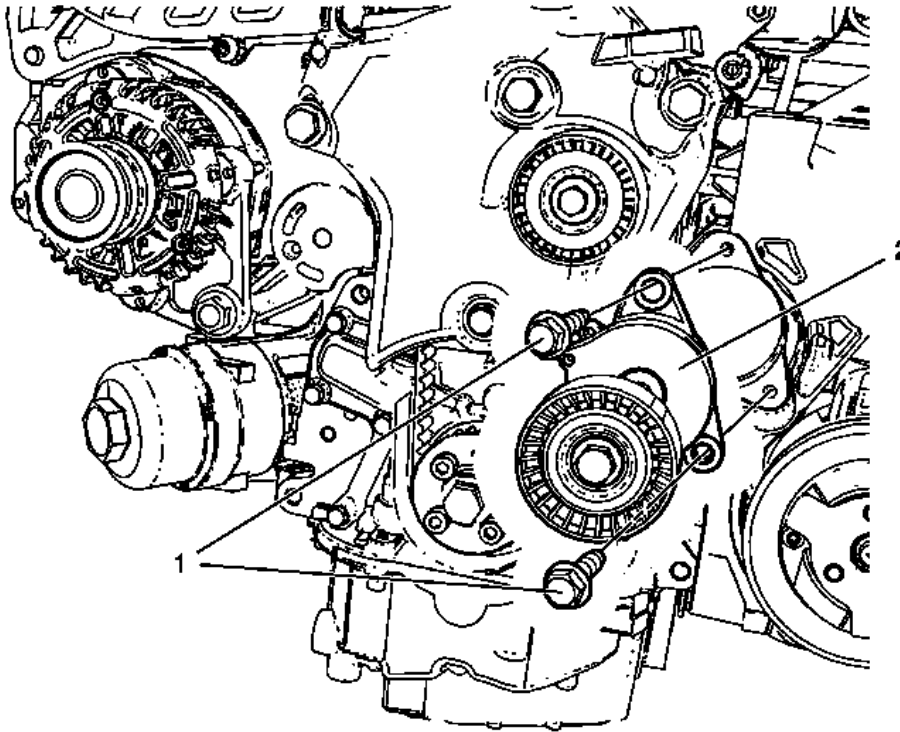


## 2014 ENGINE

## Engine Mechanical - 2.0L (LUZ) Diesel - Repair Instructions - On Vehicle - Cruze

## REPAIR INSTRUCTIONS - ON VEHICLE

## DRIVE BELT TENSIONER REPLACEMENT

**Fig. 1: Drive Belt Tensioner**

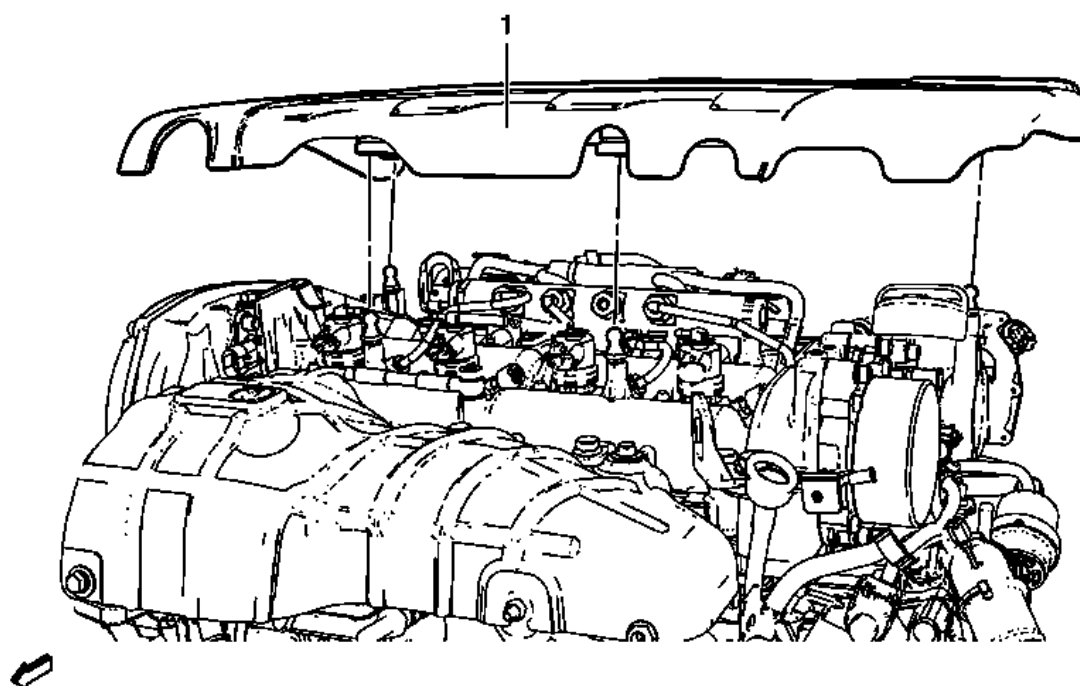
Courtesy of GENERAL MOTORS COMPANY

## Drive Belt Tensioner Replacement

Callout	Component Name
<b>Preliminary Procedures</b>	
1. Open the hood.	
2. Remove the generator, air conditioning compressor and power steering pump belt. Refer to <b><u>Generator, Air Conditioning Compressor and Power Steering Pump Belt Replacement</u></b> .	
1	Drive Belt Tensioner Bolt (Qty: 2)  <b>CAUTION:</b> Refer to <b><u>Fastener Caution</u></b> .

	<b>Tighten</b> 22 N.m (16 lb ft)
2	Drive Belt Tensioner <b>Procedure</b> Remove the <b>EN-48952</b> holding pin from the old one and install it to the new tensioner. <b>Special Tools</b> <b>EN-48952</b> Tensioner Spring Holding Pin For equivalent regional tools, refer to <b>Special Tools</b> .

## ENGINE SIGHT SHIELD REPLACEMENT



**Fig. 2: Engine Sight Shield**

Courtesy of GENERAL MOTORS COMPANY

### Engine Sight Shield Replacement

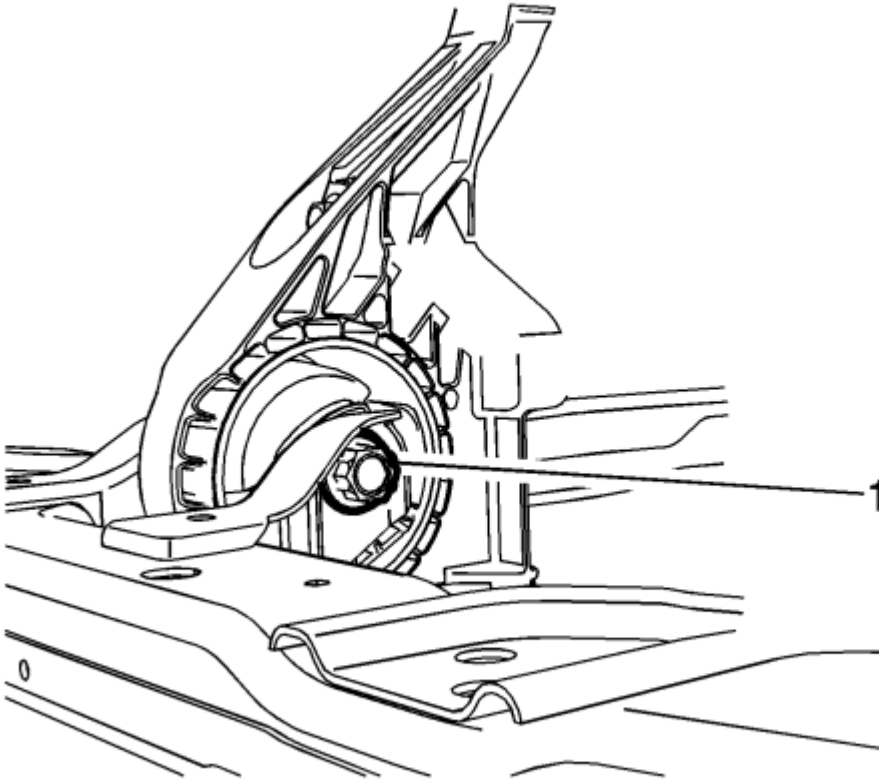
Callout	Component Name
<b>Preliminary Procedure</b> Open the hood.	
1	Engine Sight Shield <b>Procedure</b> Release the engine sight shield retainers by pulling the engine sight shield upwards.

## POWERTRAIN MOUNT BALANCING

**NOTE:** Follow the balance procedure steps listed below when no starting point has

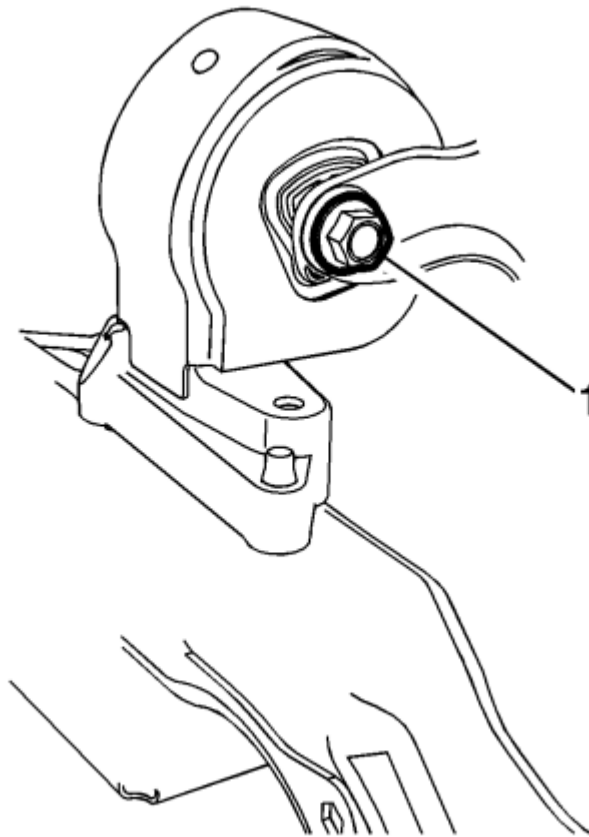
**been established such as in a collision repair.**

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .



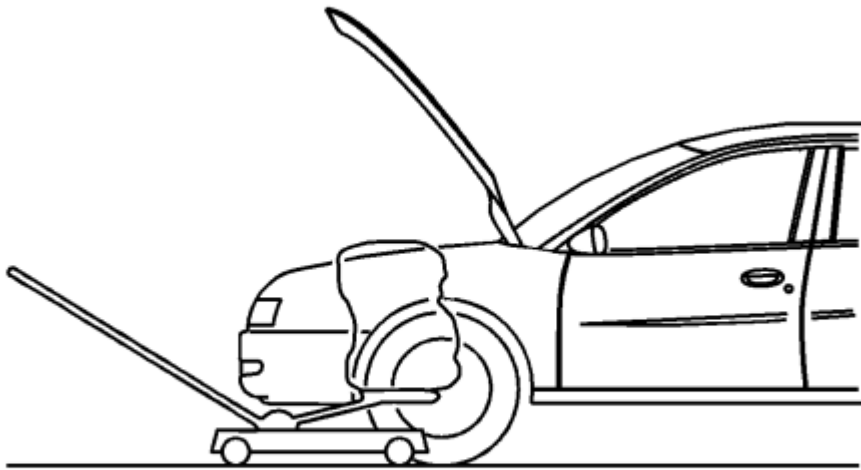
**Fig. 3: Front Transaxle Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

2. Loosen the front transaxle mount through bolt (1) until it is finger tight.



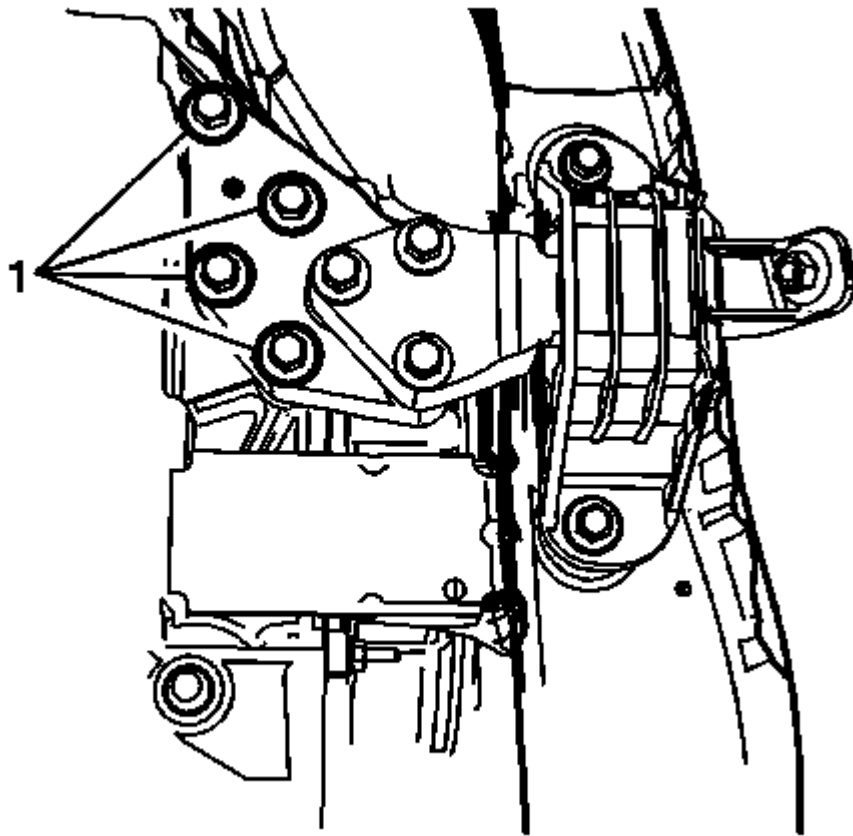
**Fig. 4: Rear Transaxle Mount Through Bolt**  
**Courtesy of GENERAL MOTORS COMPANY**

3. Loosen the rear transaxle mount (1) through bolt until it is finger tight.
4. Lower the vehicle.



**Fig. 5: Supporting Engine/Transmission With Hydraulic Floor Jack**  
**Courtesy of GENERAL MOTORS COMPANY**

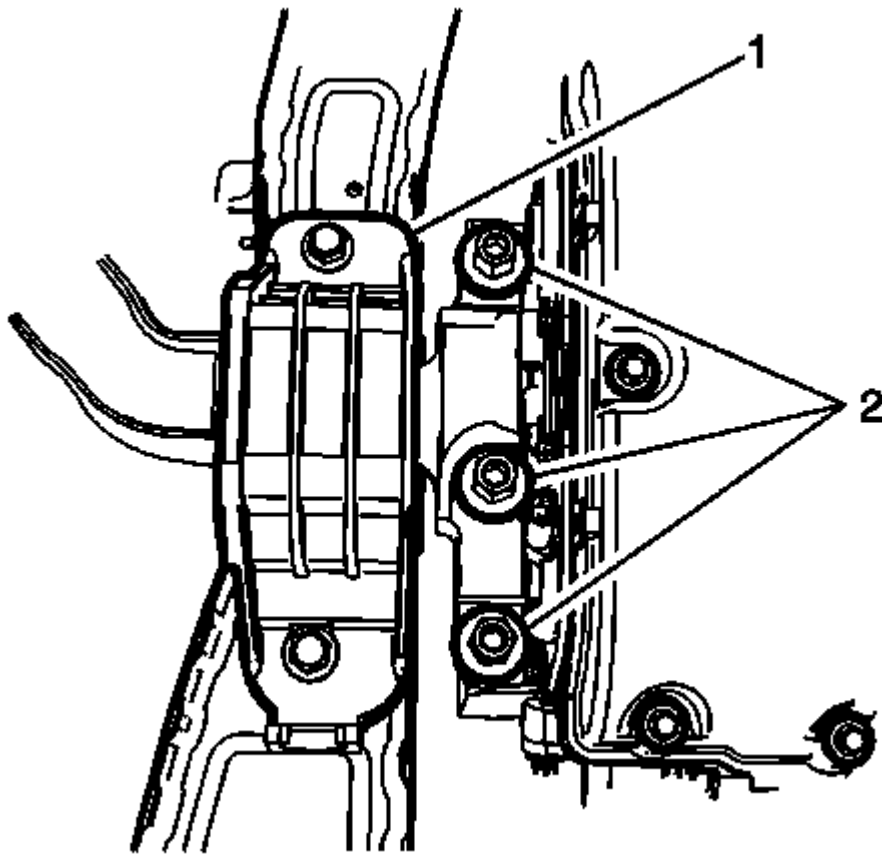
5. Position two floor jacks with wood blocks under the engine and transaxle in order to support the powertrain assembly.



**Fig. 6: Transaxle Bolts**

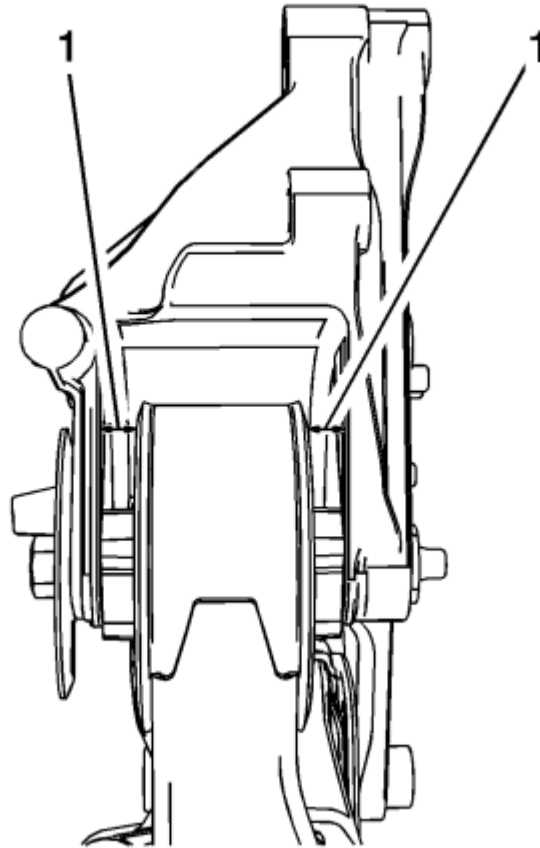
Courtesy of GENERAL MOTORS COMPANY

6. Loosen the transaxle adapter to transaxle bolts (1).



**Fig. 7: Engine Mount And Bracket Bolts**  
Courtesy of GENERAL MOTORS COMPANY

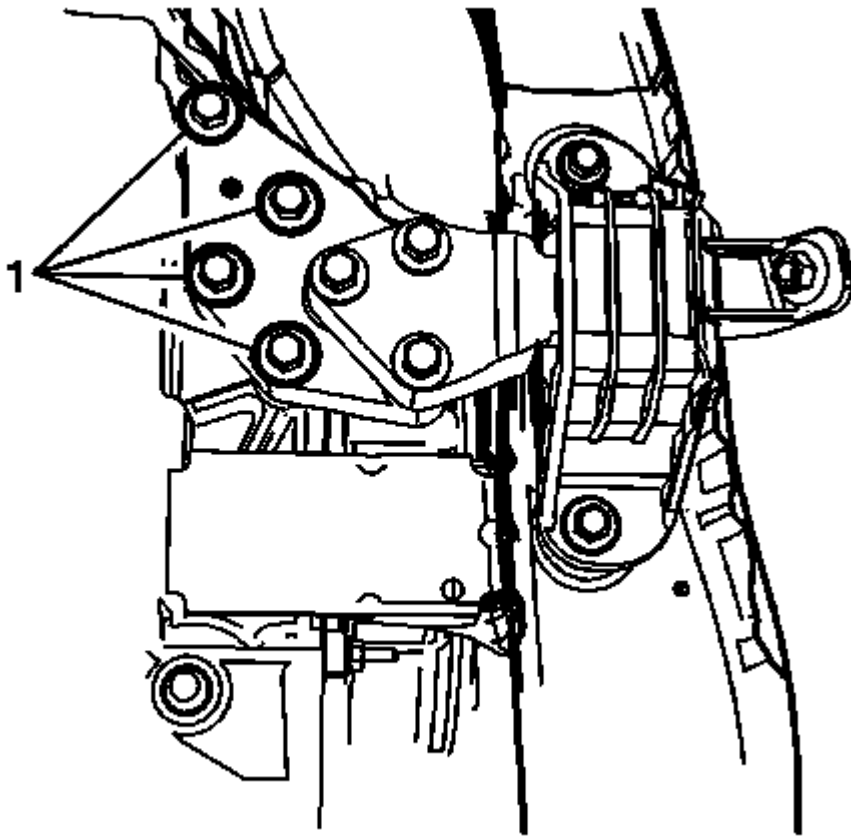
7. Loosen the engine mount (1) to bracket bolts (2).
8. Lower the floor jacks in order to allow a 1/4 inch (6 mm) gap between the upper engine mount and engine mount bracket and also between the transmission and left transmission mount.



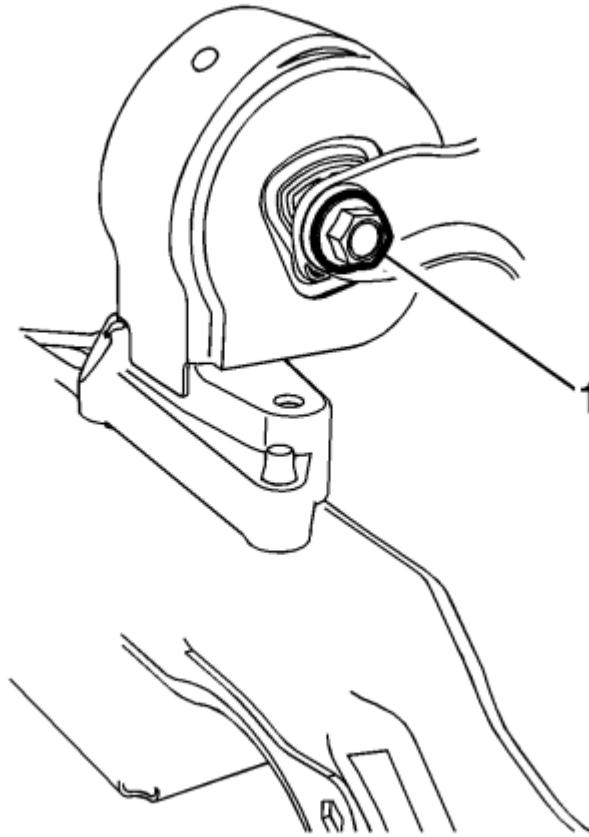
**Fig. 8: Front And Rear Powertrain Mounts**  
**Courtesy of GENERAL MOTORS COMPANY**

9. Check that the front and rear mounts are centered (1) in the mount brackets, adjust if necessary.
10. Tighten the left hand (transaxle side) mount bolts, starting with the bolt nearest to the center of the mount. See the appropriate transmission mount replacement procedure for the fastener tightening specifications.



**Fig. 9: Transaxle Bolts****Courtesy of GENERAL MOTORS COMPANY**

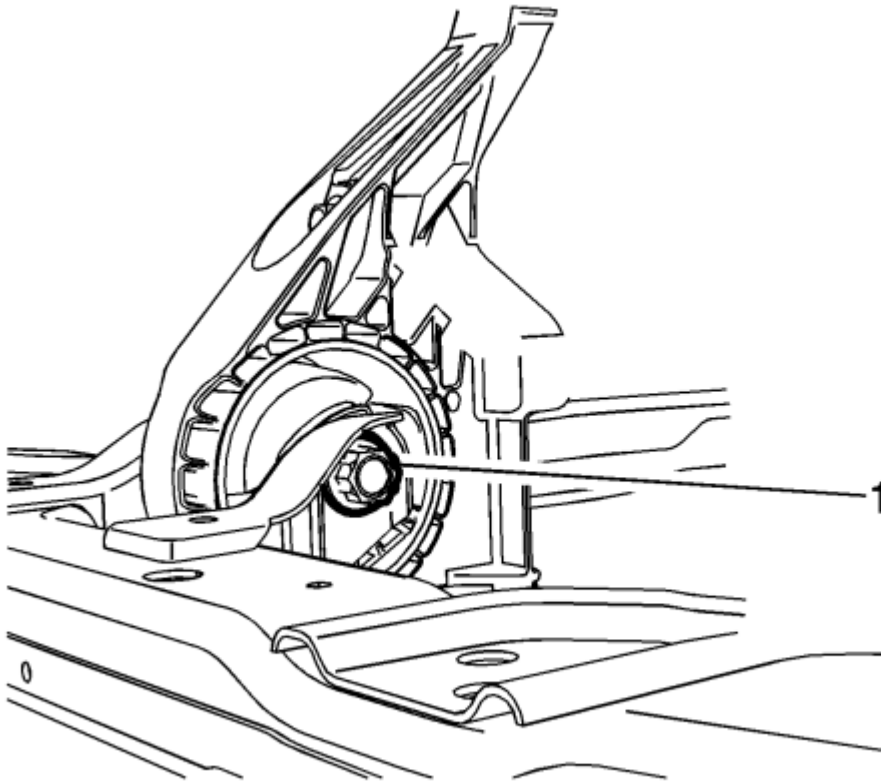
11. Tighten the right hand (engine side) mount bolts (1), starting with the bolt nearest to the center of the mount. See the appropriate engine mount replacement procedure for the fastener tightening specifications.
12. Remove the floor jacks from under the oil pan and transmission.
13. Raise the vehicle.
14. Shake the powertrain from front to rear and allow the powertrain to settle.



**Fig. 10: Rear Transaxle Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** It is essential that the lower mount through bolts should be as close to centered as possible in the oversized mount insert holes before tightening to specification.

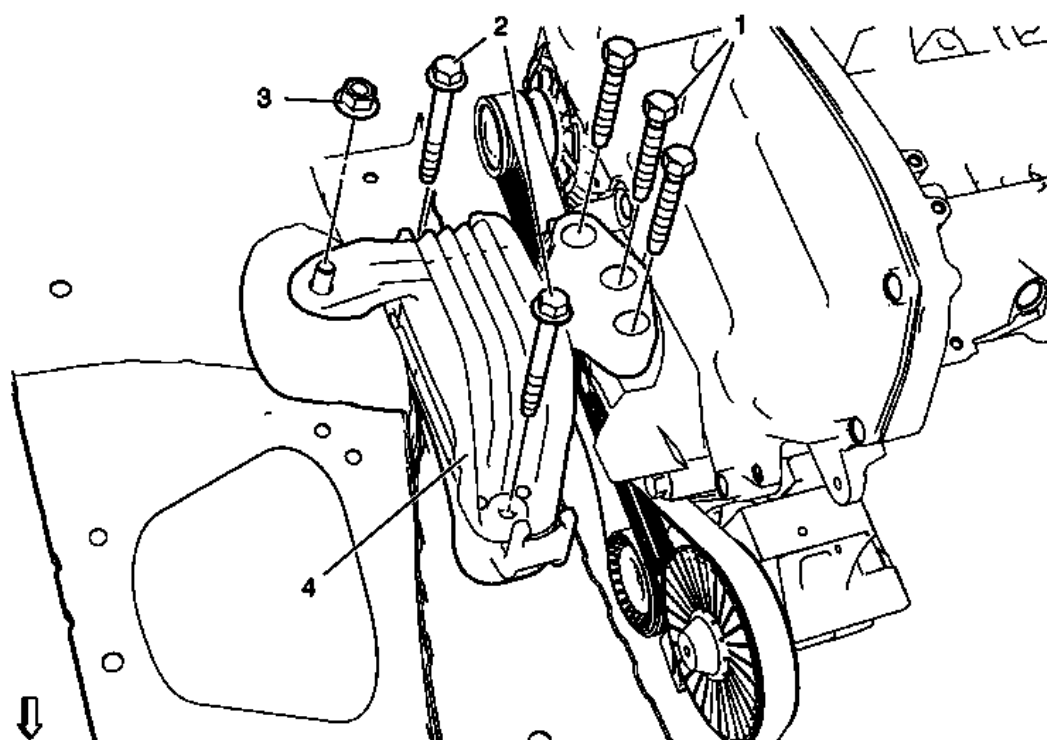
15. Tighten the rear transaxle mount through bolt (1). See the appropriate transmission mount replacement procedure for the fastener tightening specifications.



**Fig. 11: Front Transaxle Mount Through Bolt**  
**Courtesy of GENERAL MOTORS COMPANY**

16. Tighten the front transaxle mount through bolt (1). See the appropriate transmission mount replacement procedure for the fastener tightening specifications.
17. Lower the vehicle.

## **ENGINE MOUNT REPLACEMENT**

**Fig. 12: Engine Mount**

Courtesy of GENERAL MOTORS COMPANY

**Engine Mount Replacement**

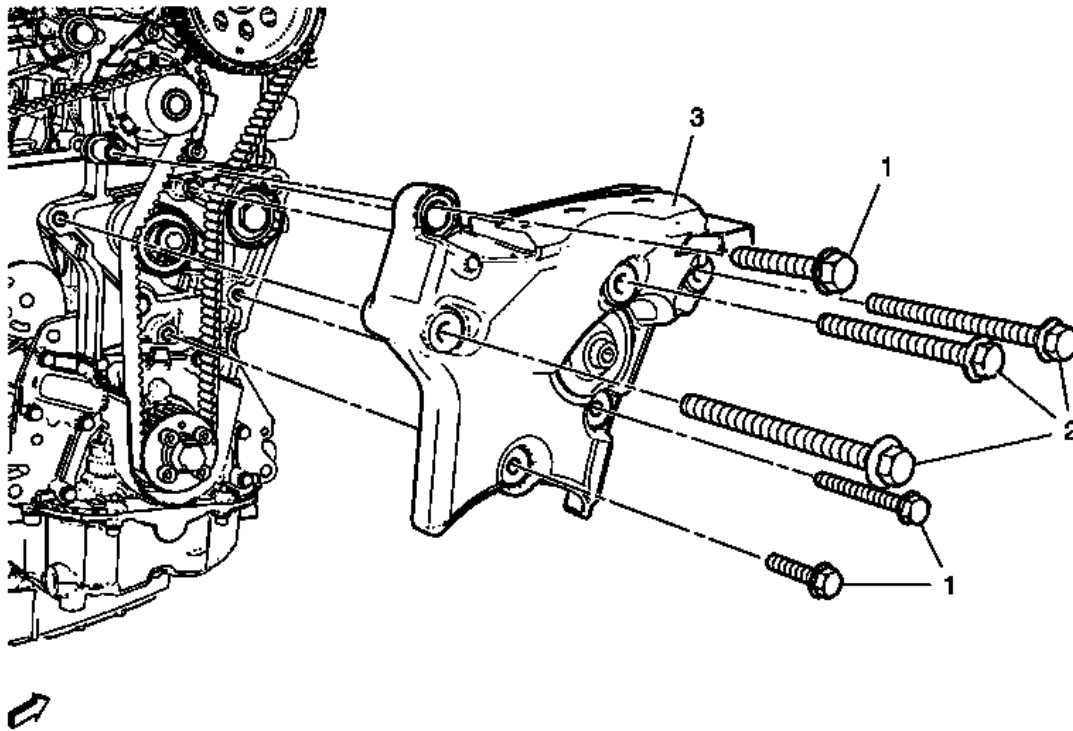
Callout	Component Name
<b>Preliminary Procedures</b>	
<ol style="list-style-type: none"> <li>1. Remove the air cleaner assembly. Refer to <a href="#">Air Cleaner Assembly Replacement</a> .</li> <li>2. Install the engine support fixture. Refer to <a href="#">Engine Support Fixture</a>.</li> </ol>	
1	<p>Engine Mount Bolt to Engine Mount Bracket (Qty: 3)</p> <p><b>CAUTION:</b> Refer to <a href="#">Fastener Caution</a> .</p> <p><b>CAUTION:</b> Refer to <a href="#">Torque-to-Yield Fastener Caution</a> .</p> <p><b>Tighten</b></p> <ul style="list-style-type: none"> <li>• First Pass: 50 (37 lb ft)</li> <li>• Final Pass: 60 - 70 degrees, using the <b>EN-45059</b> meter</li> </ul>

	<b>Special Tools</b> <b>EN-45059</b> Angle Meter For equivalent regional tools, refer to <b>Special Tools</b> .
2	Engine Mount Bolt (Qty: 2) <b>Tighten</b> 62 (46 lb ft)
3	Engine Mount Nut <b>Tighten</b> 62 (46 lb ft)
4	Engine Mount

## ENGINE MOUNT INSPECTION

1. Install the engine support fixture. Refer to **Engine Support Fixture**.
2. Observe the engine mount while raising the engine. Raising the engine removes the weight from the engine mount and creates slight tension on the rubber.
3. Replace the engine mount if the engine mount exhibits any of the following conditions:
  - The hard rubber is covered with heat check cracks.
  - The rubber is separated from the metal plate of the engine mount.
  - The rubber is split through the center of the engine mount.
4. For engine mount replacement, refer to **Engine Mount Replacement**.
5. For transmission front mount replacement, refer to **Transmission Front Mount Replacement** .
6. For transmission rear mount replacement, refer to **Transmission Rear Mount Replacement** .
7. For transmission mount replacement - left side, refer to **Transmission Mount Replacement - Left Side** .

## ENGINE MOUNT BRACKET REPLACEMENT

**Fig. 13: Engine Mount Bracket**

Courtesy of GENERAL MOTORS COMPANY

**Engine Mount Bracket Replacement**

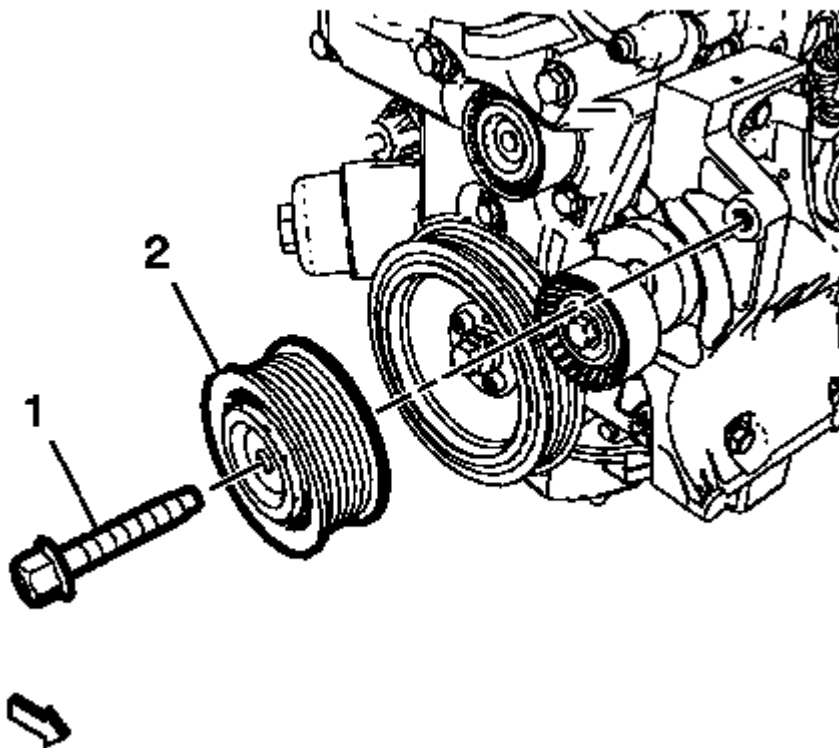
Callout	Component Name
<b>Preliminary Procedures</b>	
<ol style="list-style-type: none"> <li>1. Remove the crankshaft pulley. Refer to <u><b>Crankshaft Pulley Replacement</b></u>.</li> <li>2. Remove the belt idler pulley - engine mount side. Refer to <u><b>Belt Idler Pulley Replacement - Engine Mount Side</b></u>.</li> <li>3. Remove the timing belt front cover. Refer to <u><b>Timing Belt Front Cover Replacement</b></u>.</li> <li>4. Remove the engine mount. Refer to <u><b>Engine Mount Replacement</b></u>.</li> </ol>	
1	<p>Engine Mount Bracket Bolt M8 (Qty: 3)</p> <p><b>CAUTION:</b> Refer to <u><b>Fastener Caution</b></u> .</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <u><b>Lifting and Jacking the Vehicle</b></u> .</li> <li>2. Remove the 2 lower bolts.</li> </ol> <p><b>TIP:</b> Mind the different length of bolt.</p>

	<b>Tighten</b> 25 N.m (18 lb ft)
2	Engine Mount Bracket Bolt M10 (Qty: 3) <b>Procedure</b> Fix the engine lifter to the engine lift brackets. <b>TIP:</b> Mind the different length of bolt. <b>Tighten</b> 50 N.m (37 lb ft)
3	Engine Mount Bracket

## BELT IDLER PULLEY REPLACEMENT - PULLEY SIDE

### Removal Procedure

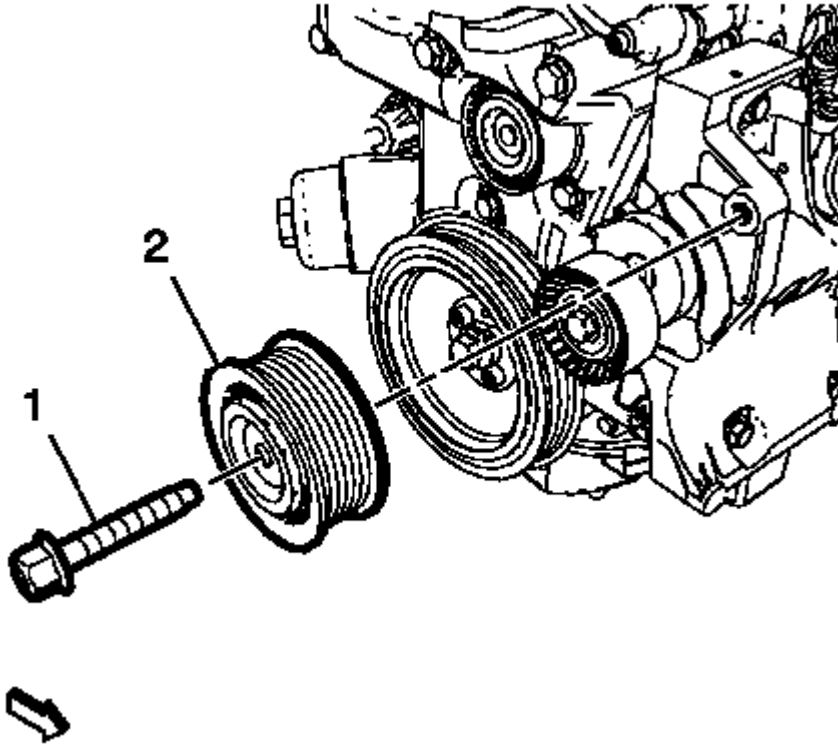
1. Remove the generator, air conditioning compressor and power steering pump belt. Refer to **Generator, Air Conditioning Compressor and Power Steering Pump Belt Replacement**.



**Fig. 14: Belt Idler Pulley Bolt**  
Courtesy of GENERAL MOTORS COMPANY

2. Remove the belt idler pulley bolt (1).
3. Remove the belt idler pulley (2).

### Installation Procedure



**Fig. 15: Belt Idler Pulley Bolt**

Courtesy of GENERAL MOTORS COMPANY

1. Install the belt idler pulley (2) along with the bolt (1).

**CAUTION: Refer to Fastener Caution .**

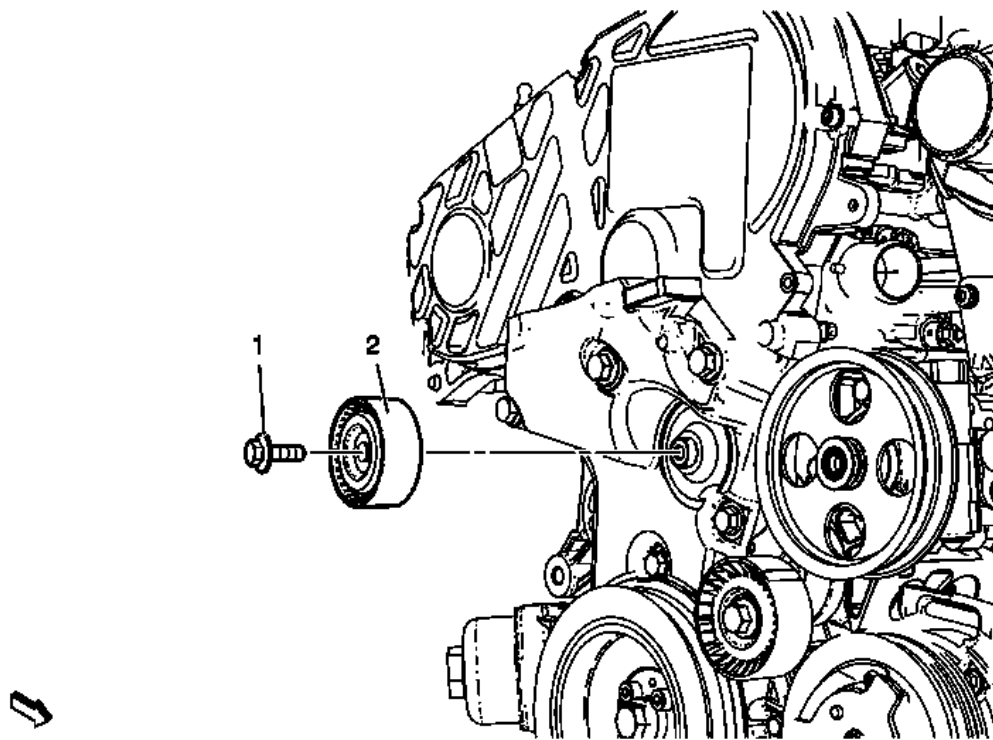
2. Tighten the belt idler pulley bolt (1) to 50 (37 lb ft).
3. Install the generator, air conditioning compressor and power steering pump belt. Refer to **Generator, Air Conditioning Compressor and Power Steering Pump Belt Replacement**.

### BELT IDLER PULLEY REPLACEMENT - ENGINE MOUNT SIDE

#### Removal Procedure

1. Remove the generator, air conditioning compressor and power steering pump belt. Refer to **Generator, Air Conditioning Compressor and Power Steering Pump Belt Replacement**.



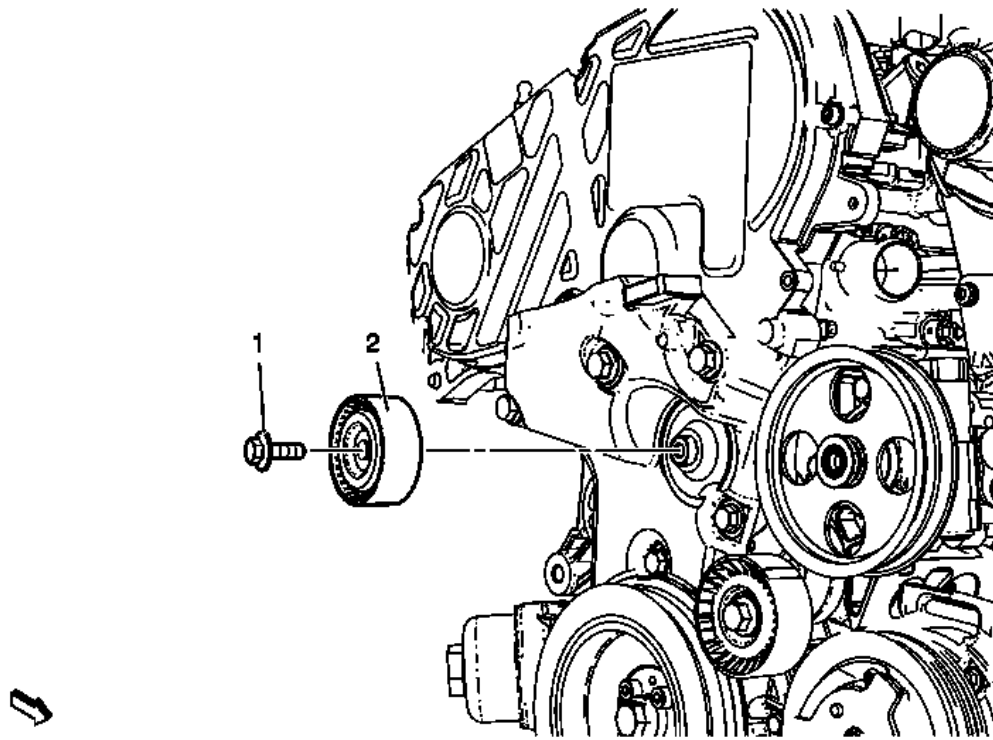


**Fig. 16: Belt Idler Pulley Bolt**

Courtesy of GENERAL MOTORS COMPANY

2. Remove the belt idler pulley bolt (1).
3. Remove the belt idler pulley (2).

#### **Installation Procedure**



**Fig. 17: Belt Idler Pulley Bolt**

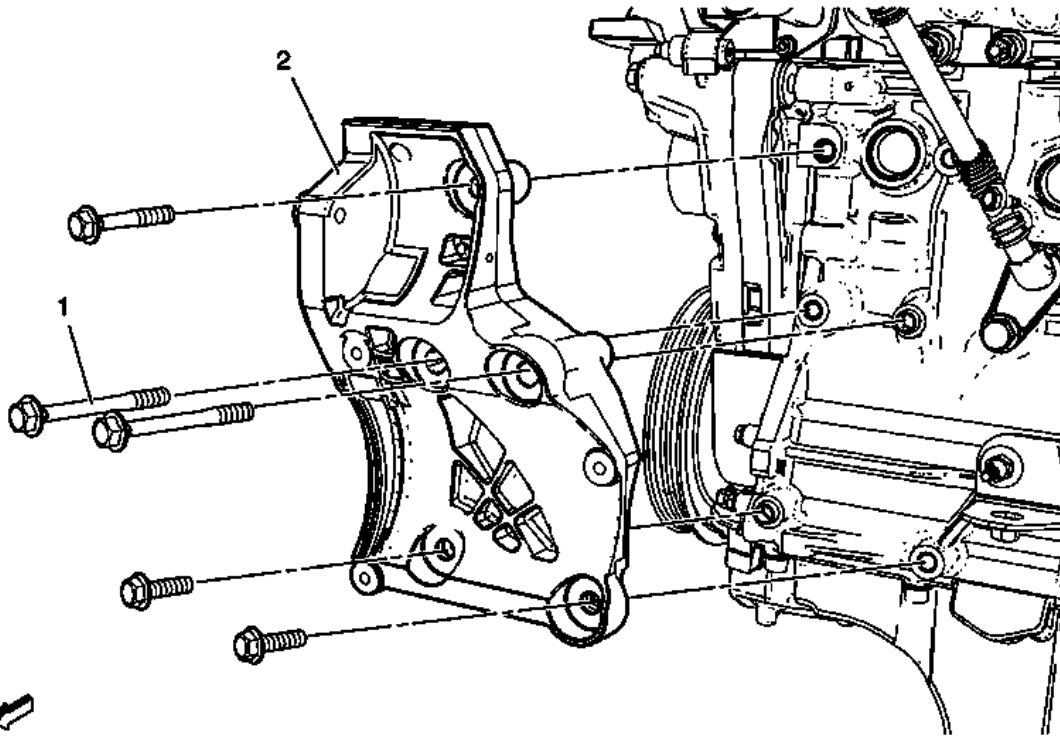
Courtesy of GENERAL MOTORS COMPANY

1. Install the belt idler pulley (2).

**CAUTION:** Refer to Fastener Caution .

2. Install the belt idler pulley bolt (1) and tighten to 25 (18 lb ft).
3. Install the generator, air conditioning compressor and power steering pump belt. Refer to Generator, Air Conditioning Compressor and Power Steering Pump Belt Replacement.

#### **BELT IDLER PULLEY BRACKET REPLACEMENT**

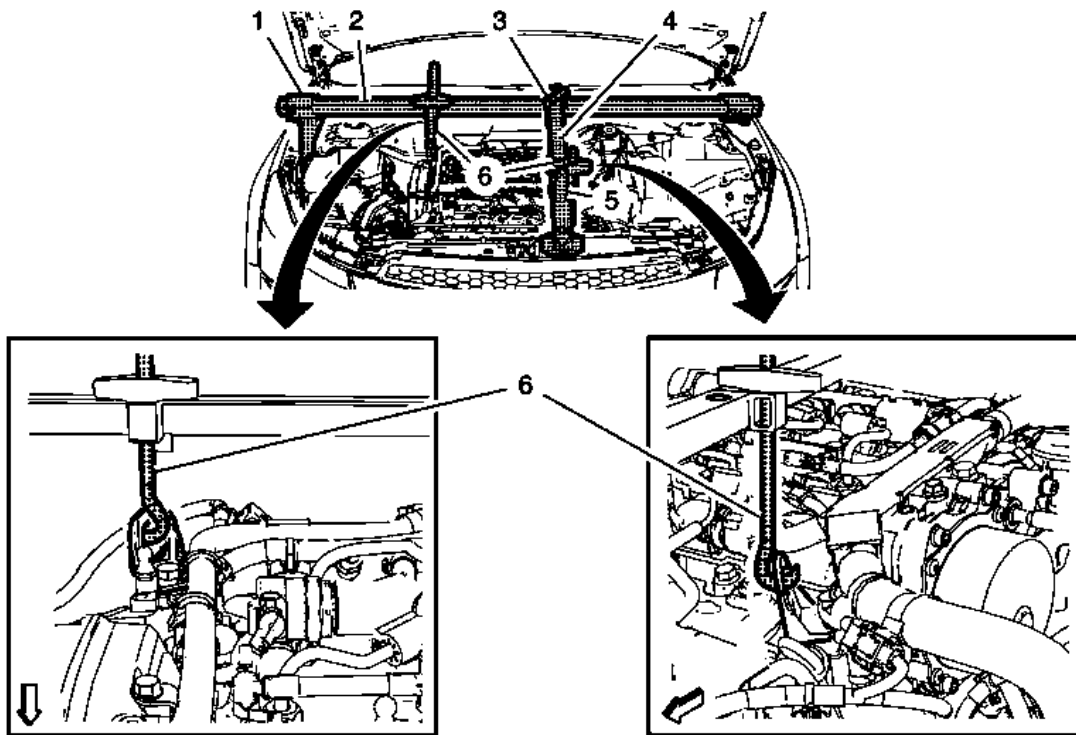


**Fig. 18: Belt Idler Pulley Bracket**  
 Courtesy of GENERAL MOTORS COMPANY

### Belt Idler Pulley Bracket Replacement

Callout	Component Name
<b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Open the hood.</li> <li>2. Remove the air conditioning compressor. Refer to <u><b>Air Conditioning Compressor Replacement (2.0L Diesel LUZ)</b></u>.</li> <li>3. Remove the belt idler pulley - pulley side. Refer to <u><b>Belt Idler Pulley Replacement - Pulley Side</b></u>.</li> <li>4. Remove the drive belt tensioner. Refer to <u><b>Drive Belt Tensioner Replacement</b></u>.</li> </ol>	
1	Belt Idler Pulley Bracket Bolt (Qty: 5)  <b>CAUTION:</b> Refer to <u><b>Fastener Caution</b></u> .  <b>Tighten</b> 50 N.m (37 lb ft) <b>TIP:</b> Mark the position of the bolts because of the different length.
2	Belt Idler Pulley Bracket

### ENGINE SUPPORT FIXTURE



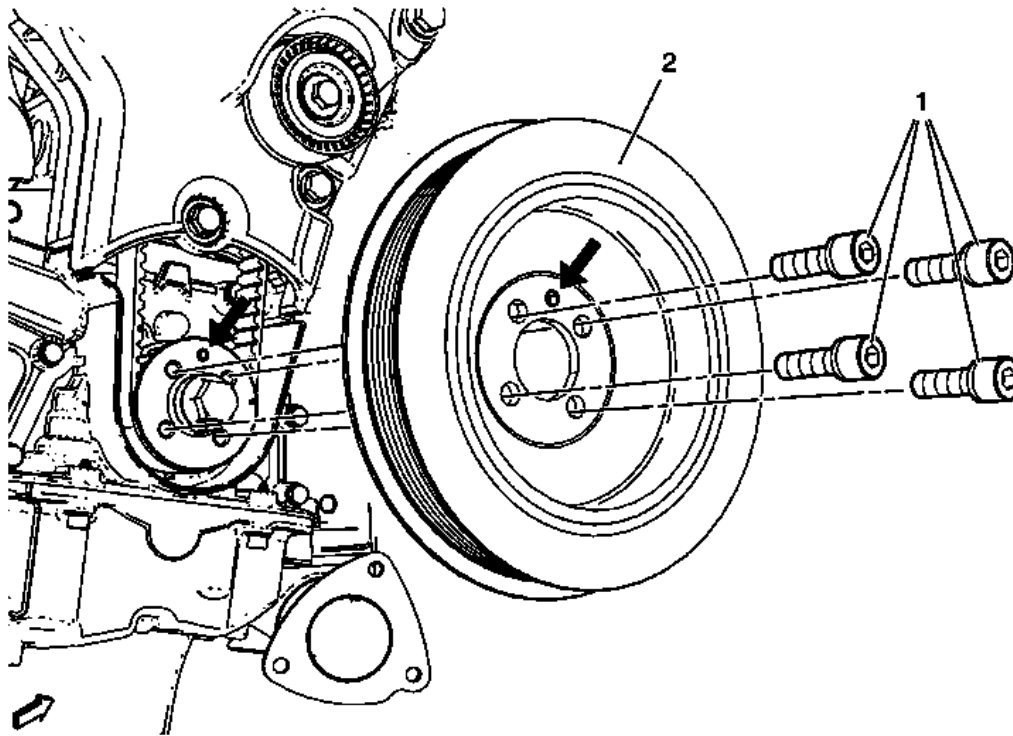
**Fig. 19: Engine Support Fixture**  
Courtesy of GENERAL MOTORS COMPANY

### Engine Support Fixture

Callout	Component Name
<b>Preliminary Procedures</b>	
<ol style="list-style-type: none"> <li>1. Remove the front fender shipping cover. Refer to <a href="#">Front Fender Shipping Cover Replacement</a> .</li> <li>2. Remove the engine sight shield. Refer to <a href="#">Engine Sight Shield Replacement</a>.</li> </ol>	
<b>Special Tools</b>	
<ul style="list-style-type: none"> <li>• J-43405 Engine Support Fixture Adapter</li> <li>• J-28467-518 Main Support Beam</li> <li>• J-28467-1A Cross Bracket</li> <li>• J-28467-5A Strut Tower Support Assembly</li> <li>• J-28467-2A Radiator Tube Shelf Assembly</li> <li>• J-36857 Engine Lift Bracket</li> <li>• J-28467-8A Hook Assembly</li> </ul>	
For equivalent regional tools, refer to <a href="#">Special Tools</a> .	
1	Engine Support Fixture Adapter Leg (Qty: 2) <b>Procedure</b>

	Install the bracket to fender frame. Do not install on top of fender lip.
2	Main Support Beam
3	Cross Bracket
4	Strut Tower Support Assembly <b>Procedure</b> Adjust the length of the strut tower support assembly.
5	Radiator Tube Shelf Assembly
6	Hook Assembly <b>Procedure</b> Use a grade 10.9 bolt to install the engine lift bracket.  <b>NOTE:</b> If the engine is not equipped with engine lift bracket, install the J-36857 engine support fixture in place.

## CRANKSHAFT PULLEY REPLACEMENT



**Fig. 20: Crankshaft Pulley**

Courtesy of GENERAL MOTORS COMPANY

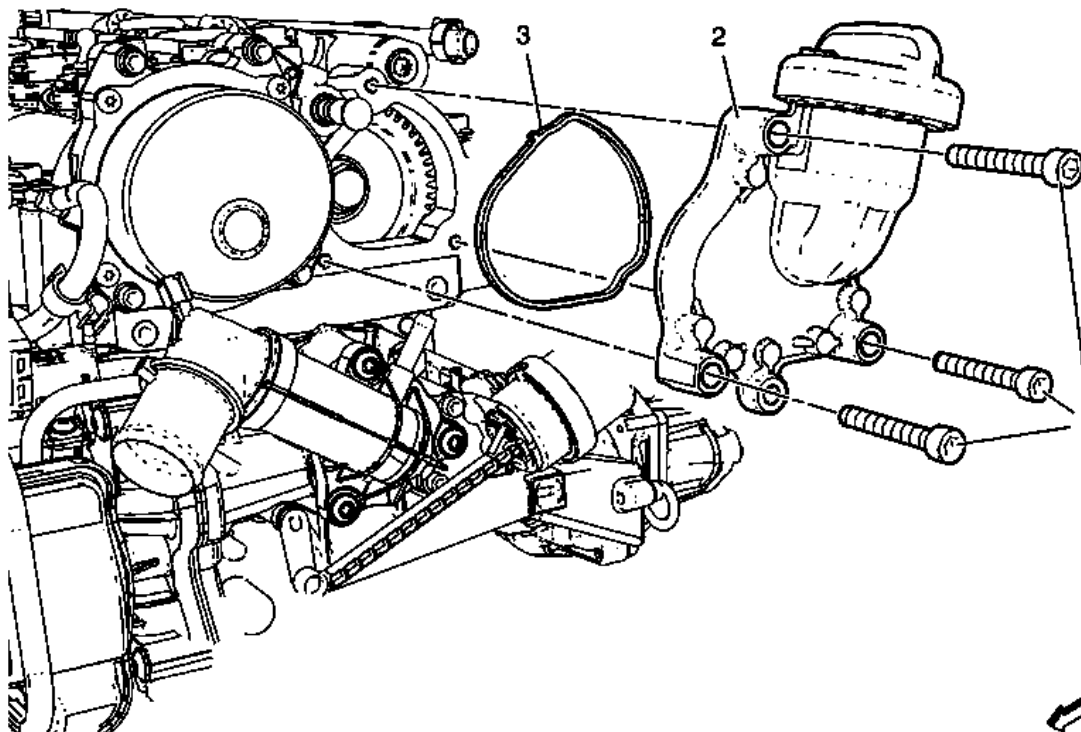
### Crankshaft Pulley Replacement

Callout	Component Name
<b>Preliminary Procedures</b>	

1. Open the hood.
2. Remove the generator, air conditioning compressor and power steering pump belt. Refer to **Generator, Air Conditioning Compressor and Power Steering Pump Belt Replacement**.

1	<p>Crankshaft Pulley Bolt (Qty: 4)</p> <p><b>CAUTION:</b> Refer to <b><u>Fastener Caution</u></b> .</p> <p><b>Procedure</b> Install a wrench on crankshaft sprocket bolt in order to hold the crankshaft. <b>TIP:</b> The center bolt must not be loosen. <b>Tighten</b> 25 N.m (18 lb ft)</p>
2	<p>Crankshaft Pulley</p> <p><b>Procedure</b> Make sure the guide pin is in its recess (see arrows).</p>

## CAMSHAFT REAR COVER REPLACEMENT



**Fig. 21: Camshaft Rear Cover**  
Courtesy of GENERAL MOTORS COMPANY

### Camshaft Rear Cover Replacement

Callout	Component Name
<b>Preliminary Procedures</b>	
<ol style="list-style-type: none"> <li>1. Open the hood.</li> <li>2. Remove the engine sight shield. Refer to <b><u>Engine Sight Shield Replacement</u></b>.</li> <li>3. Loosen the 3 charge air cooler outlet air hose bolts from the throttle body and the charge air cooler outlet air hose bracket bolt and hang the hose aside.</li> <li>4. Disconnect the engine coolant temperature sensor wiring harness plug.</li> <li>5. Remove the engine control module wiring harness bracket.</li> </ol>	
1	Camshaft Rear Cover Bolt (Qty: 3)  <b>CAUTION:</b> Refer to <b><u>Fastener Caution</u></b> .  <b>Tighten</b> 9 N.m (80 lb in)
2	Camshaft Rear Cover
3	Camshaft Rear Cover Gasket <b>Procedure</b> Install a NEW camshaft rear cover gasket prior installation of the camshaft rear cover.

## CAMSHAFT HOUSING REPLACEMENT

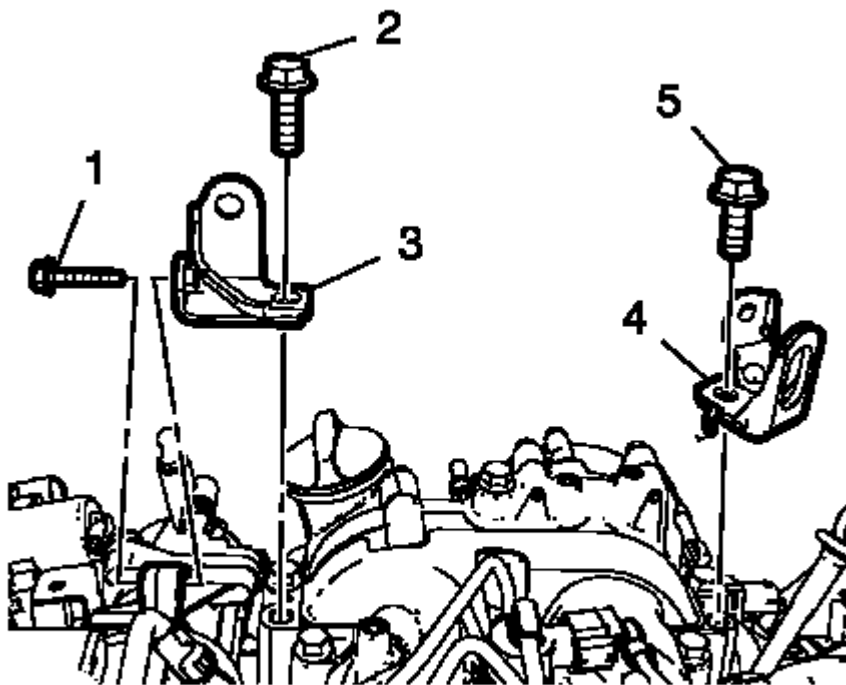
### Special Tools

EN-45059 Angle Meter

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

### Removal Procedure

1. Remove the timing belt. Refer to **Timing Belt Replacement**.
2. Remove the fuel injectors. Refer to **Fuel Injector Replacement** .
3. Remove the fuel rail. Refer to **Fuel Injection Fuel Rail Assembly Replacement** .
4. Remove the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.
5. Remove the turbocharger oil feed pipe. Refer to **Turbocharger Oil Feed Pipe Replacement**.

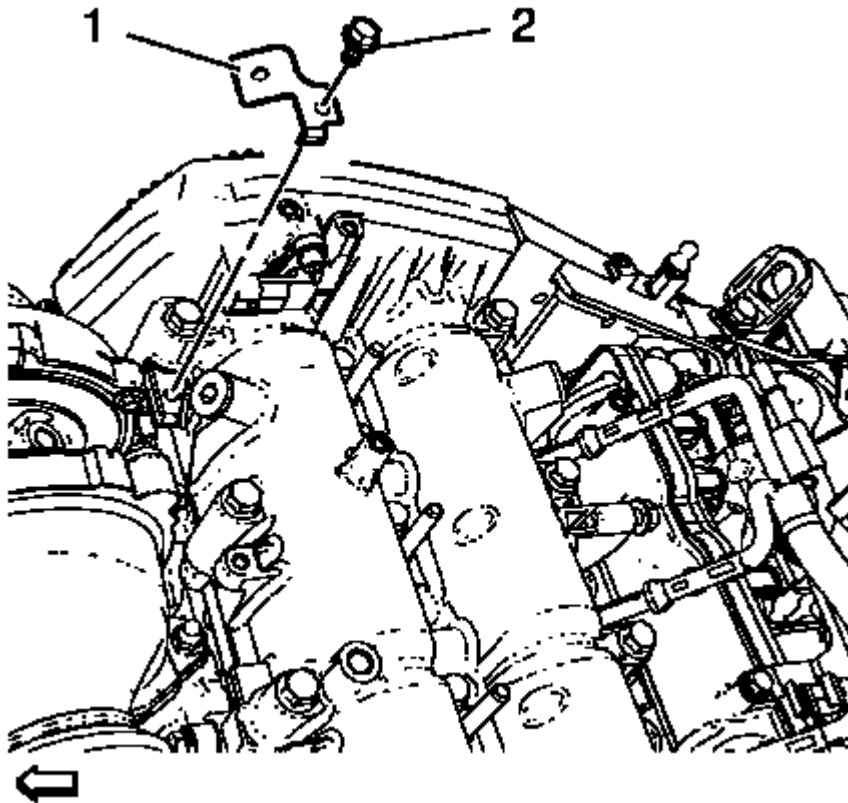


**Fig. 22: Engine Lift Brackets**

Courtesy of GENERAL MOTORS COMPANY

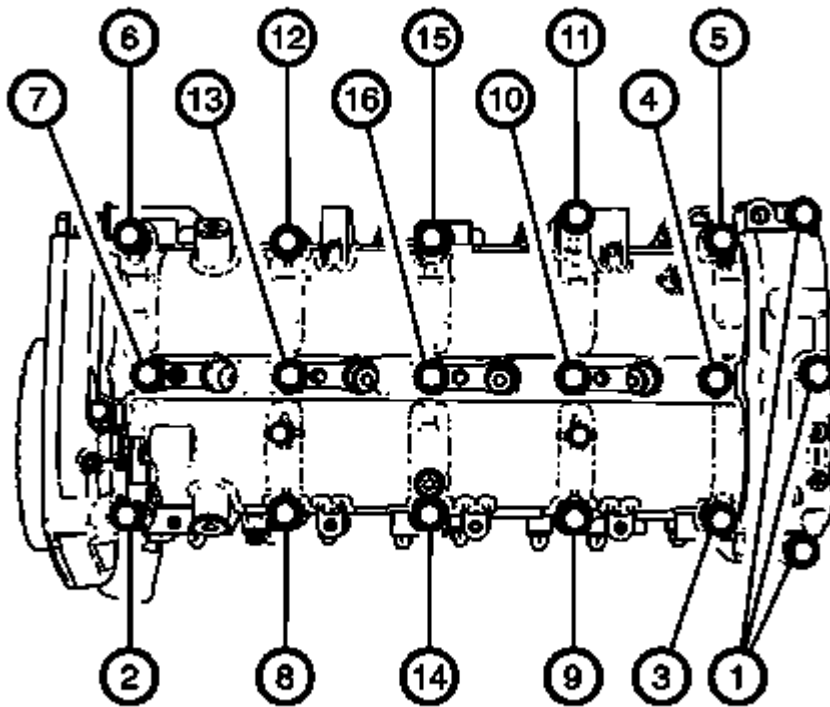
- 6.
7. Remove the 3 engine lift bracket bolts (1, 2, 5).
8. Remove the 2 engine lift brackets (3, 4).





**Fig. 23: Wiring Harness Bracket And Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

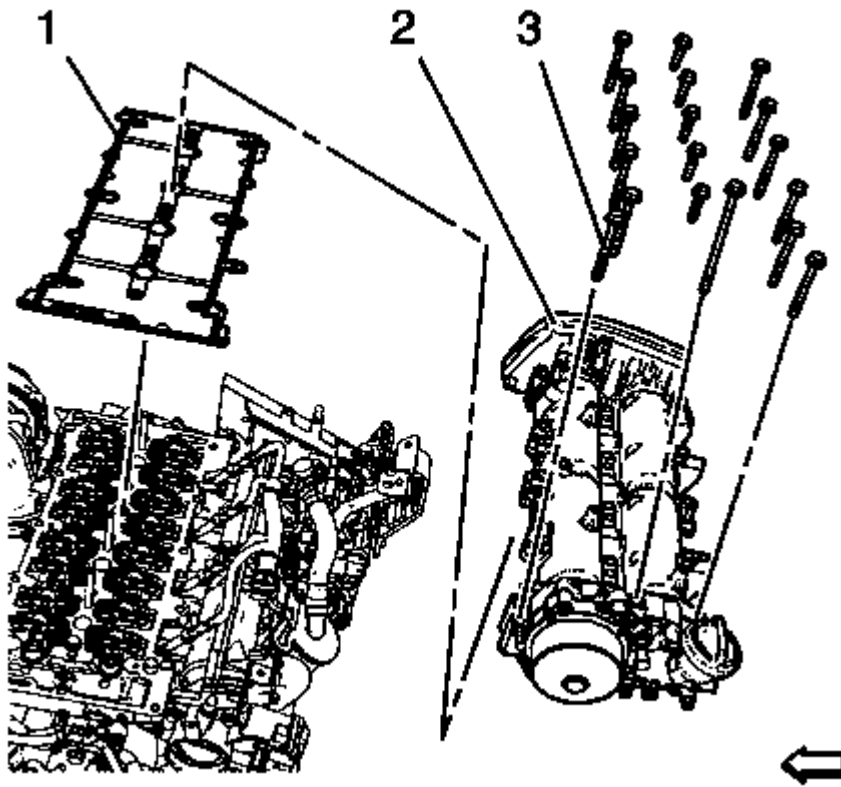
9. Disconnect the camshaft position electrical connector.
10. Remove the wiring harness bracket bolt (2) and the wiring harness bracket (1) and reposition the wiring harness.
11. Remove the charge air cooler air hose bracket bolt and disconnect the hose spring clip from the throttle body and reposition the hose. Refer to **Charge Air Cooler Outlet Air Hose Replacement**.



**Fig. 24: Camshaft Housing Bolts In Sequence**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Loosen the bolts in several passes to allow the camshaft housing to lift evenly.

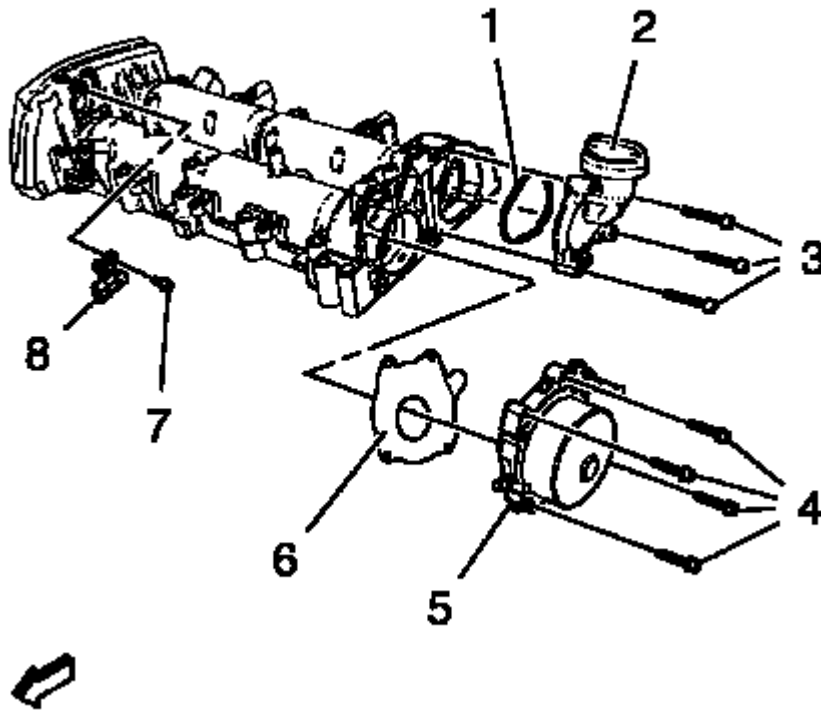
12. Loosen the camshaft housing bolts in sequence as shown in the graphic.



**Fig. 25: Camshaft Cover Bolts**

Courtesy of GENERAL MOTORS COMPANY

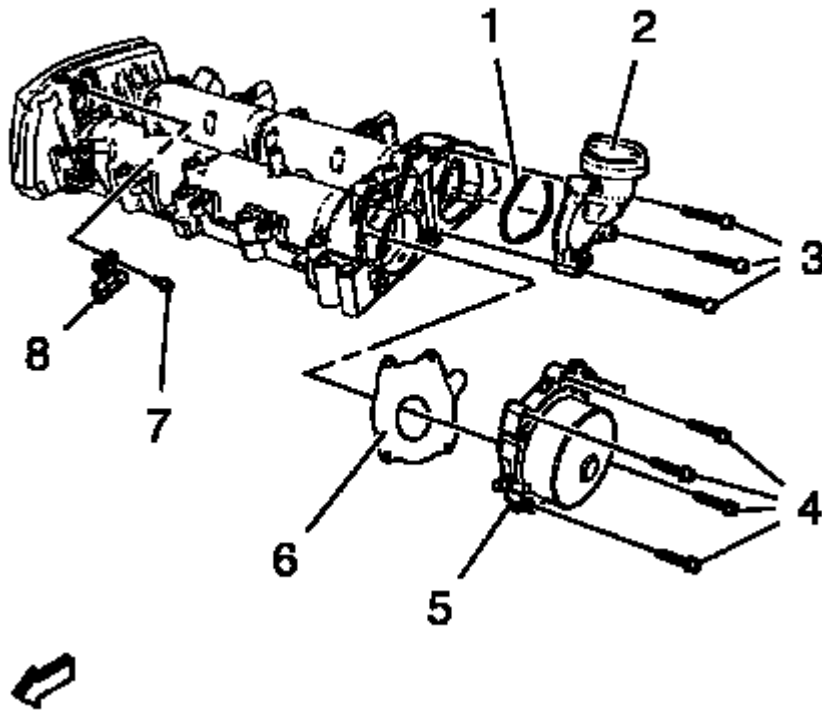
13. Remove the 18 camshaft cover bolts (3).
14. Disconnect the brake booster hose at the vacuum pump assembly. Refer to **Plastic Collar Quick Connect Fitting Service** .
15. Disconnect the small vacuum line at the vacuum pump assembly.
16. Disconnect the coolant temperature sensor inline connector at the vacuum pump assembly and unclip and reposition the wiring harness.
17. Remove the camshaft cover (2).
18. Remove the camshaft cover gasket (1).



**Fig. 26: Camshaft Position Sensor Bolt And Camshaft Position Sensor**  
 Courtesy of GENERAL MOTORS COMPANY

19. Remove the camshaft position sensor bolt (8) and the camshaft position sensor (7).
20. Remove and DISCARD 4 power brake booster pump bolts (4).
21. Remove the power brake booster pump (5) along with power brake booster pump gasket (6).
22. Remove the 3 camshaft rear cover bolts (3).
23. Remove the camshaft rear cover (2) along with camshaft rear cover seal ring (1).

#### Installation Procedure



**Fig. 27: Camshaft Position Sensor Bolt And Camshaft Position Sensor**  
 Courtesy of GENERAL MOTORS COMPANY

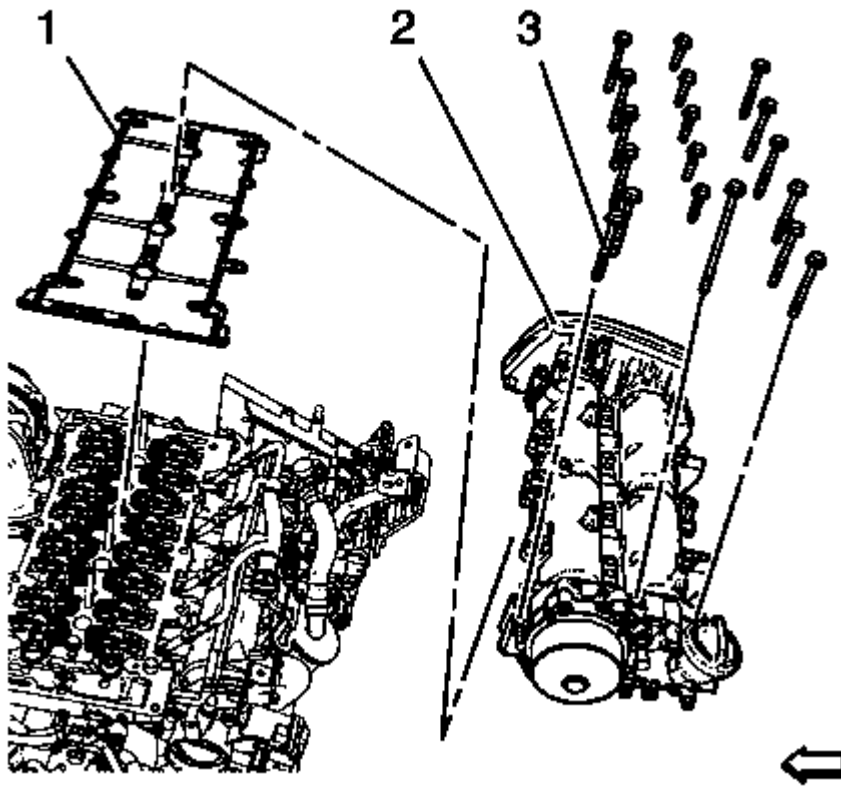
1. Install the camshaft rear cover (2) along with a NEW camshaft rear cover seal ring (1).

**CAUTION: Refer to Fastener Caution .**

2. Install the 3 camshaft rear cover bolts (3) and tighten to 9 (80 lb in).
3. Install the power brake booster pump (5) along with a NEW power brake booster pump gasket (6).

**CAUTION: Refer to Torque-to-Yield Fastener Caution .**

4. Install 4 NEW power brake booster pump bolts (4) and tighten a first pass to 5 (44 lb in).
5. Tighten the 4 NEW power brake booster pump bolts a final pass to an additional 50 degrees, using the **EN-45059** meter.
6. Install the camshaft position sensor (7).
7. Install the camshaft position sensor bolt (8) and tighten to 9 (80 lb in).



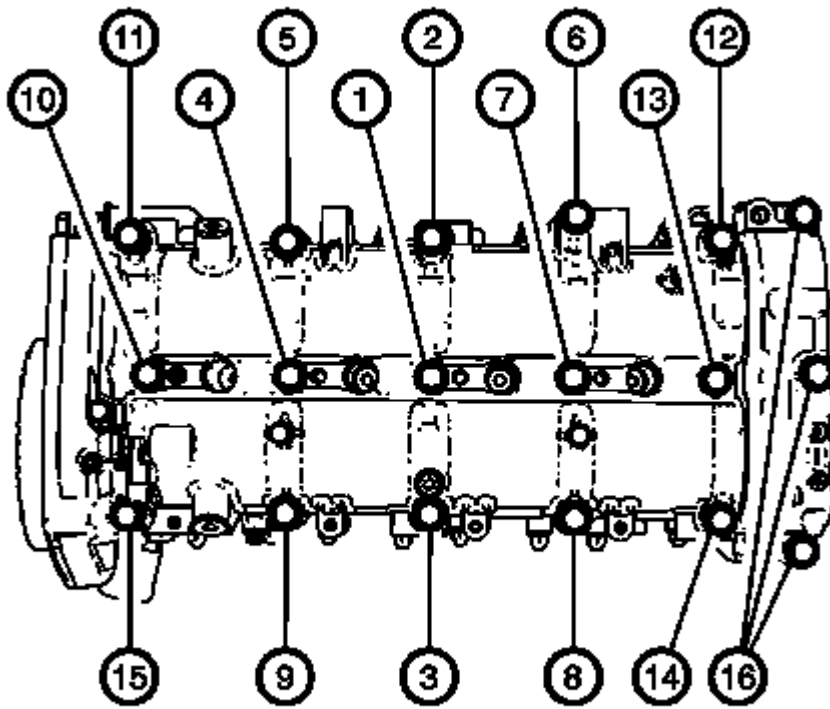
**Fig. 28: Camshaft Cover Bolts**

Courtesy of GENERAL MOTORS COMPANY

8. Install the NEW camshaft cover gasket (1).
9. Install the camshaft cover (2).

**NOTE:** Remind different bolt lengths.

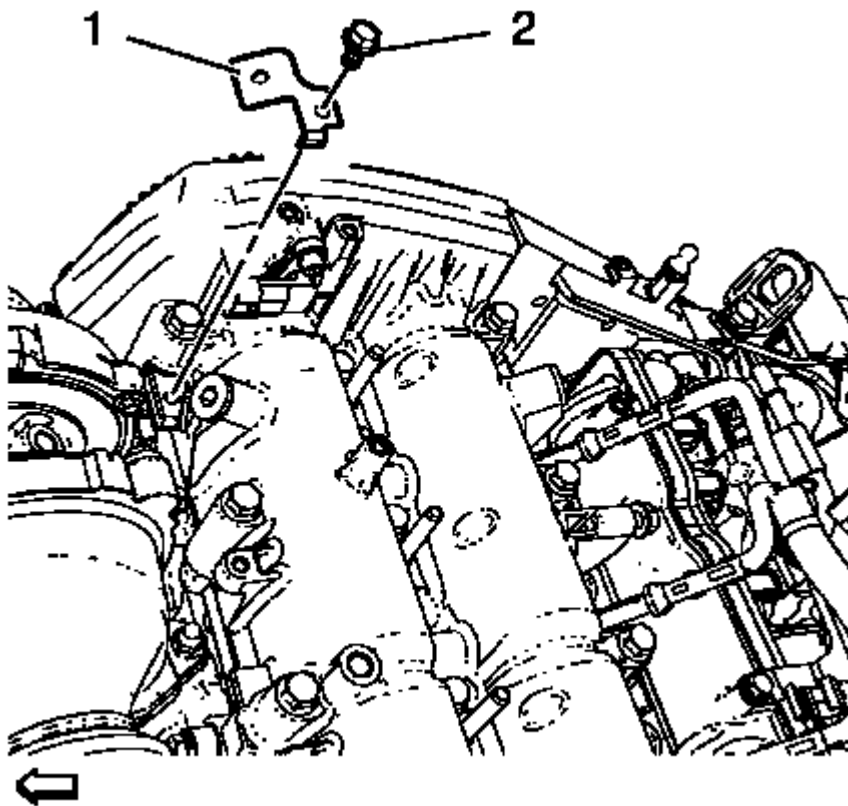
10. Install the camshaft housing bolts to the camshaft housing.

**Fig. 29: Camshaft Housing**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Tighten the bolts in several passes to allow the camshaft housing lower evenly.

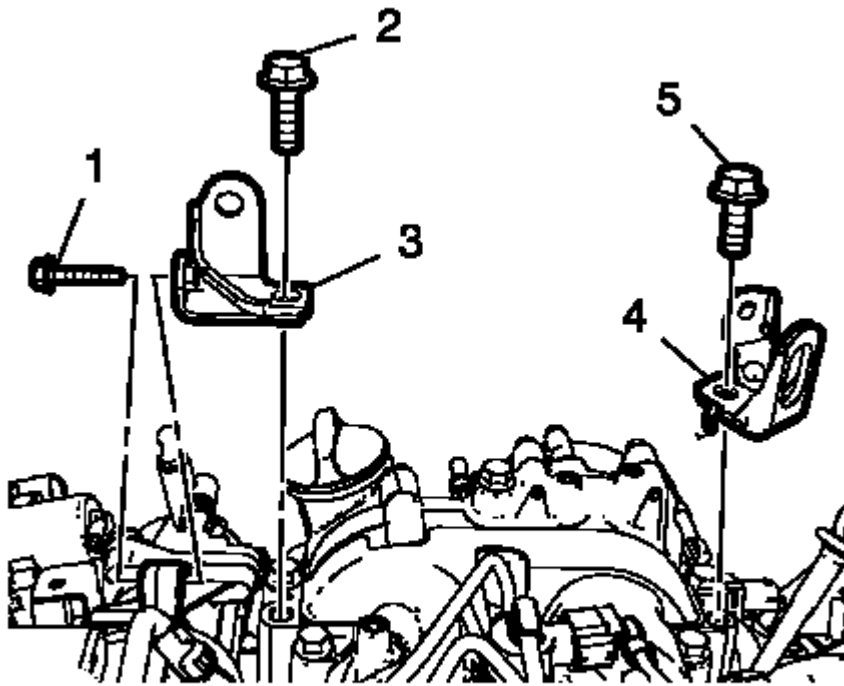
11. Tighten the camshaft housing bolts in sequence as shown in the graphic to 25 (18 lb ft).
12. Connect the coolant temperature sensor inline connector at the vacuum pump assembly and clip in and position the harness.
13. Connect the small vacuum line at the vacuum pump assembly.
14. Connect the brake booster hose at the vacuum pump assembly. Refer to **Plastic Collar Quick Connect Fitting Service** .
15. Connect the hose spring clip to the throttle body and position the hose and install the charge air cooler outlet air hose bracket bolt. Refer to **Charge Air Cooler Outlet Air Hose Replacement**.



**Fig. 30: Wiring Harness Bracket And Bolt**  
Courtesy of GENERAL MOTORS COMPANY

16. Install the wiring harness bracket (1) and the wiring harness bracket bolt (2) and tighten to 9 (80 lb in).
17. Connect the camshaft position electrical connector.



**Fig. 31: Engine Lift Brackets**

Courtesy of GENERAL MOTORS COMPANY

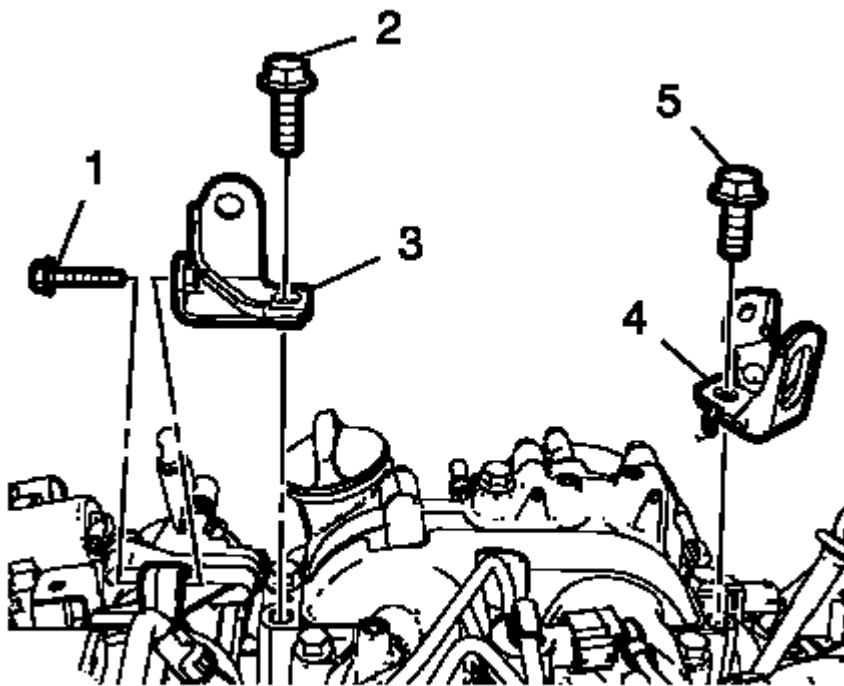
18. Install the bracket (4).
19. Install the intake manifold bracket bolt (5) and tighten to 50 (37 lb ft).
20. Install the bracket (3).
21. Install the intake manifold bracket bolt (2) and tighten to 50 (37 lb ft).
22. Install the intake manifold bracket bolt (1) and tighten to 9 (80 lb in).
23. Install the turbocharger oil feed pipe. Refer to **Turbocharger Oil Feed Pipe Replacement**.
24. Install the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.
25. Install the fuel rail. Refer to **Fuel Injection Fuel Rail Assembly Replacement**.
26. Install the fuel injectors. Refer to **Fuel Injector Replacement**.
27. Install the timing belt. Refer to **Timing Belt Replacement**.

## CAMSHAFT HOUSING AND COVER GASKET REPLACEMENT

### Removal Procedure

1. Remove the timing belt. Refer to **Timing Belt Replacement**.

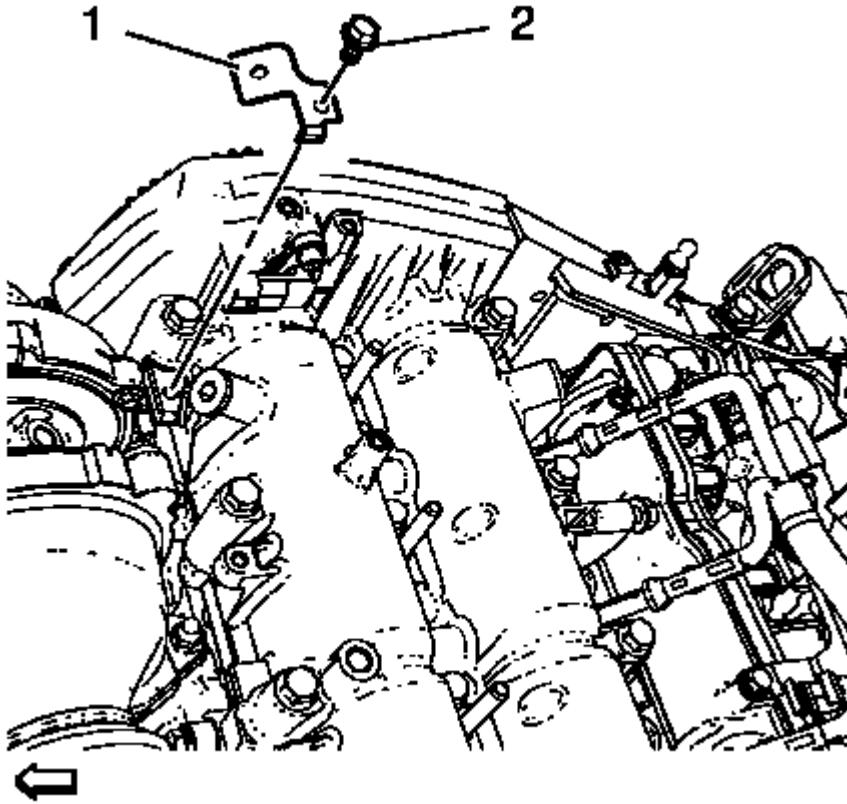
2. Install the engine mount bracket. Refer to **Engine Mount Bracket Replacement**.
3. Install the engine mount. Refer to **Engine Mount Replacement**.
4. Remove the fuel injectors. Refer to **Fuel Injector Replacement**.
5. Remove the fuel rail. Refer to **Fuel Injection Fuel Rail Assembly Replacement**.
6. Remove the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.
7. Remove the turbocharger oil feed pipe. Refer to **Turbocharger Oil Feed Pipe Replacement**.



**Fig. 32: Engine Lift Brackets**

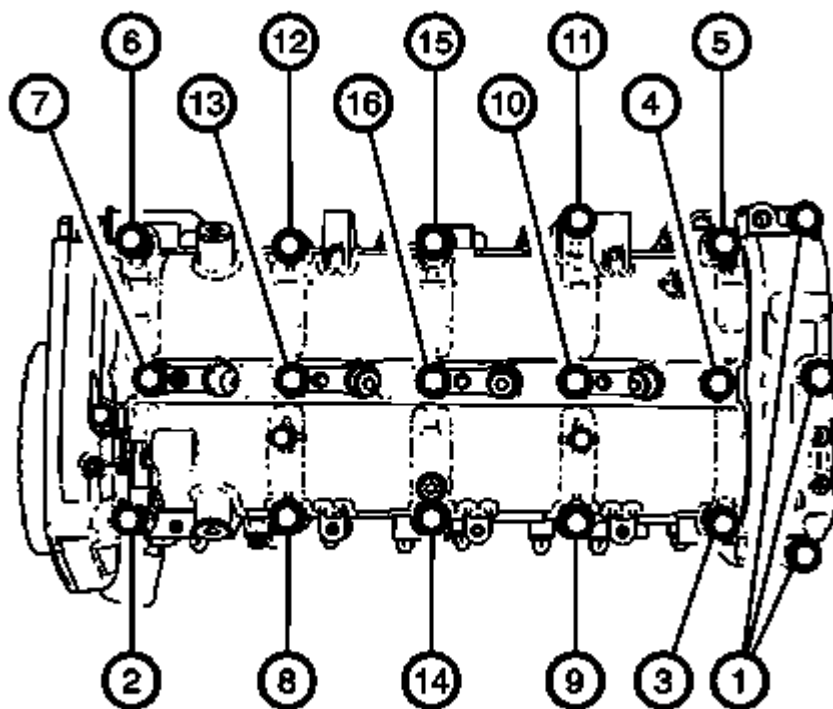
Courtesy of GENERAL MOTORS COMPANY

8. Remove the 3 engine lift bracket bolts (1, 2, 5).
9. Remove the 2 engine lift brackets (3, 4).



**Fig. 33: Wiring Harness Bracket And Bolt**  
Courtesy of GENERAL MOTORS COMPANY

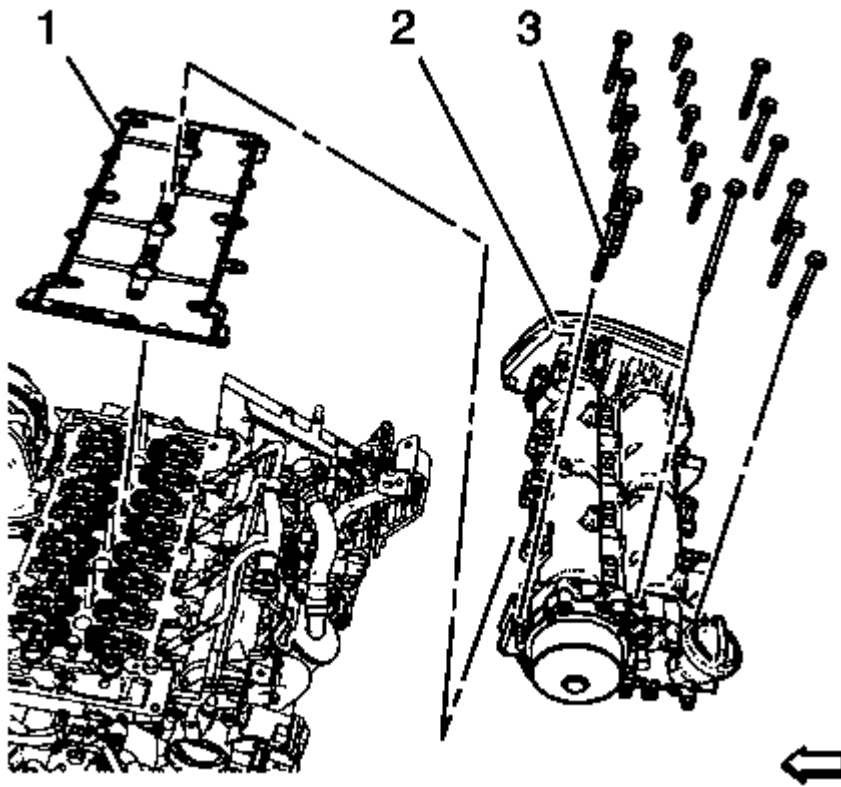
10. Disconnect the camshaft position electrical connector.
11. Remove the wiring harness bracket bolt (2) and the wiring harness bracket (1) and reposition the wiring harness.
12. Remove the charge air cooler outlet air hose bracket bolt and disconnect the hose spring clip from the throttle body and reposition the hose. Refer to **Charge Air Cooler Outlet Air Hose Replacement**.



**Fig. 34: Camshaft Housing Bolts In Sequence**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Loosen the bolts in several passes to allow the camshaft housing to lift evenly.

13. Loosen the camshaft housing bolts in sequence as shown in the graphic.

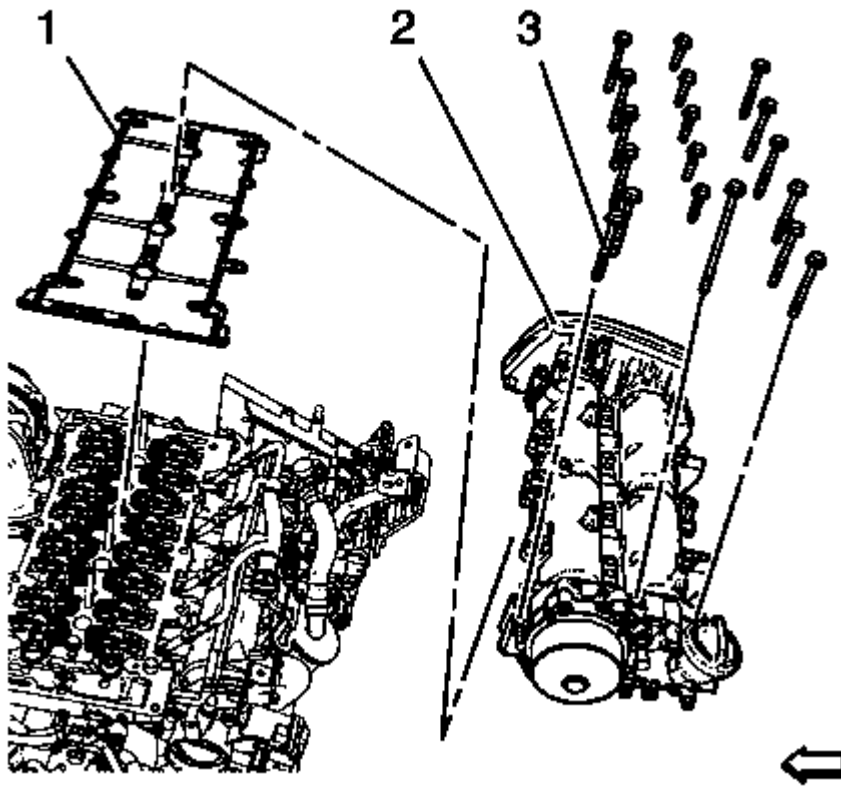


**Fig. 35: Camshaft Cover Bolts**

Courtesy of GENERAL MOTORS COMPANY

14. Remove the 18 camshaft cover bolts (3).
15. Disconnect the brake booster hose at the vacuum pump assembly. Refer to **Plastic Collar Quick Connect Fitting Service** .
16. Disconnect the small vacuum line at the vacuum pump assembly.
17. Disconnect the coolant temperature sensor inline connector at the vacuum pump assembly and unclip and reposition the harness.
18. Remove the camshaft cover (2).
19. Remove the camshaft cover gasket (1).

#### Installation Procedure



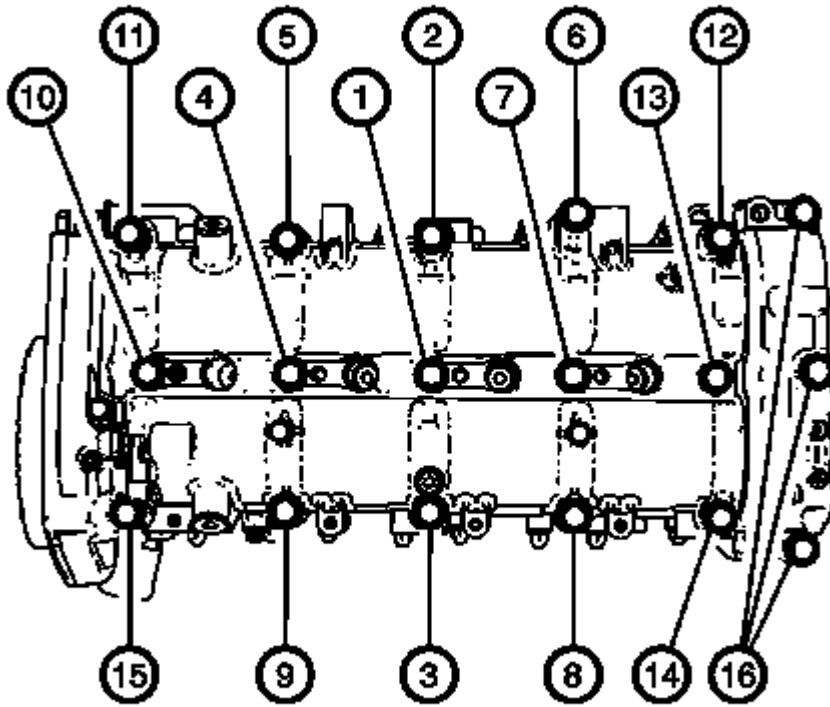
**Fig. 36: Camshaft Cover Bolts**

Courtesy of GENERAL MOTORS COMPANY

1. Install the NEW camshaft cover gasket (1).
2. Install the camshaft cover (2).

**NOTE:** Remind different bolt lengths.

3. Install the camshaft housing bolts to the camshaft housing.

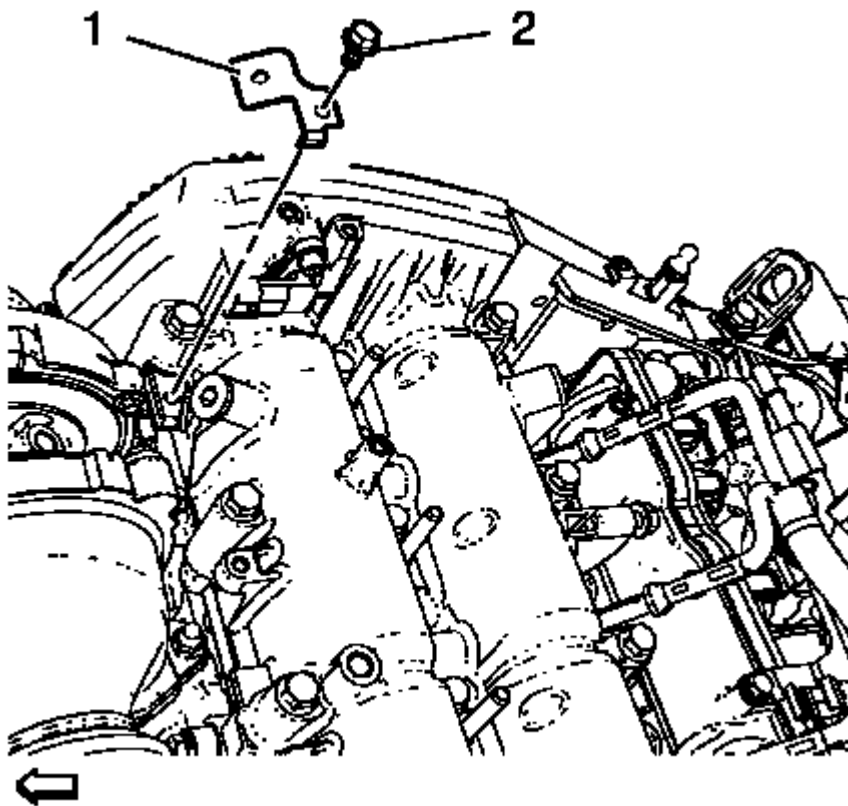
**Fig. 37: Camshaft Housing**

Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

**NOTE:** Tighten the bolts in several passes to allow the camshaft housing lower evenly.

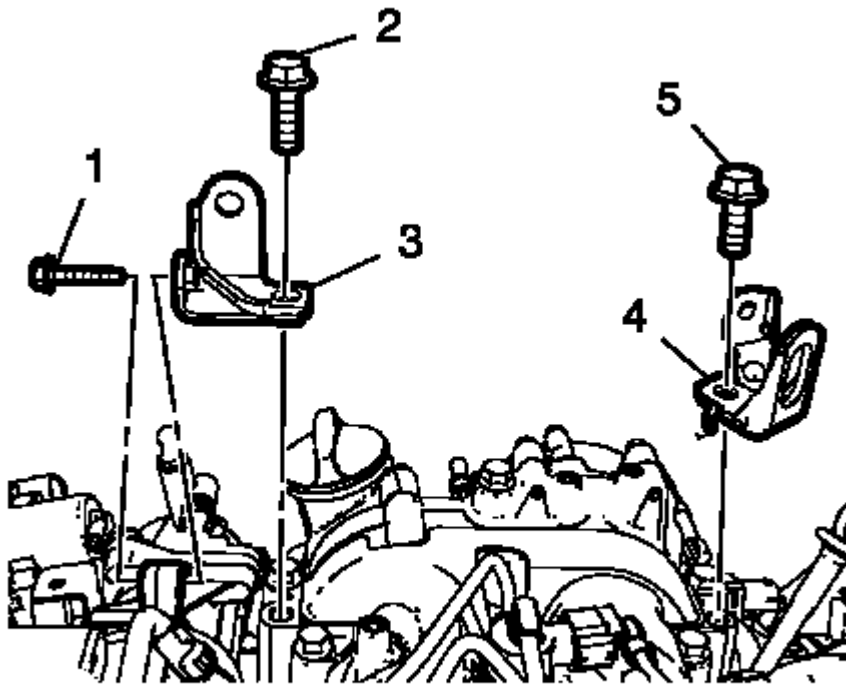
4. Tighten the camshaft housing bolts in sequence as shown in the graphic to 25 (18 lb ft).
5. Connect the coolant temperature sensor inline connector at the vacuum pump assembly and clip in and position the harness.
6. Connect the small vacuum line at the vacuum pump assembly.
7. Connect the brake booster hose at the vacuum pump assembly. Refer to Plastic Collar Quick Connect Fitting Service .
8. Connect the hose spring clip to the throttle body and position the hose and install the charge air cooler outlet air hose bracket bolt. Refer to Charge Air Cooler Outlet Air Hose Replacement.



**Fig. 38: Wiring Harness Bracket And Bolt**  
Courtesy of GENERAL MOTORS COMPANY

9. Install the wiring harness bracket (1) and the wiring harness bracket bolt (2) and tighten to 9 (80 lb in).
10. Connect the camshaft position electrical connector.





**Fig. 39: Engine Lift Brackets**

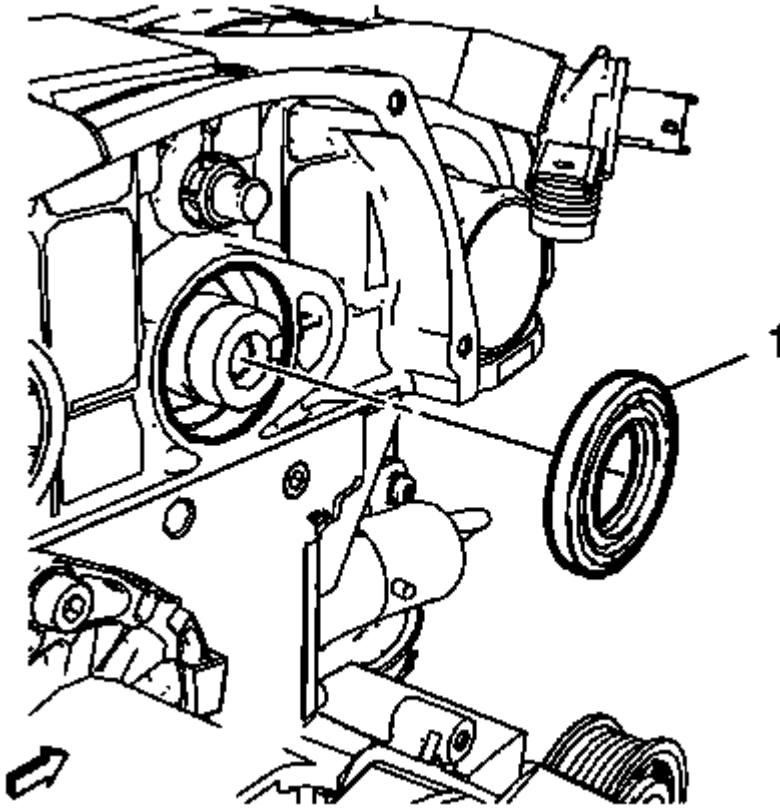
Courtesy of GENERAL MOTORS COMPANY

11. Install the bracket (4).
12. Install the intake manifold bracket bolt (5) and tighten to 50 (37 lb ft).
13. Install the bracket (3).
14. Install the intake manifold bracket bolt (2) and tighten to 50 (37 lb ft).
15. Install the intake manifold bracket bolt (1) and tighten to 9 (80 lb in).
16. Install the turbocharger oil feed pipe. Refer to **Turbocharger Oil Feed Pipe Replacement**.
17. Install the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.
18. Install the fuel rail. Refer to **Fuel Injection Fuel Rail Assembly Replacement**.
19. Remove the engine mount. Refer to **Engine Mount Replacement**.
20. Remove the engine mount bracket. Refer to **Engine Mount Bracket Replacement**.
21. Install the fuel injectors. Refer to **Fuel Injector Replacement**.
22. Install the timing belt. Refer to **Timing Belt Replacement**.

## CAMSHAFT FRONT OIL SEAL REPLACEMENT

### Removal Procedure

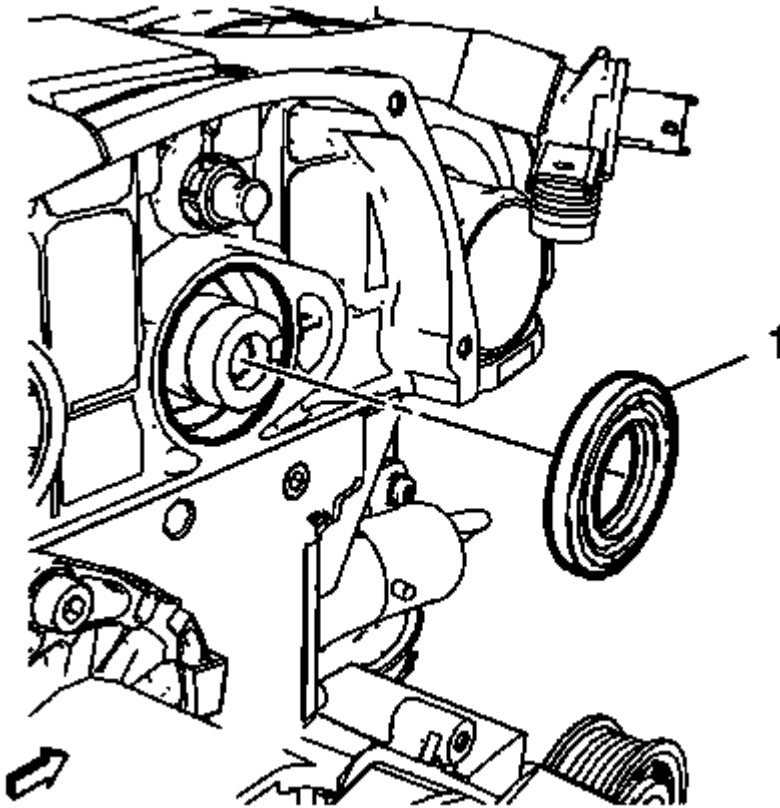
1. Remove the camshaft sprocket. Refer to **Camshaft Sprocket Replacement**.



**Fig. 40: Camshaft Front Oil Seal Ring**  
Courtesy of GENERAL MOTORS COMPANY

2. Clean the surrounding area from dirt.
3. Remove the camshaft front oil seal ring (1). Use a suitable tool.

#### **Installation Procedure**



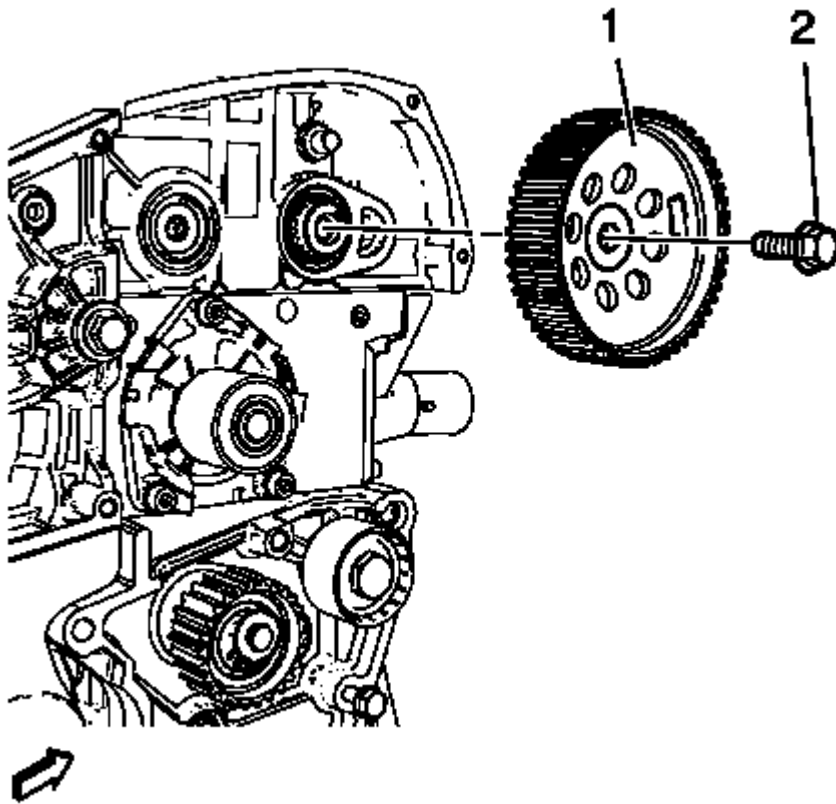
**Fig. 41: Camshaft Front Oil Seal Ring**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the camshaft front oil seal ring (1). Use a suitable tool.
2. Install the camshaft sprocket. Refer to **Camshaft Sprocket Replacement**.

## **CAMSHAFT SPROCKET REPLACEMENT**

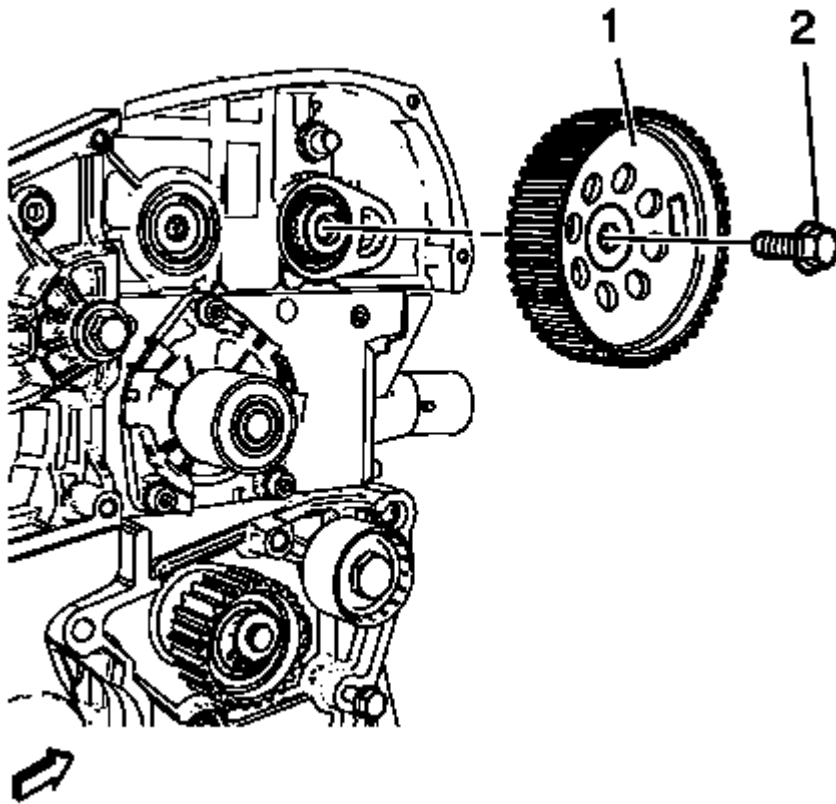
### **Removal Procedure**

1. Open the hood.
2. Remove the timing belt. Refer to **Timing Belt Replacement**.

**Fig. 42: Camshaft Sprocket Bolt****Courtesy of GENERAL MOTORS COMPANY**

3. Remove the camshaft sprocket bolt (2).
4. Remove the camshaft sprocket (1).

**Installation Procedure**



**Fig. 43: Camshaft Sprocket Bolt**

Courtesy of GENERAL MOTORS COMPANY

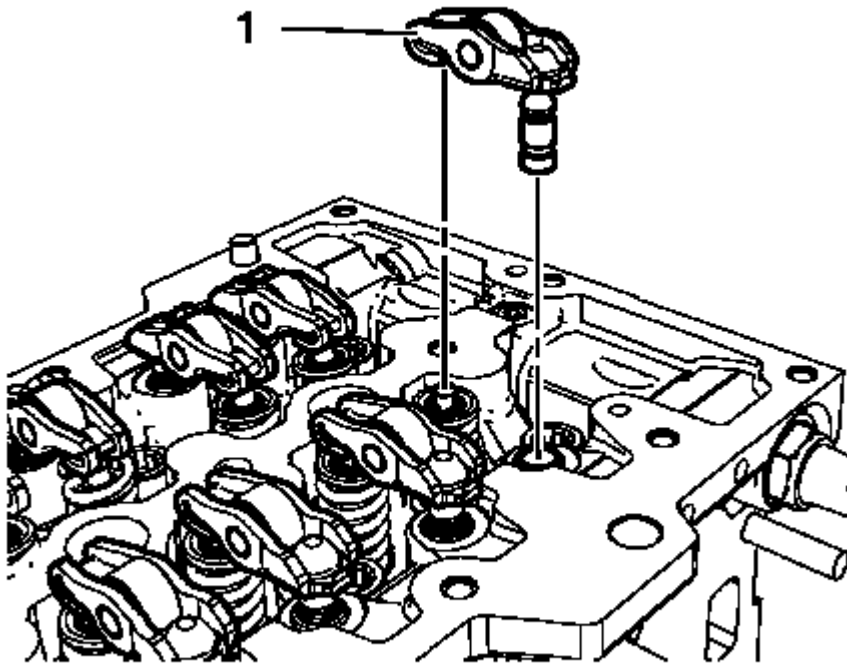
**NOTE:** Finally tighten the camshaft sprocket bolt after installing the timing belt.

1. Install the camshaft sprocket (1) and loosely install the camshaft sprocket bolt (2).
2. Install the timing belt. Refer to **Timing Belt Replacement**.
3. Close the hood.

## VALVE ROCKER ARM REPLACEMENT

### Removal Procedure

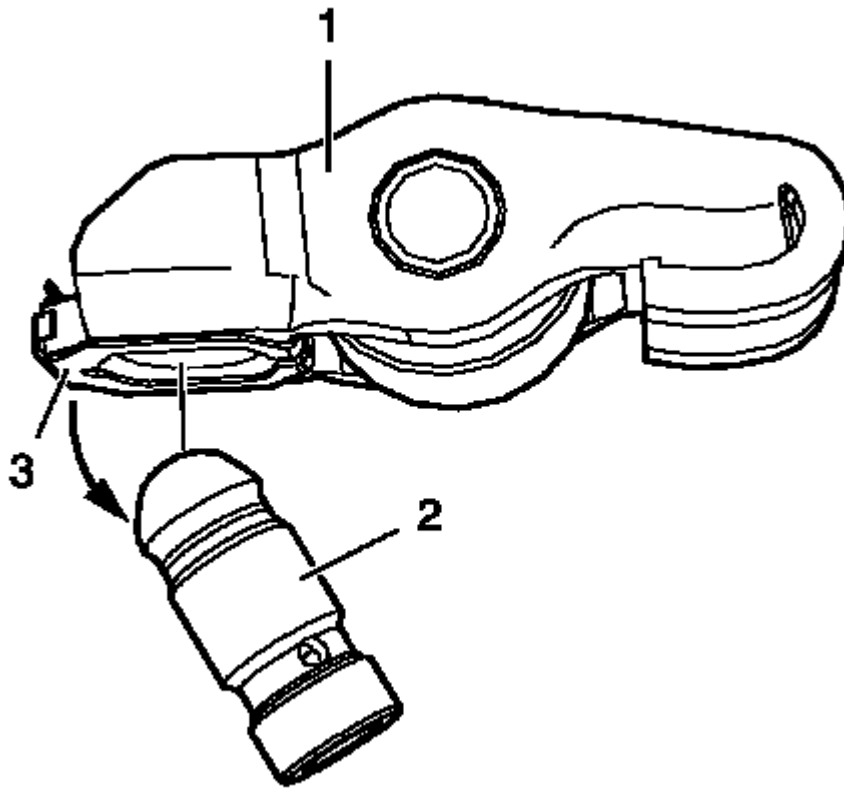
1. Open the hood.
2. Remove the camshaft housing. Refer to **Camshaft Housing and Cover Gasket Replacement**.



**Fig. 44: Valve Rocker Arms With Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** If the valve rocker arms will be reused mind the installation position to ensure they will be installed in their original position.

3. Remove the 16 valve rocker arms with the valve lifters (1).



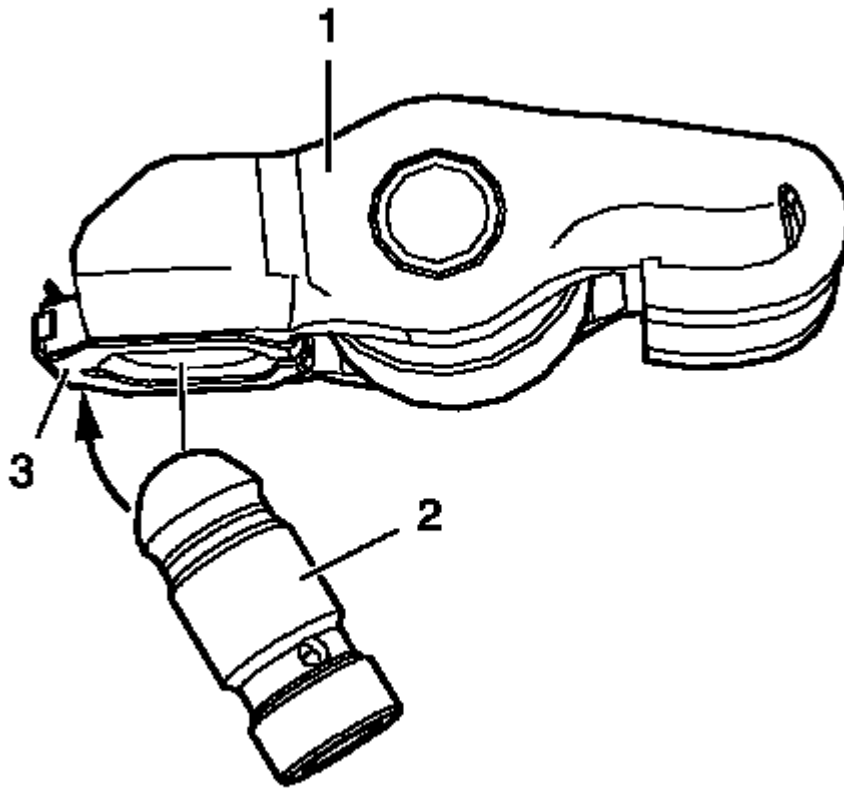
**Fig. 45: Valve Rocker Arms And Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Unclip the valve lifter from the valve rocker arm in direction as shown (arrow). Mind to the centering link on the retaining spring (3).

4. Remove the 16 valve rocker arms (1) from the valve lifters (2).

#### Installation Procedure

**NOTE:** Clean the valve lifters and the surrounding areas. Lubricate the valve lifters with engine oil.

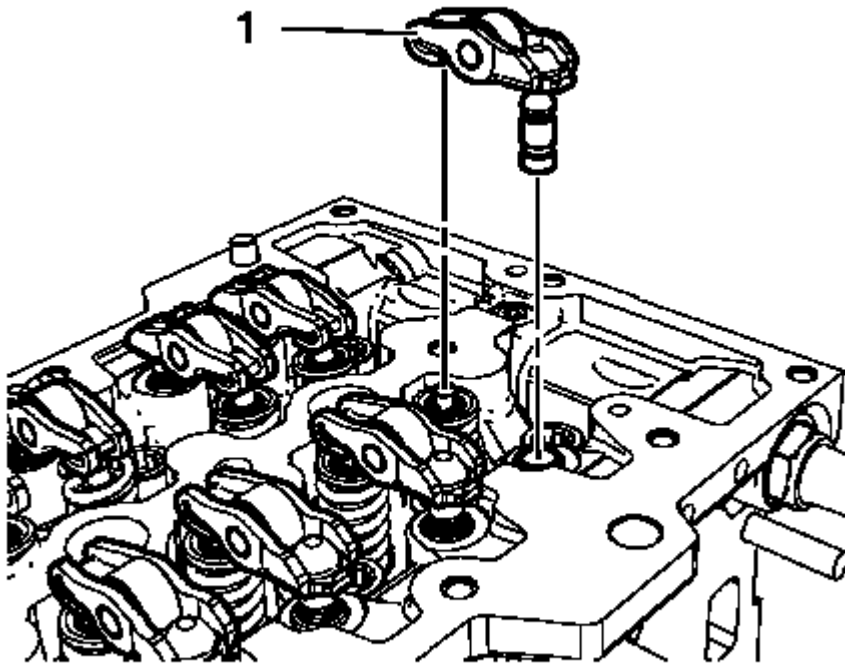


**Fig. 46: Valve Rocker Arms And Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Clip the valve lifter to the valve rocker arm in direction as shown (arrow). Mind to the centering link on the retaining spring (3).

1. Install the 16 valve rocker arms (1) to the valve lifters (2).





**Fig. 47: Valve Rocker Arms With Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** In case of reusing the valve rocker arms put them back in the original position.

2. Install the 16 valve rocker arms with the valve lifters (1).
3. Install the camshaft housing. Refer to **Camshaft Housing and Cover Gasket Replacement**.
4. Close the hood.

## **AUTOMATIC TRANSMISSION FLEX PLATE REPLACEMENT**

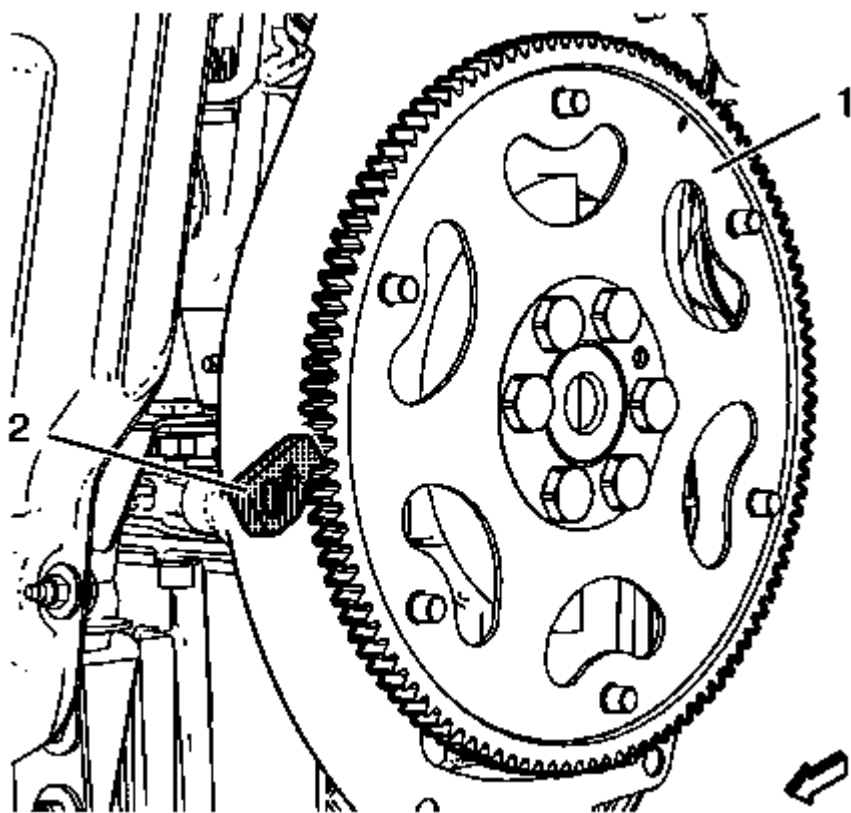
### **Special Tools**

**EN-46792** Flywheel Holder

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

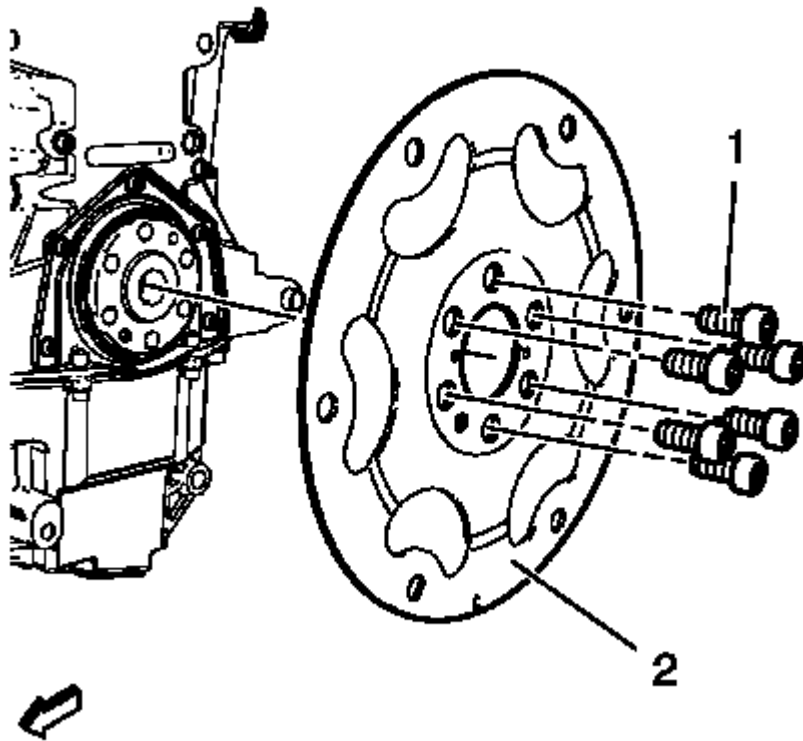
### **Removal Procedure**

1. Open the hood.
2. Remove the automatic transmission. Refer to **Transmission Replacement** .



**Fig. 48: Automatic Transmission Flexplate**  
Courtesy of GENERAL MOTORS COMPANY

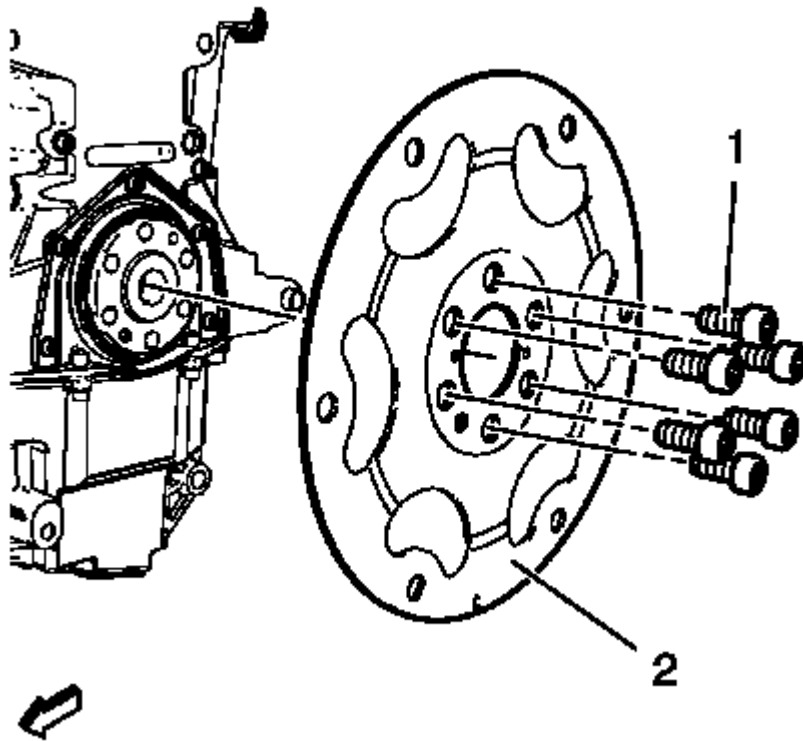
3. Lock the automatic transmission flexplate (1) by using the **EN-46792** holder (2).



**Fig. 49: Automatic Transmission Flexplate Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

4. Remove and DISCARD the 6 automatic transmission flexplate bolts (1).
5. Remove the **EN-46792** holder.
6. Remove the automatic transmission flexplate (2).

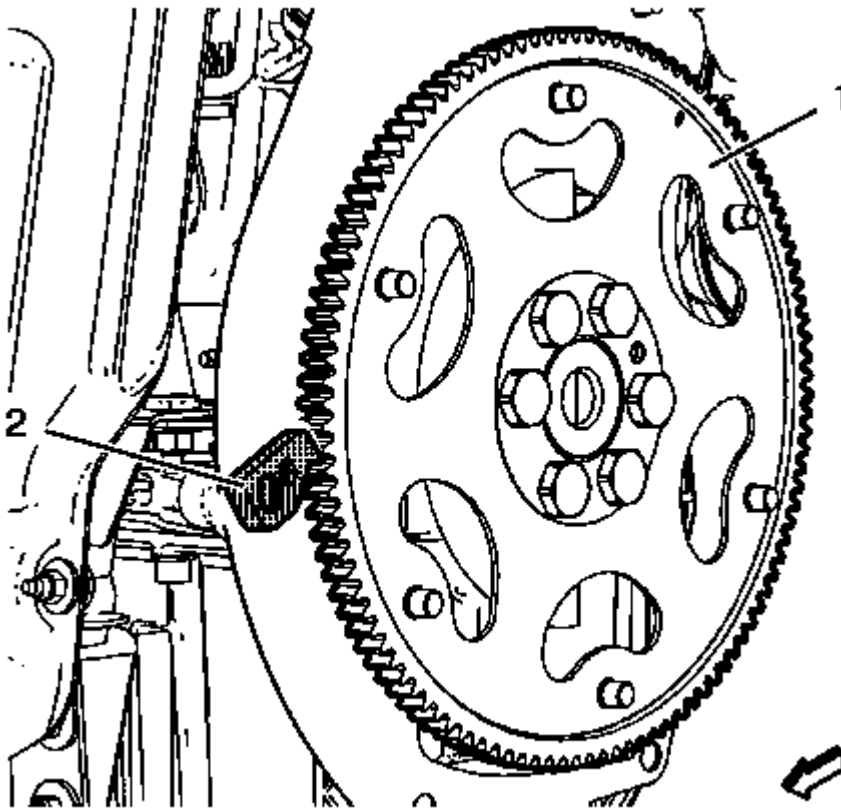
#### Installation Procedure



**Fig. 50: Automatic Transmission Flexplate Bolts**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The automatic transmission flexplate only fits in one position.

1. Install the automatic transmission flexplate (2) and loosely install 6 NEW automatic transmission flexplate bolts (1).



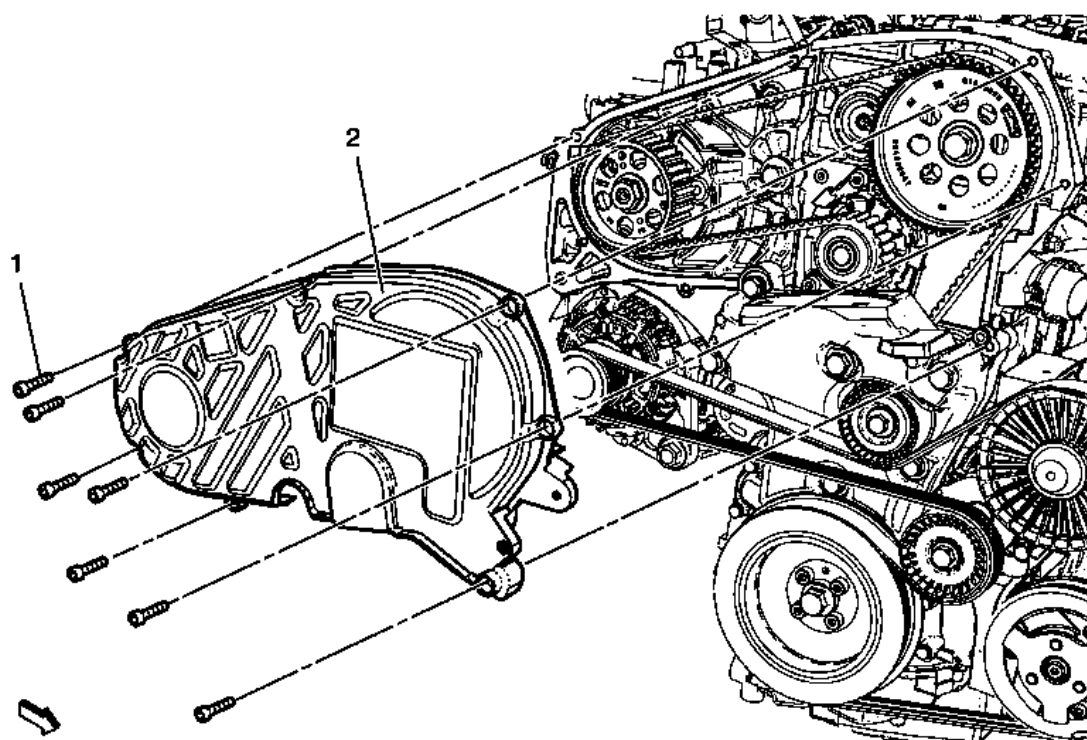
**Fig. 51: Automatic Transmission Flexplate**  
 Courtesy of GENERAL MOTORS COMPANY

2. Install the **EN-46792** holder (2) to the automatic transmission flexplate (1) in order to lock the crankshaft.

**CAUTION:** Refer to **Fastener Caution** .

3. Tighten the automatic transmission flexplate bolts to 160 N.m (118 lb ft).
4. Install the automatic transmission. Refer to **Transmission Replacement** .
5. Close the hood.

## **TIMING BELT FRONT COVER REPLACEMENT**



**Fig. 52: Timing Belt Front Cover**  
Courtesy of GENERAL MOTORS COMPANY

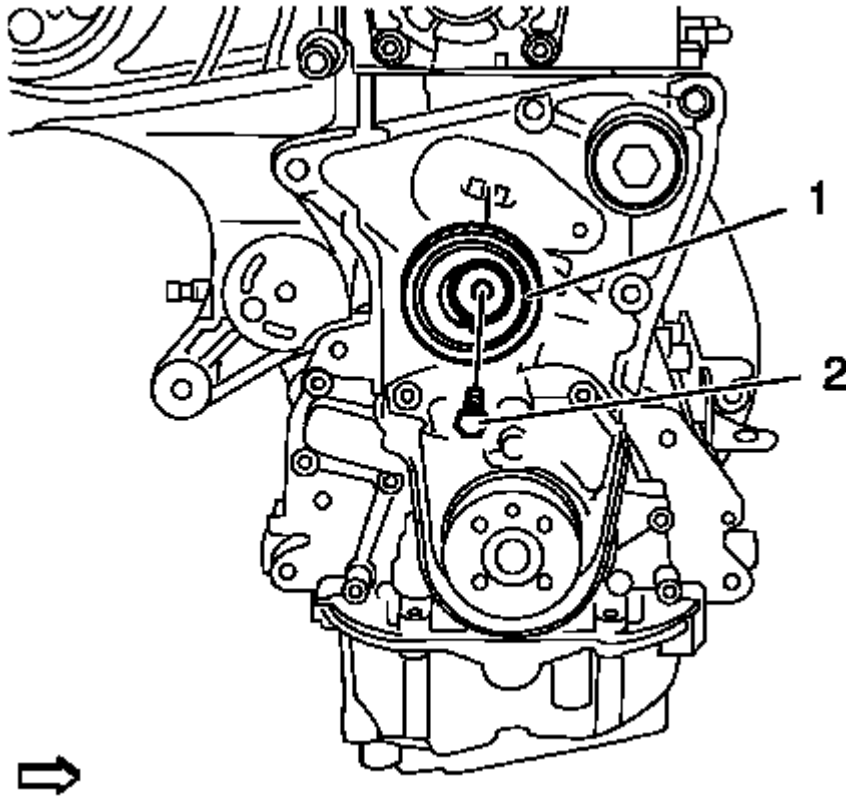
### Timing Belt Front Cover Replacement

Callout	Component Name
<b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Remove the engine sight shield.</li> <li>2. Remove the air cleaner. Refer to <a href="#">Air Cleaner Assembly Replacement</a>.</li> <li>3. Unclip the wiring harness from the timing belt front cover.</li> </ol>	
1	Timing Belt Front Cover Bolt (Qty: 7)  <b>CAUTION:</b> Refer to <a href="#">Fastener Caution</a> .  <b>Tighten</b> 9 (80 lb in)
2	Timing Belt Front Cover

### TIMING BELT TENSIONER REPLACEMENT

#### Removal Procedure

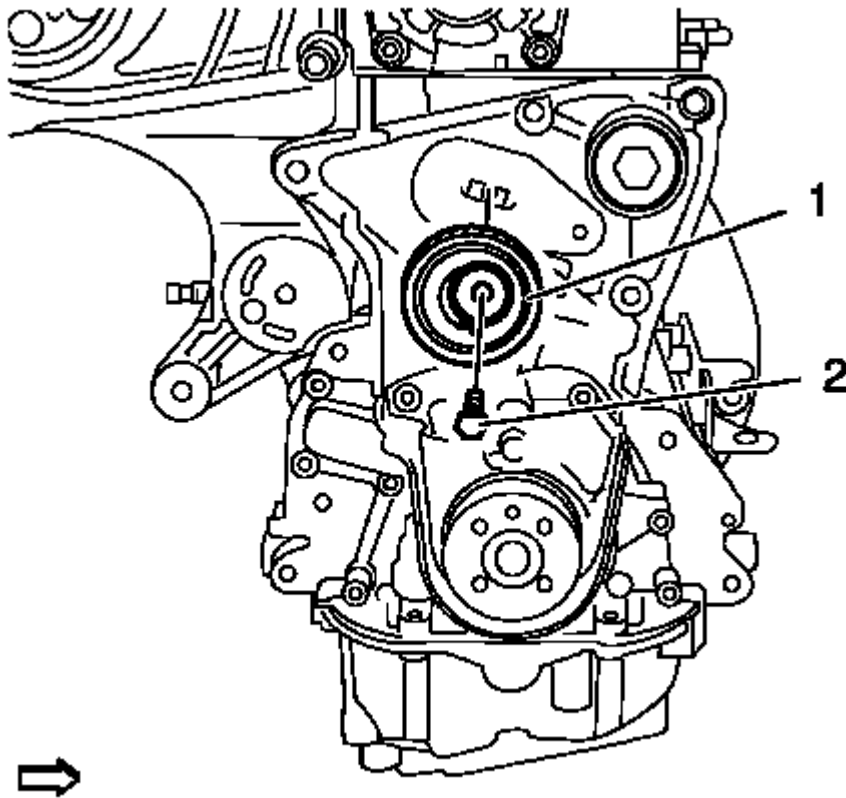
1. Open the hood.
2. Remove the timing belt. Refer to **Timing Belt Replacement**.



**Fig. 53: Timing Belt Tensioner Bolt**  
Courtesy of GENERAL MOTORS COMPANY

3. Remove the timing belt tensioner bolt (2).
4. Remove the timing belt tensioner (1).

#### **Installation Procedure**



**Fig. 54: Timing Belt Tensioner Bolt**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Finally tighten the timing belt tensioner bolt after installing the timing belt.

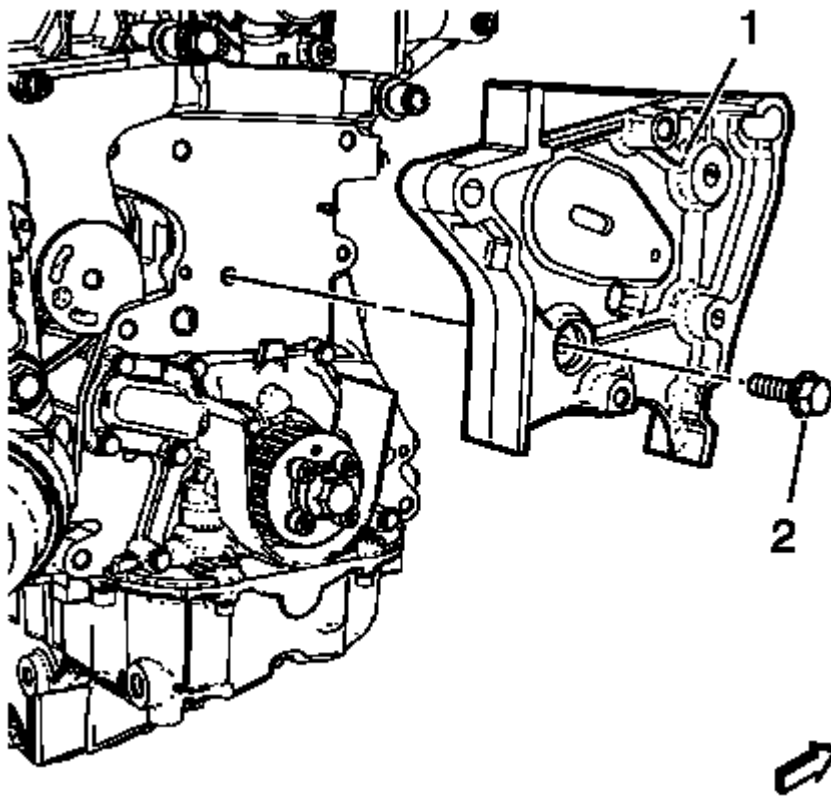
1. Install the timing belt tensioner (1) and loosely install the timing belt tensioner bolt (2).
2. Install the timing belt. Refer to **Timing Belt Replacement**.
3. Close the hood.

## **TIMING BELT TENSIONER BRACKET REPLACEMENT**

### **Removal Procedure**

1. Open the hood.
2. Remove the timing belt. Refer to **Timing Belt Replacement**.
3. Remove the timing belt tensioner. Refer to **Timing Belt Tensioner Replacement**.
4. Remove the timing belt idler pulley - lower. Refer to **Timing Belt Idler Pulley Replacement - Lower**.



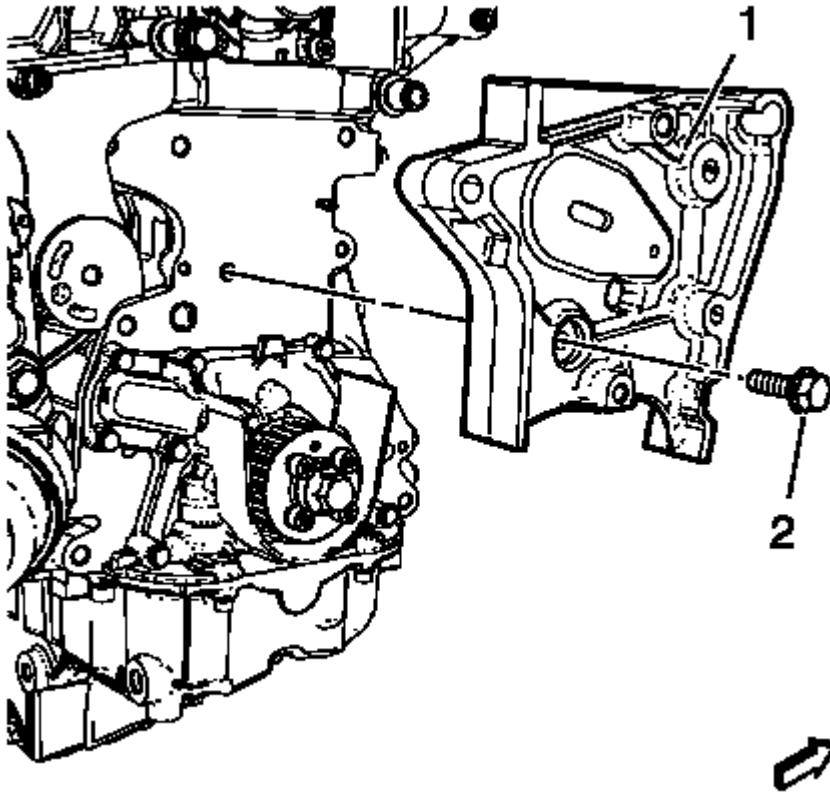


**Fig. 55: Timing Belt Tensioner Bracket**

Courtesy of GENERAL MOTORS COMPANY

5. Remove the timing belt tensioner bracket bolt (2).
6. Remove the timing belt tensioner bracket (1).

#### **Installation Procedure**



**Fig. 56: Timing Belt Tensioner Bracket**

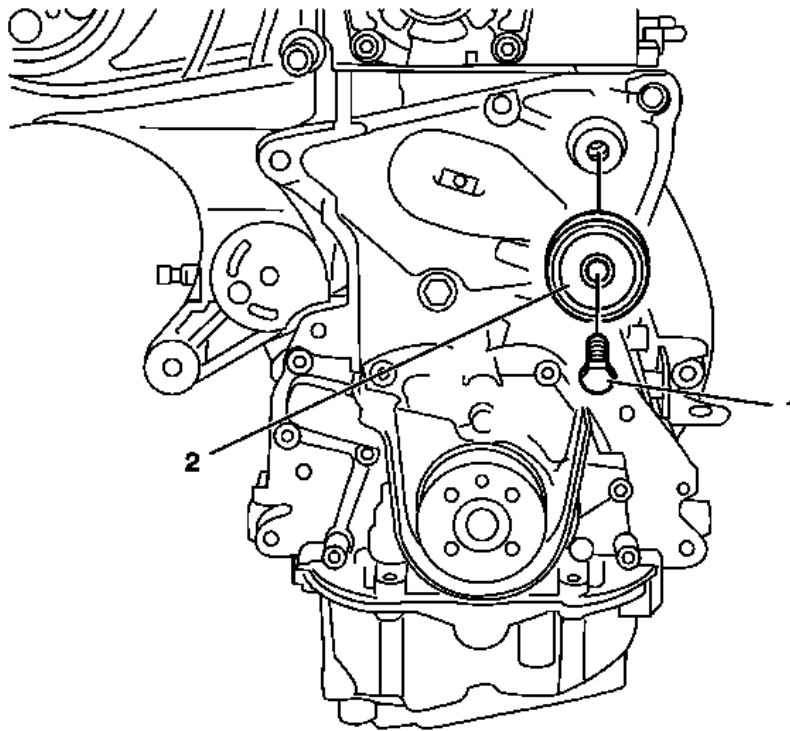
Courtesy of GENERAL MOTORS COMPANY

1. Install the timing belt tensioner bracket (1).

**CAUTION: Refer to Fastener Caution .**

2. Install the timing belt tensioner bracket bolt (2) and tighten to 25 N.m (19 lb ft).
3. Install the timing belt idler pulley - lower. Refer to **Timing Belt Idler Pulley Replacement - Lower**.
4. Install the timing belt tensioner. Refer to **Timing Belt Tensioner Replacement**.
5. Install the timing belt. Refer to **Timing Belt Replacement**.
6. Close the hood.

## **TIMING BELT IDLER PULLEY REPLACEMENT - LOWER**



**Fig. 57: Timing Belt Idler Pulley - Lower**  
Courtesy of GENERAL MOTORS COMPANY

#### Timing Belt Idler Pulley Replacement - Lower

Callout	Component Name
<b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Open the hood.</li> <li>2. Remove the timing belt. Refer to <b>Timing Belt Replacement</b>.</li> </ol>	
1	Timing Belt Idler Pulley Bolt  <b>CAUTION:</b> Refer to <b>Fastener Caution</b> .  <b>Tighten</b> 50 N.m (37 lb ft)
2	Timing Belt Idler Pulley

#### GENERATOR, AIR CONDITIONING COMPRESSOR AND POWER STEERING PUMP BELT REPLACEMENT

##### Special Tools

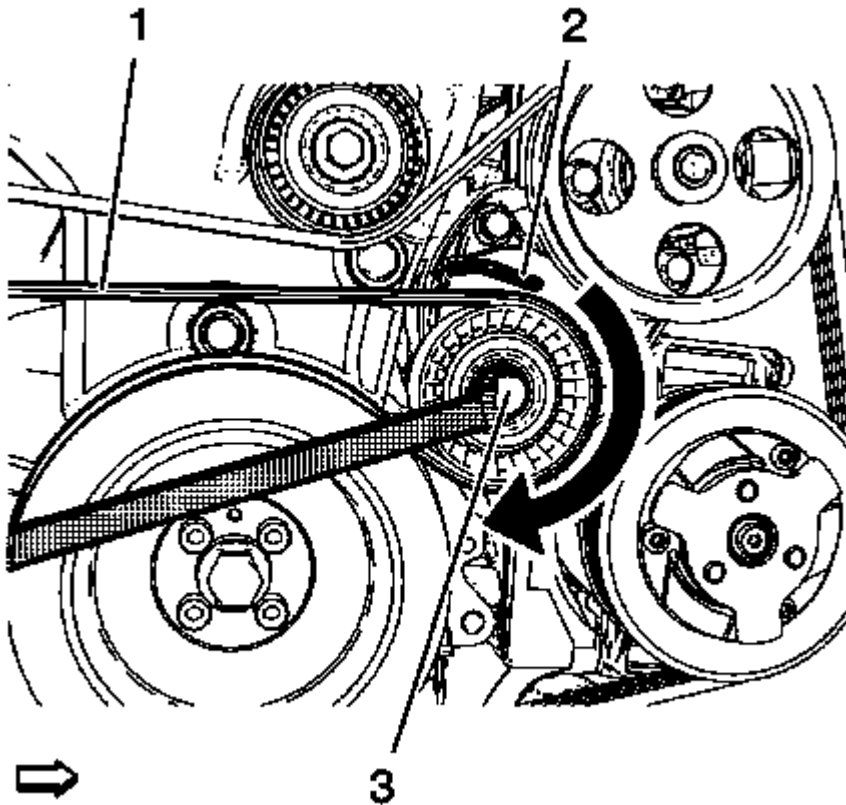
- EN-913-A Installation Wrench

- **EN-6130** Tensioner Spring Holding Pin

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

#### Removal Procedure

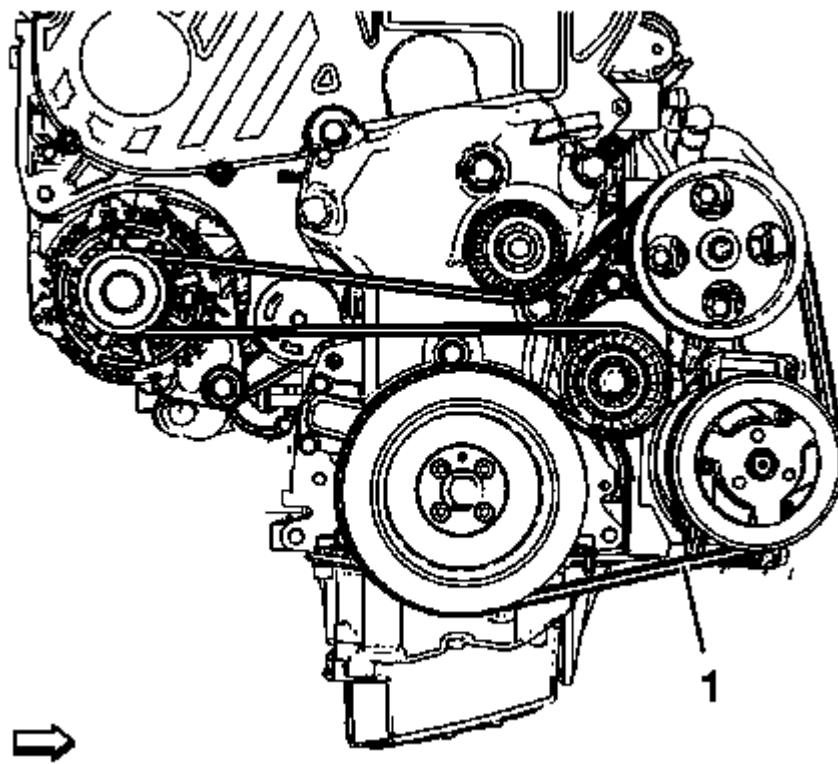
1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the front right front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .



**Fig. 58: Power Steering Pump Belt**  
Courtesy of GENERAL MOTORS COMPANY

3. Install the **EN-913-A** wrench to the tensioner bolt (3).
4. Rotate the tensioner clockwise, using the **EN-913-A** wrench in order to release the tension from the generator, air conditioning compressor and power steering pump belt and to insert the **EN-6130** holding pin (2).
5. Remove the **EN-913-A** wrench.
6. Remove the generator, air conditioning compressor and power steering pump belt (1).

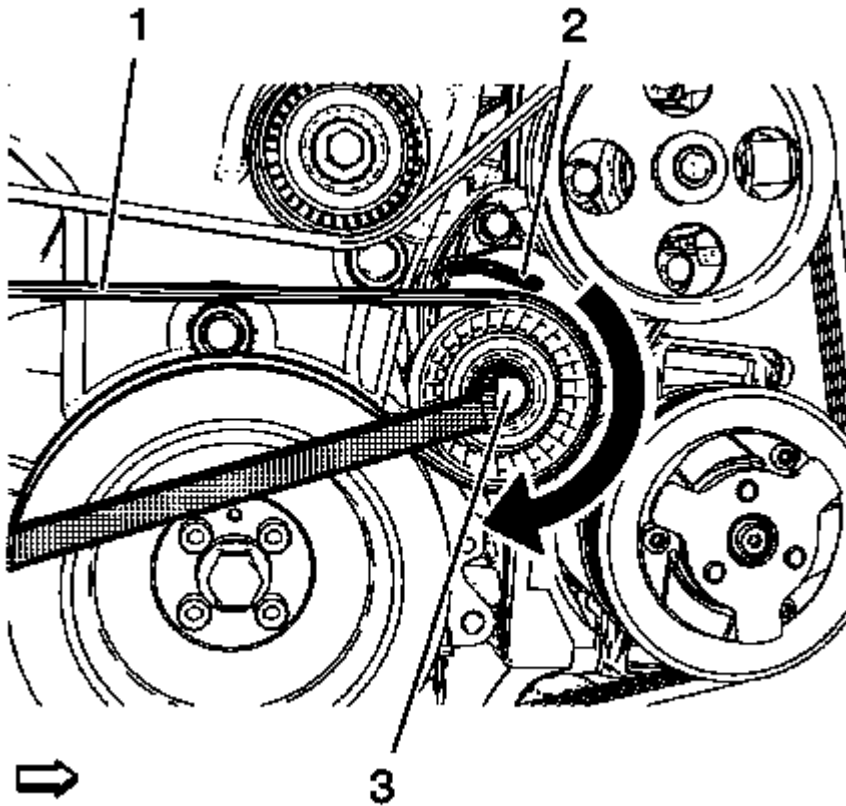
#### Installation Procedure



**Fig. 59: Drive Belt Routing**

Courtesy of GENERAL MOTORS COMPANY

1. Install and position the generator, air conditioning compressor and power steering pump belt (1) around all of the pulleys.



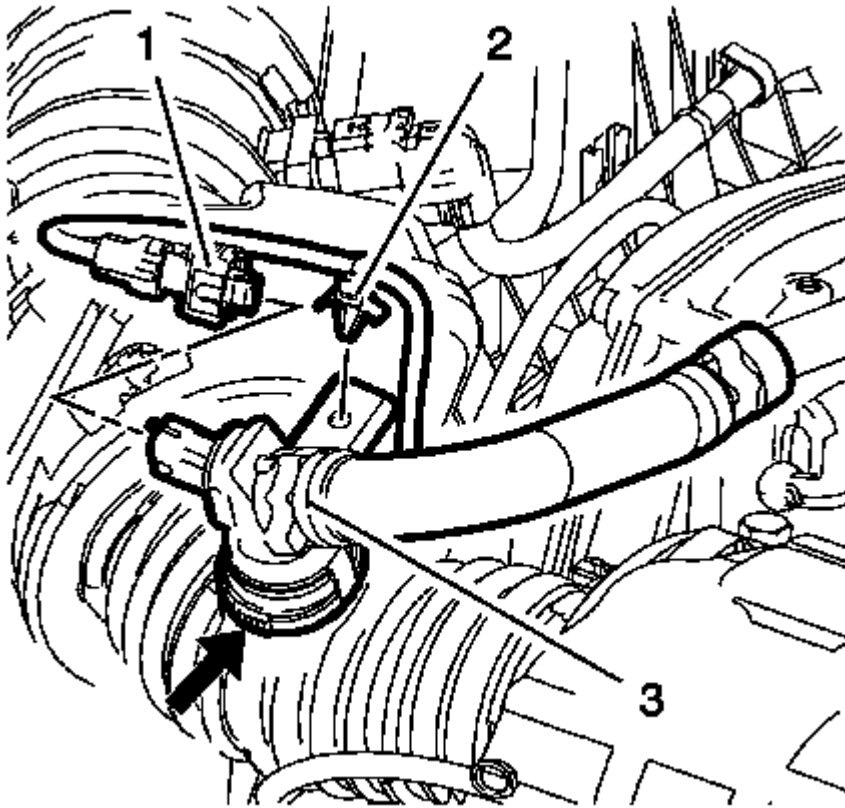
**Fig. 60: Power Steering Pump Belt**  
Courtesy of GENERAL MOTORS COMPANY

2. Install the **EN-913-A** wrench to the drive belt tensioner bolt (3).
3. Rotate the tensioner clockwise (see arrow in graphic).
4. Remove the **EN-6130** holding pin (2).
5. Rotate the **EN-913-A** wrench counterclockwise to bring the tension to the generator, air conditioning compressor and power steering pump belt.
6. Remove the **EN-913-A** wrench.
7. Install the front right front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .
8. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .

## POSITIVE CRANKCASE VENTILATION HEATER REMOVAL AND INSTALLATION

### Removal Procedure

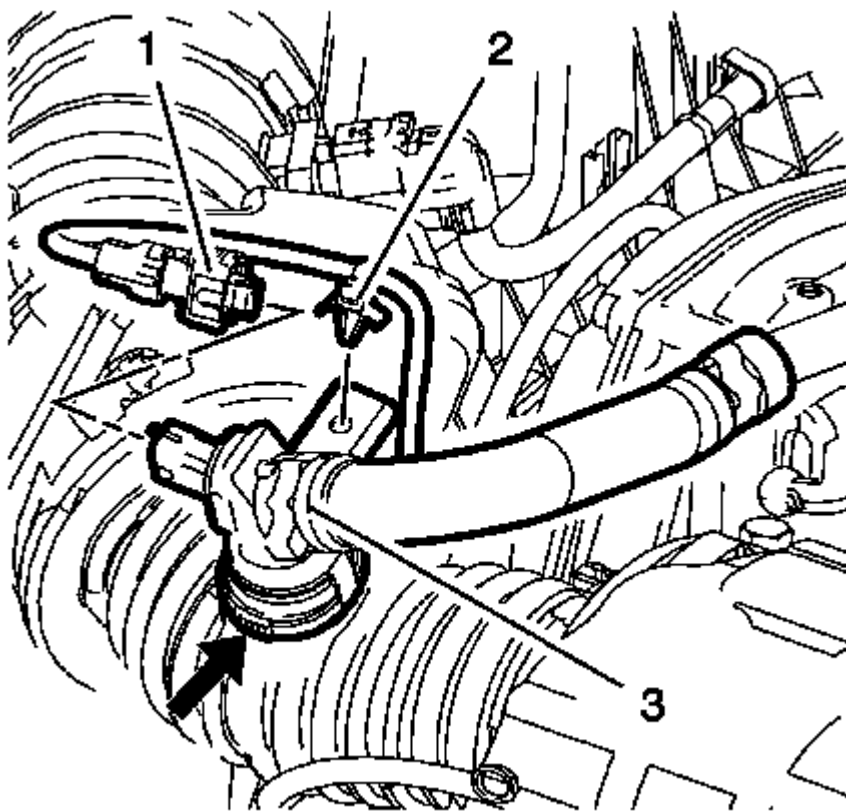
1. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement**.



**Fig. 61: Positive Crankcase Ventilation Heater Wiring Harness Plug**  
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the positive crankcase ventilation heater wiring harness plug (1).
3. Unclip wiring harness retainer clip (2).
4. Squeeze the quick connector (arrow) and disconnect the positive crankcase ventilation heater from the air cleaner outlet duct.

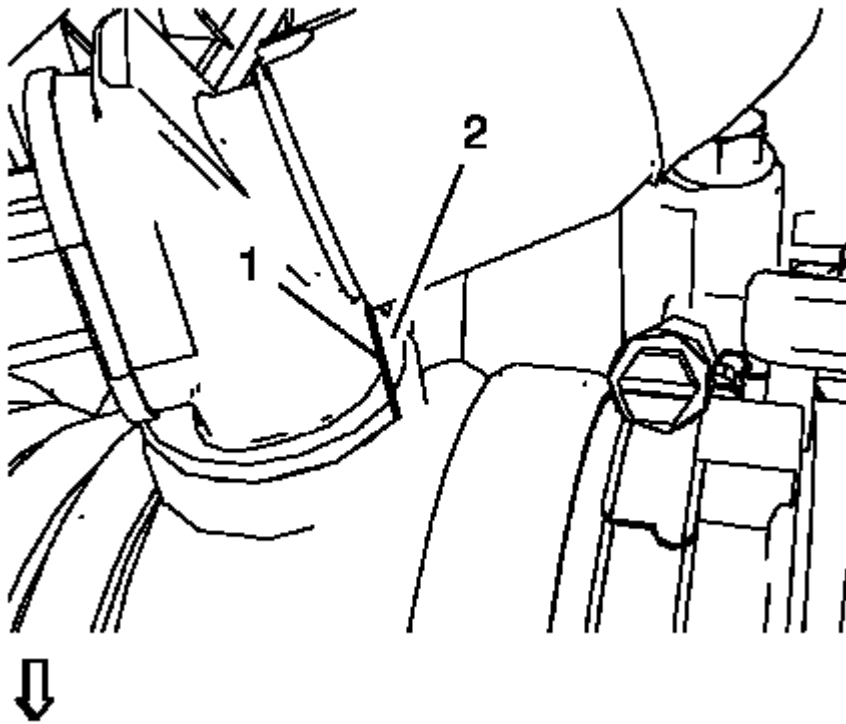
#### Installation Procedure



**Fig. 62: Positive Crankcase Ventilation Heater Wiring Harness Plug**  
**Courtesy of GENERAL MOTORS COMPANY**

1. Install the positive crankcase ventilation heater (3) to the air cleaner outlet rear duct.
2. Connect the positive crankcase ventilation heater wiring harness plug (1).
3. Clip in the wiring harness retainer (2).





**Fig. 63: Positive Crankcase Ventilation Heater Gap**  
Courtesy of GENERAL MOTORS COMPANY

4. Ensure that the positive crankcase ventilation heater gap (1) aligns to the air cleaner outlet rear duct lug (2).
5. Install the engine sight shield. Refer to **Engine Sight Shield Replacement**.

## POSITIVE CRANKCASE VENTILATION OIL SEPARATOR ASSEMBLY REPLACEMENT

### Special Tools

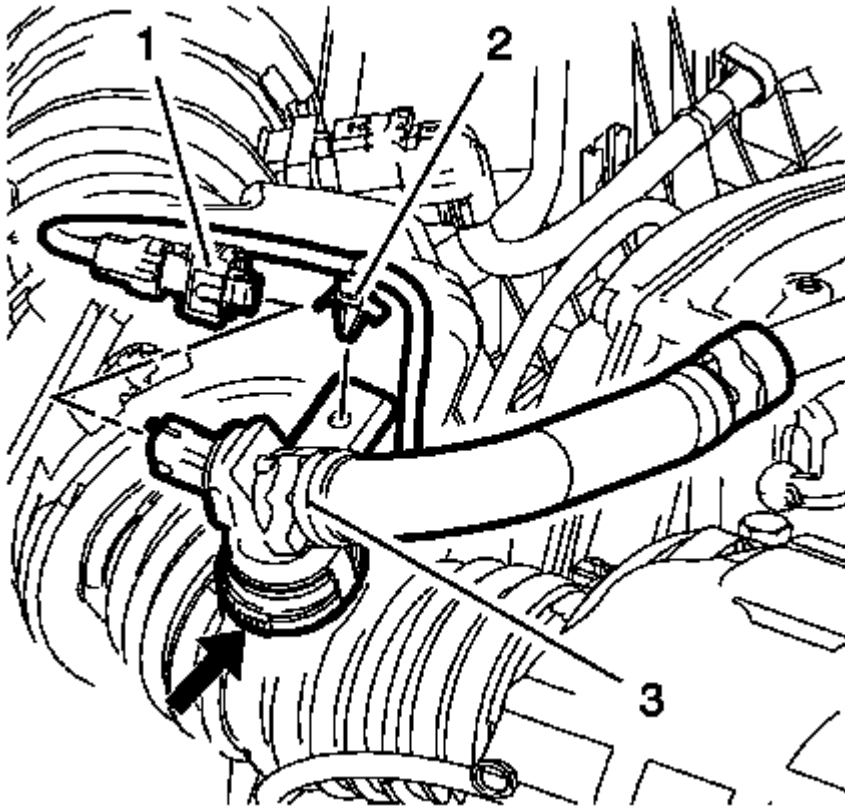
- **EN-50956** GR-6 Arnold Drive Bit
- **EN-48894** Drive Axle Boot Clamp Pliers

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

### Removal Procedure

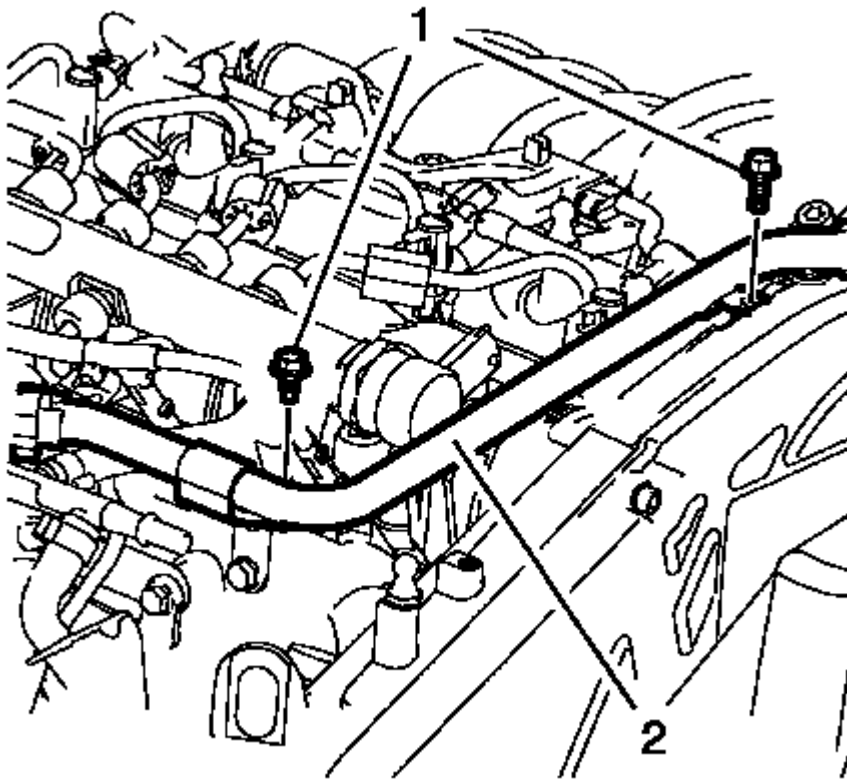
**NOTE:** Due to a government requirement, the positive crankcase ventilation components have always to be removed and installed from or to the engine as an assembly unit.

1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.
2. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement**.



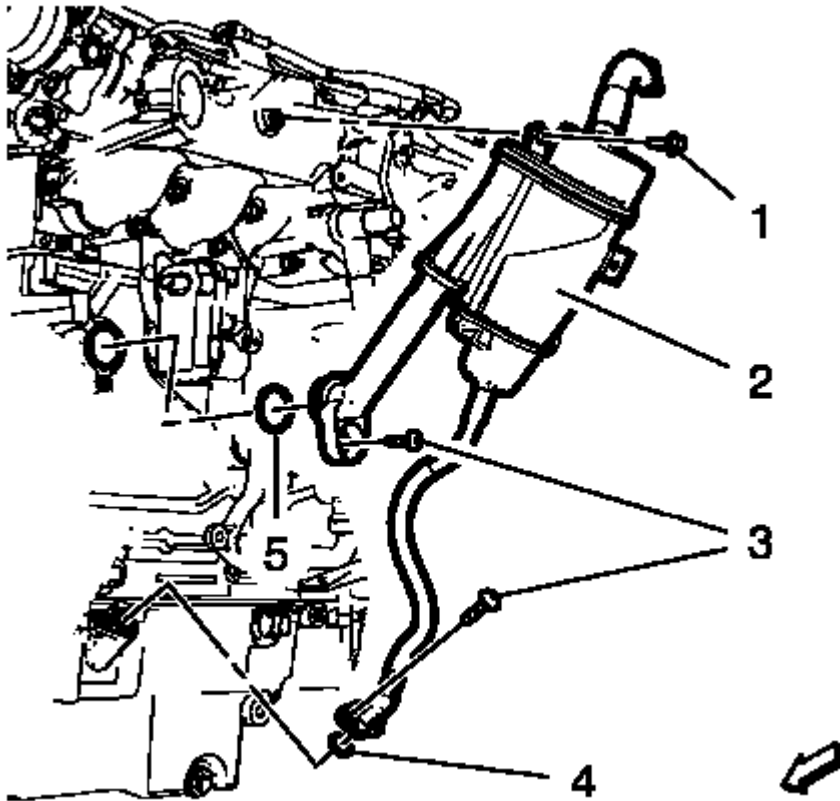
**Fig. 64: Positive Crankcase Ventilation Heater Wiring Harness Plug**  
 Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the positive crankcase ventilation heater wiring harness plug (1).
4. Unclip wiring harness retainer clip (2).
5. Squeeze the quick connector (arrow) and disconnect the positive crankcase ventilation heater from the air cleaner outlet duct.



**Fig. 65: Positive Crankcase Ventilation Tube Bolts**  
Courtesy of GENERAL MOTORS COMPANY

6. Remove the 2 positive crankcase ventilation tube bolts (1).
7. Unclip wiring harness from the positive crankcase ventilation tube (2).



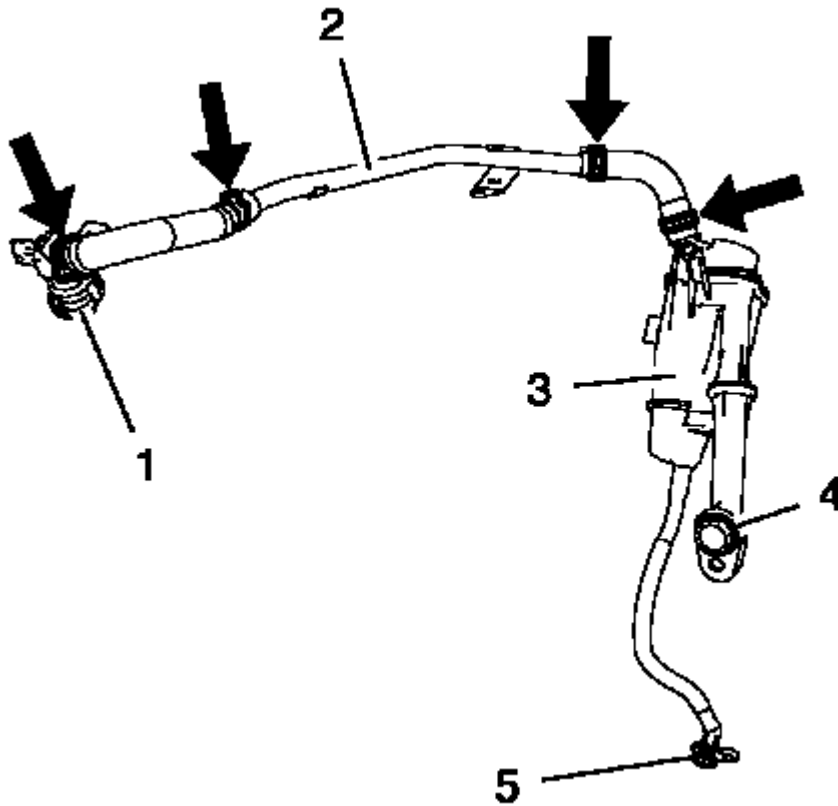
**Fig. 66: Positive Crankcase Ventilation Oil Separator Bolt**  
Courtesy of GENERAL MOTORS COMPANY

8. Remove the positive crankcase ventilation oil separator bolt (1).
9. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
10. Remove the starter. Refer to **Starter Replacement (2.0L Diesel LUZ)** .
11. Clip out the wiring harness retainer from the PCV oil separator.

**NOTE:** Use a small rotary cutter tool to cut slots into the heads of the bolts. Use an impact driver or similar device to break the initial resistance required to loosen the bolts.

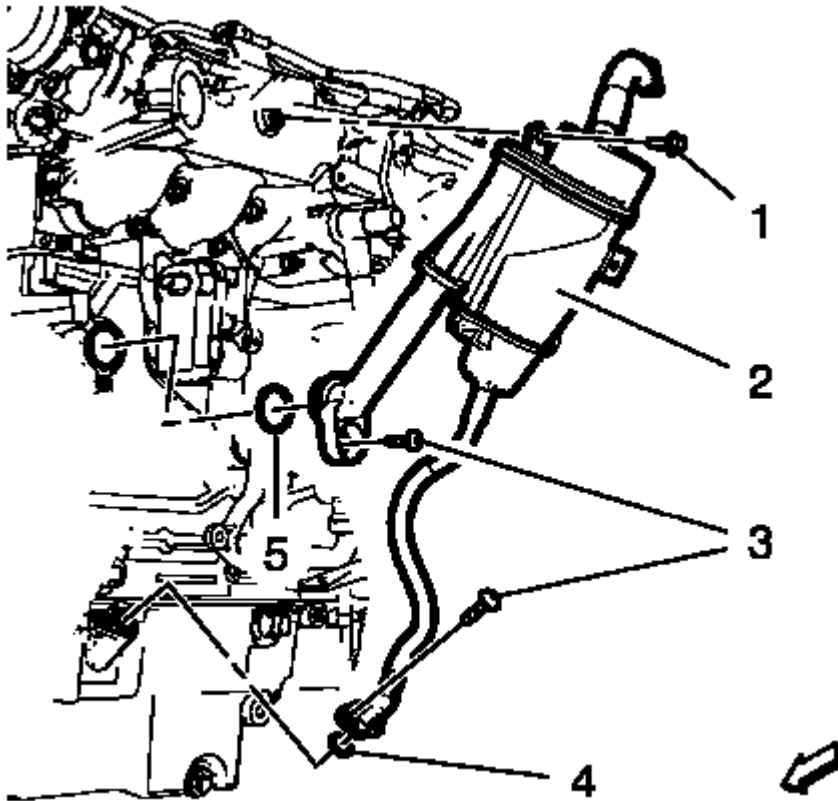
12. Remove and DISCARD the 2 positive crankcase ventilation oil separator bolts (3).
13. Lower the vehicle.
14. Remove the positive crankcase ventilation oil separator assembly (2) in top direction.
15. Remove and DISCARD the seal rings (4, 5).

#### Installation Procedure



**Fig. 67: Crankcase Ventilation Heater And Crankcase Ventilation Tube**  
 Courtesy of GENERAL MOTORS COMPANY

1. Assemble the positive crankcase ventilation unit as shown above, using the **EN-48894** pliers
  - Positive crankcase ventilation heater (1)
  - Positive crankcase ventilation tube (2)
  - Positive crankcase ventilation oil separator (3)
  - Seal rings (4, 5)
  - Hose clamps (arrows)
2. Install the positive crankcase ventilation oil separator from top direction and fix it by loosely installing the upper oil separator bolt.
3. Raise the vehicle.



**Fig. 68: Positive Crankcase Ventilation Oil Separator Bolt**  
Courtesy of GENERAL MOTORS COMPANY

4. Install NEW seal rings (4, 5).

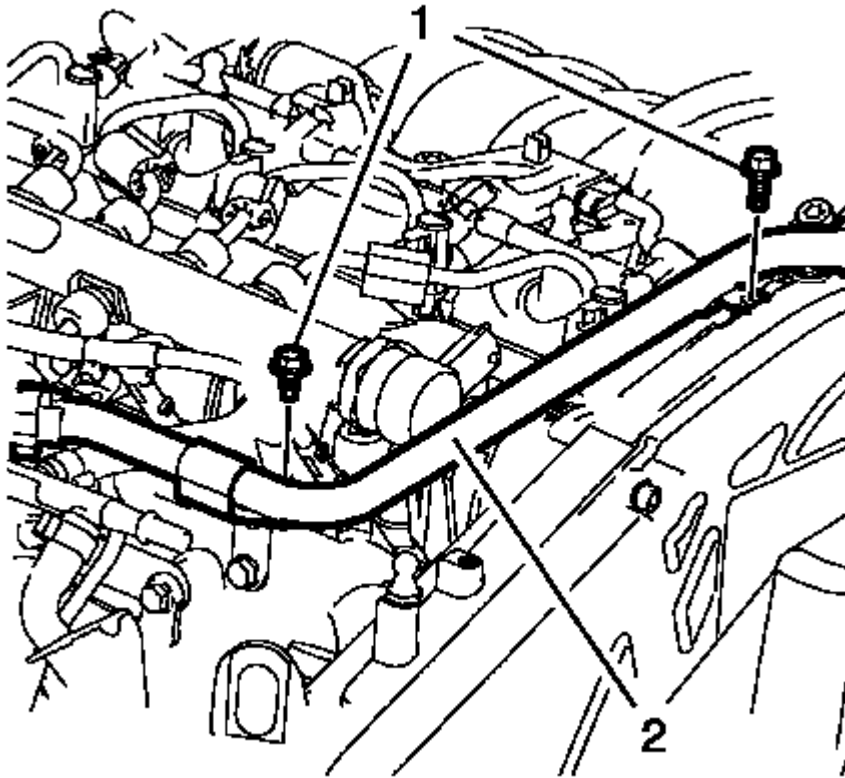
**CAUTION:** Refer to Fastener Caution .

**NOTE:** Ensure that the positive crankcase ventilation oil separator is in correct position inside of the oil pan.

**NOTE:** Current laws require these fastener only to be replaced with new tamper resistant fasteners identified specifically for this component. Refer to the Electronic Parts Catalog.

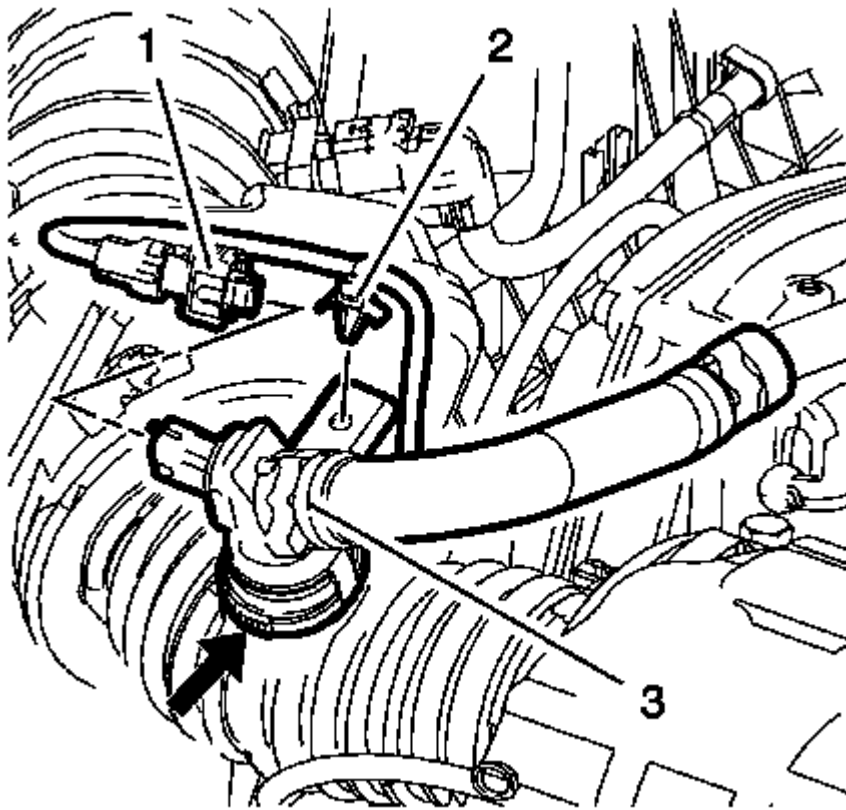
5. Install the PCV oil separator (2) to the engine.  
6. Install 2 NEW positive crankcase ventilation oil separator bolts (3) and tighten to 9 (80 lb in), using the **EN-50956** bit.  
7. Install the wiring harness retainer to the positive crankcase ventilation oil separator.  
8. Install the starter. Refer to Starter Replacement (2.0L Diesel LUZ) .

9. Lower the vehicle.
10. Tighten the positive crankcase ventilation oil separator bolt (1) to 9 (80 lb in).



**Fig. 69: Positive Crankcase Ventilation Tube Bolts**  
Courtesy of GENERAL MOTORS COMPANY

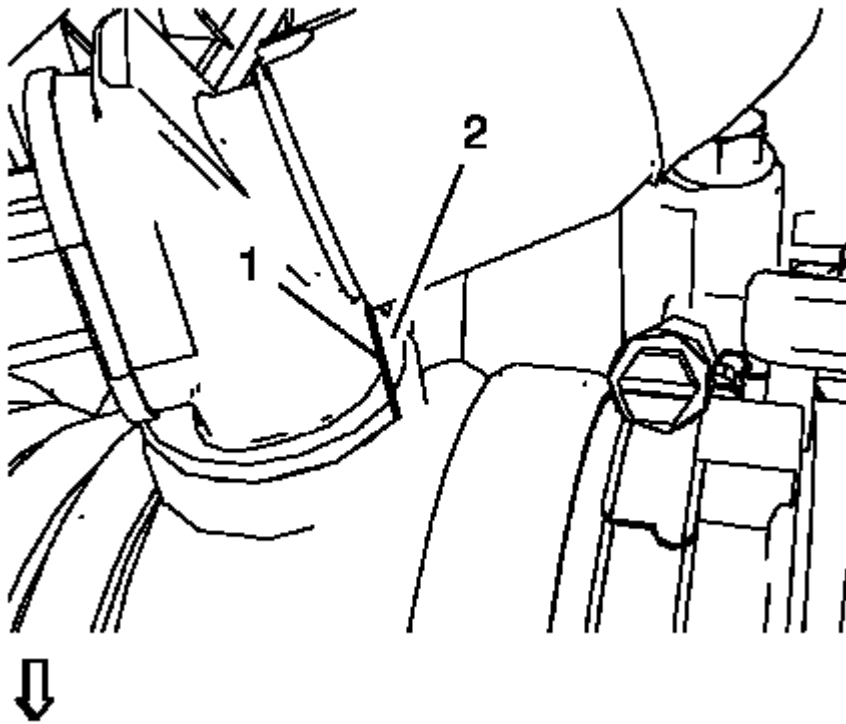
11. Reposition the positive crankcase ventilation tube (2) to the engine and install the 2 bolts (1).
12. Tighten the 2 positive crankcase ventilation tube bolts to 9 (80 lb in).
13. Clip in the wiring harness to the tube.



**Fig. 70: Positive Crankcase Ventilation Heater Wiring Harness Plug**  
**Courtesy of GENERAL MOTORS COMPANY**

14. Install the positive crankcase ventilation heater (3) to the air cleaner outlet rear duct.
15. Connect the positive crankcase ventilation heater wiring harness plug (1).
16. Clip in the wiring harness retainer (2).





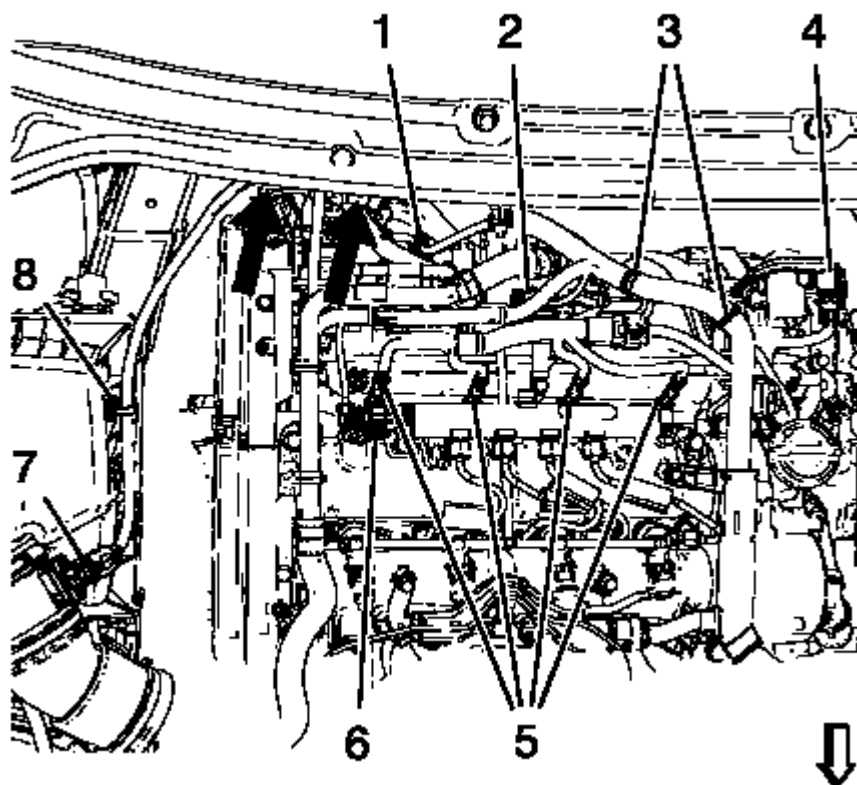
**Fig. 71: Positive Crankcase Ventilation Heater Gap**  
Courtesy of GENERAL MOTORS COMPANY

17. Ensure that the positive crankcase ventilation heater gap (1) aligns to the air cleaner outlet rear duct lug (2).
18. Install the engine sight shield. Refer to **Engine Sight Shield Replacement**.
19. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.

## INTAKE MANIFOLD REPLACEMENT

### Removal Procedure

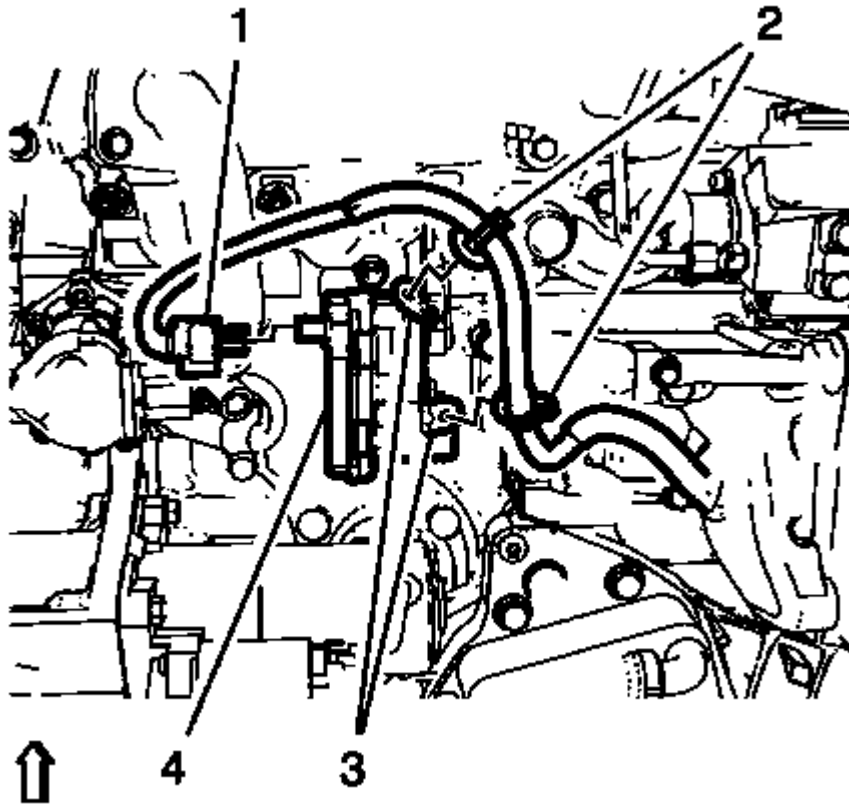
1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.
2. Drain the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)**, **Cooling System Draining and Filling (Static Fill)**.
3. Remove the exhaust gas recirculation valve cooler. Refer to **Exhaust Gas Recirculation Valve Cooler Replacement**.
4. Remove the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.



**Fig. 72: Electrical Connectors**

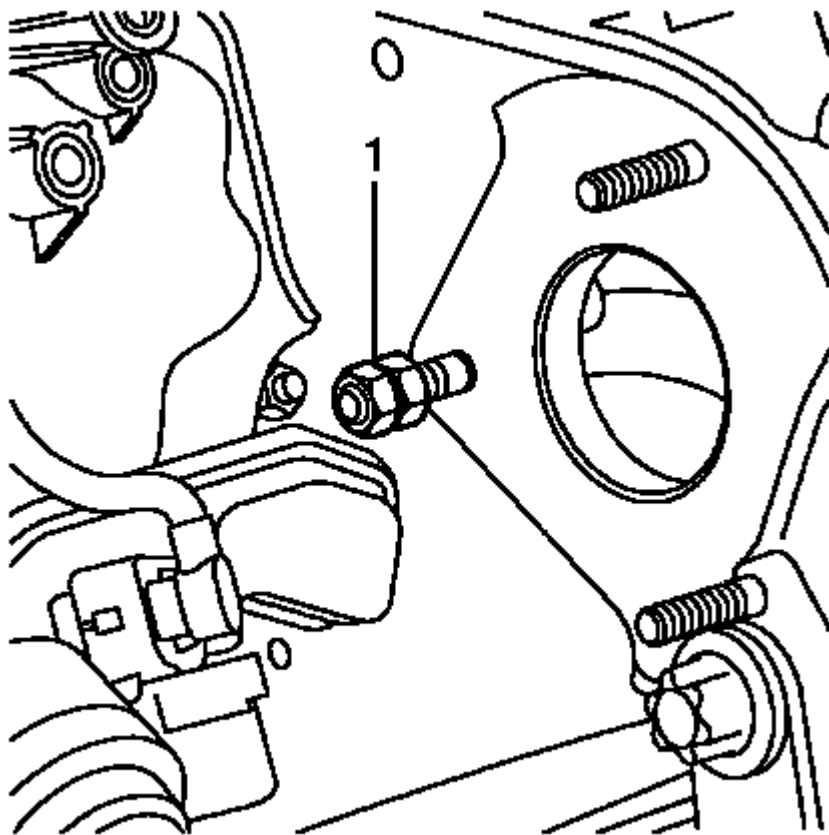
Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the electrical connectors (1, 2, 4, 5, 6 and 7).
6. Disconnect the wiring harness retainer clips (3, 8).
7. Remove the positive crankcase ventilation oil separator. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.



**Fig. 73: Electrical Connector And Intake Manifold Actuator**  
Courtesy of GENERAL MOTORS COMPANY

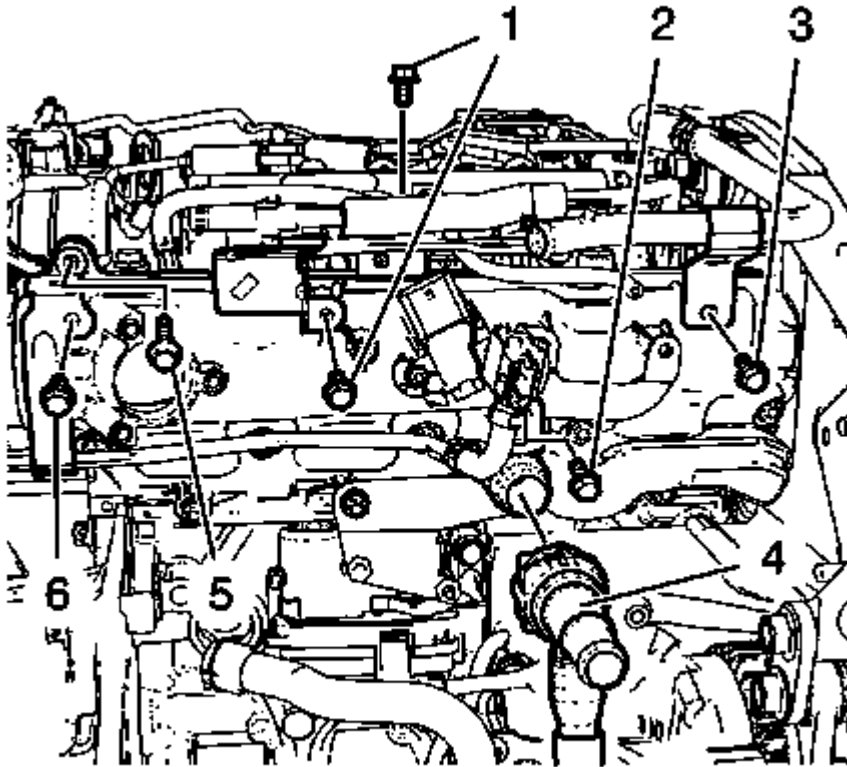
8. Disconnect the electrical connector (1) from the intake manifold actuator (4).
9. Unclip the 2 wiring harness clips (2) from the bracket (3).
10. Remove the fuel injection pump. Refer to **Fuel Injection Pump Replacement** .



**Fig. 74: Fuel Injection Pump Stud**

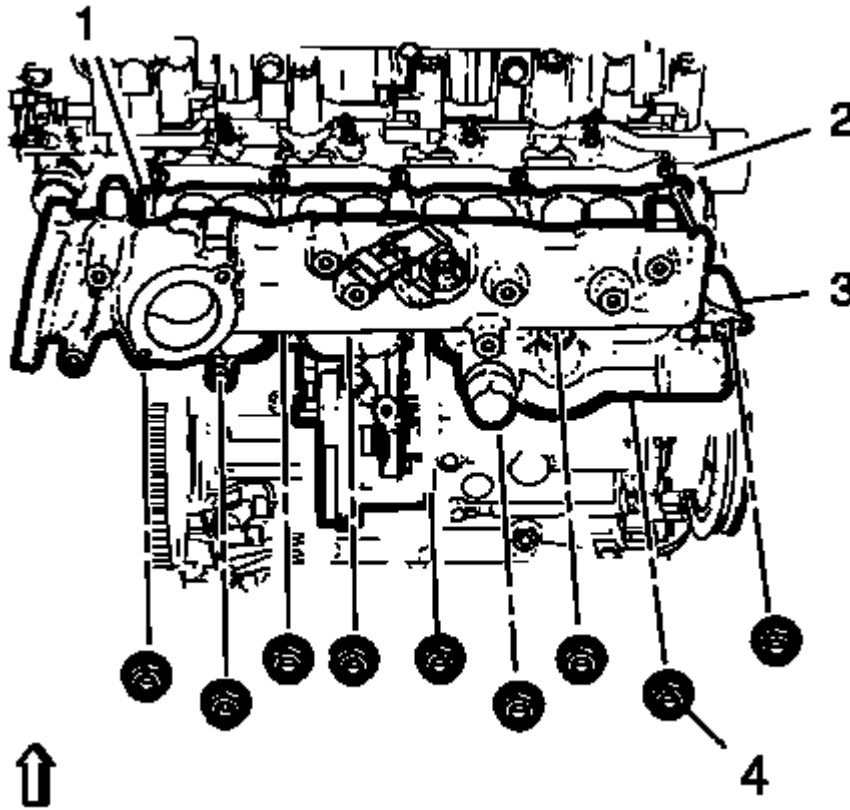
Courtesy of GENERAL MOTORS COMPANY

11. Remove the fuel injection pump stud (1), use 2 nuts to counter hold.



**Fig. 75: Exhaust Pressure Sensor Bracket Bolt And Water Outlet House**  
**Courtesy of GENERAL MOTORS COMPANY**

12. Remove the 2 wiring harness bracket bolts (1).
13. Remove the exhaust pressure sensor bracket bolt (2).
14. Remove the positive crankcase ventilation tube bolt (3).
15. Place a drain tray underneath.
16. Remove the water outlet house (4) and hang aside.
17. Remove the intake manifold bracket bolt (5).
18. Remove the exhaust pressure sensor pipe bolt (6).



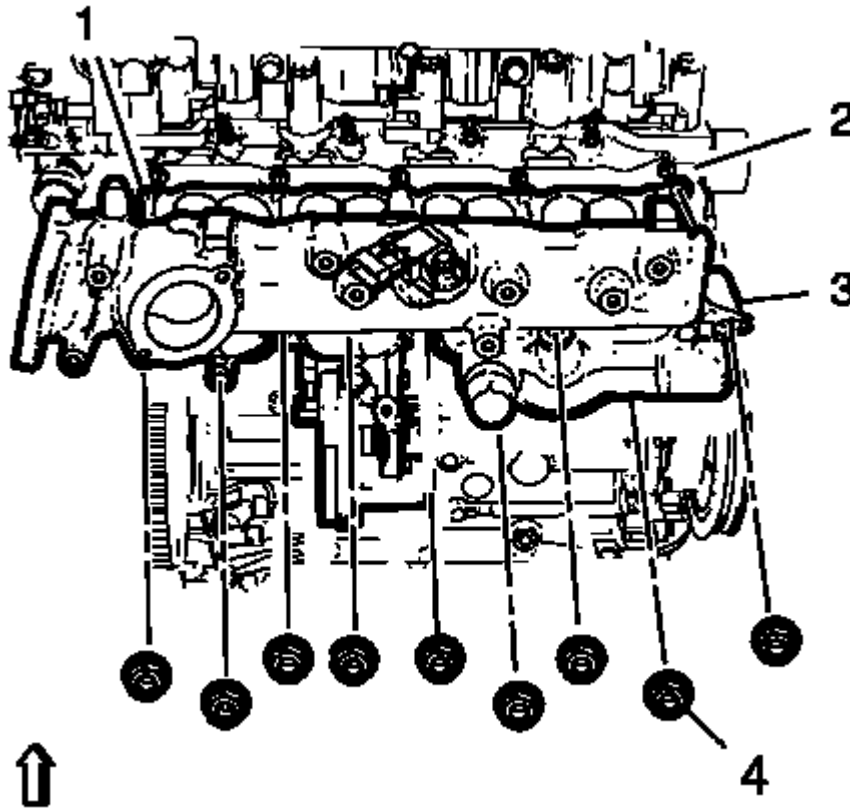
**Fig. 76: Intake Manifold Gasket**

Courtesy of GENERAL MOTORS COMPANY

19. Remove the 9 intake manifold nuts (4).
20. Remove the intake manifold (3).
21. Remove the intake manifold gasket (1) from the cylinder head (2).
22. Remove parts as needed. Refer to **Intake Manifold Disassemble** .

#### Installation Procedure

1. Install parts as needed. Refer to **Intake Manifold Assemble** .
2. Clean the sealing surfaces.



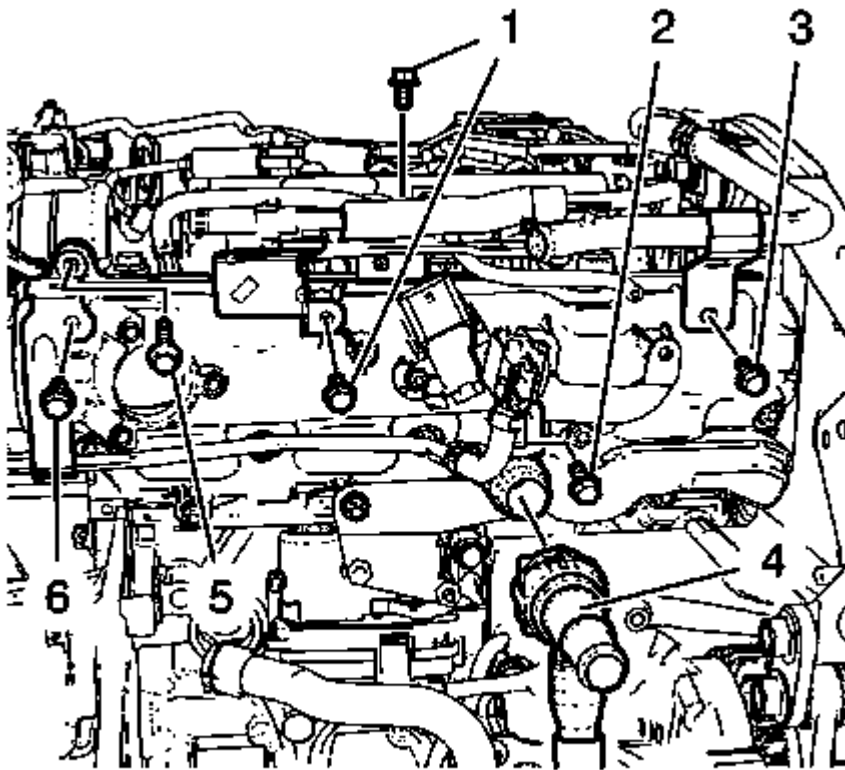
**Fig. 77: Intake Manifold Gasket**

Courtesy of GENERAL MOTORS COMPANY

3. Install a NEW intake manifold gasket (1) to the cylinder head (2).
4. Install the intake manifold (3).

**CAUTION:** Refer to Fastener Caution .

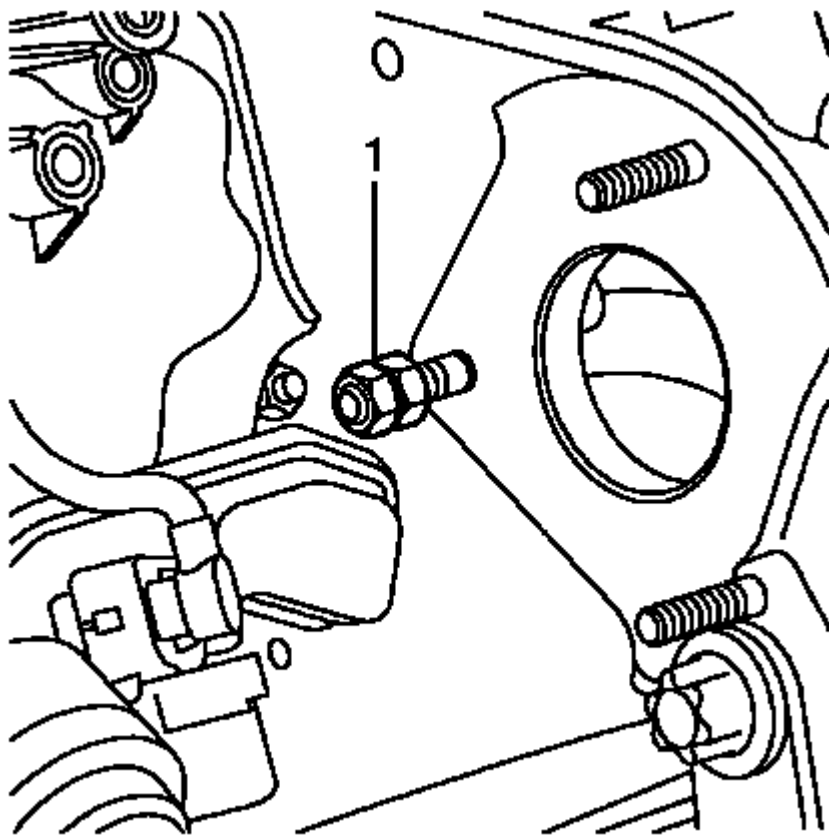
5. Install the 9 intake manifold nuts (4) and tighten to 20 (15 lb ft).



**Fig. 78: Exhaust Pressure Sensor Bracket Bolt And Water Outlet House**  
**Courtesy of GENERAL MOTORS COMPANY**

6. Install the wiring harness bracket bolts (1).
7. Install the exhaust pressure sensor bracket bolt (2).
8. Install the positive crankcase ventilation tube bolt (3).
9. Install the water outlet house (4).
10. Install the intake manifold bracket bolt (5).
11. Install the exhaust pressure sensor pipe bolt (6).

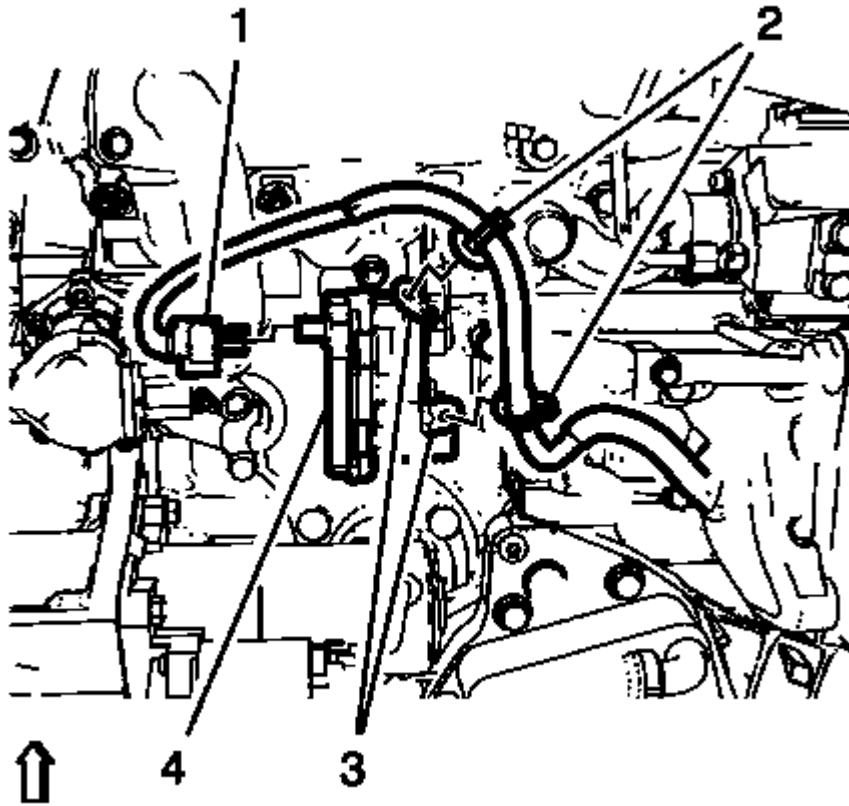




**Fig. 79: Fuel Injection Pump Stud**

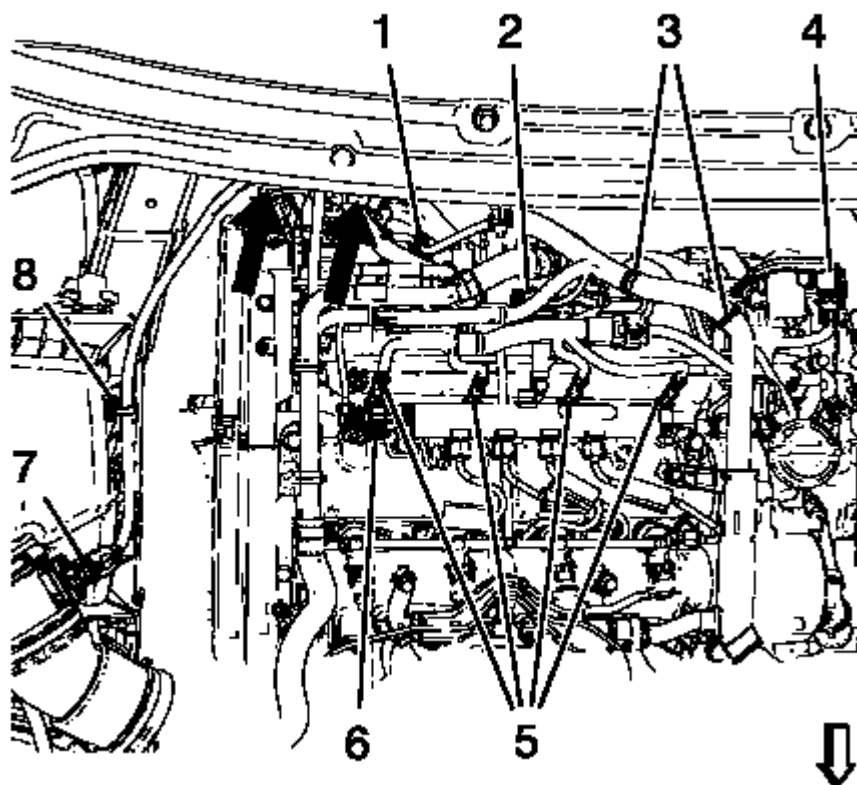
Courtesy of GENERAL MOTORS COMPANY

12. Install the fuel injection pump stud (1), use 2 nuts to counter hold.
13. Install the fuel injection pump. Refer to **Fuel Injection Pump Replacement** .



**Fig. 80: Electrical Connector And Intake Manifold Actuator**  
Courtesy of GENERAL MOTORS COMPANY

14. Clip in the 2 wiring harness clips (2) to the bracket (3).
15. Connect the electrical connector (1) to the intake manifold actuator (4).
16. Install the positive crankcase ventilation oil separator. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.



**Fig. 81: Electrical Connectors**

Courtesy of GENERAL MOTORS COMPANY

17. Connect the electrical connectors (1, 2, 4, 5, 6 and 7).
18. Connect the wiring harness retainer clips (3, 8).
19. Install the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.
20. Install the exhaust gas recirculation valve cooler. Refer to **Exhaust Gas Recirculation Valve Cooler Replacement**.
21. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.
22. Fill the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)**, **Cooling System Draining and Filling (Static Fill)**.

## TIMING BELT REPLACEMENT

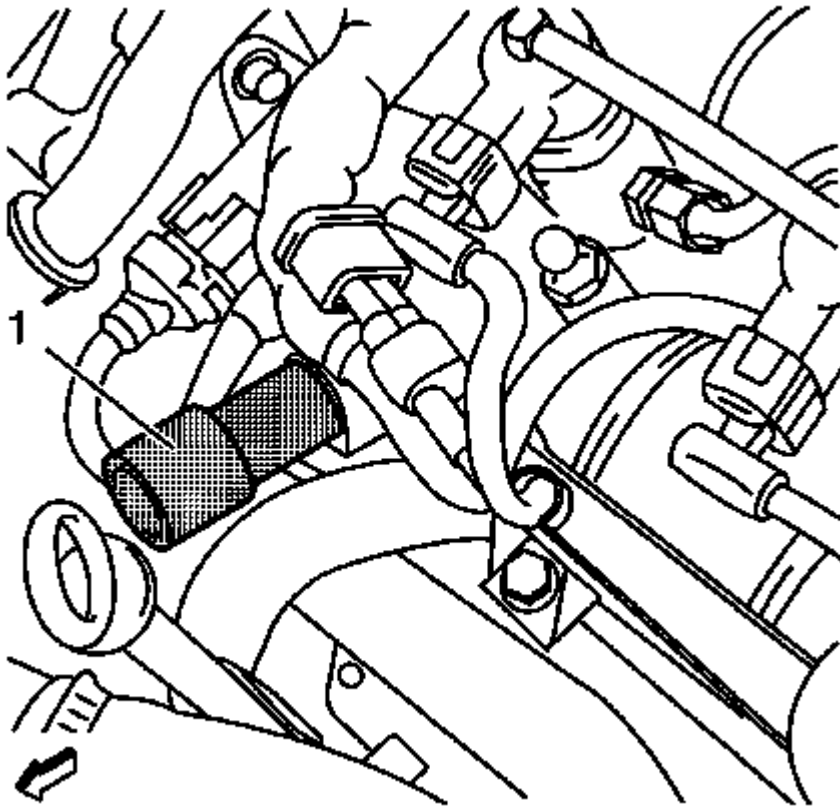
- EN-956-1 Extension
- EN-46788 Crankshaft Fixing Tool
- EN-46789 Camshaft Locking Tool
- EN-47634 Camshaft Sprocket Holding Tool

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

**Removal Procedure**

**NOTE:** If the engine timing belt is being replaced according to the maintenance schedule the timing belt tensioner, idler pulley and water pump must be replaced.

1. Protect the fender with covers.
2. Remove the battery cover and disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .
3. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement**.
4. Remove the front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .
5. Remove the engine mount bracket. Refer to **Engine Mount Bracket Replacement**.
6. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .

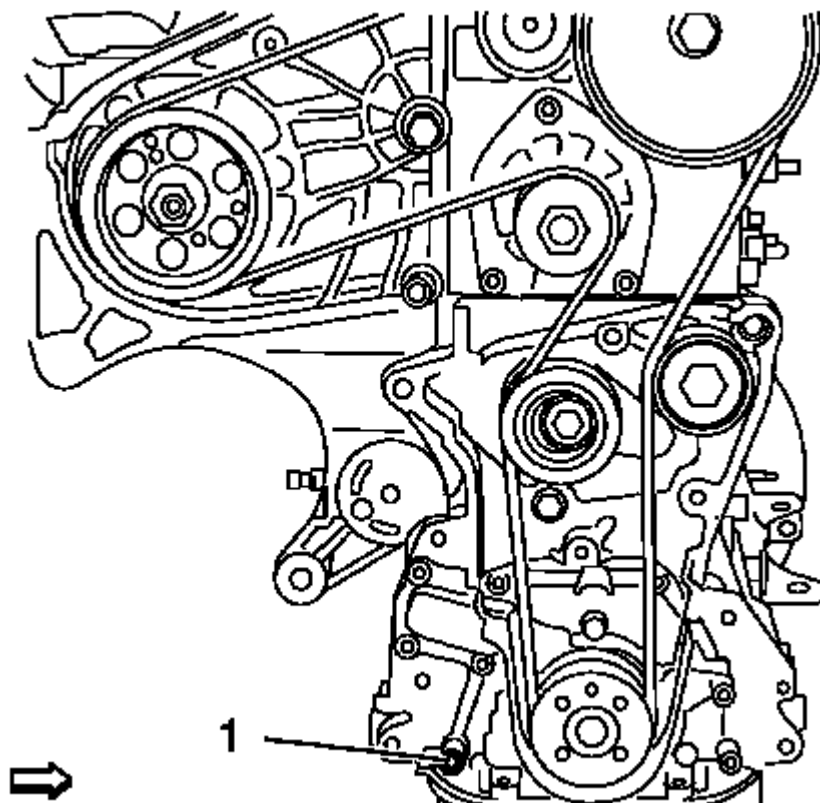


**Fig. 82: Installing Locking Tool**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Avoid the contact with cooling fluid and oil, it will damage the timing belt and can not be reused.

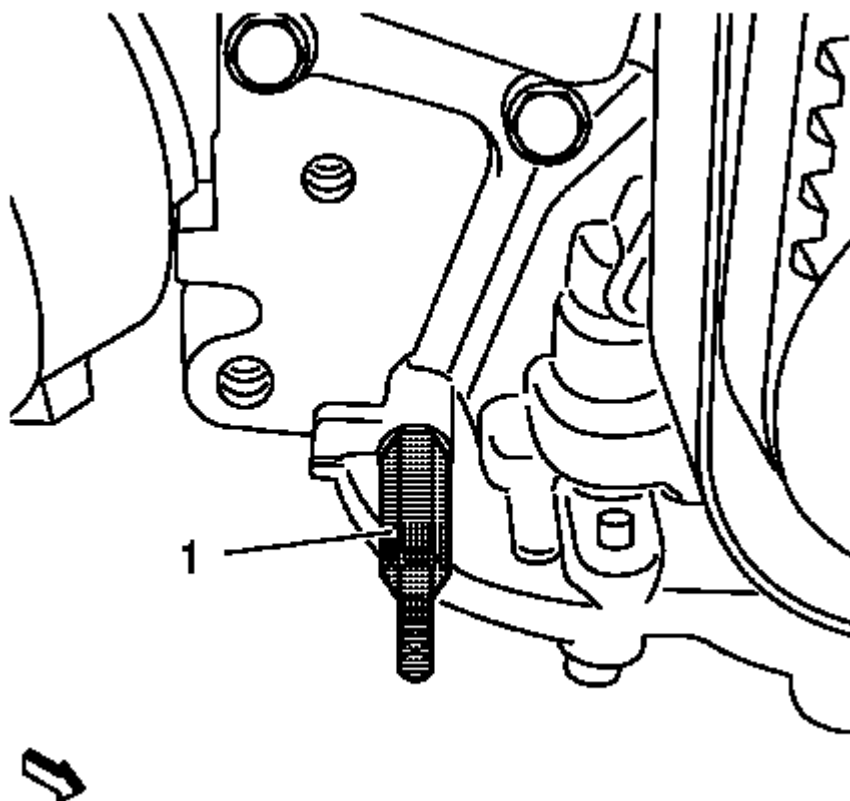
7. Set the cylinder one to TDC:

- Remove the camshaft housing closure bolt.
- Install the **EN-46789** locking tool (1) in the camshaft housing.
- Turn the engine clockwise until the **EN-46789** locking tool (1) audibly engages.



**Fig. 83: Oil Pump Bolt**  
Courtesy of GENERAL MOTORS COMPANY

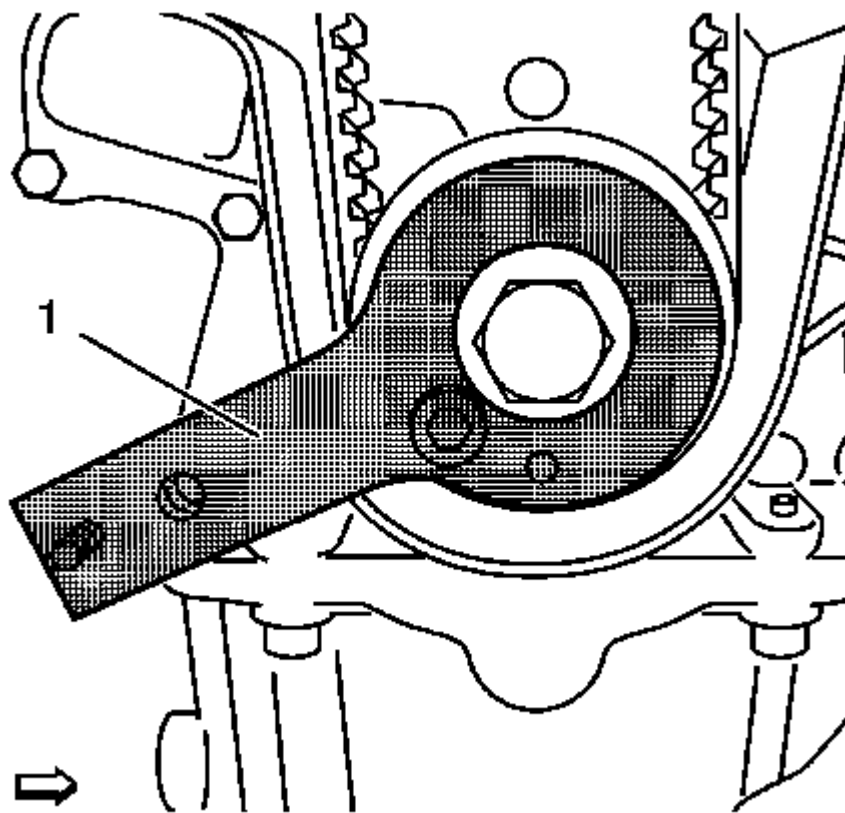
8. Remove the oil pump bolt (1).



**Fig. 84: Fixing Tool Stud**

Courtesy of GENERAL MOTORS COMPANY

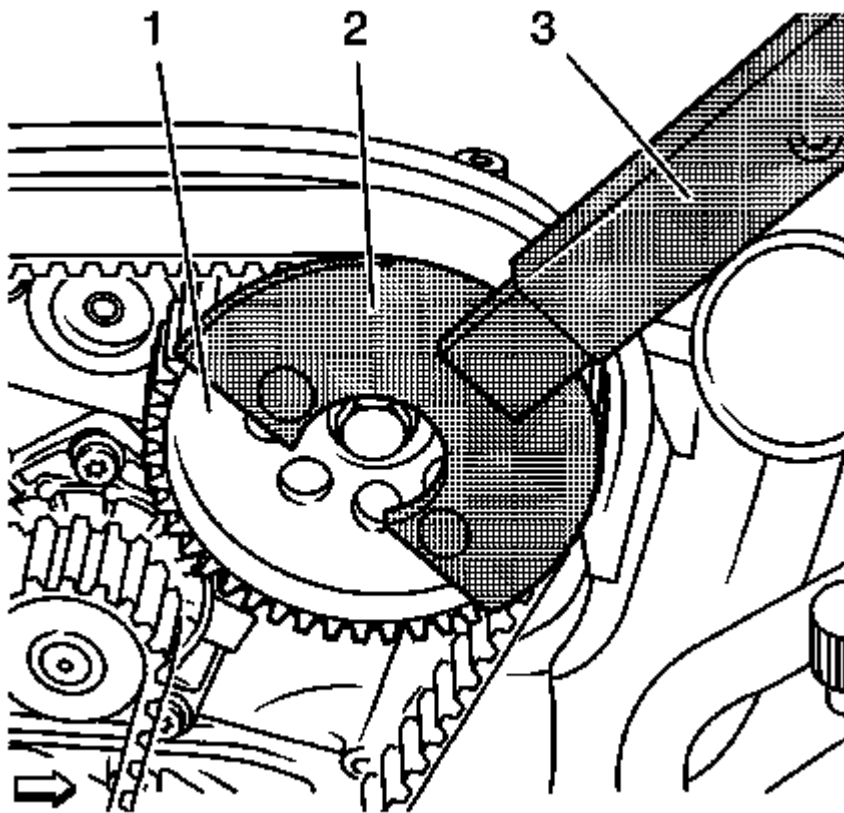
9. Install the fixing tool stud (1) of the **EN-46788** fixing tool.



**Fig. 85: Fixing Tool**

Courtesy of GENERAL MOTORS COMPANY

10. Lock the crankshaft, using the EN-46788 fixing tool (1).

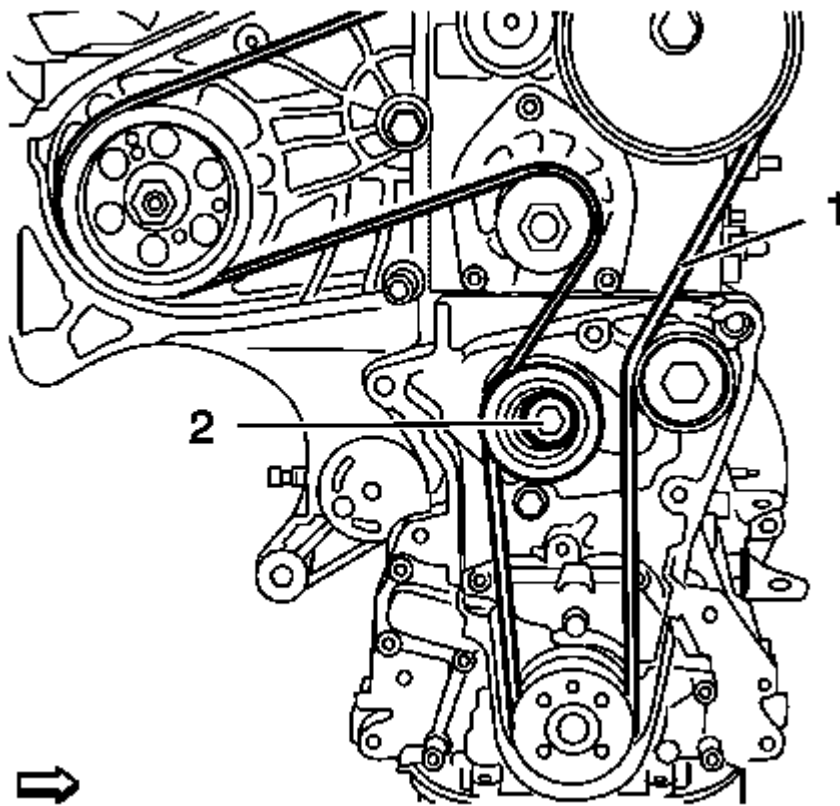


**Fig. 86: Camshaft Sprocket**

Courtesy of GENERAL MOTORS COMPANY

11. Loosen the camshaft sprocket (1).
12. Loosen the camshaft sprocket bolt, by using the **EN-47634** holding tool (2) with the **EN-956-1** extension (3).





**Fig. 87: Timing Belt Tensioner Bolt**

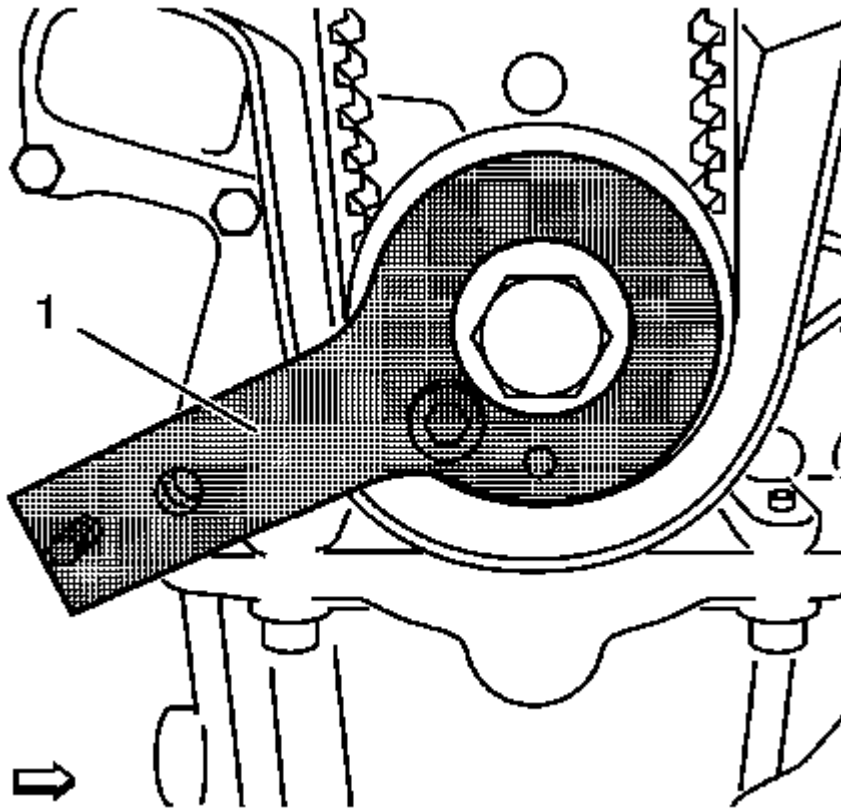
Courtesy of GENERAL MOTORS COMPANY

13. Loosen the timing belt tensioner bolt (2) to release the tension from the timing belt.
14. Remove the **EN-46788** fixing tool.

**NOTE:** Observe the direction of timing belt rotation.

15. Remove the timing belt (1).

#### Installation Procedure



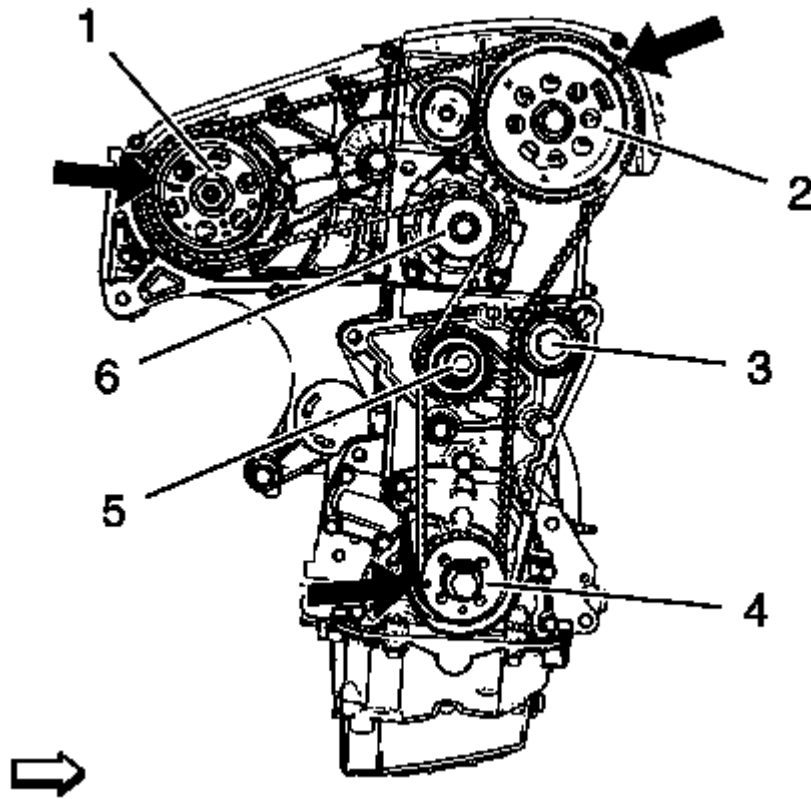
**Fig. 88: Fixing Tool**

Courtesy of GENERAL MOTORS COMPANY

1. Lock the crankshaft, using the EN-46788 fixing tool (1).

**NOTE:** Make sure that the timing belt does not fall out of the sprocket during the installation procedure.

- Install the NEW timing belt to the crankshaft sprocket.
- Install the EN-46788 fixing tool (1).

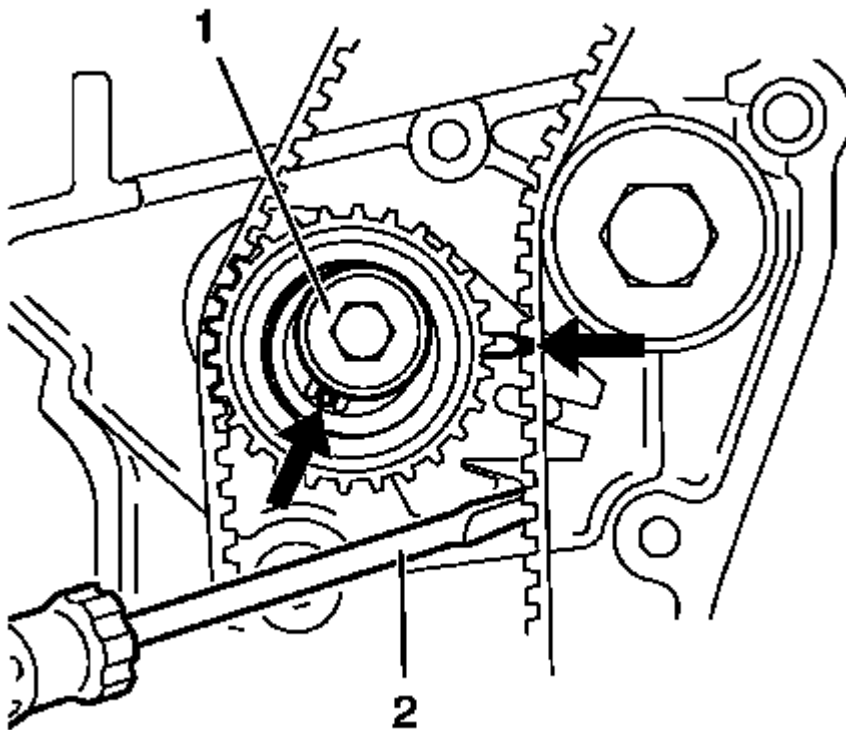


**Fig. 89: Crankshaft Sprocket, Timing Belt Tensioner And Water Pump**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The marks on the timing belt must fit to the marks on the sprockets, see arrows in picture.

**NOTE:** The timing belt tensioner must be loose.

2. Install the timing belt in the following sequence:
  - Start with the crankshaft sprocket (4).
  - Second the timing belt tensioner (5).
  - Third the water pump (6).
  - Fourth the high pressure pump sprocket (1).
  - Fifth the camshaft sprocket (2).
  - The last one is the belt idler pulley (3).

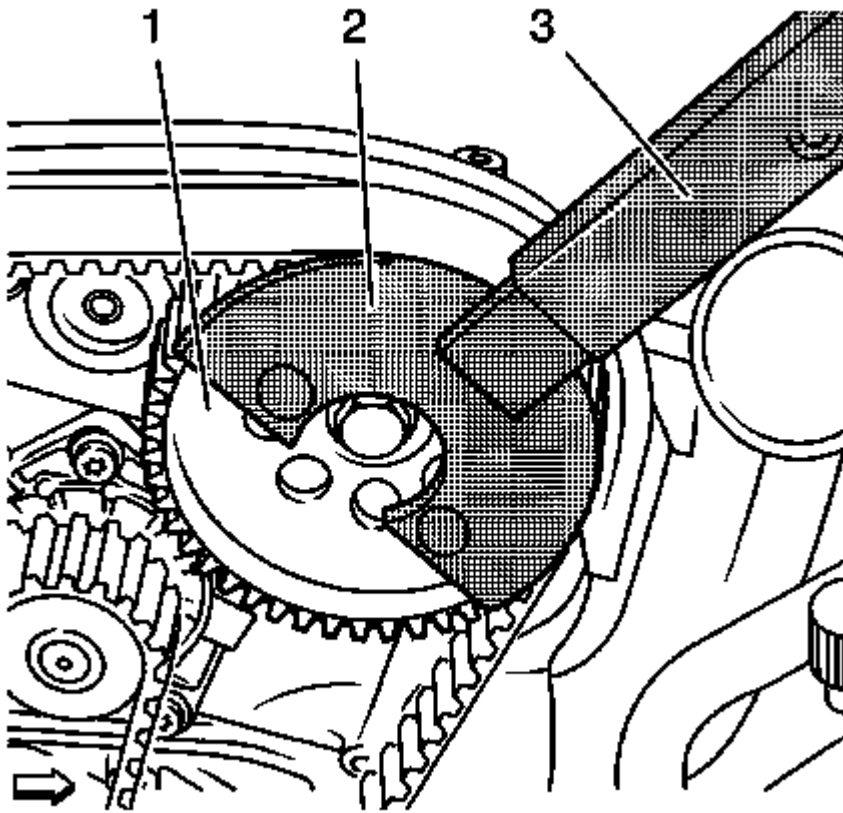


**Fig. 90: Tensioner**

Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

3. Bring the tensioner (1) in correct tension.
  - Loosen the tensioner bolt.
  - Bring the mobile index to the reference position (bore), see at arrows in picture.
  - Tighten the tensioner bolt to 25 (18 lb ft).



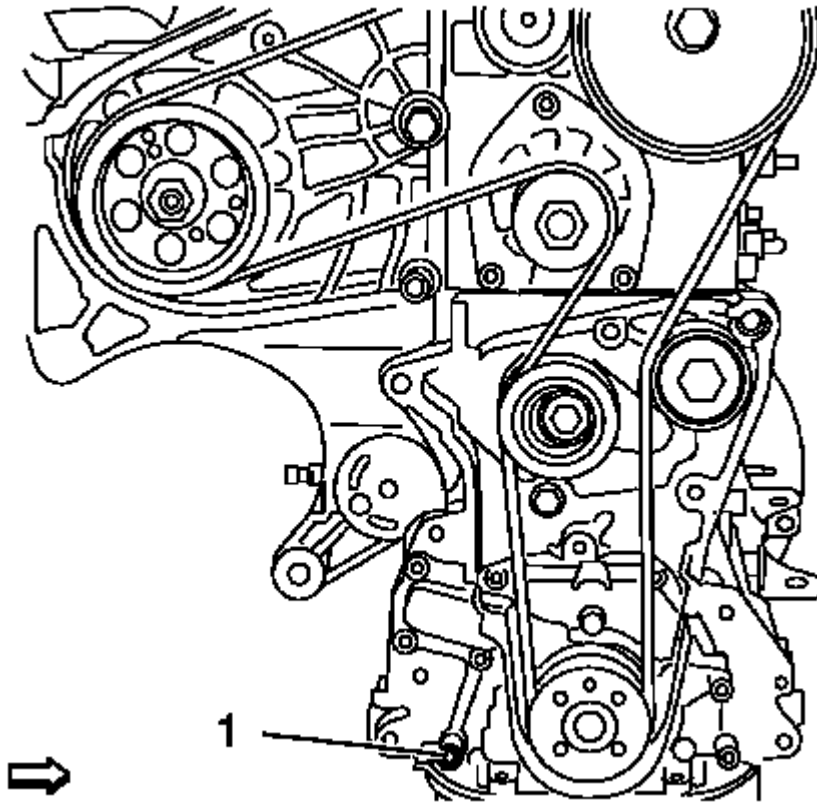
**Fig. 91: Camshaft Sprocket**

Courtesy of GENERAL MOTORS COMPANY

4. Fasten the camshaft sprocket bolt.
  - Install the **EN-47634** holding tool (2) to the camshaft sprocket (1).
  - Hold up with the **EN-956-1** extension (3) and tighten the camshaft sprocket bolt to 120 (89 lb ft).
5. Remove the **EN-47634** holding tool (2) and the **EN-956-1** extension (3).
6. Remove the **EN-46788** fixing tool and the **EN-46789** locking tool.

**NOTE:** It is absolute necessary to turn the engine clockwise, not in another direction.

7. Rotate the engine 720 degrees.
8. Check the engine timing.
  - Install the **EN-46789** locking tool.
  - Install the **EN-46788** fixing tool.
9. Remove the **EN-46789** locking tool and the **EN-46788** fixing tool.



**Fig. 92: Oil Pump Bolt**

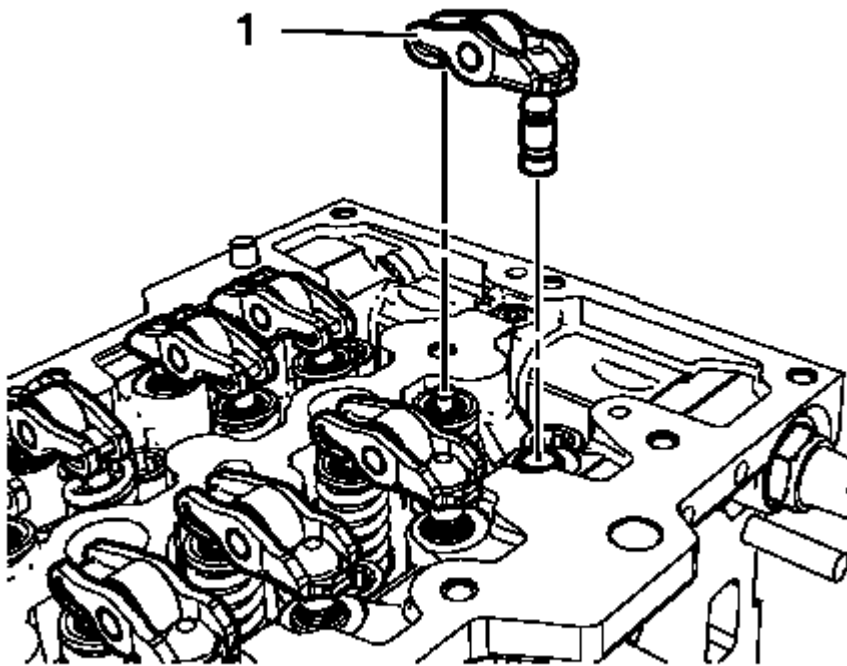
Courtesy of GENERAL MOTORS COMPANY

10. Install the oil pump bolt (1) and tighten to 9 (80 lb in).
11. Install the engine mount bracket. Refer to **Engine Mount Bracket Replacement**.
12. Install the front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement**.
13. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle**.
14. Install the engine sight shield. Refer to **Engine Sight Shield Replacement**.
15. Connect the negative battery cable and install the battery cover. Refer to **Battery Negative Cable Disconnection and Connection**.
16. Remove the covers from the fender.

## VALVE LIFTER REPLACEMENT

### Removal Procedure

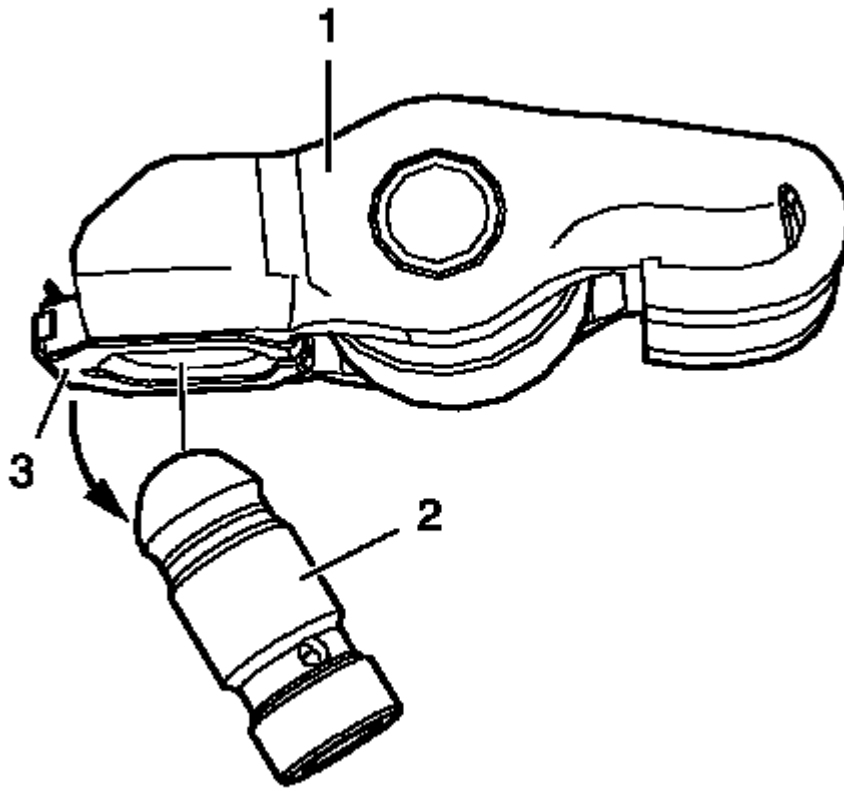
1. Open the hood.
2. Remove the camshaft housing. Refer to **Camshaft Housing Replacement**.



**Fig. 93: Valve Rocker Arms With Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** If the valve rocker arms will be reused mind the installation position to ensure they will be installed in their original position.

3. Remove the 16 valve rocker arms with the valve lifters (1).



**Fig. 94: Valve Rocker Arms And Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

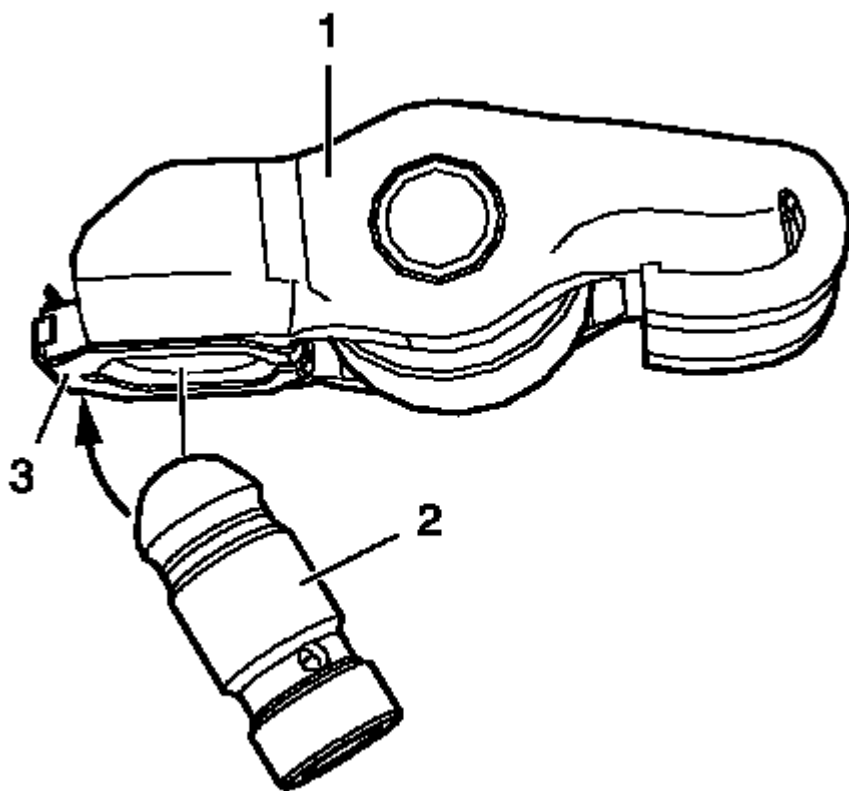
**NOTE:** Unclip the valve lifter from the valve rocker arm in direction as shown (arrow). Mind to the centring link on the retaining spring (3).

4. Remove the 16 valve lifters (2) from the valve rocker arms (1).

#### Installation Procedure

**NOTE:** Clean the valve lifters and the surrounding areas. Lubricate the valve lifters with engine oil.

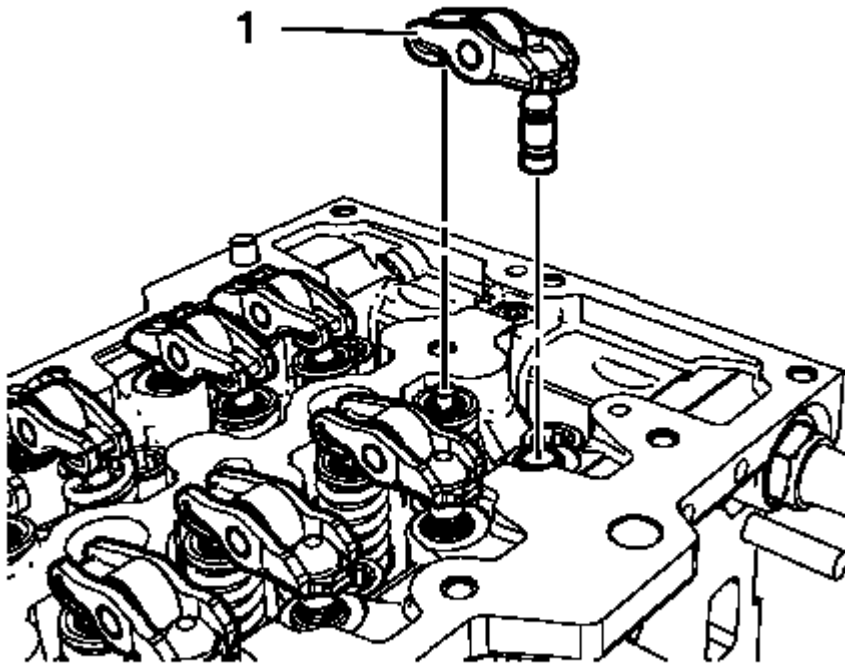




**Fig. 95: Valve Rocker Arms And Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Clip the valve lifter to the valve rocker arm in direction as shown (arrow). Mind to the centring link on the retaining spring (3).

1. Install the 16 valve lifters (2) to the valve rocker arms (1).

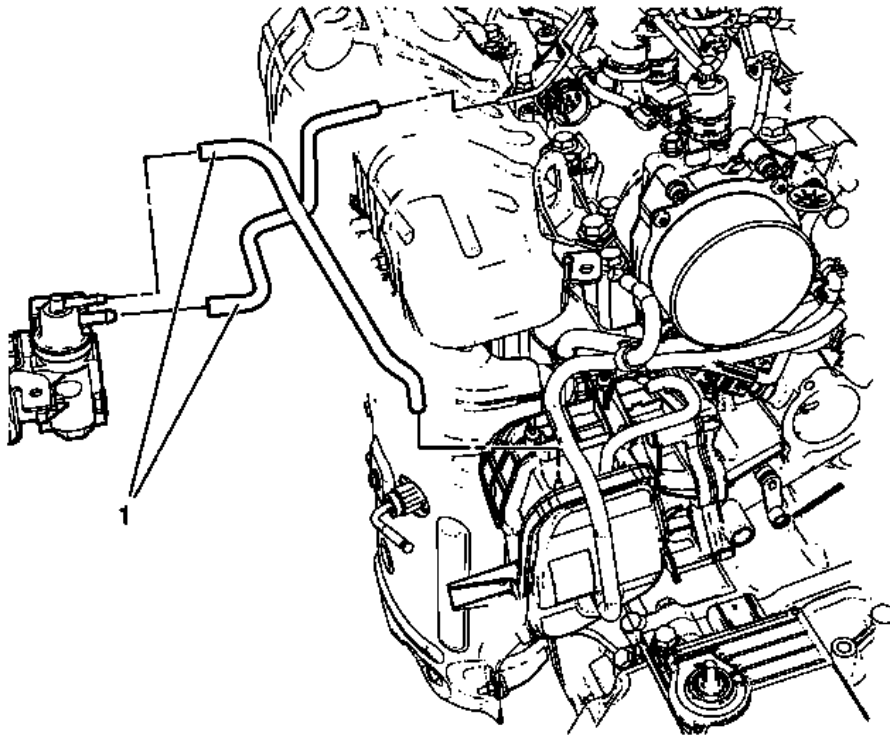


**Fig. 96: Valve Rocker Arms With Valve Lifters**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** In case of reusing the valve rocker arms put them back in the original position.

2. Install the 16 valve rocker arms with the valve lifters (1).
3. Install the camshaft housing. Refer to **Camshaft Housing Replacement**.
4. Close the hood.

## **TURBOCHARGER WASTEGATE ACTUATOR VACUUM CONTROL SOLENOID VALVE HOSE REPLACEMENT**



**Fig. 97: Turbocharger Wastegate Actuator Vacuum Control Solenoid Valve Hose**  
 Courtesy of GENERAL MOTORS COMPANY

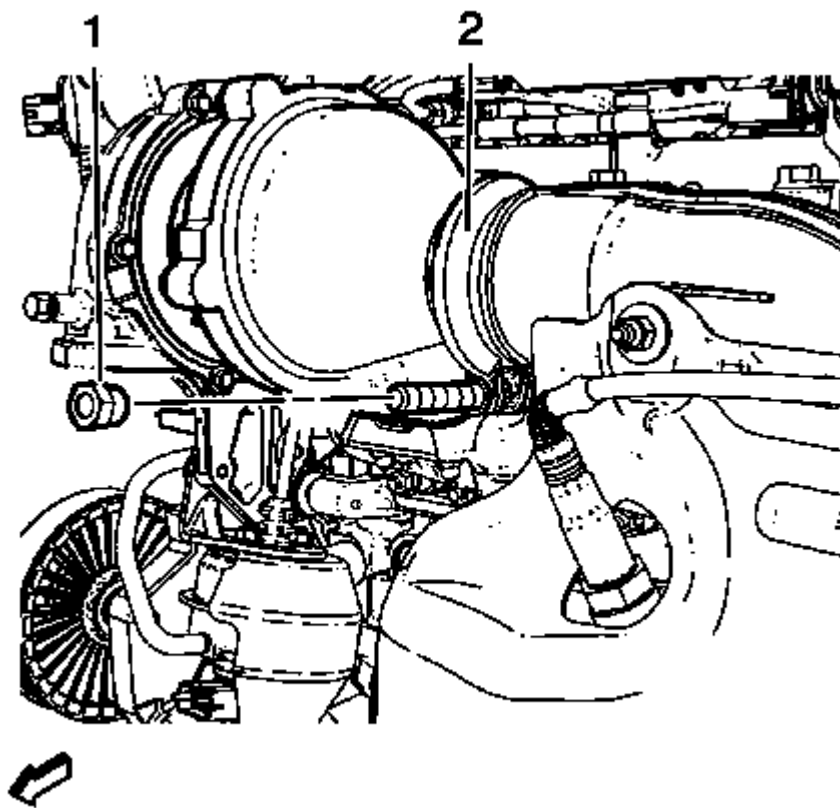
#### Turbocharger Wastegate Actuator Vacuum Control Solenoid Valve Hose Replacement

Callout	Component Name
<b>Preliminary Procedure</b> Open the hood.	
1	Turbocharger Wastegate Actuator Vacuum Control Solenoid Valve Hose (Qty: 2)

### TURBOCHARGER REPLACEMENT

#### Removal Procedure

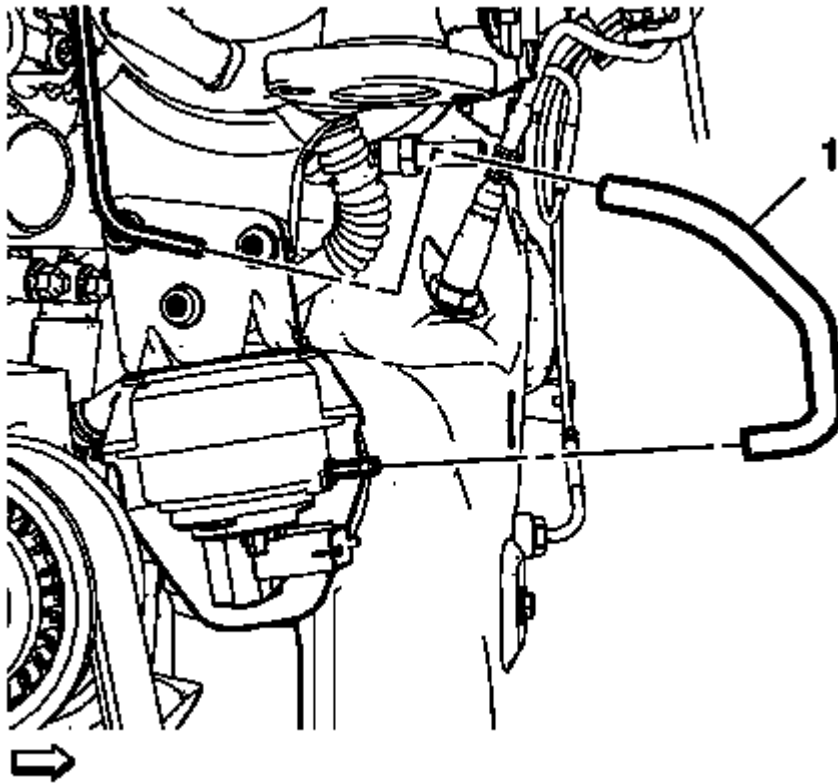
1. Remove the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#) .
2. Remove the turbocharger oil feed pipe. Refer to [Turbocharger Oil Feed Pipe Replacement](#).
3. Remove the turbocharger oil return pipe. Refer to [Turbocharger Oil Return Pipe Replacement](#).
4. Disconnect the electrical connector from the wastegate actuator.



**Fig. 98: Catalytic Converter Clamp Nut**

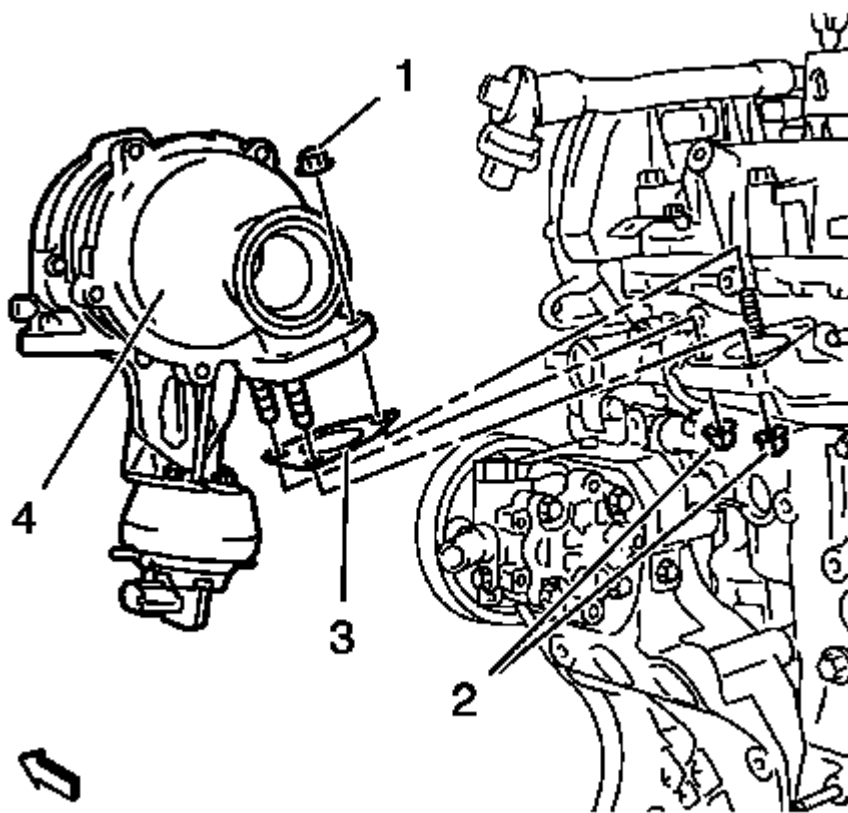
Courtesy of GENERAL MOTORS COMPANY

5. Loosen the catalytic converter clamp nut (1) and remove the catalytic converter clamp (2).
6. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .



**Fig. 99: Turbocharger Wastegate Actuator Vacuum Control Solenoid Valve Hose**  
Courtesy of GENERAL MOTORS COMPANY

7. Remove the turbocharger wastegate actuator vacuum control solenoid valve hose (1).

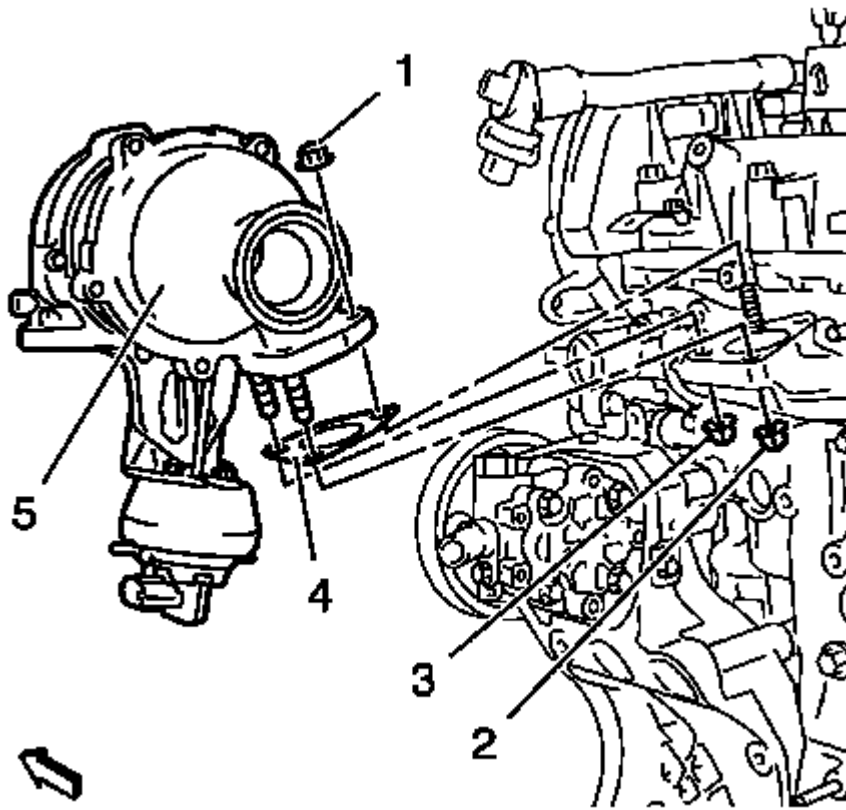


**Fig. 100: Exhaust Manifold Nuts**

Courtesy of GENERAL MOTORS COMPANY

8. Remove the 2 exhaust manifold nuts (2).
9. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle**.
10. Remove the exhaust manifold nut (1).
11. Remove the turbocharger (4).
12. Remove the turbocharger gasket (3).
13. Clean all of the gasket surfaces.

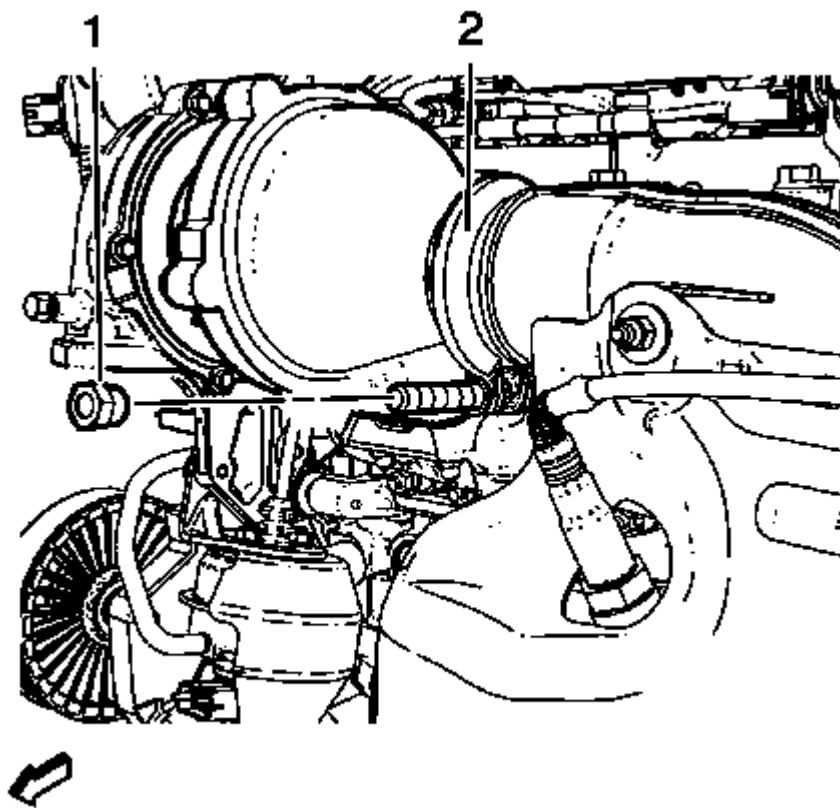
#### Installation Procedure



**Fig. 101: View Of Turbocharger Gasket**

Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW turbocharger gasket (4).
2. Install the turbocharger (5).
3. Install and hand tighten the 3 NEW exhaust manifold nuts (1, 2, 3) to align the turbocharger to the catalytic converter.

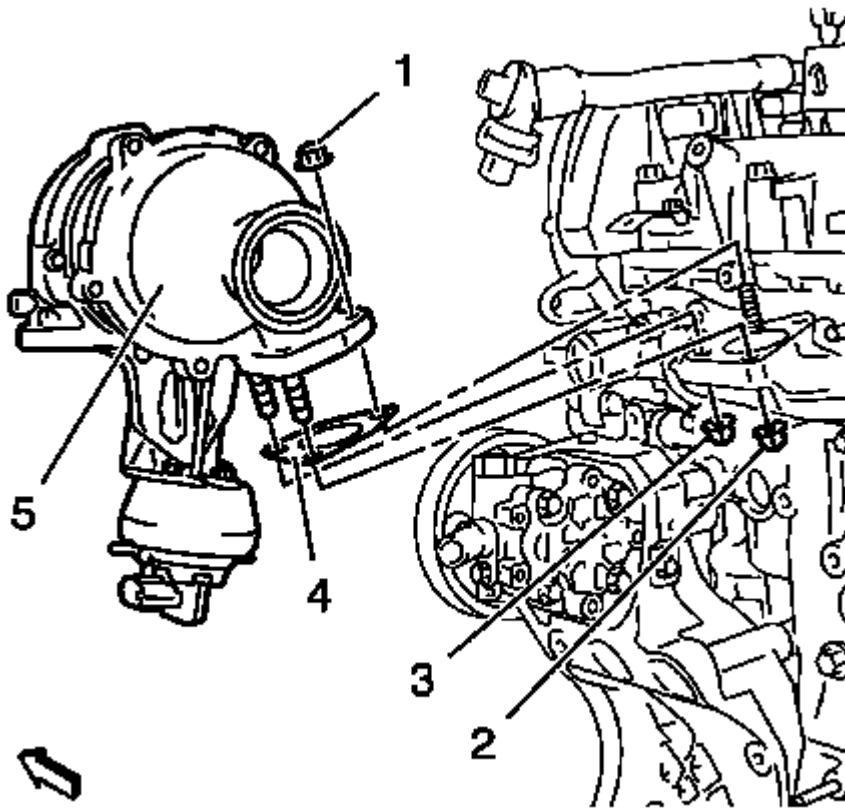


**Fig. 102: Catalytic Converter Clamp Nut**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

4. Install the catalytic converter clamp (2) and tighten the nut (1) to 20 N.m (15 lb ft).



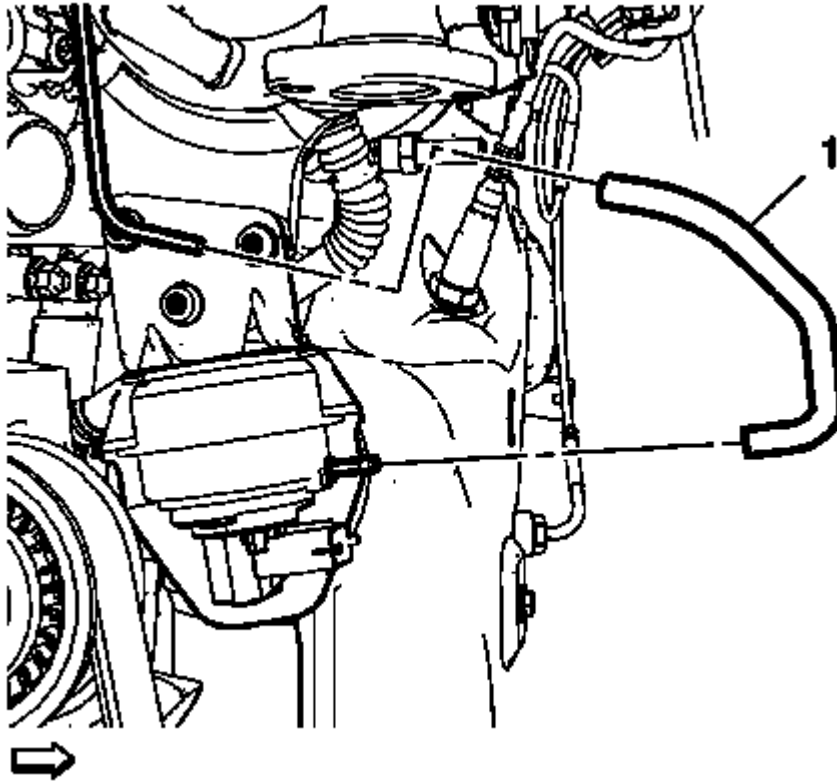


**Fig. 103: View Of Turbocharger Gasket**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The sequence is necessary to avoid damages of the gasket between the turbocharger and the exhaust manifold.

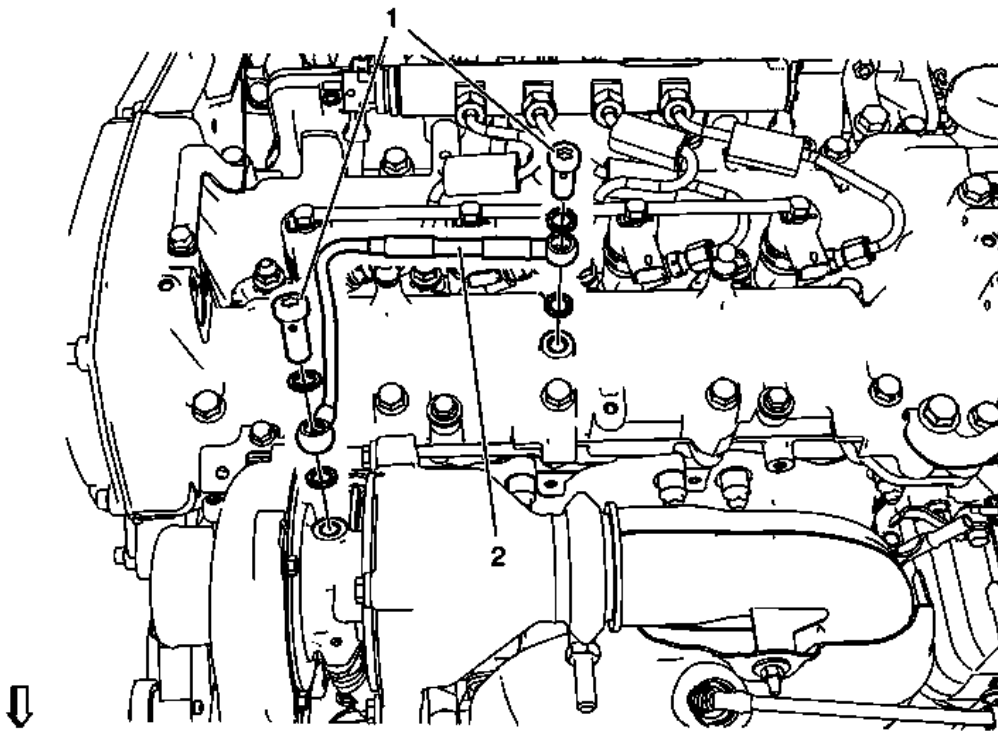
5. Tighten the 3 NEW exhaust manifold nuts (1, 2, 3) in two passes and sequence.
6. First pass to:
  1. Nut (2) to 15 N.m (11 lb ft).
  2. Nut (1) to 15 N.m (11 lb ft).
  3. Nut (3) to 15 N.m (11 lb ft).
7. Second pass to:
  1. Nut (2) to 28 N.m (21 lb ft).
  2. Nut (1) to 28 N.m (21 lb ft).
  3. Nut (3) to 28 N.m (21 lb ft).
8. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle**.



**Fig. 104: Turbocharger Wastegate Actuator Vacuum Control Solenoid Valve Hose**  
 Courtesy of GENERAL MOTORS COMPANY

9. Install the turbocharger wastegate actuator vacuum control solenoid valve hose (1).
10. Connect the electrical connector to the wastegate actuator.
11. Install the turbocharger oil return pipe. Refer to **Turbocharger Oil Return Pipe Replacement**.
12. Install the turbocharger oil feed pipe. Refer to **Turbocharger Oil Feed Pipe Replacement**.
13. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .

#### **TURBOCHARGER OIL FEED PIPE REPLACEMENT**

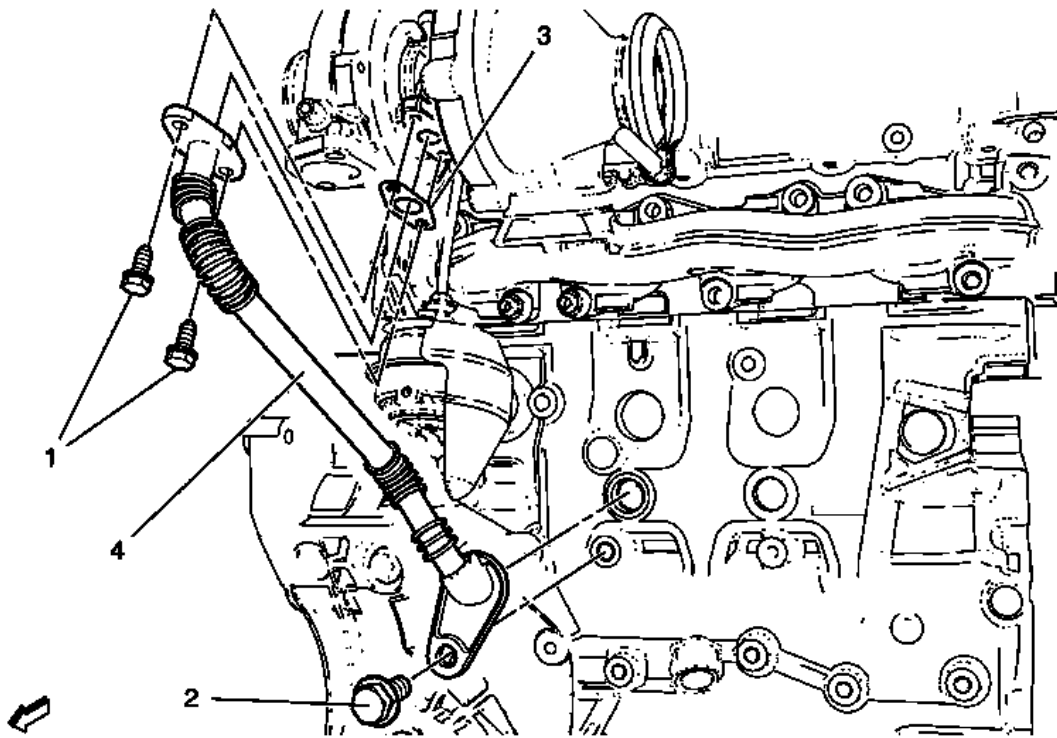


**Fig. 105: Turbocharger Oil Feed Pipe**  
 Courtesy of GENERAL MOTORS COMPANY

### Turbocharger Oil Feed Pipe Replacement

Callout	Component Name
<b>Preliminary Procedure</b> Remove the engine sight shield. Refer to <b>Engine Sight Shield Replacement</b> .	
1	Turbocharger Oil Feed Pipe Bolt (Qty: 2)  <b>CAUTION:</b> Refer to <b>Fastener Caution</b> .  <b>Tighten</b> 18 (13 lb ft)
2	Turbocharger Oil Feed Pipe  <b>Procedure</b> <ol style="list-style-type: none"> <li>1. Inspect the turbocharger oil feed pipe for damage or restriction. Do NOT attempt to clean or repair the pipe. Replace the pipe if it has damage or a restriction.</li> <li>2. Install the NEW turbocharger oil feed pipe gaskets prior installation of the turbocharger oil feed pipe.</li> </ol>

### TURBOCHARGER OIL RETURN PIPE REPLACEMENT



**Fig. 106: Turbocharger Oil Return Pipe**  
Courtesy of GENERAL MOTORS COMPANY

### Turbocharger Oil Return Pipe Replacement

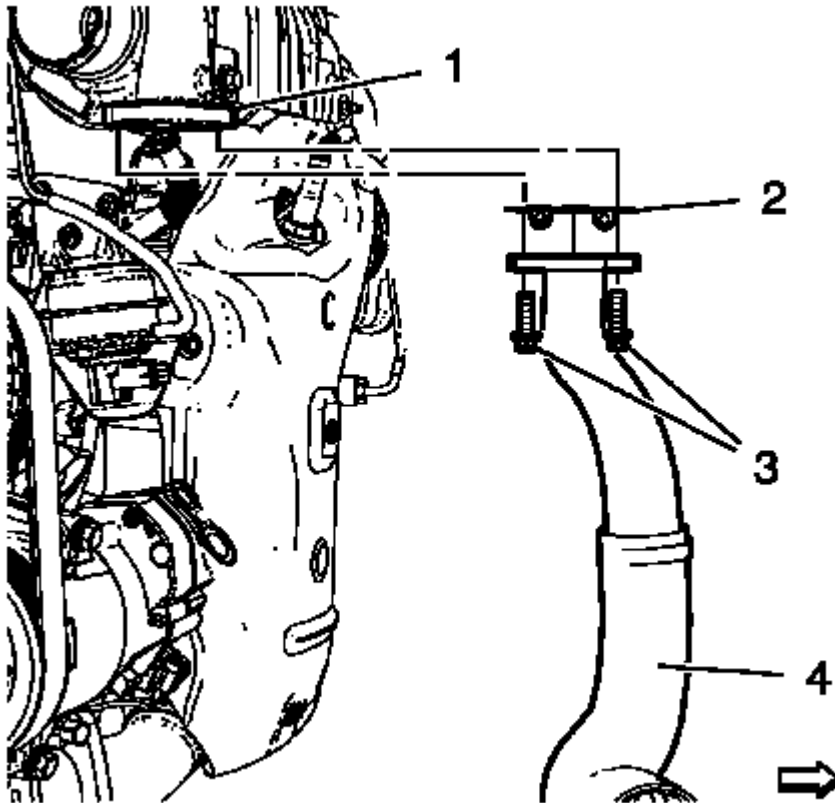
Callout	Component Name
<b>Preliminary Procedures</b>	
<ol style="list-style-type: none"> <li>1. Disconnect the battery negative cable. Refer to <b><u>Battery Negative Cable Disconnection and Connection</u></b> .</li> <li>2. Loosen the charge air cooler inlet air hose from turbocharger and hang aside. Refer to <b><u>Charge Air Cooler Inlet Air Hose Replacement</u></b>.</li> </ol>	
1	Turbocharger Oil Return Pipe Bolt (Qty: 2)  <b>CAUTION:</b> Refer to <b><u>Fastener Caution</u></b> .  <b>Tighten</b> 9 N.m (80 lb in)
2	Turbocharger Oil Return Pipe Bolt <b>Tighten</b> 25 N.m (18 lb ft)
3	Turbocharger Oil Return Pipe Gasket <b>Procedure</b> Remove the old turbocharger oil return pipe gasket and install a NEW turbocharger oil

	return pipe gasket prior installation of the pipe.
4	<b>Turbocharger Oil Return Pipe</b> <b>Procedure</b> Inspect the turbocharger oil return pipe for damage or restriction. DO NOT attempt to clean or repair the pipe. Replace the pipe if it has damage or restriction.

## CHARGE AIR COOLER INLET AIR HOSE REPLACEMENT

### Removal Procedure

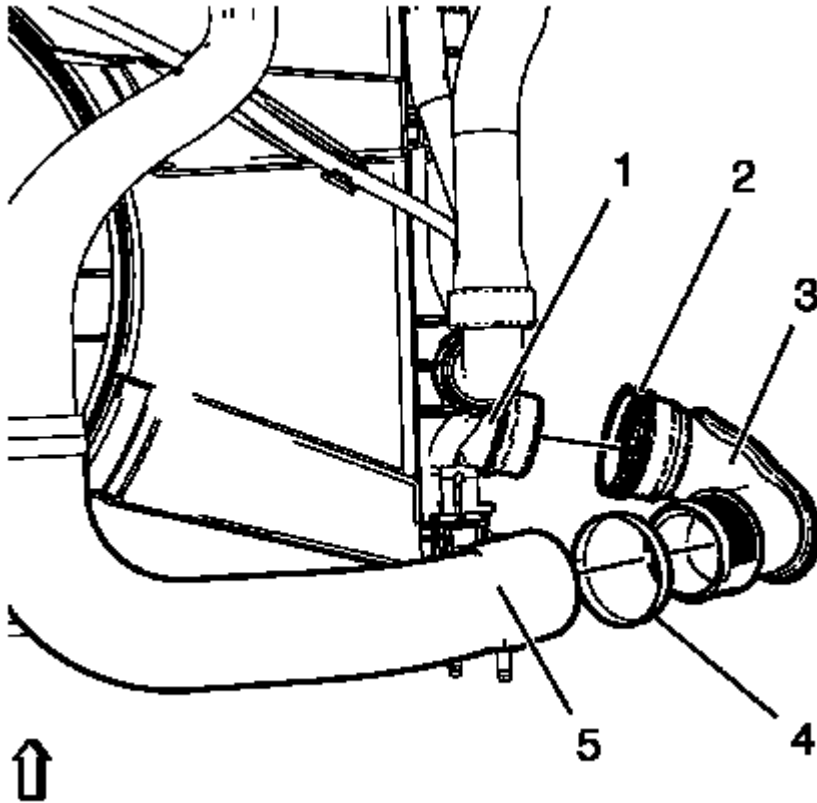
1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the front compartment insulator. Refer to **Front Compartment Insulator Replacement** .
5. Remove the charge air temperature sensor - charge air cooler inlet pipe. Refer to **Charge Air Temperature Sensor Replacement - Charge Air Cooler Inlet Pipe** .



**Fig. 107: Charge Air Cooler Inlet Air Hose Bolt**  
Courtesy of GENERAL MOTORS COMPANY

6. Remove the 2 charge air cooler inlet air hose bolt (3).

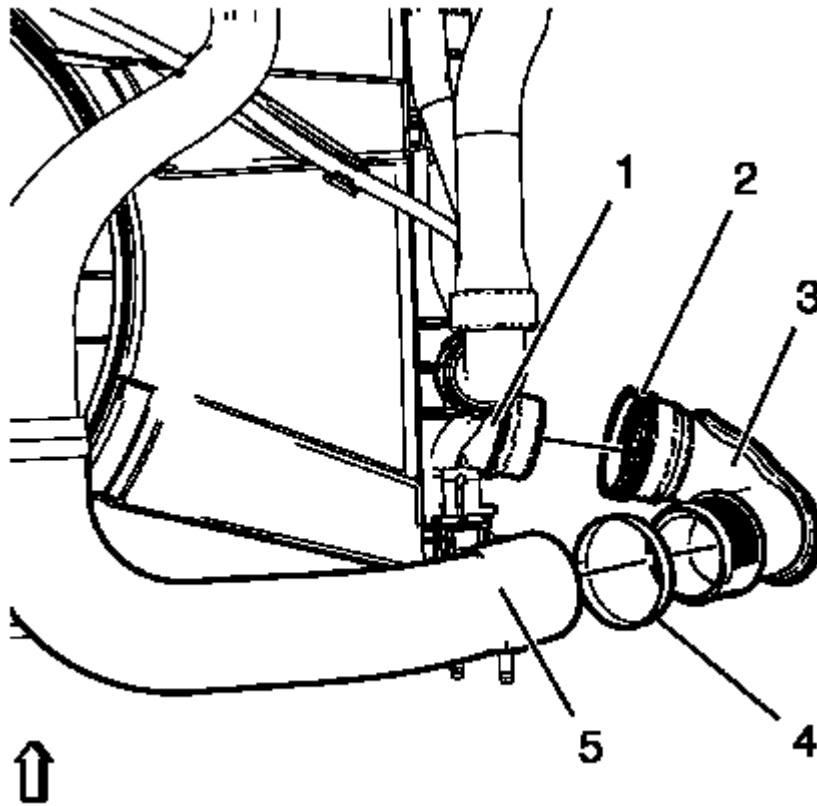
7. Remove the charge air cooler inlet air hose (4) from the turbocharger (1).
8. Remove the charge air cooler inlet air hose gasket (2).



**Fig. 108: Charge Air Cooler Inlet Air Hose**  
 Courtesy of GENERAL MOTORS COMPANY

9. Remove the charge air cooler inlet air hose (3, 5) from the charge air cooler (1).
  1. To get a better access, loosen the clamp (4) and separate the charge air cooler hose (5) from the bend (3).
  2. Loosen the clamp (2) and remove the charge air cooler inlet air hose bend (3) from charge air cooler (1).

#### Installation Procedure

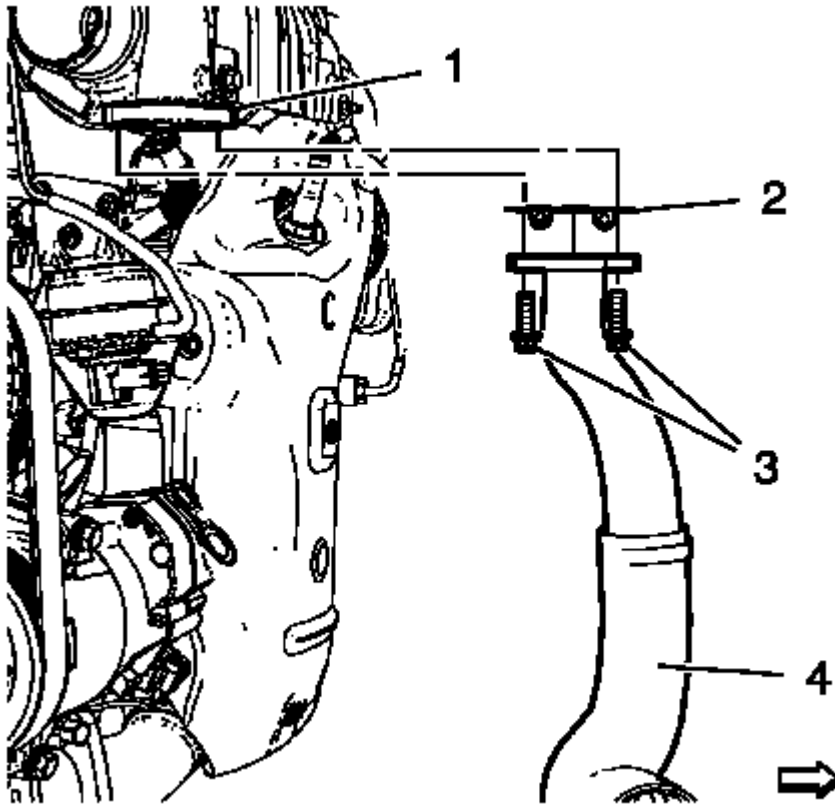


**Fig. 109: Charge Air Cooler Inlet Air Hose**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the charge air cooler air inlet hose (3, 5) to the charge air cooler (1) and fasten clamp (2).
  1. Install the charge air cooler inlet air hose bend (3) to the charge air cooler (1).
  2. Install and reposition the charge air cooler inlet air hose (5) to the bend (3).

**CAUTION: Refer to Fastener Caution .**

3. Reposition and tighten the charge air cooler clamp (4).



**Fig. 110: Charge Air Cooler Inlet Air Hose Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

2. Install a NEW charge air cooler inlet air hose gasket (2).
3. Install the charge air cooler inlet air hose (4) to the turbocharger (1) and tighten to 25 N.m (18 lb ft).
4. Install the charge air temperature sensor - charge air cooler inlet pipe. Refer to **Charge Air Temperature Sensor Replacement - Charge Air Cooler Inlet Pipe**.
5. Install the front compartment insulator. Refer to **Front Compartment Insulator Replacement**.
6. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle**.
7. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement**.
8. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.

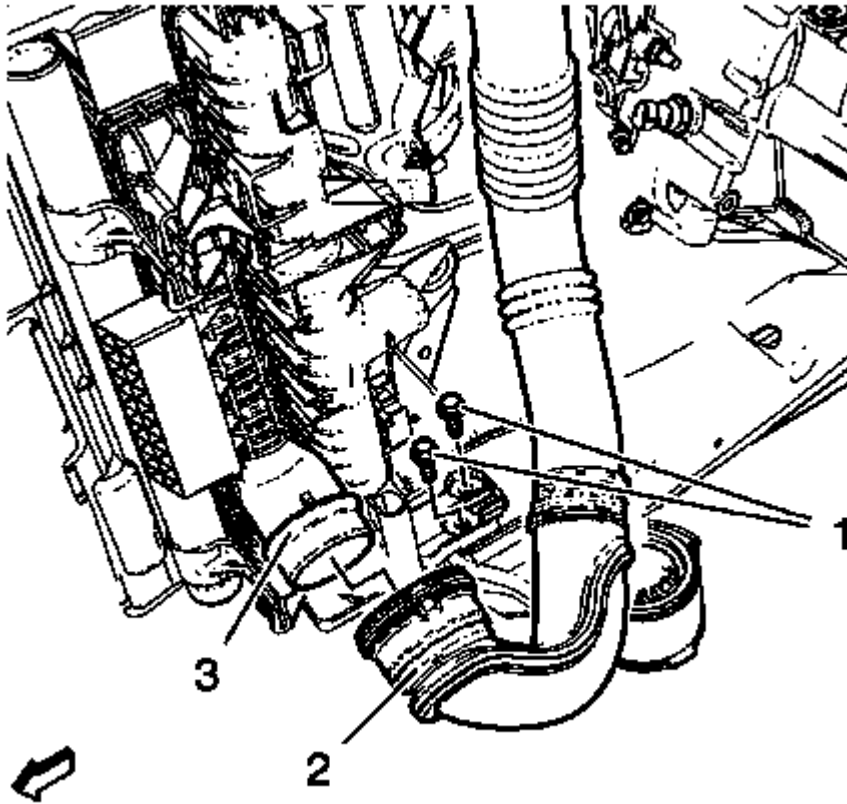
## CHARGE AIR COOLER OUTLET AIR HOSE REPLACEMENT

### Removal Procedure

1. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement**.
2. Remove the battery tray. Refer to **Battery Tray Replacement**.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
4. Remove the front bumper fascia opening lower cover. Refer to **Front Bumper Fascia Opening Lower Cover Replacement**.

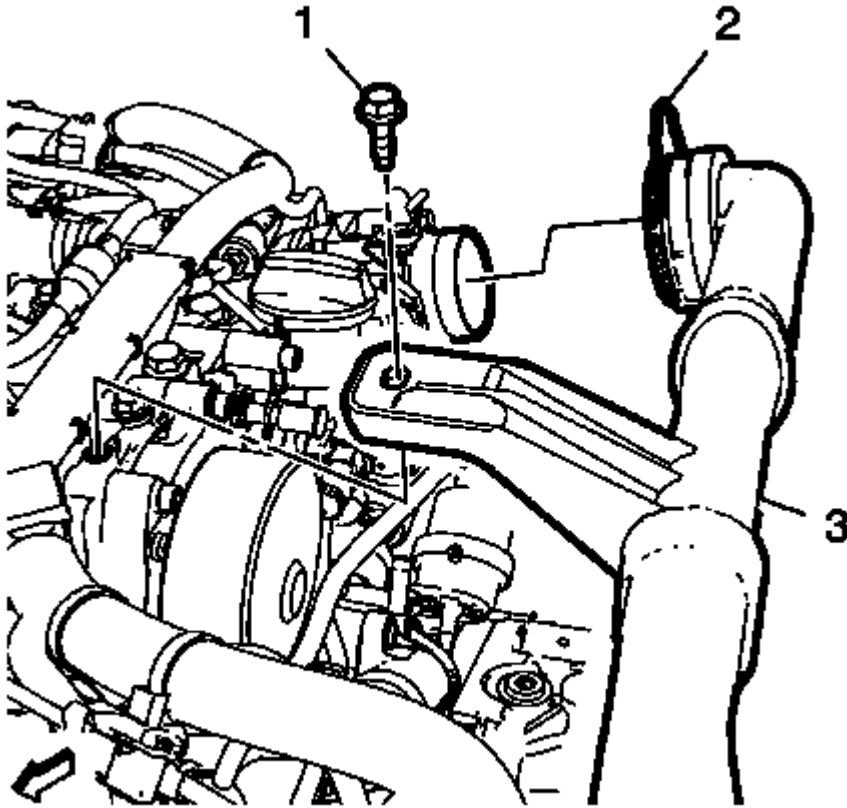


5. Remove the front compartment insulator. Refer to **Front Compartment Insulator Replacement** .



**Fig. 111: Charge Air Cooler Outlet Air Hose And Radiator And Charge Cooler Assembly**  
Courtesy of GENERAL MOTORS COMPANY

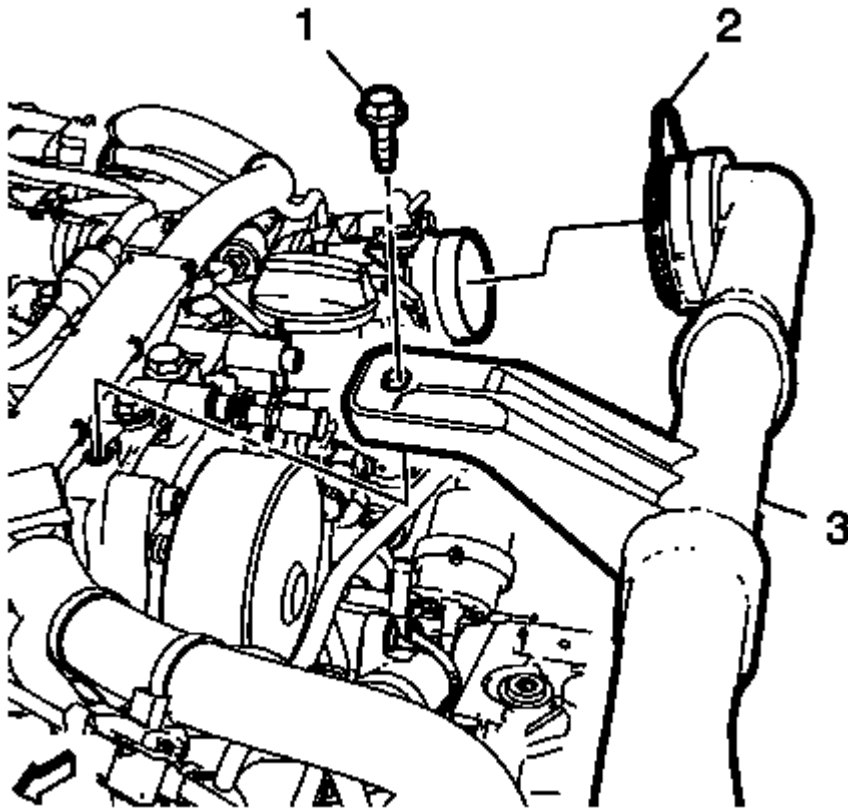
6. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .
7. Remove the charge air cooler outlet air hose (2) from the radiator and charge cooler assembly (3).
8. Remove the 2 radiator and charge air cooler bracket bolts (1).
9. Reposition the radiator and charge air cooler (3) to allow additional space.
10. Disconnect the charge air temperature sensor - charge air cooler outlet pipe electrical connector.



**Fig. 112: Charge Air Cooler Outlet Air Hose Bracket Bolt**  
Courtesy of GENERAL MOTORS COMPANY

11. Remove the charge air cooler outlet air hose bracket bolt (1).
12. Open the spring clip (2).
13. Remove the charge air cooler outlet air hose (3) from the throttle body.
14. Transfer the charge air temperature sensor - charge air cooler outlet pipe. Refer to **Charge Air Temperature Sensor Replacement - Charge Air Cooler Outlet Pipe** .

#### Installation Procedure

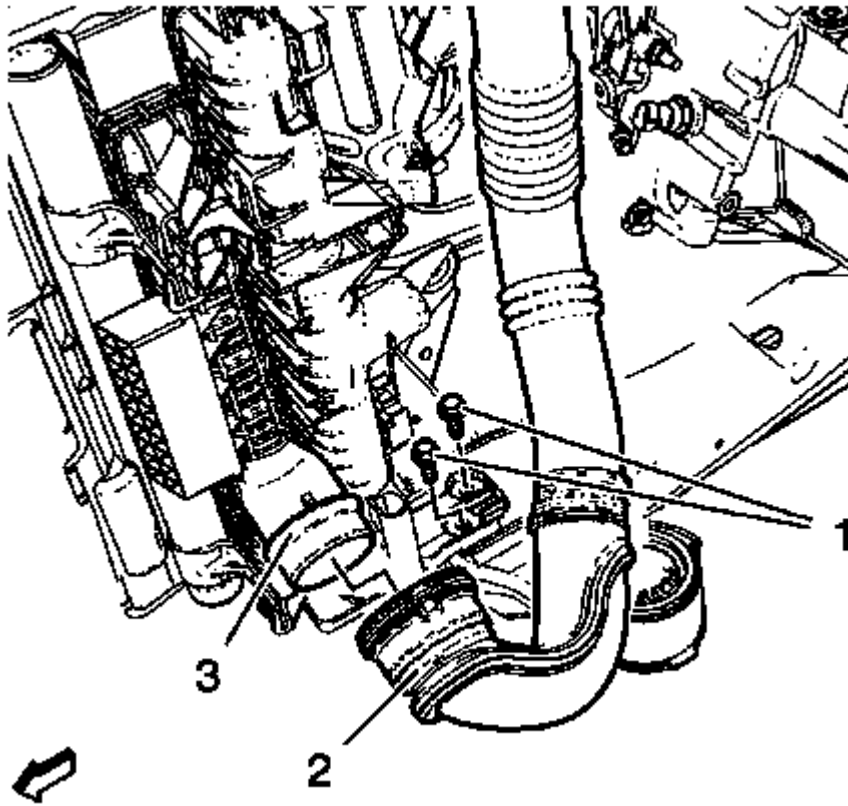


**Fig. 113: Charge Air Cooler Outlet Air Hose Bracket Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

1. Install the charge air cooler outlet air hose (3) to the throttle body.
2. Close the spring clip (2).

**CAUTION:** Refer to Fastener Caution .

3. Install the charge air cooler outlet air hose bracket bolt (1) and tighten to 9 (80 lb in).



**Fig. 114: Charge Air Cooler Outlet Air Hose And Radiator And Charge Cooler Assembly**  
**Courtesy of GENERAL MOTORS COMPANY**

4. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
5. Reposition the radiator and charge air cooler assembly (3).
6. Install the 2 radiator and charge air cooler bracket bolts (1) and tighten to 22 (16 lb ft).
7. Lock the charge air cooler outlet air hose (2) to the radiator and charge cooler assembly (3).
8. Raise the vehicle by its half height. Refer to **Lifting and Jacking the Vehicle** .
9. Install the front compartment insulator. Refer to **Front Compartment Insulator Replacement** .
10. Install the front bumper fascia opening lower cover. Refer to **Front Bumper Fascia Opening Lower Cover Replacement** .
11. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .
12. Connect the charge air temperature sensor - charge air cooler outlet pipe electrical connector.
13. Install the battery tray. Refer to **Battery Tray Replacement** .
14. Install the engine sight shield. Refer to **Engine Sight Shield Replacement**.

## CYLINDER HEAD REPLACEMENT

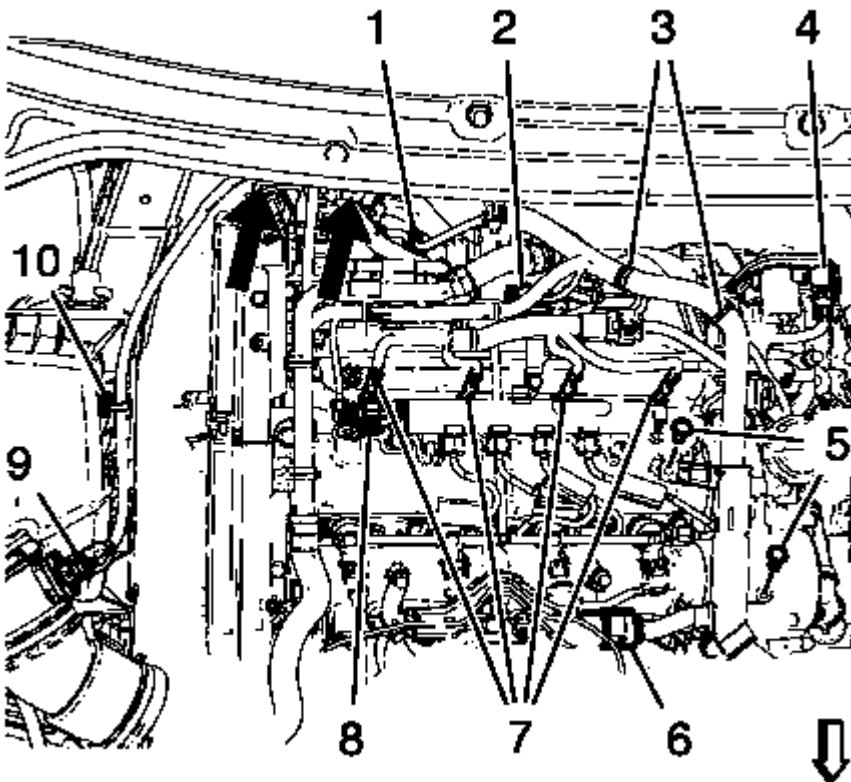
### Special Tools

- **EN-45059** Angle Meter
- **GE-7872** Magnetic Base Dial Indicator

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

#### Removal Procedure

1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .
2. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement**.
3. Remove the timing belt. Refer to **Timing Belt Replacement**.
4. Re-install the engine mount bracket. Refer to **Engine Mount Bracket Replacement**.
5. Re-install the engine mount. Refer to **Engine Mount Replacement**.
6. Remove the engine support fixture.



**Fig. 115: Removing Conduit Bolts**

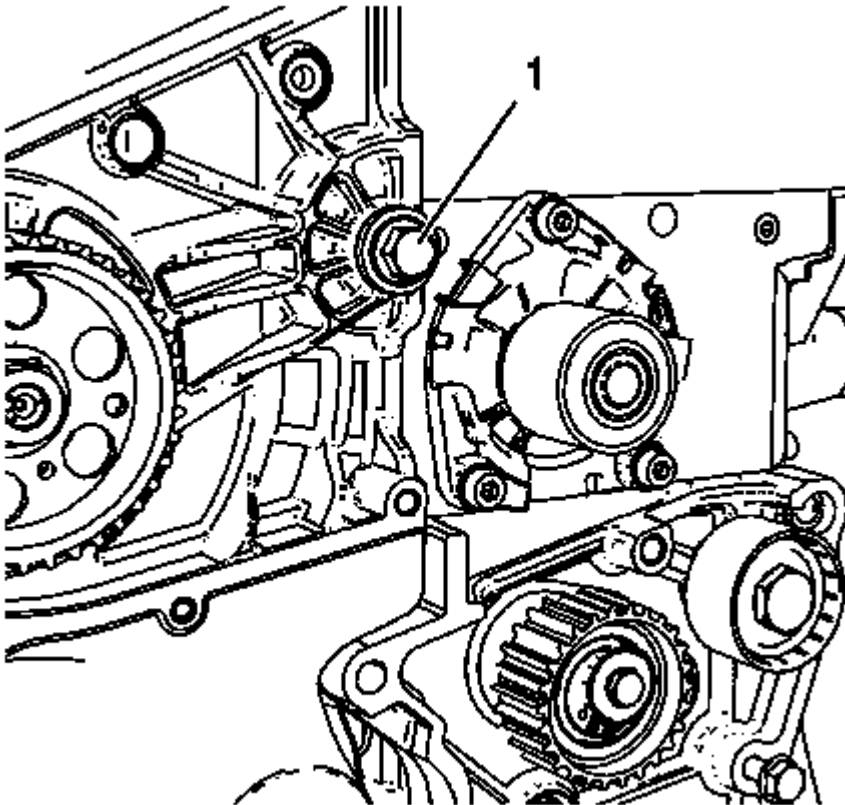
Courtesy of GENERAL MOTORS COMPANY

7. Remove the 2 conduit bolts (5).

**NOTE:** It is **NOT** necessary to remove the mass air flow sensor (9) and the clip

(10).

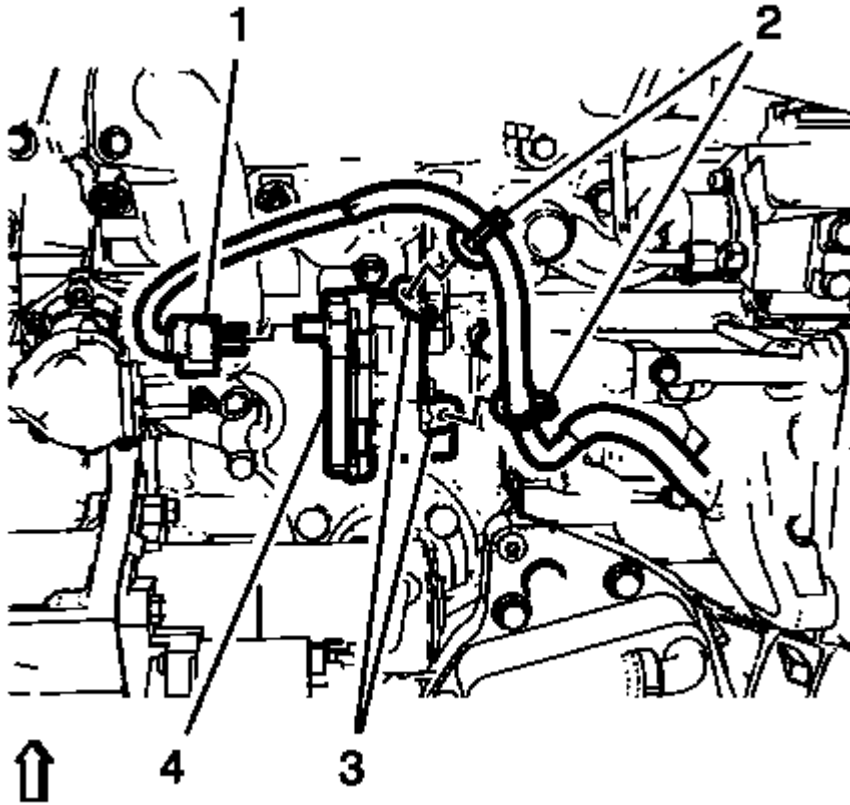
8. Disconnect the following connections (1, 2, 4, 7, 8)
9. Hang the wiring harness aside.
10. Remove the camshaft housing. Refer to **Camshaft Housing Replacement**.
11. Remove the exhaust gas recirculation valve cooler. Refer to **Exhaust Gas Recirculation Valve Cooler Replacement**.
12. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (2.0L Diesel LUZ)**.
13. Remove the turbo charger. Refer to **Turbocharger Replacement**.
14. Remove the oil level indicator tube. Refer to **Oil Level Indicator Tube Replacement**.
15. Remove the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.
16. Remove the radiator outlet hose. Refer to **Radiator Outlet Hose Replacement (2.0L Diesel LUZ)**.
17. Remove the fuel return hose. Refer to **Fuel Return Hose Replacement**.



**Fig. 116: Fuel Injection Pump Bracket Bolt**  
Courtesy of GENERAL MOTORS COMPANY

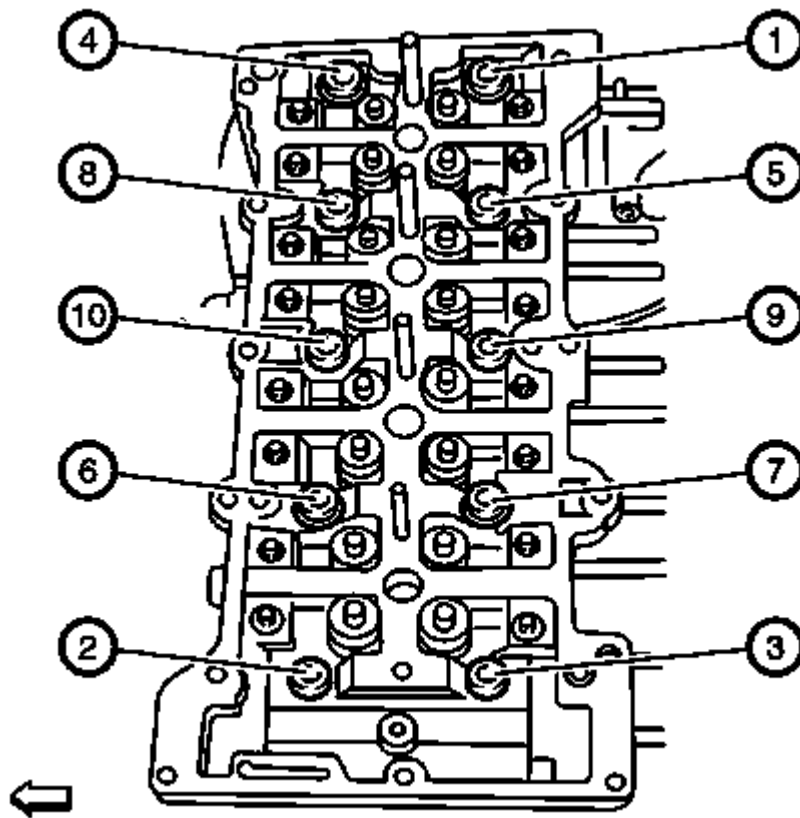
18. Remove the fuel injection pump bracket bolt (1).
19. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.

20. Remove the engine oil cooler coolant outlet hose. Refer to **Engine Oil Cooler Coolant Outlet Hose Removal**.



**Fig. 117: Electrical Connector And Intake Manifold Actuator**  
Courtesy of GENERAL MOTORS COMPANY

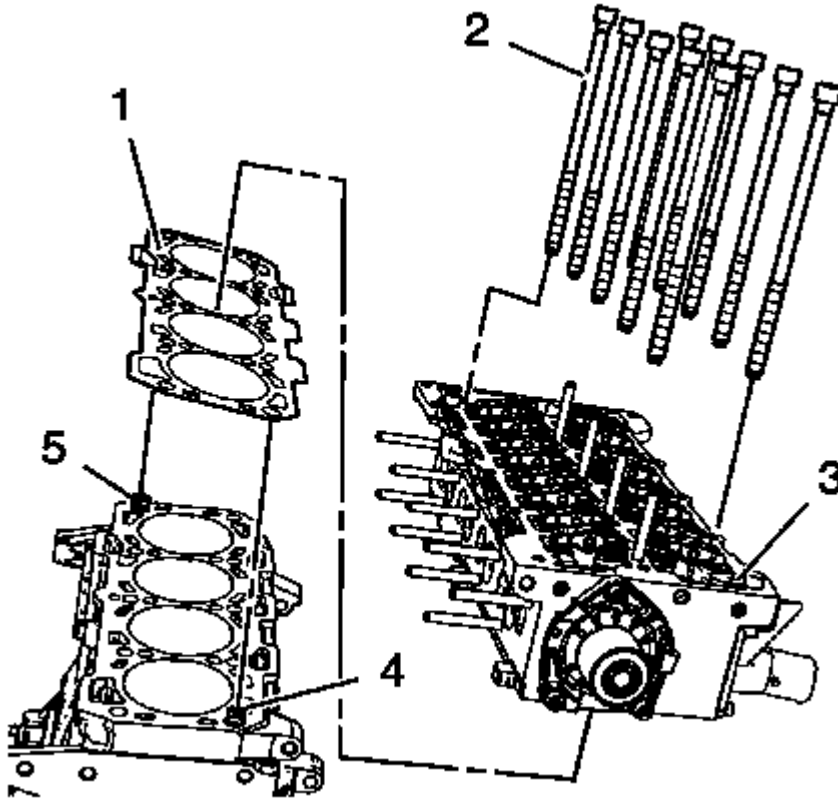
21. Disconnect the electrical connector (1) from the manifold actuator (4).  
22. Unclip the 2 wiring harness clips (2) from the wiring harness bracket (3).  
23. Lower the vehicle.



**Fig. 118: Cylinder Head Bolts In Sequence**  
Courtesy of GENERAL MOTORS COMPANY

24. Loosen the 10 cylinder head bolts in the sequence as shown. Use the following procedure:
  1. Loosen the cylinder head bolts 90 degrees.
  2. Loosen the cylinder head bolts 180 degrees.

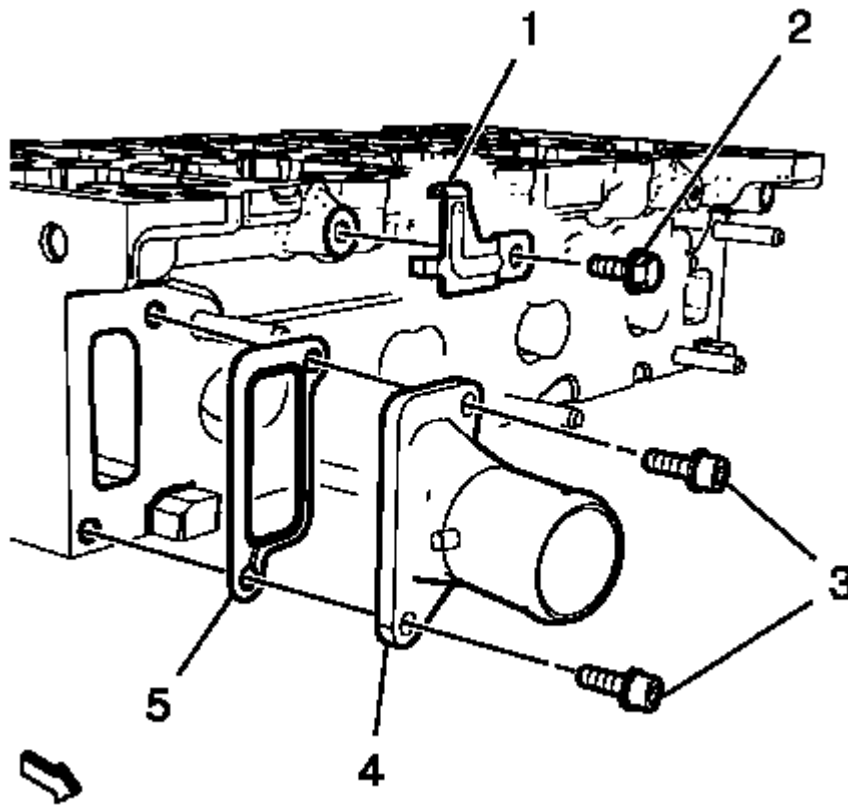




**Fig. 119: Cylinder Head Gasket And Cylinder Head**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Do not damage the guide sleeves (4) and (5).

25. Remove and DISCARD the 10 cylinder head bolts (2).
26. Remove the cylinder head (3).
27. Remove the cylinder head gasket (1).
28. Remove the assembly parts from the cylinder head:
  - Remove the intake manifold. Refer to **Intake Manifold Removal** .
  - Remove the exhaust manifold. Refer to **Exhaust Manifold Removal** .
  - Remove the valve lifter roller in conjunction with lash adjuster. Refer to **Valve Lifter Roller Removal** .
  - Remove the water pump. Refer to **Water Pump Removal** .



**Fig. 120: Water Outlet Bolts And Water Outlet**  
Courtesy of GENERAL MOTORS COMPANY

29. Remove the bracket bolt (2) and the bracket (1).
30. Remove the water outlet bolts (3).
31. Remove the water outlet (4) in conjunction with the water outlet gasket (5).

#### Installation Procedure

**CAUTION:** Clean all dirt, debris and coolant from the engine block cylinder head bolt holes. Failure to remove all foreign material may result in damaged threads, improperly tightened fasteners or damage to components.

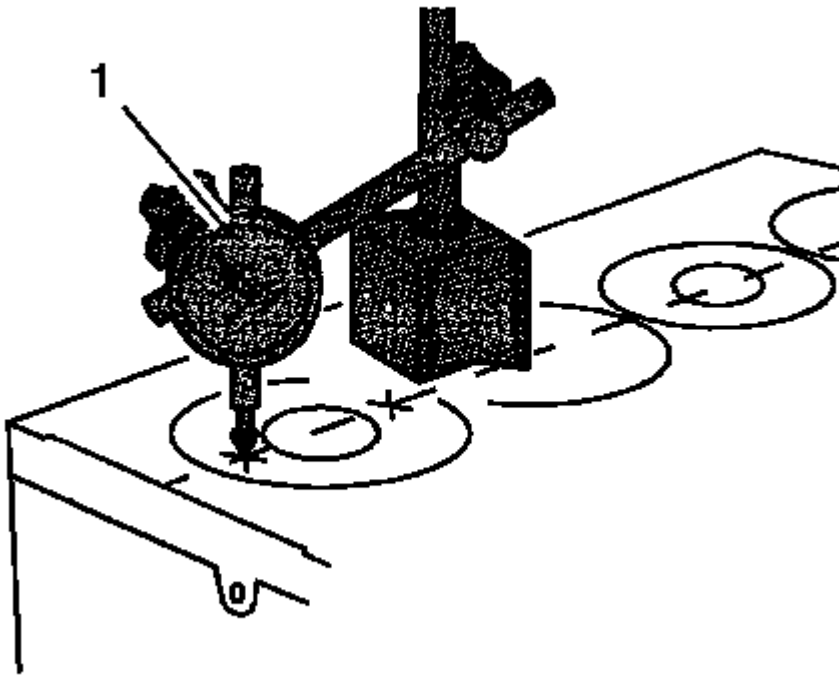
#### NOTE:

- Do not re-use the cylinder head bolts. Install NEW cylinder head bolts during assembly.
- Do not use any type of sealant on the cylinder head gasket, unless specified.
- The cylinder head gaskets must be installed in the proper direction and position.

1. Clean the sealing surfaces.

**NOTE:** Ensure that the cylinder head and the cylinder block sealing surfaces are clear of oil, grease and old gasket material.

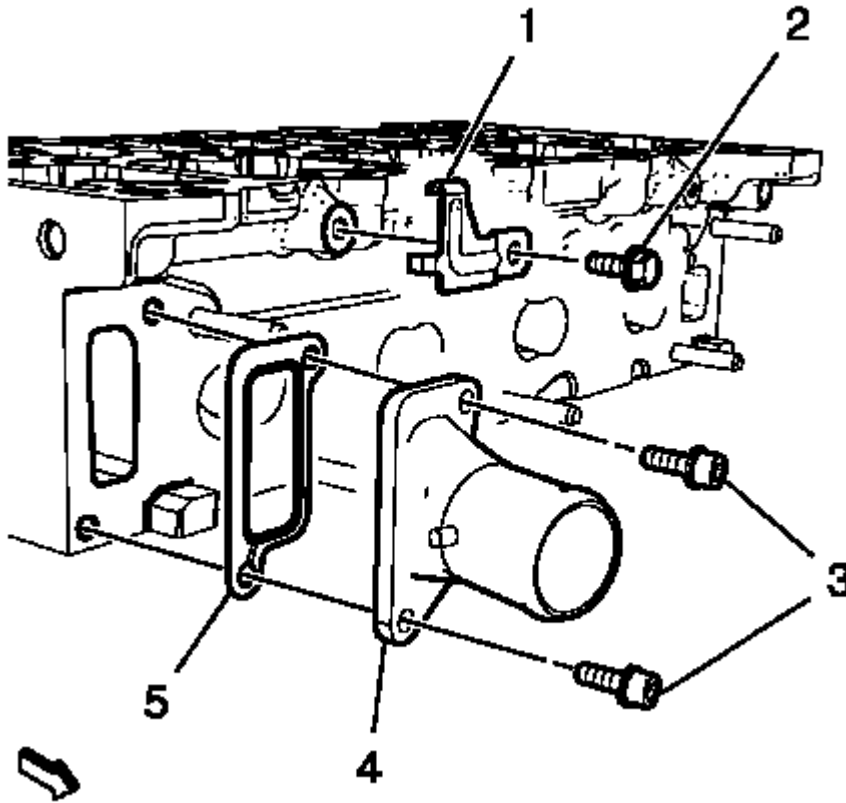
2. Inspect the flatness of cylinder head and cylinder block sealing surfaces.



**Fig. 121: Indicator**

Courtesy of GENERAL MOTORS COMPANY

3. Position the piston for the measurement in TDC. Measure with the piston projection using the **GE-7872** indicator (1).
4. Install a cylinder head gasket with the correct thickness. Refer to **Cylinder Head Gasket Selection Specifications** .

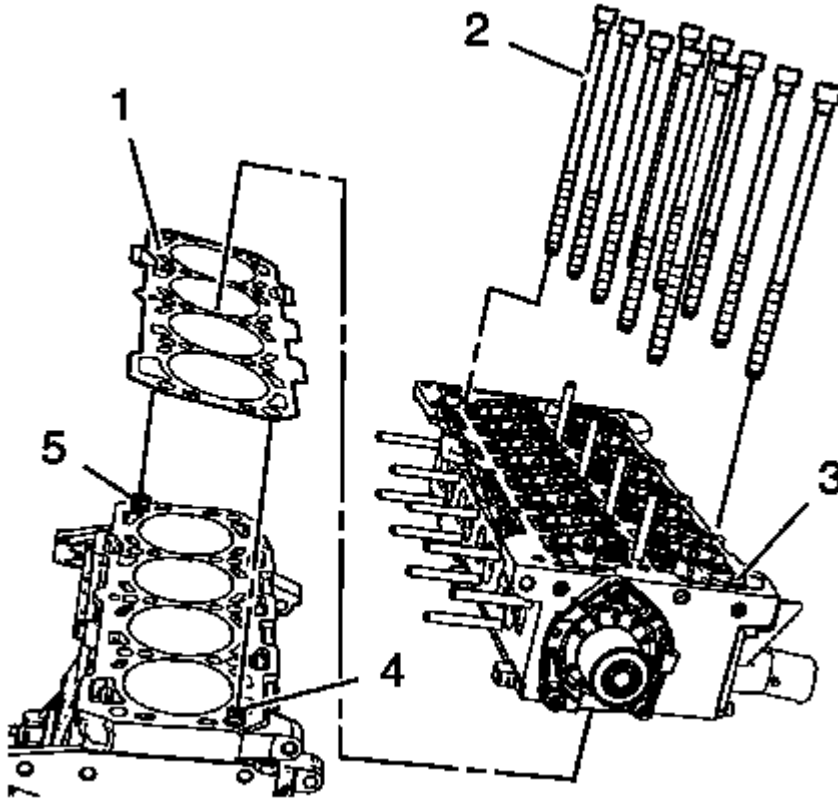


**Fig. 122: Water Outlet Bolts And Water Outlet**  
**Courtesy of GENERAL MOTORS COMPANY**

5. Install the water outlet (4) in conjunction with a NEW water outlet gasket (5).

**CAUTION: Refer to Fastener Caution .**

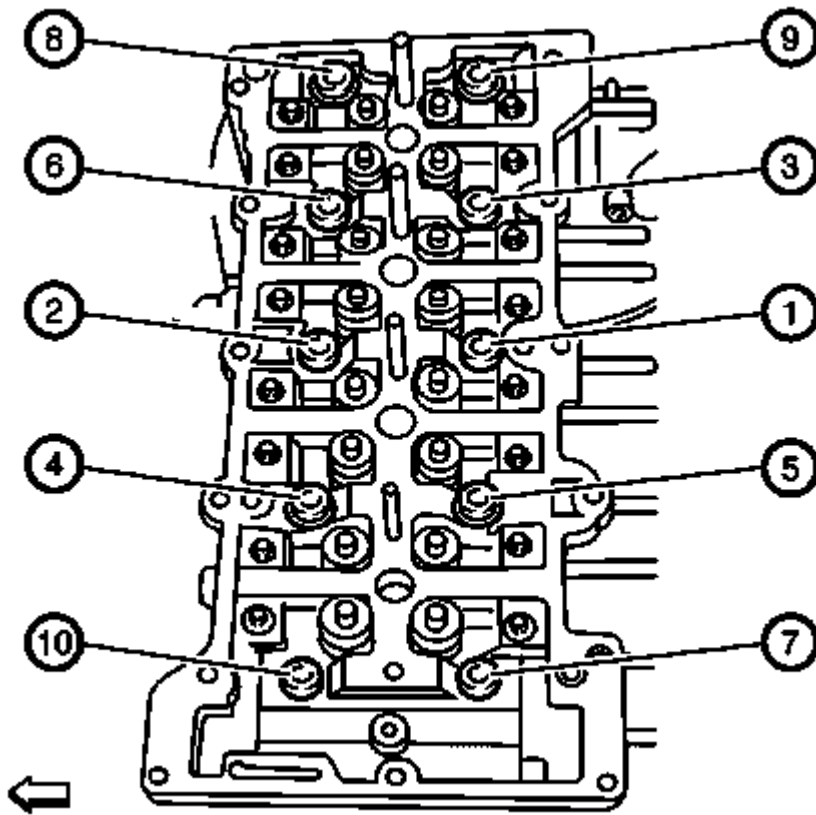
6. Install the water outlet bolts (3) and tighten to 9 (80 lb in).
7. Install the bracket (1).
8. Install the bracket bolt (2) and tighten to 9 (80 lb in).
9. Install the assembly parts from the cylinder head:
  - Install the intake manifold. Refer to Intake Manifold Installation .
  - Install the exhaust manifold. Refer to Exhaust Manifold Installation .
  - Install the valve lifter roller in conjunction with lash adjuster. Refer to Valve Lifter Roller Installation .
  - Install the water pump. Refer to Water Pump Installation .



**Fig. 123: Cylinder Head Gasket And Cylinder Head**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Do not damage the guide sleeves (4) and (5) and do not confuse the engine block guide sleeves with the camshaft guide sleeves.

10. Install a NEW cylinder head gasket (1). The marking "Top" should point to the cylinder head.
11. Install the cylinder head (3).
12. Loosely install 10 NEW cylinder head bolts (2).



**Fig. 124: Cylinder Head Bolts In Sequence**  
 Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Torque-to-Yield Fastener Caution .

13. Tighten the 10 NEW cylinder head bolts in following order:

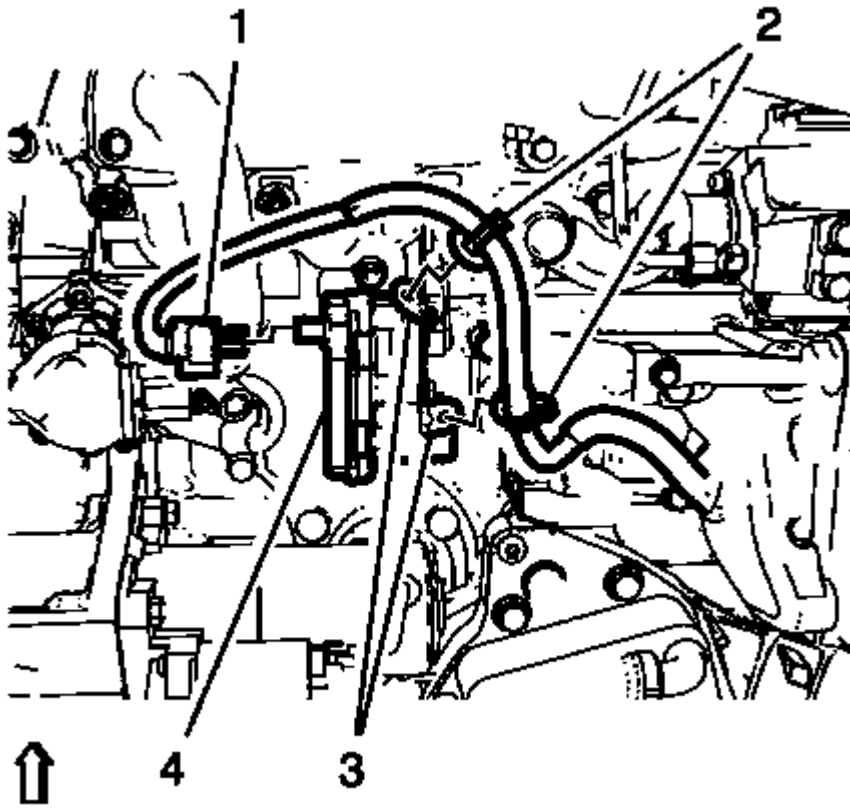
**NOTE:** The following tightening order applies to ribe cylinder head bolts.

1. First pass in sequence to 20 (15 lb ft).
2. Second pass in sequence to 65 (48 lb ft).
3. Third pass in sequence to an additional 90 degrees, using the **EN-45059** meter.
4. Fourth pass in sequence to an additional 90 degrees, using the **EN-45059** meter.
5. Fifth pass in sequence to an additional 90 degrees, using the **EN-45059** meter.

**NOTE:** The following tightening order applies to torx T60 cylinder head bolts.

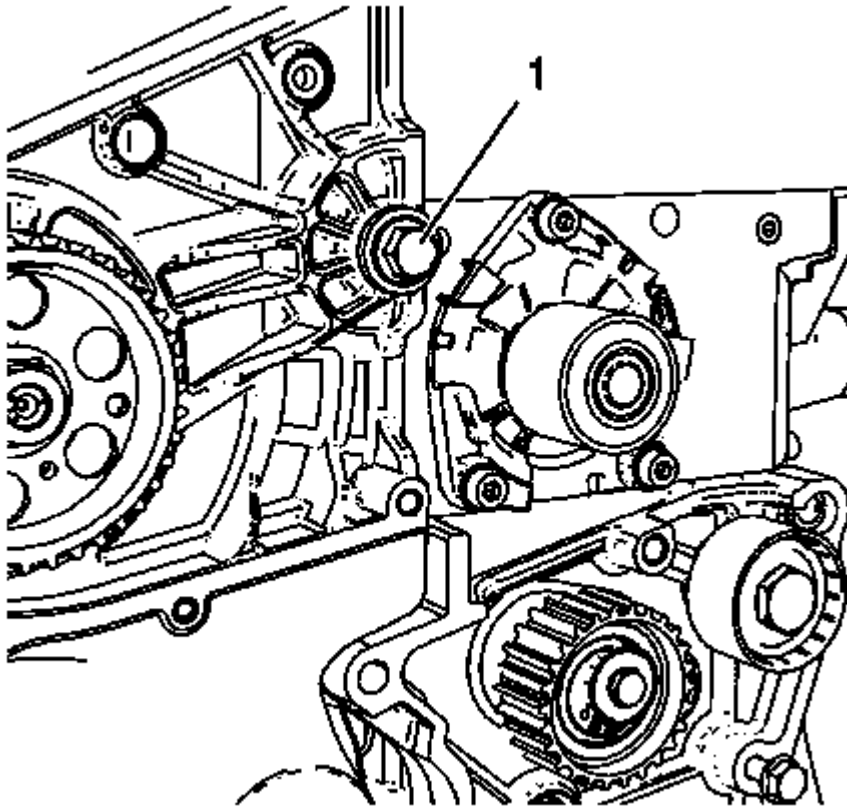
1. First pass in sequence to 20 (15 lb ft).

2. Second pass in sequence to 65 (48 lb ft).
3. Third pass in sequence to an additional 90 degrees, using the **EN-45059** meter.
4. Fourth pass in sequence to an additional 90 degrees, using the **EN-45059** meter.
5. Fifth pass in sequence to an additional 90 degrees, using the **EN-45059** meter.
6. Sixth pass in sequence to an additional 90 degrees, using the **EN-45059** meter.
14. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle**.
15. Install the engine oil cooler coolant outlet hose. Refer to **Engine Oil Cooler Coolant Outlet Hose Installation**.



**Fig. 125: Electrical Connector And Intake Manifold Actuator**  
Courtesy of GENERAL MOTORS COMPANY

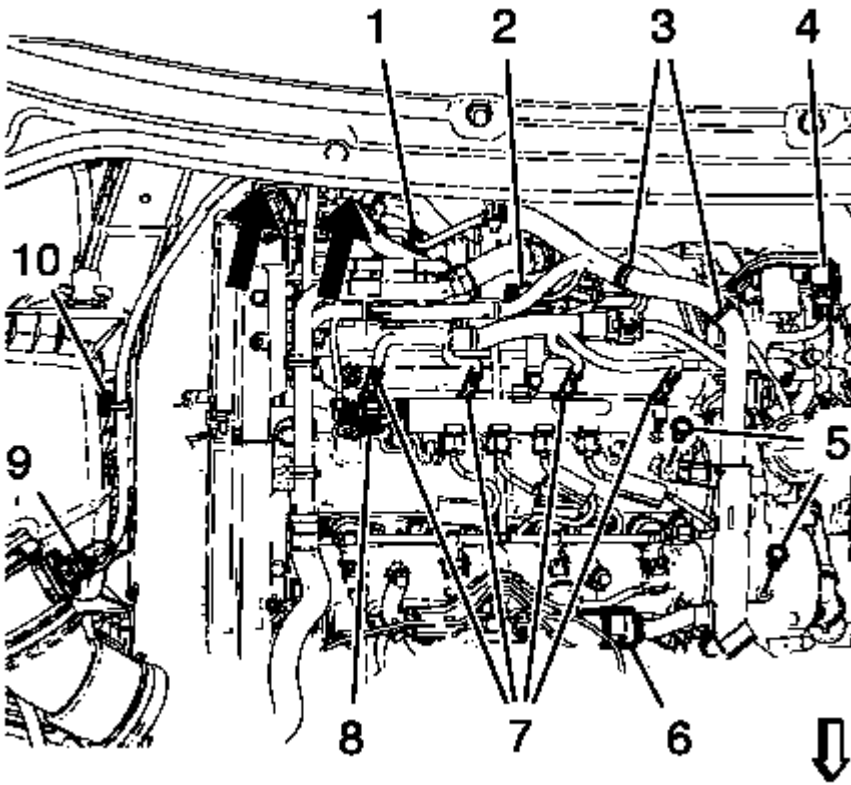
16. Connect the electrical connector (1) to the manifold actuator (4).
17. Clip in the 2 wiring harness clips (2) to the wiring harness bracket (3).
18. Lower the vehicle.



**Fig. 126: Fuel Injection Pump Bracket Bolt**  
Courtesy of GENERAL MOTORS COMPANY

19. Install the fuel injection pump bracket bolt (1) and tighten to 25 (18 lb ft).
20. Install the fuel return hose. Refer to **Fuel Return Hose Replacement** .
21. Install the radiator outlet hose. Refer to **Radiator Outlet Hose Replacement (2.0L Diesel LUZ)** .
22. Install the positive crankcase ventilation tube. Refer to **Positive Crankcase Ventilation Oil Separator Assembly Replacement**.
23. Install the oil level indicator tube. Refer to **Oil Level Indicator Tube Replacement**.
24. Install the turbo charger. Refer to **Turbocharger Replacement**.
25. Install the catalytic converter. Refer to **Catalytic Converter Replacement (2.0L Diesel LUZ)** .
26. Install the exhaust gas recirculation valve cooler. Refer to **Exhaust Gas Recirculation Valve Cooler Replacement** .
27. Install the camshaft housing. Refer to **Camshaft Housing Replacement**.



**Fig. 127: Removing Conduit Bolts**

Courtesy of GENERAL MOTORS COMPANY

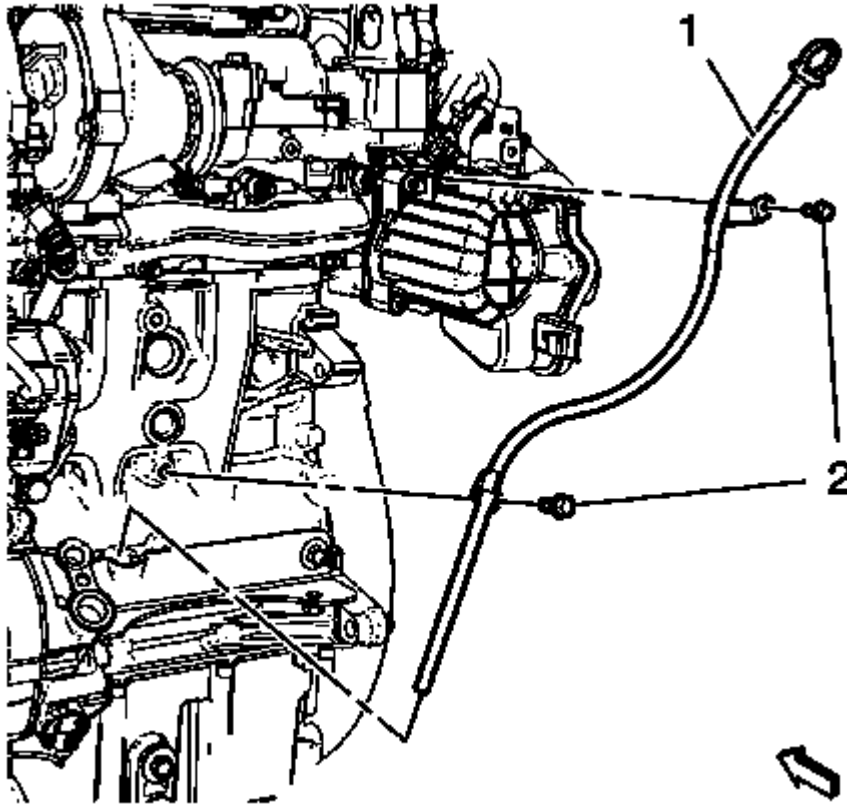
28. Install the wiring harness.
29. Connect the following connections (1, 2, 4, 7, 8)
30. Install the 2 conduit bolts (5).
31. Install the engine support fixture.
32. Remove the engine mount. Refer to **Engine Mount Replacement**.
33. Remove the engine mount bracket. Refer to **Engine Mount Bracket Replacement**.
34. Install the timing belt. Refer to **Timing Belt Replacement**.
35. Install the engine sight shield. Refer to **Engine Sight Shield Replacement**.
36. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.

## OIL LEVEL INDICATOR TUBE REPLACEMENT

### Removal Procedure

**WARNING:** While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.

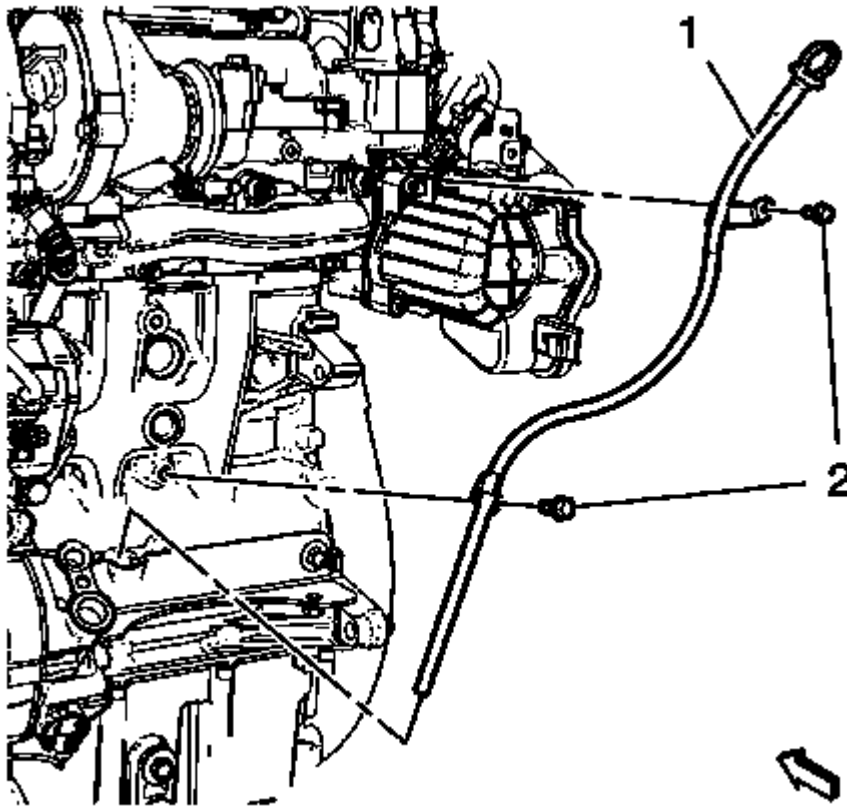
1. Open the hood.
2. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (2.0L Diesel LUZ)** .



**Fig. 128: Oil Level Indicator Tube And Bolts**  
Courtesy of GENERAL MOTORS COMPANY

3. Remove the 2 oil level indicator tube bolts (2).
4. Remove the oil level indicator tube (1).

#### Installation Procedure



**Fig. 129: Oil Level Indicator Tube And Bolts**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the oil level indicator tube (1).

**CAUTION: Refer to Fastener Caution .**

2. Install the 2 oil level indicator tube bolts (2) and tighten:
  - M6x16 to 9 N.m (80 lb in).
  - M8x16 to 25 N.m (18 lb ft).
3. Close the hood.

## OIL PAN REPLACEMENT

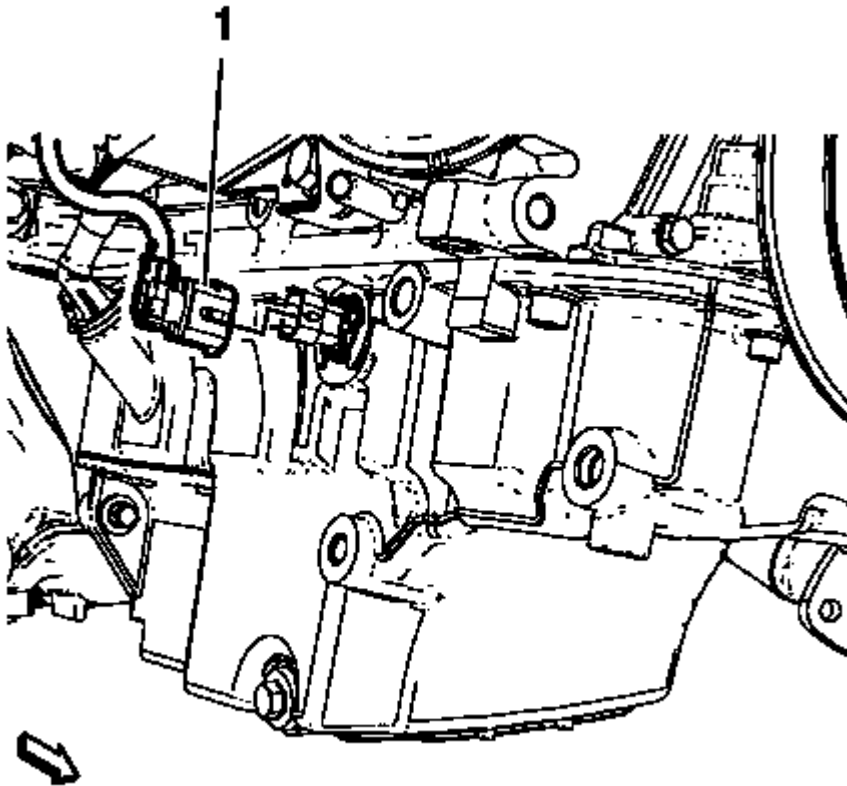
### Special Tools

- **DT-48254** Installer
- **EN-37228** Separation Tool
- **EN-50956** GR-6 Arnold Drive Bit

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

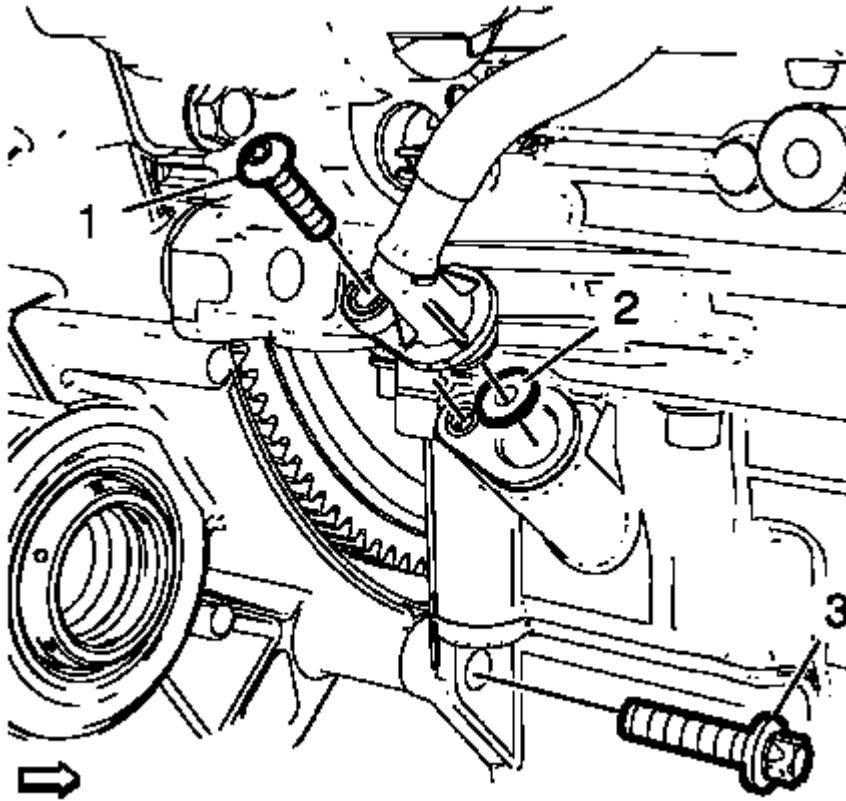
**Removal Procedure**

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the front compartment insulator. Refer to **Front Compartment Insulator Replacement** .
3. Remove the three way catalytic converter. Refer to **Three-Way Catalytic Converter Replacement** .
4. Remove the front wheel drive intermediate shaft. Refer to **Front Wheel Drive Intermediate Shaft Replacement** .
5. Remove the front wheel drive intermediate shaft bracket. Refer to **Front Wheel Drive Intermediate Shaft Bracket Replacement** .
6. Drain the engine oil. Refer to **Engine Oil and Oil Filter Replacement**.



**Fig. 130: Engine Oil Level Sensor Wiring Harness Plug**  
**Courtesy of GENERAL MOTORS COMPANY**

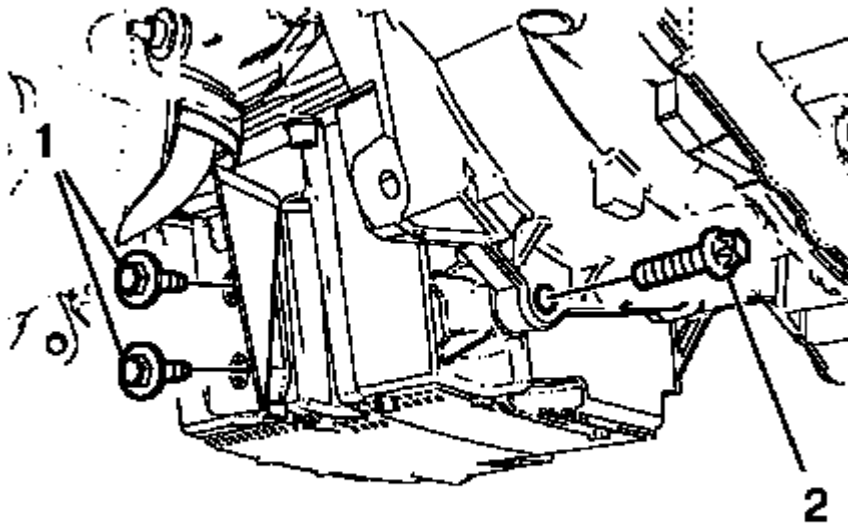
7. Disconnect the engine oil level sensor wiring harness plug (1).



**Fig. 131: Positive Crankcase Ventilation Tube Bolt And Transmission Bolt**  
Courtesy of GENERAL MOTORS COMPANY

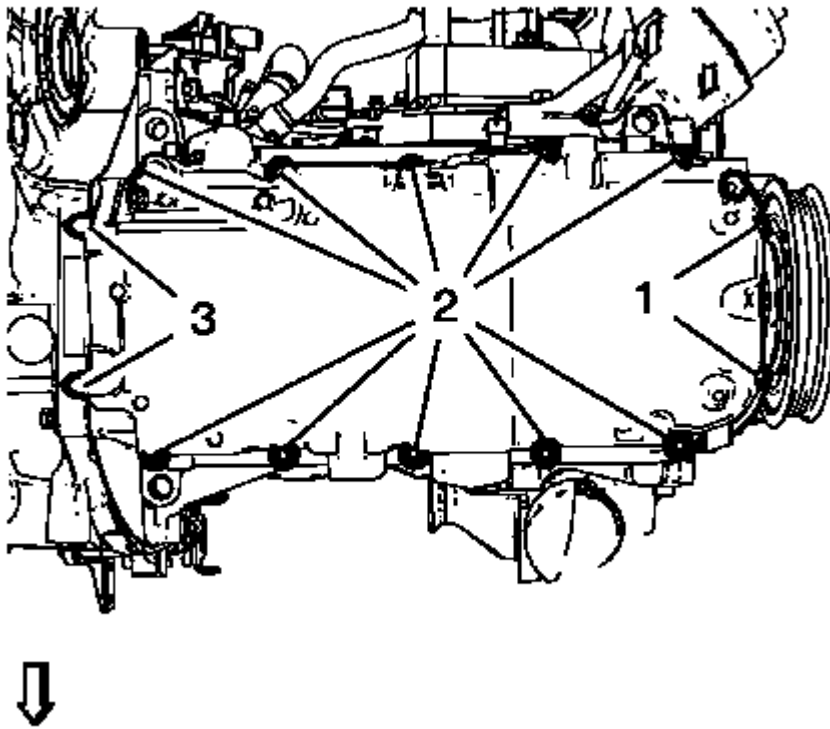
**NOTE:** Using a small rotary cutter tool, cut a slot in the head of the bolt. Use an impact driver or similar device to overcome the initial resistance to loosen the bolt.

8. Remove and DISCARD the positive crankcase ventilation tube bolt (1) and hang the tube aside.
9. Remove and DISCARD the positive crankcase ventilation tube seal ring. Replace with a NEW seal ring.
10. Remove the transmission bolt (3).
11. Remove the engine oil heater. Refer to **Engine Oil Heater Replacement**.



**Fig. 132: Catalytic Converter Brace Bracket Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

12. Remove the 2 catalytic converter brace bracket bolts (1).
13. Remove the transmission bolt (2).

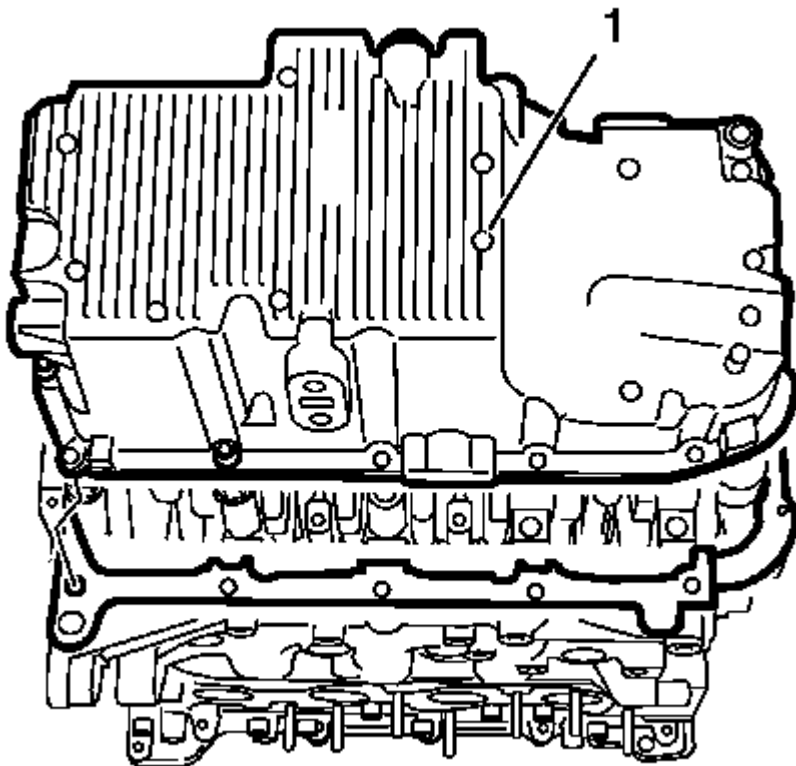


**Fig. 133: Oil Pan Bolts**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Mark the position of the oil pan bolts because of different length.

14. Remove the 2 oil pan front bolts (1) by using the M6 short wrench.
15. Remove the two access plugs at the transmission bellhousing. Remove the 2 oil pan rear bolts (3) using the M6 long wrench.
16. Remove the 10 oil pan bolts (2) using the M8 long wrench.



**Fig. 134: Oil Pan Front Bolts**

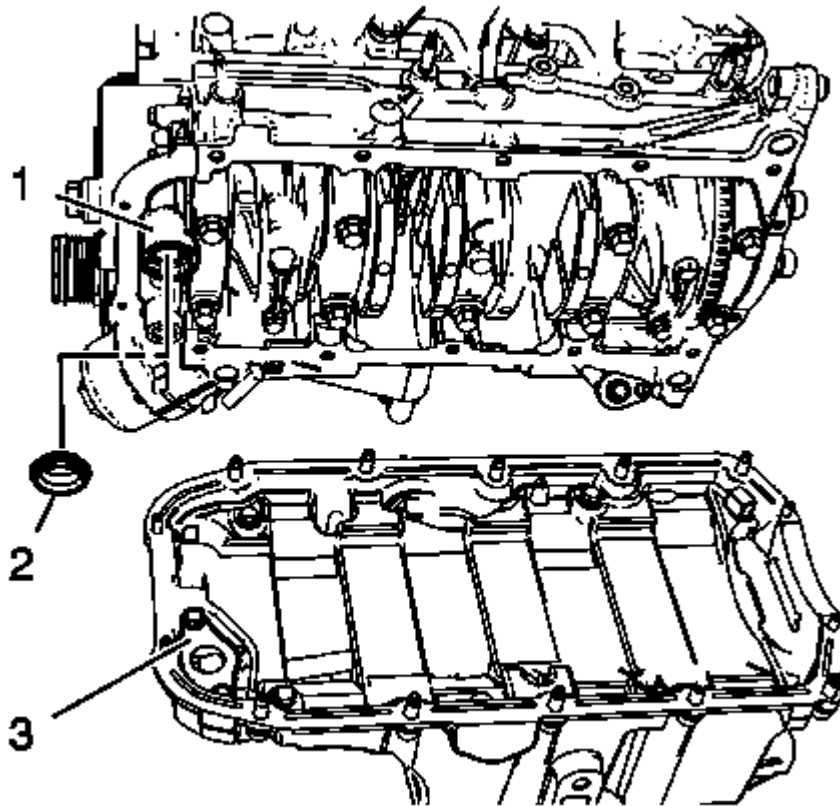
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Use a suitable tool.

**NOTE:** Be careful with oil pan sealing surfaces.

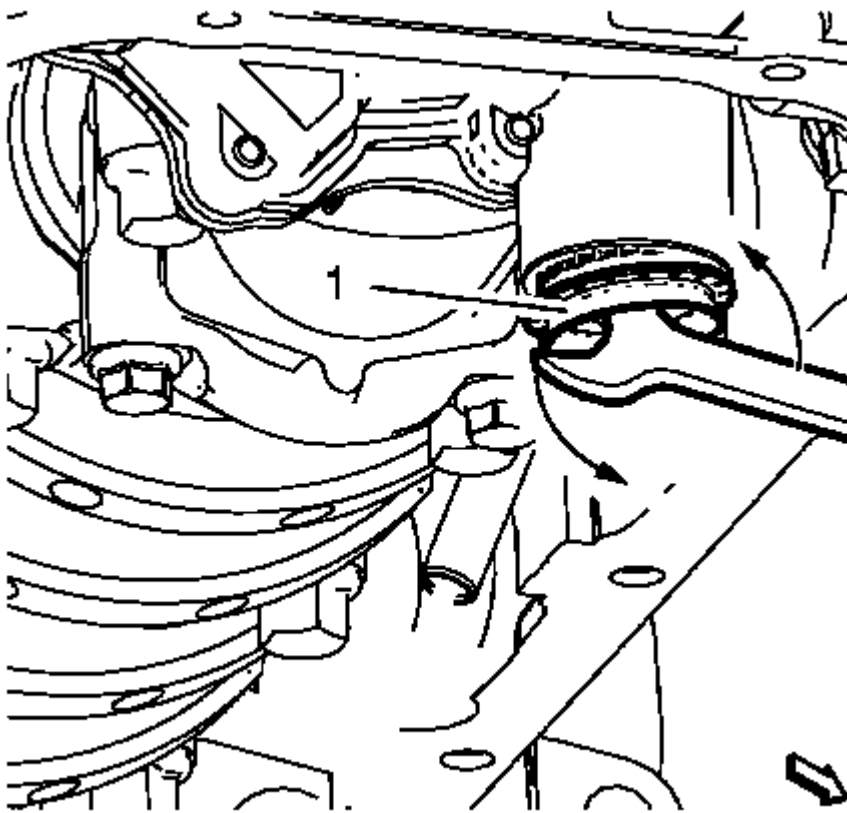
17. Remove the oil pan (1) using the EN-37228 separating tool.





**Fig. 135: Oil Pump Seal Ring And Oil Pump**  
Courtesy of GENERAL MOTORS COMPANY

18. Remove the oil pump seal ring (2) from the oil pump (1).



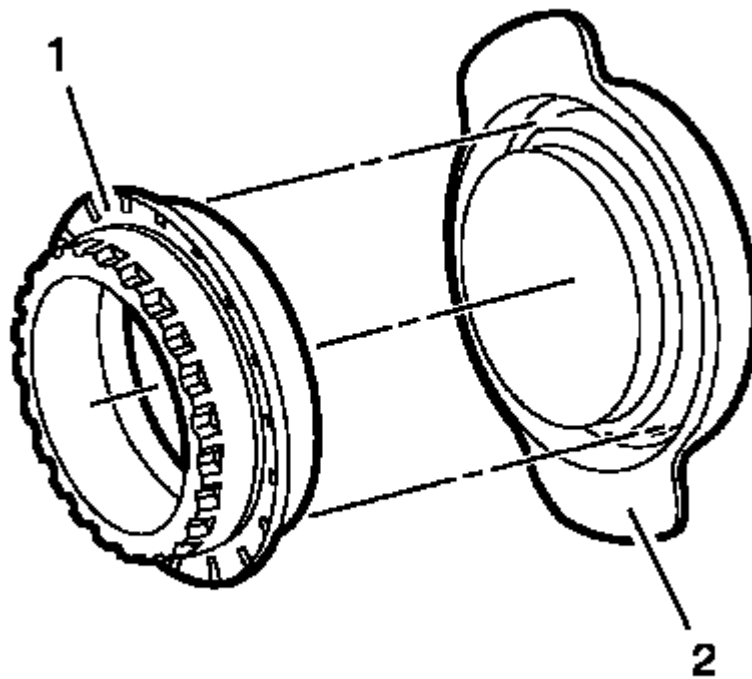
**Fig. 136: Removing Seal Ring**

Courtesy of GENERAL MOTORS COMPANY

19. Remove and DISCARD the seal ring (1), using a suitable tool.
20. Disassemble the oil pan. Refer to **Oil Pan Disassemble** .

#### Installation Procedure

1. Assemble the oil pan. Refer to **Oil Pan Assemble** .

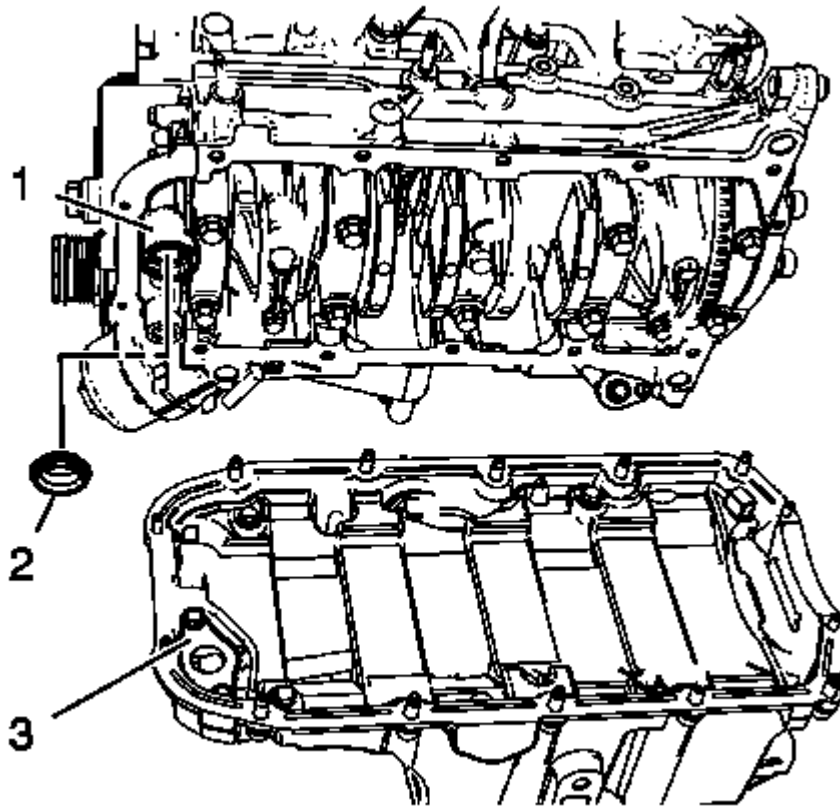


**Fig. 137: Red Cap And Pipe Gasket**

Courtesy of GENERAL MOTORS COMPANY

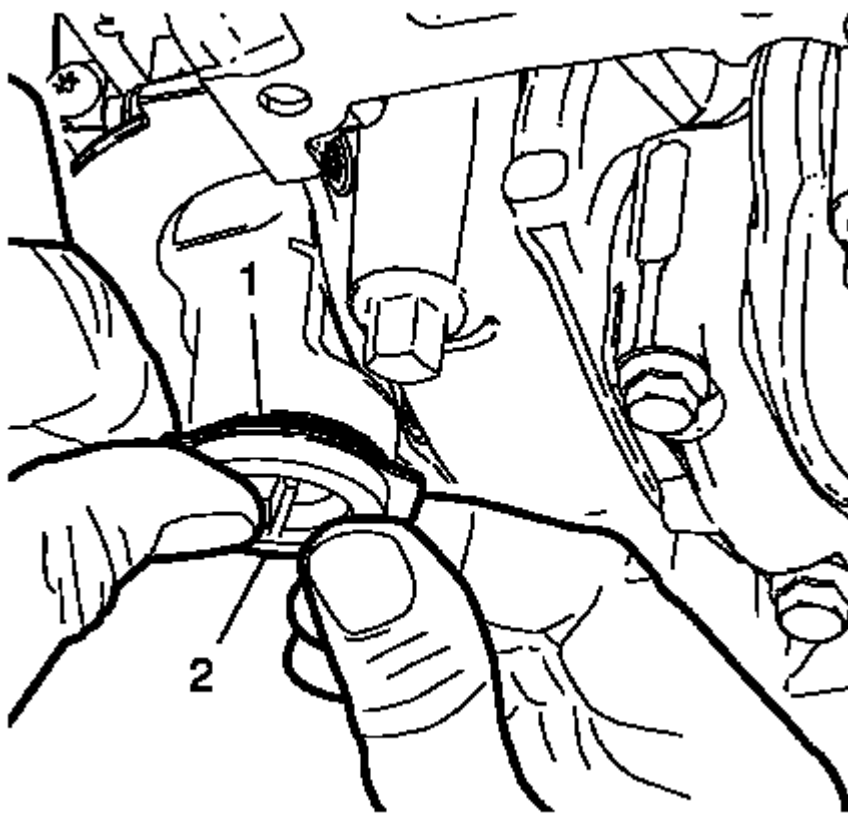
**NOTE:** The red cap (2) is included in delivery of the new oil suction seal ring.

2. Install the NEW suction pipe gasket (1) to the provided red cap (2).



**Fig. 138: Oil Pump Seal Ring And Oil Pump**  
Courtesy of GENERAL MOTORS COMPANY

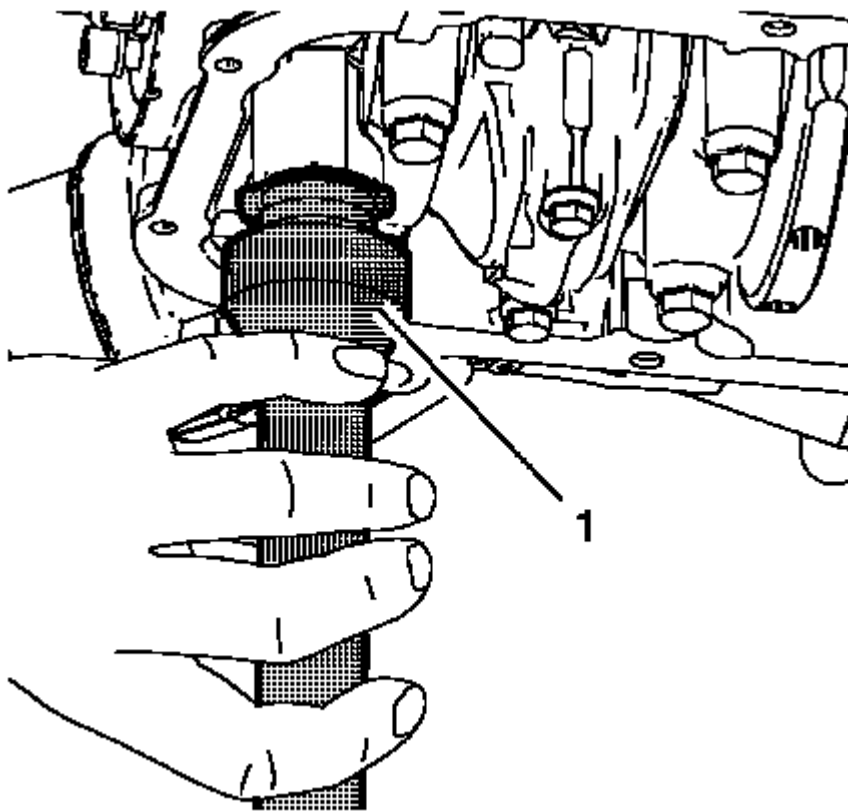
3. Install a NEW oil pump sealing (2) to the oil pump (1).



**Fig. 139: Suction Pipe Seal Ring**

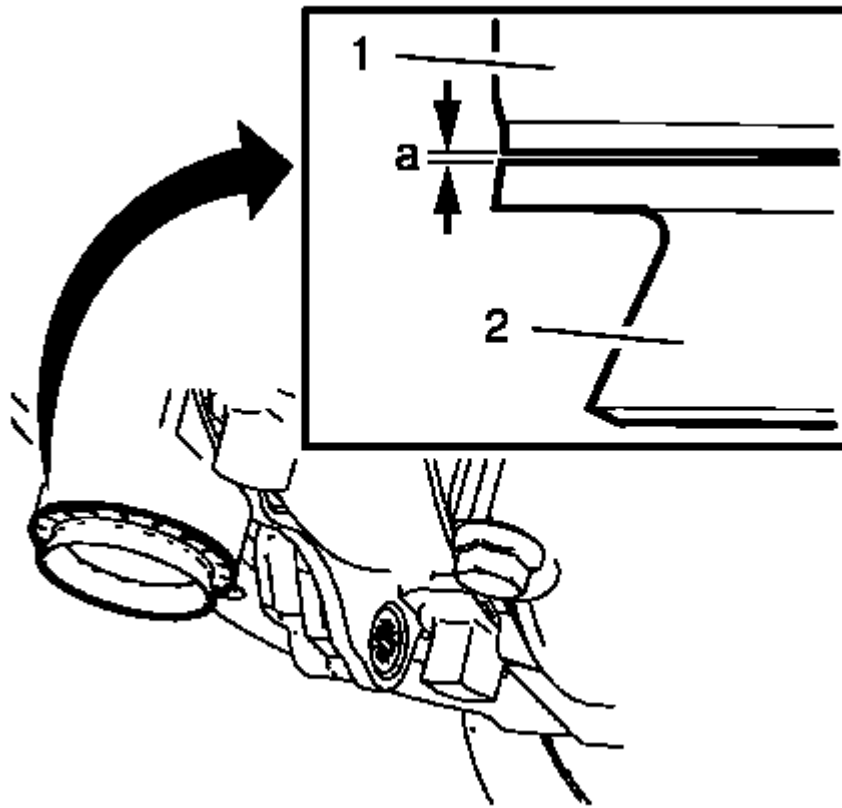
Courtesy of GENERAL MOTORS COMPANY

4. Install the NEW suction pipe seal ring (1) by means of the provided red cap (2).



**Fig. 140: Removing Red Cap From Suction Pipe Seal Ring**  
Courtesy of GENERAL MOTORS COMPANY

5. Using the **DT-48254** installer (1), apply an easy hammer hit to ensure a proper seat of the suction pipe seal ring.
6. Remove the red cap from the suction pipe seal ring.



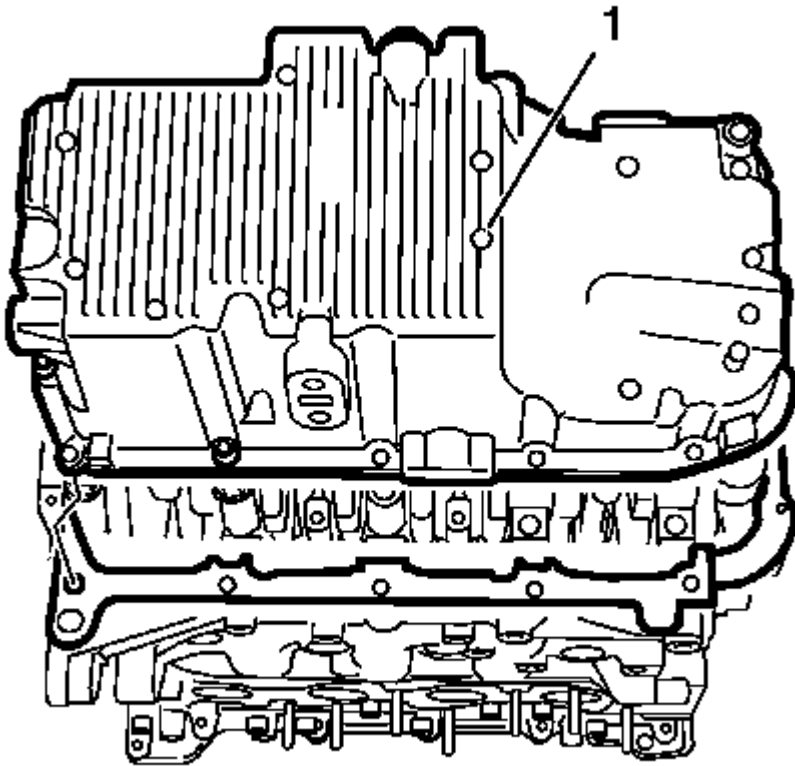
**Fig. 141: Oil Pump And Seal Ring**

Courtesy of GENERAL MOTORS COMPANY

7. Check the proper installation position of the suction pipe seal ring. The gap between the oil pump (1) and the seal ring (2) has to be constant and less than 0.5 mm (0.02 in).

**NOTE:**        **Ensure that the oil pan sealing surfaces are clear of oil, grease and oil gasket material.**

8. Clean the sealing surface from the oil pump suction pipe (3).
9. Clean the oil pan sealing surface.



**Fig. 142: Oil Pan Front Bolts**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** DO NOT coat sealant on the oil pan bolt holes, it could block the oil pan bolt threads or the engine block.

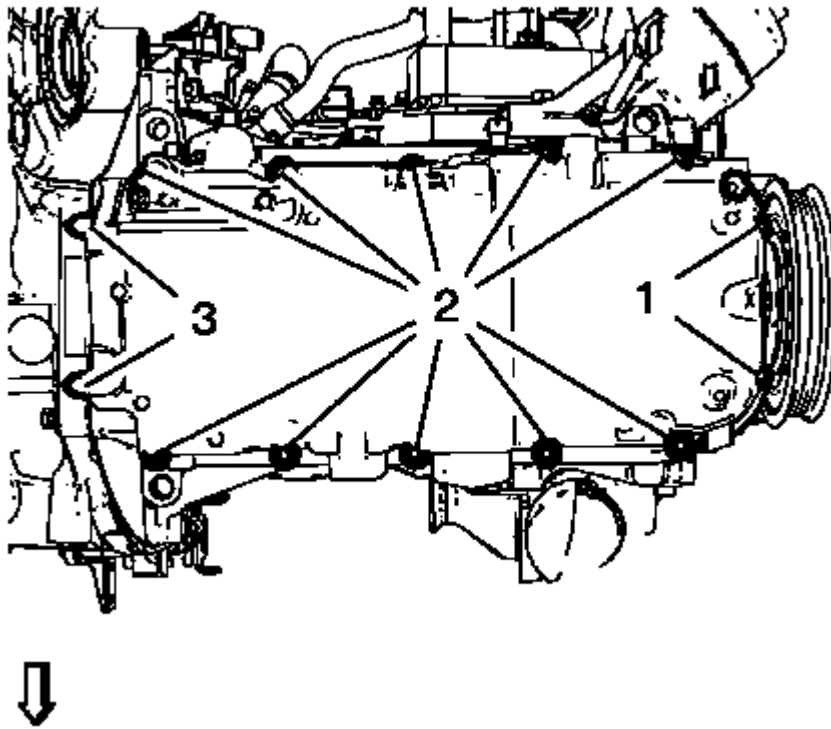
**NOTE:** Refer to Adhesives, Fluids, Lubricants and Sealers to find a suitable sealing compound.

10. Coat the oil pan sealing surface with a suitable sealing compound. The thickness of the sealing bead should be 2 mm (0.0787 in).

**NOTE:** The installation procedure should be done in 10 minutes.

11. Install the oil pan (1).

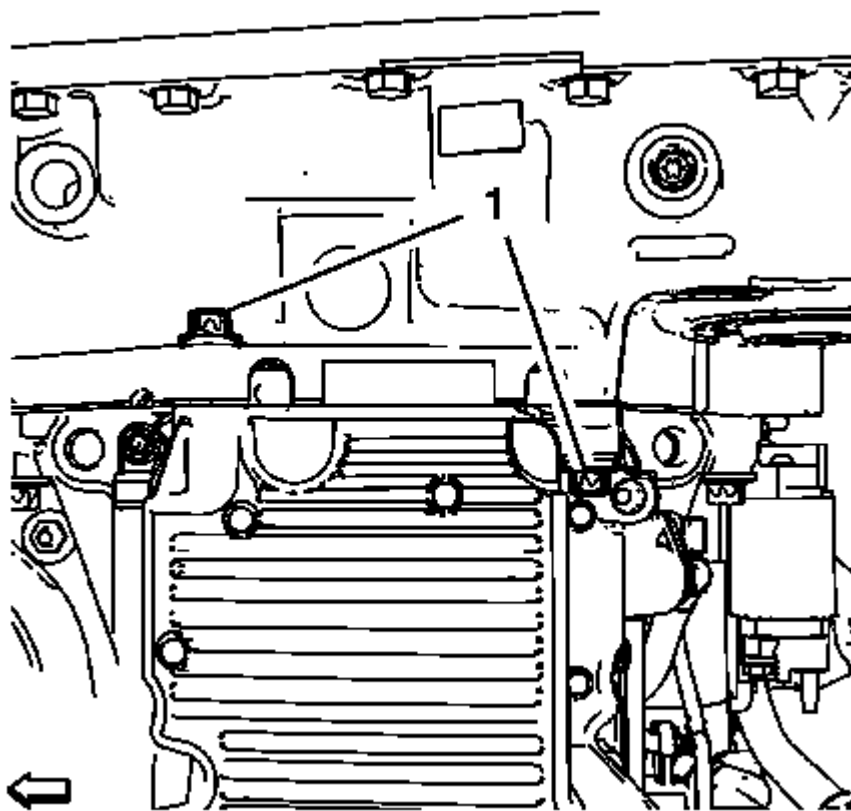




**Fig. 143: Oil Pan Bolts**

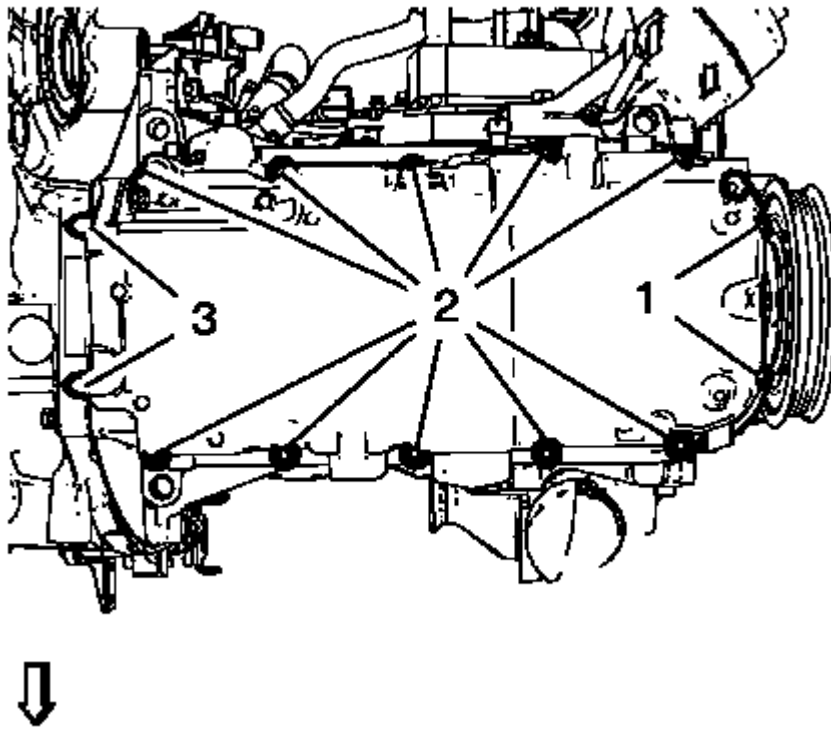
Courtesy of GENERAL MOTORS COMPANY

12. Install the 10 oil pan bolts (2) by using the M8 long wrench and loosely tighten.
13. Install the 2 oil pan rear bolts (3) using the M6 long wrench.
14. Install the 2 oil pan front bolts (1) by using the M6 short wrench and loosely tighten.



**Fig. 144: Installing Oil Pan To Transmission Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

15. Install the oil pan to transmission bolts (1) and loosely tighten.

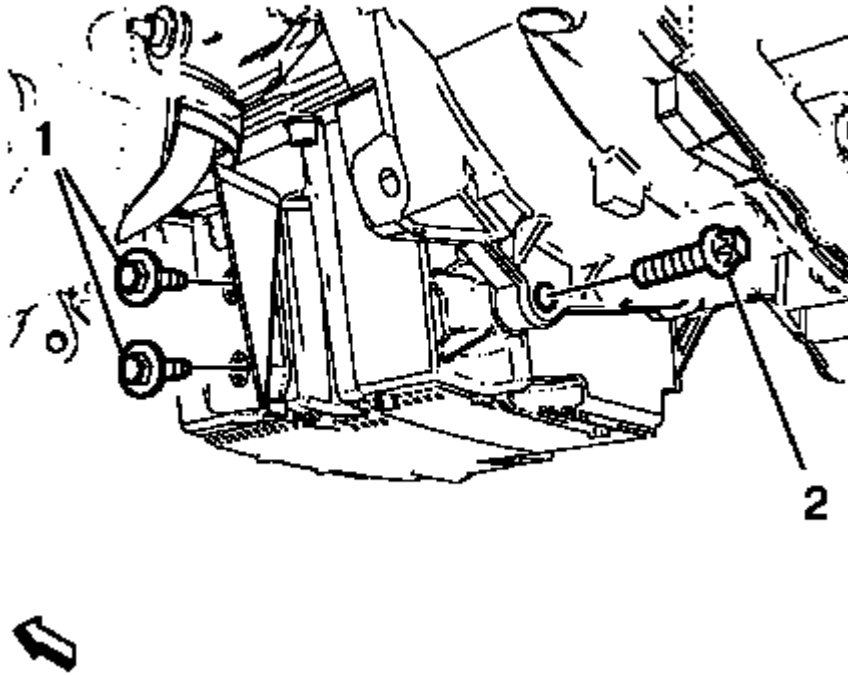


**Fig. 145: Oil Pan Bolts**

Courtesy of GENERAL MOTORS COMPANY

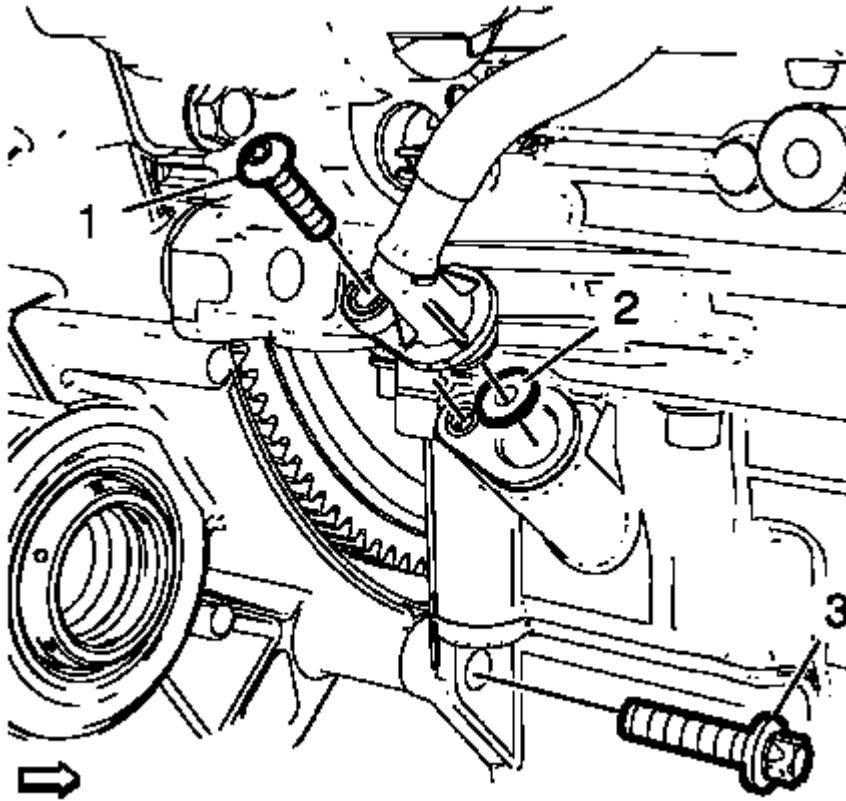
**CAUTION:** Refer to Fastener Caution .

16. Tighten the 10 M8 bolts and tighten to 25 (18 lb ft).
17. Tighten the 4 M6 bolts and tighten to 9 (80 lb in).
18. Install the 2 access plugs to the transmission bellhousing.



**Fig. 146: Catalytic Converter Brace Bracket Bolts**  
Courtesy of GENERAL MOTORS COMPANY

19. Install the 2 catalytic converter brace bracket bolts (1) and tighten to 20 (15 lb ft).
20. Install the transmission bolt (2) and tighten to 40 (30 lb ft).
21. Install the engine oil heater. Refer to **Engine Oil Heater Replacement**.

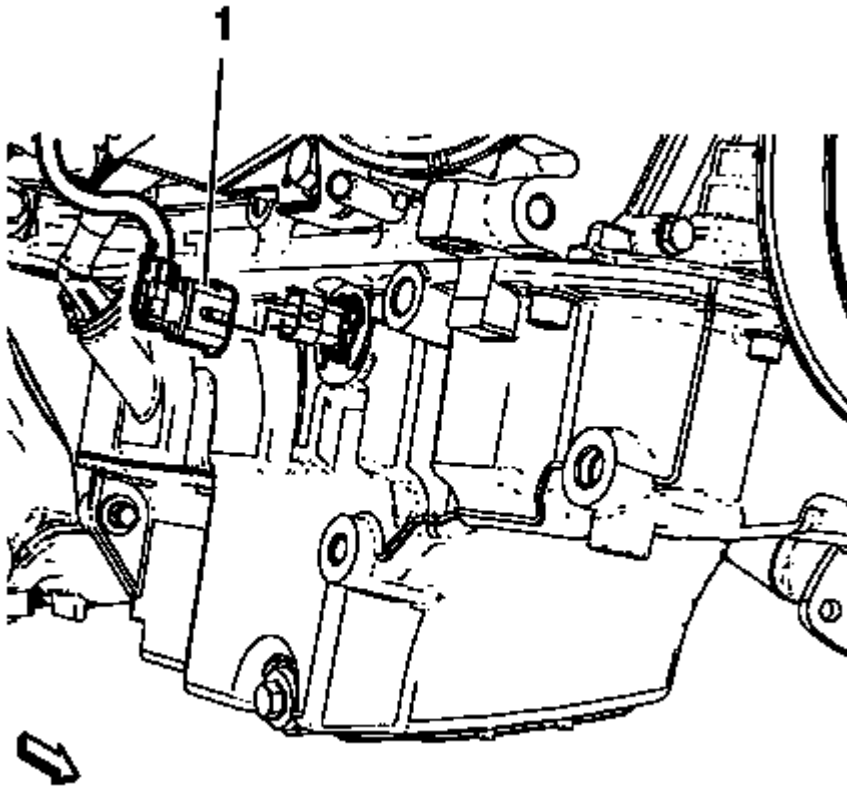


**Fig. 147: Positive Crankcase Ventilation Tube Bolt And Transmission Bolt**  
Courtesy of GENERAL MOTORS COMPANY

22. Install a NEW seal ring (2) to the positive crankcase ventilation tube.

**NOTE:** Current laws require these fasteners to only be replaced with new tamper resistant fasteners identified specifically for this component. Refer to the Electronic Parts Catalog.

23. Install the positive crankcase ventilation tube bolt (1), using **EN-50956** bit and tighten to 9 (80 lb in).
24. Install the transmission bolt (3) and tighten to 40 (30 lb ft).



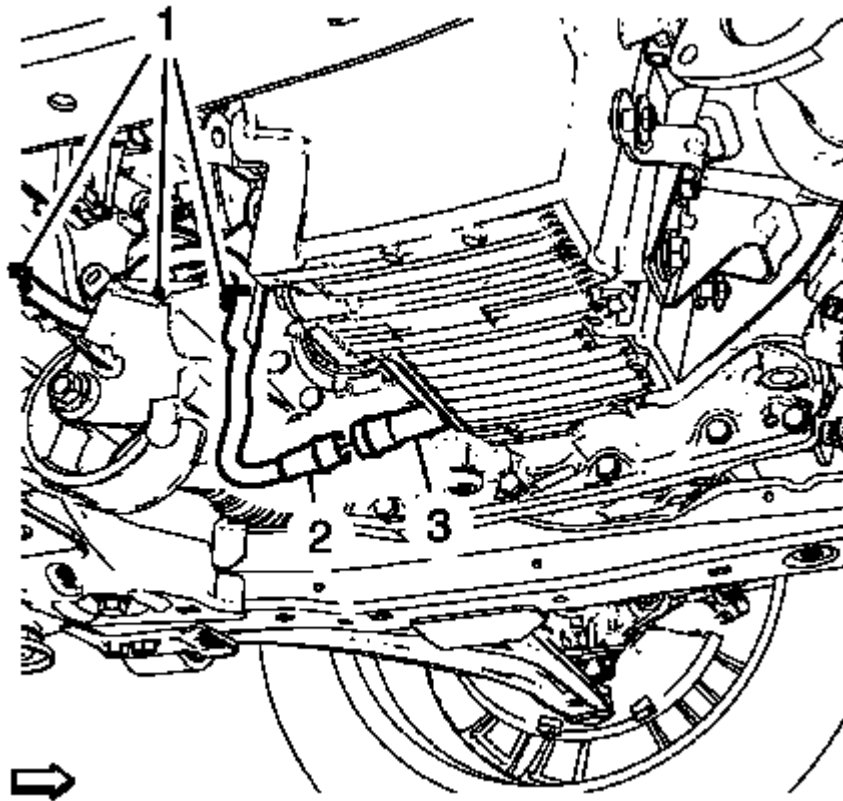
**Fig. 148: Engine Oil Level Sensor Wiring Harness Plug**  
Courtesy of GENERAL MOTORS COMPANY

25. Connect the engine oil level sensor wiring harness plug (1).
26. Install the front wheel drive intermediate shaft bracket. Refer to **Front Wheel Drive Intermediate Shaft Bracket Replacement**.
27. Install the front wheel drive intermediate shaft. Refer to **Front Wheel Drive Intermediate Shaft Replacement**.
28. Install the three way catalytic converter. Refer to **Three-Way Catalytic Converter Replacement**.
29. Install the front compartment insulator. Refer to **Front Compartment Insulator Replacement**.
30. Lower the vehicle.
31. Refill the engine oil. Refer to **Engine Mechanical Specifications**.

## ENGINE OIL HEATER POWER CABLE REPLACEMENT

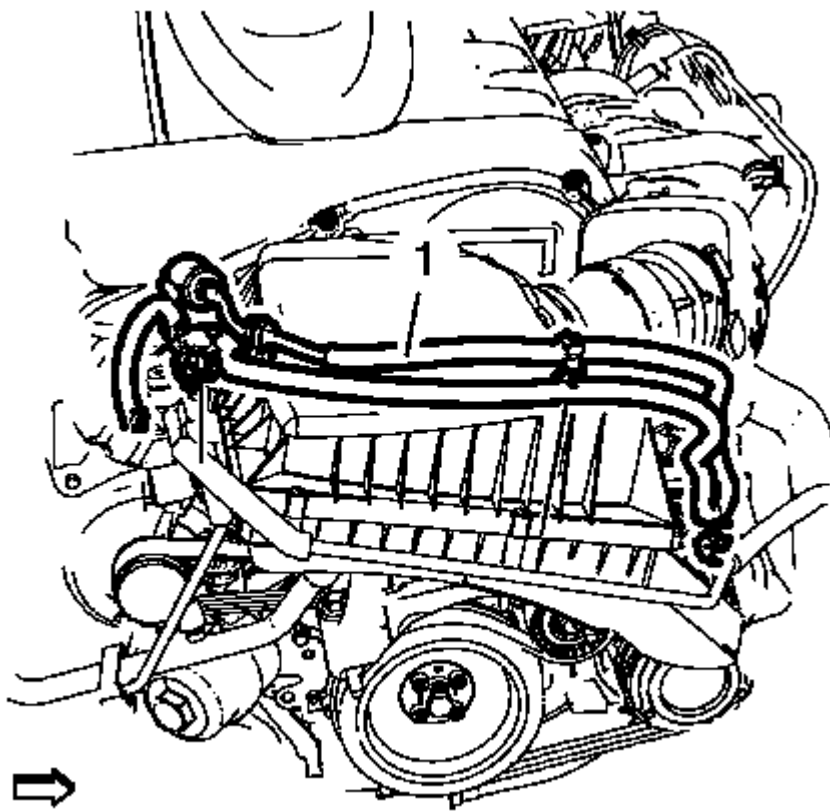
### Removal Procedure

1. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection**.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
3. Remove the front compartment insulator. Refer to **Front Compartment Insulator Replacement**.



**Fig. 149: Engine Oil Heater Power Cable Plug And Engine Oil Heater**  
**Courtesy of GENERAL MOTORS COMPANY**

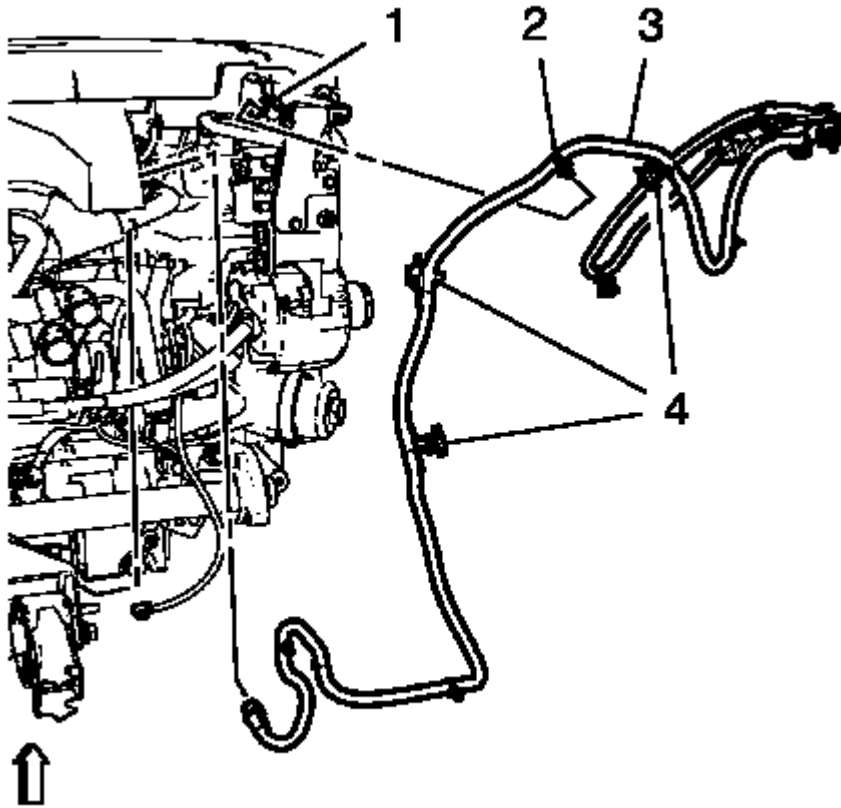
4. Remove the 3 mount wire tie clips (1).
5. Disconnect the engine oil heater power cable plug (2) from the engine oil heater (3).
6. Lower the vehicle.



**Fig. 150: Engine Oil Heater Power Cable**  
Courtesy of GENERAL MOTORS COMPANY

7. Loosen the engine oil heater power cable (1). Loosen the retainers.





**Fig. 151: Mount Wire Tie Clip And Bracket**  
Courtesy of GENERAL MOTORS COMPANY

8. Remove the mount wire tie clip (2) from the bracket (1).
9. Unclip the retainers (4).
10. Remove the engine oil heater power cable (3).

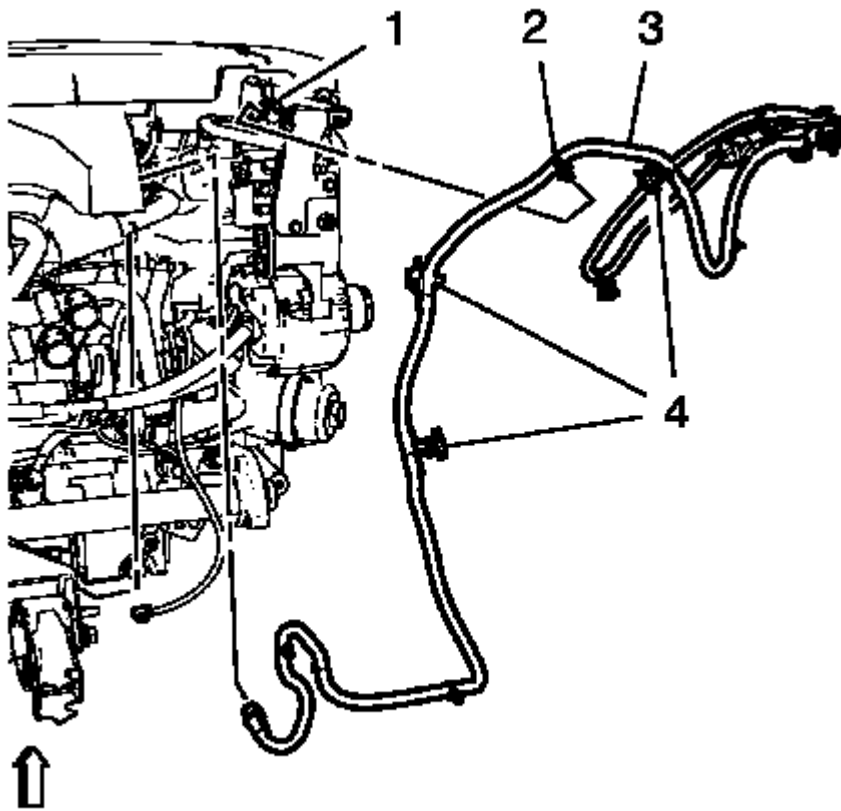
**NOTE:** Mark the original mounting position of the mount wire tie clips and the retainers.

11. Transfer the mount wire tie clips and retainers as necessary.

#### Installation Procedure

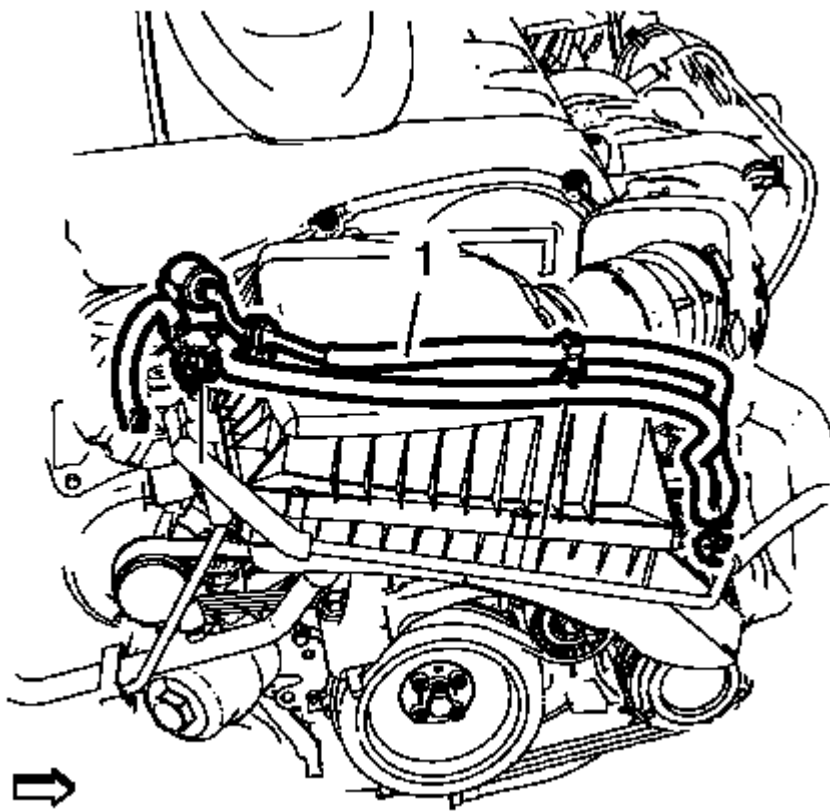
**NOTE:** Note the original installation position of the mount wire tie clips and retainers.

1. Install the mount wire tie clips and retainers as necessary.



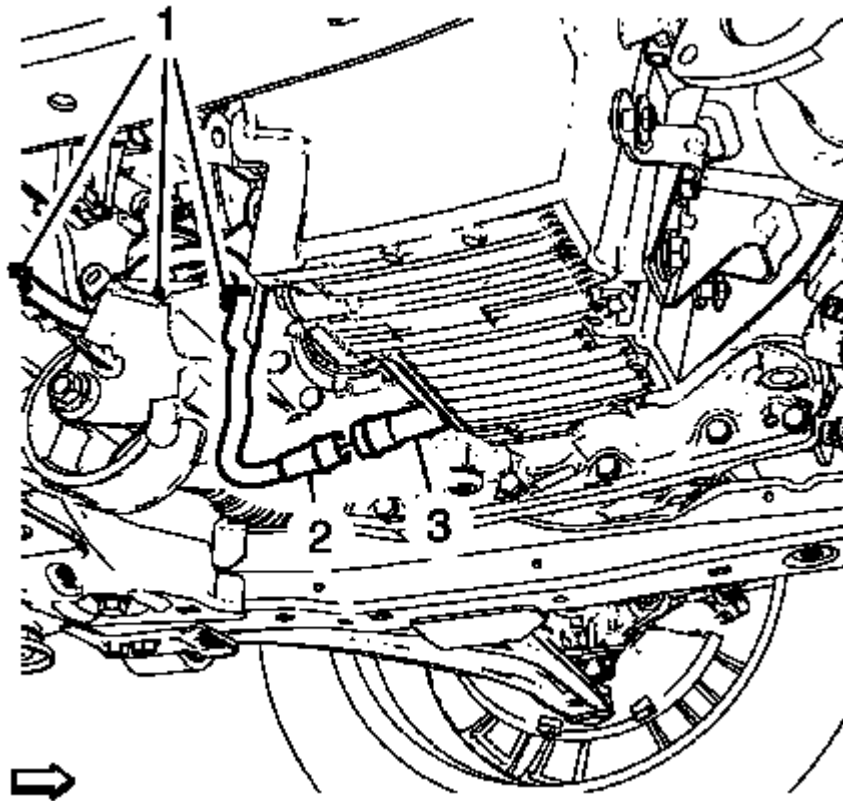
**Fig. 152: Mount Wire Tie Clip And Bracket**  
**Courtesy of GENERAL MOTORS COMPANY**

2. Install the engine oil heater power cable (3).
3. Install the engine oil heater power cable (3) to the retainers (4).
4. Install the mount wire tie clip (2) to the bracket (1).



**Fig. 153: Engine Oil Heater Power Cable**  
Courtesy of GENERAL MOTORS COMPANY

5. Position the engine oil heater power cable (1). Fasten the retainers.
6. Raise the vehicle.



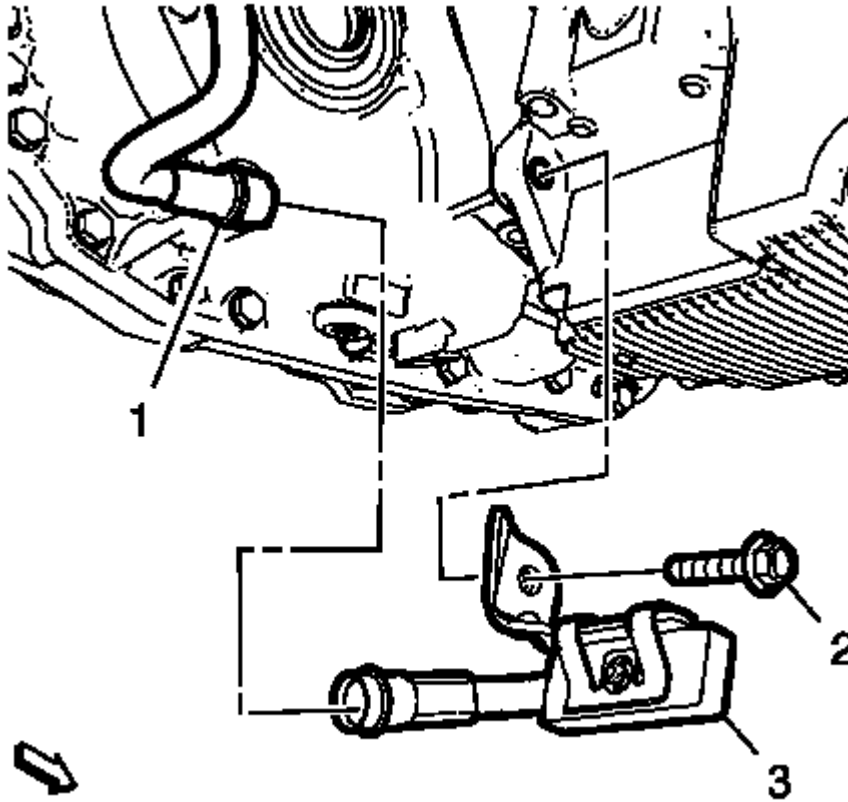
**Fig. 154: Engine Oil Heater Power Cable Plug And Engine Oil Heater**  
Courtesy of GENERAL MOTORS COMPANY

7. Install the 3 mount wire tie clips (1).
8. Connect the engine oil heater power cable plug (2) to the engine oil heater (3).
9. Install the front compartment insulator. Refer to **Front Compartment Insulator Replacement** .
10. Lower the vehicle.
11. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection** .

## ENGINE OIL HEATER REPLACEMENT

### Removal Procedure

1. Remove the front compartment insulator. Refer to **Front Compartment Insulator Replacement** .



**Fig. 155: Engine Oil Heater Bolt**

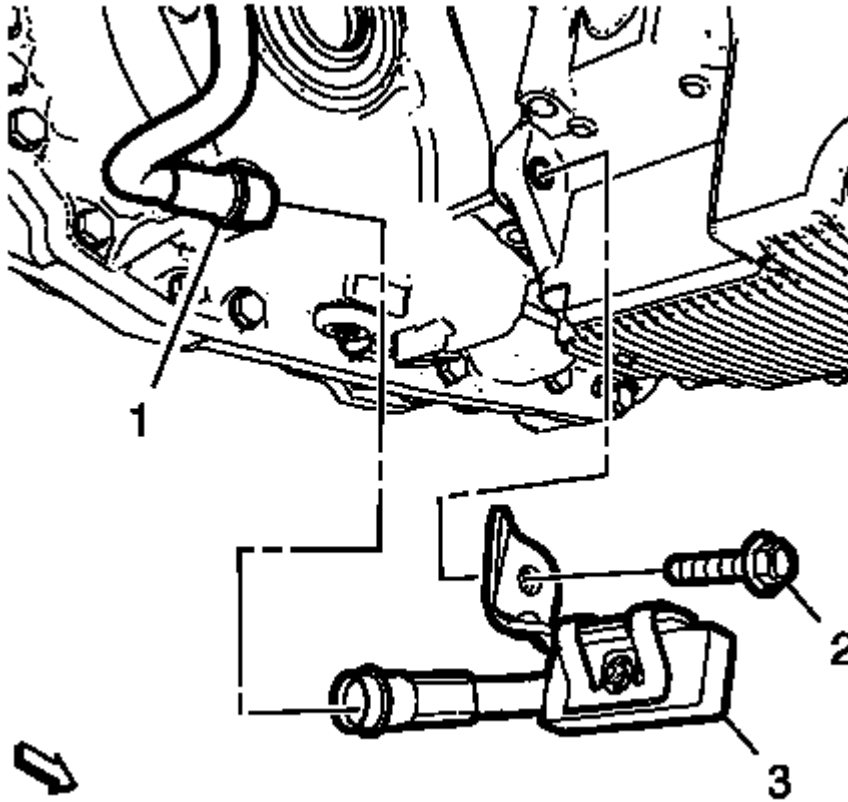
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the wiring harness (1).
3. Remove the engine oil heater bolt (2).

**NOTE:** The heater may be stuck to the oil pan from the thermal paste between the oil pan and heater.

4. Remove the engine oil heater (3).

#### Installation Procedure



**Fig. 156: Engine Oil Heater Bolt**

Courtesy of GENERAL MOTORS COMPANY

1. Coat the oil pan heater with \*Elastosil® P12 thermal paste
2. Install the engine oil heater (3).

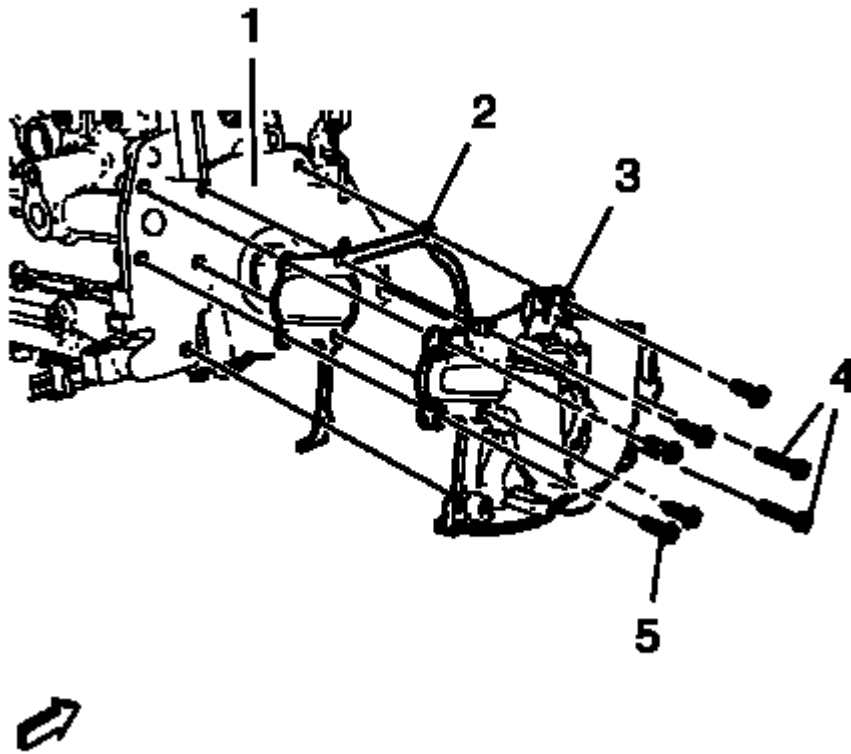
**CAUTION:** Refer to Fastener Caution .

3. Install the engine oil heater bolt (2) and tighten to 58 (43 lb ft).
4. Connect the wiring harness (1).
5. Install the front compartment insulator. Refer to Front Compartment Insulator Replacement .

## OIL PUMP REPLACEMENT

### Removal Procedure

1. Remove the timing belt. Refer to Timing Belt Replacement.
2. Remove the crankshaft sprocket. Refer to Crankshaft Sprocket Replacement.
3. Remove the oil pan. Refer to Oil Pan Replacement.
4. Disconnect the oil flow control solenoid valve electrical connector.



**Fig. 157: Oil Pump And Bolts**

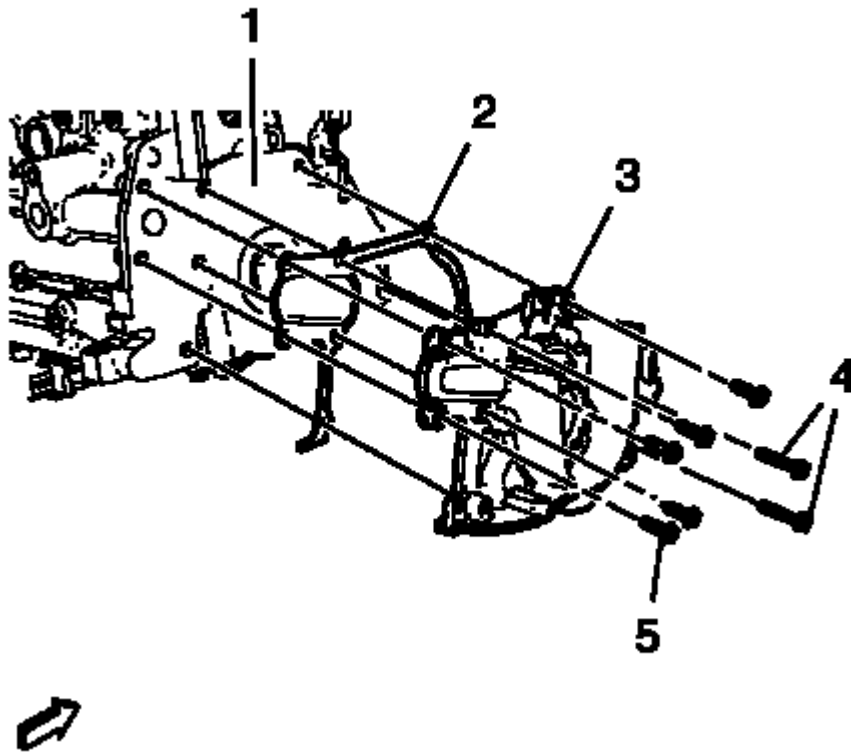
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Mark the position of the bolts because of the different length. Lower left bolt already removed during timing belt removal.

5. Remove the 5 short oil pump bolts (5) and the 2 long oil pump bolts (4).
6. Remove the oil pump (3) and the oil pump gasket (2) from the engine block (1).

#### Installation Procedure

1. Clean the threads and sealing surfaces.



**Fig. 158: Oil Pump And Bolts**

Courtesy of GENERAL MOTORS COMPANY

2. Install the oil pump (3) with a NEW oil pump gasket (2) to the engine block (1).

**CAUTION:** Refer to Fastener Caution .

**NOTE:** Use locking agent to the bolts. Lower left oil pump bolt will installed during timing belt installation.

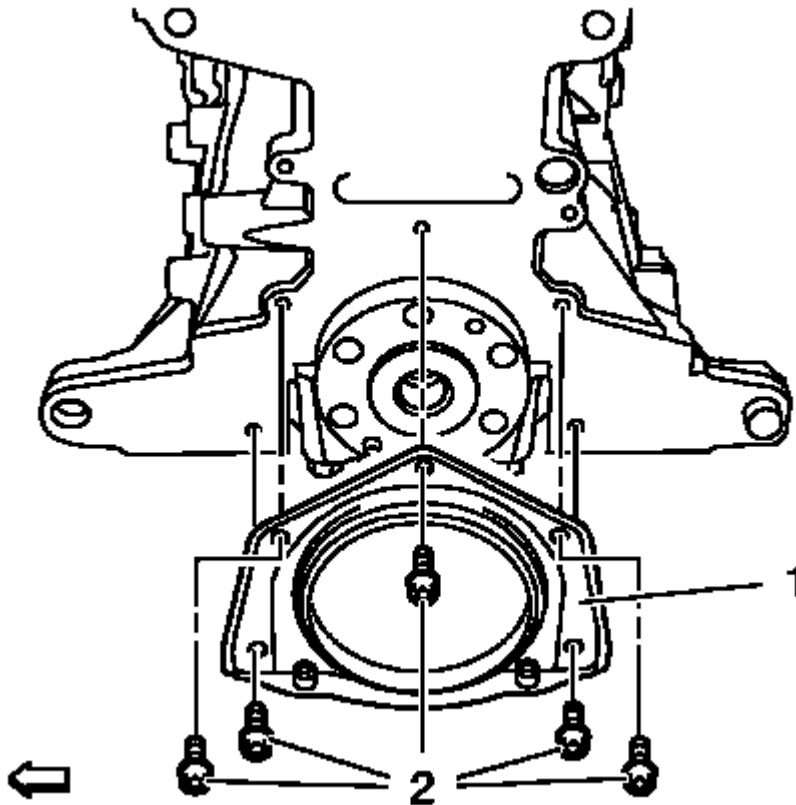
3. Install the 5 short oil pump bolts (5) and the 2 long oil pump bolts (4) and tighten to 9 (80 lb in).
4. Connect the oil flow control solenoid valve electrical connector.
5. Install the oil pan. Refer to Oil Pan Replacement.
6. Install the crankshaft sprocket. Refer to Crankshaft Sprocket Replacement.
7. Install the timing belt. Refer to Timing Belt Replacement.

## CRANKSHAFT REAR OIL SEAL REPLACEMENT

### Removal Procedure



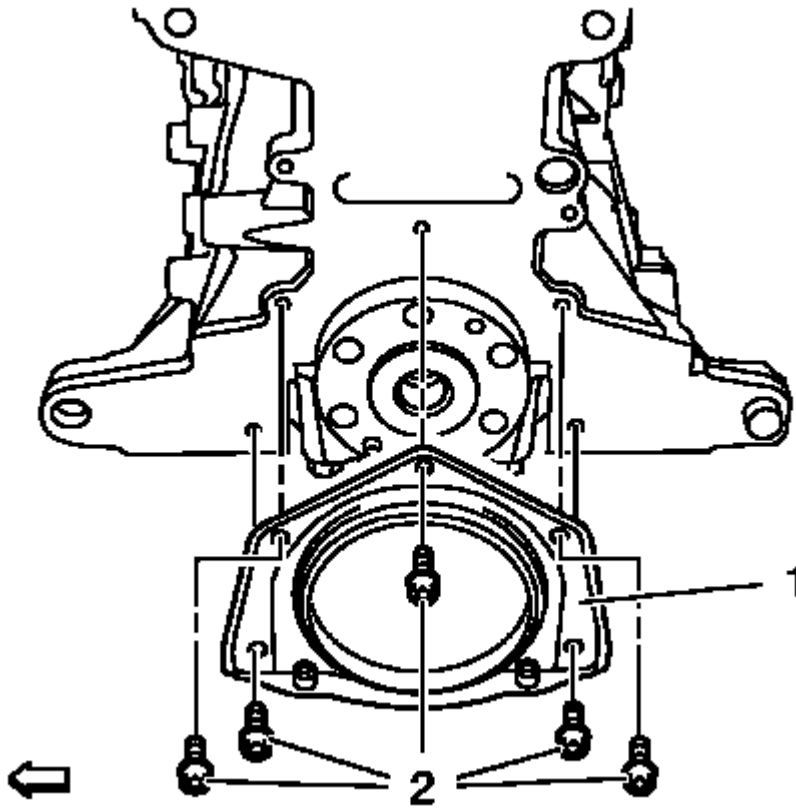
1. Remove the automatic transmission flex plate. Refer to [Automatic Transmission Flex Plate Replacement](#).
2. Remove the oil pan. Refer to [Oil Pan Replacement](#).



**Fig. 159: Crankshaft Real Oil Seal Bolts**  
Courtesy of GENERAL MOTORS COMPANY

3. Remove the 5 crankshaft real oil seal bolts (2).
4. Remove the crankshaft rear oil seal (1).

#### Installation Procedure



**Fig. 160: Crankshaft Rear Oil Seal Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW crankshaft rear oil seal (1).

**CAUTION:** Refer to Fastener Caution .

2. Install the 5 crankshaft rear oil seal bolts (2) and tighten to 9 N.m (80 lb in).
3. Install the oil pan. Refer to Oil Pan Replacement.
4. Install the automatic transmission flex plate. Refer to Automatic Transmission Flex Plate Replacement.

## CRANKSHAFT FRONT OIL SEAL REPLACEMENT

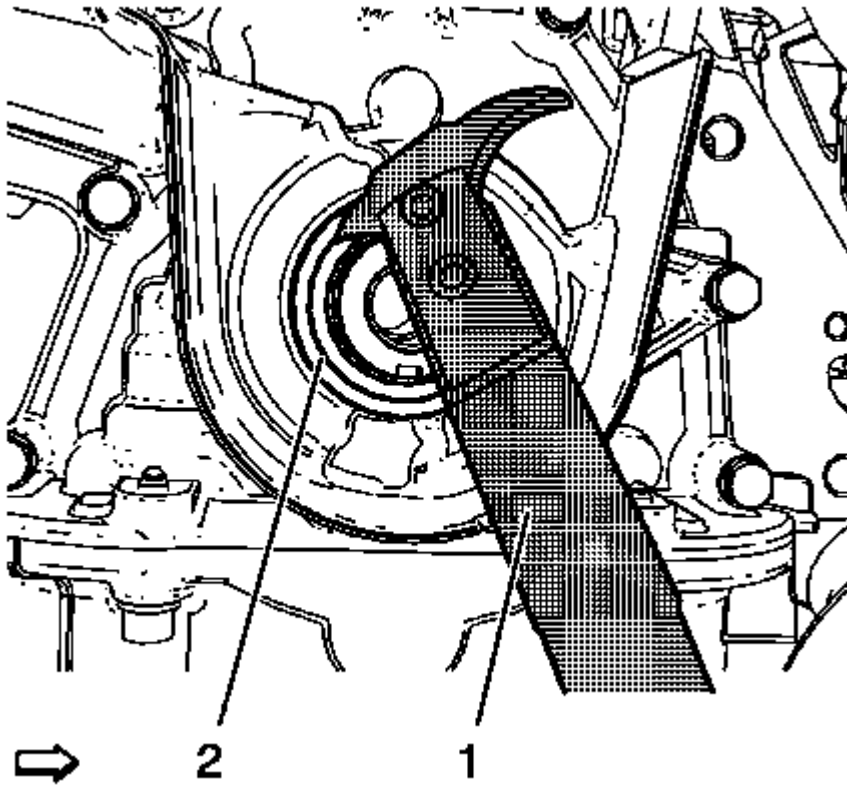
### Special Tools

- EN-45000 Seal Remover
- EN-46793 Installer

For equivalent regional tools, refer to Special Tools .

**Removal Procedure**

1. Open the hood.
2. Remove the crankshaft sprocket. Refer to Crankshaft Sprocket Replacement.



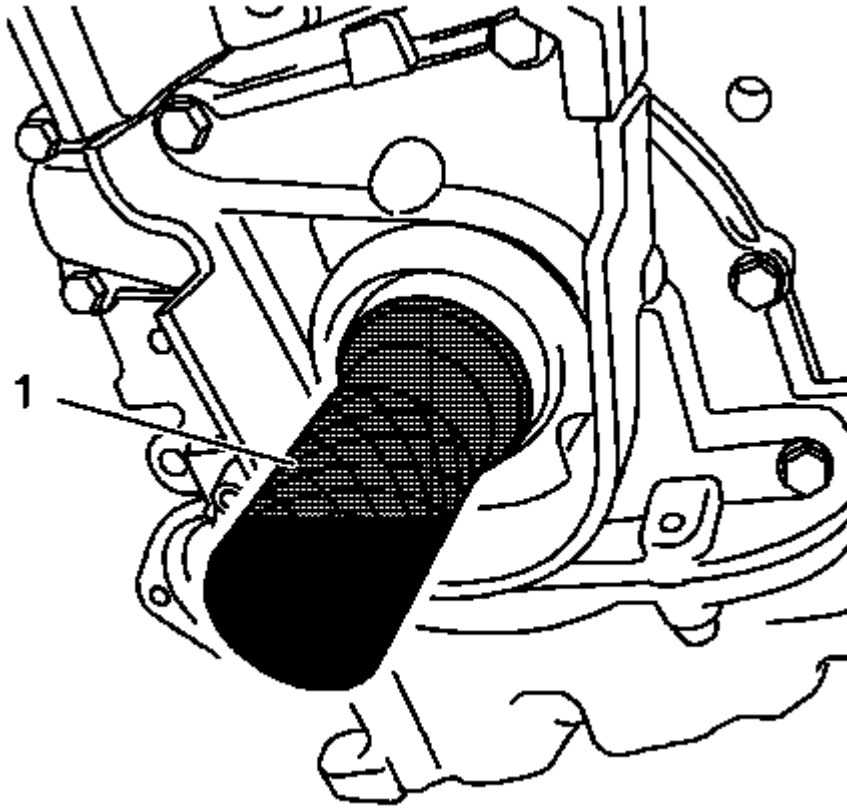
**Fig. 161: Placing Collecting Basin Underneath**  
Courtesy of GENERAL MOTORS COMPANY

3. Place a collecting basin underneath.

**NOTE:** DO NOT damage the sealing surface.

4. Install the **EN-45000** remover (1) to the crankshaft front oil seal (2).
5. Lever out the crankshaft front oil seal (2) by using **EN-45000** remover.

**Installation Procedure**



**Fig. 162: Cleaning Sealing Surface**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Clean the sealing surface.

**NOTE:** Moisten the crankshaft front oil seal ring with a little silicone grease.

1. Install a NEW crankshaft front oil seal to the crankshaft by using EN-46793 installer (1).
2. Install the crankshaft sprocket. Refer to **Crankshaft Sprocket Replacement**.
3. Close the hood.

## CRANKSHAFT SPROCKET REPLACEMENT

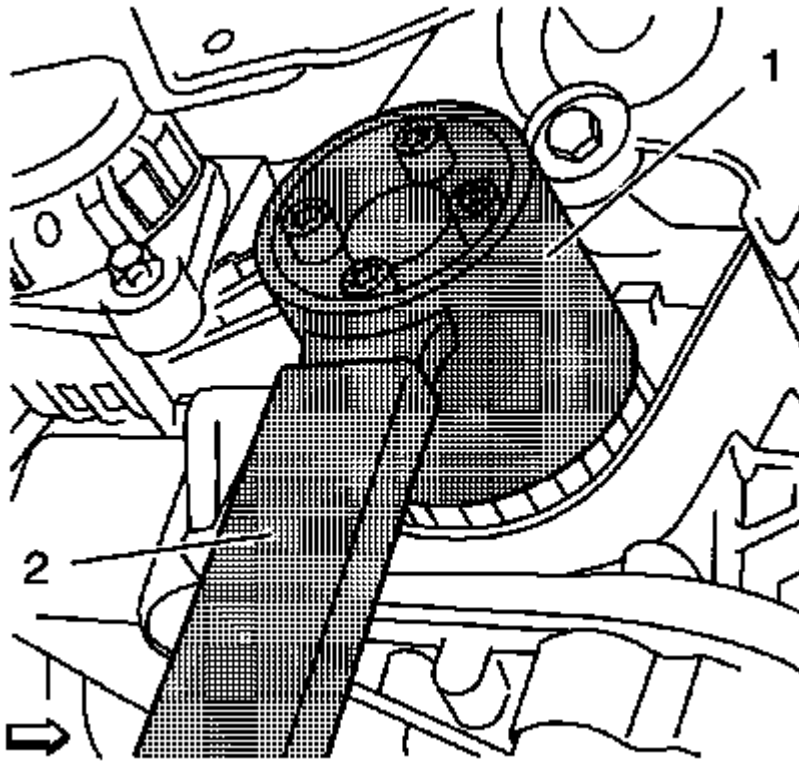
### Special Tools

- EN-956-1 Extension
- EN-47630 Crankshaft Holder

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

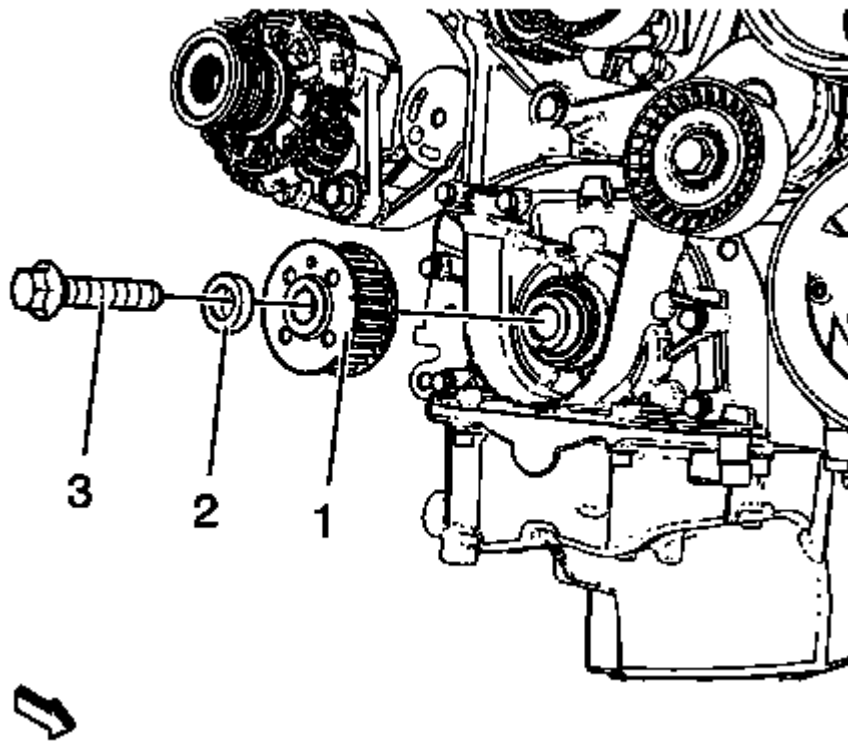
### Removal Procedure

1. Open the hood.
2. Remove the timing belt. Refer to **Timing Belt Replacement**.



**Fig. 163: Holder And Crankshaft Sprocket**  
Courtesy of GENERAL MOTORS COMPANY

3. Install the **EN-47630** holder (1) in combination with **EN-956-1** extension (2) to the crankshaft sprocket.

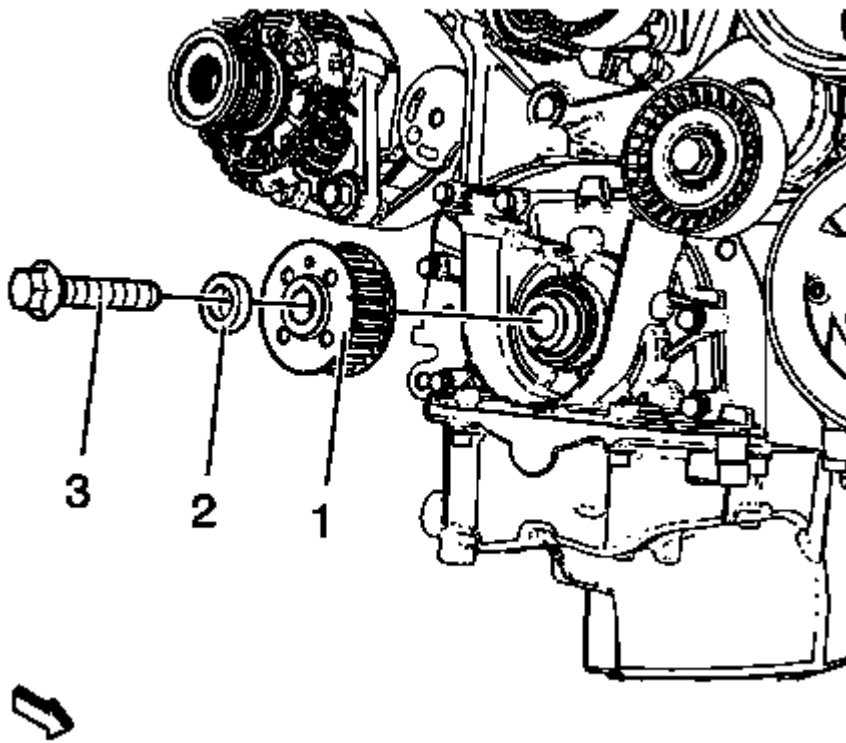


**Fig. 164: Crankshaft Sprocket Bolt And Spacer**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The bolt has left hand thread.

4. Remove the crankshaft sprocket bolt (3) and the spacer (2).
5. Remove the crankshaft sprocket (1) with the **EN-47630** holder.

#### Installation Procedure



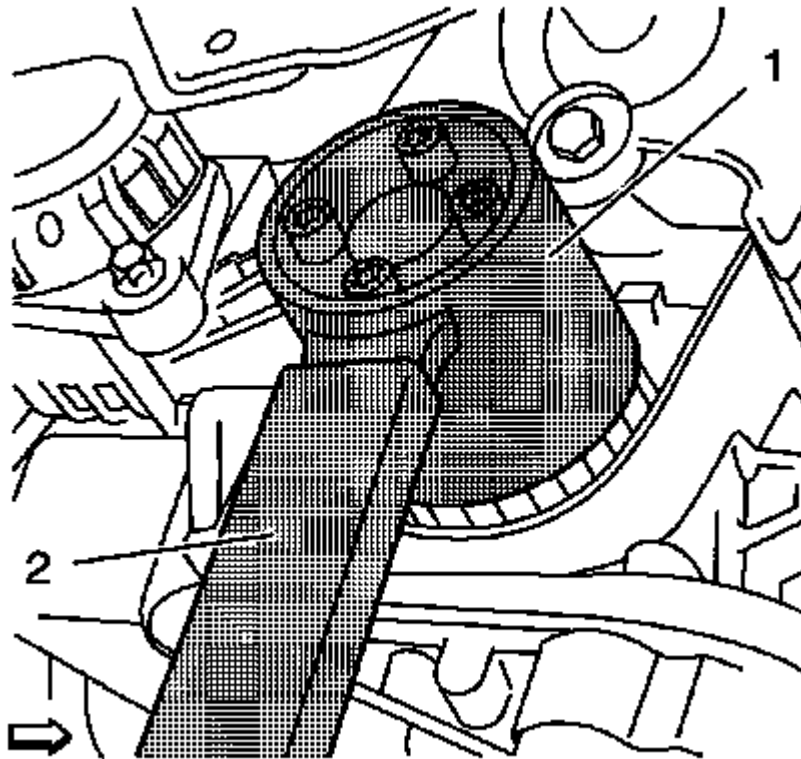
**Fig. 165: Crankshaft Sprocket Bolt And Spacer**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The crankshaft sprocket only fits in one position.

1. Install the crankshaft sprocket (1).
2. Install the crankshaft sprocket spacer (2).

**NOTE:** The bolt has left hand thread.

3. Install and handtighten the crankshaft sprocket bolt (3).



**Fig. 166: Holder And Crankshaft Sprocket**  
Courtesy of GENERAL MOTORS COMPANY

4. Install the **EN-47630** crankshaft holder (1) in combination with **EN-956-1** extension (2).

**CAUTION: Refer to Fastener Caution .**

5. Tighten the crankshaft sprocket bolt to 340 N.m (251 lb ft).
6. Remove the **EN-47630** holder (1) and the **EN-956-1** extension (2).
7. Install the timing belt. Refer to **Timing Belt Replacement**.
8. Close the hood.

## **OIL FILTER ADAPTER AND OIL COOLER ASSEMBLY REPLACEMENT**

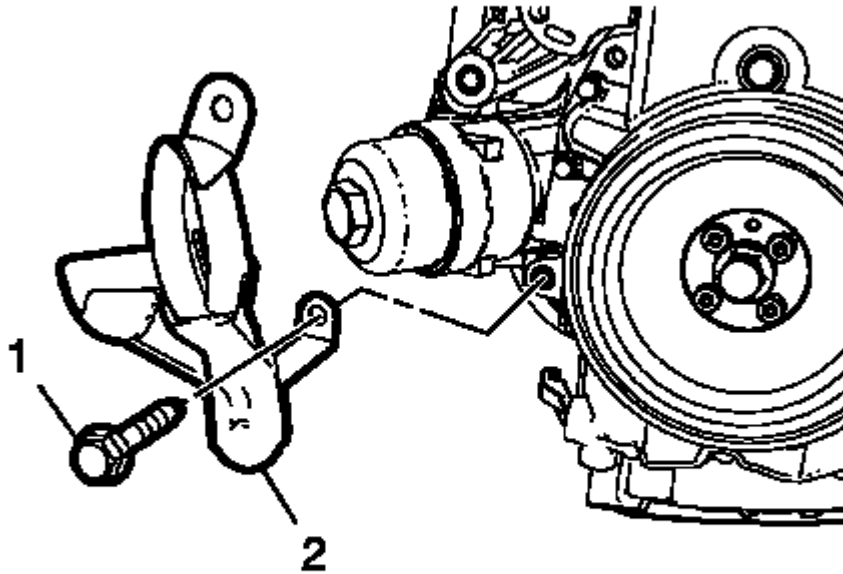
### **Removal Procedure**

1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .
2. Remove the generator. Refer to **Generator Replacement (2.0L Diesel LUZ)** .
3. Drain the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)** , **Cooling**



**System Draining and Filling (Static Fill) .**

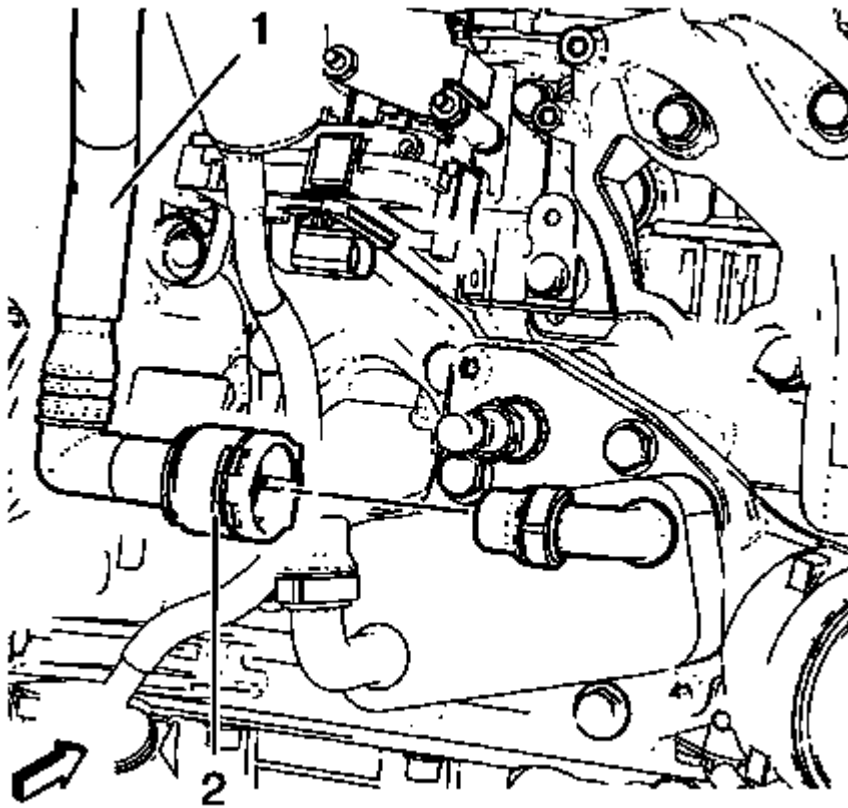
4. Drain the engine oil. Refer to **Engine Oil and Oil Filter Replacement**.
5. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .



**Fig. 167: Oil Filter Drain Deflector And Bolt**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The upper bolt already removed during the generator removal.

6. Remove the oil filter drain deflector bolt (1).
7. Remove the oil filter drain deflector (2).

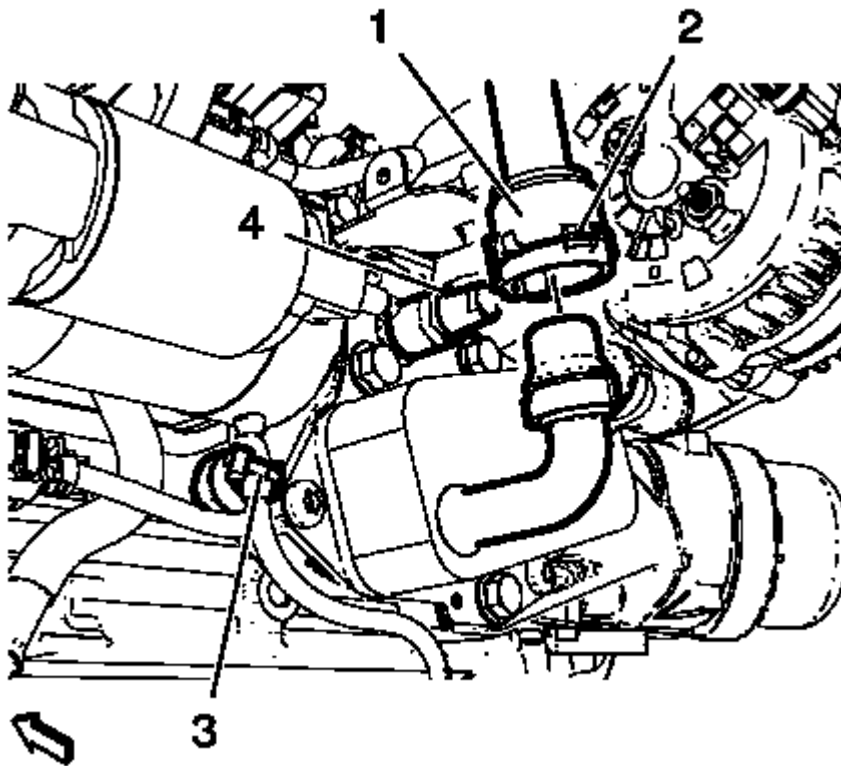


**Fig. 168: Oil Cooler Outlet Hose**

Courtesy of GENERAL MOTORS COMPANY

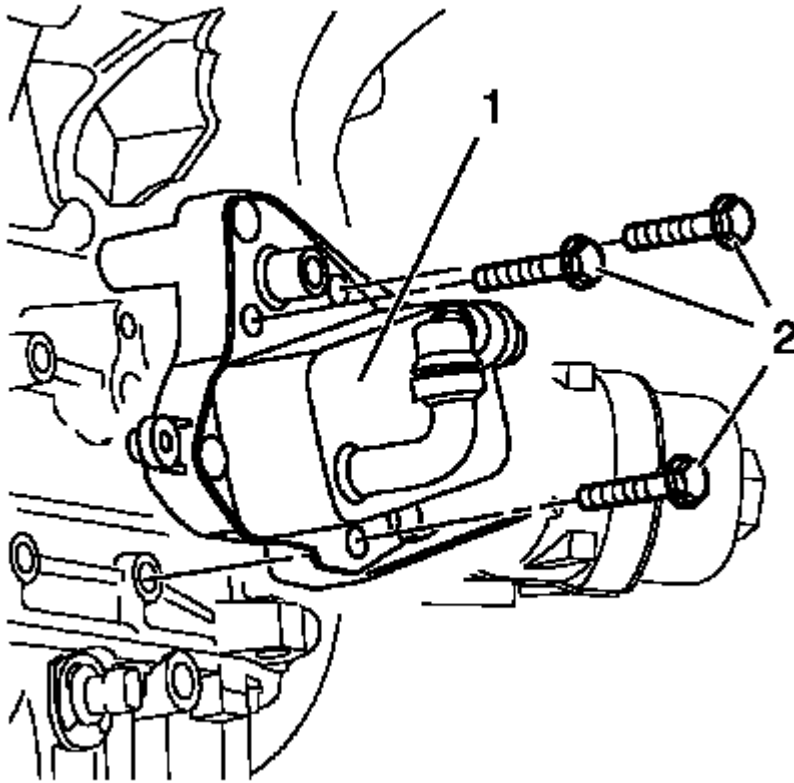
**NOTE:** Put a drain tray underneath.

8. Open the clip (2).
9. Loosen the oil cooler outlet hose (1) and hang aside.



**Fig. 169: Oil Pressure Switch And Wiring Harness Clip**  
**Courtesy of GENERAL MOTORS COMPANY**

10. Disconnect the wiring harness clip (3).
11. Disconnect the electrical connection from the oil pressure switch (4).
12. Open the clip (2).
13. Loosen the oil cooler inlet hose (1) and hang aside.

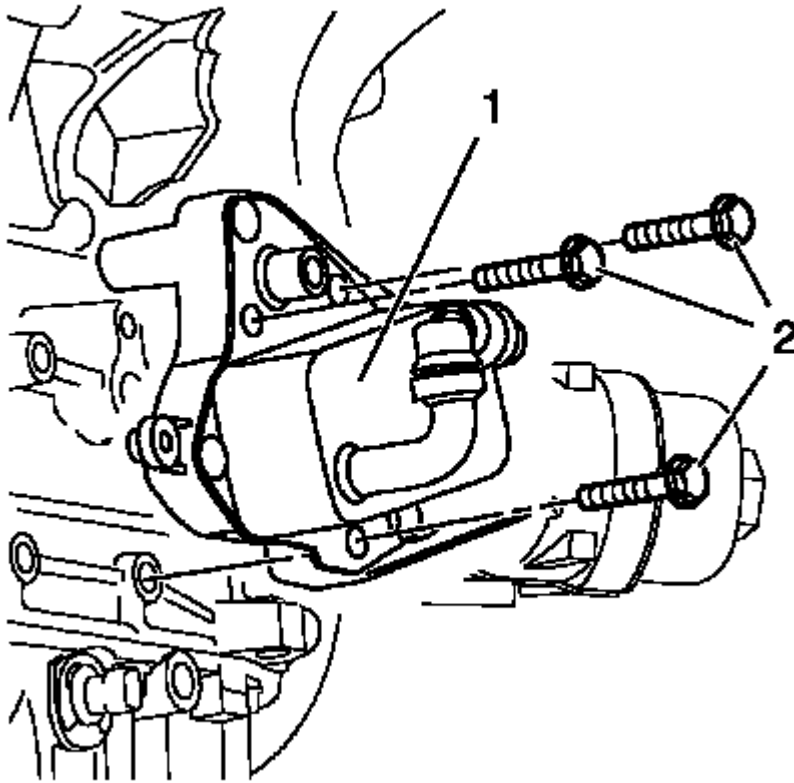


**Fig. 170: Oil Filter Adapter And Oil Cooler Assembly Bolts**  
Courtesy of GENERAL MOTORS COMPANY

14. Remove the 3 oil filter adapter and oil cooler assembly bolts (2).
15. Remove the oil filter adapter and oil cooler assembly (1) and the 2 seals.

#### Installation Procedure

1. Clean all sealing surfaces.

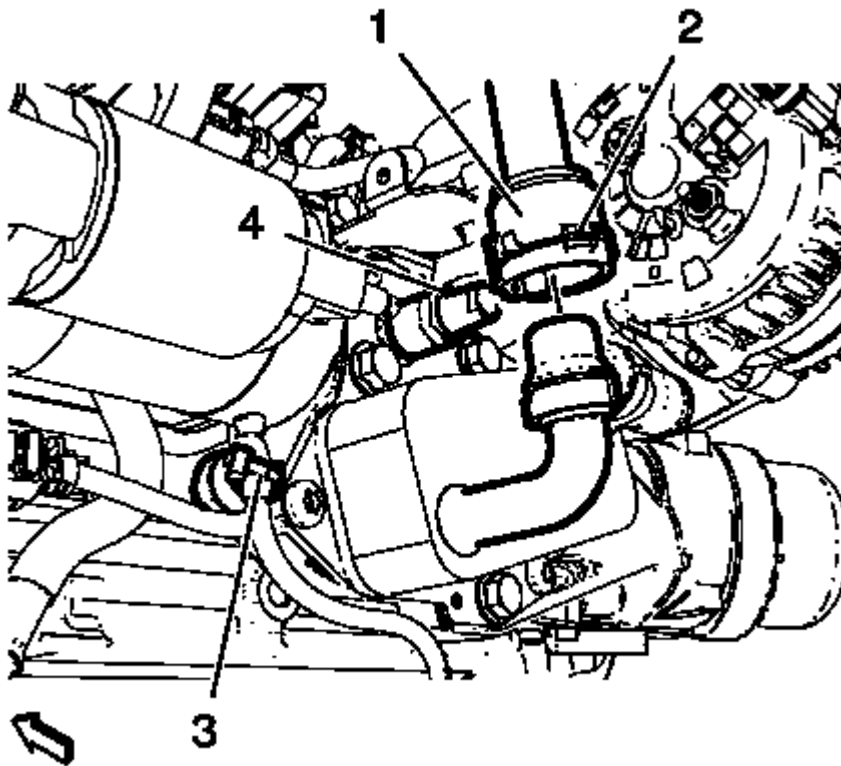


**Fig. 171: Oil Filter Adapter And Oil Cooler Assembly Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

2. Install the oil filter adapter and oil cooler assembly (1) with 2 NEW seals.

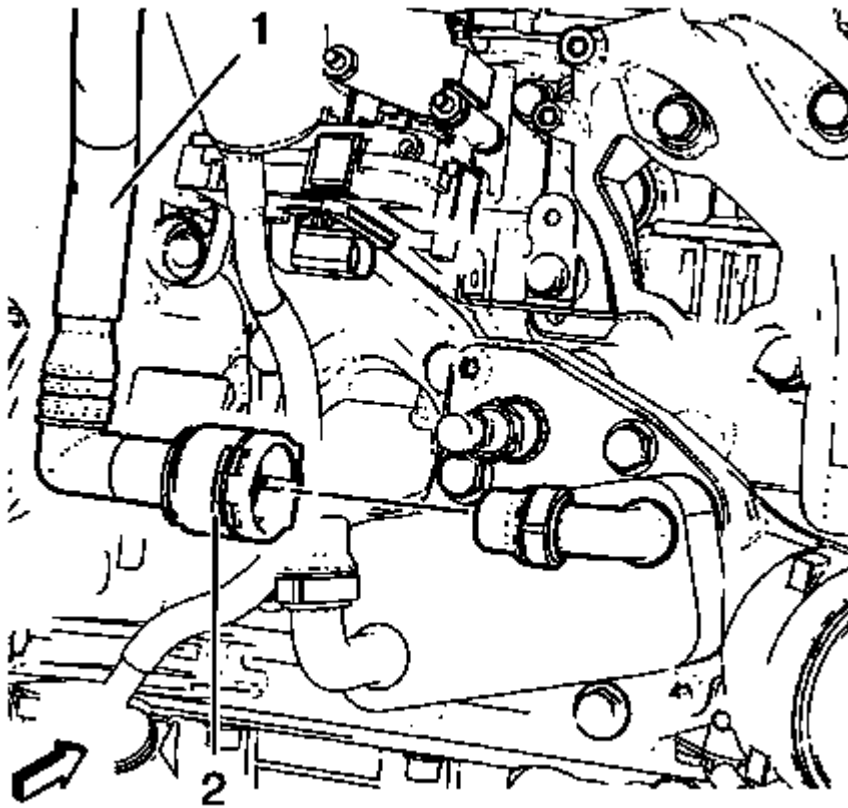
**CAUTION: Refer to Fastener Caution .**

3. Install the 3 oil filter adapter and oil cooler assembly bolts (2) and tighten to 50 (37 lb ft).



**Fig. 172: Oil Pressure Switch And Wiring Harness Clip**  
**Courtesy of GENERAL MOTORS COMPANY**

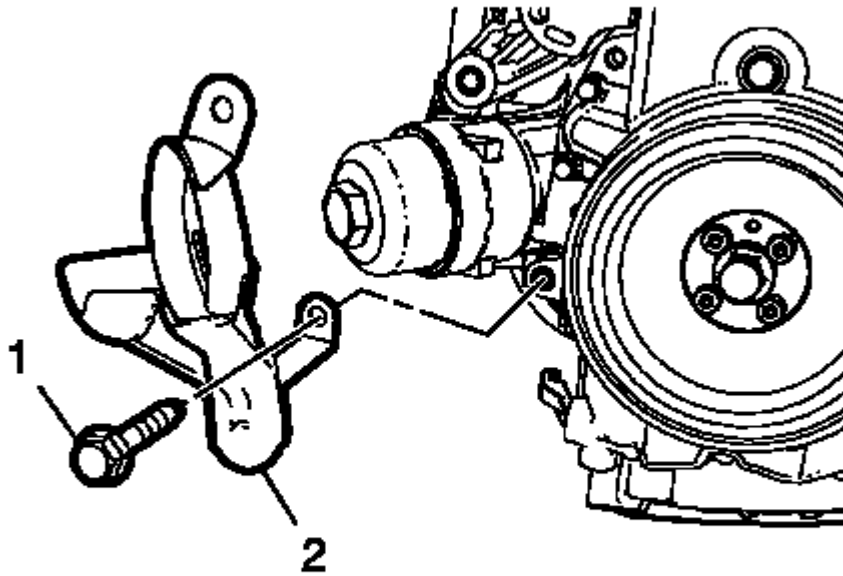
4. Install the oil cooler inlet hose (1) until the clip (2) audible engage.
5. Clip in the electrical connection (3).
6. Connect the electrical connection to the oil pressure switch (4).



**Fig. 173: Oil Cooler Outlet Hose**

**Courtesy of GENERAL MOTORS COMPANY**

7. Install the oil cooler outlet hose (1) until the clip (2) audible engage.



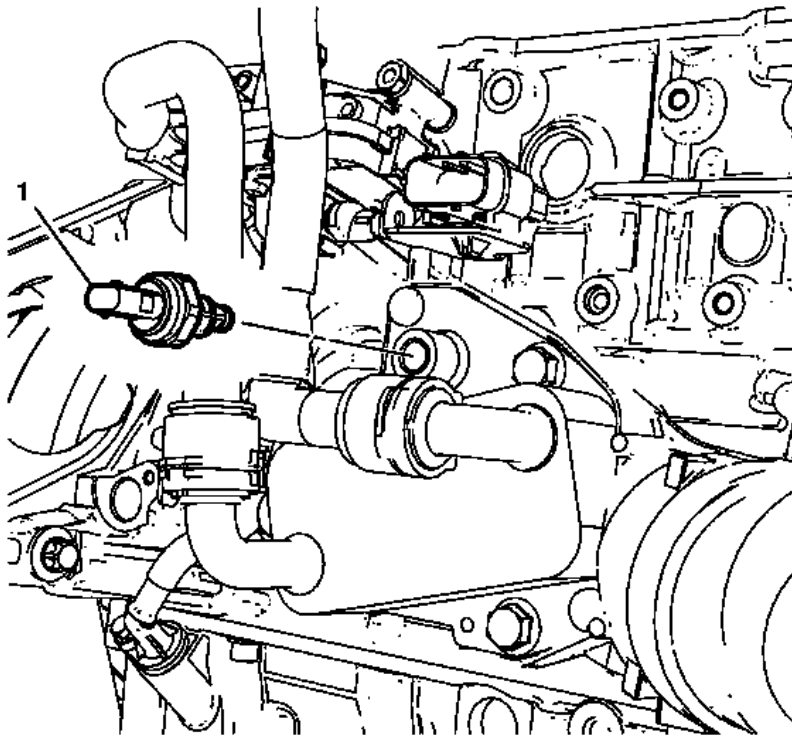
**Fig. 174: Oil Filter Drain Deflector And Bolt**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The upper bolt already installed during the generator installation.

8. Install the oil filter drain deflector (2).
9. Install the oil filter drain deflector bolt (1) and tighten.
10. Lower the vehicle.
11. Install the generator. Refer to **Generator Replacement (2.0L Diesel LUZ)** .
12. Fill the engine oil. Refer to **Engine Oil and Oil Filter Replacement**.
13. Fill the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)** , **Cooling System Draining and Filling (Static Fill)** .
14. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .

## ENGINE OIL PRESSURE SENSOR REPLACEMENT



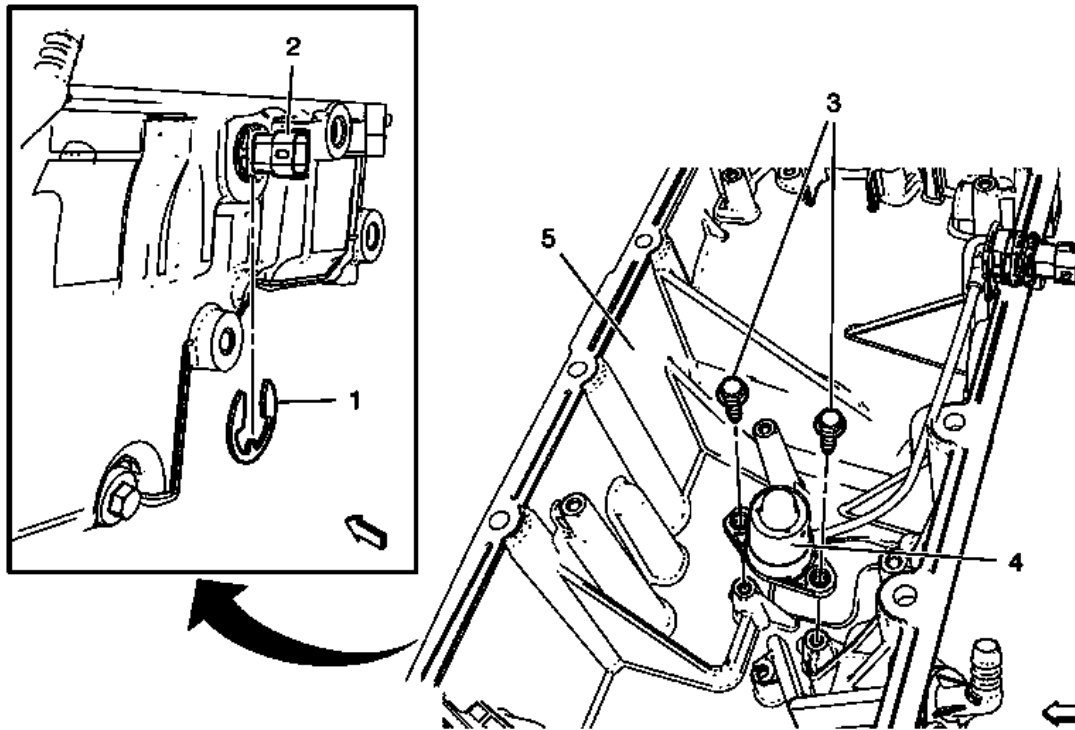
**Fig. 175: Oil Pressure Sensor**

Courtesy of GENERAL MOTORS COMPANY

**Engine Oil Pressure Sensor Replacement**

Callout	Component Name
<b>Preliminary Procedures</b>	
<ol style="list-style-type: none"> <li>1. Disconnect the battery negative cable. Refer to <b><u>Battery Negative Cable Disconnection and Connection</u></b> .</li> <li>2. Raise and support the vehicle. Refer to <b><u>Lifting and Jacking the Vehicle</u></b> .</li> <li>3. Remove the front compartment insulator. Refer to <b><u>Front Compartment Insulator Replacement</u></b> .</li> <li>4. Remove the engine oil cooler outlet hose. Refer to <b><u>Engine Oil Cooler Outlet Hose Replacement (2.0L Diesel LUZ)</u></b> .</li> <li>5. Disconnect the engine oil pressure sensor wiring harness plug.</li> </ol>	
1	Engine Oil Pressure Sensor  <b>CAUTION:</b> <b>Refer to <u>Fastener Caution</u> .</b>  <b>Tighten</b> 35 (26 lb ft)

**ENGINE OIL LEVEL SENSOR REPLACEMENT**

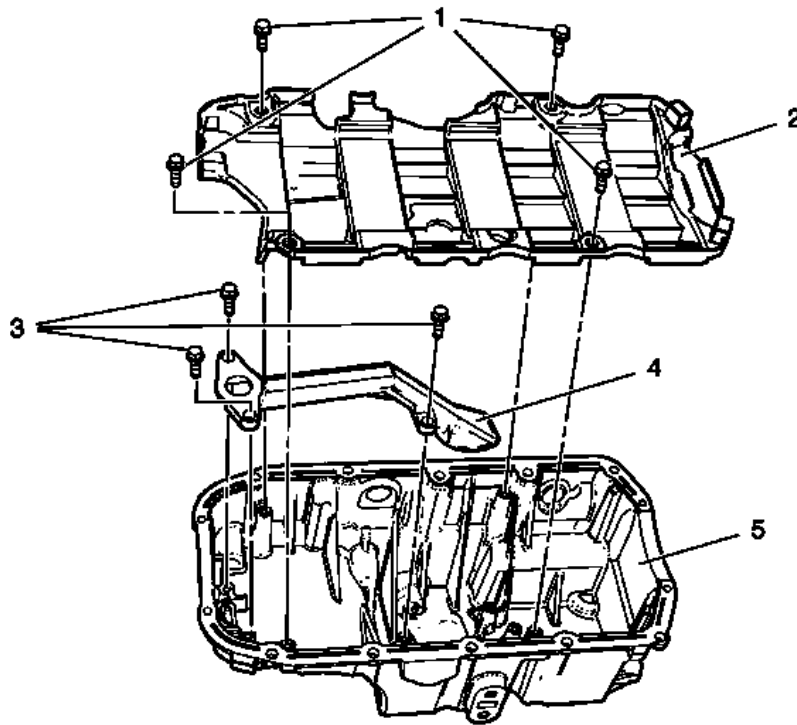


**Fig. 176: Engine Oil Level Sensor**  
Courtesy of GENERAL MOTORS COMPANY

### Engine Oil Level Sensor Replacement

Callout	Component Name
<b>Preliminary Procedures</b>	
1. Open the hood. 2. Remove the oil pan. Refer to <b>Oil Pan Replacement</b> .	
1	Engine Oil Level Sensor Lead Clip <b>Procedure</b> Remove the oil level sensor lead clip and push the oil level sensor wiring harness plug out of the guide.
2	Engine Oil Level Sensor Plug
3	Engine Oil Level Sensor Bolt (Qty: 2)  <b>CAUTION:</b> Refer to <b>Fastener Caution</b> .  <b>Tighten</b> 9 N.m (80 lb in)
4	Engine Oil Level Sensor
5	Oil Pan

## OIL PUMP SUCTION PIPE REPLACEMENT



**Fig. 177: Oil Pump Suction Pipe**  
 Courtesy of GENERAL MOTORS COMPANY

## Oil Pump Suction Pipe Replacement

Callout	Component Name
<b>Preliminary Procedures</b>	
1. Open the hood. 2. Remove the oil pan. Refer to <b>Oil Pan Replacement</b> .	
1	Oil Pan Baffle Bolt (Qty: 4)  <b>CAUTION:</b> <b>Refer to <u>Fastener Caution</u> .</b>  <b>Tighten</b> 9 N.m (80 lb in)
2	Oil Pan Baffle
3	Oil Pump Suction Pipe Bolt (Qty: 3) <b>Tighten</b> 9 N.m (80 lb in)
4	Oil Pump Suction Pipe

**TIP:** Guarantee that no dirt contaminate the oil pump suction pipe.

5 Oil Pan

## ENGINE REPLACEMENT

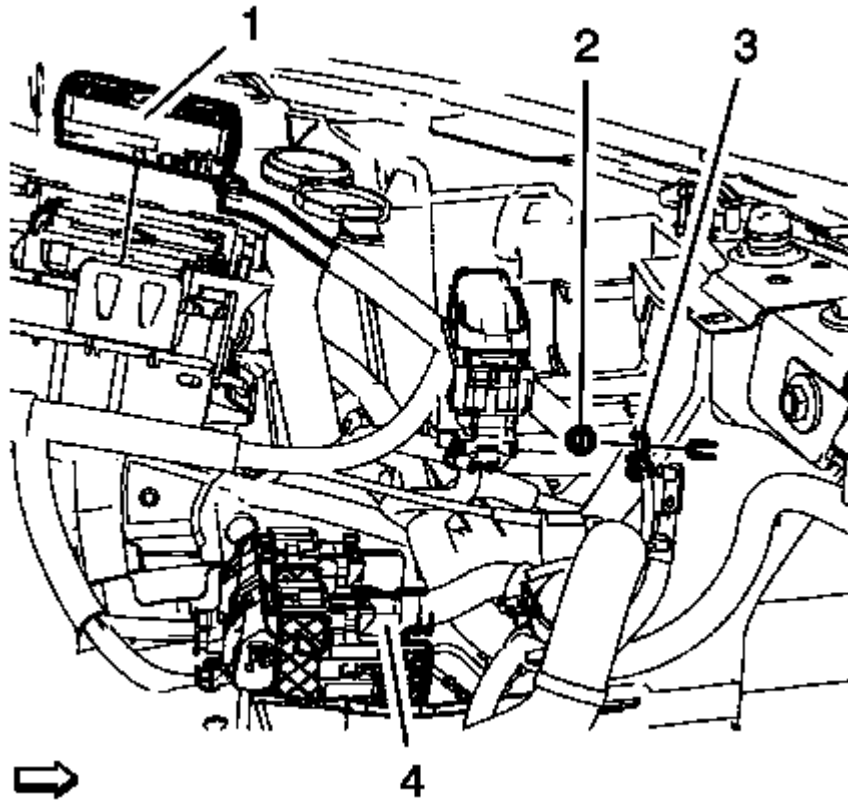
### Special Tools

- **EN-6015** Closure Plugs
- **EN-45059** Angle Meter

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

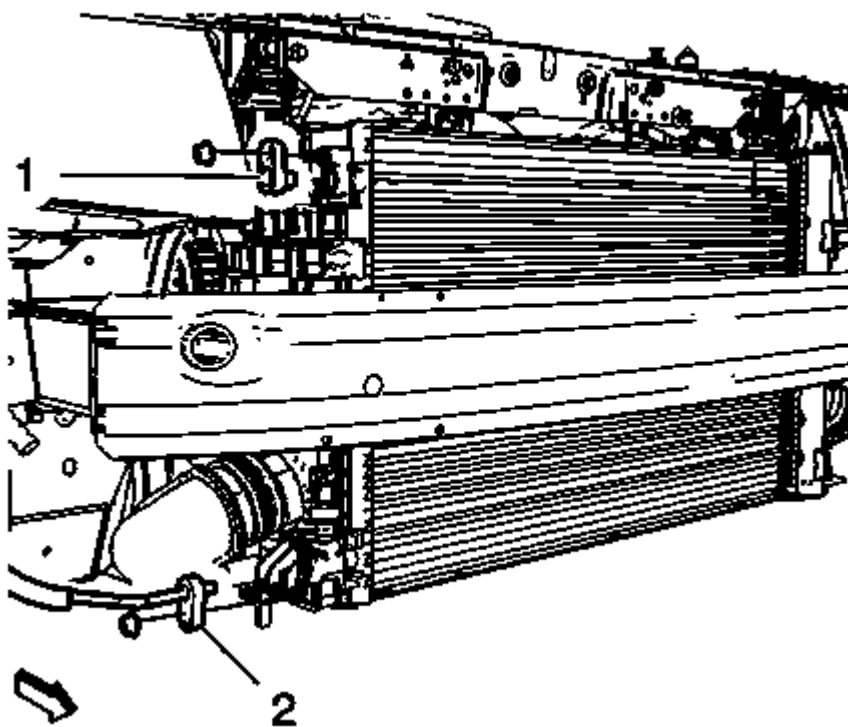
### Removal Procedure

1. Remove the lower intermediate steering shaft bolt. Refer to **Intermediate Steering Shaft Replacement** .
2. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement** .
3. Recover the refrigerant. Refer to **Refrigerant Recovery and Recharging** .
4. Remove the engine control module. Refer to **Engine Control Module Replacement** .
5. Remove the battery tray. Refer to **Battery Tray Replacement** .
6. Disconnect the range selector lever cable from the transmission and reposition. Refer to **Range Selector Lever Cable Replacement** .
7. Drain the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)** , **Cooling System Draining and Filling (Static Fill)** .
8. Disconnect the power brake booster vacuum pipe. Refer to **Power Brake Booster Vacuum Pipe Replacement (2.0L Diesel LUZ)** .
9. Disconnect the transmission vent hose from the coolant surge tank.
10. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** .
11. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
12. Remove the front compartment fuse block. Refer to **Front Compartment Fuse Block Replacement** .



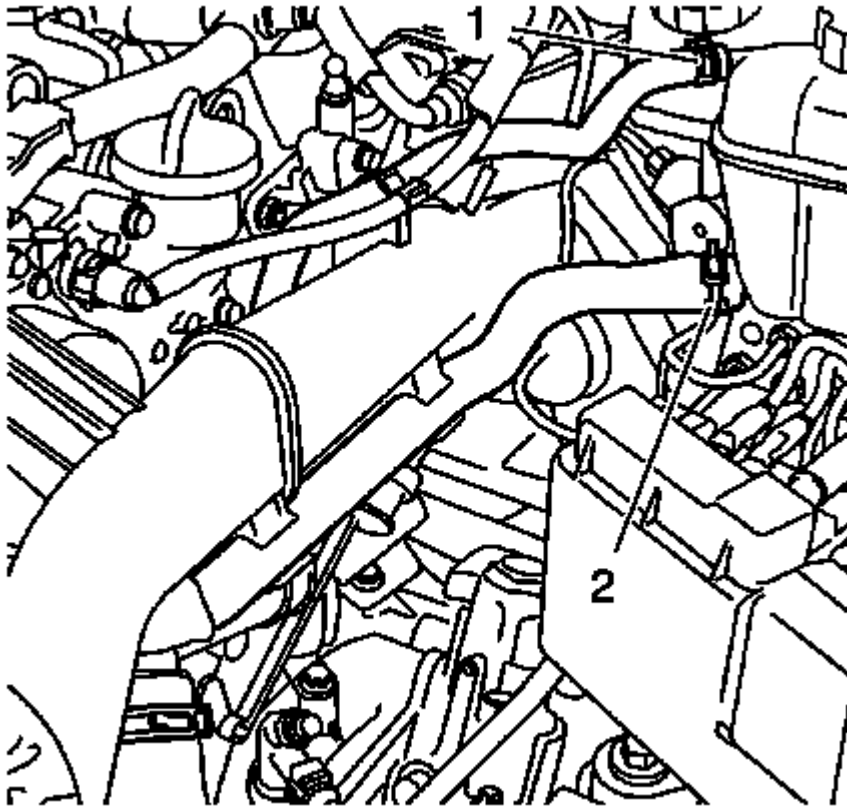
**Fig. 178: Wiring Harness Ground Cable**  
 Courtesy of GENERAL MOTORS COMPANY

13. Remove the wiring harness ground cable nut (2) and remove the wiring harness ground cable (3).
14. Remove the wiring harness plug (1) in top direction from the front compartment fuse block housing.
15. Disconnect the wiring harness connection adapter plug (4).
16. Disconnect the air conditioning compressor and condenser hose from air conditioning evaporator hose assembly. Refer to **Air Conditioning Compressor and Condenser Hose Replacement (1.4L LUV)** .
17. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
18. Drain the transmission. Refer to **Transmission Fluid Drain and Fill** .
19. Remove both front wheels. Refer to **Tire and Wheel Removal and Installation** .
20. Remove the front bumper fascia. Refer to **Front Bumper Fascia Replacement** .
21. Remove the three way catalytic converter. Refer to **Three-Way Catalytic Converter Replacement** .



**Fig. 179: Upper/Lower Condenser Hoses & Nuts**  
Courtesy of GENERAL MOTORS COMPANY

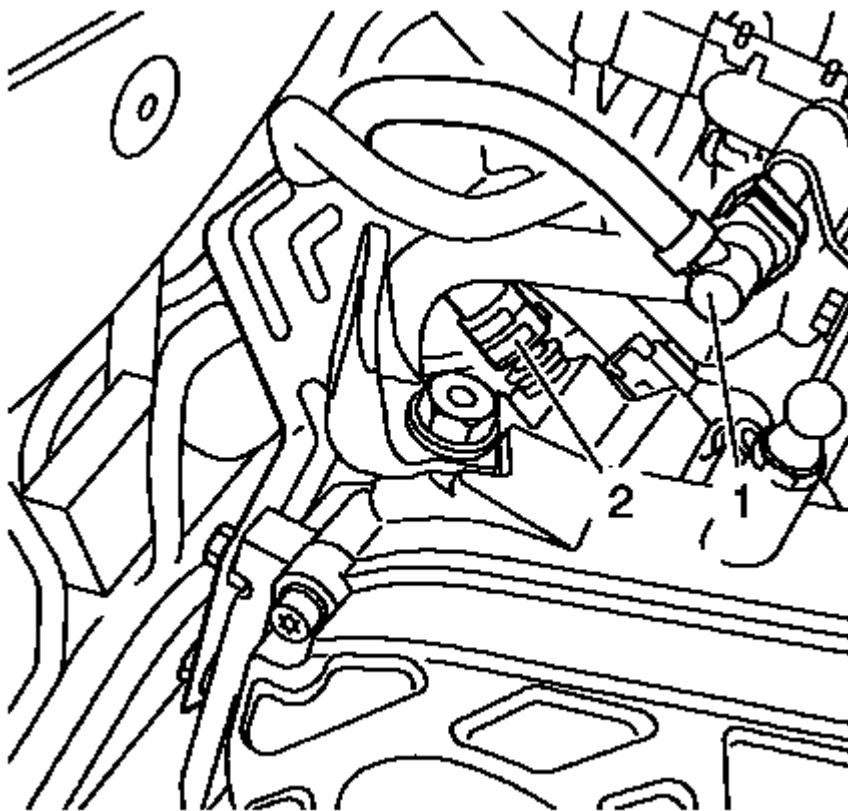
22. Remove the lower and upper condenser hose nuts and the lower and upper condenser hoses (1, 2).



**Fig. 180: Engine Coolant Air Bleed Hose**

Courtesy of GENERAL MOTORS COMPANY

23. Remove the engine coolant air bleed hose (1) and the radiator surge tank engine hose (2) from the surge tank.
24. Remove the heater inlet hose from the bulkhead. Refer to **Heater Inlet Hose Replacement (2.0L Diesel LUZ)** .
25. Remove the heater outlet hose from the bulkhead. Refer to **Heater Outlet Hose Replacement (2.0L Diesel LUZ)** .



**Fig. 181: Fuel Return Pipe And Fuel Feed Pipe**  
Courtesy of GENERAL MOTORS COMPANY

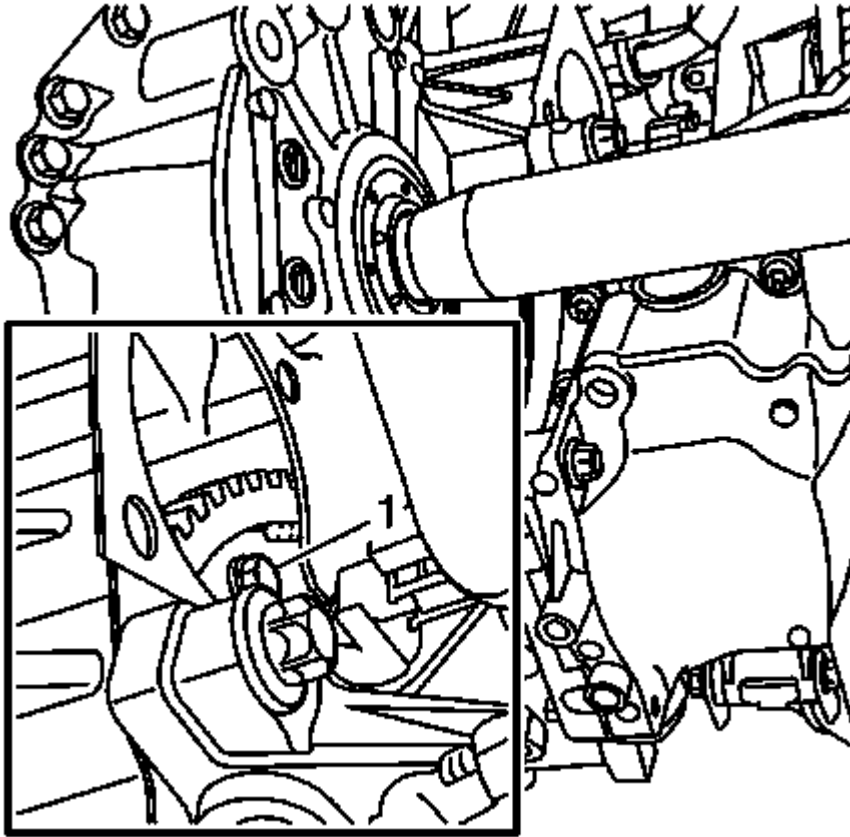
**WARNING:** Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical (Class B) fire extinguisher nearby.

**CAUTION:** Clean all fuel pipe connections and surrounding areas before disconnecting the fuel pipes to avoid contamination of the fuel system.

26. Disconnect the fuel feed pipe (2) from the fuel pump. Refer to **Plastic Collar Quick Connect Fitting Service** .
27. Disconnect the fuel return pipe (1). Refer to **Plastic Collar Quick Connect Fitting Service** .
28. Close all connections with **EN-6015** plugs.
29. Remove the turbocharger wastegate actuator vacuum control solenoid valve hose from the solenoid valve. Refer to **Turbocharger Wastegate Actuator Vacuum Control Solenoid Valve Hose Replacement**.
30. Disconnect the turbocharger wastegate actuator vacuum control solenoid valve wiring harness plug.
31. Disconnect the negative pressure pipe from the power brake booster pump.
32. Disconnect the 2 wiring harness plugs from engine cooling fan.

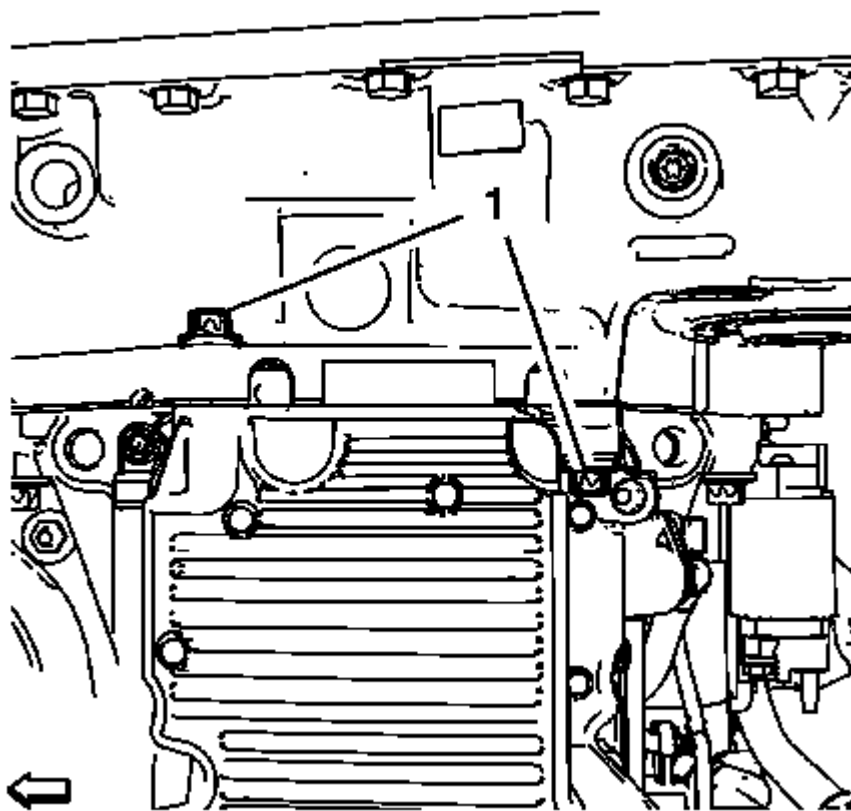


33. Disconnect the engine oil heater power cable from the engine oil heater. Refer to **Engine Oil Heater Power Cable Replacement**.
34. Remove the starter. Refer to **Starter Replacement (2.0L Diesel LUZ)** .



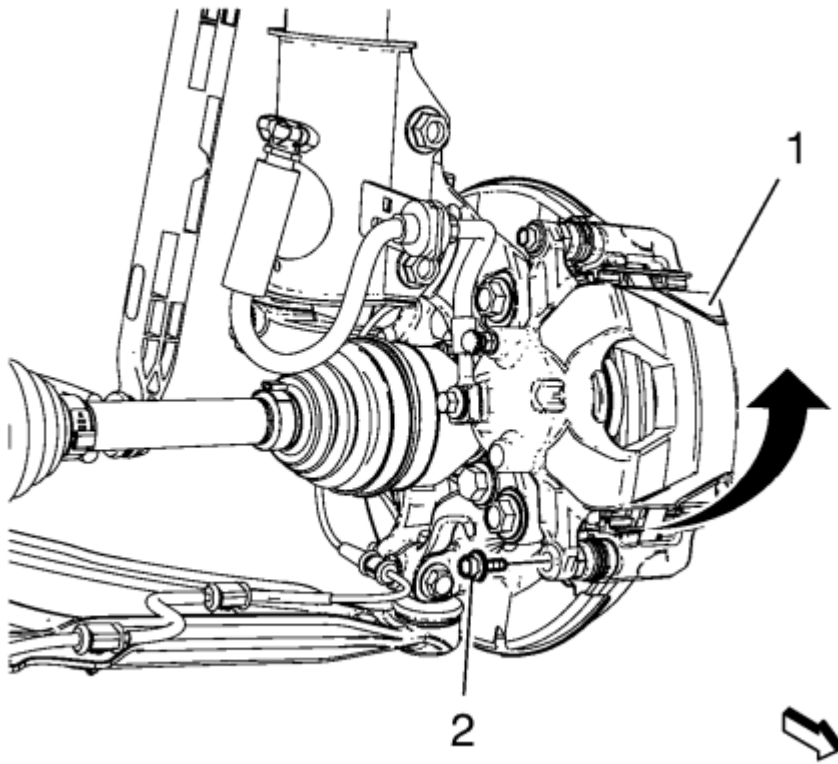
**Fig. 182: Identifying Torque Converter Bolts**  
Courtesy of GENERAL MOTORS COMPANY

35. Remove and DISCARD 6 torque converter to flywheel bolts (1).



**Fig. 183: Installing Oil Pan To Transmission Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

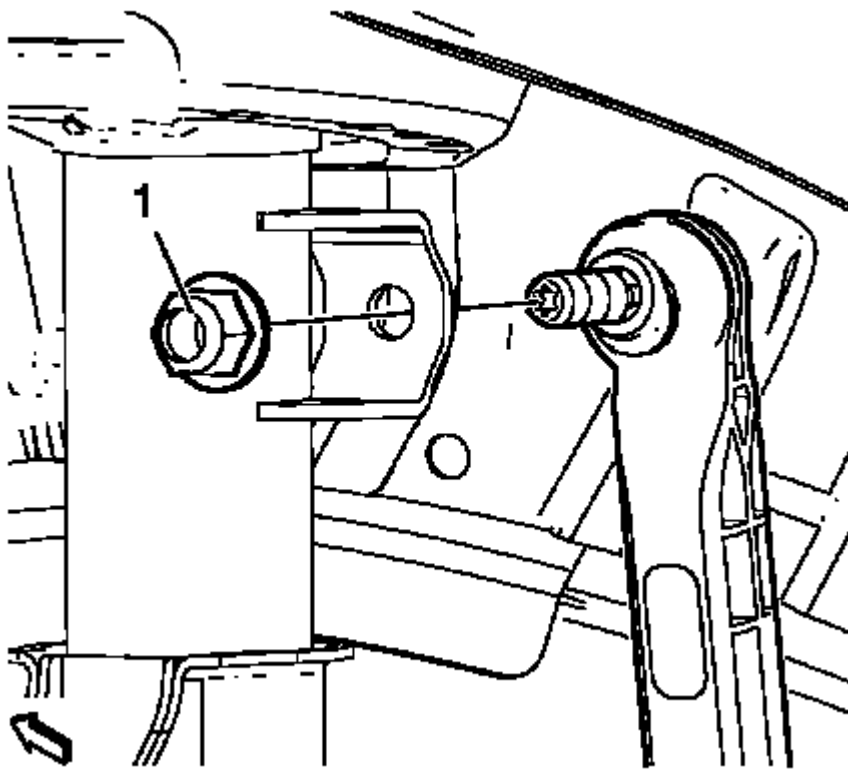
36. Remove the oil pan to transmission bolts (1).



**Fig. 184: View Of Brake Caliper And Brake Caliper Guide Pin Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Do Not disconnect the brake hoses from the calipers.

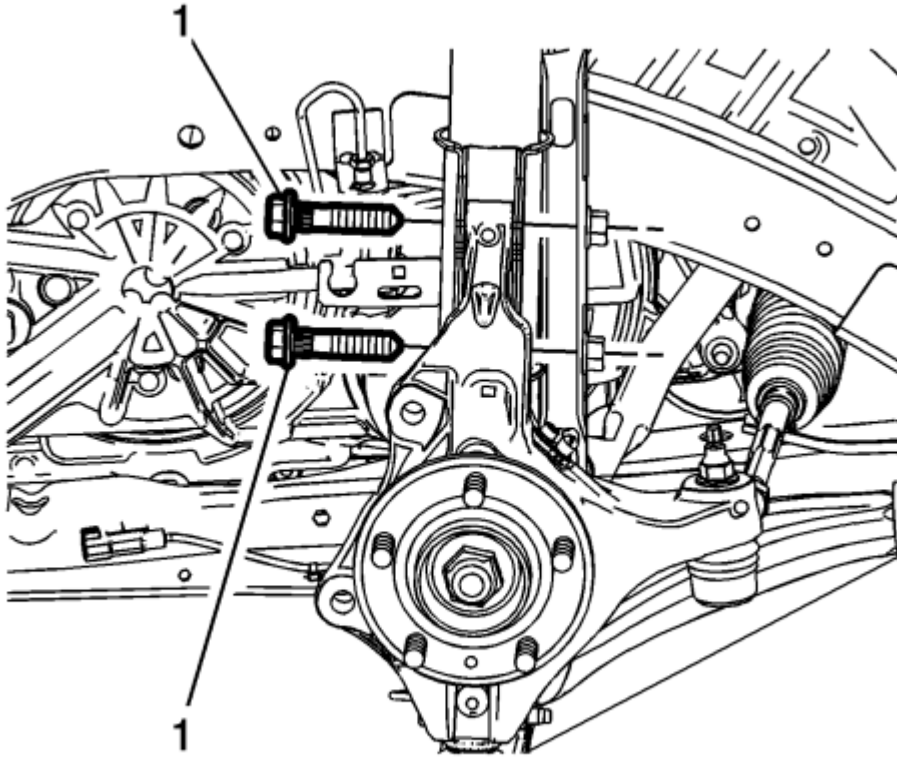
37. Remove the front brake calipers (1) and caliper bolts (2) from the caliper brackets and then suspend the calipers with mechanics wire to the body.



**Fig. 185: Stabilizer Link Nut**

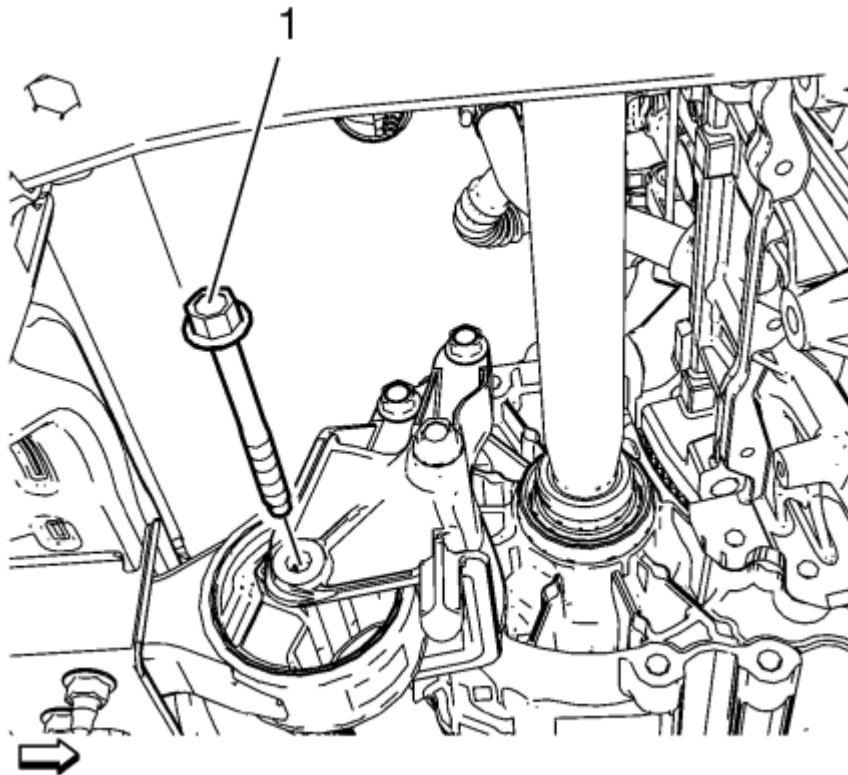
Courtesy of GENERAL MOTORS COMPANY

38. Remove and DISCARD the stabilizer link nut (1) from the strut assemblies. Refer to **Stabilizer Shaft Link Replacement** .



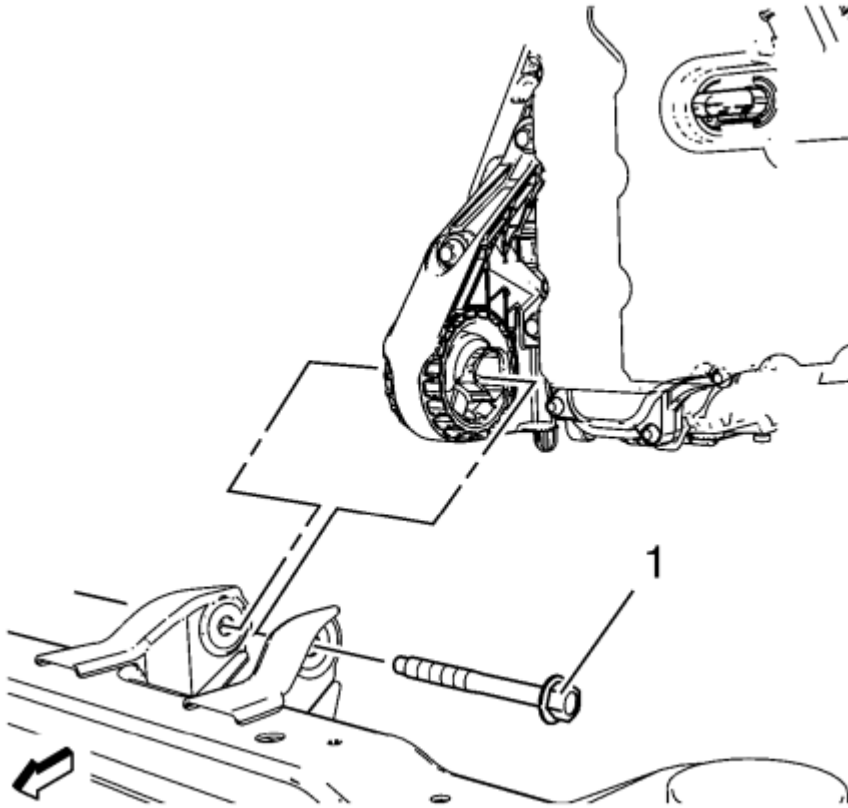
**Fig. 186: Front Steering Knuckle Bolts**  
Courtesy of GENERAL MOTORS COMPANY

39. Disconnect the front steering knuckles bolts (1) from the strut assemblies. Refer to **Steering Knuckle Replacement** .
40. Disconnect the electronic power steering connectors from the electronic power steering assembly. Refer to **FEP Connectors (Steering Gear)** .
41. Install the engine support fixture. Refer to **Engine Support Fixture**.



**Fig. 187: Transmission Bracket Mounting Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

42. Remove the rear transmission mount bracket to rear mount through bolt (1).

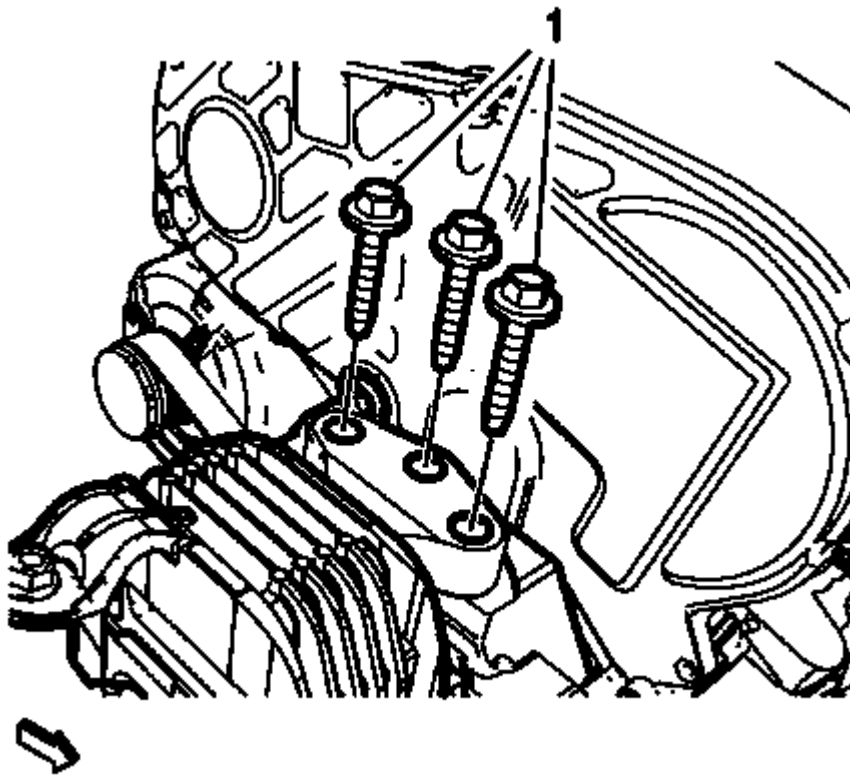


**Fig. 188: Front Transmission Mounting Bolts**  
Courtesy of GENERAL MOTORS COMPANY

43. Remove the transmission front mount through bolt (1).
44. Using suitable straps or chains, secure the front of vehicle to the hoist arms.

**NOTE:** Use the engine support fixture to slightly raise the powertrain assembly to aid in the removal of the engine and transmission mount bolts.

45. Use the engine support fixture to slightly raise the powertrain assembly to aid in the removal of the engine and transmission mount bolts.

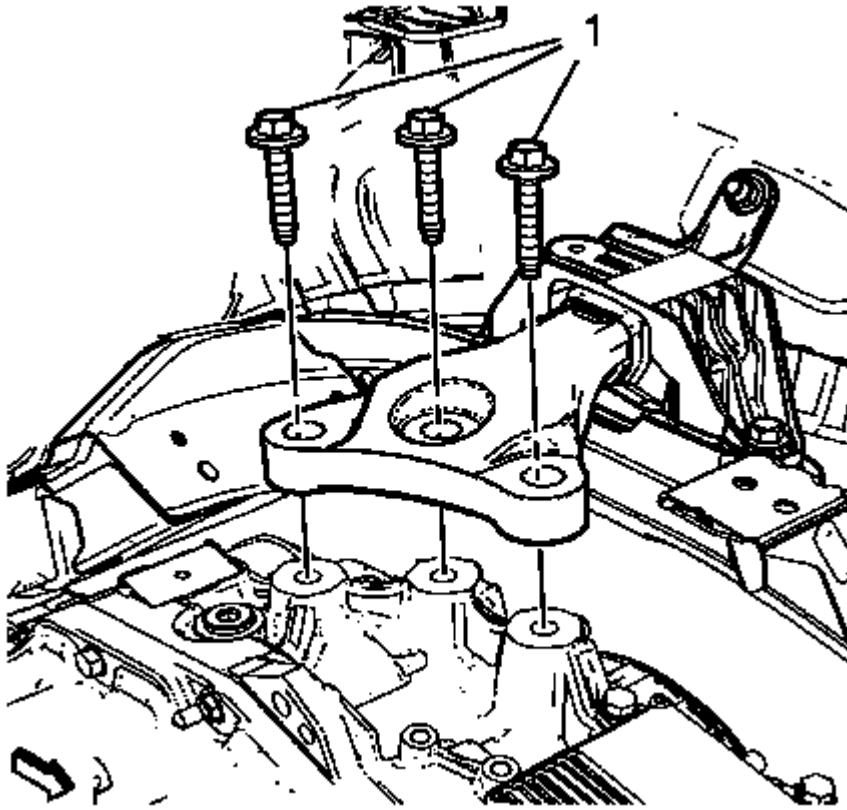


**Fig. 189: Engine Mount Bolts**

Courtesy of GENERAL MOTORS COMPANY

46. Mark the location of the engine mount bolts with a paint stick before removing.
47. Remove the engine mount bolts (1). Refer to **Engine Mount Replacement**.





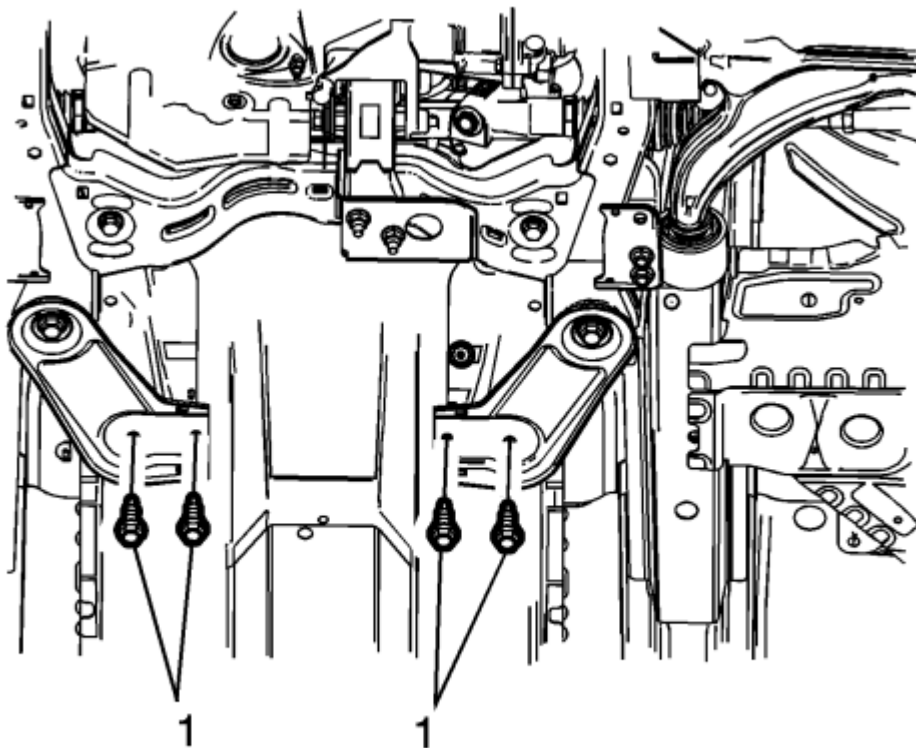
**Fig. 190: Transmission Mount Bolts**

Courtesy of GENERAL MOTORS COMPANY

48. Mark the location of the bolts (1) with a paint stick before removing.
49. Remove the transmission mount bolts. Refer to **Transmission Mount Replacement - Left Side**.
50. Using a suitable engine support table, lower the vehicle until the drivetrain and front suspension frame contacts the engine support table.
51. Position blocks of wood below the oil pan and transmission to stabilize the powertrain on the support table.
52. Using the engine support fixture, lower the powertrain down until it is resting on the engine support table.

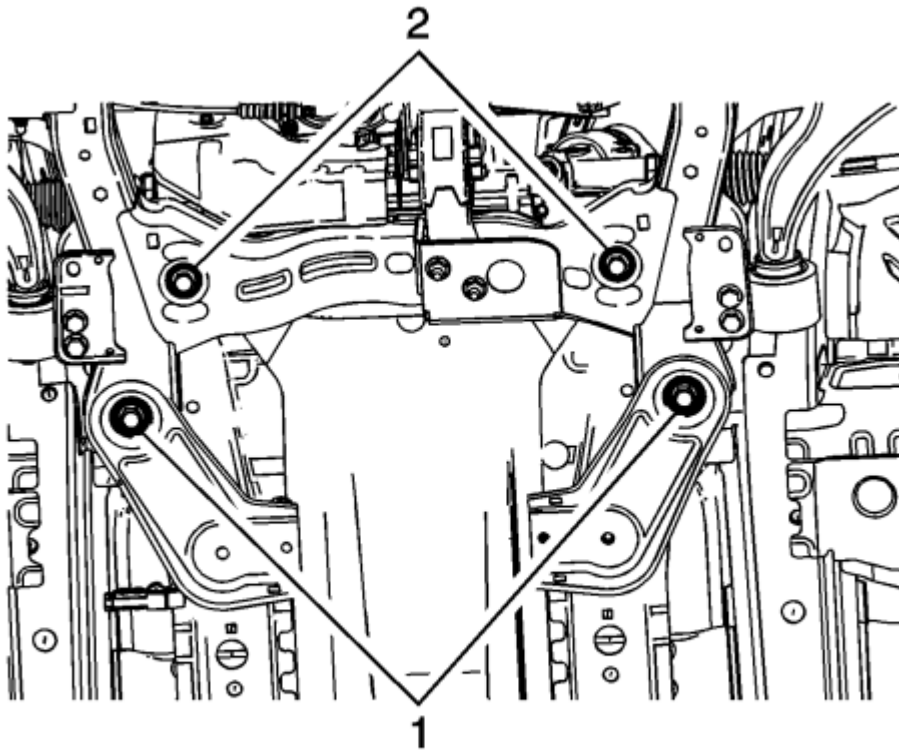
**NOTE:**        **The engine support fixture will remain on the vehicle.**

53. Remove the engine support fixture from the engine lift brackets.



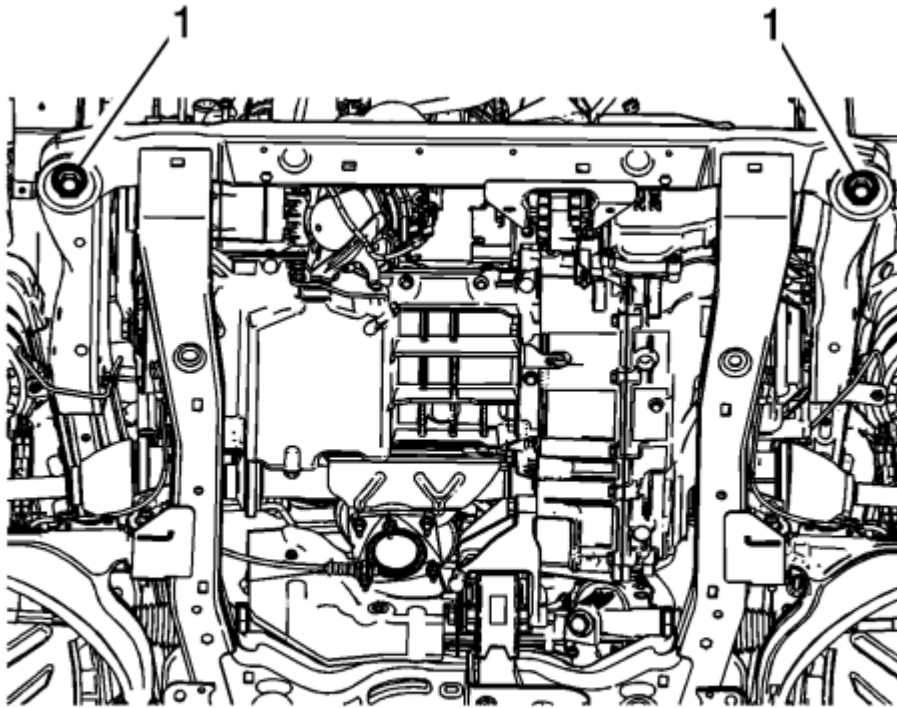
**Fig. 191: Rear Frame Reinforcement & Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

54. Remove and DISCARD the rear frame reinforcement bolts (1).



**Fig. 192: Rear Frame Reinforcement Bolts**  
Courtesy of GENERAL MOTORS COMPANY

55. Remove the rear frame reinforcement bolts (1, 2) and reinforcement.



**Fig. 193: Front Frame Reinforcement Bolts**  
Courtesy of GENERAL MOTORS COMPANY

56. Remove the front frame reinforcement bolts (1).
57. Slowly and carefully raise the vehicle, ensure the engine, transmission, radiator assembly and drivetrain suspension frame are free from wiring, hoses and other engine compartment components.
58. Disconnect engine coolant hoses as necessary.
59. Disconnect electrical connectors as necessary.
60. Remove the charge air cooler inlet and outlet air hose. Refer to **Charge Air Cooler Inlet Air Hose Replacement** and **Charge Air Cooler Outlet Air Hose Replacement**.
61. Remove the radiator outlet hose. Refer to **Radiator Outlet Hose Replacement (2.0L Diesel LUZ)**.
62. Remove the transmission fluid cooler hose. Refer to **Transmission Fluid Cooler Hose Replacement**.

**NOTE:**        **Second technician required.**

63. Remove the remaining transmission bolts and remove the transmission. Refer to **Transmission Replacement**.
64. Install the engine to the engine stand.
65. Transfer parts as needed.

**Installation Procedure**

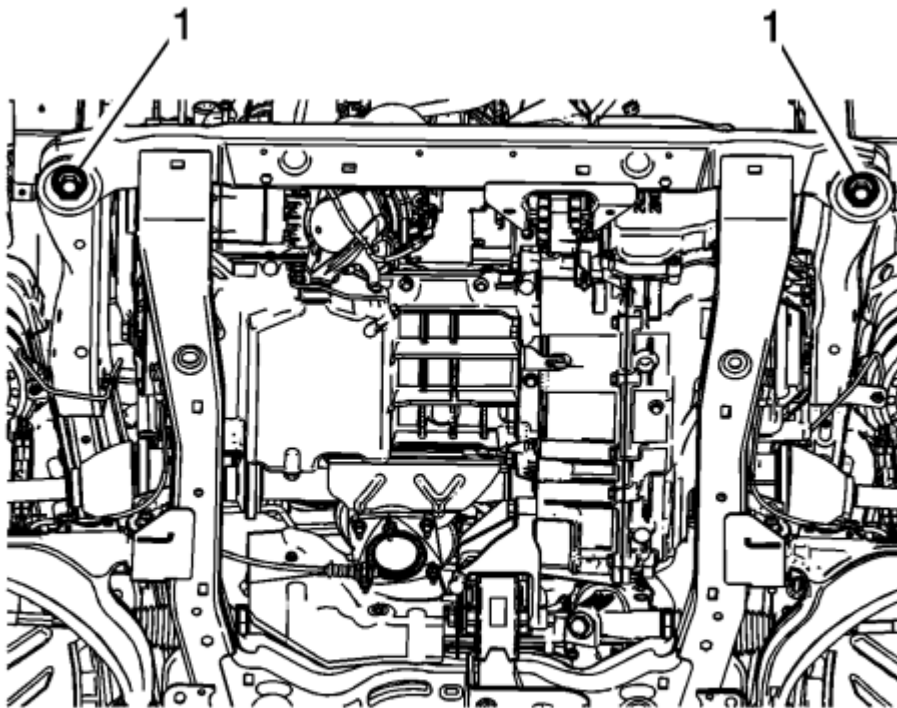
1. Remove the engine from the engine stand.
2. Install the transmission to the engine.

**NOTE:        Second technician required.**

3. Install the transmission and hand tighten 2 upper transmission bolts.

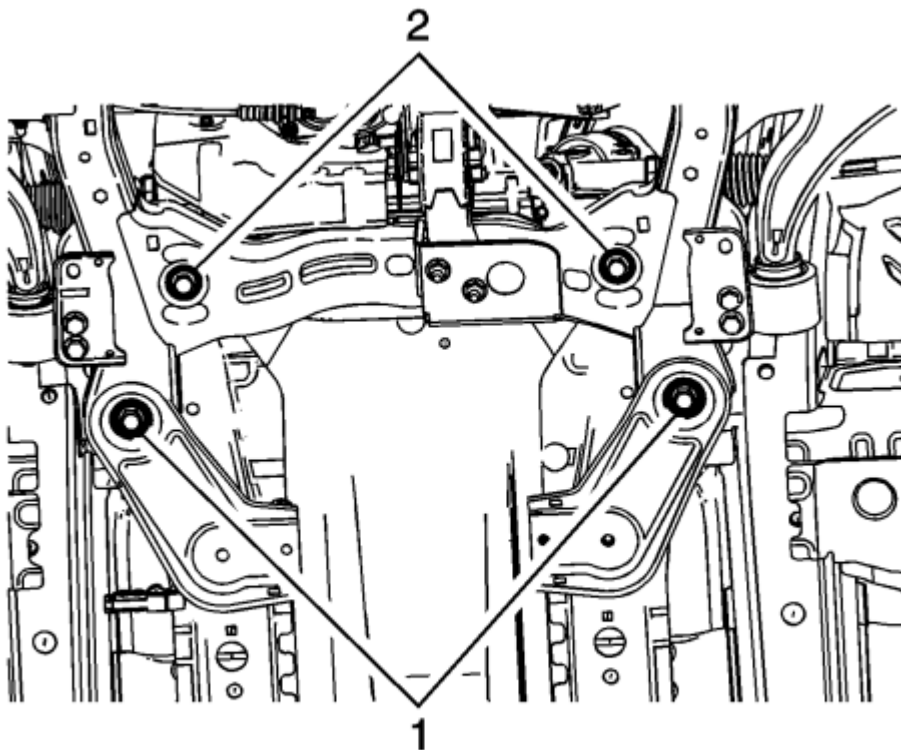
**NOTE:        Do not install the 2 lower transmission bolts**

4. Install the remaining transmission bolts and tighten. Refer to **Transmission Replacement** .
5. Install the transmission fluid cooler hose. Refer to **Transmission Fluid Cooler Hose Replacement** .
6. Install the radiator outlet hose. Refer to **Radiator Outlet Hose Replacement (2.0L Diesel LUZ)** .
7. Install the charge air cooler inlet and outlet air hose. Refer to **Charge Air Cooler Inlet Air Hose Replacement** and **Charge Air Cooler Outlet Air Hose Replacement**.
8. Connect electrical connectors as necessary.
9. Connect engine coolant hoses as necessary.
10. Position the engine, transmission, radiator assembly and drivetrain suspension frame under the vehicle.
11. Slowly and carefully lower the vehicle, ensure the engine, transmission, radiator assembly and drivetrain suspension frame are free from wiring, hoses and other engine compartment components.



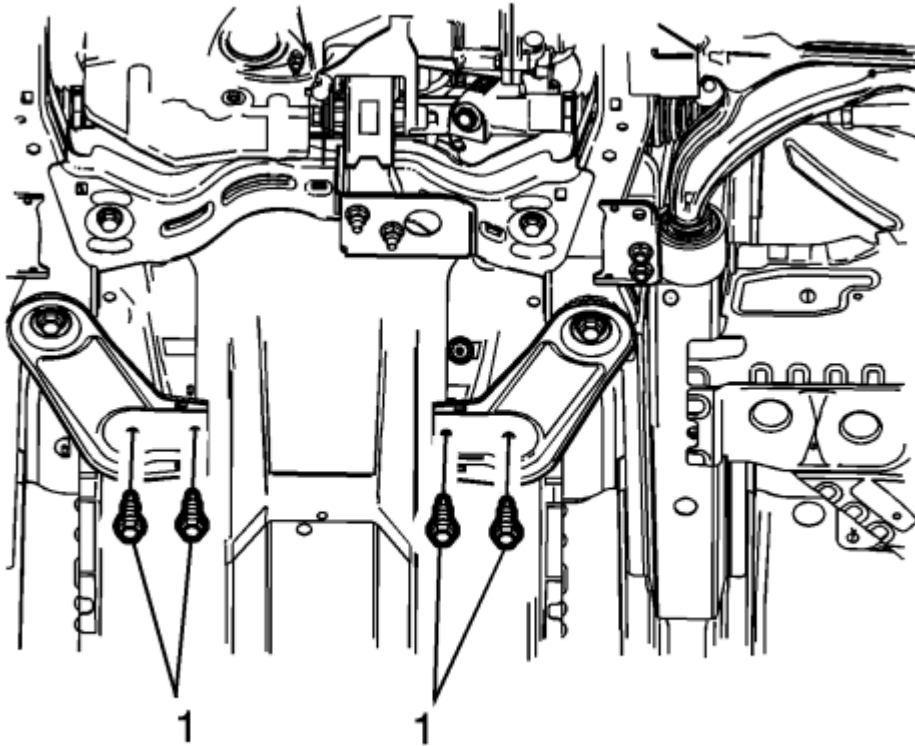
**Fig. 194: Front Frame Reinforcement Bolts**  
Courtesy of GENERAL MOTORS COMPANY

12. Install the front frame reinforcement bolts (1) and tighten to 160 (118 lb ft).



**Fig. 195: Rear Frame Reinforcement Bolts**  
Courtesy of GENERAL MOTORS COMPANY

13. Install the rear frame reinforcement bolts (1, 2) and tighten to 160 (118 lb ft).



**Fig. 196: Rear Frame Reinforcement & Bolts**  
Courtesy of GENERAL MOTORS COMPANY

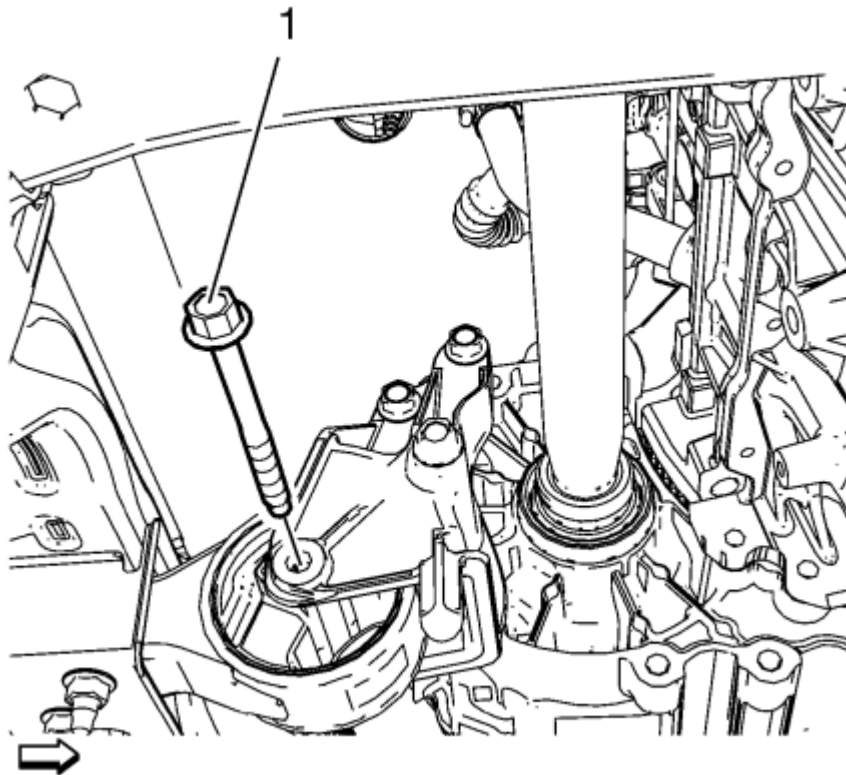
14. Install 4 NEW rear frame reinforcement bolts (1).

**CAUTION: Refer to Fastener Caution .**

**CAUTION: Refer to Torque-to-Yield Fastener Caution .**

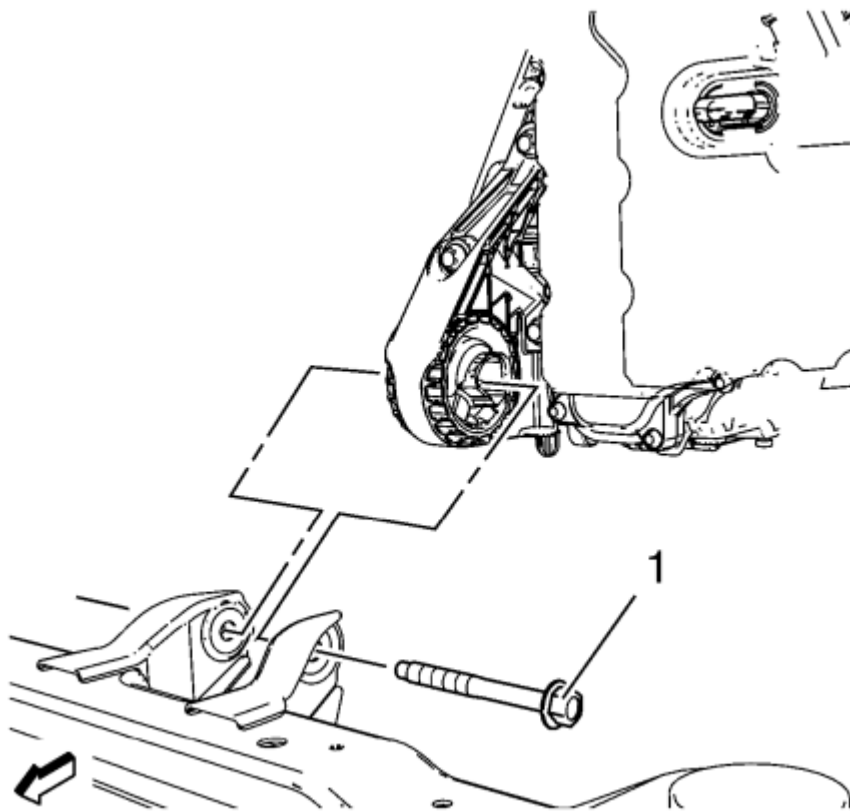
15. Tighten the 4 NEW rear frame reinforcement bolts (1) a first pass to 60 (44 lb ft).
16. Tighten the 4 NEW reinforcement bolts a final pass to an additional 45 degrees, using the **EN-45059** meter.
17. Install the engine support fixture to the engine lift brackets.





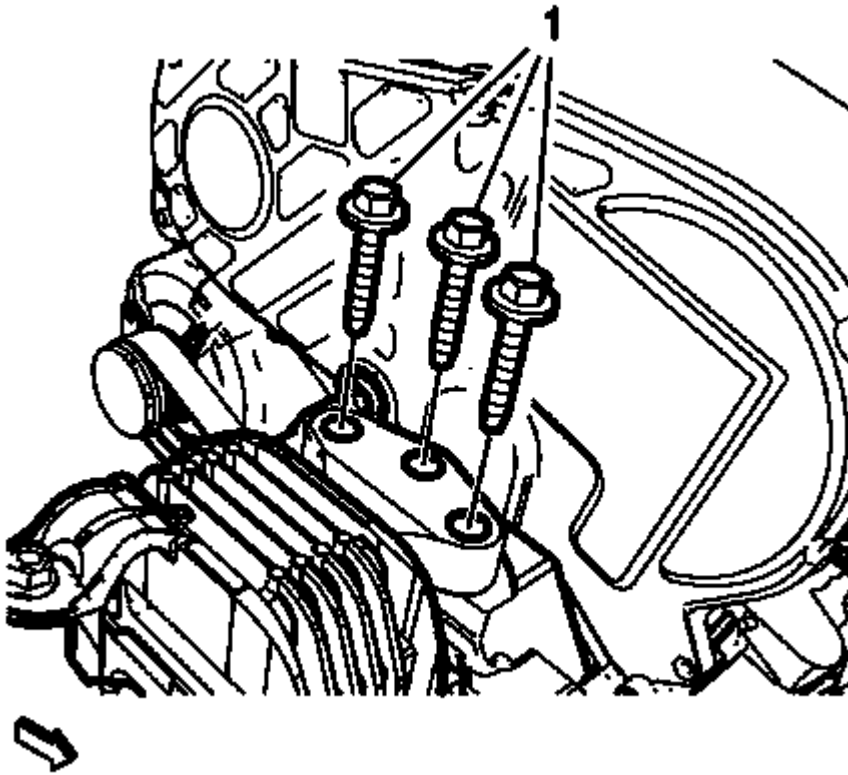
**Fig. 197: Transmission Bracket Mounting Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

18. Install the transmission bracket mount to mount through bolt (1) and tighten to 100 (74 lb ft).



**Fig. 198: Front Transmission Mounting Bolts**  
Courtesy of GENERAL MOTORS COMPANY

19. Install the transmission mount through bolt (1) and tighten to 100 (74 lb ft).



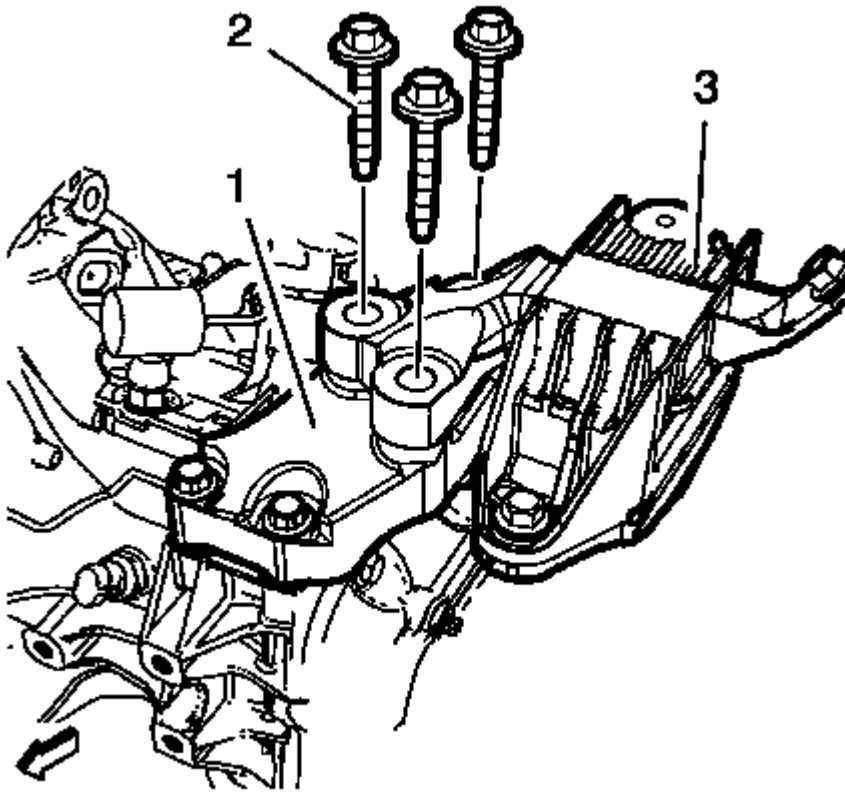
**Fig. 199: Engine Mount Bolts**

Courtesy of GENERAL MOTORS COMPANY

20. Install the engine mount bolts.
21. Align the engine mount bracket to the engine mount.

**CAUTION:** Refer to Torque-to-Yield Fastener Caution .

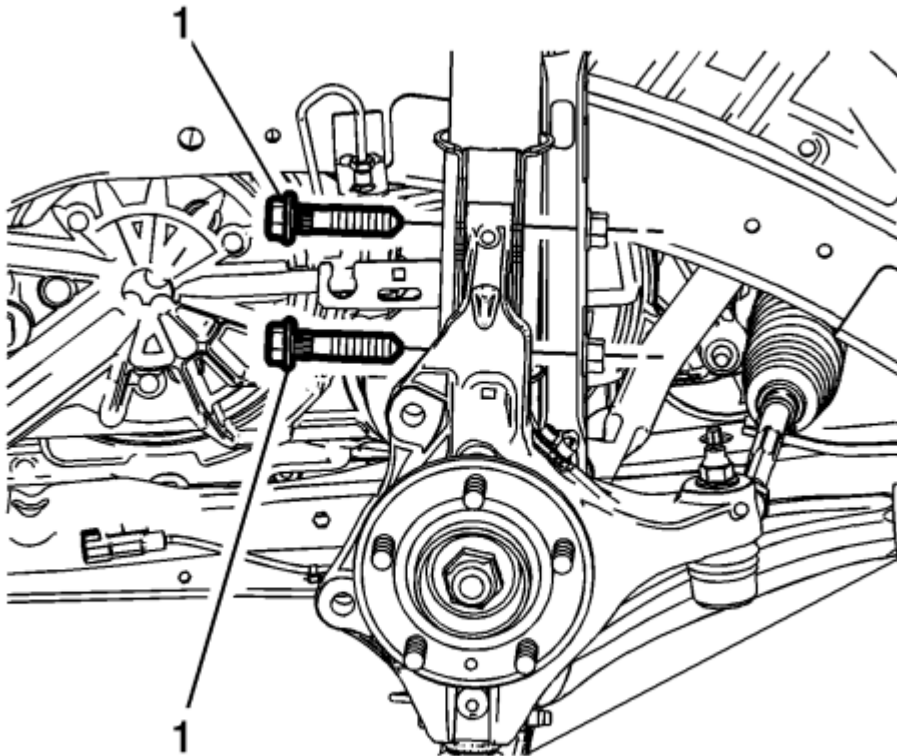
22. Tighten the engine mount bolts (1) a first pass to 50 (37 lb ft).
23. Tighten the engine mount bolts a final pass to an additional 60 - 75 degrees using **EN-45059** meter.



**Fig. 200: Transmission Mount And Transmission Mount Bracket**  
 Courtesy of GENERAL MOTORS COMPANY

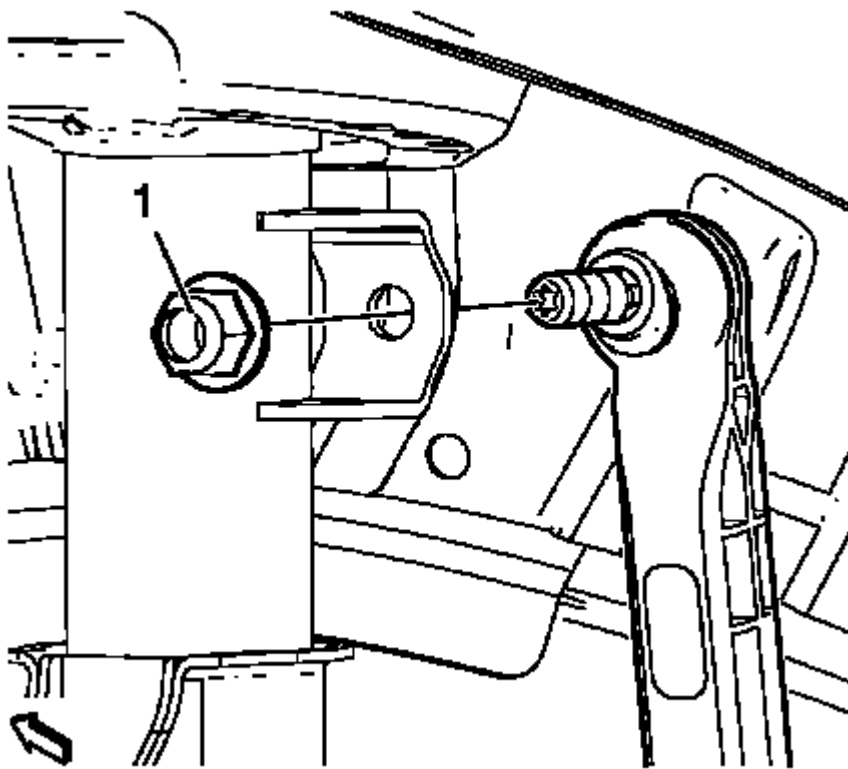
**CAUTION:** Refer to Torque-to-Yield Fastener Caution .

24. Install the 3 NEW transmission mount bolts (2) to the transmission mount (3) and the transmission mount bracket (1) and tighten a first pass to 50 (46 lb ft).
25. Tighten the 3 NEW transmission mount bolts a final pass to an additional 60 - 75 degrees, using the **EN-45059** meter.



**Fig. 201: Front Steering Knuckle Bolts**  
Courtesy of GENERAL MOTORS COMPANY

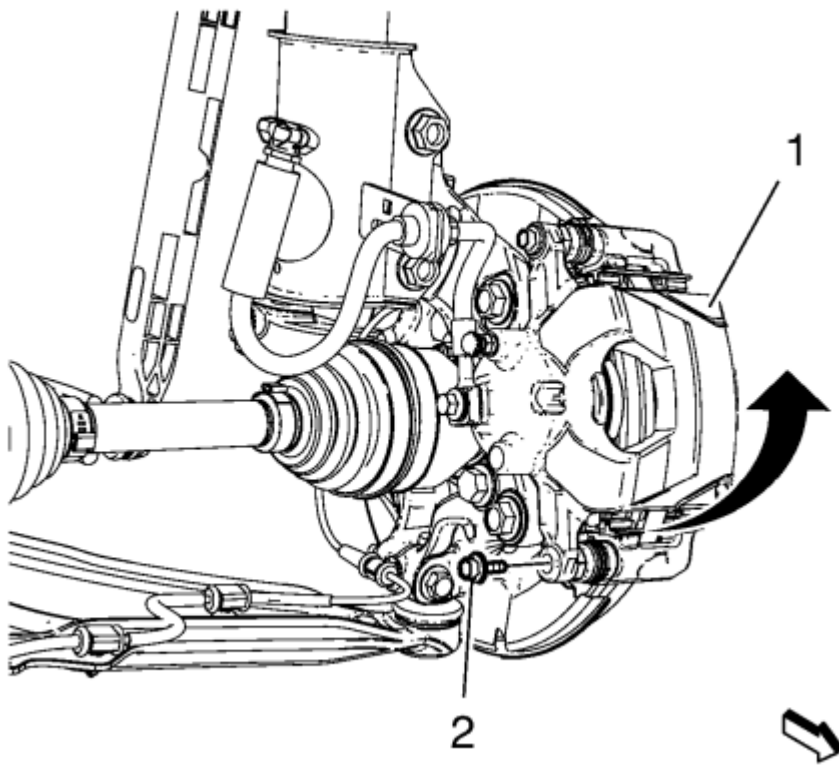
26. Connect the front steering knuckles bolts (1) to the strut assemblies. Refer to **Steering Knuckle Replacement** .



**Fig. 202: Stabilizer Link Nut**

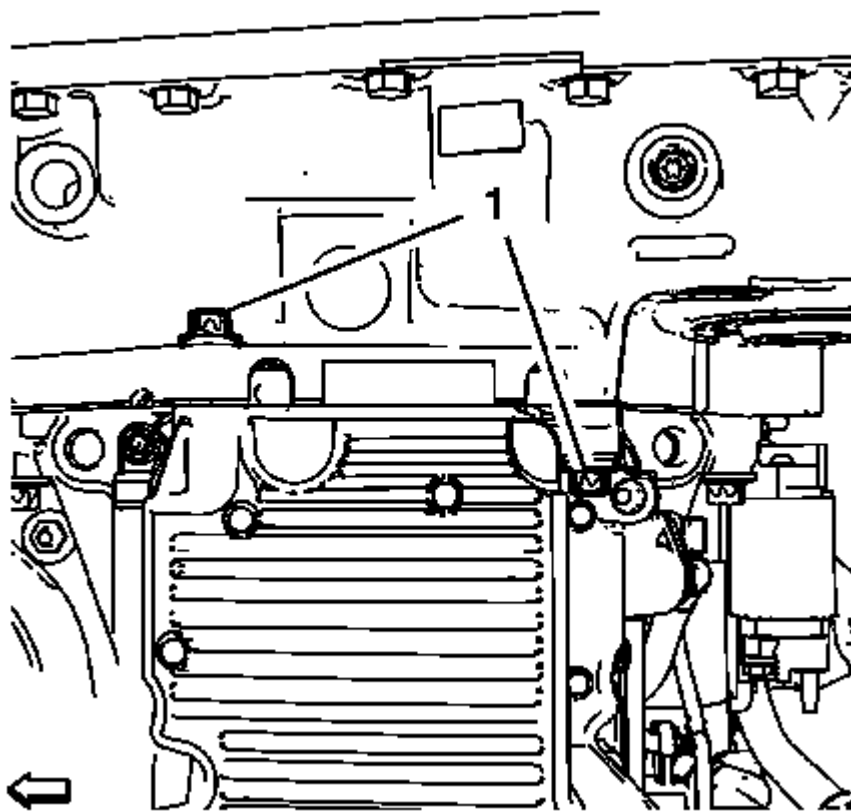
Courtesy of GENERAL MOTORS COMPANY

27. Install the NEW the stabilizer link nut (1) to the strut assemblies. Refer to **Stabilizer Shaft Link Replacement** .



**Fig. 203: View Of Brake Caliper And Brake Caliper Guide Pin Bolt**  
**Courtesy of GENERAL MOTORS COMPANY**

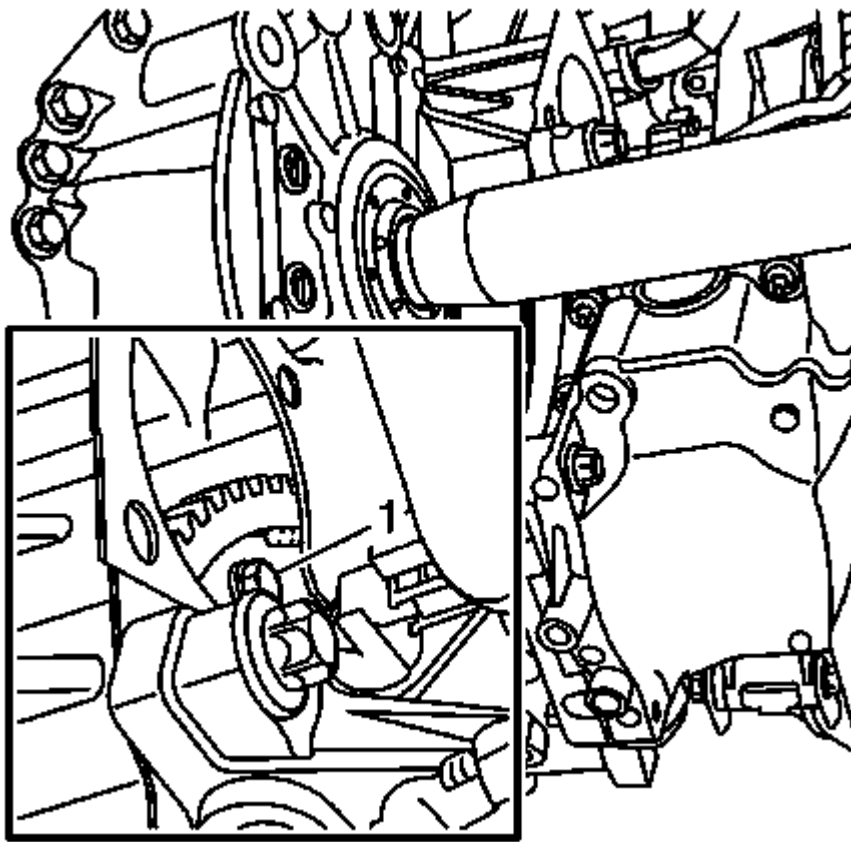
28. Install the front brake caliper (1) and tighten the brake caliper guide pin bolt (2) to 28 (21 lb ft).
29. Connect the wheel speed connectors to the steering knuckles.



**Fig. 204: Installing Oil Pan To Transmission Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

30. Install the oil pan to transmission bolts (1) and tighten to 58 (43 lb ft).

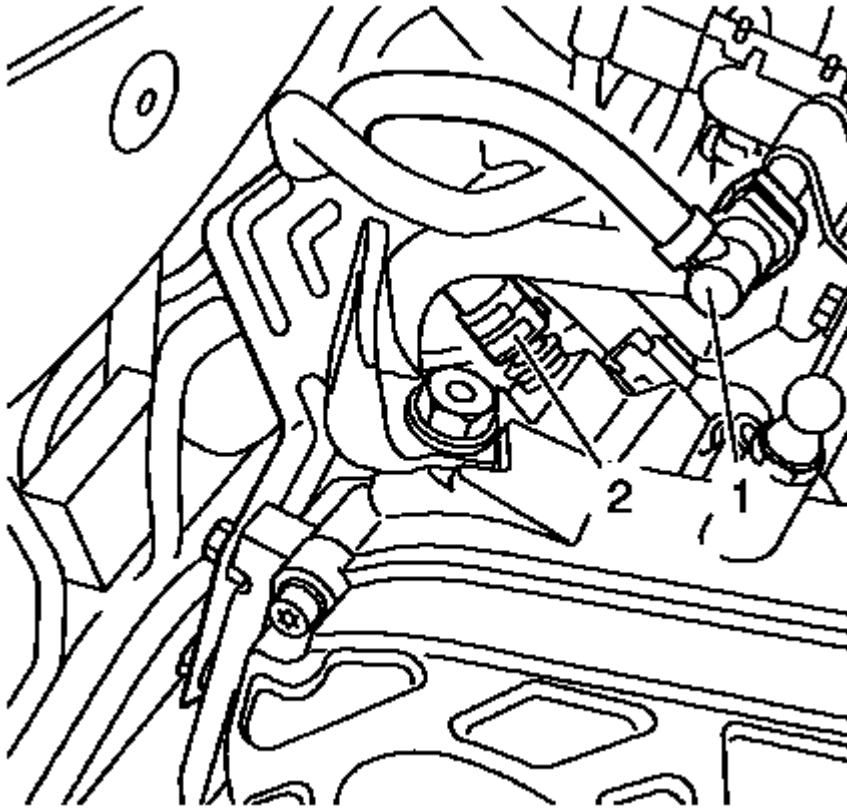




**Fig. 205: Identifying Torque Converter Bolts**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Service may offer bolts that are not microencapsulated. If this is the case apply thread lock agent to the bolts. If fasteners are microencapsulated, install **NEW** torque converter to flywheel bolts. **DO NOT** reuse the old bolts.

31. Install 6 NEW torque converter to flex plate bolts (1) and tighten to 60 (44 lb ft).
32. Install the starter. Refer to **Starter Replacement (2.0L Diesel LUZ)**.
33. Connect the engine oil heater power cable from the engine oil heater. Refer to **Engine Oil Heater Power Cable Replacement**.
34. Connect the 2 wiring harness plugs from engine cooling fan.
35. Connect the negative pressure pipe from the power brake booster pump.
36. Connect the turbocharger wastegate actuator vacuum control solenoid valve wiring harness plug.
37. Install the turbocharger wastegate actuator vacuum control solenoid valve hose from the solenoid valve. Refer to **Turbocharger Wastegate Actuator Vacuum Control Solenoid Valve Hose Replacement**.

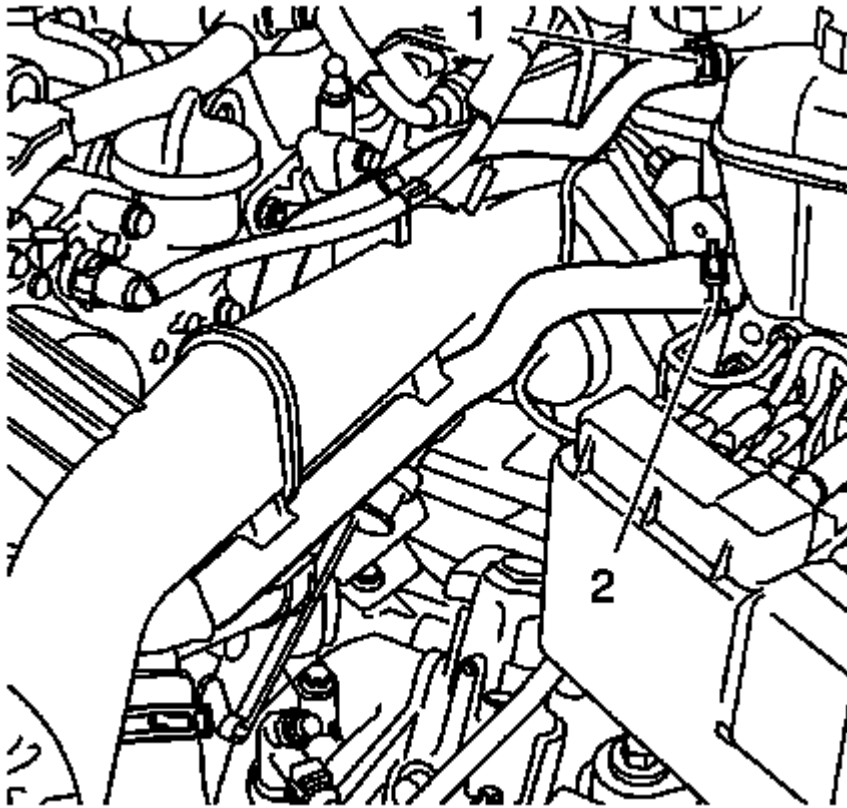


**Fig. 206: Fuel Return Pipe And Fuel Feed Pipe**  
Courtesy of GENERAL MOTORS COMPANY

**WARNING:** Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical (Class B) fire extinguisher nearby.

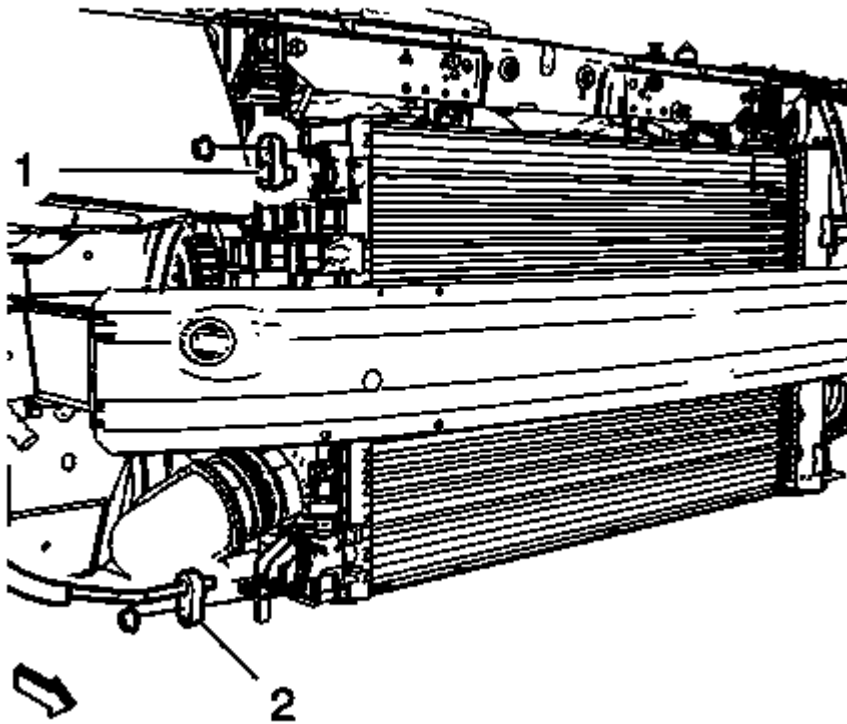
**CAUTION:** Clean all fuel pipe connections and surrounding areas before disconnecting the fuel pipes to avoid contamination of the fuel system.

38. Remove **EN-6015** plugs.
39. Connect the fuel feed pipe (2) from the fuel pump.
40. Connect the fuel return pipe (1).
41. Install the heater outlet hose from the bulkhead. Refer to **Heater Outlet Hose Replacement (2.0L Diesel LUZ)**.
42. Install the heater inlet hose from the bulkhead. Refer to **Heater Inlet Hose Replacement (2.0L Diesel LUZ)**.



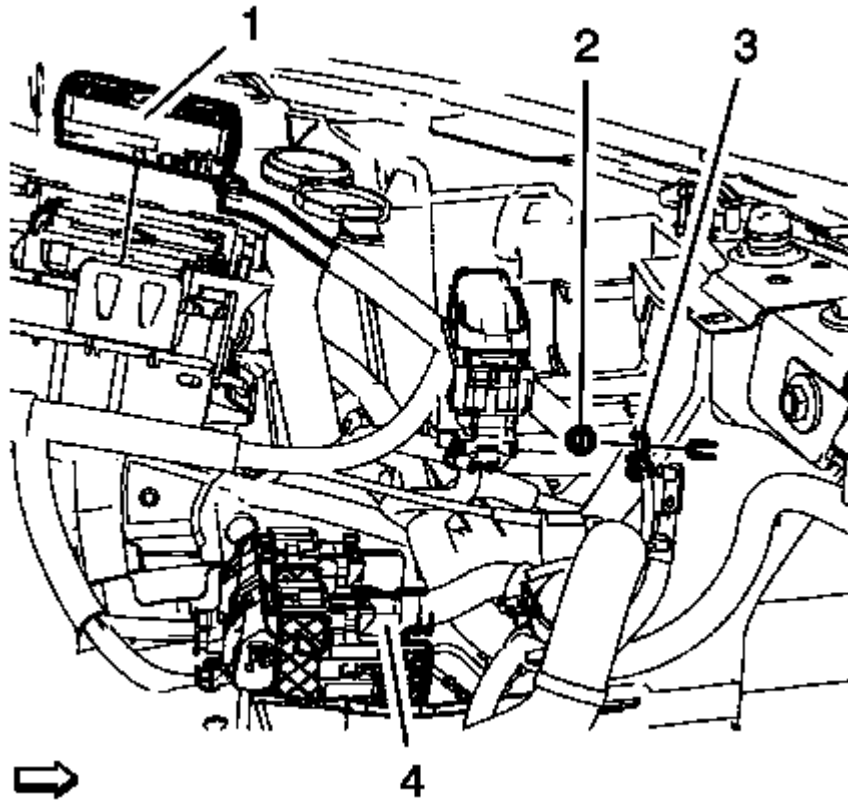
**Fig. 207: Engine Coolant Air Bleed Hose**  
**Courtesy of GENERAL MOTORS COMPANY**

43. Install the engine coolant air bleed hose (1) and the radiator surge tank engine hose (2) to the surge tank.



**Fig. 208: Upper/Lower Condenser Hoses & Nuts**  
 Courtesy of GENERAL MOTORS COMPANY

44. Use NEW O-ring seal. Refer to **Air Conditioning O-Ring Seal Replacement** .
45. Install the lower and upper condenser hoses (1, 2).
46. Install the lower and upper condenser hose nut and tighten to 19 (14 lb ft).
47. Install the three way catalytic converter. Refer to **Three-Way Catalytic Converter Replacement** .
48. Install the front bumper fascia. Refer to **Front Bumper Fascia Replacement** .
49. Install both front wheels. Refer to **Tire and Wheel Removal and Installation** .
50. Connect the air conditioning compressor and condenser hose to air conditioning evaporator hose assembly. Refer to **Air Conditioning Compressor and Condenser Hose Replacement (2.0L Diesel LUZ)** .



**Fig. 209: Wiring Harness Ground Cable**  
**Courtesy of GENERAL MOTORS COMPANY**

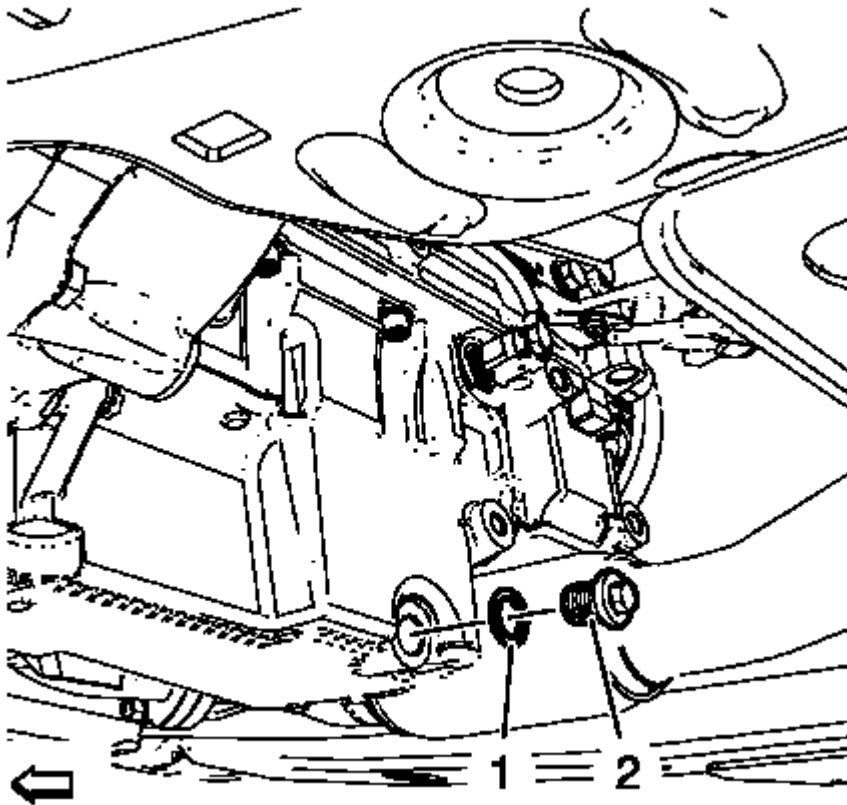
51. Connect the wiring harness connection adapter plug (4).
52. Install the wiring harness plug (1) to the front compartment fuse block housing.
53. Install the wiring harness ground cable (3) and the wiring harness ground cable nut (2) and tighten the nut to 9 (80 lb in).
54. Install the front compartment fuse block. Refer to **Front Compartment Fuse Block Replacement** .
55. Install the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
56. Install the lower intermediate steering shaft bolt. Refer to **Intermediate Steering Shaft Replacement** .
57. Install the engine sight shield. Refer to **Engine Sight Shield Replacement**.
58. Recharge the refrigerant. Refer to **Refrigerant Recovery and Recharging** .
59. Install the engine control module. Refer to **Engine Control Module Replacement** .
60. Install the battery tray. Refer to **Battery Tray Replacement** .
61. Connect the range selector lever cable to the transmission. Refer to **Range Selector Lever Cable Replacement** .
62. Refill the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)** , **Cooling System Draining and Filling (Static Fill)** .
63. Connect the power brake booster vacuum pipe. Refer to **Power Brake Booster Vacuum Pipe Replacement (2.0L Diesel LUZ)** .

64. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) .
65. Fill and check the transmission fluid level. Refer to [Transmission Fluid Drain and Fill](#) .

## ENGINE OIL AND OIL FILTER REPLACEMENT

### Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

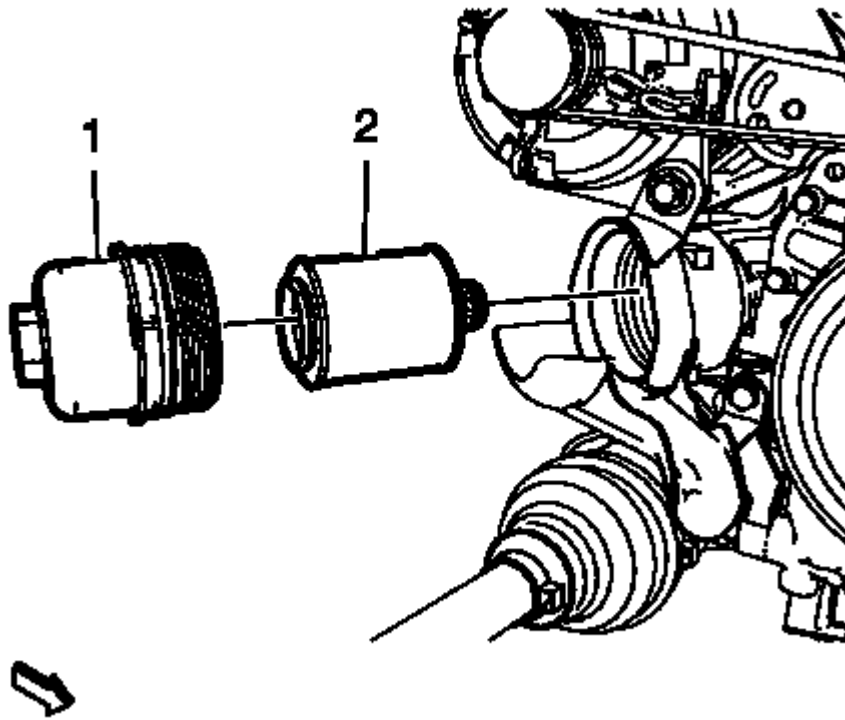


**Fig. 210: Oil Drain Screw And Seal Ring**  
Courtesy of GENERAL MOTORS COMPANY

2. Place a drain pan under the oil drain screw.
3. Remove the oil drain screw (2) and the seal ring (1).
4. DISCARD the seal ring (1)
5. Allow the oil to drain completely.

**CAUTION:** Refer to [Fastener Caution](#) .

6. Install the oil pan drain screw along with a NEW seal ring and tighten to 20 (15 lb ft).



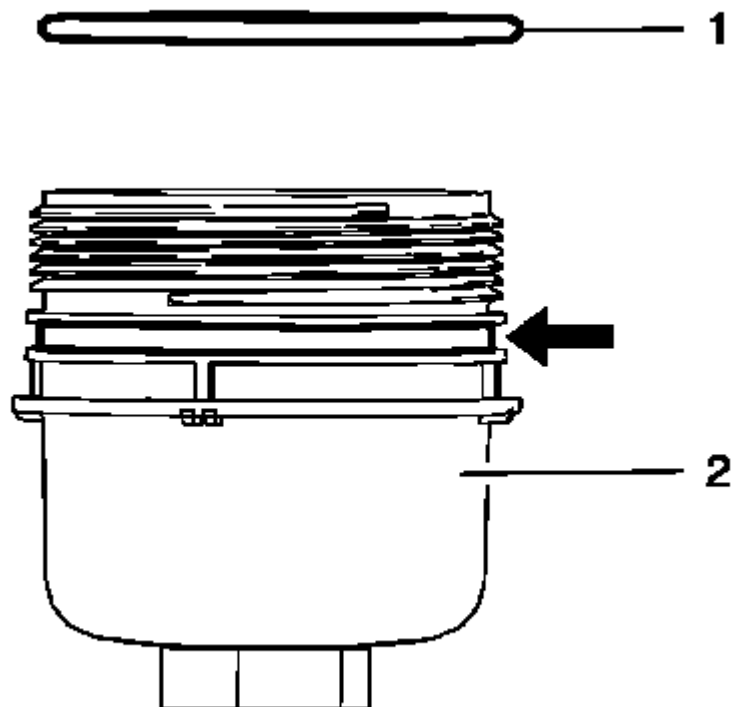
**Fig. 211: Oil Filter Cap, Oil Filter Element And Oil Filter Cap Seal Ring**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:**

- Do NOT use an open end wrench on the hex on top of the oil filter cap.
- Use care when removing the engine oil filter cap and filter to minimize fluid spillage. If fluid spillage occurs it must be cleaned with appropriate cleaner.
- Inspect the oil filter cap for any cracks or damage. If the oil filter cap is damaged it must be replaced.

7. Remove the oil filter cap (1) along with the oil filter element (2) and the oil filter cap seal ring.
8. Unclip the oil filter element from the oil filter cap.
9. DISCARD the oil filter cap seal ring.

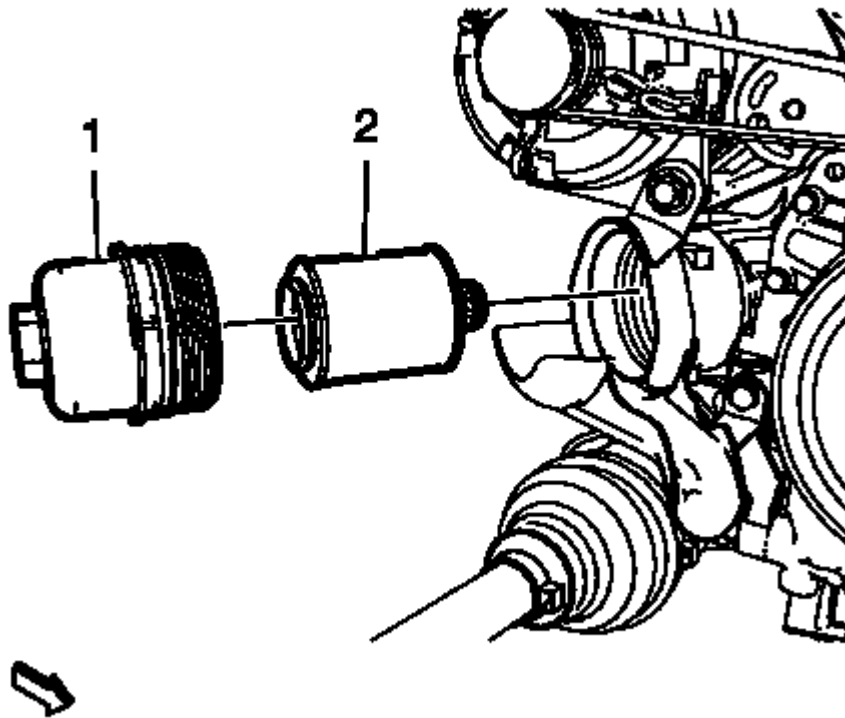
**Installation Procedure**



**Fig. 212: Oil Filter Cap Seal Ring And Oil Filter Cap Threads**  
Courtesy of GENERAL MOTORS COMPANY

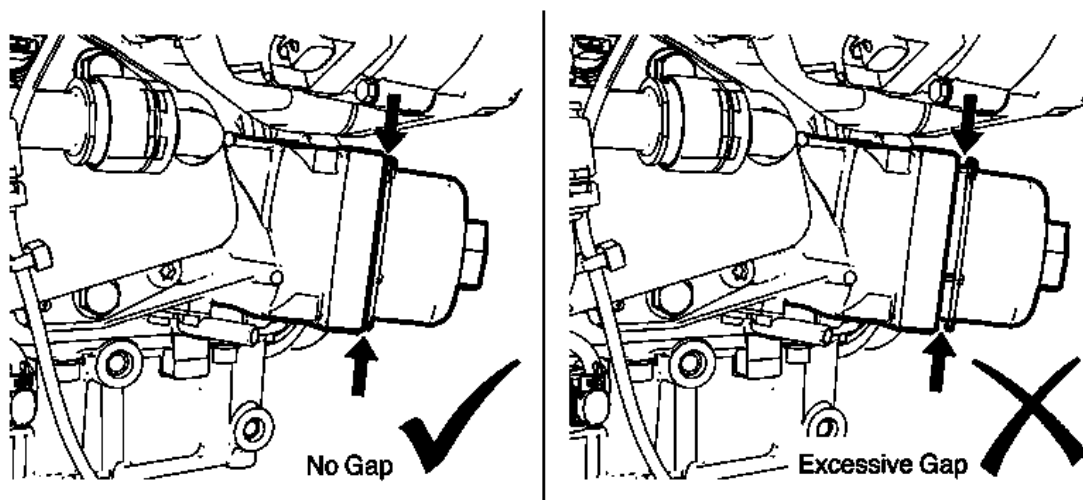
1. Install a NEW oil filter cap seal ring (1) to the shown groove (arrow).
2. Lubricate the oil filter cap threads (2) and the oil filter cap seal ring with clean engine oil.





**Fig. 213: Oil Filter Cap, Oil Filter Element And Oil Filter Cap Seal Ring**  
Courtesy of GENERAL MOTORS COMPANY

3. Clip the NEW oil filter element (2) to the oil filter cap (1).



**Fig. 214: Installing Oil Filter Cap Along With Oil Filter Element**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Ensure oil filter cap is completely seated on oil filter housing. If not

completely seated an oil leak may occur.

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

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

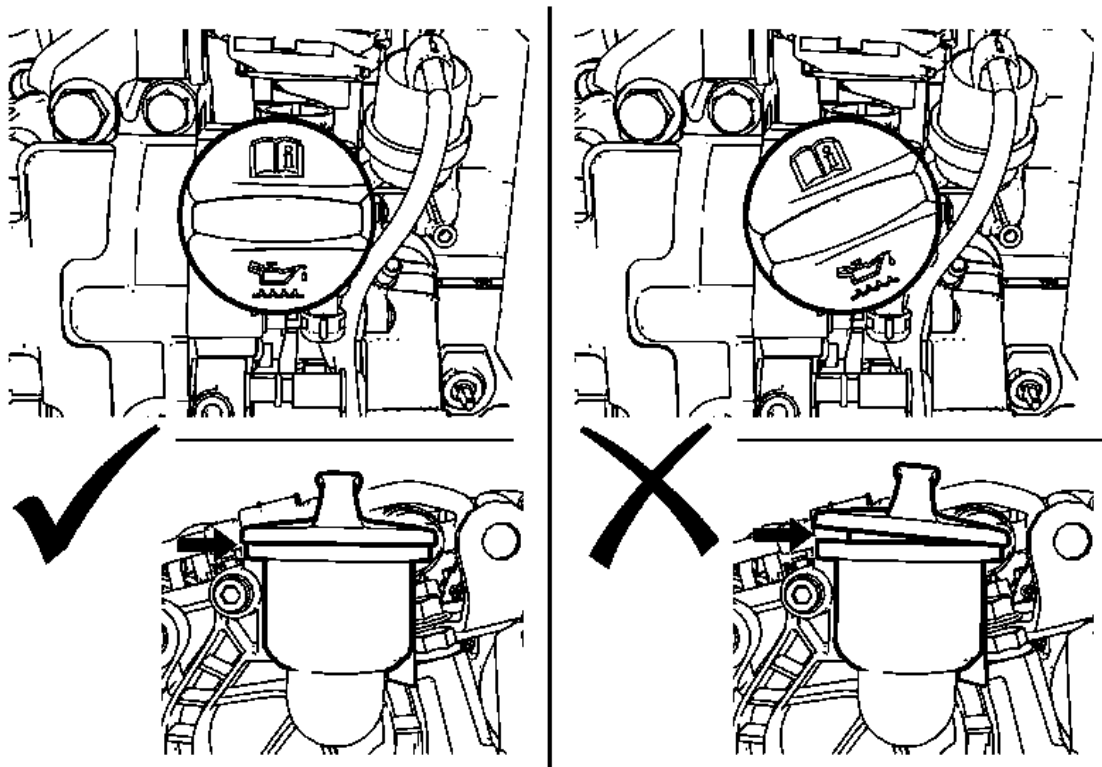
4. Install the oil filter cap along with the oil filter element and the NEW oil filter cap seal ring and tighten to 25 (18 lb ft).
5. Clean excess oil from the oil filter drain deflector.
6. Lower the vehicle.

**CAUTION:** Using engine oils of any viscosity other than those viscosities recommended could result in engine damage.

**NOTE:**

- Do NOT overfill the engine with engine oil.
- Anytime engine oil is added (top off or oil changes) ensure all engine surfaces are completely free of residual oil. If there is oil to any engine surface clean as necessary.

7. Fill the engine with oil. Refer to Engine Mechanical Specifications .

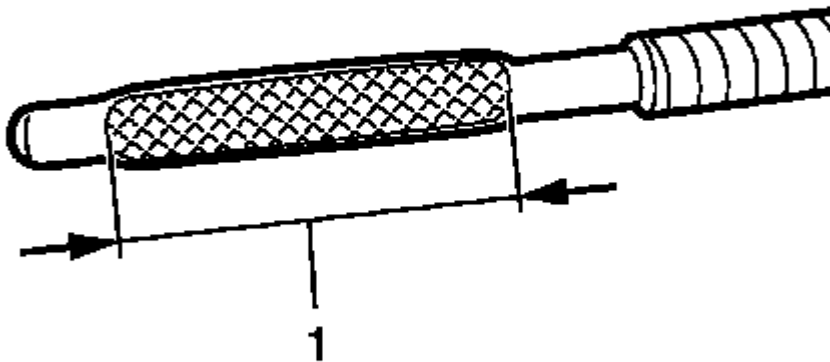


**Fig. 215: Installing Oil Fill Cap**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Oil fill cap must be properly seated and tightened during installation.

8. Install oil fill cap.
9. Start the engine and allow it to run until the oil pressure control indicator goes off. Inspect for any oil leaks around the drain plug, oil filter and oil fill cap.

**Fig. 216: Inspecting Engine Oil Level**

Courtesy of GENERAL MOTORS COMPANY

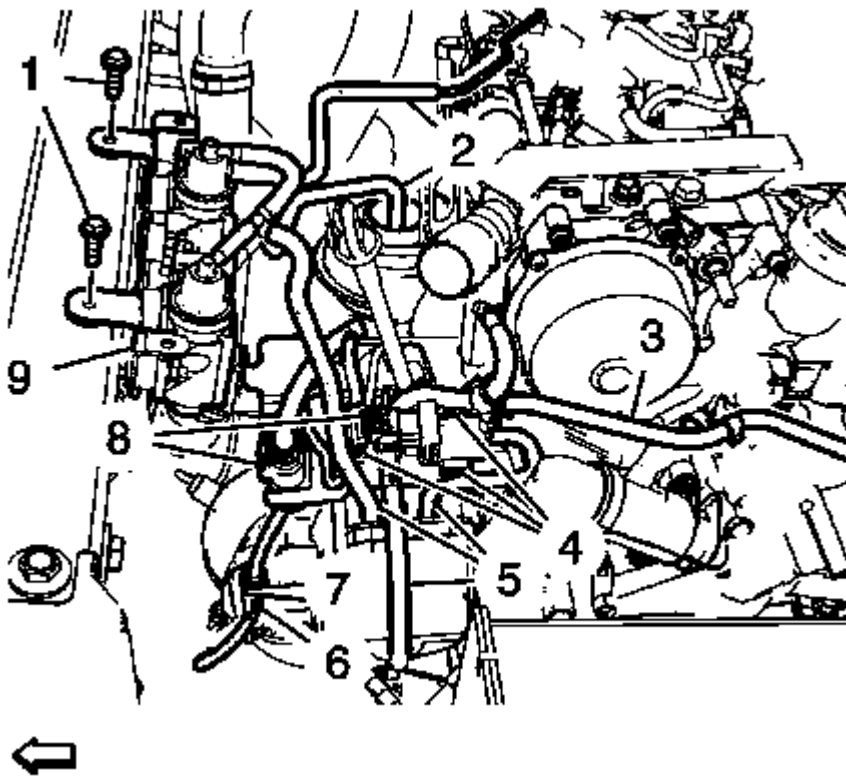
10. Inspect the engine oil level. The oil level should be in the cross-hatched section (1) of the oil level indicator as shown.
11. Reset the GM oil life system. Refer to **GM Oil Life System Resetting**.

## EXHAUST GAS RECIRCULATION VALVE VACUUM TANK REPLACEMENT

### Removal Procedure

1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.

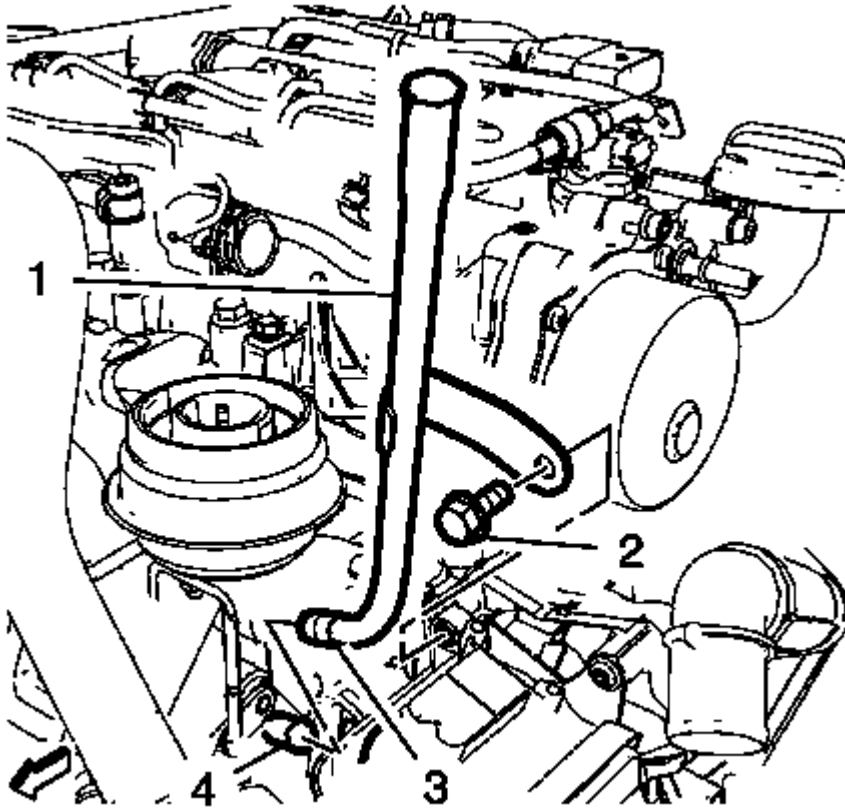
2. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement**.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
4. Drain the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)** , **Cooling System Draining and Filling (Static Fill)** .
5. Remove the ECM from the battery tray and lay aside. Refer to **Engine Control Module Replacement** .
6. Remove the charge air cooler outlet air tube. Refer to **Charge Air Cooler Outlet Air Hose Replacement**.
7. Remove the charge air bypass valve tube.



**Fig. 217: Vacuum Hoses, Wiring Harness And Wirings Harness Plugs**  
 Courtesy of GENERAL MOTORS COMPANY

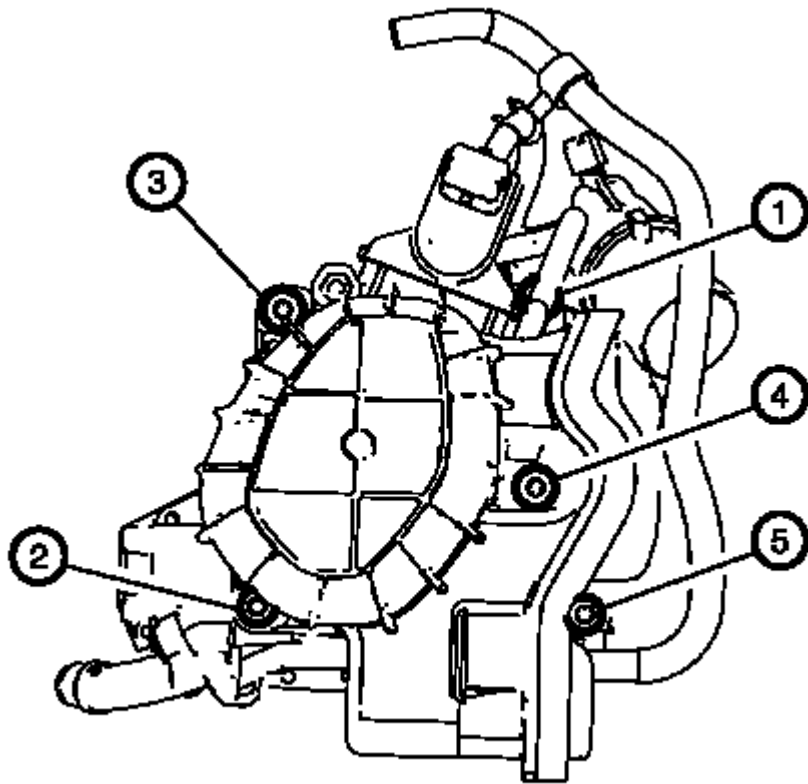
8. Remove the vacuum hoses (2) from the vacuum pipe and the wastegate vacuum dose.
9. Remove the vacuum hose (3) from the EGR control solenoid valve.
10. Remove the vacuum hoses (5) from the EGR vacuum tank.
11. Remove the 2 bolts (1) and lay the turbocharger wastegate actuator vacuum control solenoid valves with bracket (9) aside.
12. Clip out the wiring harness (6) from the vacuum tank.
13. Disconnect the wirings harness plugs (8).
14. Remove the EGR control solenoid valve bolts (4).

15. Remove the EGR vacuum regulator valve solenoid and the bracket (7) from the vacuum tank.



**Fig. 218: Upper Oil Level Indicator Tube Bolt**  
Courtesy of GENERAL MOTORS COMPANY

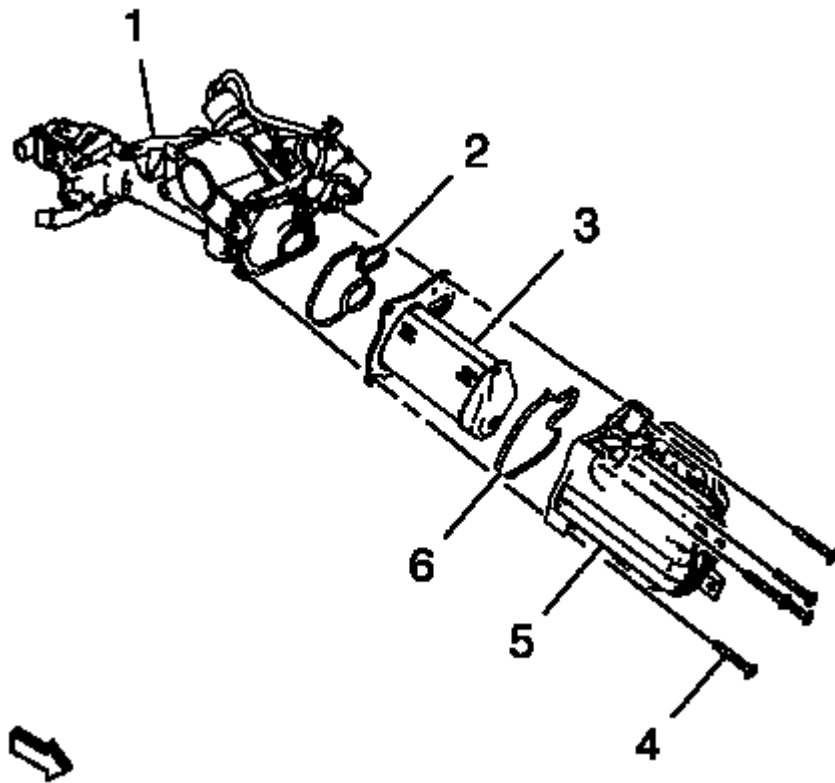
16. Remove the oil level indicator dip stick.
17. Remove the upper oil level indicator tube bolt (2).
18. Remove the oil level indicator tube - upper (1) from the oil level indicator tube - lower (4) and DISCARD the seal ring (3).



**Fig. 219: Vacuum Tank Bolts**

Courtesy of GENERAL MOTORS COMPANY

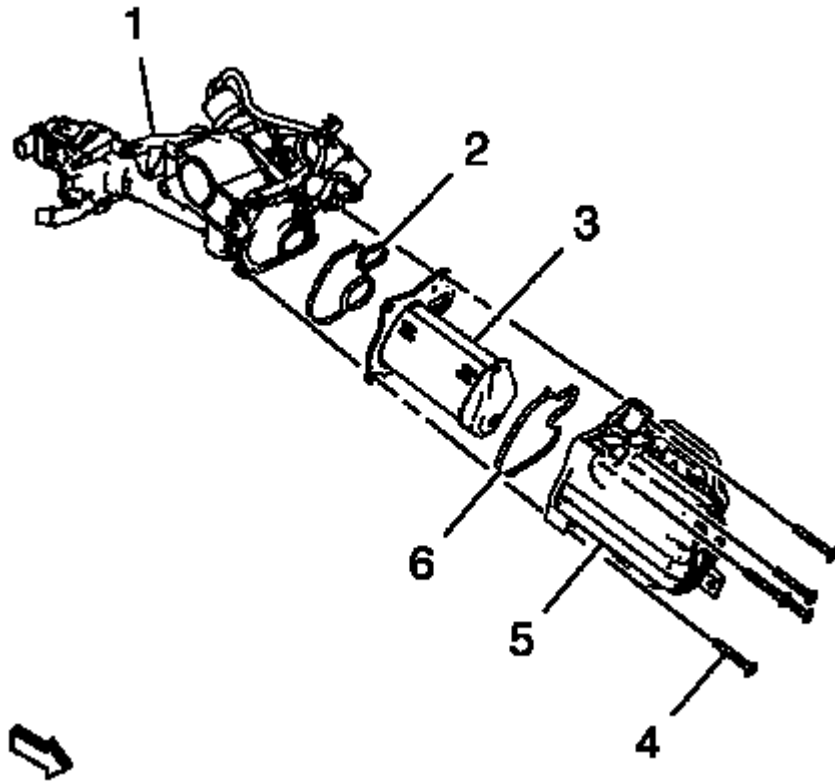
19. Loosen the vacuum tank bolts (3, 4, 5).
20. Loosen the vacuum tank bolts (1, 2).



**Fig. 220: EGR Valve Tank And EGR Heat Exchanger**  
**Courtesy of GENERAL MOTORS COMPANY**

21. Remove the 5 bolts (4) from the EGR vacuum valve body (1).
22. Remove the EGR valve tank (5) and the EGR heat exchanger (3).
23. Remove and DISCARD the EGR seals (2, 6).

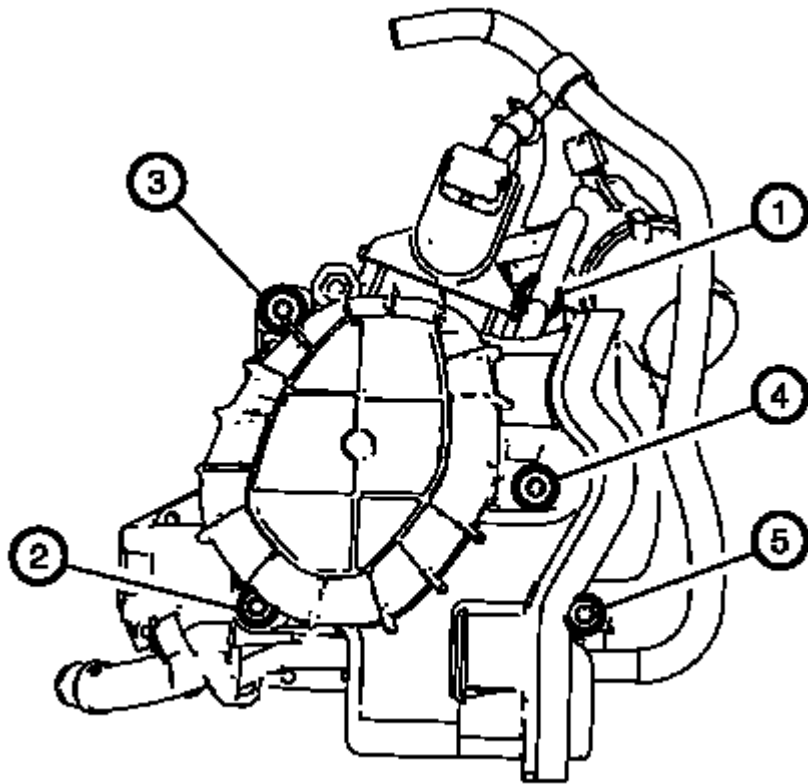
#### **Installation Procedure**



**Fig. 221: EGR Valve Tank And EGR Heat Exchanger**  
**Courtesy of GENERAL MOTORS COMPANY**

1. Clean the sealing surfaces from EGR vacuum valve body (1) and EGR valve tank (5).
2. Install a NEW seal (2) to the EGR valve tank (5).
3. Install the EGR heat exchanger (3) to the EGR valve tank (5).
4. Install a NEW seal (6) to the EGR valve body (1).
5. Install the EGR valve tank (5) to the EGR valve body (1) install the bolts (4) but do not tighten.

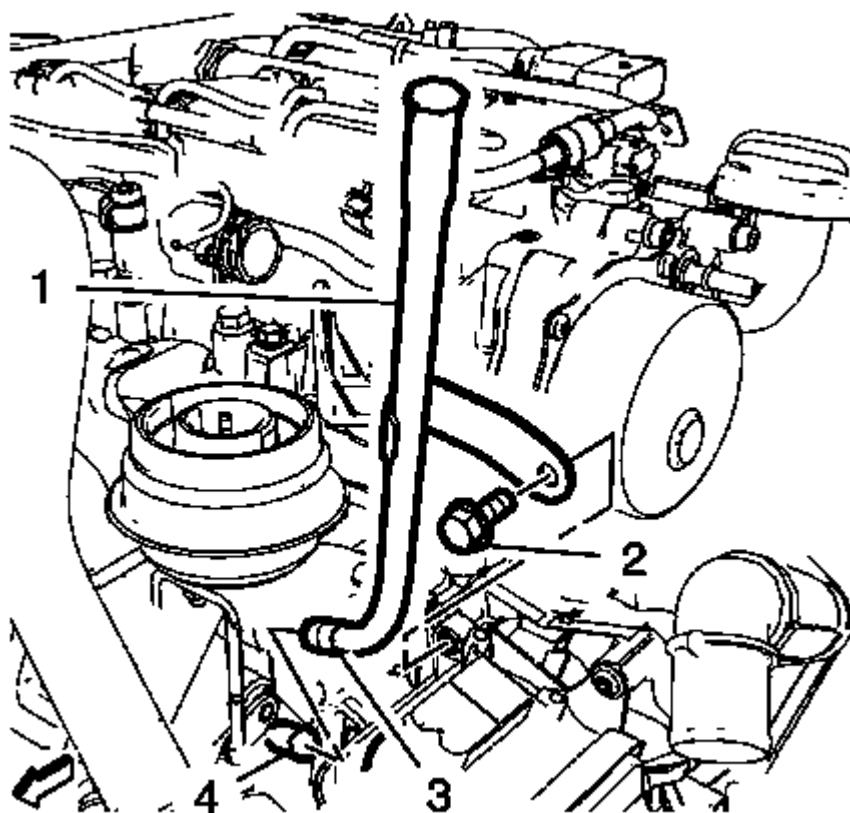




**Fig. 222: Vacuum Tank Bolts**

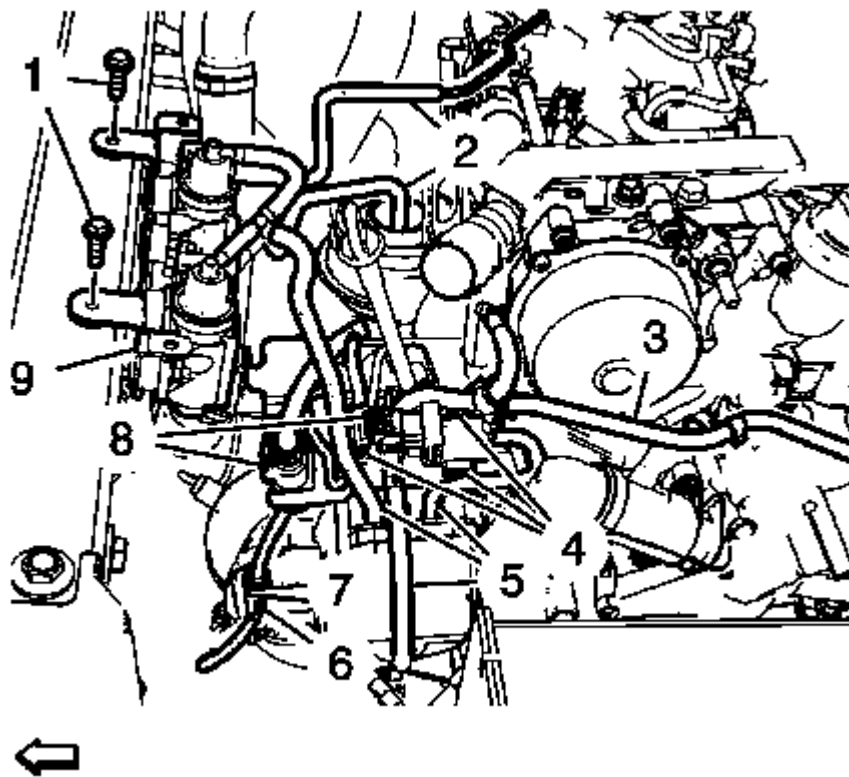
Courtesy of GENERAL MOTORS COMPANY

6. Hand tighten the vacuum tank bolts (1, 2).
7. Tighten the vacuum tank bolts (1 - 5) in sequence as shown to 10 N.m (89 lb in).



**Fig. 223: Upper Oil Level Indicator Tube Bolt**  
Courtesy of GENERAL MOTORS COMPANY

8. Install the oil level indicator tube - upper (1) with a NEW the seal ring (3) to the oil level indicator tube - lower (4).
9. Install the upper oil level indicator tube bolt (2) and tighten to 9 N.m (80 lb in).
10. Install the oil level indicator dip stick.



**Fig. 224: Vacuum Hoses, Wiring Harness And Wirings Harness Plugs**  
Courtesy of GENERAL MOTORS COMPANY

11. Install the EGR vacuum regulator valve solenoid and the bracket (7) to the vacuum tank.
12. Install the EGR control solenoid valve bolts (4)
13. Connect the wirings harness plugs (8).
14. Clip in the wiring harness (6) to the vacuum tank.
15. Install the vacuum hose (3) to the EGR control solenoid valve.
16. Install the turbocharger wastegate actuator vacuum control solenoid valves with bracket (9) to the front end upper tie bar and tighten the 2 bolts (1) to 9 N.m (80 lb in).
17. Install the vacuum hoses (5) to the EGR vacuum tank.
18. Install the vacuum hoses (2) to the vacuum pipe and the wastegate vacuum dose.
19. Install the charge air bypass valve tube.
20. Install the charge air cooler outlet air tube. Refer to **Charge Air Cooler Outlet Air Hose Replacement**.
21. Install the ECM to the battery tray. Refer to **Engine Control Module Replacement** .
22. Fill the cooling system. Refer to **Cooling System Draining and Filling (GE-47716 Fill)** , **Cooling System Draining and Filling (Static Fill)** .
23. Install the engine sight shield. Refer to **Engine Sight Shield Replacement**.
24. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .

25. Program volatile memories. Refer to **Volatile Memory Programming** .
26. Lower and unsupport the vehicle.