

2010 ENGINE**Engine Mechanical - 2.8L, 3.0L, 3.2L, or 3.6L - Repair Instructions - On Vehicle - SRX****SETTING CAMSHAFT TIMING**

NOTE: Setting the camshaft timing is necessary whenever the camshaft drive system has been disturbed such that the relationship between an chain and sprocket has been lost. Even when only one sprocket is involved multiple crankshaft rotations will not produce conditions where correct timing can be confirmed.

Follow the left bank secondary camshaft drive chain replacement procedures to reset the camshaft timing. Refer to **Secondary Camshaft Intermediate Drive Chain Replacement - Left Side**.

CAMSHAFT REPLACEMENT - LEFT SIDE**SPECIAL TOOLS**

- **EN-46111:** Crankshaft Rotation Socket
- **EN-46313:** Timing Chain Retention Tool

For equivalent regional tools, refer to **Special Tools**.

REMOVAL PROCEDURE

1. Remove the intake manifold. Refer to **Intake Manifold Replacement**.
2. Remove the left bank camshaft cover. Refer to **Camshaft Cover Replacement - Left Side (LF1)** or **Camshaft Cover Replacement - Left Side (LAU)**.
3. Remove the camshaft sensors. Refer to **Camshaft Position Sensor Replacement - Bank (Left Side) Exhaust** and **Camshaft Position Sensor Replacement - Bank (Left Side) Intake**.
4. Remove the camshaft position actuator solenoid. Refer to **Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank (Left Side) Intake**.
5. Remove the camshaft position actuator. Refer to **Camshaft Position Actuator Replacement - Bank (LF1)**.
6. Remove the crankshaft balancer. Refer to **Crankshaft Balancer Replacement**.

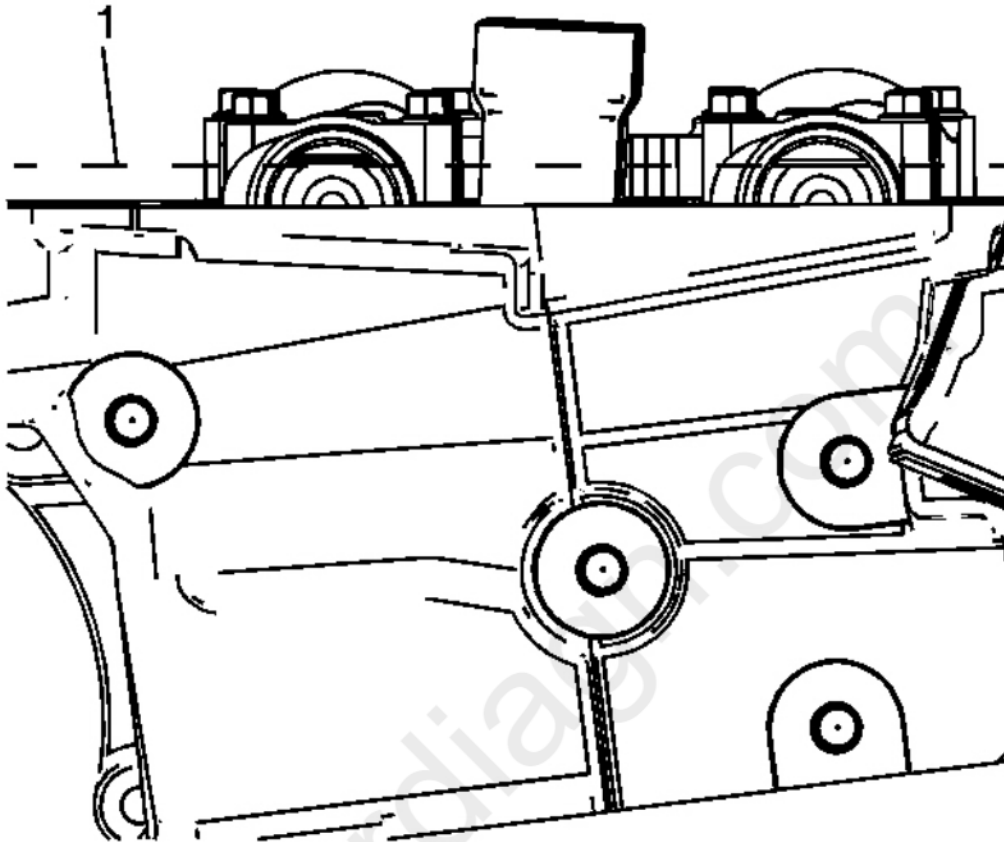


Fig. 1: Identifying Camshaft Flats Parallel With Camshaft Cover Rail
Courtesy of GENERAL MOTORS CORP.

7. Rotate the crankshaft with the **EN-46111:** socket until the camshafts are in a neutral (low tension) position. The camshaft flats will be parallel with the camshaft cover rail (1).

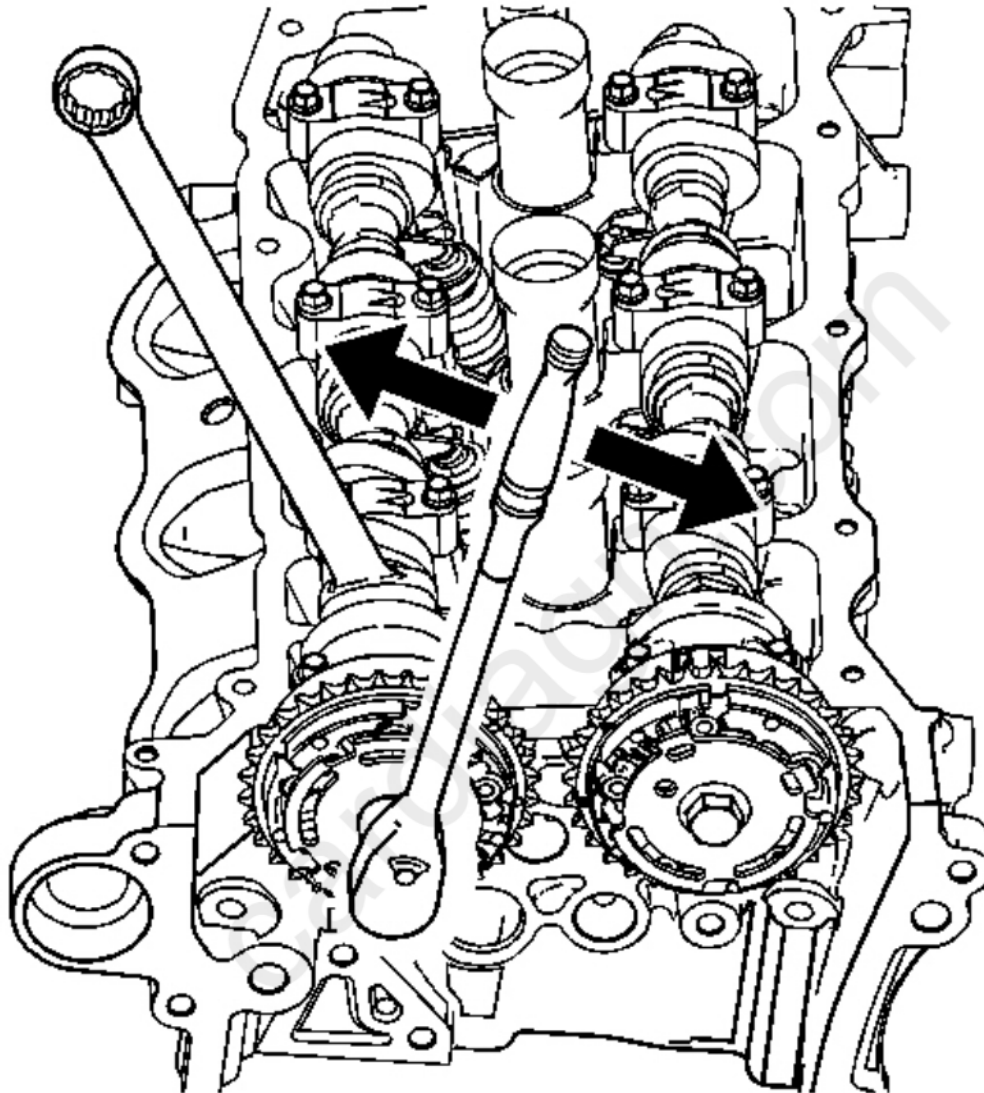


Fig. : View of Camshaft/Engine Rotation Prevention Using Open-End Wrench
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Torque Reaction Against Timing Drive Chain Caution .

NOTE:

- Use an open-end wrench at the camshaft hex to prevent camshaft/engine rotation.

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- **DO NOT** remove the camshaft position actuator bolt at this time.

8. Loosen the camshaft position actuator bolt.

NOTE: Ensure that the tips of the **EN-4 1** : tool are full engaged into the timing chain.

9. Install the **EN-46313**: tool in order to retain the timing chain.

Firmly tighten the **EN-46313**: tool nuts.

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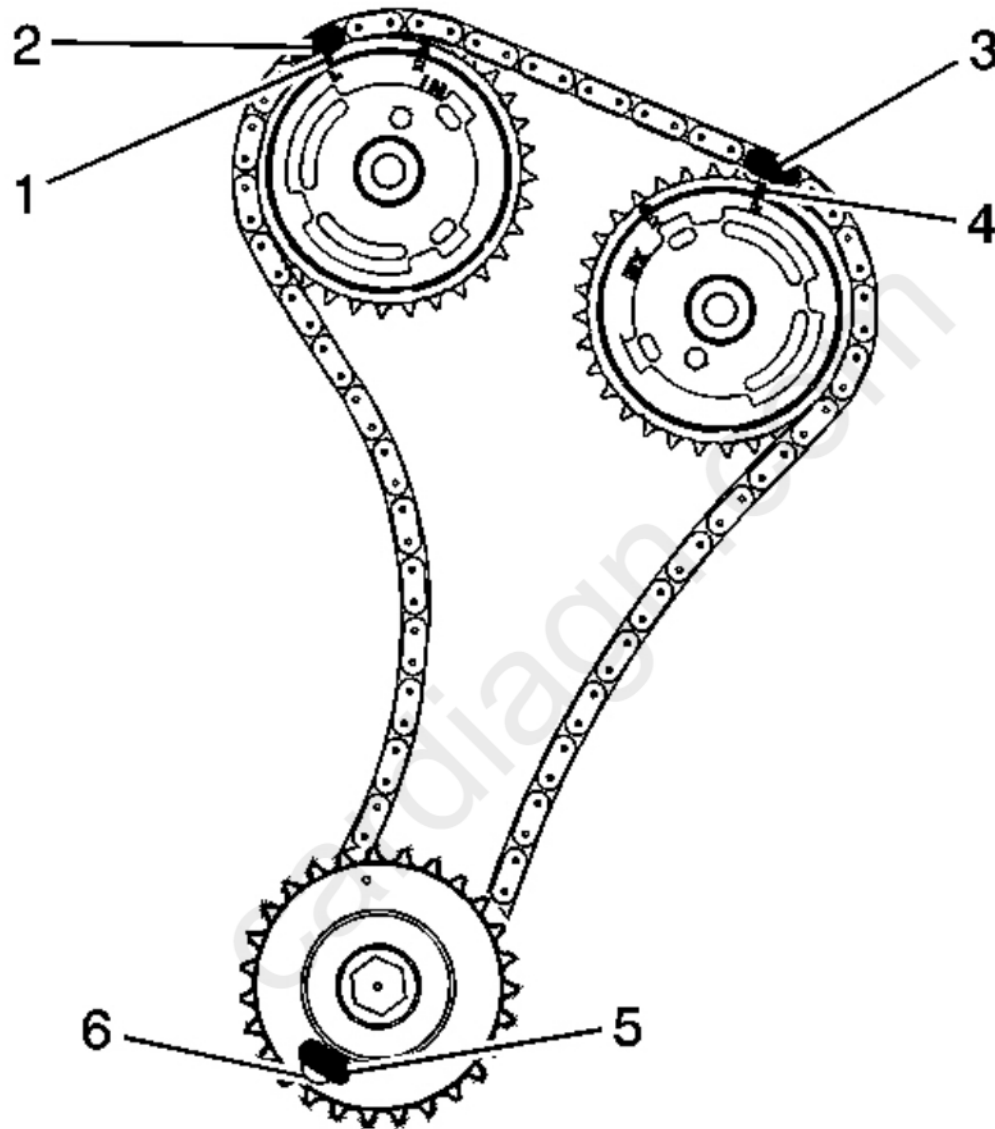


Fig. 3: Locating Left Secondary Camshaft Drive Chain Timing Marks
Courtesy of GENERAL MOTORS CORP.

NOTE: Ensure that the camshaft timing chain and the camshaft position actuators are marked for proper assembly.

10. Mark the timing chain and the respective locations on the camshaft position actuators (1-4).

11. Remove the camshaft position actuator bolt.
12. Remove the camshafts. Refer to Camshaft Removal - Left Side .

INSTALLATION PROCEDURE

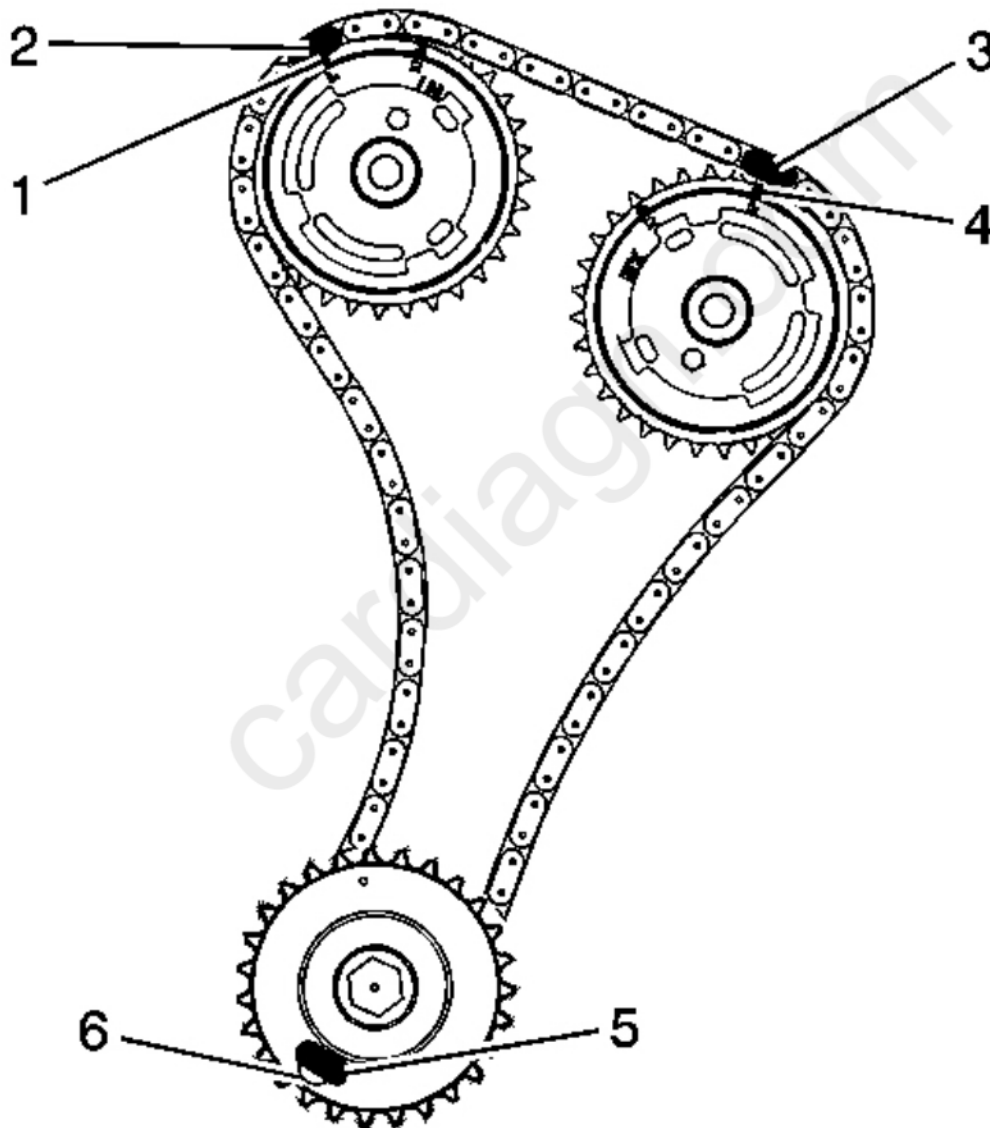


Fig. 4: Locating Left Secondary Camshaft Drive Chain Timing Marks
Courtesy of GENERAL MOTORS CORP.

NOTE:

- Ensure that the marks on the camshaft position actuator and the timing chain (1-4) are aligned.
- **DO NOT** tighten the camshaft position actuator bolt at this time.

1. Locate the camshafts to the cylinder head and assemble the camshaft actuators to the camshafts.
2. Install the camshafts and the camshaft bearing caps. Refer to **Camshaft Installation - Left Side**.
3. Remove the **EN-46108** tool.

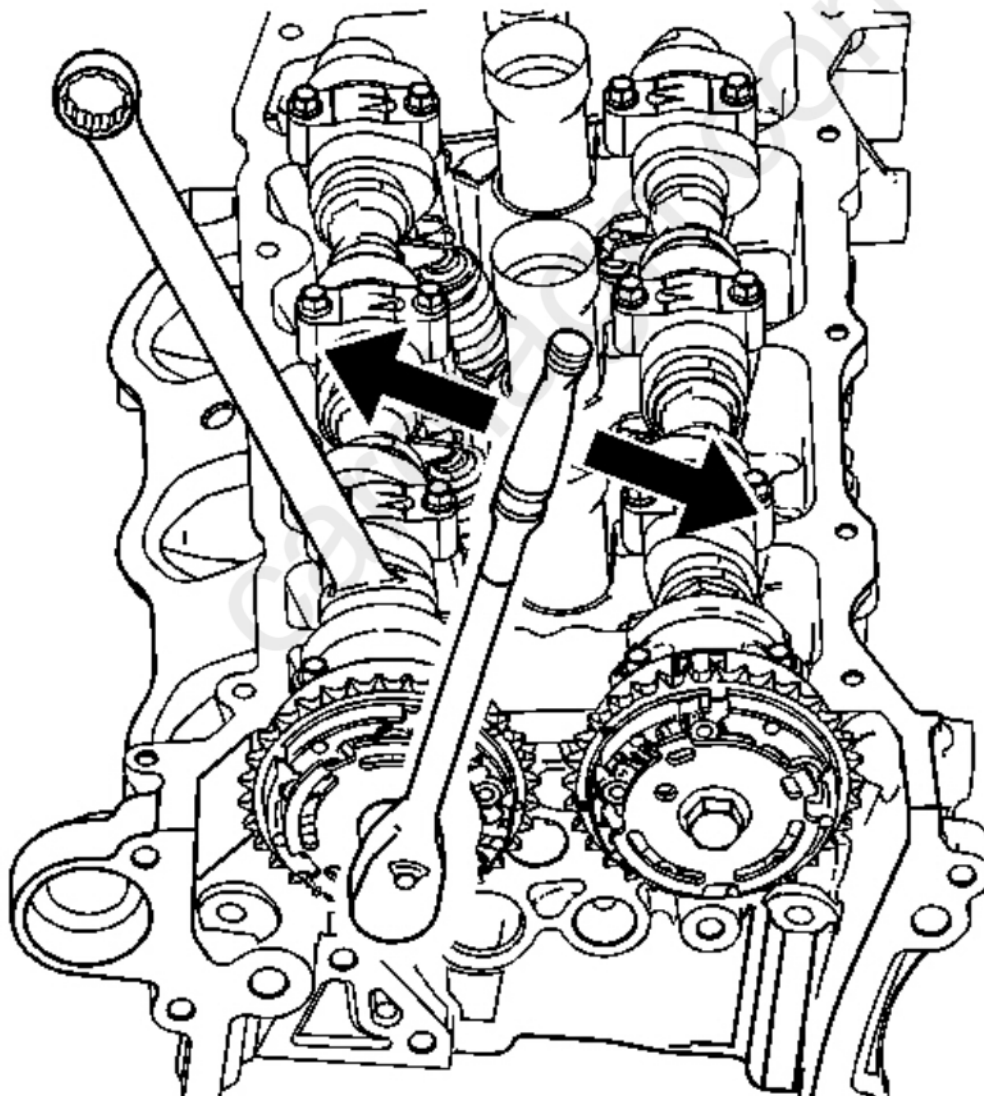


Fig. : View of Camshaft/Engine Rotation Prevention Using Open-End Wrench
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Torque Reaction Against Timing Drive Chain Caution .

NOTE: Use an open-end wrench at the camshaft hex to prevent camshaft/engine rotation.

4. Install and tighten the camshaft position actuators. Refer to Camshaft Position Actuator Installation - Left Side Intake and Camshaft Position Actuator Installation - Left Side Exhaust .
5. Install the intake camshaft position actuator solenoid. Refer to Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank (Left Side) Intake .
6. Install the camshaft sensors. Refer to Camshaft Position Sensor Replacement - Bank (Left Side) Exhaust and Camshaft Position Sensor Replacement - Bank (Left Side) Intake .
7. Install the crankshaft balancer. Refer to Crankshaft Balancer Replacement .
8. Install the camshaft cover. Refer to Camshaft Cover Replacement - Left Side (LF1) or Camshaft Cover Replacement - Left Side (LAU) .
9. Install the intake manifold. Refer to Intake Manifold Replacement .

CAMSHAFT REPLACEMENT - RIGHT SIDE

SPECIAL TOOLS

- **EN-46111:** Crankshaft Rotation socket
- **EN-46313:** Timing Chain Retention tool

For equivalent regional tools refer to Special Tools .

REMOVAL PROCEDURE

1. Remove the intake manifold. Refer to Intake Manifold Replacement .
2. Remove the camshaft cover. Refer to Camshaft Cover Replacement - Right Side (LF1) or Camshaft Cover Replacement - Right Side (LAU) .
3. Remove the camshaft sensors. Refer to Camshaft Position Sensor Replacement - Bank 1 (Right Side) Exhaust and Camshaft Position Sensor Replacement - Bank 1 (Right Side) Intake .
4. Remove the intake camshaft position actuator solenoid. Refer to Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 1 (Right Side) Intake .
5. If equipped with LF1 engine remove the camshaft position actuator. Refer to Camshaft Position Actuator Replacement - Bank 1 (LF1) .
6. If equipped with LAU engine remove the camshaft position actuator. Refer to Camshaft Position Actuator Replacement - Bank 1 (Right Side) Intake (LAU) .
7. Remove the crankshaft balancer. Refer to Crankshaft Balancer Replacement .

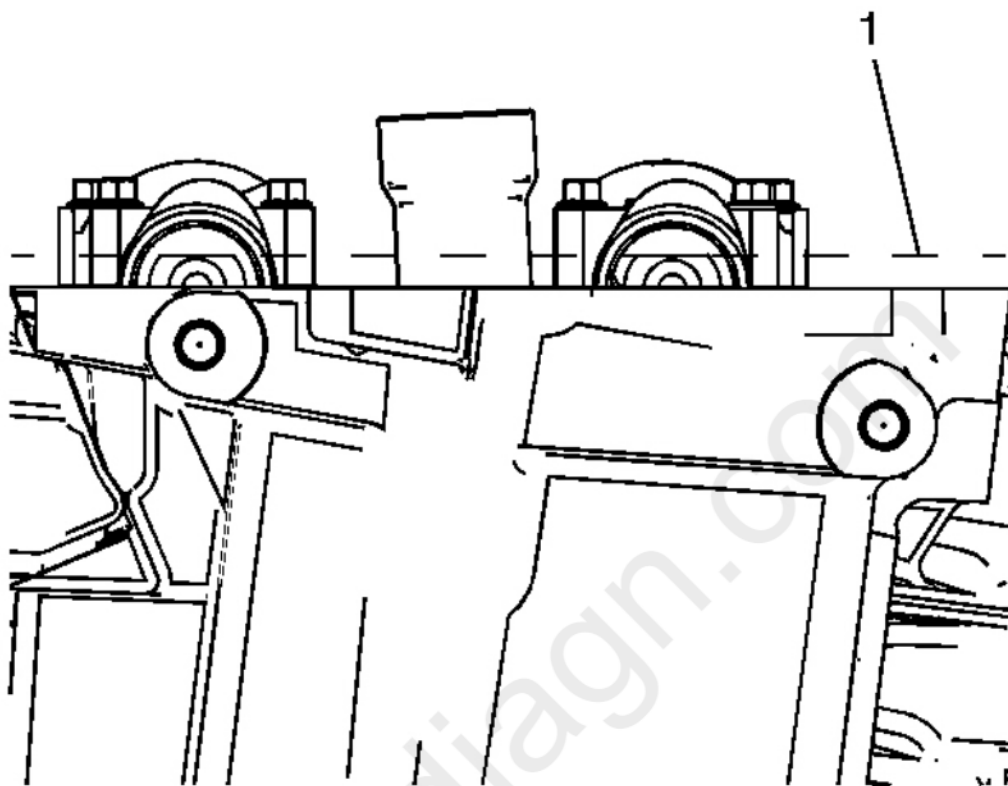


Fig. 6: Identifying Camshaft Neutral (Low Tension) Position
Courtesy of GENERAL MOTORS CORP.

8. Rotate the crankshaft with the **EN-46111:** socket until the camshafts are in a neutral (low tension) position.

The camshaft flats will be parallel with the camshaft cover rail (1).

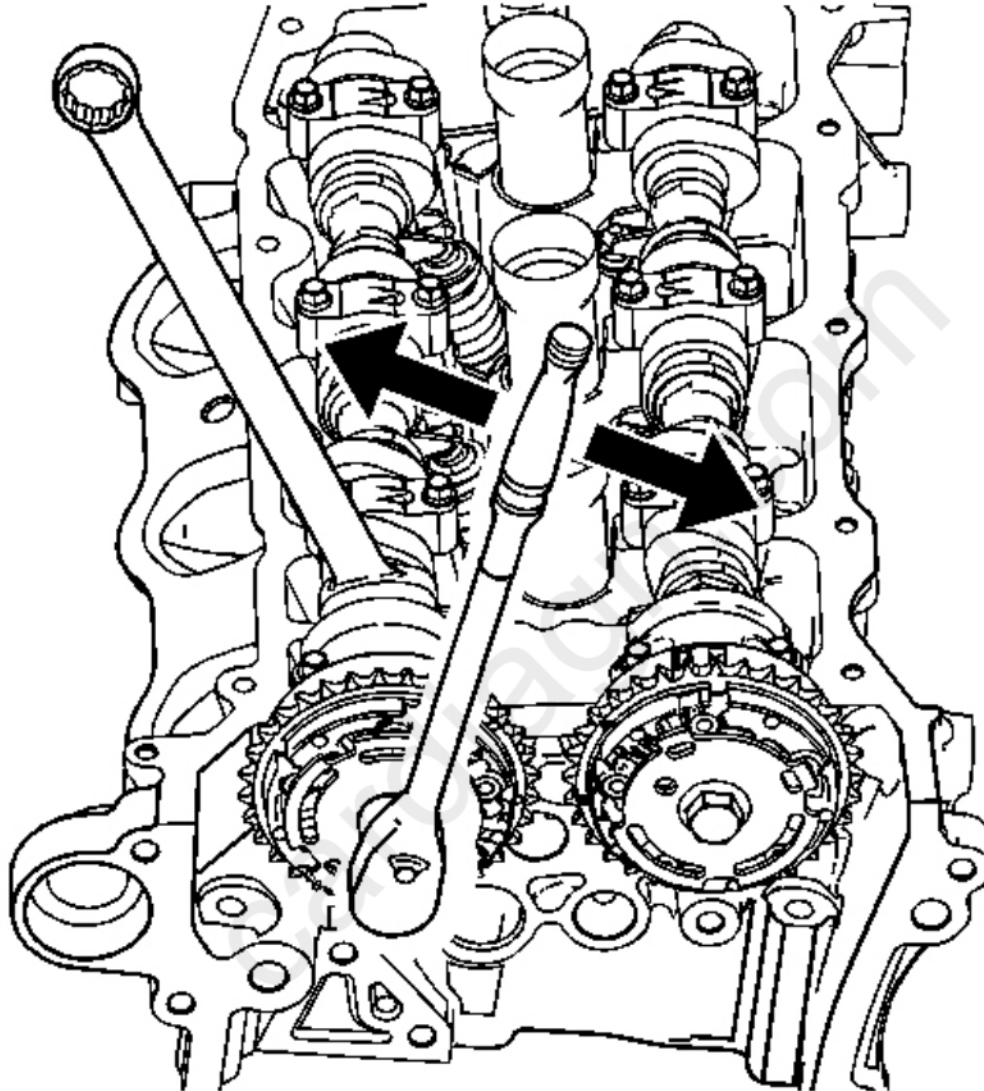


Fig. : View of Camshaft/Engine Rotation Prevention Using Open-End Wrench
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Torque Reaction Against Timing Drive Chain Caution .

NOTE:

- Use an open-end wrench at the camshaft hex to prevent camshaft/engine rotation.

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9. Loosen the camshaft position actuator bolt.

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10. Install the **EN-46313** tool in order to retain the timing chain.

Firmly tighten the **EN-46313** tool nuts.

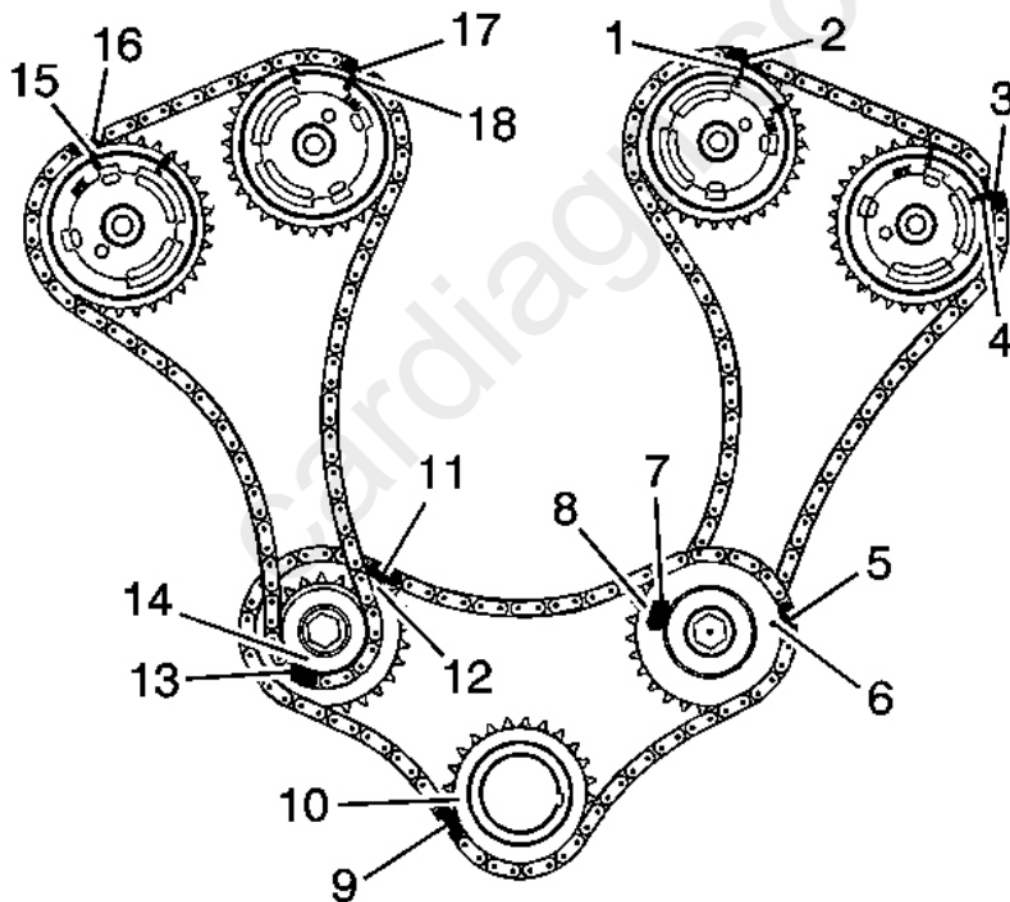


Fig. 8: Identifying Timing Chain Marks & Their Respective Locations On Gears, Sprockets & Actuators

Courtesy of GENERAL MOTORS CORP.

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11. Mark the timing chain and the respective locations on camshaft position actuators (15-18).
12. Remove the camshaft position actuator bolt.
13. Remove the camshaft bearing caps and the camshaft. Refer to Camshaft Removal - Right Side.

INSTALLATION PROCEDURE

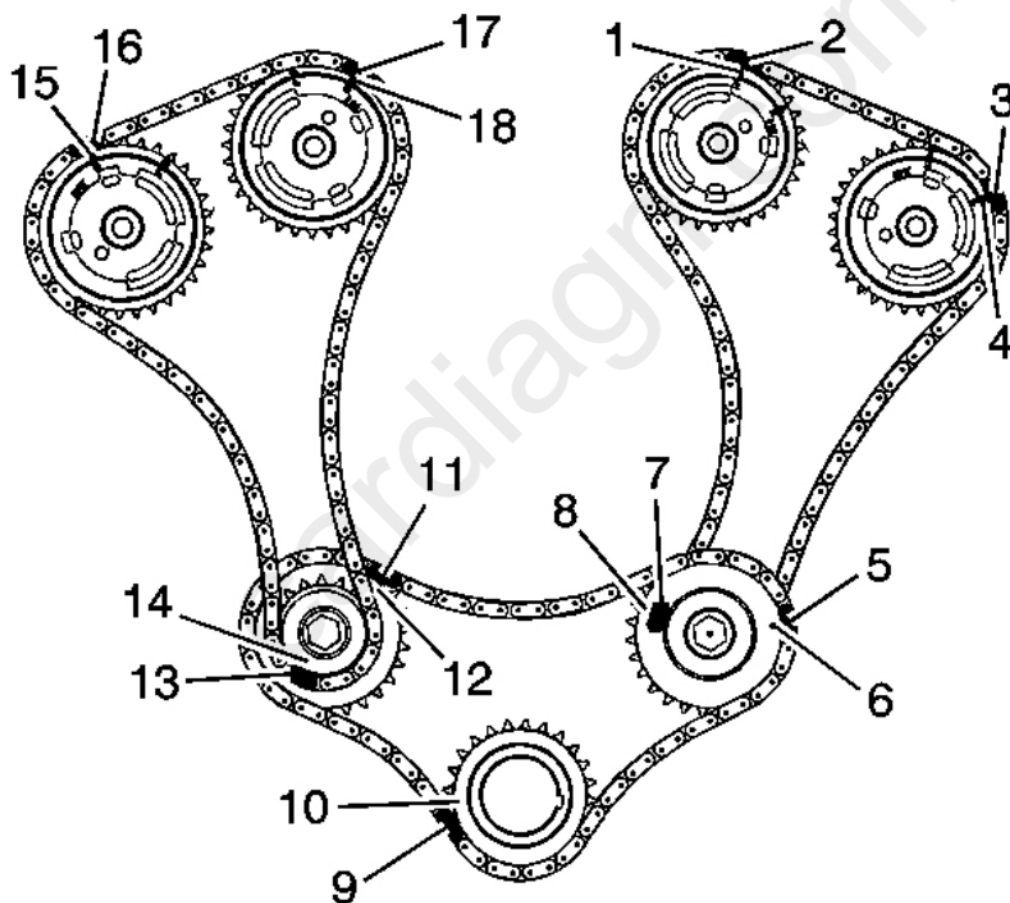


Fig. 9: Identifying Timing Chain Marks & Their Respective Locations On Gears, Sprockets & Actuators

Courtesy of GENERAL MOTORS CORP.

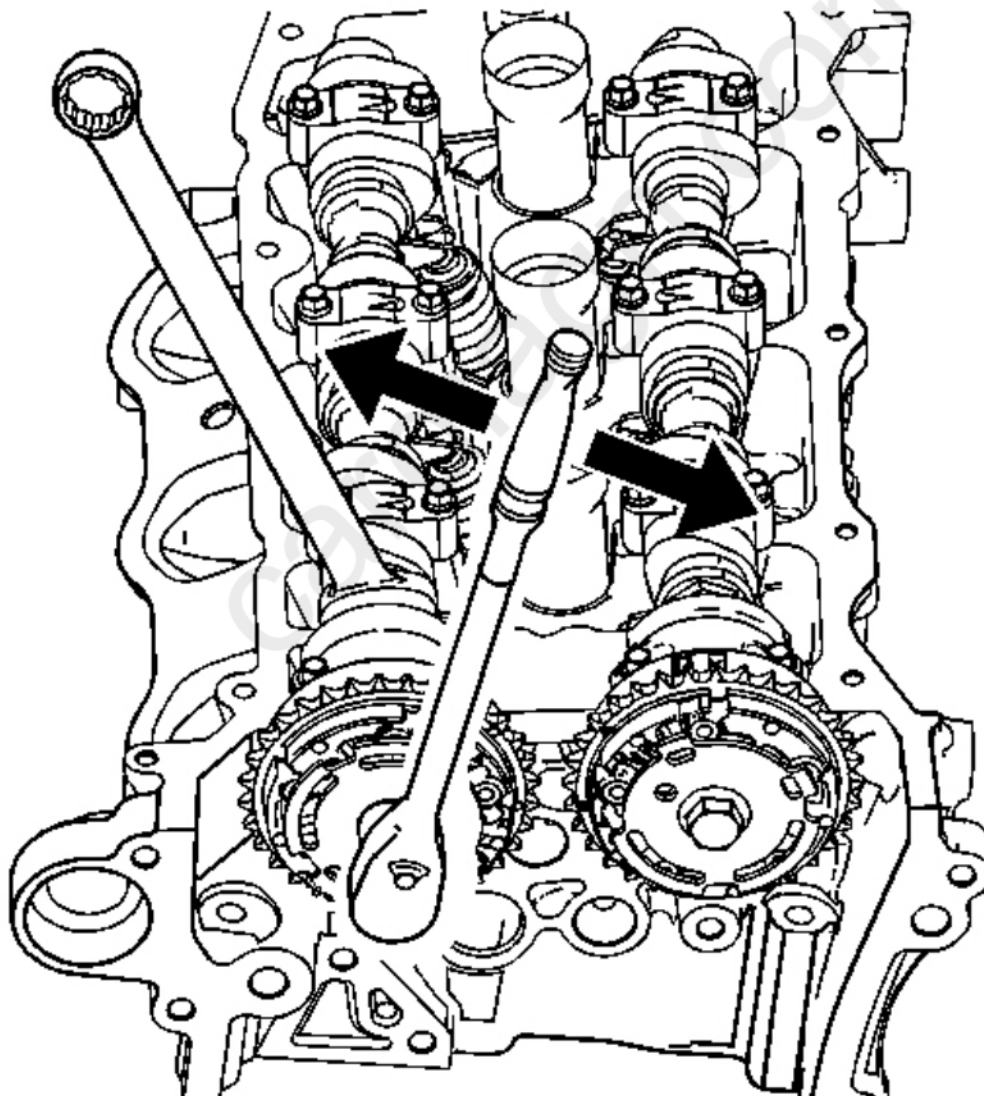
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• DO NOT i ca a i i ac a l a i i

1. Locate the camshafts to the cylinder head and assemble the camshaft actuators to the camshafts.
2. Install the camshafts and the camshaft bearing caps. Refer to Camshaft Installation - Right Side.
3. Remove the **EN-46313** tool.
4. Install the crankshaft balancer. Refer to Crankshaft Balancer Replacement.



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Fig. 10: View of Camshaft/Engine Rotation Prevention Using Open-End Wrench
Courtesy of GENERAL MOTORS CORP.

CAUTION: Do not rotate the engine or the camshaft(s) while the camshaft position actuator solenoid is being replaced.

NOTE: Do not use an open-end wrench to turn the camshaft position actuator solenoid.

5. If equipped with LF1 engine Install the camshaft position actuator. Refer to Camshaft Position Actuator Replacement - Bank 1 (LF1).
6. If equipped with LAU engine Install the camshaft position actuator. Refer to Camshaft Position Actuator Replacement - Bank 1 (Right Side) Intake (LAU).
7. Install the intake camshaft position actuator solenoid. Refer to Camshaft Position Actuator Solenoid Valve Solenoid Replacement - Bank 1 (Right Side) Intake.
8. Install the camshaft sensors. Refer to Camshaft Position Sensor Replacement - Bank 1 (Right Side) Exhaust and Camshaft Position Sensor Replacement - Bank 1 (Right Side) Intake.
9. Install the camshaft cover. Refer to Camshaft Cover Replacement - Right Side (LF1) or Camshaft Cover Replacement - Right Side (LAU).
10. Install the intake manifold. Refer to Intake Manifold Replacement.

VALVE ROCKER ARM REPLACEMENT - LEFT SIDE

REMOVAL PROCEDURE

1. Remove the applicable camshaft(s). Refer to Camshaft Replacement - Left Side.

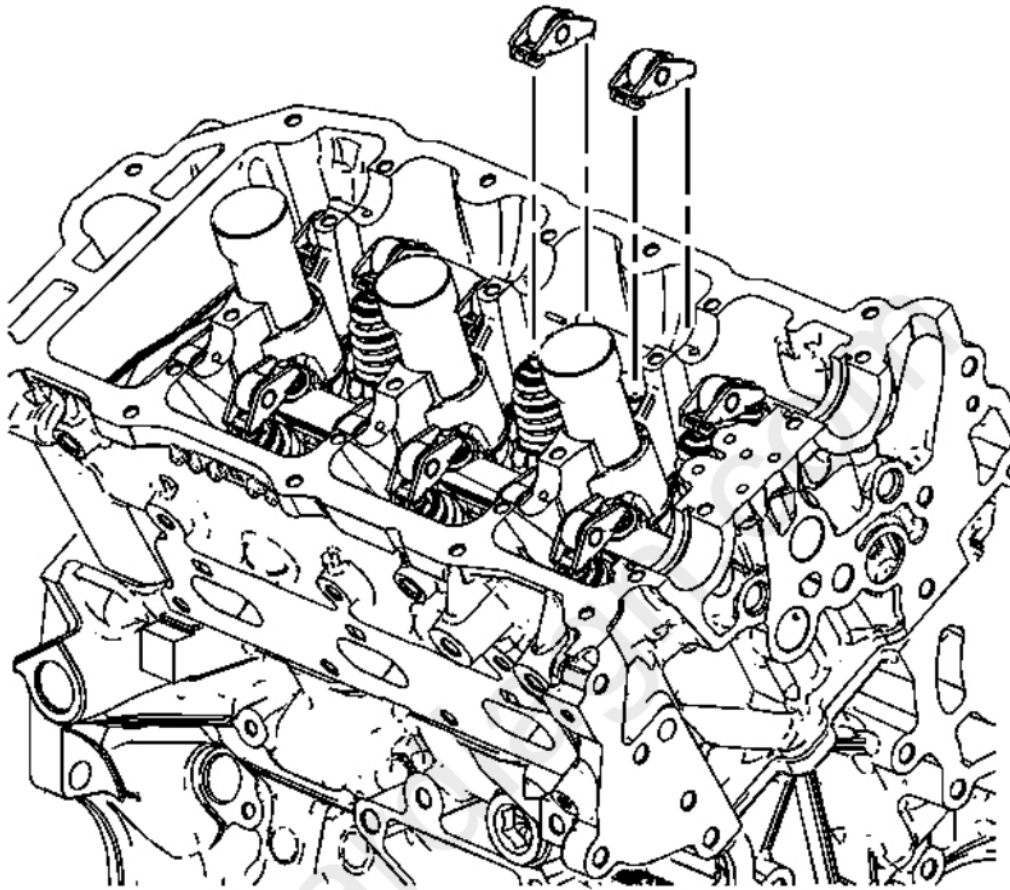


Fig. 11: Identifying Valve Rocker Arms
Courtesy of GENERAL MOTORS CORP.

2. Remove the rocker arms.
3. Clean and inspect the camshaft(s) and the rocker arm(s). Repair or replace as necessary. Refer to **Camshaft Cleaning and Inspection** and **Valve Lifter Cleaning and Inspection** .

INSTALLATION PROCEDURE

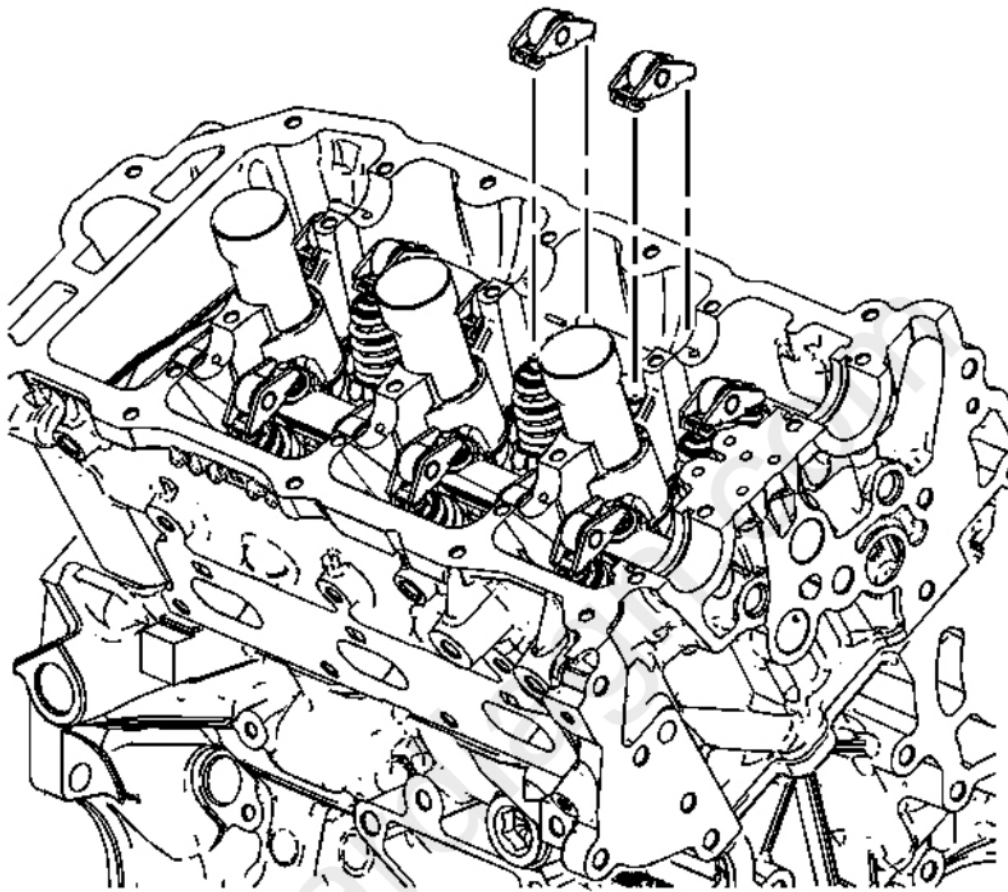


Fig. 12: Identifying Valve Rocker Arms
Courtesy of GENERAL MOTORS CORP.

1. Install the rocker arms.
2. Install the camshaft(s). Refer to Camshaft Replacement - Left Side.

VALVE ROCKER ARM REPLACEMENT - RIGHT SIDE

REMOVAL PROCEDURE

1. Remove the applicable camshaft(s). Refer to Camshaft Replacement - Right Side.

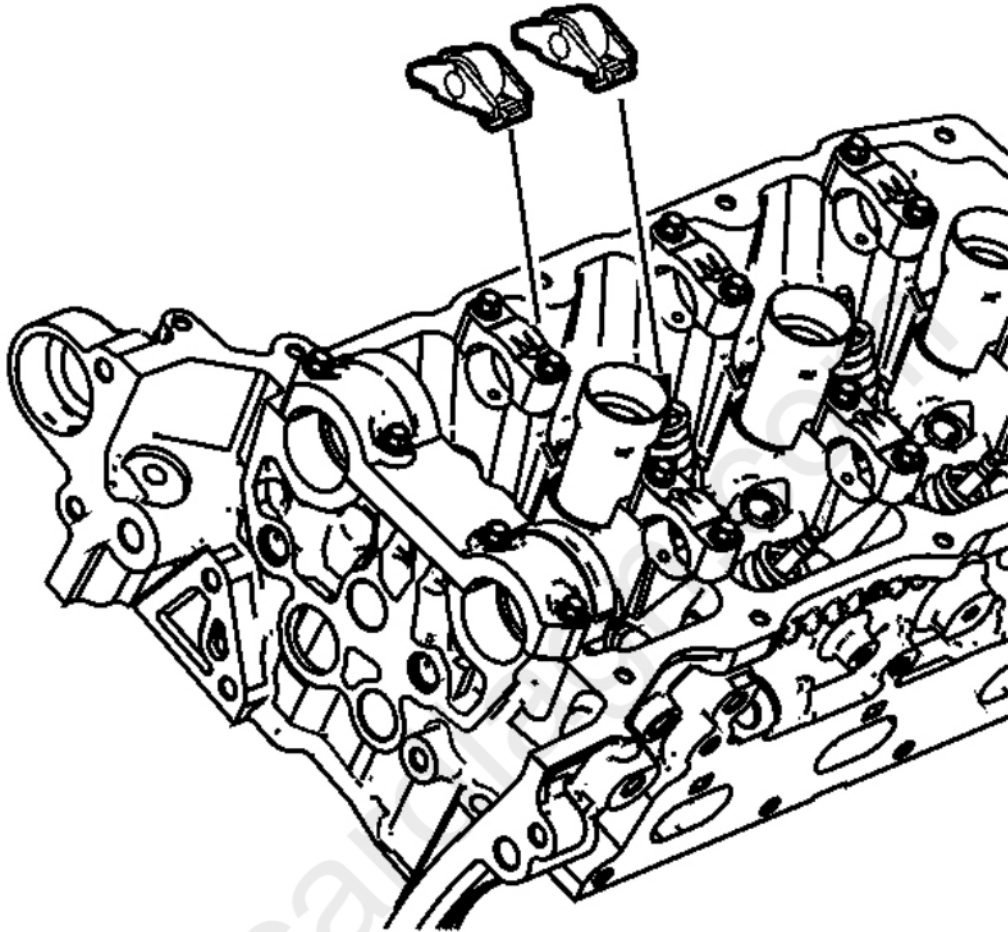


Fig. 13: View Of Valve Rocker Arm
Courtesy of GENERAL MOTORS CORP.

2. Remove the rocker arms.
3. Clean and inspect the camshaft(s) and the rocker arm(s). Repair or replace as necessary. Refer to **Camshaft Cleaning and Inspection** and **Valve Lifter Cleaning and Inspection** .
4. Clean and inspect the valve rocker arm. Refer to **Valve Rocker Arm Cleaning and Inspection**

INSTALLATION PROCEDURE

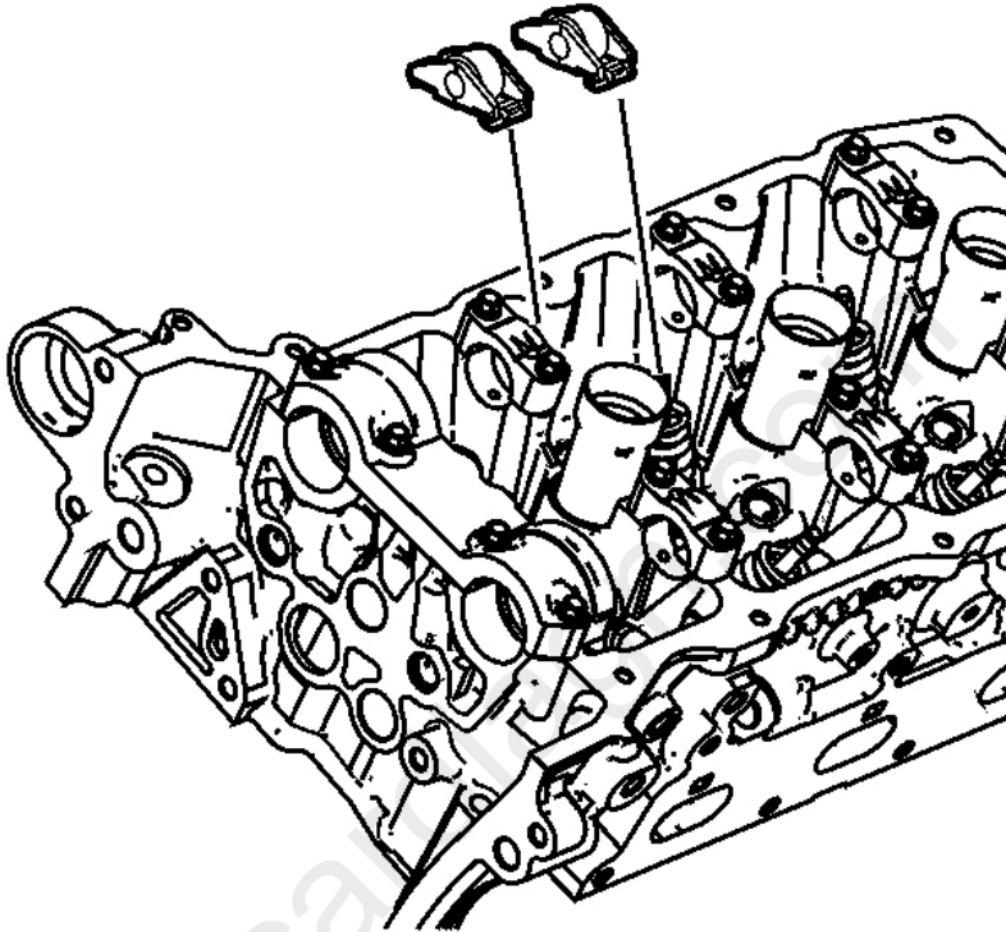


Fig. 14: View Of Valve Rocker Arm
Courtesy of GENERAL MOTORS CORP.

1. Install the rocker arms.
2. Install the camshaft(s). Refer to Camshaft Replacement - Right Side.

VALVE LIFTER REPLACEMENT - LEFT SIDE

REMOVAL PROCEDURE

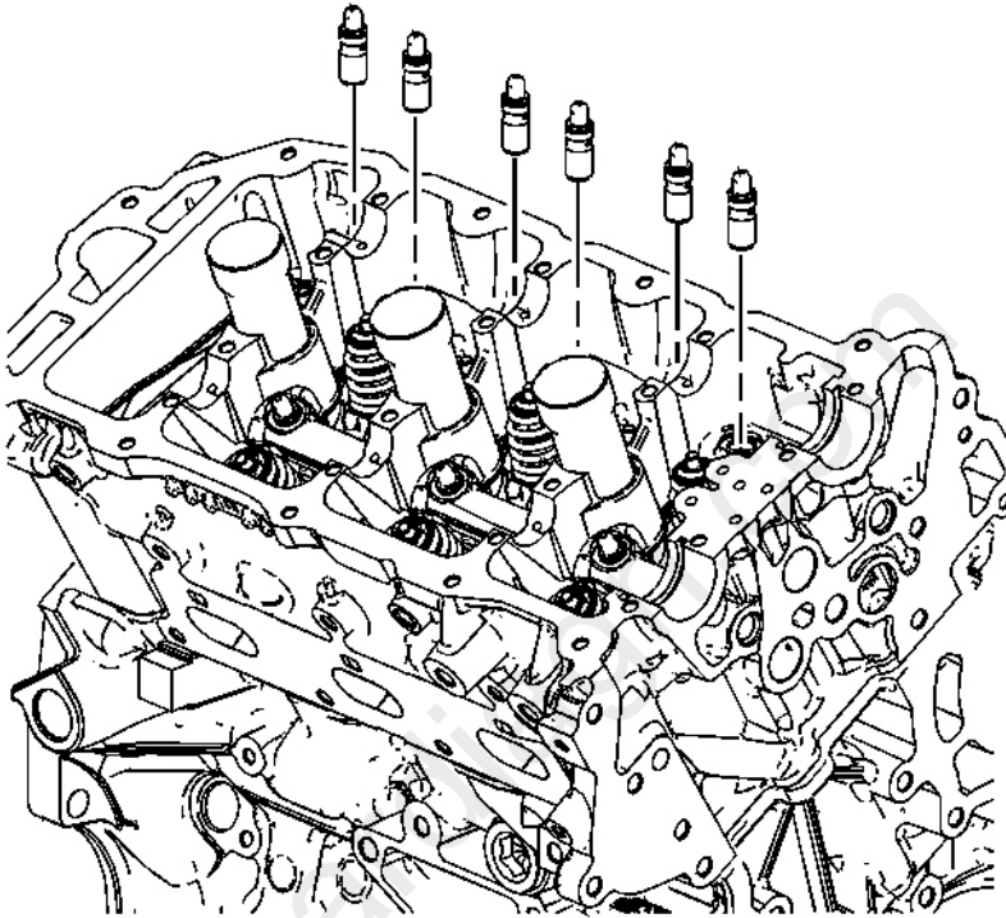


Fig. 1 : Identifying Stationary Hydraulic Lash Adjuster (SHLA)
Courtesy of GENERAL MOTORS CORP.

1. Remove the applicable camshafts. Refer to **Camshaft Replacement - Left Side**.
2. Remove the rocker arms. Refer to **Valve Rocker Arm Replacement - Left Side**.
3. Remove the lifters. Refer to **Valve Lifter Removal - Left Side**.
4. Clean and inspect the camshafts, rocker arms and lifters. Repair or replace as necessary. Refer to **Camshaft Cleaning and Inspection** and **Valve Lifter Cleaning and Inspection**.
5. Clean and inspect the rocker arm. Refer to **Valve Rocker Arm Cleaning and Inspection**.

INSTALLATION PROCEDURE

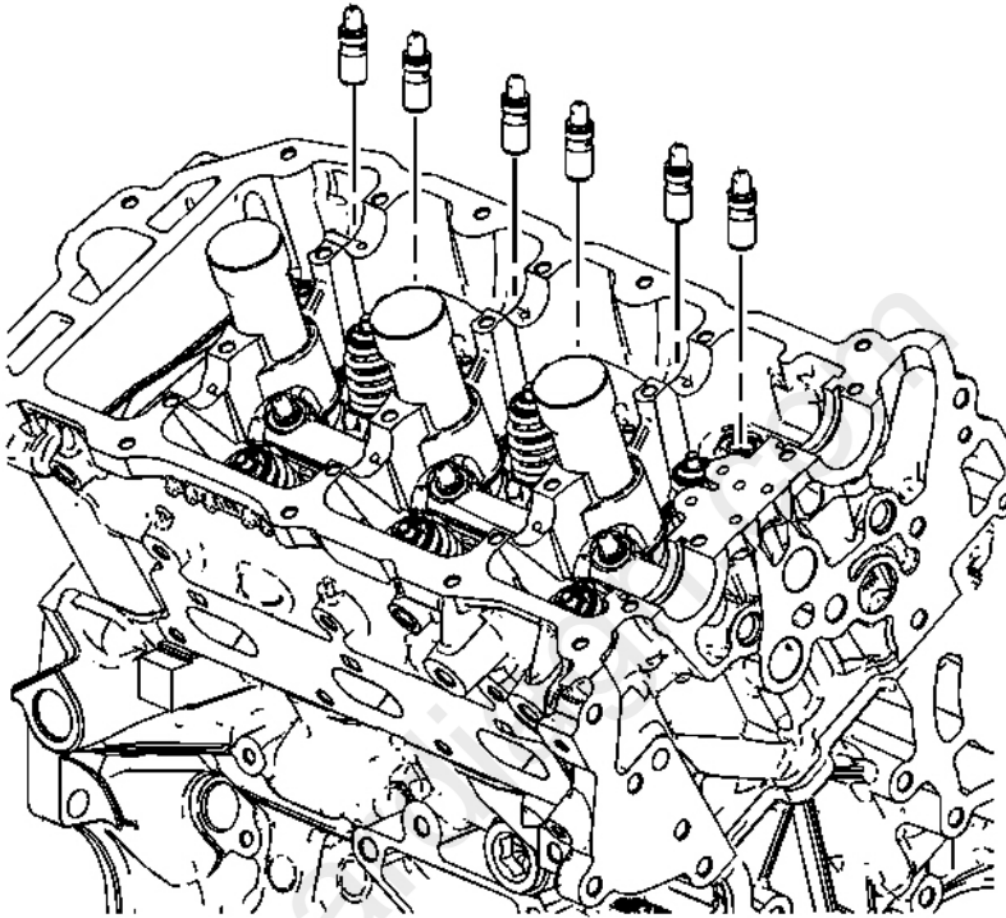


Fig. 16: Identifying Stationary Hydraulic Lash Adjuster (SHLA)
Courtesy of GENERAL MOTORS CORP.

1. Install the lifters.
2. Install the rocker arms. Refer to Valve Rocker Arm Replacement - Left Side.
3. Install the camshafts. Refer to Camshaft Replacement - Left Side.

VALVE LIFTER REPLACEMENT - RIGHT SIDE

REMOVAL PROCEDURE

1. Remove the applicable camshaft(s). Refer to Camshaft Replacement - Right Side.
2. Remove the rocker arms. Refer to Valve Rocker Arm Removal - Right Side.

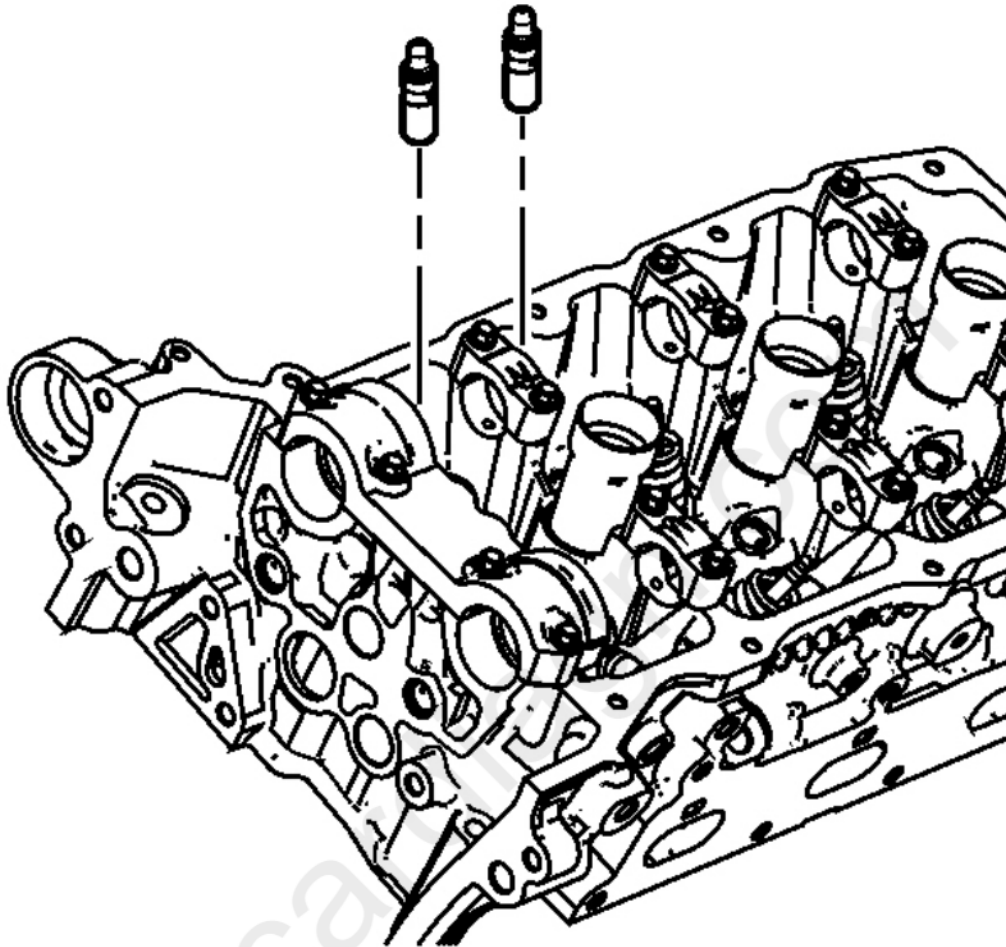


Fig. 17: View Of SHLAs

Courtesy of GENERAL MOTORS CORP.

3. Remove the lifters. Refer to **Valve Lifter Removal - Right Side** .
4. Clean and inspect the camshaft(s) and the rocker arm(s) and lifter. Repair or replace as necessary. Refer to **Camshaft Cleaning and Inspection** **Valve Lifter Cleaning and Inspection** and **Valve Rocker Arm Cleaning and Inspection** .

INSTALLATION PROCEDURE

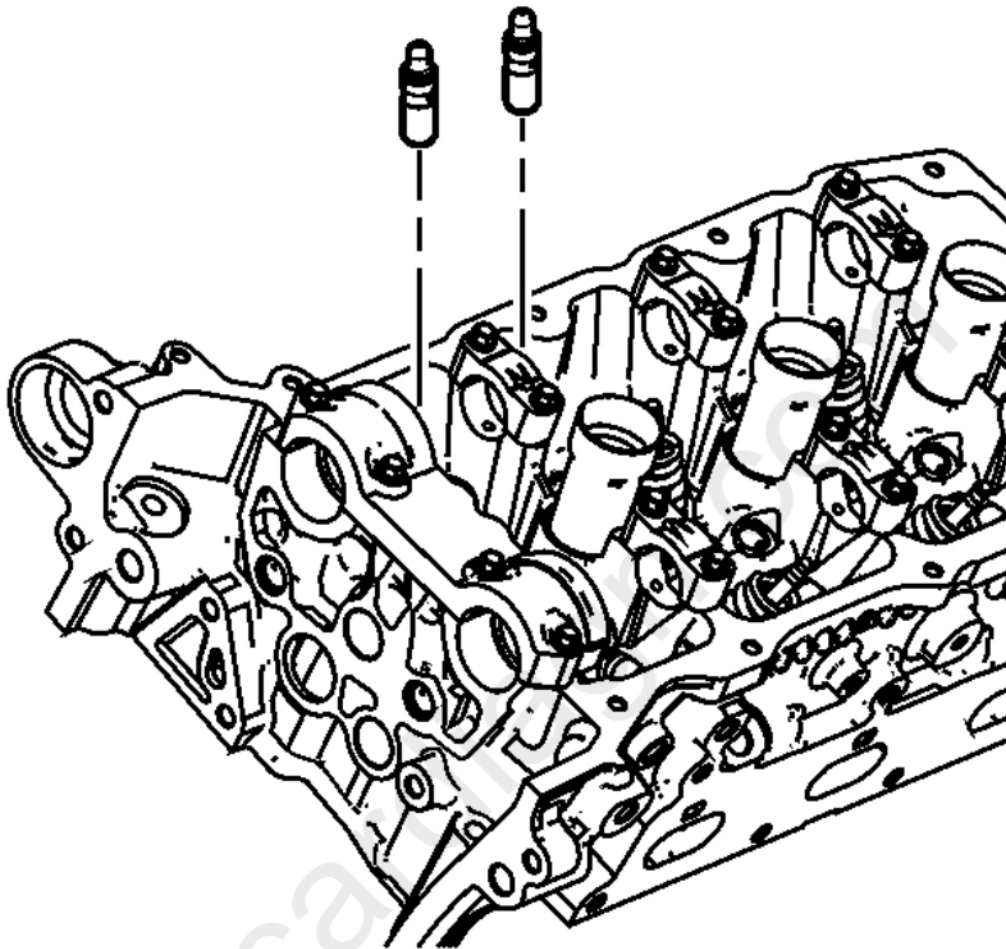


Fig. 18: View Of SHLAs

Courtesy of GENERAL MOTORS CORP.

1. Install the lifters. Refer to **Valve Lifter Installation - Right Side** .
2. Install the rocker arms. Refer to **Valve Rocker Arm Installation - Right Side** .
3. Install the applicable camshaft(s). Refer to **Camshaft Replacement - Right Side**.

AL E STEM OIL SEAL AND AL E SPRING REPLACEMENT - LEFT SIDE

SPECIAL TOOLS

- **EN-39313:** park lug ort dapter
- **EN-46106:** 1 wheel olding Tool

- **EN-46110:** n ehicle alve pring ompressor
- **EN-46116:** alve tem eal Remover/Installer

or e uivalent regional tools refer to **Special Tools** .

REMOVAL PROCEDURE

1. Remove the rocker arms. Refer to **Valve Rocker Arm Replacement - Left Side**.
2. Remove the starter motor. Refer to **Starter Replacement (LF1)** or **Starter Replacement (LAU)** .

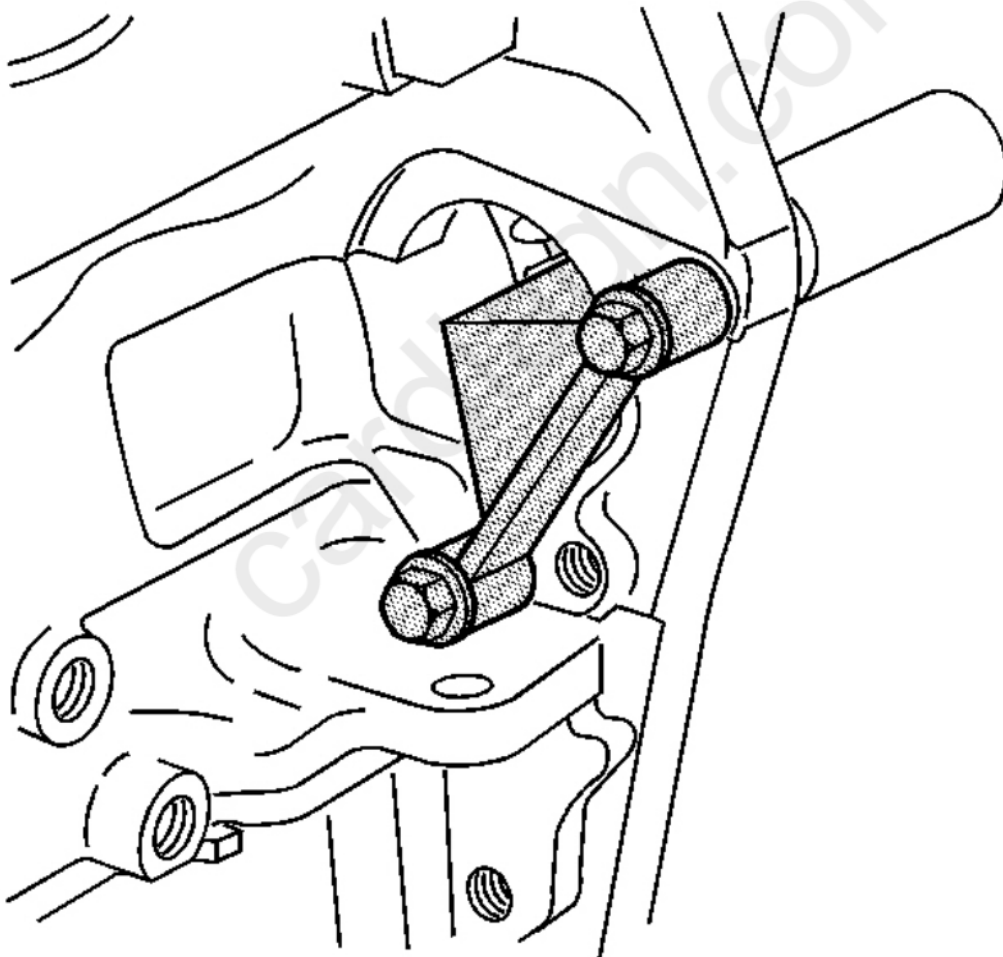


Fig. 19: Identifying Special Tool - EN 46106
Courtesy of GENERAL MOTORS CORP.

NOTE: If the EN-410 : tool is not installed the crankshaft may rotate. If the crankshaft rotates disassembly and reassembly of the entire camshaft timing system may be required.

3. Install the **EN-46106:** tool in order to prevent crankshaft rotation.
4. Remove the spark plug from the applicable cylinder. Refer to **Spark Plug Replacement**.
5. Install the **EN-39313:** adapter to the applicable cylinder.
6. Connect the **EN-39313:** adapter to a compressed air source.

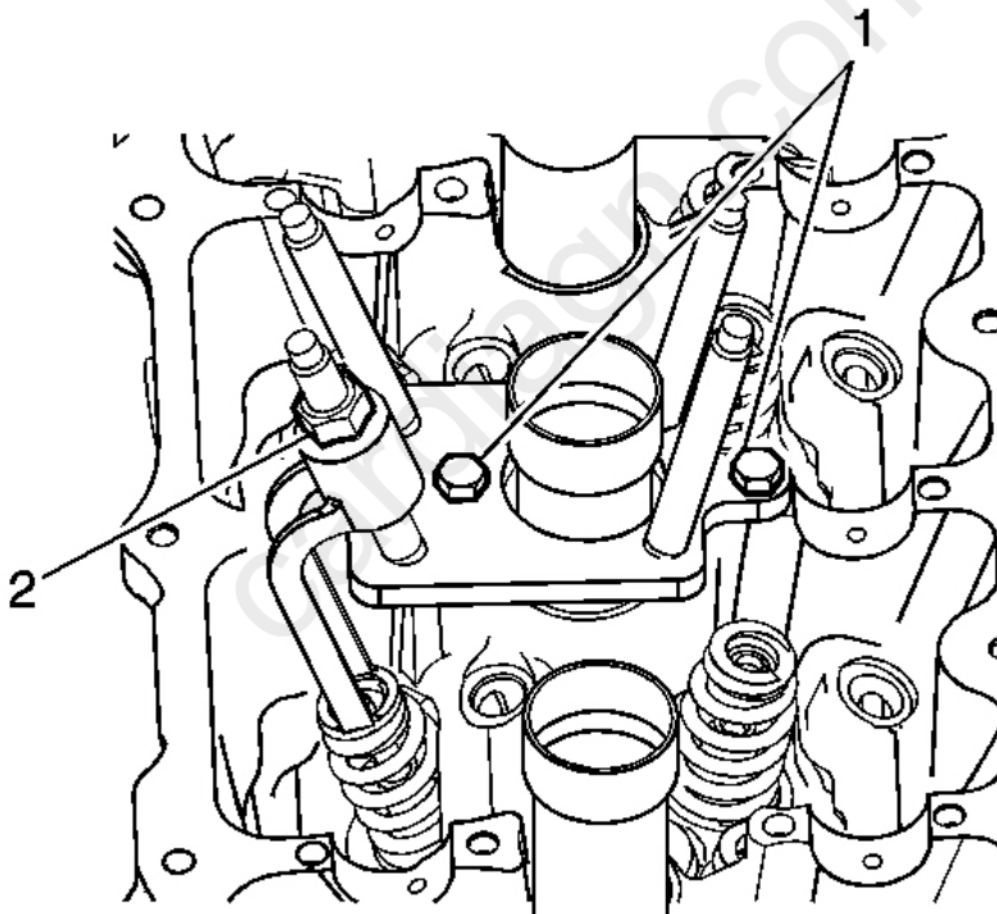


Fig. 20: View Of Installed Valve Spring Compressor Tool
Courtesy of GENERAL MOTORS CORP.

7. Install the **EN-46110:** compressor above the applicable cylinder as shown.

8. Tighten the **EN-46110:** compressor nut (2).

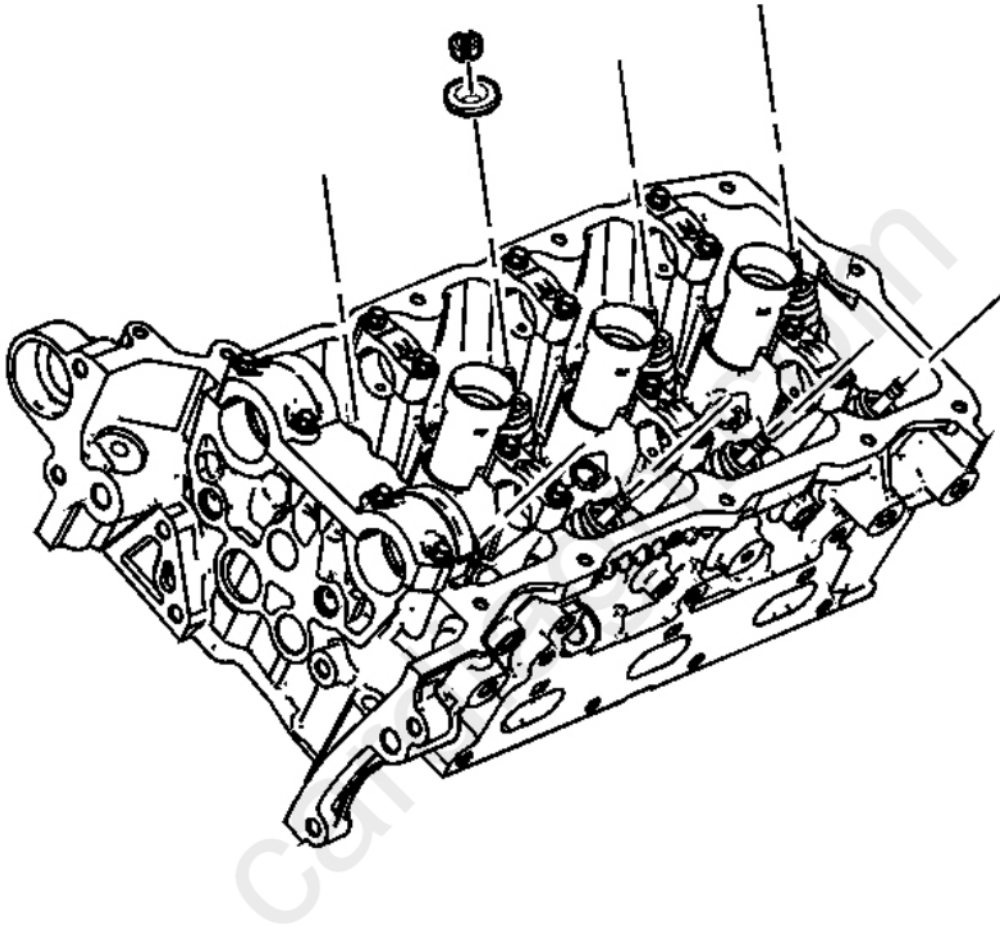


Fig. 21: View Of Valve Spring Keepers
Courtesy of GENERAL MOTORS CORP.

9. Remove the valve keepers.
10. Loosen the **EN-46110:** compressor nut.
11. Remove the valve spring retainer.

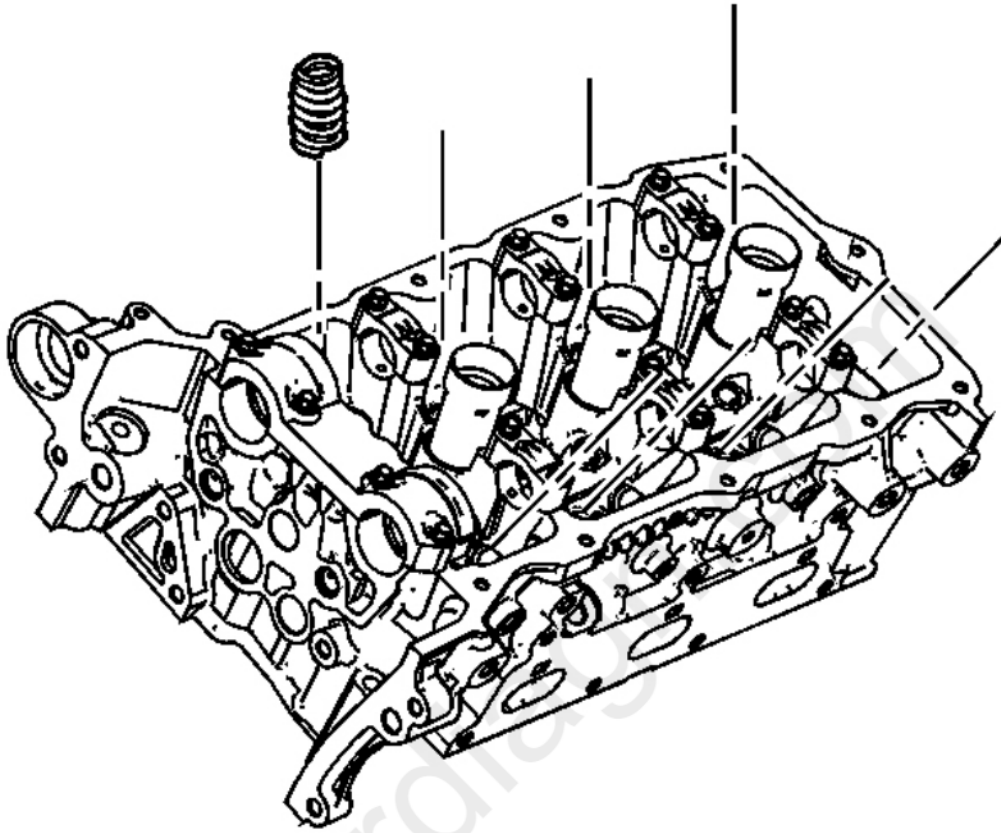


Fig. : View Of Valve Spring
Courtesy of GENERAL MOTORS CORP.

12. Remove the valve spring.

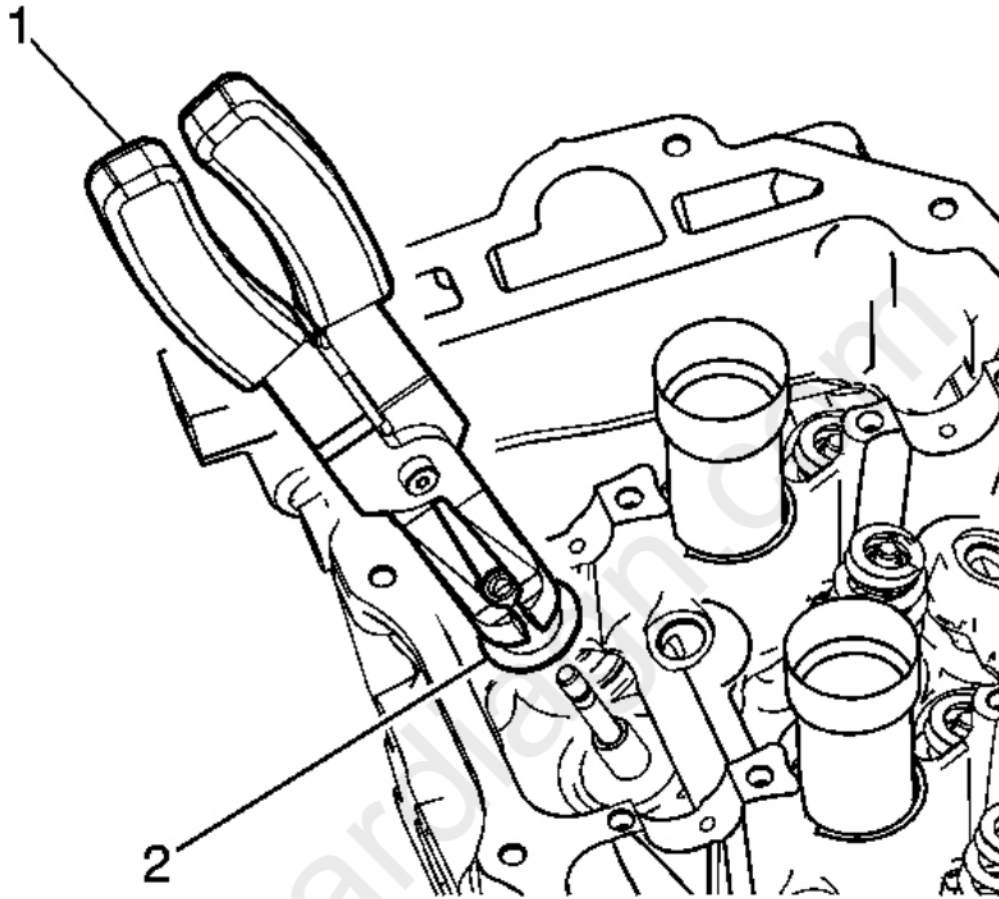


Fig. 3: Identifying Special Tool - EN-4 11 & Valve Stem Seal
Courtesy of GENERAL MOTORS CORP.

13. Use the **EN-4 11** : remover/installer (1) in order to remove the valve stem seal (2).

INSTALLATION PROCEDURE

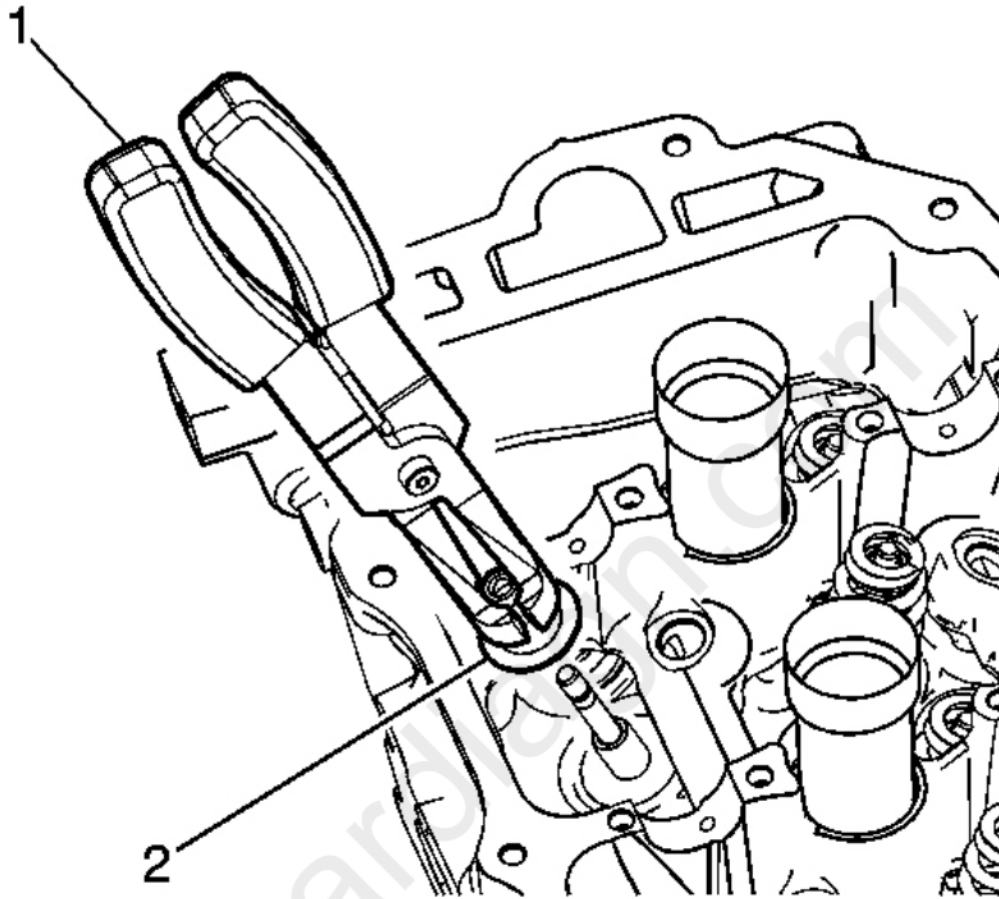


Fig. 4: Identifying Special Tool - EN-4 11 & Valve Stem Seal
Courtesy of GENERAL MOTORS CORP.

1. Use the **EN-4 11** : remover/installer (1) in order to install the valve stem seal (2).

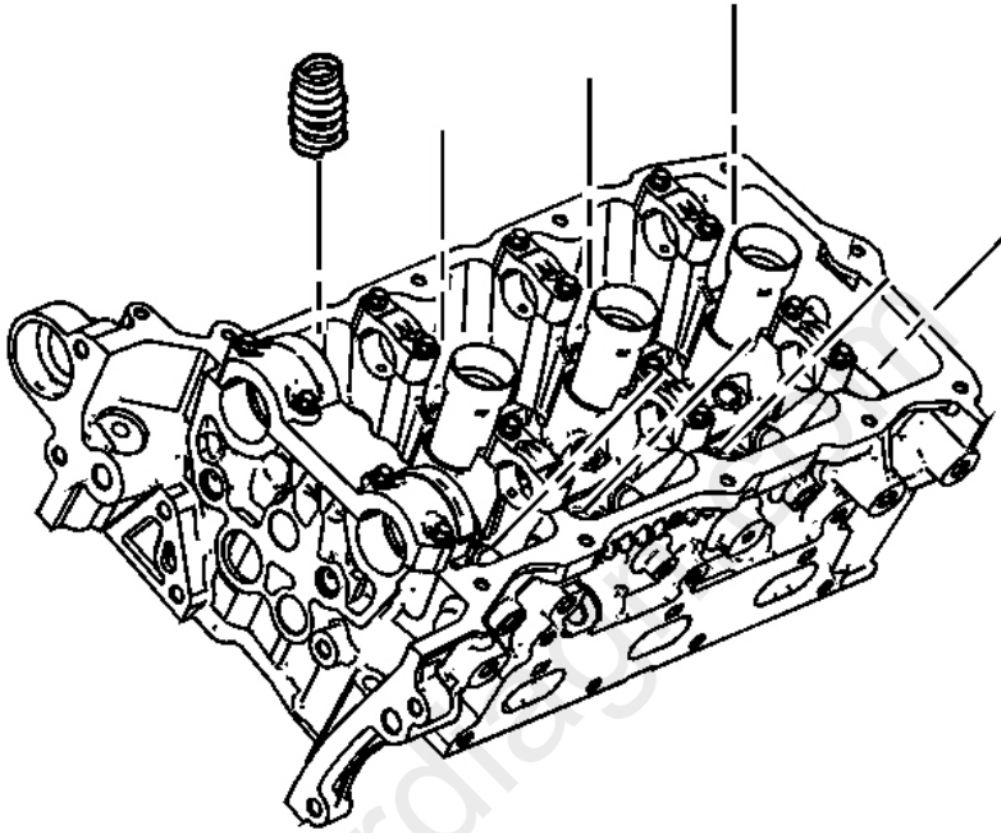


Fig. 5: View Of Valve Spring

Courtesy of GENERAL MOTORS CORP.

2. Install the valve spring.
3. Install the valve spring retainer.

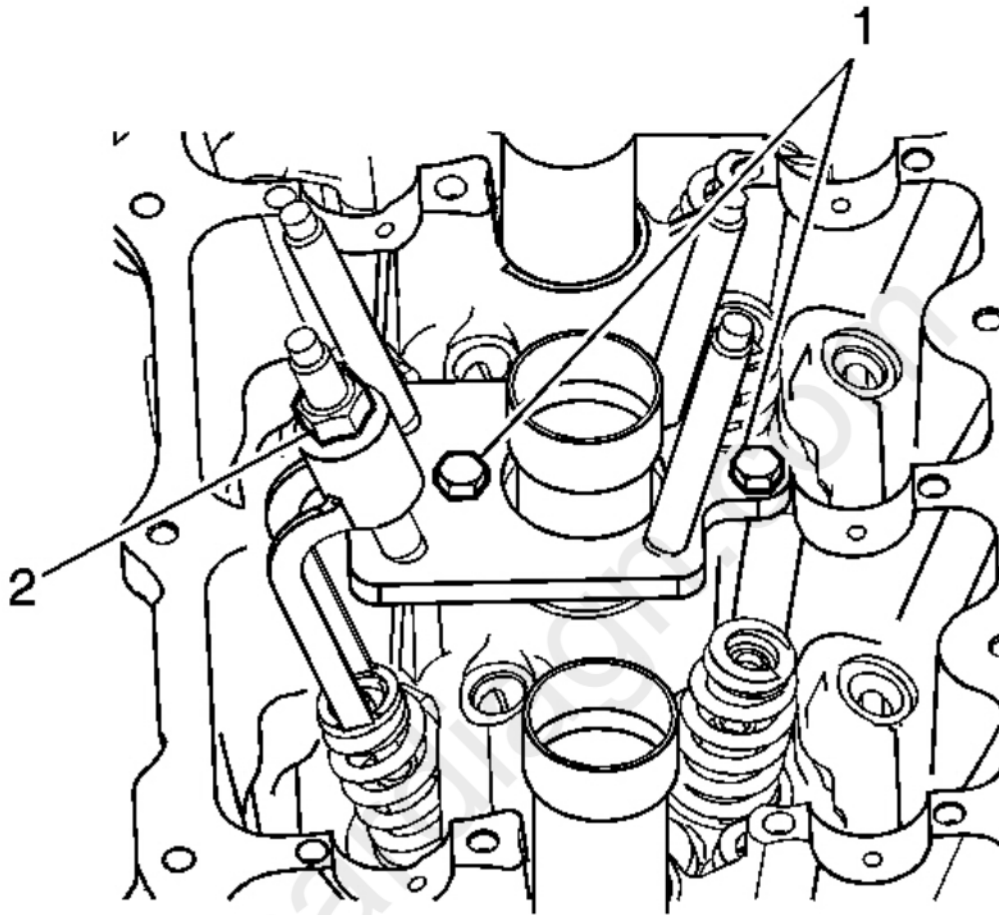


Fig. 1 : View Of Installed Valve Spring Compressor Tool
Courtesy of GENERAL MOTORS CORP.

4. Install the **EN-4 110:** compressor above the applicable valve spring as shown.

Tighten the **EN-4 110:** compressor nut (2).

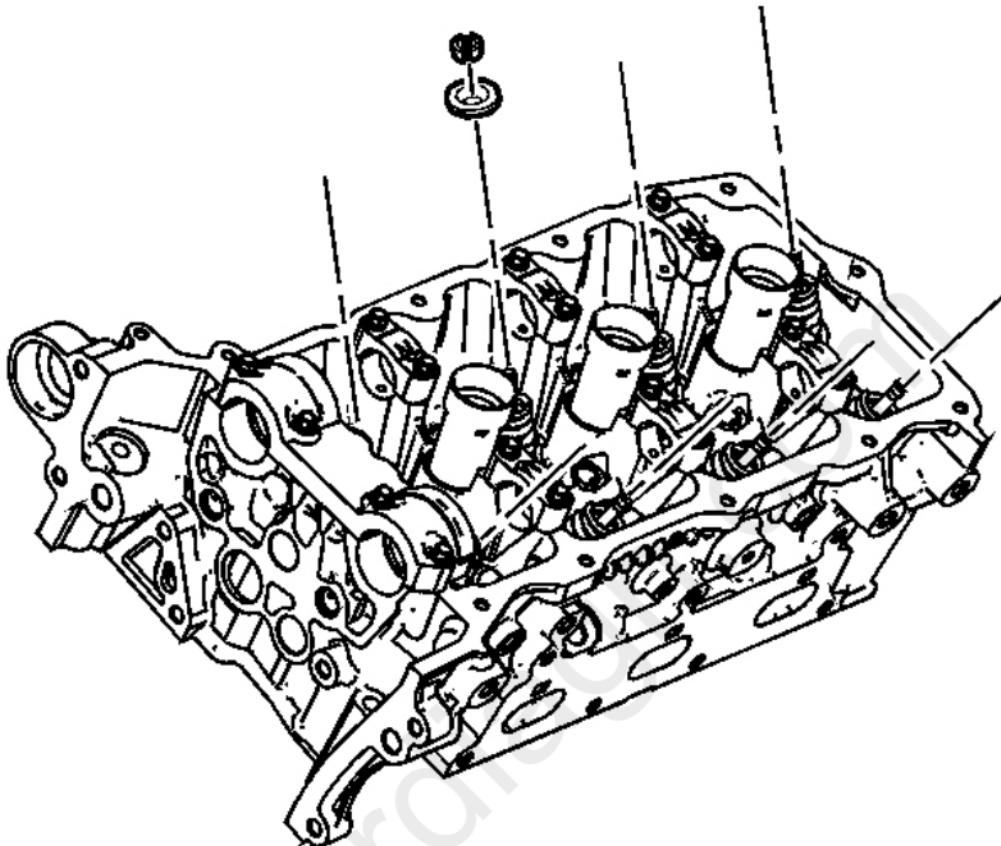


Fig. 27: View Of Valve Spring Keepers
Courtesy of GENERAL MOTORS CORP.

5. Install the valve spring keepers.
6. Remove the **EN-46110:** compressor.
7. Disconnect the **EN-39313:** adapter from the compressed air source.
8. Remove the **EN-39313:** adapter.
9. Install the spark plugs. Refer to **Spark Plug Replacement** .
10. Install the rocker arms. Refer to **Valve Rocker Arm Replacement - Left Side**.
11. Remove the **EN-46106:** tool in order to prevent crankshaft rotation.
12. Install the starter motor. Refer to **Starter Replacement (LF1)** or **Starter Replacement (LAU)** .

AL E STEM OIL SEAL AND AL E SPRING REPLACEMENT - RIGHT SIDE

SPECIAL TOOLS

- **EN-39313:** park lug port dapter
- **EN-46106:** 1 wheel olding Tool
- **EN-46110:** n ehicle alve pring ompressor
- **EN-46116:** alve tem eal Remover/Installer

or e uivalent regional tools refer to **Special Tools** .

REMOVAL PROCEDURE

1. Remove the rocker arms. Refer to **Valve Rocker Arm Replacement - Right Side**.
2. Remove the starter motor. Refer to **Starter Replacement (LF1)** or **Starter Replacement (LAU)** .

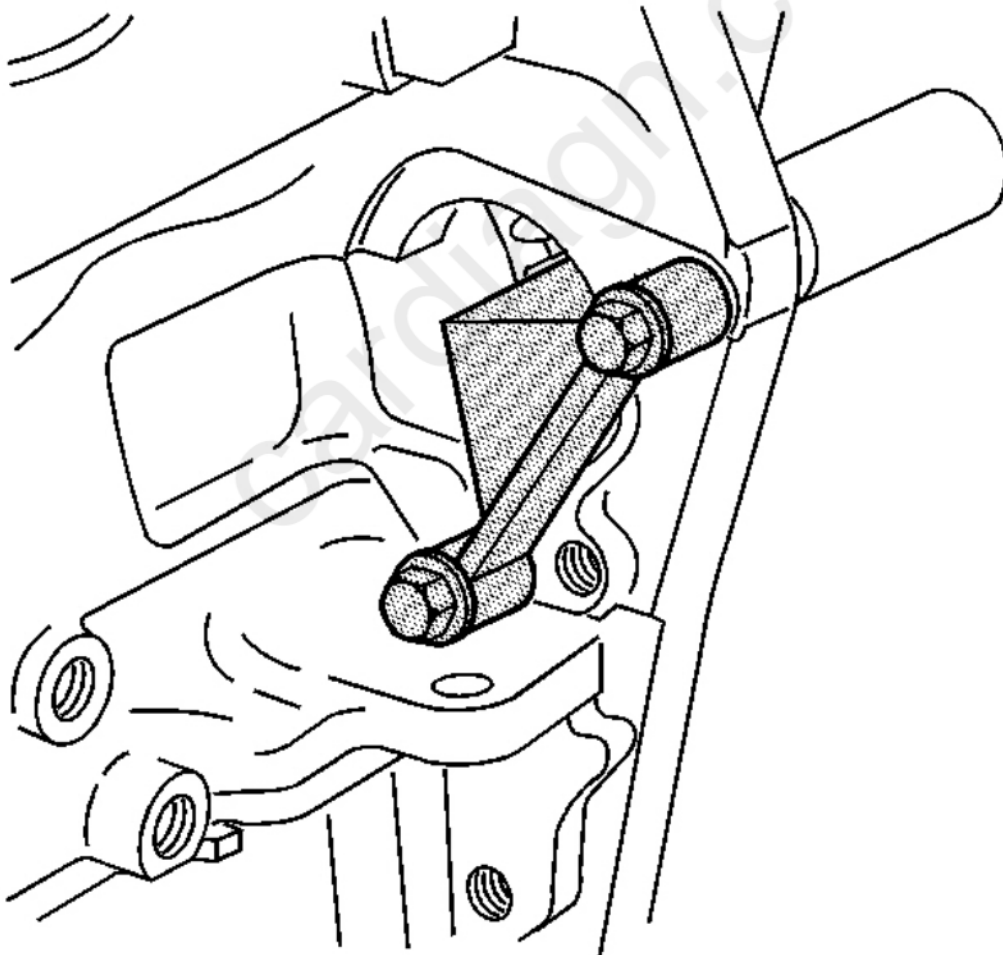


Fig. 28: Identifying Special Tool - EN 46106
Courtesy of GENERAL MOTORS CORP.

NOTE: If the EN-4 10 : tool is not installed the crankshaft ma rotate. If the crankshaft rotates disassembl and reassembl of the entire camshaft timing s stem ma be required.

3. Install the **EN-46106**: tool in order to prevent crankshaft rotation.
4. Remove the spark plug from the applicable c linder. Refer to **Spark Plug Replacement** .
5. Install the **EN-39313**: adapter to the applicable c linder.
6. onnect the **EN-39313**: adapter to a compressed air source.

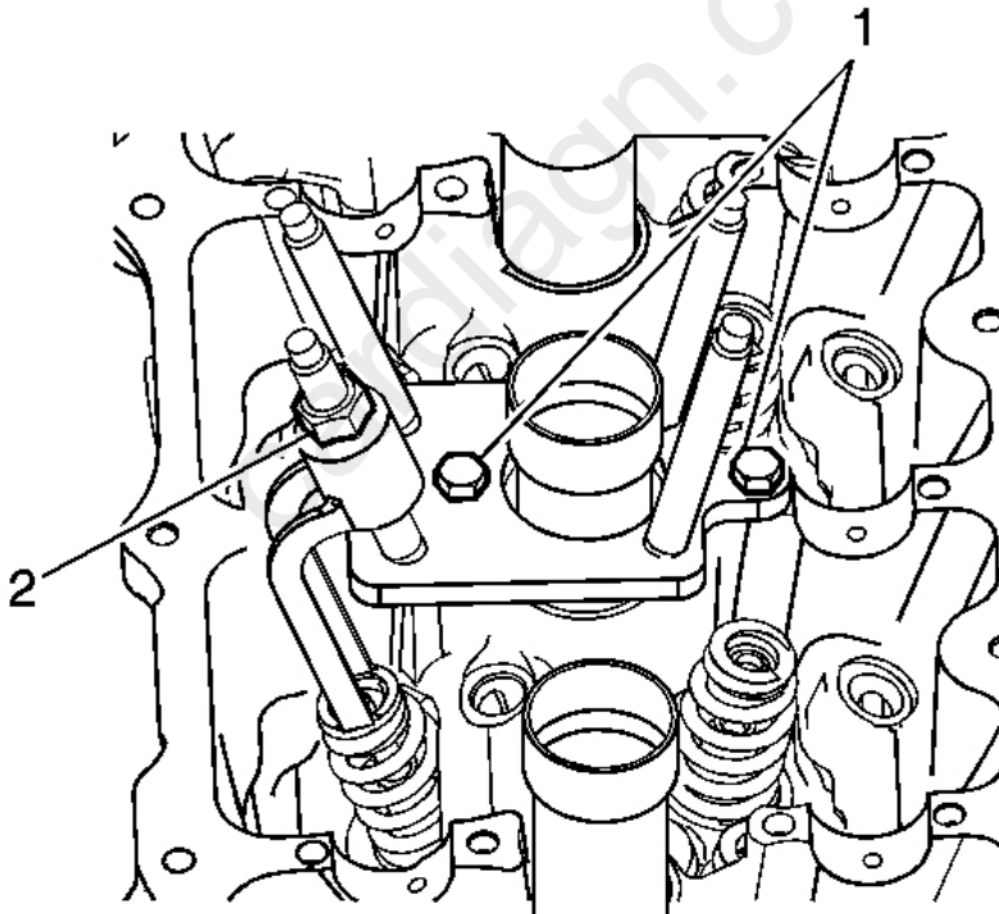


Fig. 29: View Of Installed Valve Spring Compressor Tool
Courtesy of GENERAL MOTORS CORP.

7. Install the **EN-46110:** compressor above the applicable cylinder as shown.
8. Tighten the **EN-46110:** compressor nut (2).

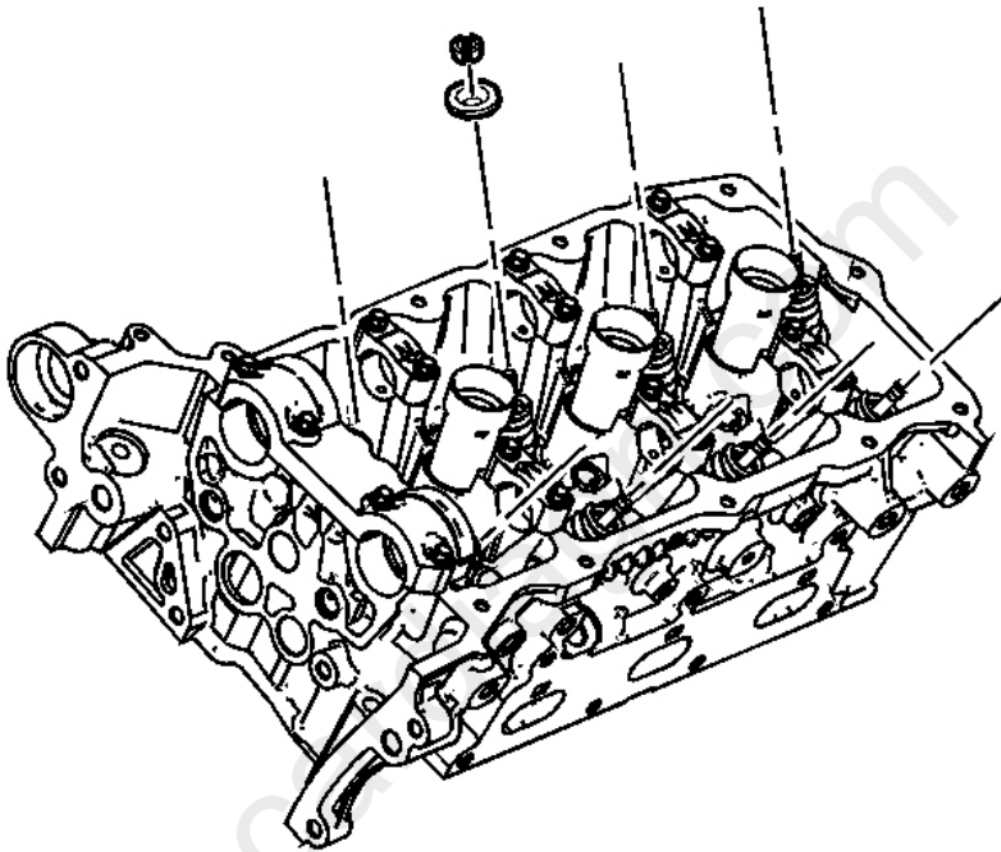


Fig. 30: View Of Valve Spring Keepers
Courtesy of GENERAL MOTORS CORP.

9. Remove the valve keepers.
10. Loosen the **EN-46110:** compressor nut.
11. Remove the valve spring retainer.

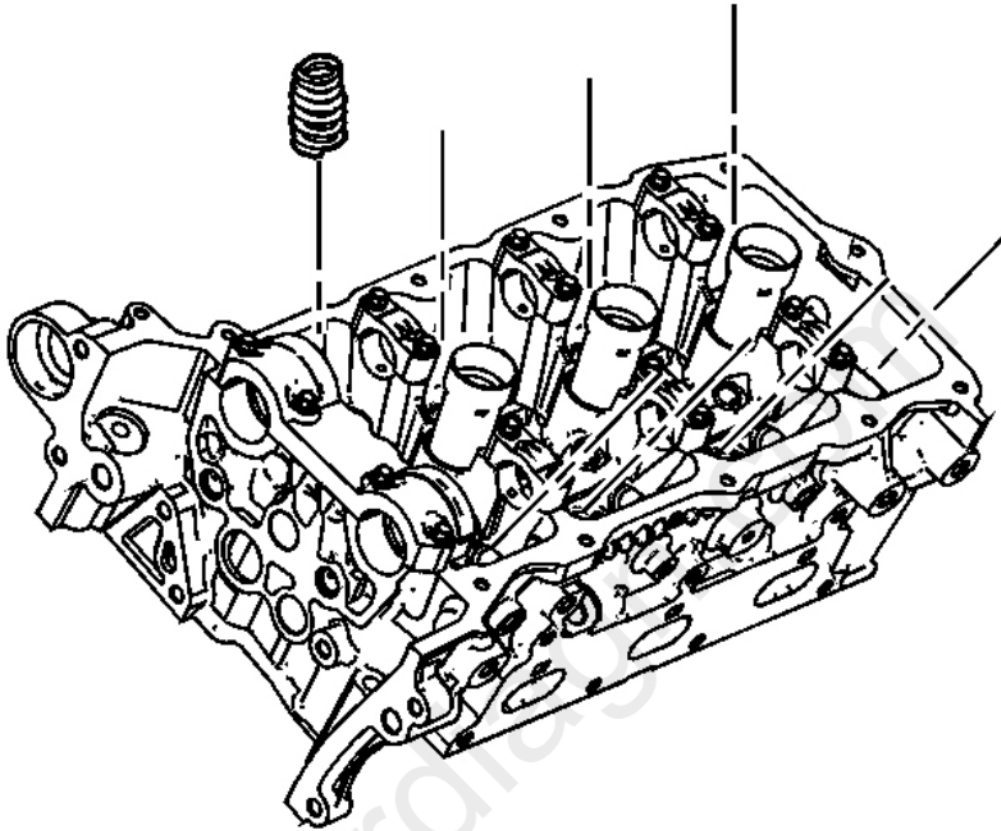


Fig. 31: View Of Valve Spring

Courtesy of GENERAL MOTORS CORP.

12. Remove the valve spring.

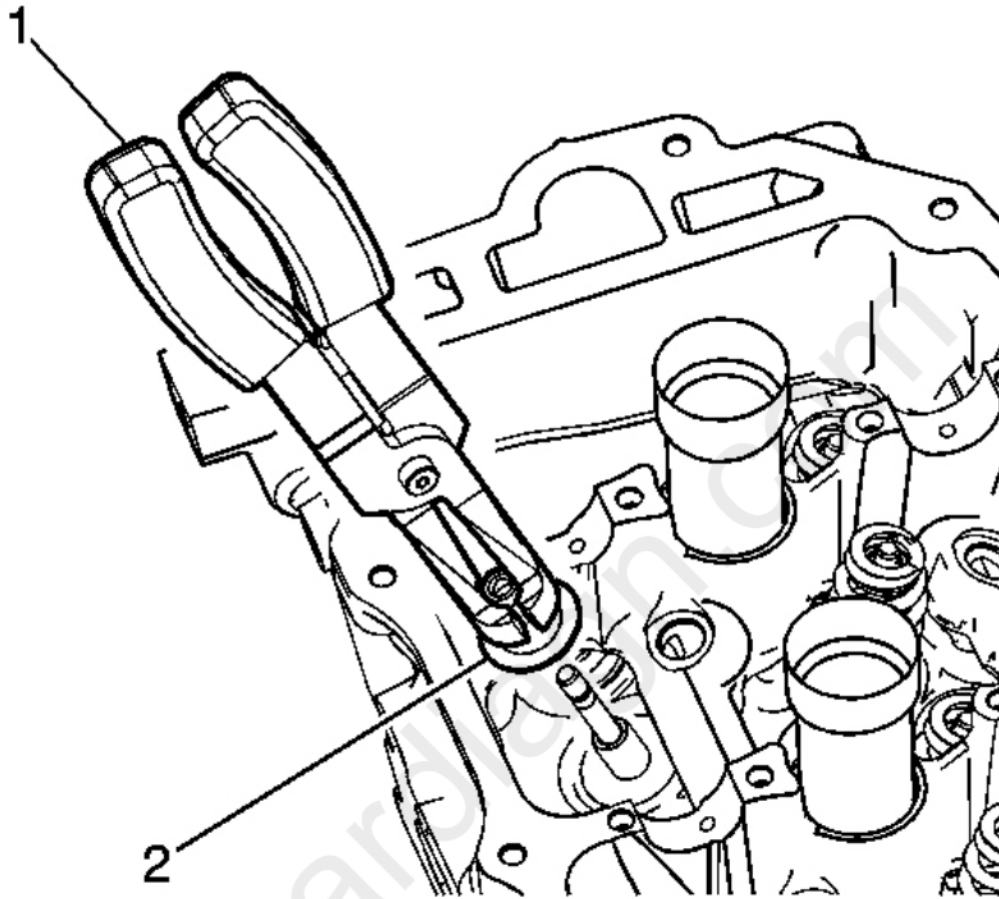


Fig. 3 : Identifying Special Tool - EN-4 11 & Valve Stem Seal
Courtesy of GENERAL MOTORS CORP.

13. Use the **EN-4 11** : remover/installer (1) in order to remove the valve stem seal (2).

INSTALLATION PROCEDURE

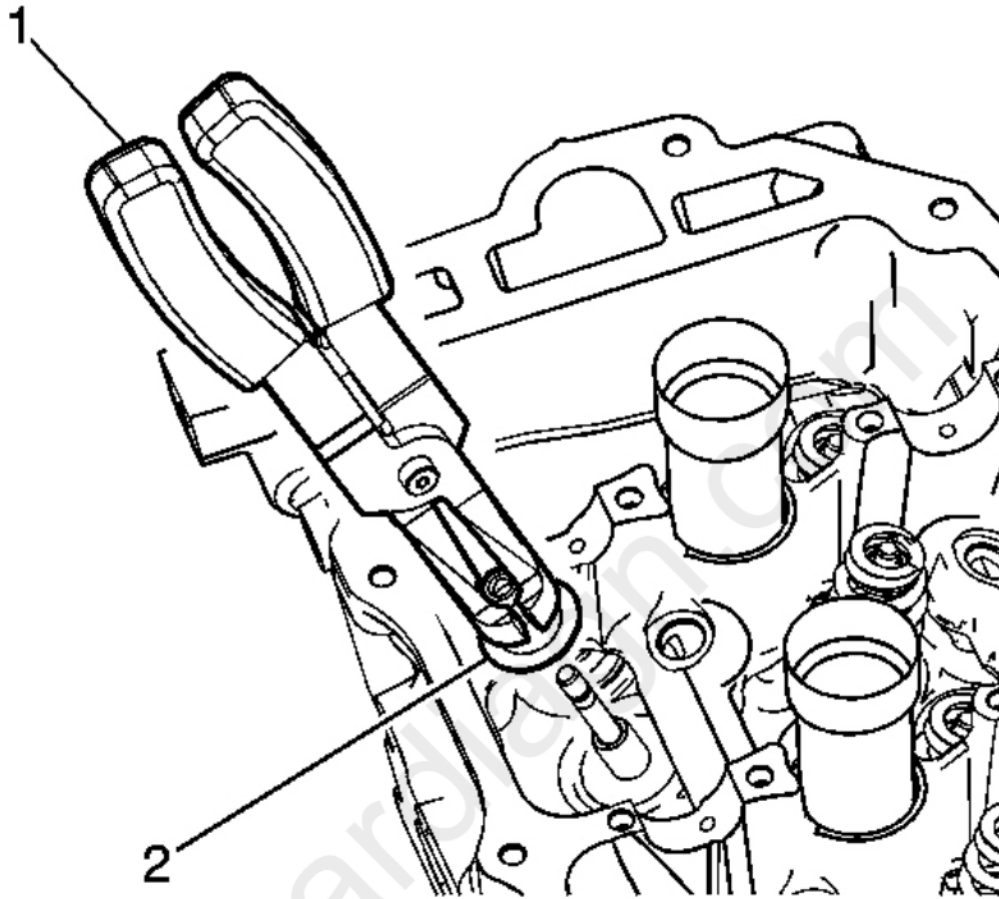


Fig. 33: Identifying Special Tool - EN-4 11 & Valve Stem Seal
Courtesy of GENERAL MOTORS CORP.

1. Use the **EN-4 11** : remover/installer (1) in order to install the valve stem seals (2).

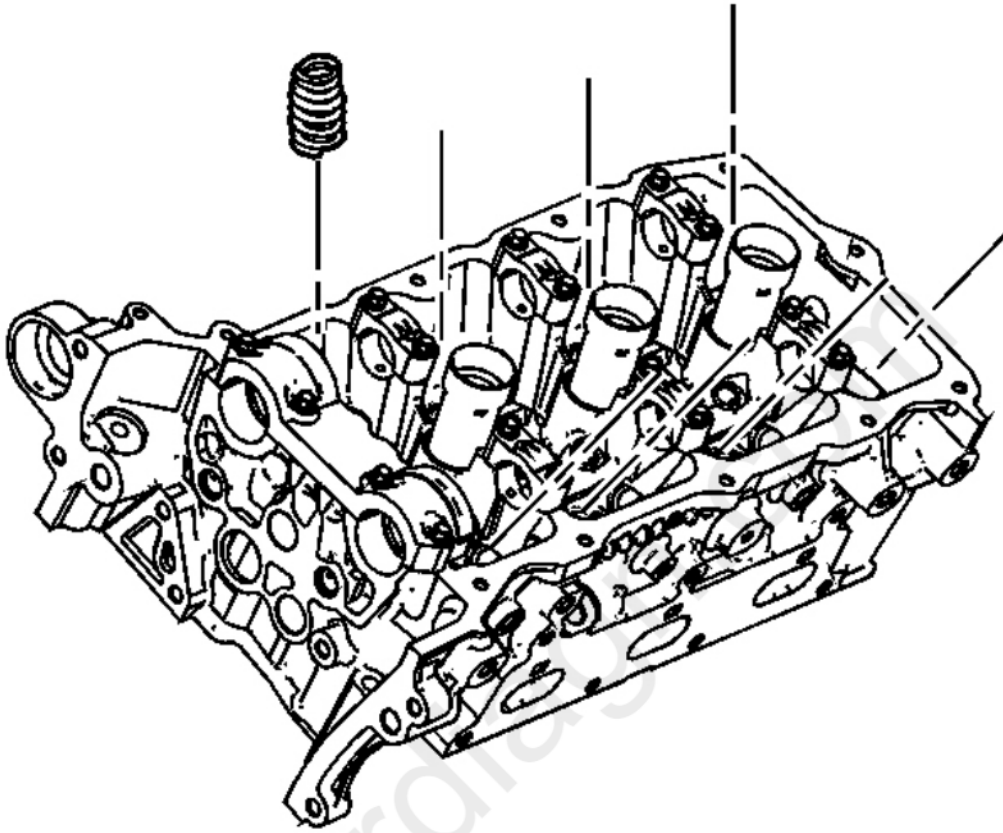


Fig. 34: View Of Valve Spring

Courtesy of GENERAL MOTORS CORP.

2. Install the valve spring.
3. Install the valve spring retainer.

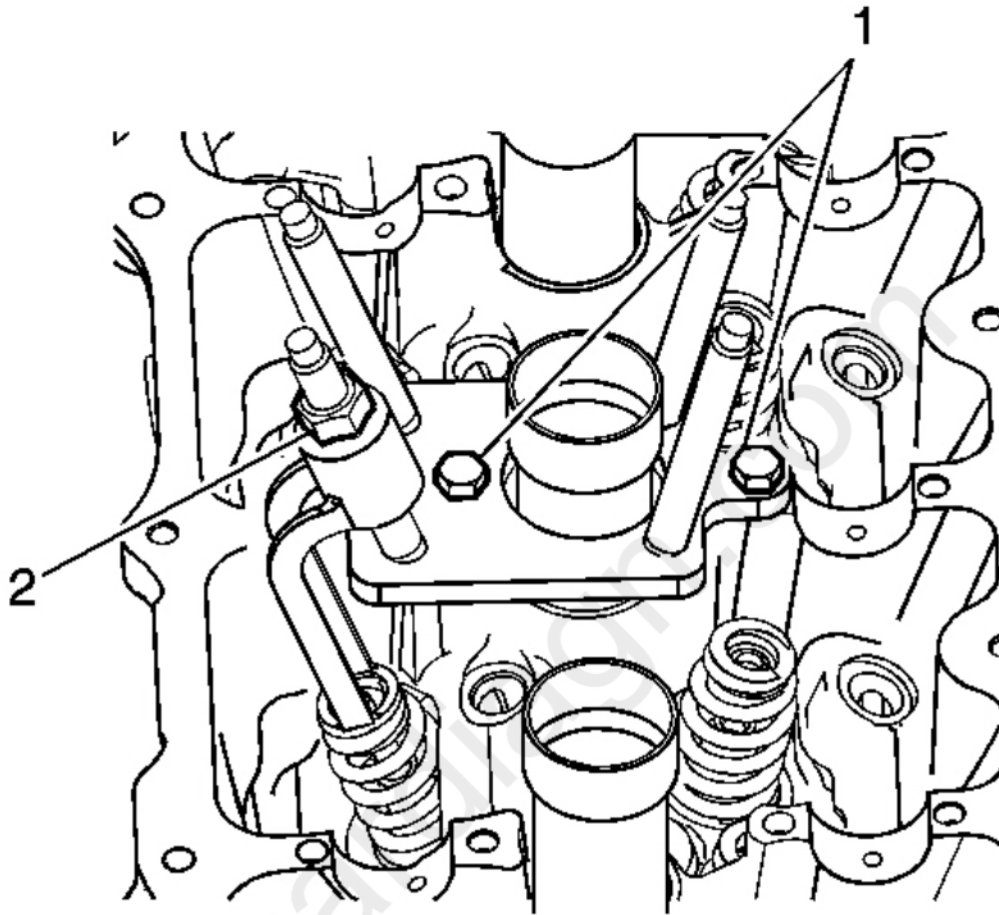


Fig. 35: View Of Installed Valve Spring Compressor Tool
Courtesy of GENERAL MOTORS CORP.

4. Install the **EN-4 110:** compressor above the applicable valve spring as shown.

Tighten the **EN-4 110:** compressor nut (2).

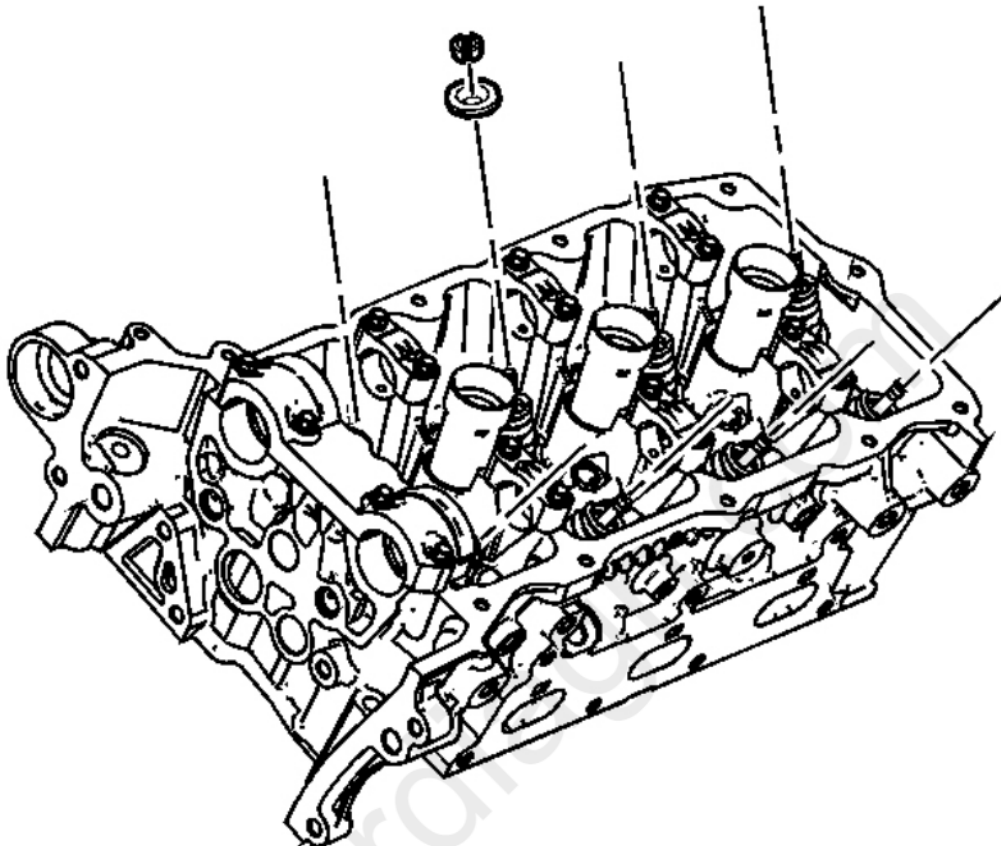


Fig. 3 : View Of Valve Spring keepers
Courtesy of GENERAL MOTORS CORP.

5. Install the valve spring keepers.
6. Remove the **EN-4 110:** compressor.
7. Disconnect the **EN-39313:** adapter from the compressed air source.
8. Remove the **EN-39313:** adapter.
9. Install the spark plugs. Refer to **Spark Plug Replacement** .
10. Install the rocker arms. Refer to **Valve Rocker Arm Replacement - Right Side**.
11. Remove the **EN-4 10 :** tool.
12. Install the starter motor. Refer to **Starter Replacement (LF1)** or **Starter Replacement (LAU)** .

CYLINDER HEAD REPLACEMENT LEFT SIDE LF1

SPECIAL TOOLS

2010 Cadillac SRX

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EN-45059: Angle meter

For equivalent regional tools, refer to **Special Tools** .

REMOVAL PROCEDURE

1. Remove the left bank secondary timing chain. Refer to **Secondary Camshaft Intermediate Drive Chain Replacement - Left Side** .
2. Remove the fuel pump. Refer to **Fuel Pump Replacement** .
3. Remove the Catalytic Converter. Refer to **Catalytic Converter Replacement - Left Side (LF1)** .
4. Remove the oil level indicator tube. Refer to **Oil Level Indicator Tube Replacement (LF1)** .

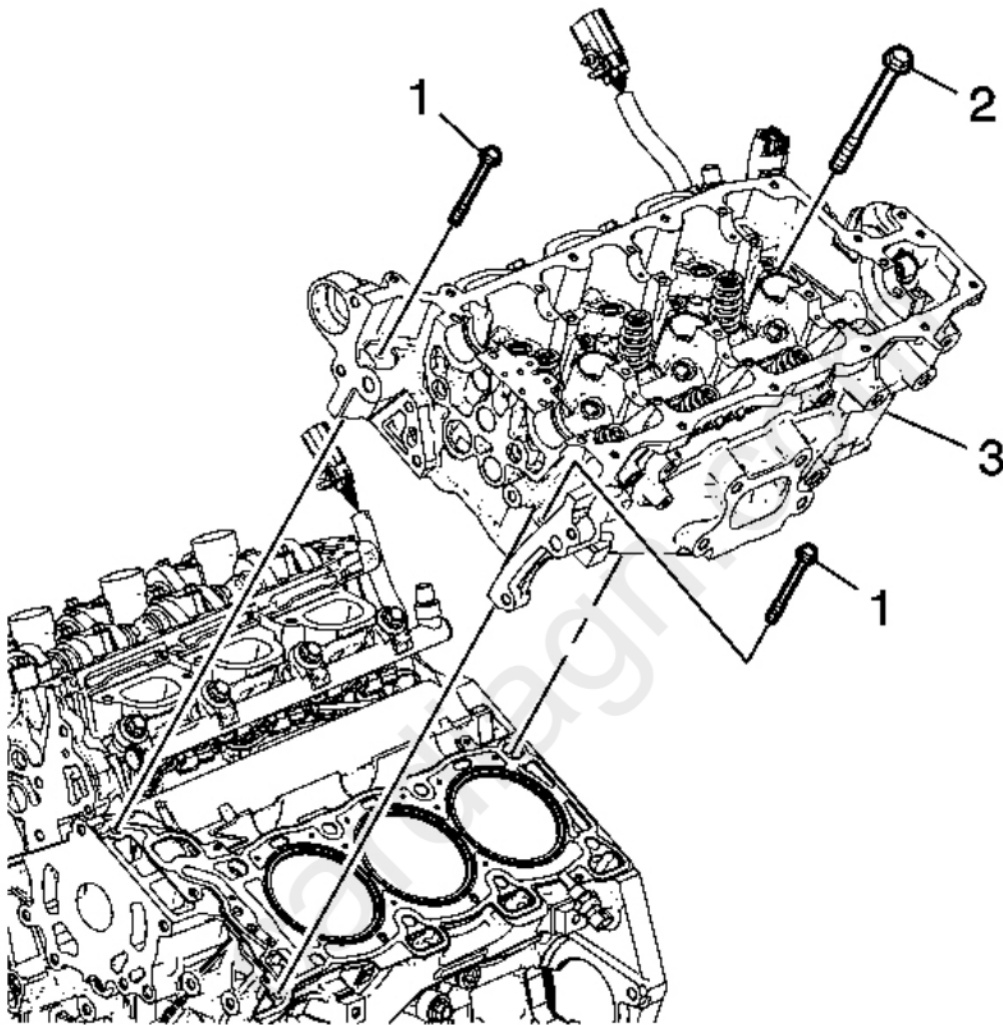


Fig. 37: View Of Left Cylinder Head & Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the 2 front 8 left cylinder head bolts (1).
6. Remove the left cylinder head bolts (2).
7. Remove the left cylinder head (3).
8. Remove the ground wire bolt and ground wire.
9. Disconnect and reposition harness as necessary.

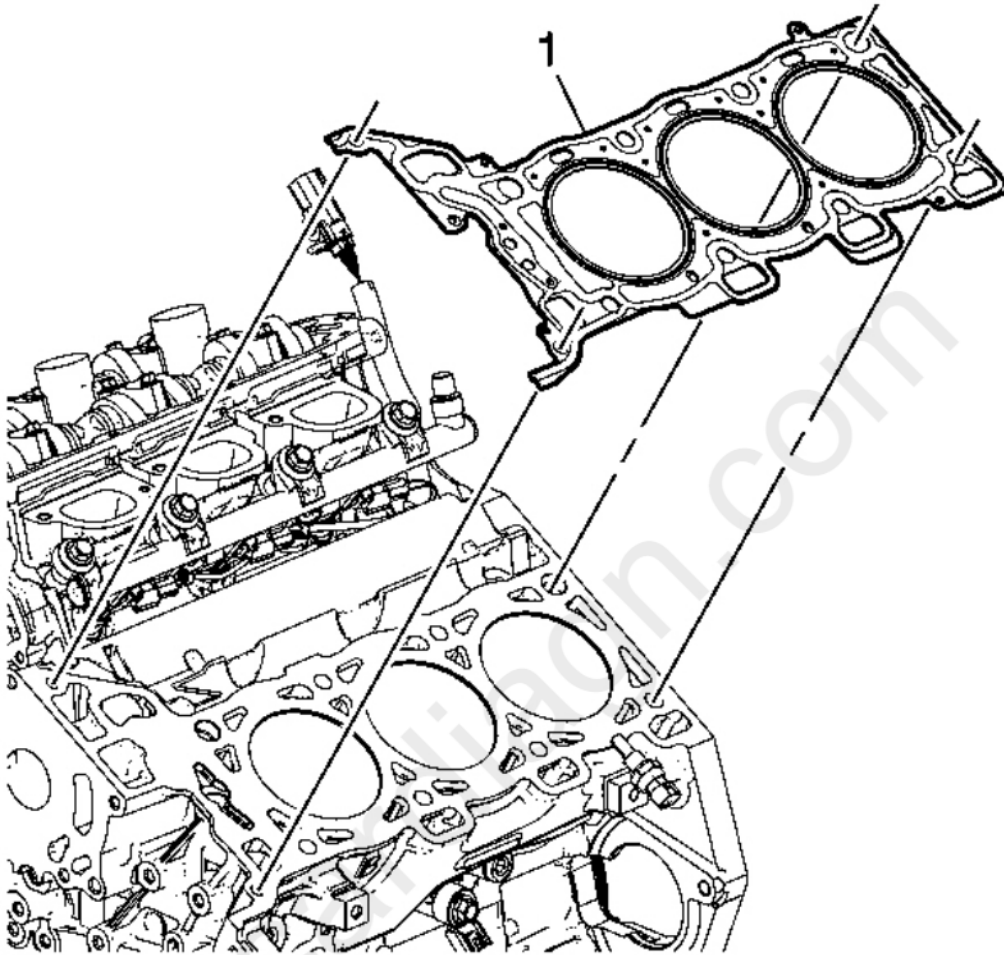


Fig. 38: View Of Left Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

10. Remove and discard the left cylinder head gasket (1).
11. 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** .
12. Transfer parts as needed. Refer to **Cylinder Head Disassemble (LF1 or LFW)** .

INSTALLATION PROCEDURE

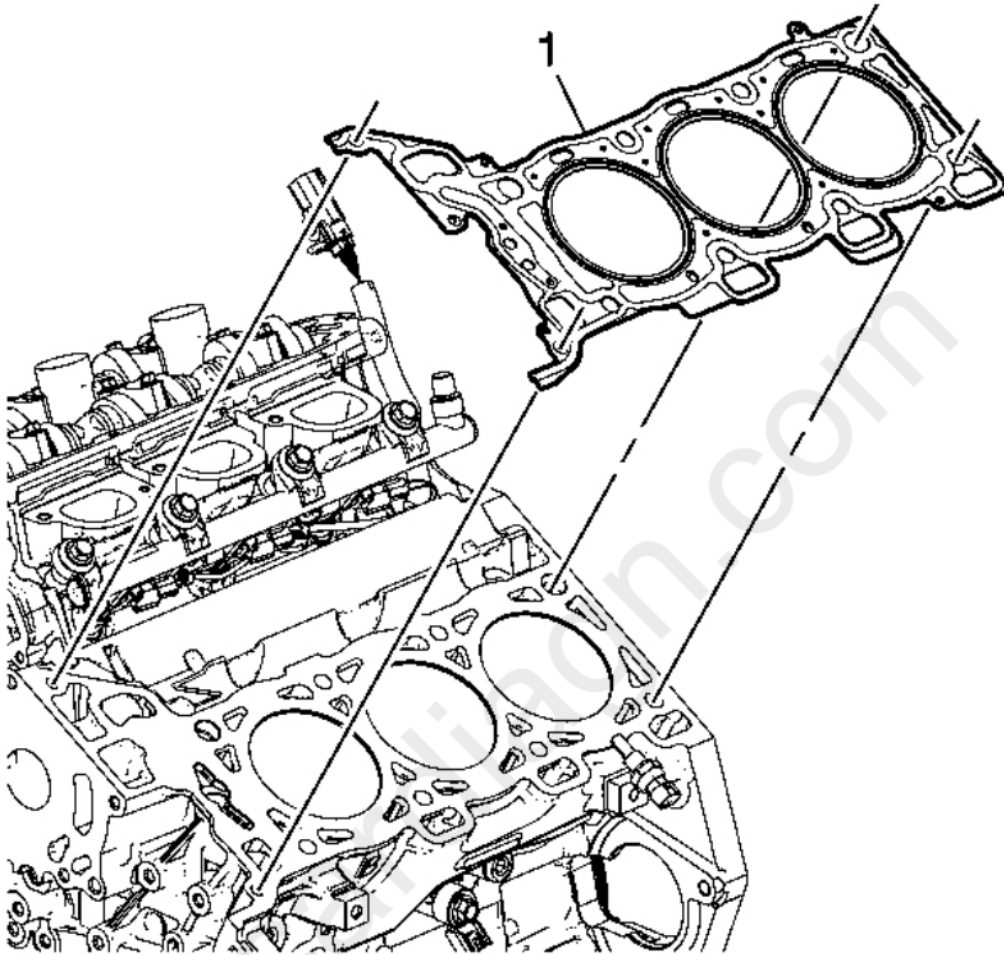


Fig. 39: View Of Left Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

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

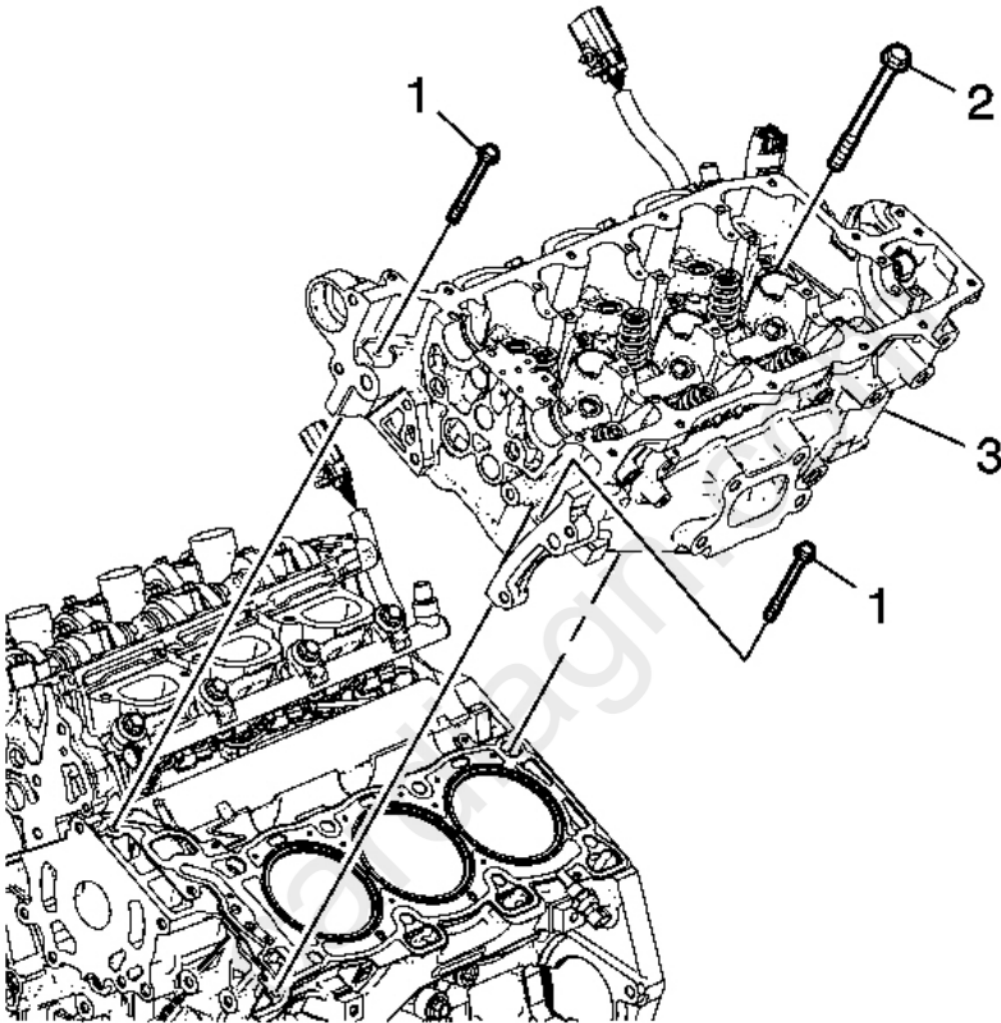


Fig. 40: View Of Left Cylinder Head & Bolts
Courtesy of GENERAL MOTORS CORP.

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.

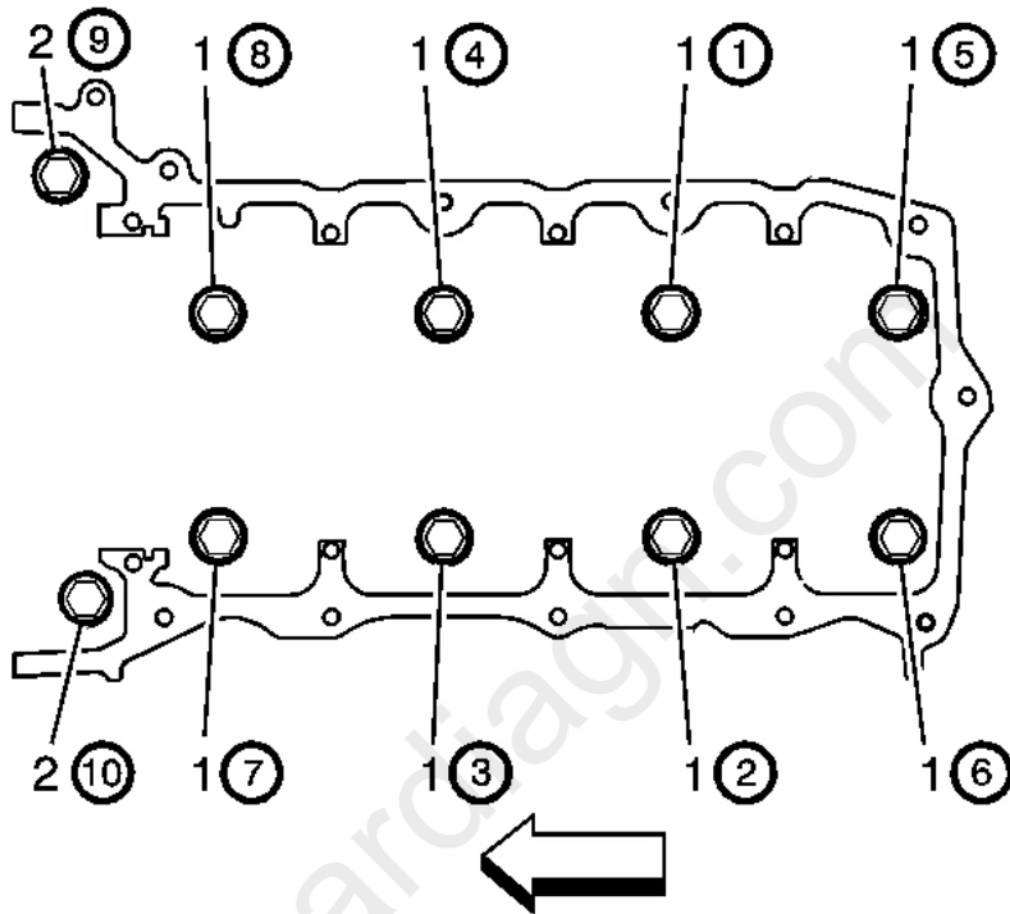


Fig. 41: Identifying M11 Cylinder Head Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

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 11 cylinder head bolts (1).
 1. Tighten the 11 cylinder head bolts a first pass in sequence to 30 .m (22 lb ft).
 2. Tighten the 11 cylinder head bolts a second pass in sequence an additional 150 degrees using the **EN-45059:** meter.

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6. Install the 2 front 8 left cylinder head bolts (2).
 1. Tighten the 8 cylinder head bolts a first pass to 15 .m (11 lb ft).
 2. Tighten the 8 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 camshaft cover. Refer to **Camshaft Cover Replacement - Left Side (LF1)** .
9. Install the fuel pump. Refer to **Fuel Pump Replacement** .
10. Install the generator. Refer to **Generator Replacement (LF1)** .
11. Install the e haust manifold. Refer to **Catalytic Converter Replacement - Left Side (LF1)** .
12. Install the oil level indicator tube. Refer to **Oil Level Indicator Tube Replacement (LF1)** .

CYLINDER HEAD REPLACEMENT LEFT SIDE LAU

SPECIAL TOOLS

EN-45059: Angle eter

For equivalent regional tools, refer to **Special Tools** .

REMOVAL PROCEDURE

1. Remove the camshaft cover. Refer to **Camshaft Cover Replacement - Left Side (LAU)** .
2. Remove the left bank secondary timing chain. Refer to **Secondary Camshaft Intermediate Drive Chain Replacement - Left Side** .
3. Remove the e haust manifold. Refer to **Exhaust Manifold Replacement - Left Side (LAU)** .
4. Remove the oil level indicator tube. Refer to **Oil Level Indicator Tube Replacement (LAU)** .
5. Remove the turbocharger bracket. Refer to **Turbocharger Bracket Replacement** .

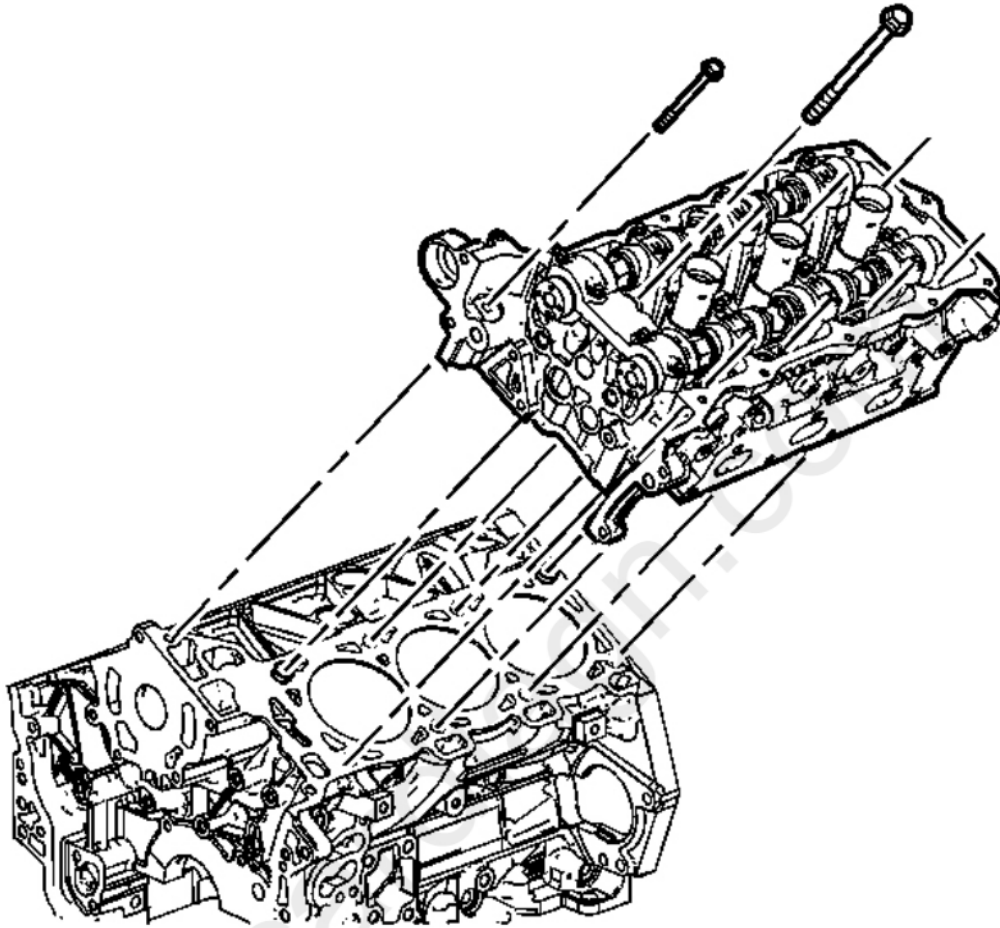


Fig. 4 : View Of Left Cylinder Head
Courtesy of GENERAL MOTORS CORP.

6. Remove the 2 front 8 left cylinder head bolts.
7. Remove the left cylinder head bolts.
8. Remove the left cylinder head.

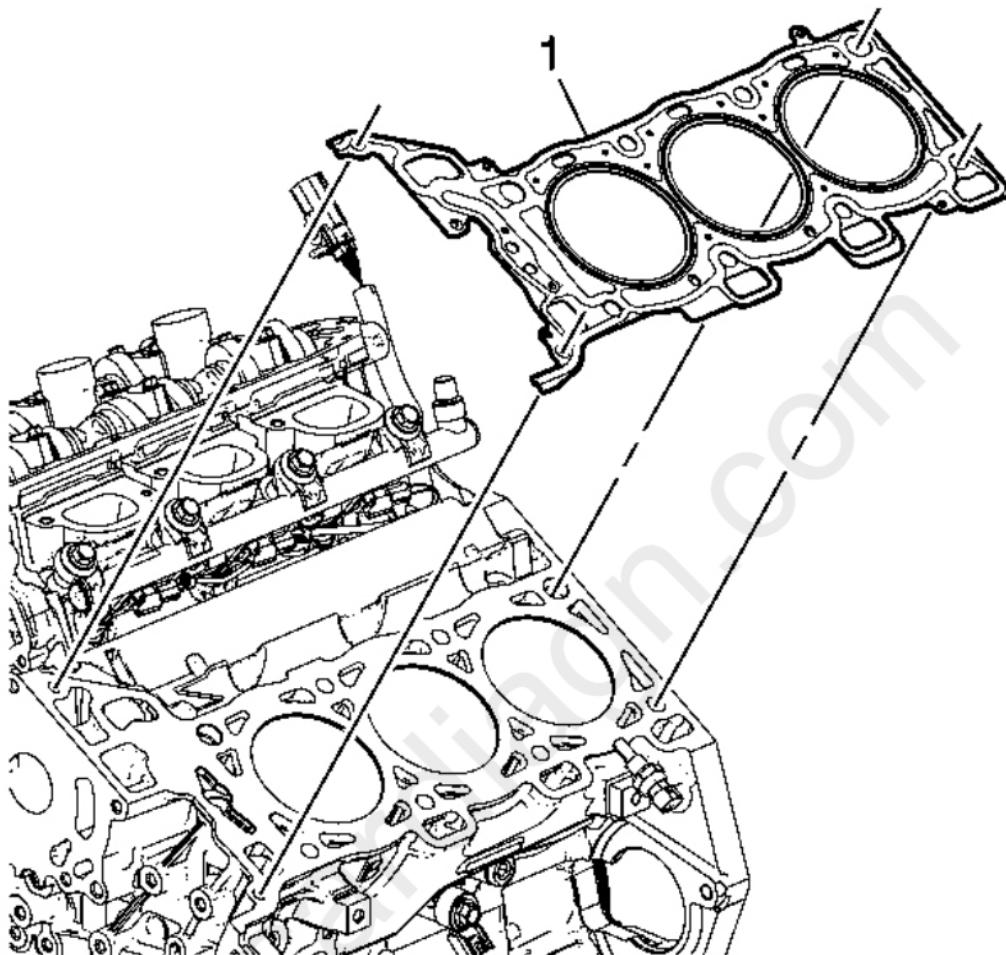


Fig. 4 : View Of Left Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

9. Remove and discard the left cylinder head gasket (1).
10. 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** .

INSTALLATION PROCEDURE

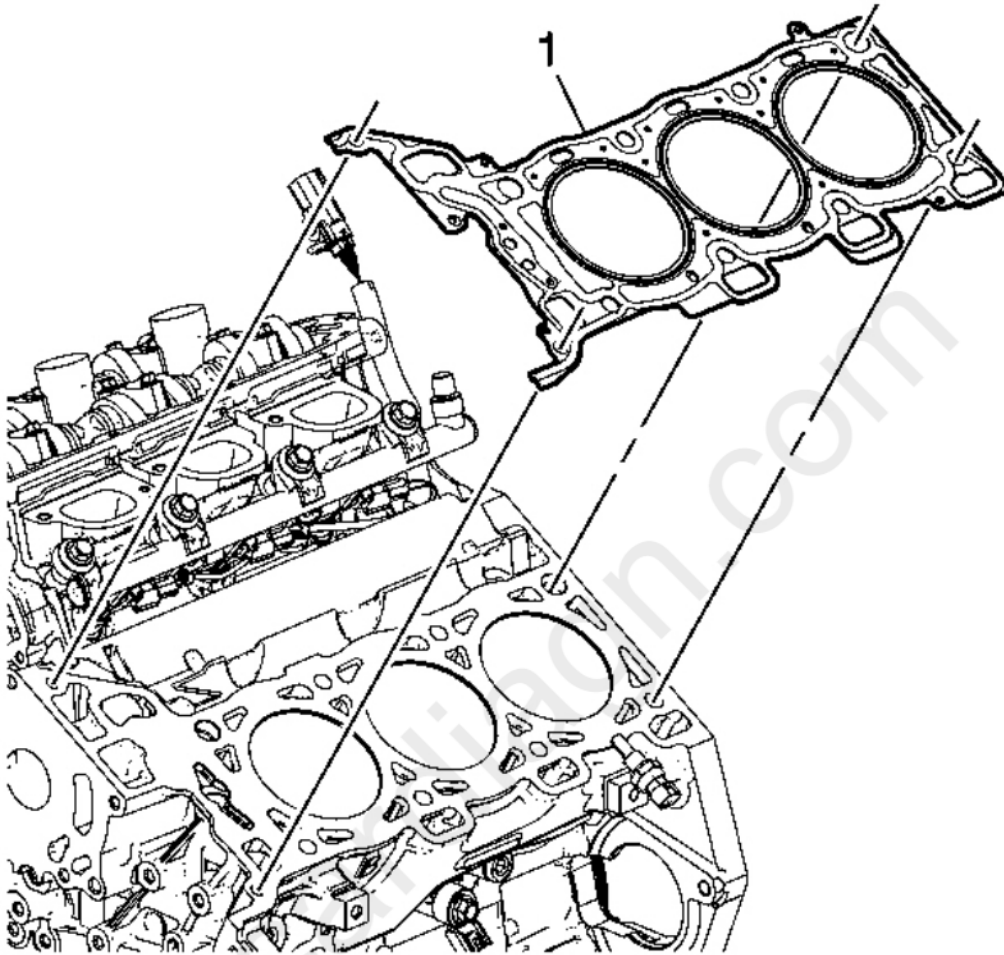


Fig. 44: View Of Left Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

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

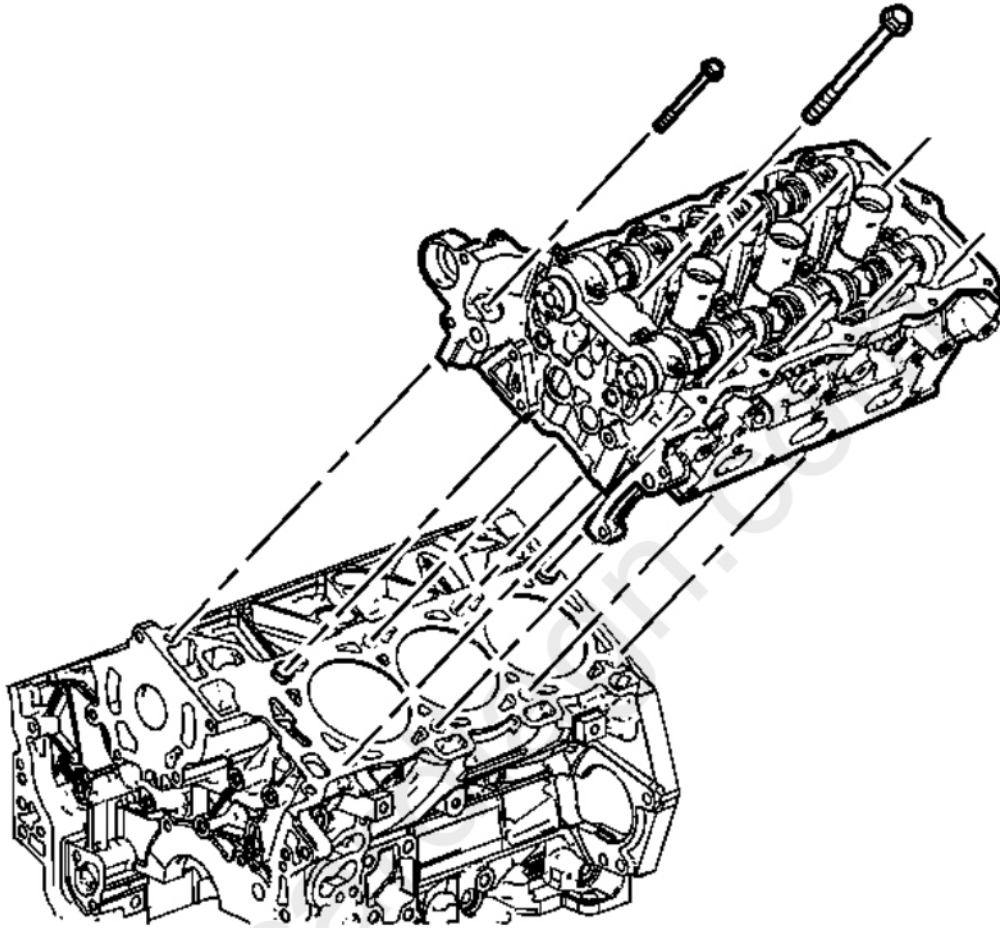


Fig. 45: View Of Left Cylinder Head
Courtesy of GENERAL MOTORS CORP.

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

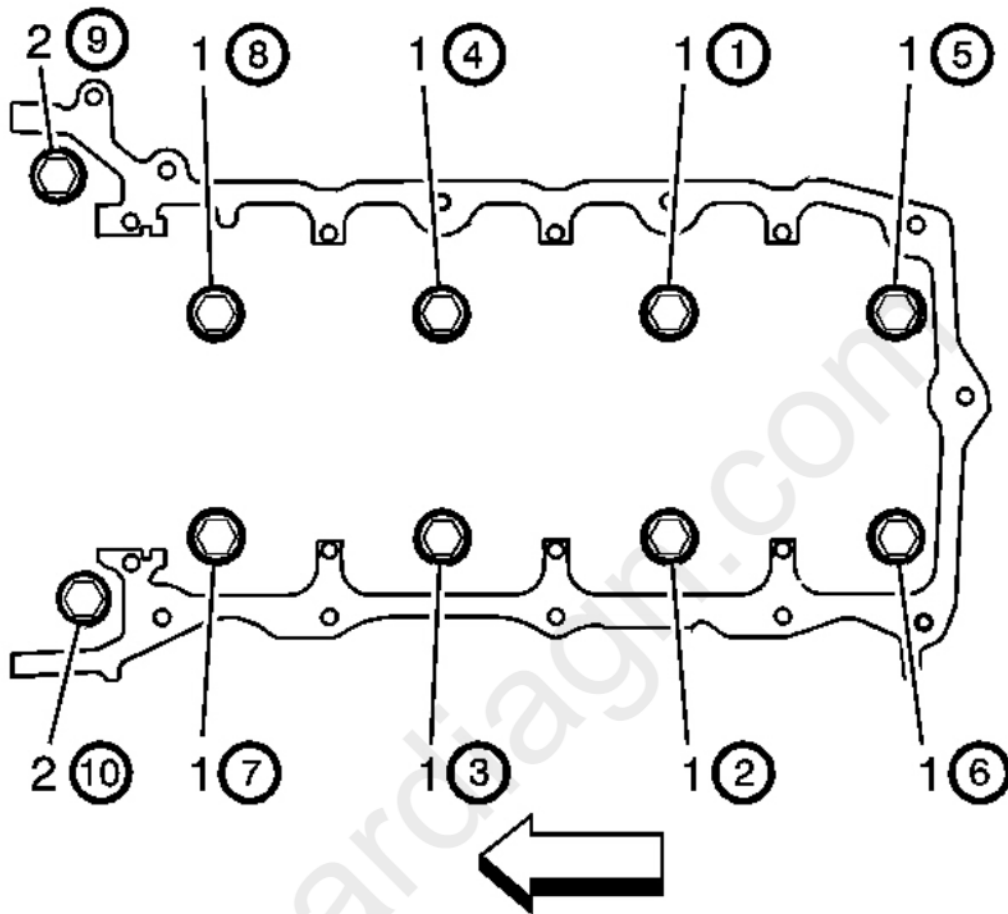


Fig. 46: Identifying M11 Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

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 11 cylinder head bolts (1).
 1. Tighten the 11 cylinder head bolts a first pass in sequence to 30 .m (22 lb ft).
 2. Tighten the 11 cylinder head bolts a second pass in sequence an additional 150 degrees using the **EN-45059:** meter.

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6. Install the 2 front 8 left cylinder head bolts (2).
 1. Tighten the 8 cylinder head bolts a first pass to 15 .m (11 lb ft).
 2. Tighten the 8 cylinder head bolts a second pass in sequence an additional 75 degrees using the **EN-45059**: meter.
7. Install the turbocharger bracket. Refer to **Turbocharger Bracket Replacement** .
8. Install the left bank secondary timing chain. Refer to **Secondary Camshaft Intermediate Drive Chain Replacement - Left Side** .
9. Install the camshaft cover. Refer to **Camshaft Cover Replacement - Left Side (LAU)** .
10. Install the exhaust manifold. Refer to **Exhaust Manifold Replacement - Left Side (LAU)** .
11. Install the oil level indicator tube. Refer to **Oil Level Indicator Tube Replacement (LAU)** .

CYLINDER HEAD REPLACEMENT RIGHT SIDE LF1

SPECIAL TOOLS

EN-45059: Angle meter

For equivalent regional tools, refer to **Special Tools** .

REMOVAL PROCEDURE

1. Remove the right bank secondary timing chain. Refer to **Secondary Camshaft Intermediate Drive Chain Replacement - Right Side** .
2. Remove the power brake booster pump aside.
3. Remove the catalytic converter. Refer to **Catalytic Converter Replacement - Right Side (LF1)** .

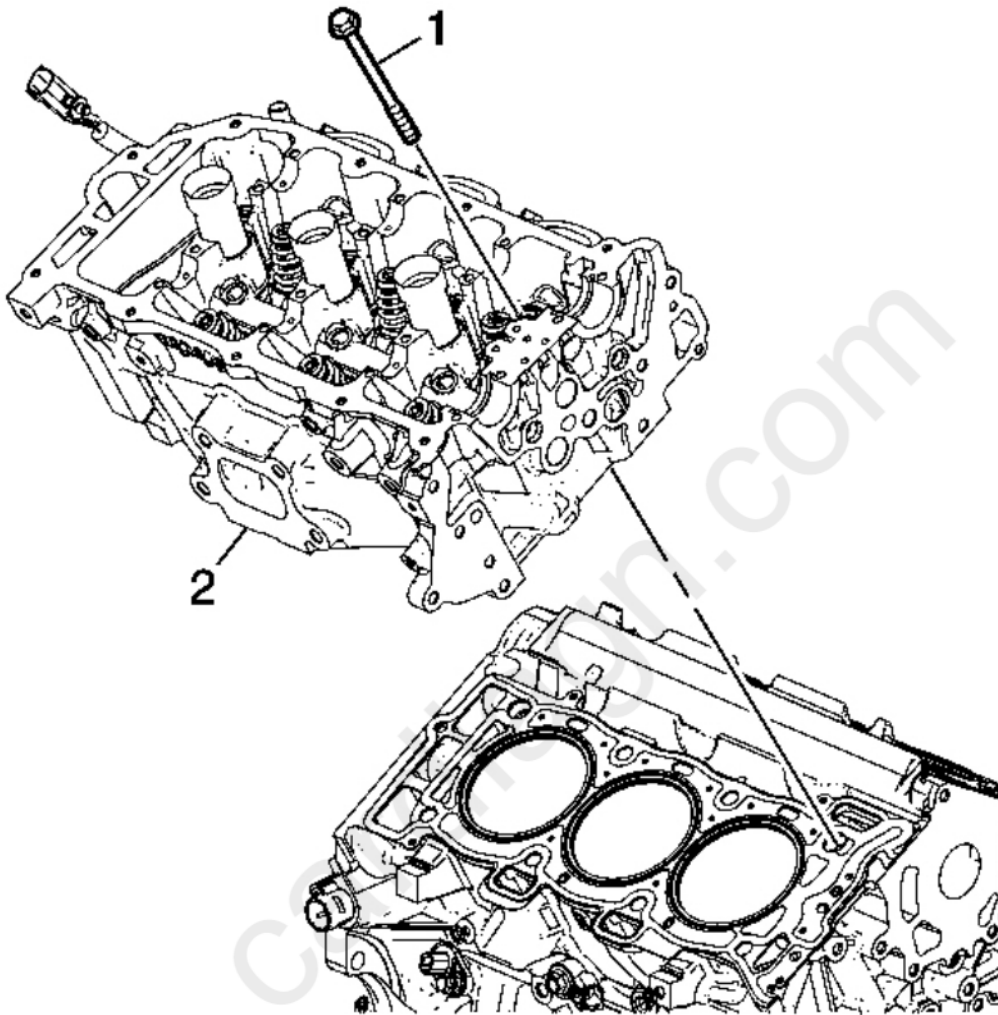


Fig. 47: View Of Right Cylinder Head & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the right cylinder head bolts (1).
5. Remove the right cylinder head (2).
6. Remove Ground wire and harness and position aside.

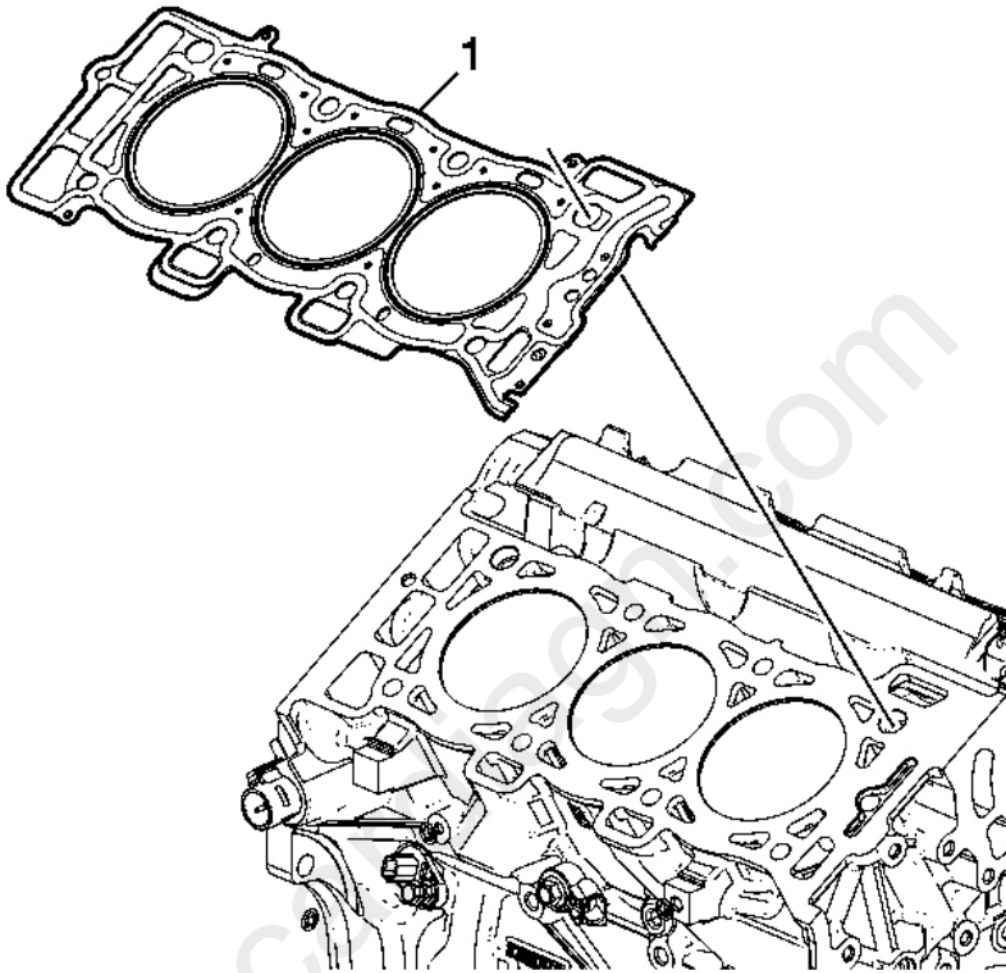


Fig. 48: View Of Right Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

7. Remove and discard the cylinder head gasket (1).
8. 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** .
9. Disassemble the cylinder head if needed. Refer to **Cylinder Head Disassemble (LF1 or LFW)** .
10. Transfer parts as needed.

INSTALLATION PROCEDURE

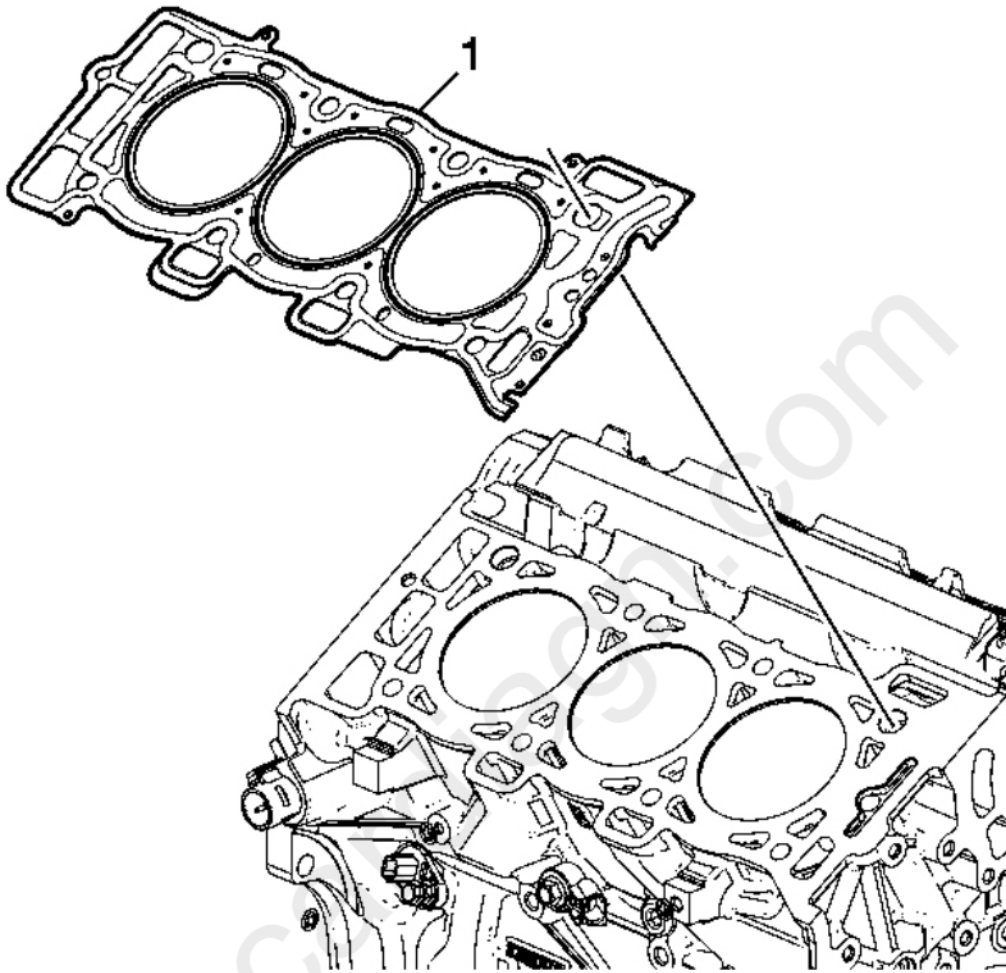


Fig. 49: View Of Right Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

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

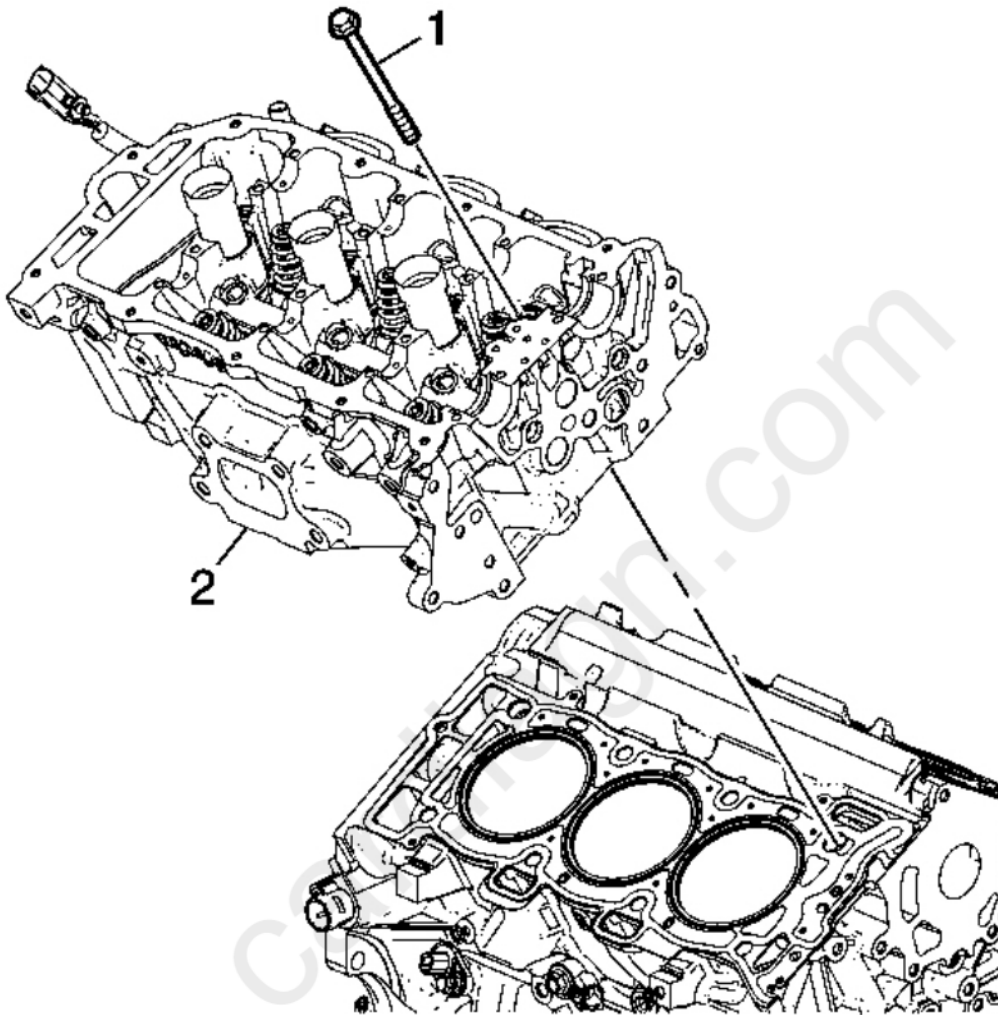


Fig. 50: View Of Right Cylinder Head Bolts
Courtesy of GENERAL MOTORS CORP.

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.

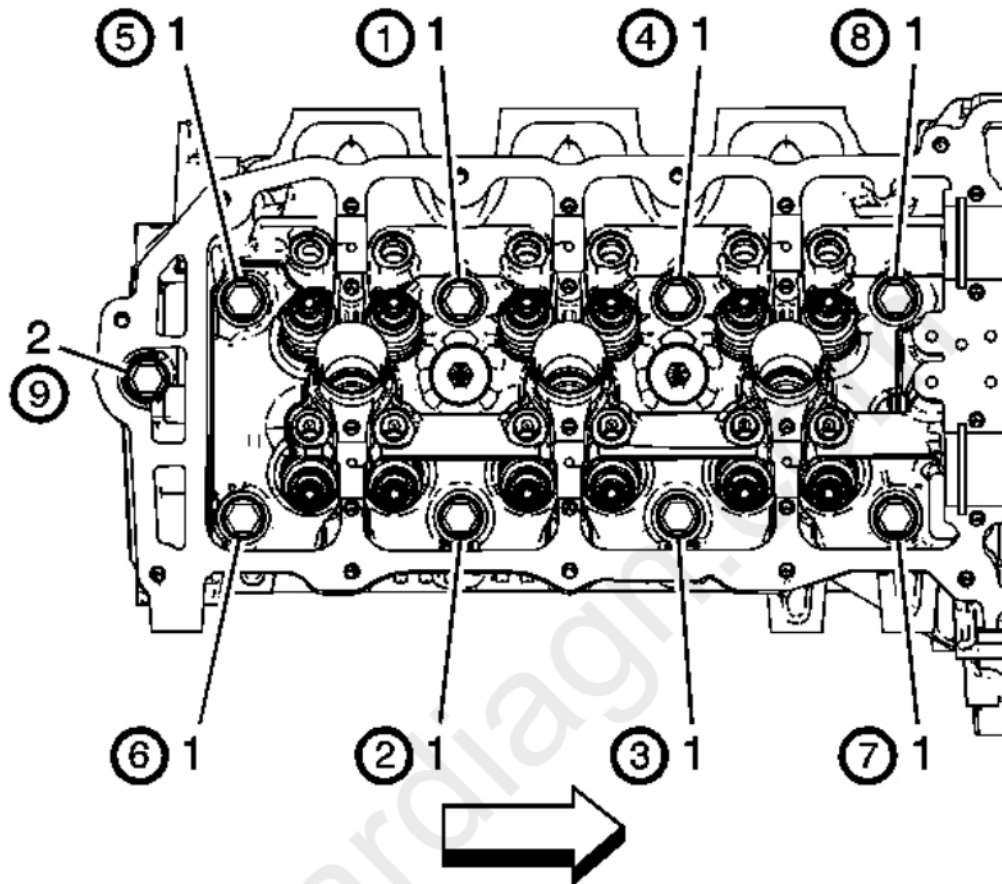


Fig. 51: Identifying M11 Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

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 11 cylinder head bolts (1).
1. Tighten the 11 cylinder head bolts a first pass in sequence to 30 in-lb (22 lb ft).
2. Tighten the 11 cylinder head bolts a second pass in sequence an additional 150 degrees using the EN-45059: meter.

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6. Install the 8 cylinder head bolt (2).
 1. Tighten the 8 cylinder head bolt a first pass to 15 .m (11 lb ft).
 2. Tighten the 8 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 e haust manifold. Refer to **Catalytic Converter Replacement - Right Side (LF1)** .
9. Install the camshaft cover. Refer to **Camshaft Cover Replacement - Right Side (LF1)** .

CYLINDER HEAD REPLACEMENT RIGHT SIDE LAU

SPECIAL TOOLS

EN-45059: Angle eter

For equivalent regional tools, refer to **Special Tools** .

REMOVAL PROCEDURE

1. Remove the camshaft cover. Refer to **Camshaft Cover Replacement - Right Side (LAU)** .
2. Remove the right bank secondary timing chain. Refer to **Secondary Camshaft Intermediate Drive Chain Replacement - Right Side** .
3. Remove the e haust manifold. Refer to **Exhaust Manifold Replacement - Right Side (LAU)** .
4. Remove the right engine lift bracket at the rear of the right cylinder head.

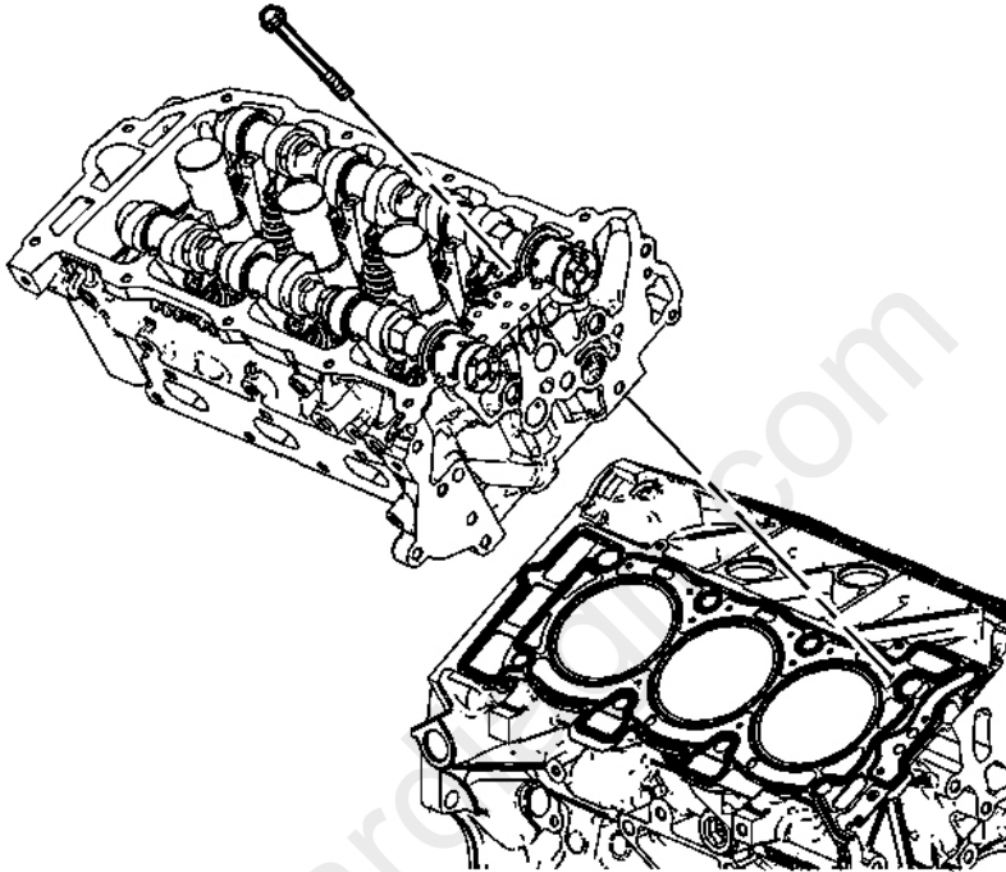


Fig. 5 : View Of Right Cylinder Head
Courtesy of GENERAL MOTORS CORP.

5. Remove the right cylinder head bolts.
6. Remove the right cylinder head.

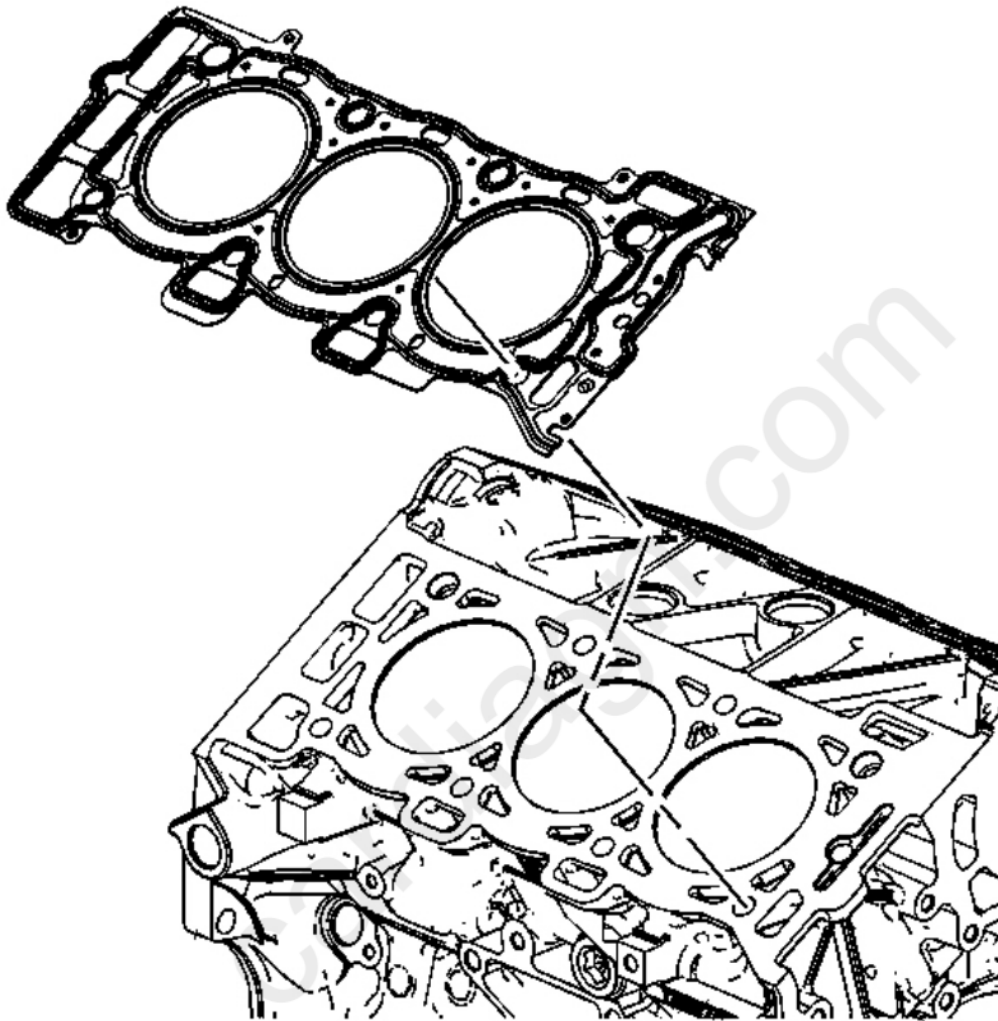


Fig. 53: View Of Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

7. Remove and discard the cylinder head gasket.
8. 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** .
9. Disassemble the cylinder head if needed. Refer to **Cylinder Head Disassemble (LAU or LBW)** .

INSTALLATION PROCEDURE

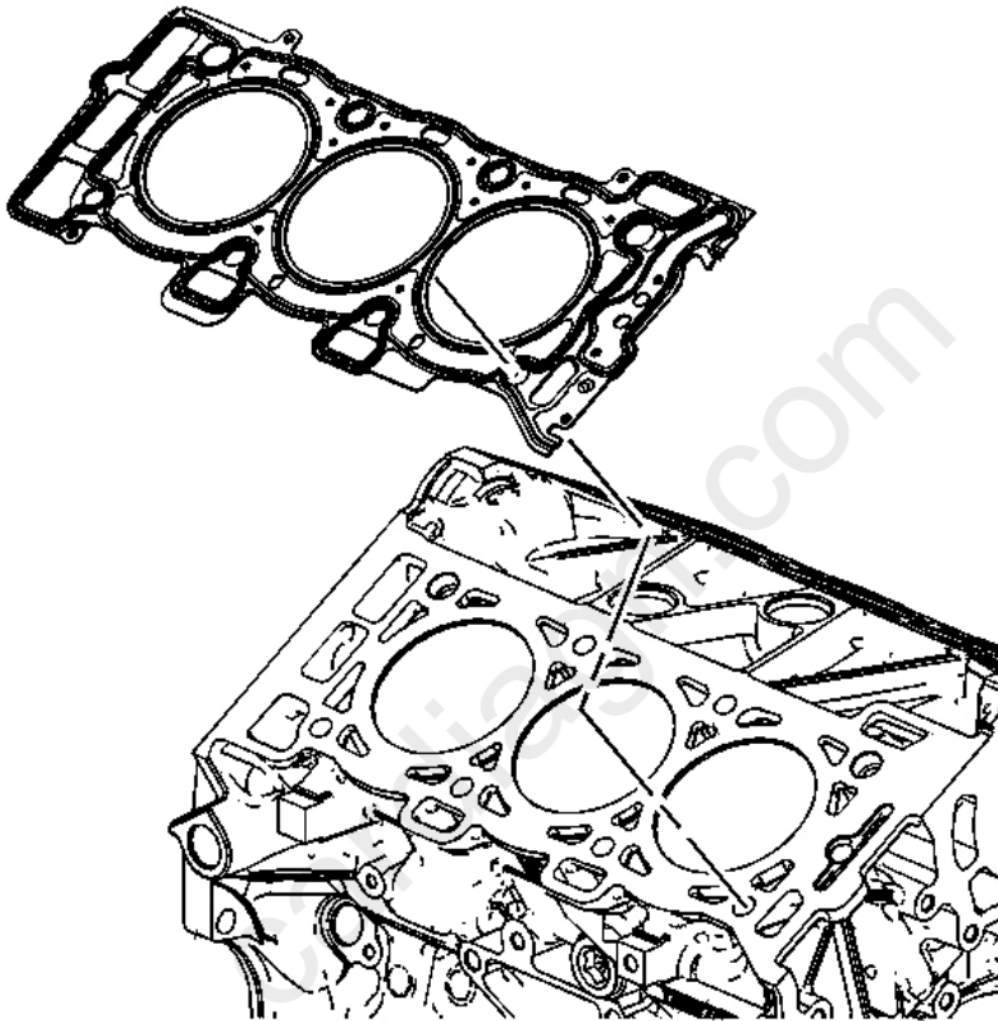


Fig. 54: View Of Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

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

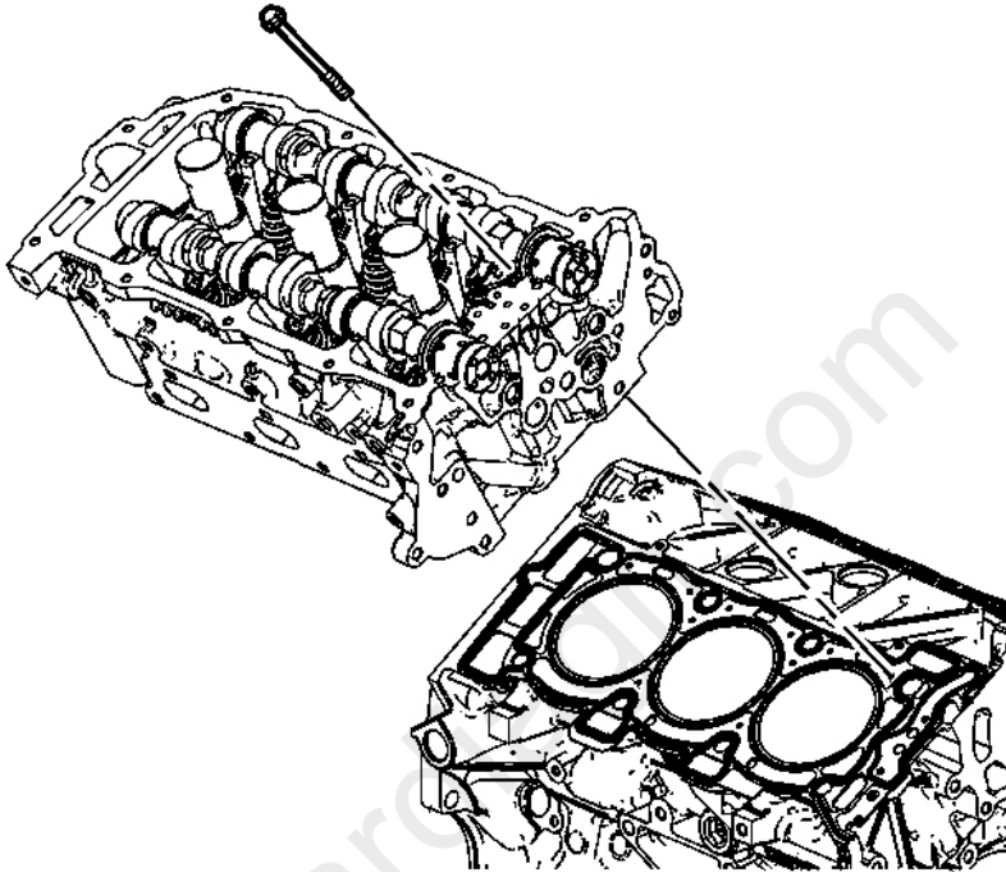


Fig. 55: View Of Right Cylinder Head
Courtesy of GENERAL MOTORS CORP.

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

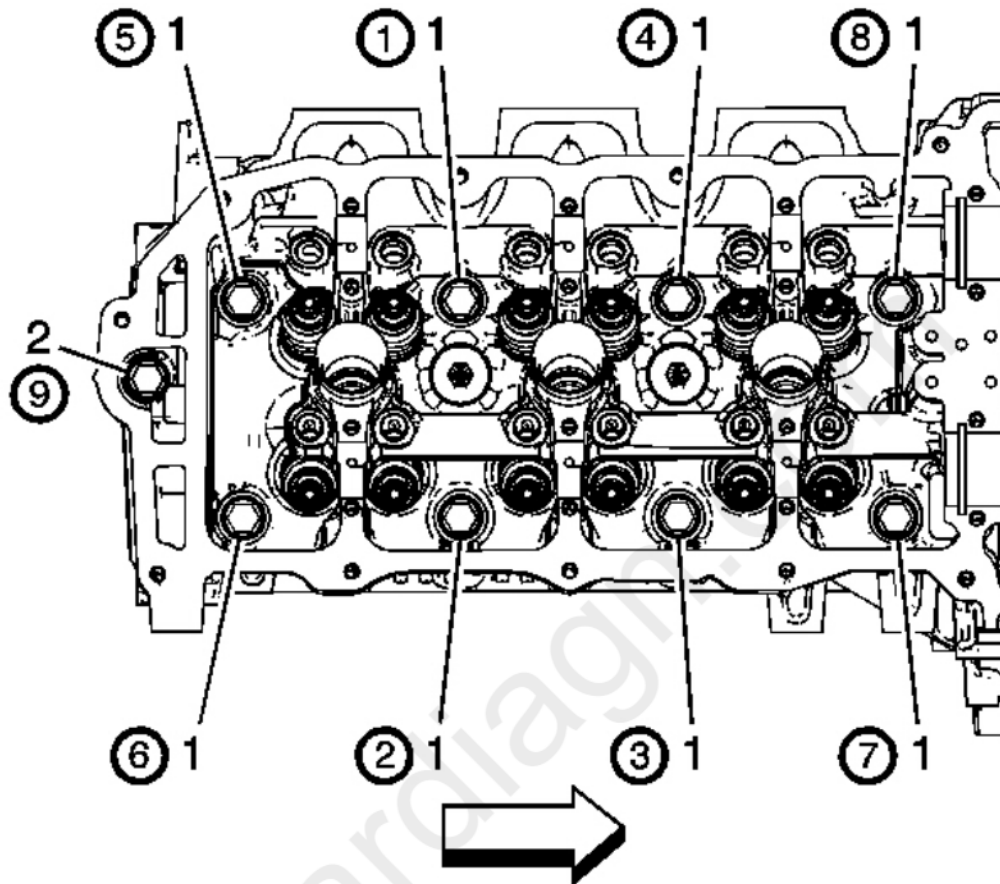


Fig. 56: Identifying M11 Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

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 11 cylinder head bolts (1).
1. Tighten the 11 cylinder head bolts a first pass in sequence to 30 .m (22 lb ft).
2. Tighten the 11 cylinder head bolts a second pass in sequence an additional 150 degrees using the **EN-45059:** meter.

6. Install the 8 cylinder head bolt (2).
 1. Tighten the 8 cylinder head bolt a first pass to 15 .m (11 lb ft).
 2. Tighten the 8 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 right engine lift bracket.
9. Install the exhaust manifold. Refer to **Exhaust Manifold Replacement - Right Side (LAU)** .
10. Install the camshaft cover. Refer to **Camshaft Cover Replacement - Right Side (LAU)** .

ENGINE FLYWHEEL REPLACEMENT

REMOVAL PROCEDURE

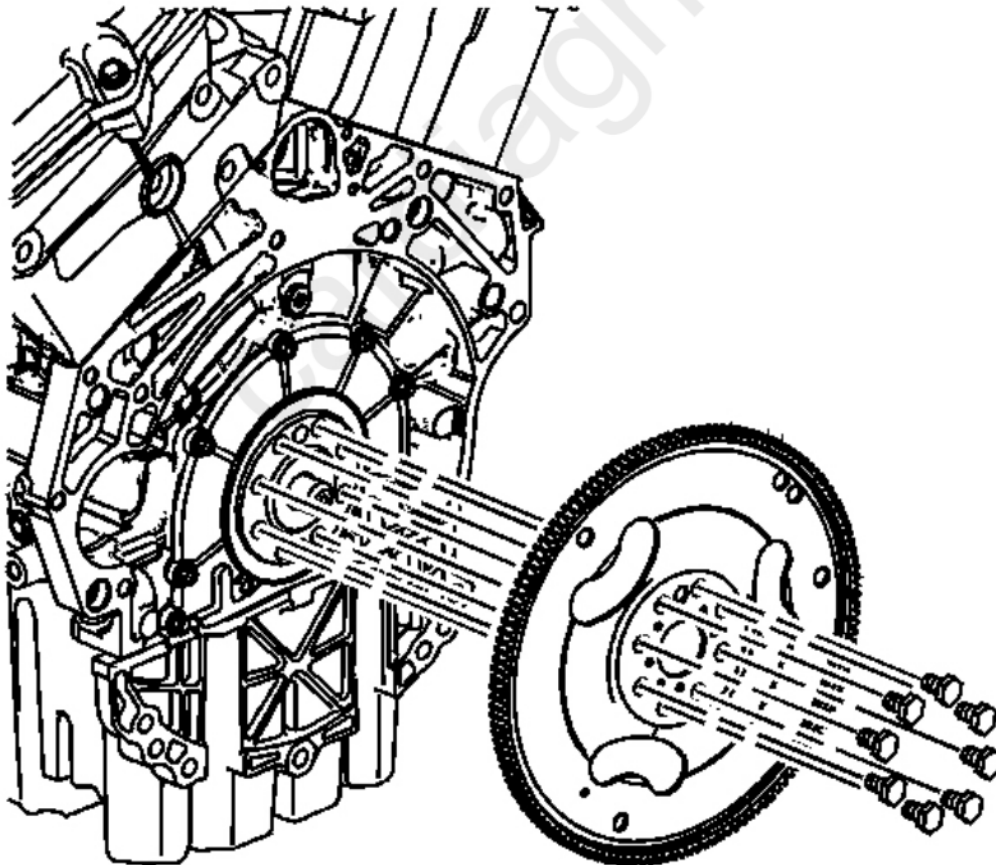
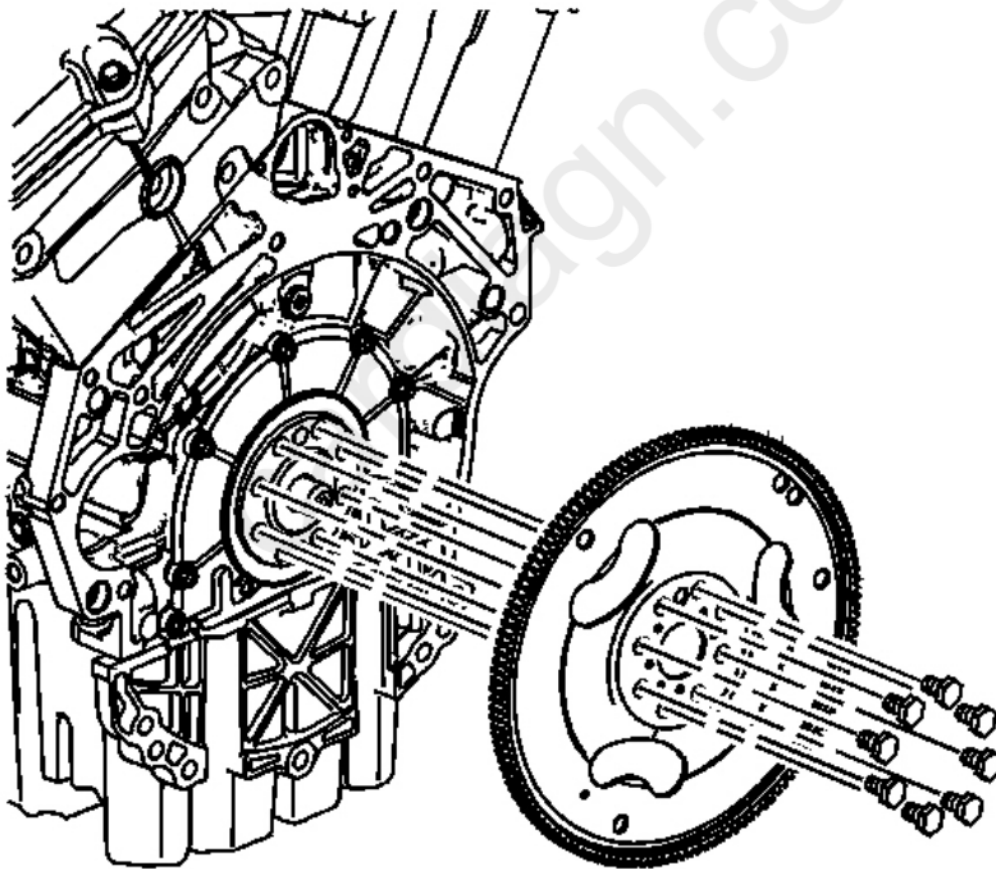


Fig. 57: View Of Engine Flywheel

Courtesy of GENERAL MOTORS CORP.

1. Remove the transmission. Refer to Transmission Replacement (A - D) or Transmission Replacement (F - D).
2. Remove the flywheel. Refer to Engine Flywheel Removal
3. Clean and inspect the flywheel. Refer to Engine Flywheel Cleaning and Inspection. If the flywheel teeth are damaged, inspect the starter for proper operation. Replace the starter if you find excessive wear or damage to the starter drive.

INSTALLATION PROCEDURE

**Fig. 5 : View Of Engine Flywheel**

Courtesy of GENERAL MOTORS CORP.

1. Install the flywheel. Refer to Engine Flywheel Installation

2. Install the transmission. Refer to Transmission Replacement (A - D) or Transmission Replacement (F - D).

CRANK SHAFT REAR OIL SEAL AND HOUSING REPLACEMENT

REMOVAL PROCEDURE

1. Remove the engine flywheel. Refer to Engine Flywheel Replacement.
2. Remove the oil pan. Refer to Oil Pan Replacement.

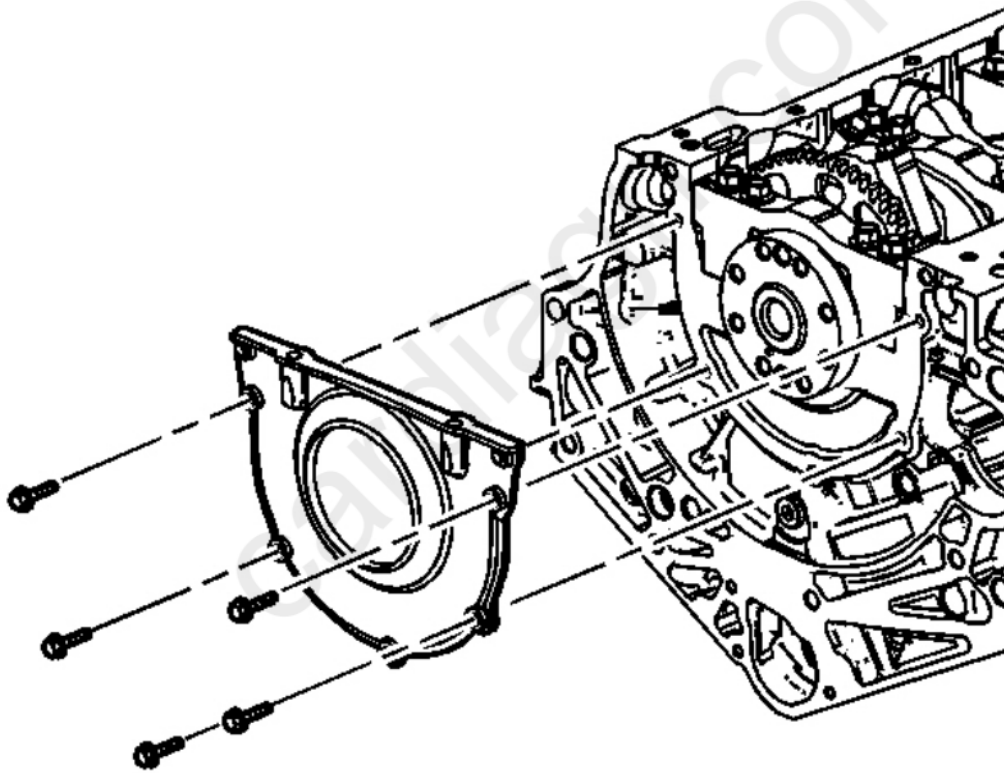


Fig. 59: View Of Crankshaft Rear Oil Seal & Housing
Courtesy of GENERAL MOTORS CORP.

3. Remove the crankshaft rear oil seal and housing. Refer to Crankshaft Rear Oil Seal and Housing Removal.

INSTALLATION PROCEDURE

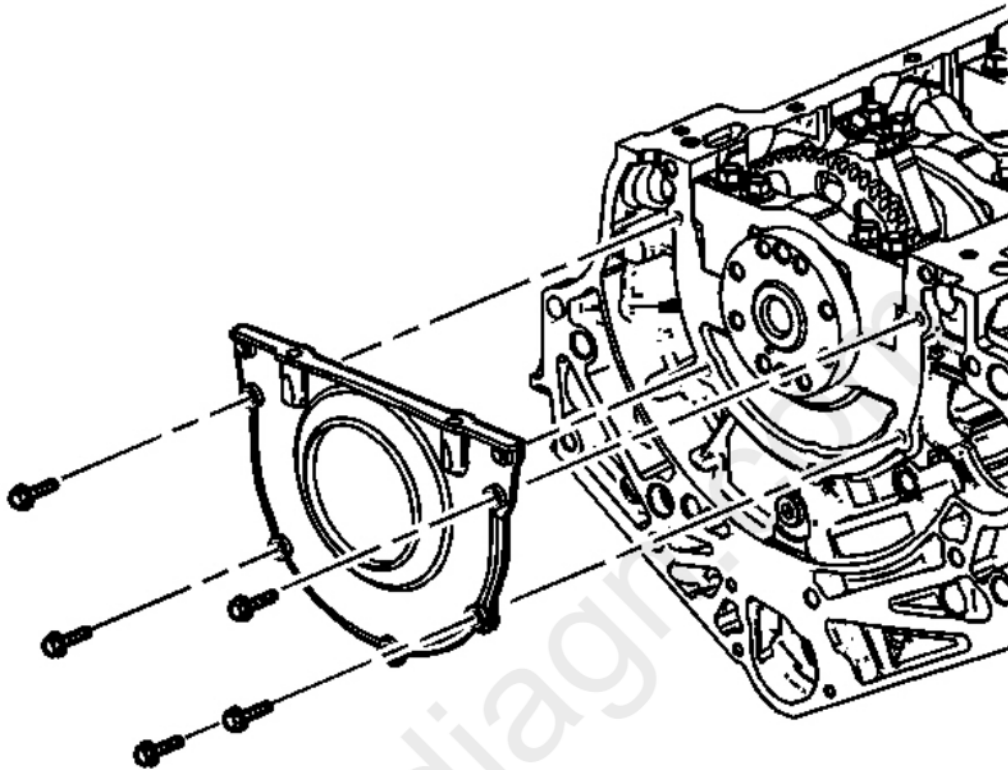


Fig. 60: View Of Crankshaft Rear Oil Seal & Housing
Courtesy of GENERAL MOTORS CORP.

1. Install the crankshaft rear oil seal and housing. Refer to **Crankshaft Rear Oil Seal and Housing Installation** .
2. Install the oil pan. Refer to **Oil Pan Replacement**.
3. Install the engine flywheel. Refer to **Engine Flywheel Replacement**.

ENGINE OIL COOLER REPLACEMENT

2010 Cadillac SRX

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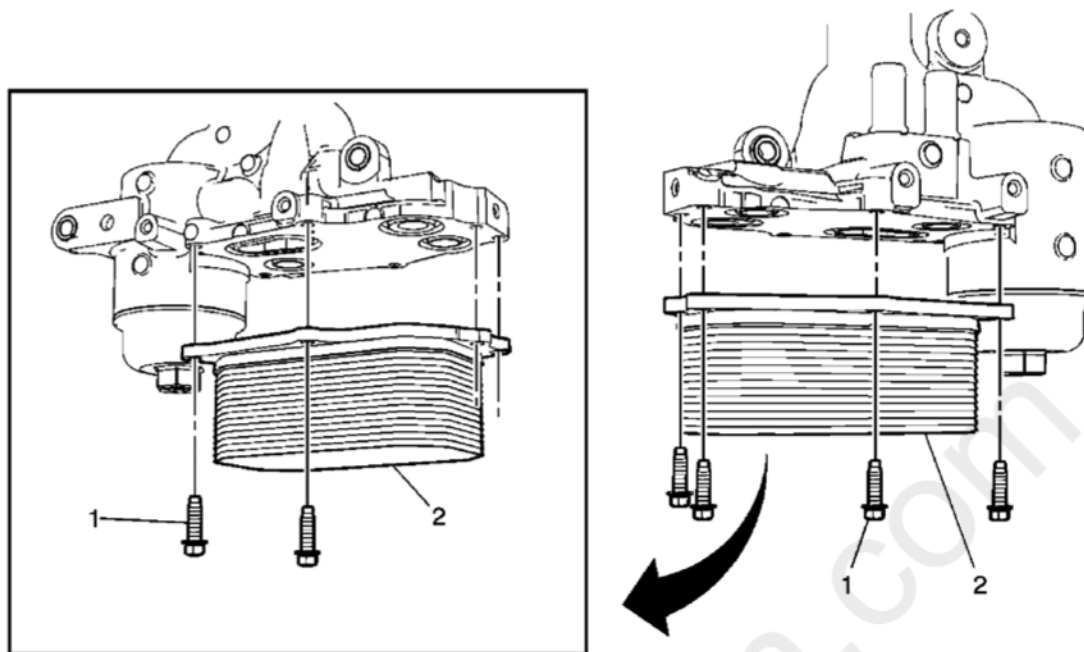


Fig. 61: View Of Engine Oil Cooler

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the engine oil cooler shield. Refer to <u>Engine Oil Cooler Shield Replacement</u> .	
1	Engine Oil Cooler Fastener (Qty 6) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)
2	Engine Oil Cooler Procedure 1. Discard the gasket. Do N T reuse. 2. Transfer components as necessary.

OIL PUMP REPLACEMENT

REMOVAL PROCEDURE

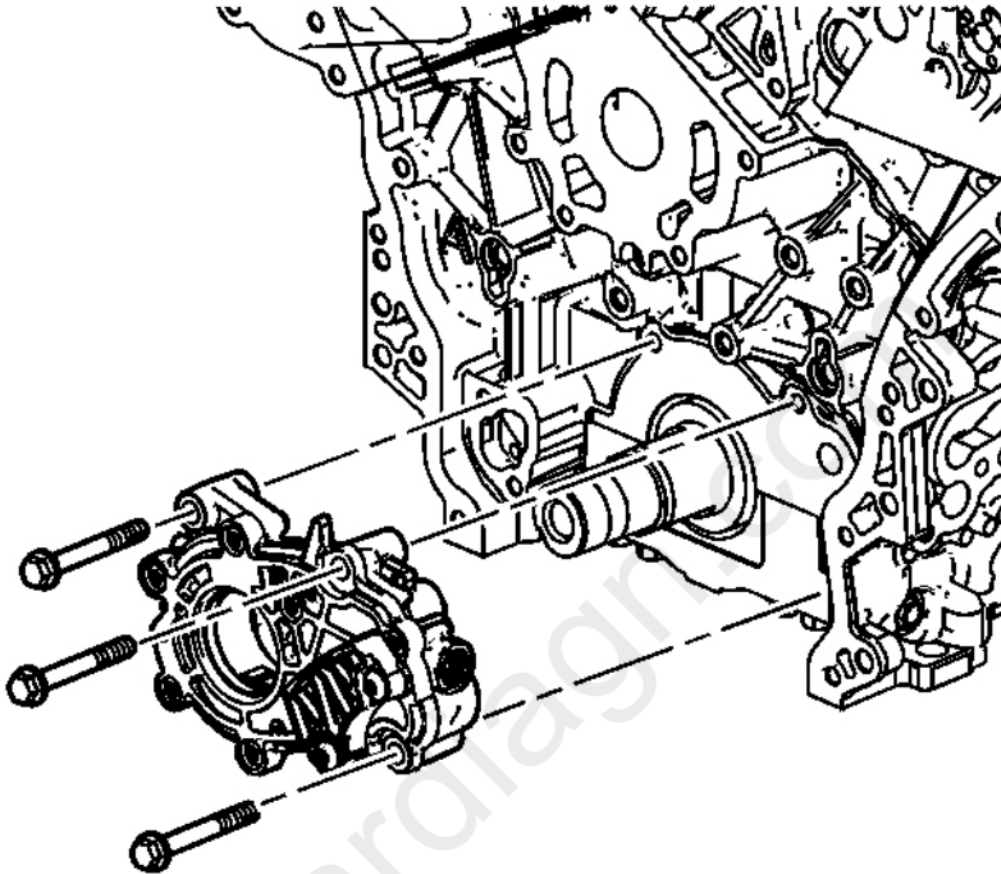


Fig. 6 : View Of Oil Pump & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not remove the left and idler sprockets.

1. Remove the primary timing chain. Refer to Primary Camshaft Drive Chain and Sprockets Replacement.
2. Remove the crankshaft sprocket. Refer to Crankshaft Sprocket Removal.
3. Remove the oil pump bolts and the oil pump.

INSTALLATION PROCEDURE

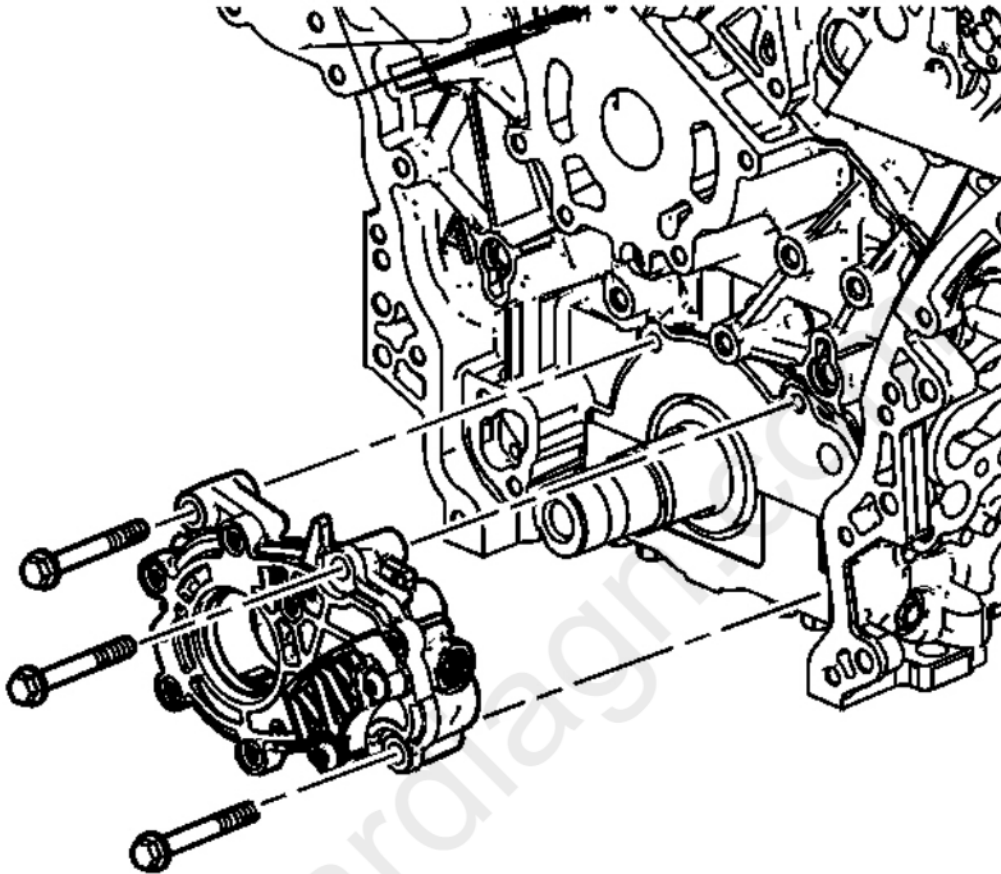


Fig. 63: View Of Oil Pump & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the oil pump and bolts. Refer to **Oil Pump Installation**
2. Install the crankshaft sprocket. Refer to **Crankshaft Sprocket Installation** .
3. Install the primary timing chain. Refer to **Primary Camshaft Drive Chain and Sprockets Replacement** .

OIL PAN REPLACEMENT

SPECIAL TOOLS

EN-46109: Guide Pin Set

For equivalent regional tools, refer to **Special Tools** .

REMOVAL PROCEDURE

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Drain the engine oil and remove the oil filter. Refer to **Engine Oil and Oil Filter Replacement (LF1)** or **Engine Oil and Oil Filter Replacement (LAU)**.
3. Remove the catalytic converter. Refer to **Catalytic Converter Replacement - Left Side (LF1)** .
4. Remove the air conditioning (A/C) compressor bolts and reposition. Refer to **Air Conditioning Compressor Replacement (LF1)** or **Air Conditioning Compressor Replacement (LAU)** .
5. Remove the front cover. Refer to **Engine Front Cover Replacement** .
6. Remove the oil pan to transmission bolts.

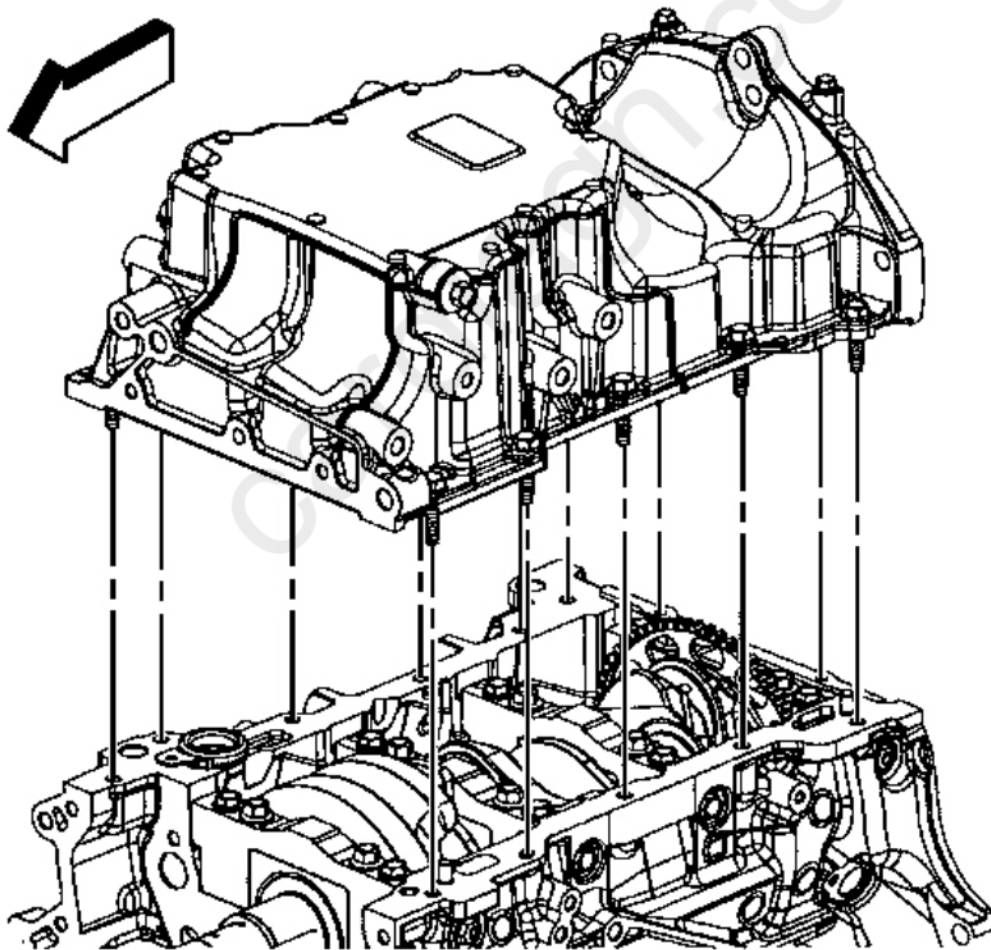


Fig. 64: Locating Oil Pan & Bolts

Courtesy of GENERAL MOTORS CORP.

7. Remove the oil pan bolts.
8. Remove the oil pan.
9. Clean the oil pan and the engine block gasket surface. Refer to Oil Pan Cleaning and Inspection .

INSTALLATION PROCEDURE

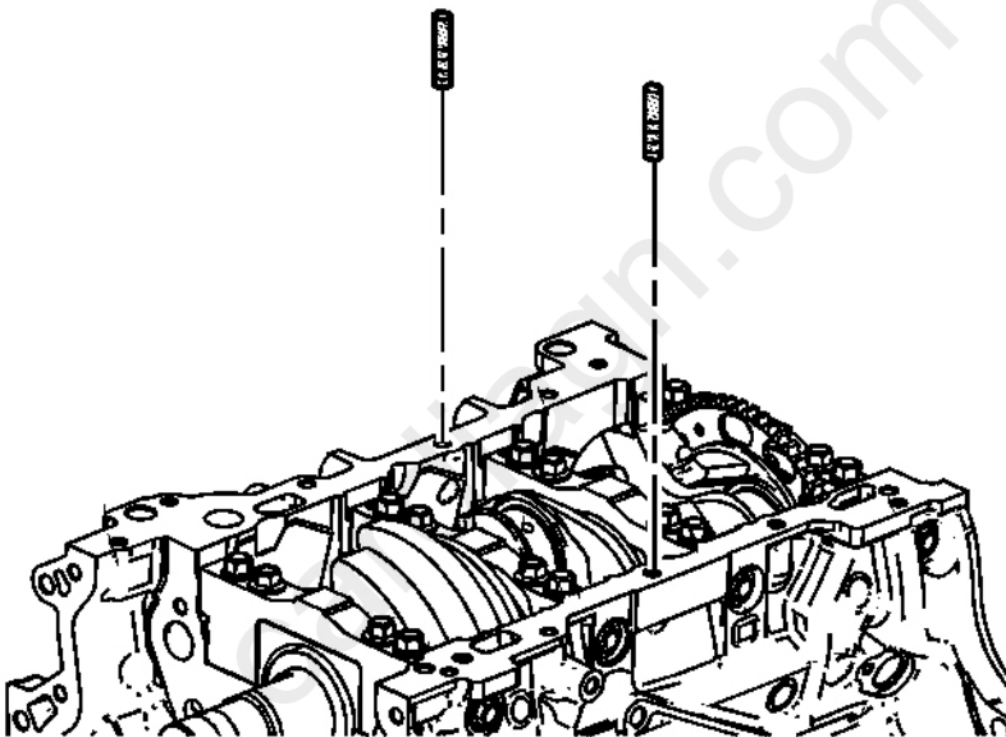


Fig. 65: Identifying Special Tool - EN 46109 Guides
Courtesy of GENERAL MOTORS CORP.

1. Install the 8 mm (0.315 in) guides from the **EN-46109**: set into the center oil pan rail bolt hole on each side of the engine block.

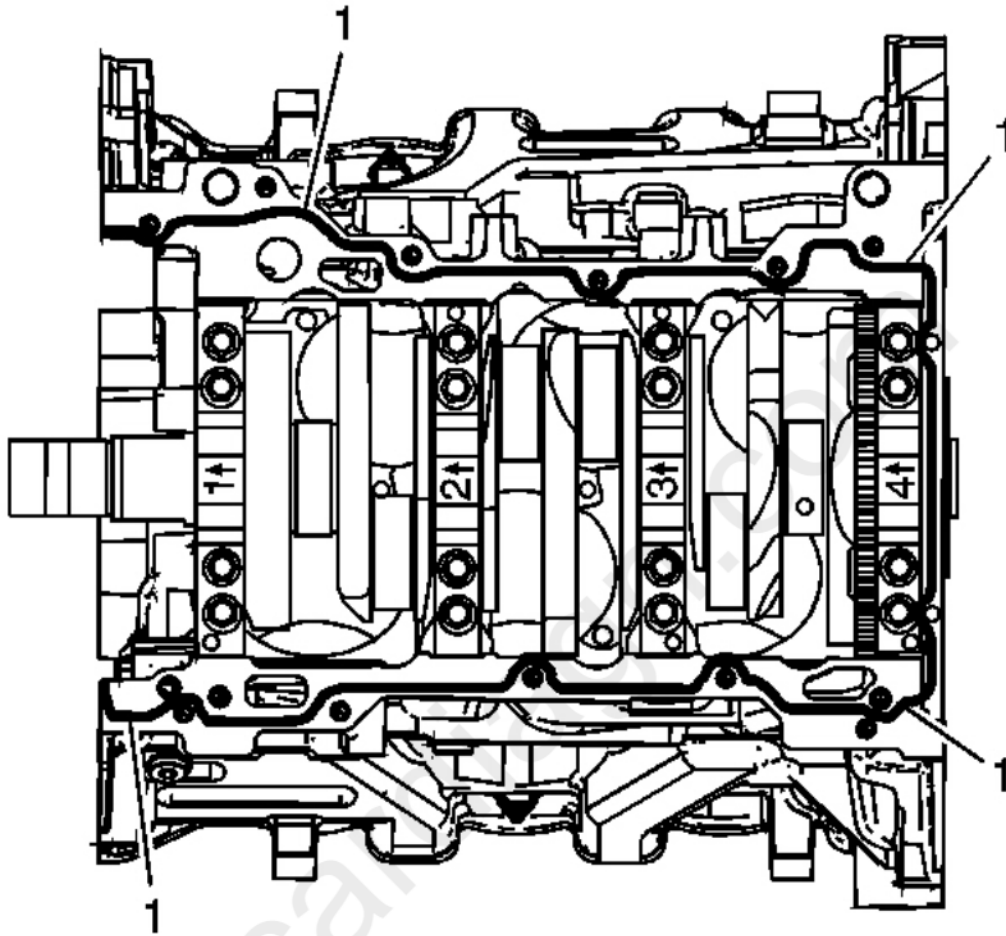


Fig. 66: Identifying Sealant Application Locations On Block Pan Rail & Crankshaft Rear Oil Seal Housing

Courtesy of GENERAL MOTORS CORP.

2. Place a 3 mm (0.118 in) bead (1) of RTV sealant, on the block pan rail and the crankshaft rear oil seal housing.

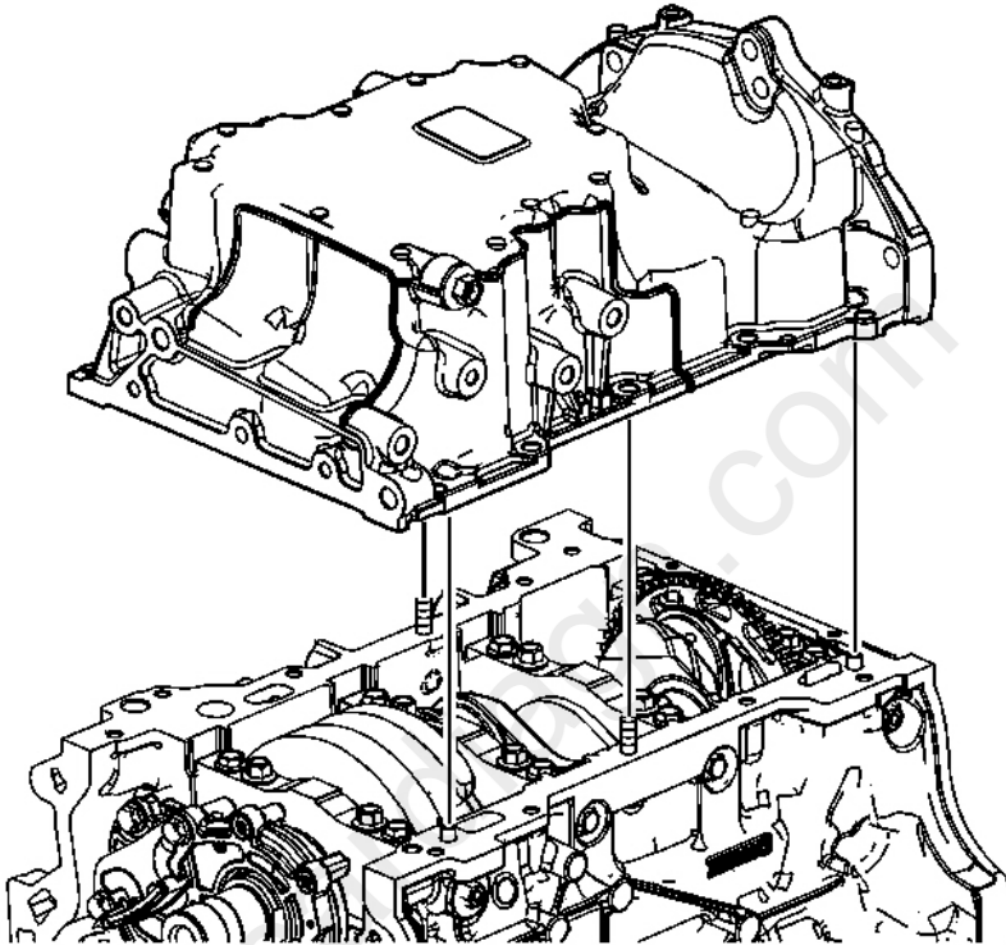


Fig. 67: View Of Oil Pan

Courtesy of GENERAL MOTORS CORP.

3. Position the oil pan onto the block.

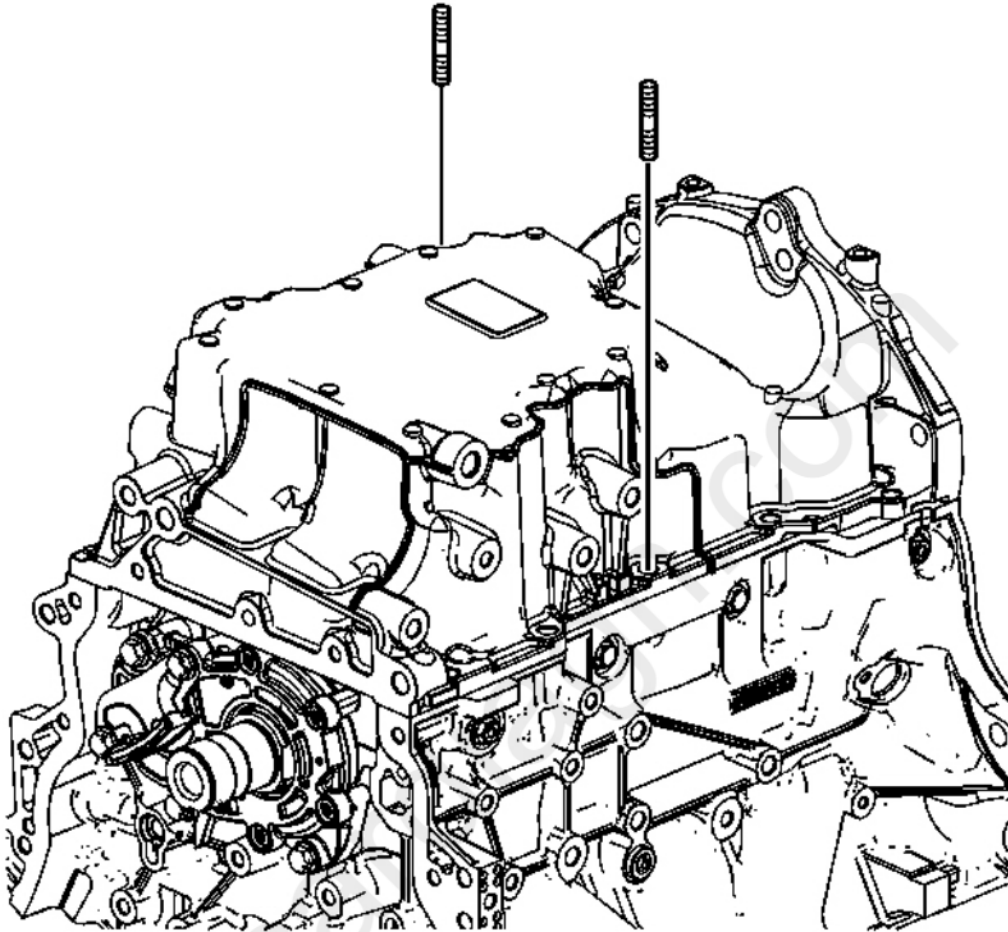


Fig. 6 : Identifying Special Tools - EN 461
Courtesy of GENERAL MOTORS CORP.

4. Remove the **EN-461** : set mm (0.315 in) guides from the engine block.

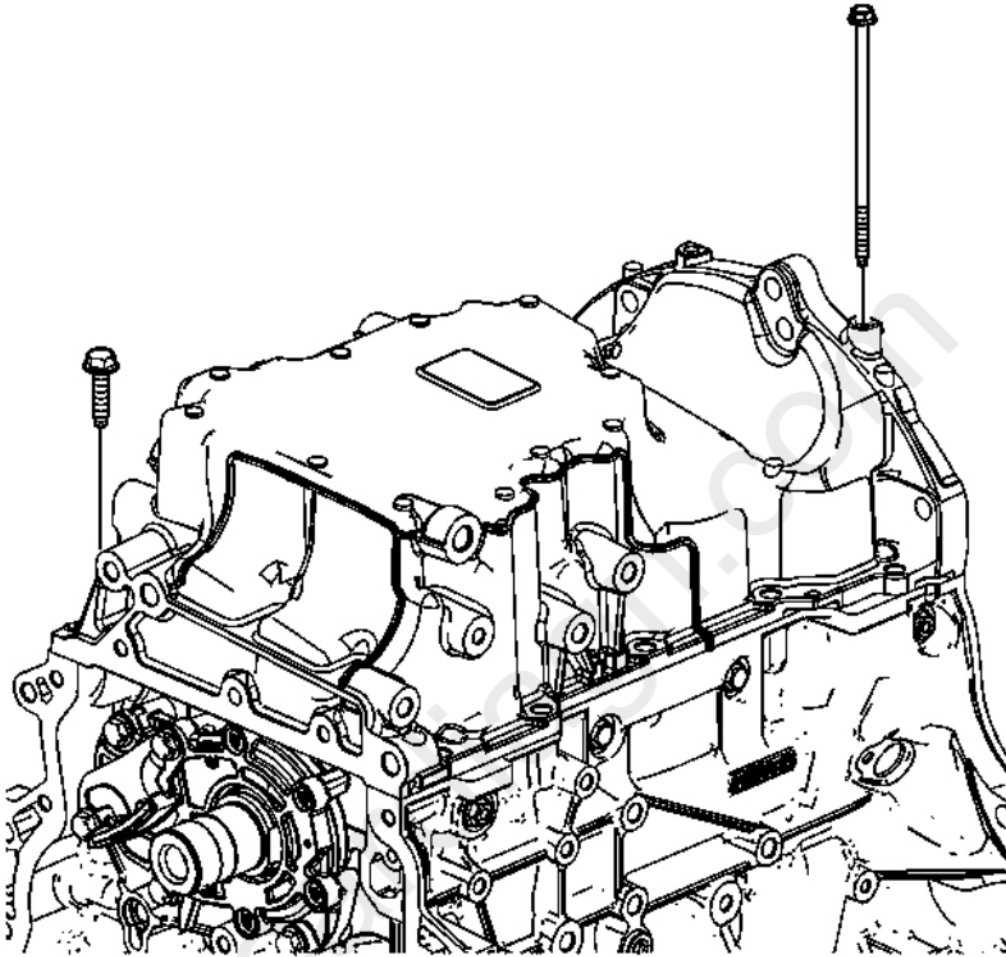


Fig. 6 : Locating Oil Pan Bolts
Courtesy of GENERAL MOTORS CORP.

5. Loosely install the oil pan bolts.

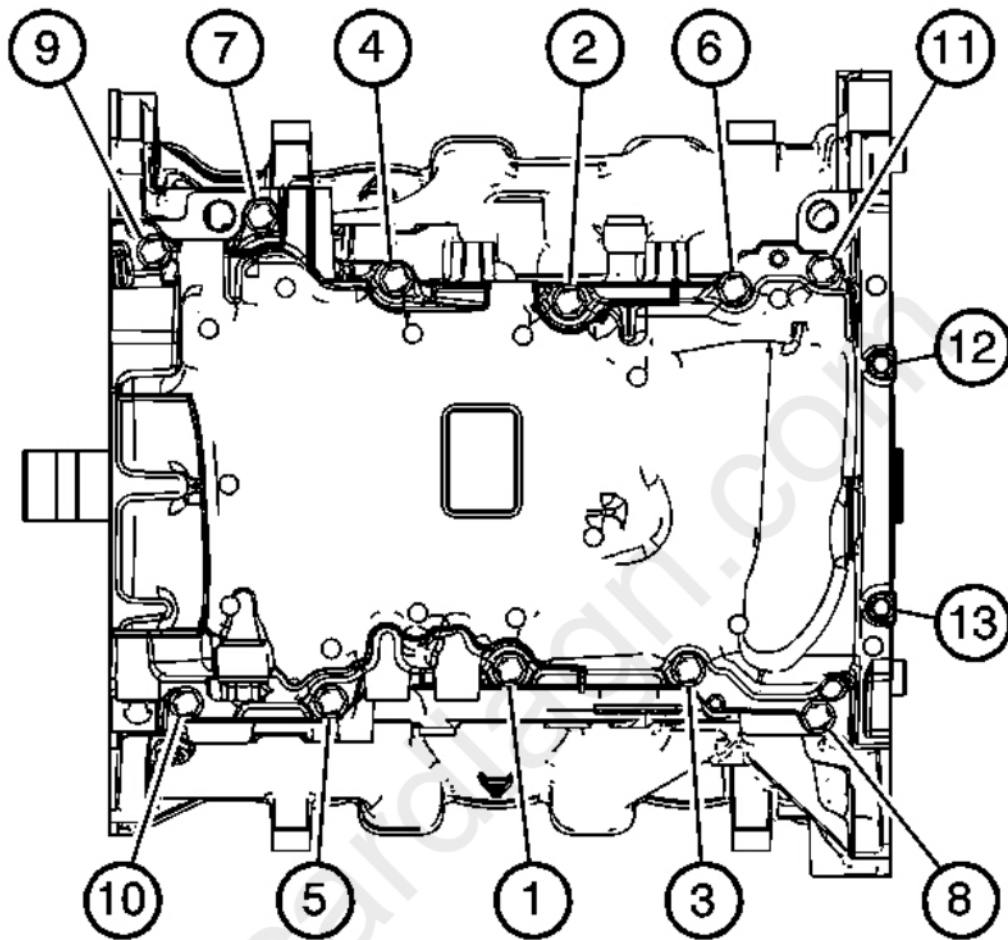


Fig. 7 : Identifying Oil Pan Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

6. Tighten the oil pan bolts in sequence.
 1. The 11 mm bolts (1-11) to 23 N.m (17 lb ft).
 2. The 6 mm bolts (12, 13) to 10 N.m (7 lb in).
7. Install engine front cover. Refer to Engine Front Cover Replacement .
8. Install the air conditioning () compressor. Refer to Air Conditioning Compressor Replacement LF1 or Air Conditioning Compressor Replacement LAU .

- . Install the catalytic converter. Refer to Catalytic Converter Replacement - Left Side LF1 .
10. Lower the vehicle. Refer to Lifting and Jacking the Vehicle .
11. Refill the engine oil. Refer to Engine Oil and Oil Filter Replacement LF1 or Engine Oil and Oil Filter Replacement LAU .

ENGINE OIL PRESSURE SENSOR AND/OR SWITCH REPLACEMENT (LF1)

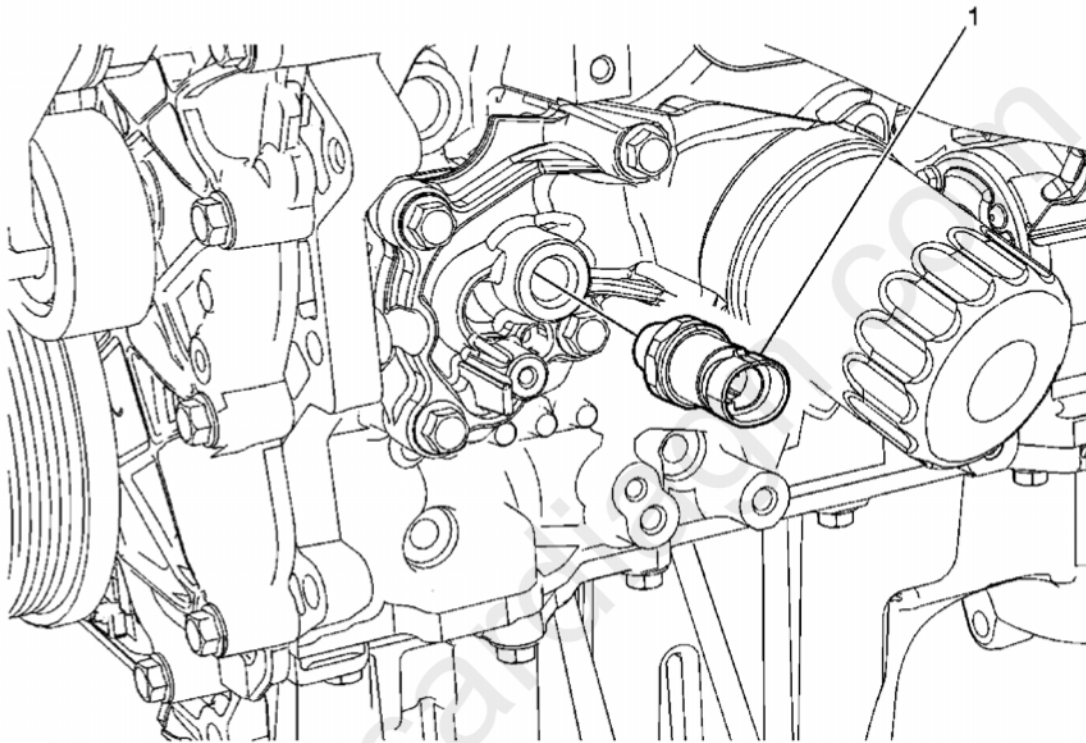


Fig. 71: Identifying Engine Oil Pressure Sensor And Or Switch LF1
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the generator. Refer to <u>Generator Replacement LF1</u> or <u>Generator Replacement LAU</u> .	
1	Engine Oil Pressure Sensor and or Switch CAUTION: Refer to <u>Component Fastener Tightening Caution</u> . Procedure 1. Disconnect the oil pressure sensor electrical connector. 2. Transfer components as necessary.

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Tighten: 20 N.m (15 lb ft)

Special Tools:

EN-41712: Oil Pressure Switch Socket

For equivalent regional tools, refer to **Special Tools** .

ENGINE OIL PRESSURE SENSOR AND/OR SWITCH REPLACEMENT (LAU)

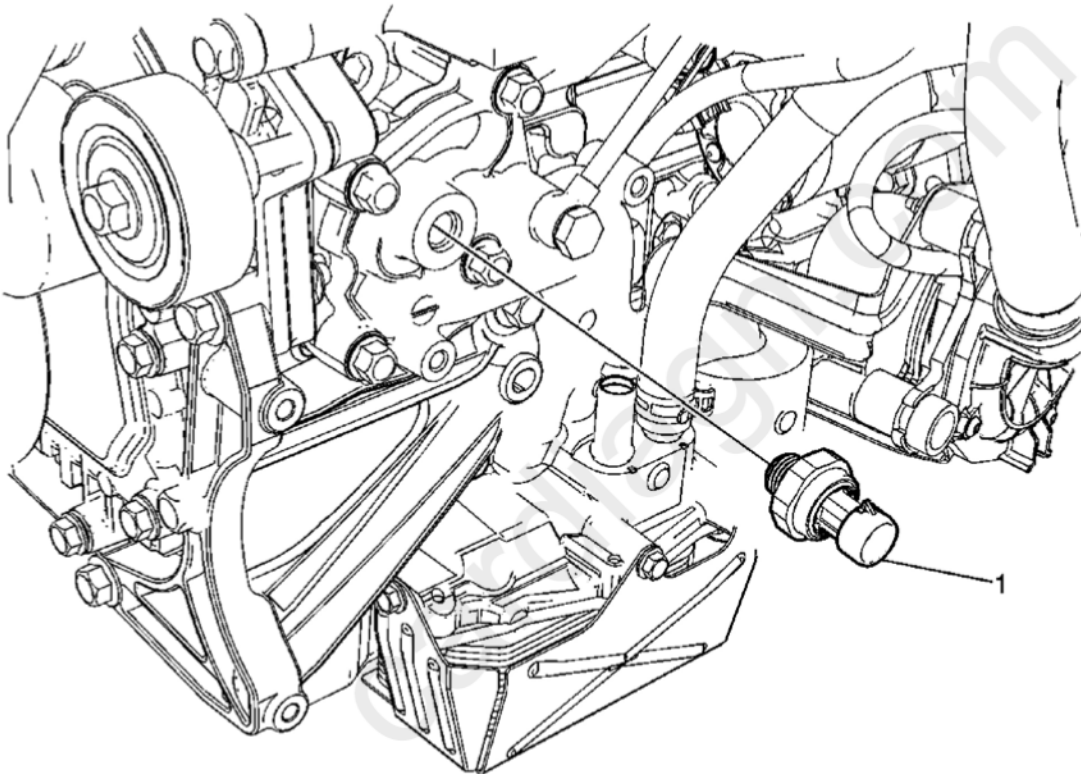


Fig. 72: Identifying Engine Oil Pressure Sensor And Or Switch LAU
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the generator. Refer to Generator Replacement LF1 or Generator Replacement LAU .	
	Engine Oil Pressure Sensor and or Switch
	CAUTION: Refer to Fastener Caution .
	Procedure

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1

1. Disconnect the oil pressure sensor electrical connector.
2. Transfer components as necessary.

Tighten: 20 N.m (15 lb ft)

Special Tools:

EN-41712: Oil Pressure Switch Socket

For equivalent regional tools, refer to **Special Tools** .

OIL PUMP SUCTION PIPE AND SCREEN ASSEM L REPLACEMENT

REMOVAL PROCEDURE

1. Remove the oil pan. Refer to **Oil Pan Replacement**.

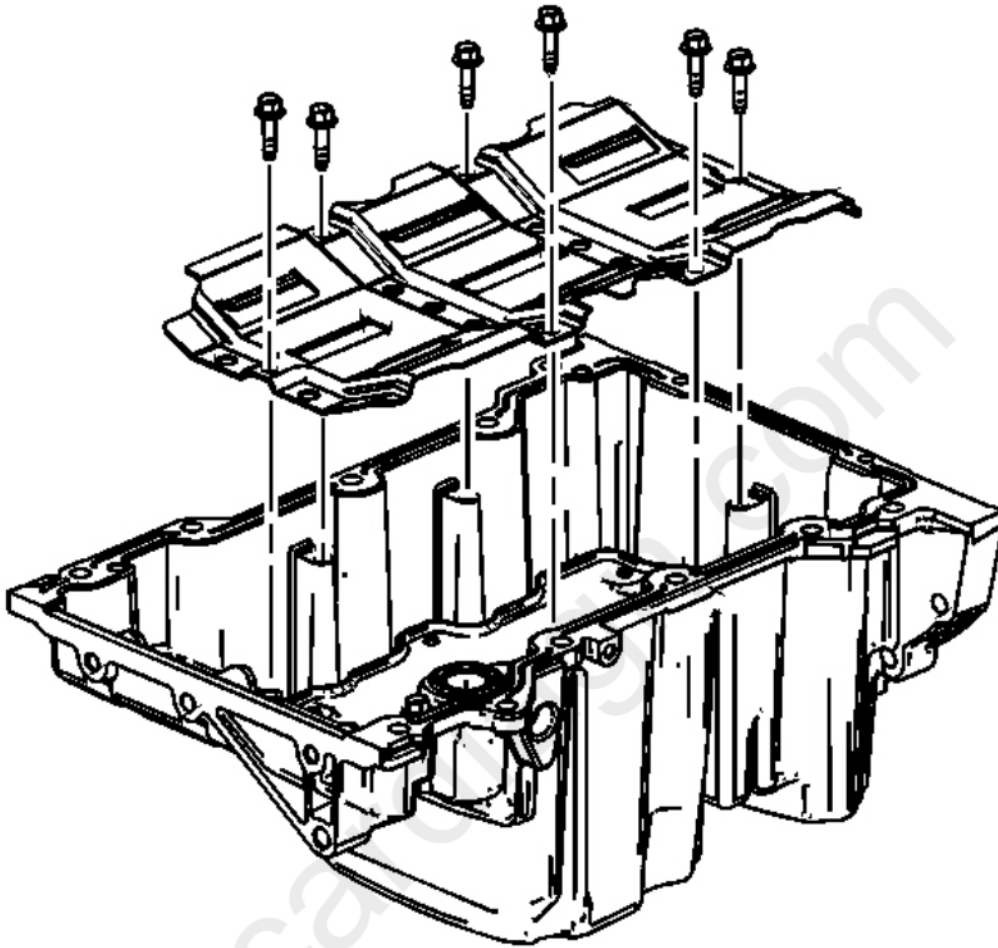


Fig. 73: View Of Oil Pan Scraper And Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the oil pan scraper bolts.
3. Remove the oil pan scraper.

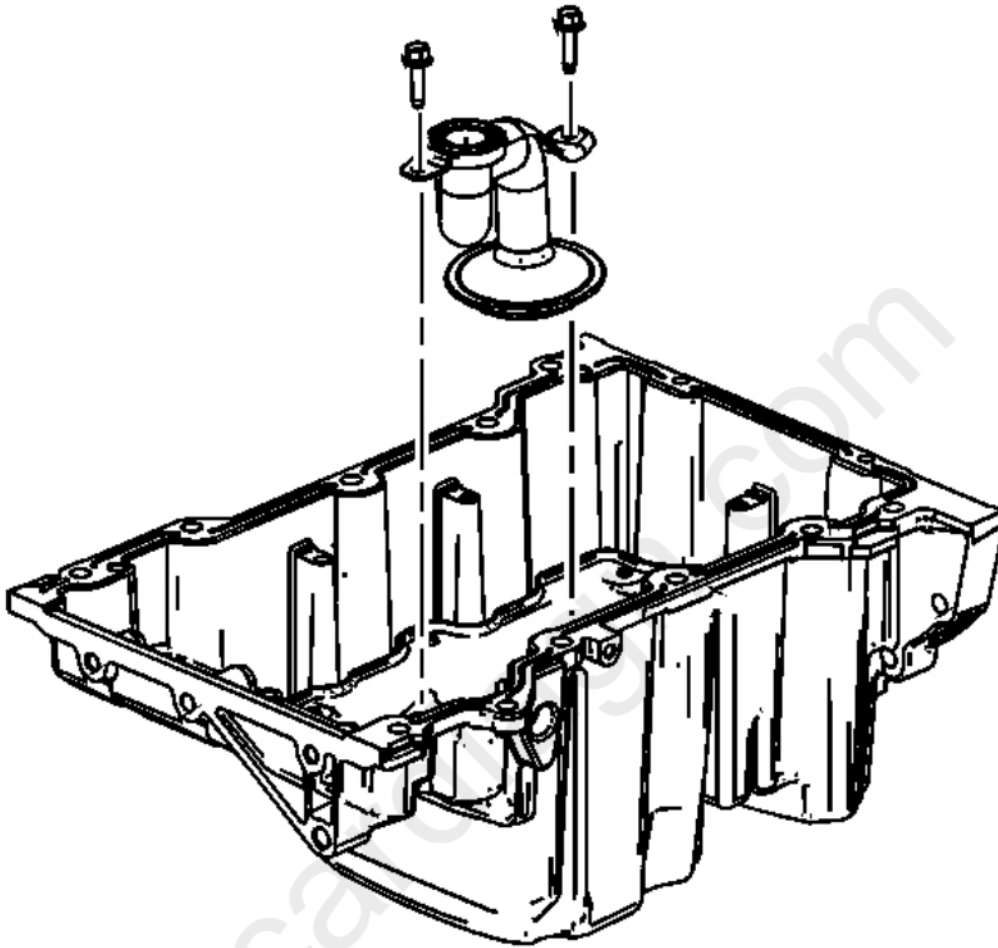


Fig. 74: View Of Oil Suction Pipe
Courtesy of GENERAL MOTORS CORP.

4. Remove the oil suction pipe bolts.
5. Remove the oil suction pipe.

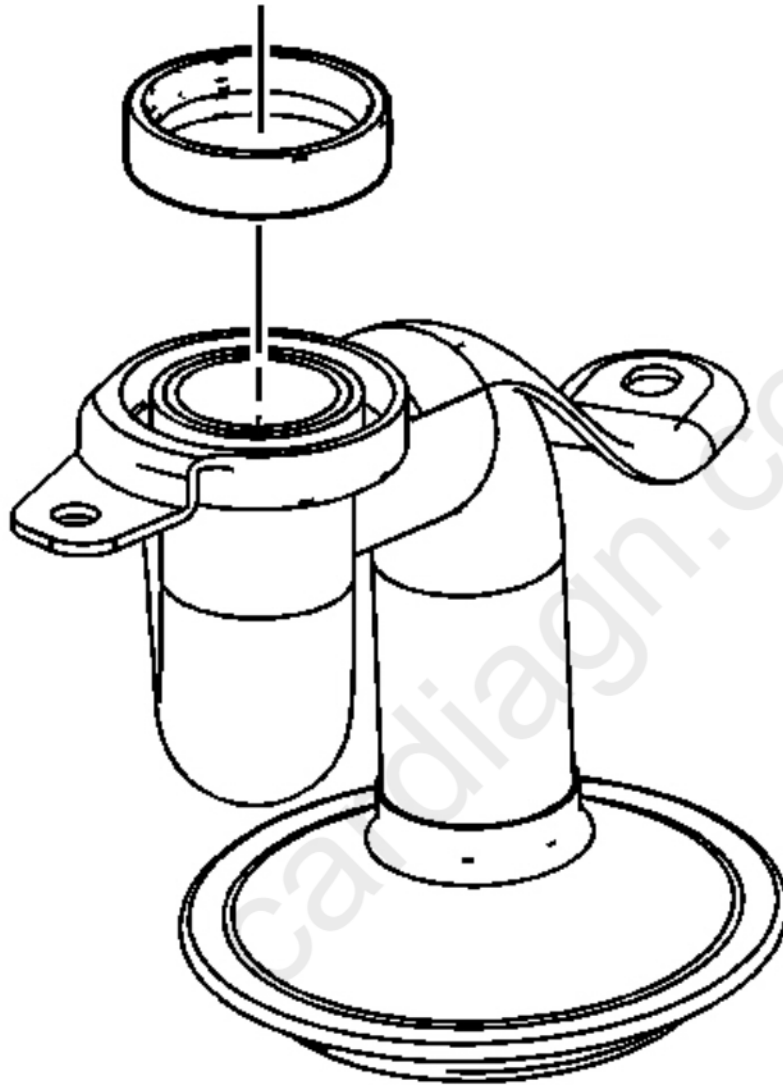


Fig. 75: View Of Oil Suction Tube Seal & Oil Suction Tube
Courtesy of GENERAL MOTORS CORP.

6. Remove the oil suction tube seal from the oil suction tube. Discard the oil suction tube seal.

INSTALLATION PROCEDURE

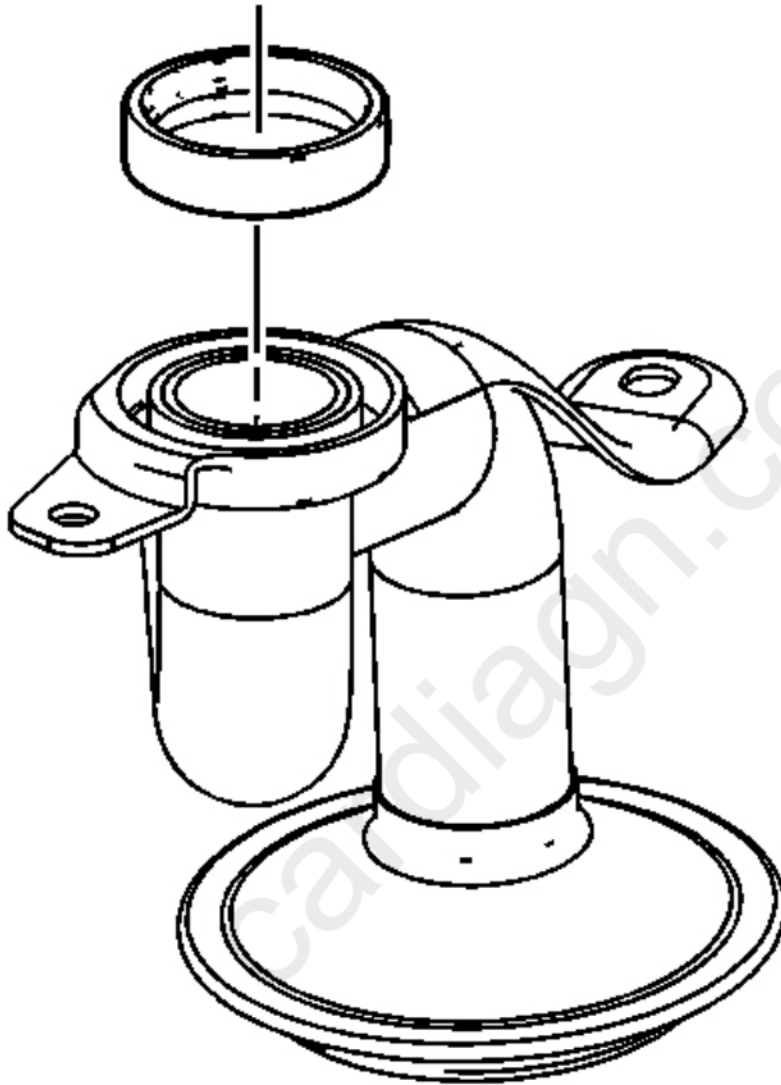


Fig. 76: View Of Oil Suction Tube Seal & Oil Suction Tube
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW oil suction tube seal onto the oil suction tube. DO NOT reuse the old oil suction tube seal.

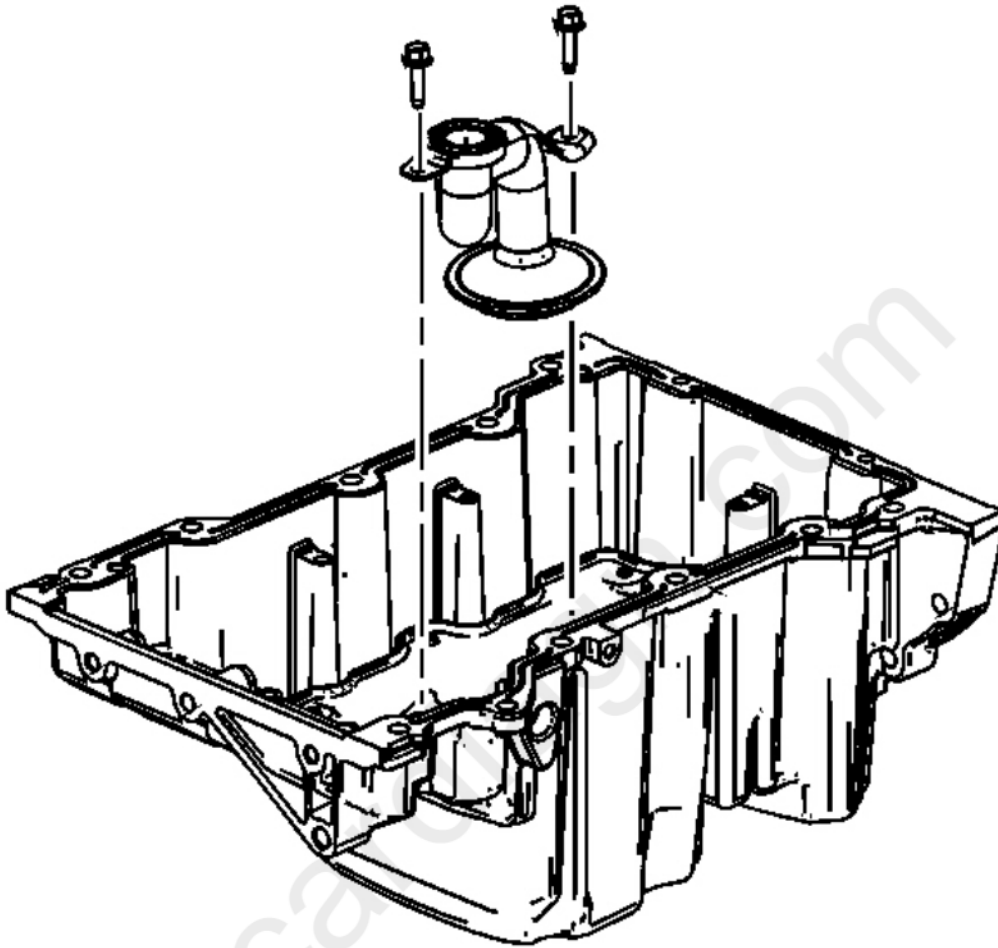


Fig. 77: View Of Oil Suction Pipe
Courtesy of GENERAL MOTORS CORP.

2. Install the oil suction pipe.

CAUTION: Refer to Fastener Caution .

3. Install the oil suction pipe bolts and tighten to 10 N.m (89 lb in).

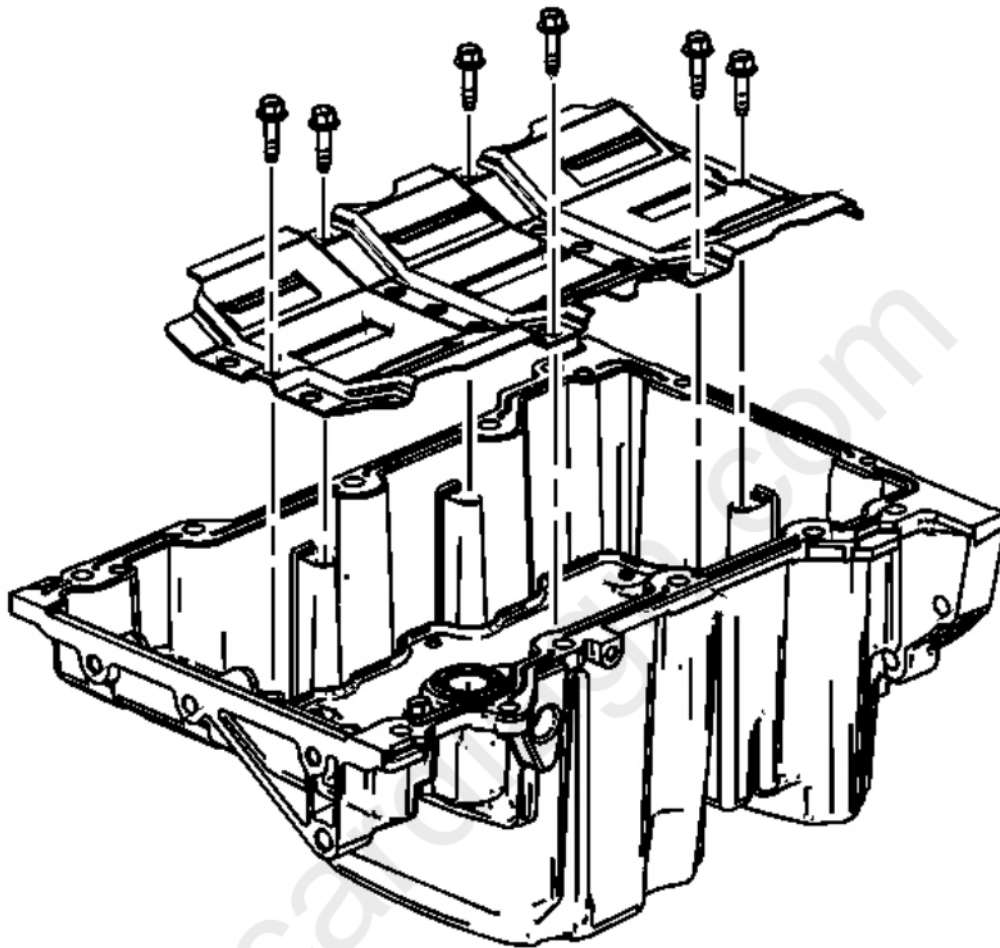


Fig. 78: View Of Oil Pan Scraper And Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the oil pan scraper.
5. Install the oil pan scraper bolts and tighten to 10 N.m (89 lb in).
6. Install the oil pan. Refer to **Oil Pan Replacement**.

ENGINE OIL COOLER SHIELD REPLACEMENT

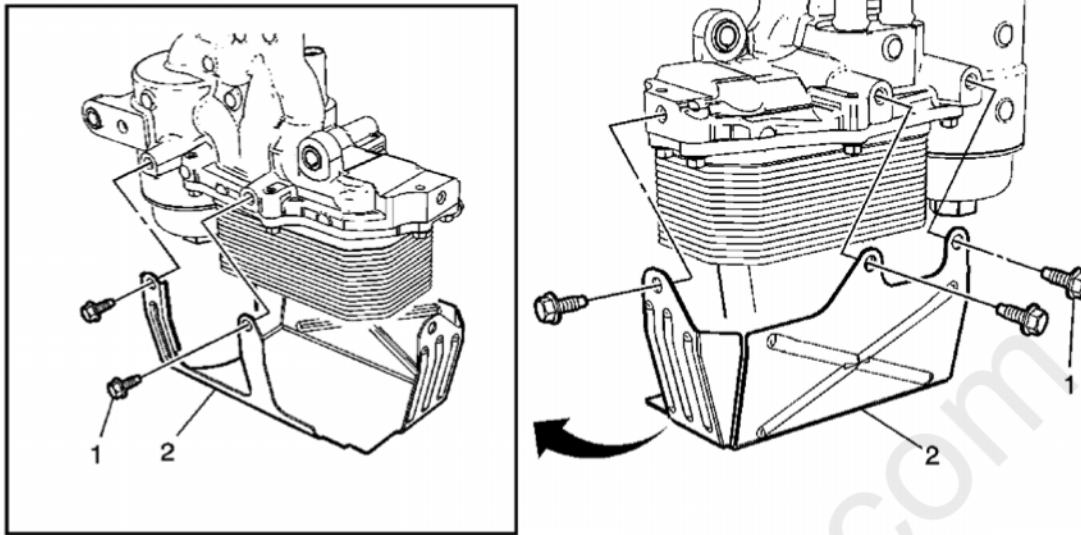


Fig. 7 : Identifying Engine Oil Cooler Shield
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the oil filter adapter and oil cooler assembly. Refer to <u>Oil Filter Upper End Plate Replacement</u> .	
1	Engine Oil Cooler Shield Fastener (Qty 5) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 9 N.m (80 lb in)
2	Engine Oil Cooler Shield Procedure: Transfer components as necessary.

ENGINE REPLACEMENT

REMOVAL PROCEDURE

1. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection .
2. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement .
3. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
4. Remove the radiator air lower deflector. Refer to Radiator Air Lower Deflector Replacement .
5. Drain the cooling system. Refer to Cooling System Draining and Filling (Static Fill LF1) or Cooling

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System Draining and Filling - Vac-N-Fill (GE 47716) or Cooling System Draining and Filling (Static Fill LAU) .

6. Drain the engine oil. Refer to Engine Oil and Oil Filter Replacement (LF1) or Engine Oil and Oil Filter Replacement (LAU).
7. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement (LF1) or Air Cleaner Assembly Replacement (LAU) .
8. Remove the battery and battery box. Refer to Battery Replacement .
9. Disconnect the transmission shifter cable.
10. Disconnect the wiring harness from the underhood junction block. Refer to Accessory Wiring Junction Block Replacement .
11. Disconnect the radiator outlet hose from the engine. Refer to Radiator Outlet Hose Replacement (LF1) or Radiator Outlet Hose Replacement (LAU) .
12. Disconnect the radiator inlet hose from the engine. Refer to Radiator Inlet Hose Replacement (LF1) or Radiator Inlet Hose Replacement (LAU) .
13. Disconnect the generator positive cable. Refer to Generator Replacement (LF1) or Generator Replacement (LAU) .
14. Remove right side front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement .
15. Remove the right side engine mount. Refer to Engine Mount Replacement - Right Side .
16. Place block of wood between engine and frame, allow engine to rest on the frame.
17. Remove the A/C compressor. D N T discharge the A/C system. Support the compressor. Refer to Air Conditioning Compressor Replacement (LF1) or Air Conditioning Compressor Replacement (LAU) .
18. Remove the radiator surge tank. Refer to Radiator Surge Tank Replacement (LF1) or Radiator Surge Tank Replacement (LAU) .
19. Remove the radiator inlet hose. Refer to Radiator Inlet Hose Replacement (LF1) or Radiator Inlet Hose Replacement (LAU) .
20. Remove the radiator outlet hose. Refer to Radiator Outlet Hose Replacement (LF1) or Radiator Outlet Hose Replacement (LAU) .
21. Disconnect the fuel feed line. Refer to Fuel Feed Pipe Replacement .
22. Disconnect the fuel evaporative emission (EVAP) line.
23. Disconnect the transmission fluid cooler Inlet pipe. Refer to Transmission Fluid Cooler Inlet Pipe Replacement .
24. Disconnect the transmission fluid cooler outlet pipe. Refer to Transmission Fluid Cooler Outlet Pipe Replacement .
25. Remove the catalytic converter left side. Refer to Catalytic Converter Replacement - Left Side (LF1) .
26. Remove the catalytic converter right side. Refer to Catalytic Converter Replacement - Right Side (LF1) .
27. Remove the starter. Refer to Starter Replacement (LF1) or Starter Replacement (LAU) .
28. Mark torque converter to flywheel relationship.
29. Remove the torque converter bolts. Rotate engine clockwise only by the crank balancer bolt.
30. Remove both outer tie rods from the steering knuckles. Refer to Steering Linkage Outer Tie Rod

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Replacement

31. Remove the stabilizer shaft link. Refer to **Stabilizer Shaft Link Replacement**

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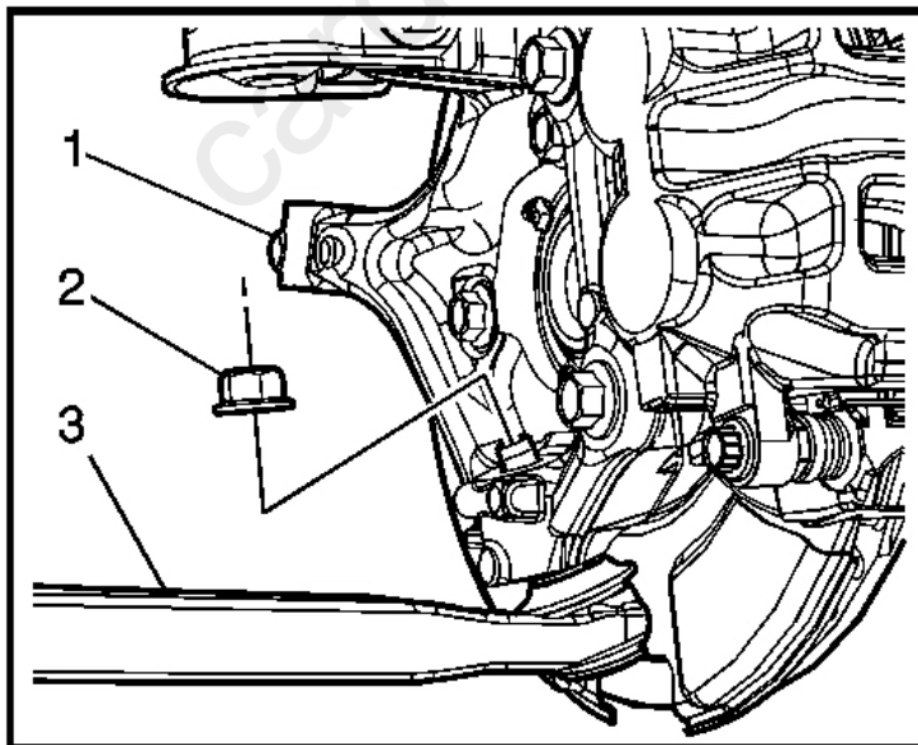
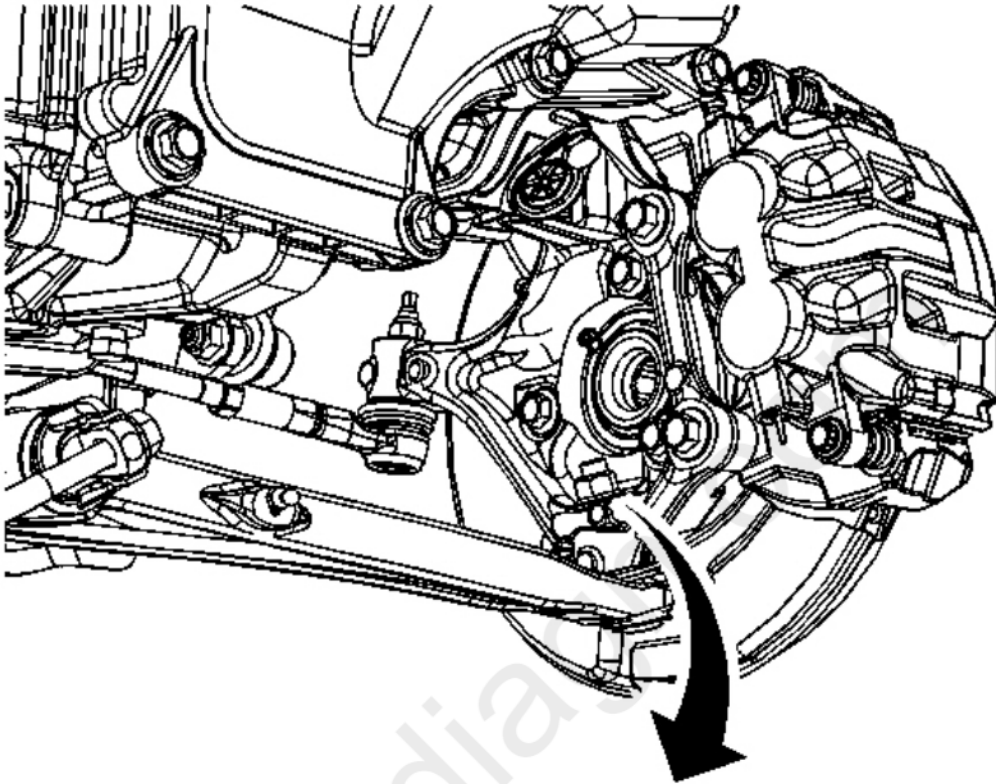


Fig. 80: Locating Lower Ball Joint Fastener
Courtesy of GENERAL MOTORS CORP.

32. Disconnect the lower ball joints from the knuckle.
33. Remove the wheel drive shafts from the hub/bearing assemblies.
34. Remove the propeller shaft (AWD if equipped). Refer to **Front Wheel Drive Shaft Replacement - Left Side**.
35. Remove the propeller shaft (AWD if equipped). Refer to **Front Wheel Drive Shaft Replacement - Right Side**.
36. Disconnect the power steering cooler lines from the cooler.
37. Disconnect and reposition harnesses as required.

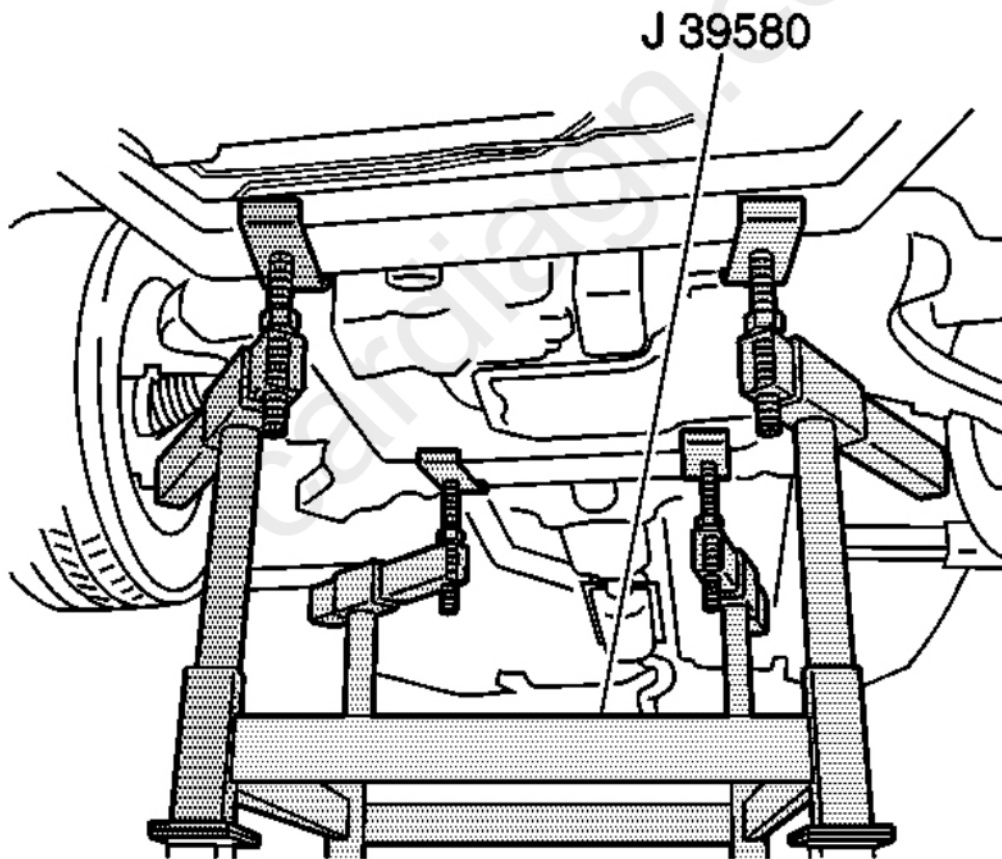


Fig. 81: Identifying Utility Stand
Courtesy of GENERAL MOTORS CORP.

38. Position engine support table under vehicle and allow vehicle frame to contract table.

39. Remove the engine frame reinforcement bolts
40. Remove the engine from to the body bolts.
41. Raise vehicle away from powertrain.
42. Remove the power steering pump and position aside. Refer to **Power Steering Pump Replacement** .
43. Attach engine lift hooks **EN-46114-1**: To cylinder heads.
44. Attach appropriate engine hoist to the lift hooks and apply tension
45. Remove the front transmission mount from the engine. Refer to **Transmission Front Mount Replacement** .
46. Remove the rear transmission mount through bolt
47. Lift the powertrain assembly off the frame and place on the floor.
48. Separate the engine from the transmission.
49. Disconnect electrical connectors as necessary.
50. Transfer parts as necessary.

INSTALLATION PROCEDURE

1. Align the engine to the transmission.
2. Install the powertrain assembly to the vehicle.
3. Install the cradle bolts. Refer to **Drivetrain and Front Suspension Frame Replacement** .
4. Remove the engine support table.
5. Remove the wood blocks from the cradle.
6. Install the lower transaxle-to-engine bolts and tighten to 75 N.m (55 lb ft).
7. For AWD, install the transfer case. Refer to **Transfer Case Replacement** .
8. For AWD, install the propeller shaft. Refer to **Propeller Shaft Replacement** .
9. Install the torque convertor-to-flywheel bolts and tighten to 62 N.m (46 lb ft).
10. Install the torque convertor inspection cover and tighten the bolts to 12 N.m (106 lb in).
11. Install the left and right axle shaft nuts. Refer to **Front Wheel Drive Shaft Replacement - Left Side** and **Front Wheel Drive Shaft Replacement - Right Side** .
12. Install the left and right stabilizer bar links. Refer to **Stabilizer Shaft Link Replacement** .
13. Install the left and right tie rod ends to the steering knuckles. Refer to **Steering Linkage Outer Tie Rod Replacement** .
14. Connect the left and right lower ball joints. Refer to **Lower Control Arm Replacement** .
15. Connect the steering shaft coupling from the steering gear. Refer to **Intermediate Steering Shaft Replacement** .
16. Install the start. Refer to **Starter Replacement (LF1)** or **Starter Replacement (LAU)**
17. Connect the transmission cooler lines to the transmission.
18. install the radiator outlet hose. Refer to **Radiator Outlet Hose Replacement (LF1)** or **Radiator Outlet Hose Replacement (LAU)**
19. install the radiator inlet hose. Refer to **Radiator Inlet Hose Replacement (LF1)** or **Radiator Inlet Hose Replacement (LAU)**

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20. Install the radiator surge tank. Refer to **Radiator Surge Tank Replacement (LF1)** or **Radiator Surge Tank Replacement (LAU)**
21. Connect the transmission fluid cooler Inlet pipe. Refer to **Transmission Fluid Cooler Inlet Pipe Replacement**
22. Install the A/C compressor. Refer to **Air Conditioning Compressor Replacement (LF1)** or **Air Conditioning Compressor Replacement (LAU)** .
23. Install the power steering pump. Refer to **Power Steering Pump Replacement** .
24. Install the front tires. Refer to **Tire and Wheel Removal and Installation** .
25. Lower the vehicle.
26. Install the fuel EVAP line.
27. Connect the fuel feed line. Refer to **Fuel Feed Pipe Replacement** .
28. Install the starter positive cable and tighten to 10 N.m (89 lb in).
29. Connect the coolant reservoir hose from the engine to reservoir.
30. Connect the A/C high pressure switch harness.
31. Connect the generator positive cable and nut and tighten to 12 N.m (106 lb in).
32. Install the ECM. Refer to **Engine Control Module Replacement** .
33. Fill the vehicle with coolant. Refer to **Cooling System Draining and Filling (Static Fill LF1)** or **Cooling System Draining and Filling - Vac-N-Fill (GE 47716)** or **Cooling System Draining and Filling (Static Fill LAU)** .
34. Fill the vehicle with engine oil. Refer to **Engine Oil and Oil Filter Replacement (LF1)** or **Engine Oil and Oil Filter Replacement (LAU)**.
35. Connect the wiring harness to the underhood junction block. Refer to **Accessory Wiring Junction Block Replacement** .
36. Connect the transmission shifter cable.
37. Install the battery box and battery. Refer to **Battery Replacement** .
38. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement (LF1)** or **Air Cleaner Assembly Replacement (LAU)** .
39. Install the intake manifold cover. Refer to **Intake Manifold Cover Replacement** .
40. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection** .
41. Perform the throttle learn procedure. Refer to **Throttle/Idle Learn (LF1, LFW)** or **Throttle/Idle Learn (Without LF1, LFW)** .

ENGINE OIL AND OIL FILTER REPLACEMENT (LF1)

REMOVAL PROCEDURE

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Place a drain pan under the oil pan drain plug.
3. Remove the oil pan drain plug. Allow the oil to drain completely.

CAUTION: Refer to **Fastener Caution** .

4. Install the oil pan drain plug and tighten to 20 N.m (15 lb ft).

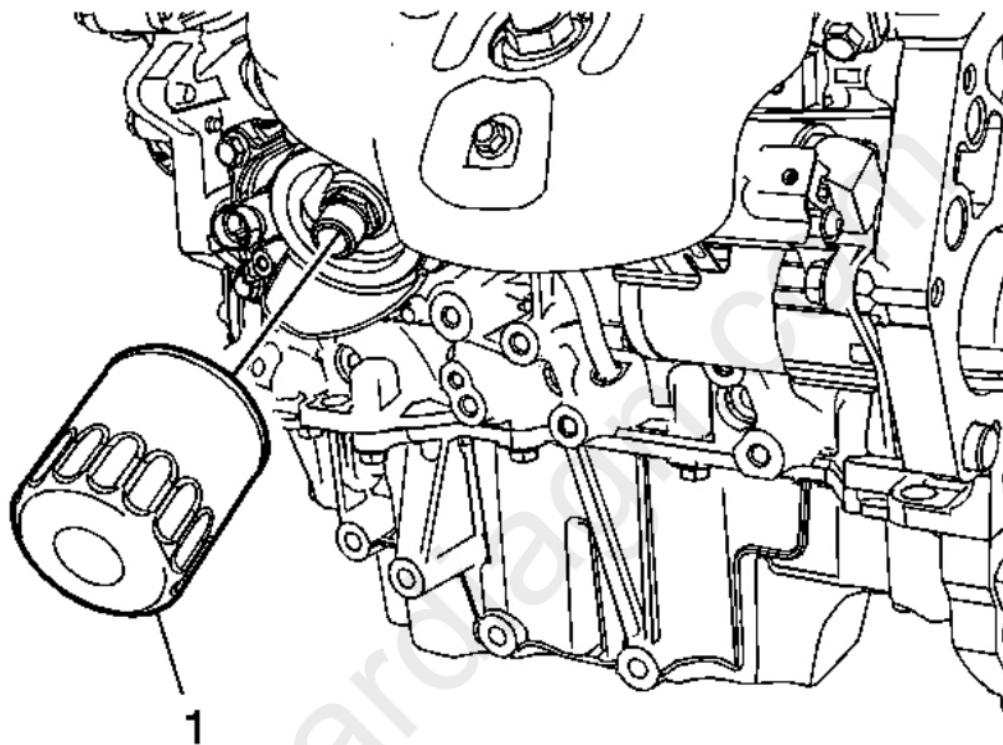


Fig. 82: Identifying Oil Filter

Courtesy of GENERAL MOTORS CORP.

WARNING: Refer to Hot Exhaust System Warning .

5. Place the drain pan under the oil filter (1).
6. Remove the oil filter. Allow the oil to drain completely.

INSTALLATION PROCEDURE

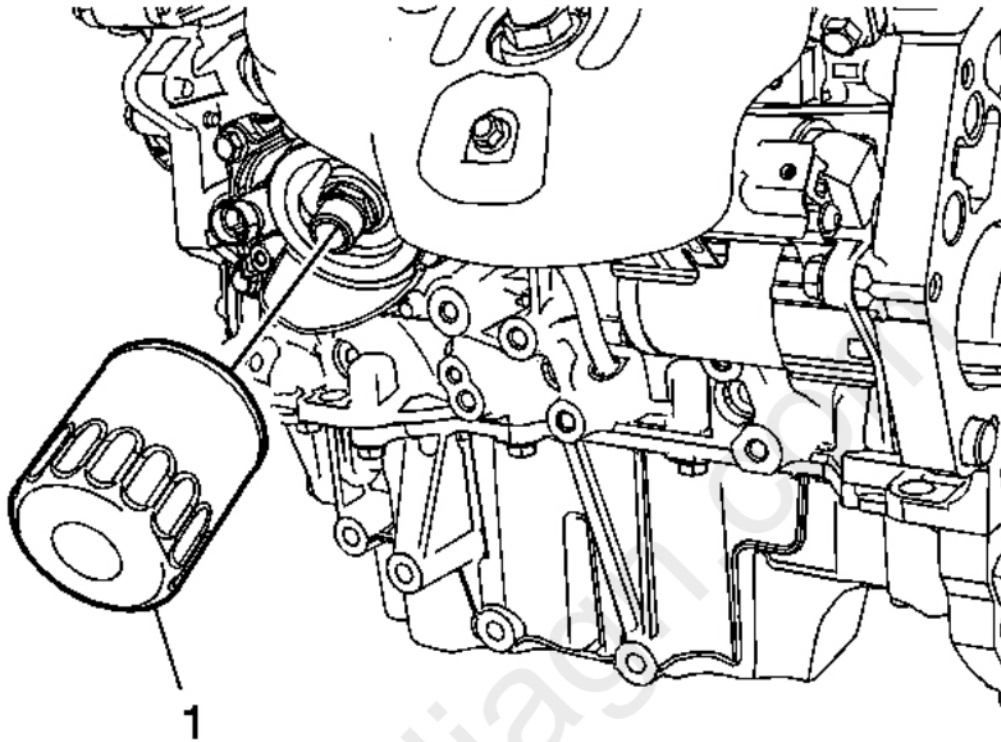


Fig. 83: Identifying Oil Filter

Courtesy of GENERAL MOTORS CORP.

1. Lubricate the NEW oil filter gasket with clean engine oil.
2. Tighten the oil filter (1) to 30 N.m (22 lb ft).
3. Lower the vehicle.
4. Refill the engine oil. Refer to Approximate Fluid Capacities .
5. Start the engine and inspect for leaks.

ENGINE OIL AND OIL FILTER REPLACEMENT (LAU)

REMOVAL PROCEDURE

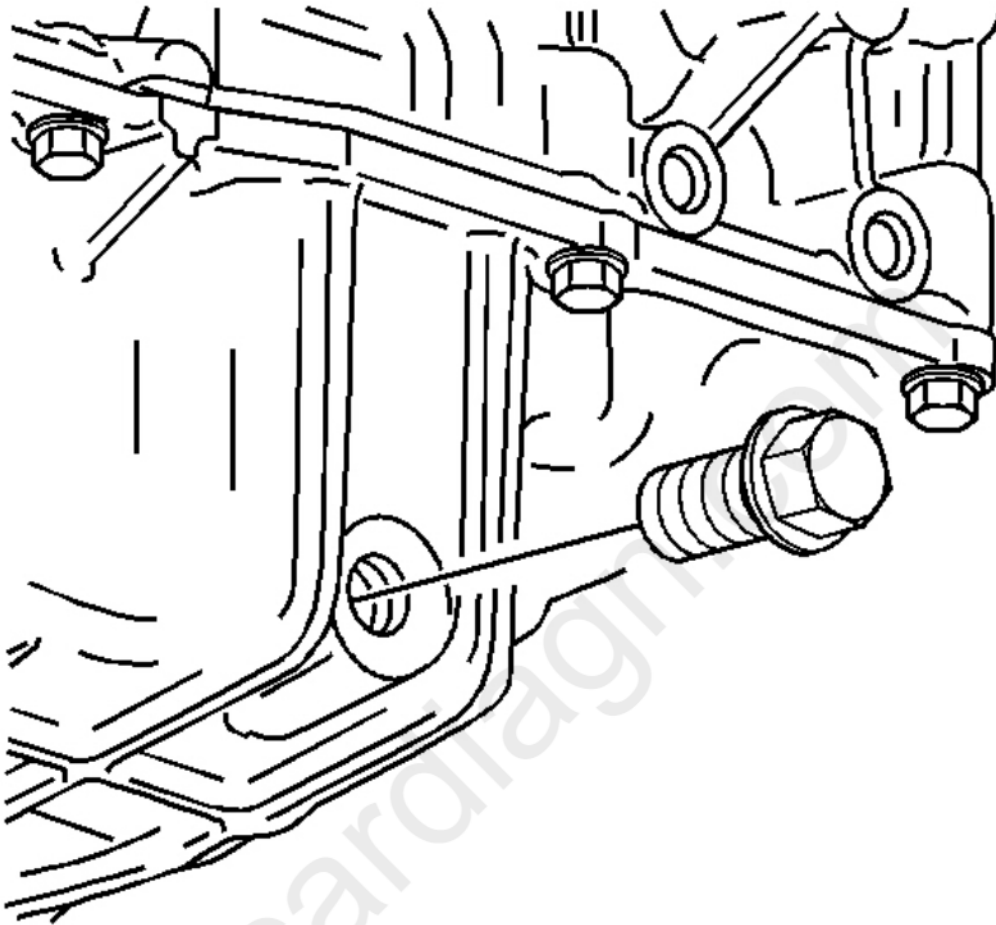


Fig. 84: View Of Oil Pan Drain Bolt
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Place a drain pan under the oil drain plug.
3. Remove the oil pan drain plug.
4. Allow the oil to drain completely.

CAUTION: Refer to **Fastener Caution** .

5. Install the oil pan drain plug and tighten to 25 N.m (18 lb ft).

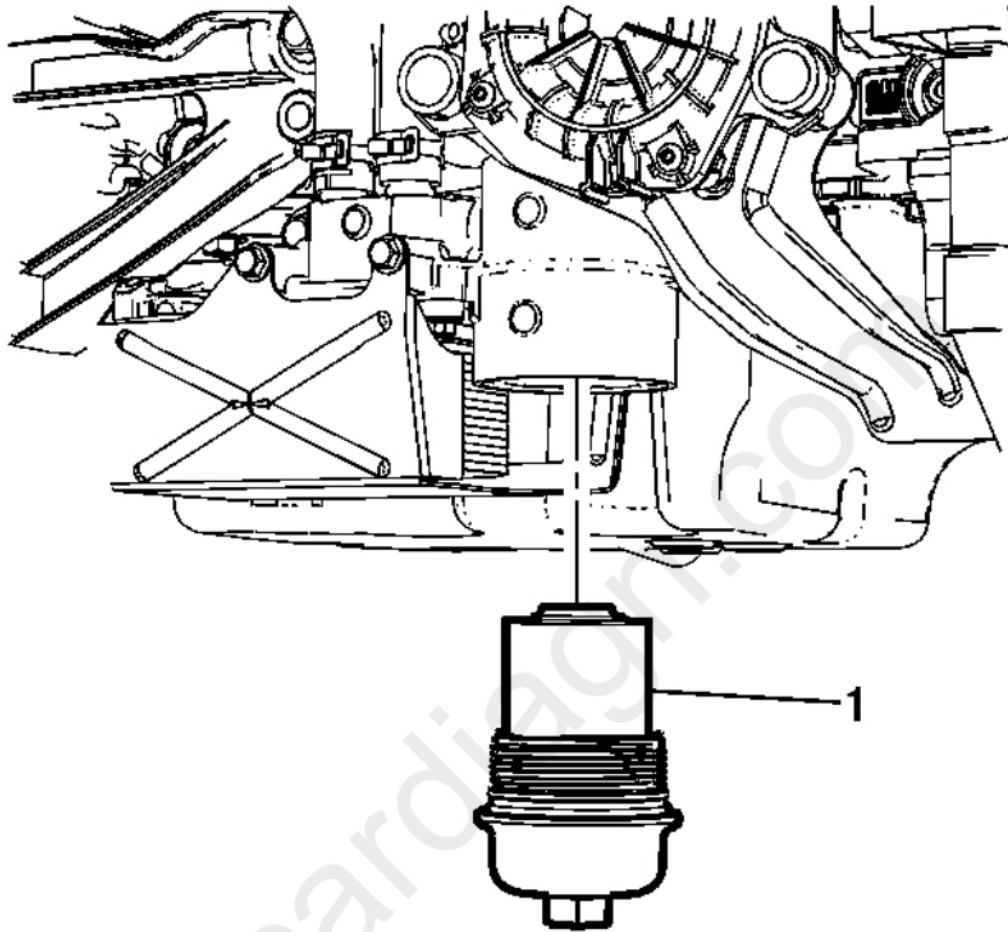


Fig. 85: View Of Oil Filter Cap
Courtesy of GENERAL MOTORS CORP.

NOTE: DO NOT use an open end wrench on the hex on top of the oil filter cap.

6. Use a 32 mm (1 1/4 in) socket on the hex on top of the oil filter cap, or an oil filter wrench on the outside diameter of the oil filter cap.
7. Remove the oil filter cap and filter.
8. Remove the filter from the cap.

INSTALLATION PROCEDURE

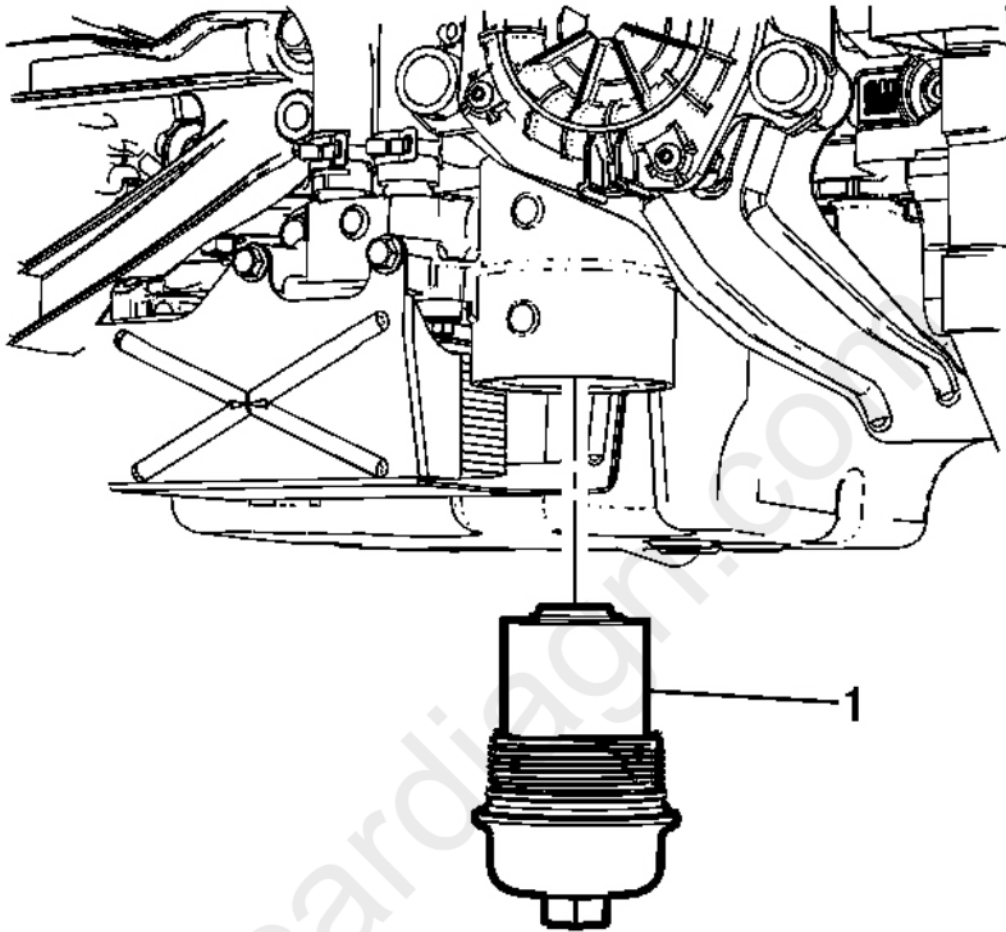


Fig. 86: View Of Oil Filter Cap
Courtesy of GENERAL MOTORS CORP.

1. Install the NEW oil filter to the cap.
2. Install the oil filter cap and filter.

CAUTION: Over torquing the oil filter cap may cause damage to the oil filter cap resulting in an oil leak.

NOTE: DO NOT use an open end wrench on the hex on top of the oil filter cap.

3. Use a 32 mm (1 1/4 in) socket on the hex on the top of the oil filter cap, or an oil filter wrench on the outside diameter of the oil filter cap. Tighten the oil filter cap until fully seated. DO NOT exceed 25 N.m

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(18 lb ft).

4. Fill the engine with oil. Refer to **Fluid and Lubricant Recommendations (USA and Canada)**.

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