

2010 ENGINE

Engine Mechanical - 2.8L, 3.0L, 3.2L, or 3.6L - Repair Instructions - Off Vehicle - Equinox & Terrain

DRIVE BELT TENSIONER REMOVAL

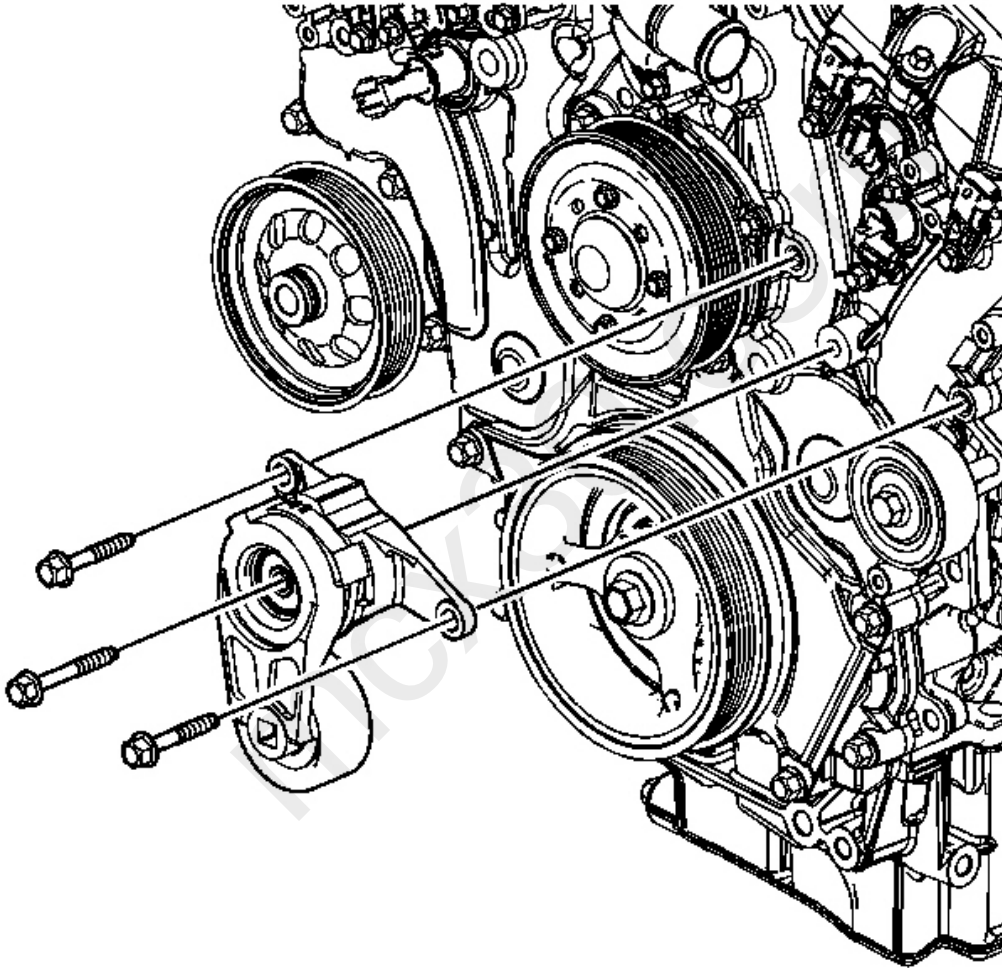


Fig. 1: View Of Left Drive Belt Tensioner
Courtesy of GENERAL MOTORS CORP.

1. Remove the drive belt tensioner bracket bolts.
2. Remove the drive belt tensioner assembly.

OIL LEVEL INDICATOR AND TUBE REMOVAL (LF1 OR LFW)

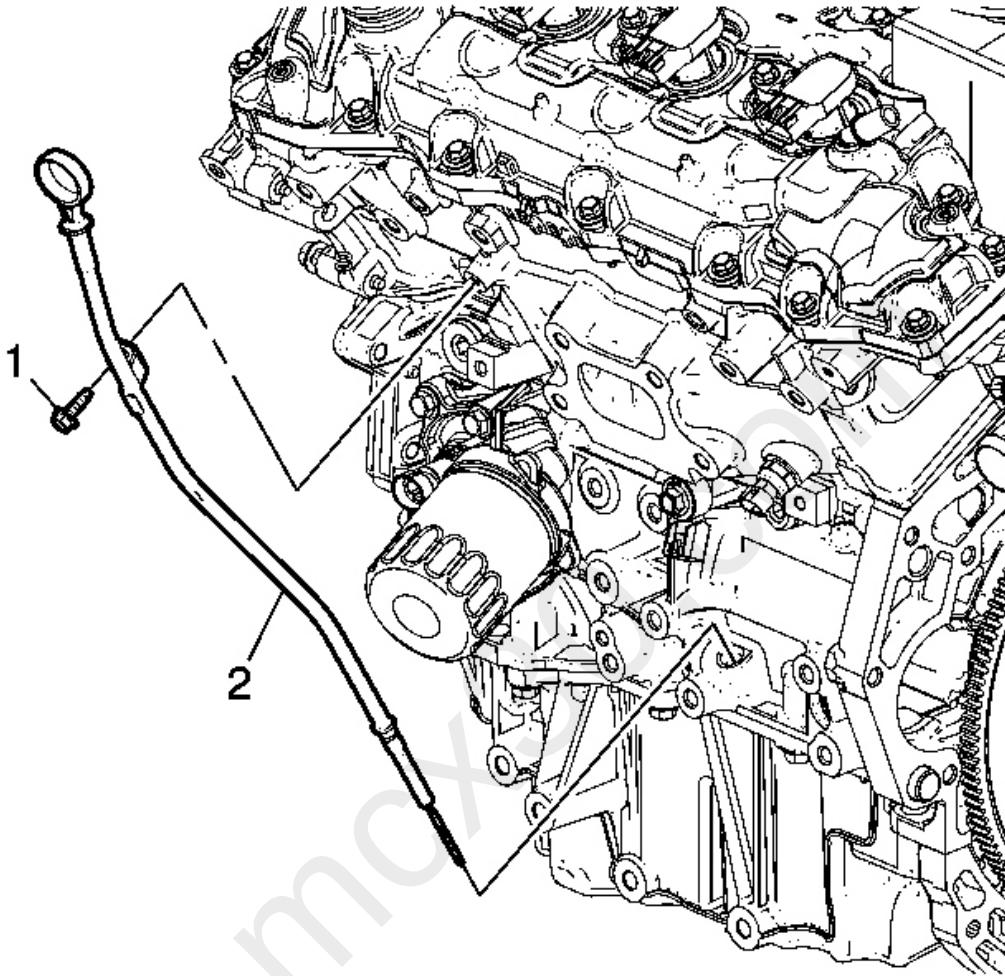


Fig. 2: Oil Level Indicator & Tube
Courtesy of GENERAL MOTORS CORP.

1. Remove the oil level indicator tube bracket bolt (1).
2. Remove the oil level indicator and tube (2) by sliding the tube out from the lower crankcase hole.

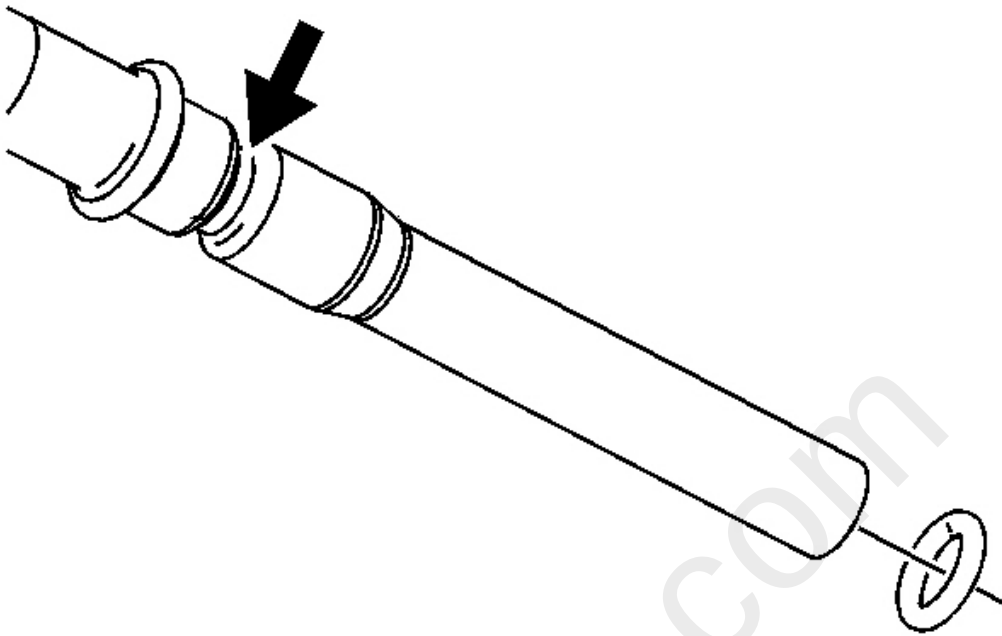


Fig. 3: View Of Oil Level Indicator Tube O-Ring
Courtesy of GENERAL MOTORS CORP.

3. Remove and discard the O-ring from the oil level indicator tube if damaged.

OIL FILTER ADAPTER REMOVAL

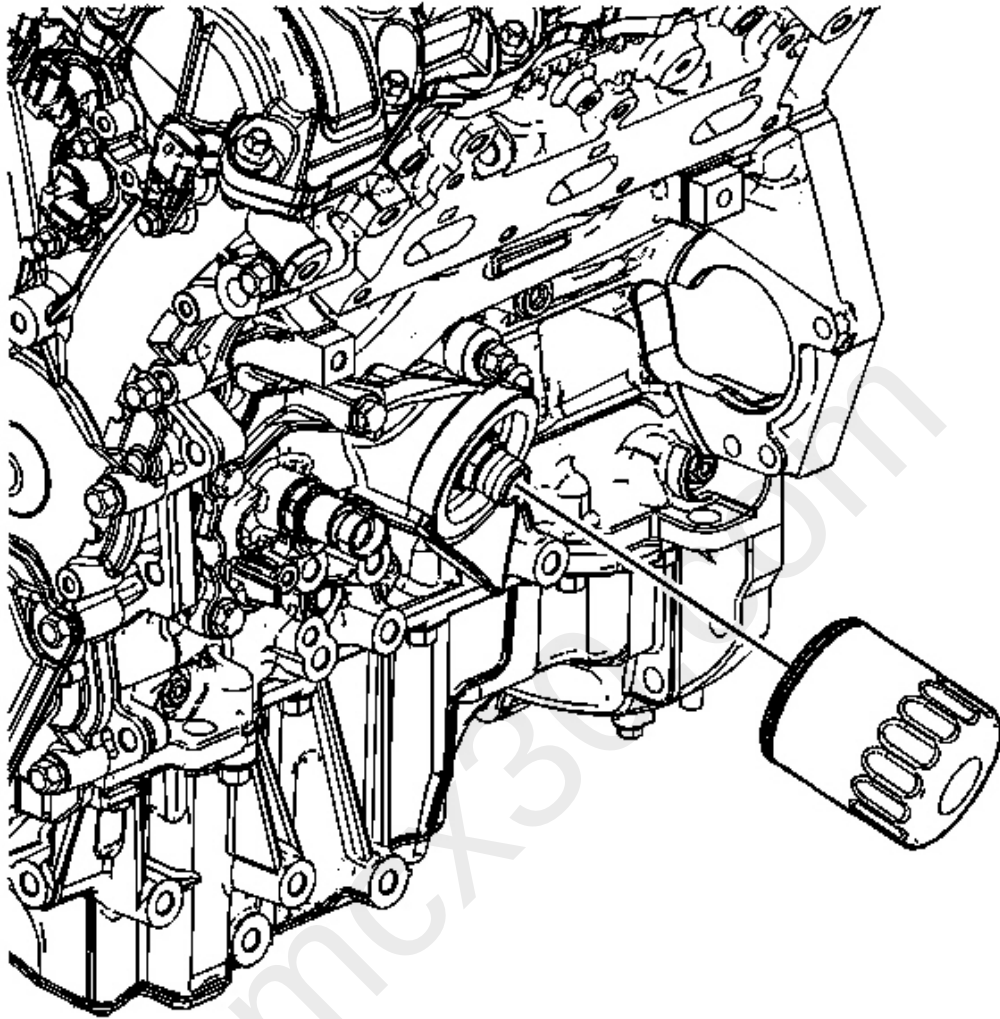


Fig. 4: Removing/Installing Oil Filter
Courtesy of GENERAL MOTORS CORP.

1. Remove and properly dispose of the oil filter.

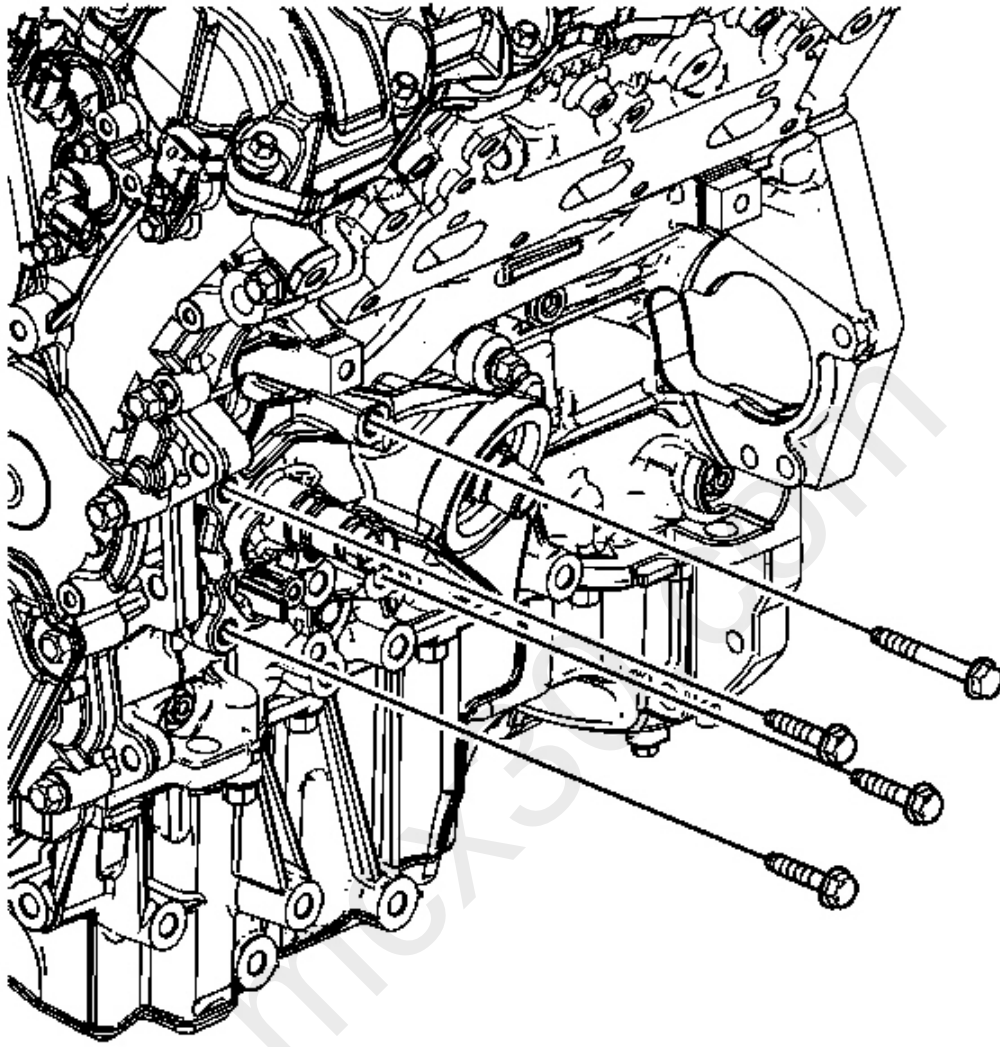


Fig. 5: View Of Oil Filter Adapter Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the oil filter adapter bolts from the engine block.

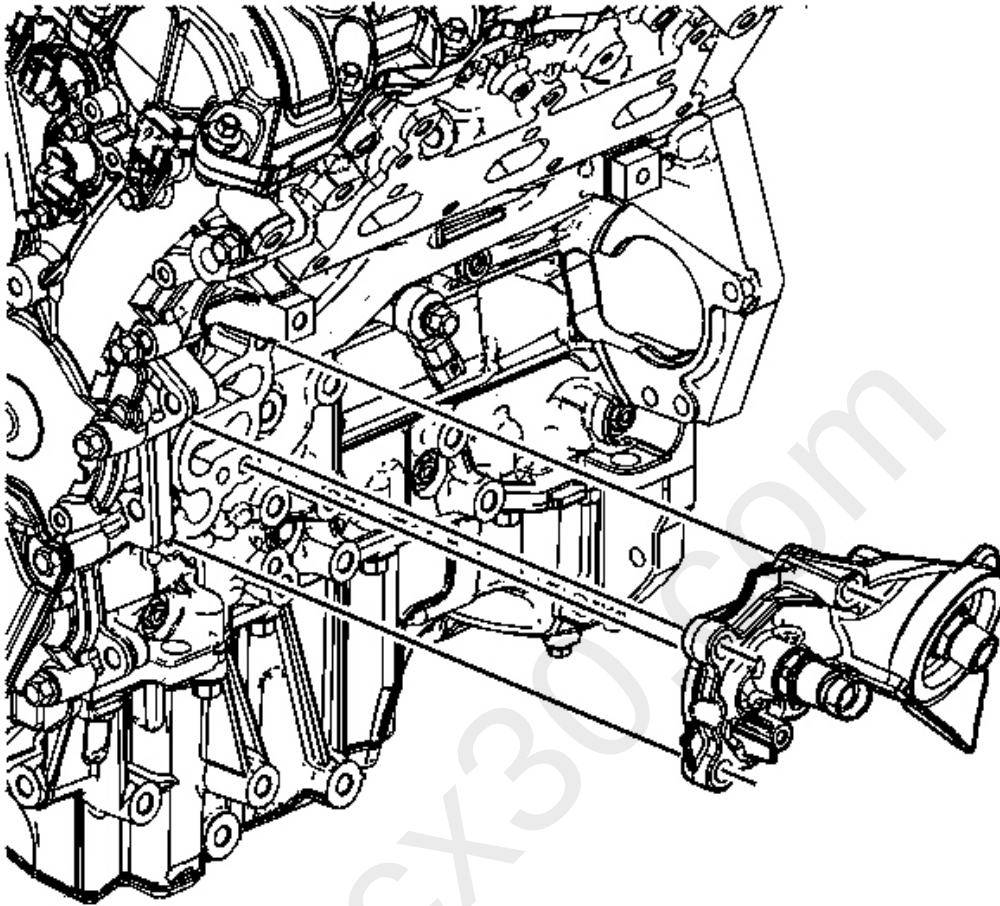


Fig. 6: Removing/Installing Oil Filter Adapter
Courtesy of GENERAL MOTORS CORP.

3. Remove the oil filter adapter.

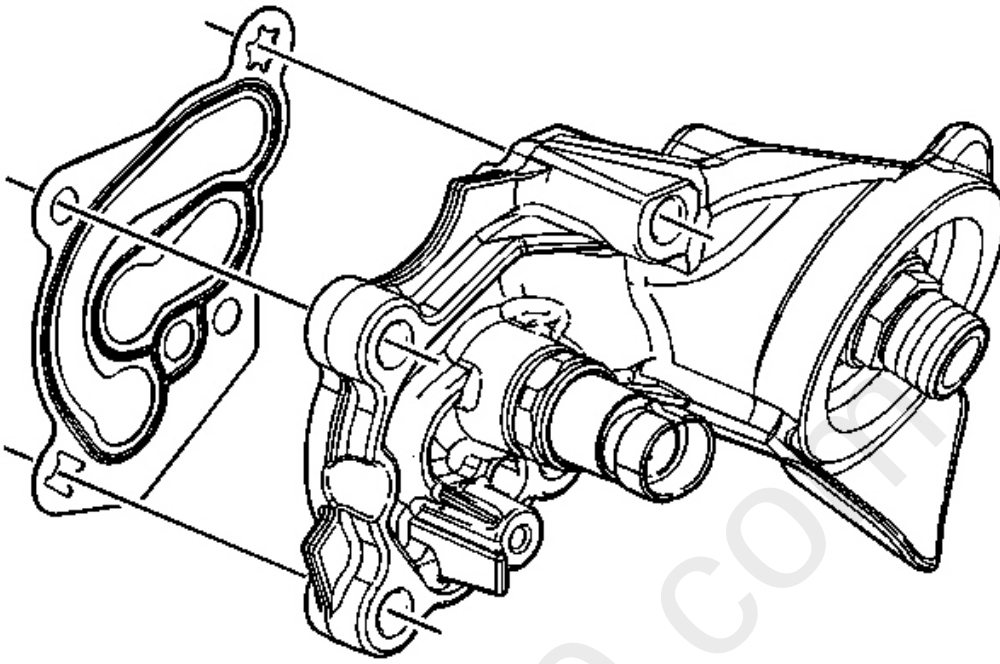


Fig. 7: View Of Oil Filter Adapter & Gasket
Courtesy of GENERAL MOTORS CORP.

4. Remove and discard the oil filter adapter gasket.

INTAKE MANIFOLD REMOVAL (LF1 OR LFW)

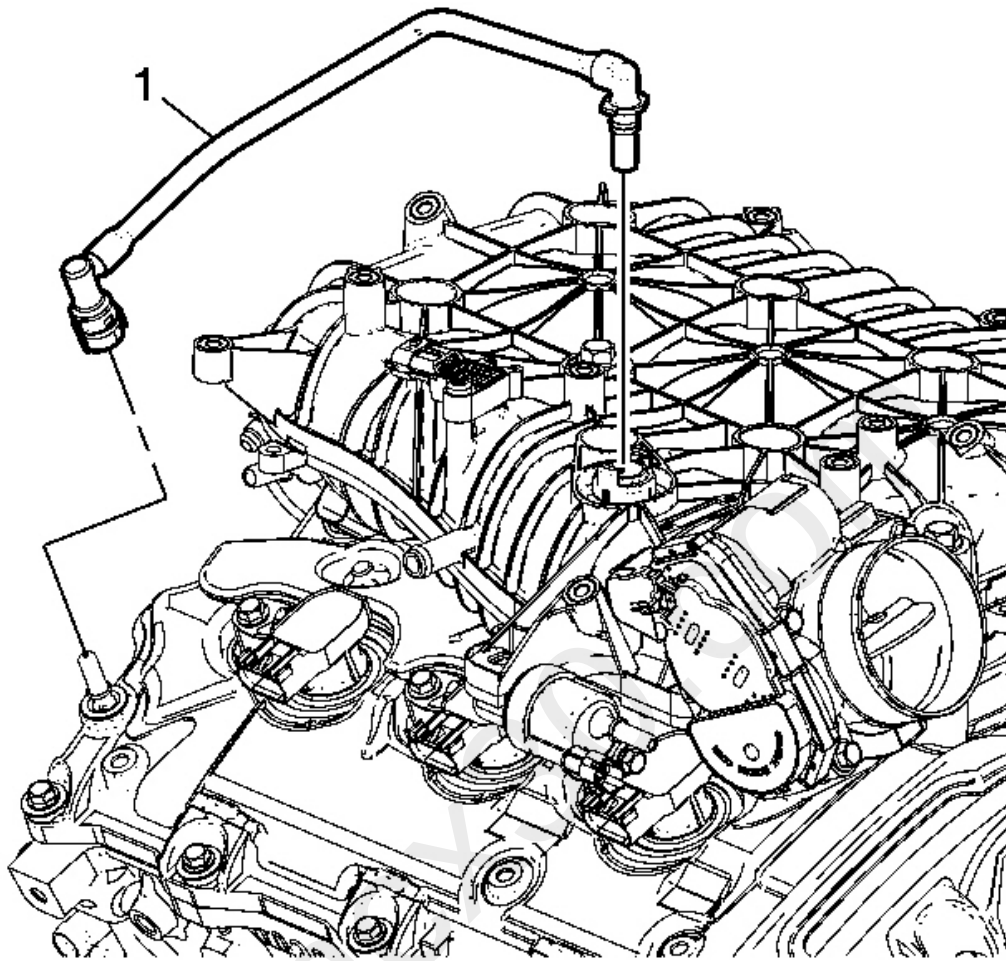


Fig. 8: Positive Crankcase Ventilation (PCV) Tube Assembly
Courtesy of GENERAL MOTORS CORP.

1. Disconnect and remove the positive crankcase ventilation (PCV) tube (1) from the intake manifold and right camshaft cover.

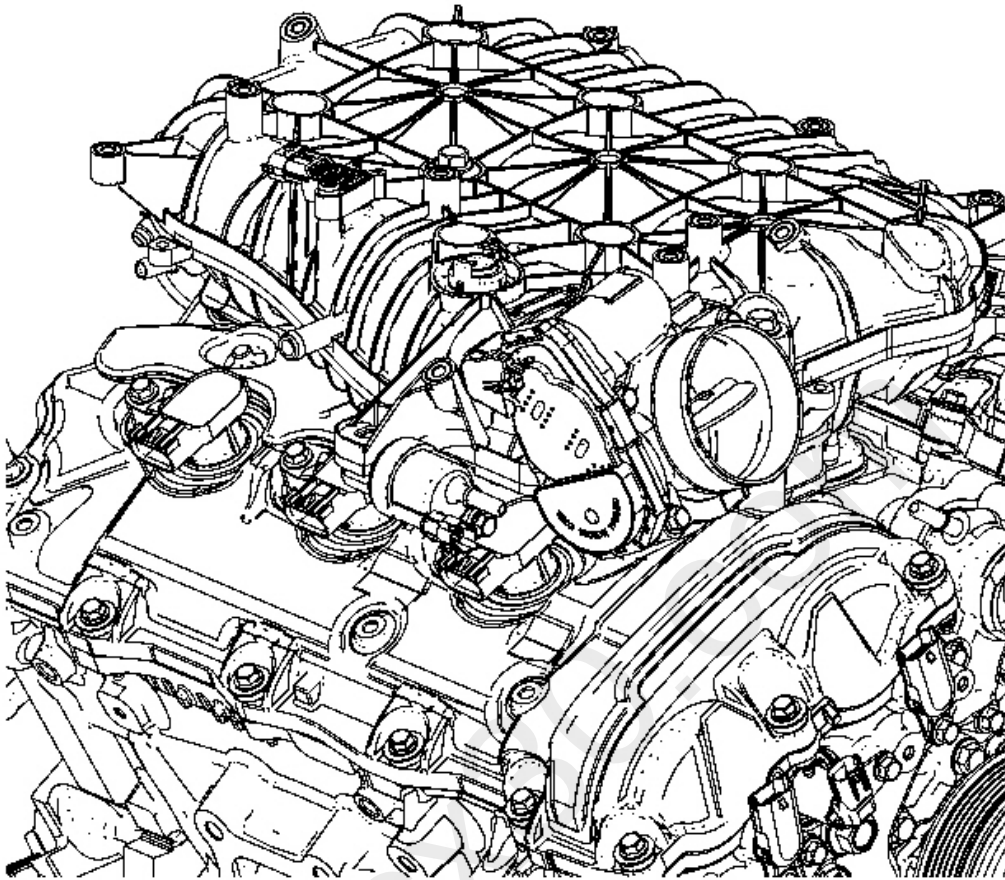


Fig. 9: Upper Intake Manifold & EVAP Solenoid
Courtesy of GENERAL MOTORS CORP.

2. Remove the evaporative (EVAP) hose from the intake manifold and EVAP solenoid.

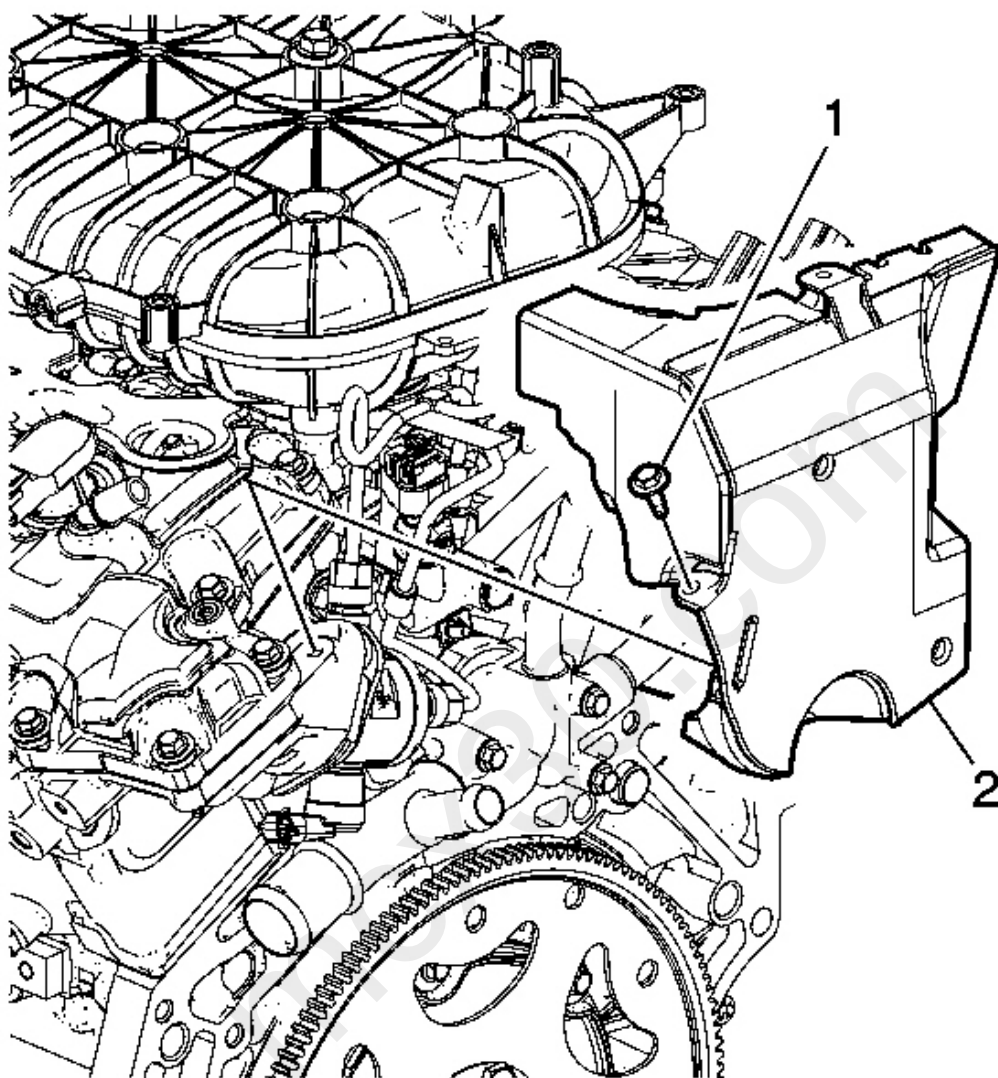


Fig. 10: Fuel Pump Cover

Courtesy of GENERAL MOTORS CORP.

3. Remove the fuel pump cover bolt (1).
4. Remove the fuel pump cover (2).

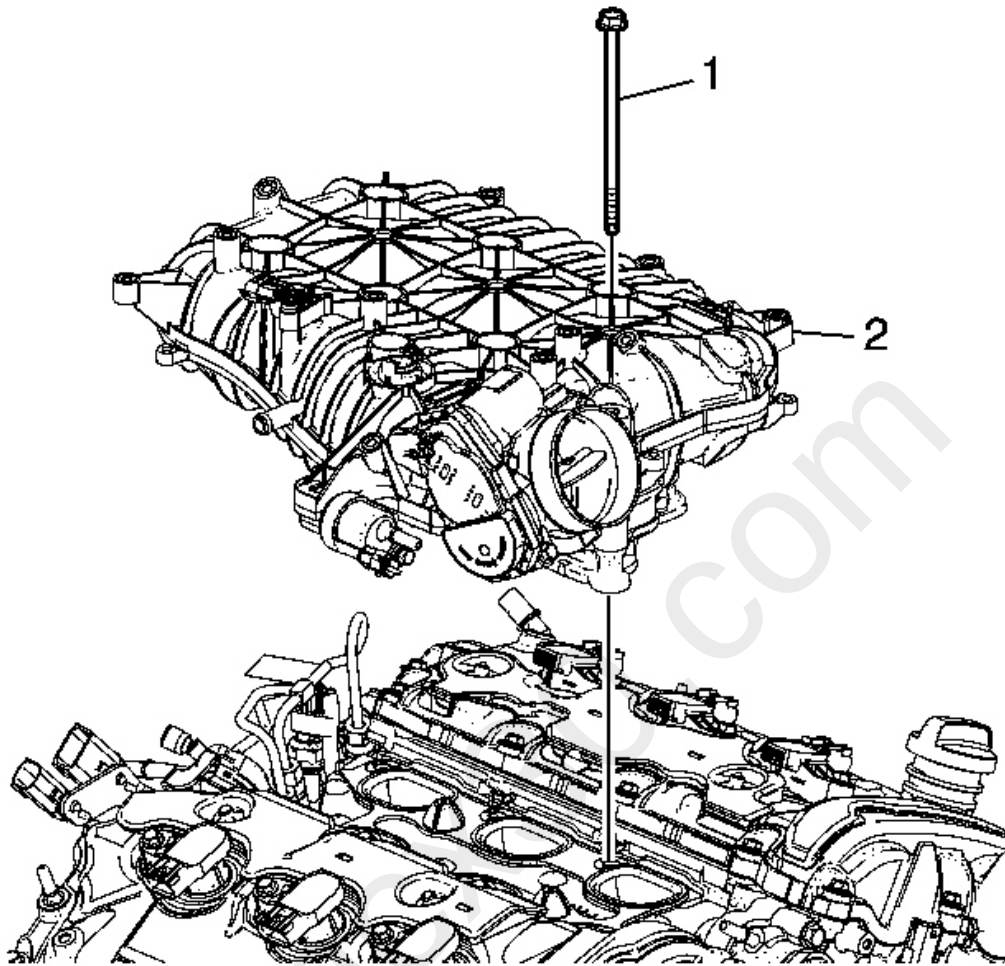


Fig. 11: Intake Manifold Assembly
Courtesy of GENERAL MOTORS CORP.

5. Remove the intake manifold bolts (1).
6. Remove the intake manifold assembly (2).

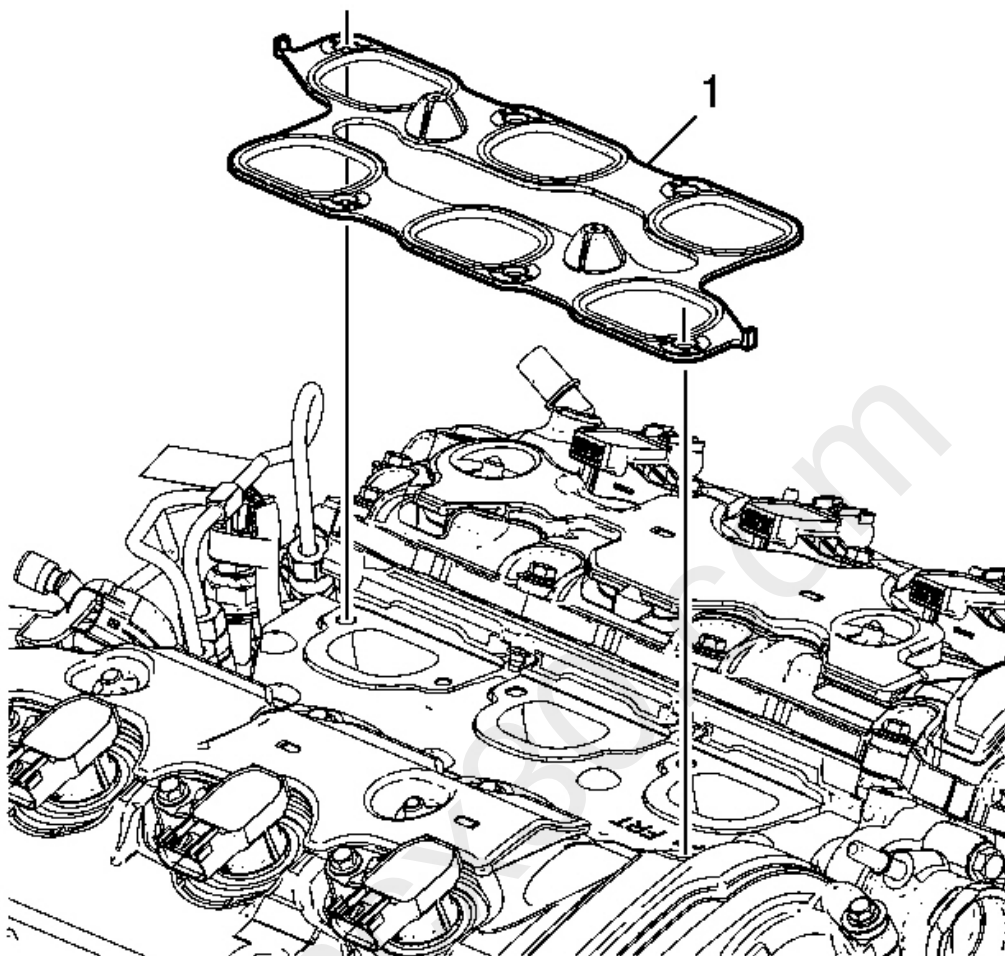


Fig. 12: Intake Manifold Gasket
Courtesy of GENERAL MOTORS CORP.

7. Remove and discard the intake manifold gasket (1).

WATER OUTLET REMOVAL

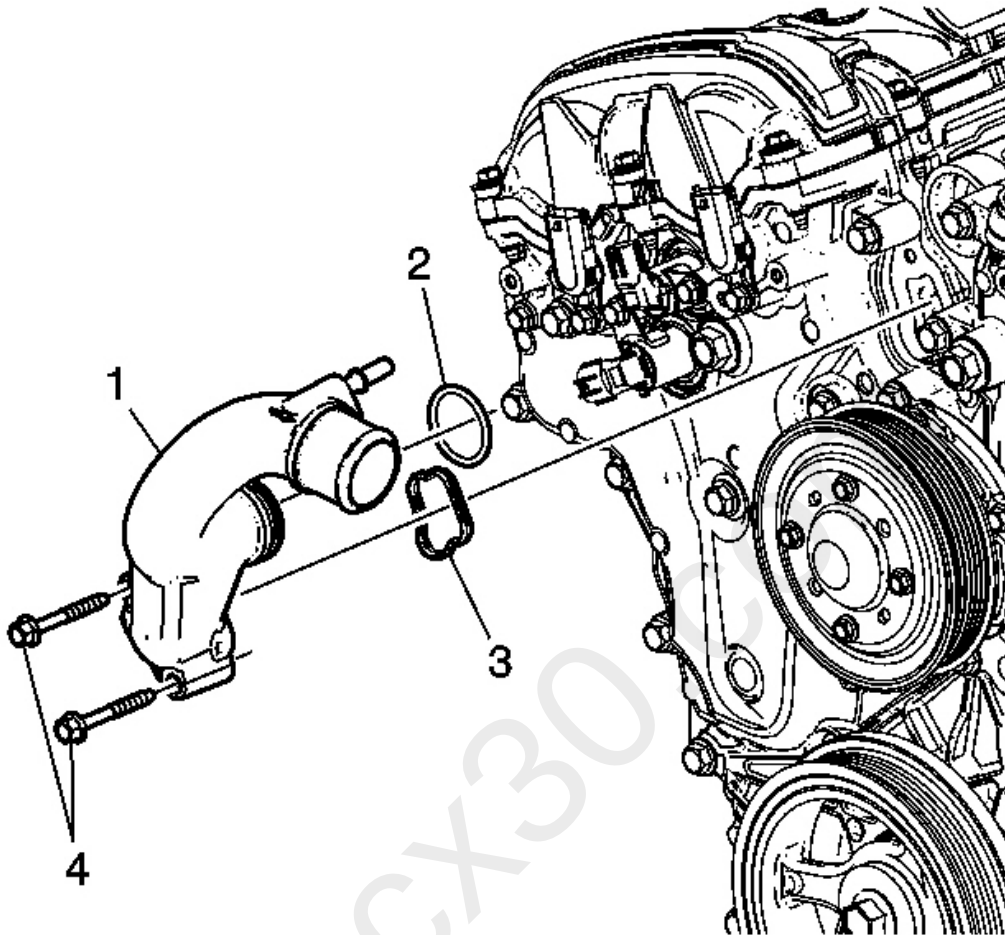


Fig. 13: Water Outlet Components
Courtesy of GENERAL MOTORS CORP.

1. Remove the water outlet bolts (4).
2. Remove the water outlet (1).
3. Remove the water outlet seals (2) and (3).

ENGINE COOLANT THERMOSTAT HOUSING REMOVAL

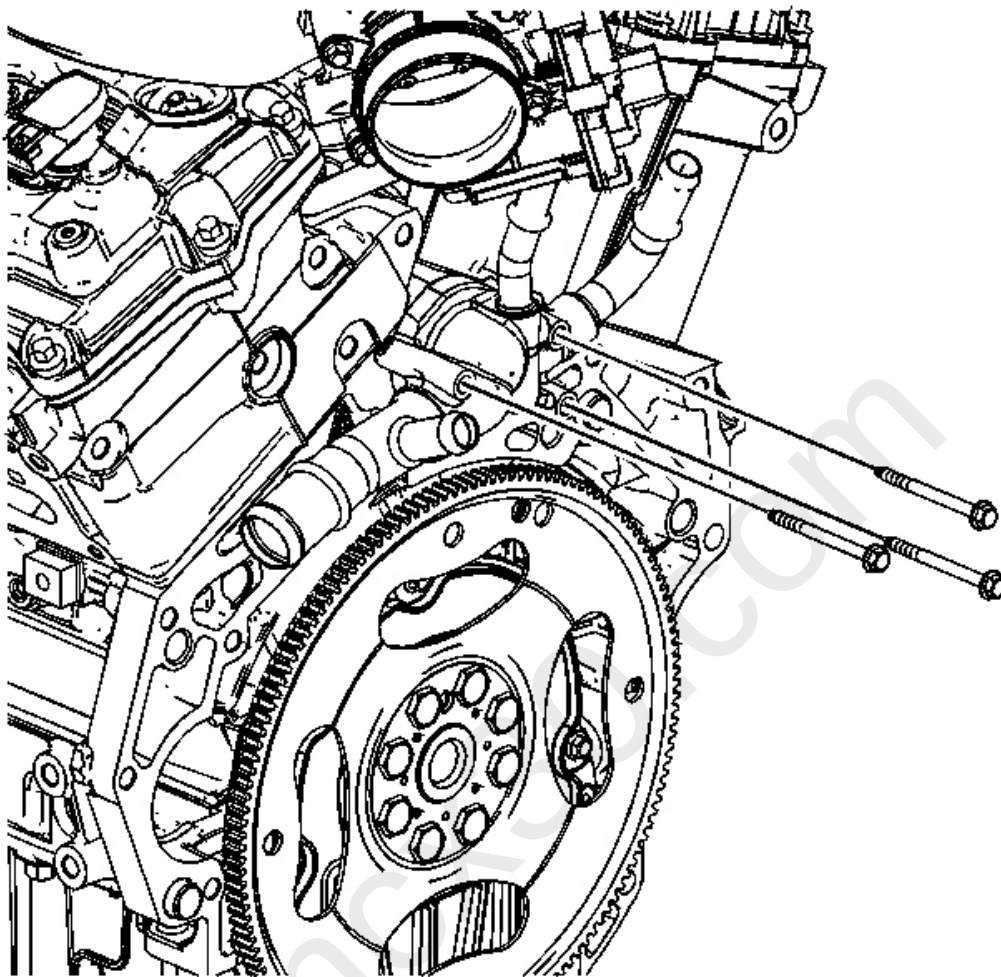


Fig. 14: View Of Thermostat Housing Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the thermostat housing bolts.

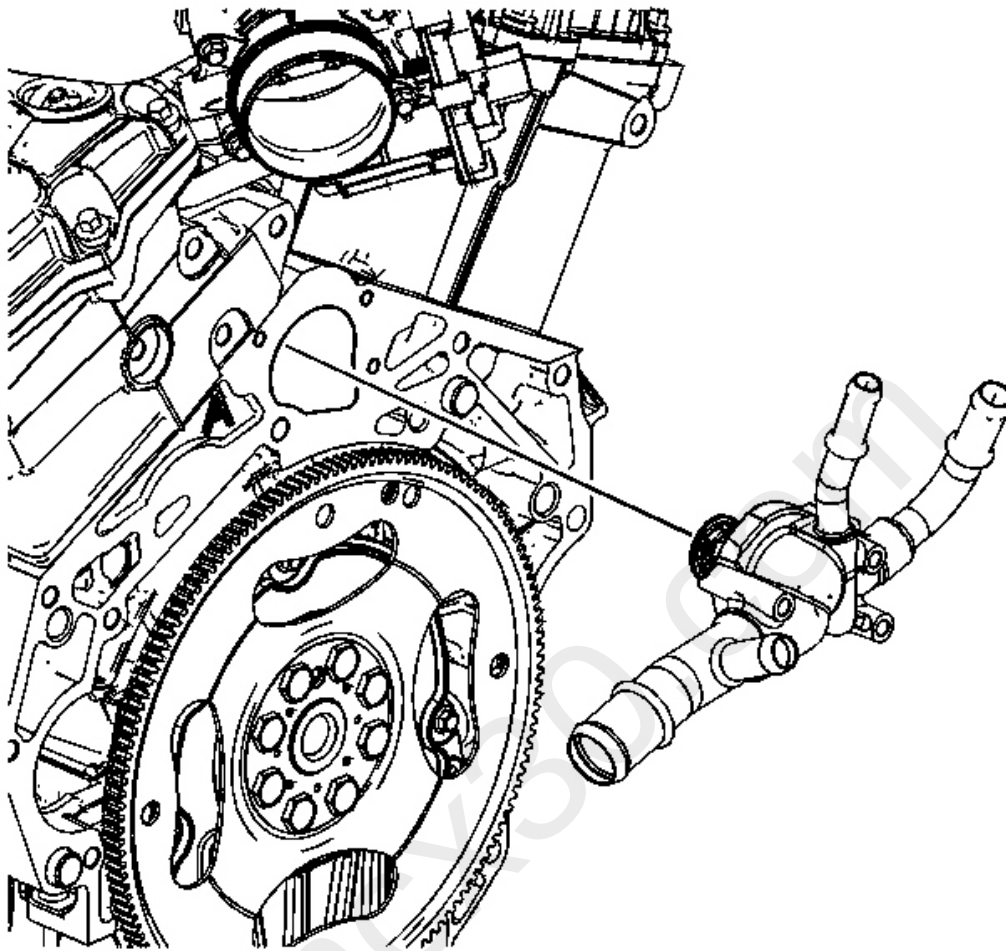


Fig. 15: View Of Thermostat Housing
Courtesy of GENERAL MOTORS CORP.

2. Remove the thermostat housing.

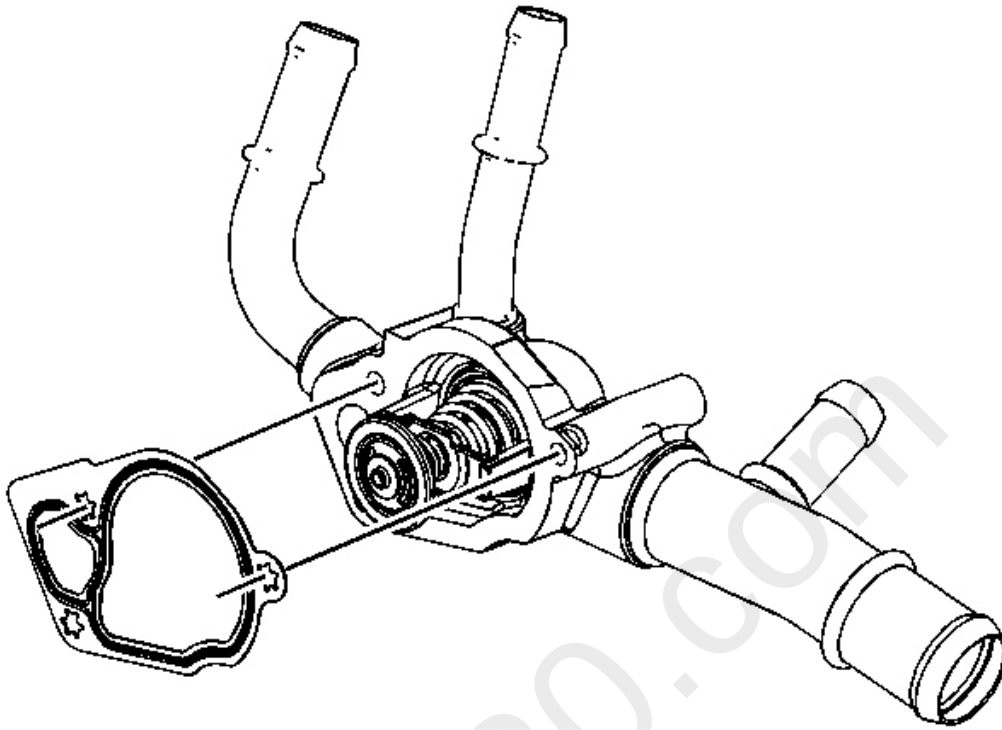


Fig. 16: View Of Thermostat Housing Gasket
Courtesy of GENERAL MOTORS CORP.

3. Remove and discard the thermostat housing gasket.

CRANKSHAFT BALANCER REMOVAL

Special Tools

- **EN 38416-2:** Crankshaft Button
- **EN 41816:** Crankshaft Balancer Remover
- **EN 46106:** Flywheel Holding Tool

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

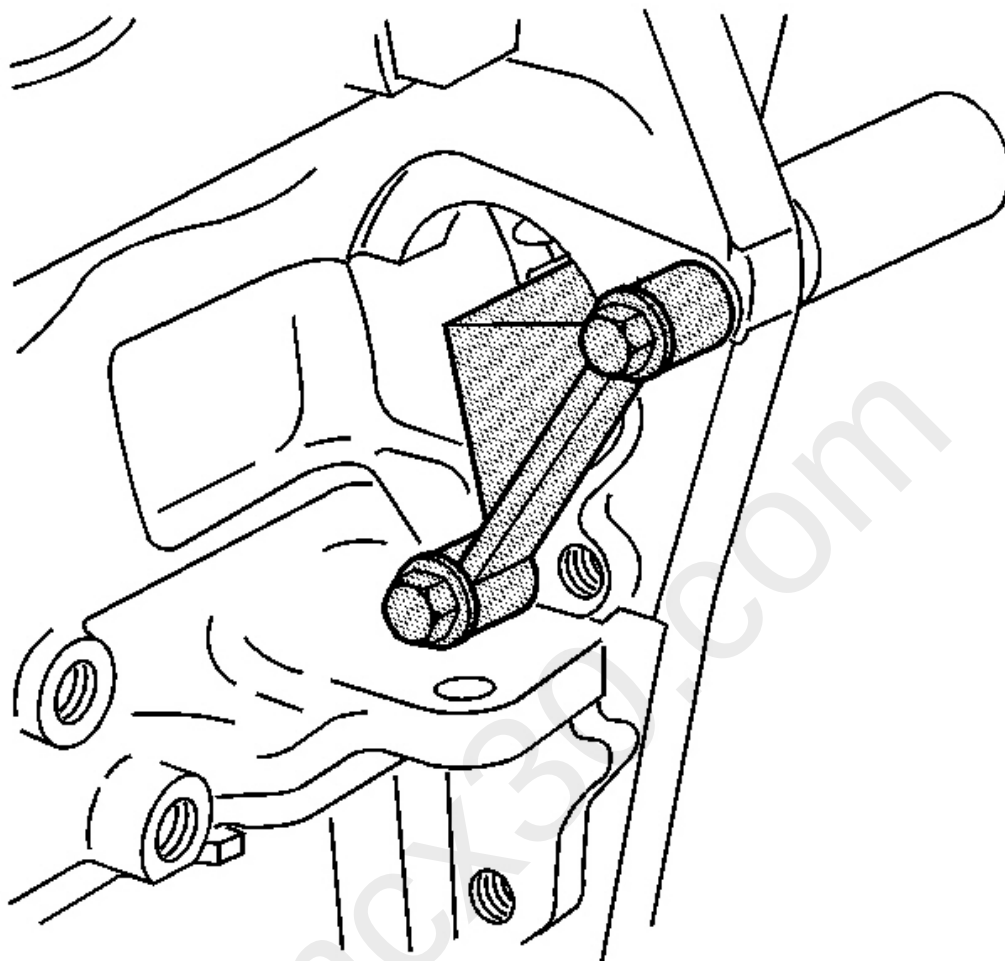


Fig. 17: View Of Tool EN 46106
Courtesy of GENERAL MOTORS CORP.

1. Install the **EN 46106** through the starter mounting hole. See **Special Tools** .

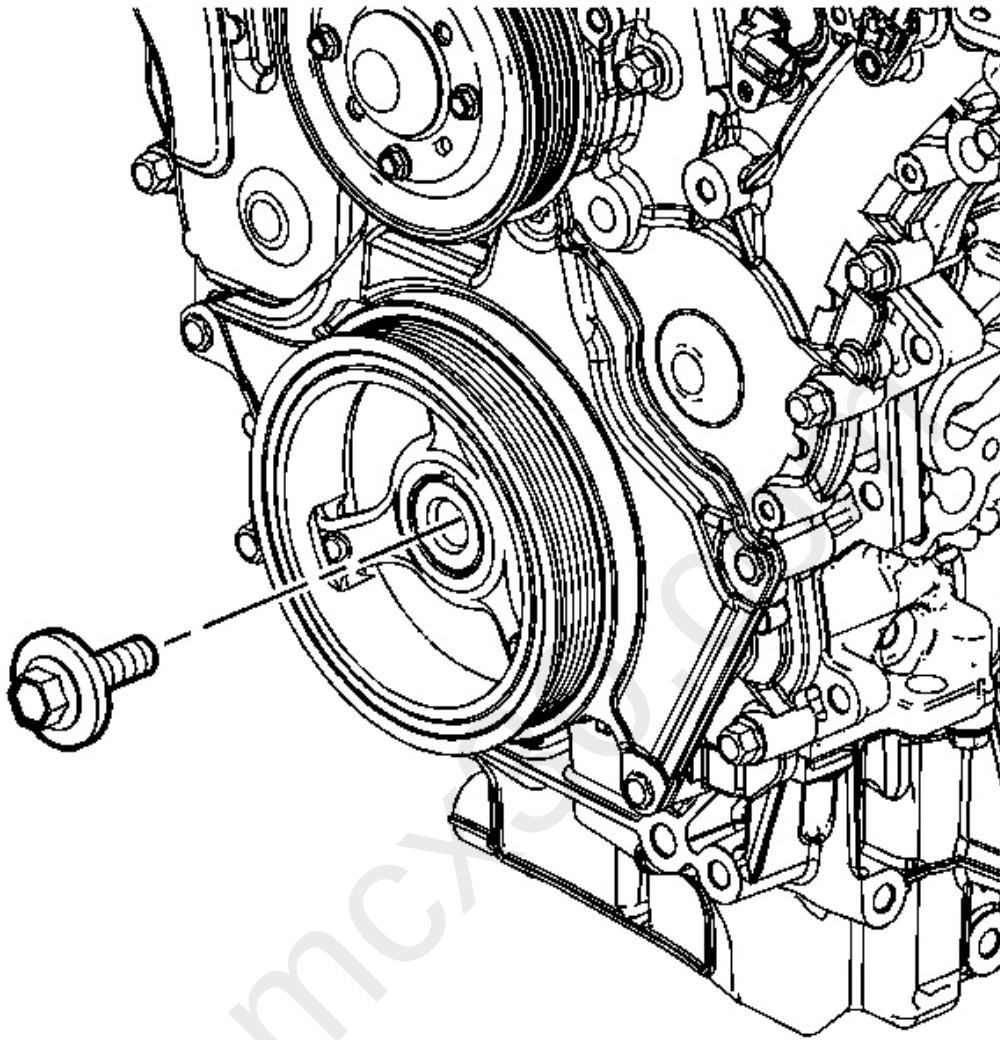


Fig. 18: View Of Crankshaft Balancer Bolt
Courtesy of GENERAL MOTORS CORP.

2. Remove and discard the crankshaft balancer bolt.

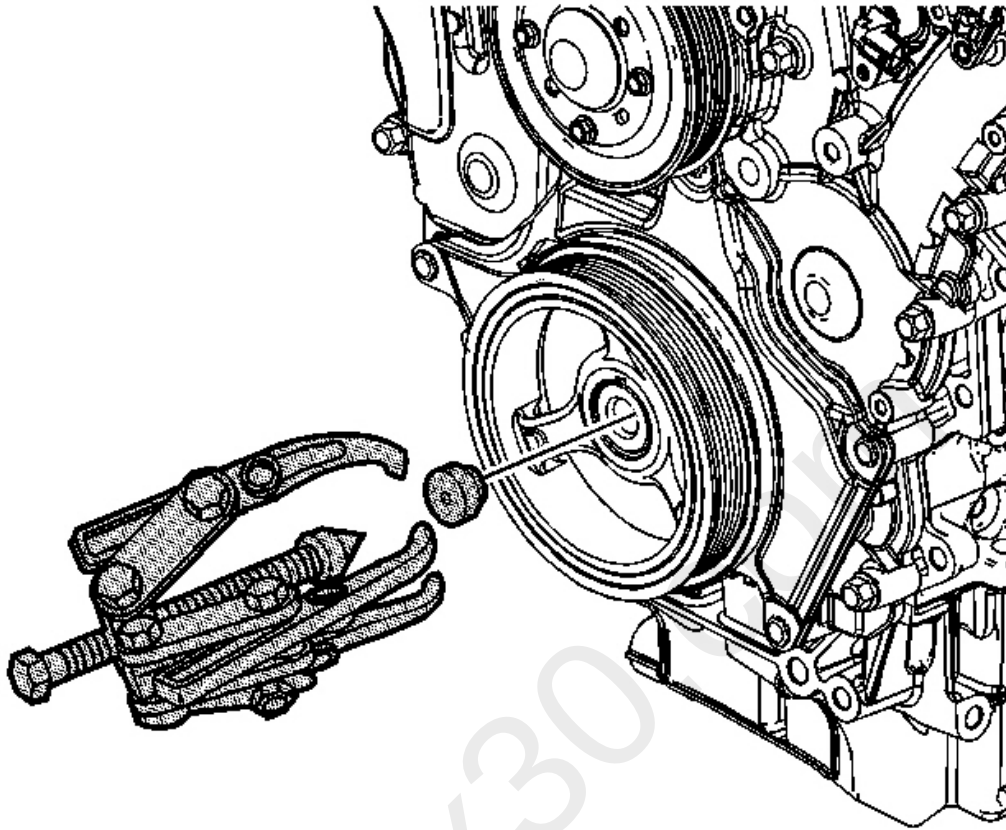


Fig. 19: View Of Crankshaft Balancer Remover
Courtesy of GENERAL MOTORS CORP.

3. Install the **EN 38416-2**: button in the nose of the crankshaft.
4. Install the **EN 41816**: remover in order to remove the crankshaft balancer.
5. Tighten the center bolt of the **EN 41816**: remover in order to pull the crankshaft balancer off of the crankshaft.
6. Remove the **EN 41816**: remover from the crankshaft balancer.

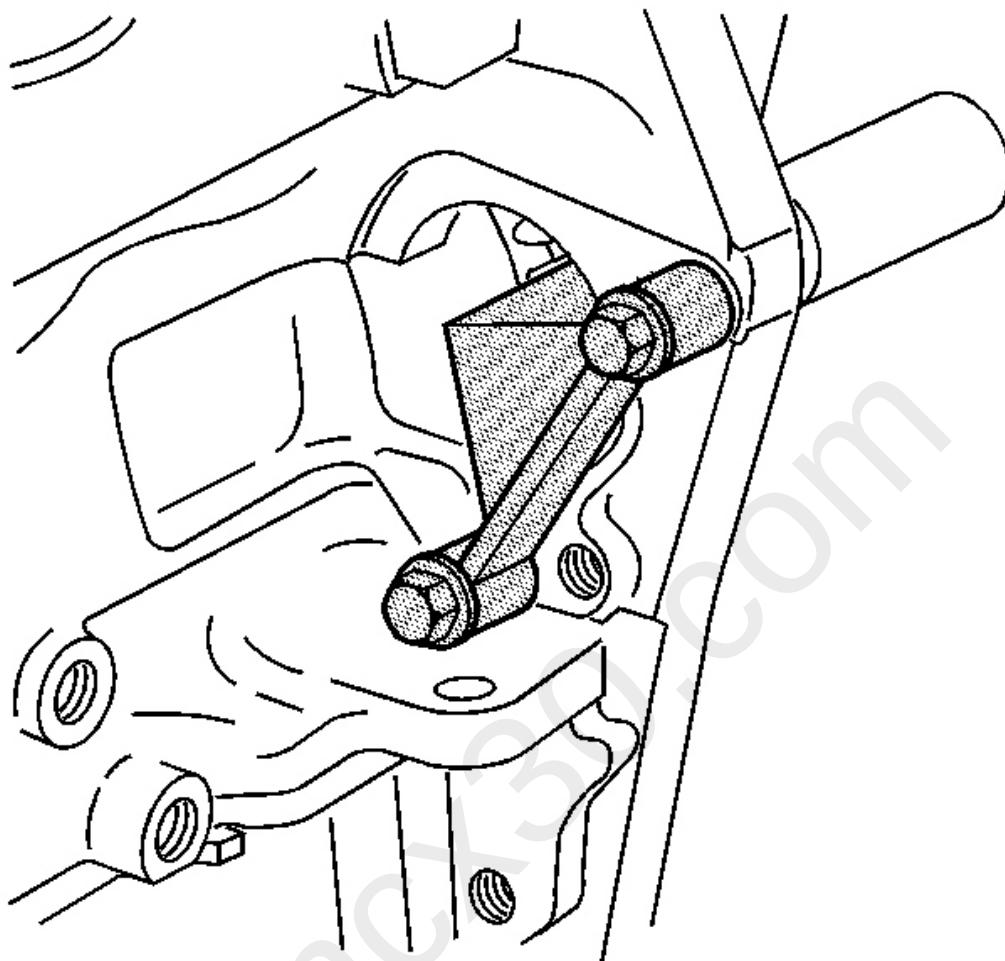


Fig. 20: View Of Tool EN 46106
Courtesy of GENERAL MOTORS CORP.

7. Remove the **EN 46106**: tool.

ENGINE FLYWHEEL REMOVAL

SPECIAL TOOLS

EN 46106 Flywheel Holding Tool. See **Special Tools** .

REMOVAL

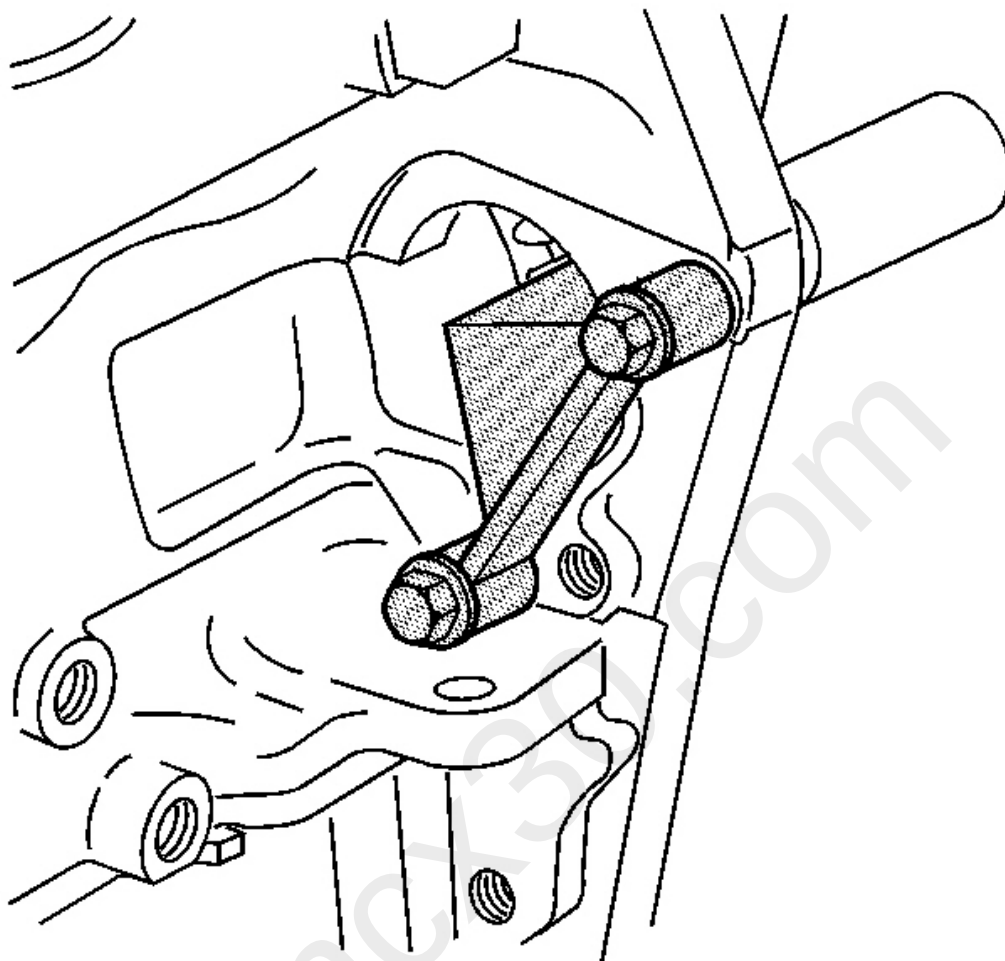


Fig. 21: View Of Tool EN 46106
Courtesy of GENERAL MOTORS CORP.

1. Install the **EN 46106** through the starter mounting hole. See **Special Tools** .

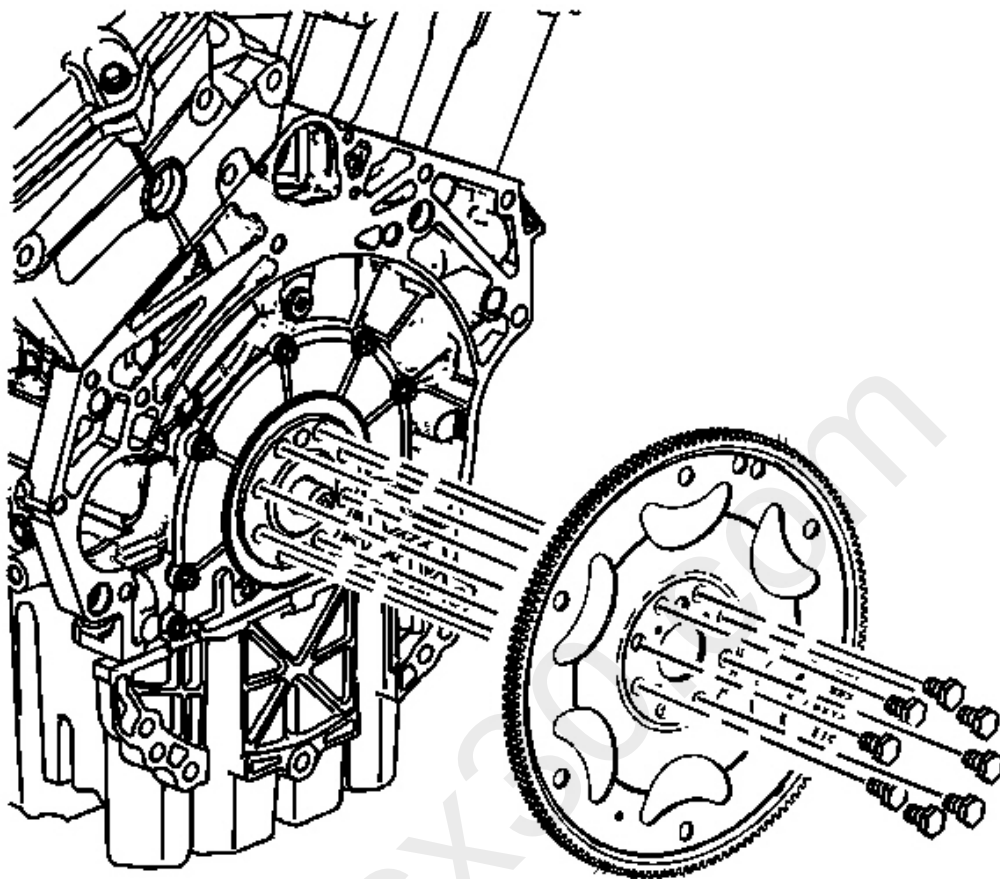


Fig. 22: View Of Engine Flywheel Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the engine flywheel bolts and discard.
3. Remove the engine flywheel from the crankshaft.

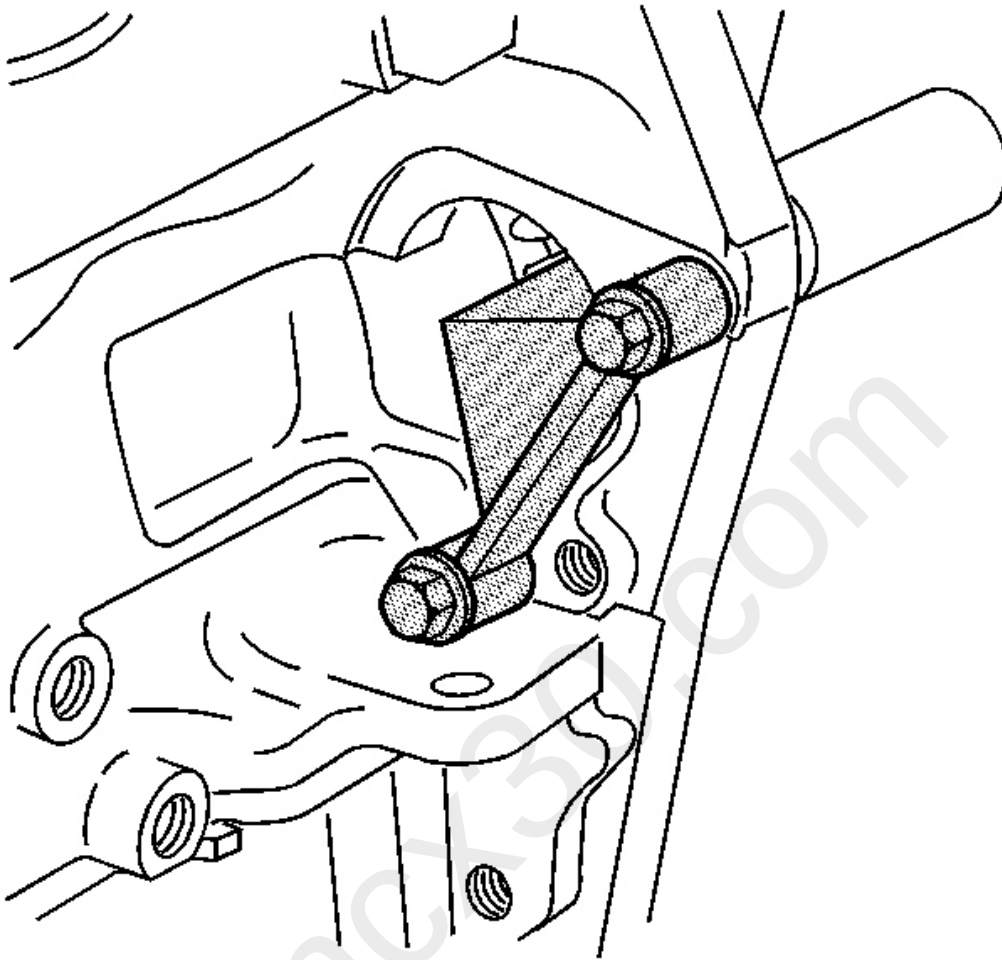


Fig. 23: View Of Tool EN 46106
Courtesy of GENERAL MOTORS CORP.

4. Remove the EN 46106 . See Special Tools .

CAMSHAFT COVER REMOVAL - LEFT SIDE

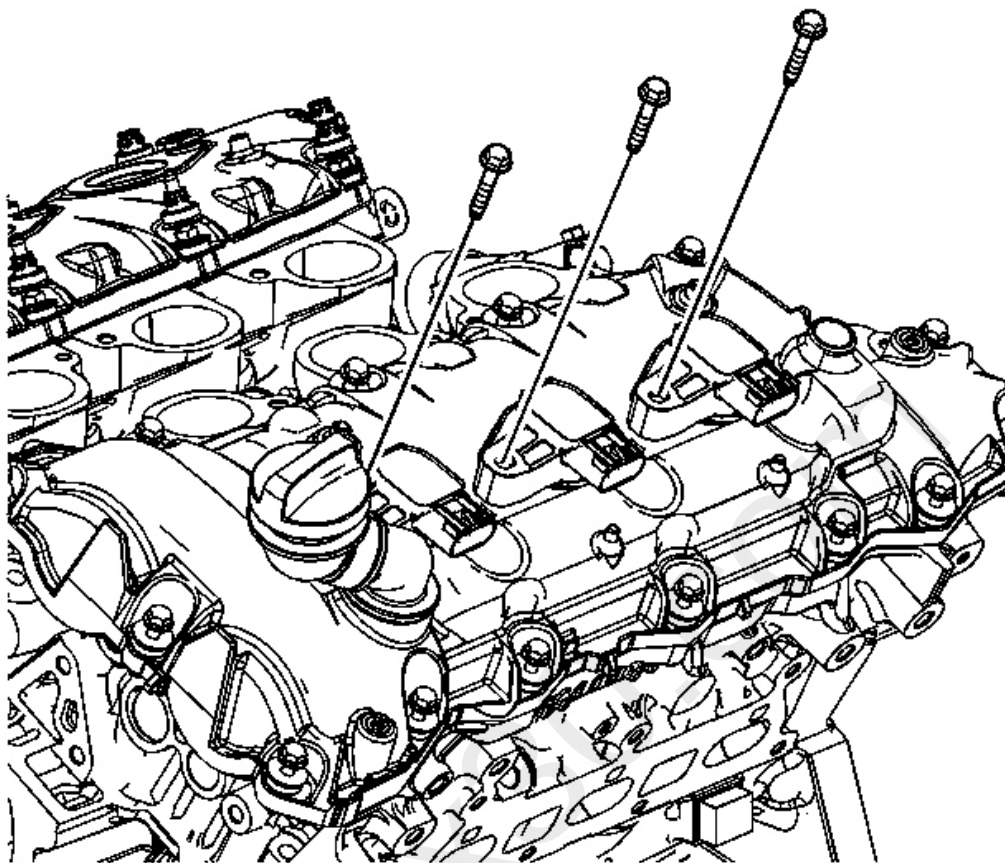


Fig. 24: Removing/Installing Ignition Coil Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the ignition coil bolts.

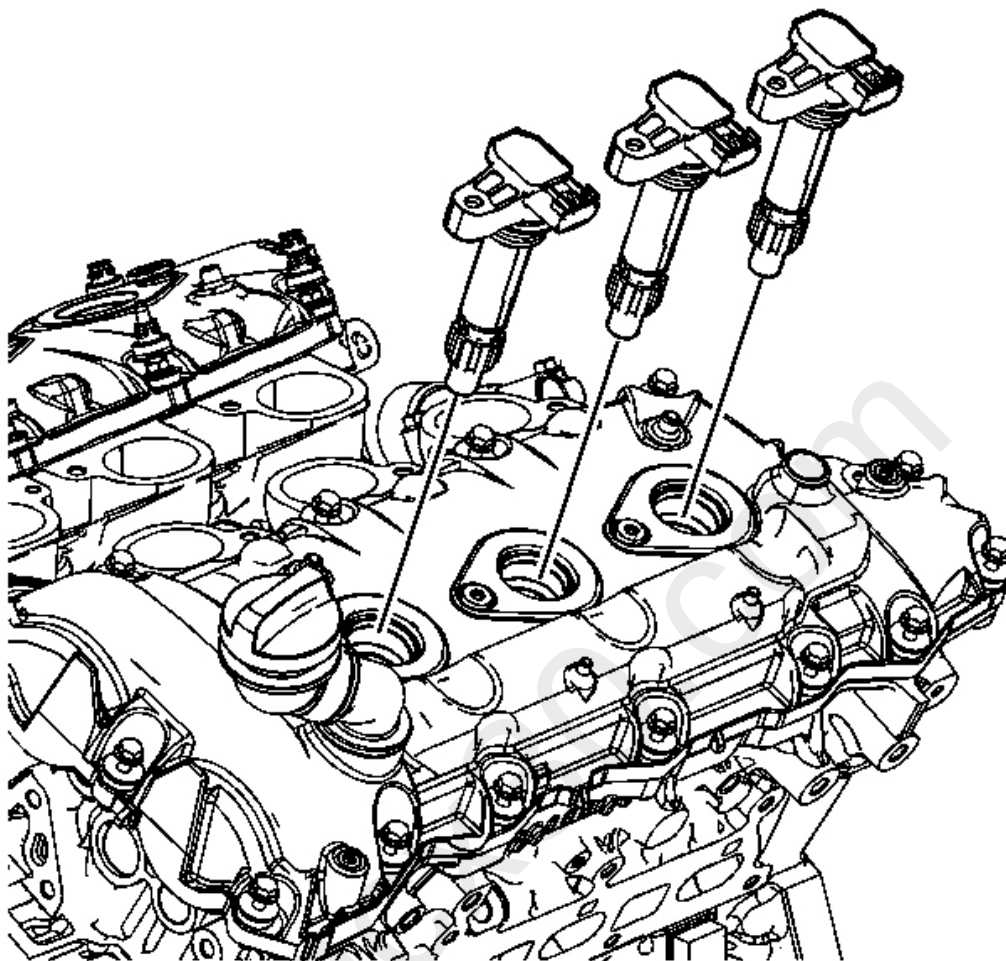


Fig. 25: Removing/Installing Ignition Coils
Courtesy of GENERAL MOTORS CORP.

2. Remove the ignition coils.

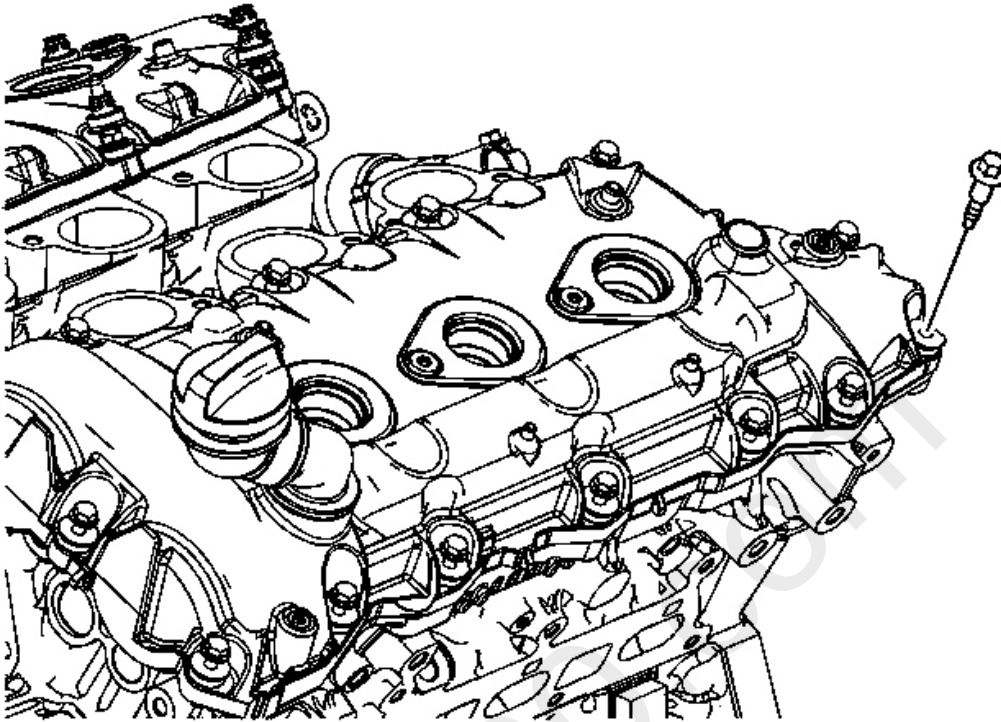


Fig. 26: View Of Left Camshaft Cover Bolt
Courtesy of GENERAL MOTORS CORP.

3. Remove the left camshaft cover bolts.
4. Remove and discard the camshaft cover grommets and camshaft cover bolts if they are serviced with the grommet.

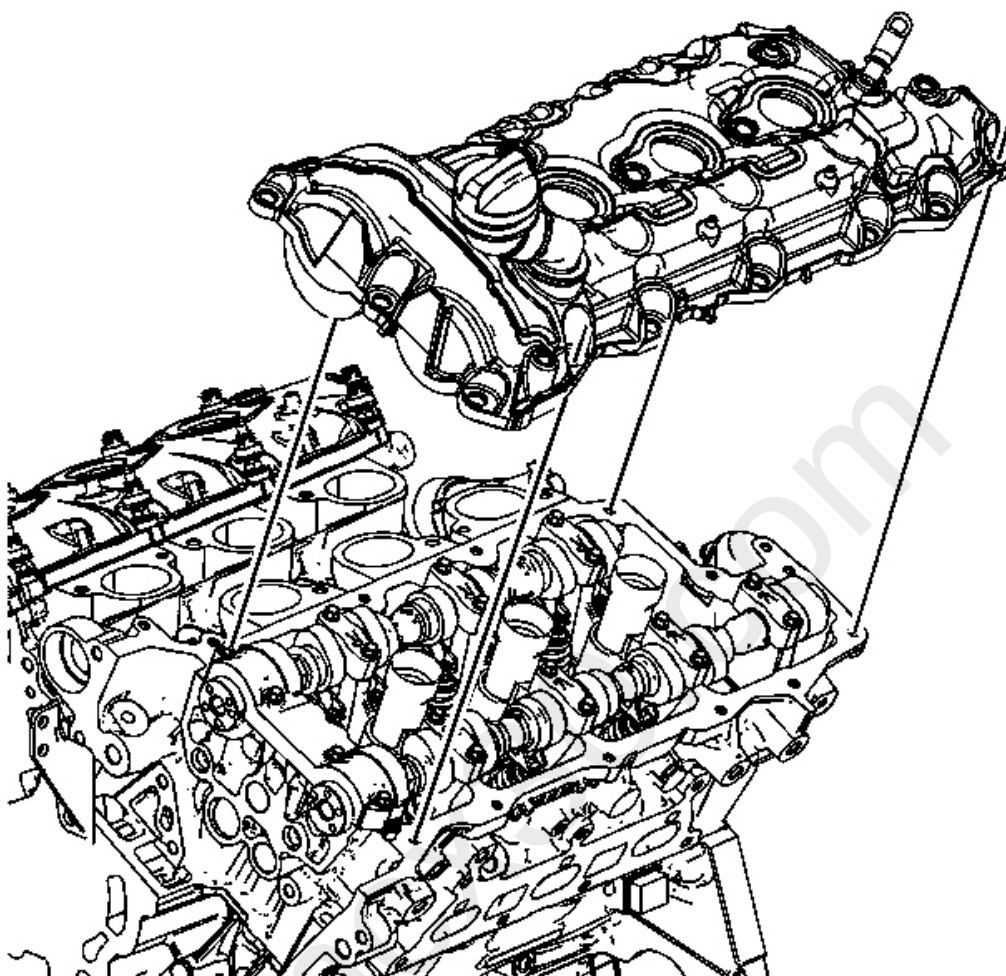


Fig. 27: View of Camshaft Cover Assembly
Courtesy of GENERAL MOTORS CORP.

5. Remove the left camshaft cover from the left cylinder head.

CAMSHAFT COVER REMOVAL - RIGHT SIDE

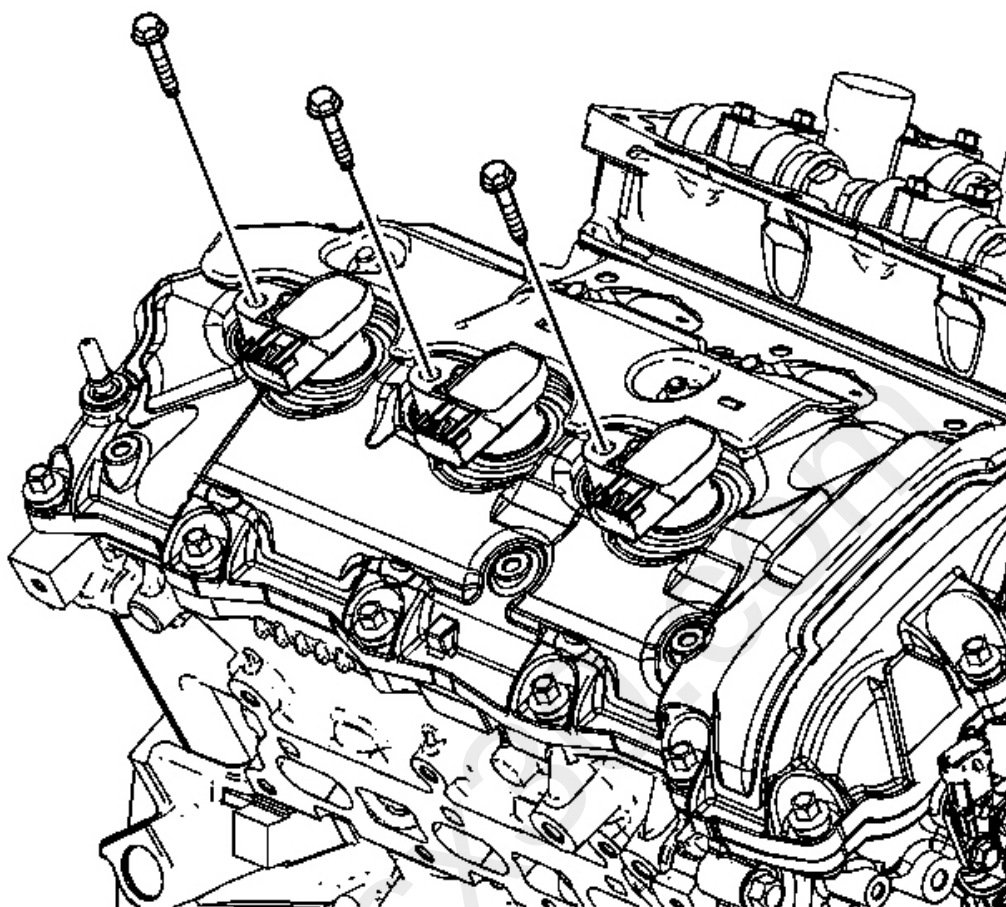


Fig. 28: View Of Ignition Coil Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the ignition coil bolts.

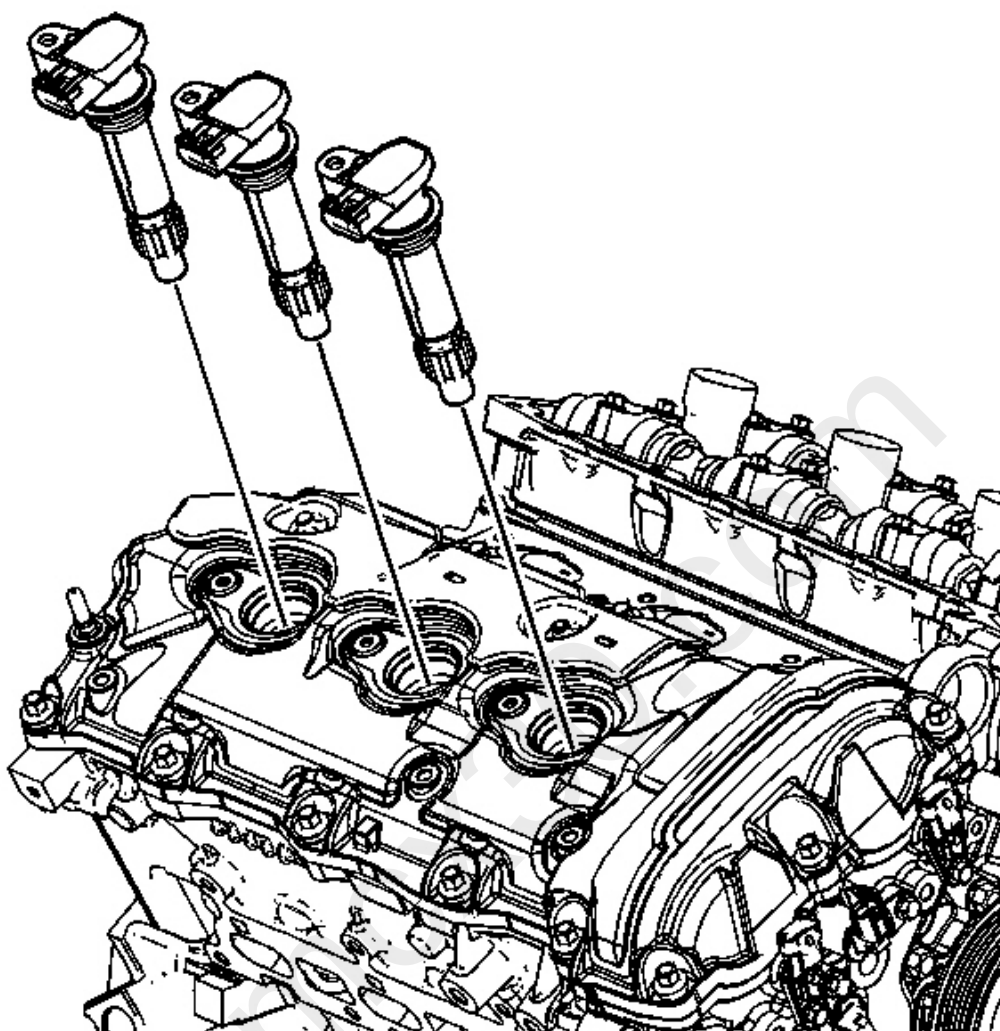


Fig. 29: View Of Ignition Coils
Courtesy of GENERAL MOTORS CORP.

2. Remove the ignition coils.

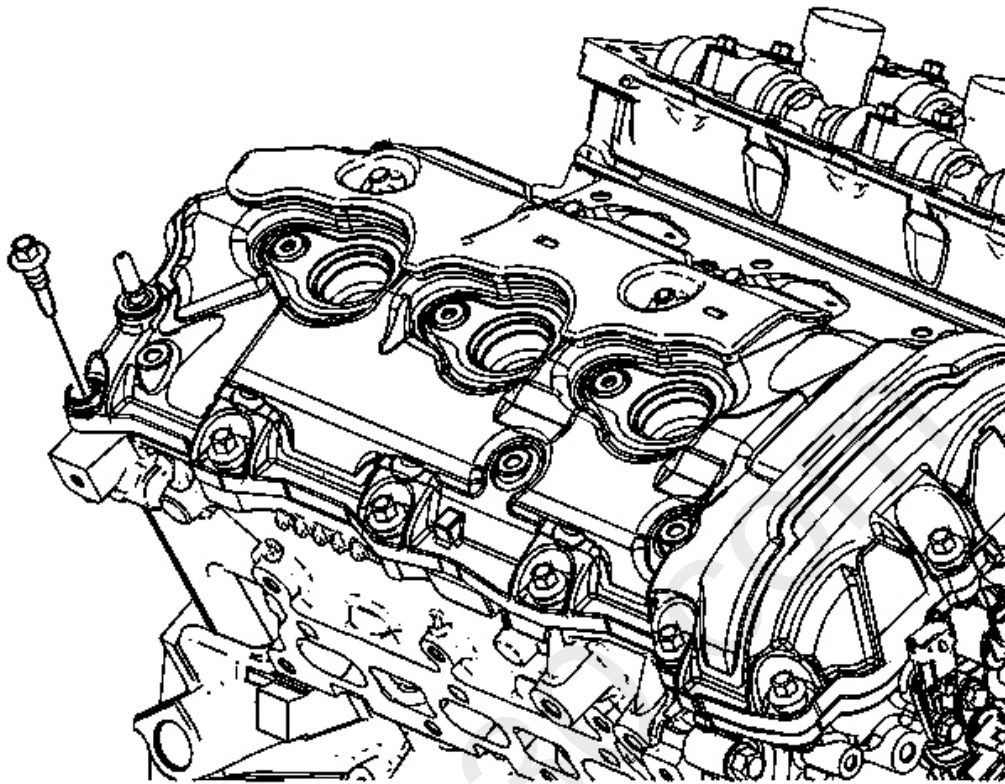


Fig. 30: View Of Camshaft Cover Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the right camshaft cover bolts.
4. Remove and discard the camshaft cover grommets and camshaft cover bolts if they are serviced with the grommet.

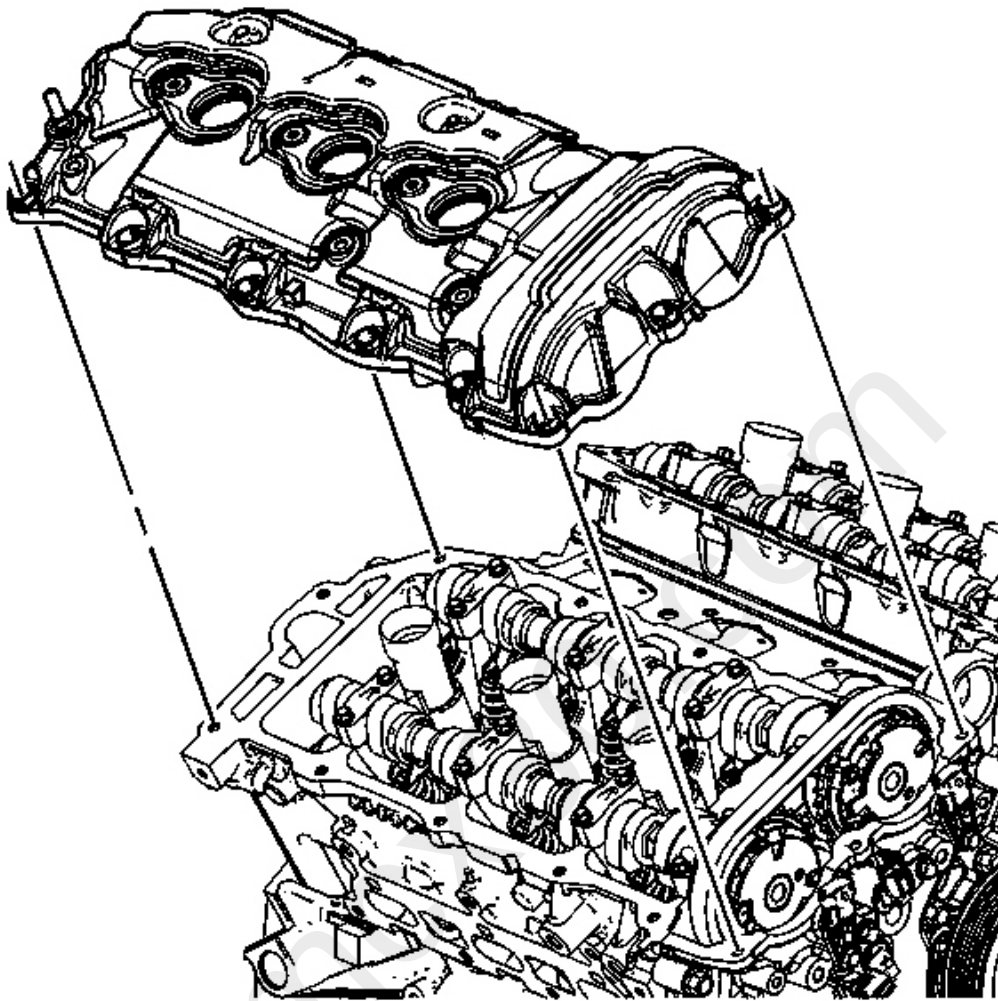


Fig. 31: View Of Right Camshaft Cover
Courtesy of GENERAL MOTORS CORP.

5. Remove the right camshaft cover from the right cylinder head.

WATER PUMP REMOVAL

TOOLS REQUIRED

EN 46104 Water Pump Pulley Holding Tool

REMOVAL

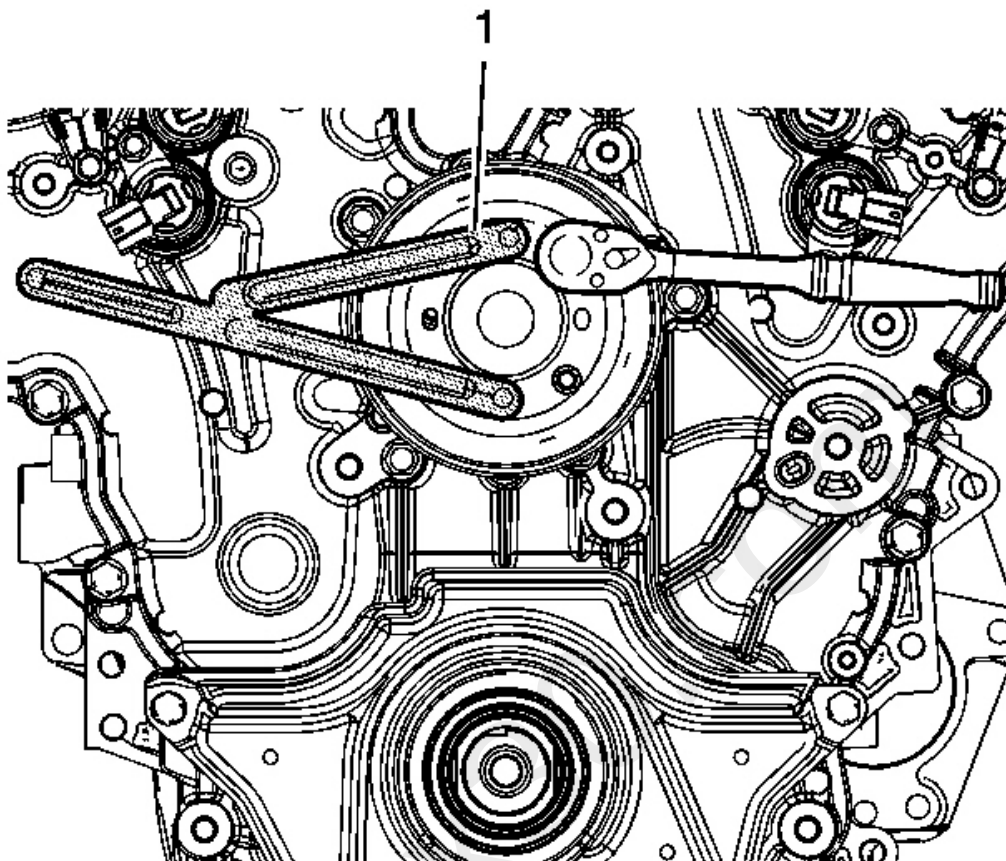


Fig. 32: View Of EN 46104
Courtesy of GENERAL MOTORS CORP.

1. Install the **EN 46104** (1) onto the water pump pulley.

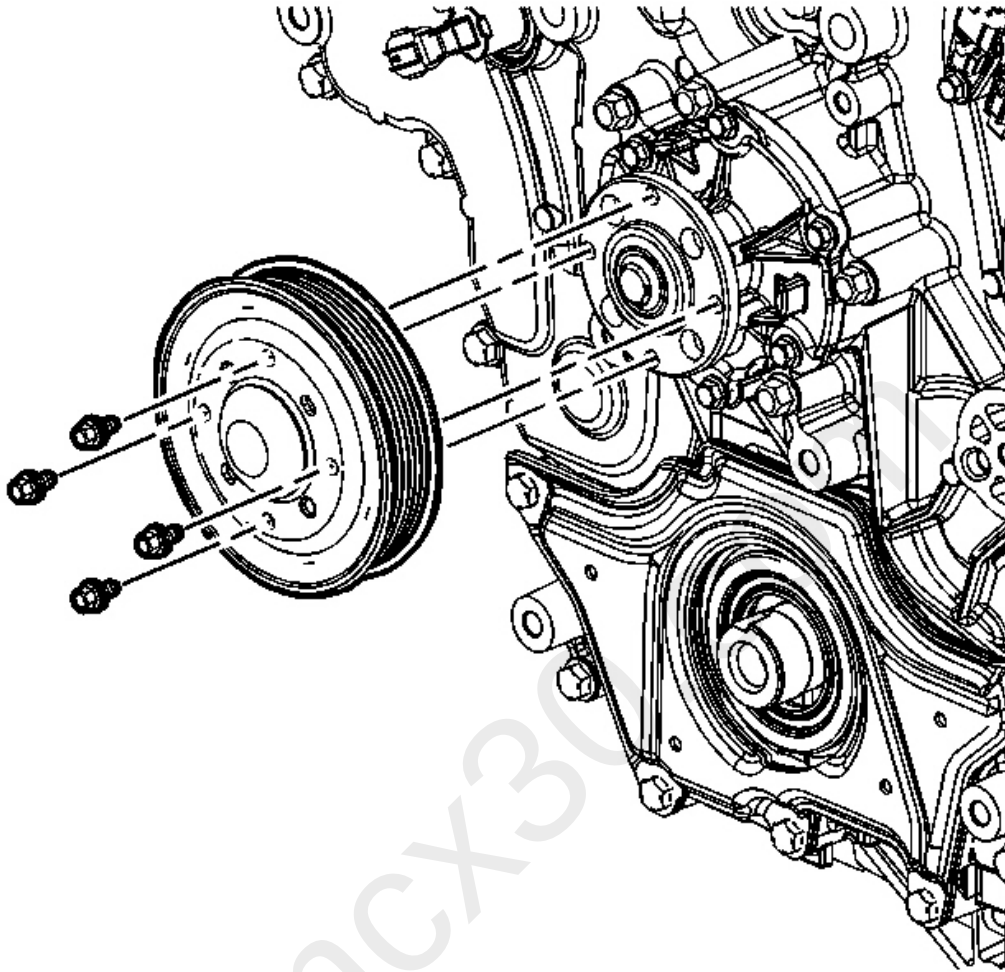


Fig. 33: View Of Water Pump Pulley Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the water pump pulley bolts.
3. Remove the water pump pulley.

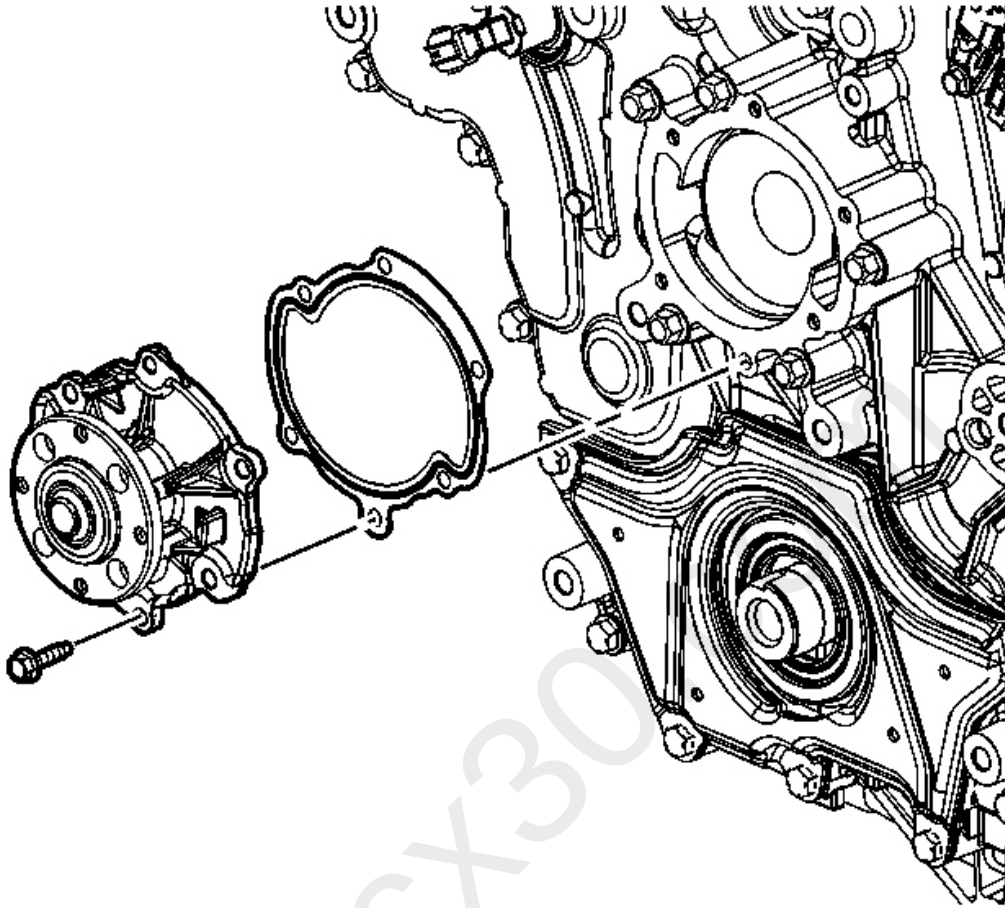


Fig. 34: View Of Water Pump Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the water pump bolts.
5. Remove the water pump from the front cover.
6. Remove the water pump gasket.

ENGINE FRONT COVER REMOVAL

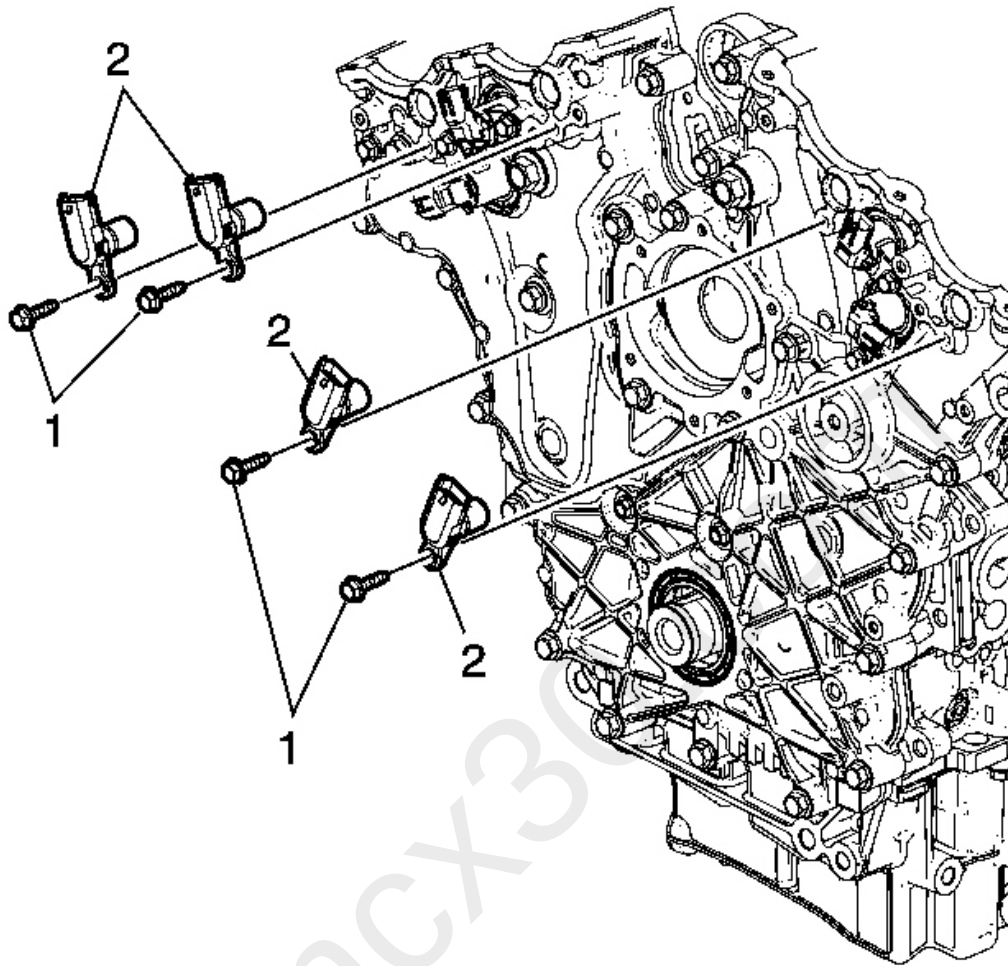


Fig. 35: Placing Camshaft Position Sensors
Courtesy of GENERAL MOTORS CORP.

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

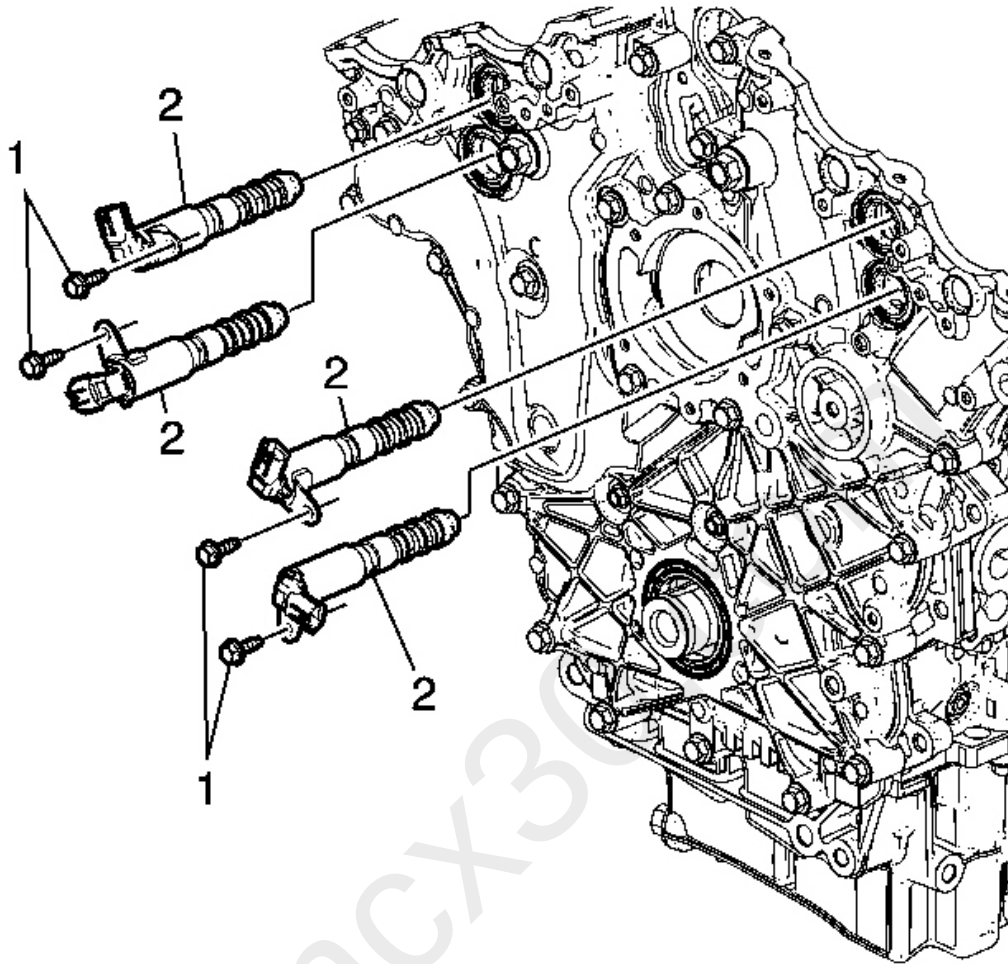


Fig. 36: Placing Camshaft Position Actuator Valves
Courtesy of GENERAL MOTORS CORP.

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.

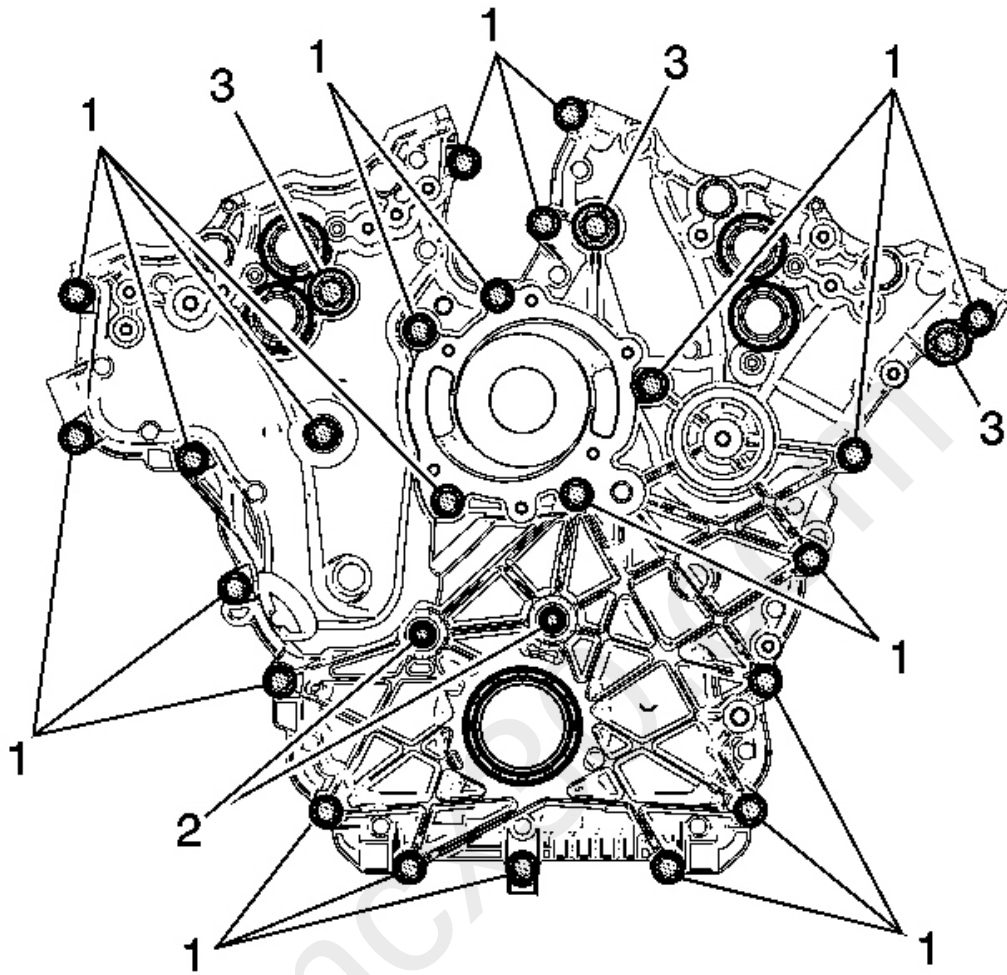


Fig. 37: Identifying Engine Front Cover Bolts
Courtesy of GENERAL MOTORS CORP.

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).

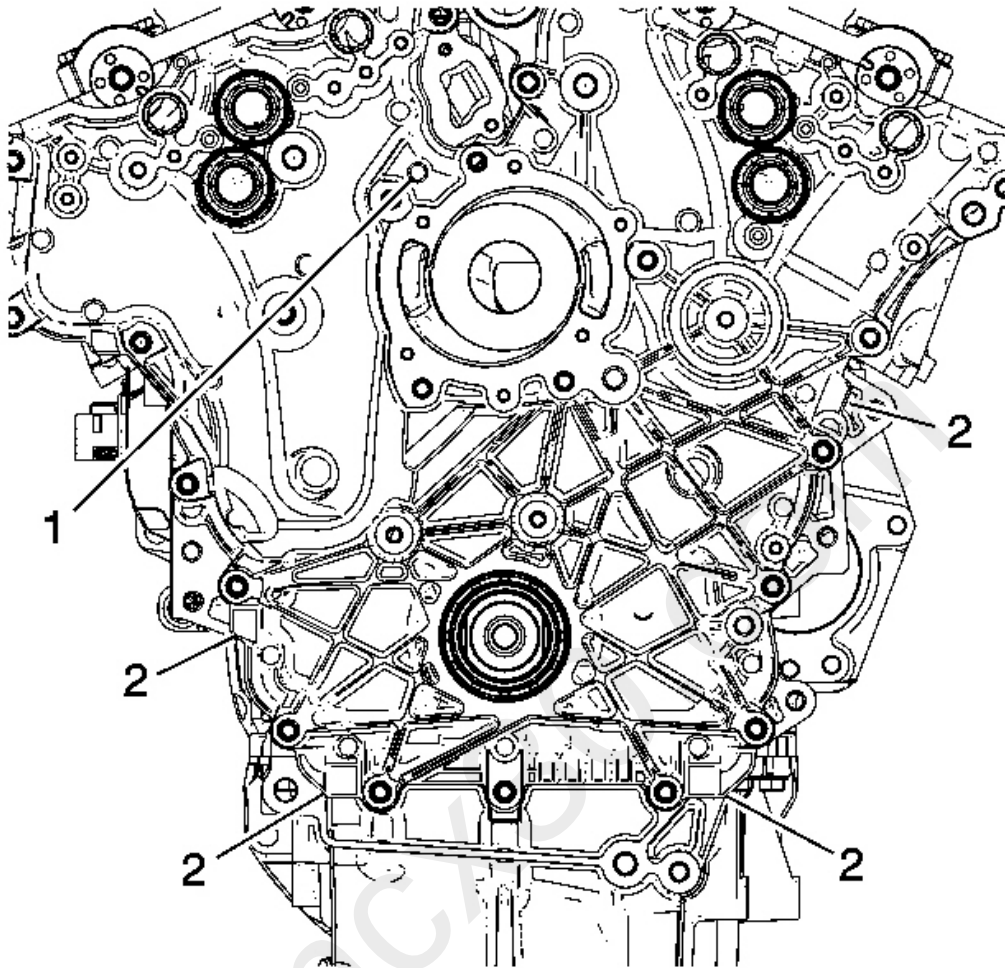


Fig. 38: Locating Jackscrew Hole
Courtesy of GENERAL MOTORS CORP.

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.

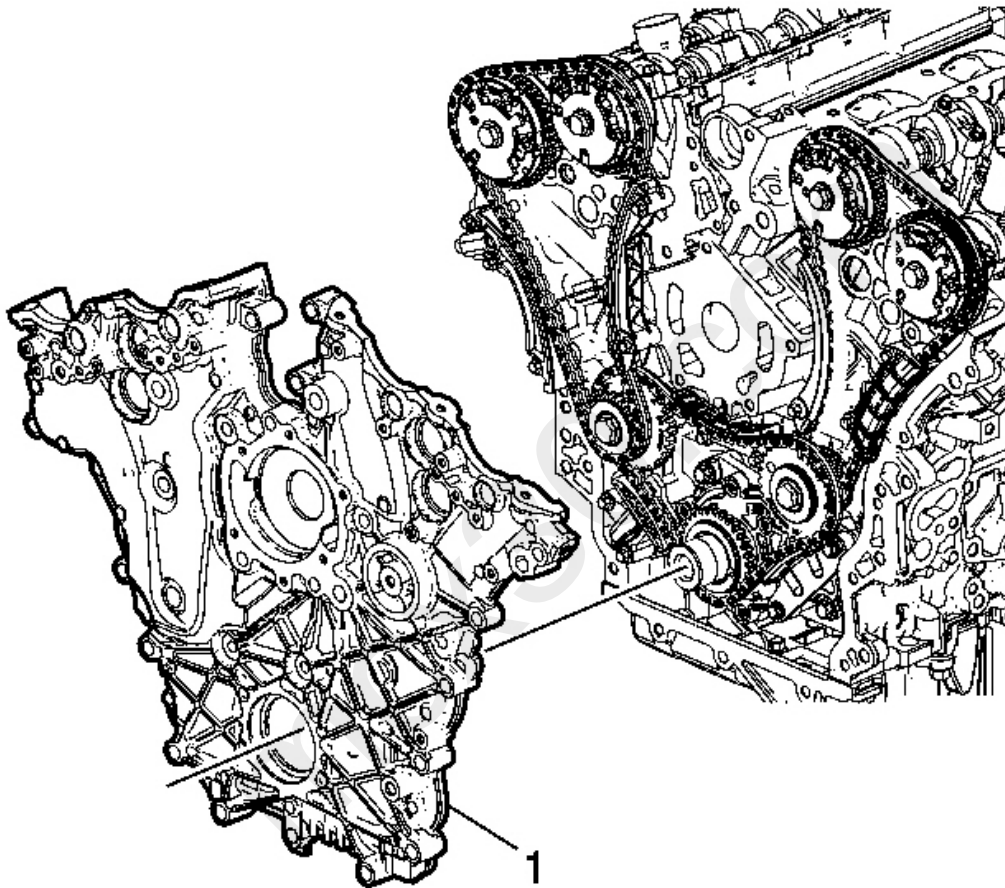


Fig. 39: Engine Front Cover

Courtesy of GENERAL MOTORS CORP.

8. Remove the engine front cover (1).

SECONDARY TIMING CHAIN TENSIONER REMOVAL - RIGHT SIDE

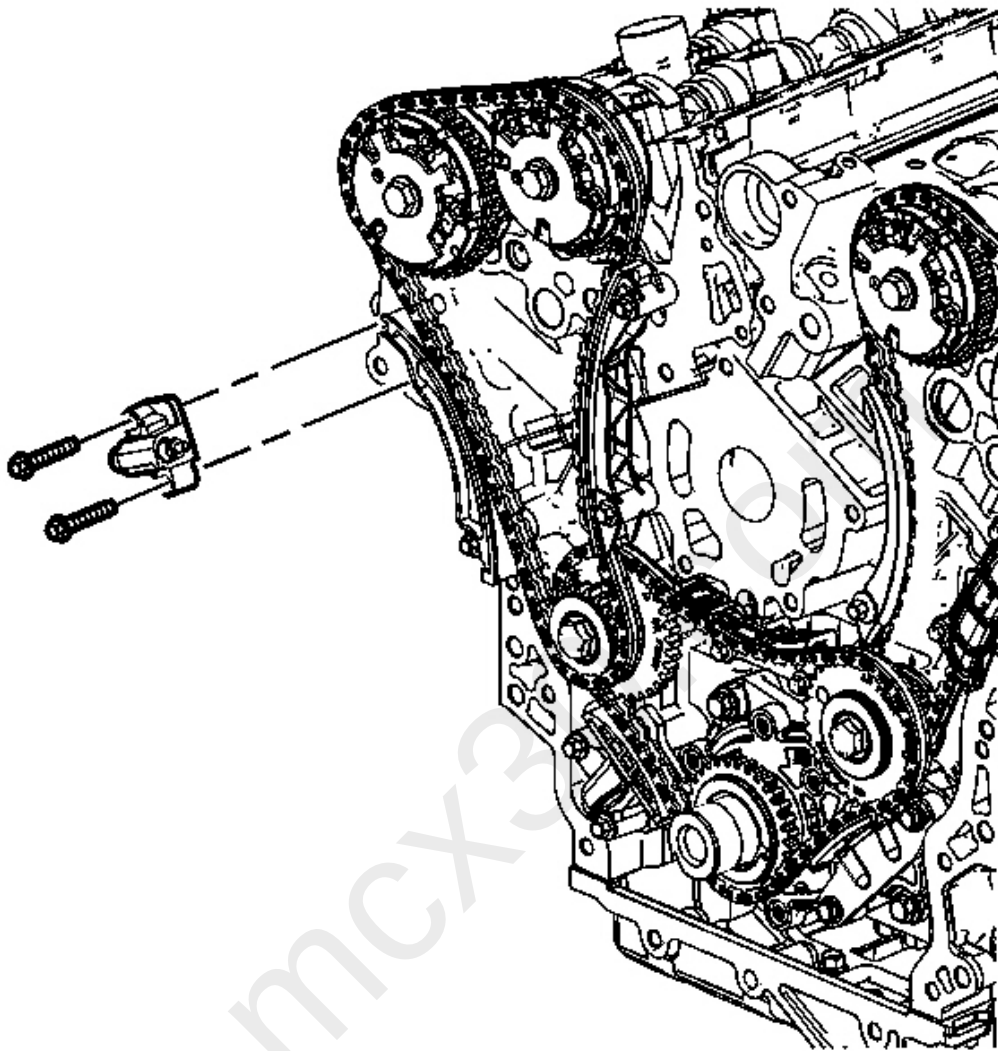


Fig. 40: View Of Secondary Camshaft Drive Chain Tensioner & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the right secondary camshaft drive chain tensioner bolts.
2. Remove the right secondary camshaft drive chain tensioner.

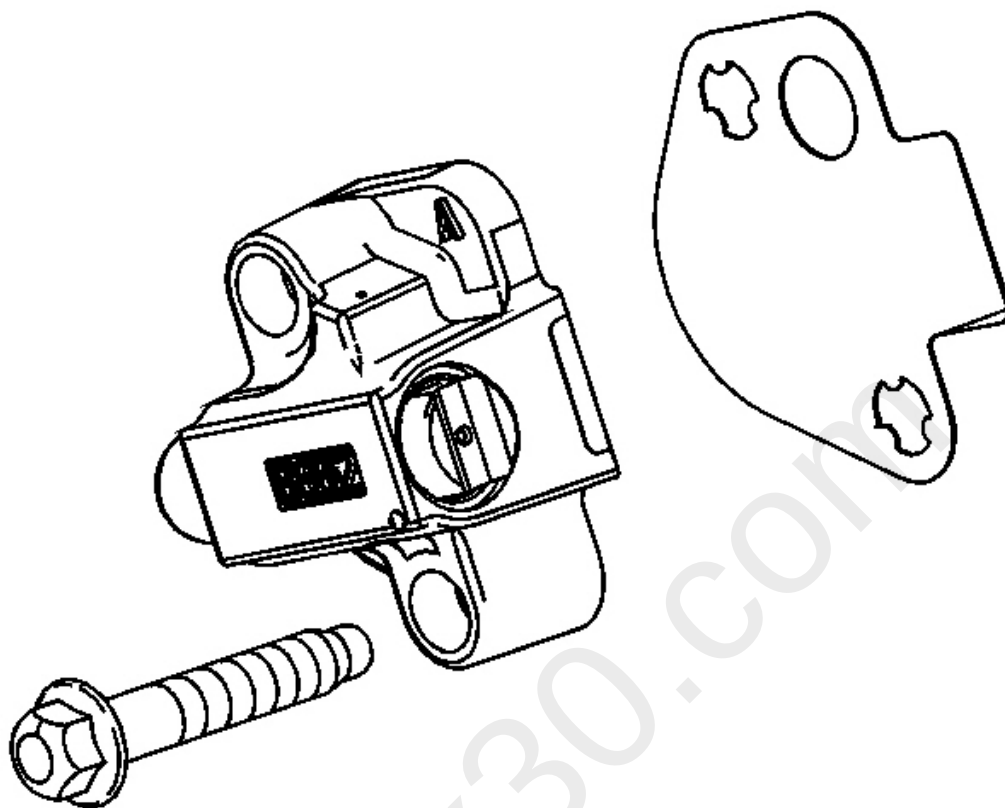


Fig. 41: Identifying Right Secondary Camshaft Drive Chain Tensioner Gasket
Courtesy of GENERAL MOTORS CORP.

3. Remove and discard the right secondary camshaft drive chain tensioner gasket.
4. Inspect the right secondary camshaft drive chain tensioner mounting surface on the right cylinder head for burrs or any defects that would degrade the sealing of the NEW right secondary camshaft drive chain tensioner gasket.

SECONDARY CAMSHAFT DRIVE CHAIN SHOE REMOVAL - RIGHT SIDE

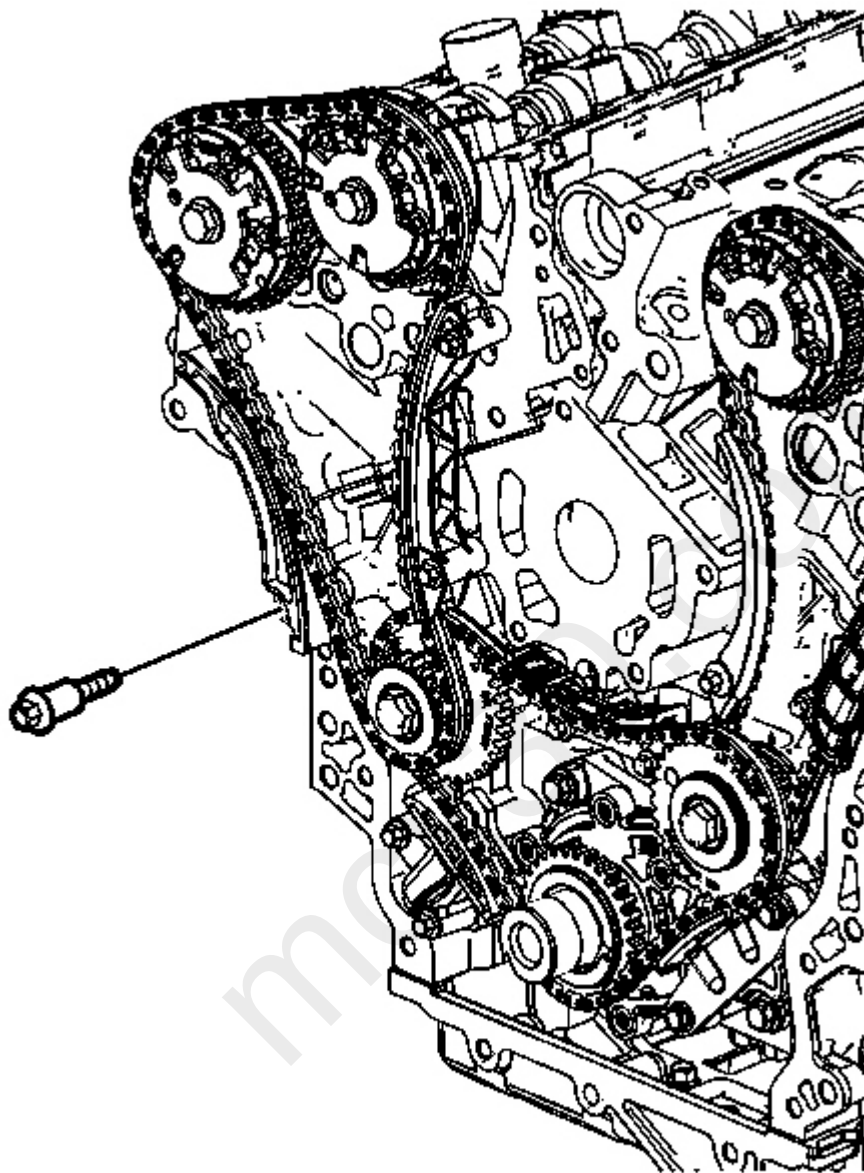


Fig. 42: View Of Right Secondary Camshaft Drive Chain Shoe Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the right secondary camshaft drive chain shoe bolt.

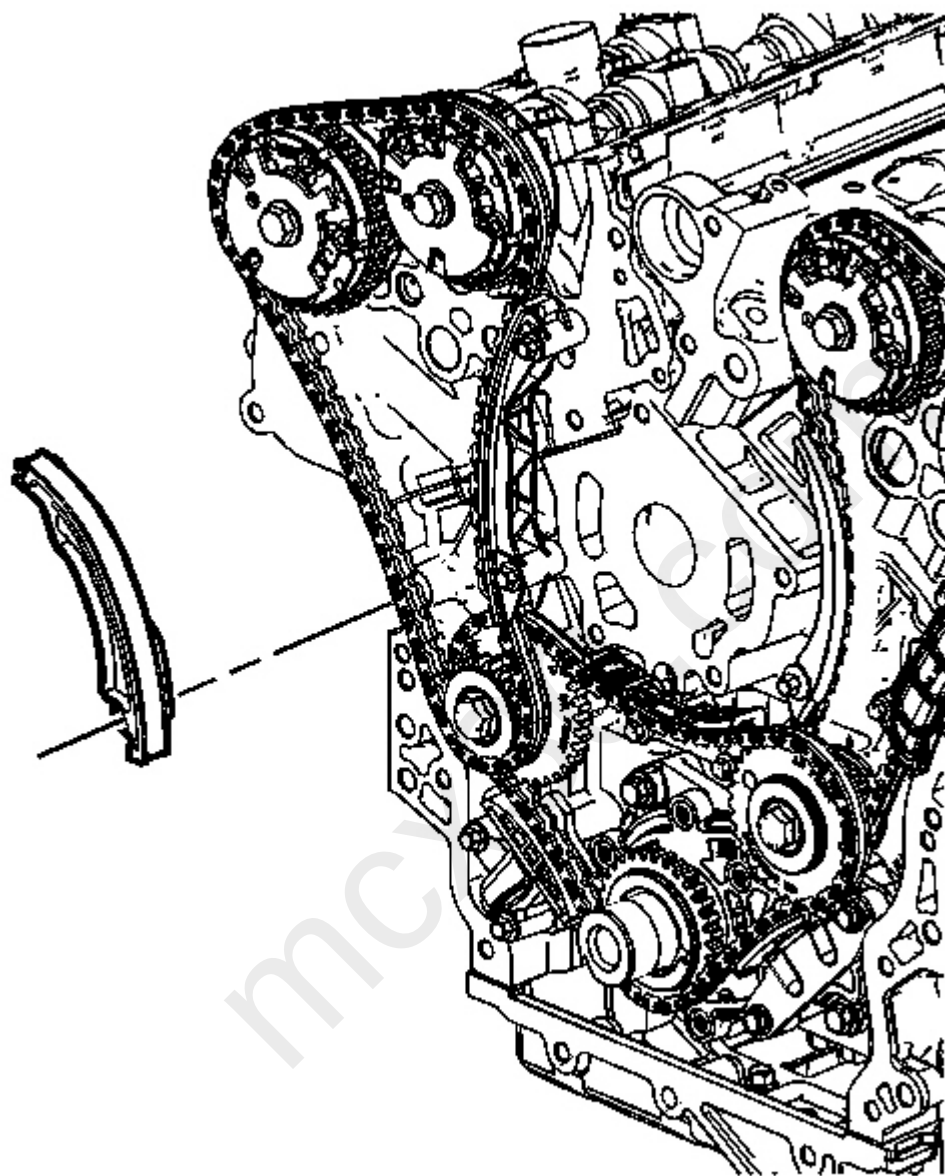


Fig. 43: View Of Right Secondary Camshaft Drive Chain Shoe
Courtesy of GENERAL MOTORS CORP.

2. Remove the right secondary camshaft drive chain shoe.

SECONDARY TIMING CHAIN GUIDE REMOVAL - RIGHT SIDE

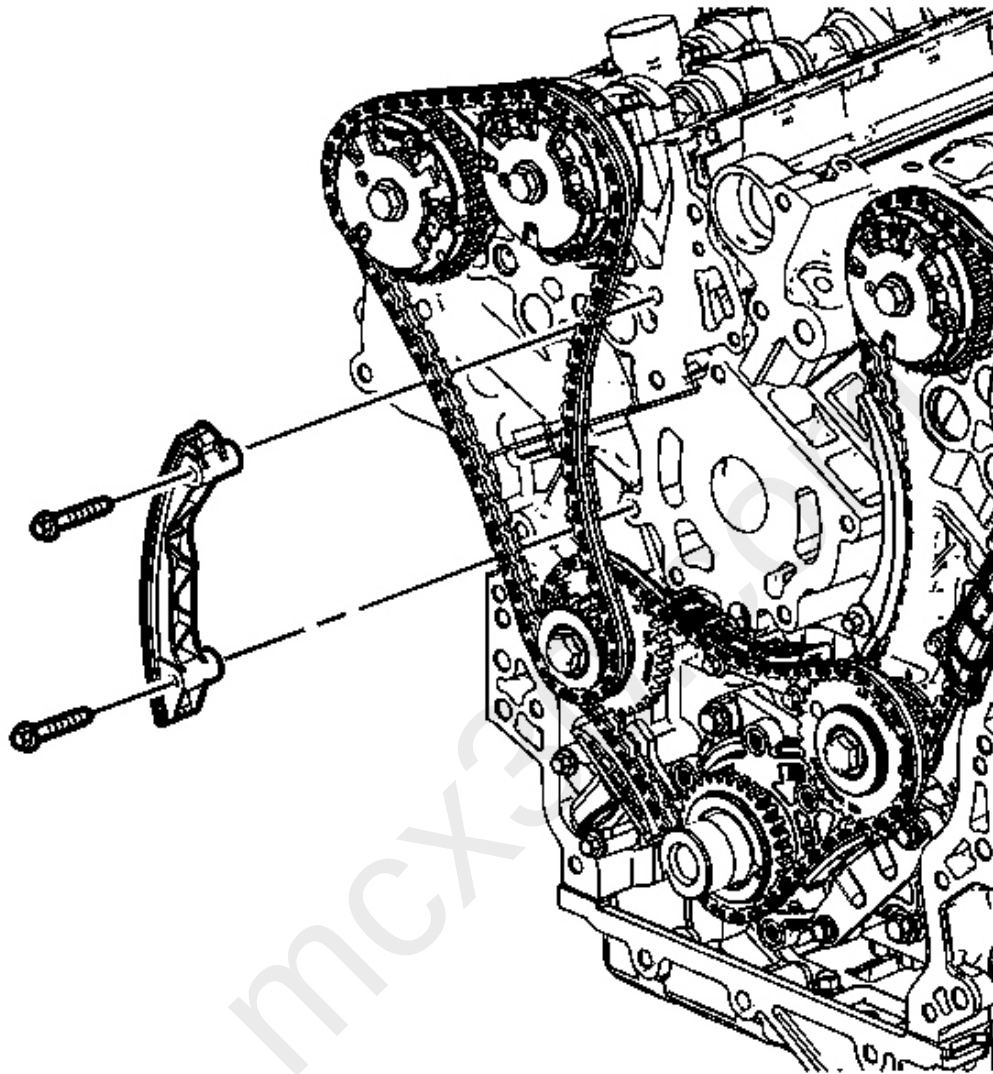


Fig. 44: View Of Right Secondary Camshaft Drive Chain Guide & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the right secondary camshaft drive chain guide bolts.
2. Remove the right secondary camshaft drive chain guide.

SECONDARY CAMSHAFT INTERMEDIATE DRIVE CHAIN REMOVAL - RIGHT SIDE

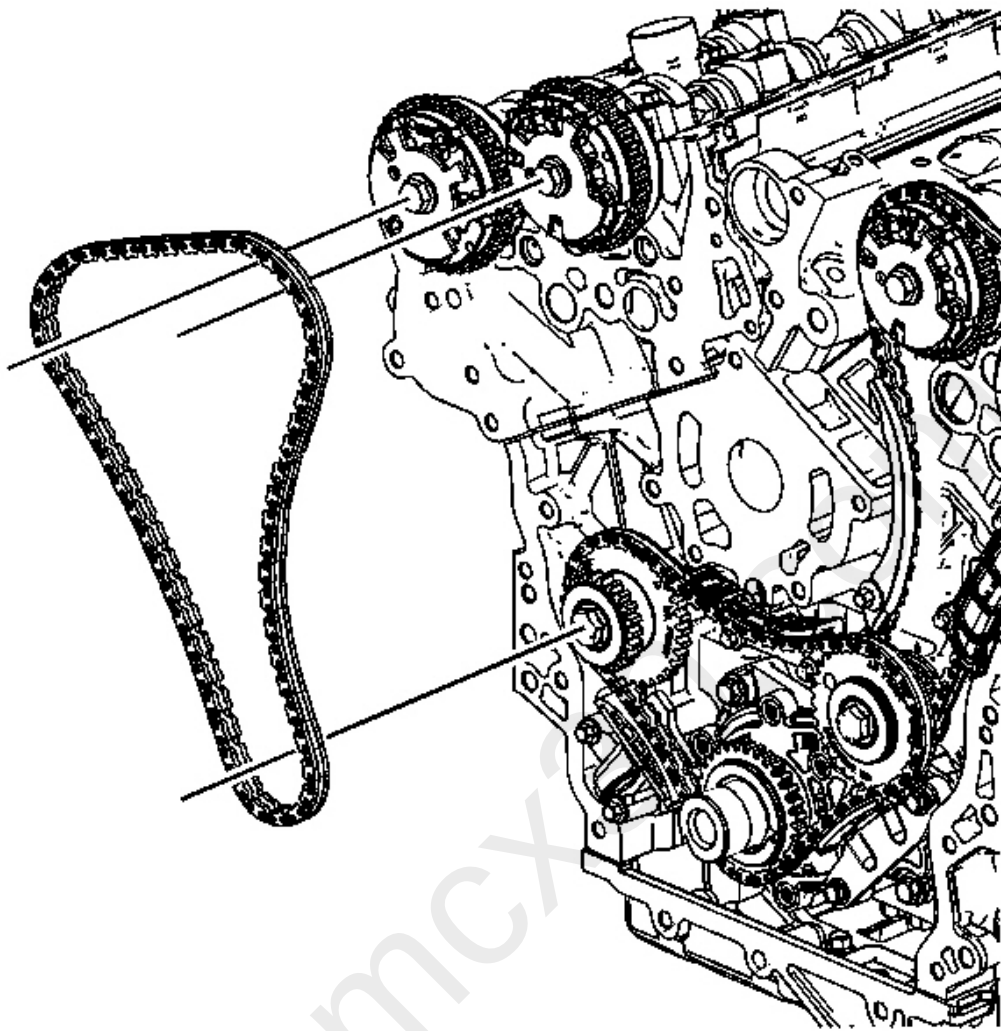


Fig. 45: View Of Secondary Camshaft Drive Chain
Courtesy of GENERAL MOTORS CORP.

Remove the right secondary camshaft drive chain from the right camshaft position actuators and the right camshaft intermediate drive chain idler sprocket.

PRIMARY CAMSHAFT INTERMEDIATE DRIVE CHAIN TENSIONER REMOVAL

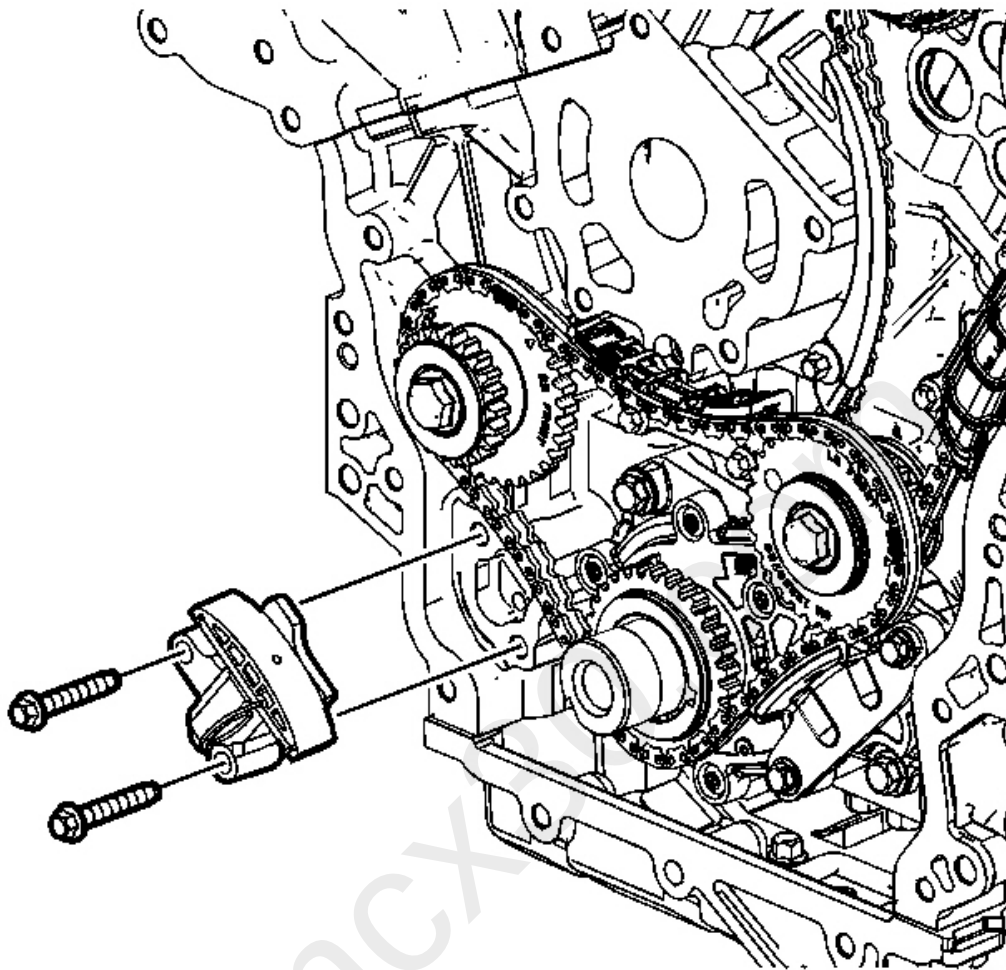


Fig. 46: View Of Primary Camshaft Drive Chain Tensioner & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the primary camshaft drive chain tensioner bolts.
2. Remove the primary camshaft drive chain tensioner.

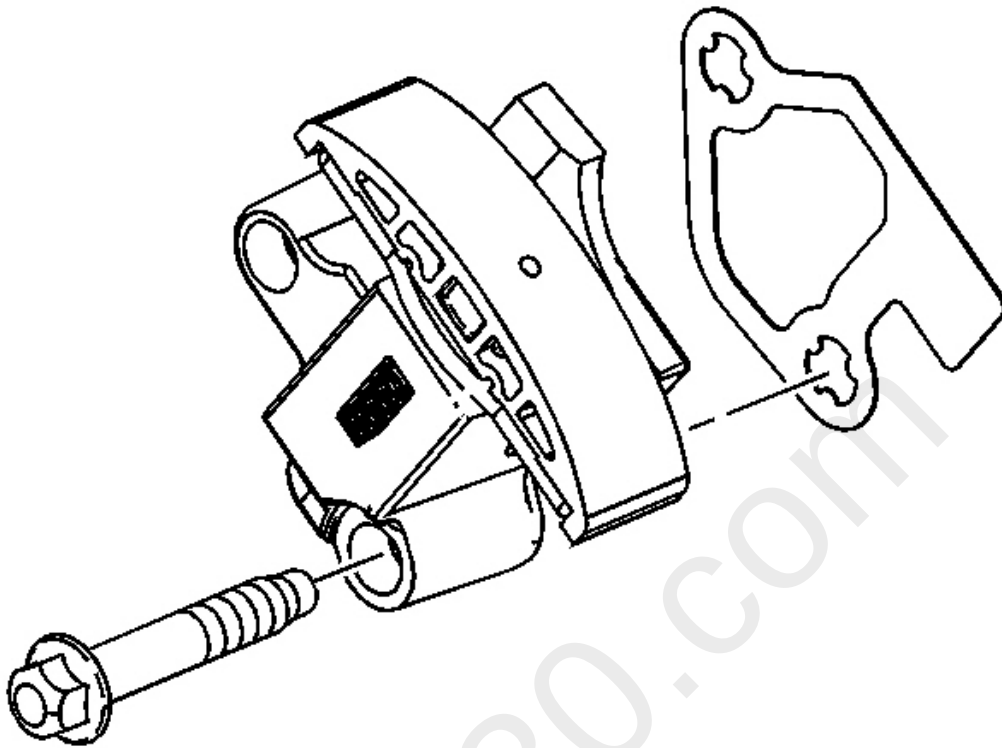


Fig. 47: Identifying Primary Camshaft Drive Chain Tensioner Gasket
Courtesy of GENERAL MOTORS CORP.

3. Remove and discard the primary camshaft drive chain tensioner gasket.
4. 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.

PRIMARY TIMING CHAIN GUIDE REMOVAL - UPPER

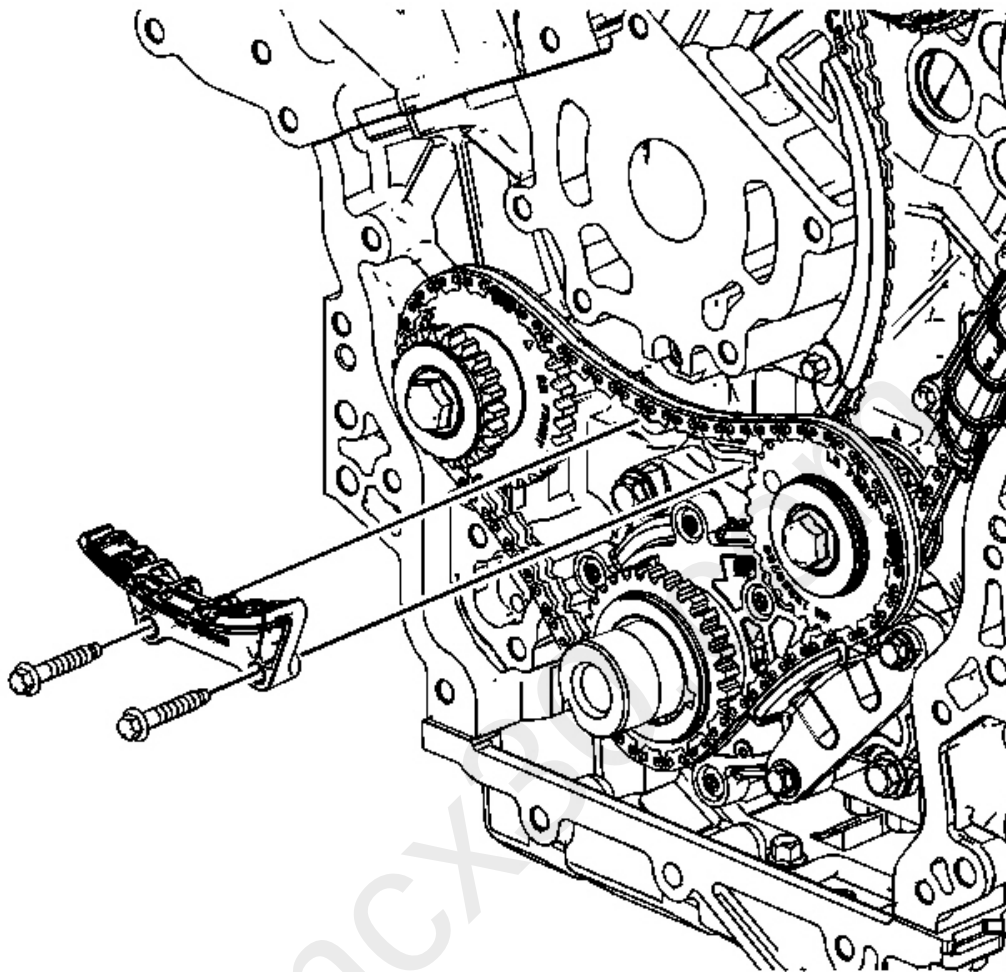


Fig. 48: View Of Primary Camshaft Drive Chain Upper Guide & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the primary camshaft drive chain upper guide bolts.
2. Remove the primary camshaft drive chain upper guides.

PRIMARY TIMING CHAIN GUIDE REMOVAL - LOWER

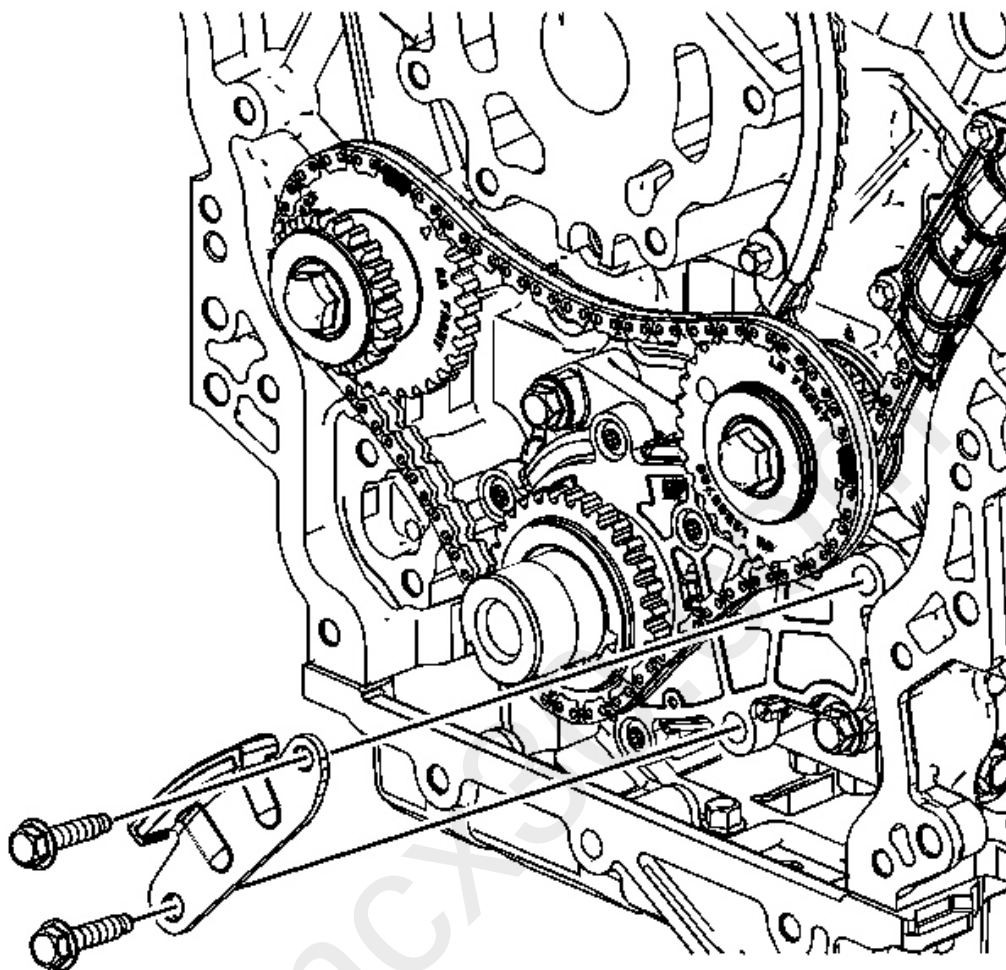


Fig. 49: View Of Primary Camshaft Drive Chain Lower Guide Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the primary camshaft drive chain lower guide bolts.
2. Remove the primary camshaft drive chain lower guide.

PRIMARY CAMSHAFT INTERMEDIATE DRIVE CHAIN REMOVAL

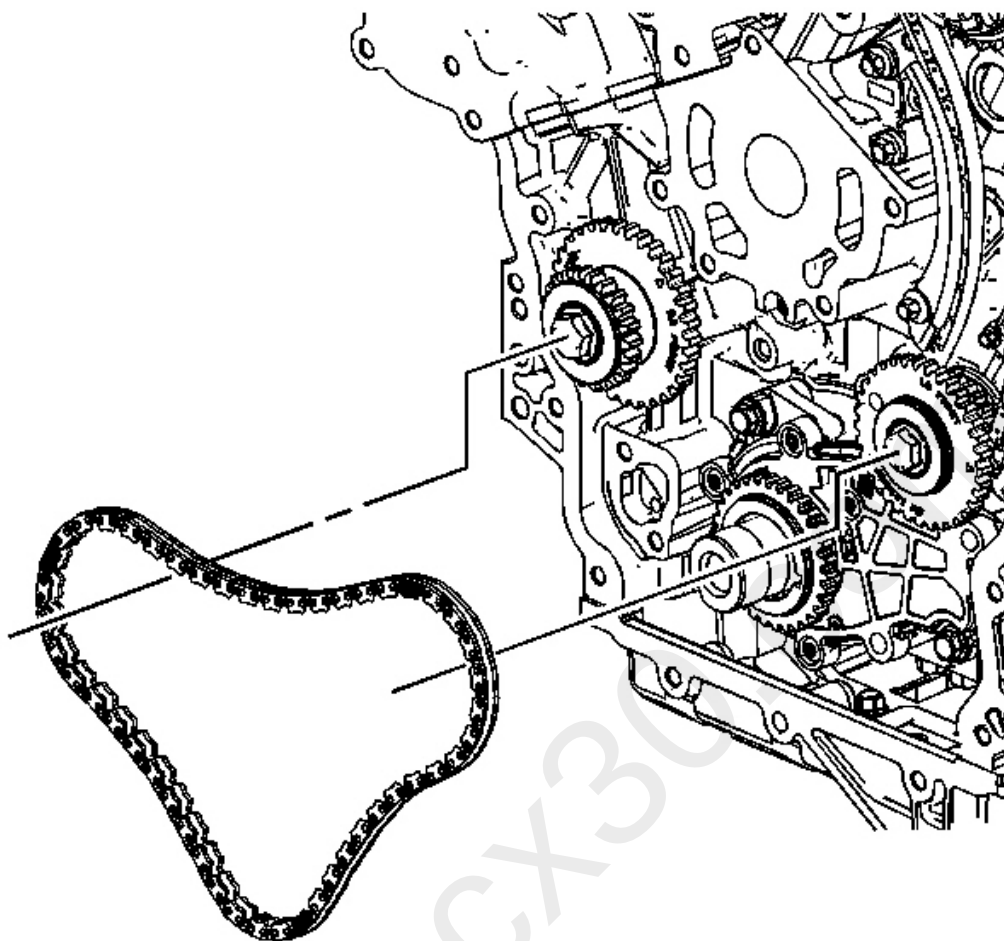


Fig. 50: View Of Primary Camshaft Drive Chain
Courtesy of GENERAL MOTORS CORP.

Remove the primary camshaft drive chain.

TIMING CHAIN IDLER SPROCKET REMOVAL - RIGHT SIDE

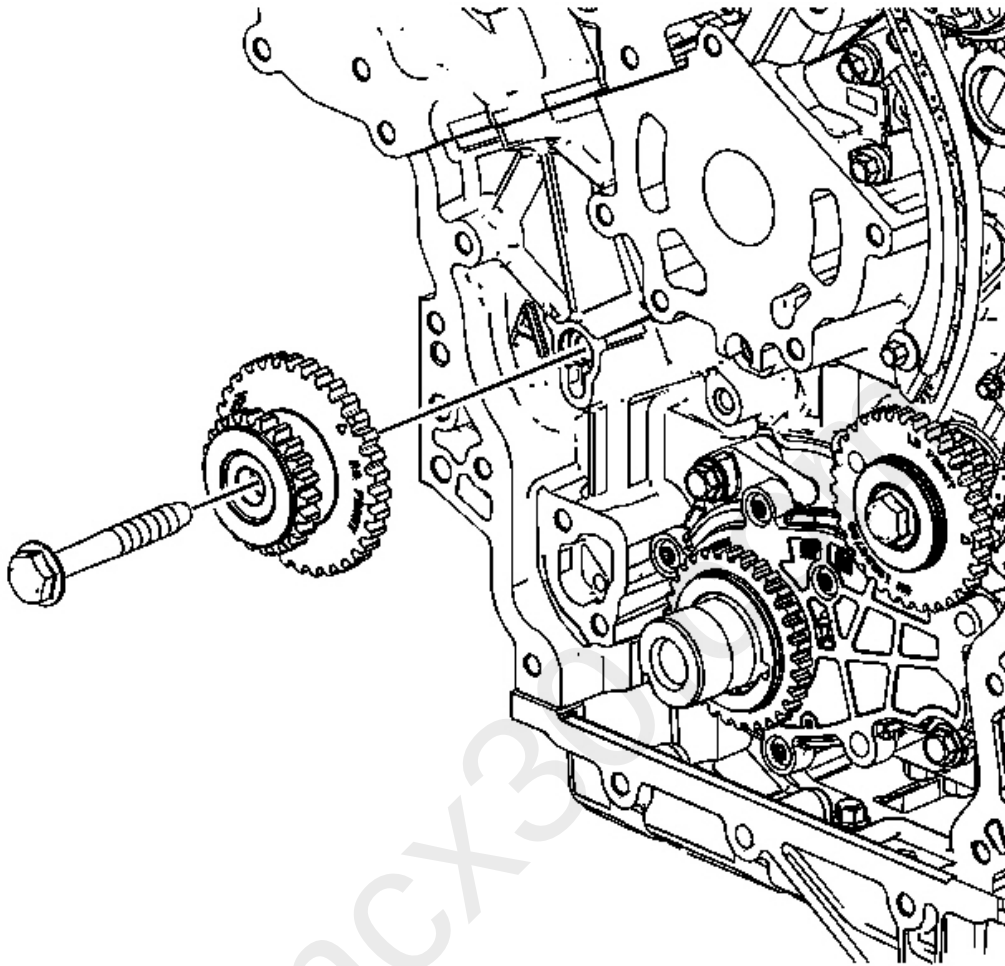


Fig. 51: View Of Camshaft Intermediate Drive Chain Idler & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the right camshaft intermediate drive chain idler bolt.
2. Remove the right camshaft intermediate drive chain idler.

SECONDARY TIMING CHAIN TENSIONER REMOVAL - LEFT SIDE

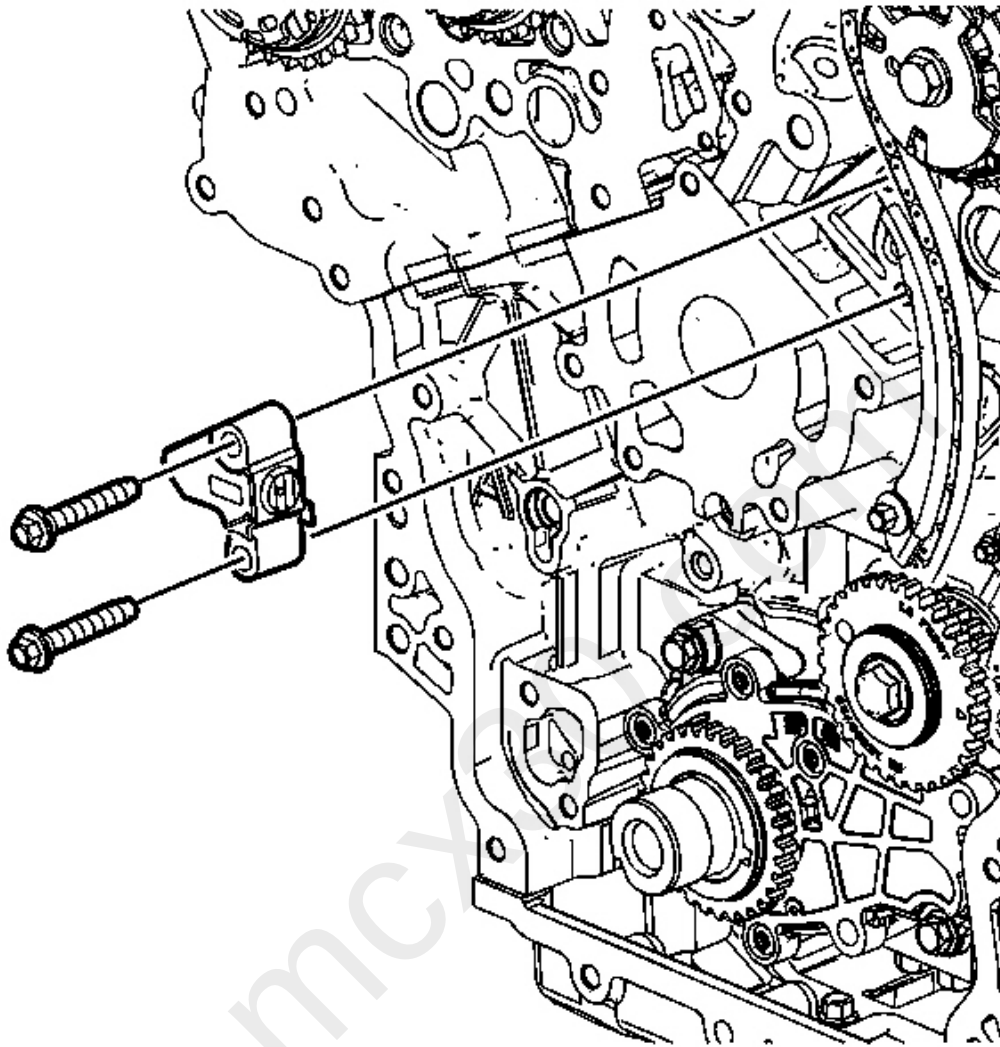


Fig. 52: View Of Secondary Camshaft Drive Chain Tensioner & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the left secondary camshaft drive chain tensioner bolts.
2. Remove the left secondary camshaft drive chain tensioner.

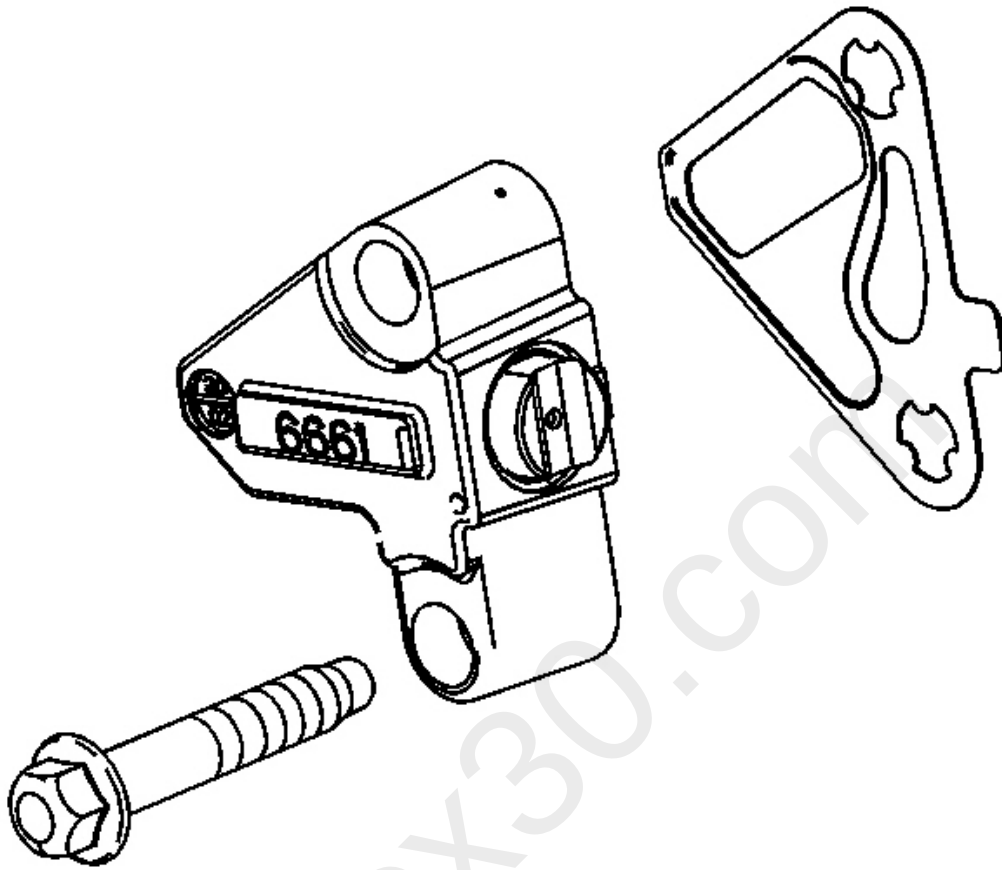


Fig. 53: View Of Left Secondary Camshaft Drive Chain Tensioner Gasket
Courtesy of GENERAL MOTORS CORP.

3. Remove and discard the left secondary camshaft drive chain tensioner gasket.
4. Inspect the left secondary camshaft drive chain tensioner mounting surface on the left cylinder head for burrs or any defects that would degrade the sealing of the NEW left secondary camshaft drive chain tensioner gasket.

SECONDARY CAMSHAFT DRIVE CHAIN SHOE REMOVAL - LEFT SIDE

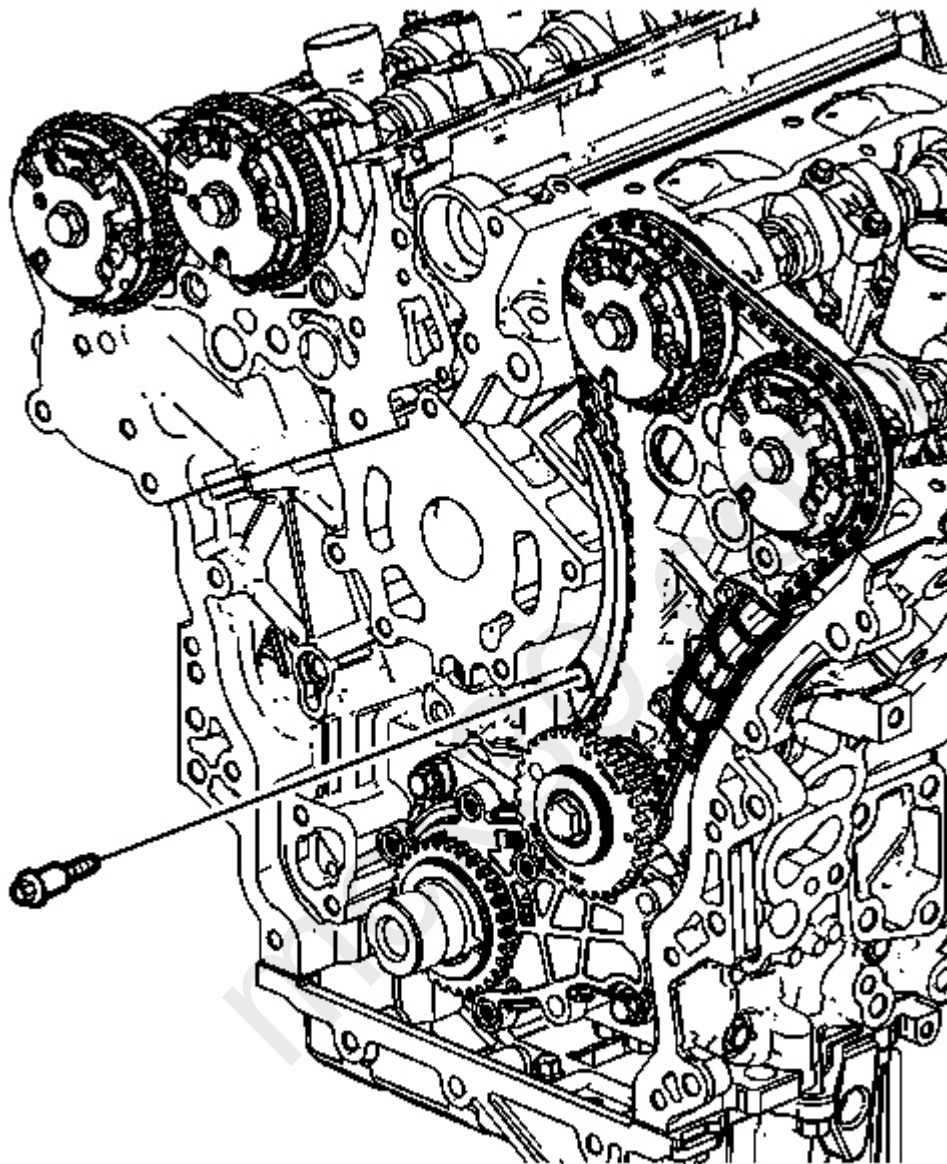


Fig. 54: View Of Left Secondary Camshaft Drive Chain Shoe Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the left secondary camshaft drive chain shoe bolt.

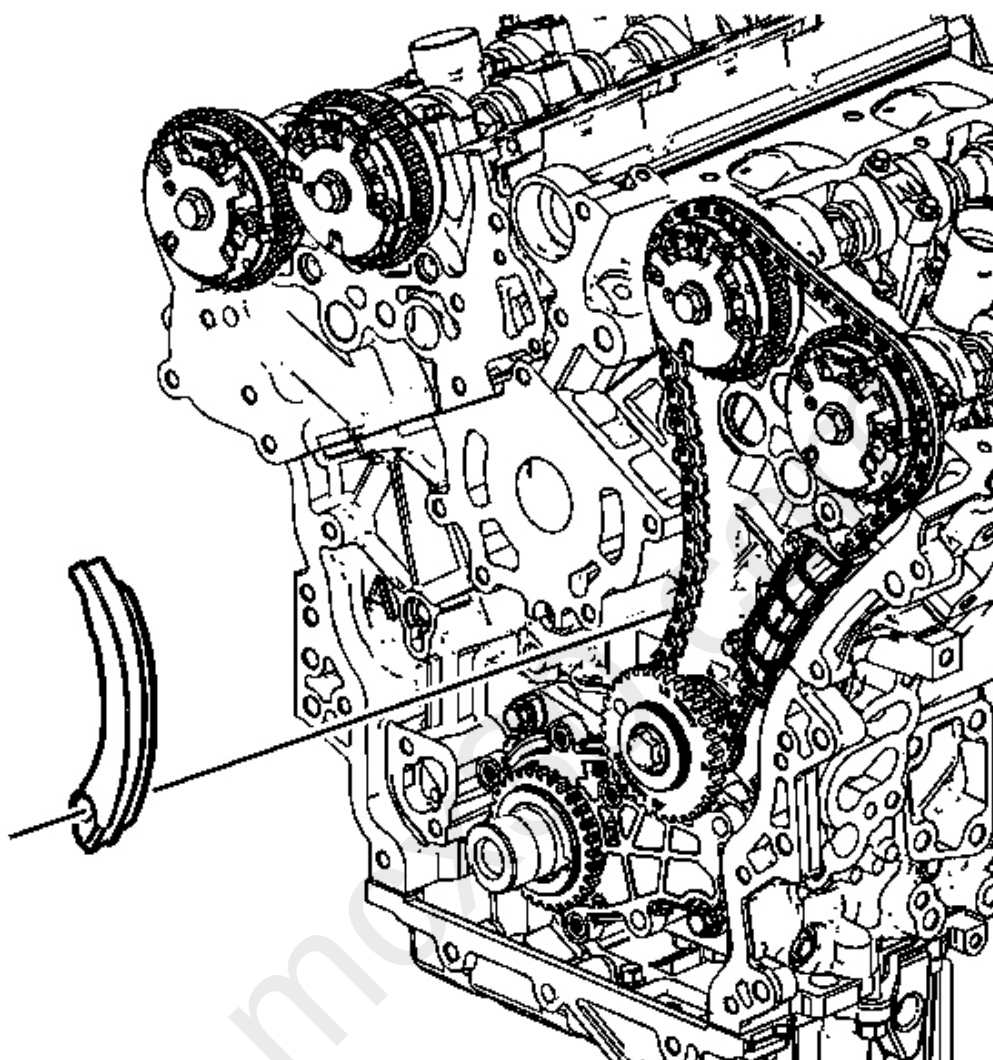


Fig. 55: View Of Left Secondary Camshaft Drive Chain Shoe
Courtesy of GENERAL MOTORS CORP.

2. Remove the left secondary camshaft drive chain shoe.

SECONDARY TIMING CHAIN GUIDE REMOVAL - LEFT SIDE

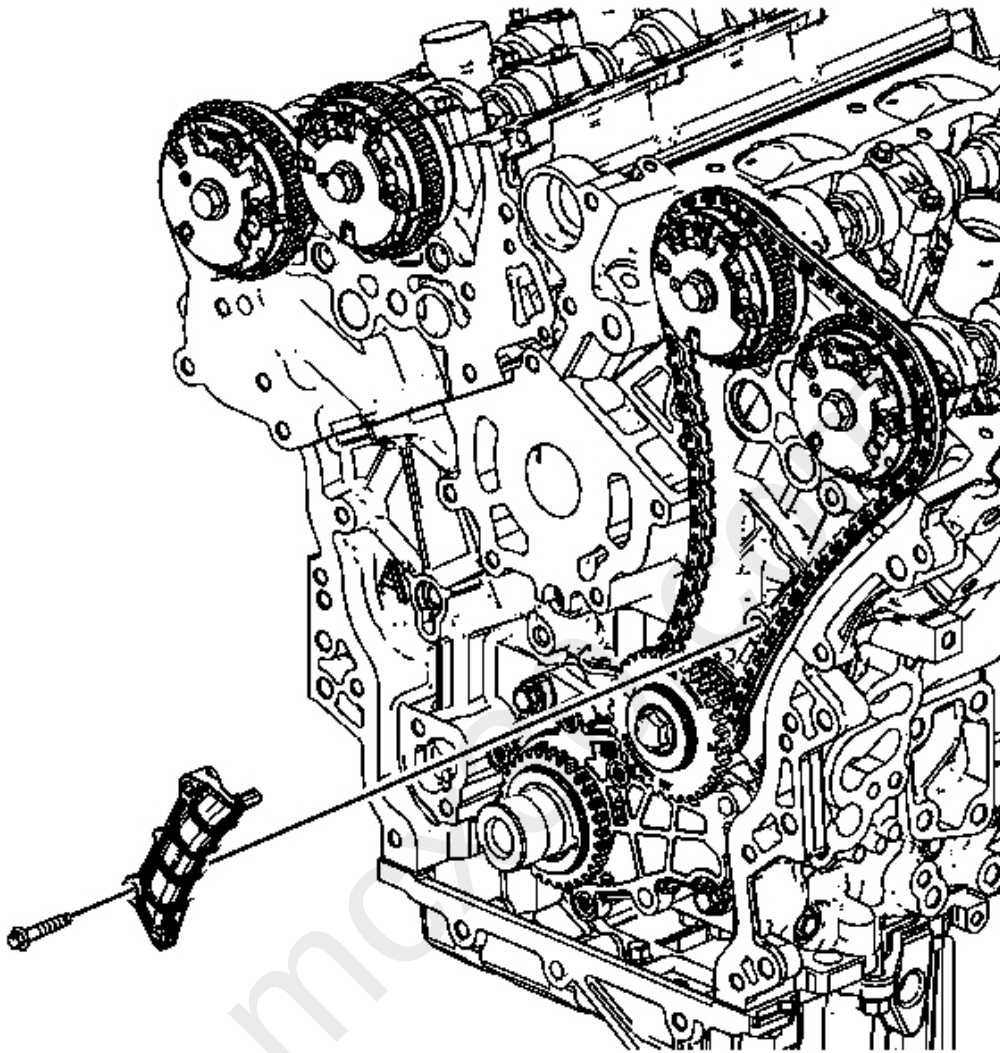


Fig. 56: View Of Secondary Camshaft Drive Chain Guide Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the left secondary camshaft drive chain guide bolts.
2. Remove the left secondary camshaft drive chain guide.

SECONDARY CAMSHAFT INTERMEDIATE DRIVE CHAIN REMOVAL - LEFT SIDE

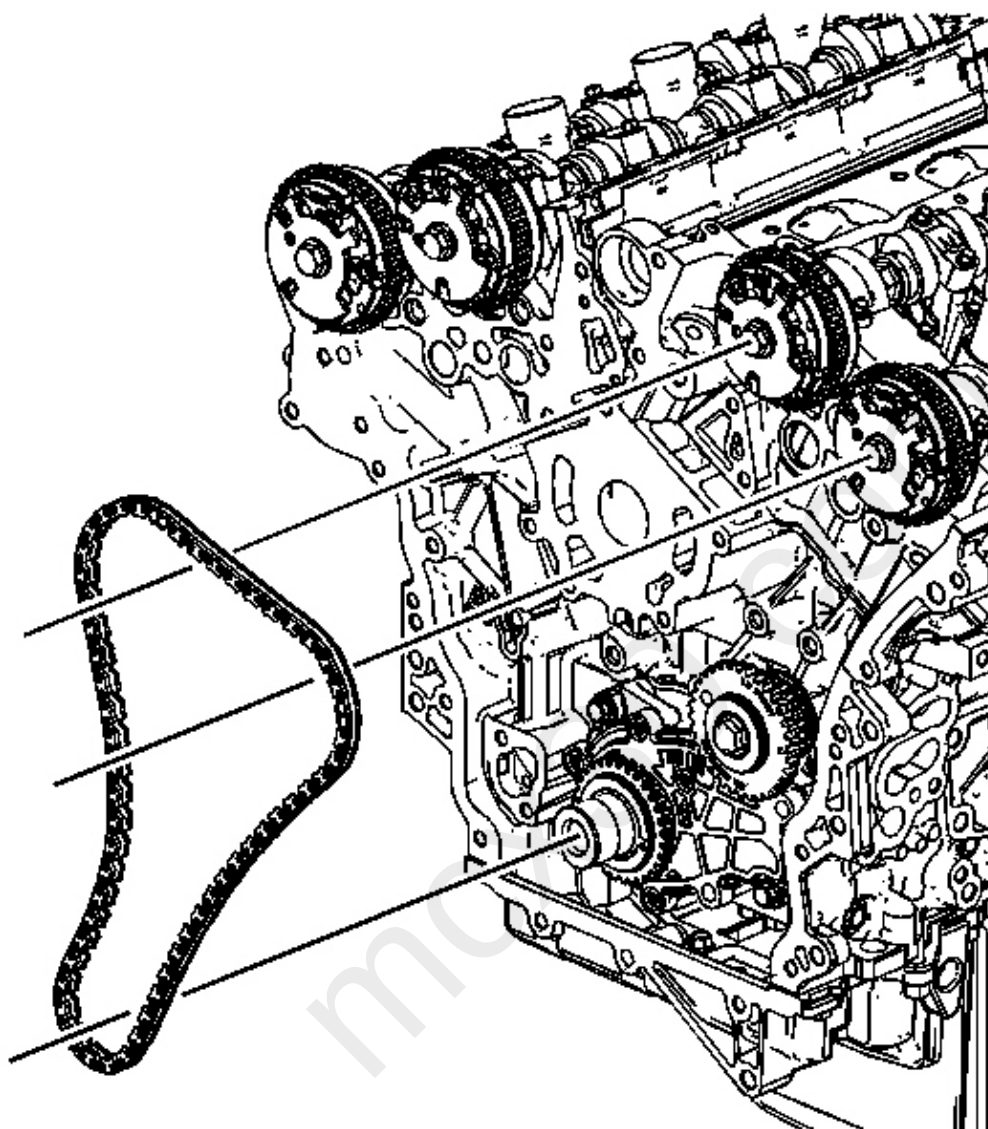


Fig. 57: View Of Left Secondary Camshaft Drive Chain
Courtesy of GENERAL MOTORS CORP.

Remove the left secondary camshaft drive chain from the left camshaft position actuators and the left camshaft intermediate drive chain idler sprocket.

TIMING CHAIN IDLER SPROCKET REMOVAL - LEFT SIDE

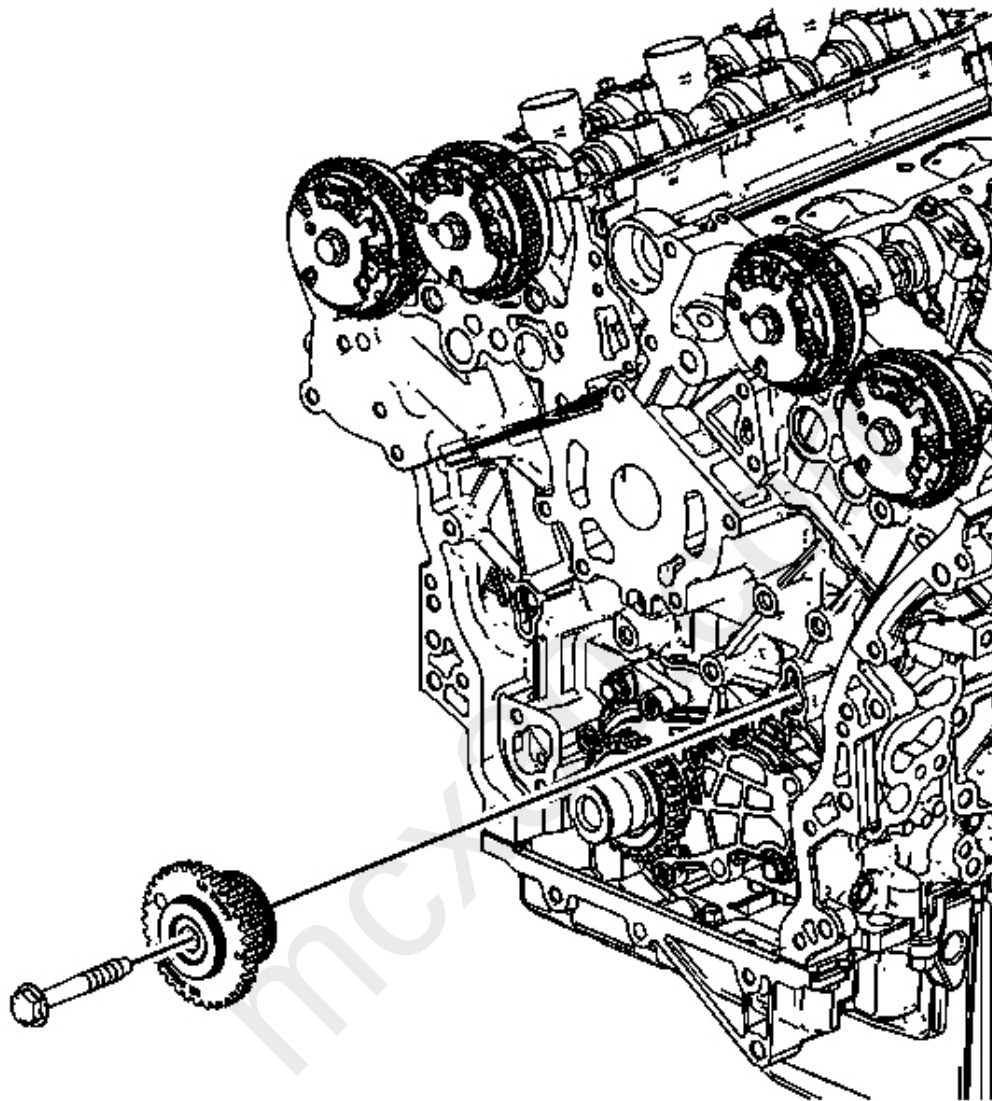


Fig. 58: View Of Left Camshaft Intermediate Drive Chain Idler & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the left camshaft intermediate drive chain idler bolt.
2. Remove the left camshaft intermediate drive chain idler.

CRANKSHAFT SPROCKET REMOVAL

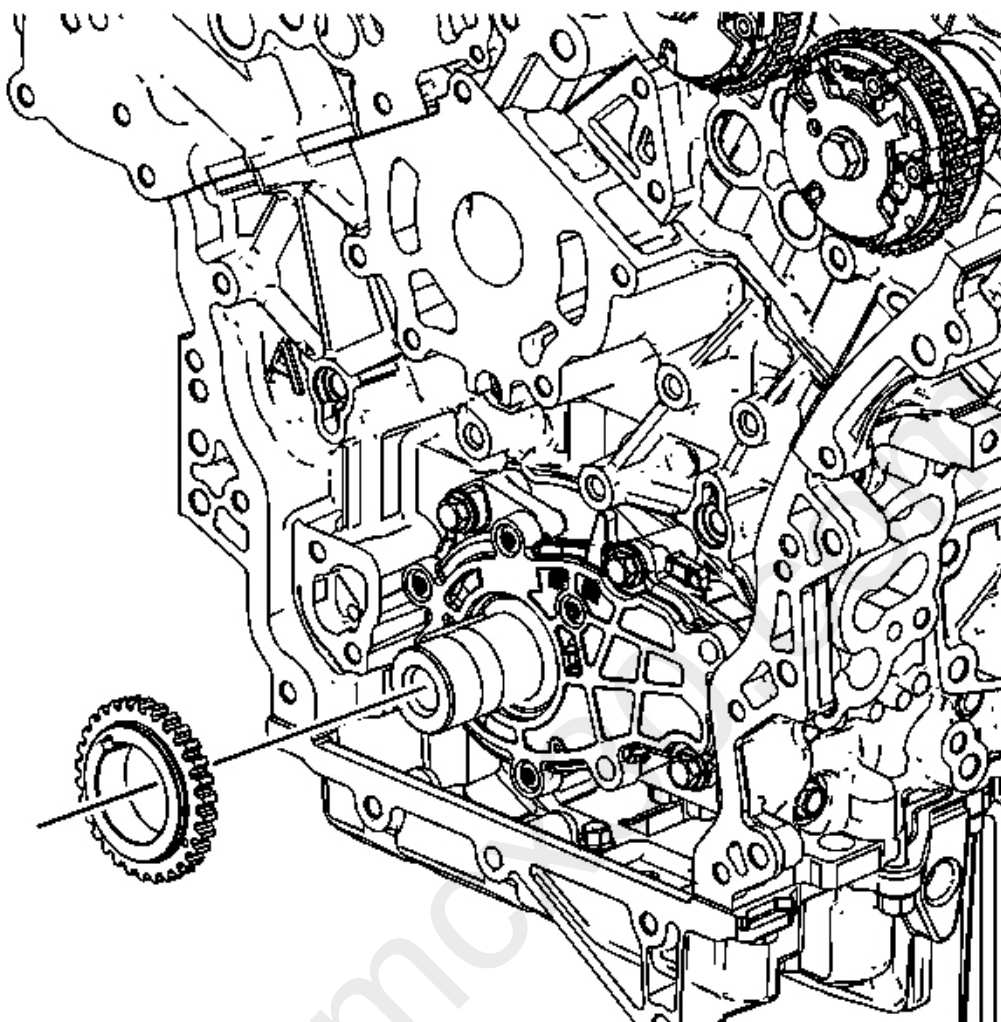


Fig. 59: View Of Crankshaft Sprocket
Courtesy of GENERAL MOTORS CORP.

Remove the crankshaft sprocket from the nose of the crankshaft.

CAMSHAFT POSITION ACTUATOR REMOVAL - LEFT SIDE EXHAUST

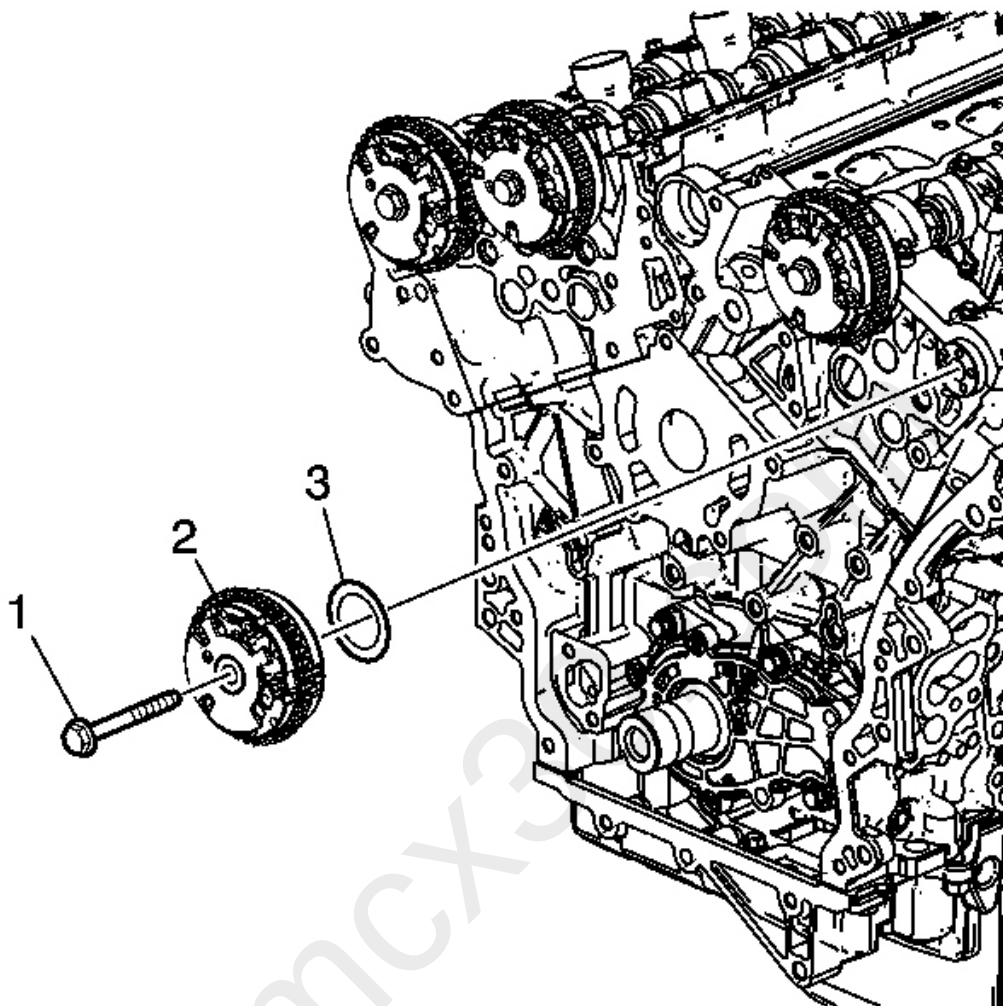


Fig. 60: View Of Exhaust Camshaft Position Actuator & Bolt
Courtesy of GENERAL MOTORS CORP.

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

1. Use an open wrench on the hex cast into the camshaft in order to prevent engine rotation when loosening the camshaft position actuator bolt.
2. Remove the left exhaust camshaft position actuator bolt (1).
3. Remove the left exhaust camshaft position actuator (2).
4. Remove the camshaft thrust washer if applicable (3).

CAMSHAFT POSITION ACTUATOR REMOVAL - LEFT SIDE INTAKE

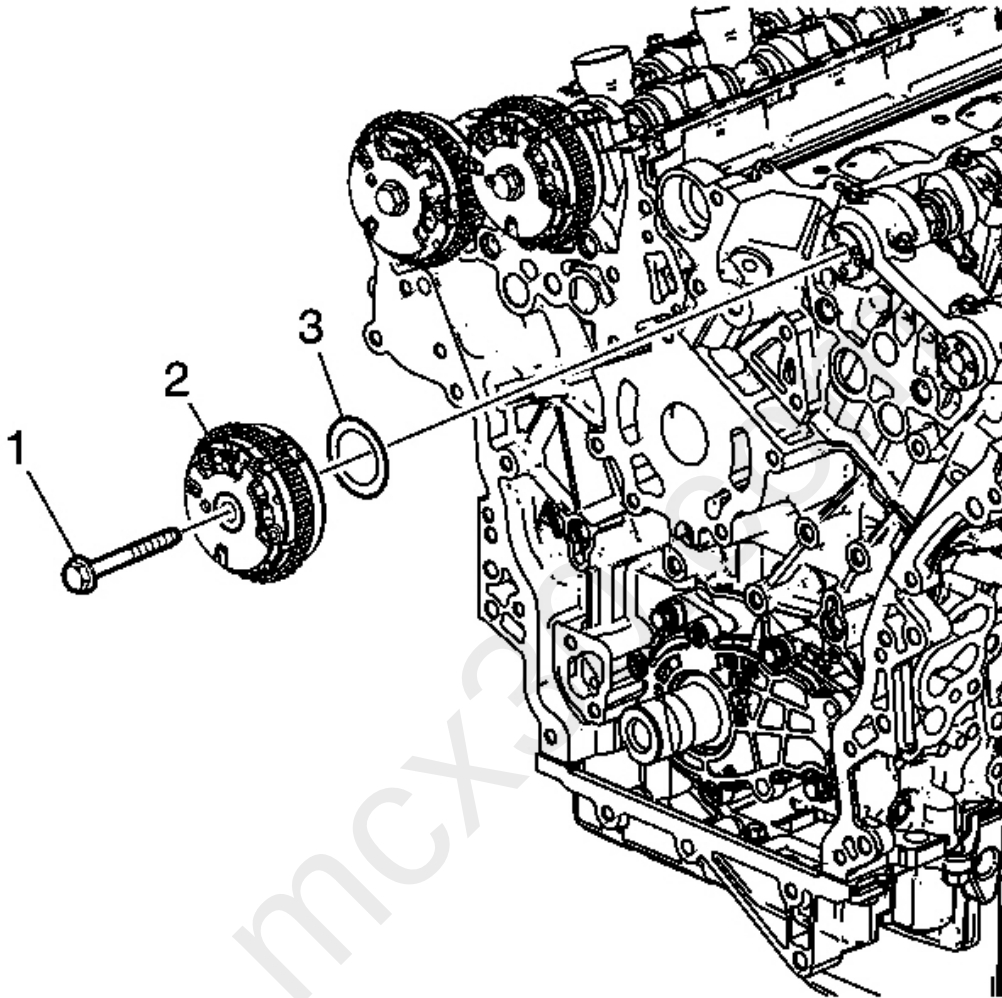


Fig. 61: View Of Camshaft Position Actuator Bolt
Courtesy of GENERAL MOTORS CORP.

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

1. Use an open wrench on the hex cast into the camshaft in order to prevent engine rotation when loosening the camshaft position actuator bolt.
2. Remove the left intake camshaft position actuator bolt (1).

3. Remove the left intake camshaft position actuator (2).
4. Remove the camshaft thrust washer if applicable (3).

CAMSHAFT POSITION ACTUATOR REMOVAL - RIGHT SIDE EXHAUST

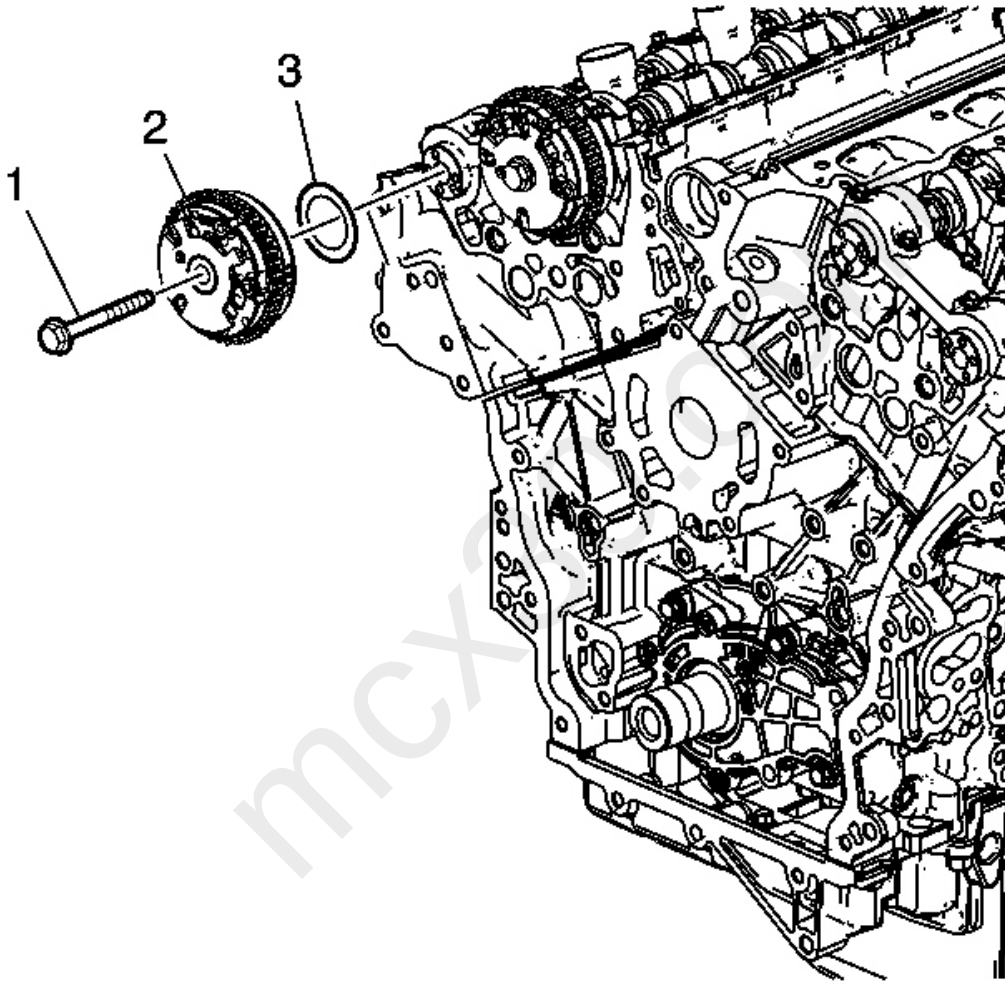


Fig. 62: Identifying Camshaft Position Actuator & Bolt
Courtesy of GENERAL MOTORS CORP.

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

1. Use an open wrench on the hex cast into the camshaft in order to prevent engine rotation when loosening

the camshaft position actuator bolt.

2. Remove the right exhaust camshaft position actuator bolt (1).
3. Remove the right exhaust camshaft position actuator (2).
4. Remove the camshaft thrust washer if applicable (3).

CAMSHAFT POSITION ACTUATOR REMOVAL - RIGHT SIDE INTAKE

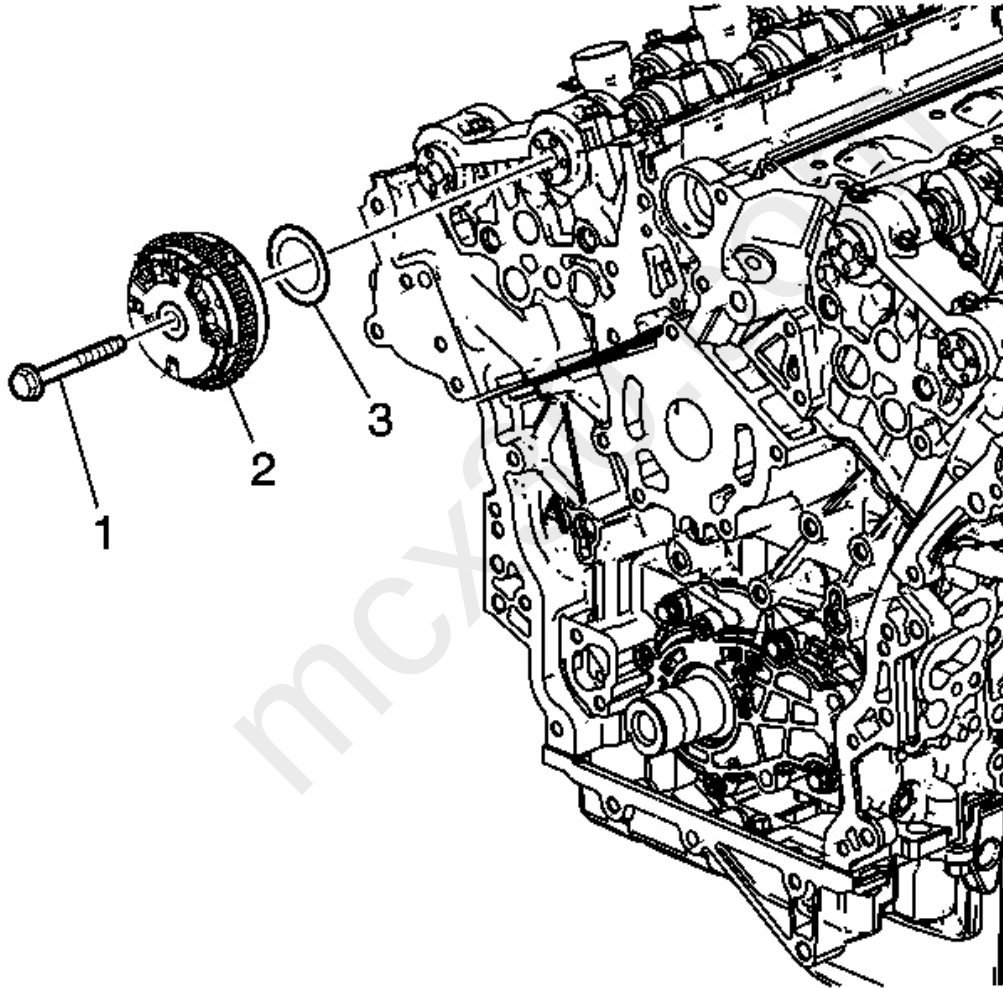


Fig. 63: Identifying Right Side Intake Camshaft Position Actuator & Bolt
Courtesy of GENERAL MOTORS CORP.

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

1. Use an open wrench on the hex cast into the camshaft in order to prevent engine rotation when loosening the camshaft position actuator bolt.
2. Remove the right intake camshaft position actuator bolt (1).
3. Remove the right intake camshaft position actuator (2).
4. Remove the camshaft thrust washer if applicable (3).

FUEL PUMP REMOVAL (LF1 OR LFW)

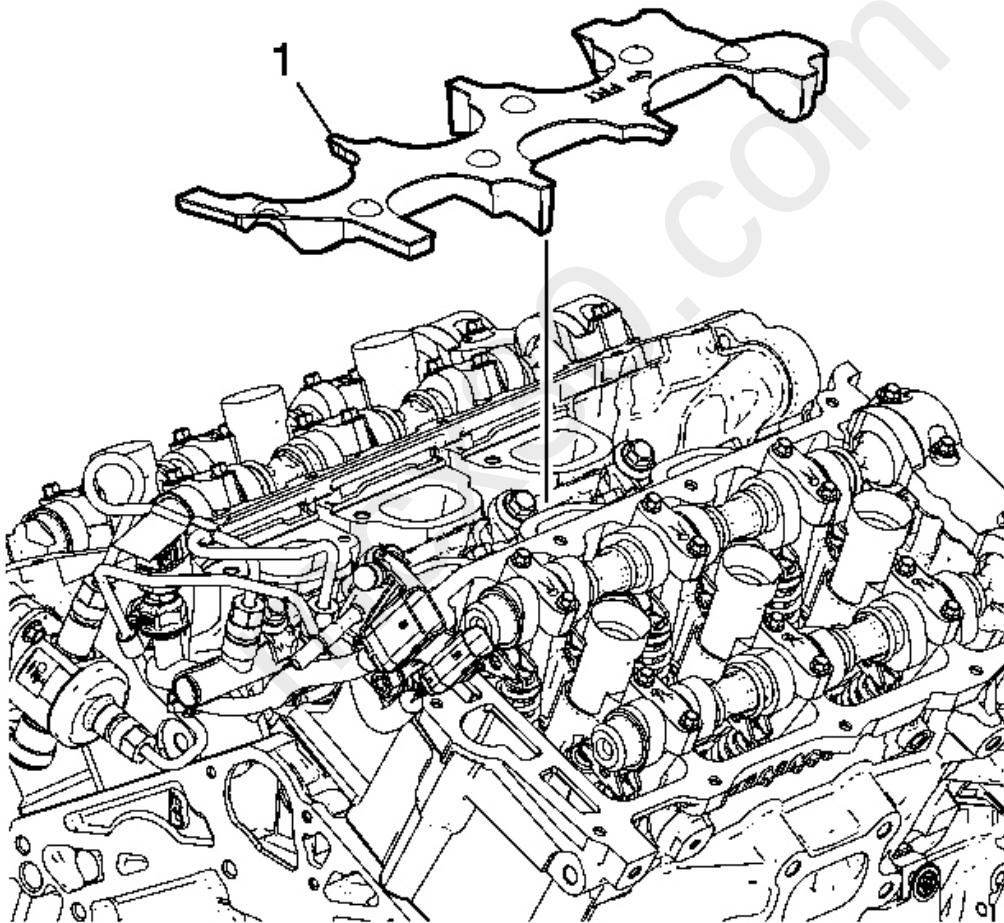


Fig. 64: Fuel Rail Noise Shield
Courtesy of GENERAL MOTORS CORP.

1. Remove the fuel rail noise shield (1).

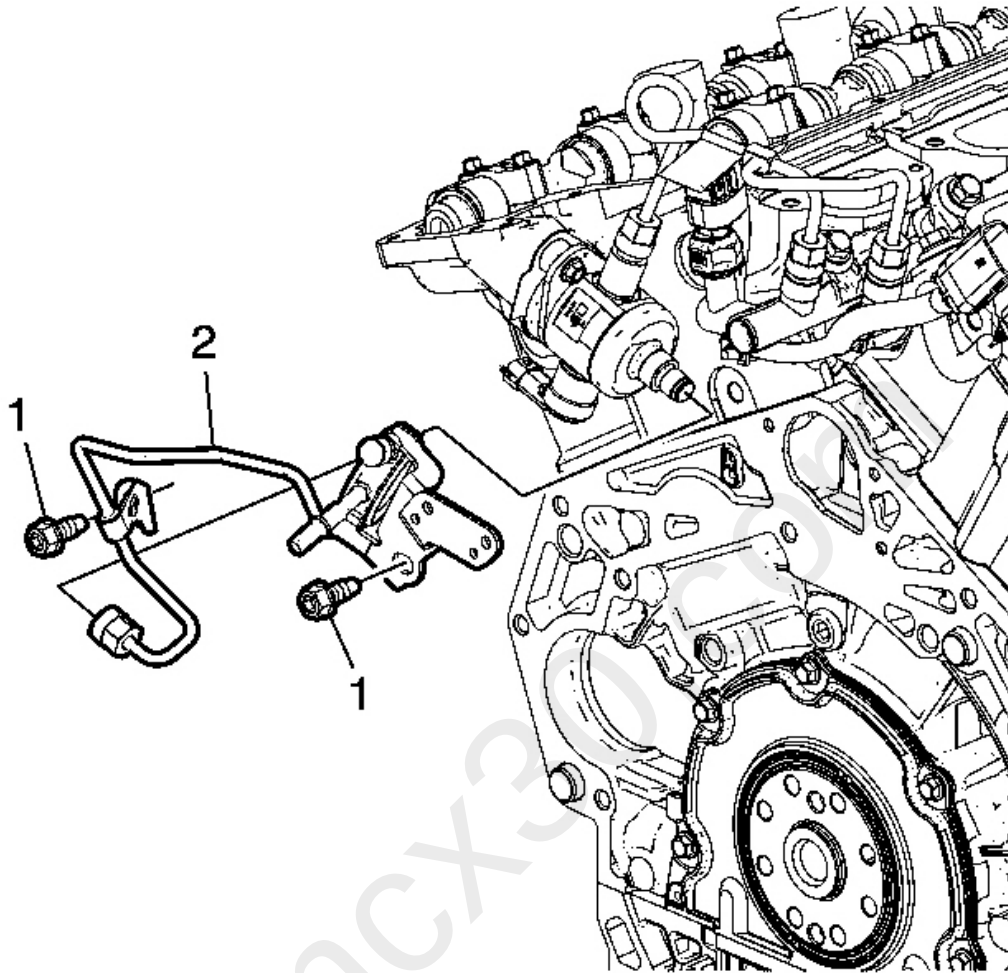


Fig. 65: Fuel Feed Pipe Components
Courtesy of GENERAL MOTORS CORP.

2. Remove the fuel rail wiring connectors from the fuel feed pipe bracket.
3. Remove the fuel feed pipe bolts (1).
4. Remove and discard the fuel feed pipe (2).

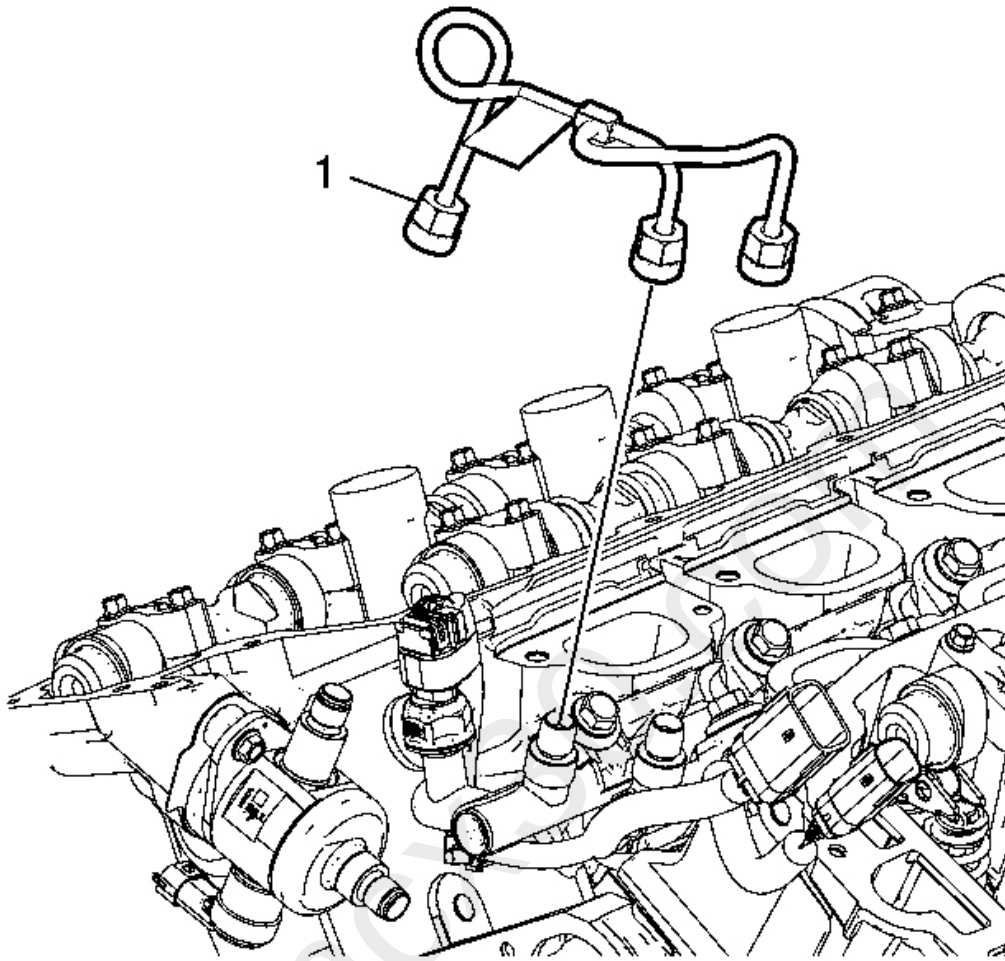


Fig. 66: Fuel Rail Crossover Pipe
Courtesy of GENERAL MOTORS CORP.

5. Remove and discard the high pressure LH to RH fuel rail crossover pipe (1).

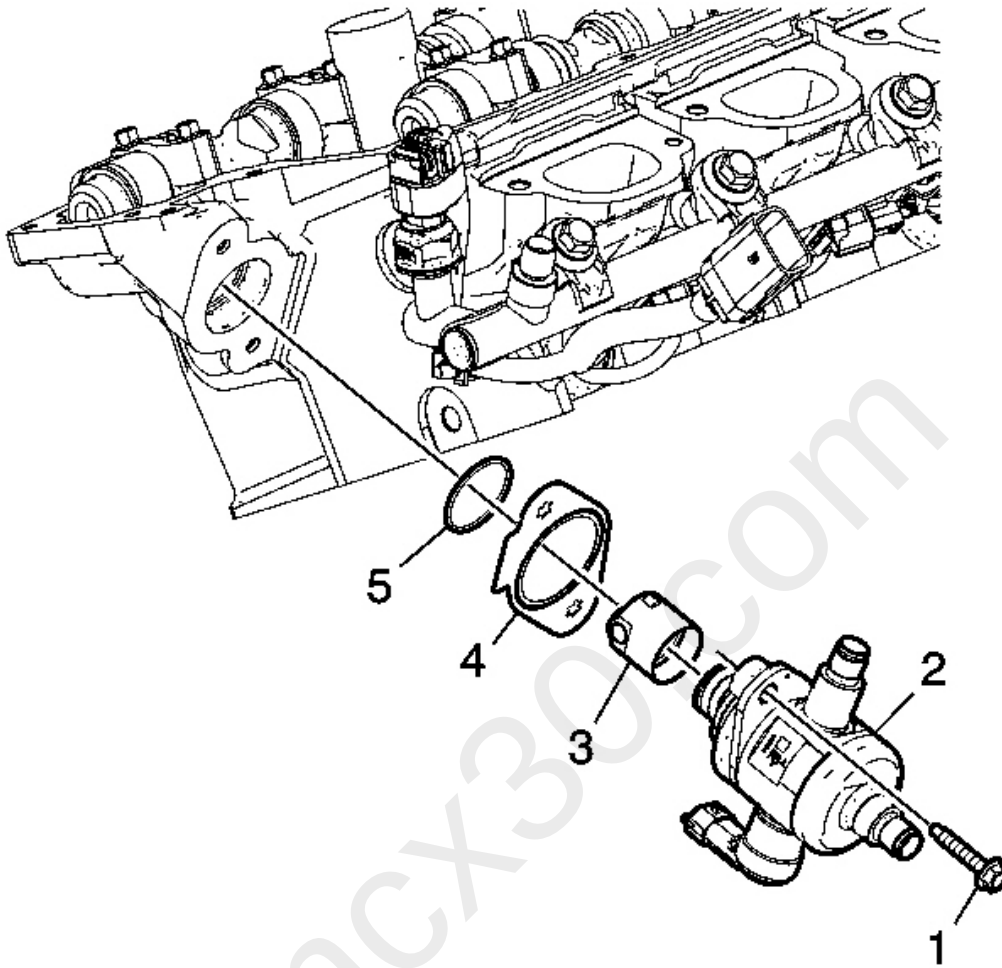


Fig. 67: High Pressure Fuel Pump Components
Courtesy of GENERAL MOTORS CORP.

6. Remove and discard high pressure fuel pump bolts (1).
7. Remove the high pressure fuel pump (2).
8. Remove the valve lifter follower (3).
9. Remove and discard the high pressure fuel pump gasket (4).
10. Remove and discard the high pressure fuel pump O-ring (5).

CAMSHAFT REMOVAL - LEFT SIDE

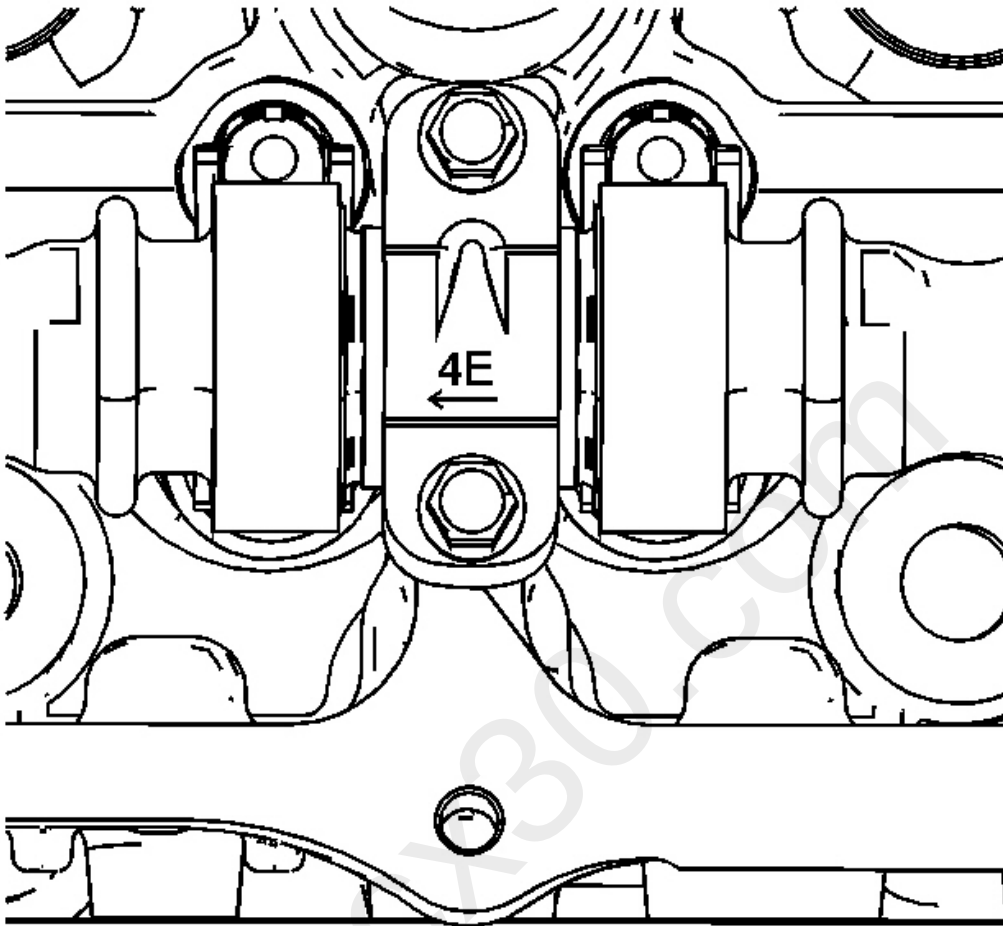


Fig. 68: Identifying Markings On Bearing Caps
Courtesy of GENERAL MOTORS CORP.

1. Observe the markings on the bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings:
 - The raised feature must always be oriented toward the center of the cylinder head.
 - The I indicates the intake camshaft.
 - The E indicates the exhaust camshaft.
 - The number indicates the journal position from the front of the engine.

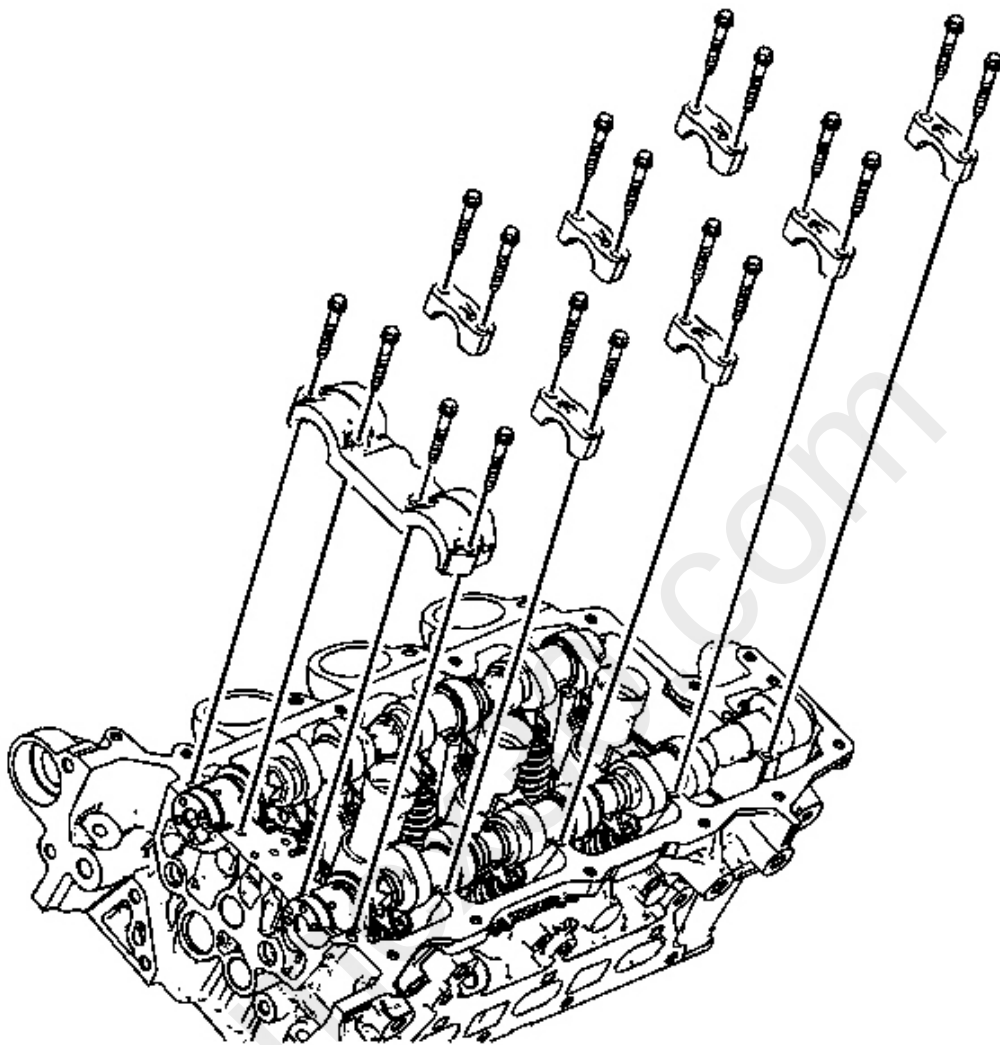


Fig. 69: Removing/Installing Camshaft Bearing Thrust Caps
Courtesy of GENERAL MOTORS CORP.

2. Remove the camshaft bearing cap bolts.
3. Remove the camshaft bearing caps.

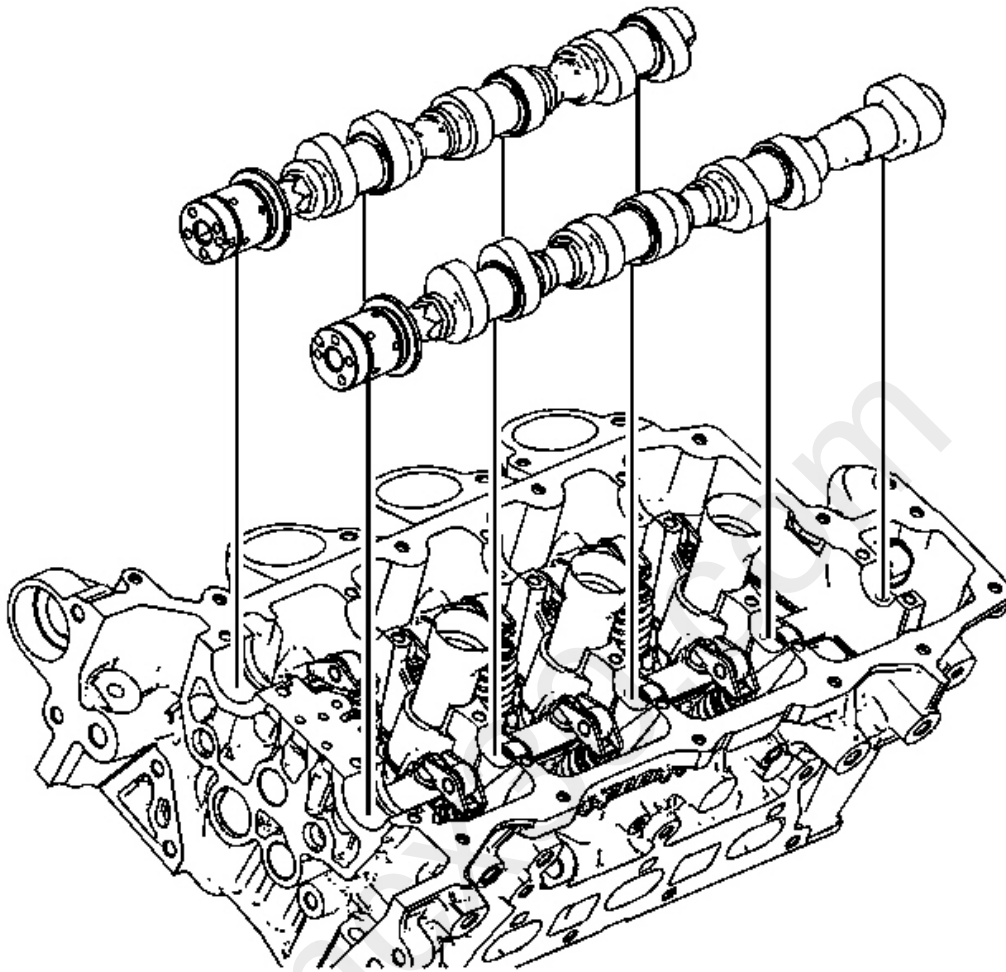


Fig. 70: View of Camshafts and Cylinder Head
Courtesy of GENERAL MOTORS CORP.

NOTE: Mark the camshafts upon removal to ensure installation is in the correct position.

4. Remove the camshafts.
5. Replace the camshaft bearing caps and bolts.

FUEL RAIL REMOVAL

Refer to **Cylinder Head Disassemble (LF1 or LFW)** .

VALVE ROCKER ARM REMOVAL - LEFT SIDE

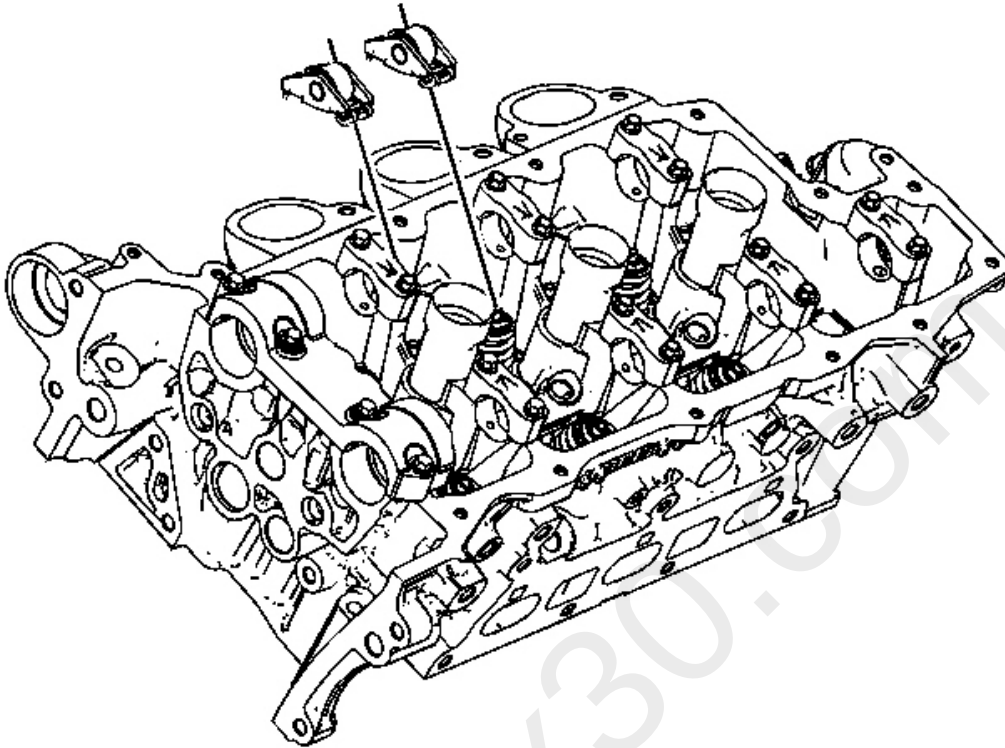


Fig. 71: View of Rocker Arm Assembly
Courtesy of GENERAL MOTORS CORP.

Remove the valve rocker arms from the cylinder head. If the rocker arms are to be reused, keep in order so they can be reinstalled in the same position.

VALVE LIFTER REMOVAL - LEFT SIDE

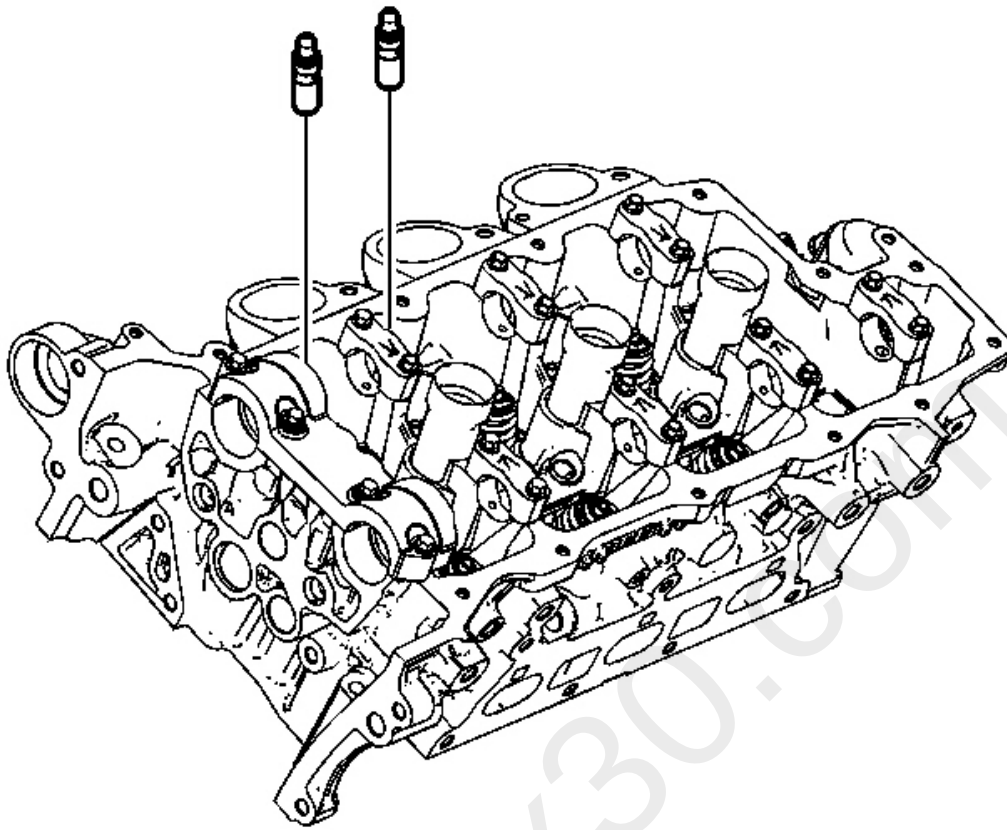


Fig. 72: Valve Lifter - Left Side

Courtesy of GENERAL MOTORS CORP.

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.

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

CYLINDER HEAD REMOVAL - LEFT SIDE (LF1 OR LFW)

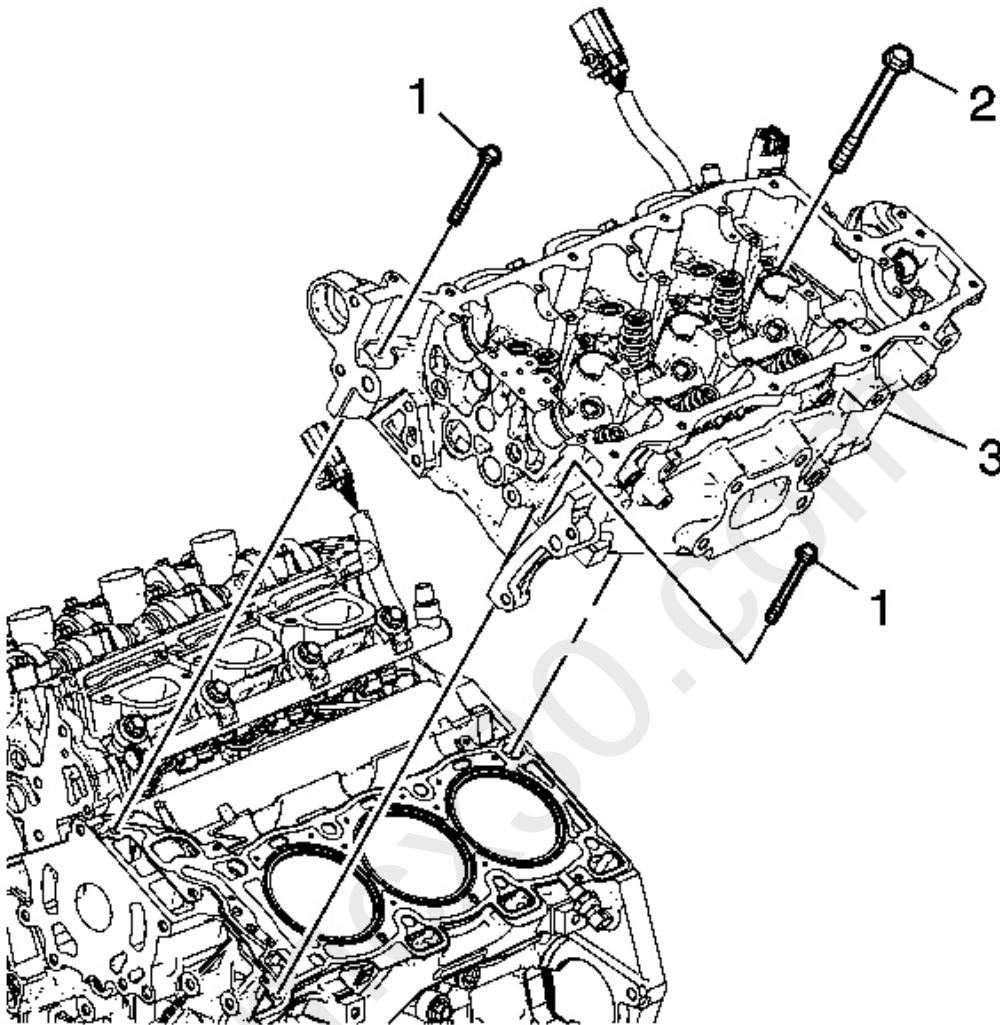


Fig. 73: Cylinder Head & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the two front M8 left cylinder head bolts (1).
2. Remove the left cylinder head bolts (2).
3. Remove the left cylinder head (3).

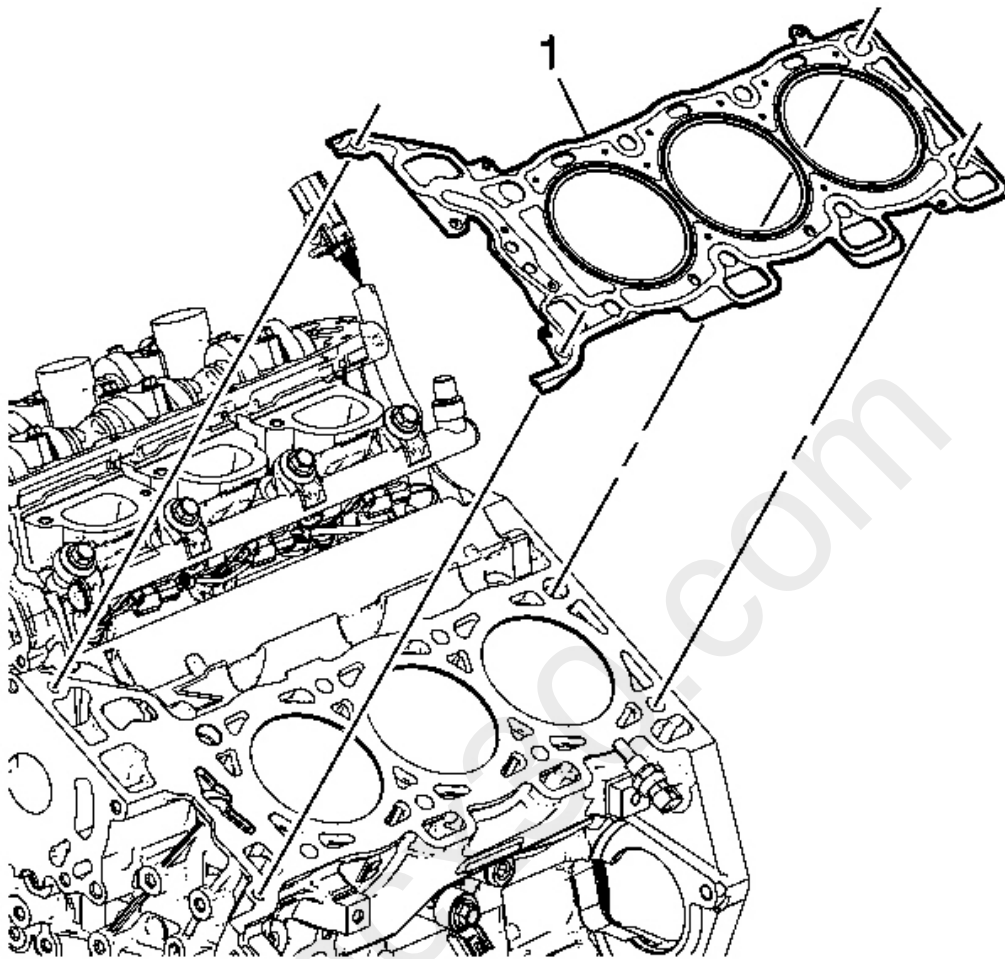


Fig. 74: Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

4. Remove and discard the left cylinder head gasket (1).

CAMSHAFT REMOVAL - RIGHT SIDE

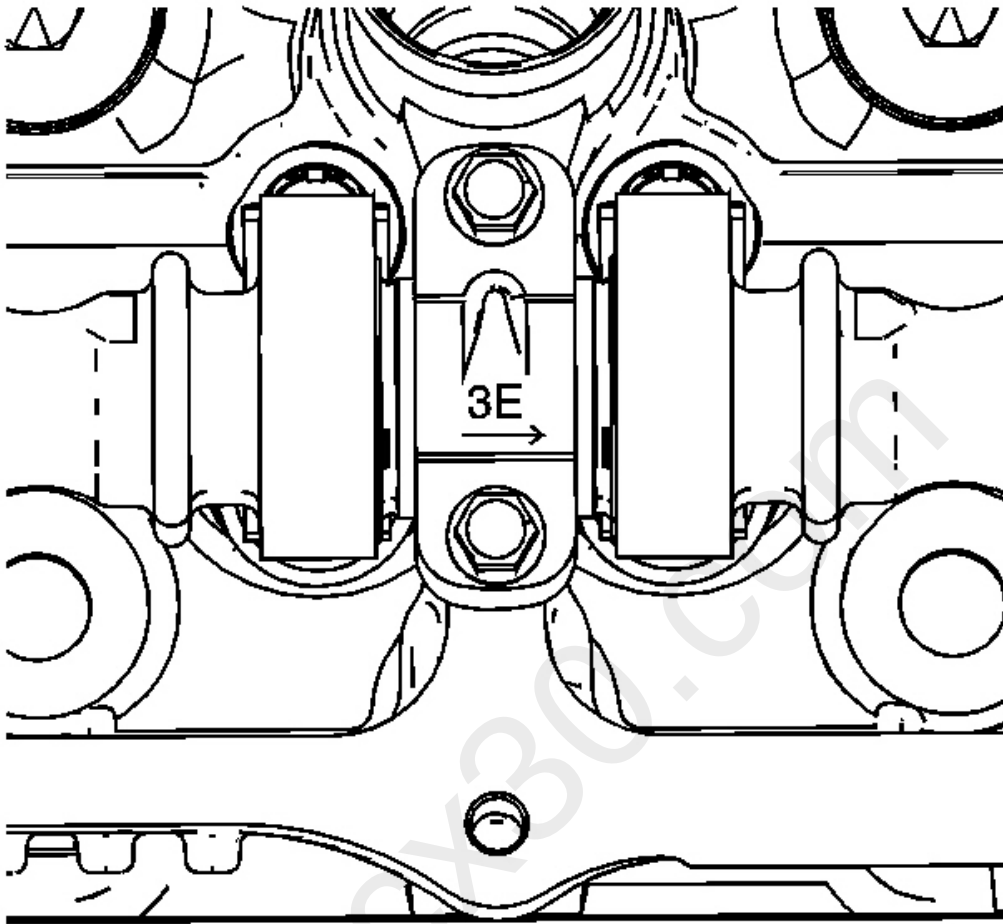


Fig. 75: Identifying Markings On Bearing Caps
Courtesy of GENERAL MOTORS CORP.

1. Observe the markings on the bearing caps. Each bearing cap is marked in order to identify its location. The markings have the following meanings:
 - The raised feature must always be oriented toward the center of the cylinder head.
 - The I indicates the intake camshaft.
 - The E indicates the exhaust camshaft.
 - The number indicates the journal position from the front of the engine.

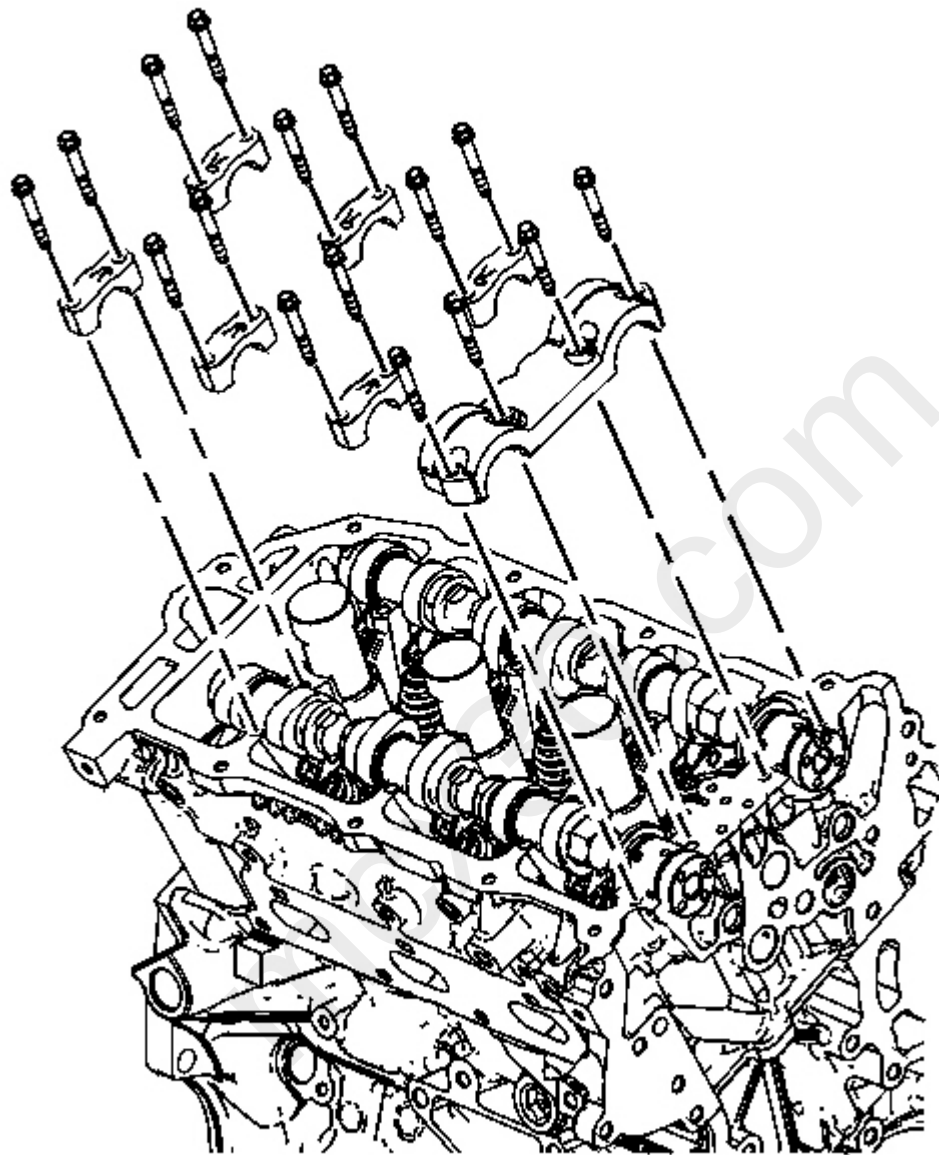


Fig. 76: View Of Camshaft Bearing Caps & Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the camshaft bearing cap bolts.
3. Remove the camshaft bearing caps.

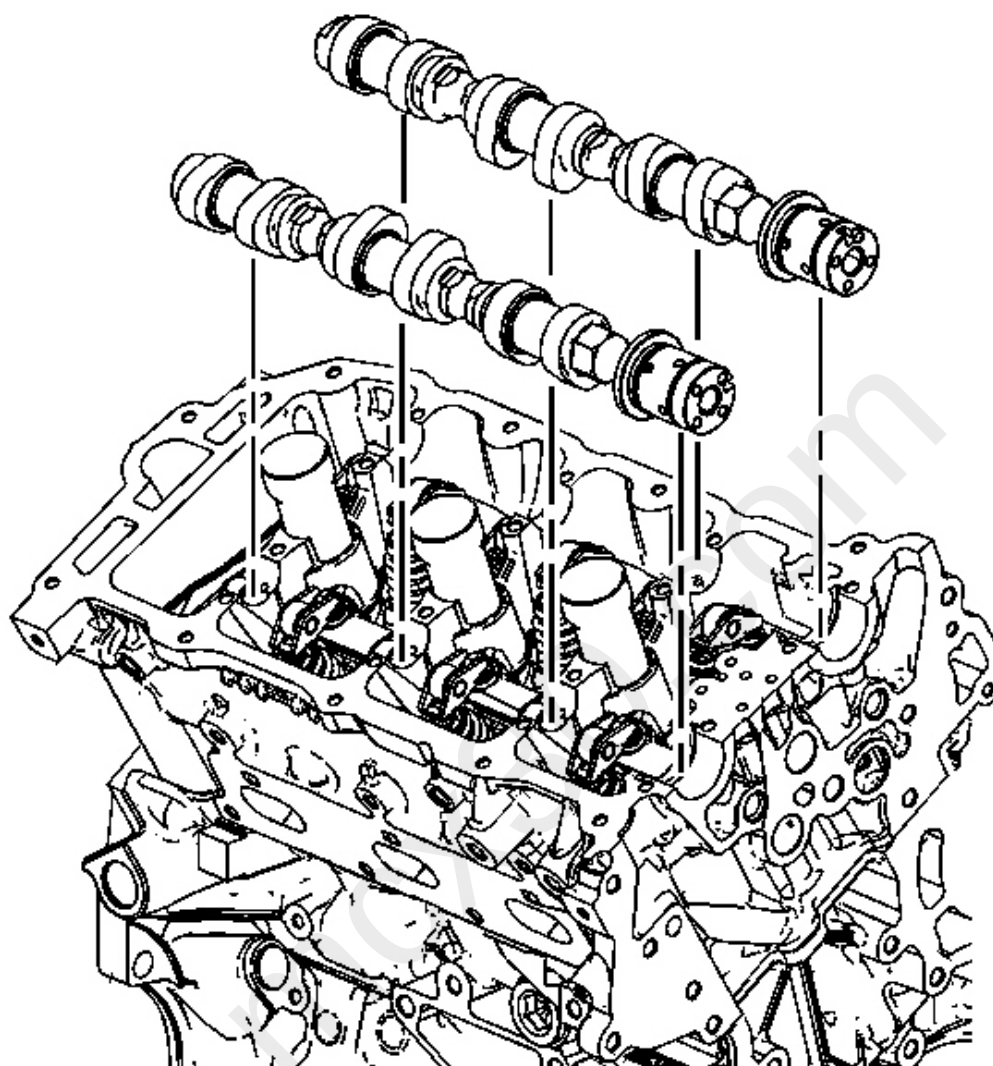


Fig. 77: Locating Camshafts

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Mark the camshafts upon removal to ensure installation is in the correct position.

4. Remove the camshafts.
5. Replace the camshaft bearing caps and bolts.

VALVE ROCKER ARM REMOVAL - RIGHT SIDE

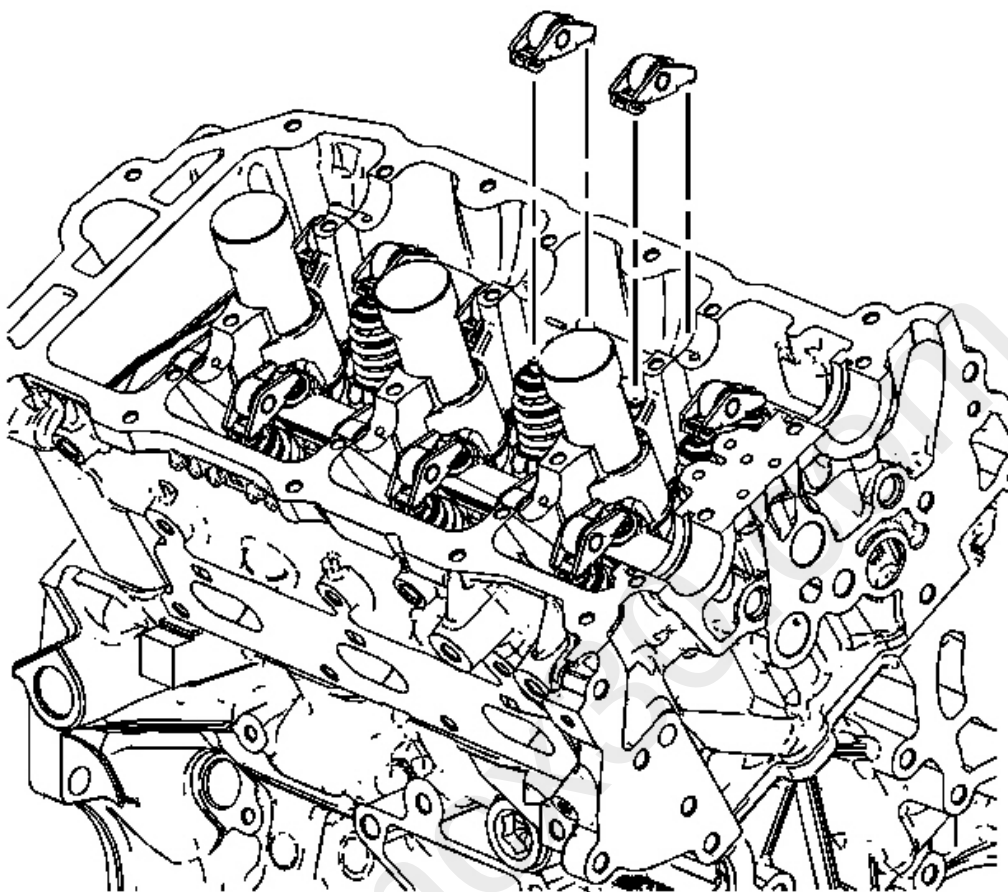


Fig. 78: Valve Rocker Arms

Courtesy of GENERAL MOTORS CORP.

Remove the valve rocker arms from the cylinder head. If the rocker arms are to be reused, keep in order so they can be reinstalled in the same position.

VALVE LIFTER REMOVAL - RIGHT SIDE

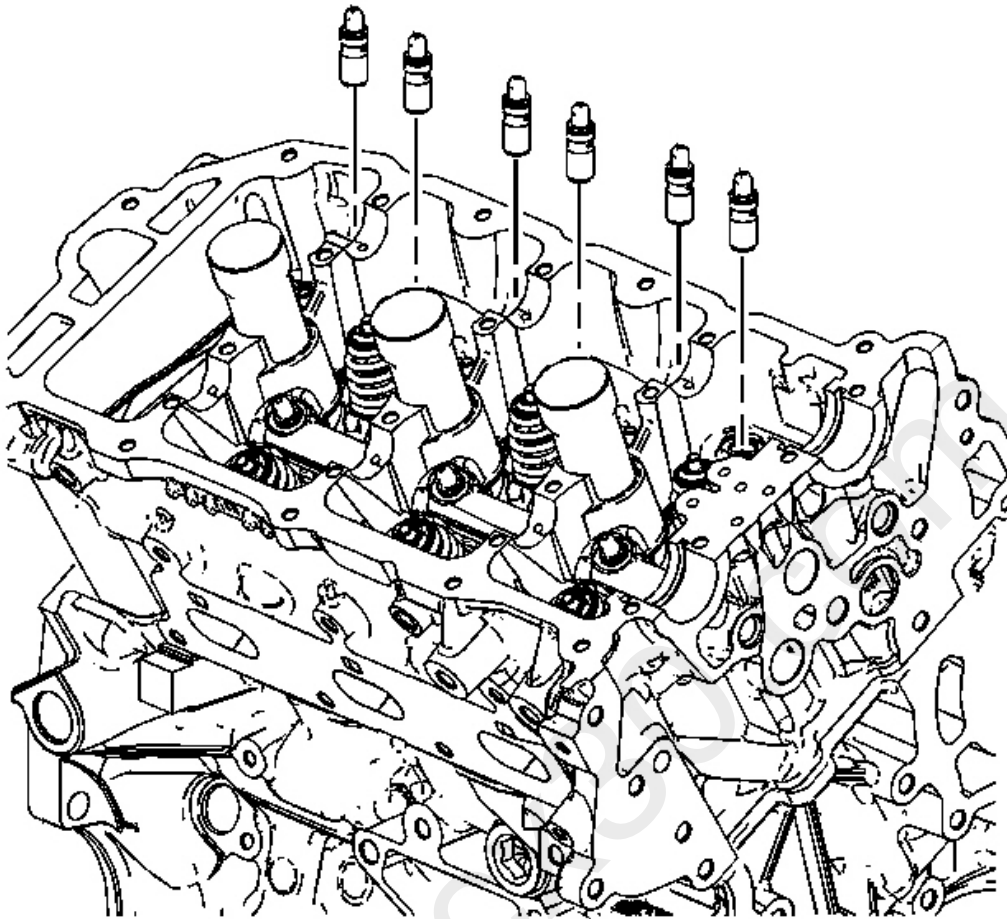


Fig. 79: View Of Stationary Hydraulic Lash Adjusters
Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- 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.

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

CYLINDER HEAD REMOVAL - RIGHT SIDE (LF1 OR LFW)

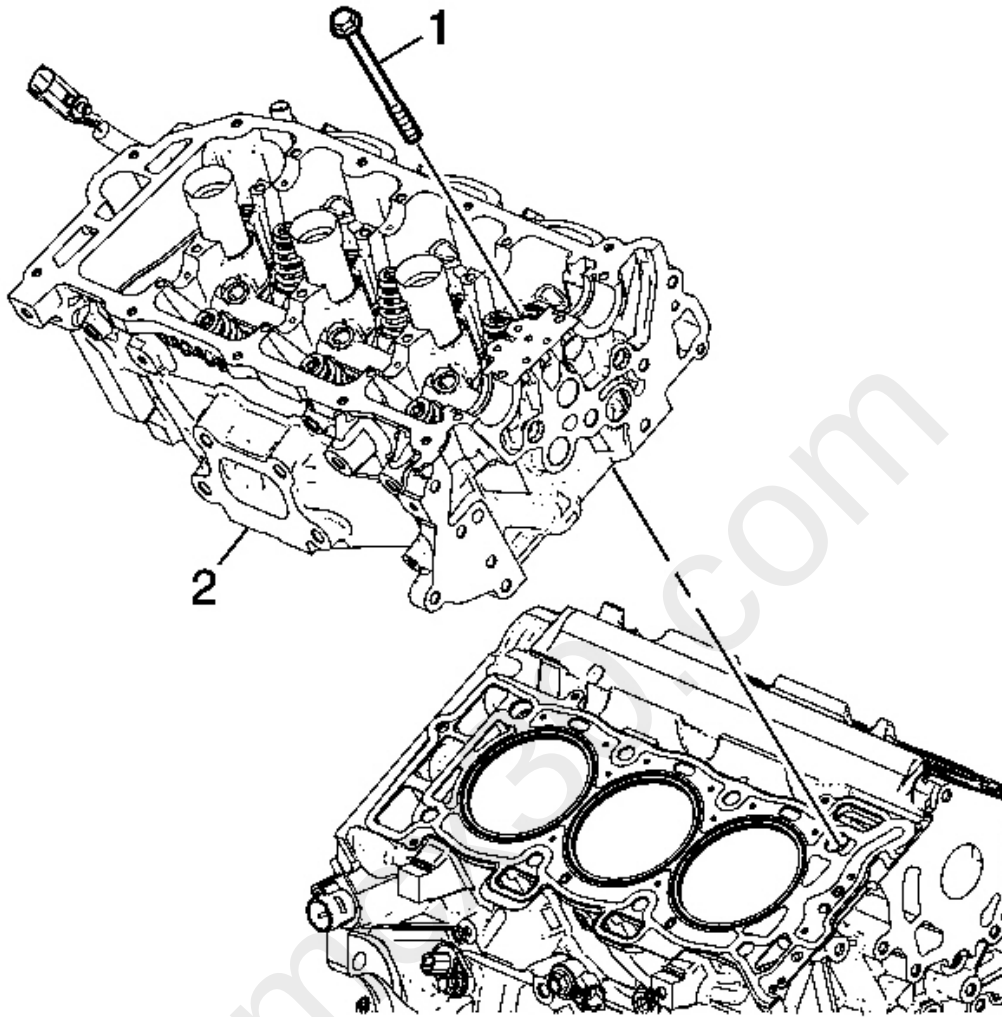


Fig. 80: Right Cylinder Head & Bolts
Courtesy of GENERAL MOTORS CORP.

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

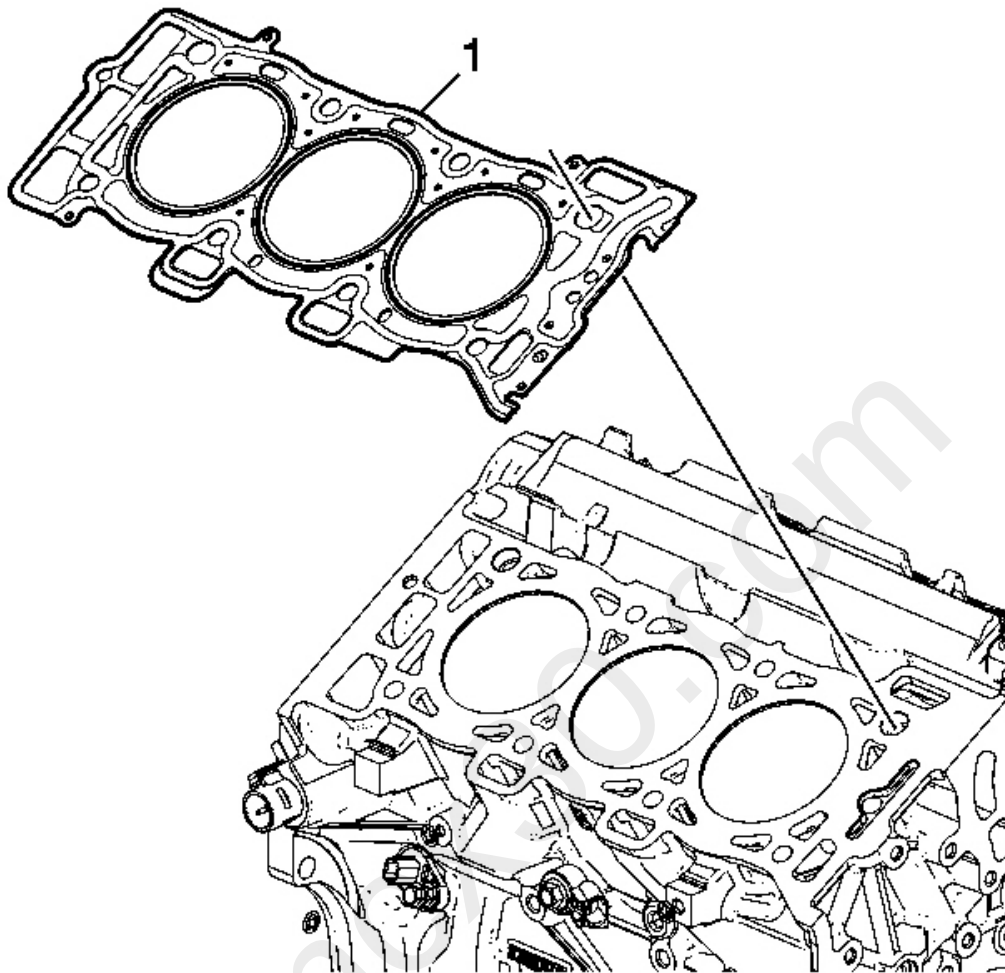


Fig. 81: Right Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

3. Remove and discard the right cylinder head gasket (1).

OIL PAN REMOVAL

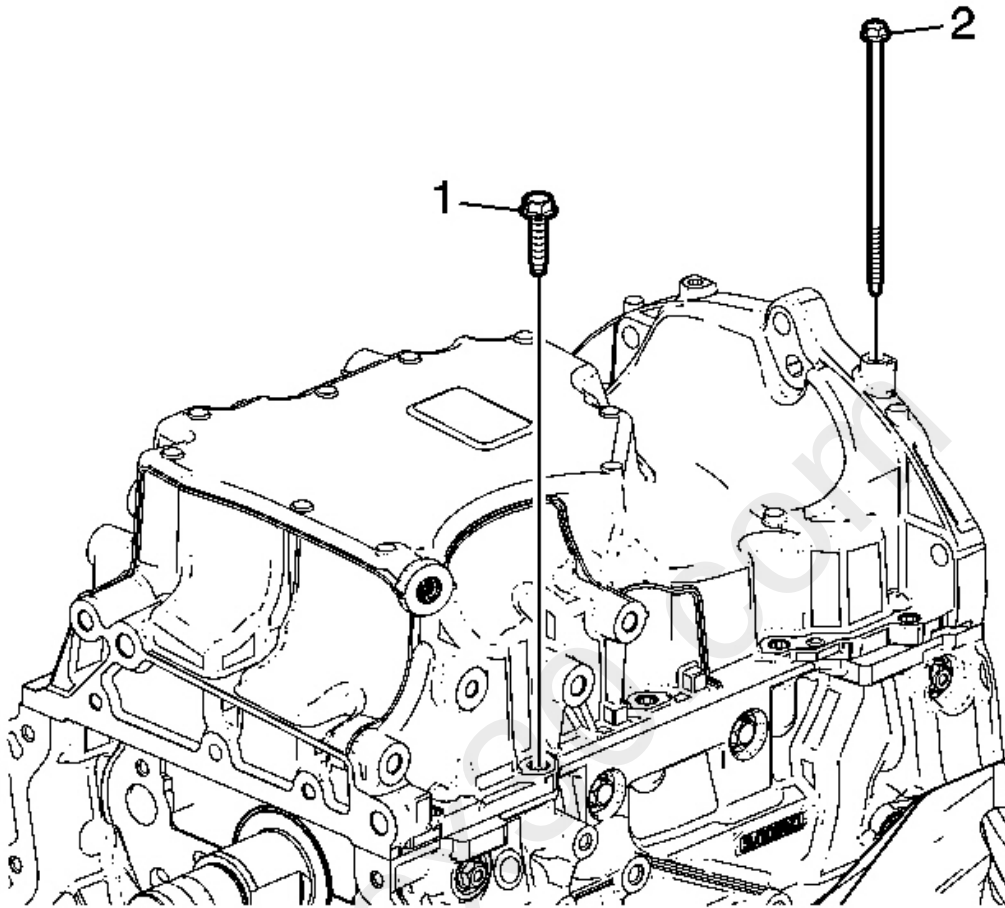


Fig. 82: Oil Pan Bolts

Courtesy of GENERAL MOTORS CORP.

1. Remove the oil pan bolts (1) and (2).
2. Using the pry points located at the edge of the oil pan separate the RTV sealant.

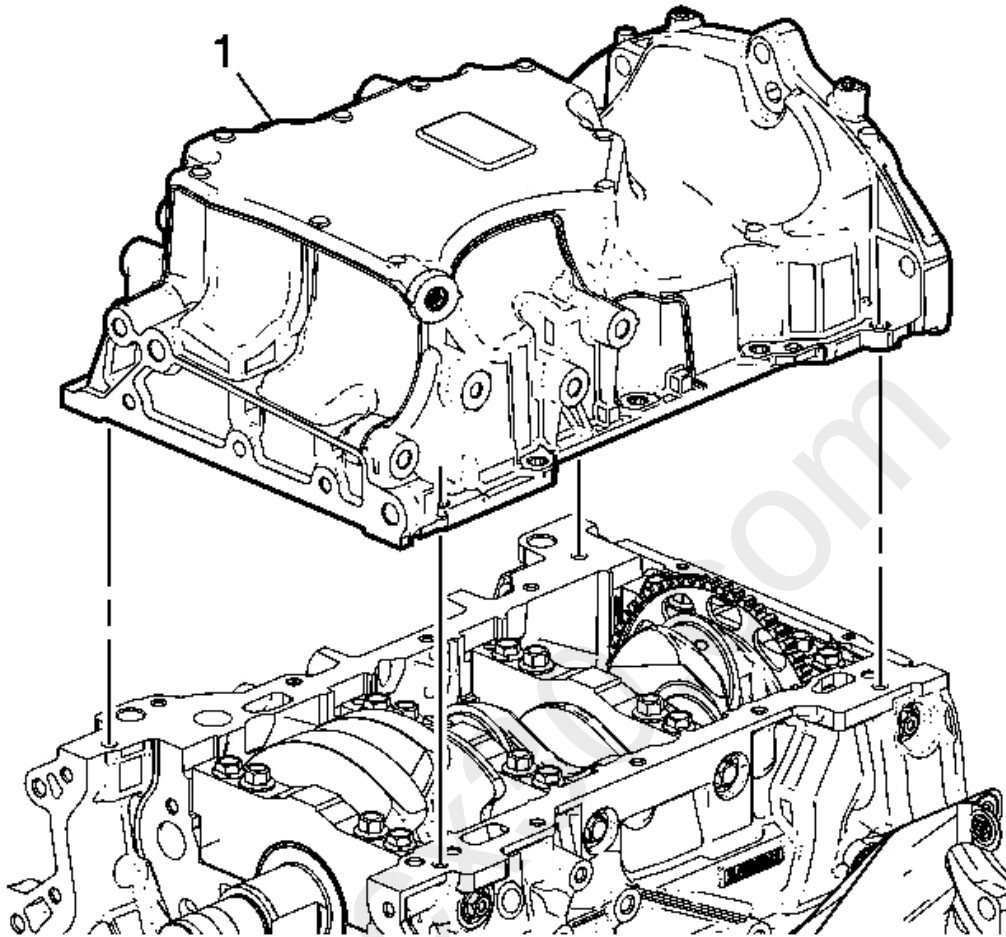


Fig. 83: Oil Pan

Courtesy of GENERAL MOTORS CORP.

3. Remove the oil pan (1) from the block.

OIL PUMP REMOVAL

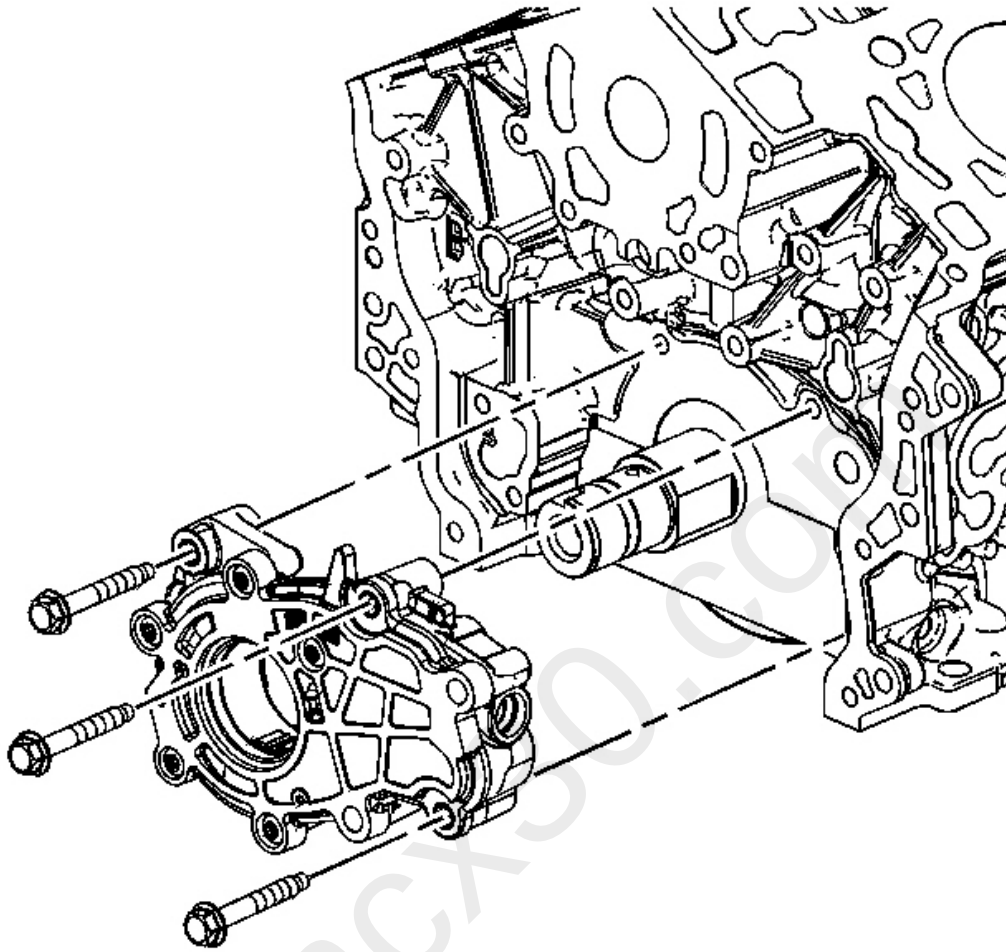


Fig. 84: Oil Pump Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the oil pump bolts.
2. Remove the oil pump.

CRANKSHAFT REAR OIL SEAL AND HOUSING REMOVAL

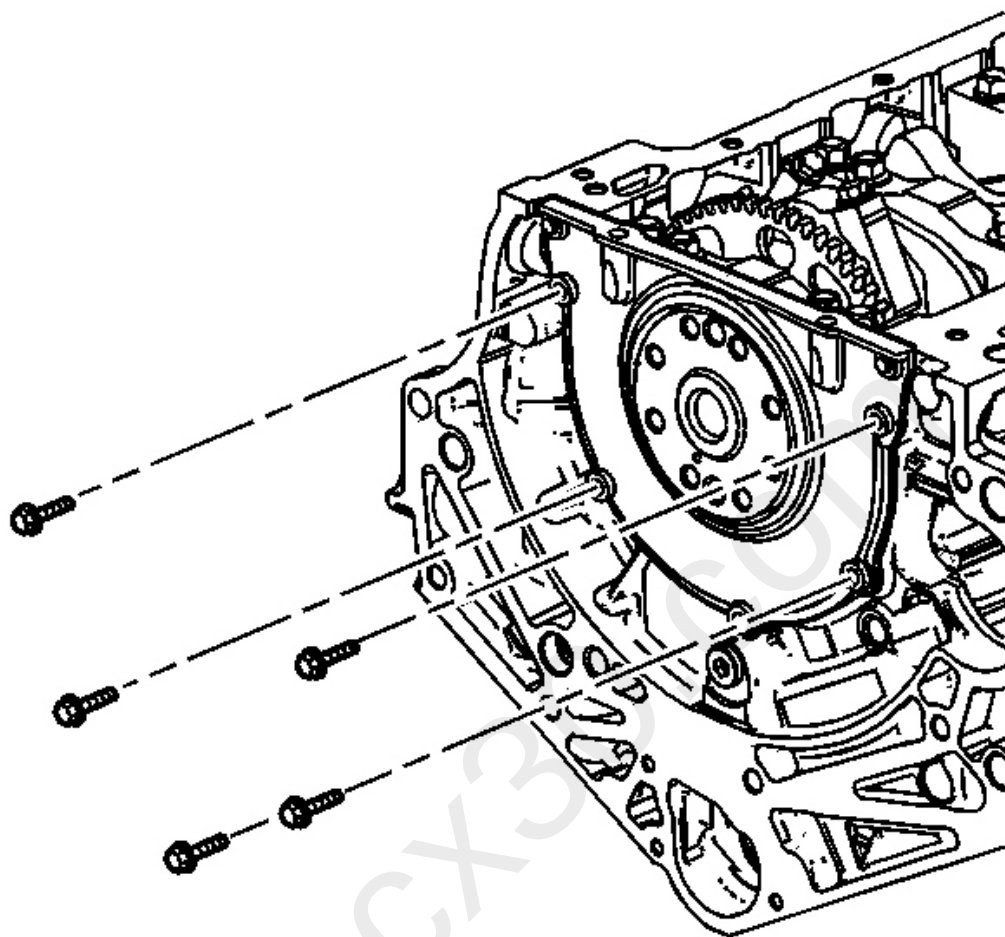


Fig. 85: View Of Crankshaft Rear Oil Seal Housing Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the crankshaft rear oil seal housing bolts.

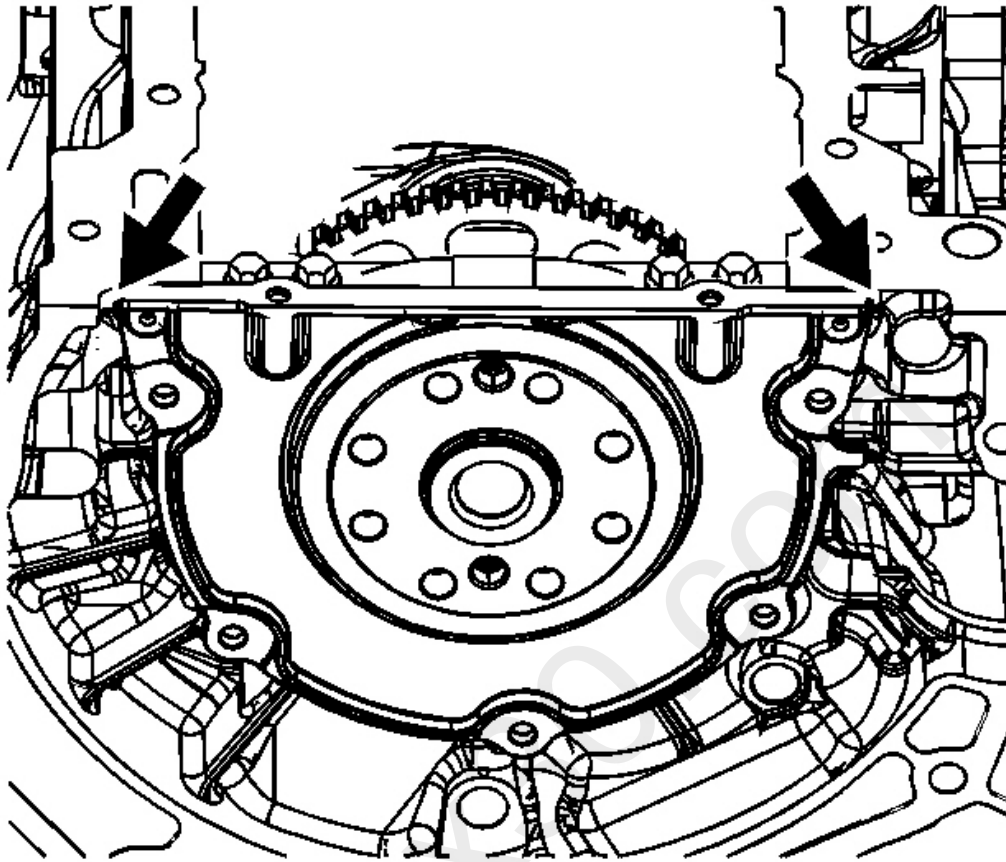


Fig. 86: Identifying Pry Points On Edge Of The Crankshaft Rear Oil Seal Housing
Courtesy of GENERAL MOTORS CORP.

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

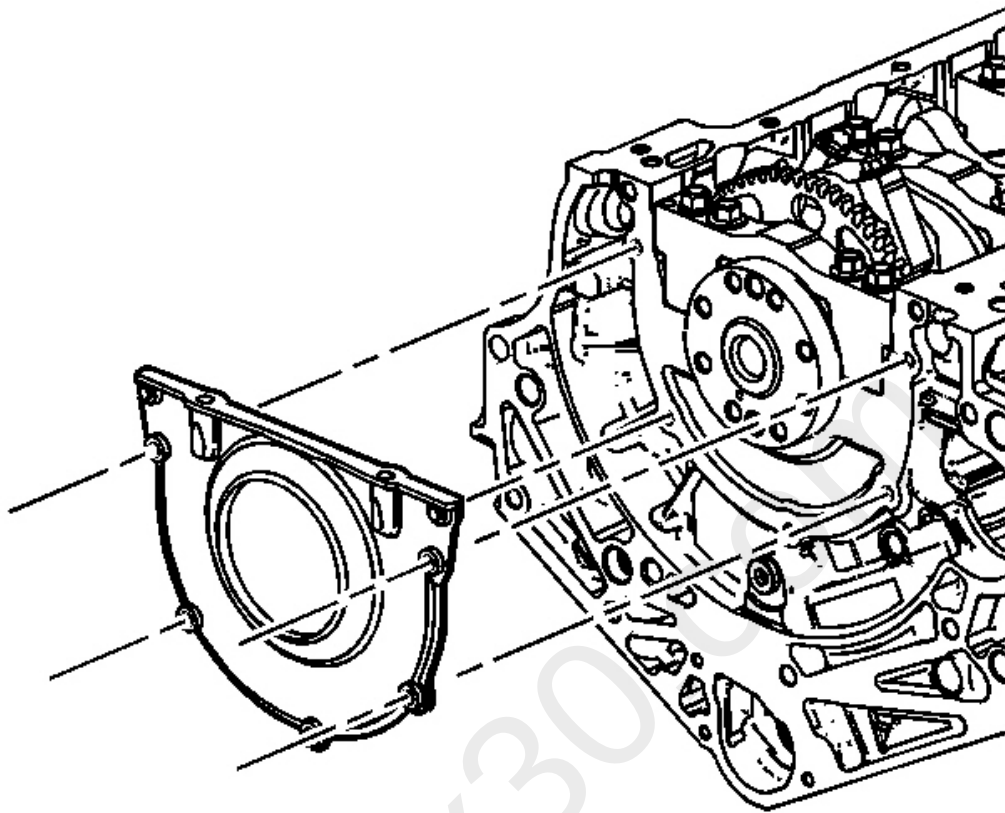


Fig. 87: View Of Crankshaft Rear Oil Seal Housing
Courtesy of GENERAL MOTORS CORP.

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

PISTON, CONNECTING ROD, AND BEARING REMOVAL

SPECIAL TOOLS

EN 46121: Connecting Rod Guide Pin Set

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

REMOVAL

NOTE:

- An arrow/dot showing proper piston orientation is located on the top of the piston.

- **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 (LF1)** .
 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.

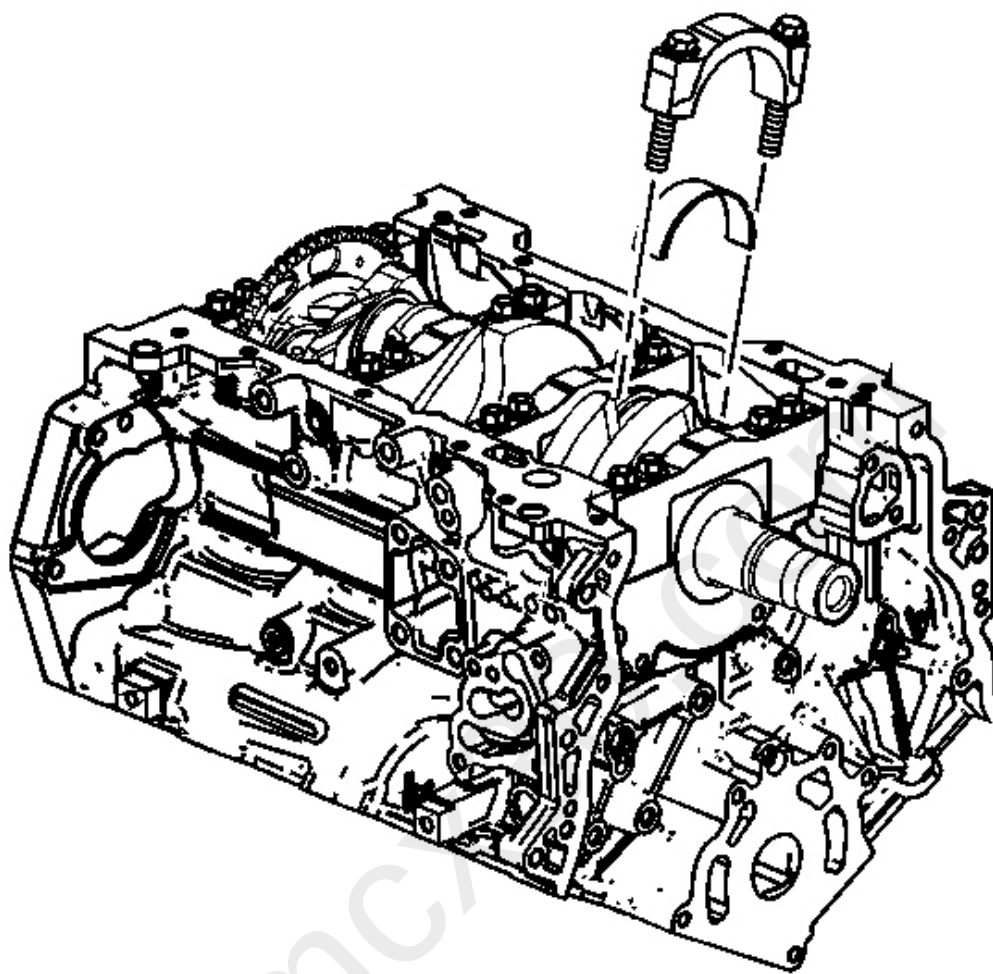


Fig. 88: View Of Connecting Rod Cap
Courtesy of GENERAL MOTORS CORP.

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.

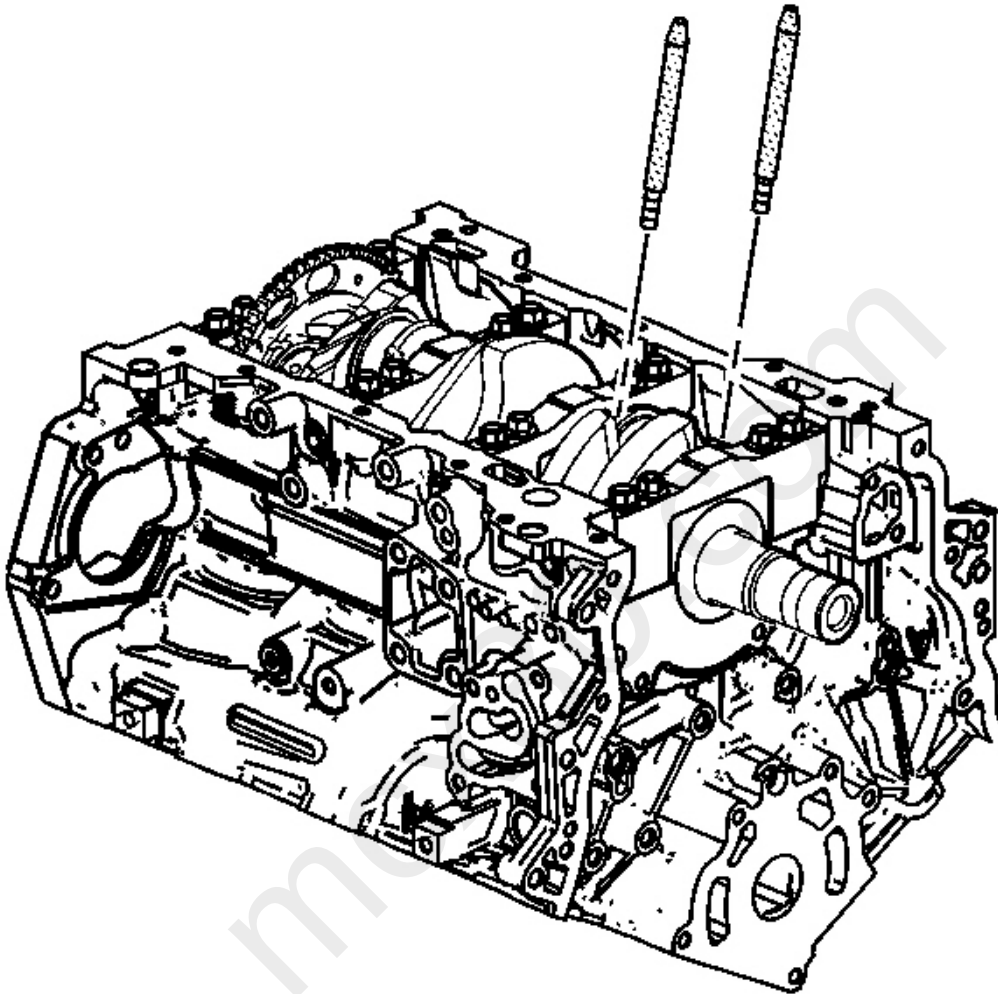


Fig. 89: View Of EN 46121
Courtesy of GENERAL MOTORS CORP.

6. Install the **EN 46121**: set into the connecting rod bolt holes.

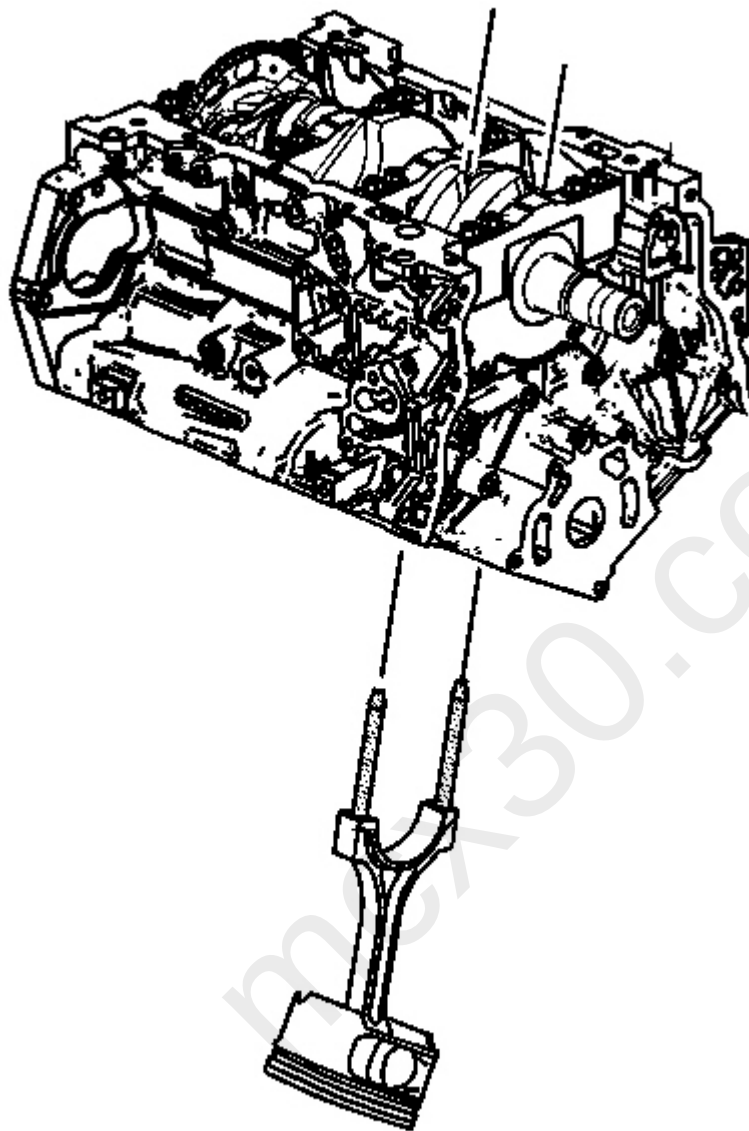


Fig. 90: View Of Connecting Rod & Piston Assembly
Courtesy of GENERAL MOTORS CORP.

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.

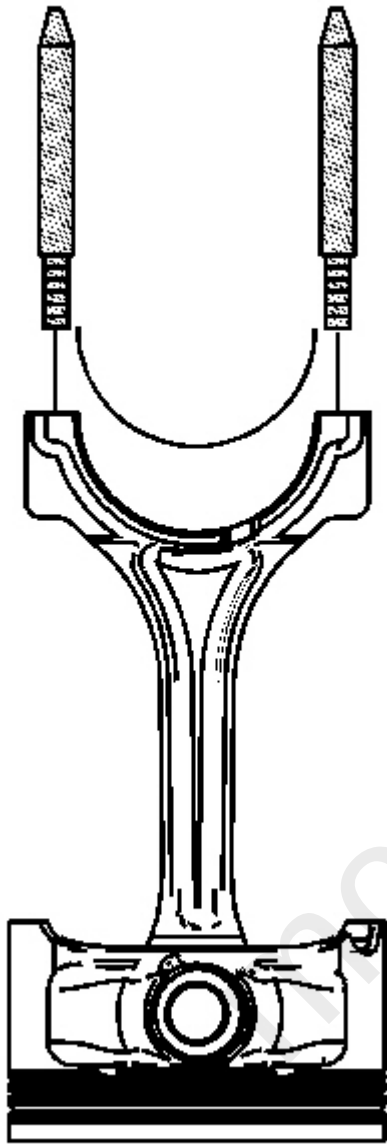


Fig. 91: View Of Piston/Connecting Rod Installation Tool
Courtesy of GENERAL MOTORS CORP.

8. Remove the **EN 46121**: set from the connecting rod bolt holes.
9. Remove the upper connecting rod bearing from the connecting rod.

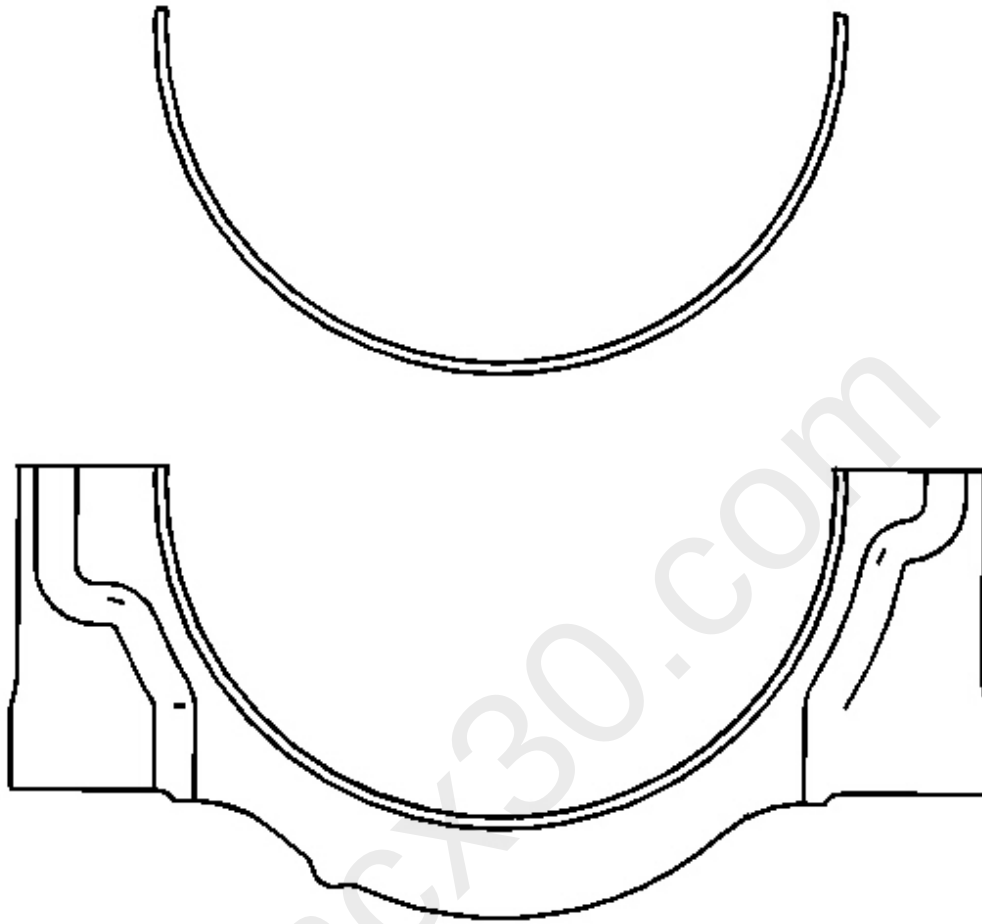


Fig. 92: View Of Lower Connecting Rod Cap & Bearing
Courtesy of GENERAL MOTORS CORP.

10. Remove the lower connecting rod bearing from the connecting rod cap.

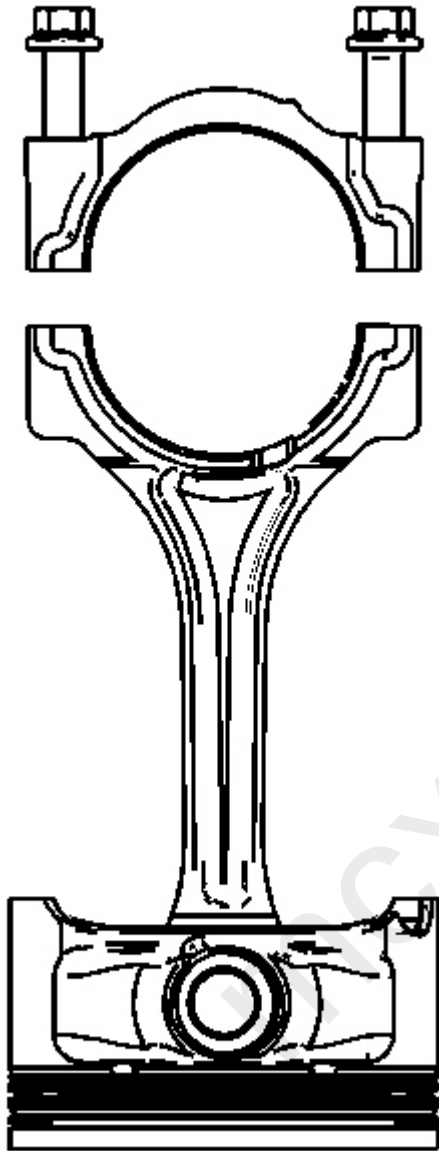


Fig. 93: View Of Connecting Rod Cap, Connecting Rod & Piston Assembly
Courtesy of GENERAL MOTORS CORP.

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.

CRANKSHAFT AND BEARING REMOVAL

Special Tools

- **GE 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 (LF1)** .
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 (LF1)** .
5. Replace the thrust bearing or crankshaft as necessary.

CRANKSHAFT REMOVAL

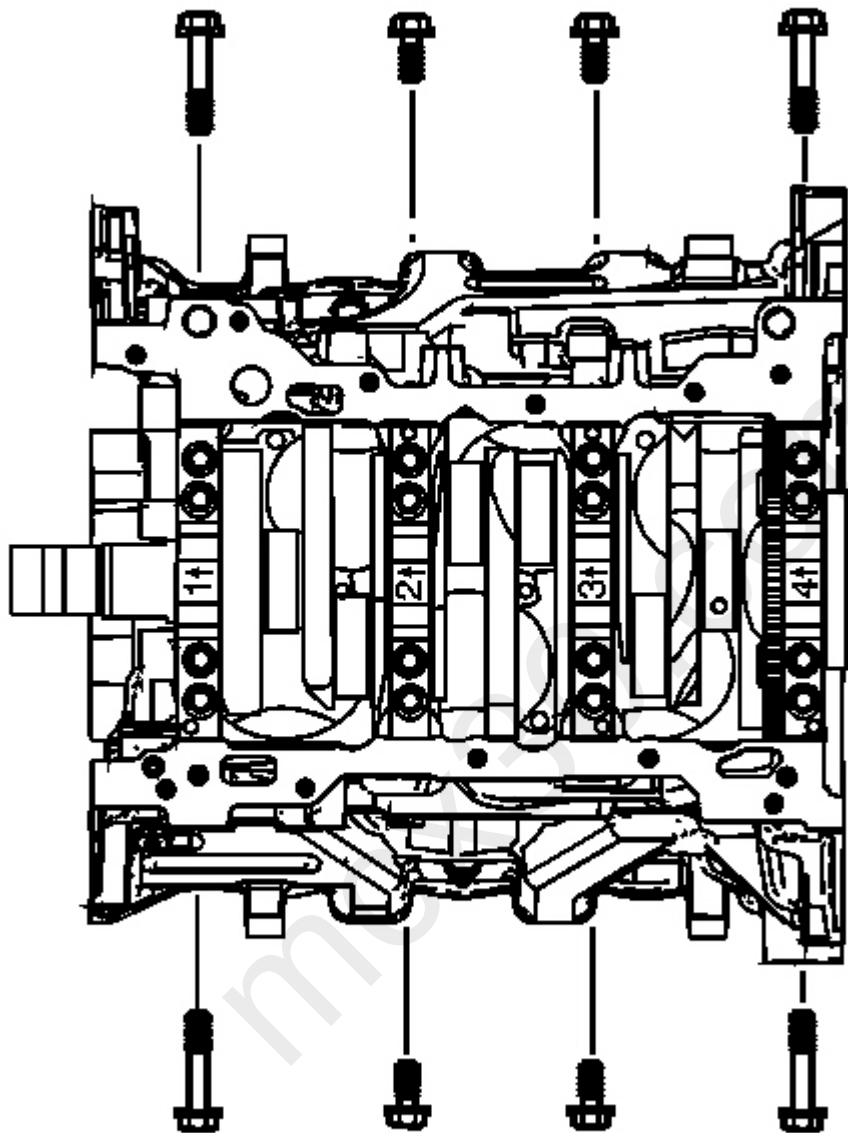


Fig. 94: Identifying Crankshaft Main Bearing Cap Side Bolts
Courtesy of GENERAL MOTORS CORP.

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

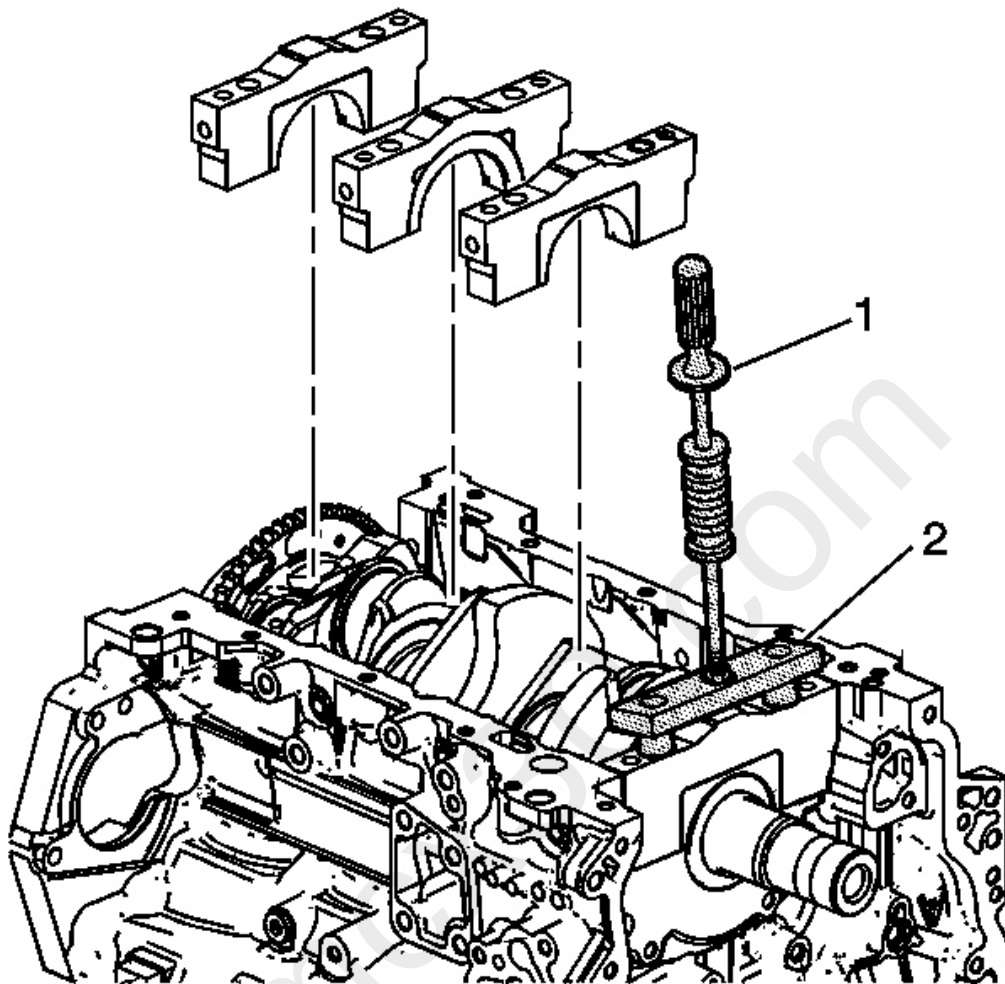


Fig. 95: View Of Crankshaft Main Bearing Caps
Courtesy of GENERAL MOTORS CORP.

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

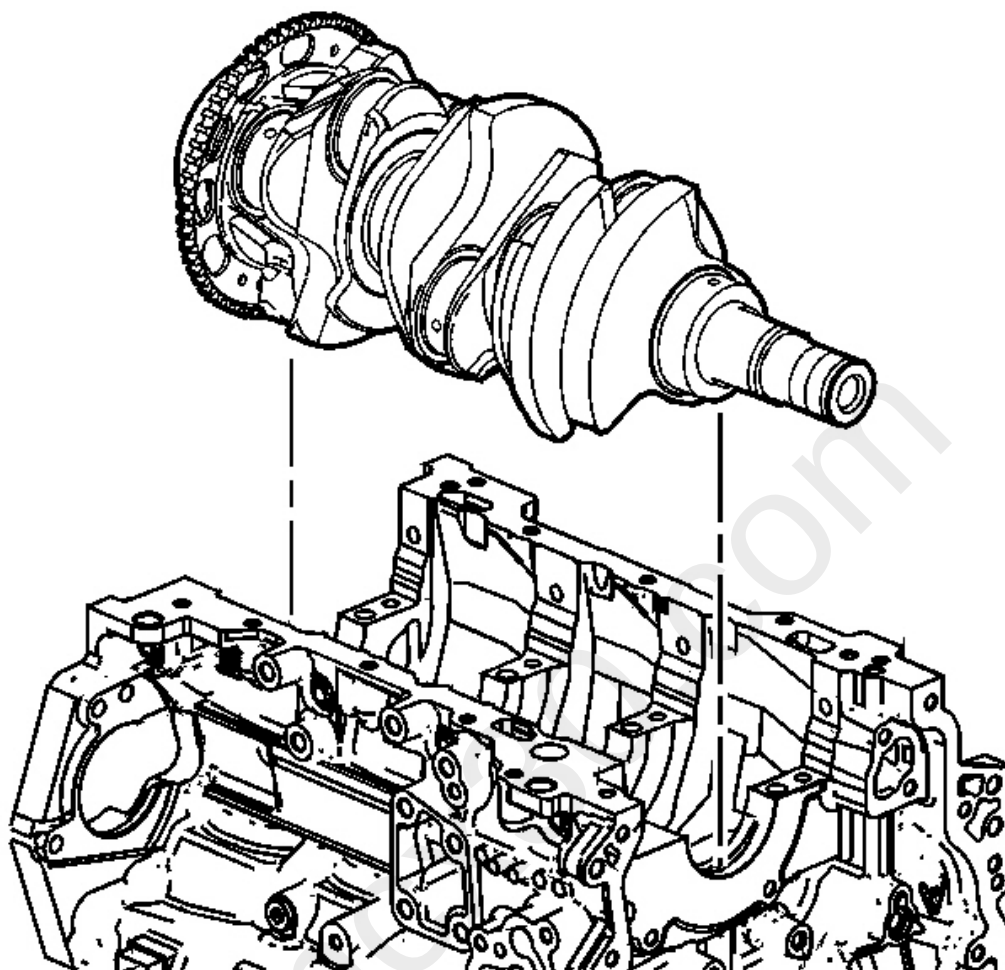


Fig. 96: View Of Crankshaft
Courtesy of GENERAL MOTORS CORP.

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

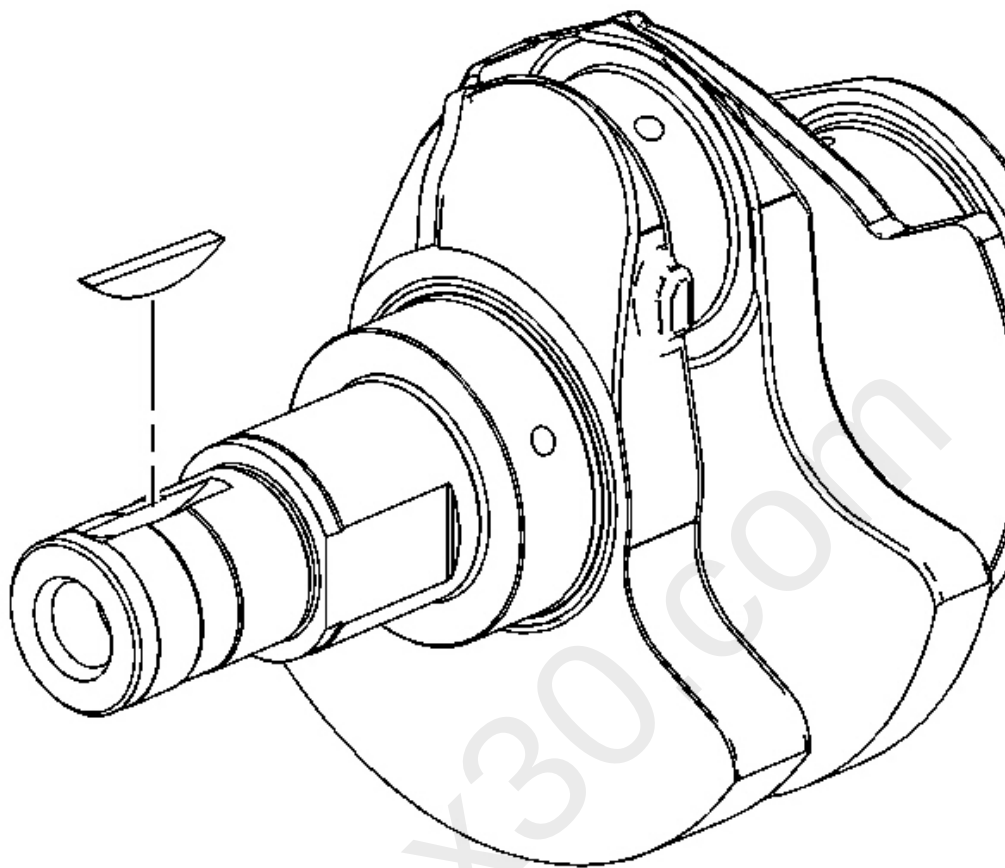


Fig. 97: Locating Crankshaft Sprocket Drive Pin
Courtesy of GENERAL MOTORS CORP.

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.

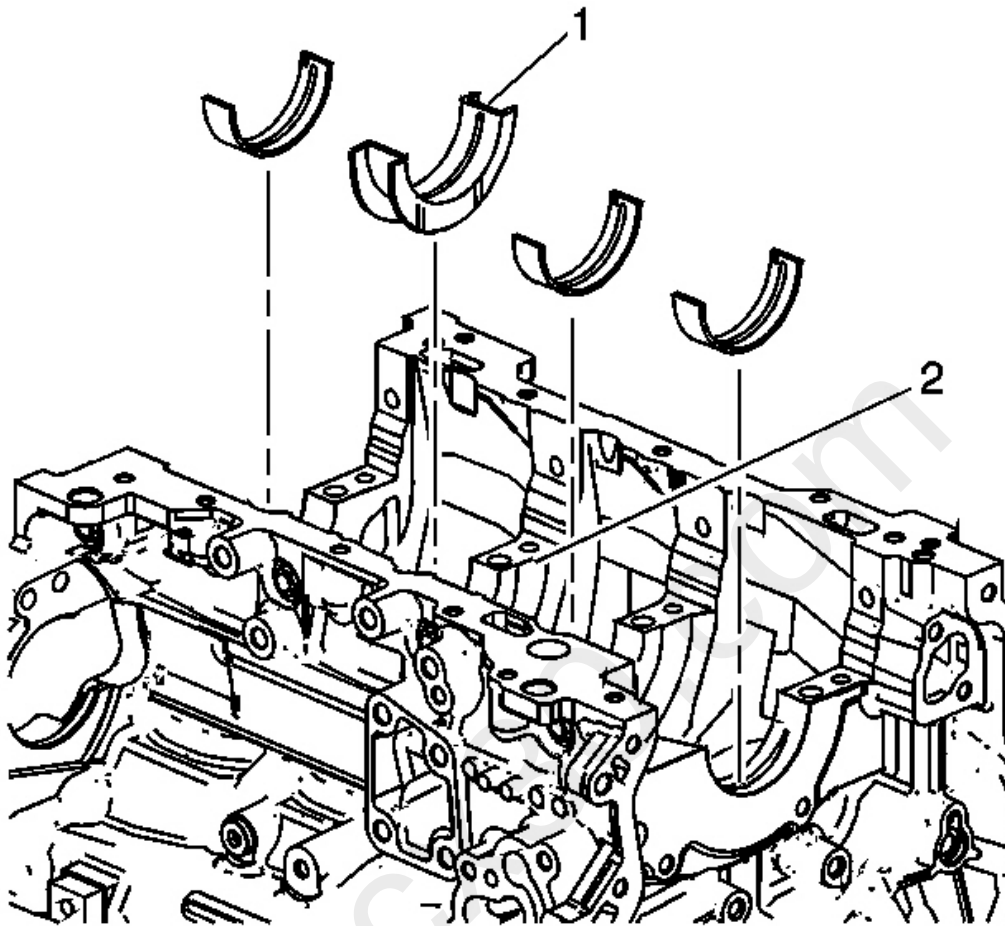


Fig. 98: Locating Thrust Bearing In Number 3 Journal
Courtesy of GENERAL MOTORS CORP.

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.

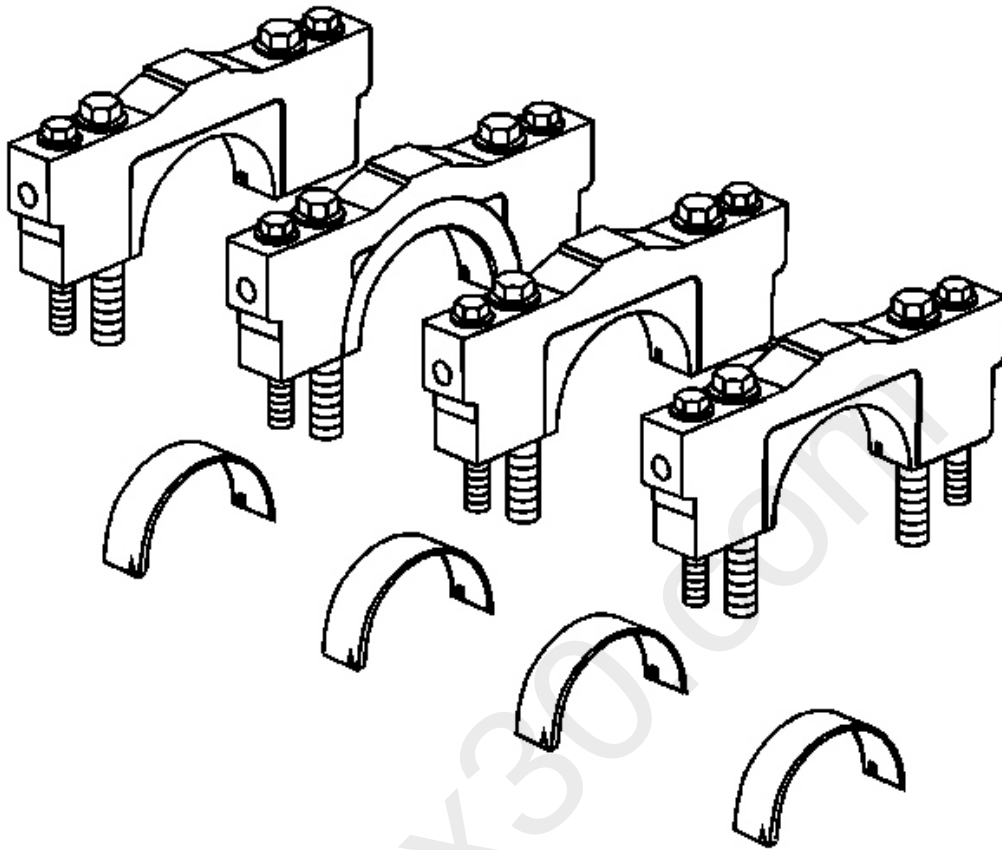


Fig. 99: View Of Crankshaft Bearing Caps & Lower Bearing Halves
Courtesy of GENERAL MOTORS CORP.

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.

ENGINE BLOCK DISASSEMBLE

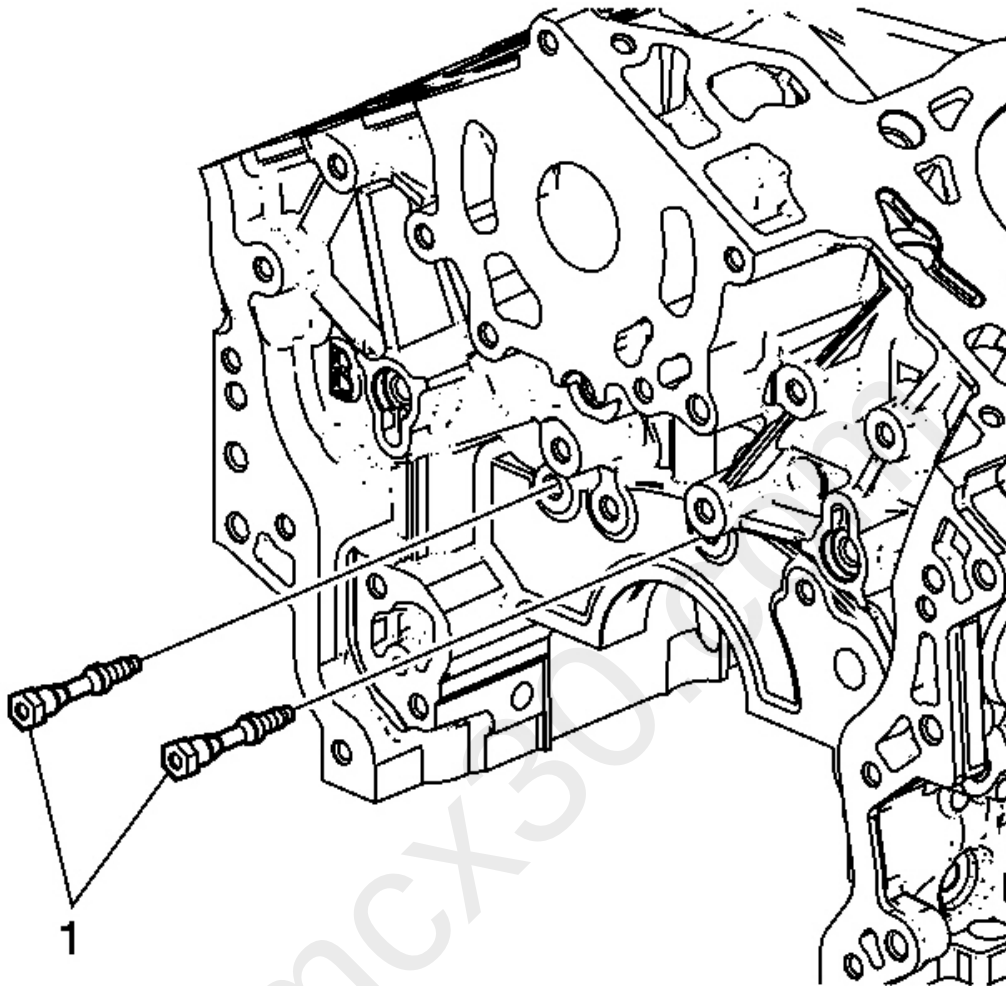


Fig. 100: Engine Front Cover Studs
Courtesy of GENERAL MOTORS CORP.

1. Remove the engine front cover studs (1).

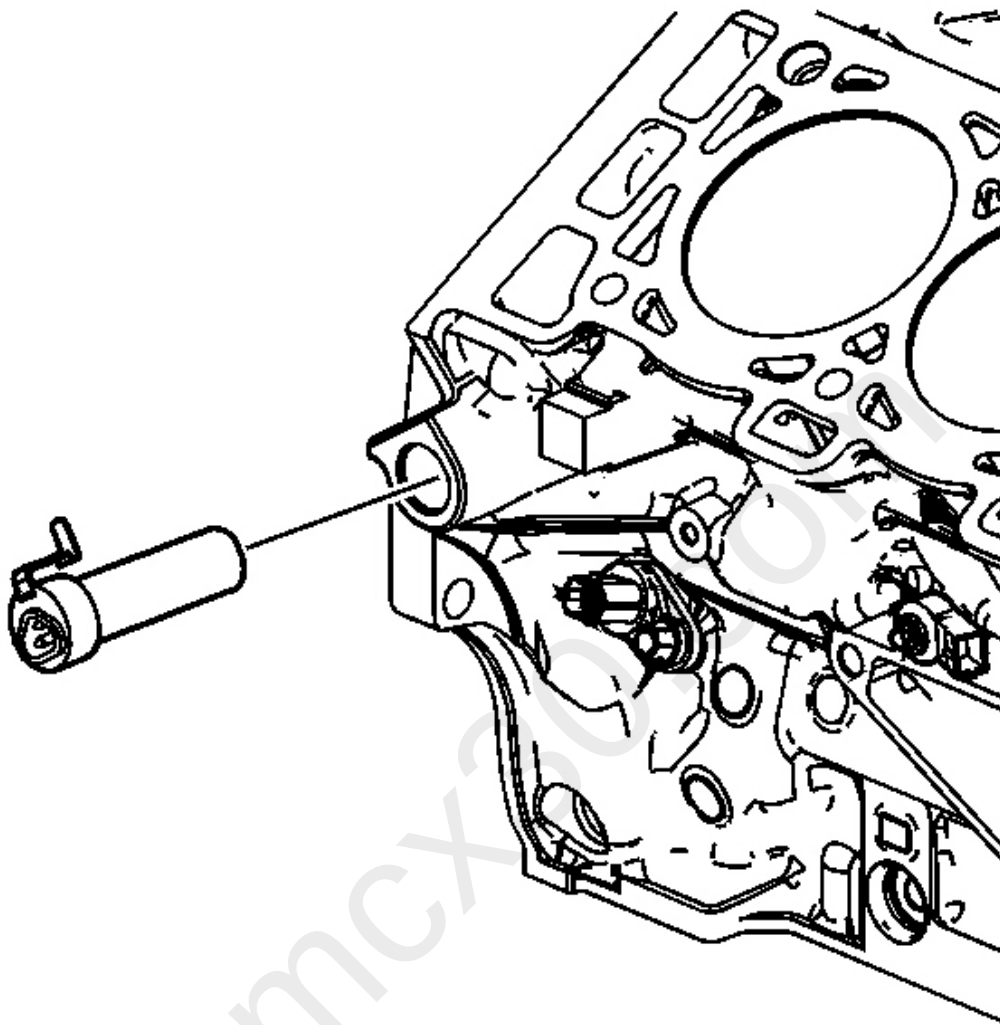


Fig. 101: View Of Block Heater Cartridge
Courtesy of GENERAL MOTORS CORP.

2. Remove the block heater cartridge, if equipped.

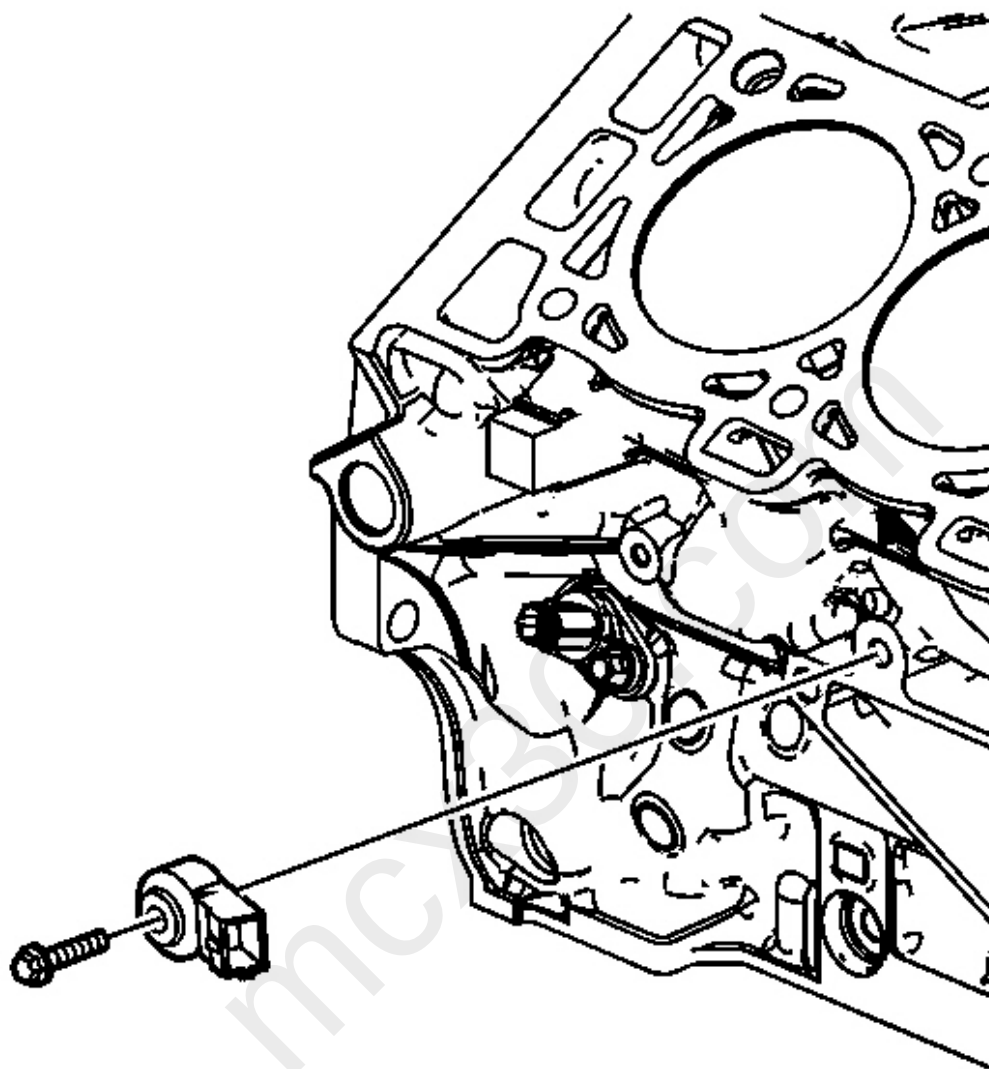


Fig. 102: View Of Right Knock Sensor
Courtesy of GENERAL MOTORS CORP.

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

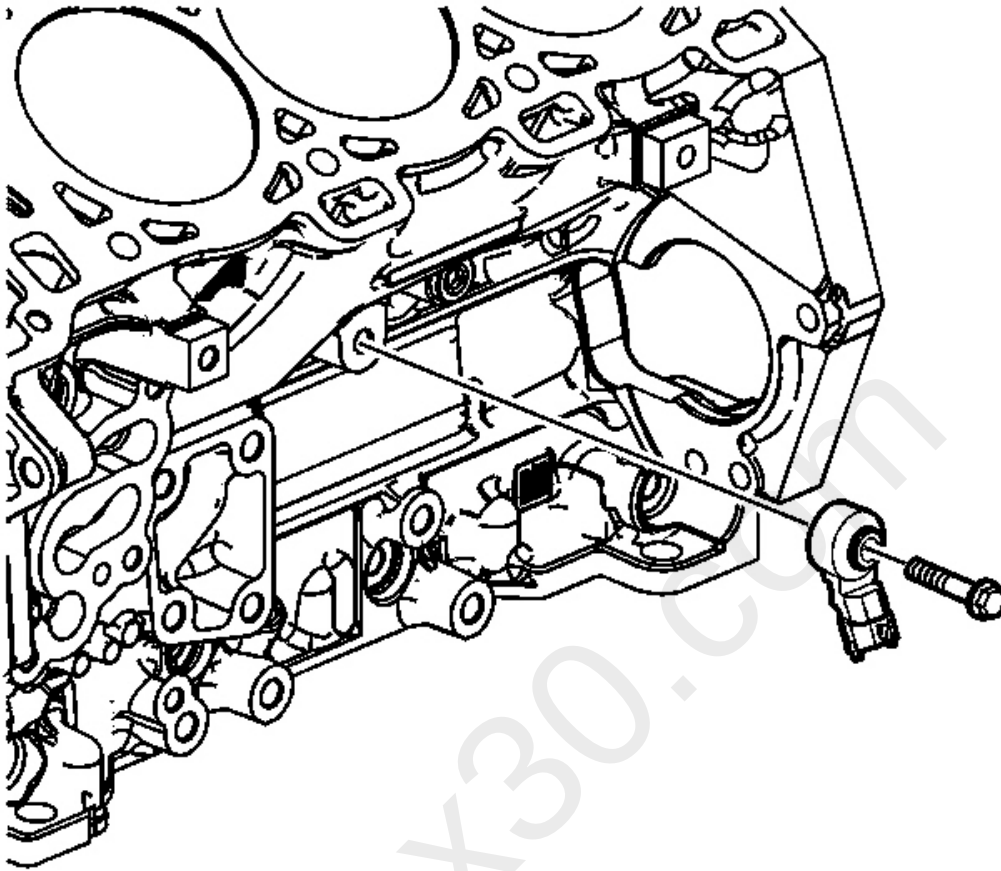


Fig. 103: View Of Left Knock Sensor & Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the left knock sensor bolt.
6. Remove the left knock sensor.

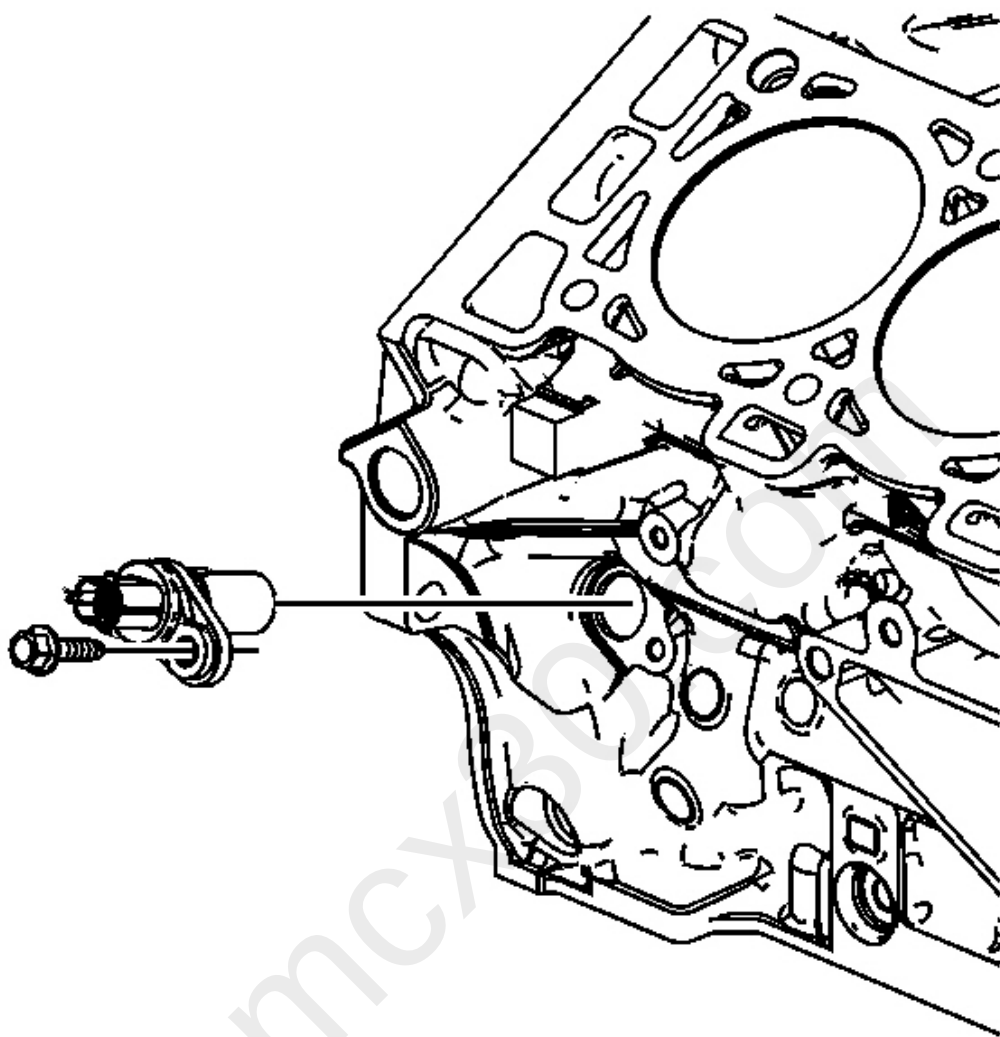


Fig. 104: View Of Crankshaft Position Sensor
Courtesy of GENERAL MOTORS CORP.

7. Remove the crankshaft position sensor bolt.
8. Remove the crankshaft position sensor.

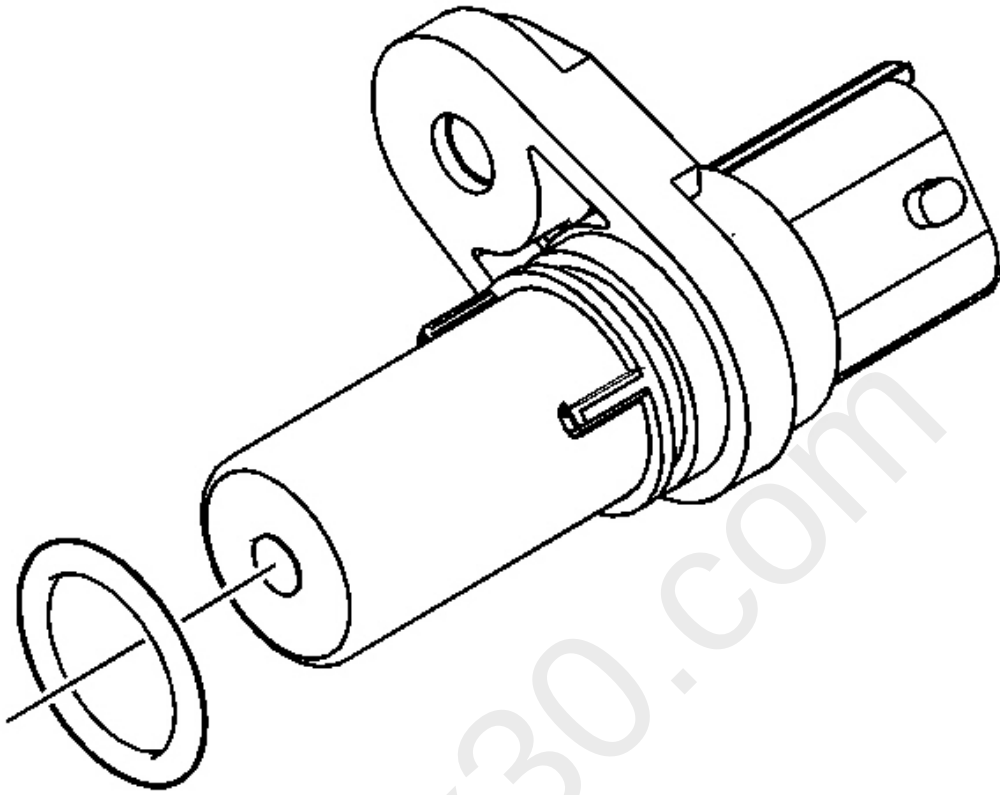


Fig. 105: View Of Crankshaft Position Sensor O-Ring
Courtesy of GENERAL MOTORS CORP.

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

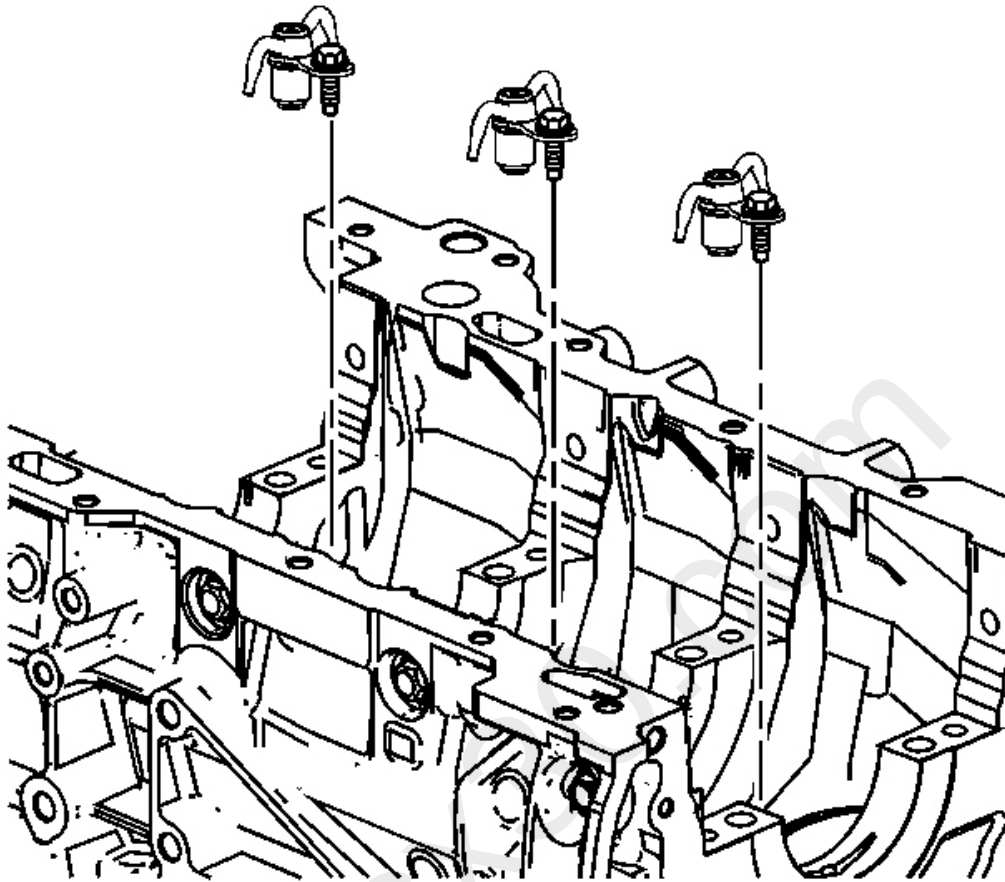


Fig. 106: View Of Oil Jets & Bolts
Courtesy of GENERAL MOTORS CORP.

10. Remove oil jet bolts.
11. Remove oil jets.

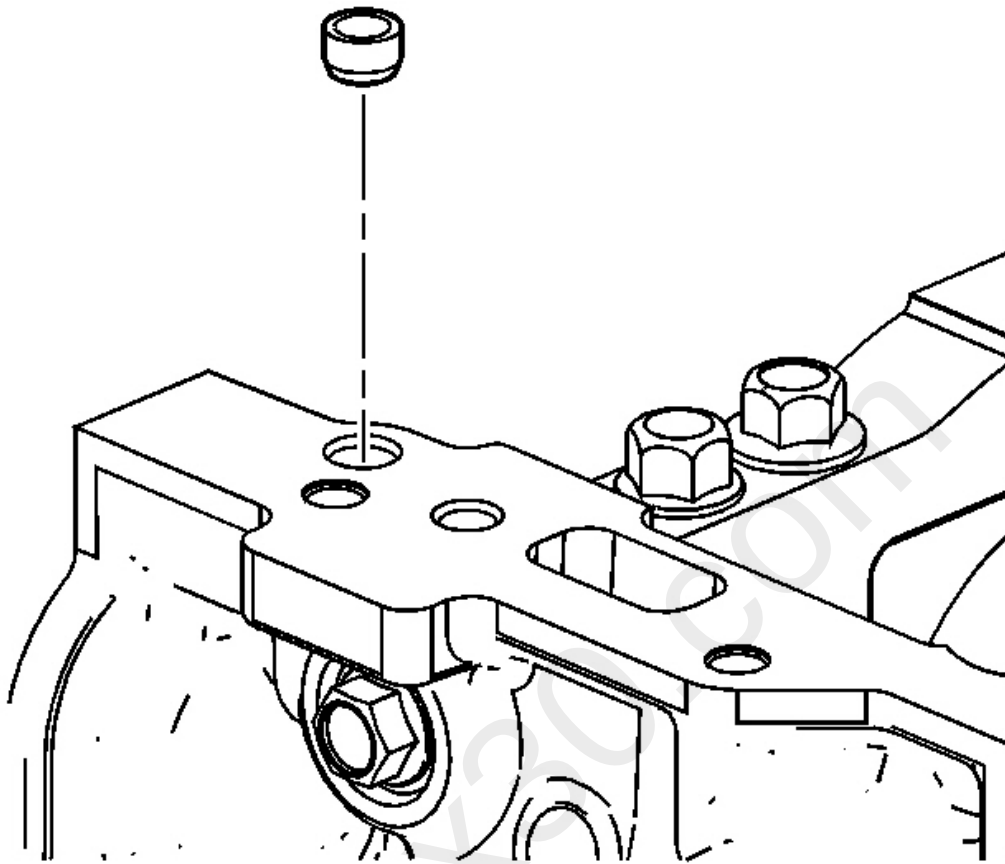


Fig. 107: Right Front Oil Pan Rail Oil Gallery Expansion Plug
Courtesy of GENERAL MOTORS CORP.

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

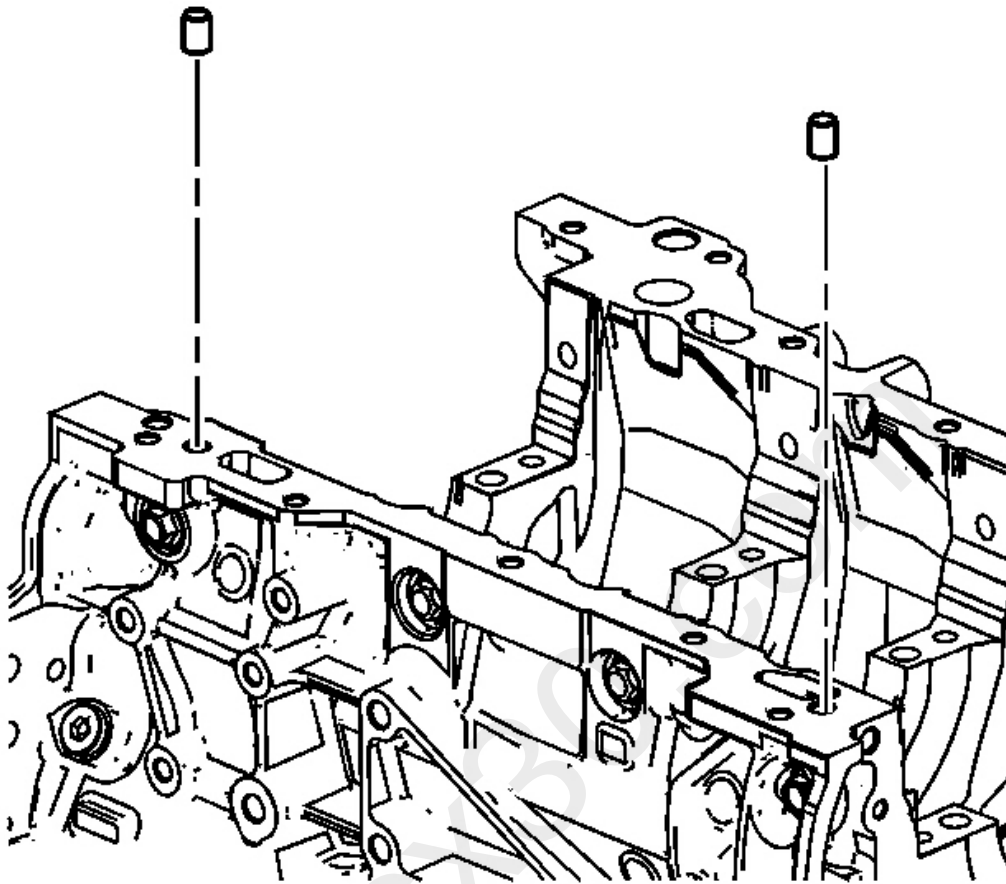


Fig. 108: Cylinder Block-To-Oil Pan Alignment Dowels
Courtesy of GENERAL MOTORS CORP.

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

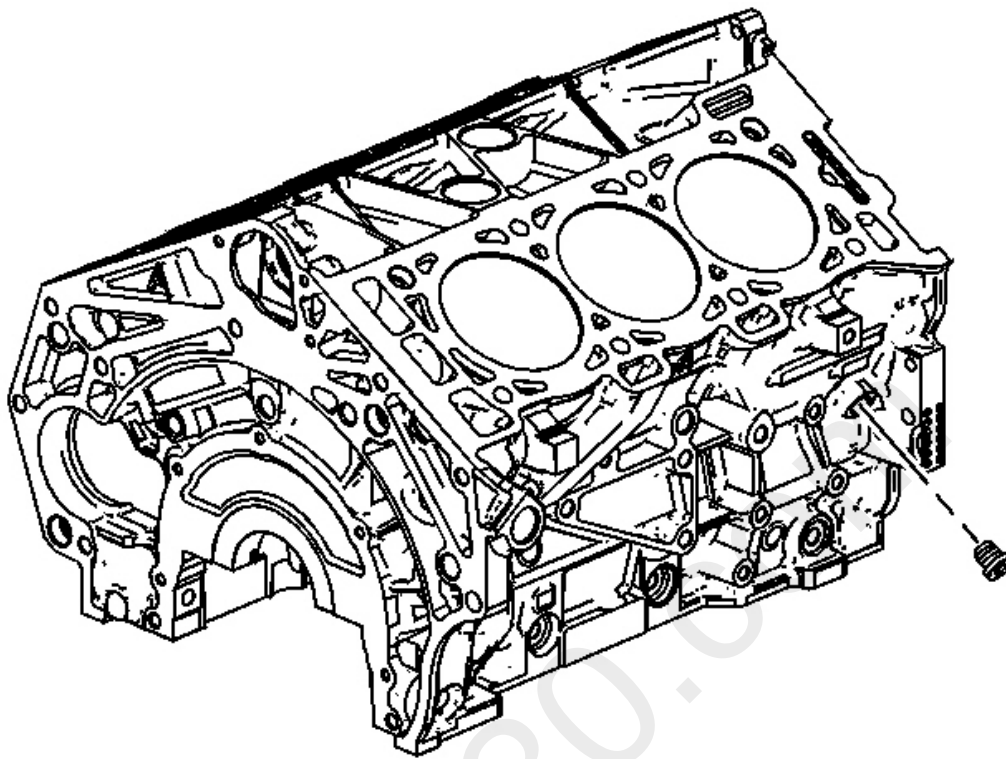


Fig. 109: View Of M14 Right Side Oil Gallery Threaded Plug
Courtesy of GENERAL MOTORS CORP.

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

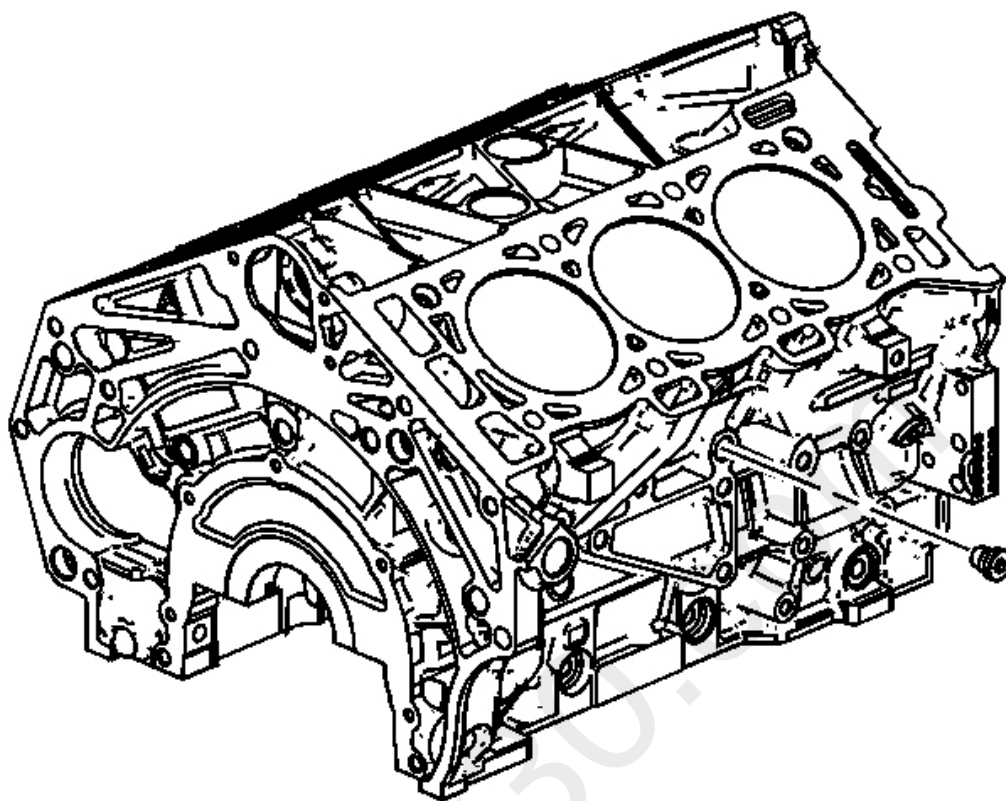


Fig. 110: Right Side Coolant Drain Threaded Plug
Courtesy of GENERAL MOTORS CORP.

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

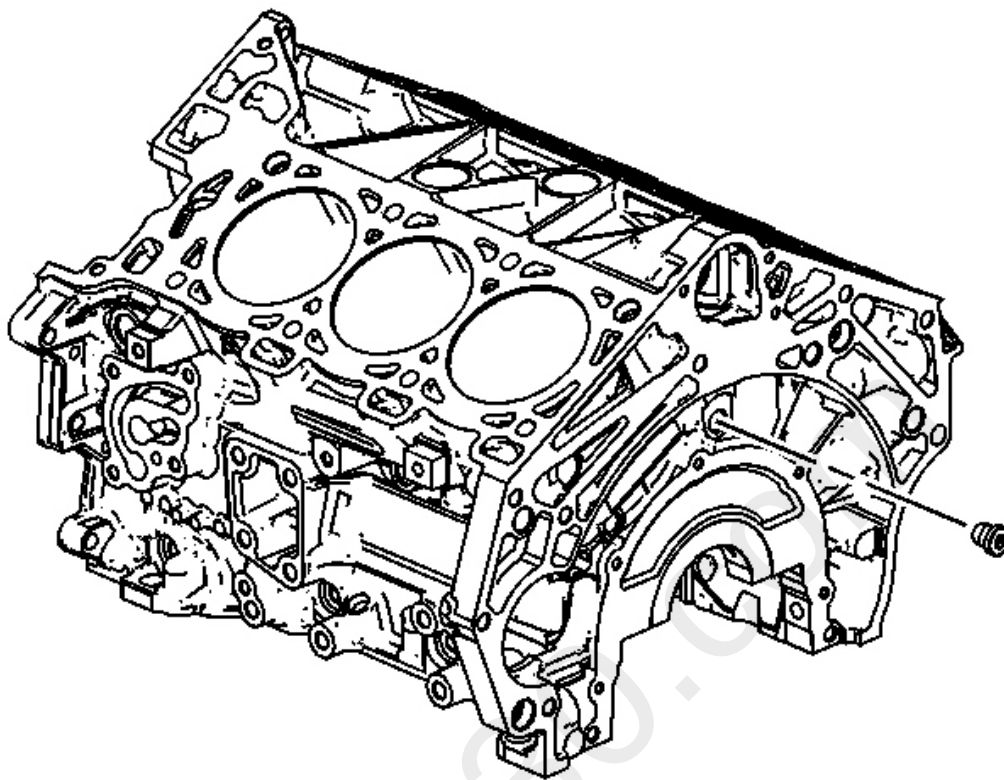


Fig. 111: M14 Rear Oil Gallery Threaded Plug
Courtesy of GENERAL MOTORS CORP.

16. Remove the M14 rear oil gallery threaded plug.

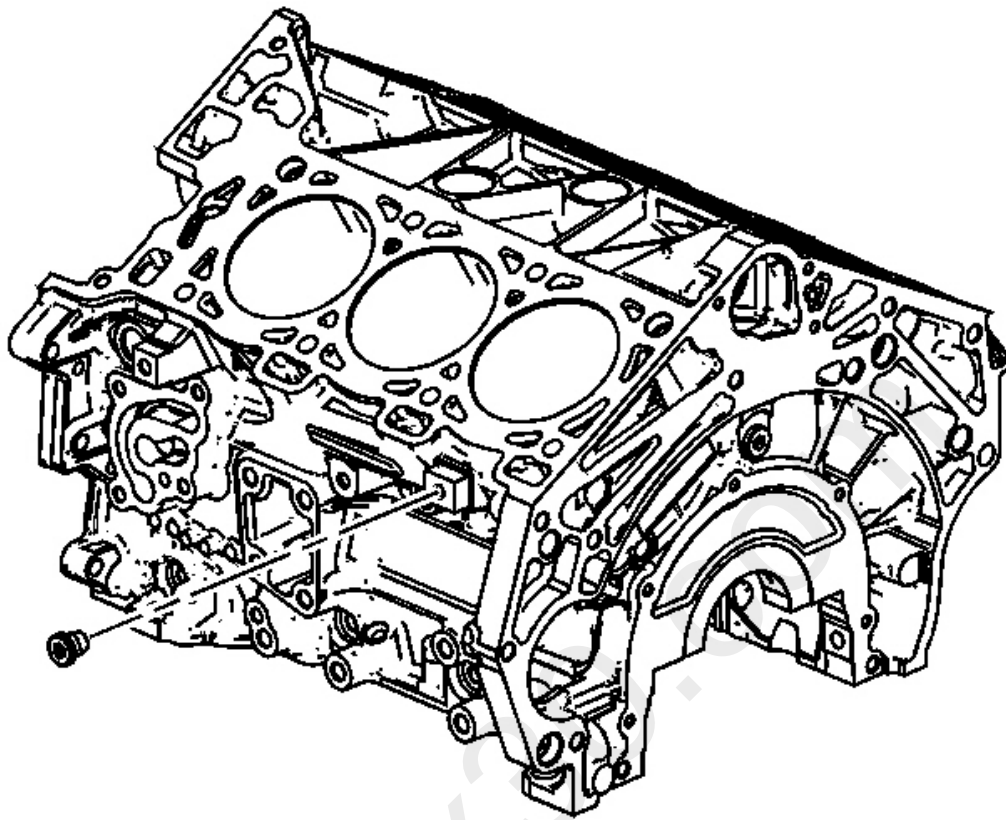


Fig. 112: View Of M14 Left Side Coolant Drain Threaded Plug
Courtesy of GENERAL MOTORS CORP.

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

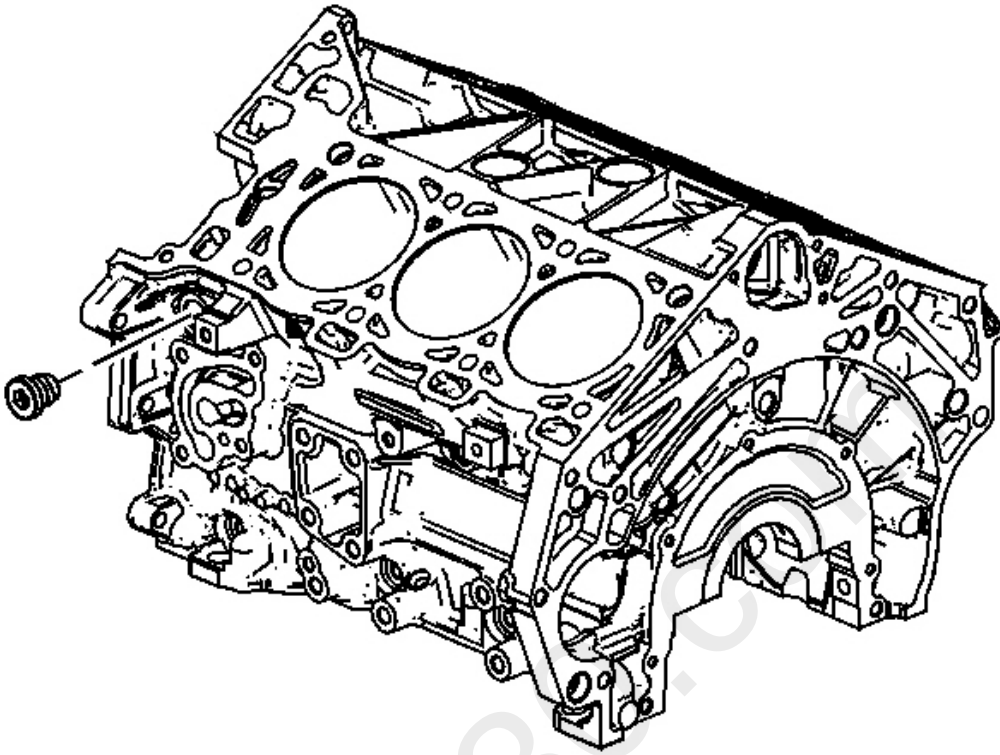


Fig. 113: Removing/Installing M20 Left Side Oil Gallery Threaded Plug
Courtesy of GENERAL MOTORS CORP.

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

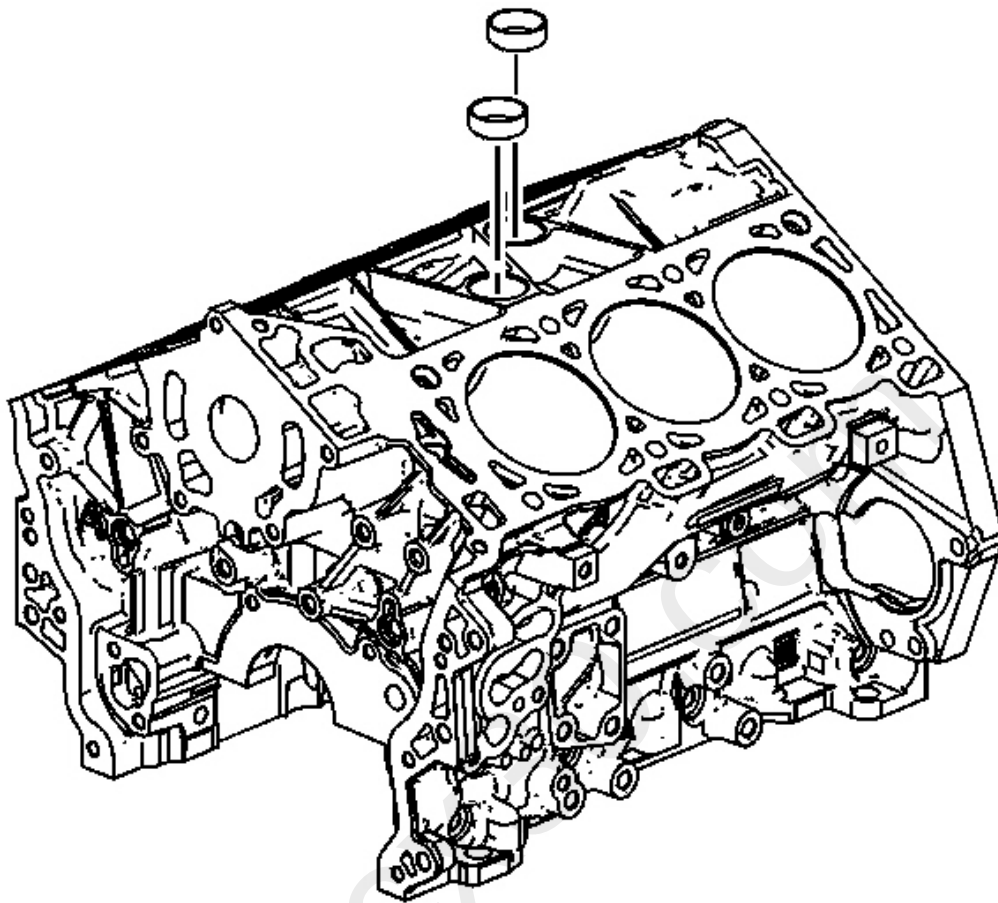


Fig. 114: Removing & Installing Coolant Expansion Plugs
Courtesy of GENERAL MOTORS CORP.

19. Remove the coolant expansion plugs.

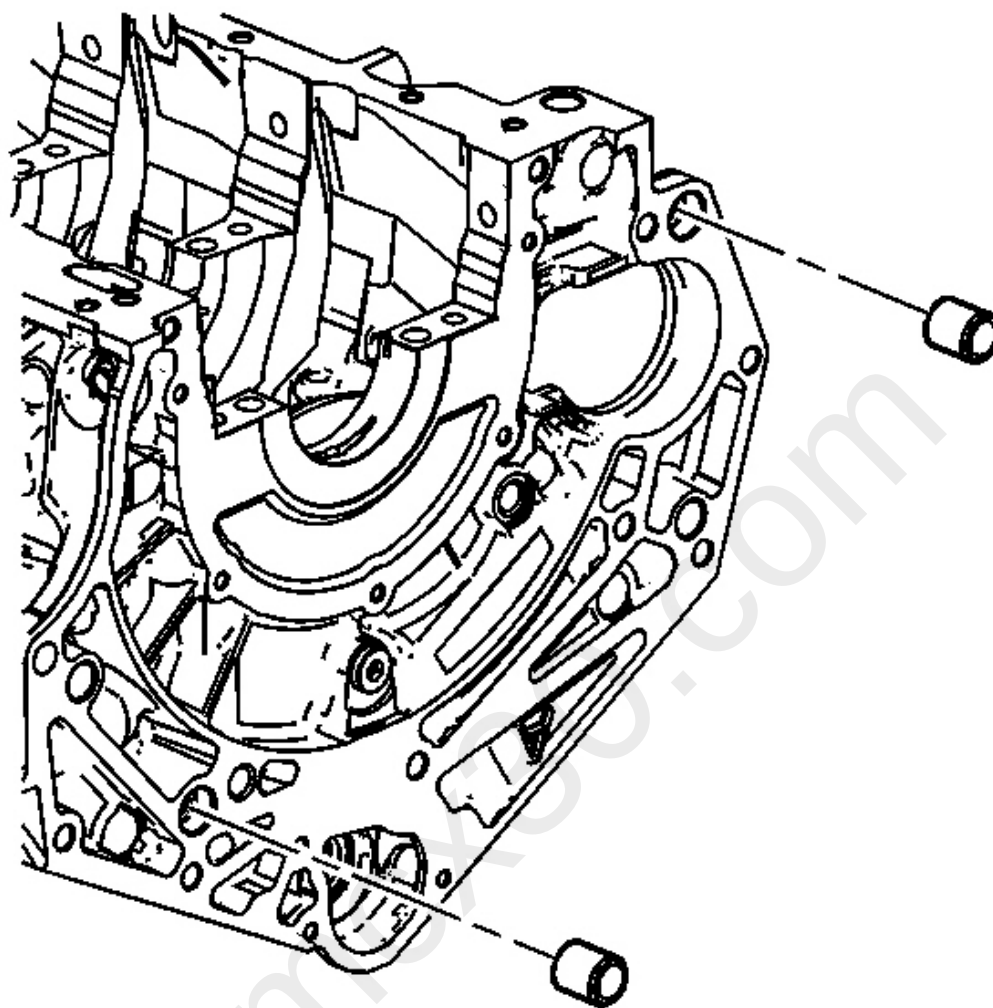


Fig. 115: Cylinder Block-To-Transmission Alignment Dowels
Courtesy of GENERAL MOTORS CORP.

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

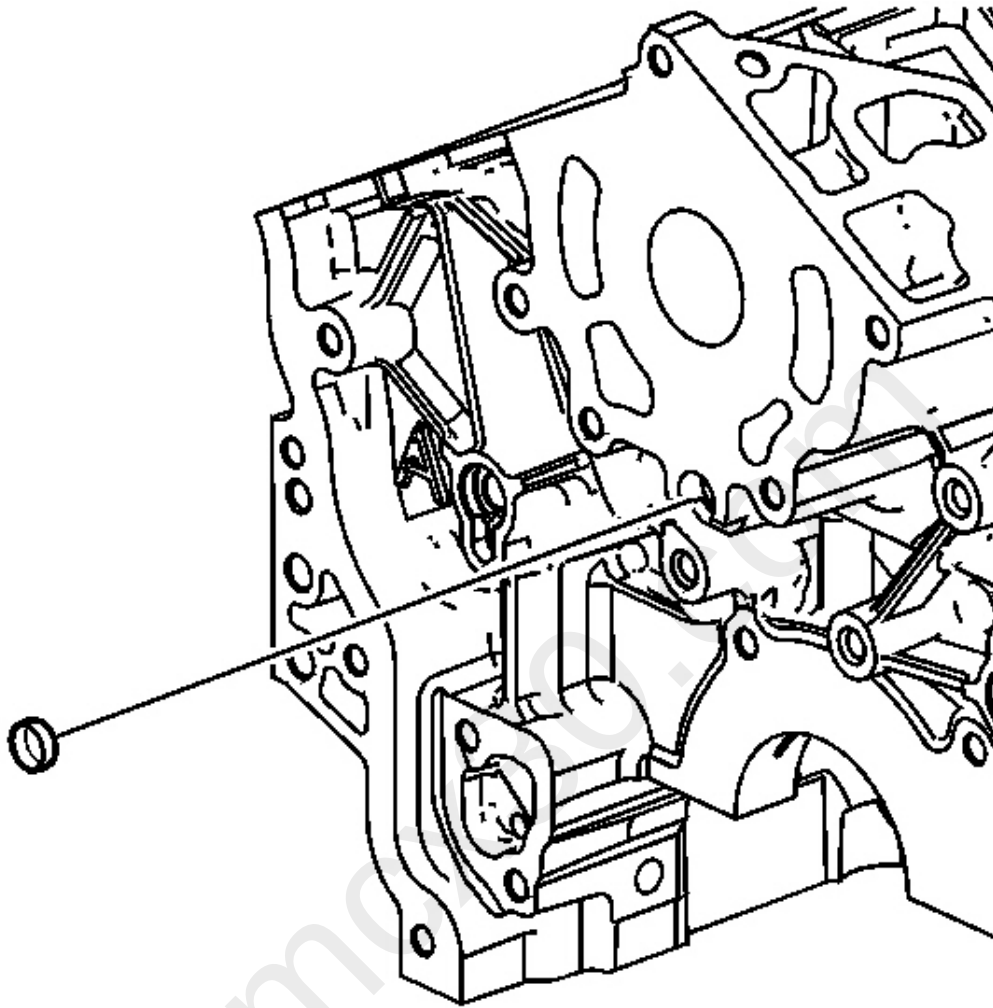


Fig. 116: View Of Front Oil Gallery Expansion Plug
Courtesy of GENERAL MOTORS CORP.

21. Remove the front oil gallery expansion plug.

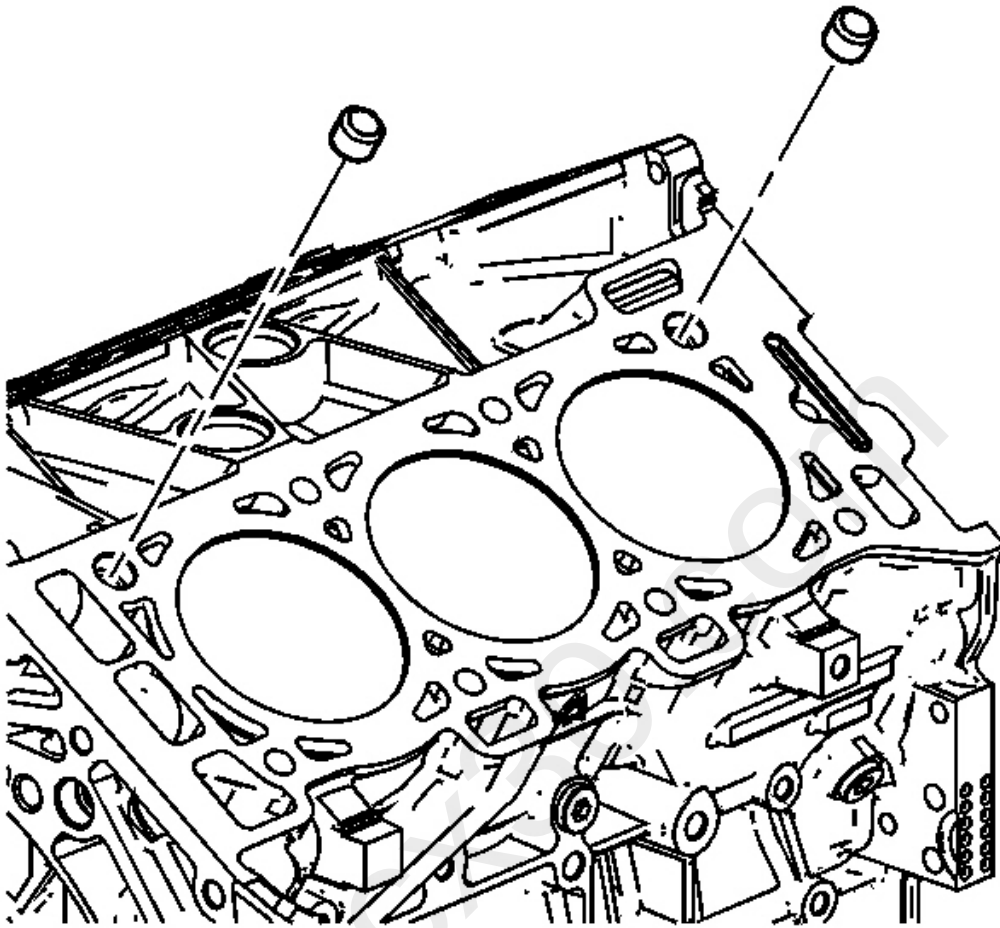


Fig. 117: Cylinder Block-To-Cylinder Head Alignment Dowels
Courtesy of GENERAL MOTORS CORP.

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

ENGINE BLOCK CLEANING AND INSPECTION

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
3. Clean all threaded and through holes with solvent.

WARNING: Refer to Safety Glasses Warning .

4. Dry the engine block with compressed air.

VISUAL INSPECTION

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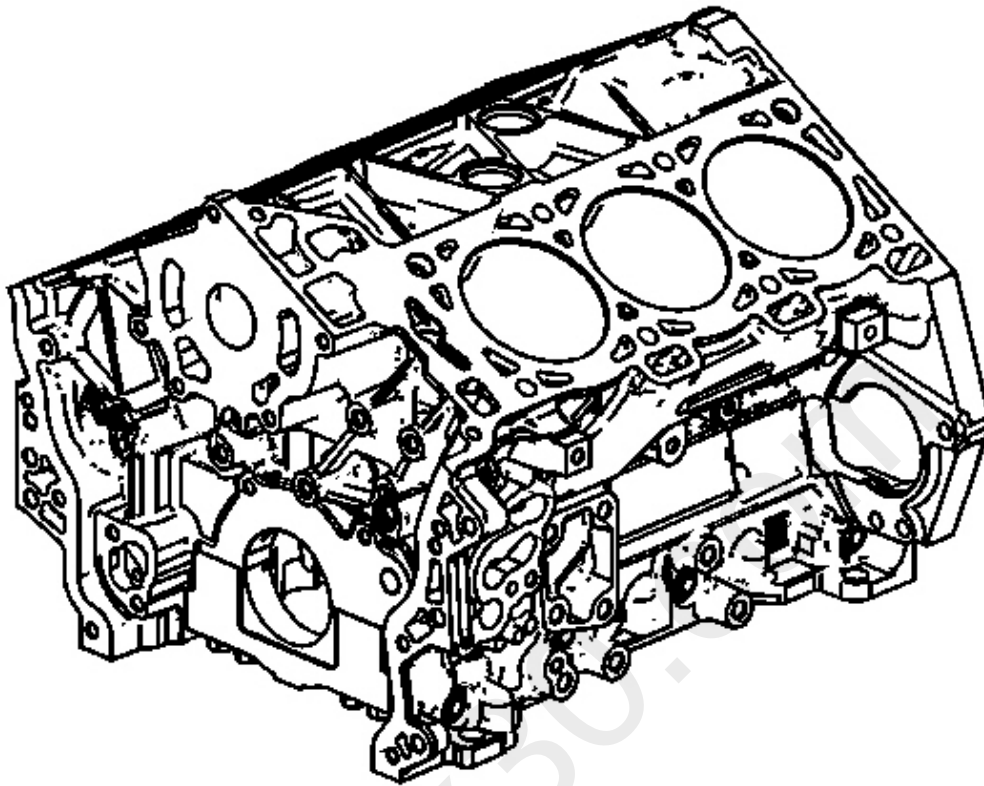


Fig. 118: View Of Engine Block
Courtesy of GENERAL MOTORS CORP.

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

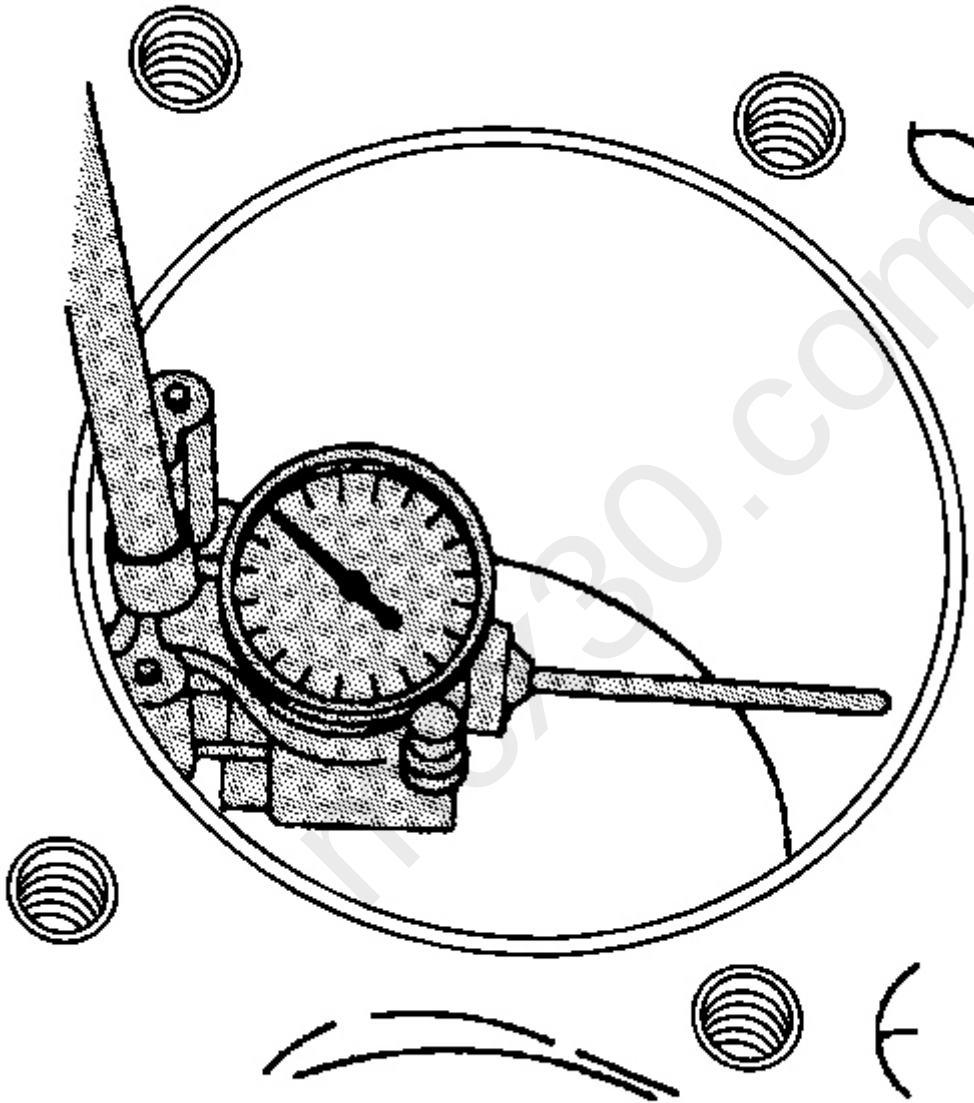


Fig. 119: Measuring Cylinder Bore
Courtesy of GENERAL MOTORS CORP.

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 (LF1)** . 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 (LF1)** . 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 (LF1)** . 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

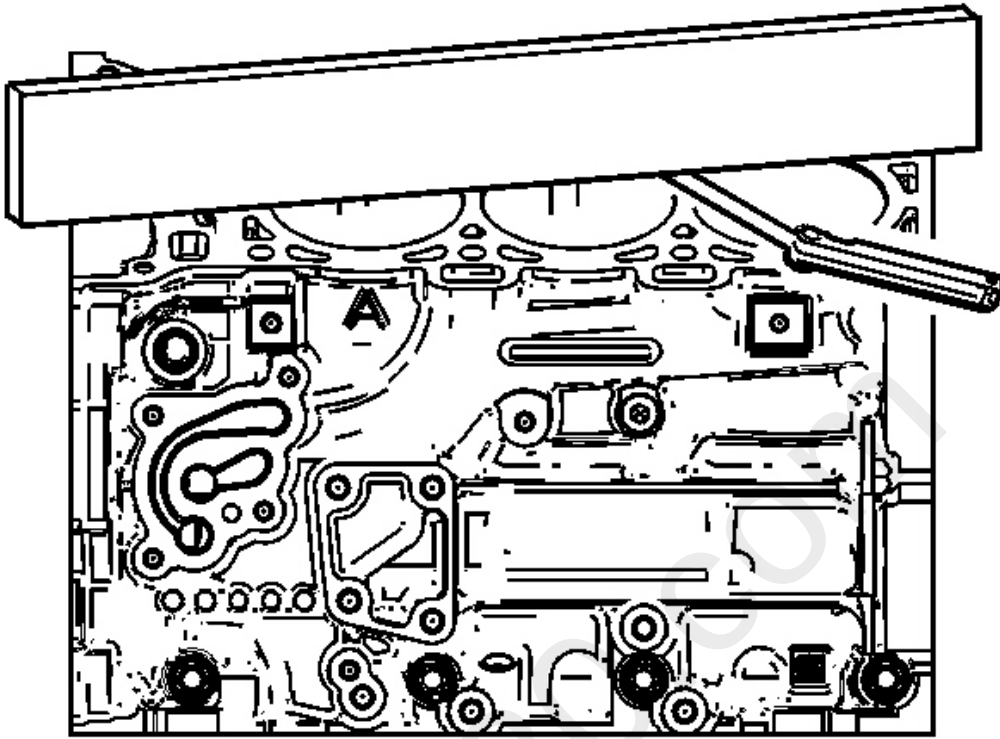


Fig. 120: Measuring Deck Flatness
Courtesy of GENERAL MOTORS CORP.

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 warp is less than 0.05 mm (0.002 in), the cylinder block 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 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.

CRANKSHAFT AND BEARING CLEANING AND INSPECTION

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 .

2. Dry the following components with compressed air:

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

VISUAL INSPECTION

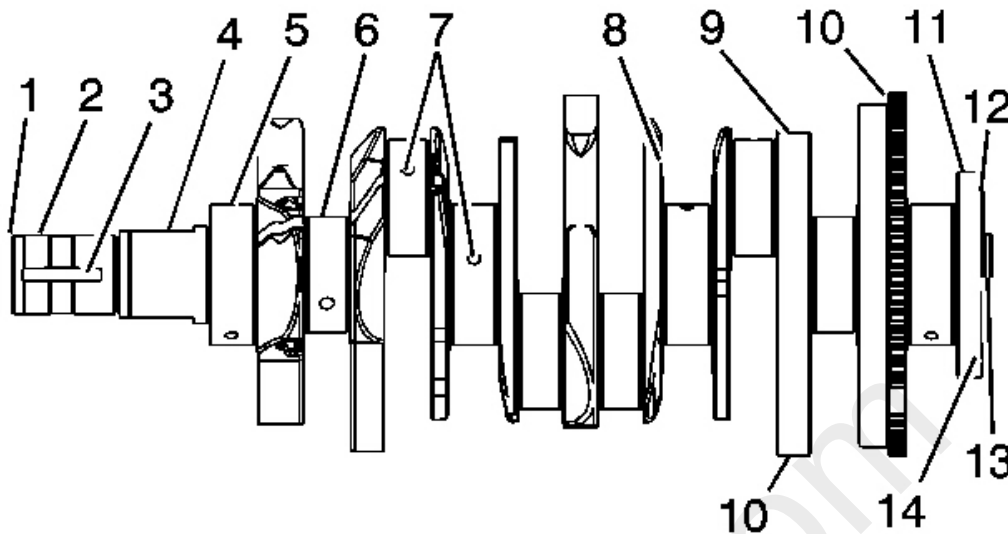


Fig. 121: Identifying Crankshaft Inspection Areas
Courtesy of GENERAL MOTORS CORP.

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.
2. Repair or replace the crankshaft as necessary.

CRANKSHAFT BEARING INSPECTION

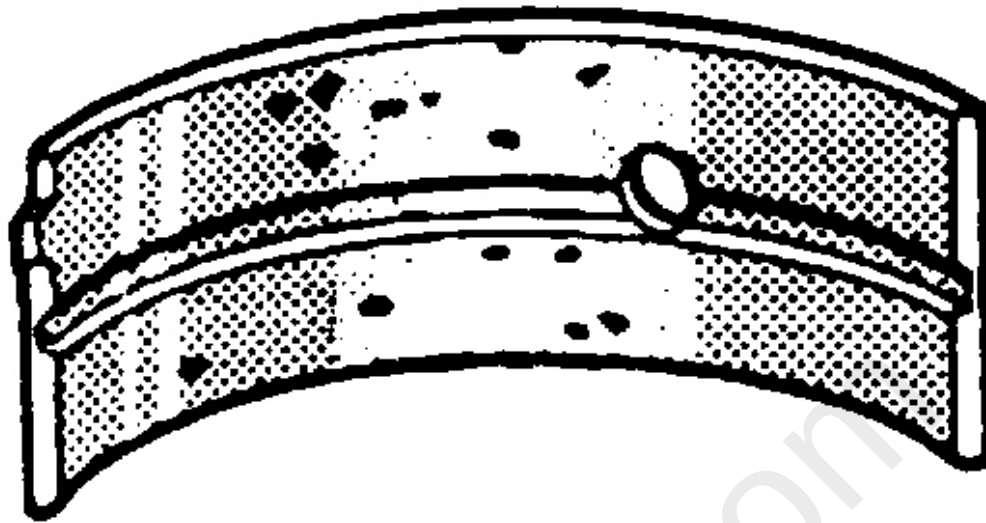


Fig. 122: Identifying Crankshaft Bearing Craters Or Pockets
Courtesy of GENERAL MOTORS CORP.

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.

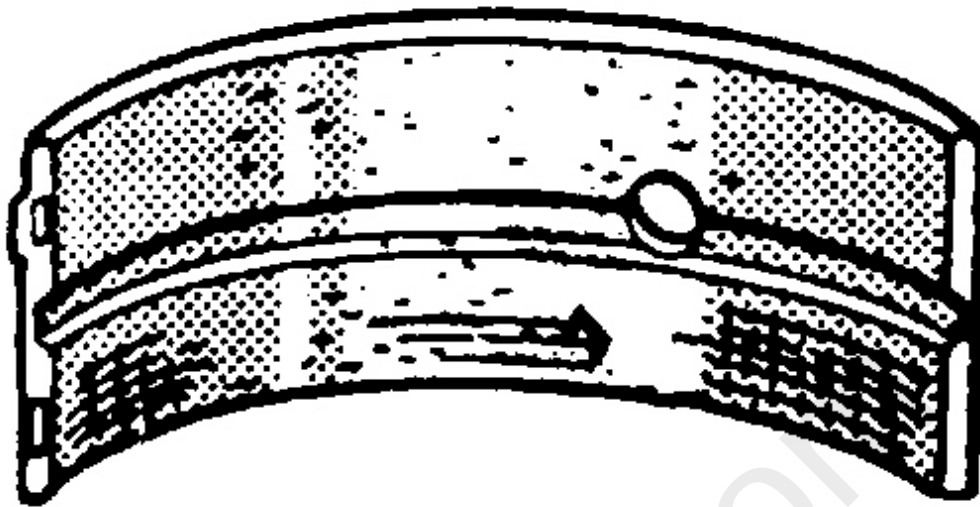


Fig. 123: Identifying Connecting Rod Bearing Scoring Or Discoloration
Courtesy of GENERAL MOTORS CORP.

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.

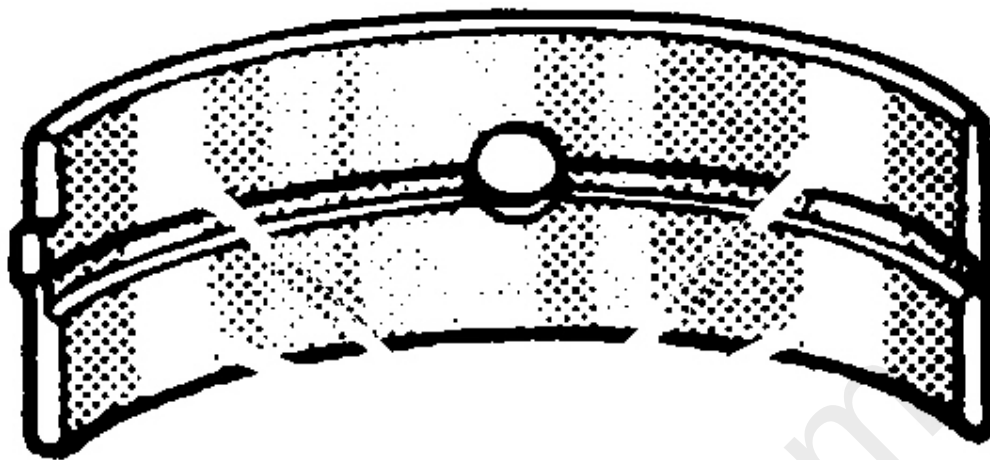


Fig. 124: Identifying Improper Seating
Courtesy of GENERAL MOTORS CORP.

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

CRANKSHAFT MEASUREMENT

Special Tools

GE 7872: Magnetic Base Dial Indicator

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

Measure

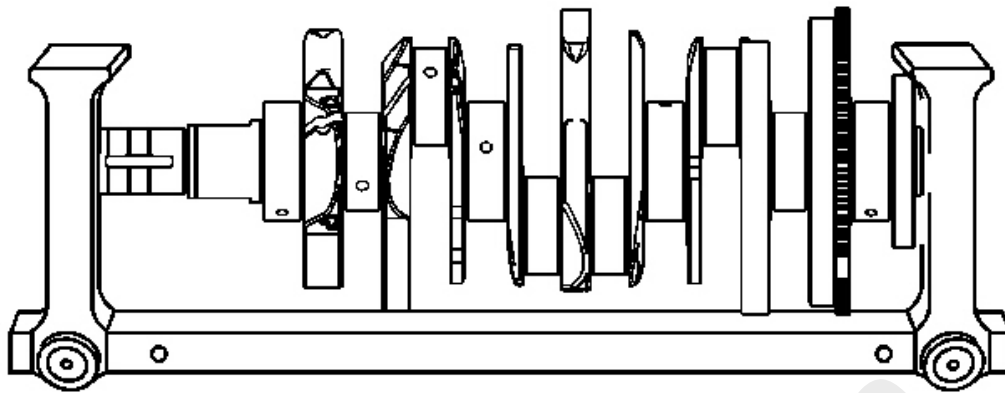


Fig. 125: View Of Crankshaft & Support
Courtesy of GENERAL MOTORS CORP.

1. Using a suitable fixture, support the crankshaft.

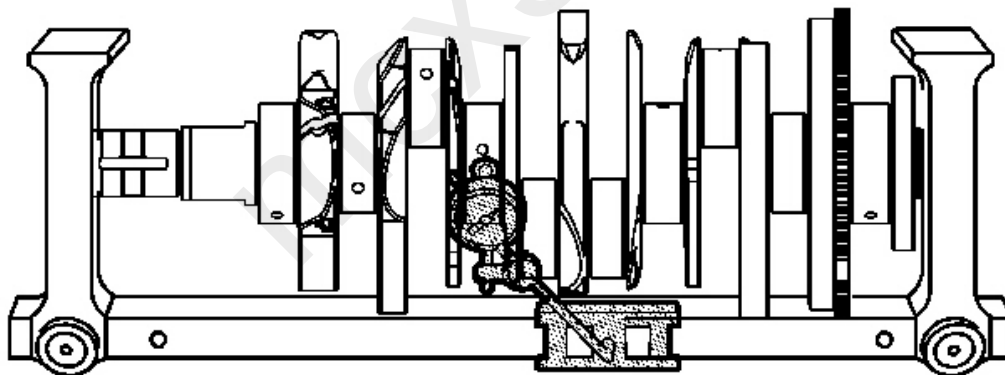


Fig. 126: View of Tool J 7872 & Crankshaft
Courtesy of GENERAL MOTORS CORP.

2. Install the **GE 7872:** indicator.
3. Measure the crankshaft runout using the **GE 7872:** indicator. Refer to **Engine Mechanical Specifications (LF1)** .

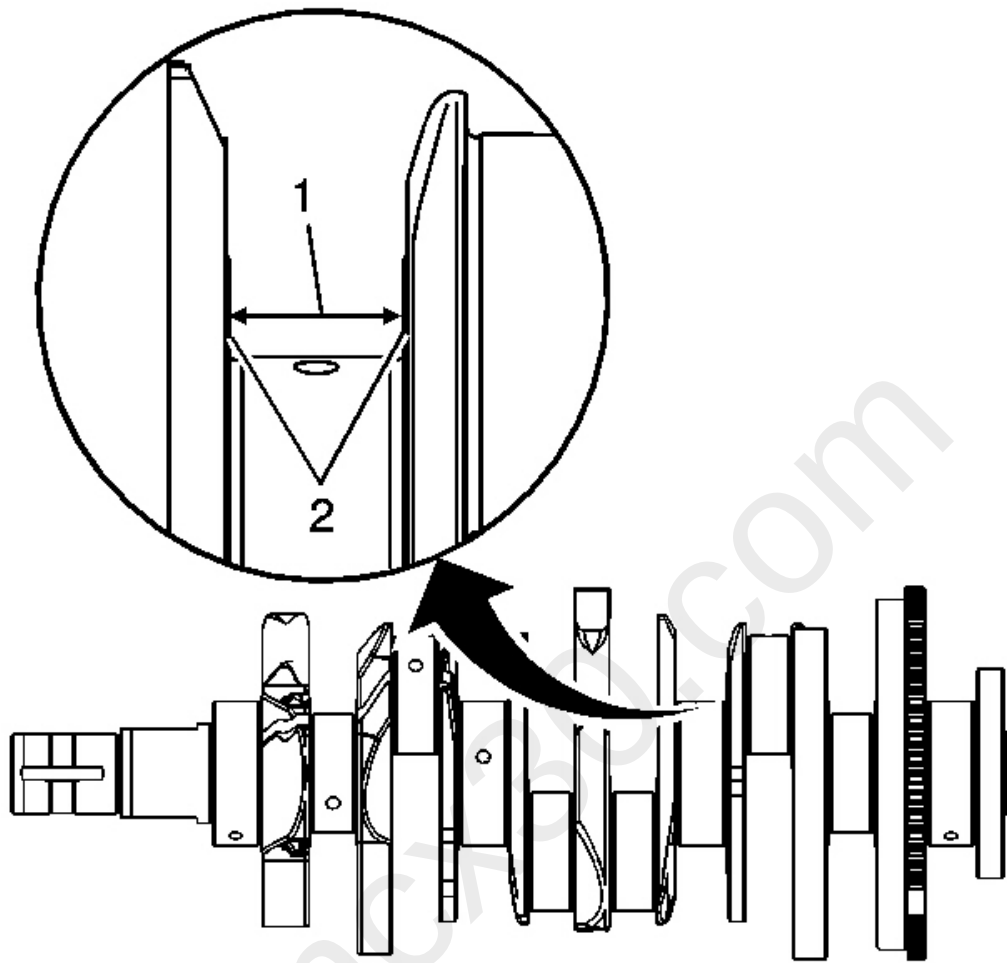


Fig. 127: Identifying Crankshaft Thrust Wall Width & Surface
Courtesy of GENERAL MOTORS CORP.

4. Measure the crankshaft thrust wall width (1) for wear using an inside micrometer. Refer to **Engine Mechanical Specifications (LF1)** .
5. Measure the crankshaft thrust wall surface (2) for runout using the **GE 7872:** indicator. Refer to **Engine Mechanical Specifications (LF1)** .
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.

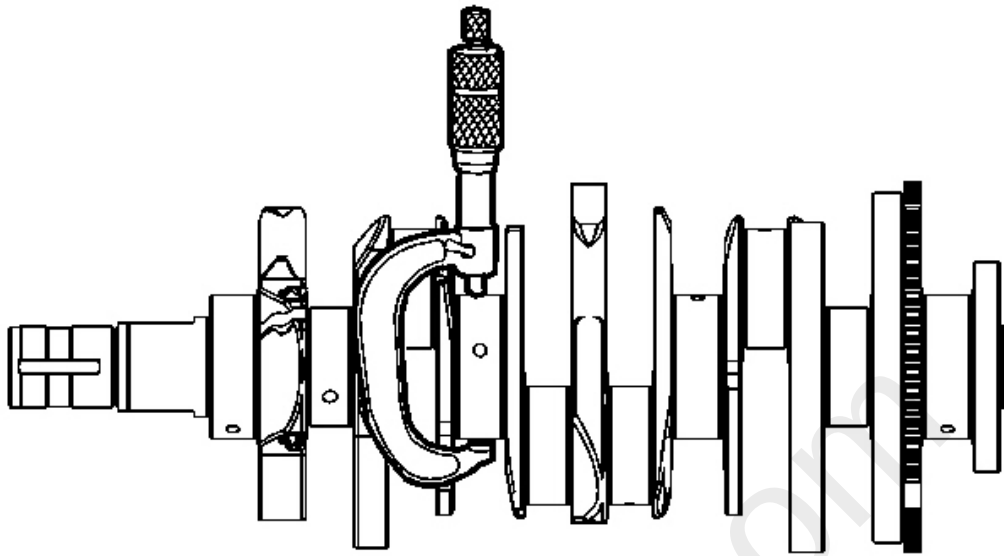


Fig. 128: Inspecting Crankshaft Main Journals
Courtesy of GENERAL MOTORS CORP.

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

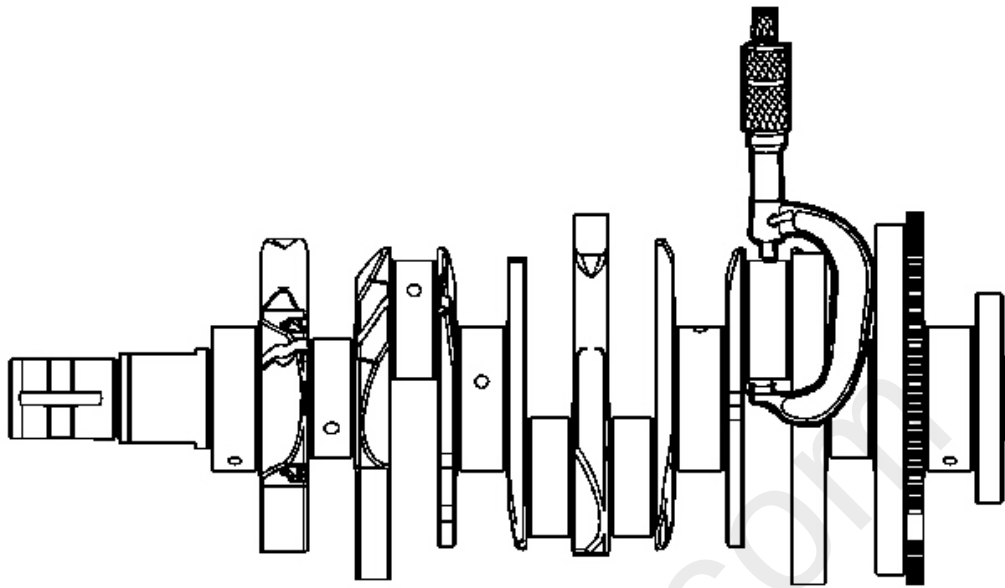


Fig. 129: Inspecting Crankpins
Courtesy of GENERAL MOTORS CORP.

8. Inspect the crankpins for undersize using an outside micrometer.
9. Compare your measurements with those listed in the **Engine Mechanical Specifications (LF1)** . 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.

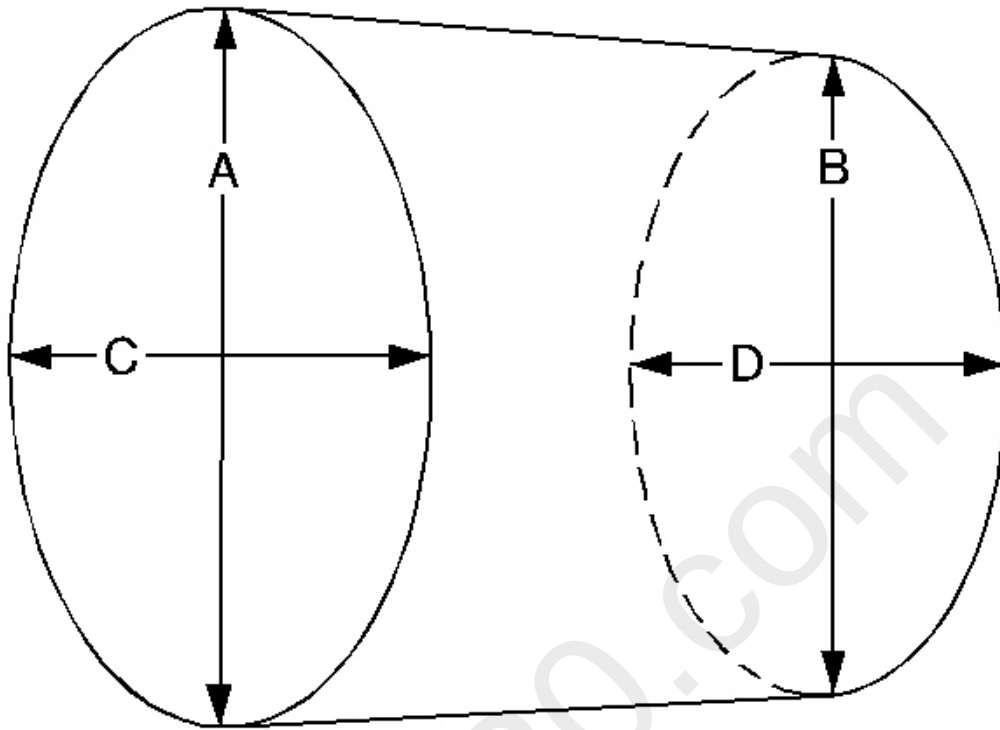


Fig. 130: Identifying Out-Of-Round Measurements
Courtesy of GENERAL MOTORS CORP.

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.

CRANKSHAFT BALANCER CLEANING AND INSPECTION

CLEANING PROCEDURE

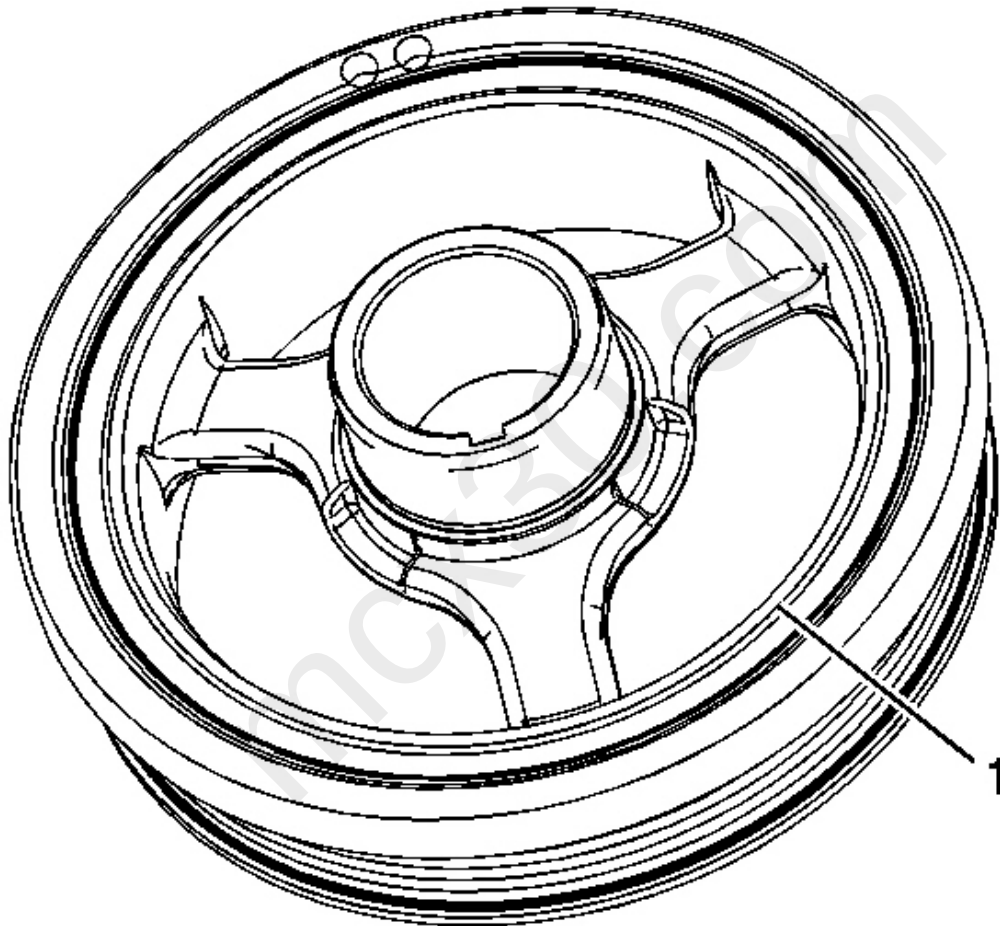


Fig. 131: View Of Crankshaft Balancer
Courtesy of GENERAL MOTORS CORP.

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

WARNING: Refer to Safety Glasses Warning .

2. Dry the crankshaft balancer with compressed air.

INSPECTION PROCEDURE

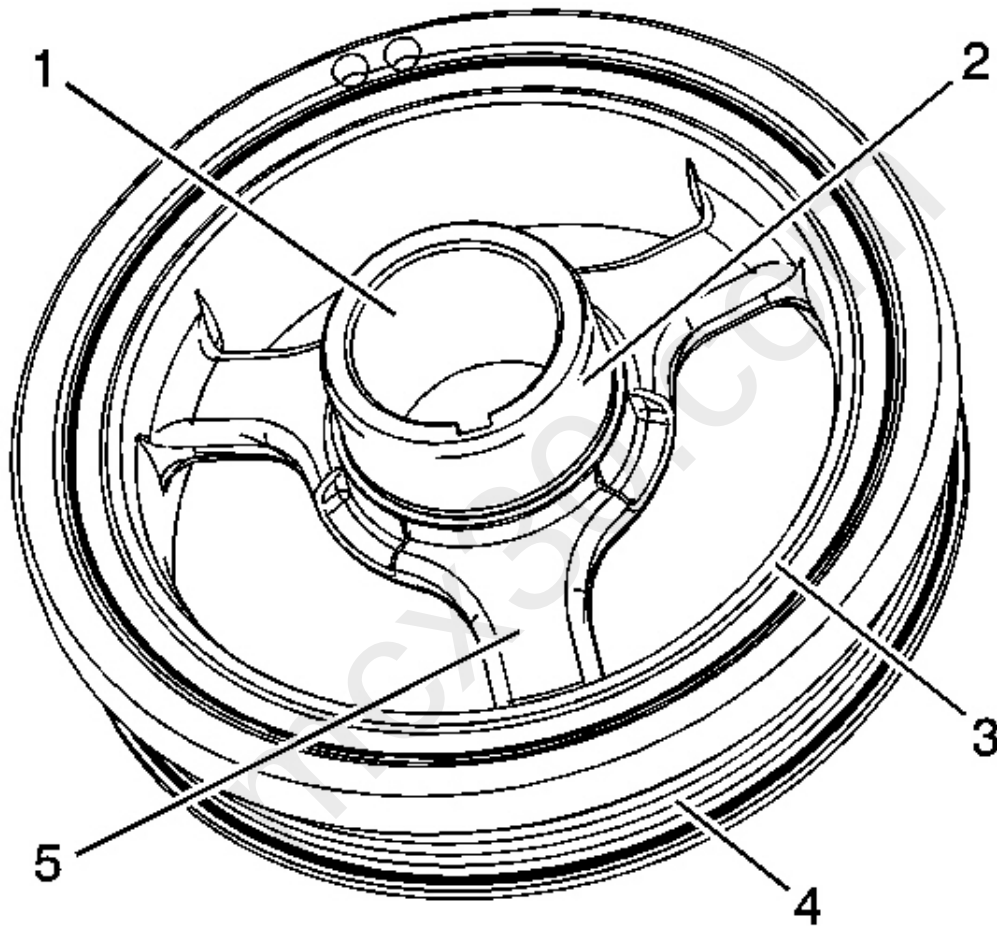


Fig. 132: Identifying Crankshaft Balancer Inspection Areas
Courtesy of GENERAL MOTORS CORP.

1. Inspect the crankshaft balancer for the following:
 - Worn or damaged hub-to-crankshaft surface (1)
 - Worn, grooved or damaged hub seal surface (2)

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 (3)
- Damaged drive belt ribs (4)
- Damaged webs (5)

2. Repair or replace the crankshaft balancer as necessary.

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