seat the seals on the valve guides.
6. Install the spring (1).

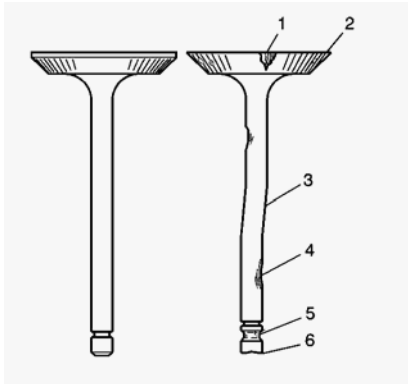


7. Install the retainer.
8. Using the *J 8062* compressor and the *EN 50031* compressor , compress the valve spring.
9. Install the valve keys.
10. Slowly release the *J 8062* compressor and the *EN 50031* compressor from the valve/spring assembly.
11. Inspect for proper valve key seating.
12. Install the remaining valves, springs, and other components.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

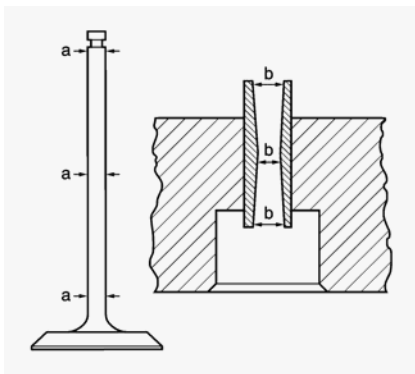
[Valve Cleaning and Inspection](#)



Note: Do not scratch the valve stem with the wire brush.

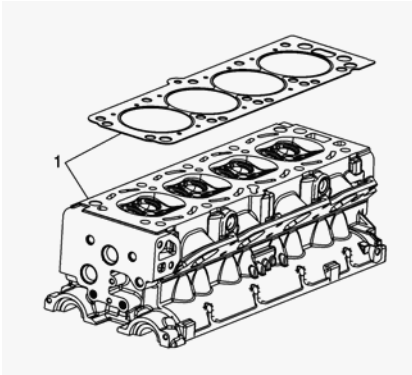
1. Clean the valves of carbon, oil and varnish. Carbon can be removed with a wire brush. Varnish can be removed by soaking in appropriate solvent.
2. Clean the valve guides.
3. Inspect the valve stem for wear (4).
4. Inspect the valve key groove for chipping or wear (5). Replace the valve if chipped or worn.
5. Inspect the valve face for burning or cracking (1). If pieces are broken off, inspect the corresponding piston and cylinder head area for damage.
6. Inspect the valve stem for burrs and scratches. Burrs and minor scratches may be removed with an oil stone.
7. Inspect the valve stem for straightness and the valve head for bending or distortion (3) using V blocks. Bent or distorted valves must be replaced.
8. Clean the deposits from the valve face. Inspect the valve face for grooving.
9. Replace the valve if the face is grooved. Valve faces cannot be machined. If worn, or damaged, the valves must be replaced.
10. The valves may be lightly lapped to the valve seats.

[Valve Guide Measurement](#)



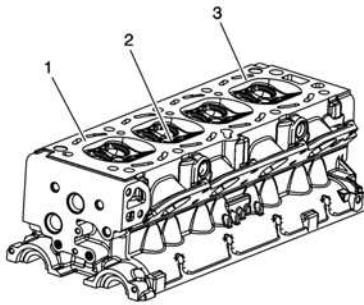
1. Measure the valve stem diameter at top, central, and lower points (a) using an adequate micrometer.
2. Measure the valve guide internal diameter at top, central, and lower points (b).
3. Calculate the difference between valve stem diameter (a) and valve guide internal diameter (b).
4. The calculated value represents the valve stem clearance at the valve guide. Refer to Engine Mechanical Specifications for proper clearance.
5. If the clearance for the valve is greater than specifications and a new standard diameter valve stem will not bring the clearance within specifications, replace the cylinder head.

[Cylinder Head and Gasket Surface Cleaning and Inspection](#)



1. Inspect the cylinder head gasket and mating surfaces (1) for leaks, corrosion and blow-by. If the gasket has failed, use the following faults to determine the cause:

1. Improper installation
2. Loose or warped cylinder head
3. Missing, off location or not fully seated dowel pins
4. Corrosion in the seal area around the coolant passages
5. Chips or debris in the cylinder head bolt holes
6. Bolt holes in the cylinder block not drilled or tapped deep enough



2. Inspect the cylinder head gasket surface.

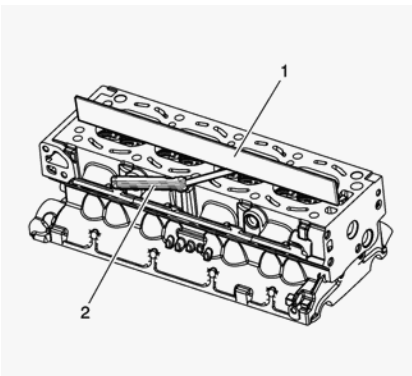
- Cylinder head may be reused if corrosion is found only outside a 4 mm (0.375 in) band around each combustion chamber (1).
- Replace the cylinder head if the area between the valve seats is cracked (2).
- Replace the cylinder head if corrosion has been found inside a 4 mm (0.375 in) band around each combustion chamber (3).

Note: Do not use a wire brush on any gasket sealing surface.

- Clean the cylinder head. Remove all varnish, soot and carbon to the bare metal.
- Clean the valve guides.
- Clean the threaded holes. Use a nylon bristle brush.
- Clean the remains of the sealer from the plug holes.
- Replace all bolts.
- Inspect the cylinder head for cracks. Check between the valve seats and in the exhaust ports.

Note: Do not attempt to weld the cylinder head, replace it.

- Inspect the cylinder head deck for corrosion, sand inclusions and blow holes.

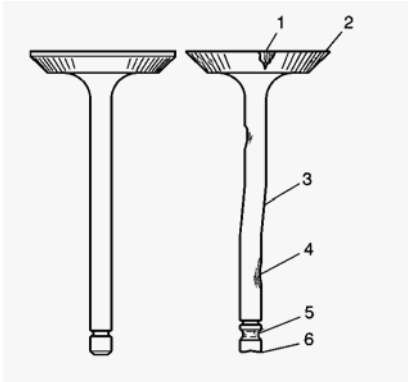


- Using a straight edge (1) and feeler gauge (2), inspect the cylinder head deck surface for flatness. Refer to Engine Mechanical Specifications. If the cylinder head is out of specification, replace the cylinder head. Do not machine the cylinder head.
- Inspect all the threaded holes for damage. Threads may be reconditioned with thread inserts.
- Inspect the sealing surfaces.

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Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

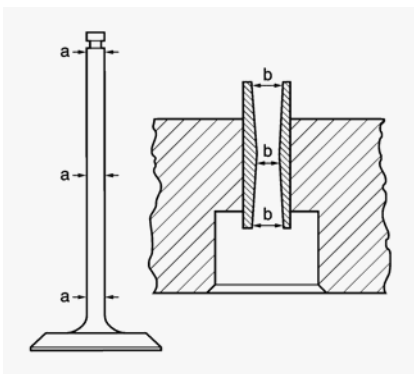
[Valve Cleaning and Inspection](#)



Note: Do not scratch the valve stem with the wire brush.

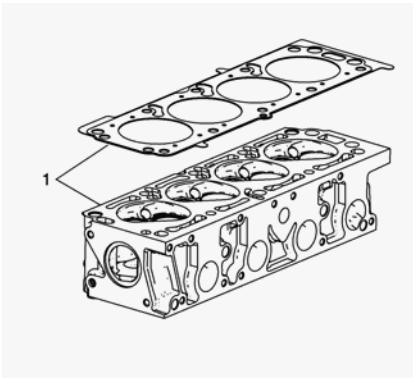
1. Clean the valves of carbon, oil and varnish. Carbon can be removed with a wire brush. Varnish can be removed by soaking in appropriate solvent.
2. Clean the valve guides.
3. Inspect the valve stem for wear (4).
4. Inspect the valve key groove for chipping or wear (5). Replace the valve if chipped or worn.
5. Inspect the valve face for burning or cracking (1). If pieces are broken off, inspect the corresponding piston and cylinder head area for damage.
6. Inspect the valve stem for burrs and scratches. Burrs and minor scratches may be removed with an oil stone.
7. Inspect the valve stem for straightness and the valve head for bending or distortion (3) using V blocks. Bent or distorted valves must be replaced.
8. Clean the deposits from the valve face. Inspect the valve face for grooving.
9. Replace the valve if the face is grooved. Valve faces cannot be machined. If worn, or damaged, the valves must be replaced.
10. The valves may be lightly lapped to the valve seats.

[Valve Guide Measurement](#)



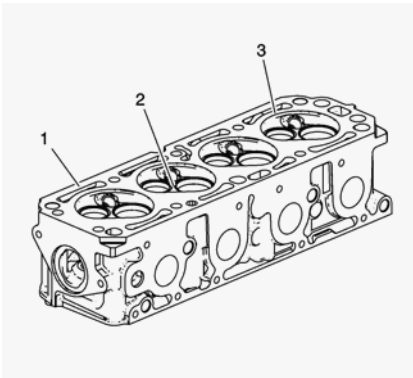
1. Measure the valve stem diameter at top, central, and lower points (a) using an adequate micrometer.
2. Measure the valve guide internal diameter at top, central, and lower points (b).
3. Calculate the difference between valve stem diameter (a) and valve guide internal diameter (b).
4. The calculated value represents the valve stem clearance at the valve guide. Refer to Engine Mechanical Specifications for proper clearance.
5. If the clearance for the valve is greater than specifications and a new standard diameter valve stem will not bring the clearance within specifications, replace the cylinder head.

[Cylinder Head and Gasket Surface Cleaning and Inspection](#)



1. Inspect the cylinder head gasket and mating surfaces (1) for leaks, corrosion and blow-by. If the gasket has failed, use the following faults to determine the cause:

1. Improper installation
2. Loose or warped cylinder head
3. Missing, off location or not fully seated dowel pins
4. Corrosion in the seal area around the coolant passages
5. Chips or debris in the cylinder head bolt holes
6. Bolt holes in the cylinder block not drilled or tapped deep enough



2. Inspect the cylinder head gasket surface.

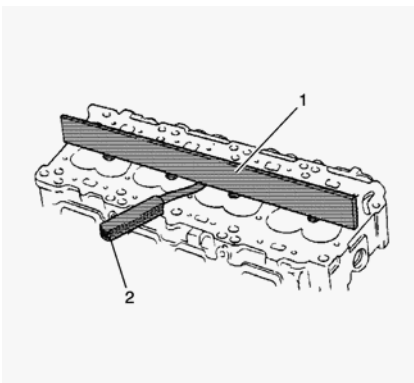
- Cylinder head may be reused if corrosion is found only outside a 4 mm (0.375 in) band around each combustion chamber (1).
- Replace the cylinder head if the area between the valve seats is cracked (2).
- Replace the cylinder head if corrosion has been found inside a 4 mm (0.375 in) band around each combustion chamber (3).

Note: Do not use a wire brush on any gasket sealing surface.

- Clean the cylinder head. Remove all varnish, soot and carbon to the bare metal.
- Clean the valve guides.
- Clean the threaded holes. Use a nylon bristle brush.
- Clean the remains of the sealer from the plug holes.
- Replace all bolts.
- Inspect the cylinder head for cracks. Check between the valve seats and in the exhaust ports.

Note: Do not attempt to weld the cylinder head, replace it.

- Inspect the cylinder head deck for corrosion, sand inclusions and blow holes.



- Using a straight edge (1) and feeler gauge (2), inspect the cylinder head deck surface for flatness. Refer to Engine Mechanical Specifications. If the cylinder head is out of specification, replace the cylinder head. Do not machine the cylinder head.
- Inspect all the threaded holes for damage. Threads may be reconditioned with thread inserts.
- Inspect the sealing surfaces.

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Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

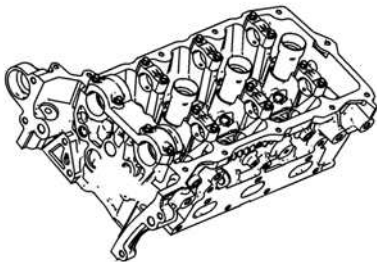
- GE 8001 Dial Indicator Set
- GE 8358 Carbon Removal Brush
- EN 28410 Gasket Remover
- EN 42096 Valve Guide Reamer

For equivalent regional tools, refer to Special Tools.

Cleaning Procedure

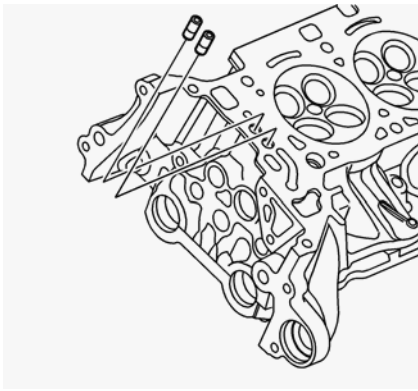
1. Remove any old thread sealant, gasket material or sealant using EN 28410 remover .
 2. Clean all cylinder head surfaces with non-corrosive solvent.
- Warning:** Refer to Safety Glasses Warning.
3. Blow out all the oil galleries using compressed air.
 4. Remove any carbon deposits from the combustion chambers using the GE 8358 brush .
 5. Clean any debris or build-up from the lifter pockets.

Visual Inspection



1. Inspect the cylinder head camshaft bearing surfaces for the following conditions:

- Excessive scoring or pitting
- Discoloration from overheating
- Deformation from excessive wear
- If the camshaft bearing journals appear to be scored or damaged, you must replace the cylinder head. DO NOT machine the camshaft bearing journals.
- If any of the above conditions exist on the camshaft bearing surfaces, replace the cylinder head.
- 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—If coolant leaks are present, measure the surface warpage as described under Cylinder Head Measurement – Deck Flatness Inspection.
 - Burrs or any defects that would degrade the sealing of the NEW secondary camshaft drive chain tensioner gasket
 - 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
- If the cylinder head is cracked or damaged, it must be replaced. No welding or patching of the cylinder head is recommended.



- Inspect the camshaft position actuator oil feed check valves. Damaged, restricted or clogged check valves must be replaced. Refer to Cylinder Head Disassemble.

[Cylinder Head Measurement](#)

Camshaft Journal Clearance

1. Install the camshaft bearing cap in the cylinder head without the camshaft.

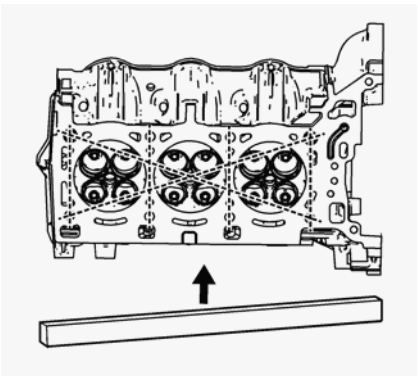
Caution: Refer to Fastener Caution.

2. Install the camshaft cap bolts and tighten to **10 Y (89 lb in)**.
3. Measure the camshaft bearings using an inside micrometer.
4. Subtract the camshaft journal diameter from the camshaft bearing diameter. This will provide the running clearance. If the running clearance exceeds specifications and the camshaft journals are within specification, replace the cylinder head.

Camshaft Journal Alignment

1. Ensure the camshafts are serviceable.
2. Inspect the cylinder head camshaft bearing surfaces for any imperfections or scratches that could inhibit proper camshaft clearances. Repair minor imperfections or scratches.
3. Install the camshafts in the cylinder head.
4. Install the camshaft bearing caps.
5. Install the camshaft cap bolts and tighten to **10 Y (89 lb in)**.
6. Ensure the camshafts spin freely in the cylinder head. If the camshaft does not run freely, replace the cylinder head.

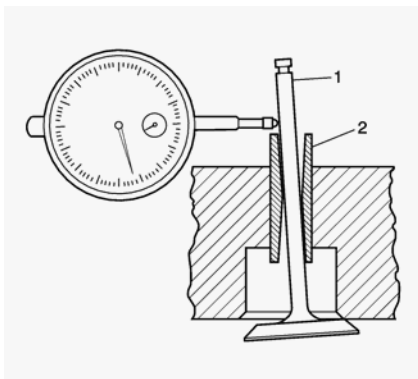
Deck Flatness Inspection



1. Ensure the cylinder head decks are clean and free of gasket material.
2. Inspect the surface for any imperfections or scratches that could inhibit proper cylinder head gasket sealing.
3. Place a straight-edge diagonally across the cylinder head deck face surface.
4. Measure the clearance between the straight-edge and the cylinder head deck face using a feeler gauge at 4 points along the straight-edge.
5. If the warp is less than 0.05 mm (0.002 in), the cylinder head deck surface does not require resurfacing.
6. If the warp is between 0.05–0.20 mm (0.002–0.008 in) or any imperfections or scratches that could inhibit proper cylinder head gasket sealing are present, the cylinder head deck surface requires resurfacing.
7. If resurfacing is required the maximum amount that can be removed is 0.25 mm (0.010 in).
8. If the cylinder head deck surface requires more than 0.25 mm (0.010 in) material removal the head must be replaced.

Valve Guide Measurement

Cylinder Head Cleaning and Inspection (LY7/LP1)



1. Measure the valve stem (1)-to-guide (2) clearance. Excessive valve stem-to-guide clearance may cause an excessive oil consumption and may also cause a valve to break. Insufficient clearance will result in noisy and sticky functioning of the valve and will disturb the engine assembly smoothness.
 2. Clamp the *GE 8001* set to the cylinder head at the camshaft cover rail.
 3. Locate the dial indicator so that the movement of the valve stem from side to side, crossways to the cylinder head, will cause a direct movement of the indicator stem. The dial indicator stem must contact the side of the valve stem just above the valve guide.
 4. Drop the valve head about 0.064 mm (0.0025 in) off the valve seat.
 5. Use light pressure when moving the valve stem from side to side in order to obtain a clearance reading. Refer to Engine Mechanical Specifications for proper clearance.
- If the clearance for the valve is greater than specifications and a new standard diameter valve stem will not bring the clearance within specifications, the valve guide may be oversized by 0.075 mm (0.003 in) using the *EN 42096* reamer . There is 1 size of oversized valve stem available for service.
 - Valve guide wear at the bottom 10 mm (0.390 in) of the valve guide is not significant to normal operation.
 - If oversizing the guide does not bring the clearance within specifications, replace the cylinder head.

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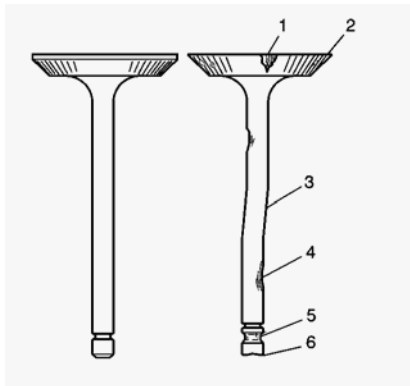
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

J 7872 Magnetic Base Dial Indicator

For equivalent regional tools, refer to Special Tools

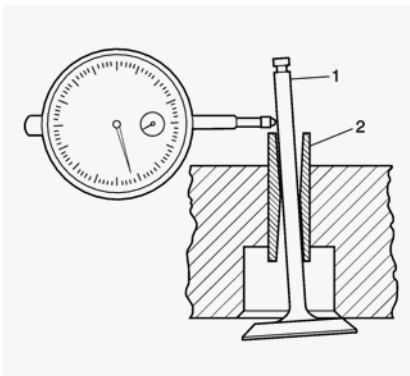
[Valve Cleaning and Inspection](#)



Note: Do not scratch the valve stem with the wire brush.

1. Clean the valves of carbon, oil and varnish. Carbon can be removed with a wire brush. Varnish can be removed by soaking in Parts Immersion Solvent GM P/N 12345368 (Canadian P/N 10953514) or equivalent.
2. Clean the valve guides.
3. Inspect the valve stem for wear (4).
4. Inspect the valve keeper groove for chipping or wear (5). Replace the valve if chipped or worn.
5. Inspect the valve face for burning or cracking (1). If pieces are broken off, inspect the corresponding piston and cylinder head area for damage.
6. Inspect the valve stem for burrs and scratches. Burrs and minor scratches may be removed with an oil stone.
7. Inspect the valve stem for straightness and the valve head for bending or distortion (3) using V blocks. Bent or distorted valves must be replaced.
8. Clean the deposits from the valve face. Inspect the valve face for grooving.
9. Replace the valve if the face is grooved. Valve faces cannot be machined. If worn, or damaged, the valves must be replaced.
10. The valves may be lightly lapped to the valve seats.

[Valve Guide Measurement](#)



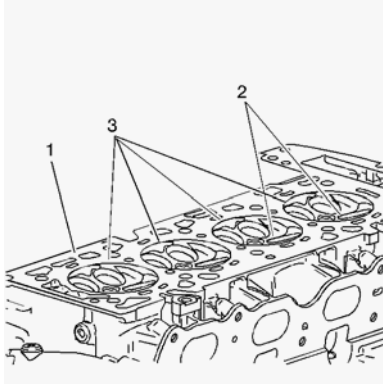
1. Measure the valve stem (1)-to-guide (2) clearance. Excessive valve stem-to-guide clearance may cause an excessive oil consumption and may also cause a valve to break. Insufficient clearance will result in noisy and sticky functioning of the valve and will disturb the engine assembly smoothness.
2. Clamp the J 7872 indicator to the cylinder head at the camshaft cover rail.
3. Locate the dial indicator so that the movement of the valve stem from side to side, crossways to the cylinder head, will cause a direct movement of the indicator stem. The dial indicator stem must contact the side of the valve stem just above the valve guide.
4. Drop the valve head about **0.064 mm (0.0025 in)** off the valve seat.
5. Use light pressure when moving the valve stem from side to side in order to obtain a clearance reading. Refer to Engine Mechanical Specifications for proper clearance.

Note: Valve guide wear at the bottom **10 mm (0.390 in)** of the valve guide is not significant to normal operation.

6. If the clearance for the valve is greater than specifications and a new standard diameter valve stem will not bring the clearance within specifications, replace the cylinder head.

Cylinder Head and Gasket Surface Cleaning and Inspection

1. Inspect the cylinder head gasket and mating surfaces for leaks, corrosion and blow-by. If the gasket has failed, use the following faults to determine the cause:
 1. Improper installation
 2. Loose or warped cylinder head
 3. Missing, off location, or not fully seated dowel pins
 4. Corrosion in the seal area around the coolant passages
 5. Chips or debris in the cylinder head bolt holes
 6. Bolt holes in the cylinder block not drilled or tapped deep enough



2. Inspect the cylinder head gasket surface.

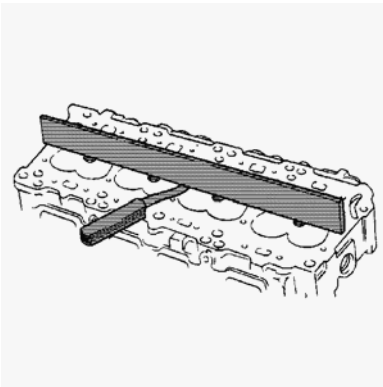
- Cylinder head may be reused if corrosion is found only outside a **4 mm (0.375 in)** band around each combustion chamber (1).
- Replace the cylinder head if the area between the valve seats is cracked (2).
- Replace the cylinder head if corrosion has been found inside a **4 mm (0.375 in)** band around each combustion chamber (3).
- Clean the cylinder head bolts.

Note: Do not use a wire brush on any gasket sealing surface.

- Clean the cylinder head. Remove all varnish, soot and carbon to the bare metal.
- Clean the valve guides.
- Clean the threaded holes. Use a nylon bristle brush.
- Clean the remains of the sealer from the plug holes.
- Inspect the cylinder head bolts for damaged threads or stretching and damaged heads caused by improper use of tools.
- Replace all suspect bolts.
- Inspect the cylinder head for cracks. Check between the valve seats and in the exhaust ports.

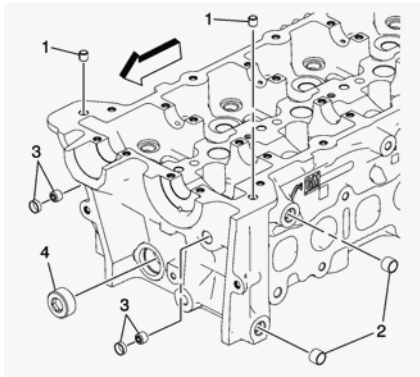
Note: Do not attempt to weld the cylinder head, replace it.

- Inspect the cylinder head deck for corrosion, sand inclusions and blow holes.



- Inspect the cylinder head deck surface for flatness. Refer to Engine Mechanical Specifications. If the cylinder head is out of specification, replace the cylinder head. Do not machine the cylinder head.
- Inspect all the threaded holes for damage. Threads may be reconditioned with thread inserts.
- Inspect the sealing surfaces.

Cylinder Head Cleaning and Inspection



- Inspect the cylinder head plugs.

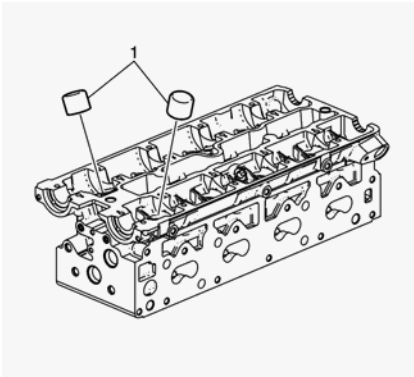
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

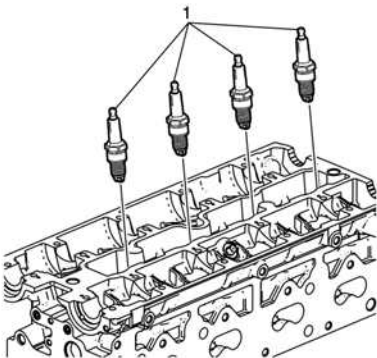
Special Tools

- EN-70006798 Valve Spring Compressor
- EN-0606050 Device to Remove and Install the Valve Springs
- EN-50889 Pliers to Remove the Valve Seals
- EN-730651 Spark Plug Wrench

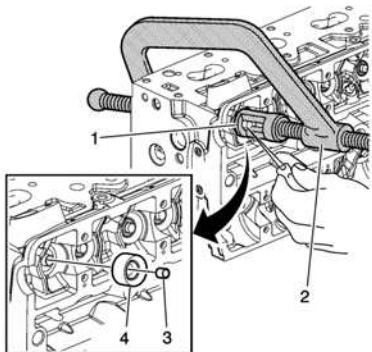
For equivalent regional tools, refer to Special Tools.



1. Remove the valve lifters (1) from the cylinder head. If the lifters are to be reused, keep in order so they can be reinstalled in the same position.

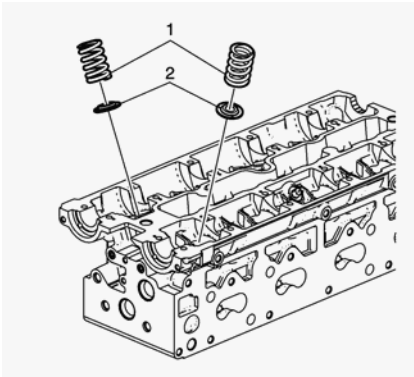


2. Remove the spark plugs (1) from the cylinder head. Use EN-730651 Spark Plug Wrench or appropriate tool.

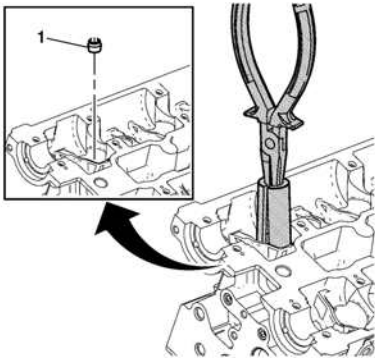


Note: Ensure that the valve train components are kept together and identified in order for proper re-installation in their original position.

3. Using the EN-70006798 compressor (2) and the EN-0606050 remover (1), compress the valve spring.
4. Remove the valve keys (3).
5. Slowly release the EN-70006798 compressor and the EN-0606050 remover from the valve spring assembly.
6. Remove the retainer (4).

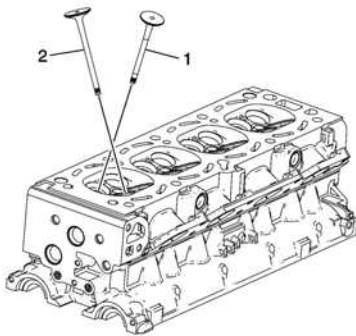


7. Remove the springs (1) and seats (2).

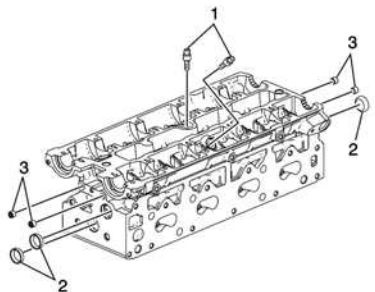


Caution: Do not damage the valve guide. Remove any burrs that have formed at the key groove by chamfering the valve stem with an oil stone or a file.

8. Remove the valve seals (1). Use the *EN-50889* pliers. Do not reuse.



9. Remove the valves (1) and (2).



10. Remove the cylinder head oil gallery air bleed orifices (1), core hole plugs (2), and oil gallery plugs (3).

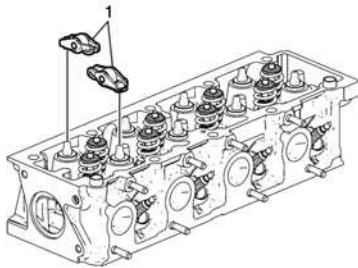
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- 7-0006798 Valve Spring Compressor
- X-0606050 Device to Remove and Install the Valve Springs
- X-0606051 Pliers to Remove the Valve Seals

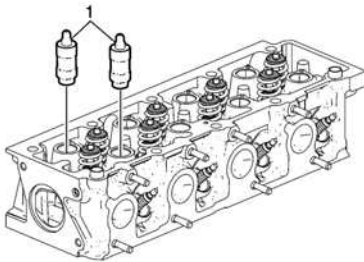
For equivalent regional tools, refer to Special Tools.



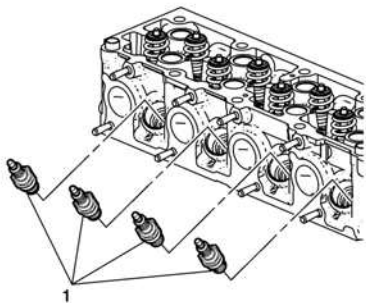
1. Remove the valve lifter rollers (1) from the cylinder head. If the lifters are to be reused, keep in order so they can be reinstalled in the same position.

Note:

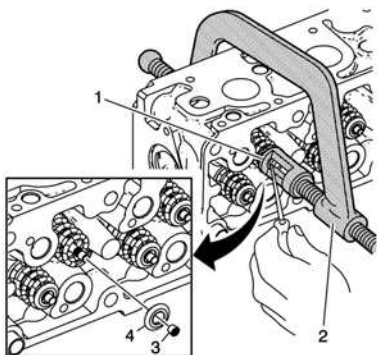
- Do not stroke/cycle the stationary hydraulic lash adjuster plunger without oil in the lower pressure chamber.
- Do not allow the stationary hydraulic lash adjuster to tip over, plunger down, after the oil fill.



2. Remove the valve lifters (SHLAs) (1) from the cylinder head. If the lifters are to be reused keep in order so they can be reinstalled in the same position.

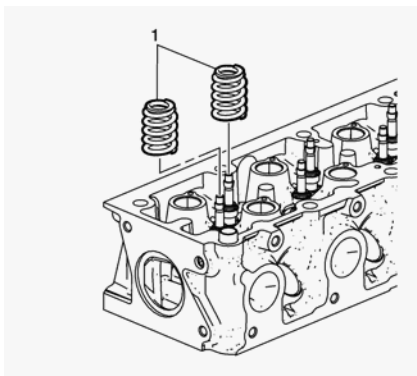


3. Remove the spark plugs (1) from the cylinder head.

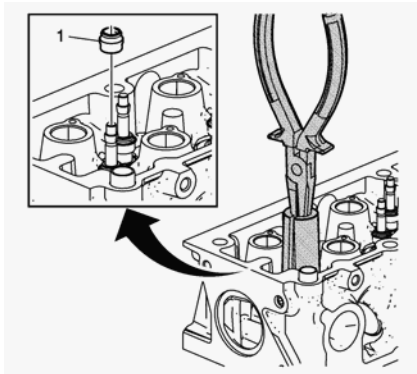


Note: Ensure that the valve train components are kept together and identified in order for proper re-installation in their original position.

4. Using the 7-0006798 compressor (2) and the X-0606050 remover (1), compress the valve spring.
5. Remove the valve keys (3).
6. Slowly release the 7-0006798 compressor and the X-0606050 remover from the valve spring assembly.
7. Remove the retainer (4).

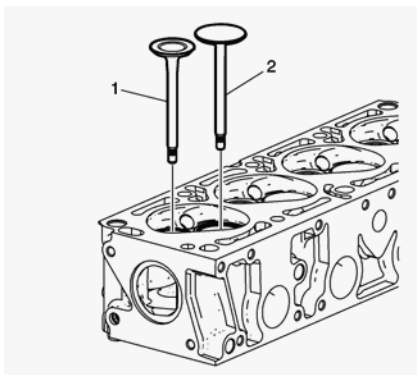


8. Remove the springs (1).



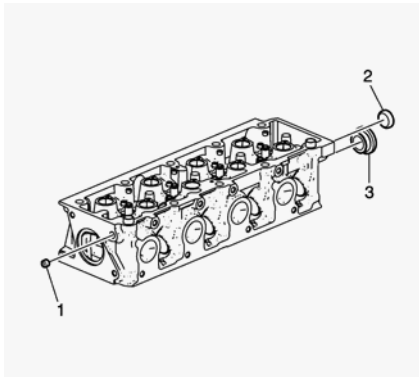
Caution: Do not damage the valve guide. Remove any burrs that have formed at the key groove by chamfering the valve stem with an oil stone or a file.

9. Remove the valve seals (1). Use the X-0606051 pliers. Do not reuse.



10. Remove the valves (1) and (2).

Cylinder Head Disassemble (LP8)



11. Remove the cylinder head oil gallery plugs (1) and core hole plugs (2) and (3).

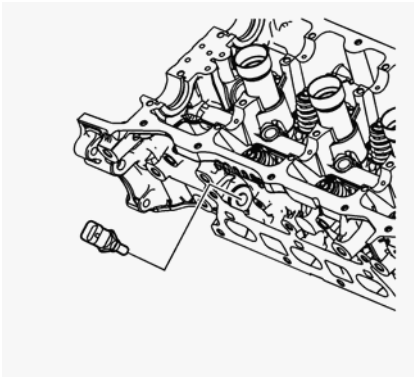
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

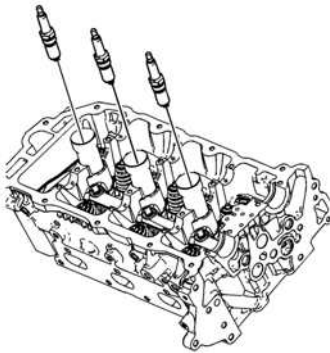
Special Tools

- EN 8062 Valve Spring Compressor - Head Off
- EN 46116 Valve Stem Seal Remover/Installer
- EN 46117 Valve Stem Key Remover/Installer
- EN 46119 Off-Vehicle Valve Spring Compressor Adapter
- EN 46122 Camshaft Position Actuator Check-Ball Valve Remover/Installer

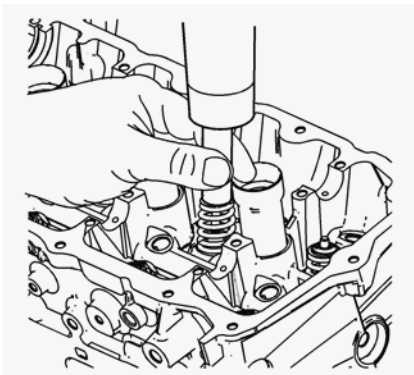
For equivalent regional tools, refer to Special Tools.



1. Remove the engine coolant temperature (ECT) sensor.

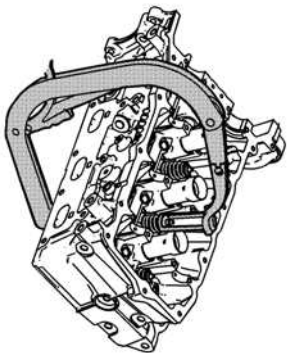


2. Remove the spark plugs.



Note: Ensure valve heads will not contact anything during the following step in order to avoid bending or damage.

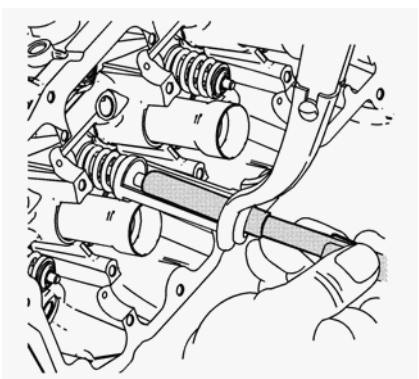
3. Using an appropriately sized deep socket and a plastic hammer, lightly tap on the valve spring retainer to loosen the valve keepers.



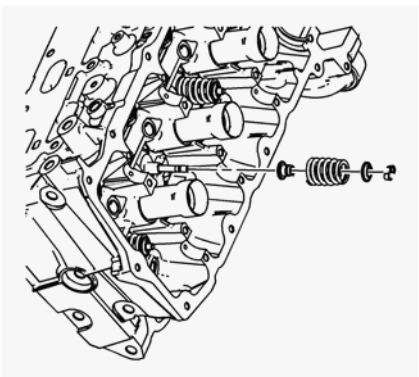
Warning: Compressed valve springs have high tension against the valve spring compressor. Valve springs that are not properly compressed by or released from the valve spring compressor can be ejected from the valve spring compressor with intense force. Use care when compressing or releasing the valve spring with the valve spring compressor and when removing or installing the valve stem keys. Failing to use care may cause personal injury.

Caution: Do not compress the valve springs to less than 24.0 mm (0.943 in). Contact between the valve spring retainer and the valve stem oil seal can cause potential valve stem oil seal damage.

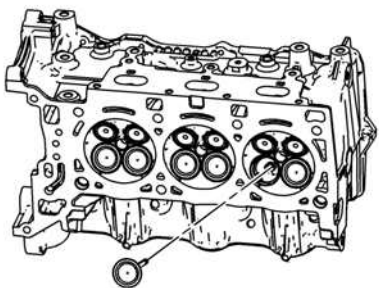
4. Compress the valve spring using the *EN 8062* compressor and the *EN 46119* adapter .



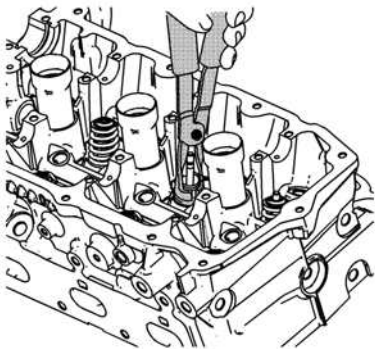
5. Use the magnet of the *EN 46117* remover/installer in order to remove the valve keepers.
6. Remove the valve spring compressor and the adapter.



7. Remove the valve spring retainer.
8. Remove the valve spring.

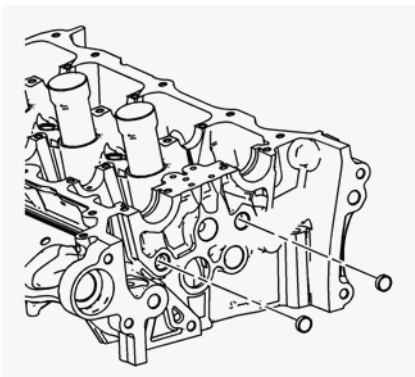


9. Remove the valve.

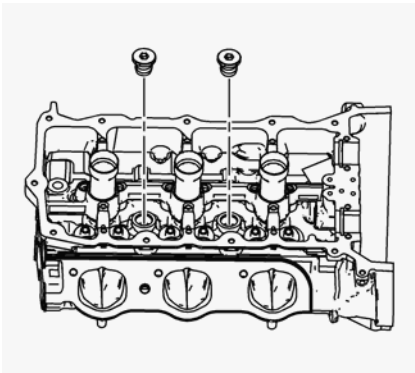


Note: NEVER reuse a valve stem oil seal.

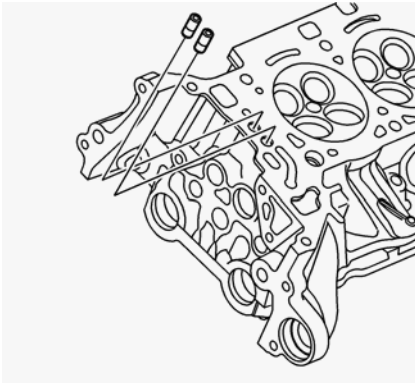
10. Remove the valve stem oil seal using the *EN 46116* remover/installer and discard.
11. Repeat these procedures for the remaining valves.



12. Remove the cylinder head oil gallery expansion plugs.



13. Remove the cylinder head coolant threaded plugs.



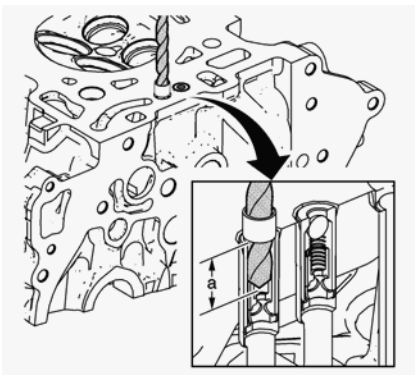
14. Inspect the camshaft position actuator oil feed check valves. Damaged, restricted or clogged check valves must be replaced.



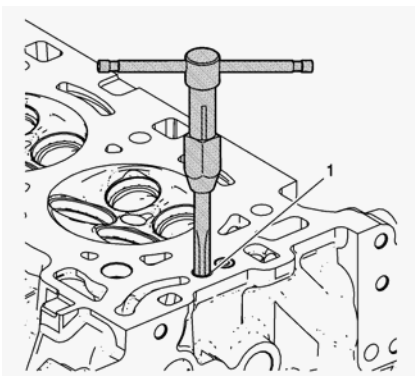
15. Place cylinder head on firm surface with check valves (1) facing up. Protect all cylinder head components and machined surfaces.
16. Using drill bit EN-46122-3, drill out top portion of check valve to expose internal check ball.



17. Remove check ball (1) and check ball spring (2) from inside of check valve.

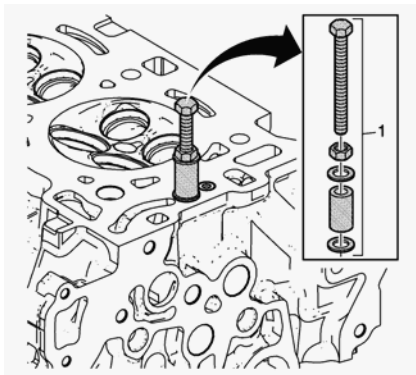


18. Continue drilling remainder of check valve sleeve to a depth of approximately 19 mm (0.75 in) (a) by placing tape on drill bit as a depth gauge. It is not necessary or desirable to drill completely through the bottom of the check valve.

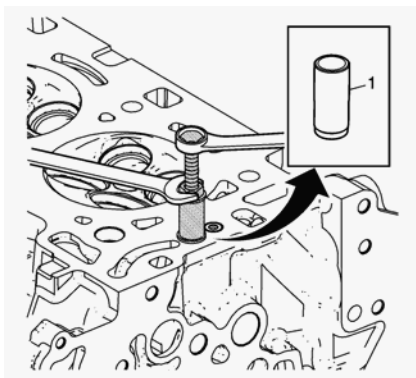


19. Lubricate tap EN 46122-4 with lubricant included in EN 46122 remover/installer . Tap drilled out portion of check valve (1) remaining in cylinder head . Tap to full depth possible until tap bottoms out in head.

Cylinder Head Disassemble (LY7, LP1 or LWR)



20. Assemble bolt, nut, washers, and collar EN 46122-2 (1) as shown. Position collar with slightly-larger inside diameter DOWN toward the cylinder head.
21. Screw bolt by hand fully down into threaded check valve sleeve, then lightly tighten nut against washer.



22. Hold bolt with one wrench, and use another to tighten the nut until the check valve sleeve (1) is removed from the cylinder head.
23. Clean check valve bore and related passages thoroughly to remove any drilling chips or other debris.

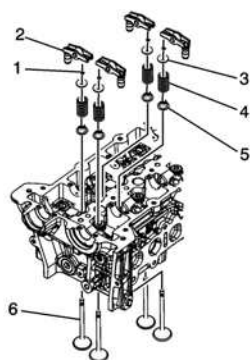
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- J 8062 Valve Spring Compressor
- EN 46116 Valve Stem Seal Remover/Installer
- EN 50031 Valve Spring Compressor (off-vehicle)

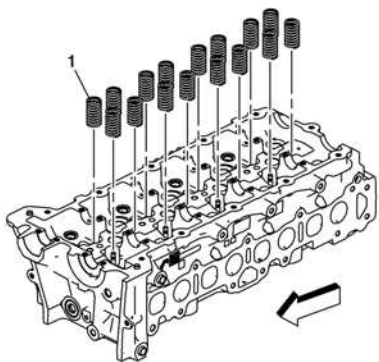
For equivalent regional tools, refer to Special Tools



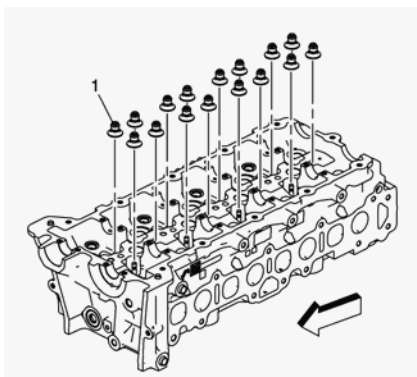
1. Remove the coolant air bleed hose fitting.

Note: Ensure that the valve train components are kept together and identified in order for proper re-installation in their original position.

2. Using the J 8062 compressor and the EN 50031 compressor, compress the valve spring (4).
3. Remove the valve keys (1).
4. Slowly release the J 8062 compressor and the EN 50031 compressor from the valve spring assembly.
5. Remove the retainer (3).



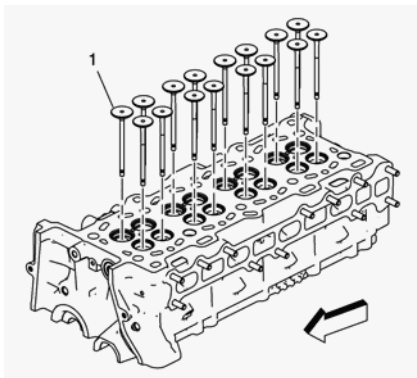
6. Remove the springs.



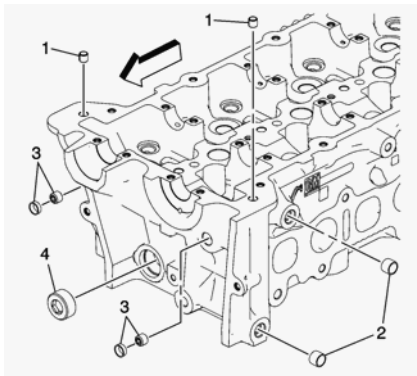
Caution: Do not damage the valve guide. Remove any burrs that have formed at the key groove by chamfering the valve stem with an oil stone or a file.

7. Remove the valve seal. Use the EN 46116 remover. Do not reuse.

Cylinder Head Disassemble



8. Remove the valve.
9. Remove the remaining valves.



10. Remove the cylinder head plugs.

2013 Chevrolet Colorado

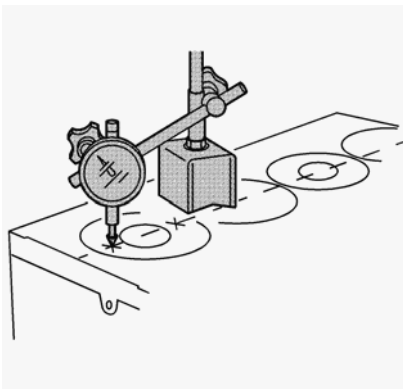
Submodel: | **Engine Type:** | **Liters:**
Fuel Delivery: | **Fuel:**

Special Tools

J 7872 Dial Indicator Set

For equivalent regional tools, refer to Special Tools

1. If a reciprocating component (crankshaft, connecting rod, piston, or bearings) has not been replaced, install the same grade head gasket that was removed.
2. The cylinder head gasket thickness is determined by the piston head projection from the cylinder block deck surface. There are cylinder head gaskets available in three different thicknesses. Follow the procedure below and refer to Cylinder Head Gasket Selection Specifications to determine what gasket to use for each bank of cylinders.
3. Be sure the piston and cylinder deck are free of carbon, gasket material, or other objects that may give you an erroneous measurement.



4. Use J 7872 dial indicator set to measure the piston projection across two different points on each piston.
 1. Zero the dial indicator to the cylinder deck surface.
 2. Place the dial indicator pointer on the piston top. Be sure the pointer is directly above the piston pin centerline to prevent inaccurate readings from piston rocking.
 3. Rotate the engine to roll the piston through Top Dead Center while noting the maximum reading on the dial indicator.
 4. Repeat procedure at the second measuring point on the piston.
5. Obtain the maximum piston projection value for that bank of cylinders.
6. Determine the gasket grade by the maximum piston projection value using the chart. Refer to Cylinder Head Gasket Selection Specifications.

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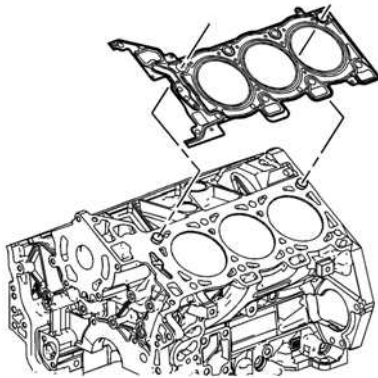
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

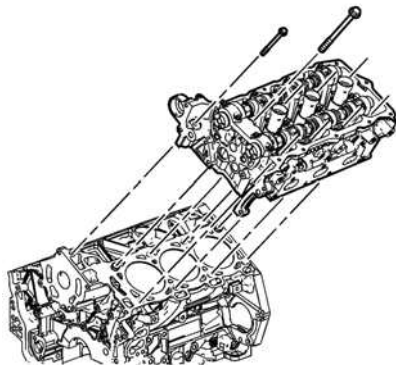
EN 45059 Angle Meter

For equivalent regional tools, refer to Special Tools.

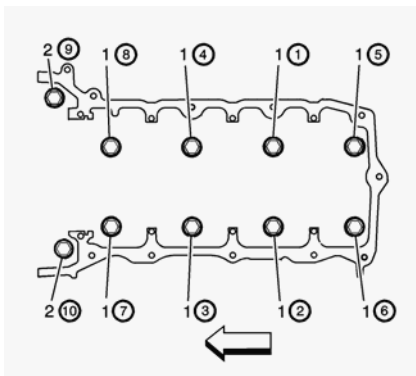
1. Ensure the cylinder head locating pins are securely mounted in the cylinder block deck face.



2. Install a NEW left cylinder head gasket using the deck face locating pins for retention.



3. Align the left cylinder head with the deck face locating pins.
4. Place the left cylinder head in position on the deck face.



Caution: Refer to Fastener Caution.

Note: DO NOT allow oil on the cylinder head bolt bosses.

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

5. Install the NEW M11 cylinder head bolts (1).
 1. Tighten the M11 cylinder head bolts a first pass in sequence to **30 Y (22 lb ft)**.
 2. Tighten the M11 cylinder head bolts a second pass in sequence an additional **150 degrees** using the EN 45059 meter.

Cylinder Head Installation - Left Side (LY7/LP1)

6. Install the 2 NEW front M8 left cylinder head bolts (2).

1. Tighten the M8 cylinder head bolts a first pass to 15 Y (11 lb ft).

2. Tighten the M8 cylinder head bolts a second pass in sequence an additional 75 degrees using the *EN 45059* meter.

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Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

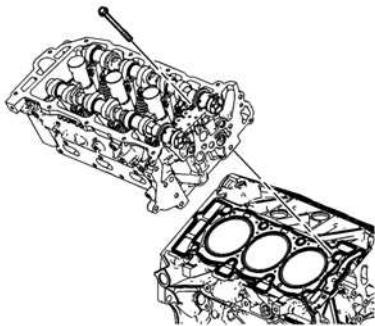
EN 45059 Angle Meter

For equivalent regional tools, refer to Special Tools.

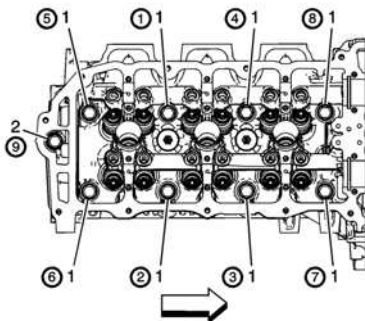
1. Ensure the cylinder head locating pins are securely mounted in the cylinder block deck face.



2. Install a NEW right cylinder head gasket using the deck face locating pins for retention.



3. Align the right cylinder head with the deck face locating pins.
4. Place the right cylinder head in position on the deck face.



Caution: Refer to Fastener Caution.

Note: DO NOT allow oil on the cylinder head bolt bosses.

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

5. Install the NEW M11 cylinder head bolts (1).
 1. Tighten the M11 cylinder head bolts a first pass in sequence to **30 Y (22 lb ft)**
 2. Tighten the M11 cylinder head bolts a second pass in sequence an additional **150 degrees** using the EN 45059 meter.

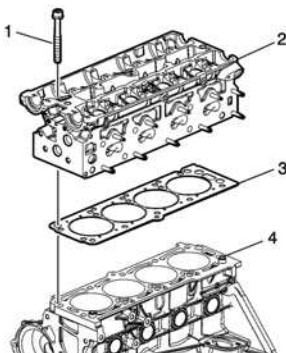
Cylinder Head Installation - Right Side (LY7/LP1)

6. Install the NEW M8 cylinder head bolt (2).

1. Tighten the M8 cylinder head bolt a first pass to **15 Y (11 lb ft)**.
2. Tighten the M8 cylinder head bolt a second pass an additional **75 degrees** using the *EN 45059* meter.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



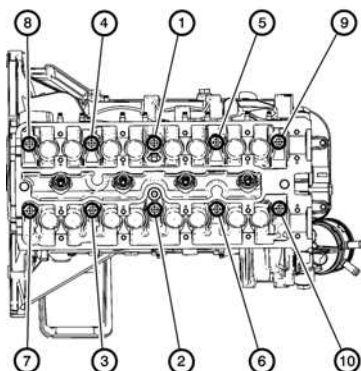
Note: Do not use any sealing material.

Note: Ensure that both locating pins (4) are in the block.

1. Install the cylinder head gasket (3) to the block.
2. Install the cylinder head (2).

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

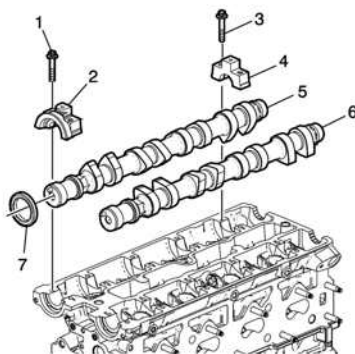
3. Install the NEW cylinder head bolts (1) finger tight



Caution: Refer to Fastener Caution.

4. Tighten the cylinder head bolts in sequence.

- Tighten the bolts to **25.0 Y (18lb ft)**.
- Using the angle meter, tighten the bolts **an additional 270°** in sequence, and **one more pass 15°** in sequence.



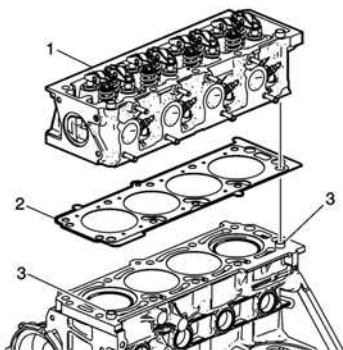
Note: Make sure to align the camshafts with the temporary marks previously made in the removal procedure.

Cylinder Head Installation (LE6)

- Install the camshafts (5 and 6).
- Install the camshaft bearing caps (2 and 4) and the NEW camshaft bearing cap seals (7).
- Install the camshaft bearing cap bolts (1 and 3), tighten to **9 Y (80 lb in)**.

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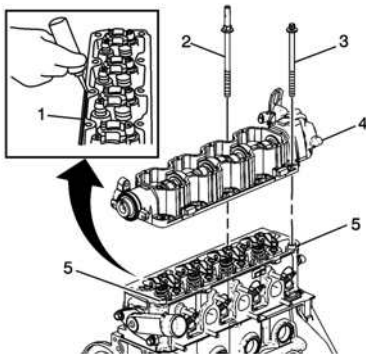
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Note: Do not use any sealing material.

Note: Ensure that both locating pins (3) are in the block.

1. Install the cylinder head gasket (2) to the block.
2. Install the cylinder head (1).



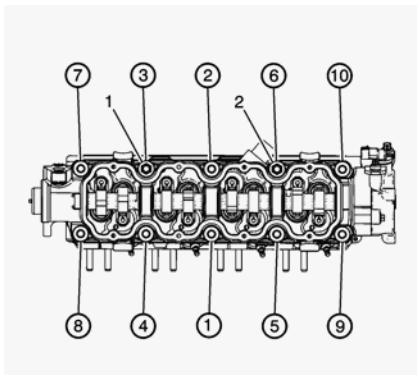
Note: Apply a 2.25 mm bead of sealer (1) on the level part of the flange next to the chamfer around the perimeter of the oil pan and the oil suction port opening. Refer to Adhesives, Fluids, Lubricants, and Sealers.

Note: Ensure that both locating pins (5) are in the cylinder head.

3. Install the camshaft housing (4) to the cylinder head.

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

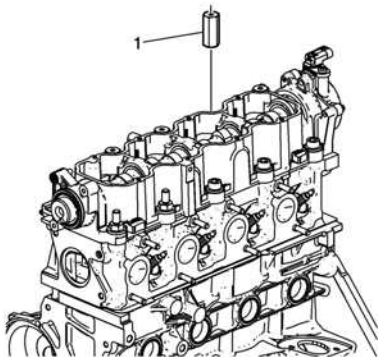
4. Install the cylinder head bolts (3) and studs (2) finger tight.



Caution: Refer to Fastener Caution.

5. Tighten the cylinder head bolts in sequence. Tighten the bolts to **25.0 Y (18 lb ft) + 90° + 90° + 90°**.

Cylinder Head Installation (LP8)



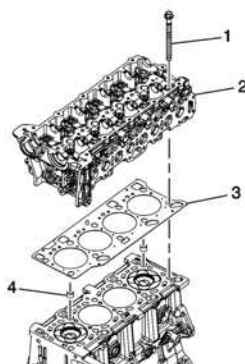
6. Install the intake manifold bracket spacer (1). Tighten to **10 Y (89 lb in)**.

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Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

J 45059 Angle Meter

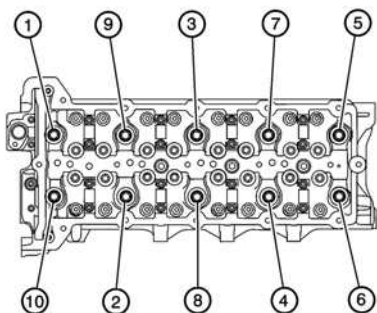


Note: Do not use any sealing material.

1. Install the cylinder head alignment pins (4) and gasket (3) to the block.
2. Install the cylinder head (2).

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

3. Install the NEW cylinder head bolts (1) finger tight.



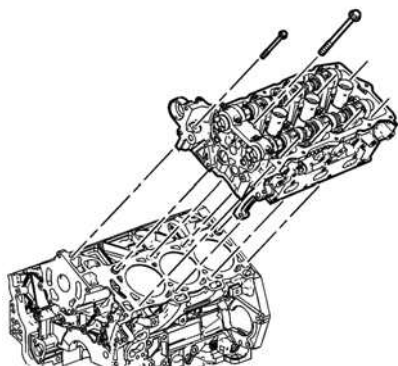
Caution: Refer to Fastener Caution.

Note: Always use new cylinder head bolts.

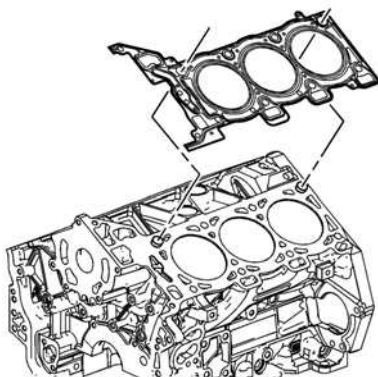
4. Tighten the NEW cylinder head bolts:
 1. Tighten the NEW bolts in sequence to **30 Y (22 lb ft)**
 2. Using J 45059 meter, tighten the bolts in sequence an additional **85 degrees** for the second, third, and final passes, for a total of **255 degrees**.

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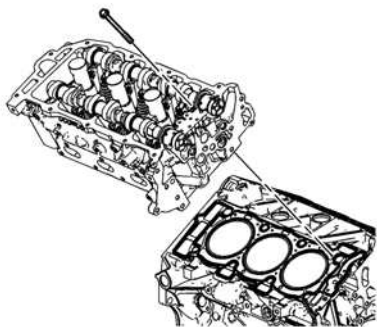
1. Remove the two front M8 left cylinder head bolts and discard.
2. Remove the left cylinder head bolts and discard.
3. Remove the left cylinder head.



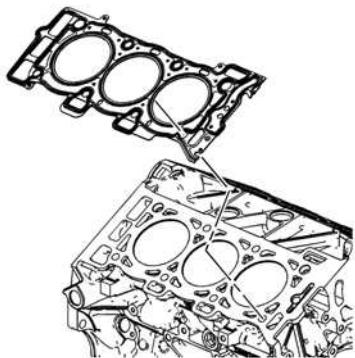
4. Remove and discard the left cylinder head gasket.

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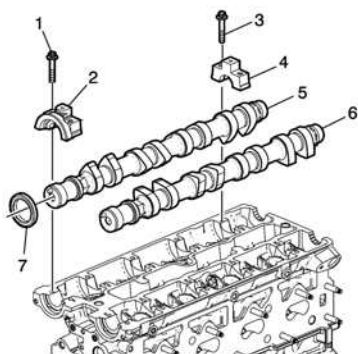
1. Remove the right cylinder head bolts and discard.
2. Remove the right cylinder head and discard.



3. Remove and discard the right cylinder head gasket.

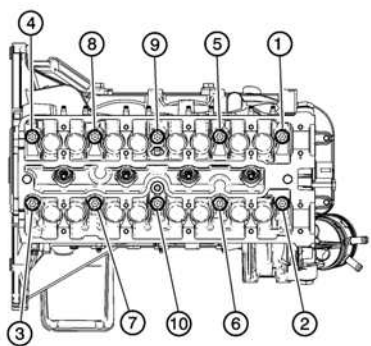
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

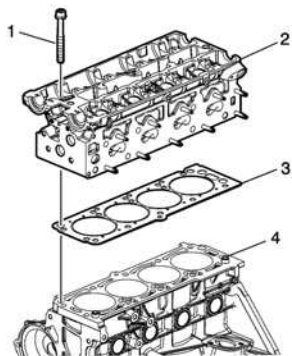


Note: Make a temporary mark on the camshaft bearing caps showing the position of the camshafts prior to removal.

1. Remove the camshaft bearing cap bolts (1 and 3).
2. Remove the camshaft bearing caps (2 and 4).
3. Remove the camshafts (5 and 6) and bearing cap seals (7).



4. Loosen the cylinder head bolts in the sequence shown.

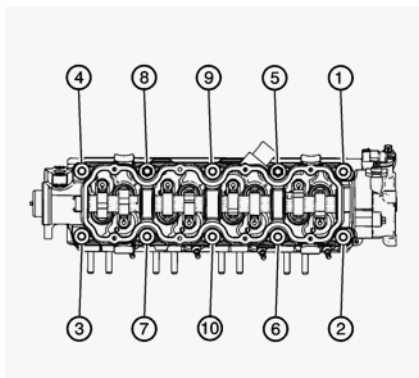


Note: The locating pins (4) may stay with the block.

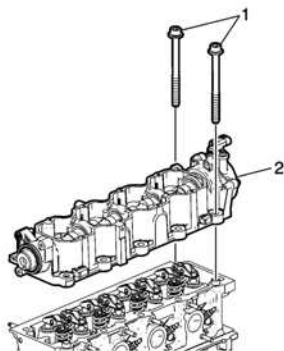
5. Remove the cylinder head bolts (1).
6. Remove the cylinder head assembly (2) and gasket (3).

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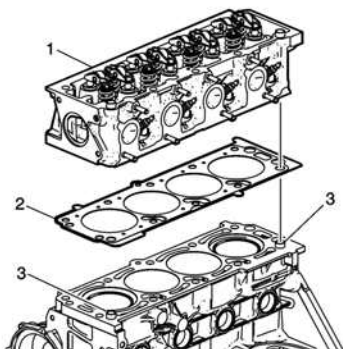
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



1. Loosen the cylinder head bolts in the sequence shown.



2. Remove the cylinder bolts (1).
3. Remove the camshaft housing assembly (2).

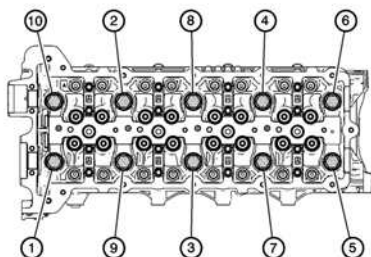


Note: The locating pins (3) may stay with the block.

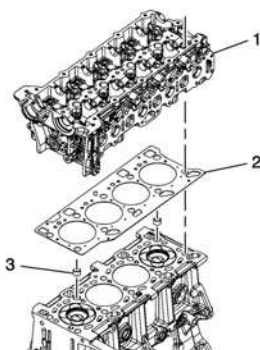
4. Remove the cylinder head (1) and gasket (2).

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Fuel Delivery: | Fuel:



1. Remove the cylinder head bolts in sequence.



Note: Ensure that the glow plugs have all been removed before removing cylinder head.

2. Remove the, cylinder head (1) and gasket (2).
3. Remove the cylinder head locating pins (3).

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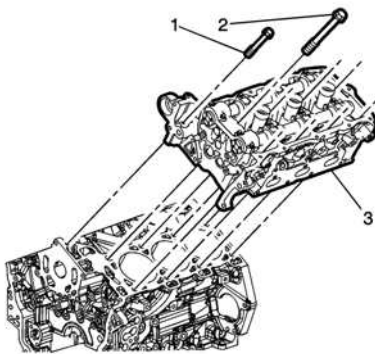
Special Tools

EN-45059 Angle Meter

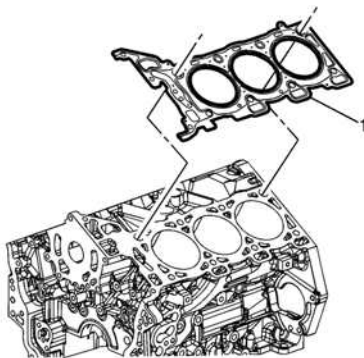
For equivalent regional tools, refer to Special Tools.

[Removal Procedure](#)

1. Remove the camshaft cover. Refer to Camshaft Cover Replacement - Left Side.
2. Remove the left bank secondary timing chain. Refer to Secondary Camshaft Intermediate Drive Chain Replacement - Left Side.
3. Remove the left exhaust manifold. Refer to Exhaust Manifold Replacement - Left Side.
4. Remove the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement.

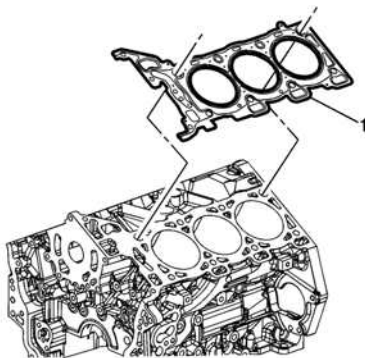


5. Remove the 2 front M8 left cylinder head bolts (1).
6. Remove the left cylinder head bolts (2).
7. Remove the left cylinder head (3).

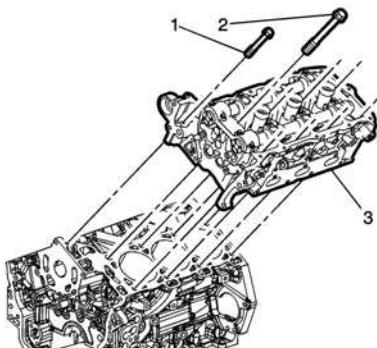


8. Remove and discard the left cylinder head gasket (1).
9. Clean and inspect the cylinder head and the engine block sealing surfaces. Refer to Cylinder Head Cleaning and Inspection and Engine Block Cleaning and Inspection.
10. Disassemble the cylinder head if needed. Refer to Cylinder Head Disassemble.

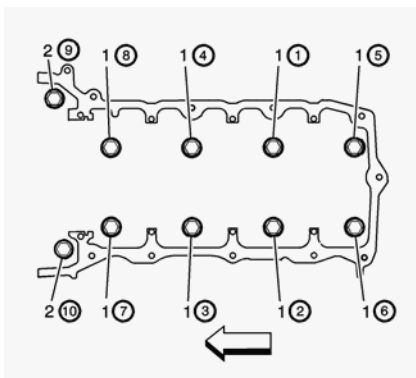
[Installation Procedure](#)



1. Ensure the cylinder head locating pins are securely mounted in the cylinder block deck face.
2. Install a NEW left cylinder head gasket (1) using the deck face locating pins for retention.



3. Align the left cylinder head (3) with the deck face locating pins.
4. Place the left cylinder head in position on the deck face.



Caution: Refer to Fastener Caution.

Note:

- DO NOT allow oil on the cylinder head bolt bosses.
 - DO NOT reuse the old cylinder head bolts.
5. Install the NEW M11 cylinder head bolts (1).
 1. Tighten the M11 cylinder head bolts a first pass in sequence to **30 Y (22 lb ft)**.
 2. Tighten the M11 cylinder head bolts a second pass in sequence an additional **150 degrees** using the *EN-45059* meter .
 6. Install the 2 NEW front M8 left cylinder head bolts (2).
 1. Tighten the M8 cylinder head bolts a first pass to **15 Y (11 lb ft)**.
 2. Tighten the M8 cylinder head bolts a second pass in sequence an additional **75 degrees** using the *EN-45059* meter .
 7. Install the left bank secondary timing chain. Refer to Secondary Camshaft Intermediate Drive Chain Replacement - Left Side.
 8. Install the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement.
 9. Install the exhaust manifold. Refer to Exhaust Manifold Replacement - Left Side.
 10. Install the camshaft cover. Refer to Camshaft Cover Replacement - Left Side.

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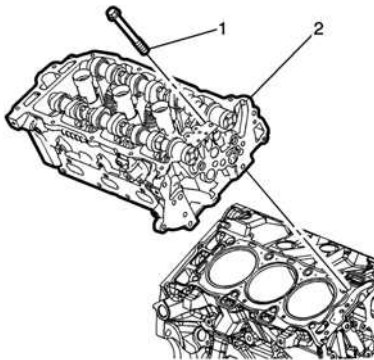
Special Tools

EN-45059 Angle Meter

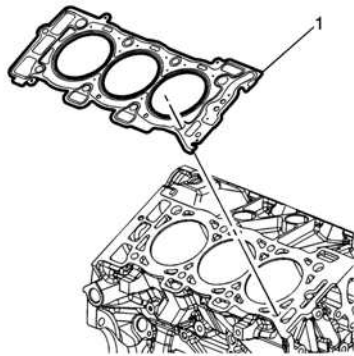
For equivalent regional tools, refer to Special Tools.

Removal Procedure

1. Remove the camshaft cover. Refer to Camshaft Cover Replacement - Right Side.
2. Remove the right bank secondary timing chain. Refer to Secondary Camshaft Intermediate Drive Chain Replacement - Right Side.
3. Remove the exhaust manifold. Refer to Exhaust Manifold Replacement - Right Side.

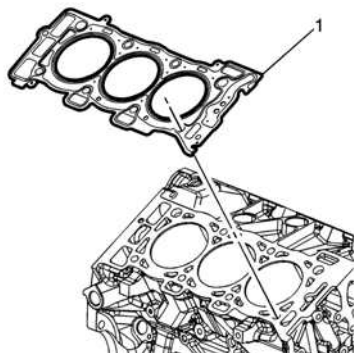


4. Remove the right cylinder head bolts (1).
5. Remove the right cylinder head (2).



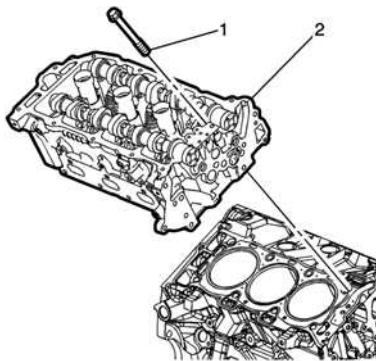
6. Remove and discard the cylinder head gasket (1).
7. Clean and inspect the cylinder head and the engine block sealing surfaces. Refer to Cylinder Head Cleaning and Inspection and Engine Block Cleaning and Inspection.
8. Disassemble the cylinder head if needed . Refer to Cylinder Head Disassemble.

Installation Procedure

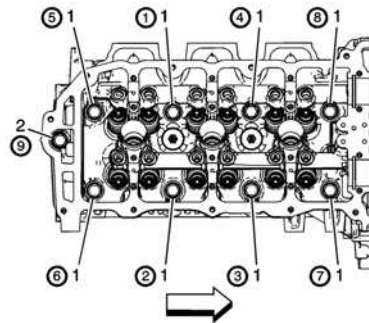


Cylinder Head Replacement - Right Side

1. Ensure the cylinder head locating pins are securely mounted in the cylinder block deck face.
2. Install a NEW right cylinder head gasket (1) using the deck face locating pins for retention.



3. Align the right cylinder head (2) with the deck face locating pins.
4. Place the right cylinder head in position on the deck face.



Caution: Refer to Fastener Caution.

Note:

- DO NOT allow oil on the cylinder head bolt bosses.
 - DO NOT reuse the old cylinder head bolts.
5. Install the NEW M11 cylinder head bolts (1).
 1. Tighten the M11 cylinder head bolts a first pass in sequence to **30 Y (22 lb ft)**.
 2. Tighten the M11 cylinder head bolts a second pass in sequence an additional **150 degrees** using the *EN-45059* meter.
 6. Install the NEW M8 cylinder head bolt (2).
 1. Tighten the M8 cylinder head bolt a first pass to **15 Y (11 lb ft)**.
 2. Tighten the M8 cylinder head bolt a second pass an additional **75 degrees** using the *EN-45059* meter.
 7. Install the right bank secondary timing chain. Refer to Secondary Camshaft Intermediate Drive Chain Replacement - Right Side.
 8. Install the exhaust manifold. Refer to Exhaust Manifold Replacement - Right Side.
 9. Install the camshaft cover. Refer to Camshaft Cover Replacement - Right Side.

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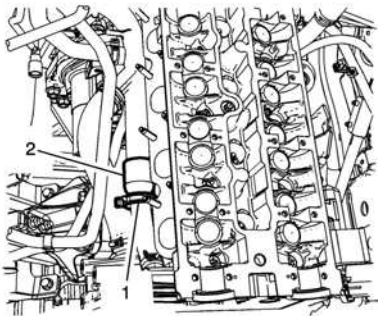
Special Tools

- *BO-38185* Hose Clamp Pliers.
- *EN-45059* Angle Meter.

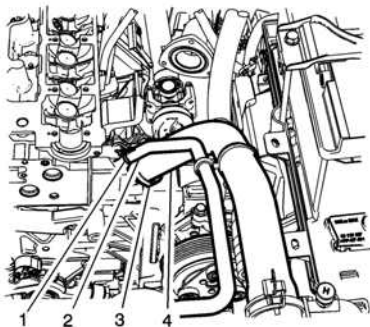
For equivalent regional tools, refer to Special Tools.

[Removal Procedure](#)

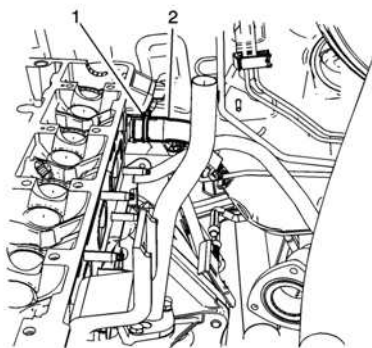
1. Drain the coolant system. Refer to Cooling System Draining and Filling.
2. Remove the intake manifold. Refer to Intake Manifold Replacement.
3. Remove the Generator and Power Steering Pump Bracket. Refer to Generator and Power Steering Pump Bracket Replacement.
4. Remove the exhaust manifold with catalytic converter. Refer to Exhaust Manifold with Catalytic Converter Replacement.
5. Remove the rear timing belt cover. Refer to Timing Belt Rear Cover Replacement.
6. Remove the intake camshaft . Refer to Intake Camshaft and Valve Lifter Replacement
7. Remove the exhaust camshaft. Refer to Exhaust Camshaft and Valve Lifter Replacement



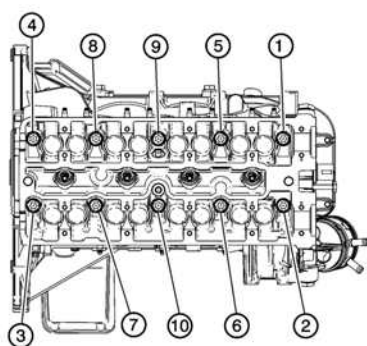
8. Release the hose clamp (1).
9. Disconnect the coolant hose (2).



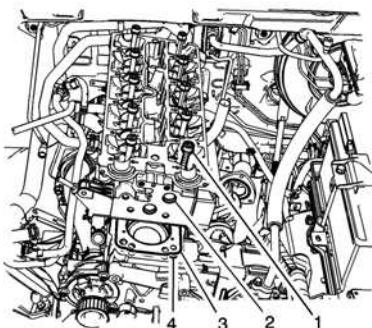
10. Release the hose clamp (1,3).
11. Disconnect the radiator inlet hose (4).
12. Disconnect the engine air bleeder hose (2).



13. Release the hose clamp (1).
14. Disconnect the heater outlet hose (2).
15. Disconnect the fuel injector electrical harness from cylinder head.
16. Disconnect the camshaft position sensor connector from cylinder head.



17. Loosen the cylinder head bolts in the sequence shown.

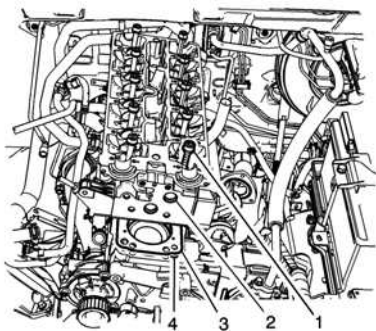


Note: The locating pins (4) may stay with the block.

18. Remove the cylinder head bolts (1).
19. Remove the cylinder head assembly (2) and gasket (3).
20. For cylinder head disassemble, refer to Cylinder Head Disassemble.
21. For cleaning and inspection, refer to Cylinder Head Cleaning and Inspection.

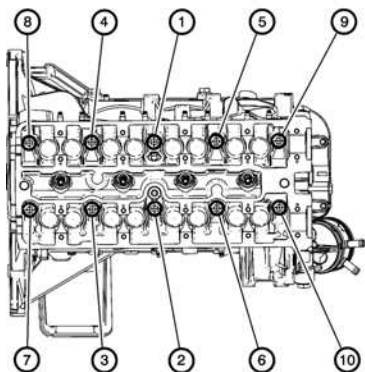
Installation Procedure

1. For cylinder head assemble, refer to Cylinder Head Assemble.



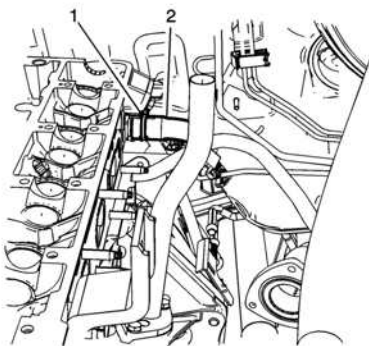
Note:

- Do not use any sealing material.
 - Ensure that both locating pins (4) are in the block.
 - Always use new cylinder head bolts.
2. Install the cylinder head gasket (3) to the block.
 3. Install the cylinder head (2).
 4. Install the NEW cylinder head bolts (1) finger tight.



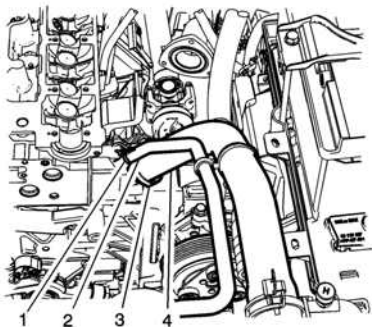
Caution: Refer to Fastener Caution.

5. Connect camshaft position sensor connector into the cylinder head.
 6. Connect fuel injector harness connector into the cylinder head.
 7. Tighten the cylinder head bolts in sequence.
- Tighten the bolts to **25 Y (18 lb ft)**.
 - Using the angle meter, tighten the bolts **an additional 270°** in sequence, and **one more pass 15°** in sequence.

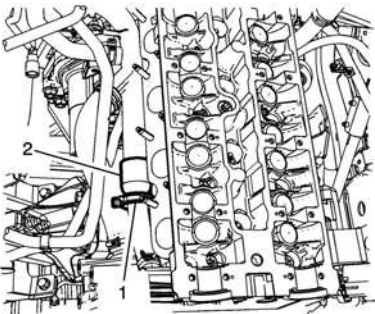


- Connect the heater outlet hose (2).
- Reinstall the hose clamp (1).

Cylinder Head Replacement (LE6)



- Connect the radiator inlet hose (4).
- Connect the engine air bleeder hose (2).
- Reinstall the hose clamp (1, 3).



- Connect the coolant hose (2).
- Reinstall the hose clamp (1).
- Install the exhaust camshaft. Refer to Exhaust Camshaft and Valve Lifter Replacement.
- Install the intake camshaft. Refer to Intake Camshaft and Valve Lifter Replacement.
- Install the rear timing belt cover. Refer to Timing Belt Rear Cover Replacement.
- Install the exhaust manifold with catalytic converter. Refer to Exhaust Manifold with Catalytic Converter Replacement.
- Install the Generator and Power Steering Pump Bracket. Refer to Generator and Power Steering Pump Bracket Replacement.
- Install the intake manifold. Refer to Intake Manifold Replacement.
- Refill the coolant system. Refer to Cooling System Draining and Filling.

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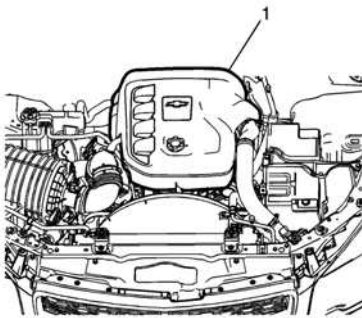
Special Tools

J 45059 Angle Meter

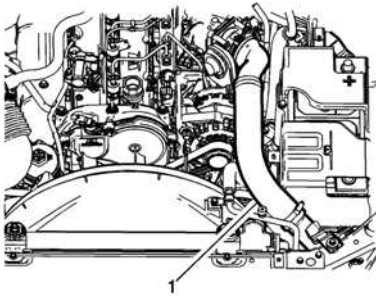
For equivalent regional tools, refer to Special Tools.

[Removal Procedure](#)

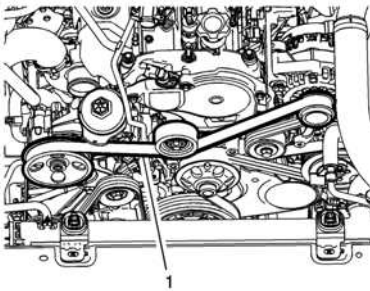
1. Drain the coolant system. Refer to Cooling System Draining and Filling.
2. Disconnect electrical connector. Refer to Battery Negative Cable Disconnection and Connection.



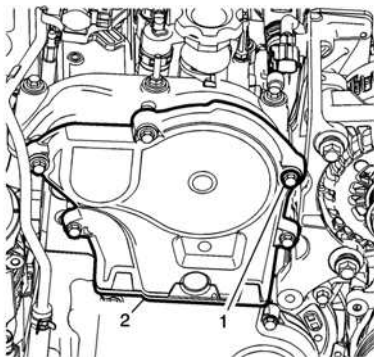
3. Remove the intake manifold cover (1). Refer to Intake Manifold Cover Replacement.



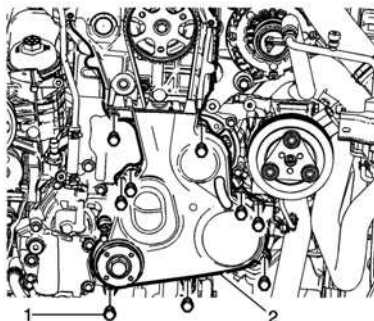
4. Remove the charge air cooler outlet air hose (1). Refer to Charge Air Cooler Outlet Air Hose Replacement.



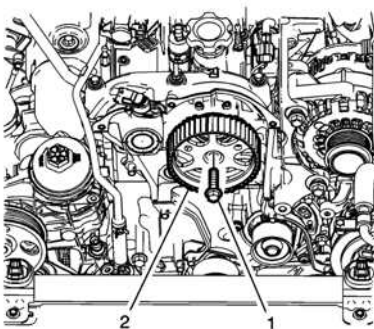
5. Remove the drive belt (1). Refer to Drive Belt Replacement.



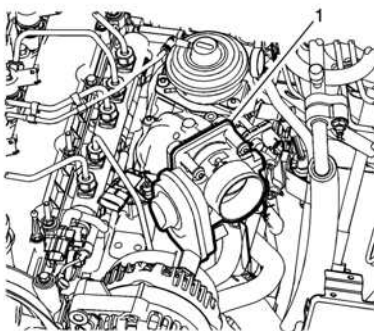
6. Remove the timing upper front cover (2). Refer to Timing Belt Upper Front Cover Replacement.



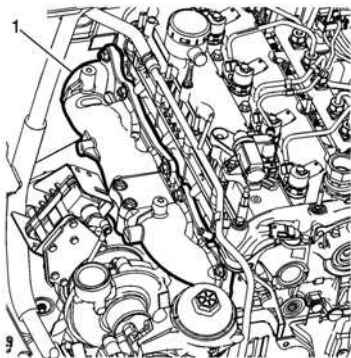
7. Remove the timing lower front cover (2). Refer to Timing Belt Lower Front Cover Replacement.
8. Remove the timing belt. Refer to Timing Belt Replacement.



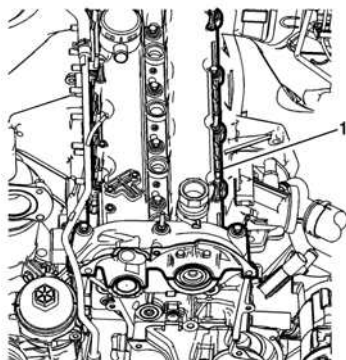
9. Remove the camshaft gear (2). Refer to Camshaft Gear Replacement.



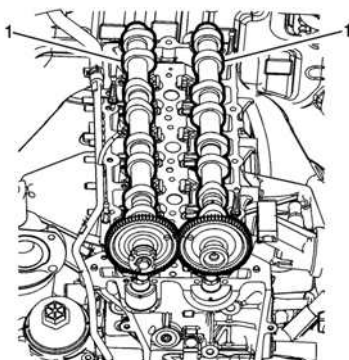
10. Remove the intake manifold (1). Refer to Intake Manifold Replacement.
11. Remove the radiator surge tank. Refer to Radiator Surge Tank Replacement.
12. Remove the charge air coolant inlet air hose. Refer to Charge Air Cooler Inlet Air Hose Replacement.



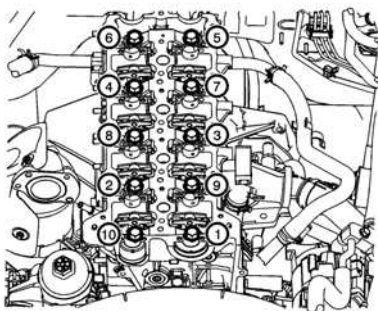
13. Remove the exhaust manifold (1). Refer to Exhaust Manifold Replacement.



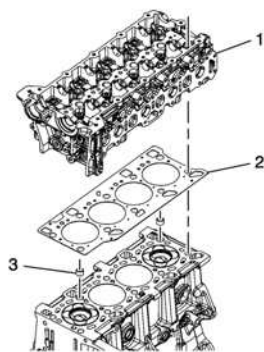
14. Remove the valve rocker arm cover (1). Refer to Valve Rocker Arm Cover Replacement.



15. Remove the camshafts (1). Refer to Camshaft Replacement.



16. Remove the cylinder head bolts in sequence and DISCARD the bolts.

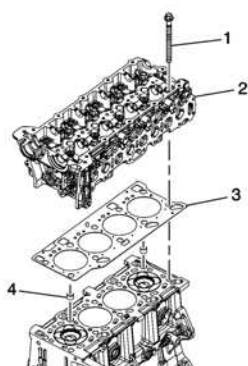


Note: Ensure that the glow plugs have all been removed before removing cylinder head.

17. Remove the, cylinder head (1) and gasket (2).
18. Remove the cylinder head locating pins (3).
19. For cleaning and inspection of the cylinder head. Refer to Cylinder Head Cleaning and Inspection.
20. For disassemble of the cylinder head. Refer to Cylinder Head Disassemble.

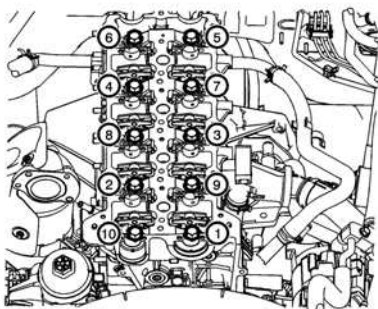
Installation Procedure

1. For assembly of the cylinder head. Refer to Cylinder Head Assemble.
2. Select the right thickness of the cylinder head gasket. Refer to Cylinder Head Gasket Selection.



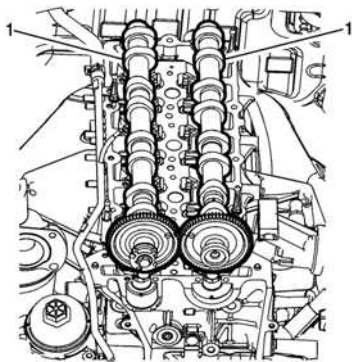
Note: Do not use any sealing material.

3. Install the cylinder head alignment pins (4) and gasket (3) to the block.
4. Install the cylinder head (2).
5. Install the cylinder head bolts (1) finger tight.

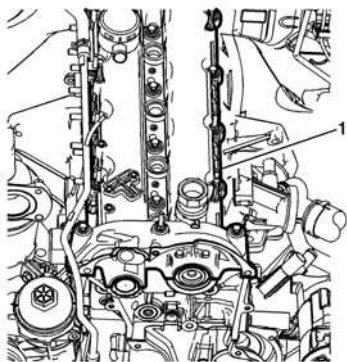


Note: Always use new cylinder head bolts.

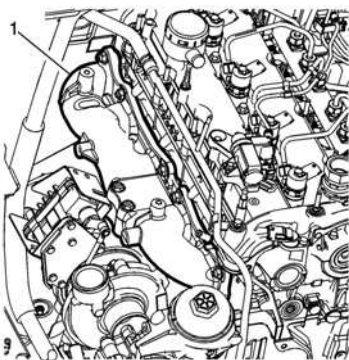
6. Tighten the cylinder head bolts:
 - Tighten the bolts in sequence to **30 Y (22 lb ft)**.
 - Using J 45059 meter, tighten the bolts in sequence an additional **85 degrees** for the second, third, and final passes, for a total of **255 degrees**.



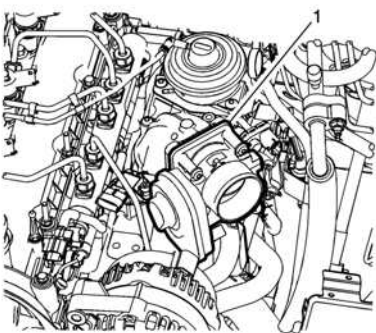
- Install the camshafts (1). Refer to Camshaft Replacement.



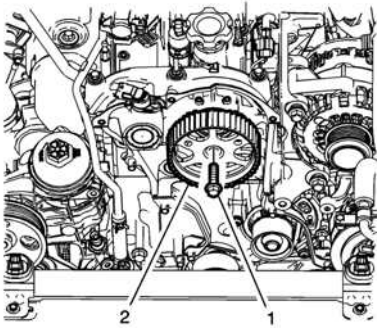
- Install the valve rocker arm cover (1). Refer to Valve Rocker Arm Cover Replacement.



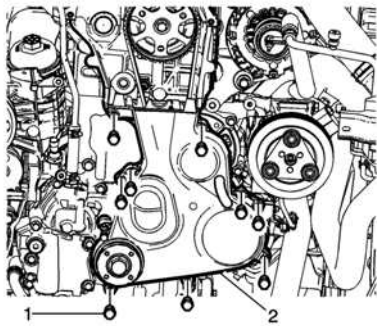
- Install the exhaust manifold (1). Refer to Exhaust Manifold Replacement.
- Install the charge air coolant inlet air hose. Refer to Charge Air Cooler Inlet Air Hose Replacement.
- Install the radiator surge tank. Refer to Radiator Surge Tank Replacement.



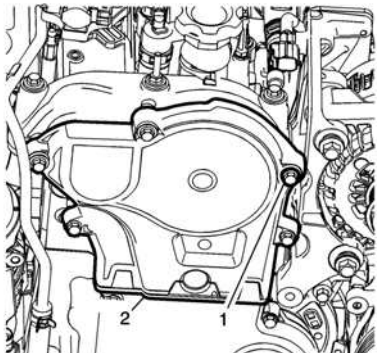
- Install the intake manifold (1). Refer to Intake Manifold Replacement.



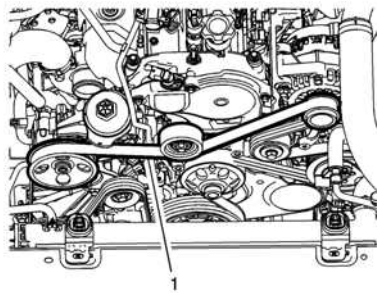
- Install the camshaft gear (2). Refer to Camshaft Gear Replacement.
- Install the timing belt. Refer to Timing Belt Replacement.



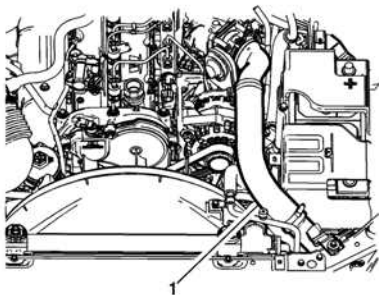
- Install the timing lower front cover (2). Refer to Timing Belt Lower Front Cover Replacement.



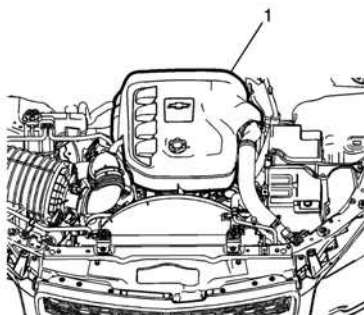
- Install the timing upper front cover (2). Refer to Timing Belt Upper Front Cover Replacement.



- Install the drive belt (1). Refer to Drive Belt Replacement.



- Install the charge air cooler outlet air hose (1). Refer to Charge Air Cooler Outlet Air Hose Replacement.



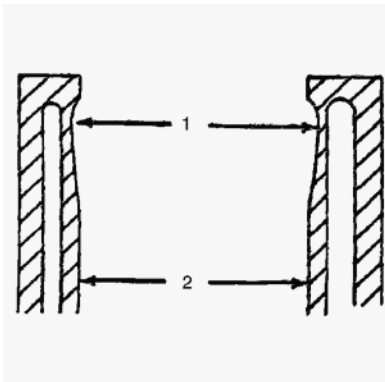
- Install the intake manifold cover (1). Refer to Intake Manifold Cover Replacement.
- Connect electrical connector. Refer to Battery Negative Cable Disconnection and Connection.
- Fill the coolant system. Refer to Cooling System Draining and Filling.

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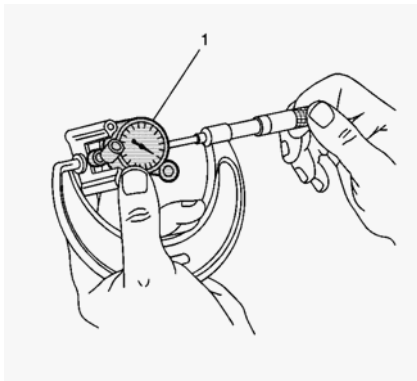
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

J 8087 Cylinder Bore Gauge



1. Measure the cylinder bore for out-of-round and taper.
2. Measure dimension (1) at 13 mm (0.5 in) below the head gasket surface. Measure dimension (2) at 100 mm (4 in) below the head gasket surface.



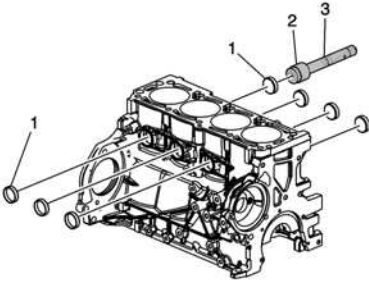
3. Measure the cylinder bores by setting the J 8087 gauge (1) dial at zero in the cylinder at the point of the desired measurement. Lock the dial indicator at zero before removing the dial from the cylinder. Measure across the gauge contact points with an outside micrometer, with the gauge at the same zero setting as when the gauge was removed from the cylinder.
4. Fine vertical scratches made by the ring ends do not, by themselves, cause excessive oil consumption. Do not hone the cylinder in order to remove these scratches.
5. If the bore is glazed but otherwise serviceable, lightly break the glaze with a hone. Replace the piston rings. Refer to Piston, Connecting Rod, and Bearing Installation.
 1. The honing stones must be clean, sharp, and straight.
 2. Move the hone slowly up and down to produce a 45 degree cross-hatch pattern.
 3. Clean the bore thoroughly with soap and water.
 4. Dry the bore.
 5. Rub clean engine oil in the bore.
 6. Re-measure the bore.
6. If the cylinder bore is out of specification, replace the block.
7. If honing is not required, clean the cylinder bores with hot water and detergent. Apply clean engine oil to the bore after washing and drying the bore.

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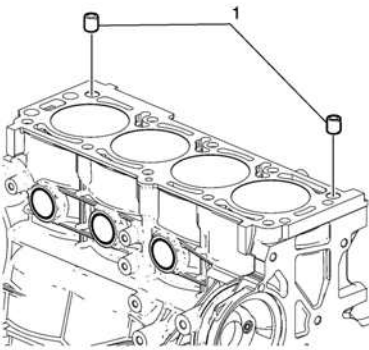
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

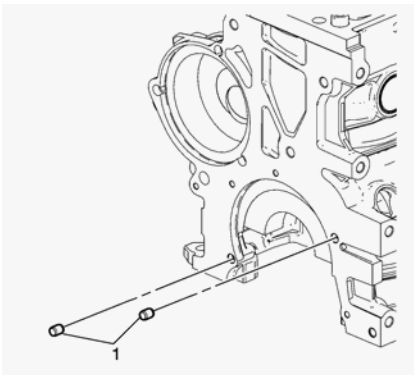
- M-840911-A Handle
- X-0206947 Installer



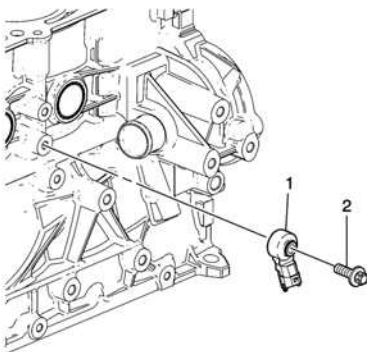
1. Using X-0206947 installer and the M-840911-A handle install the NEW engine block coolant hole cup plugs (1).



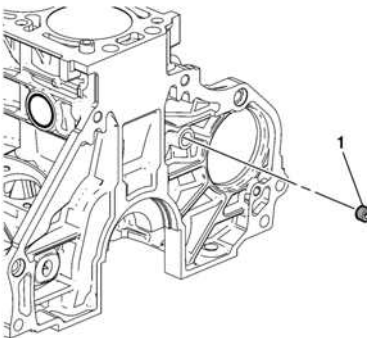
2. Install the cylinder head locating pins (1).



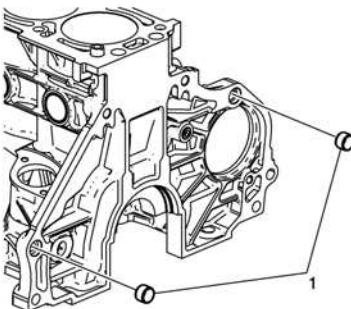
3. Install the oil pump housing locating pins (1).



4. Install the knock sensor (1) and orientate to as shown.
5. Install the knock sensor bolt (2) and tighten to **20 Y (14.7 lb ft)**.



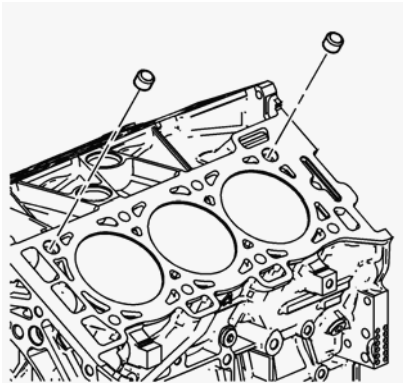
6. Apply thread sealer to the engine block oil gallery plugs (1), refer to Adhesives, Fluids, Lubricants, and Sealers.
7. Install the engine block oil gallery plugs (1) and tighten to **20 Y (14.8 lb ft)**.



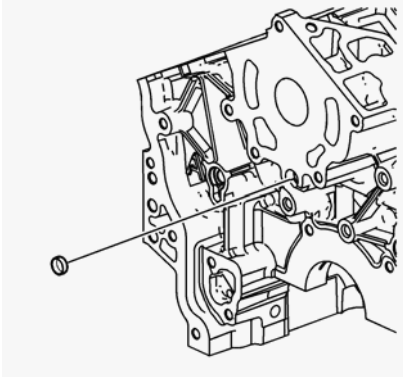
8. Install the transmission locating pins (1).

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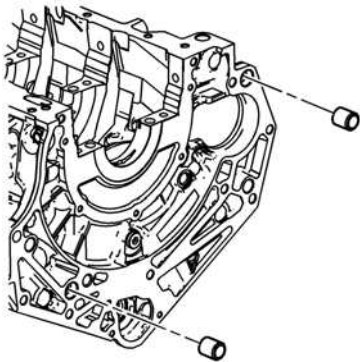
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



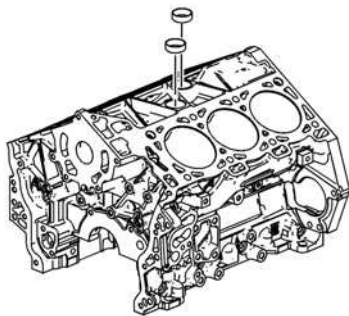
1. Install the cylinder block-to-cylinder head alignment dowels.



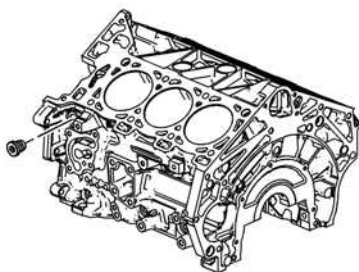
2. Install the NEW front oil gallery expansion plug.
3. Ensure the NEW front oil gallery expansion plug is installed to the proper depth.



4. Install the cylinder block-to-transmission alignment dowels.



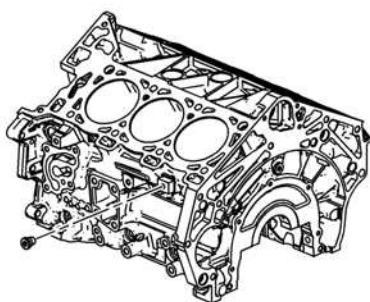
5. Apply the RTV sealant, GM P/N 12378521 (Canadian P/N 88901148) or equivalent on the NEW coolant expansion plugs.
6. Install the NEW coolant expansion plugs.
7. Ensure the NEW coolant expansion plugs are installed to the proper depth.



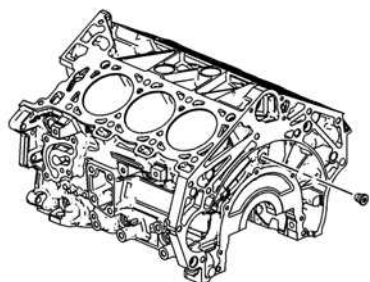
8. Apply thread sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent on the threads of the M20 left side oil gallery threaded plug.

Caution: Refer to Fastener Caution.

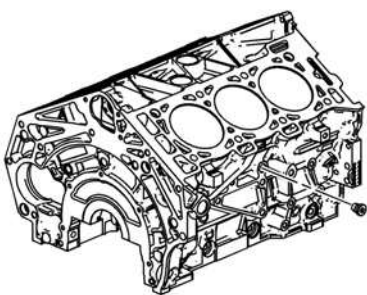
9. Install the M20 left side oil gallery threaded plug and tighten to **31 Y (23 lb ft)**.



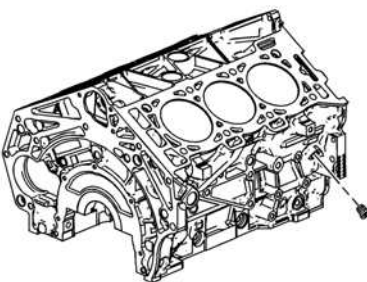
10. Apply thread sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent on the threads of the M14 left side coolant drain threaded plug.
11. Install the M14 left side coolant drain threaded plug and tighten to **31 Y (23 lb ft)**.



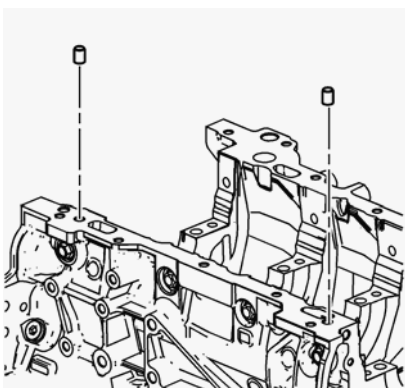
12. Apply thread sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent on the threads of the M14 rear oil gallery threaded plug.
13. Install the M14 rear oil gallery threaded plug and tighten to **31 Y (23 lb ft)**.



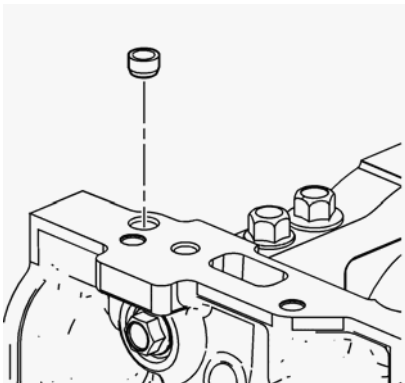
14. Apply thread sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent on the threads of the M14 right side coolant drain threaded plug.
15. Install the M14 right side coolant drain threaded plug and tighten to **31 Y (23 lb ft)**.



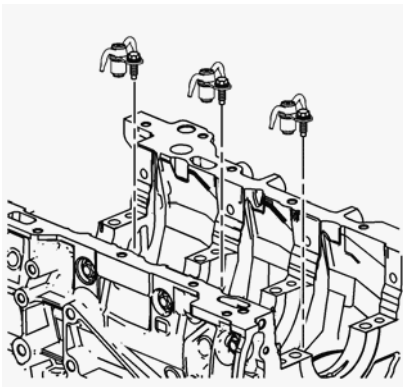
16. Apply thread sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent on the threads of the M14 right side oil gallery threaded plug.
17. Install the M14 right side oil gallery threaded plug and tighten to **31 Y (23 lb ft)**.



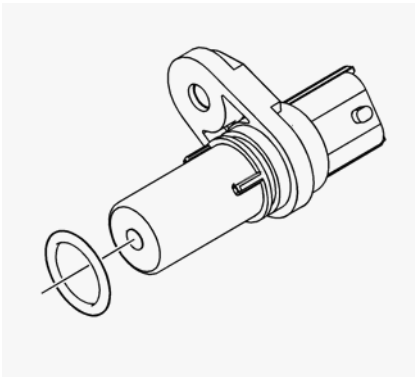
18. Install the cylinder block-to-oil pan alignment dowels.



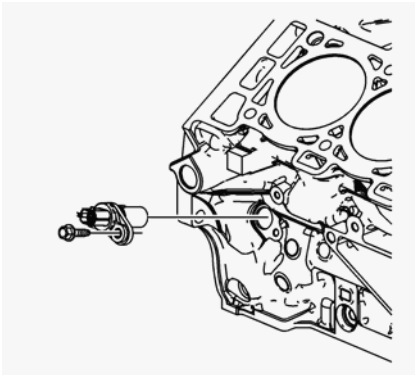
19. Install the NEW right front oil pan rail oil gallery expansion plug.
20. Ensure the NEW right front oil pan rail oil gallery expansion plug is installed to the proper depth.



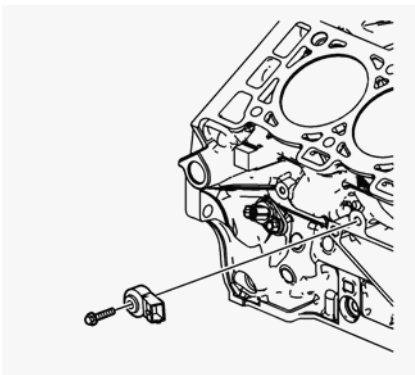
21. Install the oil jets.
22. Install the oil jet bolts and tighten to **10 Y (89 lb in)**.



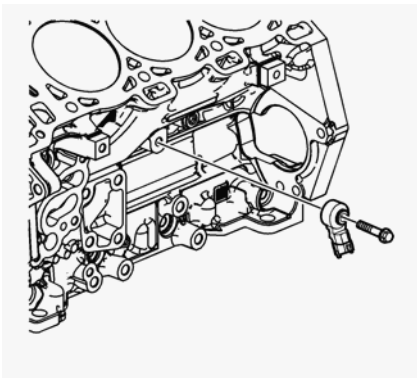
23. Install the NEW O-ring on the crankshaft position sensor, if damaged.



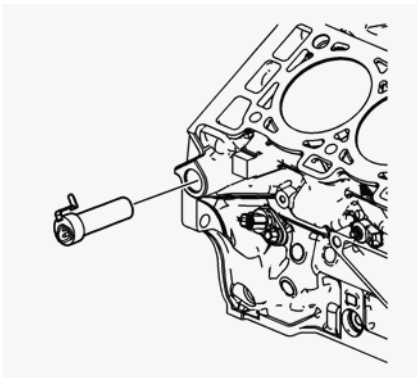
24. Position the crankshaft position sensor into the cylinder block.
25. Install the crankshaft position sensor bolt and tighten to **10 Y (89 lb in)**.



26. Position the right knock sensor to the cylinder block, as shown.
27. Install the right knock sensor bolt and tighten to **25 Y (18 lb ft)**.
28. Ensure proper right knock sensor orientation.



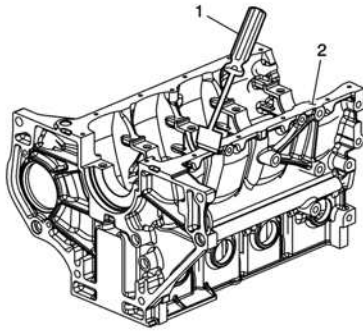
29. Position the left knock sensor to the cylinder block, as shown.
30. Install the left knock sensor bolt and tighten to **23 Y (17 lb ft)**.
31. Ensure the proper left knock sensor orientation.



32. Install the block heater cartridge, if equipped.

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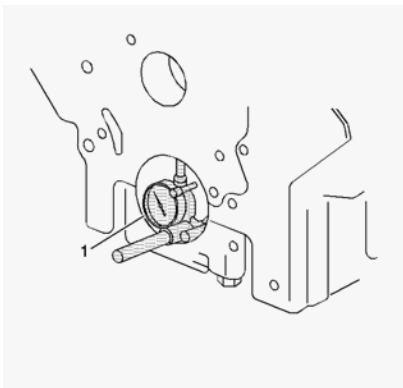
1. Clean the sealing material from the gasket mating surfaces (2) with a suitable tool (1).
2. Clean the engine block in a cleaning tank with solvent appropriate for aluminum.
3. Flush the engine block with clean water or steam.
4. Clean the oil passages.
5. Clean the blind holes.
6. Spray the cylinder bores and the machined surfaces with engine oil.
7. Inspect the threaded holes. Clean the threaded holes with a rifle brush.



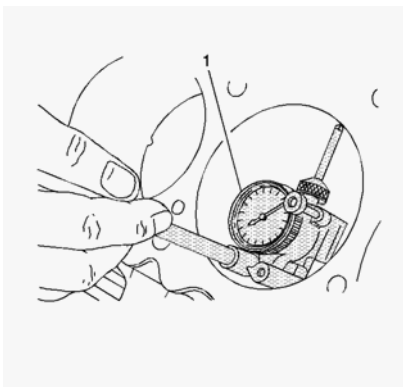
8. Inspect the mating surfaces of the transmission face.

Caution: A broken flywheel may result if the transmission case mating surface is not flat.

9. Use the following procedure in order to measure the engine block flange runout at the mounting bolt hole bosses:
 1. Temporarily install the crankshaft and upper bearings. Measure the crankshaft flange runout using the dial indicator (1).
 2. Hold the gauge plate flat against the crankshaft flange.
 3. Place the dial indicator stem on the transmission mounting bolt hole boss. Set the indicator to 0.
 4. Record the readings obtained from all of the bolt hole bosses. The measurements should not vary more than 0.203 mm (0.008 in).
 5. Recheck the crankshaft flange runout if the readings vary more than 0.203 mm (0.008 in).
 6. Remove the crankshaft and bearings.



10. Install the bed plate and bolts. Tighten the bed plate bolts to specification.
11. Inspect the crankshaft main bearing bores. Use the cylinder bore gauge (1) to measure the bearing bore concentricity and alignment. Refer to Engine Mechanical Specifications.
12. Replace the engine block and bed plate if the crankshaft bearing bores are out of specification.
13. Remove the bed plate.



14. Inspect the cylinder bores using the cylinder bore gauge (1). Inspect for the following items:

- Wear
- Taper
- Runout
- Ridging

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Special Tools

- EN 8087 Cylinder Bore Gauge
- EN 28410 Gasket Remover

For equivalent regional tools, refer to Special Tools.

Cleaning Procedure

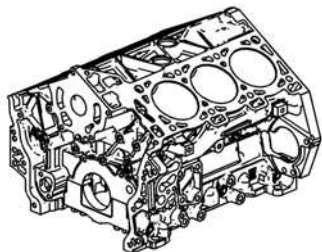
1. Remove any old thread sealant, gasket material or sealant using EN 28410 remover .
2. Clean all the following areas with solvent:

- Sealing surfaces
- Cooling passages
- Oil passages
- Bearing journals
- Clean all threaded and through holes with solvent.

Warning: Refer to Safety Glasses Warning.

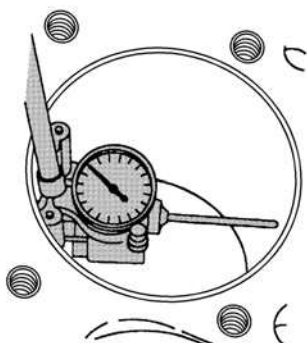
- Dry the engine block with compressed air.

Visual Inspection



1. Inspect the crankshaft bearings journals for damage or spun bearings. The crankshaft bearing journals are not repairable, if the crankshaft bearing journals are damaged the cylinder block assembly must be replaced.
2. Inspect the primary camshaft drive chain tensioner mounting surface on the engine block for burrs or any defects that would degrade the sealing of the NEW primary camshaft drive chain tensioner gasket.
3. Inspect all sealing and mating surfaces for damage, repair or replace the cylinder block assembly if necessary.
4. Inspect all threaded and through holes for damage or excessive debris.
5. Inspect all bolts for damage, if damaged replace with NEW bolts only.
6. Inspect the cylinder walls for cracks or damage. The cylinder sleeves are not serviced separately, if the cylinders are damaged the cylinder block assembly must be replaced.
7. Inspect the engine block for cracks. Do not repair any cracks. If cracks are found, the cylinder block assembly must be replaced.
8. Repair any damaged threaded holes. Refer to Thread Repair Specifications and Thread Repair.

Measuring Cylinder Bore Diameter



Measure the cylinder bore diameter 37 mm (1.457 in) from the deck face using the *EN 8087* gauge .

Compare your results with the Engine Mechanical Specifications. If the cylinder diameter exceeds the specifications, the cylinder block may be oversized to 0.25 mm (0.010 in). There is only one size of oversized pistons and rings available for service.

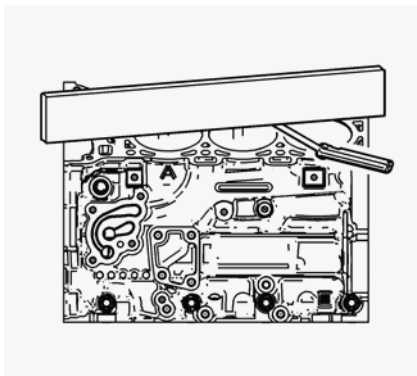
Measuring Cylinder Bore Taper

1. Measure the cylinder bore along the thrust surfaces, perpendicular to the crankshaft centerline, at 10 mm (0.397 in) below the deck surface and record your measurement.
2. Measure the cylinder bore along the thrust surfaces, perpendicular to the crankshaft centerline, at 100 mm (3.976 in) below the deck surface and record your measurement.
3. Calculate the difference between the 2 measurements. The result will be the cylinder taper.
4. Compare your results with the Engine Mechanical Specifications. If the cylinders exceed the specifications, the cylinder block may be oversized to 0.25 mm (0.010 in). There is only one size of oversized pistons and rings available for service.

Measuring Cylinder Bore Out-of-Round

1. Measure both the thrust and non-thrust cylinder diameter at 10 mm (0.397 in) below the deck. Record your measurements.
2. Calculate the difference between the 2 measurements. The result will indicate out-of-round at the upper end of the cylinder.
3. Measure both the thrust and non-thrust cylinder diameter at 100 mm (3.976 in) below the deck surface. Record your measurements.
4. Calculate the difference between the 2 measurements. The result will indicate out-of-round at the lower end of the cylinder.
5. Compare your results with the Engine Mechanical Specifications. If the cylinders exceed these specifications, the cylinder block may be oversized to 0.25 mm (0.010 in). There is only one size of oversized pistons and rings available for service.

Deck Flatness Inspection



1. Ensure the engine block decks are clean and free of gasket material.
2. Inspect the surface for any imperfections or scratches that could inhibit proper cylinder head gasket sealing.
3. Place a straight-edge diagonally across the cylinder block deck face surface.
4. Measure the clearance between the straight-edge and the cylinder block deck face using a feeler gauge at 4 points along the straight-edge.
5. If the warpage is less than 0.05 mm (0.002 in), the cylinder block deck surface does not require resurfacing.
6. If the warpage is between 0.05–0.20 mm (0.002–0.008 in) or any imperfections or scratches that could inhibit proper cylinder head gasket sealing are present, the cylinder block deck surface requires resurfacing.
7. If resurfacing is required the maximum amount that can be removed is 0.25 mm (0.010 in).
8. If the cylinder block deck surface requires more than 0.25 mm (0.010 in) material removal the block must be replaced.

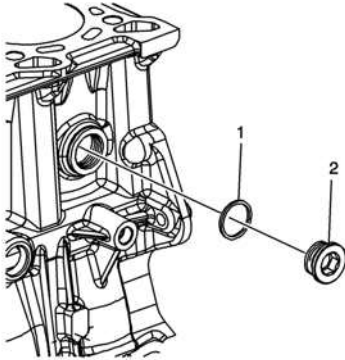
2013 Chevrolet Colorado

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Fuel Delivery: | Fuel:

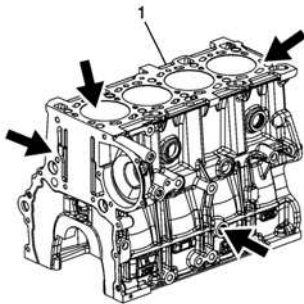
Special Tools

- J 7872 Magnetic Base Dial Indicator
- J 8087 Cylinder Bore Gauge

For equivalent regional tools, refer to Special Tools



1. Remove the engine block plugs (2) and seals (1).



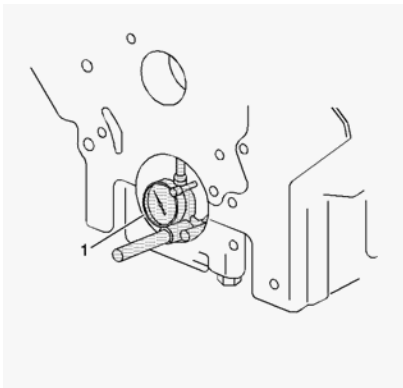
2. Clean the sealing material from the gasket mating surfaces.
3. Clean the engine block (1) and lower crankcase in a cleaning tank with solvent appropriate for aluminum.
4. Flush the engine block with clean water or steam.
5. Clean the oil passages.
6. Clean the blind holes.
7. Spray the cylinder bores and the machined surfaces with engine oil.
8. Inspect the threaded holes. Clean the threaded holes with a rifle brush. If necessary, drill out the holes and install thread inserts. Refer to Thread Repair.

Note: Do not attempt to machine the lower crankcase to engine block surfaces.

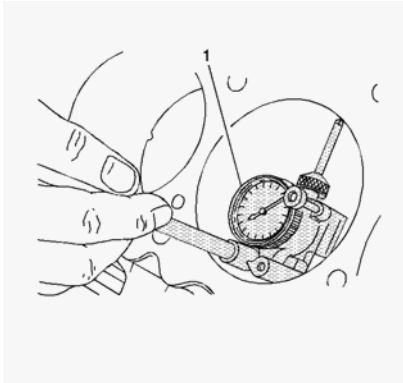
9. Use a straight edge and a feeler gauge to check the deck surface for flatness. Carefully machine minor irregularities. Replace the block if more than 0.254 mm (0.010 in) must be removed.
10. Inspect the oil pan rail for nicks. Inspect the front cover attaching area for nicks. Use a flat mill file to remove any nicks.
11. Clean the sealing material from the gasket mating surfaces on the lower crankcase engine block side.
12. Inspect the mating surfaces of the transmission face.

Caution: A broken flywheel may result if the transmission case mating surface is not flat.

13. Use the following procedure in order to measure the engine block flange runout at the mounting bolt hole bosses:
 1. Temporarily install the crankshaft and upper bearings. Measure the crankshaft flange runout using the J 7872 indicator .
 2. Hold the gauge plate flat against the crankshaft flange.
 3. Place the dial indicator stem on the transmission mounting bolt hole boss. Set the indicator to 0.
 4. Record the readings obtained from all of the bolt hole bosses. The measurements should not vary more than 0.203 mm (0.008 in).
 5. Recheck the crankshaft flange runout if the readings vary more than 0.203 mm (0.008 in).
 6. Remove the crankshaft and bearings.



14. Install the main bearing caps and bolts. Tighten the main bearing cap bolts to specification.
15. Inspect the crankshaft main bearing bores. Use the *J 8087* gauge (1) to measure the bearing bore concentricity and alignment. Refer to Engine Mechanical Specifications.
16. Replace the engine block if the crankshaft bearing bores are out of specification.

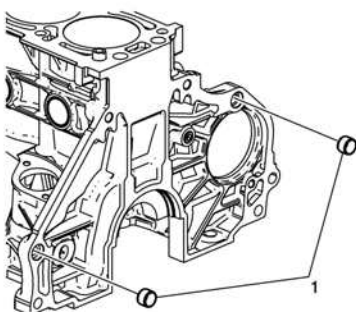


17. Inspect the cylinder bores using the *J 8087* gauge (1). Inspect for the following items:

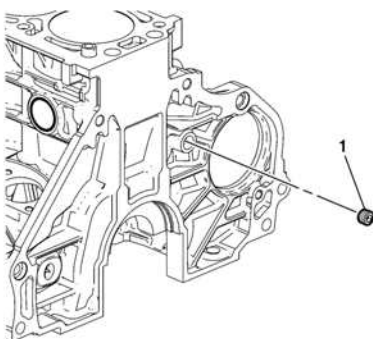
- Wear
- Taper
- Runout
- Ridging

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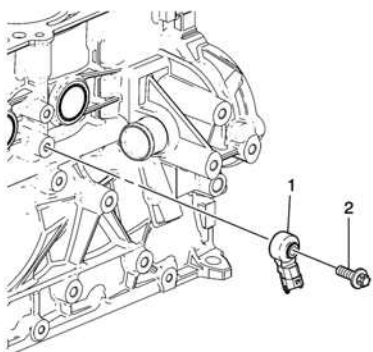
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



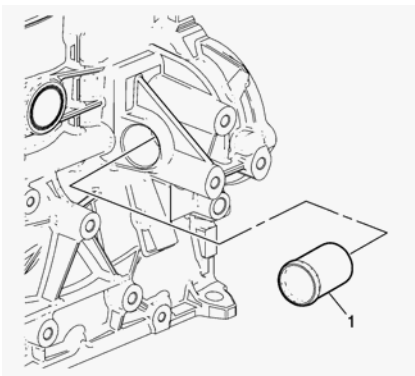
1. Remove the transmission locating pins (1).



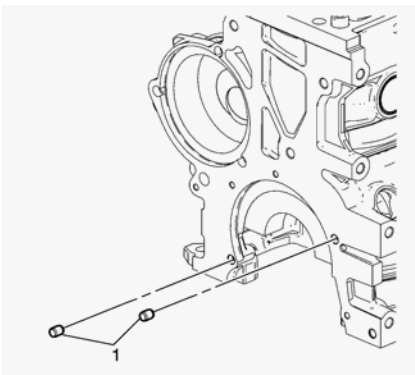
2. Remove the engine block oil gallery plugs (1).



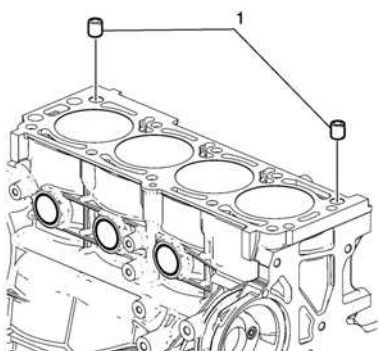
3. Remove the knock sensor bolt (2) and knock sensor (1).



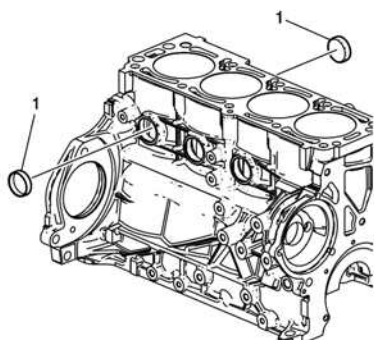
4. Remove the water inlet pipe (1).



5. Remove the oil pump housing locating pins (1).



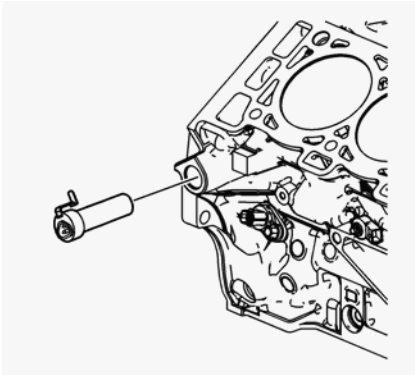
6. Remove the cylinder head locating pins (1).



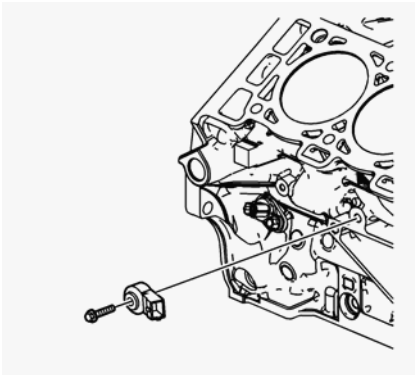
7. Remove the engine block water jacket plugs (1).

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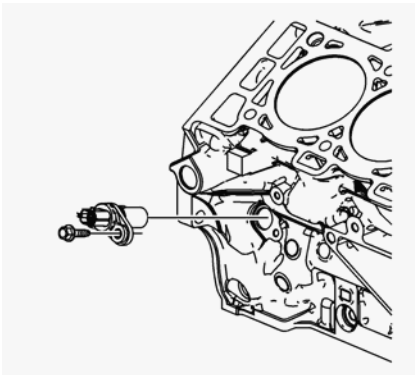
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



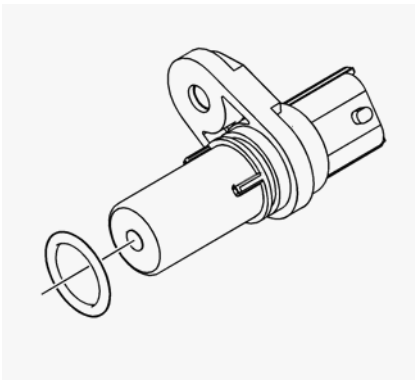
1. Remove the block heater cartridge.



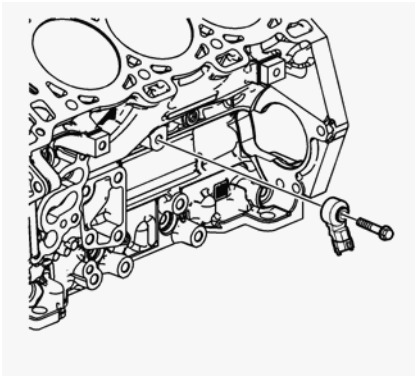
2. Remove the right knock sensor bolt.
3. Remove the right knock sensor.



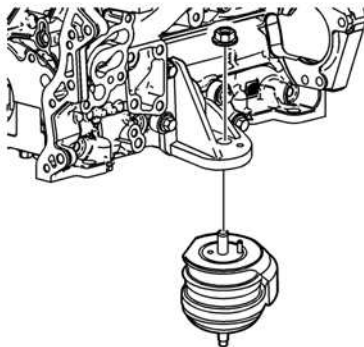
4. Remove the crankshaft position sensor bolt.
5. Remove the crankshaft position sensor.



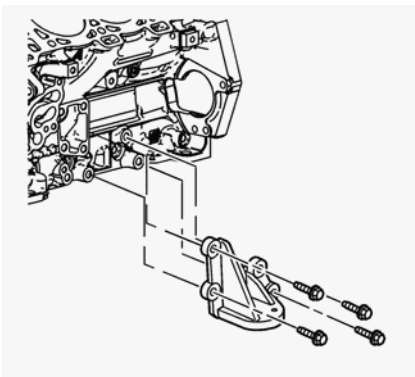
6. Remove the crankshaft position sensor O-ring, if damaged.



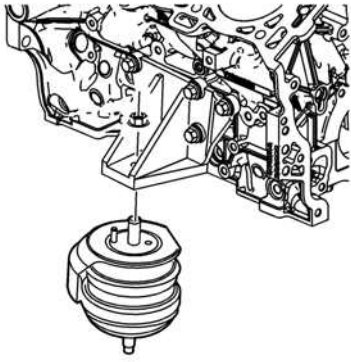
7. Remove the left knock sensor bolt.
8. Remove the left knock sensor.



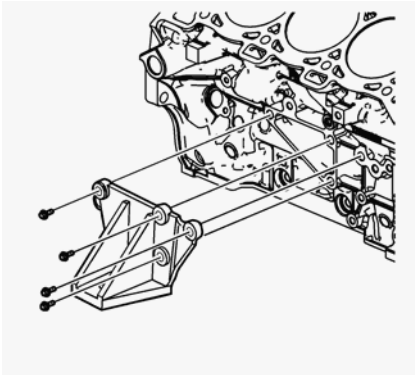
9. Remove the left engine mount nut.
10. Remove the left engine mount.



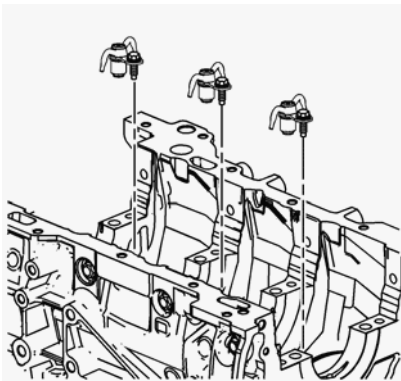
11. Remove the left engine mount bracket bolt.
12. Remove the left engine mount bracket.



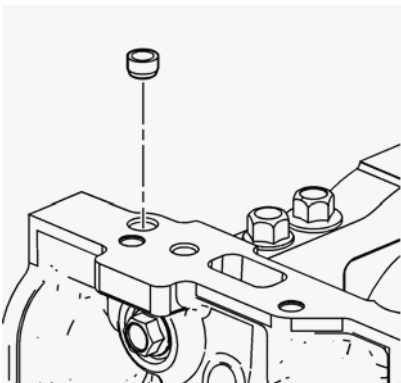
13. Remove the right engine mount nut.
14. Remove the right engine mount.



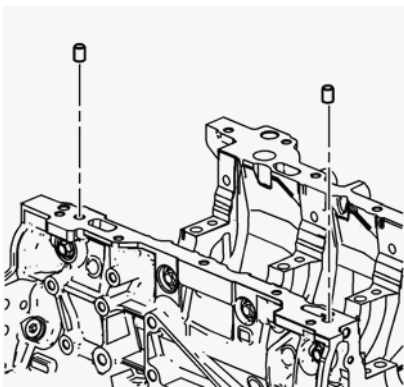
15. Remove the engine mount bracket bolts (1, 2).
16. Remove the engine mount bracket.



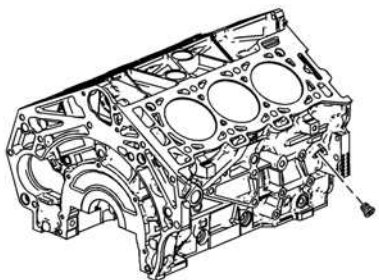
17. Remove the oil jet bolts.
18. Remove the oil jets.



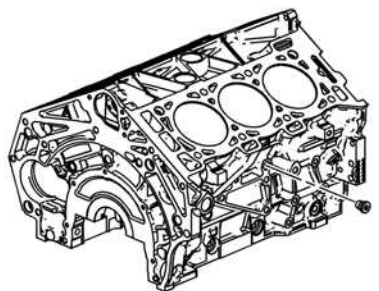
19. Remove the right front oil pan rail oil gallery expansion plug.



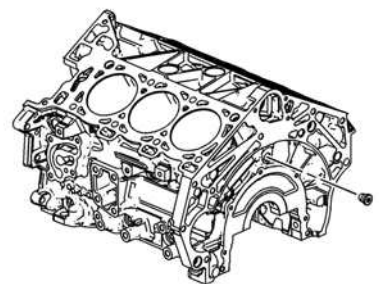
20. Remove the cylinder block-to-oil pan alignment dowels.



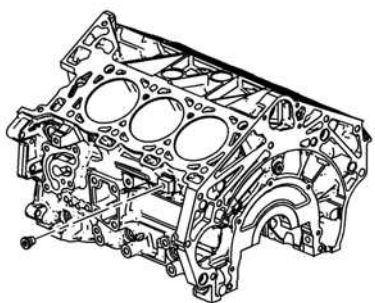
21. Remove the M14 right side oil gallery threaded plug.



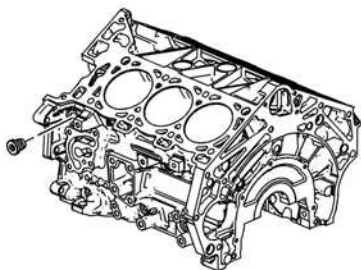
22. Remove the M14 right side coolant drain threaded plug.



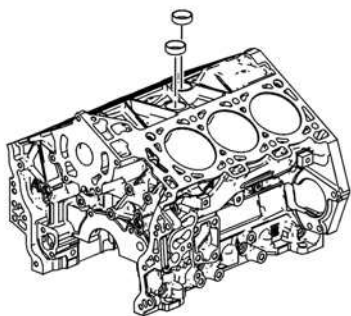
23. Remove the M14 rear oil gallery threaded plug.



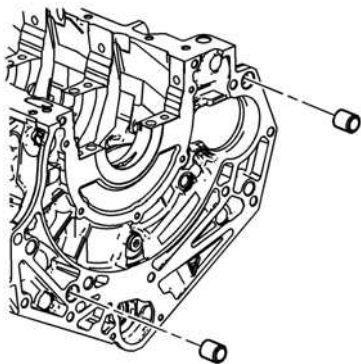
24. Remove the M14 left side coolant drain threaded plug.



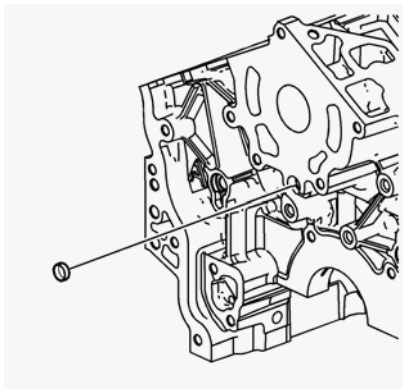
25. Remove the M20 left side oil gallery threaded plug.



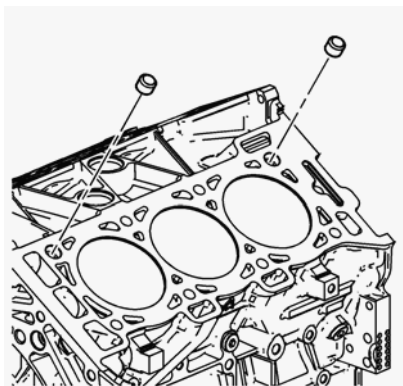
26. Remove the coolant expansion plugs.



27. Remove the cylinder block-to-transmission alignment dowels.



28. Remove the front oil gallery expansion plug.



29. Remove the cylinder block-to-cylinder head alignment dowels.

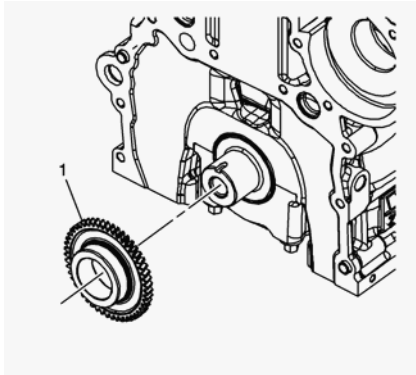
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

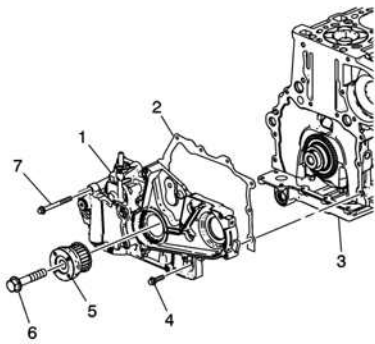
Special Tools

EN-50030 Crankshaft Locking Tool

For equivalent regional tools, refer to Special Tools



1. Install the oil pump gear (1).

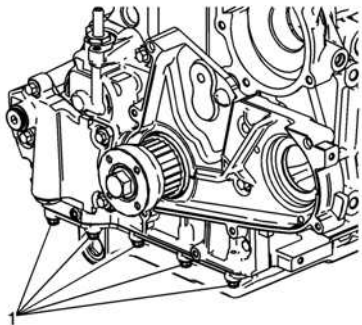


2. Temporarily install the upper oil pan (3) with enough bolts to hold it in place.
3. Install the front cover and oil pump housing gasket (2).
4. Install the front cover and oil pump housing (1) and housing bolts (4 and 7) finger tight.

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

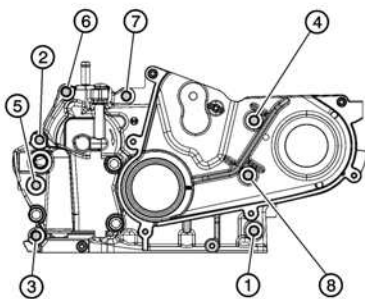
Note: The crankshaft timing pulley bolt is left hand thread. The keyway in the crankshaft should match up with the timing pulley and result in 90° ATDC.

5. Install the crankshaft timing pulley (6) and NEW pulley bolt (5) finger tight.

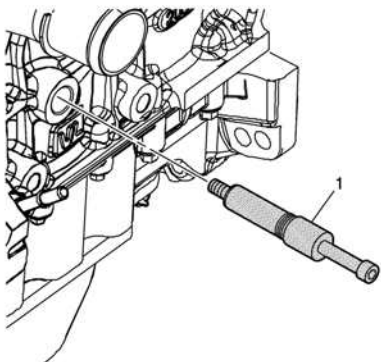


Caution: Refer to Fastener Caution.

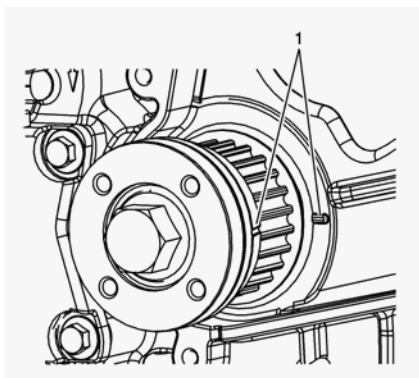
6. Install the upper oil pan to engine front cover bolts (1) and tighten to **15 Y (11 lb ft)**.



7. Tighten the engine front cover bolts in sequence to **32 Y (24 lb ft)**.
8. Remove the upper oil pan.



9. Install the *EN-50030* locking tool (1).

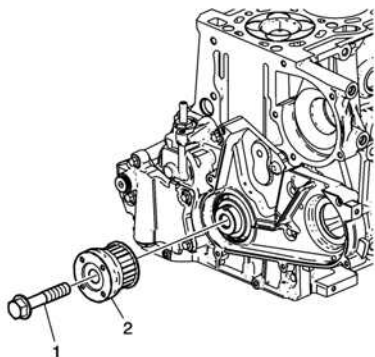


Note: The crankshaft timing pulley bolt is left hand thread. The keyway in the crankshaft should match up with the timing pulley and result in 90° ATDC.

10. Ensure that the timing mark on the crankshaft timing pulley is aligned at 90 degrees ATDC (1).
11. Tighten the NEW crankshaft timing pulley bolt.
 1. Tighten the bolt a first pass to **100 Y (74 lb ft)**.
 2. Tighten the bolt a final pass to **120 degrees**.

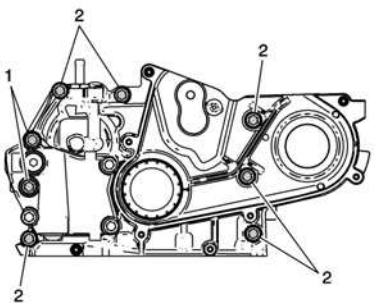
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

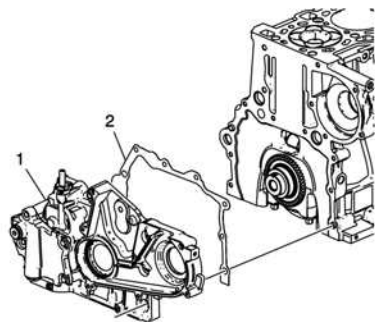


Note: The crankshaft timing pulley bolt (1) has a left hand thread.

1. Remove the crankshaft timing pulley bolt (1) and pulley (2).

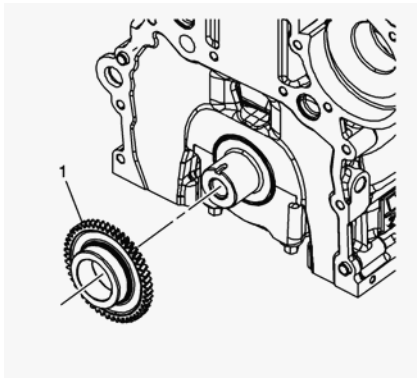


2. Remove the front cover and oil pump housing bolts (1 and 2).



3. Remove the front cover (1) and gasket (2).

Engine Front Cover and Oil Pump Removal



4. Remove the oil pump gear (1).

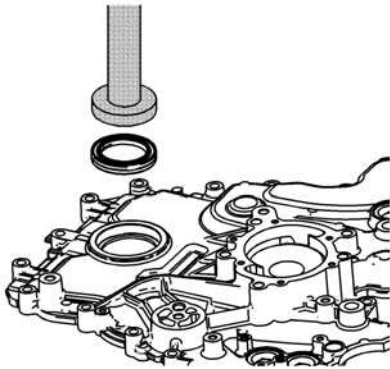
2013 Chevrolet Colorado

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Fuel Delivery: | Fuel:

Special Tools

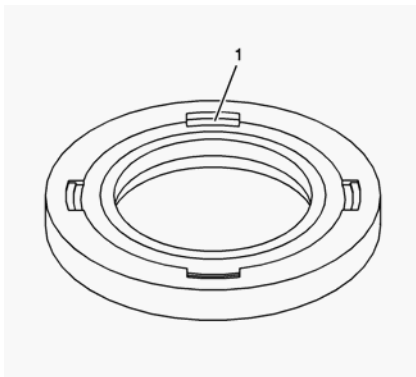
- EN 29184 Oil Seal Installer
- EN 46103 Camshaft Actuator Valve Seal Installer

For equivalent regional tools, refer to Special Tools.

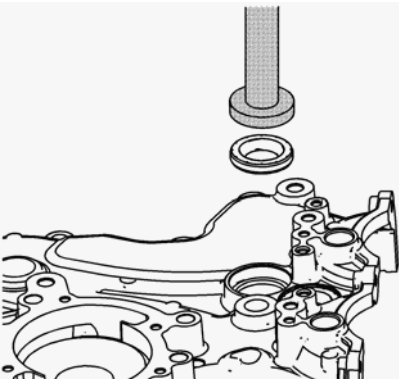


Important: Do not lubricate the crankshaft front oil seal or crankshaft balancer sealing surfaces. The crankshaft balancer is installed into a dry seal.

1. Install the NEW crankshaft front oil seal into the engine front cover using the EN 29184 installer .



2. Place the seal into position with the notches (1) in the seal down. The notches (1) will face inboard when properly installed.



3. Install the NEW camshaft position actuator valve oil seals into the engine front cover using the EN 46103 installer .

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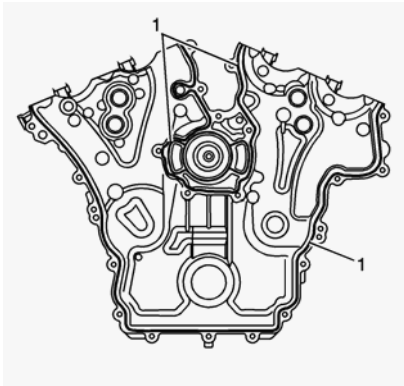
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

EN 28410 Gasket Remover

For equivalent regional tools, refer to Special Tools.

[Cleaning Procedure](#)

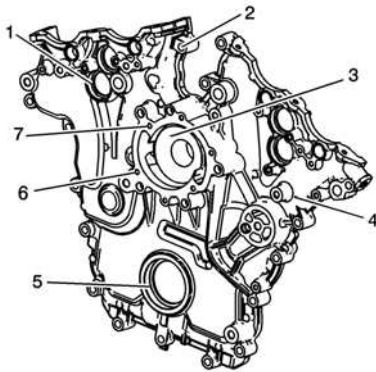


1. Remove any RTV sealant (1) from the engine front cover using *EN 28410* remover .
2. Clean out debris from the bolt holes.
3. Clean the engine front cover in solvent.

Warning: Refer to Safety Glasses Warning.

4. Dry the engine front cover with compressed air.

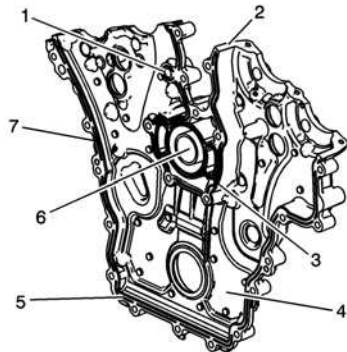
[Inspection Procedure](#)



1. Inspect the exterior of the engine front cover for the following conditions:

- Damage to the water pump bolt hole threads (7)
- Gouges or damage to the water pump sealing surfaces (6)
- Damage to the crankshaft front oil seal bore (5)
- Damage to the camshaft position actuator valve oil seal bores (1)
- Damage to the engine front cover bolt holes (2)
- Damage and/or corrosion to the engine coolant passage (3)
- Dents or damage to the exterior (4)

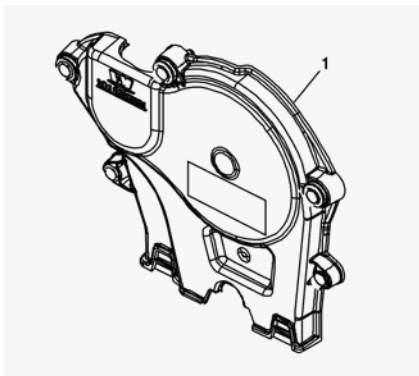
Engine Front Cover Cleaning and Inspection



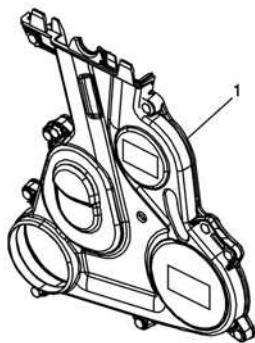
- Inspect the interior of the engine front cover for the following conditions:
 - Gouges or damage to the engine front cover sealing surfaces to the engine block (7), oil pan (5), and/or camshaft covers (2)
 - Damage and/or corrosion to the engine coolant passage (6)
 - Damage to the crankshaft front oil seal bore
 - Gouges or damage to the O-ring sealing areas
 - Gouges or damage to the water pump seal area (3)
 - Loose or damaged deadener plates (4)
 - Damage to the engine front cover bolt holes (1)
- Repair or replace the engine front cover as necessary.

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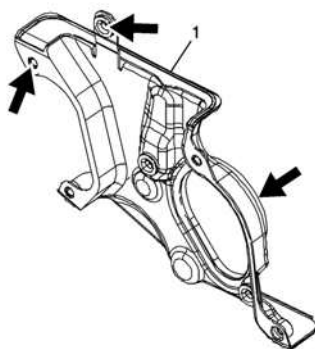
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



1. Clean and inspect the timing belt upper front cover (1).



2. Clean and inspect the timing belt lower front cover (1).



3. Clean and inspect the timing belt rear cover (1).

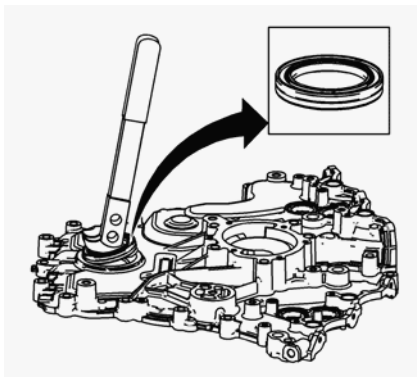
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

EN 45000 Seal Remover

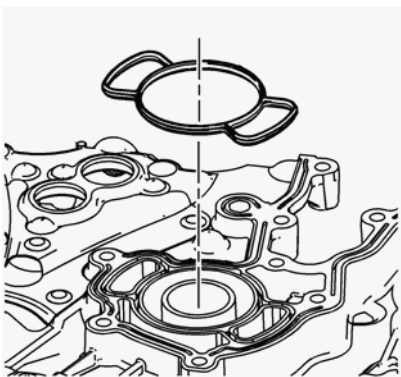
For equivalent regional tools, refer to Special Tools



1. Remove the crankshaft front oil seal from the engine front cover using the *EN 45000* remover .



2. Remove the camshaft position actuator valve oil seals from the engine front cover.



3. Remove the water pump seal from the engine front cover.
4. Discard the water pump seal.

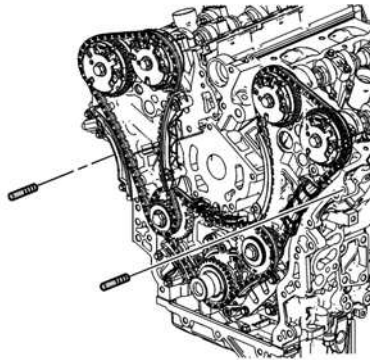
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
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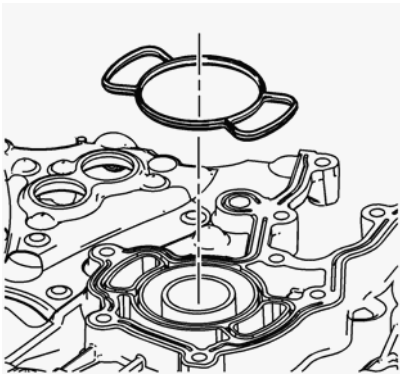
Special Tools

EN-46109 Guide Pins

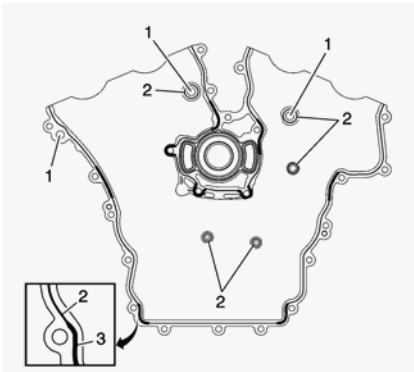
For equivalent regional tools, refer to Special Tools.



1. Install the 8 mm (0.315 in) guide from the EN-46109 pins into the cylinder block positions as shown.

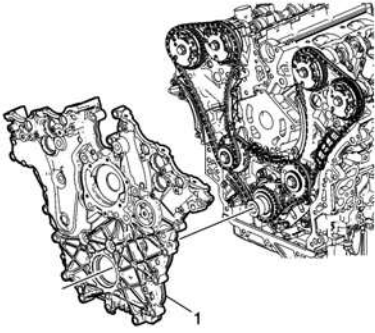


2. Install the NEW engine front cover to cylinder block seal.

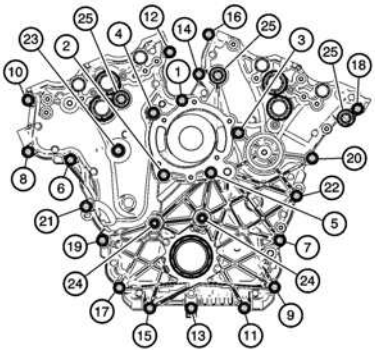


Note: No RTV sealant should be visible in the M12 bolt holes (1) upon final assembly of front cover to engine.

3. Apply a 3 mm (0.118 in) bead of RTV sealant on the engine front cover as shown (2). Apply a 5 mm (0.197 in) bead of RTV sealant on the engine front cover as shown (3). Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended sealant.



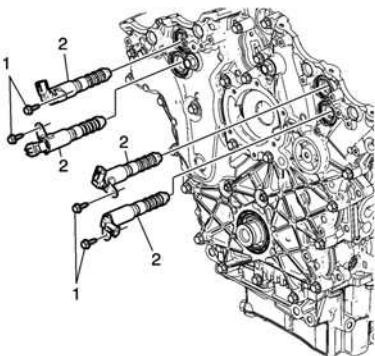
4. Place the engine front cover (1) onto the EN-46109 pins and slide into position.
5. Remove the EN-46109 pins from the cylinder block.
6. Hand start all the engine front cover bolts.



Caution: Refer to Fastener Caution.

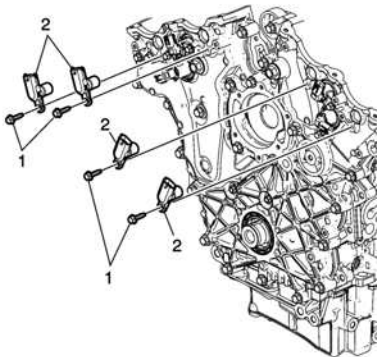
Note: Engine front cover bolts in the number (25) location are model dependent and may not apply.

7. Tighten the engine front cover bolts (1-23) in the sequence shown to **20 Y (14 lb ft)**.
 1. Tighten the engine front cover bolts (1-23) a second pass in sequence to **20 Y (14 lb ft)**.
 2. Tighten the engine front cover bolts (1-23) a third pass in sequence an additional **60 degrees**.
 3. Tighten the engine front cover bolts (24) to **15 Y (11 lb ft)**.
 4. Tighten the engine front cover bolts (25) to **65 Y (48 lb ft)**.



8. Place the camshaft position actuator valves (2) in position on the front cover.
9. Install the camshaft position actuator valve bolts (1) and tighten to **10 Y (89 lb in)**.

Engine Front Cover Installation

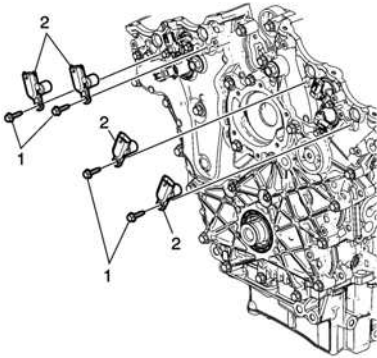


Note: Inspect the camshaft position sensor O-ring seals. If the seals are damaged, the entire camshaft position sensor must be replaced.

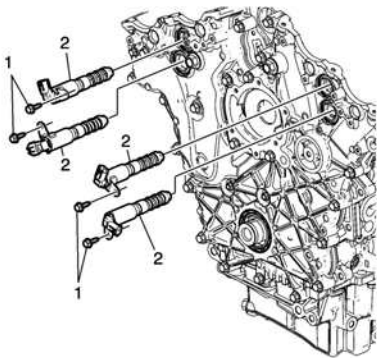
10. Place the camshaft position sensors (2) in position on the front cover.
11. Install the camshaft position sensor bolts (1) and tighten to **10 Y (89 lb in)**.

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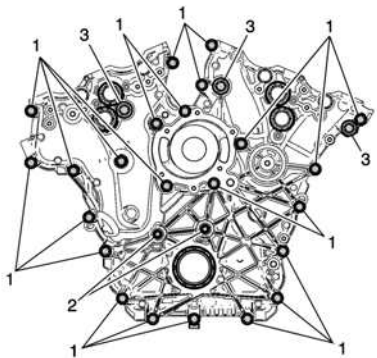
1. Remove the camshaft position sensor bolts (1).
2. Remove the camshaft position sensors (2).



3. Remove the camshaft position actuator valve bolts (1).

Caution: The camshaft position actuator valves must be removed from the front cover prior to front cover removal or damage to the valves may occur.

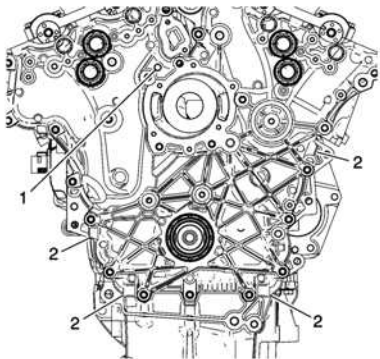
4. Remove the camshaft position actuator valves (2) from the front cover.



Note: Engine front cover bolts in the number (3) location are model dependent and may have already been removed.

Note: There are a total of 23 M8 bolts (1) and 2 M6 bolts (2) that must be removed, and 3 optional M12 bolts (3) that may need to be removed before the front cover will separate from the engine block.

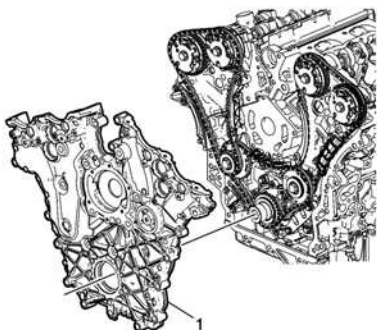
5. Remove the engine front cover bolts (1–3).



Caution: Do not use the jackscrew hole without first removing all engine front cover bolts. Failure to remove all engine front cover bolts before using the jackscrew hole could result in damage to components.

Caution: Do not pry between the engine front cover and the camshaft position sensors or the camshaft position actuators in order to separate the RTV. Use the pry points and a bolt in the jackscrew hole in order to remove the engine front cover. Damage to the camshaft position sensors or the camshaft position actuators may occur if the camshaft position sensors or the camshaft position actuators are used to pry against in order to remove the engine front cover.

6. Loosely install a 10 x 1.5 mm bolt in the jackscrew hole (1).
7. Using the pry points (2) located at the edge of the front cover and the jackscrew, separate the room temperature vulcanizing (RTV) sealant.



8. Remove the engine front cover (1).

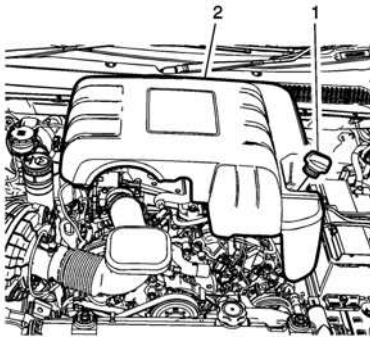
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

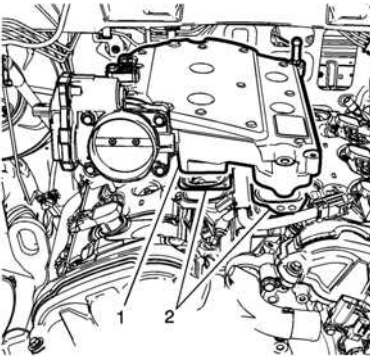
Special Tools

EN 46109 Engine Front Cover Installation Guide Pins

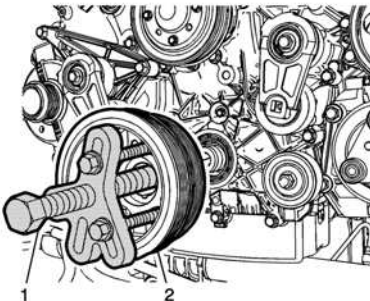
[Removal Procedure](#)



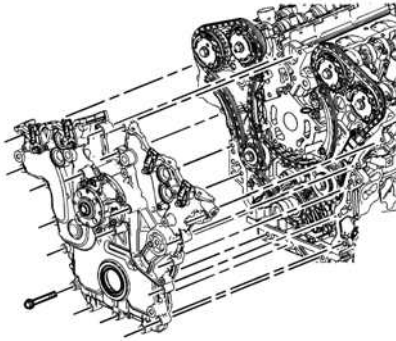
1. Remove the intake manifold cover (2). Intake Manifold Cover Replacement.
2. Remove the air cleaner outlet duct.



3. Remove the upper intake manifold. Refer to Upper Intake Manifold Replacement.
 4. Remove the camshaft covers. Refer to Camshaft Cover Replacement - Left Side and Camshaft Cover Replacement - Right Side.
 5. Drain the engine coolant. Refer to Cooling System Draining and Filling.
 6. Remove the water outlet with the radiator hose and reposition aside. Refer to Radiator Outlet Hose Replacement.
 7. Remove the accessory drive belts. Refer to Water Pump and Generator Belt Replacement and Air Conditioning Compressor and Power Steering Pump Belt Replacement.
 8. Remove the A/C compressor and power steering belt tensioner. Refer to Air Conditioning Compressor and Power Steering Pump Belt Tensioner Replacement.
 9. Remove the generator bracket with the generator and the belt tensioner. Refer to Generator Bracket Replacement.
- Note:** Do not disconnect the power steering pipes/hoses.
10. Remove the power steering pump bracket upper front bolt and loosen the remaining two bolts.



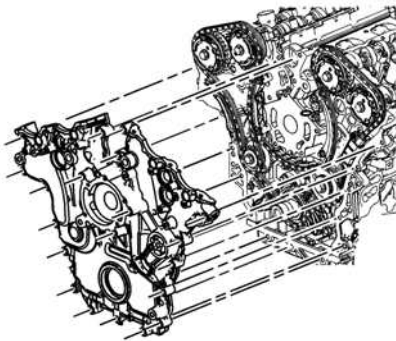
11. Remove the crankshaft balancer. Refer to Crankshaft Balancer Removal.
12. Remove the camshaft position sensors. Refer to Camshaft Position Sensor Replacement - Bank 2 (Left Side) Exhaust, Camshaft Position Sensor Replacement - Bank 2 (Left Side) Intake, Camshaft Position Sensor Replacement - Bank 1 (Right Side) Exhaust and Camshaft Position Sensor Replacement - Bank 1 (Right Side) Intake.
13. Remove the camshaft position actuator solenoid valves from the front cover. Refer to Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 1 (Right Side) Intake, Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 1 (Right Side) Exhaust, Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 2 (Left Side) Intake, and Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 2 (Left Side) Exhaust.



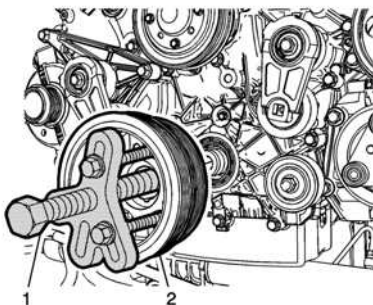
14. Remove the engine front cover with the water pump. Refer to Engine Front Cover Removal.
15. Disassemble the engine front cover. Refer to Engine Front Cover Disassemble.
Note: Do NOT use sharp and/or metal gasket scrapers in order to clean the sealing surfaces.
16. Carefully clean the engine front cover sealing surfaces. Refer to Engine Front Cover Cleaning and Inspection.
Note: Insert a piece of cardboard between the oil pan front and the oil pump in order to prevent any contaminants from falling into the oil pan.
17. Carefully clean the engine front cover sealing surfaces. Refer to Engine Front Cover Cleaning and Inspection.
18. Use compressed air in order to remove any engine coolant from the engine cooling passages and from the top of the oil pan scraper (windage tray).

Installation Procedure

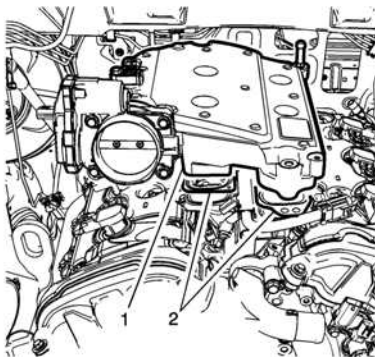
1. Assemble the engine front cover. Refer to Engine Front Cover Assemble.



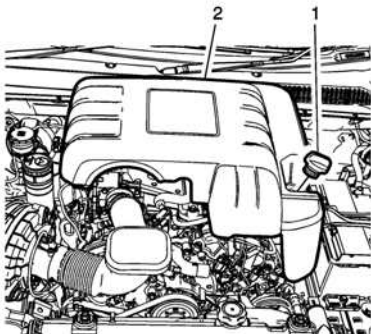
2. Use the EN 46109 Engine Front Cover Installation Guide Pins in order to install the engine front cover. Refer to Engine Front Cover Installation.
3. Install the camshaft position actuator solenoid valves to the front cover. Refer to Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 1 (Right Side) Intake, Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 1 (Right Side) Exhaust, Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 2 (Left Side) Intake, and Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 2 (Left Side) Exhaust.
4. Install the camshaft position sensors. Refer to Camshaft Position Sensor Replacement - Bank 2 (Left Side) Exhaust, Camshaft Position Sensor Replacement - Bank 2 (Left Side) Intake, Camshaft Position Sensor Replacement - Bank 1 (Right Side) Exhaust and Camshaft Position Sensor Replacement - Bank 1 (Right Side) Intake.



5. Install the crankshaft balancer. Refer to Crankshaft Balancer Installation.
6. Install the power steering pump bracket bolt and tighten the remaining two.
7. Install the generator bracket with the generator and the belt tensioner. Refer to Generator Bracket Replacement.
8. Install the A/C compressor and power steering belt tensioner. Refer to Air Conditioning Compressor and Power Steering Pump Belt Tensioner Replacement.
9. Install the accessory drive belts. Refer to Water Pump and Generator Belt Replacement and Air Conditioning Compressor and Power Steering Pump Belt Replacement.
10. Install the water outlet. . Refer to Radiator Outlet Hose Replacement.
11. Install the camshaft covers. Refer to Camshaft Cover Replacement - Left Side and Camshaft Cover Replacement - Right Side.



12. Install the upper intake manifold. Refer to Upper Intake Manifold Replacement.
13. Install the air cleaner outlet duct.



14. Install the intake manifold cover (2). Intake Manifold Cover Replacement.
15. Fill the cooling system. Refer to Cooling System Draining and Filling.

2013 Chevrolet Colorado

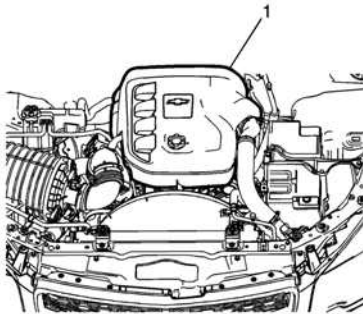
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

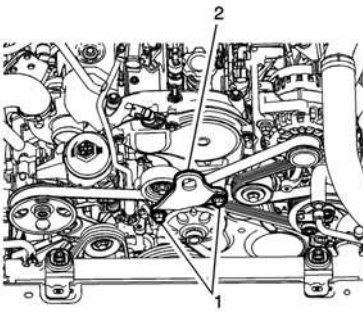
- EN-50025 Pulley Holding Wrench
- EN-50029 Camshaft Holding Tool
- EN-50030 Crankshaft Locking Tool

For equivalent regional tools, refer to Special Tools.

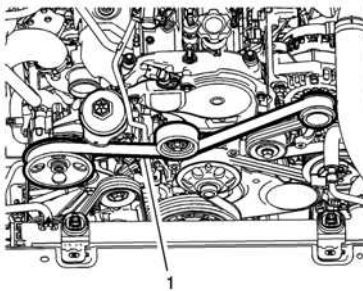
[Removal Procedure](#)



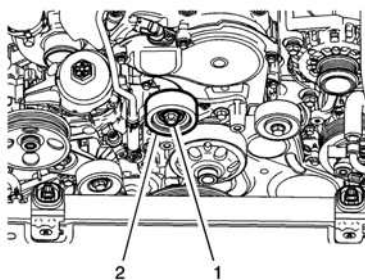
1. Remove the intake manifold cover (1). Refer to Intake Manifold Cover Replacement.
2. Remove the engine protection shield. Refer to Engine Protection Shield Replacement.
3. Remove the engine coolant fan shroud. Refer to Engine Coolant Fan Shroud Replacement.



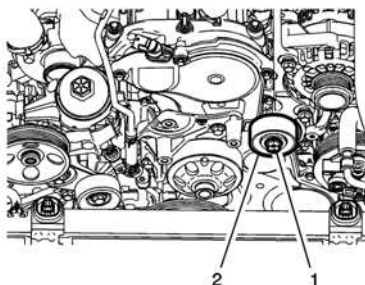
4. Remove the engine lift bracket front (2). Refer to Engine Lift Front Bracket Replacement.



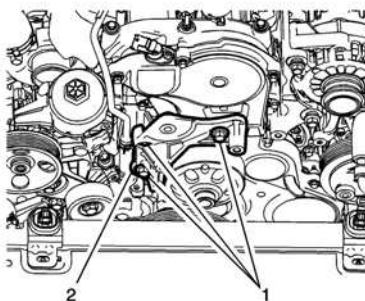
5. Remove the drive belt (1). Refer to Drive Belt Replacement.
6. Remove the air conditioning compressor. Refer to Air Conditioning Compressor Replacement.



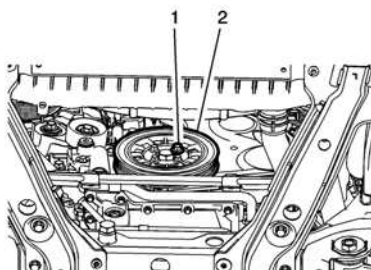
7. Remove the drive belt idler pulley fastener (1).
8. Remove the drive belt idler pulley (2).



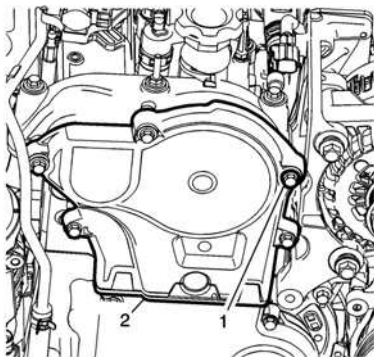
9. Remove the drive belt idler pulley fastener (1).
10. Remove the drive belt idler pulley (2).



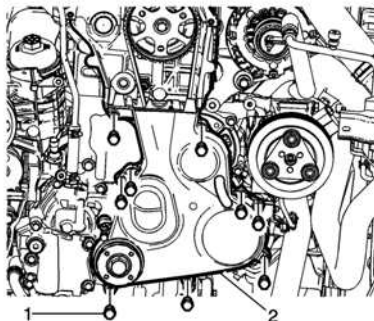
11. Remove the engine coolant fan bracket fastener (1).
12. Remove the engine coolant fan bracket (2). Refer to Engine Coolant Fan Bracket Replacement



13. Remove the crankshaft pulley fastener (1).
14. Remove the Crankshaft Pulley (2). Refer to Crankshaft Pulley Replacement

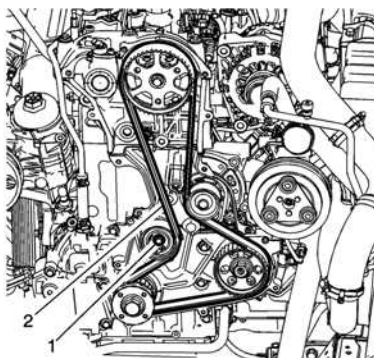


15. Remove the timing belt upper cover fastener (1).
16. Remove the timing belt upper cover (2).

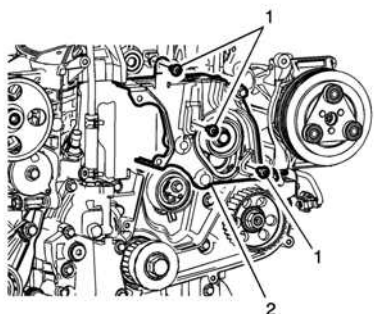


Note: Note: The bolts in the lower front cover are captured and cannot be removed.

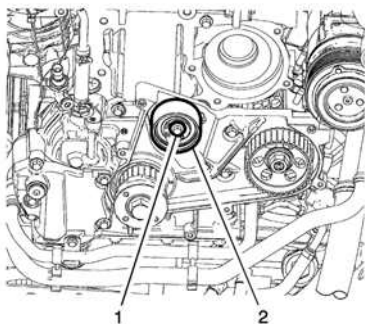
17. Remove the timing belt lower cover fastener (1).
18. Remove the timing belt lower cover (2).
19. Remove the timing belt lower cover seal and DISCARD.



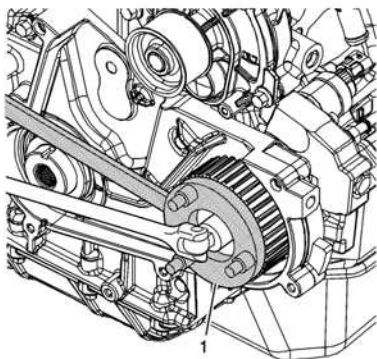
20. Loosen the timing belt tensioner bolt and rotate tensioner (1) clockwise to remove tension and remove the timing belt (2).



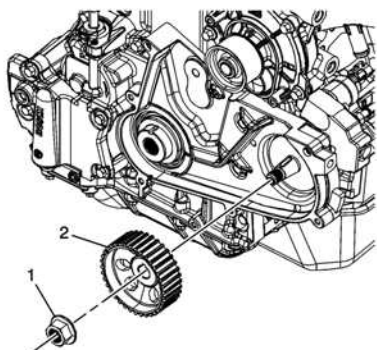
21. Remove the rear timing cover bolts (1) and rear cover (2).



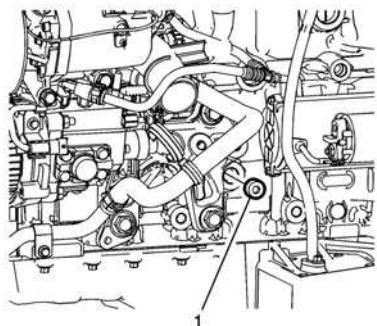
22. Remove the timing belt tensioner bolt (1) and tensioner (2).



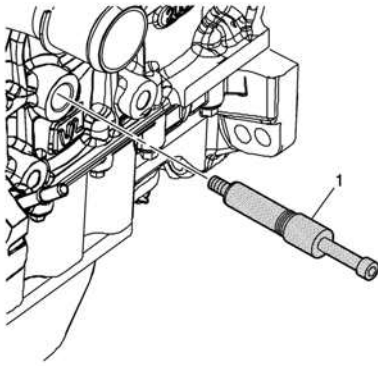
23. Hold the fuel injection pump drive pulley with the EN-50025 wrench (1) and loosen the retaining nut.



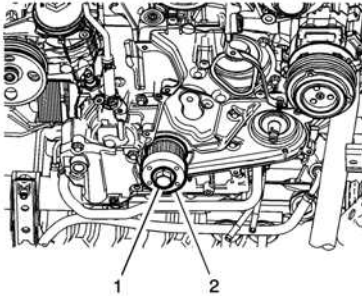
24. Remove the fuel injection pump drive pulley nut (1) and pulley (2).
25. Remove the front left tire and wheel assembly. Refer to Tire and Wheel Removal and Installation.
26. Remove engine lower front splash shield. Refer to Engine Lower Front Splash Shield Replacement



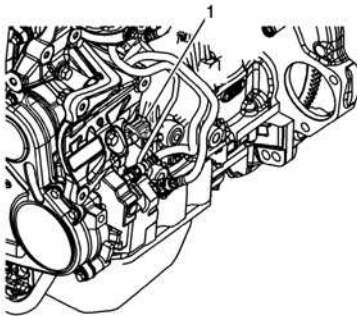
27. Remove the cylinder block core hole plug (1).



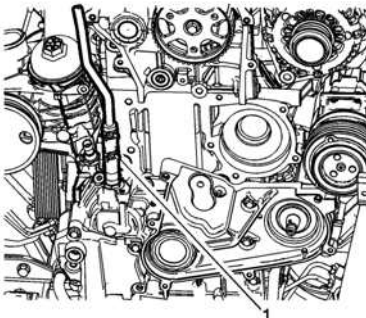
28. Install EN-50030 locking tool (1).



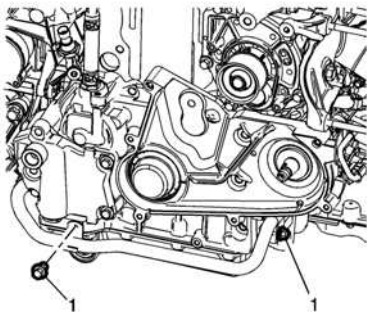
- Note:** The crankshaft timing gear bolt (1) has a left hand thread.
29. Remove the crankshaft timing gear bolt (1) and gear (2).



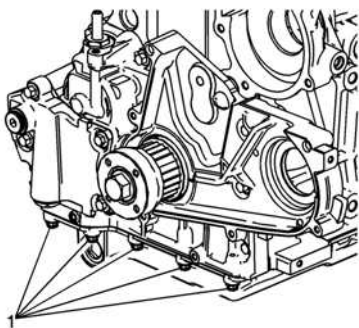
30. Disconnect the engine wiring harness (1) from the fuel injection pump.
31. Disconnect the water return pipe from the water outlet.
32. Disconnect the fuel feed and return pipes from the fuel injection pump. Refer to Plastic Collar Quick Connect Fitting Service.
33. Disconnect the fuel feed pipe between the pump and fuel rail.



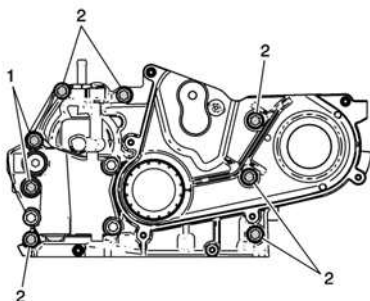
34. Disconnect the secondary air injection hose (1).



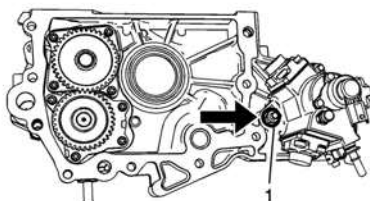
- 35. Remove the engine oil cooler inlet pipe bolt (1).
- 36. Drain completely the engine oil. Refer to Engine Oil and Oil Filter Replacement.



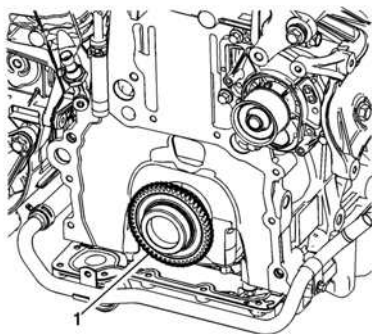
- Note:** The crankshaft timing gear bolt (1) has a left hand thread.
- 37. Remove the oil pan bolts (1).



- 38. Remove the front cover and oil pump housing bolts (1) and (2).

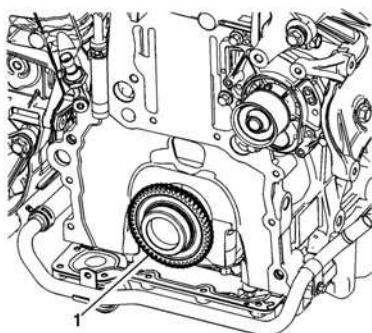


- 39. Remove the three fuel injection nuts (1).
- 40. Remove the fuel injection pump (2) from the engine front cover.

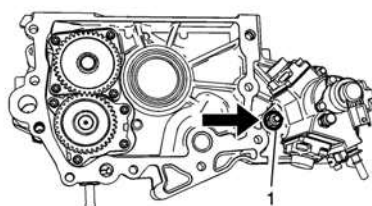


41. Remove the oil pump gear (1).
42. For cleaning and inspection. Refer to Oil Pump Cleaning and Inspection

[Installation Procedure](#)



1. Install the oil pump gear (1).

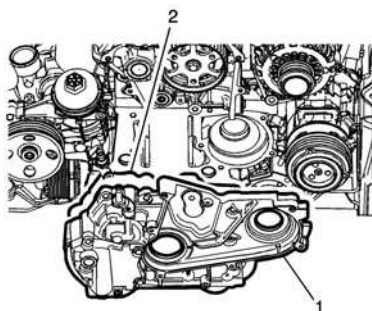


Note: Fuel lines with a threaded fitting can not be reused, but must be replaced with a new one.

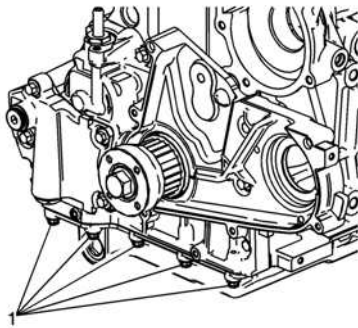
2. Install the fuel injection pump (2) in the engine front cover.

Caution: Refer to Fastener Caution.

3. Install the three fuel injection nuts (1) and tighten to **28 Y (20 lb ft)**.

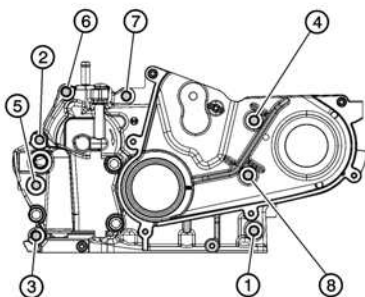


4. Install the front cover and oil pump housing (1) .
5. Install the front cover and oil pump housing (1) and housing bolts finger tight.

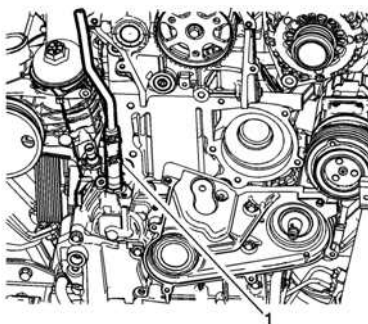


Caution: Refer to Fastener Caution.

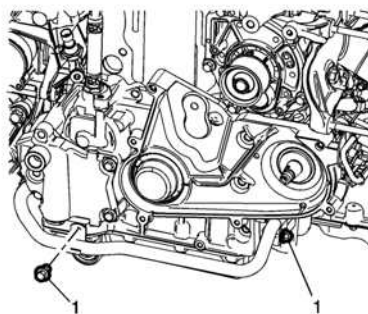
6. Tighten the upper oil pan to engine front cover bolts (1) to **15 Y (11 lb ft)**.



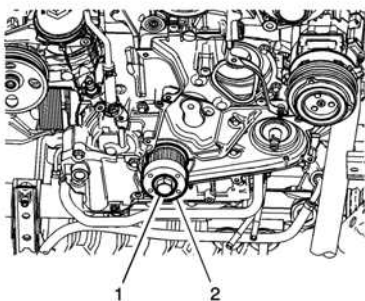
7. Tighten the engine front cover bolts in sequence to **32 Y(24 lb ft)**.



8. Connect the secondary air injection hose (1).

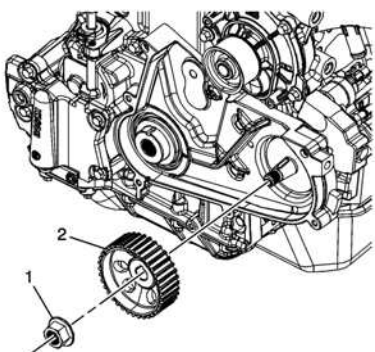


9. Install the engine oil cooler inlet pipe bolt (1) and tighten to **11 Y (97 lb in)**

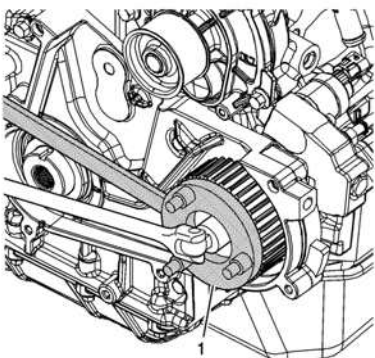


- Note:** The crankshaft timing gear bolt is left hand thread. The keyway in the crankshaft should match up with the timing pulley and result in 90° ATDC.
10. Install the crankshaft timing gear (2).
 11. Tighten the crankshaft timing gear bolt.

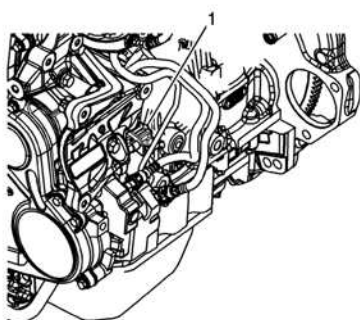
- Tighten the bolt a first pass to **100 Y (74 lb ft)**.
- Tighten the bolt a final pass to **120 degrees**.



- Install the fuel injection pump drive gear nut (1) and gear (2).

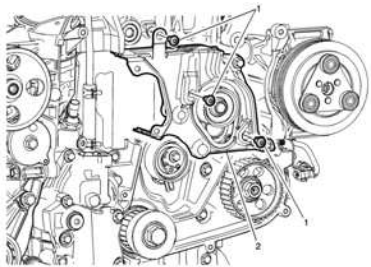


- Hold the fuel injection pump drive gear with the EN-50025 wrench (1) and tighten the retaining nut to **88 Y (65 lb ft)**.

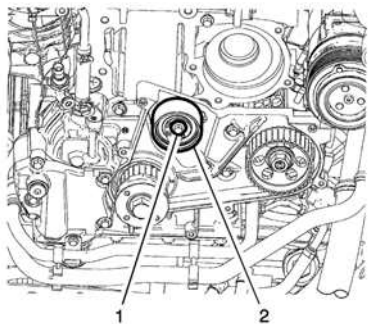


- Connect the fuel feed pipe between the pump and fuel rail and tighten the fitting to **25 Y (18 lb ft)**.
- Connect the fuel feed and return pipes to the fuel injection pump. Refer to Plastic Collar Quick Connect Fitting Service
- Connect the water return pipe to the water outlet

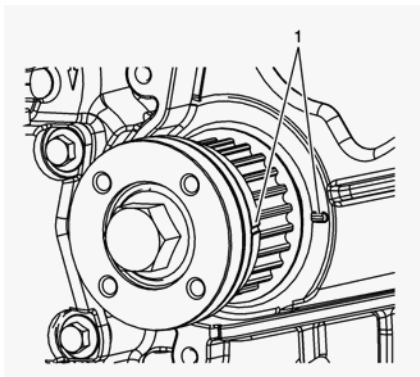
- Connect the engine wiring harness (1) to the fuel injection pump.



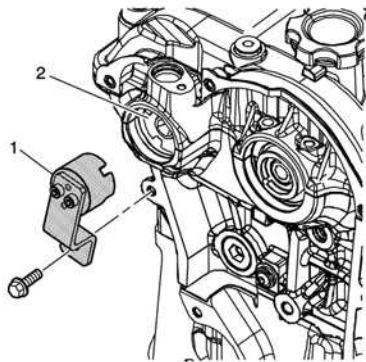
- Install timing belt rear cover (2) and tighten the bolts (1) to **11 Y (97 lb in)**.



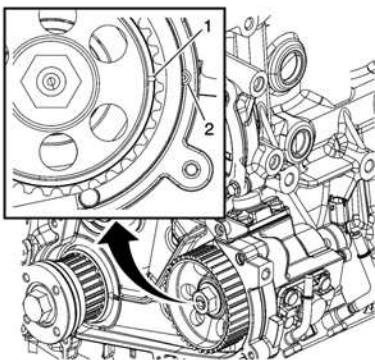
- Install the timing belt tensioner (2).
- Install the timing belt tensioner bolt (1) finger tight.



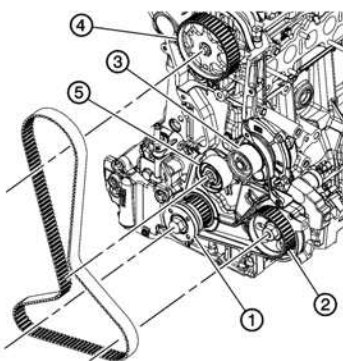
- Ensure that the timing mark on the crankshaft timing pulley (1) is aligned at 90 degrees ATDC with the mark on the front cover (1).



- Install *EN-50029* holding tool (1) on the exhaust camshaft.

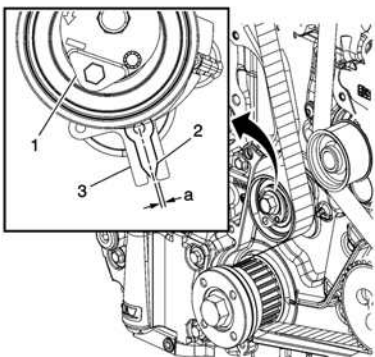


- Align the fuel injection pump pulley timing notch (1) with the notch on the front cover (2).



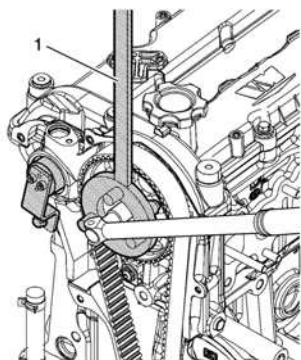
Note: Relieve the tensioner in order to fit the belt over the pulleys.

- Install the timing belt over the gears in the following order:
 1. Crankshaft
 2. Injector pump
 3. Water pump
 4. Camshaft
 5. Tensioner



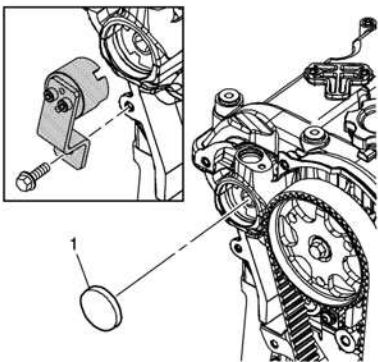
- Move the tensioner pulley by rotating the plate (1) counterclockwise until the pointer (2) is positioned in the groove at the edge of the index (3), within 1 mm, dimension (a).

- Tighten the timing belt tensioner to **28 Y (21 lb ft)**.



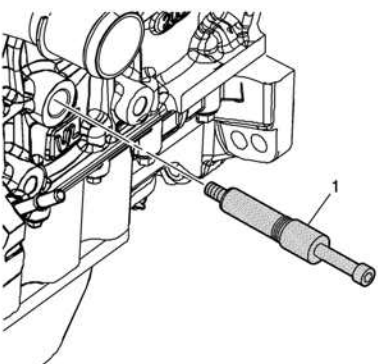
Note: EN-50029 holding tool is not designed for tightening applications. Always use EN-50025 wrench when tightening the gear bolt.

- Hold the camshaft timing gear with the EN-50025 wrench (1) and tighten the retaining bolt to **28 Y (21 lb ft)**.

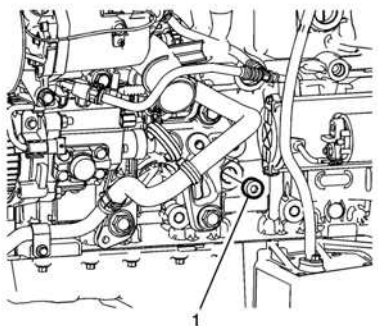


Note: Ensure the plug (1) is fully seated in the bore.

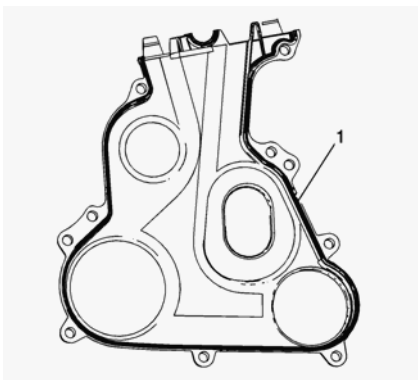
- Remove the EN-50029 holding tool.
- Install a NEW plug (1).



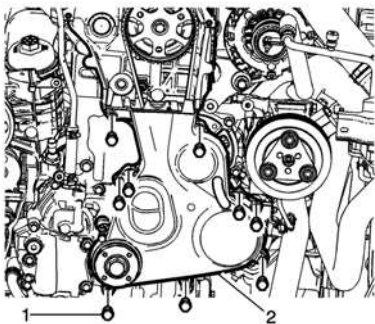
- Remove EN-50030 locking tool (1).



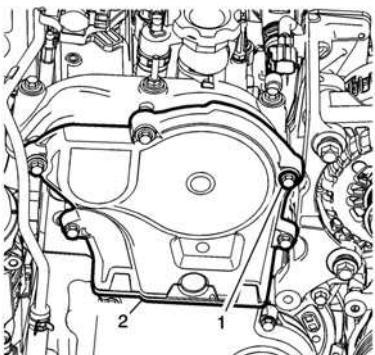
- Install the cylinder block core hole plug (1) and tighten to **50 Y (37 lb ft)**.
- Install the front left tire and wheel assembly. Refer to Tire and Wheel Removal and Installation.
- Install engine lower front splash shield. Refer to Engine Lower Front Splash Shield Replacement



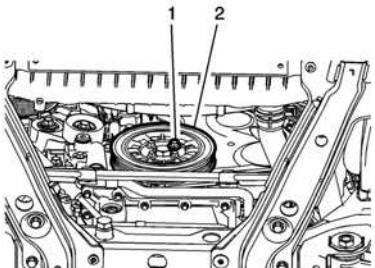
- Install NEW lower timing belt cover seal (1)



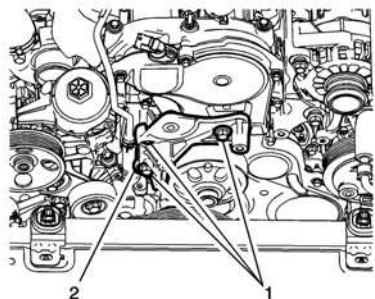
- Install the lower timing belt cover (2)
- Tighten the timing belt lower front cover bolts (1) to **8Y(71 lb in)**.



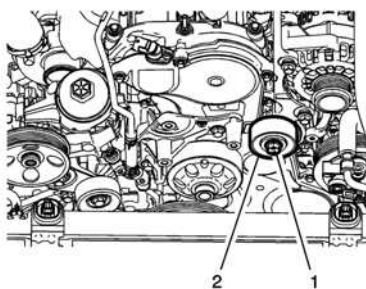
- Install the upper front timing belt cover (2).
- Tighten the timing belt upper front cover bolts (1) to **8 Y (71 lb in)**.



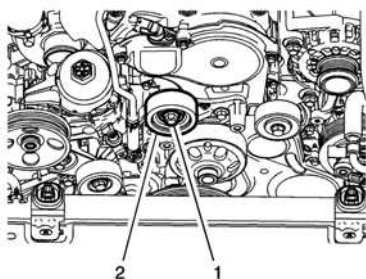
- Install the crankshaft pulley (2)
- Install the crankshaft pulley fastener (1) and tighten to **32 Y (23 lb ft)**.



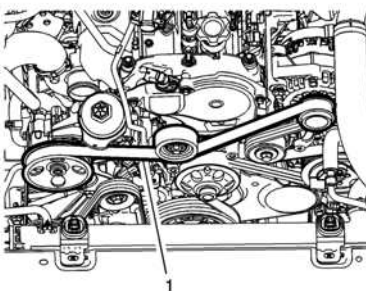
- Install the engine coolant fan bracket (2).
- Install the engine coolant fan bracket fastener (1) and tighten to **45 Y (33 lb ft)**.



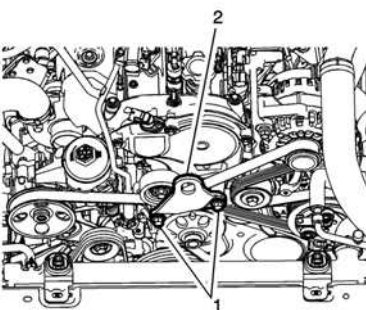
- Install drive belt idler pulley (2) and fastener (1) and tighten to **50Y(37 lb ft)**.



- Install drive belt idler pulley (2) and fastener (1) and tighten to **50Y(37 lb ft)**.
- Install the air conditioning compressor. Refer to Air Conditioning Compressor Replacement.

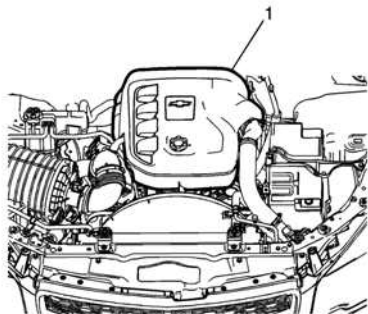


- Install drive belt. Refer to Drive Belt Replacement



- Install the engine lift front bracket (2).
- Install the engine lift front bracket fastener (1) and tighten to **68Y(50 lb ft)**.
- Install the engine coolant fan shroud. Refer to Engine Coolant Fan Shroud Replacement
- Install the engine protection shield. Refer to Engine Protection Shield Replacement

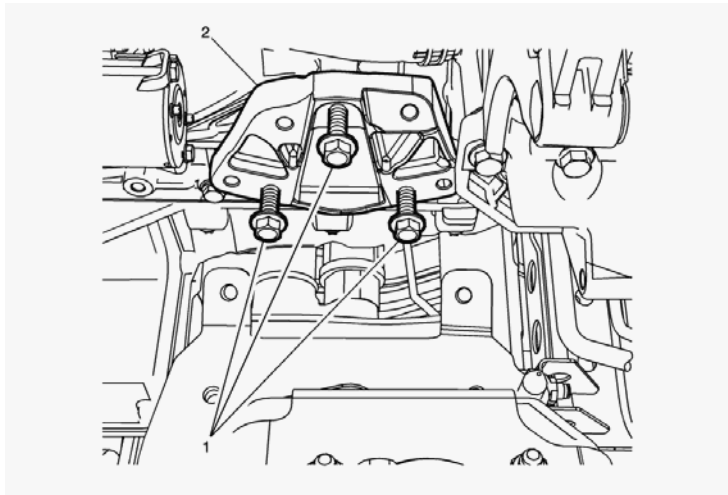
Engine Front Cover Replacement



- Install the intake manifold cover (1). Refer to Intake Manifold Cover Replacement

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Front Mount Bracket Replacement

Callout

Component Name

Preliminary Procedure

Remove the engine mount. Refer to Engine Front Mount Replacement.

Engine Front Mount Bracket Fastener (Qty: 3)

Caution: Refer to Fastener Caution.

1

Tighten

60 Y (44 lb ft)

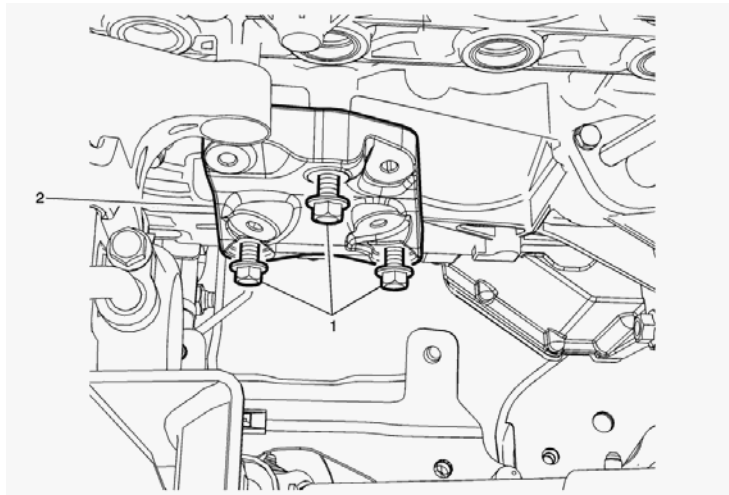
2

Engine Front Mount Bracket

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:

Fuel Delivery: | Fuel:



Engine Front Mount Bracket Replacement

Callout

Component Name

Preliminary Procedures

Remove the right engine mount. Refer to Engine Front Mount Replacement.

Engine Mount Bracket Fastener (Qty, 3)

Caution: Refer to Fastener Caution.

1

Tighten

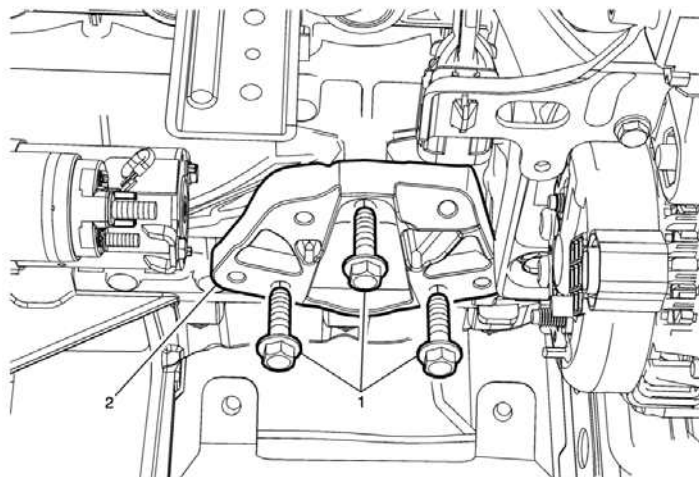
60 Y (44 lb ft)

2

Engine Mount Bracket

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Front Mount Bracket Replacement

Callout

Component Name

Preliminary Procedures

Remove the right engine mount. Refer to Engine Front Mount Replacement.

Engine Mount Bracket Fastener (Qty, 3)

Caution: Refer to Fastener Caution.

1

Tighten

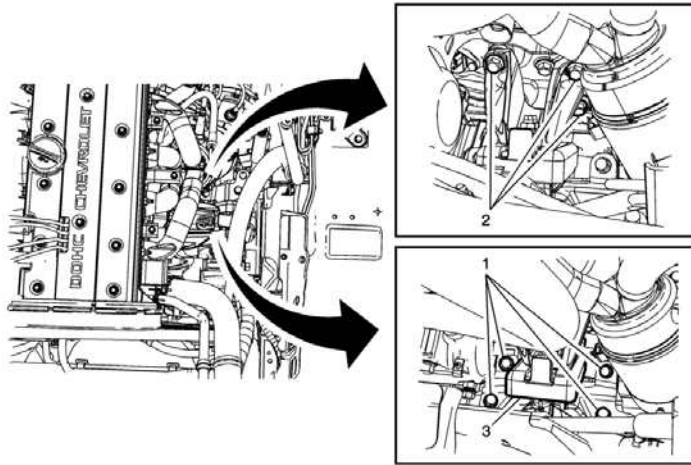
60 Y (44 lb ft)

2

Engine Mount Bracket

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Front Mount Replacement

Callout

Component Name

Preliminary Procedures

1. Remove the exhaust manifold with catalytic converter. Refer to Exhaust Manifold with Catalytic Converter Replacement.
2. Install the engine support fixture. Refer to Engine Support Fixture.

Engine Mount Fastener (Qty: 4)

Caution: Refer to Fastener Caution.

1

Tighten

60 Y (44 lb ft)

Engine Mount Fastener (Qty: 3)

2

Tighten

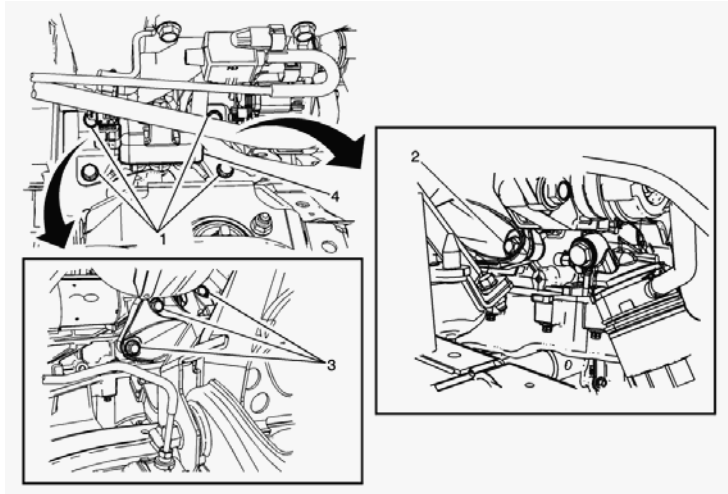
60 Y (44 lb ft)

3

Engine Mount

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Front Mount Replacement

Callout

Component Name

Preliminary Procedures

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
2. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.
3. Remove the lower engine protection. Refer to Engine Protection Shield Replacement.
4. Install engine support fixture. Refer to Engine Support Fixture.
5. Remove the intake lower manifold bracket. Refer to Intake Manifold Replacement.

Engine Mount Fastener (Qty:4)

Caution: Refer to Fastener Caution.

1

Tighten

70 Y (52 lb ft)

Engine Mount Fastener (Qty:4)

2

Tighten

60 Y (44 lb ft)

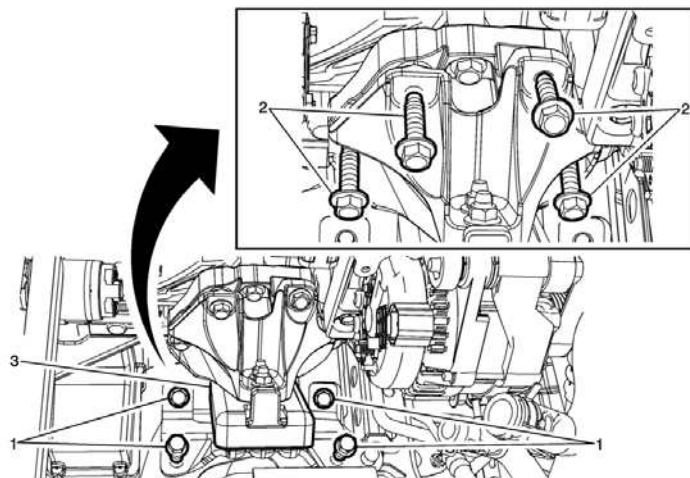
3

Engine Mount

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:

Fuel Delivery: | Fuel:



Engine Front Mount Replacement

Callout

Component Name

Preliminary Procedures

1. Remove the catalytic converter. Refer to Catalytic Converter Replacement.
2. Install engine support fixture. Refer to Engine Support Fixture.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.

Engine Mount Fastener (Qty:4)

Caution: Refer to Fastener Caution.

1

Tighten

70 Y (52 lb ft)

Engine Mount Fastener (Qty:4)

2

Tighten

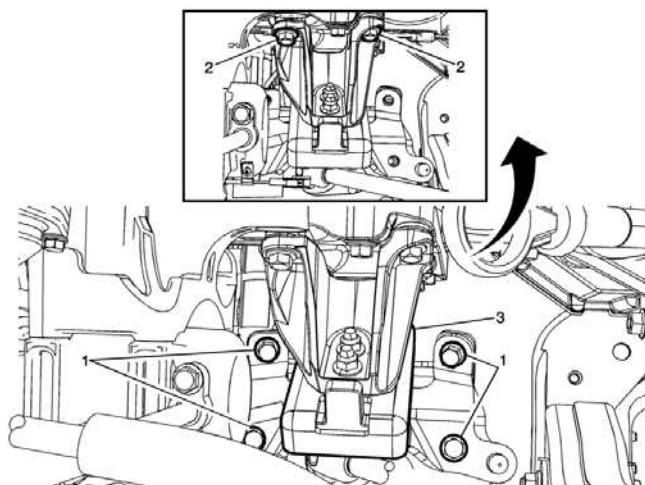
70 Y (52 lb ft)

3

Engine Mount

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Front Mount Replacement

Callout

Component Name

Preliminary Procedures

1. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.
2. Remove the air cleaner outlet resonator. Refer to Air Cleaner Outlet Duct Replacement.
3. Remove the radiator outlet hose. Refer to Radiator Outlet Hose Replacement.
4. Install engine support fixture. Refer to Engine Support Fixture.

Engine Mount Fastener (Qty:4)

Caution: Refer to Fastener Caution.

1

Tighten

70 Y (52 lb ft)

Engine Mount Fastener (Qty:4)

2

Tighten

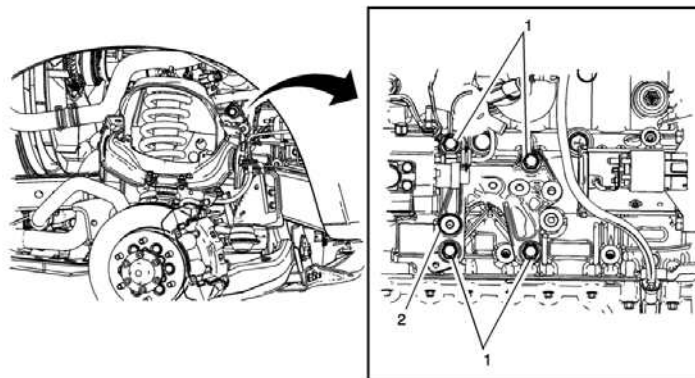
70 Y (52 lb ft)

3

Engine Mount

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Mount Bracket Replacement - Left Side

Callout

Component Name

Preliminary Procedures

1. Remove the left engine mount. Refer to Engine Mount Replacement - Left Side.
2. Remove the front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement.
3. Remove the engine protection shield. Refer to Engine Protection Shield Replacement.

Engine Mount Bracket Fastener (Qty, 4)

Caution: Refer to Fastener Caution.

1

Tighten

60 Y (44 lb ft)

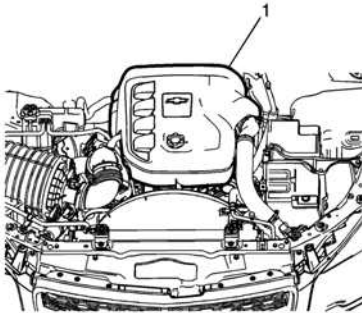
2

Engine Mount Bracket

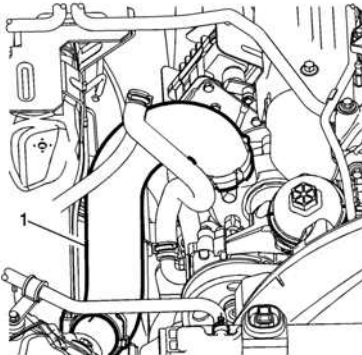
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

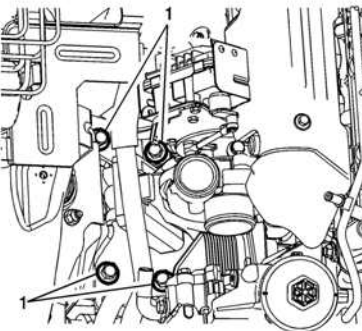
[Removal Procedure](#)



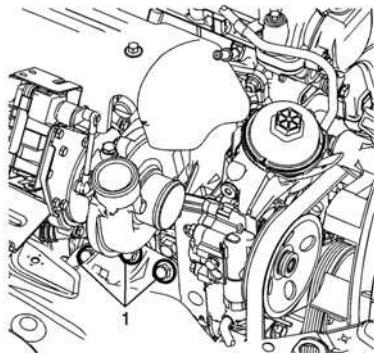
1. Remove the intake manifold cover (1). Refer to Intake Manifold Cover Replacement.
2. Install the engine support fixture. Refer to Engine Support Fixture.
3. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.
4. Remove the engine protection shield. Refer to Engine Protection Shield Replacement.



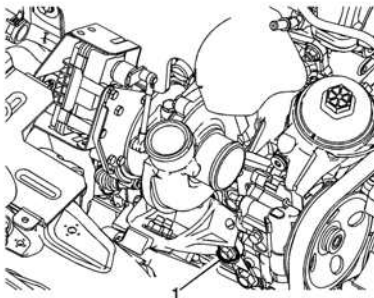
5. Remove air cooler inlet air hose (1). Refer to Charge Air Cooler Inlet Air Hose Replacement.



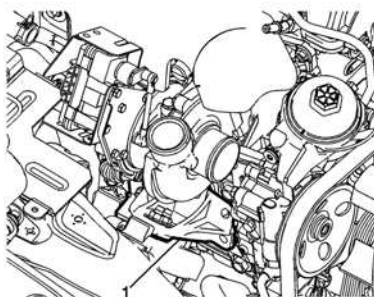
6. Remove the lower engine mount bolts (1).



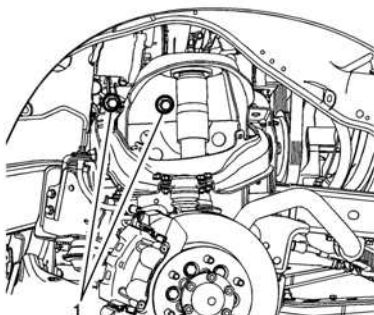
7. Remove the upper engine mount bolts (1).



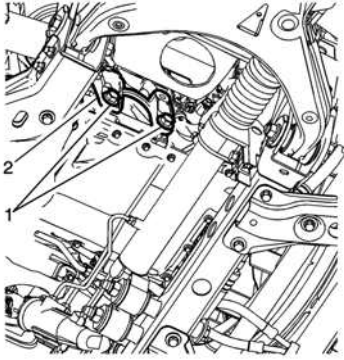
8. Remove the upper engine mount bolt (1).



9. Remove the engine mount (1).
10. Remove the front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement.

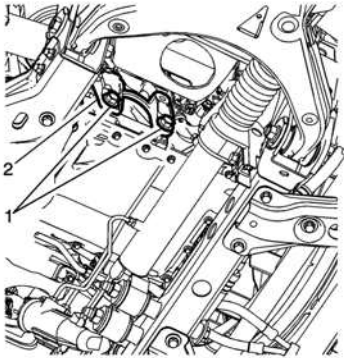


11. Remove the engine mount bracket bolts (1).
12. Raise the vehicle.

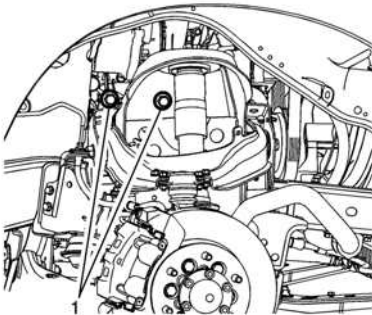


13. Remove the engine mount bracket bolt (1).
14. Remove the engine mount bracket (2).

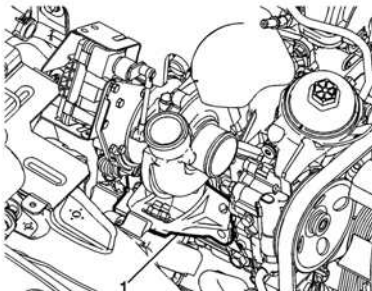
[Installation Procedure](#)



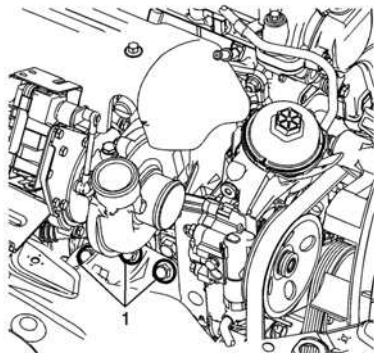
1. Install the engine mount bracket (2).
2. Install engine mount bracket bolts (1) and tighten to **60 Y (44 lb ft)**.



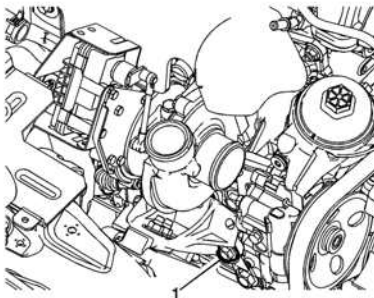
3. install engine mount bracket bolts (1) and tighten to **60 Y (44 lb ft)**.
4. Install the front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement.



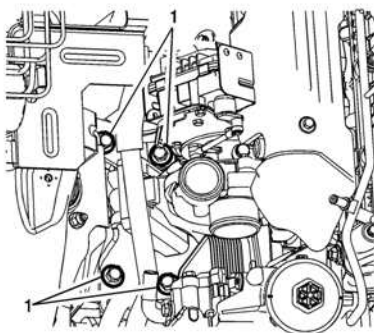
5. Install the engine mount (1).



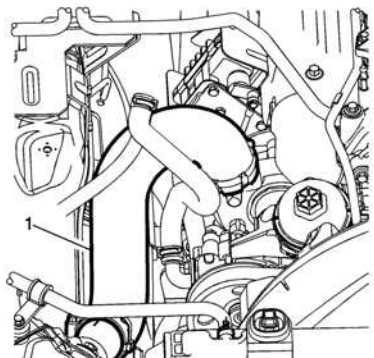
6. Install the engine mount upper bolts (1) and hand tighten.



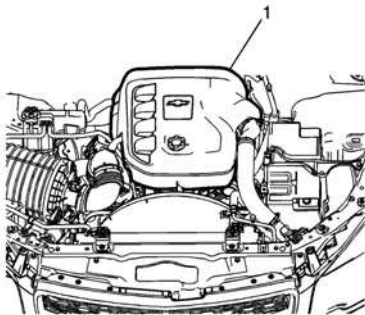
7. Install the engine mount upper bolt (1) and hand tighten.



8. Install the engine mount lower bolts (1) and hand tighten.
9. Ensure all the engine mount bolts are hand tighten before torquing the bolts to **60 Y (44 lb ft)**.



10. Install air cooler inlet air hose (1). Refer to Charge Air Cooler Inlet Air Hose Replacement.
11. Install the engine protection shield. Refer to Engine Protection Shield Replacement.
12. Remove the engine support fixture. Refer to Engine Support Fixture.
13. Install the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.



14. Install the intake manifold cover (1). Refer to Intake Manifold Cover Replacement.

2013 Chevrolet Colorado

Submodel: | **Engine Type:** | **Liters:**

Fuel Delivery: | **Fuel:**

Important: Before replacing any engine mount due to suspected fluid loss, verify that the source of the fluid is the engine mount, not the engine or accessories.

1. Install the engine support fixture. Refer to Engine Support Fixture.
2. Observe the engine mount while raising the engine. Raising the engine removes the weight from the engine mount and creates slight tension on the rubber.
3. Replace the engine mount if the engine mount exhibits any of the following conditions:
 - The hard rubber is covered with heat check cracks.
 - The rubber is separated from the metal plate of the engine mount.
 - The rubber is split through the center of the engine mount.
 - The engine mount itself is leaking fluid.
- For engine mount replacement. Refer to Engine Mount Replacement - Left Side or Engine Mount Replacement - Right Side.

2013 Chevrolet Colorado

Submodel: | **Engine Type:** | **Liters:**

Fuel Delivery: | **Fuel:**

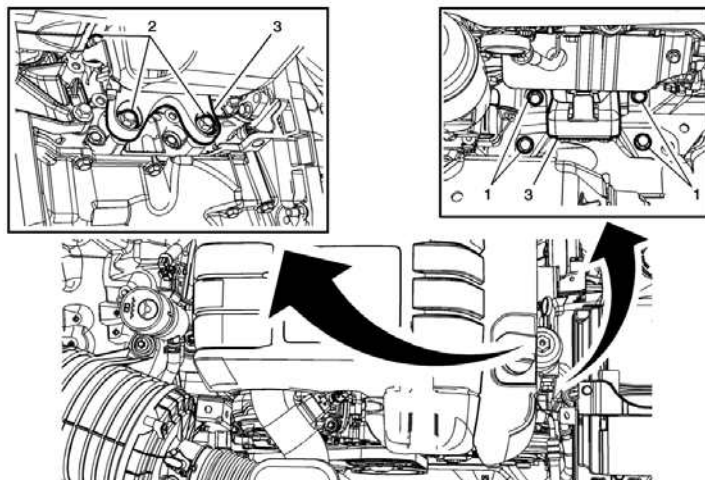
Caution: Broken or deteriorated mounts can cause misalignment and destruction of certain drive train components. When a single mount breaks, the remaining mounts are subjected to abnormally high stresses.

Caution: When raising or supporting the engine for any reason, do not use a jack under the oil pan, any sheet metal, or the crankshaft pulley. Due to the small clearance between the oil pan and the oil pump screen, jacking against the oil pan may cause the pan to be bent against the pump screen. This will result in a damaged oil pickup unit.

1. Measure the engine movement at the engine mount in order to inspect for damage to the rubber portions of the mount.
 1. Apply the park brake.
 2. Start the engine.
 3. Firmly apply and hold the primary brakes.
 4. Have an assistant stand to the side of the vehicle in order to observe for engine movement.
 5. Slightly load the engine shifting from drive to reverse a few times.
 6. If the engine moves more than 24 mm (0.945 in) from the at rest position, in either direction, inspect for loose engine mount bolts.
2. If the engine mount bolt torque is within specifications, inspect the condition of the engine mount.
3. Replace the engine mount if any of the following conditions exist:
 - Heat check cracks cover the rubber cushion surface.
 - The rubber cushion is separated from the metal plate of the mount.
 - There is a split through the rubber cushion.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Mount Replacement - Left Side

Callout

Component Name

Preliminary Procedures

1. Remove the battery tray. Refer to Battery Tray Replacement.
2. Install engine support fixture. Refer to Engine Support Fixture.
3. Remove the left exhaust manifold. Refer to Exhaust Manifold Replacement - Left Side.
4. Remove the engine lower front splash shield. Refer to Engine Lower Front Splash Shield Replacement.

Engine Mount to Frame Fastener (Qty:4)

Caution: Refer to Fastener Caution.

1

Tighten

60 Y (44 lb ft)

Engine Mount to Engine Fastener (Qty:3)

2

Tighten

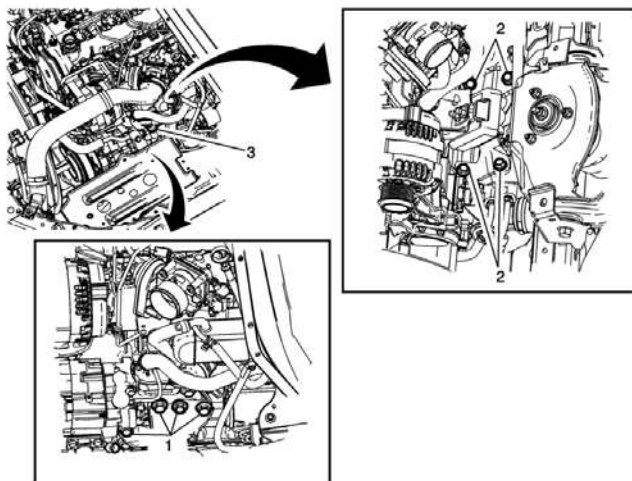
60 Y (44 lb ft)

3

Engine Mount

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Mount Replacement - Left Side

Callout

Component Name

Preliminary Procedures

1. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement.
2. Remove the intake manifold. Refer to Intake Manifold Replacement.
3. Remove the battery tray. Refer to Battery Tray Replacement.
4. Install engine support fixture. Refer to Engine Support Fixture.

Engine mount bolts (Qty: 4)

Caution: Refer to Fastener Caution.

1

Tighten

60 Y (44 lb ft)

Engine mount bolts (Qty: 4)

2

Tighten

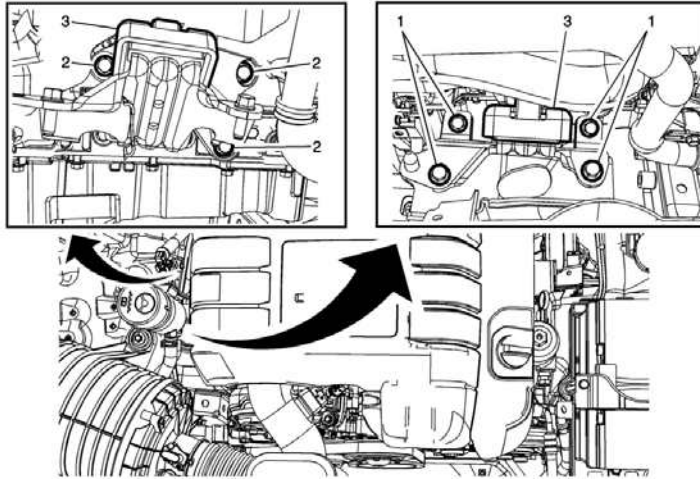
60 Y (44 lb ft)

3

Engine mount

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



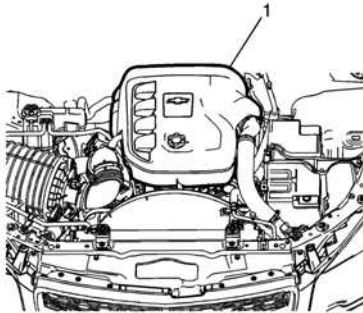
Engine Mount Replacement - Right Side

Callout	Component Name
Preliminary Procedures	
1. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement. 2. Remove the right exhaust manifold. Refer to Exhaust Manifold Replacement - Right Side. 3. Install engine support fixture. Refer to Engine Support Fixture.	
Engine Mount to Frame Fastener (Qty:4)	
1	Caution: Refer to Fastener Caution. Tighten 60 Y (44 lb ft)
Engine Mount to Engine Fastener (Qty:3)	
2	Tighten • Upper bolts 60 Y (44 lb ft). • Lower bolt 22 Y (16 lb ft).
3	Engine Mount

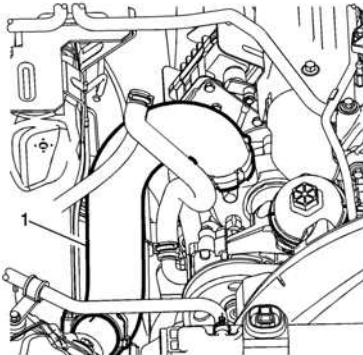
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

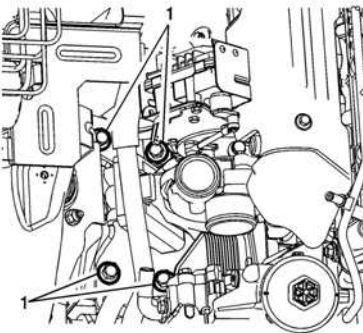
[Removal Procedure](#)



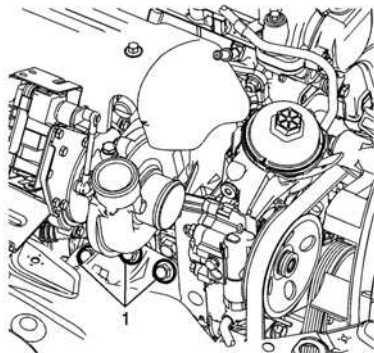
1. Remove the intake manifold cover (1). Refer to Intake Manifold Cover Replacement.
2. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.
3. Install engine support fixture. Refer to Engine Support Fixture.
4. Remove the engine protection shield. Refer to Engine Protection Shield Replacement.



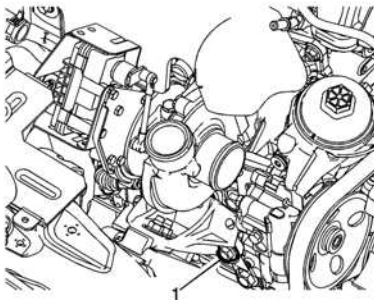
5. Remove air cooler inlet air hose (1). Refer to Charge Air Cooler Inlet Air Hose Replacement.



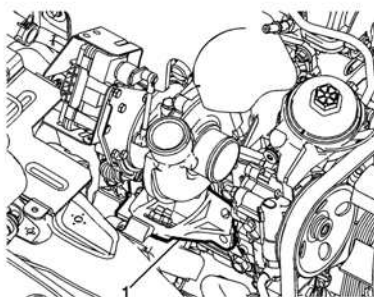
6. Remove the lower engine mount bolts (1).



7. Remove the upper engine mount bolts (1).

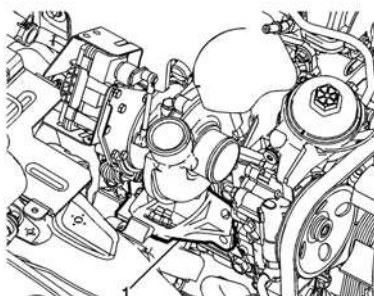


8. Remove the upper engine mount bolt (1).

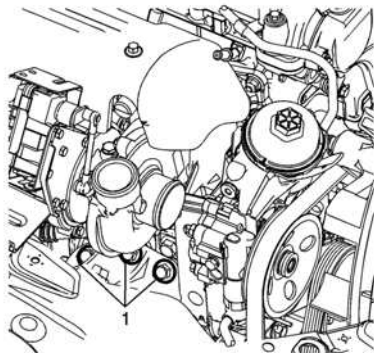


9. Remove the engine mount (1).

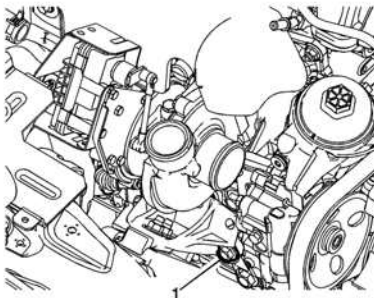
[Installation Procedure](#)



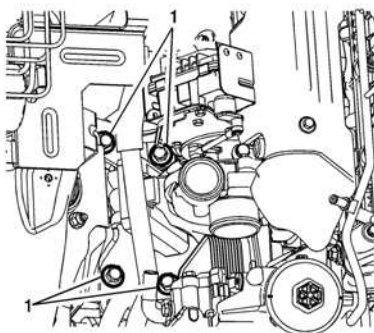
1. Install the engine mount (1).



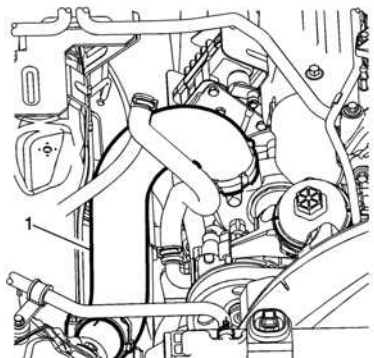
2. Install the engine mount upper bolts (1) and hand tighten.



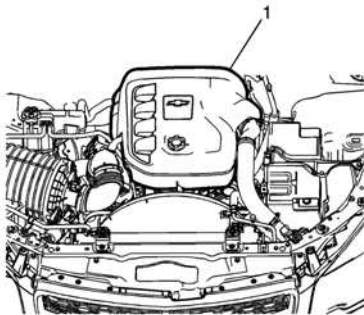
3. Install the engine mount upper bolt (1) and hand tighten.



4. Install the engine mount lower bolts (1) and hand tighten.
5. Ensure all the engine mount bolts are hand tighten before torquing the bolts to **60 Y (44 lb ft)**.



6. Install air cooler inlet air hose (1). Refer to Charge Air Cooler Inlet Air Hose Replacement.
7. Install the engine protection shield. Refer to Engine Protection Shield Replacement.
8. Remove the engine support fixture. Refer to Engine Support Fixture.
9. Install the air cleaner assembly. Refer to Air Cleaner Assembly Replacement.



10. Install the intake manifold cover (1). Refer to Intake Manifold Cover Replacement.

2013 Chevrolet Colorado

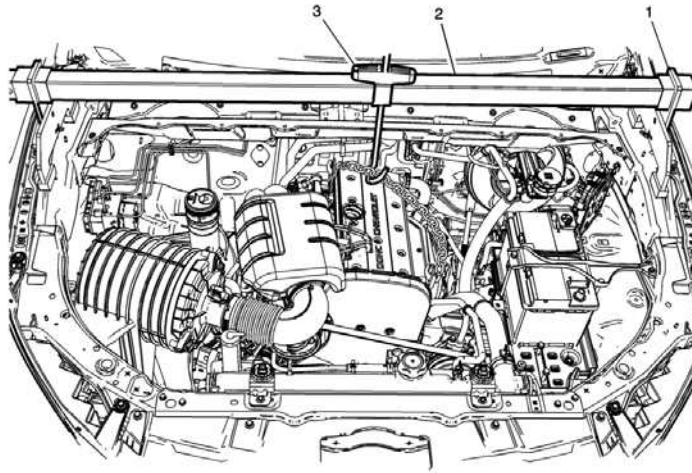
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Caution: Broken engine mountings can cause misalignment of certain drive-train components. Misalignment of drive-train components causes eventual destruction of the drive-train components.

If one engine mount breaks, the rest of the engine mounts will have increased stress put on them. This could cause the rest of the engine mounts to break.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Support Fixture

Callout

Component Name

Preliminary Procedure

Remove the front compartment side sight shield. Refer to Front Compartment Side Sight Shield Replacement.

Special Tools

EN-28467-700 Engine Support Fixture

For equivalent regional tools, refer to Special Tools.

1 Support Bar

Support Bracket

2 **Procedure**

Install the bracket to frame. Do not install on top of fender lip.

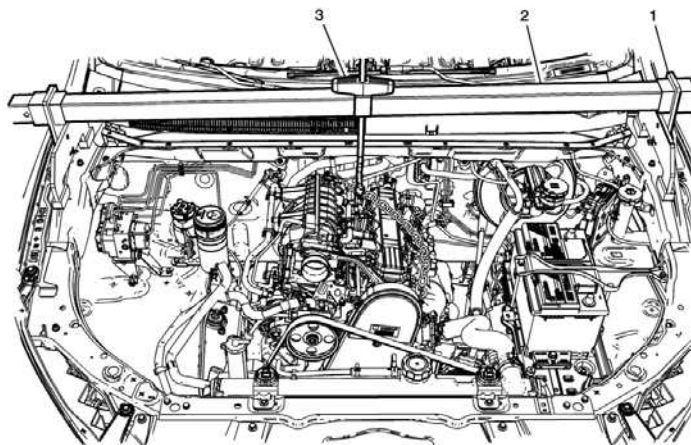
Support Handle

3 **Procedure**

Install chain across the engine as show above and tighten the handle until the chain is tight.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Support Fixture

Callout

Component Name

Preliminary Procedure

1. Remove the front compartment side sight shield. Refer to Front Compartment Side Sight Shield Replacement.
2. Remove the ignition coil. Refer to Ignition Coil Replacement.

Special Tools

EN-28467-700 Engine Support Fixture

For equivalent regional tools, refer to Special Tools.

- 1 Support Bar

Support Bracket

- 2 **Procedure**

Install the bracket to frame. Do not install on top of fender lip.

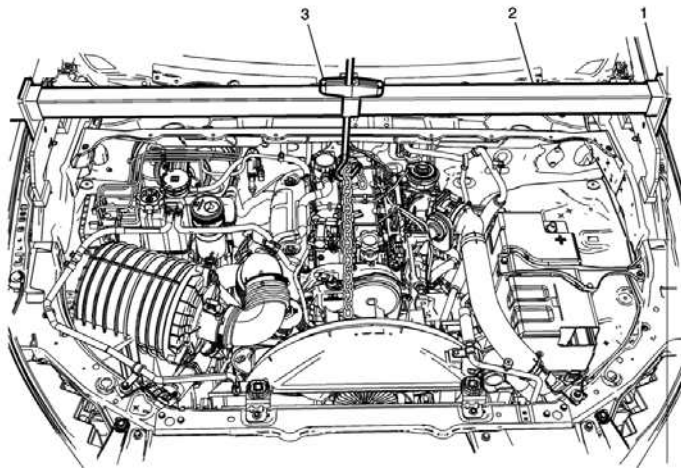
Support Handle

- 3 **Procedure**

Install chain across the engine as show above and tighten the handle until the chain is tight.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:



Engine Support Fixture

Callout

Component Name

Preliminary Procedure

1. Remove the front compartment side sight shield. Refer to Front Compartment Side Sight Shield Replacement.
2. Remove intake manifold cover. Refer to Intake Manifold Cover Replacement.

Special Tools

EN-28467-700 Engine Support Fixture

For equivalent regional tools, refer to Special Tools.

- 1 Support Bar

Support Bracket

- 2 **Procedure**

Install the bracket to frame. Do not install on top of fender lip.

Support Handle

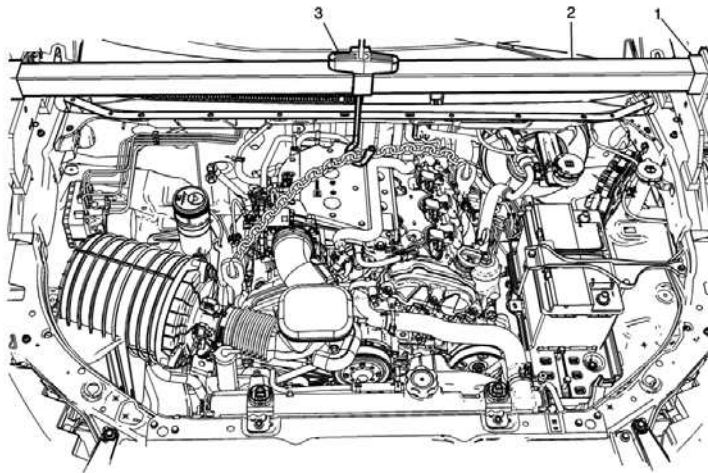
- 3 **Procedure**

Install chain across the engine as show above and tighten the handle until the chain is tight.

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Engine Support Fixture

Callout

Component Name

Preliminary Procedure

1. Remove the front compartment side sight shield. Refer to Front Compartment Side Sight Shield Replacement.
2. Remove intake manifold cover. Refer to Intake Manifold Cover Replacement.

Special Tools

- *EN-28467-700* Engine Support Fixture
- *EN-46114* Engine Lift Bracket.

For equivalent regional tools, refer to Special Tools.

- 1 Support Bar

Support Bracket

- 2 **Procedure**

Install the bracket to frame. Do not install on top of fender lip.

Support Handle

Note: While installing the chain, ensure to avoid interferences with engines components to prevent damage.

Procedure

- 3

1. If the engine is not equipped with engine lift bracket, install *EN-46114* in place.
2. Install chain across the engine as show above and tighten the handle until the chain is tight.

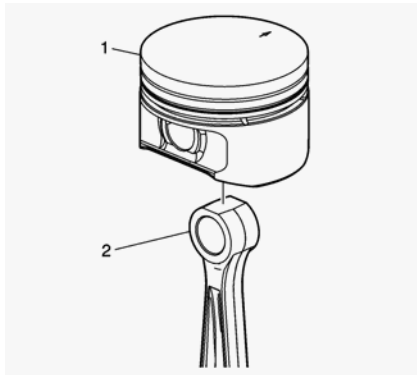
2013 Chevrolet Colorado

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Special Tools

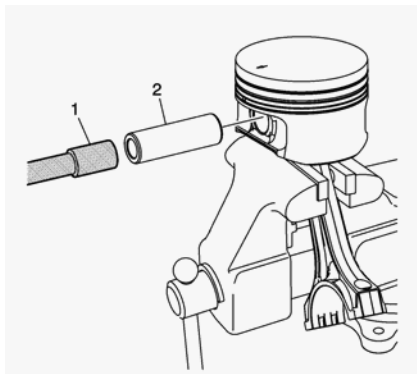
- *DT-9806680* Piston Pin Remover and Installer
- *EN-840911-A* Universal Handle

For equivalent regional tools, refer to Special Tools.

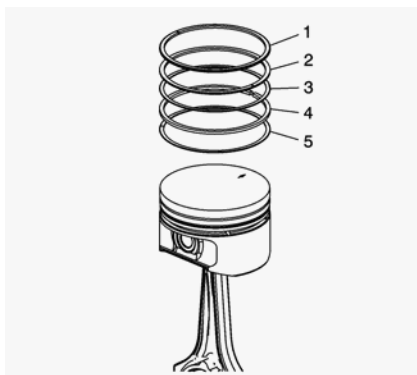


Note: Install the piston onto the connecting rod with the arrow on top of the piston toward the front oriented toward the front of the engine.

1. Heat the connecting rod between 280–320°C (536–608°F) in the piston pin shelter region.
2. Cool the piston pin with dry ice (if necessary) using appropriate tools.
3. Fasten the heated connecting rod in a bench vise using protective gloves.
4. Assemble the connecting rod (2) and the piston (1).



5. Coat the piston pin with oil.
6. Install the piston pin (2) using the *DT-9806680* installer and *EN-840911-A* Universal Handle (1)
7. Ensure that the piston moves freely.



Caution: Use a piston ring expander to install the piston rings. The rings may be damaged if expanded more than necessary.

8. Install the following components of the oil control ring assembly, bottom ring:

Piston and Connecting Rod Assemble

1. The expander (4)
2. The lower oil control ring (5)
3. The upper control ring (3)
9. Install the lower compression ring (2). Place the manufacturer's mark facing up.
10. Install the upper compression ring (1).

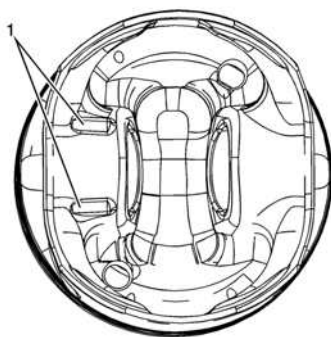
2013 Chevrolet Colorado

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Fuel Delivery: | Fuel:

Special Tools

EN-46745 Piston Pin Clip Remover/Installer

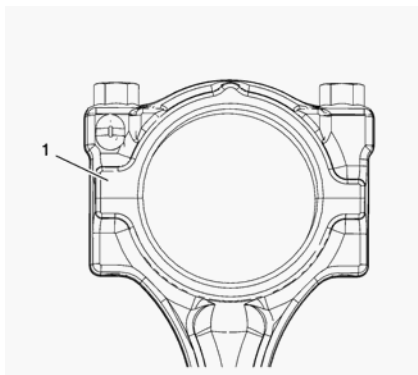
For equivalent regional tools, refer to Special Tools.



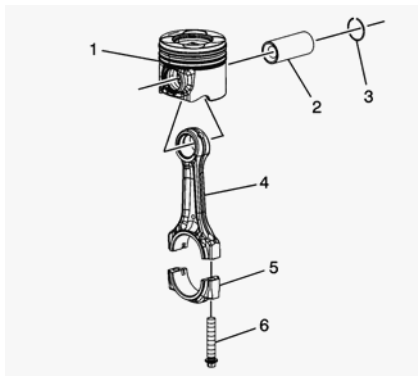
Note: Install the piston onto the connecting rod with the arrow oriented toward the front of the engine.

Note: The cast boss can be in either or both locations depending on displacement.

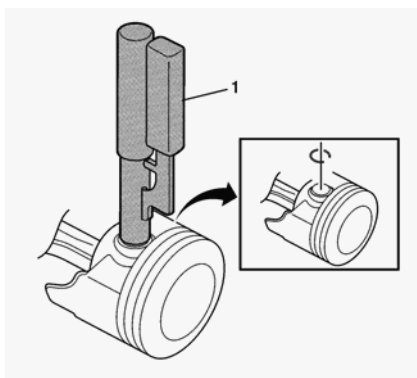
1. The cast boss (1), on the underside of the piston, must go to the rear of the block.



2. The larger feature (1), at the split line located on one side of the connecting rod, must go to the front of the block.



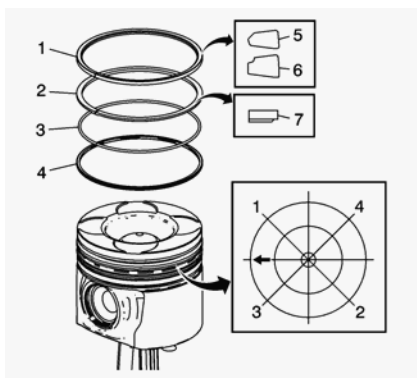
3. Assemble the connecting rod (4) and the piston (1).



Caution: Install the piston pin retainers correctly in the retaining groove during assembly in order to avoid engine damage.

4. Use the following procedure to assemble the piston pin and the retainer:

1. Coat the piston pin with oil.
2. Install one side of one piston pin retainer into the retaining groove using *EN-46745* installer . Rotate the retainer until it is fully seated in the groove.
3. Install the connecting rod and the piston pin. Push the piston pin until it bottoms in the previously installed retainer.
4. Install the second piston pin retainer, using *EN-46745* installer (1) .
5. Ensure that the piston moves freely.



Caution: Use a piston ring expander to install the piston rings. The rings may be damaged if expanded more than necessary.

Note: Ensure the 2.5L upper compression ring (5) or 2.8L upper compression ring (6) and lower compression ring (7) are orientated properly.

5. Install the following components of the oil control ring assembly, bottom ring:

1. The oil ring rail (4)
 2. The inner oil expander ring (3)
6. Install the lower compression ring, second ring (2). Place the manufacturer's mark facing up.
7. Install the upper compression ring, top ring (1). Place the manufacturer's mark facing up.
8. Install the piston rings so that the gaps are orientated as follows:

- The upper compression ring (1) and lower compression ring (2) gaps should be 180 degrees from each other.
- The inner oil expander ring (3) gap should be 180 degrees from the oil ring rail (4) gap.
- The ASSEMBLED oil ring gaps should be 90 degrees from the compression ring gaps.

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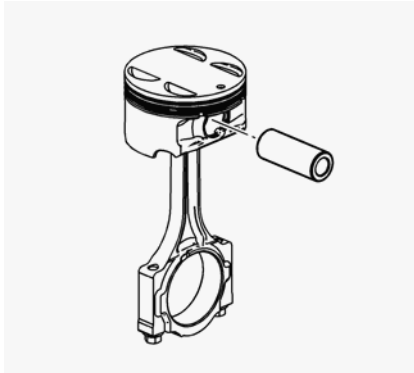
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- EN-46121 Connecting Rod Guide Pin Set
- EN-46745 Piston Pin Clip Remover/Installer

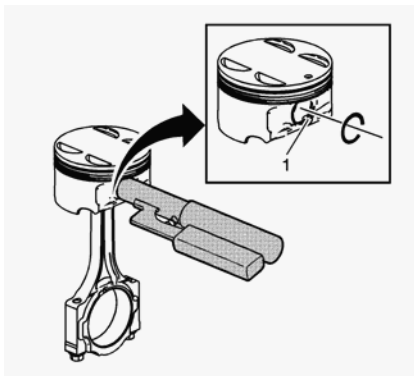
For equivalent regional tools, refer to Special Tools

[Piston and Piston Pin Installation Procedure](#)



Note:

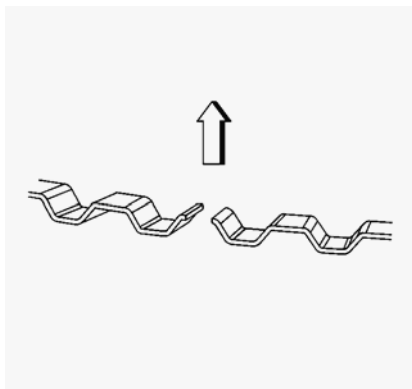
- The piston is directional and must be installed in the engine block in the proper direction. The dot on the top of the piston must face the front of the engine.
 - The piston is model dependent and may not appear exactly as shown.
1. Lubricate the piston pin bores in the piston and the connecting rod with GM prelube lubricant. Refer to Adhesives, Fluids, Lubricants, and Sealers for recommended lubricant.
 2. Assemble the piston and piston pin to the connecting rod. Properly orient the piston when reusing a marked connecting rod.
 3. Align the piston pin bore with the connecting rod bore.
 4. Slide the piston pin into the piston and the connecting rod.



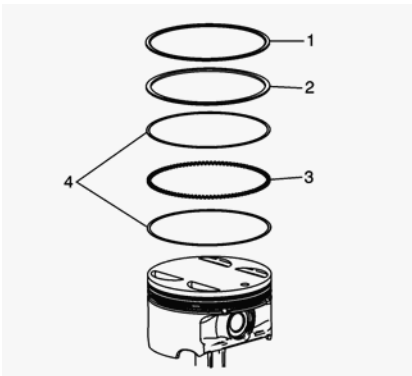
Note: New piston pin retainers must be used. Never reuse the piston pin retainers.

5. Install NEW piston pin retainers using the EN-46745 remover/installer. Align the EN-46745 remover/installer to the notch (1) in the piston.
6. Ensure that the piston pin retainers are fully seated in their grooves.
7. Repeat these procedures for the remaining pistons.

[Piston Ring Installation Procedure](#)

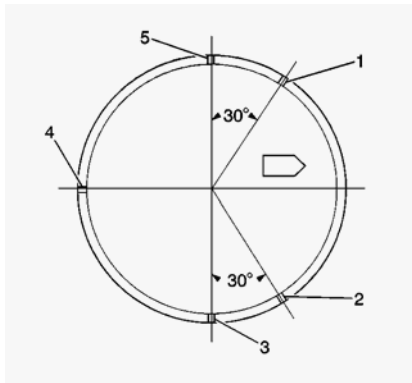


1. Properly orient the oil control ring expander as shown before installation. The ends of the expander must be facing toward the top of the piston.



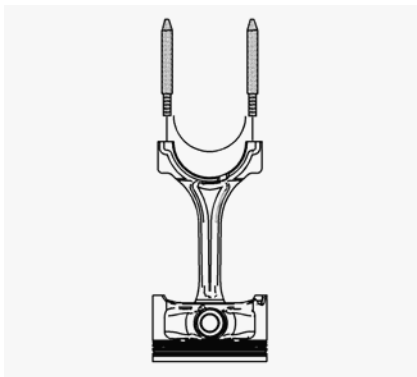
2. Using a piston ring expander, install the oil control ring assembly using the following procedure:
 1. Install the expander ring (3).
 2. Install the 2 oil scraper rings (4). Expand the rings only enough to clear the piston diameter. Overexpanding the piston rings will distort or crack the rings.
- Note:** The lower compression piston ring (2) is thicker and will not fit in the upper compression rings (1) position.
3. Install the lower compression piston ring (2) onto the piston with the mark facing the top of the piston.

Note: For the LY7, the upper compression ring is symmetrical and may be installed either side up. For all other RPO's, the mark on the piston ring should face the top of the piston.
4. Install the upper compression piston ring (1) onto the piston with the mark facing the top of the piston, if required.



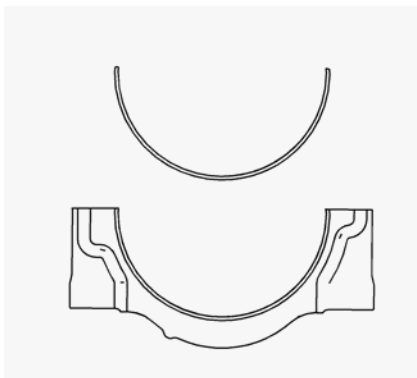
5. Once the rings are installed, set the ring gaps for the oil control, second and top ring as follows. Use the piston location arrow for reference.
 1. Lower oil control ring – position 1
 2. Upper oil control ring – position 2
 3. Top Ring – position 3
 4. Oil control ring expander – position 4
 5. Second ring – position 5

[Connecting Rod Bearing Installation Procedure](#)



Note: If the connecting rod bearings have been used in a running engine, you must replace them with NEW connecting rod bearings for reassembly.

1. Clean the connecting rod and the connecting rod cap bearing bore with a lint-free cloth.
2. Clean all the oil from behind the connecting rod bearing halves.
3. Install NEW upper connecting rod bearings into position. Roll the bearing into position so that the lock tang engages the alignment slot. The bearing must fit flush in the connecting rod.
4. Install the *EN-46121* set into the connecting rod bolt holes.



5. Install NEW lower connecting rod bearings into position in the connecting rod cap. Roll the bearing into position so that the lock tang engages the alignment slot. The bearings must fit flush with the connecting rod cap.

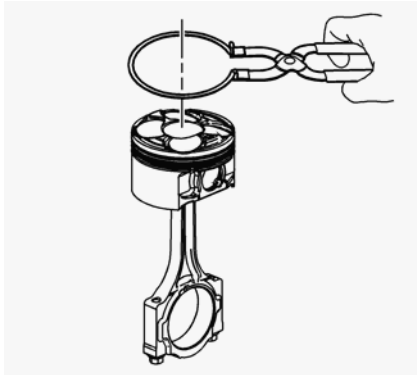
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

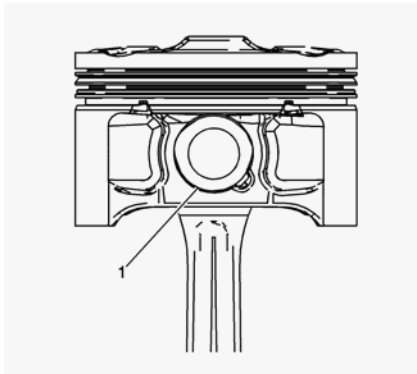
EN-46745 Piston Pin Clip Remover/Installer

For equivalent regional tools, refer to Special Tools.



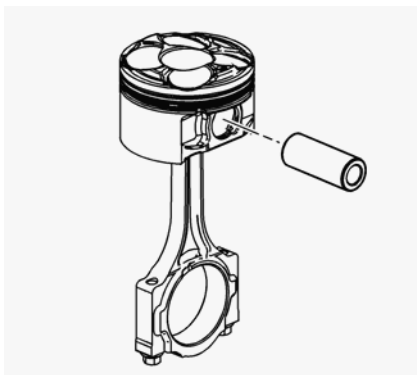
Caution: You must use a piston ring expander to remove and install the piston rings. Only expand the rings far enough to fit over the piston lands. If the rings are overexpanded, the top ring will shatter and the others will distort.

1. Remove the piston rings using a piston ring expander. Place each ring in a clean shop towel for storage.



Note:

- The connecting rod is non-directional and may be assembled/reassembled to the piston in either direction.
 - DO NOT reuse the piston pin retainers.
2. Using the EN-46745 remover/installer, remove the piston pin retainers by using the removal access notch (1) in the side of the piston. Discard the piston pin retainers.



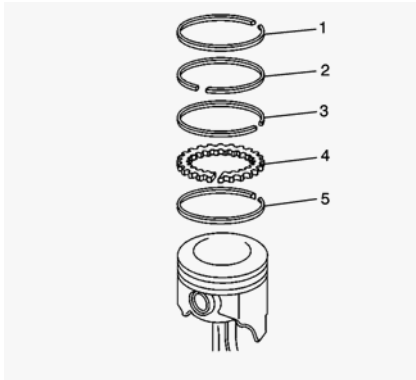
3. Slide the piston pin out of the piston. The piston will disconnect from the connecting rod.

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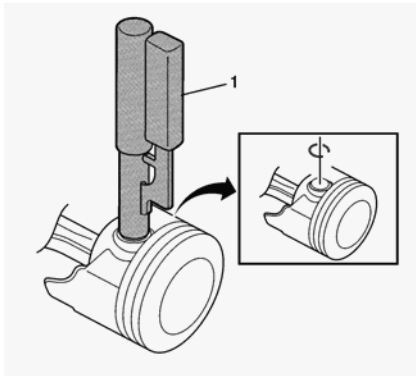
Special Tools

EN-46745 Piston Pin Clip Remover/Installer



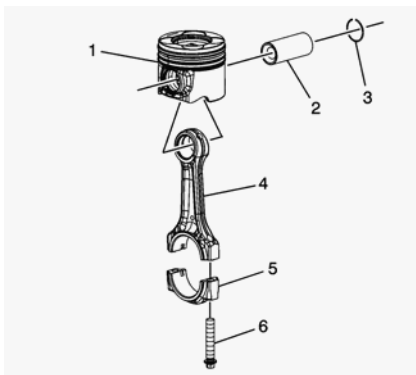
Warning: Handle the piston carefully. Worn piston rings are sharp and may cause bodily injury.

1. Disassemble the piston rings (1, 2, 3, 4, 5). Use a suitable tool to expand the rings. The piston rings must not be reused.



Note: Two retainers hold the piston pins in place. No special tools are required to remove the piston pins. Ensure that the piston pin is not damaged. Do not reuse the retainers.

2. Remove the piston pin retainers using the EN-46745 remover (1).



3. Remove the piston pin (2).

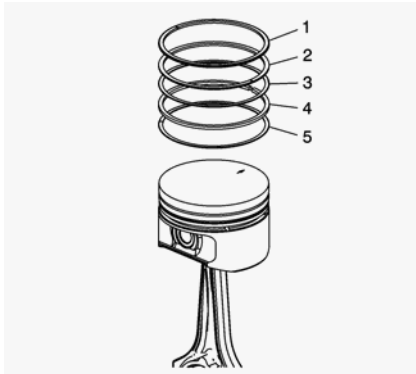
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Special Tools

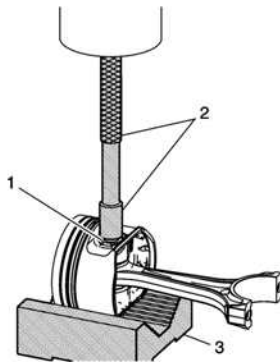
- *DT-9806680* Piston Pin Remover and Installer
- *EN-840911-A* Universal Handle
- *EN-8606014* Support Base to Remove the Piston Pin

For equivalent regional tools, refer to Special Tools.

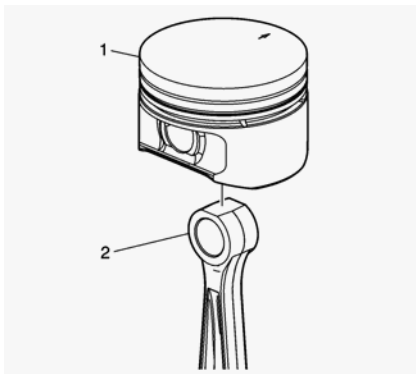


Warning: Handle the piston carefully. Worn piston rings are sharp and may cause bodily injury.

1. Disassemble the piston rings (1, 2, 3, 4, 5). Use a suitable tool to expand the rings. The piston rings must not be reused.



2. Remove the piston pin (1) using the *EN-8606014* support base (3) and *EN-840911-A* universal handle and *DT-9806680* piston pin remover and installer (2).

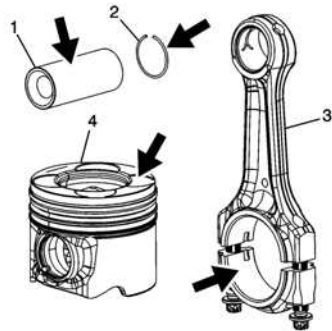


3. Remove the connecting rod (2) from the piston (1).

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[Connecting Rod Measurement](#)



Warning: Refer to Safety Glasses Warning.

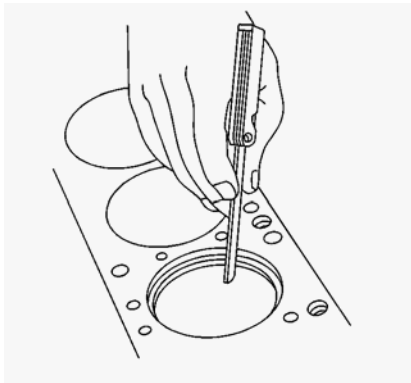
1. Clean the connecting rods (3) in solvent and dry with compressed air.
2. Inspect the connecting rods for the following:
 - Signs of being twisted, bent, nicked, or cracked
 - Scratches or abrasion on the rod bearing seating surface
 - If the connecting rod bores contain minor scratches or abrasions, clean the bores in a circular direction with a light emery paper. DO NOT scrape the rod or rod cap.
 - If the beam of the rod is scratched or has other damage replace the connecting rod.
 - Measure the piston pin (1) to connecting rod bore using the following procedure:
 1. Using an outside micrometer, take two measurements of the piston pin in the area of the connecting rod contact.
 2. Using an inside micrometer, measure the connecting rod piston pin bore.
 3. Subtract the piston pin diameter from the piston pin bore diameter.
 4. The clearance should not be more than **0.021 mm (0.0008 in)**.
 - If there is excessive clearance, replace the piston pin.
 - If there is still excessive clearance, replace the connecting rod.

[Piston Measurement](#)

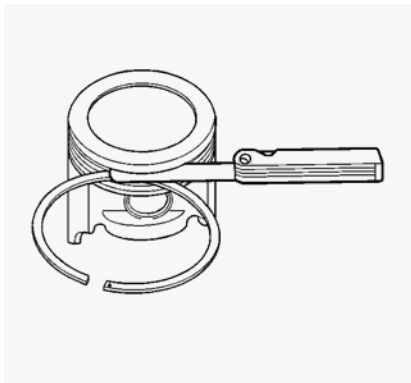


1. Clean the piston skirts and the pins with a cleaning solvent. DO NOT wire brush any part of the piston.
2. Clean the piston ring grooves with a groove cleaner. Make sure oil ring holes and slots are clean.
3. Inspect the pistons for the following conditions:
 - Cracked ring lands, skirts, or pin bosses
 - Ring grooves for nicks, burrs that may cause binding
 - Warped or worn ring lands
 - Eroded areas at the top of the piston (1)
 - Scuffed or damaged skirts (2)
 - Worn piston pin bores (3)

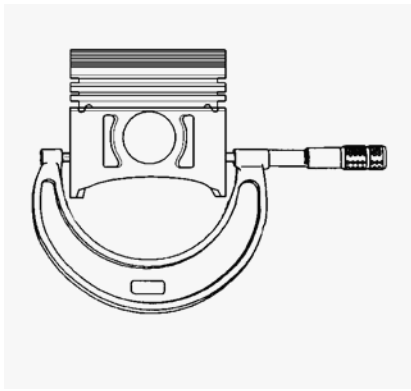
- Replace pistons that show any signs or damage or excessive wear.
- Measure the piston pin bore to piston pin clearances using the following procedure:
 1. Piston pin bores and pins must be free of varnish or scuffing.
 2. Use an outside micrometer to measure the piston pin in the piston contact areas.
 3. Using an inside micrometer, measure the piston pin bore.
 4. Subtract the measurement of the piston pin bore from the piston pin. The clearance should be within **0.002–0.012 mm (0.00007–0.00047 in)**.
 5. If the clearance is excessive, determine which component is out of specification.



- Measure the piston ring end gap using the following procedure:
 1. Place the piston ring in the area of the bore where the piston ring will travel, approximately 25 mm or 1 inch down from the deck surface. Be sure the ring is square with the cylinder bore by positioning the ring with the piston head.
 2. Measure the end gap of the piston ring with feeler gauges. Compare the measurements with those provided below:
 - The top compression ring end gap should be **0.20–0.40 mm (0.0060–0.015 in)**
 - The second compression ring end gap should be **0.35–0.55 mm (0.0137–0.0216 in)**
 - The oil ring end gap should be **0.25–0.76 mm (0.0098–0.029 in)**- If the clearance exceeds the provided specifications, the piston rings must be replaced.
- Repeat the procedure for all the piston rings.

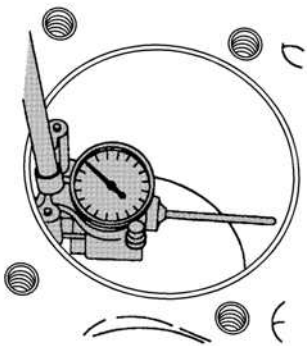


- Measure the piston ring side clearance using the following procedure:
 1. Roll the piston ring entirely around the piston ring groove. If any binding is caused by a distorted piston ring, replace the ring.
 2. With the piston ring on the piston, use feeler gauges to check clearance at multiple locations.
 3. The clearance between the surface of the top piston ring and the ring land should be no greater than **0.075 mm (0.0030 in)**.
 4. If the clearance is greater than specifications, replace the piston ring.
 5. If the new ring does not reduce the top ring side clearance to **0.075 mm (0.0030 in)** or less, install a new piston.
 - The clearance between the surface of the second piston ring and the ring land should be no greater than **0.069 mm (0.0026 in)**.
 - If the new ring does not reduce the clearance to **0.069 mm (0.0026 in)** or less, install a new piston.



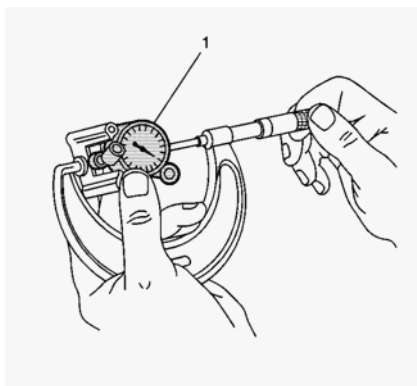
- Measure piston width using the following procedure:
 1. Using an outside micrometer, measure the width of the piston **14.5 mm (0.570 in)** above the bottom of the piston skirt at the thrust surface perpendicular to the centerline of the piston pin.
 2. Compare the measurement of the piston to its original cylinder by subtracting the piston width from the cylinder diameter.
 3. The proper clearance specification for the piston is **0.010–0.041 mm (0.0006–0.0016 in)**.
- If the clearance obtained through measurement is greater than these specifications and the cylinder bores are within specification, replace the piston.

[Piston Selection](#)



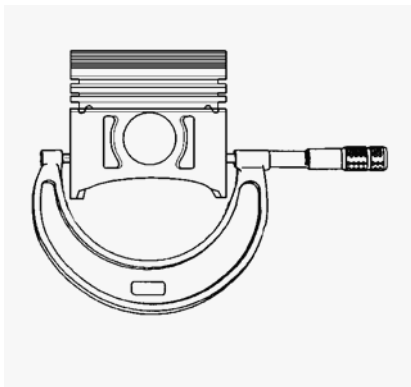
Note: Measurements of all components should be taken with the components at normal room temperature. For proper piston fit, the engine block cylinder bores must not have excessive wear or taper. A used piston and pin set may be reinstalled if, after cleaning and inspection, they are within specifications.

1. Inspect the engine block cylinder bore. Refer to Engine Block Cleaning and Inspection.
2. Inspect the piston and the piston pin. Refer to Piston, Connecting Rod, and Bearing Cleaning and Inspection.
3. Use a bore gauge and measure the cylinder bore diameter. Measure at a point **64 mm (2.5 in)** from the top of the cylinder bore.



4. Measure the bore gauge (1) with a micrometer and record the reading.

Piston, Connecting Rod, and Bearing Cleaning and Inspection



5. With a micrometer or caliper at a right angle to the piston, measure the piston **14 mm (0.570 in)** from the bottom of the skirt.
6. Subtract the piston diameter from the cylinder bore diameter in order to determine piston-to-bore clearance.
7. For proper piston-to-bore clearance. Refer to Engine Mechanical Specifications.
8. If the proper clearance cannot be obtained, select another piston and measure for the clearances.
9. If the proper fit cannot be obtained, hone the cylinder bore or replace the cylinder block.
10. When the piston-to-cylinder bore clearance is within specifications, mark the top of the piston using a permanent marker for installation to the proper cylinder. Refer to Separating Parts.

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[Cleaning Procedure](#)

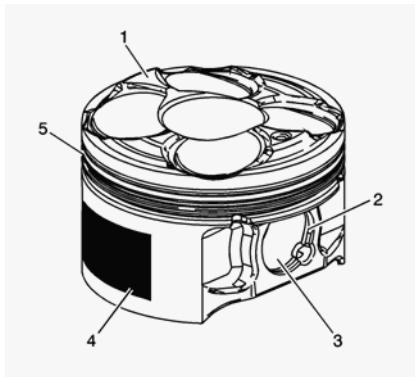
Note: DO NOT wire brush any part of the piston.

1. Clean the piston skirts and the pins with a cleaning solvent.
2. Clean the piston ring grooves with a groove cleaner. Ensure that the oil ring holes and slots are clean.

Warning: Refer to Safety Glasses Warning.

3. Dry the piston with compressed air.

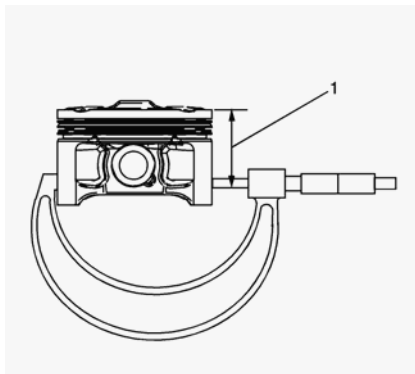
[Piston Inspection Procedure](#)



1. Inspect the pistons for the following conditions:

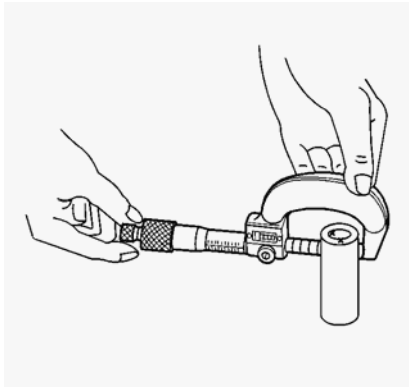
- Cracked ring lands, skirts or pin bosses
- Ring grooves for nicks, burrs that may cause binding (5)
- Warped or worn ring lands (5)
- Piston pin retainer grooves for burrs (2)
- Eroded areas at the top of the piston (1)
- Scuffed or damaged skirt coating (4)
- Worn piston pin bores or worn piston pins (3)
- Replace pistons that show any signs of damage or excessive wear.

[Piston Measurement Procedure](#)



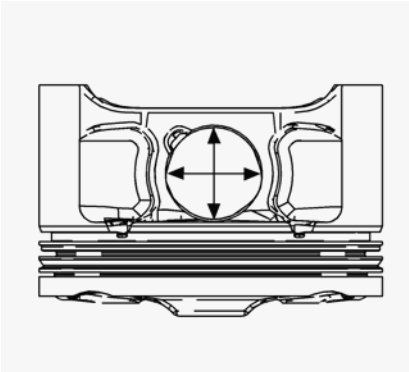
1. Measure piston width using the following procedure:

1. Using an outside micrometer, measure the width of the piston at 30 mm (1.181 in) below the crown, top, (1) at the thrust surfaces of the piston, perpendicular to the piston pin centerline.
2. Compare the measurement of the piston to its original cylinder by subtracting the piston width from the cylinder diameter.
3. Check your measurements with the Engine Mechanical Specifications.
4. If the clearance obtained through measurement is greater than the provided specifications and the cylinder bores are within specification, replace the piston.



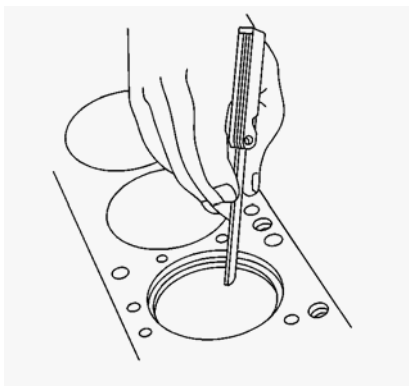
2. Measure the piston pin bore to piston pin clearances using the following procedure:

1. Piston pin bores and pins must be free of varnish or scuffing.
2. Use an outside micrometer to measure the piston pin in the piston contact areas.

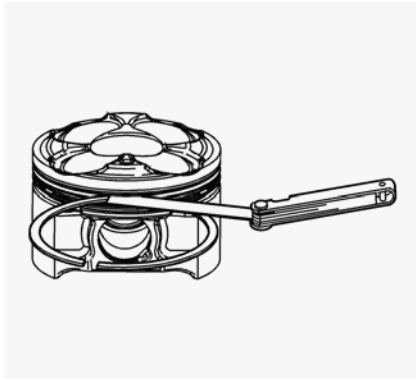


3. Using an inside micrometer, measure the piston pin bore. Compare your result with the piston pin diameter and piston pin to piston pin bore clearance listed in the Engine Mechanical Specifications.
4. If the clearance is excessive, determine which piece is out of specification and replace as necessary.
5. You must replace the piston if any of its dimensions are out of specification.
6. If the new piston does not meet clearance specifications, the cylinder block may need to be oversized to 0.25 mm (0.010 in). There is only one size of oversized pistons and rings available for service.

[Piston Ring Measurement Procedure](#)

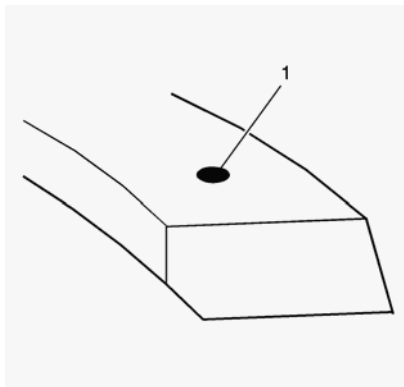


1. Measure the piston ring end gap using the following procedure:
 1. Place the piston ring in the area of the bore where the piston ring will travel approximately 25 mm (1 in) down from the deck surface. Ensure that the ring is square with the cylinder bore by positioning the ring with the piston head.
 2. Measure the end gap of the piston ring with feeler gauges. Refer to Engine Mechanical Specifications.
 3. If the clearance exceeds the provided specifications, the piston rings must be replaced.
 4. Repeat the procedure for all the piston rings.



2. Measure the piston ring side clearance using the following procedure:

1. Roll the piston ring entirely around the piston ring groove. If any binding is caused by the ring groove, dress the groove with a fine file. If any binding is caused by a distorted piston ring, replace the ring.
2. With the piston ring on the piston, use feeler gauges to check clearance at multiple locations.
3. Compare the measurements with piston ring side clearance listed in the Engine Mechanical Specifications.
4. If the clearance is greater than specifications, replace the piston rings.



3. There is a locating dimple (1) on the compression rings near the end for identification. Install the compression rings with the dimple facing up.
4. If the new ring does not reduce the clearance to the proper specification, install a new piston.
5. If the new piston does not meet clearance specifications, the cylinder block may need to be oversized to 0.25 mm (0.010 in). There is only 1 size of oversized pistons and rings available for service.

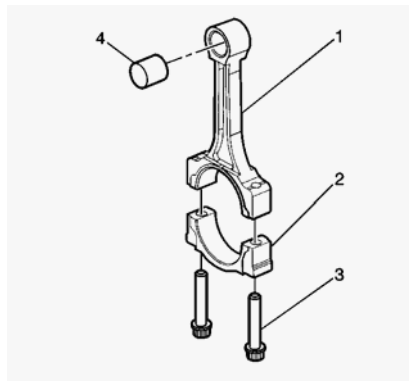
[Connecting Rod Cleaning Procedure](#)

1. Clean the connecting rods in solvent.

Warning: Refer to Safety Glasses Warning.

2. Dry the connecting rod using compressed air.
3. Remove the connecting rod cap and clean the threads.
4. Remove the connecting rod bearing and discard. Never reuse a connecting rod bearing used in a running engine.

[Connecting Rod Visual Inspection Procedure](#)



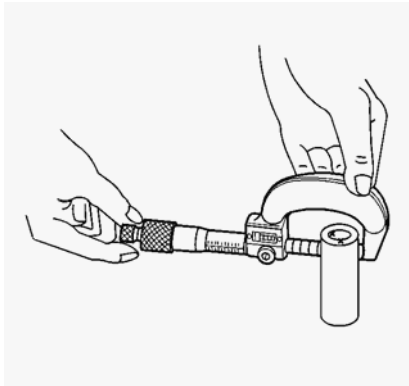
1. Inspect the piston pin bushing (4) for scoring or damage.
2. Inspect the connecting rod beam (1) for twisting or bending.
3. Inspect the rod cap (2) for any nicks or damage caused by possible interference.
4. Inspect for scratches or abrasion on the rod bearing seating surface.

Note: DO NOT scrape the rod or rod cap.

5. If the connecting rod bores contain minor scratches or abrasions, clean the bores in a circular direction with a light emery paper.

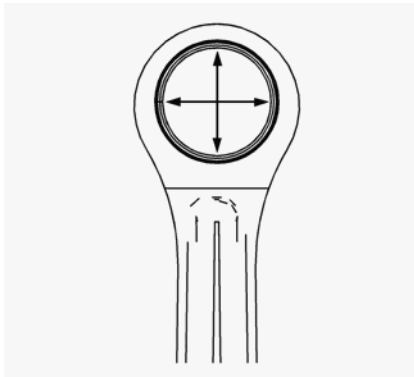
Connecting Rod Measurement Procedure

Piston Pin End



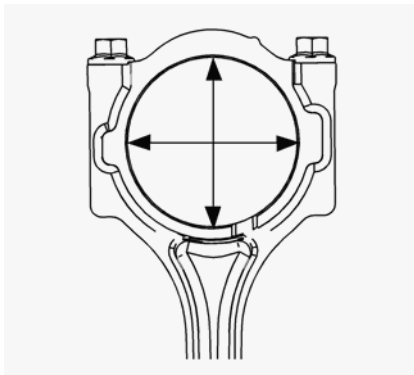
Note: Measurements of all components should be taken with the components at normal room temperature.

1. Using an outside micrometer, take 2 measurements of the piston pin in the area of the connecting rod contact.



2. Using an inside micrometer, measure the connecting rod piston pin bore.
3. Subtract the piston pin diameter from the piston pin bore.
4. Compare the clearance measurements with the Engine Mechanical Specifications.
5. If the clearance is excessive, replace the piston pin. If a new pin does not resolve the clearance problem, replace the connecting rod.

Connecting Rod Crankshaft Bearing End



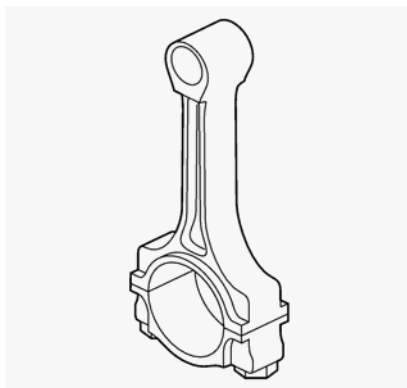
Note: Measurements of all components should be taken with the components at normal room temperature.

1. Using an inside micrometer, measure the connecting rod crankshaft bearing bore.
2. Compare the bore measurements with the Engine Mechanical Specifications.
3. Replace the connecting rod if the bore is out of specifications. DO NOT recondition the connecting rod.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

[Connecting Rod Measurement](#)



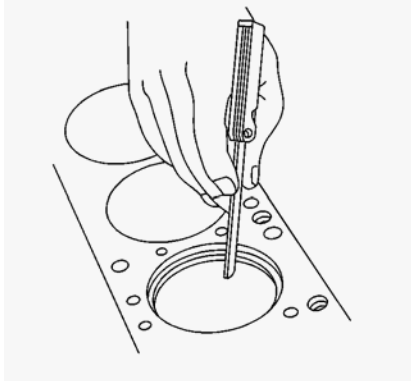
1. Clean the connecting rods in solvent and dry with compressed air.
2. Inspect the connecting rods for the following:
 - Signs of being twisted, bent, nicked, or cracked
 - Scratches or abrasion on the rod bearing seating surface
 - If the connecting rod bores contain minor scratches or abrasions, clean the bores in a circular direction with a light emery paper. DO NOT scrape the rod or rod cap.
 - If the beam of the rod is scratched or has other damage replace the connecting rod.
 - Measure the piston pin to connecting rod bore using the following procedure:
 1. Using an outside micrometer, take two measurements of the piston pin in the area of the connecting rod contact.
 2. Using an inside micrometer, measure the connecting rod piston pin bore.
 3. Subtract the piston pin diameter from the piston pin bore diameter.
 4. The clearance should not be more than 0.021 mm (0.0008 in).
 - If there is excessive clearance, replace the piston pin.
 - If there is still excessive clearance, replace the connecting rod.

[Piston Measurement](#)

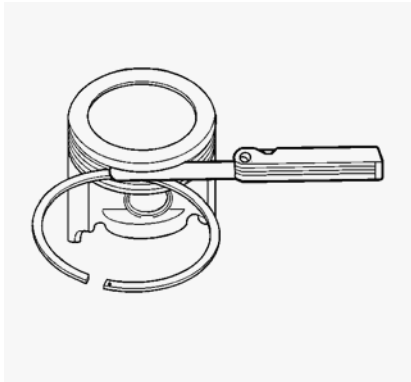


1. Clean the piston skirts and the pins with a cleaning solvent. DO NOT wire brush any part of the piston.
2. Clean the piston ring grooves with a groove cleaner. Make sure oil ring holes and slots are clean.
3. Inspect the pistons for the following conditions:
 - Cracked ring lands, skirts, or pin bosses
 - Ring grooves for nicks, burrs that may cause binding
 - Warped or worn ring lands
 - Eroded areas at the top of the piston (1)
 - Scuffed or damaged skirts (2)
 - Worn piston pin bores (3)
- Replace pistons that show any signs or damage or excessive wear.
- Measure the piston pin bore to piston pin clearances using the following procedure:

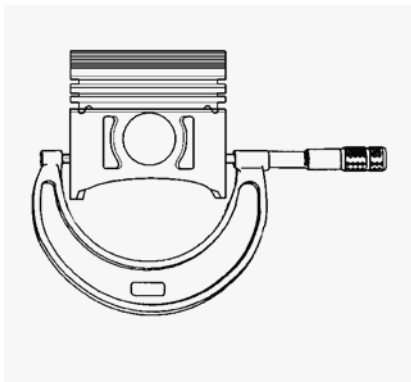
1. Piston pin bores and pins must be free of varnish or scuffing.
2. Use an outside micrometer to measure the piston pin in the piston contact areas.
3. Using an inside micrometer, measure the piston pin bore.
4. Subtract the measurement of the piston pin bore from the piston pin. The clearance should be within 0.002–0.012 mm (0.00007–0.00047 in).
5. If the clearance is excessive, determine which component is out of specification.



- Measure the piston ring end gap using the following procedure:
 1. Place the piston ring in the area of the bore where the piston ring will travel (approximately 25 mm or 1 inch down from the deck surface). Be sure the ring is square with the cylinder bore by positioning the ring with the piston head.
 2. Measure the end gap of the piston ring with feeler gauges. Compare the measurements with those provided below:
- The top compression ring end gap should be 0.20–0.40 mm (0.0060–0.015 in).
- The second compression ring end gap should be 0.35–0.55 mm (0.0137–0.0216 in).
- The oil ring end gap should be 0.25–0.76 mm (0.0098–0.029 in).
- If the clearance exceeds the provided specifications, the piston rings must be replaced.
- Repeat the procedure for all the piston rings.

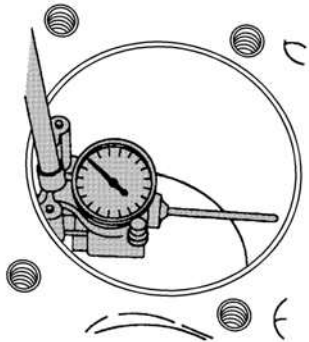


- Measure the piston ring side clearance using the following procedure:
 1. Roll the piston ring entirely around the piston ring groove. If any binding is caused by a distorted piston ring, replace the ring.
 2. With the piston ring on the piston, use feeler gauges to check clearance at multiple locations.
 3. The clearance between the surface of the top piston ring and the ring land should be no greater than 0.075 mm (0.0030 in).
 4. If the clearance is greater than specifications, replace the piston ring.
 5. If the new ring does not reduce the top ring side clearance to 0.075 mm (0.0030 in) or less, install a new piston.
- The top compression ring may be installed with either side up. There is a locating dimple on the 2nd compression ring near the end for identification of the top side. Install the 2nd compression ring with the dimple facing up.
- The clearance between the surface of the second piston ring and the ring land should be no greater than 0.069 mm (0.0026 in).
- If the new ring does not reduce the clearance to 0.069 mm (0.0026 in) or less, install a new piston.



- Measure piston width using the following procedure:
 1. Using an outside micrometer, measure the width of the piston 14.5 mm (0.570 in) above the bottom of the piston skirt at the thrust surface perpendicular to the centerline of the piston pin.
 2. Compare the measurement of the piston to its original cylinder by subtracting the piston width from the cylinder diameter.
 3. The proper clearance specification for the piston is 0.010–0.041 mm (0.0006–0.0016 in).
- If the clearance obtained through measurement is greater than these specifications and the cylinder bores are within specification, replace the piston.

Piston Selection

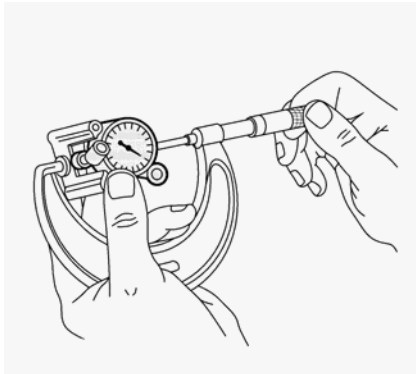


Important: Measurements of all components should be taken with the components at normal room temperature.

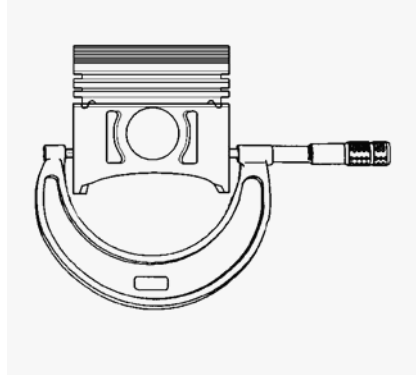
For proper piston fit, the engine block cylinder bores must not have excessive wear or taper.

A used piston and pin set may be reinstalled if, after cleaning and inspection, they are within specifications.

1. Inspect the engine block cylinder bore. Refer to Engine Block Cleaning and Inspection.
2. Inspect the piston and the piston pin.
3. Use a bore gauge and measure the cylinder bore diameter. Measure at a point 64 mm (2.5 in) from the top of the cylinder bore.



4. Measure the bore gauge with a micrometer and record the reading.



5. With a micrometer or caliper at a right angle to the piston, measure the piston 14 mm (0.570 in) from the bottom of the skirt.
6. Subtract the piston diameter from the cylinder bore diameter in order to determine piston-to-bore clearance.
7. For proper piston-to-bore clearance. Refer to Engine Mechanical Specifications.
8. If the proper clearance cannot be obtained, select another piston and measure for the clearances.
9. If the proper fit cannot be obtained, hone the cylinder bore or replace the cylinder block.
10. When the piston-to-cylinder bore clearance is within specifications, mark the top of the piston using a permanent marker for installation to the proper cylinder. Refer to Separating Parts.

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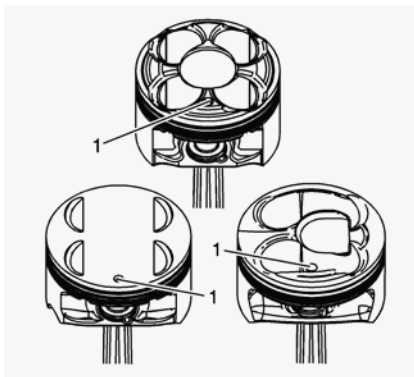
Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- EN 8037 Ring Compressor
- EN 43690-A Rod Bearing Clearance Checking Tool
- EN 43690-100 Rod Bearing Clearance Checking Tool – Adapter Kit
- EN 45059 Angle Meter
- EN 46121 Connecting Rod Guide Pin Set
- EN 48589 Crankshaft Rotation Socket

For equivalent regional tools, refer to Special Tools.

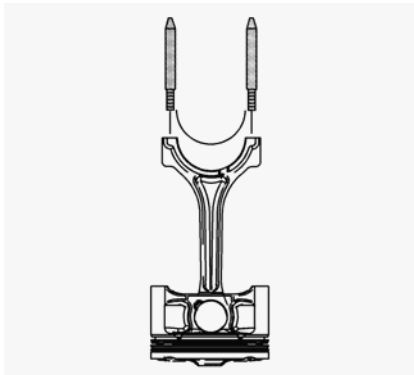
[Piston and Connecting Rod Assembly Procedure](#)



1. Liberally lubricate the cylinder walls, piston rings and piston skirts with engine oil.

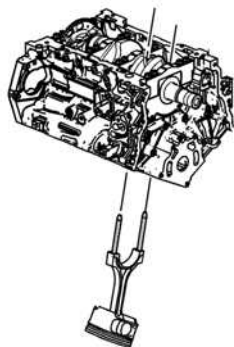
Note: The piston is directional and must be installed in the engine block in the proper direction. The dot on the top of the piston must face the front of the engine.

2. Select the correctly numbered piston/connecting rod assembly for the cylinder. A dot (1) showing proper piston orientation is located on the top of the piston. Piston is model dependent.



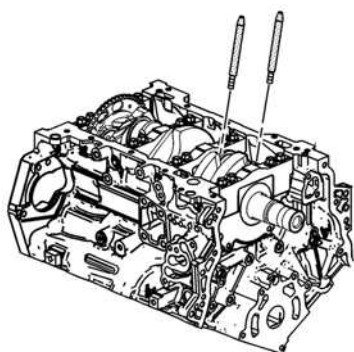
Note: If the connecting rod bearings have been used in a running engine, you must replace them with NEW connecting rod bearings for reassembly.

3. Install the connecting rod bearing into the connecting rod.
4. Install the EN 46121 set into the connecting rod bolt holes.
5. Compress the piston rings using the EN 8037 compressor or equivalent.



Note: Extreme care must be used when installing the piston and connecting rod in order to be sure the rod does not scrape or nick the cylinder bore, the oil jets, or the crankshaft surfaces.

6. Using both hands, slowly guide the piston and connecting rod assembly into the cylinder from the top and bottom of the cylinder. DO NOT allow the connecting rod to contact the cylinder wall.
7. When the EN 8037 compressor contacts the deck surface, gently tap the piston into the cylinder using the handle end of a dead-blow hammer. Guide the connecting rod onto the crankshaft bearing journal using the EN 46121 set while gently tapping the piston into the cylinder with a soft-blow hammer.



8. Remove the EN 46121 set from the connecting rod bolt holes.

[Connecting Rod Bearing Clearance Measurement Procedure — Using Plastic Gaging](#)

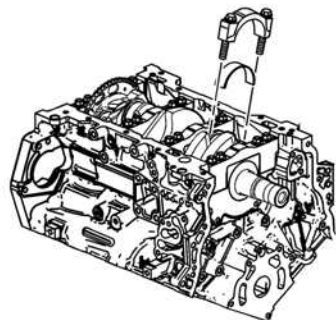
Note: Connecting rod bearings that have been run in an engine should NEVER be reused.

Before final assembly it is important to check the clearance of the new connecting rod bearings.

1. Place a length of fresh, room temperature plastic gaging material all the way across the connecting rod bearing journal.
2. Install the connecting rod bearing into the connecting rod cap.

Note: The connecting rod is non-directional therefore the connecting rod bearing lock tangs can face inboard or outboard.

3. Install the connecting rod end cap on its original connecting rod and ensure the bearing lock tangs are aligned on the same side of the rod.



Caution: Refer to Fastener Caution.

Caution: Do not lubricate the NEW connecting rod bolts. The NEW bolts have a pre-applied graphite lubricant. Applying lubricant to the connecting rod bolts will effect the clamp load when the connecting rod bolts are torqued. Improper clamp load can lead to component failure and extensive engine damage.

Note: Reuse the old connecting rod bolts ONLY for measuring the connecting rod bearing clearance.

4. Install the connecting rod bolts into the connecting rod cap and tighten to **30 Y (22 lb ft)**.
5. Loosen the connecting rod bolts until the torque reading is zero.
6. Re-tighten the connecting rod bolts.

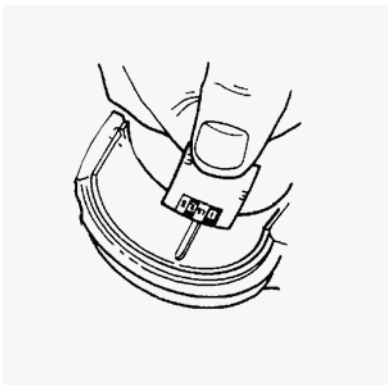
- First Pass

Tighten the connecting rod bolts to **25 Y (18 lb ft)**.

- Final Pass

Tighten the connecting rod bolts an additional **110 degrees** using the *EN 45059* meter.

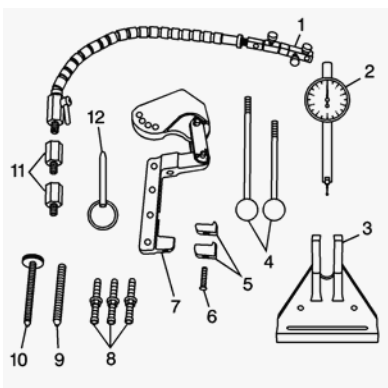
- Allow the assembly to sit for at least 2 minutes.
- Remove the connecting rod cap bolts.
- Remove the connecting rod cap.



- Determine the connecting rod bearing clearance by comparing the width of the flattened plastic gaging material at its widest point with the graduation on the gaging material container.
- Compare your measurements with the engine mechanical specifications. If the new bearings do not provide the proper crankshaft to connecting rod bearing clearance, inspect the following:
 1. Re-measure the crankshaft connecting rod journals for the correct specified size and ensure the proper new bearings are being installed. If the crankshaft connecting rod journals are incorrectly sized, replace or regrind the crankshaft. Crankshaft machining is permitted and undersized bearings are available.
 2. Re-measure the connecting rod bearing bore diameter to ensure proper size. The connecting rod is not machinable and the connecting rod must be replaced if out of specification.
- Clean the plastic gaging material from the connecting rod bearing journals using a soft lint-free cloth.

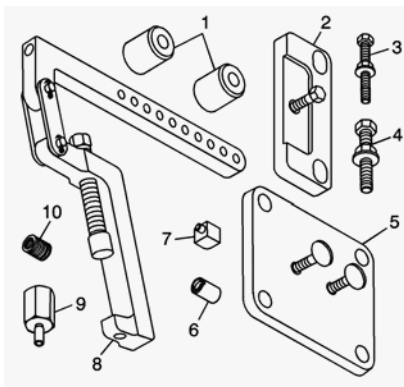
Connecting Rod Bearing Clearance Measurement Procedure — Using EN 43690-A and EN 43690-100

The *EN 43690-A* tool and the *EN 43690-100* kit have been developed as a more accurate method to measure connecting rod bearing clearances. The instructions below provide an overview of tool set-up and usage. For more detailed information, refer to the tool instruction sheets as supplied by the tool manufacturer.



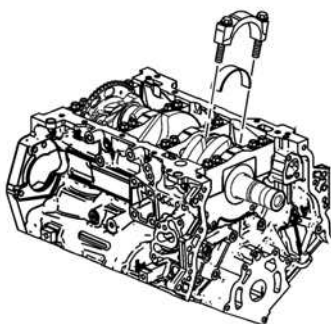
EN 43690-A tool

- EN 43690-20 Swivel Base (1)
- EN 43690-19 Dial Indicator (2)
- EN 43690-2 Base (3)
- EN 43690-5, -6 Handle (4)
- EN 43690-10, -11 Foot (5)
- 280307 Screw (6)
- EN 43690-1 Pivot Arm Assembly (7)
- EN 43690-3, -7, -8 Screws (8)
- 280319 Screw (9)
- 280311 Screw (10)
- EN 43690-17, -18 Adapter (11)
- 280310 Pin (12)



EN 43690-100 kit

- EN 43690-104 Spacer (1)
- EN 43690-105 Retainer Plate (2)
- 505478 Bolt (3)
- 511341 Bolt (4)
- EN 43690-106 Retainer Plate (5)
- EN 43690-107 Cap (6)
- EN 43690-102 Foot (7)
- EN 43690-101 Pivot Arm Assembly (8)
- EN 43690-103 Adapter (9)
- 505439 Adapter (10)



Note: Connecting rod bearings that have been run in an engine should NEVER be reused.

Before final assembly it is important to check the clearance of the new connecting rod bearings.

1. Install the connecting rod bearing into the connecting rod cap.

Note: The connecting rod is non-directional therefore the connecting rod bearing lock tangs can face inboard or outboard.

2. Install the connecting rod end cap on its original connecting rod and ensure the bearing lock tangs are aligned on the same side of the rod.

Caution: Refer to Fastener Caution.

Caution: Do not lubricate the NEW connecting rod bolts. The NEW bolts have a pre-applied graphite lubricant. Applying lubricant to the connecting rod bolts will effect the clamp load when the connecting rod bolts are torqued. Improper clamp load can lead to component failure and extensive engine damage.

Note: Reuse the old connecting rod bolts ONLY for measuring the connecting rod bearing clearance.

3. Install the connecting rod bolts into the connecting rod cap and tighten to **30 Y (22 lb ft)**.
4. Loosen the connecting rod bolts until the torque reading is zero.
5. Re-tighten the connecting rod bolts.

- First Pass

Tighten the connecting rod bolts to **25 Y (18 lb ft)**.

- Final Pass

Tighten the connecting rod bolts an additional **110 degrees** using the *EN 45059* meter.

- Rotate the crankshaft until the crankshaft journal and the connecting rod to be measured is in the 12 o'clock position.

Note: The crankshaft must be secure with no movement or rotation in order to obtain an accurate reading.

- Remove the crankshaft main bolts required to install the retainer plate EN 43690-105.

Note: Do not allow the EN 43690-105 retainer plate screw to contact the reluctor ring.

- Install the EN 43690-105 and crankshaft main bolts.
- Loosen the connecting rod bolts until the torque reading is zero.
- Re-tighten the connecting rod bolts.

- First Pass

Tighten the connecting rod bolts to **25 Y (18 lb ft)**.

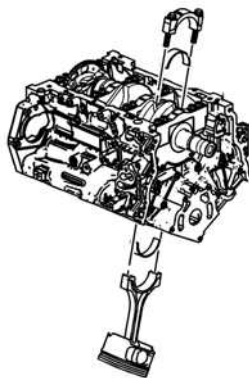
- Final Pass

Tighten the connecting rod bolts an additional **110 degrees** using the *EN 45059* meter.

- During and after installation, ensure each piston is positioned properly in the correct cylinder. The locating arrow on the top of each piston must be pointing toward the front of the engine.
- Repeat these procedures for the remaining piston/connecting rod assemblies using the *EN 48589* socket in order to rotate the crankshaft.

Connecting Rod Final Assembly Procedure

1. Guide the connecting rod away from the crankshaft connecting rod journal in order to lubricate the crankshaft connecting rod bearing journal.
2. Apply a liberal amount of crankshaft prelube GM P/N 1052367 (Canadian P/N 992869) or clean engine oil GM P/N 12345501 (Canadian P/N 992704) to the crankshaft connecting rod bearing journal.
3. Guide the connecting rod to the crankshaft connecting rod journal.
4. Install the connecting rod end cap on its original connecting rod and ensure the bearing lock tangs are aligned on the same side of the rod.



Caution: Do not lubricate the NEW connecting rod bolts. The NEW bolts have a pre-applied graphite lubricant. Applying lubricant to the connecting rod bolts will effect the clamp load when the connecting rod bolts are torqued. Improper clamp load can lead to component failure and extensive engine damage.

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

5. Install the NEW connecting rod bolts into the connecting rod cap and tighten to **30 Y (22 lb ft)**.
6. Loosen the connecting rod bolts until the torque reading is zero.
7. Re-tighten the connecting rod bolts.

1. First Pass

Tighten the connecting rod bolts to **25 Y (18 lb ft)**.

2. Final Pass

Tighten the connecting rod bolts an additional **110 degrees** using the *EN 45059* meter.

8. During and after installation, ensure each piston is positioned properly in the correct cylinder. The locating arrow on the top of each piston must be pointing toward the front of the engine.
9. Repeat these procedures for the remaining piston/connecting rod assemblies using the *EN 48589* socket in order to rotate the crankshaft.

2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

Special Tools

- EN-50034 Connecting Rod Guides
- J 45059 Angle Meter

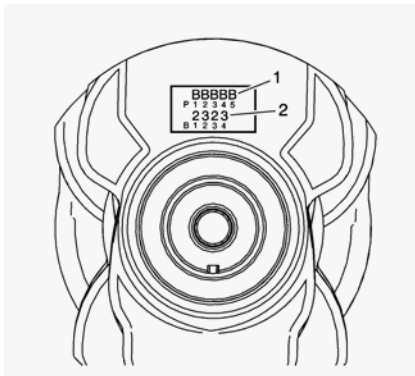
For equivalent regional tools, refer to Special Tools.

[Bearing Selection](#)

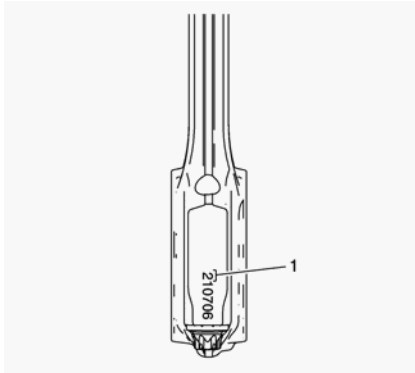
There are 3 methods to determine the correct replacement bearing size.

- Connecting Rod Bearing Grade Chart Method uses production markings on the crankshaft and the connecting rod to determine original bearing size.
- Micrometer method uses measurements of the crankshaft rod bearing journal and the connecting rod large end bore to determine the correct bearing size.
- Plastic gauging method is a way to verify the bearing clearance once the bearings are installed.

[Connecting Rod Bearing Grade Chart Method](#)



1. Inspect the bearing grade specifications located on the front crankshaft counterweight (2).

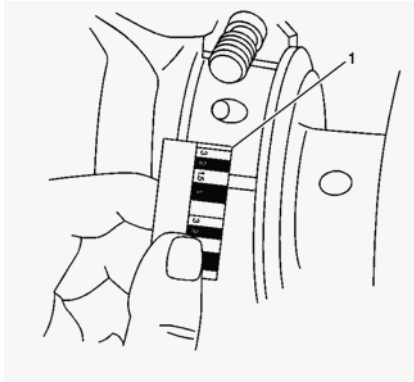


2. Inspect the connecting rod bore specification located on the side of the connecting rod (1).
3. Determine the correct bearing grade. Refer to Connecting Rod Bearings Selection Specifications.
4. Verify that the bearing clearance is within specification using the Plastic Gauging Method.

[Micrometer Method](#)

1. Install the connecting rod caps and tighten the cap bolts to specification.
2. Measure the connecting rod large end bore inside diameter in several places, 90 degrees apart, and average the measurements.
3. Measure the crankshaft pin diameter in several places, 90 degrees apart, and average the measurements.
4. Select the correct crankshaft bearings. Refer to Crankshaft Bearing Selection Specifications.

[Plastic Gauging Method](#)

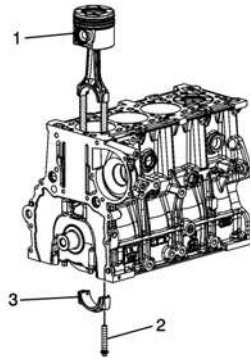


1. Clean and install the bearing inserts.
2. Install the piston and connecting rod assembly to the engine. Refer to Piston, Connecting Rod, and Bearing Installation.
3. Place a piece of plastic gauging material across the entire bearing width.
4. Install the connecting rod caps and tighten the bearing cap bolts to specification.

Note: Do not rotate the crankshaft.

5. Remove the bearing cap, leaving the gauging plastic in place. It does not matter whether the gauging plastic adheres to the journal or the bearing.
6. Measure the gauging plastic at its widest point with the scale (1) printed on the gauging plastic package.
7. Remove the gauging plastic.
8. Select the correct connecting rod bearings. Refer to Connecting Rod Bearings Selection Specifications.

[Piston, Connecting Rod and Bearing Installation](#)



1. Select the correct connecting rod bearings, refer to Connecting Rod Bearings Selection Specifications.
2. Install the connecting rod bearings. Use NEW bearings.
 1. Install the bearing inserts into the connecting rod and the connecting rod cap (3).
 2. Lubricate the connecting rod bearings with engine oil.
3. Install the EN-50034 guides into the connecting rod bolt holes. This protects the crankshaft journal during piston and connecting rod (1) installation.
4. Install the compressor, piston, and the connecting rod to the correct bore.

1. Stagger each piston ring end gap equally around the piston.
2. Lubricate the piston and the piston rings with engine oil.
3. Do not disturb the piston ring end gap location.
4. The piston must be installed so that the mark on the top of the piston faces the front of the engine.
5. Place the piston in its matching bore.
6. Tap the piston into its bore with a hammer handle. Guide the connecting rod to the connecting rod journal while tapping the piston into place.
7. Hold the compressor against the engine block until all the rings have entered the cylinder bore.
8. Remove the connecting rod guides from the connecting rod bolt holes.

Note: Ensure that the connecting rod cap is properly oriented on the connecting rod.

5. Install the connecting rod cap.

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

Caution: Refer to Fastener Caution.

6. Install the connecting rod bolts (2). Always use new bolts. Tighten the NEW connecting rod bolts to **30 Y (22 lb ft), plus 40 degrees** using the J 45059 meter.
7. Install the remaining connecting rods and piston assemblies.

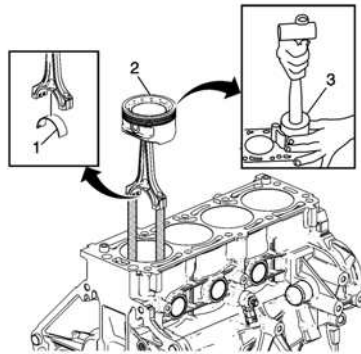
2013 Chevrolet Colorado

Submodel: | Engine Type: | Liters:
Fuel Delivery: | Fuel:

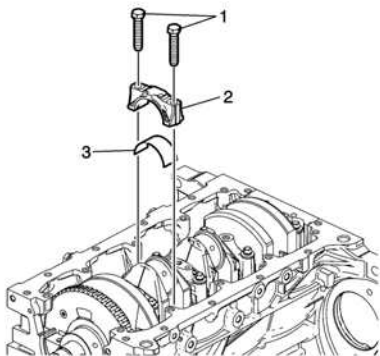
Special Tools

EN-9806681 Connecting Rod Guides

For equivalent regional tools, refer to Special Tools.



1. Install the connecting rod bearings (1). Use NEW bearings.
 1. Install the bearing inserts into the connecting rod and the connecting rod cap.
 2. Lubricate the connecting rod bearings with clean engine oil.
2. Install the EN-9806681 Connecting Rod Guides (4) into the connecting rod bolt holes. This protects the crankshaft journal during piston and connecting rod installation.
3. Install compressor (3), piston, and piston assembly (2) to the correct bore.
 1. Stagger each piston ring end gap equally around the piston.
 2. Lubricate the piston and the piston rings with clean engine oil.
 3. Do not disturb the piston ring end gap location.
 4. The piston must be installed so that the mark on the top of the piston faces the front of the engine.
 5. Place the piston in its matching bore.
 6. Tap the piston into its bore with a hammer handle. Guide the connecting rod to the connecting rod journal while tapping the piston into place.
 7. Hold the compressor (3) against the engine block until all the rings have entered the cylinder bore.
 8. Remove the connecting rod guides from the connecting rod bolt holes.



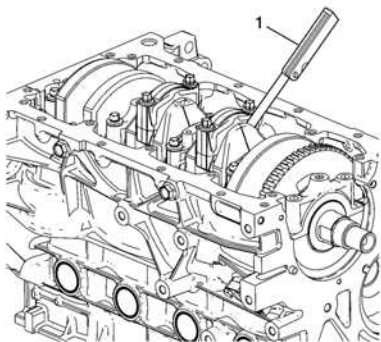
Note: Ensure that the connecting rod cap is properly oriented on the connecting rod.

4. Install the connecting rod cap bearing (3). Use NEW bearings.
5. Lubricate the connecting rod bearings with engine oil.
6. Install the connecting rod caps (2) in correct orientation to connecting rod.

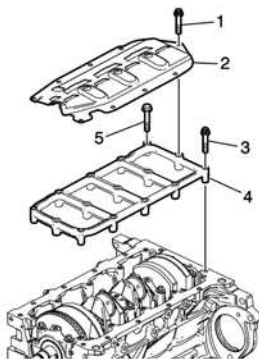
Caution: Refer to Fastener Caution.

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

7. Install the connecting rod bolts (1). Always use NEW bolts. Tighten the connecting rod bolts to **35 Y (25 lb ft) plus 45° plus an additional 15°**
8. Install the remaining connecting rods and piston assemblies.



9. Measure the connecting rod side clearance with a feeler gauge (1).
Refer to Engine Mechanical Specifications.



10. Install the engine bridge cap (4).
11. Install the engine bridge cap bolts (3 and 5) finger tight.
12. Install the oil pan baffle (2).
13. Install the oil pan baffle bolts (1) finger tight.
14. Tighten the engine bridge cap bolts (3 and 5) and oil pan baffle bolts (1) to **20 Y (15 lb ft) plus 43° plus an additional 4°**.

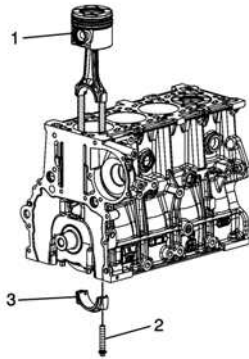
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Special Tools

EN-50034 Connecting Rod Guides



1. Rotate the crankshaft to a position where the connecting rod bolts are the most accessible.
2. Mark the connecting rod and cap with the cylinder position. Also mark their orientation. This will ensure the caps and connecting rods are re-assembled properly.
3. Remove any ridge at the top of the cylinder bore to avoid damage to the piston ring lands.
4. Remove the connecting rod bolts (2).
5. Remove the connecting rod cap (3).
6. Install EN-50034 guides on the connecting rod bolts before removing the piston and connecting rod assembly.
7. Remove the piston and connecting rod assembly (1).

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Special Tools

EN 46121 Connecting Rod Guide Pin Set

For equivalent regional tools, refer to Special Tools.

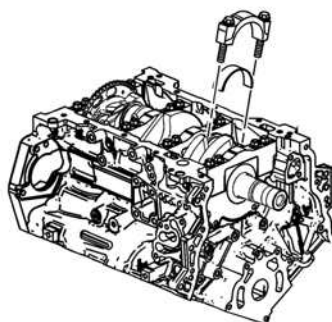
Note: An arrow/dot showing proper piston orientation is located on the top of the piston.

Note: If the connecting rod bearings have been used in a running engine, you must replace them with NEW connecting rod bearings for reassembly.

1. Before removing the connecting rods, check the connecting rod side clearance using the following procedure:
 1. Tap the connecting rod to one end of the crankshaft journal with a dead-blow or wooden hammer.
 2. Using feeler gauges, measure the clearance between the crankshaft counterweight and the connecting rod.
 3. The connecting rod side clearance should not exceed specifications. Refer to Engine Mechanical Specifications.
 4. If the end play exceeds the specified limits, measure the width of the crankpin end of the connecting rod. Refer to Piston, Connecting Rod, and Bearing Cleaning and Inspection.
 5. If the connecting rod width is significantly smaller than specified and severe wear is present on the side of the connecting rod, replace the connecting rod.
 6. If the connecting rod width is within specification and excessive scoring is present on the crankshaft journals, replace the crankshaft.
2. Using a marker, number each piston face. Draw an arrow along the centerline of the piston pointing toward the front of the engine.

Caution: Do not use a stamp, punch or any other method that may distort or stress the connecting rod or connecting rod cap. Extensive engine damage may result from a connecting rod that is distorted or stressed.

3. Mark the cylinder number on the connecting rod and the connecting rod cap with a scribe, paint stick or permanent marker.

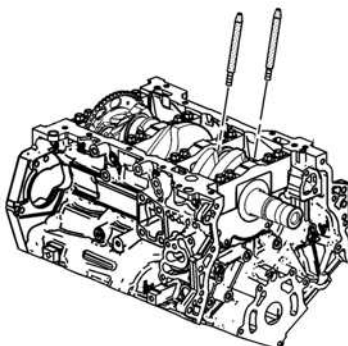


Caution: Powdered metal connecting rods have rod bolts which yield when torqued. If the rod bolts are loosened or removed the rod bolts must be replaced. Rod bolts that are not replaced will not torque to the correct clamp load and can lead to serious engine damage.

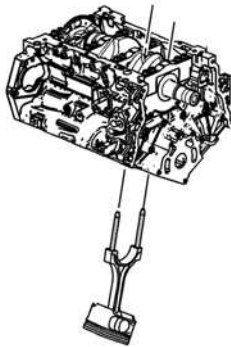
4. Remove the connecting rod bolts.

Note: The connecting rod caps must remain with the original connecting rod.

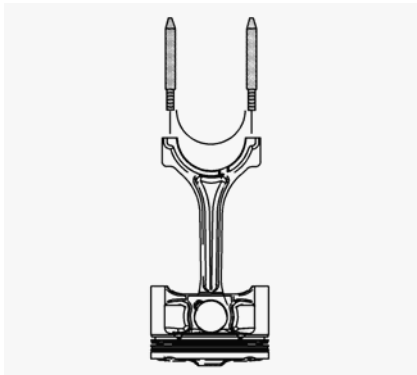
5. Remove the connecting rod cap.



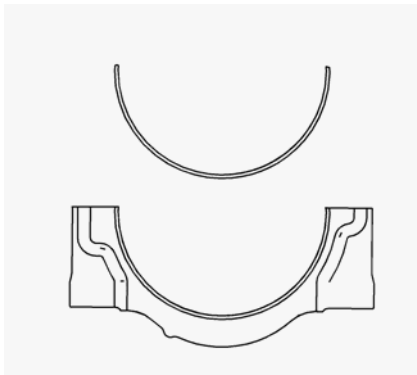
6. Install the EN 46121 set into the connecting rod bolt holes.



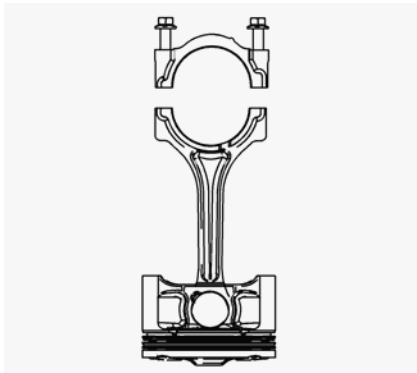
7. Using the *EN 46121* set , push the connecting rod and piston assembly through the top of the cylinder. DO NOT scratch the crankshaft journal or cylinder wall and DO NOT damage the oil jets when removing the connecting rod and piston assembly.



8. Remove the *EN 46121* set from the connecting rod bolt holes.
9. Remove the upper connecting rod bearing from the connecting rod.



10. Remove the lower connecting rod bearing from the connecting rod cap.



11. Reattach the connecting rod cap to the connecting rod to prevent damage to their mating surfaces. The cap and rod are a matched set and must be kept together.

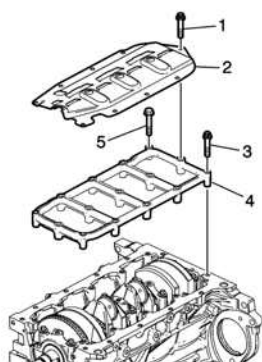
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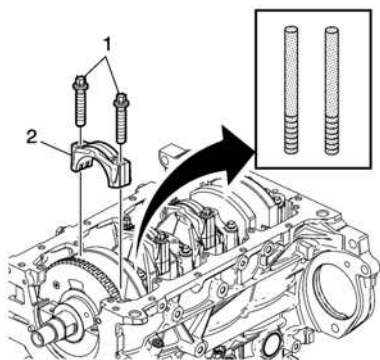
Special Tools

EN-9806681 Connecting Rod Guides

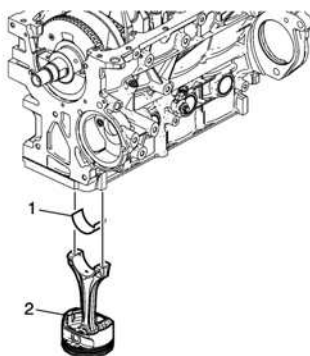
For equivalent regional tools, refer to Special Tools.



1. Remove the oil pan baffle bolts (1).
2. Remove the oil pan baffle (2).
3. Remove the engine bridge cap bolts (3 and 5).
4. Remove the engine bridge cap (4)

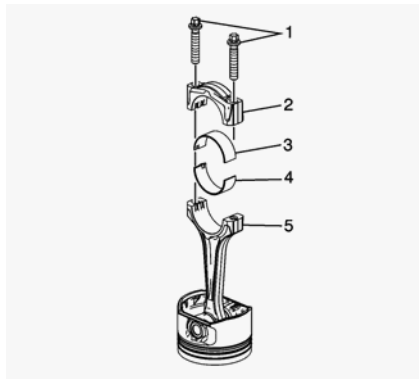


5. Rotate the crankshaft to a position where the connecting rod bolts are the most accessible.
6. Mark the connecting rod and cap with the cylinder position. Also mark their orientation. This will ensure the caps and connecting rods are re-assembled properly.
7. Remove any ridge at the top of the cylinder bore to avoid damage to the piston ring lands.
8. Remove the connecting rod bolts (1).
9. Remove the connecting rod cap (2).
10. Install *EN-9806681* connecting rod guides on the connecting rod bolts before removing the piston and connecting rod assembly.



11. Remove the piston and connecting rod assembly (2) and bearing (1).

Piston, Connecting Rod, and Bearing Removal

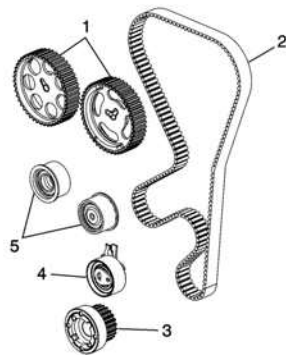


12. Keep the connecting rod bolts (1), connecting rod caps (2), connecting rod bearings (3 and 4) with the correct connecting rod (5).

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1. Clean camshaft sprockets, crankshaft sprocket, tensioner, and rollers with solvent.

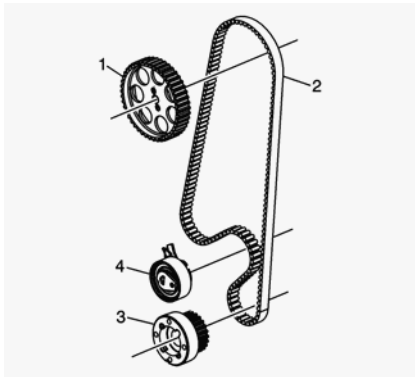
Warning: Refer to Safety Glasses Warning.

2. Inspect the camshaft sprocket teeth (1) for signs of wear.
3. Inspect the timing belt (2) for signs of cracking or wear.
4. Inspect the crankshaft sprocket teeth (3) for signs of wear.
5. Inspect the timing belt tensioner assembly (4) and guide rollers (5) for scoring.
6. Replace the components as necessary.

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1. Clean the camshaft sprocket, crankshaft sprocket, and tensioner with solvent.

Warning: Refer to Safety Glasses Warning.

2. Inspect the camshaft sprocket teeth (1) for signs of wear.
3. Inspect the timing belt (2) for signs of cracking or wear.
4. Inspect the crankshaft sprocket teeth (3) for signs of wear.
5. Replace components as necessary.