

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### 2004 ENGINE

#### Engine Mechanical - 4.2L - Ascender

## SPECIFICATIONS

### FASTENER TIGHTENING SPECIFICATIONS

#### Fastener Tightening Specifications

| Application                                      | Specifications |             |
|--|----------------|-------------|
|  | Metric         | English     |
| A/C Line Bracket Nut at Oil Level Indicator Tube | 7 N.m          | 61 lb in    |
| A/C Line Bracket Bolt at Engine Lift Bracket     | 10 N.m         | 89 lb in    |
| A/C Compressor Bolts                             | 50 N.m         | 37 lb ft    |
| Accelerator Control Cable Bracket Bolt           | 10 N.m         | 89 lb in    |
| A.I.R. Cover Stud                                | 25 N.m         | 18 lb ft    |
| Camshaft Cap Bolt                                | 12 N.m         | 106 lb in   |
| Camshaft Cover Bolt                              | 10 N.m         | 89 lb in    |
| Camshaft Position Actuator Valve Bolt            | 10 N.m         | 89 lb in    |
| Connecting Rod Cap Bolt                          |                |             |
| • First Pass                                     | 25 N.m         | 18 lb ft    |
| • Final Pass                                     | 110 degrees    |             |
| Coolant Temperature Sensor                       | 20 N.m         | 15 lb ft    |
| Cooling Fan Hub Nut                              | 56 N.m         | 41 lb ft    |
| Crankshaft Balancer Bolt                         |                |             |
| • First Pass                                     | 150 N.m        | 110.6 lb ft |
| • Final Pass                                     | 180 degrees    |             |
| Crankshaft Main Bearing Cap Bolt                 |                |             |
| • First Pass                                     | 25 N.m         | 18 lb ft    |
| • Final Pass                                     | 180 degrees    |             |
| Crankshaft Position Sensor Bolt                  | 10 N.m         | 89 lb in    |
| Crankshaft Rear Housing Bolt                     | 10 N.m         | 89 lb in    |
| Cylinder Head Access Hole Plug - Plastic         | 5 N.m          | 44 lb in    |
| Cylinder Head Bolt - 14                          |                |             |
| • First Pass                                     | 30 N.m         | 22 lb ft    |
| • Final Pass                                     | 155 degrees    |             |
| Cylinder Head End Bolts - 2 Short                |                |             |
| • First Pass                                     | 7 N.m          | 62 lb in    |
| • Final Pass                                     | 60 degrees     |             |

**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

**Cylinder Head End Bolts - 1 Long**

|  |             |          |
|--|-------------|----------|
| • First Pass                                   | 7 N.m       | 62 lb in |
| • Final Pass                                   | 120 degrees |          |
| Cylinder Head Oil Gallery Plug                 | 38 N.m      | 28 lb ft |
| Drive Belt Idler Pulley Bolt                   | 50 N.m      | 37 lb ft |
| Drive Belt Tensioner Bolt                      | 50 N.m      | 37 lb ft |
| Engine Block Oil Gallery Plug - Front and Rear | 80 N.m      | 60 lb ft |
| Engine Block Oil Gallery Plug - Side           | 35 N.m      | 26 lb ft |
| Engine Flywheel Bolt                           |             |          |
| • First Pass                                   | 25 N.m      | 18 lb ft |
| • Final Pass                                   | 50 degrees  |          |
| Engine Front Cover Bolt                        | 10 N.m      | 89 lb in |
| Engine Front Cover Spacer Bolt                 | 10 N.m      | 89 lb in |
| Engine Front Lift Bracket Bolt                 | 50 N.m      | 37 lb ft |
| Engine Harness Bracket Bolt                    | 50 N.m      | 37 lb ft |
| Engine Mount Bracket Bolt - Engine             | 50 N.m      | 37 lb ft |
| Engine Mount Bracket Bolt - Frame              | 110 N.m     | 81 lb ft |
| Engine Mount Nuts - Upper and Lower            | 70 N.m      | 52 lb ft |
| Engine Protection Shield Bolts                 | 25 N.m      | 18 lb ft |
| EVAP Purge Solenoid Valve Bolt                 | 10 N.m      | 89 lb in |
| Exhaust Camshaft Actuator Bolt                 |             |          |
| • First Pass                                   | 25 N.m      | 18 lb ft |
| • Final Pass                                   | 135 degrees |          |
| Exhaust Camshaft Position Sensor Bolt          | 10 N.m      | 89 lb in |
| Exhaust Manifold Bolt                          |             |          |
| • First Pass                                   | 25 N.m      | 18 lb ft |
| • Second Pass                                  | 25 N.m      | 18 lb ft |
| • Final Pass                                   | 25 N.m      | 18 lb ft |
| Exhaust Manifold Heat Shield Nut               | 10 N.m      | 89 lb in |
| Exhaust Manifold Heat Shield Stud              | 10 N.m      | 89 lb in |
| Exhaust Pipe Bolt                              | 50 N.m      | 37 lb ft |
| Front Differential Bolt                        | 85 N.m      | 63 lb ft |
| Fuel Injector Rail Bolt                        | 10 N.m      | 89 lb in |
| Generator Battery Lead Nut                     | 9 N.m       | 80 lb in |
| Heater Inlet Fitting                           | 45 N.m      | 33 lb ft |
| Heater Outlet Fitting                          | 45 N.m      | 33 lb ft |
| Ignition Coil Bolt                             | 10 N.m      | 89 lb in |
| Intake Camshaft Sprocket Bolt                  |             |          |
|  |             |          |

**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|  |             |           |
|--|-------------|-----------|
| • First Pass                               | 20 N.m      | 15 lb ft  |
| • Final Pass                               | 100 degrees |           |
| Intake Manifold Bolt                       | 16 N.m      | 12 lb ft  |
| Knock Sensor                               | 25 N.m      | 18 lb ft  |
| Oil Filter                                 |             |           |
| • First Pass                               | 17 N.m      | 13 lb ft  |
| • Final Pass                               | 150 degrees |           |
| Oil Filter Adapter                         | 30 N.m      | 22 lb ft  |
| Oil Filter Bypass Hole Plug                | 14 N.m      | 124 lb in |
| Oil Filter Fitting                         | 30 N.m      | 22 lb ft  |
| Oil Level Indicator Tube Stud              | 10 N.m      | 89 lb in  |
| Oil Level Sensor Bolt                      | 10 N.m      | 89 lb in  |
| Oil Pan Bolt - Ends                        | 10 N.m      | 89 lb in  |
| Oil Pan Bolt - Sides                       | 25 N.m      | 18 lb ft  |
| Oil Pan Drain Plug                         | 26 N.m      | 19 lb ft  |
| Oil Pan Nut                                | 25 N.m      | 18 lb ft  |
| Oil Pan Stud                               | 11 N.m      | 97 lb in  |
| Oil Pressure Sensor                        | 20 N.m      | 15 lb ft  |
| Oil Pump Cover Bolt                        | 10 N.m      | 89 lb in  |
| Oil Pump Pickup Tube                       | 10 N.m      | 89 lb in  |
| Oil Pump Pressure Relief Valve             | 14 N.m      | 124 lb in |
| Power Steering Pump Bolt                   | 25 N.m      | 18 lb ft  |
| Power Steering Pump Bracket Bolt           | 50 N.m      | 37 lb ft  |
| Spark Plug                                 | 18 N.m      | 13 lb ft  |
| Starter Motor Bolt                         | 50 N.m      | 37 lb ft  |
| Starter Motor Nut                          | 50 N.m      | 37 lb ft  |
| Starter Motor Stud                         | 16 N.m      | 12 lb ft  |
| Thermostat Housing bolt                    | 10 N.m      | 89 lb in  |
| Throttle Control Module Bolt               | 10 N.m      | 89 lb in  |
| Timing Chain Tensioner Bolt                | 25 N.m      | 18 lb ft  |
| Timing Chain Tensioner Guide Bolt          | 14 N.m      | 124 lb in |
| Timing Chain Tensioner Shoe Bolt           | 25 N.m      | 18 lb ft  |
| Timing Chain Top Guide Bolt                | 10 N.m      | 89 lb in  |
| Torque Converter Bolts                     | 60 N.m      | 44 lb ft  |
| Transmission Bell Housing Bolts            | 50 N.m      | 37 lb ft  |
| Transmission Fluid Tube to Air Adapter Nut | 10 N.m      | 89 lb in  |
| Water Outlet Bolt                          | 10 N.m      | 89 lb in  |
| Water Pump Bolt                            | 10 N.m      | 89 lb in  |
| Water Pump Pulley Bolt                     | 25 N.m      | 18 lb ft  |

**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

**ENGINE MECHANICAL SPECIFICATIONS****Engine Mechanical Specifications**

| Application  | Specification    |                  |
|--|------------------|------------------|
|  | Metric           | English          |
| General  |                  |                  |
| • Engine Type  | In-Line-6        |                  |
| • Displacement   | 4.2L             | 256 cu in        |
| • RPO  | LL8              |                  |
| • VIN  | "S"              |                  |
| • Bore   | 93 mm            | 3.66 in          |
| • Stroke   | 102 mm           | 4.02 in          |
| • Compression Ratio  | 10:1             |                  |
| • Engine Compression Test                                  | 1482 KPa         | 215 psi          |
| • Firing Order   | 1-5-3-6-2-4      |                  |
| • Spark Plug Gap   | 1.07 mm          | 0.042 in         |
| Block  |                  |                  |
| • Crankshaft Main Bearing Bore Diameter                    | 78.070-78.088 mm | 3.0760-3.0766 in |
| • Cylinder Bore Diameter                                   | 92.990-93.006 mm | 3.6638-3.6644 in |
| • Cylinder Bore Out-of-Round                               | 0.013 mm         | 0.0005 in        |
| • Cylinder Head Deck Surface Flatness                      | 0.08 mm          | 0.003 in         |
| • Cylinder Liner Recession                                 | 0.015 mm         | 0.0006 in        |
| Camshaft   |                  |                  |
| • Camshaft End Play - Exhaust                              | 0.045-0.215 mm   | 0.0017-0.0084 in |
| • Camshaft End Play - Intake                               | 0.051-0.201 mm   | 0.0020-0.0079 in |
| • Camshaft Journal Diameter - All Intake and Exhaust #2-#7 | 26.936-26.960 mm | 1.0612-1.0622 in |
| • Camshaft Journal Diameter - Exhaust #1                   | 29.936-29.960 mm | 1.1794-1.1804 in |
| • Camshaft Journal to Bore Clearance                       | 0.040-0.085 mm   | 0.0015-0.0033 in |
| Connecting Rod   |                  |                  |
| • Connecting Rod Bearing Clearance                         | 0.021-0.065 mm   | 0.0008-0.0025 in |
| • Connecting Rod Bore Diameter - Bearing End               | 60.322-60.338 mm | 2.3749-2.3755 in |
| • Connecting Rod Bore Out-of-Round - Bearing End           | 0.005 mm         | 0.0002 in        |
| Connecting Rod Side Clearance                              | 0.05-0.35 mm     | 0.0019-0.0137 in |



**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

**Crankshaft**

|  |                  |                  |
|--|------------------|------------------|
| • Crankshaft End Play                  | 0.112-0.388 mm   | 0.0044-0.0153 in |
| • Crankshaft Main Bearing Clearance    | 0.012-0.064 mm   | 0.0004-0.0025 in |
| • Crankshaft Main Journal Diameter     | 69.968-69.984 mm | 2.7567-2.7574 in |
| • Crankshaft Main Journal Out-of-Round | 0.005 mm         | 0.0002 in        |
| • Crankshaft Main Journal Taper        | 0.005 mm         | 0.0002 in        |

**Cylinder Head**

|  |         |          |
|--|---------|----------|
| • Surface Flatness - Block Deck            | 0.08 mm | 0.003 in |
| • Surface Flatness - Exhaust Manifold Deck | 0.08 mm | 0.003 in |
| • Surface Flatness - Intake Manifold Deck  | 0.08 mm | 0.003 in |

**Exhaust Manifold**

|                    |         |          |
|--------------------|---------|----------|
| • Surface Flatness | 0.08 mm | 0.003 in |
|--------------------|---------|----------|

**Lubrication System**

|                                 |        |                   |
|---------------------------------|--------|-------------------|
| • Oil Capacity - with Filter    | 6.6 L  | 7.0 qts           |
| • Oil Capacity - without Filter | 6.1 L  | 6.5 qts           |
| • Oil Pressure - Minimum        | 85 KPa | 12 psi @ 1200 RPM |

**Oil Pump**

|                                  |                  |                |
|----------------------------------|------------------|----------------|
| • Gear Diameter - Drive          | 73.415-73.370 mm | 2.893-2.891 in |
| • Gear Diameter - Driven         | 87-86.975 mm     | 3.428-3.426 in |
| • Gear Pocket - Depth            | 15.609-15.584 mm | 0.615-0.614 in |
| • Gear Pocket - Diameter         | 87.065-87.040 mm | 3.430-3.429 in |
| • Gear Thickness - Drive         | 15.546-15.521 mm | 0.613-0.611 in |
| • Gear Thickness - Driven        | 15.360-15.511 mm | 0.605-0.611 in |
| • Lobe Inner Diameter - Maximum  | 11.9 mm          | 0.469 in       |
| • Relief Valve-to-Bore Clearance | 2.57-1.63 mm     | 0.101-0.064 in |

**Piston Rings**

|   |                |                  |
|---|----------------|------------------|
| • Piston Ring End Gap - First Compression Ring              | 0.15-0.3 mm    | 0.0059-0.0118 in |
| • Piston Ring End Gap - Second Compression Ring             | 0.36-0.51 mm   | 0.0142-0.0201 in |
| • Piston Ring End Gap - Oil Control Ring                    | 0.250-0.760 mm | 0.0098-0.0299 in |
| • Piston Ring to Groove Clearance - First Compression Ring  | 0.043-0.093 mm | 0.0017-0.0037 in |
| • Piston Ring to Groove Clearance - Second Compression Ring | 0.043-0.093 mm | 0.0017-0.0037 in |
|   |                |                  |

**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|  |                       |                         |
|--|-----------------------|-------------------------|
| • Piston Ring to Groove Clearance - Oil Control Ring | 0.059-0.215 mm        | 0.0023-0.0085 in        |
| Pistons and Pins                                     |                       |                         |
| • Piston - Piston Diameter                           | 92.971-93.005 mm      | 3.6603-3.6616 in        |
| • Piston - Piston Pin Bore Diameter                  | 23.002-23.008 mm      | 0.9056-0.9058 in        |
| • Piston - Piston to Bore Clearance                  | -0.015-0.035 mm       | -0.0006-0.0014 in       |
| • Pin - Piston Pin Clearance to Connecting Rod Bore  | 0.001-0.018 mm        | 0.0004-0.0007 in        |
| • Pin - Piston Pin Clearance to Piston Pin Bore      | 0.003-0.012 mm        | 0.00012-0.0005 in       |
| • Pin - Piston Pin Diameter                          | 22.996-22.999 mm      | 0.9054-0.9055 in        |
| Valve System   |                       |                         |
| • Valves - Valve Face Runout                         | 0.038 mm              | 0.0015 in               |
| • Valves - Valve Seat Runout                         | 0.05 mm               | 0.002 in                |
| • Valves - Valve Stem-to-Guide Clearance - Exhaust   | 0.0375-0.0775 mm      | 0.0015-0.0030 in        |
| • Valves - Valve Stem-to-Guide Clearance - Intake    | 0.030-0.065 mm        | 0.0011-0.0025 in        |
| • Valve Springs - Valve Spring Load - Closed         | 211.4-233.4 N @ 35 mm | 47.5-52.5 lb @ 1.701 in |
| • Valve Springs - Valve Spring Load - Open           | 579-631 N @ 24.5 mm   | 130-142 lb @ 1.260 in   |

**SEALERS, ADHESIVES, AND LUBRICANTS****Sealers, Adhesives, and Lubricants**

| <b>Application</b>                       | <b>Type of Material</b> |
|--|-------------------------|
| Camshaft Position Actuator Bolt          | Sealant                 |
| Camshaft Position Sensor Bolt            | Sealant                 |
| Coolant Sensor Threads                   | Sealant                 |
| Crankshaft Position Sensor Bolt          | Sealant                 |
| Cylinder Head Core Hole Plugs            | Sealant                 |
| Cylinder Head Expansion Plugs - Aluminum | Sealant                 |
| Engine Block Front Oil Gallery Plug      | Sealant                 |
| Engine Block Plug                        | Sealant                 |
| Engine Front Cover Surface               | Sealant                 |
| Engine Oil                               | 5W-30 Oil               |
| EVAP Purge Solenoid Valve Bolt           | Sealant                 |
| Exhaust Manifold Bolt Threads            | Threadlock              |
| Exhaust Manifold Heat Shield Nuts        | Anti-Sieze              |
| Lubricant                                | Lubricant               |
|  |                         |

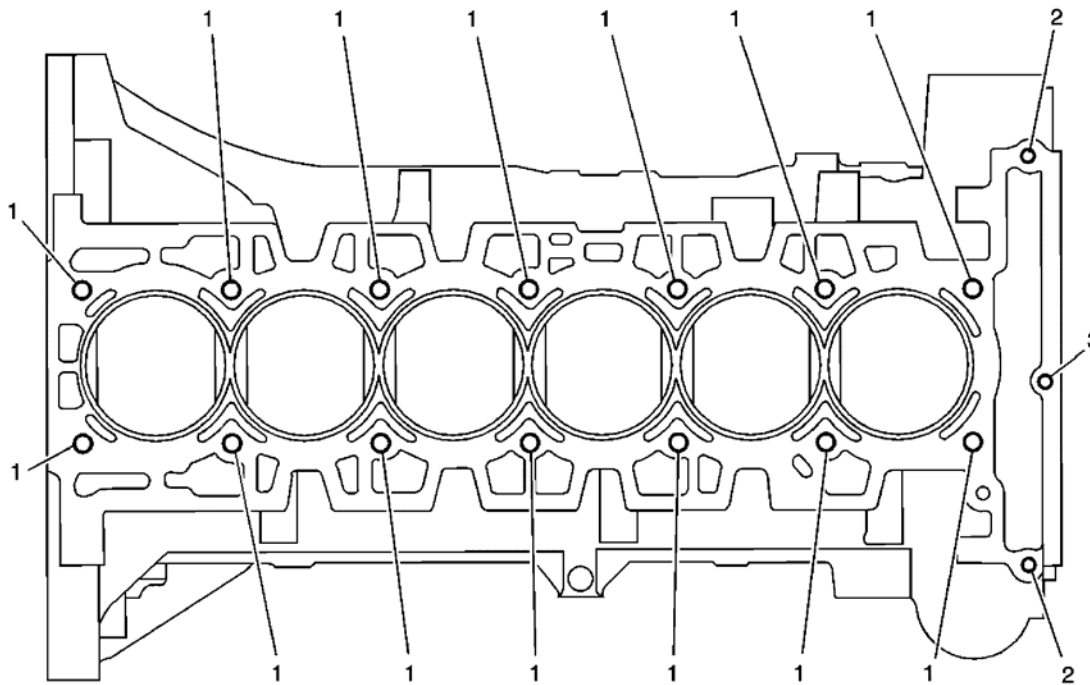
## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|                               |                  |
|-------------------------------|------------------|
| Oil Level Indicator Tube Stud | Sealant          |
| Oil Pan Surface               | Sealant          |
| Oil Pressure Sensor Threads   | Sealant          |
| Oil Pump Pipe Bolt            | Sealant          |
| Parts Cleaner                 | Cleaner          |
| PVC Hose                      | Lubricant        |
| Rear Oil Seal Housing Surface | (3-Bond) Sealant |
| Throttle Control Module Bolt  | Sealant          |
| Timing Chain Guide Bolt       | Threadlock       |

### THREAD REPAIR SPECIFICATIONS

#### Engine Block - Top View



**Fig. 1: Engine Block Thread Repair - Top View**  
Courtesy of GENERAL MOTORS CORP.

#### Engine Block - Top View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| -                     |             |       |                  |             |     |        |        |                   |       |                 |       |
| 1                     | M 11 x 2    | 402   | n/a              | n/a         | 403 | 404    | 108    | 59                | 2.324 | 51              | 2.009 |
| 2                     | M 11 x 2    | 402   | n/a              | n/a         | 403 | 404    | 108    | 59                | 2.324 | 51              | 2.009 |

## 2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |          |     |     |     |     |     |     |    |       |    |       |
|----|----------|-----|-----|-----|-----|-----|-----|----|-------|----|-------|
| 3  | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 4  | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 5  | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 6  | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 7  | M 6 x 1  | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 8  | M 6 x 1  | 201 | 202 | n/a | 203 | 204 | 205 | 30 | 1.182 | 26 | 1.024 |
| 9  | M 6 x 1  | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 10 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 11 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 12 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 13 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 14 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 15 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 16 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |
| 17 | M 11 x 2 | 402 | n/a | n/a | 403 | 404 | 108 | 59 | 2.324 | 51 | 2.009 |

This technical drawing shows a side view of a 6-cylinder inline engine block. The block is symmetrical with six cylinders arranged in a row. Numbered callouts identify various components: '1' points to the cylinder head, combustion chamber, piston pin, crankshaft, and main bearing cap; '2' points to the intake and exhaust ports; and '3' points to the crankshaft pin. The drawing illustrates the internal components and the external structure of the engine block.

### Engine Block - Bottom View

[illegible]

# 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

| Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|---------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
| -             |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| 1             | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 2             | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 3             | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 4             | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 5             | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 6             | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 7             | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 8             | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 9             | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 10            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 11            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 12            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 13            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 14            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 15            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 16            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 17            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 18            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 19            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 20            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 21            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 22            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 23            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 24            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 25            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 26            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 27            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 28            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 29            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 30            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 31            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |
| 32            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 33            | 20 x 16     | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 33                | 1.300 | 23              | 0.906 |
| 34            | 8 x 1.25    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 30                | 1.182 | 25              | 0.985 |
| 35            | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 30                | 1.182 | 25              | 0.985 |
| 36            | 10 x 1.5    | 417   | n/a              | n/a         | 418 | 419    | 420    | 53                | 2.088 | 45              | 1.773 |

Engine Block - Left Side View

## 2004 ENGINE Engine Mechanical - 4.2L - Ascender

[illegible]

**2004 Isuzu Ascender LS**

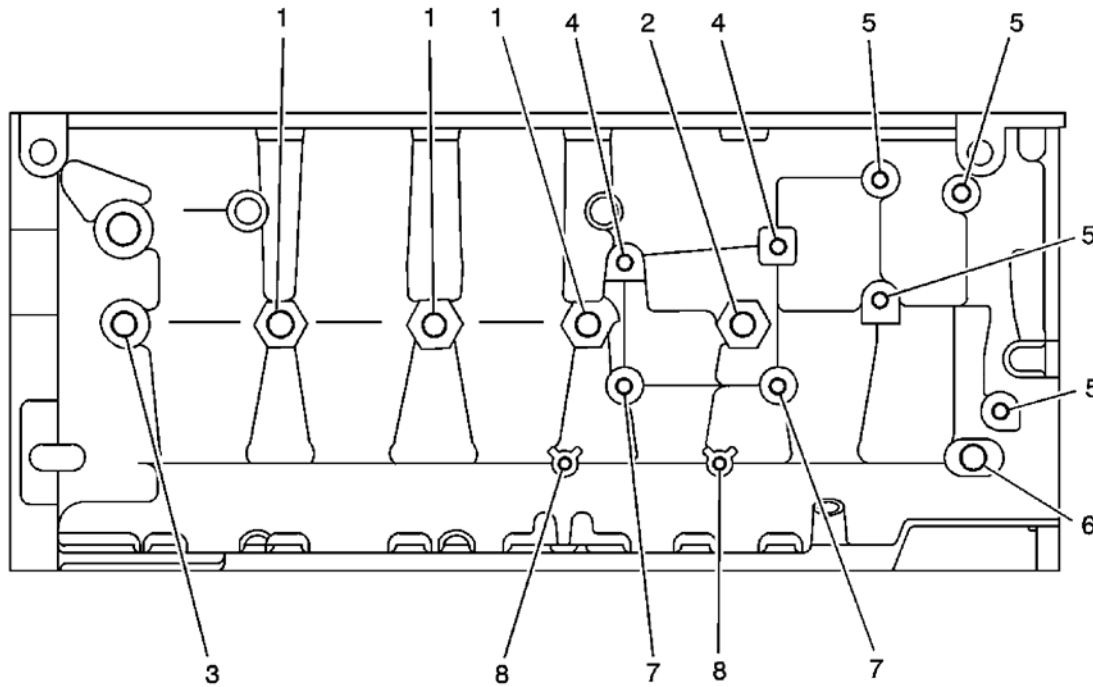
2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |               |     |     |     |     |     |     |    |       |    |       |
|----|---------------|-----|-----|-----|-----|-----|-----|----|-------|----|-------|
| 10 | M 8 x<br>1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 25 | 0.985 | 20 | 0.788 |
| 11 | M 6 x 1       | 201 | 202 | n/a | 203 | 204 | 205 | 25 | 0.985 | 20 | 0.788 |
| 12 | M 8 x<br>1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 25 | 0.985 | 20 | 0.788 |
| 13 | M 8 x<br>1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 25 | 0.985 | 20 | 0.788 |
| 14 | M 6 x 1       | 201 | 202 | n/a | 203 | 204 | 205 | 19 | 0.748 | 15 | 0.591 |
| 15 | M 8 x<br>1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 25 | 0.985 | 20 | 0.788 |
| 16 | M 10 x<br>1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 25 | 0.985 | 20 | 0.788 |
| 17 | M 8 x<br>1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 19 | 0.748 | 15 | 0.591 |
| 18 | M 10 x<br>1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 33 | 1.3   | 27 | 1.063 |
| 19 | M 8 x<br>1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 33 | 1.3   | 27 | 1.063 |
| 20 | M 6 x 1       | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 21 | M 10 x<br>1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 33 | 1.3   | 27 | 1.063 |
| 22 | M 10 x<br>1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 33 | 1.3   | 27 | 1.063 |
| 23 | M 10 x<br>1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 33 | 1.3   | 27 | 1.063 |
| 24 | M 10 x<br>1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 33 | 1.3   | 27 | 1.063 |

**Engine Block - Right Side View**

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 4: Engine Block Thread Repair - Right Side View**  
Courtesy of GENERAL MOTORS CORP.

### Engine Block - Right Side View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
| -                     |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| 1                     | 16 x 1.5    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 32                | 1.260 | 23              | 0.906 |
| 2                     | 16 x 1.5    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 32                | 1.260 | 23              | 0.906 |
| 3                     | 16 x 1.5    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 32                | 1.260 | 23              | 0.906 |
| 4                     | 10 x 1.5    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 33                | 1.300 | 27              | 1.063 |
| 5                     | 16 x 1.5    | 211   | 212              | n/a         | 213 | 214    | 420    | 32                | 1.260 | 23              | 0.906 |
| 6                     | 10 x 1.5    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 33                | 1.300 | 27              | 1.063 |
| 7                     | 10 x 1.5    | 211   | 212              | n/a         | 213 | 214    | 420    | 33                | 1.300 | 27              | 1.063 |
| 8                     | 10 x 1.5    | 211   | 212              | n/a         | 213 | 214    | 420    | 33                | 1.300 | 27              | 1.063 |
| 9                     | 10 x 1.5    | 211   | 212              | n/a         | 213 | 214    | 420    | 33                | 1.300 | 27              | 1.063 |
| 10                    | 10 x 1.5    | 211   | 212              | n/a         | 213 | 214    | 420    | 33                | 1.300 | 27              | 1.063 |
| 11                    | 16 x 2      | 211   | 212              | n/a         | 213 | 214    | 420    | 24                | 0.945 | 16              | 0.630 |
| 12                    | 10 x 1.5    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 29                | 1.142 | 26              | 1.024 |
| 13                    | 8 x 1.25    | 211   | 212              | n/a         | 213 | 214    | 420    | 23                | 0.906 | 18              | 0.709 |
| 14                    | 10 x 1.5    | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 29                | 1.142 | 26              | 1.024 |
| 15                    | 8 x 1.25    | 211   | 212              | n/a         | 213 | 214    | 420    | 23                | 0.906 | 18              | 0.709 |

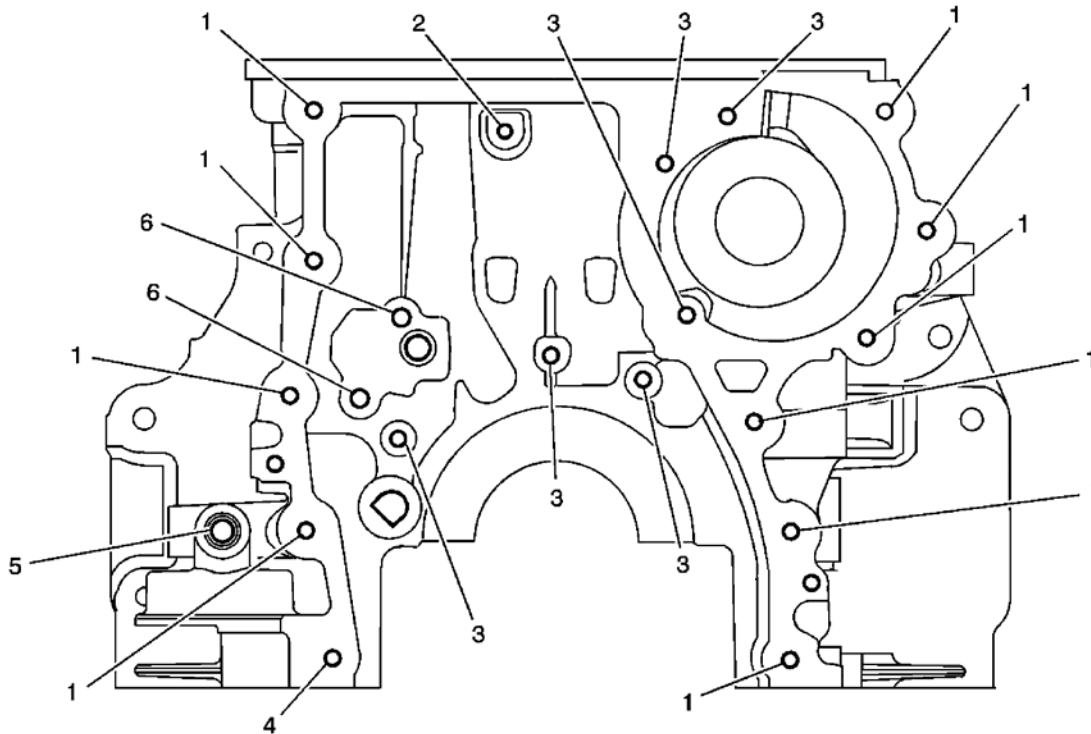


## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |          |     |     |     |     |     |     |    |       |    |       |
|----|----------|-----|-----|-----|-----|-----|-----|----|-------|----|-------|
| 16 | 16 x 1.5 | 206 | 207 | n/a | 208 | 209 | 210 | 32 | 1.260 | 23 | 0.906 |
| 17 | 20 x 1.5 | n/a | n/a | n/a | n/a | n/a | n/a | 29 | 1.142 | 26 | 1.024 |

### Engine Block - Front View



**Fig. 5: Engine Block Thread Repair - Front View**  
Courtesy of GENERAL MOTORS CORP.

### Engine Block - Front View

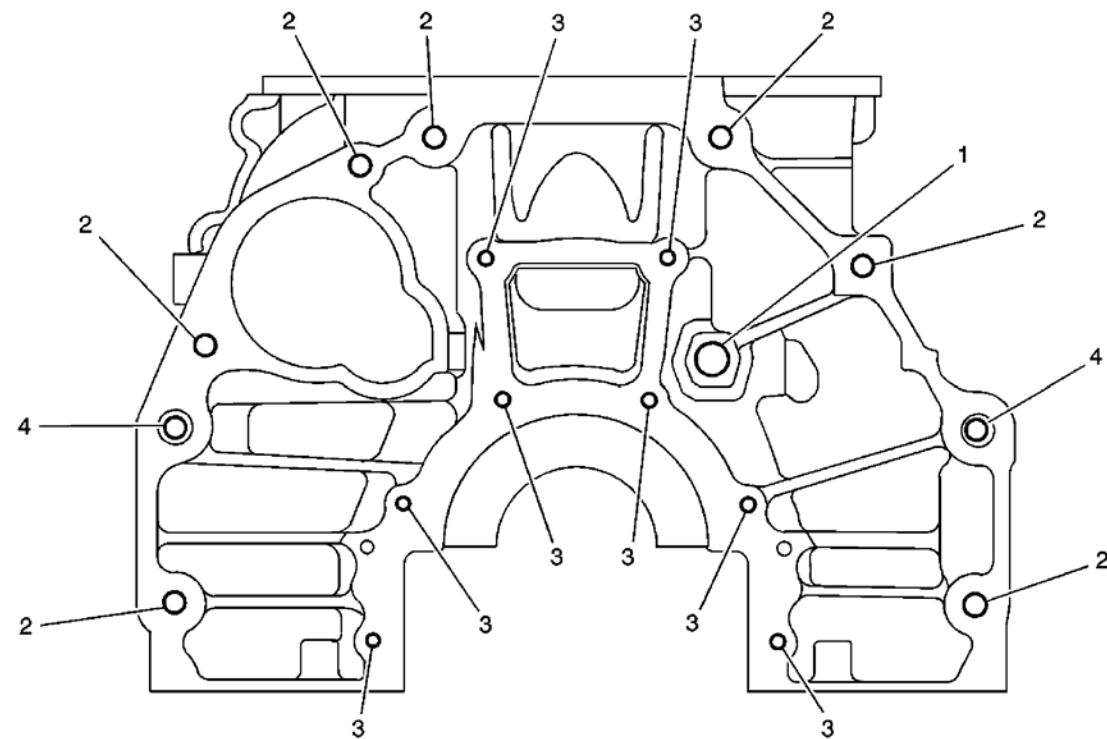
| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| 1                     | 6 x 1       | 405   | n/a              | 407         | 203 | 204    | 205    | 30                | 1.182 | 26              | 1.024 |
| 2                     | 6 x 1       | 201   | 202              | n/a         | 203 | 204    | 205    | 18                | 0.709 | 14              | 0.551 |
| 3                     | 6 x 1       | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 4                     | 6 x 1       | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 5                     | 6 x 1       | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 6                     | 6 x 1       | 405   | n/a              | 407         | 203 | 204    | 205    | 30                | 1.182 | 26              | 1.024 |
| 7                     | 6 x 1       | 405   | n/a              | 407         | 203 | 204    | 205    | 30                | 1.182 | 26              | 1.024 |
| 8                     | 6 x 1       | 405   | n/a              | 407         | 203 | 204    | 205    | 30                | 1.182 | 26              | 1.024 |
| 9                     | 6 x 1       | 405   | n/a              | 407         | 203 | 204    | 205    | 30                | 1.182 | 26              | 1.024 |

|   |
|---|
| <b>2004 Isuzu Ascender LS</b>                   |
| 2004 ENGINE Engine Mechanical - 4.2L - Ascender |

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |          |     |     |     |     |     |     |    |       |    |       |
|----|----------|-----|-----|-----|-----|-----|-----|----|-------|----|-------|
| 10 | 6 x 1    | 405 | n/a | 407 | 203 | 204 | 205 | 30 | 1.182 | 26 | 1.024 |
| 11 | 6 x 1    | 405 | n/a | 407 | 203 | 204 | 205 | 30 | 1.182 | 26 | 1.024 |
| 12 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 13 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 14 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 15 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 30 | 1.182 | 26 | 1.024 |
| 16 | 6 x 1    | 405 | n/a | 407 | 203 | 204 | 205 | 30 | 1.182 | 26 | 1.024 |
| 17 | 16 x 1.5 | 405 | n/a | 407 | 203 | 204 | 205 | 24 | 0.945 | 16 | 0.630 |
| 18 | 6 x 1    | 405 | n/a | 407 | 203 | 204 | 205 | 30 | 1.182 | 26 | 1.024 |
| 19 | 8 x 1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 30 | 1.182 | 25 | 0.985 |
| 20 | 8 x 1.25 | 206 | 207 | n/a | 208 | 209 | 210 | 30 | 1.182 | 25 | 0.985 |
| 21 | 6 x 1    | 405 | n/a | 407 | 203 | 204 | 205 | 30 | 1.182 | 26 | 1.024 |

### Engine Block - Rear View



**Fig. 6: Engine Block Thread Repair - Rear View**  
**Courtesy of GENERAL MOTORS CORP.**

### Engine Block - Rear View

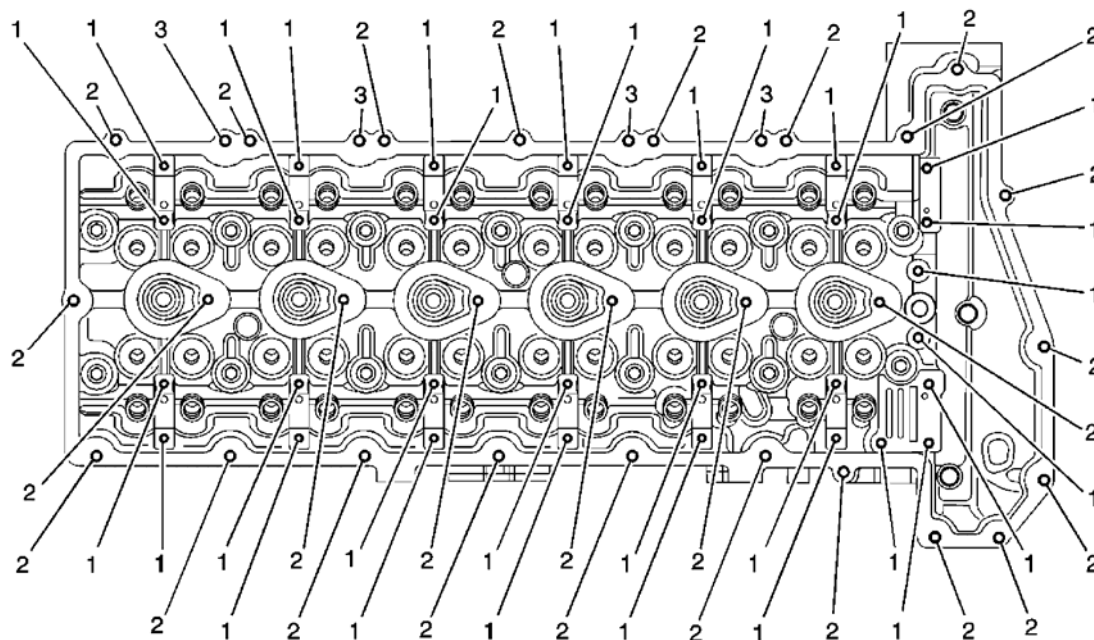
[illegible]

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |          |     | -   |     |     |     |     | mm | (in)  | mm | (in)  |
|----|----------|-----|-----|-----|-----|-----|-----|----|-------|----|-------|
| 1  | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 216 | 39 | 1.536 | 33 | 1.300 |
| 2  | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 39 | 1.536 | 33 | 1.300 |
| 3  | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 4  | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 5  | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 39 | 1.536 | 33 | 1.300 |
| 6  | 16 x 1.5 | n/a | n/a | n/a | n/a | n/a | n/a | 24 | 0.945 | 16 | 0.630 |
| 7  | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 39 | 1.536 | 33 | 1.300 |
| 8  | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 215 | 57 | 2.245 | 54 | 2.127 |
| 9  | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 39 | 1.536 | 33 | 1.300 |
| 10 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 11 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 12 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 13 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 14 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 15 | 6 x 1    | 201 | 202 | n/a | 203 | 204 | 205 | 20 | 0.788 | 16 | 0.630 |
| 16 | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 215 | 39 | 1.536 | 33 | 1.300 |
| 17 | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 215 | 57 | 2.245 | 54 | 2.127 |
| 18 | 10 x 1.5 | 211 | 212 | n/a | 213 | 214 | 420 | 39 | 1.536 | 33 | 1.300 |

### Cylinder Head - Top View



**Fig. 7: Cylinder Head Thread Repair - Top View**  
Courtesy of GENERAL MOTORS CORP.

# 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

## Cylinder Head - Top View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
| -                     |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| 1                     | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 2                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 3                     | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 4                     | M 6 x 1     | 405   | n/a              | 407         | 203 | 204    | 205    | THRU              |       | THRU            |       |
| 5                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 6                     | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 7                     | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 8                     | M 6 x 1     | 405   | n/a              | 407         | 203 | 204    | 205    | THRU              |       | THRU            |       |
| 9                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 10                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 11                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 12                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 13                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 14                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 15                    | M 6 x 1     | 405   | n/a              | 407         | 203 | 204    | 205    | THRU              |       | THRU            |       |
| 16                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 17                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 18                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 19                    | M 6 x 1     | 405   | n/a              | 407         | 203 | 204    | 205    | THRU              |       | THRU            |       |
| 20                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 21                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 22                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 23                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 24                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 25                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 26                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 27                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 28                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 23              | 0.906 |
| 29                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 30                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 19              | 0.748 |
| 31                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 23              | 0.906 |
| 32                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 33                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |
| 34                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 35                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 36                    | M 6 x 1     | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 24              | 0.945 |

**2004 Isuzu Ascender LS**

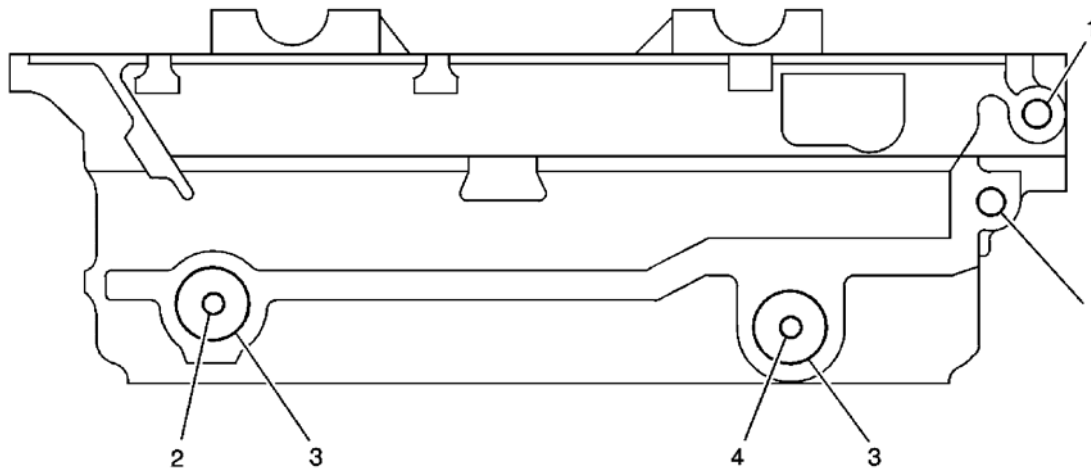
2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |         |     |     |     |     |     |     |    |       |    |       |
|----|---------|-----|-----|-----|-----|-----|-----|----|-------|----|-------|
| 37 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 38 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 39 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 40 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 41 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 42 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 23 | 0.906 | 19 | 0.748 |
| 43 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 44 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 45 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 46 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 23 | 0.906 | 19 | 0.748 |
| 47 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 48 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 49 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 50 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 23 | 0.906 | 19 | 0.748 |
| 51 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 52 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 53 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 54 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 23 | 0.906 | 19 | 0.748 |
| 55 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 56 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 57 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 58 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 59 | M 6 x 1 | 405 | n/a | 406 | 203 | 204 | 205 | 28 | 1.103 | 24 | 0.945 |
| 60 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 61 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 23 | 0.906 | 19 | 0.748 |
| 62 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |

**Cylinder Head - End View (Front)**

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 8: Cylinder Head Thread Repair - End View (Front)**  
Courtesy of GENERAL MOTORS CORP.

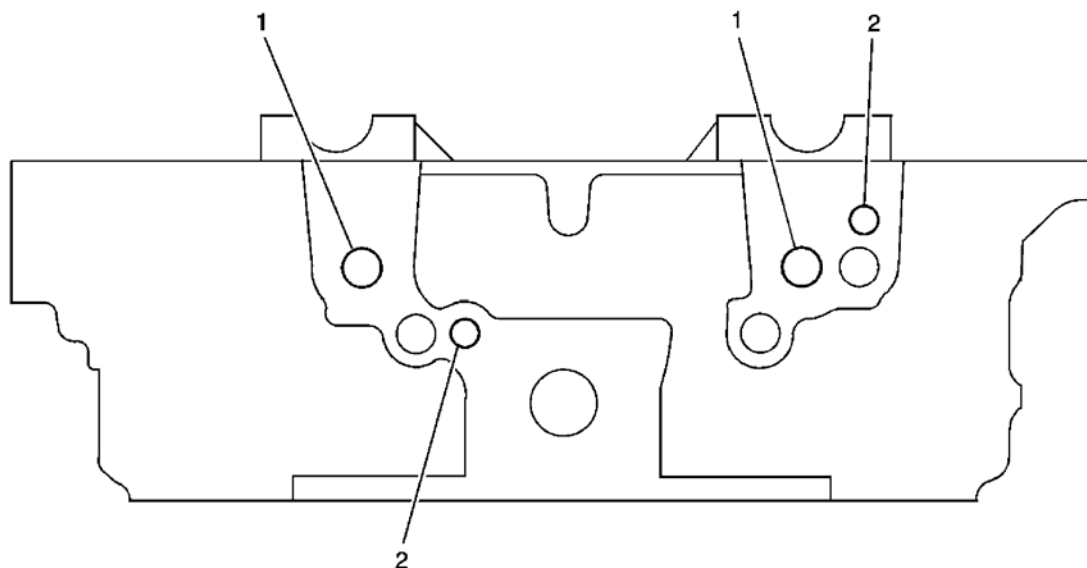
### Cylinder Head - End View (Front)

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| -                     |             |       |                  |             |     |        |        |                   |       |                 |       |
| 1                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | 28                | 1.103 | 22              | 0.866 |
| 2                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | 28                | 1.103 | 22              | 0.866 |
| 3                     | M 24 x 1.5  | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | THRU              |       | THRU            |       |
| 4                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 28                | 1.103 | 23              | 0.906 |
| 5                     | M 24 x 1.5  | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | THRU              |       | THRU            |       |
| 6                     | M 8 x 1.25  | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |

### Cylinder Head - End View (Rear)

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 9: Cylinder Head Thread Repair - End View (Rear)**  
Courtesy of GENERAL MOTORS CORP.

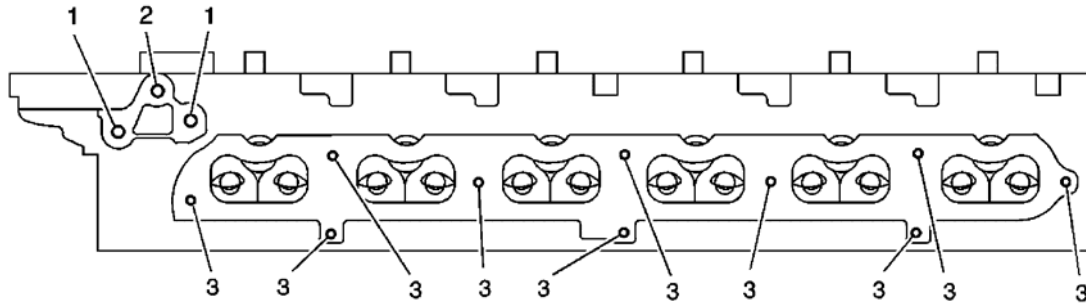
### Cylinder Head - End View (Rear)

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| -                     |             |       |                  |             |     |        |        |                   |       |                 |       |
| 1                     | M 14 x 1.5  | 409   | 410              | n/a         | 411 | 412    | 413    | 36                | 1.418 | 28              | 1.103 |
| 2                     | M 14 x 1.5  | 409   | 410              | n/a         | 411 | 412    | 413    | 36                | 1.418 | 28              | 1.103 |
| 3                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | 28                | 1.103 | 22              | 0.866 |
| 4                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | 28                | 1.103 | 22              | 0.866 |

### Cylinder Head - Intake Manifold Deck View

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 10: Cylinder Head Thread Repair - Intake Manifold Deck View**  
Courtesy of GENERAL MOTORS CORP.

### Cylinder Head - Intake Manifold Deck View

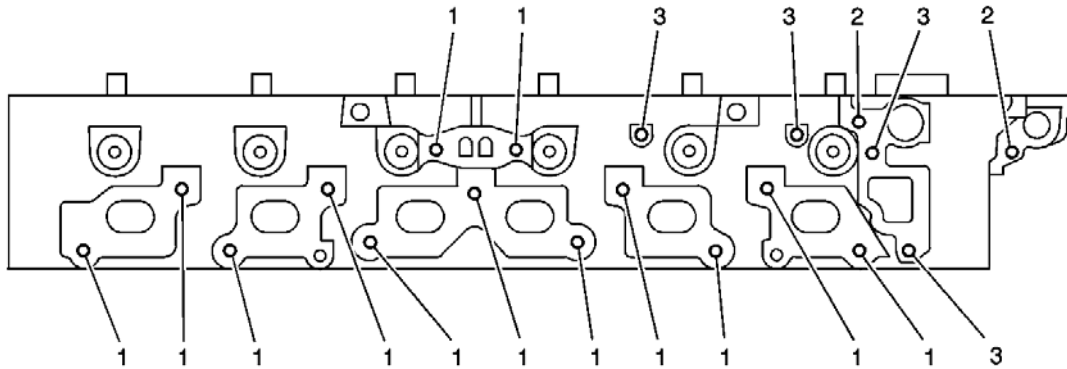
| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| -                     |             |       |                  |             |     |        |        |                   |       |                 |       |
| 1                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 33                | 1.3   | 27              | 1.063 |
| 2                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | 28                | 1.103 | 22              | 0.866 |
| 3                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 33                | 1.3   | 27              | 1.063 |
| 4                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 5                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 6                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 7                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 8                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 9                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 10                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 11                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 12                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |
| 13                    | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 23                | 0.906 | 18              | 0.709 |

### Cylinder Head - Exhaust Manifold Deck View



## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 11: Cylinder Head Thread Repair - Exhaust Manifold Deck View**  
Courtesy of GENERAL MOTORS CORP.

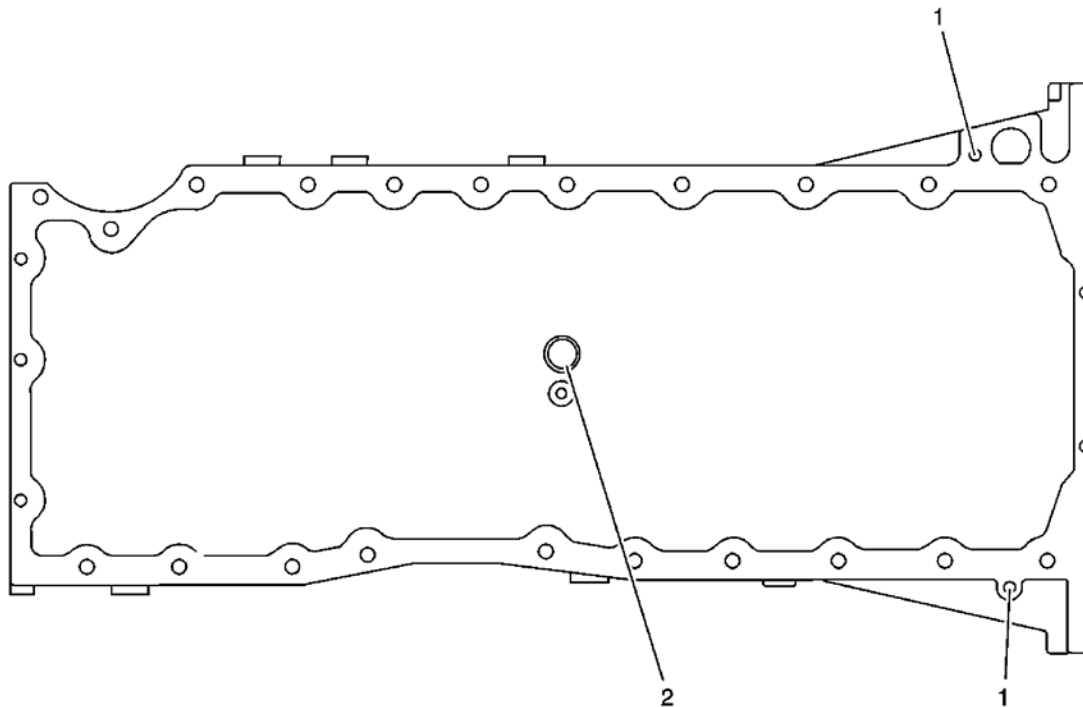
### Cylinder Head - Exhaust Manifold Deck View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| 1                     | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 2                     | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 3                     | 6 x 1       | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 23              | 0.906 |
| 4                     | 6 x 1       | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 23              | 0.906 |
| 5                     | 6 x 1       | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 6                     | 6 x 1       | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 23              | 0.906 |
| 7                     | 6 x 1       | 201   | 202              | n/a         | 203 | 204    | 205    | 22                | 0.866 | 18              | 0.709 |
| 8                     | 6 x 1       | 405   | n/a              | 406         | 203 | 204    | 205    | 28                | 1.103 | 23              | 0.906 |
| 9                     | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 10                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 11                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 12                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 13                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 14                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 15                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 16                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 208    | 210    | 28                | 1.103 | 23              | 0.906 |
| 17                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 18                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |
| 19                    | 8 x 1.25    | 206   | 207              | n/a         | 208 | 209    | 210    | 28                | 1.103 | 23              | 0.906 |

### Oil Pan - Top View

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 12: Oil Pan Thread Repair - Top View**  
Courtesy of GENERAL MOTORS CORP.

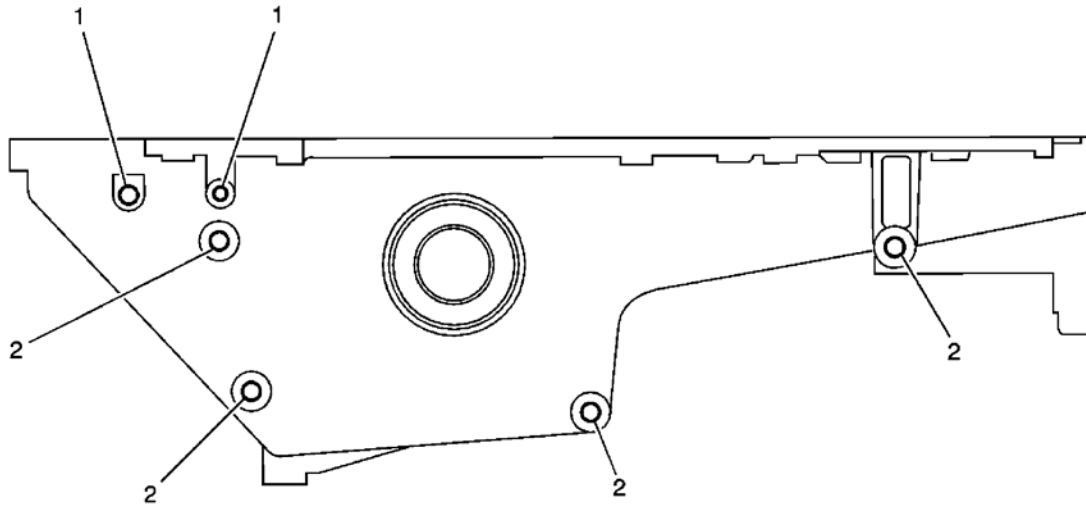
### Oil Pan - Top View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |      | Tap Depth (Min) |      |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|------|-----------------|------|
|                       |             |       |                  |             |     |        |        | mm                | (in) | mm              | (in) |
| 1                     | M 8 x 1.25  | 206   | 207              | n/a         | 208 | 209    | 415    | THRU              |      | THRU            |      |
| 2                     | M 8 x 1.25  | 206   | 207              | n/a         | 208 | 209    | 415    | THRU              |      | THRU            |      |
| 3                     | M 12 x 1.75 | 856   | 857              | n/a         | 858 | 859    | 416    | THRU              |      | THRU            |      |

### Oil Pan - Left Side View

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 13: Oil Pan Thread Repair - Left Side View**  
Courtesy of GENERAL MOTORS CORP.

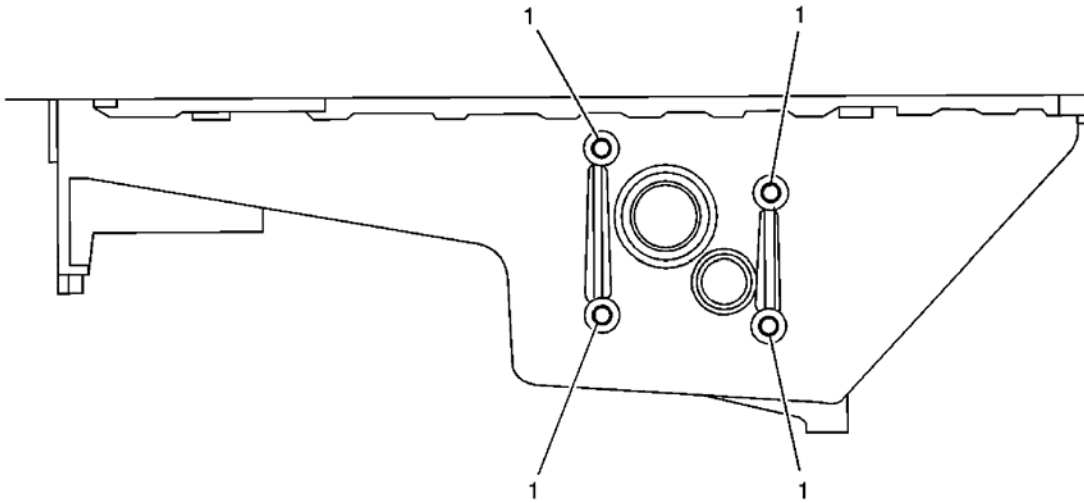
### Oil Pan - Left Side View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| -                     |             |       |                  |             |     |        |        |                   |       |                 |       |
| 1                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 40                | 1.576 | 25              | 0.985 |
| 2                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 40                | 1.576 | 25              | 0.985 |
| 3                     | M 10 x 1.5  | 856   | 857              | n/a         | 858 | 859    | 855    | 42                | 1.654 | 25              | 0.985 |
| 4                     | M 10 x 1.5  | 856   | 857              | n/a         | 858 | 859    | 855    | 42                | 1.654 | 25              | 0.985 |
| 5                     | M 10 x 1.5  | 856   | 857              | n/a         | 858 | 859    | 855    | 42                | 1.654 | 25              | 0.985 |
| 6                     | M 10 x 1.5  | 856   | 857              | n/a         | 858 | 859    | 855    | 42                | 1.654 | 25              | 0.985 |

### Oil Pan - Right Side View

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 14: Oil Pan Thread Repair - Right Side View**  
Courtesy of GENERAL MOTORS CORP.

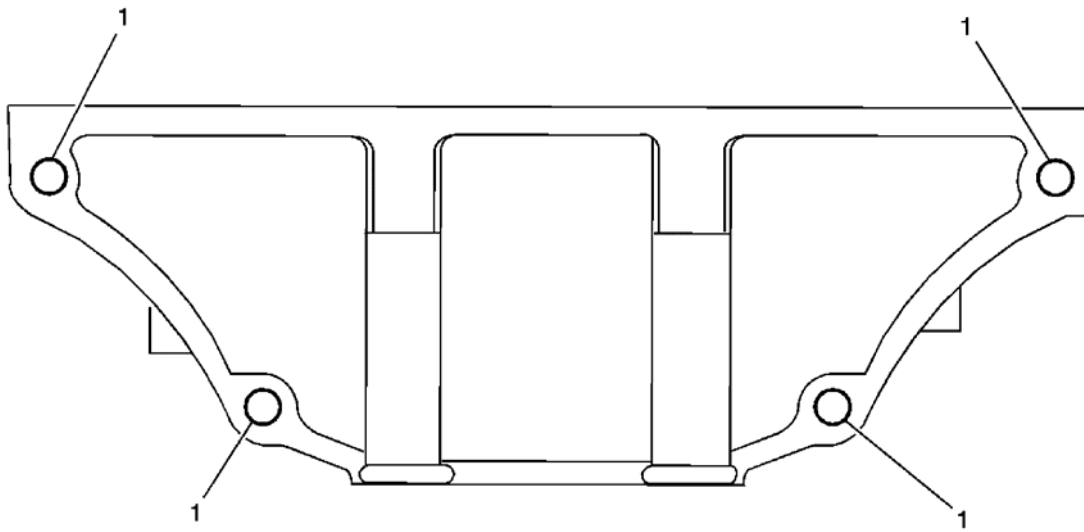
### Oil Pan - Right Side View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
|                       |             |       |                  |             |     |        |        | mm                | (in)  | mm              | (in)  |
| -                     |             |       |                  |             |     |        |        |                   |       |                 |       |
| 1                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 42                | 1.654 | 25              | 0.985 |
| 2                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 42                | 1.654 | 25              | 0.985 |
| 3                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 42                | 1.654 | 25              | 0.985 |
| 4                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 420    | 42                | 1.654 | 25              | 0.985 |

### Oil Pan - Rear View

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 15: Oil Pan Thread Repair - Rear View**  
Courtesy of GENERAL MOTORS CORP.

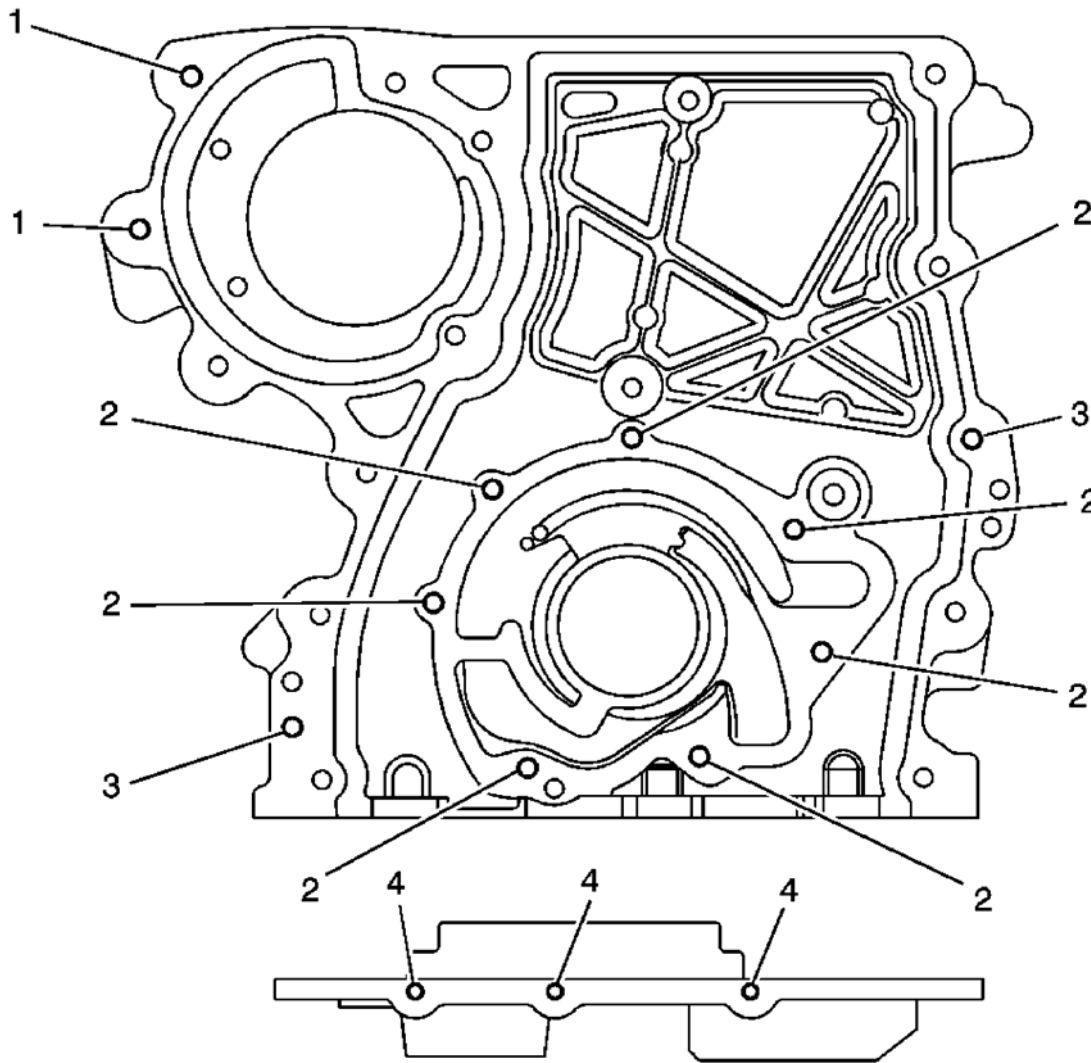
### Oil Pan - Rear View

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |      | Tap Depth (Min) |      |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|------|-----------------|------|
|                       |             |       |                  |             |     |        |        | mm                | (in) | mm              | (in) |
| -                     |             |       |                  |             |     |        |        |                   |      |                 |      |
| 1                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | THRU              |      | THRU            |      |
| 2                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | THRU              |      | THRU            |      |
| 3                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | THRU              |      | THRU            |      |
| 4                     | M 10 x 1.5  | 211   | 212              | n/a         | 213 | 214    | 215    | THRU              |      | THRU            |      |

### Engine Front Cover

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 16: Engine Front Cover Thread Repair**  
Courtesy of GENERAL MOTORS CORP.

### Engine Front Cover

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) |       | Tap Depth (Min) |       |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-------|-----------------|-------|
| 1                     | M 6 x 1     | n/a   | n/a              | n/a         | n/a | n/a    | n/a    | 30                | 1.182 | 26              | 1.024 |
| 2                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 16.5              | 0.65  | 13              | 0.512 |
| 3                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | THRU              |       | THRU            |       |
| 4                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 16.5              | 0.65  | 13              | 0.512 |
| 5                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 16.5              | 0.65  | 13              | 0.512 |
| 6                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 16.5              | 0.65  | 13              | 0.512 |
| 7                     | M 6 x 1     | 201   | 202              | n/a         | 203 | 204    | 205    | 17                | 0.669 | 14              | 0.551 |

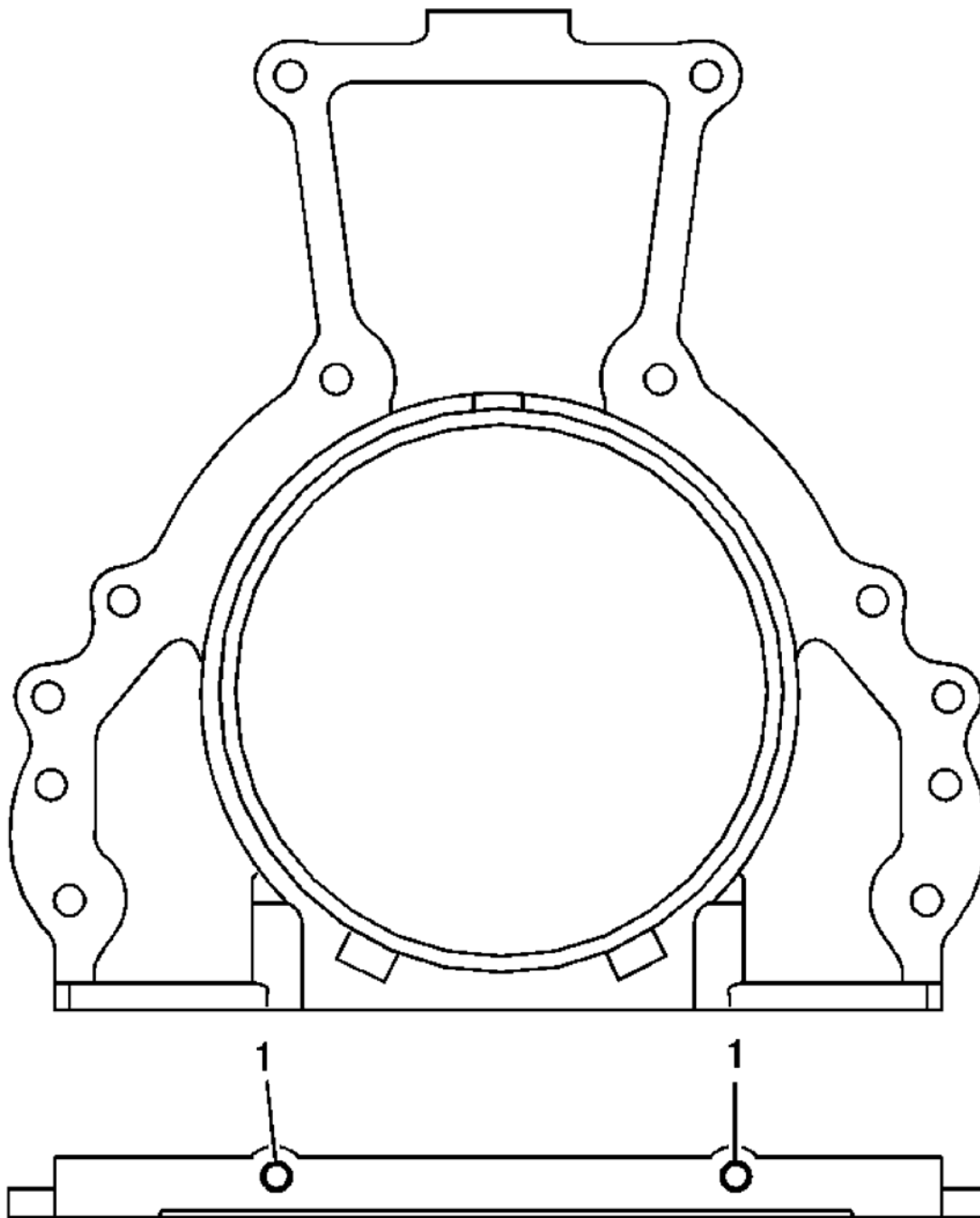
|   |
|---|
| 2004 Isuzu Ascender LS                          |
| 2004 ENGINE Engine Mechanical - 4.2L - Ascender |

|    |         |     |     |     |     |     |     |      |       |      |       |
|----|---------|-----|-----|-----|-----|-----|-----|------|-------|------|-------|
| 8  | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 17   | 0.669 | 14   | 0.551 |
| 9  | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 17   | 0.669 | 14   | 0.551 |
| 10 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 16.5 | 0.65  | 13   | 0.512 |
| 11 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 414 | THRU |       | THRU |       |
| 12 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 16.5 | 0.65  | 13   | 0.512 |
| 13 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 16.5 | 0.65  | 13   | 0.512 |
| 14 | M 6 x 1 | n/a | n/a | n/a | n/a | n/a | n/a | 30   | 1.182 | 26   | 1.024 |

Crankshaft Rear Oil Seal Housing

|   |
|---|
| <b>2004 Isuzu Ascender LS</b>                   |
| 2004 ENGINE Engine Mechanical - 4.2L - Ascender |

|   |
|---|
| <b>2004 Isuzu Ascender LS</b>                   |
| 2004 ENGINE Engine Mechanical - 4.2L - Ascender |



**Fig. 17: Crankshaft Rear Oil Seal Housing Thread Repair**  
**Courtesy of GENERAL MOTORS CORP.**

## Crankshaft Rear Oil Seal Housing

| Service Hole Location | Thread Size | Drill | Counterbore Tool | Stop Collar | Tap | Driver | Insert | Drill Depth (Max) | Tap Depth (Min) |
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-----------------|
|-----------------------|-------------|-------|------------------|-------------|-----|--------|--------|-------------------|-----------------|



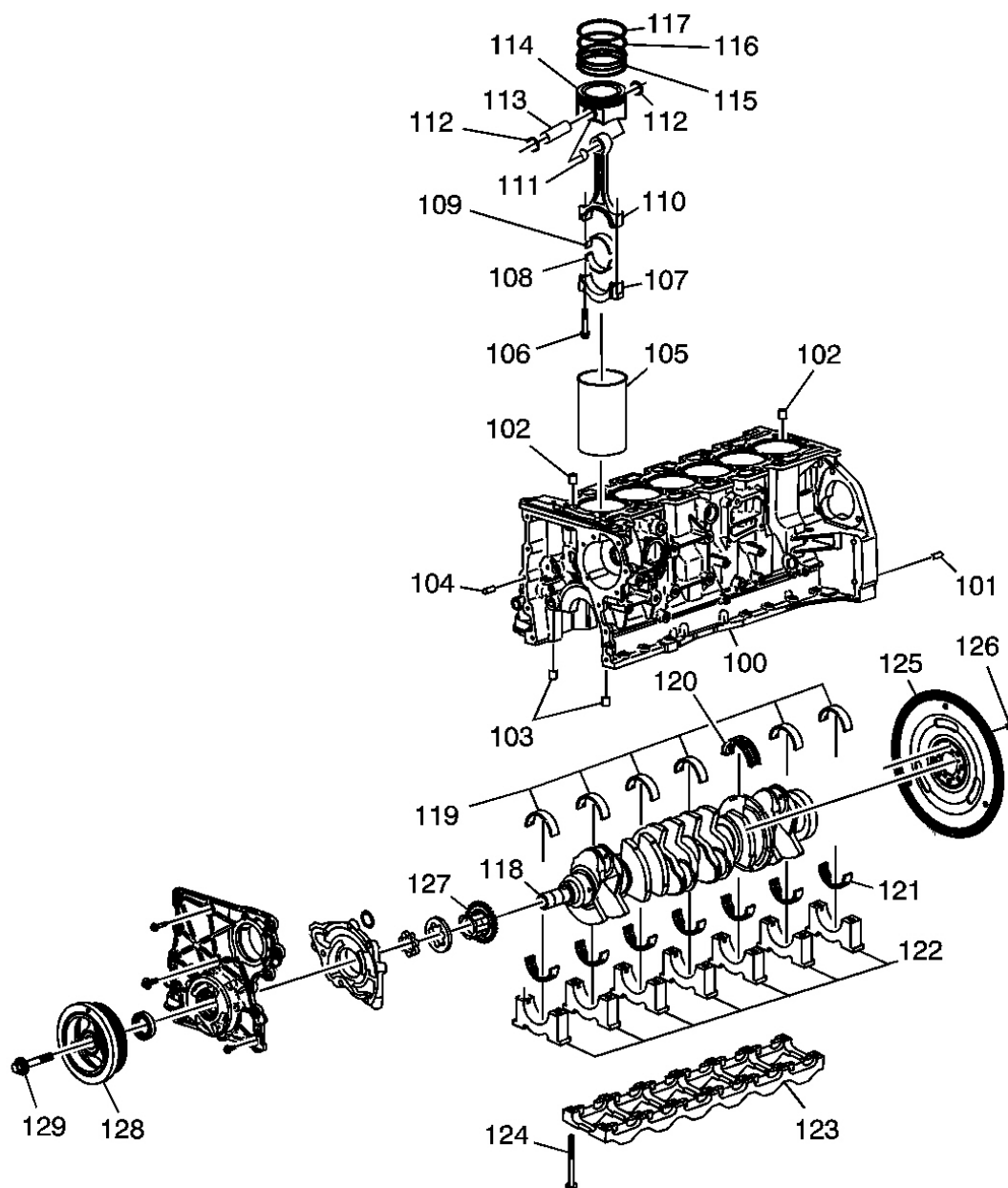
## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|   |         |     |     |     |     |     |     | mm | (in)  | mm | (in)  |
|---|---------|-----|-----|-----|-----|-----|-----|----|-------|----|-------|
| 1 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |
| 2 | M 6 x 1 | 201 | 202 | n/a | 203 | 204 | 205 | 22 | 0.866 | 18 | 0.709 |

## COMPONENT LOCATOR

### DISASSEMBLED VIEWS



## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

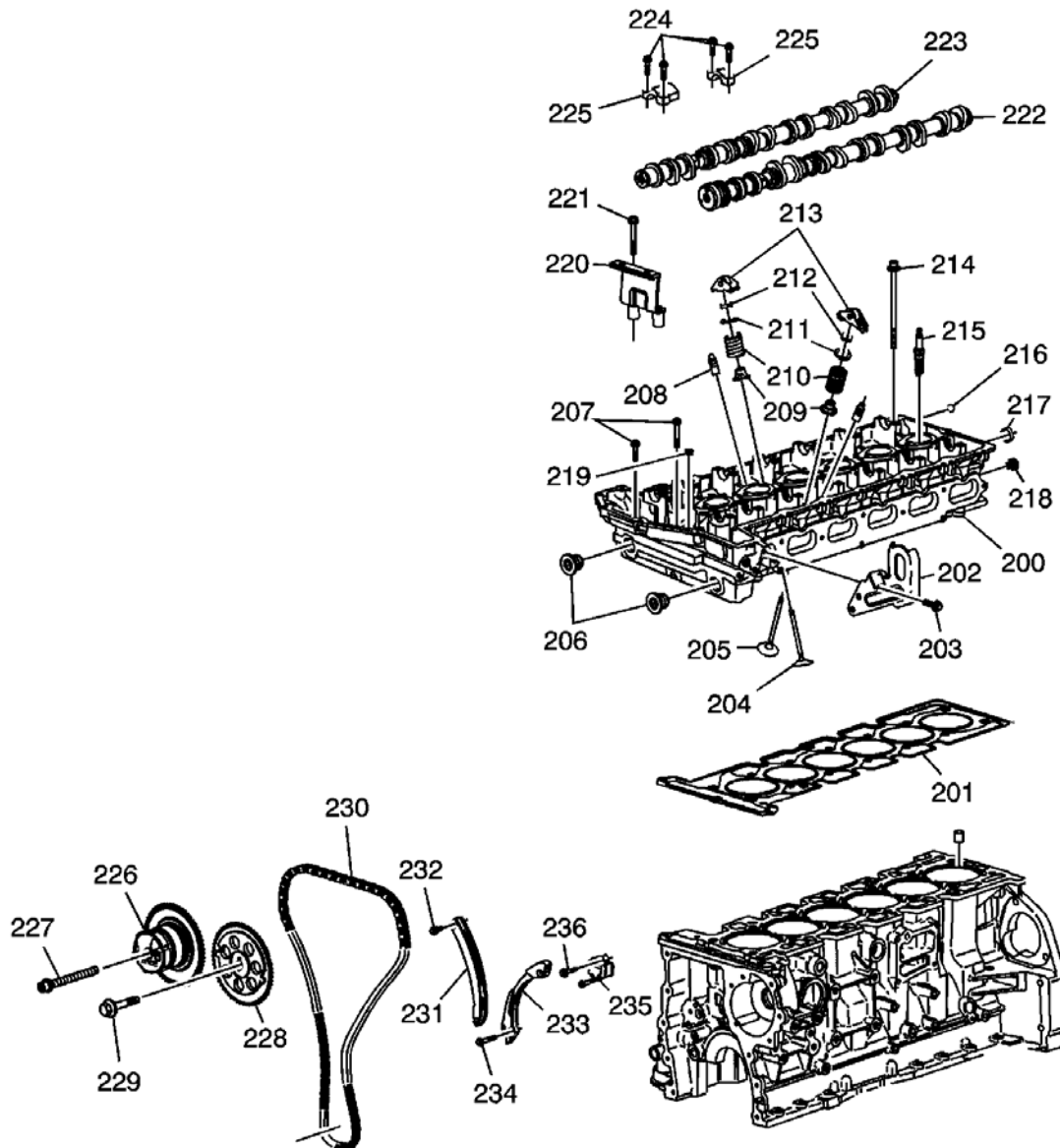
**Fig. 18: Engine Block, Crankshaft & Pistons Disassembled View**  
Courtesy of GENERAL MOTORS CORP.

### Callouts For Fig. 18

| Callout | Component Name                    |
|---------|-----------------------------------|
| 100     | Engine Block                      |
| 101     | Transmission Locator Pin          |
| 102     | Cylinder Head Locator Pin         |
| 102     | Cylinder Head Locator Pin         |
| 103     | Main Bearing Cap Locator Pin      |
| 104     | Engine Front Cover Locator Pin    |
| 105     | Cylinder Sleeve                   |
| 106     | Connecting Rod Bolt               |
| 107     | Connecting Rod Cap                |
| 108     | Connecting Rod Lower Bearing      |
| 109     | Connecting Rod Upper Bearing      |
| 110     | Connecting Rod                    |
| 111     | Connecting Rod Bushing            |
| 112     | Piston Pin Retainer               |
| 112     | Piston Pin Retainer               |
| 113     | Piston Pin                        |
| 114     | Piston                            |
| 115     | Oil Control Ring Set              |
| 116     | Lower Compression Ring            |
| 117     | Upper Compression Ring            |
| 118     | Crankshaft                        |
| 119     | Upper Main Bearings               |
| 120     | Main Thrust Bearing               |
| 121     | Lower Main Bearing                |
| 122     | Main Bearing Cap                  |
| 123     | Main Bearing Cap Stiffener        |
| 124     | Main Bearing Cap Bolt             |
| 125     | Flywheel - Automatic Transmission |
| 126     | Flywheel Bolt                     |
| 127     | Crankshaft Sprocket               |
| 128     | Crankshaft Balancer               |
| 129     | Crankshaft Balancer Bolt          |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 19: Cylinder Head, Valves, Lifters, Timing Component & Camshaft Disassembled View**  
Courtesy of GENERAL MOTORS CORP.

### Callouts For Fig. 19

| Callout | Component Name            |
|---------|---------------------------|
| 200     | Cylinder Head             |
| 201     | Cylinder Head Gasket      |
| 202     | Engine Lift Bracket       |
| 203     | Engine Lift Bracket Bolts |
| 204     | Intake Valve              |
|         |                           |

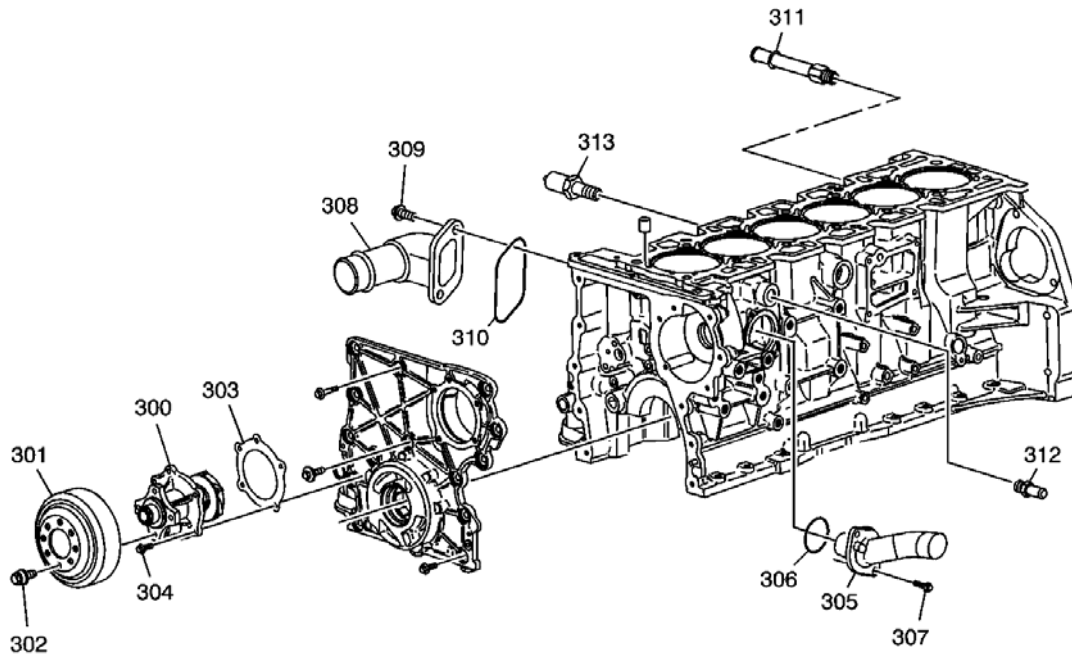
**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|     |                                  |
|-----|----------------------------------|
| 205 | Exhaust Valve                    |
| 206 | Access Hole Plugs                |
| 207 | Cylinder Head Bolt               |
| 208 | Valve Lash Adjusters             |
| 209 | Valve Seals                      |
| 210 | Valve Springs                    |
| 211 | Valve Spring Retainers           |
| 212 | Valve Keys                       |
| 213 | Valve Rocker Arms                |
| 214 | Cylinder Head Bolt               |
| 215 | Spark Plug                       |
| 216 | A.I.R. Pipe Plug                 |
| 217 | Water Jacket Plug                |
| 218 | Oil Gallery Plug                 |
| 219 | Oil Gallery Plug                 |
| 220 | Timing Chain Top Guide           |
| 221 | Timing Chain Top Guide Bolt      |
| 222 | Intake Camshaft                  |
| 223 | Exhaust Camshaft                 |
| 224 | Camshaft Cap Bolts               |
| 225 | Camshaft Cap                     |
| 225 | Camshaft Cap                     |
| 226 | Exhaust Camshaft Actuator        |
| 227 | Exhaust Camshaft Actuator Bolt   |
| 228 | Intake Camshaft Sprocket         |
| 229 | Intake Camshaft Sprocket Bolt    |
| 230 | Timing Chain                     |
| 231 | Timing Chain Tensioner Shoe      |
| 232 | Timing Chain Tensioner Shoe Bolt |
| 233 | Timing Chain Guide               |
| 234 | Timing Chain Guide Bolt          |
| 235 | Timing Chain Tensioner           |
| 236 | Timing Chain Tensioner Bolt      |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



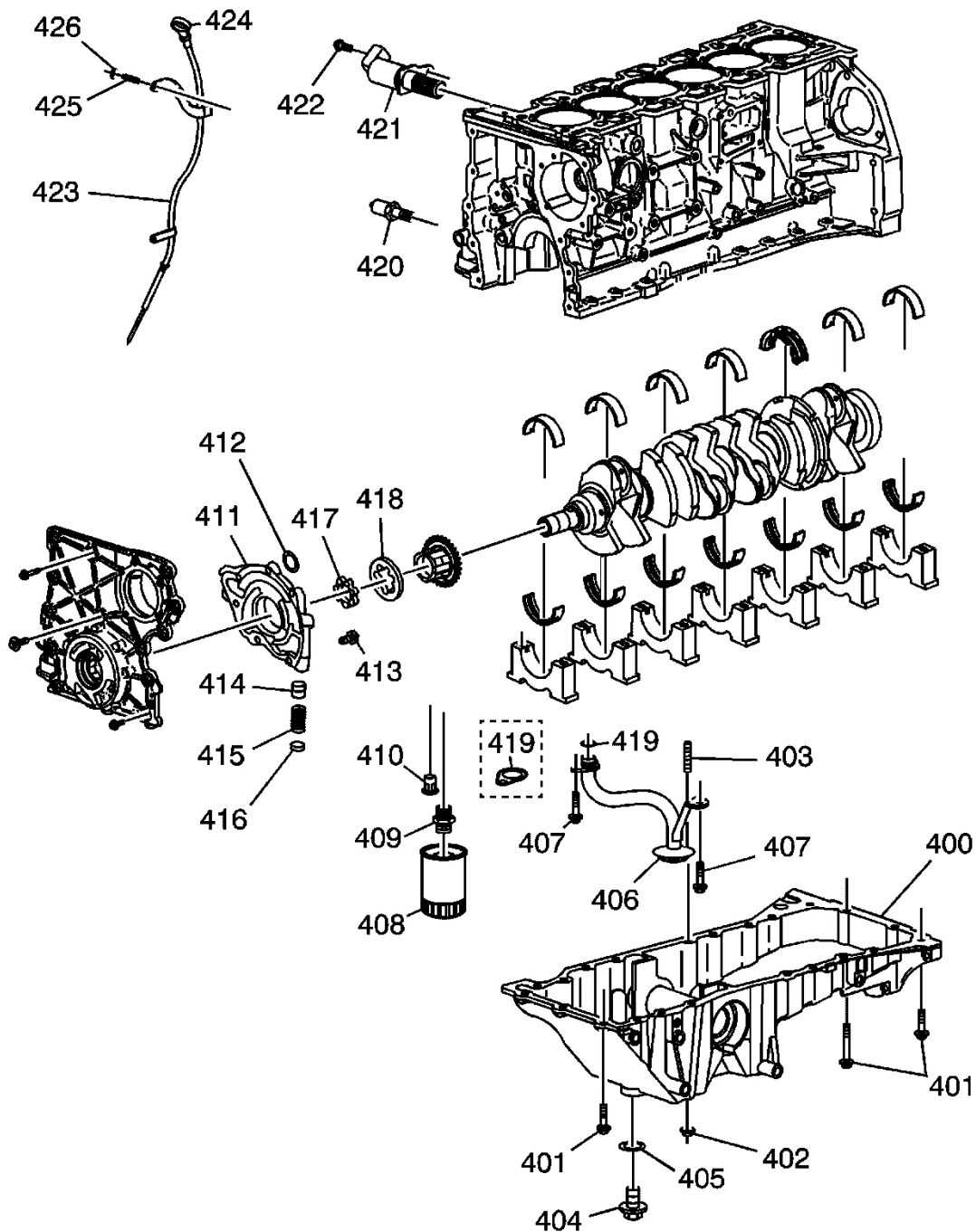
**Fig. 20: Cooling, Water Pump Disassembled View**  
Courtesy of GENERAL MOTORS CORP.

### Callouts For Fig. 20

| Callout | Component Name             |
|---------|----------------------------|
| 300     | Water Pump                 |
| 301     | Water Pump Pulley          |
| 302     | Water Pump Pulley Bolt     |
| 303     | Water Pump Gasket          |
| 304     | Water Pump Bolt            |
| 305     | Thermostat Housing         |
| 306     | Thermostat Housing Seal    |
| 307     | Thermostat Housing Bolt    |
| 308     | Water Outlet               |
| 309     | Water Outlet Bolt          |
| 310     | Water Outlet Seal          |
| 311     | Heater Inlet Hose Fitting  |
| 312     | Heater Outlet Hose Fitting |
| 313     | Coolant Temperature Sensor |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 21: Oil Pan, Pump, Filter, Tube Disassembled View**  
Courtesy of GENERAL MOTORS CORP.

### Callouts For Fig. 21

| Callout | Component Name     |
|---------|--------------------|
| 400     | Oil Pan            |
| 401     | Oil Pan Bolt       |
| 402     | Oil Pan Bolt       |
| 403     | Oil Tube           |
| 404     | Oil Pan Bolt       |
| 405     | Oil Pan Bolt       |
| 406     | Oil Tube Gasket    |
| 407     | Oil Tube Nut       |
| 408     | Oil Filter         |
| 409     | Oil Filter Bracket |
| 410     | Oil Filter Nut     |
| 411     | Oil Pump           |
| 412     | Oil Pump Bracket   |
| 413     | Oil Pump Bolt      |
| 414     | Oil Pump Bolt      |
| 415     | Oil Pump Bolt      |
| 416     | Oil Pump Bolt      |
| 417     | Oil Pump Tube      |
| 418     | Oil Pump Nut       |
| 419     | Oil Pump Tube      |
| 420     | Oil Pan Bolt       |
| 421     | Oil Pan Bolt       |
| 422     | Oil Pan Bolt       |
| 423     | Oil Pan Bolt       |
| 424     | Oil Pan Bolt       |
| 425     | Oil Pan Bolt       |
| 426     | Oil Pan Bolt       |

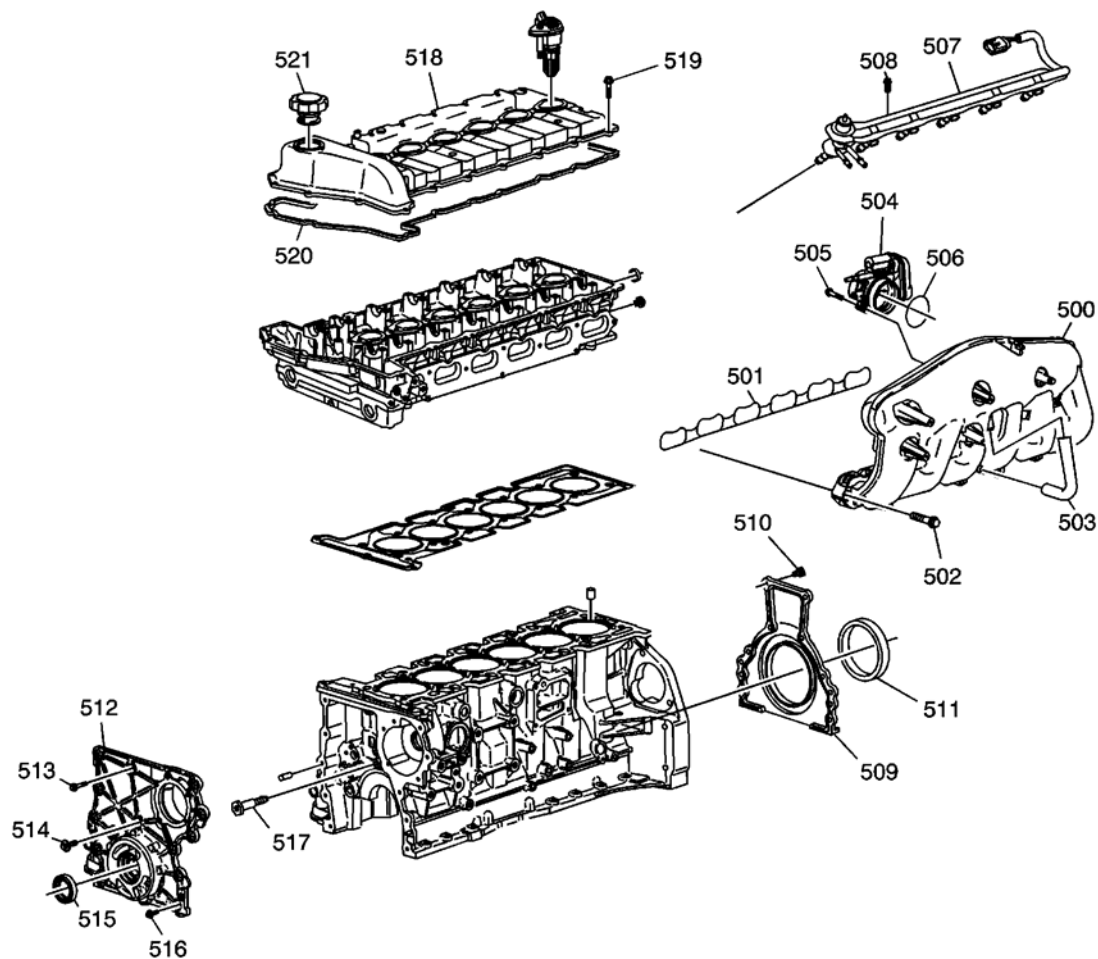
**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|     |  |
|-----|--|
| 400 | Oil Pan  |
| 401 | Oil Pan Bolt   |
| 401 | Oil Pan Bolt   |
| 402 | Oil Pan Nut  |
| 403 | Oil Pan Stud   |
| 404 | Oil Drain Plug                                       |
| 405 | Oil Drain Plug Gasket                                |
| 406 | Oil Pump Pickup Tube                                 |
| 407 | Oil Pump Pickup Tube Bolt                            |
| 407 | Oil Pump Pickup Tube Bolt                            |
| 408 | Oil Filter   |
| 409 | Oil Filter Adapter                                   |
| 410 | Oil Filter Bypass Valve                              |
| 411 | Oil Pump   |
| 412 | Oil Pump Seal  |
| 413 | Oil Pump Bolt  |
| 414 | Oil Pressure Relief Valve                            |
| 415 | Oil Pressure Relief Valve Spring                     |
| 416 | Oil Pressure Relief Valve Plug                       |
| 417 | Oil Pump Inner Gear                                  |
| 418 | Oil Pump Outer Gear                                  |
| 419 | Oil Pump Pickup Tube O-ring/Gasket - Model Dependent |
| 420 | Oil Pressure Switch                                  |
| 421 | Camshaft Position Actuator Solenoid Valve            |
| 422 | Camshaft Position Actuator Solenoid Valve Bolt       |
| 423 | Oil Level Indicator Tube                             |
| 424 | Oil Level Indicator                                  |
| 425 | Oil Level Indicator Tube Stud                        |
| 426 | Oil Level Indicator Tube Nut                         |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 22: Intake Manifold, Rails, Covers Disassembled View**  
Courtesy of GENERAL MOTORS CORP.

### Callouts For Fig. 22

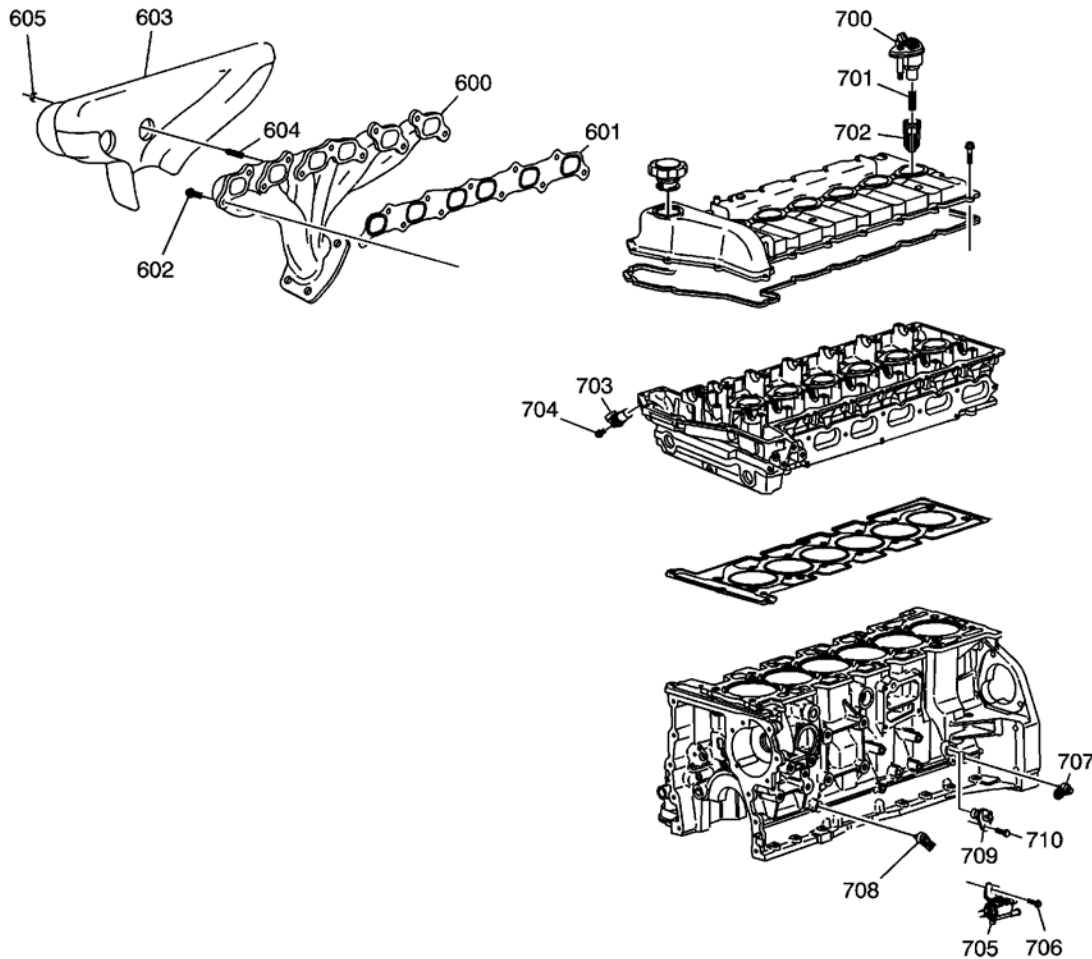
| Callout | Component Name                        |
|---------|---------------------------------------|
| 500     | Intake Manifold                       |
| 501     | Intake Manifold Seal                  |
| 502     | Intake Manifold Bolt                  |
| 503     | Positive Crankcase Vent Hose          |
| 504     | Throttle Control Module               |
| 505     | Throttle Control Module Bolt          |
| 506     | Throttle Control Module Seal          |
| 507     | Fuel Injector Rail                    |
| 508     | Fuel Injector Rail Bolt               |
| 509     | Crankshaft Rear Oil Seal Housing      |
| 510     | Crankshaft Rear Oil Seal Housing Bolt |



## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|     |                                |
|-----|--------------------------------|
| 511 | Crankshaft Rear Oil Seal       |
| 512 | Engine Front Cover             |
| 513 | Engine Front Cover Bolt        |
| 514 | Engine Front Center Cover Bolt |
| 515 | Engine Front Oil Seal          |
| 516 | Engine Front Cover Bolt        |
| 517 | Engine Front Cover Bolt Spacer |
| 518 | Camshaft Cover                 |
| 519 | Camshaft Cover Bolt            |
| 520 | Camshaft Cover Seal            |
| 521 | Oil Fill Cap                   |



**Fig. 23: Exhaust Manifold & Sensors Disassembled View**  
Courtesy of GENERAL MOTORS CORP.

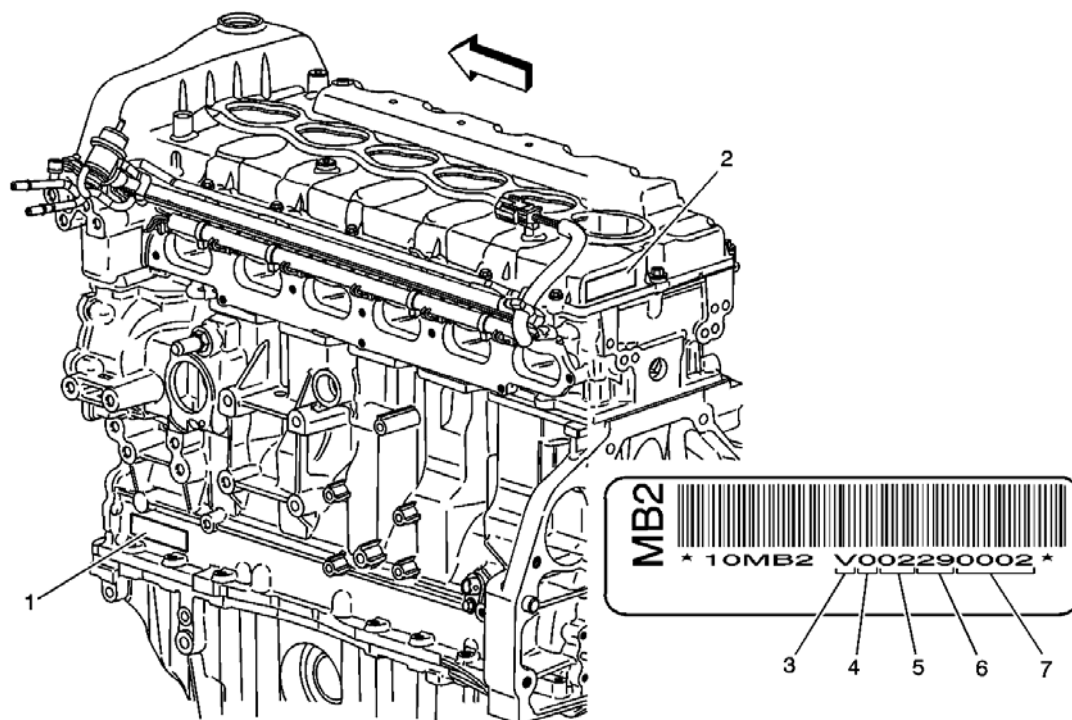
**Callouts For Fig. 23**

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

| Callout | Component Name                             |
|---------|--|
| 600     | Exhaust Manifold                           |
| 601     | Exhaust Manifold Gasket                    |
| 602     | Exhaust Manifold Bolt                      |
| 603     | Exhaust Manifold Heat Shield               |
| 604     | Exhaust Manifold Heat Shield Stud          |
| 605     | Exhaust Manifold Heat Shield Nut           |
| 700     | Ignition Control Module                    |
| 701     | Ignition Control Module Spring             |
| 702     | Ignition Control Module Boot               |
| 703     | Exhaust Camshaft Position Sensor           |
| 704     | Exhaust Camshaft Position Sensor Bolt      |
| 705     | EVAP Emission Canister Purge Solenoid      |
| 706     | EVAP Emission Canister Purge Solenoid Bolt |
| 707     | Knock Sensor                               |
| 708     | Knock Sensor                               |
| 709     | Crankshaft Position Sensor                 |
| 710     | Crankshaft position Sensor Bolt            |

### ENGINE IDENTIFICATION



**Fig. 24: View Of Engine Identification Tag**  
Courtesy of GENERAL MOTORS CORP.

**Callouts For Fig. 24**

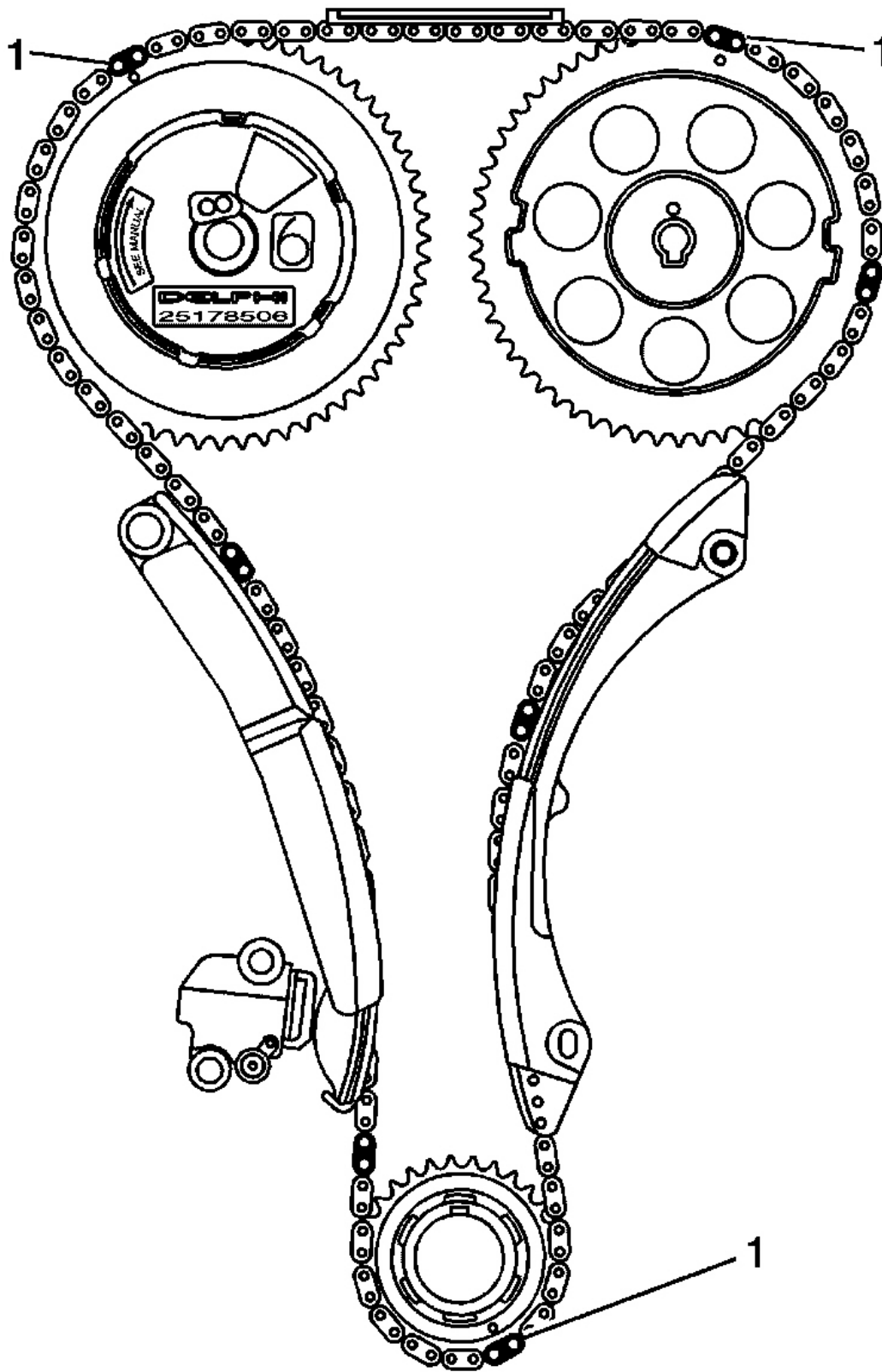
| Callout | Component Name   |
|---------|--|
| 1       | Engine ID Location   |
| 2       | Engine ID Location   |
| 3       | The first digit identifies the engine build location - All first digits will be a V, this engine is only being built at Flint Engine South |
| 4       | The second digit identifies the build year   |
| 5       | The third and fourth digits identify the build month   |
| 6       | The fifth and sixth digits identify the build date   |
| 7       | The seventh through tenth digits identify the engine build sequence  |

**SCHEMATIC AND ROUTING DIAGRAMS**

**TIMING CHAIN ALIGNMENT DIAGRAM**

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 25: Timing Chain Alignment Diagram**  
Courtesy of GENERAL MOTORS CORP.

**Callouts For Fig. 25**

| Callout | Component Name |
|---------|----------------|
| 1       | Timing Marks   |
| 1       | Timing Marks   |
| 1       | Timing Marks   |

## DIAGNOSTIC INFORMATION AND PROCEDURES

### DIAGNOSTIC STARTING POINT - ENGINE MECHANICAL

Begin the system diagnosis by reviewing the **Disassembled Views**, or **Engine Component Description**, and **Lubrication Description**. Reviewing the description and operation information will help you determine the correct symptom diagnostic procedure when a malfunction exists. Reviewing the description and operation information will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Engine Mechanical** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

### SYMPTOMS - ENGINE MECHANICAL

#### Strategy Based Diagnostics

1. Perform A Diagnostic System Check in Engine Controls before using the symptom tables (if applicable).
2. Review the system operations in order to familiarize yourself with the system functions. Refer to **Disassembled Views**, and **Engine Component Description**, and **Lubrication Description**.

All diagnosis on a vehicle should follow a logical process. Strategy based diagnostics is a uniform approach for repairing all systems. The diagnostic flow may always be used in order to resolve a system problem. The diagnostic flow is the place to start when repairs are necessary.

#### Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the engine.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Check for the correct oil level, proper oil viscosity, and correct filter application.
- Verify the exact operating conditions under which the concern exists. Note factors such as engine RPM, ambient temperature, engine temperature, amount of engine warm-up time, and other specifics.
- Compare the engine sounds (if applicable) to a known good engine and make sure you are not trying to correct a normal condition.

#### Intermittent

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating properly.

### Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Base Engine Misfire without Internal Engine Noises
- Base Engine Misfire with Abnormal Internal Lower Engine Noises
- Base Engine Misfire with Abnormal Valve Train Noise
- Base Engine Misfire with Coolant Consumption
- Base Engine Misfire with Excessive Oil Consumption
- Engine Compression Test
- Engine Noise on Start-Up, but Only Lasting a Few Seconds
- Upper Engine Noise, Regardless of Engine Speed
- Lower Engine Noise, Regardless of Engine Speed
- Engine Noise Under Load
- Engine Will Not Crank - Crankshaft Will Not Rotate
- Oil Consumption Diagnosis
- Oil Pressure Diagnosis and Testing
- Oil Leak Diagnosis

### BASE ENGINE MISFIRE WITHOUT INTERNAL ENGINE NOISES

#### Base Engine Misfire without Internal Engine Noises

| Cause   | Correction  |
|---|---|
| Abnormalities (severe cracking, bumps, or missing areas) in the accessory drive belt<br>(Abnormalities in the accessory drive system and/or components may cause engine RPM variations and lead to a misfire DTC. A misfire code may be present without an actual misfire condition). | Replace the drive belt.                                     |
| Worn, damaged, or mis-aligned accessory drive components or excessive pulley runout and may lead to a misfire DTC.<br>(A misfire code may be present without an actual misfire condition.)  | Inspect the components, and repair or replace as required.  |
| Loose or improperly installed engine flywheel or crankshaft balancer<br>(A misfire code may be present without an actual misfire condition.)  | Repair or replace the flywheel and/or balancer as required. |
| Restricted exhaust system<br>(A severe restriction in the exhaust flow can cause  | Repair or replace as required.                              |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|   |   |
|---|---|
| significant loss of engine performance and may set a DTC. Possible causes of restrictions include collapsed or dented pipes or plugged mufflers and/or catalytic converters).   |   |
| Improperly installed or damaged vacuum hoses  | Repair or replace as required.  |
| Improper sealing between the intake manifold and cylinder head or throttle body.  | Replace the intake manifold, gaskets, cylinder head, and/or throttle body as required.  |
| Improperly installed or damaged MAP sensor (The sealing grommet of the MAP sensor should not be torn or damaged.)   | Repair or replace the MAP sensor as required.   |
| Damage to the MAP sensor housing and/or O-ring seal   | Replace the intake manifold.  |
| Worn or loose valve rocker arms (The rocker arm bearing end caps and/or needle bearings should be intact and in the proper position)  | Replace the valve rocker arms as required.  |
| Worn valve lash adjusters   | Replace the valve lash adjusters.   |
| Stuck valves (Carbon buildup on the valve stem can cause the valve not to close properly.)  | Repair or replace as required.  |
| Excessively worn or mis-aligned timing chain  | Replace the timing chain and sprockets as required.   |
| Worn camshaft lobes   | Replace the camshaft and valve lash adjusters.  |
| Excessive oil pressure  | <ul style="list-style-type: none"><li>• Perform an oil pressure test. Refer to <b><u>Oil Pressure Diagnosis and Testing</u></b>.</li><li>• Repair or replace the oil pump as required.</li></ul>  |
| Faulty cylinder head gasket and/or cracking or other damage to the cylinder head and engine block cooling system passages. (Coolant consumption may or may not cause the engine to overheat.)   | <ul style="list-style-type: none"><li>• Inspect for spark plugs saturated by coolant.</li><li>• Inspect the cylinder head, engine block, and/or head gasket.</li><li>• Repair or replace as required.</li></ul>   |
| Worn Piston Rings (Oil consumption may or may not cause the engine to misfire.)   | <ul style="list-style-type: none"><li>• Inspect the spark plugs for oil deposits.</li><li>• Inspect the cylinders for a loss of compression. Refer to <b><u>Engine Compression Test</u></b>.</li><li>• Perform cylinder leak down and compression testing to identify the cause.</li><li>• Repair or replace as required.</li></ul> |
| A damaged crankshaft reluctor wheel (A damaged crankshaft reluctor wheel can result in different symptoms depending on the severity and location of the damage.)<br><br><ul style="list-style-type: none"><li>• Systems with electronic communications (DIS or coil per cylinder) and severe reluctor</li></ul> | Replace the sensor and/or crankshaft as required.   |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

ring damage may exhibit periodic loss of crankshaft position, stop delivering a signal, and then re-sync the crankshaft position.)

- Systems with electronic communication (DIS or coil per cylinder) and slight reluctor ring damage may exhibit no loss of crankshaft position and no misfire may occur. However, a P0300 DTC may be set.
- Systems with mechanical communications (high voltage switch) and severe reluctor ring damage may cause additional pulses and effect fuel and spark delivery to the point of generating a P0300 DTC or P0336.

### BASE ENGINE MISFIRE WITH ABNORMAL INTERNAL LOWER ENGINE NOISES

#### Base Engine Misfire with Abnormal Internal Lower Engine Noises

| Cause  | Correction   |
|--|--|
| Abnormalities (severe cracking, bumps or missing areas) in the accessory drive belt<br>(Abnormalities in the accessory drive system and/or components may cause engine RPM variations, noises similar to a faulty lower engine and also lead to a misfire condition. A misfire code may be present without an actual misfire condition.) | Replace the drive belt.  |
| Worn, damaged, or mis-aligned accessory drive components or excessive pulley runout<br>(A misfire code may be present without an actual misfire condition.)  | Inspect the components, repair or replace as required.   |
| Loose or improperly installed engine flywheel or crankshaft balancer<br>(A misfire code may be present without an actual misfire condition.)   | Repair or replace the flywheel and/or balancer as required.  |
| Worn Piston Rings<br>(Oil consumption may or may not cause the engine to misfire.)   | <ul style="list-style-type: none"><li>• Inspect the spark plugs for oil deposits.</li><li>• Inspect the cylinders for a loss of compression. Refer to <b><u>Engine Compression Test</u></b>.</li><li>• Perform cylinder leak down and compression testing to determine the cause.</li><li>• Repair or replace as required.</li></ul> |
| Worn Crankshaft Thrust Bearings<br>(Severely worn thrust surfaces on the crankshaft and/or thrust bearing may permit fore and aft movement of the crankshaft and create a DTC  | Replace the crankshaft and bearings as required.   |



## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

without an actual misfire condition.)

### BASE ENGINE MISFIRE WITH ABNORMAL VALVE TRAIN NOISE

#### Base Engine Misfire with Abnormal Valve Train Noise

| Cause  | Correction   |
|--|--|
| Worn or loose valve rocker arms<br>(The rocker arm bearing end caps and/or needle bearings should be intact within the rocker arm assembly.) | Replace the valve rocker arms as required.                   |
| Stuck valves<br>(Carbon buildup on the valve stem can cause the valve not to close properly.)  | Repair or replace as required.                               |
| Excessively worn or mis-aligned timing chain   | Replace the timing chain and sprockets as required.          |
| Worn camshaft lobes  | Replace the camshaft, valve lash adjusters, and rocker arms. |
| Sticking valve lash adjusters  | Replace as required.   |

### BASE ENGINE MISFIRE WITH COOLANT CONSUMPTION

#### Base Engine Misfire with Coolant Consumption

| Cause  | Correction   |
|--|--|
| Faulty cylinder head gasket and/or cracking or other damage to the cylinder head and engine block cooling system passages.<br>(Coolant consumption may or may not cause the engine to overheat.) | <ul style="list-style-type: none"><li>• Inspect for spark plugs saturated by coolant.</li><li>• Perform a cylinder leak down test.</li><li>• Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket.</li><li>• Repair or replace as required.</li></ul> |

### BASE ENGINE MISFIRE WITH EXCESSIVE OIL CONSUMPTION

#### Base Engine Misfire with Excessive Oil Consumption

| Cause  | Correction   |
|--|--|
| Worn valves, valve guides and/or valve stem oil seals                              | <ul style="list-style-type: none"><li>• Inspect the spark plugs for oil deposits.</li><li>• Repair or replace as required.</li></ul>   |
| Worn Piston Rings<br>(Oil consumption may or may not cause the engine to misfire.) | <ul style="list-style-type: none"><li>• Inspect the spark plugs for oil deposits.</li><li>• Inspect the cylinders for a loss of compression. Refer to <b><u>Engine Compression Test</u></b>.</li><li>• Perform cylinder leak down and compression testing to determine the cause.</li><li>• Repair or replace as required.</li></ul> |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### ENGINE NOISE ON START-UP, BUT ONLY LASTING A FEW SECONDS

#### Engine Noise on Start-Up, but Only Lasting a Few Seconds

| Cause   | Correction  |
|---|---|
| Incorrect oil filter without anti-drainback feature | Install the correct oil filter.   |
| Incorrect oil viscosity                             | <ol style="list-style-type: none"><li>1. Drain the oil.</li><li>2. Install the correct viscosity oil.</li></ol>                                       |
| Worn crankshaft thrust bearing                      | <ul style="list-style-type: none"><li>• Inspect the thrust bearing and crankshaft.</li><li>• Repair or replace as required.</li></ul>                 |
| Damaged or faulty oil filter by-pass valve          | <ul style="list-style-type: none"><li>• Inspect the oil filter by-pass valve for proper operation.</li><li>• Repair or replace as required.</li></ul> |

### UPPER ENGINE NOISE, REGARDLESS OF ENGINE SPEED

#### Upper Engine Noise, Regardless of Engine Speed

| Cause  | Correction   |
|--|--|
| Low oil pressure   | <ul style="list-style-type: none"><li>• Perform an oil pressure test. Refer to <b><u>Oil Pressure Diagnosis and Testing</u></b>.</li><li>• Repair or replace as required.</li></ul>  |
| Worn or damaged valve rocker arm                               | <ul style="list-style-type: none"><li>• Inspect the rocker arm for wear or missing needle bearings</li><li>• Replace the valve rocker arms as required.</li></ul>  |
| Improper lubrication to the valve rocker arms                  | Inspect the following components, and repair or replace as required: <ul style="list-style-type: none"><li>• The valve rocker arm</li><li>• The valve lash adjusters</li><li>• The oil filter bypass valve</li><li>• The oil transfer tube</li><li>• The oil pump and pump screen</li><li>• The engine block oil galleries</li></ul> |
| Broken valve spring  | Replace the valve spring.  |
| Worn or dirty valve lash adjusters                             | Replace the valve lash adjusters.  |
| Stretched or broken timing chain and/or damaged sprocket teeth | Replace the timing chain and sprockets.  |
| Worn engine camshaft lobes                                     | <ul style="list-style-type: none"><li>• Inspect the engine camshaft lobes.</li><li>• Replace the camshaft, valve lash adjusters, and rocker arms as required.</li></ul>  |
| Worn valve guides or valve stems                               | Inspect the following components, and repair as  |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|   |   |
|---|---|
|   | required: <ul style="list-style-type: none"><li>• The valves</li><li>• The valve guides</li></ul>   |
| Stuck Valves<br>(Carbon on the valve stem or valve seat may cause the valve to stay open) | Inspect the following components, and repair as required: <ul style="list-style-type: none"><li>• The valves</li><li>• The valve guides</li></ul> |

### LOWER ENGINE NOISE, REGARDLESS OF ENGINE SPEED

#### Lower Engine Noise, Regardless of Engine Speed

| Cause  | Correction   |
|--|--|
| Low oil pressure   | <ul style="list-style-type: none"><li>• Perform an oil pressure test. Refer to <b><u>Oil Pressure Diagnosis and Testing</u></b>.</li><li>• Repair or replace damaged components as required.</li></ul> |
| Worn accessory drive components<br>(Abnormalities such as severe cracking, bumps or missing areas in the accessory drive belt and/or misalignment of system components.) | <ul style="list-style-type: none"><li>• Inspect the accessory drive system.</li><li>• Repair or replace as required.</li></ul>   |
| Loose or damaged crankshaft balancer   | <ul style="list-style-type: none"><li>• Inspect the crankshaft balancer.</li><li>• Repair or replace as required.</li></ul>  |
| Detonation or spark knock  | Verify the correct operation of the ignition controls system. Refer to Engine Controls.  |
| Loose torque converter bolts   | <ul style="list-style-type: none"><li>• Inspect the torque converter bolts and flywheel.</li><li>• Repair or replace as required.</li></ul>  |
| Loose or damaged flywheel  | Repair or replace the flywheel.  |
| Oil pump screen loose, damaged or restricted   | <ul style="list-style-type: none"><li>• Inspect the oil pump screen.</li><li>• Repair or replace as required.</li></ul>  |
| Oil transfer tube loose, damaged or restricted   | <ul style="list-style-type: none"><li>• Inspect the transfer tube.</li><li>• Repair or replace as required.</li></ul>  |
| Excessive piston-to-cylinder bore clearance  | <ul style="list-style-type: none"><li>• Inspect the piston and cylinder bore.</li><li>• Repair as required.</li></ul>  |
| Excessive piston pin-to-bore clearance   | <ul style="list-style-type: none"><li>• Inspect the piston, piston pin, and the connecting rod.</li><li>• Repair or replace as required.</li></ul>   |
| Excessive connecting rod bearing clearance   | Inspect the following components, and repair as  |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|   |  |
|---|--|
|   | required: <ul style="list-style-type: none"><li>• The connecting rod bearings</li><li>• The connecting rods</li><li>• The crankshaft</li><li>• The crankshaft journals</li></ul> |
| Excessive crankshaft bearing clearance  | Inspect the following components, and repair as required: <ul style="list-style-type: none"><li>• The crankshaft bearings</li><li>• The crankshaft journals</li></ul>            |
| Incorrect piston, piston pin and connecting rod installation<br>(Pistons must be installed with the mark or dimple on the top of the piston facing the front of the engine. Piston pins must be centered in the connecting rod pin bore.) | <ul style="list-style-type: none"><li>• Verify the pistons, piston pins and connecting rods are installed correctly.</li><li>• Repair as required.</li></ul>                     |

## ENGINE NOISE UNDER LOAD

### Engine Noise Under Load

| Cause                                      | Correction   |
|--|--|
| Low oil pressure                           | <ul style="list-style-type: none"><li>• Perform an oil pressure test. Refer to <b><u>Oil Pressure Diagnosis and Testing</u></b>.</li><li>• Repair or replace as required.</li></ul>            |
| Detonation or spark knock                  | Verify the correct operation of the ignition controls. Refer to Engine Controls.   |
| Loose torque converter bolts               | <ul style="list-style-type: none"><li>• Inspect the torque converter bolts and flywheel.</li><li>• Repair as required.</li></ul>   |
| Cracked flywheel (automatic transmission)  | <ul style="list-style-type: none"><li>• Inspect the flywheel bolts and flywheel.</li><li>• Repair as required.</li></ul>   |
| Excessive connecting rod bearing clearance | Inspect the following components, and repair as required: <ul style="list-style-type: none"><li>• The connecting rod bearings</li><li>• The connecting rods</li><li>• The crankshaft</li></ul> |
| Excessive crankshaft bearing clearance     | Inspect the following components, and repair as required: <ul style="list-style-type: none"><li>• The crankshaft bearings</li></ul>  |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

- The crankshaft journals
- The cylinder block crankshaft bearing bore

### ENGINE WILL NOT CRANK - CRANKSHAFT WILL NOT ROTATE

#### Engine Will Not Crank - Crankshaft Will Not Rotate

| Cause   | Correction  |
|---|---|
| Seized accessory drive system component   | <ol style="list-style-type: none"><li>1. Remove the accessory drive belt.</li><li>2. Confirm that the engine will rotate. Rotate the crankshaft by hand at the crankshaft balancer or flywheel location.</li><li>3. Repair or replace the components as required.</li></ol>   |
| Seized automatic transmission torque converter  | <ol style="list-style-type: none"><li>1. Remove the torque converter-to-flywheel bolts.</li><li>2. Confirm that the engine will rotate. Rotate the crankshaft by hand at the crankshaft balancer or flywheel location.</li><li>3. Repair or replace the components as required.</li></ol>   |
| Broken timing chain   | <ul style="list-style-type: none"><li>• Inspect the timing chain and gears.</li><li>• Repair or replace the components as required.</li></ul>   |
| Seized timing chain or timing gears   | <ul style="list-style-type: none"><li>• Inspect the timing chain and gears for foreign material or a seized chain.</li><li>• Repair or replace the components as required.</li></ul>  |
| Seized or broken camshaft   | <ul style="list-style-type: none"><li>• Inspect the camshaft.</li><li>• Repair or replace the components as required.</li></ul>   |
| Bent valve in the cylinder head   | <ul style="list-style-type: none"><li>• Inspect the valves and the cylinder head.</li><li>• Repair or replace the components as required.</li></ul>   |
| Seized oil pump   | <ul style="list-style-type: none"><li>• Inspect the oil pump assembly.</li><li>• Repair or replace as required.</li></ul>   |
| Hydraulically locked cylinder <ul style="list-style-type: none"><li>• Coolant/antifreeze in the cylinder</li><li>• Oil in the cylinder</li><li>• Fuel in the cylinder</li></ul> | <ol style="list-style-type: none"><li>1. Remove spark plugs and check for fluid in the cylinder. When rotating the engine with the spark plugs removed, the piston (on compression stroke) will push fluid from the combustion chamber.</li><li>2. Inspect for failed/broken head gasket.</li><li>3. Inspect for a cracked engine block or cylinder head.</li><li>4. Inspect for a sticking fuel injector.</li><li>5. Repair or replace the components as required.</li></ol> |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|  |   |
|--|---|
| Material in the cylinder <ul style="list-style-type: none"><li>• Broken valve</li><li>• Broken piston ring(s)</li><li>• Piston material</li><li>• Foreign material</li></ul> | <ul style="list-style-type: none"><li>• Inspect the cylinder for damaged components and/or foreign materials.</li><li>• Repair or replace the components as required.</li></ul> |
| Seized crankshaft or connecting rod bearings   | <ul style="list-style-type: none"><li>• Inspect crankshaft and connecting rod bearings.</li><li>• Repair or replace the components as required.</li></ul>                       |
| Bent or broken connecting rod  | <ul style="list-style-type: none"><li>• Inspect the connecting rods.</li><li>• Repair or replace the components as required.</li></ul>  |
| Broken crankshaft  | <ul style="list-style-type: none"><li>• Inspect the crankshaft.</li><li>• Repair or replace the components as required.</li></ul>   |

## COOLANT IN COMBUSTION CHAMBER

### Coolant in Combustion Chamber

| Cause  | Correction   |
|--|--|
| DEFINITION: Excessive white smoke and/or coolant type odor coming from the exhaust pipe may indicate coolant in the combustion chamber. Low coolant levels, an inoperative cooling fan, or a faulty thermostat may lead to an "overtemperature" condition which may cause engine component damage. <ul style="list-style-type: none"><li>• A slower than normal cranking speed may indicate coolant entering the combustion chamber. Refer to <b><u>Engine Will Not Crank - Crankshaft Will Not Rotate</u></b>.</li><li>• Remove the spark plugs and inspect for spark plugs saturated by coolant or coolant in the cylinder bore.</li><li>• Inspect by performing a <b><u>Cylinder Leakage Test</u></b>. During this test, excessive air bubbles within the coolant may indicate a faulty gasket or damaged component.</li><li>• Inspect by performing a cylinder compression test. Two cylinders "side-by-side" on the engine block, with low compression, may indicate a failed cylinder head gasket. Refer to <b><u>Engine Compression Test</u></b>.</li></ul> |  |
| Faulty cylinder head gasket  | Replace the head gasket and components as required. Refer to <b><u>Cylinder Head Cleaning and Inspection</u></b> and <b><u>Cylinder Head Replacement</u></b> . |
| Warped cylinder head   | Replace the cylinder head and gasket. Refer to <b><u>Cylinder Head Replacement</u></b> .   |
| Cracked cylinder head  | Replace the cylinder head and gasket.  |
| Cracked cylinder sleeve or engine block  | Replace the components as required.  |
| Cylinder head or engine block porosity   | Replace the components as required.  |

## COOLANT IN ENGINE OIL

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### Coolant in Engine Oil

| Cause   | Correction  |
|---|---|
| <p>DEFINITION: Foamy or discolored oil or an engine oil "overfill" condition may indicate coolant entering the engine crankcase. Low coolant levels, an inoperative cooling fan, or a faulty thermostat may lead to an "overtemperature" condition which may cause engine component damage. Contaminated engine oil and oil filter should be changed.</p> <ul style="list-style-type: none"><li>Inspect the oil for excessive foaming or an overfill condition. Oil diluted by coolant may not properly lubricate the crankshaft bearings and may lead to component damage. Refer to <b><u>Lower Engine Noise, Regardless of Engine Speed.</u></b></li><li>Inspect by performing a <b><u>Cylinder Leakage Test.</u></b> During this test, excessive air bubbles within the cooling system may indicate a faulty gasket or damaged component.</li><li>Inspect by performing a cylinder compression test. Two cylinders "side-by-side" on the engine block with low compression may indicate a failed cylinder head gasket. Refer to <b><u>Engine Compression Test.</u></b></li></ul> |   |
| Faulty external engine oil cooler   | Replace the components as required.   |
| Faulty cylinder head gasket   | Replace the head gasket and components as required. Refer to <b><u>Cylinder Head Cleaning and Inspection</u></b> and <b><u>Cylinder Head Replacement.</u></b> |
| Warped cylinder head  | Replace the cylinder head gasket. Refer to <b><u>Cylinder Head Replacement.</u></b>   |
| Cracked cylinder head   | Replace the cylinder head and gasket.   |
| Cracked cylinder sleeve or engine block   | Replace the components as required.   |
| Cylinder head, block, or manifold porosity  | Replace the components as required.   |
| Faulty sealing on engine front cover  | Reseal or replace front cover.  |

### ENGINE COMPRESSION TEST

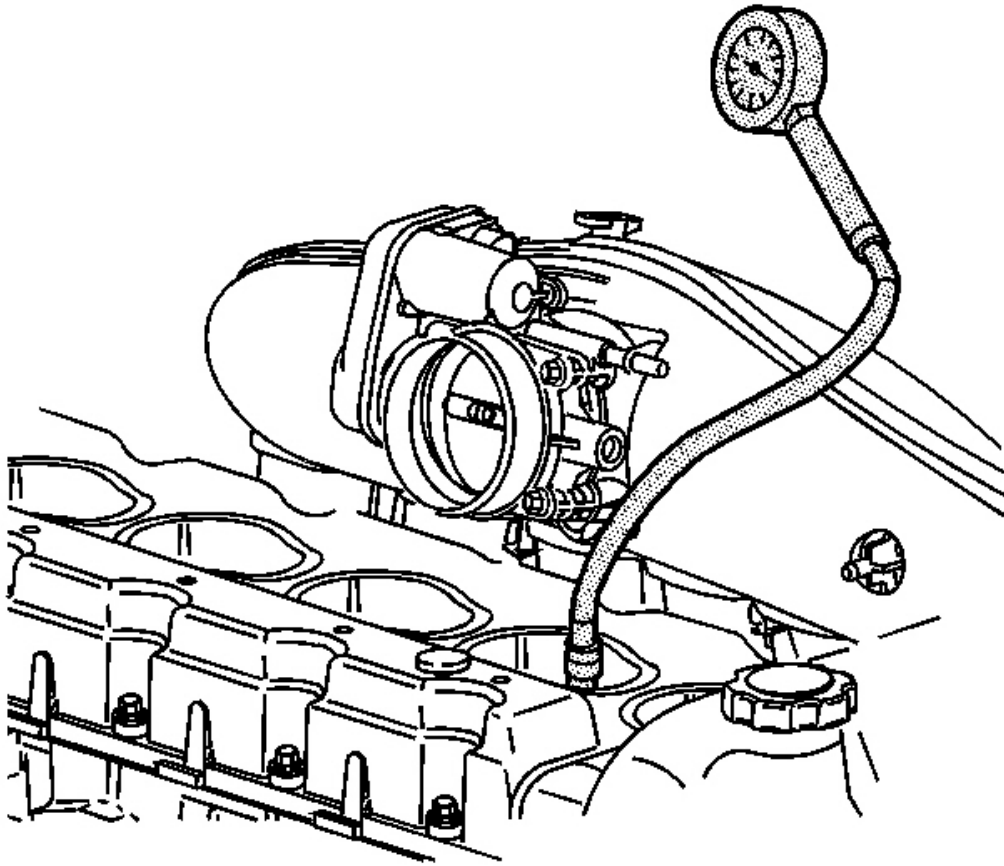
#### Tools Required

**J 38722** Compression Tester. See **Special Tools and Equipment.**

A compression pressure test of the engine cylinders determines the condition of the rings, the valves, and the head gasket.

**IMPORTANT: The battery must be at or near full charge. Do not block the throttle open.**

1. Remove the air duct from the throttle control module.
2. Remove the ignition control modules.
3. Disable the fuel system.
4. Remove the spark plugs.



**Fig. 26: Measuring Engine Compression**  
Courtesy of GENERAL MOTORS CORP.

5. Measure the engine compression, using the following procedure:
  1. Firmly install **J 38722** to the spark plug hole. See **Special Tools and Equipment**.
  2. Have an assistant crank the engine through at least four compression strokes in the testing cylinder.
  3. Check and record the readings on **J 38722** at each stroke. See **Special Tools and Equipment**.
  4. Disconnect **J 38722** . See **Special Tools and Equipment**.
  5. Repeat the compression test for each cylinder.
6. Record the compression readings from all of the cylinders. A normal reading should be approximately 1482 kPa (215 psi).

The lowest reading should not be less than 70 percent of the highest reading.



7. The following are examples of the possible measurements:

- When the compression measurement is normal, the compression builds up quickly and evenly to the specified compression on each cylinder.
- When the compression is low on the first stroke and tends to build up on the following strokes, but does not reach the normal compression, or if the compression improves considerably with the addition of three squirts of oil, the piston rings may be the cause.
- When the compression is low on the first stroke and does not build up in the following strokes, or the addition of oil does not affect the compression, the valves may be the cause.
- When the compression is low on two adjacent cylinders, or coolant is present in the crankcase, the head gasket may be the cause.

8. Install the air duct to the throttle body.

9. Install the spark plugs.

10. Enable the fuel system.

11. Install the ignition control modules.

## **CYLINDER LEAKAGE TEST**

### **Tools Required**

**J 35667-A** Cylinder Head Leakdown Tester. See **Special Tools and Equipment**.

**CAUTION:** Refer to **Battery Disconnect Caution** in **Cautions and Notices**.

**IMPORTANT:** A leakage test may be performed to measure cylinder/combustion chamber leakage. High cylinder leakage may indicate one or more of the following:

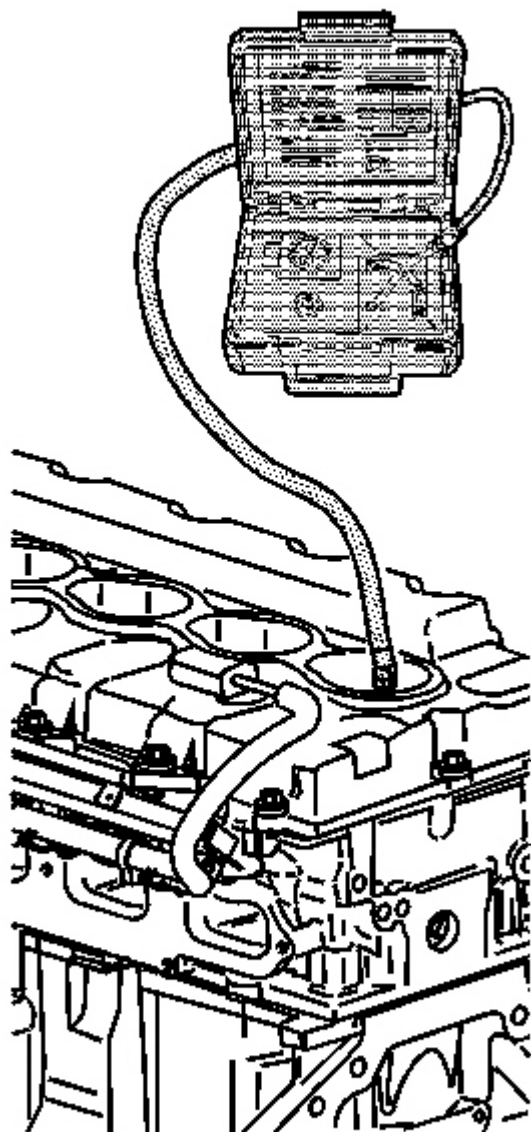
- **Worn or burnt valves**
- **Broken valve springs**
- **Stuck valve lash adjuster**
- **Damaged piston**
- **Worn piston rings**
- **Worn or scored cylinder bore**
- **Damaged cylinder head gasket**
- **Cracked or damaged cylinder head**
- **Cracked or damaged engine block**

1. Disconnect the battery ground negative cable.

2. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Control.

3. Rotate the crankshaft to place the piston in the cylinder being tested at Top Dead Center (TDC) of the compression stroke.

4. Install J 35667-A . See Special Tools and Equipment.



**Fig. 27: Checking For Cylinder Leakage**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** It may be necessary to hold the crankshaft balancer bolt to prevent the engine from rotating.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

5. Apply shop air pressure to **J 35667-A** and adjust according to the manufacturers instructions. See **Special Tools and Equipment**.
6. Record the cylinder leakage value. Cylinder leakage that exceeds 25 percent is considered excessive and may require component service. In excessive leakage situations, inspect for the following conditions:
  - Air leakage sounds at the throttle control module or air inlet hose may indicate a worn or burnt intake valve or a broken valve spring.
  - Air leakage sounds at the exhaust system tailpipe may indicate a worn or burnt exhaust valve or a broken valve spring.
  - Air leakage sounds from the crankcase, oil level indicator tube, or oil fill tube may indicate worn piston rings, a damaged piston, a worn or scored cylinder bore, a damaged engine block or a damaged cylinder head.
  - Air bubbles in the cooling system may indicate a damaged cylinder head or a damaged cylinder head gasket.
7. Perform the leakage test on the remaining cylinders and record the values.

## OIL CONSUMPTION DIAGNOSIS

### Oil Consumption Diagnosis

| Checks   | Causes  |
|--|---|
| Excessive oil consumption (not due to leaks) is the use of 0.95 L (1.0 qts) or more of engine oil within 2,414 kilometers (1,500 miles). |   |
| Preliminary  | <p>The causes of excessive oil consumption may include the following conditions:</p> <ul style="list-style-type: none"><li>• External oil leaks</li></ul> <p>Refer to <b><u>Oil Leak Diagnosis</u></b>.</p> <ul style="list-style-type: none"><li>• Incorrect oil level or improper reading of the oil level indicator</li></ul> <p>With the vehicle on a level surface, run the engine for a few minutes, allow adequate drain down time (2-3 minutes) and check for the correct engine oil level.</p> <ul style="list-style-type: none"><li>• Improper oil viscosity</li></ul> <p>Refer to the vehicle owners manual and use the recommended SAE grade and viscosity for the prevailing temperatures.</p> <ul style="list-style-type: none"><li>• Continuous high speed driving and/or severe usage</li><li>• Crankcase ventilation system restrictions or malfunctioning components</li><li>• Worn valve guides and/or valve stems</li><li>• Worn or improperly installed valve stem oil seals</li></ul> |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

- Piston rings broken, worn, not seated properly

Allow adequate time for the rings to seat.

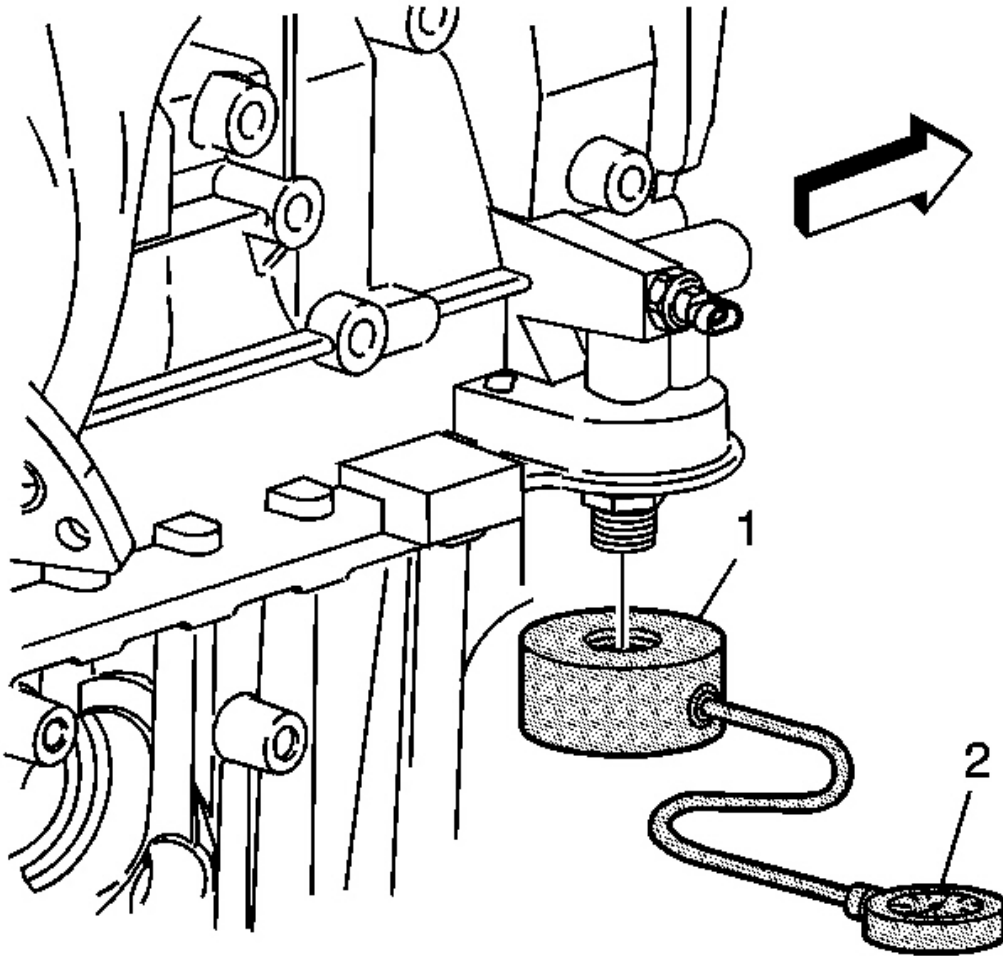
Replace worn piston rings as necessary.

- Piston and rings improperly installed or miss-fitted to the cylinder bore

### OIL PRESSURE DIAGNOSIS AND TESTING

#### Tools Required

- **J 21867** Pressure Gage and Hose Assembly. See **Special Tools and Equipment**.
  - **J 42907** Oil Pressure Tester. See **Special Tools and Equipment**.
1. With the vehicle on a level surface, run the vehicle for a few minutes, allow adequate drain down time (2-3 minutes) and measure for a low oil level.
  2. If required, add the recommended grade engine oil and fill the crankcase until the oil level measures full on the oil level indicator.
  3. Run the engine briefly (10-15 seconds) and verify low or no oil pressure on the vehicle gage or light.
  4. Listen for a noisy valve train or a knocking noise.
  5. Inspect for the following:
    - Oil diluted by water or glycol (anti freeze)
    - Foamy oil
  6. Remove the oil filter and install the **J 42907** . See **Special Tools and Equipment**.



**Fig. 28: Measuring Oil Pressure Using J 42907**  
Courtesy of GENERAL MOTORS CORP.

7. Install **J 21867** or equivalent to the **J 42907** . See **Special Tools and Equipment**.
8. Run the engine and measure the engine oil pressure.
9. Compare the readings to **Engine Mechanical Specifications**.
10. If the engine oil pressure is below specifications, inspect the engine for one or more of the following:
  - Oil pump worn or dirty

Refer to **Oil Pump Cleaning and Inspection**.

- Oil pump screen loose, plugged, or damaged

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

- Oil pump screen O-ring seal missing or damaged
- Malfunctioning oil pump pressure regulator valve
- Excessive bearing clearance
- Cracked, porous, or restricted oil galleries
- Oil gallery plugs missing or incorrectly installed

Refer to **Engine Block Plug Installation**.

- Broken valve lash adjusters

Repair as necessary

11. If the reading on **J 21867** or equivalent is within specifications, inspect for the following. See **Special Tools and Equipment**.

- Plugged or incorrect oil filter and/or malfunctioning oil bypass valve
- Malfunctioning vehicle oil pressure gage or sensor

Repair as necessary

## OIL LEAK DIAGNOSIS

### Oil Leak Diagnosis

| Step   | Action   | Yes                  | No                  |
|--|--|----------------------|---------------------|
| <b>IMPORTANT:</b><br>You can repair most fluid leaks by first visually locating the leak, repairing or replacing the component, or by resealing the gasket surface. Once the leak is identified, determine the cause of the leak. Repair the cause of the leak as well as the leak itself. |  |                      |                     |
| 1  | 1. Operate the vehicle until it reaches normal operating temperature.<br>2. Park the vehicle on a level surface, over a large sheet of paper or other clean surface.<br>3. Wait 15 minutes.<br>4. Check for drippings.<br><br>Are drippings present? | Go to <b>Step 2</b>  | System OK           |
| 2  | Can you identify the type of fluid and the approximate location of the leak?   | Go to <b>Step 10</b> | Go to <b>Step 3</b> |
| 3  | 1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.<br>2. Check for leaks at the following locations: <ul style="list-style-type: none"><li>• Sealing surfaces</li><li>• Fittings</li></ul>        |                      |                     |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|   |   |                      |                     |
|---|---|----------------------|---------------------|
|   | <ul style="list-style-type: none"> <li>• Cracked or damaged components</li> </ul> <p>Can you identify the type of fluid and the approximate location of the leak?</p>   | Go to <b>Step 10</b> | Go to <b>Step 4</b> |
| 4 | <ol style="list-style-type: none"> <li>1. Completely clean the entire engine and surrounding components.</li> <li>2. Operate the vehicle for several kilometers (miles) at normal operating temperature and at varying speeds.</li> <li>3. Park the vehicle on a level surface, over a large sheet of paper or other clean surface.</li> <li>4. Wait 15 minutes.</li> <li>5. Identify the type of fluid, and the approximate location of the leak.</li> </ol> <p>Can you identify the type of fluid and the approximate location of the leak?</p>               | Go to <b>Step 10</b> | Go to <b>Step 5</b> |
| 5 | <ol style="list-style-type: none"> <li>1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.</li> <li>2. Check for leaks at the following locations: <ul style="list-style-type: none"> <li>• Sealing surfaces</li> <li>• Fittings</li> <li>• Cracked or damaged components</li> </ul> </li> </ol> <p>Can you identify the type of fluid and the approximate location of the leak?</p>  | Go to <b>Step 10</b> | Go to <b>Step 6</b> |
| 6 | <ol style="list-style-type: none"> <li>1. Completely clean the entire engine and surrounding components.</li> <li>2. Apply an aerosol-type powder (baby powder, foot powder, etc.) to the suspected area.</li> <li>3. Operate the vehicle for several kilometers (miles) at normal operating temperature and at varying speeds.</li> <li>4. Identify the type of fluid, and the approximate location of the leak, from the discolorations in the powder surface.</li> </ol> <p>Can you identify the type of fluid and the approximate location of the leak?</p> | Go to <b>Step 10</b> | Go to <b>Step 7</b> |
|   | <ol style="list-style-type: none"> <li>1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.</li> <li>2. Check for leaks at the following locations:</li> </ol>   |                      |                     |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |   |                      |                     |
|----|---|----------------------|---------------------|
| 7  | <ul style="list-style-type: none"> <li>• Sealing surfaces</li> <li>• Fittings</li> <li>• Cracked or damaged components</li> </ul> <p>Can you identify the type of fluid and the approximate location of the leak?</p>   | Go to <b>Step 10</b> | Go to <b>Step 8</b> |
| 8  | <p>Use <b>J 28428-E</b> to identify the type of fluid, and the approximate location of the leak. Refer to the manufacturer's instructions when using the tool. Can you identify the type of fluid and the approximate location of the leak? See <b><u>Special Tools and Equipment</u></b>.</p>  | Go to <b>Step 10</b> | Go to <b>Step 9</b> |
| 9  | <ol style="list-style-type: none"> <li>1. Visually inspect the suspected area. Use a small mirror to assist in looking at hard to see areas.</li> <li>2. Check for leaks at the following locations: <ul style="list-style-type: none"> <li>• Sealing surfaces</li> <li>• Fittings</li> <li>• Cracked or damaged components</li> </ul> </li> </ol> <p>Can you identify the type of fluid and the approximate location of the leak?</p>  | Go to <b>Step 10</b> | System OK           |
| 10 | <ol style="list-style-type: none"> <li>1. Inspect the engine for mechanical damage. Special attention should be shown to the following areas: <ul style="list-style-type: none"> <li>• Higher than recommended fluid levels</li> <li>• Higher than recommended fluid pressures</li> <li>• Plugged or malfunctioning fluid filters or pressure bypass valves</li> <li>• Plugged or malfunctioning engine ventilation system</li> <li>• Improperly tightened or damaged fasteners</li> <li>• Cracked or porous components</li> <li>• Improper sealants or gaskets where required</li> <li>• Improper sealant or gasket installation</li> <li>• Damaged or worn gaskets or seals</li> <li>• Damaged or worn sealing surfaces</li> </ul> </li> <li>2. Inspect the engine for customer modifications.</li> </ol> <p>Is there mechanical damage, or customer modifications to the engine?</p> | Go to <b>Step 11</b> | System OK           |



## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

11

Repair or replace all damaged or modified components.  
Does the engine still leak oil?

Go to **Step 1**

System OK

### CRANKCASE VENTILATION SYSTEM INSPECTION/DESCRIPTION

A crankcase ventilation system is used in order to provide a more complete scavenging of crankcase vapors. The air cleaner supplies fresh air through a filter to the crankcase. The crankcase mixes the fresh air with blow-by gases. This mixture then passes through a pipe located in the intake manifold.

The crankcase ventilation system has no serviceable components so no maintenance of the system is required.

### DRIVE BELT CHIRPING DIAGNOSIS

#### Diagnostic Aids

The symptom may be intermittent due to moisture on the drive belt(s) or the pulleys. It may be necessary to spray a small amount of water on the drive belt(s) in order to duplicate the customer's concern. If spraying water on the drive belt(s) duplicates the symptom, cleaning the belt pulleys may be the probable solution.

A loose or improper installation of a body component, a suspension component, or other items of the vehicle may cause the chirping noise.

#### Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

**2:** The noise may not be engine related. This step is to verify that the engine is making the noise. If the engine is not making the noise do not proceed further with this table.

**3:** The noise may be an internal engine noise. Removing the drive belt and operating the engine for a brief period will verify the noise is related to the drive belt. When removing the drive belt(s) the water pump may not be operating and the engine may overheat. Also DTCs may set when the engine is operating with the drive belt removed.

**4:** Inspect all drive belt pulleys for pilling. Pilling is the small balls or pills or it may be strings in the drive belt grooves from the accumulation of rubber dust.

**6:** Misalignment of the pulleys may be caused from improper mounting of the accessory drive component, incorrect installation of the accessory drive component pulley, or the pulley bent inward or outward from a previous repair. Test for a misalign pulley using a straight edge in the pulley grooves across two or three pulleys. If a misalign pulley is found refer to that accessory drive component for the proper installation procedure for that pulley.

**10:** Inspecting of the fasteners can eliminate the possibility that a wrong bolt, nut, spacer, or washer was installed.

**12:** Inspecting the pulleys for being bent should include inspecting for a dent or other damage to the pulleys that would prevent the drive belt from not seating properly in all of the pulley grooves or on the smooth surface of a pulley when the back side of the belt is used to drive the pulley.

**14:** Replacing the drive belt when it is not damaged or there is not excessive pilling will only be a

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

temporary repair.

### Drive Belt Chirping Diagnosis

| Step  | Action  | Yes  | No   |
|---|---|--|--|
| <b>NOTE:</b><br>Refer to <b><u>Belt Dressing Notice</u></b> in Cautions and Notices.  |   |  |  |
| <b>DEFINITION:</b> The following items are indications of chirping: <ul style="list-style-type: none"> <li>• A high pitched noise that is heard once per revolution of the drive belt or a pulley.</li> <li>• It usually occurs on cold damp mornings and will subside once vehicle reached normal operating temp.</li> </ul> |   |  |  |
| 1   | Did you review the Drive Belt Symptom operation and perform the necessary inspections?  | Go to <b>Step 2</b>  | Go to <b><u>Symptoms - Engine Mechanical</u></b> |
| 2   | Verify that there is a chirping noise.<br>Does the engine make the chirping noise?  | Go to <b>Step 3</b>  | Go to Diagnostic Aids                            |
| 3   | 1. Remove the drive belt. Refer to <b><u>Drive Belt Replacement</u></b> .<br>2. Operate the engine for no longer than 30 to 40 seconds.<br><br>Does the chirping noise still exist? | Go to <b><u>Engine Noise on Start-Up, but Only Lasting a Few Seconds</u></b> | Go to <b>Step 4</b>                              |
| 4   | Inspect for severe pilling exceeding 1/3 of the belt groove depth.<br>Does the belt grooves have pilling?   | Go to <b>Step 5</b>  | Go to <b>Step 6</b>                              |
| 5   | Clean the drive belt pulleys with a suitable wire brush.<br>Did you complete the repair?  | Go to <b>Step 15</b>   | Go to <b>Step 6</b>                              |
| 6   | Inspect for misalignment of the pulleys.<br>Are any of the pulleys misaligned?  | Go to <b>Step 7</b>  | Go to <b>Step 8</b>                              |
| 7   | Replace or repair any misaligned pulleys.<br>Did you complete the repair?   | Go to <b>Step 15</b>   | Go to <b>Step 8</b>                              |
| 8   | Inspect for bent or cracked brackets.<br>Did you find any bent or cracked brackets?   | Go to <b>Step 9</b>  | Go to <b>Step 10</b>                             |
| 9   | Replace any bent or cracked brackets.<br>Did you complete the repair?   | Go to <b>Step 15</b>   | Go to <b>Step 10</b>                             |
| 10  | Inspect for improper, loose or missing fasteners.<br>Did you find the condition?  | Go to <b>Step 11</b>   | Go to <b>Step 12</b>                             |
| 11  | Tighten any loose fasteners.<br>Replace any improper or missing fasteners. Refer to <b><u>Fastener Tightening Specifications</u></b> .<br>Did you complete the repair?              | Go to <b>Step 15</b>   | Go to <b>Step 12</b>                             |
| 12  | Inspect for a bent pulley.<br>Did you find the condition?   | Go to <b>Step 13</b>   | Go to <b>Step 14</b>                             |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |   |                      |                       |
|----|---|----------------------|-----------------------|
| 13 | Replace the bent pulley.<br>Did you complete the repair?  | Go to <b>Step 15</b> | Go to <b>Step 14</b>  |
| 14 | Replace the drive belt. Refer to <b><u>Drive Belt Replacement</u></b> .<br>Did you complete the repair? | Go to <b>Step 15</b> | Go to Diagnostic Aids |
| 15 | Operate the system in order to verify the repair.<br>Did you correct the condition?                     | System OK            | Go to <b>Step 3</b>   |

### DRIVE BELT SQUEAL DIAGNOSIS

#### Diagnostic Aids

A loose or improper installation of a body component, a suspension component, or other items of the vehicle may cause the squeal noise.

If the noise is intermittent, verify the accessory drive components by varying their loads making sure they are operated to their maximum capacity. An overcharged A/C system, power steering system with a pinched hose or wrong fluid, or a generator failing are suggested items to inspect.

#### Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

- 2:** The noise may not be engine related. This step is to verify that the engine is making the noise. If the engine is not making the noise do not proceed further with this table
- 3:** The noise may be an internal engine noise. Removing the drive belt and operating the engine for a brief period will verify the squeal noise is the drive belt(s) or an accessory drive component. When removing the drive belt the water pump may not be operating and the engine may overheat. Also DTCs may set when the engine is operating with the drive belt removed.
- 4:** This test is to verify that an accessory drive component does not have a seized bearing. With the belt remove test the bearings in the accessory drive components for turning smoothly. Also test the accessory drive components with the engine operating by varying the load on the components to verify that the components operate properly.
- 5:** This test is to verify that the drive belt tensioner operates properly. If the drive belt tensioner is not operating properly, proper belt tension may not be achieved to keep the drive belt from slipping which could cause a squeal noise.
- 6:** This test is to verify that the drive belt(s) is not too long, which would prevent the drive belt tensioner from working properly. Also if an incorrect length drive belt was installed, it may not be routed properly and may be turning an accessory drive component in the wrong direction.
- 7:** Misalignment of the pulleys may be caused from improper mounting of the accessory drive component, incorrect installation of the accessory drive component pulley, or the pulley bent inward or outward from a previous repair. Test for a misalign pulley using a straight edge in the pulley grooves across two or three pulleys. If a misalign pulley is found refer to that accessory drive component for the proper installation procedure for that pulley.
- 8:** This test is to verify that the pulleys are the correct diameter or width. Using a known good vehicle compare the pulley sizes.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### Drive Belt Squeal Diagnosis

| Step  | Action  | Yes  | No  |
|---|---|--|---|
| <b>NOTE:</b><br>Refer to <b><u>Belt Dressing Notice</u></b> in Cautions and Notices.  |   |  |   |
| DEFINITION: The following items are indications of drive belt squeal:   |   |  |   |
| <ul style="list-style-type: none"><li>• A loud screeching noise that is caused by a slipping drive belt (this is unusual for a drive belt with multiple ribs)</li><li>• The noise occurs when a heavy load is applied to the drive belt, such as an air conditioning compressor engagement snapping the throttle, or slipping on a seized pulley or a faulty accessory drive component.</li></ul> |   |  |   |
| 1   | Did you review the Drive Belt Symptom operation and perform the necessary inspections?  | Go to <b>Step 2</b>  | Go to <b><u>Symptoms - Engine Mechanical</u></b>        |
| 2   | Verify that there is a squeal noise.<br>Does the engine make the squeal noise?  | Go to <b>Step 3</b>  | Go to Diagnostic Aids                                   |
| 3   | 1. Remove the drive belt(s). Refer to <b><u>Drive Belt Replacement</u></b><br>2. Operate the engine for no longer than 30 to 40 seconds.<br><br>Does the noise still exist? | Go to <b><u>Engine Noise on Start-Up, but Only Lasting a Few Seconds</u></b> | Go to <b>Step 4</b>                                     |
| 4   | Inspect for an accessory drive component seized bearing or a faulty accessory drive component.<br>Did you find and correct the condition?                                   | Go to <b>Step 9</b>  | Go to <b>Step 5</b>                                     |
| 5   | Test the drive belt tensioner for proper operation. Refer to <b><u>Drive Belt Tensioner Diagnosis</u></b><br>Did you find and correct the condition?                        | Go to <b>Step 9</b>  | Go to <b>Step 6</b>                                     |
| 6   | Inspect for the correct drive belt length. Refer to <b><u>Drive Belt Replacement</u></b><br>Did you find and correct the condition?   | Go to <b>Step 9</b>  | Go to <b>Step 7</b>                                     |
| 7   | Inspect for misalignment of a pulley.<br>-<br>Did you find and correct the condition?   | Go to <b>Step 9</b>  | Go to <b>Step 8</b>                                     |
| 8   | Inspect for the correct pulley size.<br>Did you find and correct the condition?   | Go to <b>Step 9</b>  | Go to <b><u>Drive Belt Idler Pulley Replacement</u></b> |
| 9   | Operate the system in order to verify the repair.<br>Did you correct the condition?   | System OK  | Go to <b>Step 3</b>                                     |

### DRIVE BELT WHINE DIAGNOSIS

#### Diagnostic Aids

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

The drive belt(s) will not cause the whine noise.

If the whine noise is intermittent, verify the accessory drive components by varying their loads making sure they are operated to their maximum capacity. Such items but not limited to may be an A/C system overcharged, the power steering system restricted or the wrong fluid, or the generator failing.

### Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

**3:** This test is to verify that the noise is being caused by the drive belt(s) or the accessory drive components. When removing the drive belt the water pump may not be operating and the engine may overheat. Also DTCs may set when the engine is operating with the drive belt removed.

**4:** The inspection should include checking the drive belt tensioner and the drive belt idler pulley bearings. The drive belt(s) may have to be installed and the accessory drive components operated separately by varying their loads. Refer to the suspected accessory drive component for the proper inspection and replacement procedure.

### Drive Belt Whine Diagnosis

| Step  | Action  | Yes  | No   |
|---|---|--|--|
| <b>NOTE:</b><br>Refer to <b><u>Belt Dressing Notice</u></b> in Cautions and Notices.                                  |   |  |  |
| <b>DEFINITION:</b> A high pitched continuous noise that may be caused by an accessory drive component failed bearing. |   |  |  |
| 1   | Did you review the Drive Belt Symptom operation and perform the necessary inspections?  | Go to <b>Step 2</b>  | Go to <b><u>Symptoms - Engine Mechanical</u></b> |
| 2   | Verify that there is a whine noise.<br>Does the engine make the whine noise?  | Go to <b>Step 3</b>  | Go to Diagnostic Aids                            |
| 3   | 1. Remove the drive belt(s). Refer to <b><u>Drive Belt Replacement</u></b> .<br>2. Operate the engine for no longer than 30 to 40 seconds.<br><br>Does the whine noise still exist? | Go to <b><u>Engine Noise on Start-Up, but Only Lasting a Few Seconds</u></b> | Go to <b>Step 4</b>                              |
| 4   | Inspect for a failed accessory drive component bearing.<br>Did you find and repair the condition?   | Go to <b>Step 5</b>  | Go to Diagnostic Aids                            |
| 5   | Operate the system in order to verify the repair.<br>Did you correct the condition?   | System OK  | -  |

### DRIVE BELT RUMBLING DIAGNOSIS

#### Diagnostic Aids

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

Vibration from the engine operating may cause a body component or another part of the vehicle to make rumbling noise.

The drive belt(s) may have a condition that can not be seen or felt. Sometimes replacing the drive belt may be the only repair for the symptom.

If replacing the drive belt(s), completing the diagnostic table, and the noise is only heard when the drive belt(s) is installed, there might be an accessory drive component with a failure. Varying the load on the different accessory drive components may aid in identifying which component is causing the rumbling noise.

### Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

**2:** This test is to verify that the symptom is present during diagnosing. Other vehicle components may cause a similar symptom.

**3:** This test is to verify that the drive belt(s) is causing the rumbling noise. Rumbling noise may be confused with an internal engine noise due to the similarity in the description. Remove only one drive belt at a time if the vehicle has multiple drive belts. When removing the drive belt the water pump may not be operating and the engine may overheat. Also DTCs may set when the engine is operating with the drive belt removed.

**4:** Inspecting the drive belt(s) is to ensure that it is not causing a the noise. Small cracks across the ribs of the drive belt will not cause the noise. Belt separation is identified by the plys of the belt separating and may be seen at the edge of the belt or felt as a lump in the belt.

**5:** Small amounts of pilling is normal condition and acceptable. When the pilling is severe the drive belt does not have a smooth surface for proper operation.

### Drive Belt Rumbling Diagnosis

| Step   | Action   | Yes                 | No   |
|--|--|---------------------|--|
| <b>NOTE:</b><br>Refer to <b><u>Belt Dressing Notice</u></b> in Cautions and Notices.   |  |                     |  |
| <b>DEFINITION:</b> <ul style="list-style-type: none"><li>• A low pitch tapping, knocking, or thumping noise heard at or just above idle.</li><li>• Heard once per revolution of the drive belt or a pulley.</li><li>• Rumbling may be caused from:<ul style="list-style-type: none"><li>○ Pilling, the accumulation of rubber dust that forms small balls (pills) or strings in the drive belt pulley groove</li><li>○ The separation of the drive belt</li><li>○ A damaged drive belt</li></ul></li></ul> |  |                     |  |
| 1  | Did you review the Drive Belt Symptom operation and perform the necessary inspections? | Go to <b>Step 2</b> | Go to <b><u>Symptoms - Engine Mechanical</u></b> |
|  |  |                     |  |

**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|   |  |  |                       |
|---|--|--|-----------------------|
| 2 | Verify that there is a rumbling noise.<br>Does the engine make the rumbling noise?   | Go to <b>Step 3</b>  | Go to Diagnostic Aids |
| 3 | 1. Remove the drive belt(s). Refer to <b><u>Drive Belt Replacement</u></b><br>2. Operate the engine for no longer than 30 to 40 seconds.<br><br>Does the rumbling noise still exist? | Go to <b><u>Engine Noise on Start-Up, but Only Lasting a Few Seconds</u></b> | Go to <b>Step 4</b>   |
| 4 | Inspect the drive belt(s) for damage, separation, or sections of missing ribs.<br>Did you find any of these conditions?  | Go to <b>Step 7</b>  | Go to <b>Step 5</b>   |
| 5 | Inspect for severe pilling of more than 1/3 of the drive belt pulley grooves.<br>Did you find severe pilling?  | Go to <b>Step 6</b>  | Go to <b>Step 7</b>   |
| 6 | 1. Clean the drive belt pulleys using a suitable wire brush.<br>2. Reinstall the drive belt. Refer to <b><u>Drive Belt Replacement</u></b><br><br>Did you complete the repair?       | Go to <b>Step 8</b>  | Go to <b>Step 7</b>   |
| 7 | Install a new drive belt. Refer to <b><u>Drive Belt Replacement</u></b><br>Did you complete the replacement?   | Go to <b>Step 8</b>  | -                     |
| 8 | Operate the system in order to verify the repair.<br>Did you correct the condition?  | System OK  | Go to Diagnostic Aids |

**DRIVE BELT VIBRATION DIAGNOSIS****Diagnostic Aids**

The accessory drive components can have an affect on engine vibration. Such as but not limited to the A/C system over charged, the power steering system restricted or the incorrect fluid, or an extra load on the generator. To help identify an intermittent or an improper condition, vary the loads on the accessory drive components.

**Test Description**

The number(s) below refer to the step number(s) on the diagnostic table.

**2:** This test is to verify that the symptom is present during diagnosing. Other vehicle components may cause a similar symptom such as the exhaust system, or the drivetrain.

**3:** This test is to verify that the drive belt(s) or accessory drive components may be causing the vibration. When removing the drive belt the water pump may not be operating and the engine may overheat. Also DTCs may set when the engine is operating with the drive belt removed.

**4:** The drive belt(s) may cause a vibration. While the drive belt(s) is removed this is the best time to

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

inspect the condition of the belt.

**6:** Inspecting of the fasteners can eliminate the possibility that a wrong bolt, nut, spacer, or washer was installed.

**8:** This step should only be performed if the fan is driven by the drive belt. Inspect the engine cooling fan for bent, twisted, loose, or cracked blades. Inspect the fan clutch for smoothness, ease of turning. Inspect for a bent fan shaft or bent mounting flange.

**9:** This step should only be performed if the water pump is driven by the drive belt. Inspect the water pump shaft for being bent. Also inspect the water pump bearings for smoothness and excessive play. Compare the water pump with a known good water pump.

**10:** Accessory drive component brackets that are bent, cracked, or loose may put extra strain on that accessory component causing it to vibrate.

### Drive Belt Vibration Diagnosis

| Step  | Action   | Yes  | No   |
|---|--|--|--|
| <b>NOTE:</b><br>Refer to <b><u>Belt Dressing Notice</u></b> in Cautions and Notices.  |  |  |  |
| DEFINITION: The following items are indications of drive belt vibration: <ul style="list-style-type: none"><li>• The vibration is engine-speed related.</li><li>• The vibration may be sensitive to accessory load.</li></ul> |  |  |  |
| 1   | Did you review the Drive Belt Symptom operation and perform the necessary inspections?   | Go to <b>Step 2</b>  | Go to <b><u>Symptoms - Engine Mechanical</u></b> |
| 2   | Verify that the vibration is engine related.<br>Does the engine make the vibration?  | Go to <b>Step 3</b>  | Go to Diagnostic Aids                            |
| 3   | 1. Remove the drive belt. Refer to <b><u>Drive Belt Replacement</u></b><br>2. Operate the engine for no longer than 30 to 40 seconds.<br><br>Does the engine still make the vibration? | Go to <b><u>Diagnostic Starting Point - Vibration Diagnosis and Correction</u></b> in Vibration Diagnosis and Correction | Go to <b>Step 4</b>                              |
| 4   | Inspect the drive belt for wear, damage, debris build-up and missing drive belt ribs.<br>Did you find any of these conditions?   | Go to <b>Step 5</b>  | Go to <b>Step 6</b>                              |
| 5   | Install a new drive belt. Refer to <b><u>Drive Belt Replacement</u></b><br>Did you complete the replacement?   | Go to <b>Step 11</b>   | Go to <b>Step 6</b>                              |
| 6   | Inspect for improper, loose or missing fasteners.<br>Did you find any of these conditions?   | Go to <b>Step 7</b>  | Go to <b>Step 8</b>                              |
|   | 1. Tighten any loose fasteners.<br>2. Replace improper or missing fasteners. Refer to  |  |  |



## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

|    |  |                      |                       |
|----|--|----------------------|-----------------------|
| 7  | <b><u>Fastener Tightening Specifications.</u></b><br>Did you complete the repair?  | Go to <b>Step 11</b> | Go to <b>Step 8</b>   |
| 8  | Inspect for damaged fan blades or bent fan clutch shaft, if the fan is belt driven. Refer to <b><u>Cooling Fan and Shroud Replacement</u></b><br>Did you find and correct the condition?                               | Go to <b>Step 11</b> | Go to <b>Step 9</b>   |
| 9  | Inspect for a bent water pump shaft, if the water pump is belt driven. Refer to <b><u>Water Pump Replacement (LL8)</u></b> and <b><u>Water Pump Replacement (LM4)</u></b> .<br>Did you find and correct the condition? | Go to <b>Step 11</b> | Go to <b>Step 10</b>  |
| 10 | Inspect for bent or cracked brackets.<br>Did you find and correct the condition?   | Go to <b>Step 11</b> | Go to Diagnostic Aids |
| 11 | Operate the system in order to verify the repair.<br>Did you correct the condition?  | System OK            | Go to <b>Step 3</b>   |

### DRIVE BELT FALLS OFF DIAGNOSIS

#### Diagnostic Aids

If the drive belt(s) repeatedly falls off the drive belt pulleys, this is because of pulley misalignment.

An extra load that is quickly applied on released by an accessory drive component may cause the drive belt to fall off the pulleys. Verify the accessory drive components operate properly.

If the drive belt(s) is the incorrect length, the drive belt tensioner may not keep the proper tension on the drive belt.

#### Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

**2:** This inspection is to verify the condition of the drive belt. Damage may of occurred to the drive belt when the drive belt fell off. The drive belt may of been damaged, which caused the drive belt to fall off. Inspect the belt for cuts, tears, sections of ribs missing, or damaged belt plys.

**4:** Misalignment of the pulleys may be caused from improper mounting of the accessory drive component, incorrect installation of the accessory drive component pulley, or the pulley bent inward or outward from a previous repair. Test for a misalign pulley using a straight edge in the pulley grooves across two or three pulleys. If a misalign pulley is found refer to that accessory drive component for the proper installation procedure of that pulley.

**5:** Inspecting the pulleys for being bent should include inspecting for a dent or other damage to the pulleys that would prevent the drive belt from not seating properly in all of the pulley grooves or on the smooth surface of a pulley when the back side of the belt is used to drive the pulley.

**6:** Accessory drive component brackets that are bent or cracked will let the drive belt fall off.

**7:** Inspecting of the fasteners can eliminate the possibility that a wrong bolt, nut, spacer, or washer was

**2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

installed. Missing, loose, or the wrong fasteners may cause pulley misalignment from the bracket moving under load. Over tightening of the fasteners may cause misalignment of the accessory component bracket.

**Drive Belt Falls Off Diagnosis**

| Step  | Action  | Yes                  | No   |
|---|---|----------------------|--|
| <b>NOTE:</b><br>Refer to <b><u>Belt Dressing Notice</u></b> in Cautions and Notices.              |   |                      |  |
| <b>DEFINITION:</b> The drive belt falls off the pulleys or may not ride correctly on the pulleys. |   |                      |  |
| 1   | Did you review the Drive Belt Symptom operation and perform the necessary inspections?  | Go to <b>Step 2</b>  | Go to <b><u>Symptoms - Engine Mechanical</u></b> |
| 2   | Inspect for a damaged drive belt.<br>Did you find the condition?  | Go to <b>Step 3</b>  | Go to <b>Step 4</b>                              |
| 3   | Install a new drive belt. Refer to <b><u>Drive Belt Replacement</u></b> .<br>Does the drive belt continue to fall off?  | Go to <b>Step 4</b>  | System OK  |
| 4   | Inspect for misalignment of the pulleys.<br>Did you find and repair the condition?  | Go to <b>Step 12</b> | Go to <b>Step 5</b>                              |
| 5   | Inspect for a bent or dented pulley.<br>Did you find and repair the condition?  | Go to <b>Step 12</b> | Go to <b>Step 6</b>                              |
| 6   | Inspect for a bent or a cracked bracket.<br>Did you find and repair the condition?  | Go to <b>Step 12</b> | Go to <b>Step 7</b>                              |
| 7   | Inspect for improper, loose or missing fasteners.<br>Did you find loose or missing fasteners?   | Go to <b>Step 8</b>  | Go to <b>Step 9</b>                              |
| 8   | 1. Tighten any loose fasteners.<br>2. Replace improper or missing fasteners. Refer to <b><u>Fastener Tightening Specifications</u></b> .<br>Does the drive belt continue to fall off? | Go to <b>Step 9</b>  | System OK  |
| 9   | Test the drive belt tensioner for operating correctly.<br>Refer to <b><u>Drive Belt Tensioner Diagnosis</u></b> .<br>Does the drive belt tensioner operate correctly?                 | Go to <b>Step 11</b> | Go to <b>Step 10</b>                             |
| 10  | Replace the drive belt tensioner. Refer to <b><u>Drive Belt Tensioner Replacement</u></b> .<br>Does the drive belt continue to fall off?  | Go to <b>Step 11</b> | System OK  |
| 11  | Inspect for failed drive belt idler and drive belt tensioner pulley bearings.<br>Did you find and repair the condition?   | Go to <b>Step 12</b> | Go to Diagnostic Aids                            |
| 12  | Operate the system in order to verify the repair.<br>Did you correct the condition?   | System OK            | Go to <b>Step 2</b>                              |

**DRIVE BELT EXCESSIVE WEAR DIAGNOSIS**

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### Diagnostic Aids

Excessive wear on a drive belt(s) is usually caused by an incorrect installation or the wrong drive belt for the application.

Minor misalignment of the drive belt pulleys will not cause excessive wear, but will probably cause the drive belt(s) to make a noise or to fall off.

Excessive misalignment of the drive belt pulleys will cause excessive wear but may also make the drive belt(s) fall off.

### Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

**2:** The inspection is to verify the drive belt(s) is correctly installed on all of the drive belt pulleys. Wear on the drive belt(s) may be caused by mis-positioning the drive belt(s) by one groove on a pulley.

**3:** The installation of a drive belt that is too wide or too narrow will cause wear on the drive belt. The drive belt ribs should match all of the grooves on all of the pulleys.

**4:** This inspection is to verify the drive belt(s) is not contacting any parts of the engine or body while the engine is operating. There should be sufficient clearance when the drive belt accessory drive components load varies. The drive belt(s) should not come in contact with an engine or a body component when snapping the throttle.

### Drive Belt Excessive Wear Diagnosis

| Step   | Action   | Yes                 | No   |
|--|--|---------------------|--|
| <b>NOTE:</b><br>Refer to <b><u>Belt Dressing Notice</u></b> in Cautions and Notices.               |  |                     |  |
| DEFINITION: Wear at the outside ribs of the drive belt due to an incorrectly installed drive belt. |  |                     |  |
| 1  | Did you review the Drive Belt Symptom operation and perform the necessary inspections?   | Go to <b>Step 2</b> | Go to <b><u>Symptoms - Engine Mechanical</u></b> |
| 2  | Inspect the drive belt(s) for the proper installation. Refer to <b><u>Drive Belt Replacement</u></b> .<br>Did you find this condition? | Go to <b>Step 5</b> | Go to <b>Step 3</b>                              |
| 3  | Inspect for the proper drive belt.<br>Did you find this condition?   | Go to <b>Step 5</b> | Go to <b>Step 4</b>                              |
| 4  | Inspect for the drive belt rubbing against a bracket, hose, or wiring harness.<br>Did you find and repair the condition?               | Go to <b>Step 6</b> | Go to Diagnostic Aids                            |
| 5  | Replace the drive belt. Refer to <b><u>Drive Belt Replacement</u></b> .<br>Did you complete the replacement?                           | Go to <b>Step 6</b> | -  |
| 6  | Operate the system in order to verify the repair.  |                     |  |

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

Did you correct the condition?

System OK

-

### DRIVE BELT TENSIONER DIAGNOSIS

#### Inspection Procedure

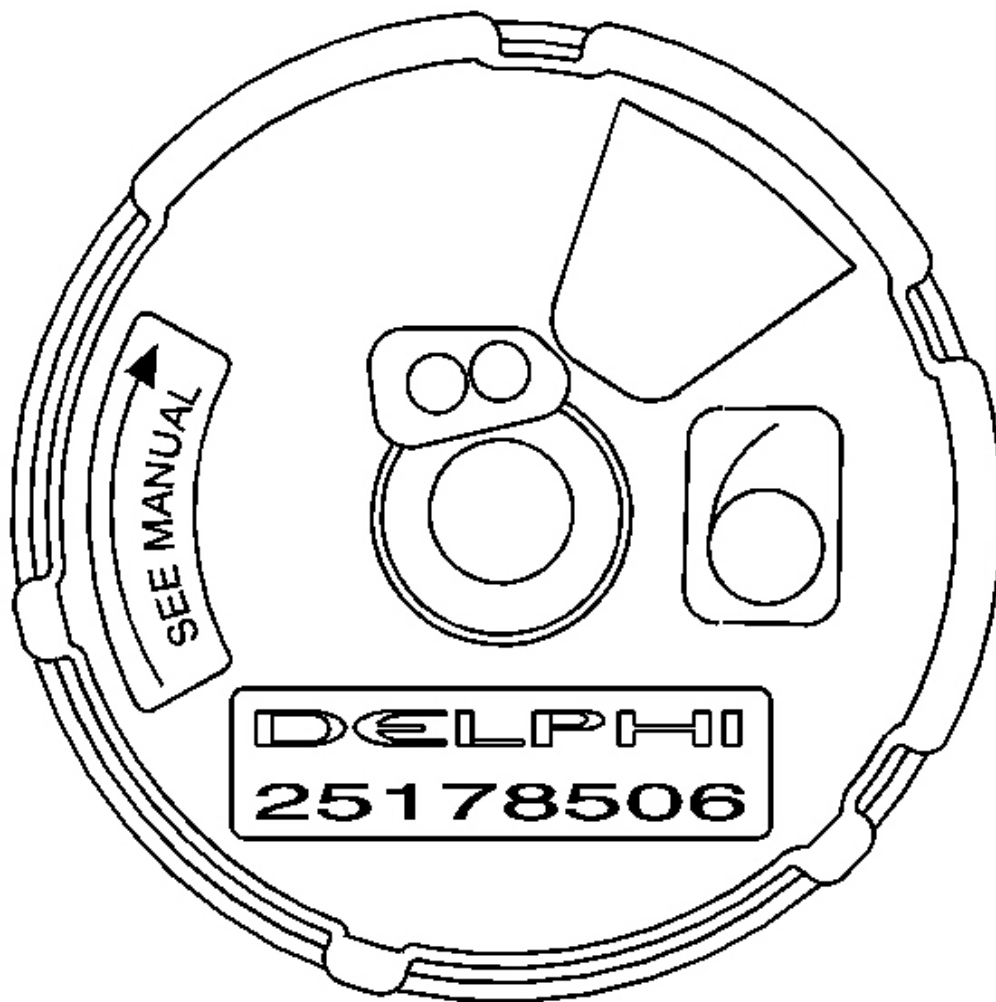
**NOTE:** Allowing the drive belt tensioner to snap into the free position may result in damage to the tensioner.

1. Remove the drive belts. Refer to **Drive Belt Replacement**.
2. Position a hex-head socket on the belt tensioner pulley bolt head.
3. Move the drive belt tensioner through it's full travel.
  - The movement should feel smooth.
  - There should be no binding.
  - The tensioner should return freely.
4. If any binding is observed, replace the tensioner. Refer to **Drive Belt Tensioner Replacement**.
5. Install the drive belt. Refer to **Drive Belt Replacement**.

### CAMSHAFT POSITION (CMP) ACTUATOR DIAGNOSIS

For overall description of the camshaft position sensor refer to **Exhaust Camshaft Position Actuator Description**.

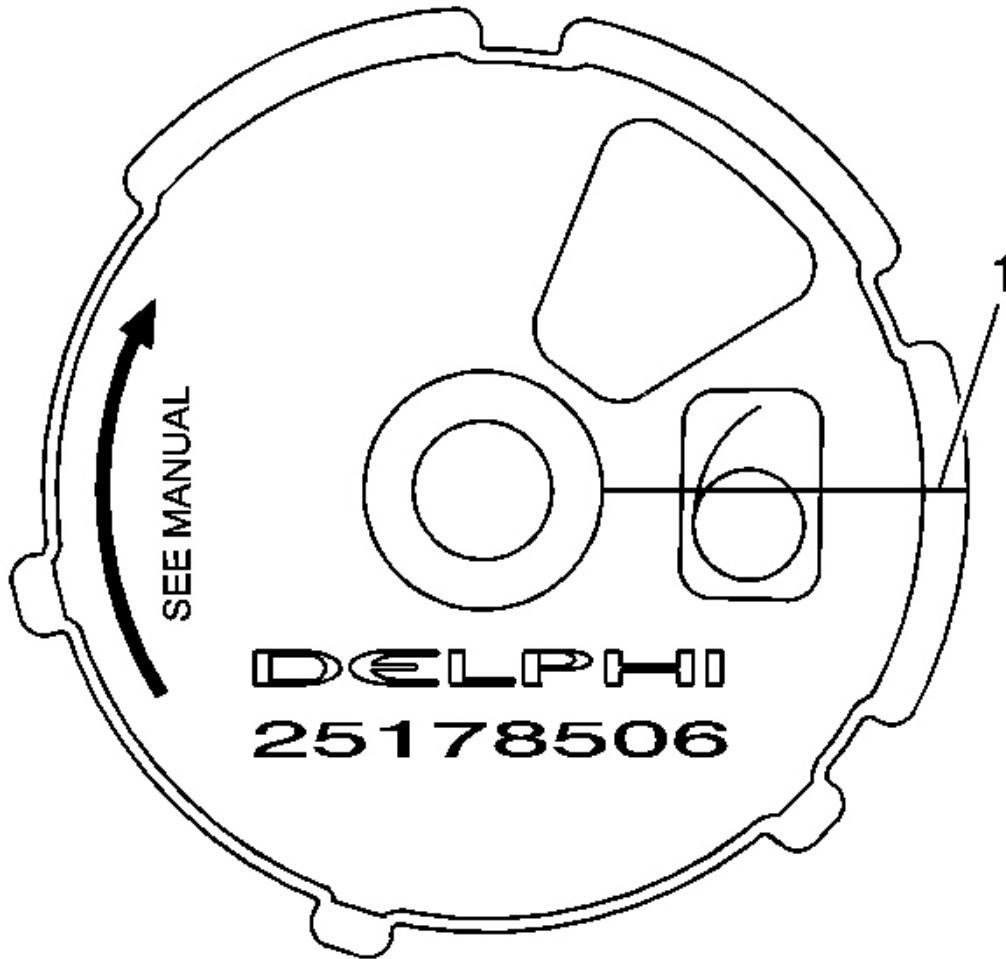
The camshaft position actuator will only phase 25-cam degrees retard (counterclockwise). Full advance (clockwise) is 0 degrees. The arrow on the actuator shows advance direction.



**Fig. 29: Identifying Camshaft Position (CMP) Actuator**  
Courtesy of GENERAL MOTORS CORP.

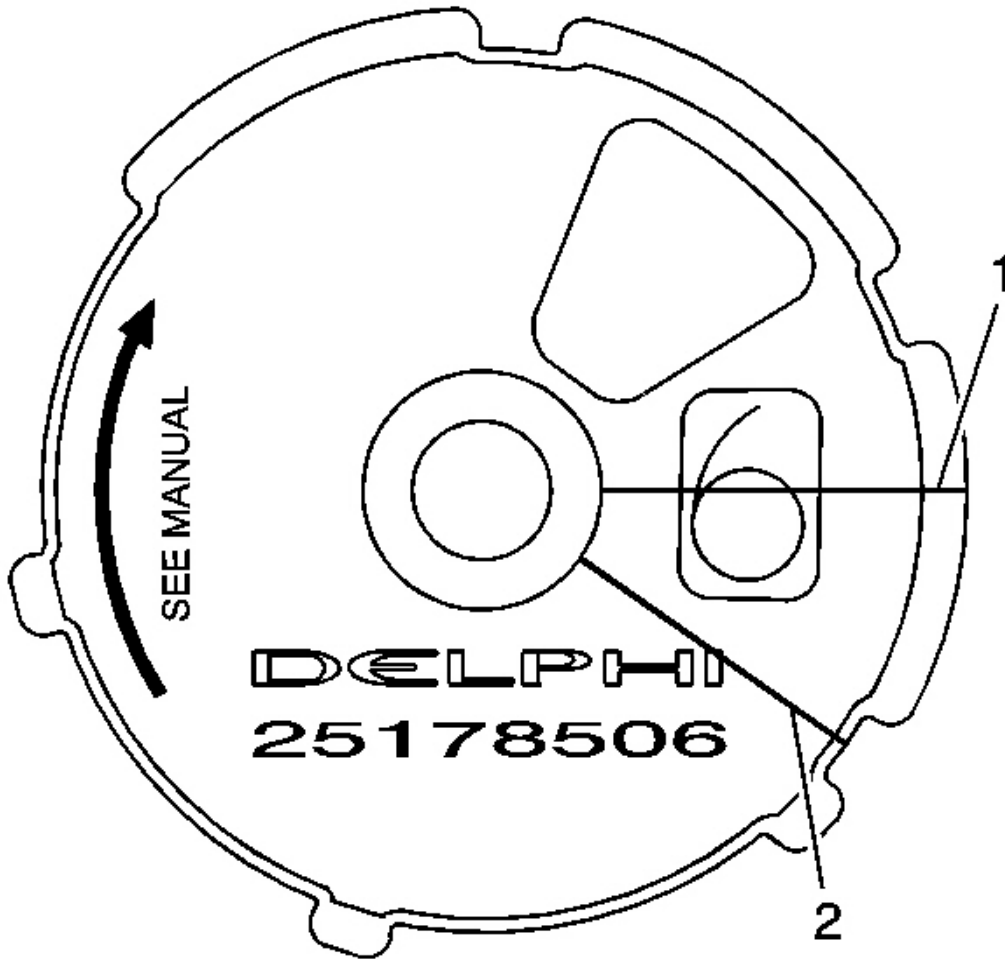
The camshaft position actuator should always be serviced/replaced in the full advanced position (full clockwise or 0 degrees). New replacement (service) camshaft position actuators are shipped at full advance or 0 degrees. To be sure the camshaft position actuator is performing properly, perform the following to help in the diagnostics.

1. Use a 25 mm (1 in) wrench on the hex of the exhaust camshaft to rotate the exhaust camshaft and camshaft position actuator back and forth (clockwise and counterclockwise) to purge the oil out of the camshaft position actuator.



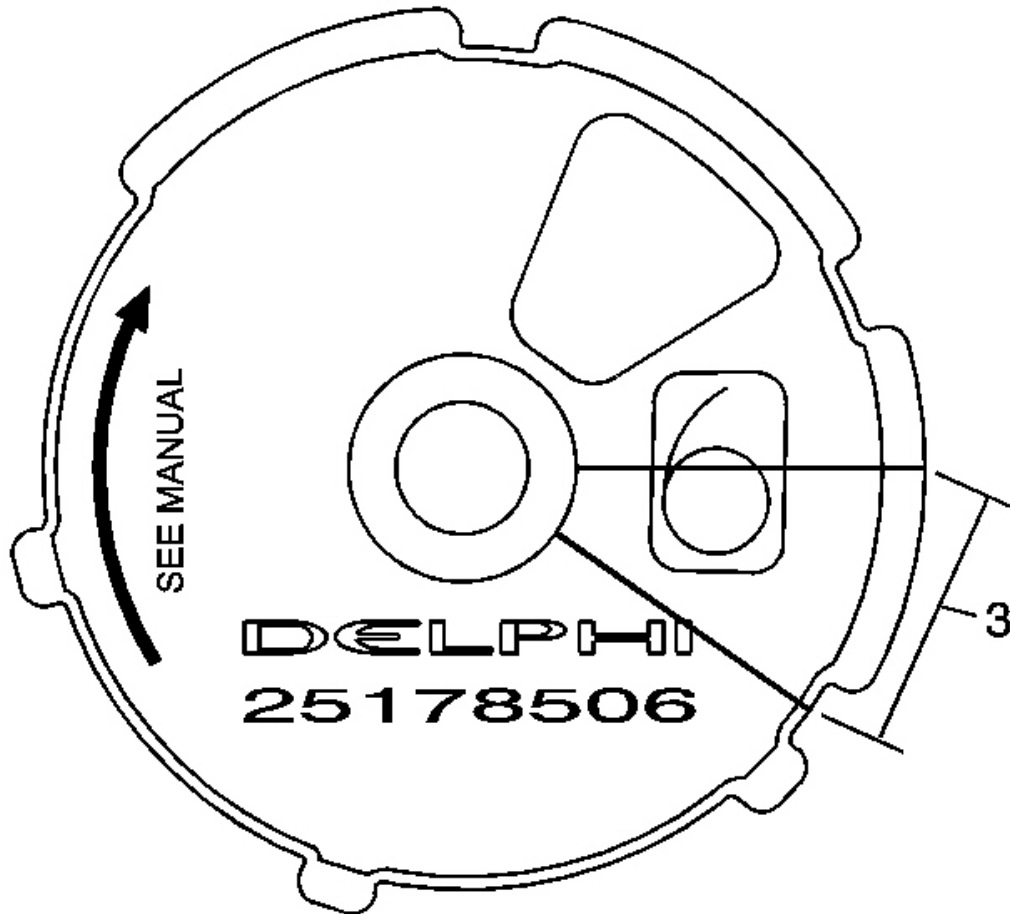
**Fig. 30: View Of Camshaft Position (CMP) Actuator Full Advanced Position**  
**Courtesy of GENERAL MOTORS CORP.**

2. To perform an on-vehicle test, scribe or draw a line (1) on the camshaft position actuator, flush with the head, in the full advanced position. See arrow on the camshaft position actuator. With the engine at TDC on #1 cylinder, the wording should be level.
3. Use a 25 mm (1 in) wrench on the hex of the exhaust camshaft to rotate the camshaft and camshaft position actuator counterclockwise to full retard.



**Fig. 31: View Of Camshaft Position (CMP) Actuator Full Retard Position**  
**Courtesy of GENERAL MOTORS CORP.**

4. Scribe or draw a line (2) on the camshaft position actuator at that position.



**Fig. 32: Measuring Distance Between The Two Camshaft Position (CMP) Actuator Positions**  
Courtesy of GENERAL MOTORS CORP.

5. Measure the distance between the two lines. The measurement (3) should be 14-15 mm (0.55-0.59 in). If the measurement is far more or far less, the camshaft position actuator needs to be replaced.

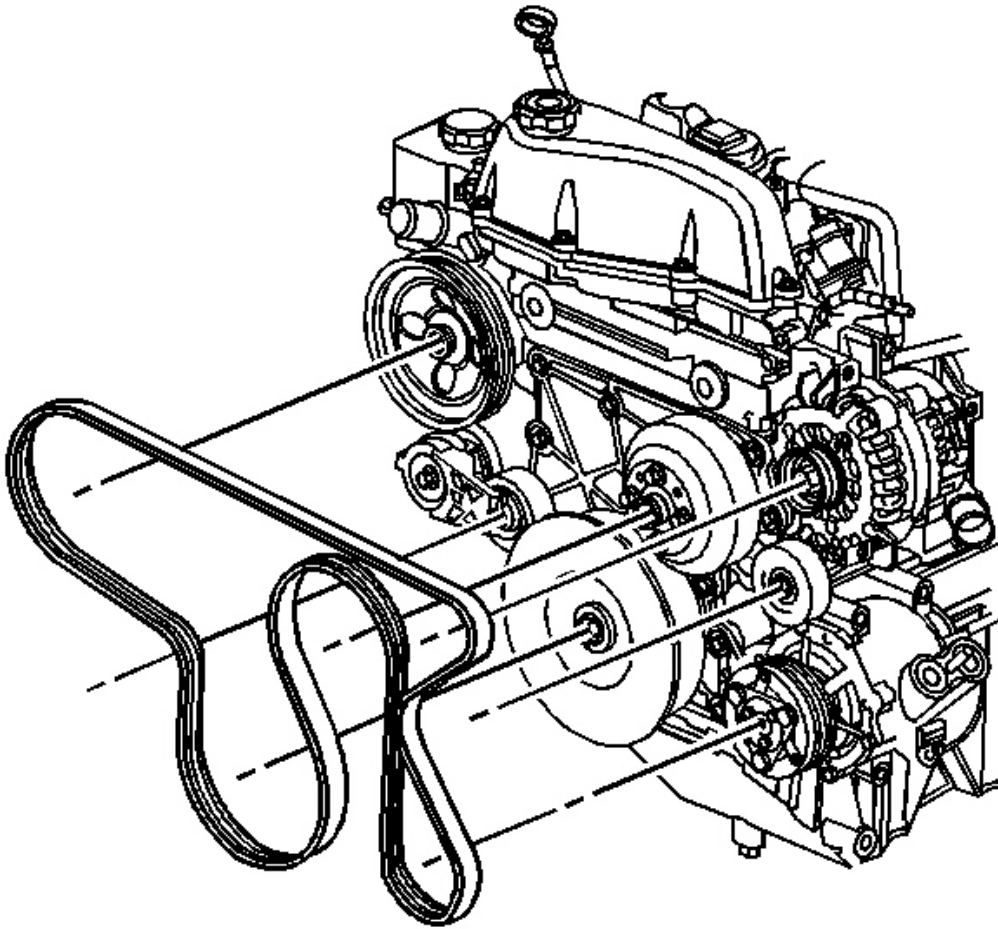
## REPAIR INSTRUCTIONS

### DRIVE BELT REPLACEMENT

#### Removal Procedure

1. Install 3/8 inch breaker bar on the drive belt tensioner arm and turn the breaker bar clockwise enough to relieve the tension on the drive belt.

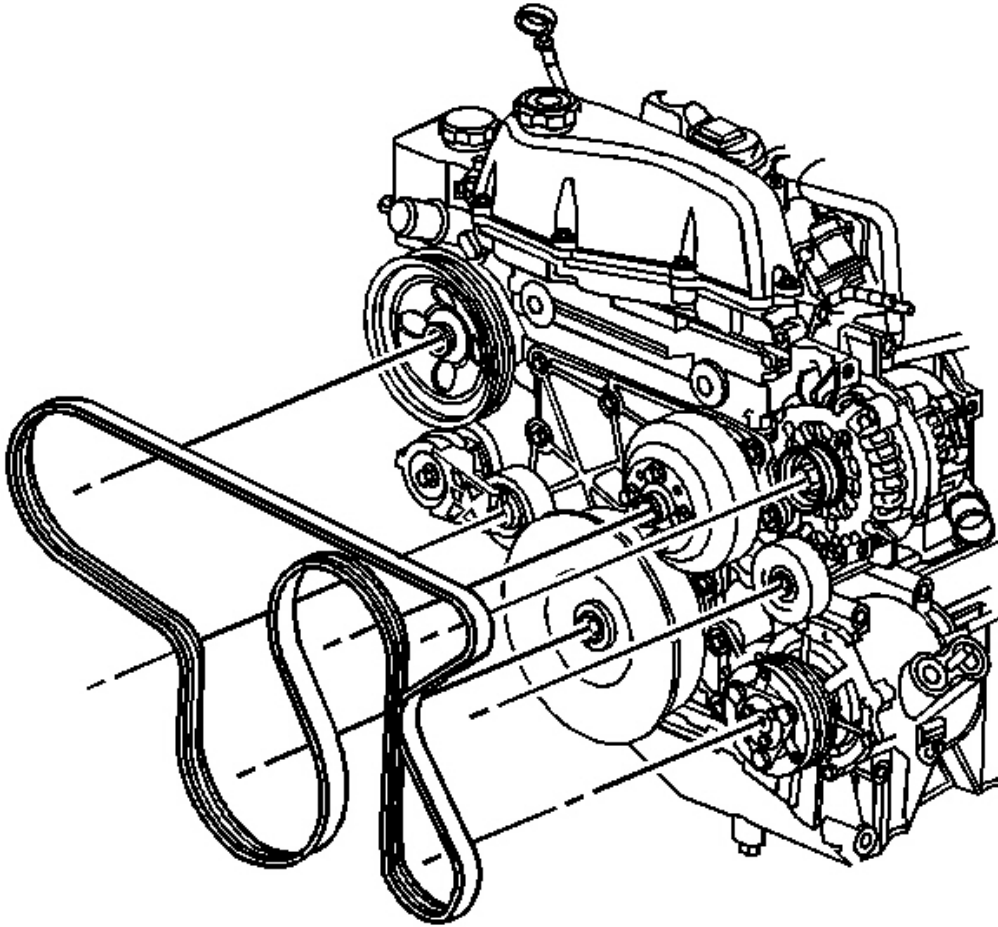




**Fig. 33: View Of Drive Belt**  
**Courtesy of GENERAL MOTORS CORP.**

2. Remove the drive belt.
3. Release the tension on the tensioner arm.

#### **Installation Procedure**



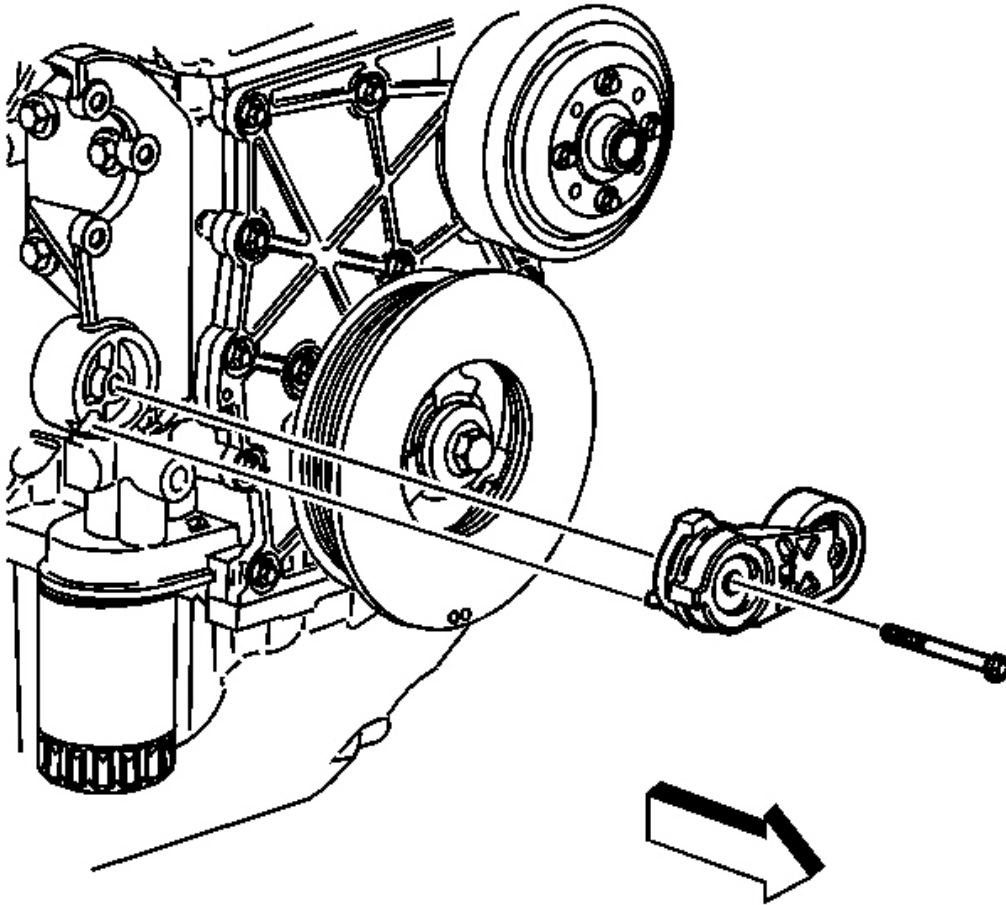
**Fig. 34: View Of Drive Belt**  
**Courtesy of GENERAL MOTORS CORP.**

1. Route the drive belt over all the pulleys except the drive belt tensioner pulley.
2. Install the 3/8 inch breaker bar on the drive belt tensioner arm and turn the breaker bar clockwise.
3. Install the drive belt over the drivebelt tensioner pulley.
4. Slowly release the tension to the drive belt tensioner arm.
5. Inspect for proper installation of the drive belt on the pulleys.

## **DRIVE BELT TENSIONER REPLACEMENT**

### **Removal Procedure**

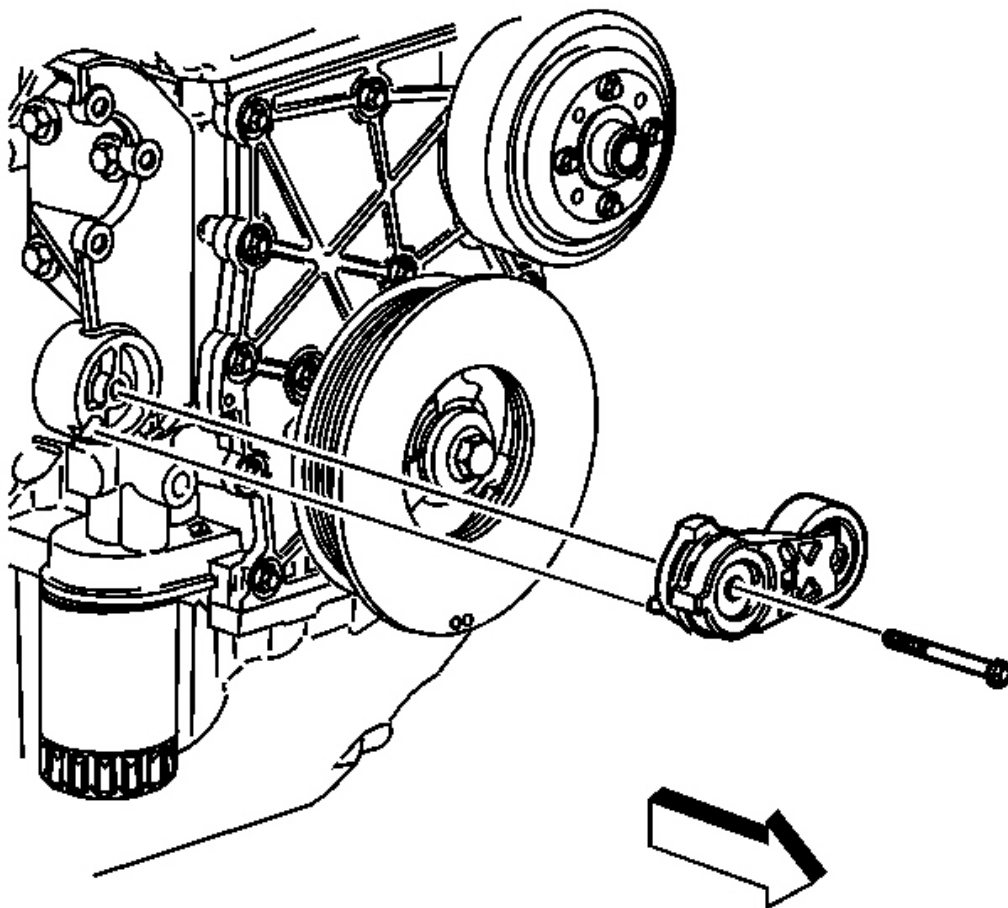
1. Remove the drive belt. Refer to **Drive Belt Replacement**.
2. Remove the drive belt tensioner bolt.



**Fig. 35: View Of Drive Belt Tensioner**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the drive belt tensioner.

#### **Installation Procedure**



**Fig. 36: View Of Drive Belt Tensioner**  
Courtesy of GENERAL MOTORS CORP.

1. Install the drive belt tensioner.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the drive belt tensioner bolt.

**Tighten:** Tighten the drive belt tensioner bolt to 50 N.m (37 lb ft).

3. Install the drive belt Drive Belt Replacement.

## DRIVE BELT IDLER PULLEY REPLACEMENT

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### Removal Procedure

1. Remove the drive belt. Refer to **Drive Belt Replacement**.
2. Remove the idler pulley bolt from the idler pulley bracket.
3. Remove idler pulley.

### Installation Procedure

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

1. Install the idler pulley and secure the pulley with the bolt.

**Tighten:** Tighten the idler pulley bolt to 50 N.m (37 lb ft).

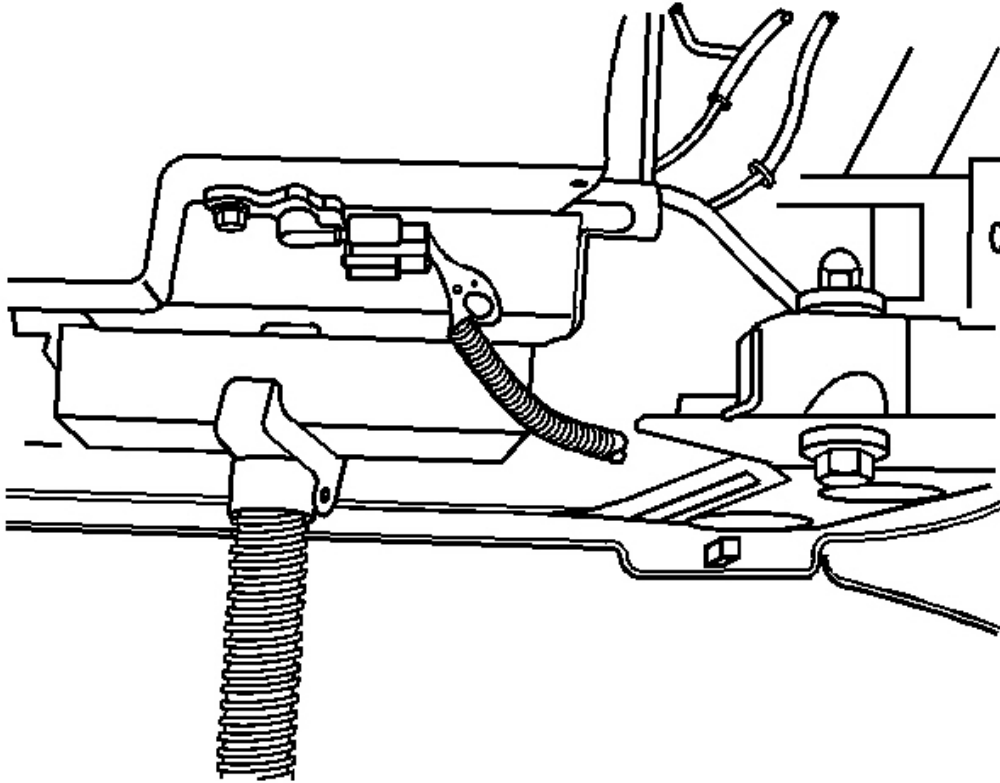
2. Install the drive belt. Refer to **Drive Belt Replacement**.

### ENGINE MOUNT INSPECTION

#### Front Engine Mount

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

1. Install a pole jack underneath the oil pan.

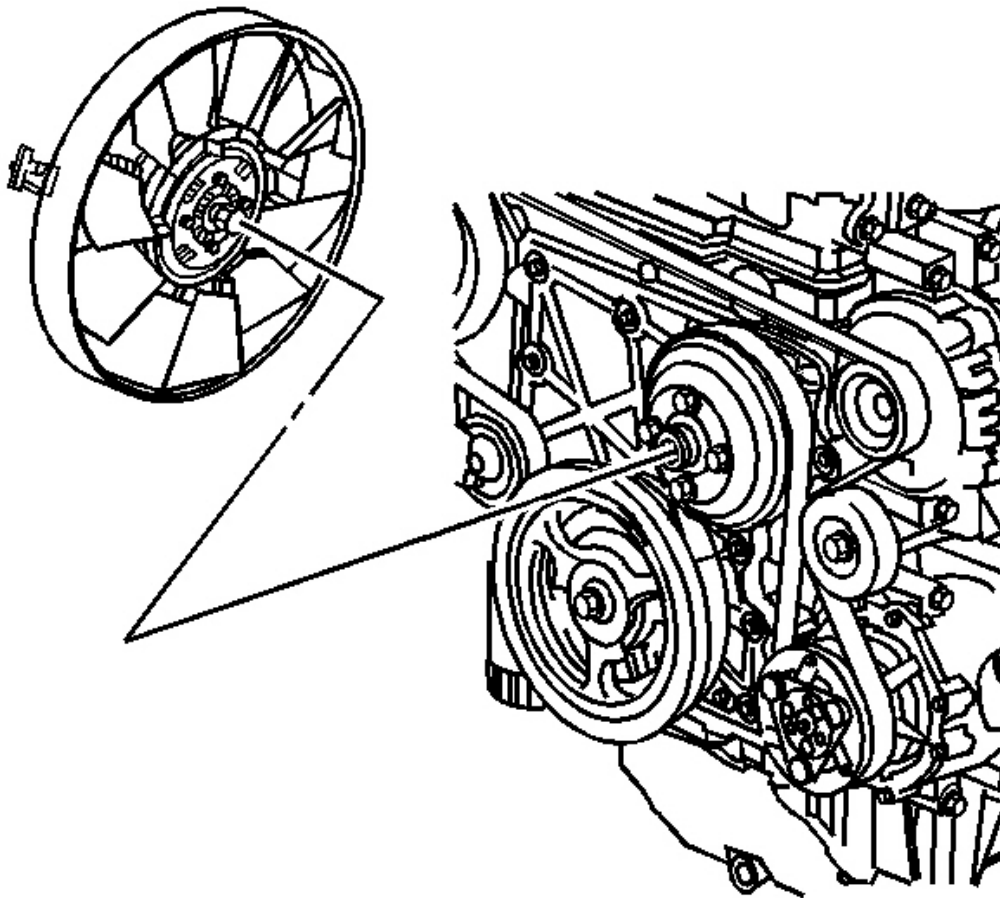


**Fig. 37: Block Of Wood Between Engine Oil Pan And Pole Jack**  
Courtesy of GENERAL MOTORS CORP.

2. Insert a block of wood between the engine oil pan and the pole jack.
3. Raise the jack until the wooden block contacts the engine oil pan.
4. Raise the engine in order to place a slight tension on the rubber cushion. Observe both mounts while raising the engine.
5. Replace the mounts if any of the following conditions exist:
  - Hard rubber surface covered with heat check cracks
  - The rubber cushion separated from the metal plate of the mount
  - The rubber cushion is split through the center
  - The mount is leaking
6. If there is movement between a metal plate of the mount and its attaching points, lower the engine and tighten the bolts or nuts attaching the mount to the engine, the frame or the bracket.

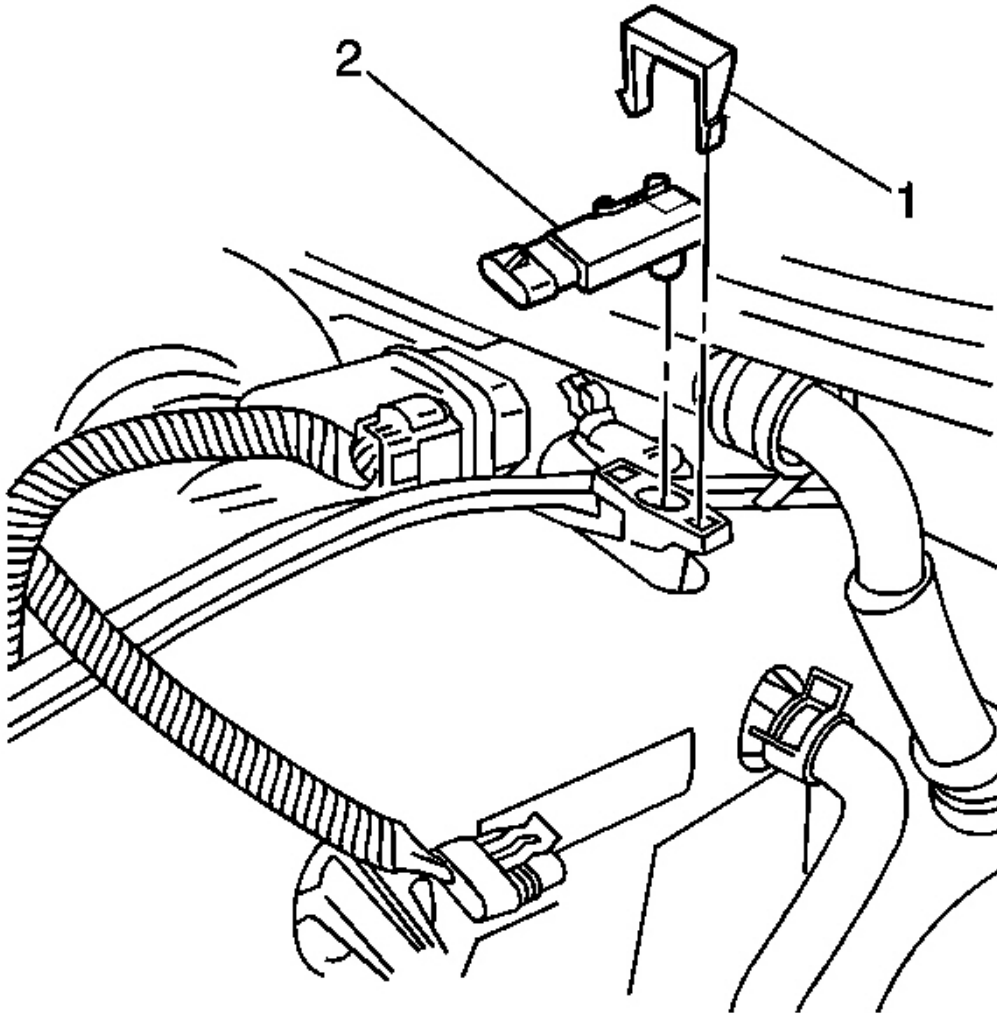
### Removal Procedure

1. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnect/Connect Procedure in Engine Electrical.



**Fig. 38: Identifying Cooling Fan**  
Courtesy of GENERAL MOTORS CORP.

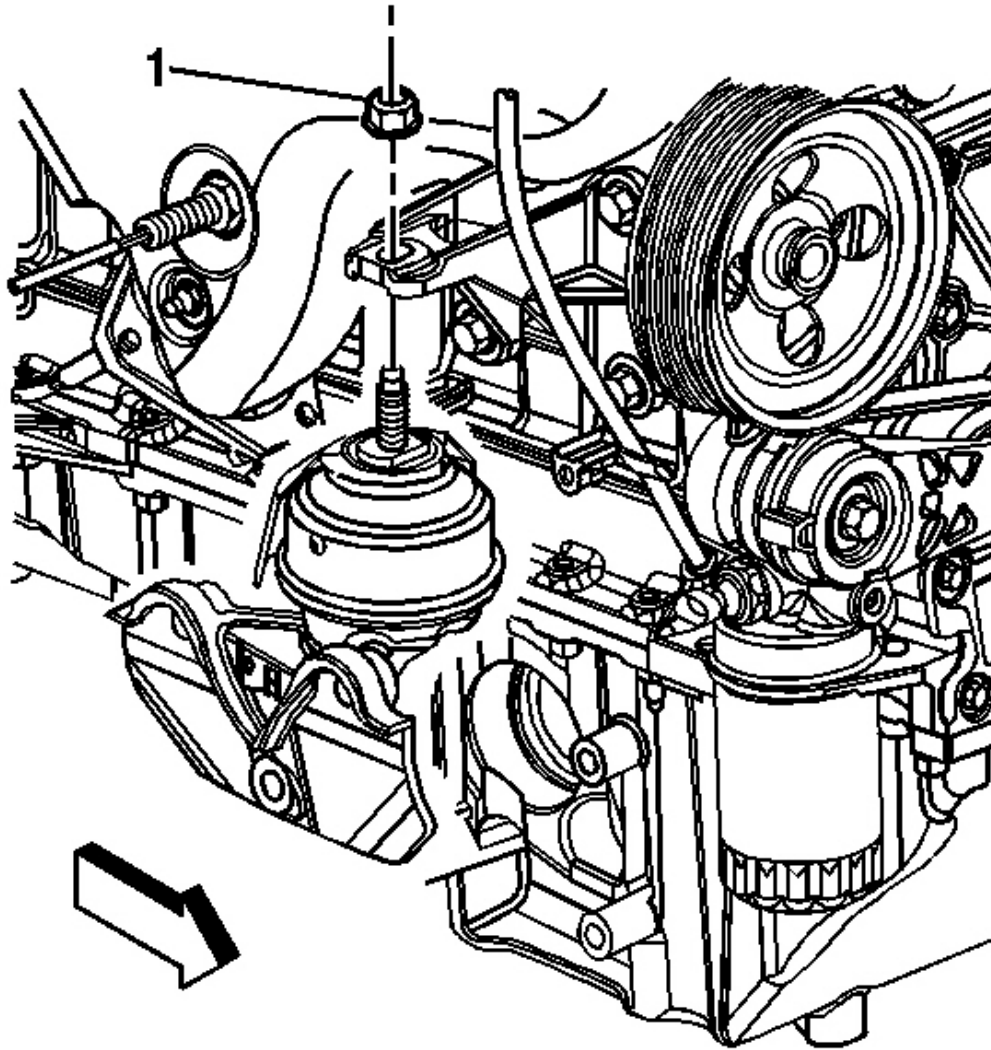
2. Remove the cooling fan. Refer to Cooling Fan and Shroud Replacement in Engine Cooling.



**Fig. 39: View Of MAP Sensor & Retainer**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the manifold absolute pressure (MAP) sensor electrical connector and the retainer (1).
4. Remove the MAP sensor (2).
5. Remove the left shock module (if frame mount is being removed). Refer to **Shock Module Replacement** in Front Suspension.



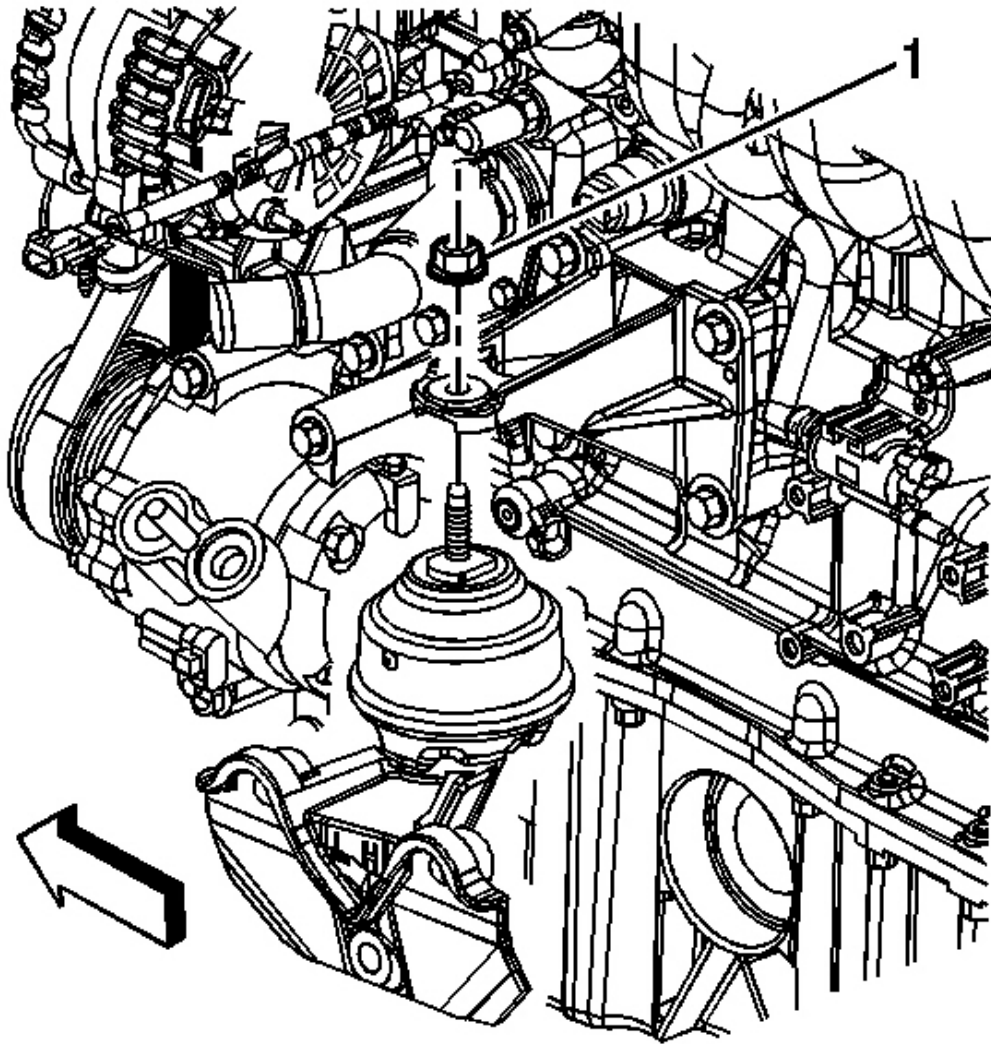


**Fig. 40: View Of Upper Engine Mount Nuts**  
Courtesy of GENERAL MOTORS CORP.

6. Remove the right and the left upper engine mount nuts (1).
7. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
8. Remove the right and the left lower engine mount nuts.
9. Remove the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.

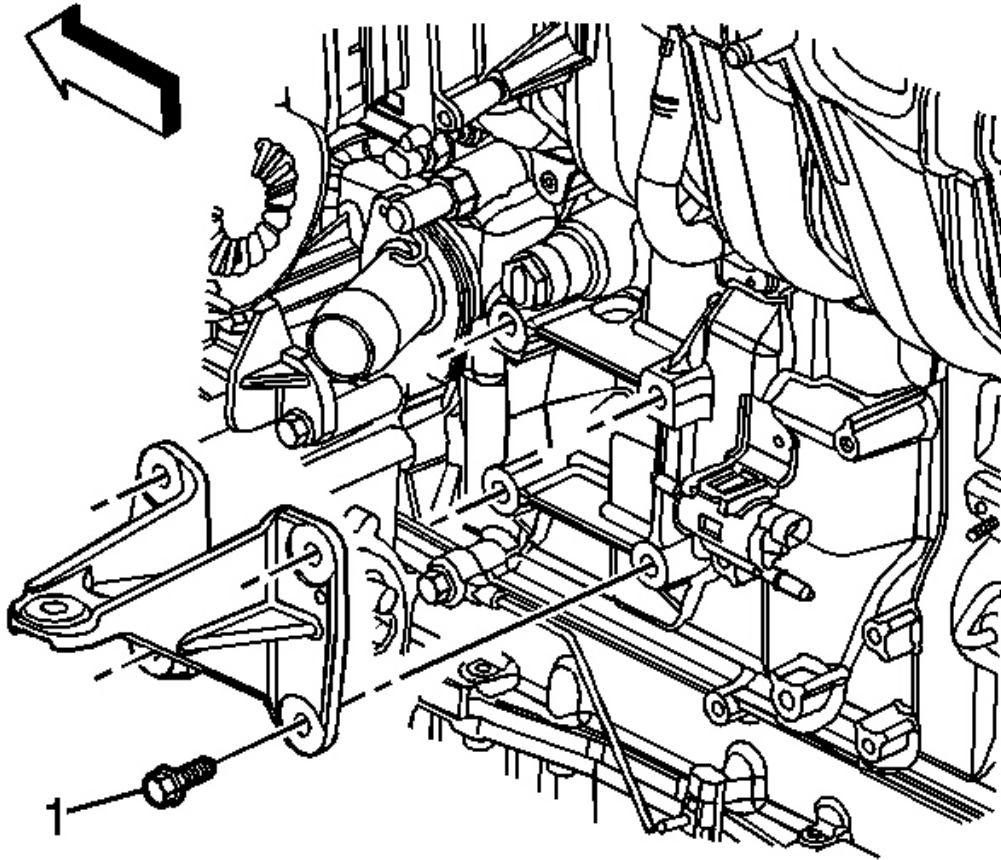
**IMPORTANT:** When placing jack onto the oil pan, pay close attention to not damage the oil level sender.

10. Lower the vehicle and place a floor jack under the oil pan with a block of wood.
11. Raise the engine with the jack just enough to clear the engine mount stud.



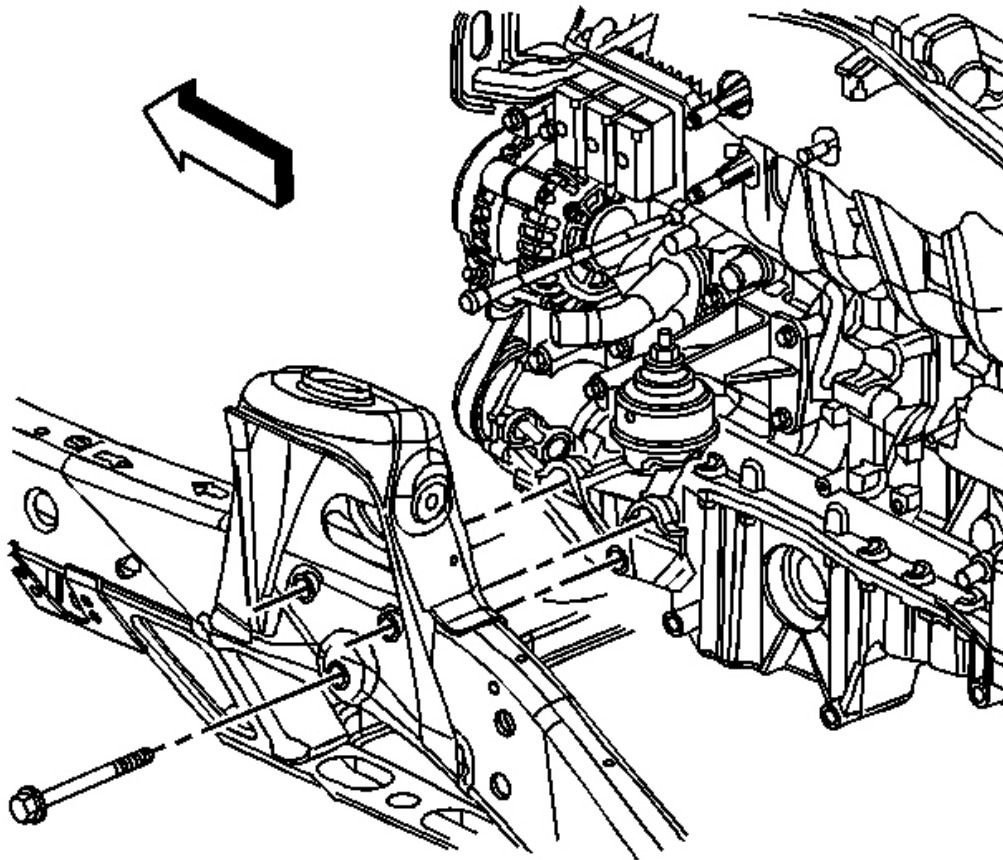
**Fig. 41: View Of Left Engine Mount**  
Courtesy of GENERAL MOTORS CORP.

12. Remove the left engine mount from the bracket.



**Fig. 42: View Of Left Engine Mount Bracket Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

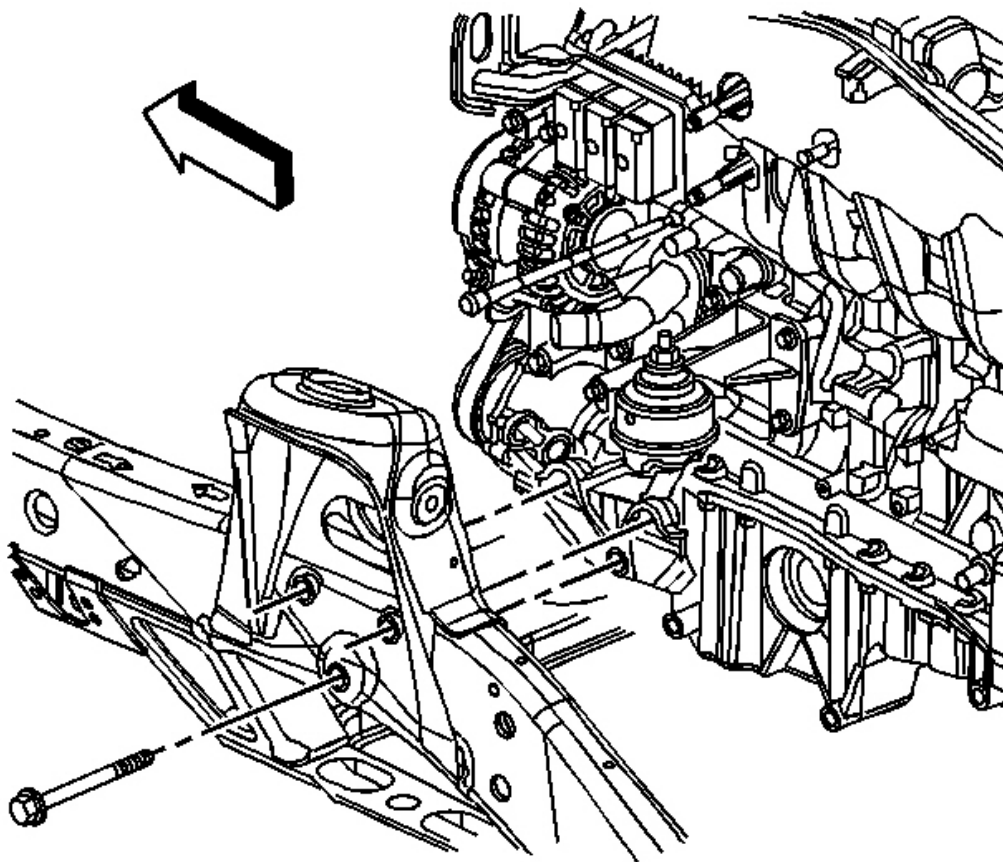
13. Remove the left engine mount bracket bolts (1).
14. Remove the left engine mount bracket.



**Fig. 43: View Of Left Frame Engine Mount Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

15. Remove the left frame engine mount bracket bolts.
16. Remove the left frame engine mount bracket, if required.

**Installation Procedure**



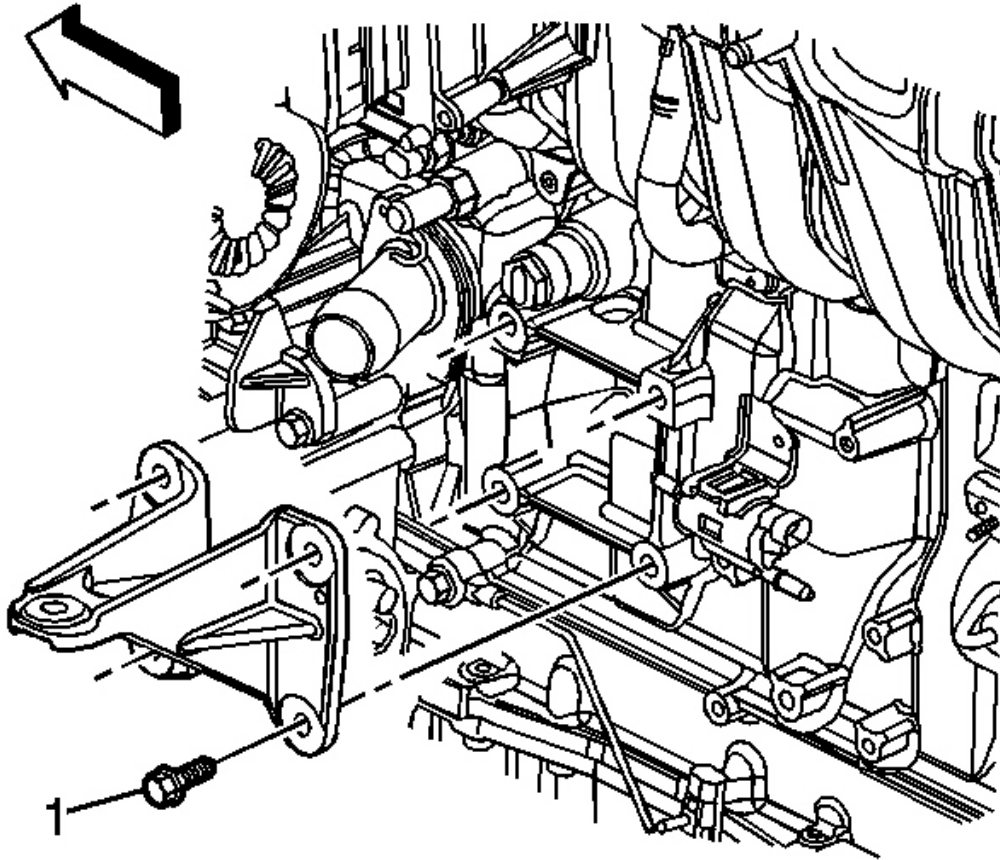
**Fig. 44: View Of Left Frame Engine Mount Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Install the left frame engine mount bracket, if removed.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the left frame engine mount bracket bolts, if removed.

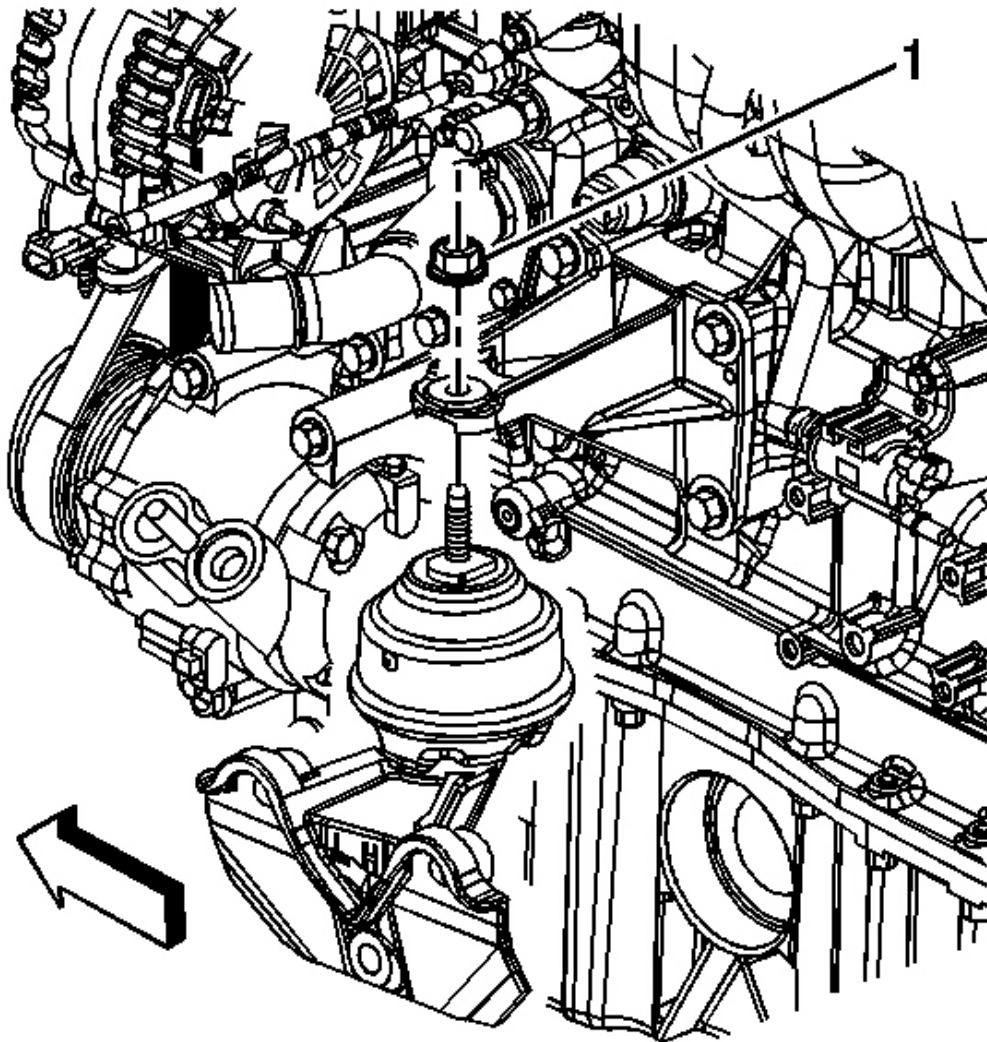
**Tighten:** Tighten the mount bracket bolts to 110 N.m (81 lb ft).



**Fig. 45: View Of Left Engine Mount Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

3. Install the left engine mount bracket and secure the bracket with the bolts (1).

**Tighten:** Tighten the engine mount bracket bolts to 50 N.m (37 lb ft).



**Fig. 46: View Of Left Engine Mount**  
Courtesy of GENERAL MOTORS CORP.

4. Install the left engine mount onto the bracket.
5. Lower the engine onto the engine mounts.
6. Install the right and the left upper engine mount nuts (1).

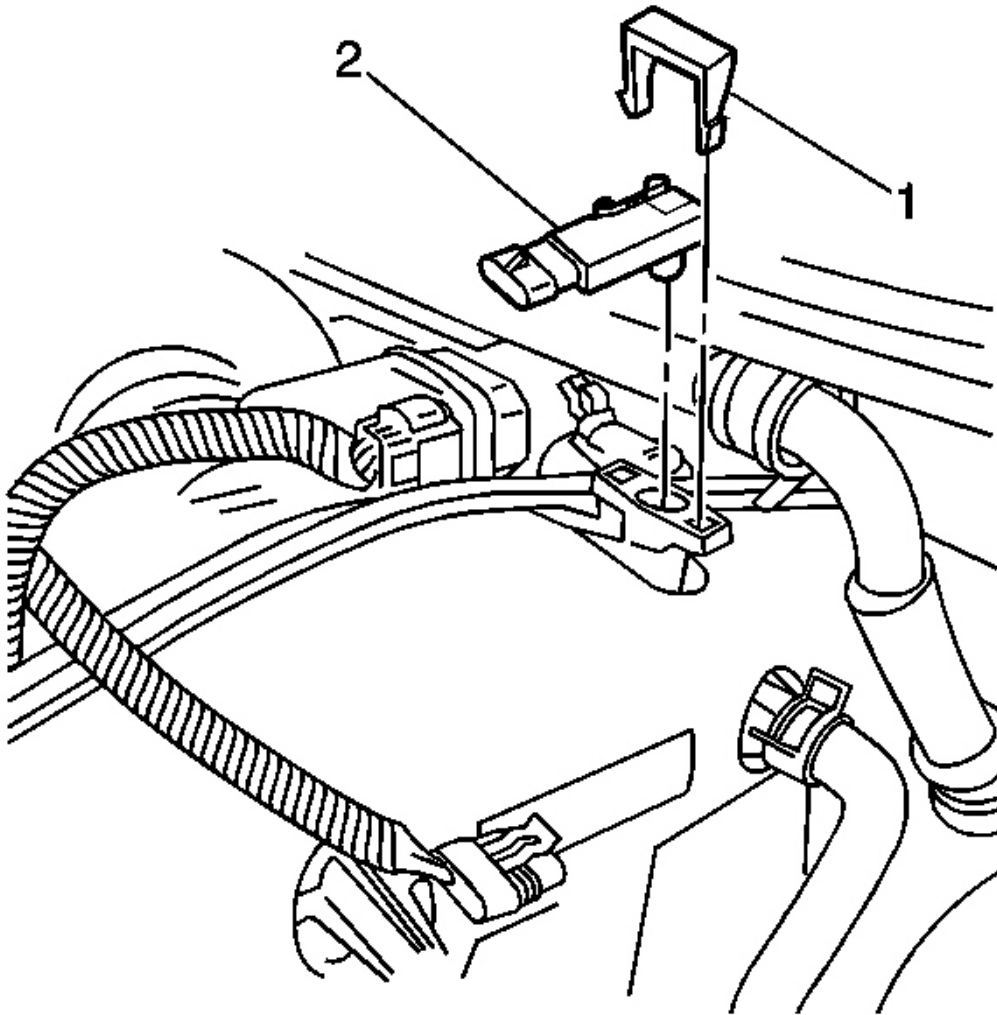
**Tighten:** Tighten the upper engine mount nuts to 70 N.m (52 lb ft).

7. Raise the vehicle and remove the jack from under the vehicle.

8. Install the engine protection shield and secure the shield with the bolts. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
9. Install the right and the left lower engine mount nuts.

**Tighten:** Torque the lower engine mount nuts to 70 N.m (52 lb ft).

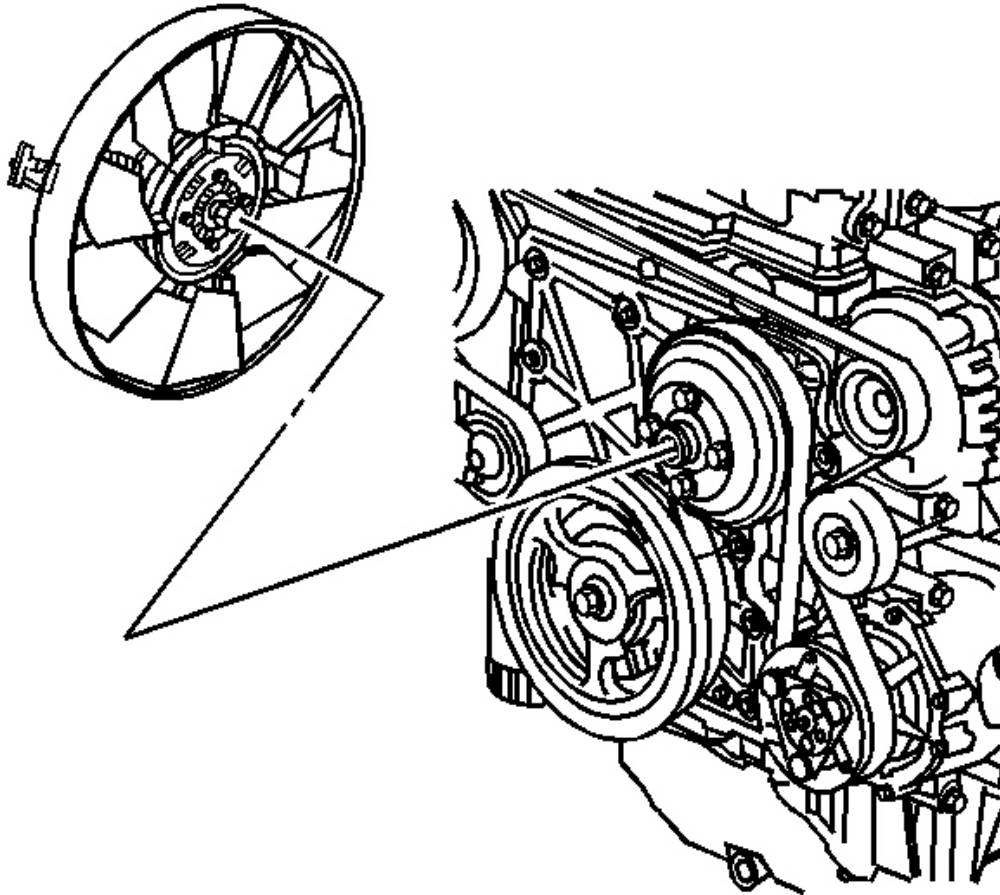
10. Lower the vehicle.
11. Install the left shock module. Refer to **Shock Module Replacement** in Front Suspension.



**Fig. 47: View Of MAP Sensor & Retainer**  
Courtesy of GENERAL MOTORS CORP.



12. Install the MAP sensor (2).
13. Install the MAP sensor retainer (1) and the electrical connector.



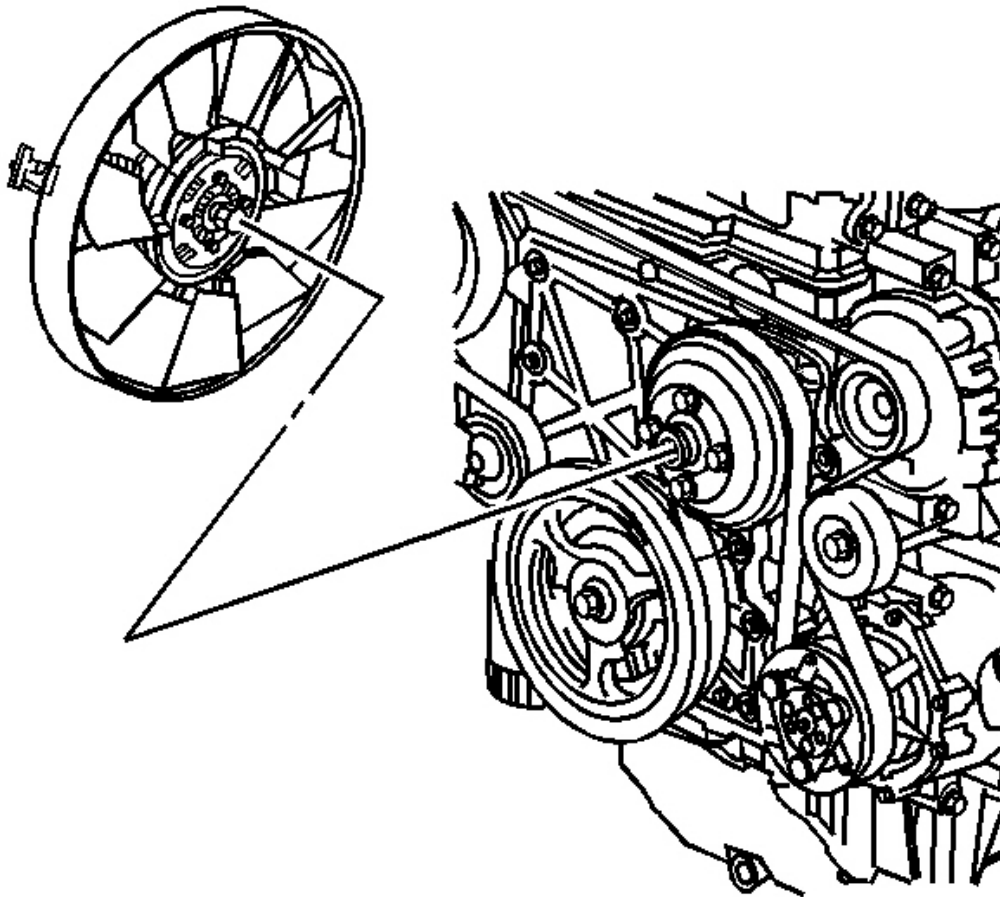
**Fig. 48: Identifying Cooling Fan**  
Courtesy of GENERAL MOTORS CORP.

14. Connect the cooling fan hub nut to the water pump shaft.
15. Install the cooling fan. Refer to **Cooling Fan and Shroud Replacement** in Engine Cooling.
16. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

## **ENGINE MOUNT AND BRACKET REPLACEMENT - RIGHT**

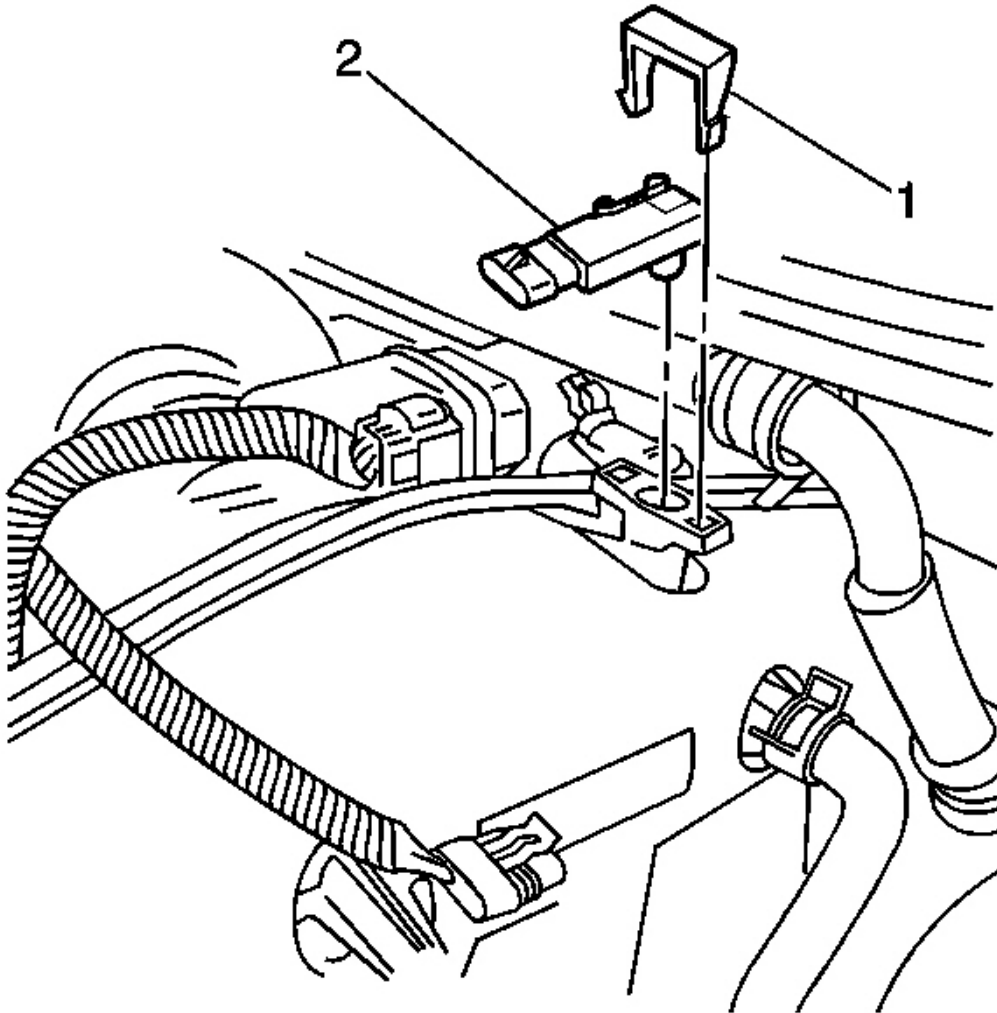
### **Removal Procedure**

1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.



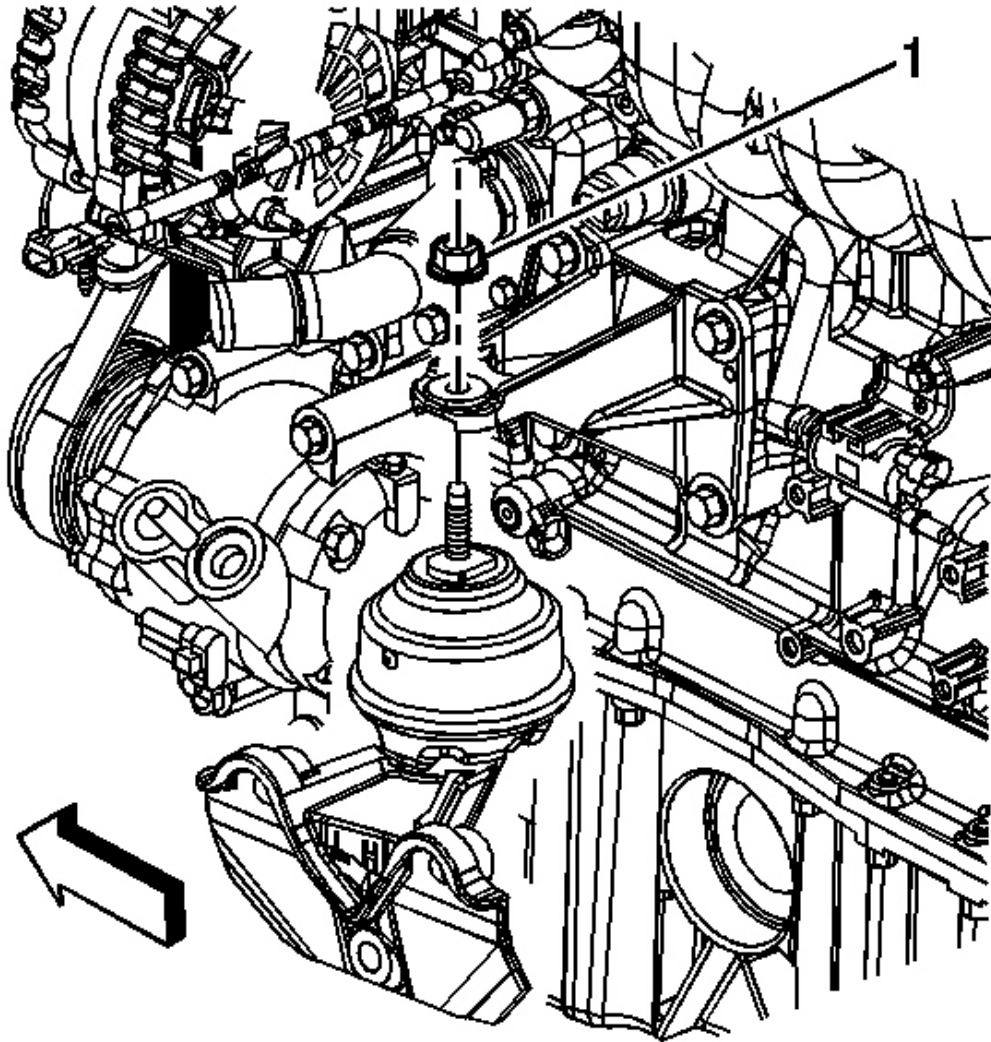
**Fig. 49: Identifying Cooling Fan**  
Courtesy of GENERAL MOTORS CORP.

2. Remove the cooling fan. Refer to **Cooling Fan and Shroud Replacement** in Engine Cooling.



**Fig. 50: View Of MAP Sensor & Retainer**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the manifold absolute pressure (MAP) sensor electrical connector and retainer (1).
4. Remove the MAP sensor (2).
5. Remove the right shock module, if frame engine mount is being removed. Refer to **Shock Module Replacement** in Front Suspension.

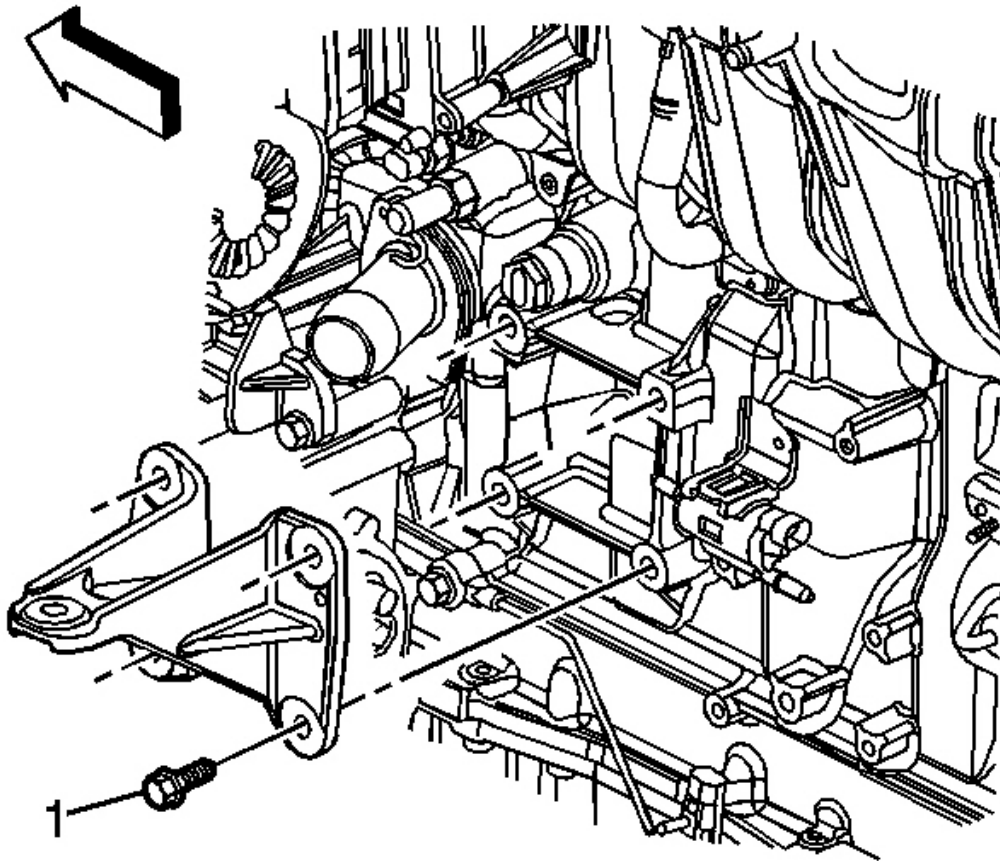


**Fig. 51: View Of Left Engine Mount**  
Courtesy of GENERAL MOTORS CORP.

6. Remove the right and the left upper engine mount nuts (1).
7. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
8. Remove the right and the left lower engine mount nuts.
9. Remove the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.

**IMPORTANT:** When placing jack onto the oil pan, pay close attention to not damaging the oil level sender.

10. Lower the vehicle and place a floor jack under the oil pan with a block of wood.
11. Raise the engine with the jack just enough to clear the engine mount studs.
12. Remove the right engine mount from the bracket. Note the location of the heat shield for installation.

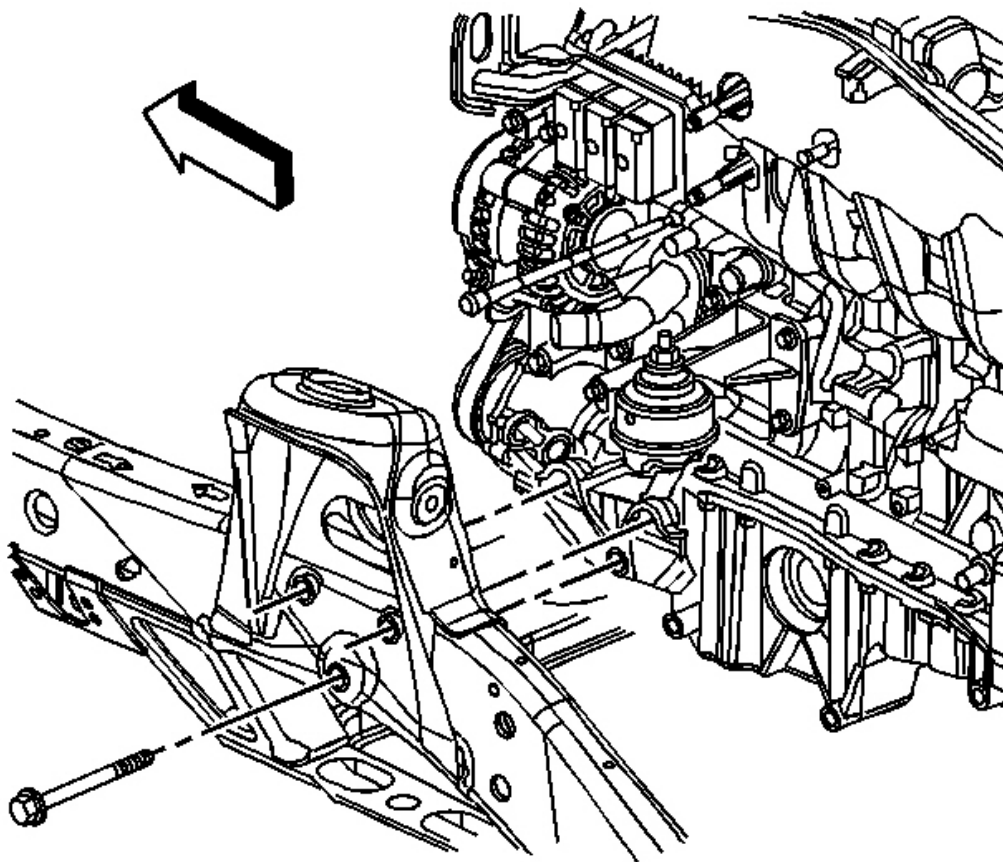


**Fig. 52: View Of Left Engine Mount Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

13. Graphic shows left, right is similar.

Remove the right engine mount bracket bolts.

14. Remove the right engine mount bracket.



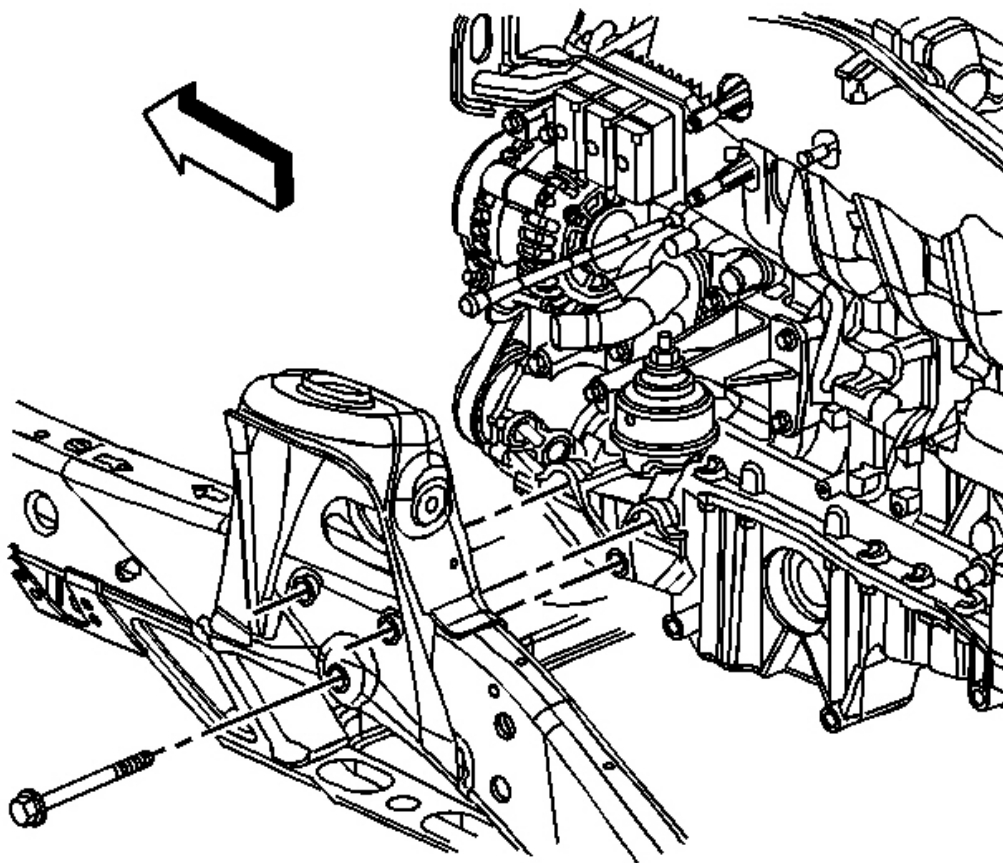
**Fig. 53: View Of Left Frame Engine Mount Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

15. Graphic shows left, right is similar.

Remove the right frame engine mount bracket bolts, if required.

16. Remove the right frame engine mount bracket, if required.

#### **Installation Procedure**



**Fig. 54: View Of Left Frame Engine Mount Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

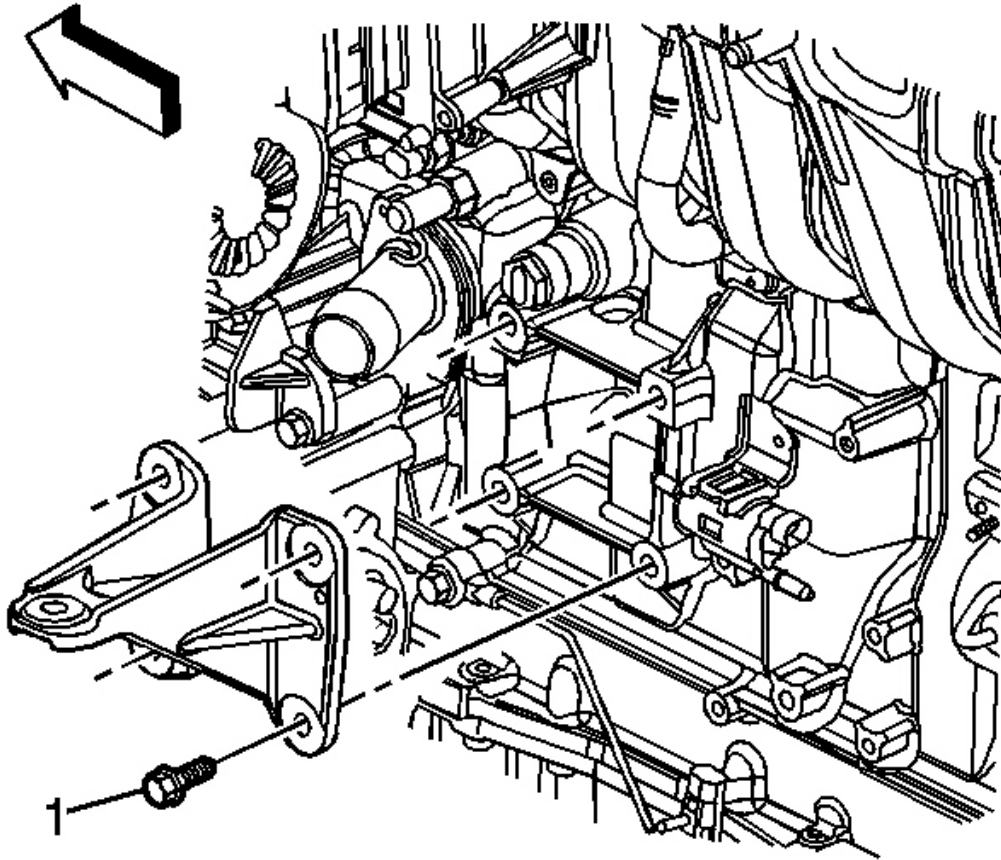
1. Graphic shows left, right is similar.

Install the right frame engine mount bracket, if removed.

**NOTE:** Refer to **Fastener Notice** in Cautions and Notices.

2. Install the right frame engine mount bracket bolts, if removed.

**Tighten:** Tighten the mount bracket bolts to 110 N.m (81 lb ft).



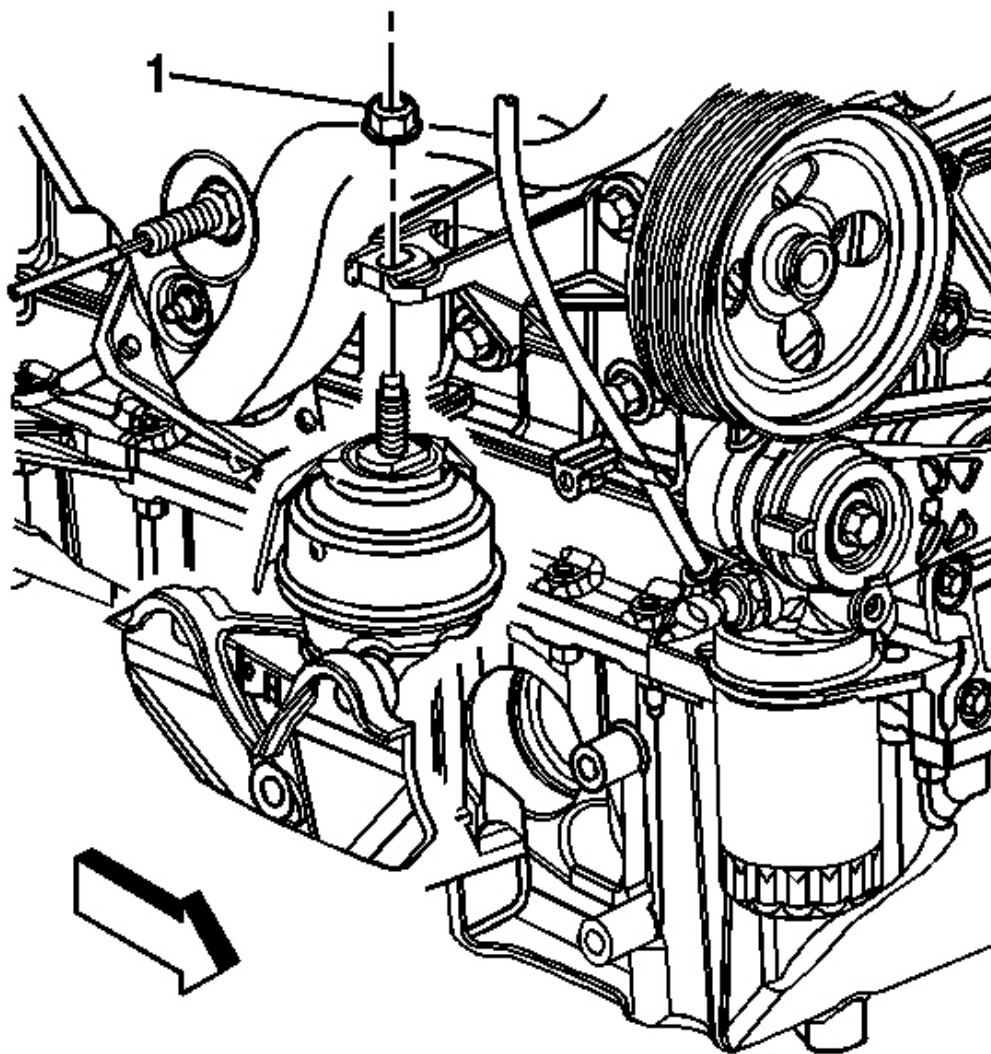
**Fig. 55: View Of Left Engine Mount Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

3. Graphic shows left, right is similar.

Install the right engine mount bracket and secure with the bolts (1).

**Tighten:** Tighten the engine mount bracket bolts to 50 N.m (37 lb ft).





**Fig. 56: View Of Upper Engine Mount Nuts**  
Courtesy of GENERAL MOTORS CORP.

4. Install the right engine mount.

**IMPORTANT:** Ensure that the heat shield is located properly over the anti-rotation feature - right side only.

5. Lower the engine onto the engine mounts.
6. Install the right and the left upper engine mount nuts (1)

## 2004 Isuzu Ascender LS

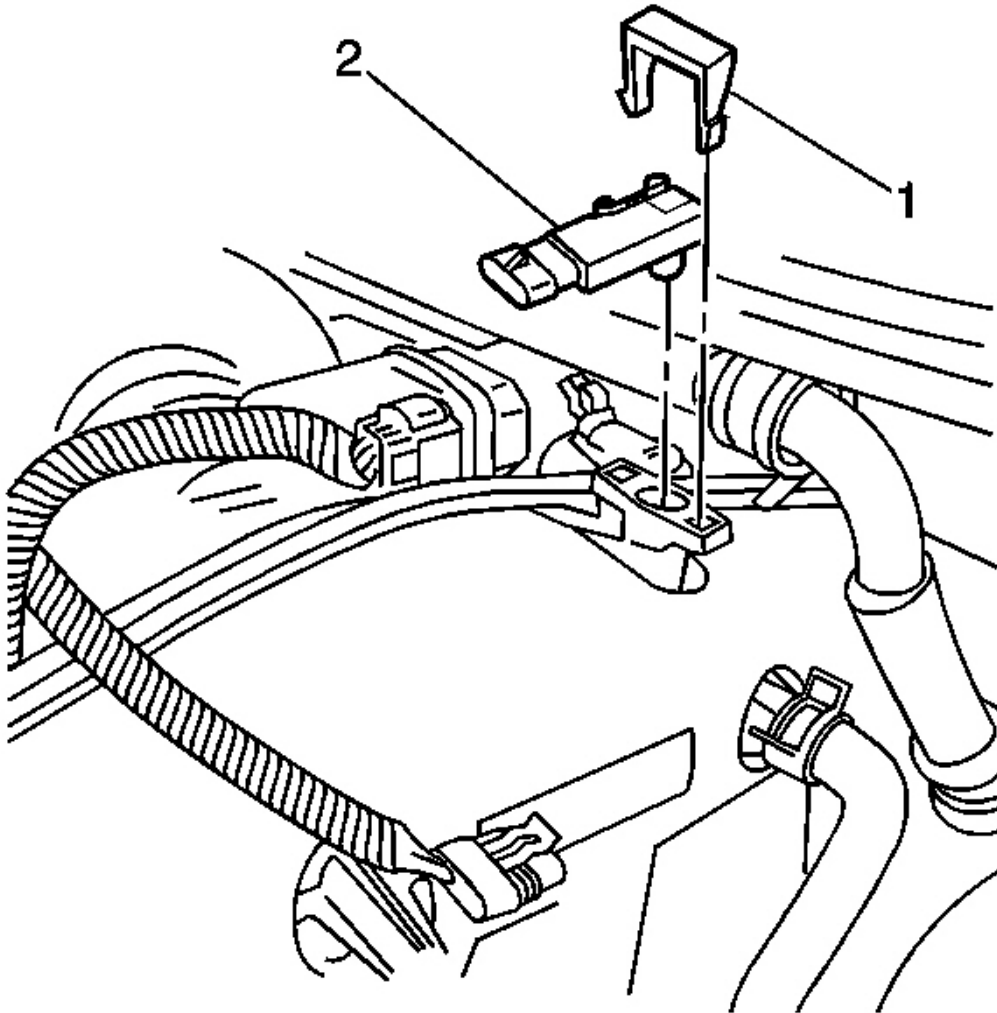
2004 ENGINE Engine Mechanical - 4.2L - Ascender

**Tighten:** Tighten the upper engine mount nuts to 70 N.m (52 lb ft).

7. Raise the vehicle and remove the floor jack from under the vehicle.
8. Install the engine protection shield and secure with the bolts. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
9. Install the right and the left lower engine mount nuts.

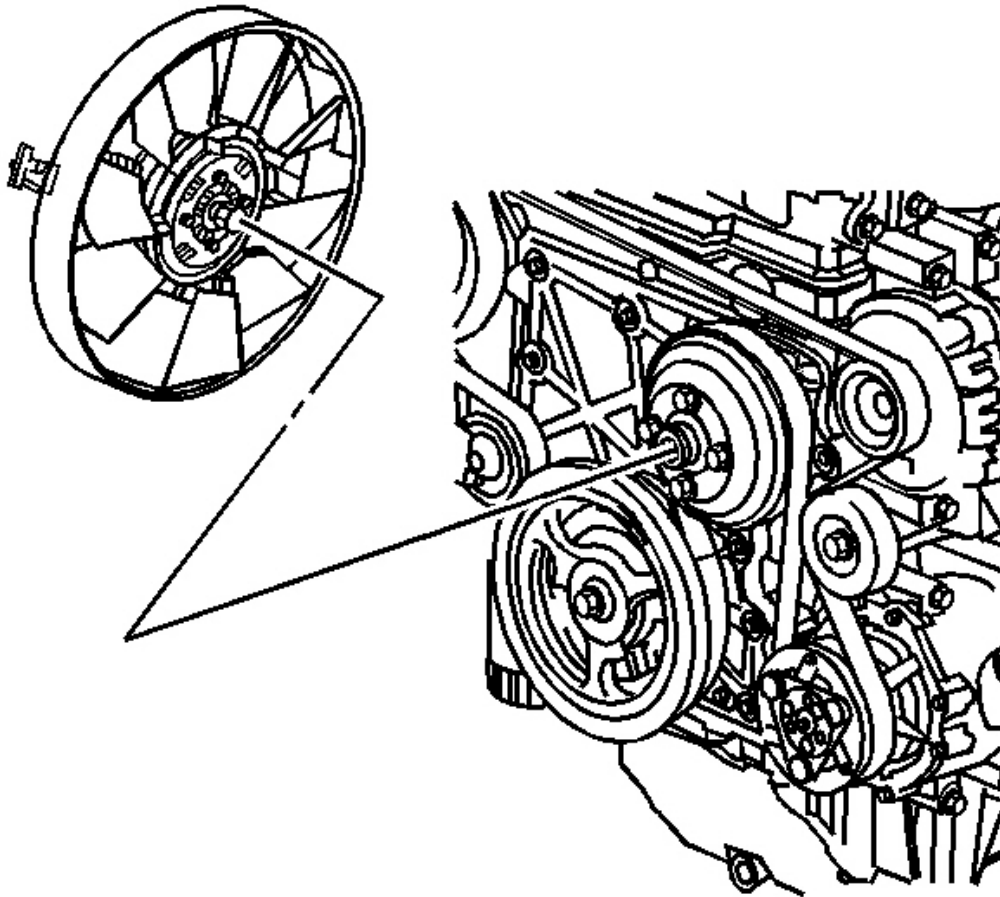
**Tighten:** Tighten the lower engine mount nuts to 70 N.m (52 lb ft).

10. Lower the vehicle.
11. Install the right shock module. Refer to **Shock Module Replacement** in Front Suspension.



**Fig. 57: View Of MAP Sensor & Retainer**  
**Courtesy of GENERAL MOTORS CORP.**

12. Install the MAP sensor (2).
13. Install the MAP sensor retainer (1) and the electrical connector.

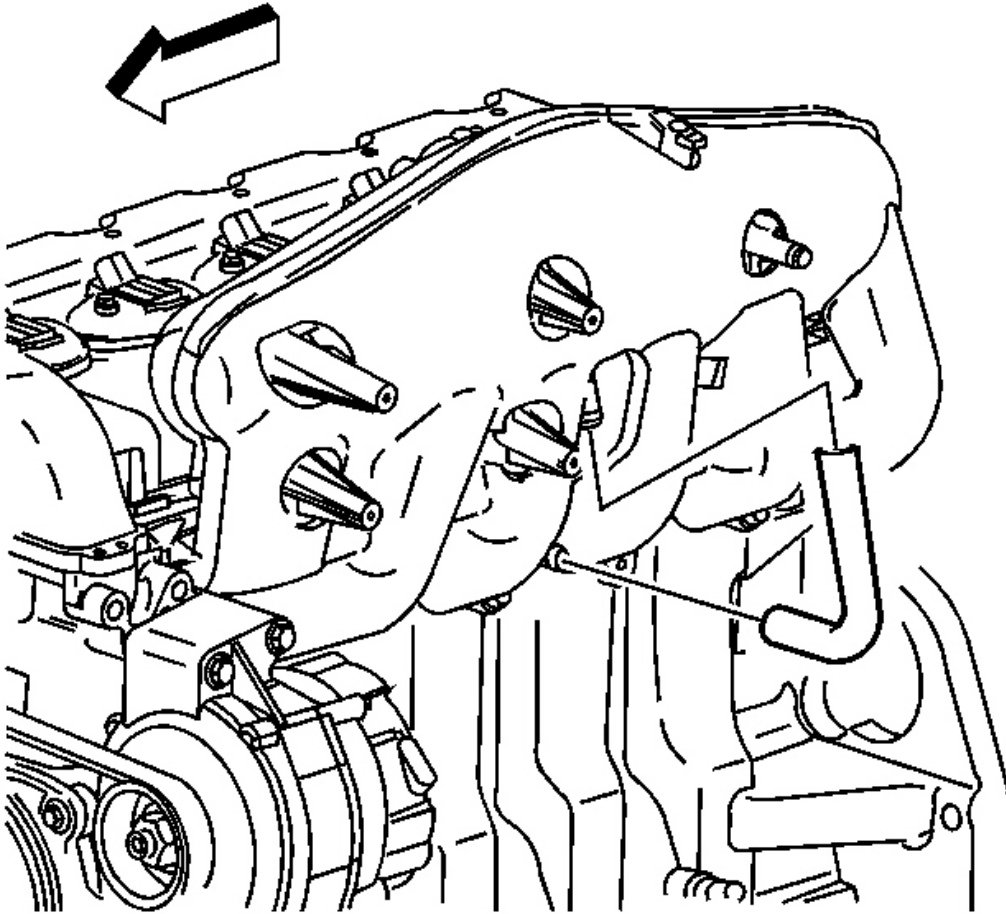


**Fig. 58: Identifying Cooling Fan**  
Courtesy of GENERAL MOTORS CORP.

14. Connect the cooling fan hub nut to the water pump shaft.
15. Install the cooling fan. Refer to **Cooling Fan and Shroud Replacement** in Engine Cooling.
16. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

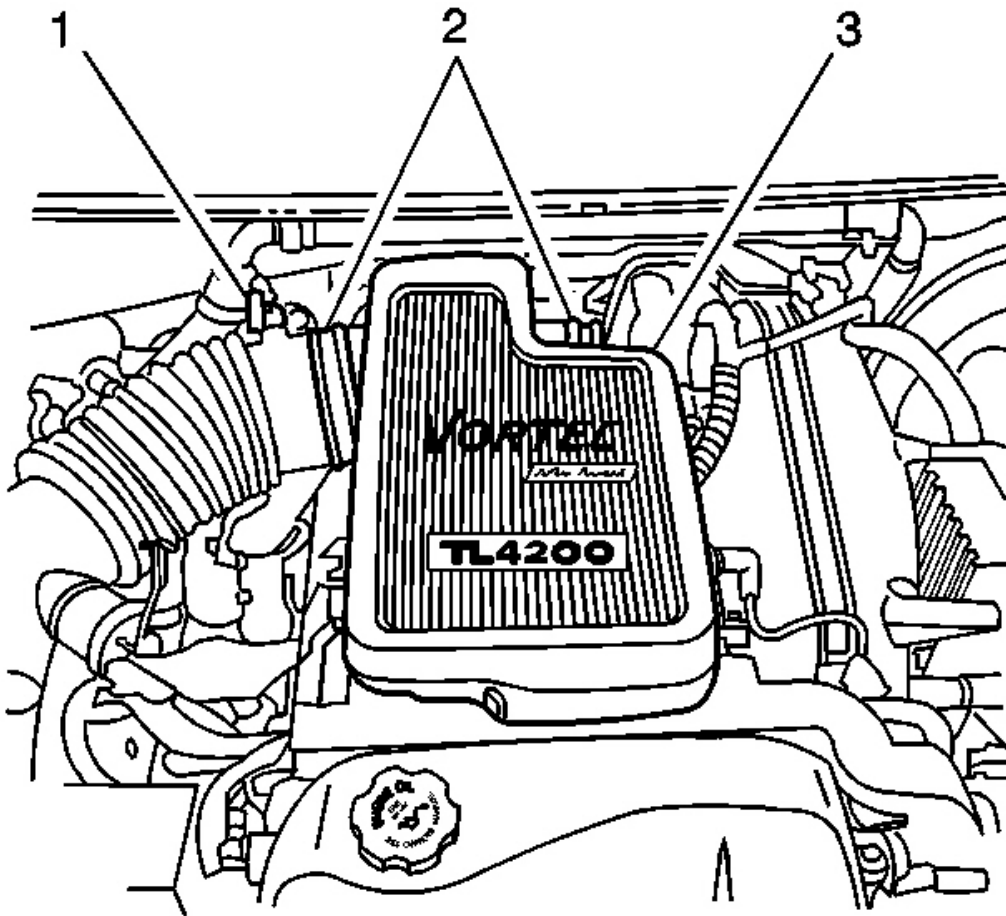
## **CRANKCASE VENTILATION HOSES/PIPES REPLACEMENT**

### **Removal Procedure**



**Fig. 59: View Of Crankcase Ventilation Hose Location**  
Courtesy of GENERAL MOTORS CORP.

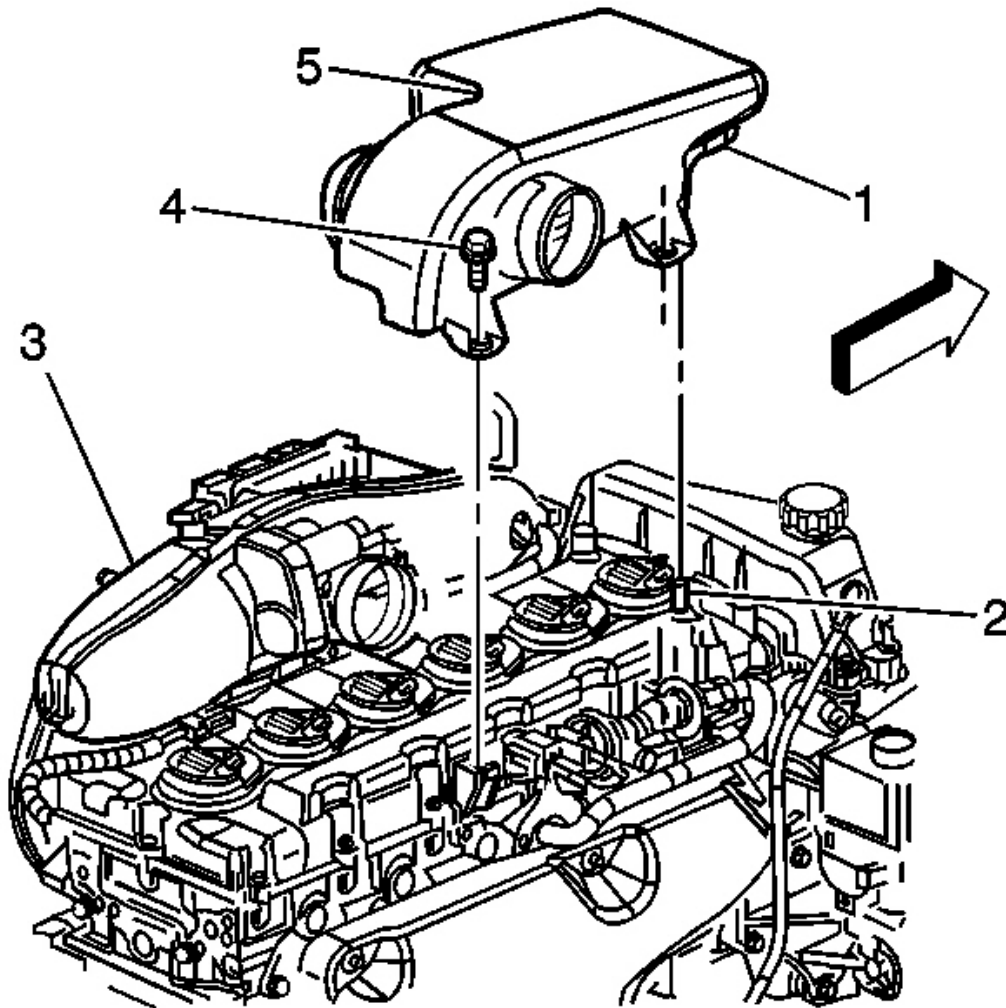
1. Disconnect the crankcase dirty air hose from the intake manifold.
2. Disconnect the crankcase dirty air hose from the positive crankcase ventilation (PCV) orifice tube.



**Fig. 60: Top Of Engine View**

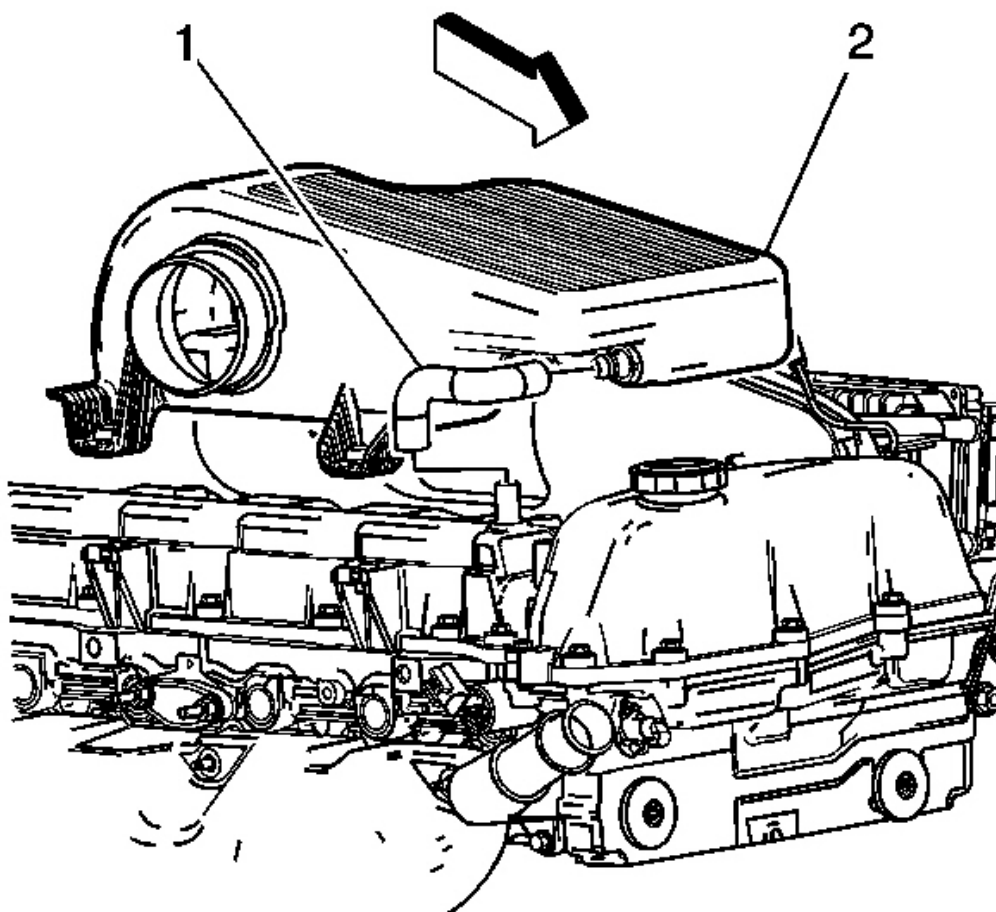
Courtesy of GENERAL MOTORS CORP.

3. Loosen the throttle body clamps (2).
4. Disconnect the fuel pressure regulator vacuum supply hose from the air cleaner outlet resonator.



**Fig. 61: View Of Engine Bolts & Air Cleaner Outlet Resonator**  
**Courtesy of GENERAL MOTORS CORP.**

5. Remove the 2 resonator to engine bolts (4) from the air cleaner outlet resonator (5).

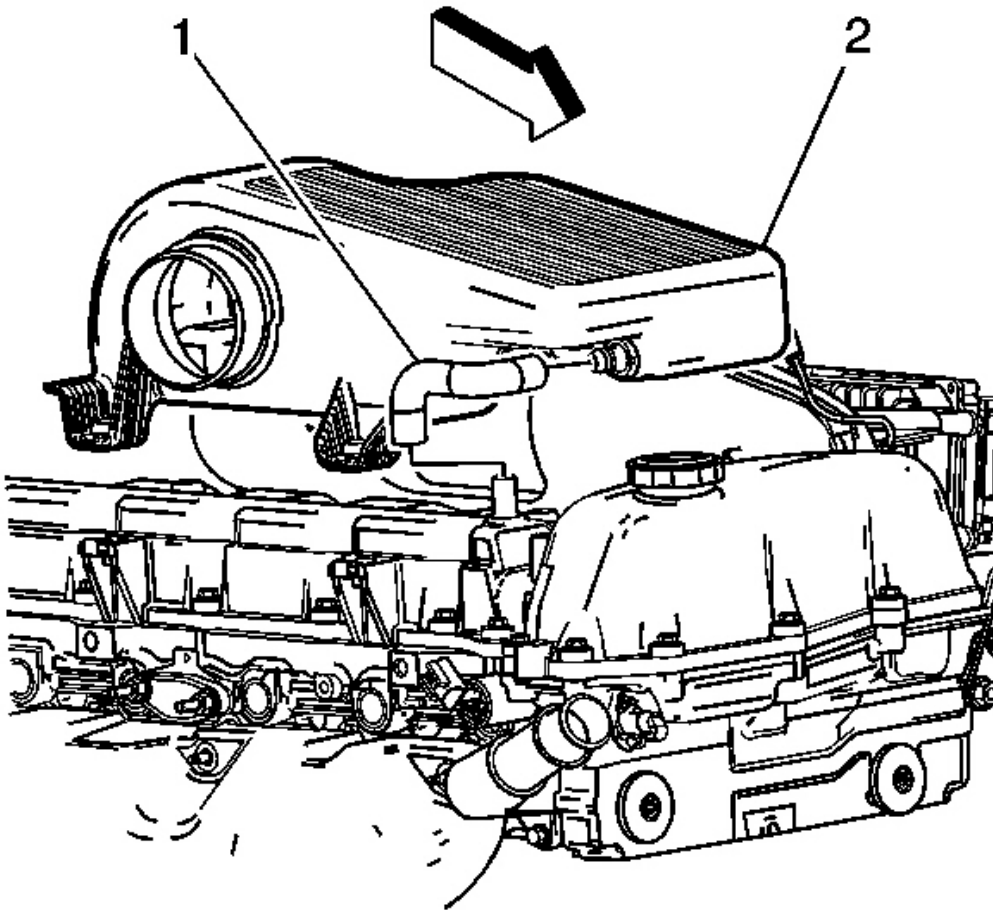


**Fig. 62: View Of Crankcase Clean Air Hose & Air Cleaner Outlet Resonator**  
Courtesy of GENERAL MOTORS CORP.

6. Lift up the front of the air cleaner outlet resonator (2).
7. Disconnect the crankcase clean air hose from the valve cover port.
8. Disconnect the crankcase clean air hose from the air cleaner outlet resonator (2).

#### Installation Procedure

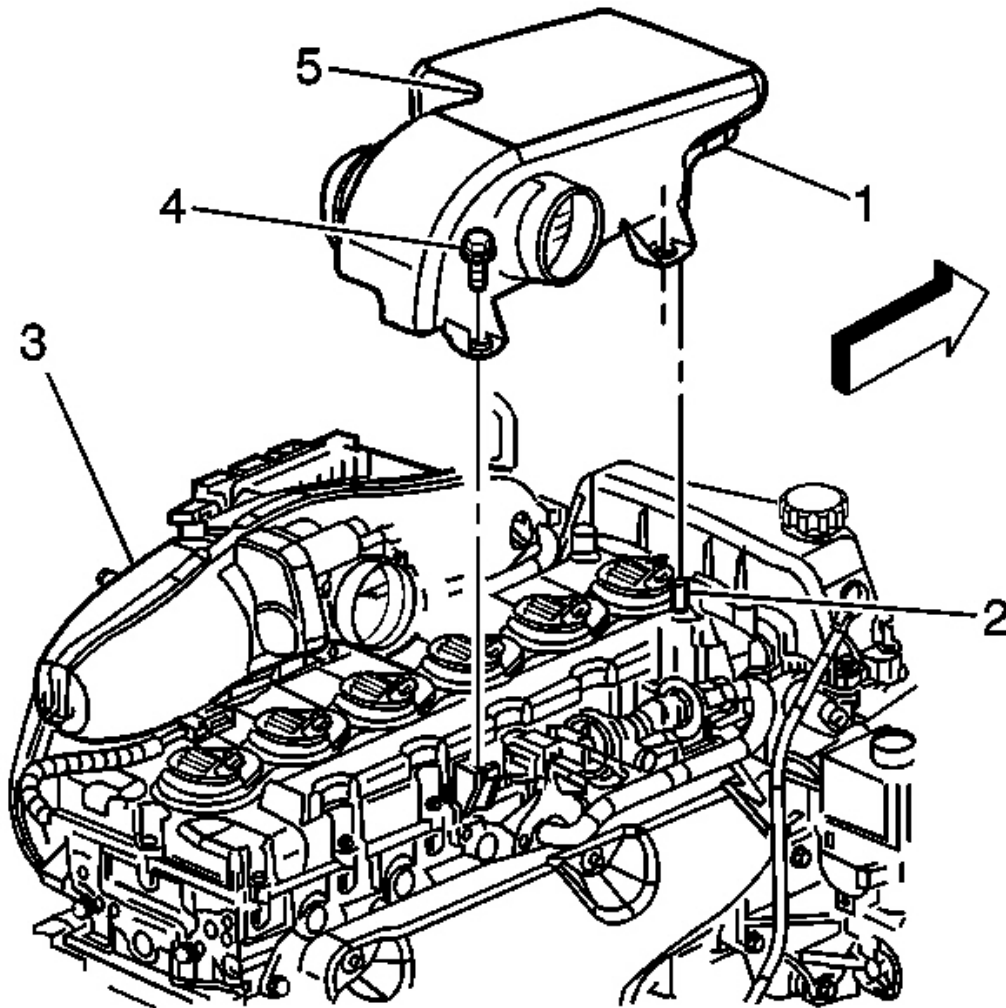




**Fig. 63: View Of Crankcase Clean Air Hose & Air Cleaner Outlet Resonator**  
Courtesy of GENERAL MOTORS CORP.

1. Connect the crankcase clean air hose to the air cleaner outlet resonator (2).
2. Connect the crankcase clean air hose to the valve cover port.

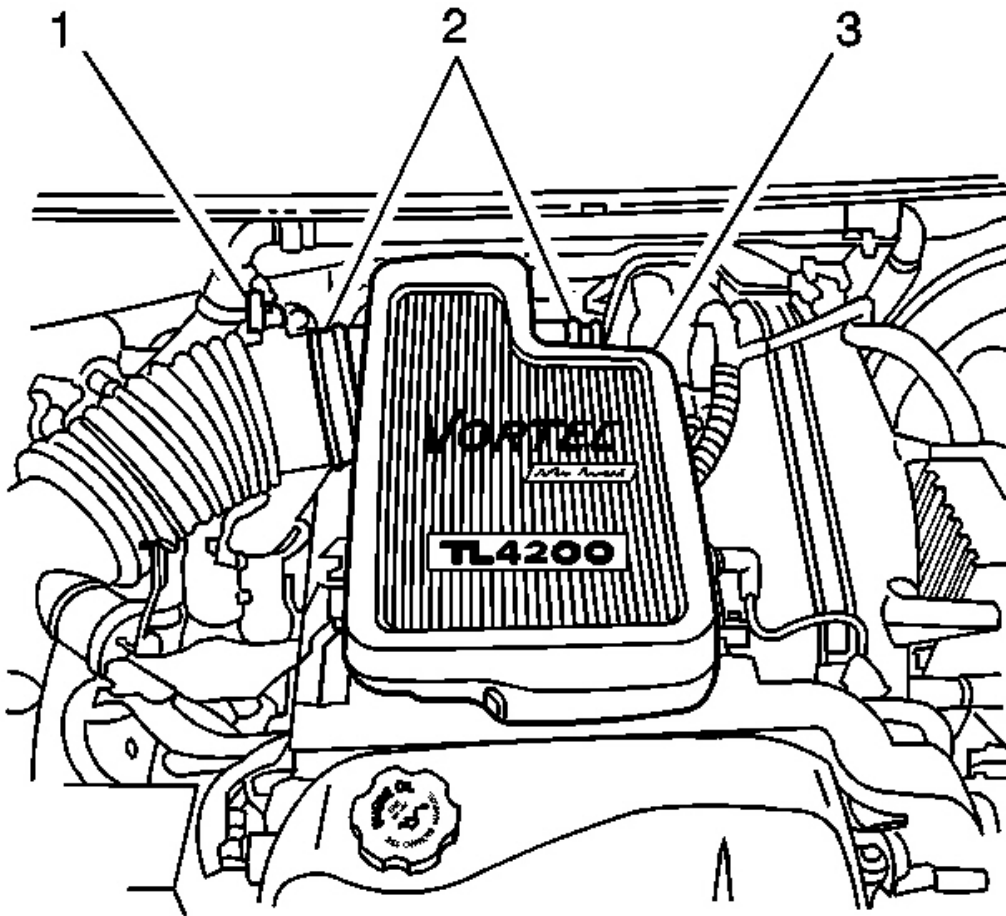
**NOTE:** Refer to Fastener Notice in Cautions and Notices.



**Fig. 64: View Of Engine Bolts & Air Cleaner Outlet Resonator**  
**Courtesy of GENERAL MOTORS CORP.**

3. Install the 2 resonator to engine bolts (4) to the air cleaner outlet resonator (5).

**Tighten:** Tighten the bolts to 6 N.m (53 lb in).



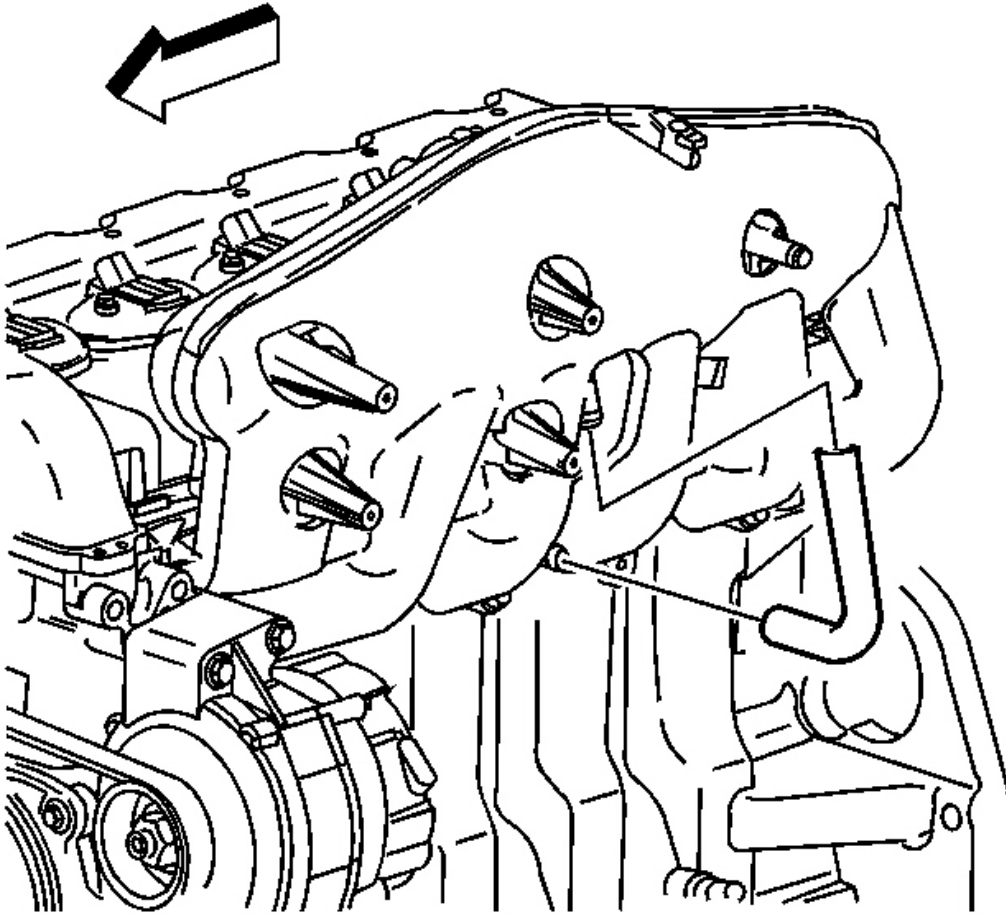
**Fig. 65: Top Of Engine View**

Courtesy of GENERAL MOTORS CORP.

4. Tighten the throttle body clamps (2).

**Tighten:** Tighten the clamps to 4 N.m (35 lb in).

5. Connect the fuel pressure regulator vacuum supply hose to the air cleaner outlet resonator.



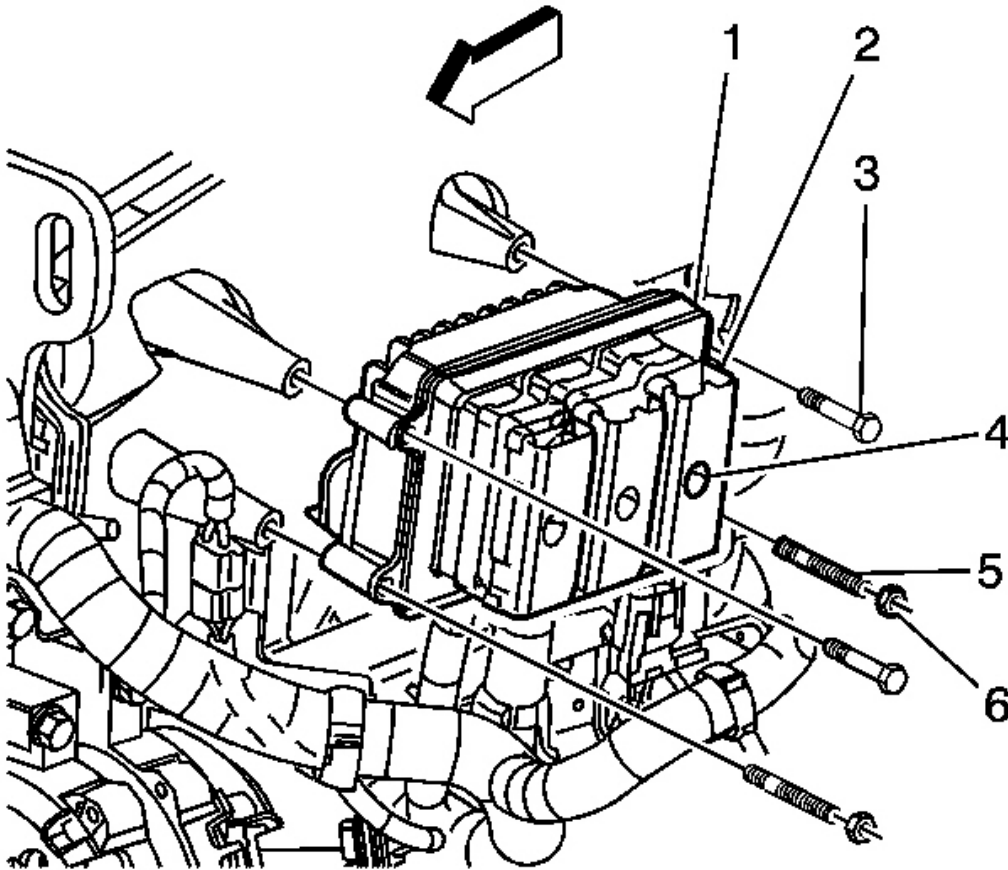
**Fig. 66: View Of Crankcase Ventilation Hose Location**  
Courtesy of GENERAL MOTORS CORP.

6. Lubricate the inner diameter of the crankcase ventilation hose with GM P/N 12345884 (Canadian P/N 5728223) or equivalent.
7. Connect the crankcase dirty air hose to the intake manifold.
8. Connect the crankcase dirty air hose to the PCV orifice tube.

## **INTAKE MANIFOLD REPLACEMENT**

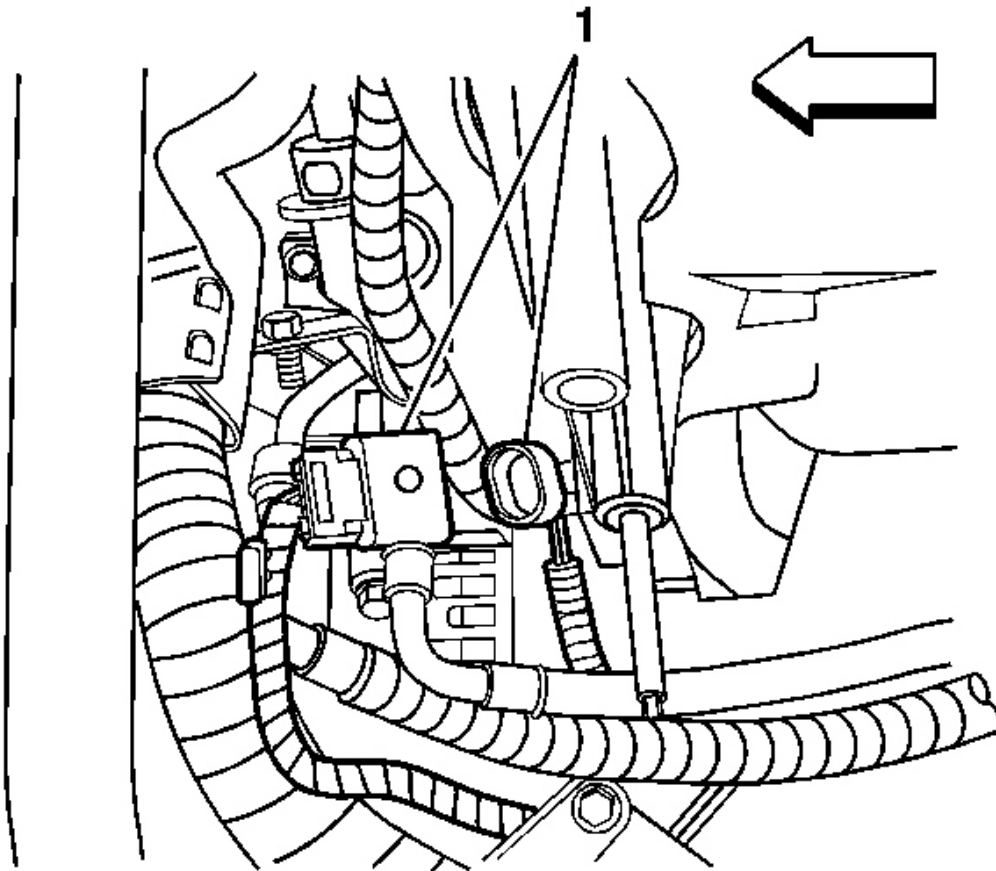
### **Removal Procedure**

1. Relieve the fuel pressure. Refer to **Fuel Pressure Relief Procedure** .
2. Remove the throttle body. Refer to **Throttle Body Assembly Replacement** in Engine Controls - 4.2L.



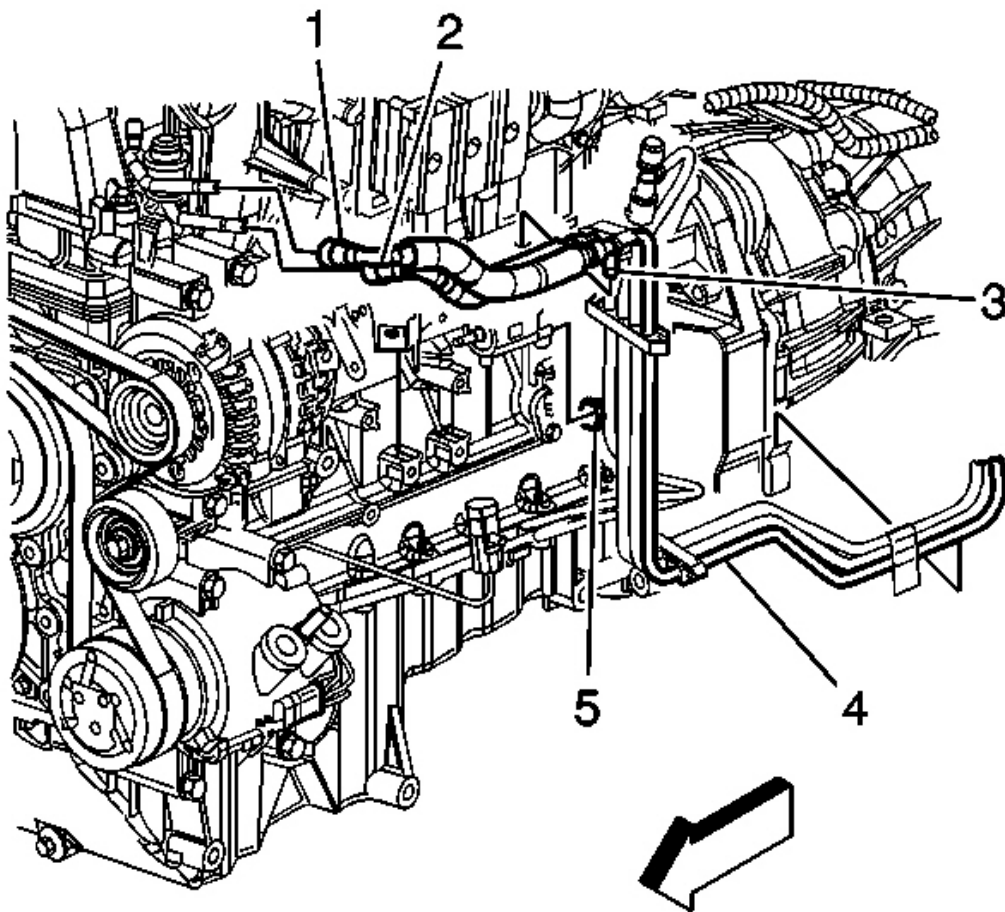
**Fig. 67: View Of PCM Assembly**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the powertrain control module (PCM) retaining bolts (3) and nuts (6).
4. Remove the PCM mounting studs (5) and position the PCM out of the way.



**Fig. 68: View Of Engine Coolant Temperature Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the engine coolant temperature (ECT) sensor electrical connector (1).

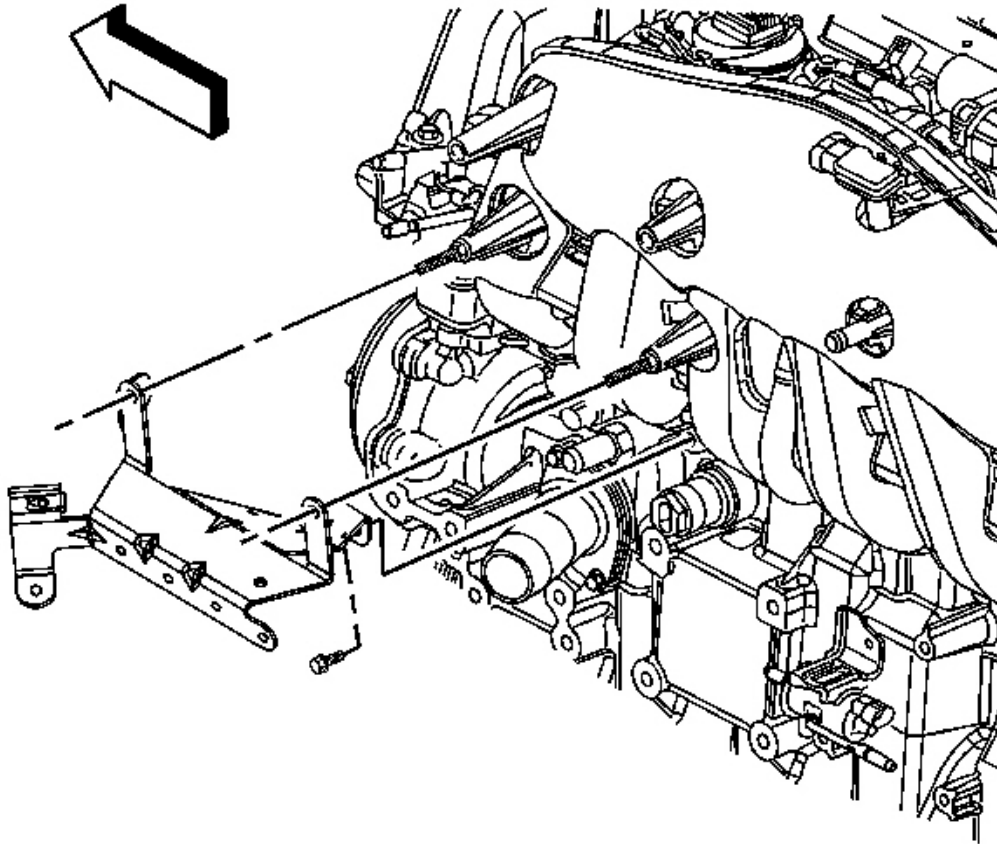


**Fig. 69: Fuel Feed And Fuel Return Pipes (Left Side Of Engine)**

Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to **Fuel and Evaporative Emission (EVAP) Hose/Pipe Connection Cleaning Notice** in Cautions and Notices.

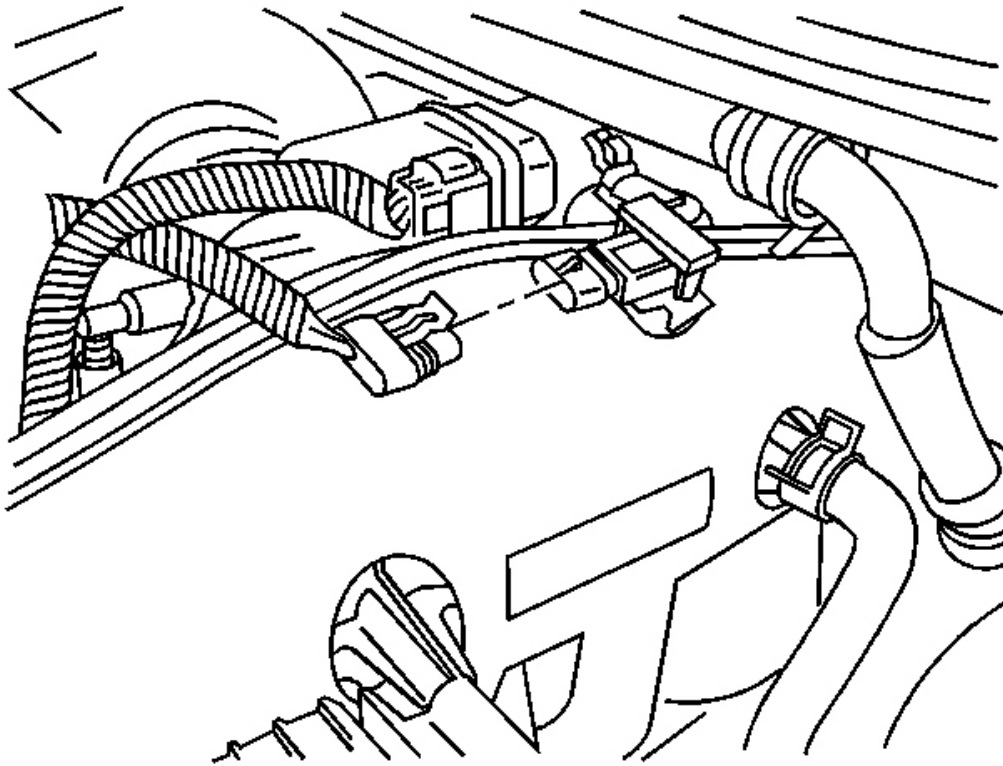
6. Disconnect the fuel feed (1) and fuel return (2) pipes from the fuel rail. Refer to **Quick Connect Fitting (s) Service (Metal Collar)** .
7. Disconnect the integral clip (3) from the wire harness bracket.



**Fig. 70: View Of Engine Wire Harness Bracket & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

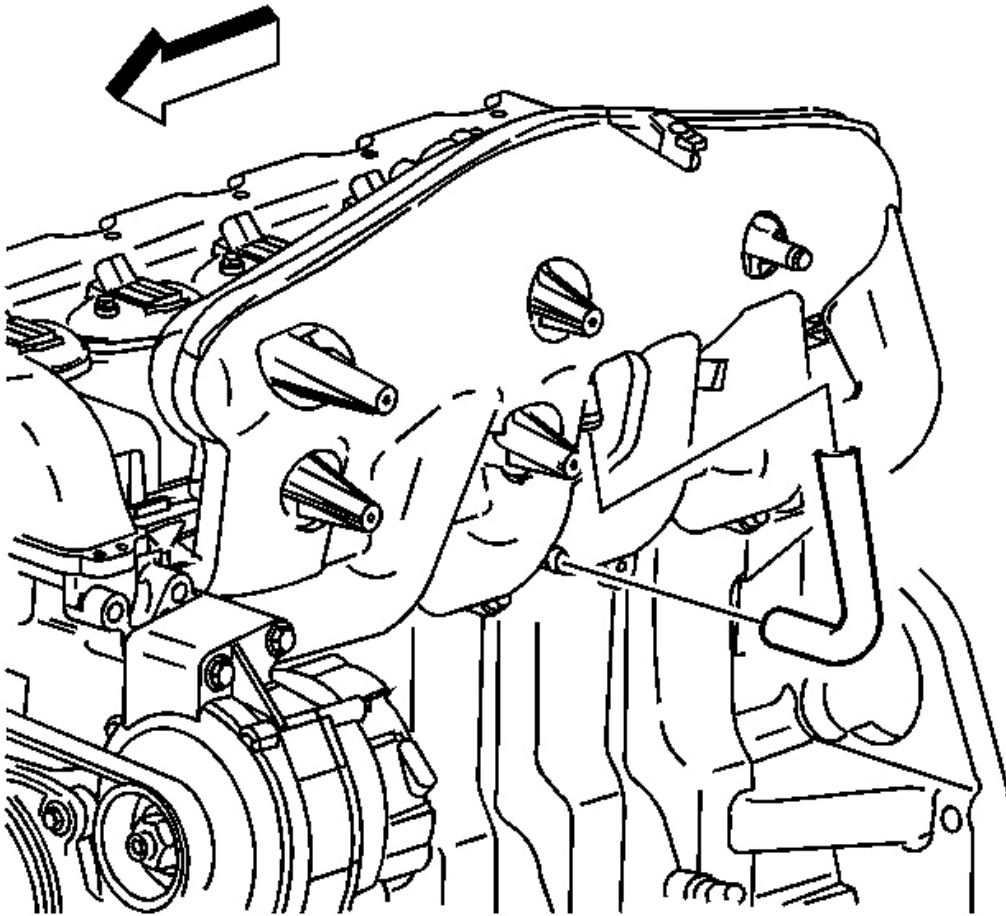
8. Remove the engine wire harness bracket bolt.
9. Position the engine electrical wire harness bracket with wires attached out of the way.





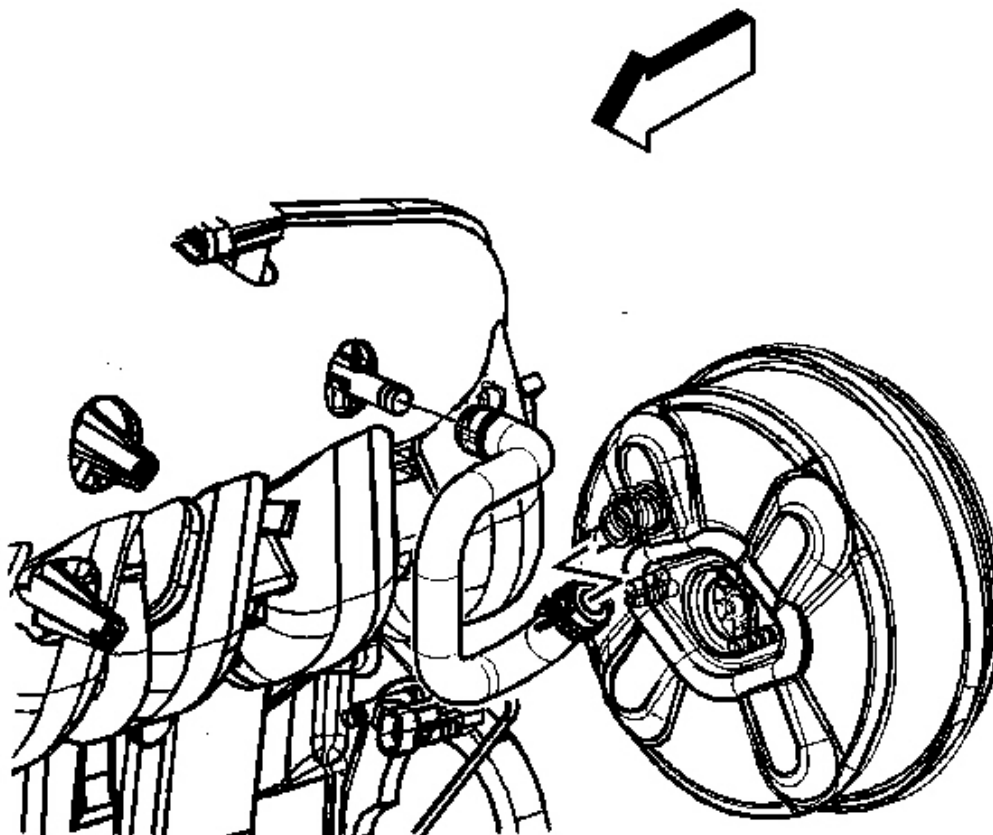
**Fig. 71: View Of MAP Sensor Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

10. Disconnect the manifold absolute pressure (MAP) sensor electrical connector.



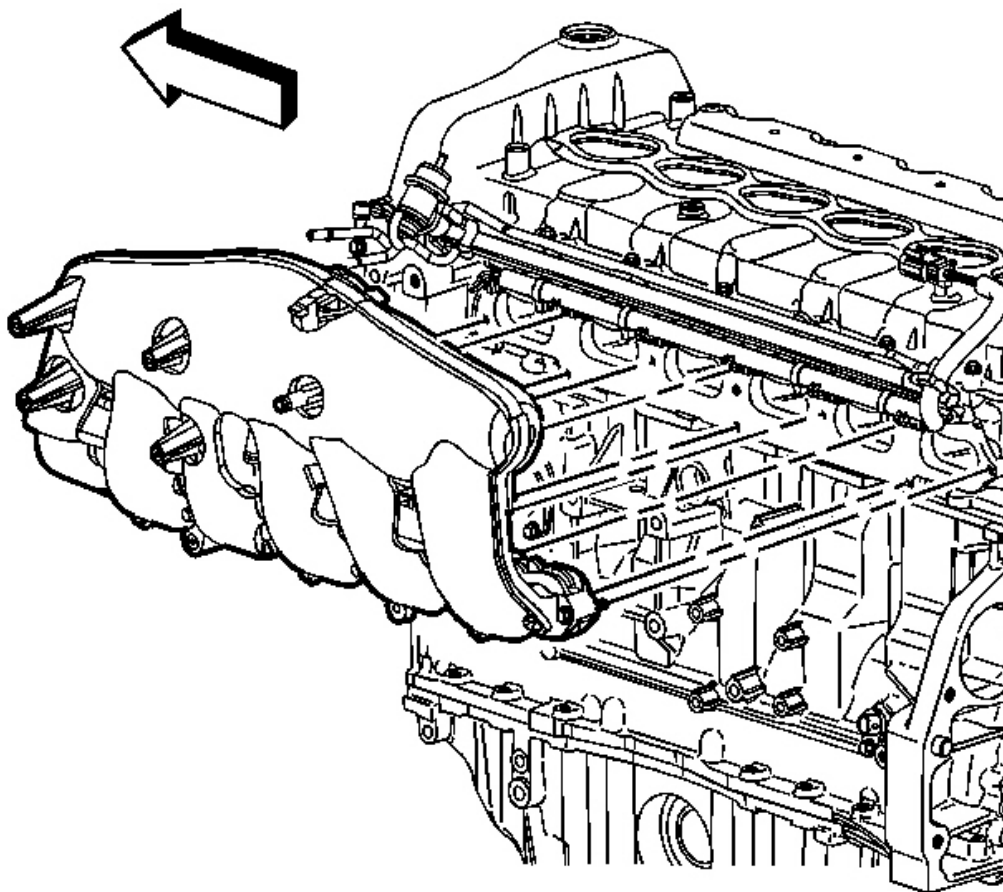
**Fig. 72: View Of Crankcase Ventilation Hose Location**  
Courtesy of GENERAL MOTORS CORP.

11. Disconnect the crankcase ventilation hose from the intake manifold.



**Fig. 73: View Of Vacuum Brake Booster Hose**  
Courtesy of GENERAL MOTORS CORP.

12. Disconnect the vacuum brake booster hose at the intake manifold.
13. Remove the generator. Refer to **Generator Replacement (4.2L Engine)** or **Generator Replacement (5.3L Engine)** in Engine Electrical.



**Fig. 74: View Of Intake Manifold & Bolts**  
Courtesy of GENERAL MOTORS CORP.

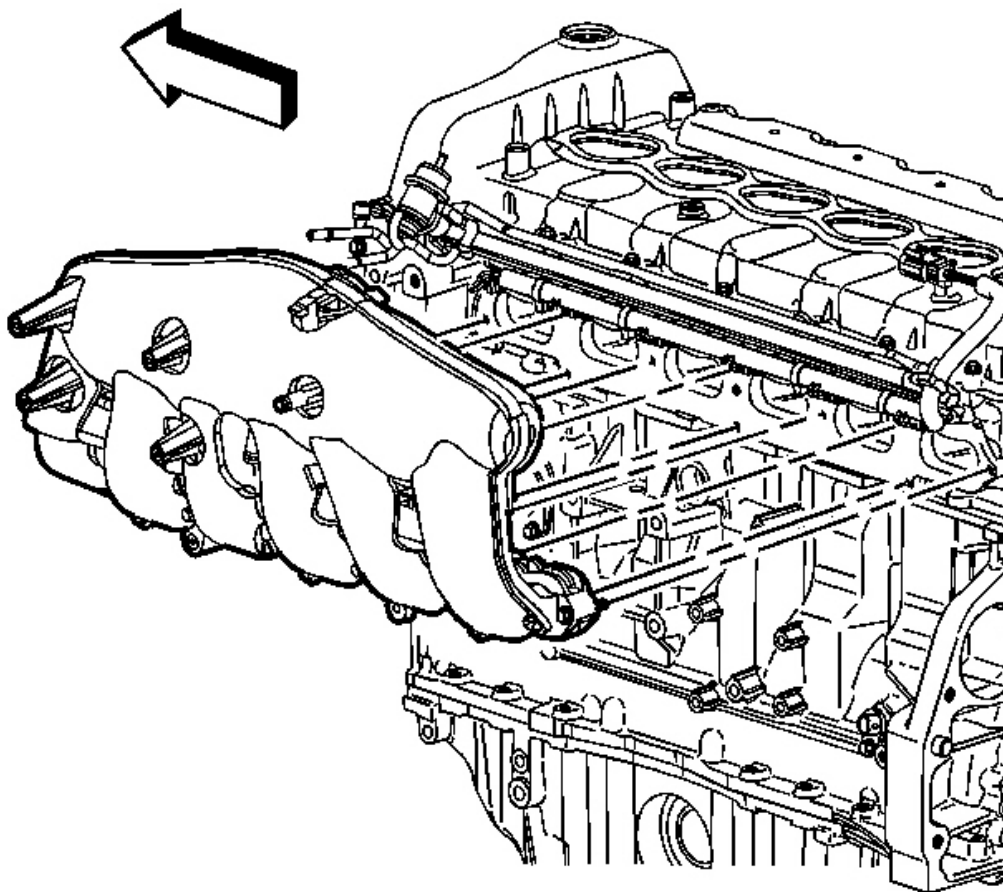
**IMPORTANT:** The intake manifold bolts are captured within the intake manifold. Do not attempt to remove the bolts from the intake manifold.

14. Loosen the intake manifold bolts.
15. Remove the intake manifold.

#### Installation Procedure

1. Install a new intake manifold gasket to the intake manifold.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

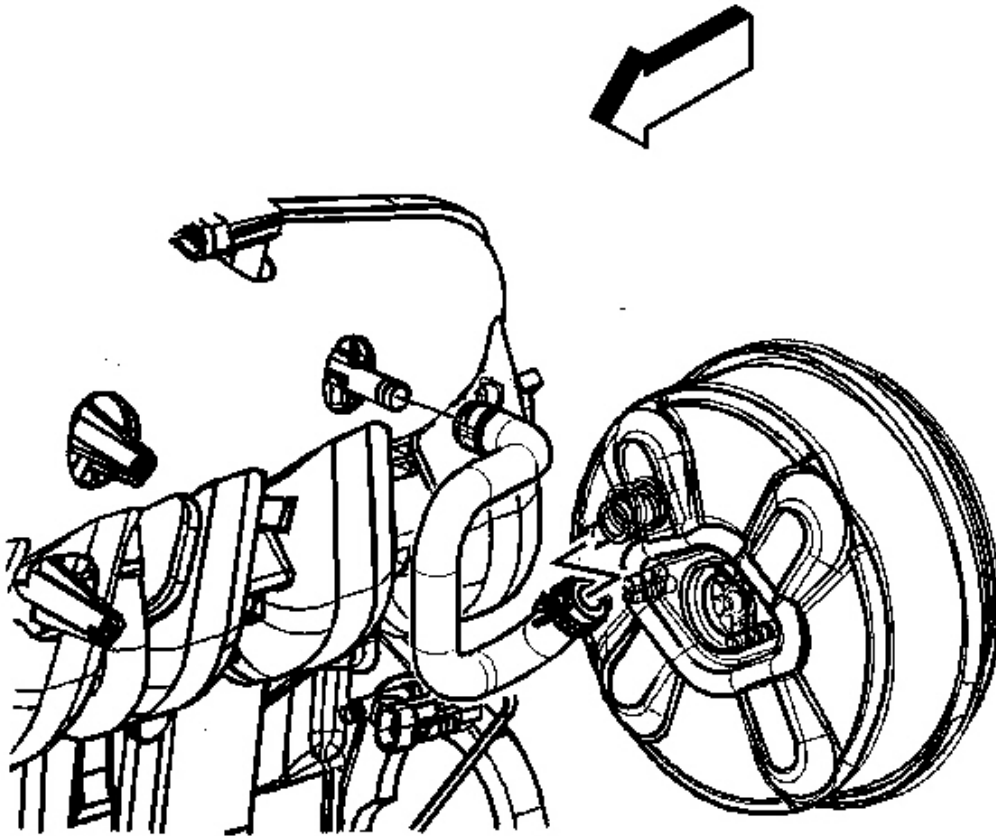


**Fig. 75: View Of Intake Manifold & Bolts**  
Courtesy of GENERAL MOTORS CORP.

2. Install the intake manifold onto the engine and secure the manifold with the bolts.

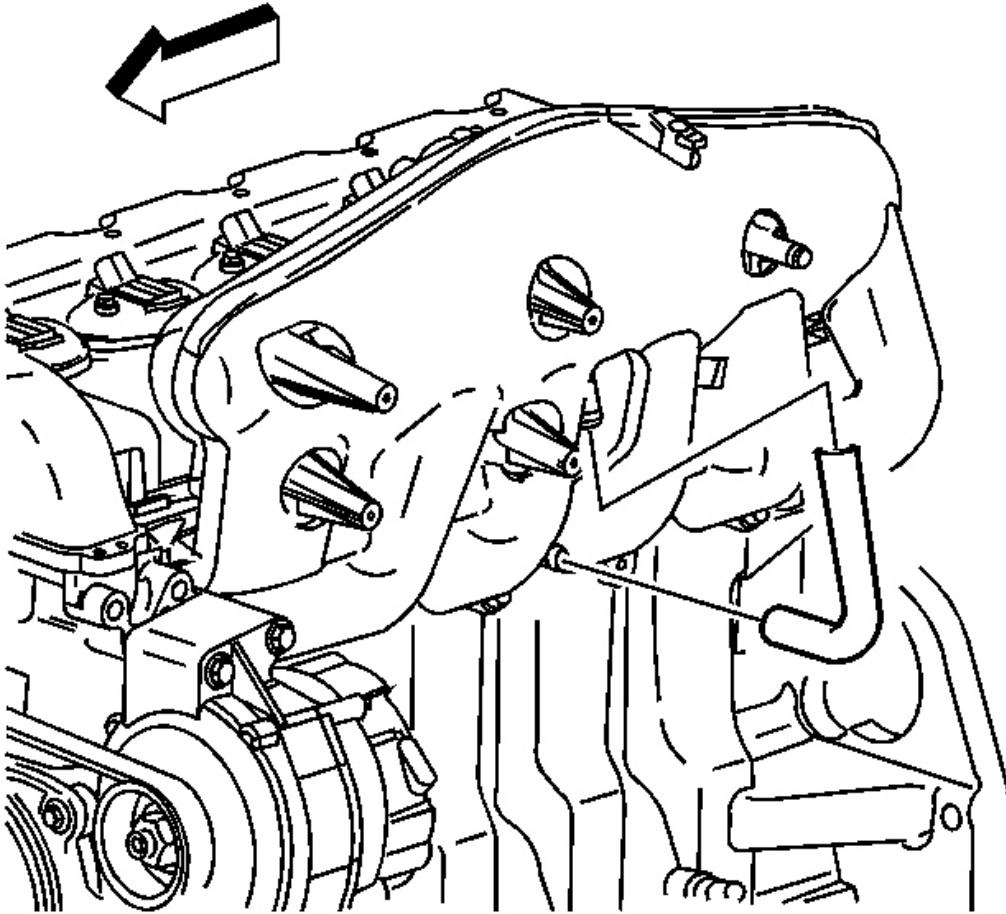
**Tighten:** Tighten the intake manifold bolts to 10 N.m (89 lb in).

3. Install the generator. Refer to **Generator Replacement (4.2L Engine)** or **Generator Replacement (5.3L Engine)** in Engine Electrical.



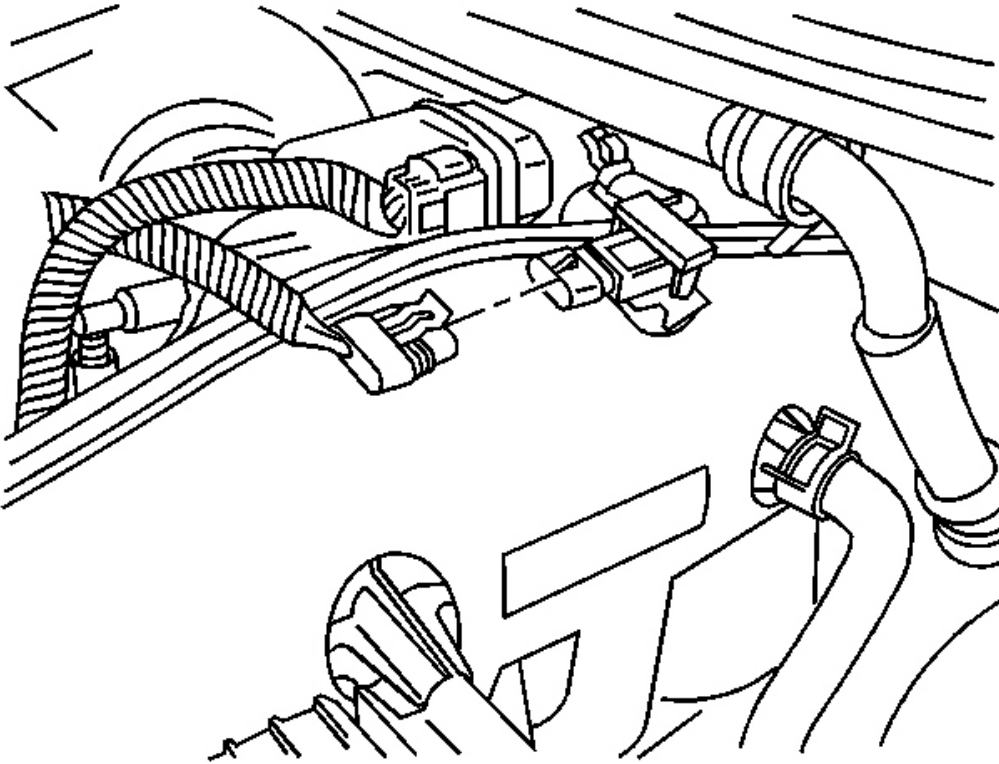
**Fig. 76: View Of Vacuum Brake Booster Hose**  
**Courtesy of GENERAL MOTORS CORP.**

4. Install the vacuum brake booster hose to the intake manifold.



**Fig. 77: View Of Crankcase Ventilation Hose Location**  
Courtesy of GENERAL MOTORS CORP.

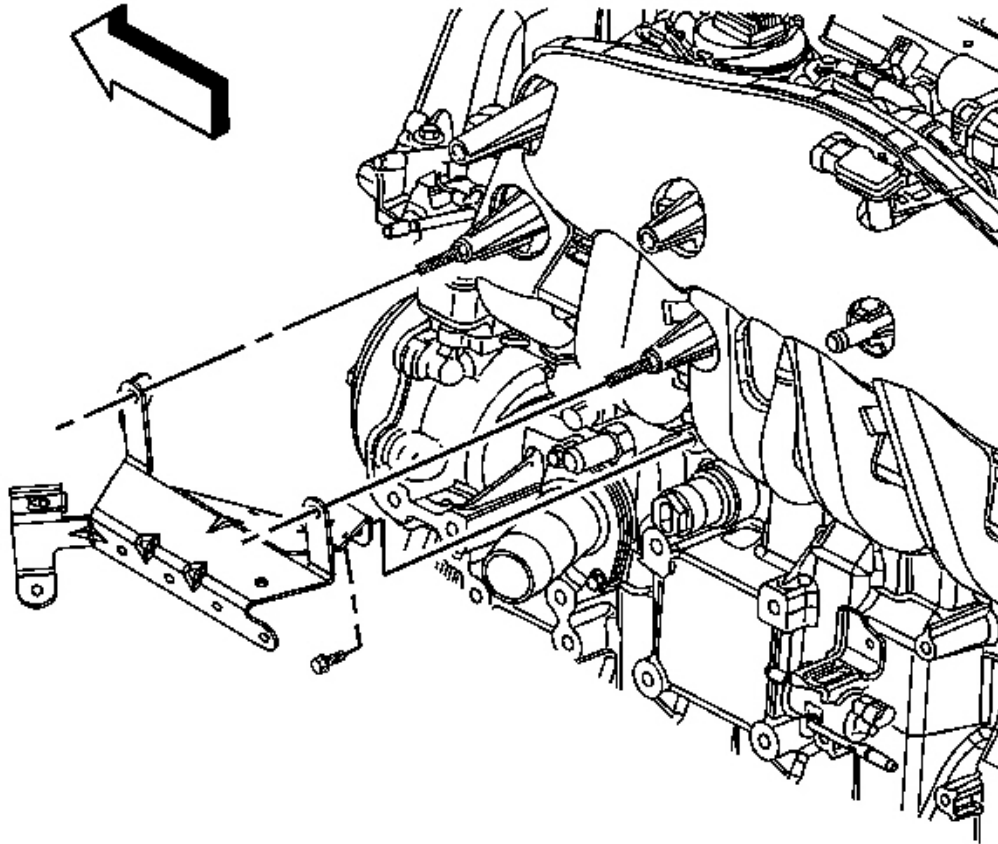
5. Lubricate the inner diameter of the crankcase ventilation hose with GM P/N 12345884 (Canadian P/N 5728223) or equivalent.
6. Install the crankcase ventilation hose.



**Fig. 78: View Of MAP Sensor Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

7. Connect the MAP sensor electrical connector.
8. Properly position the engine electrical harness bracket to the intake manifold.

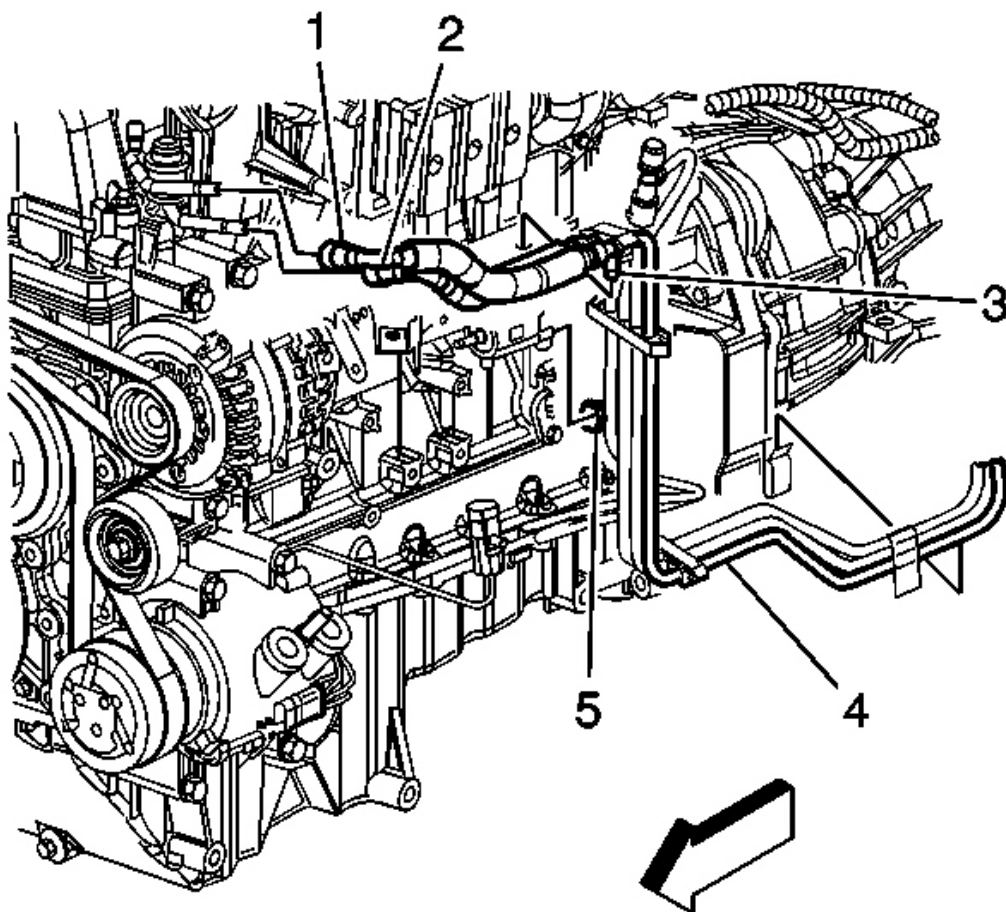




**Fig. 79: View Of Engine Wire Harness Bracket & Bolts**  
Courtesy of GENERAL MOTORS CORP.

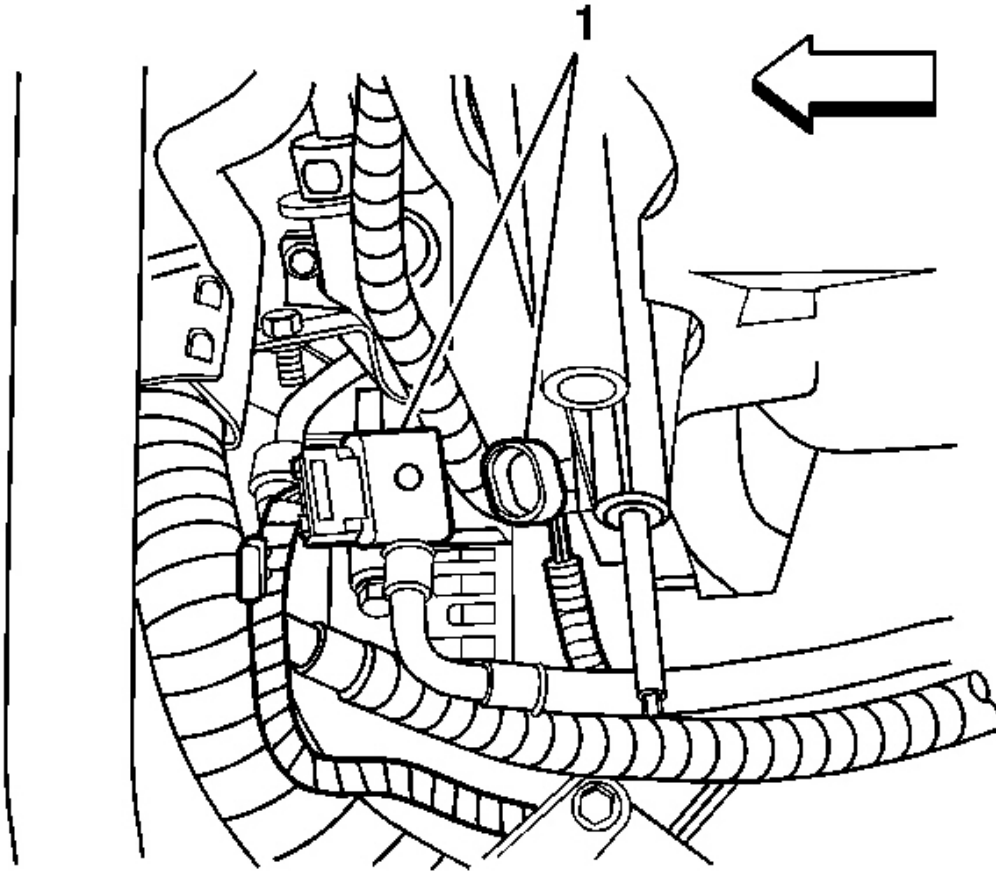
9. Install the engine electrical harness bracket bolt.

**Tighten:** Tighten the bolt to 10 N.m (89 lb in).



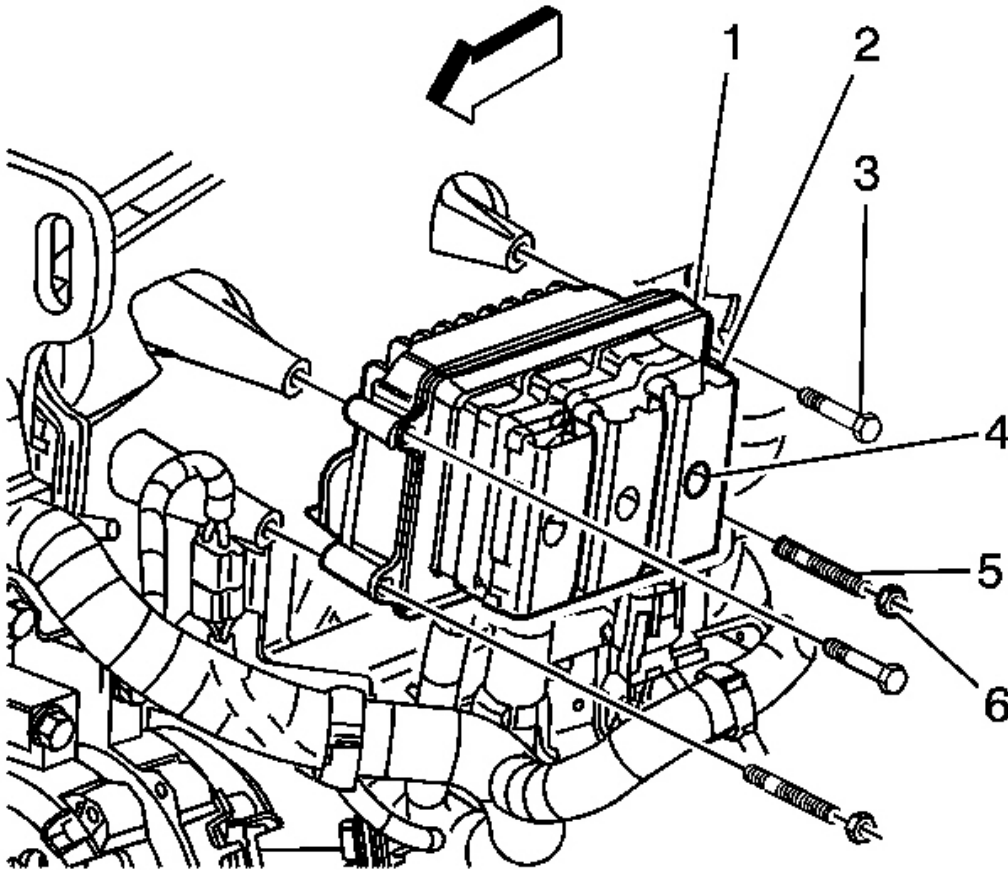
**Fig. 80: Fuel Feed And Fuel Return Pipes (Left Side Of Engine)**  
Courtesy of GENERAL MOTORS CORP.

10. Connect the integral clip (3) to the wire harness bracket.
11. Connect the fuel feed (1) and fuel return (2) pipes to the fuel rail. Refer to **Quick Connect Fitting(s) Service (Metal Collar)**.



**Fig. 81: View Of Engine Coolant Temperature Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

12. Connect the ECT sensor electrical connector (1).



**Fig. 82: View Of PCM Assembly**  
Courtesy of GENERAL MOTORS CORP.

13. Install the PCM mounting studs (5) to the intake manifold.

**Tighten:** Tighten the studs to 6 N.m (53 lb in).

14. Install the PCM (1) onto the studs (5).
15. Install the PCM retaining bolts (3).

**Tighten:** Tighten the bolts to 8 N.m (71 lb in).

16. Install the PCM retaining nuts (6).

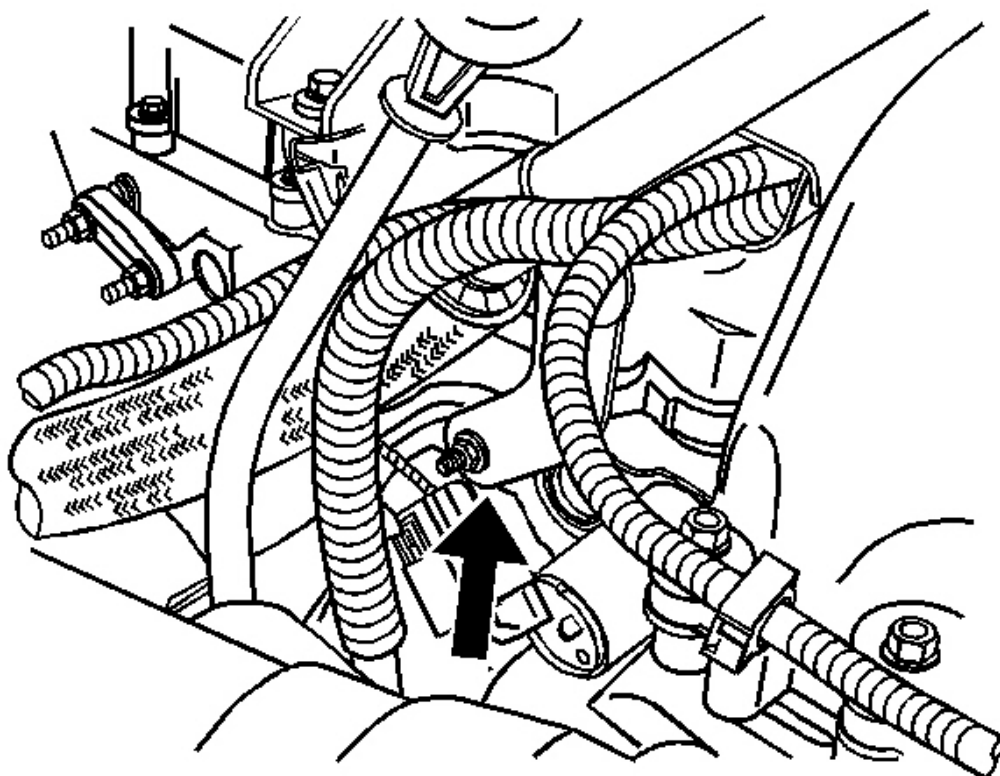
**Tighten:** Tighten the nuts to 8 N.m (71 lb in).

17. Install the throttle body. Refer to **Throttle Body Assembly Replacement** in Engine Controls - 4.2L.
18. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.
19. Inspect for leaks using the following procedure:
  1. Turn ON the ignition, with the engine OFF for 2 seconds.
  2. Turn OFF the ignition, for 10 seconds.
  3. Turn ON the ignition, with the engine OFF.
  4. Inspect for fuel leaks.

## **CAMSHAFT COVER REPLACEMENT**

### **Removal Procedure**

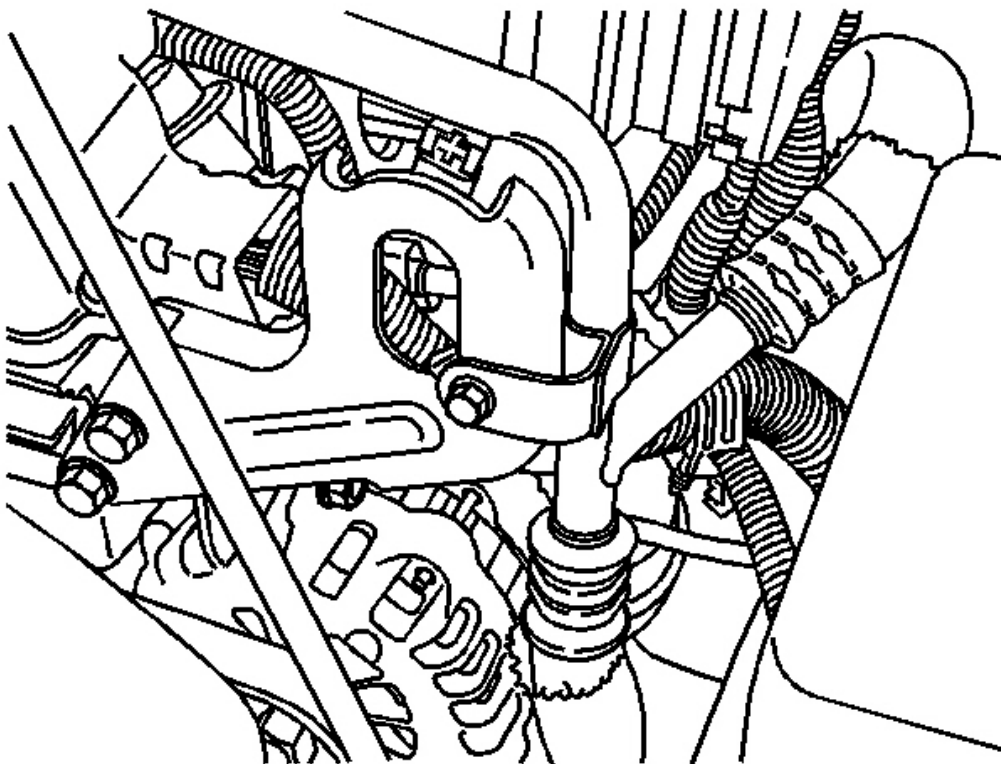
1. Remove the intake manifold. Refer to **Intake Manifold Replacement**.



**Fig. 83: View Of Oil Level Indicator Tube Bracket Nut**

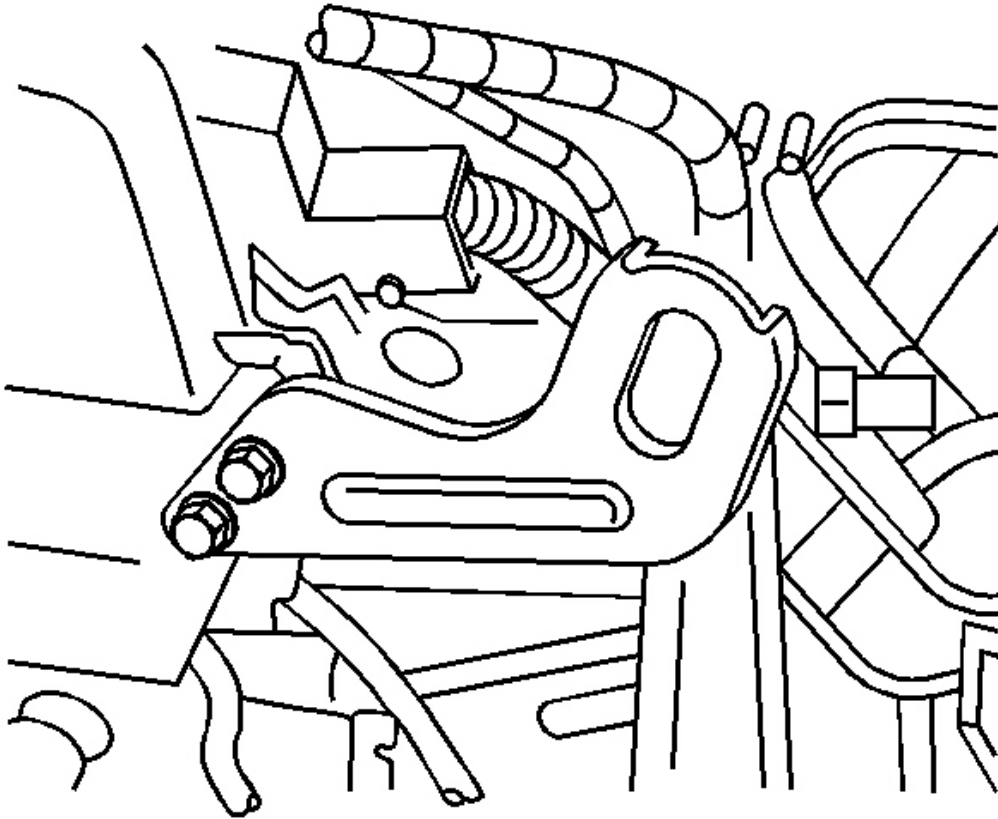
**Courtesy of GENERAL MOTORS CORP.**

2. Remove the A/C line at the oil level indicator tube bracket nut.



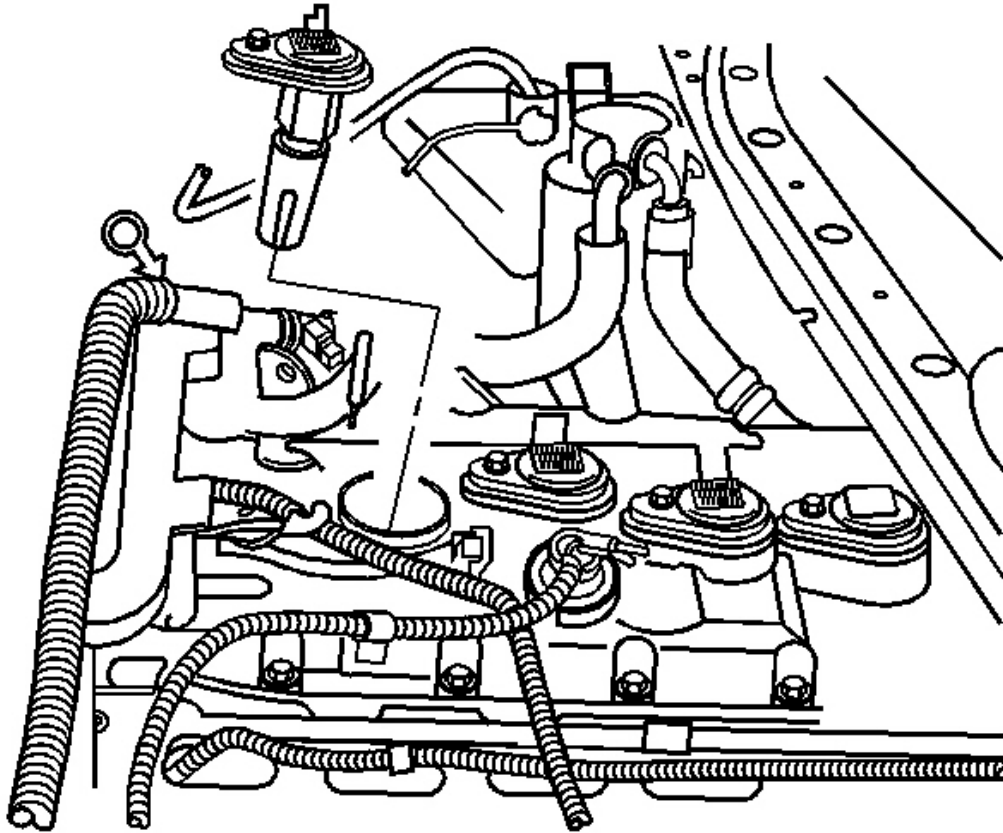
**Fig. 84: View Of Engine Lift Hook & A/C Bracket Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the A/C bracket bolt from the engine lift hook.
4. Position the A/C line out of the way.



**Fig. 85: View Of Engine Lift Bracket**  
**Courtesy of GENERAL MOTORS CORP.**

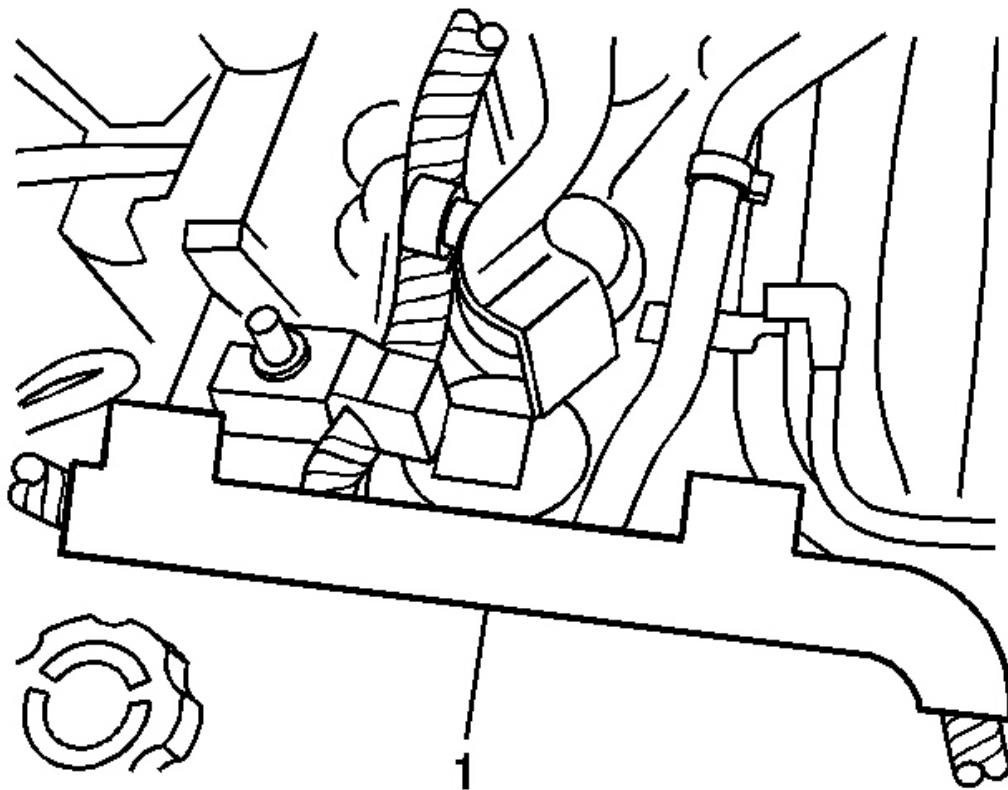
5. Remove the engine lift bracket.
6. Disconnect the ignition control module electrical connectors.
7. Loosen the ignition control module bolts.



**Fig. 86: View Of Ignition Control Module**  
**Courtesy of GENERAL MOTORS CORP.**

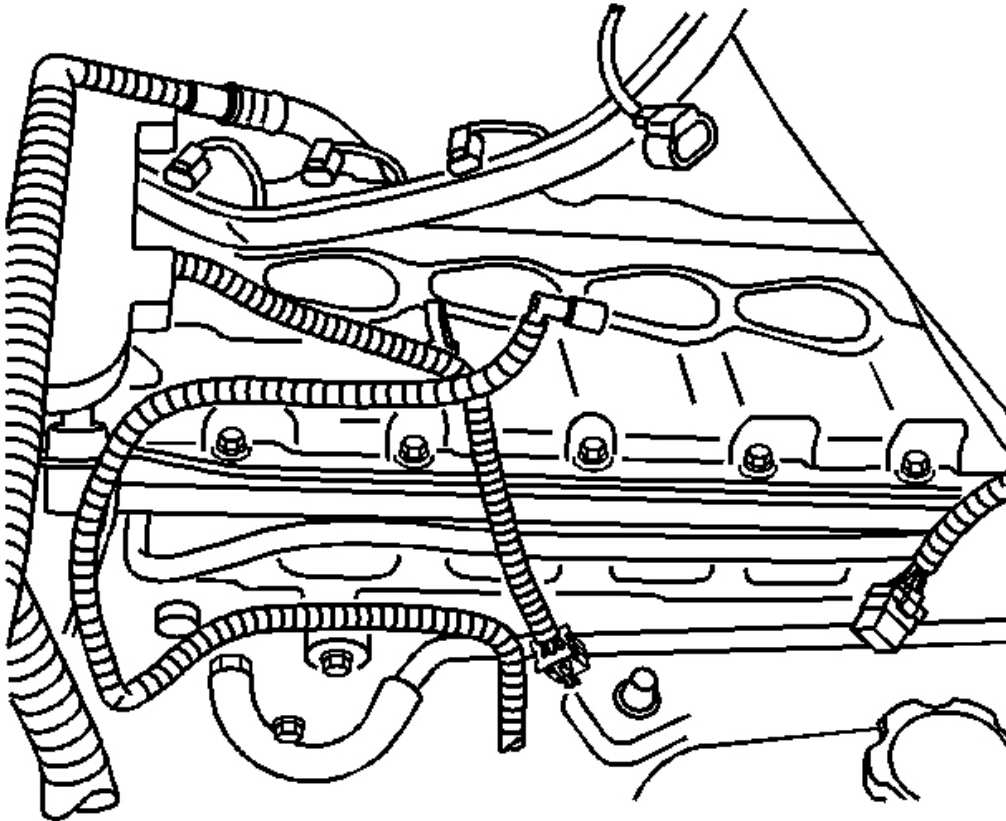
8. Remove the ignition control module.





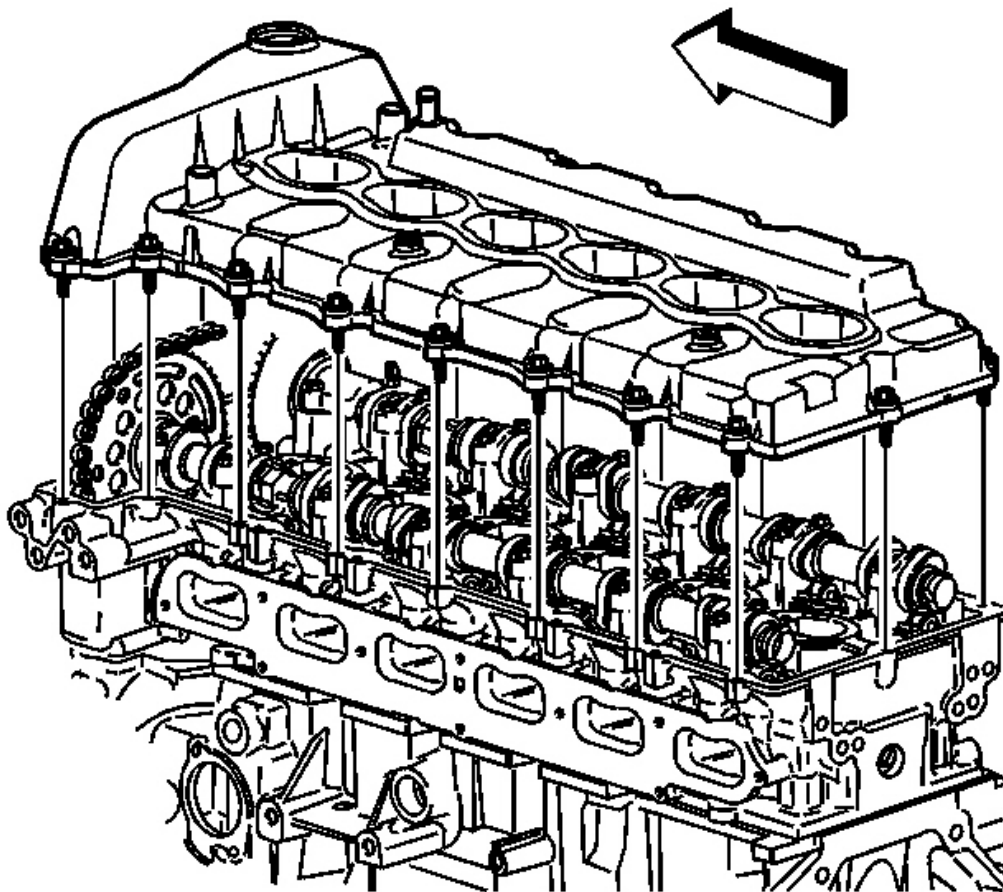
**Fig. 87: View Of Engine Electrical Harness Housing**  
Courtesy of GENERAL MOTORS CORP.

9. Disconnect the engine electrical harness housing from the camshaft cover (1) taking care not to damage the clips that hold the housing in place.
10. Disconnect the fuel injection harness electrical connector.



**Fig. 88: View Of Camshaft Cover Bolts**  
Courtesy of GENERAL MOTORS CORP.

11. Loosen and remove the camshaft cover bolts.



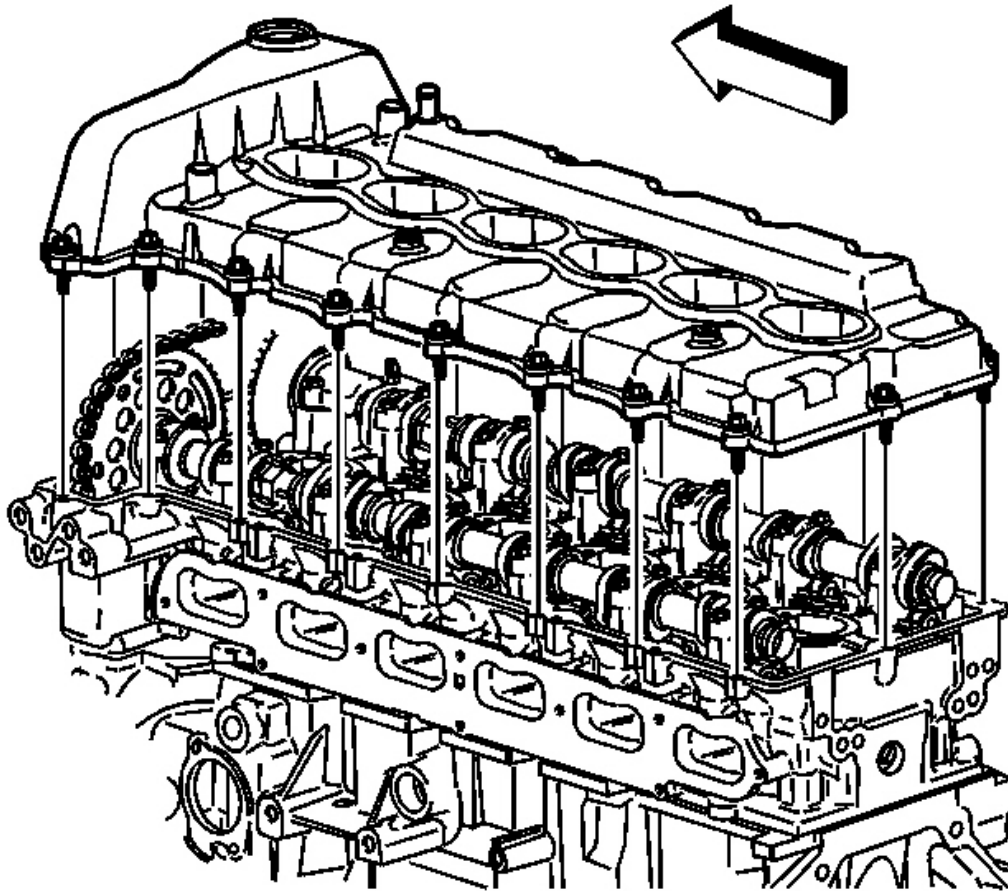
**Fig. 89: View Of Camshaft Cover & Bolts**  
Courtesy of GENERAL MOTORS CORP.

12. Remove the camshaft cover.
13. Clean and inspect the camshaft cover. Refer to Camshaft Cover Cleaning and Inspection.

#### Installation Procedure

1. Install a new camshaft cover seal.
2. Install new rubber ignition control module seals.

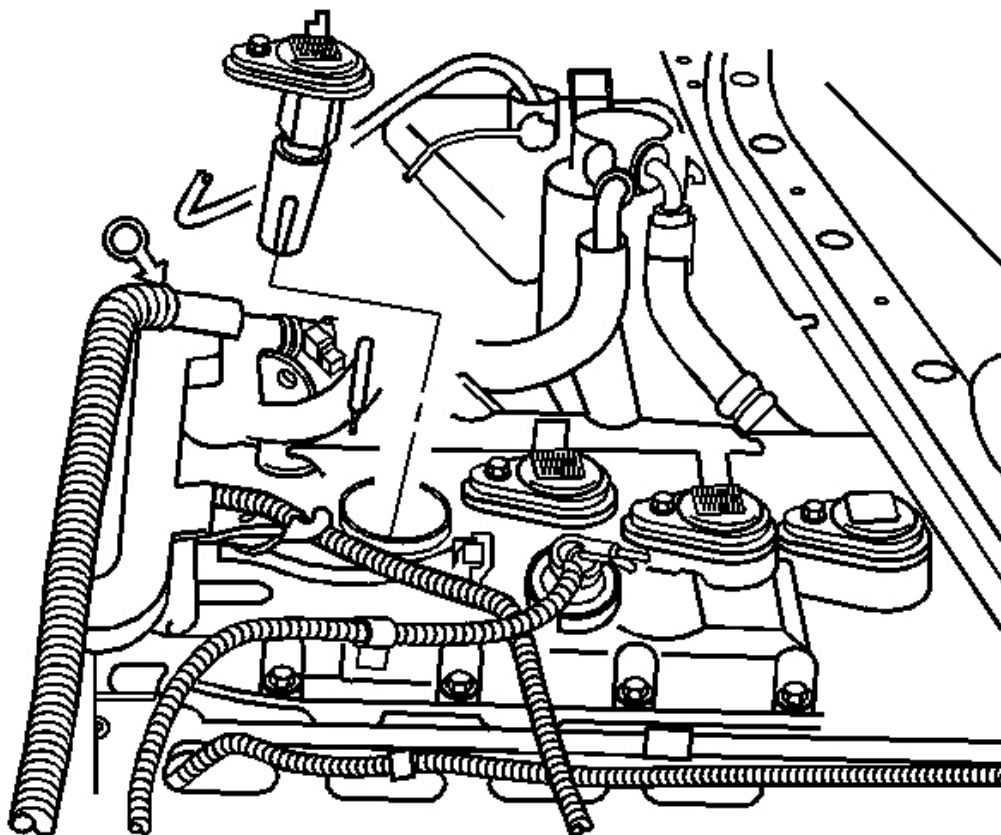
**NOTE:** Refer to Fastener Notice in Cautions and Notices.



**Fig. 90: View Of Camshaft Cover & Bolts**  
Courtesy of GENERAL MOTORS CORP.

3. Install the camshaft cover and secure with the cam cover bolts.

**Tighten:** Tighten the camshaft cover bolts to 10 N.m (89 lb in).

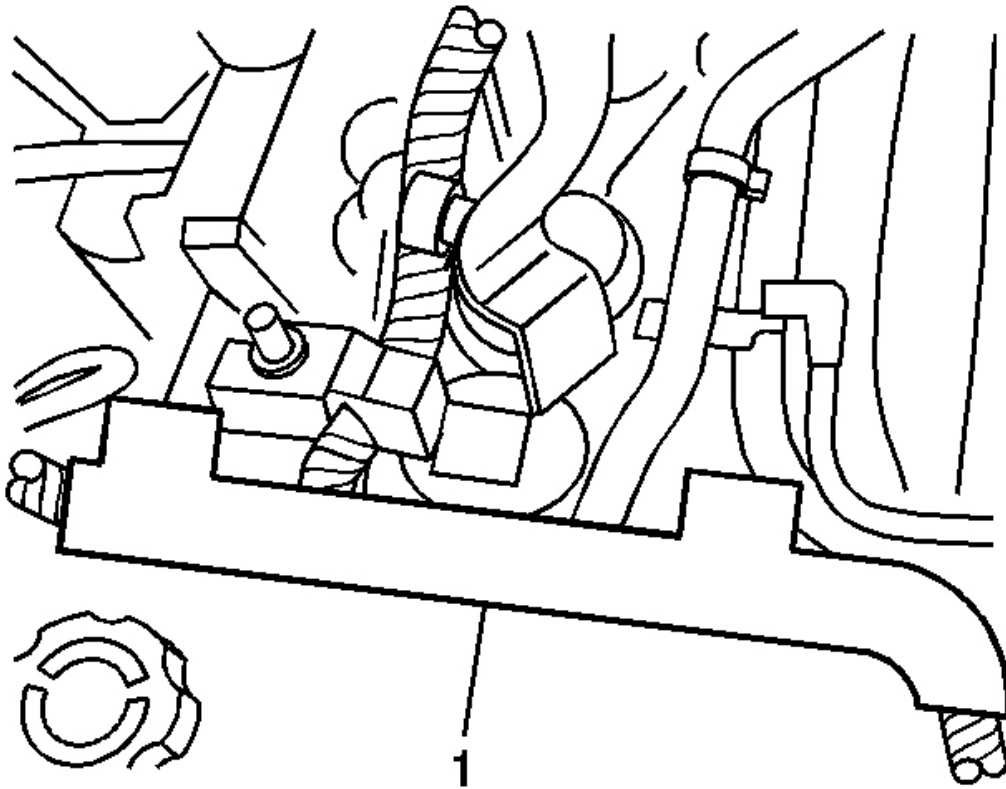


**Fig. 91: View Of Ignition Control Module**  
Courtesy of GENERAL MOTORS CORP.

4. Install the ignition control modules and secure the modules with bolts.

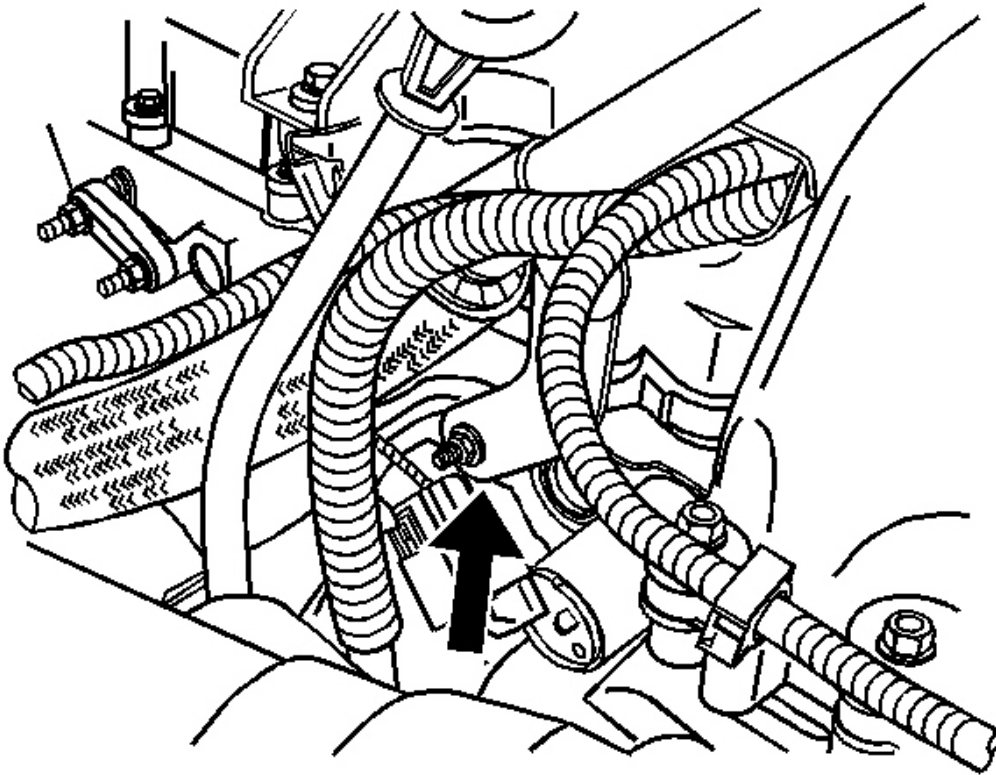
**Tighten:** Tighten the ignition coil bolts to 10 N.m (89 lb in).

5. Connect the ignition control module electrical connectors.
6. Install the fuel injector electrical connectors.



**Fig. 92: View Of Engine Electrical Harness Housing**  
Courtesy of GENERAL MOTORS CORP.

7. Install the engine electrical harness housing (1).



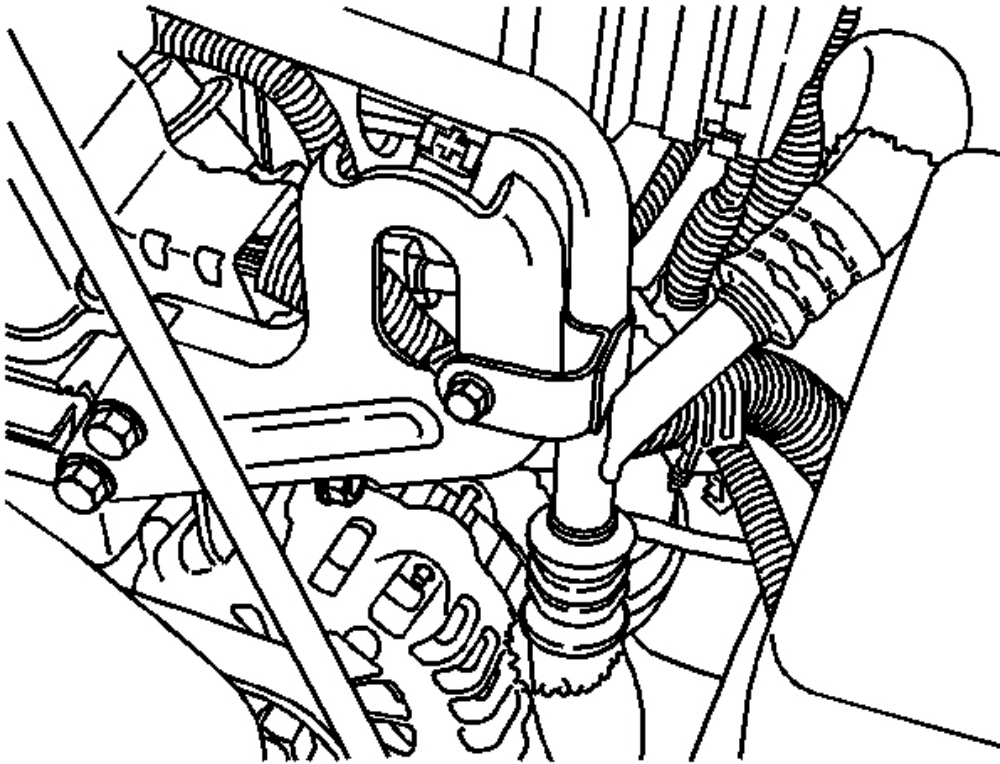
**Fig. 93: View Of Oil Level Indicator Tube Bracket Nut**  
Courtesy of GENERAL MOTORS CORP.

8. Install the A/C line bracket to the oil level indicator tube stud and secure the bracket with the nut.

**Tighten:** Tighten the A/C line bracket nut to 7 N.m (62 lb in).

9. Install the engine lift bracket and secure the lift hook with the bolts.

**Tighten:** Tighten the lift bracket bolts to 50 N.m (37 lb ft).



**Fig. 94: View Of Engine Lift Hook & A/C Bracket Bolt**  
Courtesy of GENERAL MOTORS CORP.

10. Install the A/C line bracket to the engine lift bracket and secure the A/C bracket with the bolt.

**Tighten:** Tighten the A/C bracket bolt to 10 N.m (89 lb in).

11. Install the intake manifold. Refer to **Intake Manifold Replacement**.

## VALVE ROCKER ARM AND VALVE LASH ADJUSTER REPLACEMENT

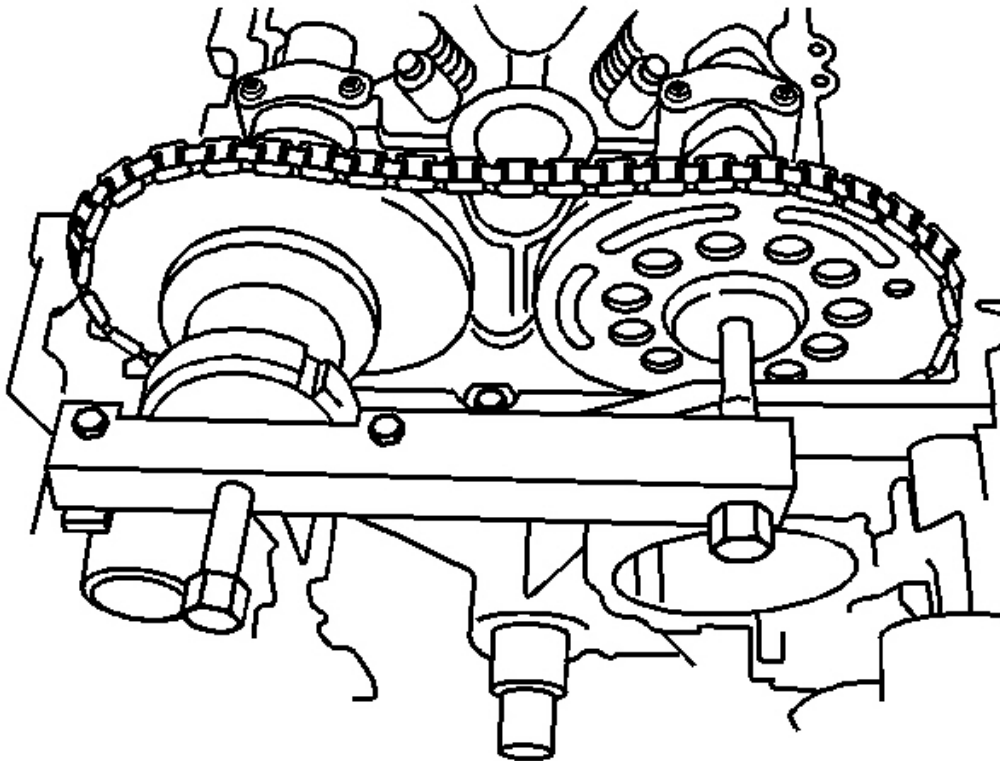
### Tools Required

- J 36660-A Torque Angle Meter
- J 44222 Camshaft Sprocket Holding Tool. See **Special Tools and Equipment**.

### Removal Procedure



1. Remove the camshaft cover. Refer to Camshaft Cover Replacement.
2. Remove the exhaust and the intake sprocket bolts.

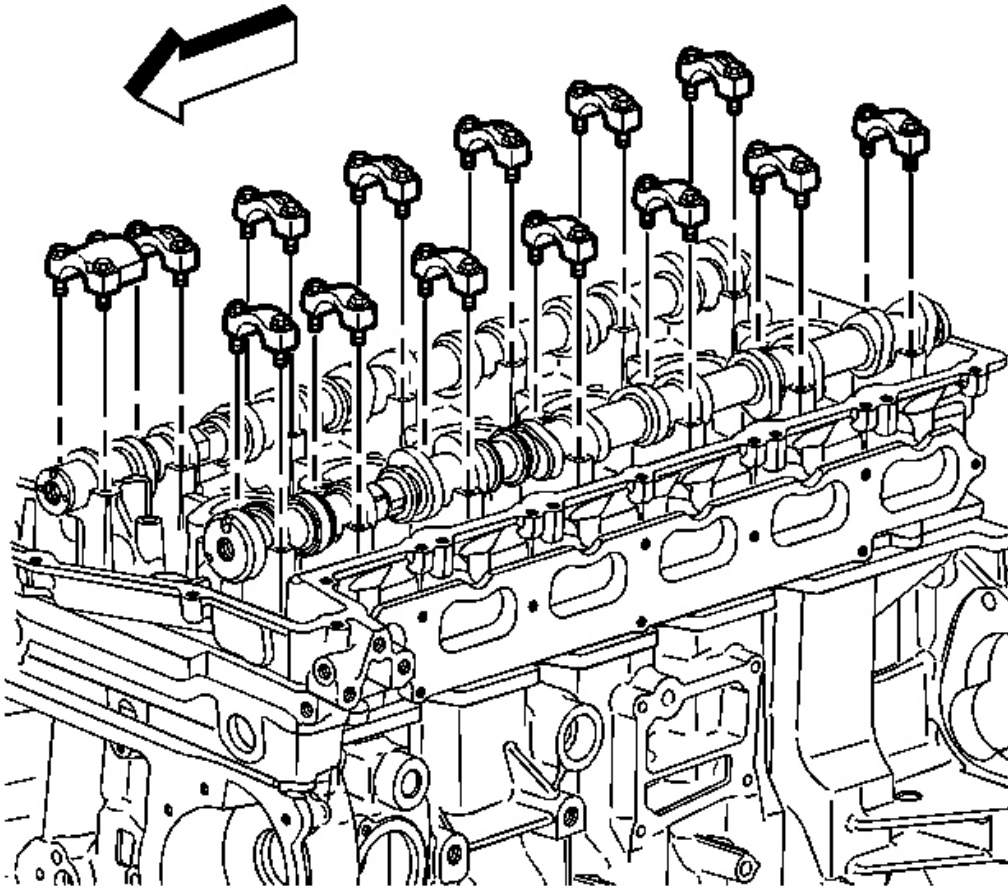


**Fig. 95: View Of J 44222 Installed Onto Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

3. Install the **J 44222** onto the cylinder head and adjust the horizontal bolts into the camshaft sprockets in order to maintain chain tension and keep from disturbing the timing chain components. See Special Tools and Equipment.
4. Carefully move the sprockets with the timing chain off of the camshafts.

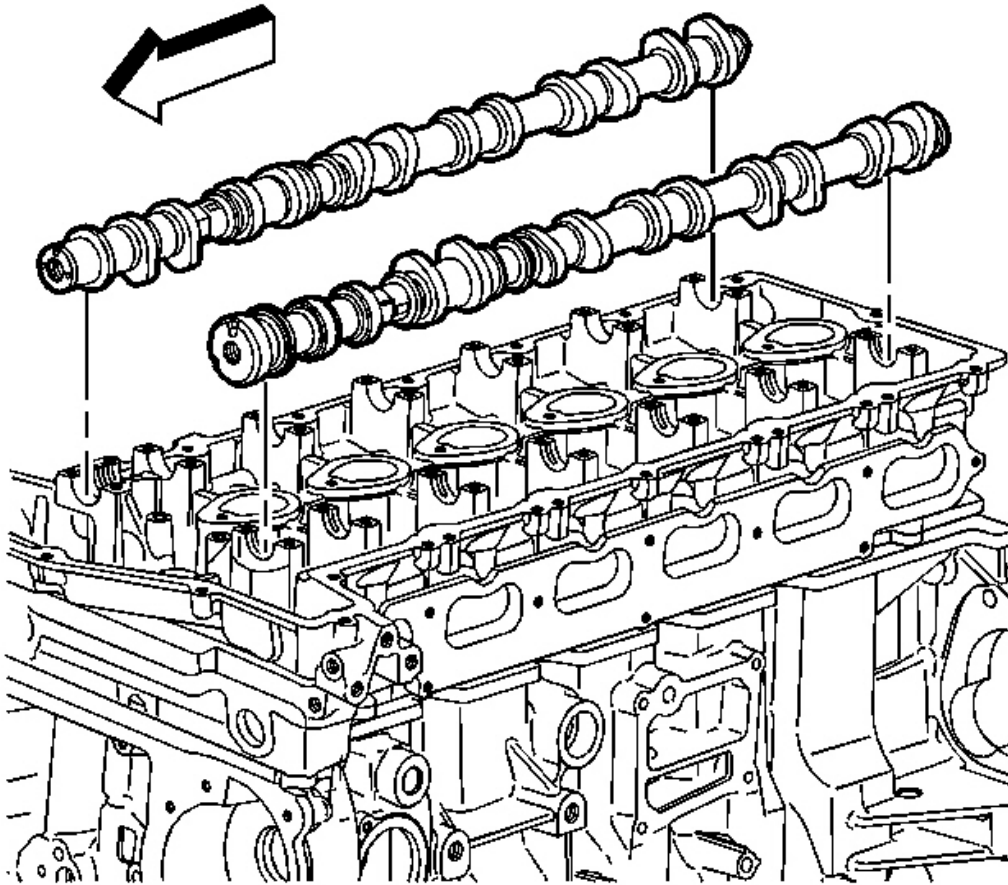
**IMPORTANT:** Place the camshaft caps in a rack to ensure the caps are installed in the same location from which they were removed.

5. Remove the camshaft cap bolts.



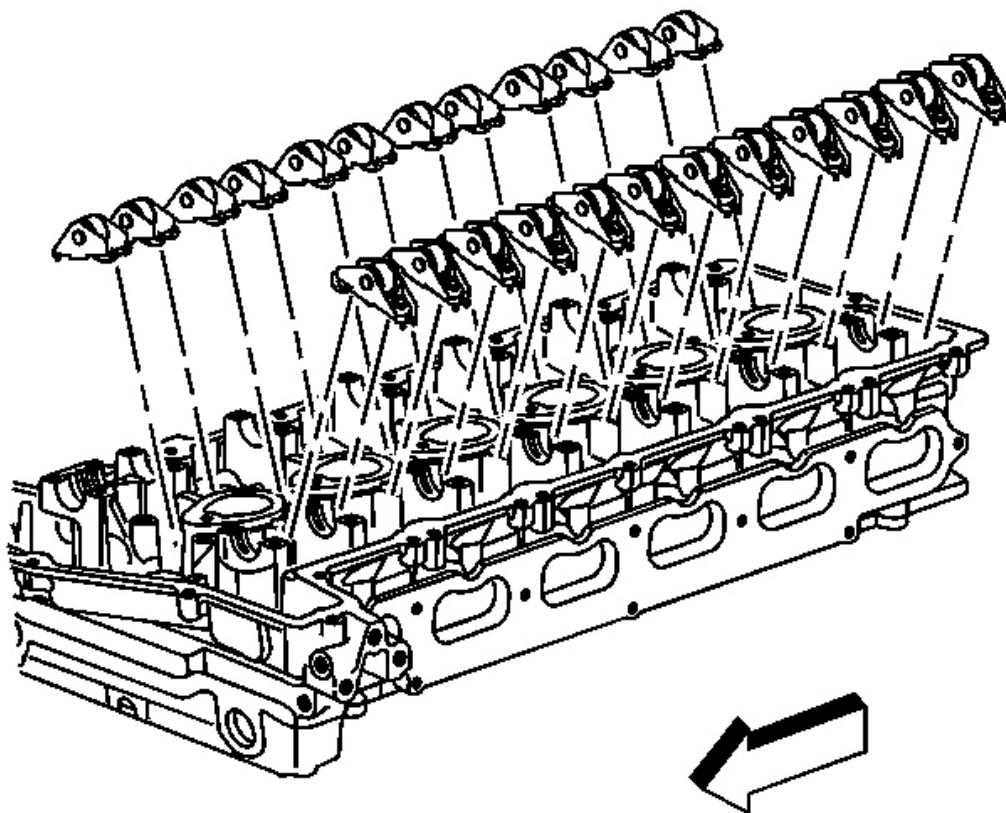
**Fig. 96: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

6. Remove the camshaft caps.



**Fig. 97: Removing/Installing Camshafts**  
Courtesy of GENERAL MOTORS CORP.

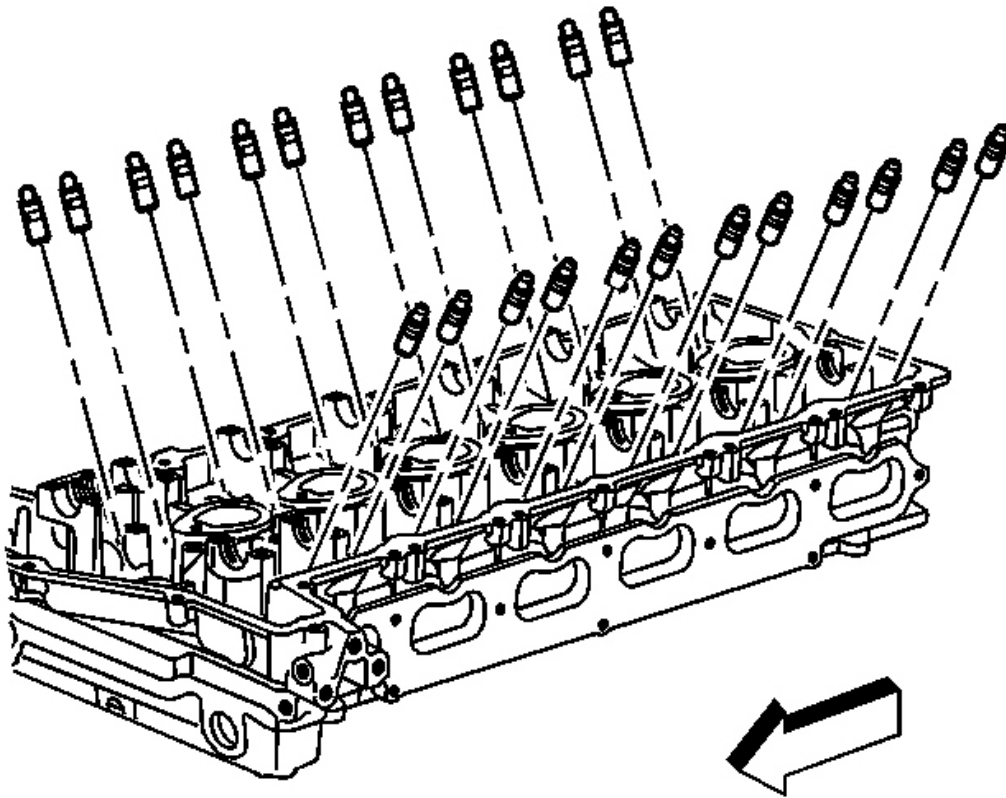
7. Remove the camshafts.



**Fig. 98: View Of Valve Rocker Arms**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Once removed, place the valve rocker arms and valve lash adjusters in an organized order so the components can be installed into the original locations.

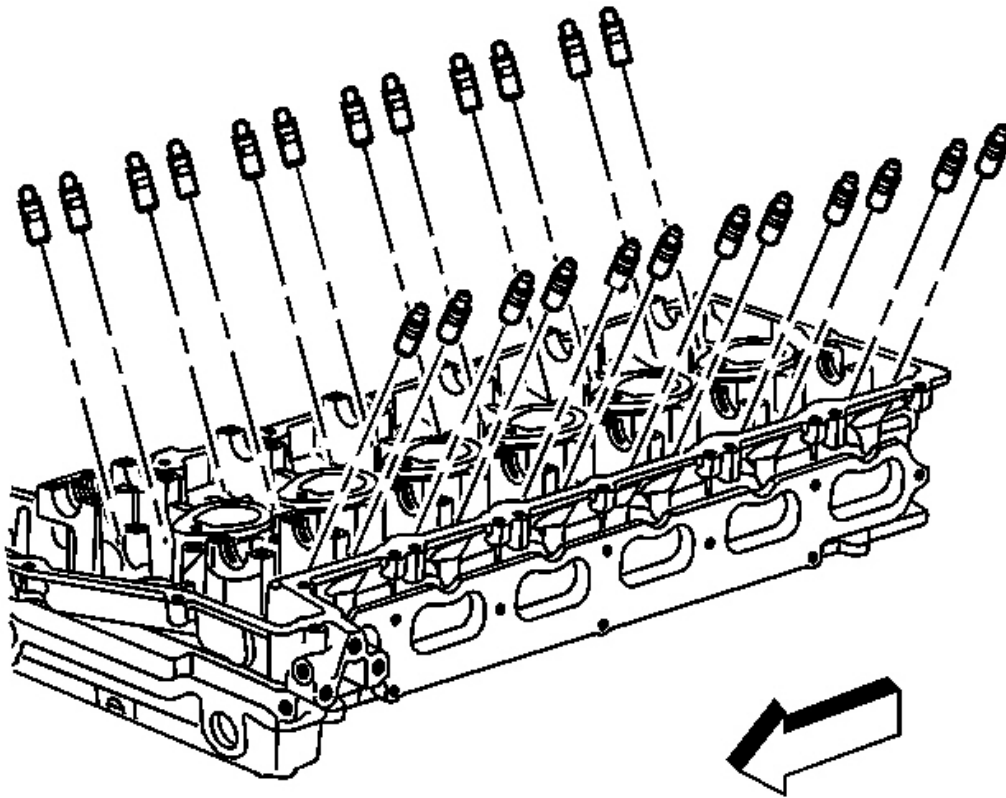
8. Remove the valve rocker arms.



**Fig. 99: View Of Valve Lash Adjusters**  
**Courtesy of GENERAL MOTORS CORP.**

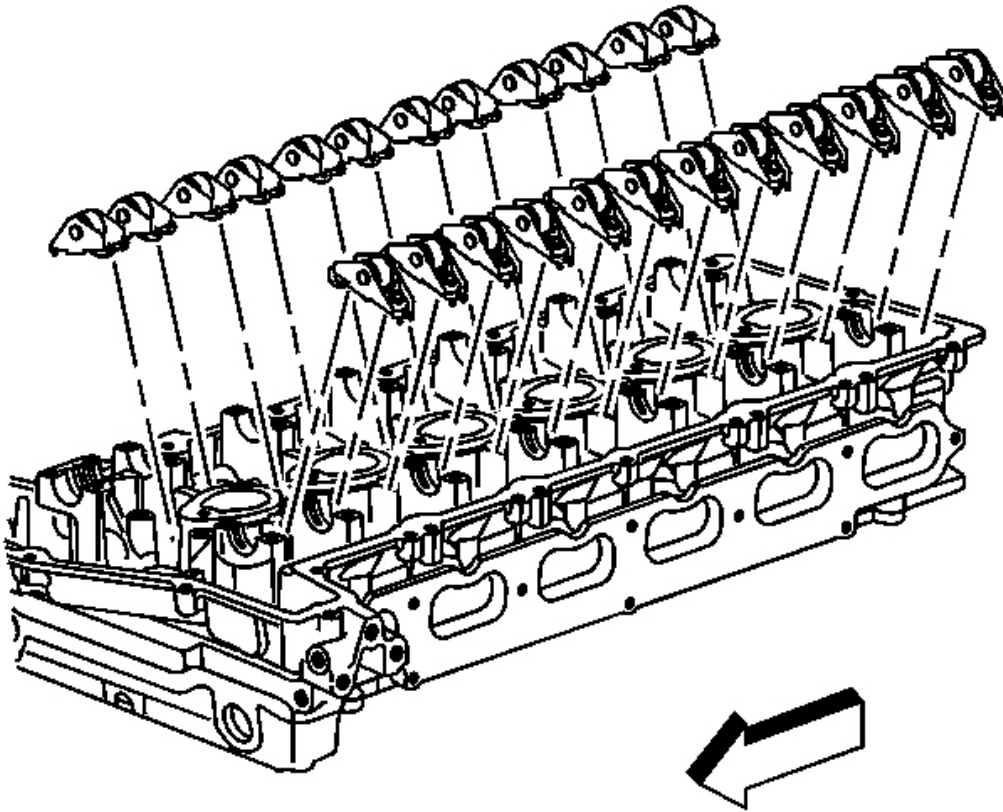
9. Remove the valve lash adjusters.

#### **Installation Procedure**



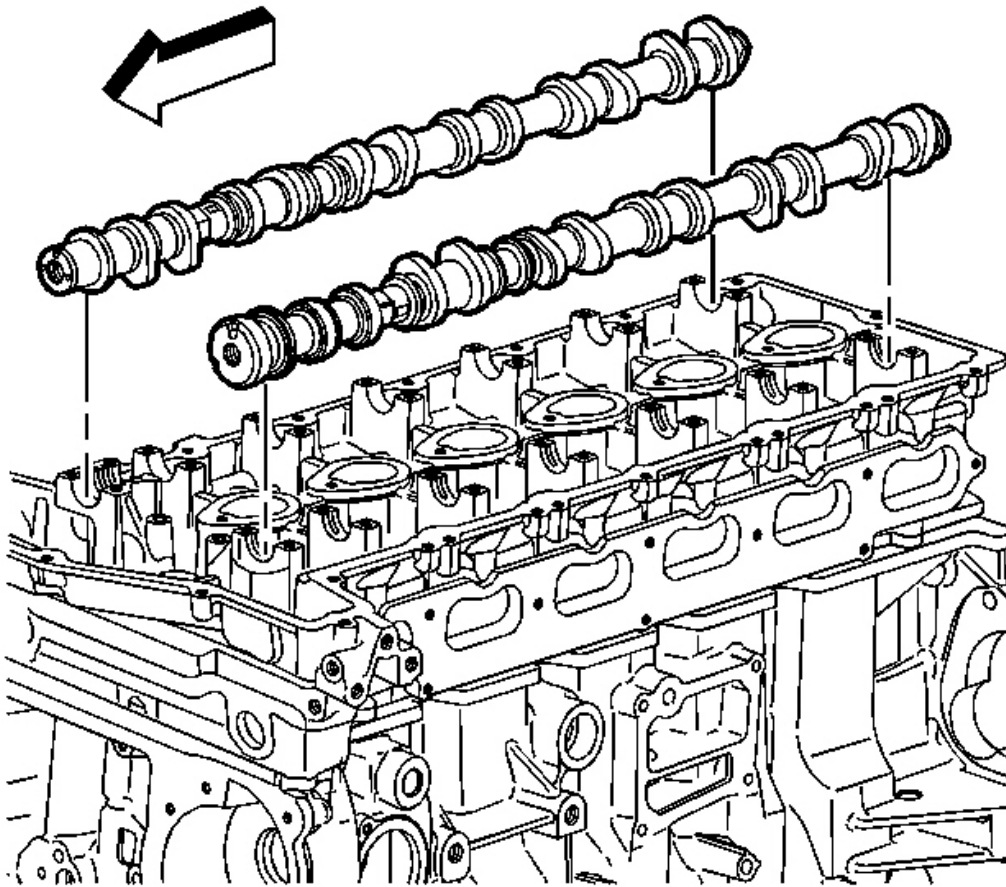
**Fig. 100: View Of Valve Lash Adjusters**  
**Courtesy of GENERAL MOTORS CORP.**

1. Lubricate and fill the valve lash adjusters with engine oil.
2. Install the valve lash adjusters in their original locations.



**Fig. 101: View Of Valve Rocker Arms**  
**Courtesy of GENERAL MOTORS CORP.**

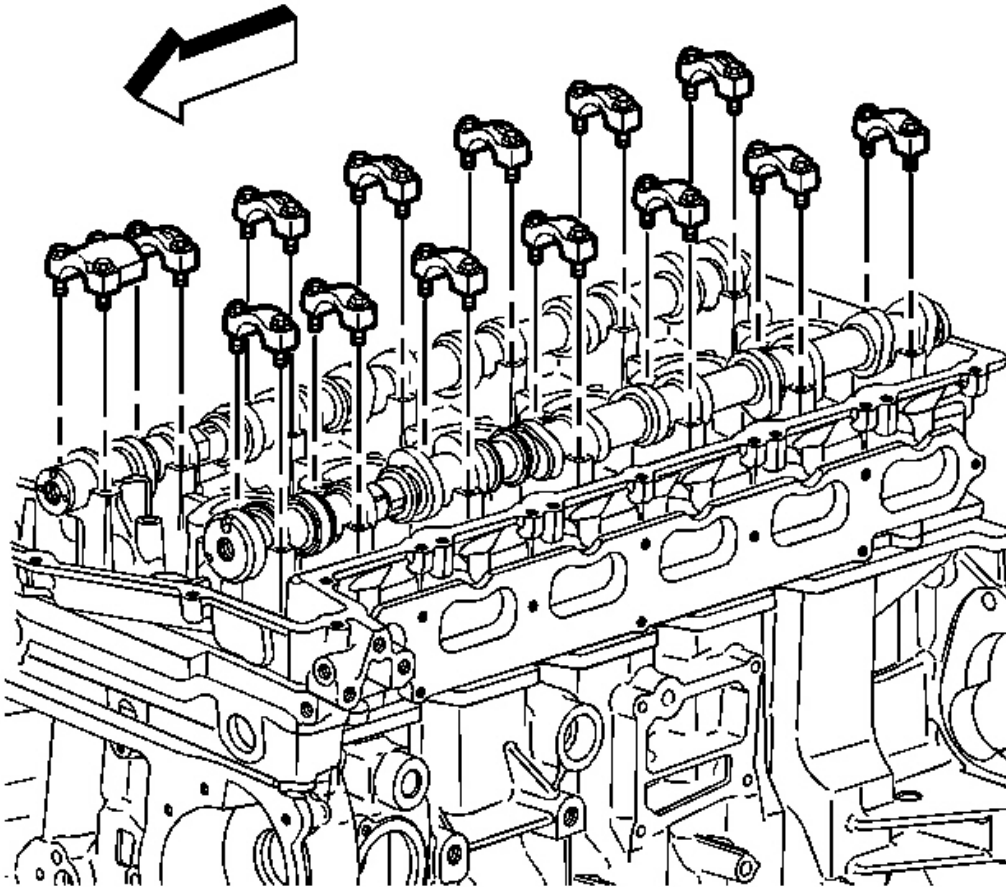
3. Lubricate the valve rocker arm roller.
4. Install the valve rocker arms in their original locations.
5. Coat the camshaft journals with engine oil.



**Fig. 102: Removing/Installing Camshafts**  
Courtesy of GENERAL MOTORS CORP.

6. Install the camshafts to their original position



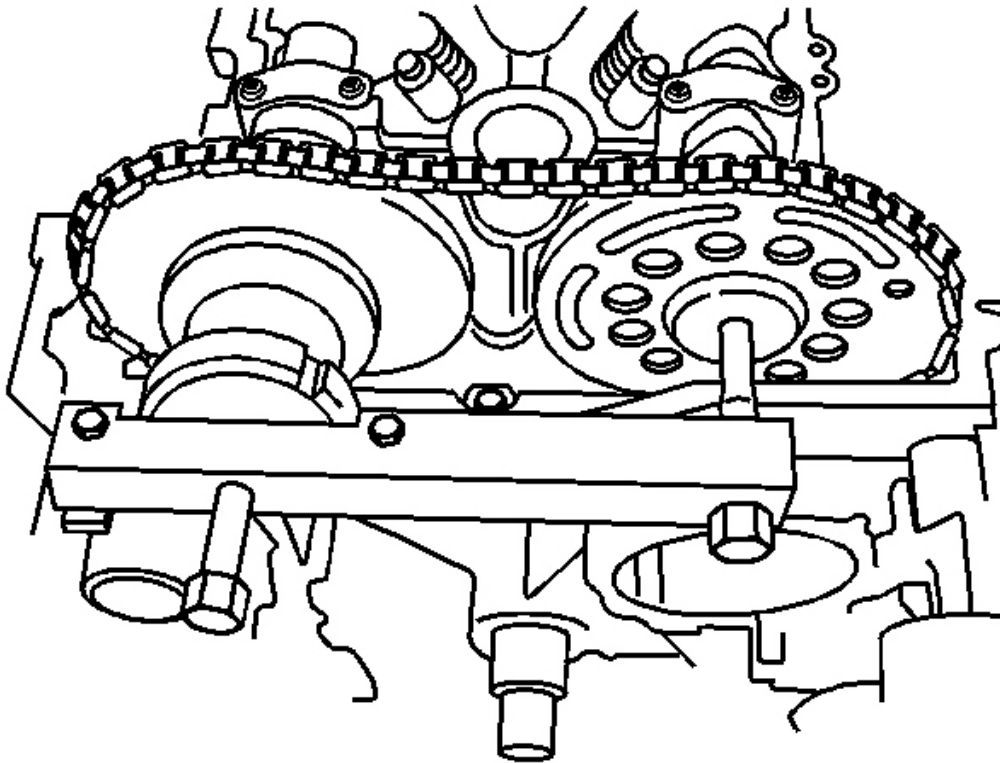


**Fig. 103: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

7. Install the camshaft caps onto their original journal.

**Tighten:** Tighten the camshaft cap bolts to 12 N.m (106 lb in).



**Fig. 104: View Of J 44222 Installed Onto Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

8. Carefully move the camshaft sprockets back onto the camshafts and remove the **J 44222** . See **Special Tools and Equipment**.
9. Install the intake camshaft sprocket washer, and the bolt, and the exhaust camshaft actuator bolt.

**Tighten:**

- Tighten the intake camshaft sprocket bolt the first pass 20 N.m (15 lb ft).
- Use the J 36660-A to tighten the intake camshaft sprocket bolt the final pass and additional 100 degrees.
- Tighten the exhaust camshaft actuator bolt the first pass to 25 N.m (18 lb ft).
- Use the J 36660-A to tighten the exhaust camshaft actuator bolt a final pass an additional 135 degrees.

10. Install the camshaft cover. Refer to **Camshaft Cover Replacement**.

## **VALVE STEM OIL SEAL AND VALVE SPRING REPLACEMENT**

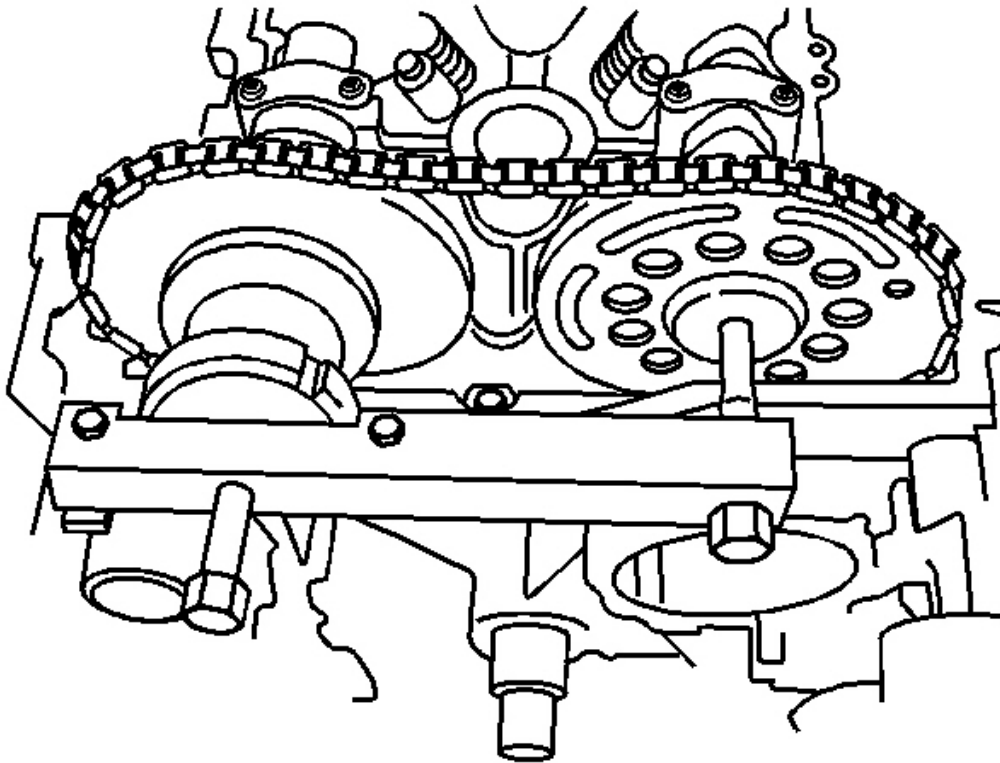
### **Tools Required**

- **J 38820** Valve Stem Seal Remover and Installer. See **Special Tools and Equipment**.
- **J 44222** Camshaft Sprocket Holding Tool. See **Special Tools and Equipment**.
- **J 44228** Valve Spring Compressor. See **Special Tools and Equipment**.

### **Removal Procedure**

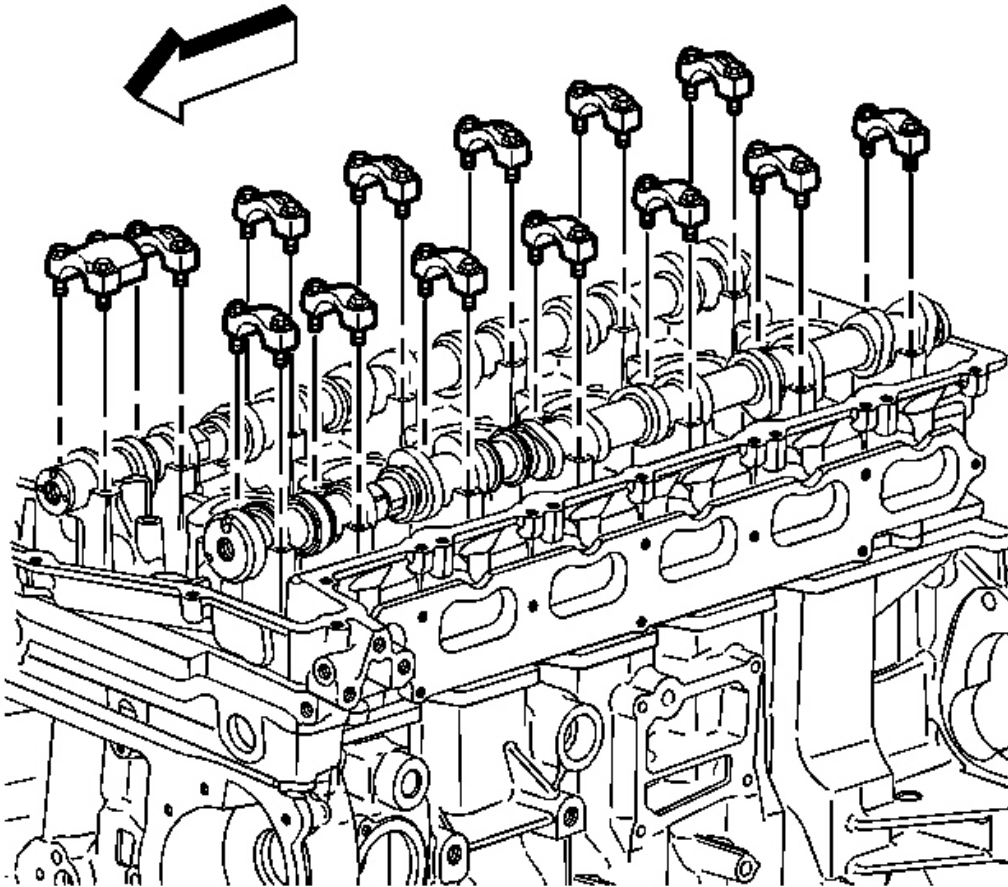
**IMPORTANT:** Organize the valve train components when disassembling so they can be reassembled in the same location and matched up with the same components, as previously installed.

1. Remove the cam cover. Refer to **Camshaft Cover Replacement**.
2. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls-4.2 L.
3. Remove the exhaust and the intake sprocket bolts.



**Fig. 105: View Of J 44222 Installed Onto Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

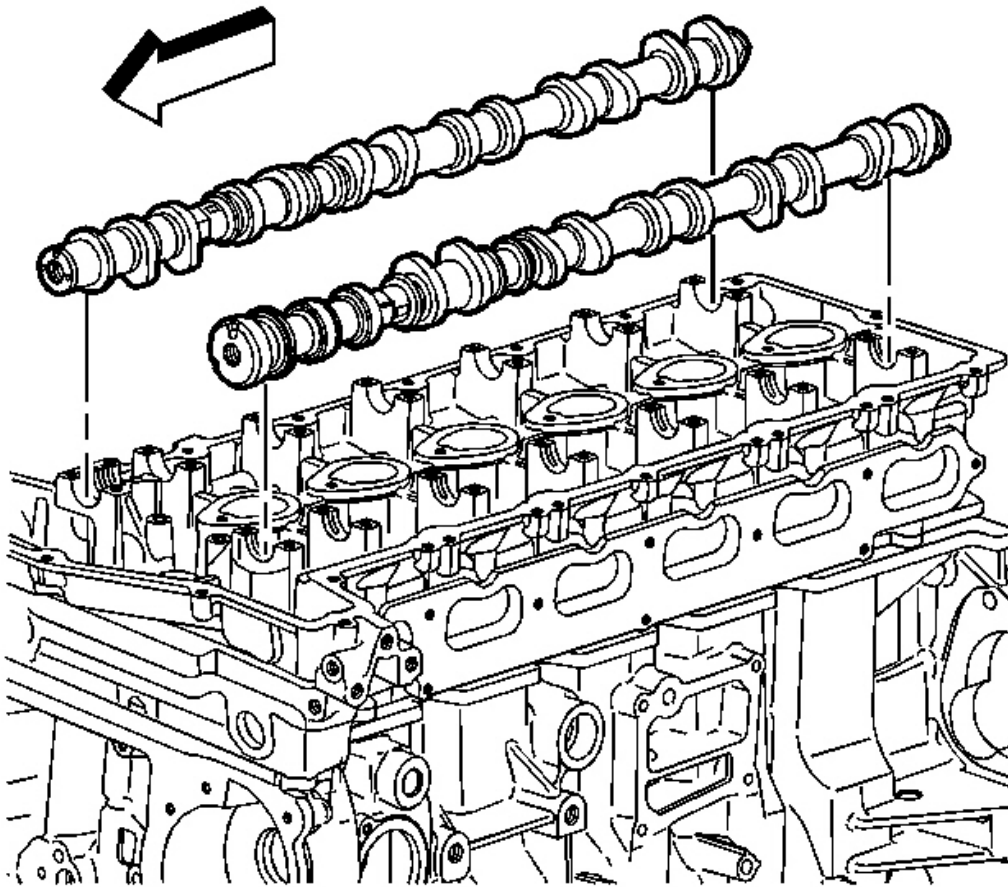
4. Install the **J 44222** onto the cylinder head in order to keep from disturbing the timing chain components. See **Special Tools and Equipment**.
5. Adjust the 2 horizontal bolts into the camshaft sprockets to maintain chain tension.
6. Carefully move the sprockets with the timing chain, off of the camshafts.
7. Remove the camshaft cap bolts.



**Fig. 106: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

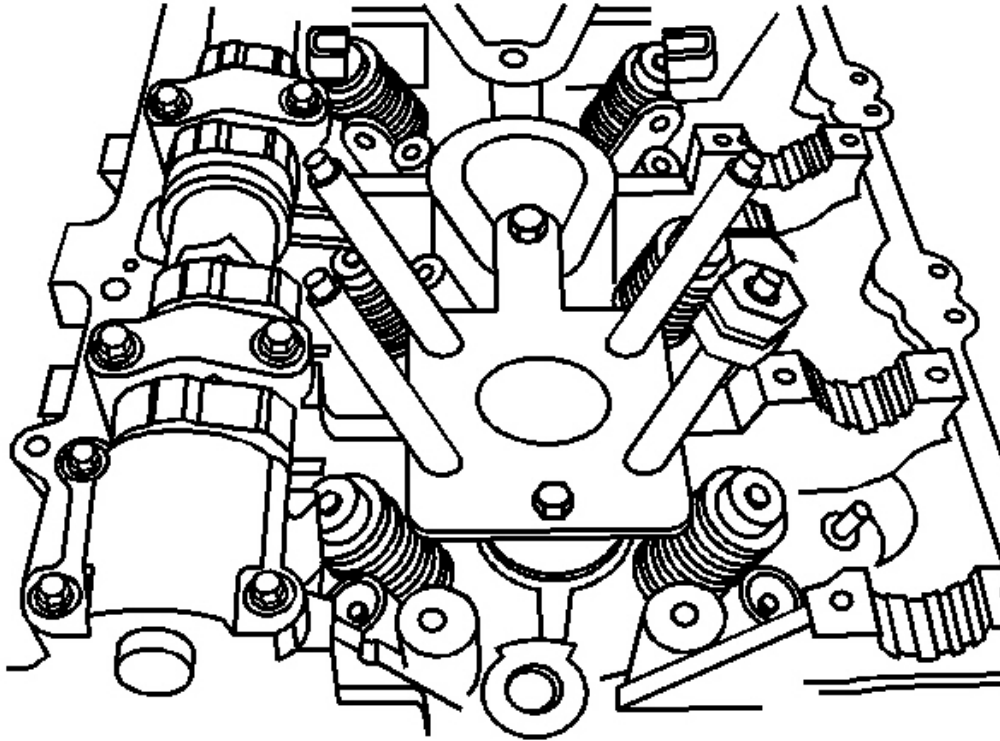
**IMPORTANT:** Place the camshaft caps in a rack to ensure the caps are installed in the same location from which they were removed.

8. Remove the camshaft caps.



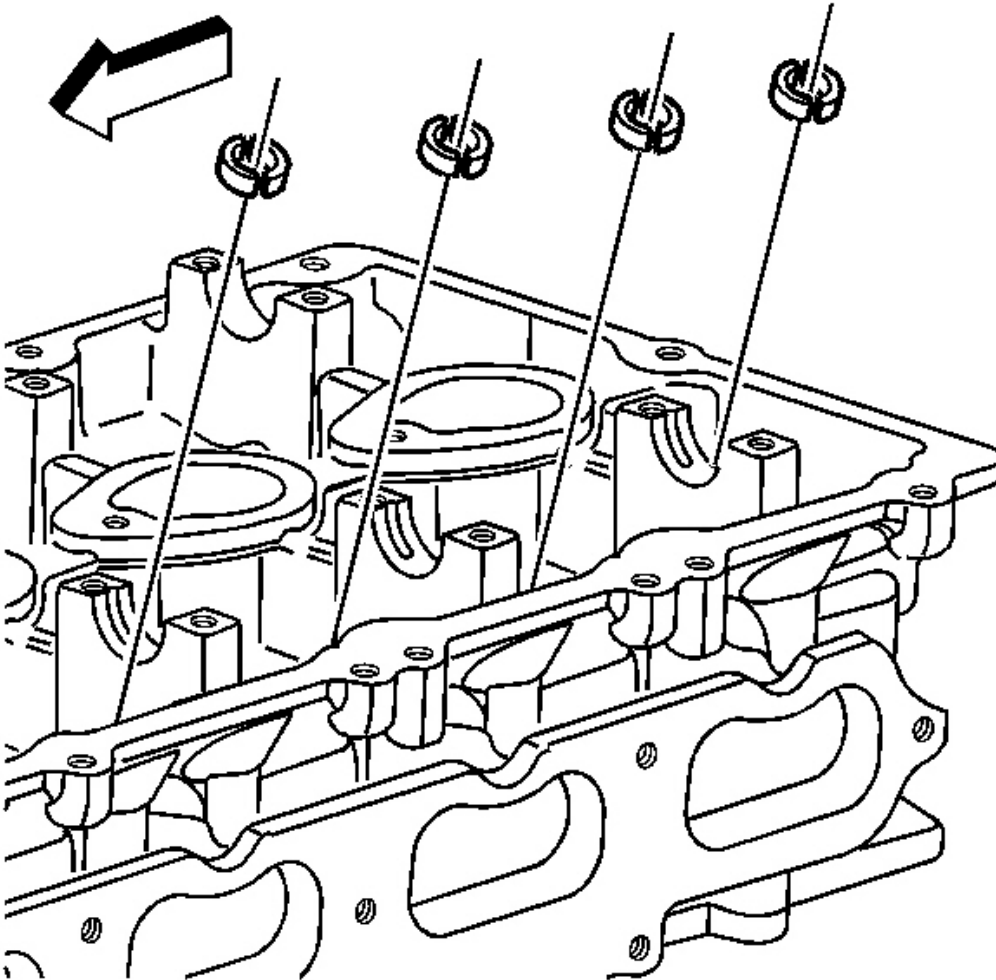
**Fig. 107: Removing/Installing Camshafts**  
Courtesy of GENERAL MOTORS CORP.

9. Remove the camshafts.
10. Using a suitable adapter, apply air pressure to the cylinder.



**Fig. 108: View Of J 44228 Base Plate**  
Courtesy of GENERAL MOTORS CORP.

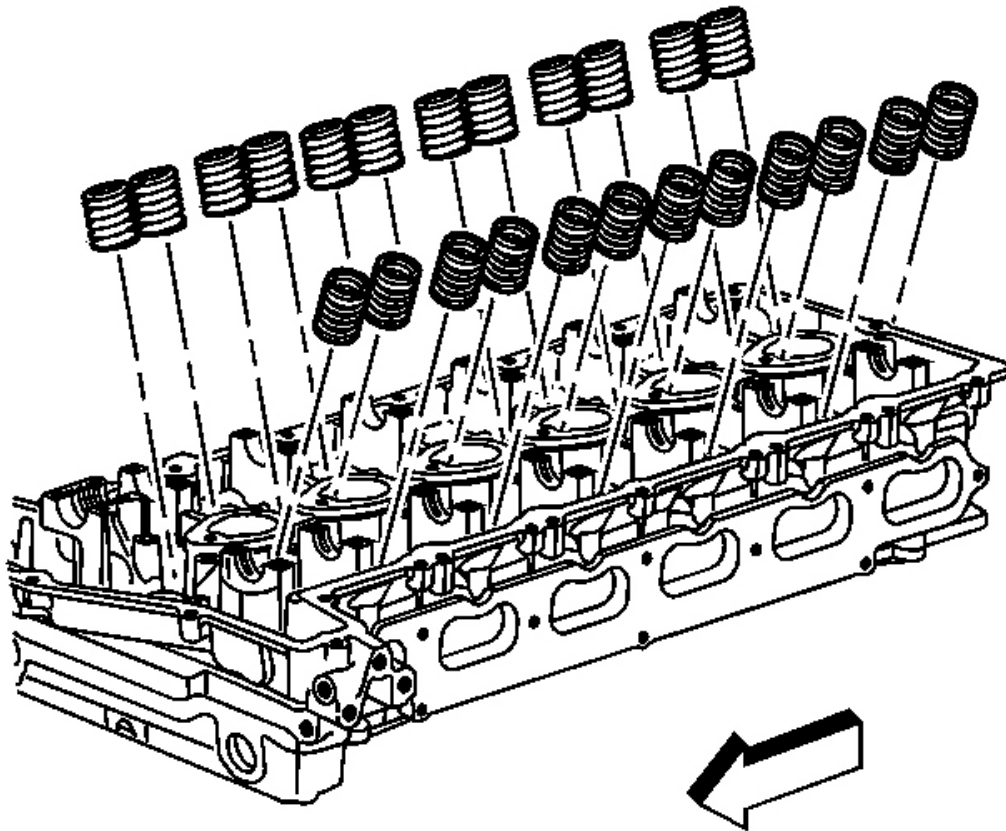
11. Install the **J 44228** and compress the valve springs. See **Special Tools and Equipment**.



**Fig. 109: View Of Valve Keys**  
Courtesy of GENERAL MOTORS CORP.

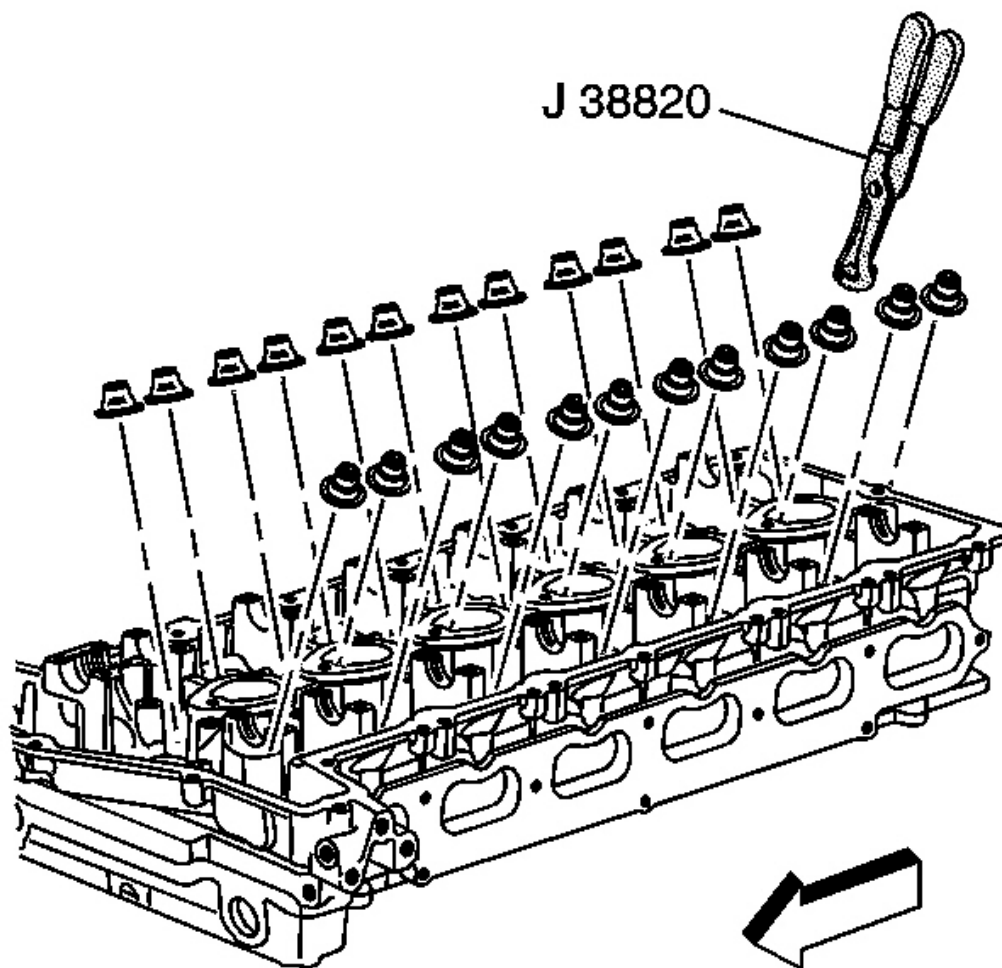
12. Remove the valve keys.
13. Remove the J 44228 . See **Special Tools and Equipment**.





**Fig. 110: View Of Valve Springs & Retainer**  
Courtesy of GENERAL MOTORS CORP.

14. Remove the valve spring retainer and the valve spring.

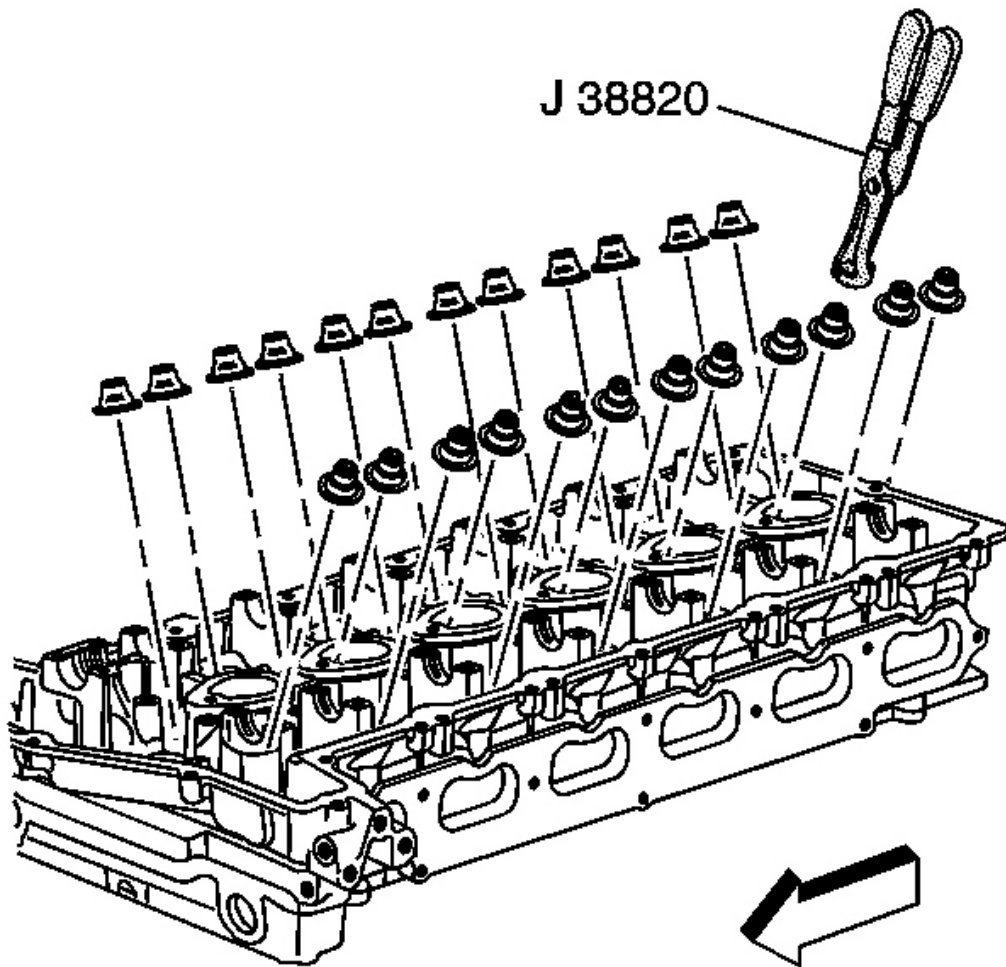


**Fig. 111: View Of J 38820 & Valve Seals**  
Courtesy of GENERAL MOTORS CORP.

15. Use the **J 38820** and remove the seals. See **Special Tools and Equipment**.
16. Clean and inspect the cylinder head. Refer to **Cylinder Head Cleaning and Inspection**.

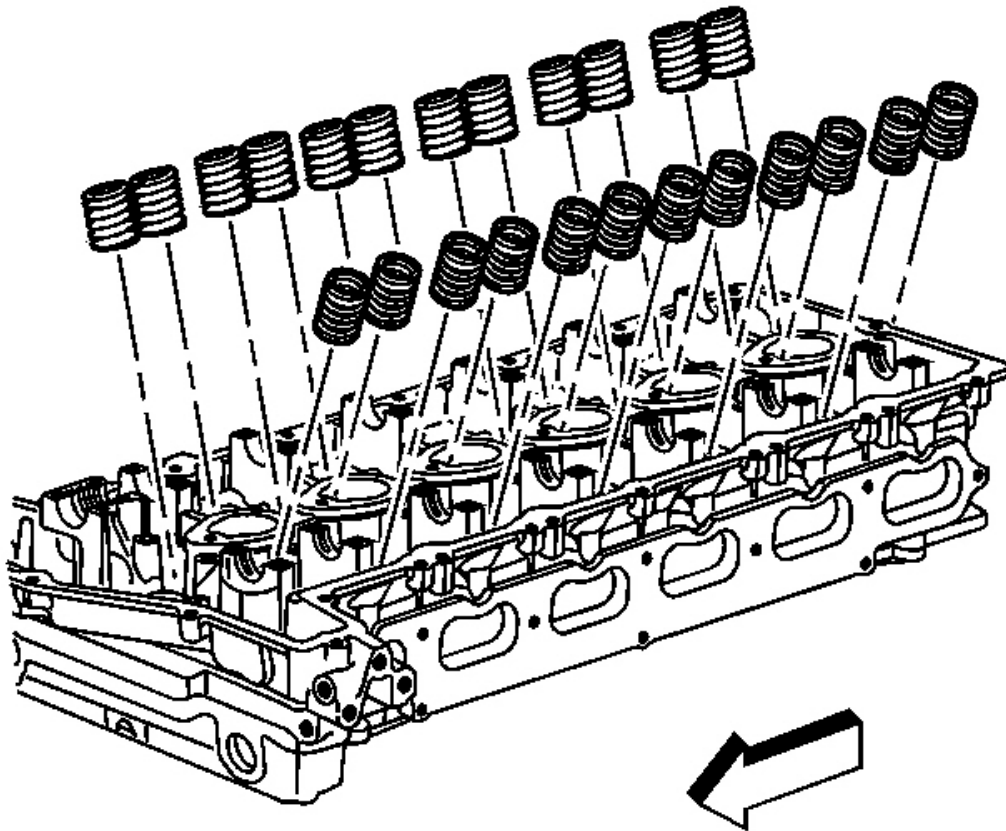
#### **Installation Procedure**

**IMPORTANT:** Lubricate the valve stems with clean engine oil before installing.



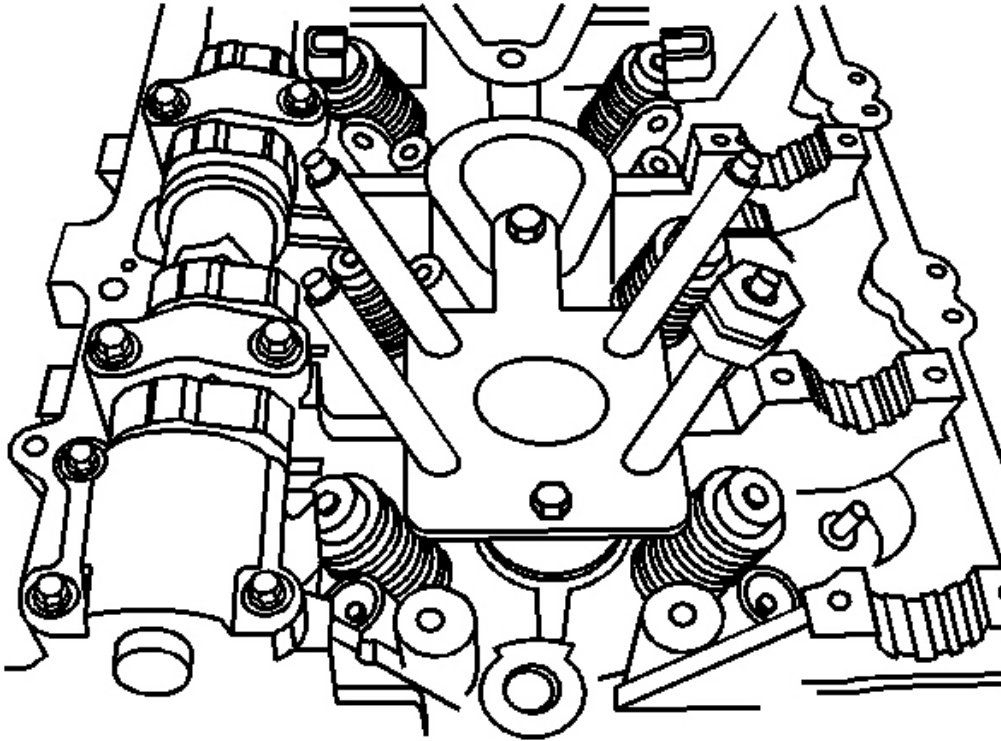
**Fig. 112: View Of J 38820 & Valve Seals**  
Courtesy of GENERAL MOTORS CORP.

1. Use the **J 38820** to install the valve seals. There is only one size seal. See **Special Tools and Equipment**.



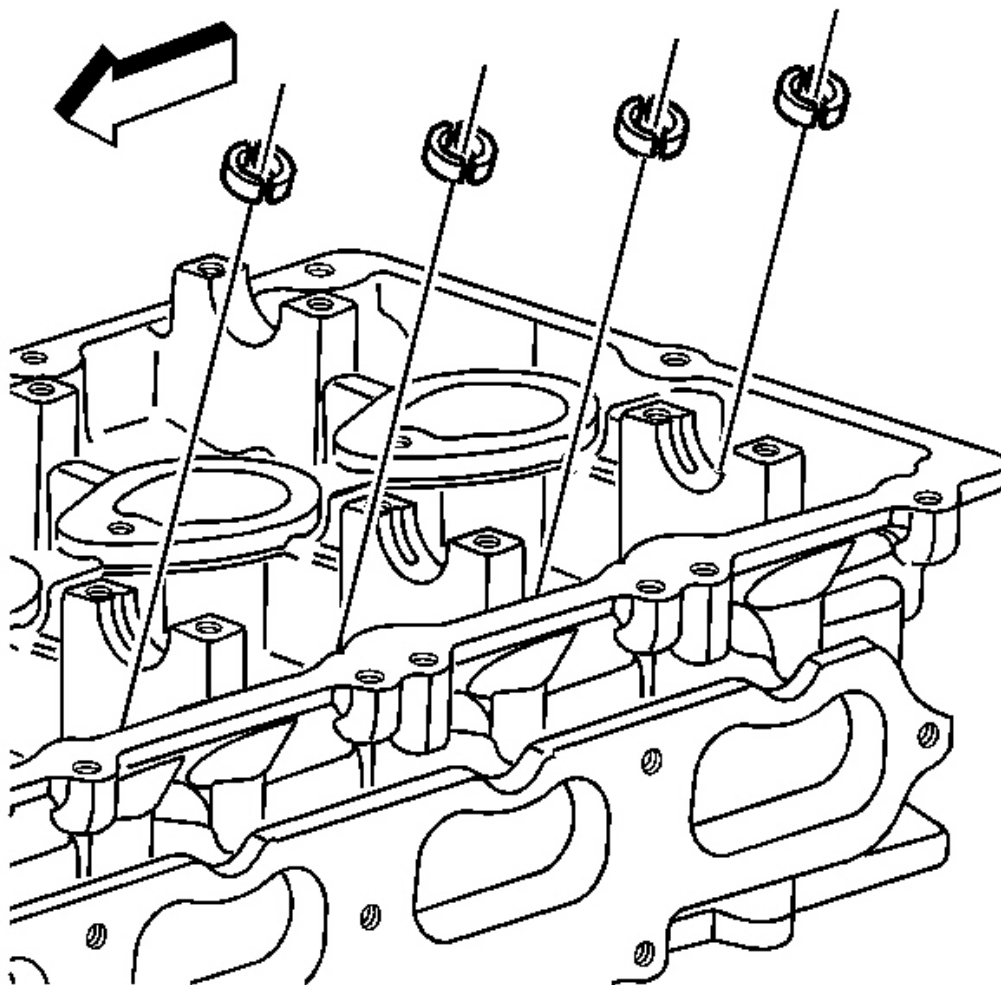
**Fig. 113: View Of Valve Springs & Retainer**  
Courtesy of GENERAL MOTORS CORP.

2. Install the valve spring and the valve spring retainer.



**Fig. 114: View Of J 44228 Base Plate**  
Courtesy of GENERAL MOTORS CORP.

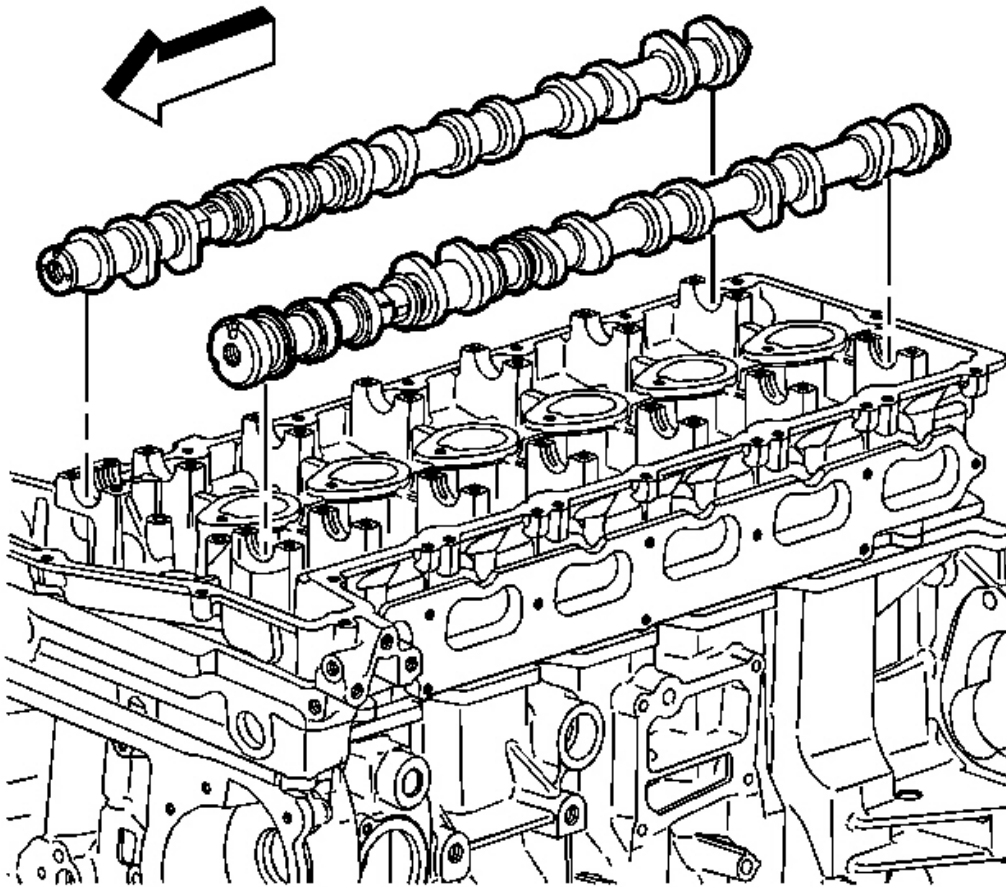
3. Use the **J 44228** and compress the valve springs. See **Special Tools and Equipment**.



**Fig. 115: View Of Valve Keys**

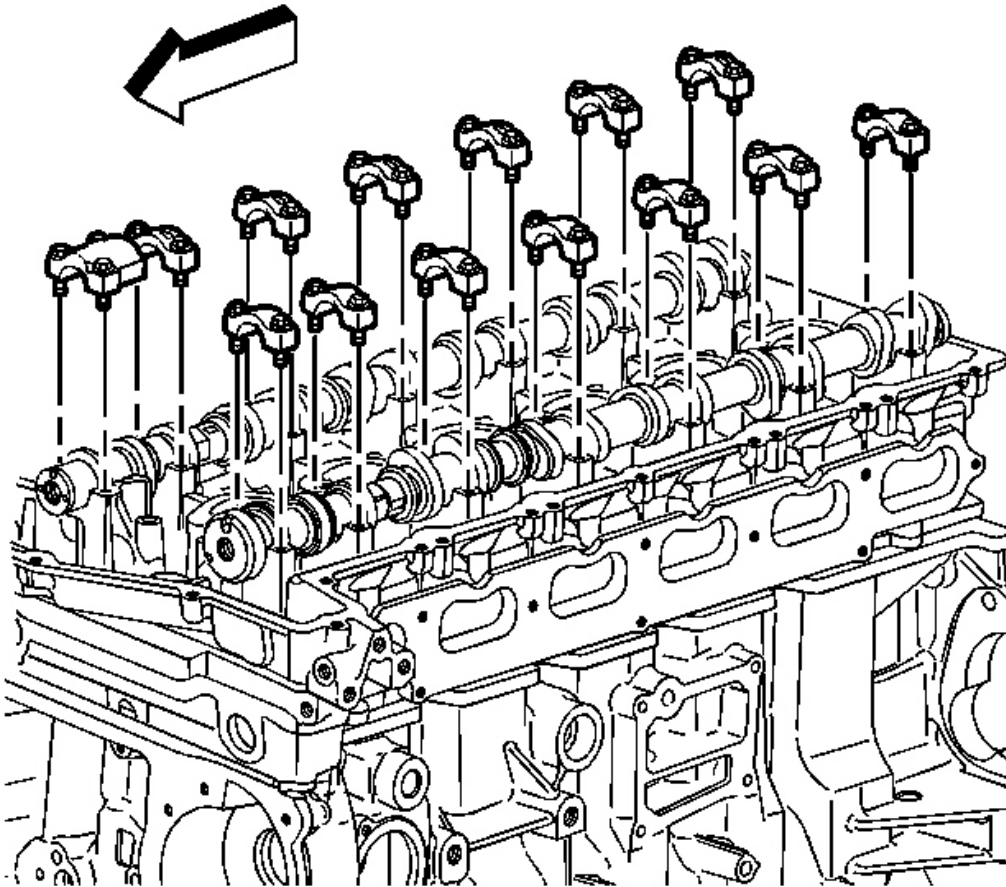
**Courtesy of GENERAL MOTORS CORP.**

4. Install the valve keys.
5. Remove the J 44228 . See **Special Tools and Equipment**.
6. Remove the air pressure to the cylinder.
7. Coat the camshaft journals, the camshaft journal thrust face, and the camshaft lobes with clean engine oil.



**Fig. 116: Removing/Installing Camshafts**  
Courtesy of GENERAL MOTORS CORP.

8. Install the camshafts to their original position.



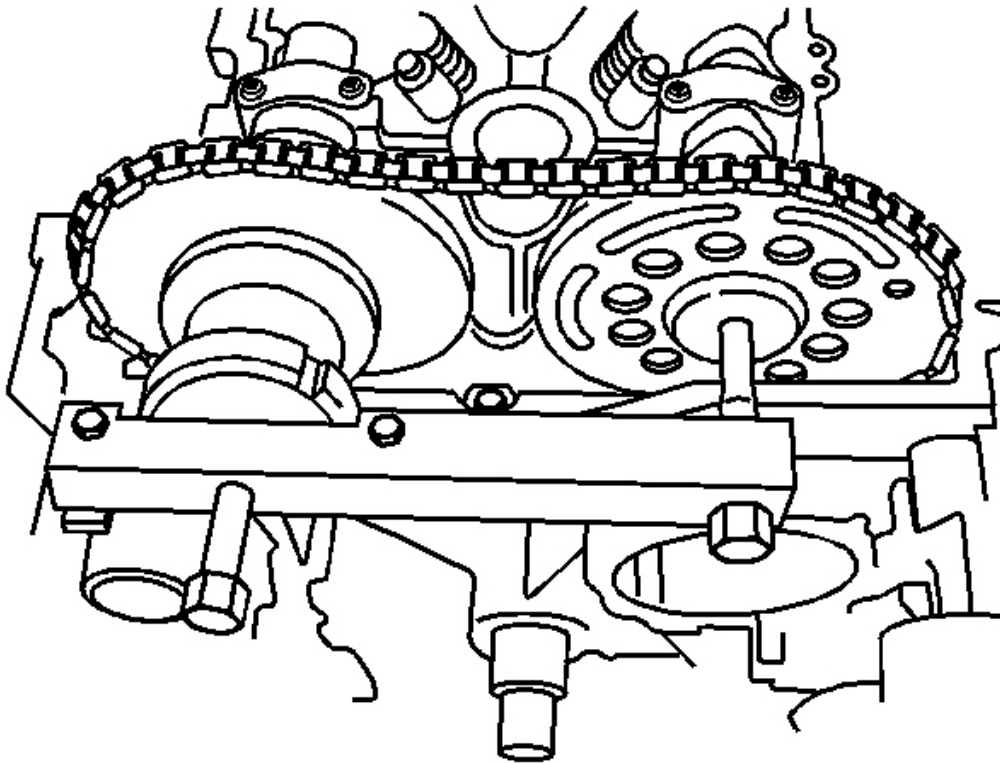
**Fig. 117: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

9. Install the camshaft caps onto their original journal.

**Tighten:** Tighten the camshaft cap bolts to 12 N.m (106 lb in).





**Fig. 118: View Of J 44222 Installed Onto Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

10. Carefully move the camshaft sprockets back onto the camshafts and remove the **J 44222** . See **Special Tools and Equipment**.
11. Install the intake camshaft sprocket washer and the bolt, and the exhaust camshaft actuator bolt.

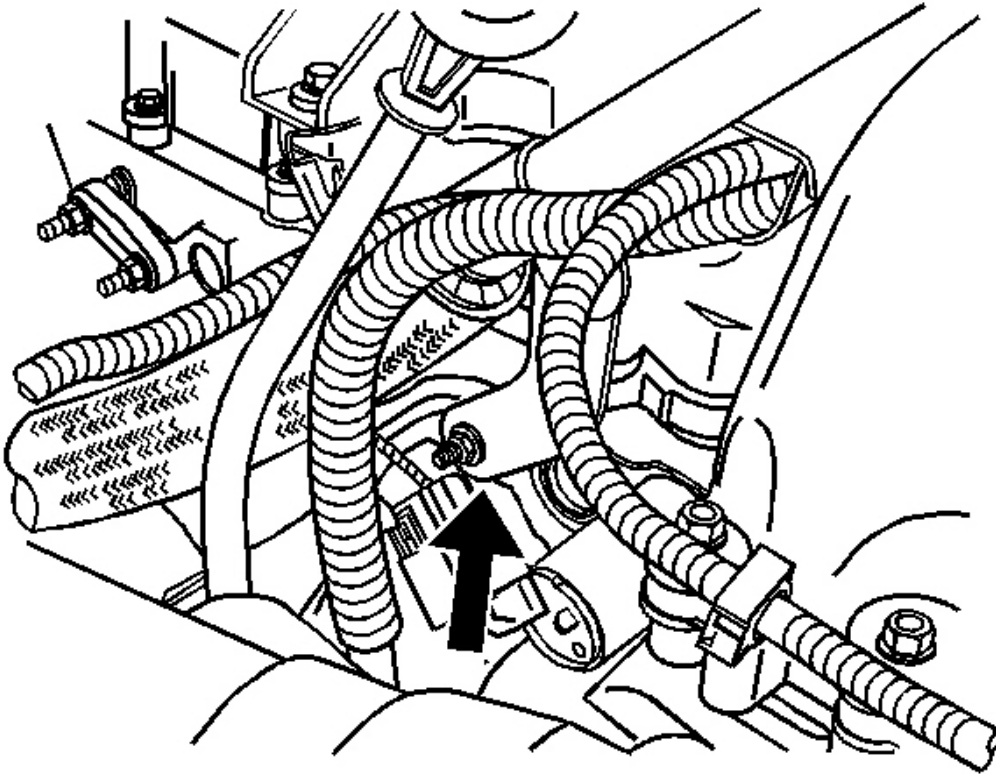
**Tighten:**

- Tighten the intake camshaft sprocket bolt the first pass to 20 N.m (15 lb ft).
- Use the J 36660-A to tighten the intake camshaft sprocket bolt the final pass and additional 100 degrees.
- Tighten the exhaust camshaft actuator bolt the first pass to 25 N.m (18 lb ft).
- Use the J 36660-A to tighten the exhaust camshaft actuator bolt a final pass an additional 135 degrees.

12. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls-4.2 L.
13. Install the camshaft cover. Refer to **Camshaft Cover Replacement**.

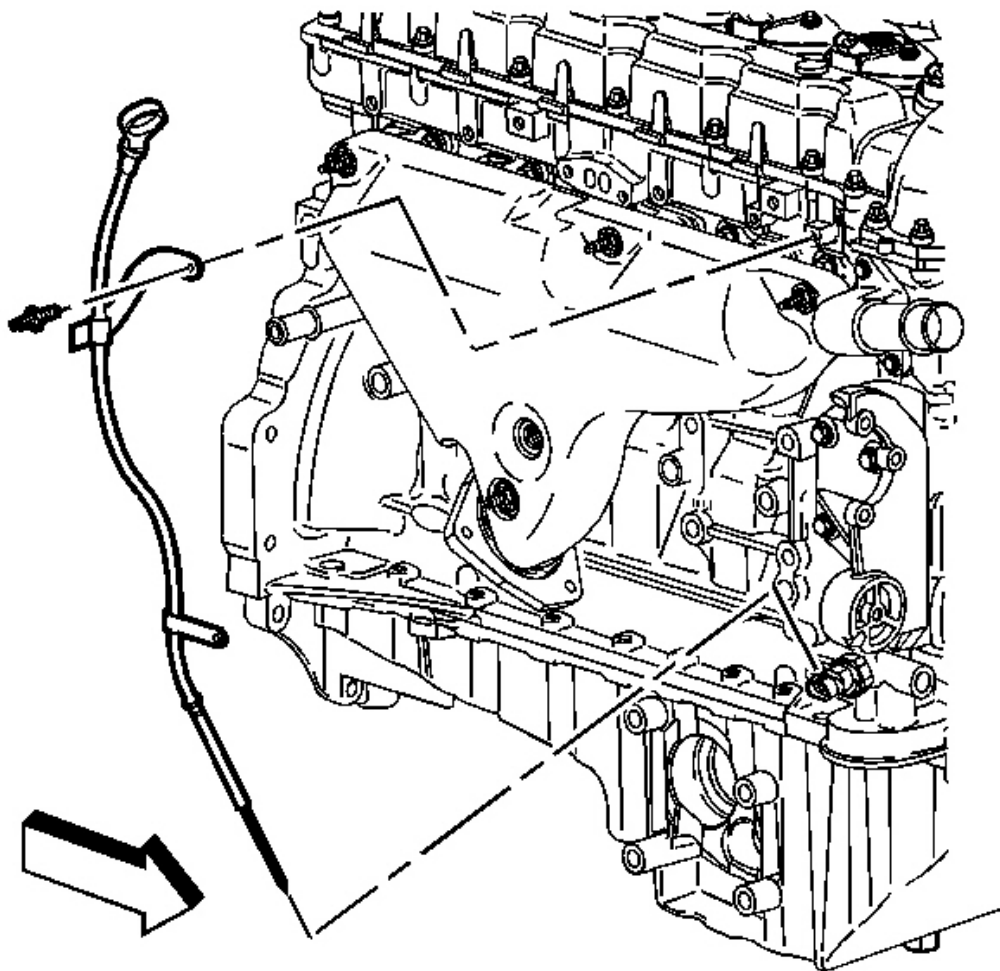
## **OIL LEVEL INDICATOR AND TUBE REPLACEMENT**

### **Removal Procedure**



**Fig. 119: View Of Oil Level Indicator Tube Bracket Nut**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the A/C line bracket nut.
2. Remove the A/C line bracket from the oil level indicator tube stud.
3. Disconnect the O2 sensor electrical connector from the oil level indicator bracket.



**Fig. 120: View Of Oil Level Indicator Tube Stud**  
Courtesy of GENERAL MOTORS CORP.

4. Remove the oil level indicator tube stud.
5. Pull the indicator out of the tube.
6. Pull the tube out of the block.

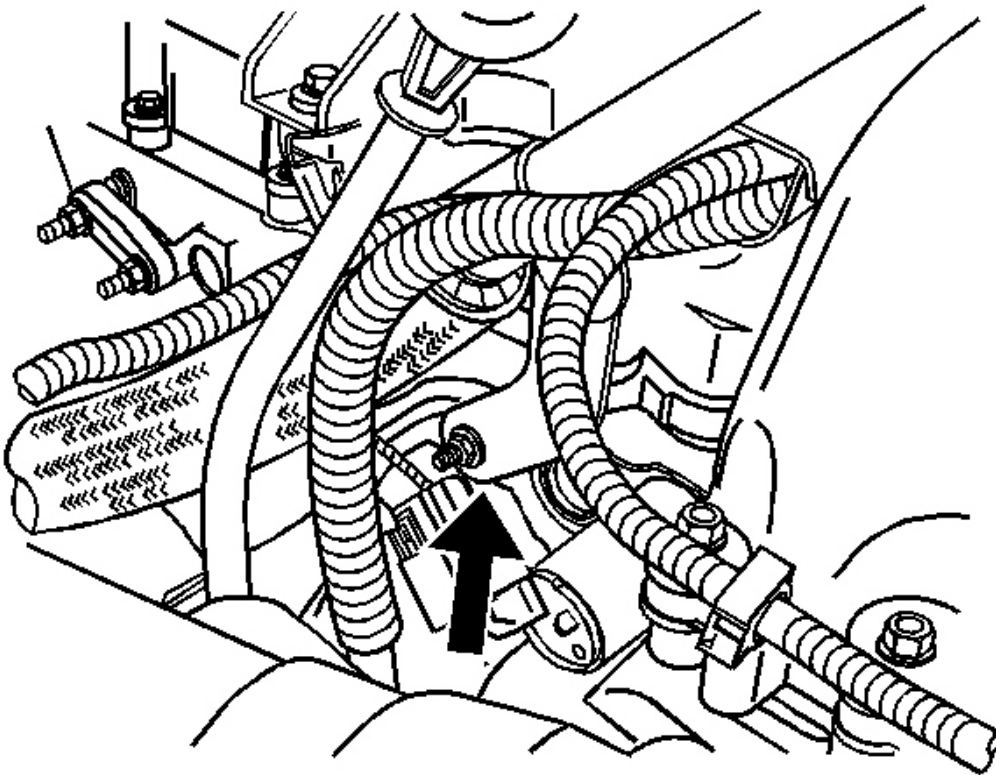
#### **Installation Procedure**

1. Install the oil level indicator tube into the engine block.
2. Add sealant GM P/N 12346004 (Canadian P/N 10953480) to the oil level indicator tube stud threads.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

3. Install the oil level indicator tube stud.

**Tighten:** Tighten the oil level indicator tube stud to 10 N.m (89 lb in).



**Fig. 121: View Of Oil Level Indicator Tube Bracket Nut**  
Courtesy of GENERAL MOTORS CORP.

4. Install the A/C line bracket to oil level indicator tube and secure with the nut.

**Tighten:** Tighten the A/C line bracket nut to 7 N.m (6 lb in).

5. Connect the O2 sensor electrical connector.
6. Install the oil level indicator into the tube.

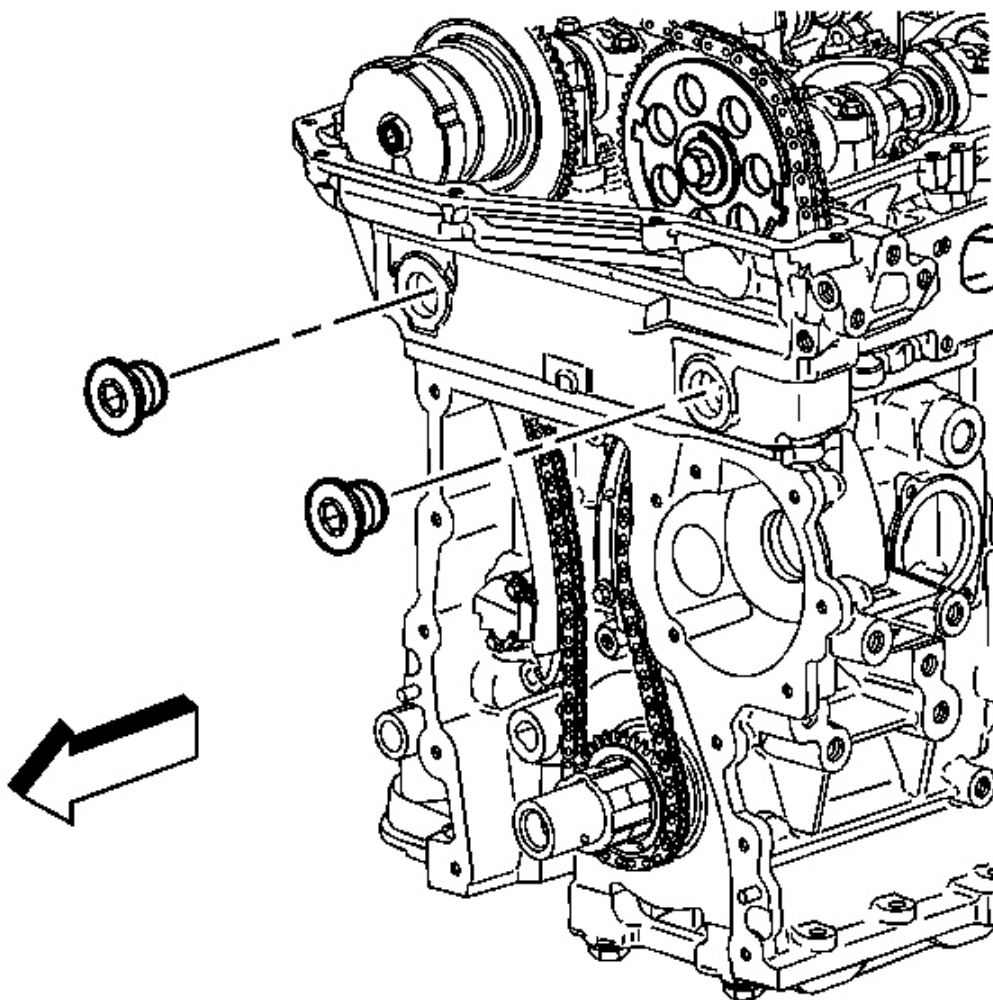
## CYLINDER HEAD REPLACEMENT

**Tools Required**

J 36660-A Torque Angle Meter

**Removal Procedure**

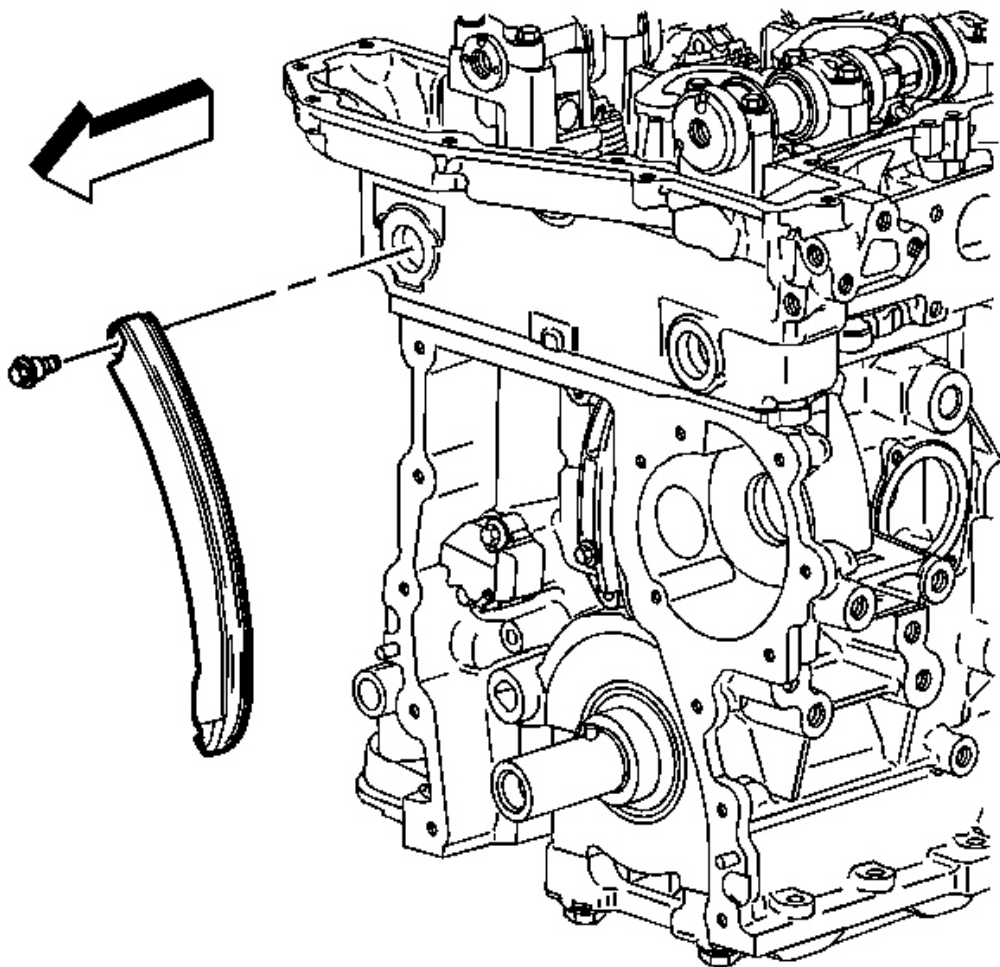
1. Remove the camshaft cover. Refer to **Camshaft Cover Replacement**.
2. Remove the exhaust manifold. Refer to **Exhaust Manifold Replacement (4.2L Engine)**.
3. Remove the front cover. Refer to **Engine Front Cover Replacement**.



**Fig. 122: View Of Cylinder Head Access Hole Plugs**

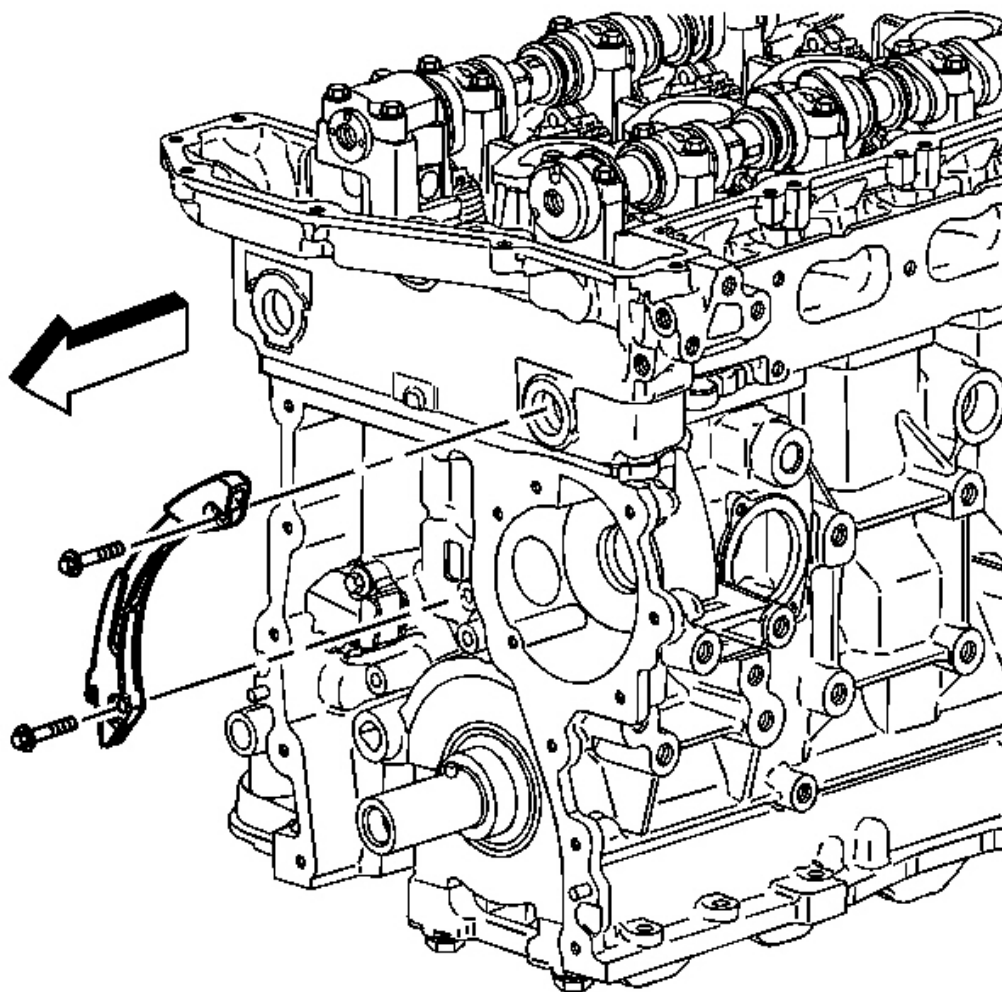
Courtesy of GENERAL MOTORS CORP.

4. Remove the cylinder head access hole plugs.



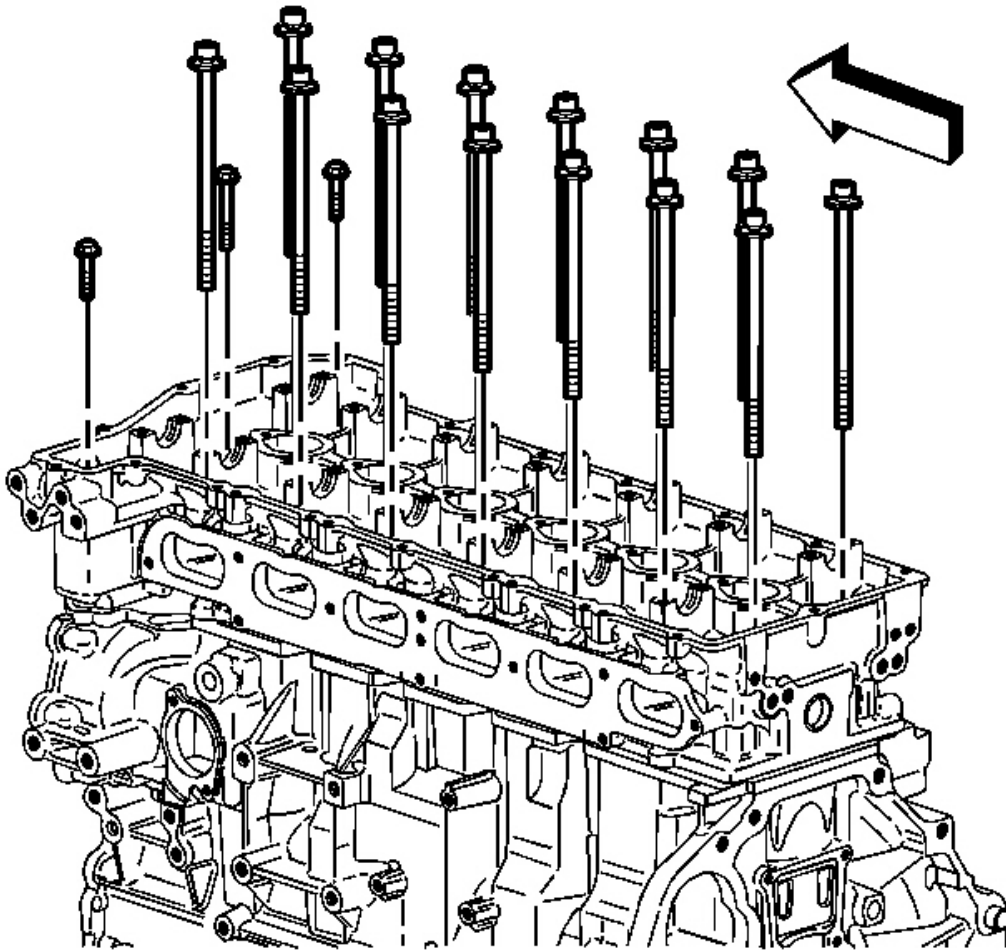
**Fig. 123: View Of Timing Chain Tensioner Shoe & Bolt**  
Courtesy of GENERAL MOTORS CORP.

5. Remove the timing chain tensioner shoe bolt.
6. Remove the timing chain tensioner shoe.



**Fig. 124: View Of Timing Chain Guide & Bolts**  
Courtesy of GENERAL MOTORS CORP.

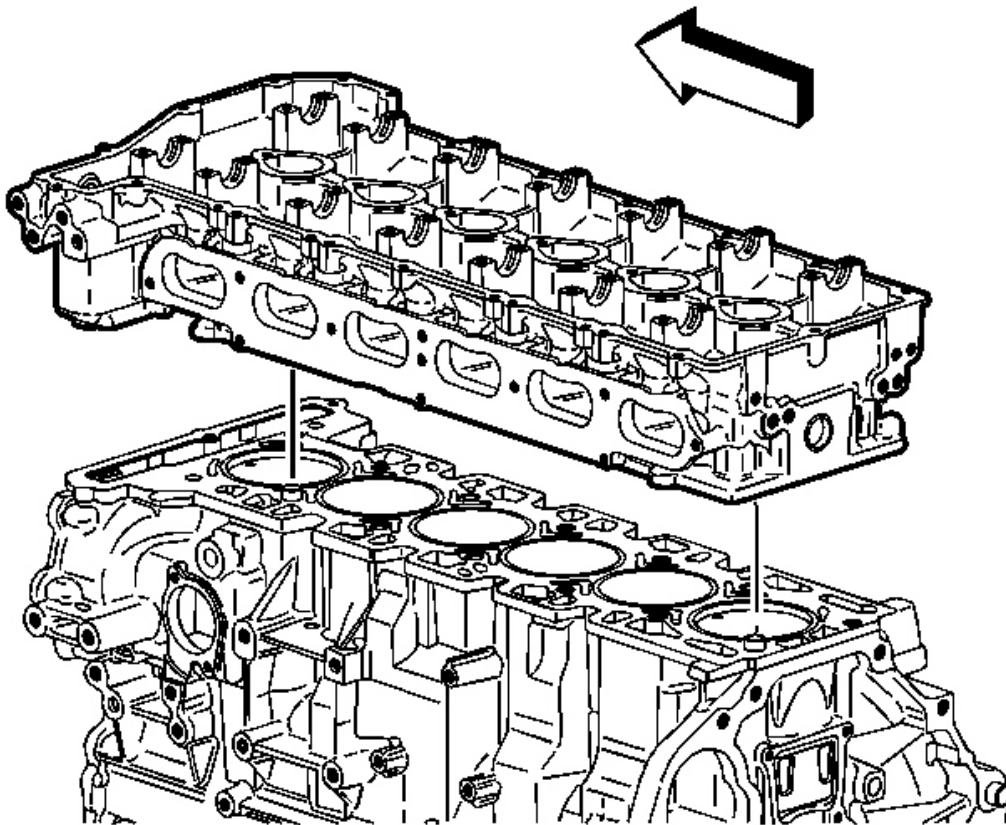
7. Remove the timing chain tensioner guide bolts.
8. Remove the timing chain tensioner guide.
9. Remove the timing chain and the sprockets. Refer to **Timing Chain, Sprockets, and/or Tensioner Replacement**.



**Fig. 125: View Of Cylinder Head Bolts**  
Courtesy of GENERAL MOTORS CORP.

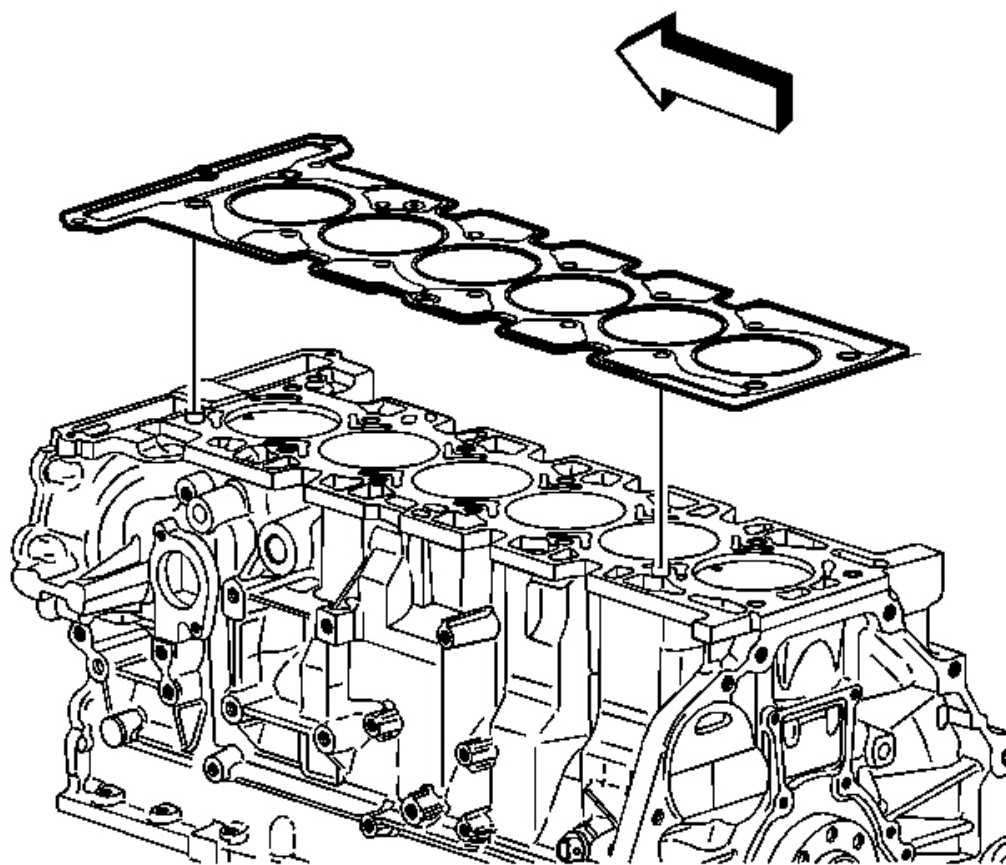
10. Loosen and remove the cylinder head bolts.





**Fig. 126: View Of Cylinder Head**  
**Courtesy of GENERAL MOTORS CORP.**

11. Remove the cylinder head.



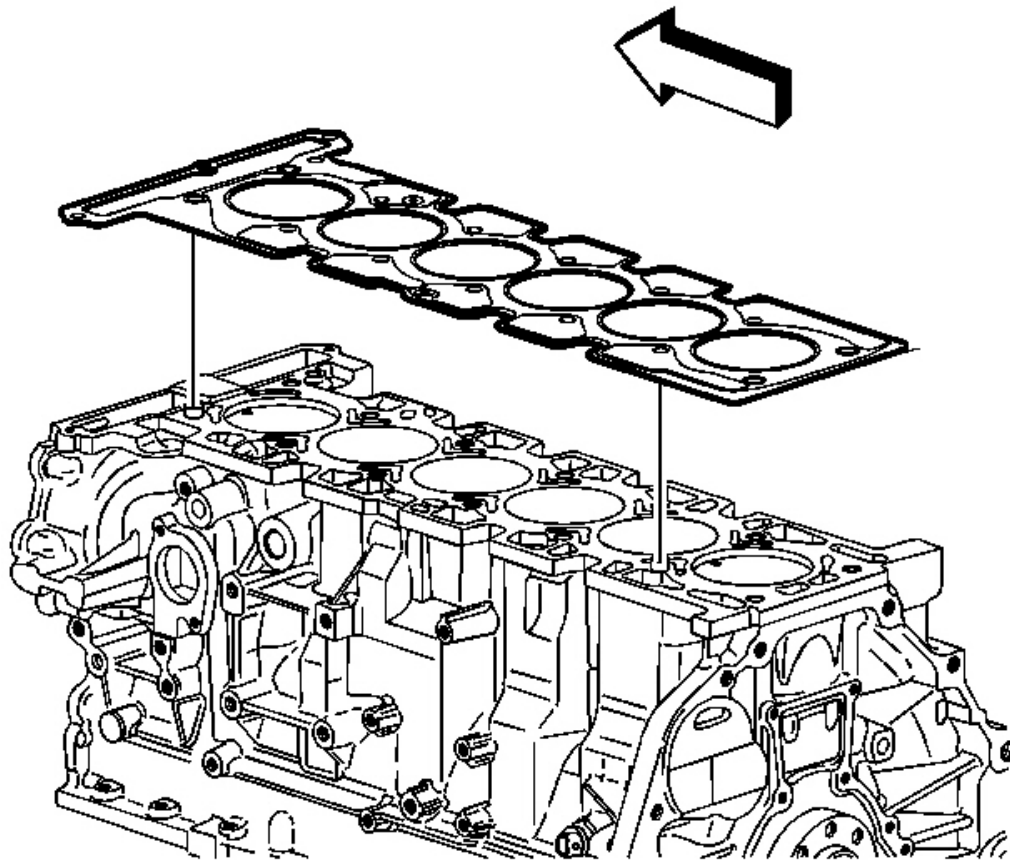
**Fig. 127: View Of Cylinder Head Gasket**  
Courtesy of GENERAL MOTORS CORP.

12. Remove the cylinder head gasket.
13. Place the cylinder head on a flat, clean surface with the combustion chambers face up, in order to prevent damage to the deck face.
14. If replacing cylinder head refer to Cylinder Head Disassemble.
15. Clean and inspect the cylinder head. Refer to Cylinder Head Cleaning and Inspection.

#### Installation Procedure

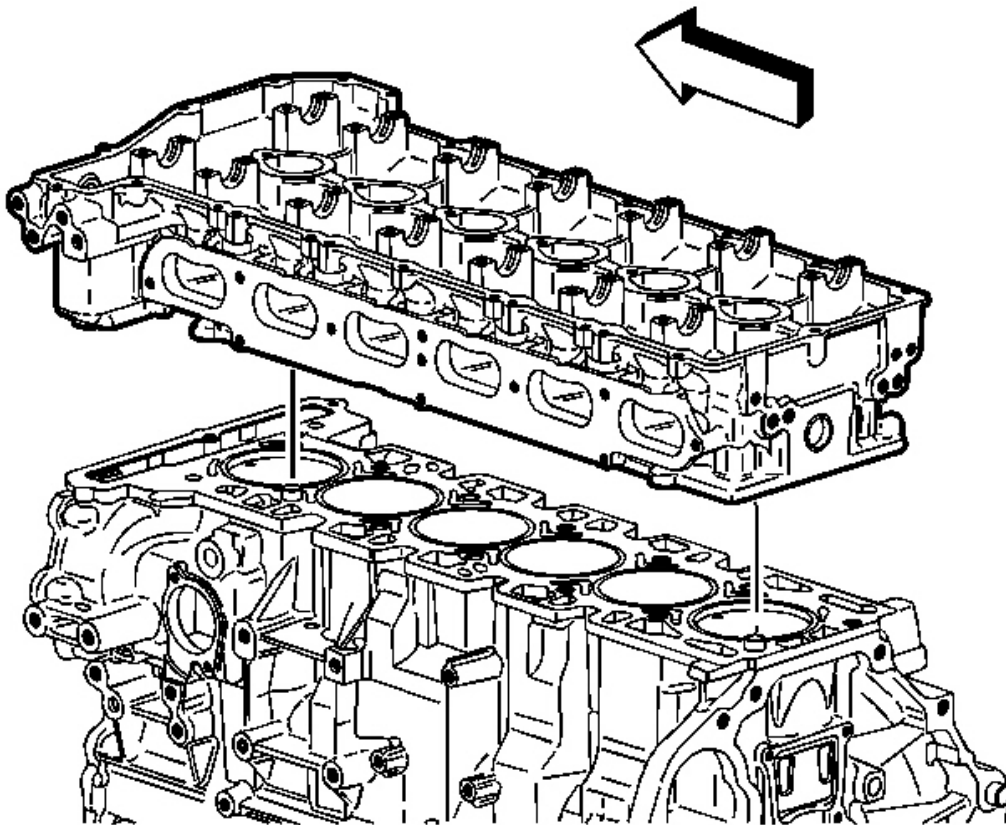
**IMPORTANT:** Ensure number 1 piston is at top dead center. The crank pin will be at 12 o'clock when the number 1 piston is at top dead center.

1. If installing new cylinder head, refer to Cylinder Head Assemble.



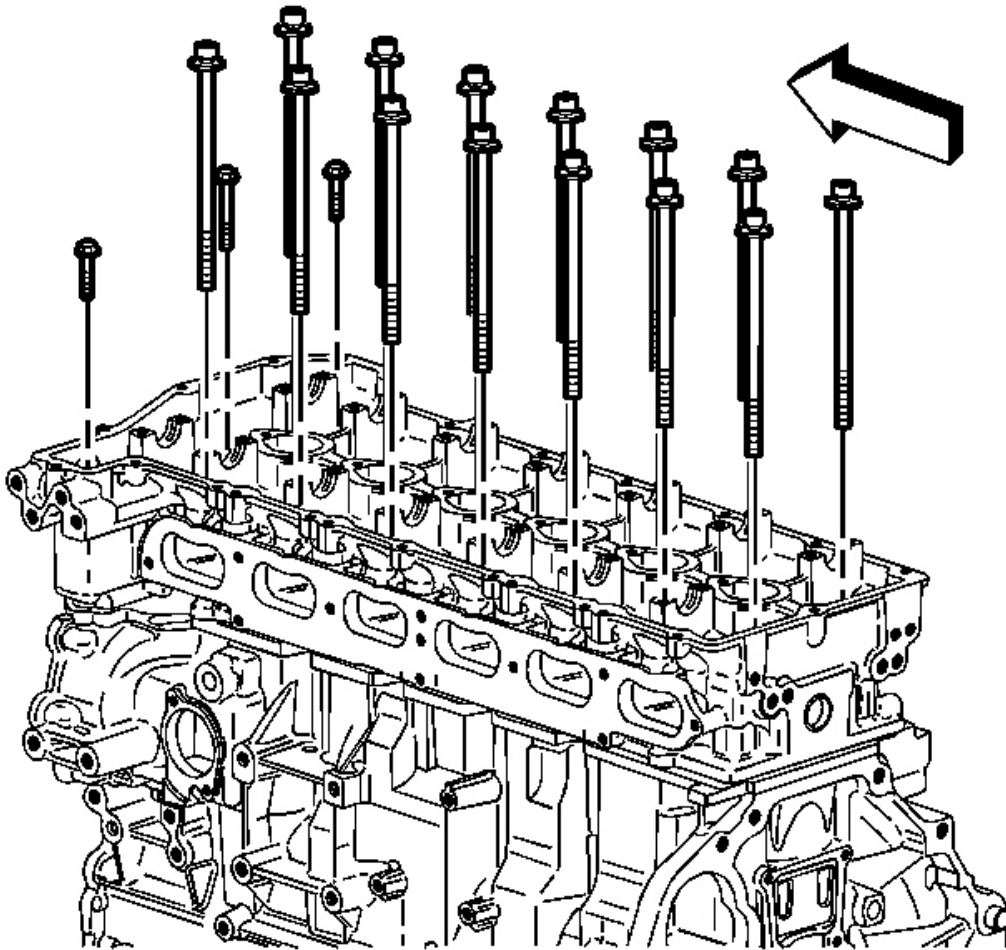
**Fig. 128: View Of Cylinder Head Gasket**  
**Courtesy of GENERAL MOTORS CORP.**

2. Install the dowel pins, cylinder head locator, if necessary.
3. Install a new cylinder head gasket.



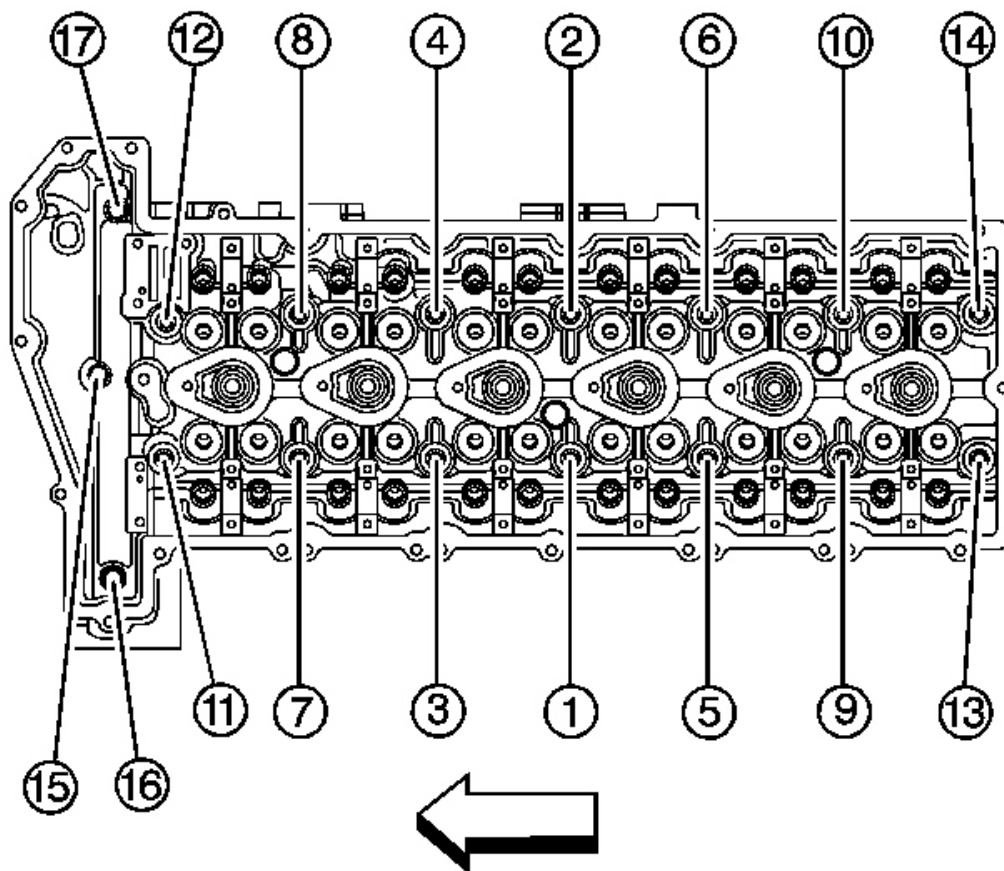
**Fig. 129: View Of Cylinder Head**  
**Courtesy of GENERAL MOTORS CORP.**

4. Install the cylinder head.



**Fig. 130: View Of Cylinder Head Bolts**  
Courtesy of GENERAL MOTORS CORP.

5. Install new cylinder head bolts.



**Fig. 131: Tightening Sequence For Cylinder Head Bolts**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

6. Tighten the new cylinder head bolts in the following sequence:

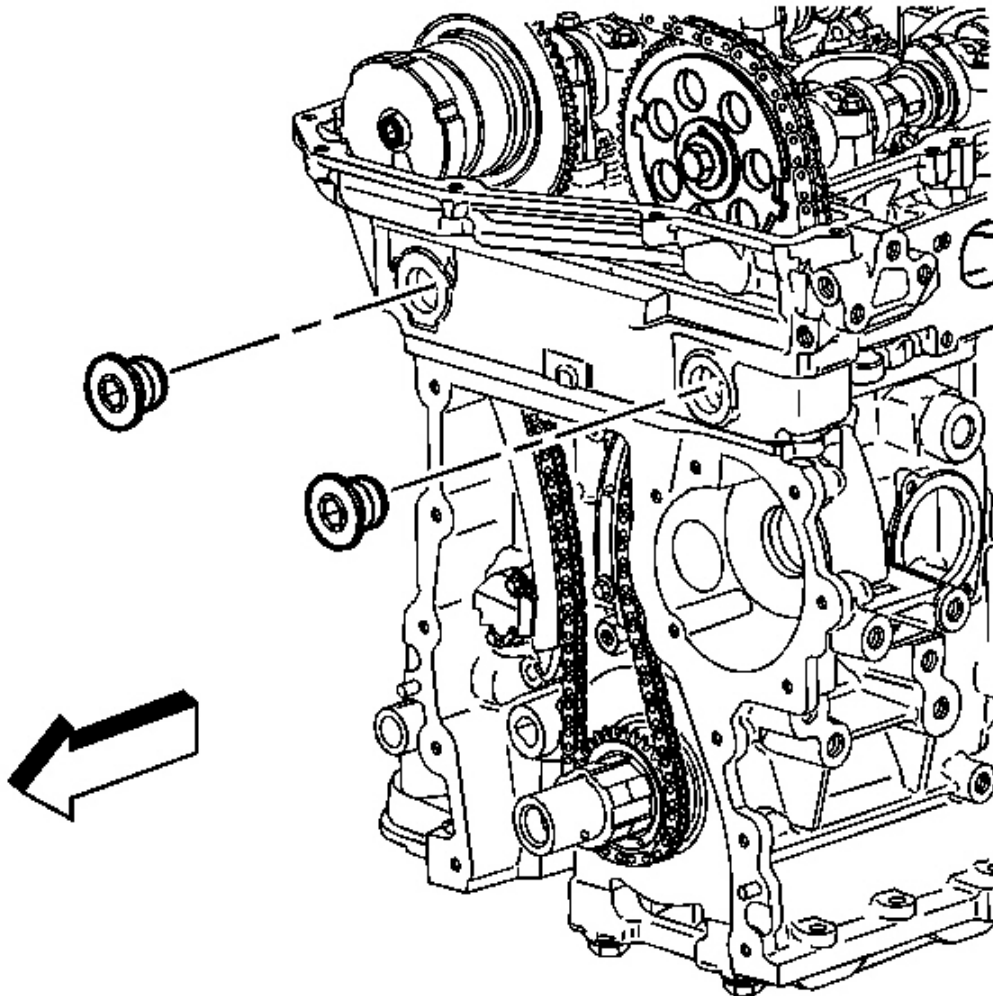
**Tighten:**

1. Tighten the cylinder head bolts (1-14) in sequence to 30 N.m (22 lb ft).
2. Use J 36660-A to tighten the cylinder head bolts in sequence an additional 155 degrees.
3. Tighten the (2 Short) end bolts to 7 N.m (62 lb in).

Use J 36660-A to tighten the short cylinder head end bolts an additional 60 degrees.

4. Tighten the (1 Long) end bolt to 7 N.m (62 lb in).

Use J 36660-A to tighten the long cylinder head end bolt an additional 120 degrees.



**Fig. 132: View Of Cylinder Head Access Hole Plugs**  
Courtesy of GENERAL MOTORS CORP.

7. Install the cylinder head access hole plugs.

**Tighten:** Tighten the plugs to 5 N.m (44 lb in).

8. Install the timing chain and sprockets. Refer to **Timing Chain, Sprockets, and/or Tensioner Replacement**.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

9. Install the front cover. Refer to **Engine Front Cover Replacement**.
10. Install the camshaft cover. Refer to **Camshaft Cover Replacement**.
11. Install the exhaust manifold. Refer to **Exhaust Manifold Replacement (4.2L Engine)** .

### CRANKSHAFT BALANCER REPLACEMENT

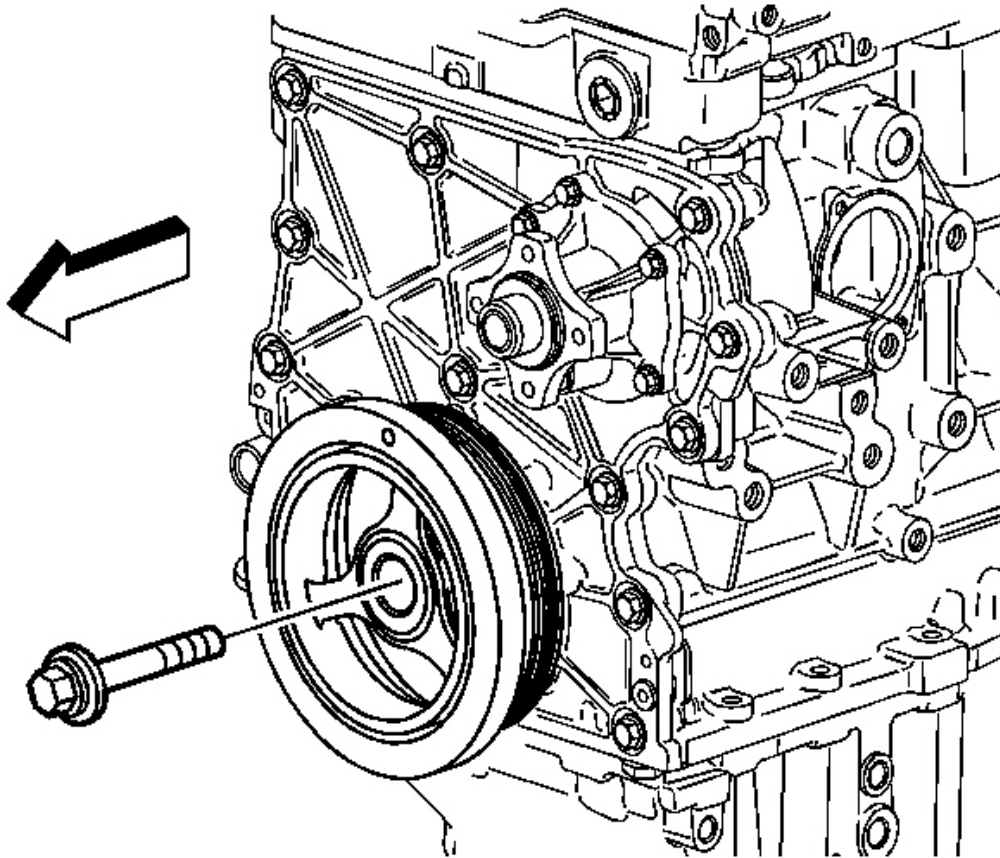
#### Tools Required

- J 36660-A Torque Angle Meter
- **J 41478** Crankshaft Front Oil Seal Installer. See **Special Tools and Equipment**.
- **J 41816-2** Crankshaft End Protector. See **Special Tools and Equipment**.
- **J 44226** Crankshaft Balancer Remover/Holder. See **Special Tools and Equipment**.

#### Removal Procedure

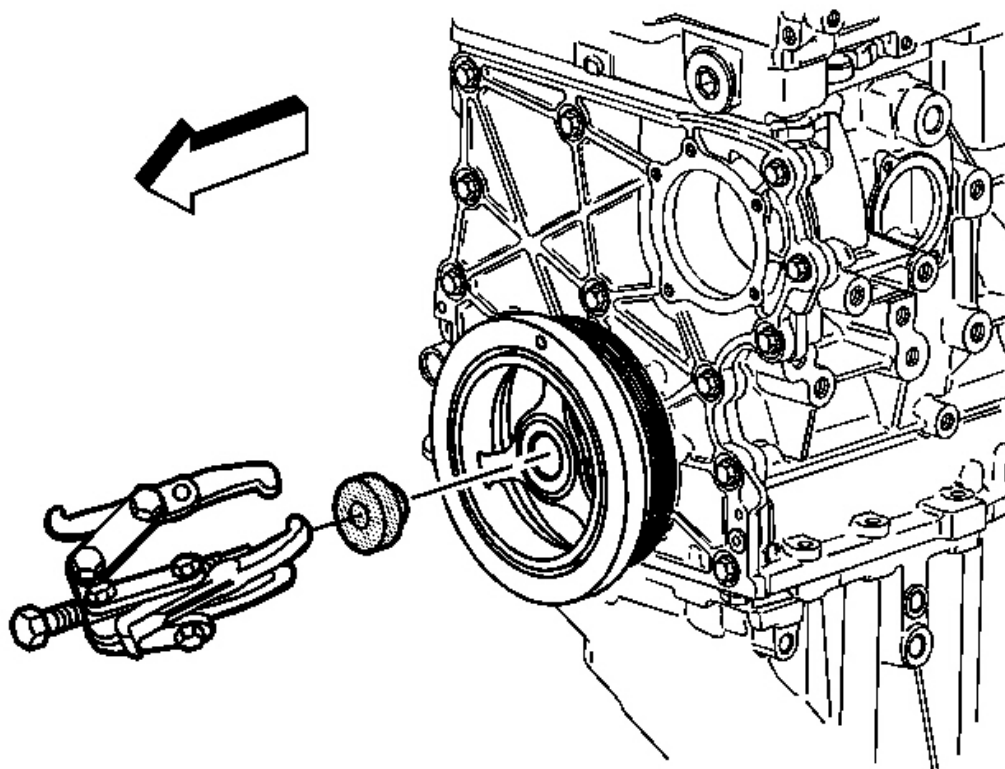
1. Remove the cooling fan and shroud. Refer to **Cooling Fan and Shroud Replacement** in Engine Cooling.
2. Remove the drive belt. Refer to **Drive Belt Replacement**.





**Fig. 133: View Of Crankshaft Balancer Bolt**  
Courtesy of GENERAL MOTORS CORP.

3. Carefully loosen and remove the balancer bolt.



**Fig. 134: Removing The Crankshaft Balancer Using J 41816-2**  
Courtesy of GENERAL MOTORS CORP.

4. Install **J 41816-2** into the end of the crankshaft. See Special Tools and Equipment.

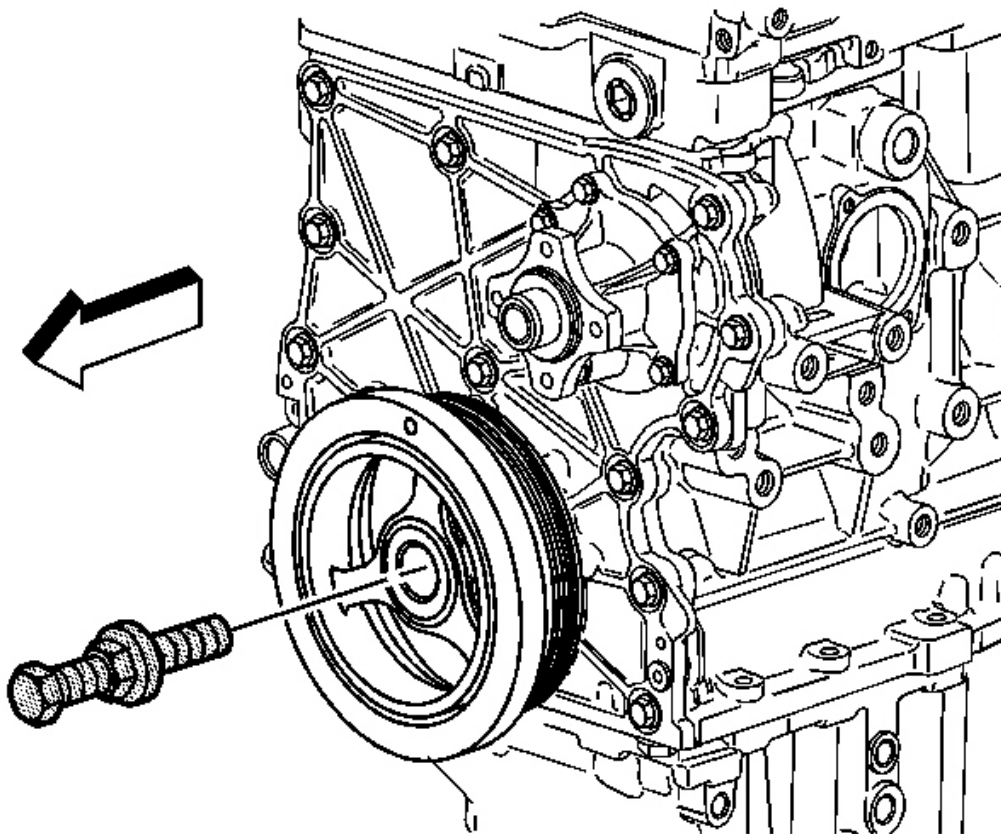
**IMPORTANT:** Do not pull on outer edge of the crankshaft balancer.

5. Use a 3 jaw puller to remove the crankshaft balancer.
6. Remove the 3 jaw puller and the **J 41816-2** . See Special Tools and Equipment.
7. Remove the crankshaft balancer shim from the crankshaft snout.
8. Clean and inspect the crankshaft balancer. Refer to Crankshaft Balancer Cleaning and Inspection.

#### Installation Procedure

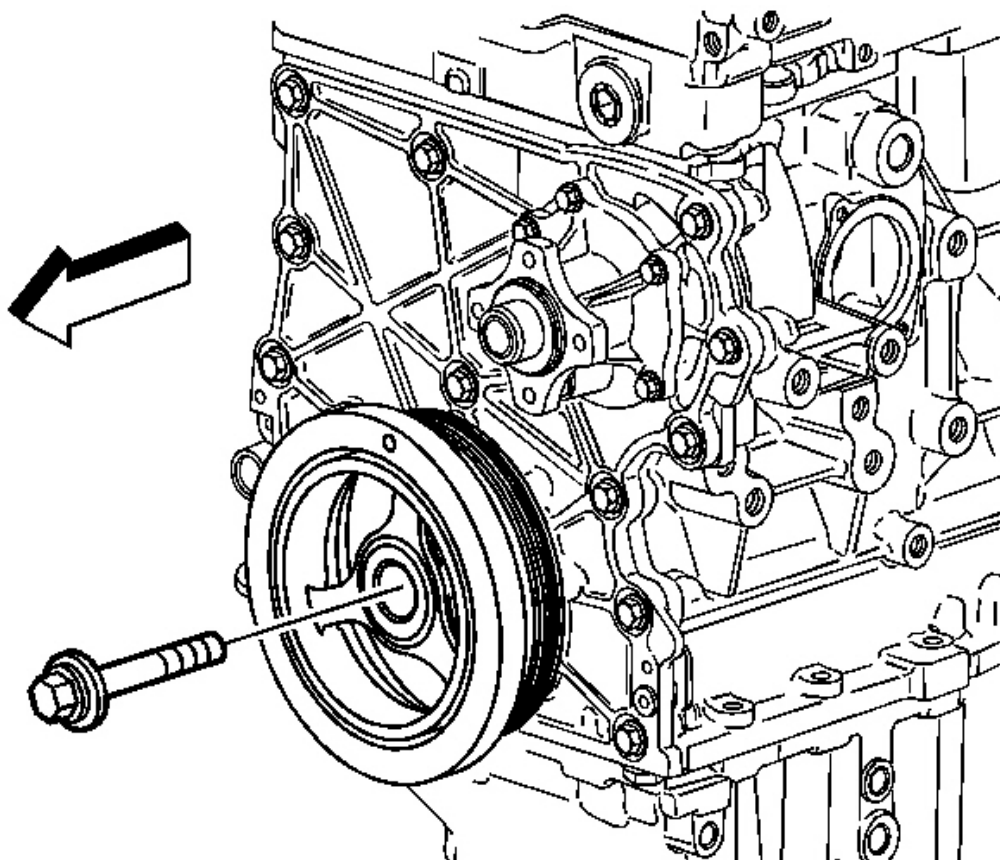
**IMPORTANT:** The crankshaft balancer does not have a key-way; so the crankshaft could turn when tightening, causing an improper torque. Make sure to follow the installation procedure to prevent damage.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the torque converter access plug in the dry part of the oil pan.
3. Use the torque converter holding tool from the **J 44226** kit and secure the torque converter while tightening the crankshaft balancer. See **Special Tools and Equipment**.
4. Install a new crankshaft balancer shim GM P/N 12573950 over the crankshaft snout, against the crankshaft gear.



**Fig. 135: Installing Crankshaft Balancer Using The J 41478**  
Courtesy of GENERAL MOTORS CORP.

5. Using the **J 41478** install and seat the crankshaft balancer. See **Special Tools and Equipment**.
6. Remove the **J 41478** . See **Special Tools and Equipment**.



**Fig. 136: View Of Crankshaft Balancer Bolt**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

7. While still holding the flywheel, install the balancer washer and the bolt.

**Tighten:** Tighten the crankshaft balancer bolt to 150 N.m (110 lb ft). Use the J 36660-A in order to tighten the balancer bolt an additional 180 degrees.

8. Remove the torque converter holding tool.
9. Install the torque converter access plug into the oil pan.
10. Lower the vehicle.
11. Install the drive belt. Refer to Drive Belt Replacement.
12. Install the cooling fan and shroud. Refer to Cooling Fan and Shroud Replacement in Engine Cooling

## CRANKSHAFT FRONT OIL SEAL REPLACEMENT

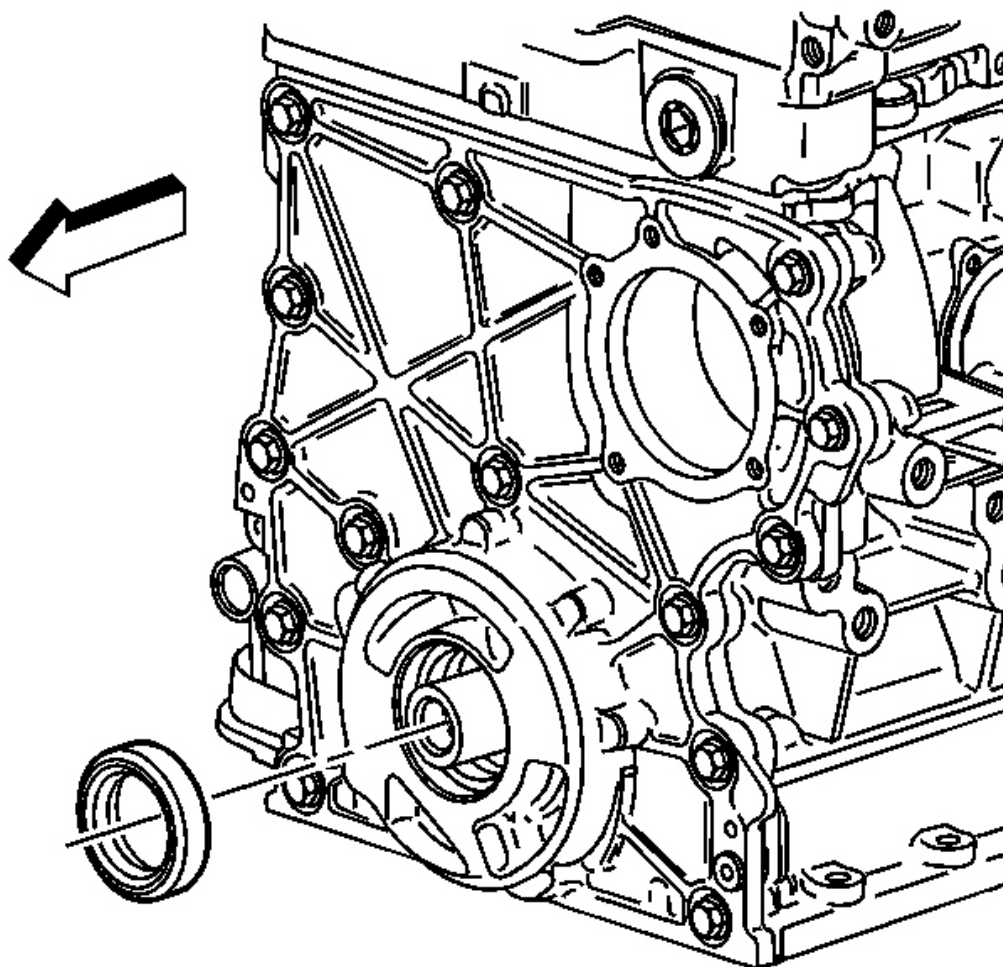
### Tools Required

**J 44218** Seal Installer. See Special Tools and Equipment.

### Removal Procedure

**IMPORTANT:** Do not damage the engine front cover or the crankshaft.

1. Remove the crankshaft balancer. Refer to Crankshaft Balancer Replacement.

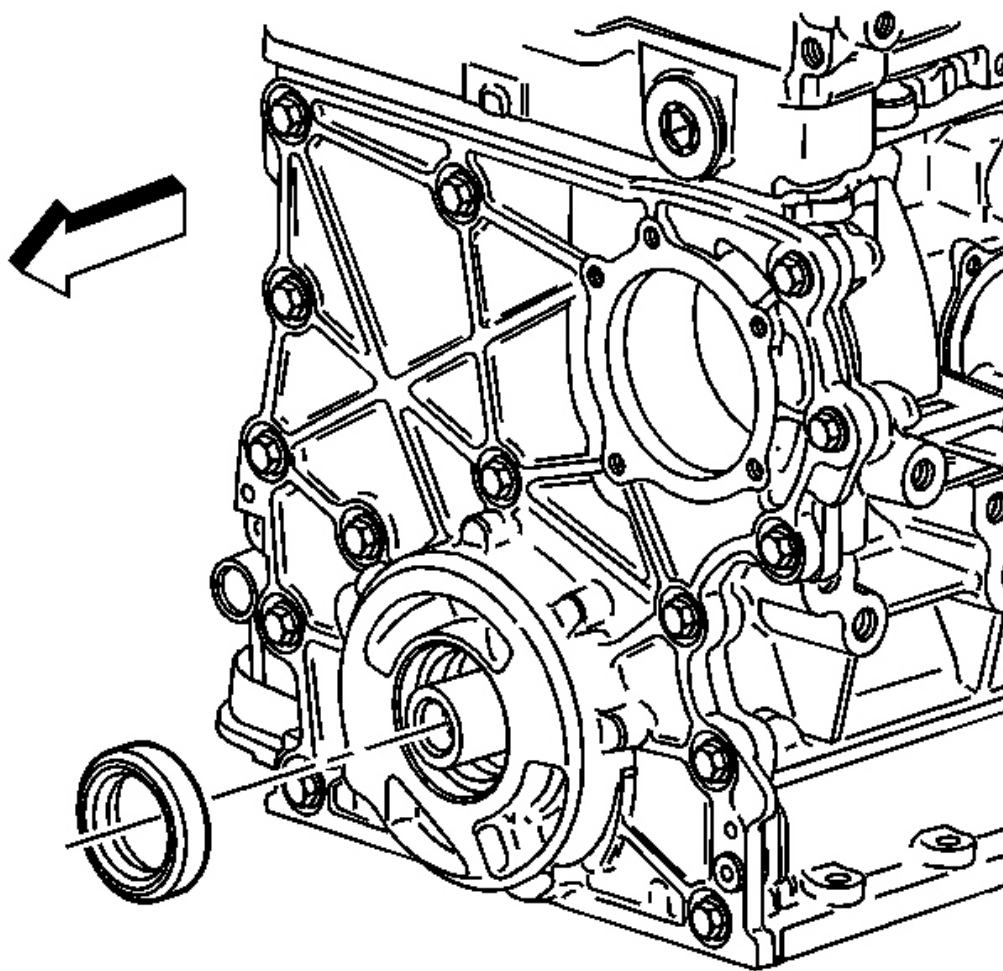


**Fig. 137: View Of Crankshaft Front Oil Seal**

**Courtesy of GENERAL MOTORS CORP.**

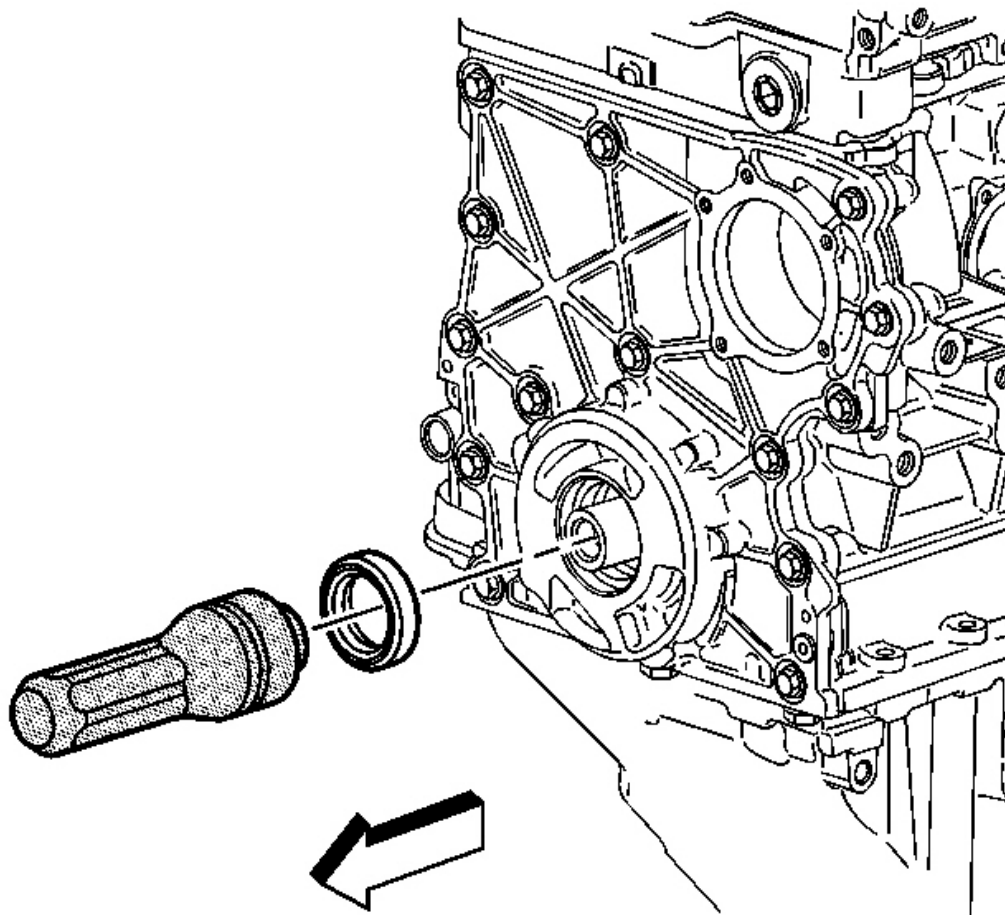
2. Pry out the crankshaft front oil seal using a suitable tool. Use the provided slots for prying out the seal.

**Installation Procedure**



**Fig. 138: View Of Crankshaft Front Oil Seal**  
**Courtesy of GENERAL MOTORS CORP.**

1. Apply the engine oil to the outside diameter of the crankshaft front oil seal.



**Fig. 139: Installing Crankshaft Front Oil Seal Using J 44218**  
Courtesy of GENERAL MOTORS CORP.

2. Use the **J 44218** to install the front oil seal. See **Special Tools and Equipment**.
3. Remove the **J 44218** . See **Special Tools and Equipment**.
4. Install the crank balancer shaft. Refer to **Crankshaft Balancer Replacement**.

## ENGINE FRONT COVER REPLACEMENT

### Tools Required

**J 44219** Cover Alignment Pins. See **Special Tools and Equipment**.

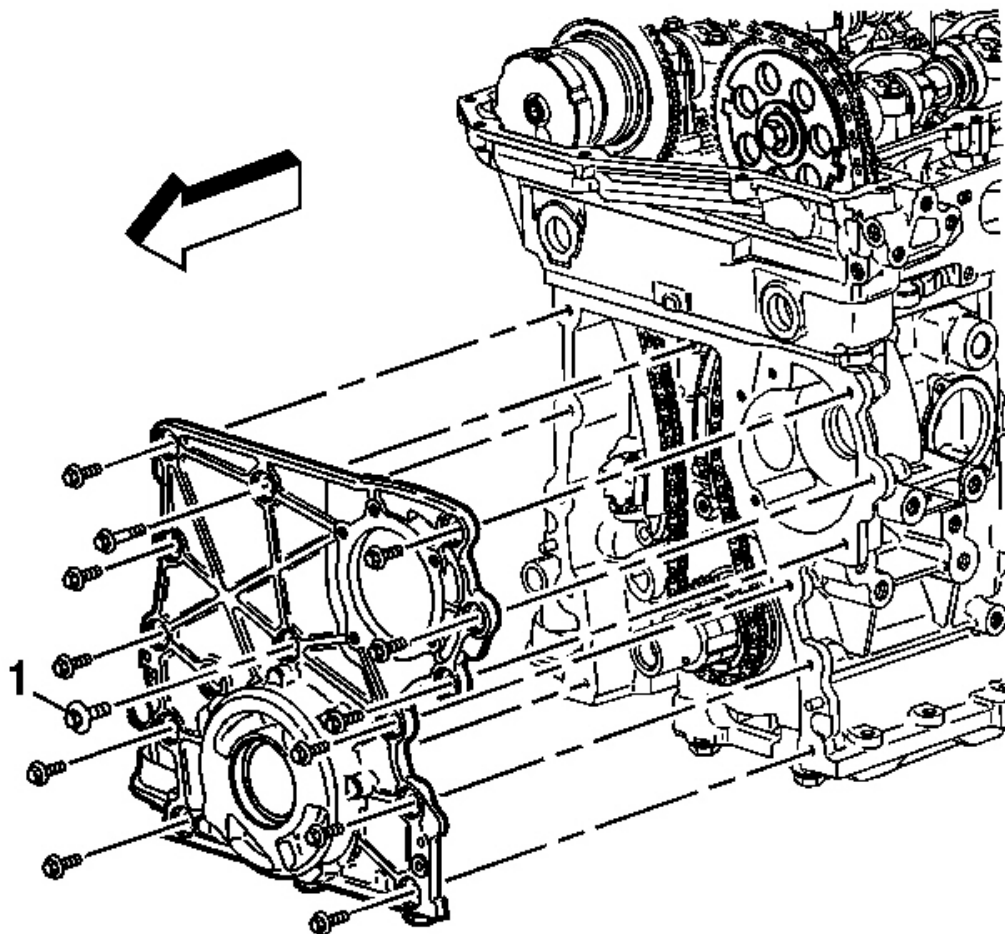
### Removal Procedure

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

1. Drain the engine coolant. Refer to **Draining and Filling Cooling System (Body Vin Code 6)** in Engine Cooling.
2. Remove the cooling fan and the shroud. Refer to **Cooling Fan and Shroud Replacement** in Engine Cooling.
3. Remove the drive belt. Refer to **Drive Belt Replacement**.
4. Remove the water pump. Refer to **Water Pump Replacement (LL8)** or **Water Pump Replacement (LM4)** in Engine Cooling.
5. Remove the crankshaft balancer. Refer to **Crankshaft Balancer Replacement**.
6. Remove the power steering pump. Refer to **Power Steering Pump Replacement (5.3L)** or **Power Steering Pump Replacement (4.2L)** in Power Steering.
7. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
8. Remove the oil pan. Refer to **Oil Pan Replacement**.
9. Lower the vehicle.

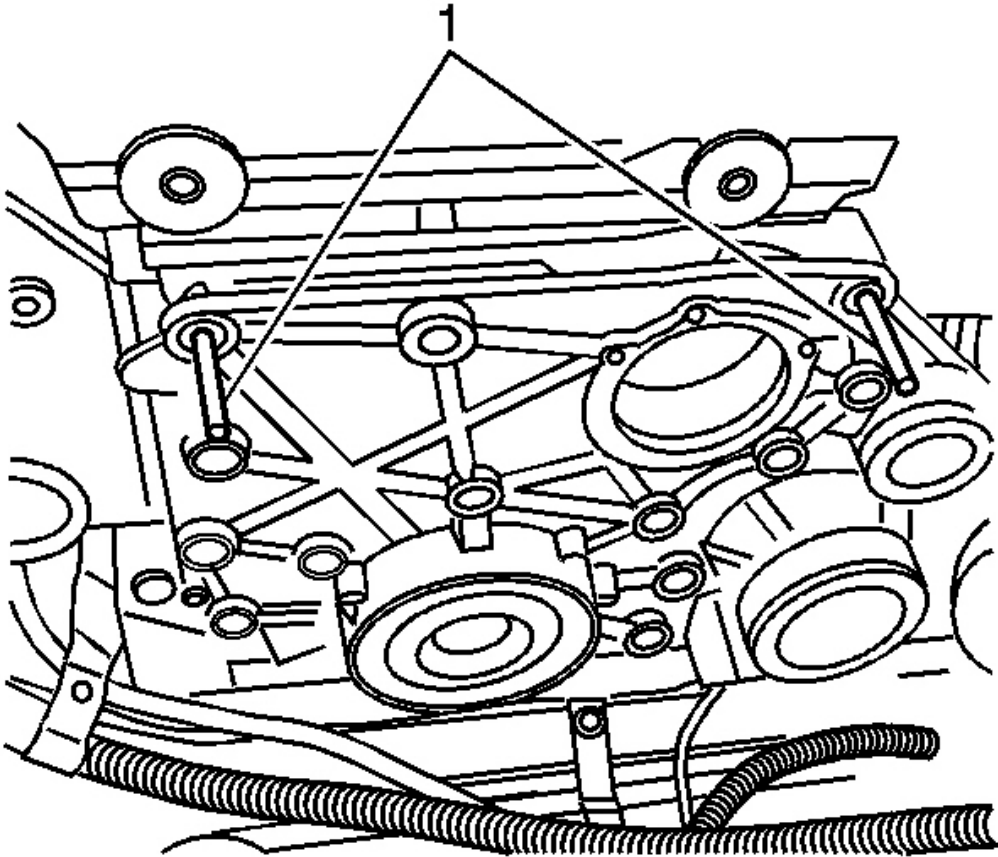




**Fig. 140: View Of Engine Front Cover Bolts**  
Courtesy of GENERAL MOTORS CORP.

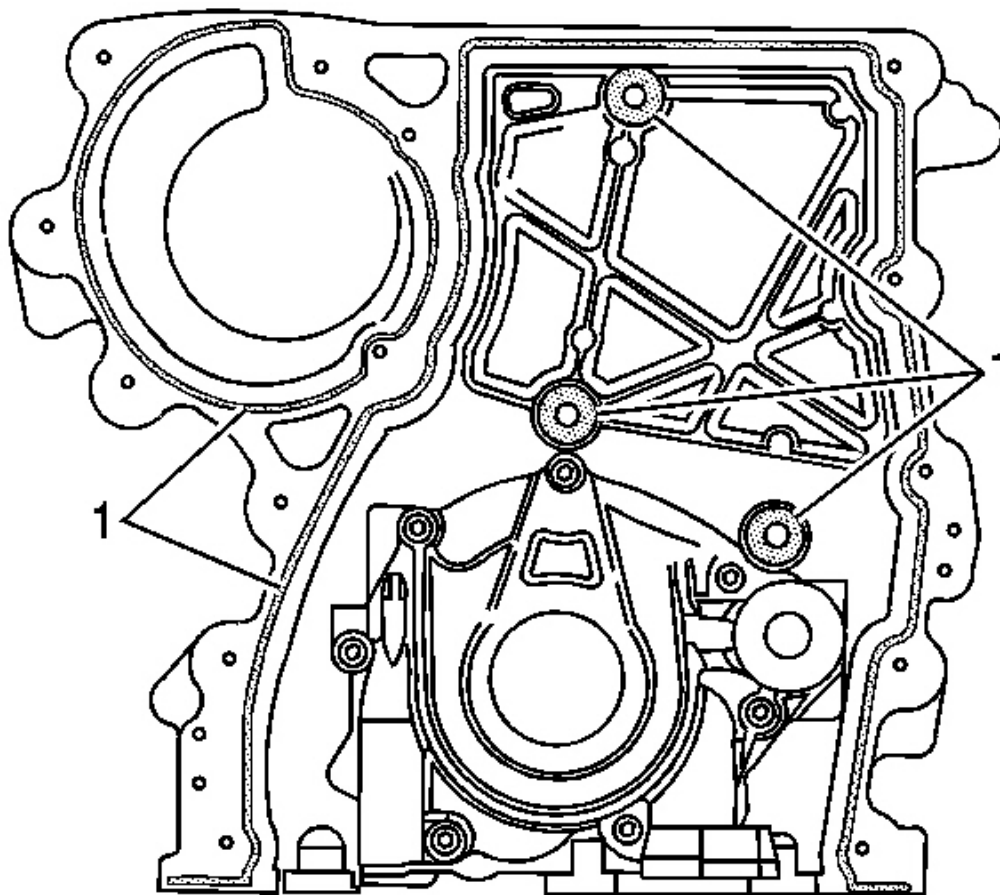
10. Remove the 7 mm center bolt (1).
11. Loosen and remove the remaining engine front cover bolts.
12. Place two of the front cover bolts in the jack screw holes on the front cover and tighten the bolts evenly to release the front cover from the engine.
13. Remove the two bolts from the front cover.
14. Remove the oil pump. Refer to **Oil Pump Replacement**.
15. Clean and Inspect the front cover. Refer to **Engine Front Cover Cleaning and Inspection**.

1. Install the **J 44219** , onto the engine. See **Special Tools and Equipment**.



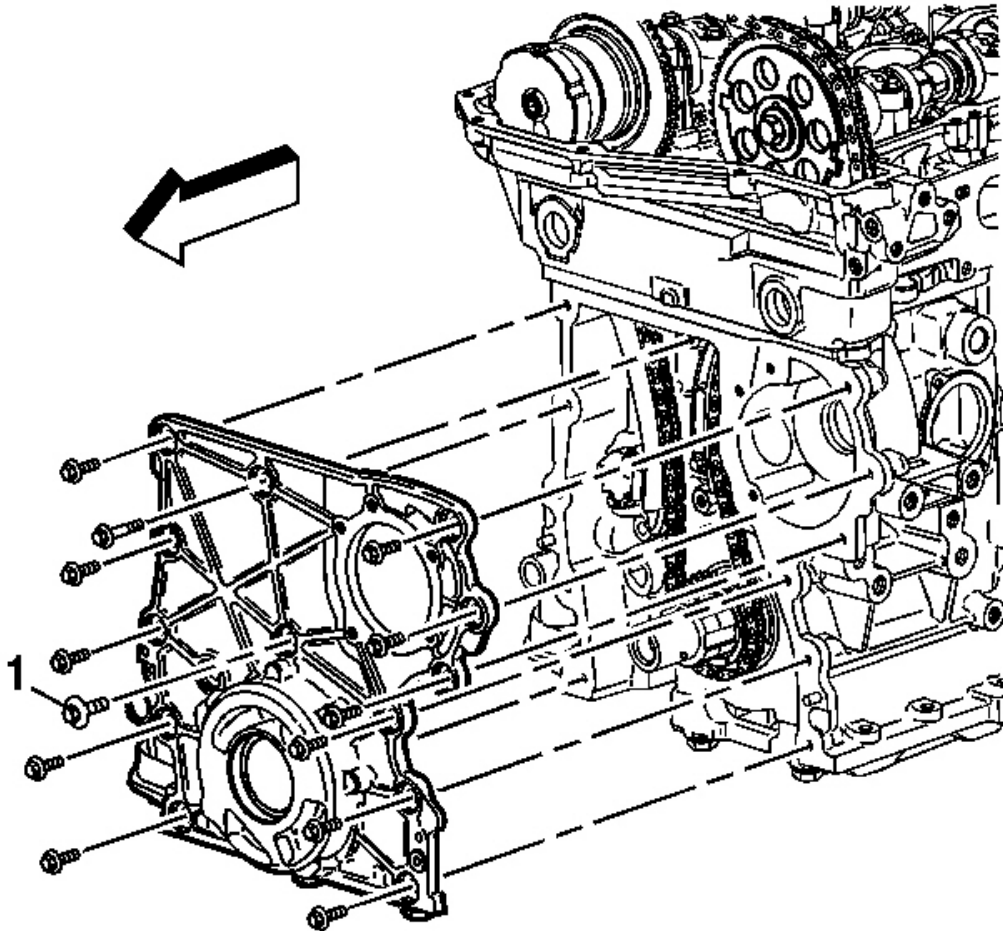
**Fig. 141: Aligning Engine Front Cover Using J 44219**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** The engine front cover must be installed within 10 minutes from when the sealer was applied.



**Fig. 142: Applying Sealant To Engine Front Cover**  
**Courtesy of GENERAL MOTORS CORP.**

2. Apply a 3 mm (0.12 in) bead of sealer GM P/N 12378521 to the trace grooves on back side of the engine front cover (1).
3. Also apply sealant on the inside three bolt hole bosses on the cover.
4. Align the oil pump to the crankshaft sprocket splines.



**Fig. 143: View Of Engine Front Cover Bolts**  
Courtesy of GENERAL MOTORS CORP.

5. Install the front cover.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

6. Install the front cover bolts, tightening the center bolt last (1).

**Tighten:** Tighten the front cover bolts to 10 N.m (89 lb in).

7. Remove the **J 44219** . See Special Tools and Equipment.
8. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

9. Install the oil pan. Refer to **Oil Pan Replacement**.
10. Lower the vehicle.
11. Install the power steering pump. Refer to **Power Steering Pump Replacement (5.3L)** or **Power Steering Pump Replacement (4.2L)** in Power Steering System.
12. Install the crankshaft balancer. Refer to **Crankshaft Balancer Replacement**.
13. Install the water pump. Refer to **Water Pump Replacement (LL8)** or **Water Pump Replacement (LM4)** in Engine Cooling.
14. Install the drive belt. Refer to **Drive Belt Replacement**.
15. Install the cooling fan and shroud. Refer to **Cooling Fan and Shroud Replacement** in Engine Cooling.
16. Fill the engine with coolant. Refer to **Draining and Filling Cooling System (Body Vin Code 6)** in Engine Cooling.

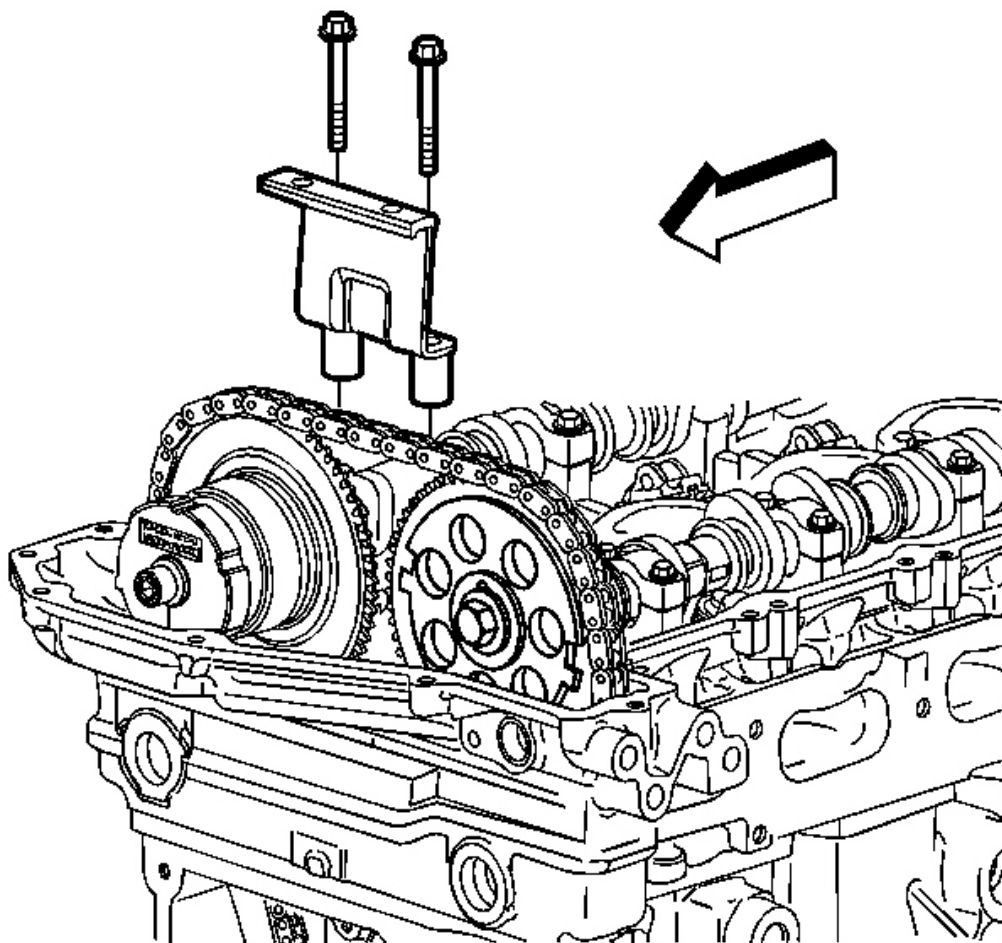
### CAMSHAFT POSITION ACTUATOR REPLACEMENT - EXHAUST

#### Tools Required

- J 36660-A Torque Angle Meter
- J 44217 Timing Chain Retention Tool

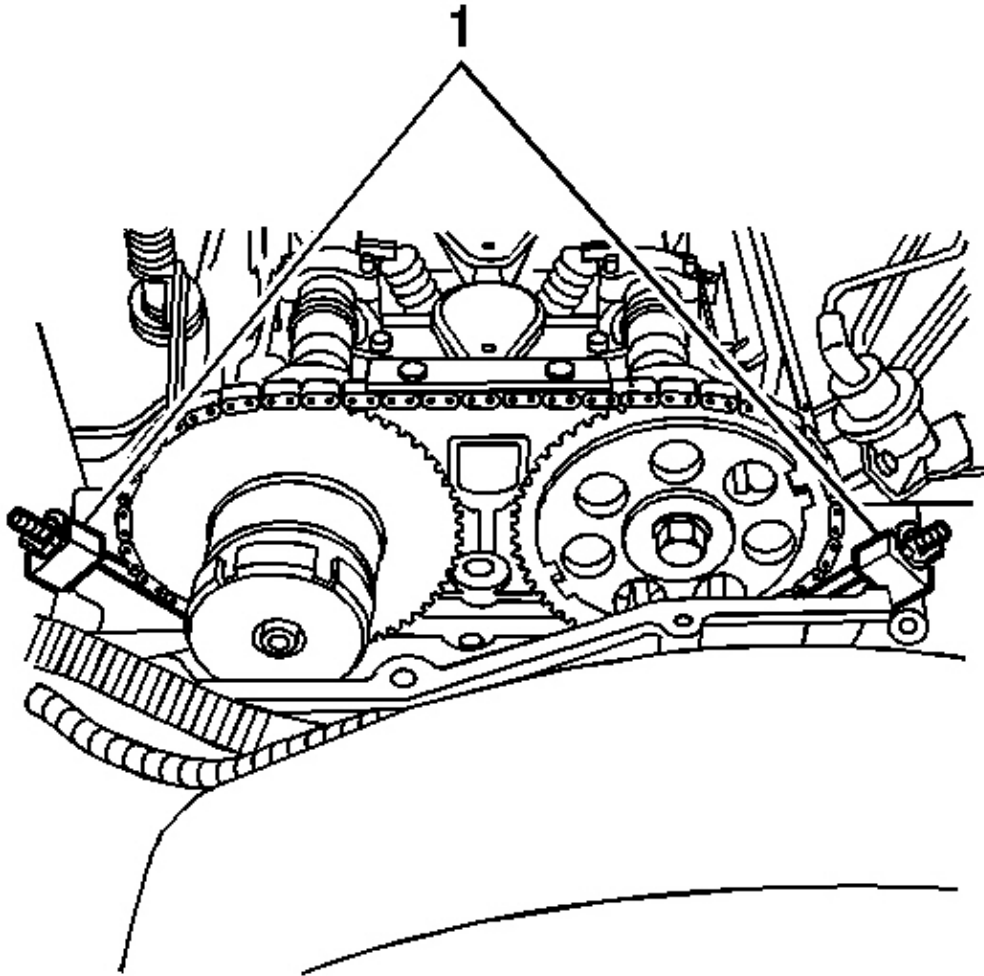
#### Removal Procedure

1. Remove the camshaft cover. Refer to **Camshaft Cover Replacement**.
2. Rotate the engine until the word Delphi on the exhaust camshaft position actuator is lined up parallel with the cylinder head to cam cover mating surface.



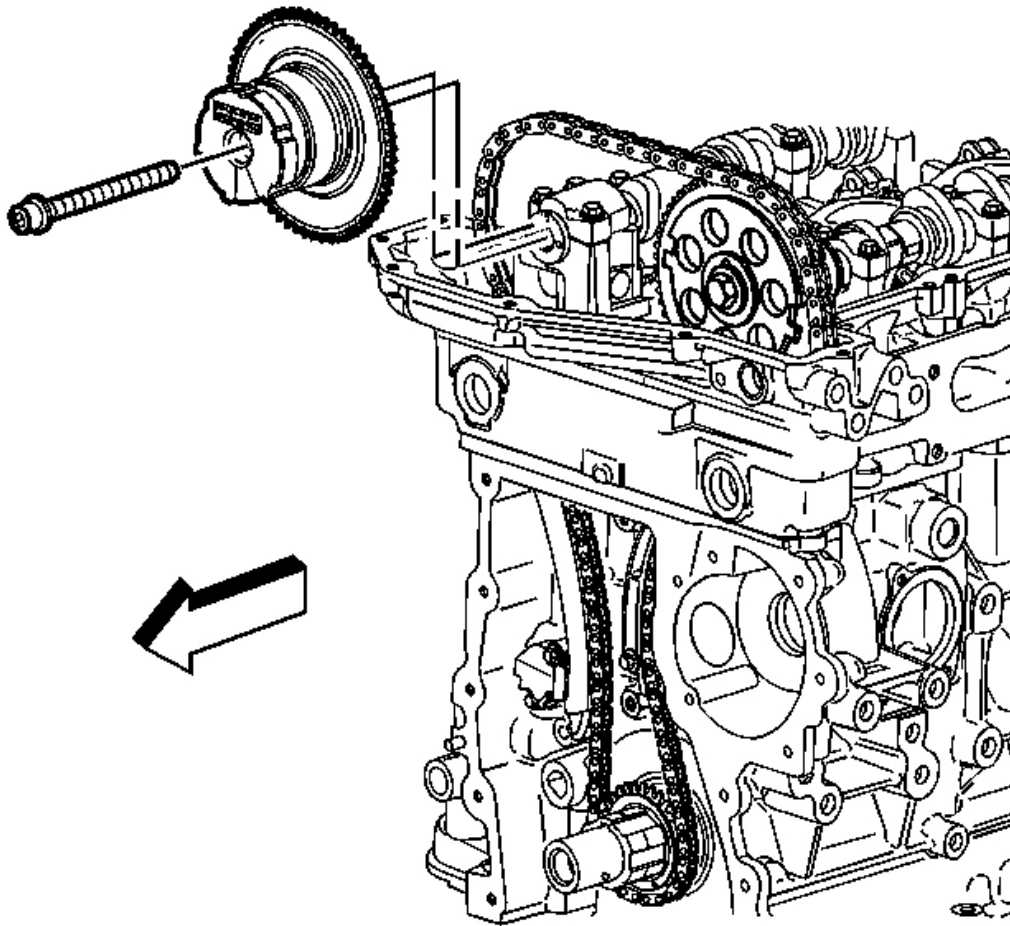
**Fig. 144: View Of Top Chain Guide**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the top chain guide bolts.
4. Remove the top chain guide.
5. Using the timing mark on the exhaust camshaft position actuator sprocket as a reference, make a mark on the timing chain link across from it.



**Fig. 145: Installing 44217 & EN-44217-45 To Timing Chains**  
Courtesy of GENERAL MOTORS CORP.

6. Install the J-44217 (1).
  1. Install the hook portion of the timing chain retention tools into one of the timing chain links near the timing chain shoe on both sides of the engine.
  2. Tighten the wing nuts.
  3. Ensure the hooks are still in one of the links and the gage blocks of the tool are firmly in place on the edge of the head.

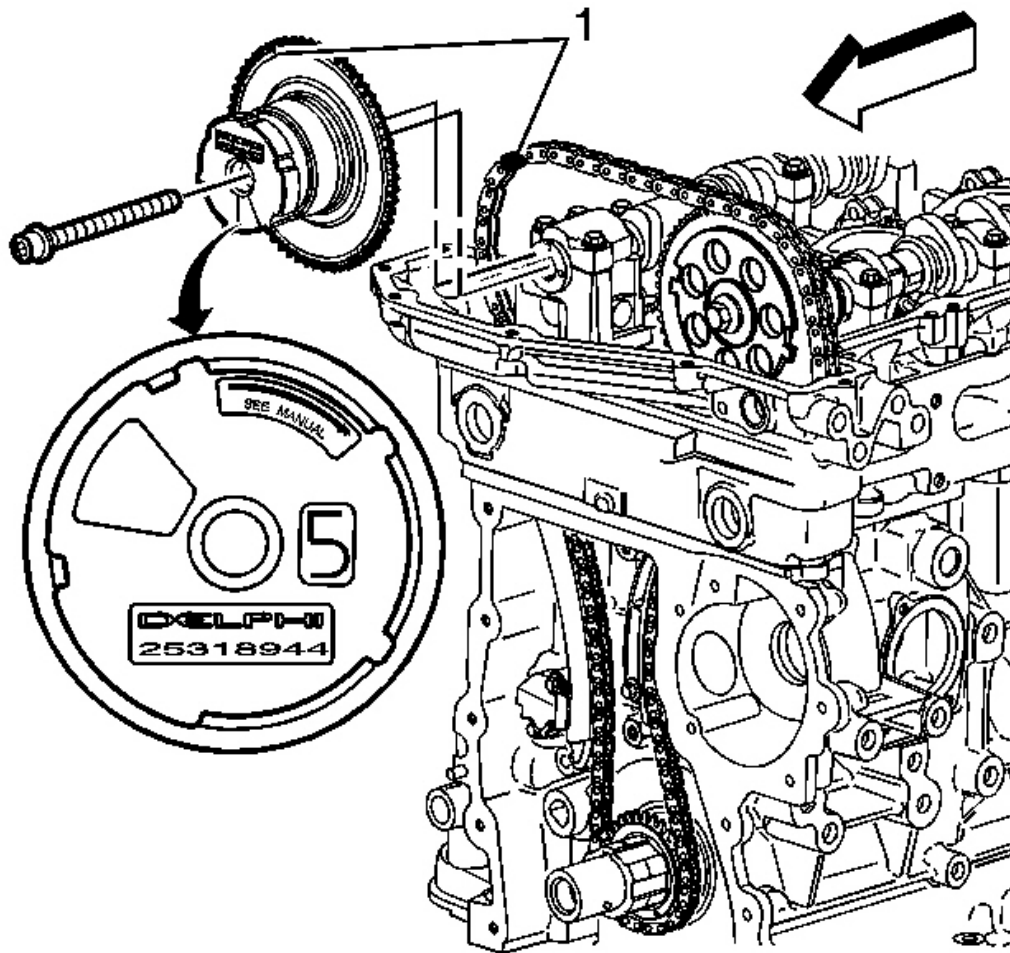


**Fig. 146: View Of Exhaust Camshaft Position Actuator**  
**Courtesy of GENERAL MOTORS CORP.**

7. Remove the exhaust camshaft position actuator bolt.
8. Remove the exhaust camshaft position actuator.

**Installation Procedure**



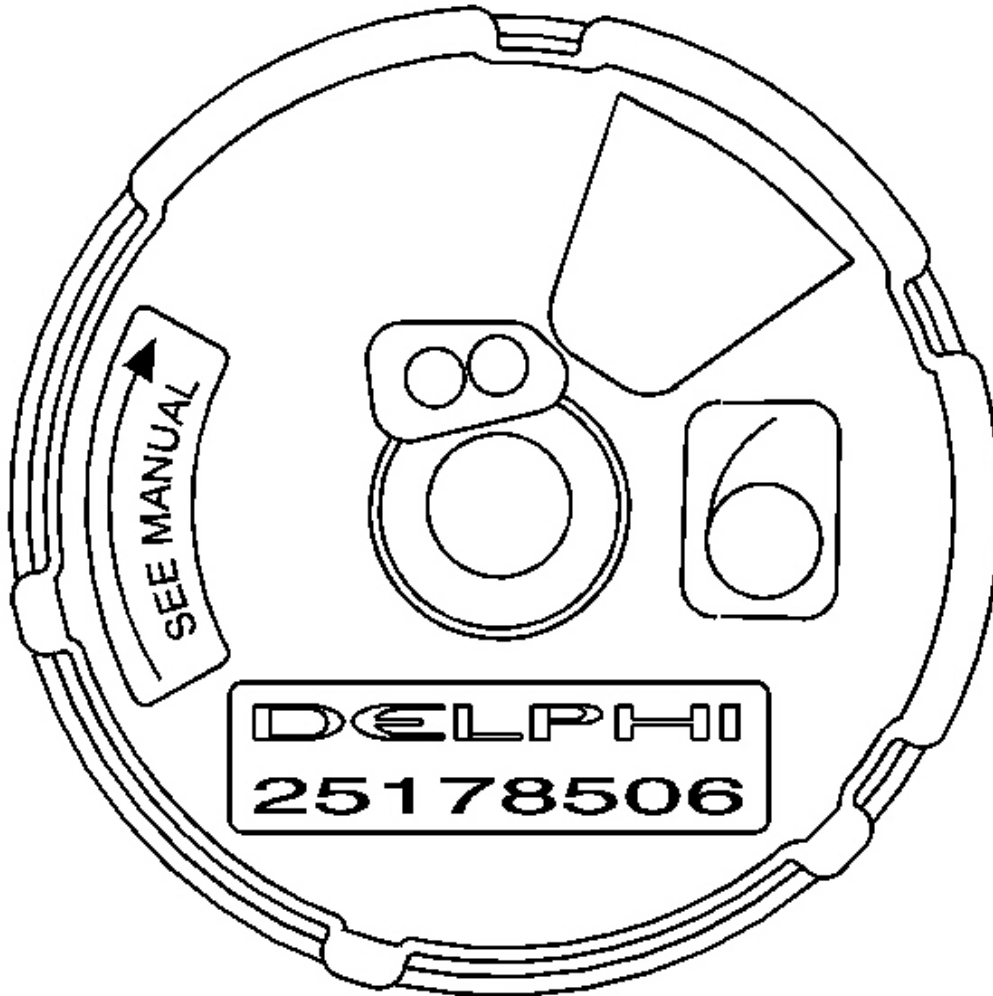


**Fig. 147: Aligning Exhaust Camshaft Position Actuator**  
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust camshaft actuator into the timing chain.
2. Align the marked link of the timing chain with the timing mark on the exhaust camshaft position actuator sprocket (1).

**IMPORTANT:** Ensure the alignment pin is engaged between the camshaft and the exhaust camshaft position actuator.

3. Install the exhaust camshaft actuator onto the exhaust camshaft.



**Fig. 148: Identifying Camshaft Position (CMP) Actuator**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** The camshaft actuator must be fully advanced during installation. Engine damage may occur if the camshaft actuator is not fully advanced.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

**IMPORTANT:** Ensure the camshaft actuator is rotated clockwise relative to the camshaft prior to tightening the bolt. Do not force the camshaft actuator to rotate clockwise. If it does not move easily, it is already fully advanced. New

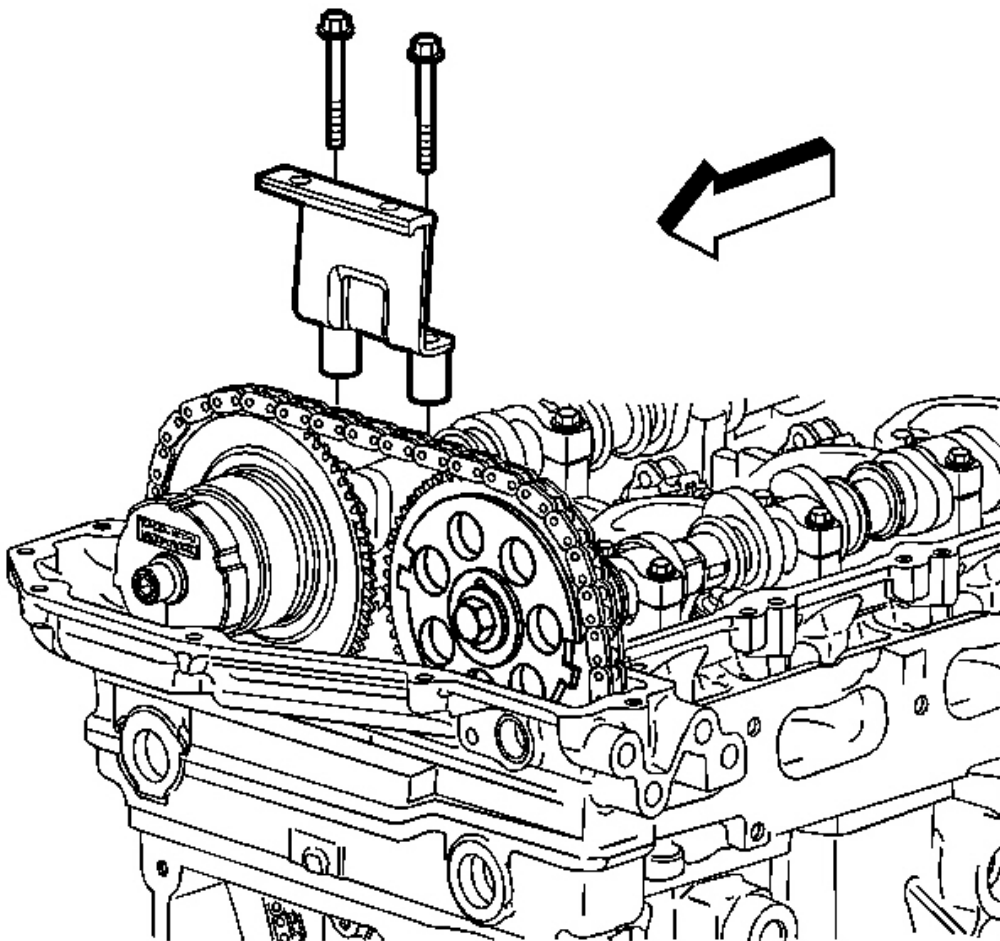
**camshaft actuators are already packaged in the fully advanced (clockwise) position.**

4. Install the exhaust camshaft actuator bolt.

**Tighten:**

- Tighten the exhaust camshaft actuator bolt the first pass to 25 N.m (18 lb ft).
- Use the J 36660-A to tighten the exhaust camshaft actuator bolt the final pass an additional 135 degrees.

5. Remove the J-44217 .



**Fig. 149: View Of Top Chain Guide**

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### Courtesy of GENERAL MOTORS CORP.

6. Install the top chain guide.
7. Add threadlocker GM P/N 12345493 (Canadian P/N 10953488) to the top chain guide bolt threads.
8. Install the top chain guide bolts.

**Tighten:** Tighten the top chain guide bolts to 10 N.m (89 lb in).

9. Install the camshaft cover. Refer to **Camshaft Cover Replacement**.

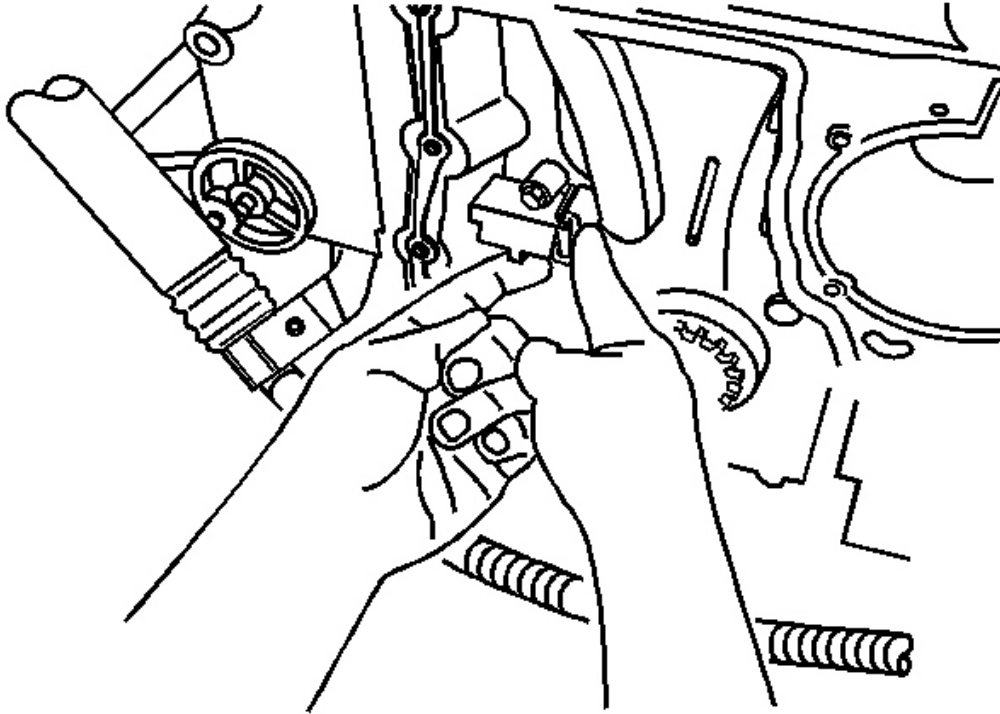
## TIMING CHAIN, SPROCKETS, AND/OR TENSIONER REPLACEMENT

### Tools Required

- J 36660-A Torque Angle Meter
- **J 44221** Camshaft Holding Tool. See **Special Tools and Equipment**.

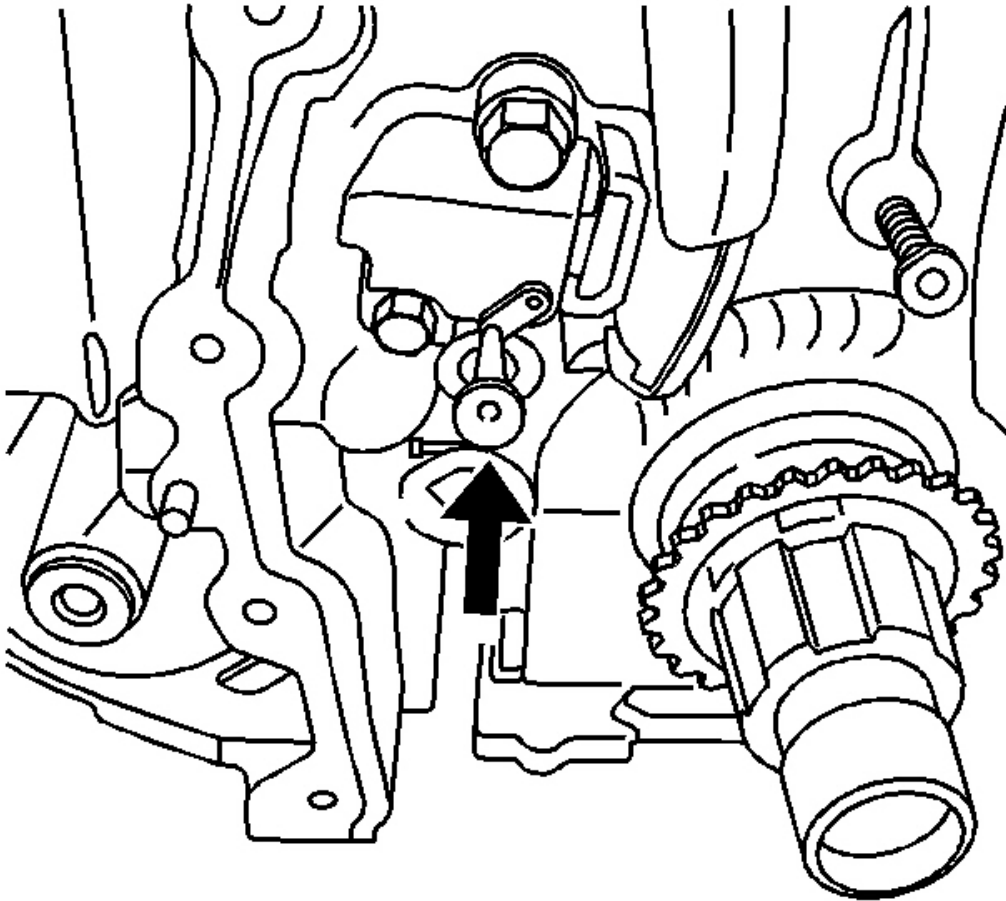
### Removal Procedure

1. Remove the camshaft cover. Refer to **Camshaft Cover Replacement**.
2. Remove the engine front cover. Refer to **Engine Front Cover Replacement**.



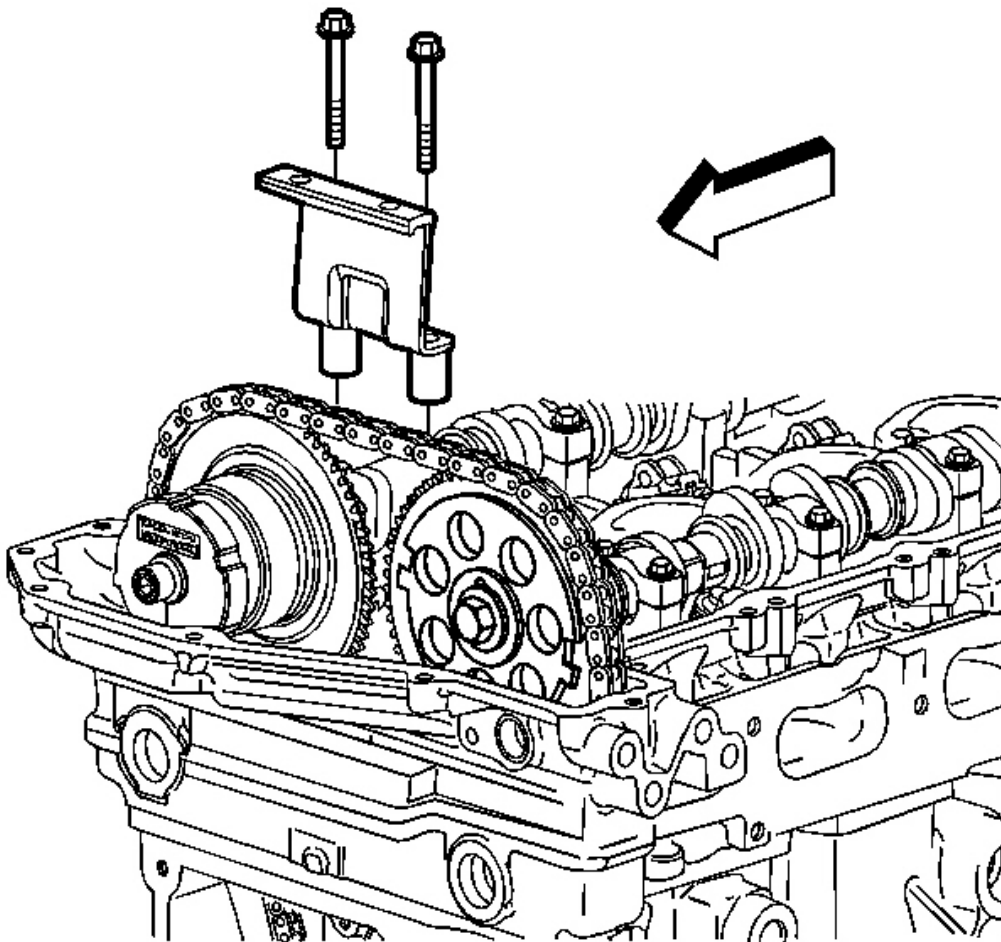
**Fig. 150: Releasing Tension On Timing Chain**  
Courtesy of GENERAL MOTORS CORP.

3. Release the tension on the timing chain by moving the tensioner shoe in.



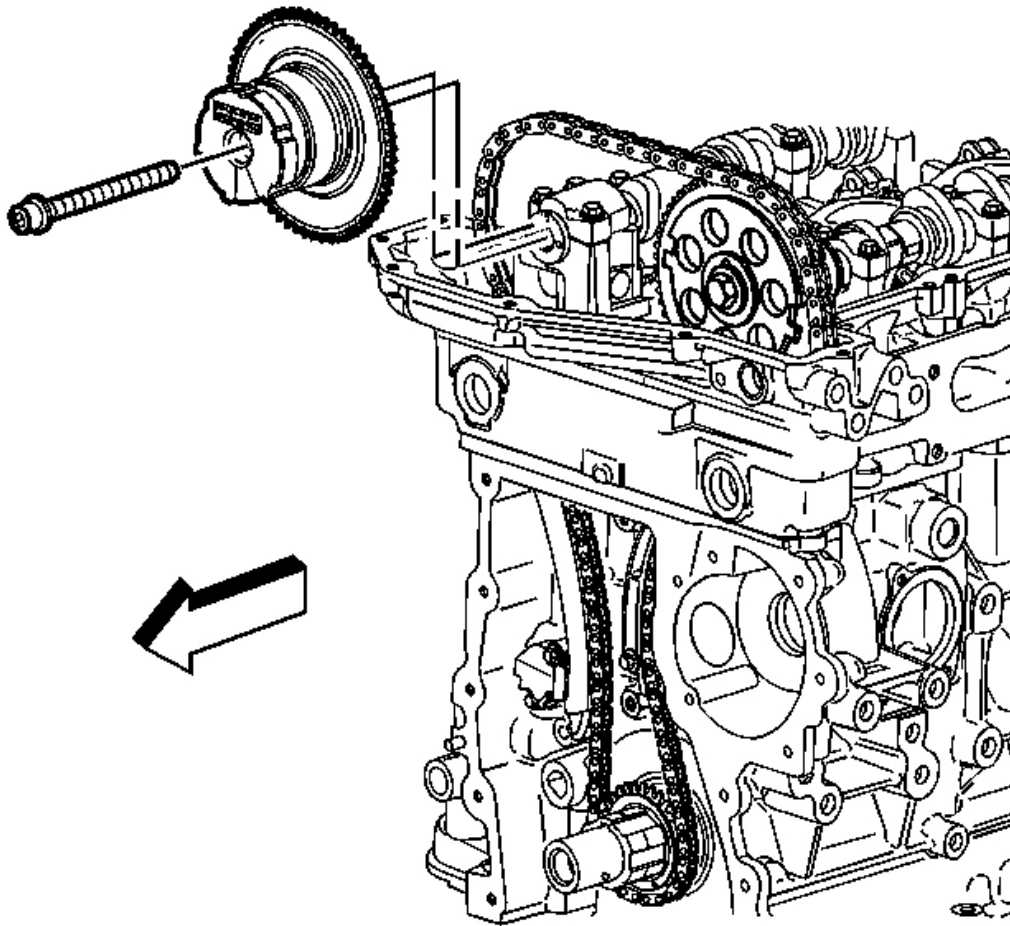
**Fig. 151: View Of Tee At Timing Chain Tensioner**  
Courtesy of GENERAL MOTORS CORP.

4. Place the tee into the tensioner to hold the shoe in place.



**Fig. 152: View Of Top Chain Guide**  
**Courtesy of GENERAL MOTORS CORP.**

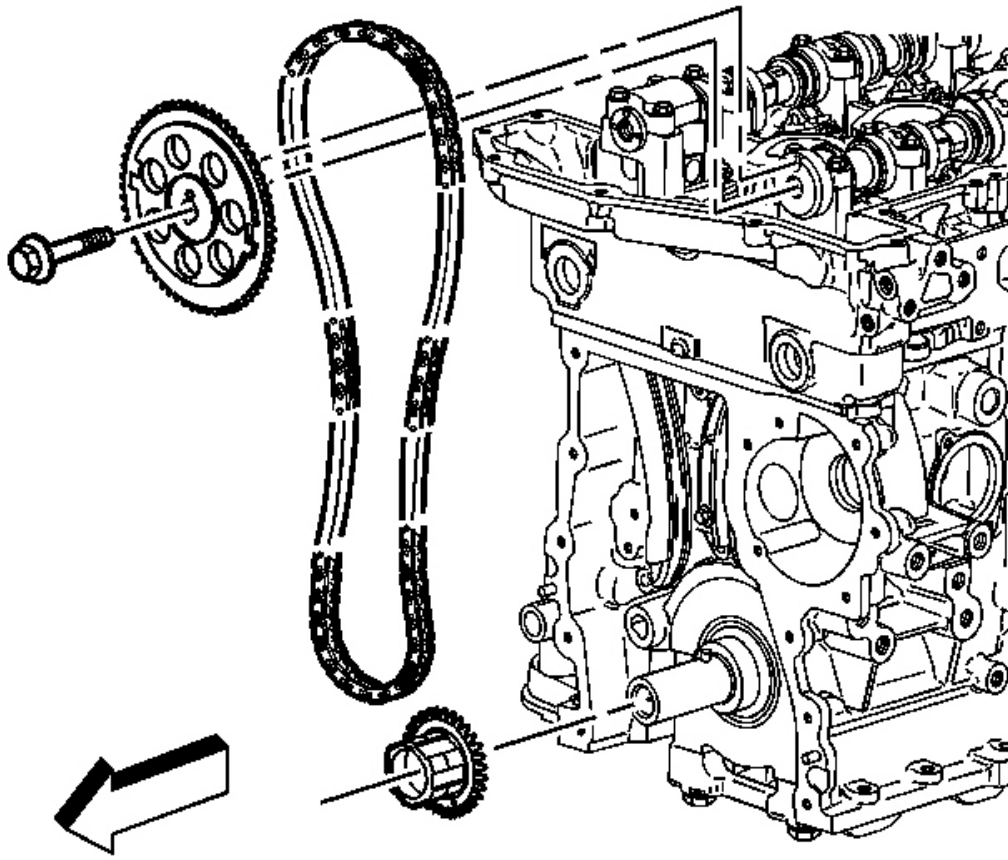
5. Remove the top chain guide bolts.
6. Remove the top chain guide.



**Fig. 153: View Of Exhaust Camshaft Position Actuator**  
**Courtesy of GENERAL MOTORS CORP.**

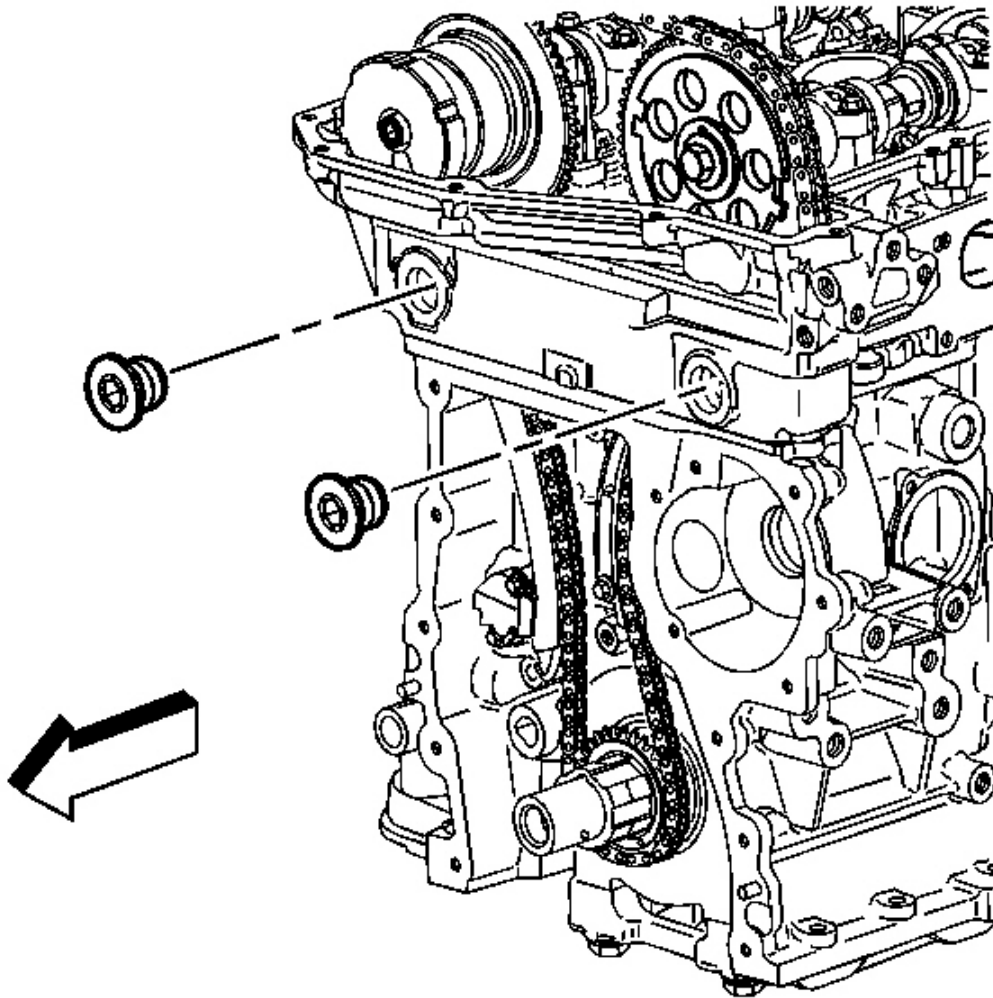
7. Remove the exhaust camshaft position actuator bolt.
8. Remove the exhaust camshaft position actuator.





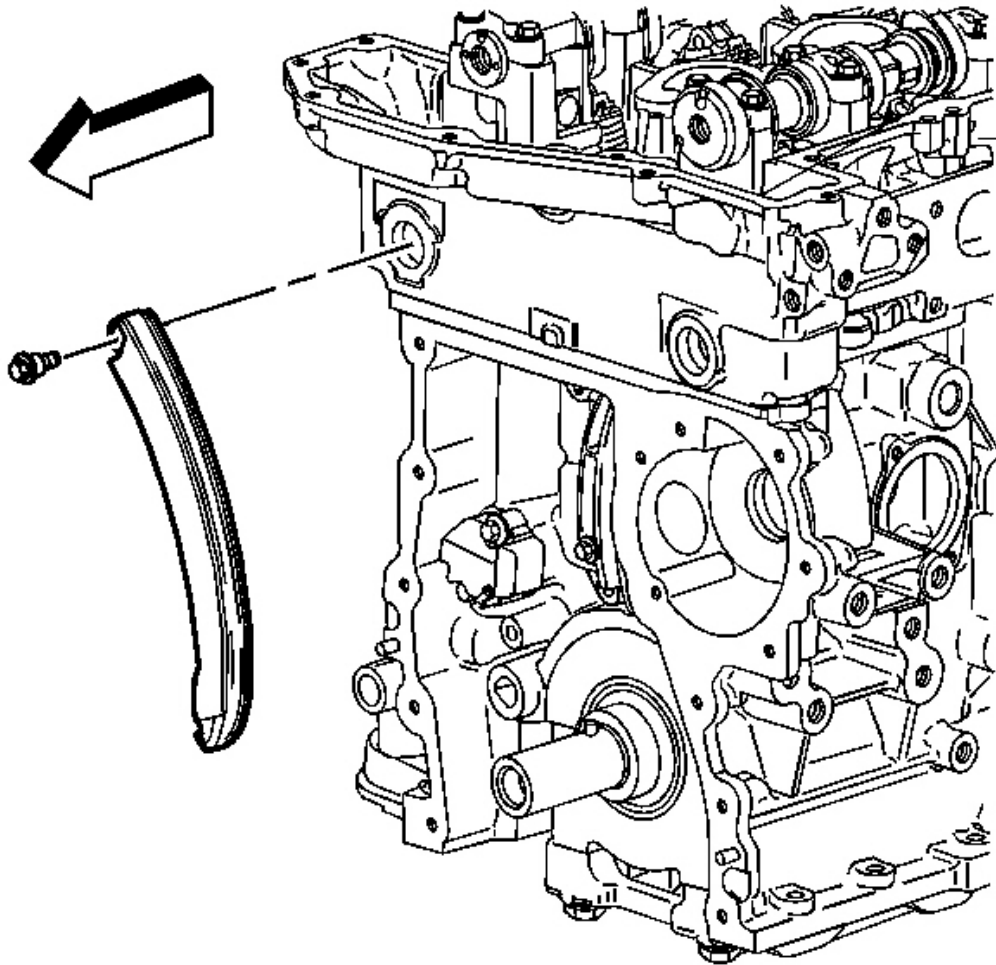
**Fig. 154: View Of Timing Chain & Sprockets**  
Courtesy of GENERAL MOTORS CORP.

9. Remove the intake camshaft sprocket bolt.
10. Remove the intake camshaft sprocket.
11. Remove the timing chain.
12. Remove the crankshaft sprocket.



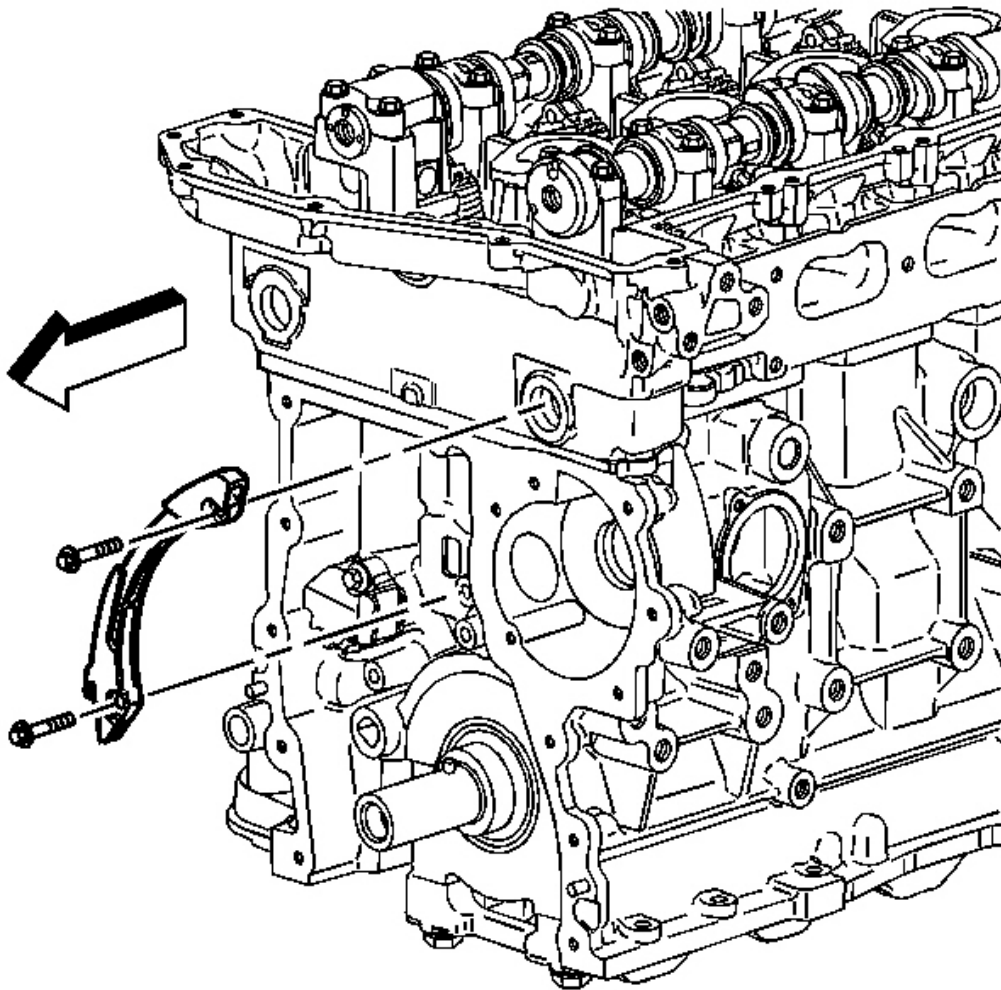
**Fig. 155: View Of Cylinder Head Access Hole Plugs**  
Courtesy of GENERAL MOTORS CORP.

13. Remove the cylinder head access hole plugs.



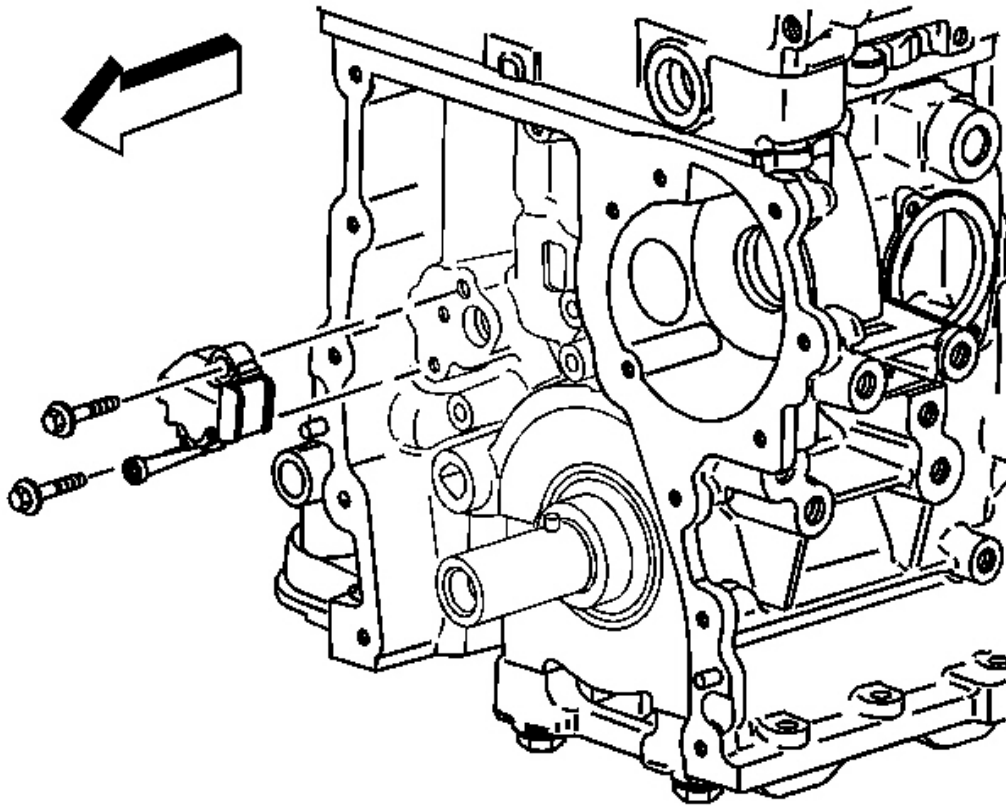
**Fig. 156: View Of Timing Chain Tensioner Shoe & Bolt**  
Courtesy of GENERAL MOTORS CORP.

14. Remove the timing chain tensioner shoe bolt.
15. Remove the timing chain tensioner shoe.



**Fig. 157: View Of Timing Chain Guide & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

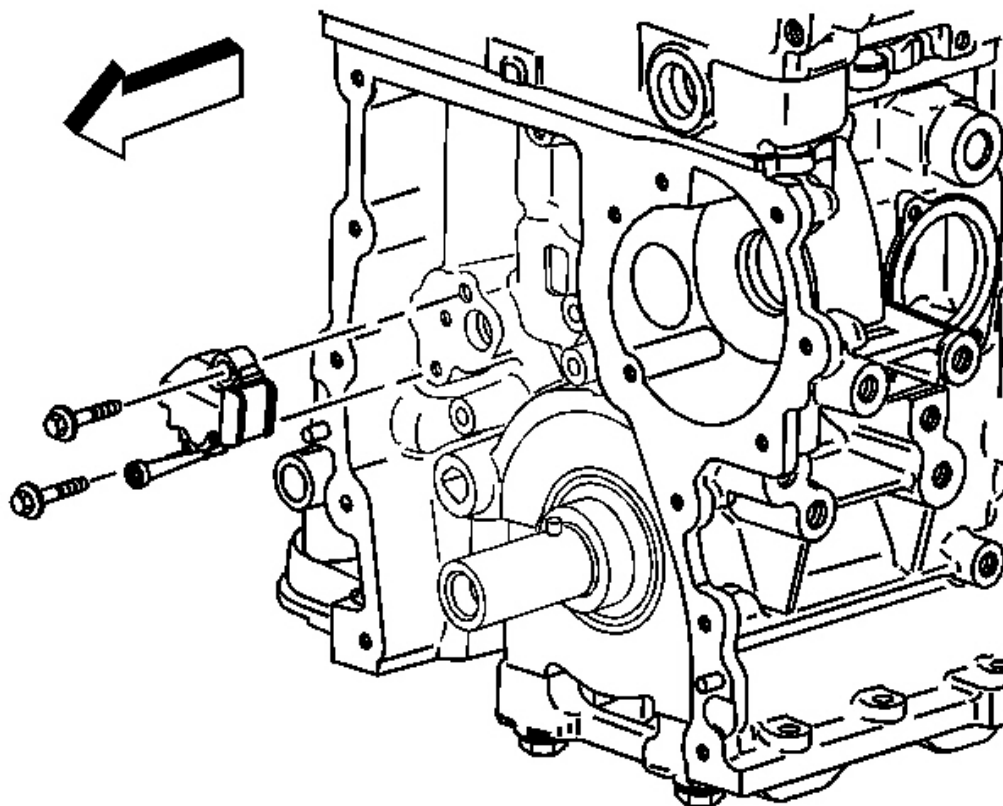
16. Remove the timing chain tensioner guide bolts.
17. Remove the timing chain tensioner guide.



**Fig. 158: View Of Timing Chain Tensioner & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

18. Remove the timing chain tensioner bolts.
19. Remove the timing chain tensioner.

#### **Installation Procedure**



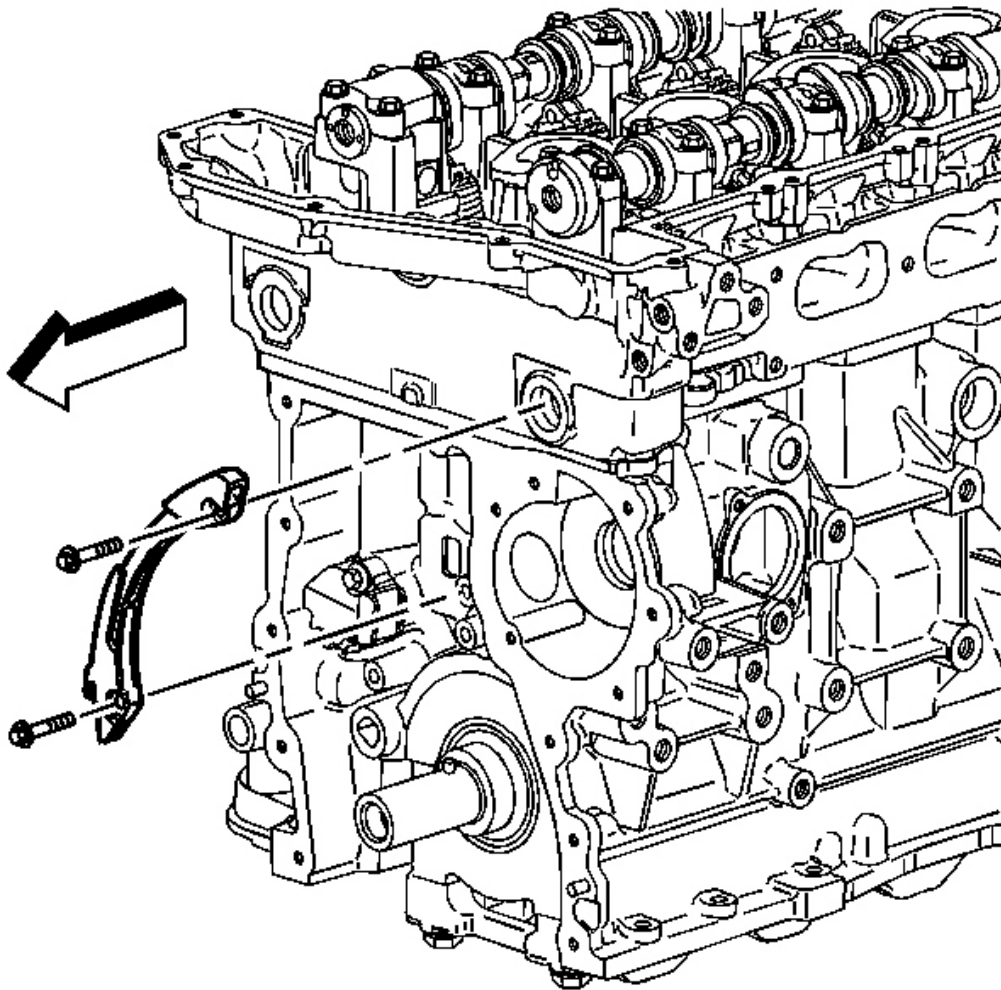
**Fig. 159: View Of Timing Chain Tensioner & Bolts**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

**IMPORTANT:** Every seventh link of the timing chain is darkened to aid in aligning the timing marks.

1. Install the timing chain tensioner and secure the tensioner with the bolts.

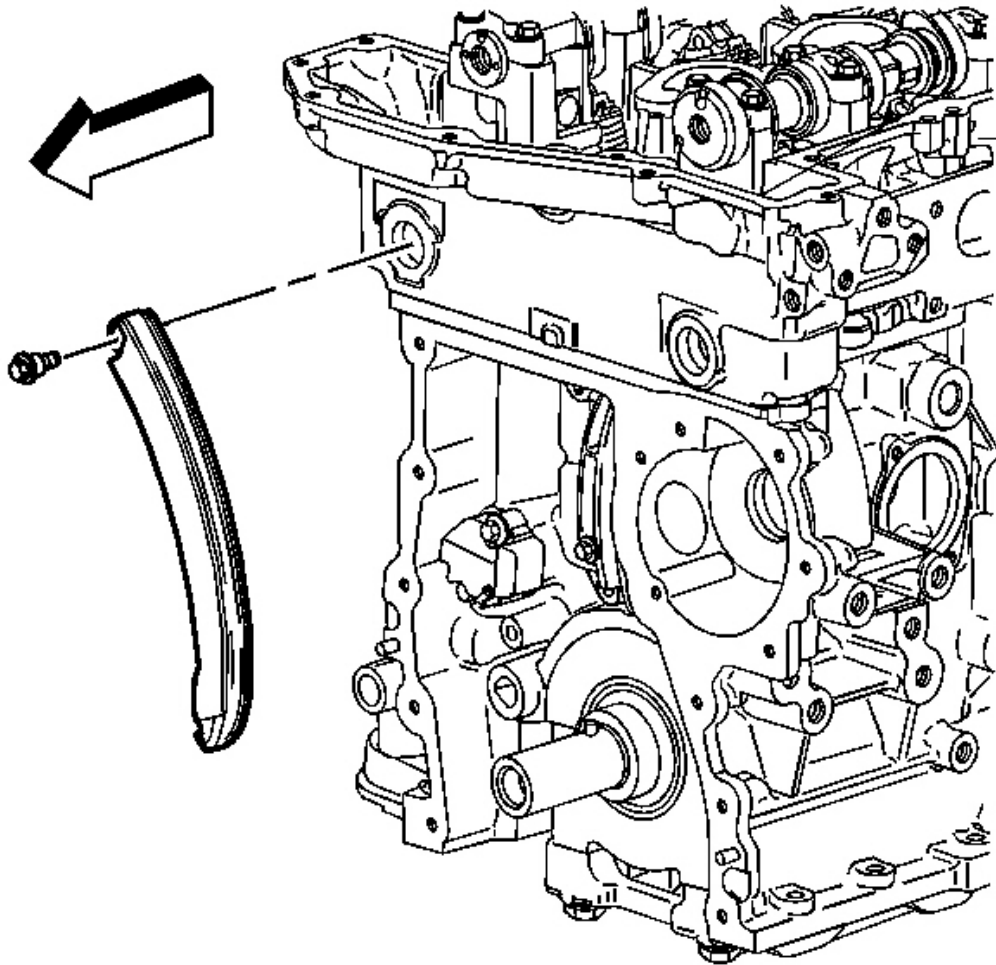
**Tighten:** Tighten the timing chain tensioner bolts to 25 N.m (18 lb ft).



**Fig. 160: View Of Timing Chain Guide & Bolts**  
Courtesy of GENERAL MOTORS CORP.

2. Install the timing chain tensioner guide and secure the guide with the bolts.

**Tighten:** Tighten the timing chain tensioner guide to 10 N.m (89 lb in).

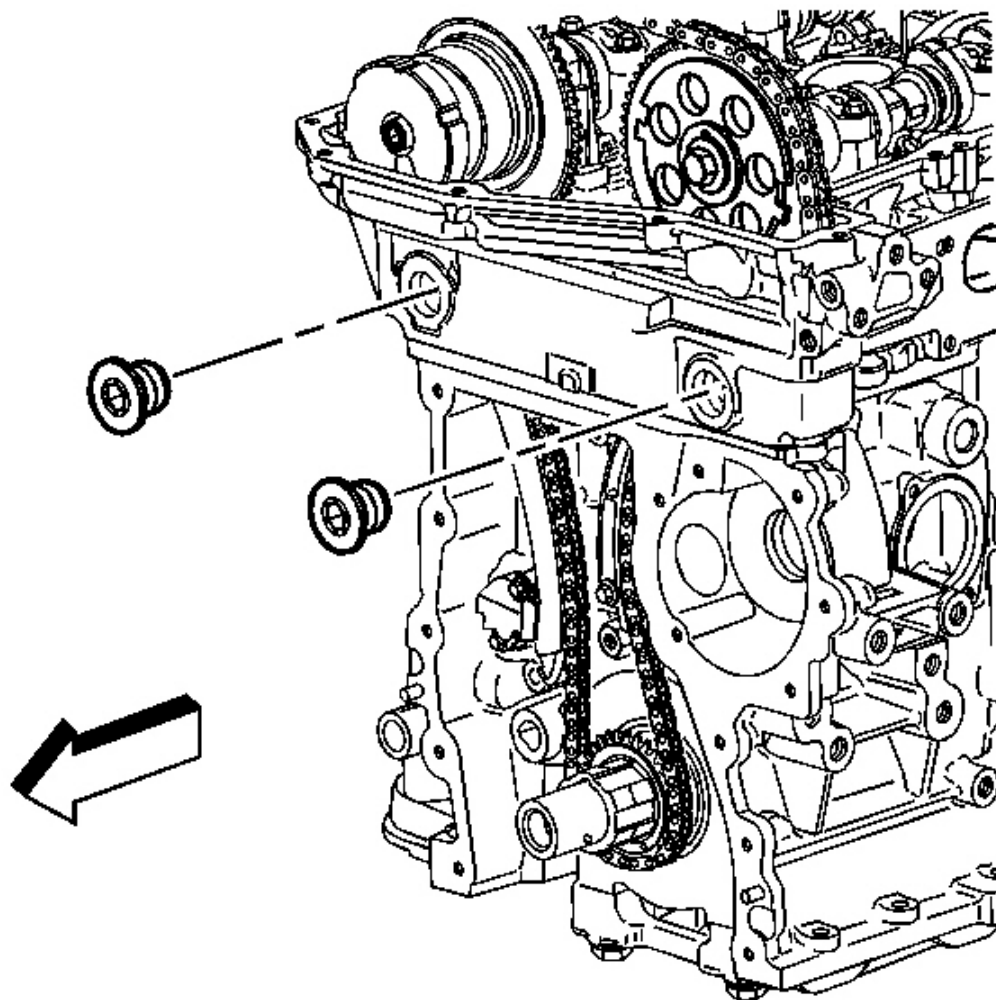


**Fig. 161: View Of Timing Chain Tensioner Shoe & Bolt**  
Courtesy of GENERAL MOTORS CORP.

3. Install the timing chain tensioner shoe and secure the shoe with the bolt.

**Tighten:** Tighten the timing chain tensioner shoe bolt to 26 N.m (19 lb ft).

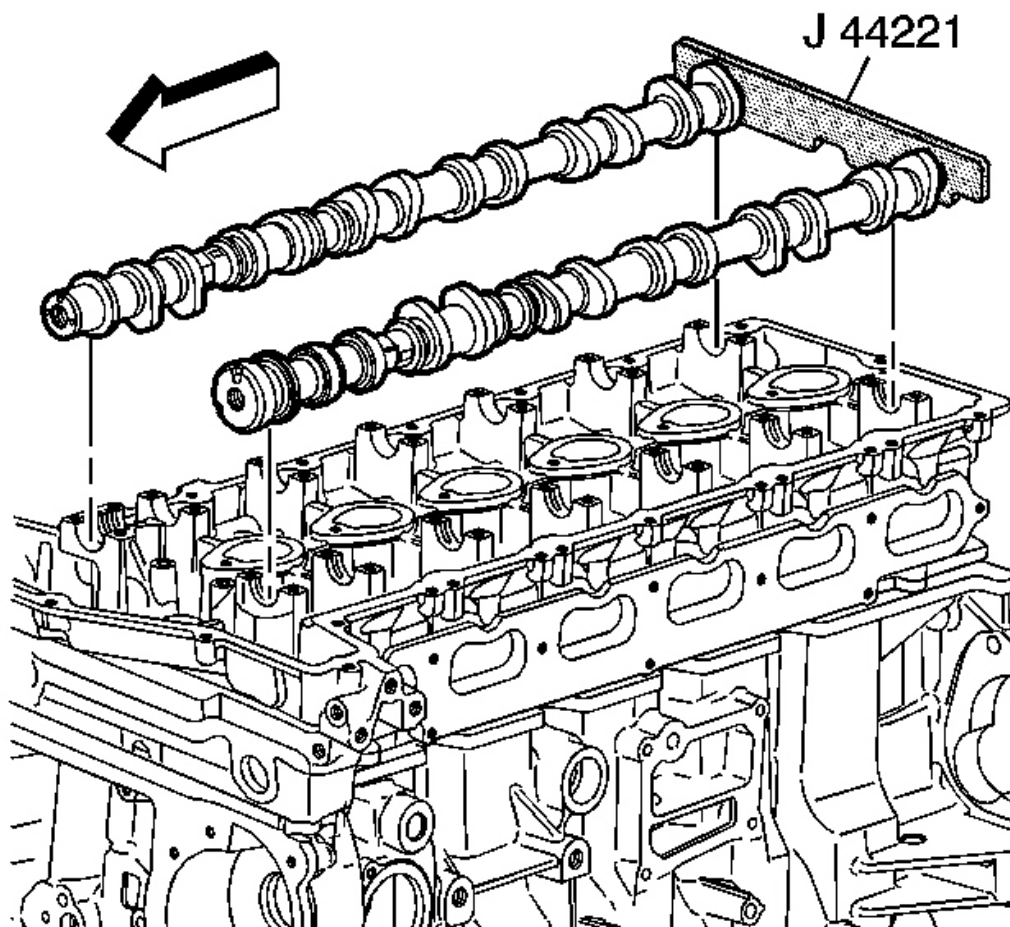




**Fig. 162: View Of Cylinder Head Access Hole Plugs**  
Courtesy of GENERAL MOTORS CORP.

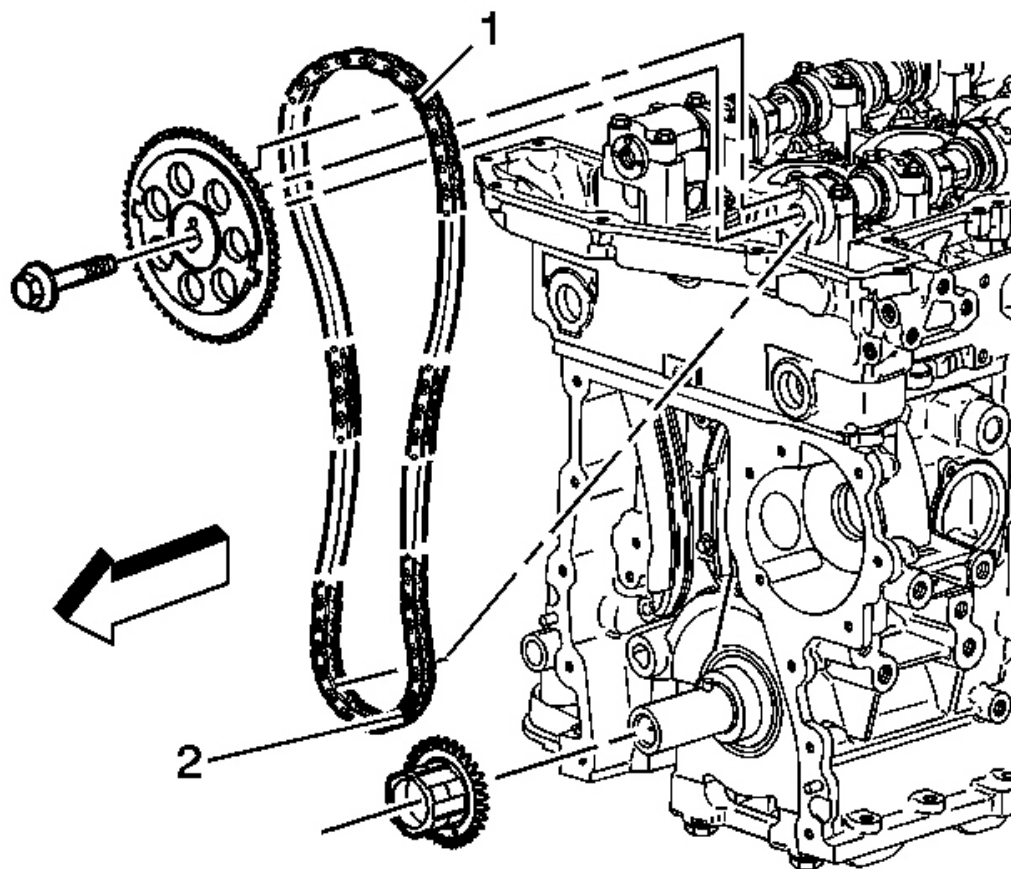
4. Install the cylinder head access hole plugs.

**Tighten:** Tighten the cylinder head access hole plugs to 5 N.m (44 lb in).



**Fig. 163: Installing J 44221 Onto Camshafts**  
Courtesy of GENERAL MOTORS CORP.

5. Install the **J 44221** with the camshaft flats up and the number 1 piston at top dead center. The crank pin will be at 12 o'clock when the number 1 piston is at top dead center. See **Special Tools and Equipment**.



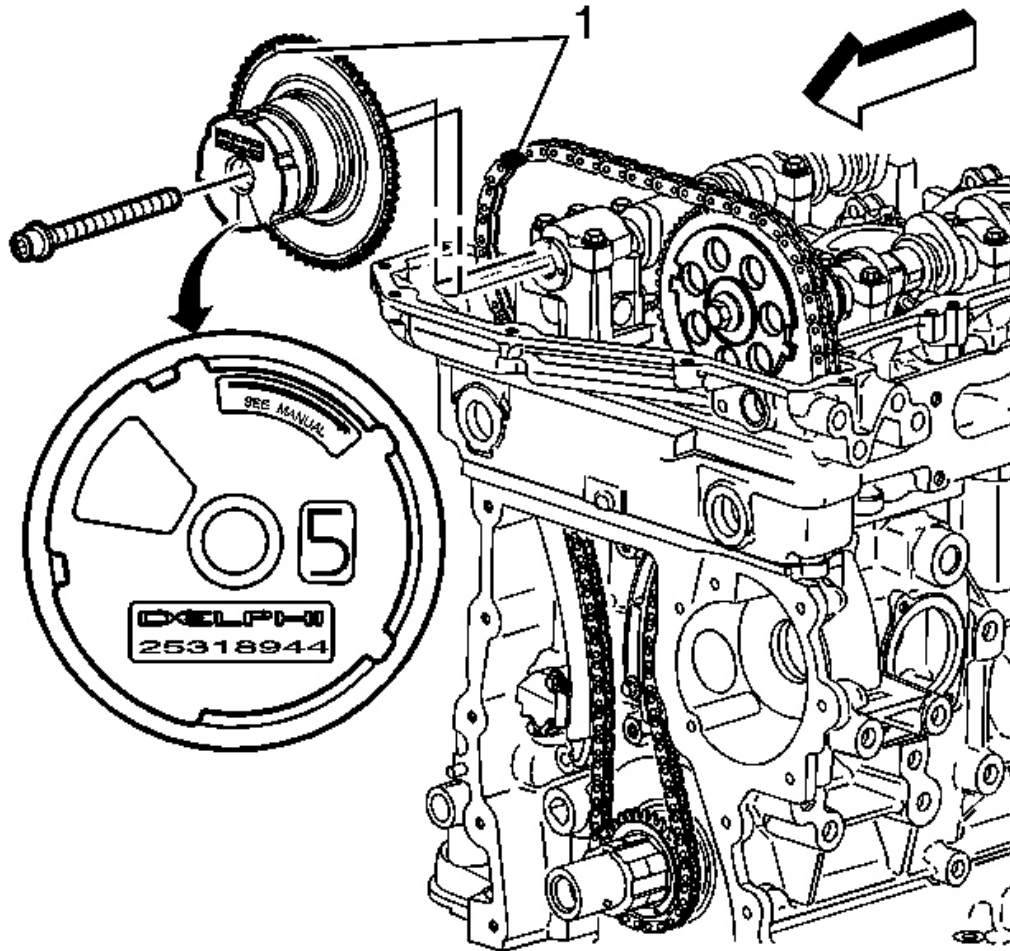
**Fig. 164: Installing Timing Chain & Sprockets**  
 Courtesy of GENERAL MOTORS CORP.

6. Install the crankshaft sprocket (1).
7. Install the intake camshaft sprocket into the timing chain.
8. Align the dark link of the timing chain with the timing mark on the intake camshaft sprocket (1).
9. Feed the timing chain down through the opening in the head.
10. Install the timing chain on the crankshaft sprocket. Align the dark link of the timing chain with the timing mark on to the crankshaft sprocket.

**IMPORTANT:** It may be necessary to remove J 44221 to rotate and hold the camshaft (hex) to align the pin to the camshaft sprocket. See Special Tools and Equipment.

11. Install the intake camshaft sprocket onto the intake camshaft

12. Install the intake camshaft sprocket washer and bolt.

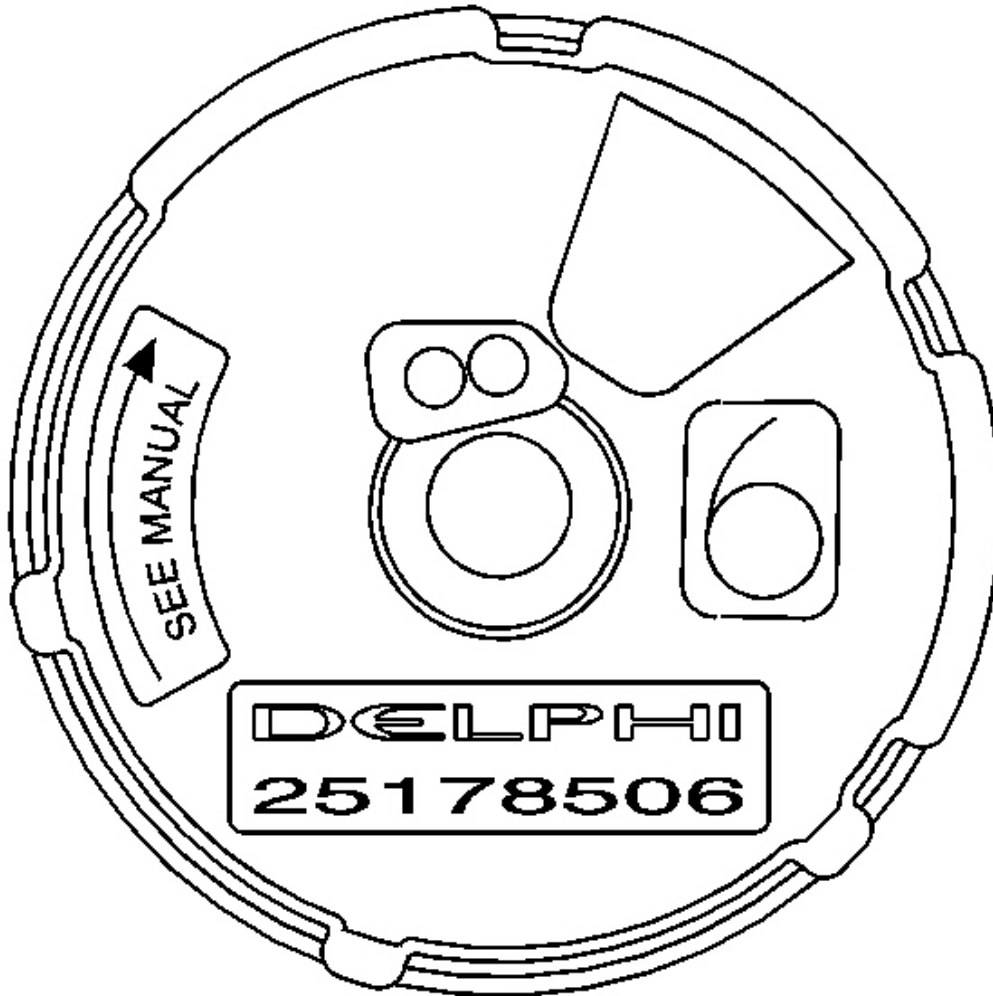


**Fig. 165: Installing Exhaust Camshaft Actuator Into The Timing Chain**  
Courtesy of GENERAL MOTORS CORP.

13. Install the exhaust camshaft actuator into the timing chain.
14. Align the dark link of the timing chain with the timing mark on the exhaust camshaft actuator (1).

**IMPORTANT:** It may be necessary to remove the J 44221 to rotate and hold the camshaft hex to align the pin to the camshaft sprocket. See Special Tools and Equipment.

15. Install the exhaust camshaft actuator onto the exhaust camshaft.



**Fig. 166: Identifying Camshaft Position (CMP) Actuator**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Rotate the camshaft actuator clockwise relative to the camshaft prior to tightening the bolt.

**NOTE:** The camshaft actuator must be fully advanced during installation. Engine damage may occur if the camshaft actuator is not fully advanced.

16. Install the exhaust camshaft actuator bolt.

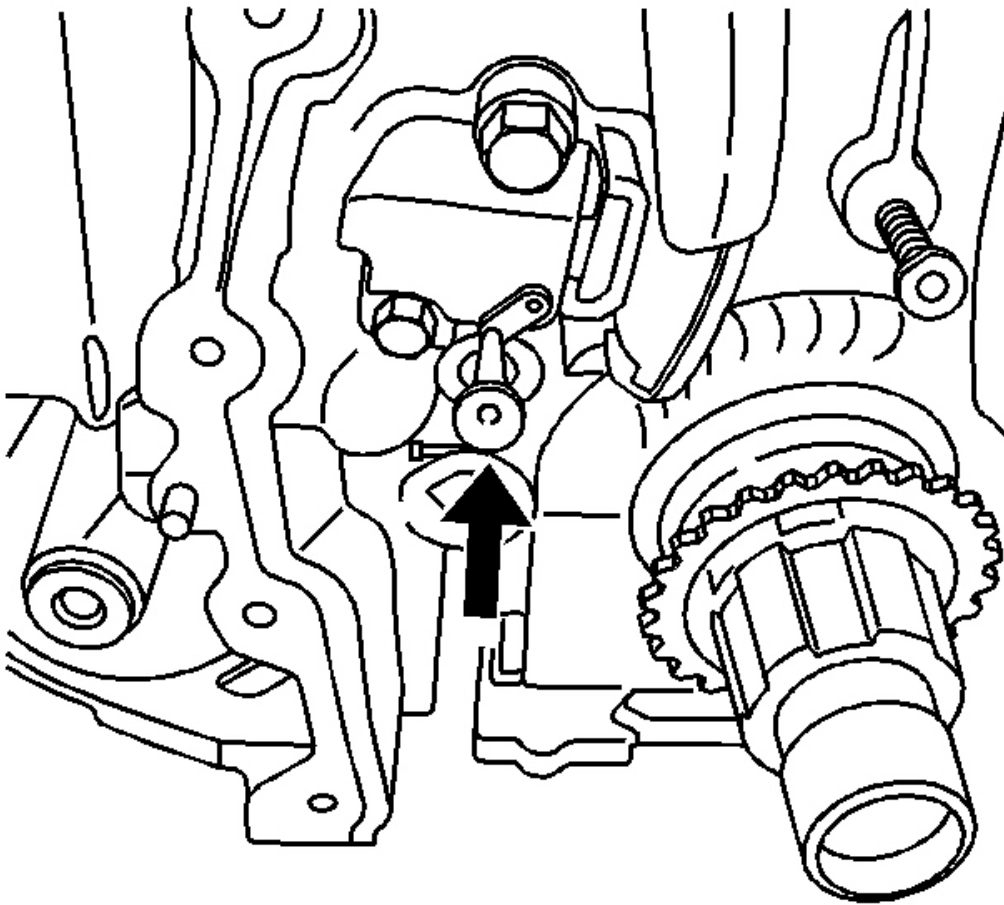
**Tighten:**

- Tighten the exhaust camshaft actuator bolt the first pass to 25 N.m (18 lb ft).
- Use J 36660-A to tighten the exhaust camshaft actuator bolt the final pass an additional 135 degrees.

17. Install the intake camshaft sprocket bolt.

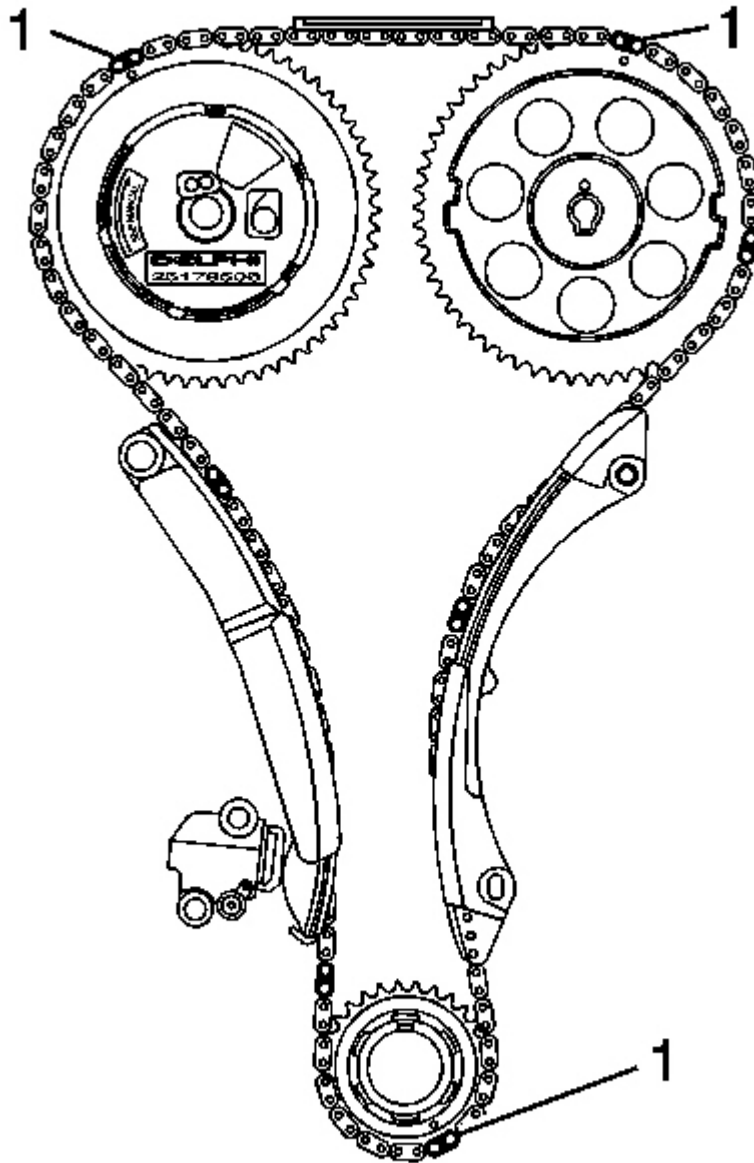
**Tighten:**

- Tighten the intake camshaft sprocket bolt the first pass to 20 N.m (15 ft lb).
- Use J 36660-A to tighten the intake camshaft sprocket bolt the final pass an additional 100 degrees.



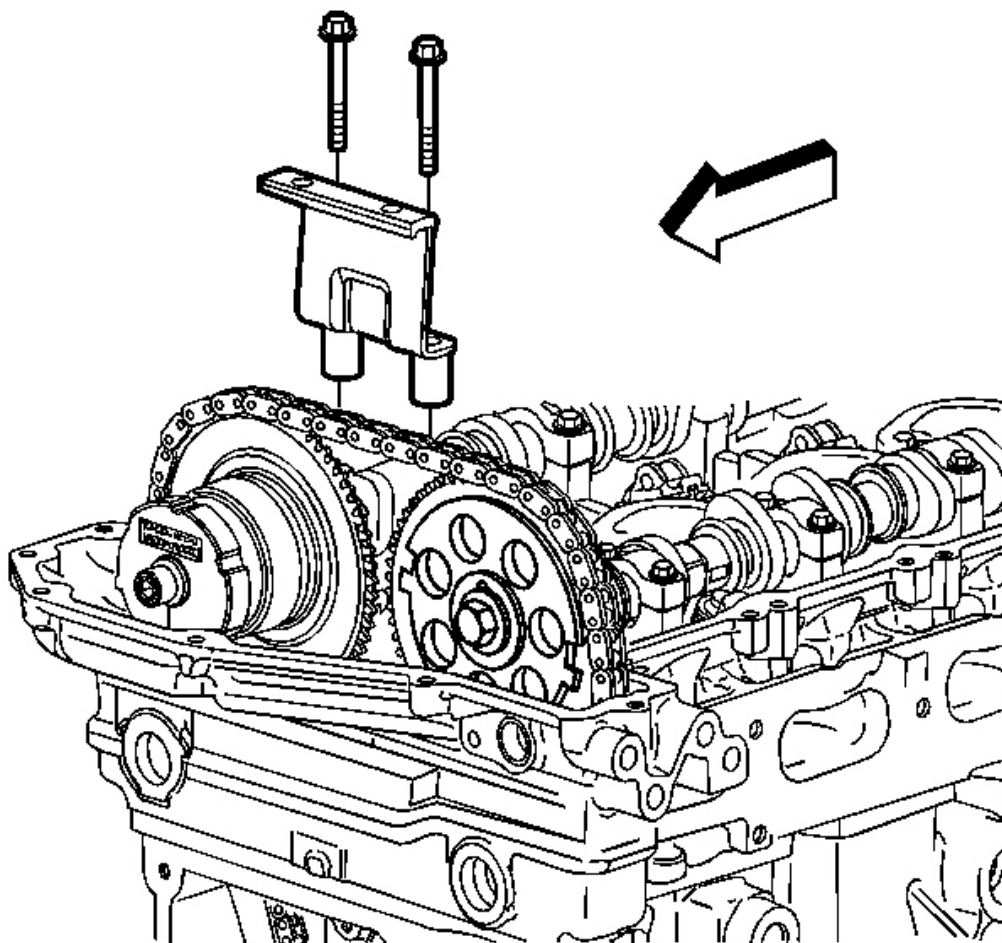
**Fig. 167: View Of Tee At Timing Chain Tensioner**  
Courtesy of GENERAL MOTORS CORP.

18. Remove the tee in the timing chain tensioner to regain tension on the timing chain.
19. Remove the **J 44221** . See **Special Tools and Equipment**.



**Fig. 168: View Of Timing Chain Aligning Marks**  
Courtesy of GENERAL MOTORS CORP.

20. The dark lines (1) on the chain should be aligned with the marks on the sprockets as shown.



**Fig. 169: View Of Top Chain Guide**  
Courtesy of GENERAL MOTORS CORP.

21. Install the top chain guide.  
22. Add threadlock GM P/N 12345496 on the top chain guide bolt threads.  
23. Install the top chain guide bolts.

**Tighten:** Tighten the top chain guide bolts to 10 N.m (89 lb in).

24. Install the engine front cover. Refer to **Engine Front Cover Replacement**.  
25. Install the camshaft cover. Refer to **Camshaft Cover Replacement**.



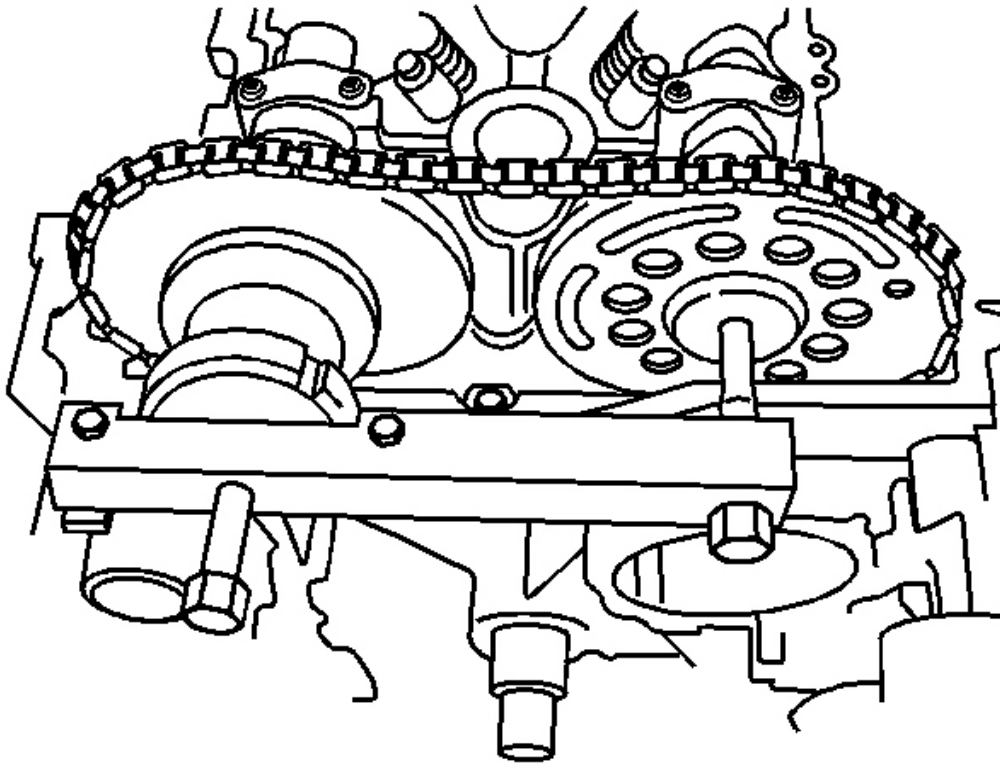
## CAMSHAFT REPLACEMENT

### Tools Required

- **J 44221** Camshaft Holding Tool. See Special Tools and Equipment.
- **J 44222** Camshaft Sprocket Holding Tool. See Special Tools and Equipment.
- J 36660-A Torque/Angle Meter

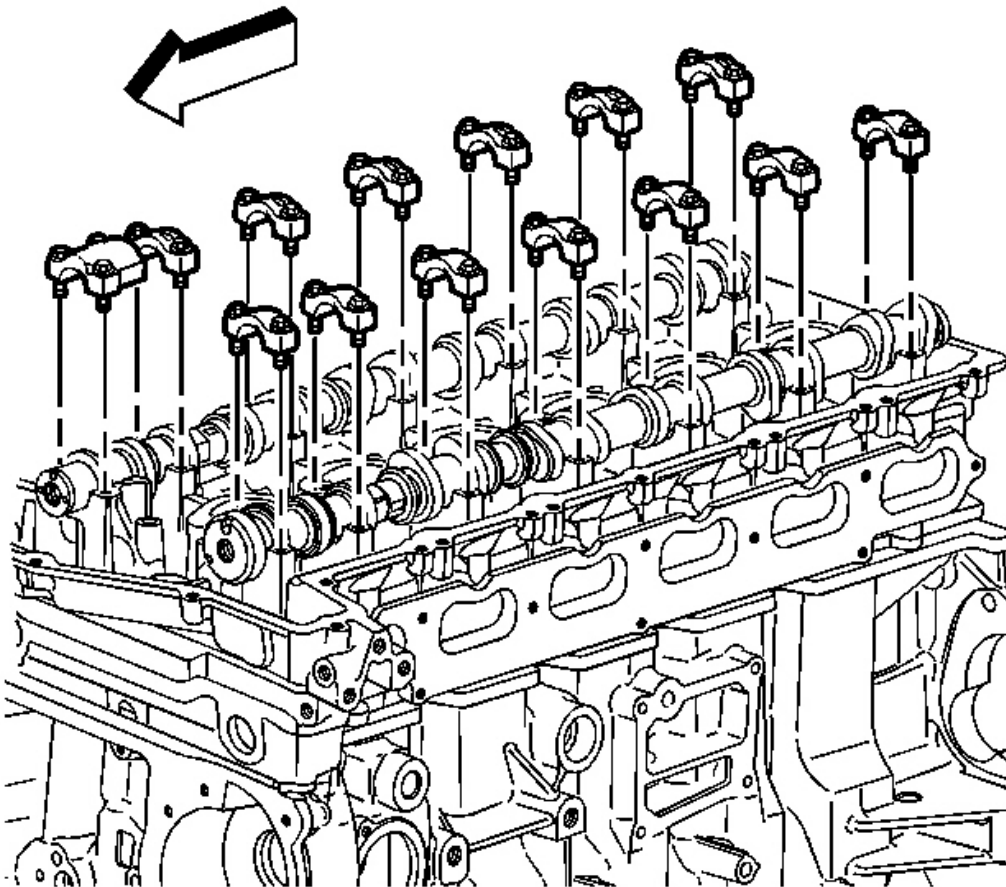
### Removal Procedure

1. Remove the camshaft cover. Refer to Camshaft Cover Replacement.
2. Remove the intake and the exhaust camshaft sprocket bolts.



**Fig. 170: View Of J 44222 Installed Onto Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

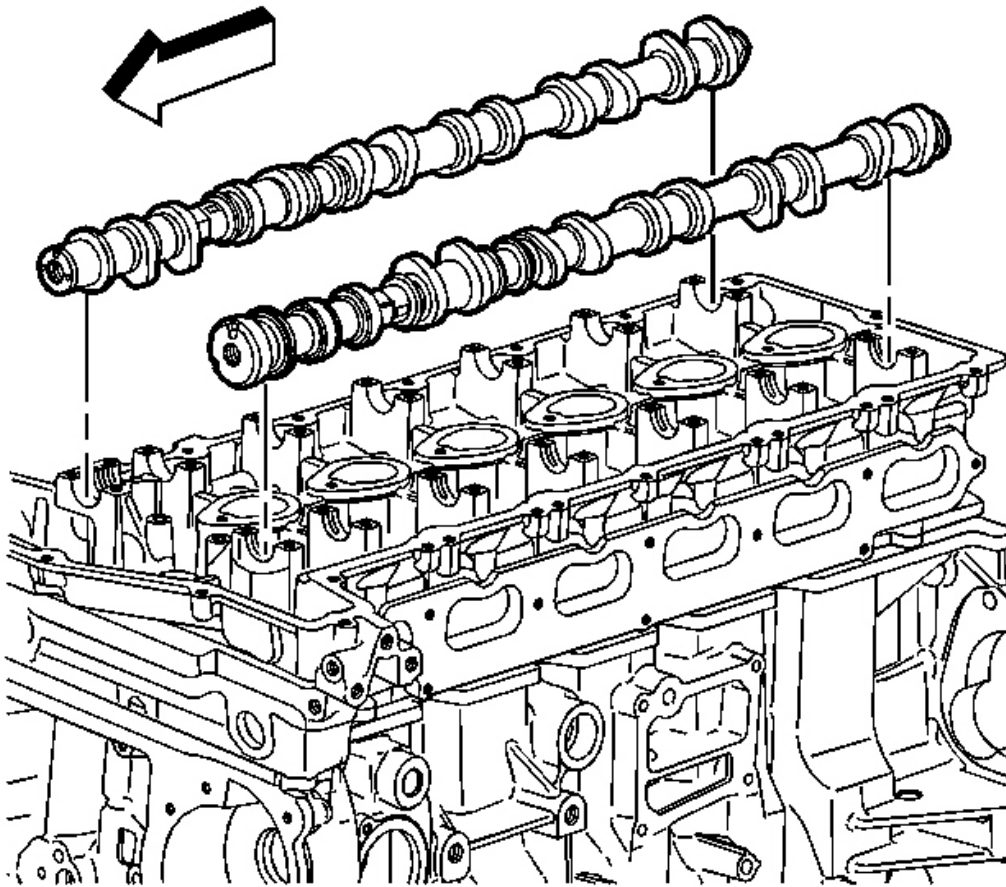
3. Install the **J 44222** onto the cylinder head and adjust the horizontal bolts into the camshaft sprockets in order to maintain chain tension and keep from disturbing the timing chain components. See **Special Tools and Equipment**.
4. Carefully move the sprockets with the timing chain, off of the camshafts.
5. Remove the camshaft cap bolts.



**Fig. 171: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Place the camshaft caps in a rack to ensure the caps are installed in the same location from which they were removed.

6. Remove the camshaft caps and store.

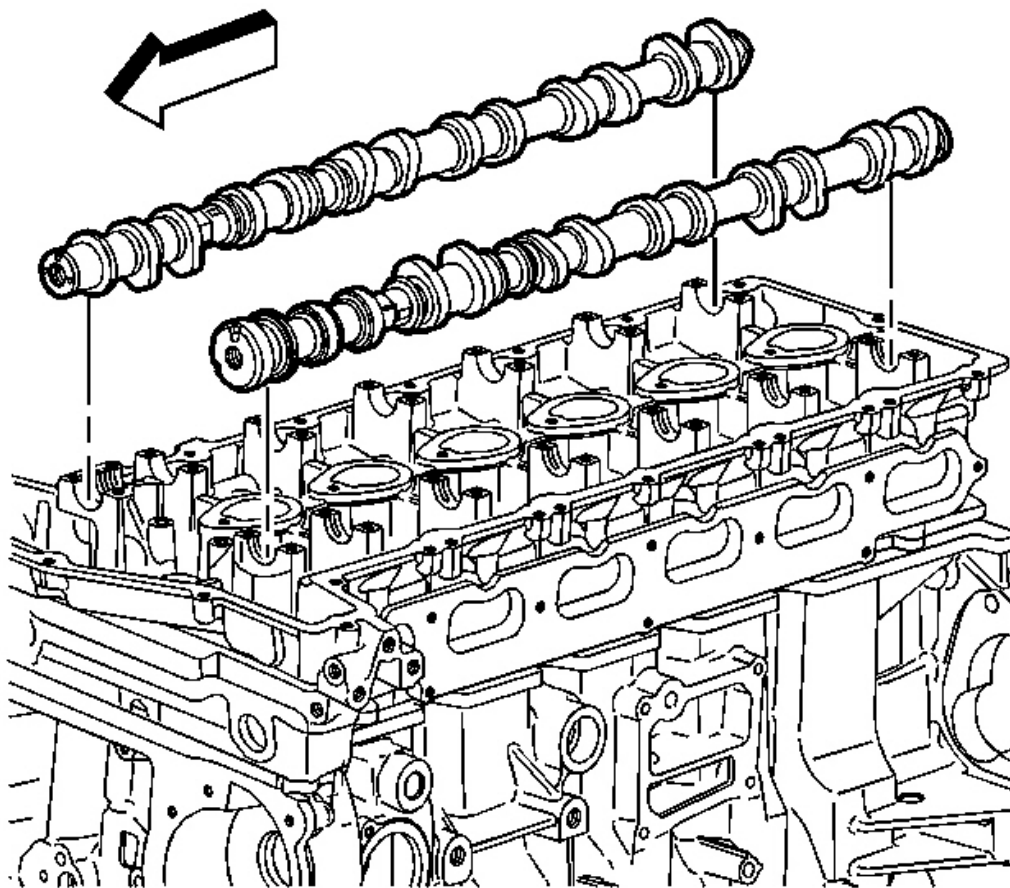


**Fig. 172: Removing/Installing Camshafts**  
**Courtesy of GENERAL MOTORS CORP.**

7. Remove the camshafts.

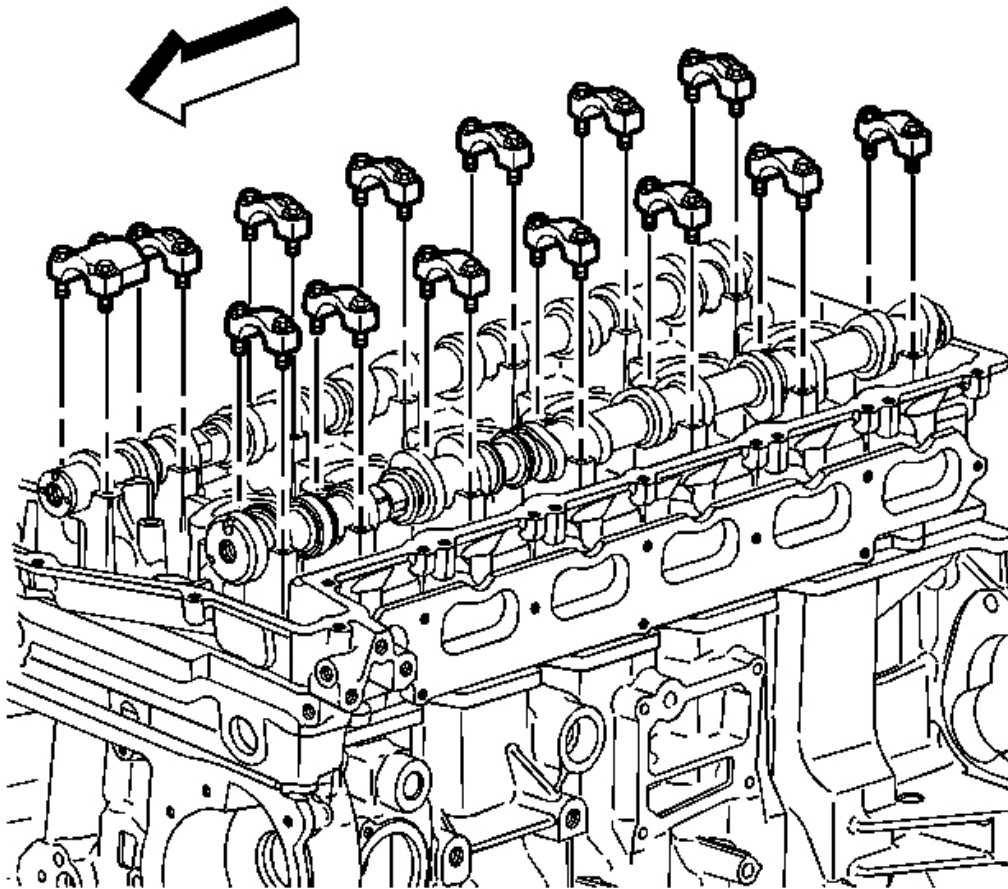
#### **Installation Procedure**

1. Coat the camshaft journals, camshaft journal thrust face, and camshaft lobes with clean engine oil.



**Fig. 173: Removing/Installing Camshafts**  
Courtesy of GENERAL MOTORS CORP.

2. Install the intake and exhaust camshafts to their original positions.
3. Install the **J 44221** with the camshaft flats up and the number 1 cylinder at top dead center. See **Special Tools and Equipment**.



**Fig. 174: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

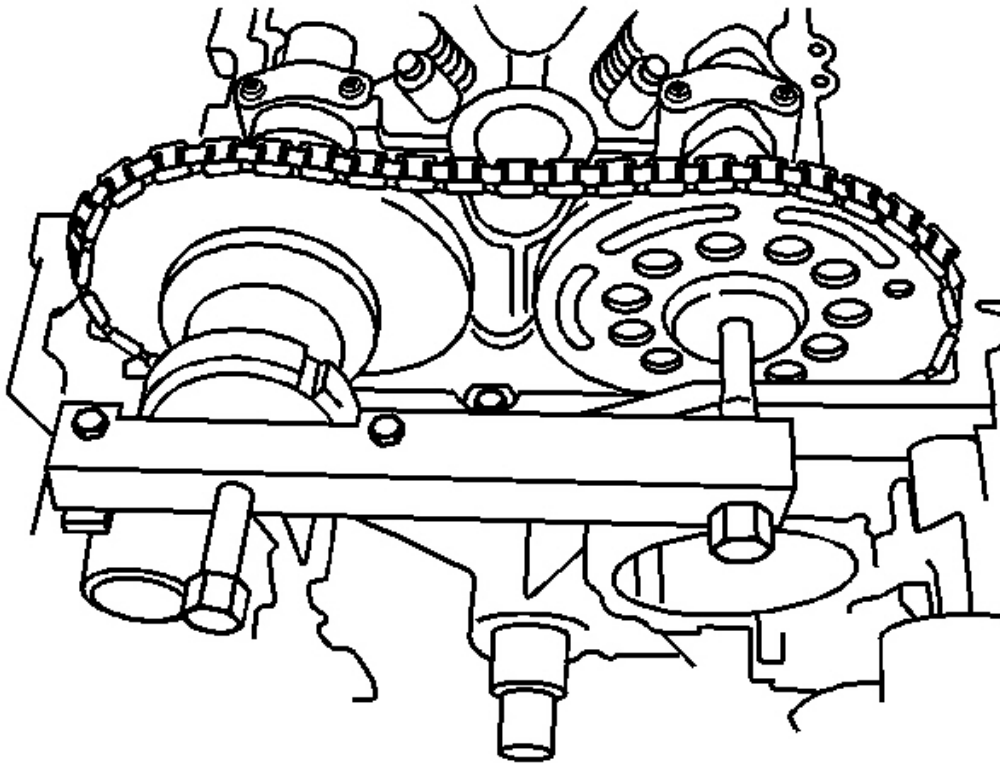
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

**IMPORTANT:** Install the camshaft caps onto their original locations. The camshaft caps are pin stamped for direction and numerical order.

4. Install the camshaft caps and bolts.

**Tighten:** Tighten the camshaft cap bolts to 12 N.m (106 lb in).

5. Remove the **J 44221** . See Special Tools and Equipment.



**Fig. 175: View Of J 44222 Installed Onto Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

6. Carefully move the sprockets back onto the camshafts and remove the **J 44222** . See **Special Tools and Equipment**.
7. Install the intake camshaft sprocket washer and bolt, and the exhaust camshaft actuator bolt.

**Tighten:**

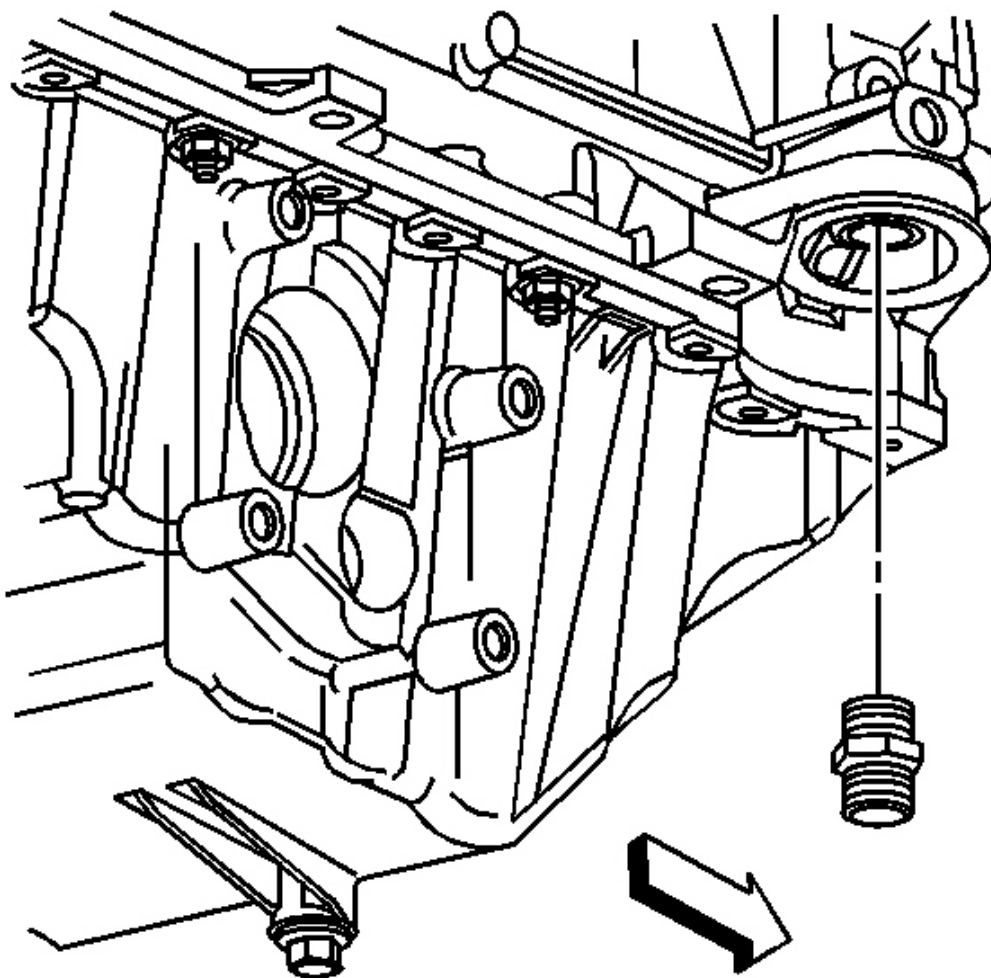
- Tighten the intake camshaft sprocket bolt the first pass to 20 N.m (15 lb ft).
- Use the J 36660-A to tighten the intake camshaft sprocket bolt the final pass an additional 100 degrees.
- Tighten the exhaust camshaft actuator bolt the first pass to 25 N.m (18 lb ft).
- Use the J 36660-A to tighten the exhaust camshaft actuator bolt a final pass an additional 135 degrees.

8. Install the camshaft cover. Refer to **Camshaft Cover Replacement**.

## **OIL FILTER ADAPTER AND BYPASS VALVE ASSEMBLY REPLACEMENT**

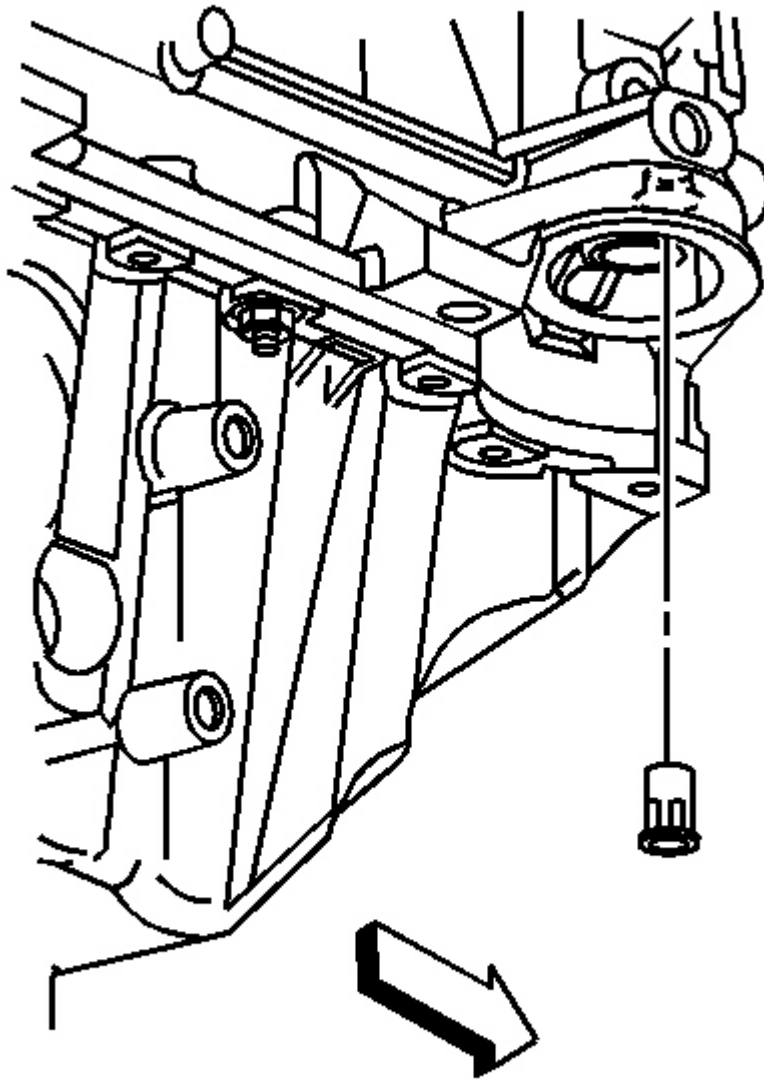
### **Removal Procedure**

1. Remove the oil filter. Refer to **Engine Oil and Oil Filter Replacement**.



**Fig. 176: View Of Oil Filter Adapter**  
**Courtesy of GENERAL MOTORS CORP.**

2. Remove the oil filter adapter.

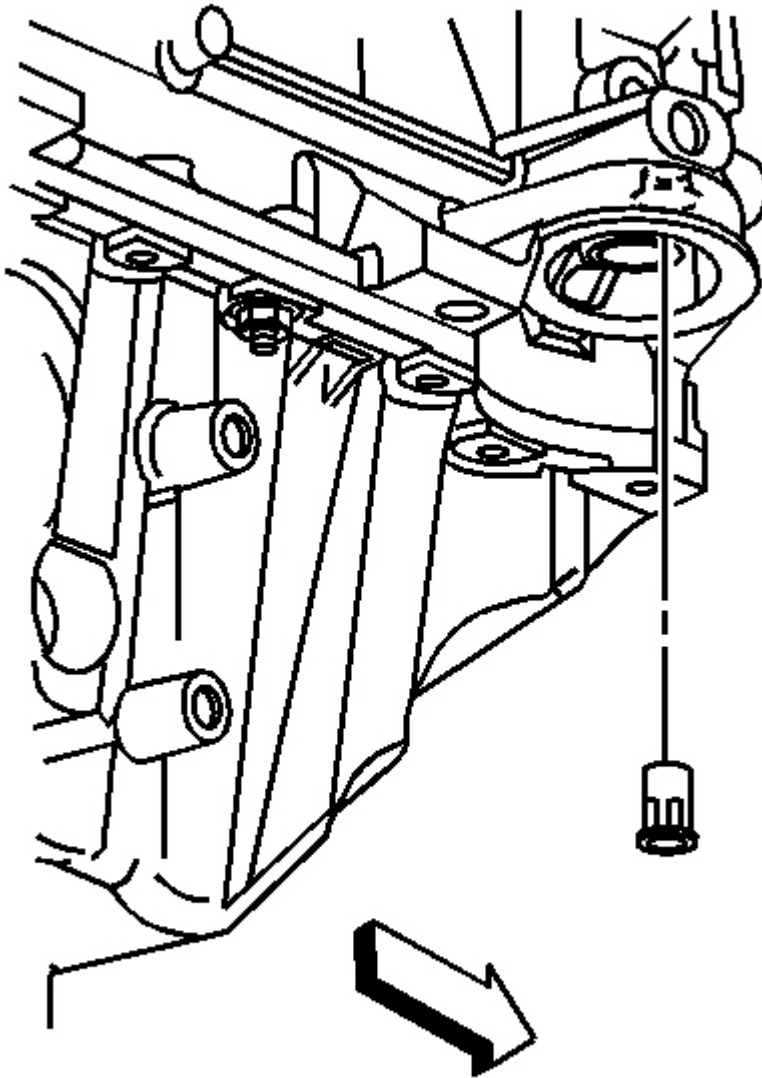


**Fig. 177: View Of Oil Filter Bypass Valve**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the oil filter bypass valve.

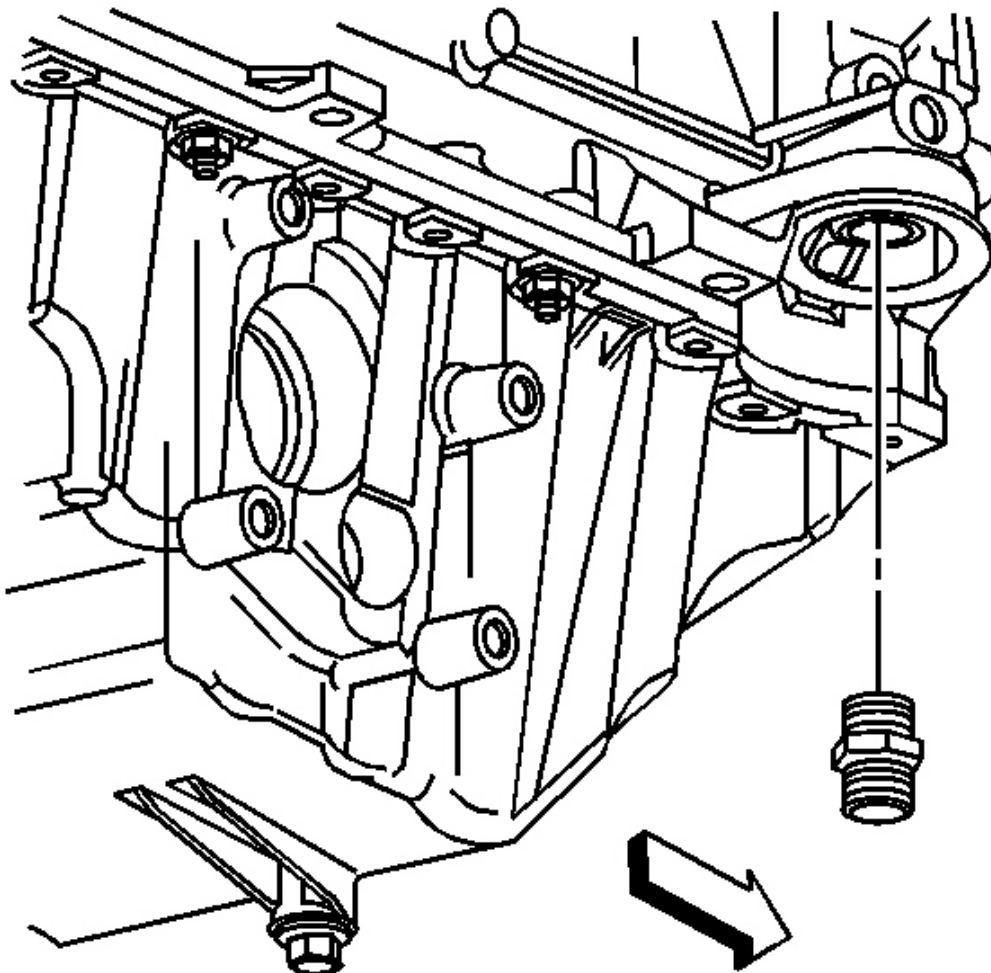
#### **Installation Procedure**





**Fig. 178: View Of Oil Filter Bypass Valve**  
**Courtesy of GENERAL MOTORS CORP.**

1. Install the oil filter bypass valve.



**Fig. 179: View Of Oil Filter Adapter**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the oil filter adapter.

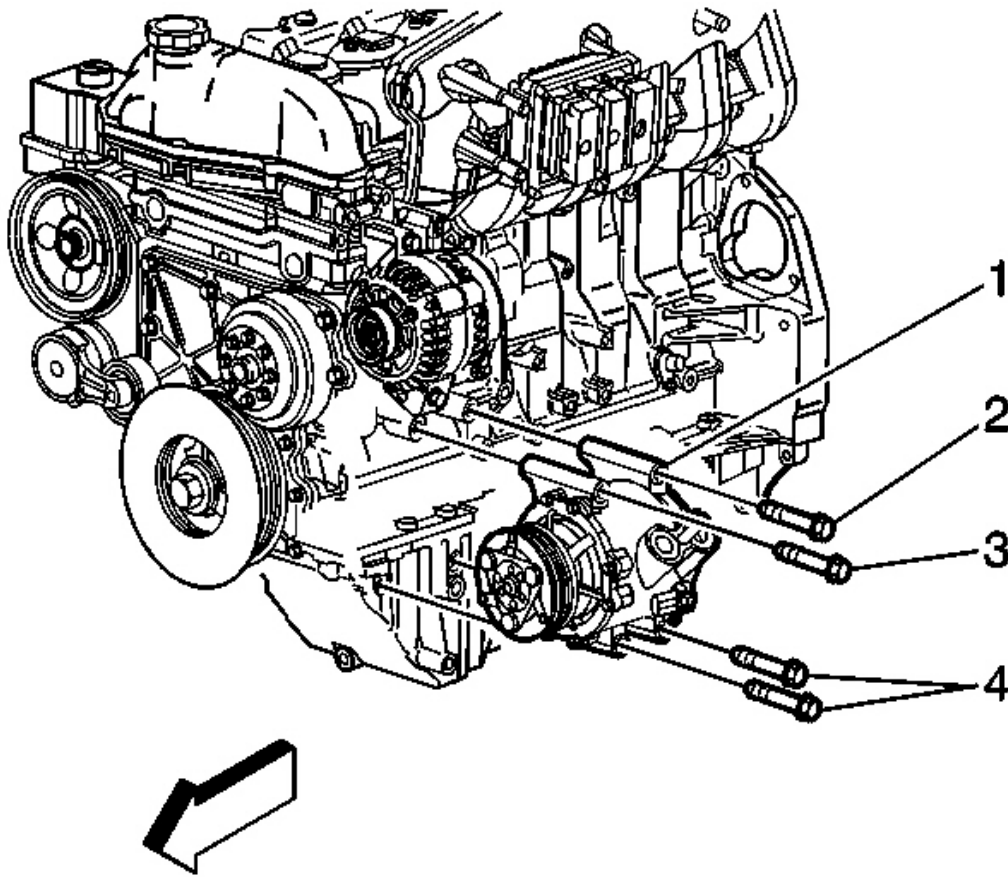
**Tighten:** Tighten the oil filter adapter to 30 N.m (22 lb ft).

3. Install the oil filter. Refer to **Engine Oil and Oil Filter Replacement**.

## OIL PAN REPLACEMENT

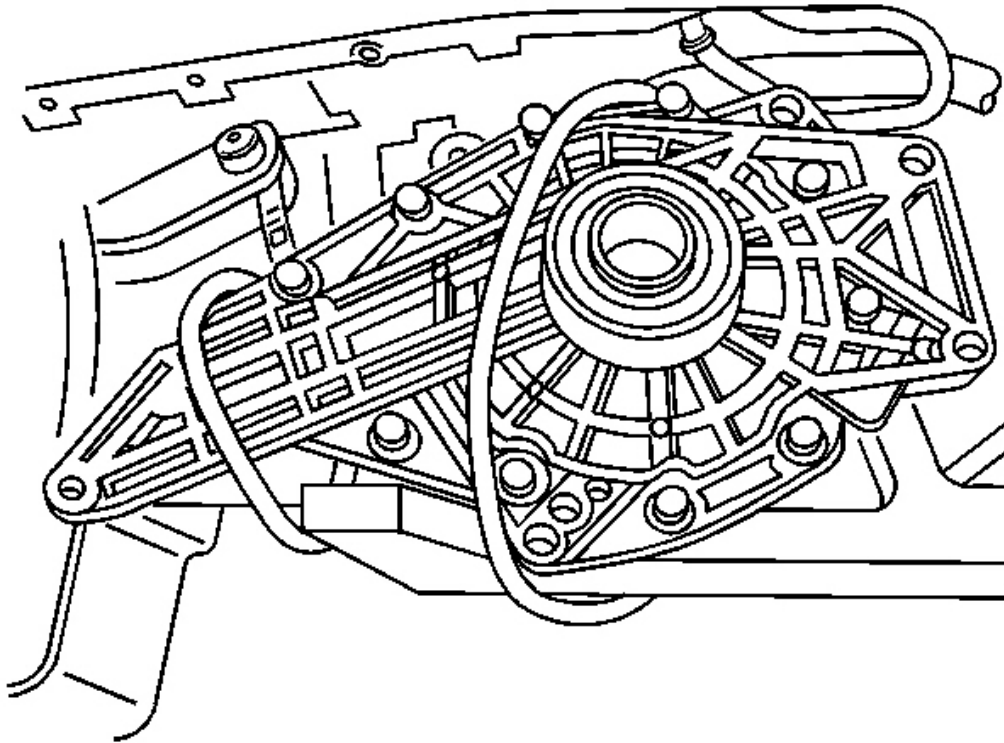
### Removal Procedure

1. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnect/Connect Procedure in Engine Electrical.



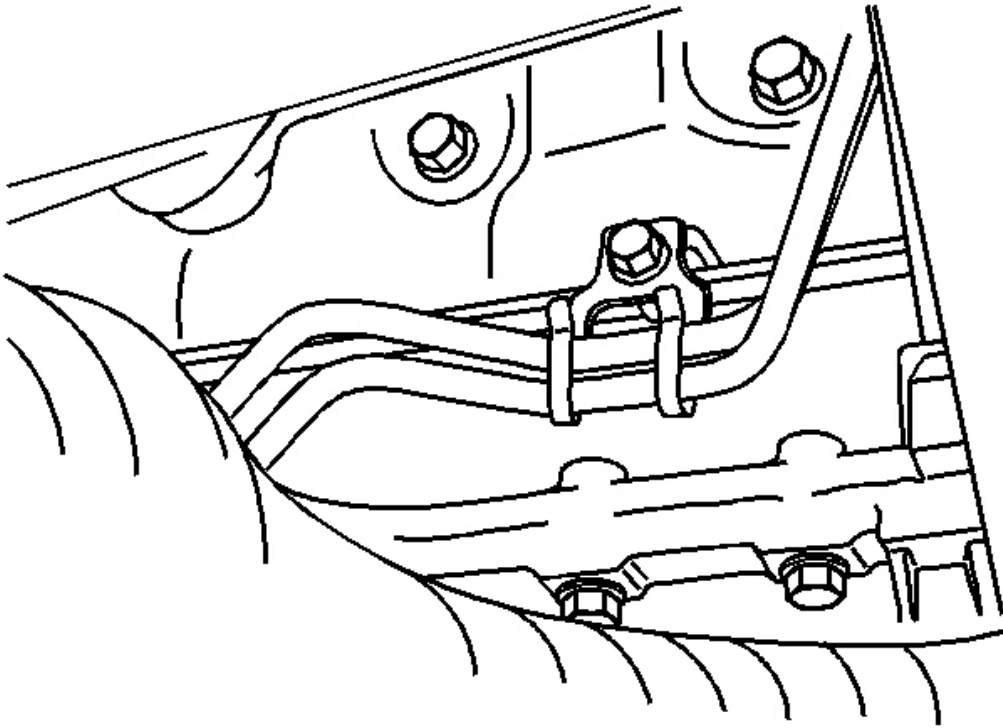
**Fig. 180: View Of A/C Compressor & Mounting Bolts**  
Courtesy of GENERAL MOTORS CORP.

2. Remove the A/C compressor bottom bolts (4) and loosen the top bolts (2, 3).
3. Remove the oil level indicator and tube. Refer to Oil Level Indicator and Tube Replacement.
4. Remove the stabilizer shaft. Refer to Stabilizer Shaft Replacement in Front Suspension.



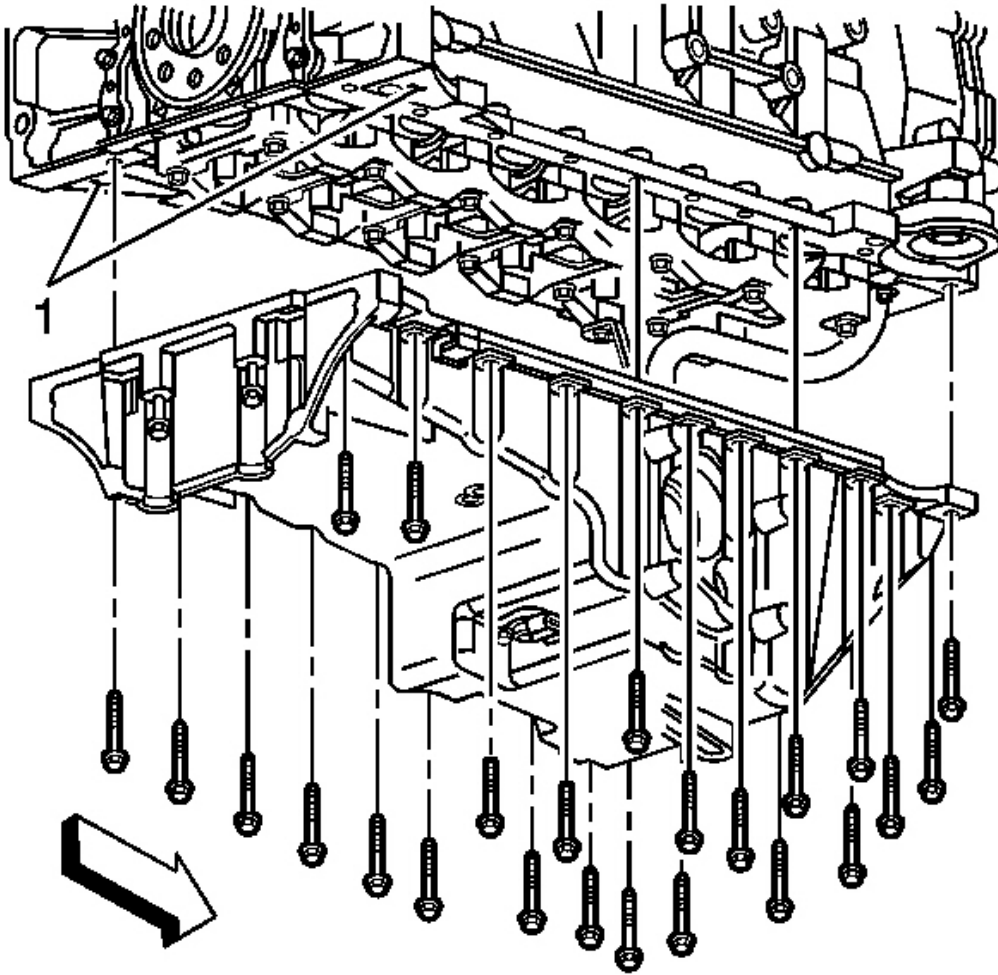
**Fig. 181: Securing Front Differential To Frame**  
Courtesy of GENERAL MOTORS CORP.

5. Remove the front differential and secure to the frame. Refer to **Differential Carrier Assembly Replacement (4.8L, 5.3L, 6.0L V-8)** in Front Drive Axle.
6. Remove the front drive axle intermediate shaft bearing assembly. Refer to **Intermediate Shaft Bearing Assembly Replacement - Front Drive Axle (S4WD)** or **Intermediate Shaft Bearing Assembly Replacement - Front Drive Axle (A4WD)** in Front Drive Axle.
7. Drain the engine oil. Refer to **Engine Oil and Oil Filter Replacement**.



**Fig. 182: View Of Transmission Cooler Lines & Clips**  
Courtesy of GENERAL MOTORS CORP.

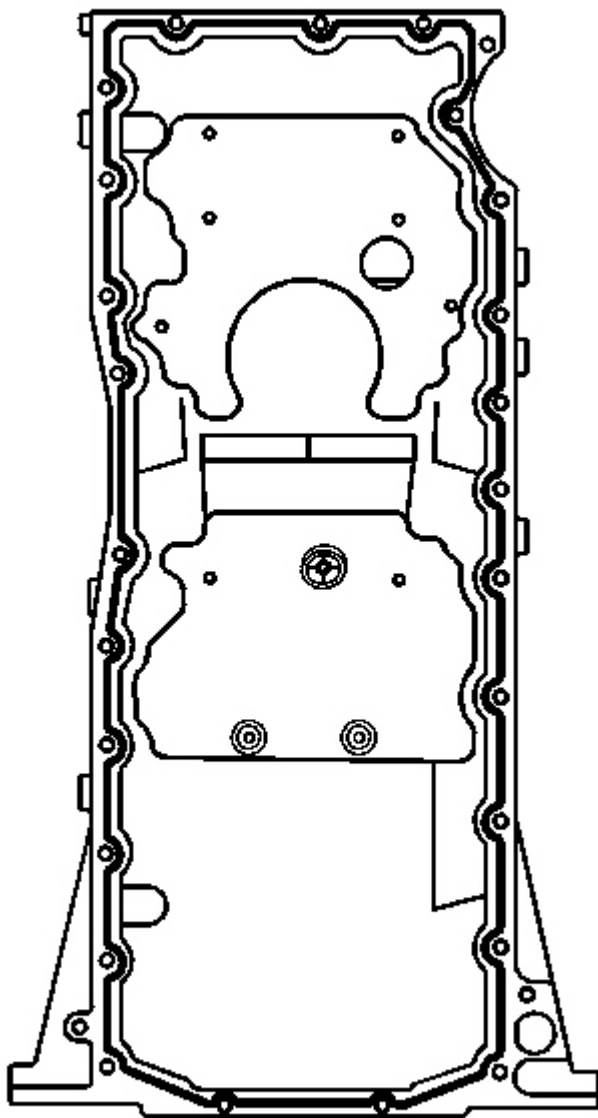
8. Unclip the transmission cooler lines from the engine block.
9. Remove 4 transmission bell housing bolts that are attached to the oil pan.



**Fig. 183: View Of Engine & Oil Pan Bolts**  
Courtesy of GENERAL MOTORS CORP.

10. Remove the remaining oil pan bolts.
11. Place 2 oil pan bolts in the jack screws on the oil pan and tighten evenly to release the oil pan from the engine (1).
12. Clean and inspect the oil pan. Refer to **Oil Pan Cleaning and Inspection**.

**Installation Procedure**



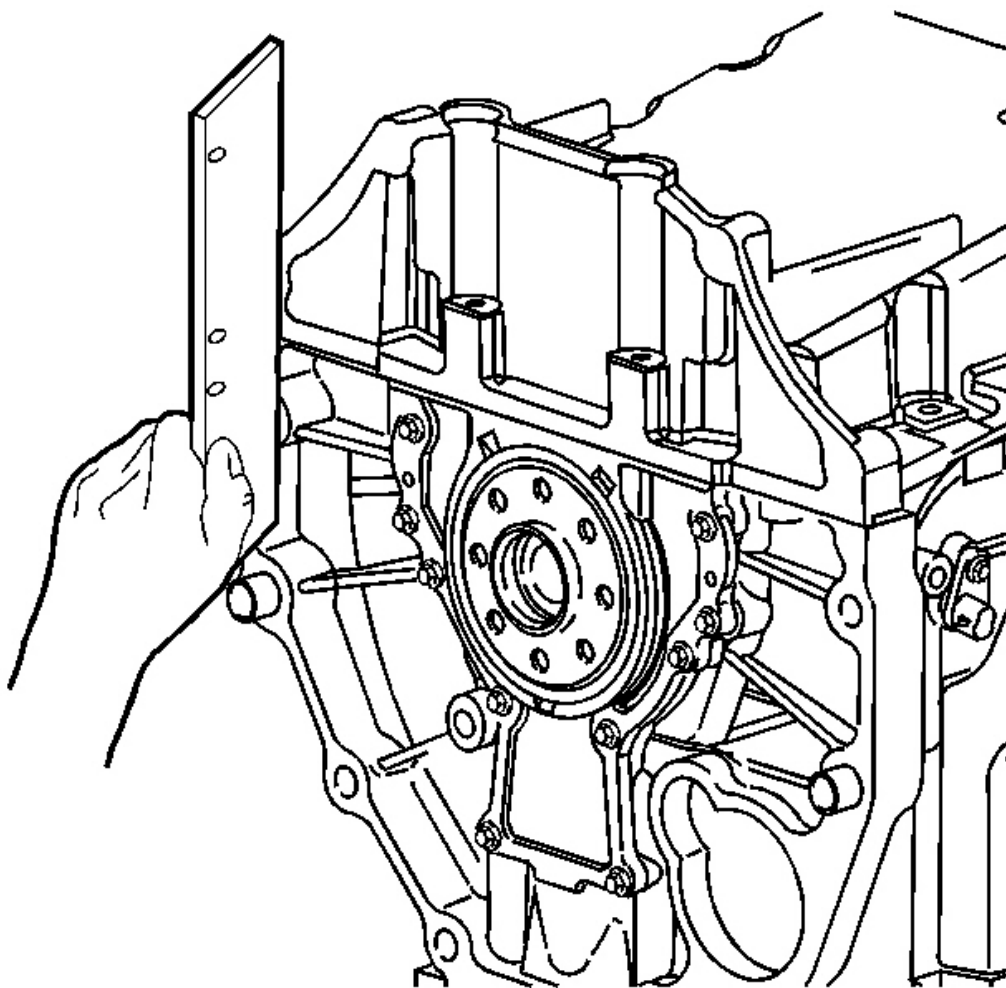
**Fig. 184: Applying Sealant To Oil Pan**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** The oil pan must be installed within 10 minutes from when sealer was applied.

1. Apply a 3 mm (0.12 in) bead of sealer GM P/N 12378521 to the block, rather than the oil pan.

**IMPORTANT:** When you install the oil pan, it could be shifted front or back a little which could cause a transmission alignment problem. The back of the oil pan needs to be flush with the block.

2. Install the oil pan, maneuvering the oil pan to clear the oil pump and screen assembly.
3. Install the oil pan bolts.



**Fig. 185: Inspecting Oil Pan Alignment**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.



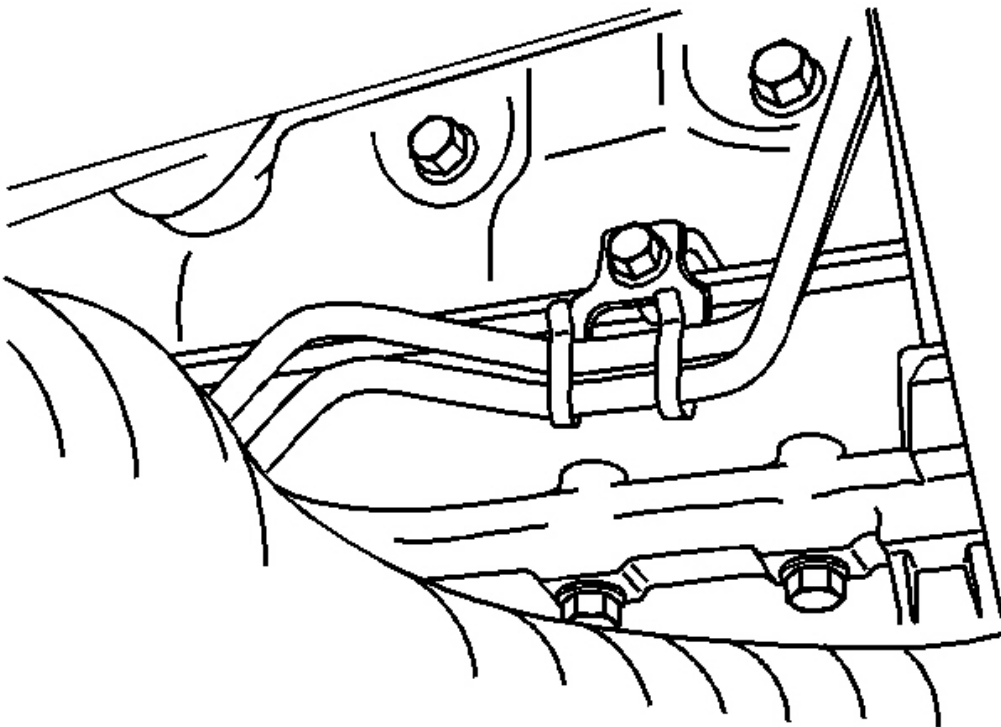
4. Inspect the oil pan alignment. Use a straight edge on the back of the block and the oil pan transmission mounting surface.

**Tighten:**

- Tighten the oil pan side bolts to 25 N.m (18 lb ft).
- Tighten the oil pan end bolts to 10 N.m (89 lb in).

5. Install the 4 transmission bell housing bolts that attach to the oil pan.

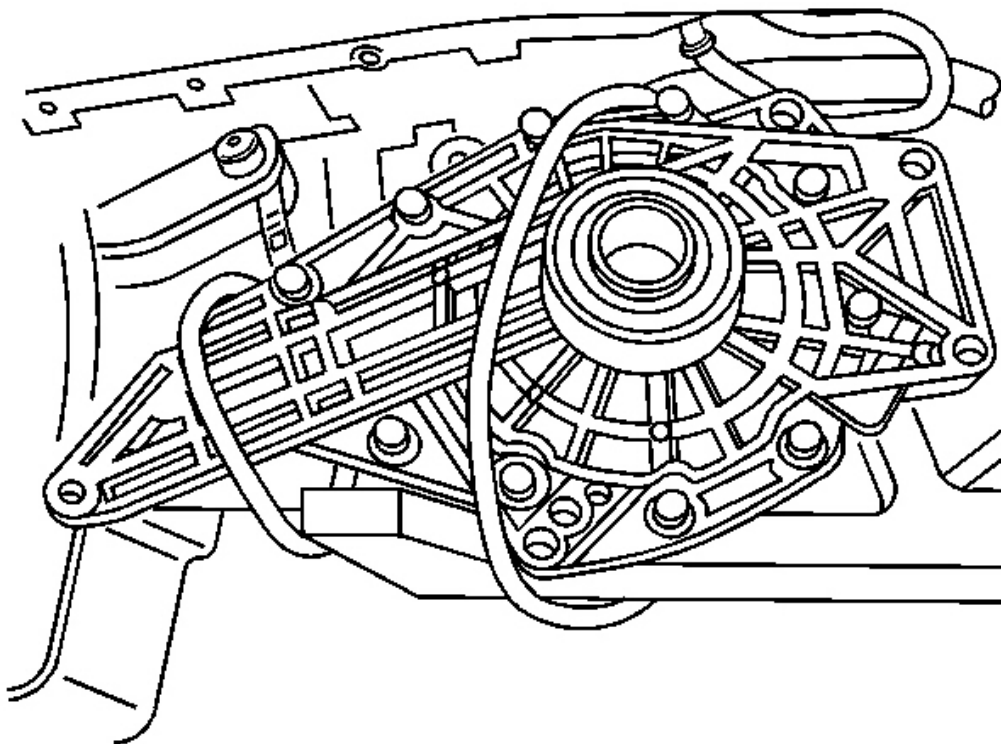
**Tighten:** Tighten bolts to 47 N.m (35 lb ft).



**Fig. 186: View Of Transmission Cooler Lines & Clips**  
Courtesy of GENERAL MOTORS CORP.

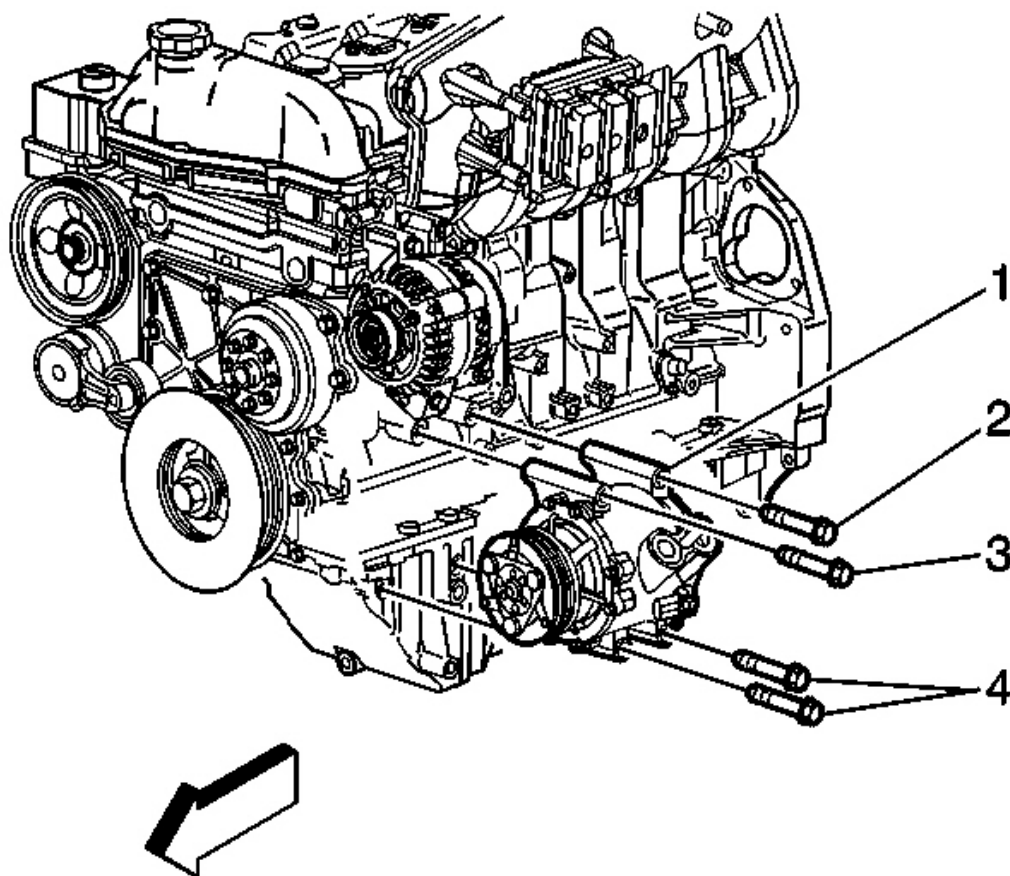
6. Clip transmission cooler lines to the engine block.
7. Install the front drive axle intermediate shaft bearing assembly. Refer to **Intermediate Shaft Bearing Assembly Replacement - Front Drive Axle (S4WD)** or **Intermediate Shaft Bearing Assembly Replacement - Front Drive Axle (A4WD)** in Front Drive Axle.

8. Install the oil drain plug and filter. Refer to **Engine Oil and Oil Filter Replacement**.



**Fig. 187: Securing Front Differential To Frame**  
Courtesy of GENERAL MOTORS CORP.

9. Install the front differential to the engine. Refer to **Differential Carrier Assembly Replacement (4.8L, 5.3L, 6.0L V-8)** in Front Drive Axle.
10. Install the stabilizer shaft. Refer to **Stabilizer Shaft Replacement** in Front Suspension.



**Fig. 188: View Of A/C Compressor & Mounting Bolts**  
Courtesy of GENERAL MOTORS CORP.

11. Install the A/C compressor 2 bottom bolts (4).

**Tighten:** Tighten all 4 bolts (2, 3, 4) to 50 N.m (37 lb ft).

12. Install the oil level indicator and tube. Refer to Oil Level Indicator and Tube Replacement.
13. Connect the negative battery cable. Refer to Battery Negative Cable Disconnect/Connect Procedure in Engine Electrical.

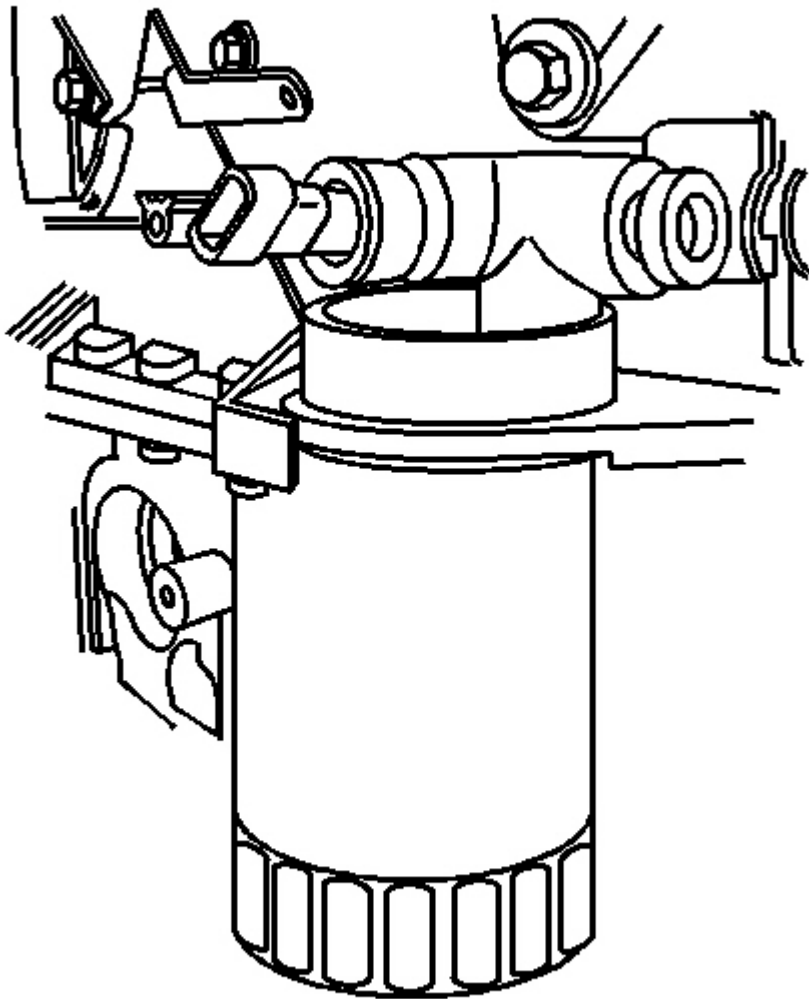
**IMPORTANT:** Inspect the engine for oil leaks in order to ensure all sealing surfaces are sealed.

14. Fill the engine with oil. Refer to Engine Oil and Oil Filter Replacement.

## **ENGINE OIL PRESSURE SENSOR AND/OR SWITCH REPLACEMENT**

### **Removal Procedure**

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the engine shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.

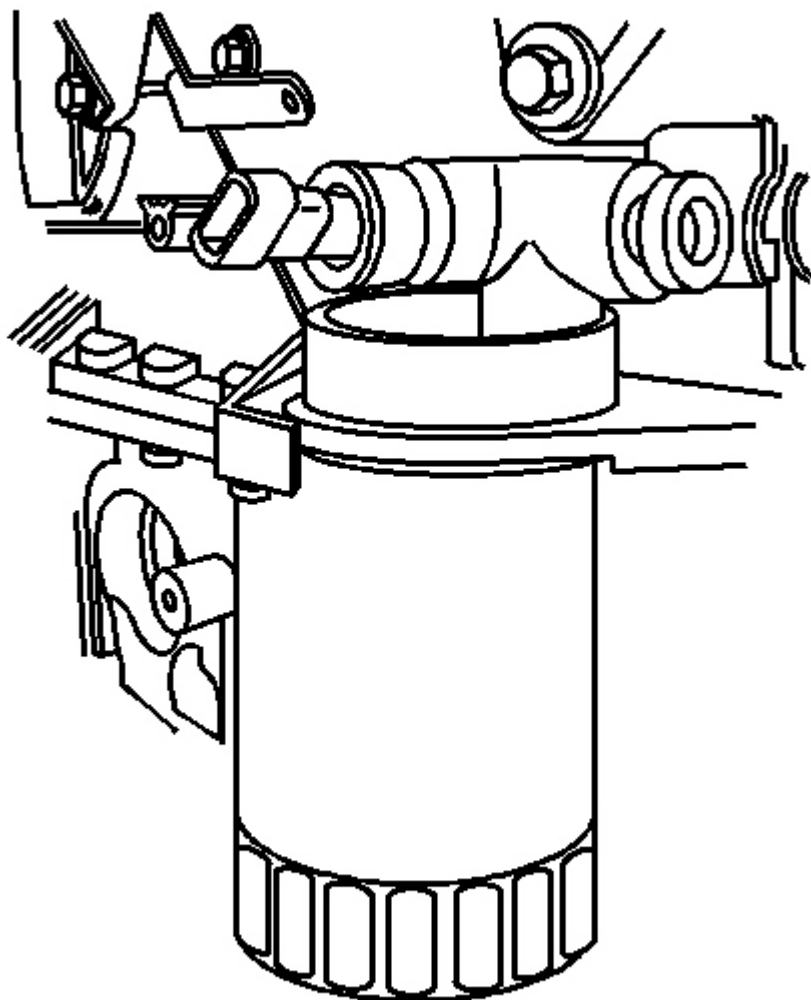


**Fig. 189: View Of Oil Pressure Switch & Connector**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the electrical connector from the oil pressure switch.

4. Remove the oil pressure switch.

#### **Installation Procedure**



**Fig. 190: View Of Oil Pressure Switch & Connector**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

1. Install the oil pressure switch.

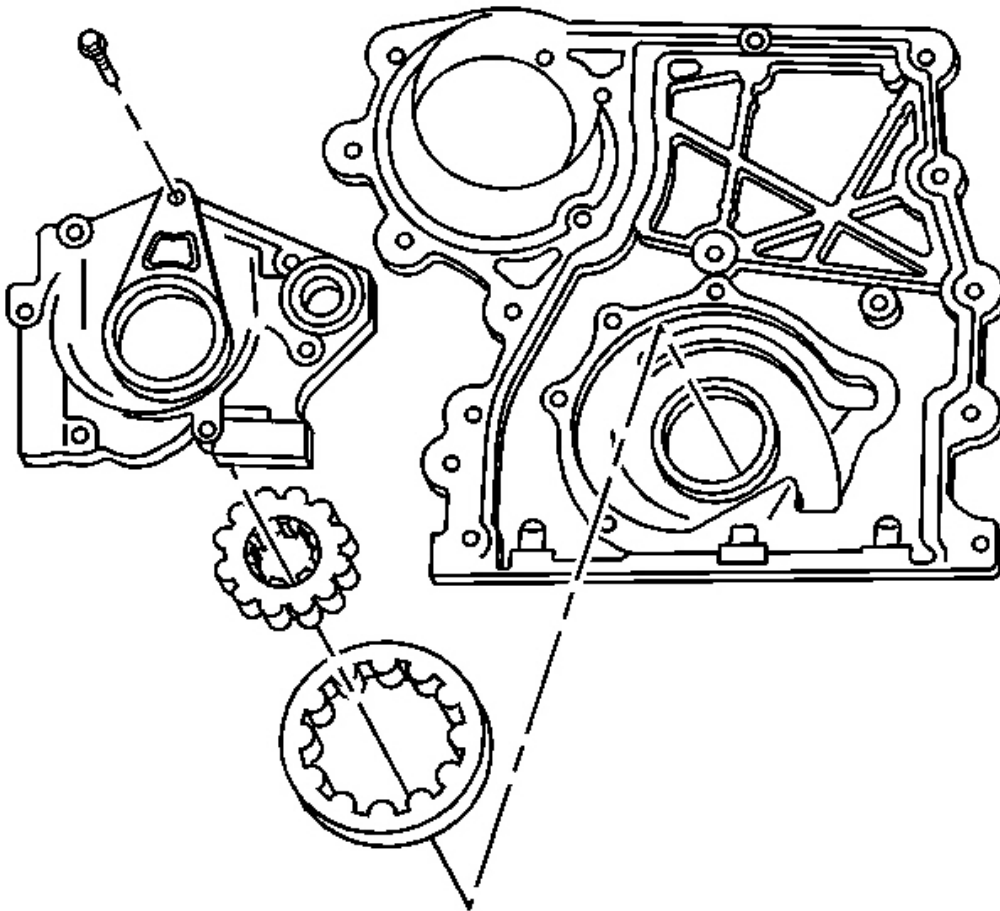
**Tighten:** Tighten the oil pressure switch to 20 N.m (15 lb ft).

2. Install the electrical connector to the oil pressure switch.
3. Install the engine shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
4. Lower the vehicle.

## OIL PUMP REPLACEMENT

### Removal Procedure

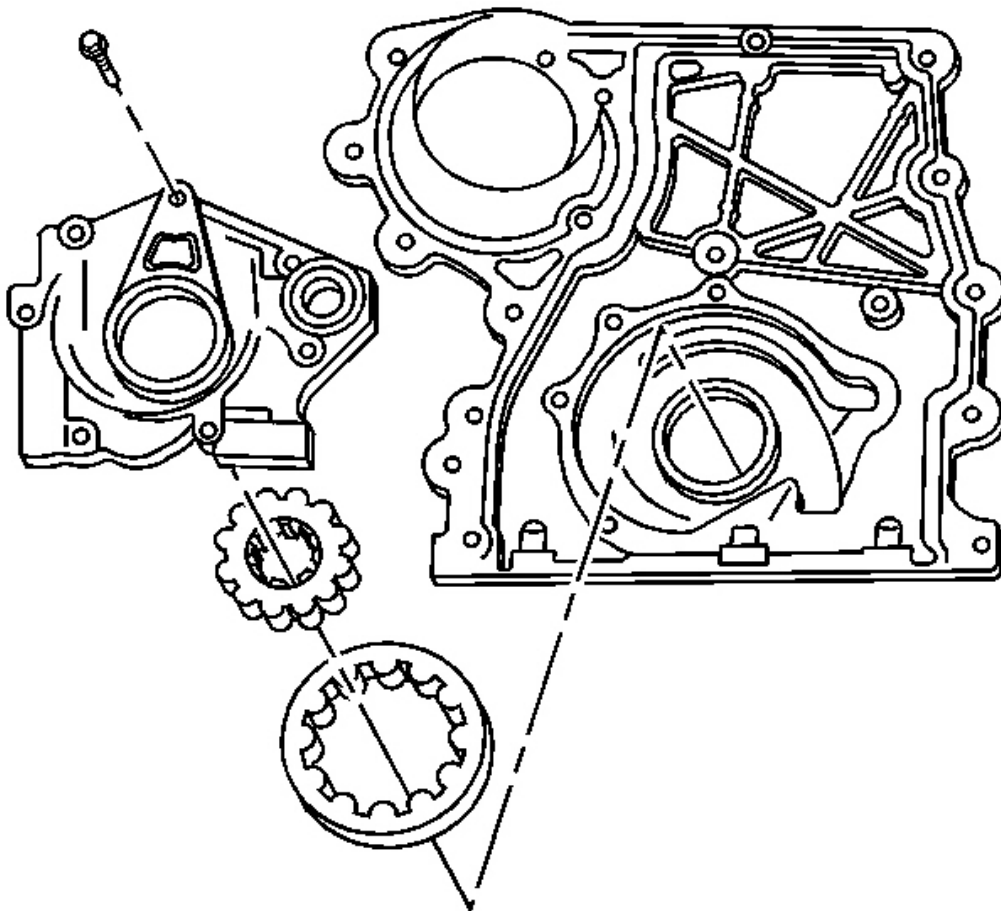
1. Remove the engine front cover. Refer to **Engine Front Cover Replacement**.



**Fig. 191: Exploded View Of Oil Pump**  
Courtesy of GENERAL MOTORS CORP.

2. Remove the oil pump cover bolts.
3. Remove the oil pump cover.
4. Mark the inner and the outer gears in relation to the oil pump housing.
5. Remove the inner and the outer oil pump gears.
6. Remove the oil pump pressure relief valve plug.
7. Remove the oil pump pressure relief valve and the spring.

**Installation Procedure**



**Fig. 192: Exploded View Of Oil Pump**  
**Courtesy of GENERAL MOTORS CORP.**

1. Install the oil pump pressure relief valve and the spring.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the oil pump pressure relief valve plug.

**Tighten:** Tighten the oil pump pressure relief valve to 14 N.m (124 lb in).

3. Install the oil pump outer and inner gears as removed.
4. Install the oil pump cover.
5. Install the oil pump cover bolts.

**Tighten:** Tighten the oil pump cover bolts to 10 N.m (89 lb in).

6. Install the front cover. Refer to **Engine Front Cover Replacement**.

### CRANKSHAFT REAR OIL SEAL AND HOUSING REPLACEMENT

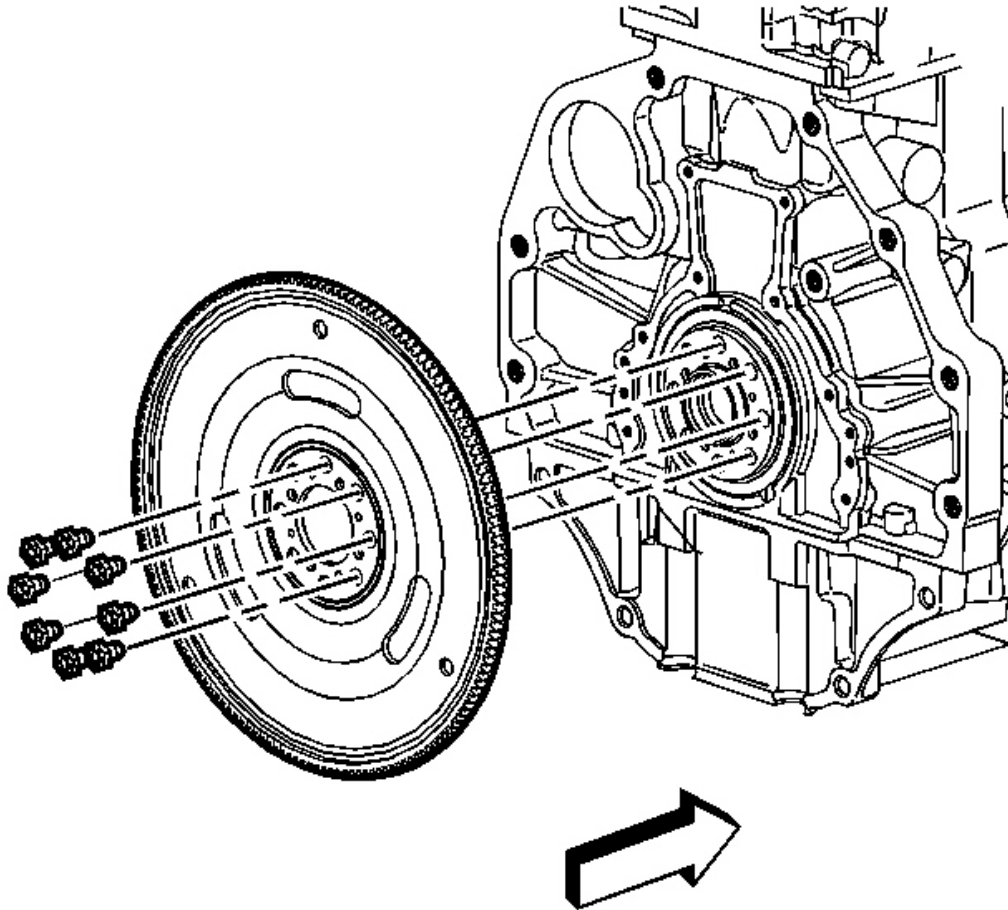
#### Tools Required

- J 36660-A Torque Angle Meter
- **J 44219** Cover Alignment Pins. See **Special Tools and Equipment**.
- **J 44227** Rear Seal Installer. See **Special Tools and Equipment**.

#### Removal Procedure

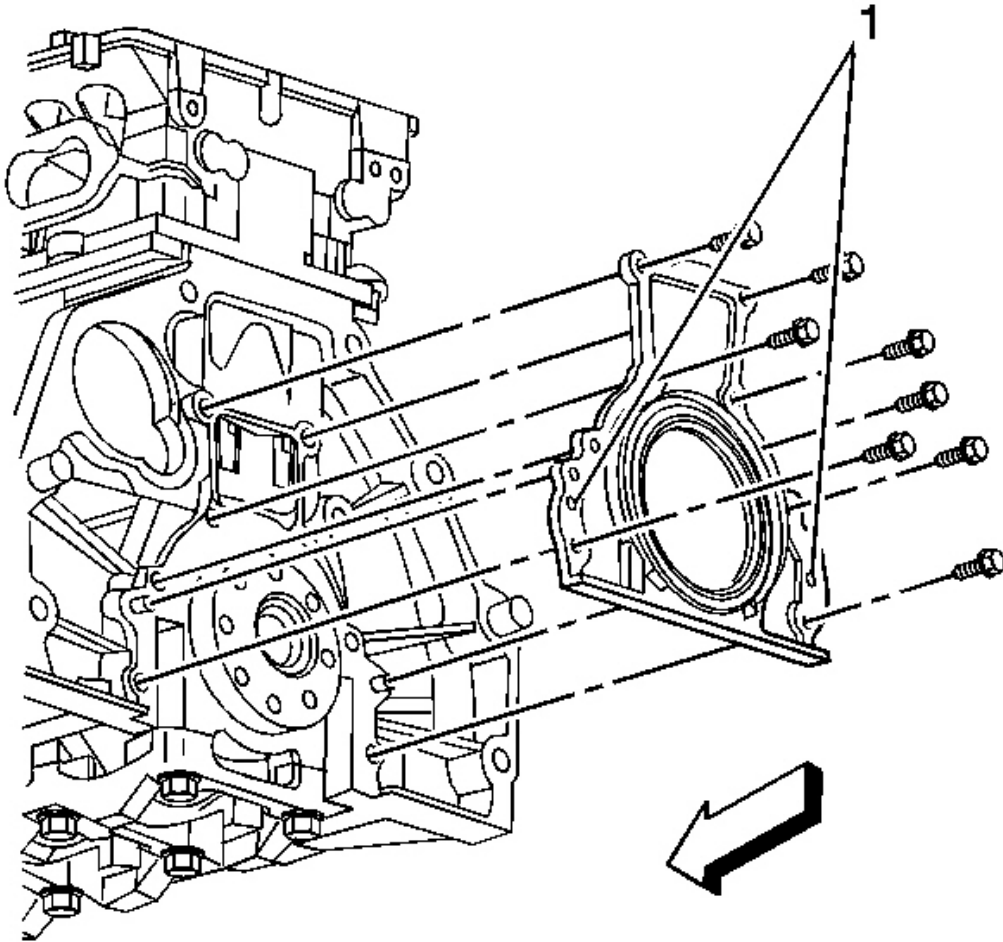
1. Remove the transmission. Refer to **Transmission Replacement (LM4)** or **Transmission Replacement (LL8)** in Automatic Transmission - 4L60-E/4L65-E.





**Fig. 193: View Of Flywheel & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

2. Remove the flywheel bolts and remove the flywheel.

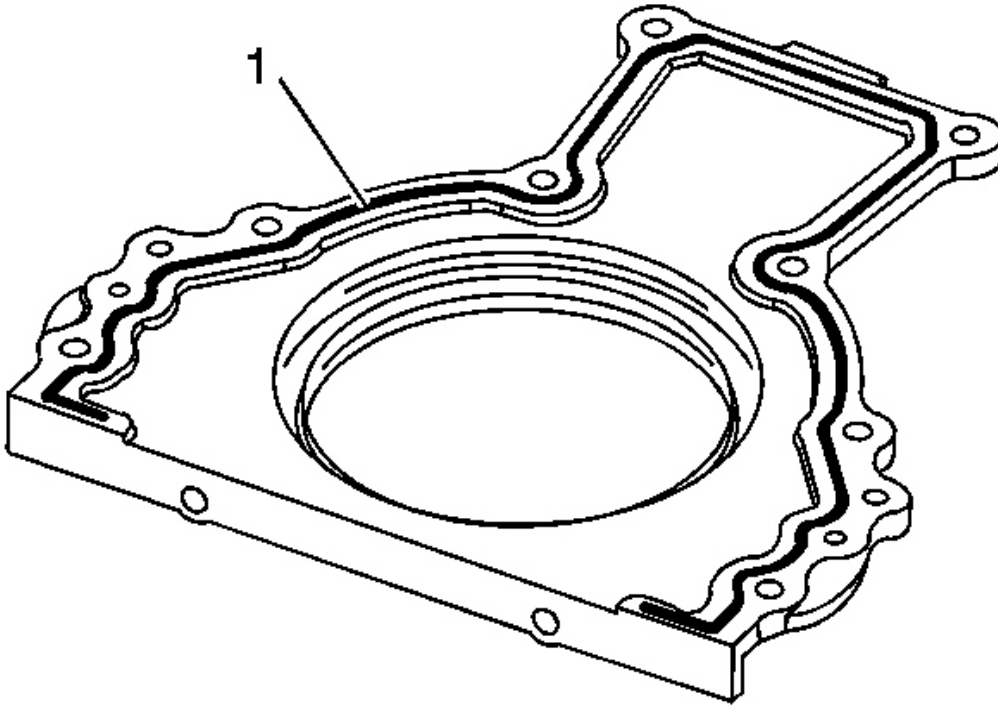


**Fig. 194: View Of Crankshaft Rear Oil Seal Housing & Bolts**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the crankshaft rear oil seal housing bolts.
4. Install 2 bolts into the jackscrew holes (1) to release the cover from the block.
5. Remove the crankshaft and rear oil seal housing.
6. Remove the oil seal from the crankshaft snout.

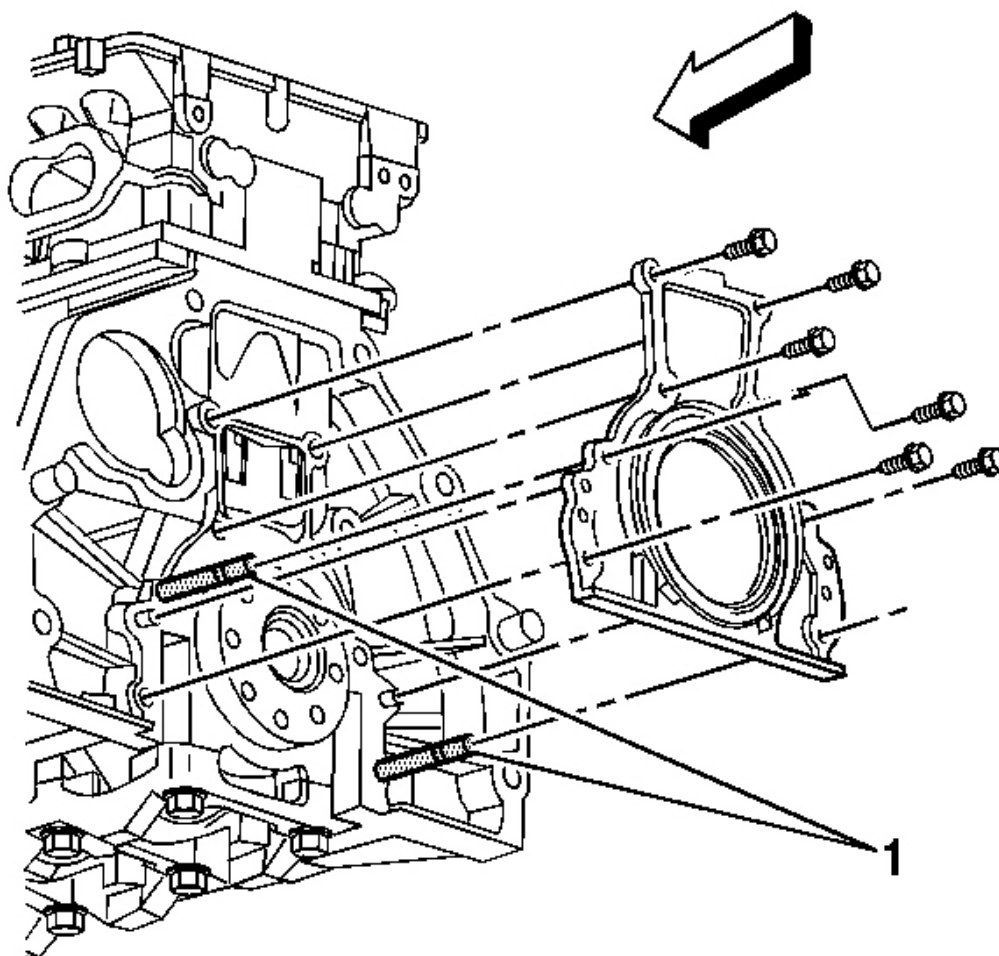
#### Installation Procedure

1. Use the **J 44227** to install the crankshaft rear oil seal. See **Special Tools and Equipment**.
2. Remove the **J 44227** . See **Special Tools and Equipment**.



**Fig. 195: Applying Sealant To Rear Oil Seal Housing**  
**Courtesy of GENERAL MOTORS CORP.**

3. Apply a 3 mm (0.12 in) bead of GM P/N 12378521 to the rear oil seal housing (1).



**Fig. 196: View Of J 44219 Guide Pins Installed Into Rear Of Engine Block**  
Courtesy of GENERAL MOTORS CORP.

4. Install the **J 44219** guide pins (1) into the block. See **Special Tools and Equipment**.

**IMPORTANT:**

- When installing a new seal, use the plastic installation sleeve supplied with the new seal.
- The seal installation sleeve should come off after the seal is installed. Discard the sleeve.

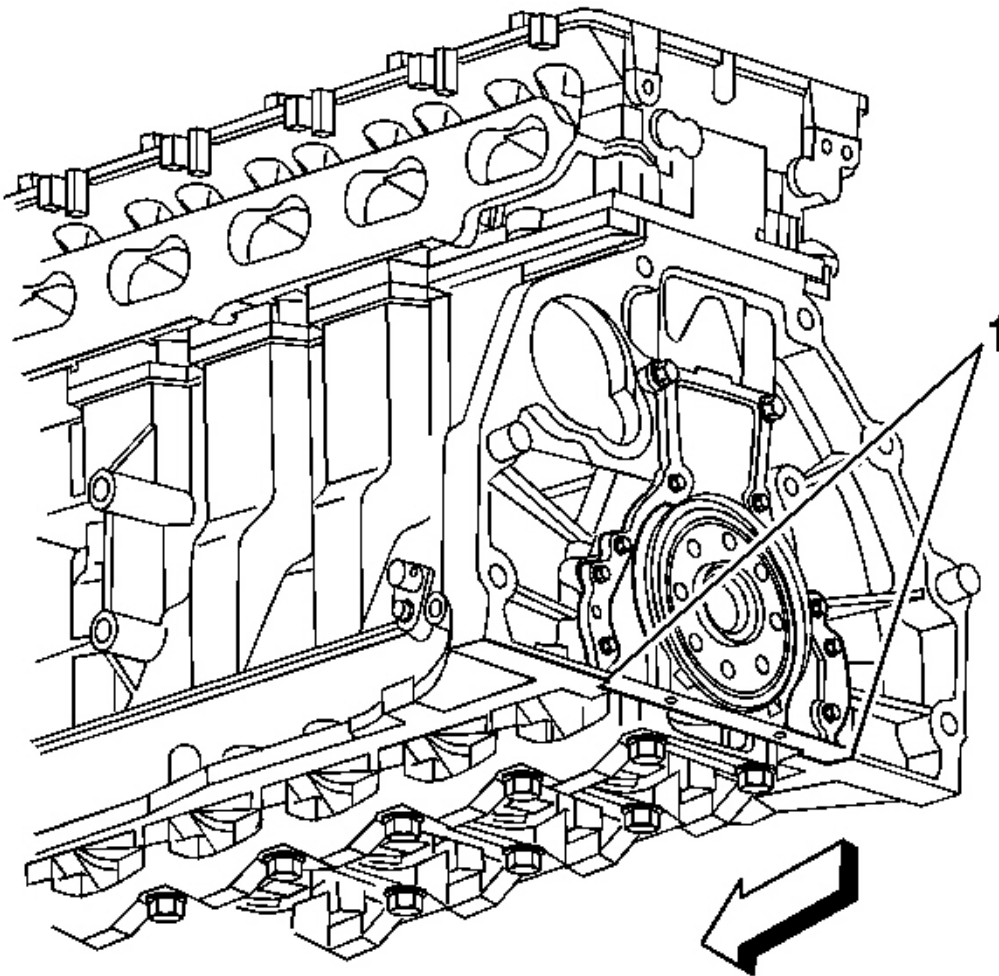
5. Slide the crankshaft rear oil seal housing over the alignment pins **J 44219** and crankshaft. See **Special Tools and Equipment**.

6. Install the crankshaft rear oil seal housing bolts, except the 2 in place of the guide pins.
7. Remove the **J 44219** guide pins. See **Special Tools and Equipment**.

**NOTE:** Refer to **Fastener Notice** in **Cautions and Notices**.

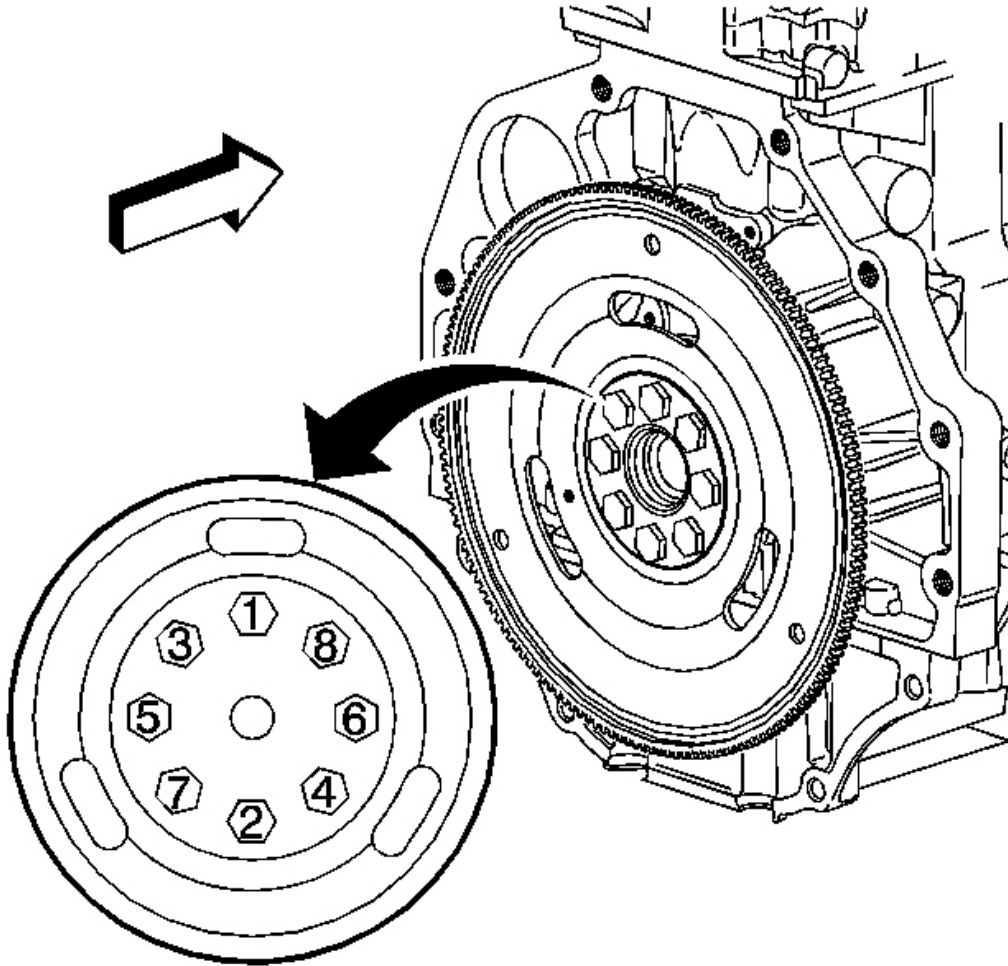
8. Install the remaining 2 crankshaft rear oil seal housing bolts.

**Tighten:** Tighten all the oil seal housing bolts to 10 N.m (89 lb in).



**Fig. 197: View Of Oil Pan Sealing Area On Crankshaft Rear Oil Seal Housing**  
Courtesy of GENERAL MOTORS CORP.

9. Wipe off any excess material from the bottom of the oil pan sealing area (1).



**Fig. 198: Tightening Sequence For Flywheel Bolts**  
Courtesy of GENERAL MOTORS CORP.

10. Install the flywheel and secure with the bolts.

**Tighten:** Tighten the flywheel bolts in sequence to 25 N.m (18 lb ft).

11. Use the J 36660-A to tighten the bolts an additional 50 degrees.
12. Install the transmission. Refer to **Transmission Replacement (LM4)** or **Transmission Replacement (LL8)** in Automatic Transmission - 4L60-E/4L65-E.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### CRANKSHAFT REAR OIL SEAL REPLACEMENT

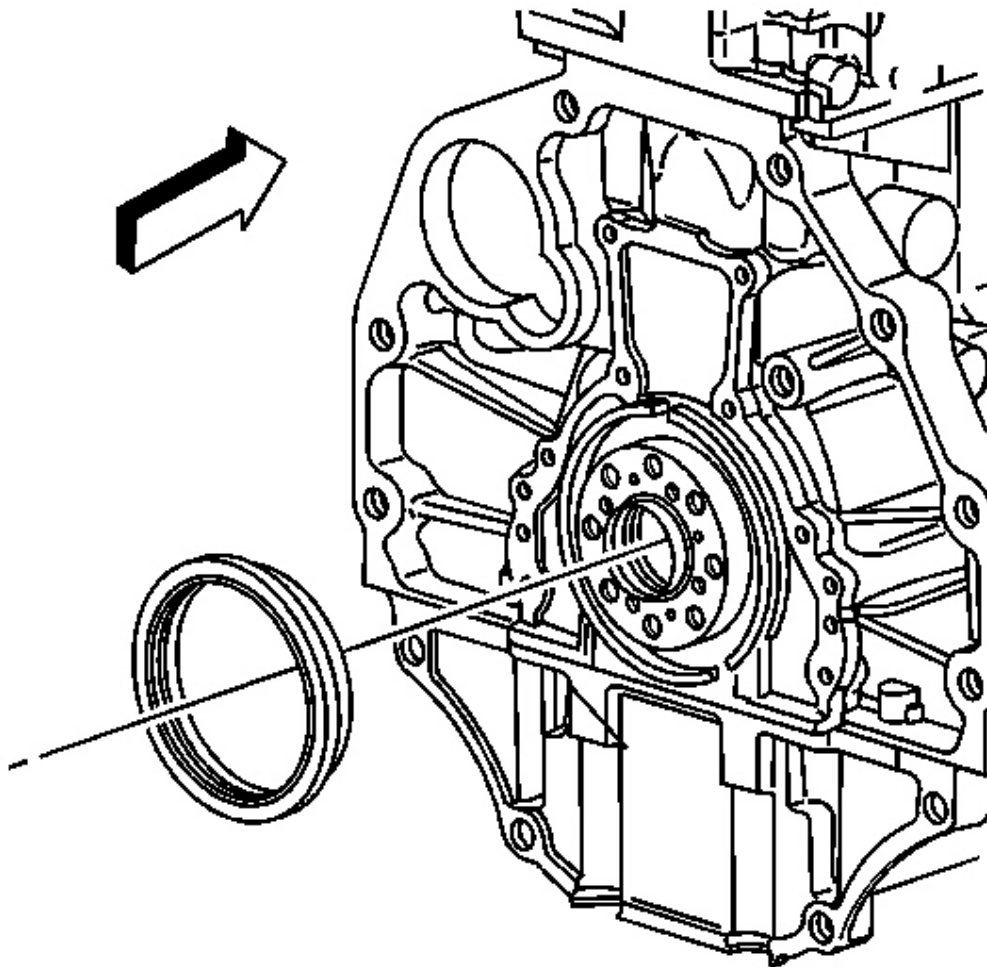
#### Tools Required

**J 44227** Rear Seal Installer. See **Special Tools and Equipment**.

#### Removal Procedure

1. Remove the transmission. Refer to **Transmission Replacement (LM4)** or **Transmission Replacement (LL8)** in Automatic Transmission - 4L60-E/4L65-E.
2. Remove the flywheel. Refer to **Engine Flywheel Replacement**.

**IMPORTANT:** Do not damage the crankshaft or seal bore.



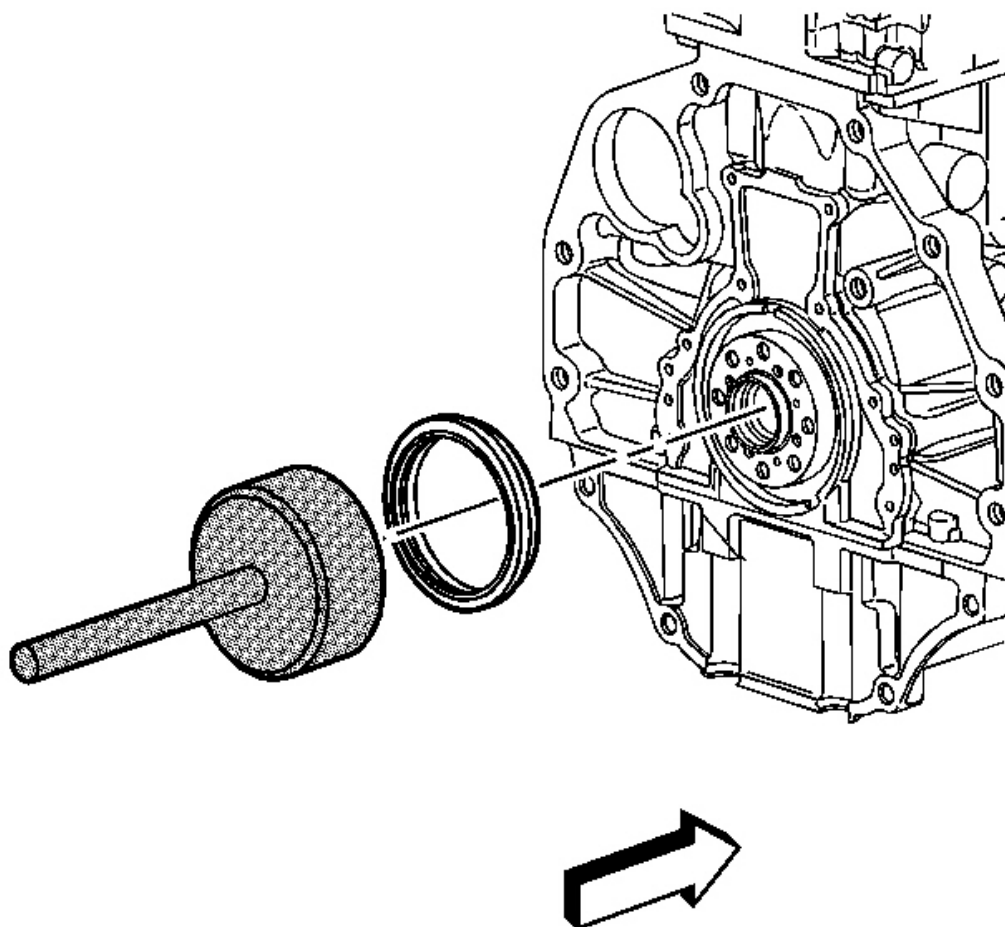
**Fig. 199: View Of Crankshaft Rear Oil Seal Housing & Seal**  
Courtesy of GENERAL MOTORS CORP.

3. Pry the crankshaft rear oil seal out of the rear oil seal housing using a suitable tool.

#### Installation Procedure

**IMPORTANT:** Use the plastic installation sleeve supplied with the new seal when installing a new seal.





**Fig. 200: Installing Crankshaft Rear Oil Seal Using J 44227**  
**Courtesy of GENERAL MOTORS CORP.**

1. Use **J 44227** to install the crankshaft rear oil seal. See **Special Tools and Equipment**.
2. Remove the **J 44227** . See **Special Tools and Equipment**.
3. Remove the seal installation sleeve after the seal is installed. Discard the sleeve.
4. Install the flywheel. Refer to **Engine Flywheel Replacement**.
5. Install the transmission. Refer to **Transmission Replacement (LM4)** or **Transmission Replacement (LL8)** in Automatic Transmission - 4L60-E/4L65-E.

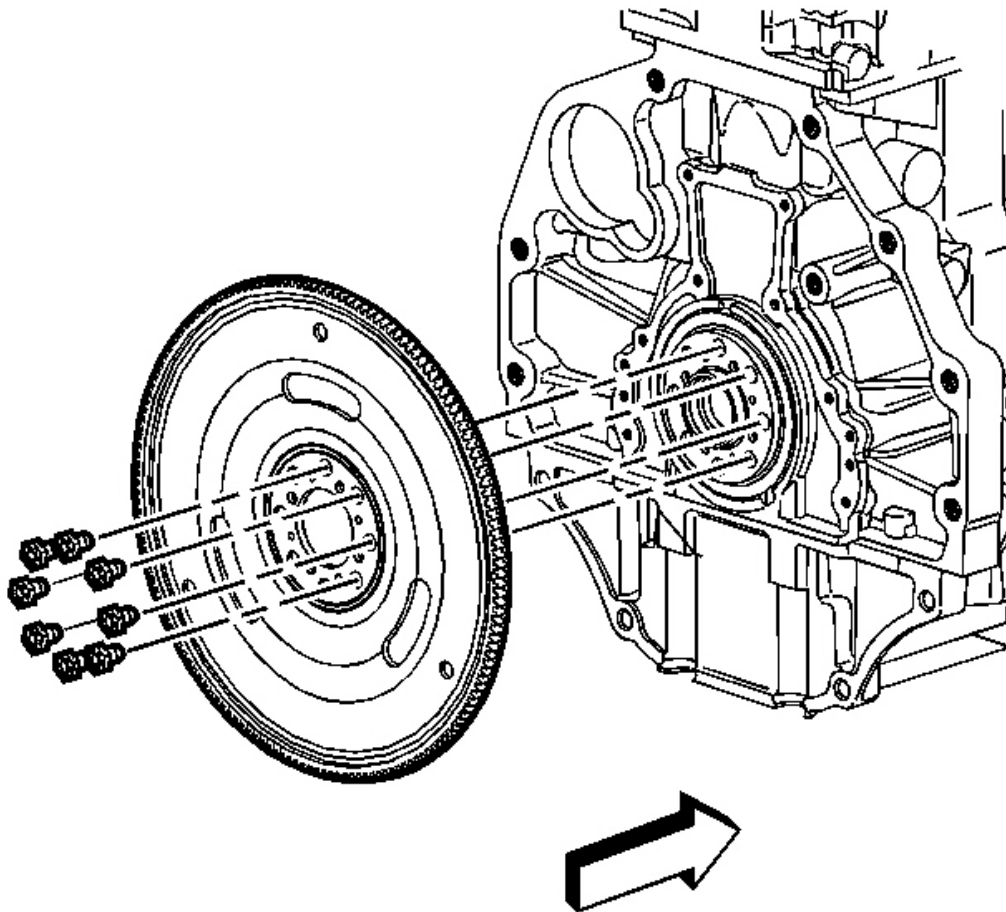
## **ENGINE FLYWHEEL REPLACEMENT**

### **Tools Required**

J 36660-A Torque Angle Meter

**Removal Procedure**

1. Remove the transmission. Refer to **Transmission Replacement (LM4)** or **Transmission Replacement (LL8)** in Automatic Transmission - 4L60-E/4L65-E.



**Fig. 201: View Of Flywheel & Bolts**  
Courtesy of GENERAL MOTORS CORP.

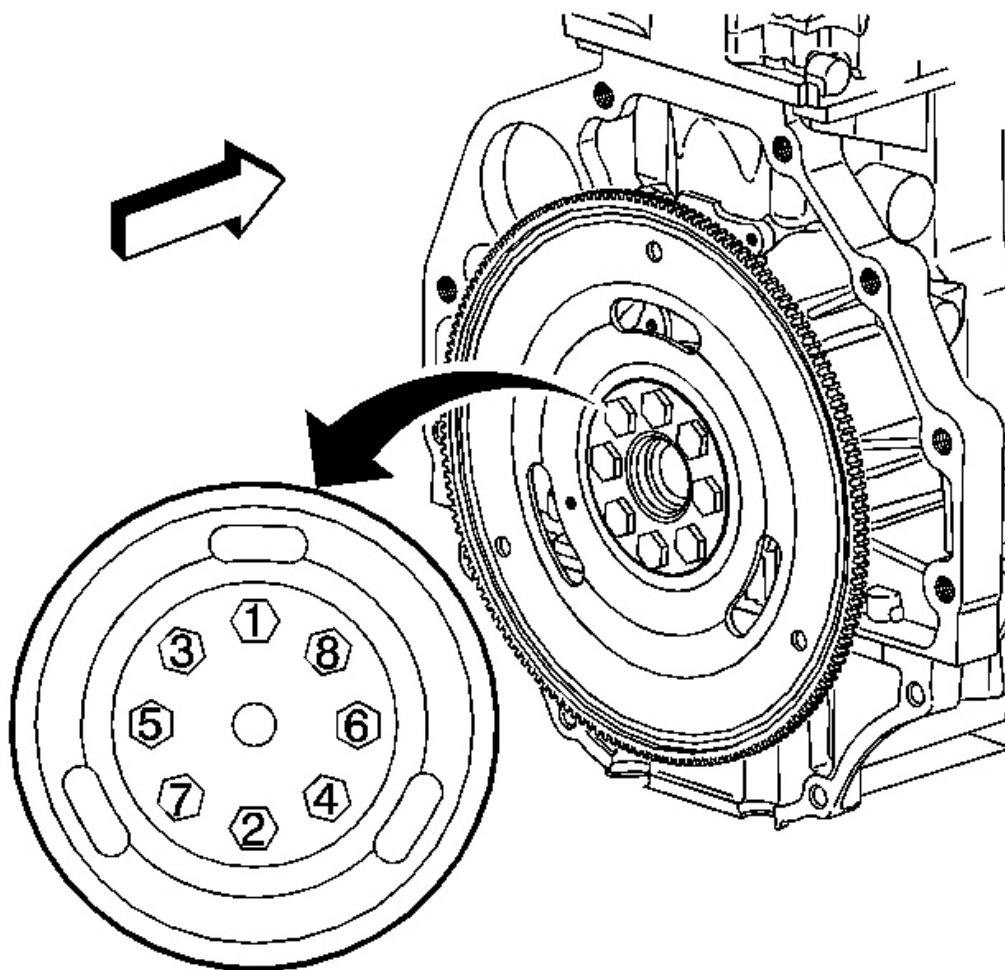
**IMPORTANT:** Note the position and the direction of the engine flywheel before removal.

2. Remove the flywheel bolts.
3. Remove the flywheel.

4. Clean and Inspect the flywheel. Refer to **Engine Flywheel Cleaning and Inspection.**

**Installation Procedure**

1. Add threadlock GM P/N 12345493 (Canadian P/N 10953488) to the new flywheel bolts.



**Fig. 202: Tightening Sequence For Flywheel Bolts**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the flywheel and secure the flywheel with the new bolts.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### **Tighten:**

1. Tighten the bolts in sequence to 25 N.m (18 lb ft).
2. Use the J 36660-A in order to tighten the bolts an additional 50 degrees.
3. Install the transmission. Refer to **Transmission Replacement (LM4)** or **Transmission Replacement (LL8)** in Automatic Transmission - 4L60-E/4L65-E.

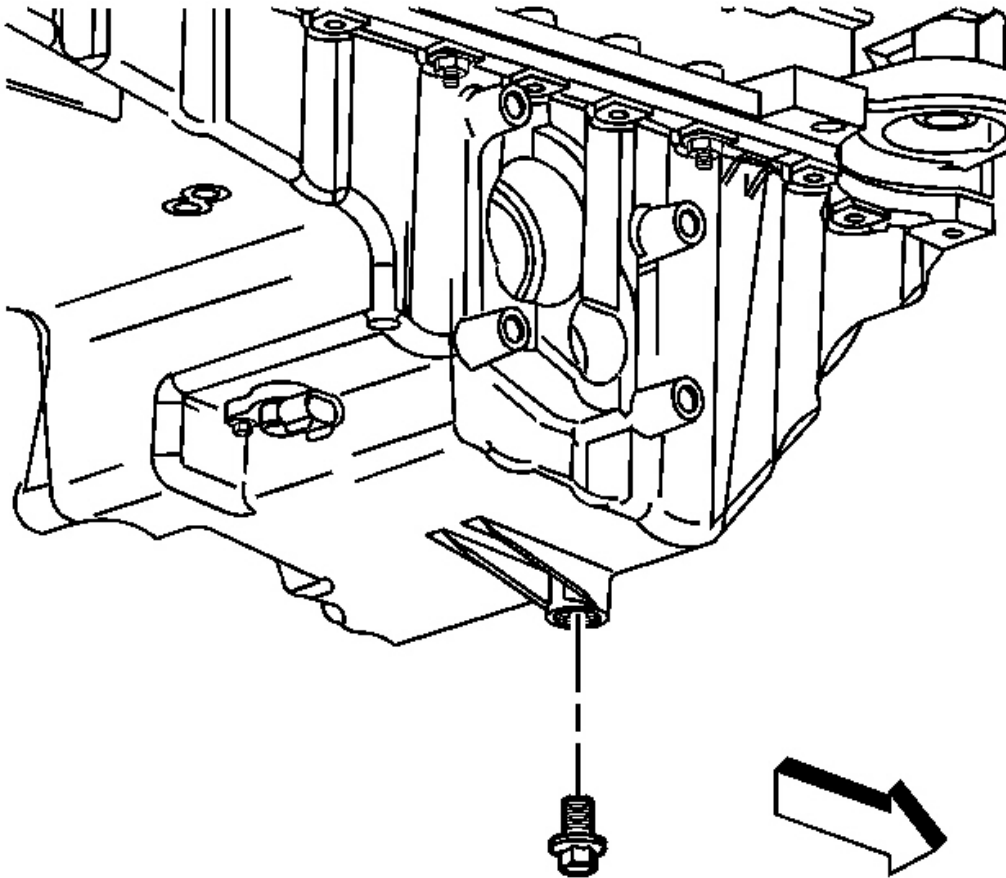
## **ENGINE REPLACEMENT**

### **Tools Required**

**J 44220** Engine Lift Bracket. See **Special Tools and Equipment**.

### **Removal Procedure**

1. Remove the hood. Refer to **Hood Replacement** in Body Front End.
2. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.
3. Drain engine coolant. Refer to **Draining and Filling Cooling System (Body Vin Code 6)** in Engine Cooling.
4. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging** in Heating, Ventilation and Air Conditioning.



**Fig. 203: View Of Oil Pan Drain Plug**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Keep drain plug removed during engine removal and installation.

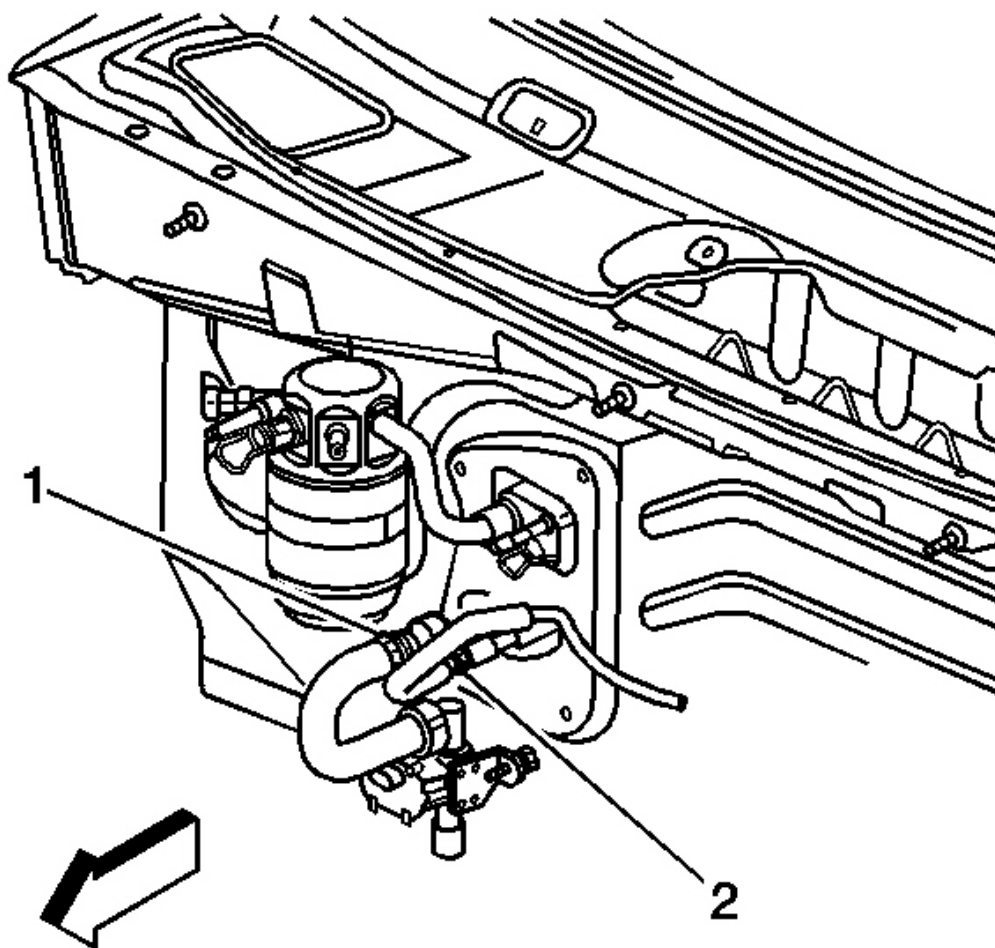
5. Remove the oil pan drain plug and drain the oil.
6. Install a suitable plug into the oil pan after draining to prevent any oil leakage during the rest of the procedure.
7. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 4.2L.
8. Remove the throttle body. Refer to **Throttle Body Assembly Replacement** in Engine Controls - 4.2L.
9. Remove the manifold absolute pressure (MAP) sensor. Refer to **Manifold Absolute Pressure (MAP) Sensor Replacement** in Engine Controls - 4.2L.
10. Remove the washer solvent container. Refer to **Washer Solvent Container Replacement** in

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

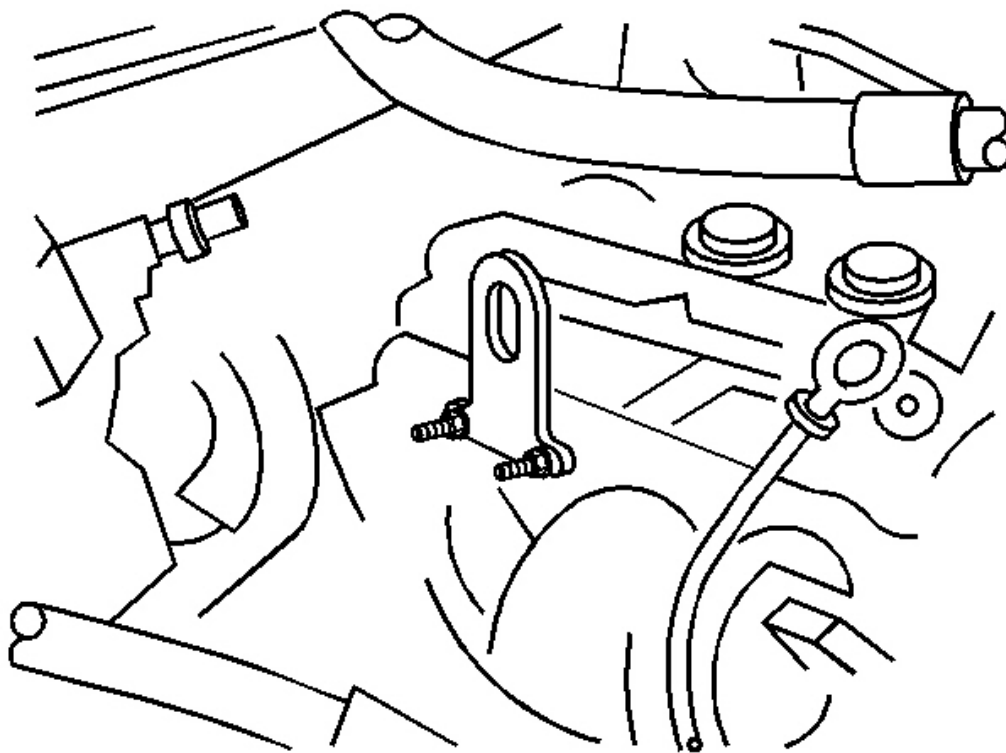
Wipers/Washer Systems.

11. Remove the grill. Refer to **Grille Replacement** in Exterior Trim.
12. Remove the headlamp housing. Refer to **Headlamp Housing Panel Replacement** in Body Front End.
13. Remove the radiator support brace. Refer to **Brace Replacement - Radiator Support Diagonal** in Body Front End.
14. Remove the hood latch. Refer to **Hood Latch Support Replacement** in Body Front End.
15. Disconnect A/C lines at the condenser.
16. Disconnect the transmission cooler lines at the engine, not the radiator.
17. Remove the cooling fan and the shroud tilting the radiator forward, and the cooling fan and the shroud rearward for clearance. Refer to **Cooling Fan and Shroud Replacement** in Engine Cooling.
18. Remove the radiator with condenser and transmission cooler lines. Refer to **Radiator Replacement (SWB - Short Wheel Base)** or **Radiator Replacement (LWB - Long Wheel Base)** in Engine Cooling.
19. Remove the drive belt. Refer to **Drive Belt Replacement**.
20. Remove the power steering pump bolts and lay the pump aside.



**Fig. 204: View Of Heater Hoses & Secondary AIR Reaction Solenoid Valve**  
Courtesy of GENERAL MOTORS CORP.

21. Ensure the heater hoses at the heater core are disconnected.
22. Remove the secondary air injection (AIR) reaction solenoid valve. Refer to **Secondary Air Injection (AIR) Solenoid Valve Replacement** in Engine Controls - 4.2L.

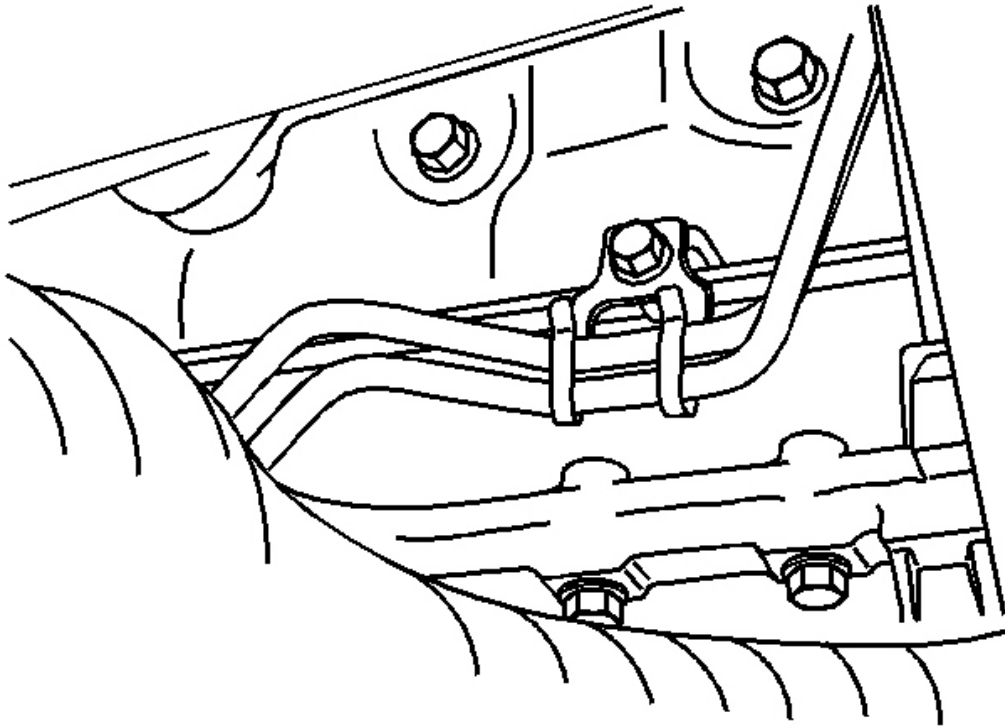


**Fig. 205: View Of Lift Hook**

Courtesy of GENERAL MOTORS CORP.

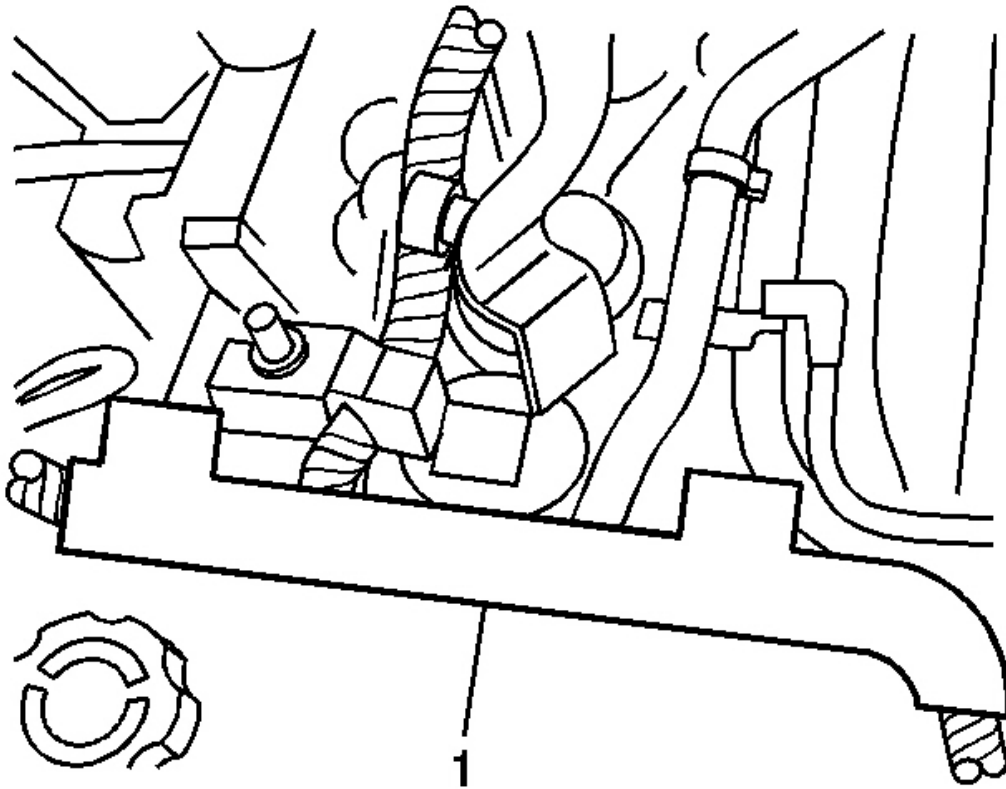
23. Install the lift hook **J 44220** to the AIR port on the engine head. See **Special Tools and Equipment**.
24. Disconnect the oxygen sensor electrical connector.
25. Disconnect the A/C line at the accumulator.
26. Disconnect the front axle actuator electrical connector.
27. Disconnect the camshaft phaser actuator valve electrical connector.





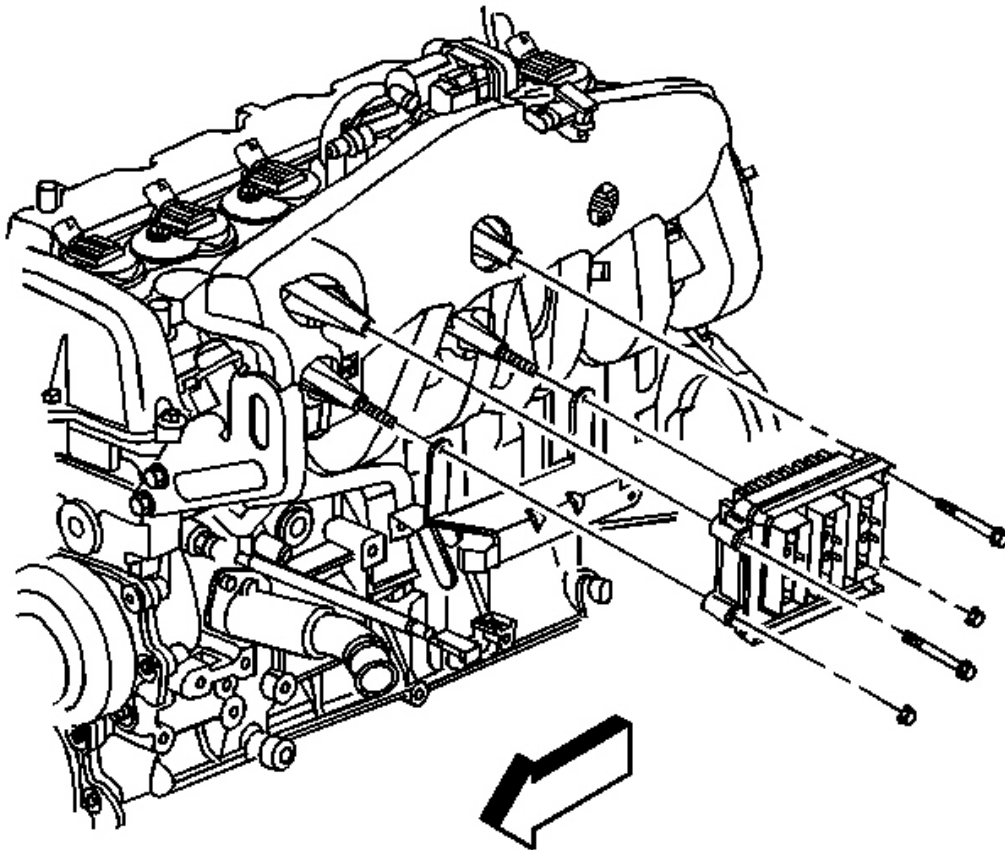
**Fig. 206: View Of Transmission Cooler Lines & Clips**  
**Courtesy of GENERAL MOTORS CORP.**

28. Unclip the transmission cooler lines from right side of the engine block.
29. Disconnect the ignition coil harness connectors.



**Fig. 207: View Of Engine Electrical Harness Housing**  
Courtesy of GENERAL MOTORS CORP.

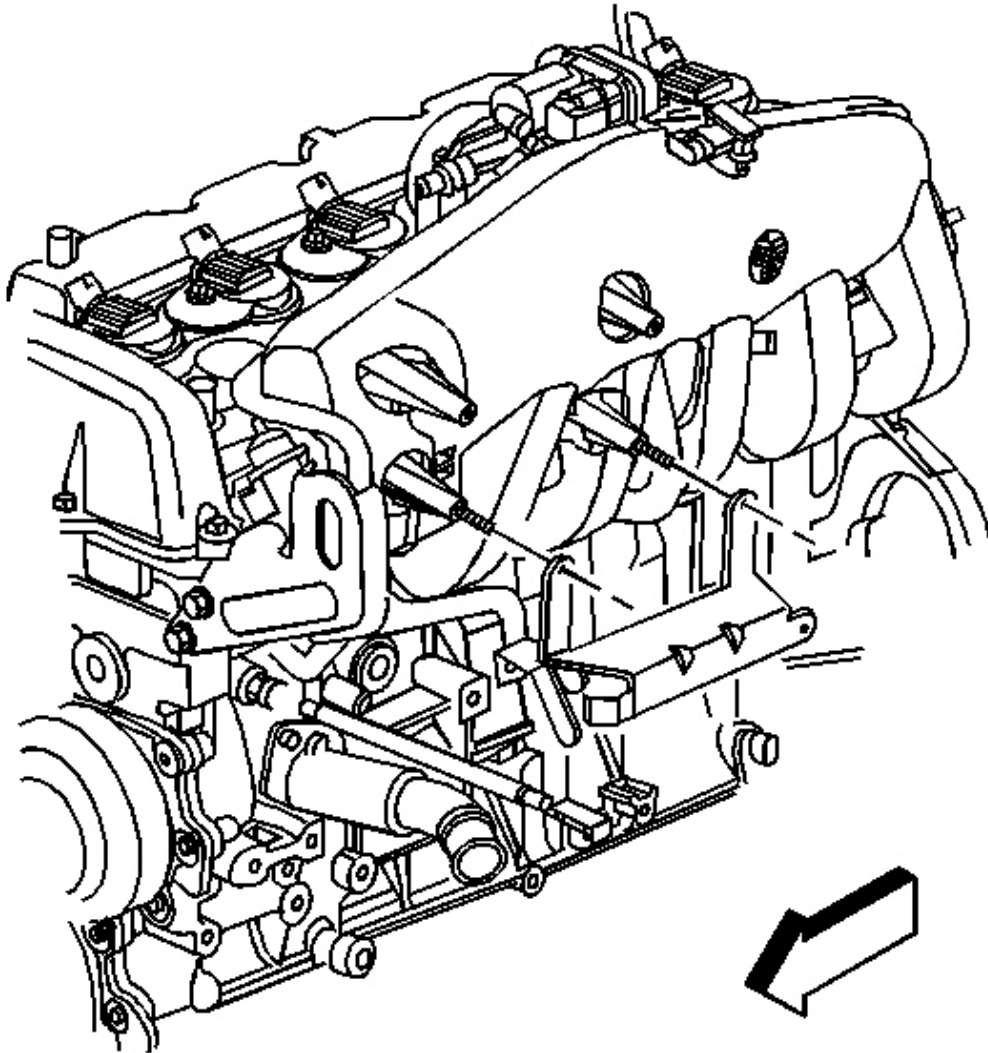
30. Carefully disconnect harness retainer at clips (1) and remove.
31. Remove power brake hose at booster.



**Fig. 208: View Of PCM**

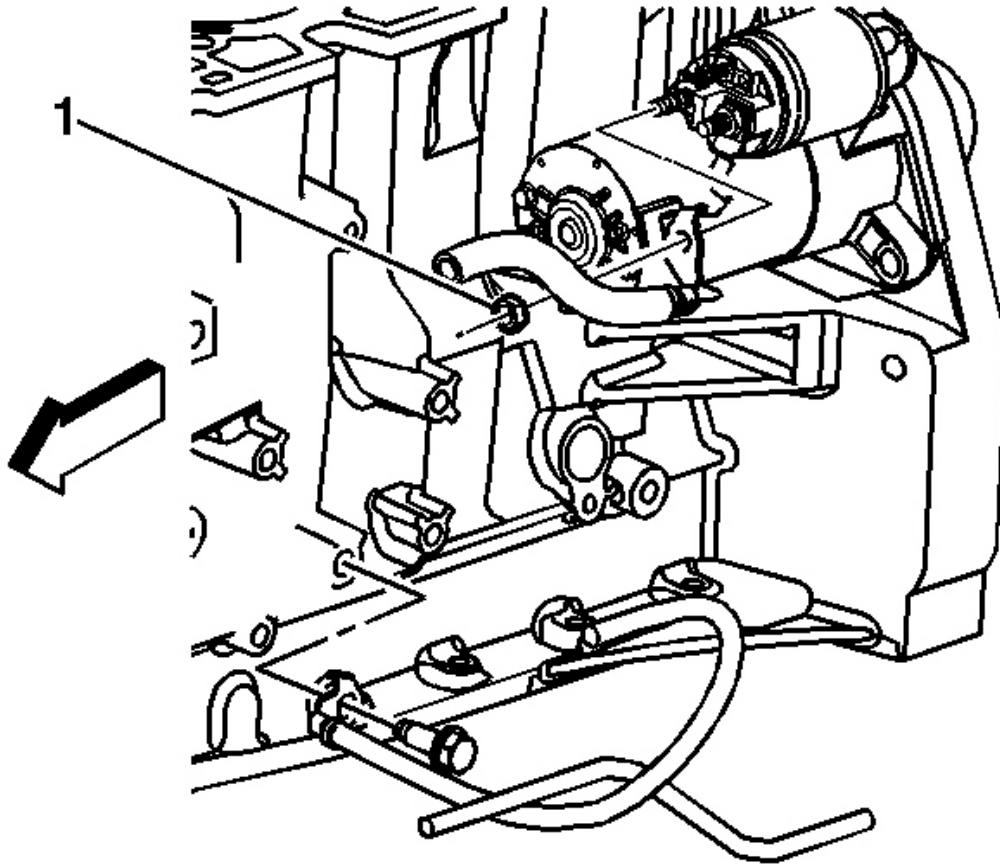
Courtesy of GENERAL MOTORS CORP.

32. Remove the PCM. Refer to **Powertrain Control Module (PCM) Replacement** in Engine Controls - 4.2L.
33. Disconnect the fuel lines at the fuel pressure regulator and cap lines. Refer to **Fuel Pressure Regulator Replacement** in Engine Controls - 4.2L.
34. Remove all harnesses from the engine harness bracket.
35. Disconnect the front differential vent hose from the engine harness bracket.



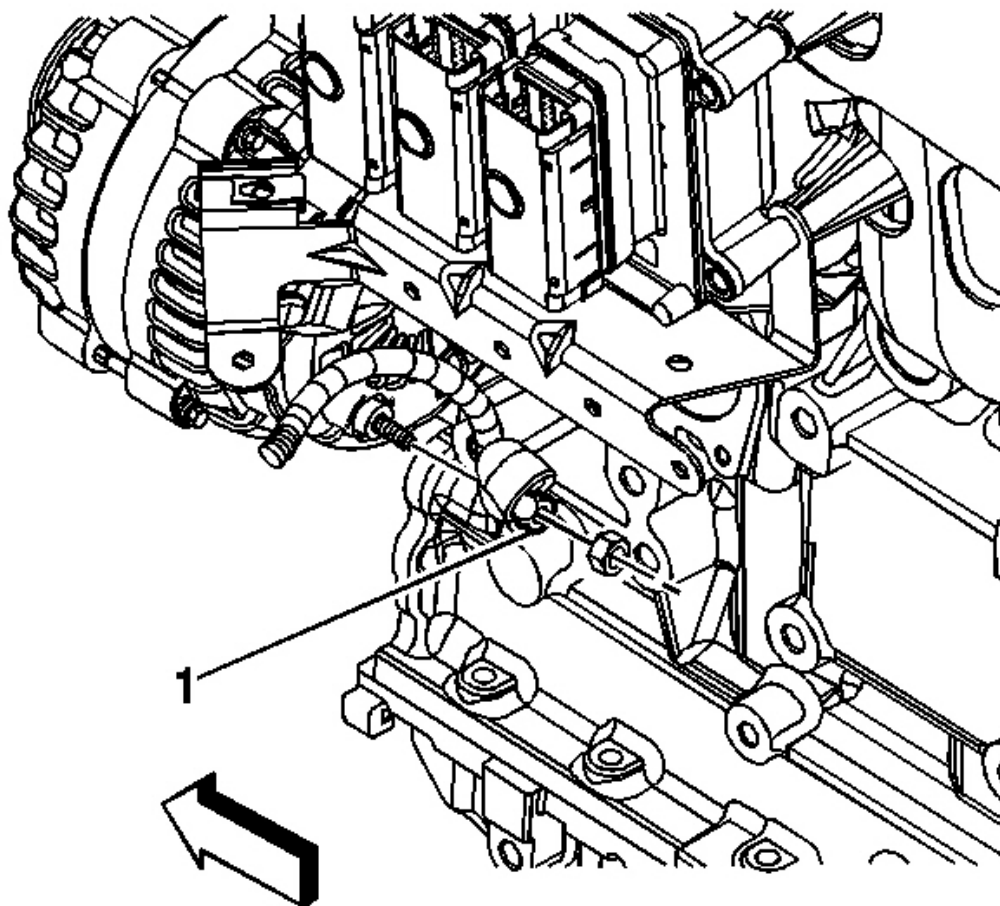
**Fig. 209: View Of Engine Harness Bracket & Bolts**  
Courtesy of GENERAL MOTORS CORP.

36. Remove the engine harness bracket bolt and remove bracket.



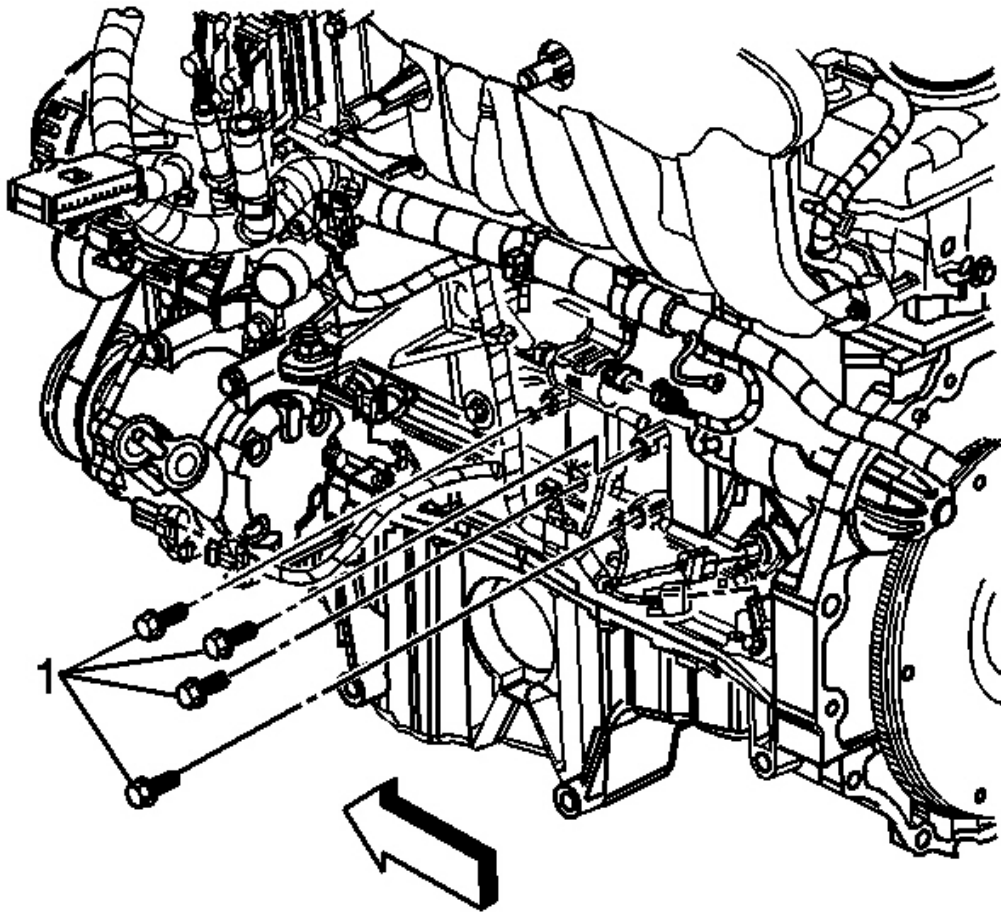
**Fig. 210: View Of Starter & Related Components**  
**Courtesy of GENERAL MOTORS CORP.**

37. Disconnect starter electrical connections (1).
38. Disconnect the A/C pressure sensor and clutch electrical connector.



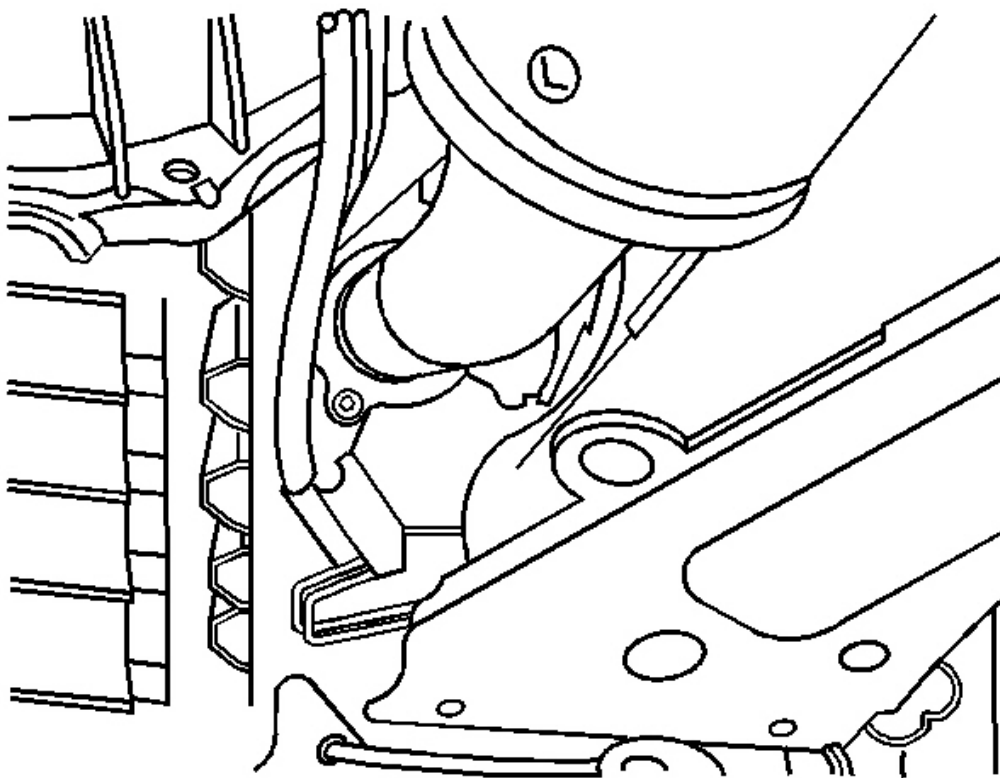
**Fig. 211: Rear Of Generator (Alternator) View**  
**Courtesy of GENERAL MOTORS CORP.**

39. Disconnect generator electrical connector and battery lead (1).
40. Disconnect the knock sensor electrical connector.
41. Disconnect the crankshaft sensor electrical connector.
42. Disconnect the camshaft sensor electrical connector.



**Fig. 212: View Of Left Side Of Block**  
Courtesy of GENERAL MOTORS CORP.

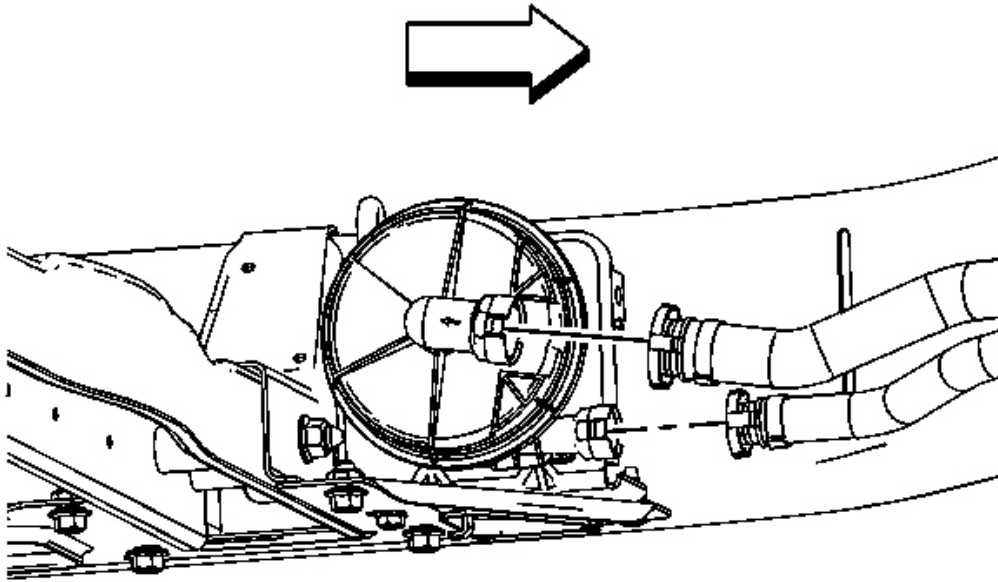
43. Remove 4 grounds on the left side of the block (1).
44. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
45. Remove the wheel drive shafts, left and right. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.
46. Remove the propeller shaft from the front axle pinion yoke. Refer to **Propeller Shaft Replacement - Front** in Propeller Shaft.
47. Remove the engine protection shield. Refer to **Engine Protection Shield Replacement** in Body Front End.



**Fig. 213: View Of Exhaust Pipe At Exhaust Manifold**  
Courtesy of GENERAL MOTORS CORP.

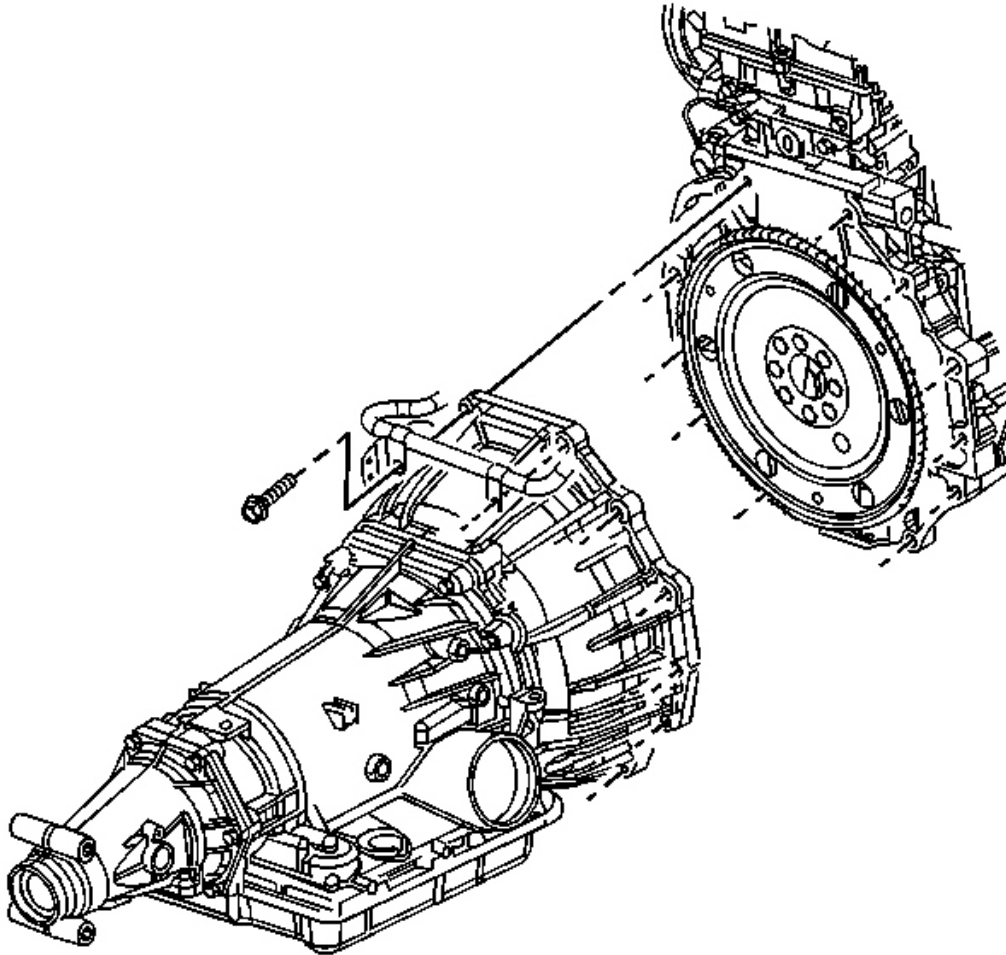
48. Disconnect the exhaust pipe from the exhaust manifold and slide the exhaust pipe backward slightly.
49. Remove the fuel tank shield, if equipped. Refer to **Fuel Tank Shield Replacement (Short Wheelbase)** or **Fuel Tank Shield Replacement (Long Wheelbase)** in Frame and Underbody.





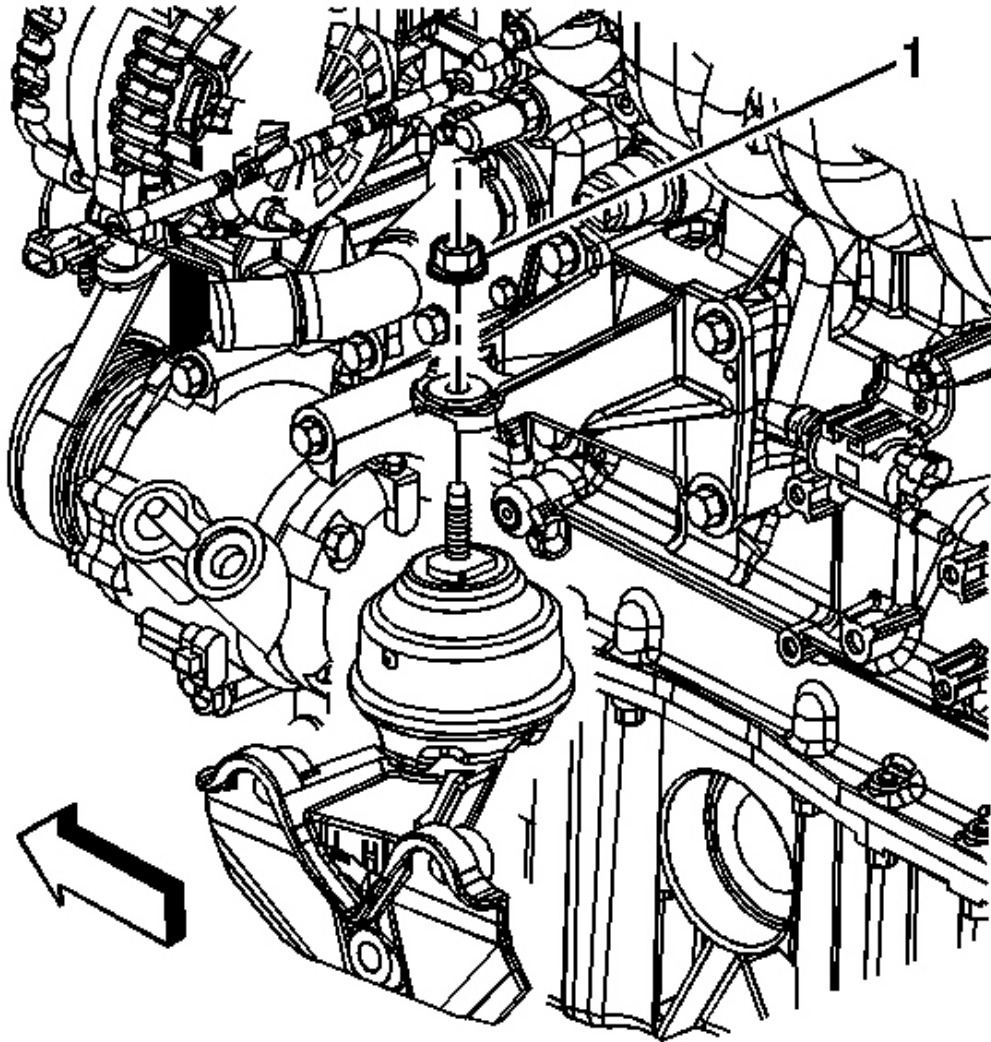
**Fig. 214: View Of Secondary AIR Pipes & Pump**  
Courtesy of GENERAL MOTORS CORP.

50. Disconnect the secondary AIR pipes from the secondary AIR pump.
51. Remove the torque converter bolt access cover.
52. Remove the torque converter bolts.
53. Place a jack on the transmission oil pan for support.
54. Remove the transmission support. Refer to **Transmission Support Replacement** in Frame and Underbody.
55. Lower the transmission enough to reach the top bell housing bolts.



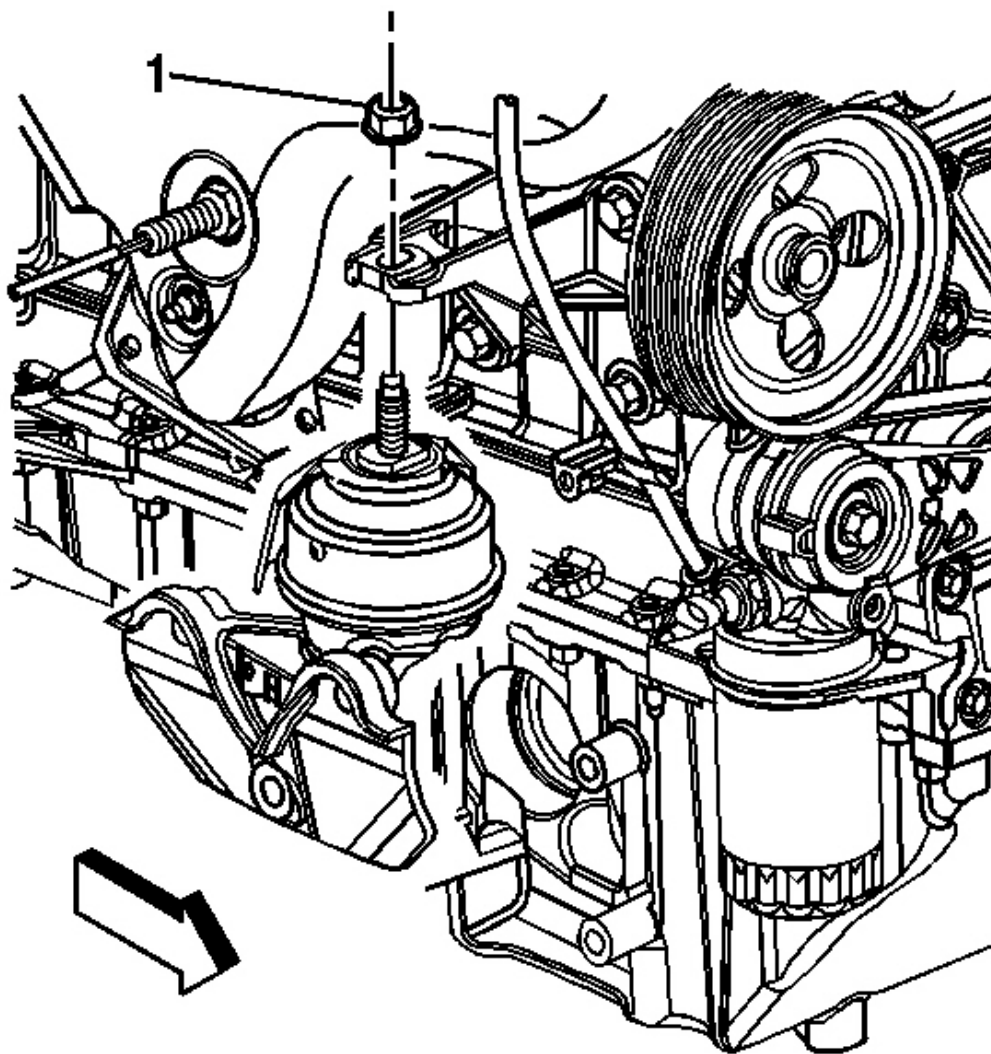
**Fig. 215: View Of Bell Housing Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

56. Remove the top 4 bell housing bolts, there may be 2 harness clips that will need to be removed in order to have access to 2 of the top bolts.
57. Raise the transmission.
58. Reinstall the transmission support using only 2 through bolts.
59. Remove the remaining bell housing bolts, for a total of 11 bolts.
60. Remove the left and right engine lower mount nuts.
61. Disconnect the oil pressure switch electrical connector.
62. Lower the vehicle.



**Fig. 216: View Of Left Engine Mount**  
Courtesy of GENERAL MOTORS CORP.

63. Remove the left upper engine mount nut (1).



**Fig. 217: View Of Upper Engine Mount Nuts**  
Courtesy of GENERAL MOTORS CORP.

64. Remove the right upper engine mount nut (1).
65. Install the engine hoist.
66. Raise the engine out of the compartment slowly keeping the transmission supported.
67. Remove both engine mounts for clearance.
68. Remove the fasteners securing the AIR pipes to the back of the engine head.
69. Remove the AIR pipes from the vehicle.

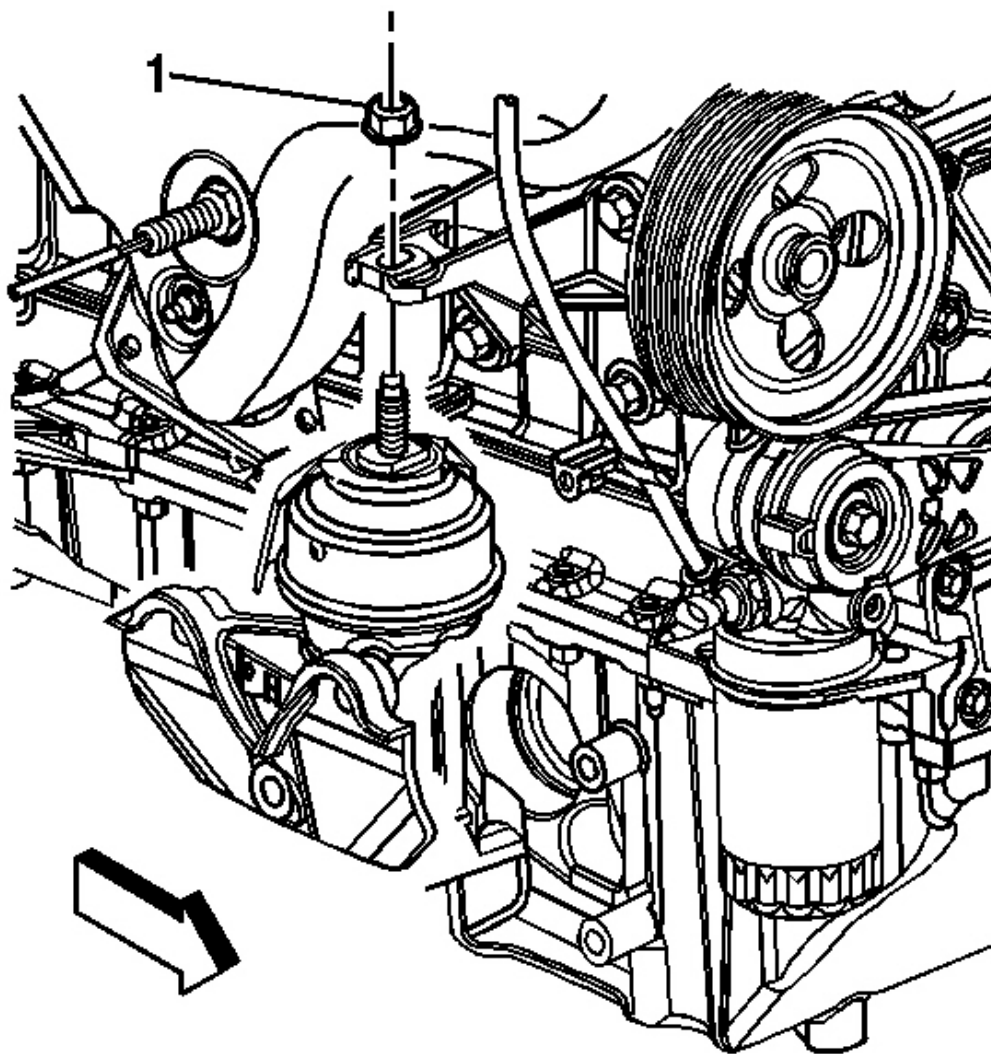
## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

70. Continue raising the engine out of the vehicle.
71. Install the engine to the engine stand.

### Installation Procedure

1. Remove the engine from the engine stand.
2. Slowly install the engine into the engine compartment aligning the engine mounts with the brackets.
3. Install the AIR pipes to the engine.
4. Install the fasteners securing the AIR pipes to the back of the engine head.
5. When the engine mounts are aligned, install the engine mounts, putting the mount up through the engine mount brackets before inserting into the chassis mount brackets.



**Fig. 218: View Of Upper Engine Mount Nuts**  
Courtesy of GENERAL MOTORS CORP.

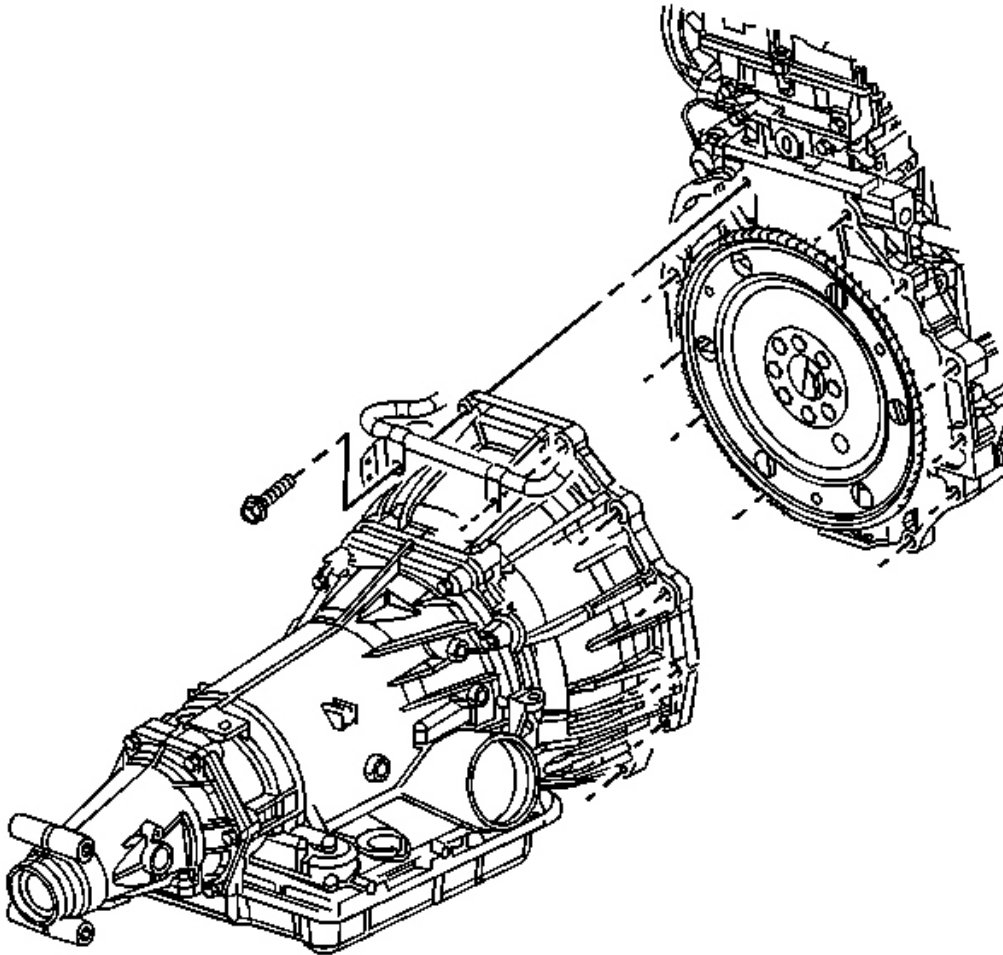
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

6. Lower the engine onto the mounts and install the upper engine mount nuts (1).

**Tighten:** Tighten the nuts to 70 N.m (51 lb ft).

7. Remove the engine hoist.

8. Lay the radiator into the radiator support, but do not install the radiator completely.
9. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.



**Fig. 219: View Of Bell Housing Bolts**  
Courtesy of GENERAL MOTORS CORP.

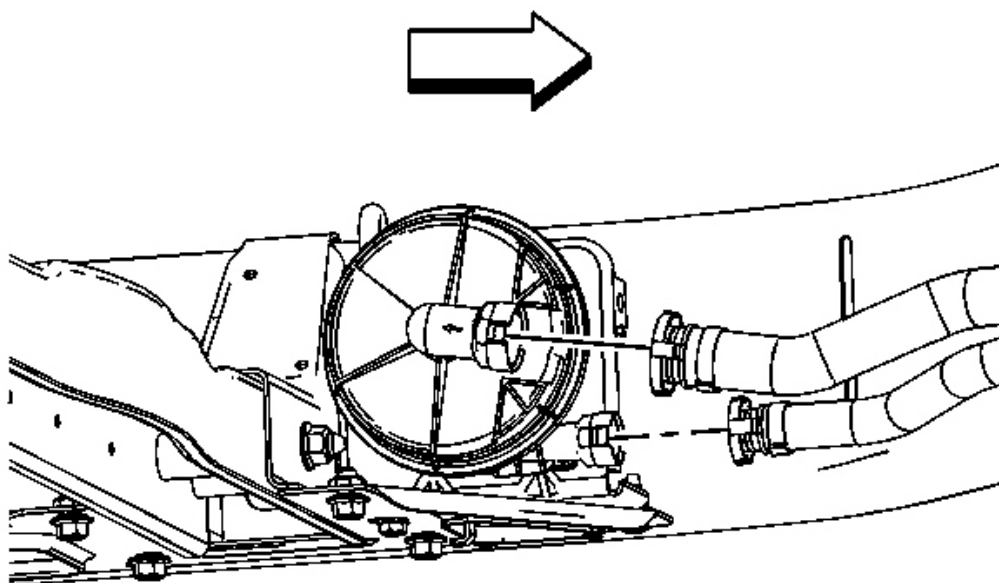
10. Install all of the lower bell housing bolts, excluding the top 4.
11. Remove the 2 through bolts securing the transmission support.
12. Lower the transmission.
13. Install the top 4 bell housing bolts.

**Tighten:** Tighten all 11 bell housing bolts to 50 N.m (37 lb ft).

14. Raise the transmission.
15. Install the transmission support. Refer to **Transmission Support Replacement** in Frame and Underbody.
16. Install the 3 torque converter bolts.

**Tighten:** Tighten the torque converter bolts to 60 N.m (44 lb ft).

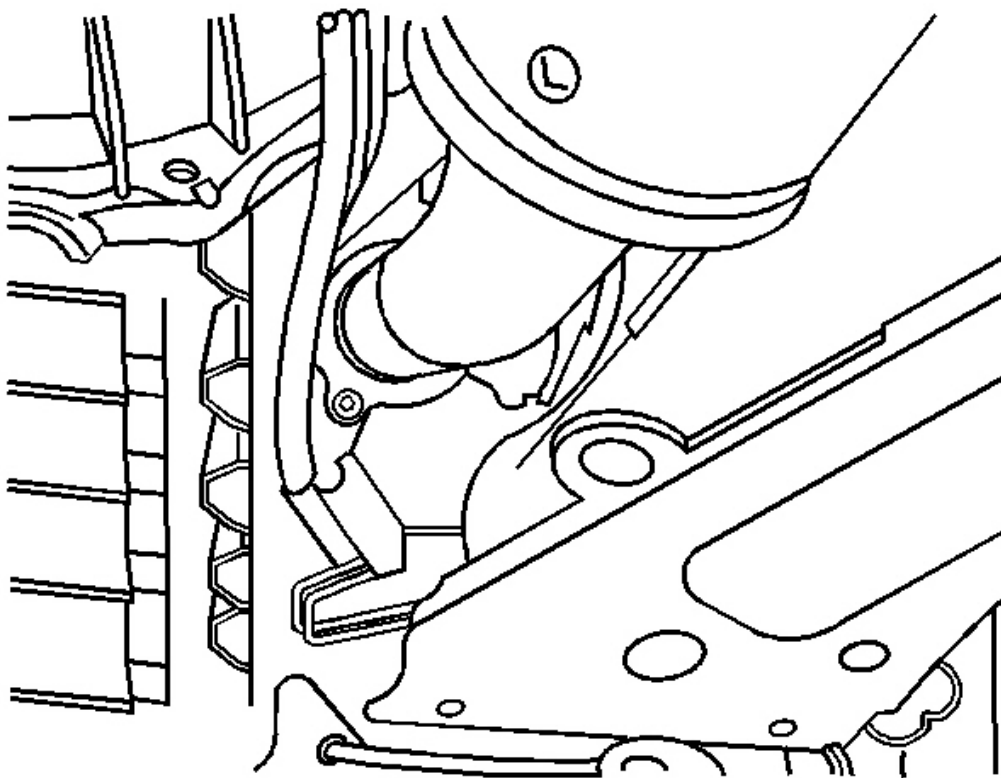
17. Install the torque converter bolt cover.
18. Install the fuel tank shield, if removed. Refer to **Fuel Tank Shield Replacement (Short Wheelbase)** or **Fuel Tank Shield Replacement (Long Wheelbase)** in Frame and Underbody.



**Fig. 220: View Of Secondary AIR Pipes & Pump**  
Courtesy of GENERAL MOTORS CORP.

19. Connect the secondary AIR pipes to the secondary AIR pump.
20. Install the engine protection shield. Refer to **Engine Protection Shield Replacement** .
21. Install the propeller shaft to the front axle pinion yoke. Refer to **Propeller Shaft Replacement - Front** in Propeller Shaft.



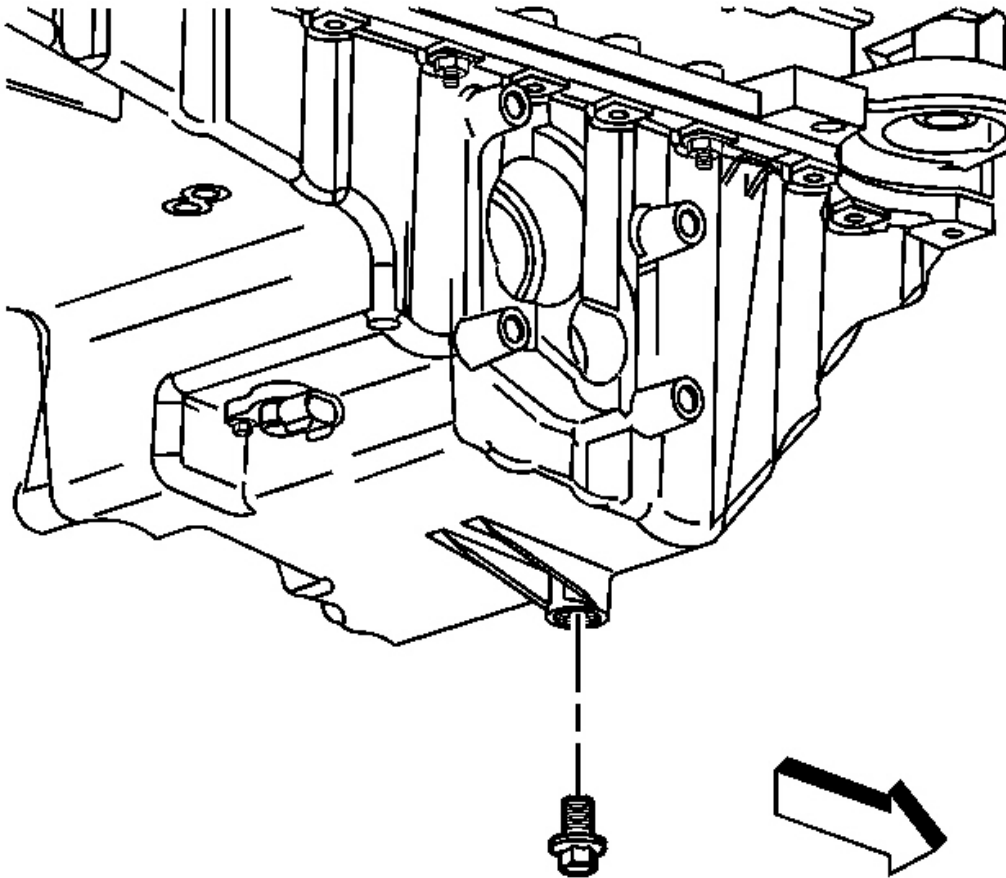


**Fig. 221: View Of Exhaust Pipe At Exhaust Manifold**  
Courtesy of GENERAL MOTORS CORP.

22. Connect the exhaust pipe to the manifold and secure the pipe with the bolts.

**Tighten:** Tighten the exhaust pipe bolts to 50 N.m (37 lb ft).

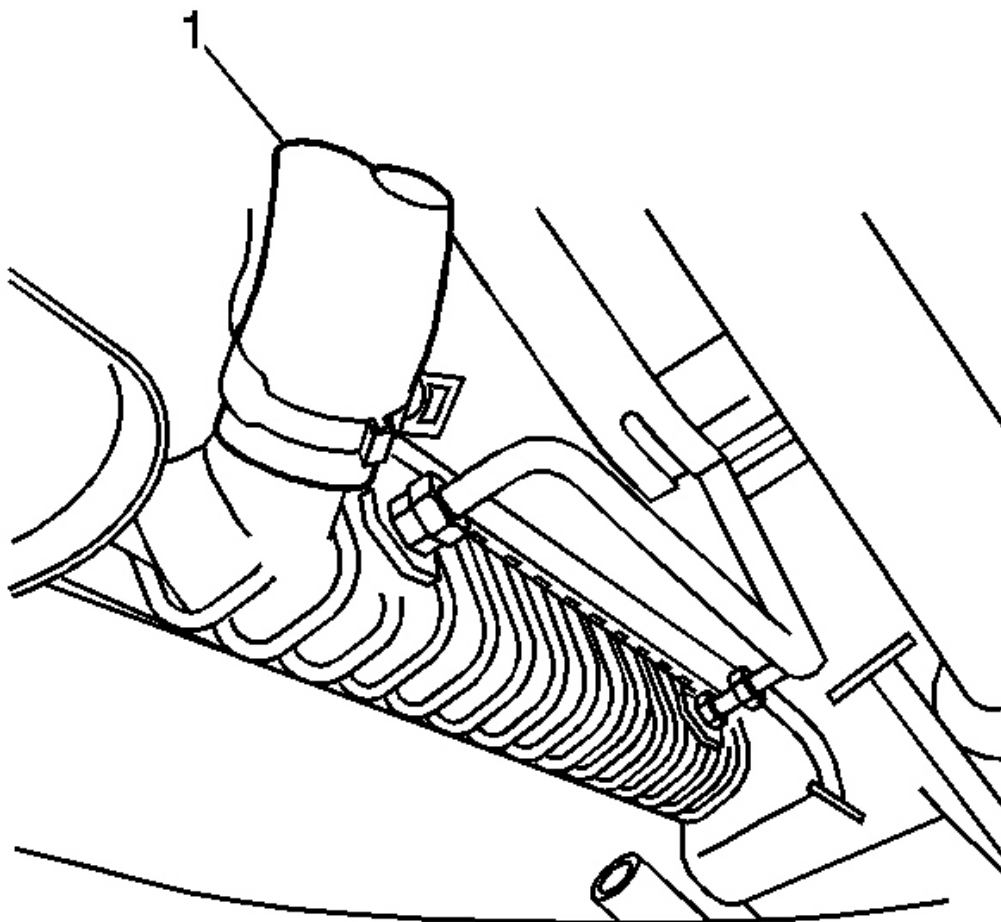
23. Connect the oil pressure sensor electrical connector.



**Fig. 222: View Of Oil Pan Drain Plug**  
Courtesy of GENERAL MOTORS CORP.

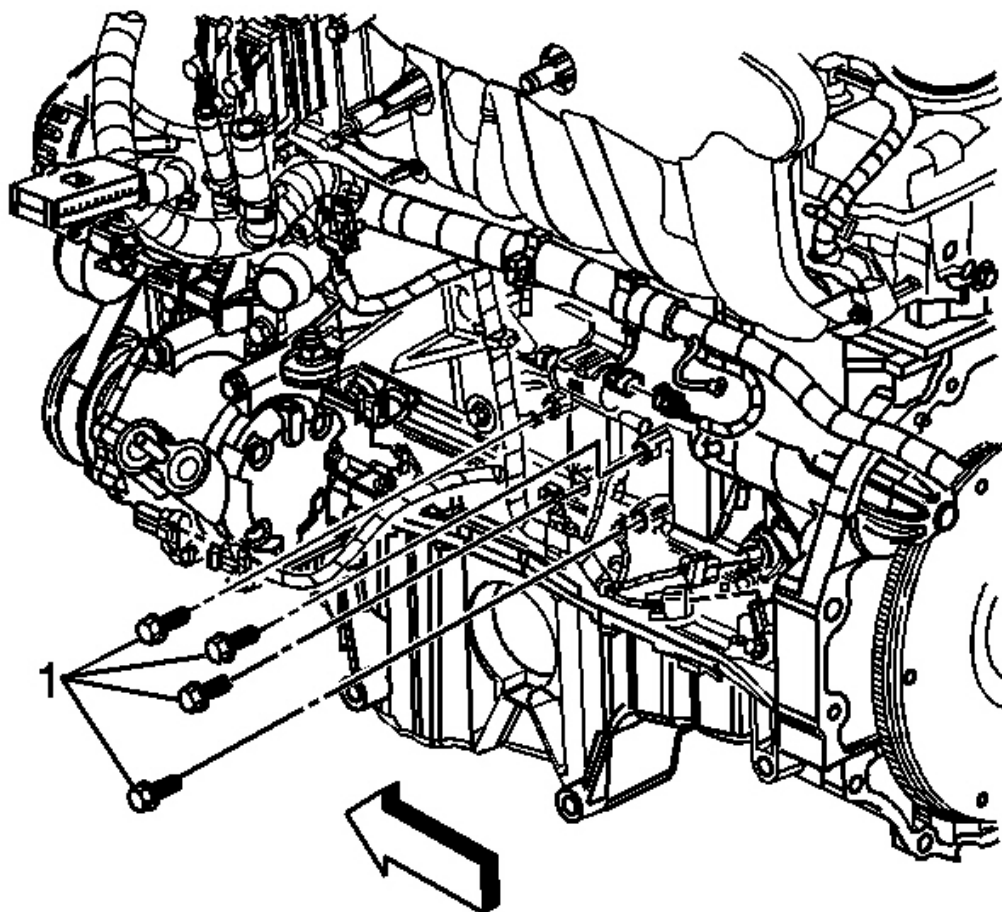
24. Install the oil pan drain plug.

**Tighten:** Tighten the plug to 26 N.m (19 lb ft).



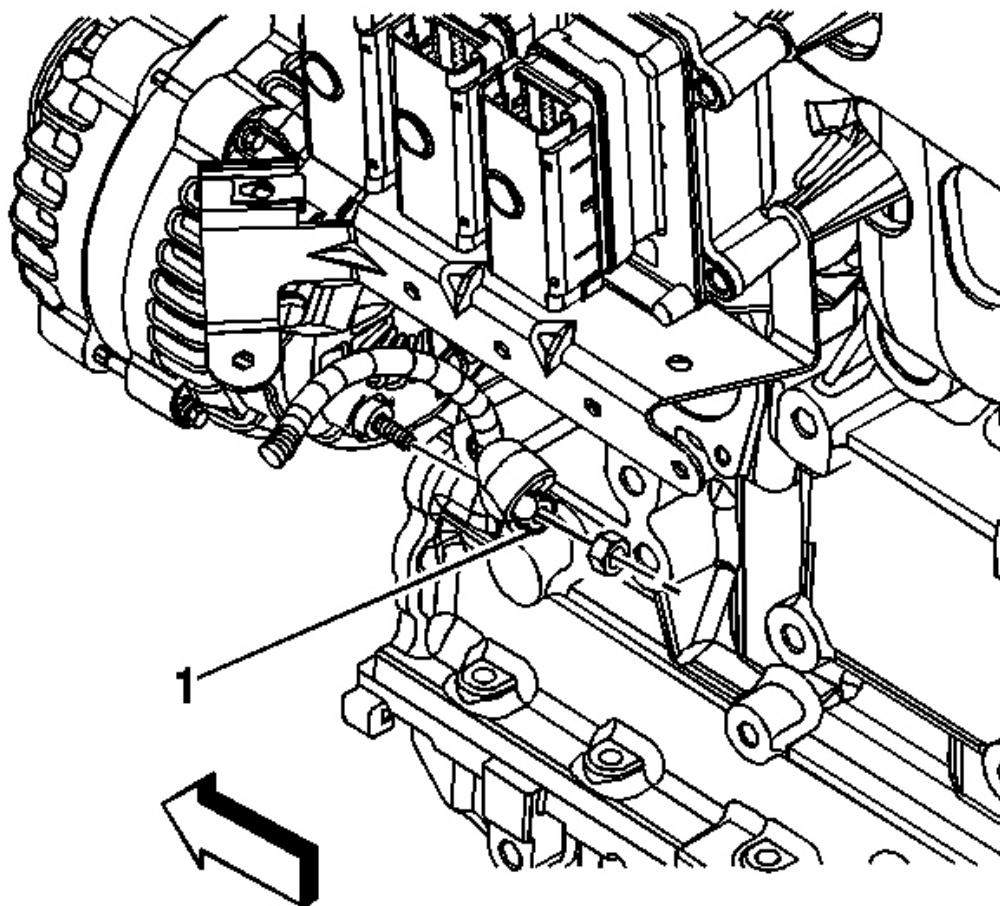
**Fig. 223: View Of Radiator Hose**  
Courtesy of GENERAL MOTORS CORP.

25. Install the lower radiator hose (1).
26. Install the left and right wheel drive shafts. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.
27. Lower the vehicle.



**Fig. 224: View Of Left Side Of Block**  
**Courtesy of GENERAL MOTORS CORP.**

28. Install the 4 grounds on the left side of the block (1).
29. Install the camshaft sensor electrical connectors.
30. Install the crankshaft sensor electrical connector.
31. Install the knock sensor electrical connector.

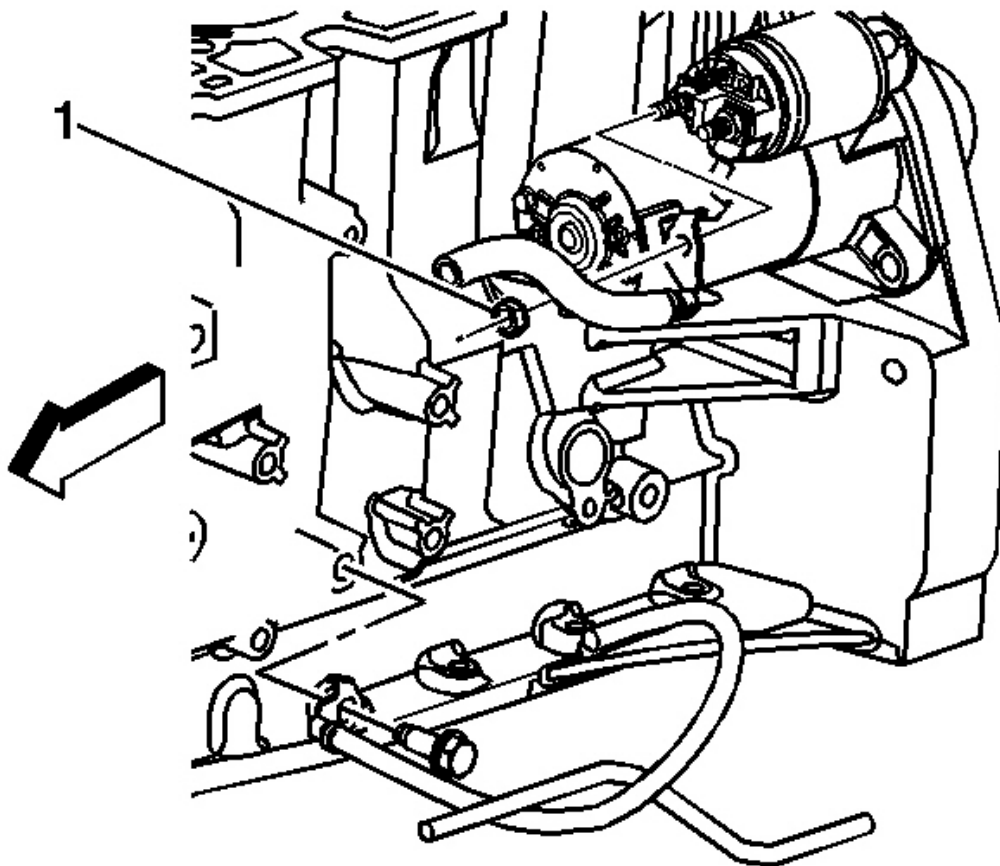


**Fig. 225: Rear Of Generator (Alternator) View**  
Courtesy of GENERAL MOTORS CORP.

32. Install the generator electrical connector and battery lead (1).

**Tighten:** Tighten the generator battery lead nut to 9 N.m (80 lb in).

33. Install the A/C pressure sensor and clutch electrical connector.

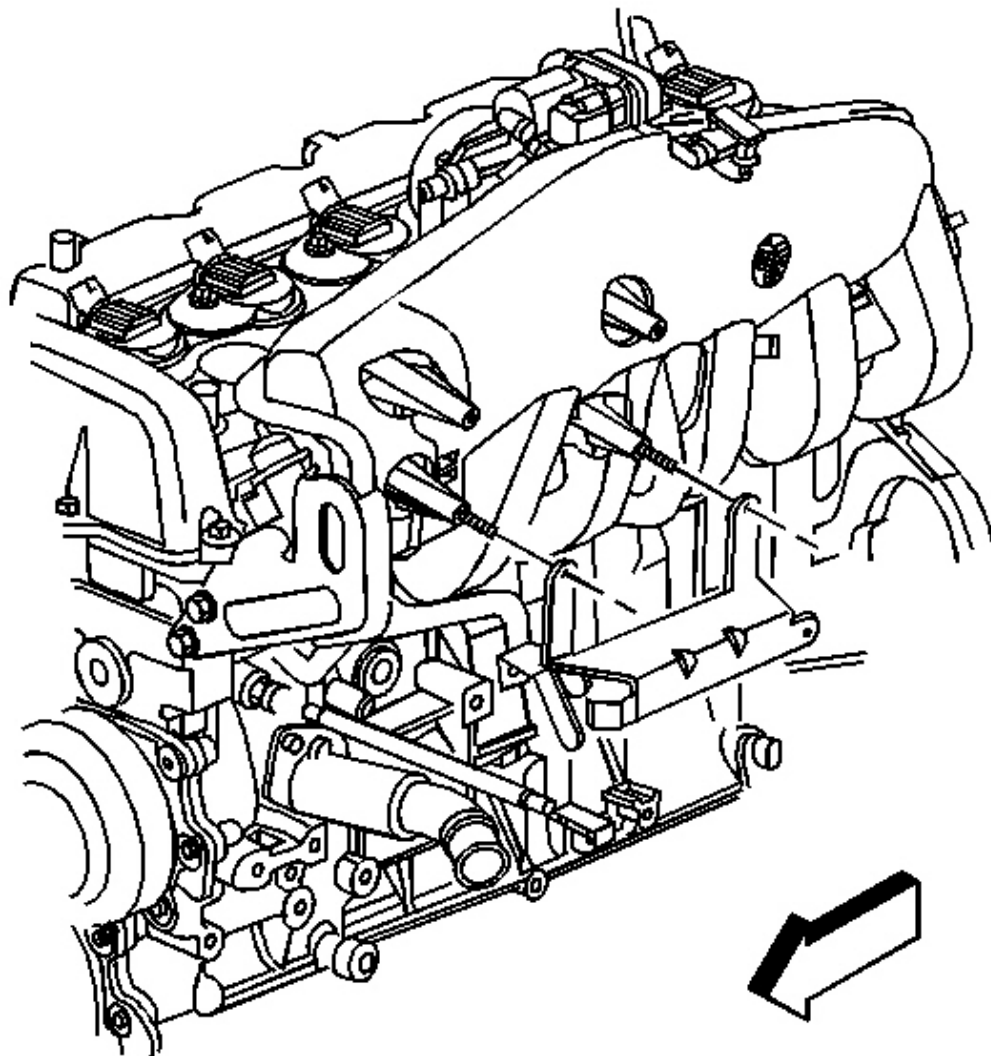


**Fig. 226: View Of Starter & Related Components**  
Courtesy of GENERAL MOTORS CORP.

34. Install starter electrical connectors and battery lead (1).

**Tighten:** Tighten the starter battery lead to 9 N.m (80 lb in).

35. Install the fuel lines at the fuel pressure regulator. Refer to **Fuel Pressure Regulator Replacement** in Engine Controls - 4.2L.



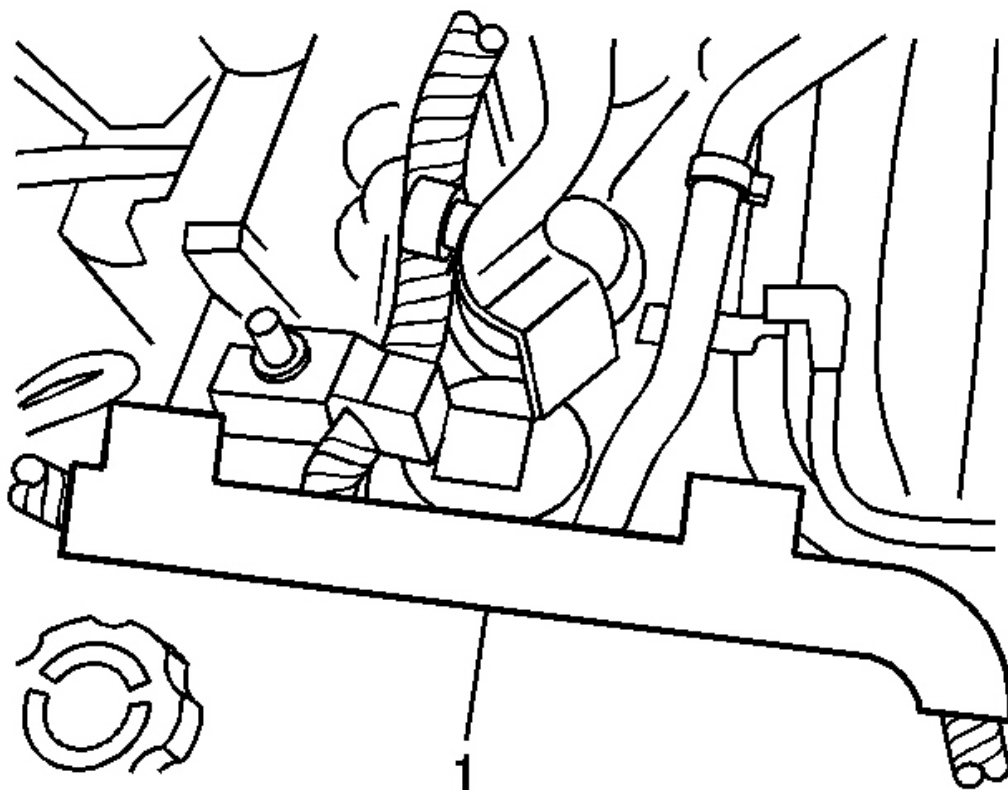
**Fig. 227: View Of Engine Harness Bracket & Bolts**  
Courtesy of GENERAL MOTORS CORP.

36. Install the engine harness bracket and bolt.

**Tighten:** Tighten the engine harness bracket bolt to 50 N.m (37 lb ft).

37. Install the front differential vent hose, to the engine harness bracket.  
38. Install all the harnesses to the engine harness bracket.

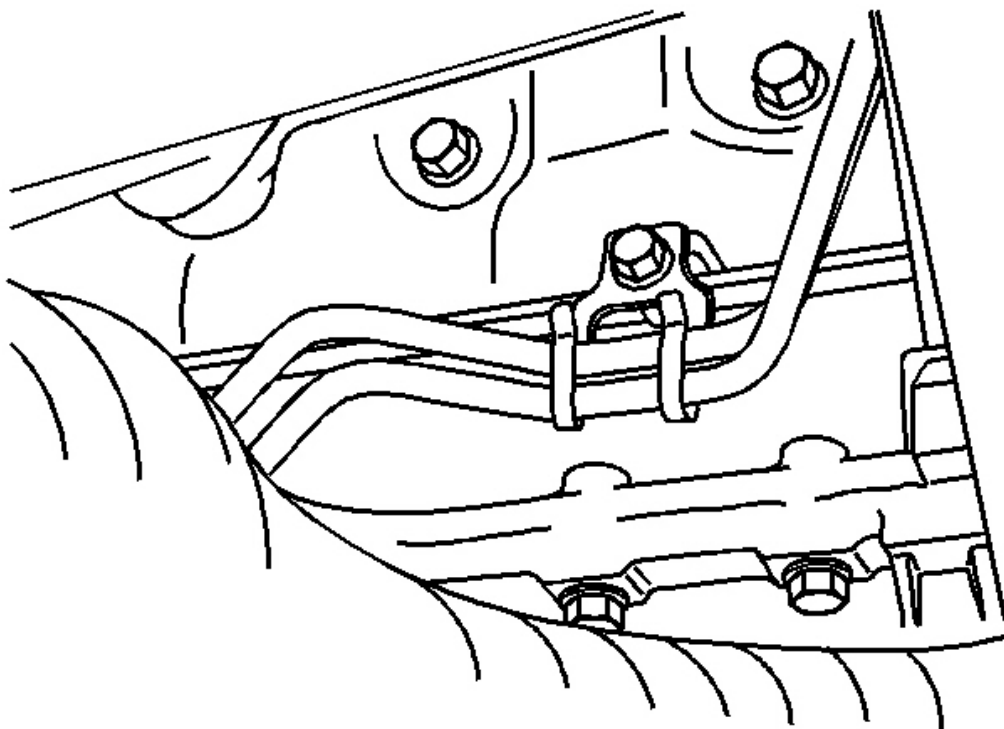
39. Install the PCM. Refer to **Powertrain Control Module (PCM) Replacement** in Engine Controls - 4.2L.
40. Install the power brake hose at booster



**Fig. 228: View Of Engine Electrical Harness Housing**  
Courtesy of GENERAL MOTORS CORP.

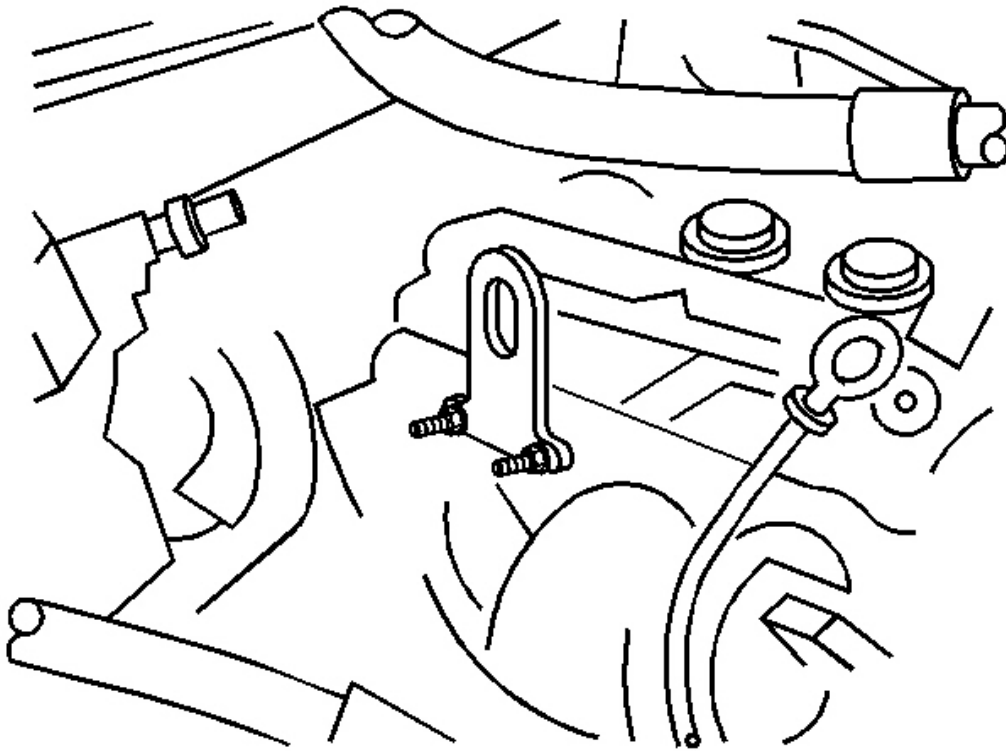
41. Install the harness retainer (1) to the original location.
42. Install the ignition coil harness electrical connectors.





**Fig. 229: View Of Transmission Cooler Lines & Clips**  
**Courtesy of GENERAL MOTORS CORP.**

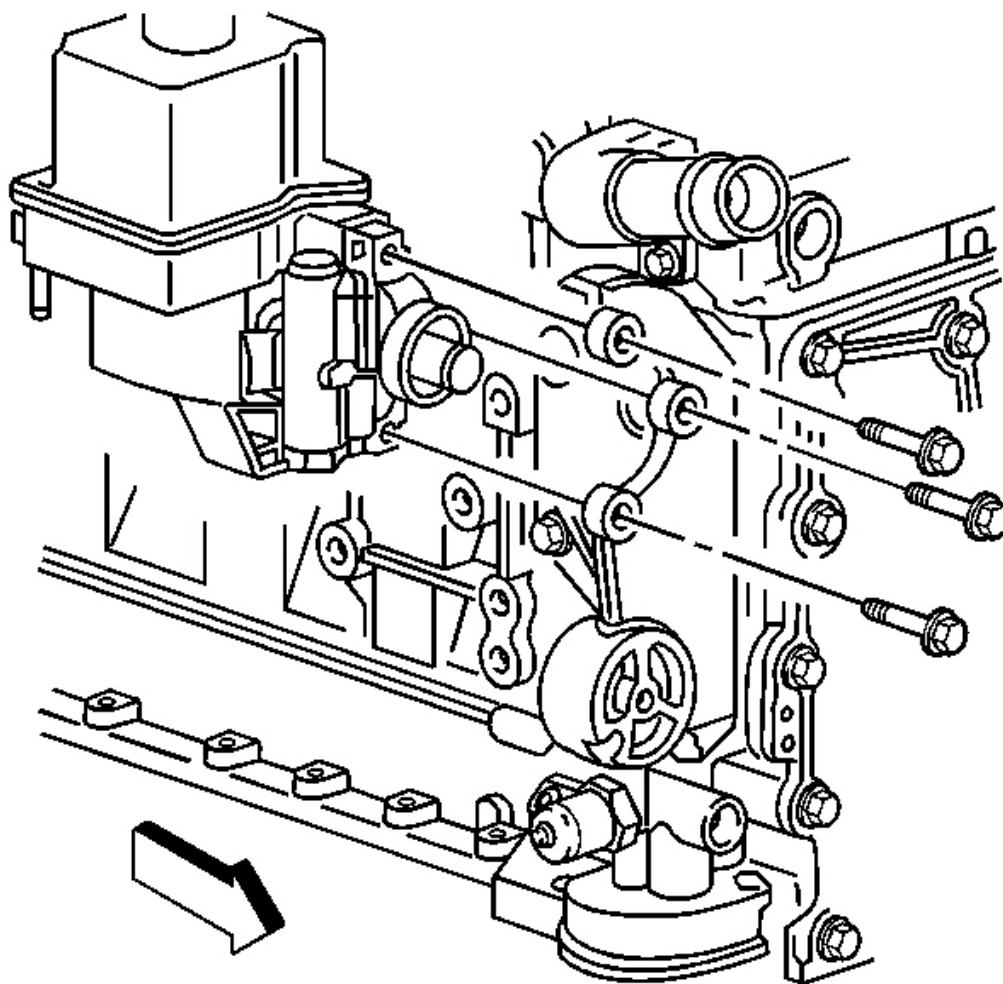
43. Clip the transmission cooler lines to the right side of the engine block.
44. Connect the camshaft phaser actuator valve electrical connector.
45. Connect the front axle actuator electrical connector.
46. Connect the A/C line at the accumulator.
47. Install the oxygen sensor electrical connector.



**Fig. 230: View Of Lift Hook**

Courtesy of GENERAL MOTORS CORP.

48. Remove the lift hook J 44220 . See **Special Tools and Equipment**.
49. Install the secondary AIR solenoid valve. Refer to **Secondary Air Injection (AIR) Solenoid Valve Replacement** in Engine Controls - 4.2L.
50. Install the heater hoses to the heater core. Refer to **Heater Hose Replacement - Inlet (SWB (Short Wheel Base))** or **Heater Hose Replacement - Inlet (LWB (Long Wheel Base))** and **Heater Hose Replacement - Outlet (SWB (Short Wheel Base))** or **Heater Hose Replacement - Outlet (LWB (Long Wheel Base))** in Heating, Ventilation, and Air Conditioning.
51. Install the power steering pump.



**Fig. 231: View Of Power Steering Pump Bolts**  
Courtesy of GENERAL MOTORS CORP.

52. Install the power steering pump bolts.

**Tighten:** Tighten the bolts to 25 N.m (18 lb ft).

53. Install the drive belt. Refer to **Drive Belt Replacement**.
54. Install cooling fan and shroud, tilting the radiator forward for clearance.
55. Finish installing the radiator. Refer to **Radiator Replacement (SWB - Short Wheel Base)** or **Radiator Replacement (LWB - Long Wheel Base)** in Engine Cooling.
56. Install transmission cooler lines together.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

57. Install the MAP sensor. Refer to **Manifold Absolute Pressure (MAP) Sensor Replacement** in Engine Controls - 4.2L.
58. Install the throttle body. Refer to **Throttle Body Assembly Replacement** in Engine Controls - 4.2L.
59. Install the hood latch. Refer to **Hood Latch Support Replacement** in Body Front End.
60. Install the head lamp housing. Refer to **Headlamp Housing Panel Replacement** in Body Front End.
61. Install the grill. Refer to **Grille Replacement** in Exterior Trim.
62. Install the washer solvent container. Refer to **Washer Solvent Container Replacement** in Wipers/Washer Systems.
63. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 4.2L.
64. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.
65. Install the hood. Refer to **Hood Replacement** in Body Front End.
66. Service the engine oil.
67. Fill the cooling system. Refer to **Draining and Filling Cooling System (Body Vin Code 6)** in Engine Cooling.
68. Recharge the refrigerant. Refer to **Refrigerant Recovery and Recharging** in Heating, Ventilation and Air Conditioning.
69. Perform the CKP system variation learn procedure. Refer to **CKP System Variation Learn Procedure** in Engine Controls - 4.2L.

**IMPORTANT: After an overhaul, the engine should be tested. Use the following procedure after the engine is installed in the vehicle.**

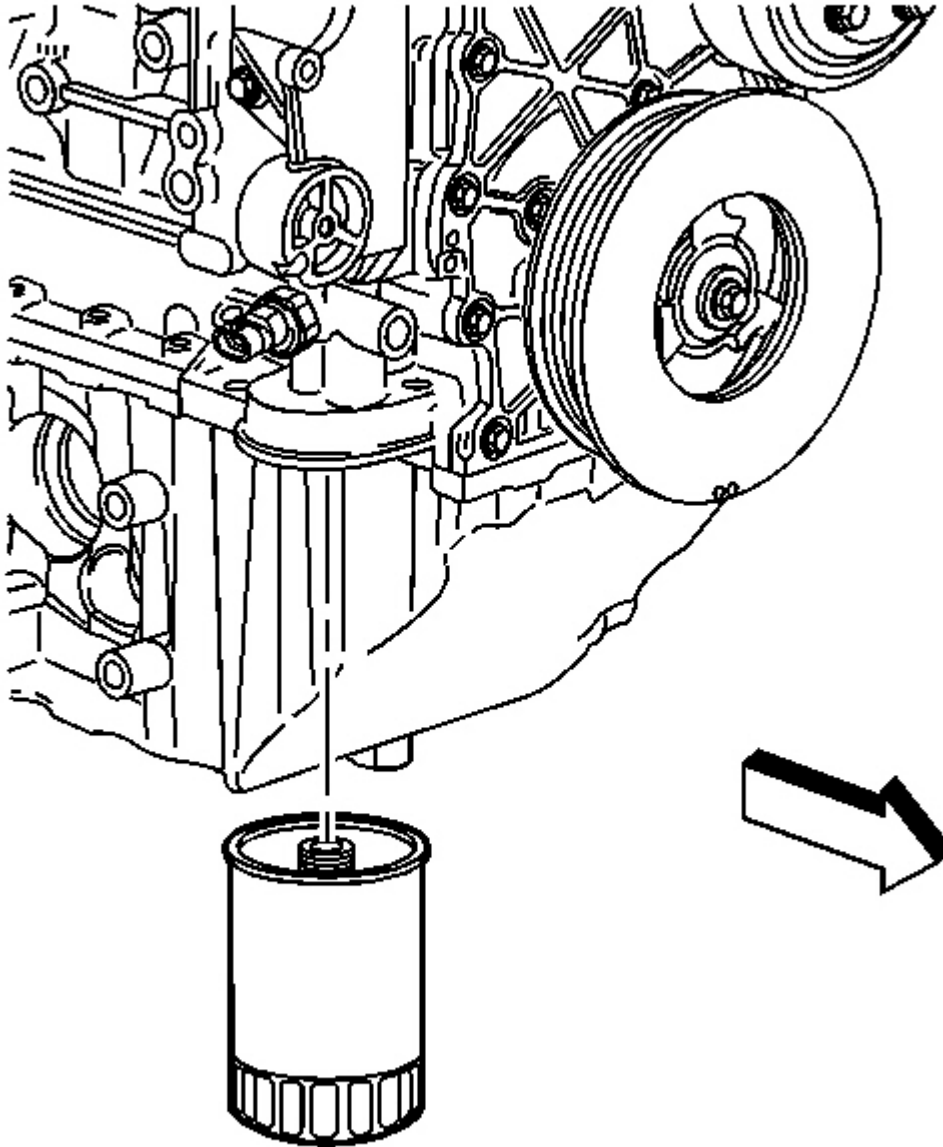
- Disable the ignition system.
  - Crank the engine several times. Listen for unusual noises or evidence that parts are binding.
  - Enable the ignition system.
  - Start the engine and listen for unusual noises.
  - Check the vehicle oil pressure gage or light and confirm that the engine has acceptable oil pressure.
  - Run the engine speed at about 1000 RPM until the engine has reached normal operating temperature.
  - Listen for a sticking lifter and other unusual noises.
  - Inspect for fuel, oil and/or coolant leaks while the engine is running.
  - Perform a final inspection for the proper engine oil and coolant levels.
70. Install the hood. Refer to **Hood Replacement** in Body Front End.

## ENGINE OIL AND OIL FILTER REPLACEMENT

### Removal Procedure

1. Remove the oil fill cap.
2. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

3. Remove the oil pan drain plug and drain the oil into a suitable container.



**Fig. 232: View Of Oil Filter**  
Courtesy of GENERAL MOTORS CORP.

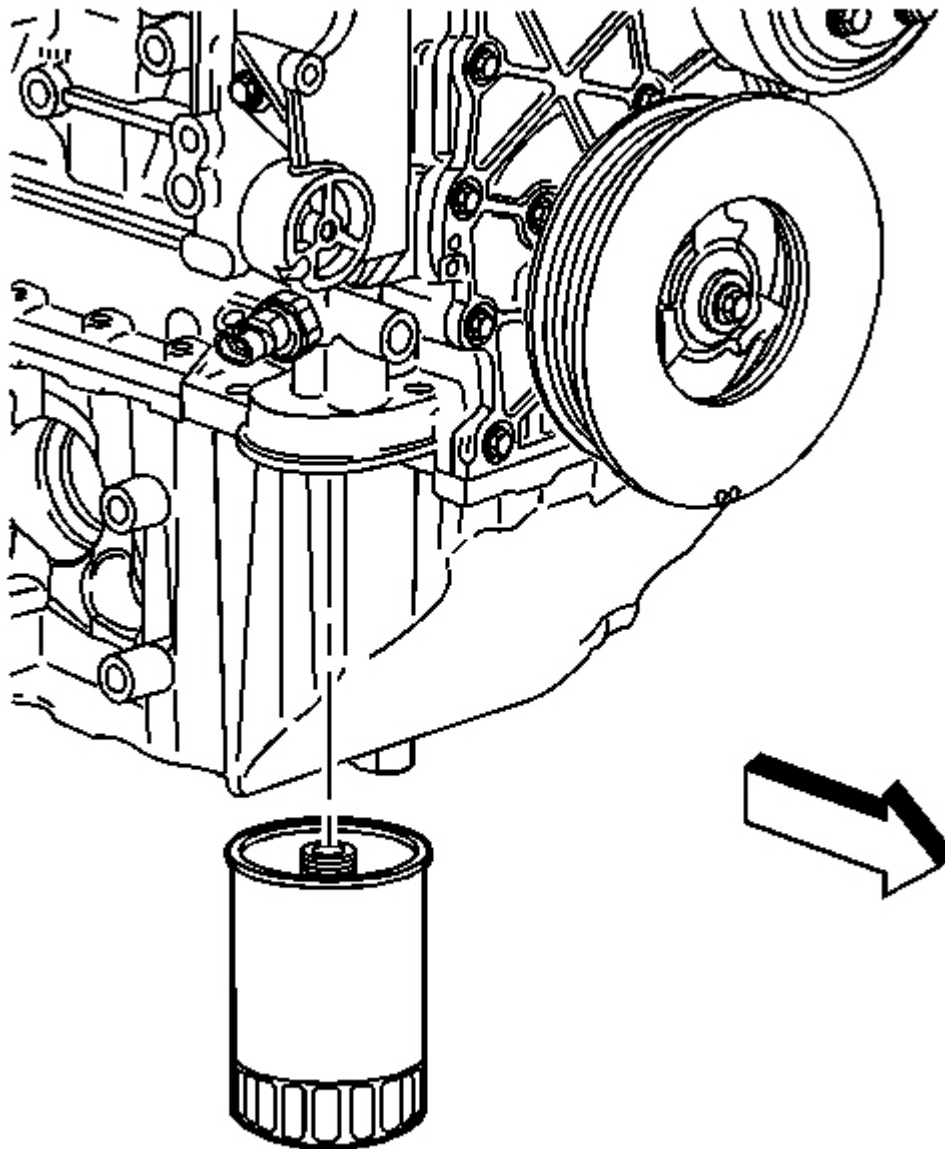
4. Remove the oil filter using a suitable wrench.

|   |
|---|
| <b>2004 Isuzu Ascender LS</b>                   |
| 2004 ENGINE Engine Mechanical - 4.2L - Ascender |

5. Inspect the old oil filter to ensure the filter seal is not left on the engine block.

**Installation Procedure**

1. Wipe the excess oil from the oil filter housing.
2. Lubricate the oil filter seal with clean engine oil.



**Fig. 233: View Of Oil Filter**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

3. Install the new oil filter.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

**Tighten:** Tighten the oil filter to 17 N.m (22 lb ft) plus 150 degrees.

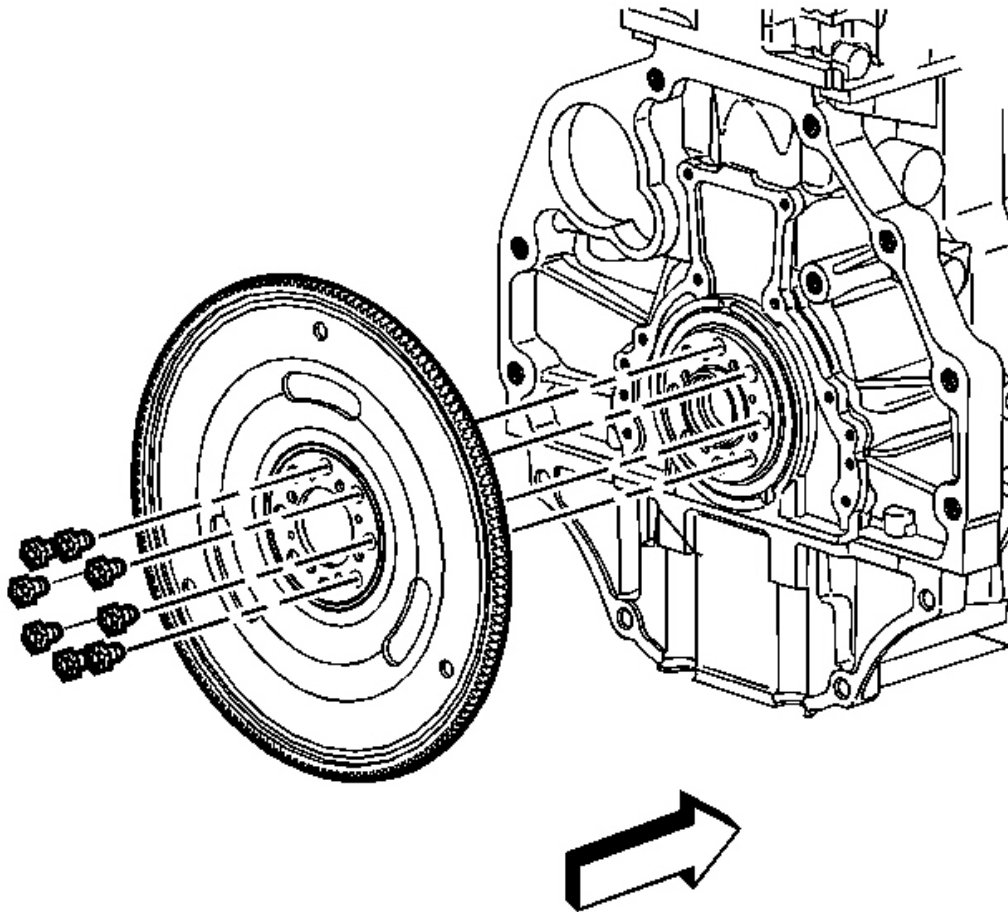
4. Install the oil pan drain plug.

**Tighten:** Tighten the oil pan drain plug to 26 N.m (19 lb ft).

5. Lower the vehicle.
6. Fill the crankcase with the proper quantity of engine oil. Refer to **Capacities - Approximate Fluid** and **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.
7. Remove the oil level indicator.
8. Wipe the indicator with a clean cloth.
9. Install the oil level indicator.
10. Remove the oil level indicator and check the oil level.
11. Add oil if necessary.
12. Check for any oil leaks.

### ENGINE FLYWHEEL REMOVAL

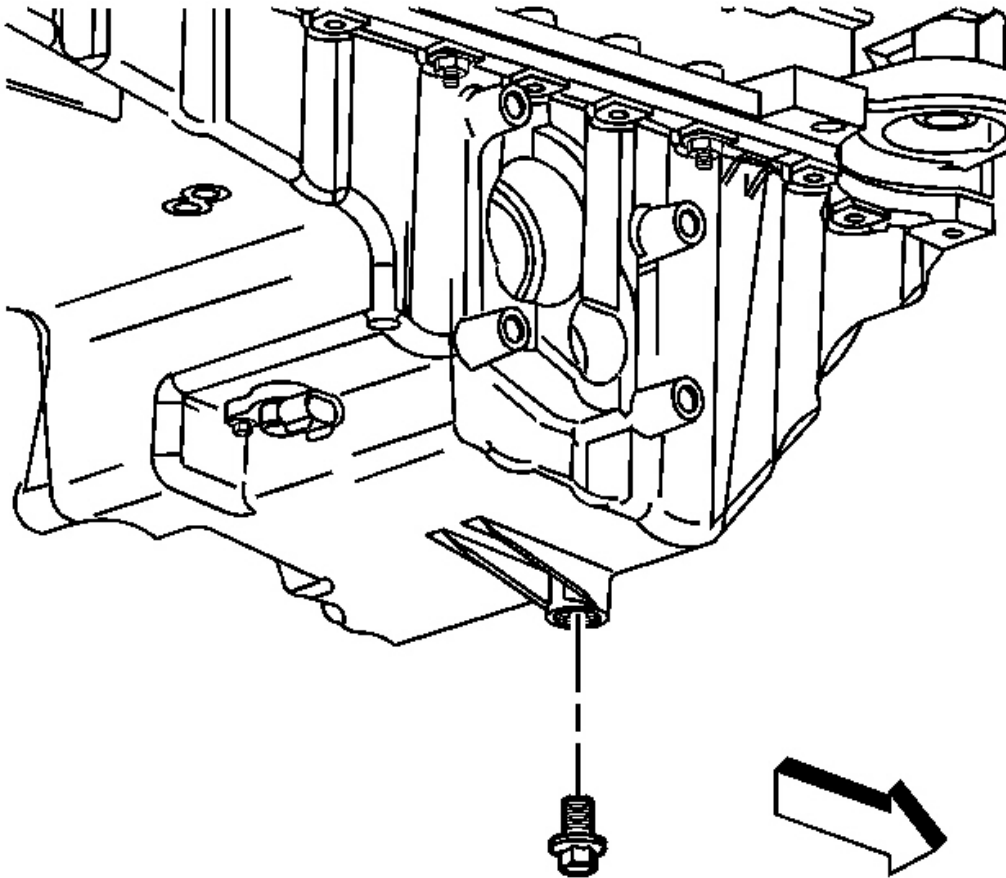




**Fig. 234: View Of Flywheel & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

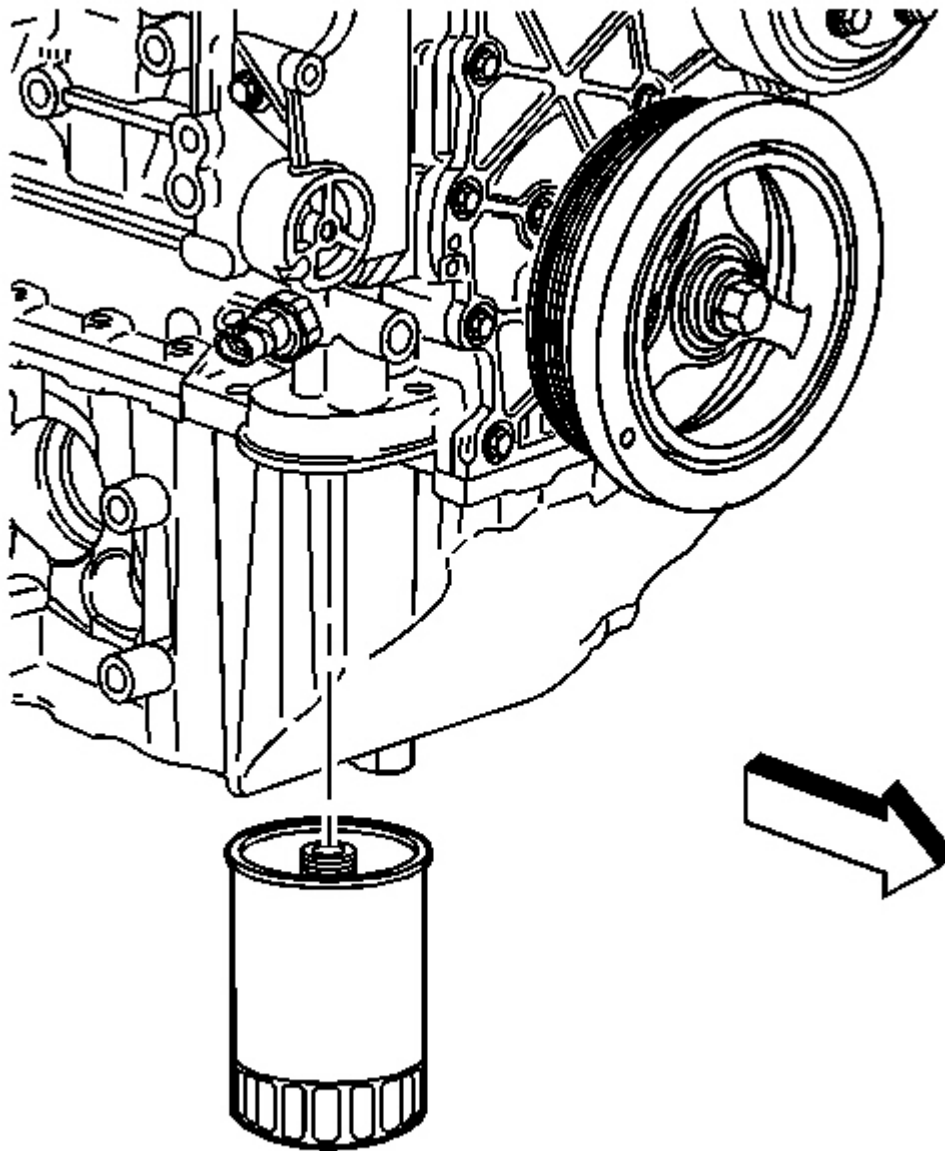
1. Remove the flywheel bolts.
2. Remove the flywheel.

## **DRAINING FLUIDS AND OIL FILTER REMOVAL**



**Fig. 235: View Of Oil Pan Drain Plug**  
**Courtesy of GENERAL MOTORS CORP.**

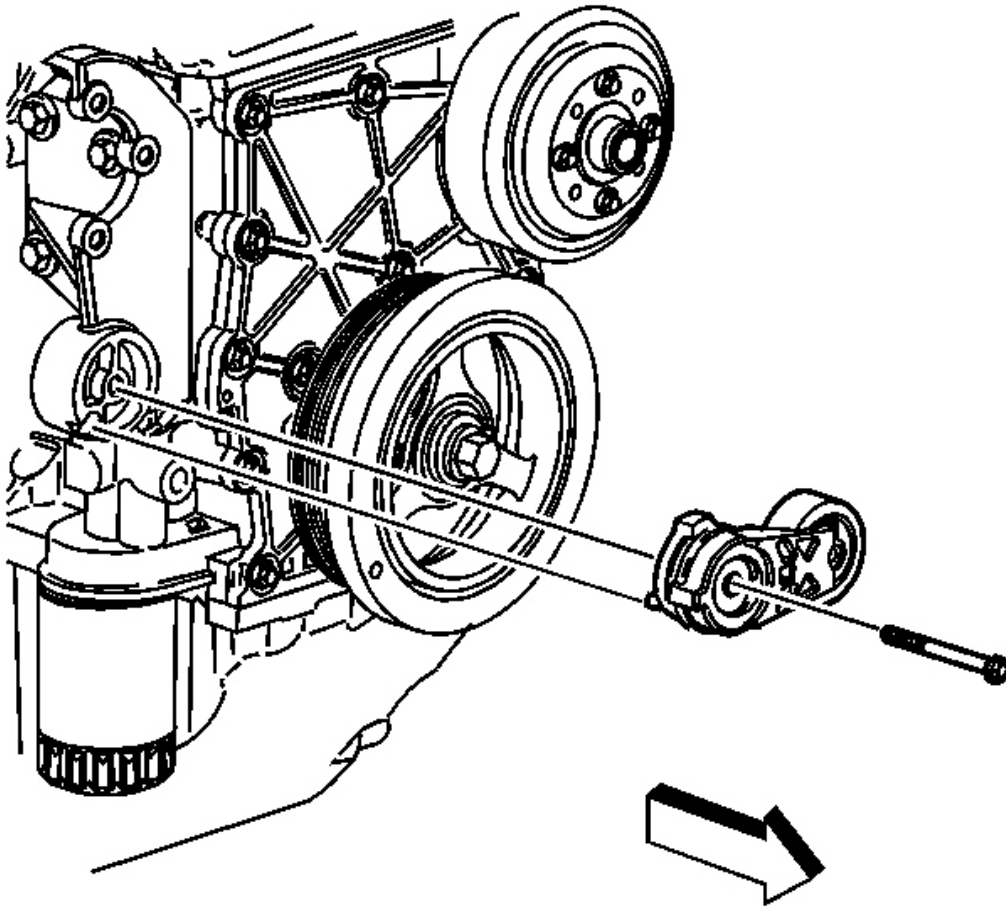
1. Remove the oil pan drain plug.
2. Drain the engine oil.



**Fig. 236: Locating Oil Filter**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the oil filter.

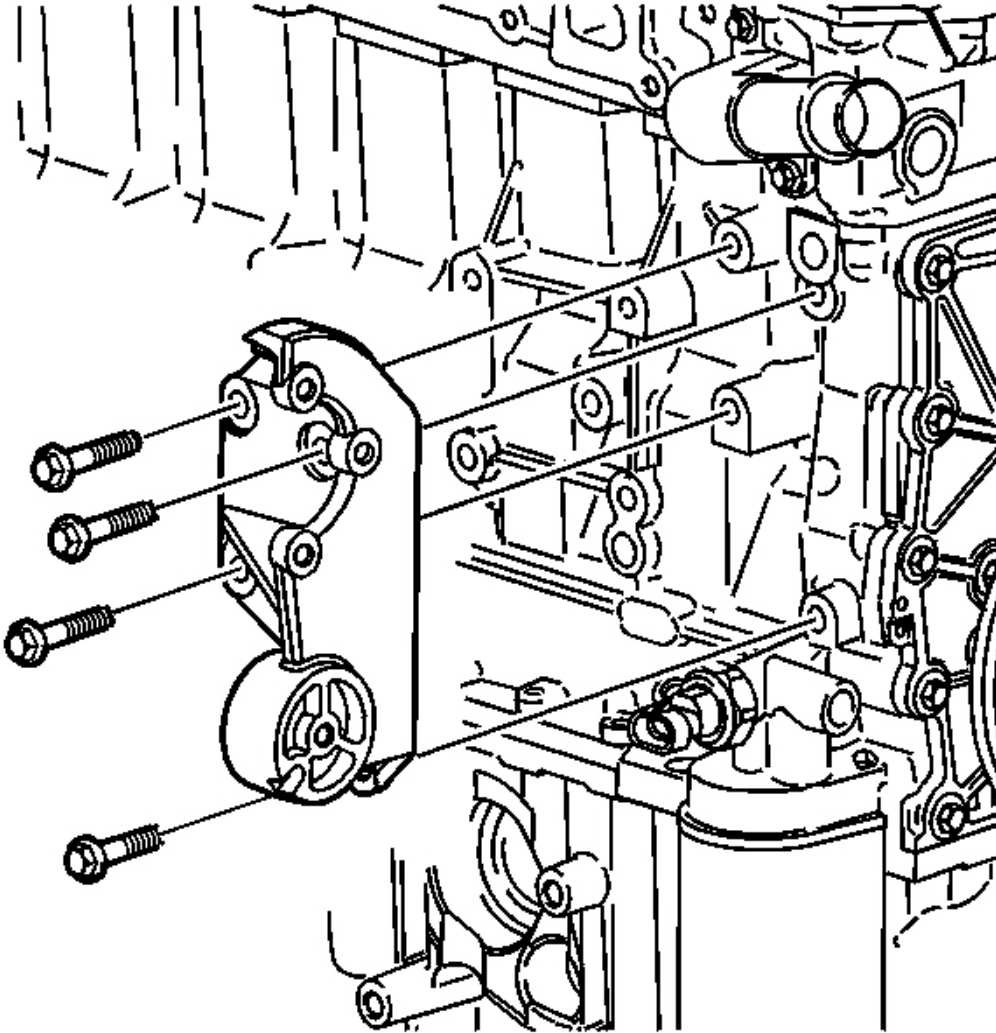
#### **DRIVE BELT TENSIONER REMOVAL**



**Fig. 237: View Of Drive Belt Tensioner & Bolt**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the drive belt tensioner bolt.
2. Remove the drive belt tensioner.

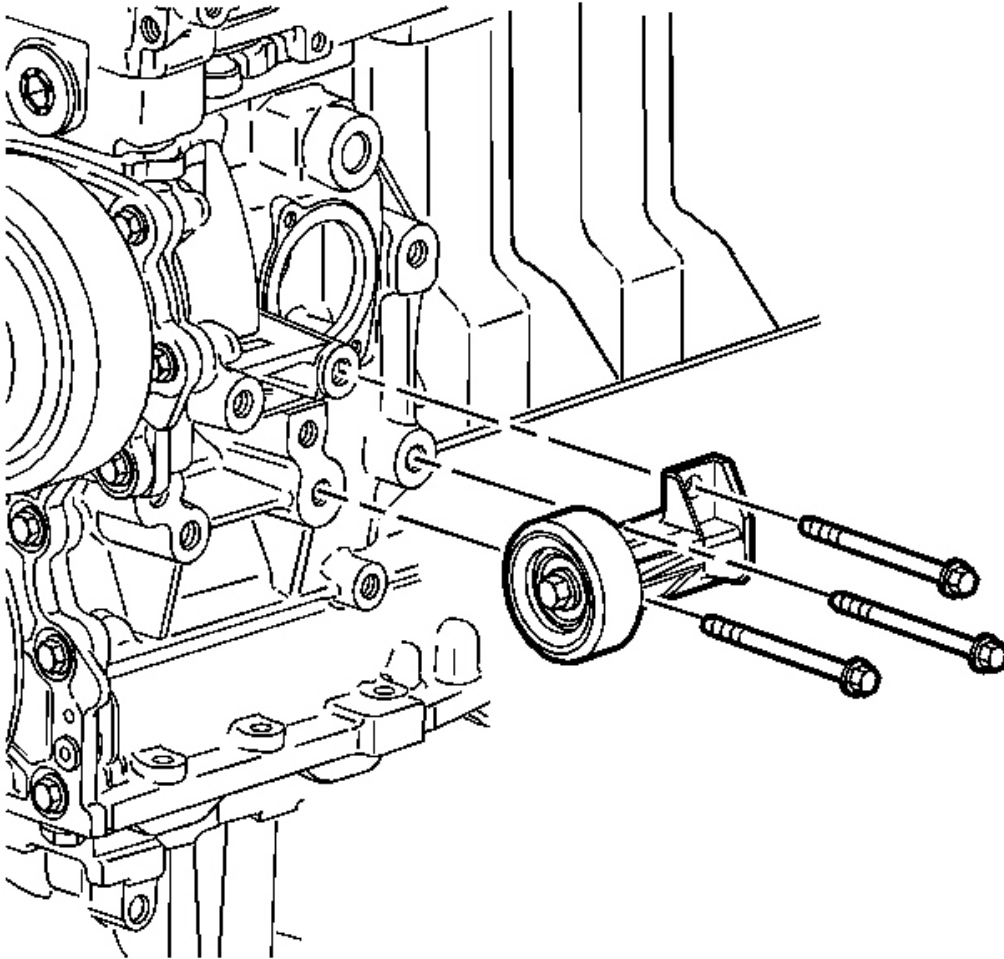
#### **POWER STEERING PUMP BRACKET REMOVAL**



**Fig. 238: View Of Power Steering Pump Bracket & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the power steering pump bracket bolts.
2. Remove the power steering pump bracket.

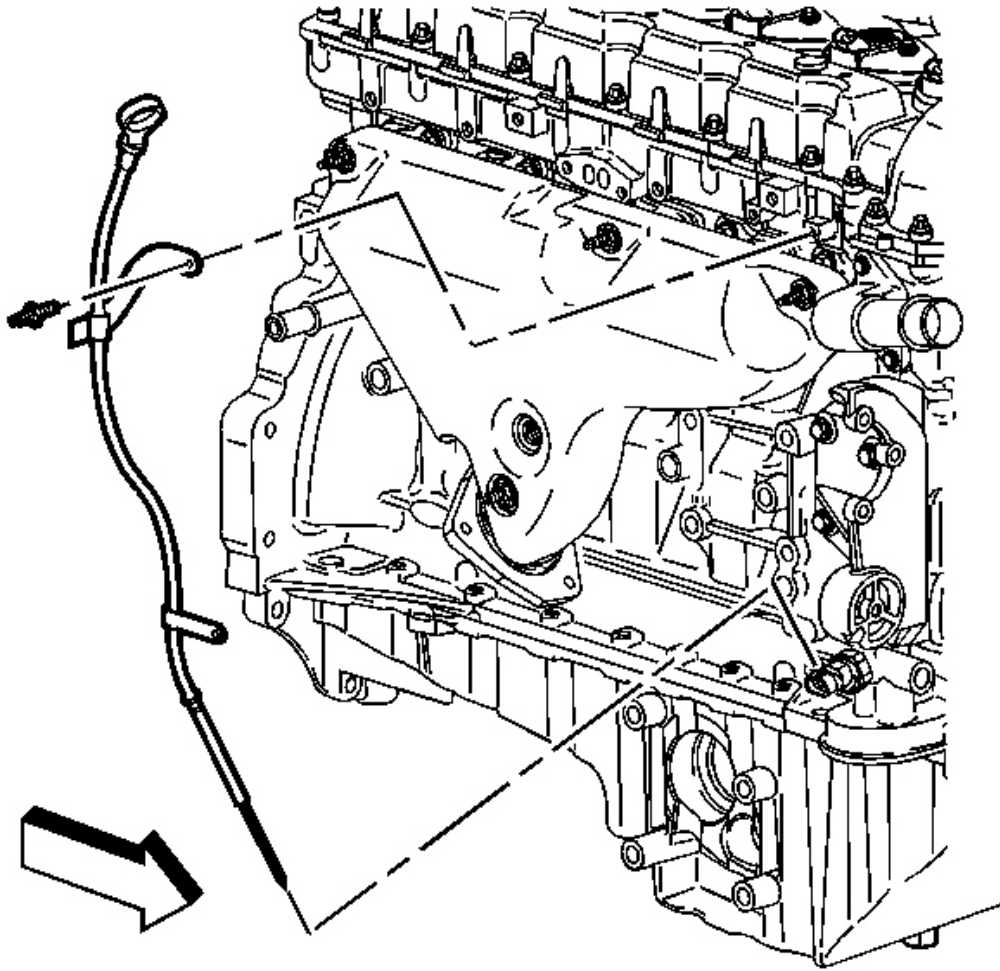
#### **DRIVE BELT IDLER PULLEY REMOVAL**



**Fig. 239: View Of Drive Belt Idler Pulley & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the drive belt idler pulley bolts.
2. Remove the drive belt idler pulley.

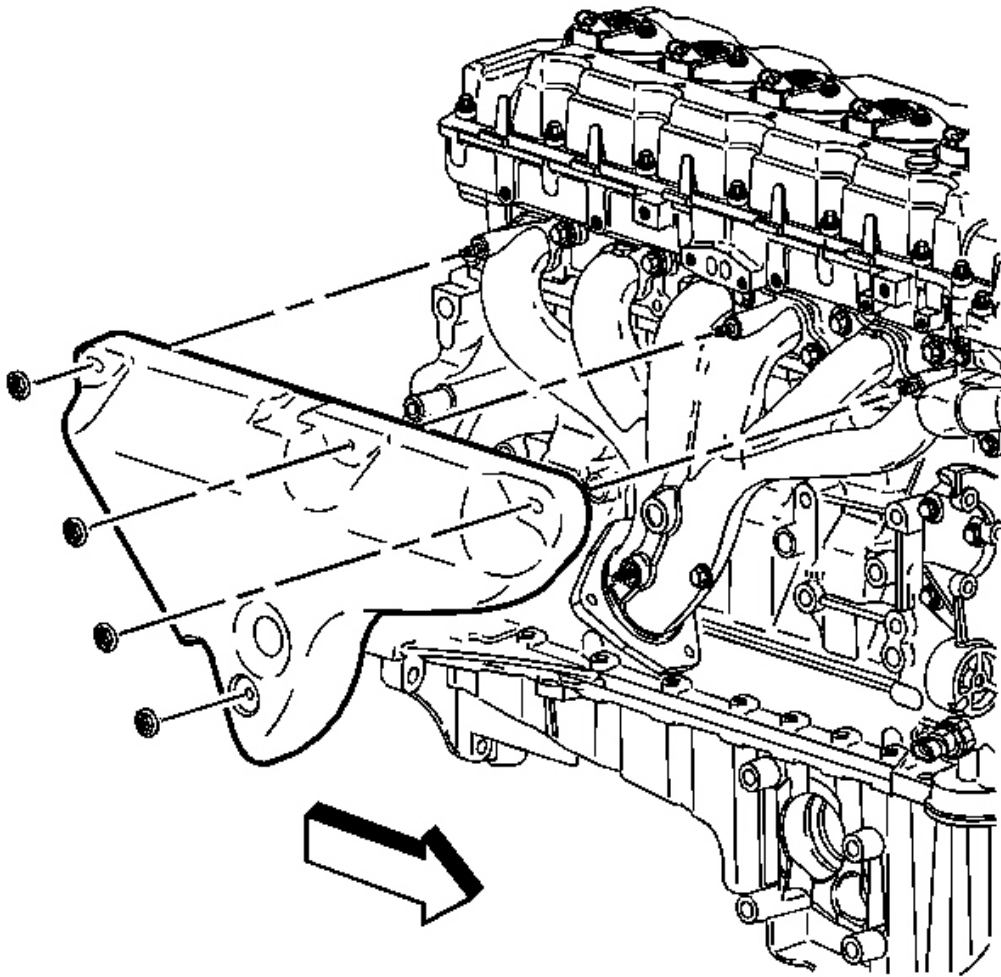
#### **OIL LEVEL INDICATOR AND TUBE REMOVAL**



**Fig. 240: View Of Oil Level Indicator Tube Stud**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the oil level indicator.
2. Remove the oil level indicator tube stud.
3. Remove the oil level indicator tube.

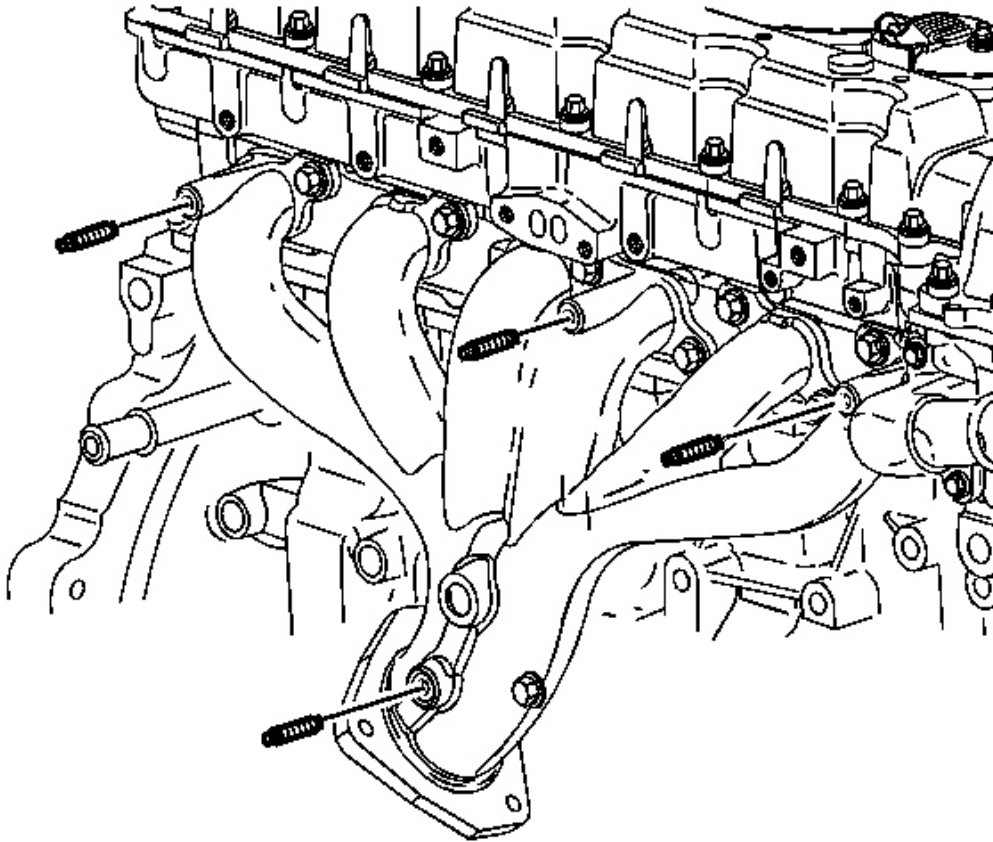
## **EXHAUST MANIFOLD REMOVAL**



**Fig. 241: View Of Exhaust Manifold Heat Shield & Nuts**  
**Courtesy of GENERAL MOTORS CORP.**

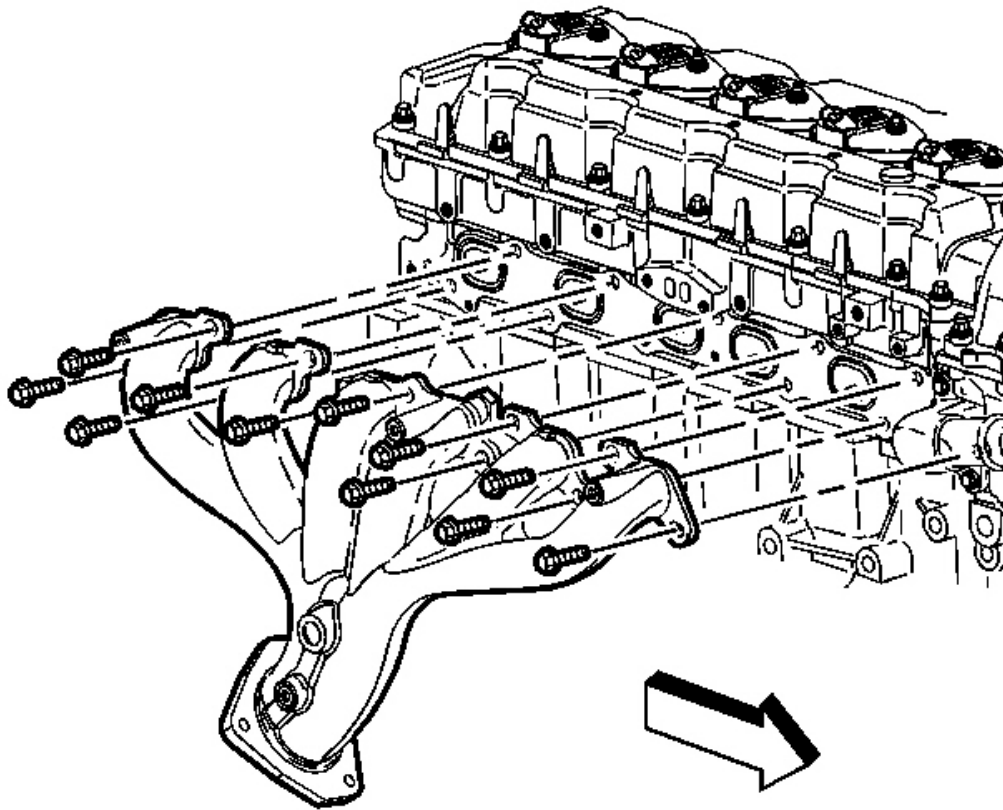
1. Remove the exhaust manifold heat shield nuts.
2. Remove the exhaust manifold heat shield.





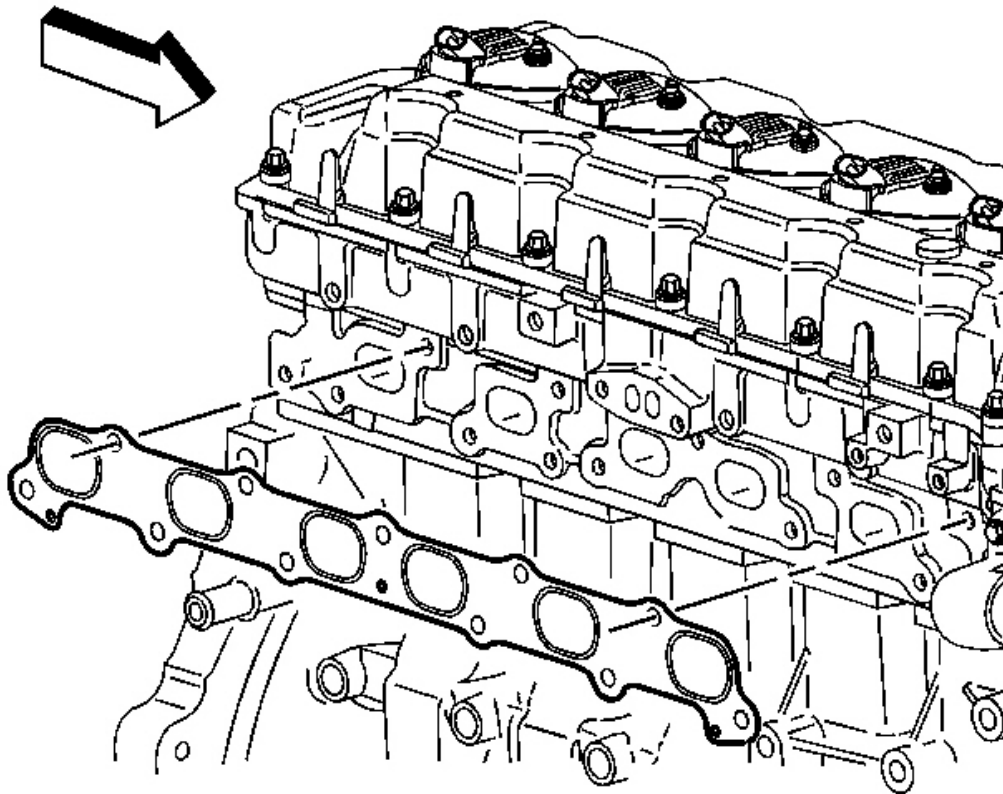
**Fig. 242: View Of Exhaust Manifold Studs**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the exhaust manifold studs (if needed).



**Fig. 243: View Of Exhaust Manifold & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

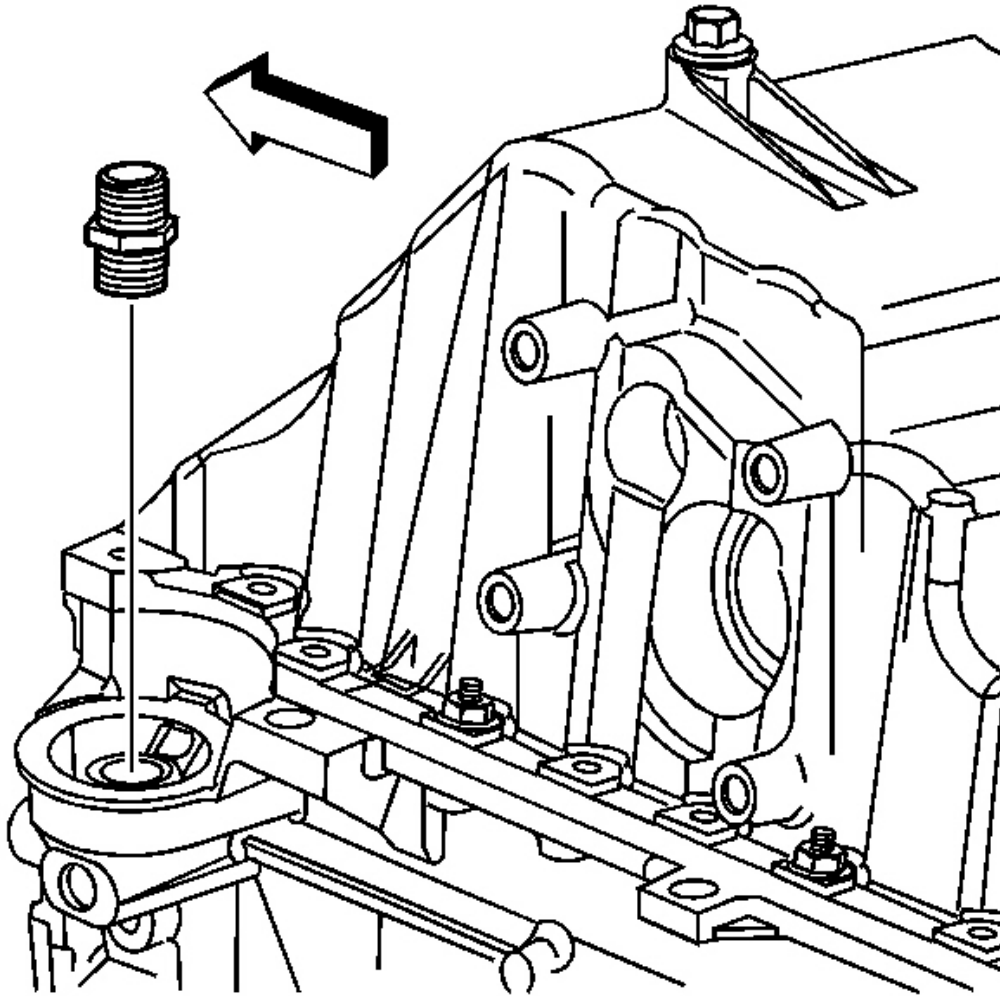
4. Remove the exhaust manifold bolts.
5. Remove the exhaust manifold.



**Fig. 244: View Of Exhaust Manifold Gasket**  
**Courtesy of GENERAL MOTORS CORP.**

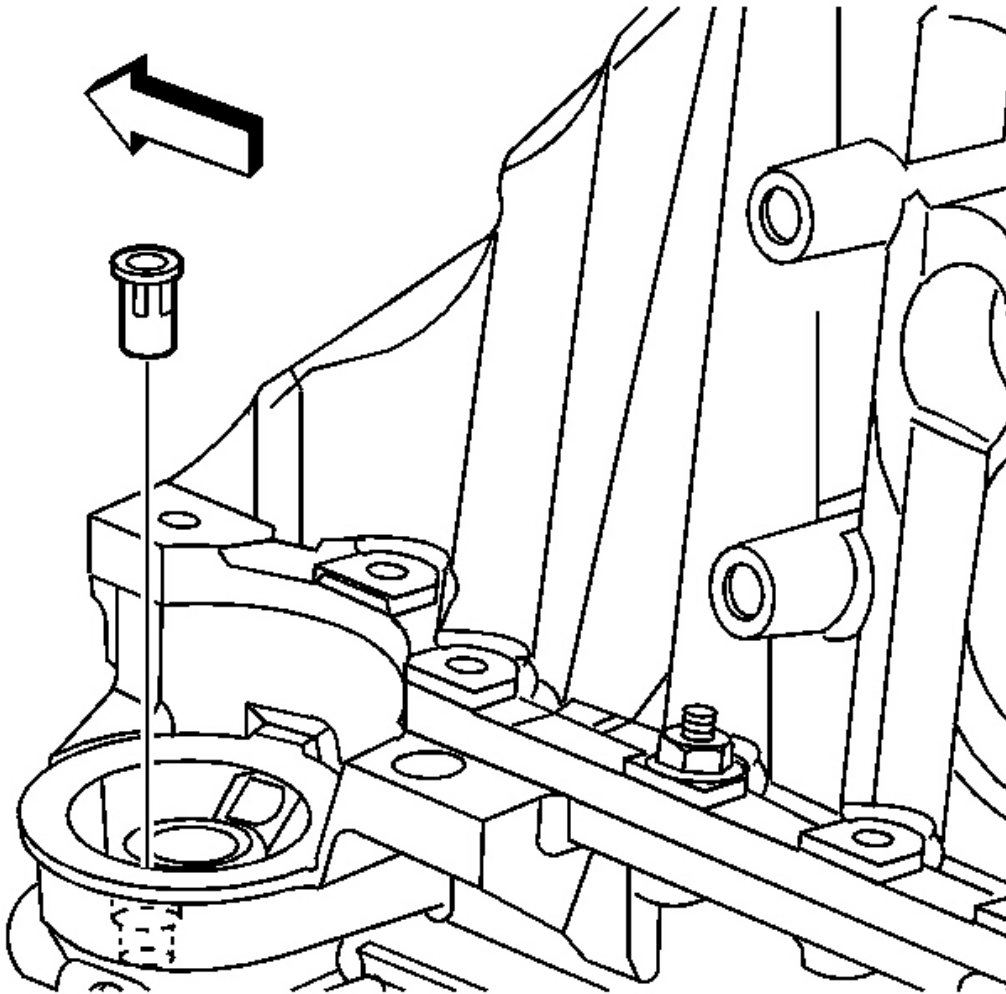
6. Remove the exhaust manifold gasket.

#### **OIL FILTER ADAPTER REMOVAL**



**Fig. 245: View Of Oil Filter Adapter**  
**Courtesy of GENERAL MOTORS CORP.**

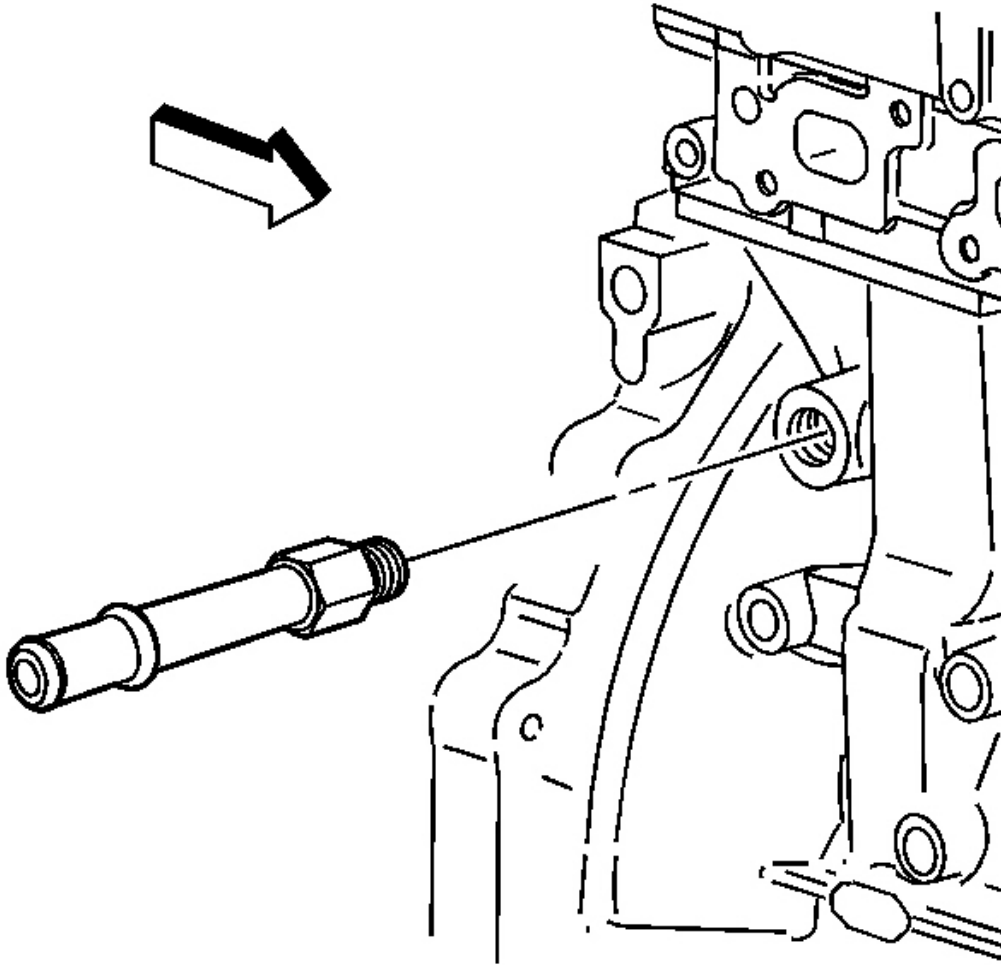
1. Remove the oil filter adapter.



**Fig. 246: View Of Oil Filter Bypass Valve**  
**Courtesy of GENERAL MOTORS CORP.**

2. Remove the oil filter bypass valve.

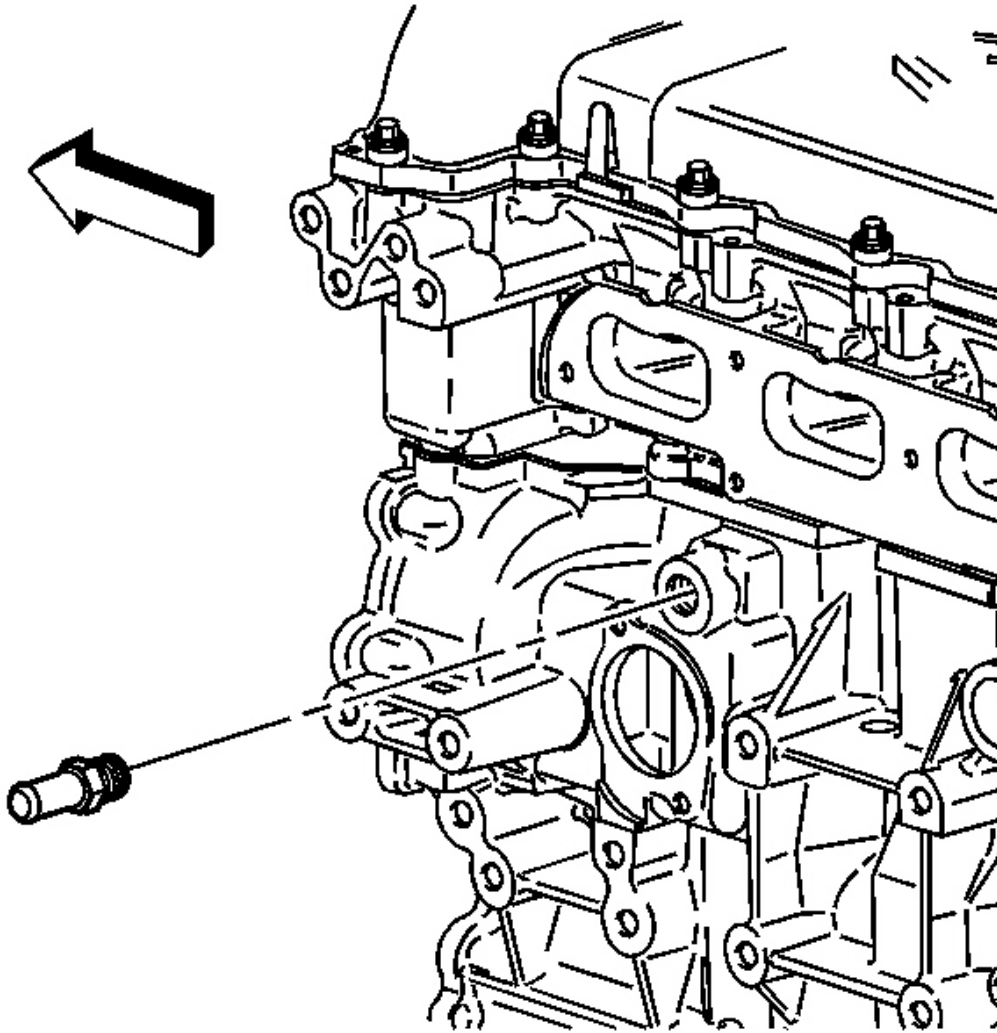
#### **HEATER INLET HOSE FITTING REMOVAL**



**Fig. 247: View Of Heater Inlet Hose Fitting**  
Courtesy of GENERAL MOTORS CORP.

Remove the heater inlet hose fitting.

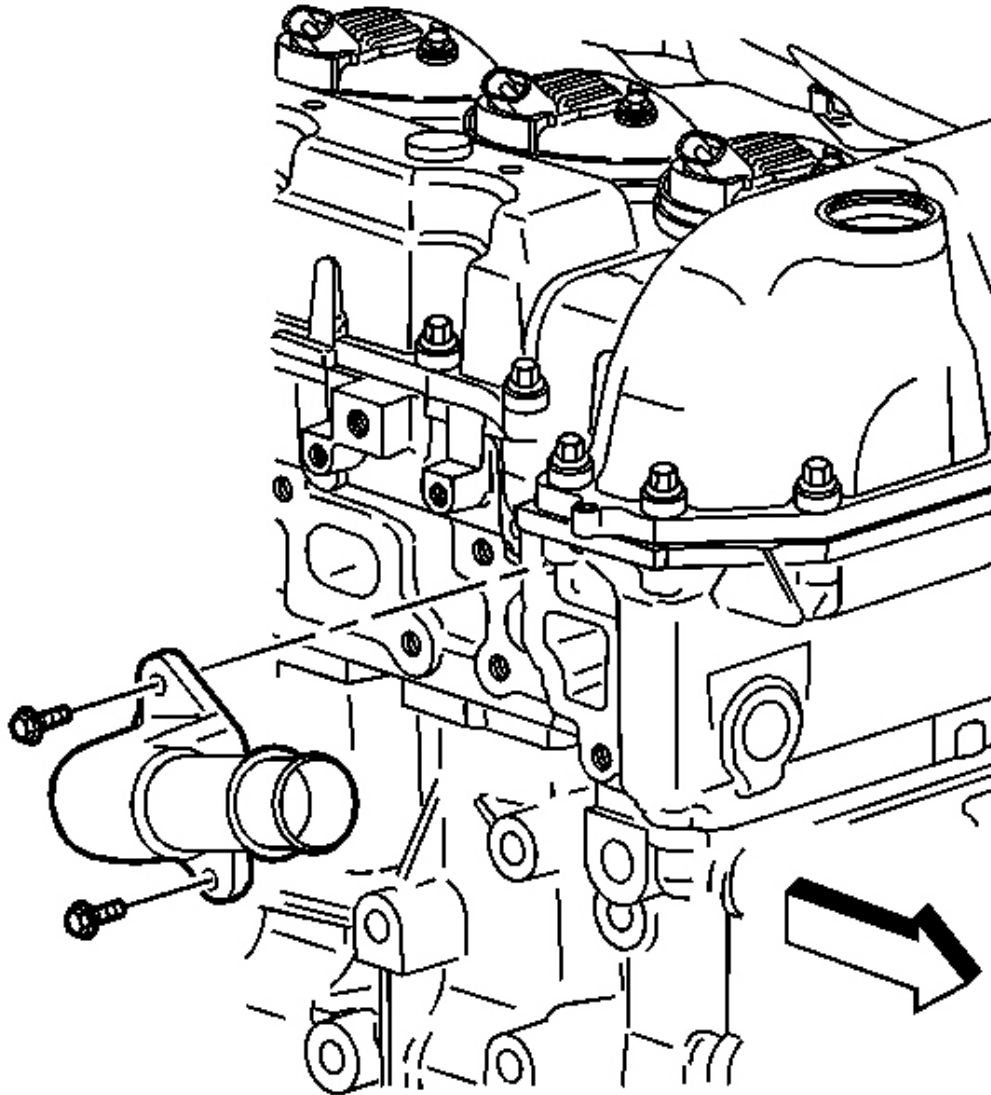
#### **HEATER OUTLET HOSE FITTING REMOVAL**



**Fig. 248: View Of Heater Outlet Hose Fitting**  
Courtesy of GENERAL MOTORS CORP.

Remove the heater outlet hose fitting.

#### **WATER OUTLET REMOVAL**



**Fig. 249: View Of Water Outlet**  
Courtesy of GENERAL MOTORS CORP.

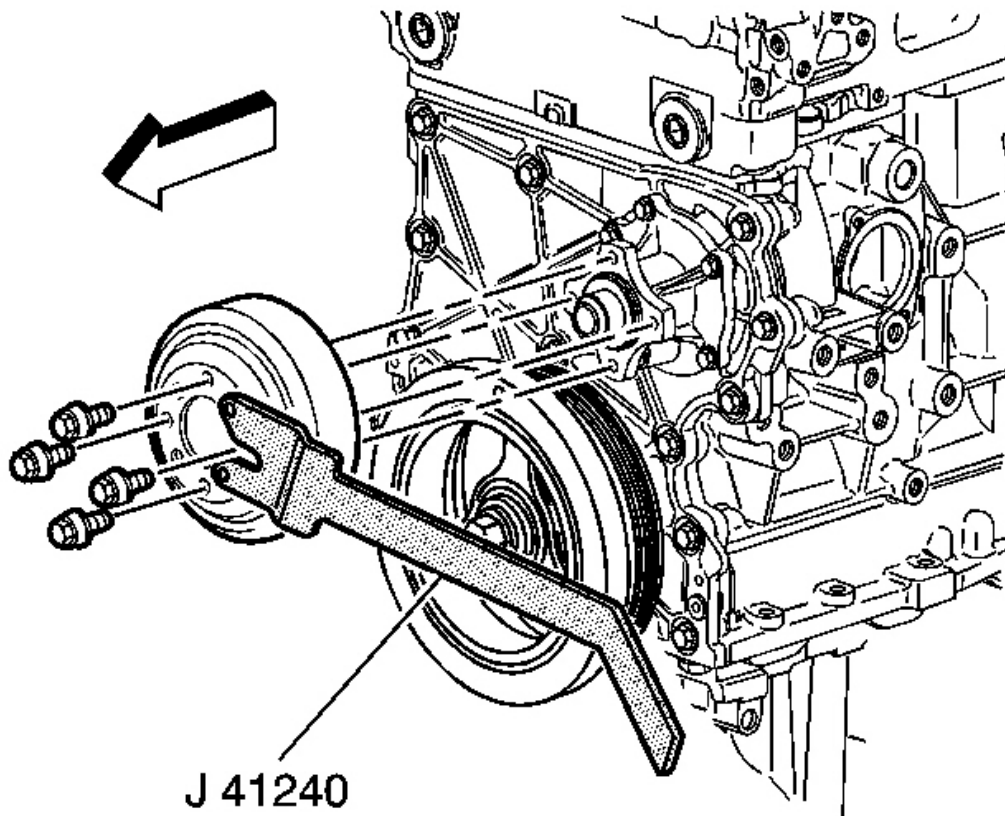
1. Remove the water outlet bolts.
2. Remove the water outlet.

## **WATER PUMP REMOVAL**



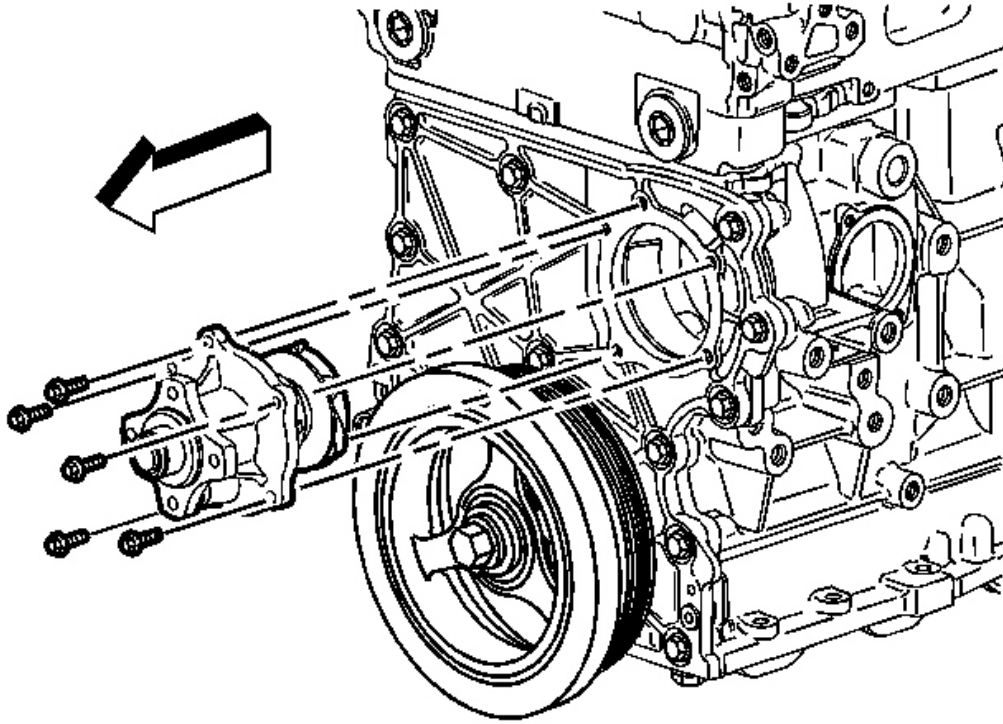
### Tool Required

**J 41240** Fan Clutch Remover and Installer. See Special Tools and Equipment.



**Fig. 250: View Of Water Pump Pulley, Bolts & J 41240**  
Courtesy of GENERAL MOTORS CORP.

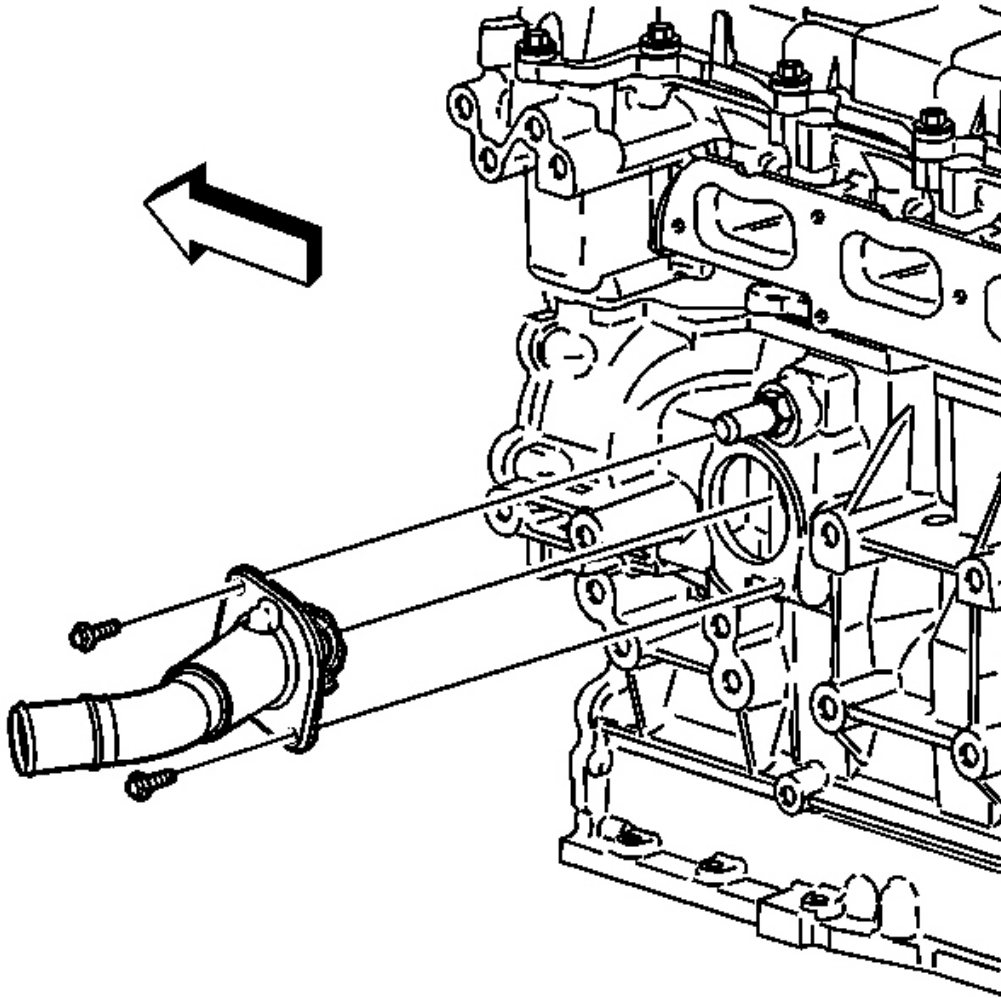
1. Install **J 41240** to hold the pulley. See Special Tools and Equipment.
2. Remove the water pump pulley bolts.
3. Remove **J 41240** . See Special Tools and Equipment.
4. Remove the water pump pulley



**Fig. 251: View Of Water Pump, Gasket & Bolts**  
Courtesy of GENERAL MOTORS CORP.

5. Remove the water pump bolts.
6. Remove the water pump.
7. Remove the water pump gasket.

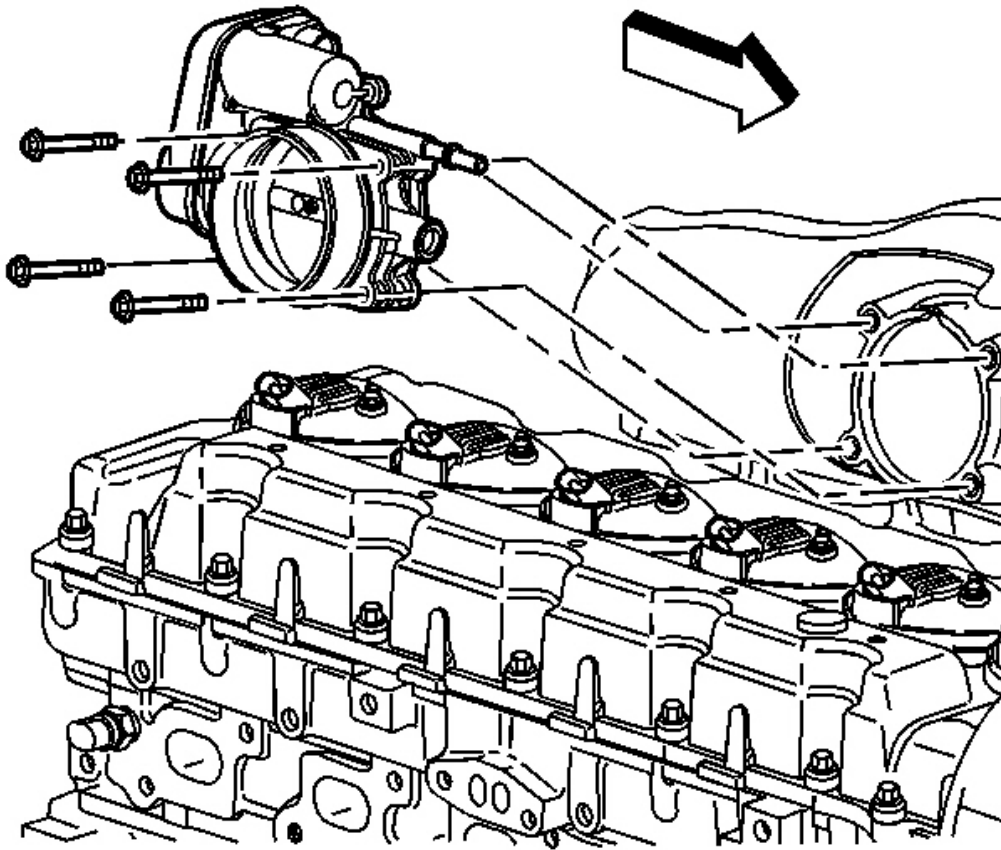
#### **THERMOSTAT HOUSING REMOVAL**



**Fig. 252: View Of Thermostat Housing & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

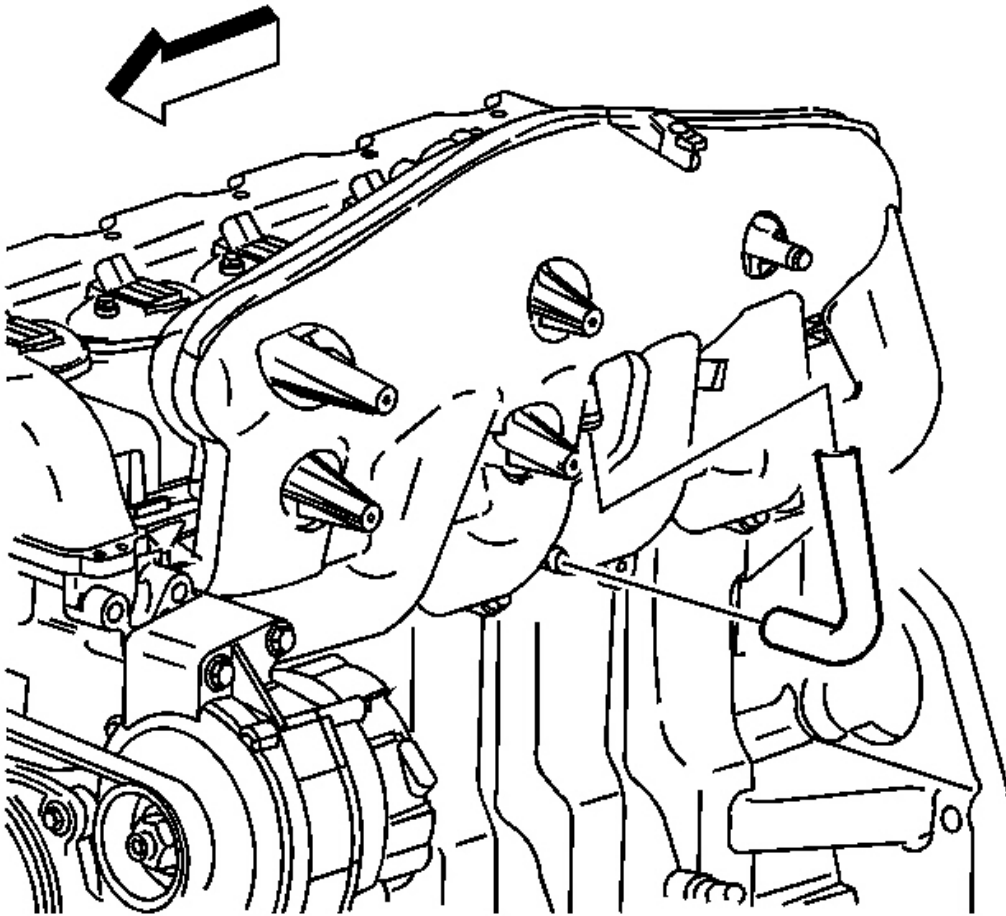
1. Remove the thermostat housing bolts.
2. Remove the thermostat housing.

## **INTAKE MANIFOLD REMOVAL**



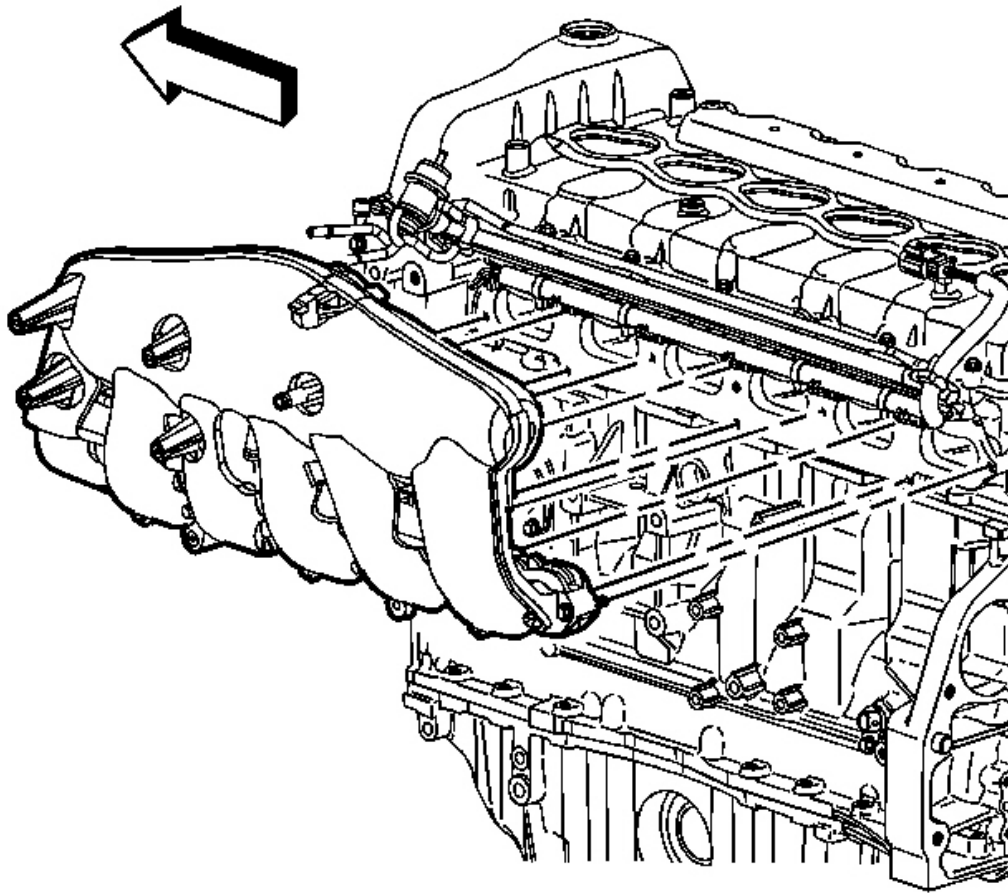
**Fig. 253: View Of Throttle Control Module & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the throttle control module bolts.
2. Remove the throttle control module.
3. Remove the throttle control module gasket.



**Fig. 254: View Of Crankcase Ventilation Hose Location**  
Courtesy of GENERAL MOTORS CORP.

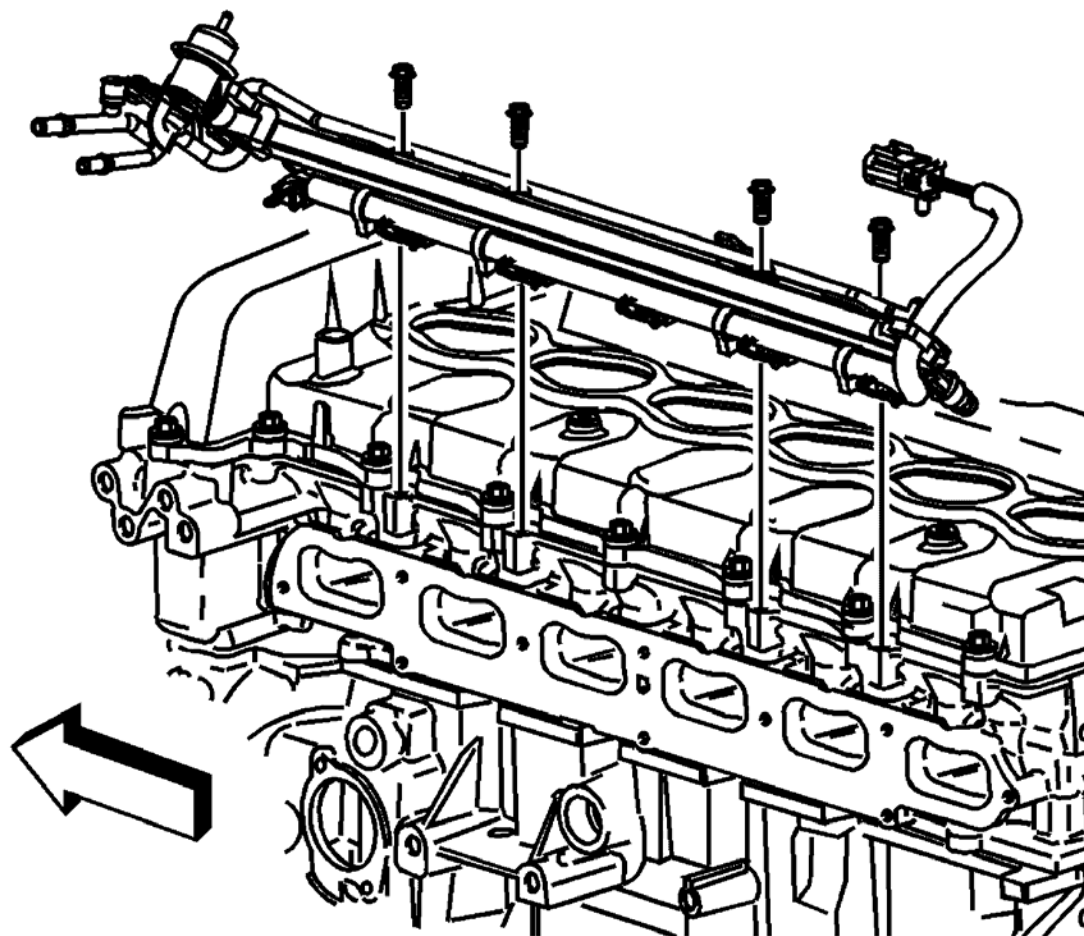
4. Remove the crankcase ventilation hose.



**Fig. 255: View Of Intake Manifold & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

5. Remove the intake manifold and bolts.

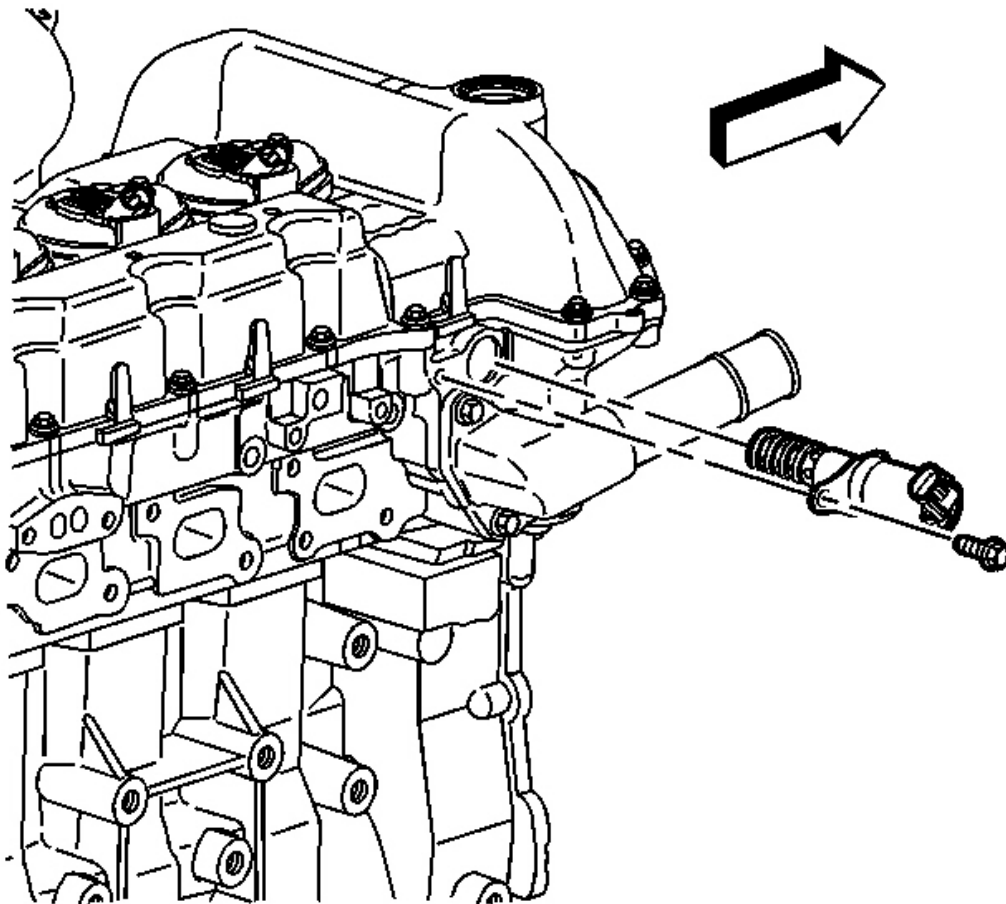
#### **FUEL RAIL AND INJECTORS REMOVAL**



**Fig. 256: View Of Fuel Injector Rail & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the fuel injector rail bolts.
2. Remove the fuel injector rail.

#### **CAMSHAFT POSITION ACTUATOR VALVE REMOVAL**

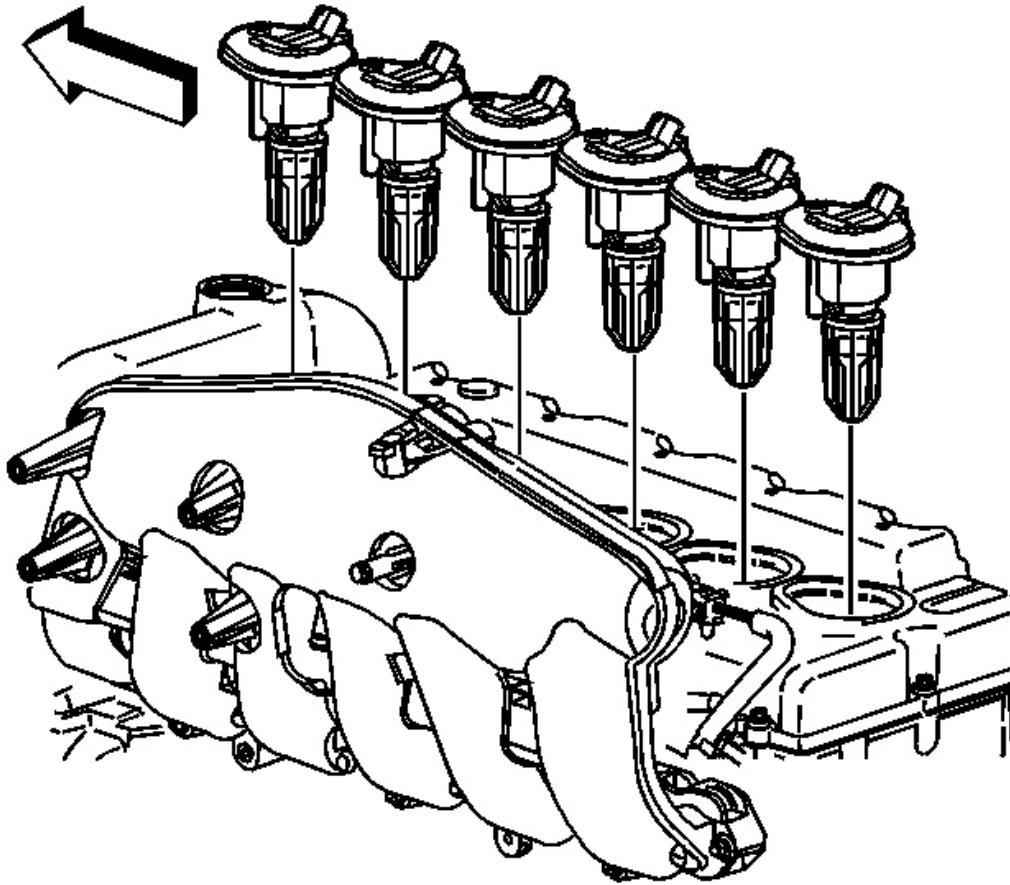


**Fig. 257: View Of Camshaft Position Actuator Valve & Bolt**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the camshaft position actuator valve bolt.
2. Remove the camshaft position actuator valve.

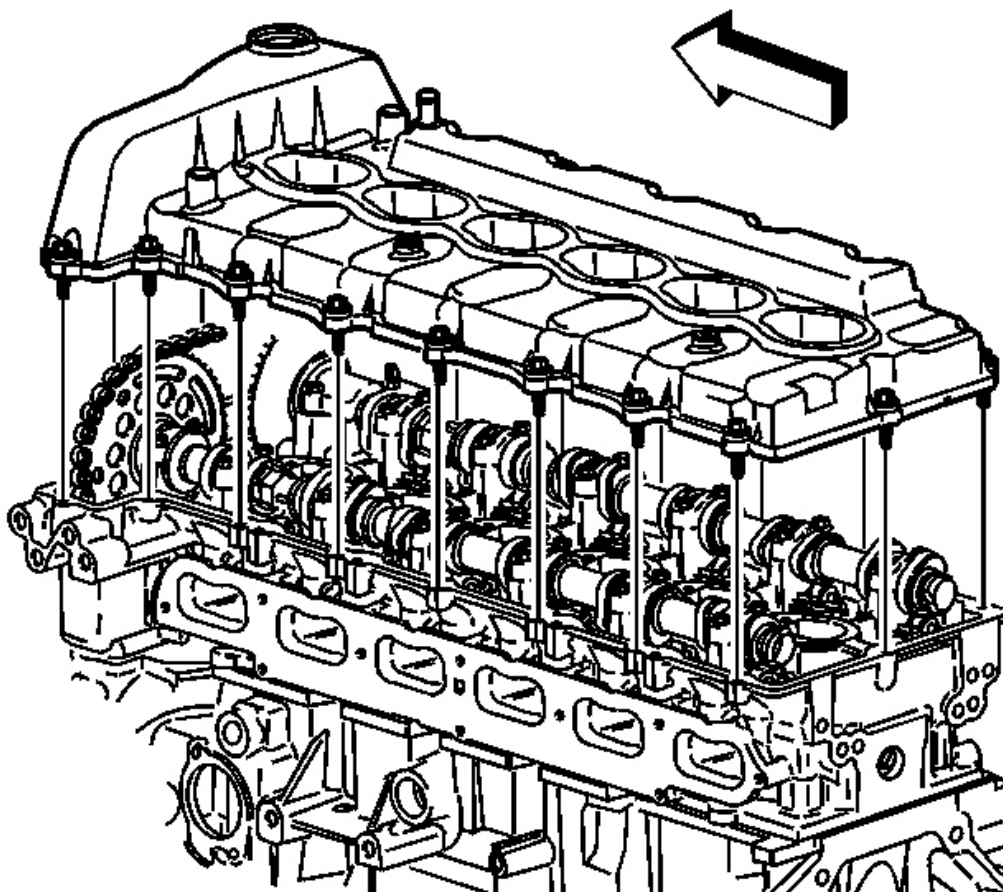
### **CAMSHAFT COVER REMOVAL**





**Fig. 258: View Of Ignition Control Modules & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the ignition control modules and bolts.



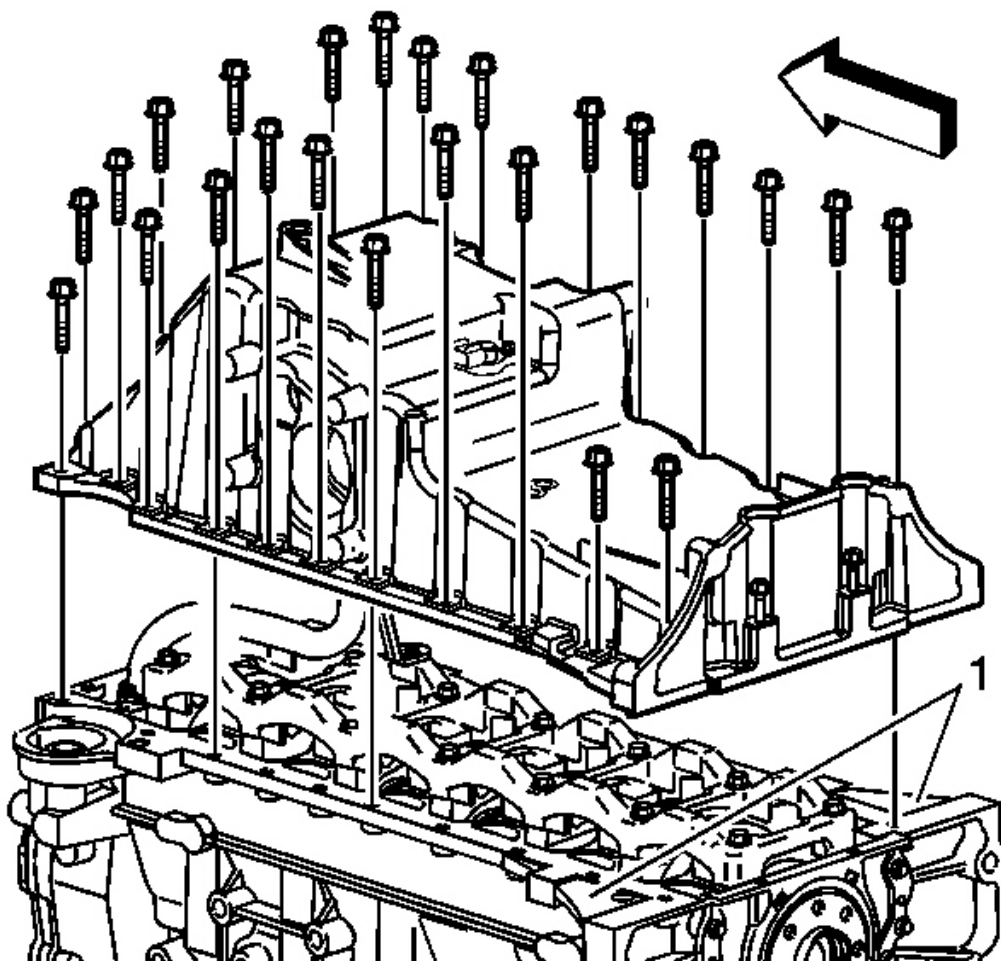
**Fig. 259: View Of Camshaft Cover & Bolts**  
Courtesy of GENERAL MOTORS CORP.

2. Remove the camshaft cover and bolts.

## OIL PAN REMOVAL

**NOTE:** Remove the oil level sensor, located in the oil pan, before the oil pan is removed. The sensor may be damaged if the oil pan is removed first.

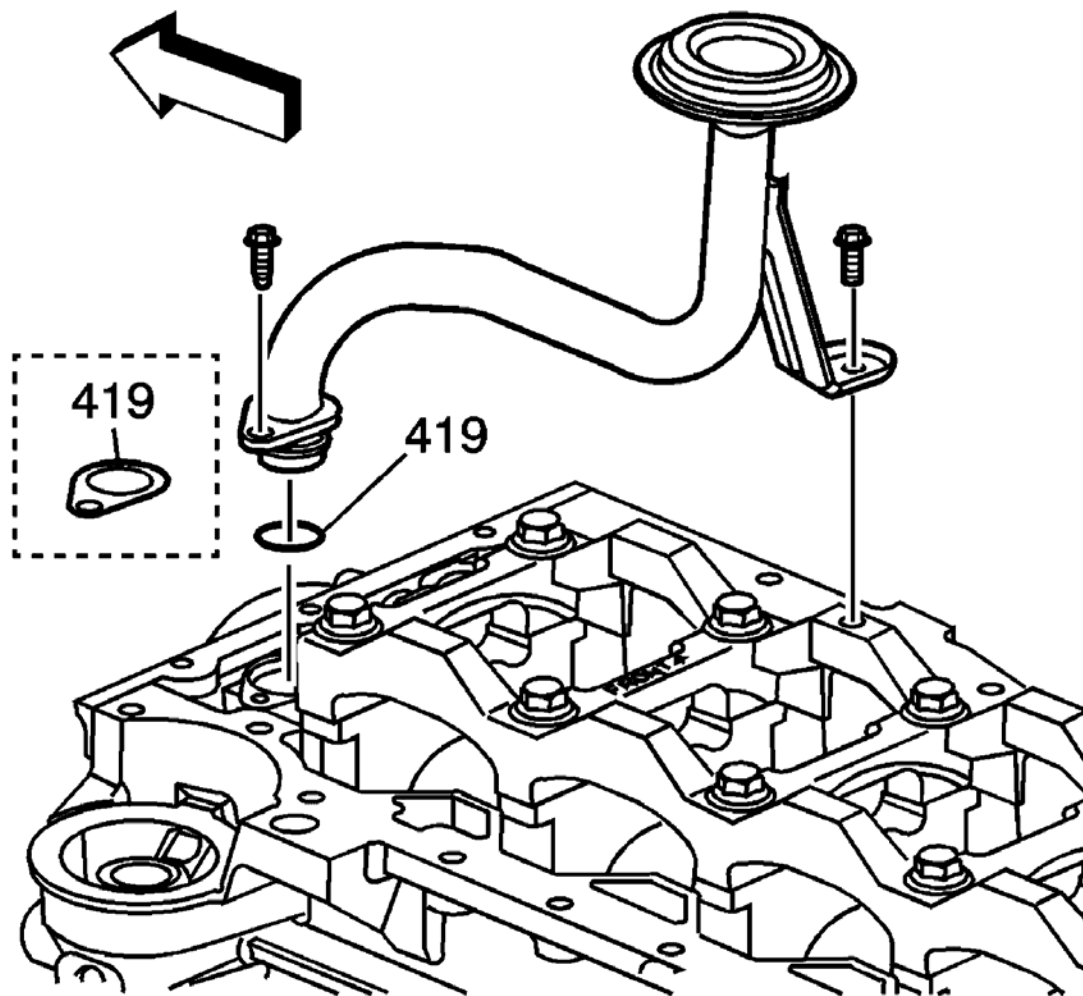
1. Remove the oil level sensor.
2. Remove the oil pan bolts and nuts.



**Fig. 260: View Of Oil Pan & Bolts**  
Courtesy of GENERAL MOTORS CORP.

3. Install two of the oil pan bolts into the threaded holes (jack bolts) to break the seal of oil pan (1).
4. Remove the oil pan.

#### **OIL PUMP PIPE AND SCREEN ASSEMBLY REMOVAL**



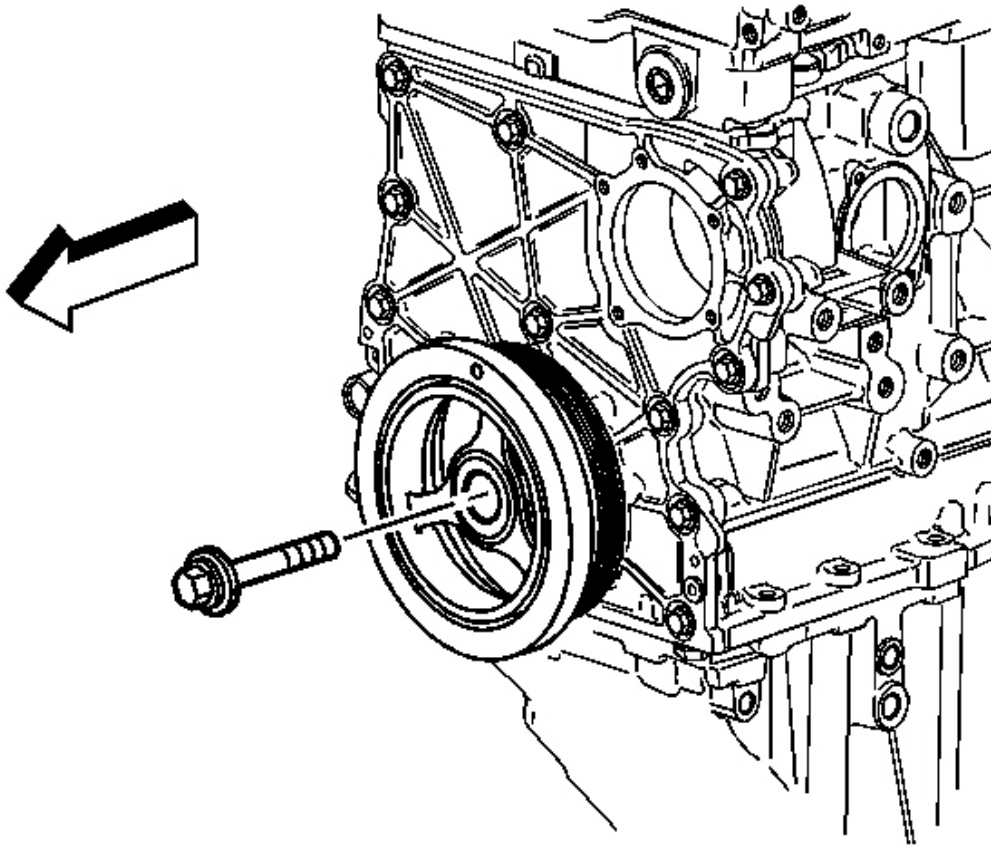
**Fig. 261: View Of Oil Pump Pipe, O-Ring & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

1. Remove the oil pump pipe bolts.
2. Remove the oil pump pipe.
3. Discard the O-ring/gasket (419) - model dependent.

## **CRANKSHAFT BALANCER REMOVAL**

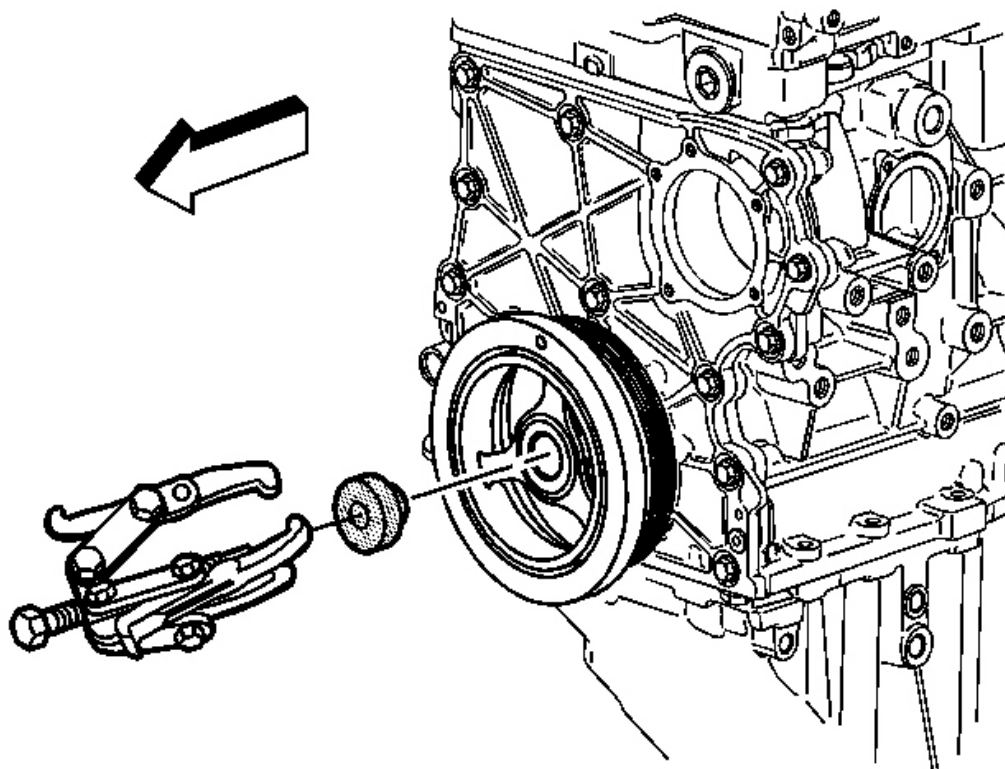
### **Tools Required:**

**J 41816-2** Crankshaft End Protector. See **Special Tools and Equipment**.



**Fig. 262: View Of Crankshaft Balancer Bolt**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the crankshaft balancer bolt.



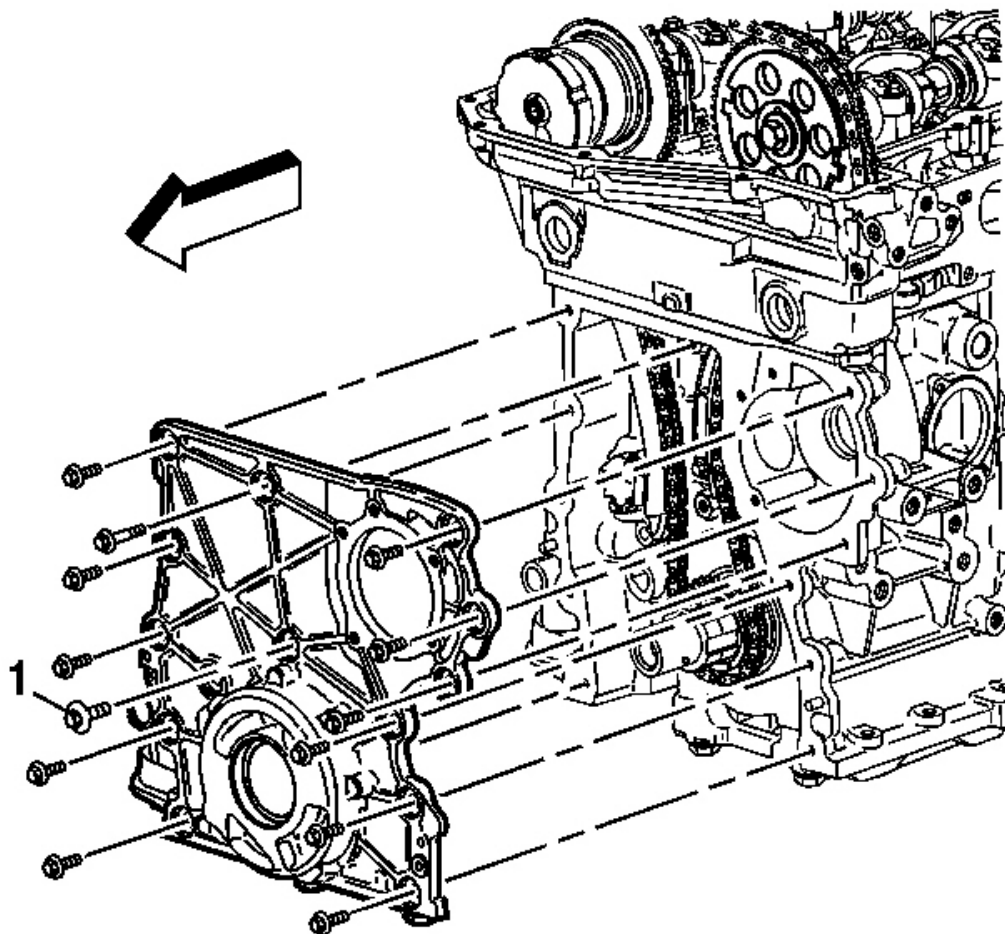
**Fig. 263: Removing Crankshaft Balancer Using J 41816-2**  
Courtesy of GENERAL MOTORS CORP.

2. Install **J 41816-2** into the end of the crankshaft. See **Special Tools and Equipment**.

**IMPORTANT:** Do not pull on outer edge of the crankshaft balancer.

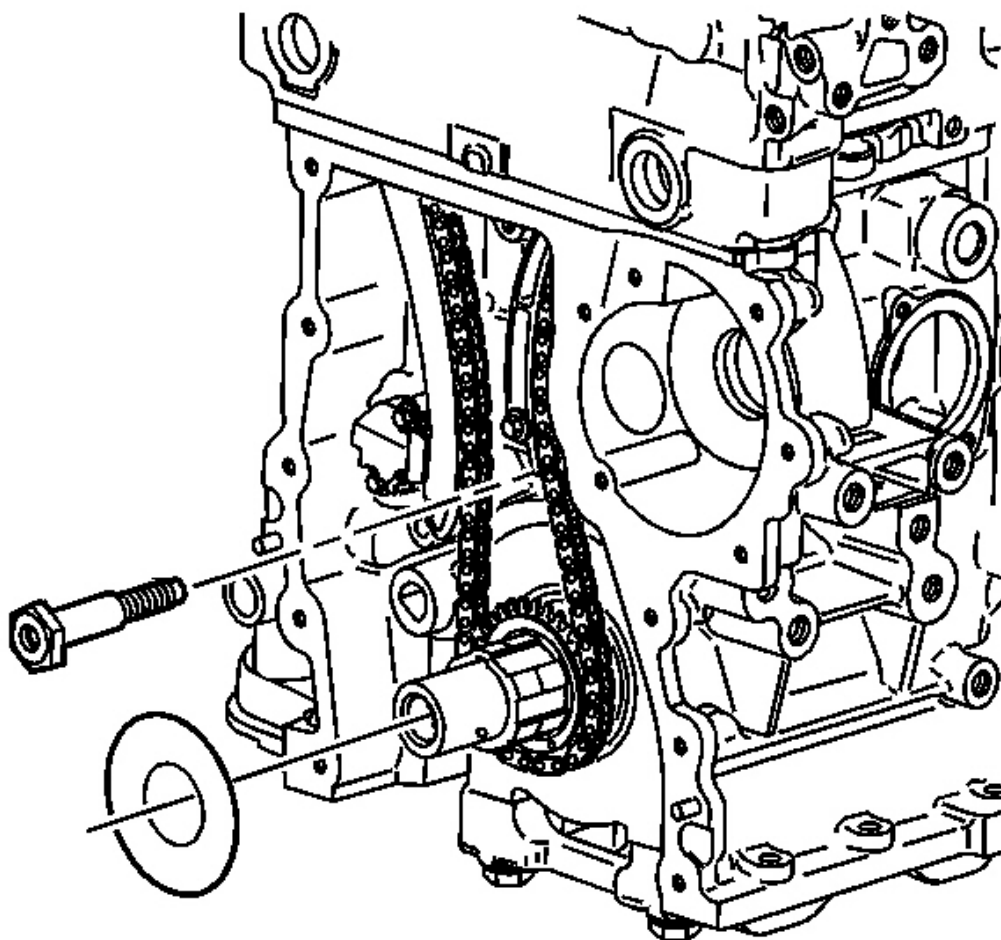
3. Use a three jaw puller to remove the crankshaft balancer.
4. Remove **J 41816-2** . See **Special Tools and Equipment**.

## **ENGINE FRONT COVER REMOVAL**



**Fig. 264: View Of Engine Front Cover Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the 7 mm center bolt (1) first.
2. Remove the engine front cover bolts.
3. Remove the engine front cover.

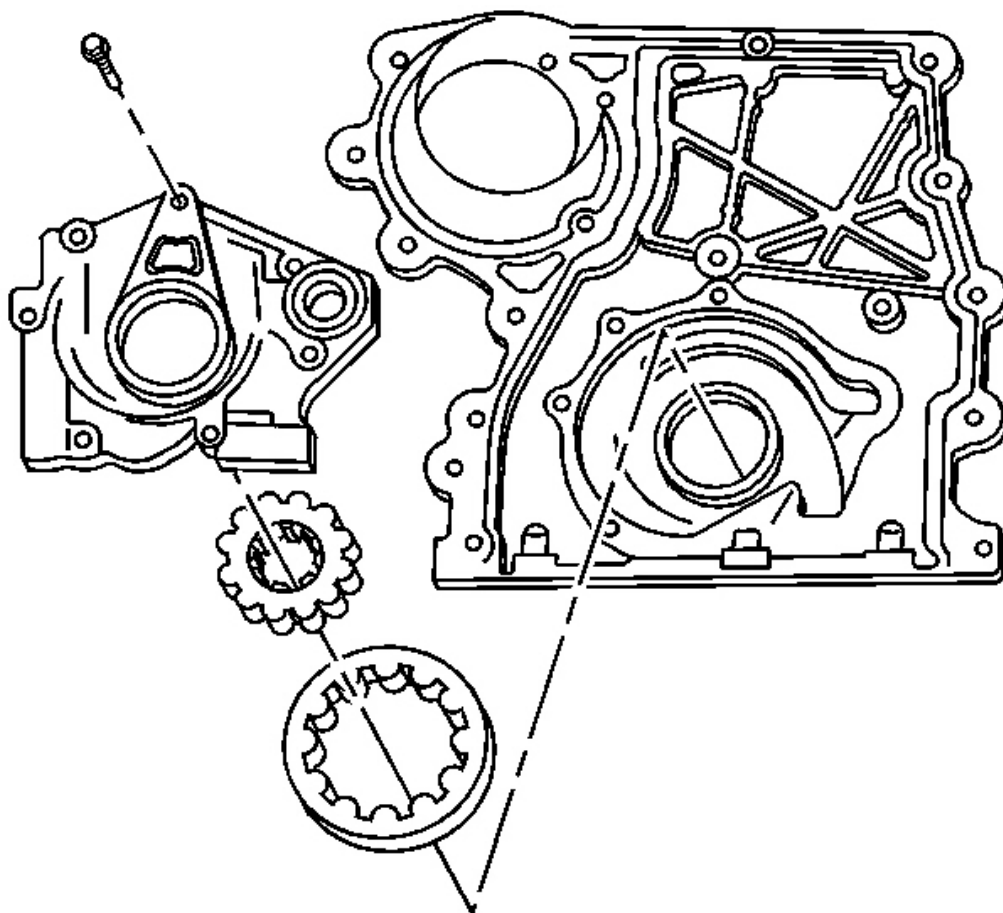


**Fig. 265: View Of Crankshaft Snout, Balancer Friction Washer & Bolt**  
Courtesy of GENERAL MOTORS CORP.

4. Remove the spacer bolt.
5. Remove the crankshaft balancer friction washer from the crankshaft snout.

## OIL PUMP REMOVAL

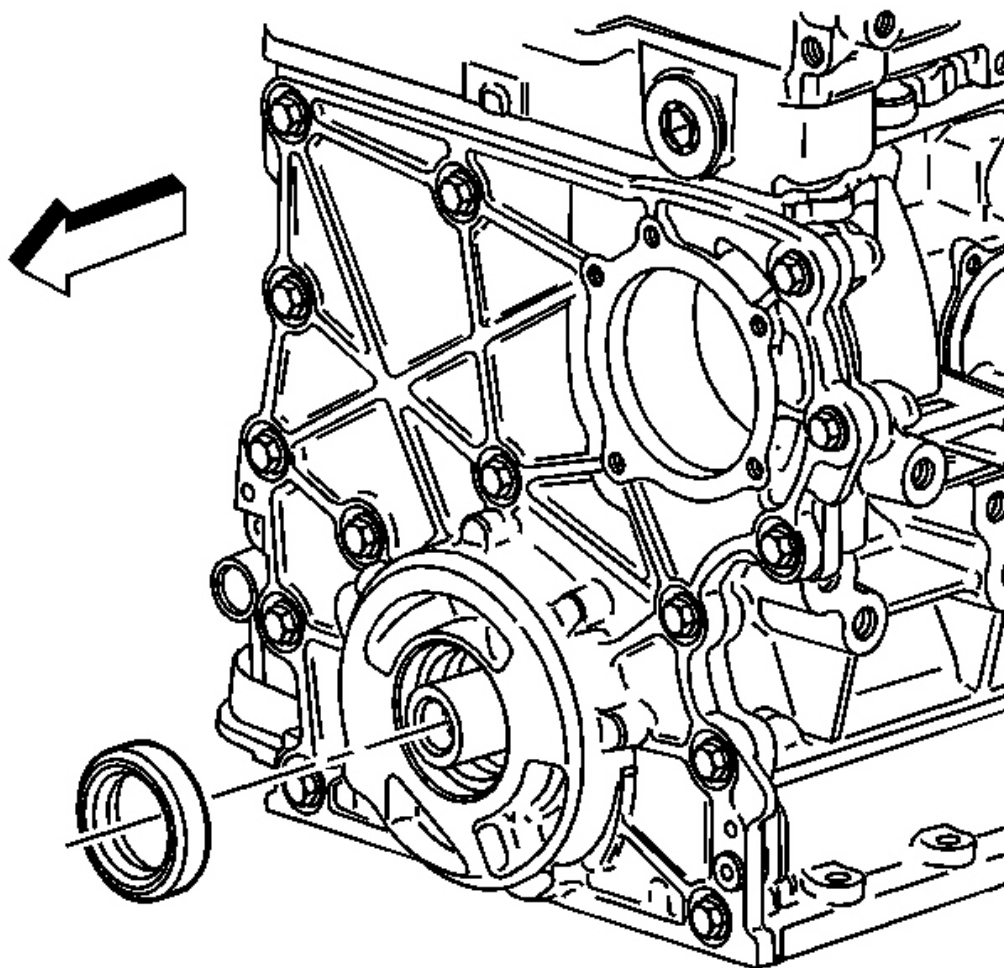




**Fig. 266: Exploded View Of Oil Pump**  
**Courtesy of GENERAL MOTORS CORP.**

1. Remove the oil pump cover bolts.
2. Remove the oil pump cover.
3. Mark the inner and outer gears in relation to the oil pump housing.
4. Remove the inner and outer oil pump gears.
5. Remove the oil pump pressure relief valve plug.
6. Remove the oil pump pressure relief valve and spring.

## **CRANKSHAFT FRONT OIL SEAL REMOVAL**

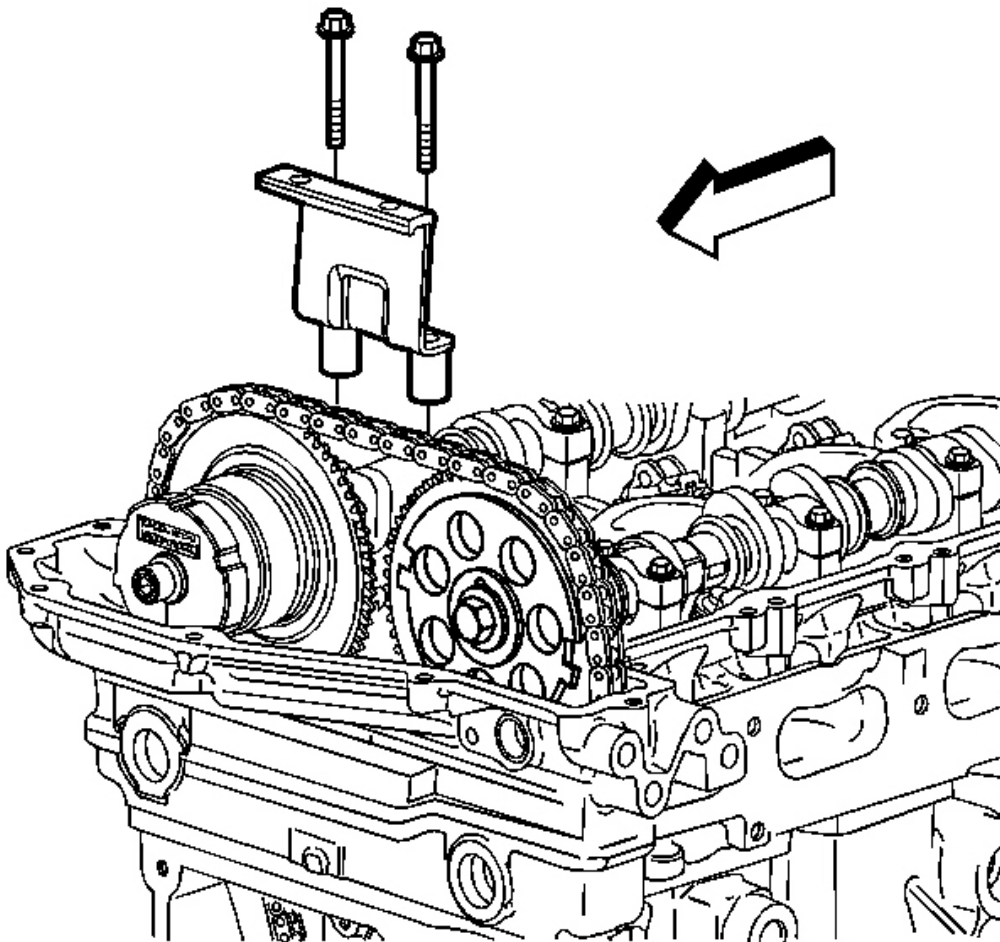


**Fig. 267: View Of Crankshaft Front Oil Seal**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Do not damage the engine front cover or the crankshaft.

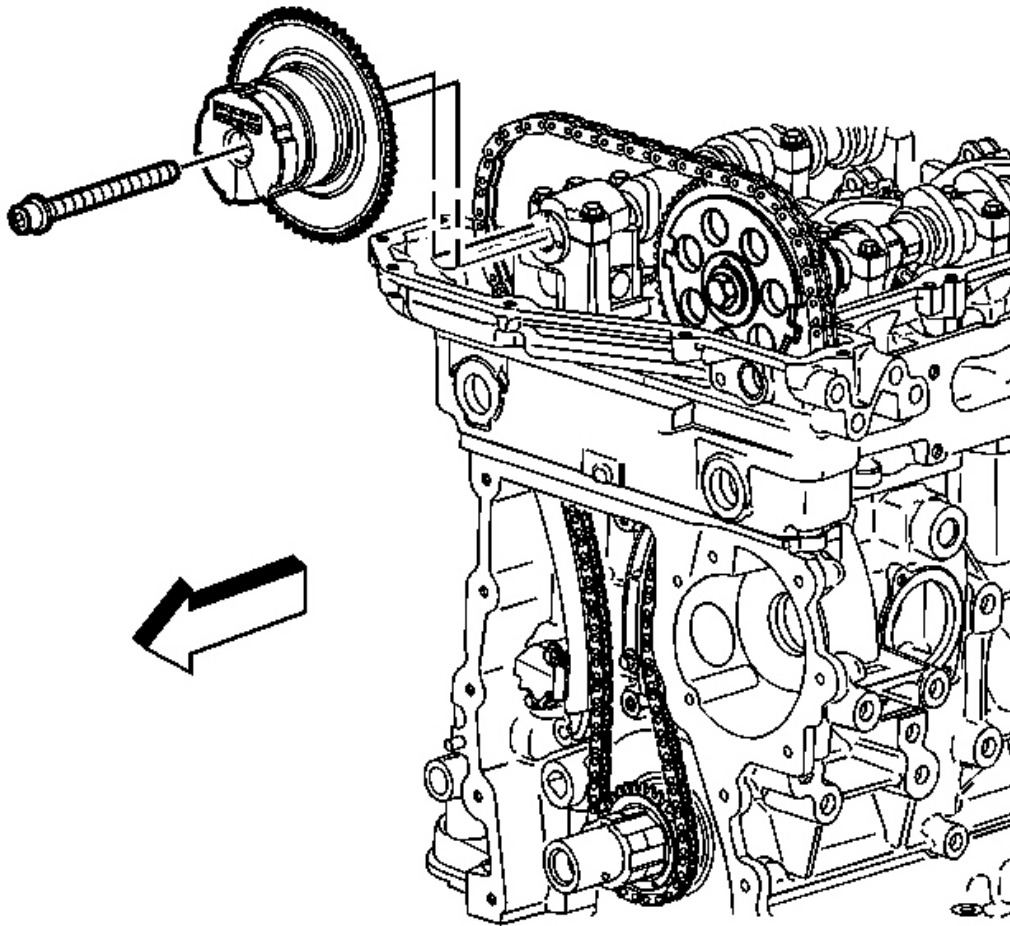
Pry out the crankshaft front oil seal using a suitable tool.

#### **TIMING CHAIN AND SPROCKETS REMOVAL**



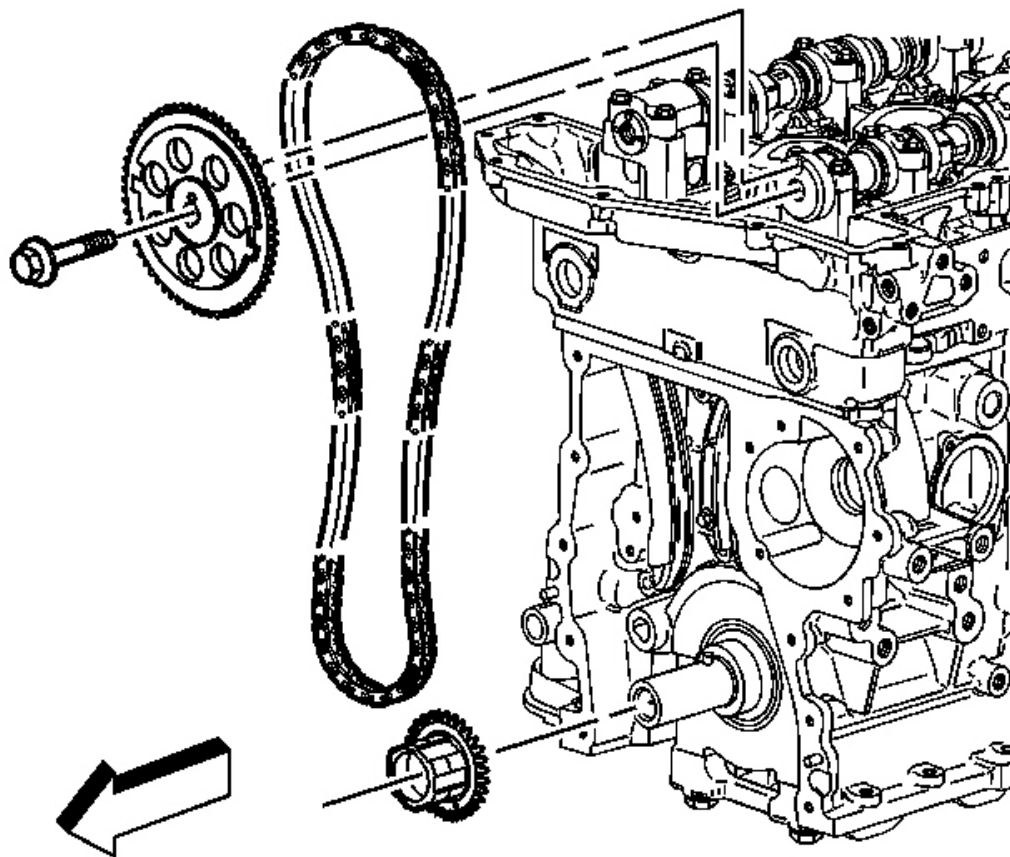
**Fig. 268: View Of Top Chain Guide**  
**Courtesy of GENERAL MOTORS CORP.**

1. Remove the top chain guide bolts.
2. Remove the top chain guide.



**Fig. 269: View Of Exhaust Camshaft Position Actuator**  
**Courtesy of GENERAL MOTORS CORP.**

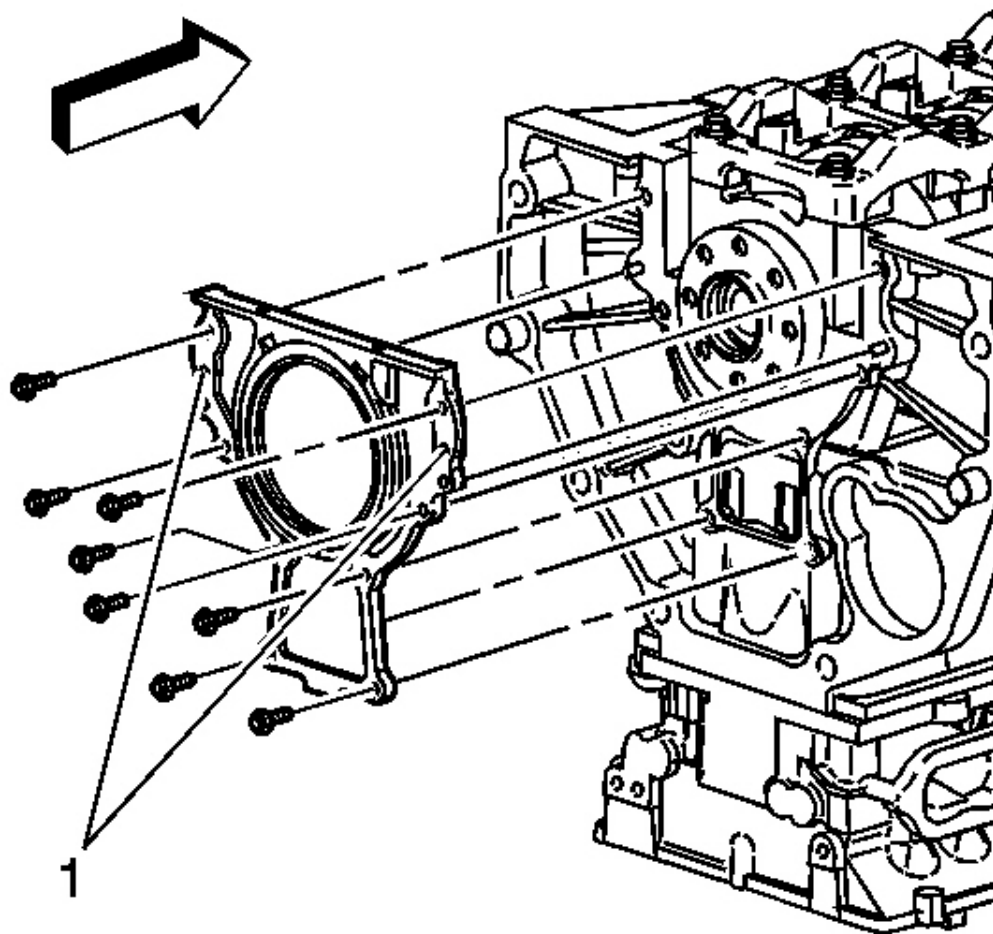
3. Remove the exhaust camshaft position actuator bolt.
4. Remove the exhaust camshaft position actuator.



**Fig. 270: View Of Timing Chain & Sprockets**  
Courtesy of GENERAL MOTORS CORP.

5. Remove the intake camshaft sprocket bolt.
6. Remove the intake camshaft sprocket.
7. Remove the timing chain.
8. Remove the crankshaft sprocket.

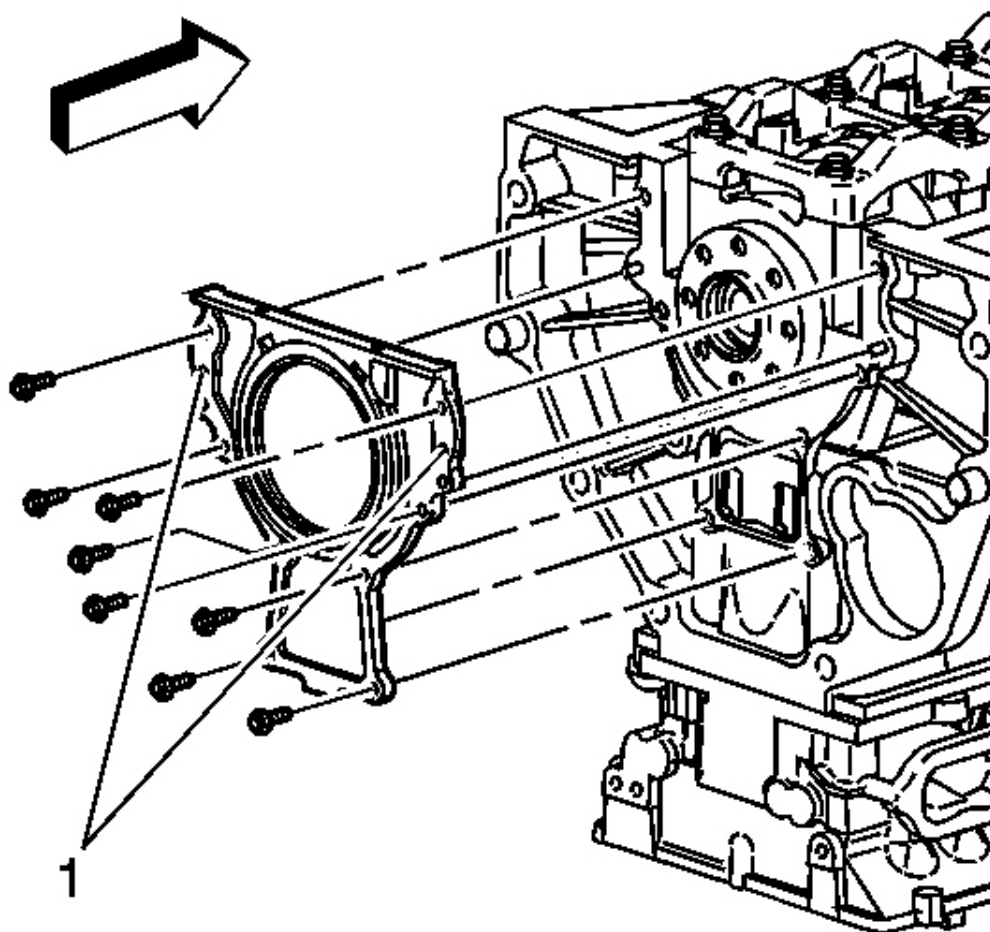
#### **CRANKSHAFT REAR OIL SEAL AND HOUSING REMOVAL**



**Fig. 271: View Of Crankshaft Rear Oil Seal Housing, Bolts & Threaded Holes**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the crankshaft rear oil seal housing bolts.
2. Install two bolts (Jack Screws) into the threaded holes (1) to break the seal of the housing.
3. Remove the crankshaft rear oil seal housing.

#### **CRANKSHAFT REAR OIL SEAL REMOVAL**

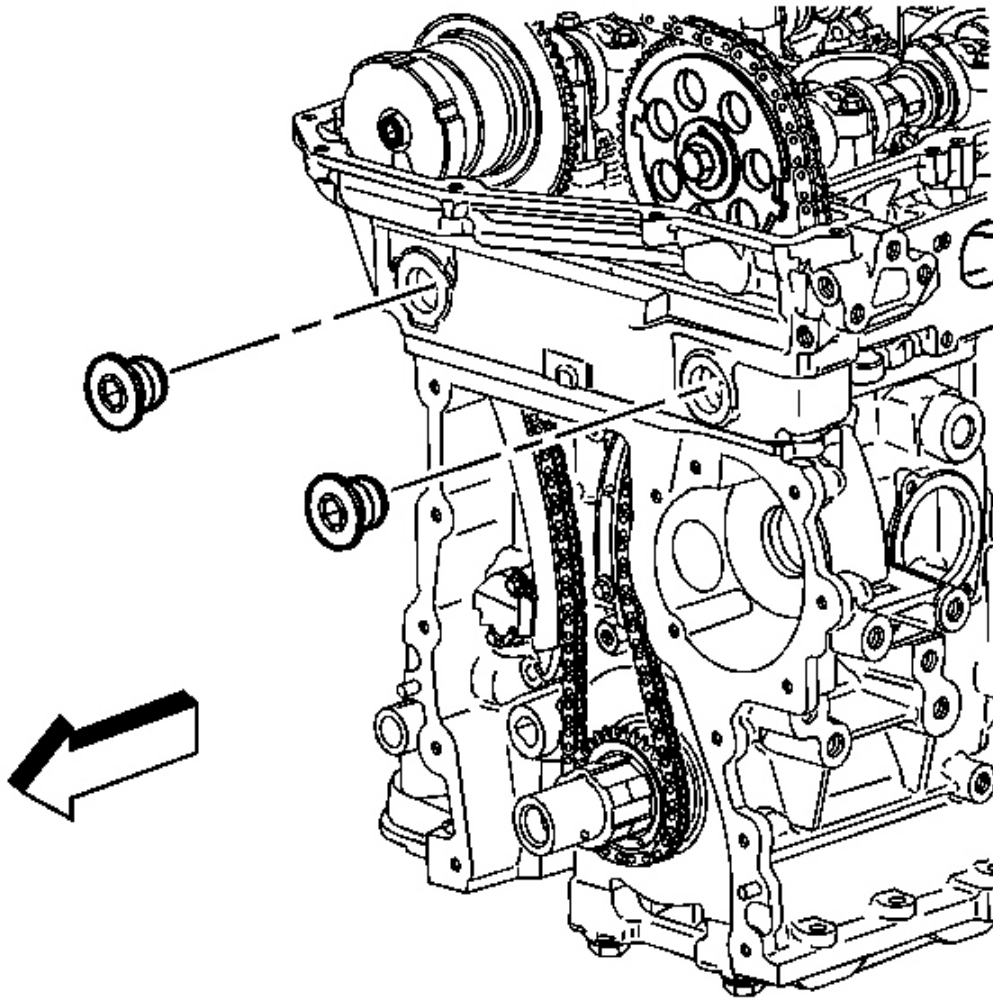


**Fig. 272: View Of Crankshaft Rear Oil Seal Housing, Bolts & Threaded Holes**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Do not damage the crankshaft or seal bore. Pry out the crankshaft rear oil seal out using a suitable tool.

Remove the crankshaft rear oil seal.

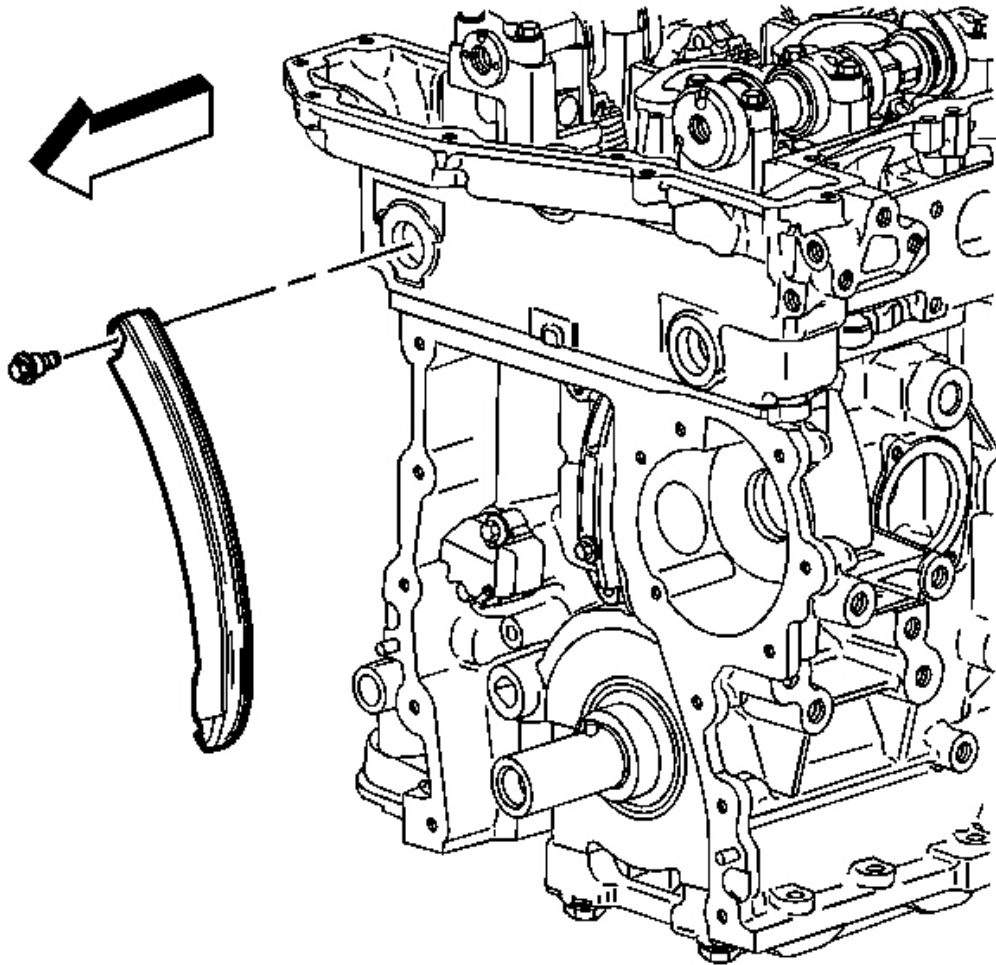
#### **TIMING CHAIN TENSIONER REMOVAL**



**Fig. 273: View Of Cylinder Head Access Hole Plugs**  
Courtesy of GENERAL MOTORS CORP.

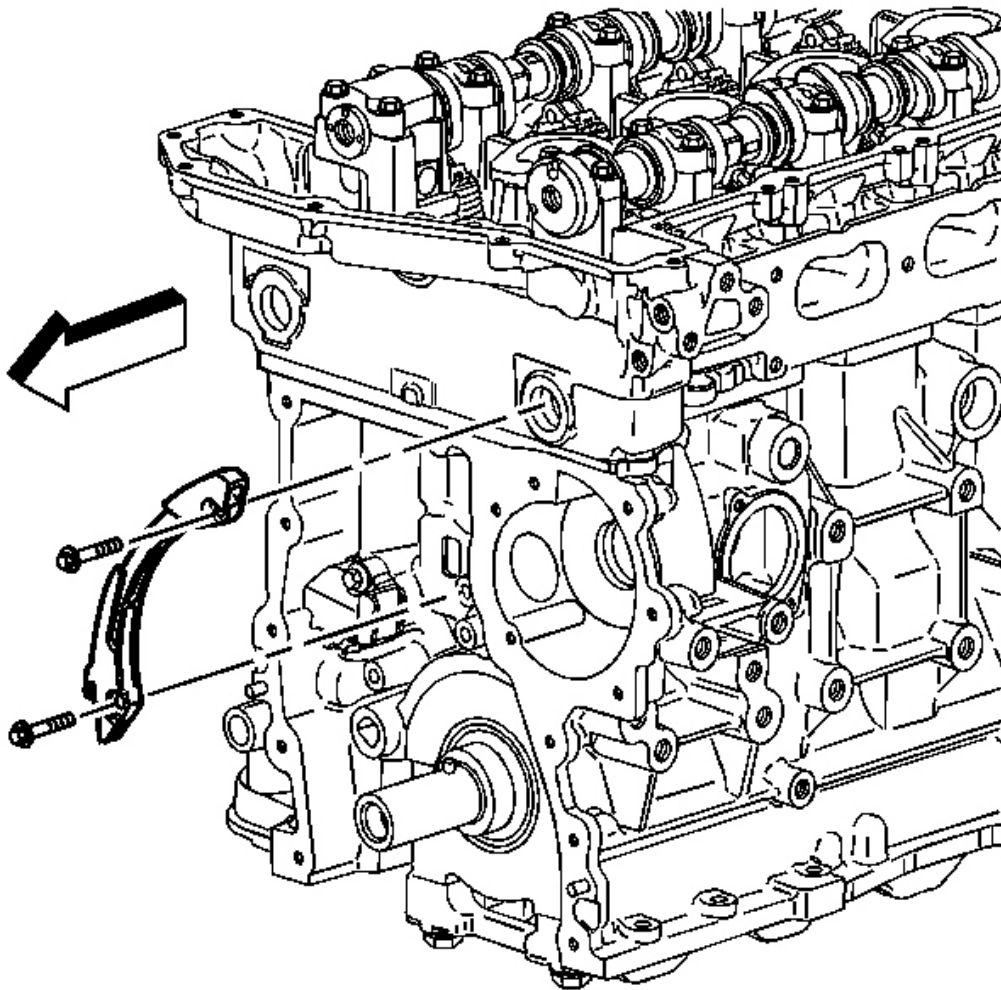
1. Remove the cylinder head access hole plugs.





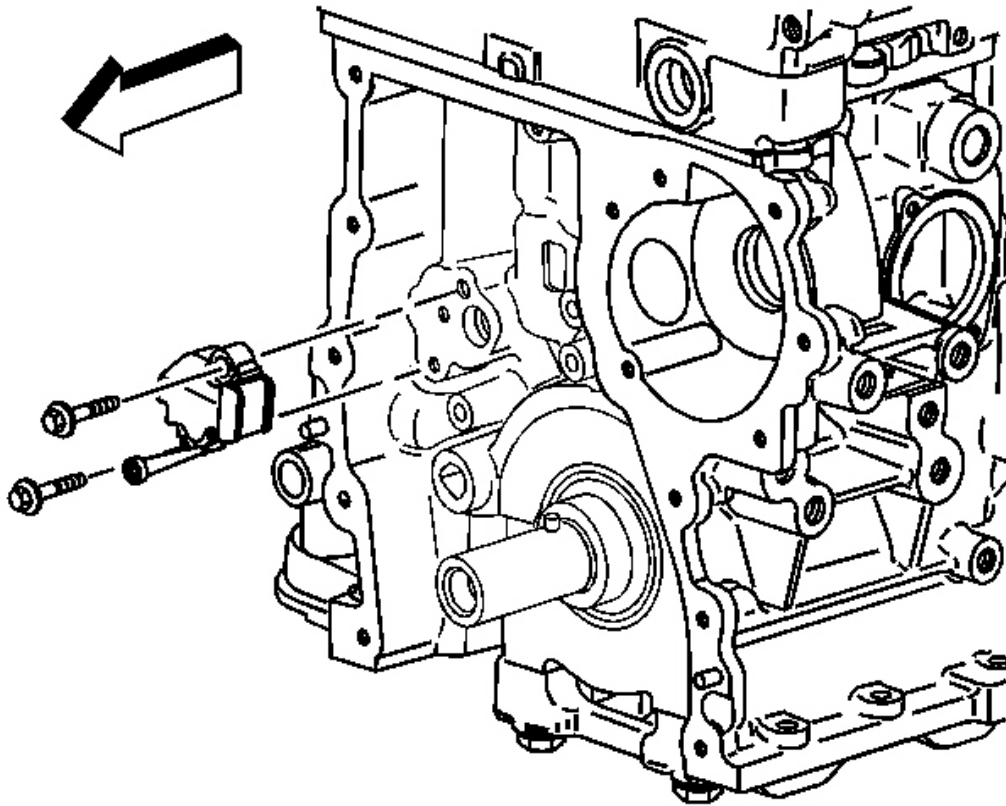
**Fig. 274: View Of Timing Chain Tensioner Shoe & Bolt**  
Courtesy of GENERAL MOTORS CORP.

2. Remove the timing chain tensioner shoe bolt.
3. Remove the timing chain tensioner shoe.



**Fig. 275: View Of Timing Chain Guide & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

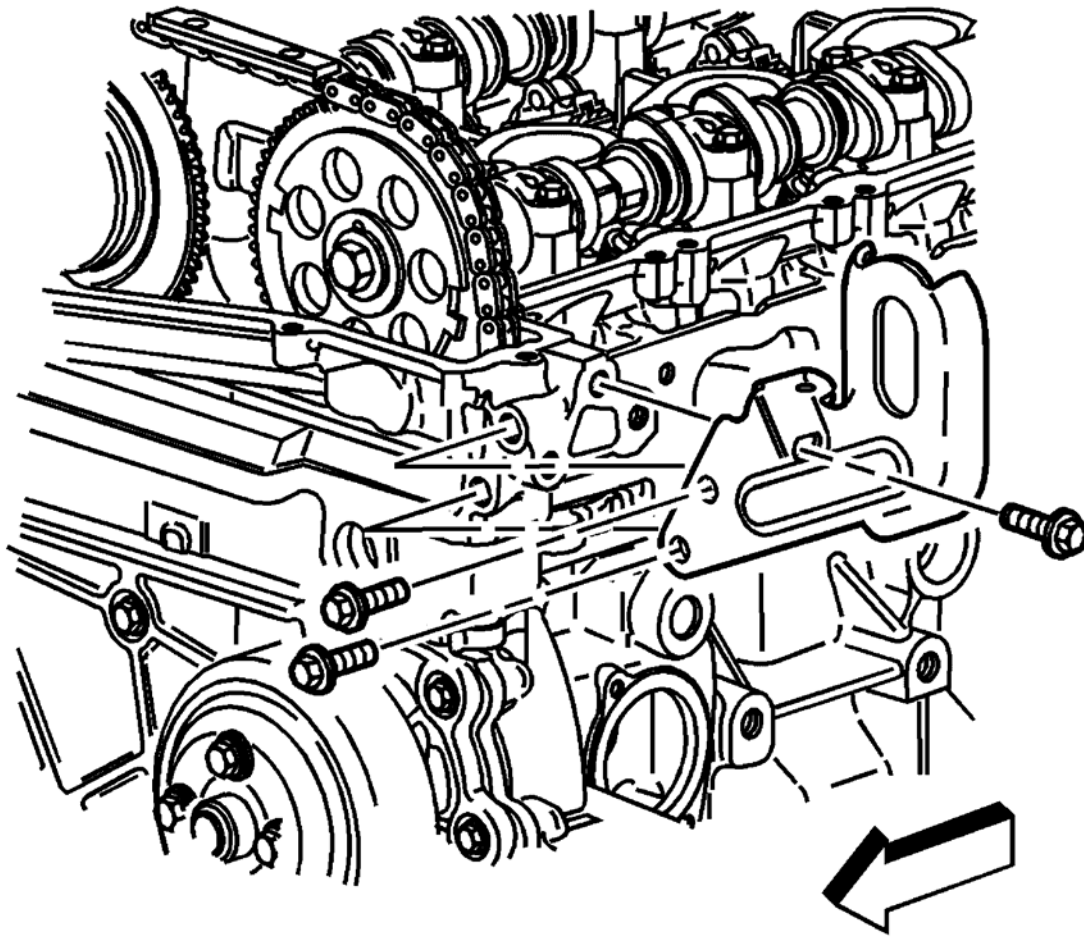
4. Remove the timing chain tensioner guide bolts.
5. Remove the timing chain tensioner guide.



**Fig. 276: View Of Timing Chain Tensioner & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

6. Remove the timing chain tensioner bolts.
7. Remove the timing chain tensioner.

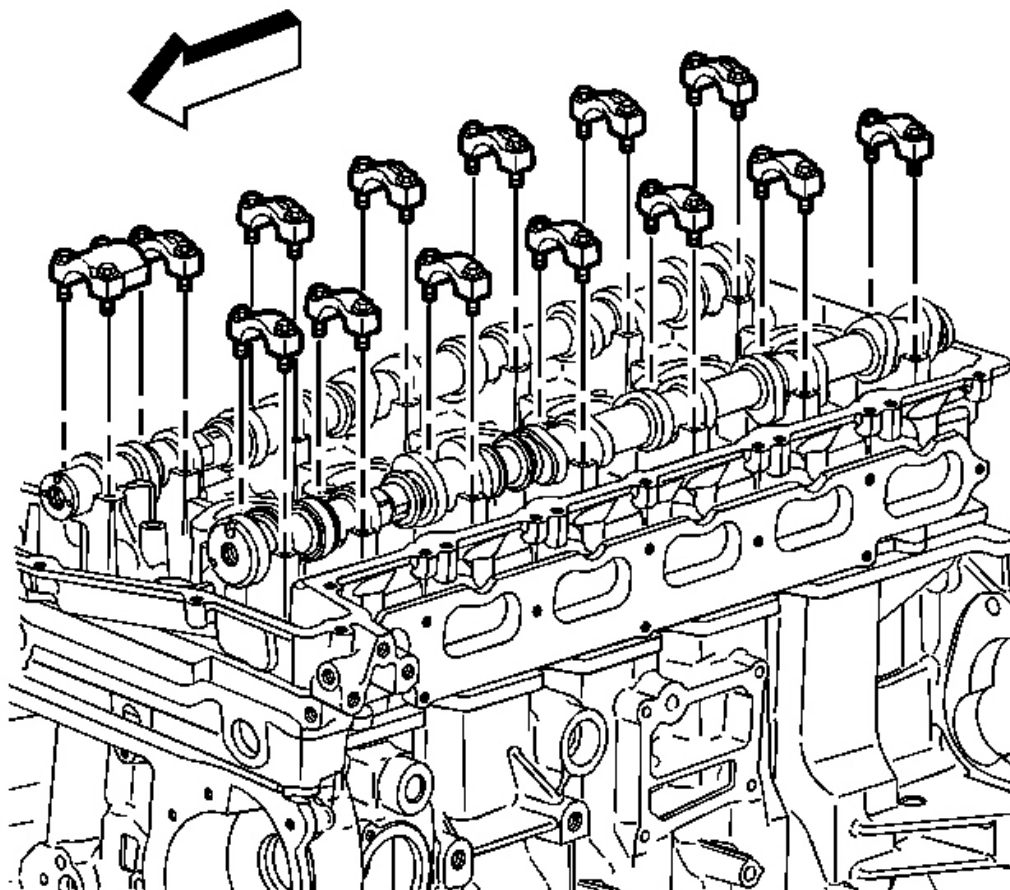
#### **ENGINE LIFT BRACKET REMOVAL**



**Fig. 277: View Of Engine Lift Bracket & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

1. Remove the engine lift bracket bolts.
2. Remove the engine lift bracket.

## **CAMSHAFT REMOVAL**

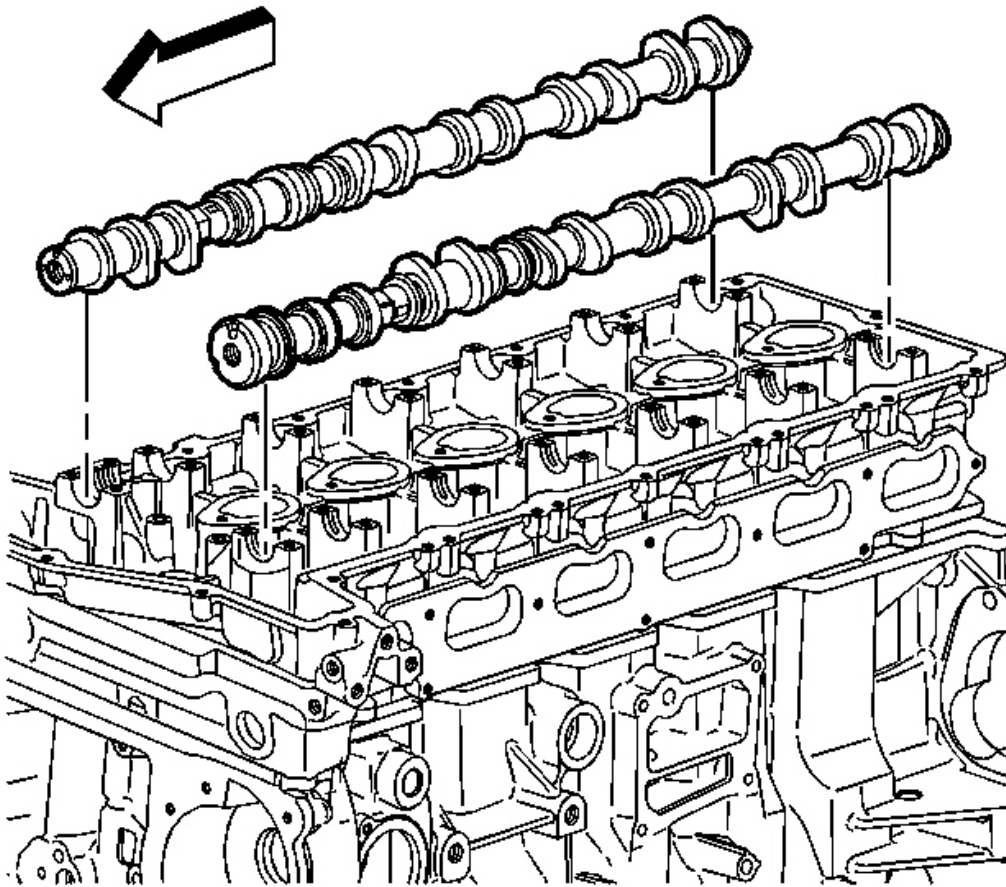


**Fig. 278: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the camshaft cap bolts.

**IMPORTANT:** Place the camshaft caps in a rack to ensure the caps are installed in the same location from which they were removed.

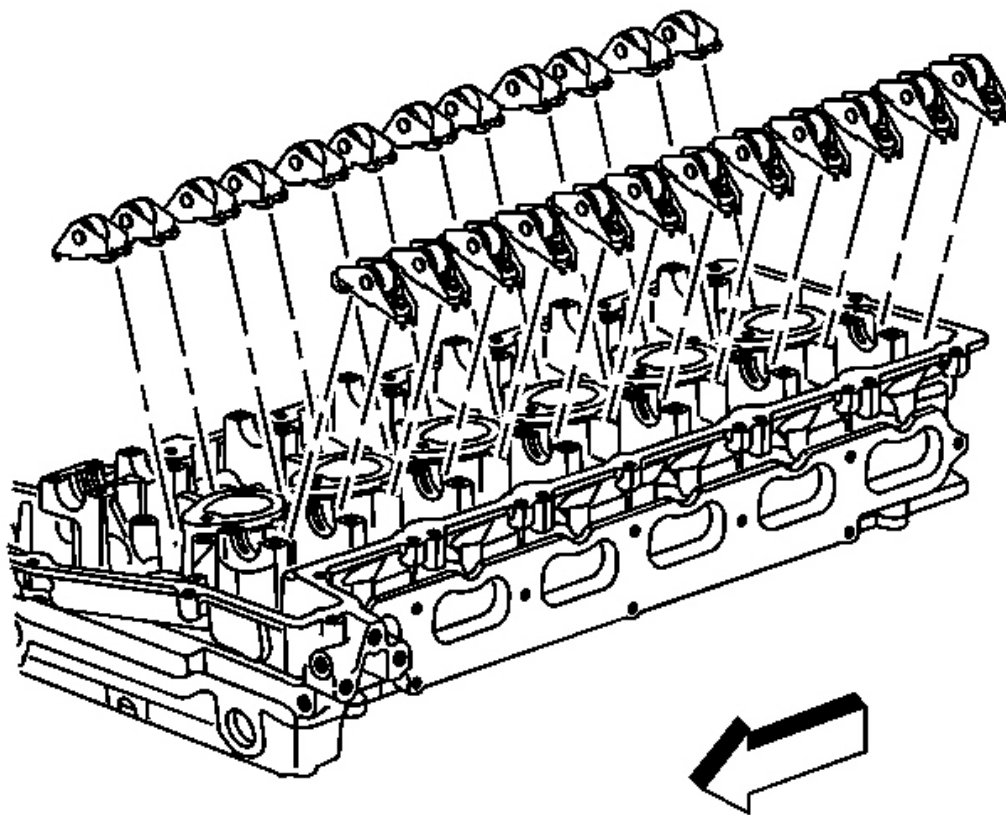
2. Remove the camshaft caps.



**Fig. 279: Removing/Installing Camshafts**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the camshafts.

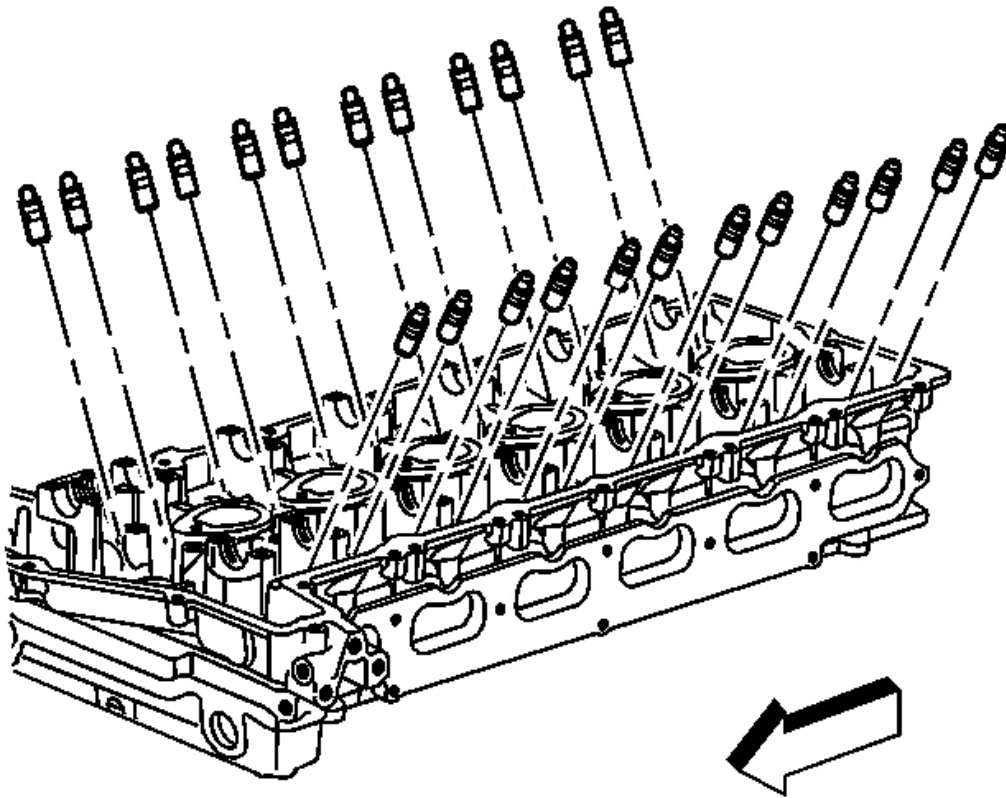
#### **VALVE ROCKER ARM AND VALVE LASH ADJUSTER REMOVAL**



**Fig. 280: View Of Valve Rocker Arms**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Once removed, place the valve rocker arms and valve lash adjusters in an organized order so the components can be installed into the original locations.

1. Remove the valve rocker arms.

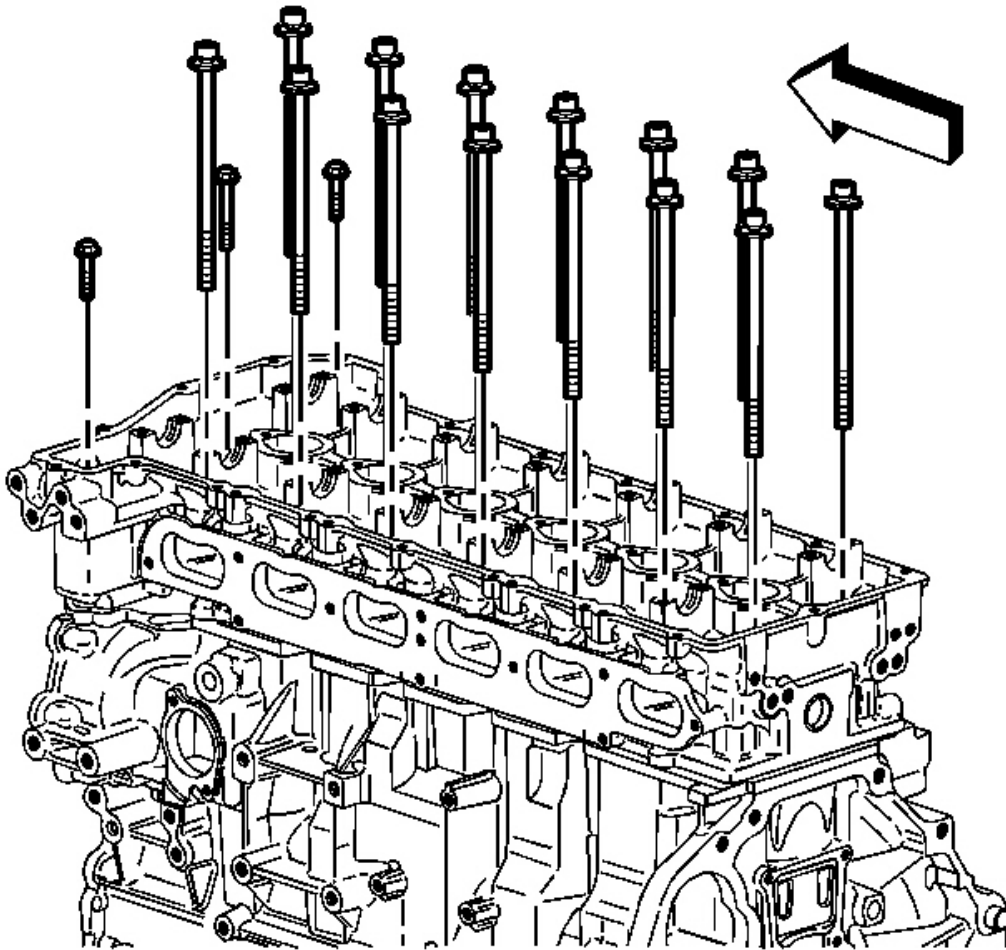


**Fig. 281: View Of Valve Lash Adjusters**  
Courtesy of GENERAL MOTORS CORP.

2. Remove the valve lash adjusters.

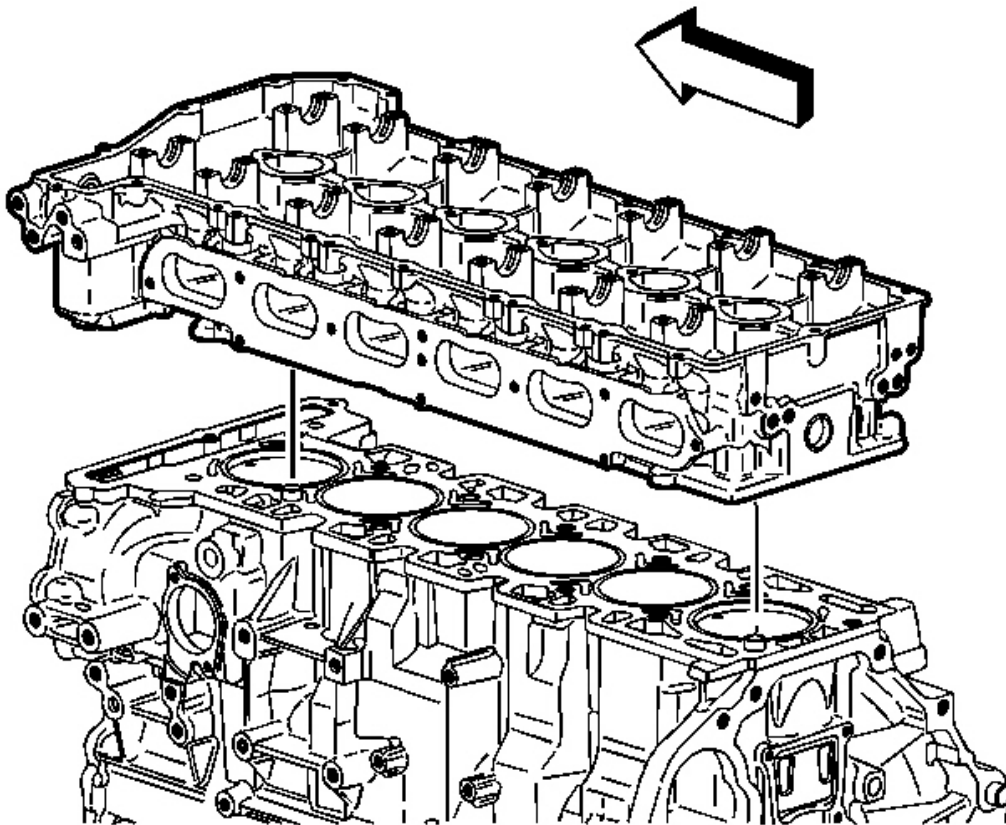
## CYLINDER HEAD REMOVAL





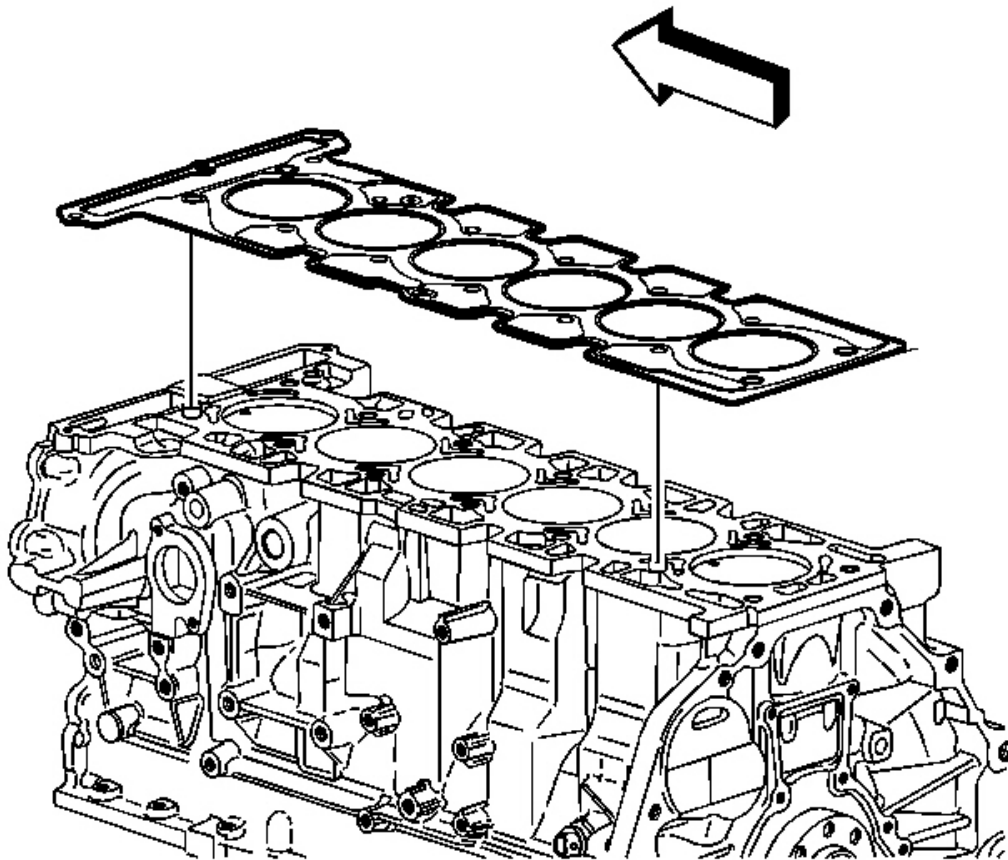
**Fig. 282: View Of Cylinder Head Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the cylinder head bolts.



**Fig. 283: View Of Cylinder Head**  
**Courtesy of GENERAL MOTORS CORP.**

2. Remove the cylinder head.



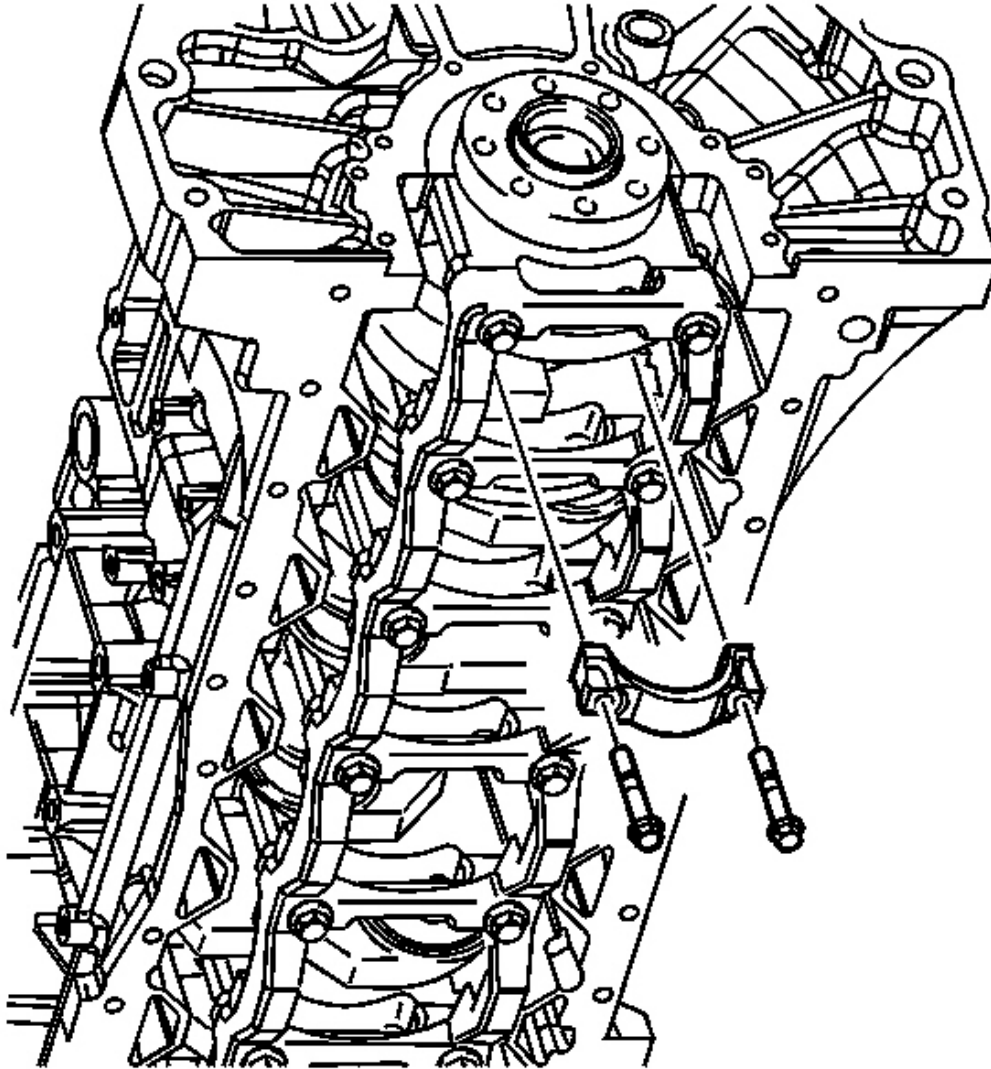
**Fig. 284: View Of Cylinder Head Gasket**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the cylinder head gasket.

### **PISTON, CONNECTING ROD, AND BEARING REMOVAL**

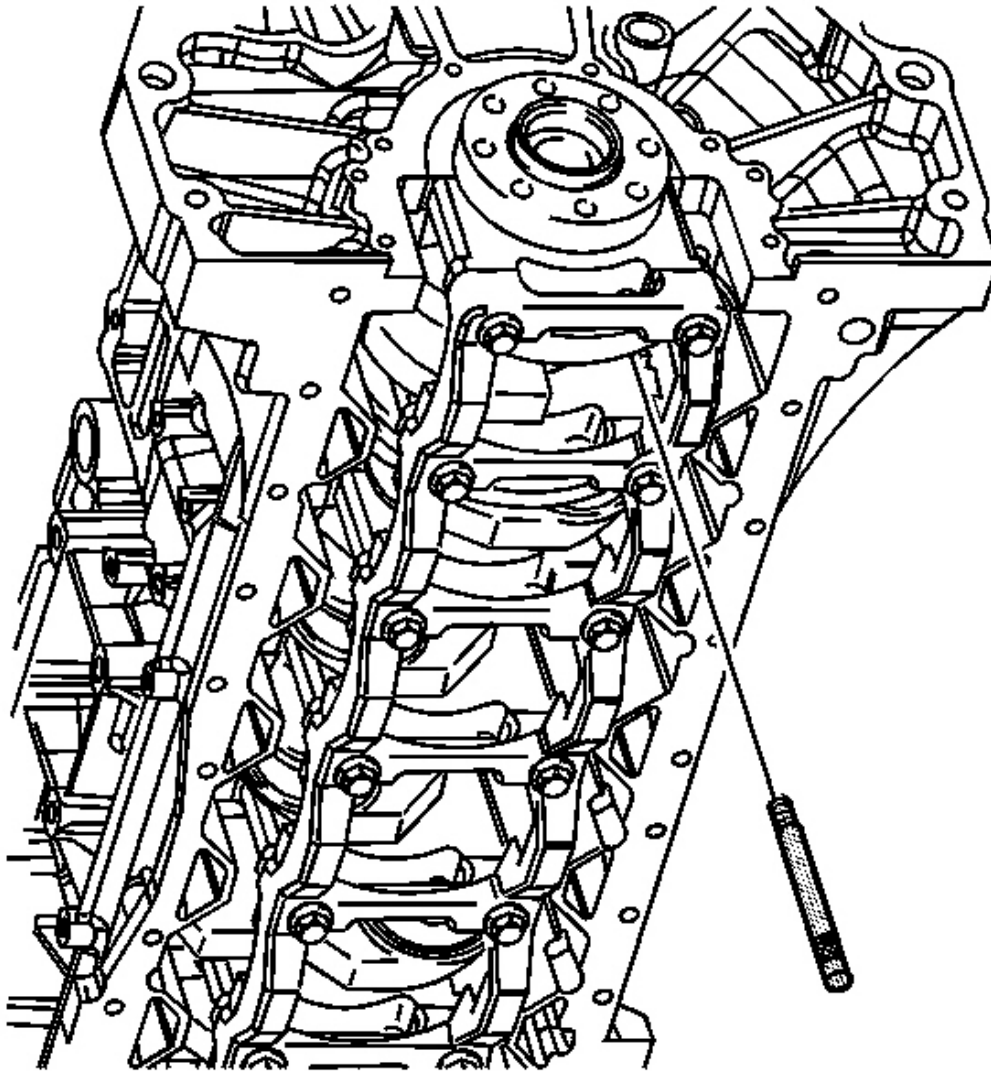
#### **Tools Required:**

**J 41556** Connecting Rod Guides. See **Special Tools and Equipment**.



**Fig. 285: View Of Connecting Rod, Cap & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

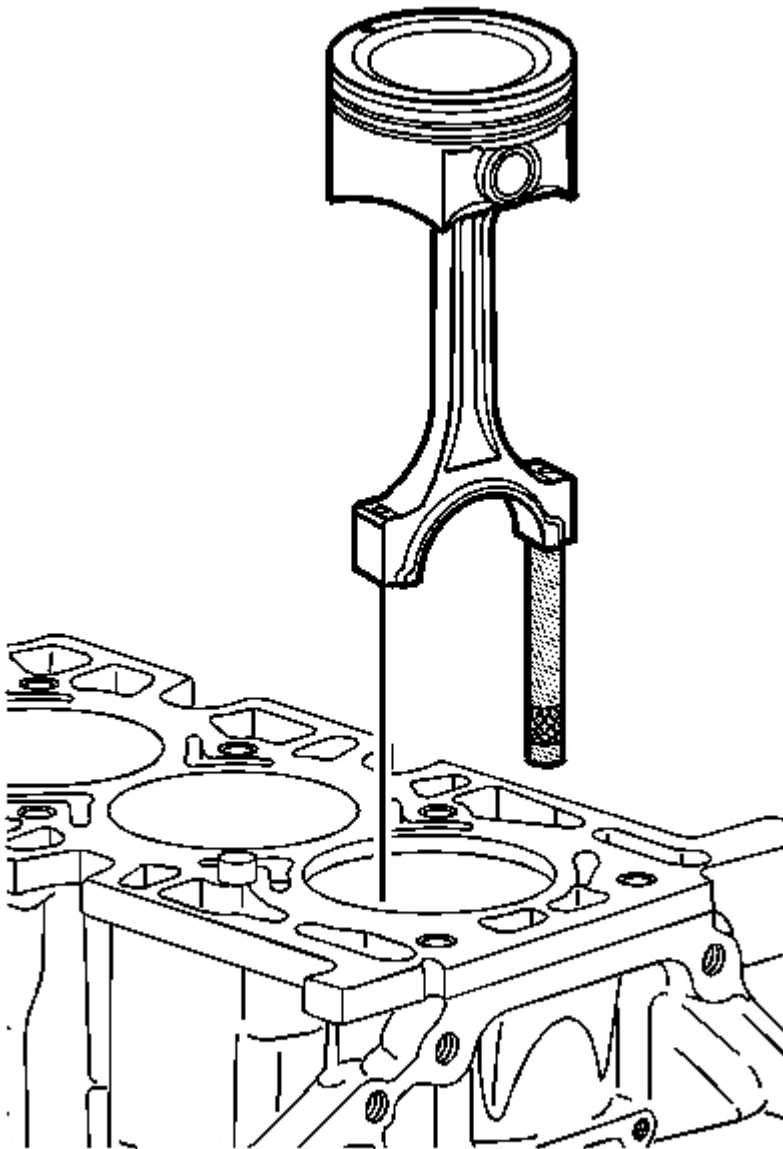
1. Mark the piston with the number of the cylinder from which the piston is being removed.
2. Mark the connecting rod and the connecting rod cap with the cylinder position. Also mark the orientation. This will ensure the caps and connecting rods are re-assembled properly.
3. Remove the connecting rod bolts.
4. Remove the connecting rod cap and bearing half.



**Fig. 286: View Of J 41556**

Courtesy of GENERAL MOTORS CORP.

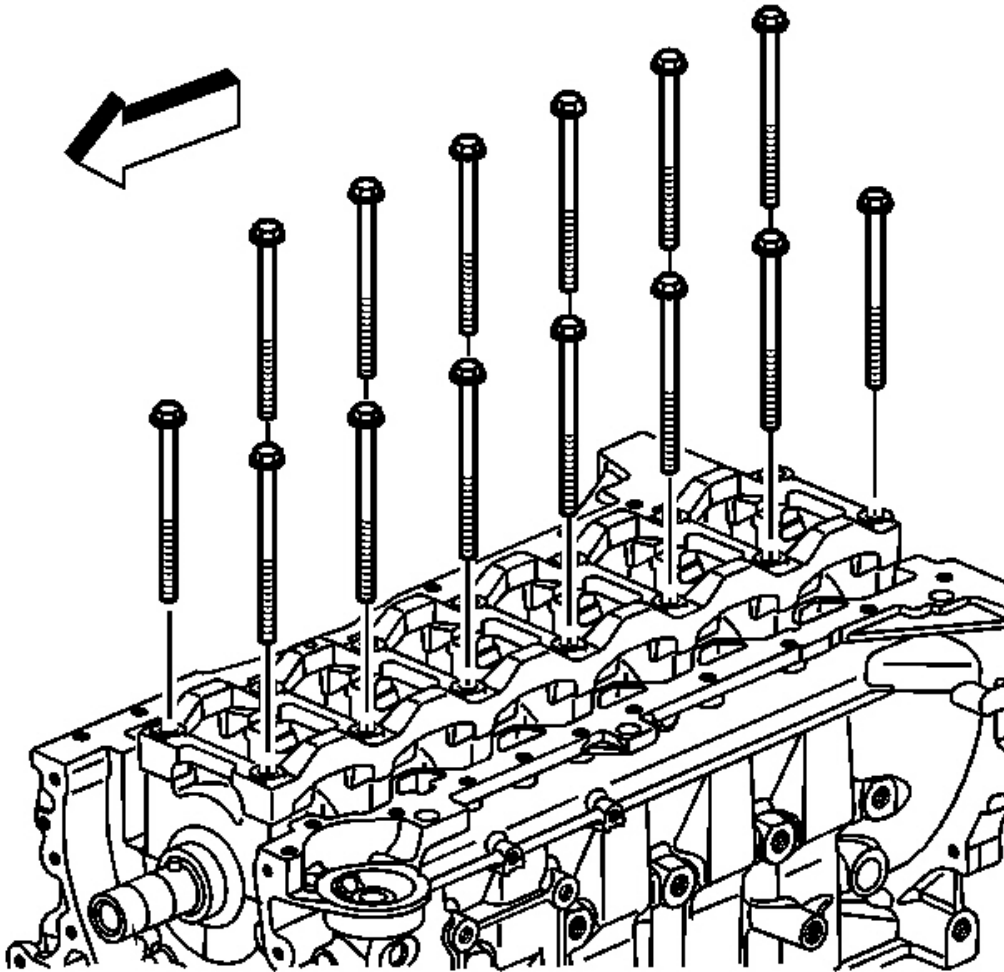
5. Install **J 41556** on the connecting rod. See Special Tools and Equipment.



**Fig. 287: View Of Connecting Rod, Piston Assembly & J 41556**  
Courtesy of GENERAL MOTORS CORP.

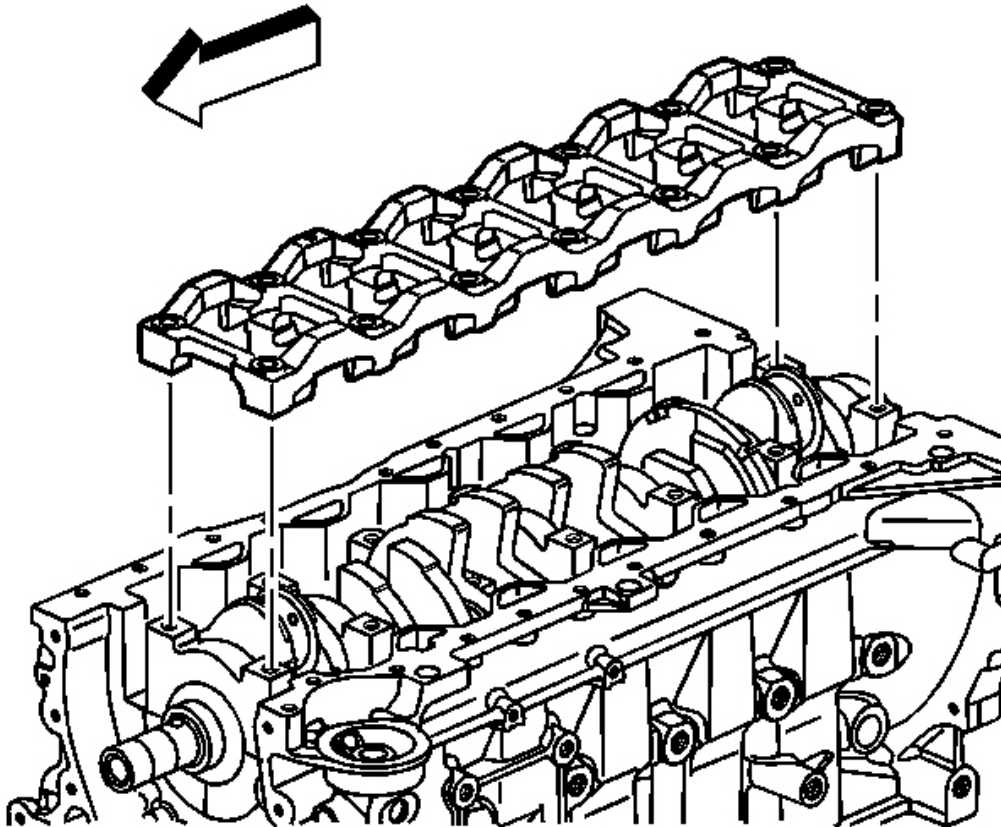
6. Remove the connecting rod and piston assembly. Push out the assembly.
7. Remove **J 41556** . See **Special Tools and Equipment**.

## CRANKSHAFT AND BEARINGS REMOVAL



**Fig. 288: View Of Crankshaft Main Bearing Cap Bolts**  
Courtesy of GENERAL MOTORS CORP.

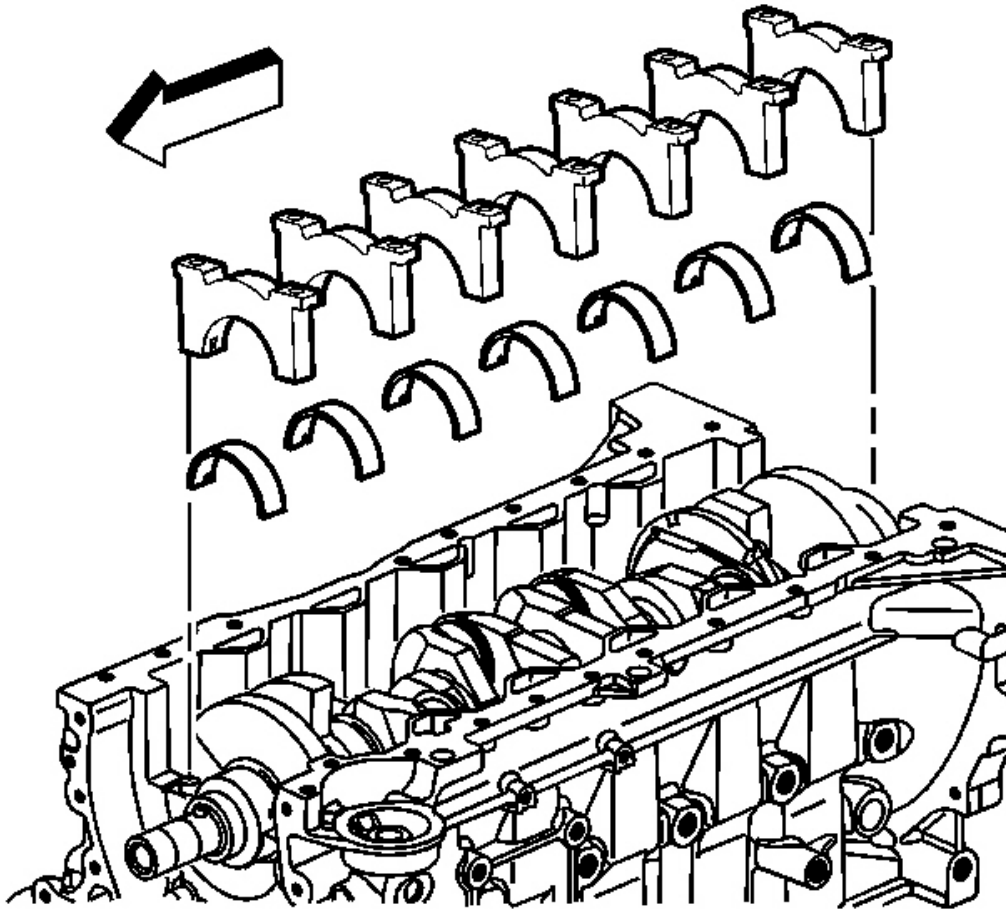
1. Remove the crankshaft main bearing cap bolts.



**Fig. 289: View Of Crankshaft Main Bearing Cap Stiffener**  
Courtesy of GENERAL MOTORS CORP.

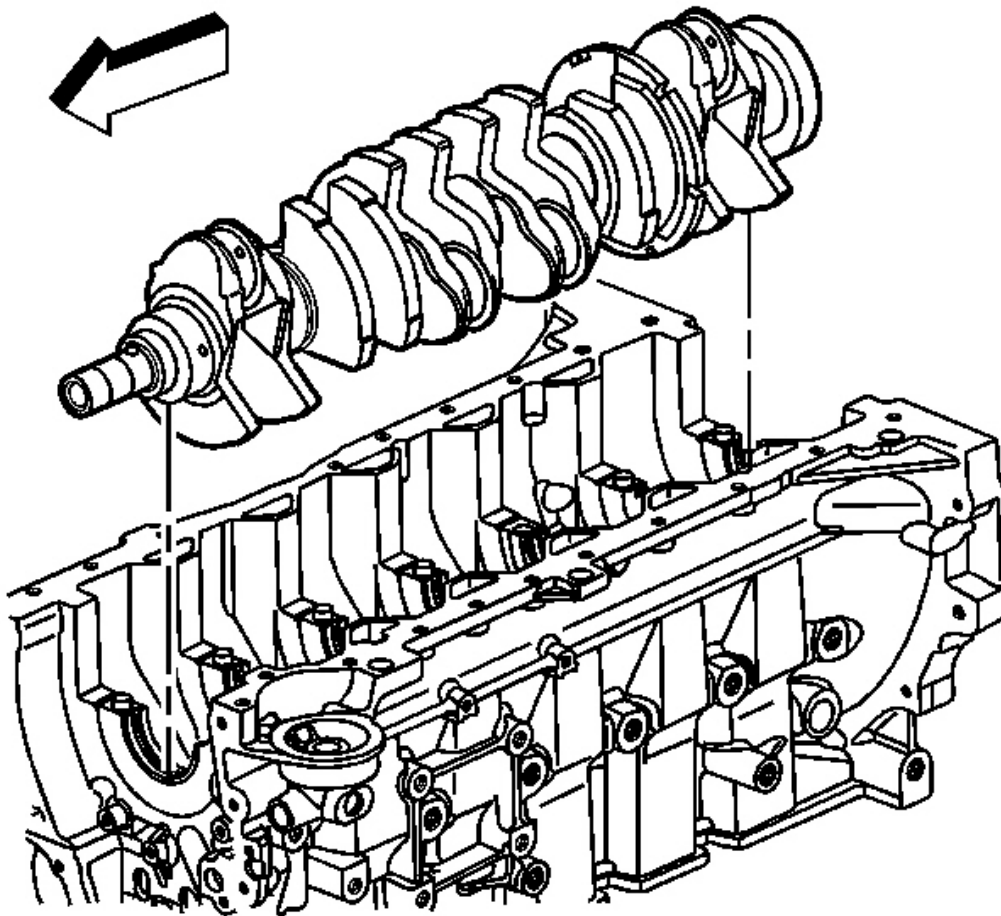
2. Remove the crankshaft main bearing cap stiffener.





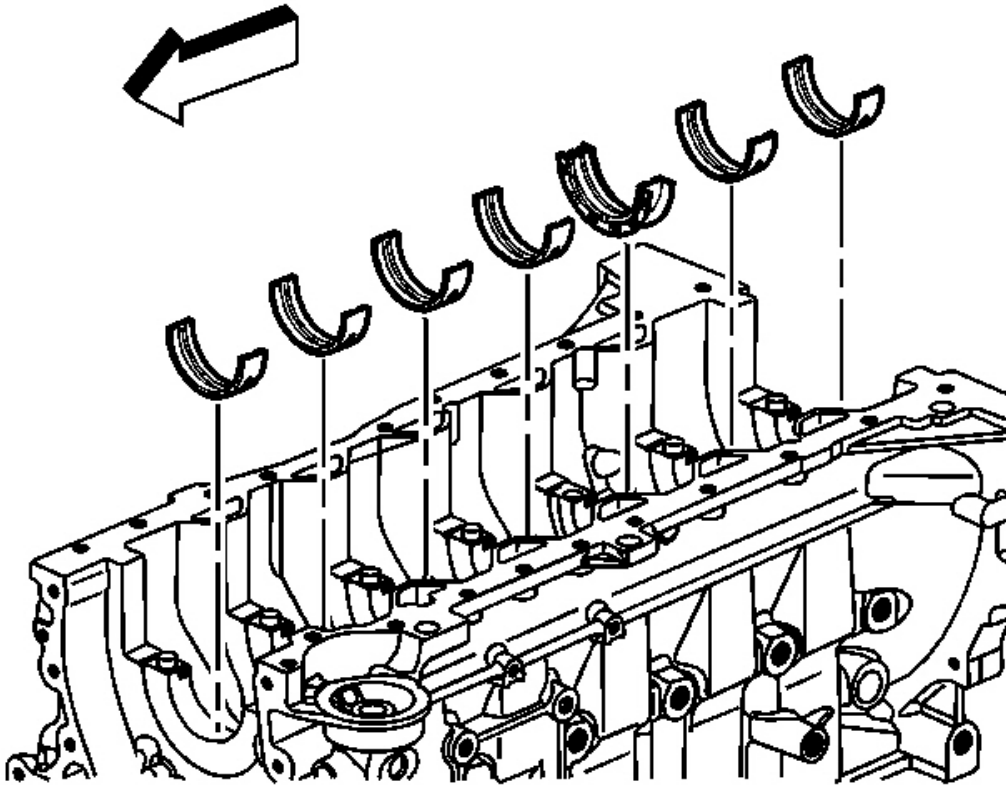
**Fig. 290: View Of Crankshaft Main Bearing Caps & Lower Bearings**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the crankshaft main bearing caps and lower bearings.



**Fig. 291: View Of Crankshaft**  
**Courtesy of GENERAL MOTORS CORP.**

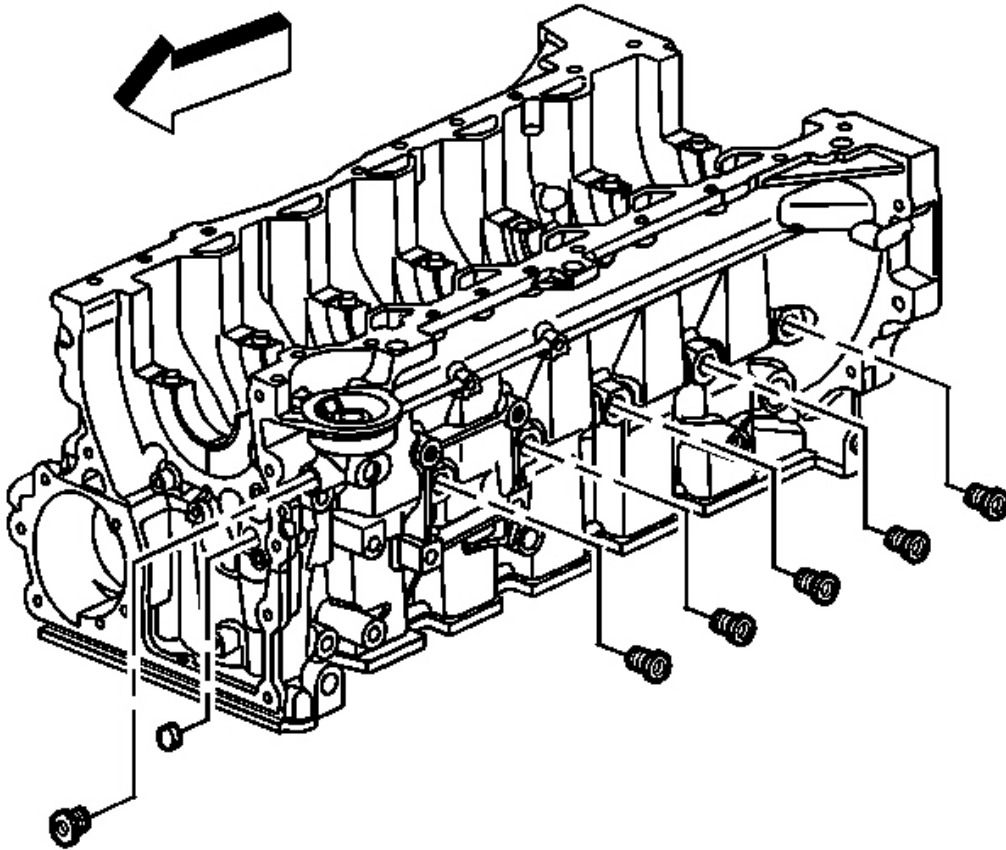
4. Remove the crankshaft.



**Fig. 292: View Of Upper Crankshaft Main Bearing Halves**  
Courtesy of GENERAL MOTORS CORP.

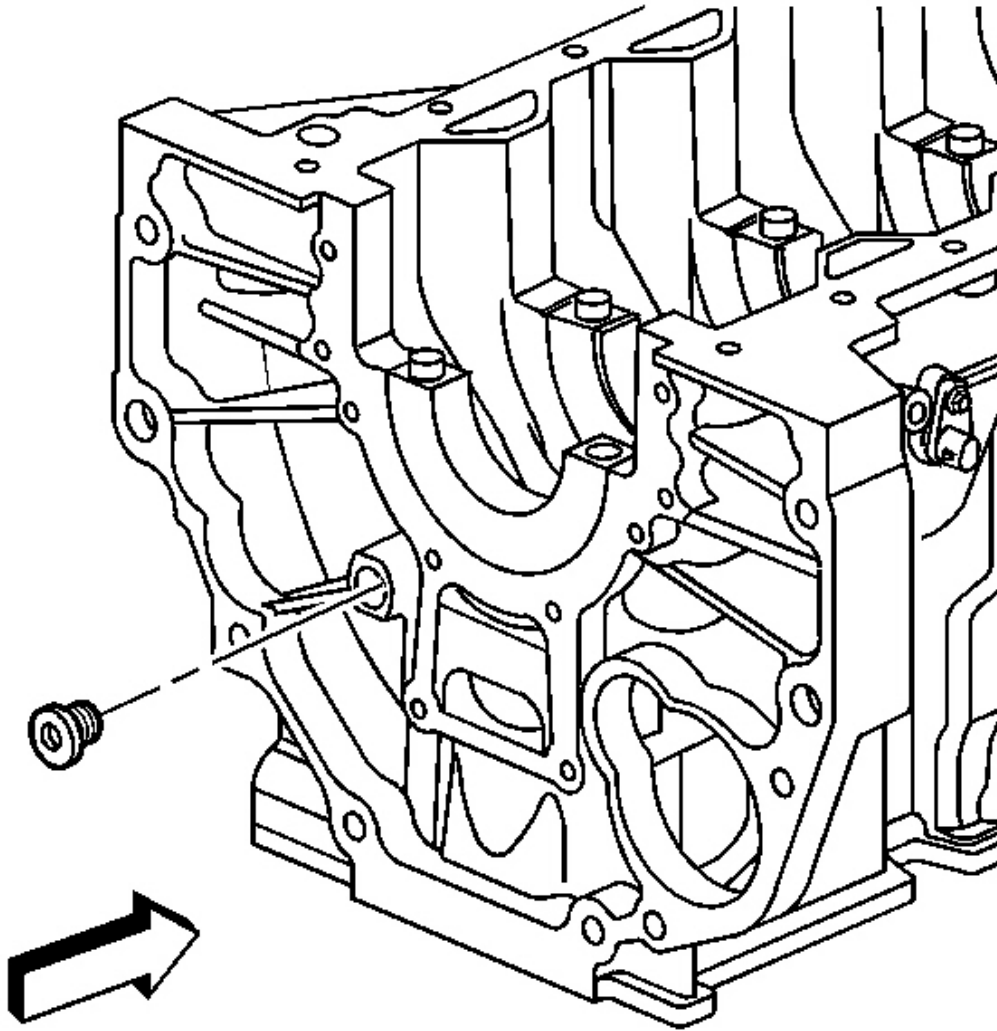
5. Remove the upper crankshaft main bearing halves.

## ENGINE BLOCK PLUG REMOVAL



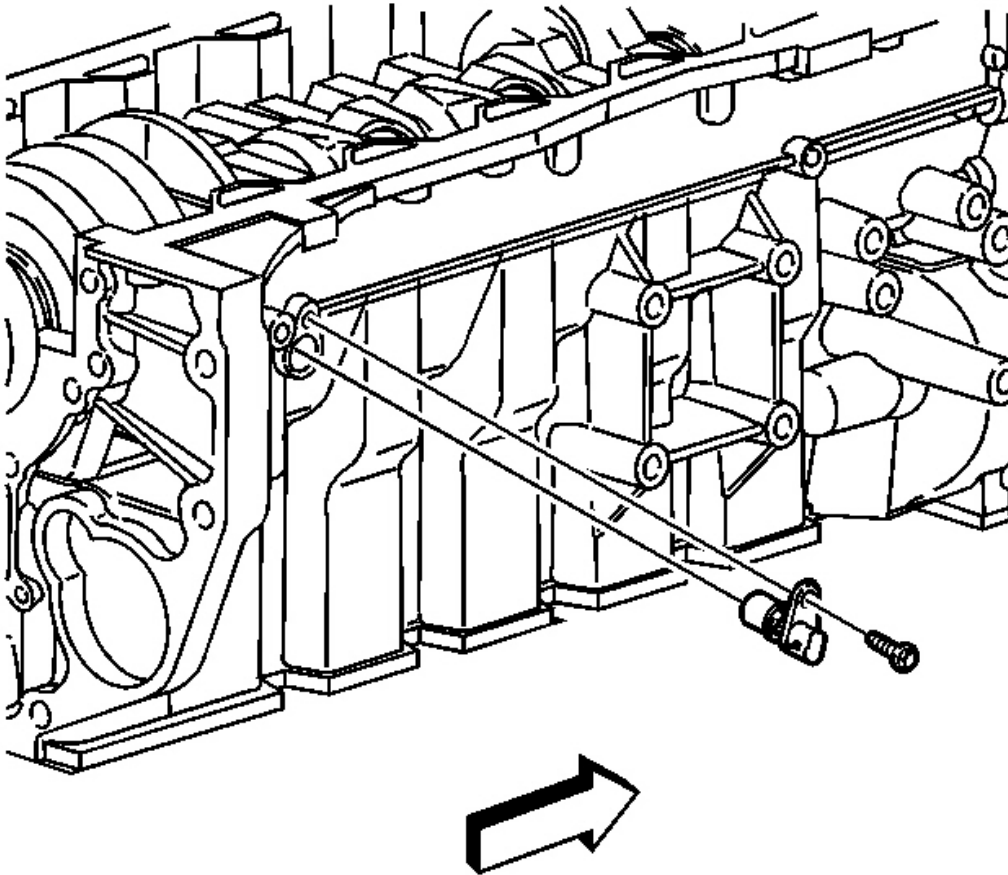
**Fig. 293: View Of Oil Gallery Plugs**  
**Courtesy of GENERAL MOTORS CORP.**

1. Remove the engine block oil gallery plugs.



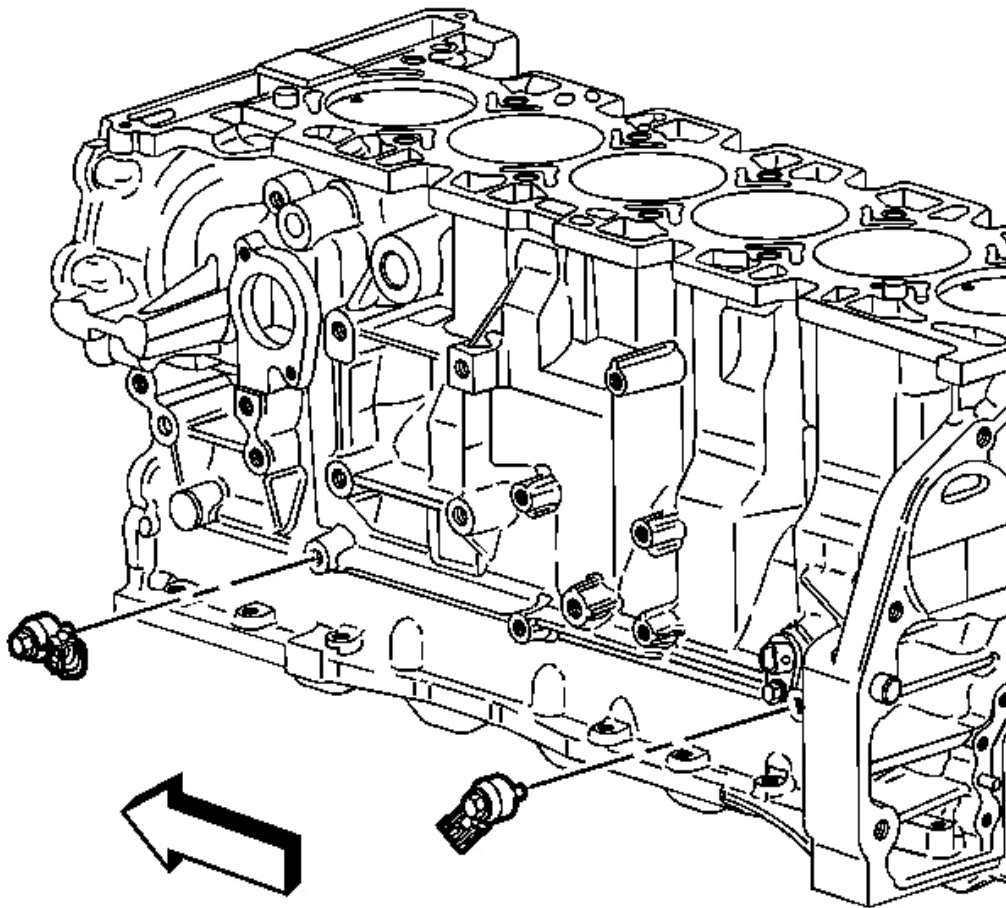
**Fig. 294: View Of Oil Gallery Plug From Rear Of Block**  
**Courtesy of GENERAL MOTORS CORP.**

2. Remove the engine block oil gallery plug from rear of block.



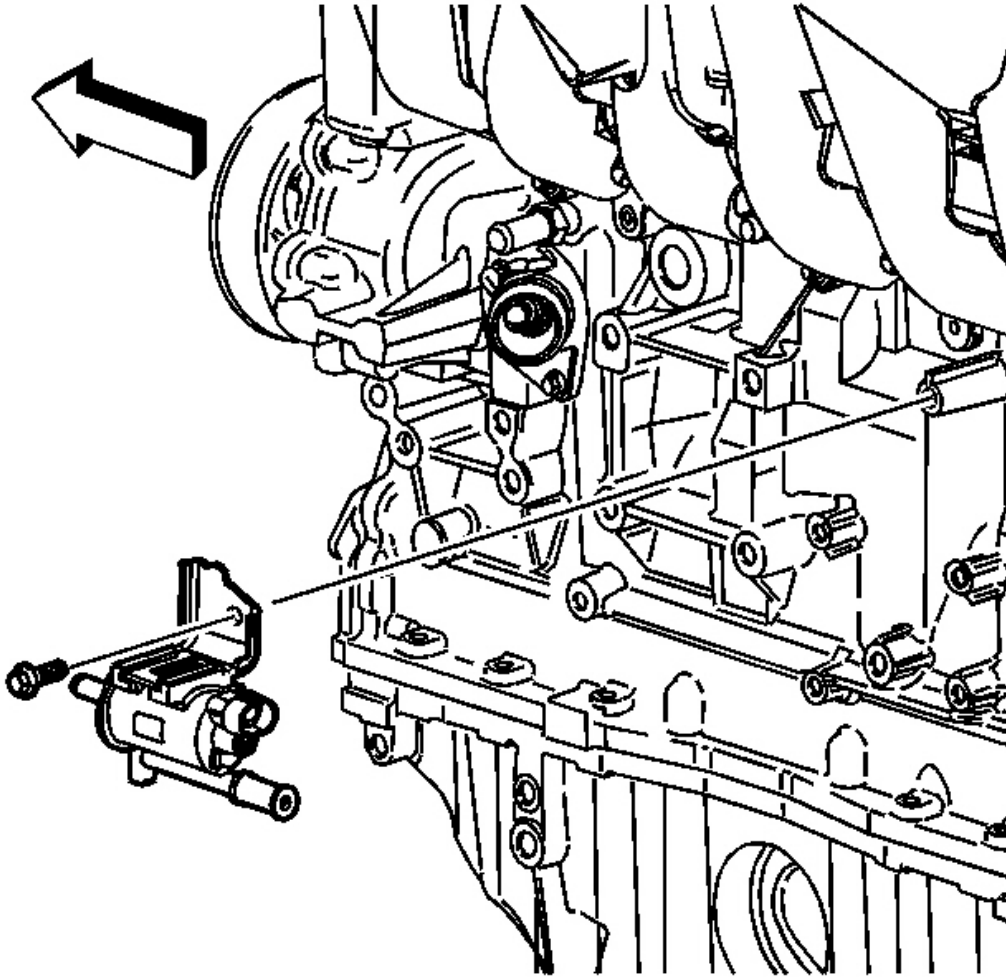
**Fig. 295: View Of Crankshaft Position Sensor**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the crankshaft position sensor.



**Fig. 296: View Of Knock Sensors**  
Courtesy of GENERAL MOTORS CORP.

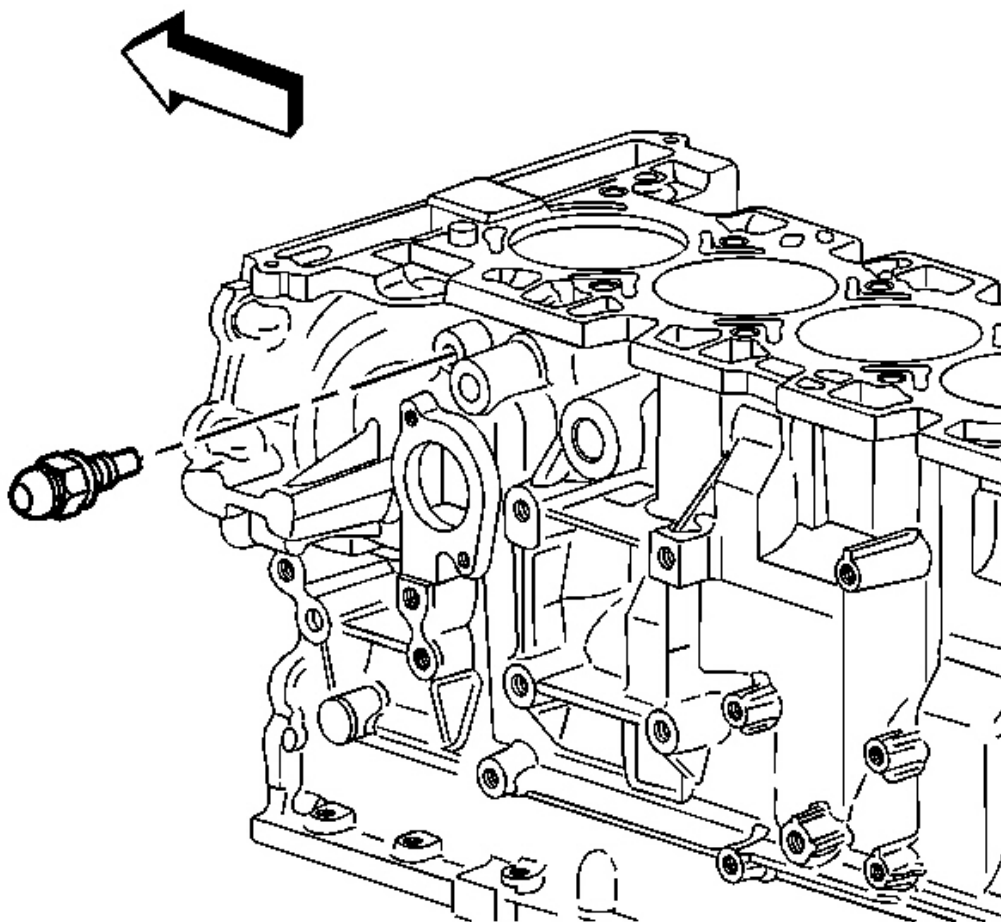
4. Remove the knock sensors.



**Fig. 297: View Of EVAP Solenoid**  
Courtesy of GENERAL MOTORS CORP.

5. Remove the EVAP solenoid.





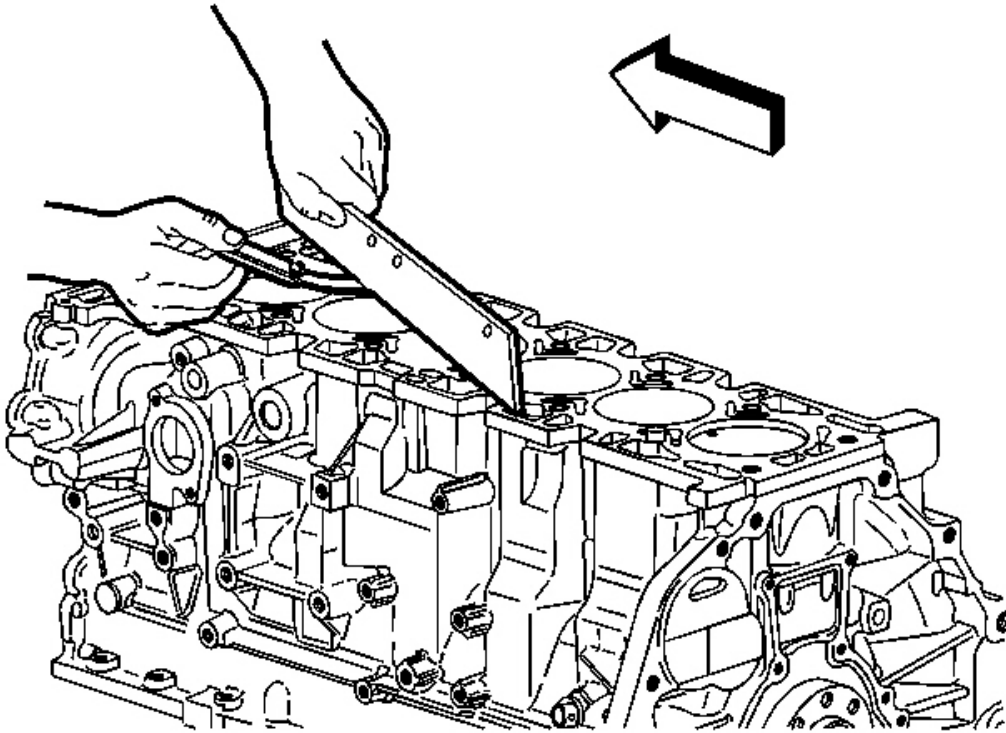
**Fig. 298: View Of Coolant Temperature Sensor**  
Courtesy of GENERAL MOTORS CORP.

6. Remove the coolant temperature sensor.

## **ENGINE BLOCK CLEANING AND INSPECTION**

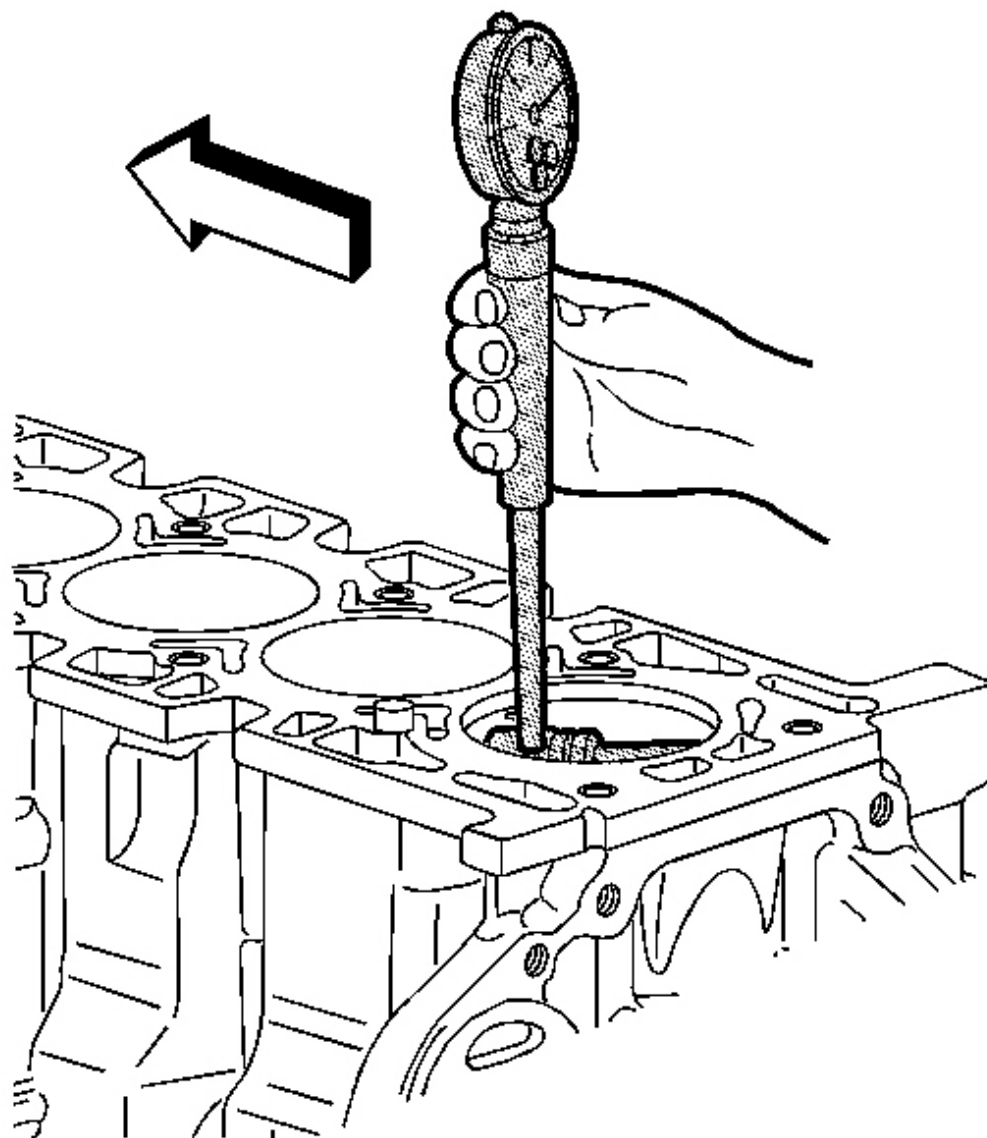
### **Tools Required**

- **J 8001** Dial Indicator Set
- **J 8087** Cylinder Bore Gauge. See **Special Tools and Equipment**.
- **J 45059** Angle Meter. See **Special Tools and Equipment**.



**Fig. 299: Cleaning Sealant From Gasket Mating Surface**  
**Courtesy of GENERAL MOTORS CORP.**

1. Clean the sealing material from all gasket mating surfaces.
2. Clean the engine block with a cleaning solution.
3. Flush the engine block with clean water.
4. Clean the oil passages.
5. Coat the cylinder bores and the machined surfaces with engine oil.
6. Inspect the threaded holes. Clean the holes with a tap, if needed.
7. Use a straight edge and a feeler gauge to check the deck surface for flatness. Carefully remove any minor irregularities. Replace the block if there is more than 0.08 mm (0.003 in) gap.



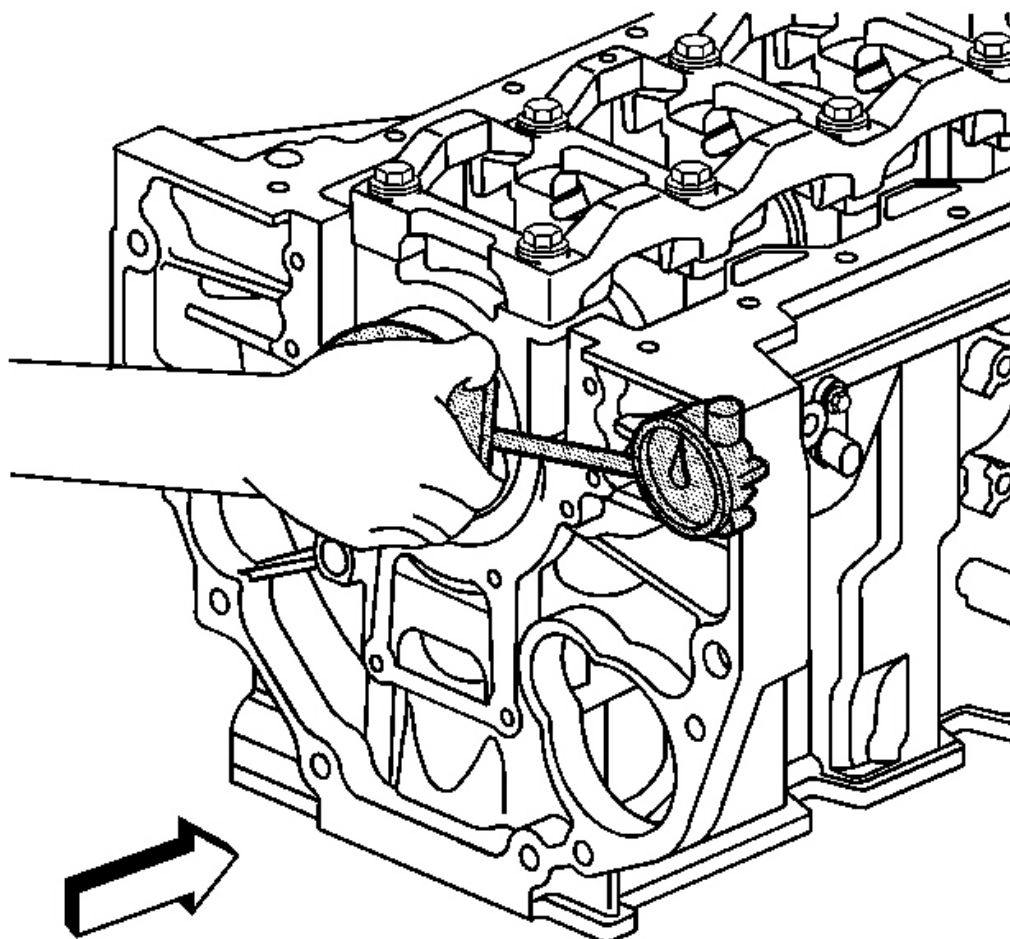
**Fig. 300: Measuring Cylinder Bores With J 8087**  
**Courtesy of GENERAL MOTORS CORP.**

8. Replace the engine block if the bores are out of specification.
9. Inspect the cylinder bores. Use **J 8087** to measure the cylinder bore. See **Special Tools and Equipment**. Inspect the bores for the following conditions:
  - Wear

- Taper
- Runout
- Ridging

**IMPORTANT:** If the bore is worn beyond the limits, bore the cylinders and refit with the one oversized piston available.

10. Leave sufficient material to allow finish honing when fitting the pistons.



**Fig. 301: Measuring Bolt Hole Bosses**  
Courtesy of GENERAL MOTORS CORP.

11. Inspect the oil pan rail for nicks. Use a flat file to remove an nicks.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

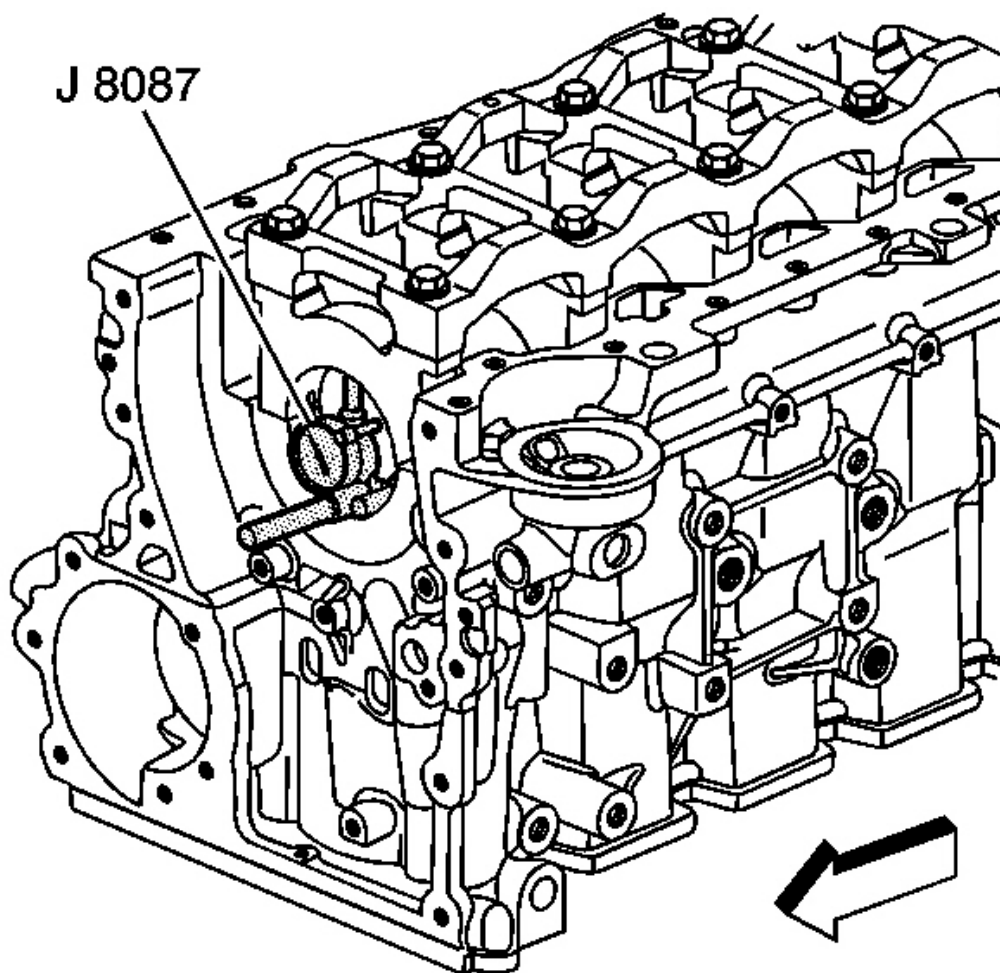
12. Inspect the front cover attaching area for nicks. Use a flat file to remove any nicks.
13. Inspect the mating surfaces of the transmission case.
14. Use the following procedure to measure the engine block flange runout at the mounting bolt hole bosses:
  1. Temporarily install the crankshaft. Measure the crankshaft flange runout.
  2. Hold a gauge plate flat against the crankshaft flange.
  3. Place **J 8001** (dial indicator stem) on the transmission mounting bolt hole boss. Set the indicator to zero.
  4. Record the readings obtained from all of the bolt hole bosses. The measurements should not vary more than 0.25 mm (0.010 in).
  5. Recheck the crankshaft flange runout if the readings vary more than 0.25 mm (0.010 in). If the crankshaft flange runout is within the specification, replace the engine block.
15. Remove the crankshaft.

**NOTE:**        **Refer to Fastener Notice in Cautions and Notices.**

16. Re-install the crankshaft bearing caps, stiffener, and bolts.

**Tighten:**

1. Tighten the crankshaft bearing cap bolts to 25 N.m (18 lb ft).
2. Use **J 45059** to tighten the crankshaft bearing cap bolts an additional 180 degrees. See **Special Tools and Equipment**.

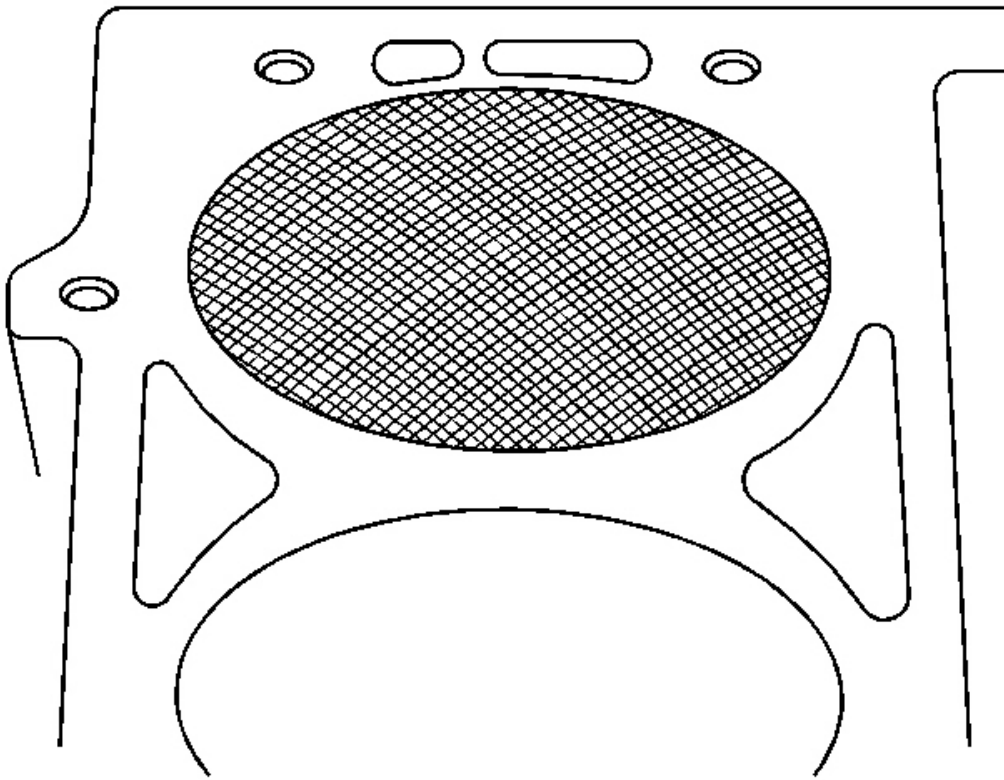


**Fig. 302: Inspecting Crankshaft Main Bearing Bores With J 8087**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Perform the following inspections, and reconditioning (if necessary), with the crankshaft main bearing caps installed and tightened to specification.

17. Inspect the crankshaft main bearing bores. Use **J 8087** to measure the bearing bore concentricity and alignment. See **Special Tools and Equipment**.
18. Remove the crankshaft main bearing cap stiffener and main bearing caps with bearings.

## CYLINDER HONING



**Fig. 303: Identifying Cylinder Bore Cross Hatch Pattern**  
Courtesy of GENERAL MOTORS CORP.

**CAUTION: Refer to Safety Glasses Caution in Cautions and Notices.**

1. When honing the cylinder bores, follow the manufacturer's recommendations for equipment use, cleaning, and lubrication.
  - Use only clean sharp stones of the proper grade for the amount of material to be removed.
  - Dull, dirty stones cut unevenly and generate excessive heat.
  - DO NOT hone to a final grade with a coarse or medium-grade stone.
  - Leave sufficient metal so that all the stone marks will be removed with the fine grade stones.
  - Perform the final honing with a fine-grade stone and hone the cylinder bore in a cross hatch pattern at 45-65 degrees to obtain the proper clearance.
2. During the honing operation, thoroughly check the cylinder bore.
  - Repeatedly check the cylinder bore fit with the selected piston.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

- All measurements of the piston or cylinder bore should be made with the components at normal room temperature.
- 3. When honing to eliminate taper in the cylinder bore, use full strokes the complete length of the cylinder bore.

Repeatedly check the measurement at the top, the middle, and the bottom of the cylinder bore.

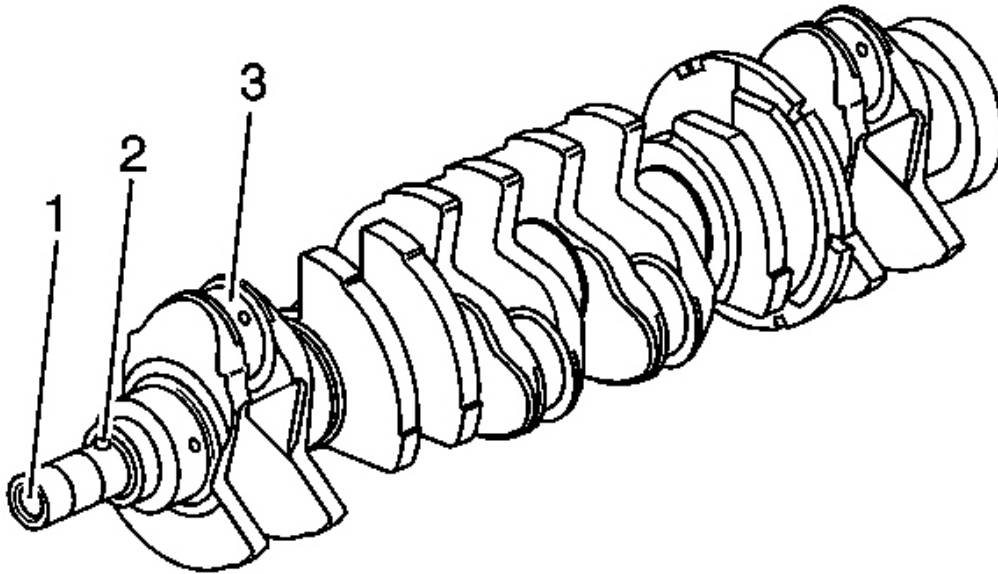
- The finish marks should be clean but not sharp.
  - The finish marks should be free from imbedded particles or torn or folded metal.
4. When finished, the reconditioned cylinder bores should have less than or meet the specified out-of-round and taper requirements.
  5. After the final honing and before the piston is checked for fit, clean the cylinder bore with hot water and detergent.
    1. Scrub the cylinder bores with a stiff bristle brush.
    2. Rinse the cylinder bores thoroughly with clean hot water.
    3. Dry the cylinder bores with a clean rag.
    4. Do not allow any abrasive material to remain in the cylinder bores.
      - Abrasive material may cause premature wear of the new piston rings and the cylinder bores.
      - Abrasive material will contaminate the engine oil and may cause premature wear of the bearings.
  6. Perform final measurements of the piston and the cylinder bore.
  7. Permanently mark the top of the piston for the specified cylinder to which it has been fitted.
  8. Apply clean engine oil to each cylinder bore in order to prevent rusting.

## CRANKSHAFT AND BEARINGS CLEANING AND INSPECTION

### Tools Required

- **J 45059** Angle Meter. See Special Tools and Equipment.
- **J 8087** Cylinder Bore Gauge. See Special Tools and Equipment.

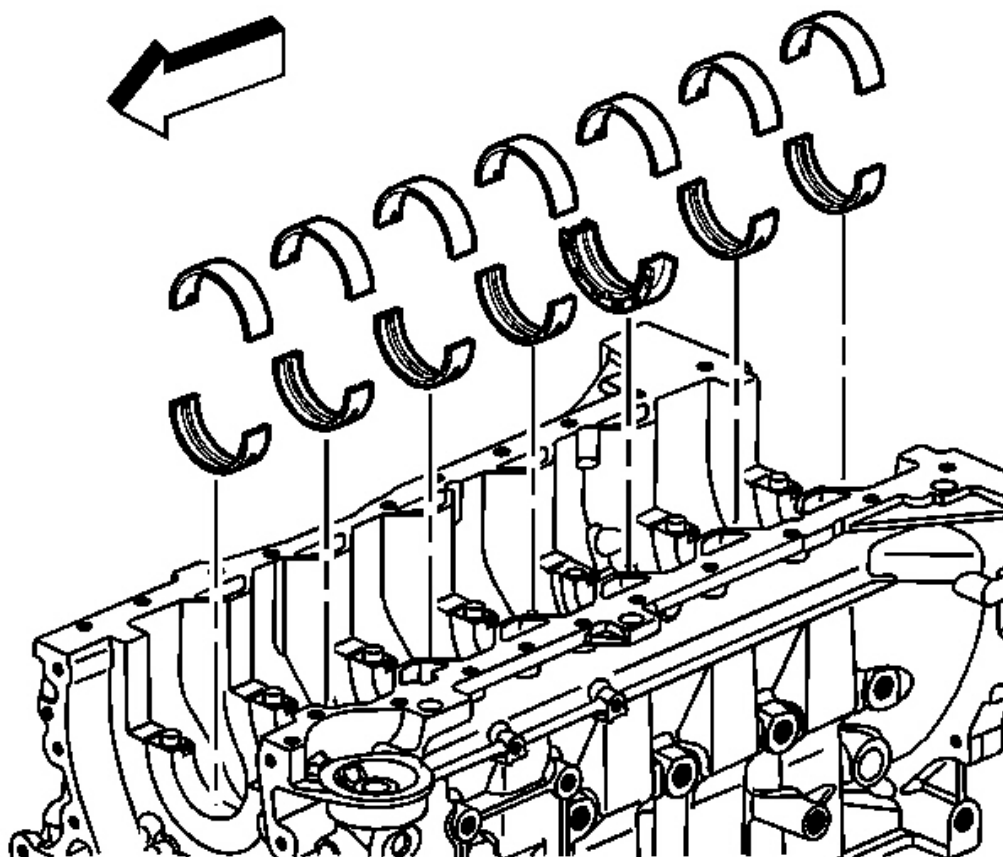




**Fig. 304: Inspecting Crankshaft For Wear**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Use care when handling the crankshaft. Avoid damaging the crankshaft reluctor wheel. Nicks, burrs or other damage to the teeth may effect the On-Board Diagnostics (OBD) II system performance.

1. Clean the crankshaft of all elements.
2. Inspect the crankshaft oil passages for obstructions.
3. Inspect the crankshaft for the following conditions:
  - Damaged threads (1)
  - Damaged mounting faces
  - Worn crankshaft pin (2)
  - Wear without any grooves or scratches (3)
  - Grooves or scoring (3)
  - Scratches (3)
  - Pitting or embedded bearing material (3)
  - Overheating (discoloration) (3)



**Fig. 305: Inspecting Crankshaft Bearing Inserts**

Courtesy of GENERAL MOTORS CORP.

4. Inspect the corresponding crankshaft bearing inserts for embedded material and determine the source of the material.

**IMPORTANT:** If cracks, severe gouges or burned spots are found, replace the crankshaft. Remove slight roughness using a fine polishing cloth soaked in clean engine oil. Remove any burrs using a fine oil stone.

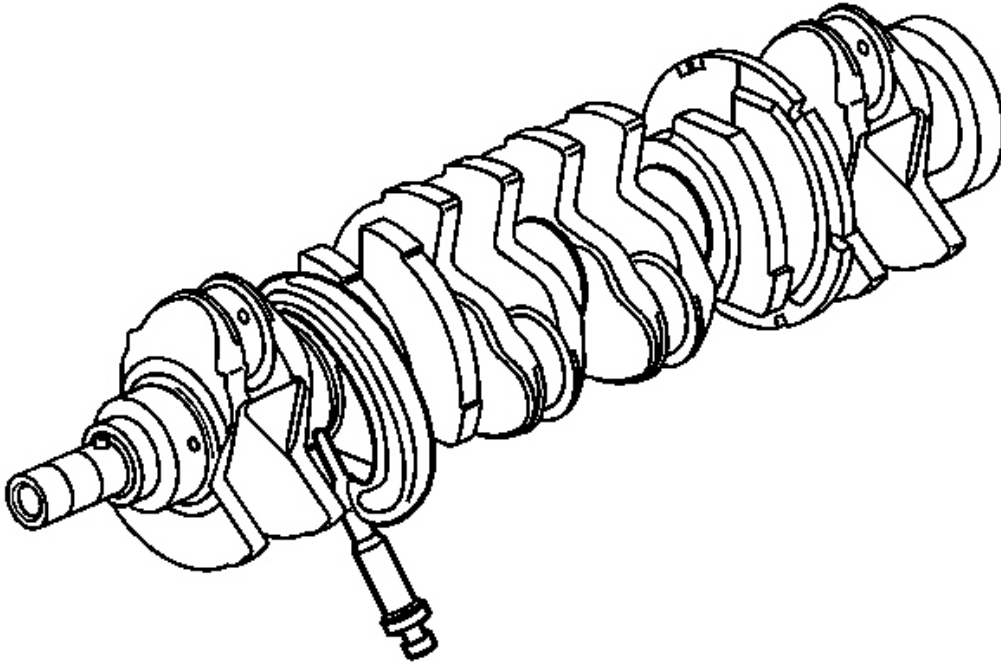
5. Inspect the outer surfaces of the crankshaft bearings for the following conditions:
  - Wear - surface wear indicates either movement of the insert or high spots in the surrounding material (spot wear)
  - Overheating or discoloration
  - Looseness or rotation indicated by flattened tangs and wear grooves

**IMPORTANT: Note the location of the crankshaft main bearing high spots. If the spots are not in line, the crankshaft is bent. Replace the crankshaft.**

6. Inspect the crankshaft main bearings for craters or pockets. Flattened sections on the crankshaft bearing halves also indicate fatigue.
7. Inspect the thrust surfaces of the main thrust bearing for the following conditions:
  - Wear
  - Grooving - Grooves are caused by irregularities of the crankshaft thrust surface.
8. Inspect the crankshaft bearings for excessive scoring or discoloration.
9. Inspect the crankshaft bearings for dirt or imbedded debris.
10. Inspect the crankshaft bearings for improper seating indicated by bright, polished sections.
11. Inspect the crankshaft bearings for uneven side-to-side wear. This may indicate a bent crankshaft or a tapered bearing journal.

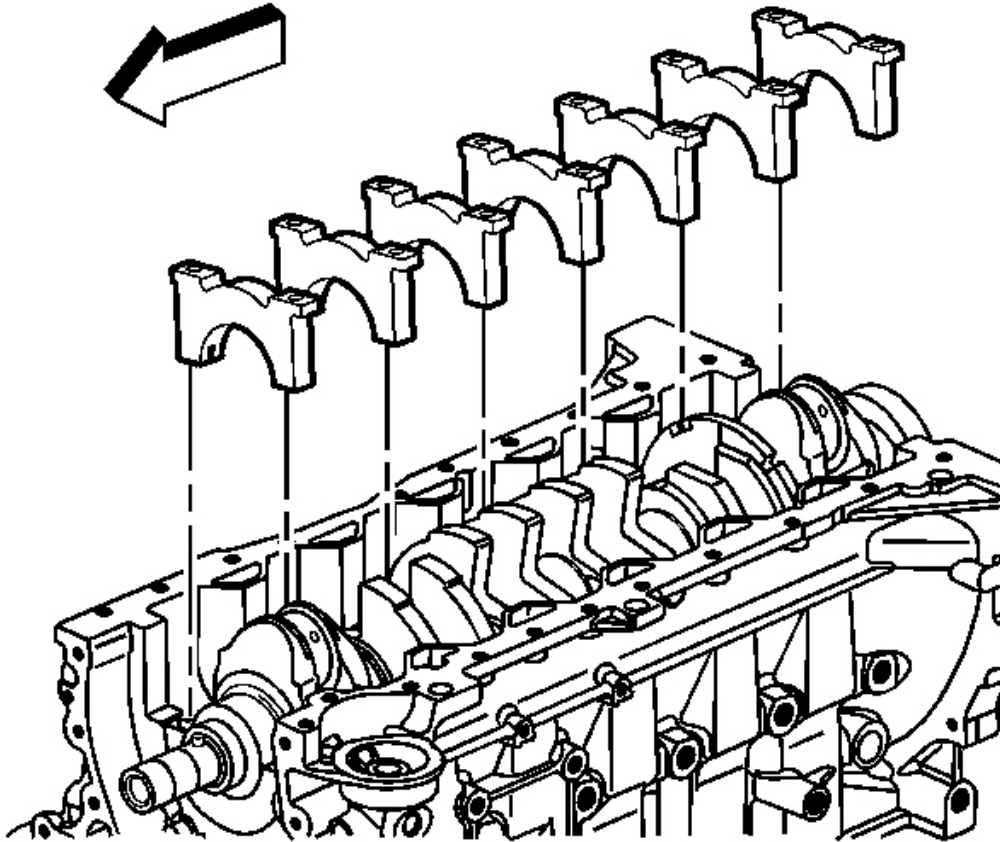
**IMPORTANT: If crankshaft bearing failure is due to conditions other than normal wear, investigate the cause of the condition. Inspect the crankshaft or connecting rod bearing bores.**

12. Inspect the connecting rod bearing bores using the following procedure:
  1. Tighten the connecting rod bearing cap to specification.
  2. Use **J 8087** to measure the bearing bore for taper and out-of-round. Record the readings. See **Special Tools and Equipment**.
  3. No taper or out-of-round should exist.



**Fig. 306: Measuring Diameter Of Crankshaft Bearing Journal**  
**Courtesy of GENERAL MOTORS CORP.**

13. Measure the crankshaft bearing journal diameter with a micrometer in several places, 90 degrees apart. Average the measurements.



**Fig. 307: View Of Crankshaft Bearing Caps**  
Courtesy of GENERAL MOTORS CORP.

14. Measure the crankshaft bearing journal taper and runout.

**IMPORTANT:** Refer to the pin stamp on the crankshaft main bearing caps for sequence and direction of installation. The pin stamp arrow points to the front of the engine.

15. Install the crankshaft bearing caps.
16. Install the crankshaft main bearing cap stiffener.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

17. Install the crankshaft bearing cap bolts.

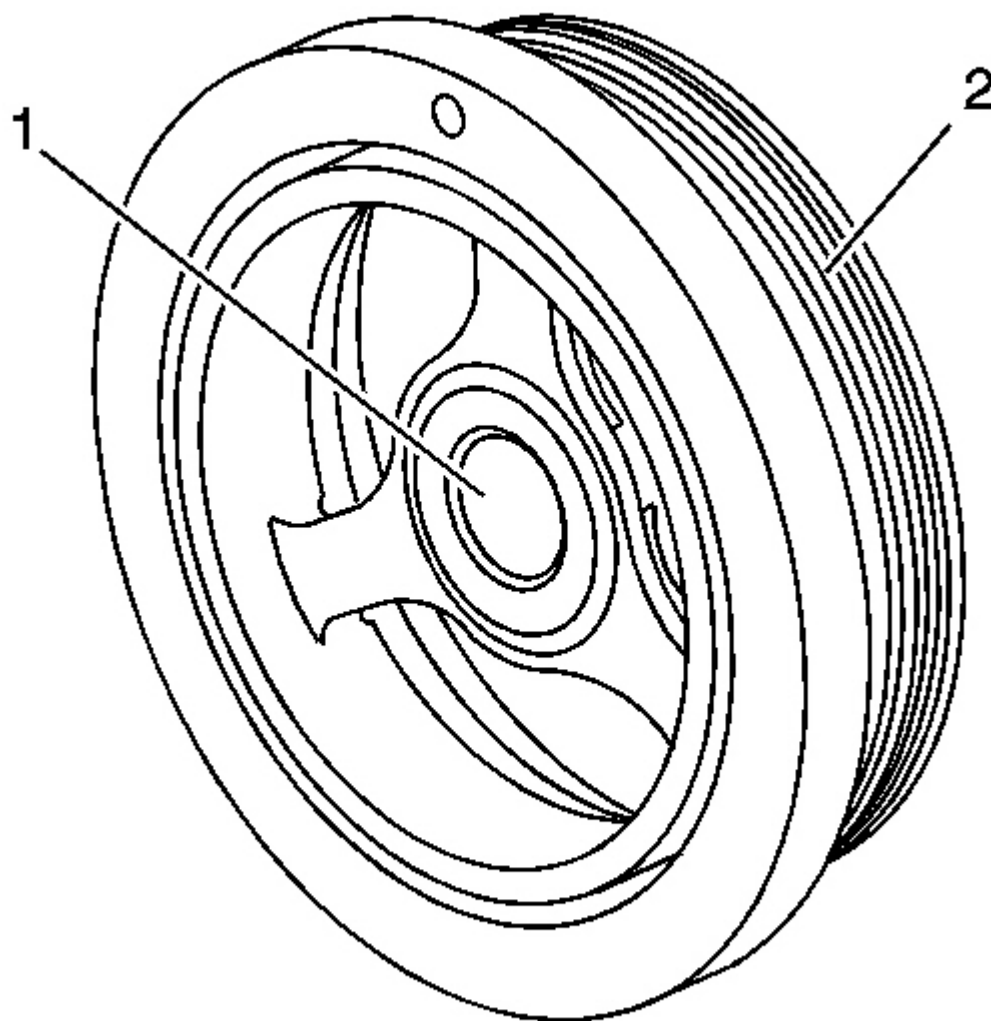
## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### **Tighten:**

1. Tighten the crankshaft bearing cap bolts to 25 N.m (18 lb ft).
  2. Use **J 45059** to tighten the crankshaft bearing cap bolts an additional 180 degrees. See **Special Tools and Equipment**.
- 
18. Measure the crankshaft main bearing inside diameter with an inside micrometer.
  19. Measure the connecting rod inside diameter in the same direction as the length of the rod with an inside micrometer.
  20. If the specified clearances cannot be met, the crankshaft, connecting rods, or block may need to be replaced.

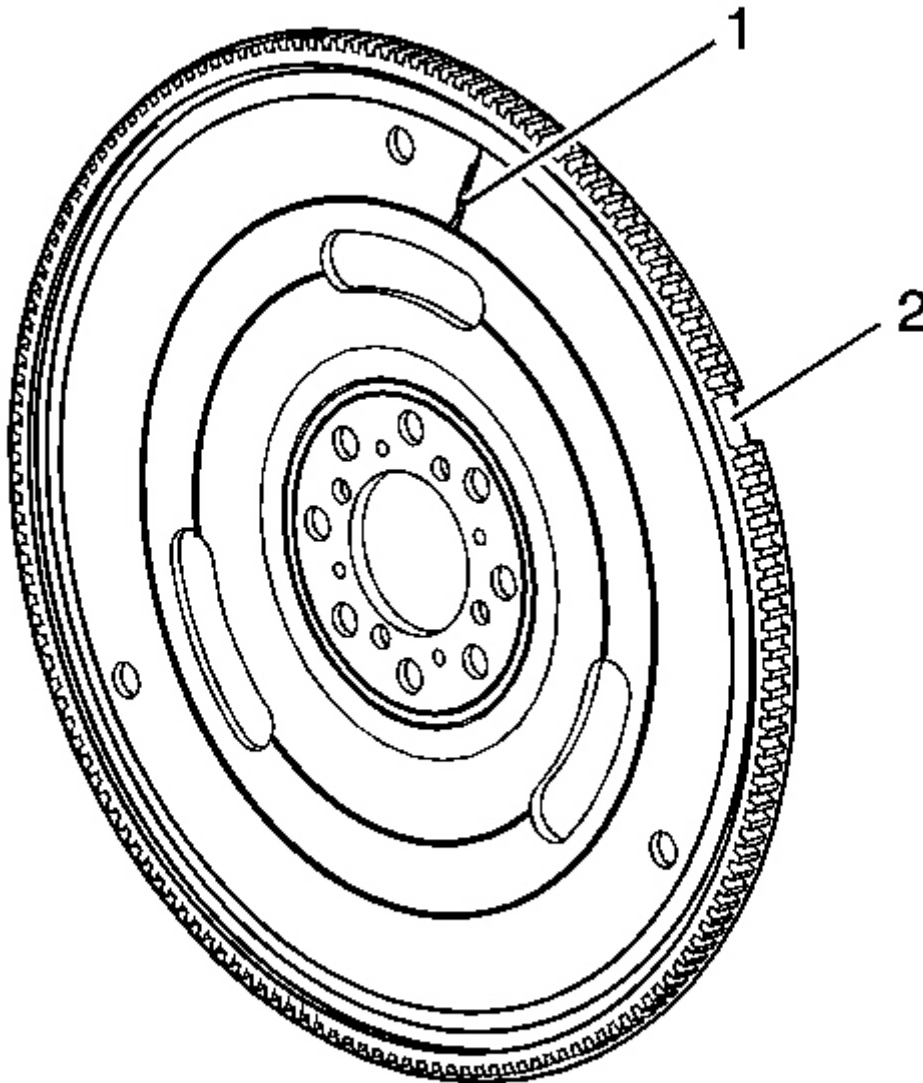
### **CRANKSHAFT BALANCER CLEANING AND INSPECTION**



**Fig. 308: View Of Crankshaft Balancer Sealing Area & Belt Ribs**  
**Courtesy of GENERAL MOTORS CORP.**

1. Inspect the crankshaft balancer sealing area for grooves, nicks, or burs (1).
2. Inspect the crankshaft balancer belt ribs for dents or damage (2).
3. Replace the crankshaft balancer if damage is present.

## **ENGINE FLYWHEEL CLEANING AND INSPECTION**



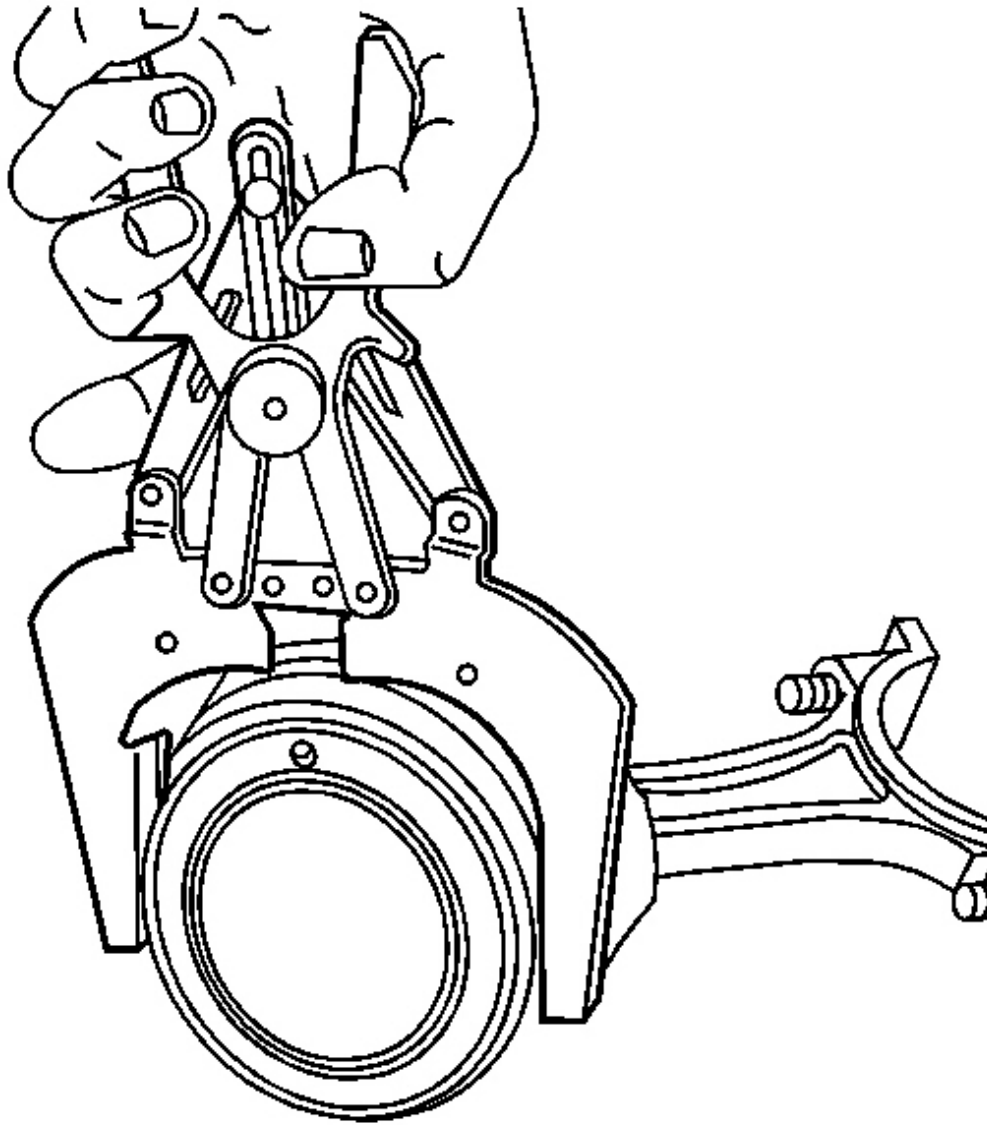
**Fig. 309: Inspecting Engine Flywheel & Teeth**  
Courtesy of GENERAL MOTORS CORP.

1. Inspect the engine flywheel for cracks (1).
2. Inspect the engine flywheel teeth for damage (2).
3. Replace the engine flywheel if damage is present.



### Tools Required

**J 43654** Piston Pin Retainer Clip Remover/Installer. See **Special Tools and Equipment**.

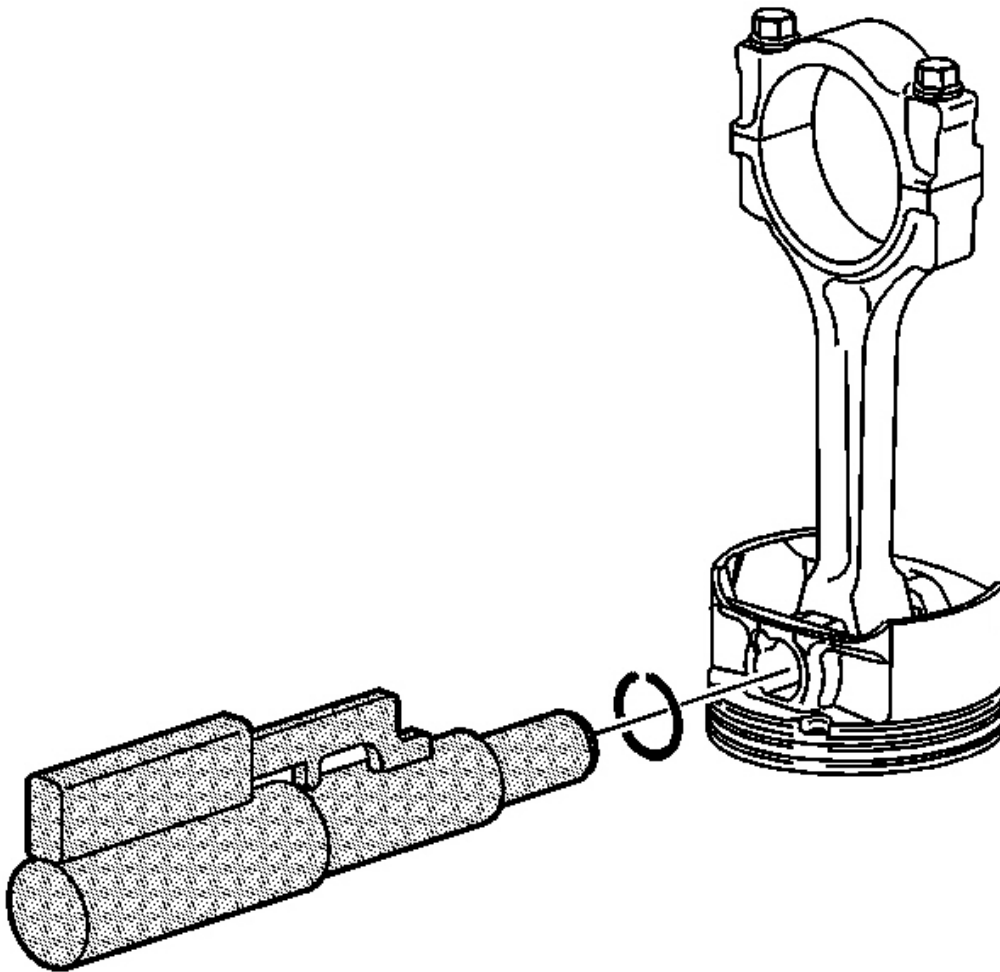


**Fig. 310: View Of Piston Rings & Piston Expander**  
Courtesy of GENERAL MOTORS CORP.

**CAUTION:** Handle the piston carefully. Worn piston rings are sharp and may cause bodily injury.

**IMPORTANT:** Do not reuse the piston rings.

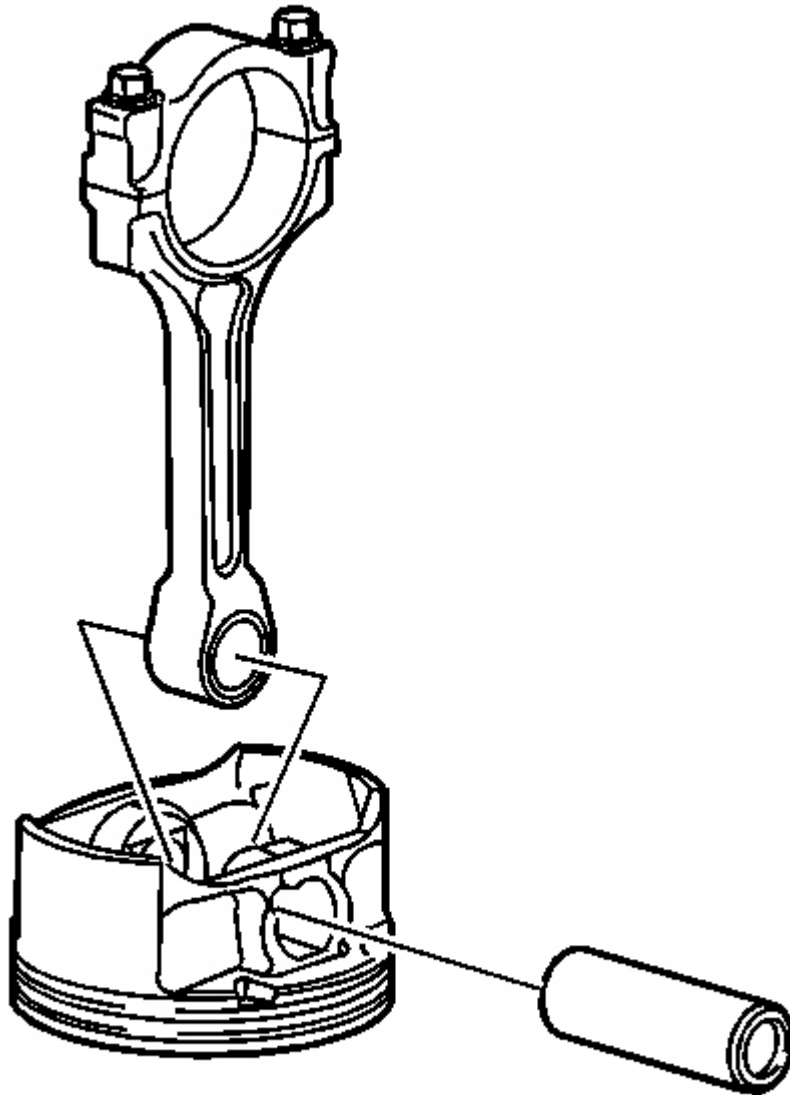
1. Remove the piston rings using a piston ring expander.



**Fig. 311: View Of Piston Pin Retaining Clips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Two retainers hold the piston pins in place. Reuse the retainers if they are not damaged during removal.

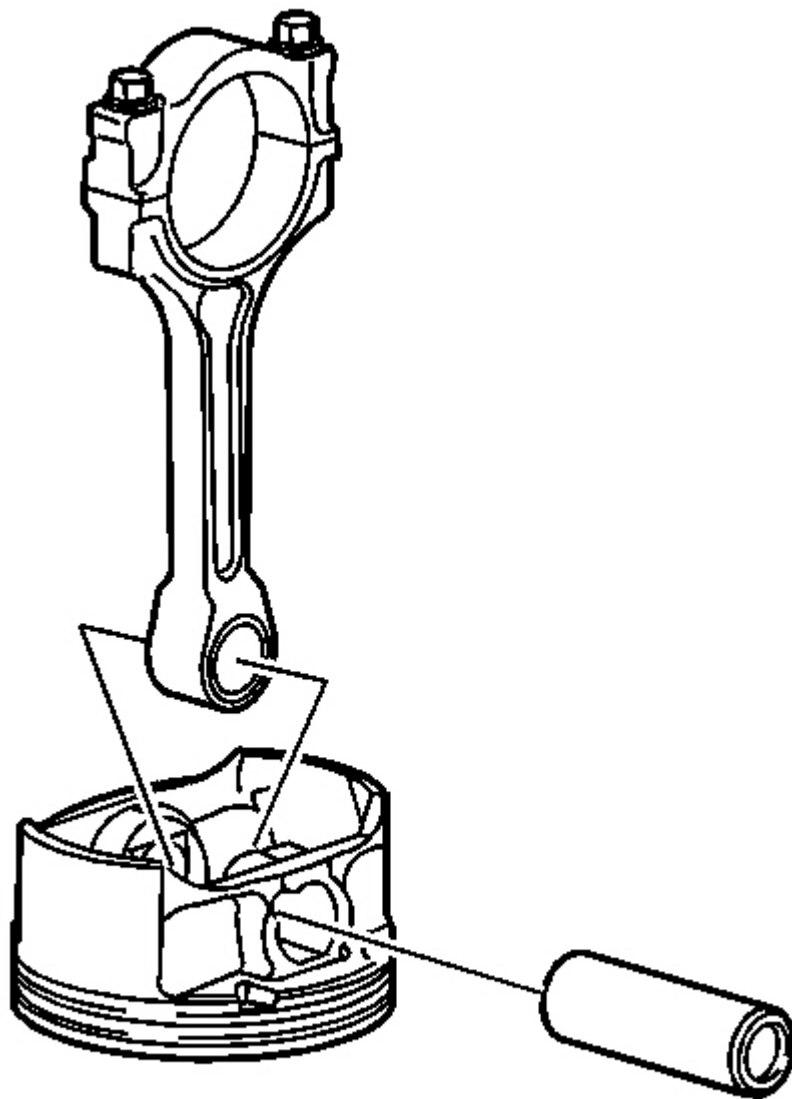
2. Remove the piston pin retaining clips.



**Fig. 312: View Of Piston Pin & Connecting Rod**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the piston pin.

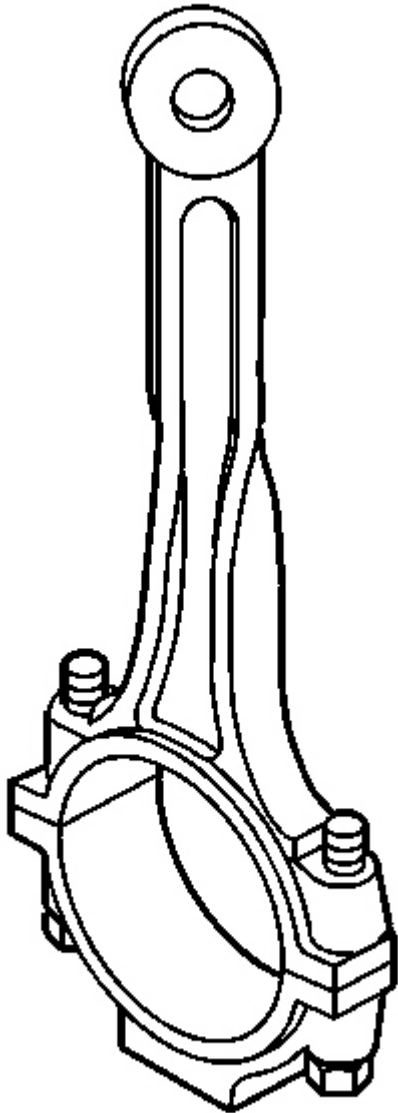
**J 8087** Cylinder Bore Gage. See **Special Tools and Equipment.**



**Fig. 313: View Of Piston Pin & Connecting Rod**  
**Courtesy of GENERAL MOTORS CORP.**

1. Clean and soak the following components in a carburetor cleaning solution to remove carbon, sludge, and varnish:
  - Piston

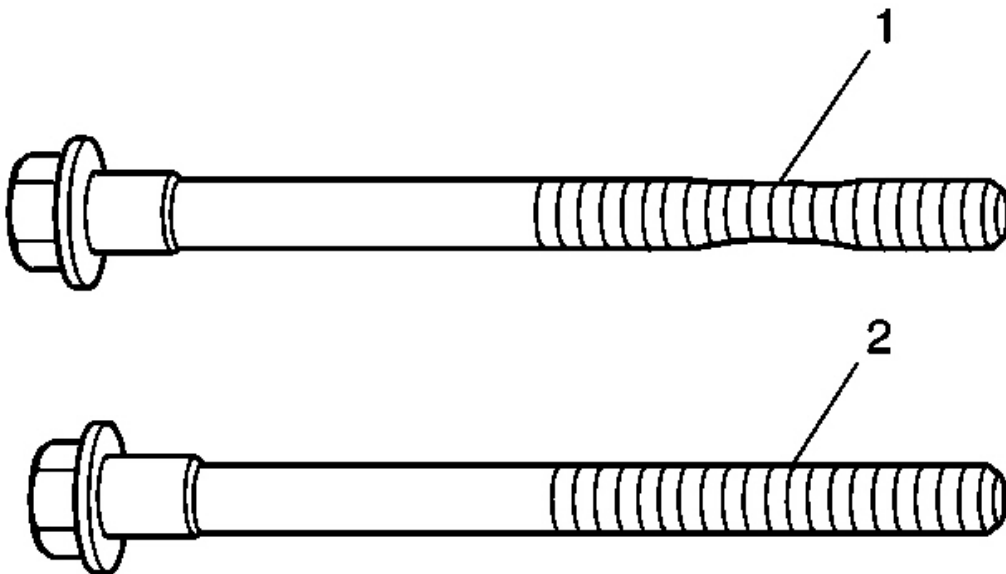
- Piston pin
- Connecting rod



**Fig. 314: Identifying Twisted Connecting Rod**  
Courtesy of GENERAL MOTORS CORP.

2. Install the connecting rod cap.

3. Place the connecting rod assembly on a checking fixture.
4. Inspect the connecting rod assembly for bending or twisting.
5. Replace any bent or twisted connecting rods.
6. If the connecting rod large bore contains minor scratches or abrasions, clean the bore in a circular direction with light emery paper. **DO NOT** scrape the connecting rod or cap.
7. Measure the piston pin to connecting rod bore using the following procedure:
  - Using an outside micrometer, take two measurements of the piston pin in the area of the connecting rod contact.
  - Using an inside micrometer, measure the connecting rod piston pin bore.
  - Subtract the piston pin diameter from the piston pin bore diameter.
  - The clearance should not be more than 0.018 mm (0.0007 in).
8. If there is excessive clearance, replace the piston pin.
9. If there is still excessive clearance, replace the connecting rod.
10. If there is evidence of pin bore or pin scoring, replace the rod and pin assembly.



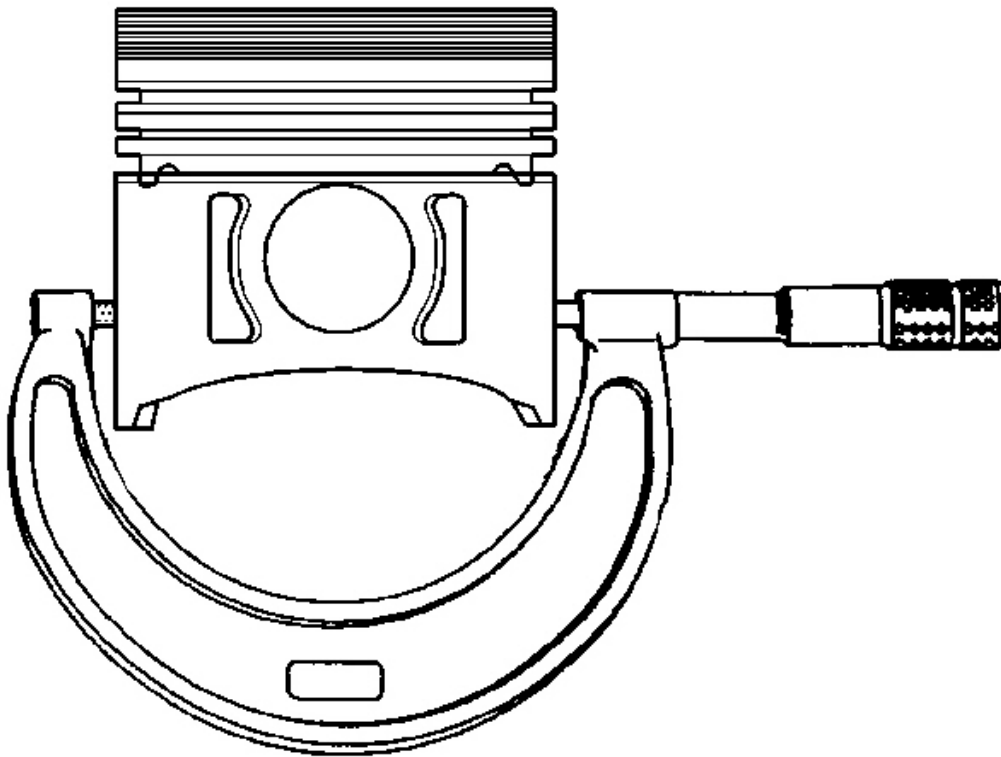
**Fig. 315: Inspecting Connecting Rod Cap Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

11. Inspect the connecting rod bearings for the following conditions:
  - Craters or pockets

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

- Flattened sections
  - Excessive scoring or discoloration.
  - Imbedded debris
  - bright, polished sections
12. Inspect the inside of the connecting rod bearing and outside diameter of the connecting rod bearing journal for wear. This indicates high spots.
  13. Inspect the connecting rod bearing bore for taper and out-of-round.
  14. Inspect the connecting rod bolts for stretching (compare to new or known good bolt). (1) is a stretched bolt, (2) is a new or good bolt.
  15. Clean the piston skirts and the pins with a cleaning solvent. DO NOT wire brush any part of the piston.
  16. Clean the piston ring grooves. Ensure that the oil ring holes and slots are clean.
  17. Inspect the pistons for the following conditions:
    - Cracked ring lands, skirts, or pin bosses
    - Ring grooves for nicks, burrs that may cause binding
    - Warped or worn ring lands
    - Eroded areas at the top of the piston
    - Scuffed or damaged skirts
    - Worn piston pin bores
  18. Replace pistons that show any signs or damage or excessive wear.

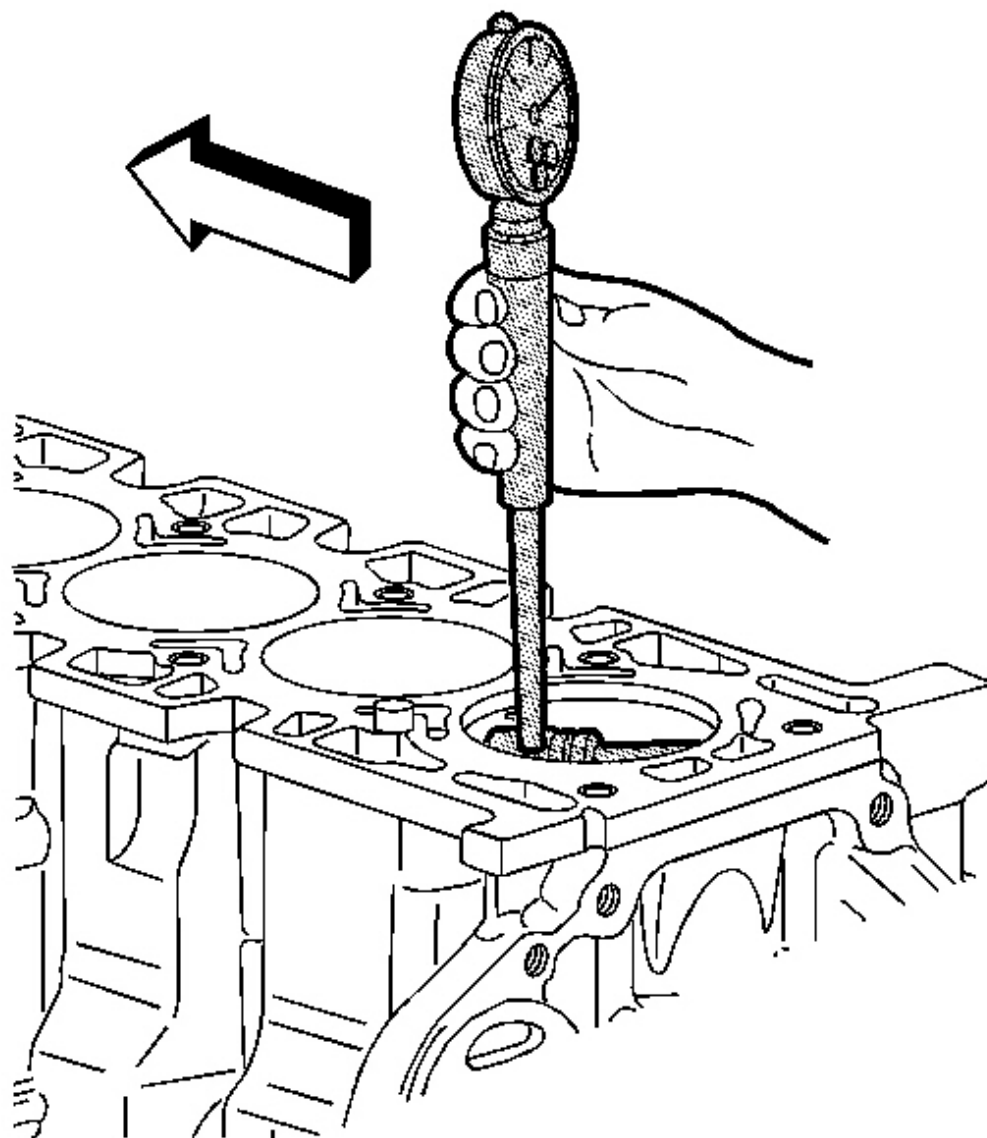


**Fig. 316: Measuring Piston Diameter**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** When fitting pistons, consider both the piston and the cylinder bore conditions together. Production and service pistons have the same nominal weight and may be intermixed without affecting engine balance. If necessary, used pistons may be fitted selectively to any cylinder of the engine, providing the pistons are in good condition and the same weight. Do not cut oversize pistons down or the engine balance may be affected. Finish hone when selecting the piston.

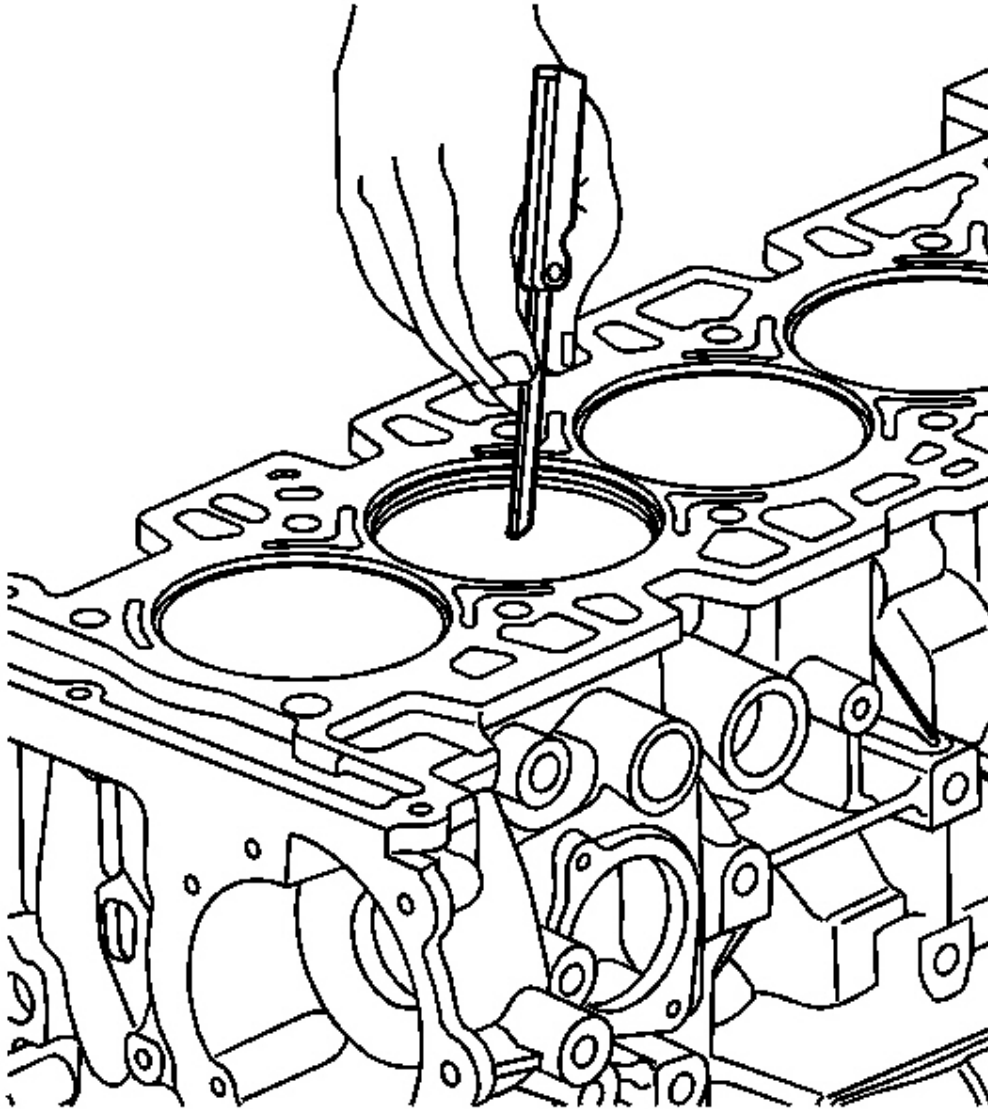
19. Measure the piston diameter for size with a micrometer or caliper at a right angle to the pin center line, across the skirts, 38 mm (1.50 in) from the top of the piston.





**Fig. 317: Measuring Cylinder Bores With J 8087**  
**Courtesy of GENERAL MOTORS CORP.**

20. Replace the piston if worn beyond specifications or if damaged.
21. Use **J 8087** to measure the cylinder bore. See **Special Tools and Equipment**.



**Fig. 318: Honing Cylinder Bore**

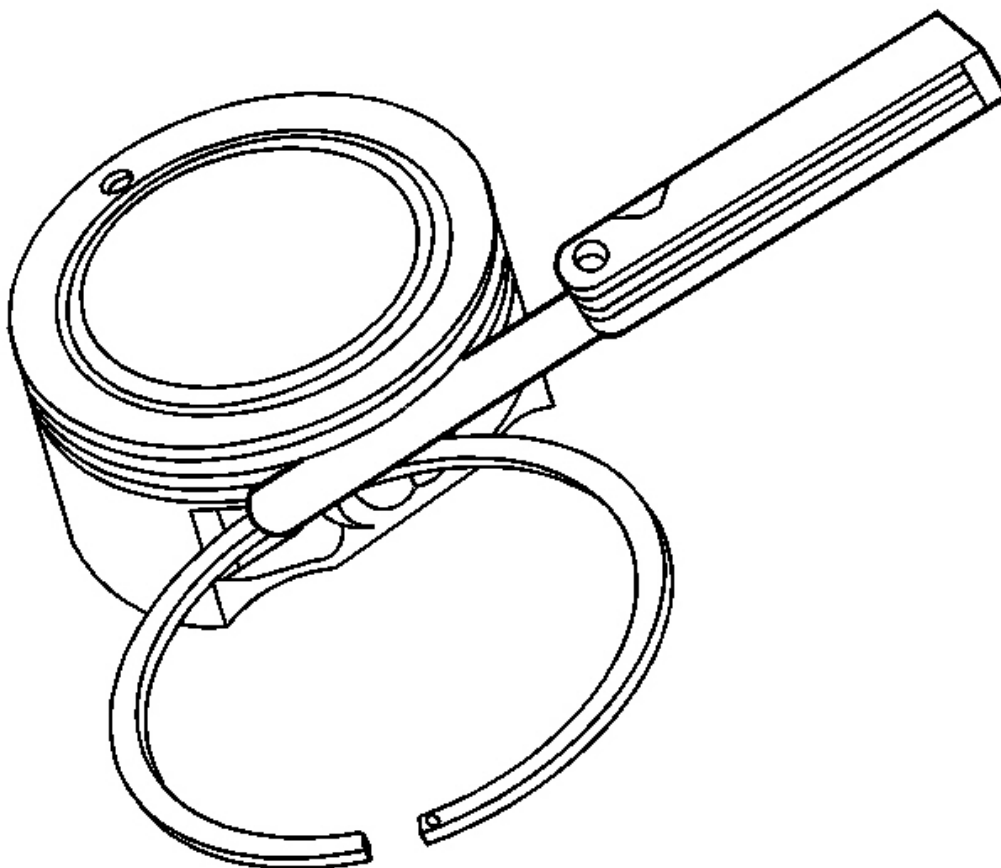
Courtesy of GENERAL MOTORS CORP.

22. Hone to size if necessary. Use the following procedure to hone the cylinder bore to the correct size.
  1. Select a piston.
  2. Hone the cylinder bore to obtain the recommended clearance.
  3. Clean the piston and cylinder bore with soap and water. Dry the cylinder bore and piston. Lubricate the cylinder bore with clean engine oil.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

23. Use the following procedure to measure the piston-to-cylinder bore clearance.
  1. Subtract the piston diameter from the cylinder bore diameter to determine the piston-to-bore clearance.
  2. Compare the piston-to-bore clearance using the specifications to determine if the clearance is in the acceptable range.
  3. If the used piston is not acceptable, a new service piston may be selected.
24. When a piston has been selected, mark the piston to identify the cylinder for which the piston was fitted.
25. Select a set of new piston rings.
26. Install each ring, one at a time, into the corresponding cylinder.
27. Install the piston for that cylinder, upside down (top of piston pushing on the ring) and push the ring to approximately 25 mm (1 in) down from the deck surface.
28. Remove the piston.
29. Measure the ring end gap with a feeler gage.



**Fig. 319: Measuring Piston Ring Gap**  
Courtesy of GENERAL MOTORS CORP.

30. If the ring gap is not within the specification range, replace the rings.
31. Measure the piston ring side clearance - compression rings.

**NOTE:** The piston ring groove must only be cleaned with a ring groove cleaning tool. Proper engine performance and durability depends on the straightness and smoothness of the ring groove. Cleaning the piston ring groove with an improper tool can damage the piston ring groove and effect the performance and durability of the engine.

32. Use the following procedure to measure the compression ring side clearance.
  1. Roll the piston ring around the groove.
  2. Measure the side clearance with a feeler gage.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

3. If the ring is too tight, inspect the piston ring groove for nicks, burrs, or damage. Use emery cloth to remove any minor burrs.
4. If the ring side clearance is greater than the specification, replace the piston.

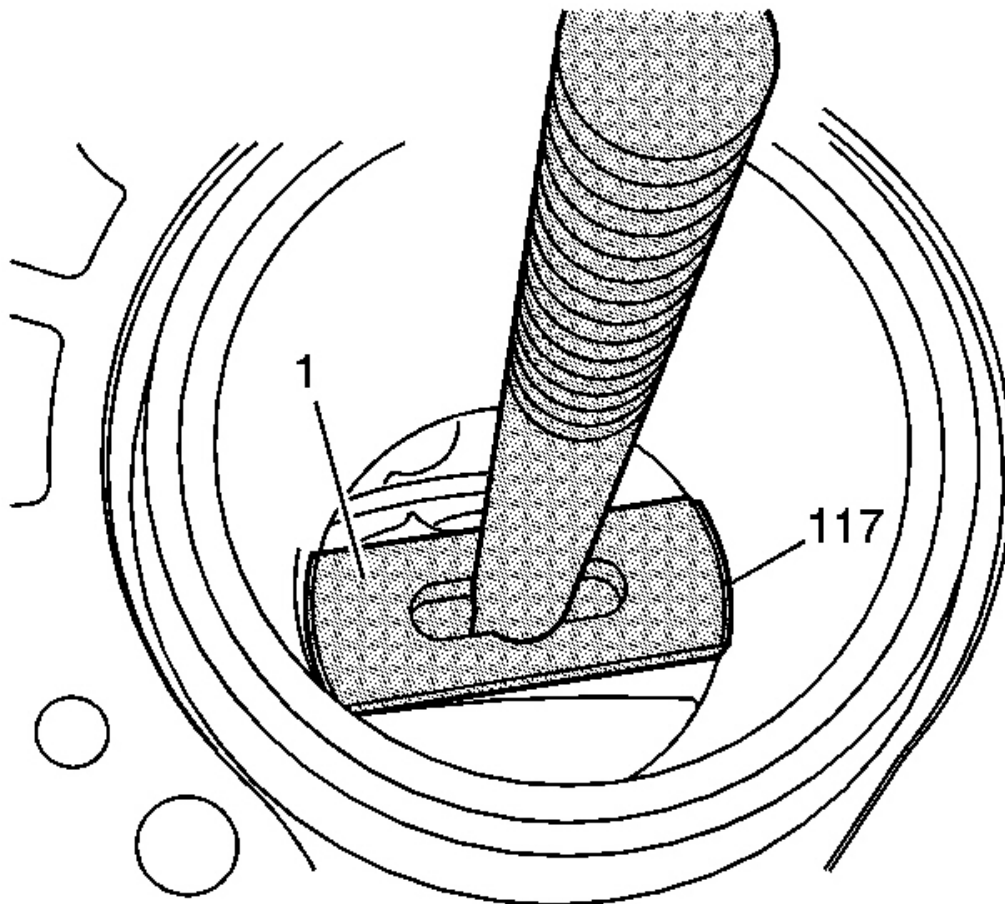
### CYLINDER SLEEVE REMOVAL

#### Tools Required

**EN-45680-400** Cylinder Sleeve Removal and Installation Kit. See Special Tools and Equipment.

**NOTE:** Do not chill or heat the cylinder bore sleeve or the cylinder block when removing or installing a new cylinder bore sleeve. Chilling or heating the cylinder bore sleeve or the cylinder block will cause engine damage and will not aid the removal or installation of the new cylinder bore sleeve.

**NOTE:** Do not damage the crankshaft connecting rod journals or reluctor ring or engine damage will occur.

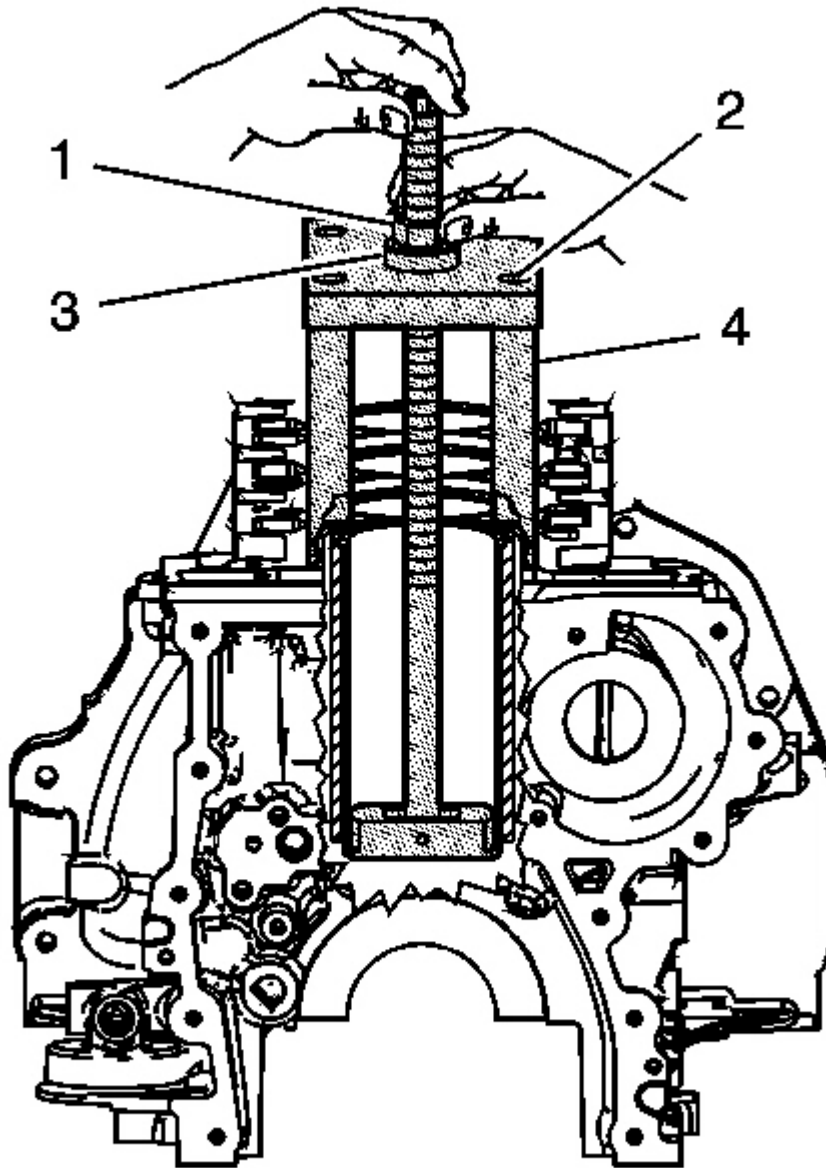


**Fig. 320: View Of Cylinder Bore Liner Puller**  
Courtesy of GENERAL MOTORS CORP.

1. If the crankshaft is still installed, rotate the crankshaft so that the counterweight is to the right side and the connecting rod journal is to the left side and not in alignment with the cylinder bore.
2. Install the cylinder bore sleeve puller EN 45680-402 (1) which is part of **EN-45680-400** , through the cylinder bore. See **Special Tools and Equipment**.

**NOTE:**        **Ensure that the shoe is flat against the bottom of the cylinder bore sleeve or damage to the cylinder bore sleeve puller will occur.**

3. Align the shoe (1) of the cylinder bore sleeve puller EN 45680-402 to the bottom of the cylinder bore sleeve (117).



**Fig. 321: View Of Cylinder Bore Sleeve Puller EN 45680-402**  
Courtesy of GENERAL MOTORS CORP.

4. Hold the threaded shaft of the cylinder bore sleeve puller EN 45680-402 upward in order to retain the shoe alignment to the bottom of the cylinder bore sleeve.
5. Install the fixture EN 456850-401 (4) onto the threaded shaft of the cylinder bore sleeve puller EN

456850-402 and the engine block.

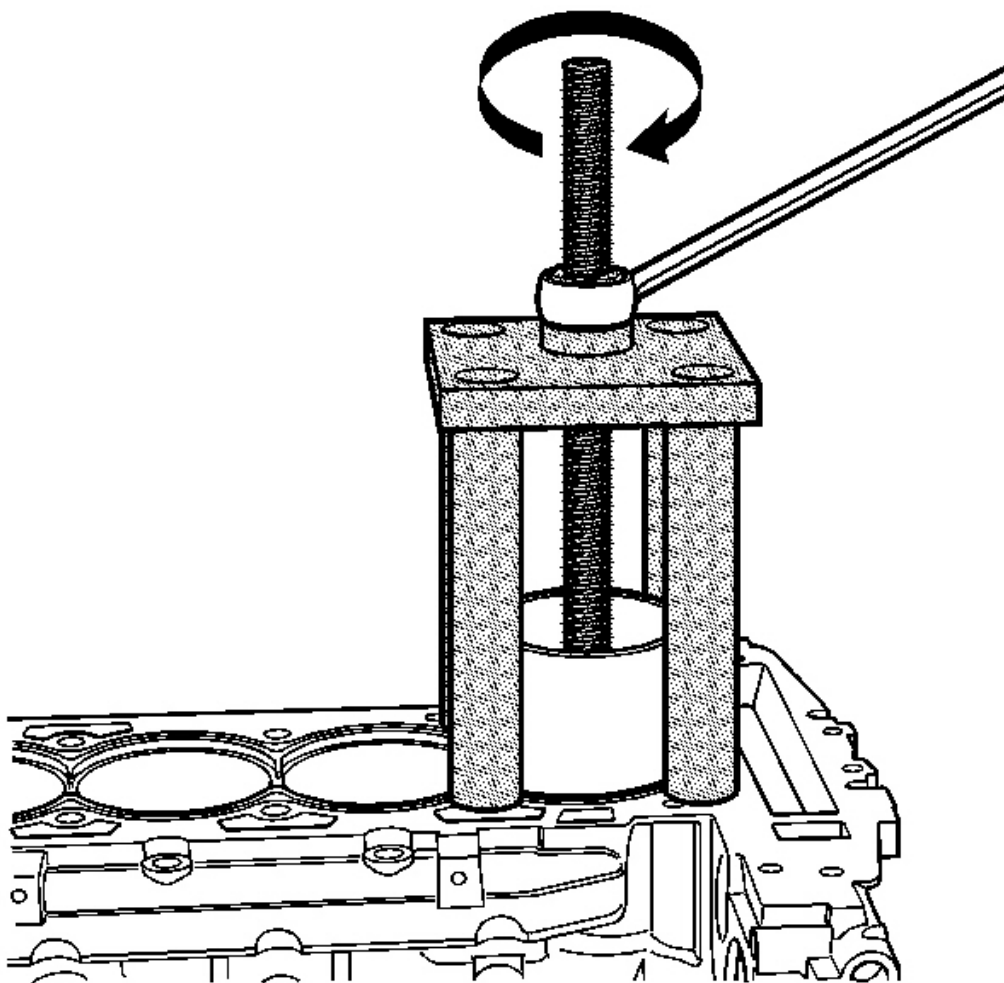
6. Install the bearing (3) and the nut (1).
7. Tighten the nut (1) to the bearing (3).

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

**IMPORTANT:** Use four old cylinder head bolts for the attaching bolts.

8. Install and tighten the 4 attaching bolts (2) into the cylinder head bolt holes of the block.

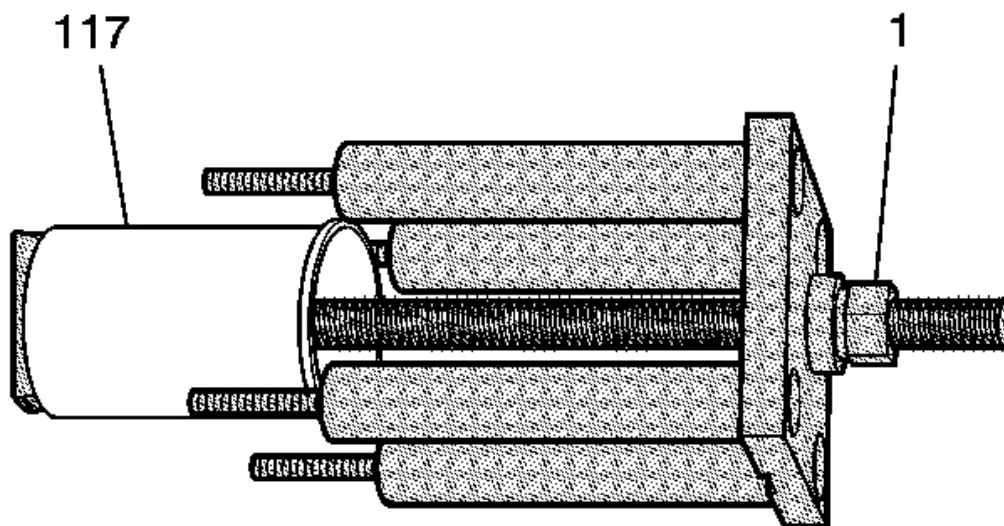
**Tighten:** Tighten the bolts to 15 N.m (11 lb ft).





**Fig. 322: Removing Cylinder Bore Sleeve By Rotating Nut**  
Courtesy of GENERAL MOTORS CORP.

9. Rotate the nut clockwise in order to remove the cylinder bore sleeve.



**Fig. 323: Removing Cylinder Bore Sleeve**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Do not damage the cylinder block surface. Damage to the cylinder block surface can cause engine failure.

10. Remove fixture EN 45680-401, cylinder bore sleeve puller EN 45680-402, and the cylinder bore sleeve (117) from the engine block.
11. Loosen the nut (1) in order to remove the cylinder bore sleeve (117).
12. Inspect the cylinder bore in the cylinder block for cracks or damage. If cracked or damaged, replace the cylinder block.
13. Inspect the piston, piston rings, and connecting rod for damage. Refer to **Piston, Connecting Rod, and Bearings Cleaning and Inspection**.

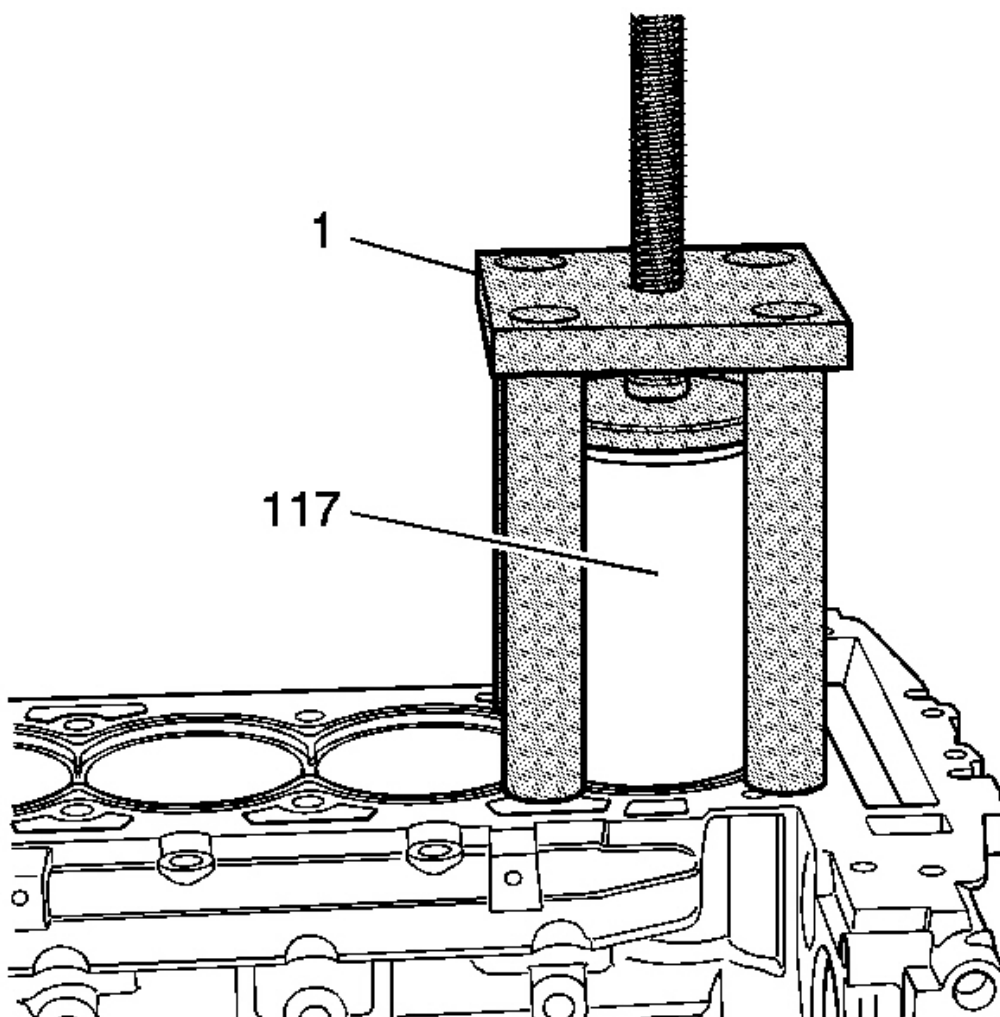
## CYLINDER SLEEVE INSTALLATION

### Tools Required

EN-45680-400 Cylinder Sleeve Removal and Installation Kit. See **Special Tools and Equipment**.

**NOTE:** Do not use assembly aids or lubricants on the cylinder bore sleeve or the cylinder bore block when installing a new cylinder bore sleeve, or engine damage will occur. These items will not aid in the installation of the new cylinder bore sleeve.

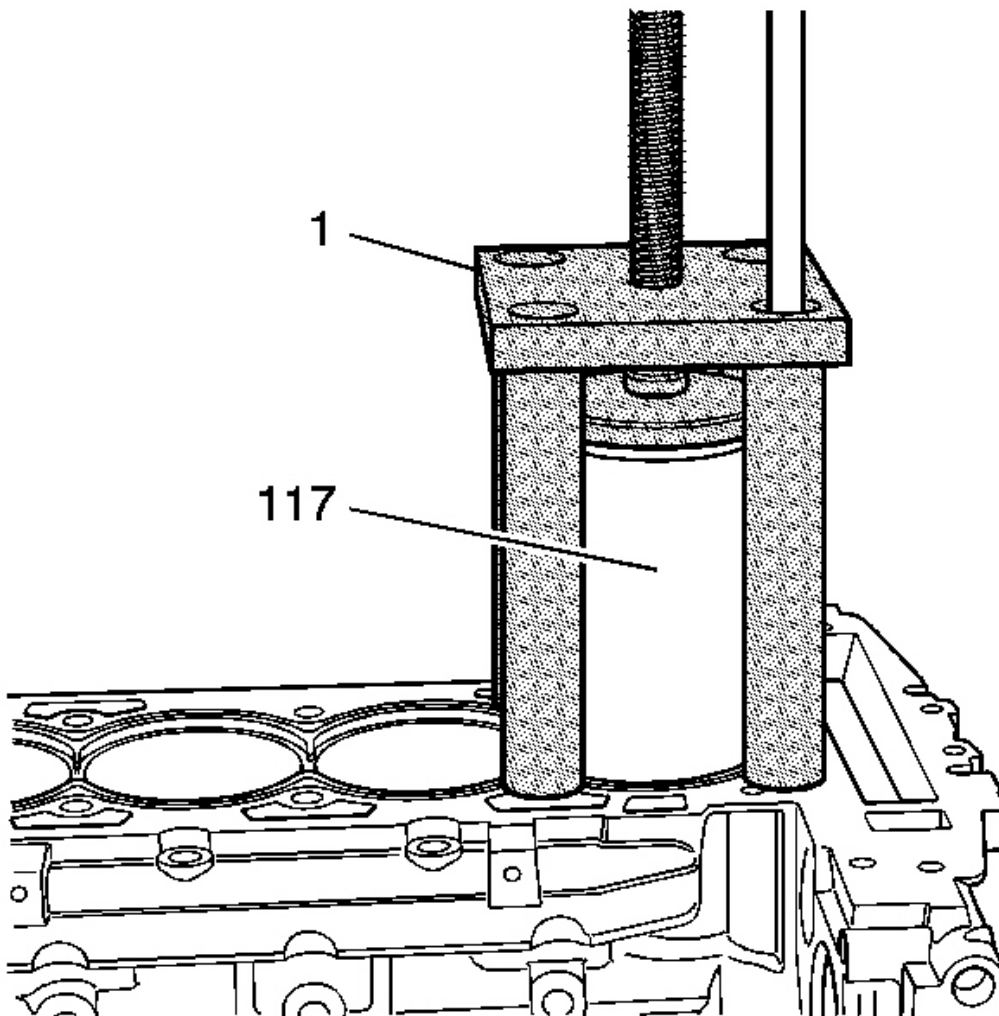
**NOTE:** Do not chill or heat the cylinder bore sleeve or the cylinder block when removing or installing a new cylinder bore sleeve. Chilling or heating the cylinder bore sleeve or the cylinder block will cause engine damage and will not aid the removal or installation of the new cylinder bore sleeve.



**Fig. 324: View Of Cylinder Bore Sleeve Fixture**

Courtesy of GENERAL MOTORS CORP.

1. Place the NEW cylinder bore sleeve (117) onto the cylinder block.
2. Install fixture EN 45680-401/cylinder bore sleeve installer EN 45680-403 assembly (1) which is part of **EN-45680-400** , over the cylinder bore sleeve (117) and onto the cylinder block. See **Special Tools and Equipment**. Do not apply downward pressure to the cylinder bore sleeve (117).



**Fig. 325: Installing Cylinder Bore Sleeve Puller Attachment Bolts**  
Courtesy of GENERAL MOTORS CORP.

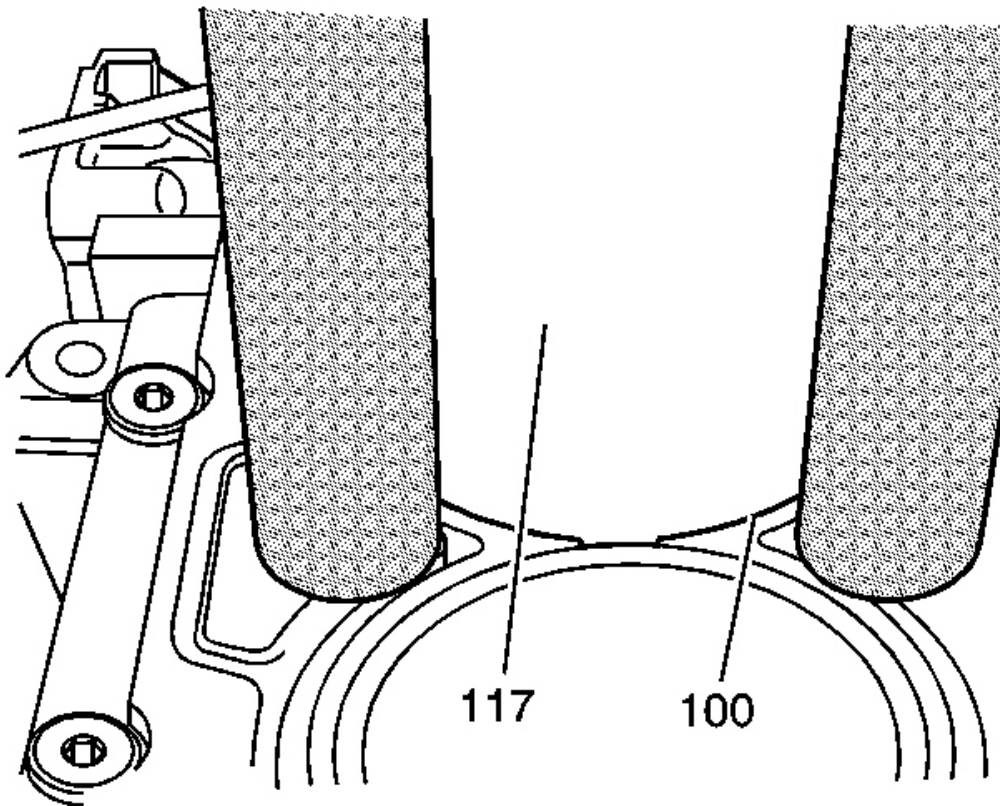
**IMPORTANT:** Use 4 old cylinder head bolts for the attaching bolts.

3. Insert the 4 attachment bolts into the legs of the fixture EN 45680-401 (1).

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

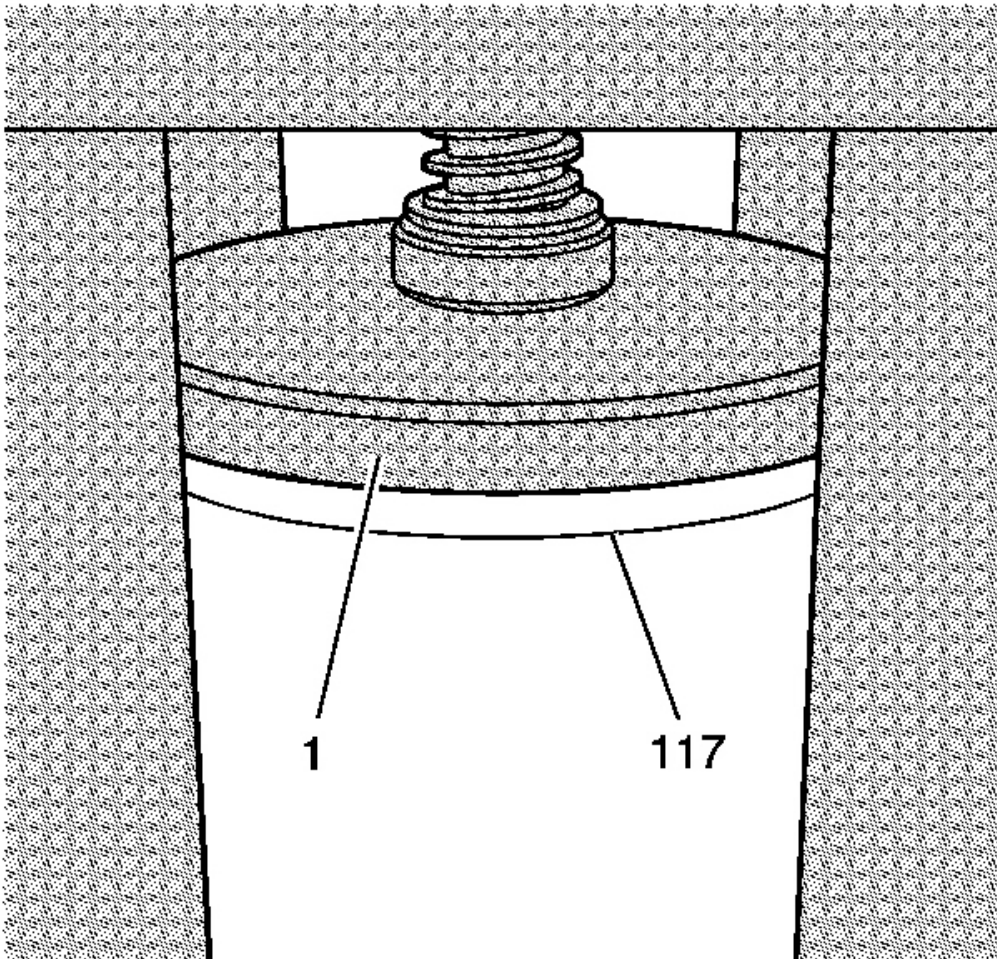
4. Tighten the 4 attachment bolts. Do not apply downward pressure to the cylinder bore sleeve (117).

**Tighten:** Tighten the 4 attachment bolts to 15 N.m (11 lb ft).



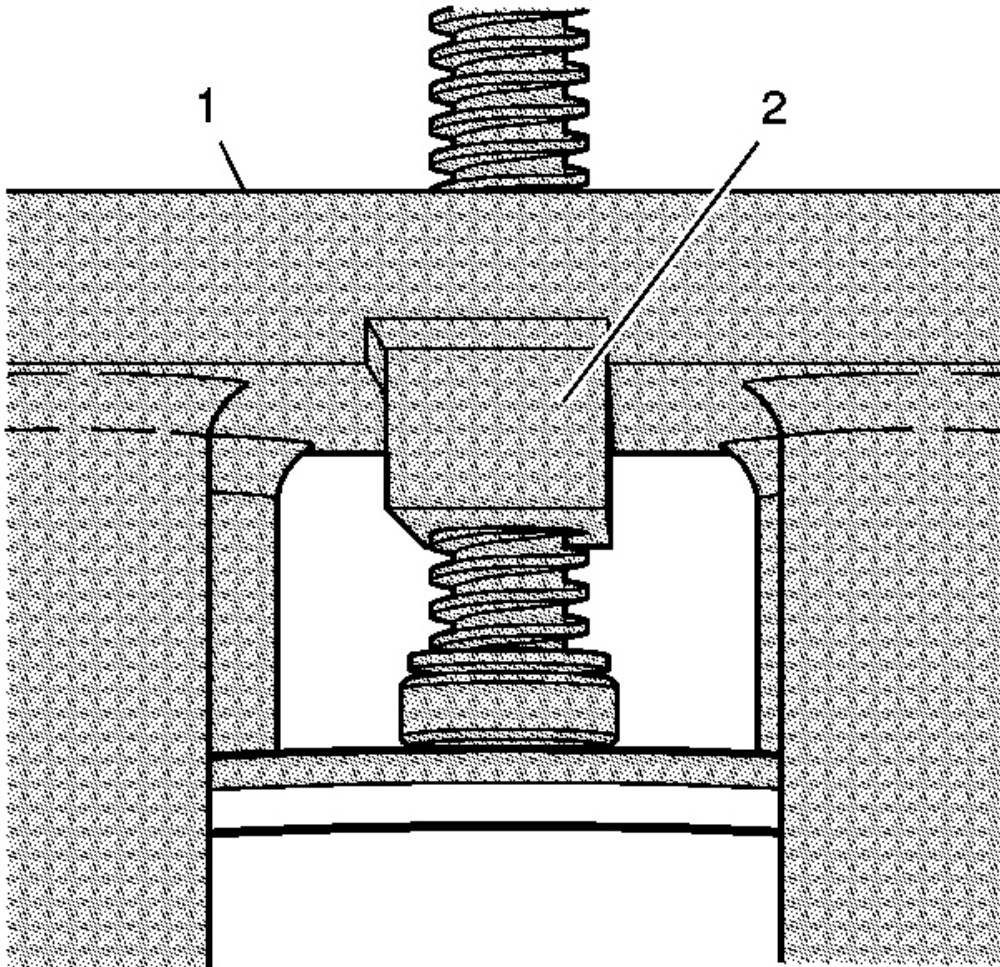
**Fig. 326: View Of Proper Liner Alignment**  
Courtesy of GENERAL MOTORS CORP.

5. Align the bottom of the cylinder bore sleeve (117) with the cylinder bore of the block (100).



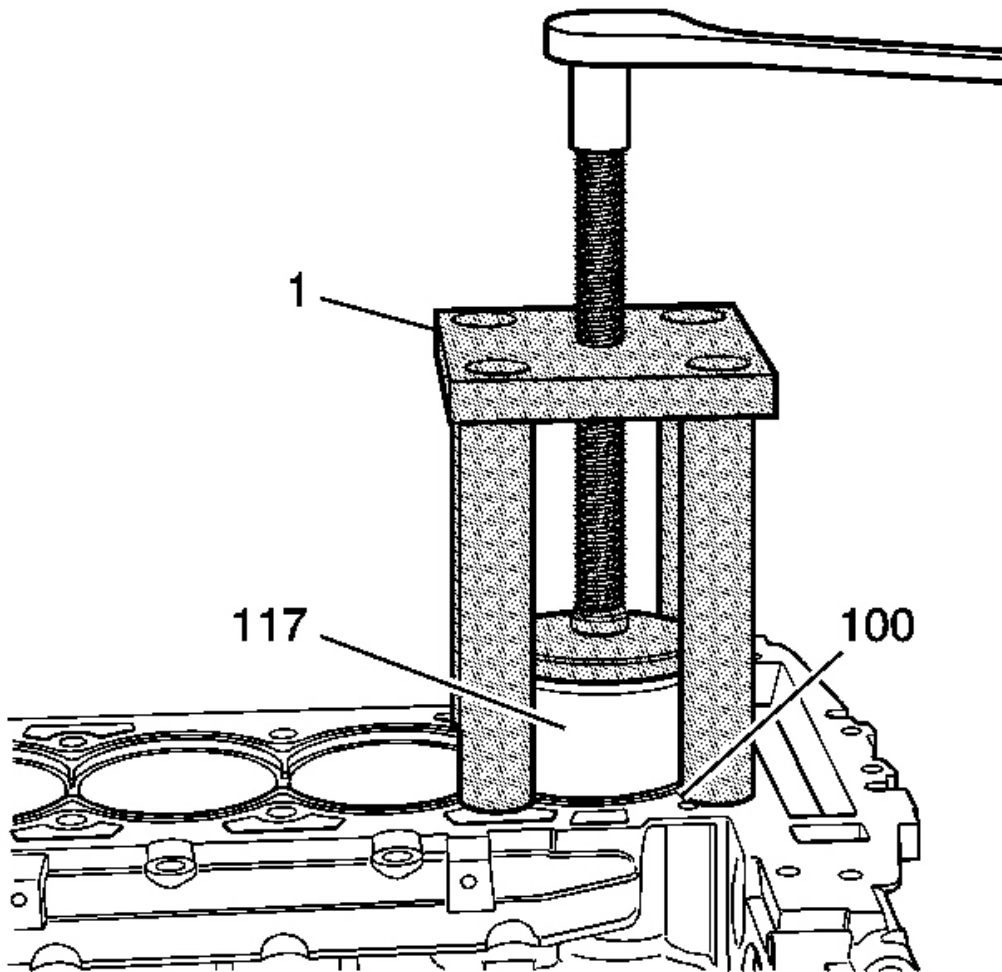
**Fig. 327: View Of Installation Arbor**  
**Courtesy of GENERAL MOTORS CORP.**

6. Align the installation arbor (1) onto the top of the cylinder bore sleeve (117).



**Fig. 328: View Of Pusher Block**  
Courtesy of GENERAL MOTORS CORP.

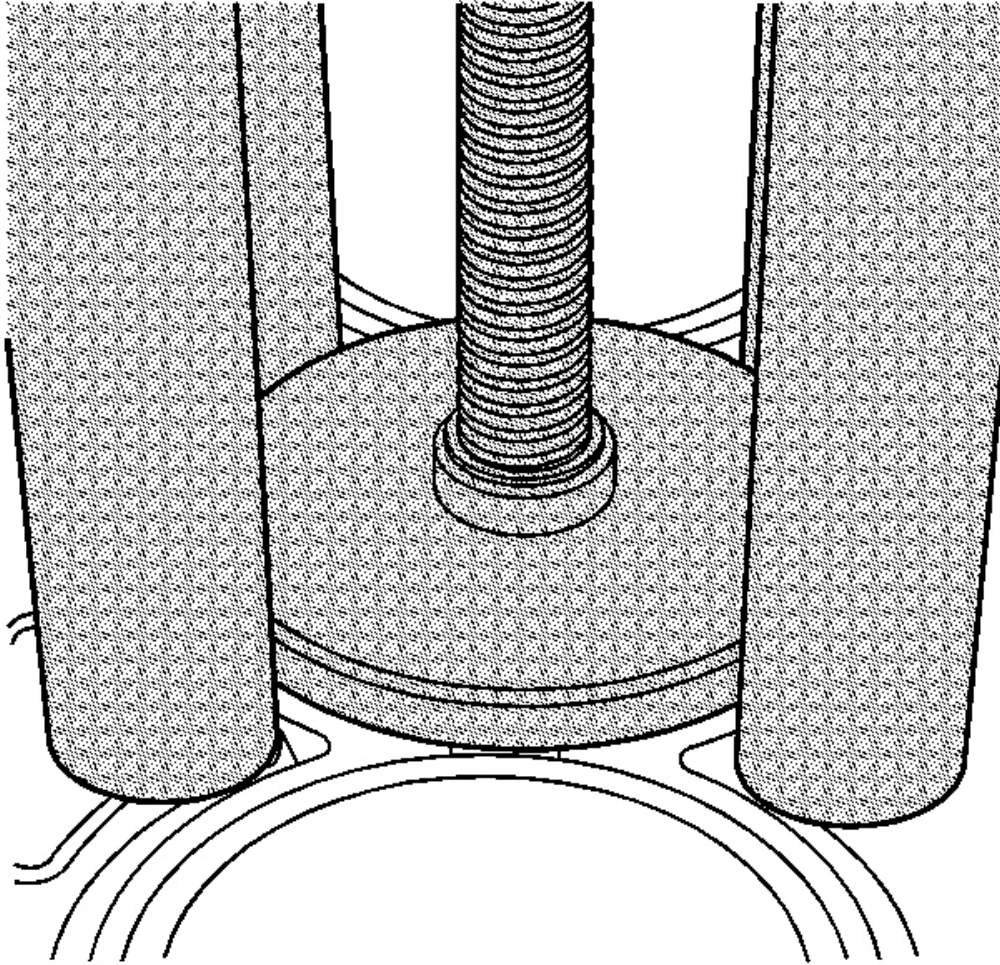
7. Align the pusher block (2) of cylinder bore sleeve installer EN 45680-403 into the groove of fixture EN 45680-401 (1).



**Fig. 329: Installing Cylinder Bore Sleeve Into Engine Block Using Tool**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Do not use any air powered or electric tools to rotate the threaded shaft of the fixture EN 45680-401/cylinder bore sleeve installer EN 45680-403 assembly or damage to the cylinder bore sleeve will occur.

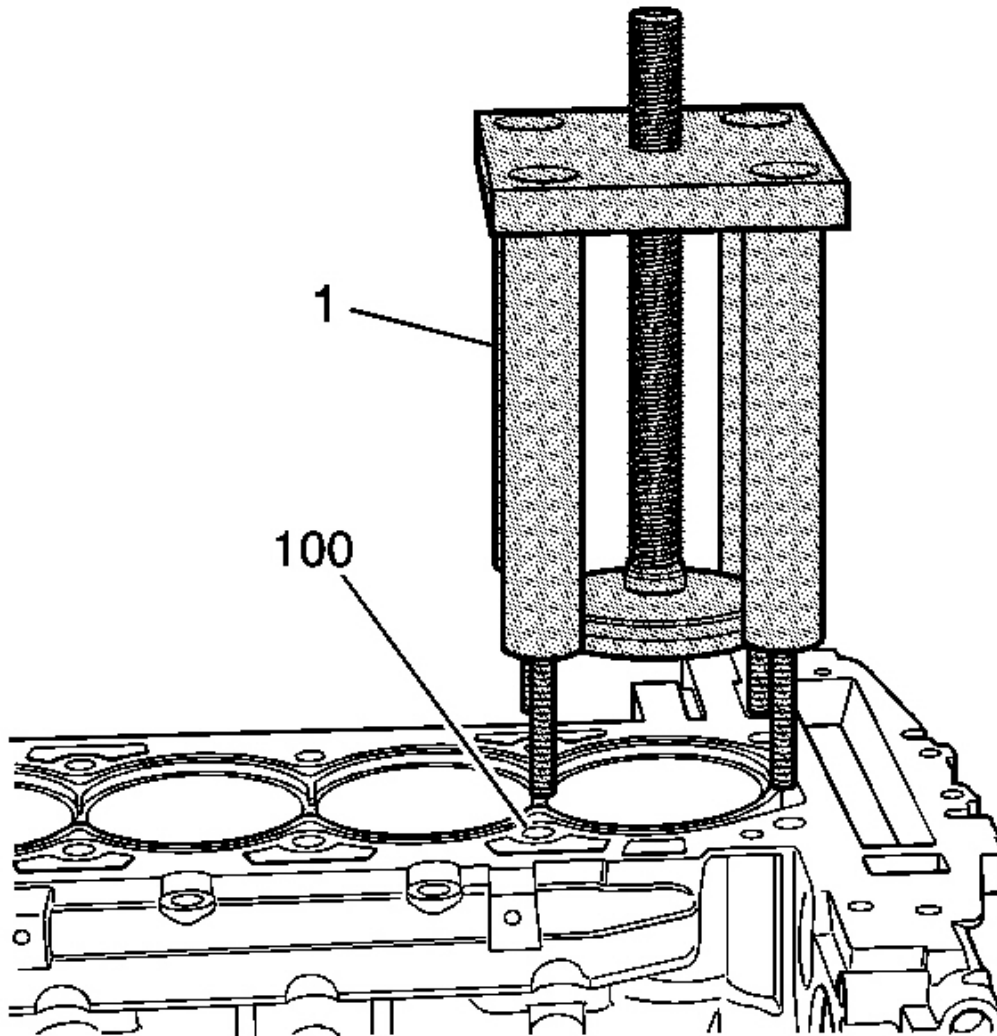
8. Using a ratchet, rotate the threaded shaft of fixture EN 45680-401/cylinder bore sleeve installer EN 45680-403 assembly (1) in order to install the cylinder bore sleeve (117) into the engine block (100).
9. Do not completely seat the cylinder bore sleeve in the block. Leave approximately 1/16 inch of the cylinder bore sleeve above the surface of the cylinder block.



**Fig. 330: Seating Cylinder Bore Sleeve Completely Using Tool**  
**Courtesy of GENERAL MOTORS CORP.**

10. Using a torque wrench, torque the threaded shaft of the fixture EN 45680-401/cylinder bore sleeve installer EN 45680-403 assembly to 102 N.m (75 lb ft) in order to completely seat the cylinder bore sleeve in the cylinder block. With the cylinder bore sleeve properly installed, a minimal portion of the cylinder bore sleeve flange will protrude above the block deck surface.

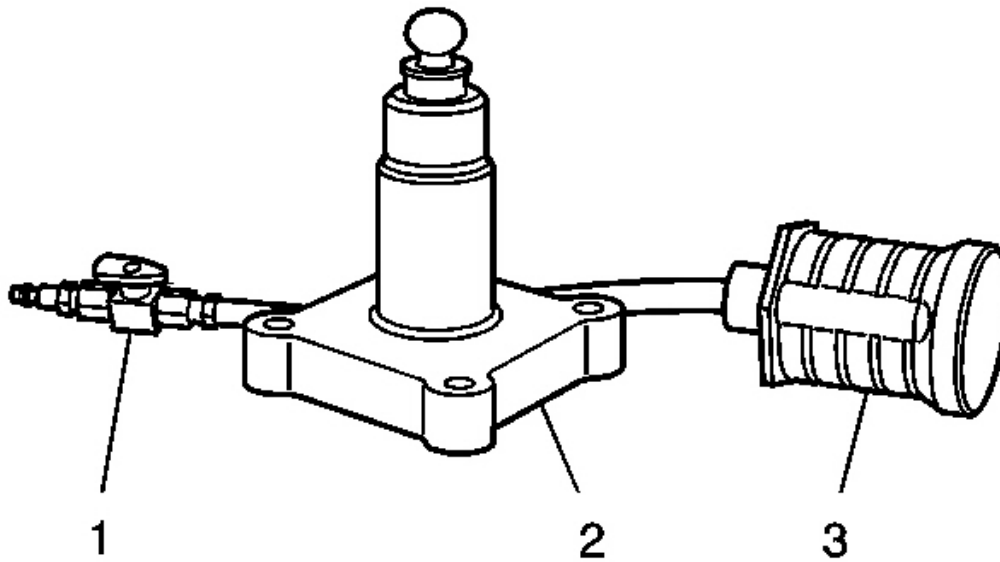




**Fig. 331: View Of Service Tool Assembly**  
**Courtesy of GENERAL MOTORS CORP.**

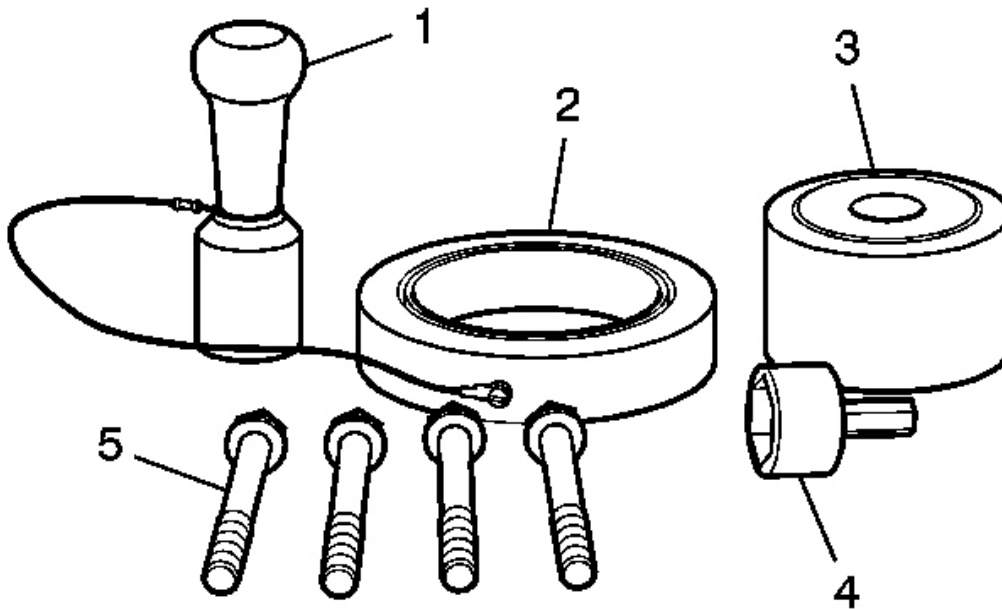
11. Remove the fixture EN 45680-401/cylinder bore sleeve installer EN 45680-403 assembly (1) from the cylinder block (100).

**Cylinder Sleeve Trimming**



**Fig. 332: Cylinder Liner Trimming Tools View (1 Of 2)**  
**Courtesy of GENERAL MOTORS CORP.**

- EN 45680-865 Debris Collector (3)
- EN 45680-411 Trim Tool Assembly (2)
- Air Control Valve (1 - Part of EN 45680-411)
- Drill Motor with 1/2 inch chuck, 1 1/8 hp, 7 amps, triple gear reduction, and a 450-600 RPM rotational speed in a clockwise direction



**Fig. 333: Cylinder Liner Trimming Tools View (2 Of 2)**

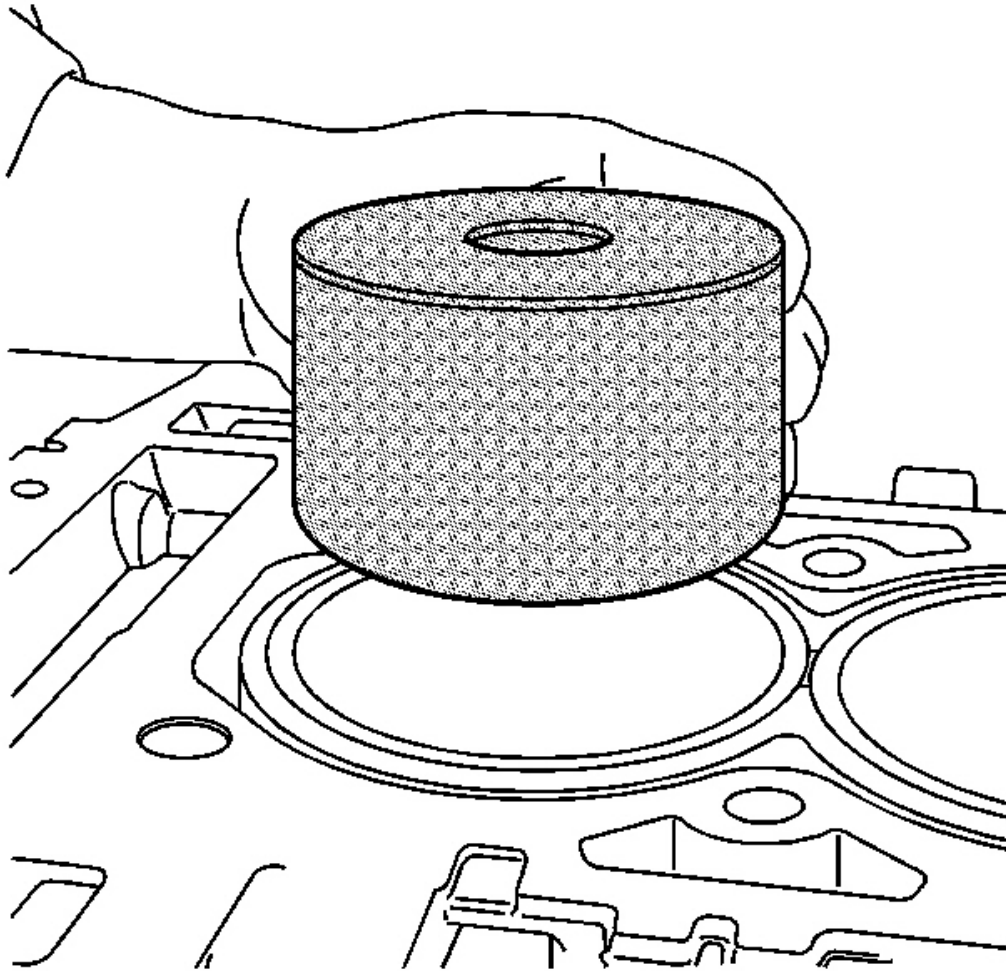
Courtesy of GENERAL MOTORS CORP.

- Trim Tool Preloader (1)
- EN 45680-412 Set Gage Ring (2)
- EN 45680-413 Metal Shavings Catch Plug (3)
- EN 45680-866 Drive Adapter (4)
- EN 45680-414 Bolts (5)

**NOTE:** Do not bore or hone the cylinder bore sleeve. The cylinder bore sleeve inside diameter (I.D) is fully machined and honed to size and is optimally finished as shipped. Any attempt to modify this factory-produced sizing and finish with additional boring and honing will lead to engine damage, excessive noise or abnormal oil consumption.

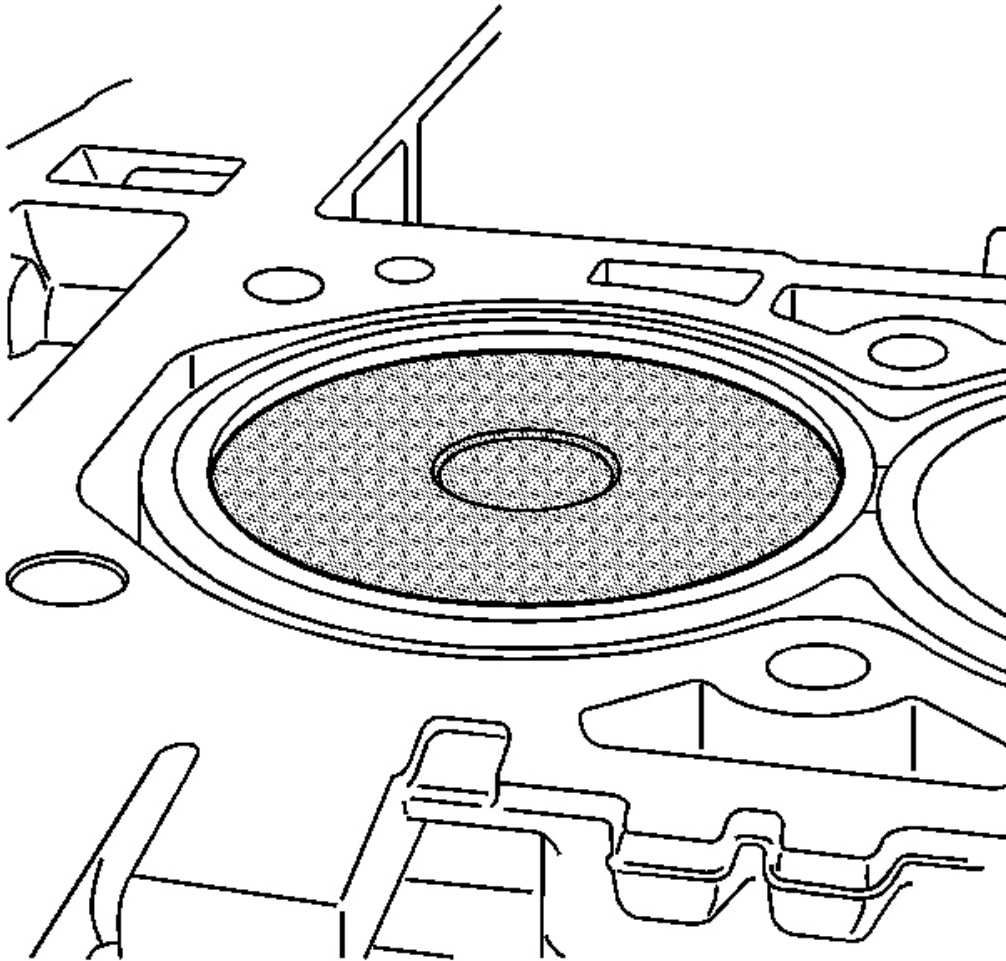
1. After installing the NEW cylinder bore sleeve(s) into the engine block, trim the excess material from the cylinder bore sleeve flange.

**NOTE:** Ensure that all the metal particles are collected in order to prevent internal damage to the transaxle or bearings.



**Fig. 334: Placing Metal Shaving Catch Plug Into Cylinder Bore Sleeve**  
**Courtesy of GENERAL MOTORS CORP.**

2. Place metal shaving catch plug EN 45680-413 into the cylinder bore sleeve to be trimmed. Position the top of the EN 45680-413 approximately 3.0 mm (0.12 in) below the top surface of the cylinder bore sleeve.
3. Place additional metal shaving catch plugs EN 45680-413 into all remaining cylinder bore sleeves.

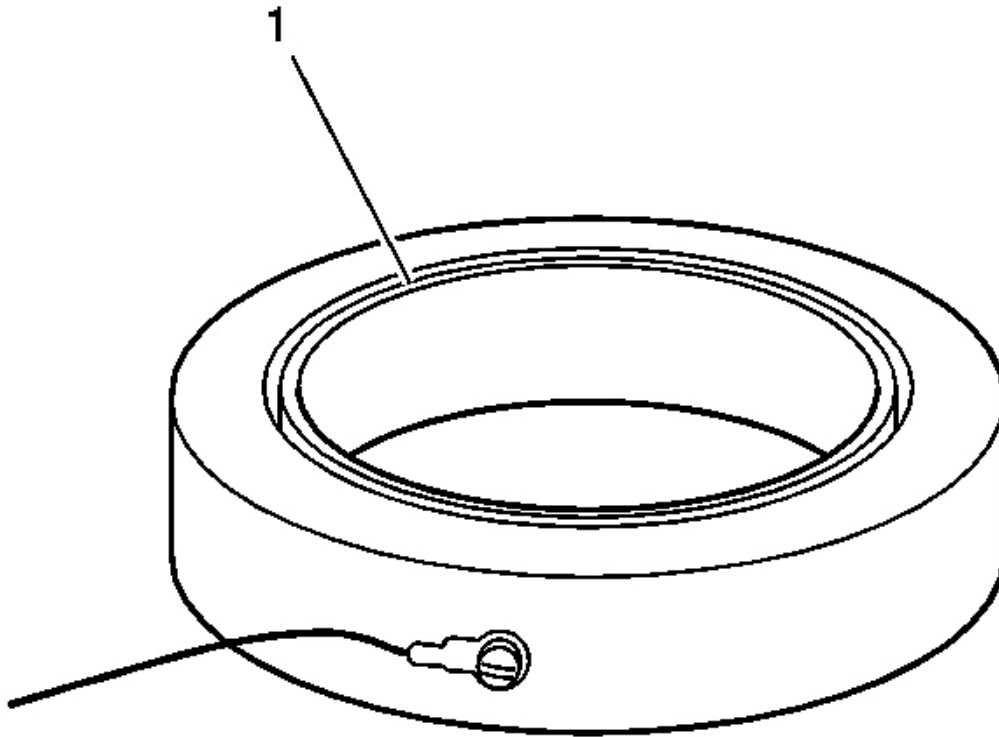


**Fig. 335: Identifying Catch Plug Positioning**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Installing the metal shaving catch plug deeper than the recommended depth will create a decrease in vacuum system performance. A decrease in vacuum system performance will cause metal shavings to enter the engine and cause engine failure.

**NOTE:** Installing the metal shaving catch plug above the recommended depth will cause damage to the metal shaving catch plug.

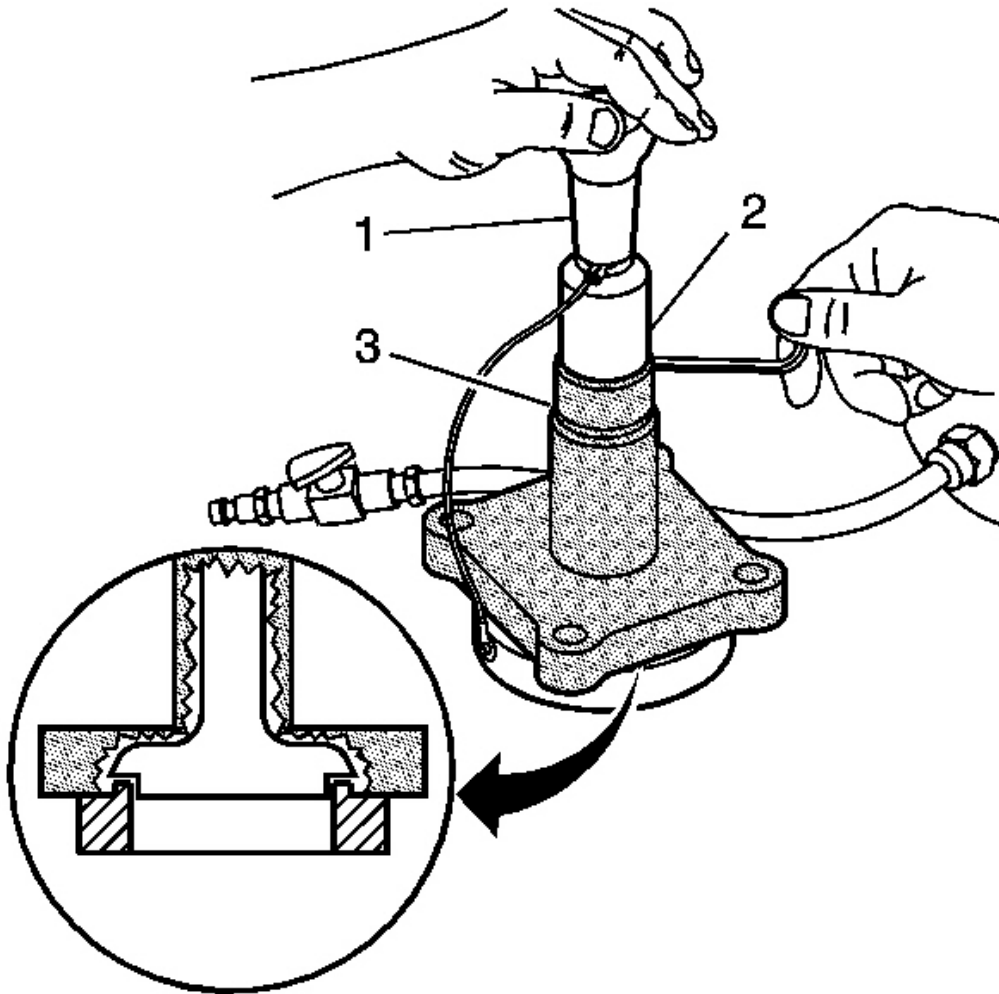
4. Ensure that the metal shaving catch plug EN 45680-413 is 3.0 mm (0.12 in) below the top surface of the cylinder bore sleeve.



**Fig. 336: Identifying Set Gauge Ring Groove**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Before using trim tool assembly EN 45680-411, the height of the cutting blades must be set to the proper specification. The proper specification is that the cylinder bore sleeve flange must be flush to  $+0.02$  mm (0.0008 in) above the block deck surface.

5. The groove side of the set gage ring EN 45680-412 (1) should be positioned upward on a flat surface.



**Fig. 337: View Of Trim Tool Assembly Components And Positioning**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Ensure that the set gage ring EN 45680-412 surfaces are clean.

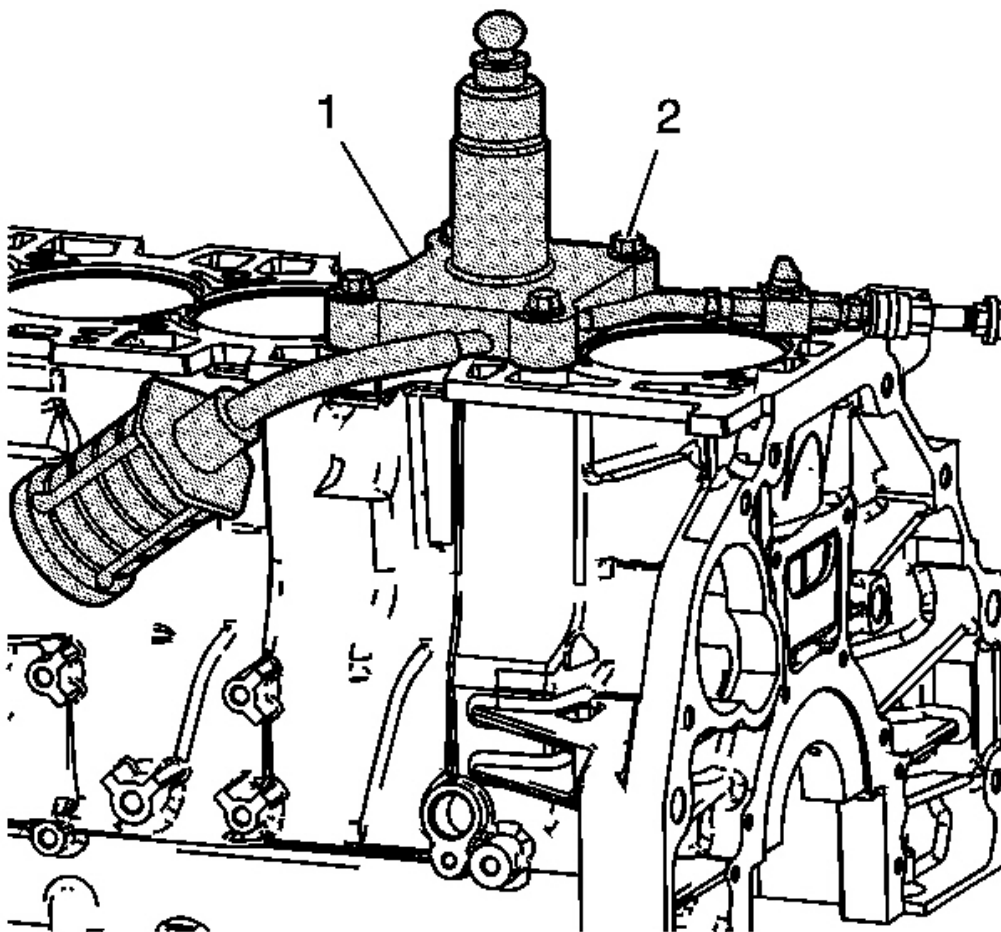
6. Carefully position trim tool assembly EN 45680-411 onto the set gage ring EN 45680-412.
7. Loosen the shaft collar screw (2).
8. Push the shaft collar (2) downward using the trim tool preloader (1) until the shaft collar is positioned against the top of the flange bearing (3).

**IMPORTANT:** Once this procedure is done, it is not necessary to reset the trim tool

**assembly EN 45680-411 height until the blades are worn or damaged.**

9. Apply downward pressure on the collar and inner drive shaft using the trim tool preloader (1), then tighten the shaft collar screw.

**Tighten:** Tighten the shaft collar screw to 19 N.m (14 lb ft).

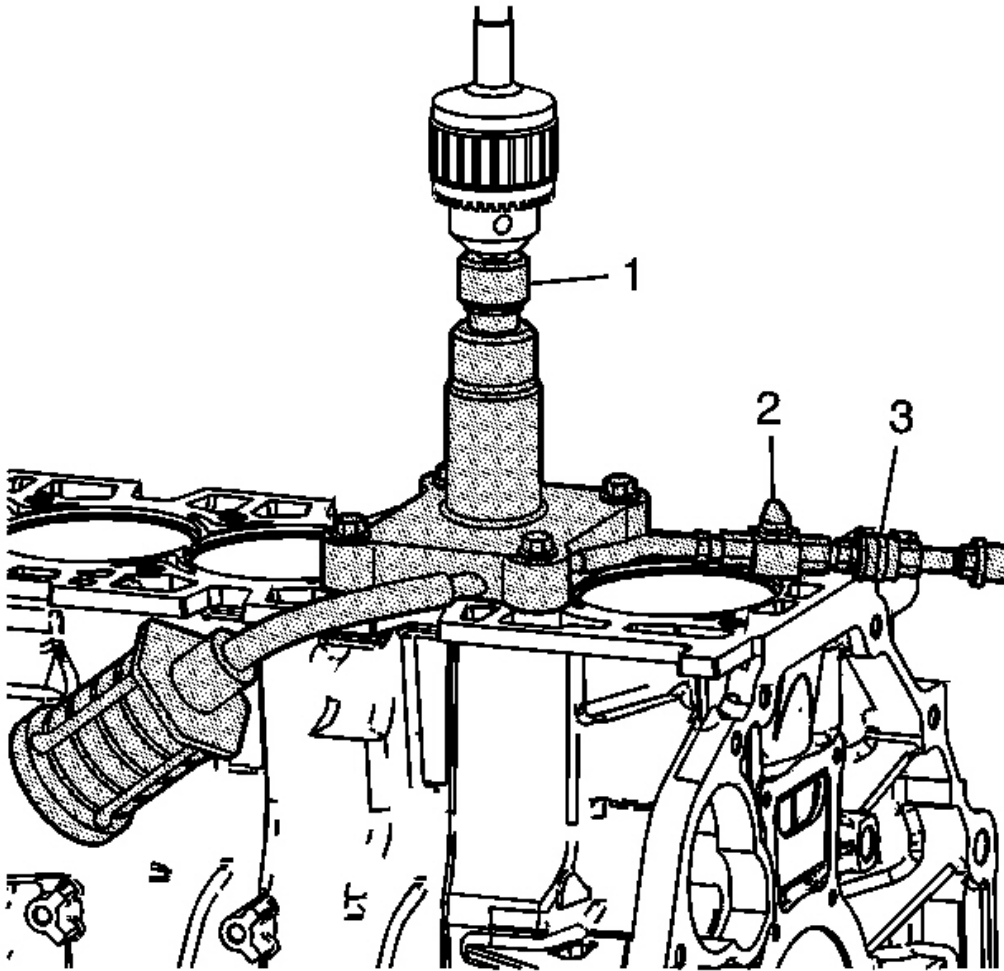


**Fig. 338: Placing Trim Tool Assembly EN 45680-411 Onto The Cylinder**  
**Courtesy of GENERAL MOTORS CORP.**

10. Place trim tool assembly EN 45680-411 onto the cylinder to be trimmed with the directional arrow (1) pointing in line with the crankshaft centerline and the front of the block.
11. Install the 4 bolts EN 45680-414 (2) into the cylinder head bolt holes in the block.



**Tighten:** Tighten the bolts to 20 N.m (15 lb ft).



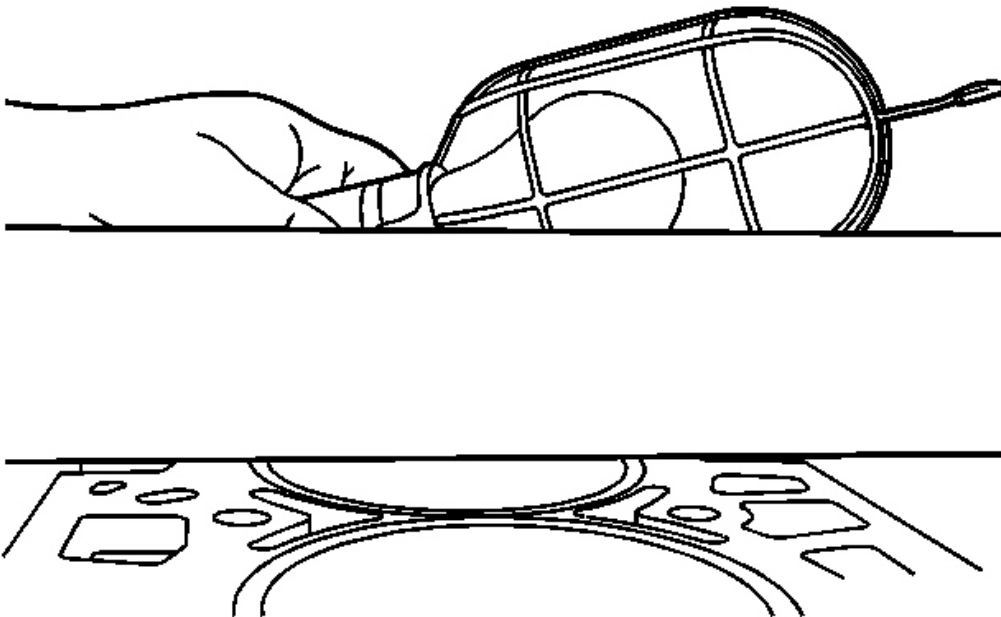
**Fig. 339: Attaching Drill Motor To EN 45680-411**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** For proper tool operation, a drill motor with a 1/2 inch chuck, 1 1/8 hp, 7 amps, triple gear reduction, and a 450-600 RPM rotational speed in a clockwise direction must be used. If the proper drill motor is not used, damage to the cylinder bore sleeve will occur.

12. Fasten drive adapter EN 45680-866 (1) into the drill chuck.

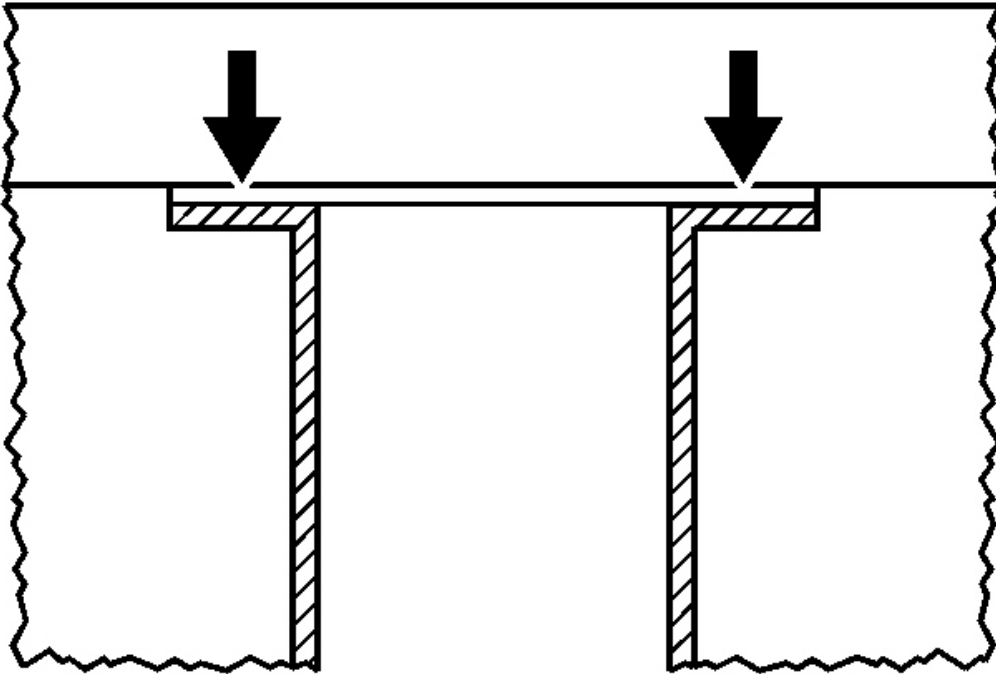
**NOTE:** Ensure that there are no crimps in the air feed hose or the vacuum hose. Crimps in the hose may cause metal shavings to exit the cutting tool in any direction, causing engine damage.

13. Connect a compressed air supply (75-125 psi) to the male quick connect (3) located on trim tool assembly EN 45680-411. Turn the compressed air valve (2) to the open position. This starts the venturi vacuum system that will catch the metal shavings.
14. Place drive adapter EN 45680-866 and drill assembly (1) vertically onto the drive adapter end of trim tool assembly EN 45680-411. Do not apply downward force on the drill until full rotational speed has been reached. After reaching full rotational speed, gradually apply downward force until the cutting action is complete in approximately 5 seconds.
15. Remove drive adapter EN 45680-866 (1) and drill assembly from the trim tool assembly EN 45680-411.
16. Turn off the compressed air valve (2).
17. Remove trim tool assembly EN 45680-411 from the engine block.
18. Remove any material shavings that may be found on the metal shaving catch plug EN 45680-413.
19. Wipe the cylinder bore sleeve and surrounding areas free of any powder residue and then remove the metal shaving catch plug EN 45680-413.



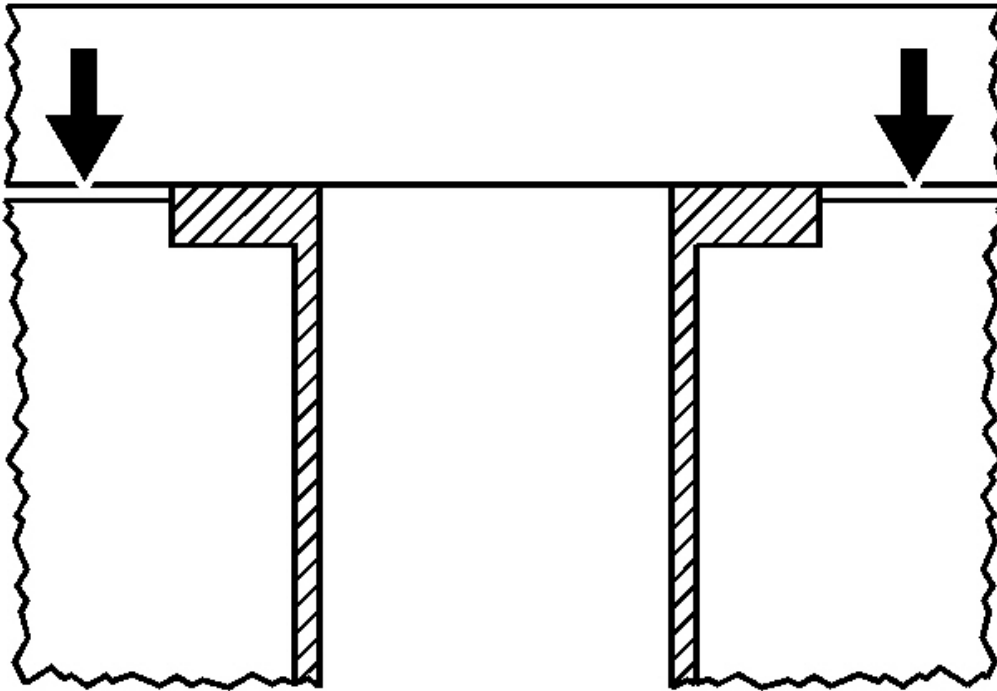
**Fig. 340: Checking Cylinder Block Deck Surface With Straight Edge**  
Courtesy of GENERAL MOTORS CORP.

20. Install a straight edge on the cylinder block perpendicular to the crankshaft center line.
21. Using a light, illuminate the backside of the straight edge.



**Fig. 341: View Of Improperly Cut Cylinder Bore Sleeve**  
Courtesy of GENERAL MOTORS CORP.

22. Looking at the front of the straight edge, check to see if light is protruding through the bottom of the straight edge and the top of the cylinder bore sleeve flange. If light is present of either side or both sides of the cylinder bore sleeve, the cylinder bore sleeve is cut incorrectly and a new cylinder bore sleeve needs to be installed.



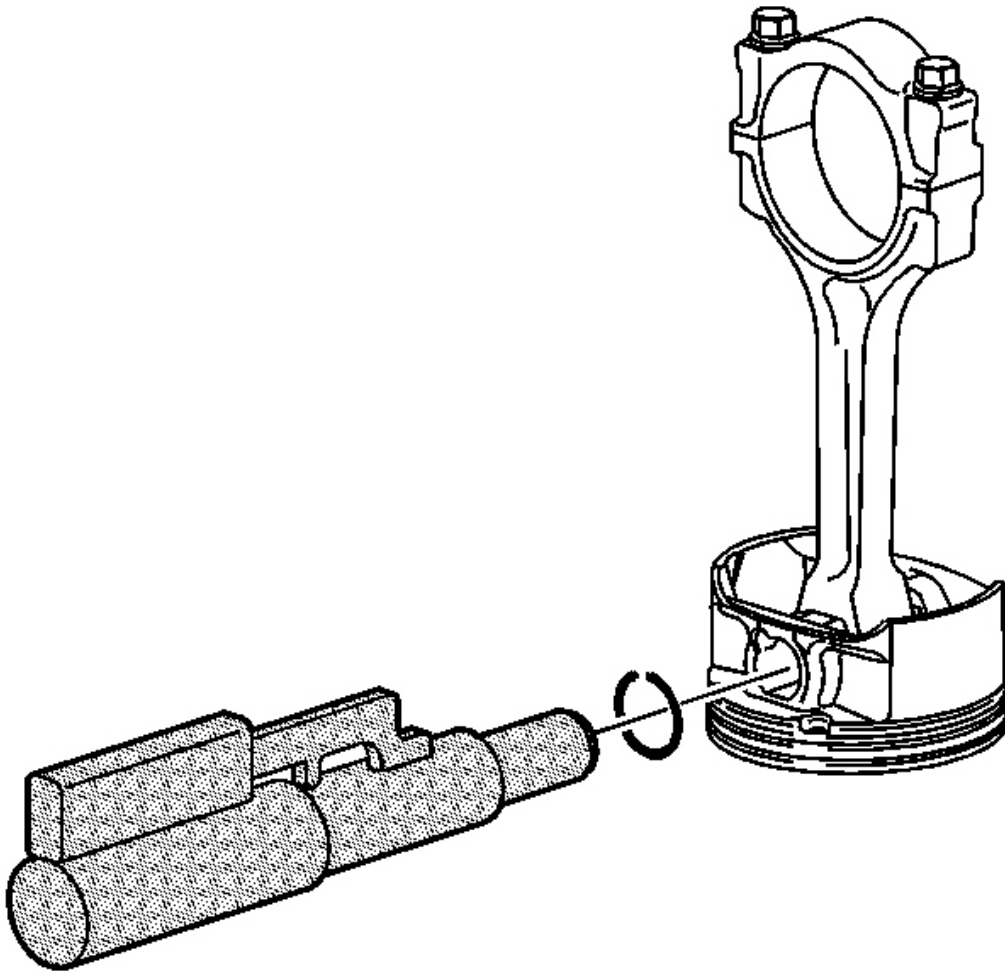
**Fig. 342: View Of For Properly Cut Cylinder Bore Sleeve**  
Courtesy of GENERAL MOTORS CORP.

23. Looking at the front of the straight edge, check to see if light is protruding through the bottom of the straight edge and the top of the cylinder block deck surface. If light is present on both sides of the cylinder block, the cylinder bore sleeve is cut correctly.
24. Proceed to the next bore sleeve to be trimmed repeating steps 10-23 if necessary.

## **PISTON AND CONNECTING ROD ASSEMBLE**

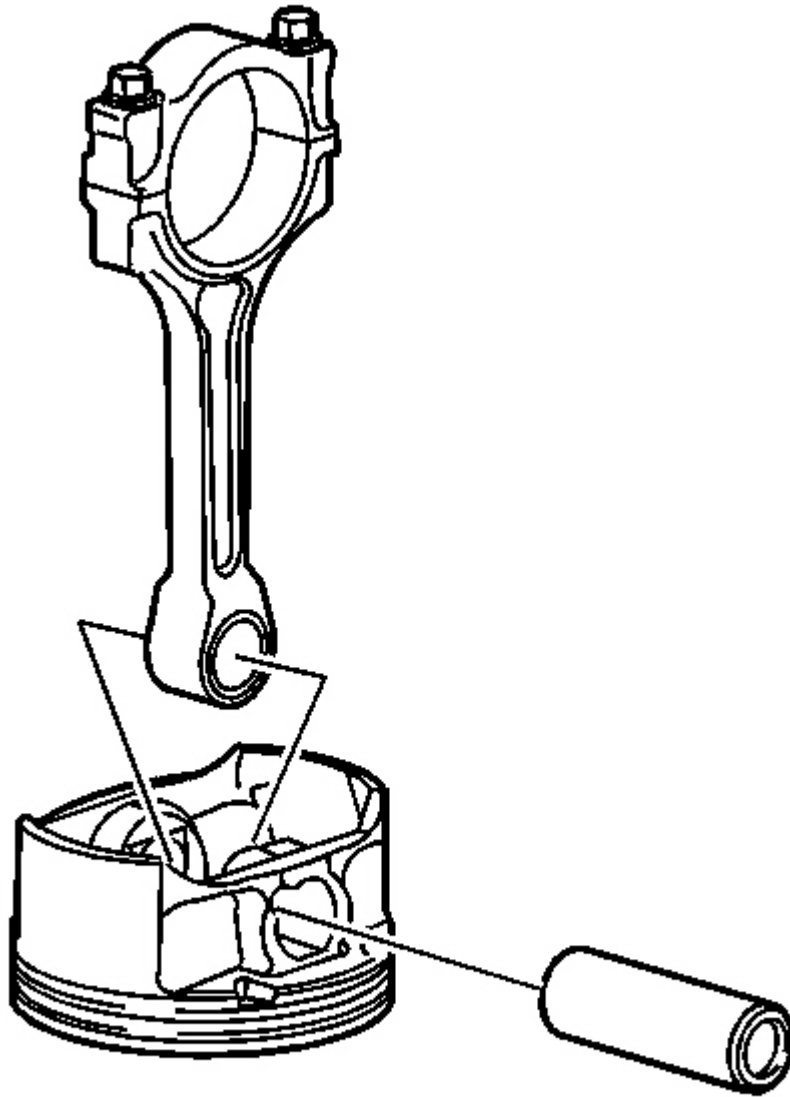
### **Tools Required**

**J 43654** Piston Pin Retaining Clip Remover/Installer. See **Special Tools and Equipment**.



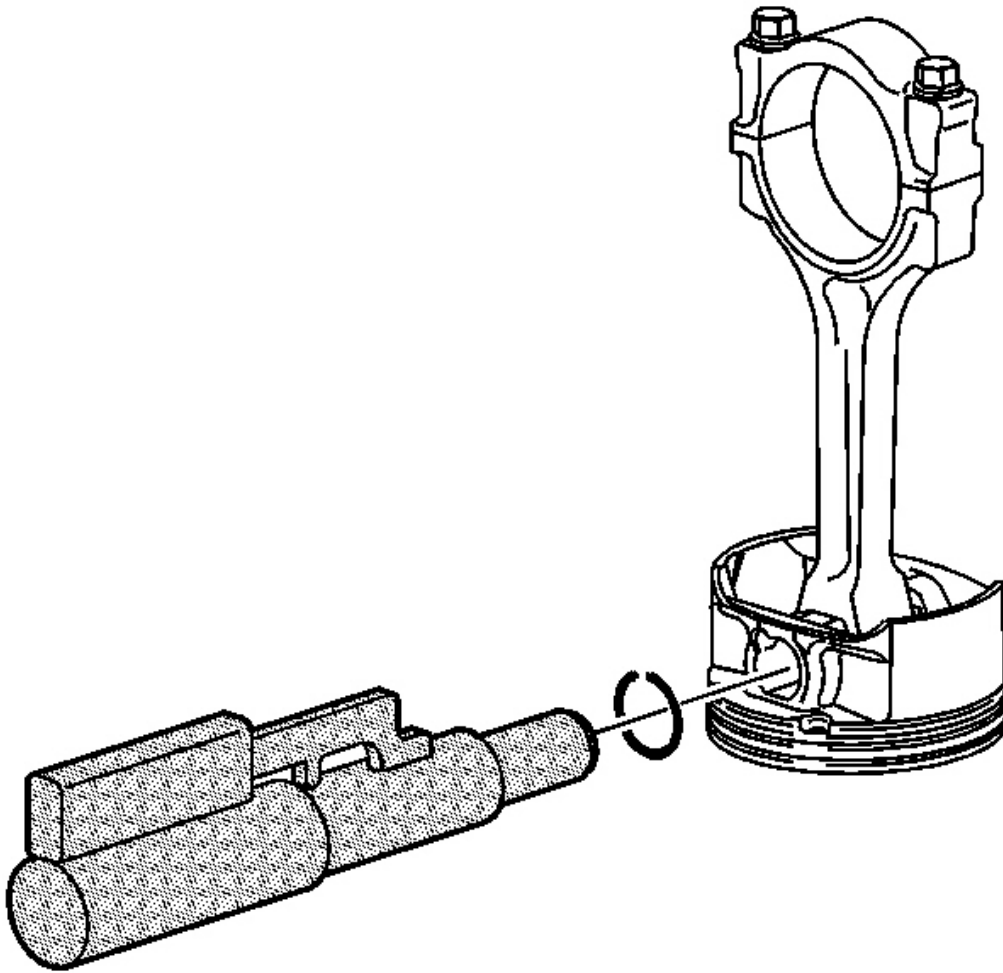
**Fig. 343: View Of Piston Pin Retaining Clips**  
Courtesy of GENERAL MOTORS CORP.

1. Lubricate the piston pin with clean engine oil.
2. Install one of the piston pin retainers into the retainer groove.



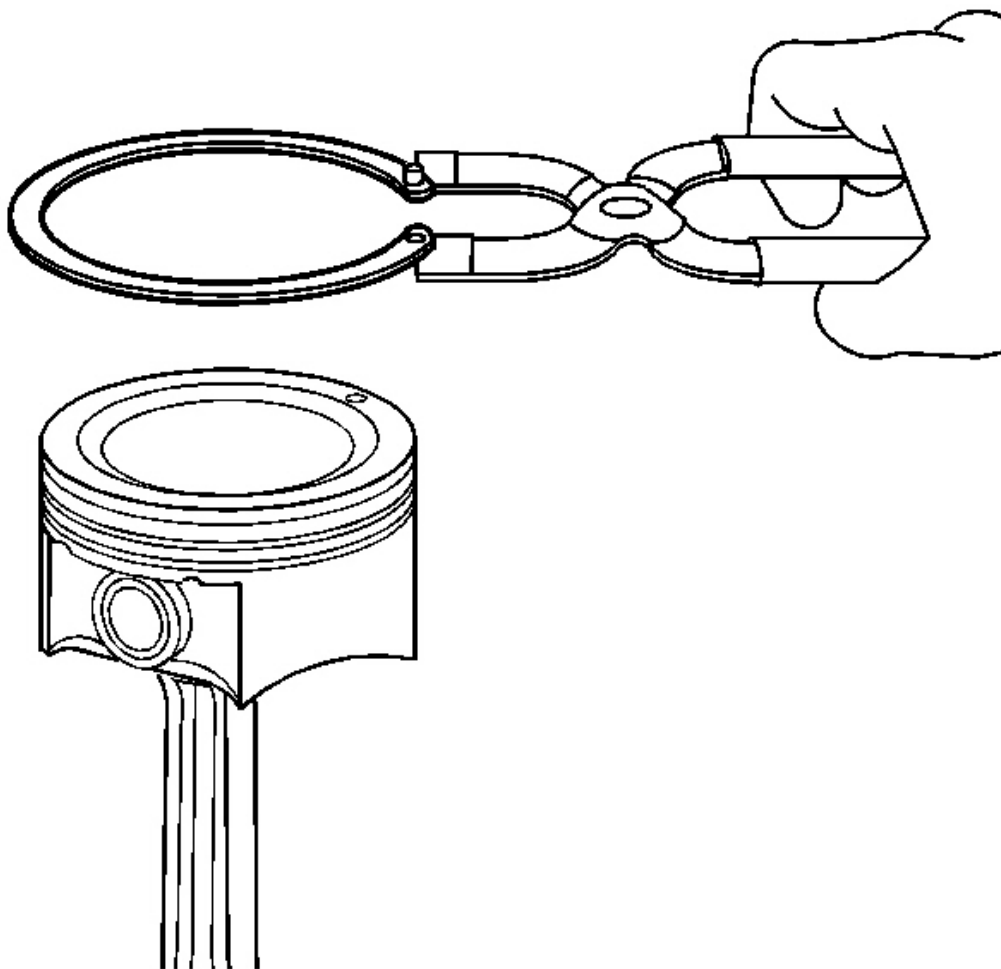
**Fig. 344: View Of Piston Pin & Connecting Rod**  
**Courtesy of GENERAL MOTORS CORP.**

3. Install the connecting rod and piston pin. Push the piston pin in until it bottoms against the installed piston pin retainer.



**Fig. 345: View Of Piston Pin Retaining Clips**  
Courtesy of GENERAL MOTORS CORP.

4. Install the second piston pin retainer.



**Fig. 346: Installing Piston Rings**  
Courtesy of GENERAL MOTORS CORP.

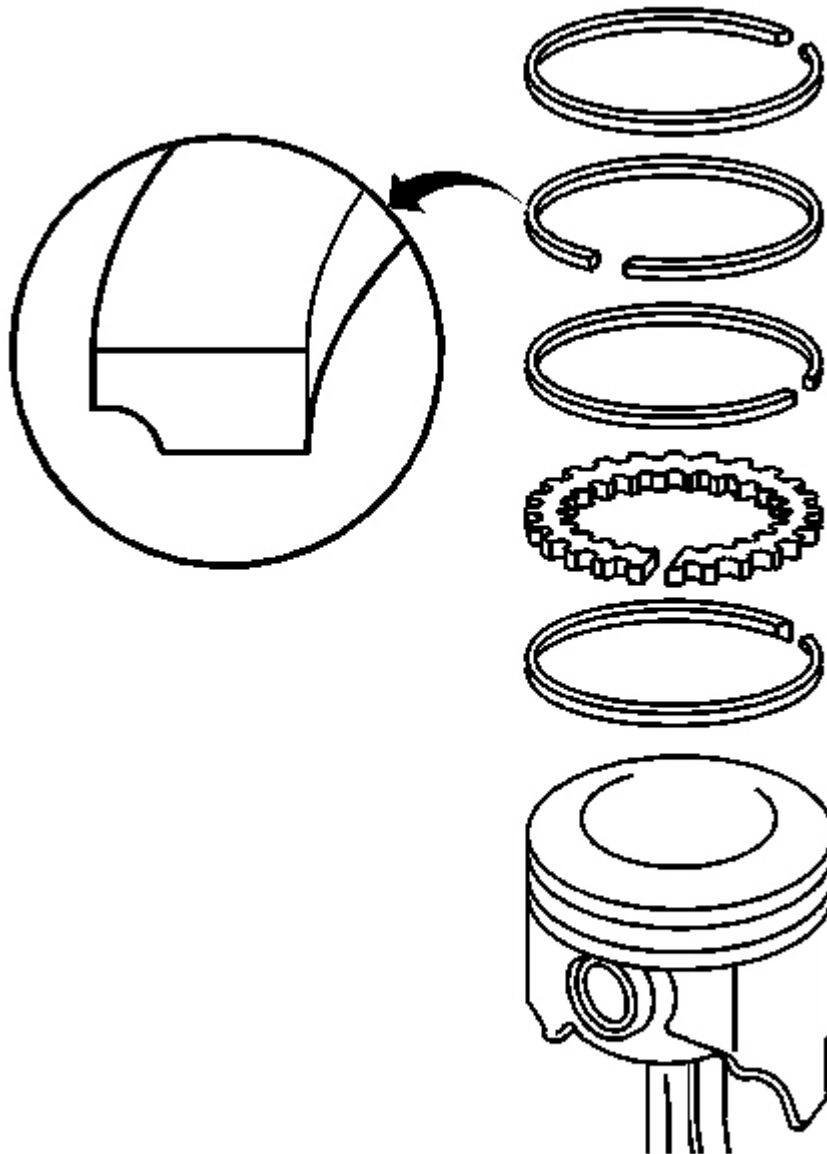
**IMPORTANT:** The piston ring end gaps must be staggered 90 degrees apart.

**NOTE:** Use a piston ring expander to install the piston rings. The rings may be damaged if expanded more than necessary.

5. Install the following components of the bottom ring assembly (oil control ring).
  1. The expander
  2. The lower oil control ring



3. The upper oil control ring



**Fig. 347: Installing Middle Ring (Compression Ring)**  
Courtesy of GENERAL MOTORS CORP.

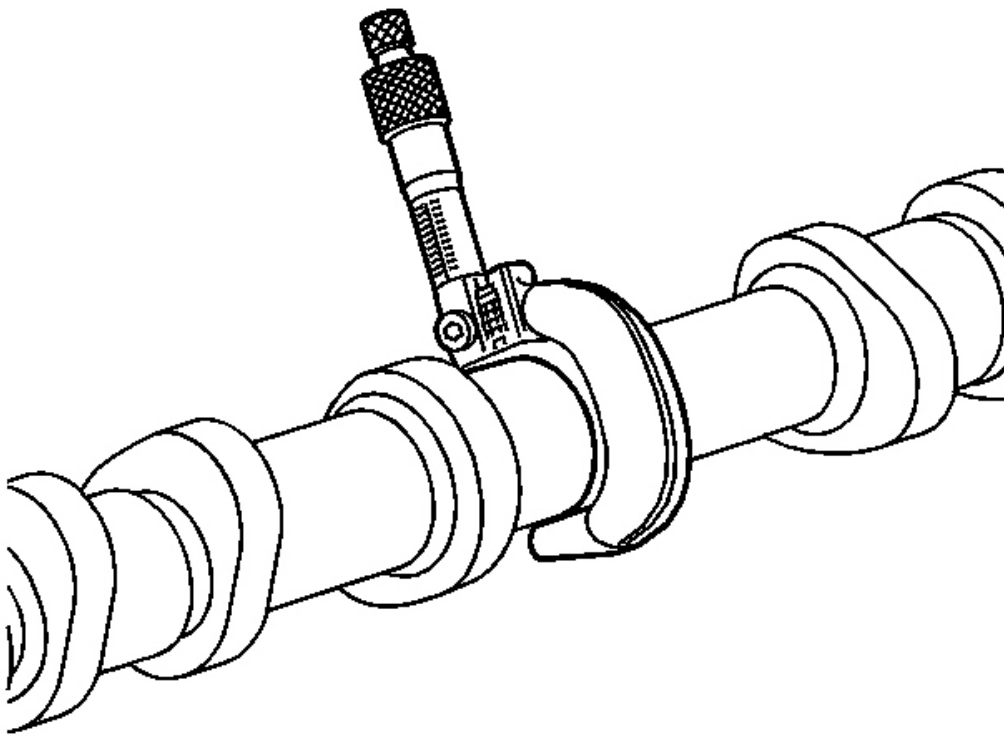
6. Install the middle ring (compression ring) with the napier groove facing down.

7. Install the top ring.

## **CAMSHAFTS CLEANING AND INSPECTION**

### **Tools Required**

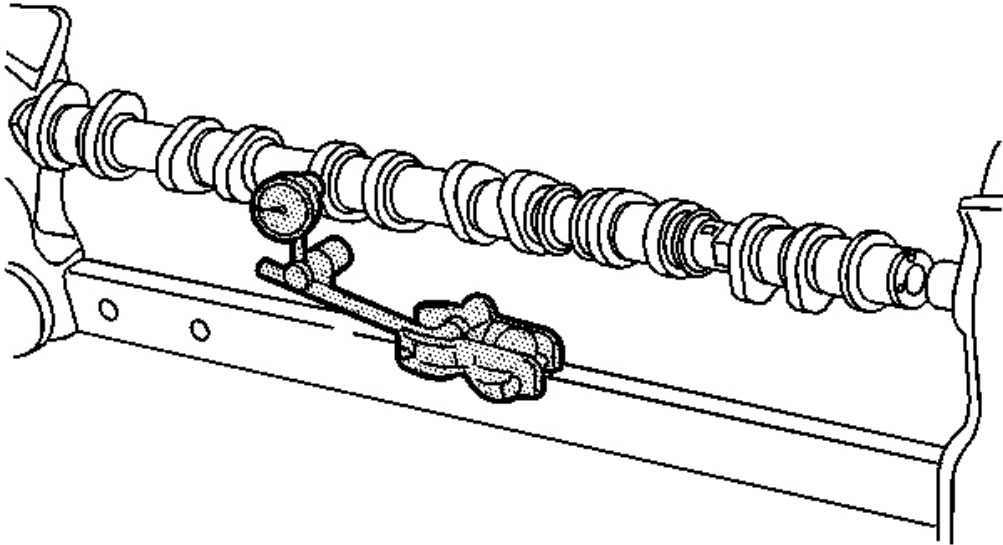
**J 7872** Magnetic Base Dial Indicator Set



**Fig. 348: Measuring Camshaft Lobes**  
**Courtesy of GENERAL MOTORS CORP.**

1. Clean the camshafts with cleaning solvent.
2. Inspect the camshafts for the following conditions:
  - Scored camshaft journals
  - Damaged camshaft lobes
  - Damaged camshaft sprocket locator pin slots
  - Damaged threads
3. Measure the camshaft lobes using a micrometer. The intake camshaft lobes should be a minimum of 41.5

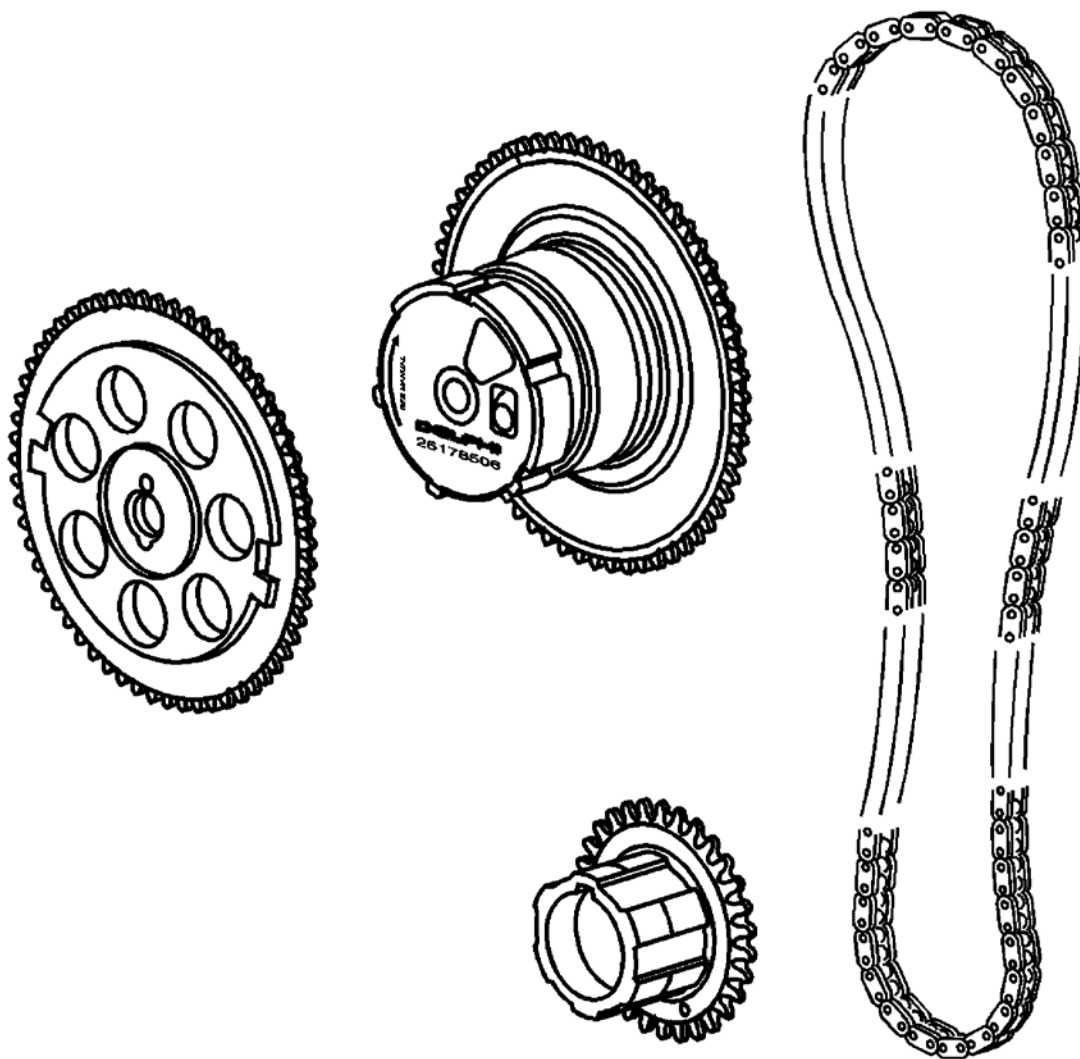
mm (1.635 in). The exhaust camshaft lobes should be a minimum of 41 mm (1.615 in).



**Fig. 349: Measuring Camshaft Runout & Lobe Lift**  
Courtesy of GENERAL MOTORS CORP.

4. Use **J 7872** to measure the camshaft runout.
  1. Set the camshaft in V-blocks between the centers.
  2. Measure the intermediate camshaft journal.
5. Use **J 7872** to measure the camshaft lobe lift.
  1. Lubricate the camshaft to V-block contact areas with engine oil.
  2. Set the camshaft on V-blocks.
  3. Measure the camshaft lobe lift.
6. If the runout or camshaft lobe lift is not within specifications, replace the camshaft.

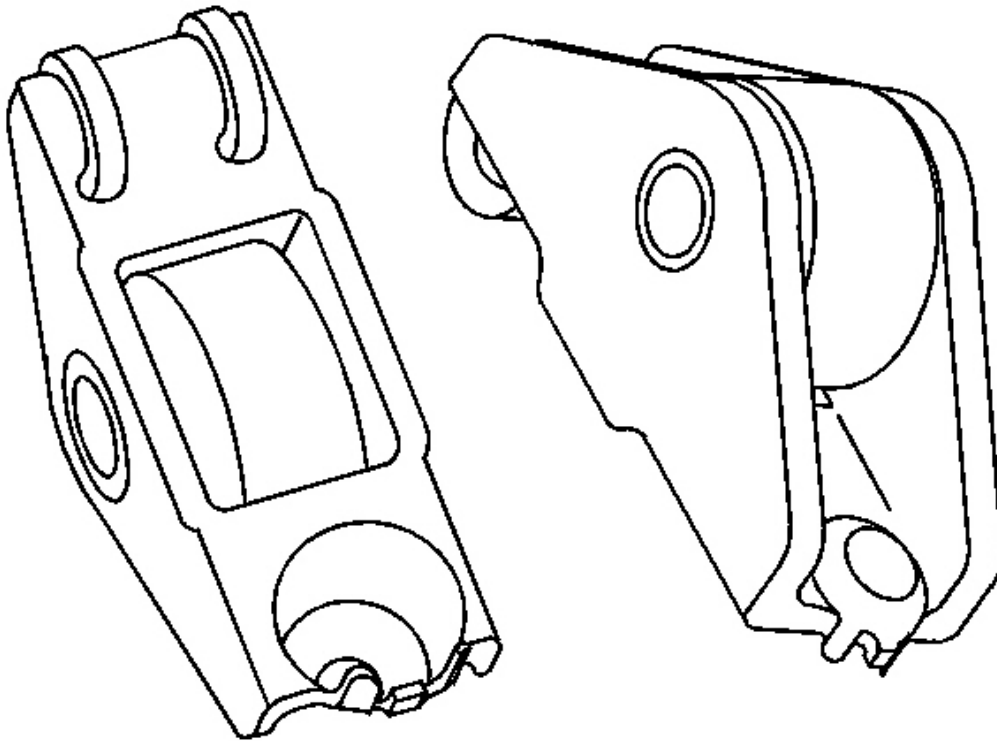
## **TIMING CHAIN AND SPROCKETS CLEANING AND INSPECTION**



**Fig. 350: View Of Timing Chain & Sprockets**  
Courtesy of GENERAL MOTORS CORP.

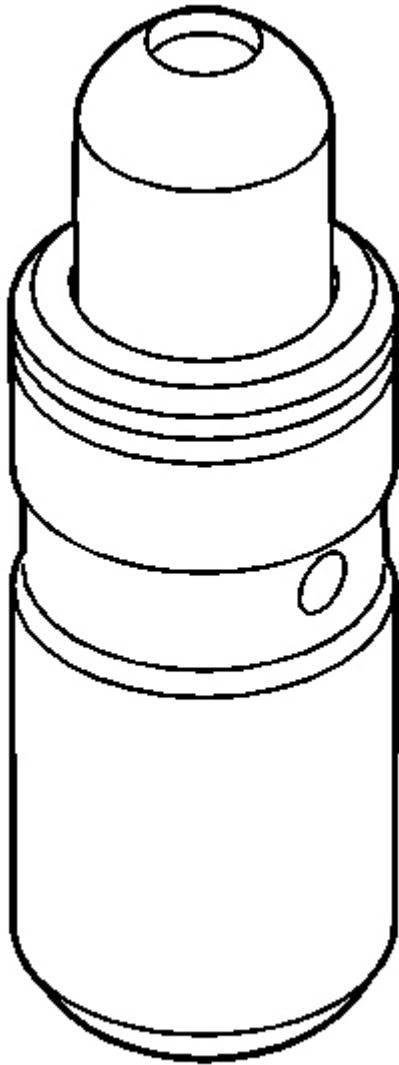
1. Inspect the timing chain sprockets for cracks or teeth that are worn, broken, or chipped.
2. Inspect the timing chain for binding or stretching.
3. Inspect the dowel pins for wear or damage
4. Inspect the crankshaft sprocket keyway and the locating dowel pins in the crankshaft for damage.
5. Inspect the timing chain shoe and guide for excessive wear or cracks.
6. Inspect the timing chain tensioner for damage.
7. Replace the timing chain and sprockets if damaged.

## **VALVE ROCKER ARM AND VALVE LASH ADJUSTER CLEANING AND INSPECTION**



**Fig. 351: View Of Valve Rocker Arm**  
**Courtesy of GENERAL MOTORS CORP.**

1. Clean the valve rocker arms and valve lash adjusters in cleaning solvent.
2. Dry the valve rocker arms and valve lash adjusters with compressed air.
3. Inspect the valve rocker arms for the following conditions:
  - Excessive wear at the valve contact or valve lash adjuster socket area
  - A loose or damaged pin
  - A worn or damaged roller. The roller should rotate freely with no binding or roughness.



**Fig. 352: View Of Valve Lash Adjuster**  
**Courtesy of GENERAL MOTORS CORP.**

**IMPORTANT: Keep the valve rocker arms and valve lash adjusters in the order from where they were removed.**

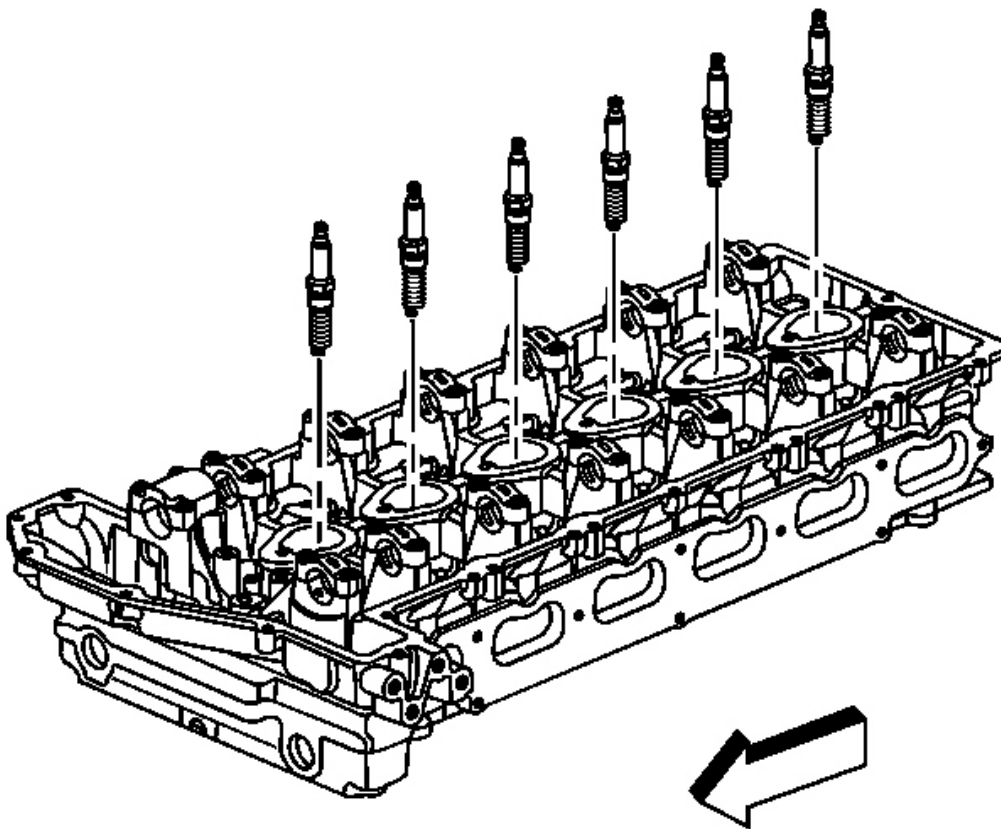
4. Inspect the valve lash adjusters for the following conditions:
  - Excessive wear

- Clogging of the oil passage
- Damage
- Collapsed or spongy

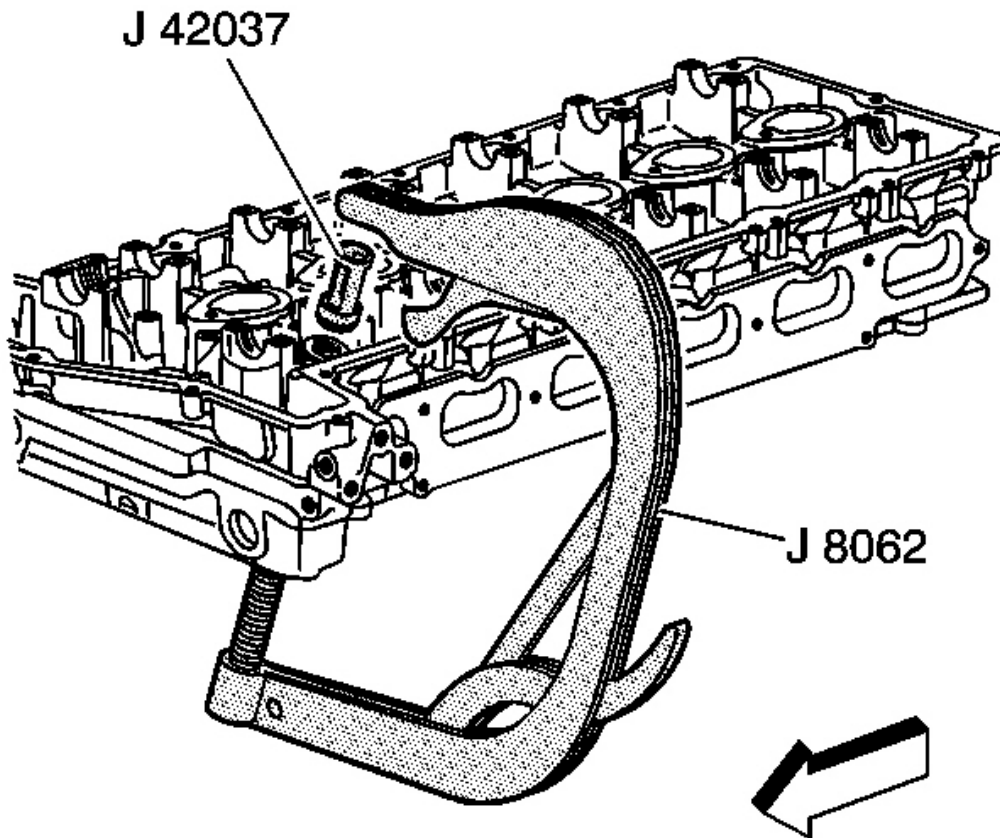
## CYLINDER HEAD DISASSEMBLE

### Tools Required

- **J 8062** Valve Spring Compressor. See Special Tools and Equipment.
- **J 42037** Valve Spring Compressor Adapter. See Special Tools and Equipment.
- **J 38820** Valve Stem Seal Remover/Installer. See Special Tools and Equipment.



**Fig. 353: View Of Spark Plugs**  
Courtesy of GENERAL MOTORS CORP.

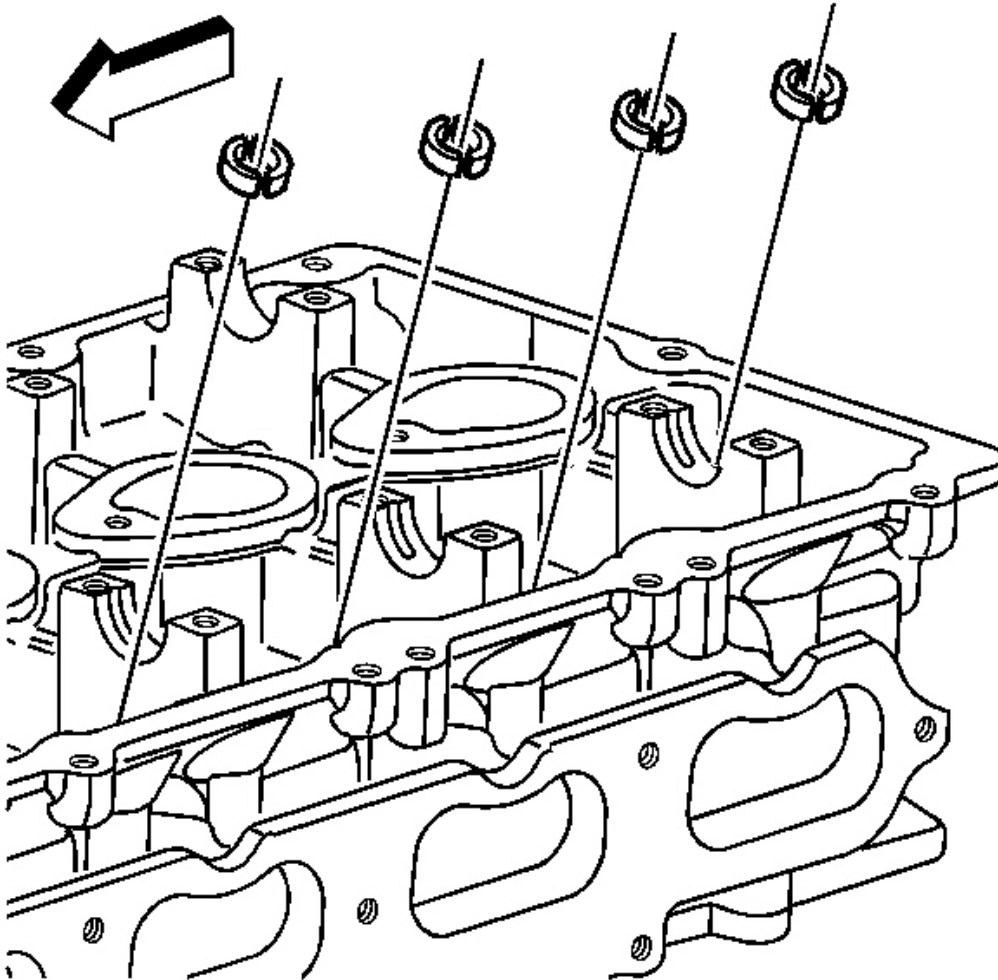


**Fig. 354: Compressing Valve Spring Using J 8062 & J 42037**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Organize the valve train components when disassembling so they can be reassembled in the same location and matched up with the same components as previously installed.

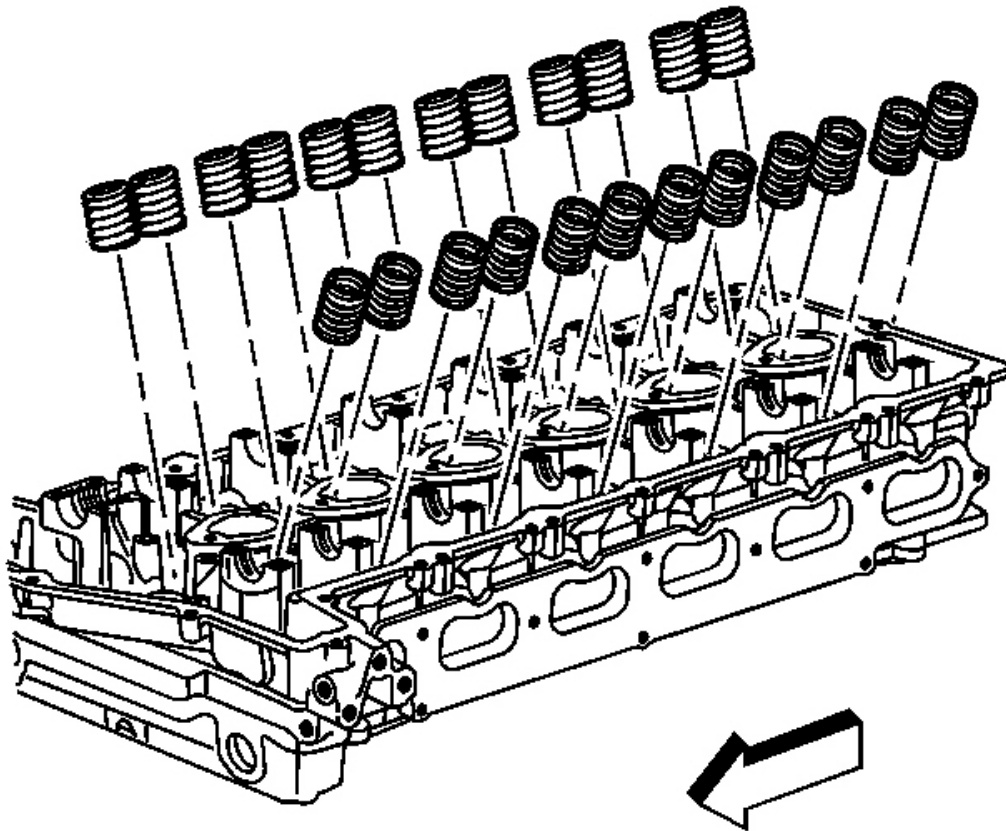
2. Use **J 8062** and **J 42037** to compress the valve spring. See **Special Tools and Equipment**.





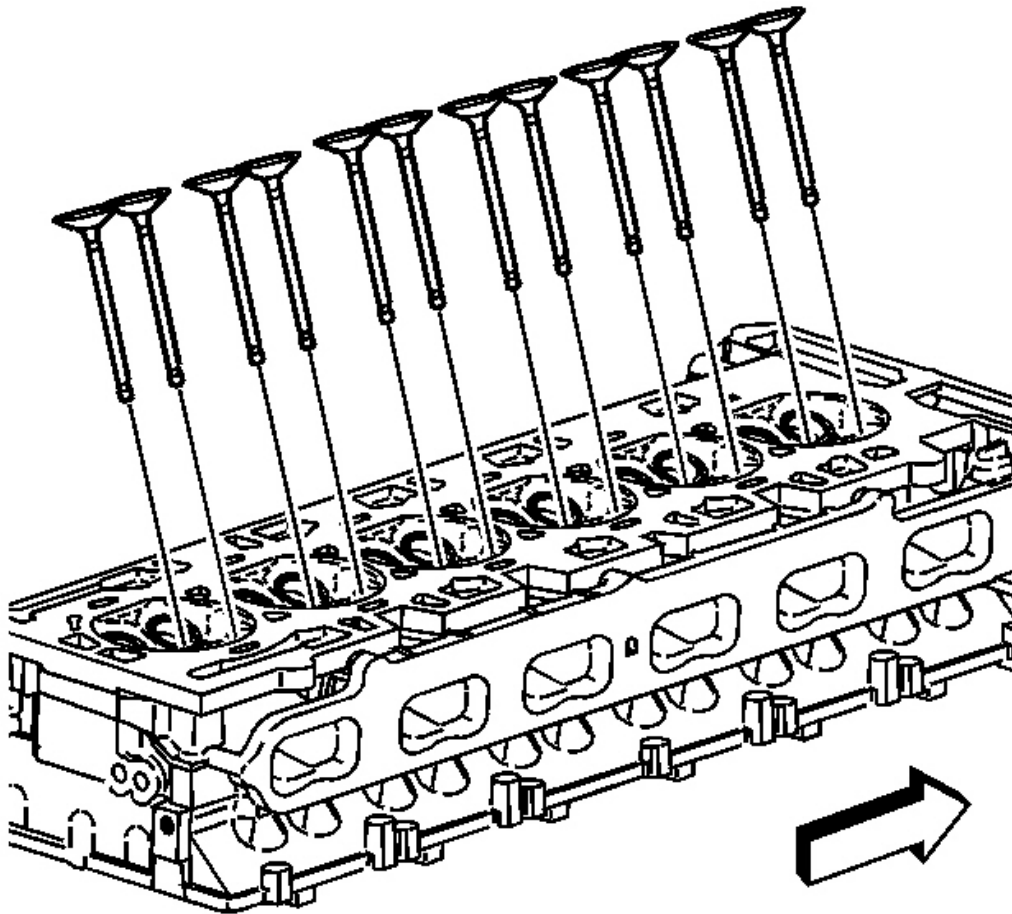
**Fig. 355: View Of Valve Keys**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the valve keys.



**Fig. 356: View Of Valve Springs & Retainer**  
Courtesy of GENERAL MOTORS CORP.

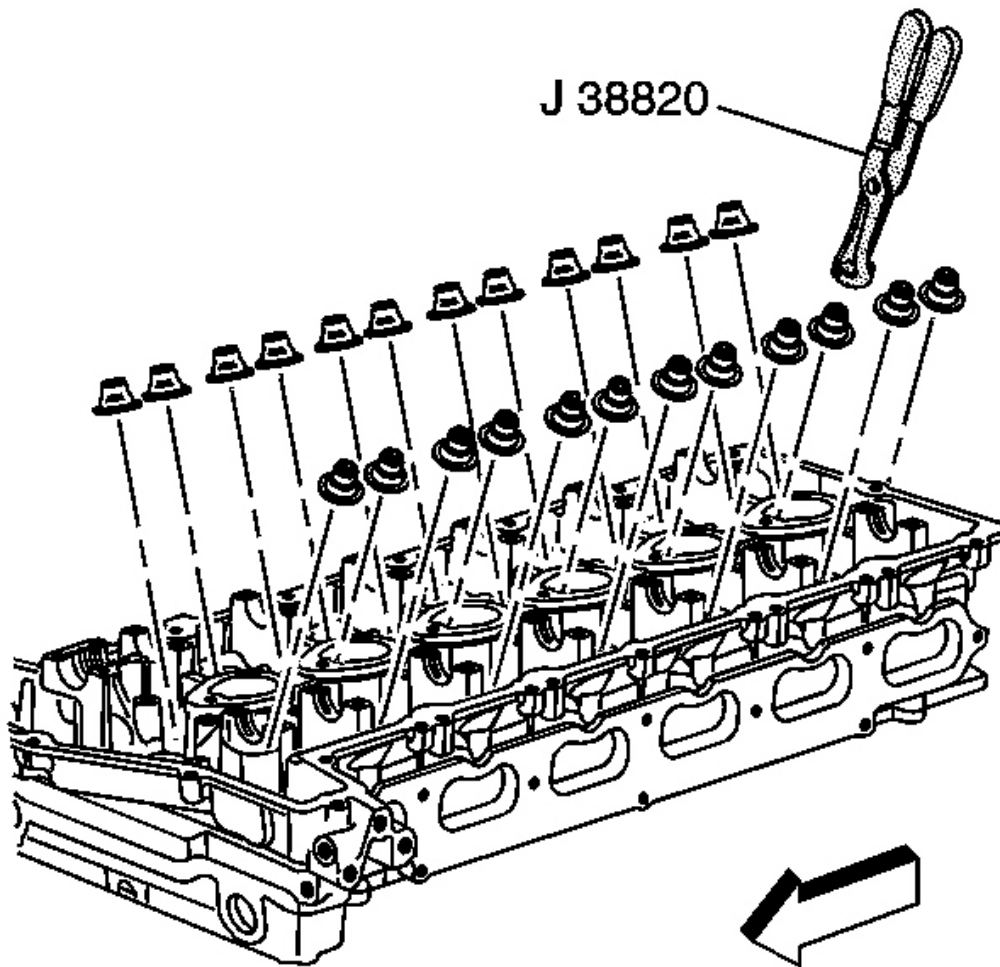
4. Remove **J 8062** and **J 42037** . See **Special Tools and Equipment**.
5. Remove the valve spring retainer and valve spring.



**Fig. 357: View Of Valves**

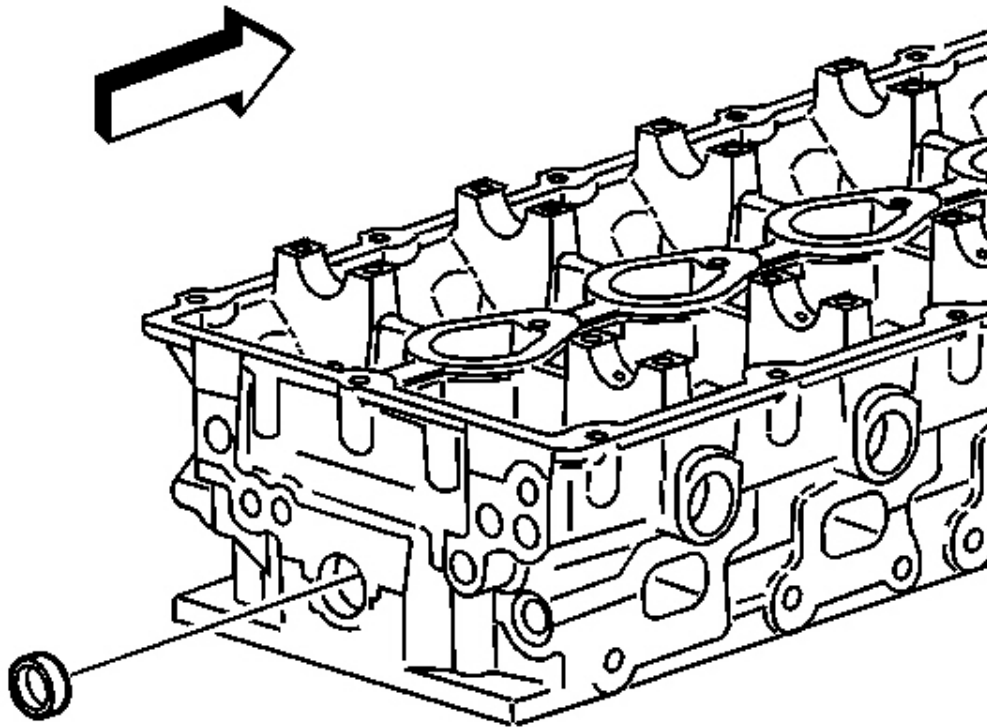
Courtesy of GENERAL MOTORS CORP.

6. Remove the valves.



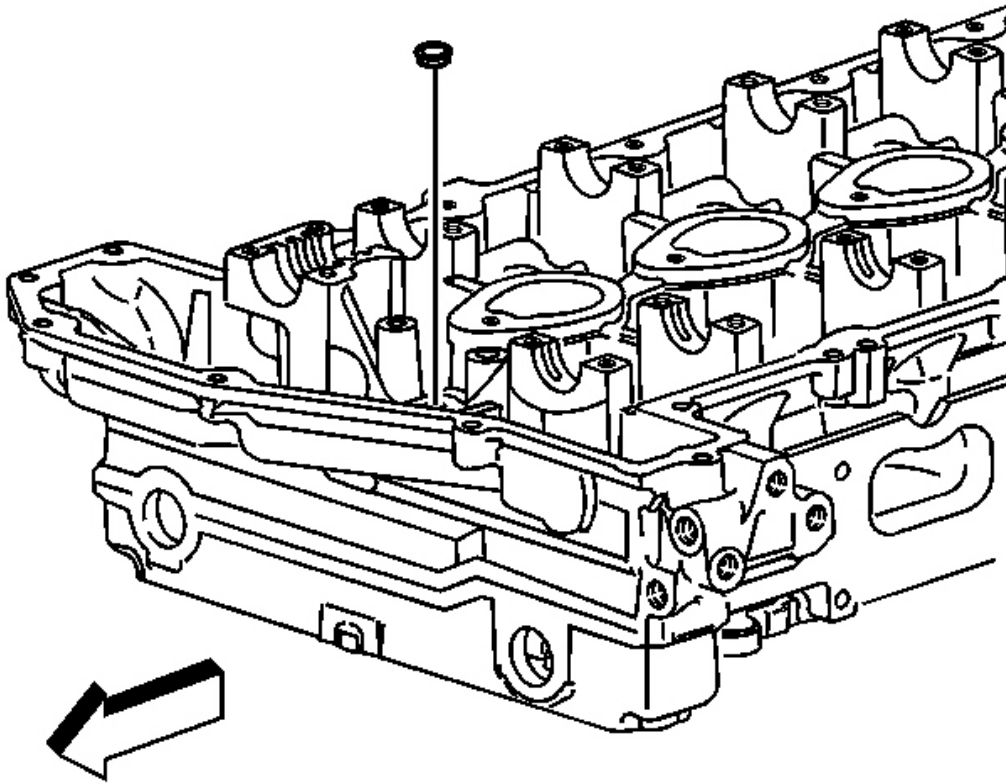
**Fig. 358: View Of J 38820 & Valve Seals**  
Courtesy of GENERAL MOTORS CORP.

7. Use **J 38820** to remove the valve seals. See **Special Tools and Equipment**.



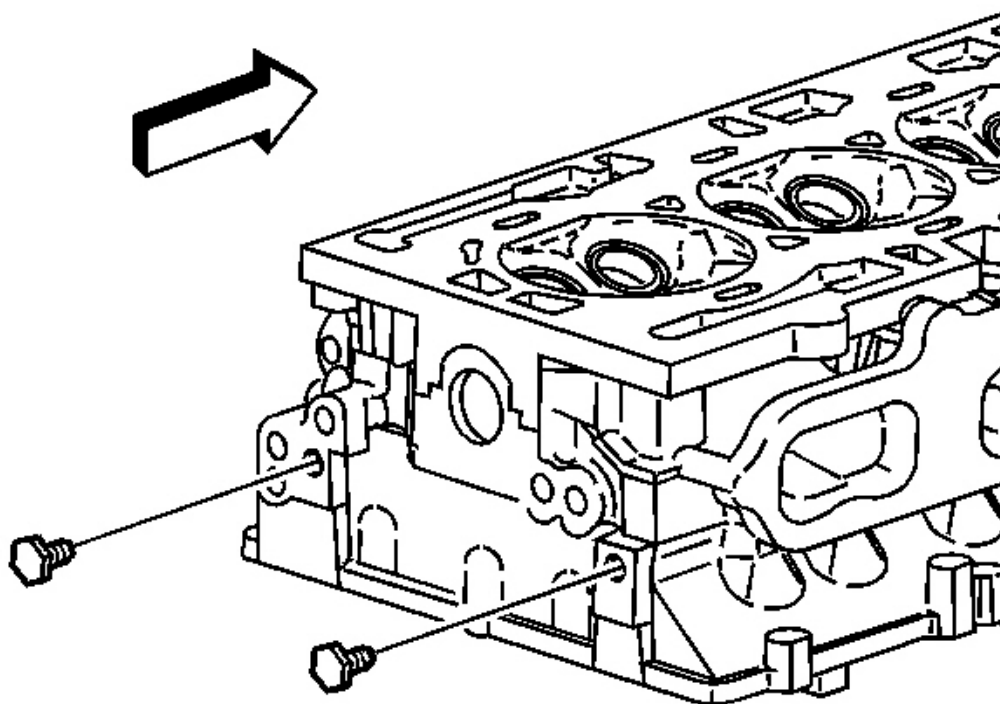
**Fig. 359: View Of Water Jacket Plug**  
Courtesy of GENERAL MOTORS CORP.

8. Inspect the water jacket plug, for leakage. Replace if necessary.



**Fig. 360: View Of Inner Oil Gallery Plug**  
Courtesy of GENERAL MOTORS CORP.

9. Inspect the (inner) oil gallery plug, for leakage. Replace if necessary.



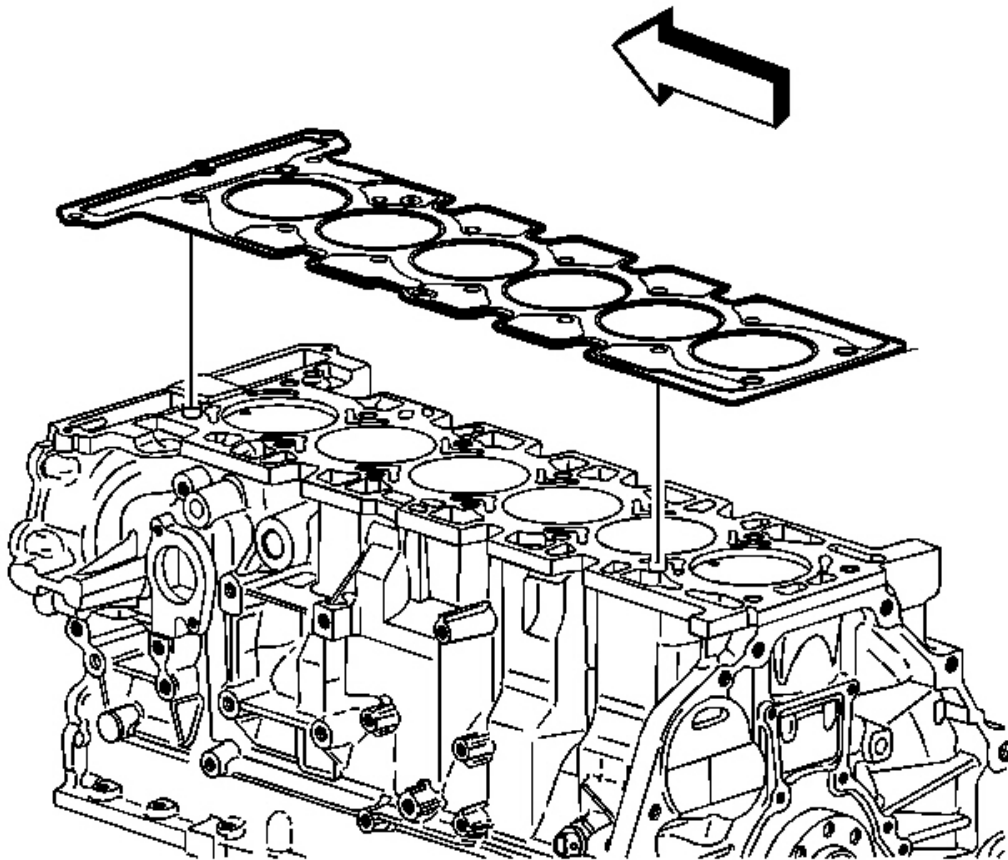
**Fig. 361: View Of End Oil Gallery Plugs**  
**Courtesy of GENERAL MOTORS CORP.**

10. Inspect the (end) oil gallery plugs, for leakage. Replace if necessary.

## **CYLINDER HEAD CLEANING AND INSPECTION**

### **Tools Required**

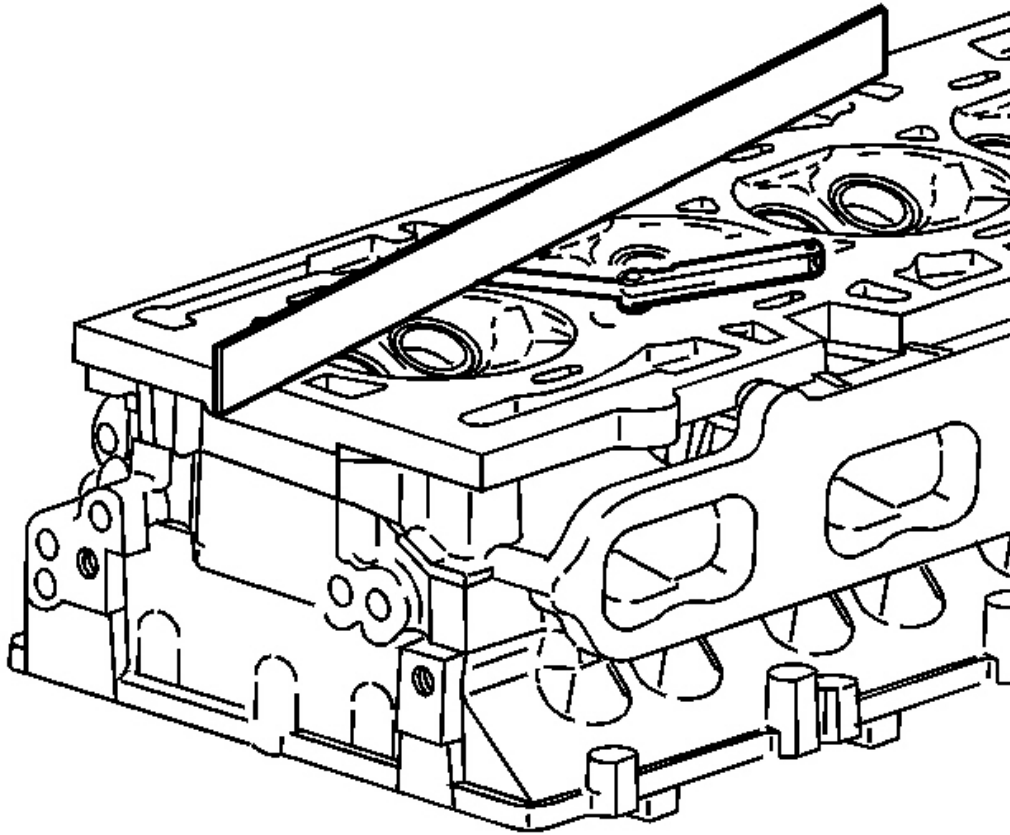
**J 9666** Valve Spring Tester



**Fig. 362: View Of Cylinder Head Gasket**  
**Courtesy of GENERAL MOTORS CORP.**

1. Inspect the cylinder head gasket and the mating surface. Inspect for leaks, corrosion, and blowby.





**Fig. 363: Checking For Cylinder Head Warpage**  
Courtesy of GENERAL MOTORS CORP.

2. If the gasket failed, determine the cause. The following conditions may cause gasket failure:
  - Improper installation
  - Warped cylinder head
  - Missing or not fully seated dowel pins
  - Low torque on the cylinder head bolts
  - Incorrect length cylinder head bolts
  - A warped engine block surface
  - Scratched surfaces
  - Foreign material
  - Cracked engine block threaded holes
3. Clean the following components:

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

- The gasket surfaces

Do not use a motorized brush on the head gasket sealing surface.

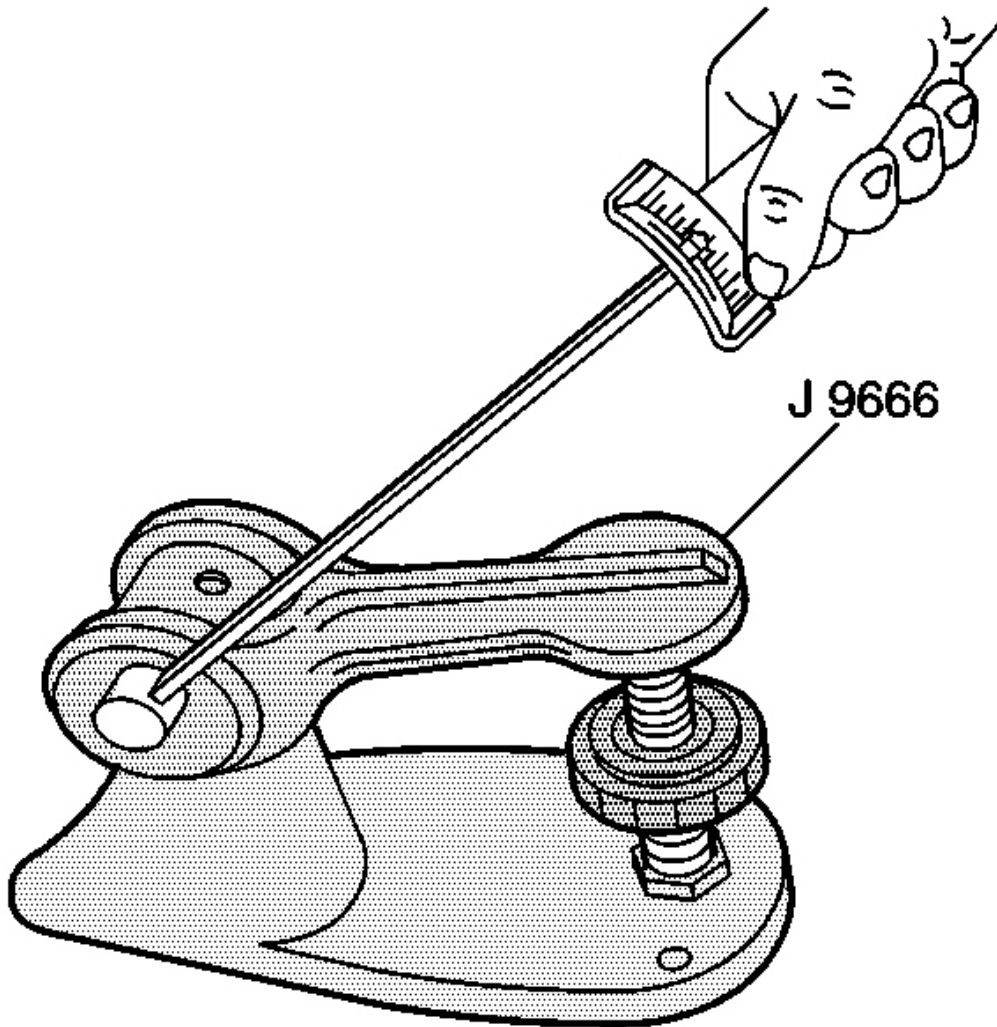
- Valve stems and valve heads
- The bolt hole threads

Remove all dirt, debris, or threadlocking material from the bolt holes.

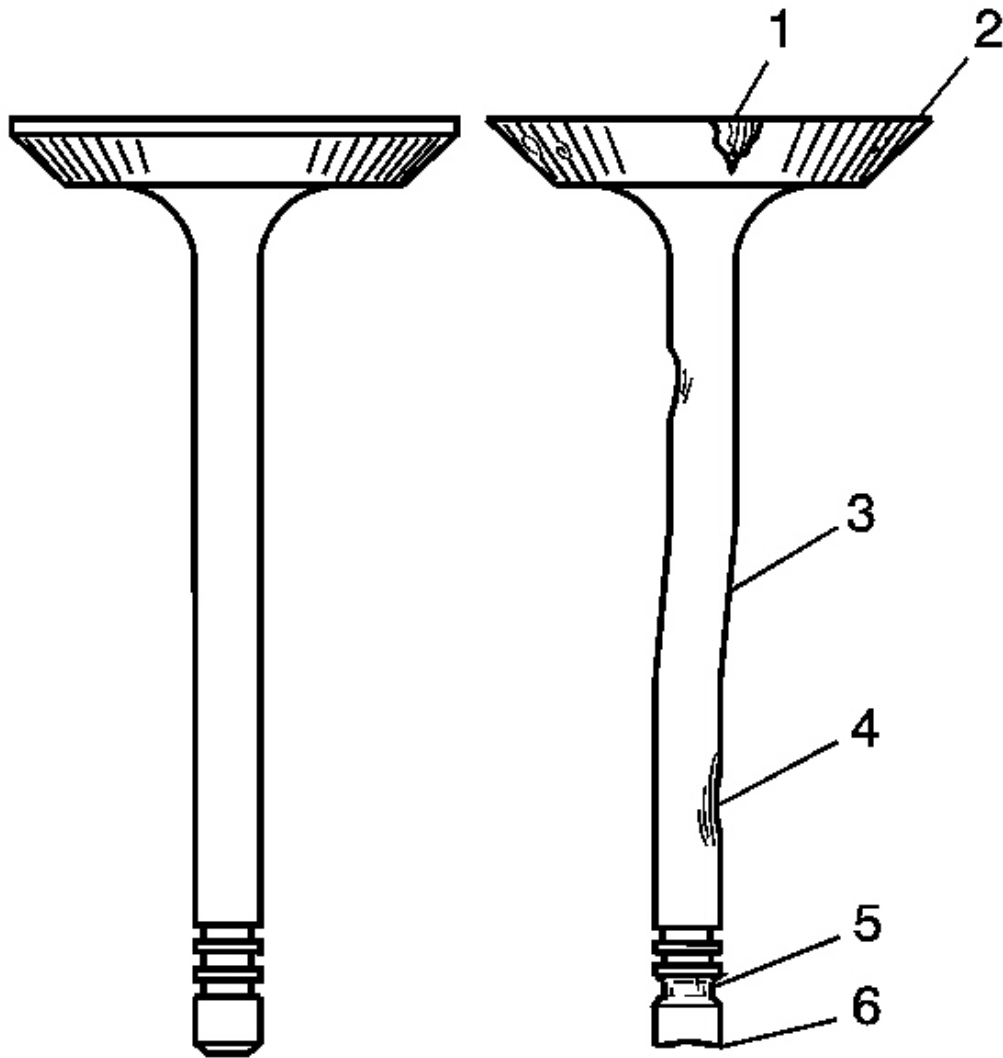
4. Inspect the cylinder head mating surfaces for flatness. Use a feeler gauge and a straight edge.
5. Replace the cylinder head if warped more than 0.08 mm (0.003 in).
6. Inspect the cylinder head for cracks.

**IMPORTANT: Do not attempt to weld the cylinder head. If the cylinder head is damaged, replace the cylinder head. Minor nicks may be repaired with a fine flat file or emery cloth.**

7. Inspect the cylinder head deck for corrosion.
8. Inspect the valve springs for squareness.
9. Use **J 9666** to measure the valve spring tension. Replace the valve spring if the tension is not within specification.



**Fig. 364: Measuring Valve Spring Tension**  
Courtesy of GENERAL MOTORS CORP.



**Fig. 365: Inspecting Valve Guides**  
Courtesy of GENERAL MOTORS CORP.

10. Inspect the valve guides for wear. The valve guides may be reamed oversized 0.075 mm (0.003 in) and oversized stemmed valves may be installed. The same size valve seal should be used.
11. Inspect the valve seats for excessive wear, damage, or hot spots.
12. Use the following procedure to measure the valve seat concentricity:
  1. Lift the valve off the valve seat.
  2. Apply a dab of blue dye to the valve face.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

3. Seat and rotate the valve. The blue dye traces transferred to the valve seat are an indication of concentricity of the valve seat.
13. Use the following procedure to measure the valve runout:
  1. Clean off the blue dye.
  2. Apply blue dye to the valve seat.
  3. Seat and rotate the valve.
  4. The traces of blue dye transferred to the valve indicates valve runout.
14. Replace the head if the valve seats are damaged.
15. Inspect the valves for the following damage:
  - Grooving (1, 2)
  - Bent valve stem (3). Replace any bent valve.
  - Burrs or scratches (4). Minor burrs or scratches may be removed with a fine oil stone.
  - Chipped or worn key grooves (5). Replace if damaged.
  - Valve tip wear (6). Replace if worn.

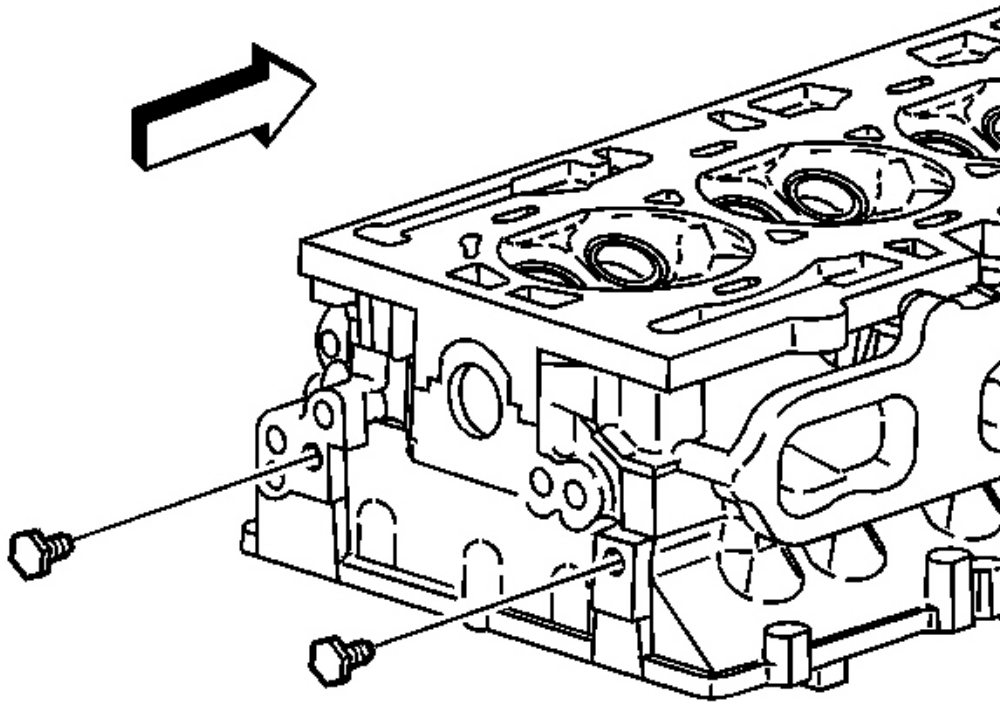
### CYLINDER HEAD ASSEMBLE

#### Tools Required

- **J 8062** Valve Spring Compressor. See **Special Tools and Equipment.**
- **J 42037** Valve Spring Compressor Adapter. See **Special Tools and Equipment.**
- **J 38820** Valve Stem Seal Remover/Installer. See **Special Tools and Equipment.**

1. Apply sealant to the threads.

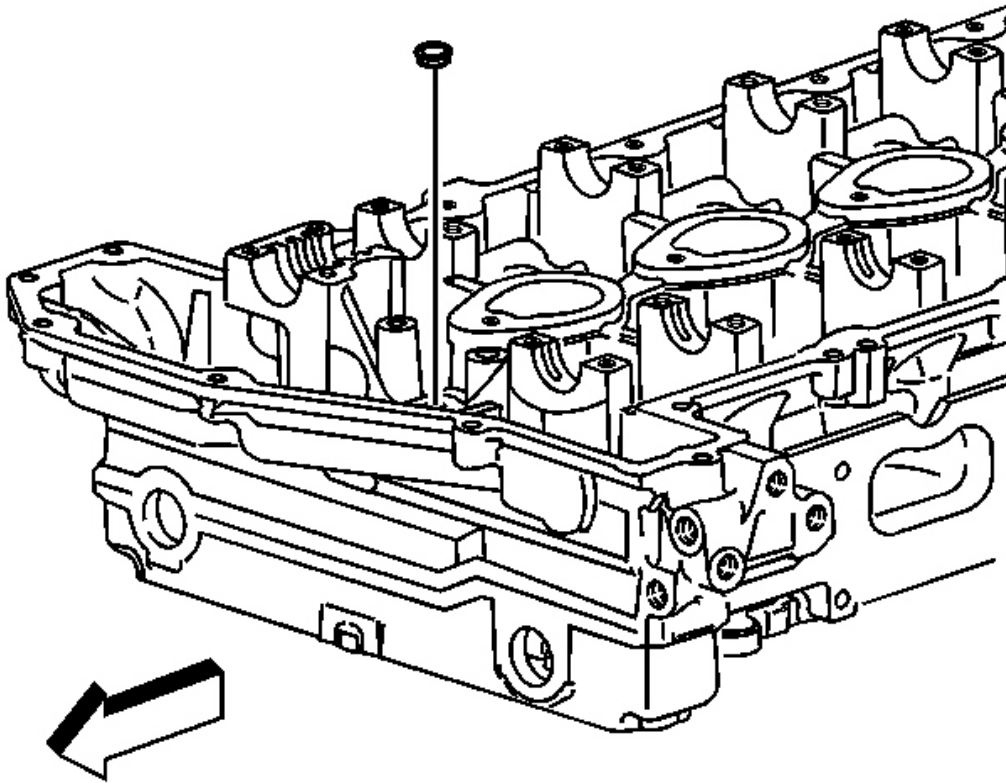
**NOTE:**        **Refer to Fastener Notice in Cautions and Notices.**



**Fig. 366: View Of End Oil Gallery Plugs**  
**Courtesy of GENERAL MOTORS CORP.**

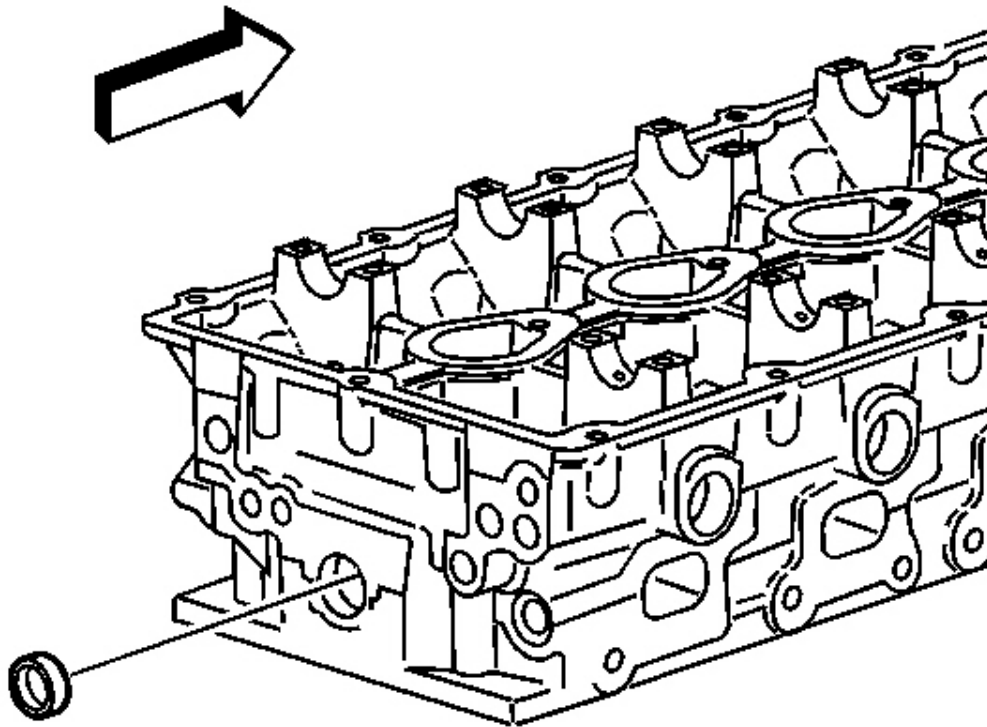
2. Install the (end) oil gallery plugs.

**Tighten:** Tighten the oil gallery plugs to 38 N.m (28 lb ft).



**Fig. 367: View Of Inner Oil Gallery Plug**  
**Courtesy of GENERAL MOTORS CORP.**

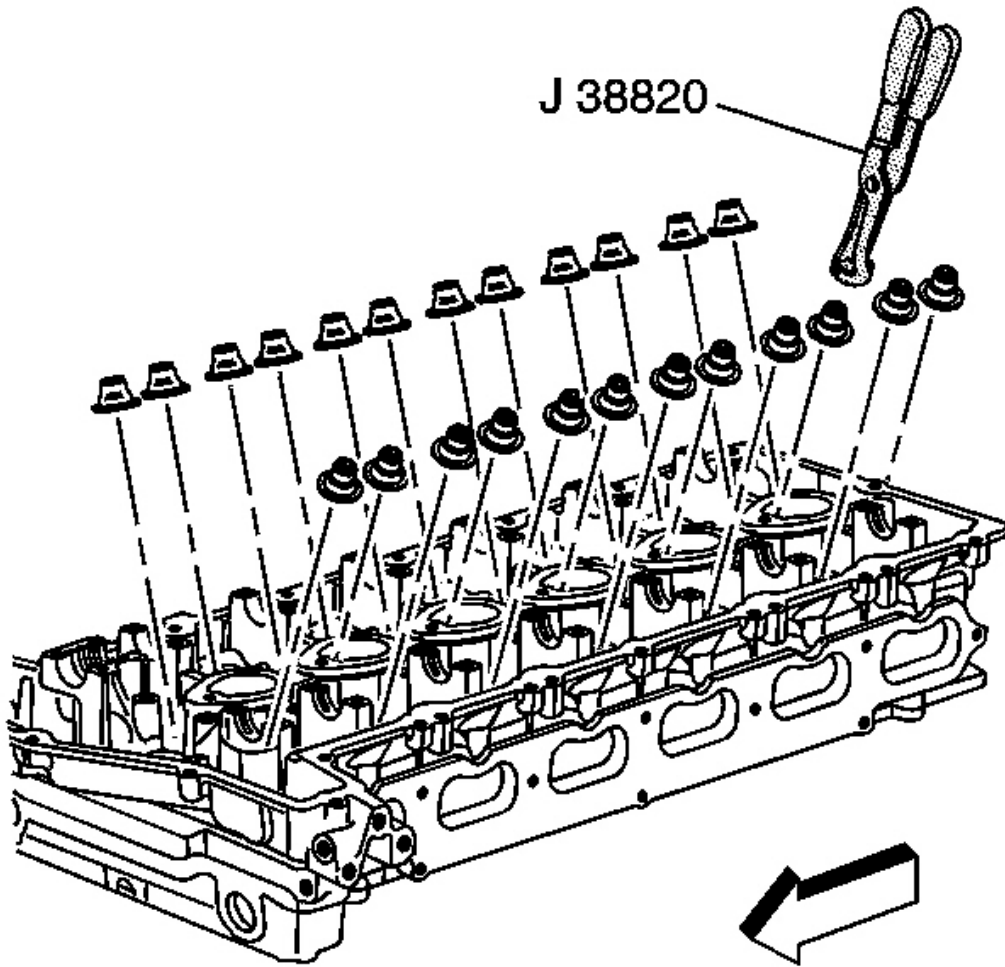
3. Apply sealant to the plugs.
4. Install the (inner) oil gallery plugs.



**Fig. 368: View Of Water Jacket Plug**  
Courtesy of GENERAL MOTORS CORP.

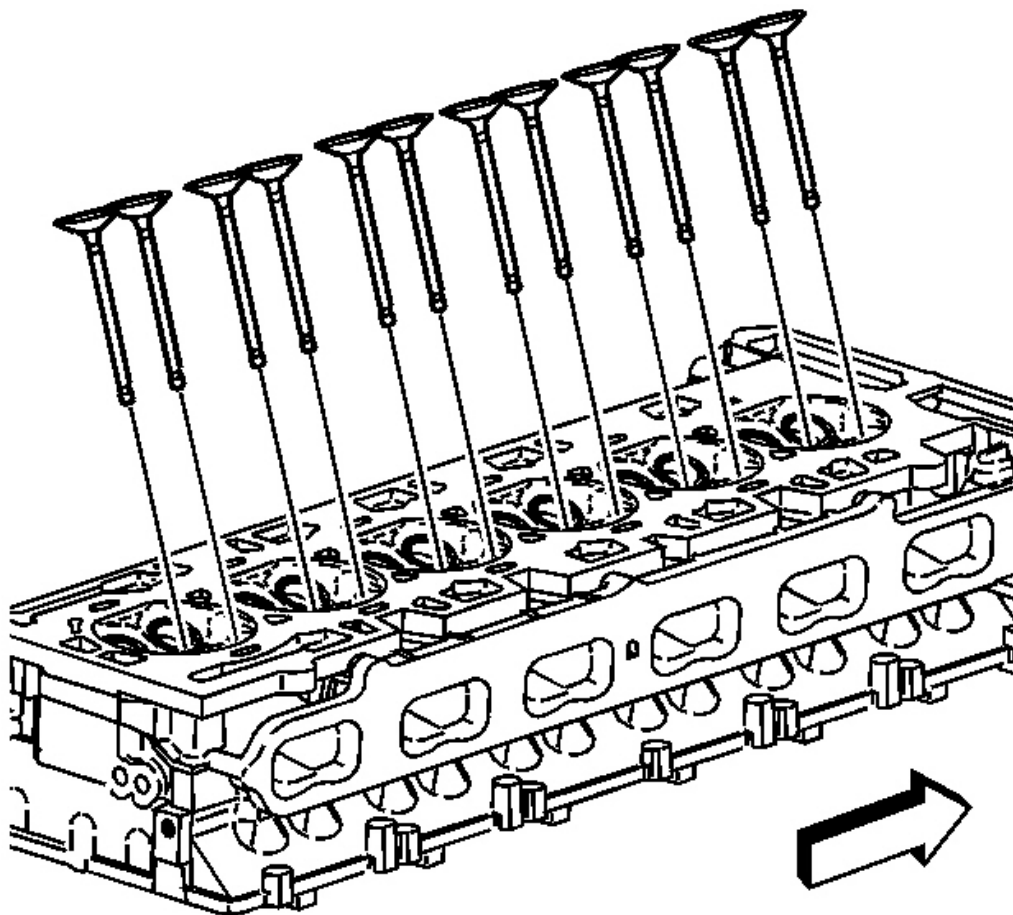
5. Apply sealant to the plug.
6. Install the water jacket plug.





**Fig. 369: View Of J 38820 & Valve Seals**  
Courtesy of GENERAL MOTORS CORP.

7. Use **J 38820** to install the valve seals. There is only one size valve seal. See **Special Tools and Equipment**.

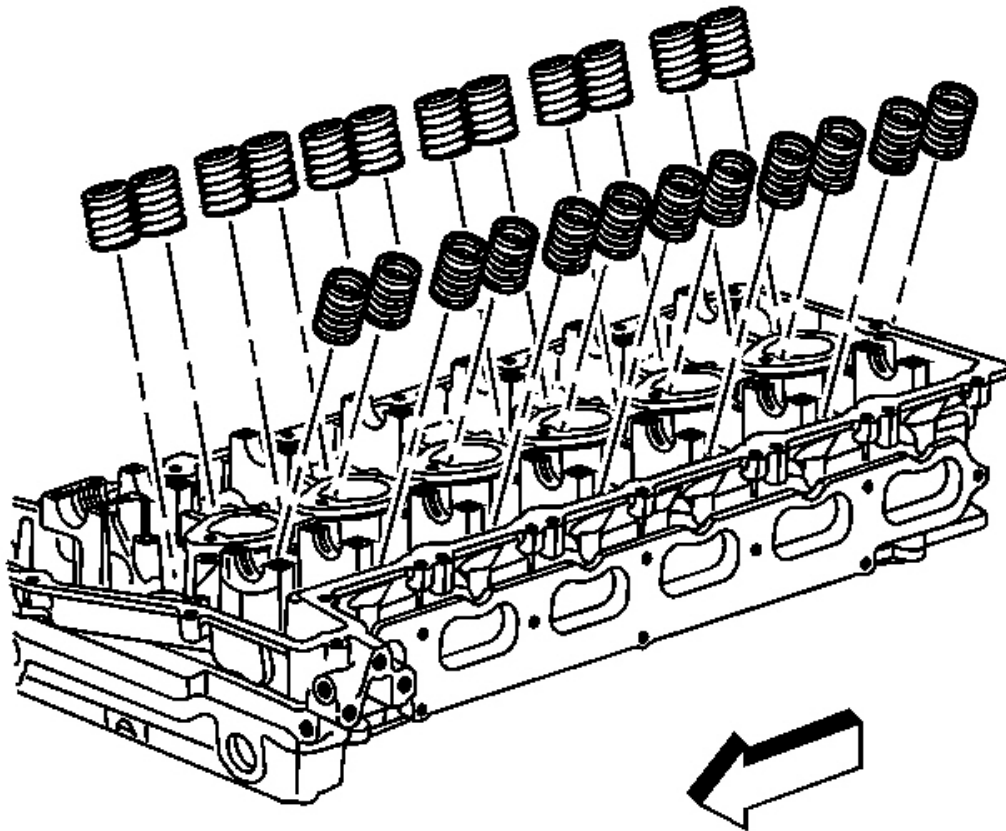


**Fig. 370: View Of Valves**

Courtesy of GENERAL MOTORS CORP.

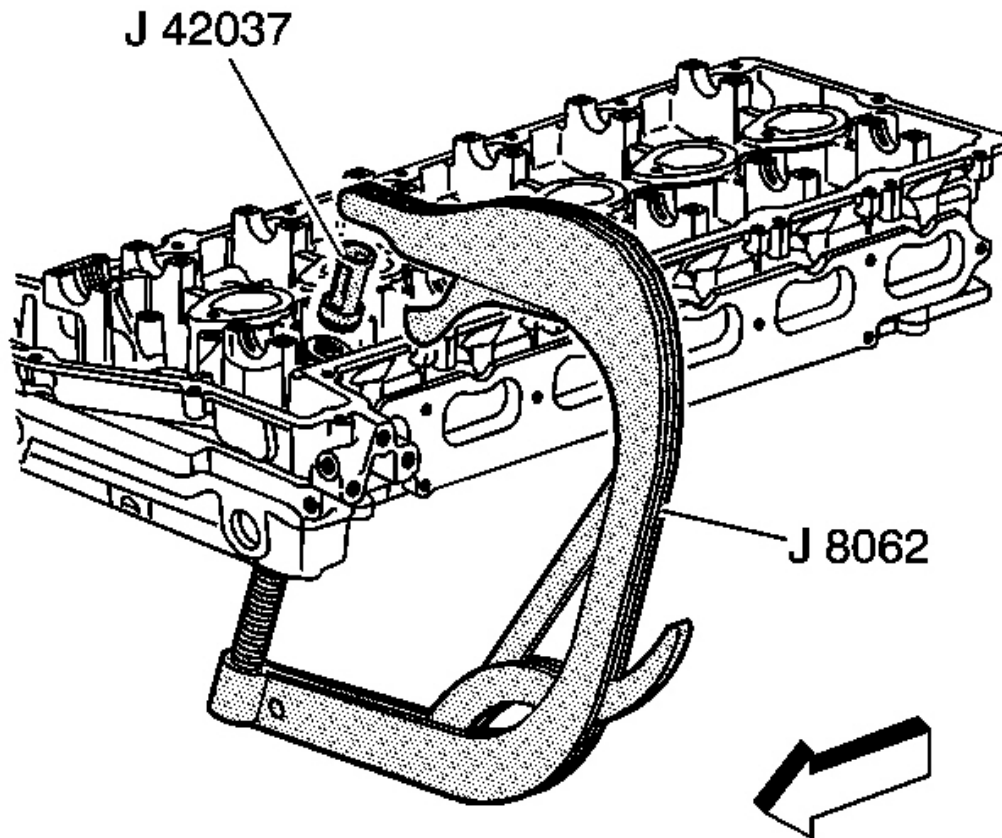
**IMPORTANT:** Lubricate the valve stems with clean engine oil before installing.

8. Install the valves. 0.075 mm (0.003 in) oversized valves are available if the valve guides needed to be reamed. Use the same (original size) valve seal.



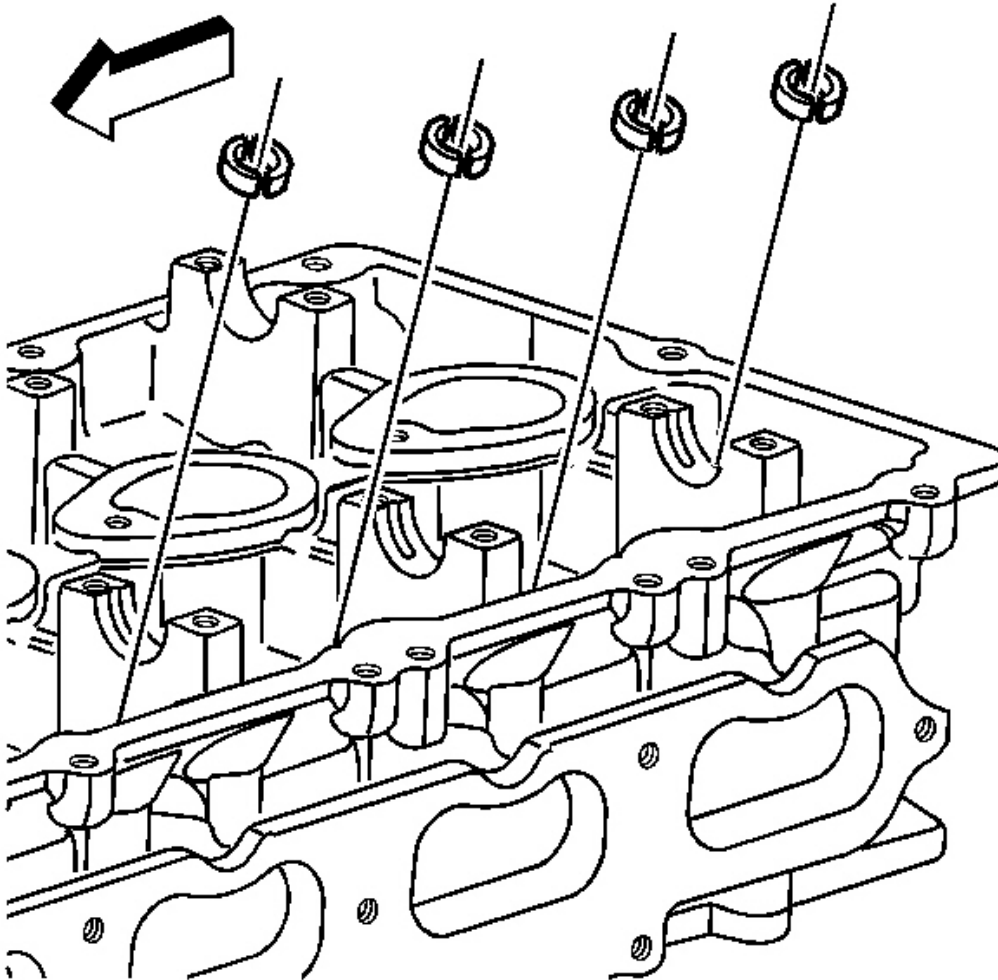
**Fig. 371: View Of Valve Springs & Retainer**  
Courtesy of GENERAL MOTORS CORP.

9. Install the valve spring and the valve spring retainer.



**Fig. 372: Compressing Valve Springs Using J 8062 & J 42037**  
Courtesy of GENERAL MOTORS CORP.

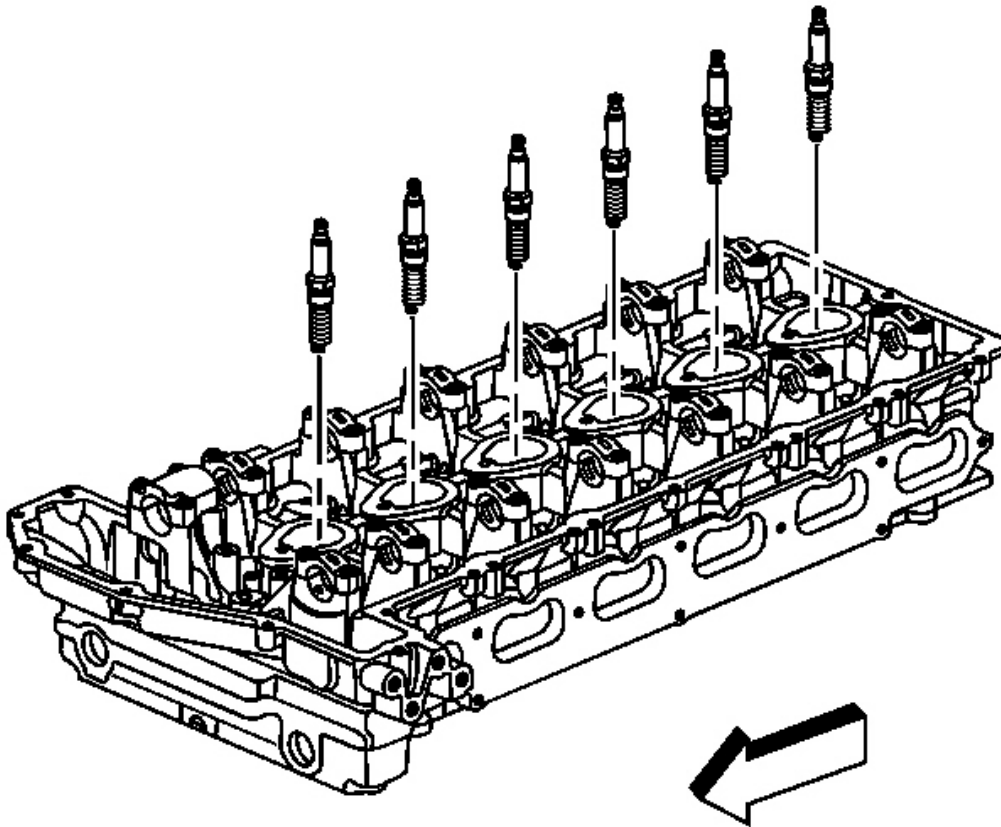
10. Use **J 8062** and **J 42037** to compress the valve spring. See **Special Tools and Equipment**.



**Fig. 373: View Of Valve Keys**

Courtesy of GENERAL MOTORS CORP.

11. Install the valve keys.
12. Remove **J 8062** and **J 42037** . See Special Tools and Equipment.



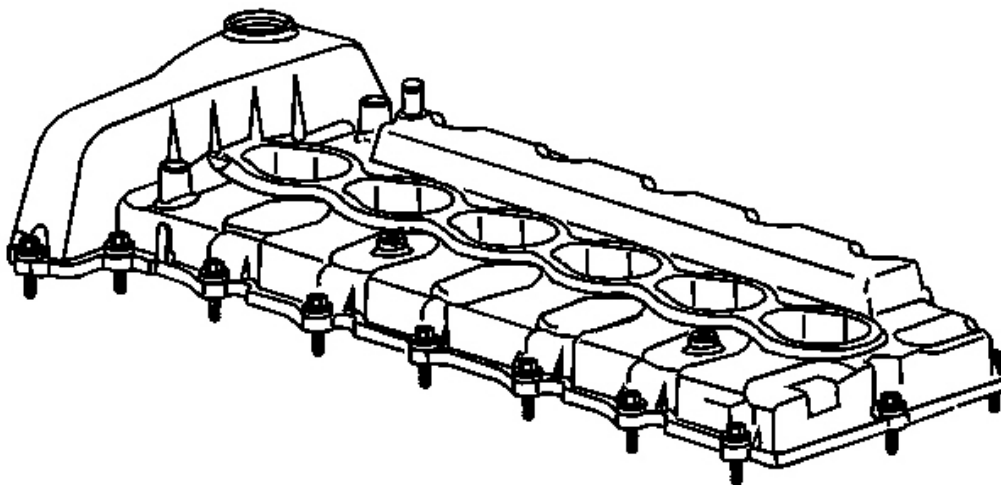
**Fig. 374: View Of Spark Plugs**

Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Do not try to centralize the electrode on the spark plug. The electrode is offset by design.

13. Install the spark plugs.

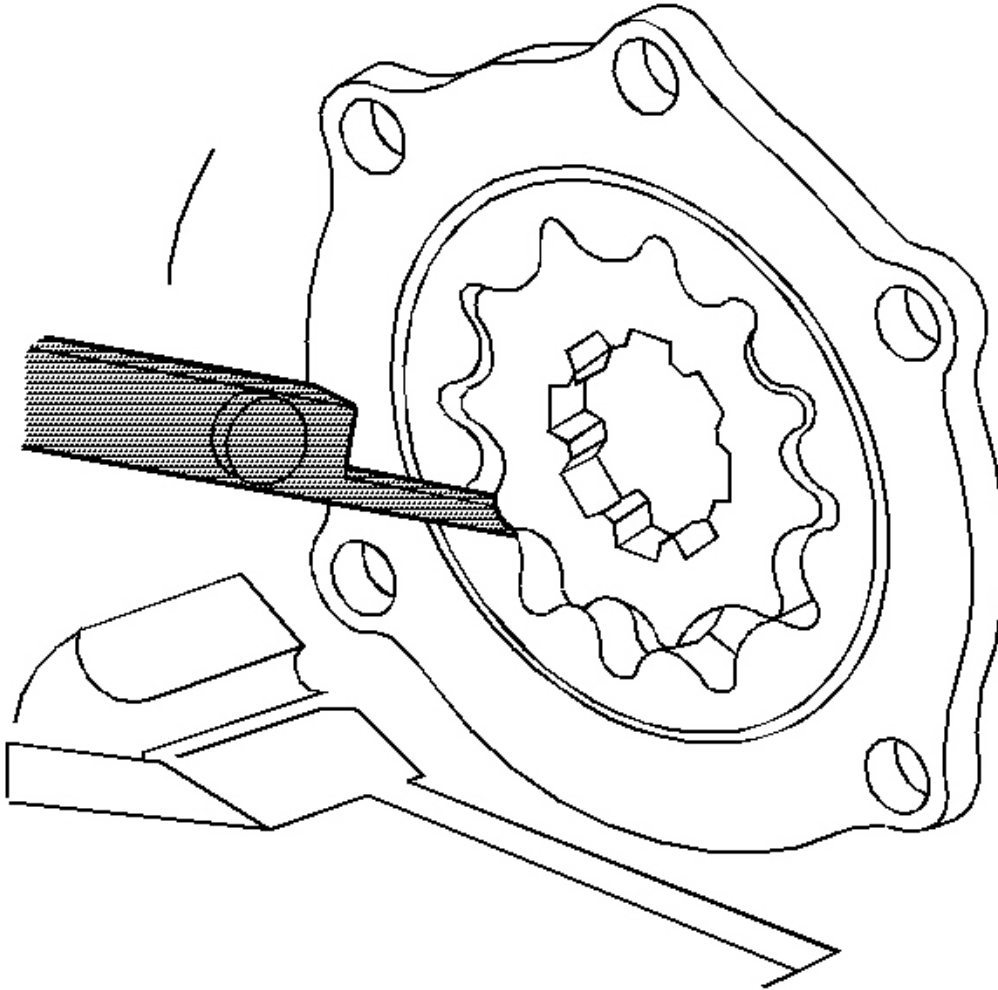
#### **CAMSHAFT COVER CLEANING AND INSPECTION**



**Fig. 375: View Of Camshaft & Cover Seal**  
**Courtesy of GENERAL MOTORS CORP.**

1. Remove and discard the rubber ignition coil seals, and the camshaft cover seal.
2. Clean the camshaft cover with a suitable cleaning solvent.
3. Inspect the camshaft cover for cracks or damage.
4. Inspect the bolt threads for damage.
5. Replace the camshaft cover if necessary.

## **OIL PUMP CLEANING AND INSPECTION**

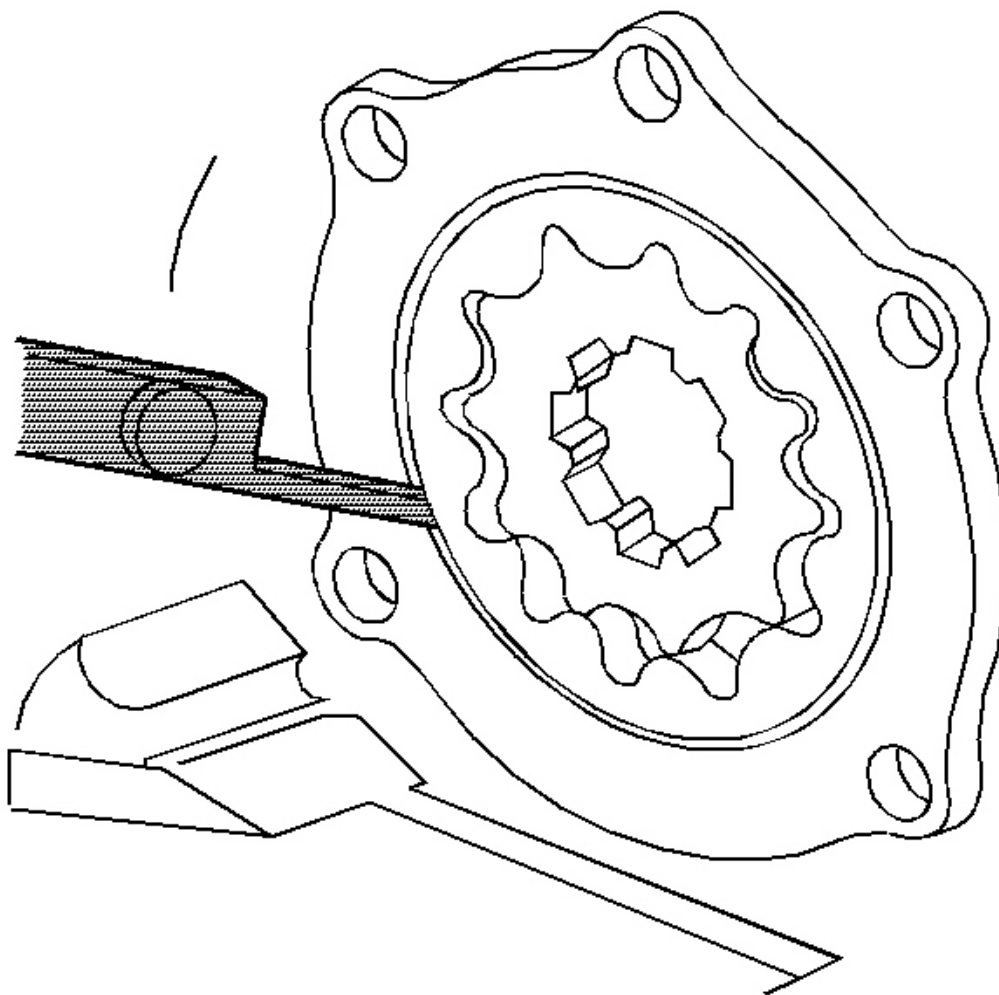


**Fig. 376: Measuring Inner Oil Pump Gear Tip Clearance**  
**Courtesy of GENERAL MOTORS CORP.**

1. Clean all parts of sludge, oil, and varnish by soaking in carburetor cleaner or cleaning solvent.
2. Inspect for foreign material and determine the source of the foreign material.
3. Inspect the oil pump housing and engine front cover for the following conditions:
  - Cracks or casting imperfections
  - Scoring
  - Damaged threads
4. Do not attempt to repair the oil pump housing. Replace the oil pump housing if damage is found.

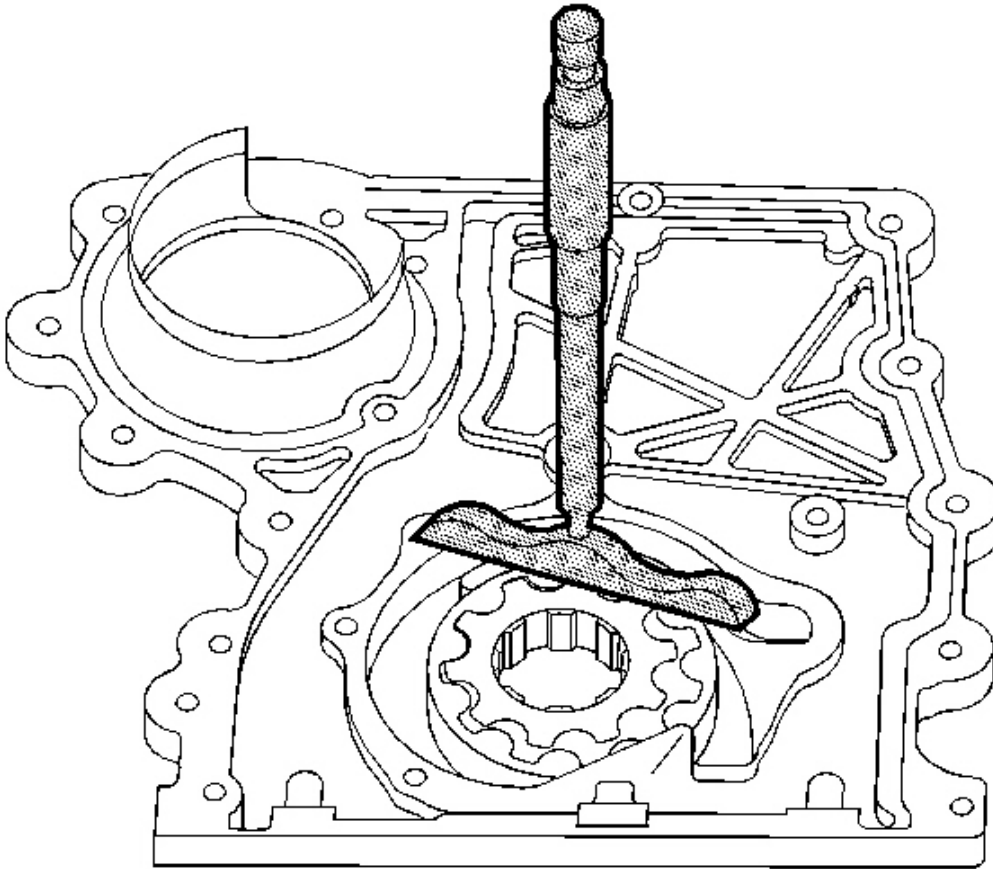


5. Inspect the oil pump gears for damage.
6. Measure the inner oil pump gear tip clearance in several places.



**Fig. 377: Measuring Outer Oil Pump Gear Tip Clearance**  
**Courtesy of GENERAL MOTORS CORP.**

7. Measure the outer oil pump gear tip clearance in several places.



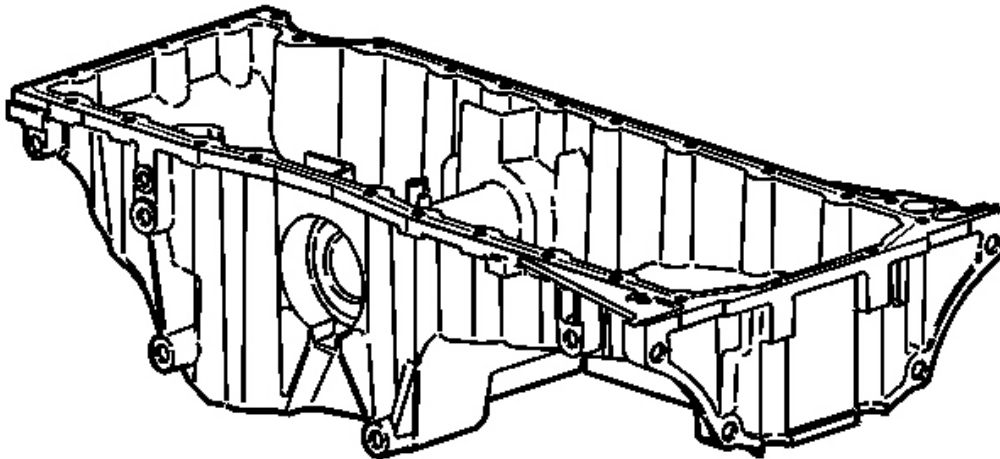
**Fig. 378: Measuring Clearance Of Oil Pump Gear Side**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT: When deciding oil pump serviceability based on end clearance, consider depth of the wear pattern in the pump cover.**

8. Measure the oil pump gear side clearance.
9. Inspect the pressure regulator valve for the following conditions:
  - Scoring
  - Sticking
  - Burrs - Burrs may be removed using a fine oil stone.
10. Inspect the pressure regulator valve spring for loss of tension or bending. Replace the pressure regulator spring if damaged.

11. Inspect the oil pump pipe pickup tube and screen assembly for the following conditions:
  - Looseness - If the oil pump pipe pickup tube is loose or bent, replace the oil pump pipe pickup tube.
  - Broken wire mesh or screen
  - Inspect the O-ring seal at the base of the oil pump pickup tube for damage.

## **OIL PAN CLEANING AND INSPECTION**



**Fig. 379: View Of Oil Pan**

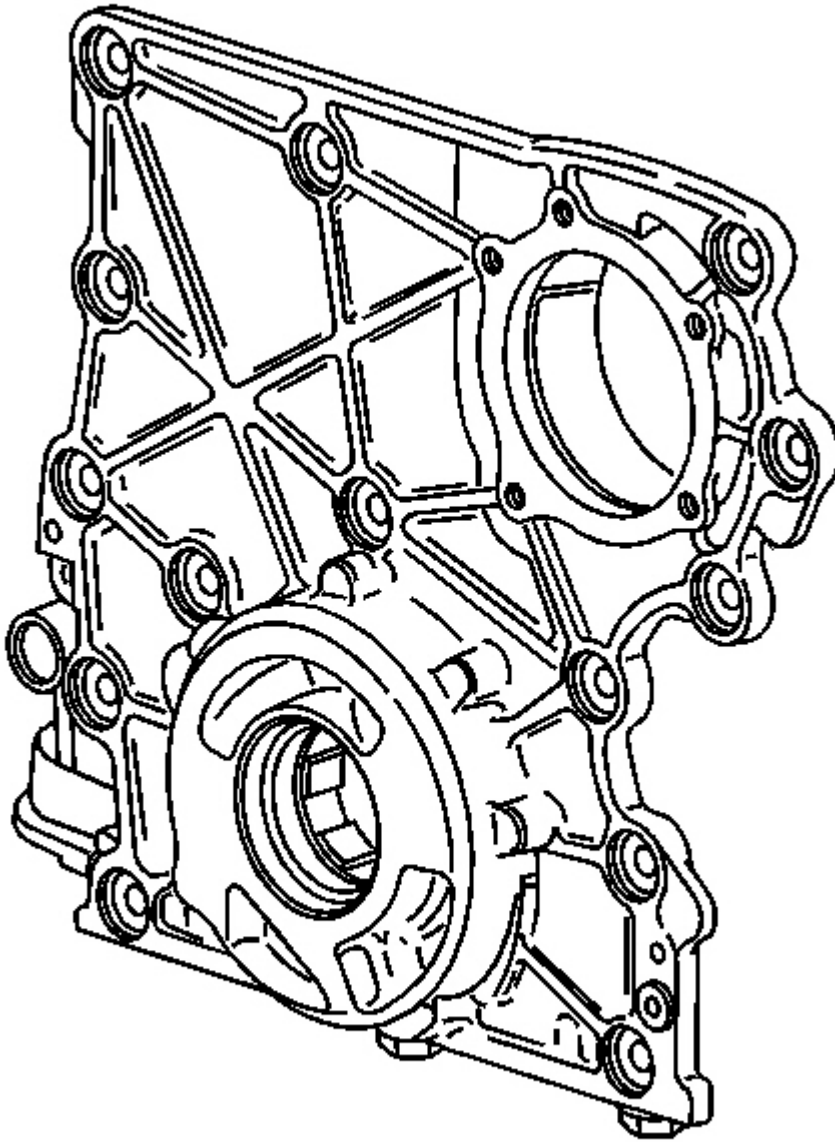
Courtesy of GENERAL MOTORS CORP.

1. Clean the oil pan in solvent. Remove all sludge and debris from the oil pan.

**IMPORTANT: Do not use a motorized tool or bristle disc to clean this component.**

2. Remove all sealing material from the oil pan rails.
3. Inspect the oil pan sealing surfaces for nicks or damage. Remove any minor nicks with a fine flat file.
4. Inspect the threads in the oil drain plug hole.
5. Replace the oil pan if necessary.

## **ENGINE FRONT COVER CLEANING AND INSPECTION**



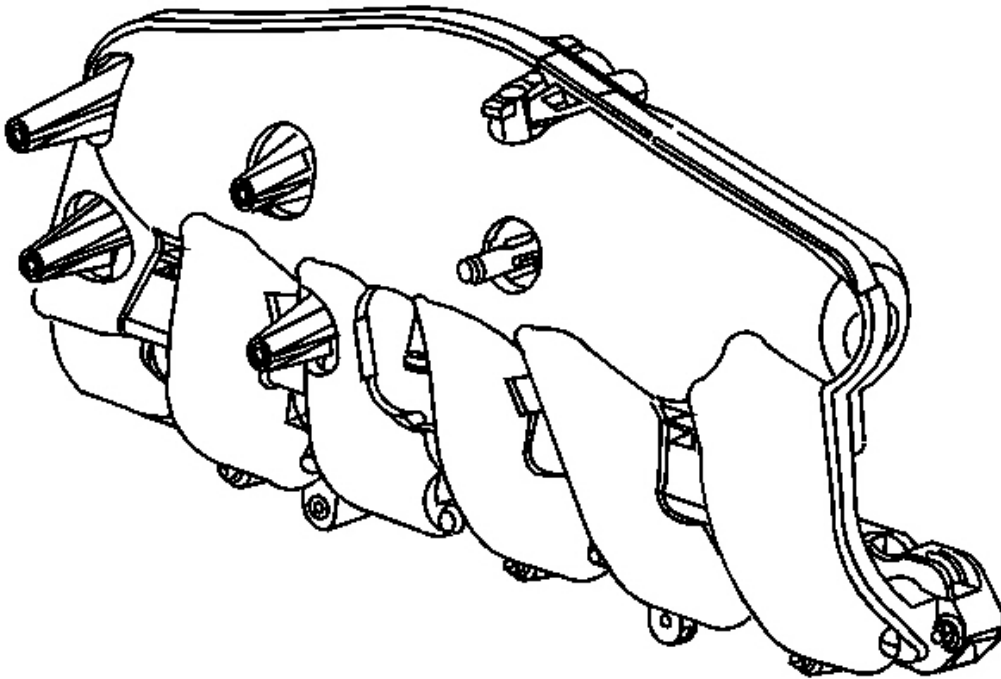
**Fig. 380: View Of Engine Front Cover**  
Courtesy of GENERAL MOTORS CORP.

1. Clean the engine front cover with cleaning solvent.

**IMPORTANT:** Do not use a motorized tool or bristle disc to clean this component.

2. Remove all sealing material.
3. Inspect the engine front cover sealing surfaces for nicks or damage. Use a fine flat file to remove any minor nicks.
4. Inspect the engine front cover threaded holes for damage.
5. Repair or replace the engine front cover as necessary.

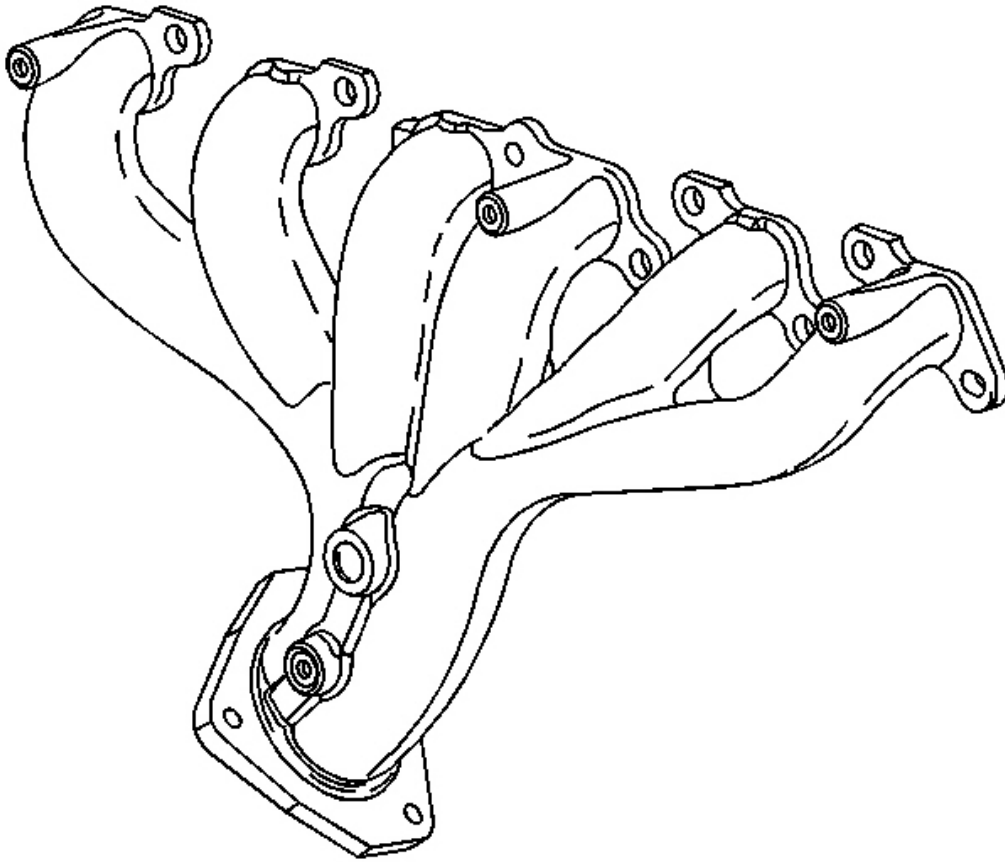
## **INTAKE MANIFOLD CLEANING AND INSPECTION**



**Fig. 381: View Of Intake Manifold**  
**Courtesy of GENERAL MOTORS CORP.**

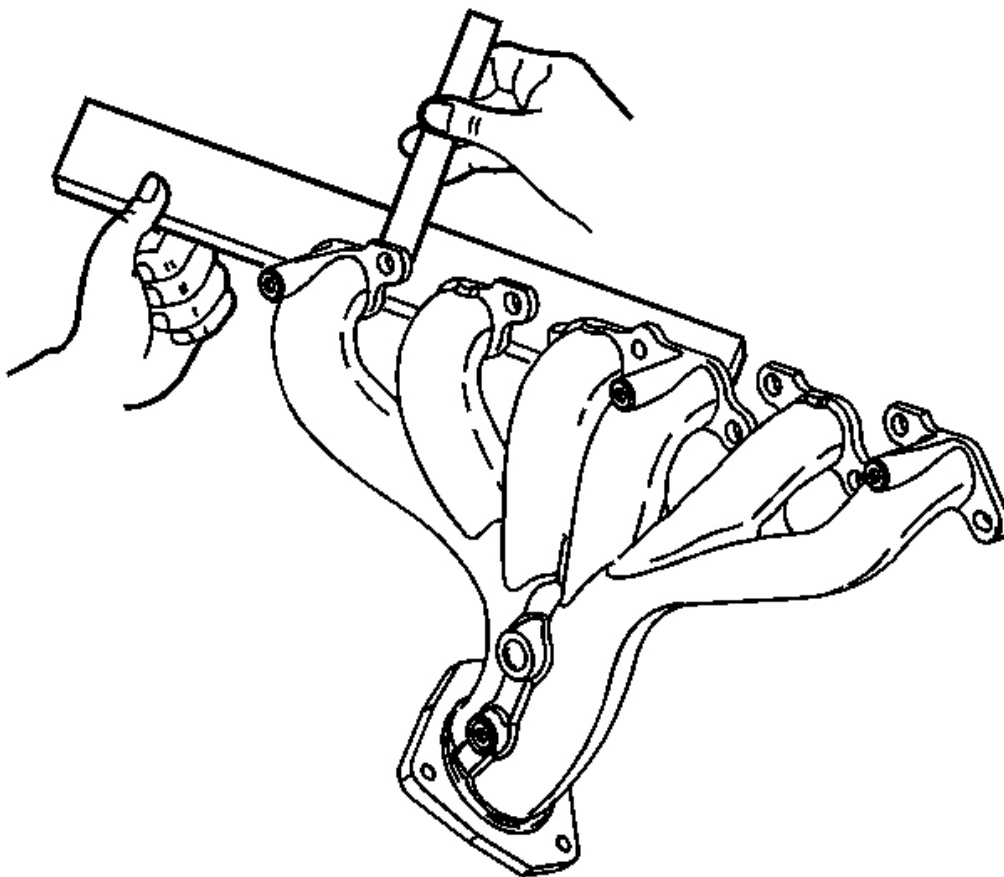
1. Clean the intake manifold gasket mating surface.
2. Inspect the threads on the retaining bolts.
3. Inspect the intake manifold for cracks.
4. Clean the internal ports of all debris.
5. Replace the intake manifold if necessary.

## **EXHAUST MANIFOLD CLEANING AND INSPECTION**



**Fig. 382: View Of Exhaust Manifold**  
**Courtesy of GENERAL MOTORS CORP.**

1. Clean the exhaust manifold.
2. Inspect the exhaust manifold for cracks or damage.
3. Inspect the exhaust manifold threads and studs (if necessary).

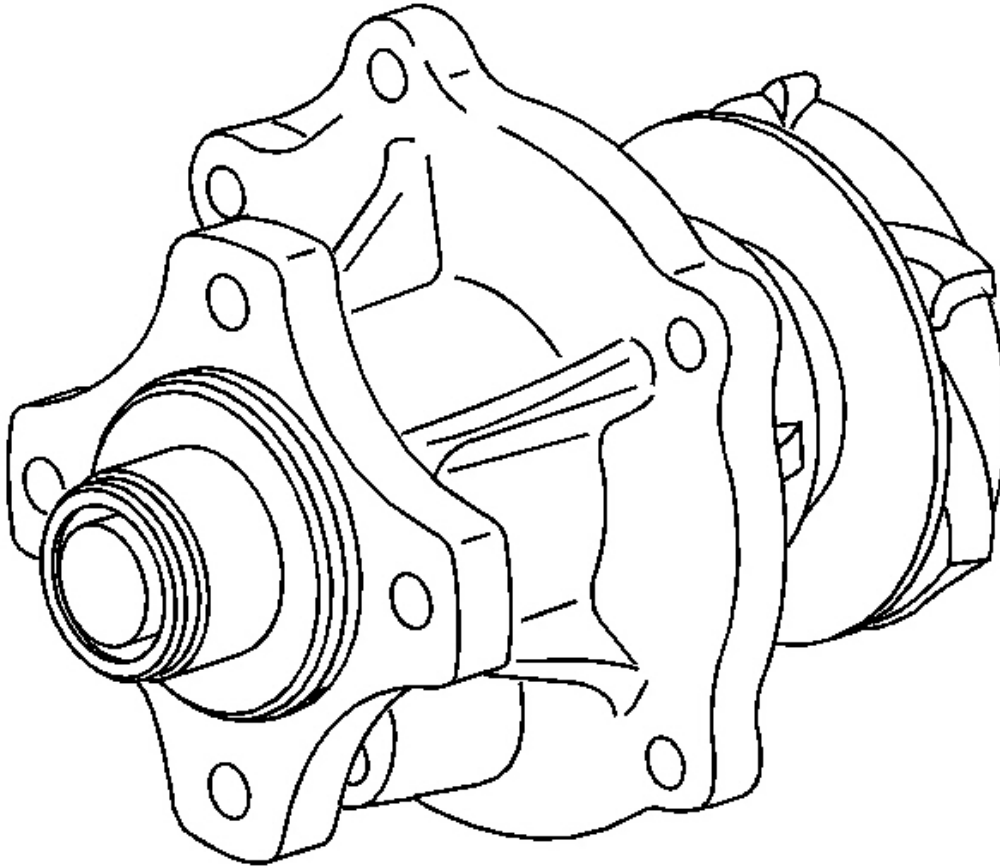


**Fig. 383: Checking Exhaust Manifold Mating Surface**  
Courtesy of GENERAL MOTORS CORP.

4. Check the exhaust manifold mating surface for flatness. Use a straight edge and a feeler gauge.
5. Replace the exhaust manifold if necessary.

#### **WATER PUMP CLEANING AND INSPECTION**

1. Remove all sealing material from the sealing surface.
2. Inspect the water pump impeller for damage.



**Fig. 384: View Of Water Pump**  
**Courtesy of GENERAL MOTORS CORP.**

3. Inspect the water pump shaft for looseness.
4. Inspect the threads for damage.
5. Replace the water pump if necessary.

## **THREAD REPAIR**

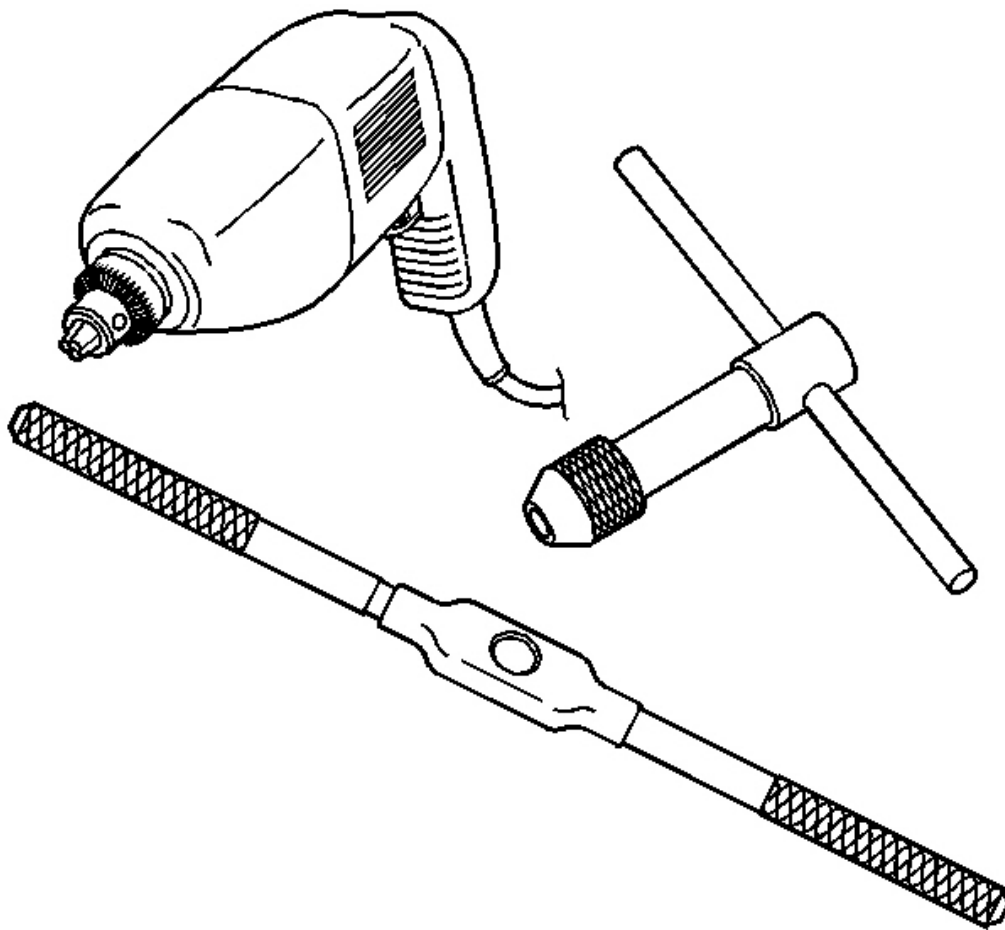
### **Tools Required**

- **J 42385-400** Thread Repair Kit. See **Special Tools and Equipment**.
- **J 43965** Extension Kit. See **Special Tools and Equipment**.

The thread repair process involves a solid, thin walled, self-locking, carbon steel, bushing type insert. During

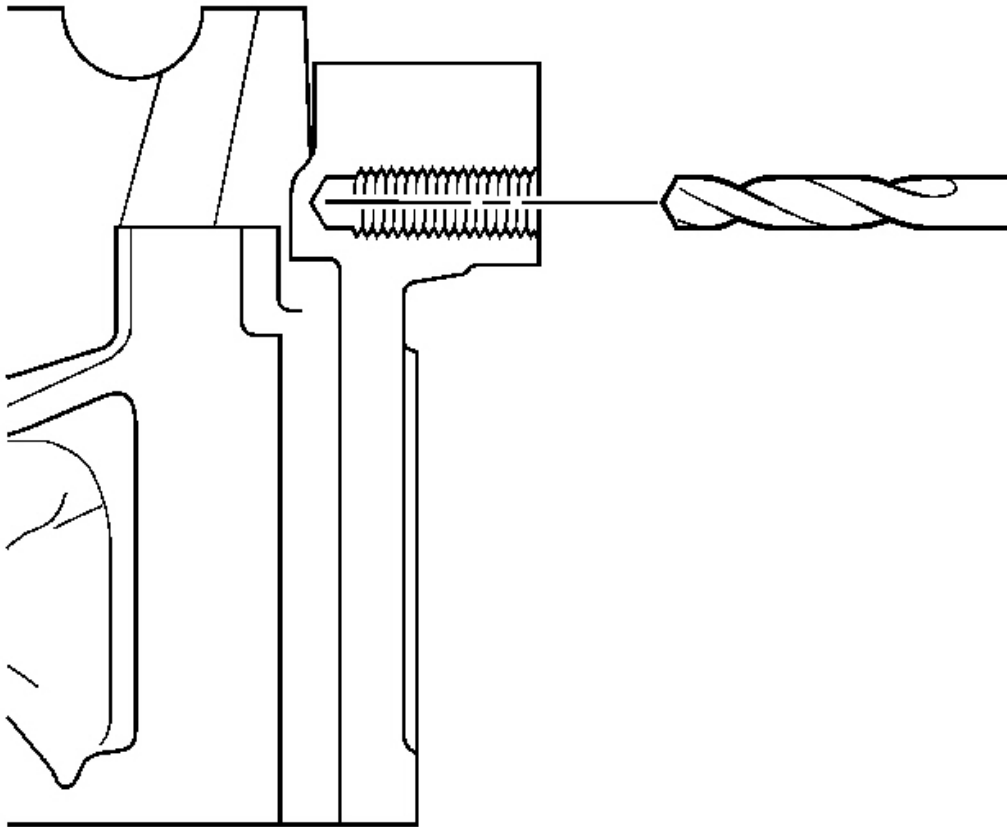


the insert installation process, the installation driver tool cold-rolls the bottom internal threads and expands the bottom external threads of the insert into the base material. This action mechanically locks the insert into place.



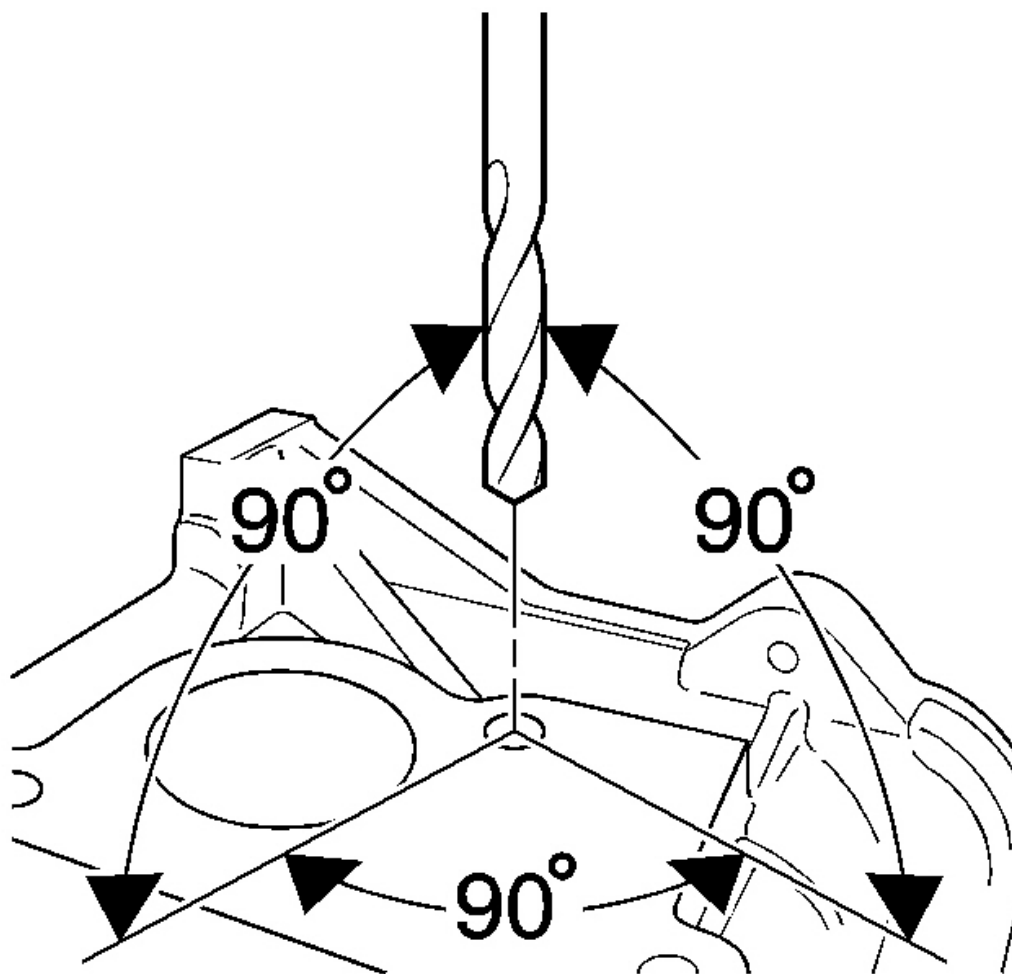
**Fig. 385: View Of J 42385-400 Tool Kit**  
Courtesy of GENERAL MOTORS CORP.

The tool kit **J 42385-400** is designed for use with either a suitable tap wrench or drill motor. See **Special Tools and Equipment**. Limited access and larger hole repair may process better using a tap wrench. An extension **J 43965** may also be necessary to drive the thread repair tooling dependent on access to the hole being repaired. See **Special Tools and Equipment**.



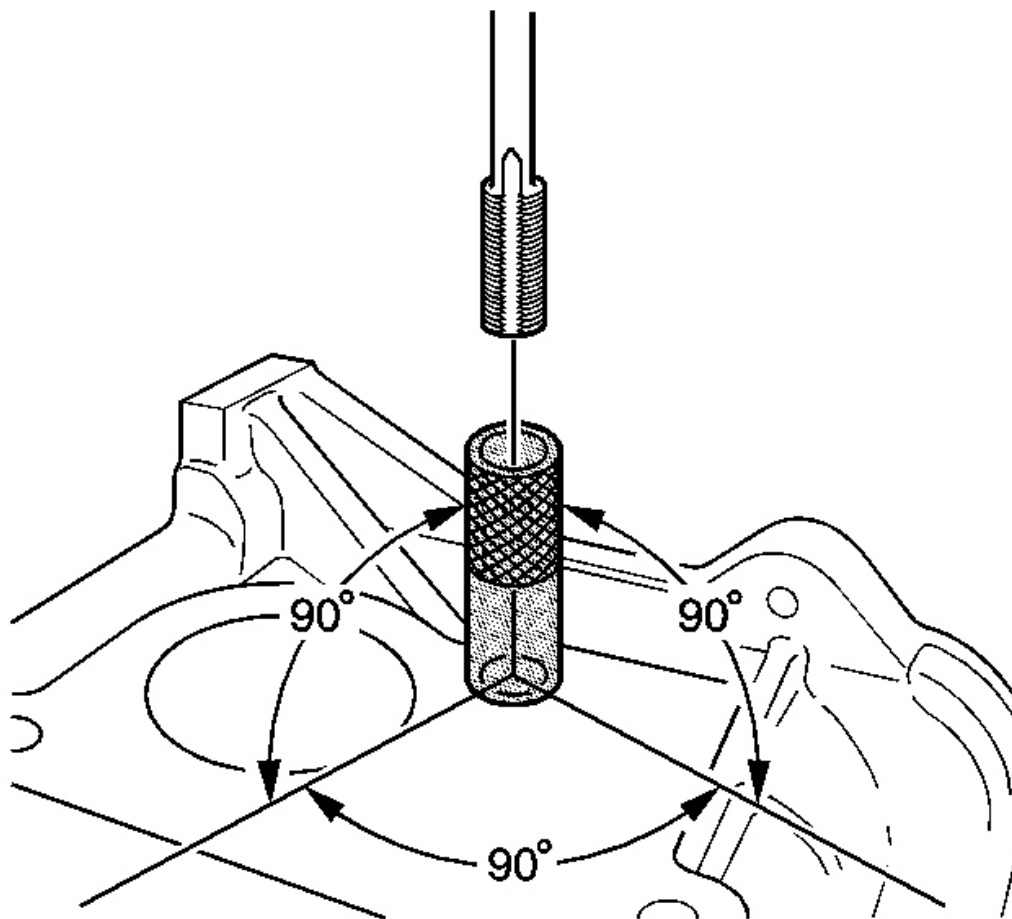
**Fig. 386: Drilled Hole Centerline**  
**Courtesy of GENERAL MOTORS CORP.**

It is critical that the drilling, counterboring and tapping of the hole to be repaired follows the same centerline as the original hole.



**Fig. 387: Identifying Proper Drilling Angle**  
Courtesy of GENERAL MOTORS CORP.

During the drilling and tapping of the hole being repaired ensure the tooling is consistently machining perpendicular to the surface of the base material.



**Fig. 388: View Of Tapping Guide**

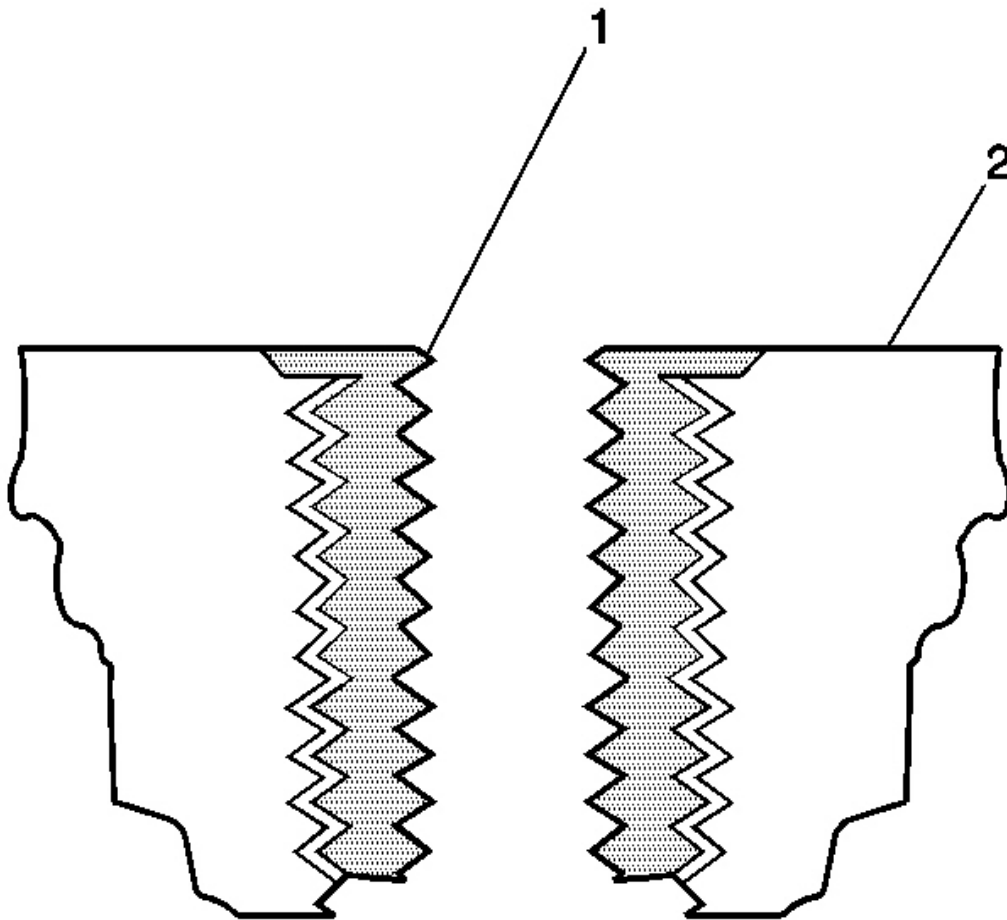
Courtesy of GENERAL MOTORS CORP.

If the threaded hole being repaired has a base surface perpendicular to the hole centerline, tapping guides are available to aid in tapping the hole.

#### Thread Repair

| Tap Size | Tap Guide | Tape Size | Tape Guide | Tap Size | Tape Guide |
|----------|-----------|-----------|------------|----------|------------|
| -        | J 42385-  | -         | J 42385-   | -        | J 42385-   |
| 6 x 1.0  | 729       | 10 x 1.5  | 731        | 14 x 1.5 | 736        |
| 8 x 1.25 | 730       | 12 x 1.5  | 732        | 20 x 1.5 | 737        |

#### Standard Thread Repair - Flush Hole

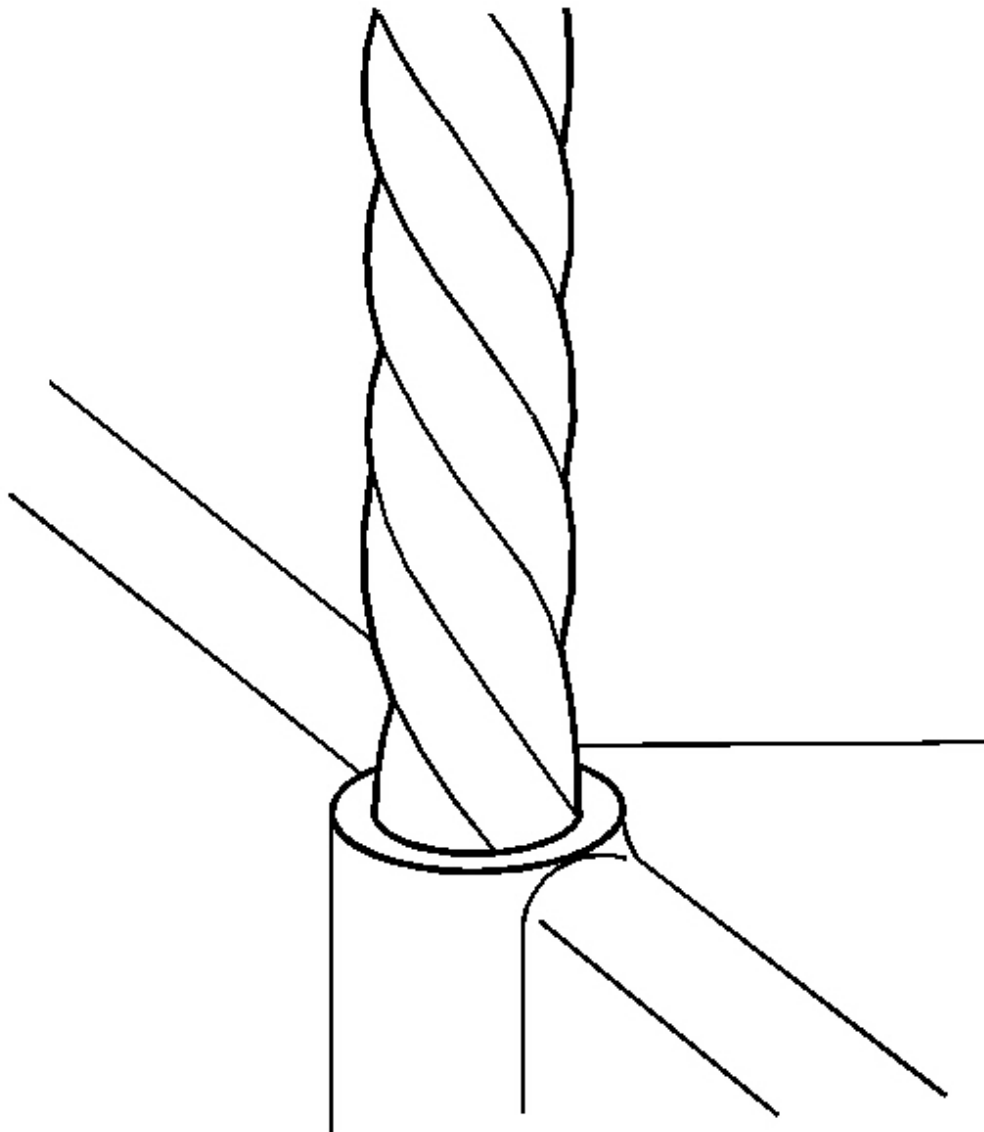


**Fig. 389: View Of Bushing Type Insert & Base Material**  
Courtesy of GENERAL MOTORS CORP.

**CAUTION:** Refer to Safety Glasses Caution in Cautions and Notices.

**IMPORTANT:** The use of a cutting type fluid is recommended when performing the drilling, counterboring and tapping procedures.

When installed to the proper depth, the flange (1) of the insert will be seated against the counterbore of the drilled/tapped hole and just below the surface (2) of the base material.

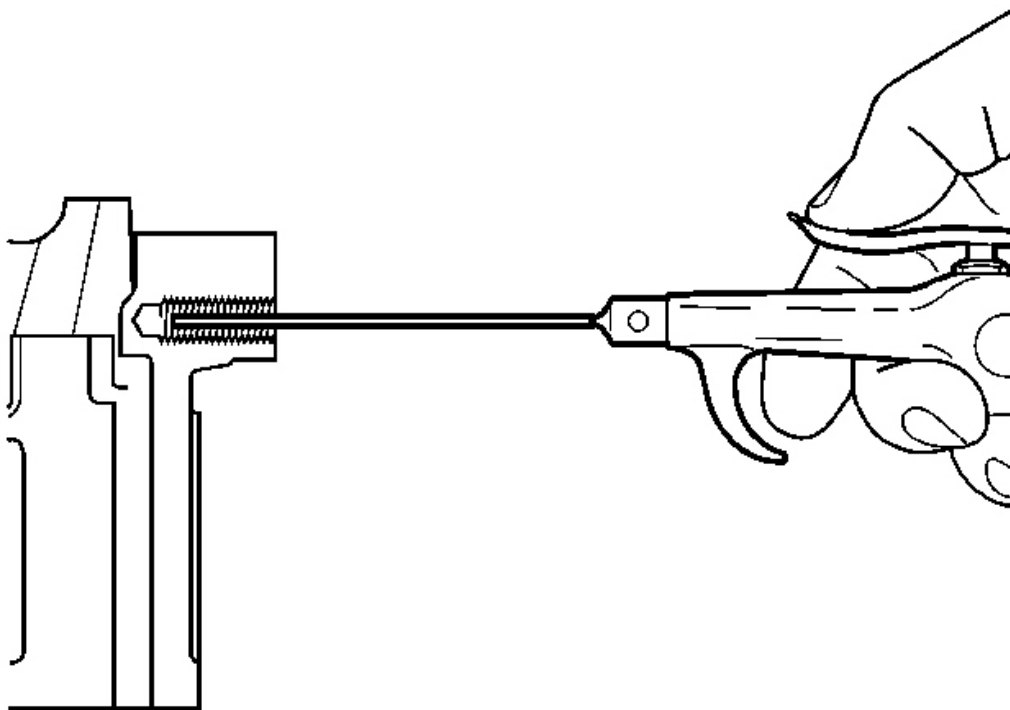


**Fig. 390: Drilling Out Threads Of Damaged Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- During the drilling process, it is necessary to repeatedly remove the drill and clean chips from the hole and the flutes of the drill.
- Do NOT drill any further than the original hole depth.

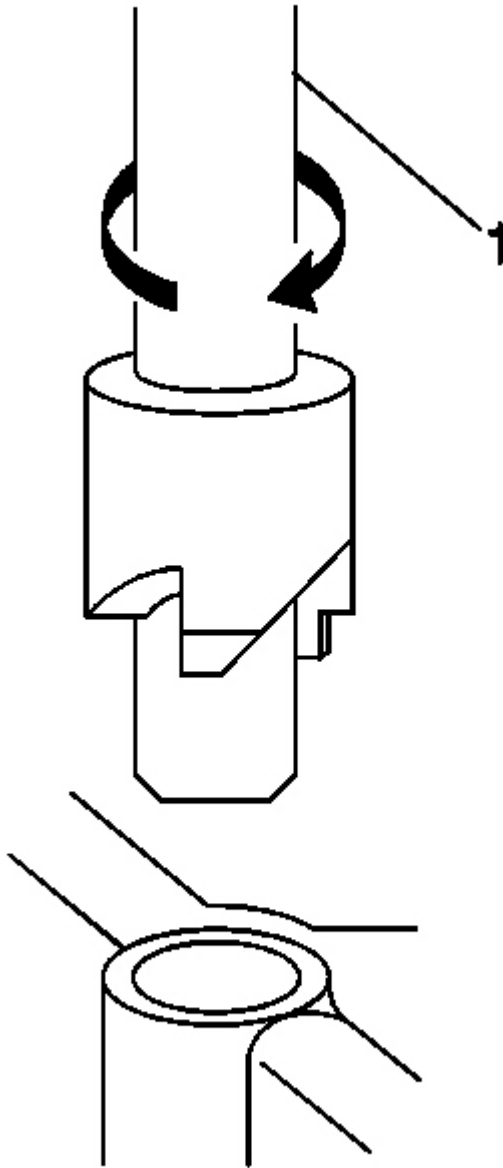
1. Drill out the threads of the damaged hole.
  - M6 inserts require a minimum drill depth of 15 mm (0.59 in).
  - M8 inserts require a minimum drill depth of 20 mm (0.79 in).
  - M10 inserts require a minimum drill depth of 23.5 mm (0.93 in).



**Fig. 391: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the drilled hole prior to tapping.

2. Using compressed air, clean out any chips.



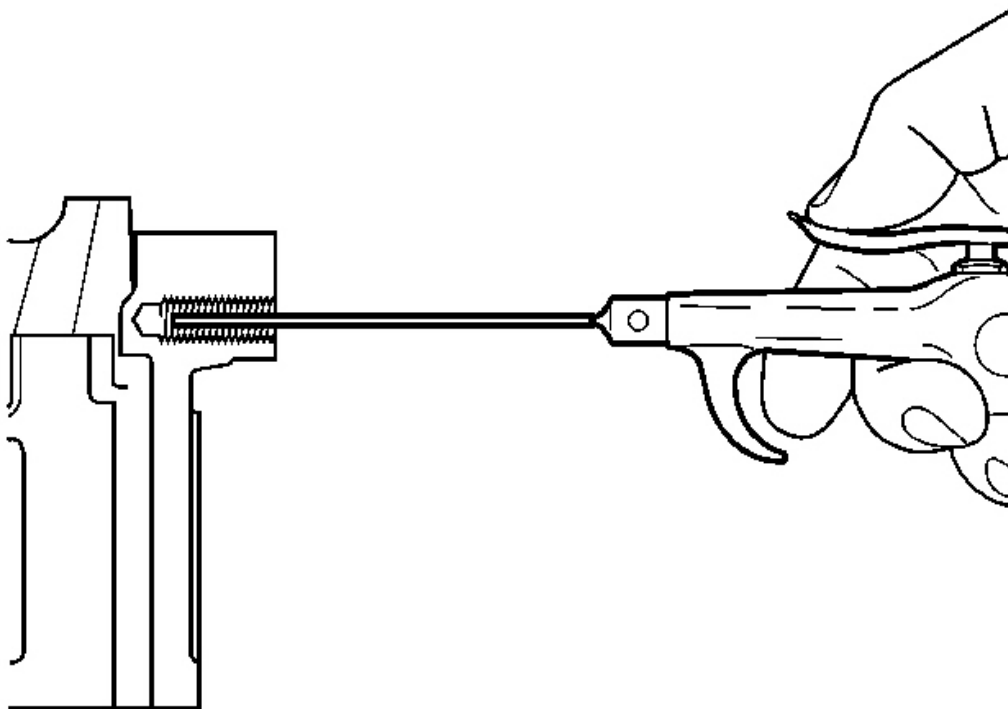
**Fig. 392: View Of Counterbore Drill**

Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** A properly counterbored hole will show a slight burnishing on the surface of the base material for 360 degrees around the drilled hole.



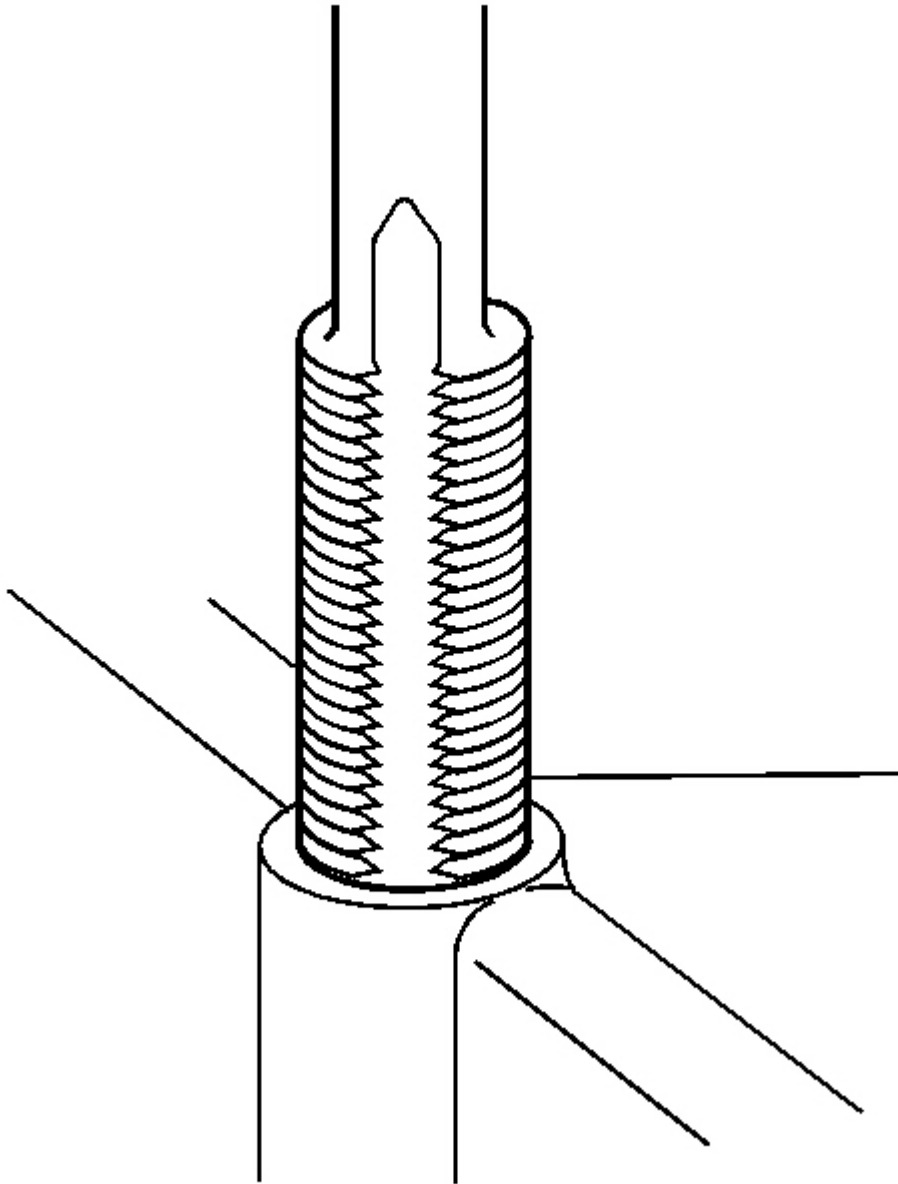
3. Counterbore the drilled hole to the full depth permitted by the tool (1).



**Fig. 393: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the drilled hole prior to tapping.

4. Using compressed air, clean out any chips.



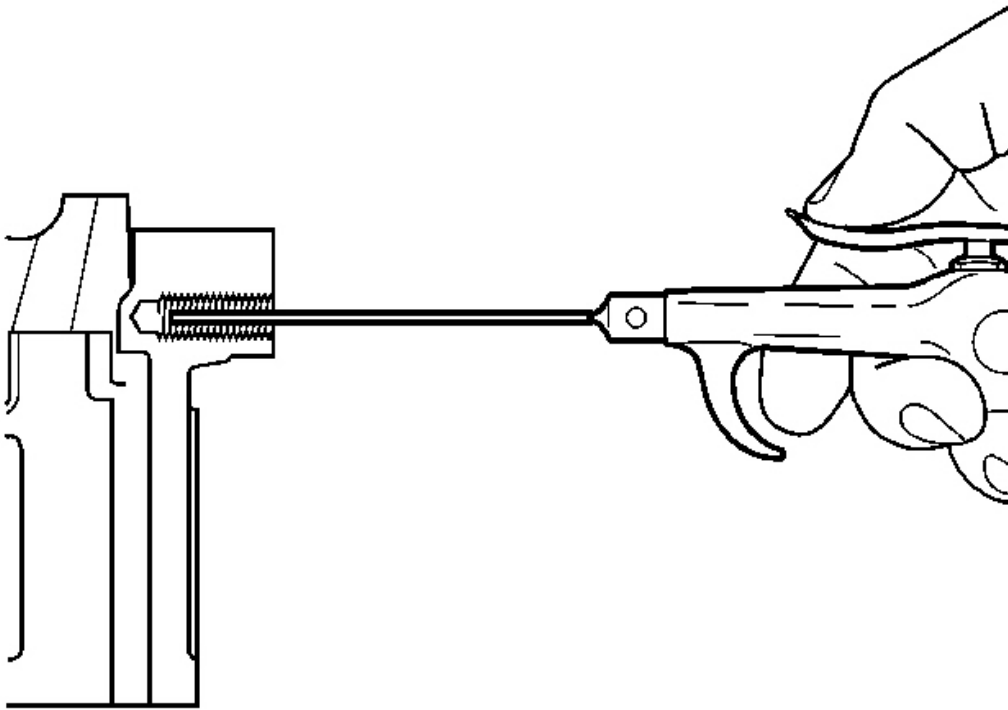
**Fig. 394: Tapping Threads Of Drilled Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- During the tapping process, it is necessary to repeatedly remove the tap and clean chips from the hole and the flutes of the tap.

- **Ensure the tap has created full threads at least to the depth equal to the insert length.**

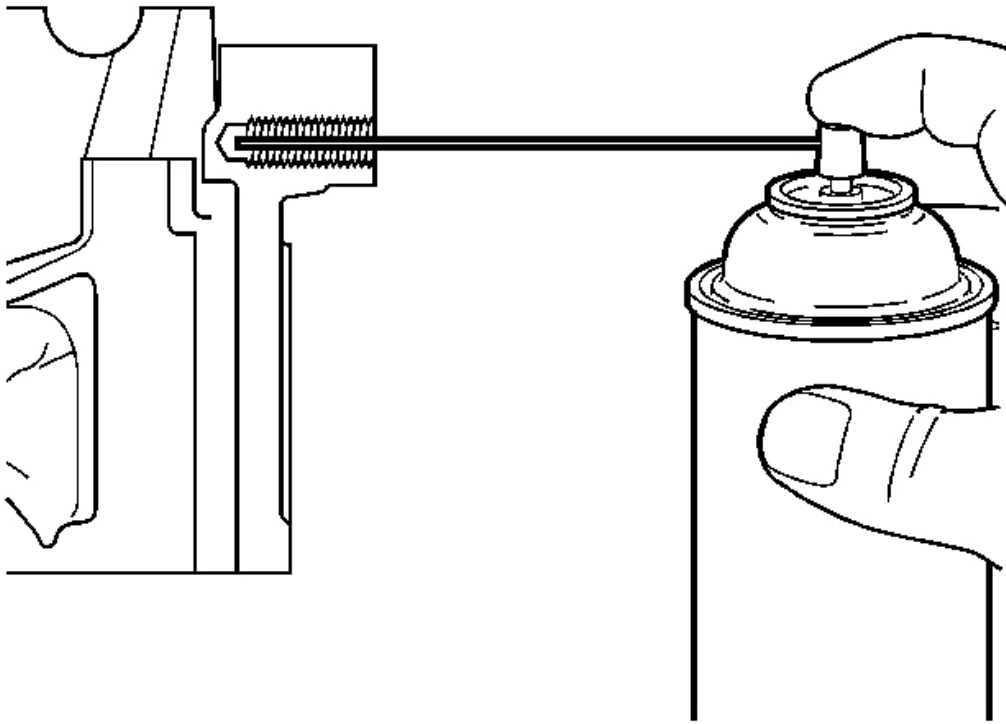
5. Using a suitable tapping wrench, tap the threads of the drilled hole.
  - M6 inserts require a minimum tap depth of 15 mm (0.59 in).
  - M8 inserts require a minimum tap depth of 20 mm (0.79 in).
  - M10 inserts require a minimum tap depth of 23.5 mm (0.93 in).



**Fig. 395: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

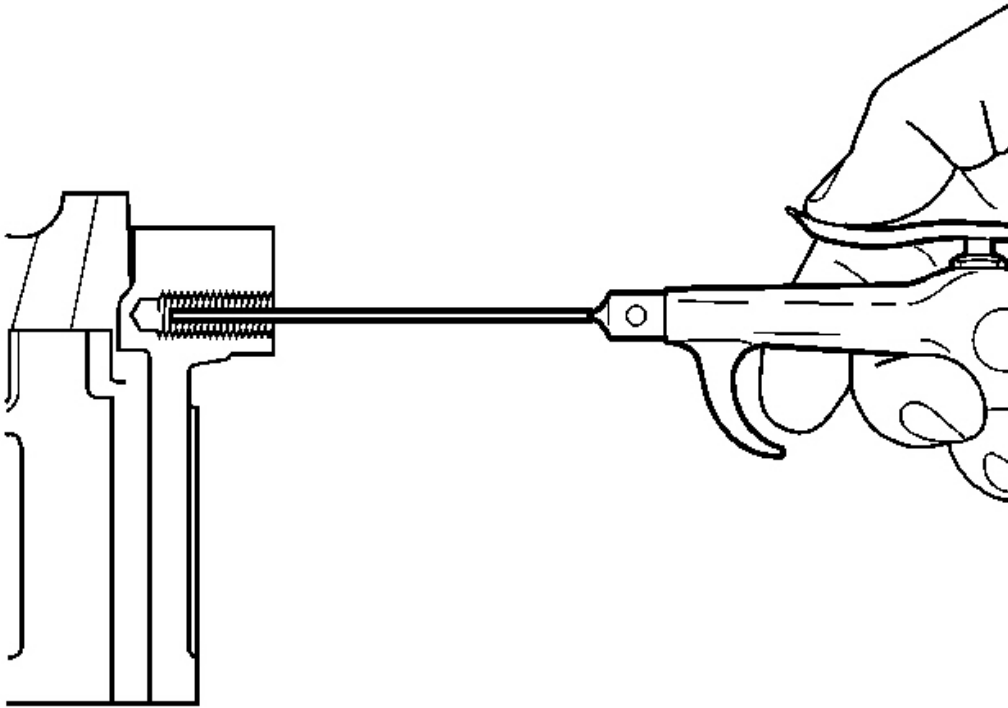
**IMPORTANT: All chips must be removed from the tapped hole prior to insert installation.**

6. Using compressed air, clean out any chips.



**Fig. 396: Spraying Cleaner Into Tapped Hole**  
Courtesy of GENERAL MOTORS CORP.

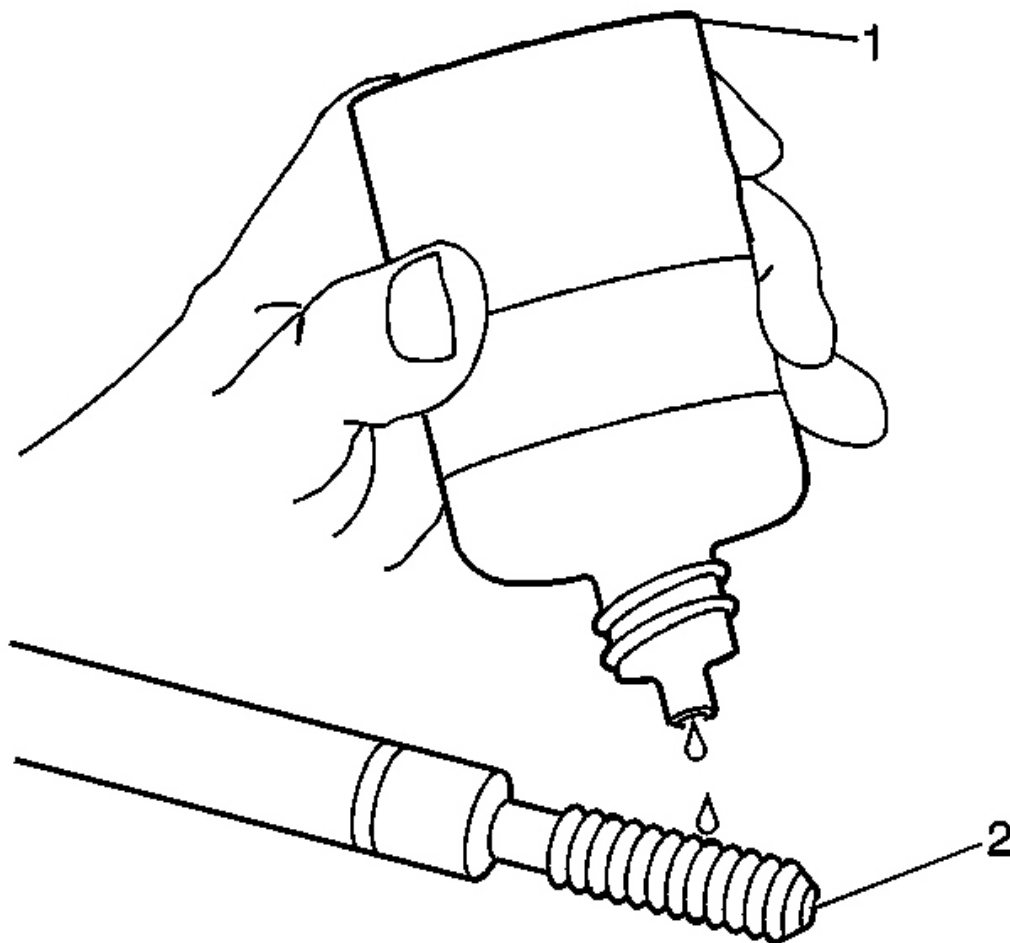
7. Spray cleaner into the tapped hole.



**Fig. 397: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

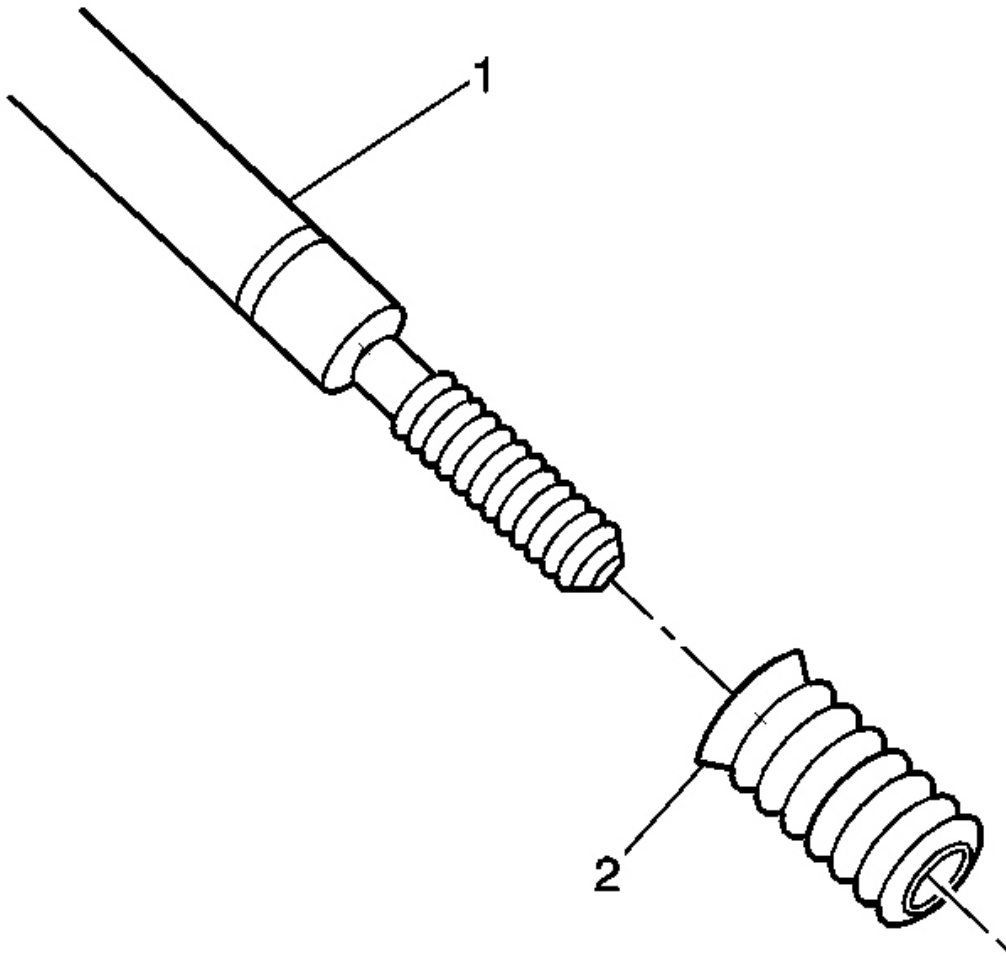
8. Using compressed air, clean out any chips.



**Fig. 398: Lubricating Installer Tool Using Driver Oil**  
Courtesy of GENERAL MOTORS CORP.

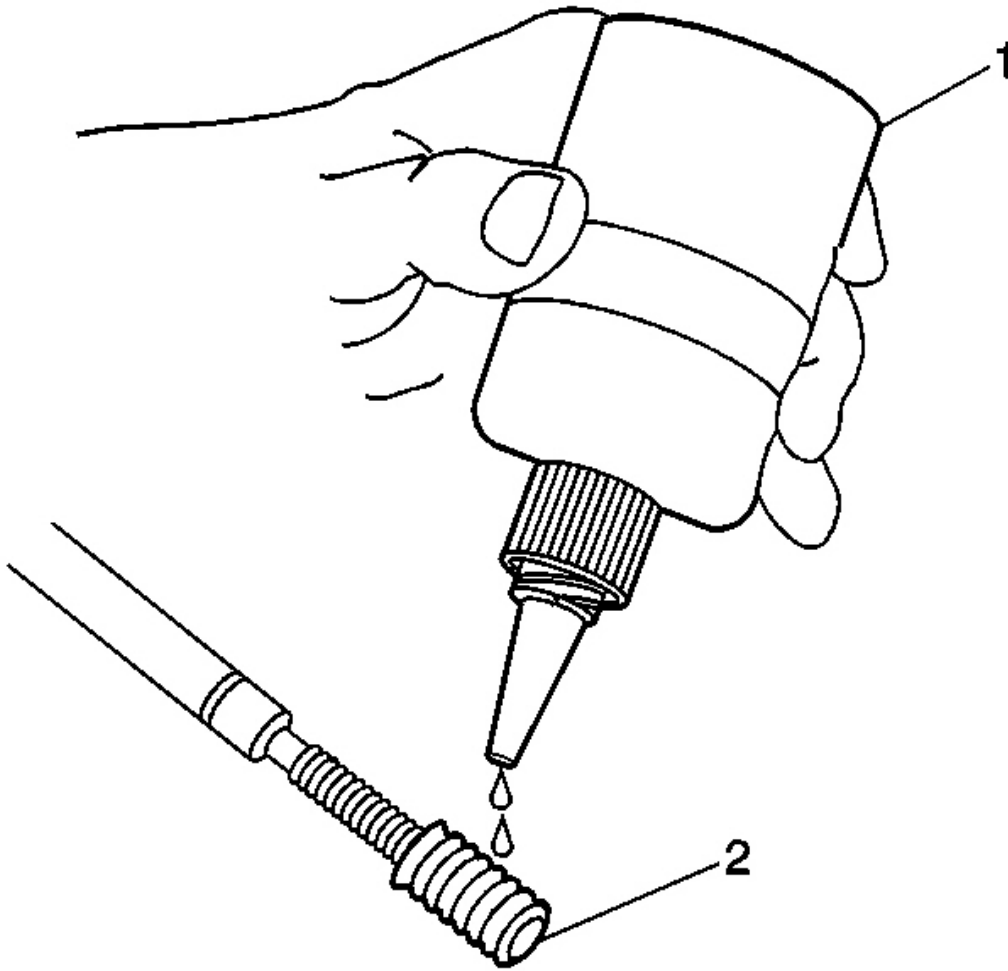
**IMPORTANT:** Do not allow oil or other foreign material to contact the outside diameter (OD) of the insert.

9. Lubricate the threads of the driver installation tool (2) with the driver oil (1) J 42385-110.



**Fig. 399: View of Bushing Type Insert**  
**Courtesy of GENERAL MOTORS CORP.**

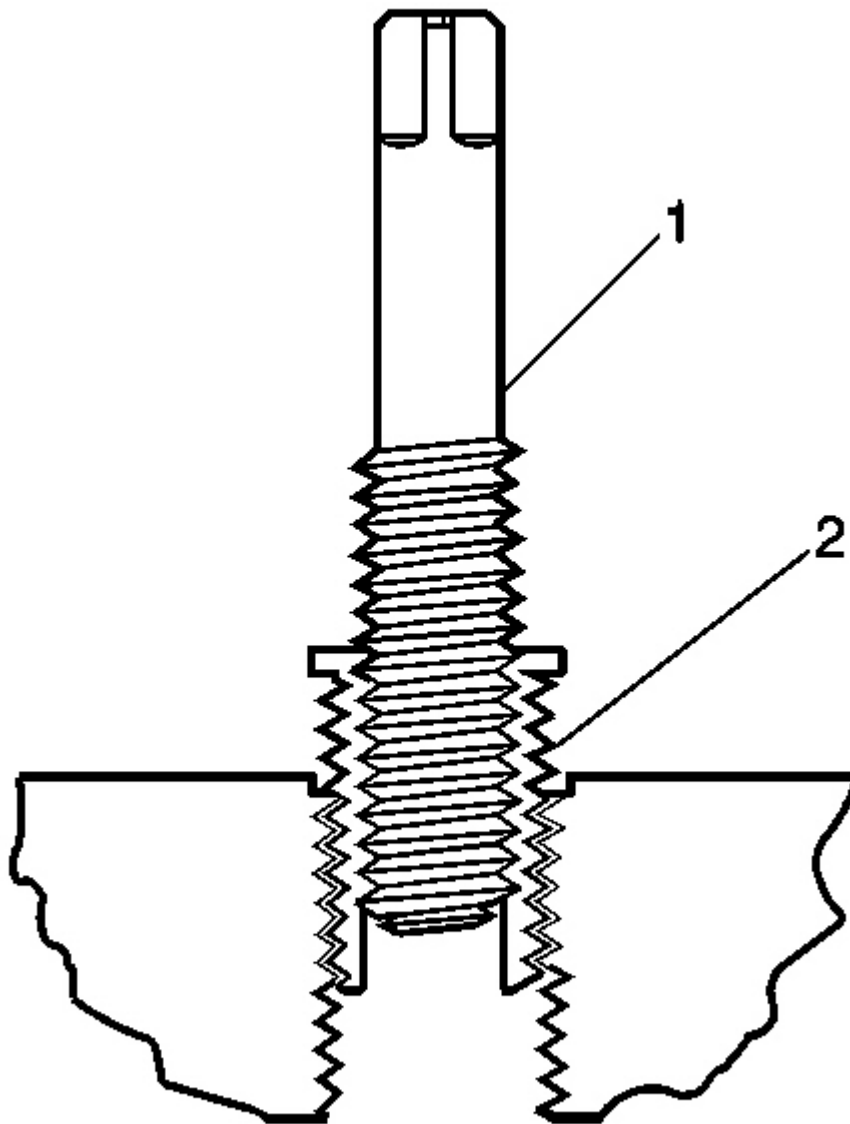
10. Install the insert (2) onto the driver installation tool (1).



**Fig. 400: Applying Threadlock To Insert**  
**Courtesy of GENERAL MOTORS CORP.**

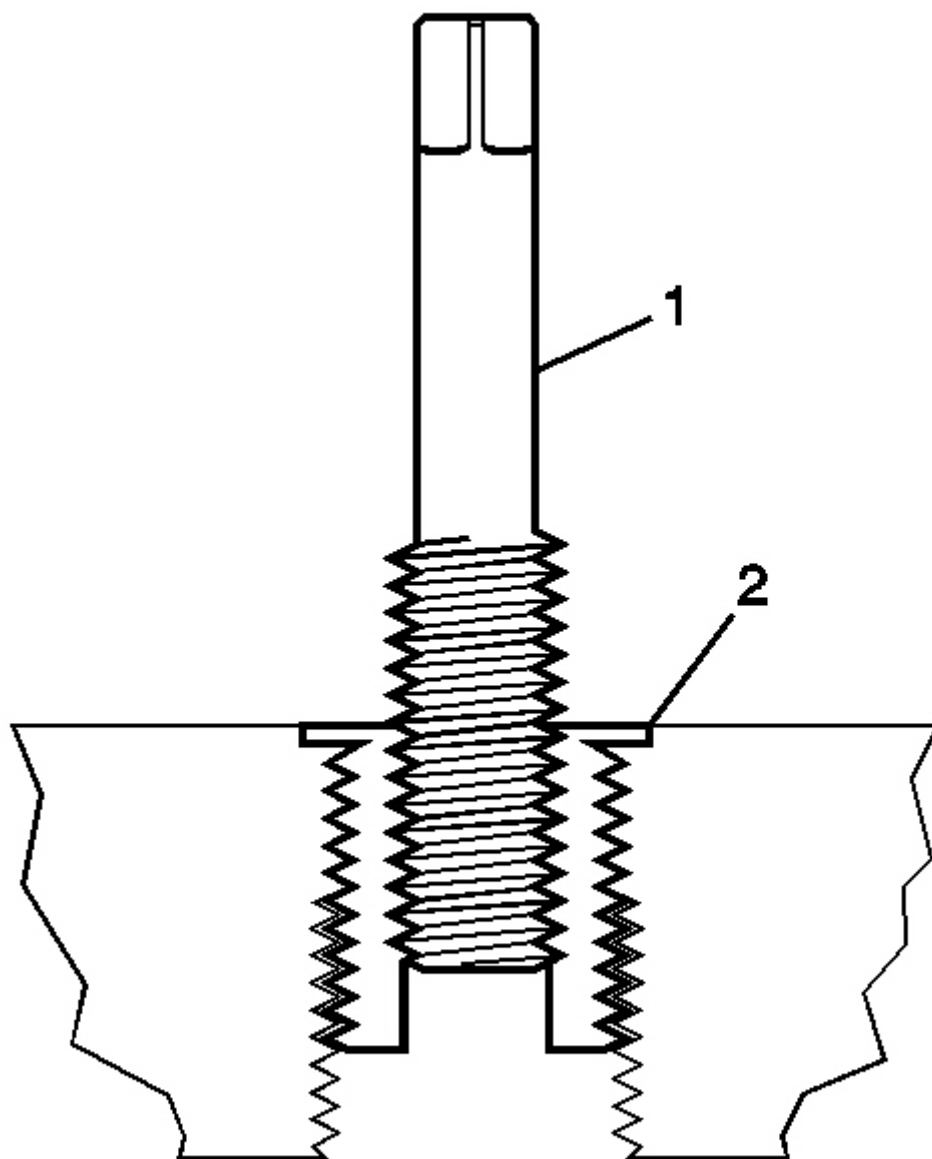
11. Apply threadlock sealant (1) to the insert OD threads (2).





**Fig. 401: Installing Insert Into Tapped Bolt Hole**  
Courtesy of GENERAL MOTORS CORP.

12. Install the insert (2) into the tapped hole.

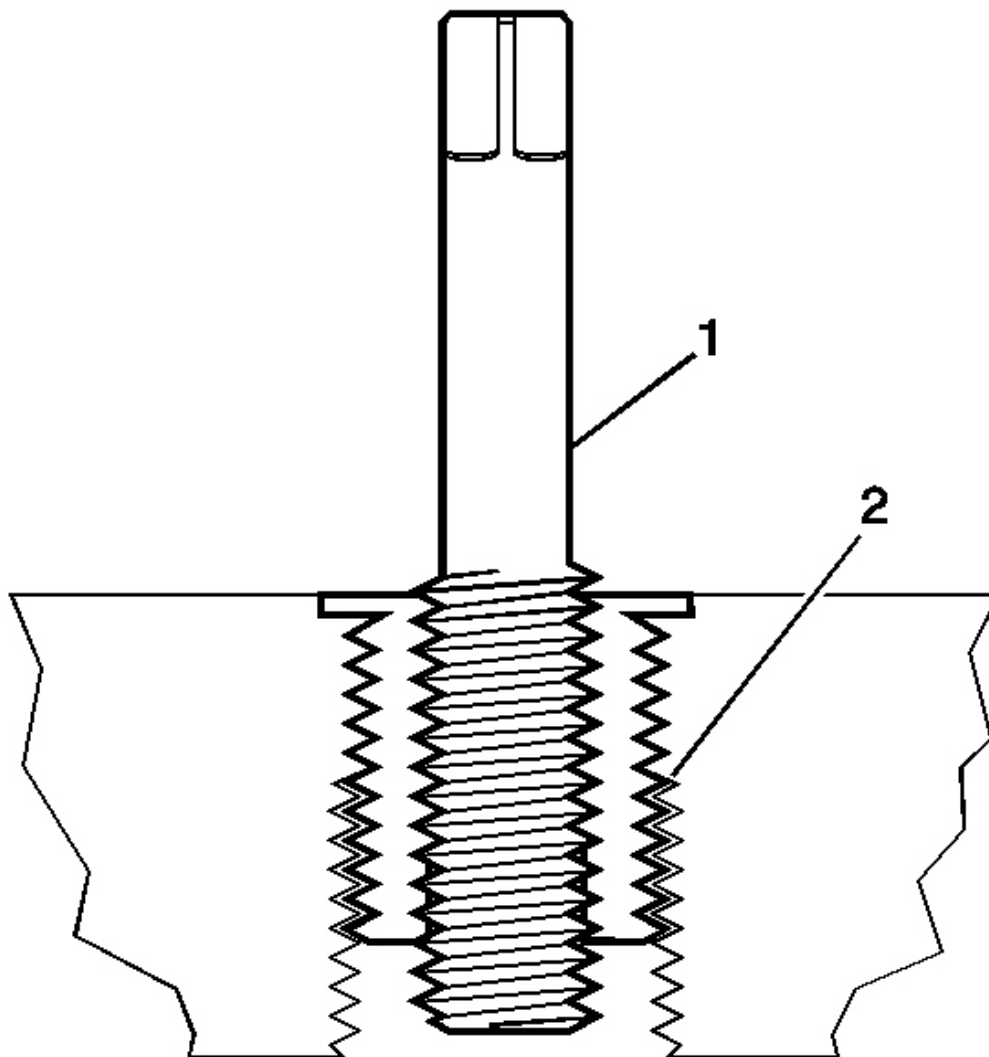


**Fig. 402: Installing Insert - Standard Thread**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** If the insert will not thread down until the flange contacts the counterbored surface, remove the insert immediately with a screw extracting tool and inspect the tapped hole for any remaining chips and/or

**improper tapping.**

13. Install the insert until the flange (2) of the insert contacts the counterbored surface.

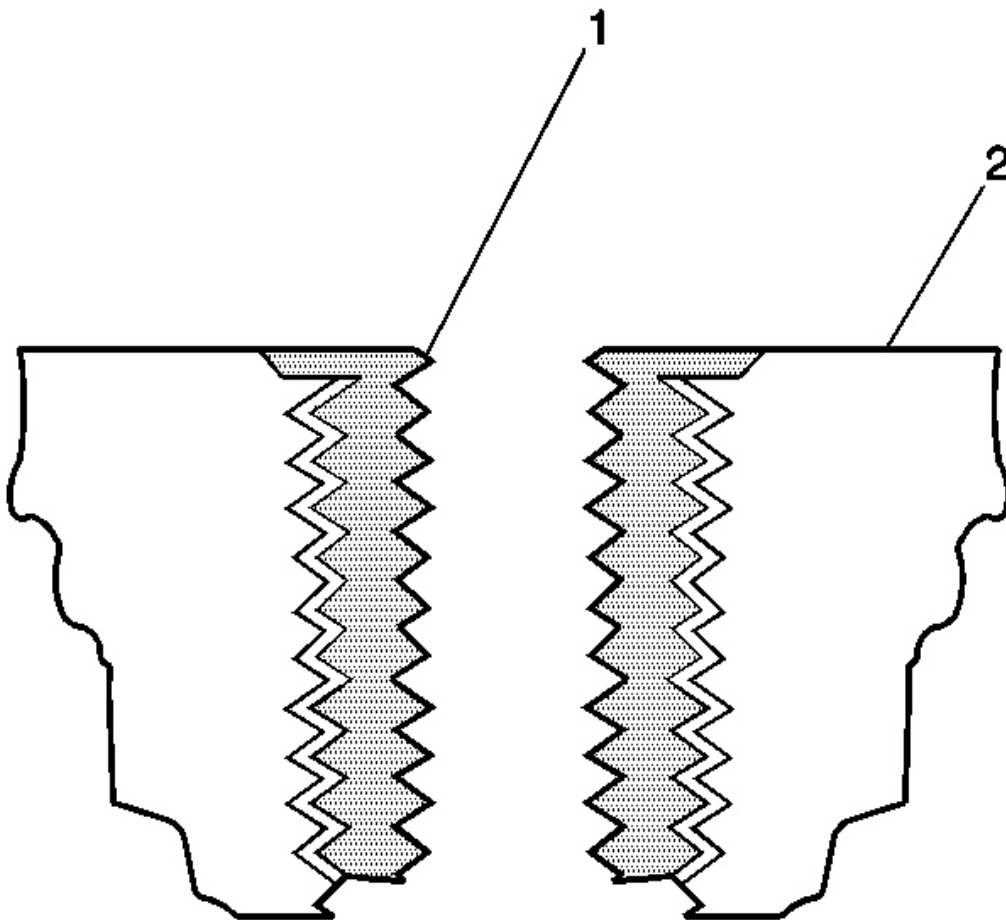


**Fig. 403: View Insert And Tool - Standard Thread**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** The driver installation tool will tighten up before screwing completely through the insert. This is acceptable. The threads at the bottom of the

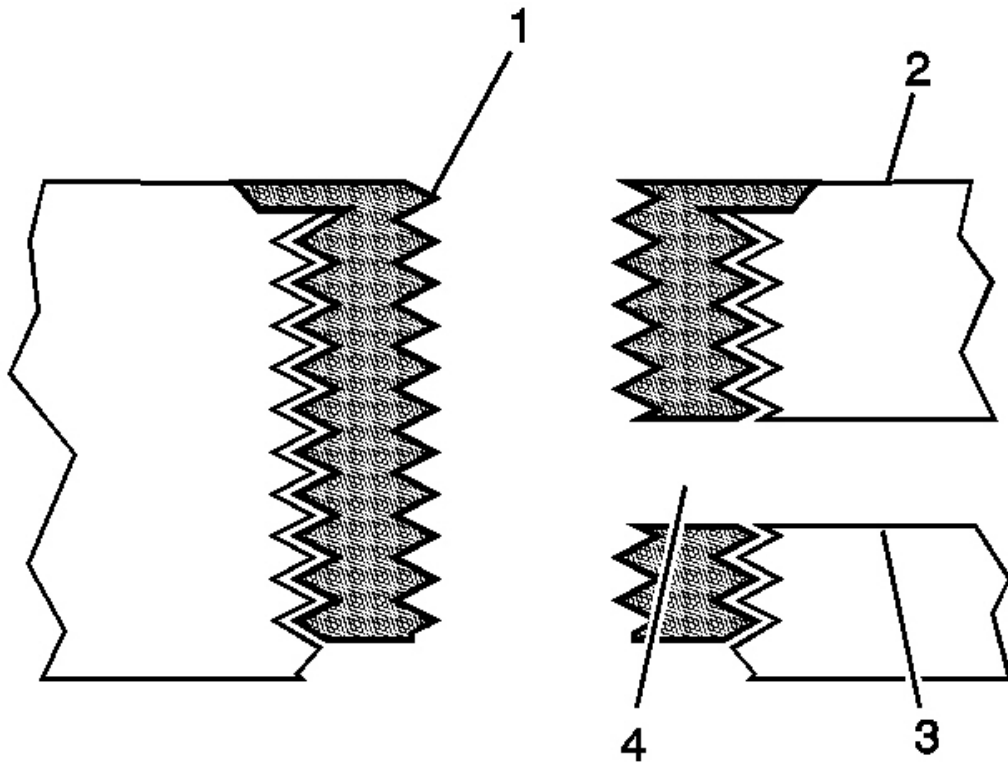
**insert are being formed and the insert is mechanically locking the insert into the base material threads.**

14. Continue to rotate the driver installation tool (1) through the insert (2).



**Fig. 404: View Of Bushing Type Insert & Base Material**  
**Courtesy of GENERAL MOTORS CORP.**

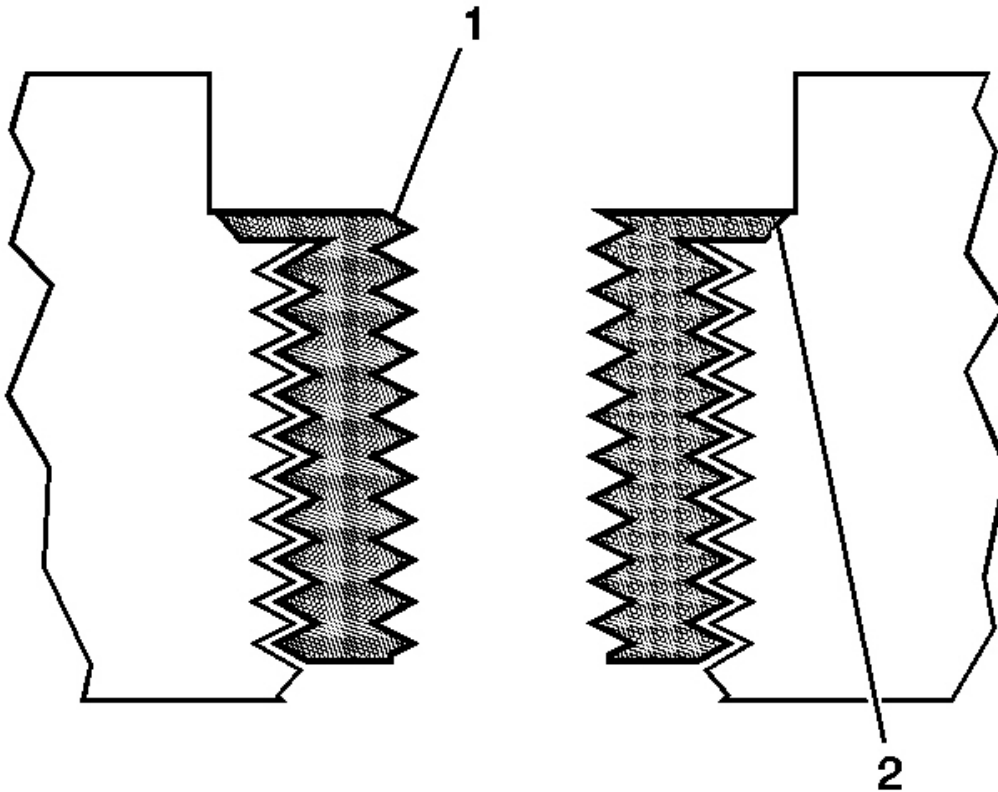
15. Inspect the insert for proper installation into the tapped hole. A properly installed insert (1) will be either flush or slightly below flush with the surface of the base material (2).



**Fig. 405: View Of Restricted Engine Coolant Passages - Standard Thread Repair**  
Courtesy of GENERAL MOTORS CORP.

16. Any installed insert that restricts or blocks an oil or engine coolant passage (3) will need to have the oil or engine coolant passage drilled out (4) to the original size of the oil or engine coolant passage. After drilling the restriction or blockage, clean out any chips and thread the installation driver tool through the insert again to remove any burrs caused by the drilling of the oil or engine coolant passage.

#### **Recessed Thread Repair**



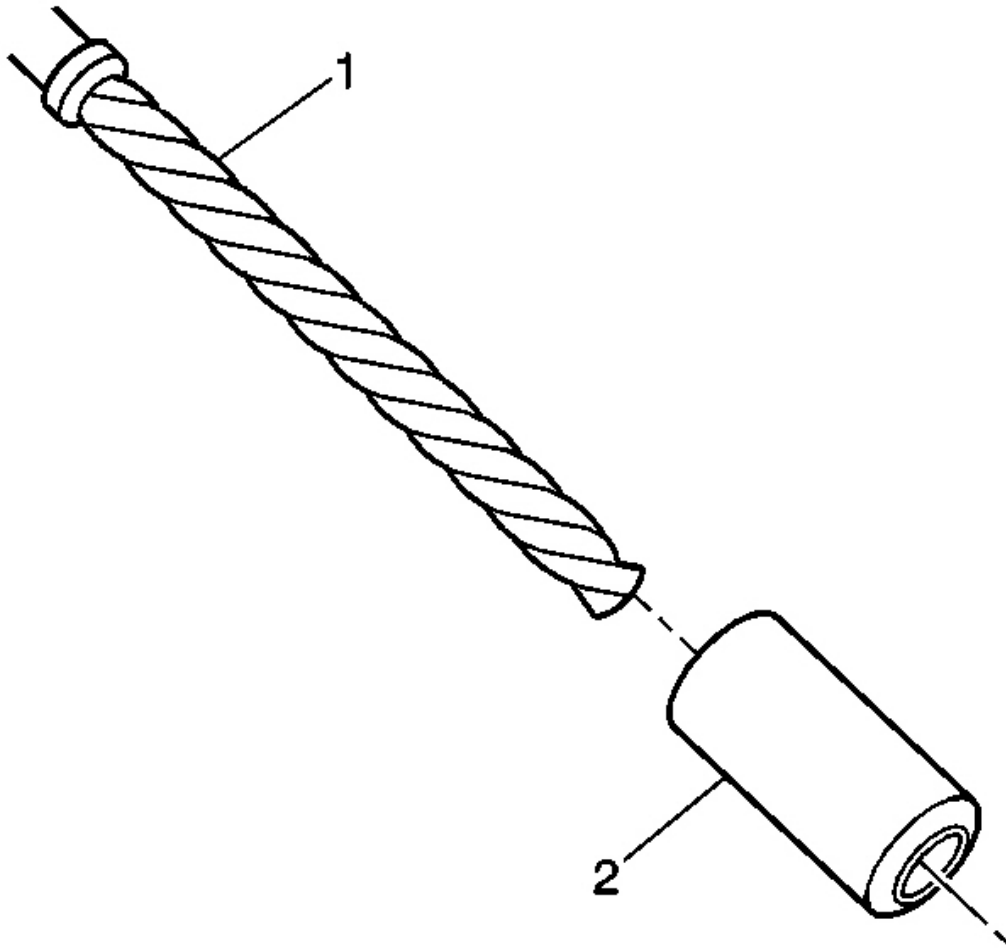
**Fig. 406: Inspecting Insert For Proper Installation - Recessed Thread**  
Courtesy of GENERAL MOTORS CORP.

**CAUTION:** Refer to Safety Glasses Caution in Cautions and Notices.

**IMPORTANT:**

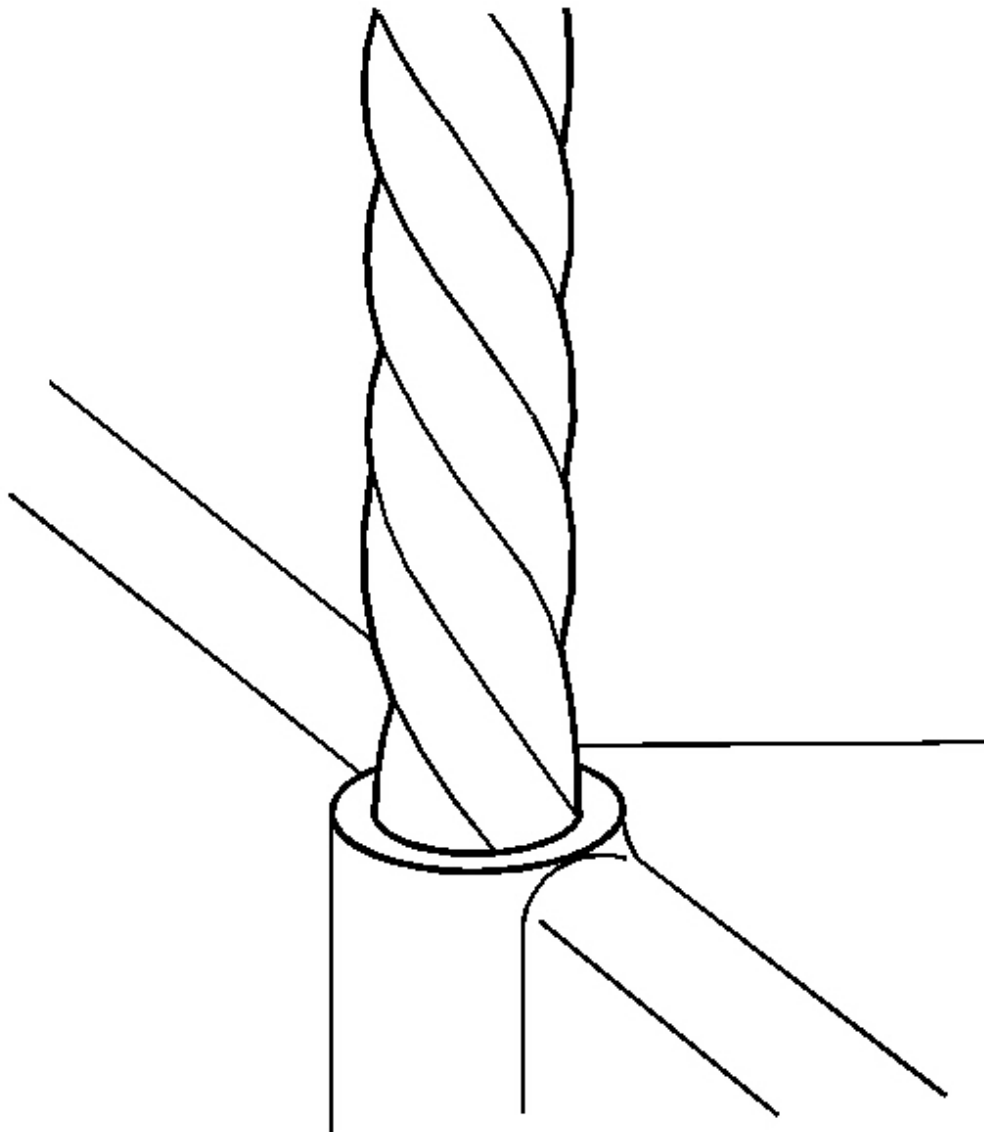
- The use of a cutting type fluid is recommended when performing the drilling, counterboring and tapping procedures.
- Do NOT remove the original stop collar from a counterbore drill.

When installed to the proper depth, the flange of the insert (1) will be seated against the counterbore (2) of the drilled/tapped hole.



**Fig. 407: View Of Stop Collar & Counterbore Drill**  
Courtesy of GENERAL MOTORS CORP.

1. Install a stop collar (2) on the counterbore drill (1), if required.



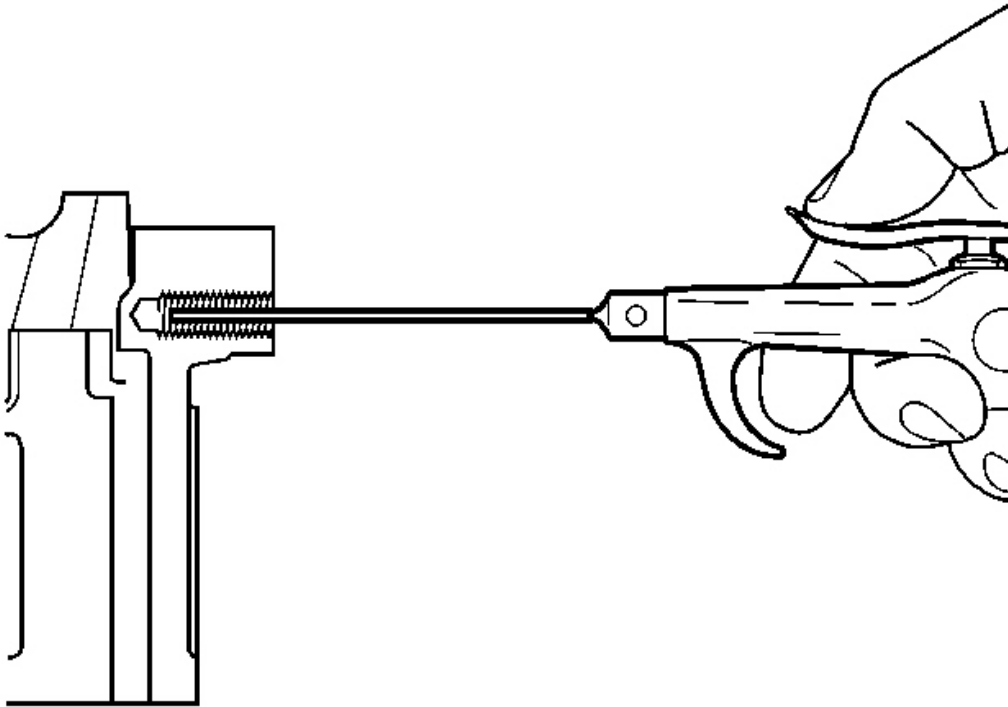
**Fig. 408: Drilling Out Threads Of Damaged Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- During the drilling process, it is necessary to repeatedly remove the drill and clean chips from the hole and the flutes of the drill.
- Drill the hole until the stop collar contacts the surface of the base material.



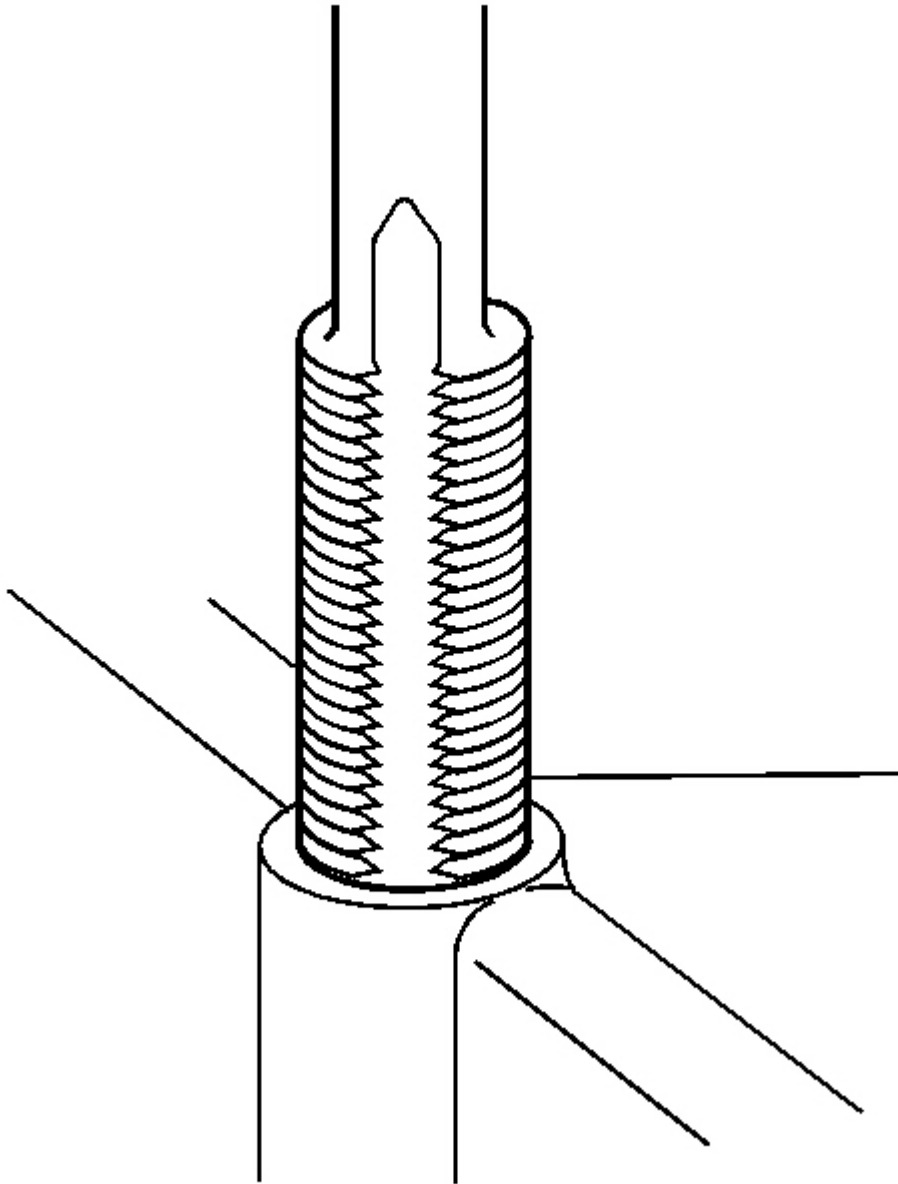
2. Drill out the threads of the damaged hole.



**Fig. 409: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the drilled hole prior to tapping.

3. Using compressed air, clean out any chips.



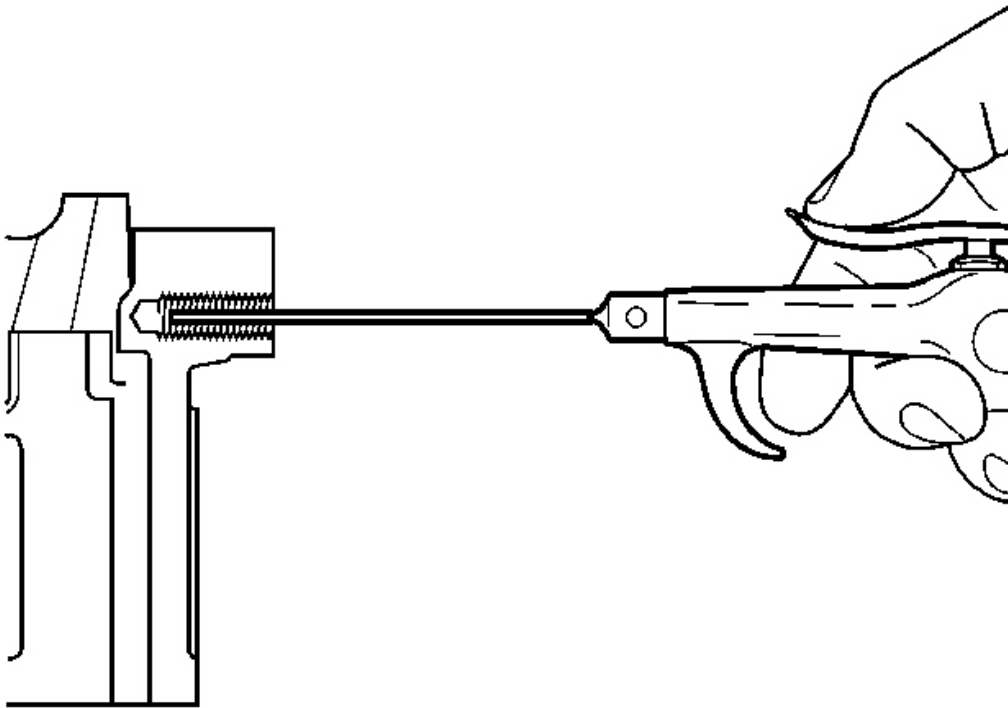
**Fig. 410: Tapping Threads Of Drilled Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- During the tapping process, it is necessary to repeatedly remove the tap and clean chips from the hole and the flutes of the tap.

- Ensure the tap has created full threads at least to the depth equal to the insert length.

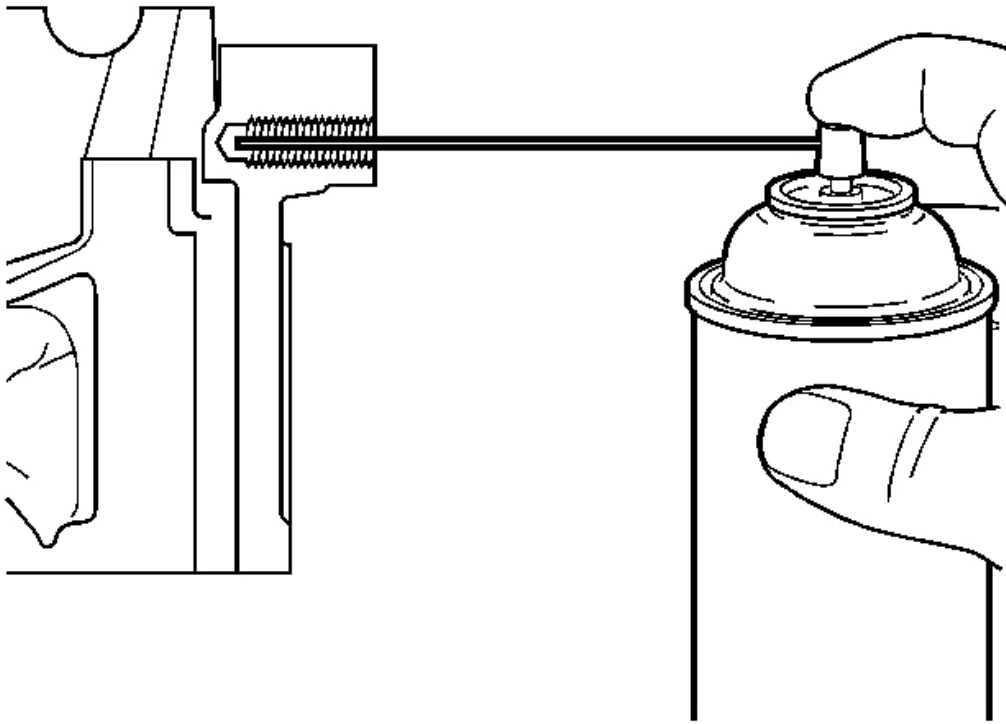
4. Using a suitable tapping wrench, tap the threads of the drilled hole.



**Fig. 411: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

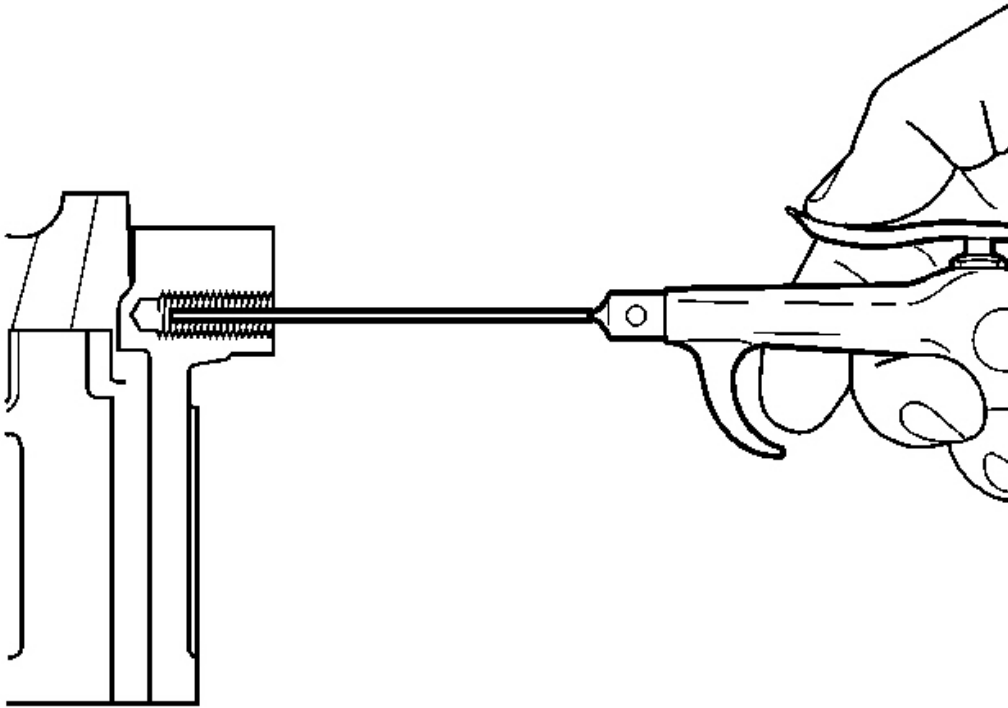
**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

5. Using compressed air, clean out any chips.



**Fig. 412: Spraying Cleaner Into Tapped Hole**  
Courtesy of GENERAL MOTORS CORP.

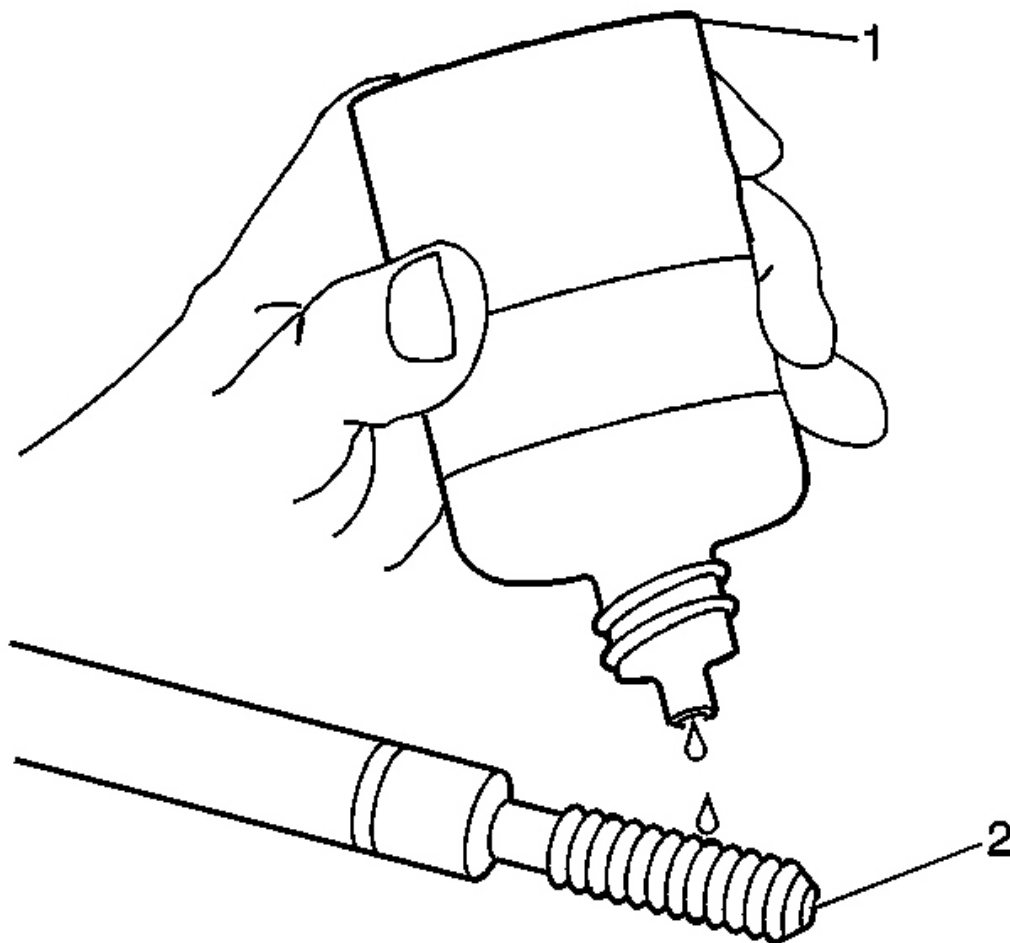
6. Spray cleaner into the tapped hole.



**Fig. 413: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

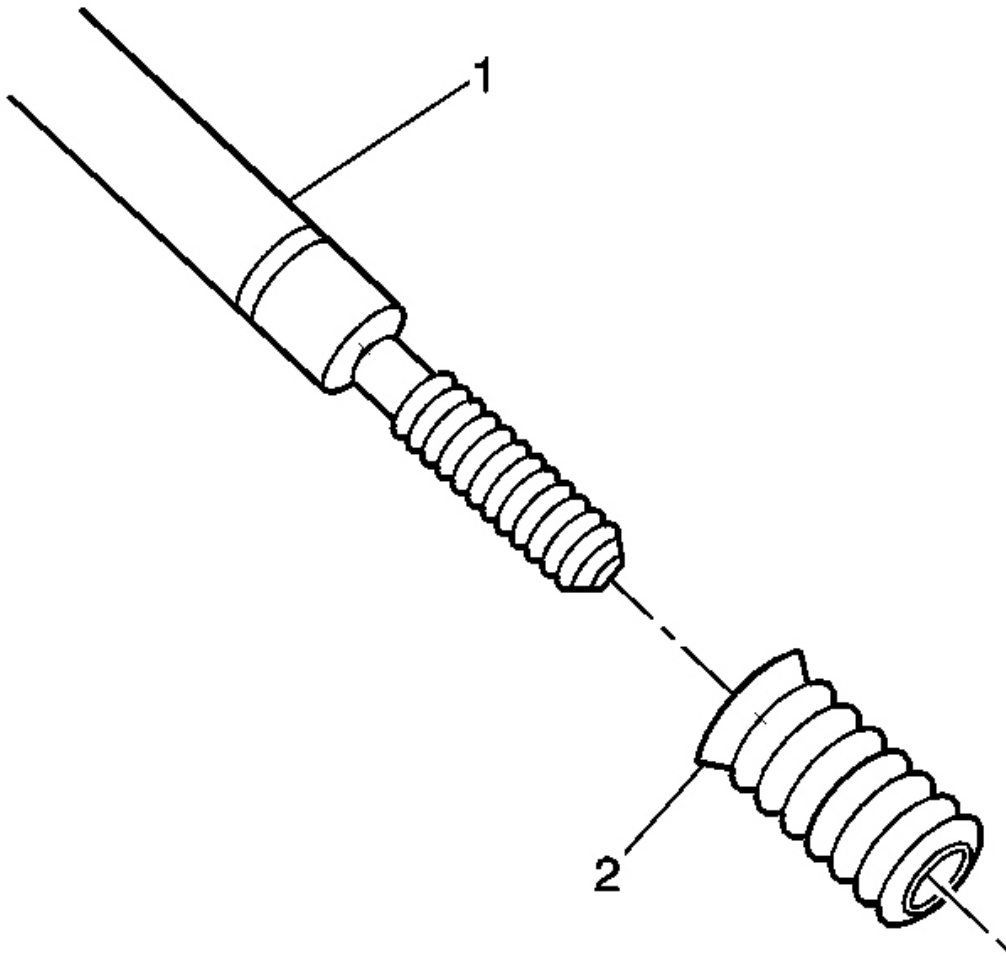
7. Using compressed air, clean out any chips.



**Fig. 414: Lubricating Installer Tool Using Driver Oil**  
Courtesy of GENERAL MOTORS CORP.

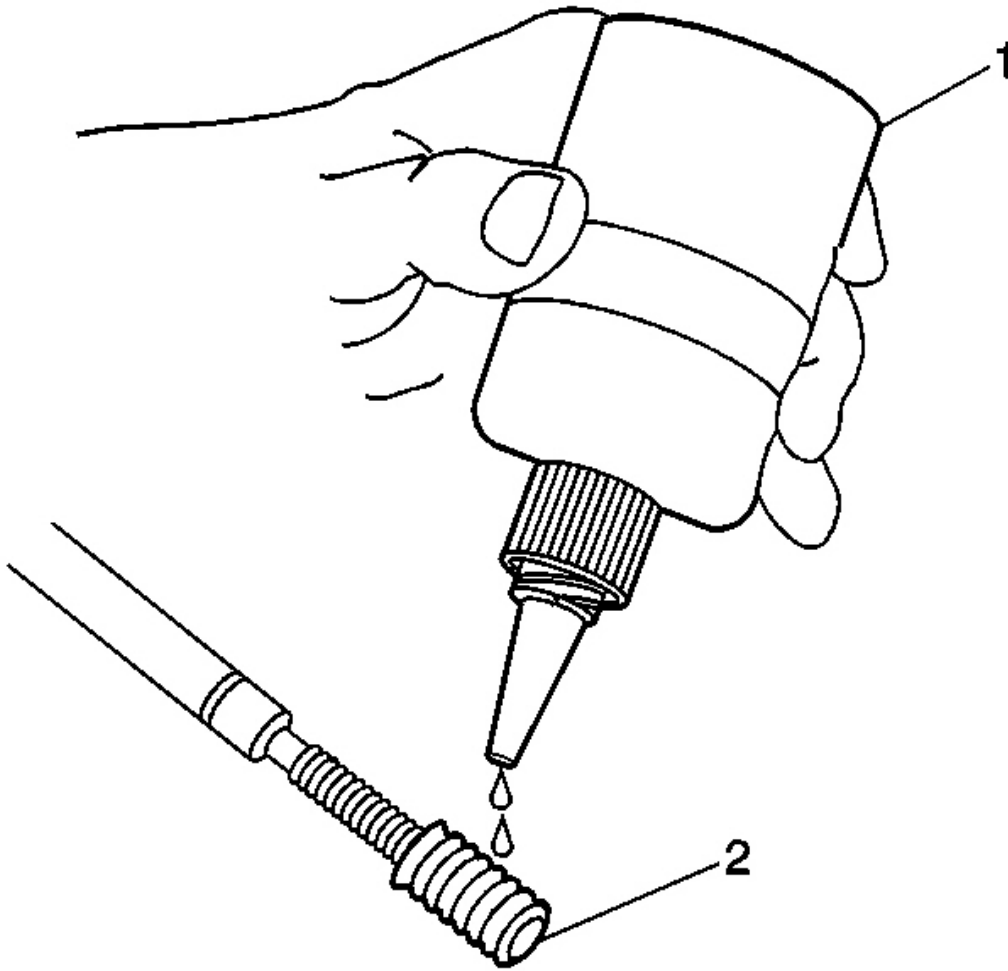
**IMPORTANT:** Do not allow oil or other foreign material to contact the outside diameter (OD) of the insert.

8. Lubricate the threads of the driver installation tool (2) with the driver oil (1) J 42385-110.



**Fig. 415: View of Bushing Type Insert**  
**Courtesy of GENERAL MOTORS CORP.**

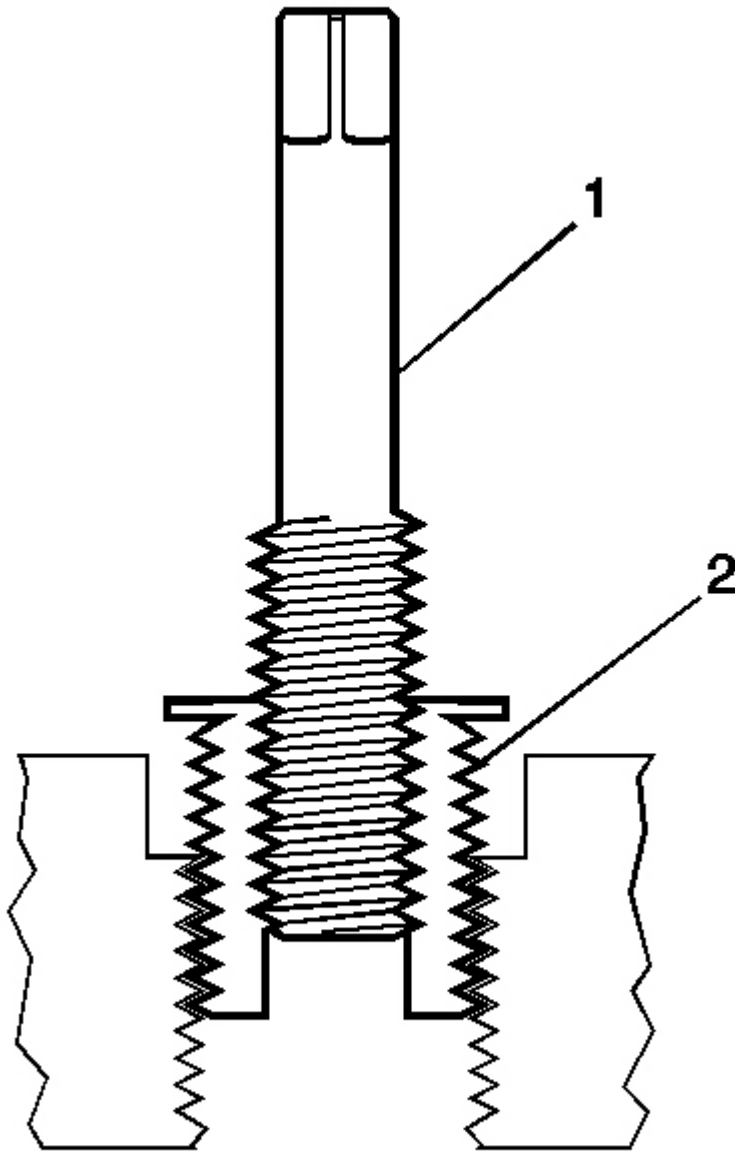
9. Install the insert (2) onto the driver installation tool (1).



**Fig. 416: Applying Threadlock To Insert**  
**Courtesy of GENERAL MOTORS CORP.**

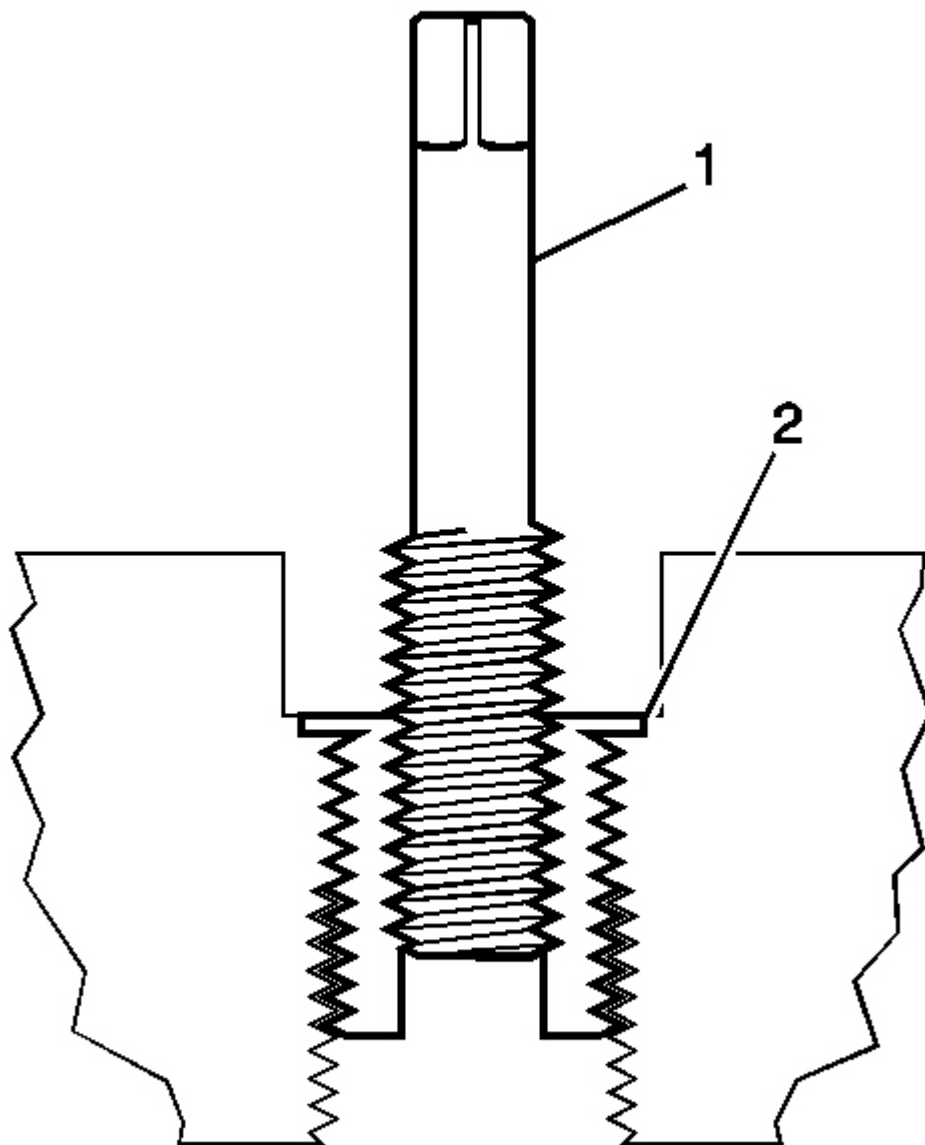
10. Apply threadlock sealant (1) to the insert OD threads (2).





**Fig. 417: Installing Insert - Recessed Thread**  
Courtesy of GENERAL MOTORS CORP.

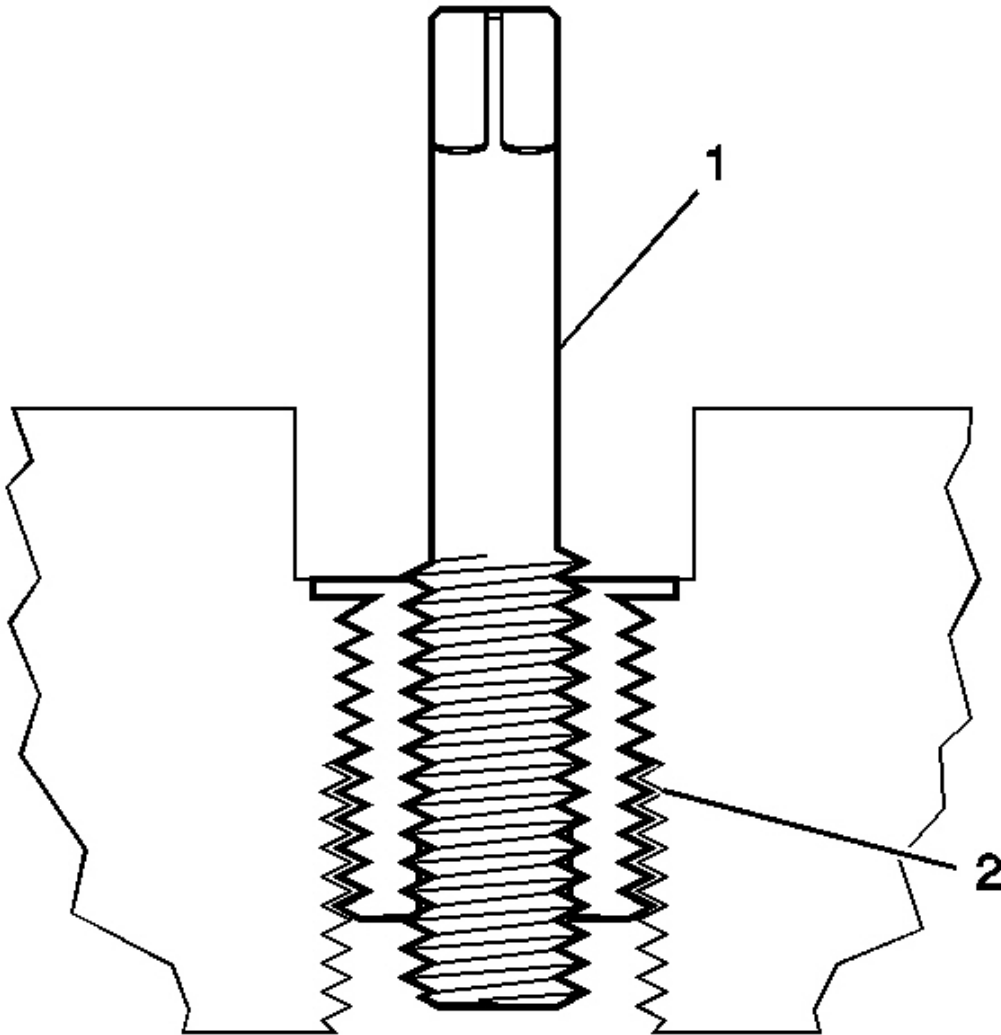
11. Install the insert (2) into the tapped hole.



**Fig. 418: View Of Installed Insert - Recessed Thread**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** If the insert will not thread down until the flange contacts the counterbored surface remove the insert immediately with a screw extracting tool and inspect the tapped hole for any remaining chips and/or improper tapping.

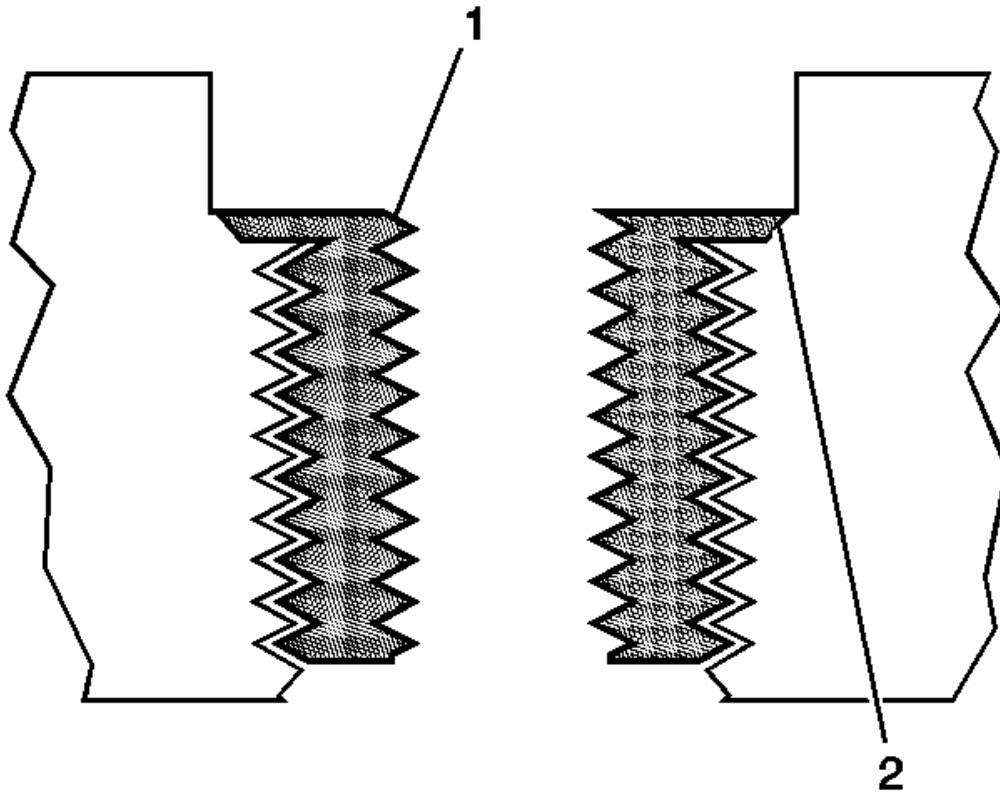
12. Install the insert until the flange (2) of the insert contacts the counterbored surface.



**Fig. 419: Installed Insert - Recessed Thread Repair**  
Courtesy of GENERAL MOTORS CORP.

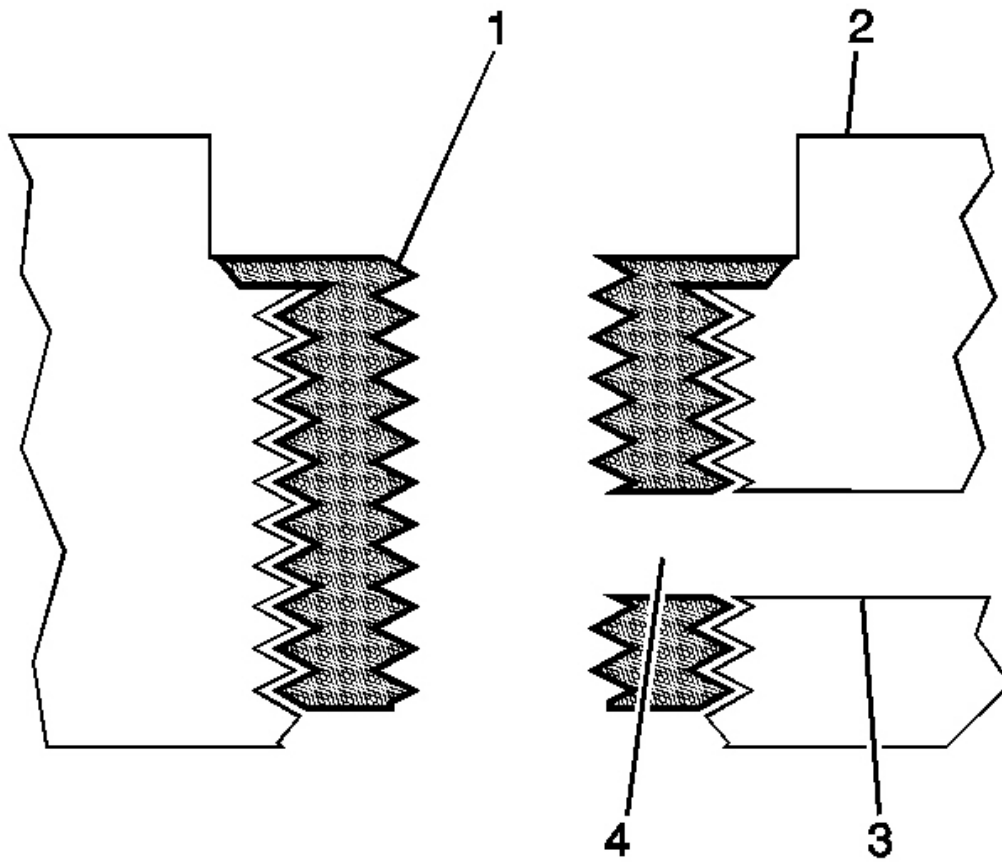
**IMPORTANT:** The driver installation tool will tighten up before screwing completely through the insert. This is acceptable. The threads at the bottom of the insert are being formed and the insert is mechanically locking the insert into the base material threads.

13. Continue to rotate the driver installation tool (1) through the insert (2).



**Fig. 420: Inspecting Insert For Proper Installation - Recessed Thread**  
Courtesy of GENERAL MOTORS CORP.

14. Inspect the insert (1) for proper installation (2) into the tapped hole.

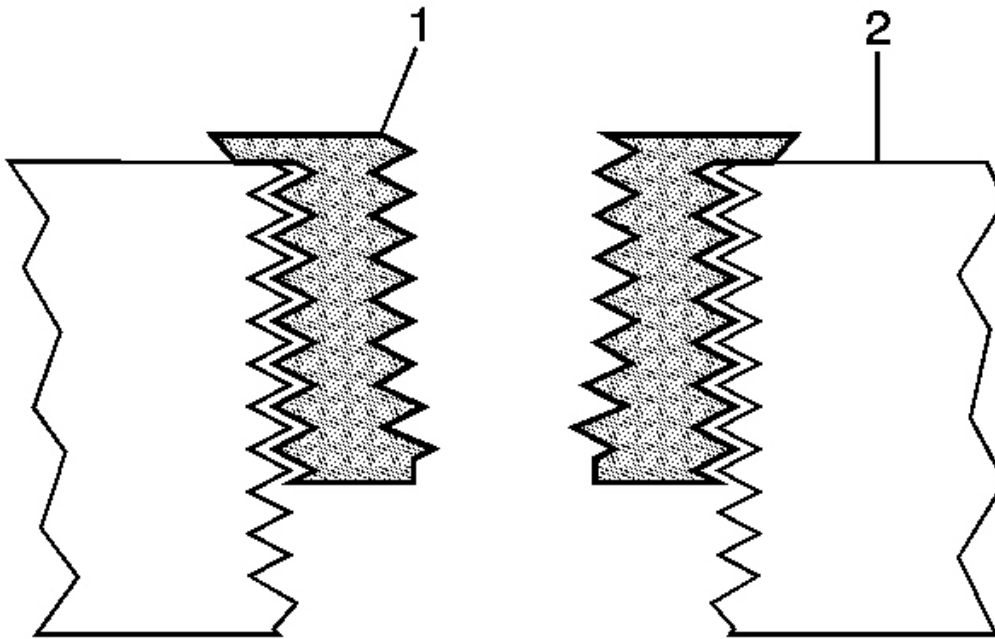


**Fig. 421: View Of Restricted Engine Coolant Passage - Recessed Thread Repair**  
Courtesy of GENERAL MOTORS CORP.

15. Any installed insert that restricts or blocks an oil or engine coolant passage (3) will need to have the oil or engine coolant passage drilled out (4) to the original size of the oil or engine coolant passage. After drilling the restriction or blockage, clean out any chips and thread the installation driver tool through the insert again to remove any burrs caused by the drilling of the oil or engine coolant passage.

#### **Tapered Pipe Thread Repair**

The thread repair insert for tapered pipe threads is coated with a clear silver zinc coating.

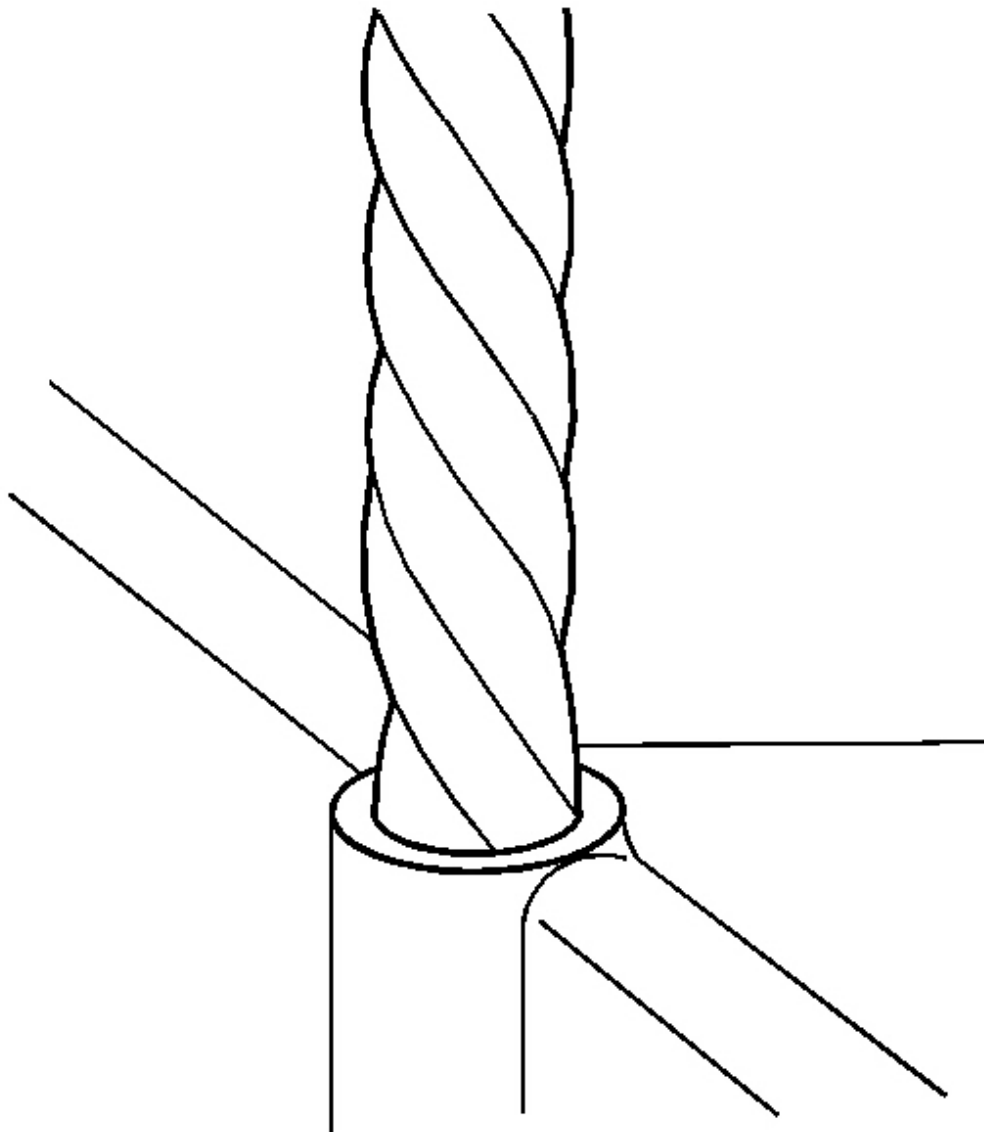


**Fig. 422: Inspecting Insert For Proper Installation - Tapered Thread**  
Courtesy of GENERAL MOTORS CORP.

**CAUTION:** Refer to Safety Glasses Caution in Cautions and Notices.

**IMPORTANT:** The use of a cutting type fluid is recommended when performing the drilling, counterboring and tapping procedures.

When installed to the proper depth, the flange (1) of the insert will be seated against surface (2) of the base material of the drilled/tapped hole.

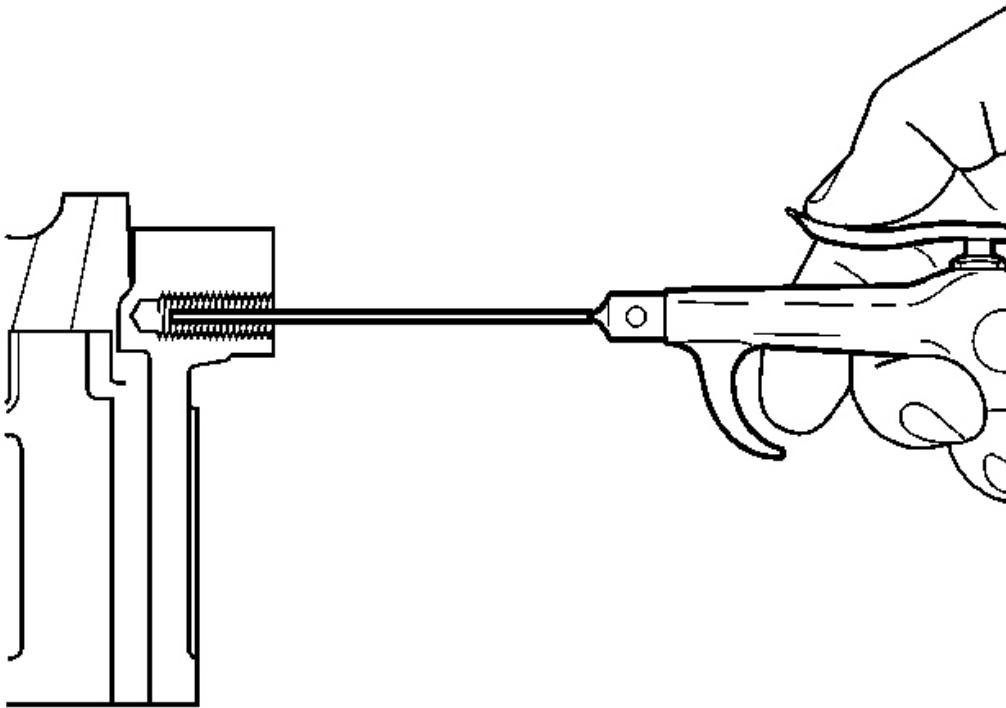


**Fig. 423: Drilling Out Threads Of Damaged Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- During the drilling process, it is necessary to repeatedly remove the drill and clean chips from the hole and the flutes of the drill.
- Drill the hole until the stop collar contacts the surface of the base material.

1. Drill out the threads of the damaged hole.

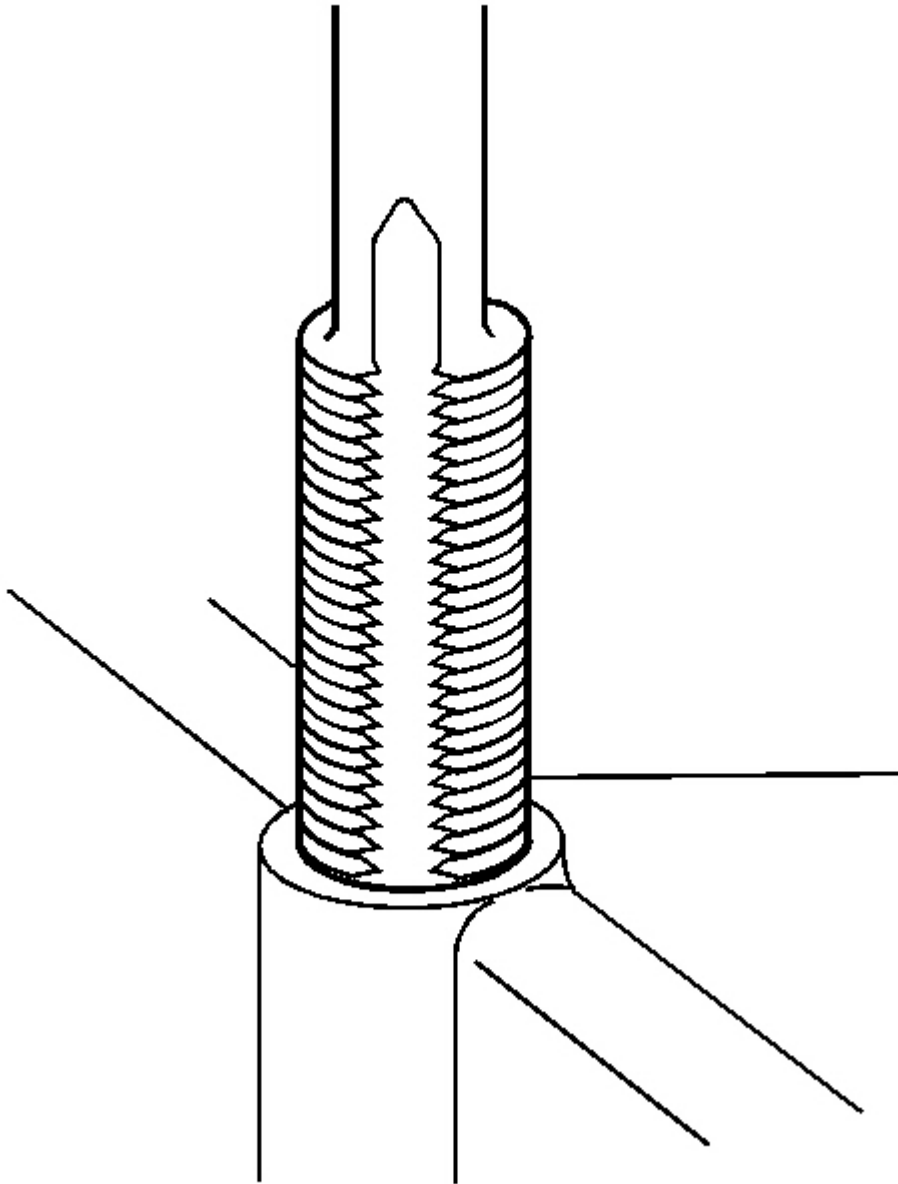


**Fig. 424: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the drilled hole prior to tapping.

2. Using compressed air, clean out any chips.





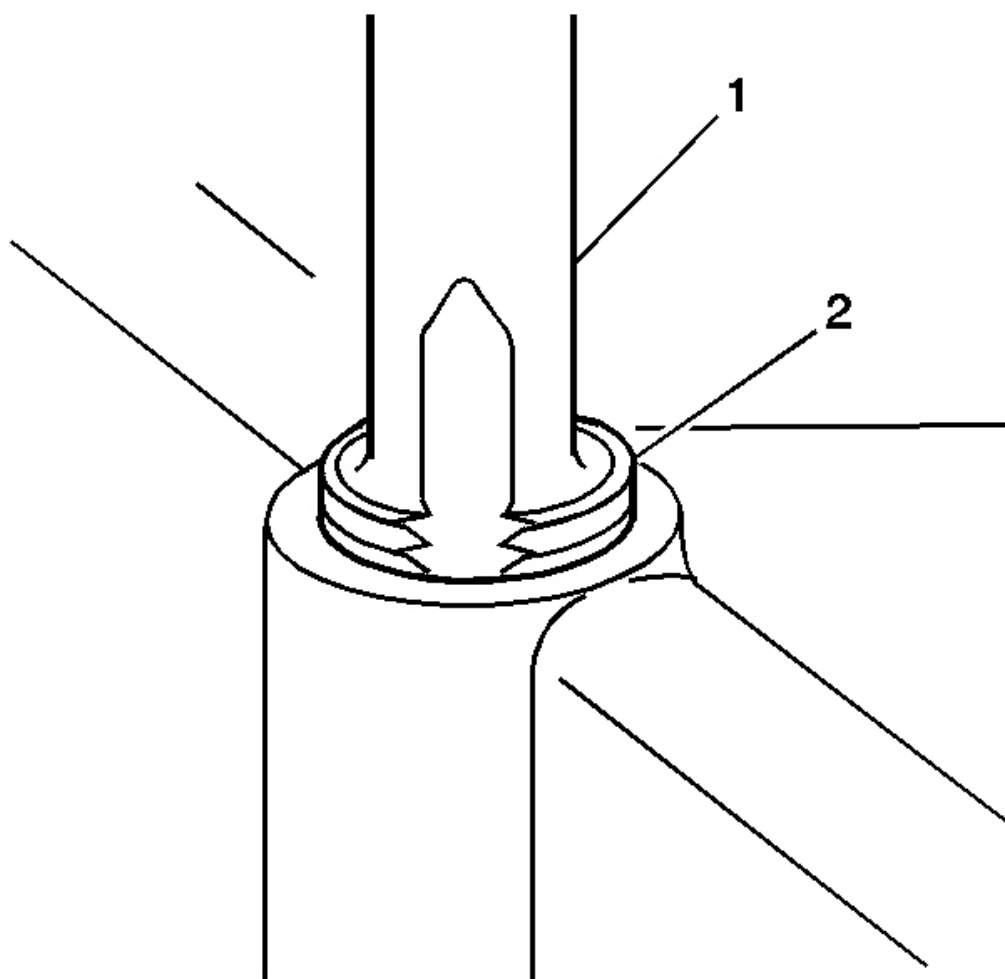
**Fig. 425: Tapping Threads Of Drilled Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- During the tapping process, it is necessary to repeatedly remove the tap and clean chips from the hole and the flutes of the tap.

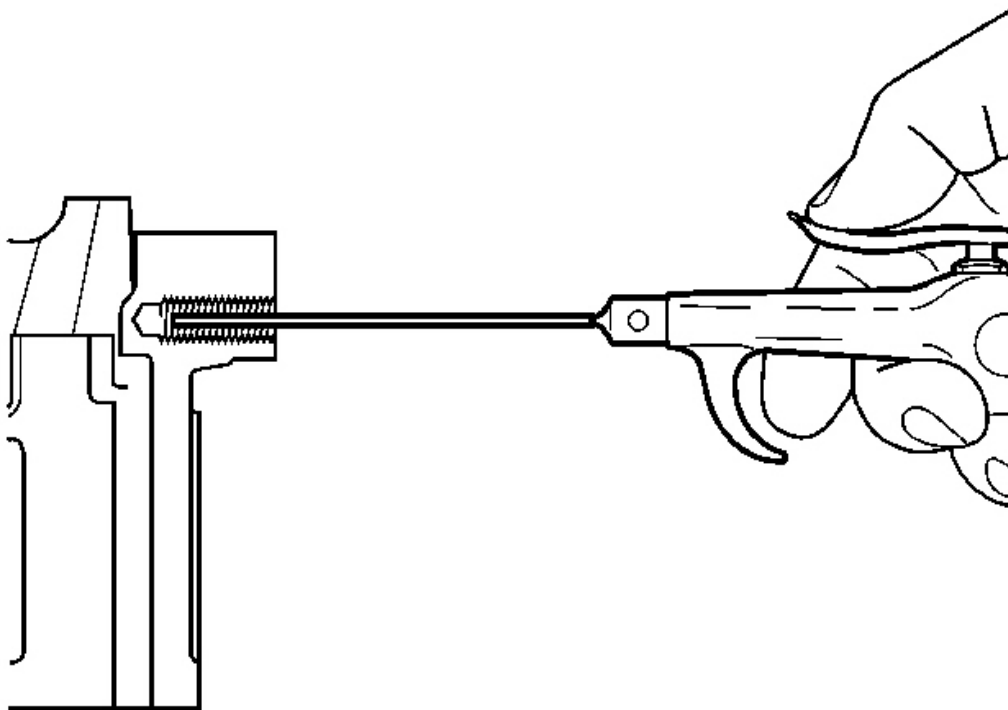
- Ensure the tap has created full threads at least to the depth equal to the insert length.

3. Using a suitable tapping wrench, tap the threads of the drilled hole.



**Fig. 426: View Of Proper Tapping Distance - Tapered Thread**  
**Courtesy of GENERAL MOTORS CORP.**

4. Tap the drilled hole until the threads at the top of the tap (2) are down to the surface of the base material.

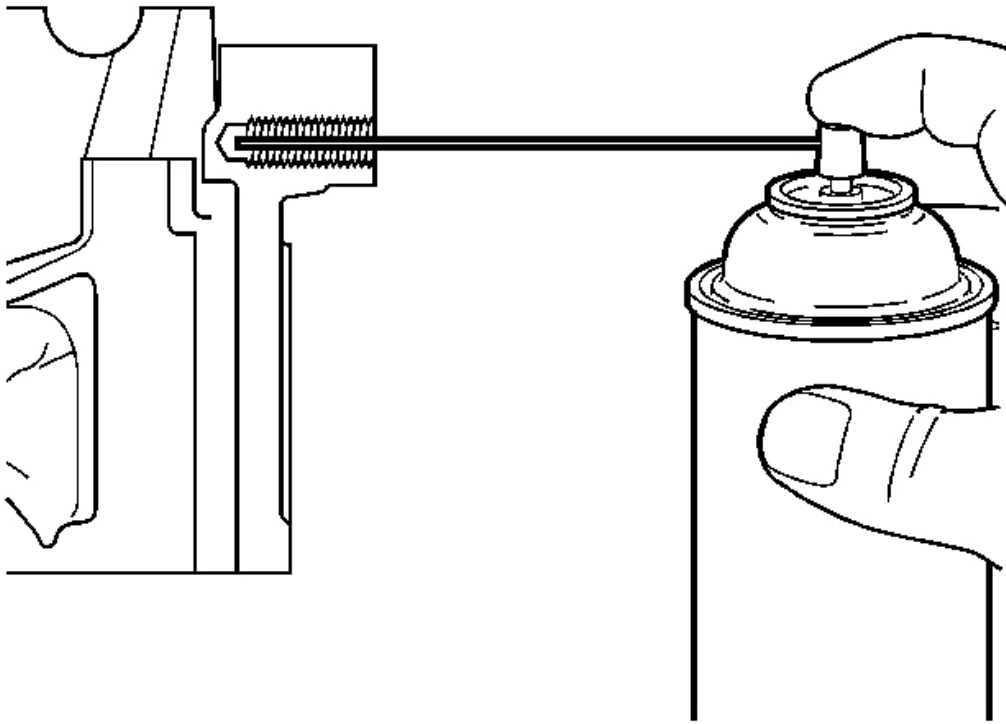


**Fig. 427: Cleaning Out Metal Chips**

Courtesy of GENERAL MOTORS CORP.

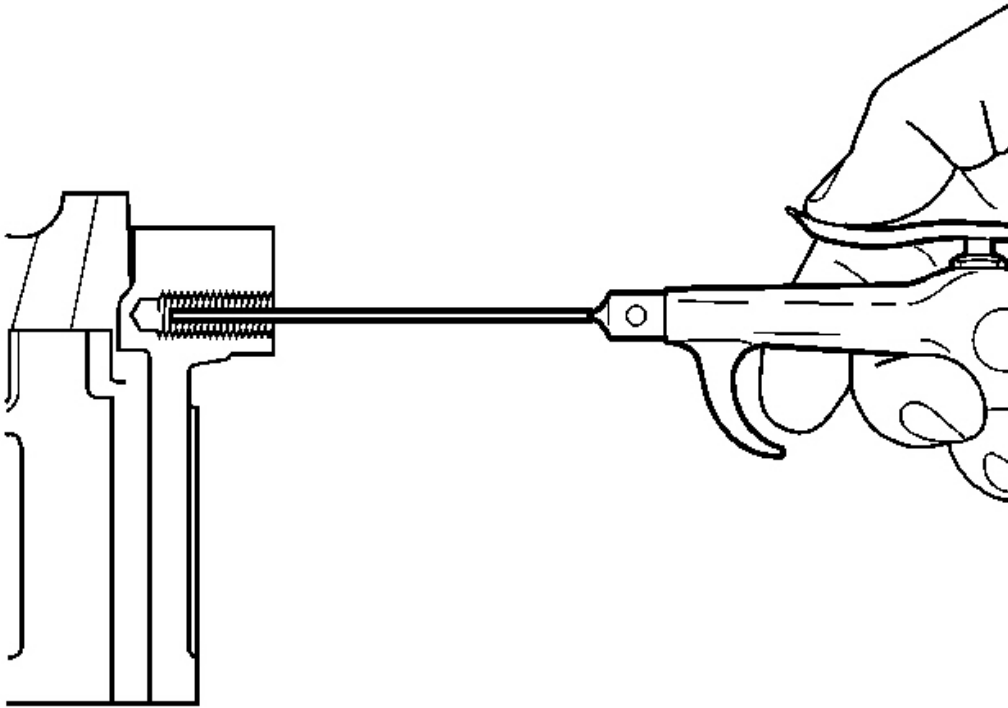
**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

5. Using compressed air, clean out any chips.



**Fig. 428: Spraying Cleaner Into Tapped Hole**  
Courtesy of GENERAL MOTORS CORP.

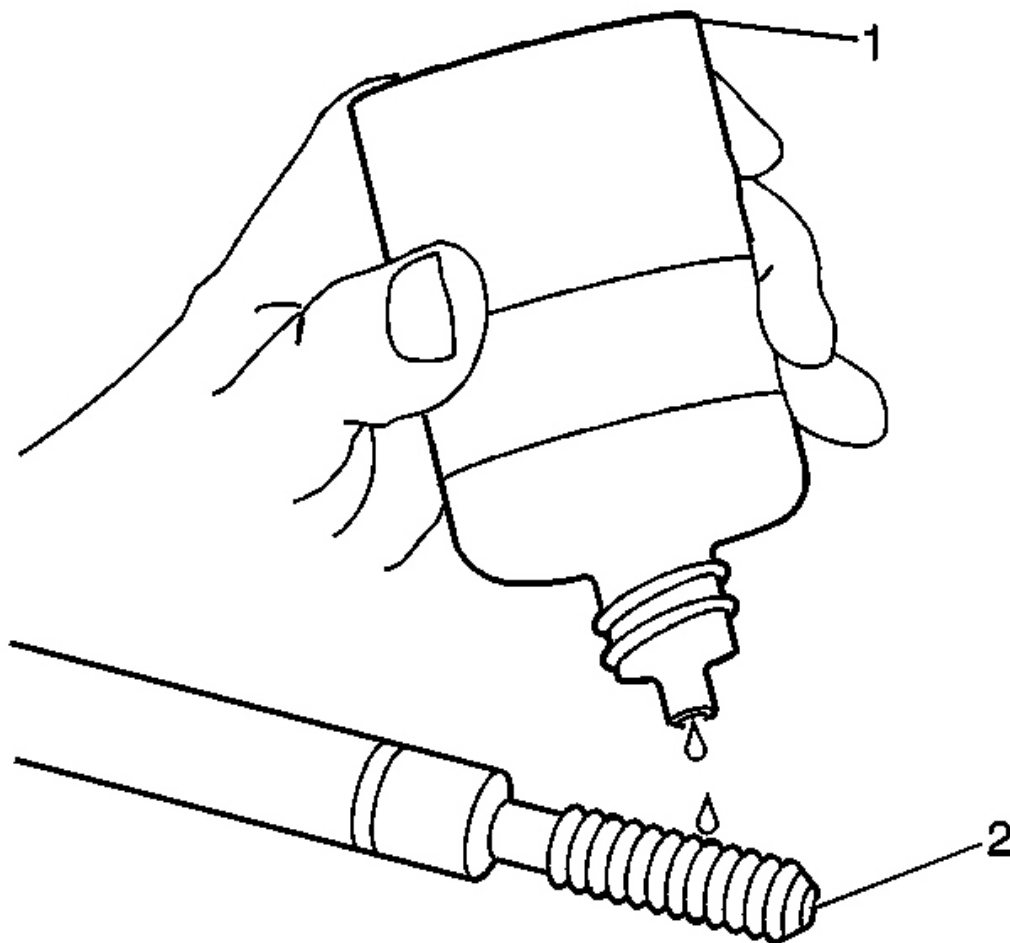
6. Spray cleaner into the tapped hole.



**Fig. 429: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

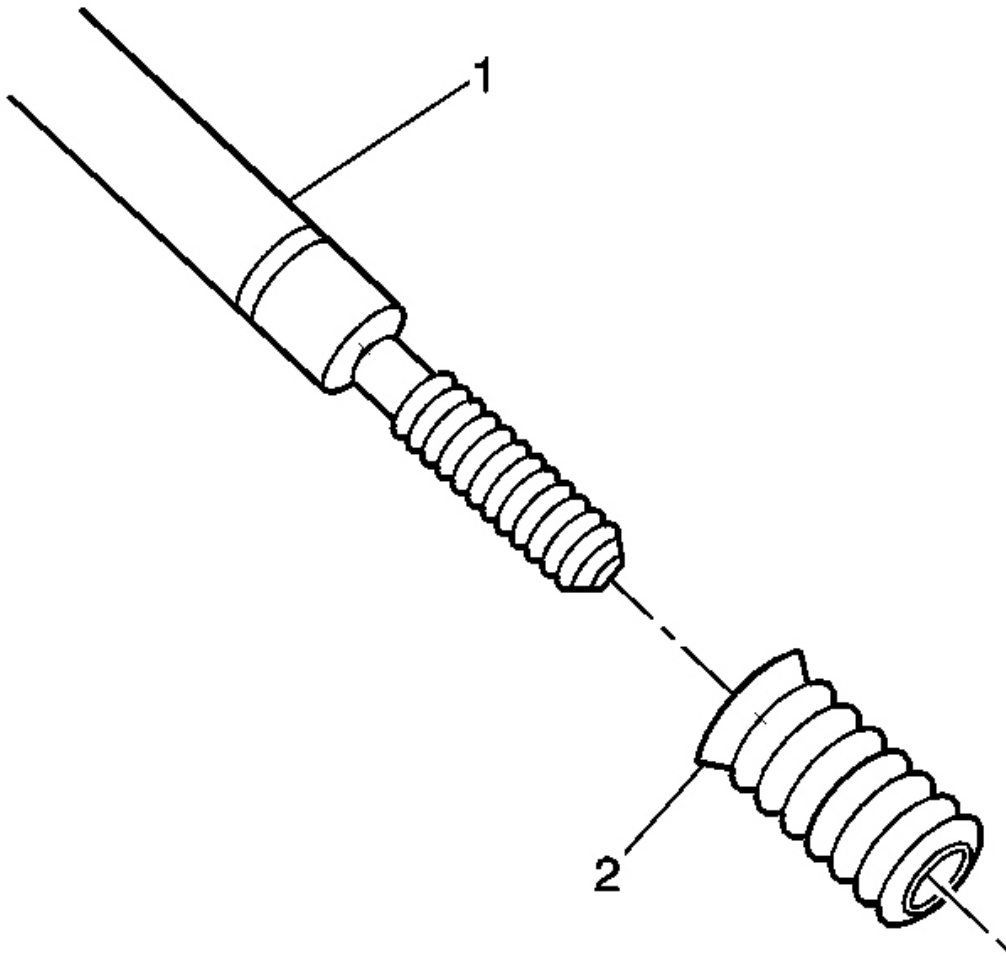
7. Using compressed air, clean out any chips.



**Fig. 430: Lubricating Installer Tool Using Driver Oil**  
Courtesy of GENERAL MOTORS CORP.

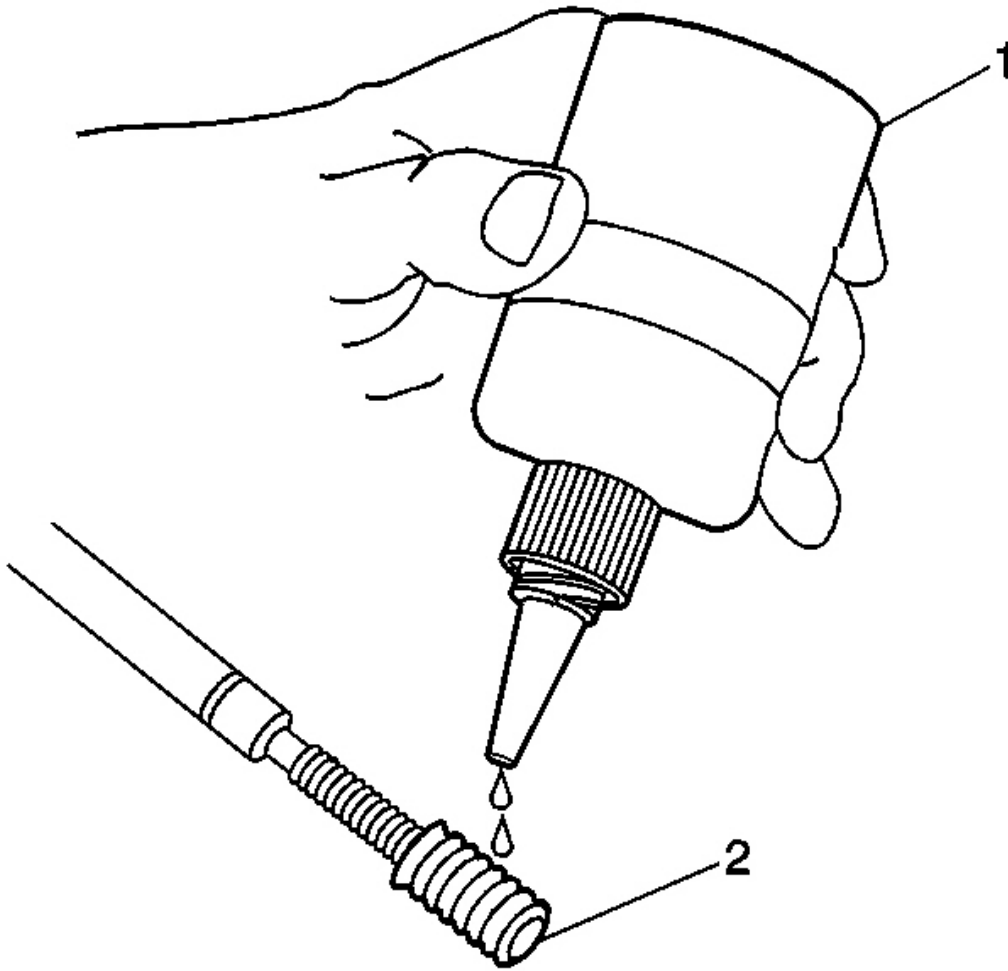
**IMPORTANT:** Do not allow oil or other foreign material to contact the outside diameter (OD) of the insert.

8. Lubricate the threads of the driver installation tool (2) with the driver oil (1) J 42385-110.



**Fig. 431: View of Bushing Type Insert**  
**Courtesy of GENERAL MOTORS CORP.**

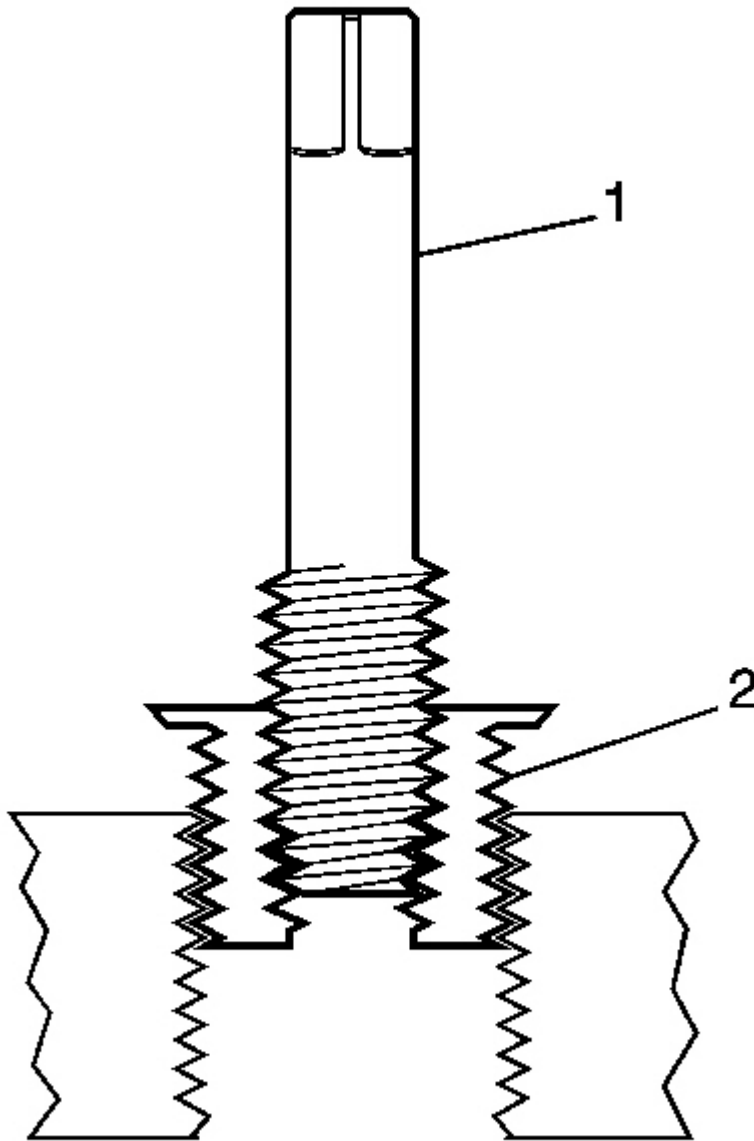
9. Install the insert (2) onto the driver installation tool (1).



**Fig. 432: Applying Threadlock To Insert**  
**Courtesy of GENERAL MOTORS CORP.**

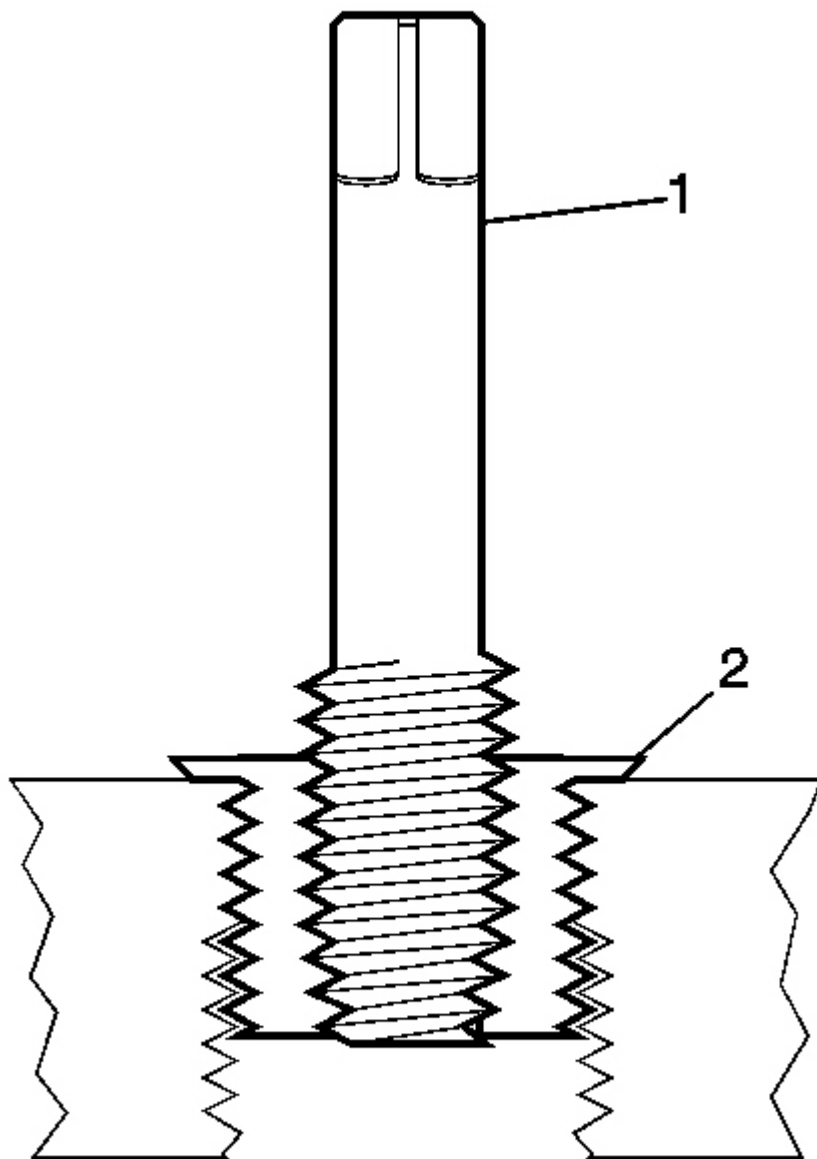
10. Apply threadlock sealant (1) to the insert OD threads (2).





**Fig. 433: Installing Insert - Tapered Thread**  
Courtesy of GENERAL MOTORS CORP.

11. Install the insert (2) into the tapped hole.

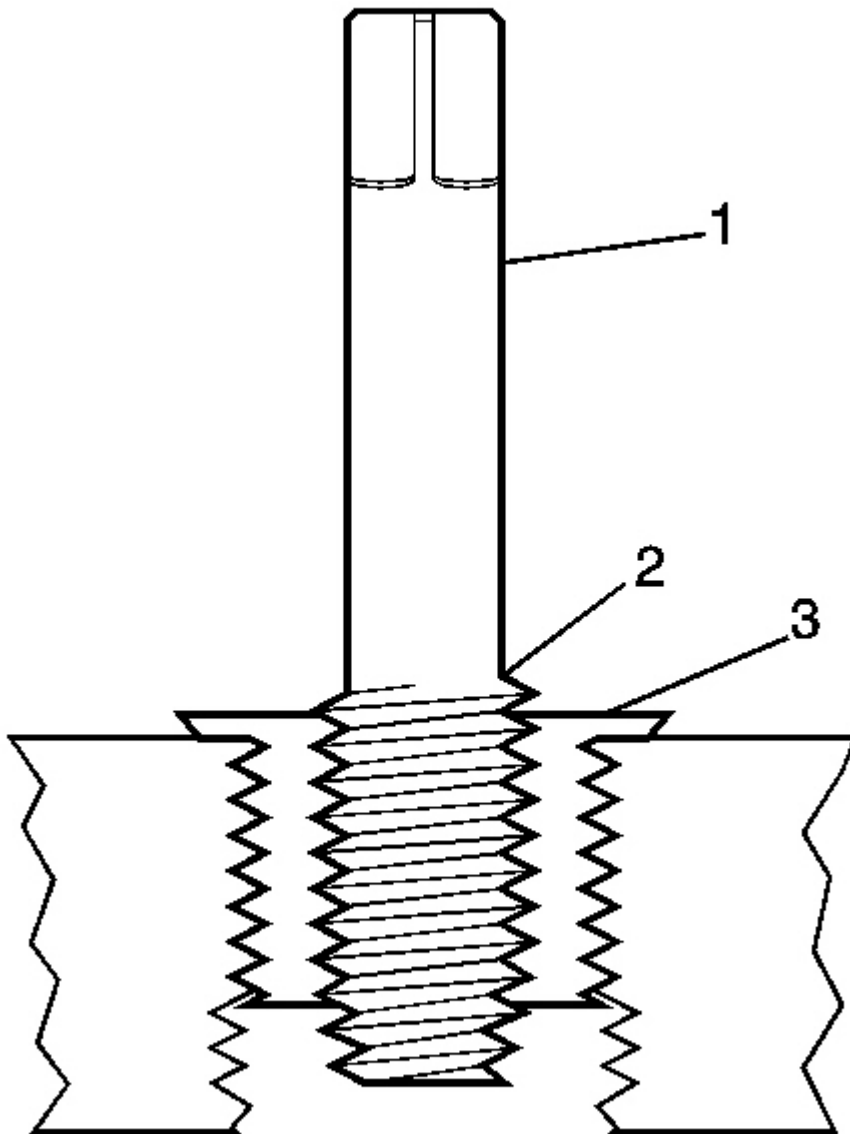


**Fig. 434: Installing Insert - Tapered Pipe Thread Repair**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** If the insert will not thread down until the flange contacts the surface of the base material remove the insert immediately with a screw extracting tool and inspect the tapped hole for any remaining chips and/or improper

tapping.

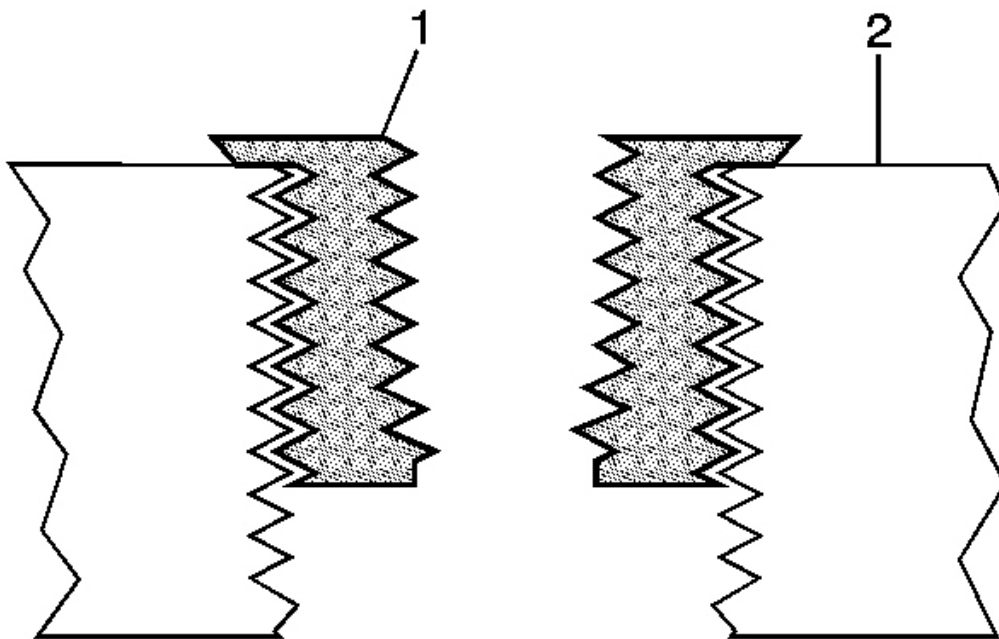
12. Install the insert until the flange (2) of the insert contacts the surface of the base material.



**Fig. 435: Installed Insert - Tapered Pipe Thread Repair**  
Courtesy of GENERAL MOTORS CORP.

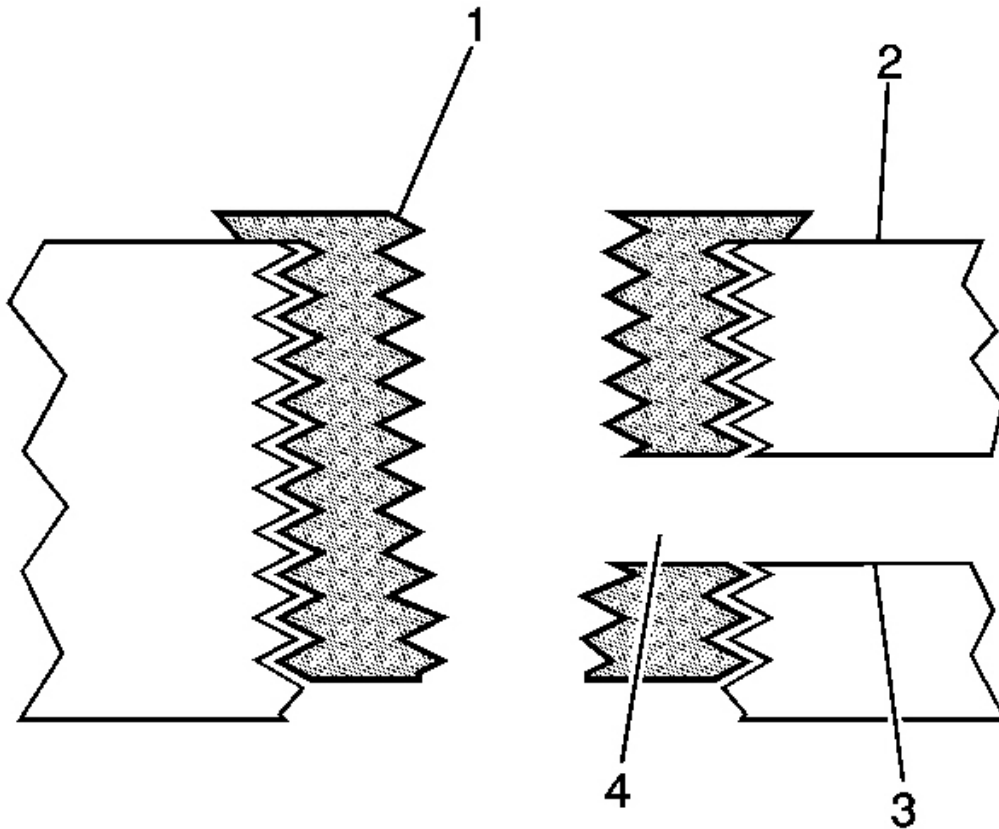
**IMPORTANT:** The driver installation tool will tighten up before screwing completely through the insert. This is acceptable. The threads at the bottom of the insert are being formed and the insert is mechanically locking the insert into the base material threads.

13. Continue to rotate the driver installation tool (1) until the top of the threaded section (2) is level with the top of the insert (3).



**Fig. 436: Inspecting Insert For Proper Installation - Tapered Thread**  
Courtesy of GENERAL MOTORS CORP.

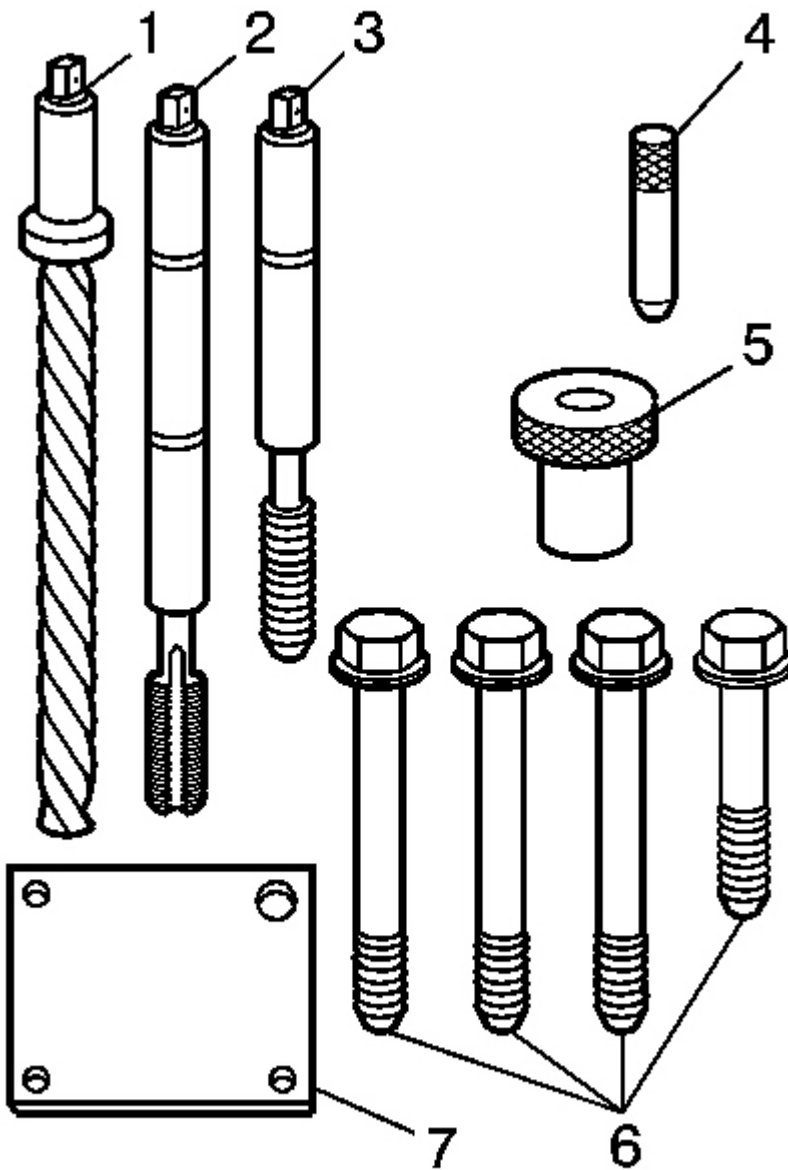
14. Inspect the insert (1) for proper installation (2) into the tapped hole.



**Fig. 437: View Of Restricted Engine Coolant Passages - Tapered Pipe Thread Repair**  
Courtesy of GENERAL MOTORS CORP.

15. Any installed insert that restricts or blocks an oil or engine coolant passage (3) will need to have the oil or engine coolant passage drilled out (4) to the original size of the oil or engine coolant passage. After drilling the restriction or blockage, clean out any chips and thread the installation driver tool through the insert again to remove any burrs caused by the drilling of the oil or engine coolant passage.

#### Cylinder Head Bolt Hole Thread Repair



**Fig. 438: View Of Cylinder Head Bolt Hole Required Tools**  
 Courtesy of GENERAL MOTORS CORP.

The cylinder head bolt hole required tools consist of the following:

- Drill (1) J 42385-402

## 2004 Isuzu Ascender LS

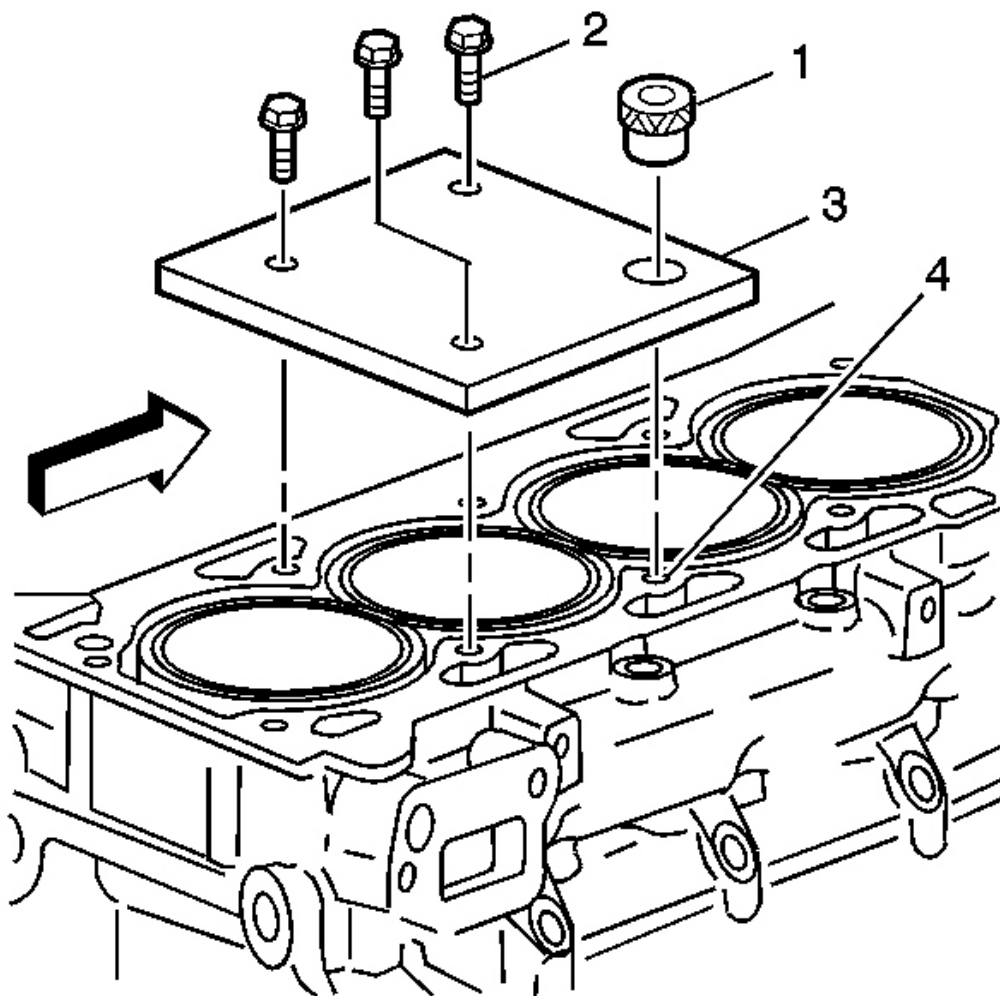
2004 ENGINE Engine Mechanical - 4.2L - Ascender

- Tap (2) J 42385-403
- Installation driver (3) J 42385-404
- Alignment pin (4) J 42385-303
- Bushing (5) J 42385-302
- Bolts (6) J 42385-421
- Fixture plate (7) J 42385-401

**CAUTION: Refer to Safety Glasses Caution in Cautions and Notices.**

- IMPORTANT:**
- **Remove the fixture plate prior to installing the insert with the installer tool.**
  - **The use of a cutting type fluid is recommended when performing the drilling, counterboring and tapping procedures.**

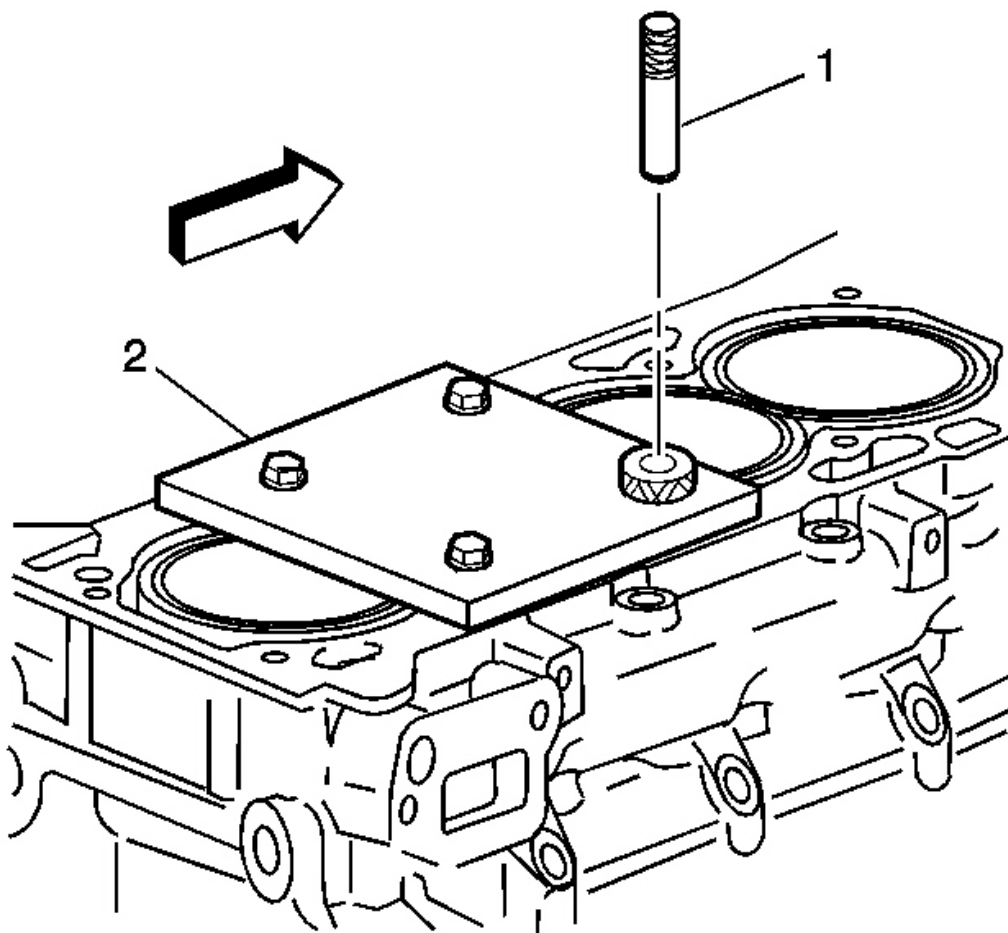
When installed to the proper depth, the flange of the insert will be seated against the counterbore of the drilled/tapped hole.



**Fig. 439: View Of Bushing, Fixture Plate, Bolts & Bolt Hole**  
**Courtesy of GENERAL MOTORS CORP.**

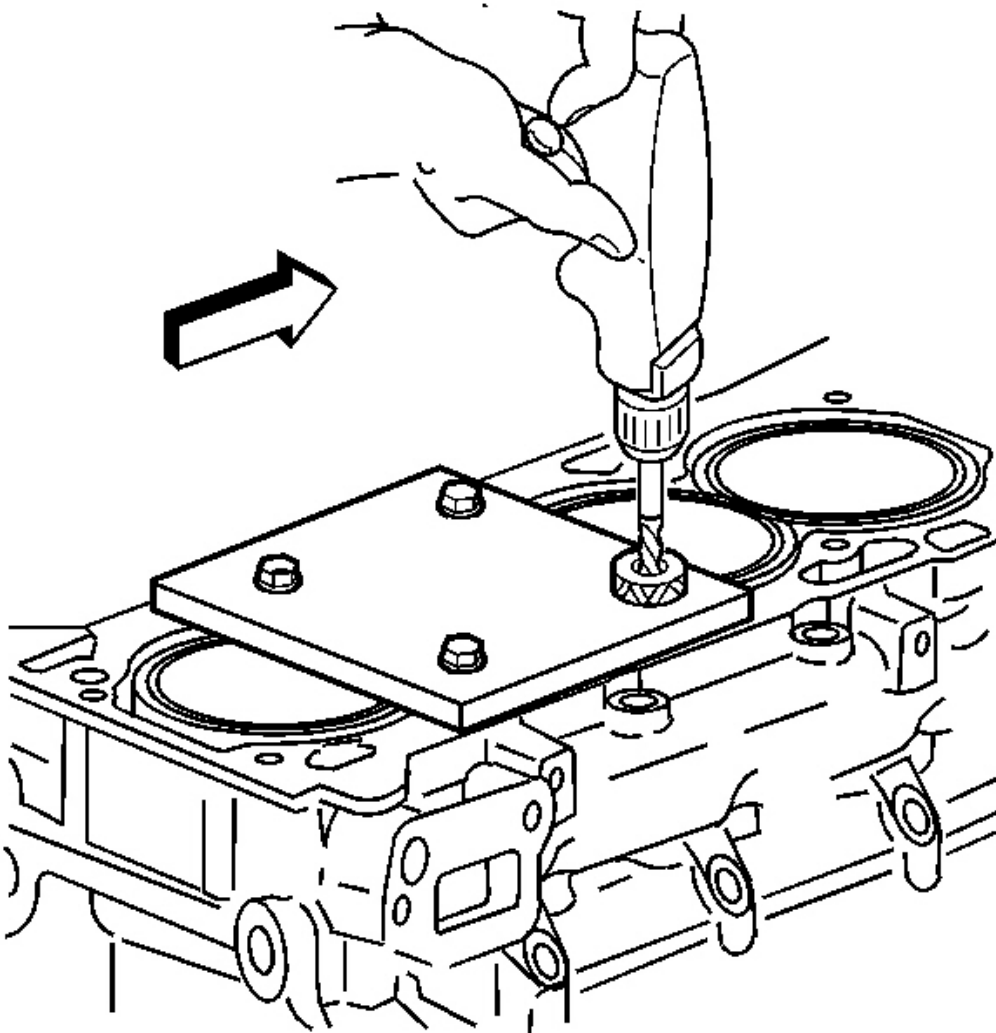
1. Position the fixture plate (3) with the bushing (1) installed over the cylinder head bolt hole to be repaired (4).
2. Loosely install the fixture plate bolts (2) into the remaining cylinder head bolt holes.





**Fig. 440: View Of Alignment Pin & Fixture Retaining Bolts**  
Courtesy of GENERAL MOTORS CORP.

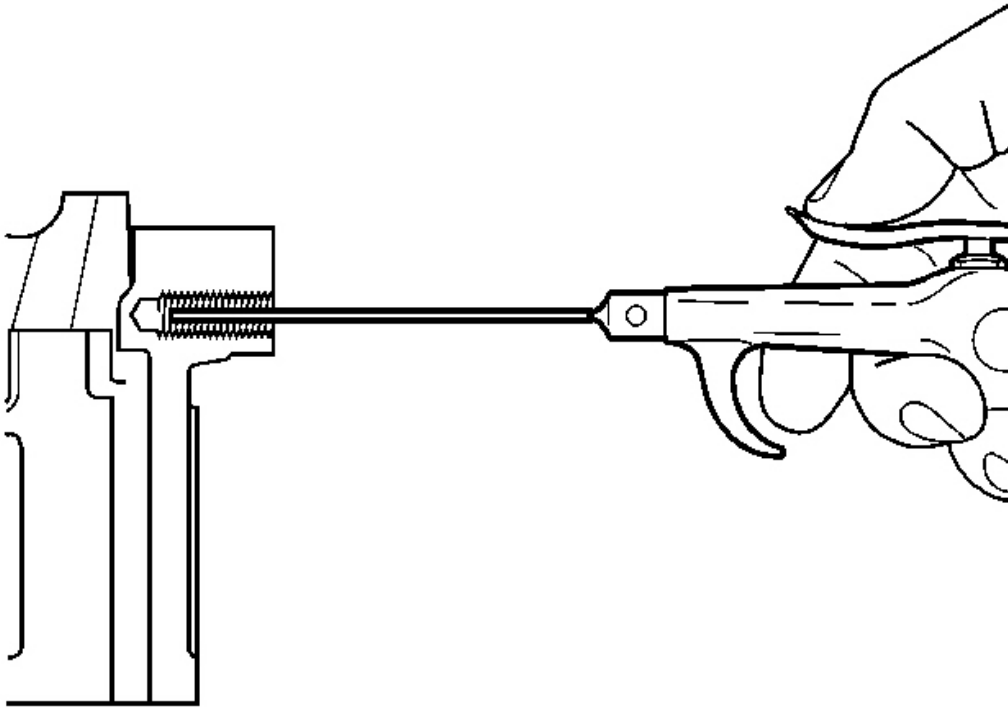
3. Position the alignment pin (1) through the bushing and into the cylinder head bolt hole.
4. With the alignment pin in the desired cylinder head bolt hole, tighten the fixture retaining bolts (2).
5. Remove the alignment pin (1) from the cylinder head bolt hole.



**Fig. 441: Drilling Out Threads Of Damaged Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** During the drilling process, it is necessary to repeatedly remove the drill and clean chips from the hole and the flutes of the drill.

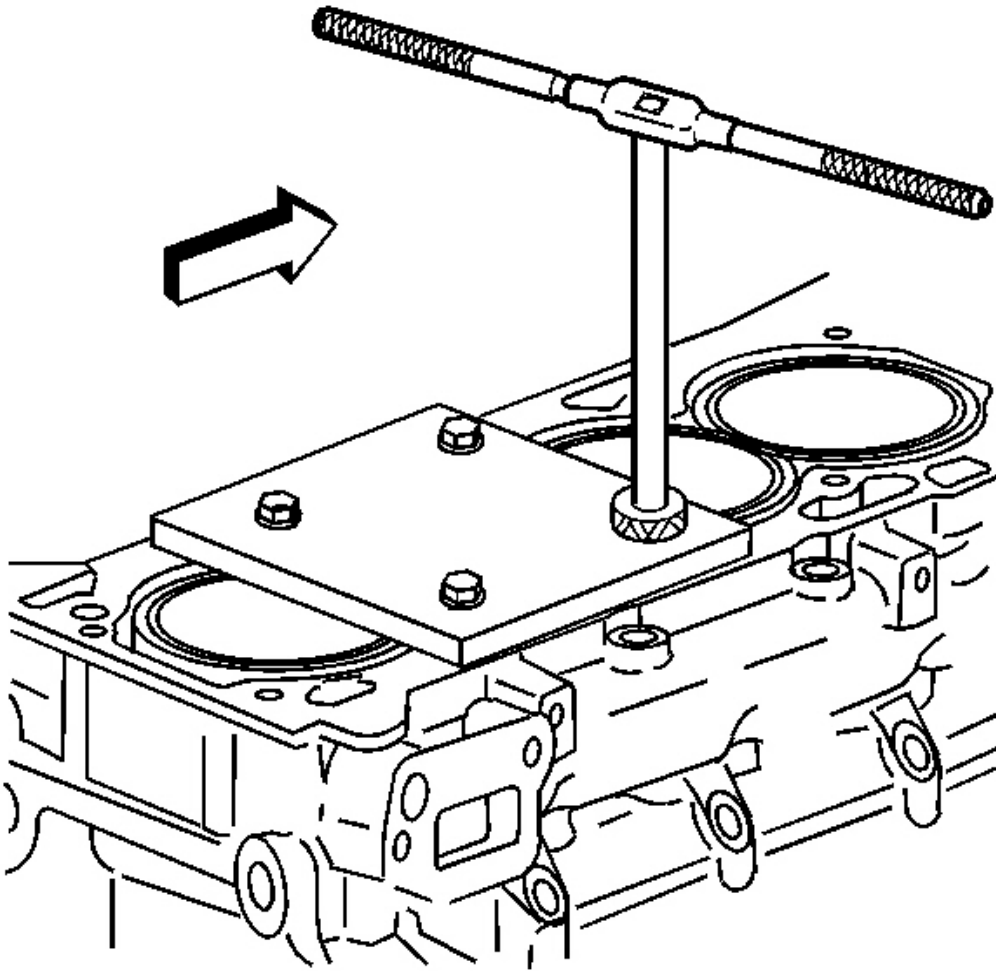
6. Drill out the threads of the damaged hole.



**Fig. 442: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the drilled hole prior to tapping.

7. Using compressed air, clean out any chips.

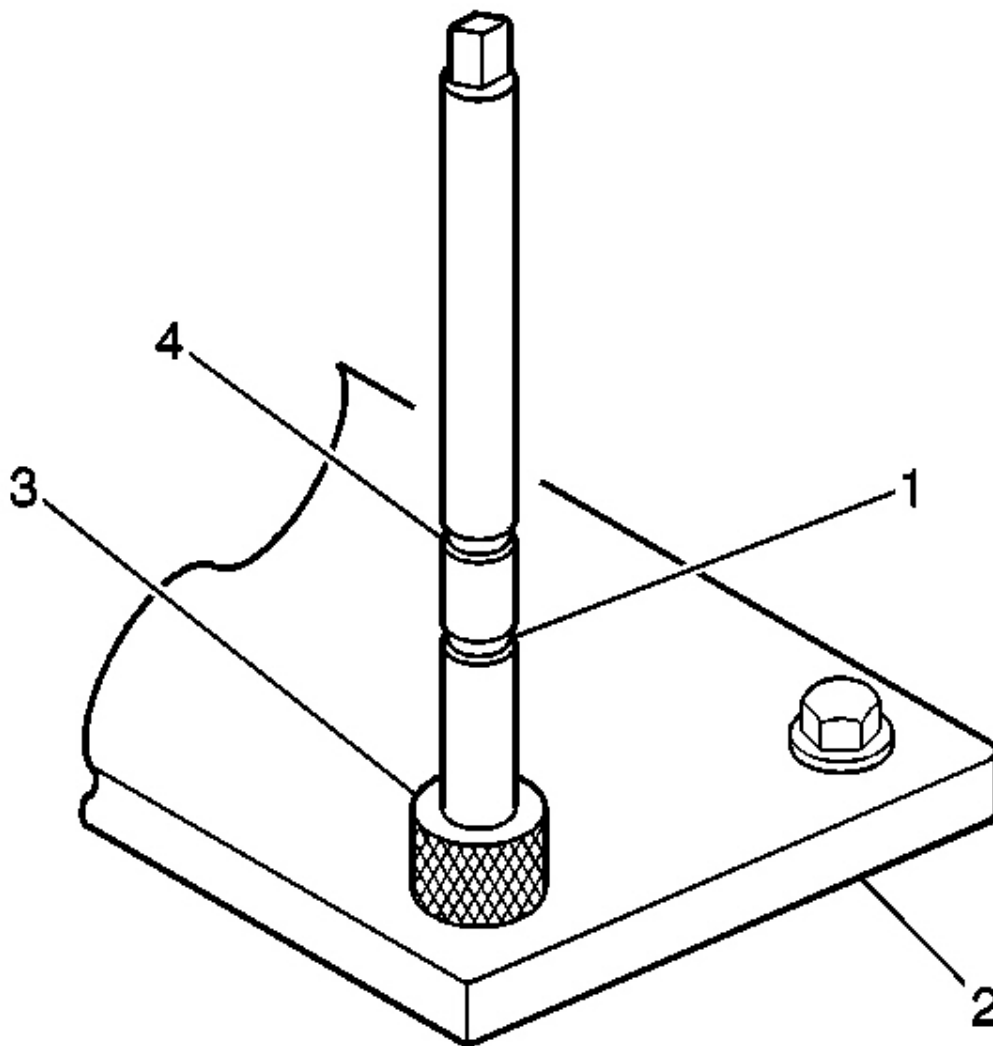


**Fig. 443: Tapping Out Threads Of Drilled Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

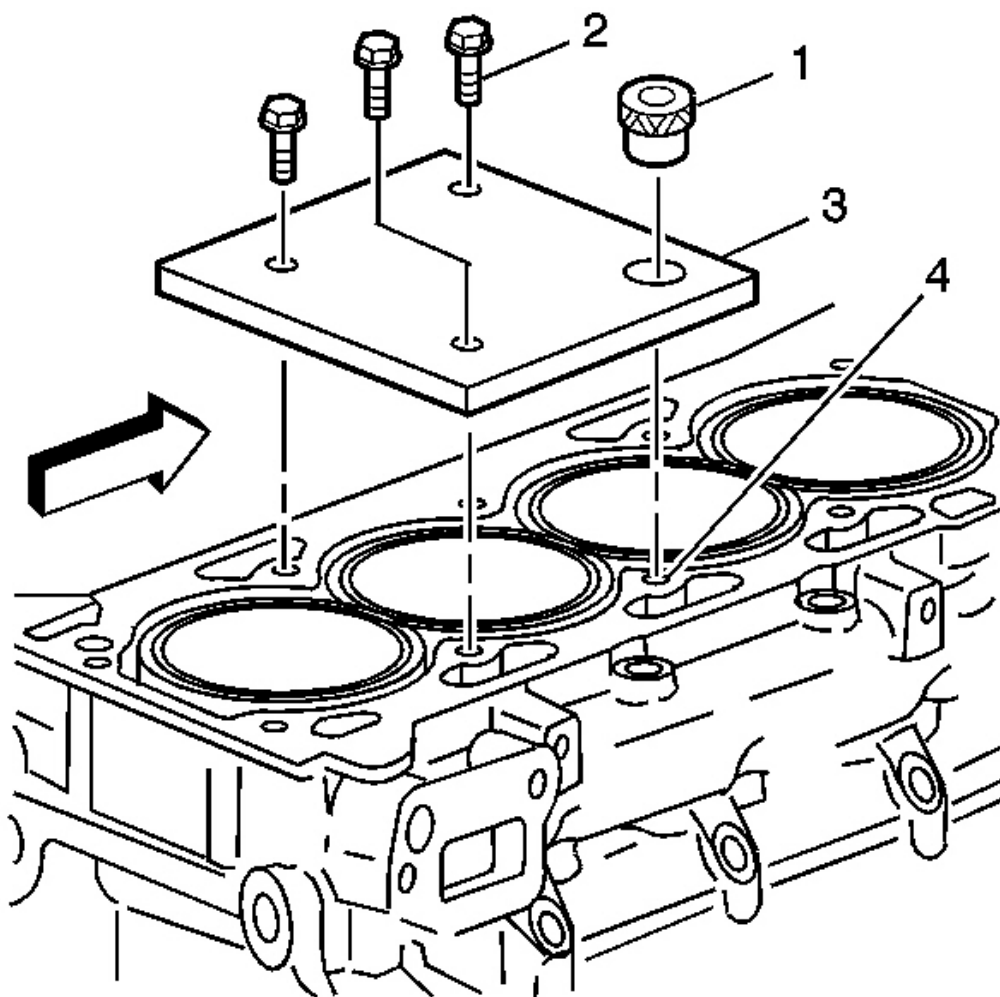
- During the tapping process, it is necessary to repeatedly remove the tap and clean chips from the hole and the flutes of the tap.
- Ensure the tap has created full threads at least to the depth equal to the insert length.

8. Using a suitable tapping wrench, tap the threads of the drilled hole.



**Fig. 444: View Of Tap Upper & Lower Marks, Fixture Plate & Bushing**  
Courtesy of GENERAL MOTORS CORP.

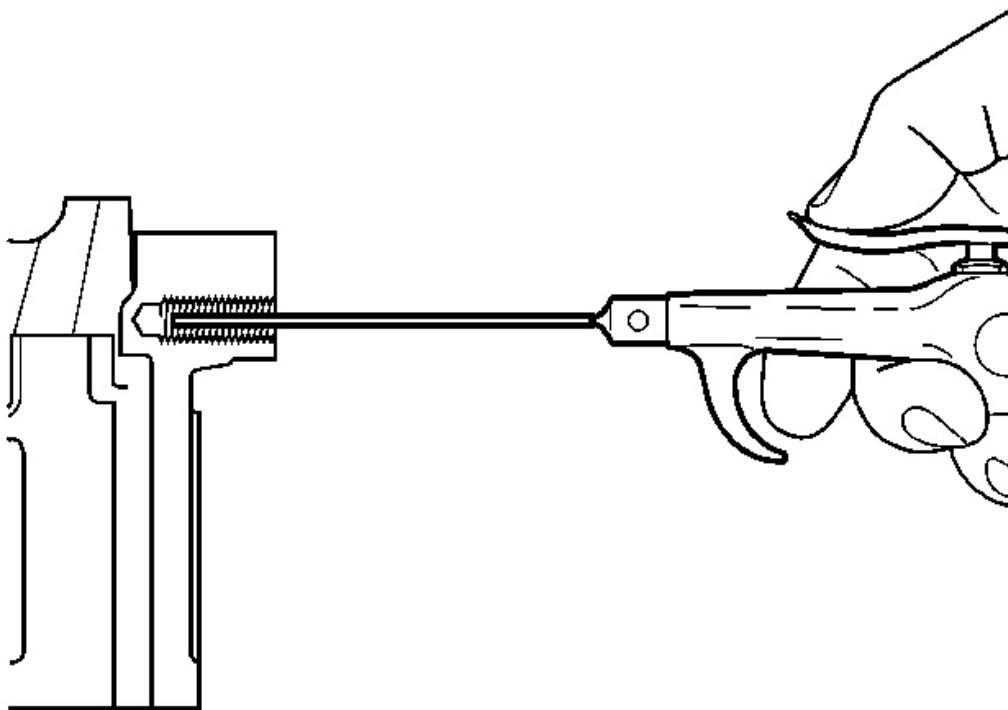
9. In order to tap the new threads for the insert to the proper depth, rotate the tap into the cylinder head bolt hole until the first mark (1) on the tap aligns with the top of the drill bushing (3).



**Fig. 445: View Of Bushing, Fixture Plate, Bolts & Bolt Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Remove the fixture plate prior to installing the insert with the installer tool.

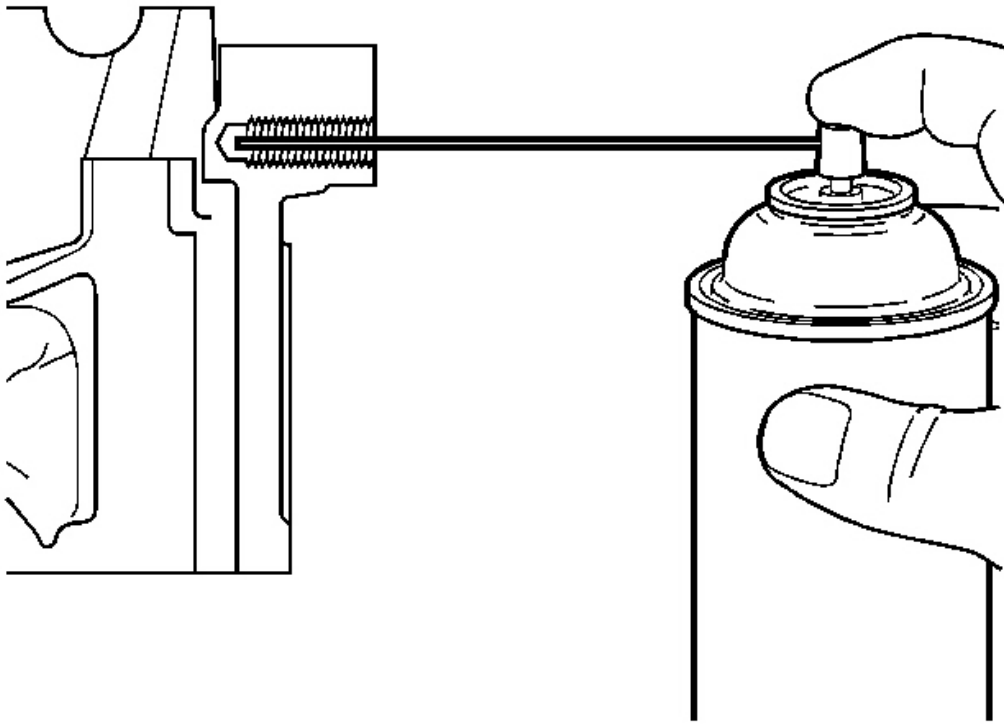
10. Remove the fixture plate bolts (2).
11. Remove the fixture plate (3) and bushing (1).



**Fig. 446: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

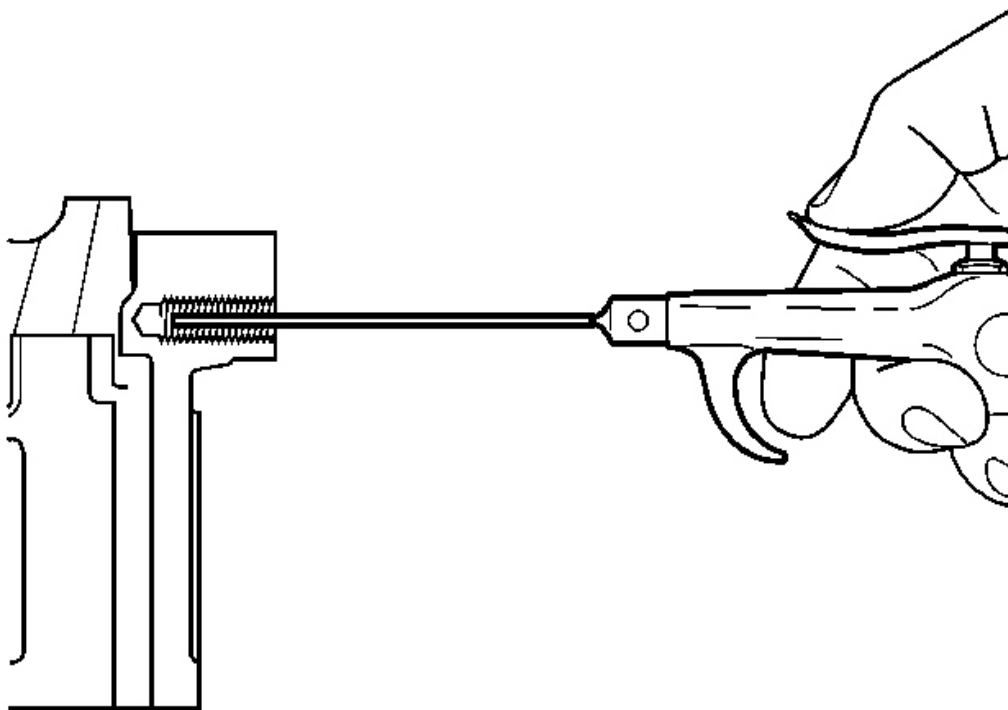
12. Using compressed air, clean out any chips.



**Fig. 447: Spraying Cleaner Into Tapped Hole**  
Courtesy of GENERAL MOTORS CORP.

13. Spray cleaner into the tapped hole.

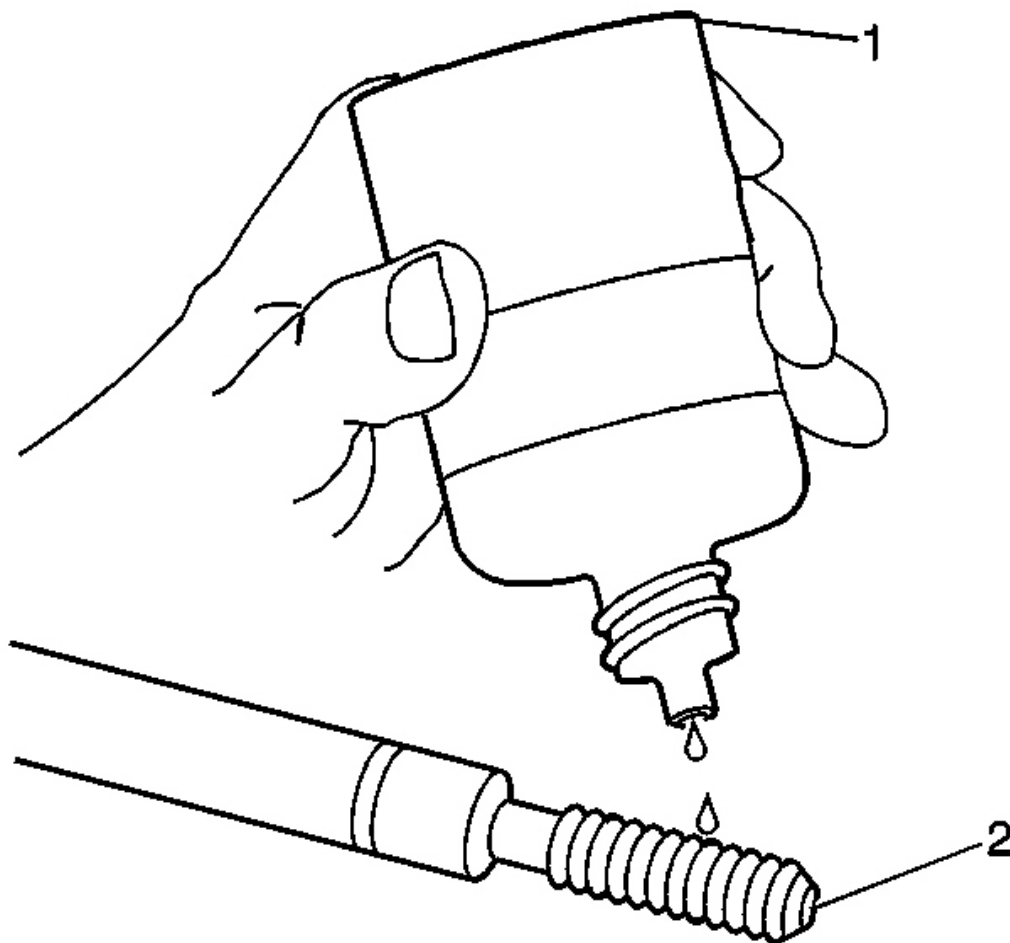




**Fig. 448: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

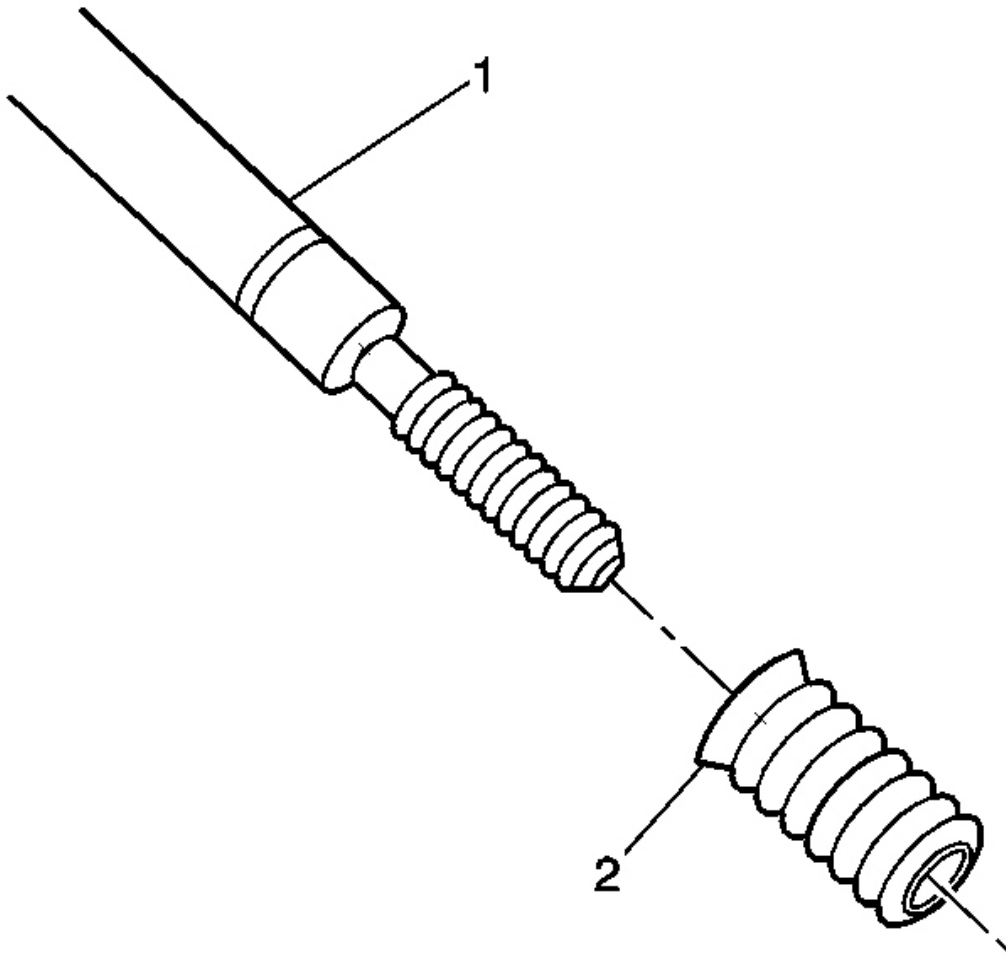
14. Using compressed air, clean out any chips.



**Fig. 449: Lubricating Installer Tool Using Driver Oil**  
Courtesy of GENERAL MOTORS CORP.

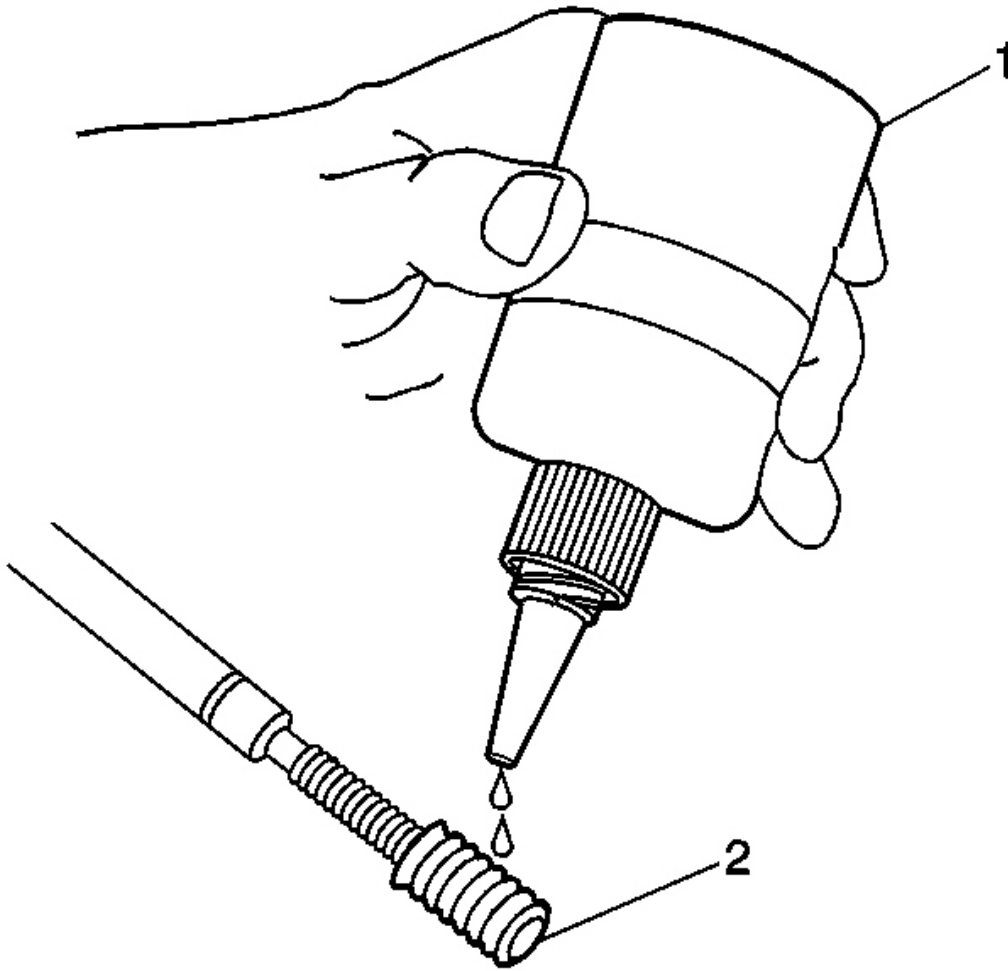
**IMPORTANT:** Do not allow oil or other foreign material to contact the outside diameter (OD) of the insert.

15. Lubricate the threads of the driver installation tool (2) with the driver oil (1) J 42385-110.



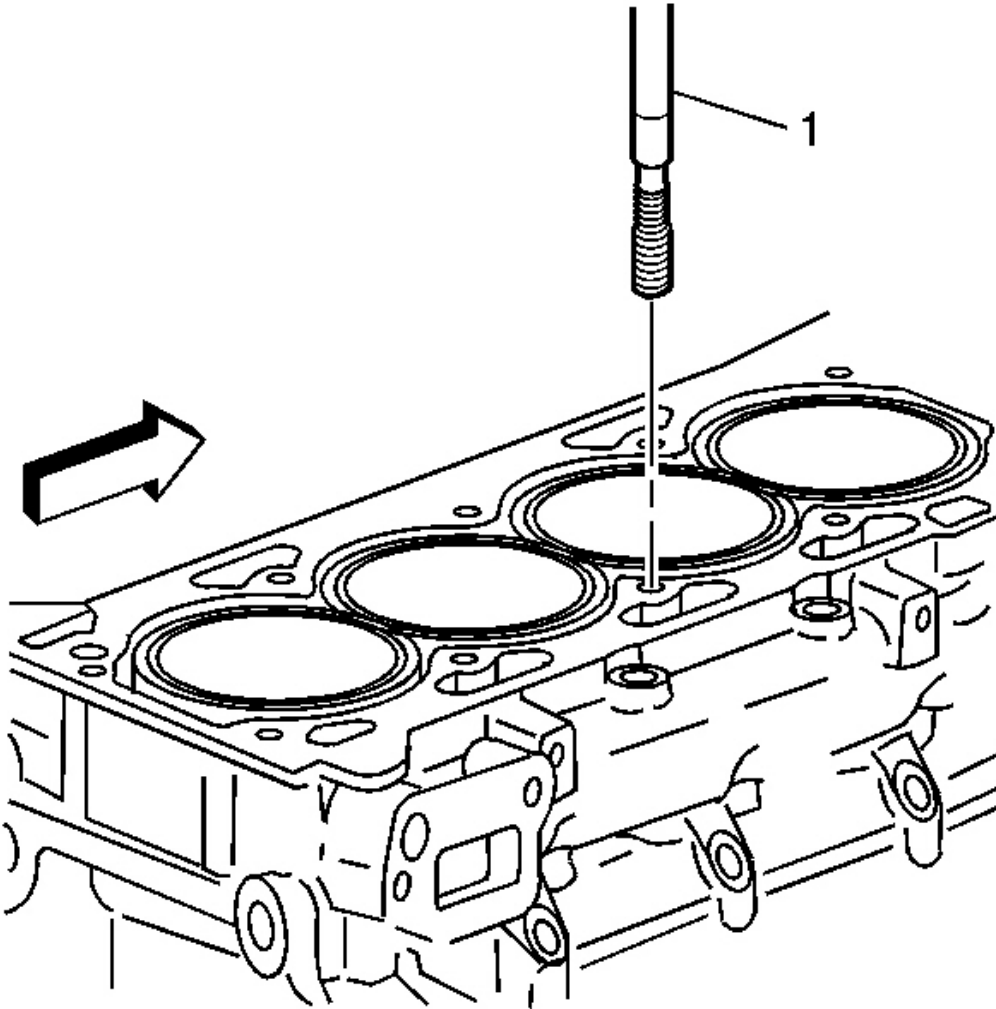
**Fig. 450: View of Bushing Type Insert**  
**Courtesy of GENERAL MOTORS CORP.**

16. Install the insert (2) onto the driver installation tool (1).



**Fig. 451: Applying Threadlock To Insert**  
**Courtesy of GENERAL MOTORS CORP.**

17. Apply threadlock sealant (1) to the insert OD threads (2).



**Fig. 452: View Of Installation Driver**  
Courtesy of GENERAL MOTORS CORP.

18. Install the insert and installation driver (1) into the tapped hole.
19. Start the insert into the threaded hole.

**IMPORTANT:** If the insert will not thread down until the flange contacts the counterbored surface remove the insert immediately with a screw extracting tool and inspect the tapped hole for any remaining chips and/or improper tapping.

20. Install the insert until the flange of the insert contacts the counterbored surface.

**IMPORTANT:** The driver installation tool will tighten up before screwing completely through the insert. This is acceptable. The threads at the bottom of the insert are being formed and the insert is mechanically locking the insert into the base material threads.

21. Continue to rotate the driver installation tool through the insert.  
22. Inspect the insert for proper installation into the tapped hole.

#### Crankshaft Main Bolt Hole Thread Repair

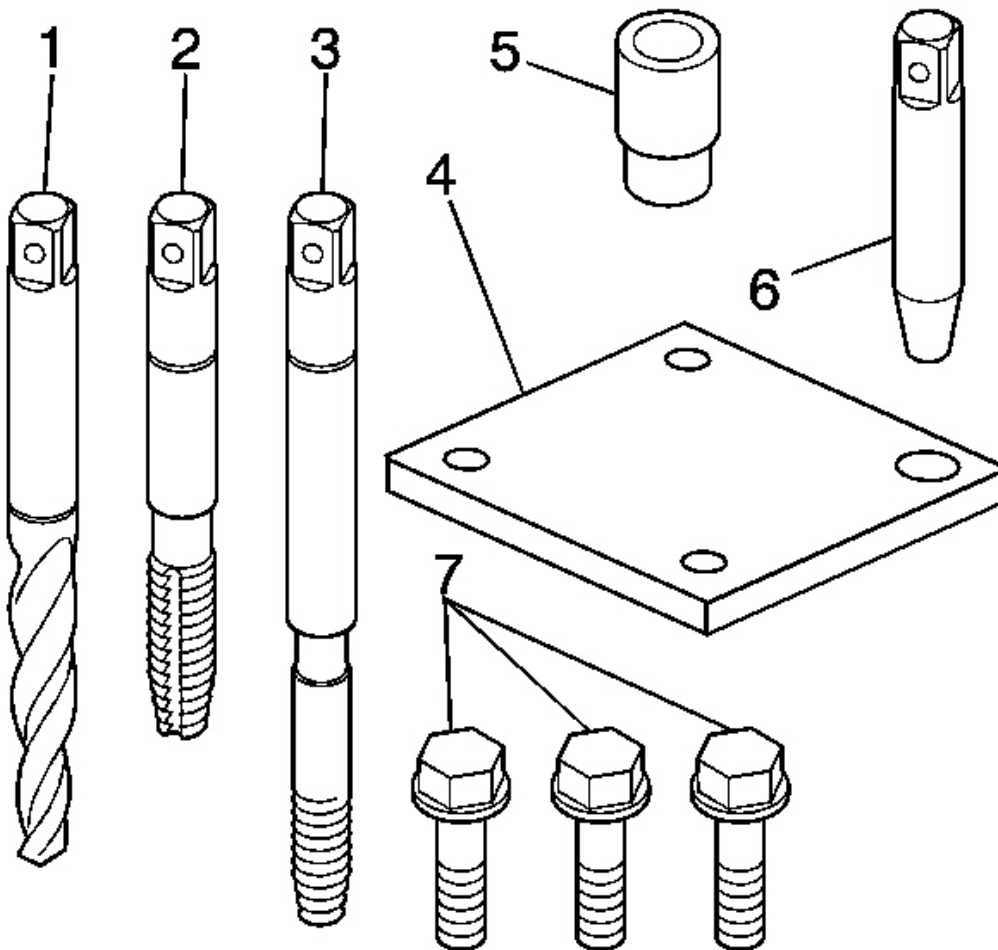


Fig. 453: View Of Crankshaft Main Bearing Bolt Hole Required Tools

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- In order to repair some crankshaft main bolt holes it will be necessary to mount the fixture plate upside down.
- Do NOT remove the fixture plate prior to installing the insert with the installation driver. The fixture plate remains in position throughout the thread repair process.

The crankshaft main bearing bolt hole required tools consist of the following:

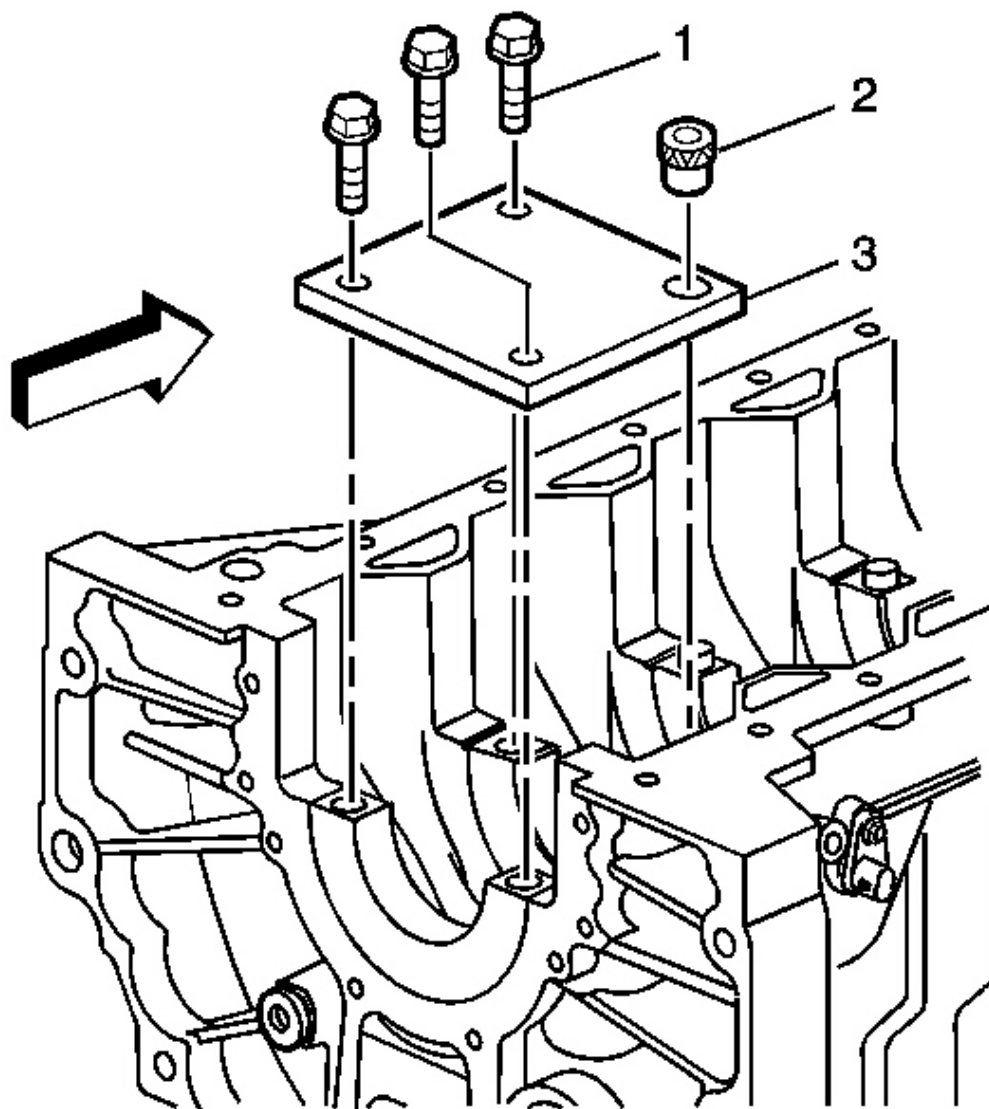
- Drill (1) J 42385-417
- Tap (2) J 42385-418
- Installation driver (3) J 42385-419
- Fixture plate (4) J 42385-401
- Bushing (5) J 42385-307
- Alignment pin (6) J 42385-308
- Bolts (7) J 42385-510

**CAUTION:** Refer to Safety Glasses Caution in Cautions and Notices.

**IMPORTANT:**

- Ensure the fixture plate is installed during the machining and installation processes of the insert.
- The use of a cutting type fluid is recommended when performing the drilling, counterboring and tapping procedures.

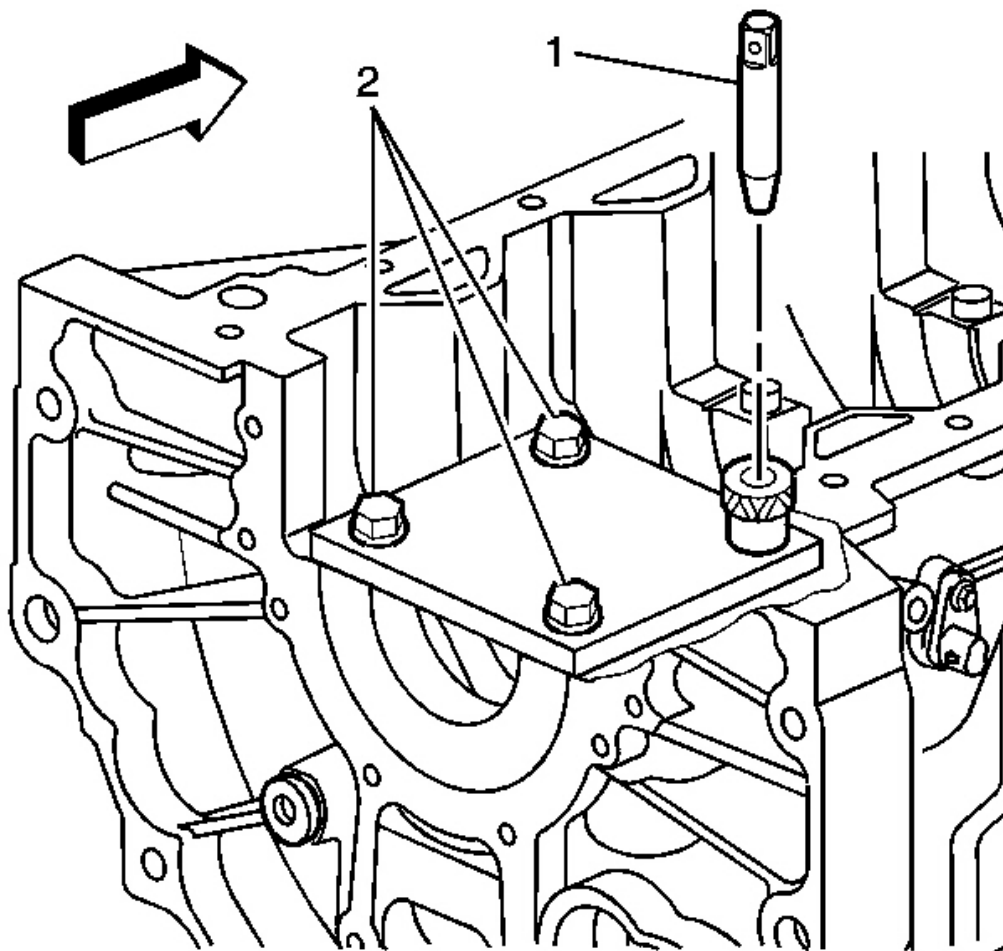
When installed to the proper depth, the flange of the insert will be seated against the counterbore of the drilled/tapped hole.



**Fig. 454: View Of Fixture Plate, Bolts & Bushing**  
Courtesy of GENERAL MOTORS CORP.

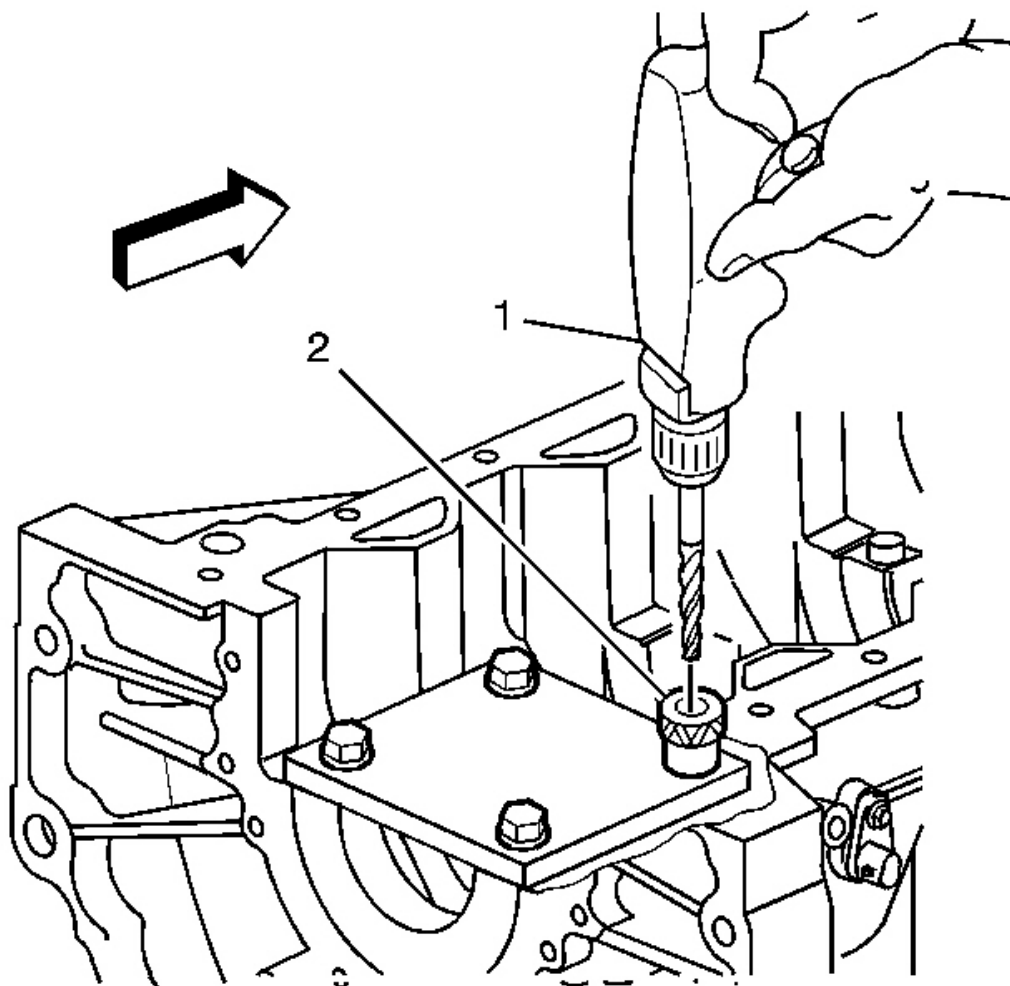
1. Position the fixture plate (3) with the bushing (2), installed over the crankshaft main cap bolt hole to be repaired.
2. Loosely install the fixture plate bolts (1) into the remaining crankshaft main cap bolt holes.





**Fig. 455: View Of Alignment Pin & Fixture Retaining Bolts**  
Courtesy of GENERAL MOTORS CORP.

3. Position the alignment pin (1) through the bushing and into the crankshaft main cap bolt hole.
4. With the alignment pin in the desired crankshaft main cap bolt hole, tighten the fixture retaining bolts (2).
5. Remove the alignment pin (1) from the crankshaft main cap bolt hole.



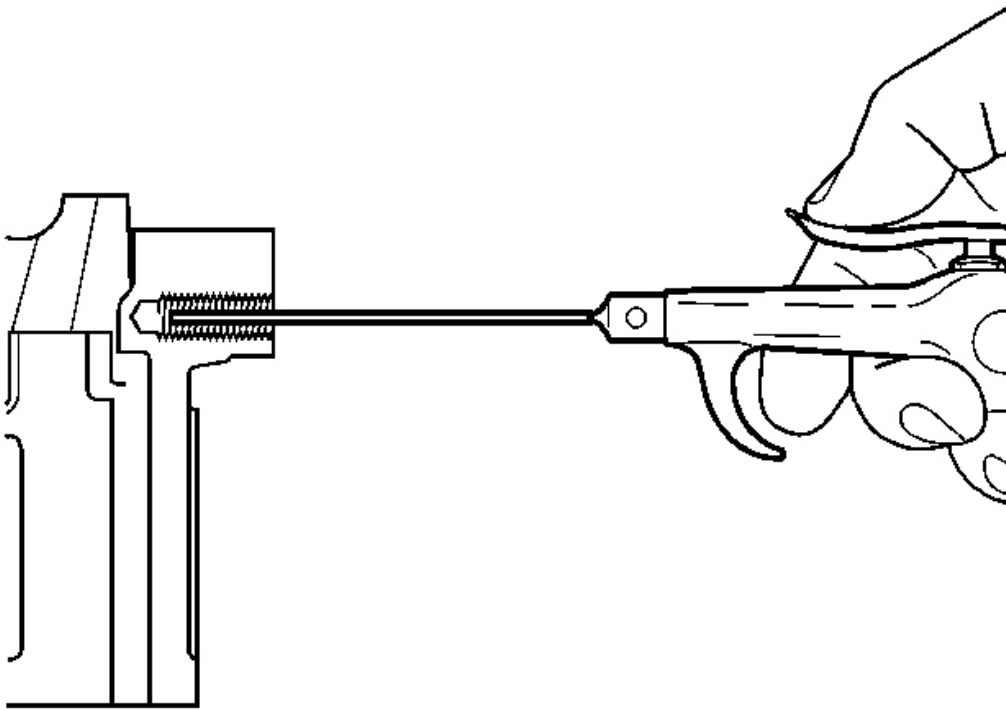
**Fig. 456: Drilling Bushing**

Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

- During the drilling process, it is necessary to repeatedly remove the drill and clean chips from the hole and the flutes of the drill.
- Drill the crankshaft main bolt hole until the mark (1) on the drill aligns with the top of the drill bushing (2).

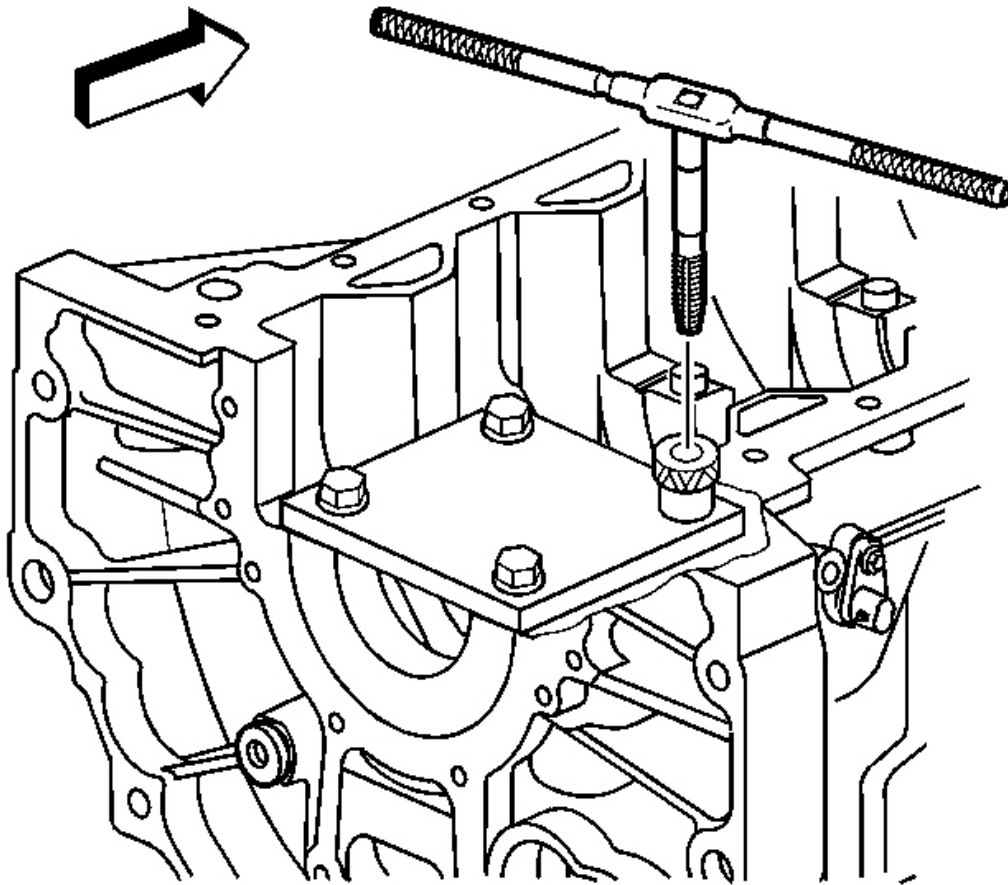
6. Drill out the threads of the damaged hole.



**Fig. 457: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the drilled hole prior to tapping.

7. Using compressed air, clean out any chips.

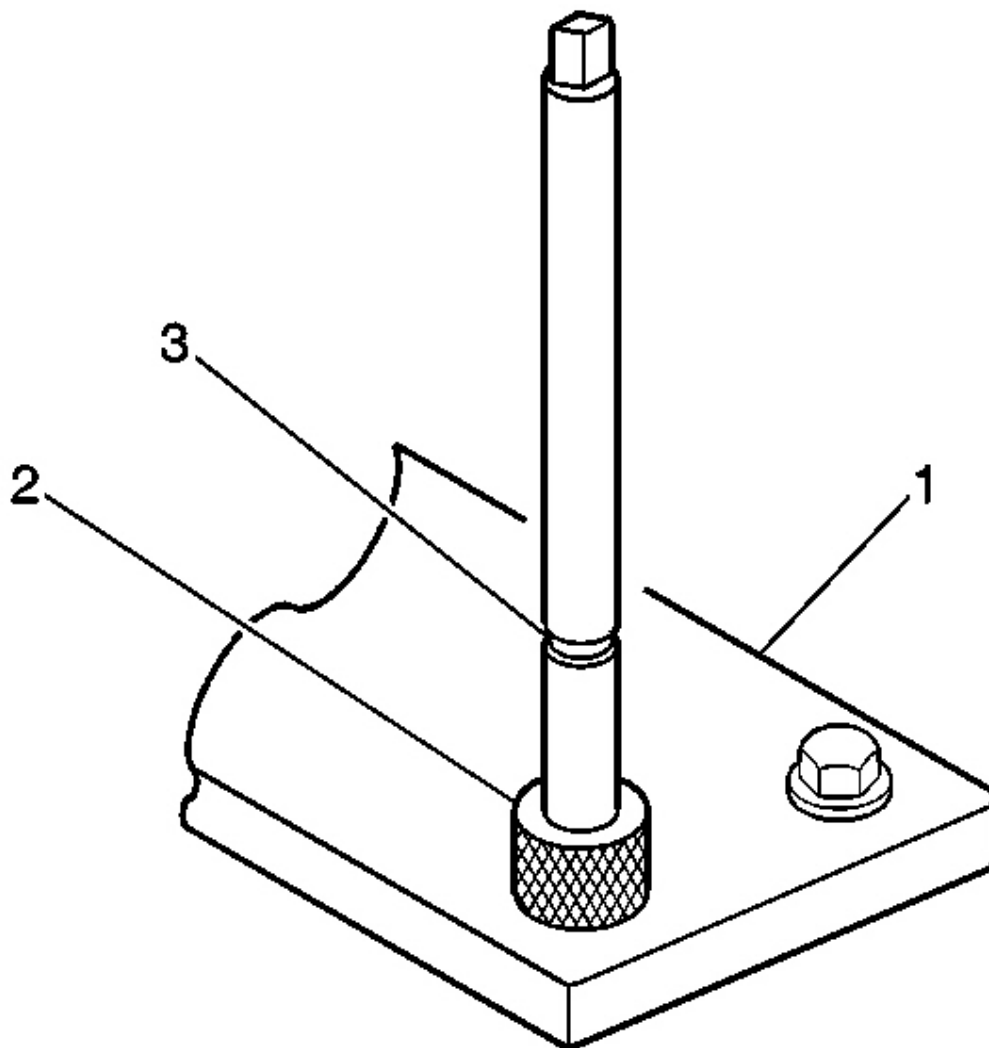


**Fig. 458: Tapping Out Threads Of Crankshaft Main Bolt Hole**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

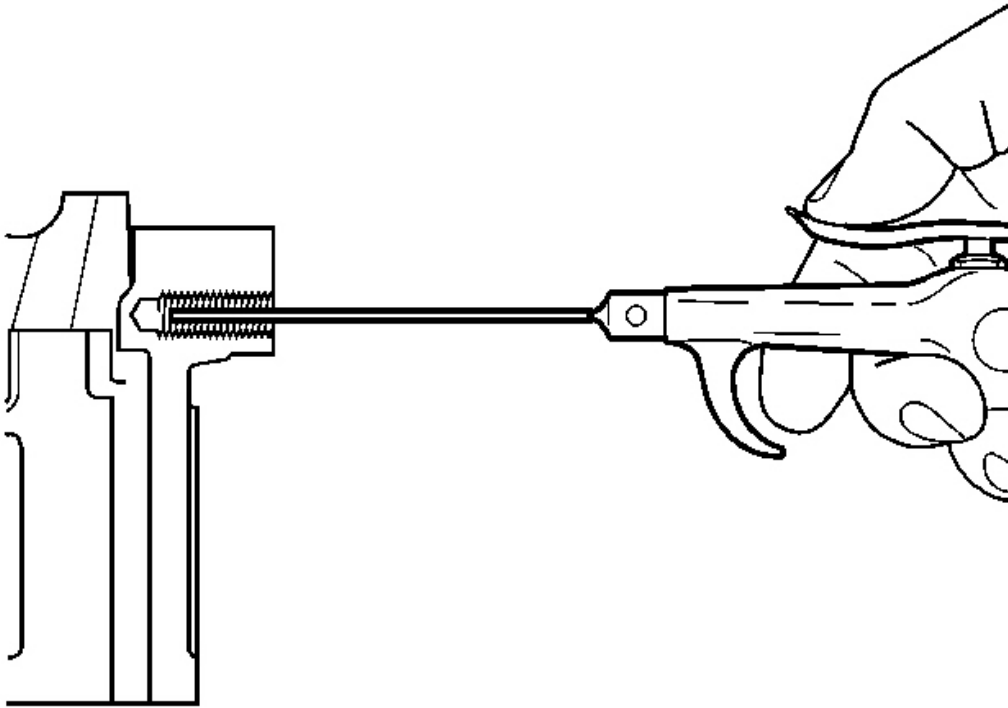
- Do not remove the fixture plate, ensure the fixture plate is installed during the machining and installation processes of the insert.
- During the tapping process, it is necessary to repeatedly remove the tap and clean chips from the hole and the flutes of the tap.
- Ensure the tap has created full threads at least to the depth equal to the insert length.

8. Using a suitable tapping wrench, tap the threads of the drilled hole.



**Fig. 459: View Of Fixture Plate, Drill Bushing & Tool Marking**  
Courtesy of GENERAL MOTORS CORP.

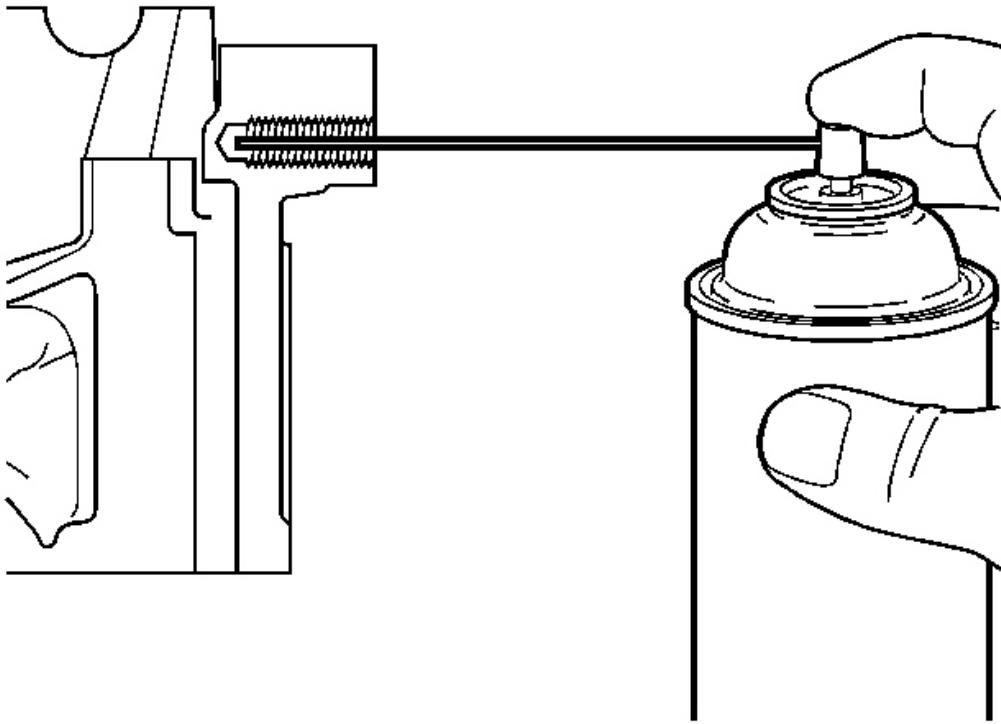
9. In order to tap the new threads for the insert to the proper depth, rotate the tap into the crankshaft main cap bolt hole until the mark (3) on the tap aligns with the top of the drill bushing (2).



**Fig. 460: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

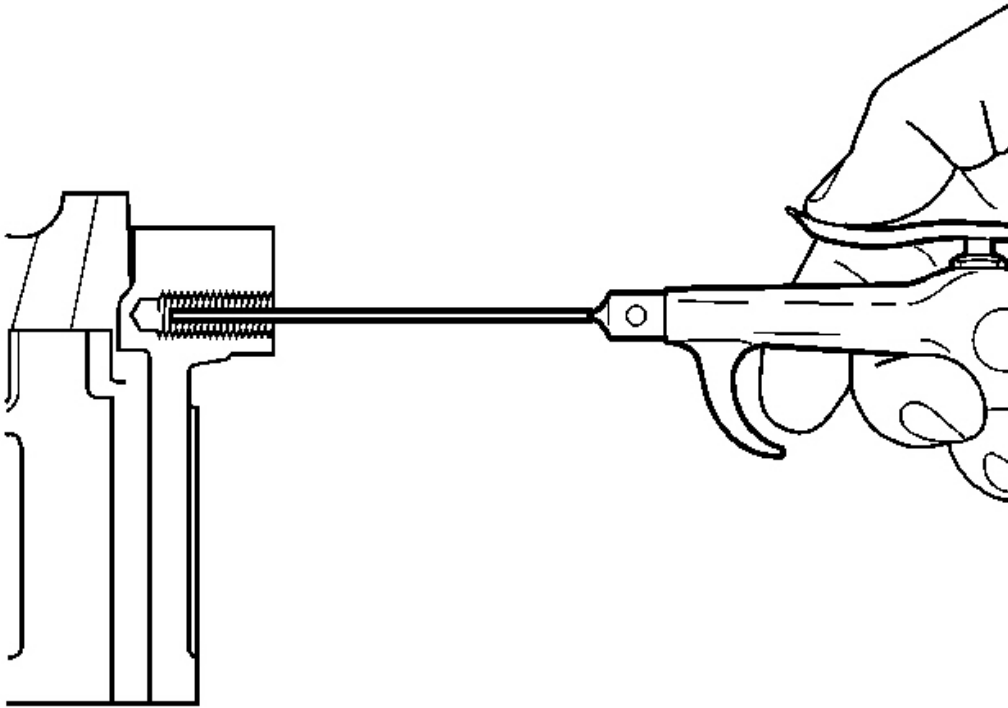
**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

10. Using compressed air, clean out any chips.



**Fig. 461: Spraying Cleaner Into Tapped Hole**  
Courtesy of GENERAL MOTORS CORP.

11. Spray cleaner into the tapped hole.

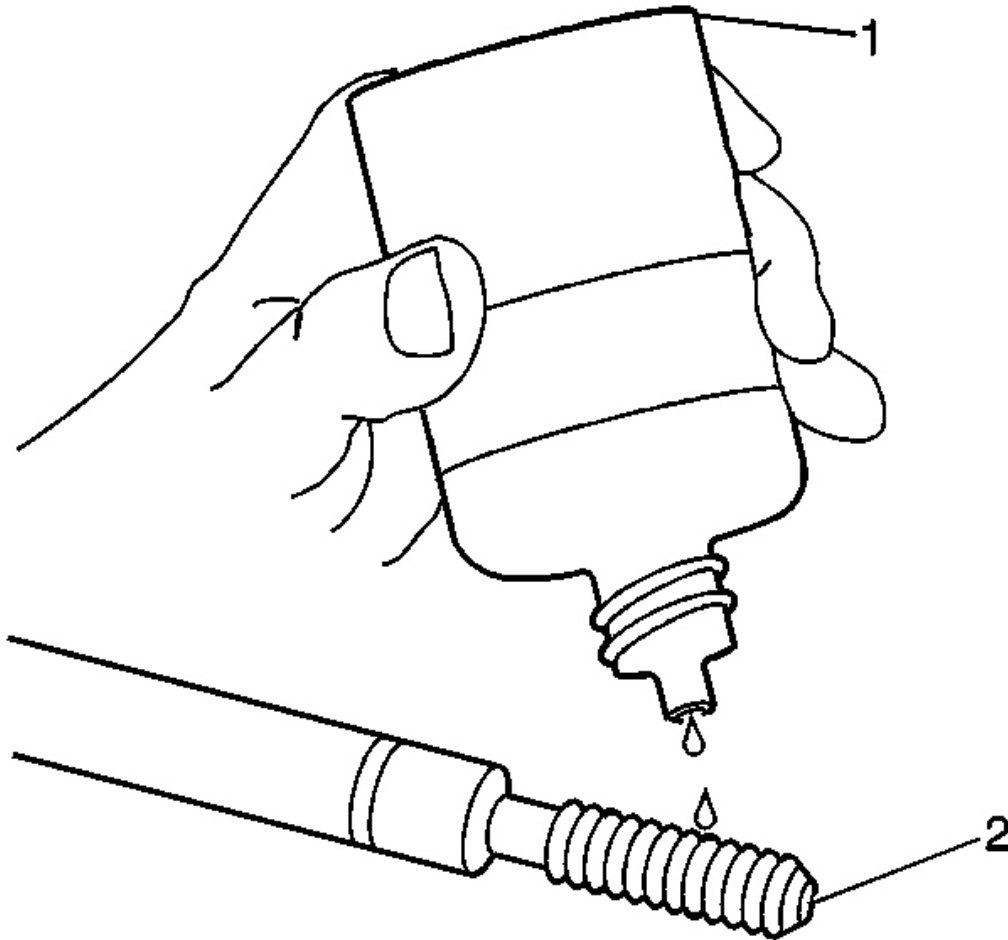


**Fig. 462: Cleaning Out Metal Chips**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** All chips must be removed from the tapped hole prior to insert installation.

12. Using compressed air, clean out any chips.



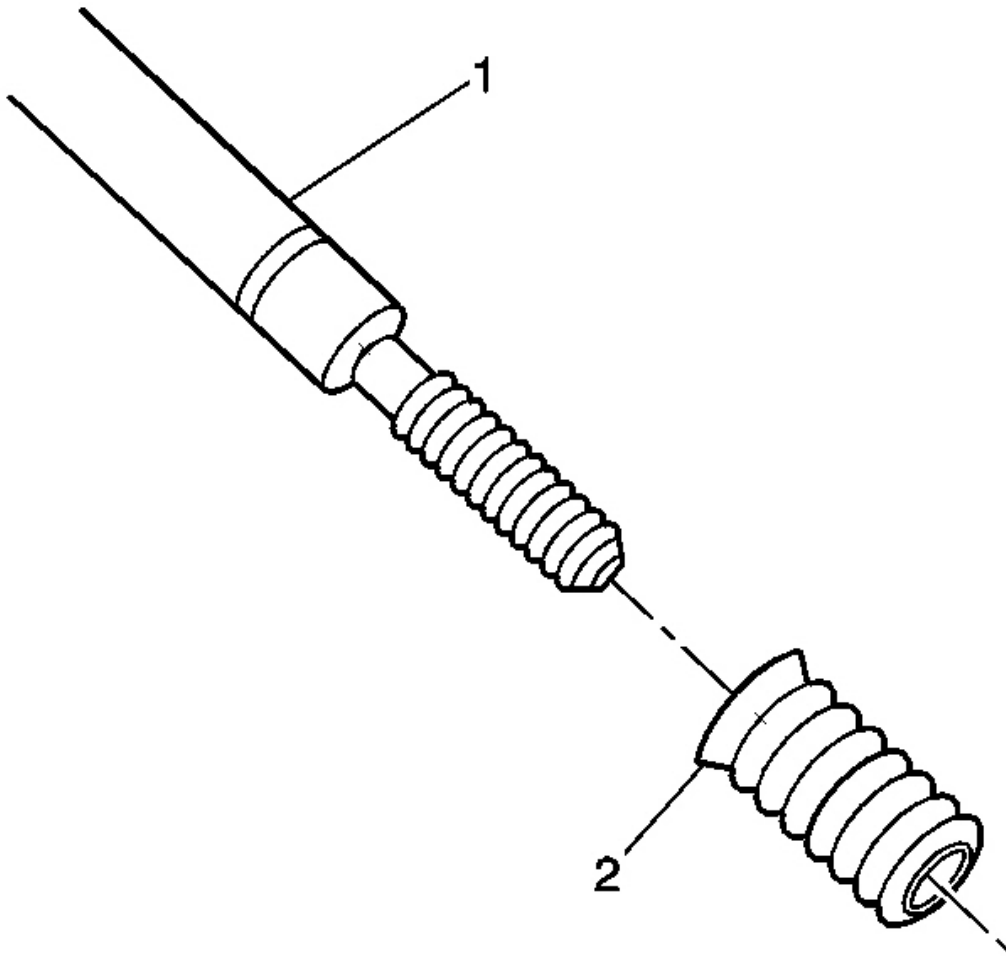


**Fig. 463: Lubricating Installer Tool Using Driver Oil**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:**

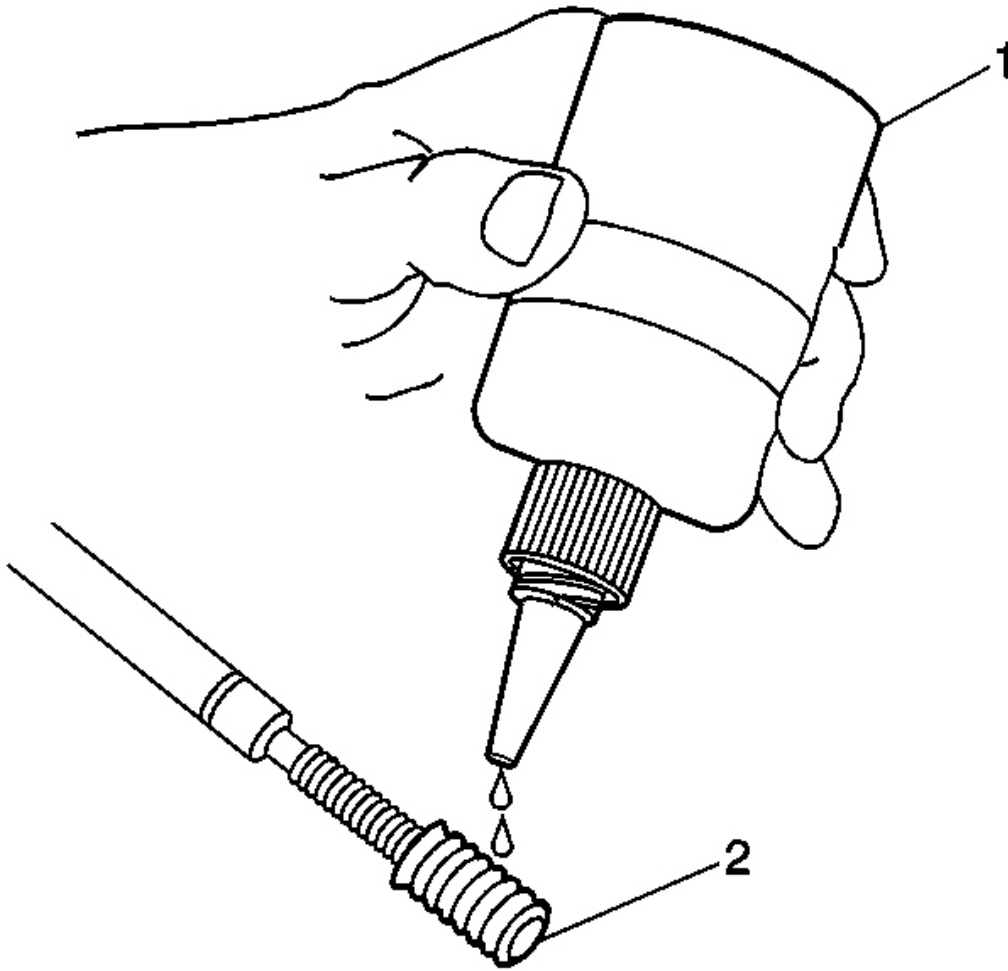
- Do not remove the fixture plate, ensure the fixture plate is installed during the installation process of the insert.
- Do not allow oil or other foreign material to contact the outside diameter (OD) of the insert.

13. Lubricate the threads of the driver installation tool (2) with the driver oil (1) J 42385-110.



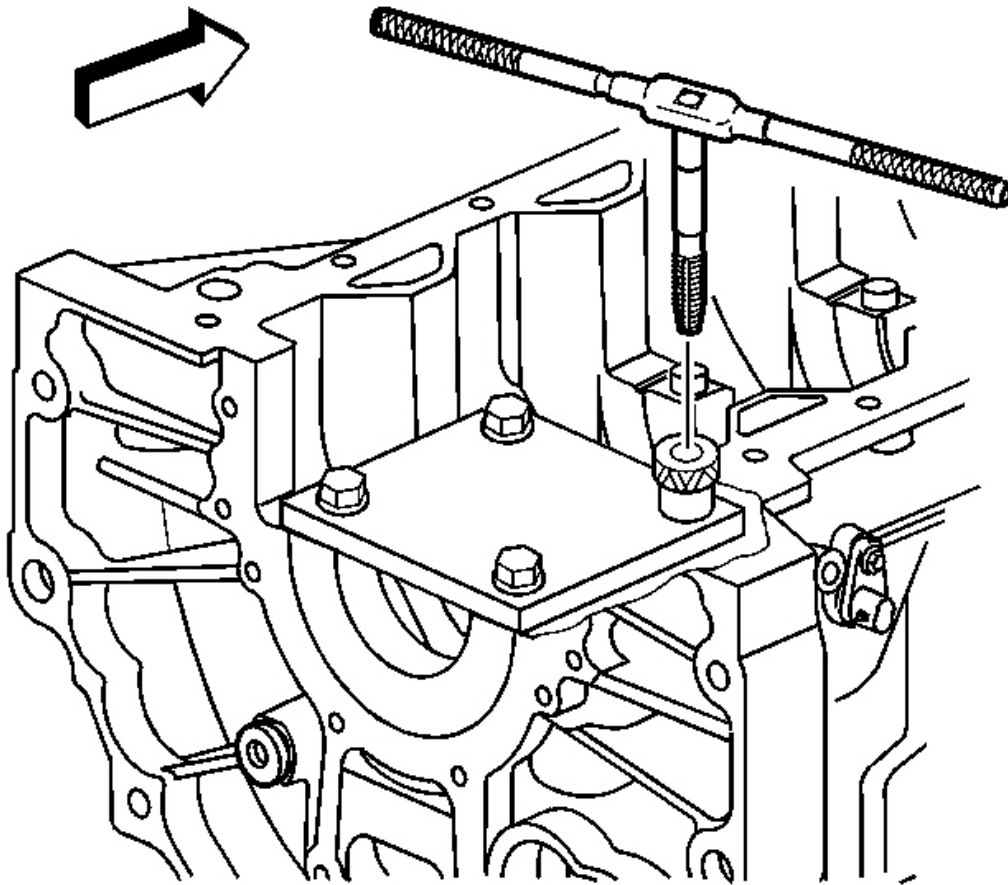
**Fig. 464: View of Bushing Type Insert**  
**Courtesy of GENERAL MOTORS CORP.**

14. Install the insert (2) onto the driver installation tool (1).



**Fig. 465: Applying Threadlock To Insert**  
**Courtesy of GENERAL MOTORS CORP.**

15. Apply threadlock sealant (1) to the insert OD threads (2).



**Fig. 466: Tapping Out Threads Of Crankshaft Main Bolt Hole**  
Courtesy of GENERAL MOTORS CORP.

16. Install the insert and installation driver (1) into the tapped hole.
17. Start the insert into the threaded hole.

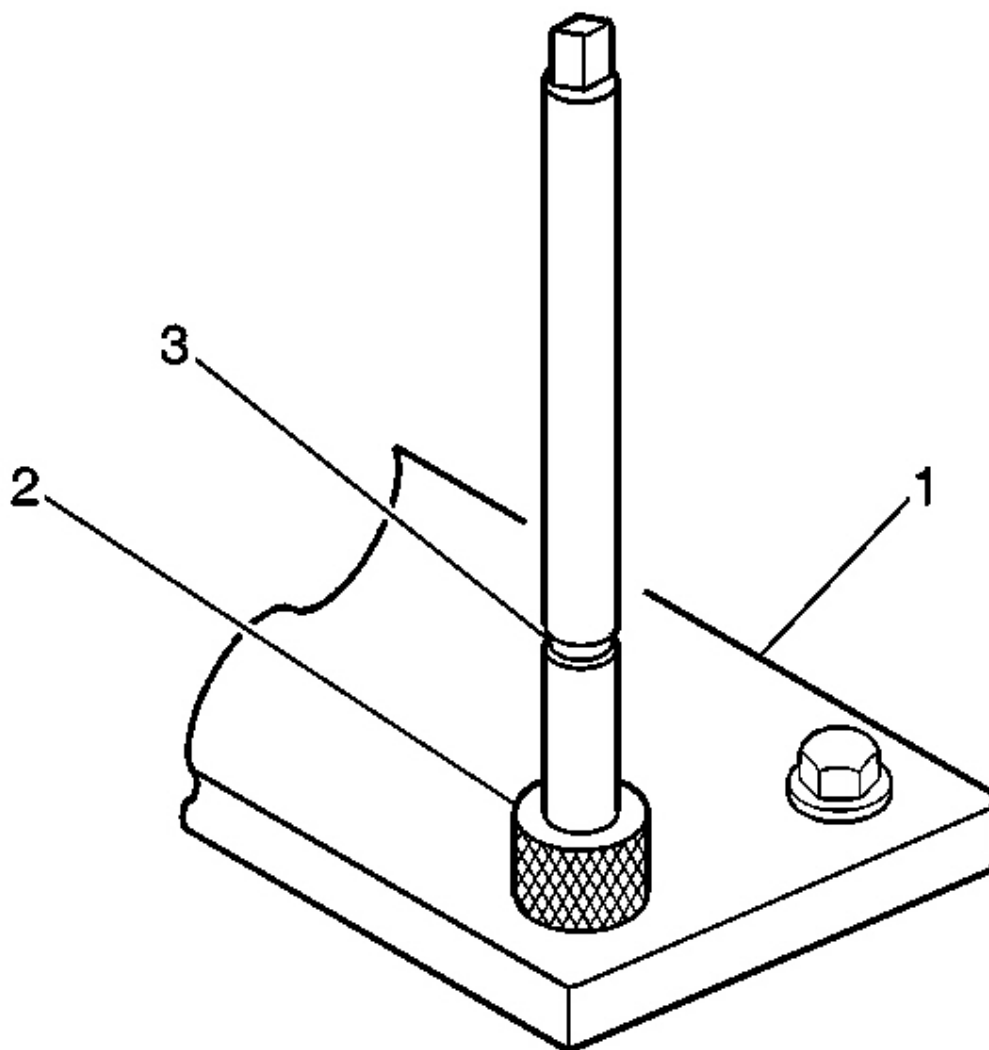
**IMPORTANT:** If the insert will not thread down until the flange contacts the counterbored surface remove the insert immediately with a screw extracting tool and inspect the tapped hole for any remaining chips and/or improper tapping.

18. Install the insert until the flange of the insert contacts the counterbored surface.

**IMPORTANT:** The driver installation tool will tighten up before screwing completely through the insert. This is acceptable. The threads at the bottom of the

**insert are being formed and the insert is mechanically locking the insert into the base material threads.**

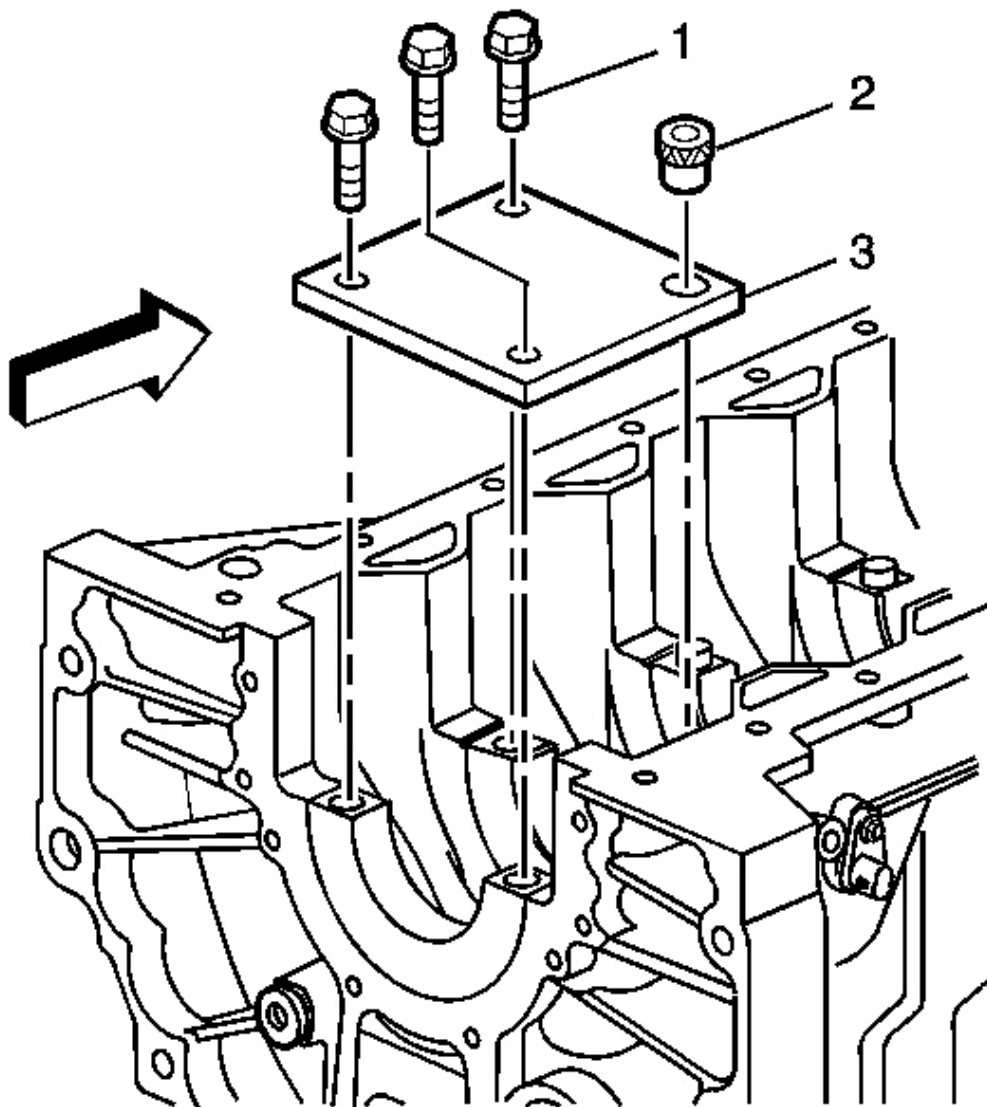
19. Continue to rotate the driver installation tool through the insert.



**Fig. 467: View Of Fixture Plate, Drill Bushing & Tool Marking**  
**Courtesy of GENERAL MOTORS CORP.**

20. Rotate the driver installation tool until the mark (3) on the driver installation tool aligns with the top of the drill bushing (2).

21. Inspect the insert for proper installation into the tapped hole.



**Fig. 468: View Of Fixture Plate, Bolts & Bushing**  
**Courtesy of GENERAL MOTORS CORP.**

22. Remove the fixture plate bolts (1).
23. Remove the fixture plate (3) and bushing (2).

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

### SERVICE PRIOR TO ASSEMBLY

Dirt will cause premature wear of the rebuilt engine. Clean all of the components. Use the proper tools in order to measure components when inspecting for excessive wear. Repair or replace the components that are not within the manufacturers specification. When components are reinstalled into an engine, return the components to their original location, position, and direction. During assembly, lubricate all of the moving parts with clean engine oil or engine assembly lubricant (unless otherwise specified). This will provide initial lubrication when the engine is first started.

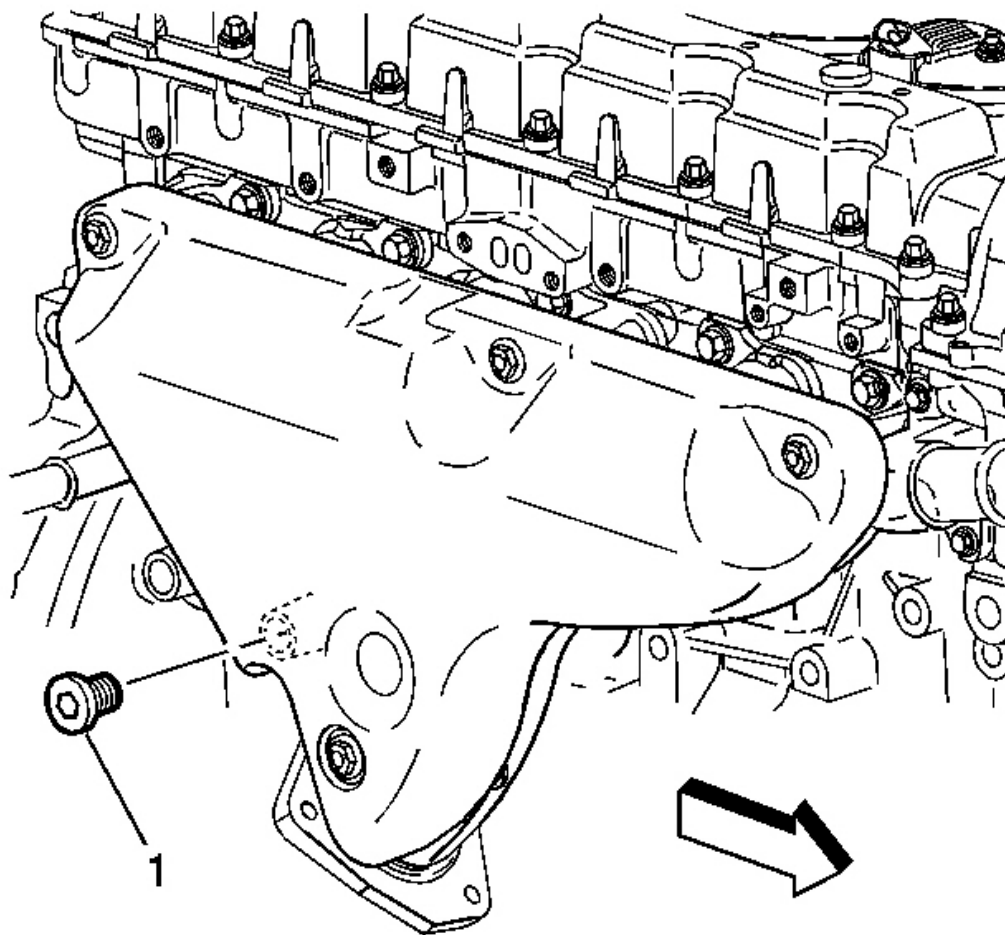
### ENGINE PRELUBING

#### Tools Required

**J 45299** Engine Preluber. See Special Tools and Equipment.

**IMPORTANT:** A constant/continuous flow of clean engine oil is required to properly prime the engine. Be sure to use an approved engine oil as specified in the owners manual.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.



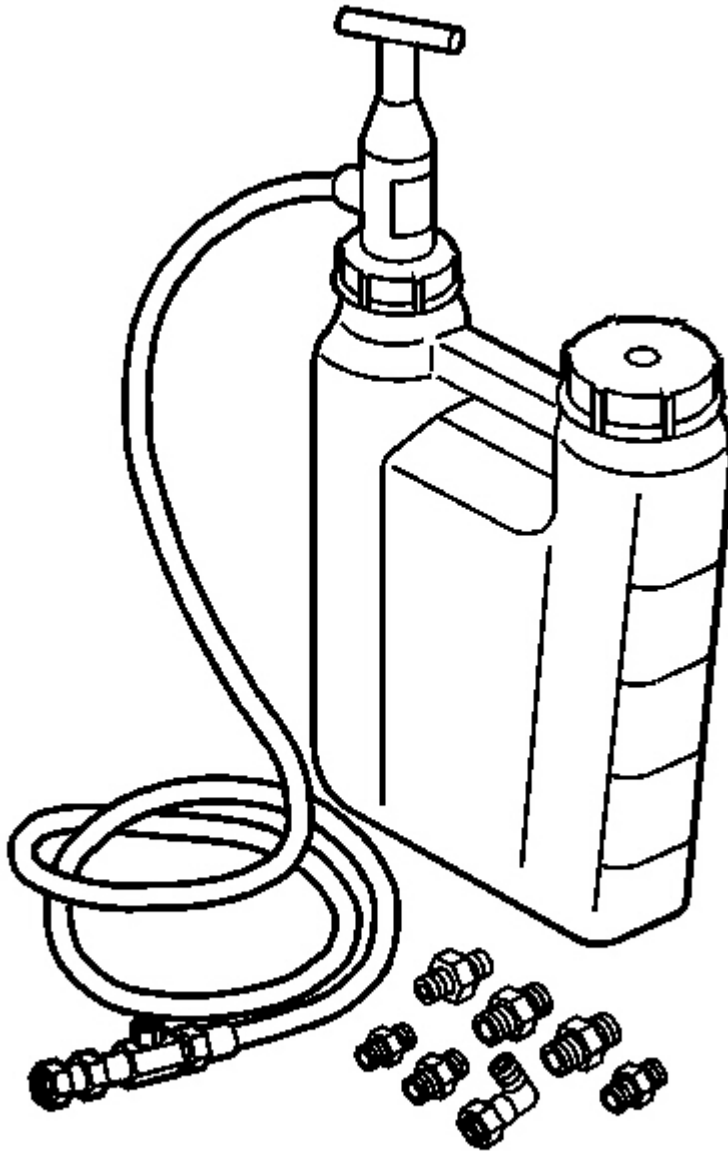
**Fig. 469: View Of Engine Block Oil Gallery Plug**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the engine oil filter, fill with clean engine oil, and reinstall.

**Tighten:** Tighten the oil filter to 30 N.m (22 lb ft).

2. Remove the engine block oil gallery plug (1).
3. Install the M16 x 1.5 adapter P/N 509375.
4. Install the flexible hose to the adapter and open the valve.
5. Pump the handle on **J 45299** to flow a minimum of 1-2 quarts of engine oil. Observe the flow of engine oil through the flexible hose and into the engine assembly. See **Special Tools and Equipment**





**Fig. 470: Identifying Engine Preluber J 45299**  
Courtesy of GENERAL MOTORS CORP.

6. Close the valve and remove the flexible hose and adapter from the engine.
7. Install the engine block oil gallery plug (1).

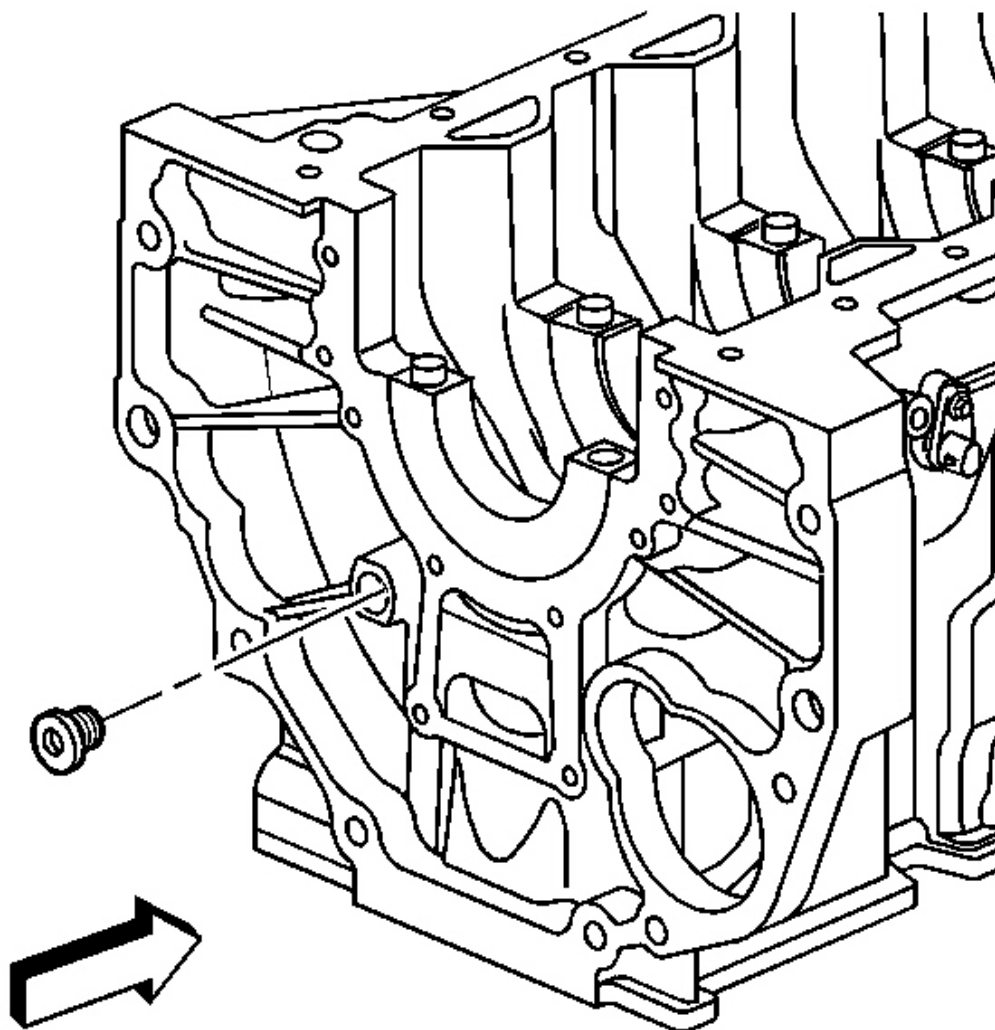
**Tighten:** Tighten the oil pressure sensor to 35 N.m (26 lb ft).

8. Top-off the engine oil to the proper level.

## **ENGINE BLOCK PLUG INSTALLATION**

1. Add sealer to the plug threads.

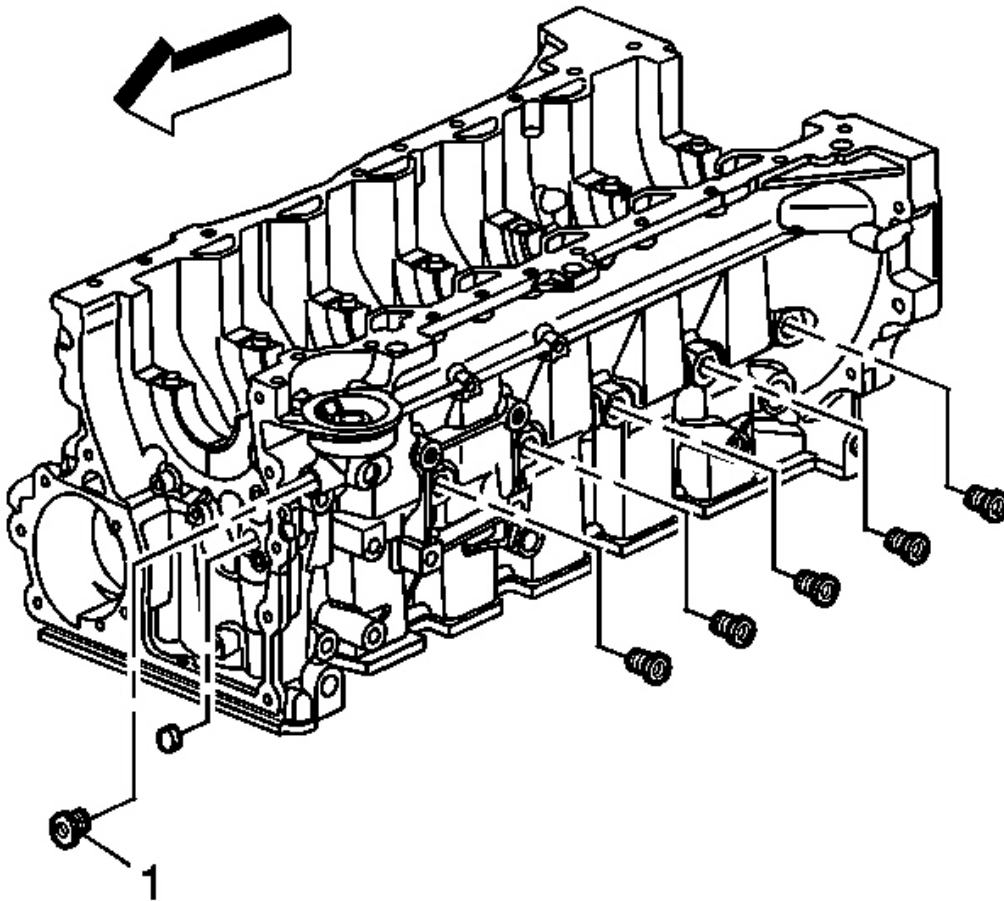
**NOTE:** Refer to Fastener Notice in Cautions and Notices.



**Fig. 471: View Of Oil Gallery Plug From Rear Of Block**  
Courtesy of GENERAL MOTORS CORP.

2. Install the engine block oil gallery plug to rear of block.

**Tighten:** Tighten the engine block oil gallery plug to 80 N.m (40 lb ft).

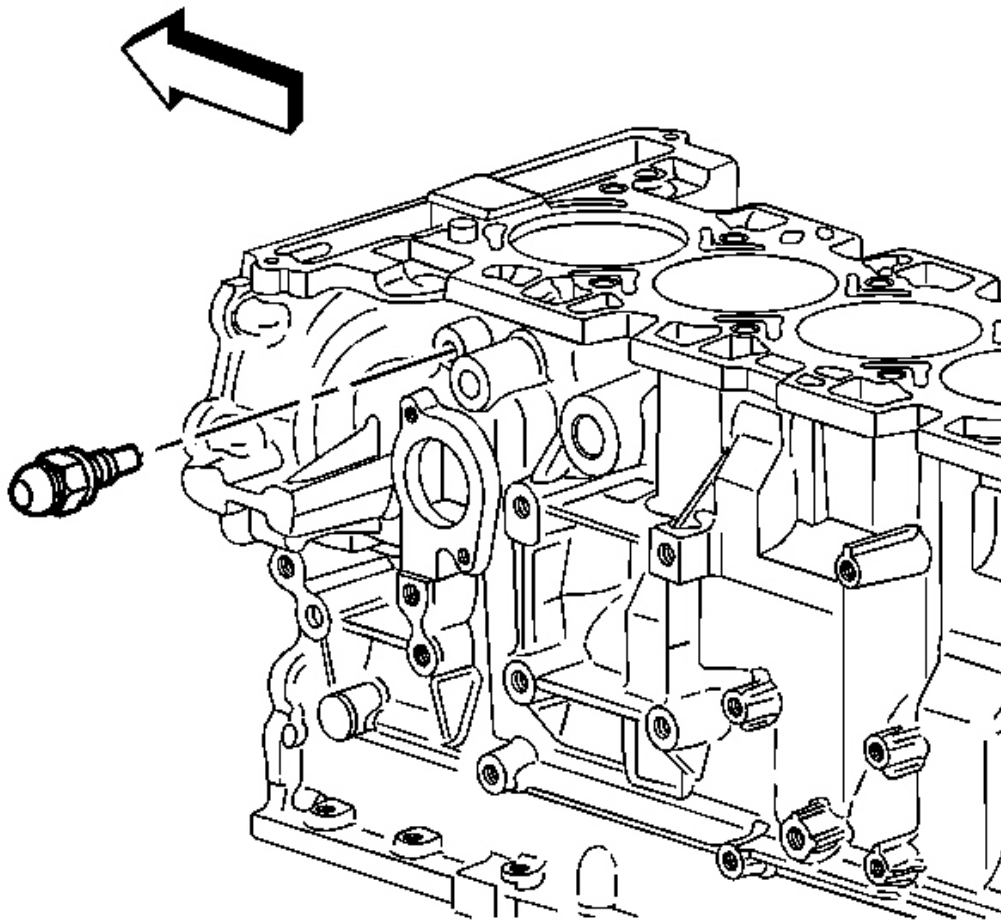


**Fig. 472: View Of Front Engine Block Oil Gallery Plug**  
Courtesy of GENERAL MOTORS CORP.

3. Add sealer to the plug threads.
4. Install the engine block oil gallery plugs to front and left of block.

**Tighten:**

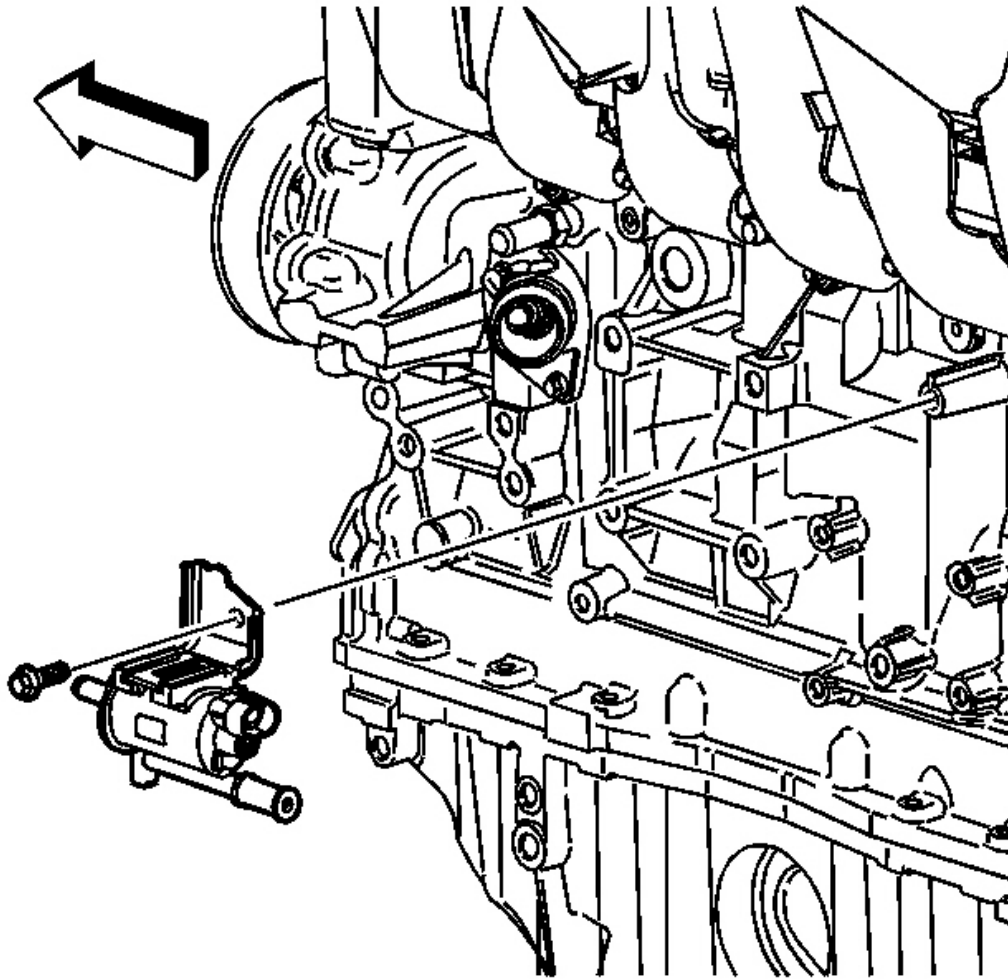
- Tighten the side engine block oil gallery plugs to 35 N.m (26 lb ft).
- Tighten the front (1) engine block oil gallery plug to 80 N.m (40 lb ft).



**Fig. 473: View Of Coolant Temperature Sensor**  
Courtesy of GENERAL MOTORS CORP.

5. Add sealer to the coolant temperature sensor threads.
6. Install the coolant temperature sensor.

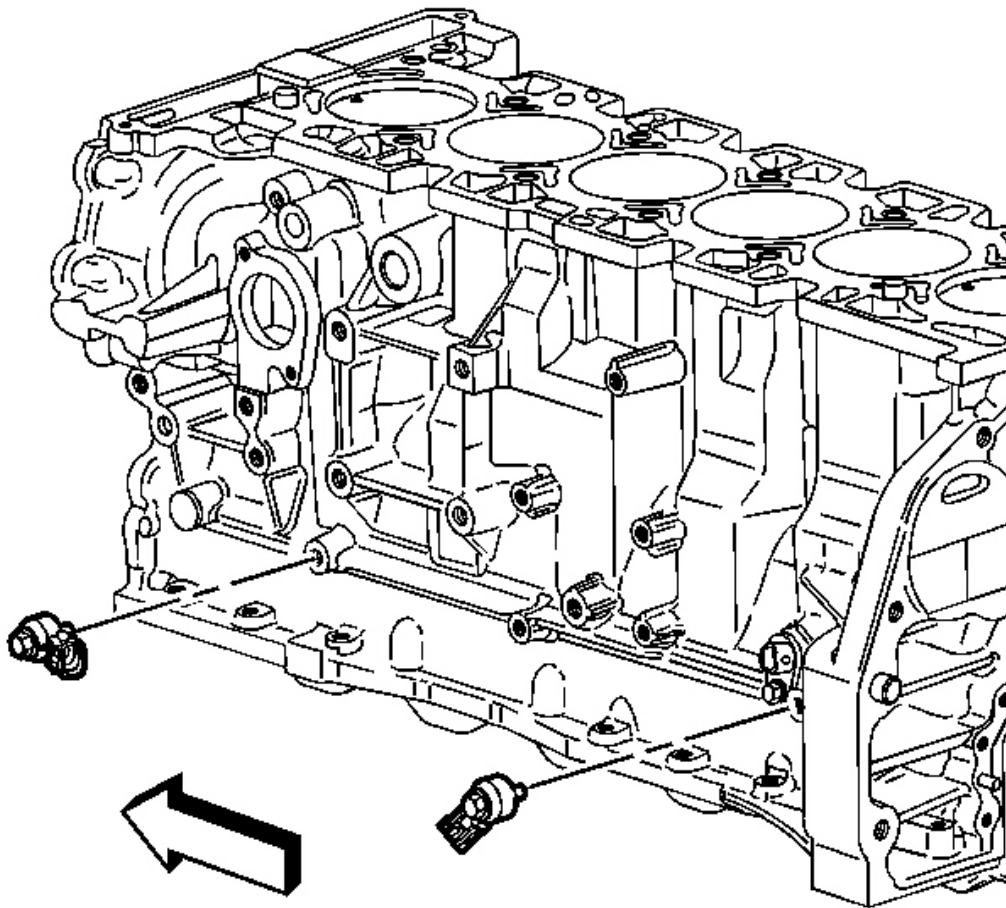
**Tighten:** Tighten the coolant temperature sensor to 20 N.m (15 lb ft).



**Fig. 474: View Of EVAP Solenoid**  
Courtesy of GENERAL MOTORS CORP.

7. Add sealer to the EVAP solenoid bolt threads.

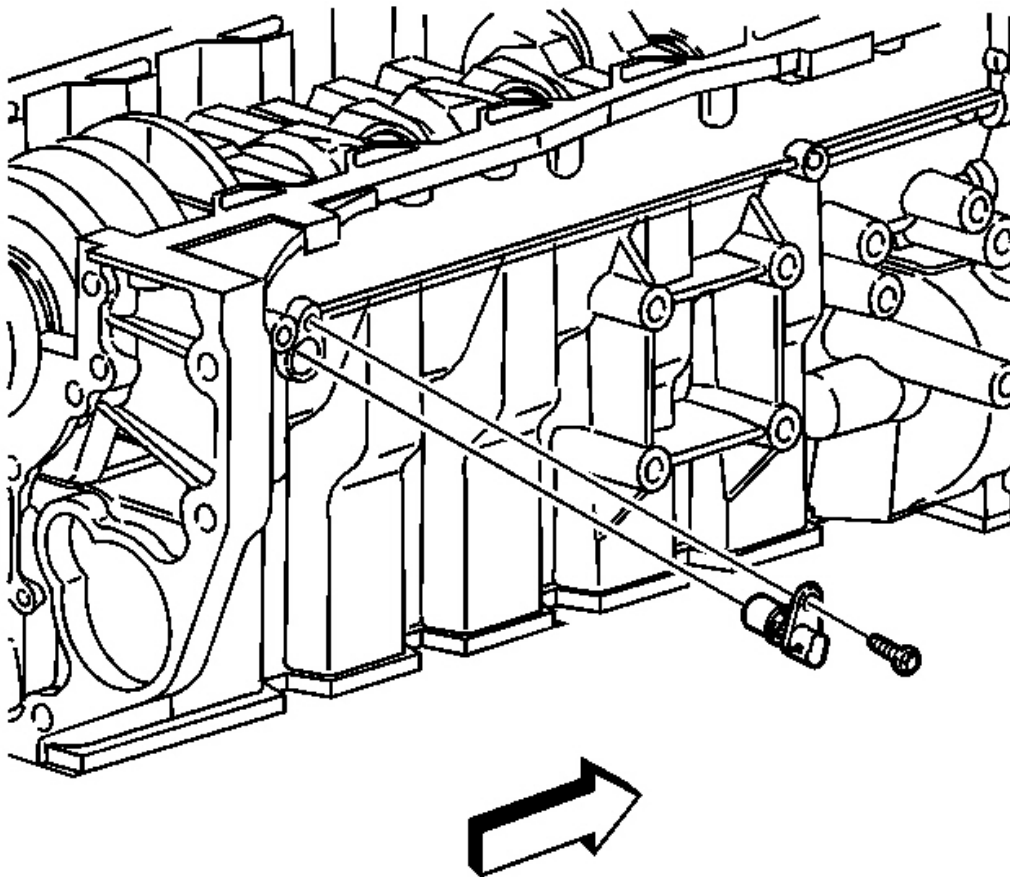
**Tighten:** Tighten the EVAP solenoid bolt to 10 N.m (89 lb in).



**Fig. 475: View Of Knock Sensors**  
Courtesy of GENERAL MOTORS CORP.

8. Install the knock sensors.

**Tighten:** Tighten the knock sensors to 25 N.m (18 lb ft).



**Fig. 476: View Of Crankshaft Position Sensor**  
Courtesy of GENERAL MOTORS CORP.

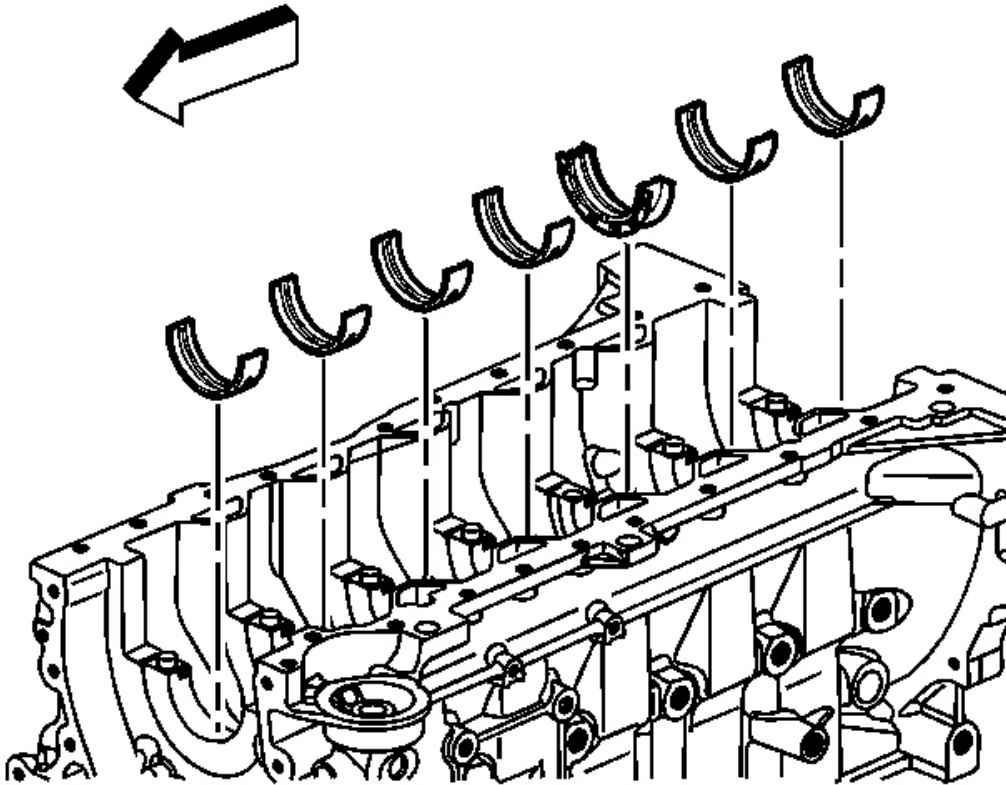
9. Add sealer to the crankshaft position sensor bolt.
10. Install the crankshaft position sensor and bolt.

**Tighten:** Tighten the crankshaft position sensor bolt to 10 N.m (89 lb in).

## CRANKSHAFT AND BEARINGS INSTALLATION

### Tools Required

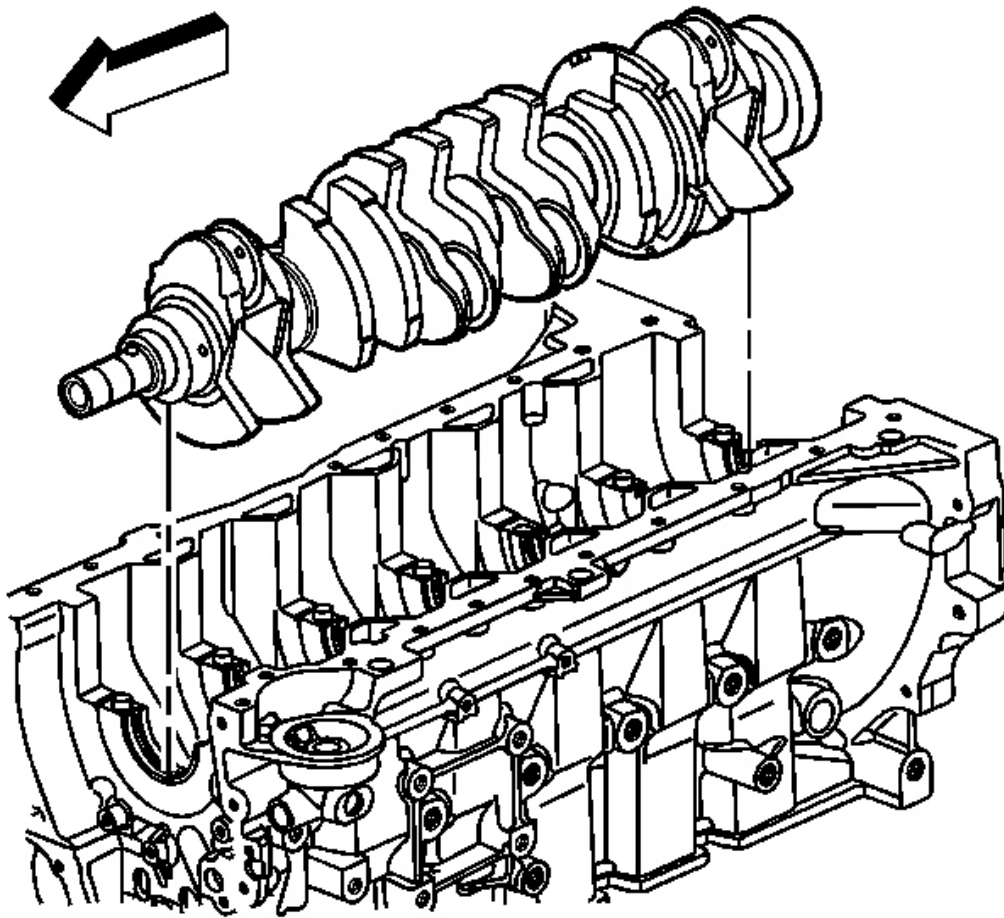
**J 45059** Angle Meter. See Special Tools and Equipment.



**Fig. 477: View Of Upper Crankshaft Main Bearing Halves**  
Courtesy of GENERAL MOTORS CORP.

1. Install the upper crankshaft main bearings into the block.

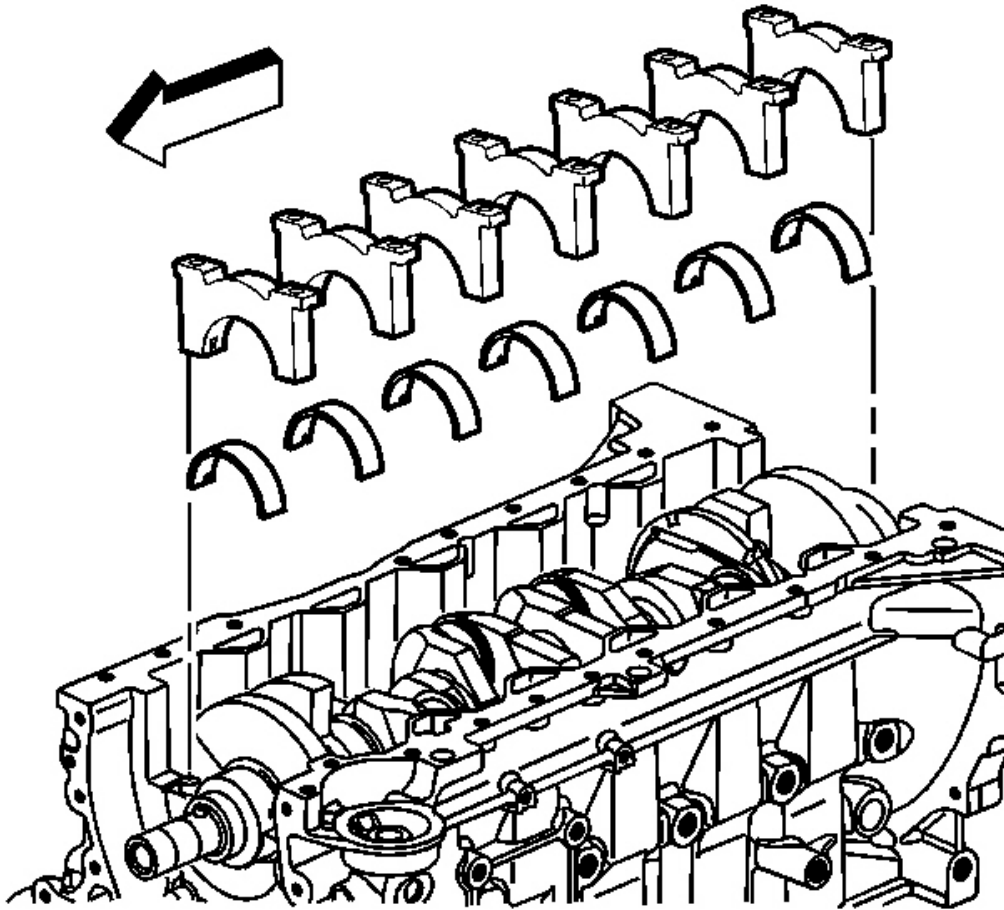




**Fig. 478: View Of Crankshaft**

Courtesy of GENERAL MOTORS CORP.

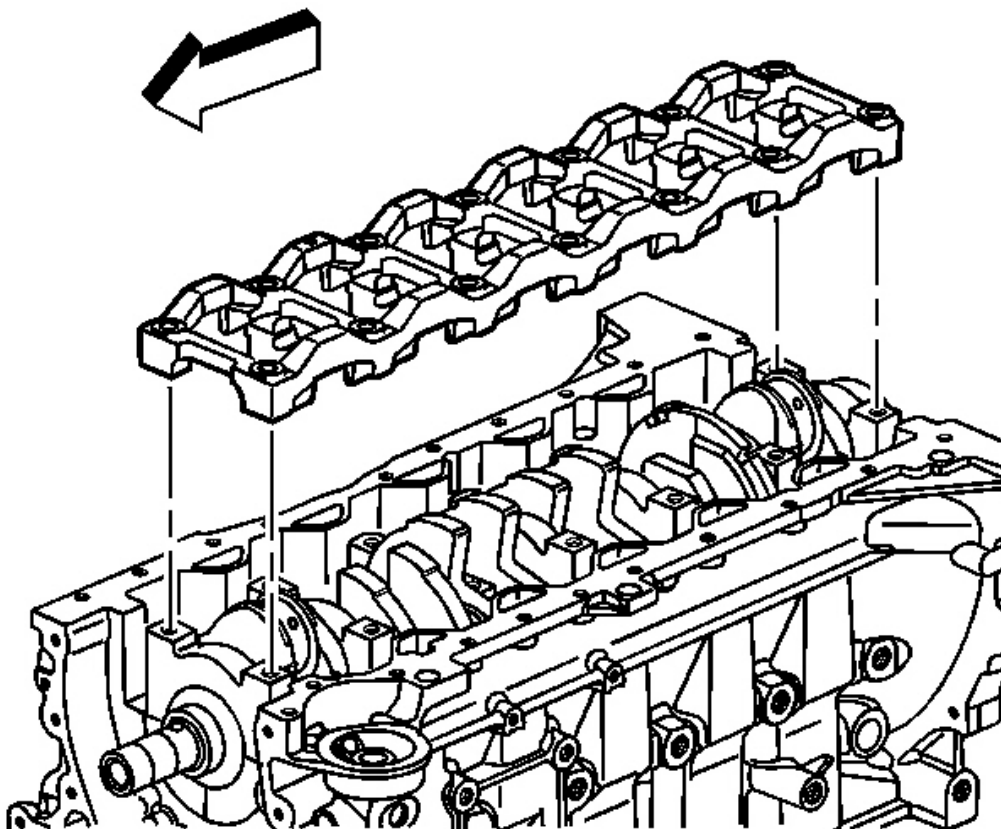
2. Lubricate the upper crankshaft main bearing surface with clean engine oil.
3. Install the crankshaft.



**Fig. 479: View Of Crankshaft Main Bearing Caps & Lower Bearings**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Refer to the pin stamp on the crankshaft main bearing caps for sequence and direction of installation. The pin stamp arrow points to the front of the engine.

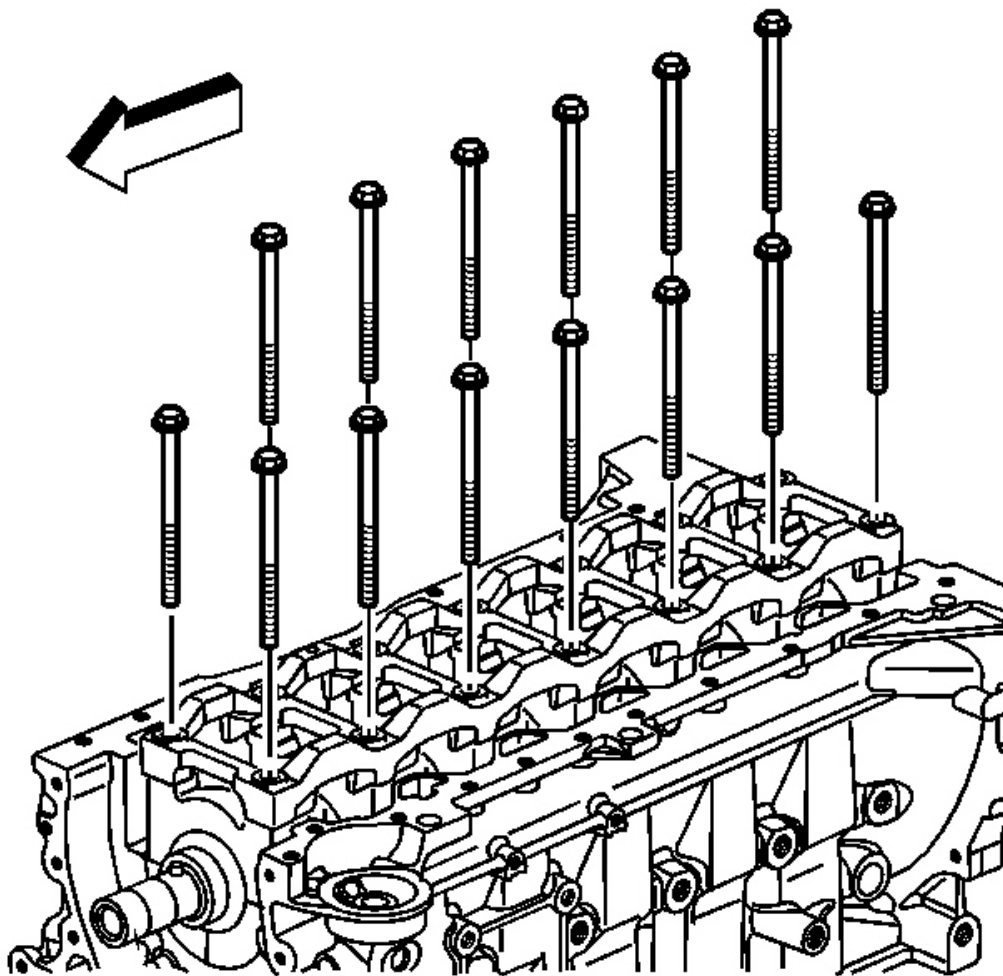
4. Install the lower crankshaft main bearings into the main bearing caps.
5. Lubricate the lower crankshaft main bearing surface with clean engine oil.
6. Install the crankshaft main bearing caps.



**Fig. 480: View Of Crankshaft Main Bearing Cap Stiffener**  
Courtesy of GENERAL MOTORS CORP.

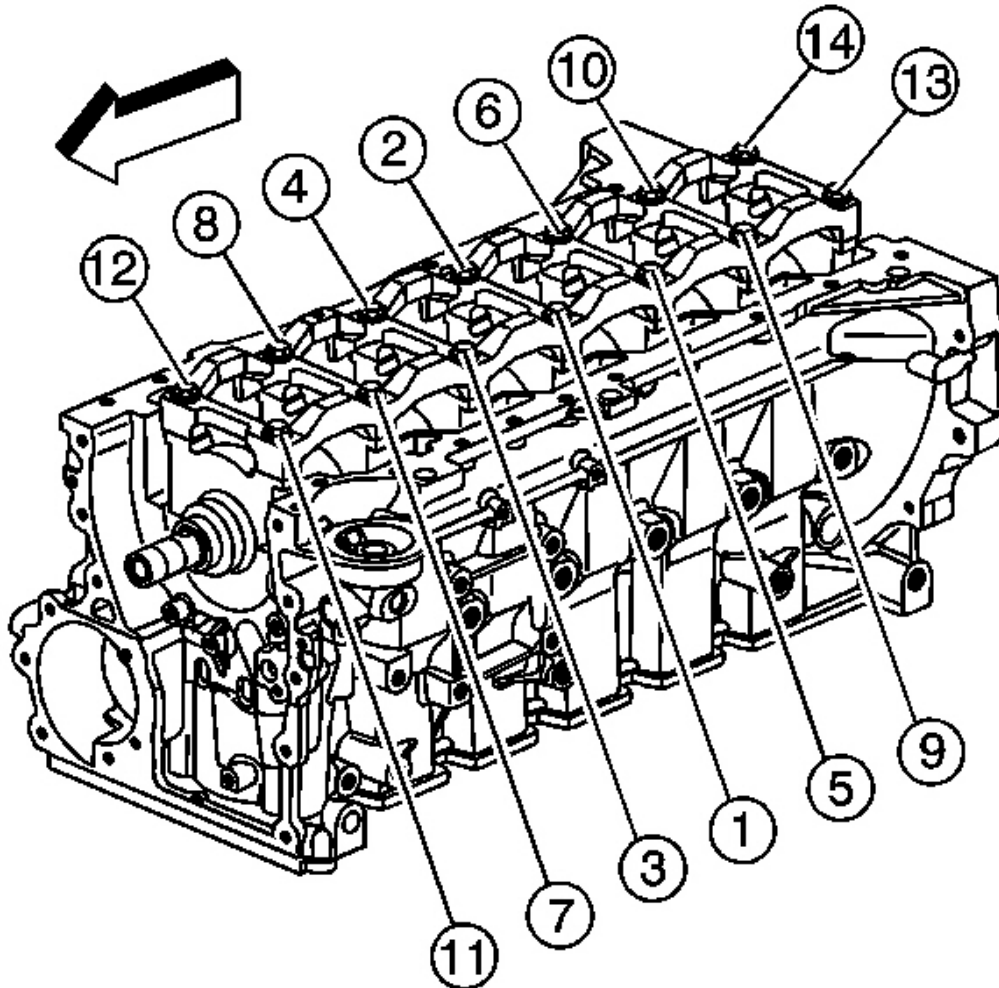
**IMPORTANT:** The crankshaft main bearing cap stiffener is directional. The end marked front goes to the front.

7. Install the crankshaft main bearing cap stiffener.



**Fig. 481: View Of Crankshaft Main Bearing Cap Bolts**  
Courtesy of GENERAL MOTORS CORP.

8. Install new crankshaft main bearing bolts. Start the crankshaft main bearing cap bolts by hand. Ensure the bottom of the crankshaft main bearing cap is parallel to the block surface.



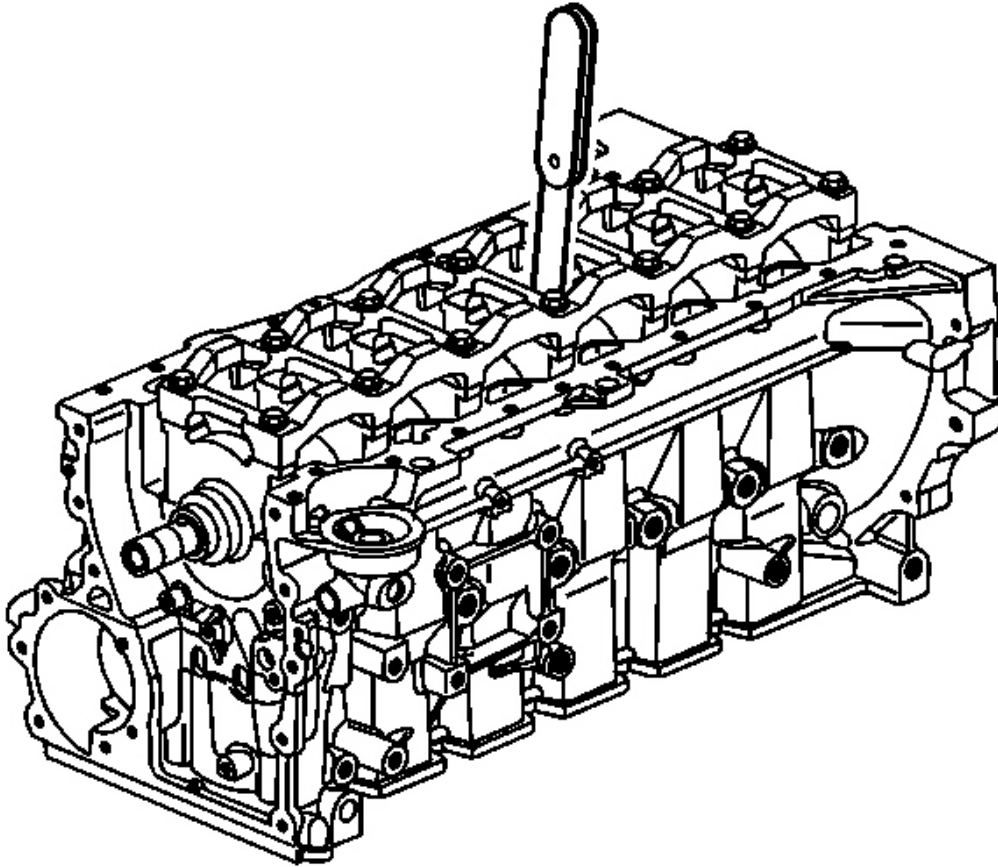
**Fig. 482: Tightening Sequence For Crankshaft Main Bearing Cap Bolts**  
 Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

9. Tighten the crankshaft main bearing cap bolts in equal increments.

**Tighten:**

1. Tighten the crankshaft main bearing cap bolts to 25 N.m (18 lb ft) in sequence.
2. Use **J 45059** to tighten the crankshaft main bearing cap bolts an additional 180 degrees. See **Special Tools and Equipment**.



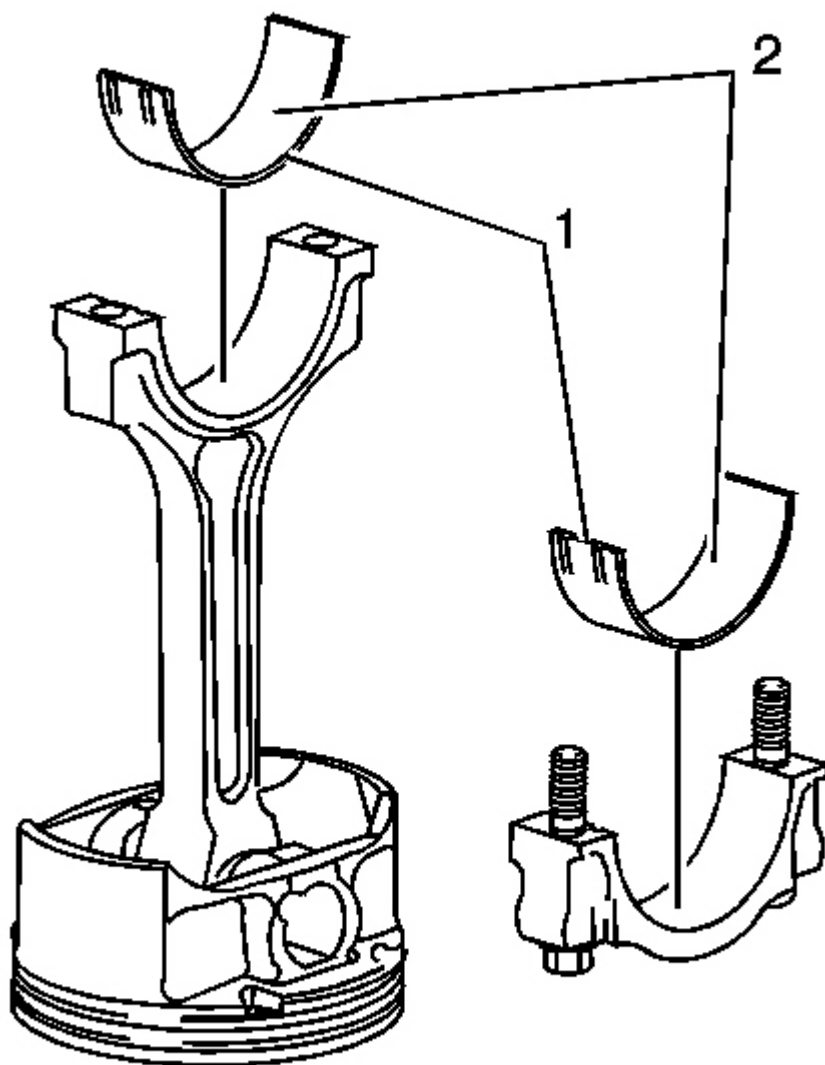
**Fig. 483: Measuring Crankshaft End Play**  
Courtesy of GENERAL MOTORS CORP.

10. Measure the crankshaft end play.
  1. Thrust the crankshaft forward or rearward.
  2. Insert a feeler gage between the thrust crankshaft bearing and the bearing surface of the crankshaft and measure the bearing clearance. Refer to **Engine Mechanical Specifications** for the proper clearance.
  3. If the bearing clearance is not within specifications, inspect the thrust surfaces for nicks, gouges or raised metal. Minor imperfections may be removed with a fine stone.

## **PISTON, CONNECTING ROD, AND BEARING INSTALLATION**

### **Tools Required**

- **J 45059** Angle Meter. See **Special Tools and Equipment**.
- **J 8037** Piston Ring Compressor. See **Special Tools and Equipment**.
- **J 41556** Connecting Rod Guide. See **Special Tools and Equipment**.



**Fig. 484: View Of Connecting Rods & Caps**  
**Courtesy of GENERAL MOTORS CORP.**

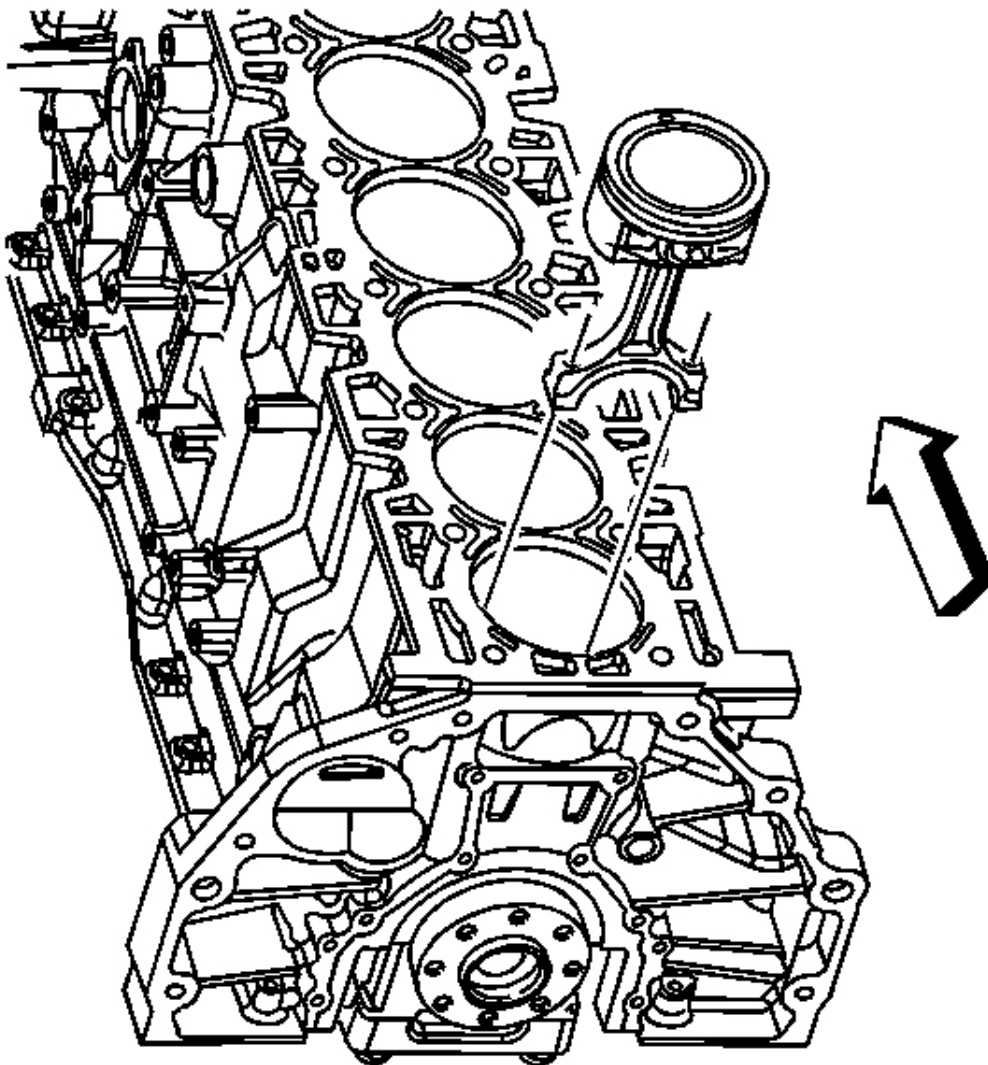
1. Rotate the crankshaft so the connecting rod journal for the piston being installed is at Bottom Dead

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

Center.

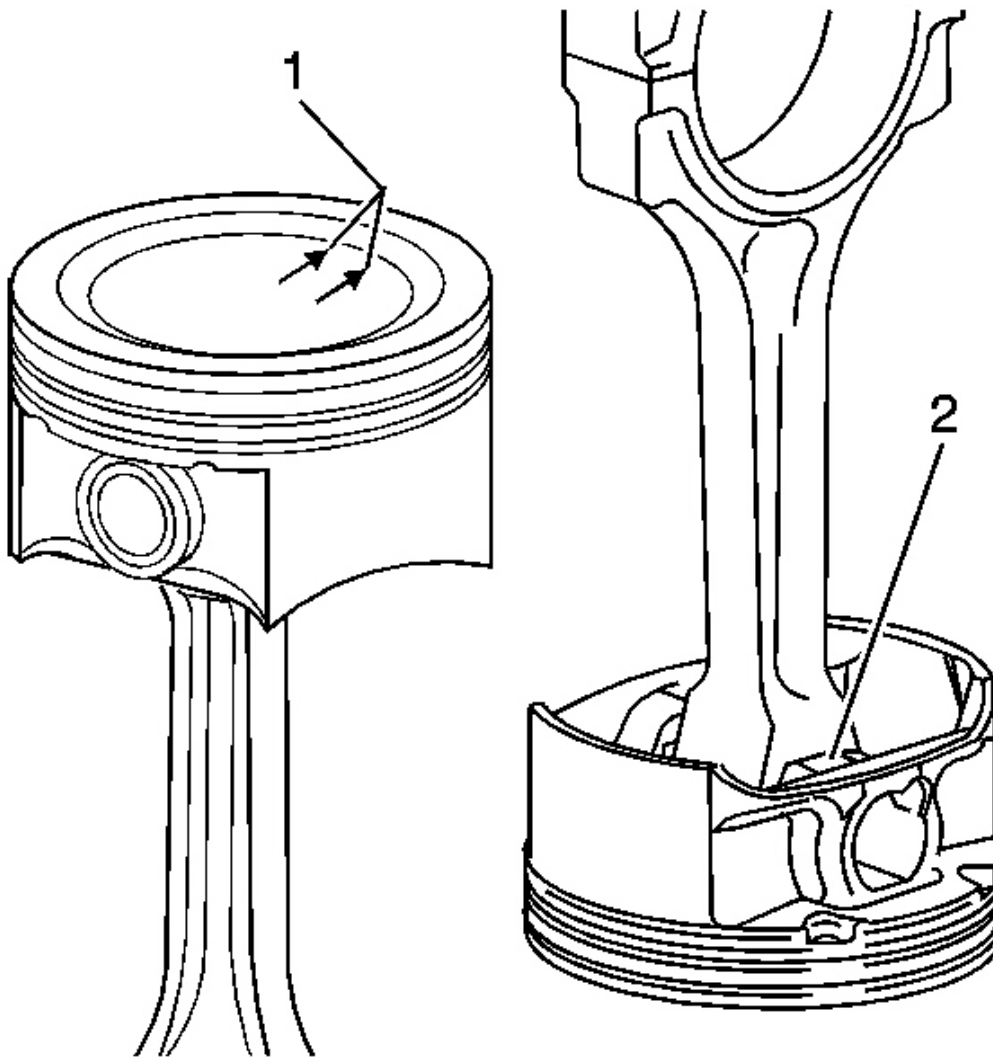
2. Lubricate the cylinder wall with engine oil.
3. Lubricate the piston and rings with engine oil.
4. Stagger the ring end gaps 90 degrees apart.
5. Install **J 8037** onto the piston and ring assembly to compress the rings. See **Special Tools and Equipment**.
6. Install the connecting rod bearings into the connecting rods and caps (1).





**Fig. 485: Lubricating Connecting Rod Bearing Contact Surface**  
Courtesy of GENERAL MOTORS CORP.

7. Lubricate the connecting rod bearing contact surfaces with engine oil (2).
8. Install the **J 41556** into the connecting rod. See **Special Tools and Equipment**.

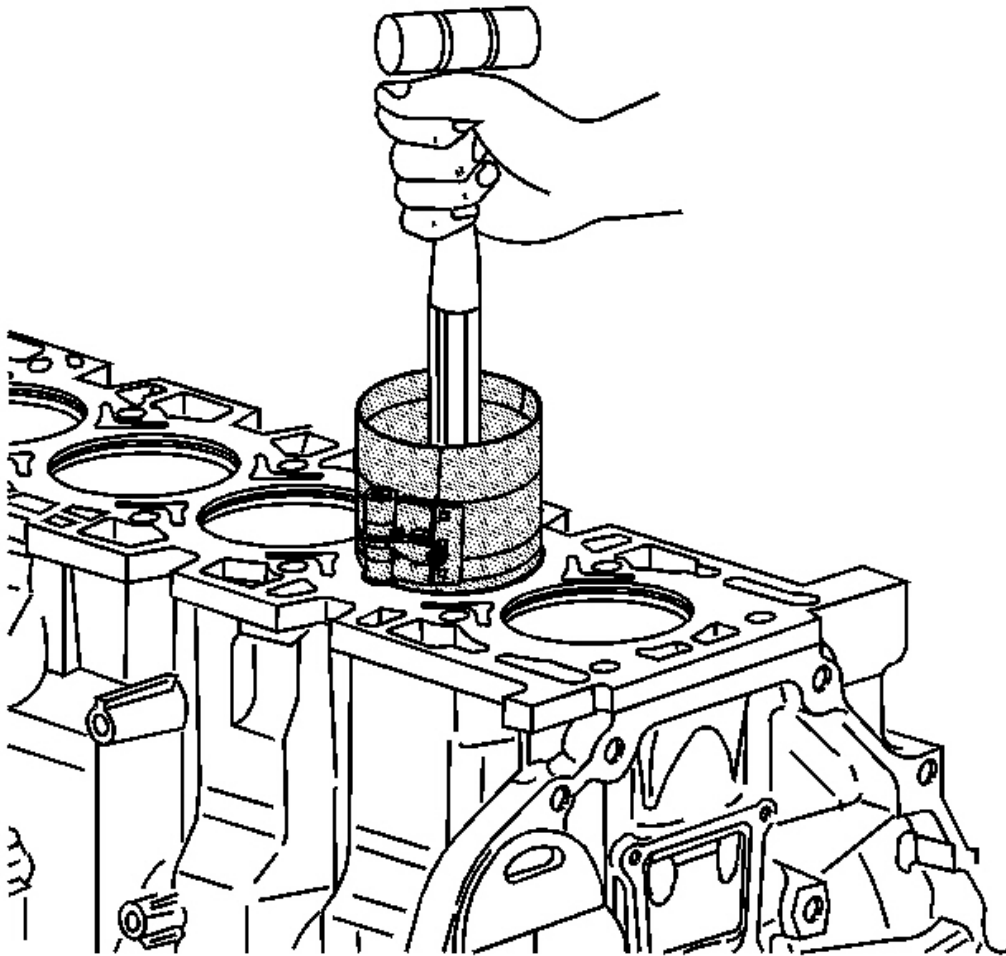


**Fig. 486: View Of Piston Alignment Mark & Flat Casting Boss**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** The piston and cylinder bore have been measured and the bore has been

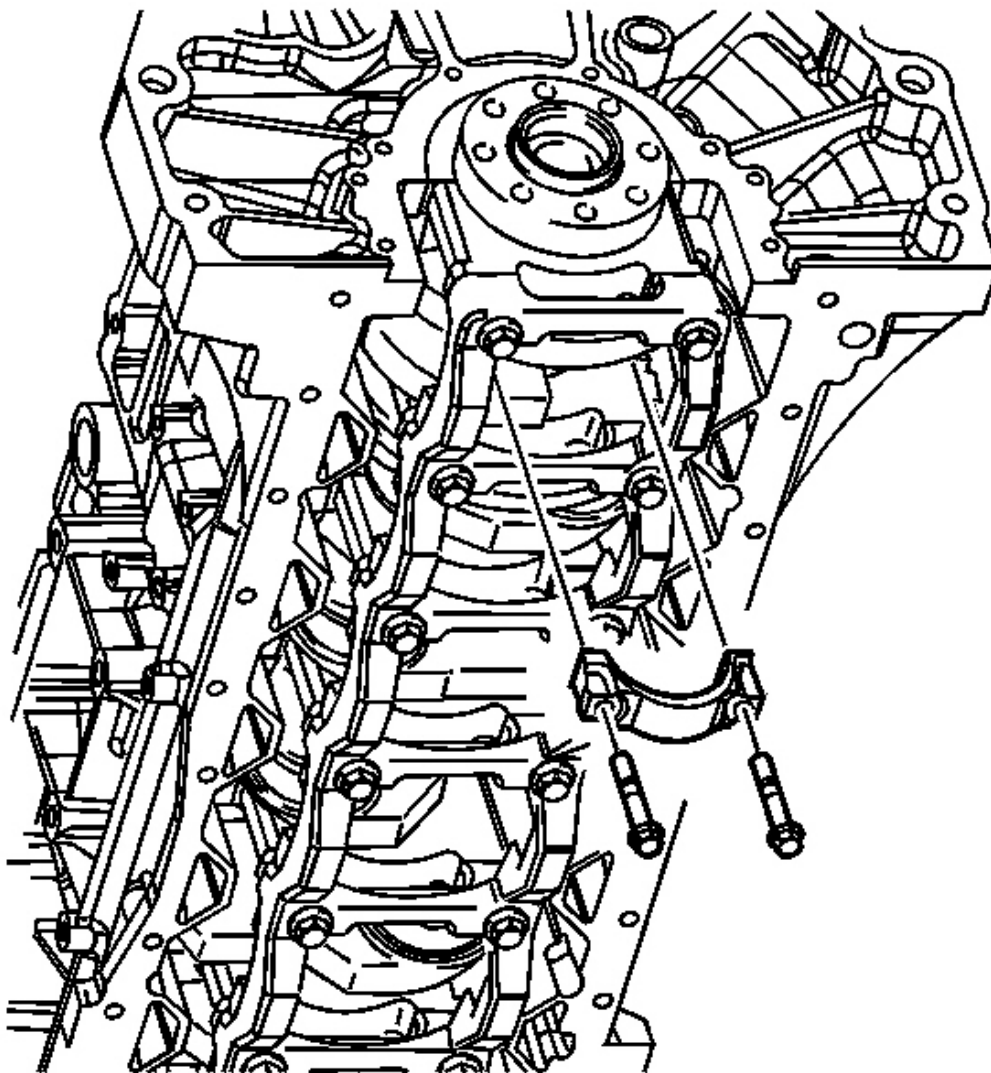
sized for the proper clearance. Install the piston and connecting rod assembly into the proper cylinder bore. The piston alignment mark **MUST** face the front of the engine block (1) or the flat casting boss (2).

9. Install the connecting rod and piston into the proper cylinder bore.



**Fig. 487: Tapping Piston Rings Into Cylinder Bore**  
Courtesy of GENERAL MOTORS CORP.

10. Hold the **J 8037** firmly against the engine block. Using a wooden hammer handle, lightly tap the top of the piston until all of the piston rings enter the cylinder bore. See **Special Tools and Equipment**.



**Fig. 488: View Of Connecting Rod, Cap & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

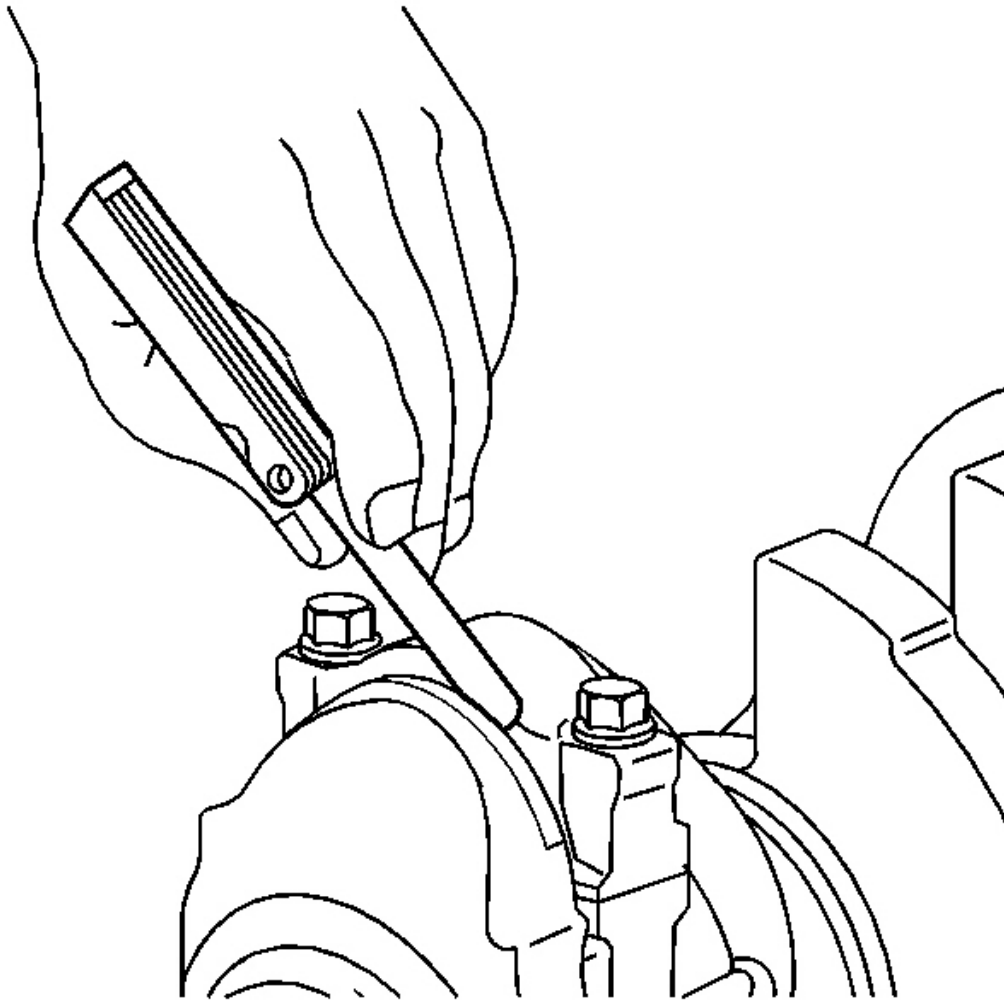
11. Guide the connecting rod end onto the crankshaft journal.

Use **J 41556** to pull the connecting rod into place. See **Special Tools and Equipment**.

12. Install the connecting rod bearing, cap, and bolts.

**Tighten:**

1. Tighten the connecting rod bearing cap bolts on the first pass to 25 N.m (18 lb ft).
2. Use **J 45059** to tighten the connecting rod bearing cap bolts on the second pass an additional 110 degrees. See **Special Tools and Equipment**.



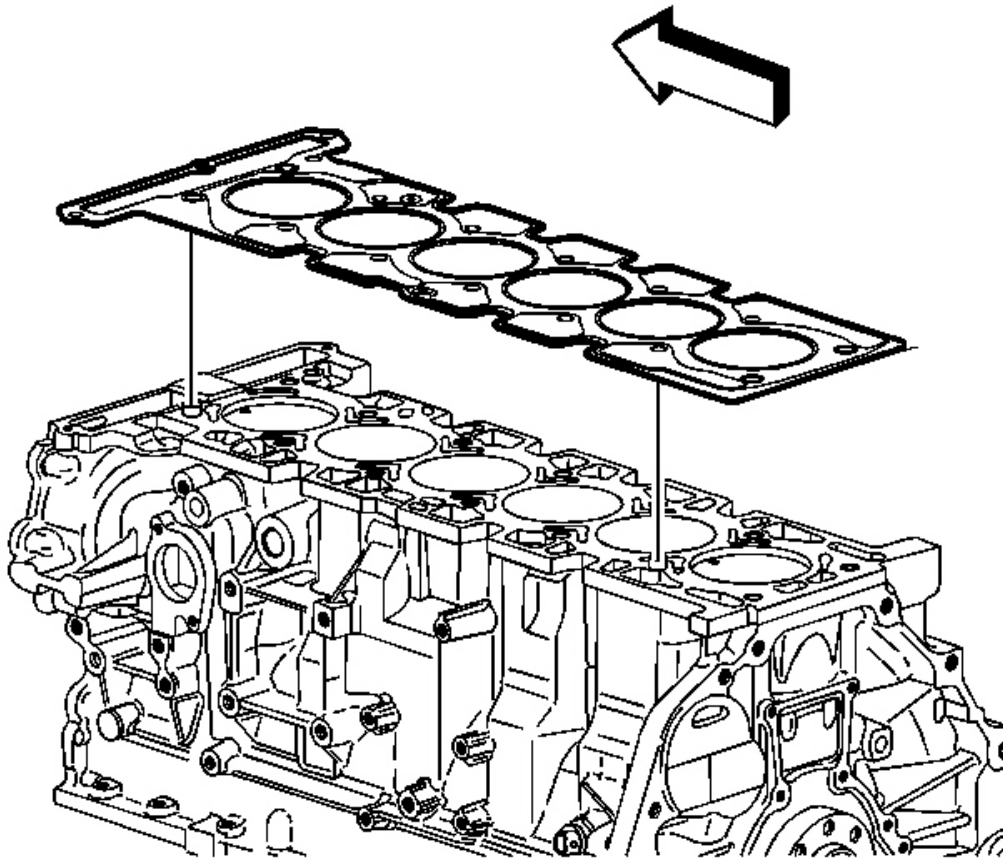
**Fig. 489: Tapping Connecting Rod Assembly Parallel To Crankshaft**  
Courtesy of GENERAL MOTORS CORP.

13. With the pistons and connecting rods installed, use a soft faced mallet and lightly tap each connecting rod assembly parallel to the crankshaft.
14. Measure the connecting rod side clearance using a feeler gauge. Connecting rod side clearance should be between 0.05-0.35 mm (0.0019-0.0137 in).

## **CYLINDER HEAD INSTALLATION**

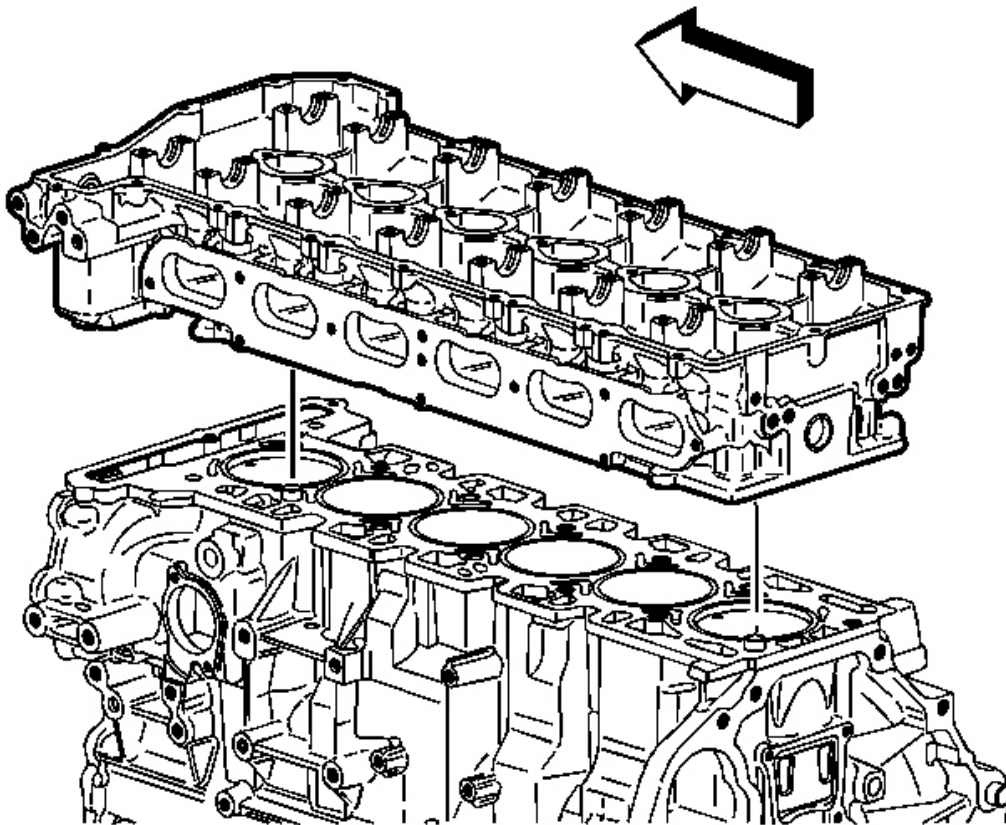
### **Tools Required**

**J 45059** Angle Meter. See **Special Tools and Equipment.**



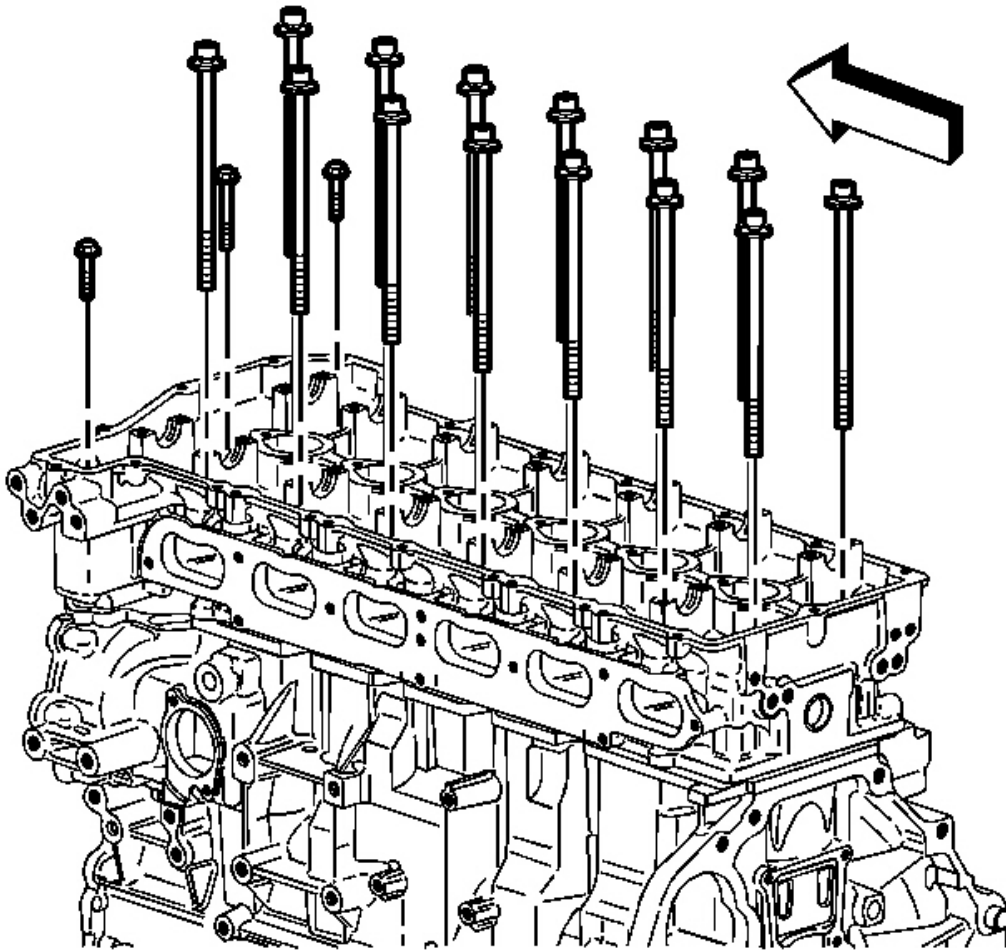
**Fig. 490: View Of Cylinder Head Gasket**  
**Courtesy of GENERAL MOTORS CORP.**

1. Install the dowel pins (cylinder head locator) (if necessary).
2. Install a new cylinder head gasket.



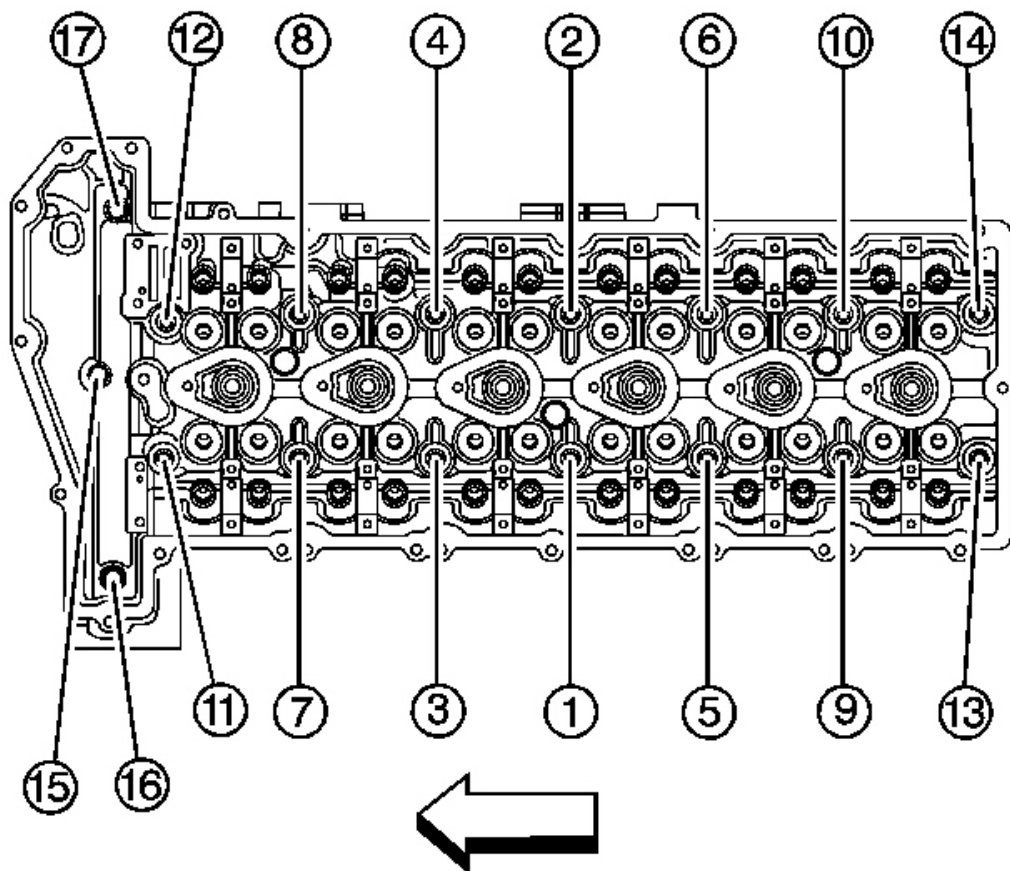
**Fig. 491: View Of Cylinder Head**  
**Courtesy of GENERAL MOTORS CORP.**

3. Install the cylinder head.



**Fig. 492: View Of Cylinder Head Bolts**  
Courtesy of GENERAL MOTORS CORP.

4. Install new cylinder head bolts.



**Fig. 493: View Of Tightening Sequence For Cylinder Head Bolts**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

5. Tighten the new cylinder head bolts in the following sequence:

**Tighten:**

1. Tighten the (14) long cylinder head bolts in sequence to 30 N.m (22 lb ft).
2. Use **J 45059** to tighten the cylinder head bolts in sequence an additional 155 degrees. See **Special Tools and Equipment**.
3. Tighten the (2 Short) end bolts to 7 N.m (62 lb in).

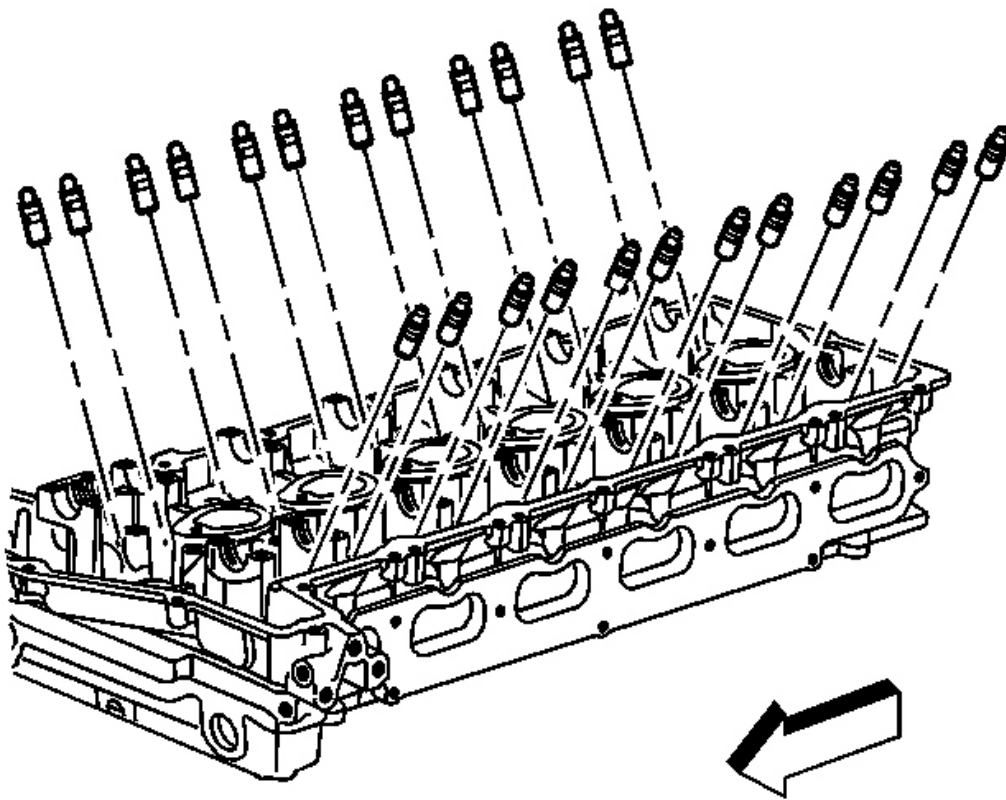
Use **J 45059** to tighten the short cylinder head end bolts an additional 60 degrees. See **Special Tools and Equipment**.



4. Tighten the (1 Long) end bolt to 7 N.m (62 lb in).

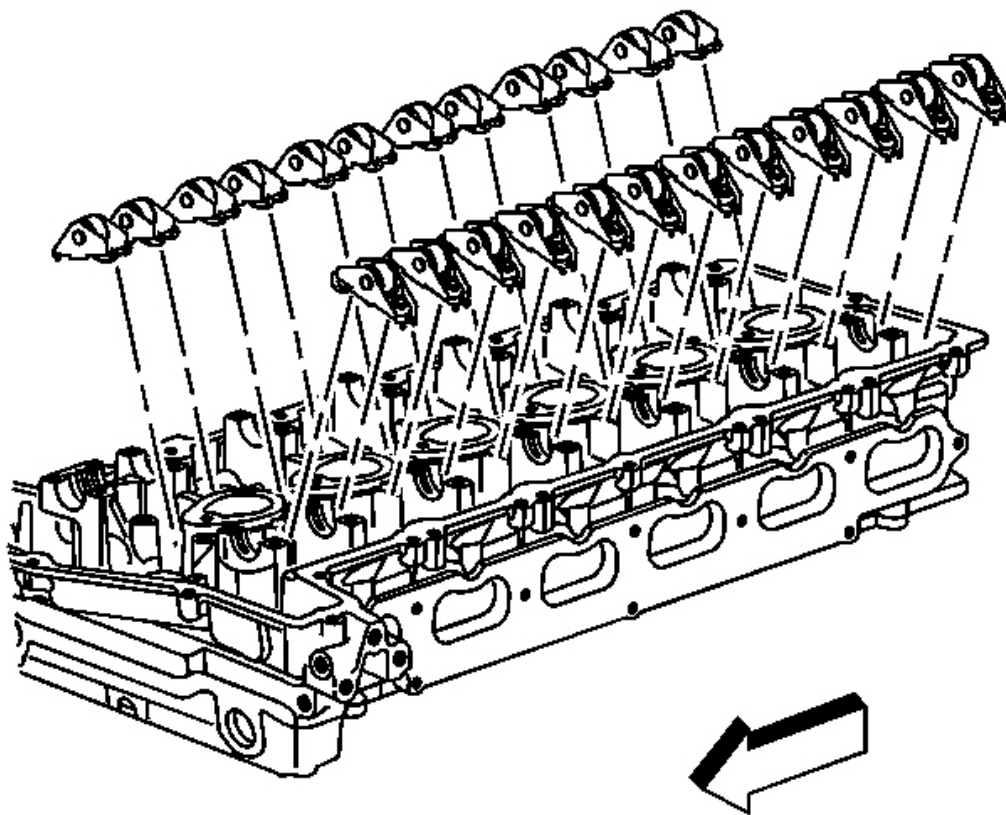
Use **J 45059** to tighten the long cylinder head end bolt an additional 120 degrees. See **Special Tools and Equipment**.

## VALVE ROCKER ARM AND VALVE LASH ADJUSTER INSTALLATION



**Fig. 494: View Of Valve Lash Adjusters**  
Courtesy of GENERAL MOTORS CORP.

1. Lubricate and fill the valve lash adjusters with engine oil.
2. Install the valve lash adjusters in their original locations.



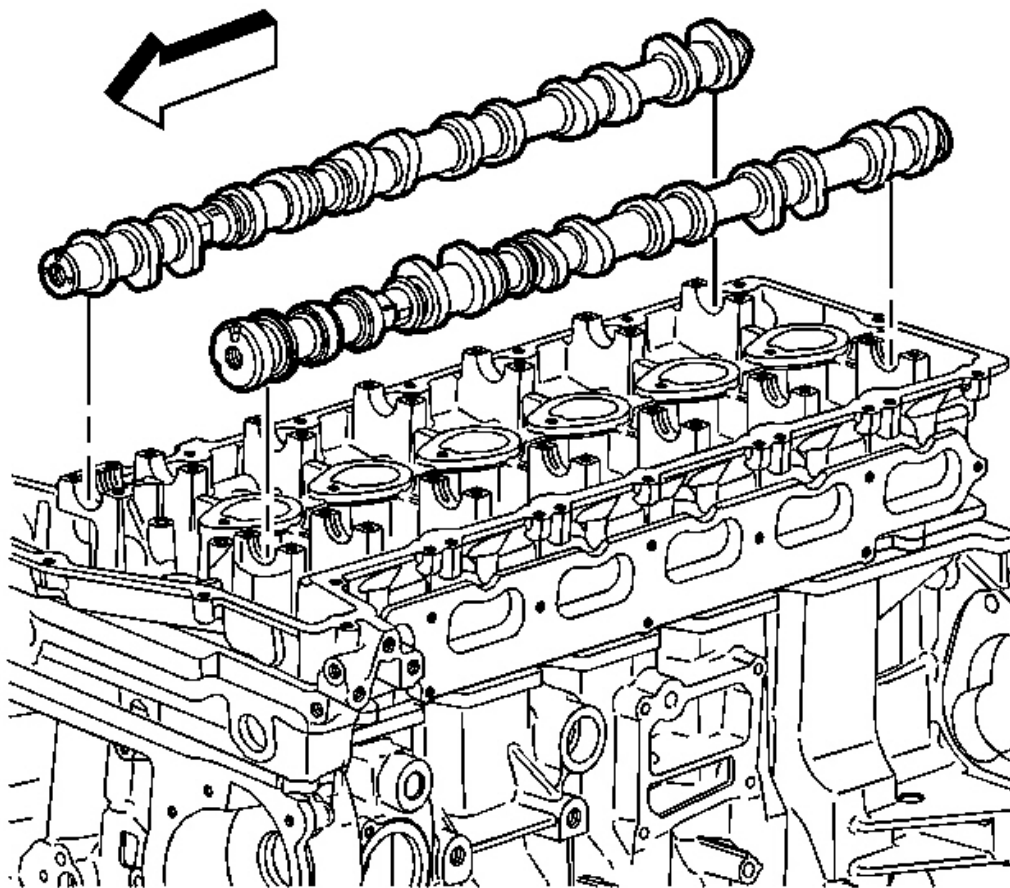
**Fig. 495: View Of Valve Rocker Arms**  
Courtesy of GENERAL MOTORS CORP.

3. Lubricate the valve rocker arm roller, needle bearings, valve pallet, and lash adjuster pocket.
4. Install the valve rocker arms in their original locations.

## **CAMSHAFT INSTALLATION**

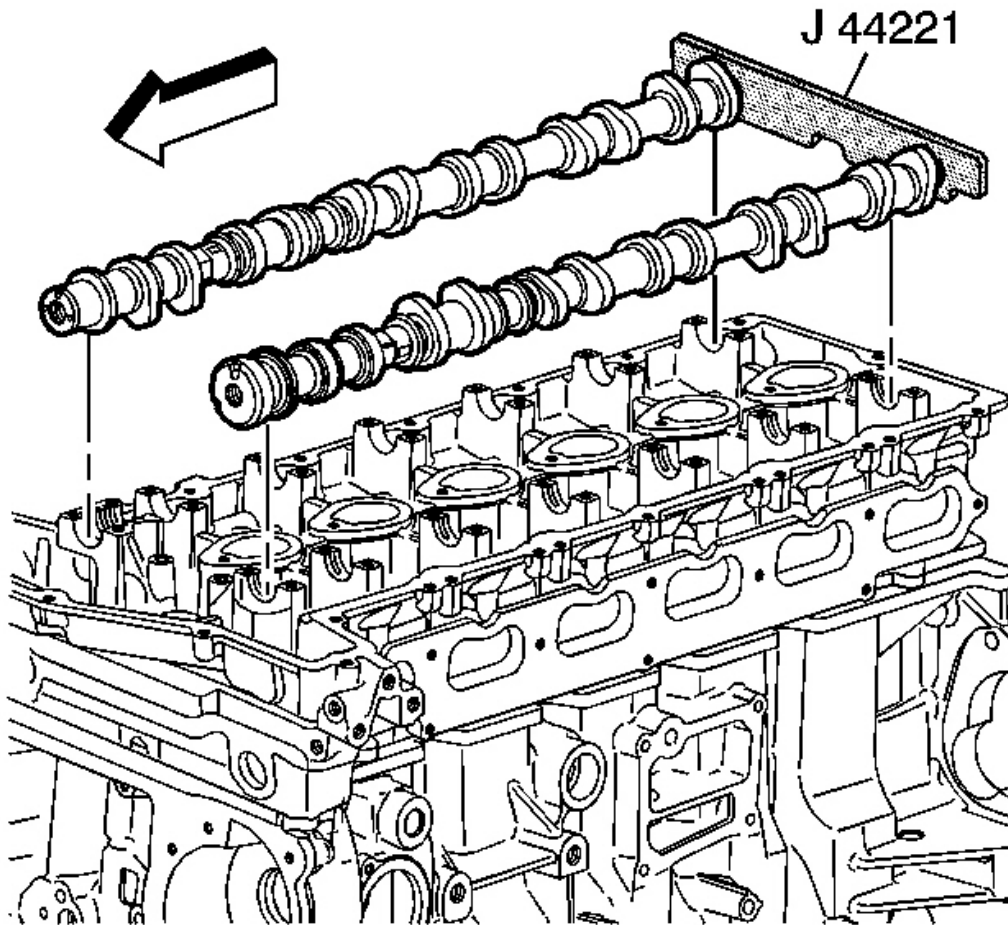
### **Tools Required**

**J 44221** Camshaft Holding Tool. See **Special Tools and Equipment**.



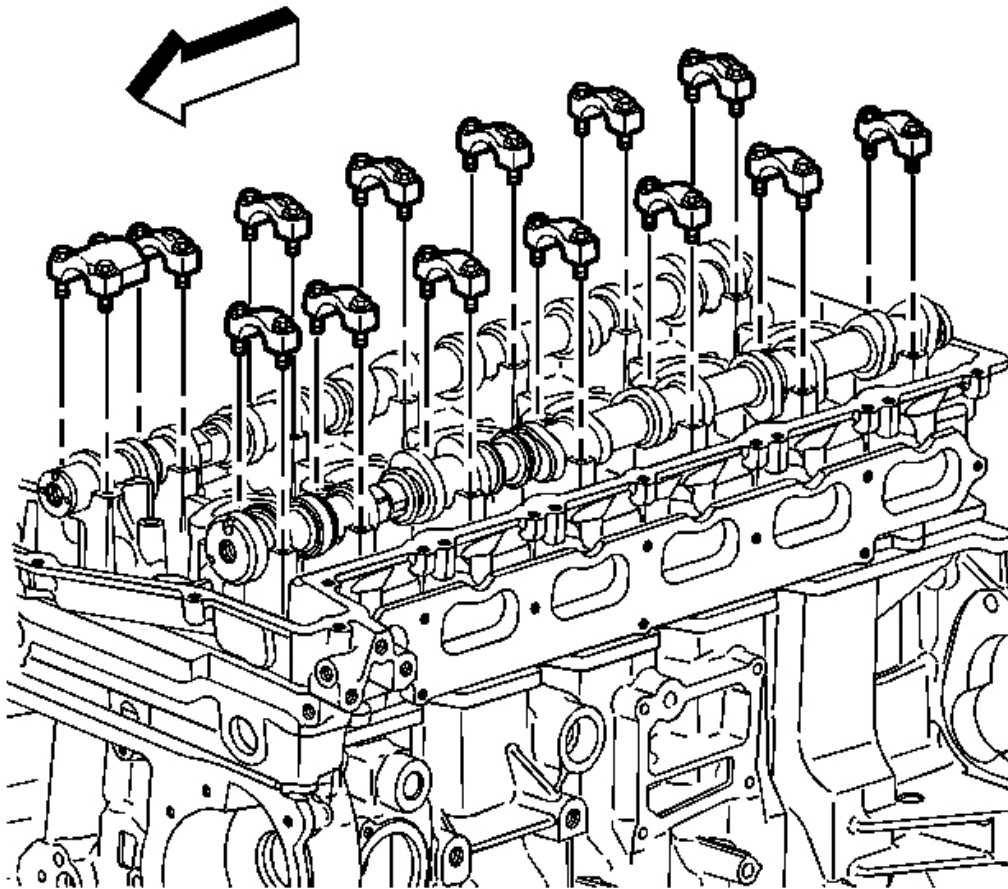
**Fig. 496: Removing/Installing Camshafts**  
Courtesy of GENERAL MOTORS CORP.

1. Coat the camshaft journals, camshaft journal thrust face, and camshaft lobes with clean engine oil.
2. Install the exhaust camshaft.
3. Install the intake camshaft.



**Fig. 497: Installing J 44221 Onto Camshafts**  
Courtesy of GENERAL MOTORS CORP.

4. Install **J 44221** with the camshaft flats up and the number 1 cylinder at top dead center. See **Special Tools and Equipment**.



**Fig. 498: Installing Camshaft Retainer Caps**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Install the same camshaft cap onto the same camshaft journal from which it was removed. The camshaft caps are pin stamped for direction and numerical order.

5. Install the exhaust camshaft caps.
6. Install the intake camshaft caps.

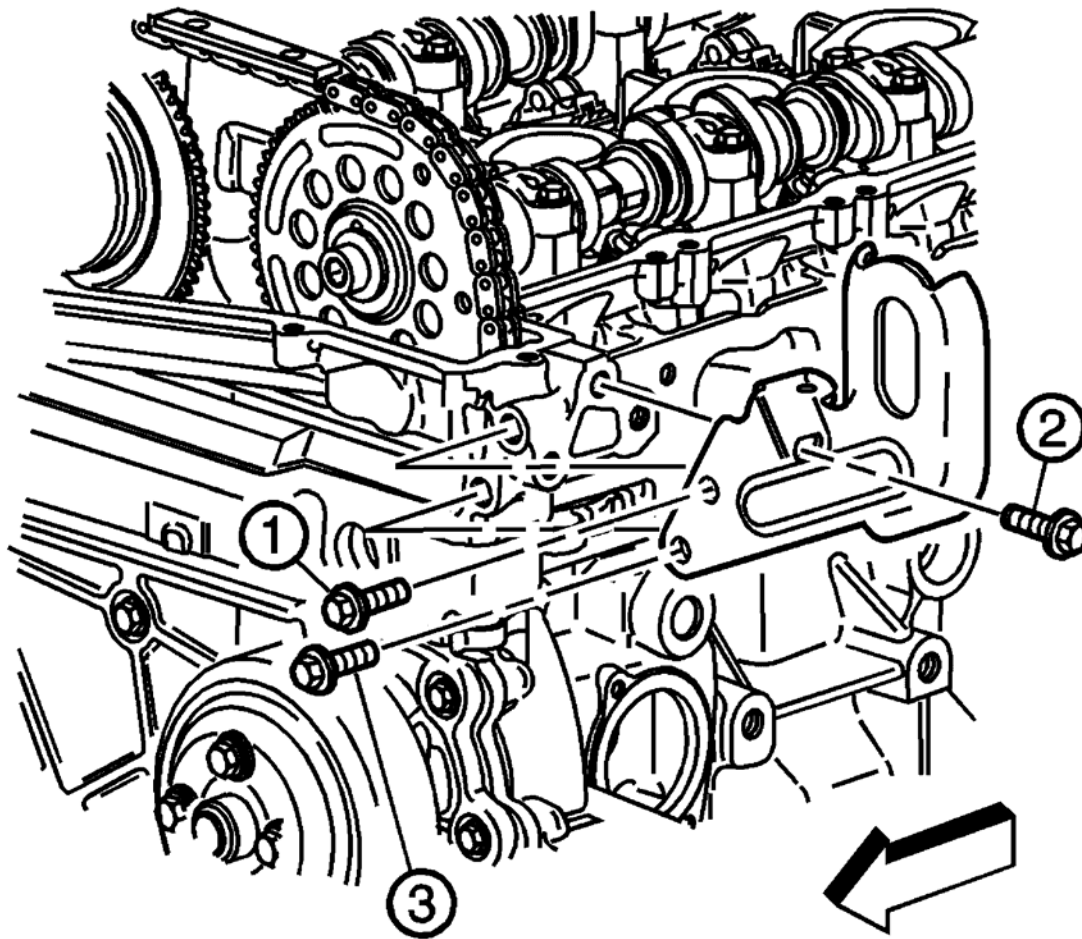
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

7. Install the camshaft cap bolts.

**Tighten:** Tighten the camshaft cap bolts to 12 N.m (106 lb in).

8. Remove J 44221 . See Special Tools and Equipment.

## ENGINE LIFT BRACKET INSTALLATION



**Fig. 499: View Of Engine Lift Bracket Bolts**  
Courtesy of GENERAL MOTORS CORP.

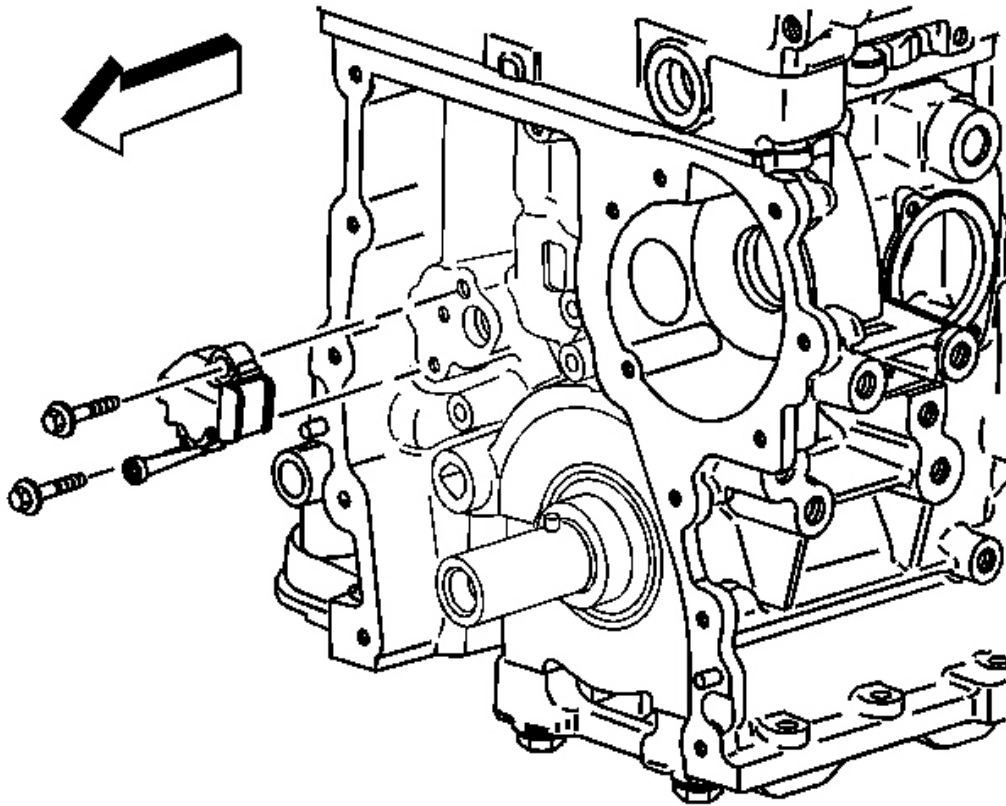
1. Install the engine lift bracket.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the engine lift bracket bolts in sequence.

**Tighten:** Tighten the engine lift bracket bolts in sequence to 50 N.m (37 lb ft)

## TIMING CHAIN TENSIONER INSTALLATION



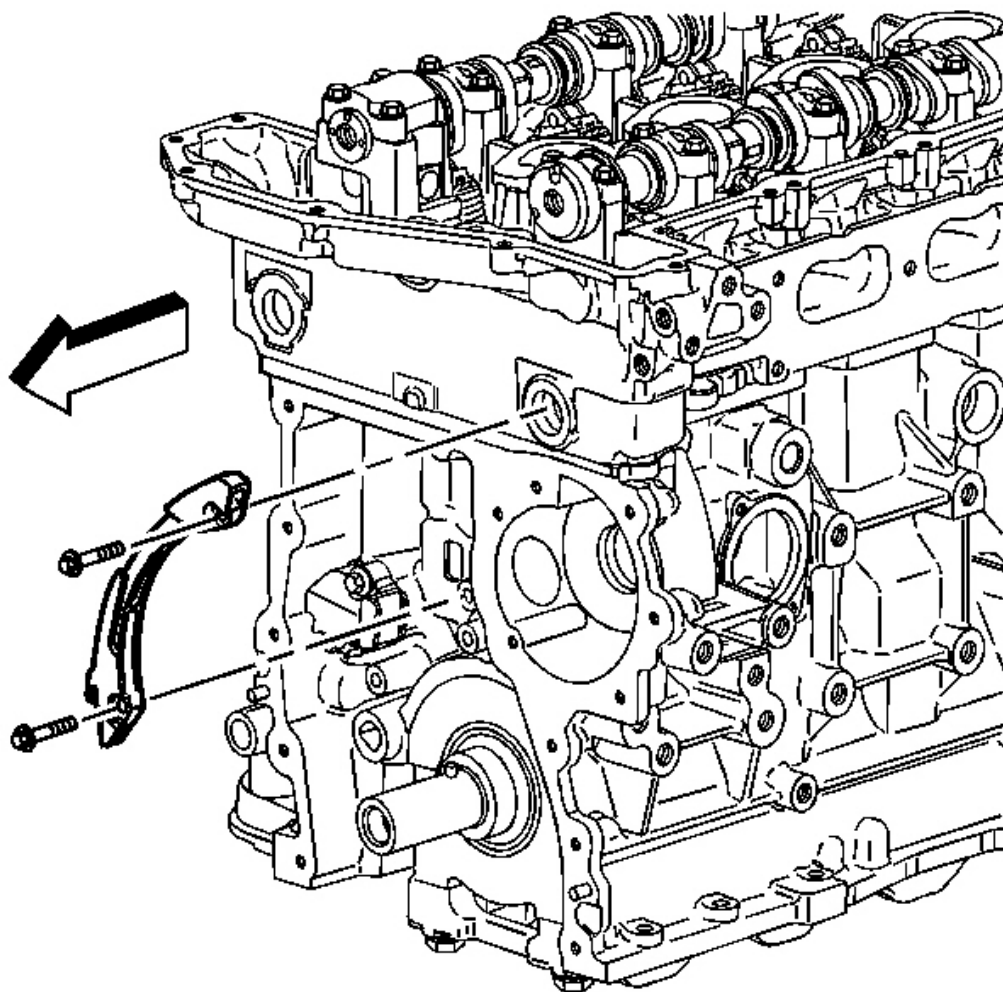
**Fig. 500: View Of Timing Chain Tensioner & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Install the timing chain tensioner.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the timing chain tensioner bolts.

**Tighten:** Tighten the timing chain tensioner bolts to 25 N.m (18 lb ft).

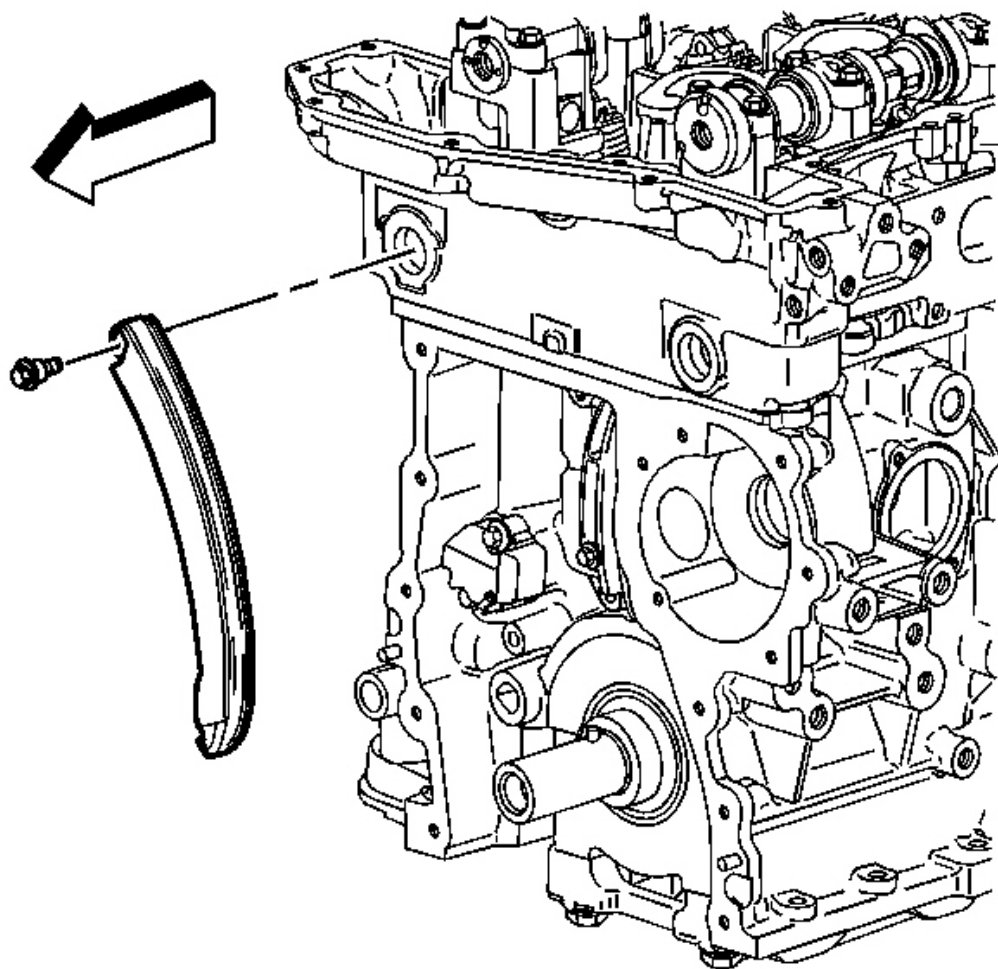


**Fig. 501: View Of Timing Chain Guide & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

3. Install the timing chain tensioner guide.
4. Install the timing chain tensioner guide bolts.

**Tighten:** Tighten the timing chain tensioner guide bolts to 14 N.m (124 lb in).

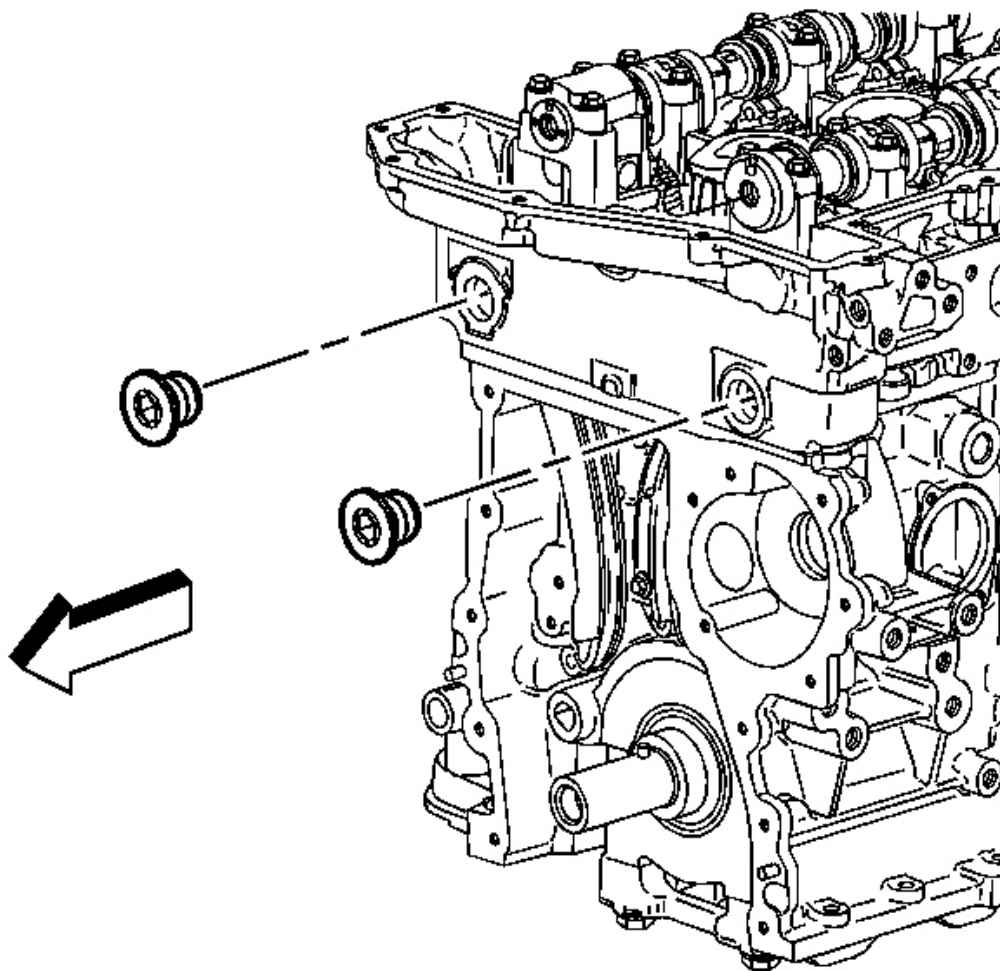




**Fig. 502: View Of Timing Chain Tensioner Shoe & Bolt**  
Courtesy of GENERAL MOTORS CORP.

5. Install the timing chain tensioner shoe.
6. Install the timing chain tensioner shoe bolt.

**Tighten:** Tighten the timing chain tension shoe bolt to 25 N.m (18 lb ft).



**Fig. 503: View Of Cylinder Head Access Hole Plugs**  
Courtesy of GENERAL MOTORS CORP.

7. 7. Install the cylinder head access hole plugs.

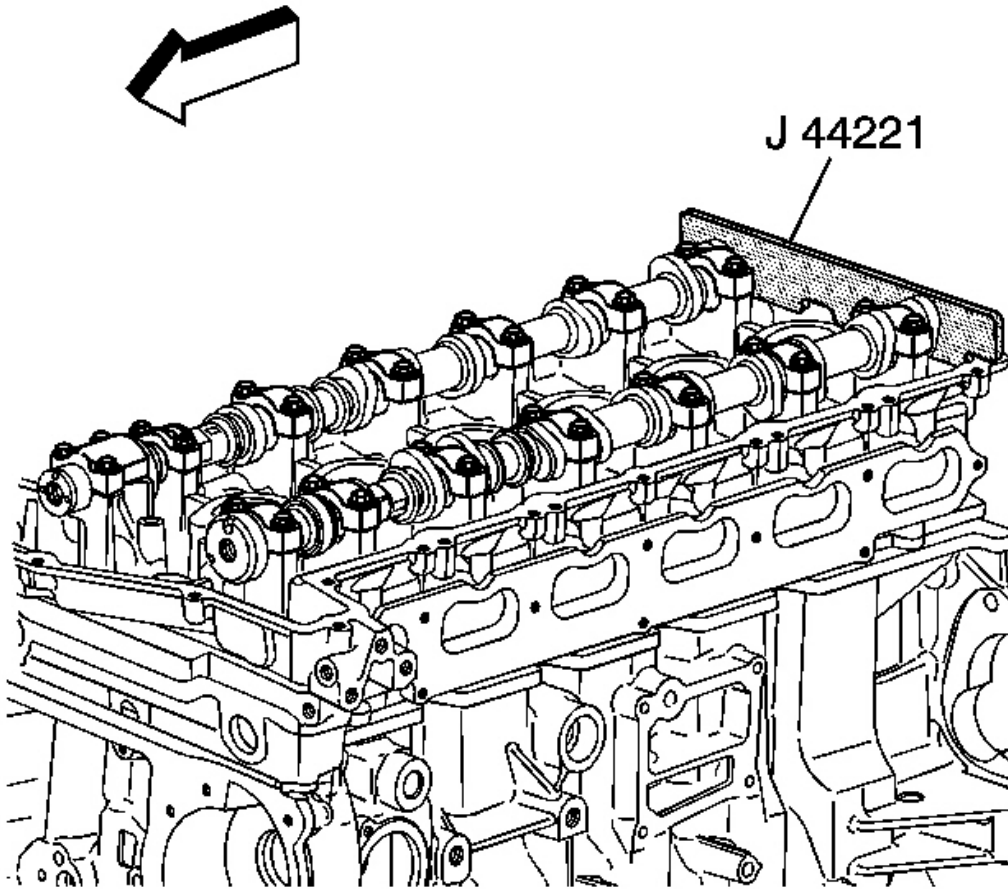
**Tighten:** Tighten the cylinder head access hole plugs to 5 N.m (44 lb in).

## TIMING CHAIN AND SPROCKETS INSTALLATION

### Tools Required

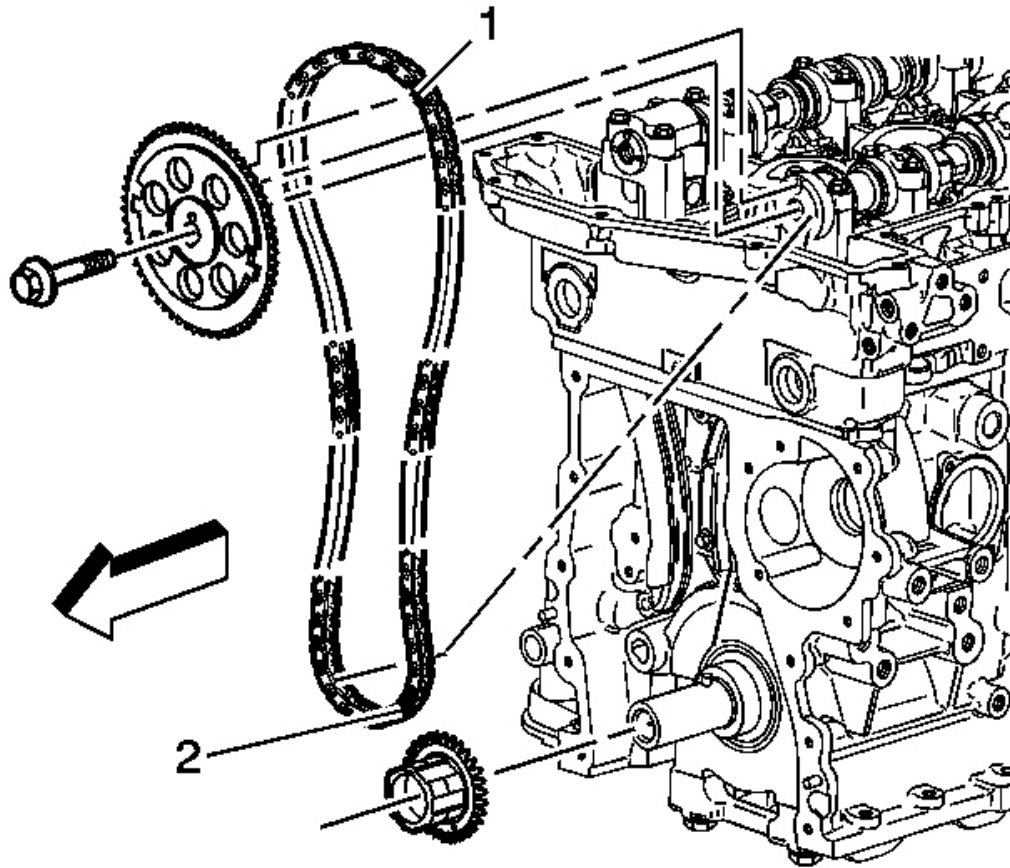
- **J 44221** Camshaft Holding Tool. See **Special Tools and Equipment**.

- **J 45059** Angle Meter. See Special Tools and Equipment.



**Fig. 504: View Of J 44221 Installed To Camshafts**  
Courtesy of GENERAL MOTORS CORP.

1. Install **J 44221** with the camshaft flats up and the number 1 cylinder at top dead center. See Special Tools and Equipment.

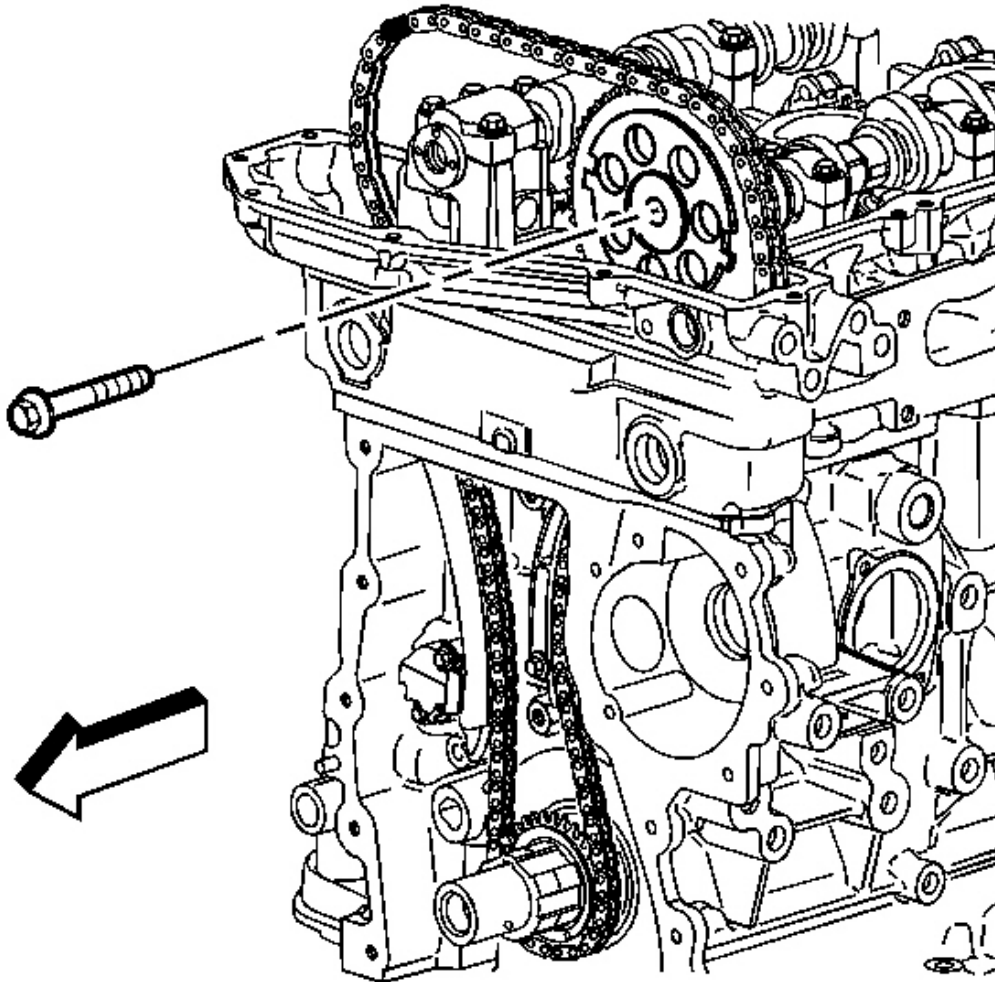


**Fig. 505: Installing Timing Chain & Sprockets**  
Courtesy of GENERAL MOTORS CORP.

2. Compress the tensioner and lock in place.
3. Install the crankshaft sprocket.
4. Install the intake camshaft sprocket into the timing chain.
5. Align the (dark) link of the timing chain with the timing mark on the intake camshaft sprocket (1).
6. Feed the timing chain down through the opening in the head.
7. Install the timing chain onto the crankshaft sprocket. Align the (dark) link of the timing chain with the timing mark on the crankshaft sprocket (2).

**IMPORTANT:** It may be necessary to remove J 44221 to rotate and hold the camshaft (hex) to align the pin to the camshaft sprocket. See Special Tools and Equipment.

8. Install the intake camshaft sprocket onto the intake camshaft.



**Fig. 506: View Of Intake Camshaft Sprocket Washer & Bolt**  
Courtesy of GENERAL MOTORS CORP.

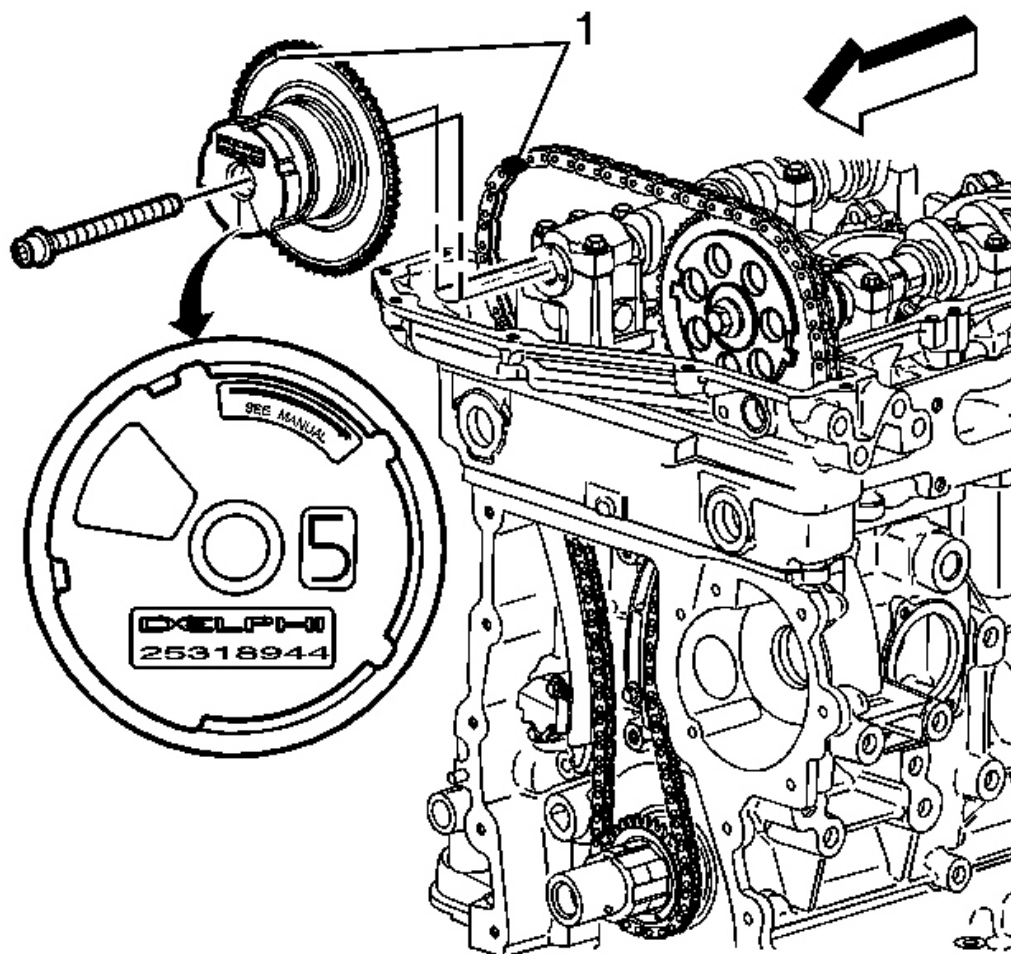
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

9. Install the intake camshaft sprocket washer and new bolt.

**Tighten:**

- Tighten the new intake camshaft sprocket bolt the first pass to 20 N.m (15 lb ft).

- Use **J 45059** to tighten the intake camshaft sprocket bolt the final pass an additional 100 degrees. See **Special Tools and Equipment**.



**Fig. 507: Aligning Exhaust Camshaft Position Actuator**  
Courtesy of GENERAL MOTORS CORP.

10. Install the exhaust camshaft actuator into the timing chain.
11. Align the (dark) link of the timing chain with the timing mark on the exhaust camshaft actuator (1).

**IMPORTANT:** It may be necessary to remove J 44221 to rotate and hold the camshaft (hex) to align the pin to the camshaft sprocket. See **Special Tools and Equipment**.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

12. Install the exhaust camshaft actuator onto the exhaust camshaft.

**NOTE:**        **The camshaft actuator must be fully advanced during installation. Engine damage may occur if the camshaft actuator is not fully advanced.**

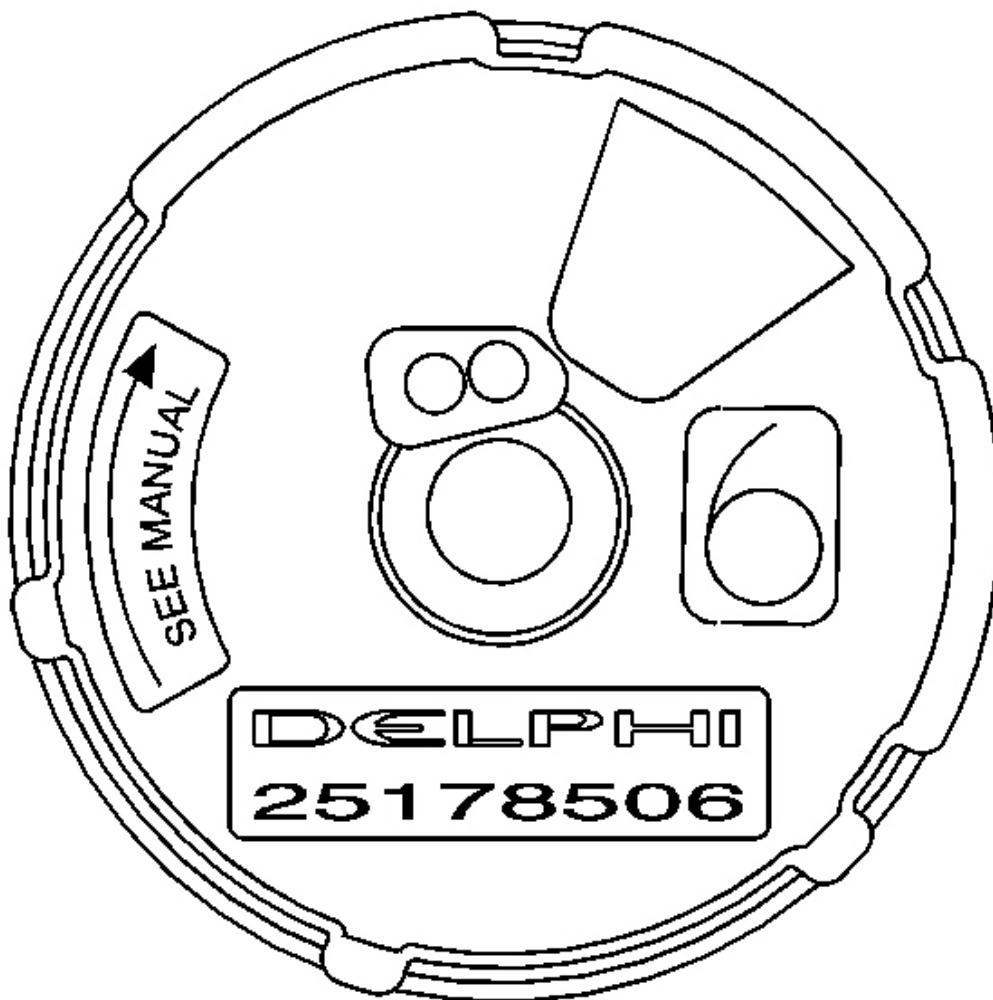
13. Install the new exhaust camshaft actuator bolt.

**Tighten:**

- Tighten the new exhaust camshaft actuator bolt the first pass to 25 N.m (18 lb ft).
- Use **J 45059** to tighten the exhaust camshaft actuator bolt the final pass an additional 135 degrees. See **Special Tools and Equipment**.

14. Unlock the tensioner.

15. Remove **J 44221** . See **Special Tools and Equipment**.

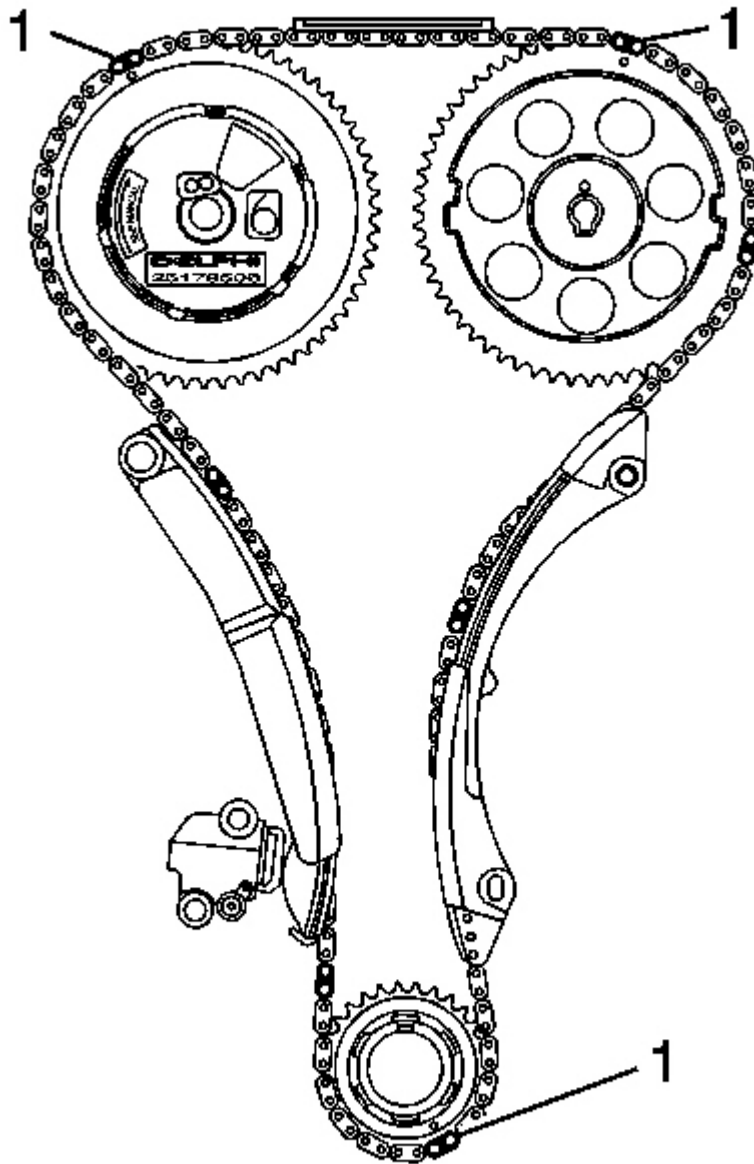


**Fig. 508: Identifying Camshaft Position (CMP) Actuator**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Rotate the camshaft actuator clockwise relative to the camshaft prior to tightening the bolt.

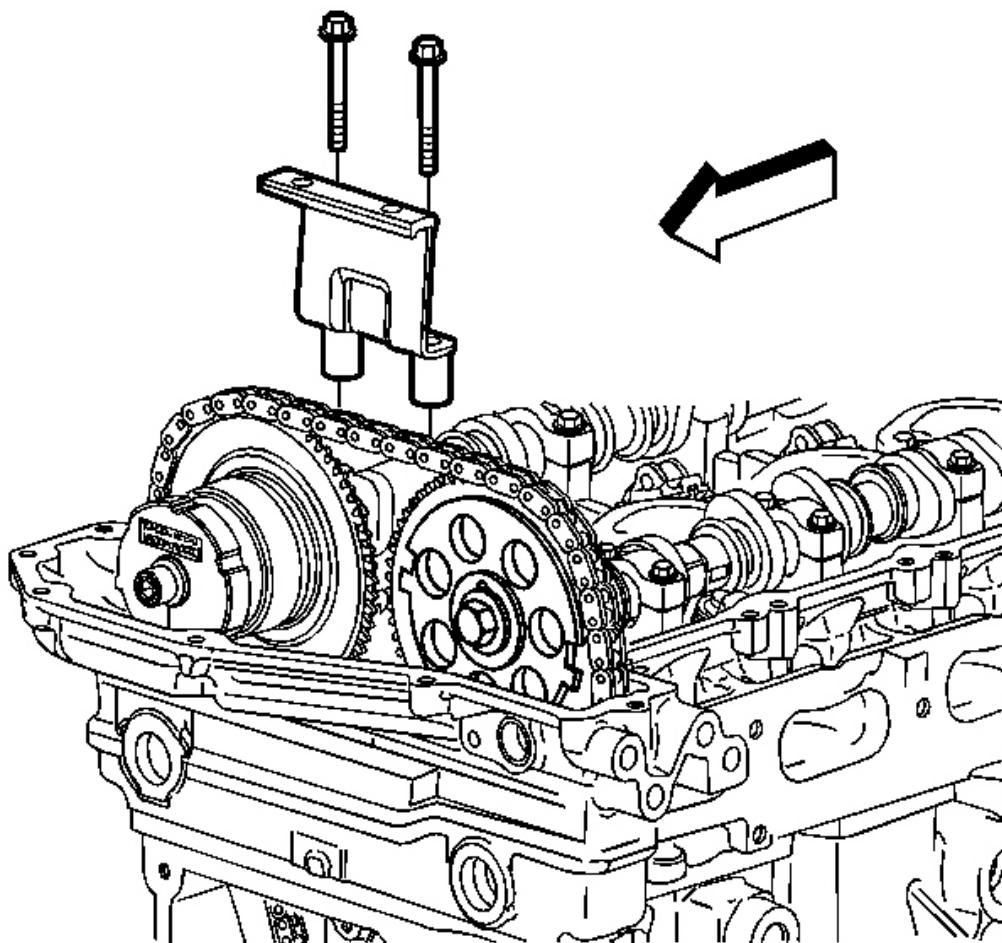
16. Rotate the camshaft actuator clockwise (as seen from the front of the vehicle).





**Fig. 509: View Of Timing Chain Aligning Marks**  
Courtesy of GENERAL MOTORS CORP.

17. The dark links (1) on the chain should be aligned with marks on sprockets as shown.



**Fig. 510: View Of Top Chain Guide**  
**Courtesy of GENERAL MOTORS CORP.**

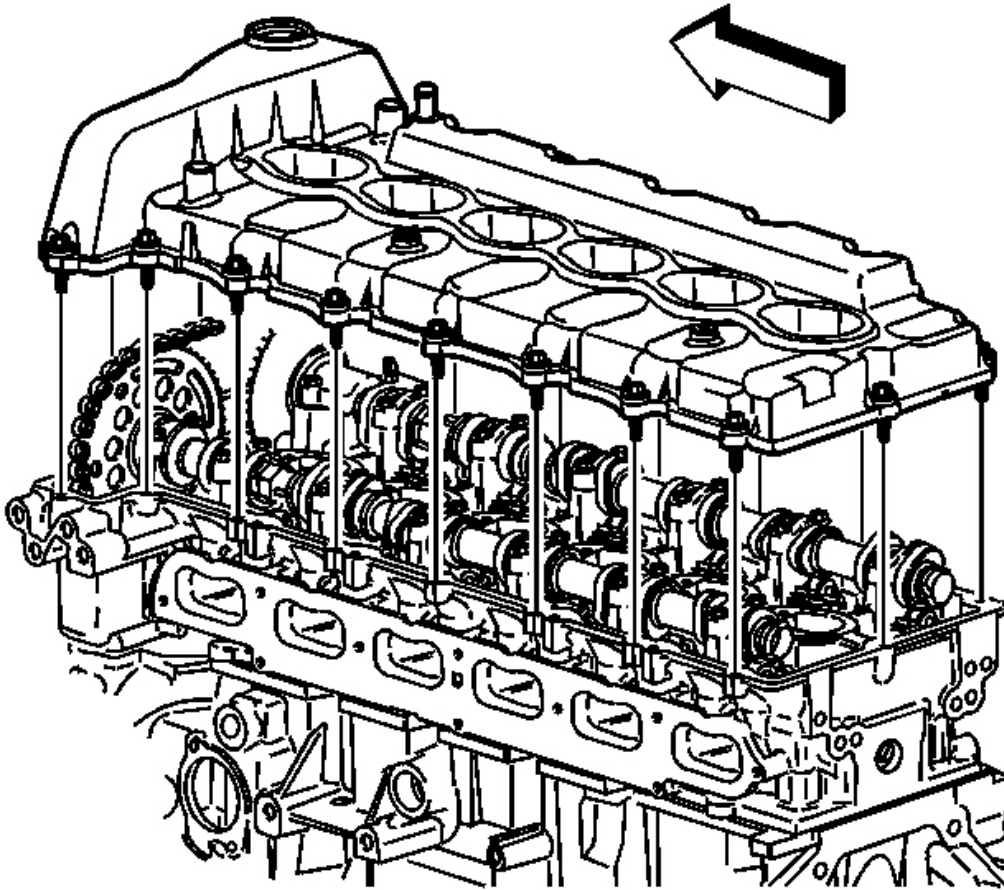
18. Install the top chain guide.
19. Add threadlock to the top chain guide bolt threads.
20. Install the top chain guide bolts.

**Tighten:** Tighten the top chain guide bolts to 10 N.m ( 89 lb in).

## **CAMSHAFT COVER INSTALLATION**

1. Install a new camshaft cover seal.

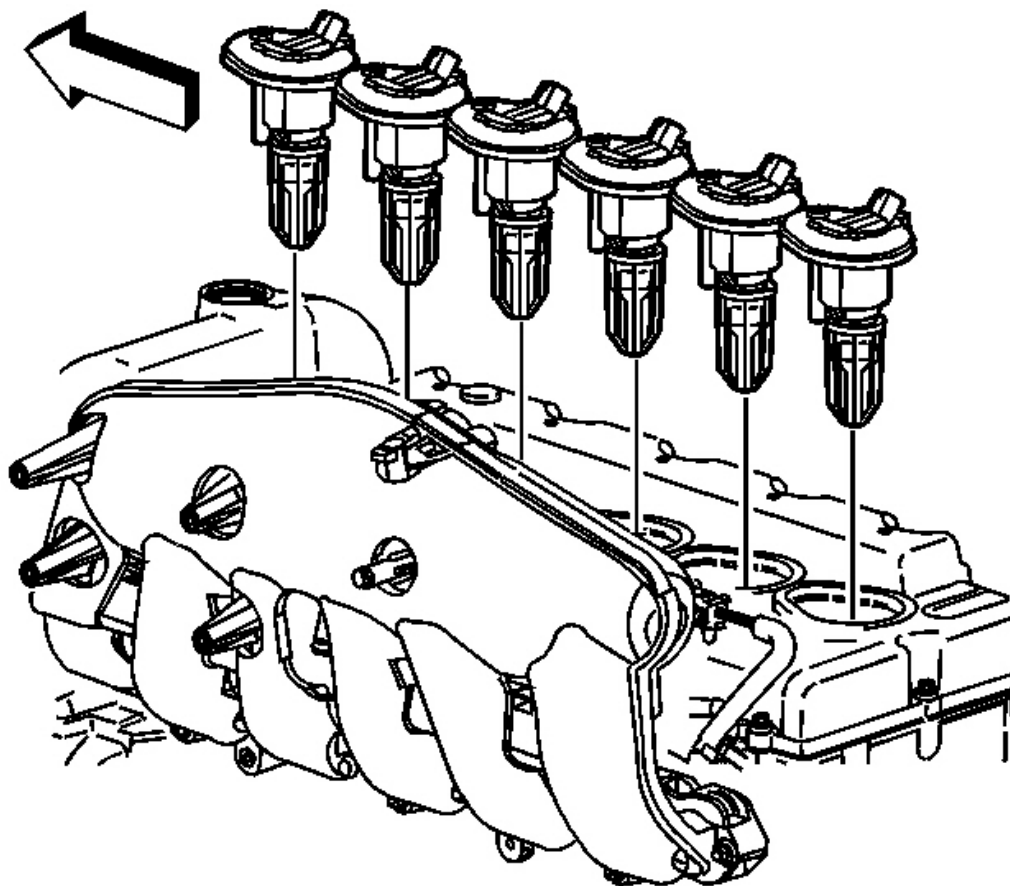
**NOTE:** Refer to Fastener Notice in Cautions and Notices.



**Fig. 511: View Of Camshaft Cover & Bolts**  
Courtesy of GENERAL MOTORS CORP.

2. Install the camshaft cover and bolts.

**Tighten:** Tighten the camshaft cover bolts to 10 N.m (89 lb in).

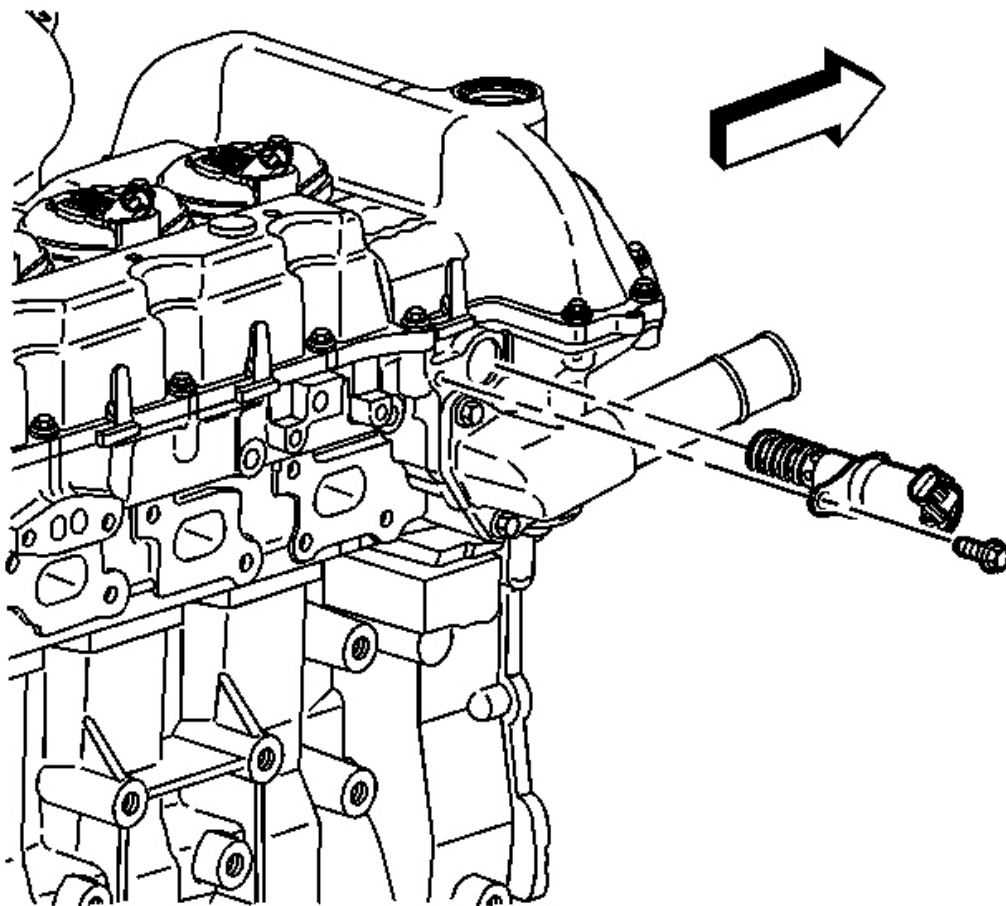


**Fig. 512: View Of Ignition Control Modules & Bolts**  
Courtesy of GENERAL MOTORS CORP.

3. Install new ignition control module seals.
4. Install the ignition control modules and bolts.

**Tighten:** Tighten the ignition control module bolts to 10 N.m (89 lb in).

#### **CAMSHAFT POSITION ACTUATOR VALVE INSTALLATION**



**Fig. 513: View Of Camshaft Position Actuator Valve & Bolt**  
Courtesy of GENERAL MOTORS CORP.

1. Apply clean engine oil to the camshaft position actuator valve hole.
2. Install the camshaft position actuator valve.
3. Add sealant to the camshaft position actuator valve bolt threads.

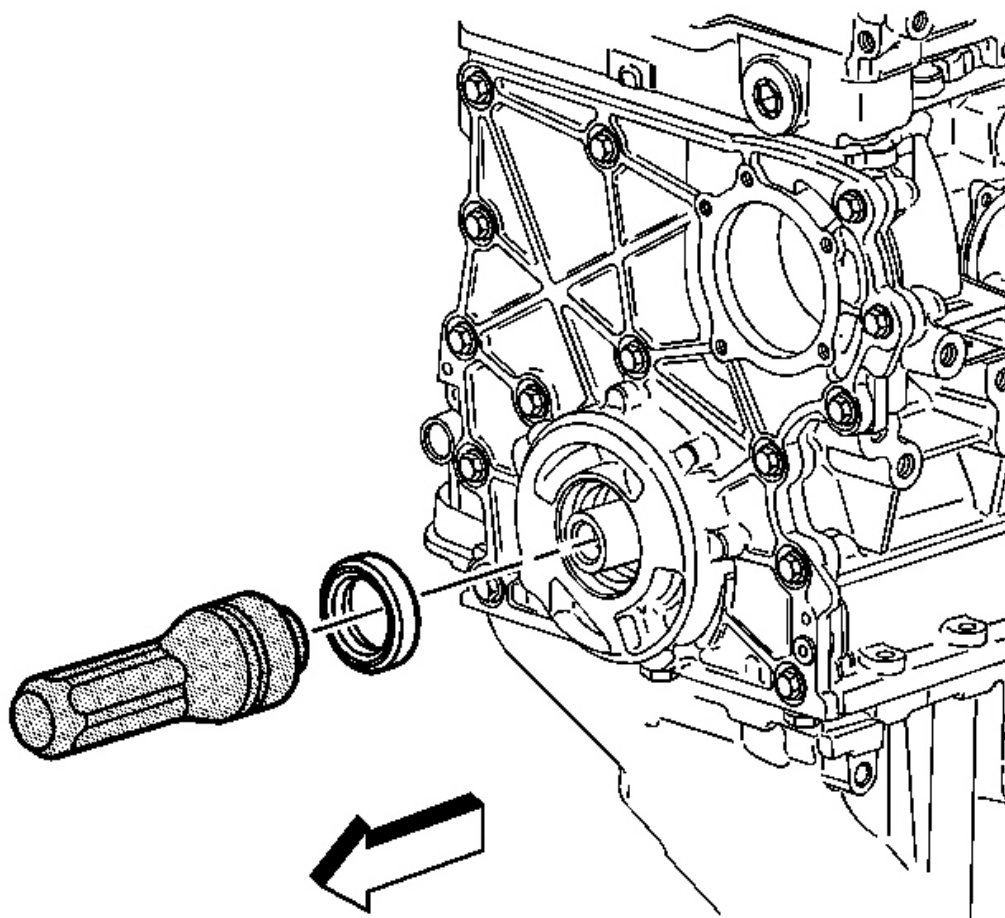
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

4. Install the camshaft position actuator valve bolt.

**Tighten:** Tighten the camshaft position actuator valve bolt to 10 N.m (89 lb in).

## Tools Required

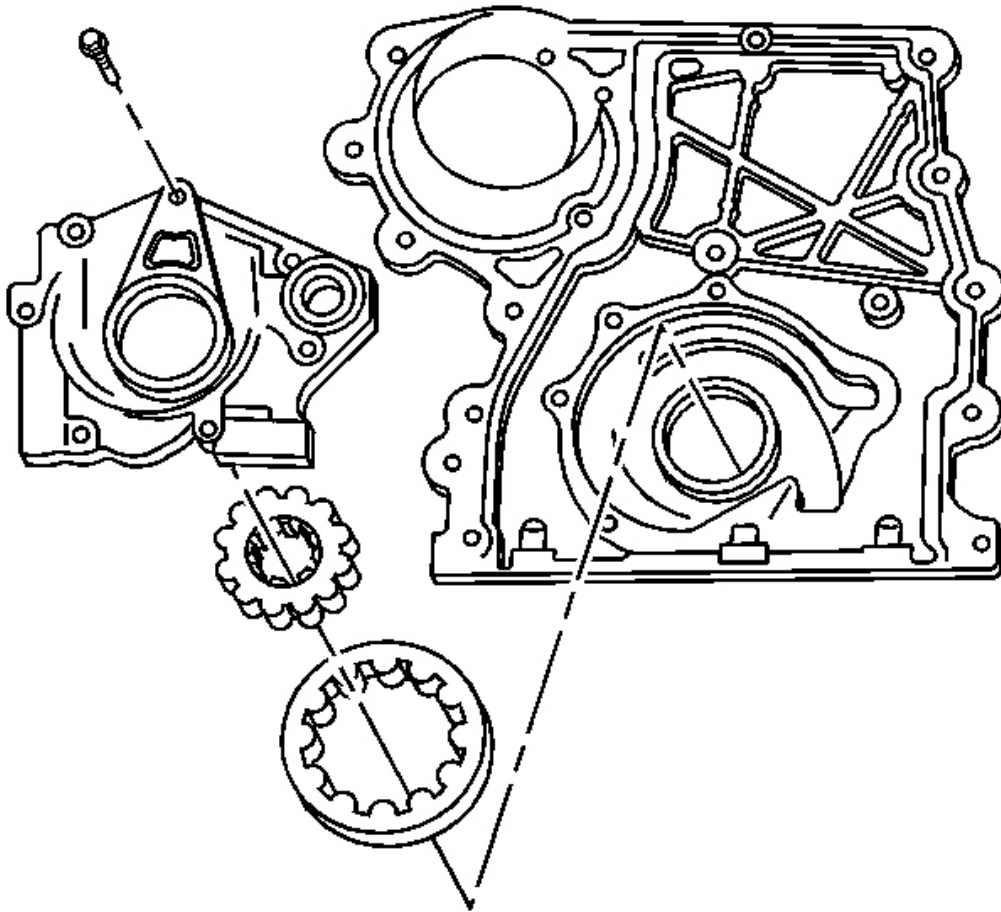
**J 44218** Seal Installer. See Special Tools and Equipment.



**Fig. 514: Installing Crankshaft Front Oil Seal Using J 44218**  
Courtesy of GENERAL MOTORS CORP.

1. Apply engine oil to the outside diameter of the crankshaft front oil seal.
2. Use **J 44218** to install the crankshaft front oil seal. See Special Tools and Equipment.
3. Remove **J 44218** . See Special Tools and Equipment.

## OIL PUMP INSTALLATION



**Fig. 515: Exploded View Of Oil Pump**  
Courtesy of GENERAL MOTORS CORP.

1. Install the oil pump pressure relief valve and spring.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the oil pump pressure relief valve plug.

**Tighten:** Tighten the oil pump pressure relief valve plug to 14 N.m (124 lb in).

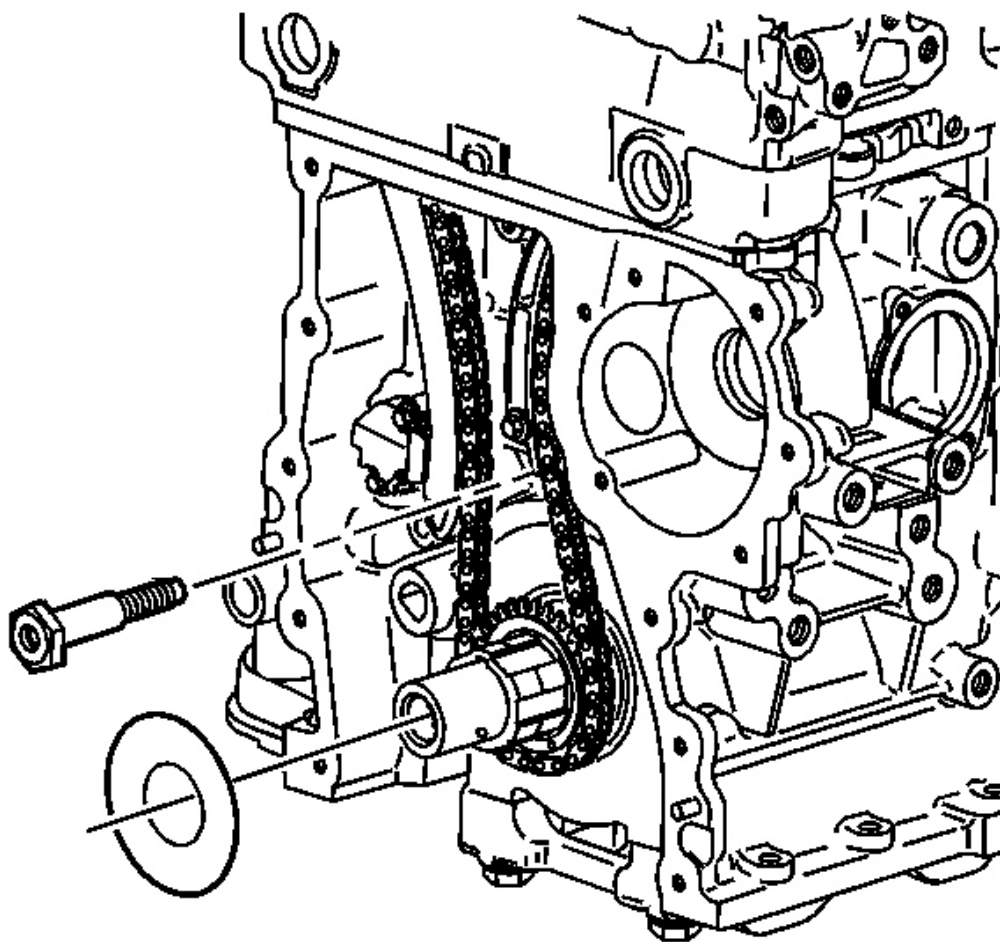
3. Install the oil pump outer and inner gears as removed.
4. Install the oil pump cover.
5. Install the oil pump cover bolts.

**Tighten:** Tighten the oil pump cover bolts to 10 N.m (89 lb in).

## ENGINE FRONT COVER INSTALLATION

### Tools Required

**J 44219** Engine Cover Alignment Pins. See Special Tools and Equipment.



**Fig. 516: View Of Crankshaft Snout, Balancer Friction Washer & Bolt**  
Courtesy of GENERAL MOTORS CORP.

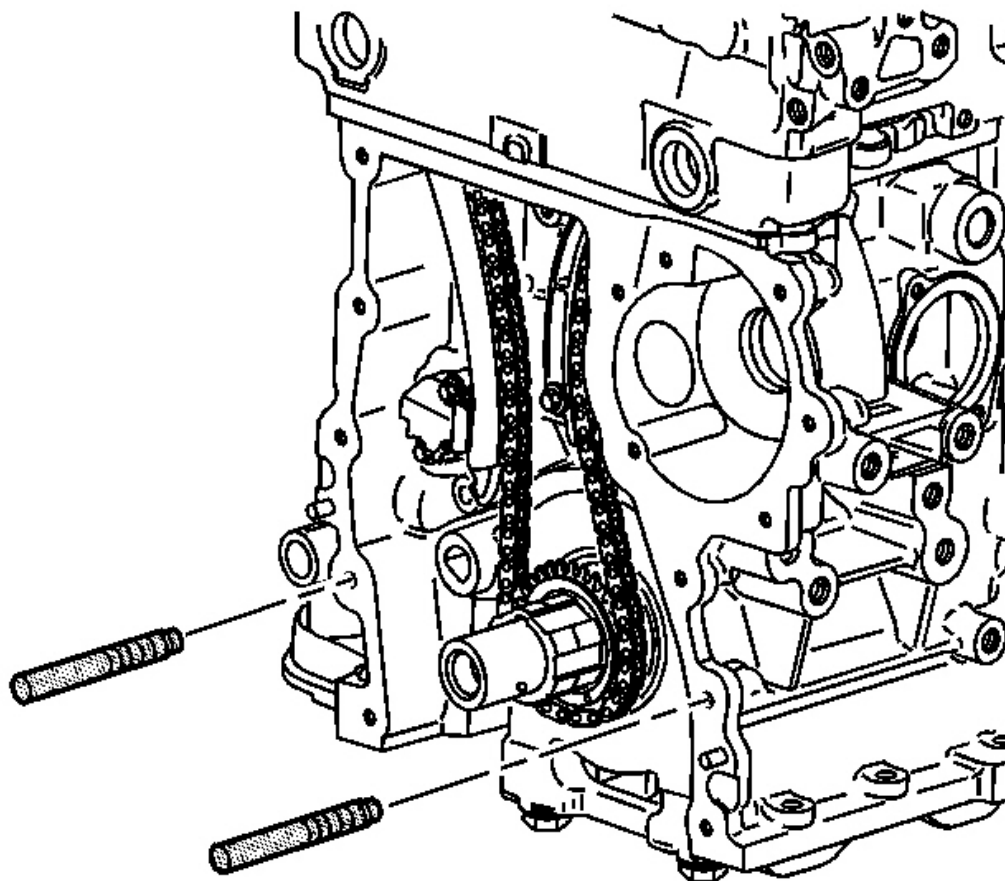
**NOTE:** Refer to Fastener Notice in Cautions and Notices.



1. Install the engine front cover spacer bolt.

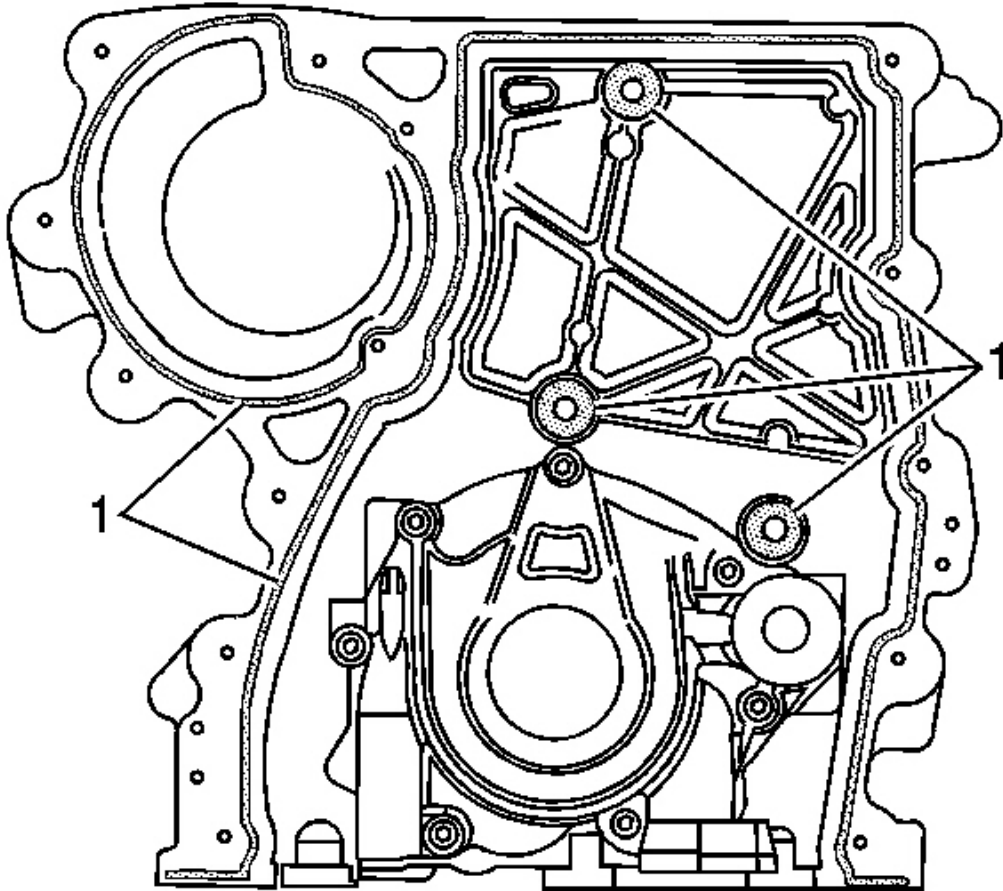
**Tighten:** Tighten the engine front cover spacer bolt to 10 N.m (89 lb in).

2. Install the crankshaft balancer friction washer over the crankshaft snout, up against the crankshaft gear.



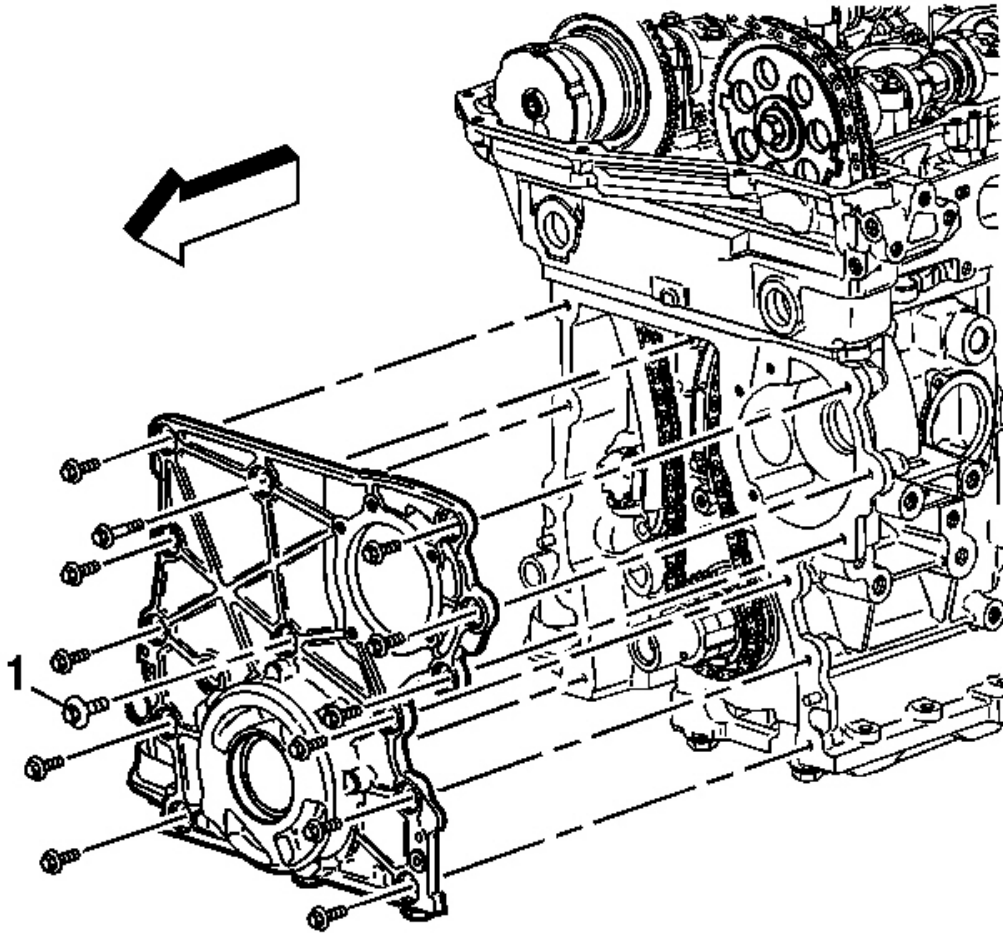
**Fig. 517: Installing J 44219 Into Engine Block**  
Courtesy of GENERAL MOTORS CORP.

3. Install J 44219 . See Special Tools and Equipment.



**Fig. 518: View Of Engine Front Cover**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** The engine front cover must be installed within 10 minutes from when the sealer was applied.



**Fig. 519: View Of Engine Front Cover Bolts**  
Courtesy of GENERAL MOTORS CORP.

4. Apply a 3 mm (0.12 in) bead of sealer to the back side of the engine front cover (1).
5. Align the oil pump to the crankshaft sprocket splines.
6. Install the engine front cover.
7. Remove **J 44219** . See **Special Tools and Equipment**.
8. Install the engine front cover bolts.

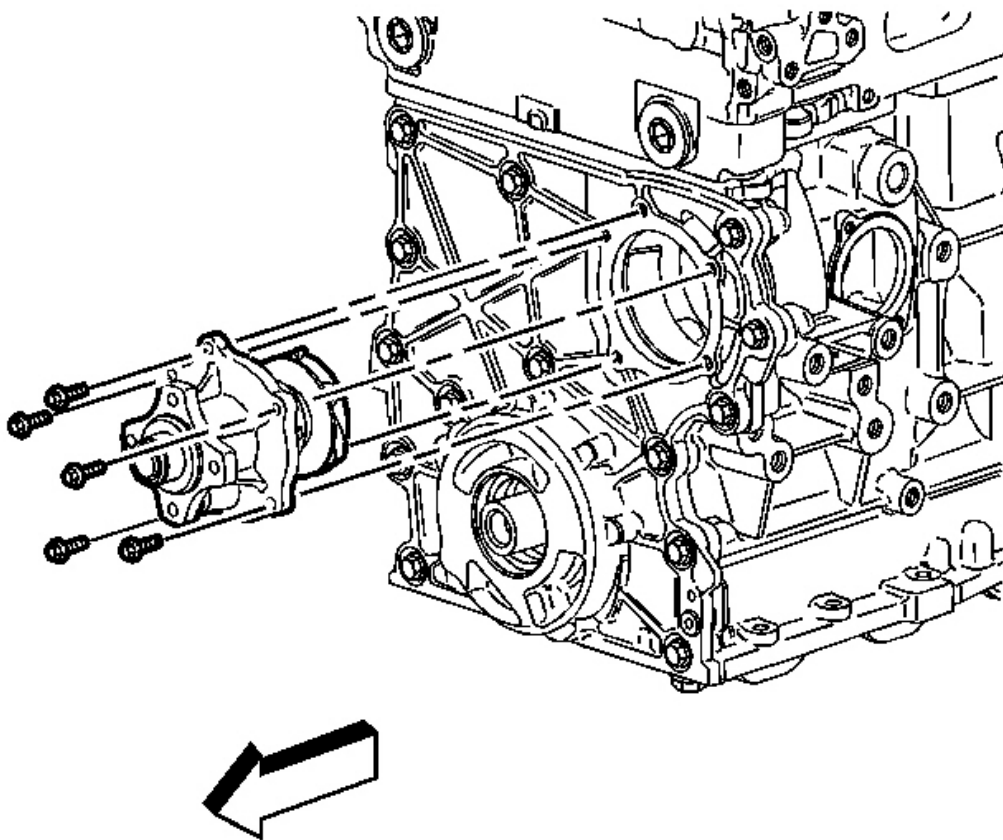
**Tighten:**

1. Tighten the engine front cover bolts to 10 N.m (89 lb in).
2. Tighten the small center bolt (1) last to 10 N.m (89 lb in).

## WATER PUMP INSTALLATION

### Tool Required

**J 41240** Fan Clutch Remover and Installer. See Special Tools and Equipment.



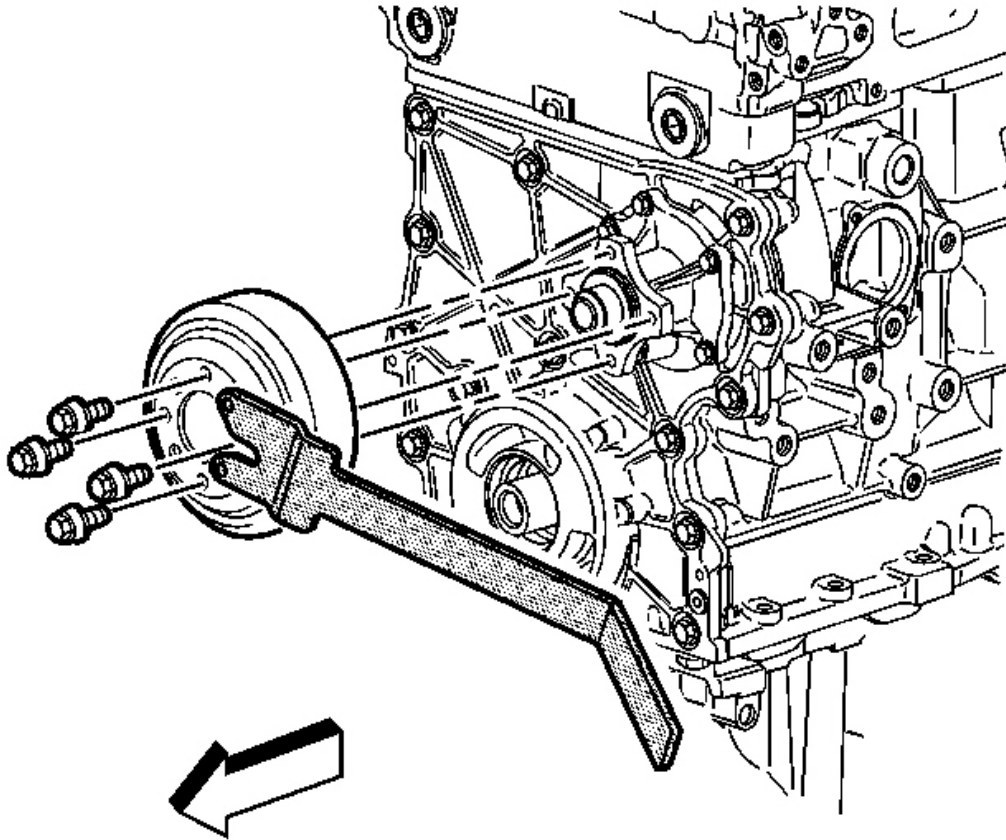
**Fig. 520: View Of Water Pump & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Install the water pump gasket.
2. Install the water pump.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

3. Install the water pump bolts.

**Tighten:** Tighten the water pump bolts to 10 N.m (89 lb in).



**Fig. 521: Tightening Water Pump Pulley Bolts**  
Courtesy of GENERAL MOTORS CORP.

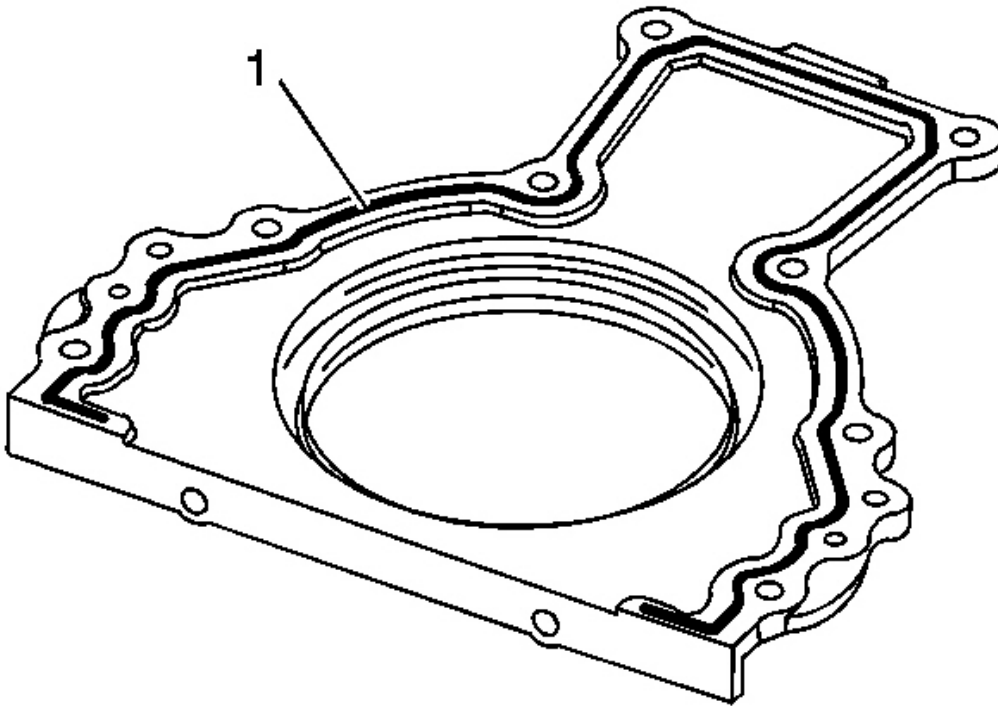
4. Install the water pump pulley.
5. Install the water pump pulley bolts.
6. Install **J 41240** to hold pulley. See **Special Tools and Equipment**.
7. Tighten the water pump pulley bolts.

**Tighten:** Tighten the water pump pulley bolts to 25 N.m (18 lb ft).

8. Remove **J 41240** . See **Special Tools and Equipment**.

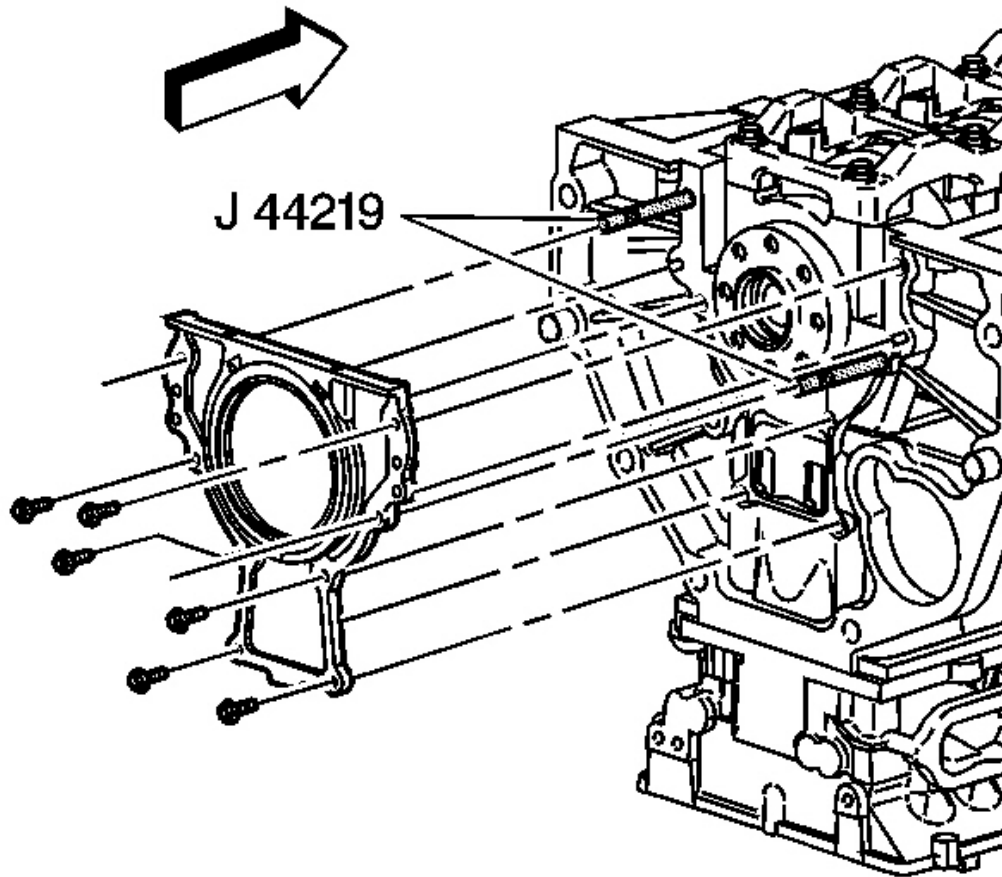
### Tools Required

**J 44219** Housing Alignment Pins. See **Special Tools and Equipment**.



**Fig. 522: View Of Rear Oil Seal Housing**  
**Courtesy of GENERAL MOTORS CORP.**

1. Apply a 3 mm (0.12 in) bead of to the rear oil seal housing (1).



**Fig. 523: View Of J 44219 Installed In Engine Block**  
 Courtesy of GENERAL MOTORS CORP.

2. Install **J 44219** into the block. See Special Tools and Equipment.

**IMPORTANT:** With the help of the plastic installation aid (supplied with the new seal), be sure the lip of the seal faces inward.

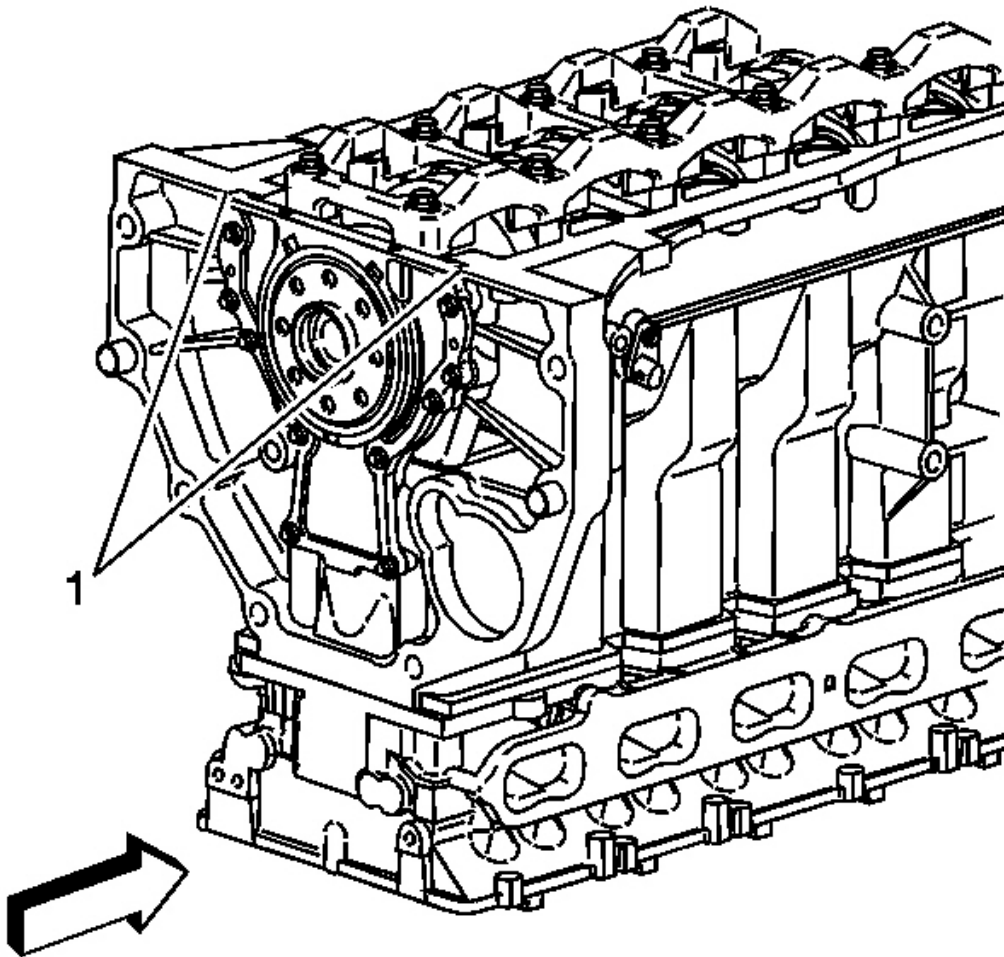
3. Slide the crankshaft rear oil seal housing over the alignment pins (**J 44219**) and crankshaft. See Special Tools and Equipment.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

4. Install the crankshaft rear oil seal housing bolts (except the two in place of the guide pins).

5. Remove **J 44219** . See Special Tools and Equipment.
6. Install the remaining two crankshaft rear oil seal housing bolts.

**Tighten:** Tighten the crankshaft rear oil seal housing bolts to 10 N.m (89 lb in).

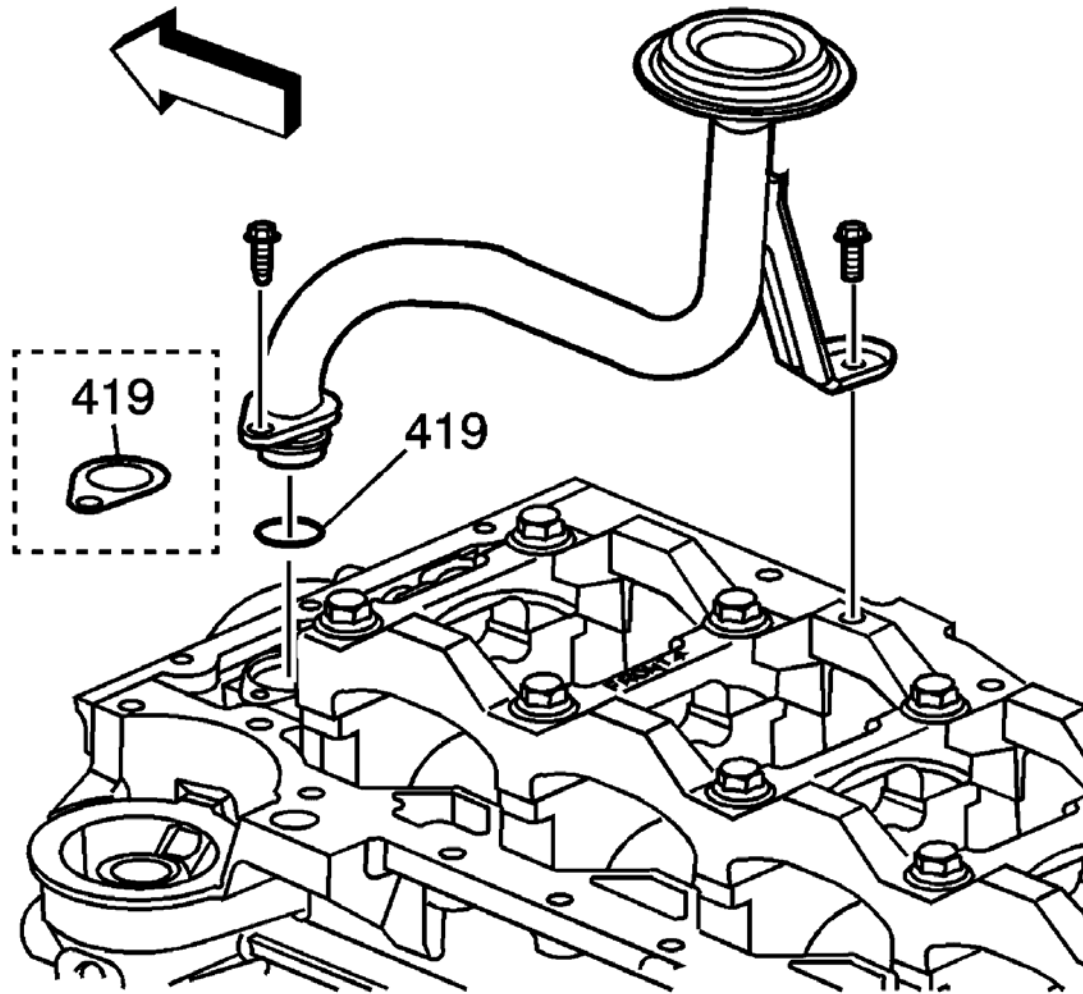


**Fig. 524: View Of Oil Pan Sealing Area**  
Courtesy of GENERAL MOTORS CORP.

7. Wipe off any excess material from the bottom of the oil pan sealing area (1).

#### OIL PUMP PIPE AND SCREEN ASSEMBLY INSTALLATION





**Fig. 525: View Of Oil Pump Pipe, O-Ring & Bolts**  
Courtesy of GENERAL MOTORS CORP.

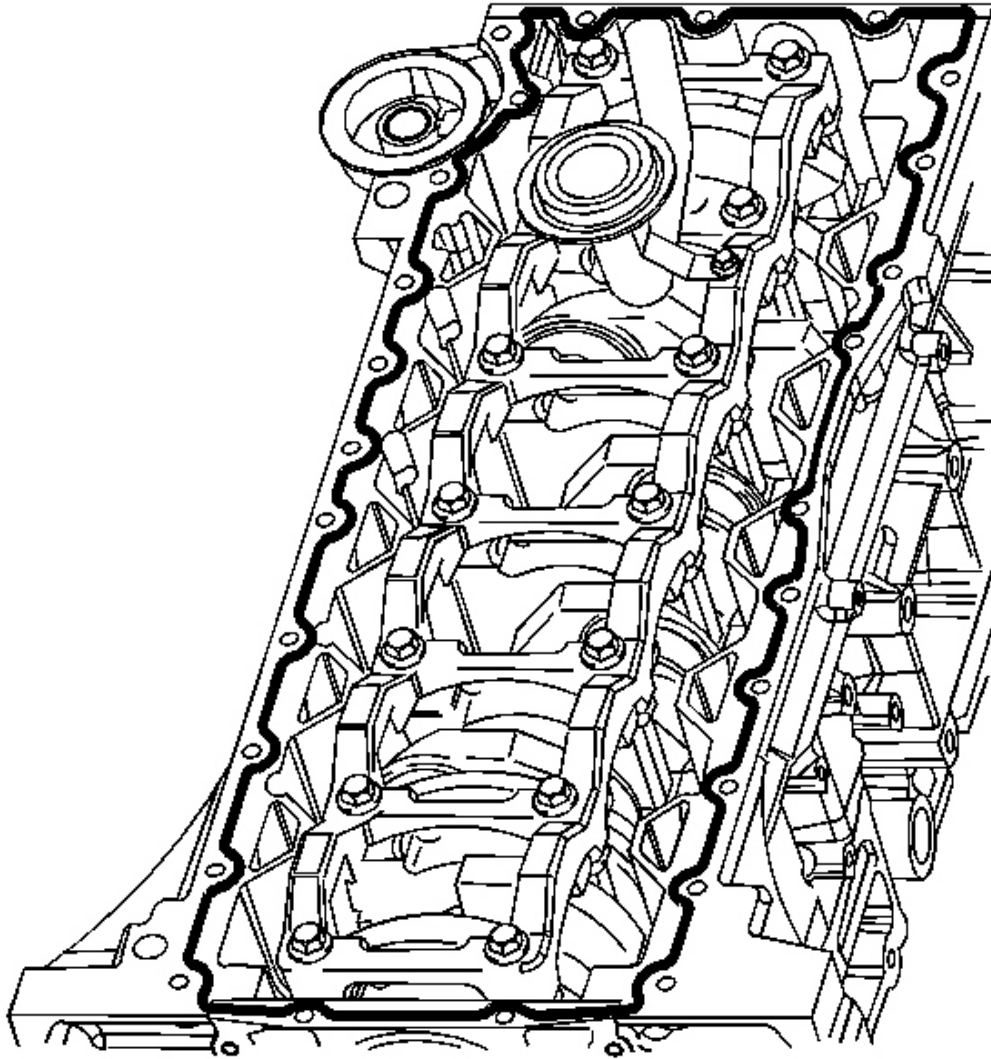
1. Install a new oil pump pipe O-ring/gasket (419) - model dependent.
2. Install the oil pump pipe and screen assembly.
3. Add sealant GM P/N 12346004 (Canadian P/N 10953480) to the oil pump pipe bolt threads.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

4. Install the oil pump pipe and screen assembly bolts.

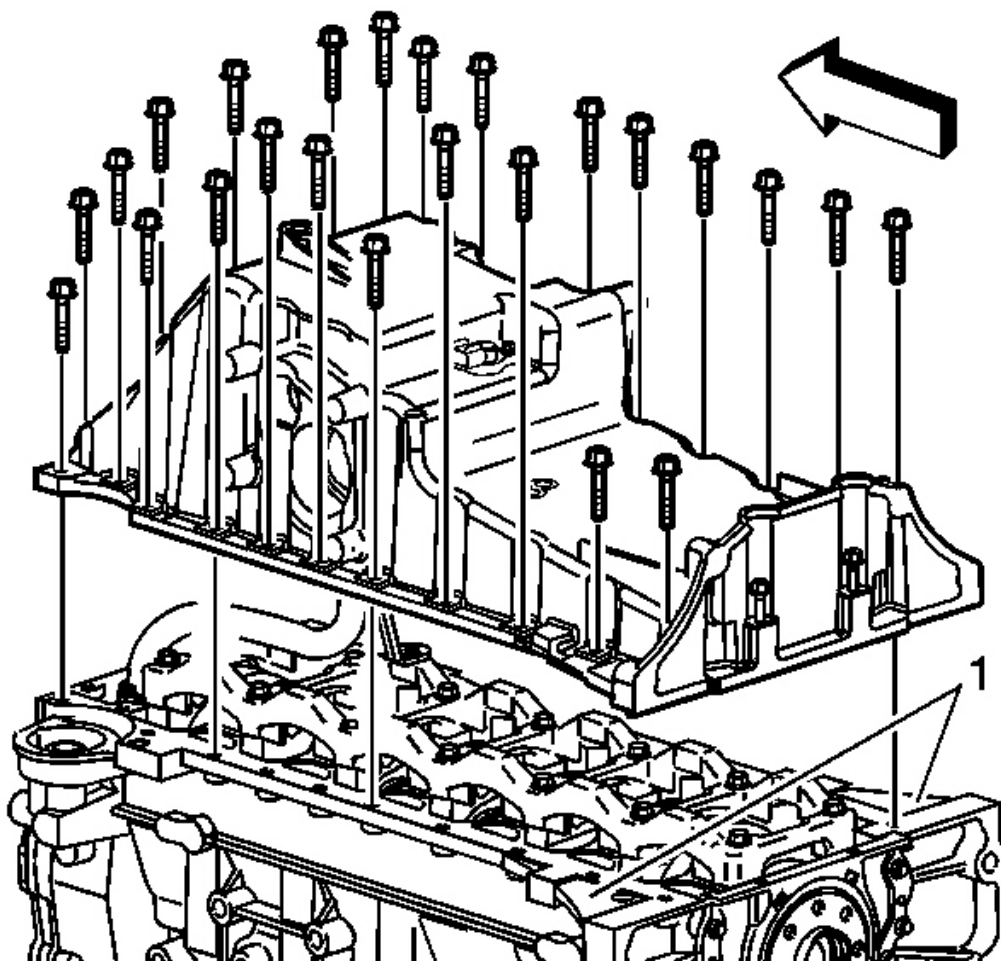
**Tighten:** Tighten the oil pump pipe and screen assembly bolts to 10 N.m (89 lb in).

## OIL PAN INSTALLATION



**Fig. 526: Applying Sealant To Block**  
Courtesy of GENERAL MOTORS CORP.

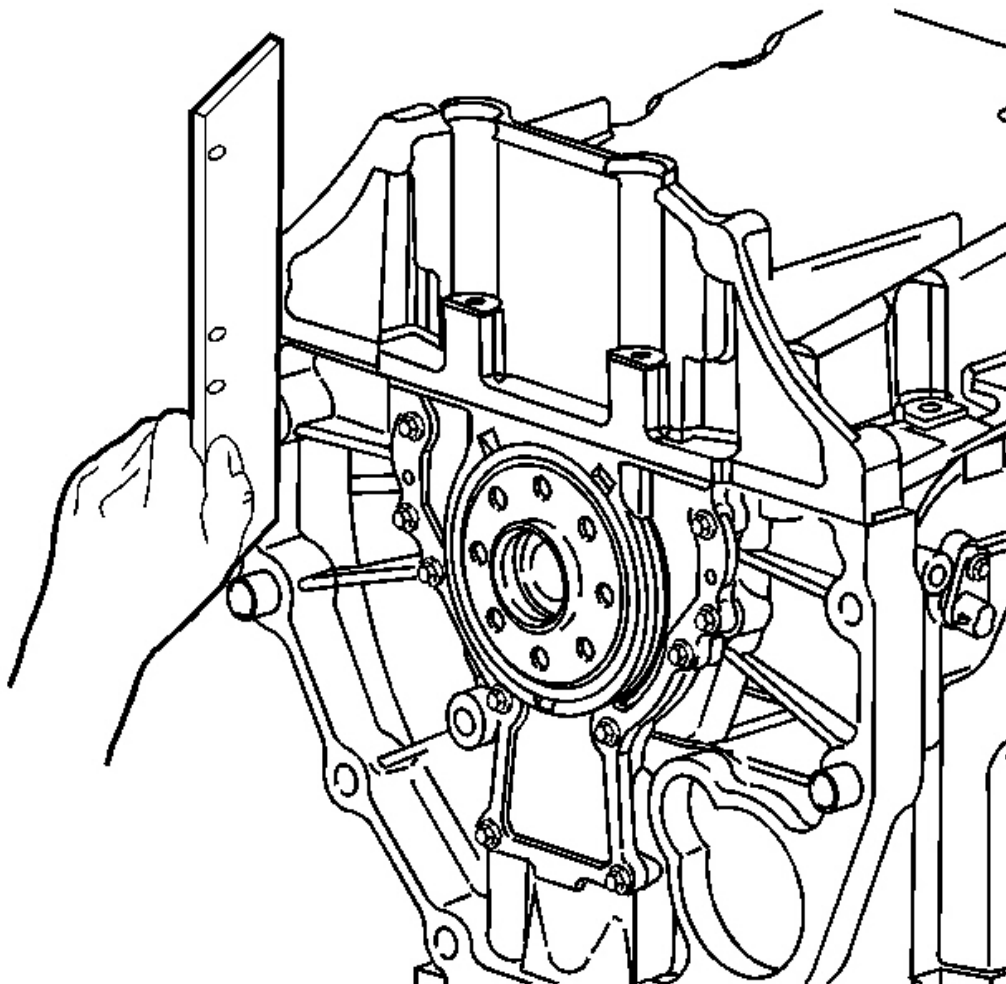
1. Apply a 3 mm (0.12 in) bead of sealer to the block.



**Fig. 527: View Of Oil Pan & Bolts**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** The oil pan must be installed within 10 minutes from when the sealer was applied.

2. Install the oil pan.
3. Install the oil pan bolts.



**Fig. 528: Inspecting Oil Pan Alignment**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** When installing the oil pan, it could be shifted front or back a little which could cause a transmission alignment problem. The back of the oil pan needs to be flush with the block.

4. Check the oil pan alignment. Use a straight edge on the back of the block and oil pan (transmission mounting surface).

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

5. Tighten the oil pan bolts.

**Tighten:**

- Tighten the (side) oil pan bolts to 25 N.m (1 lb ft).
- Tighten the (end) oil pan bolts to 10 N.m (89 lb in).

6. Install the oil level sensor.

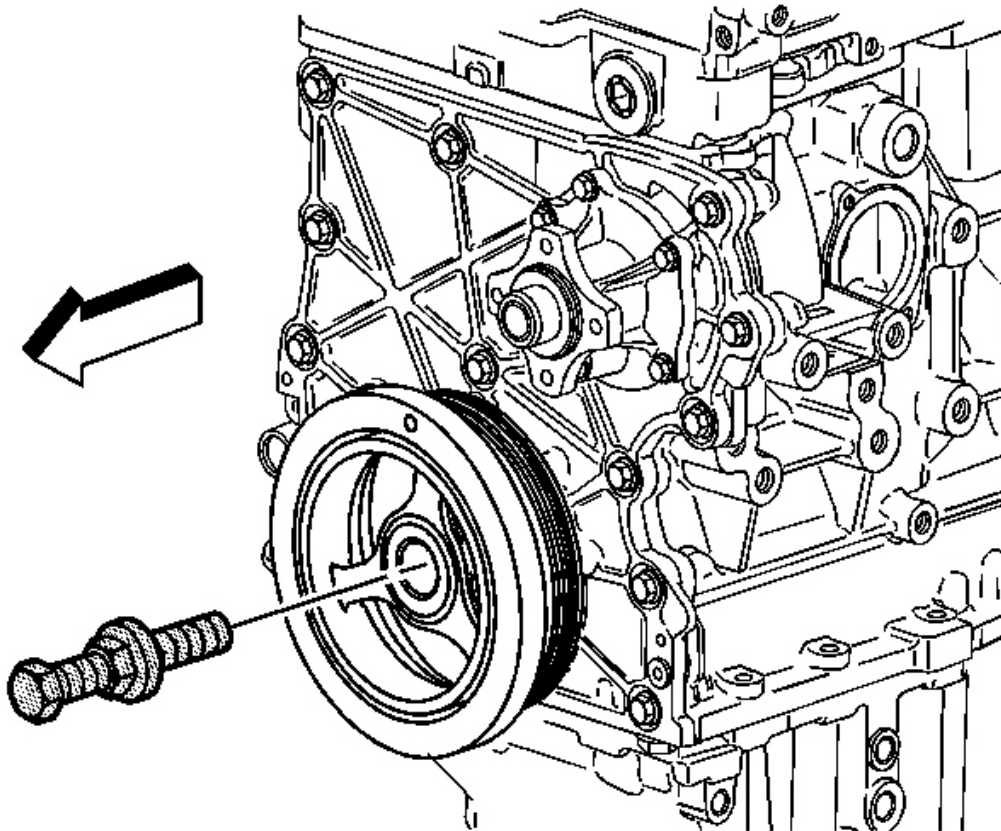
7. Install the oil level sensor bolt.

**Tighten:** Tighten the oil level sensor bolt to 10 N.m (89 lb in).

### CRANKSHAFT BALANCER INSTALLATION

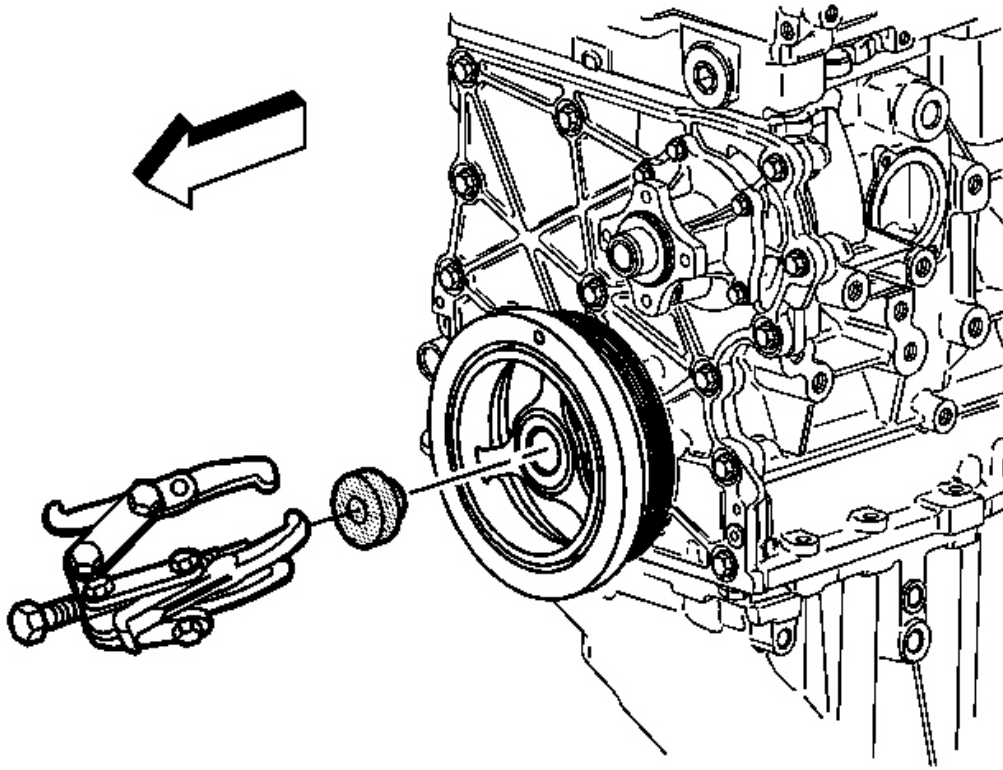
#### Tools Required

- **J 45059** Angle Meter. See Special Tools and Equipment.
- **J 41478** Crankshaft Balancer Installer. See Special Tools and Equipment.



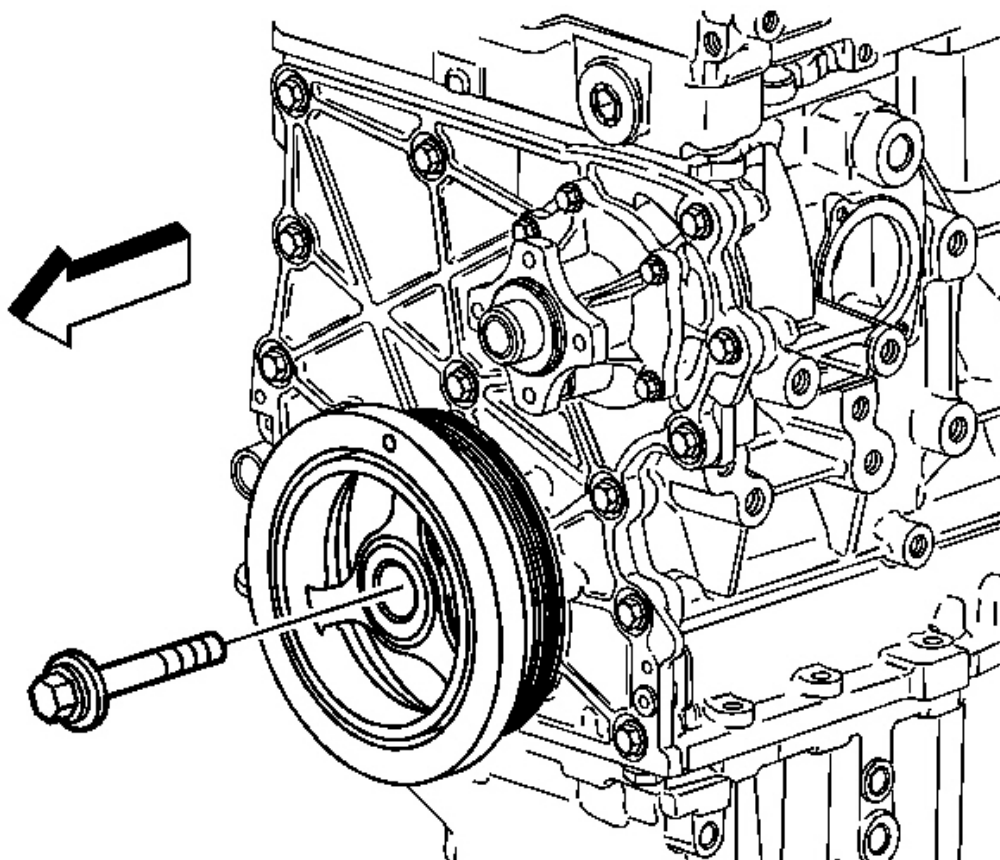
**Fig. 529: Installing Crankshaft Balancer Using J 41478**  
Courtesy of GENERAL MOTORS CORP.

1. Install the crankshaft balancer using **J 41478** . See **Special Tools and Equipment**.
2. Remove **J 41478** . See **Special Tools and Equipment**.



**Fig. 530: View Of Crankshaft Balancer**  
Courtesy of GENERAL MOTORS CORP.

3. Hold the flywheel or back of the crankshaft. The crankshaft balancer does not have a keyway so the crankshaft could turn when tightening, causing an improper torque.



**Fig. 531: View Of Crankshaft Balancer Bolt**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Be sure the crankshaft balancer friction washer, was installed prior to the engine front cover installation.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

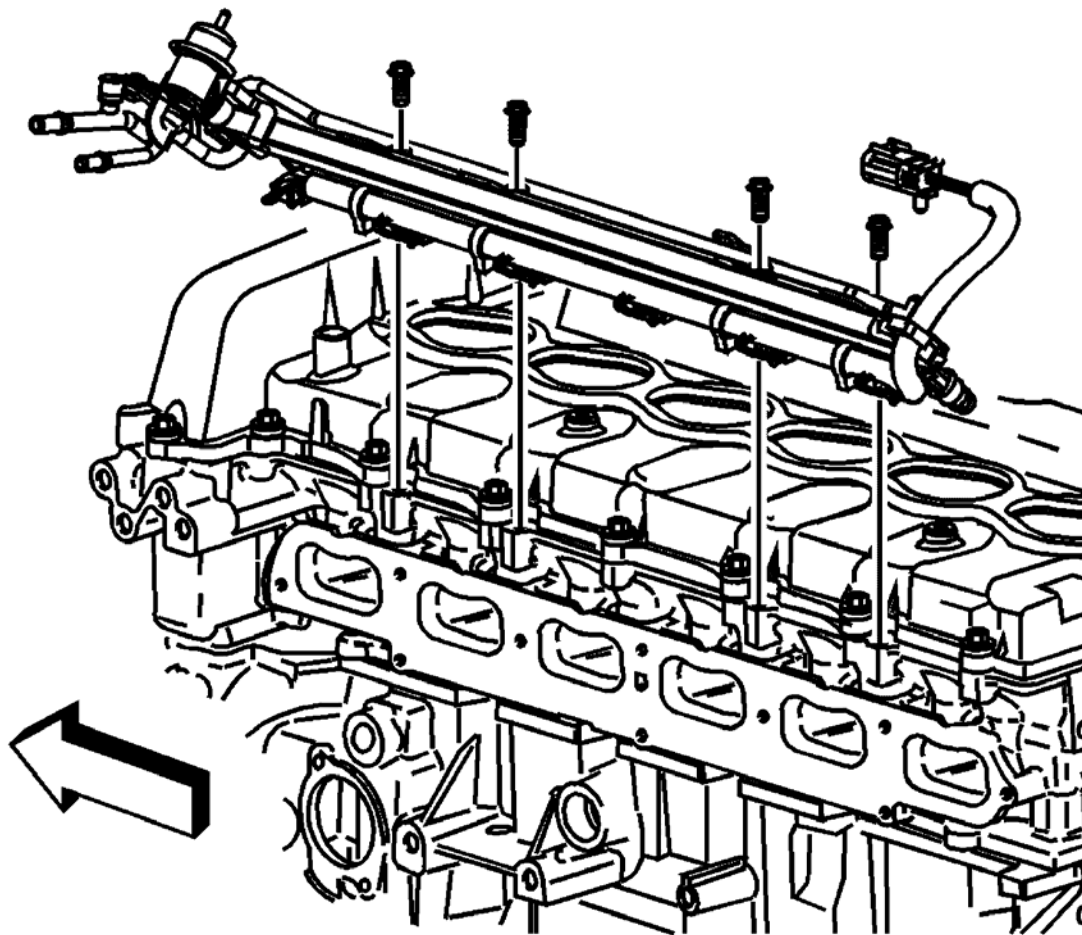
4. Install the crankshaft balancer washer and new bolt.

**Tighten:**

1. Tighten the new crankshaft balancer bolt while holding the back to 150 N.m (110 lb ft).
2. Use **J 45059** to tighten the crankshaft balancer bolt an additional 180 degrees. See **Special Tools and Equipment**.



## FUEL RAIL AND INJECTORS INSTALLATION



**Fig. 532: View Of Fuel Injector Rail & Bolts**  
Courtesy of GENERAL MOTORS CORP.

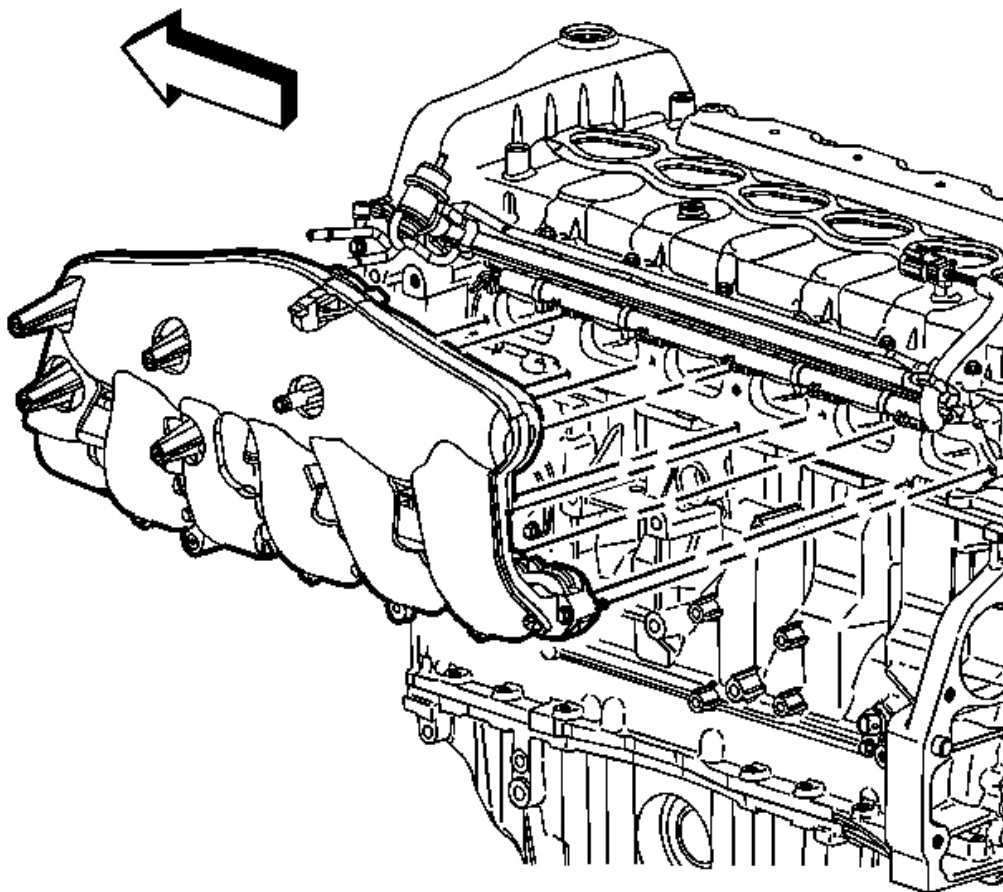
1. Lubricate the lower injector O-rings with mineral oil.
2. Install the fuel injector rail.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

3. Install the fuel injector rail bolts.

**Tighten:** Tighten the fuel injector rail bolts to 10 N.m (89 lb in).

## INTAKE MANIFOLD INSTALLATION



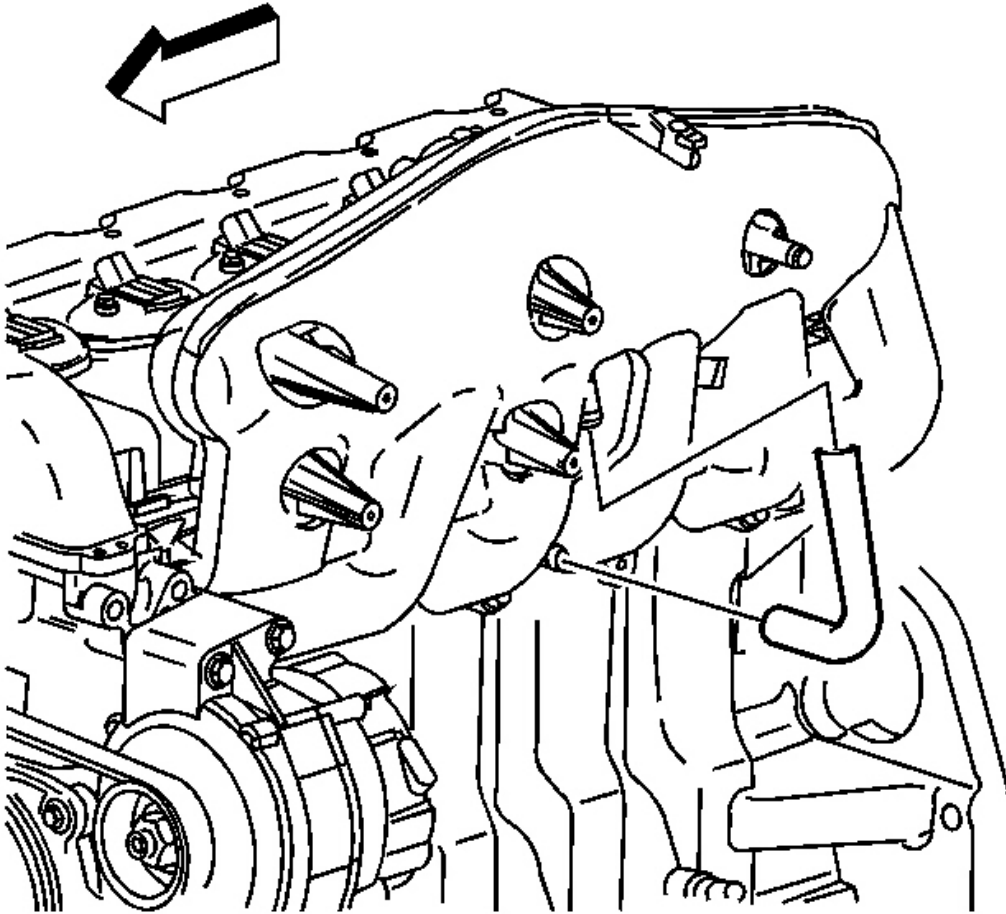
**Fig. 533: View Of Intake Manifold & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Install a new intake manifold gasket.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

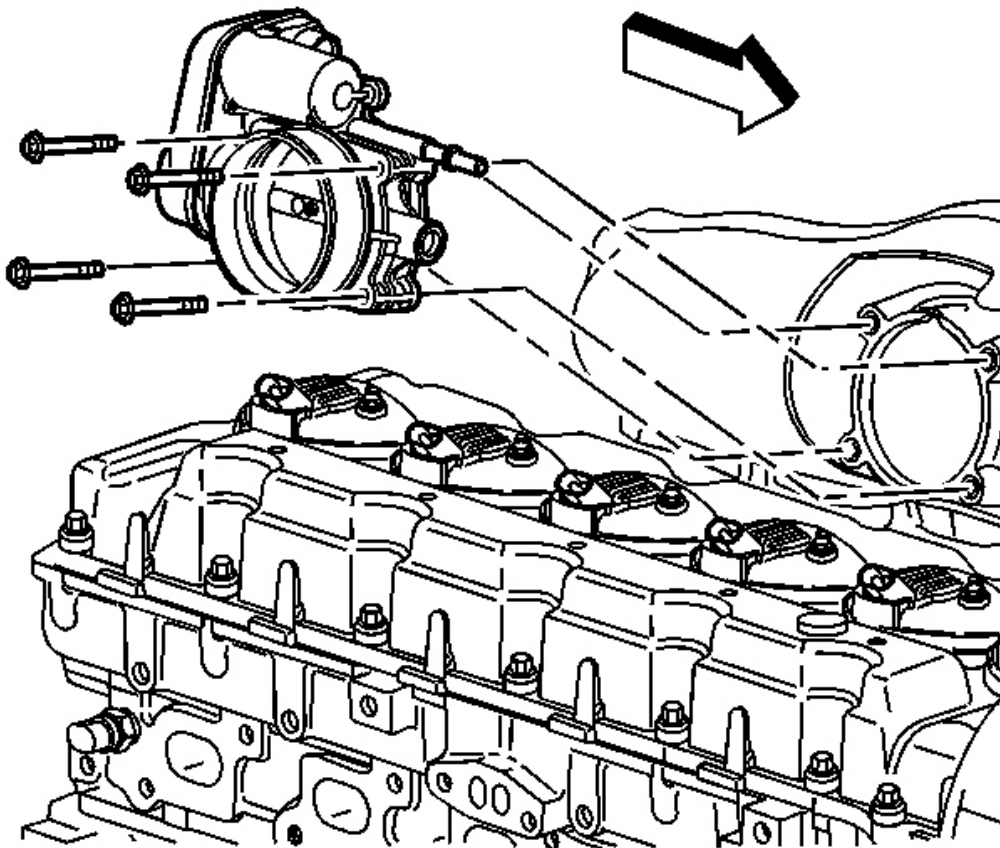
2. Install the intake manifold and bolts.

**Tighten:** Tighten the intake manifold bolts from the inside out to 16 N.m (12 lb ft).



**Fig. 534: View Of Crankcase Ventilation Hose Location**  
Courtesy of GENERAL MOTORS CORP.

3. Lubricate the inner diameter of the ends of PCV hose with lubricant.
4. Install the PCV hose.



**Fig. 535: View Of Throttle Control Module & Bolts**  
Courtesy of GENERAL MOTORS CORP.

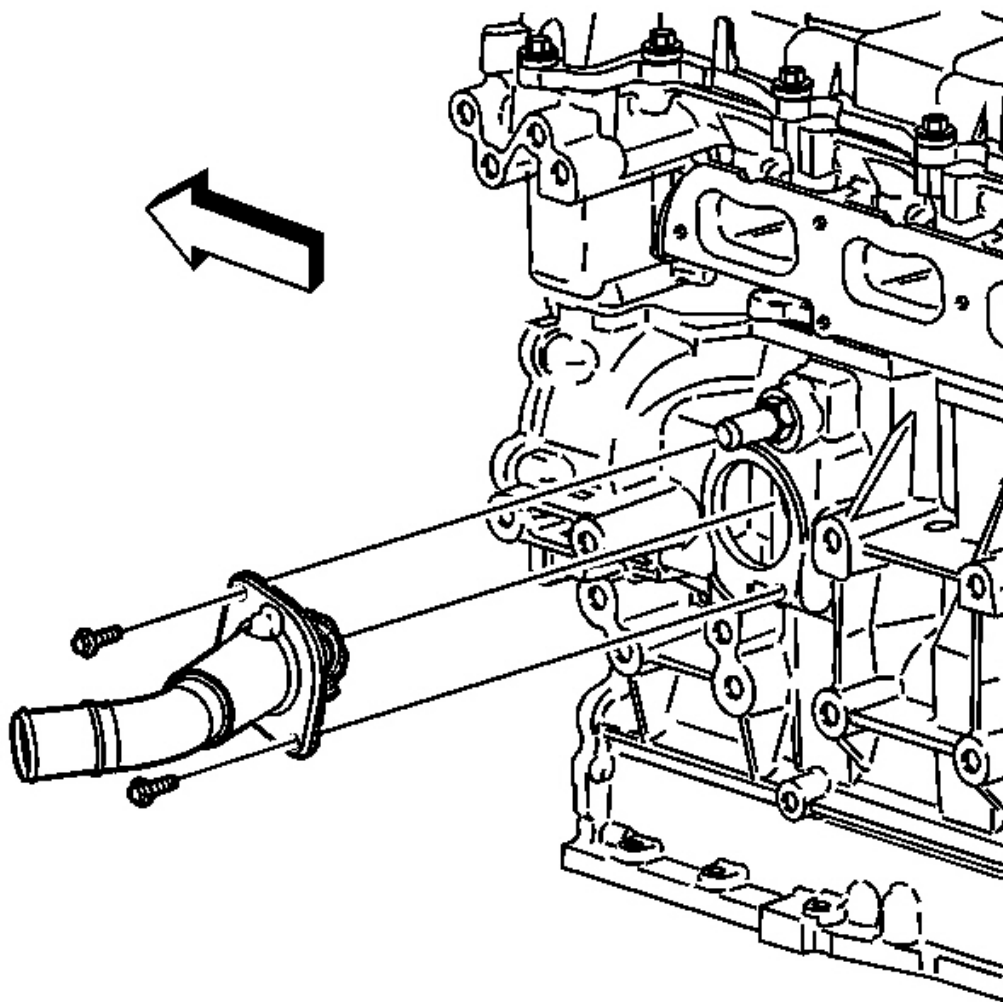
5. Install a new throttle control module gasket.
6. Install the throttle control module.
7. Add sealer to the throttle control module bolt threads.

**NOTE:** Refer to in Cautions and Notices.

8. Install the throttle control module bolts.

**Tighten:** Tighten the throttle control module bolts to 10 N.m (89 lb in).

## THERMOSTAT HOUSING INSTALLATION



**Fig. 536: View Of Thermostat Housing & Bolts**  
Courtesy of GENERAL MOTORS CORP.

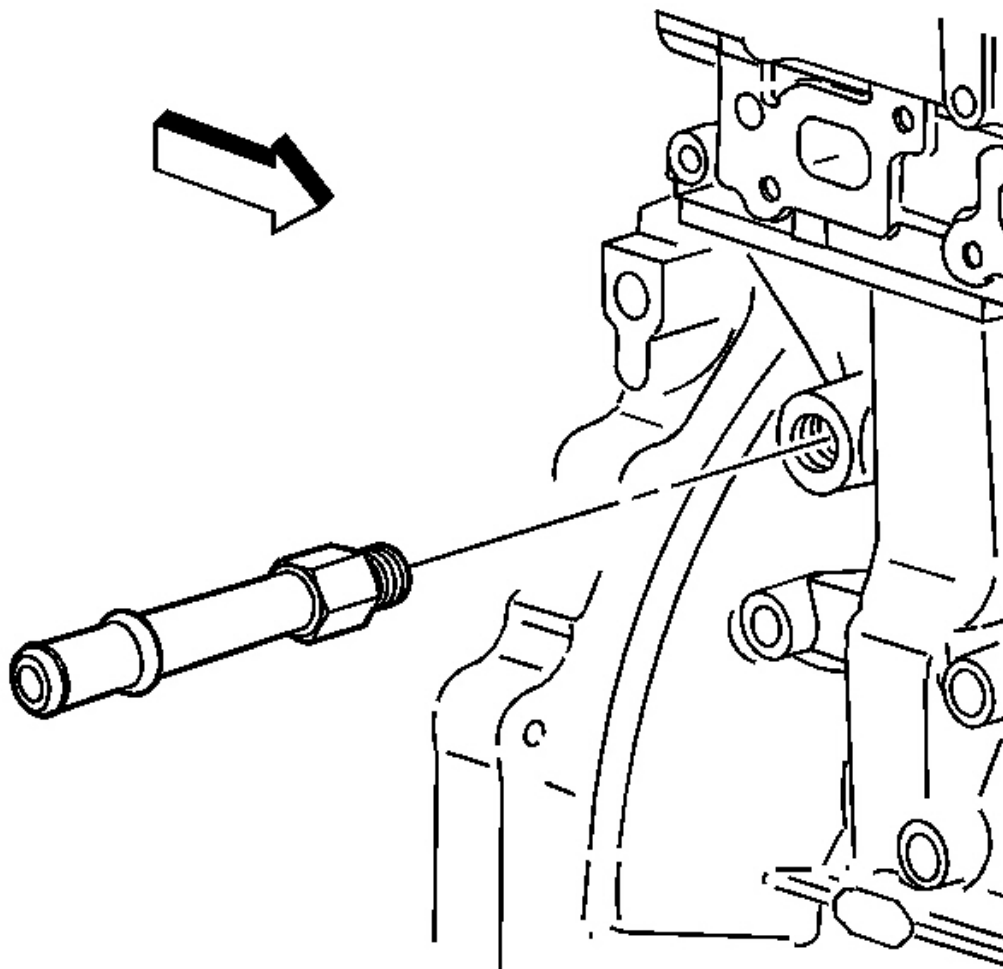
1. Install the thermostat housing.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the thermostat housing bolts.

**Tighten:** Tighten the thermostat housing bolts to 10 N.m (89 lb in).

## HEATER INLET HOSE FITTING INSTALLATION



**Fig. 537: View Of Heater Inlet Hose Fitting**  
Courtesy of GENERAL MOTORS CORP.

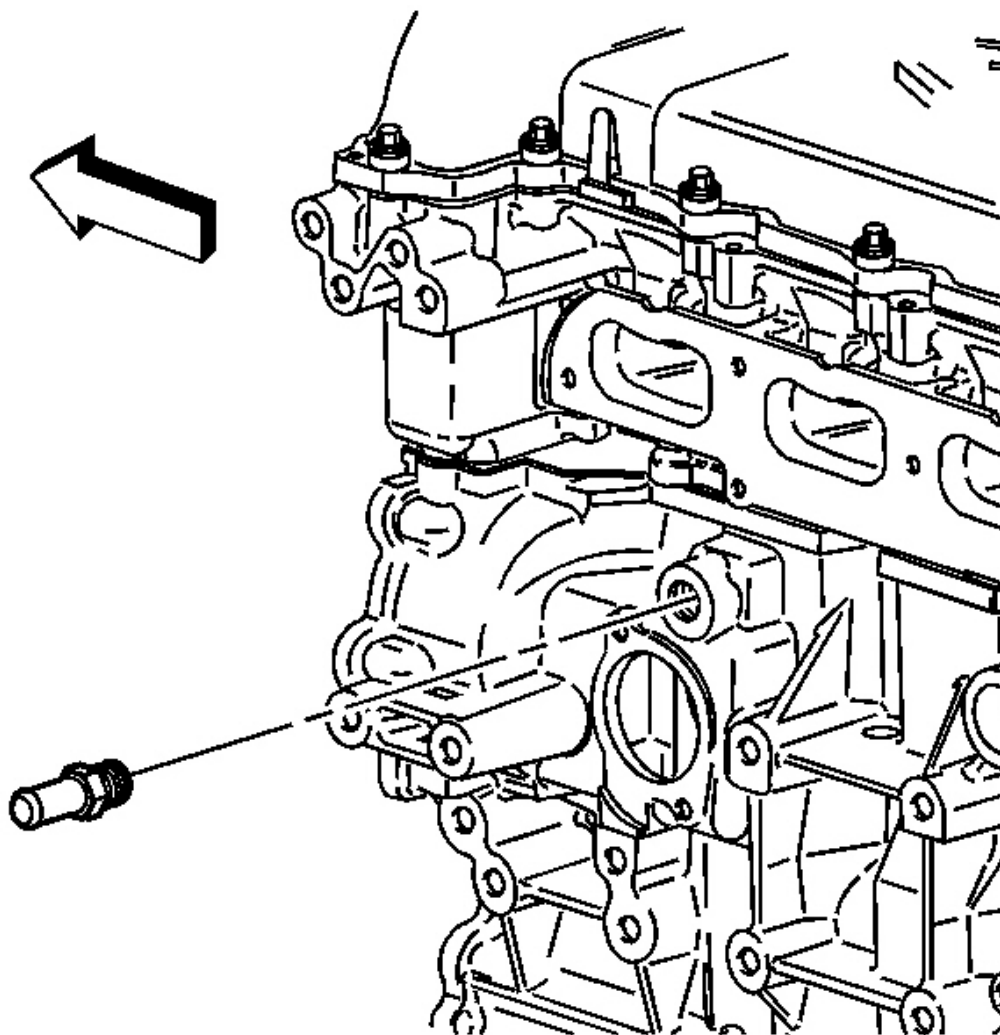
1. Apply sealant to the heater inlet hose fitting threads.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the heater inlet hose fitting.

**Tighten:** Tighten the heater inlet hose fitting to 45 N.m (33 lb ft).

#### HEATER OUTLET HOSE FITTING INSTALLATION



**Fig. 538: View Of Heater Outlet Hose Fitting**  
Courtesy of GENERAL MOTORS CORP.

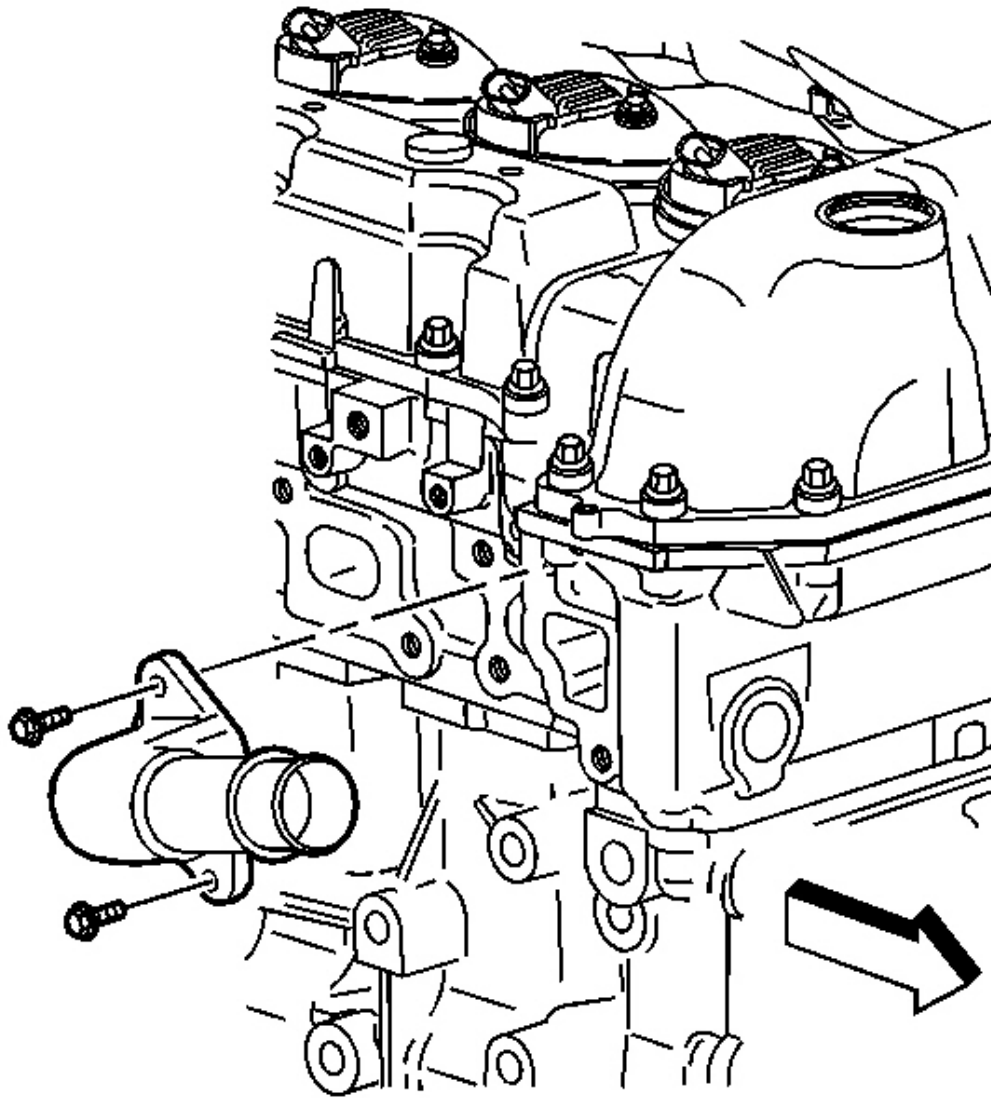
1. Apply sealant to the heater outlet hose fitting threads.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the heater outlet hose fitting.

**Tighten:** Tighten the heater outlet hose fitting to 45 N.m (33 lb ft).

## WATER OUTLET INSTALLATION



**Fig. 539: View Of Water Outlet**  
Courtesy of GENERAL MOTORS CORP.

1. Install the water outlet.

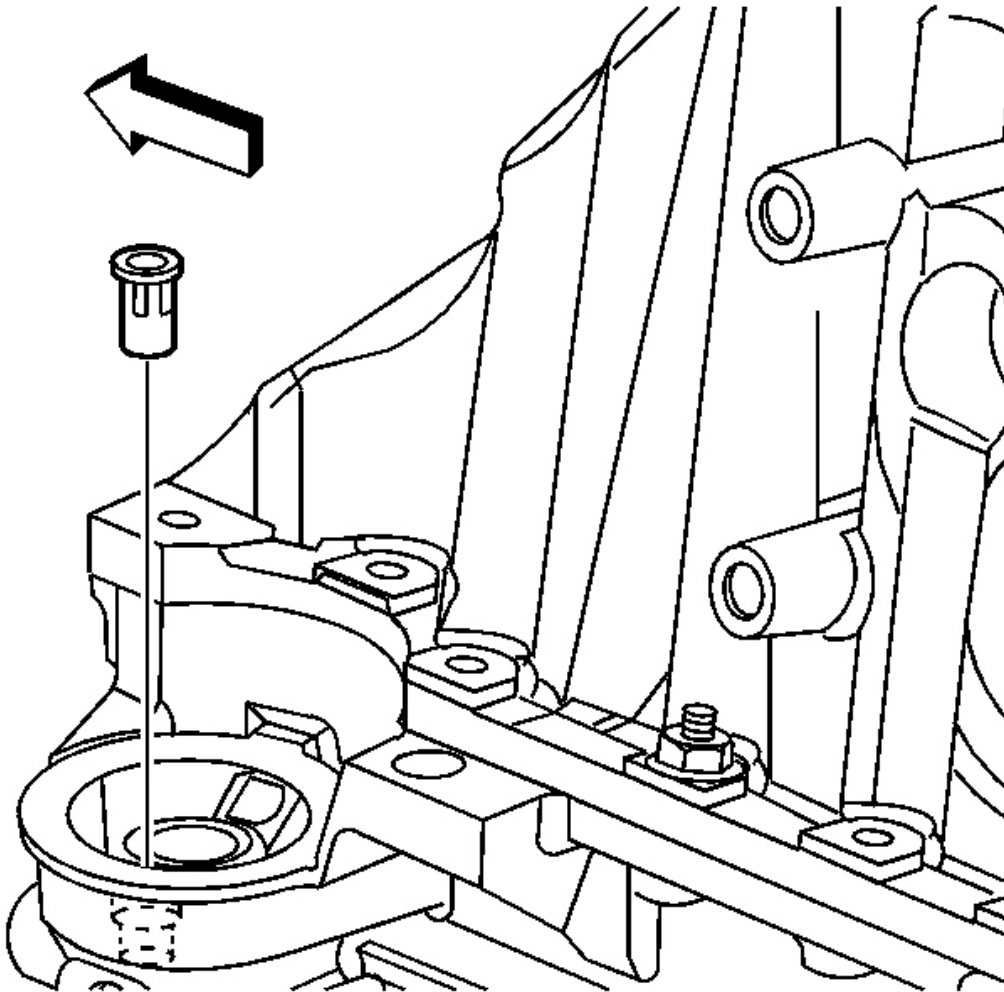
**NOTE:** Refer to Fastener Notice in Cautions and Notices.



2. Install the water outlet bolts.

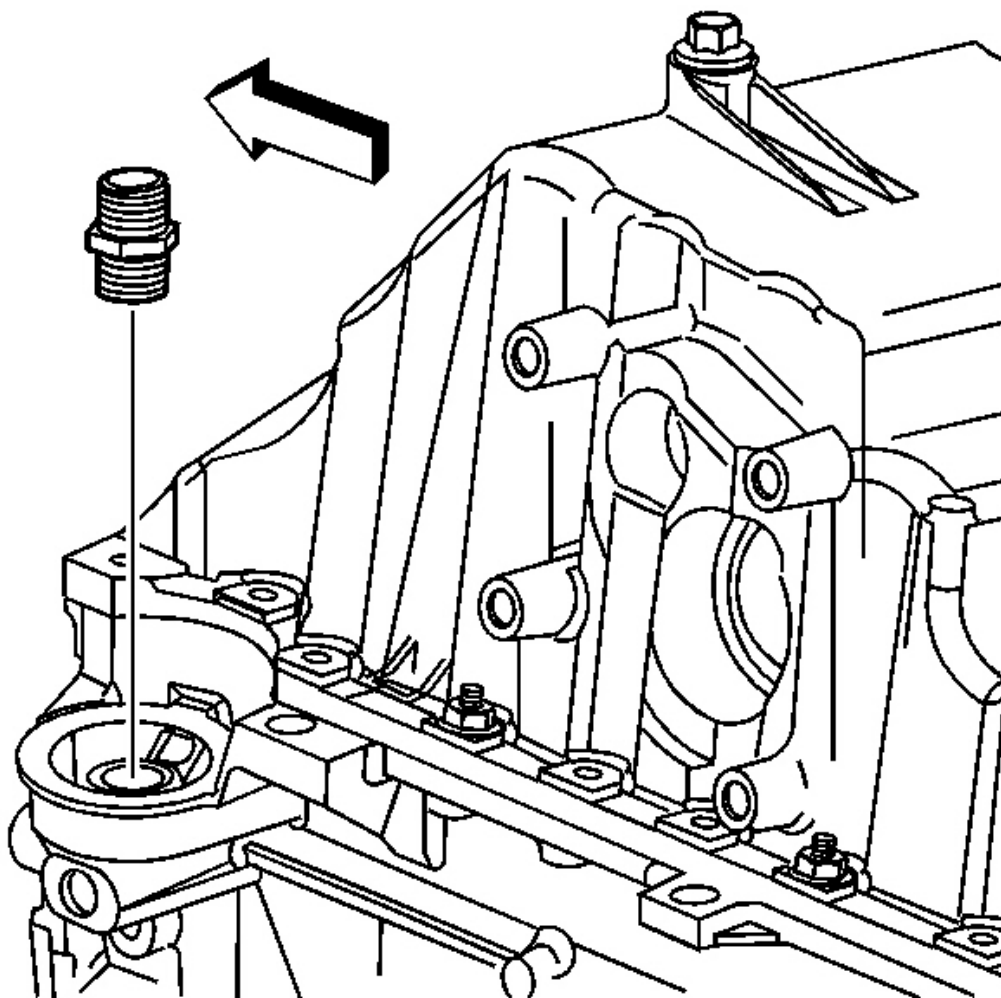
**Tighten:** Tighten the water outlet bolts to 10 N.m (89 lb in).

## OIL FILTER ADAPTER INSTALLATION



**Fig. 540: View Of Oil Filter Bypass Valve**  
Courtesy of GENERAL MOTORS CORP.

1. Install the oil filter bypass valve.



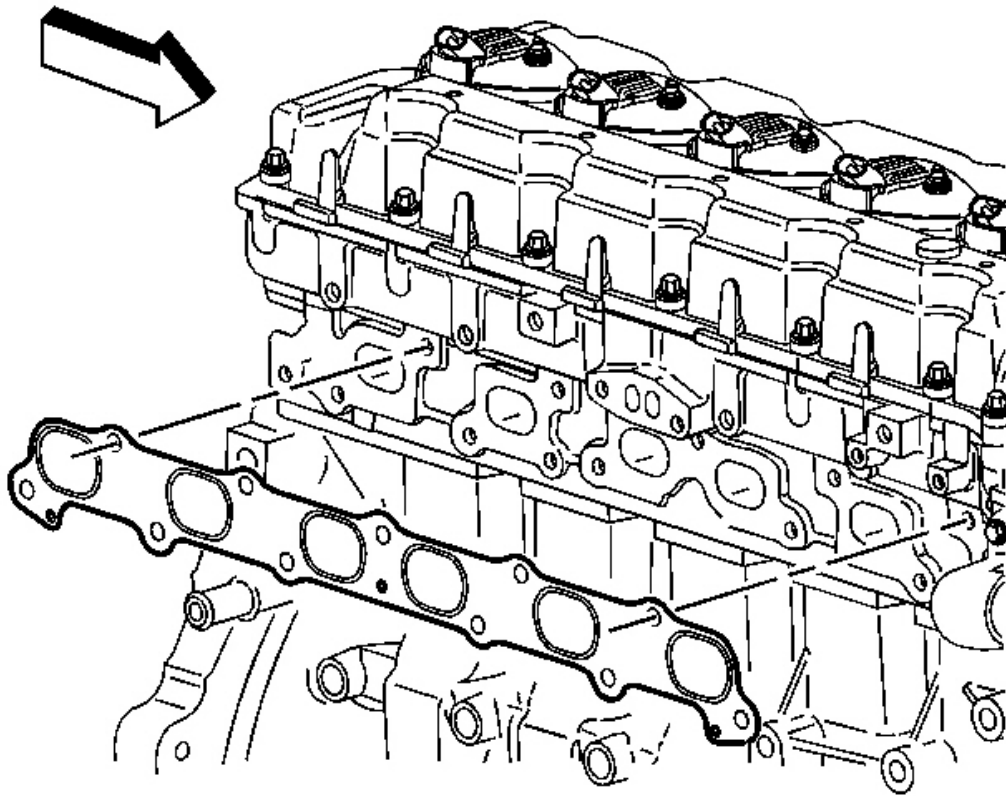
**Fig. 541: View Of Oil Filter Adapter**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the oil filter adapter.

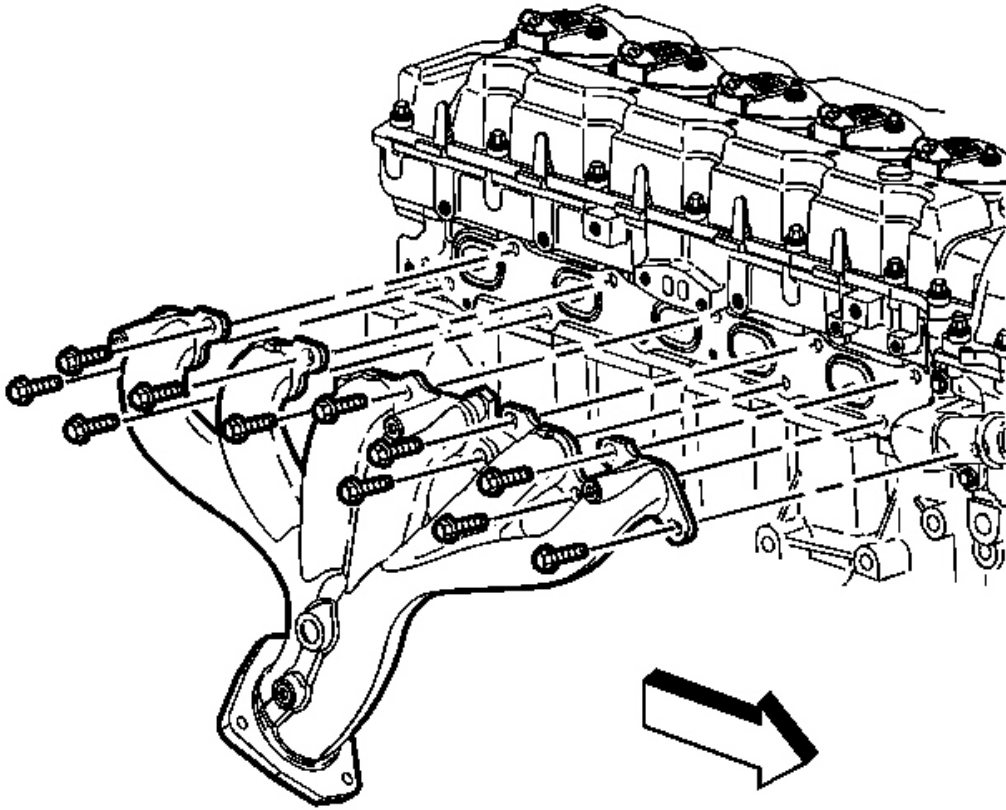
**Tighten:** Tighten the oil filter adapter to 50 N.m (37 lb ft).

## EXHAUST MANIFOLD INSTALLATION



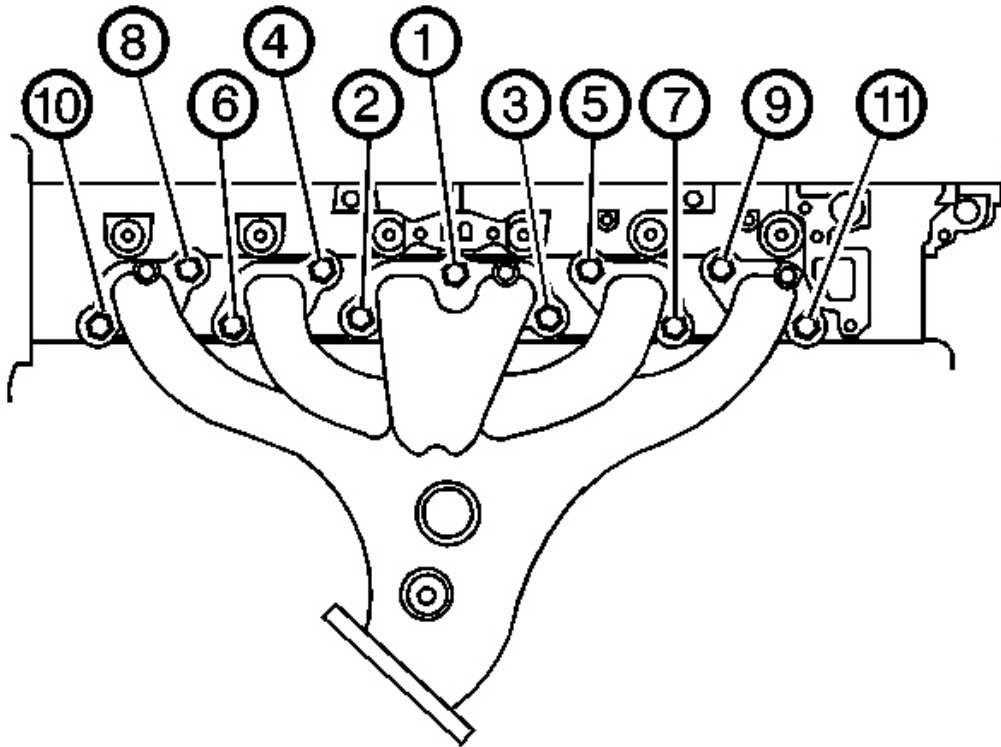
**Fig. 542: View Of Exhaust Manifold Gasket**  
**Courtesy of GENERAL MOTORS CORP.**

1. Install the exhaust manifold gasket.



**Fig. 543: View Of Exhaust Manifold & Bolts**  
**Courtesy of GENERAL MOTORS CORP.**

2. Install the exhaust manifold.
3. Add threadlock to the exhaust manifold bolt threads.
4. Install the exhaust manifold bolts.



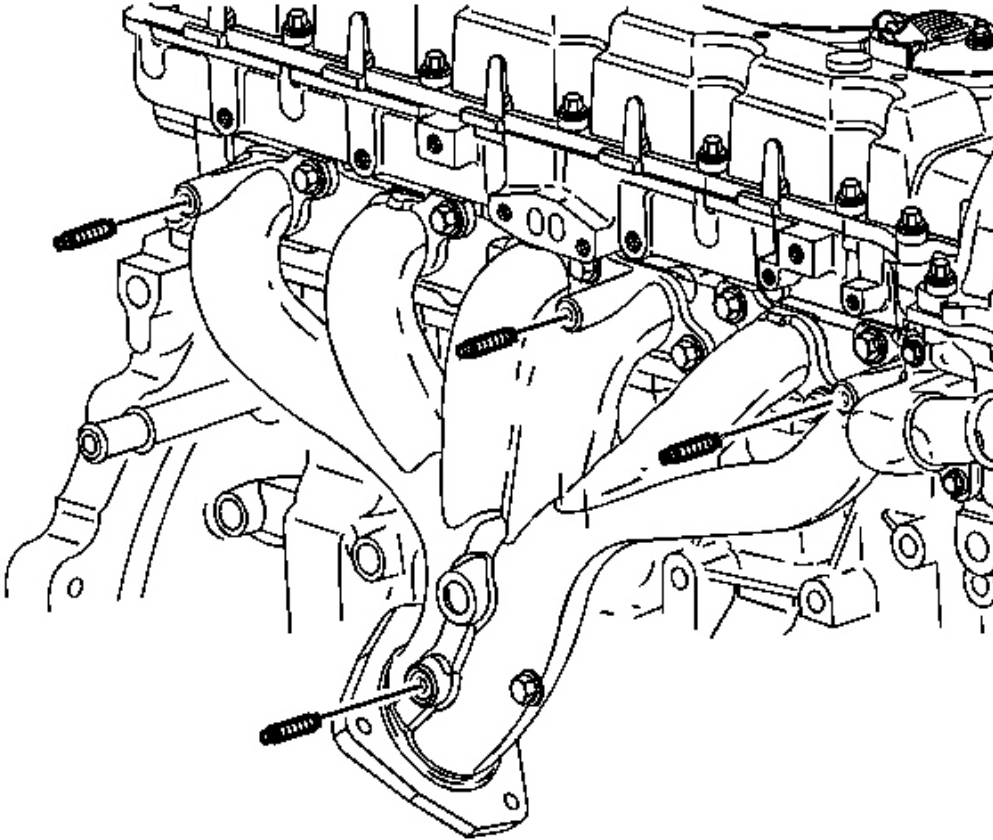
**Fig. 544: Tightening Exhaust Manifold Bolts**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

5. Tighten the exhaust manifold bolts.

**Tighten:**

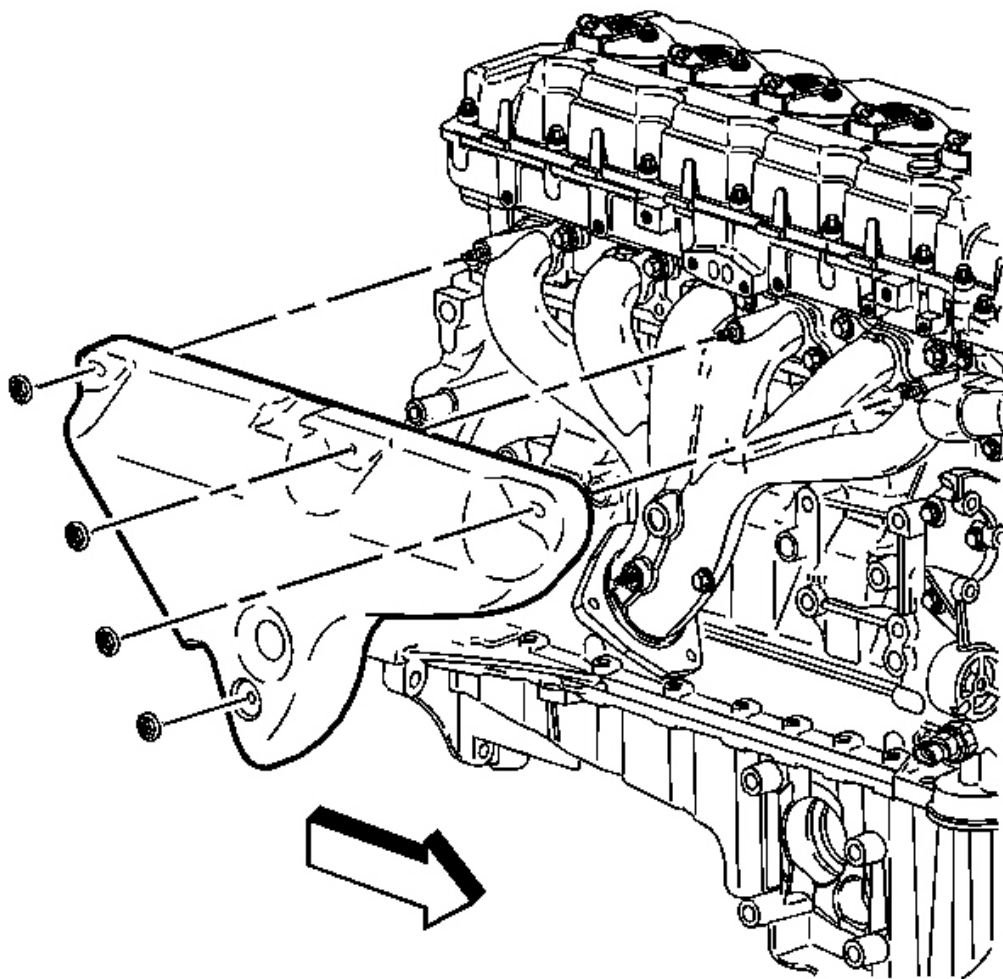
1. Tighten the exhaust manifold bolts a first pass in sequence to 25 N.m (18 lb ft).
2. Tighten the exhaust manifold bolts a second pass in sequence to 25 N.m (18 lb ft).
3. Tighten the exhaust manifold bolts a final pass in sequence to 25 N.m (18 lb ft).



**Fig. 545: View Of Exhaust Manifold Studs**  
Courtesy of GENERAL MOTORS CORP.

6. Install the exhaust manifold heat shield studs (if required).

**Tighten:** Tighten the exhaust manifold heat shield studs to 10 N.m (89 lb in).

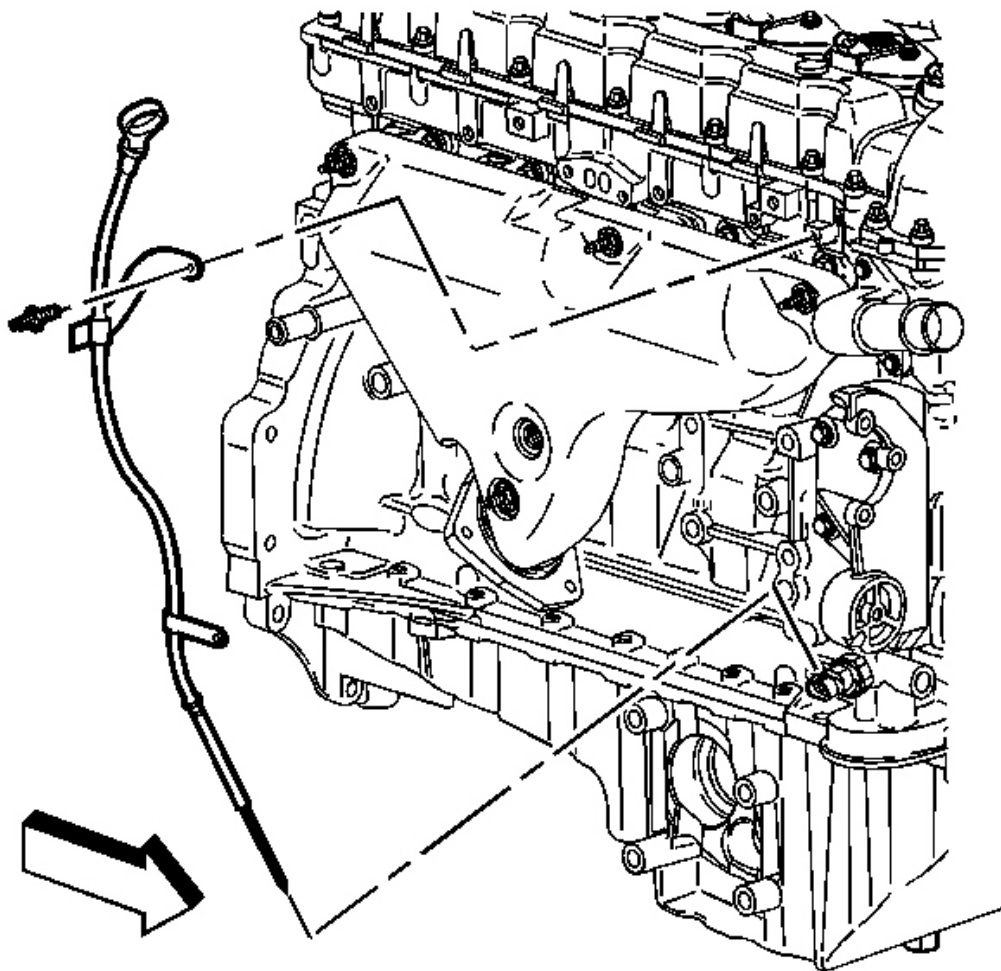


**Fig. 546: View Of Exhaust Manifold Heat Shield & Nuts**  
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust manifold heat shield.
8. Add anti-seize to the exhaust manifold heat shield nuts.
9. Install the exhaust manifold heat shield nuts.

**Tighten:** Tighten the exhaust manifold heat shield nuts to 10 N.m (89 lb in).

## OIL LEVEL INDICATOR AND TUBE INSTALLATION



**Fig. 547: View Of Oil Level Indicator Tube Stud**  
Courtesy of GENERAL MOTORS CORP.

1. Install the oil level indicator tube.
2. Add sealant to the oil level indicator tube stud threads.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

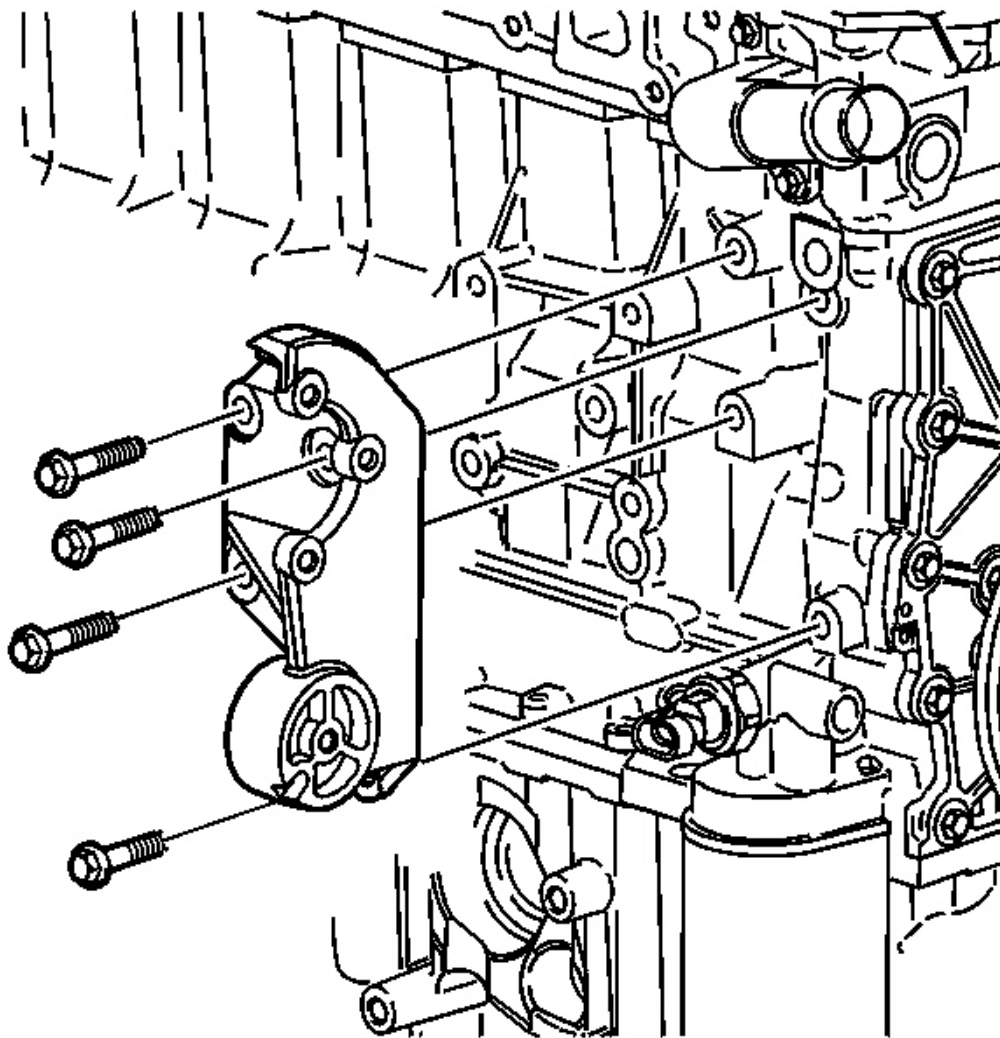
3. Install the oil level indicator tube stud.

**Tighten:** Tighten the oil level indicator tube stud to 10 N.m (89 lb in).



4. Install the oil level indicator.

## POWER STEERING PUMP BRACKET INSTALLATION



**Fig. 548: View Of Power Steering Pump Bracket & Bolts**  
Courtesy of GENERAL MOTORS CORP.

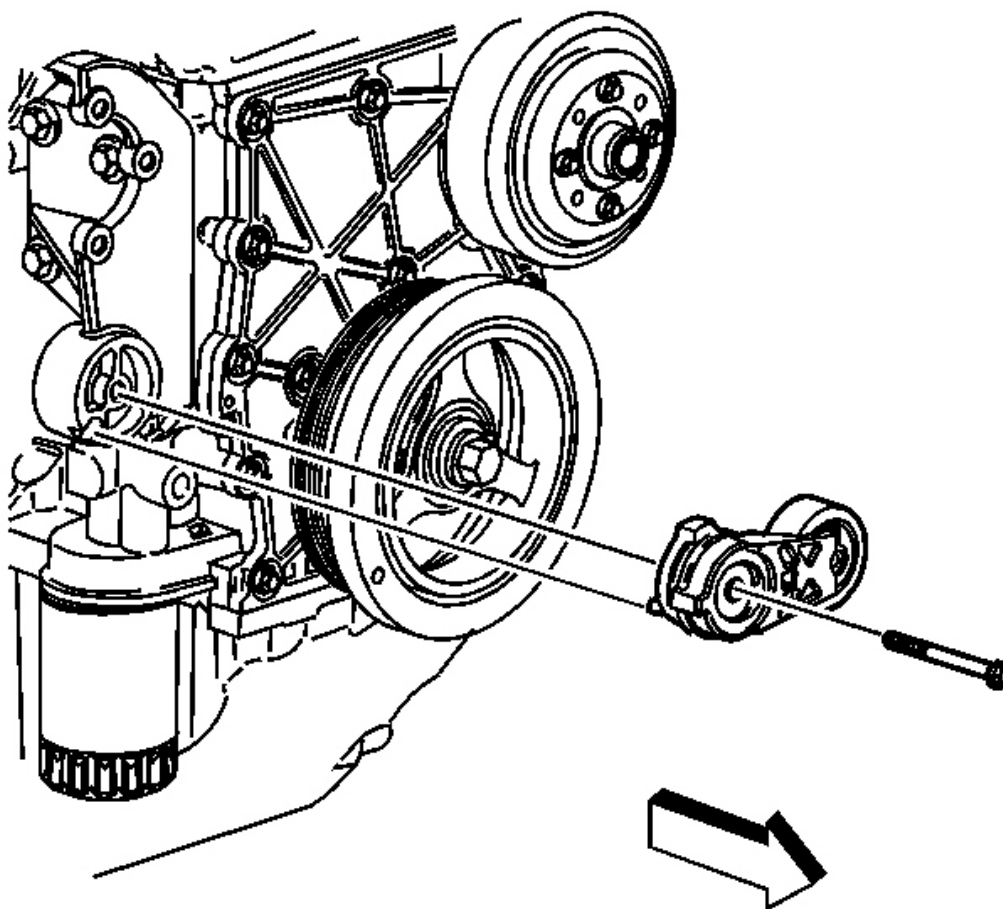
1. Install the power steering pump bracket.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering pump bracket bolts.

**Tighten:** Tighten the power steering pump bracket bolts to 50 N.m (37 lb ft).

## DRIVE BELT TENSIONER INSTALLATION



**Fig. 549: View Of Drive Belt Tensioner & Bolt**  
Courtesy of GENERAL MOTORS CORP.

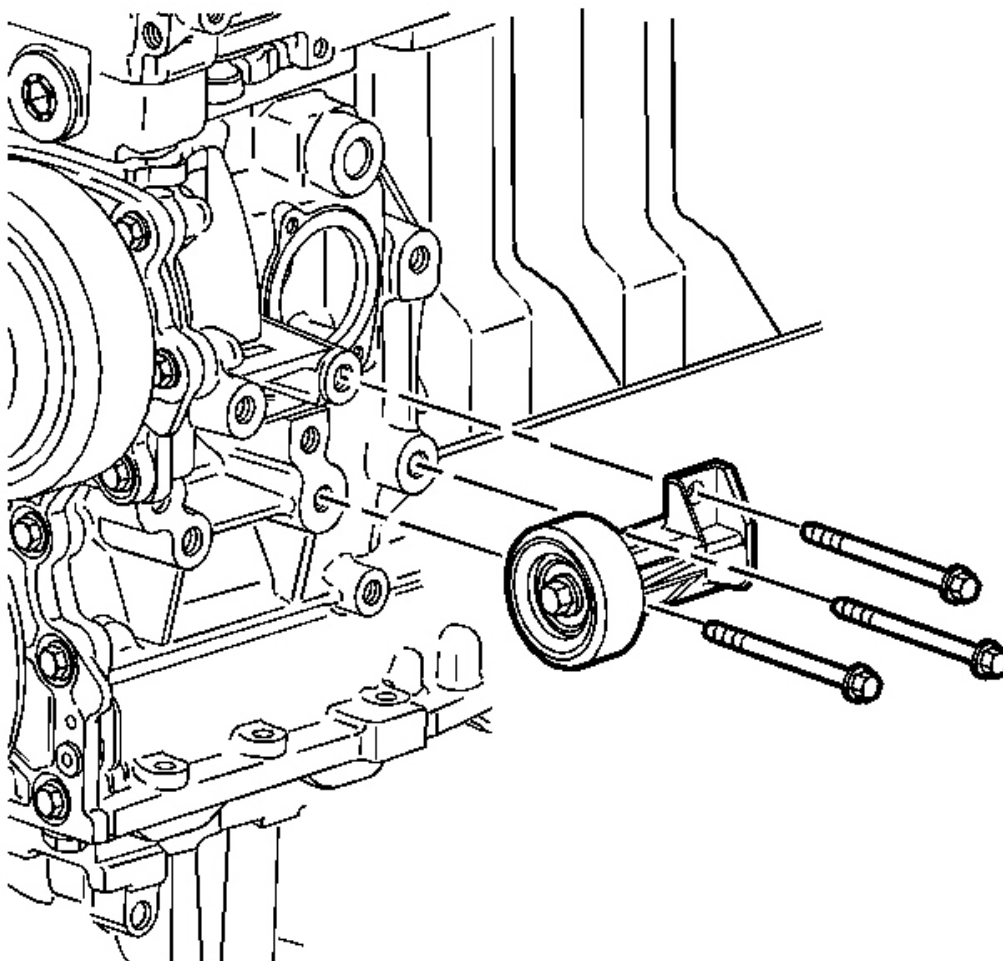
1. Install the drive belt tensioner.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the drive belt tensioner bolt.

**Tighten:** Tighten the drive belt tensioner bolt to 50 N.m (37 lb ft).

## DRIVE BELT IDLER PULLEY INSTALLATION



**Fig. 550: View Of Drive Belt Idler Pulley & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Install the drive belt idler pulley.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

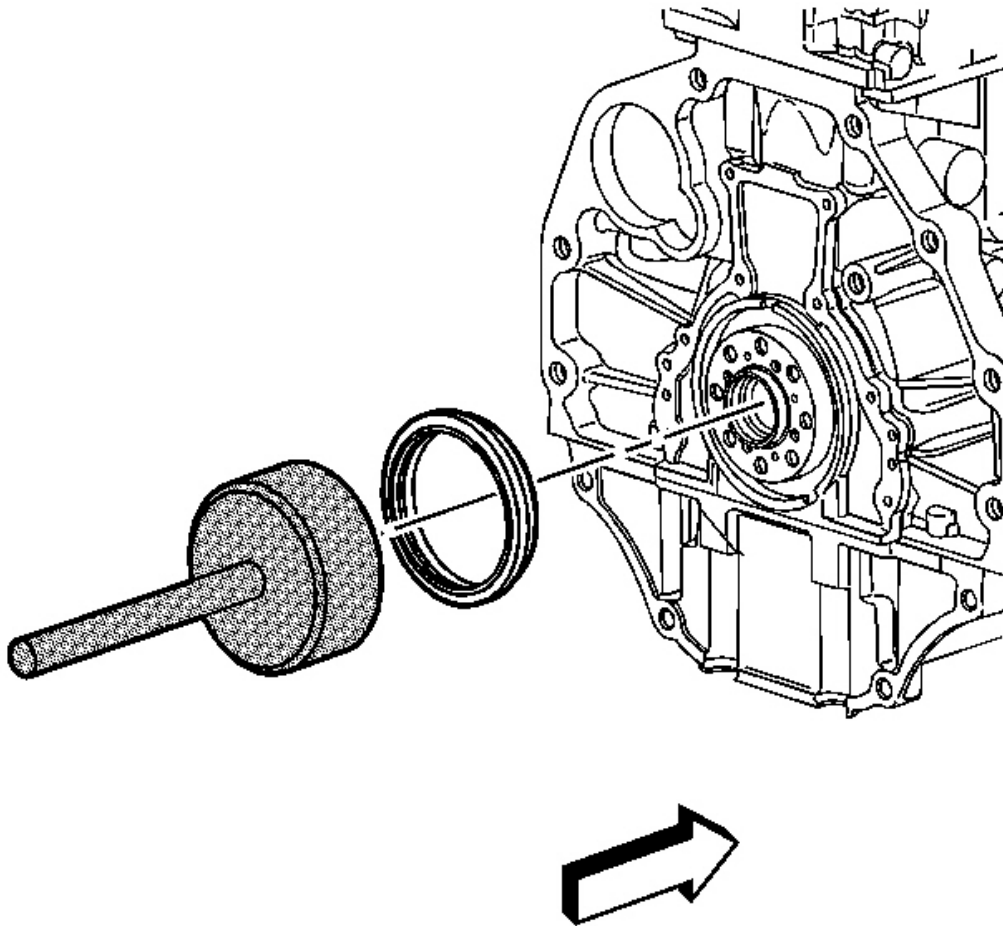
2. Install the drive belt idler pulley bolts.

**Tighten:** Tighten the drive belt idler pulley bolts to 50 N.m (37 lb ft).

## CRANKSHAFT REAR OIL SEAL INSTALLATION

### Tools Required

**J 44227** Rear Seal Installer. See **Special Tools and Equipment**.



**Fig. 551: Installing Crankshaft Rear Oil Seal Using J 44227**  
Courtesy of GENERAL MOTORS CORP.

1. Use the plastic installation sleeve supplied with the new seal when installing a new seal.

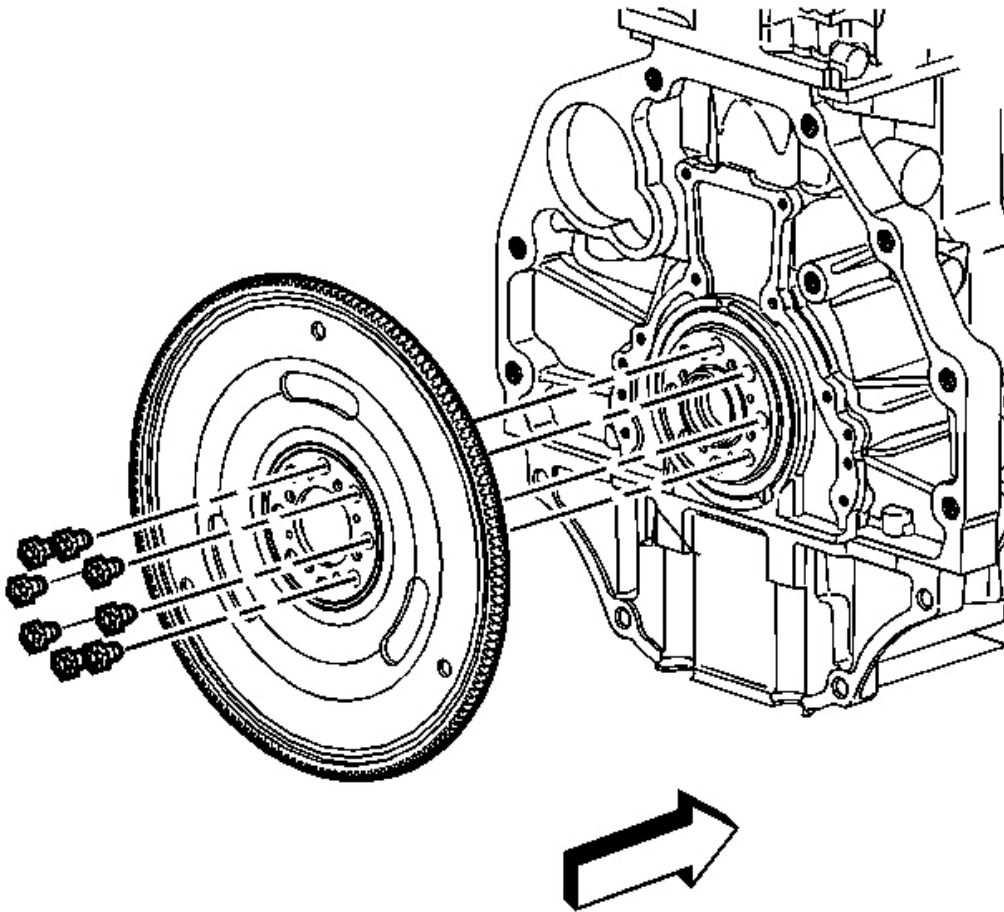
Use **J 44227** to install the crankshaft rear oil seal. See **Special Tools and Equipment**.

2. Remove **J 44227** . See Special Tools and Equipment.

## ENGINE FLYWHEEL INSTALLATION

### Tools Required

**J 45059** Angle Meter. See Special Tools and Equipment.



**Fig. 552: View Of Flywheel & Bolts**  
Courtesy of GENERAL MOTORS CORP.

1. Install the flywheel.

**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install new flywheel bolts.

**Tighten:**

1. Tighten the new flywheel bolts to 25 N.m (18 lb ft).
2. Use **J 45059** to tighten the flywheel bolts an additional 50 degrees. See **Special Tools and Equipment**.

## **DESCRIPTION AND OPERATION**

### **CRANKCASE VENTILATION SYSTEM DESCRIPTION**

A closed crankcase ventilation system is used in order to provide a more complete scavenging of crankcase vapors. Fresh air from the throttle body is supplied to the crankcase, mixed with blow-by gases, and then passed through a crankcase ventilation pipe/passage into the intake manifold.

#### **Results of Incorrect Operation**

A plugged PCV Pipe/passage way may cause:

- Rough idle
- Stalling or slow idle speed
- Oil leaks
- Sludge in engine

### **DRIVE BELT SYSTEM DESCRIPTION**

The drive belt system consists of the following components:

- The drive belt
- The drive belt tensioner
- The drive belt idler pulley
- The crankshaft balancer pulley
- The accessory drive component mounting brackets
- The accessory drive components
  - The power steering pump, if belt driven
  - The generator
  - The A/C compressor, if equipped
  - The engine cooling fan, if belt driven
  - The water pump, if belt driven
  - The vacuum pump, if equipped
  - The air compressor, if equipped

## **2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

The drive belt system may use one belt or two belts. The drive belt is thin so that it can bend backwards and has several ribs to match the grooves in the pulleys. There also may be a V-belt style belt used to drive certain accessory drive components. The drive belts are made of different types of rubbers (chloroprene or EPDM) and have different layers or plys containing either fiber cloth or cords for reinforcement.

Both sides of the drive belt may be used to drive the different accessory drive components. When the back side of the drive belt is used to drive a pulley, the pulley is smooth.

The drive belt is pulled by the crankshaft balancer pulley across the accessory drive component pulleys. The spring loaded drive belt tensioner keeps constant tension on the drive belt to prevent the drive belt from slipping. The drive belt tensioner arm will move when loads are applied to the drive belt by the accessory drive components and the crankshaft.

The drive belt system may have an idler pulley, which is used to add wrap to the adjacent pulleys. Some systems use an idler pulley in place of an accessory drive component when the vehicle is not equipped with the accessory.

### **ENGINE COMPONENT DESCRIPTION**

#### **Engine Block**

The lost foam all aluminum engine block utilizes a deep skirt design for increased rigidity. The cylinders are positioned in a straight in-line 6 cylinder orientation. The crankshaft bearing caps have a bearing beam or "ladder" for enhanced structural rigidity and vibration reduction.

#### **Oil Pan**

A single piece cast aluminum oil pan contributes to crankshaft and block rigidity while reducing overall weight. The oil pan bolts to the bell housing as well as the block. This eliminates points of vibration and makes the complete powertrain act as a single casting. Jack screws are used to remove the oil pan.

#### **Crankshaft**

The crankshaft is a nodular iron design with seven main bearings.

#### **Connecting Rods**

The connecting rods are forged powdered metal. The connecting rods and caps are of a fractured split design to improve durability and reduce internal friction. Care must be taken to ensure the mating surfaces are not damaged during service procedures.

#### **Pistons**

The pistons are a full-floating design. The piston pins are a slip fit in the bronze bushed connecting rod and are retained in the piston by round wire retainers. There are two compression rings and one oil control ring.

#### **Cylinder Head**

## **2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

The cylinder head is also made of the lost foam aluminum for lighter weight and rapid heat dissipation. There are 4 valves per cylinder and the ports are of a high swirl design for improved combustion. The cylinder head gasket consist of a steel laminated construction.

### **Valve Train**

The engine utilizes dual overhead camshafts and roller followers for reduced friction, which results in improved gas mileage.

### **Fuel System**

A new electronic throttle control system is used on the engine. A throttle actuator control or TAC system eliminates cable linkage from the pedal to the throttle control module. All throttle movements are controlled by the PCM.

### **Oil Pump**

The oil pump is gear driven directly from the crankshaft. The oil pump drive gear is a slip fit to the crankshaft.

### **Engine Covers**

There is a front engine cover and a rear engine cover, both are made of aluminum. The front engine cover and rear engine cover have "T" sealing joints and need to be removed after the oil pan. The front and rear covers need to be installed before the oil pan. Jack screws are used to remove the covers. Guide pins are used to aid in the installation of both covers.

## **EXHAUST CAMSHAFT POSITION ACTUATOR DESCRIPTION**

The camshaft position actuator is bolted to the front of the exhaust camshaft and is integral with the sprocket. The actuator and sprocket can only be replaced as one unit. The actuator has a hydraulically actuated piston located in the hub. The piston has an internal helical spline that slides in mesh with the gear. As the piston moves, the piston and gear mechanism changes the timing of the exhaust camshaft, relative to the cam drive sprocket. When oil pressure is applied to one side of the piston, the cam moves clockwise and timing is advanced. When oil pressure is applied to the other side of the piston the cam moves counter-clockwise to retard timing. The total range of actuator rotation is 0 to 25 camshaft degrees. At idle, the exhaust camshaft position actuator is at full advance or 0 degrees.

## **NEW PRODUCT INFORMATION**

The purpose of New Product Information is to highlight or indicate important new features for the service community.

Changes may include one or more of the following items:

- Torque values and/or fastener tightening strategies
- Engine specifications
- New sealants and/or adhesives



## **2004 Isuzu Ascender LS**

2004 ENGINE Engine Mechanical - 4.2L - Ascender

- Disassembly and assembly procedure revisions
- Engine mechanical diagnostic procedure revisions
- Special tools required

### **New Features on the LL8 Engine**

- Pan-axle design oil pan
- Exhaust camshaft position actuator
- Exhaust camshaft position actuator valve
- Jack bolts on the front cover, rear cover, and oil pan

### **Engine Features**

- Powder metal connecting rods
- Full floating piston pins
- Lost foam casted aluminum block and head
- Composite plastic camshaft cover
- Electronic Throttle Control - ETC
- Composite intake manifold
- Bridge/bearing beam - stiffener ladder
- Stainless steel fuel rail
- Coil-on-plug ignition system
- Inlet side thermostat
- No EGR
- No AIR

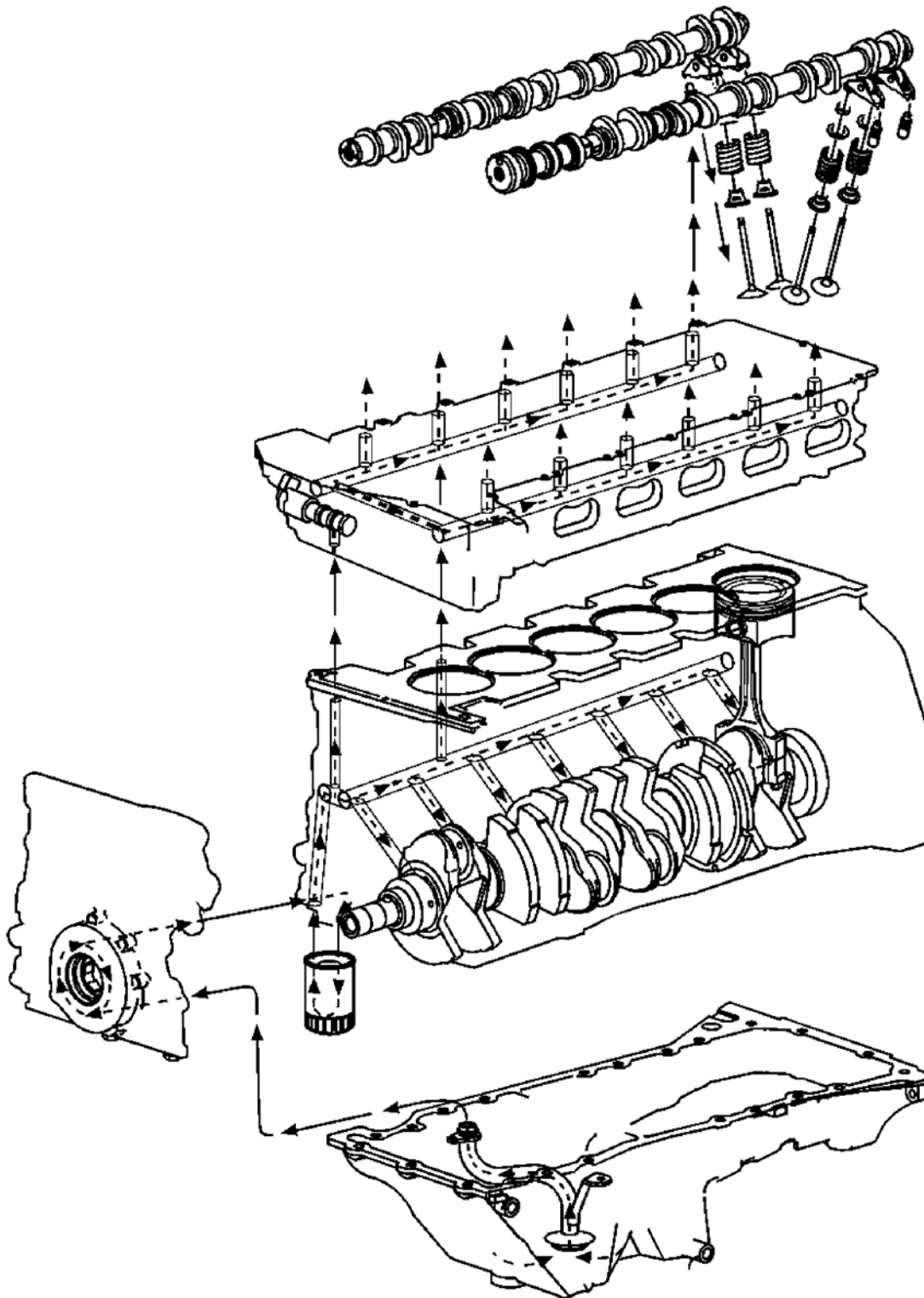
### **New Special Tools Required**

- J 44217 Timing chain holding tool
- J 44218 Front seal installation tool
- J 44219 Cover alignment pins
- J 44220 Engine lift bracket
- J 44221 Camshaft holding tool
- J 44222 Camshaft actuator and sprocket holding tool
- J 44226 Crankshaft damper holding and removal tool
- J 22227 Rear main seal installation tool

## **LUBRICATION DESCRIPTION**

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



**Fig. 553: View Of Engine Lubrication System**  
Courtesy of GENERAL MOTORS CORP.

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

The engine lubrication system is of the force-feed type. The oil is supplied under full pressure to the crankshaft, connecting rods, valve lash adjusters, and cam phasing system. A controlled volume of oil is supplied to the camshaft and valve rocker arms. Gravity flow or splash lubricates all other parts. The engine oil is stored in the oil pan, which is filled through a fill cap in the camshaft cover. A removable oil level indicator, on the right side of the engine block, is provided to check the oil level. The oil pump is located in the engine front cover and is driven by the crankshaft. It is a gerotor-style pump, which is a combination of a gear, and a rotor pump.

It is connected by a passage in the cylinder block to an oil screen and pipe assembly. The screen is submerged in the oil supply and has ample volume for all operating conditions. Oil is drawn into the pump through the screen and pipe assembly, and a passage in the crankcase, connecting to the passages in the engine front cover. Oil is discharged from the oil pump to the oil filter. The oil pressure relief valve limits the oil pressure. The oil filter bypass valve opens when the oil filter is restricted to approximately 68.95 kPa (10 psi) of pressure difference between the oil filter inlet and discharge. The oil will then bypass the oil filter and channel unfiltered oil directly to the main oil galleries of the engine. A full-flow oil filter is mounted to the oil filter adapter on the lower right front side of the engine. The main oil galleries run the full length of the engine block and cut into the valve lash adjuster holes to supply oil at full pressure to the valve lash adjusters. Holes are drilled from the crankshaft bearings to the main oil gallery. Oil is transferred from the crankshaft bearings to the connecting rod bearings through holes drilled in the crankshaft. Pistons, piston pins, and cylinder walls are lubricated by oil splash from the crankshaft and connecting rods. The camshafts and valve rocker arms are supplied with oil from the oil passages drilled into the camshaft mounting areas.

### CLEANLINESS AND CARE

An automobile engine is a combination of many of the following surfaces:

- Machined
- Honed
- Polished
- Lapped

The tolerances of these surfaces are measured in the ten-thousandths of an inch. When you service any internal engine part, cleanliness and care are important. Apply a liberal coating of engine oil to the friction areas during assembly in order to protect and lubricate the surfaces on initial operation. Throughout this section, practice proper cleaning and protection procedures to the machined surfaces and to the friction areas.

**NOTE:**        **Engine damage may result if an abrasive paper, pad, or motorized wire brush is used to clean any engine gasket surfaces.**

Whenever you remove the valve train components, keep the components in order. Follow this procedure in order to install the components in the same locations and with the same mating surfaces as when removed.

**CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.**

Disconnect the negative battery cables before you perform any major work on the engine. For more information

on the disconnection of the battery, refer to Engine Electrical.

## **SEPARATING PARTS**

The components of an internal combustion engine develop wear patterns with their mating components. During disassembly of the engine, parts should be separated and kept in order so they may be reinstalled in the same location from which they were removed.

## **REPLACING ENGINE GASKETS**

1. Do not reuse any gasket unless otherwise specified. Reusable gaskets will be identified in the service procedure. Do not apply sealant to any gasket or sealing surface unless called out in the service procedure.
2. Use jack screws to separate components.

**IMPORTANT: Do not use any other method or technique in order to remove the gasket material from a components.**

**Do not use the following items in order to clean the gasket surfaces:**

- Abrasive pads
- Sand paper
- Power tools

**These methods of cleaning may damage the component.**

**Abrasive pads also produce a fine grit that the oil filter cannot remove from the oil. This grit is abrasive and may cause internal engine damage.**

3. Remove all of the gasket and the sealing material from the component using a plastic or a wood scraper. Do not gouge or scrape the sealing surfaces.

**IMPORTANT: Do not allow the sealant to enter any blind threaded holes. The sealant may cause the following conditions:**

- Prevent you from properly seating the bolt
- Cause damage when you tighten the bolt

4. When assembling components, use only the sealant specified in the service procedure. Ensure that the sealing surfaces are clean and free of debris or oil. When applying sealant to a component, apply a bead size as specified in the service procedure.
5. Tighten the bolts to the specifications.

## **USE OF ROOM TEMPERATURE VULCANIZING (RTV) AND ANAEROBIC SEALER**

**IMPORTANT: The correct sealant and amount of sealant must be used in the proper location to prevent oil leaks, coolant leaks, or the loosening of the fasteners. DO NOT interchange the sealants. Use only the sealant (or equivalent) as specified in the service procedure.**

### Sealant Types

The following 2 major types of sealant are commonly used in engines:

- Aerobic sealant (Room Temperature Vulcanizing (RTV))
- Anaerobic sealant, which include the following:
  - Gasket eliminator
  - Pipe
  - Threadlock

### Aerobic Type Room Temperature Vulcanizing (RTV) Sealant

Aerobic type Room Temperature Vulcanizing (RTV) sealant cures when exposed to air. This type of sealant is used where 2 components (such as the intake manifold and the engine block) are assembled together.

Use the following information when using RTV sealant:

- Do not use RTV sealant in areas where extreme temperatures are expected. These areas include:
  - The exhaust manifold
  - The head gasket
  - Any other surfaces where a different type of sealant is specified in the service procedure
- Always follow all the safety recommendations and the directions that are on the RTV sealant container.
- Use a plastic or wood scraper in order to remove all the RTV sealant from the components.

**IMPORTANT: Do not allow the RTV sealant to enter any blind threaded holes, as it may prevent the fasteners from clamping properly or cause damage when the fastener is tightened.**

- The surfaces to be sealed must be clean and dry.
- Use a RTV sealant bead size as specified in the service procedure.
- Apply the RTV sealant bead to the inside of any bolt holes areas.
- Assemble the components while the RTV sealant is still wet to the touch. Do not wait for the RTV sealant to skin over.
- Tighten the fasteners in sequence (if specified) and to the proper torque specifications. DO NOT overtighten the fasteners.

### Anaerobic Type Threadlock Sealant

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

Anaerobic type threadlock sealant cures in the absence of air. This type of sealant is used for threadlocking and sealing of bolts, fittings, nuts, and studs. This type of sealant cures only when confined between 2 close fitting metal surfaces.

Use the following information when using threadlock sealant:

- Always follow all safety recommendations and directions that are on the threadlock sealant container.
- The threaded surfaces to be sealed must be clean and dry.
- Apply the threadlock sealant as specified on the threadlock sealant container.

**IMPORTANT: Fasteners that are partially torqued and then the threadlock sealant allowed to cure more than five minutes, may result in incorrect clamp load of assembled components.**

- Tighten the fasteners in sequence (if specified) and to the proper torque specifications. DO NOT overtighten the fasteners.

### Anaerobic Type Pipe Sealant

Anaerobic type pipe sealant cures in the absence of air and remains pliable when cured. This type of sealant is used where 2 parts are assembled together and require a leak proof joint.

Use the following information when using pipe sealant:

- Do not use pipe sealant in areas where extreme temperatures are expected. These areas include:
  - The exhaust manifold
  - The head gasket
  - Surfaces where a different sealant is specified
- Always follow all the safety recommendations and the directions that are on the pipe sealant container.
- The surfaces to be sealed must be clean and dry.
- Use a pipe sealant bead of the size or quantity as specified in the service procedure.

**IMPORTANT: Do not allow the pipe sealant to enter any of the blind threaded holes, as the pipe sealant may prevent the fastener from clamping properly, or cause component damage when the fastener is tightened.**

- Apply the pipe sealant bead to the inside of any bolt hole areas.
- Apply a continuous bead of pipe sealant to 1 sealing surface.
- Tighten the fasteners in sequence (if specified) and to the proper torque specifications. DO NOT overtighten the fasteners.

## TOOLS AND EQUIPMENT

Work in a clean and well-lit area. Have the following components available before you begin to work:

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender

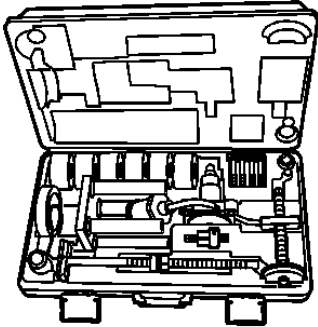
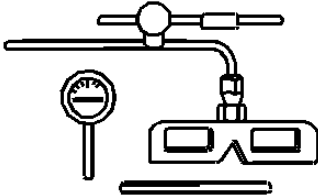
- A suitable parts cleaning tank
- A compressed air supply
- Trays, in order to keep the parts and the fasteners organized
- An adequate set of hand tools

An approved engine repair stand will prevent personal injury or damage to the engine components. The special tools are designed in order to quickly and safely accomplish the operations for which the tools are intended. Using the tools will minimize possible damage to the engine components. Precision measuring tools are required for the inspection of certain critical components. Torque wrenches are needed for the correct assembly of various parts.

## SPECIAL TOOLS AND EQUIPMENT

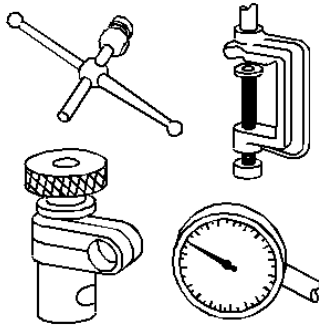
### SPECIAL TOOLS

#### Special Tools

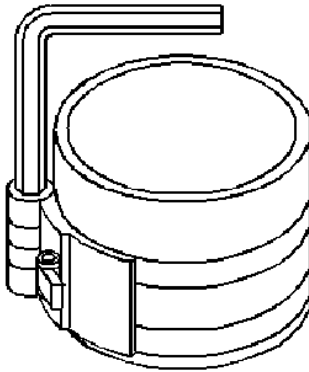
| Illustration  | Tool Number/Description                                     |
|---|---|
|   | EN45680-400<br>Cylinder Sleeve Removal and Installation Kit |
|  | J 7872<br>Magnetic Base Dial Indicator Set                  |
|   |   |

## 2004 Isuzu Ascender LS

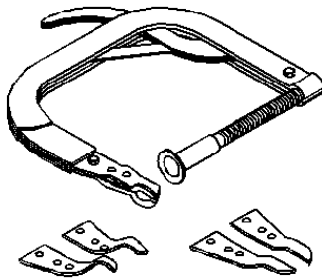
2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 8001  
Dial Indicator Set



J 8037  
Piston Ring Compressor

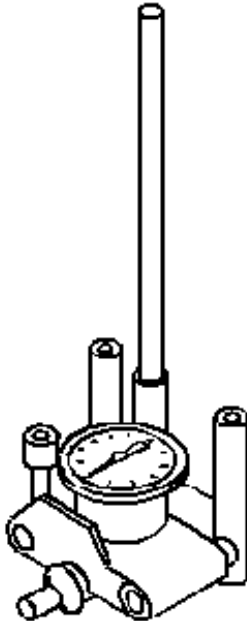


J 8062  
Valve Spring Compressor (Head-Off)

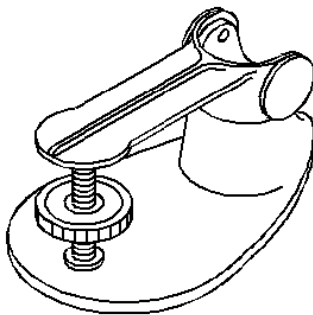


## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 8087  
Cylinder Bore Gage

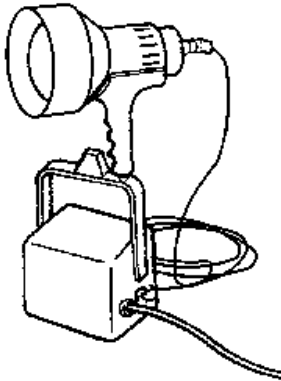
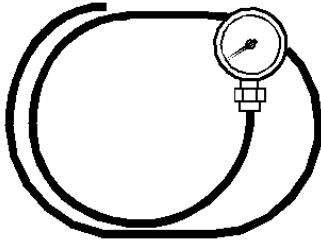


J 9666  
Valve Spring Tester

J 21867  
Pressure Gage and Hose

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 28428-E  
High Intensity Black Light



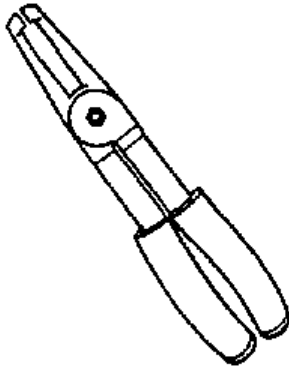
J 35667-A  
Cylinder Head Leakdown Tester

## 2004 Isuzu Ascender LS

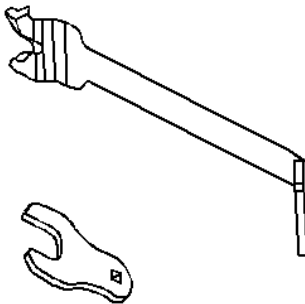
2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 38722  
Compression Tester



J 38820  
Valve Stem Seal Remover/Installer

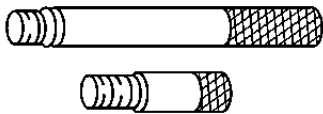
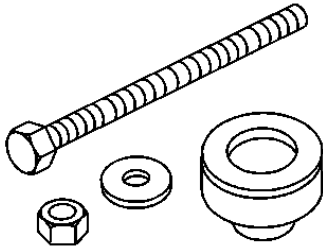


J 41240  
Fan Clutch Remover and Installer

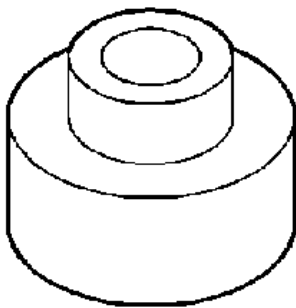
J 41478  
Crankshaft Front Oil Seal Installer

## 2004 Isuzu Ascender LS

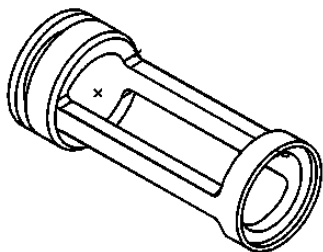
2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 41556  
Connecting Rod Guides



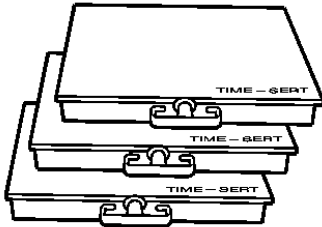
J 41816-2  
Crankshaft End Protector



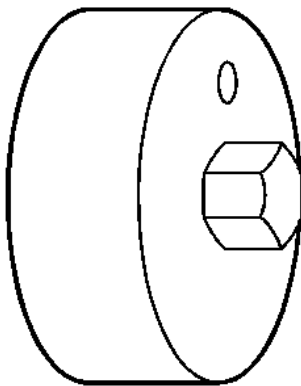
J 42037  
Valve Spring Compressor Adapter

## 2004 Isuzu Ascender LS

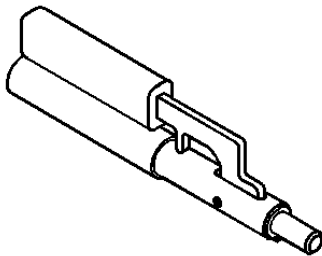
2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 42385-400  
Thread Repair Kit



J 42907  
Oil Pressure Tester

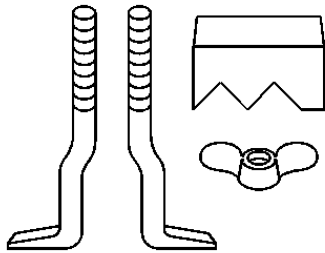
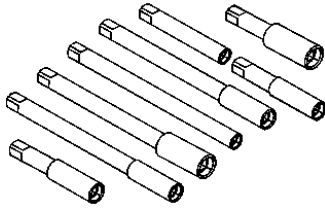


J 43654  
Piston Pin Retainer Clip Remover/Installer

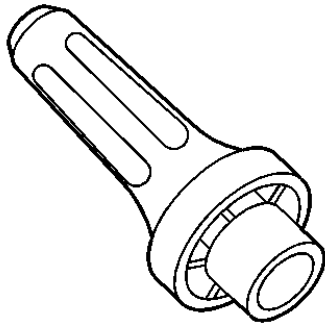
J 43965  
Thread Repair Extension Kit

## 2004 Isuzu Ascender LS

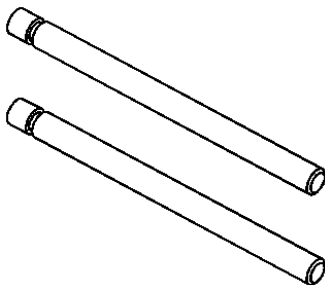
2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 44217  
Timing Chain Retention Tool



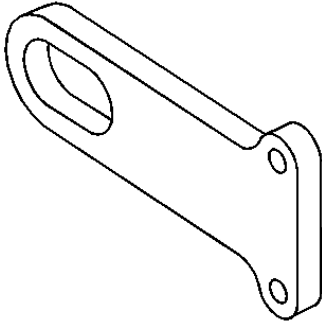
J 44218  
Seal Installer



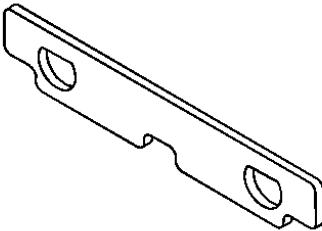
J 44219  
Cover Alignment Pins

## 2004 Isuzu Ascender LS

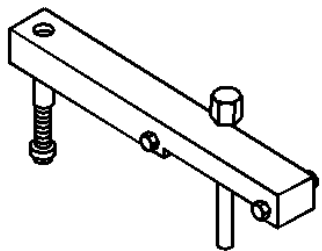
2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 44220  
Engine Lift Bracket



J 44221  
Camshaft Holding Tool

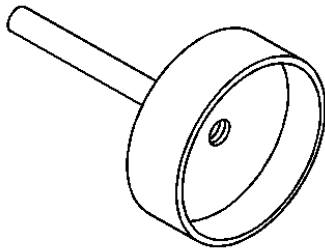
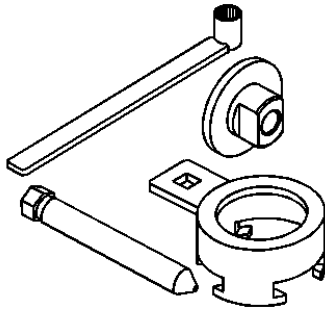


J 44222  
Camshaft Sprocket Holding Tool

J 44226  
Crankshaft Balancer Remover

## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



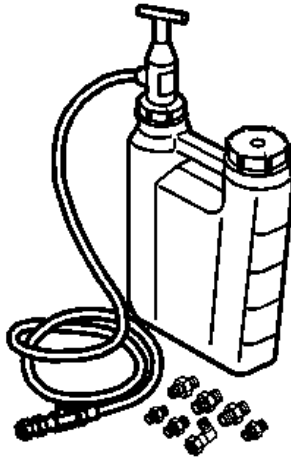
J 44227  
Rear Seal Installer

J 44228  
Valve Spring Compressor

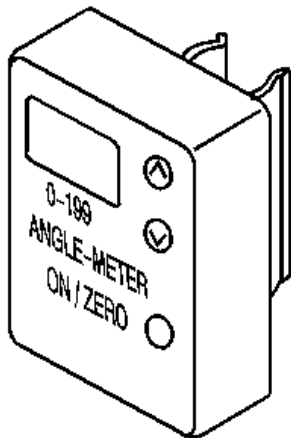


## 2004 Isuzu Ascender LS

2004 ENGINE Engine Mechanical - 4.2L - Ascender



J 44299  
Engine Preluber



J 45059  
Angle Meter