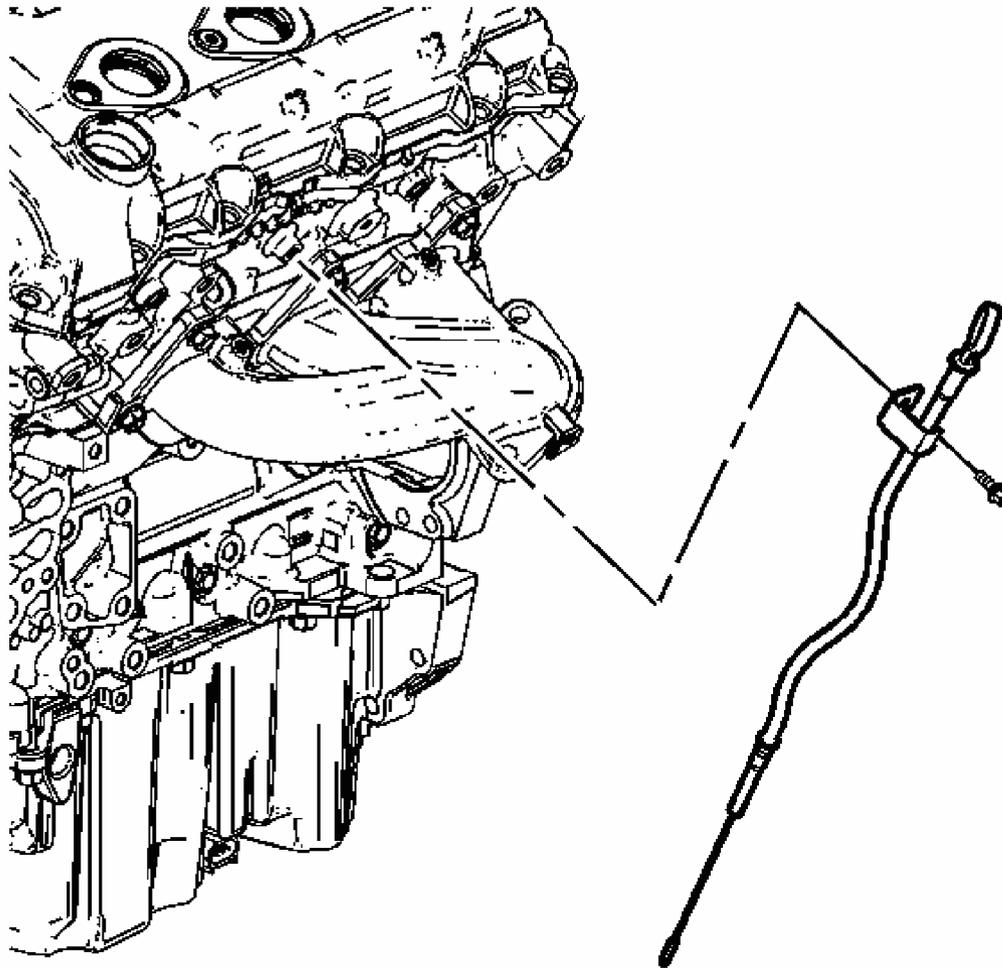


# REPAIR INSTRUCTIONS

## OIL LEVEL INDICATOR AND TUBE INSTALLATION

1. Install a NEW O-ring on the oil level indicator tube.



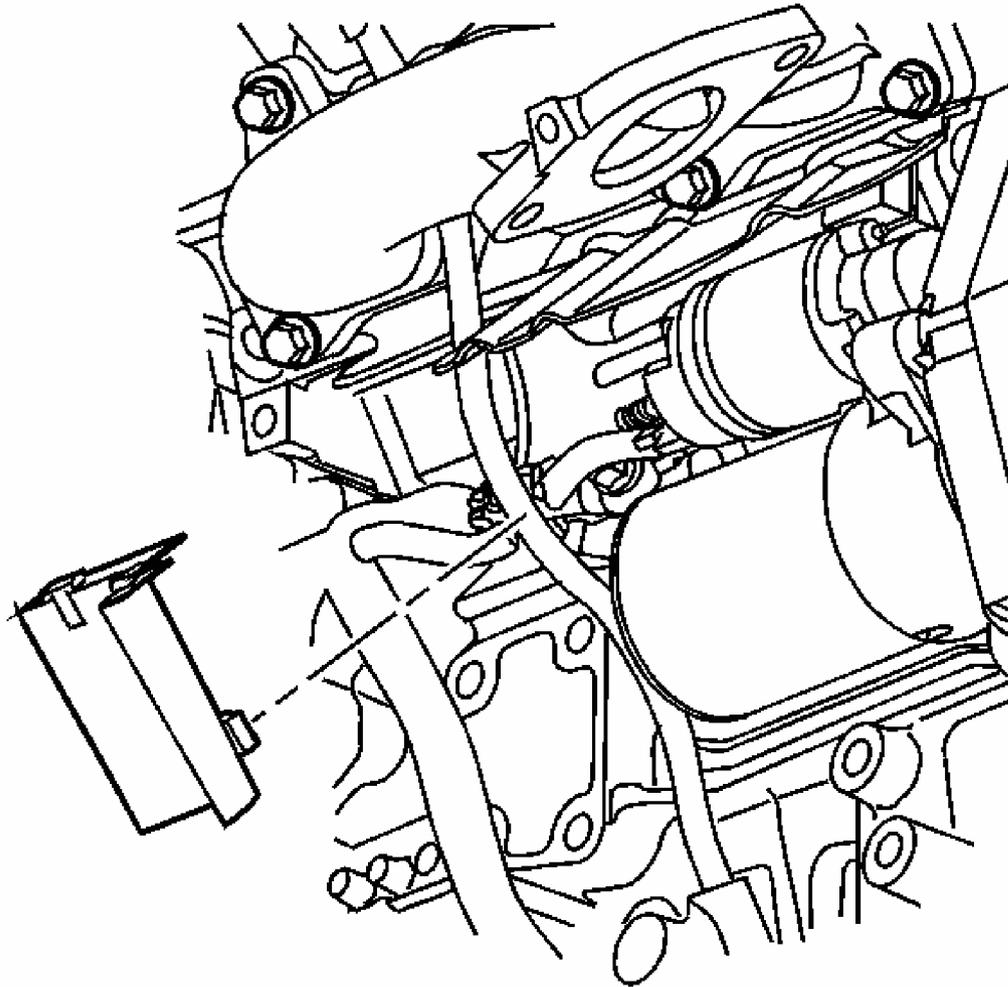
**Fig. 1: View Of Oil Level Indicator Tube**  
Courtesy of GENERAL MOTORS CORP.

2. Install the oil level indicator and tube by sliding the tube down through the lower crankcase hole.

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

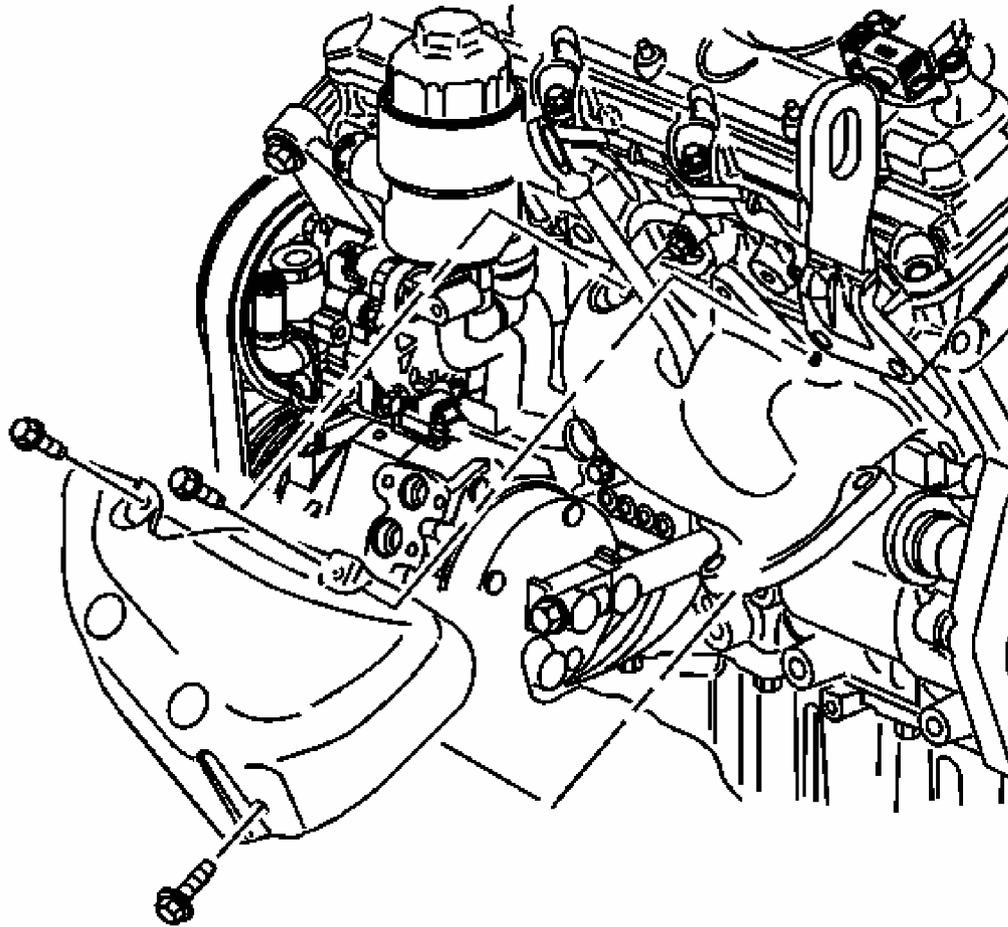
3. Install the oil level indicator tube bracket bolt.

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



**Fig. 2: View Of Left Exhaust Manifold Lower Insulator**  
Courtesy of GENERAL MOTORS CORP.

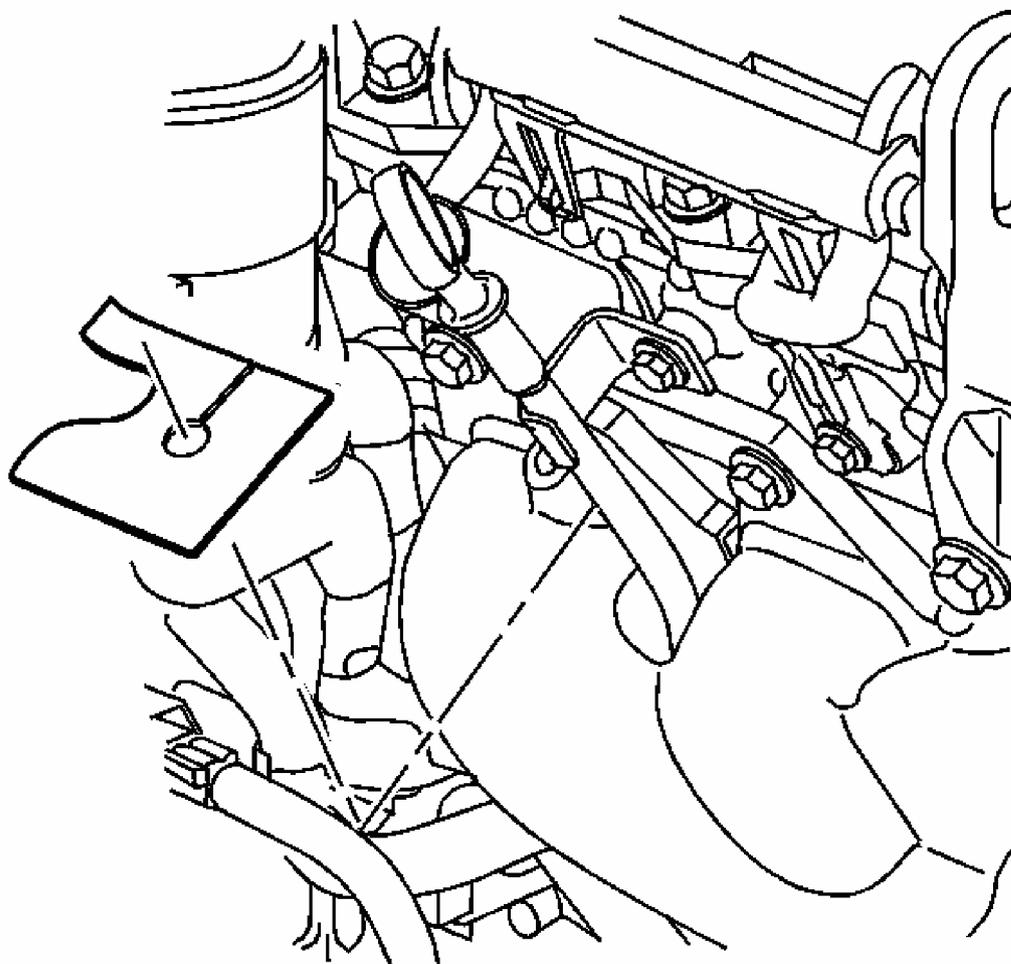
4. Install the left exhaust manifold lower insulator onto the oil level indicator tube.



**Fig. 3: View Of Left Exhaust Manifold Heat Shield**  
**Courtesy of GENERAL MOTORS CORP.**

5. Place the left exhaust manifold heat shield in position.
6. Install the exhaust manifold heat shield bolts.

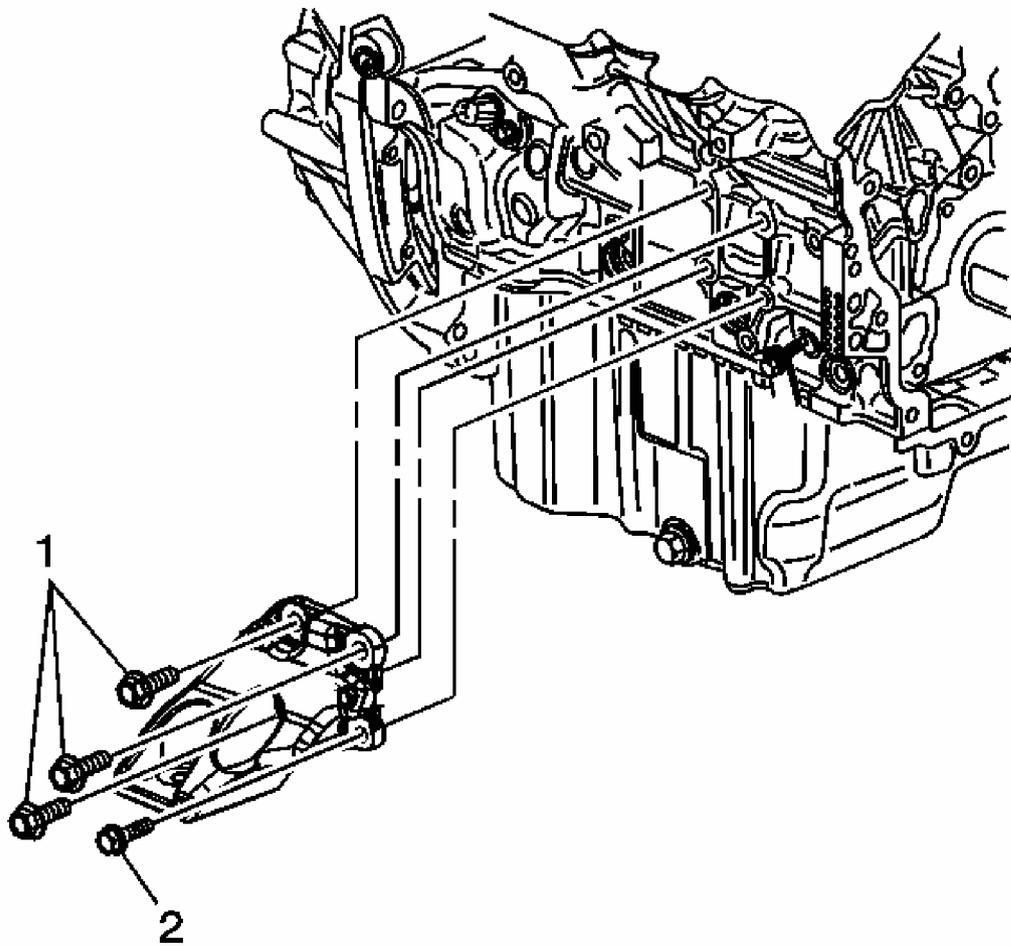
**Tighten:** Tighten the exhaust manifold heat shield bolts to 10 N.m (89 lb in).



**Fig. 4: View Of Left Exhaust Manifold Upper Insulator**  
**Courtesy of GENERAL MOTORS CORP.**

7. Install the left exhaust manifold upper insulator onto the oil level indicator tube.

**EXHAUST MANIFOLD INSTALLATION - RIGHT**



**Fig. 5: Removing & Installing Engine Mount Bracket**  
Courtesy of GENERAL MOTORS CORP.

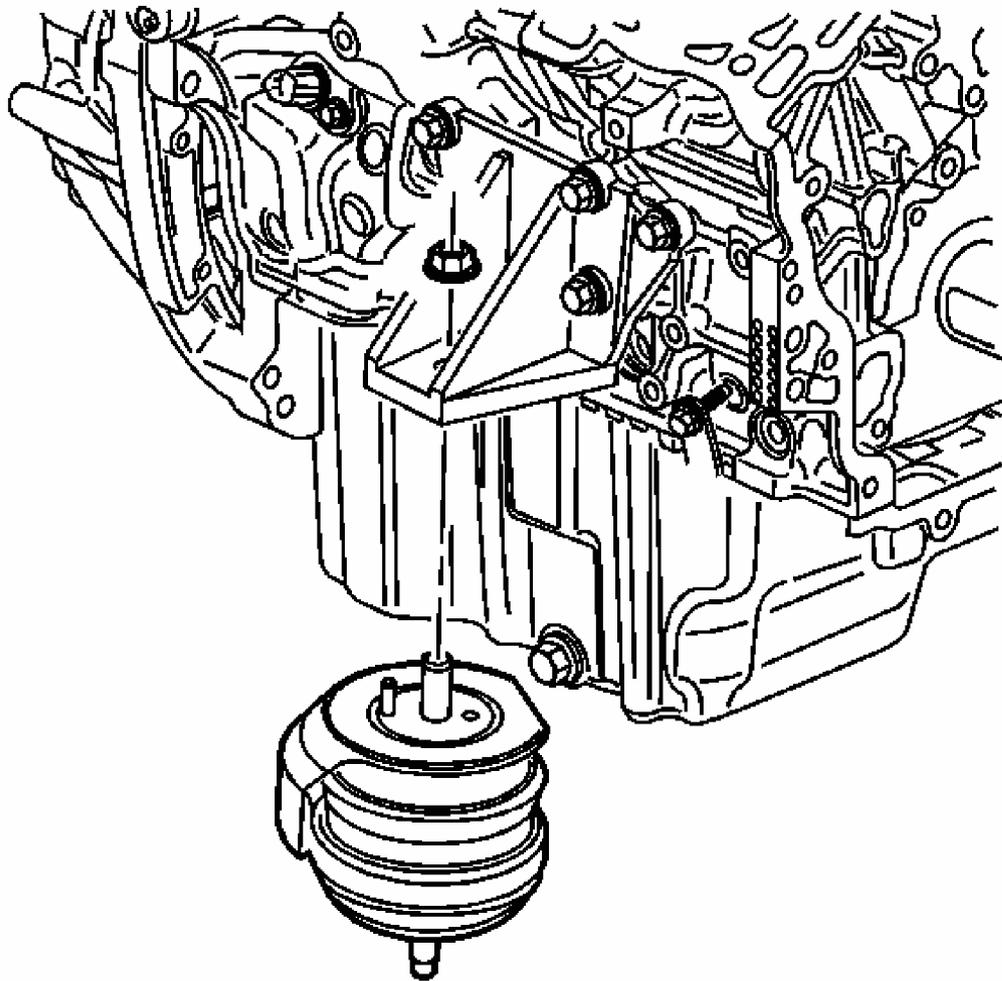
1. Install the engine mount bracket.

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

2. Install the engine mount bracket bolts.

**Tighten:**

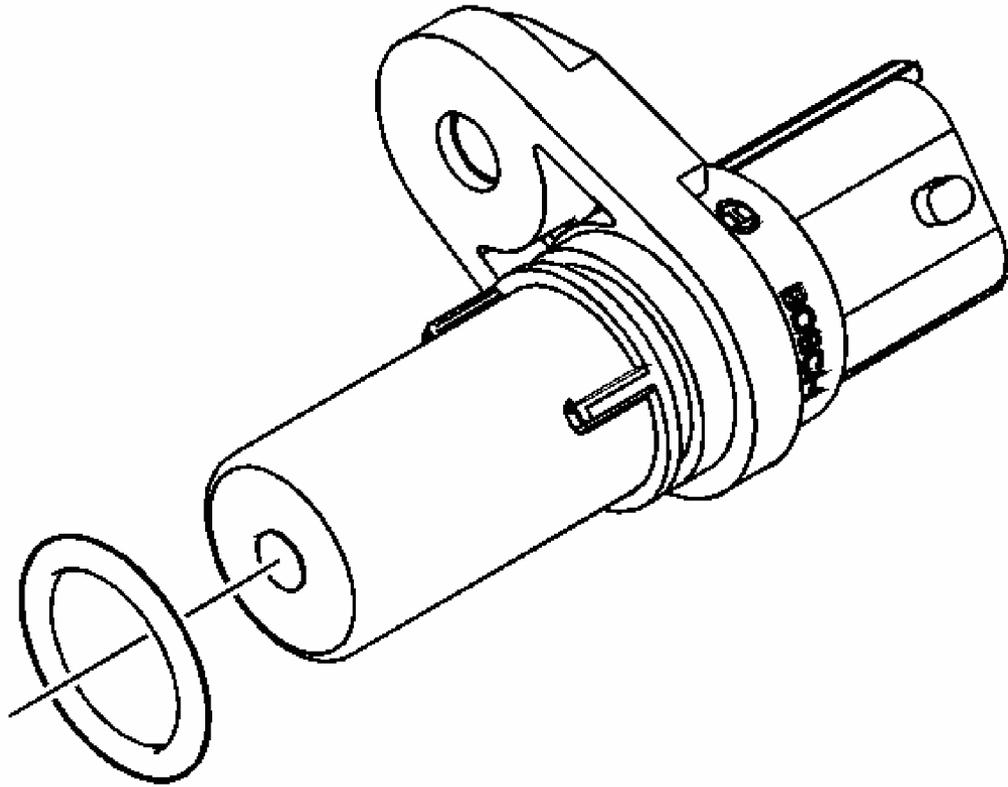
- Tighten the M10 engine mount bracket bolts (1) to 60 N.m (44 lb ft).
- Tighten the M8 engine mount bracket bolt (2) to 38 N.m (28 lb ft).



**Fig. 6: Removing & Installing Engine Mount**  
**Courtesy of GENERAL MOTORS CORP.**

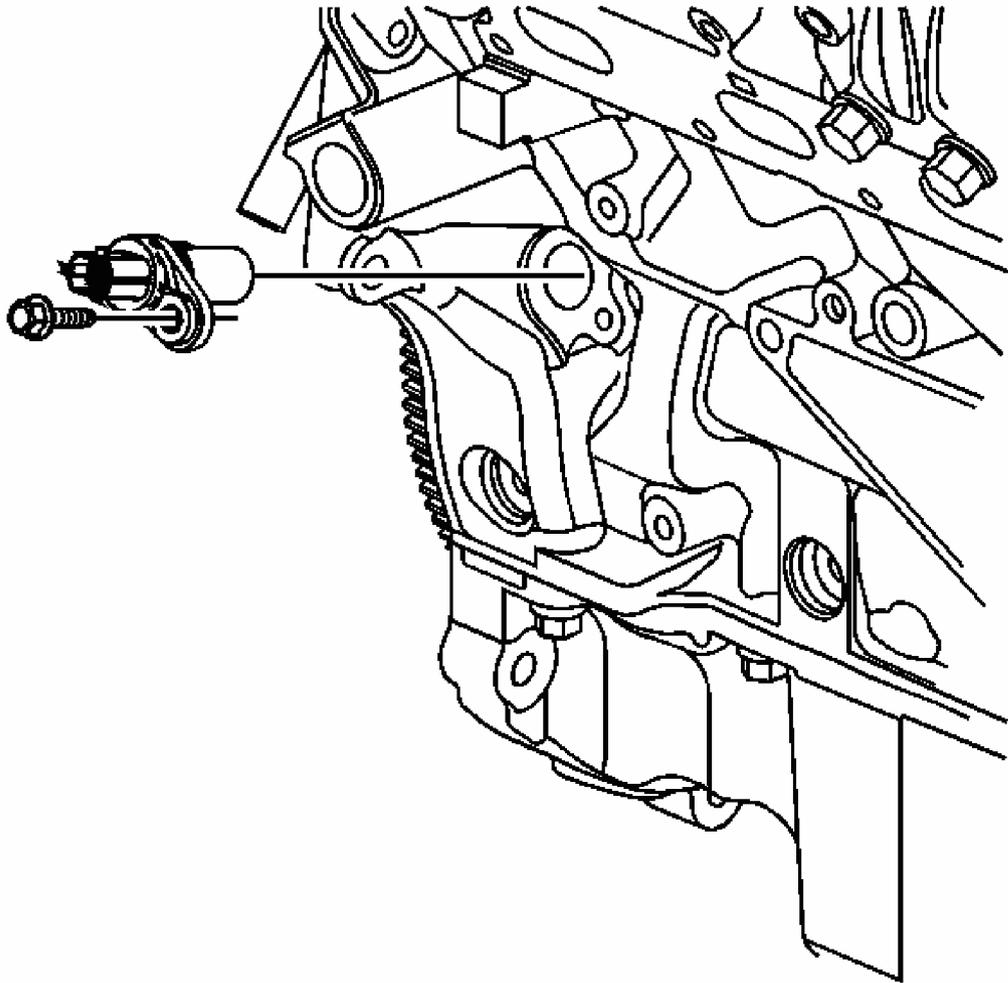
3. Install the engine mount.
4. Install the engine mount nut.

**Tighten:** Tighten the engine mount nut to 80 N.m (59 lb ft).



**Fig. 7: View Of Crankshaft Position Sensor O-Ring**  
**Courtesy of GENERAL MOTORS CORP.**

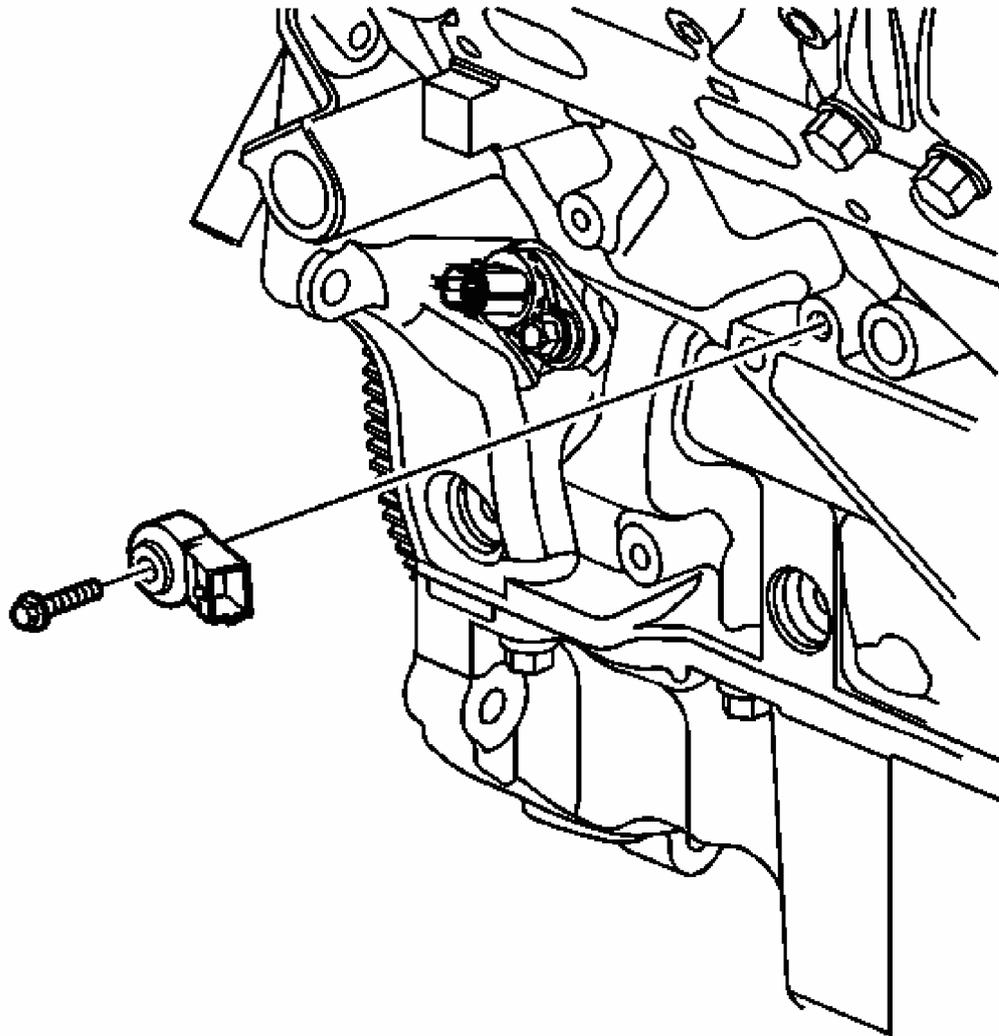
5. Install the NEW O-ring on the crankshaft position sensor, if damaged.



**Fig. 8: View Of Crankshaft Position Sensor & Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

6. Position the crankshaft position sensor into the cylinder block.
7. Install the crankshaft position sensor bolt.

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

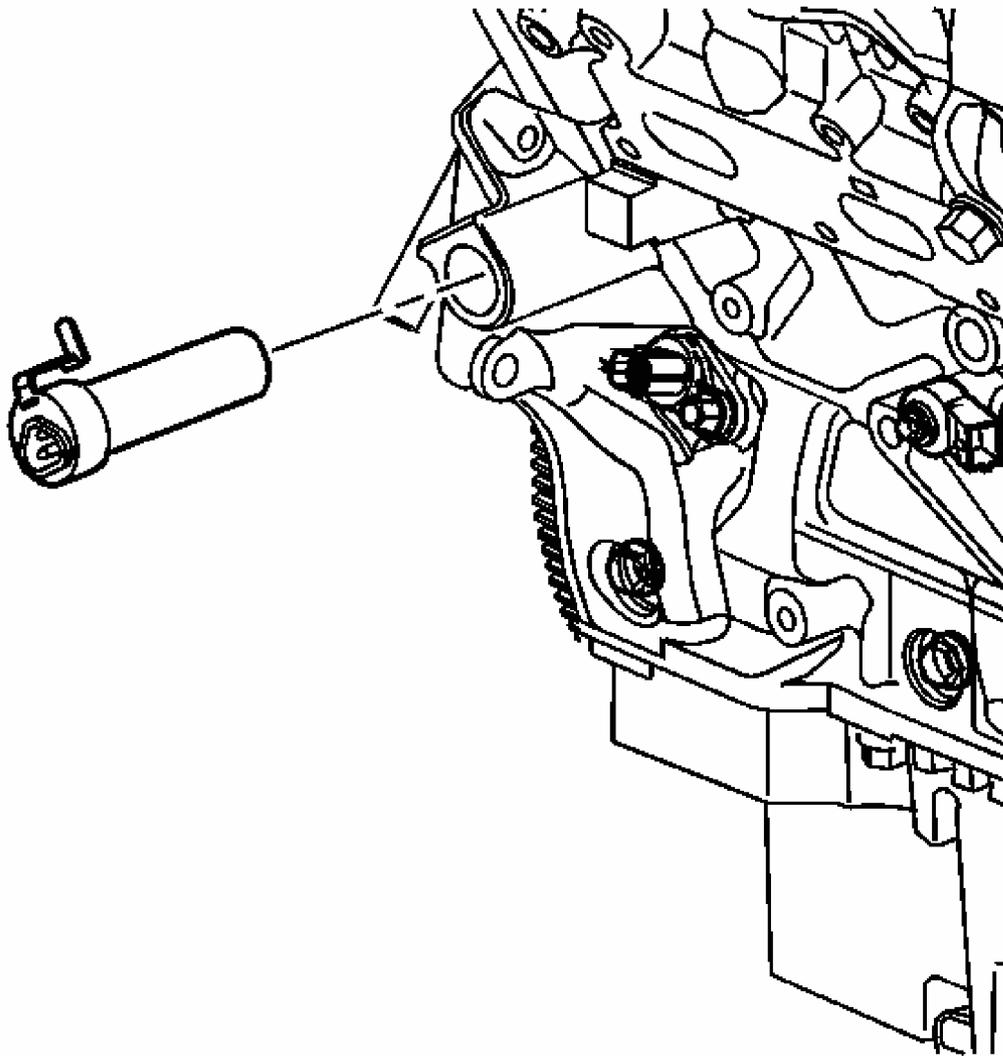


**Fig. 9: View Of Right Knock Sensor & Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

8. Position the right knock sensor to the cylinder block as shown.
9. Install the knock sensor bolt.

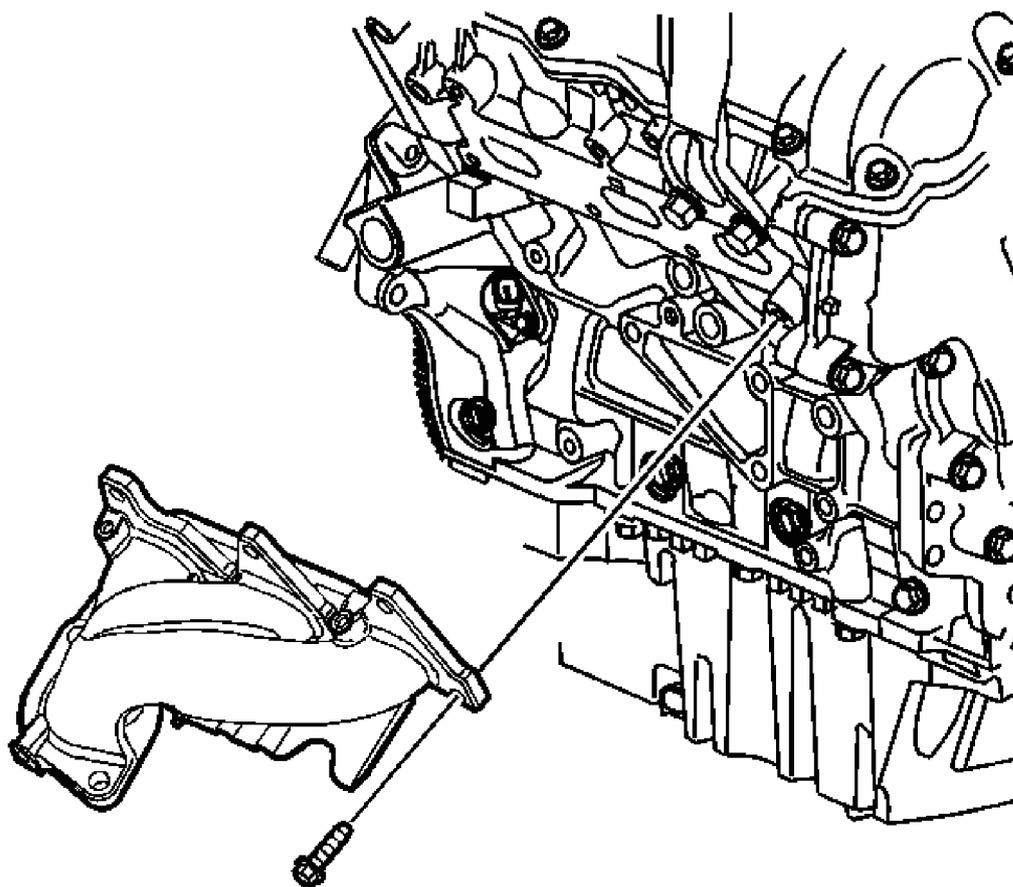
**Tighten:** Tighten the knock sensor bolt to 23 N.m (17 lb ft).

10. Ensure proper knock sensor orientation.



**Fig. 10: View Of Block Heater Cartridge**  
**Courtesy of GENERAL MOTORS CORP.**

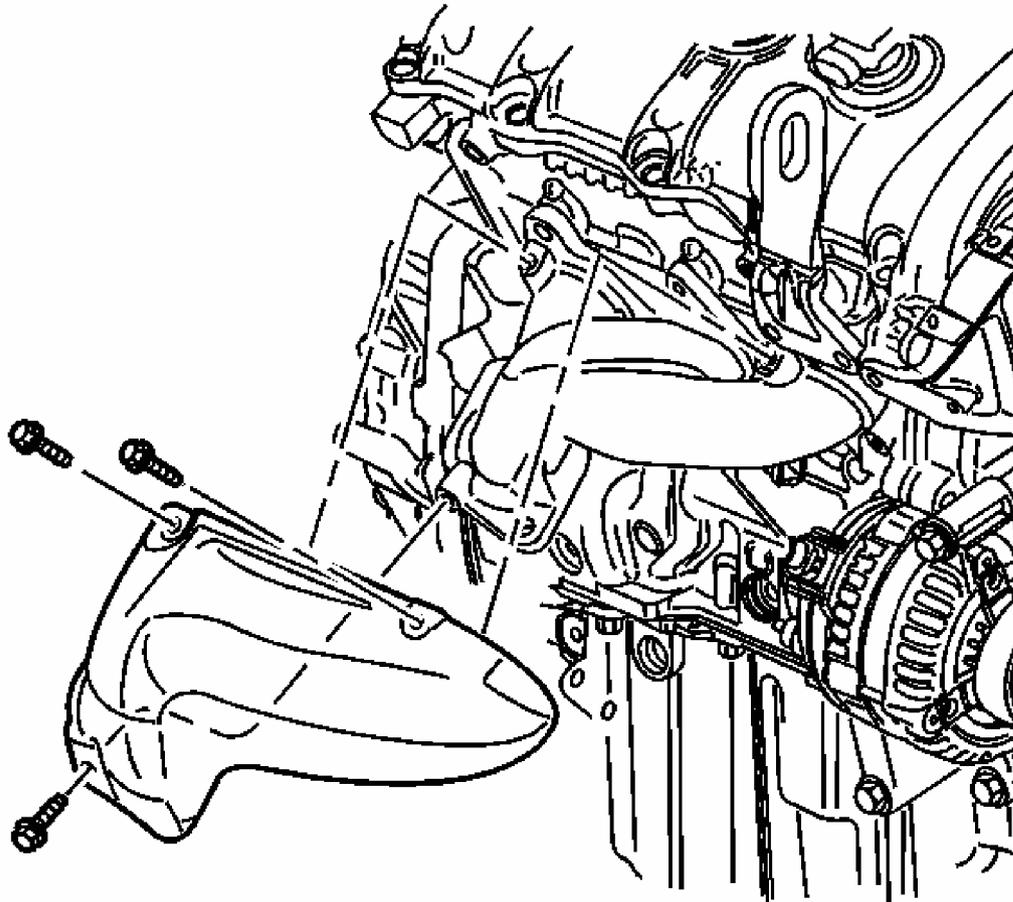
11. Install the block heater cartridge, if equipped.



**Fig. 11: Removing & Installing Right Exhaust Manifold**  
**Courtesy of GENERAL MOTORS CORP.**

12. Position a NEW exhaust manifold gasket onto the right exhaust manifold.
13. Install the exhaust manifold bolts into the right exhaust manifold.
14. Place the right exhaust manifold, exhaust manifold gasket and bolts as an assembly in position on the right cylinder head.
15. Install the exhaust manifold bolts into the right cylinder head.

**Tighten:** Tighten the exhaust manifold bolts to 25 N.m (18 lb ft).

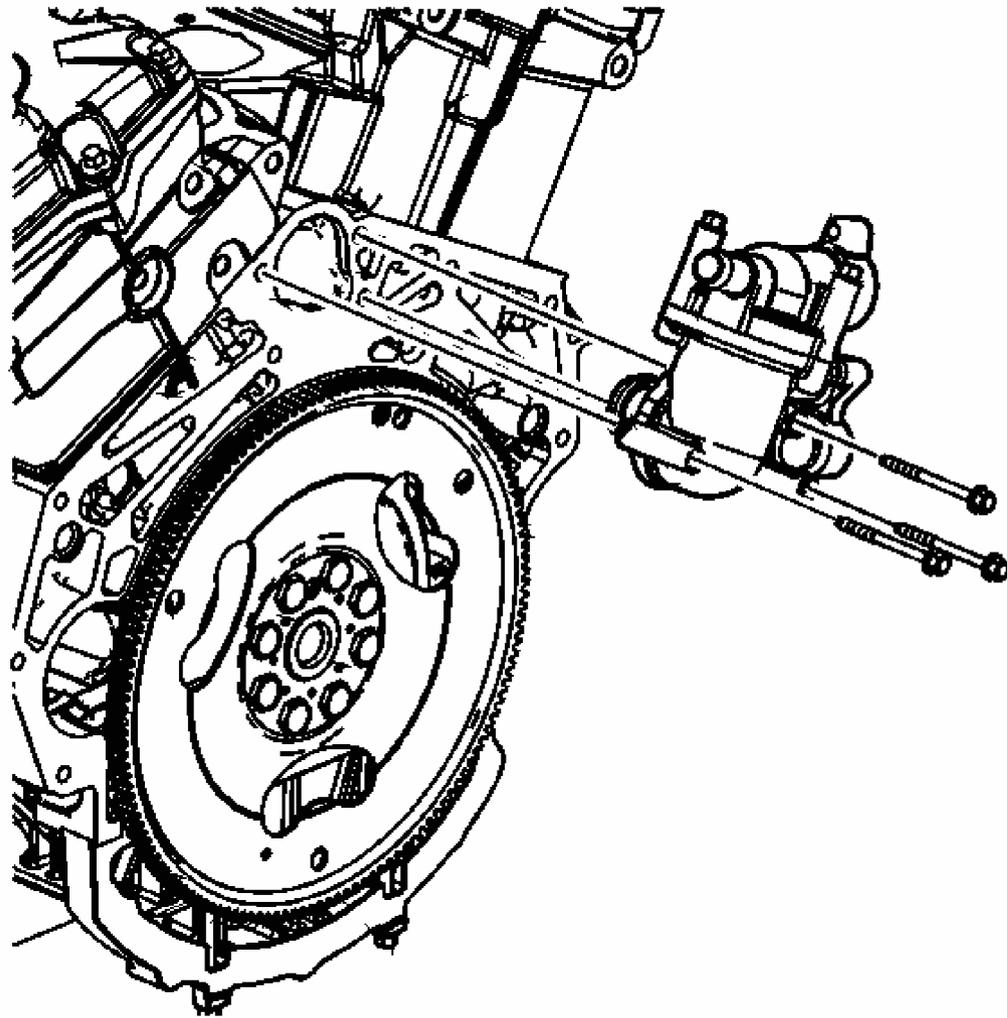


**Fig. 12: View Of Right Exhaust Manifold Heat Shield**  
Courtesy of GENERAL MOTORS CORP.

16. Place the right exhaust manifold heat shield in position.
17. Install the exhaust manifold heat shield bolts.

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

#### **THERMOSTAT HOUSING INSTALLATION**



**Fig. 13: View Of Thermostat Housing With Heater Pipes, Heater Hoses, Gasket & Bolts**

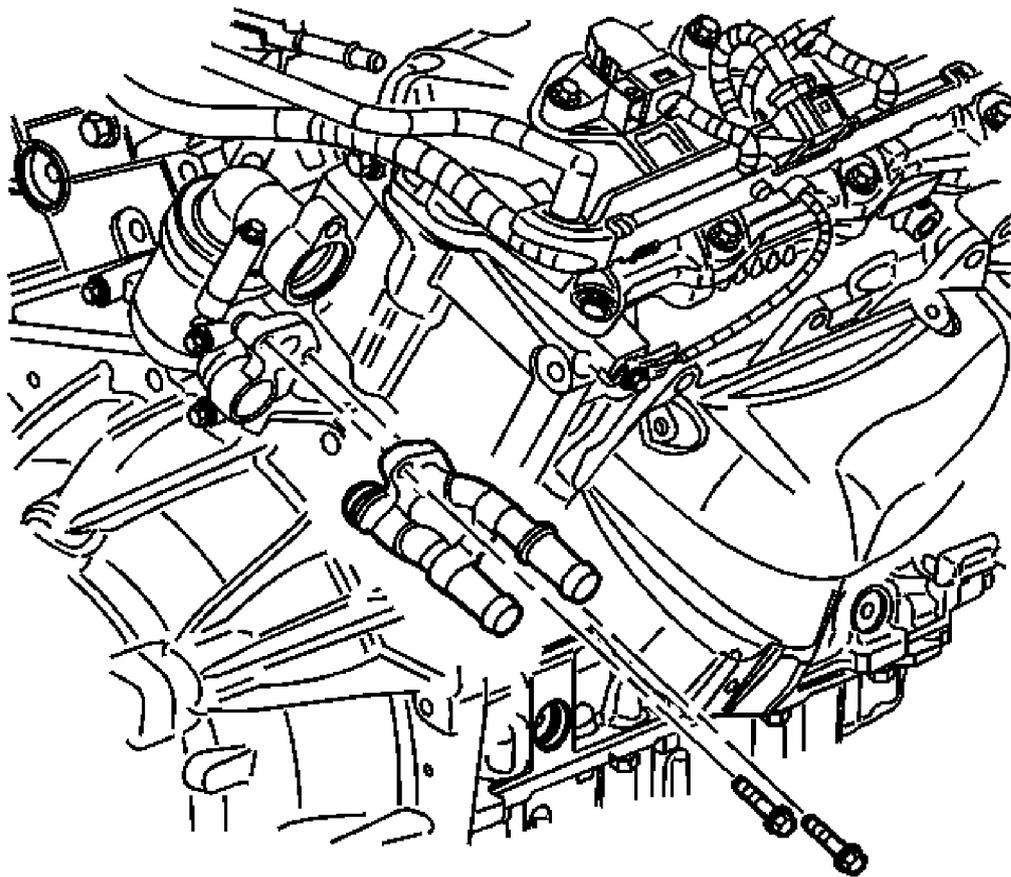
**Courtesy of GENERAL MOTORS CORP.**

1. Place the thermostat housing and gaskets in position.

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

2. Install the thermostat housing bolts.

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

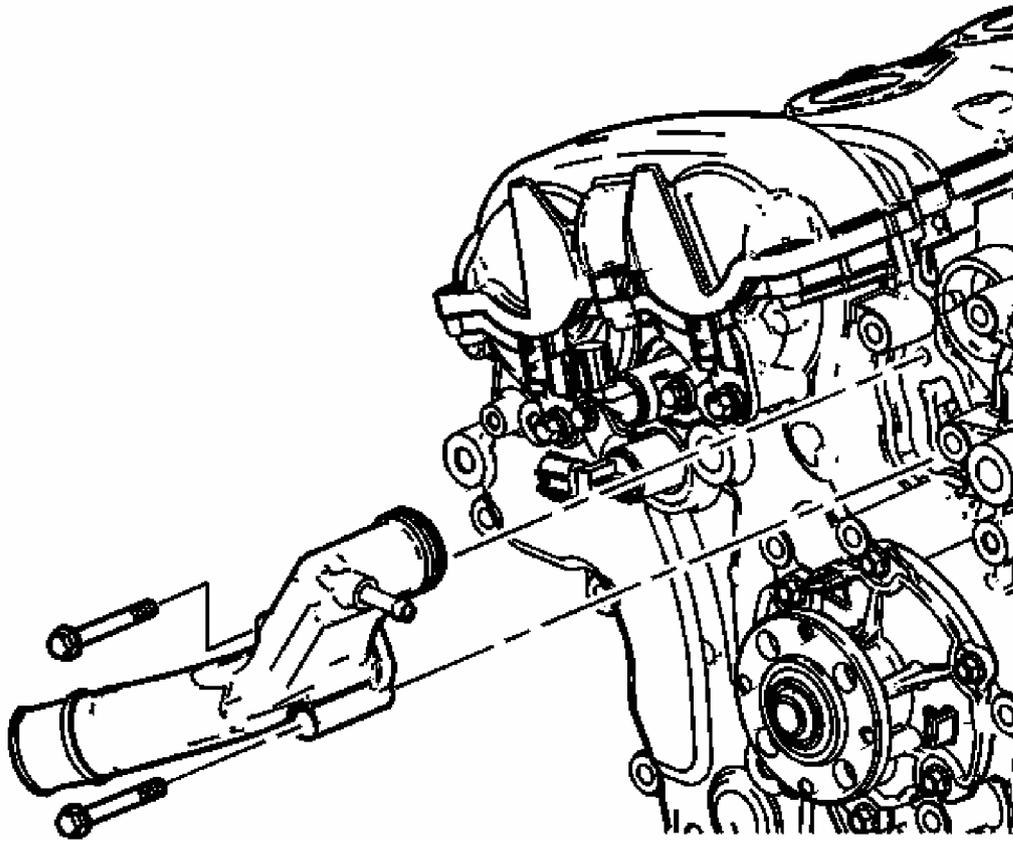


**Fig. 14: View Of Heater Inlet/Outlet Pipe Assembly**  
**Courtesy of GENERAL MOTORS CORP.**

3. Install the heater inlet/outlet pipe assembly.
4. Install the heater inlet/outlet pipe assembly bolts.

**Tighten:** Tighten the heater inlet/outlet pipe assembly bolts to 10 N.m (89 lb in).

#### **WATER OUTLET INSTALLATION**



**Fig. 15: View Of Water Outlet Housing**  
**Courtesy of GENERAL MOTORS CORP.**

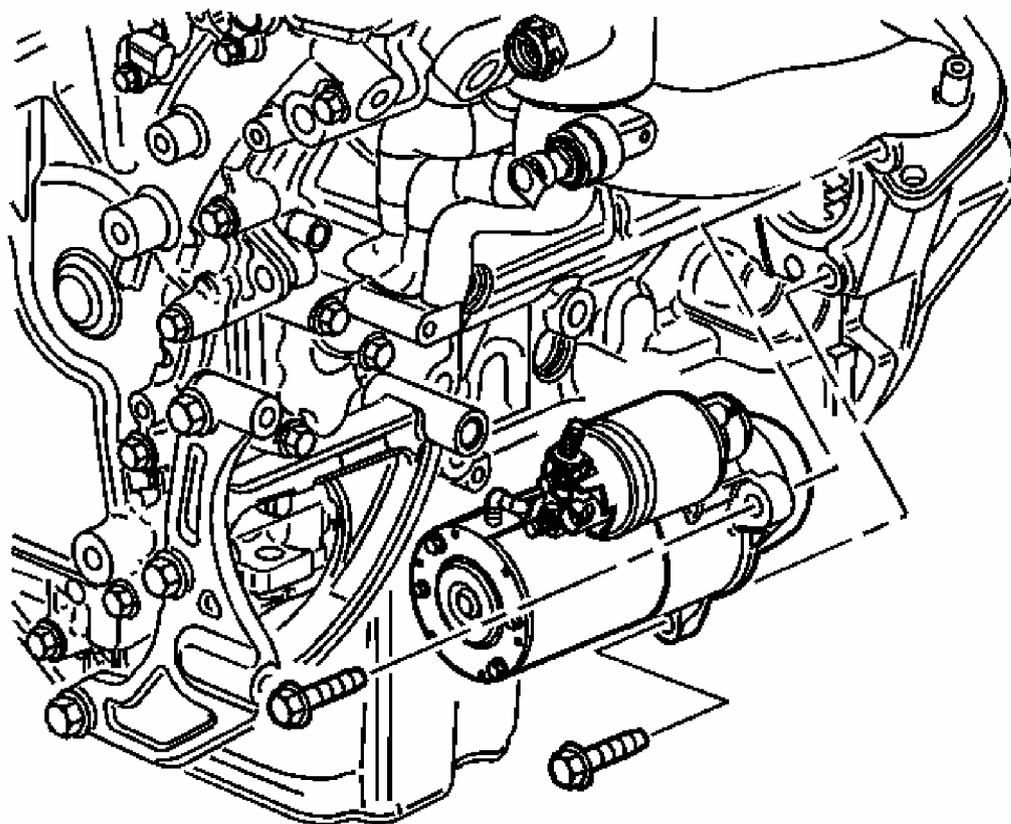
1. Place the water outlet and gaskets in position.

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

2. Install the water outlet bolts.

**Tighten:** Tighten the water outlet bolts to 10 N.m (89 lb in).

#### **STARTER MOTOR INSTALLATION**



**Fig. 16: View Of Starter Motor**  
**Courtesy of GENERAL MOTORS CORP.**

1. Install the starter motor.

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

2. Install the starter motor bolts.

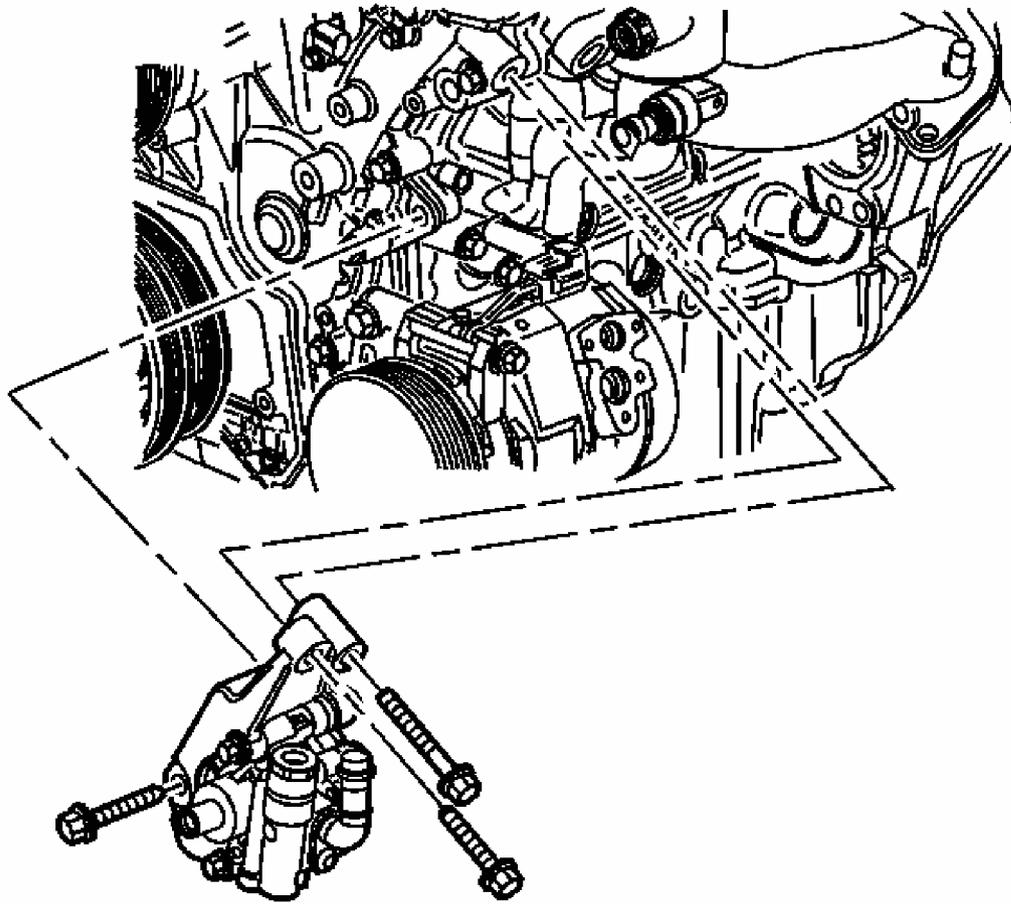
**Tighten:** Tighten the starter motor bolts to 50 N.m (37 lb ft).

## **POWER STEERING PUMP INSTALLATION**

### **Tools Required**

**J 25033-C** Pulley Installer

### **Installation Procedure**



**Fig. 17: View Of Power Steering Pump**  
**Courtesy of GENERAL MOTORS CORP.**

**IMPORTANT: Follow the procedure sequence in order to prevent drive belt mis-alignment and/or possible damage/distortion to the components.**

1. Place the power steering pump in position to the cylinder block.
2. Loosely install the power steering side bolts in order to hold the power steering pump in position.
3. Place the power steering front bracket in position.
4. Loosely install the power steering front bracket bolts.
5. Hold the power steering pump firmly against the engine block.

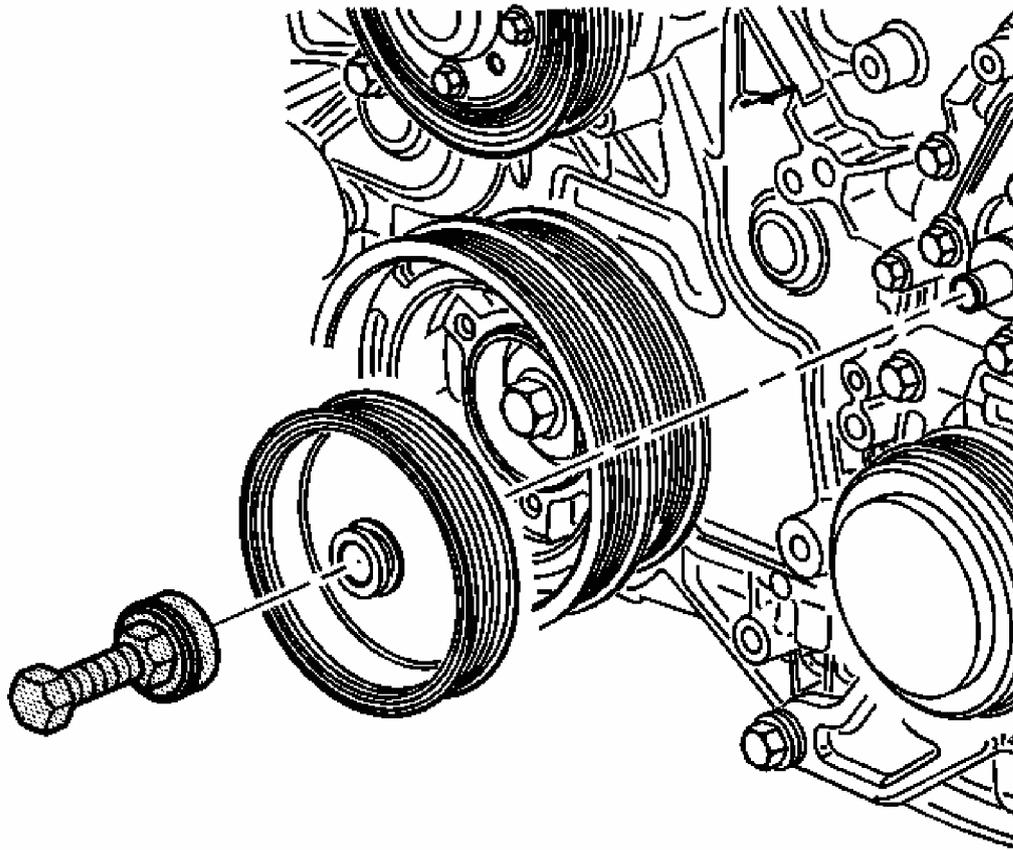
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

6. Tighten the power steering pump front bracket bolt.

**Tighten:** Tighten the power steering pump front bracket bolt to 50 N.m (37 lb ft).

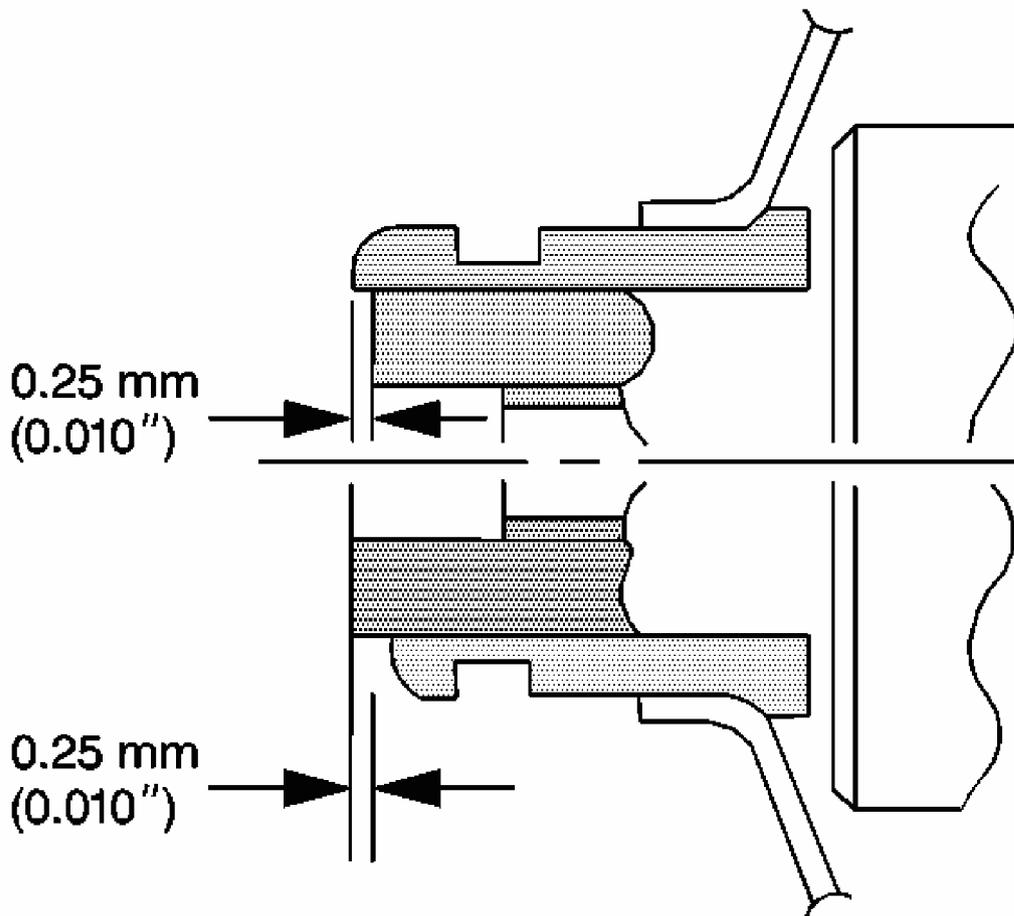
7. Install the power steering pump side bolts.

**Tighten:** Tighten the power steering pump side bolts to 50 N.m (37 lb ft).



**Fig. 18: Installing Power Steering Pump Pulley Using J 25033-C**  
Courtesy of GENERAL MOTORS CORP.

8. If removed, install the power steering pump pulley using the J 25033-C .

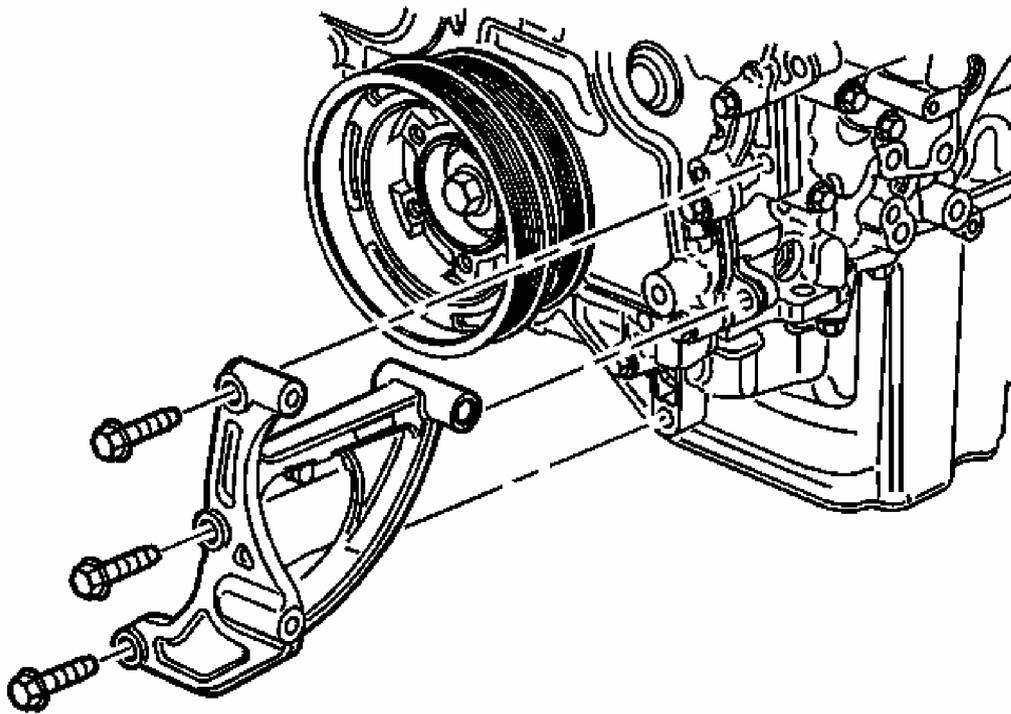


**Fig. 19: Measuring Axial Tolerance Of Power Steering Pulley On Pump**  
Courtesy of GENERAL MOTORS CORP.

9. Ensure that the axial tolerance of the power steering pulley on the power steering pump is within 0.25 mm (0.010 in).

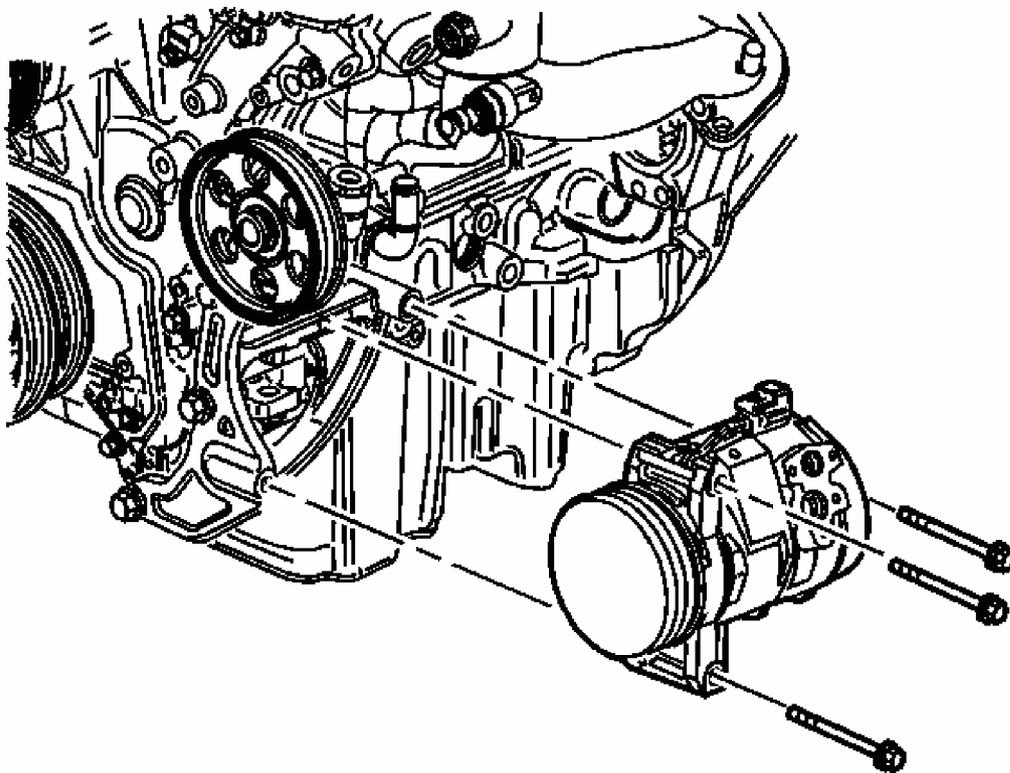
#### **AIR CONDITIONING (A/C) COMPRESSOR INSTALLATION**

**IMPORTANT:** Follow the procedure sequence in order to prevent drive belt mis-alignment and/or possible damage/distortion to the components.



**Fig. 20: Removing & Installing Air Conditioning Compressor Bracket**  
**Courtesy of GENERAL MOTORS CORP.**

1. Place the A/C compressor bracket in position to the cylinder block.
2. Loosely install the A/C compressor bracket bolts.



**Fig. 21: Removing & Installing A/C Compressor**  
Courtesy of GENERAL MOTORS CORP.

3. Place the A/C compressor in position to the A/C compressor bracket.
4. Loosely install the A/C compressor bolts through the A/C compressor and A/C compressor bracket into the engine block.

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

5. Tighten the A/C compressor bracket center bolt.

**Tighten:** Tighten the A/C compressor bracket center bolt to 50 N.m (37 lb ft).

6. Tighten the A/C compressor bracket upper bolt.

**Tighten:** Tighten the A/C compressor bracket upper bolt to 50 N.m (37 lb ft).

7. Tighten the A/C compressor bracket lower bolt.

**Tighten:** Tighten the A/C compressor bracket lower bolt to 50 N.m (37 lb ft).

8. Tighten the A/C compressor front upper and lower bolts.

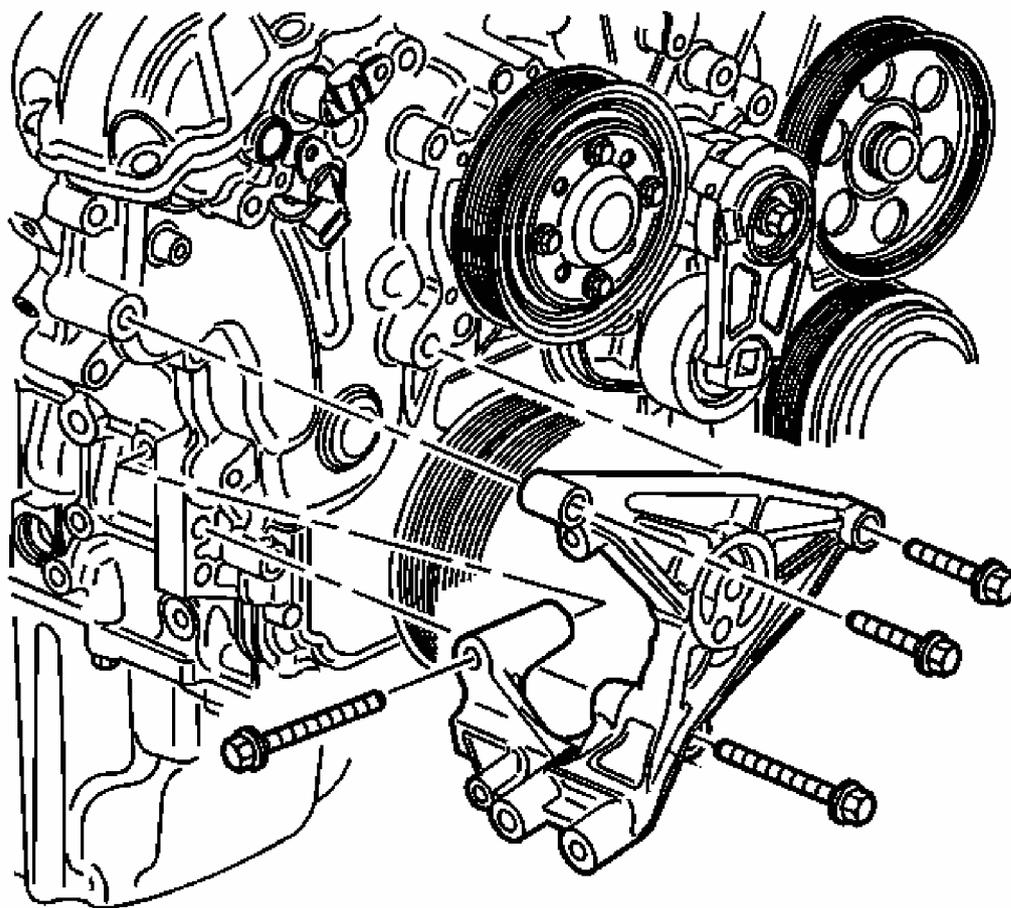
**Tighten:** Tighten the A/C compressor front upper and lower bolts to 22 N.m (16 lb ft).

9. Tighten the A/C compressor rear bolt.

**Tighten:** Tighten the A/C compressor rear bolt to 50 N.m (37 lb ft).

## GENERATOR INSTALLATION

**IMPORTANT:** Follow the procedure sequence in order to prevent drive belt mis-alignment and/or possible damage/distortion to the components.



**Fig. 22: View Of Generator Bracket**  
**Courtesy of GENERAL MOTORS CORP.**

1. Place the generator bracket in position to the cylinder block.
2. Loosely install the generator bracket bolts.

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

3. Tighten the front lower generator bracket bolt.

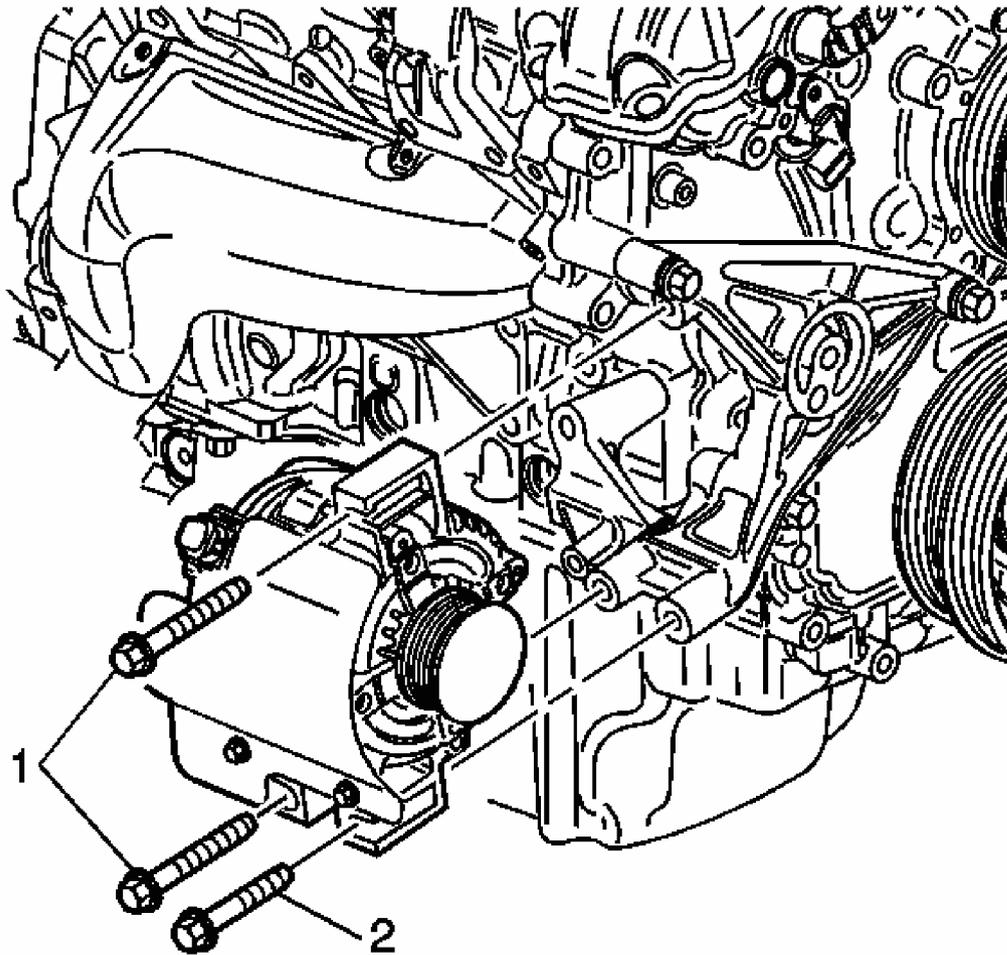
**Tighten:** Tighten the front lower generator bracket bolt to 50 N.m (37 lb ft).

4. Tighten the front upper generator bracket bolts.

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

5. Tighten the side generator bracket bolt.

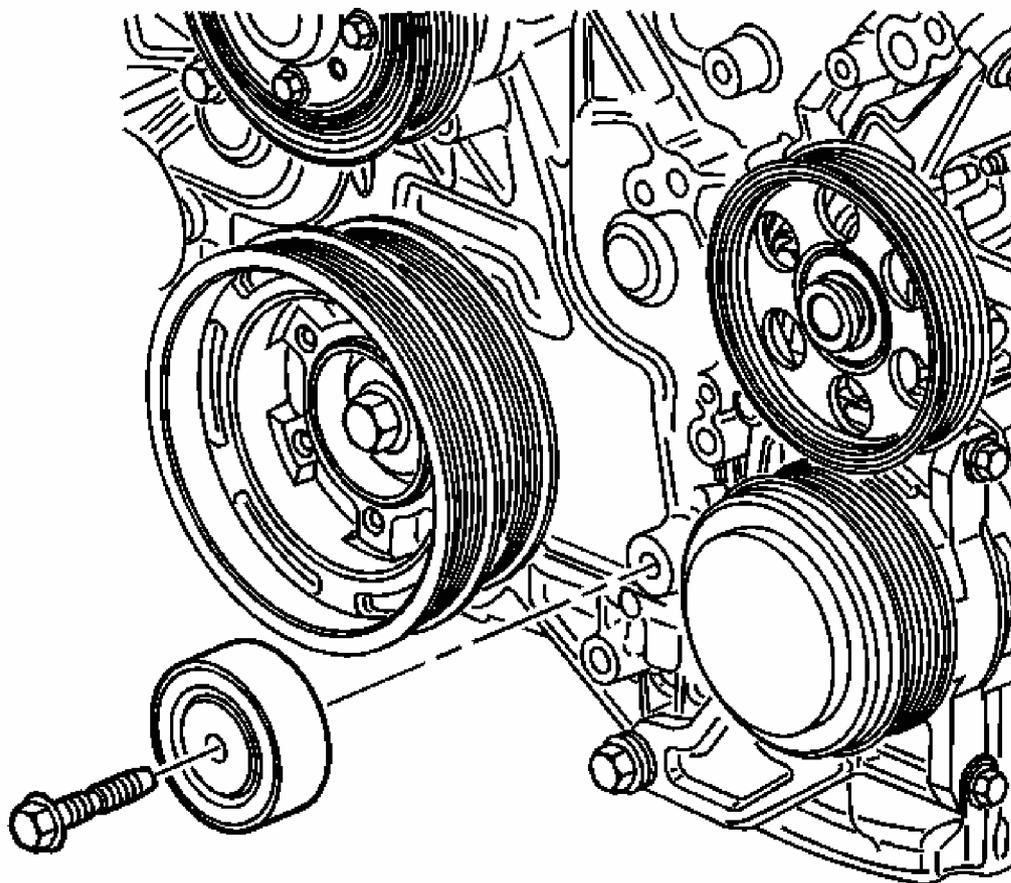
**Tighten:** Tighten the side generator bracket bolt to 22 N.m (16 lb ft).



**Fig. 23: Identifying Generator Side Bolts**  
Courtesy of GENERAL MOTORS CORP.

6. Place the generator in position to the generator bracket.
7. Loosely install the generator side bolts. Ensure the longer bolts (1) are installed in the upper and lower rear positions and the shorter bolts (2) are installed into the lower front position.
8. Hold the generator firmly against the engine block.
9. Tighten the generator side bolts.

**Tighten:** Tighten the generator side bolts to 50 N.m (37 lb ft).



**Fig. 24: Removing & Installing Drive Belt Idler Pulley**  
Courtesy of GENERAL MOTORS CORP.

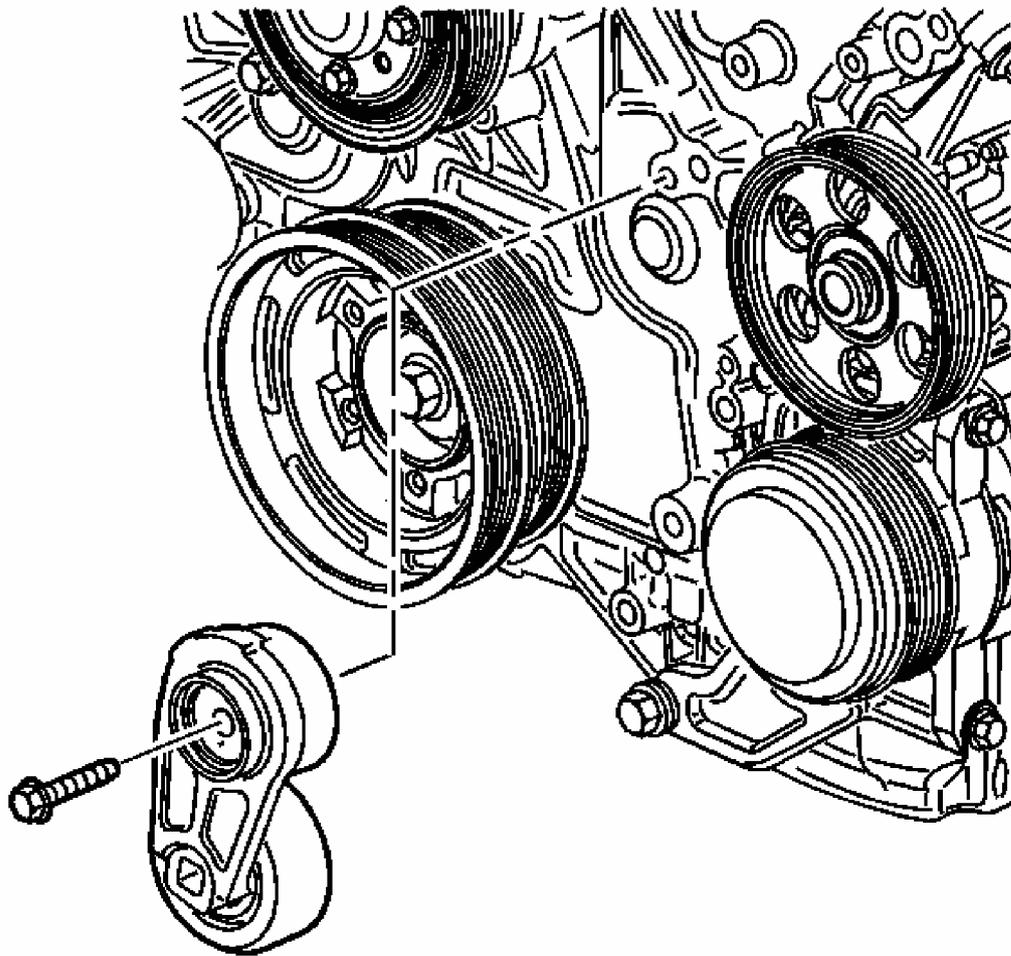
1. Place the drive belt idler pulley in position to the engine front cover.

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

2. Install the drive belt idler pulley bolt.

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

**DRIVE BELT TENSIONER INSTALLATION - LEFT**



**Fig. 25: View Of Left Drive Belt Tensioner**  
Courtesy of GENERAL MOTORS CORP.

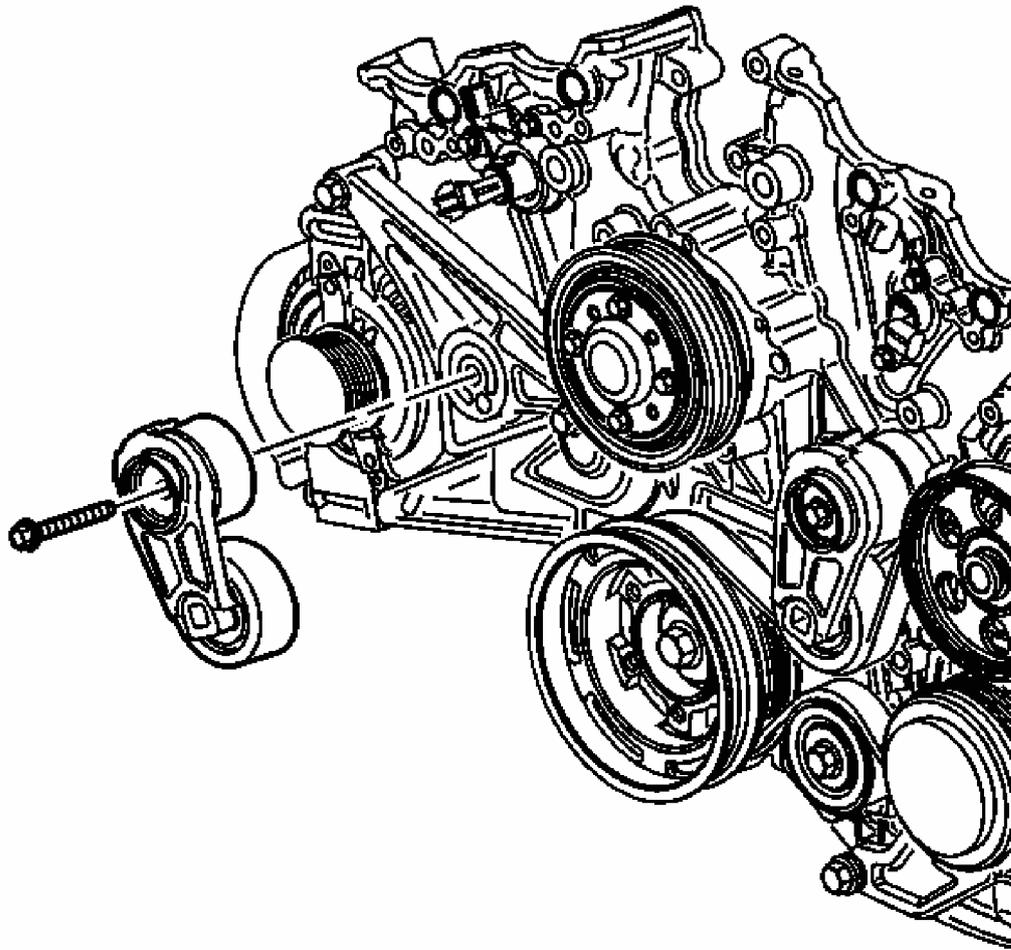
1. Place the left drive belt tensioner in position to the engine front cover.

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

2. Install the left drive belt tensioner bolt.

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

**DRIVE BELT TENSIONER INSTALLATION - RIGHT**



**Fig. 26: Removing & Installing Right Drive Belt Tensioner**  
Courtesy of GENERAL MOTORS CORP.

1. Place the right drive belt tensioner in position to the engine front cover.

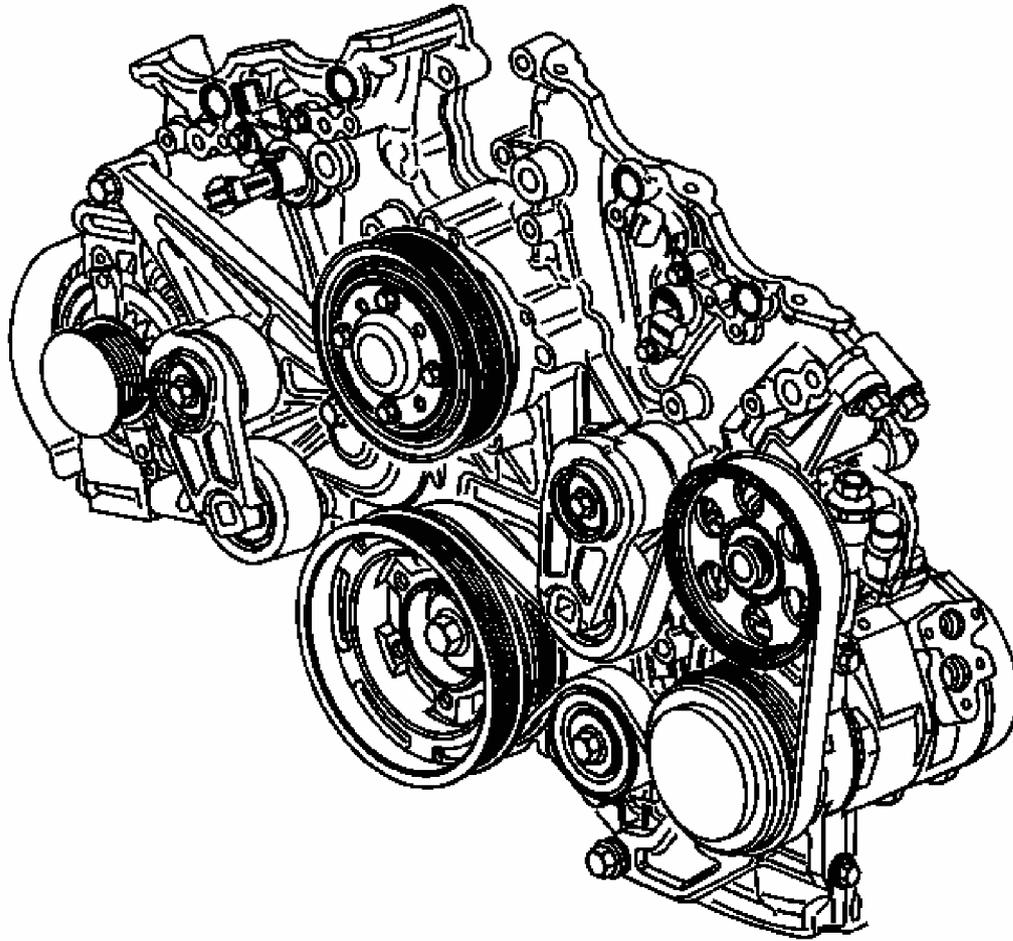
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

2. Install the right drive belt tensioner bolt.

**Tighten:** Tighten the right drive belt tensioner bolt to 23 N.m (17 lb ft).

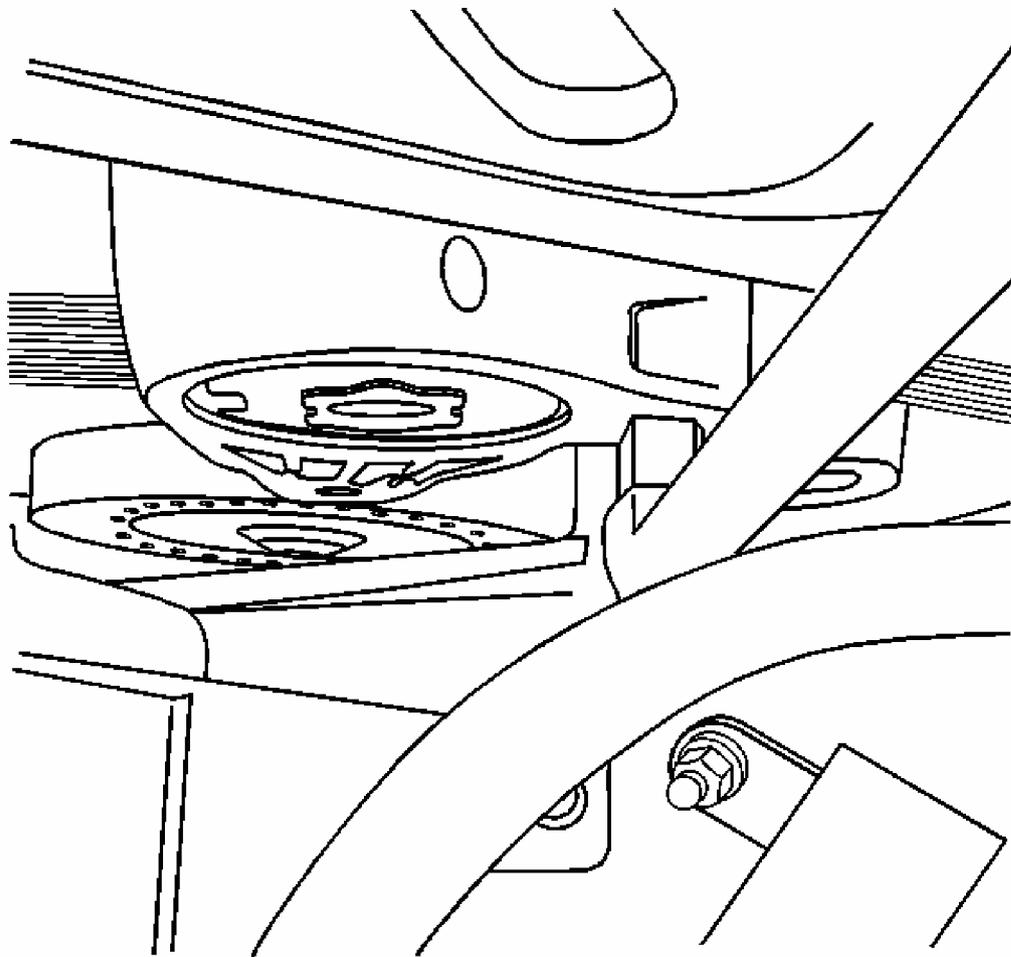
## DRIVE BELT INSTALLATION

### Inner Drive Belt



**Fig. 27: Identifying Inner Drive Belt**  
**Courtesy of GENERAL MOTORS CORP.**

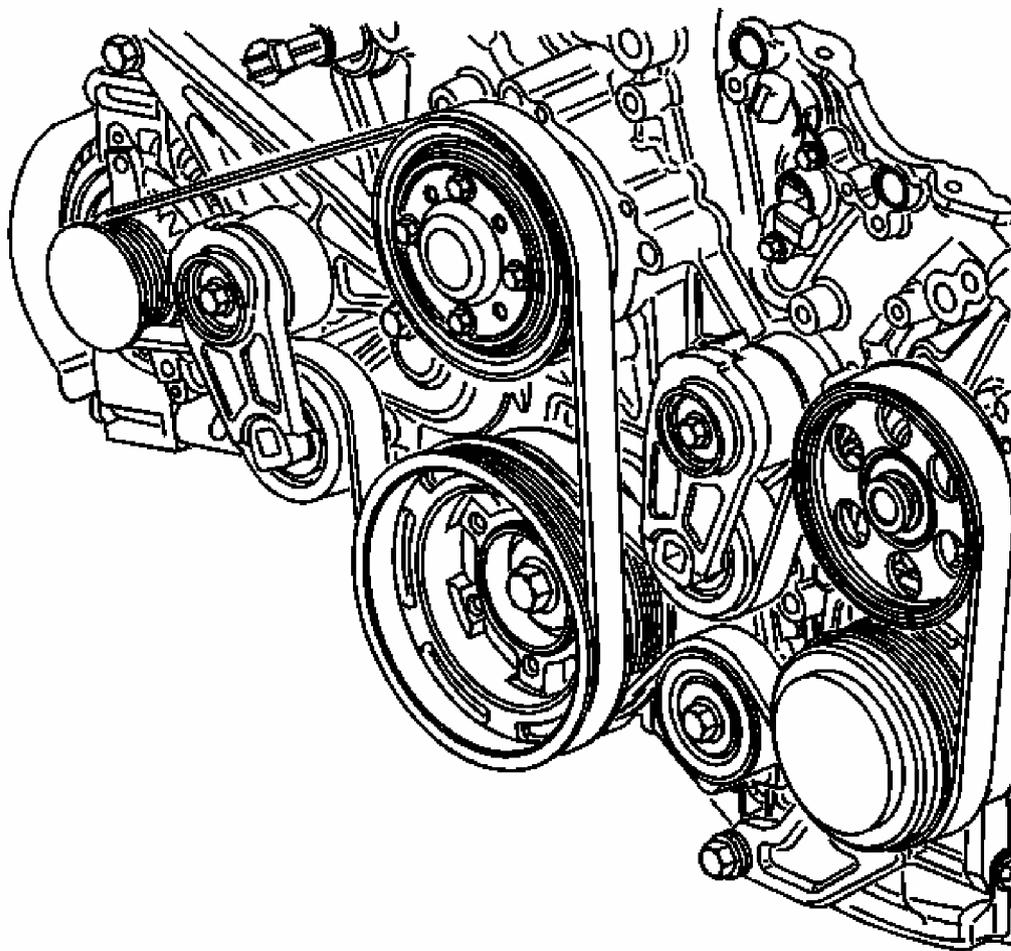
1. Route the inner drive belt around the following:
  - Crankshaft balancer
  - Air conditioning compressor
  - Drive belt tensioner
  - Power steering pump
  - Water pump pulley



**Fig. 28: View Of Drive Belt Tensioner & Pulleys**  
**Courtesy of GENERAL MOTORS CORP.**

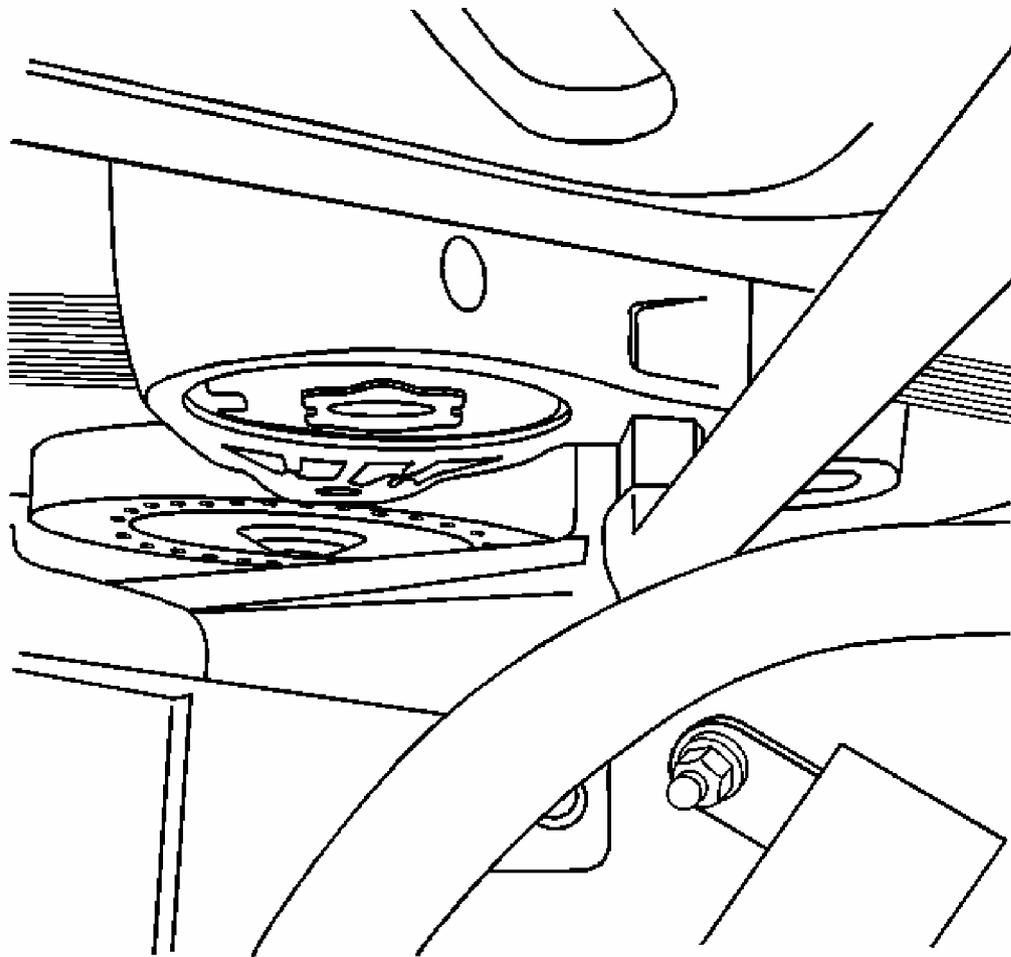
2. Insert a 1/2 inch drive ratchet into the inner drive belt tensioner.
3. Rotate the drive belt tensioner clockwise.
4. Route the remainder of the drive belt around the drive belt idler.
5. Slowly rotate the drive belt tensioner counterclockwise until the drive belt is tight.
6. Remove the 1/2 inch drive ratchet.
7. Inspect the drive belt for proper seating in all pulleys.

#### **Outer Drive Belt**



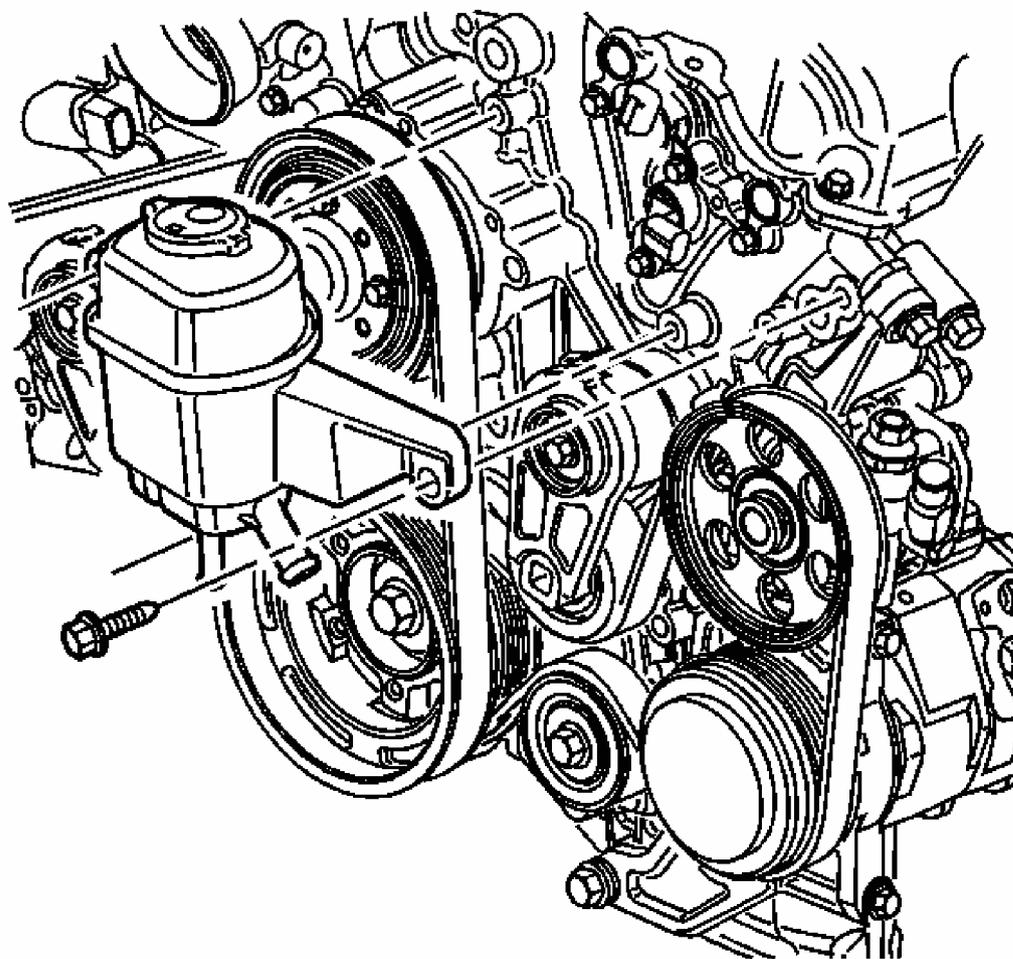
**Fig. 29: Identifying Outer Drive Belt**  
**Courtesy of GENERAL MOTORS CORP.**

1. Route the outer drive belt around the following:
  - Crankshaft balancer
  - Generator



**Fig. 30: View Of Drive Belt Tensioner & Pulleys**  
**Courtesy of GENERAL MOTORS CORP.**

2. Insert a 1/2 inch drive ratchet into the outer drive belt tensioner.
3. Rotate the drive belt tensioner clockwise.
4. Route the remainder of the drive belt around the drive belt tensioner.
5. Slowly rotate the drive belt tensioner counter-clockwise until the drive belt is tight.
6. Remove the 1/2 inch drive ratchet.
7. Inspect the drive belt for proper seating in all pulleys.



**Fig. 31: Removing & Installing Power Steering Pump Reservoir**  
Courtesy of GENERAL MOTORS CORP.

8. Place the power steering pump reservoir.

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

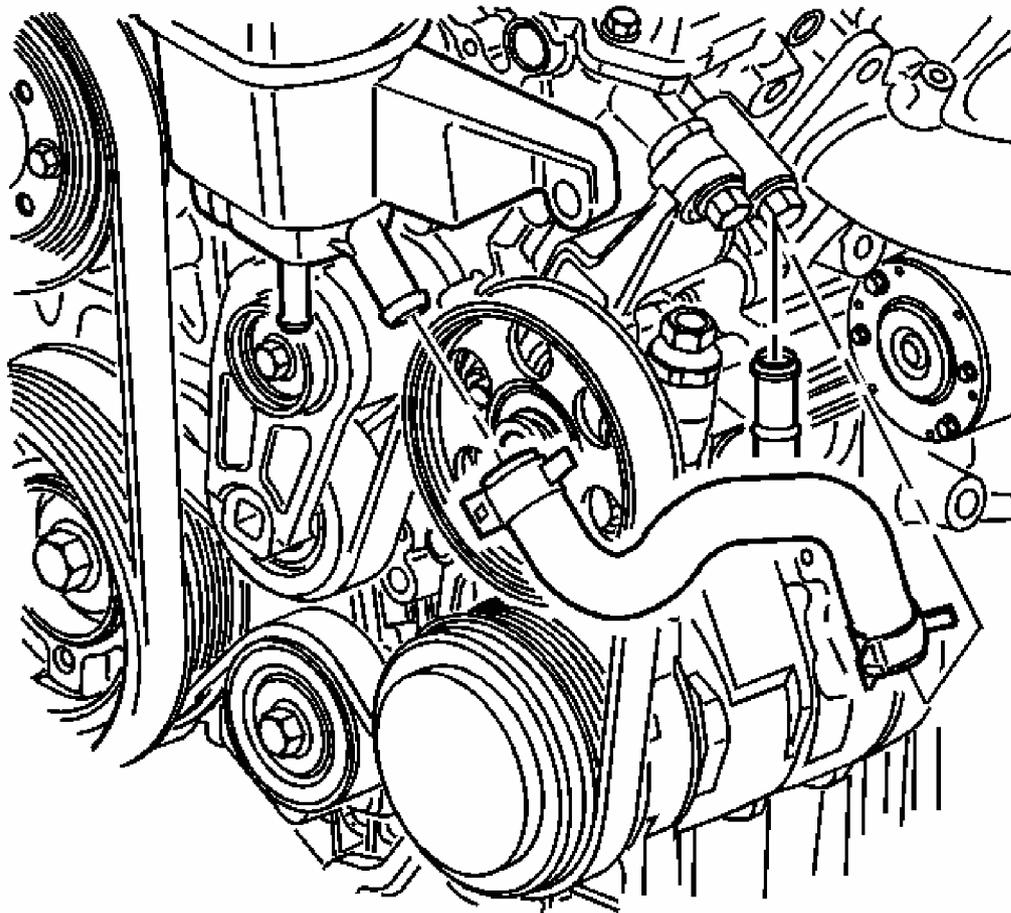
9. Install the upper inboard and lower power steering pump reservoir bolts.

**Tighten:** Tighten the upper inboard and lower power steering pump reservoir bolts to 9 N.m (80 lb in).

10. Install the upper outboard power steering pump reservoir bolts.

**Tighten:** Tighten the upper outboard power steering pump reservoir bolts to 25 N.m (18

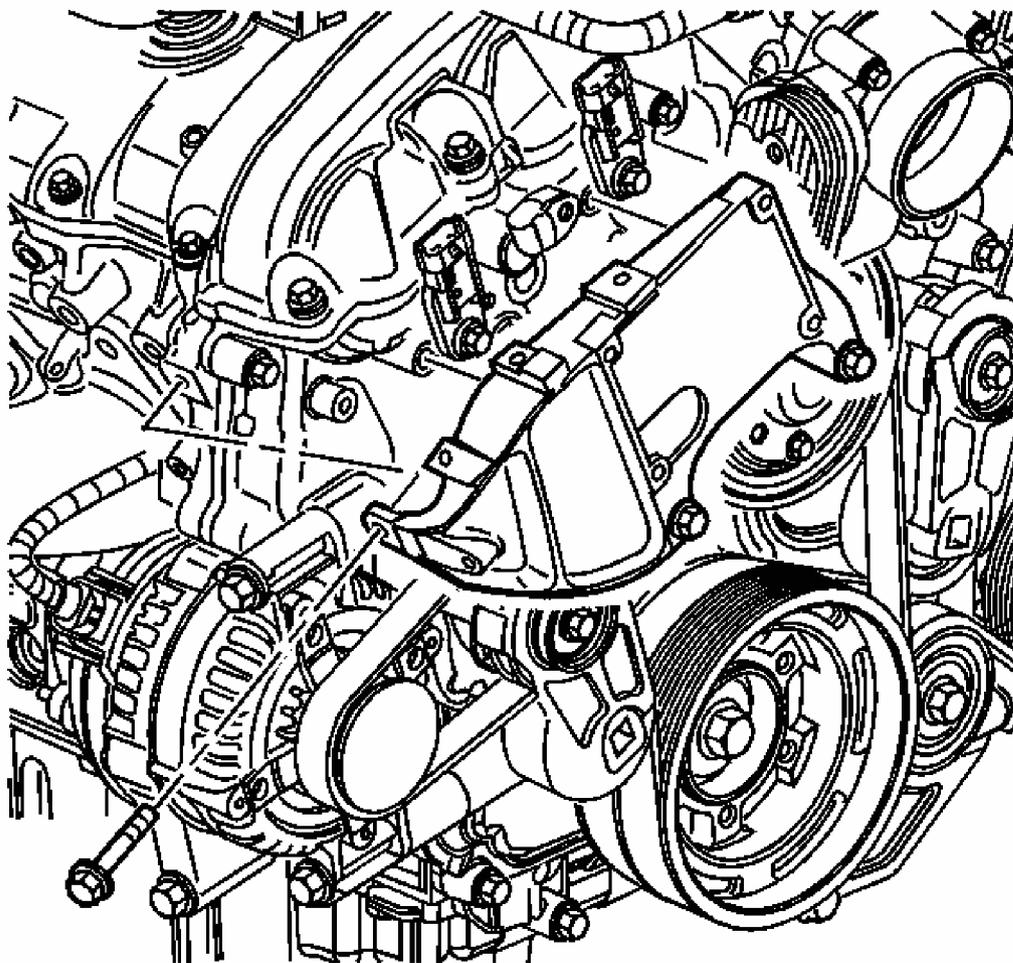
lb ft).



**Fig. 32: Removing & Installing Power Steering Reservoir Hose**  
**Courtesy of GENERAL MOTORS CORP.**

11. Install the power steering reservoir hose to the power steering pump.
12. Compress and reposition the clamp on the power steering reservoir hose at the power steering pump.

**ENGINE WIRING HARNESS ASSEMBLY INSTALLATION**



**Fig. 33: View Of ECM Bracket**  
Courtesy of GENERAL MOTORS CORP.

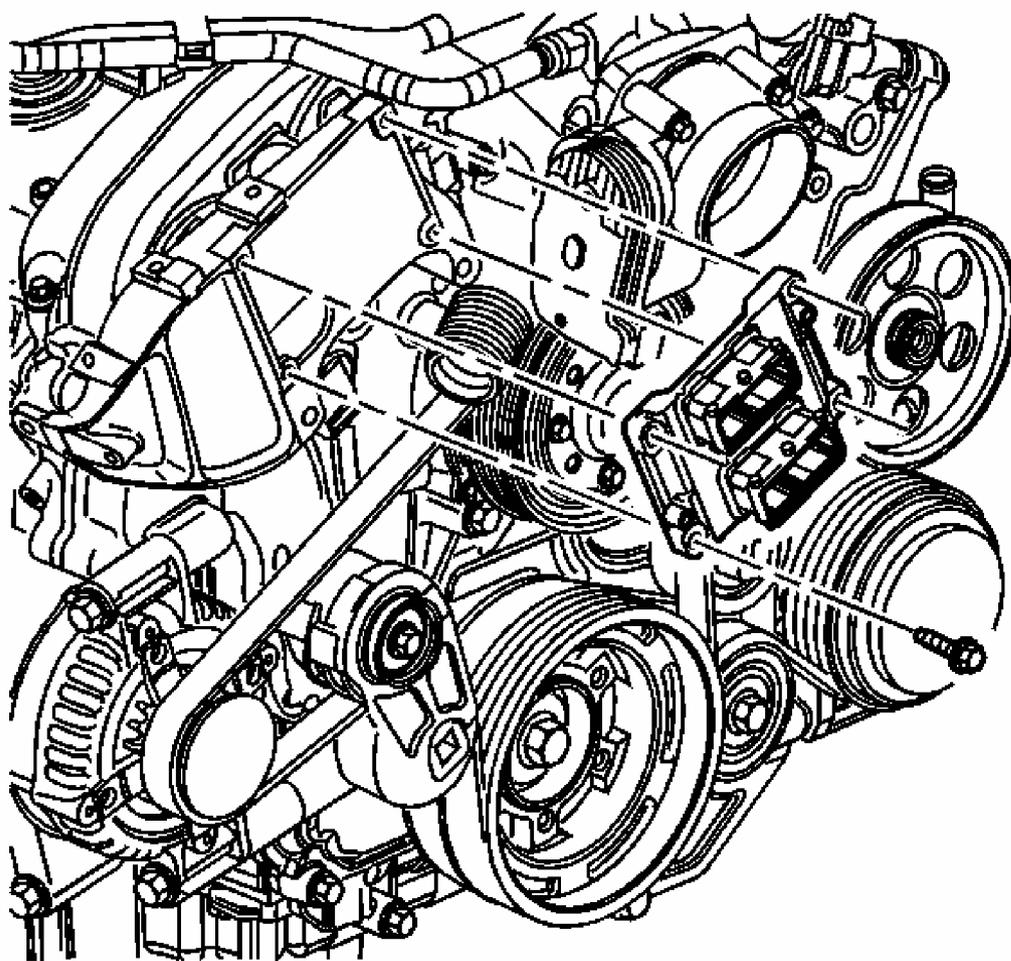
1. Install the engine control module (ECM) bracket.

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

2. Loosely install the ECM bracket bolts.

**Tighten:**

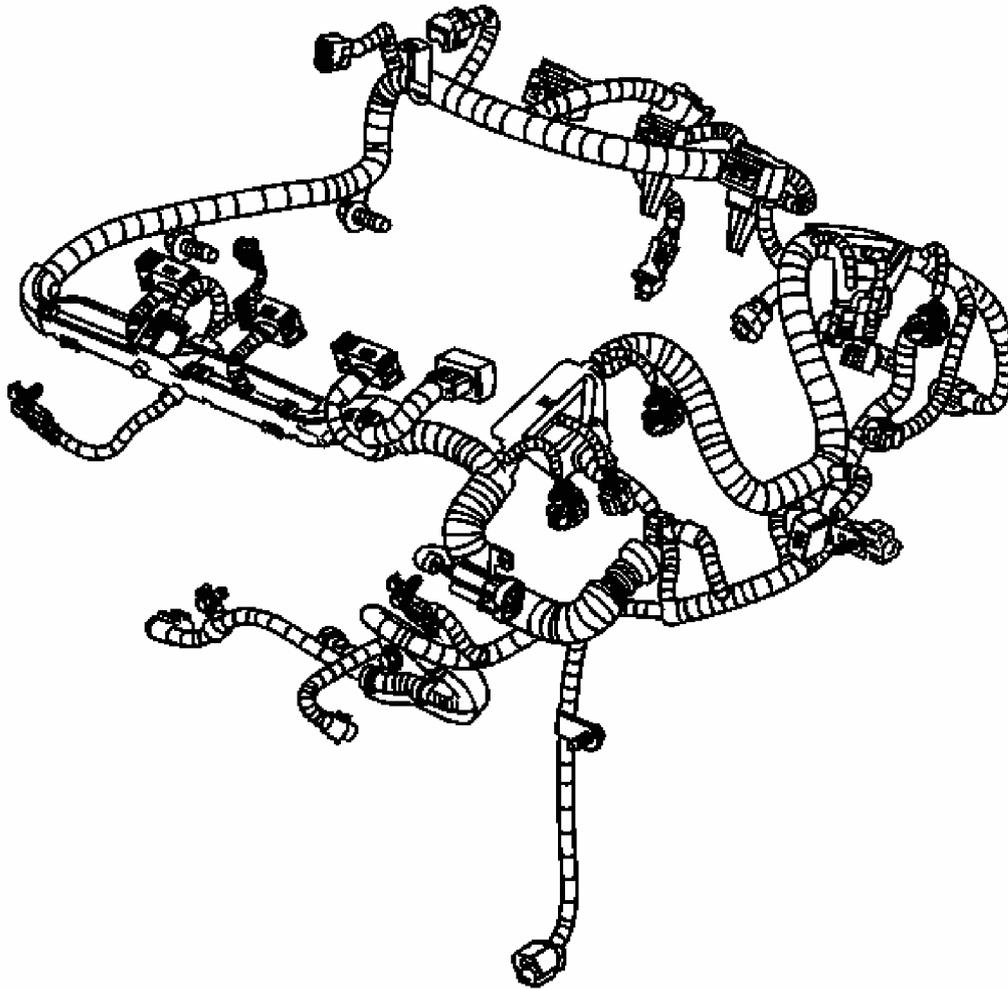
1. Tighten the side ECM bracket bolts to 10 N.m (89 lb in).
2. Tighten the front ECM bracket bolts to 23 N.m (17 lb ft).



**Fig. 34: View Of ECM Module**  
**Courtesy of GENERAL MOTORS CORP.**

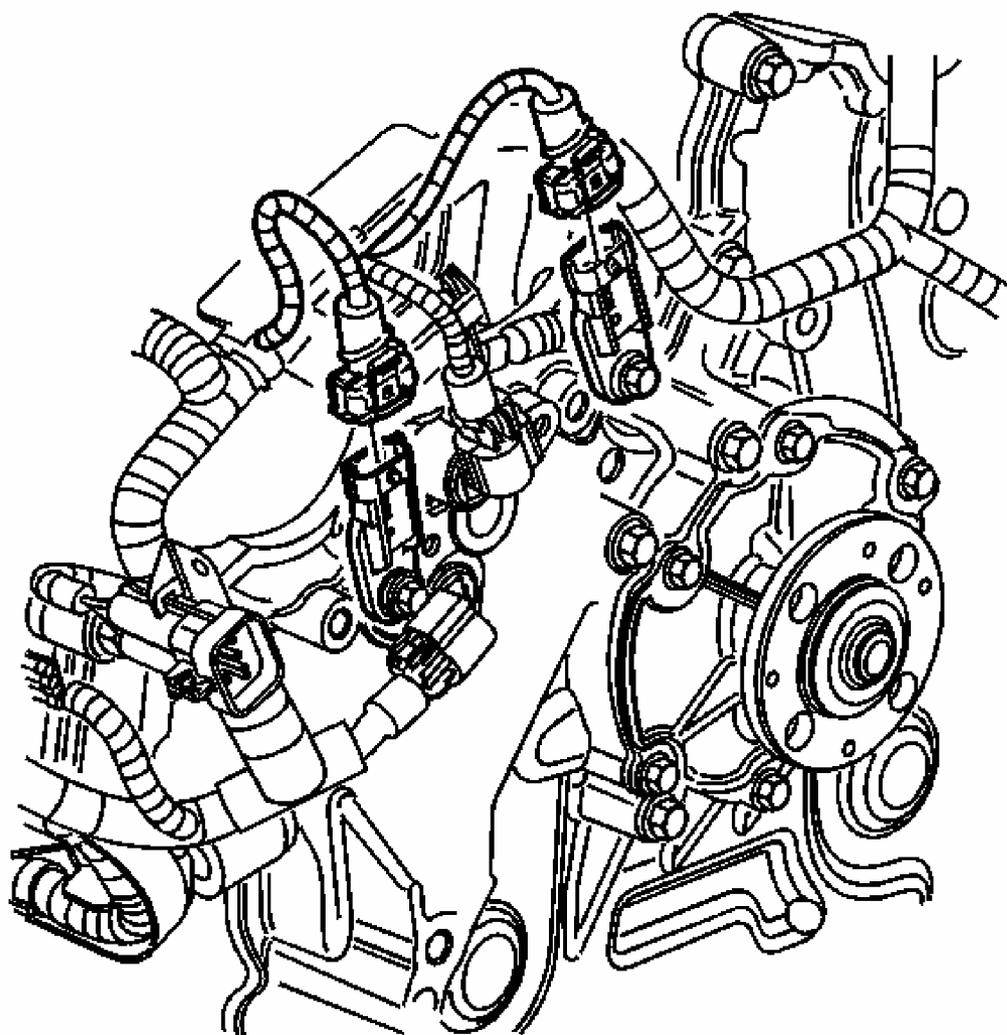
3. Install the ECM module to the ECM bracket.
4. Install the ECM module bolts.

**Tighten:** Tighten the ECM module bolts to 10 N.m (89 lb in).



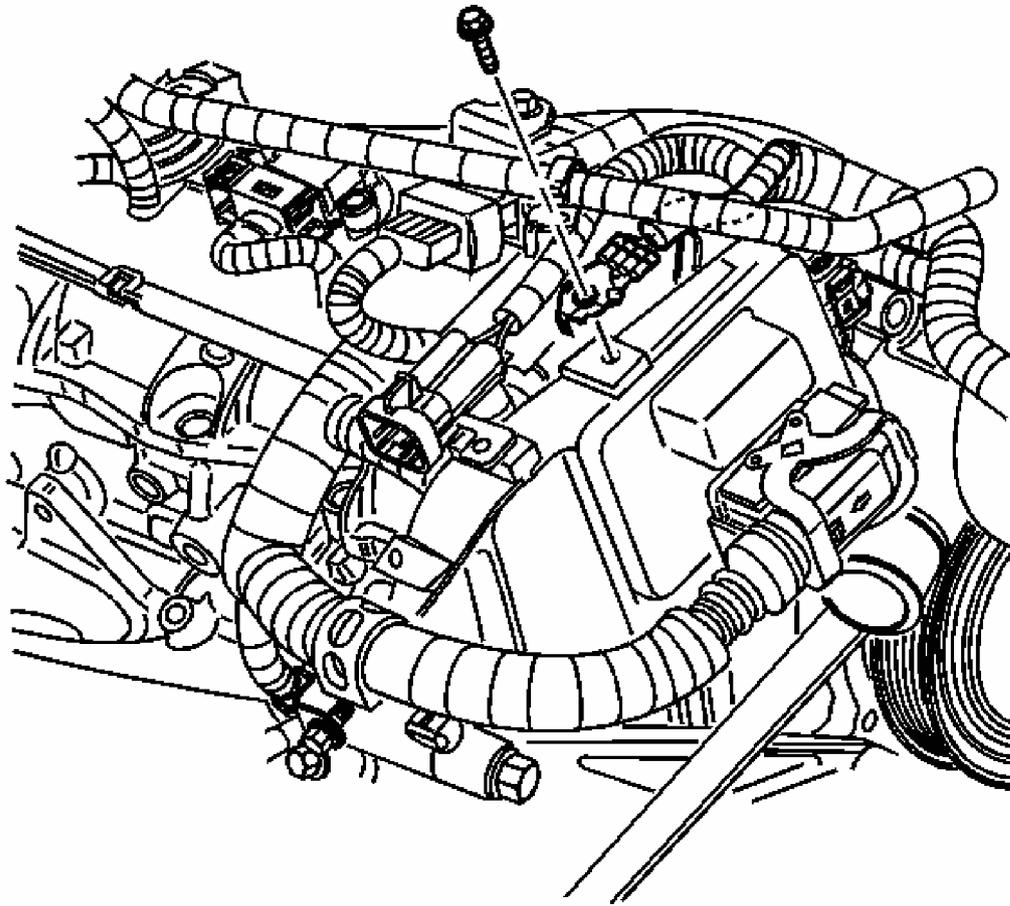
**Fig. 35: View Of Engine Wiring Harness**  
**Courtesy of GENERAL MOTORS CORP.**

5. Install the engine wiring harness to the engine.



**Fig. 36: View Of Right Camshaft Position Sensors Electrical Connectors**  
Courtesy of GENERAL MOTORS CORP.

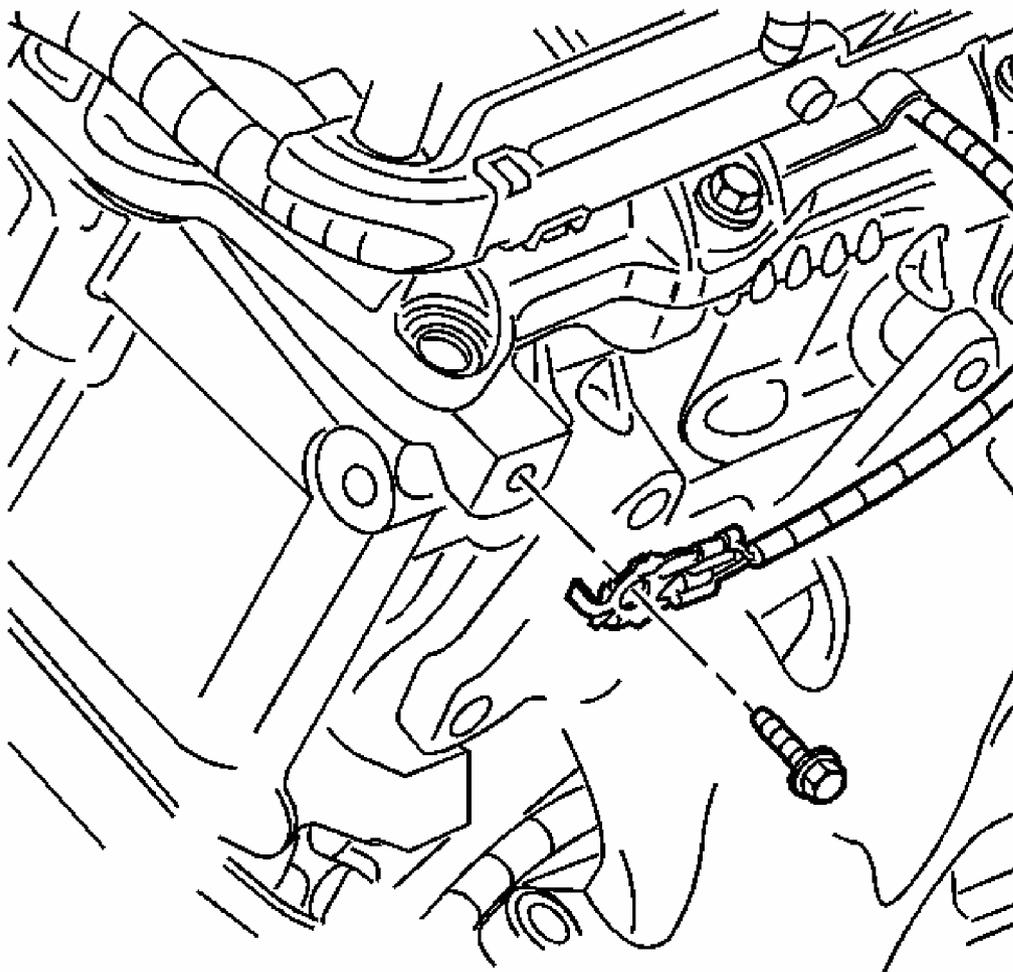
6. Connect the engine wiring harness to the right camshaft position sensors.



**Fig. 37: View Of ECM Bracket Wiring Harness Ground Bolt**  
Courtesy of GENERAL MOTORS CORP.

7. Install the engine wiring harness ground bolt to the ECM bracket.

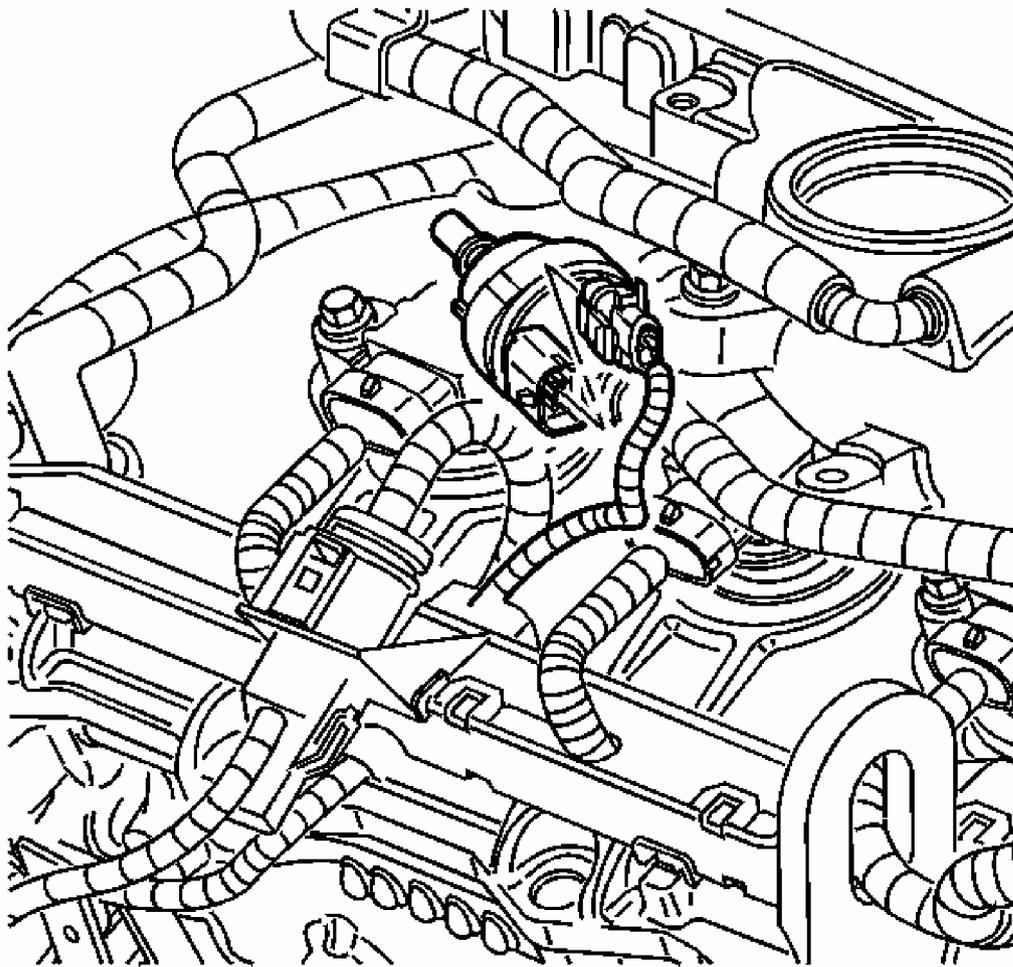
**Tighten:** Tighten the engine wiring harness ground bolt to 10 N.m (89 lb in).



**Fig. 38: View Of Wiring Harness Ground Bolt At Side Of Right Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

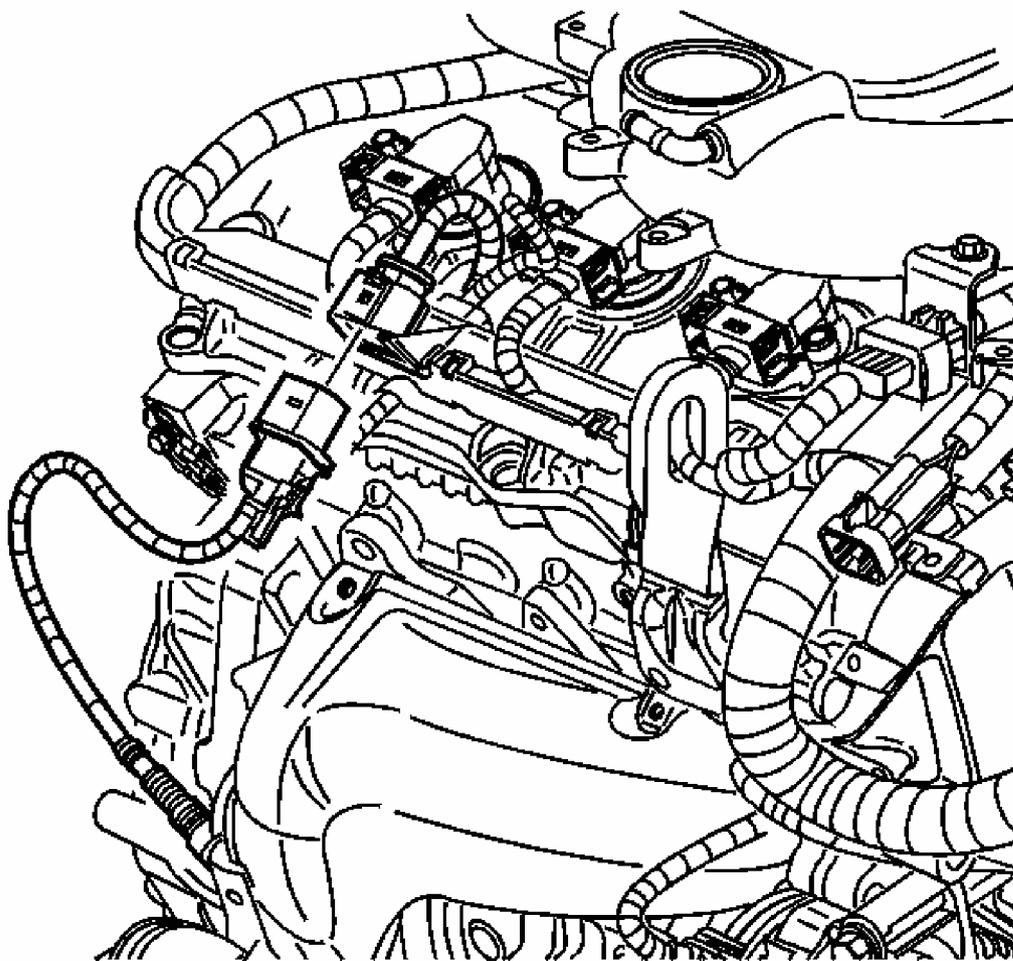
8. Install the engine wiring harness ground bolt to the side of the right cylinder head.

**Tighten:** Tighten the engine wiring harness ground bolt to 10 N.m (89 lb in).



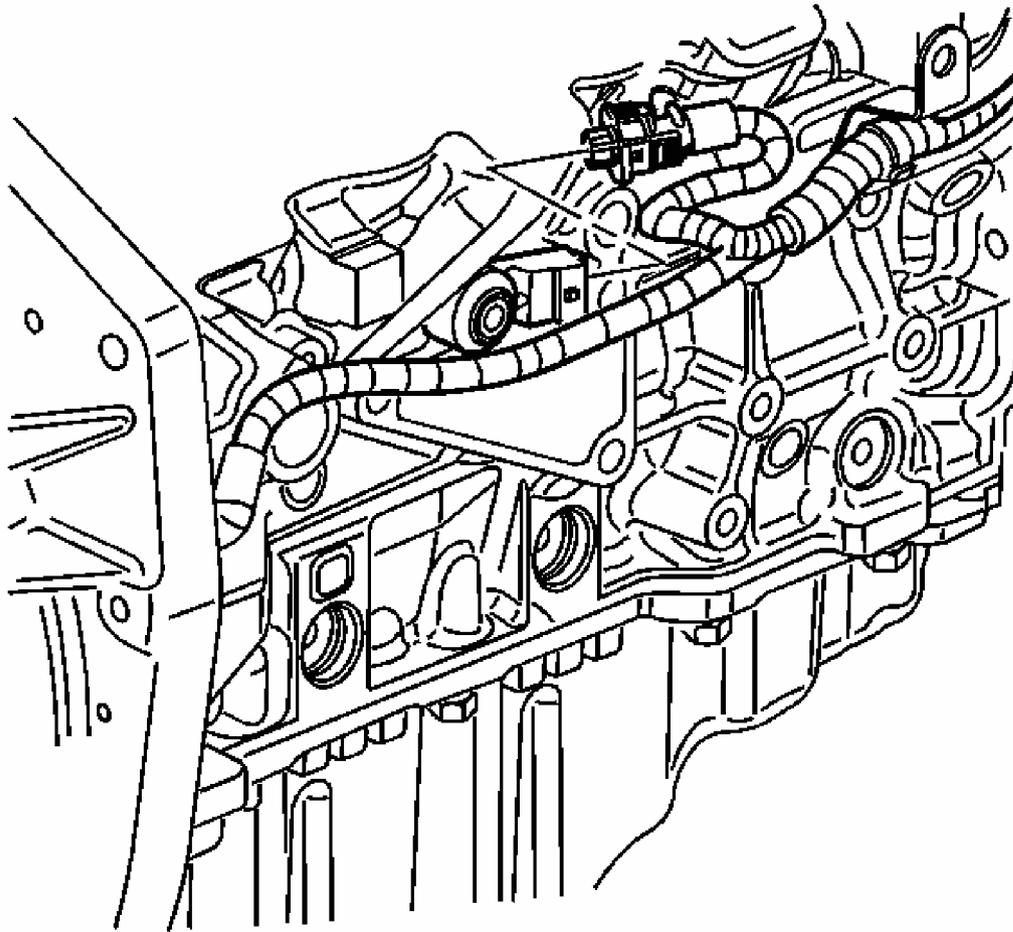
**Fig. 39: View Of EVAP Solenoid Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

9. Connect the engine wiring harness to the evaporative emission (EVAP) solenoid.



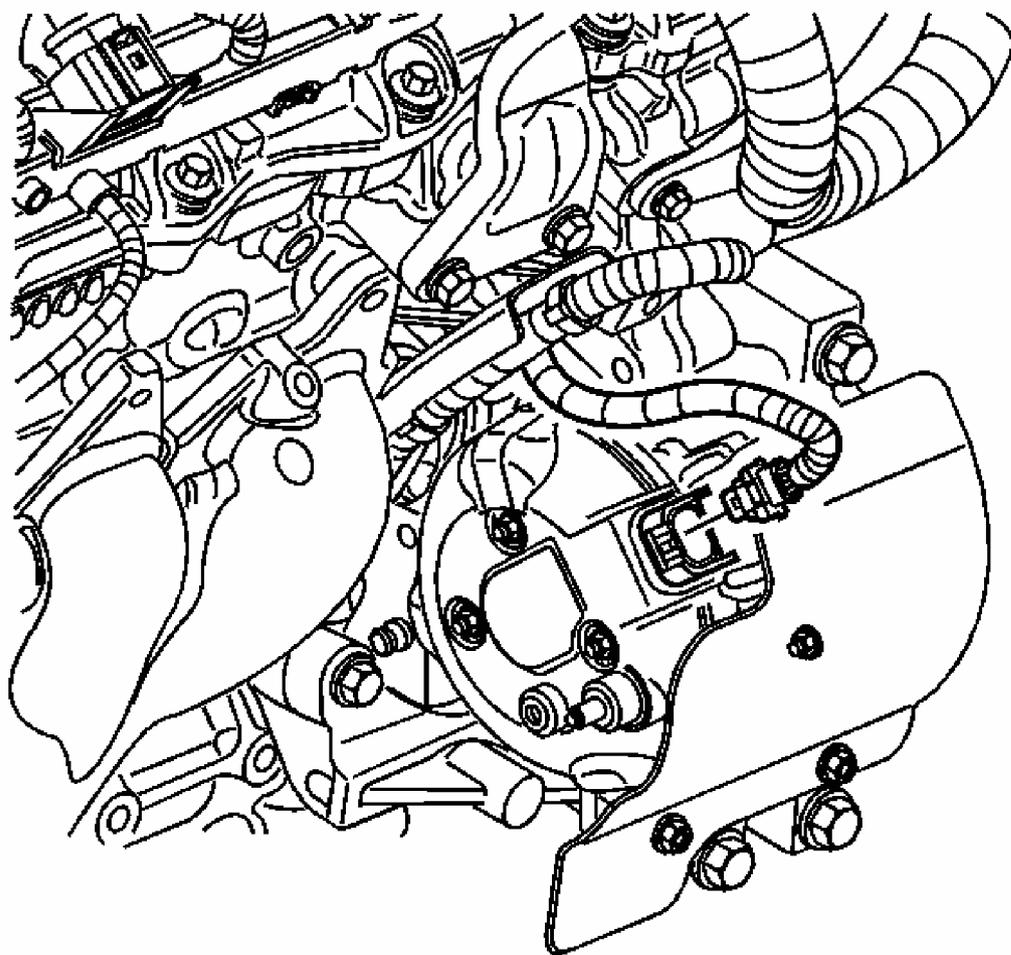
**Fig. 40: View Of Right Oxygen Sensor Harness Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

10. Connect the engine wiring harness to the right oxygen sensor harness.



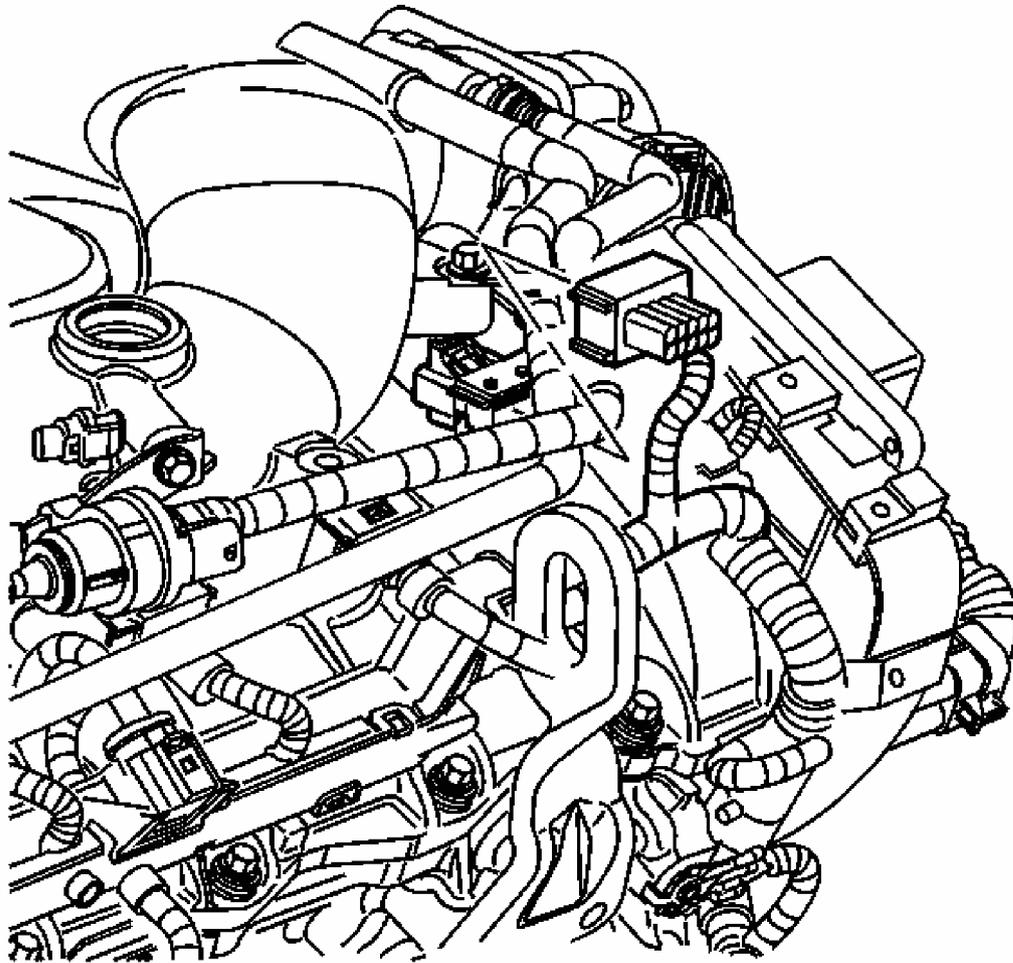
**Fig. 41: View Of Right Knock Sensor And Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

11. Connect the engine wiring harness to the right knock sensor.



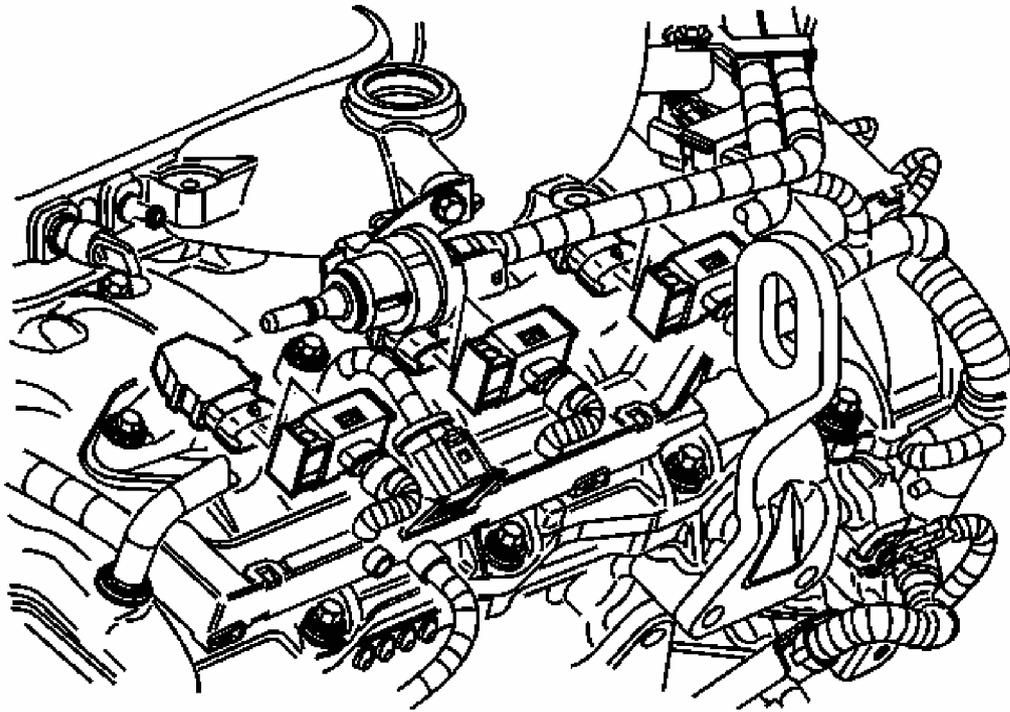
**Fig. 42: View Of Generator Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

12. Connect the engine wiring harness to the generator.



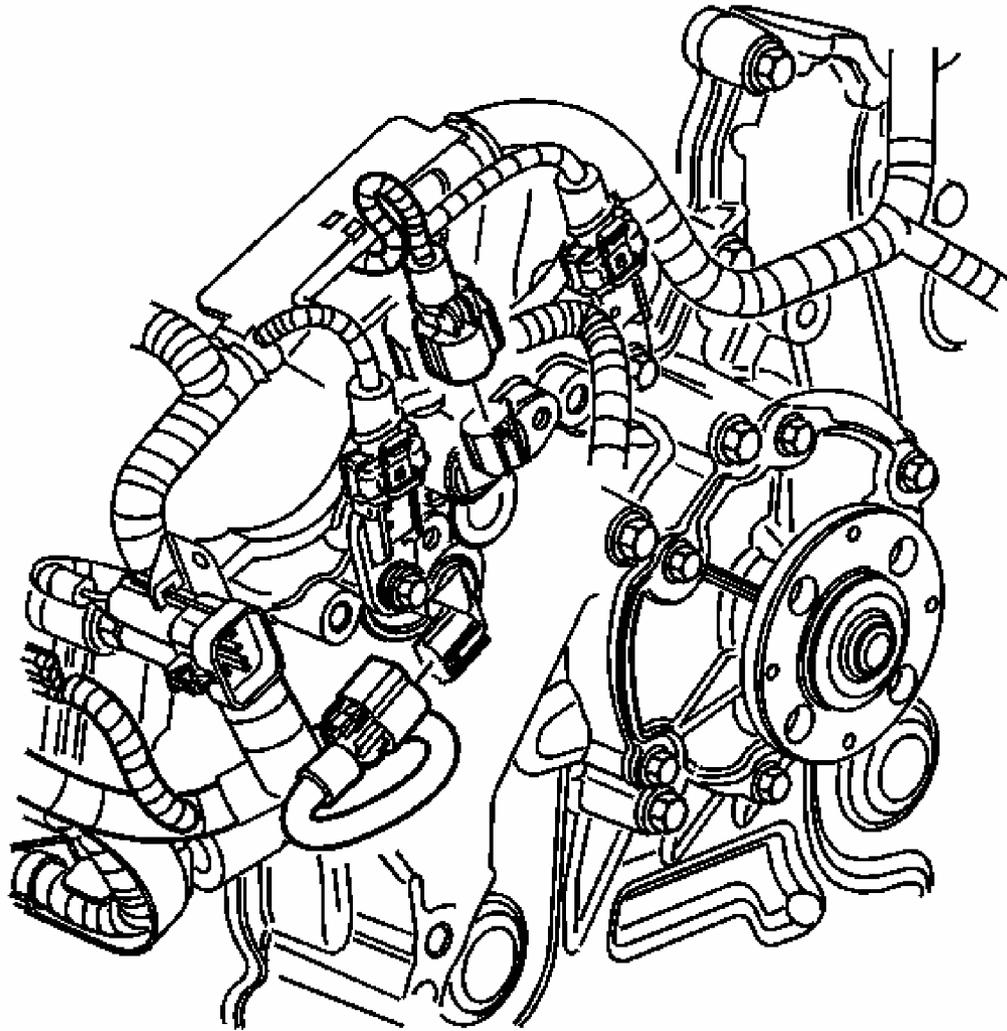
**Fig. 43: View Of Fuel Injector Harness Electrical Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

13. Connect the engine wiring harness to the fuel injector harness.



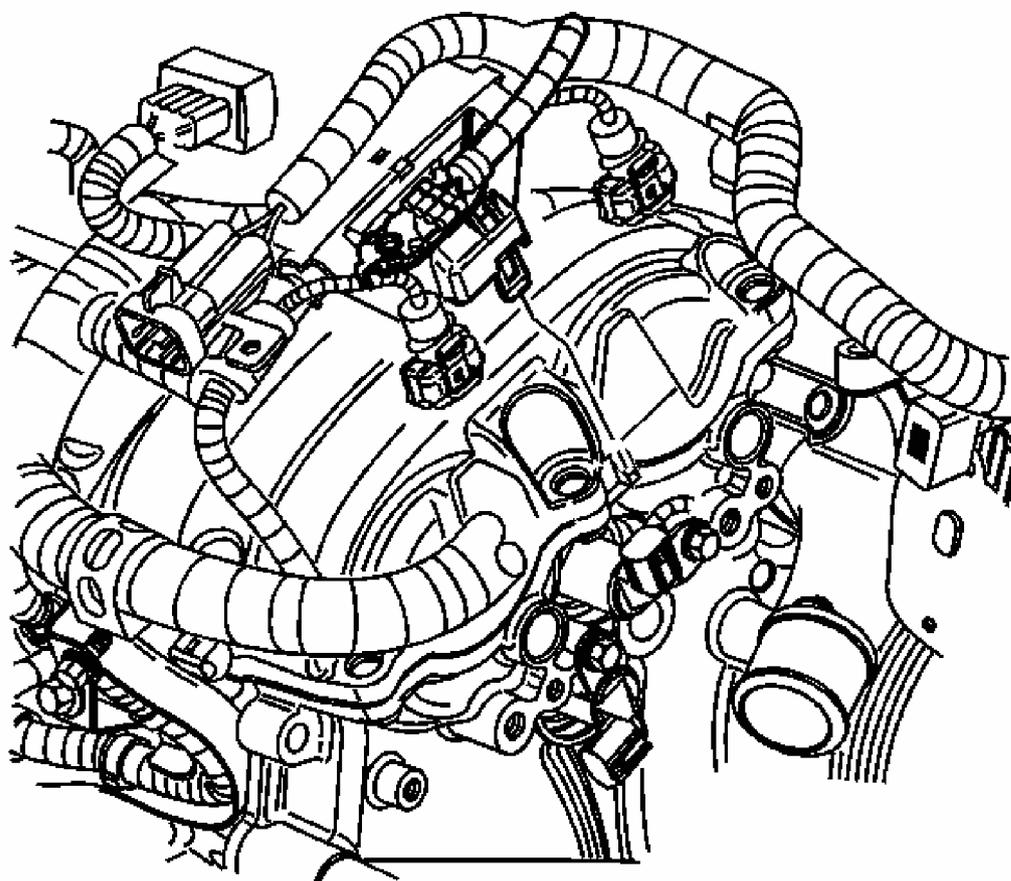
**Fig. 44: View Of Right Ignition Coils Electrical Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

14. Connect the engine wiring harness to the right ignition coils.



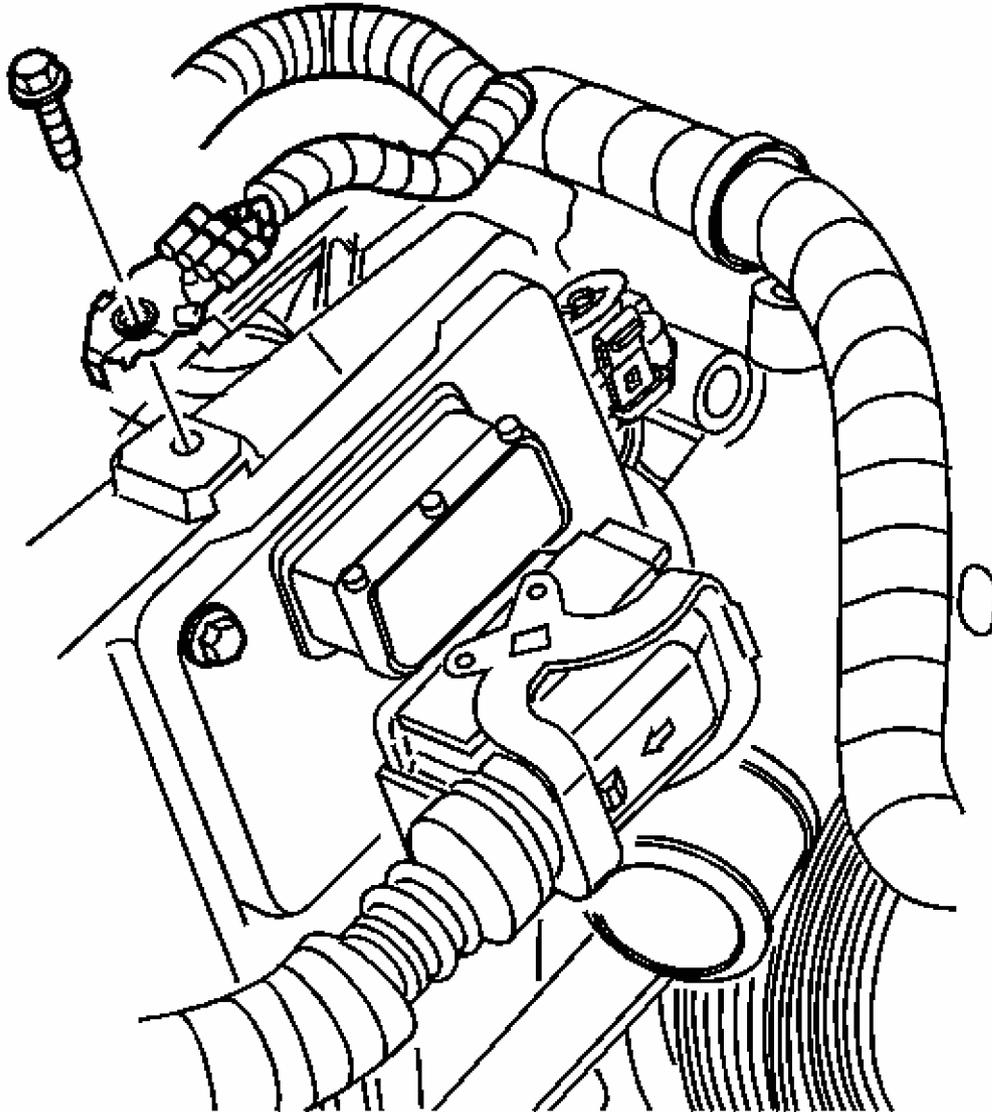
**Fig. 45: View Of Right Camshaft Position Actuator Valves Electrical Connectors**  
Courtesy of GENERAL MOTORS CORP.

15. Connect the engine wiring harness to the right camshaft position actuator valves.



**Fig. 46: View Of Right Camshaft Cover Wiring Harness Connector - Front**  
Courtesy of GENERAL MOTORS CORP.

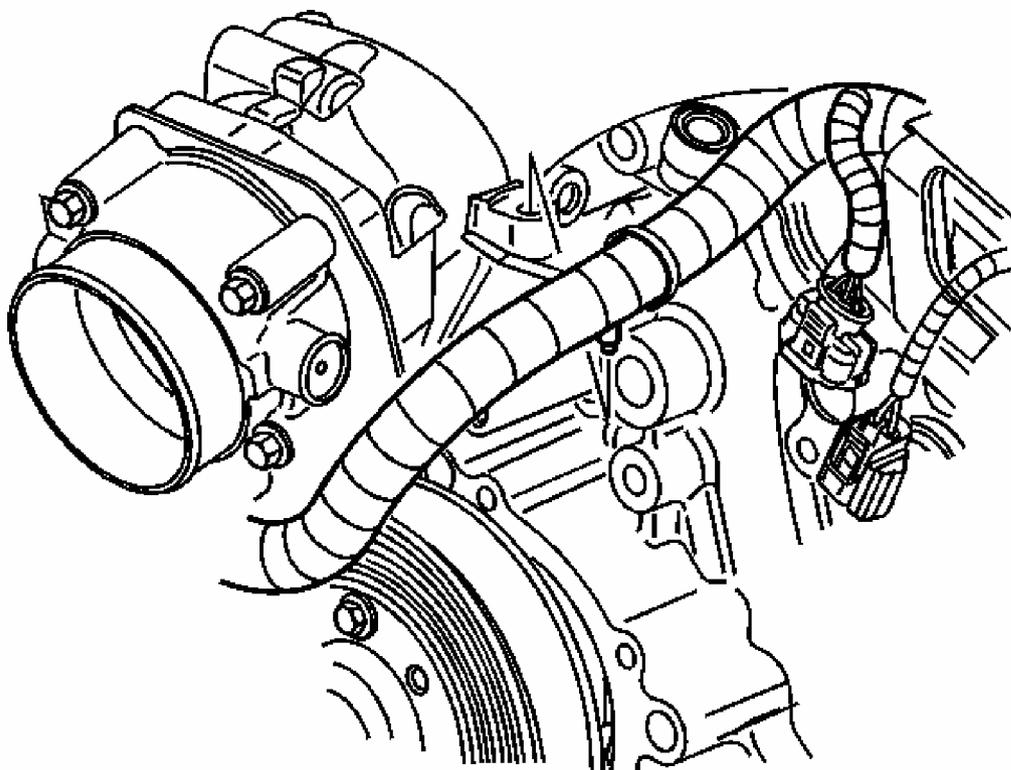
16. Connect the engine wiring harness to the front of the right camshaft cover.



**Fig. 47: View Of ECM Ground Harness Terminal Screw**  
**Courtesy of GENERAL MOTORS CORP.**

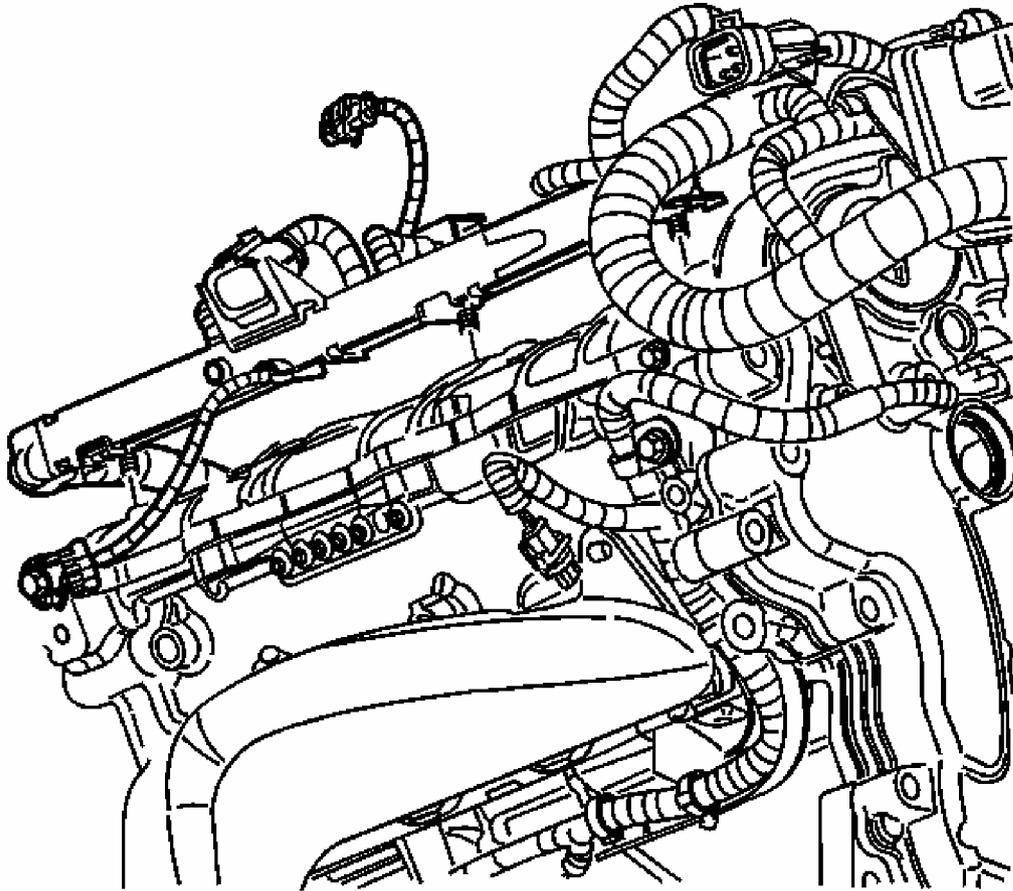
17. Position the ECM ground harness ring terminal to ECM lug and install the ECM ground harness ring terminal screw.

**Tighten:** Tighten the ECM ground harness ring terminal screw to 4.5 N.m (40 lb in).



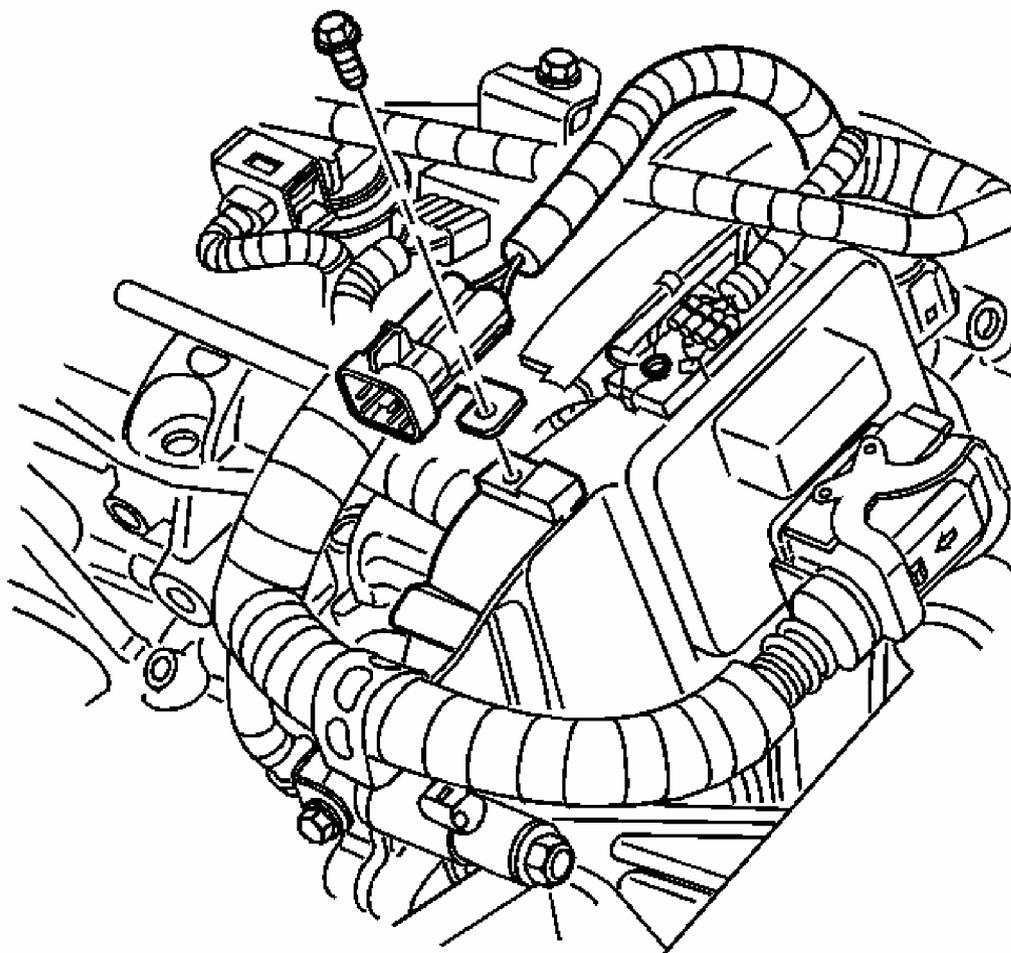
**Fig. 48: View Of Engine Wiring Harness At Left Side Of Throttle Body/Intake Manifold**  
Courtesy of GENERAL MOTORS CORP.

18. Connect the engine wiring harness to the left side of the throttle body/intake manifold.



**Fig. 49: View Of Right Camshaft Cover Wiring Harness Connector - Top**  
**Courtesy of GENERAL MOTORS CORP.**

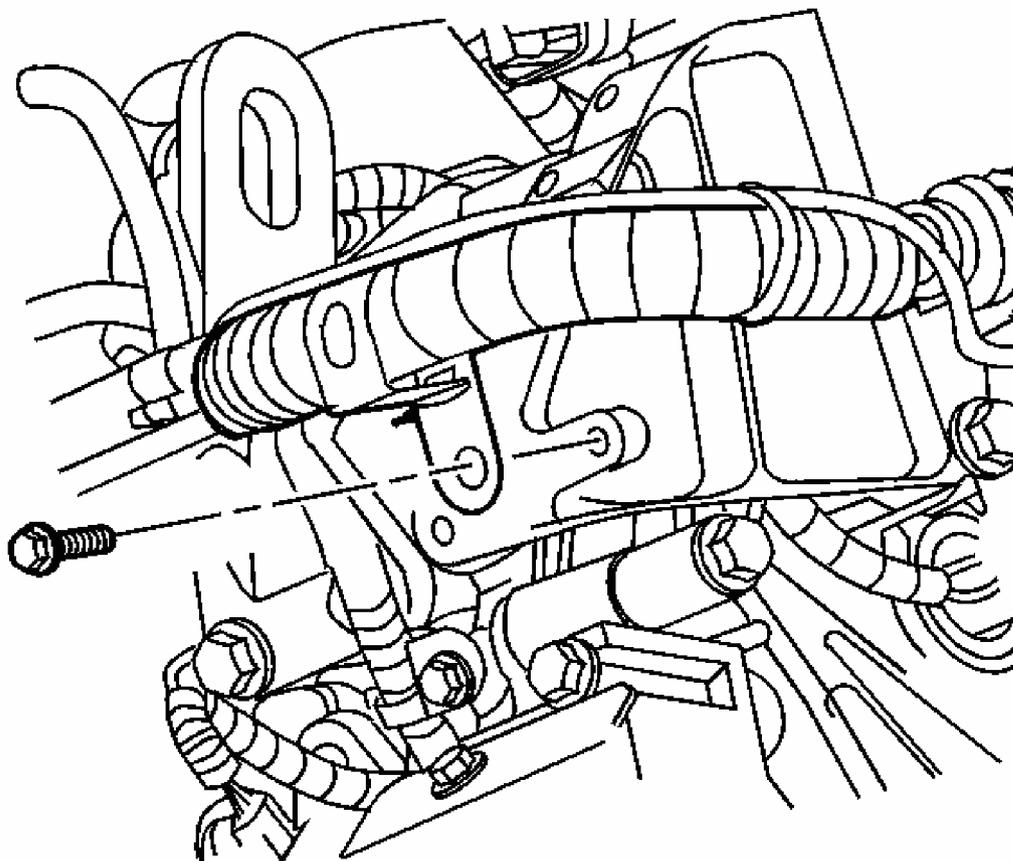
19. Connect the engine wiring harness to the top of the right camshaft cover.



**Fig. 50: View Of Engine Wiring Harness Bracket Bolt - Top Of ECM Bracket**  
Courtesy of GENERAL MOTORS CORP.

20. Install the engine wiring harness bracket bolt to the top of the ECM bracket.

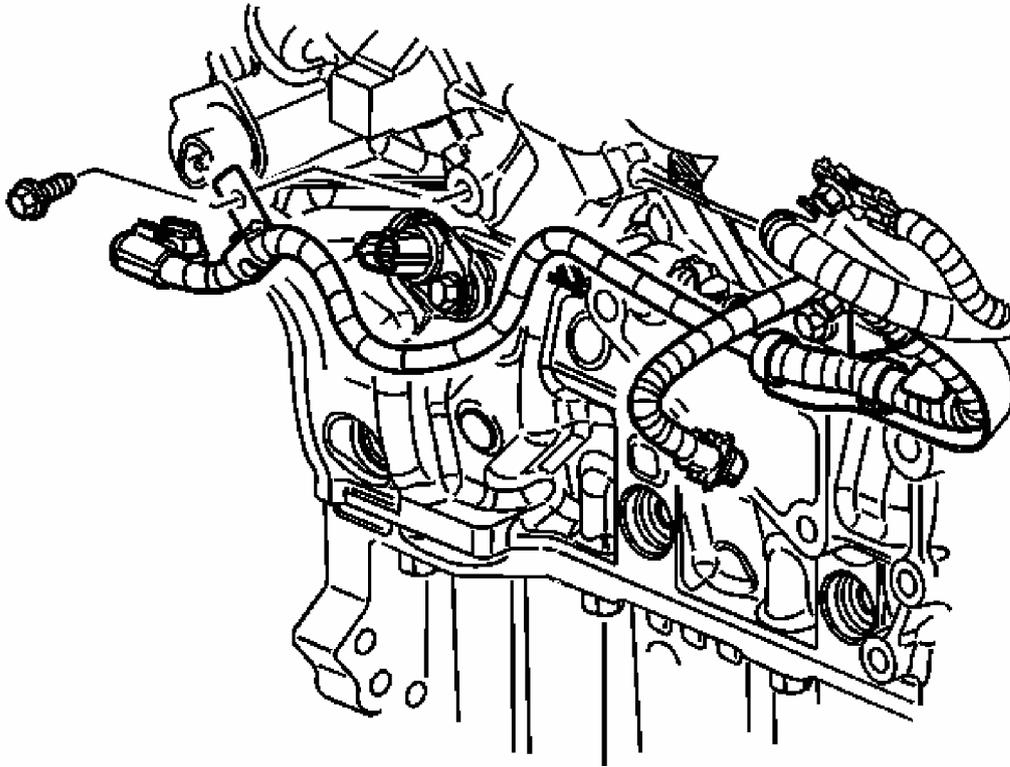
**Tighten:** Tighten the engine wiring harness bracket bolt to 10 N.m (89 lb in).



**Fig. 51: View Of Engine Wiring Harness Bracket Bolt - Side Of ECM Bracket**  
Courtesy of GENERAL MOTORS CORP.

21. Install the engine wiring harness bracket bolt to the side of the ECM bracket.

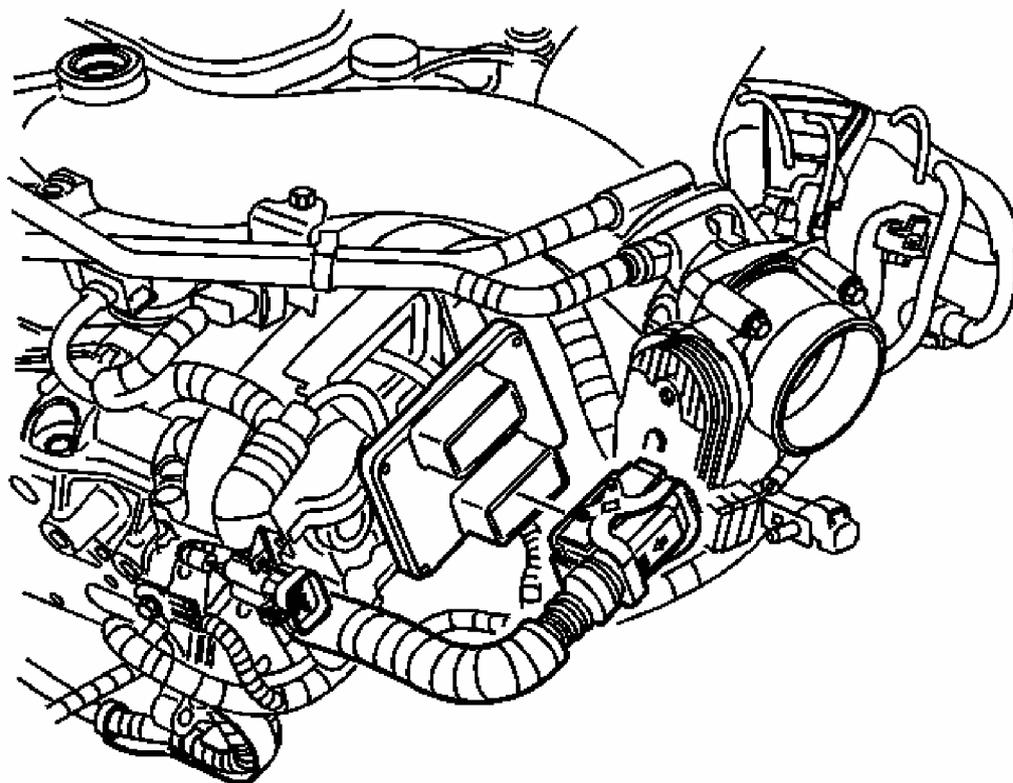
**Tighten:** Tighten the engine wiring harness bracket bolt to 23 N.m (17 lb ft).



**Fig. 52: View Of Engine Wiring Harness Bracket Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

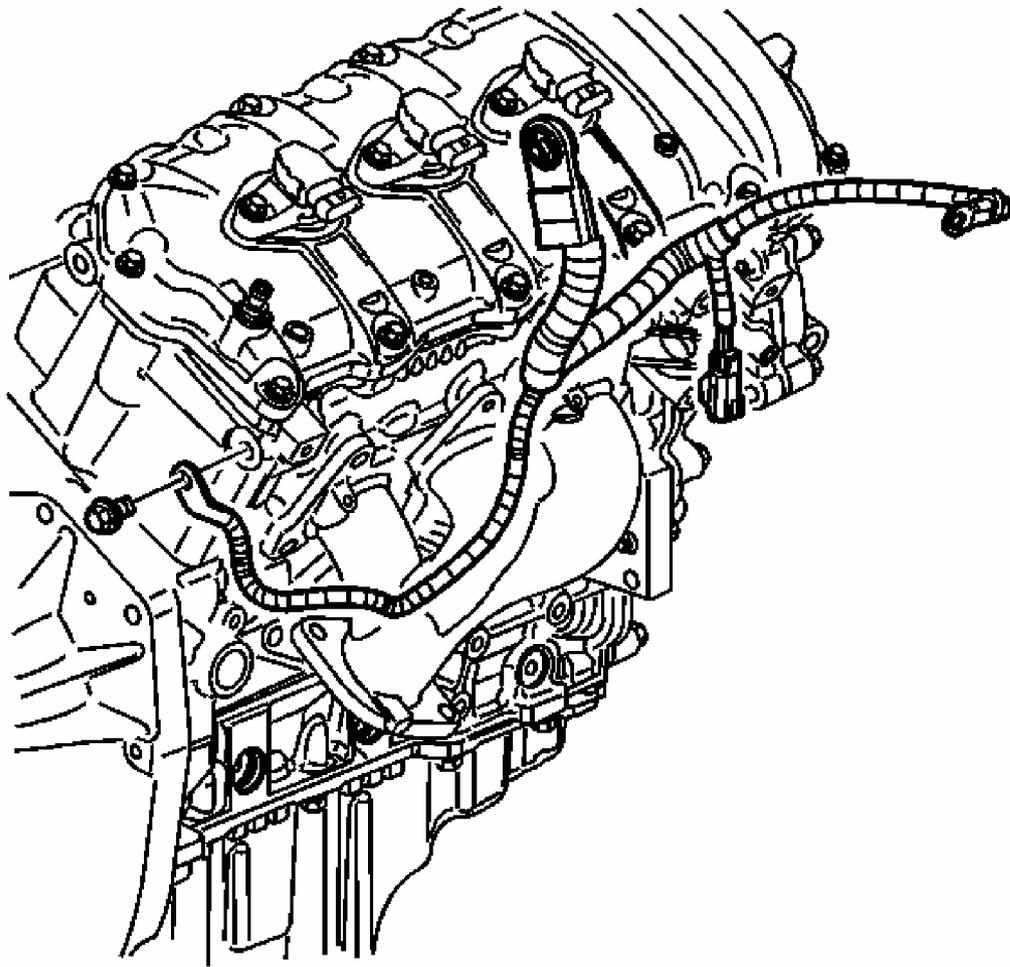
22. Connect the engine wiring harness to the crankshaft position sensor.
23. Install the engine wiring harness bracket bolt.

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



**Fig. 53: View Of ECM Wiring Harness Connector**  
**Courtesy of GENERAL MOTORS CORP.**

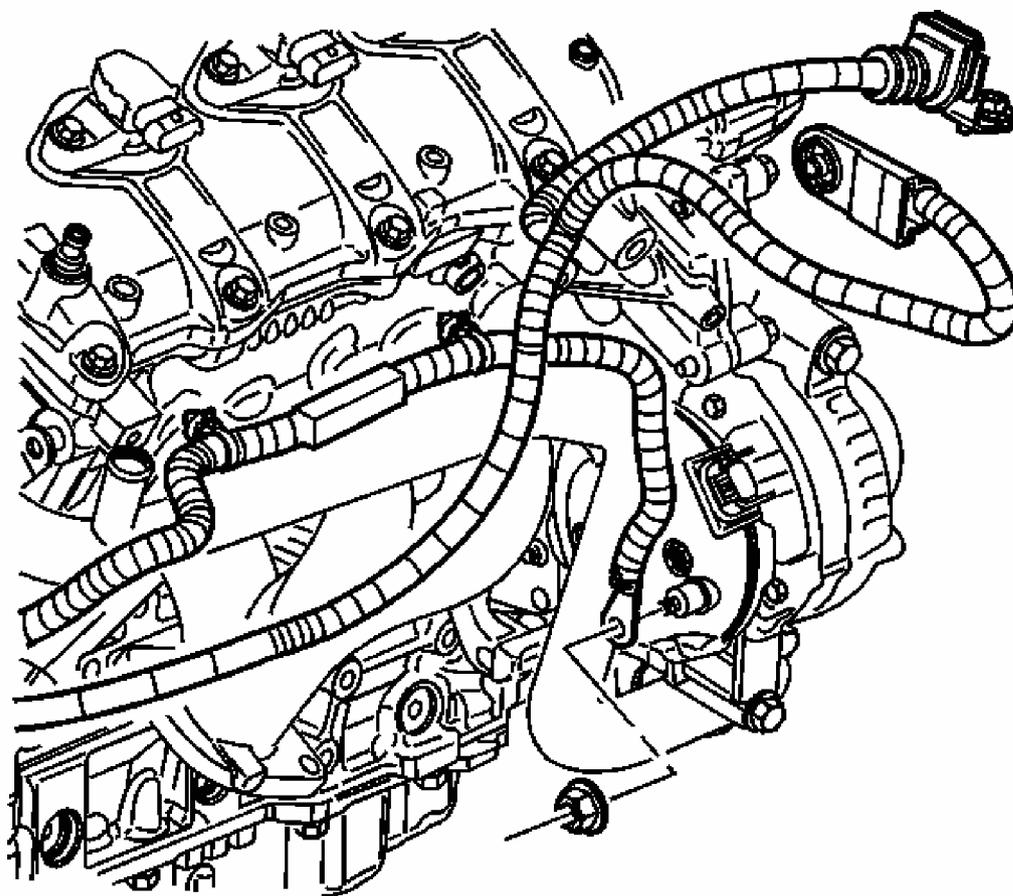
24. Connect the engine wiring harness to the ECM module.



**Fig. 54: View Of Battery Cable Ground**  
**Courtesy of GENERAL MOTORS CORP.**

25. Install the battery cable ground.
26. Install the battery cable ground bolt to the rear of the left cylinder head.

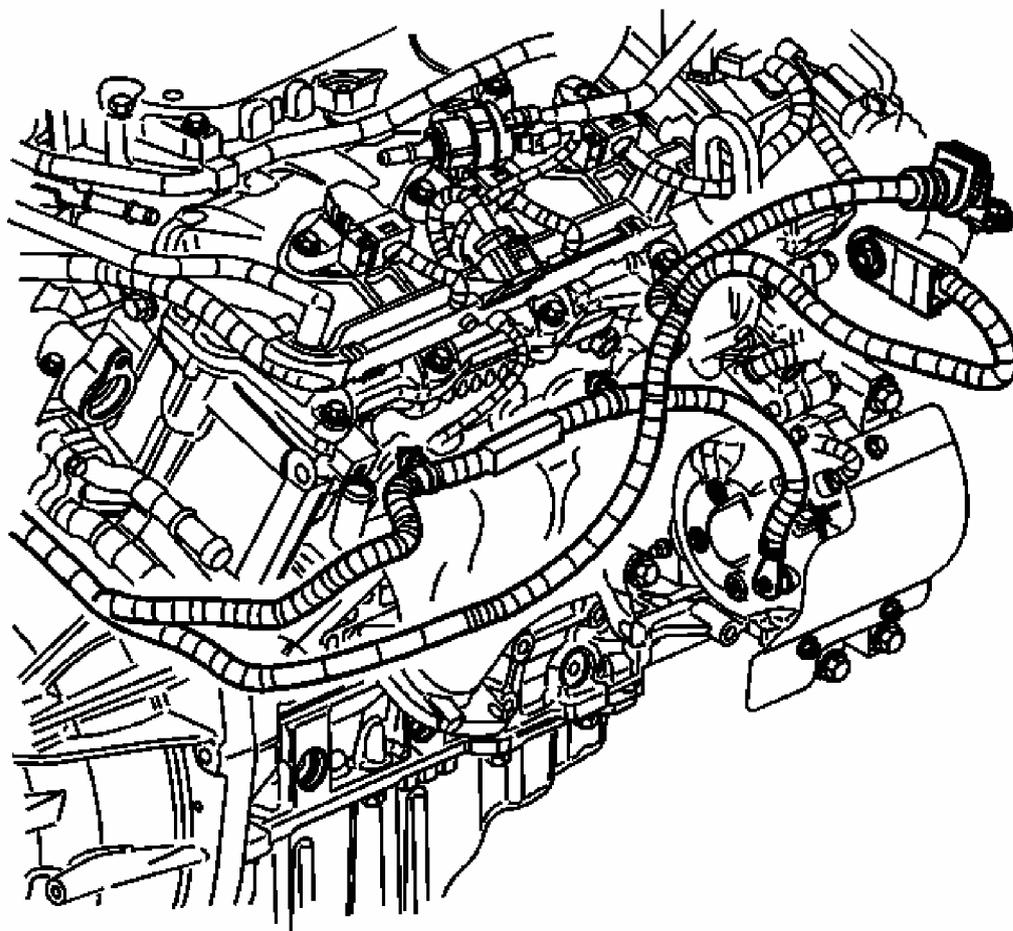
**Tighten:** Tighten the battery cable ground bolt to 50 N.m (37 lb ft).



**Fig. 55: View Of Generator Battery Cable**  
**Courtesy of GENERAL MOTORS CORP.**

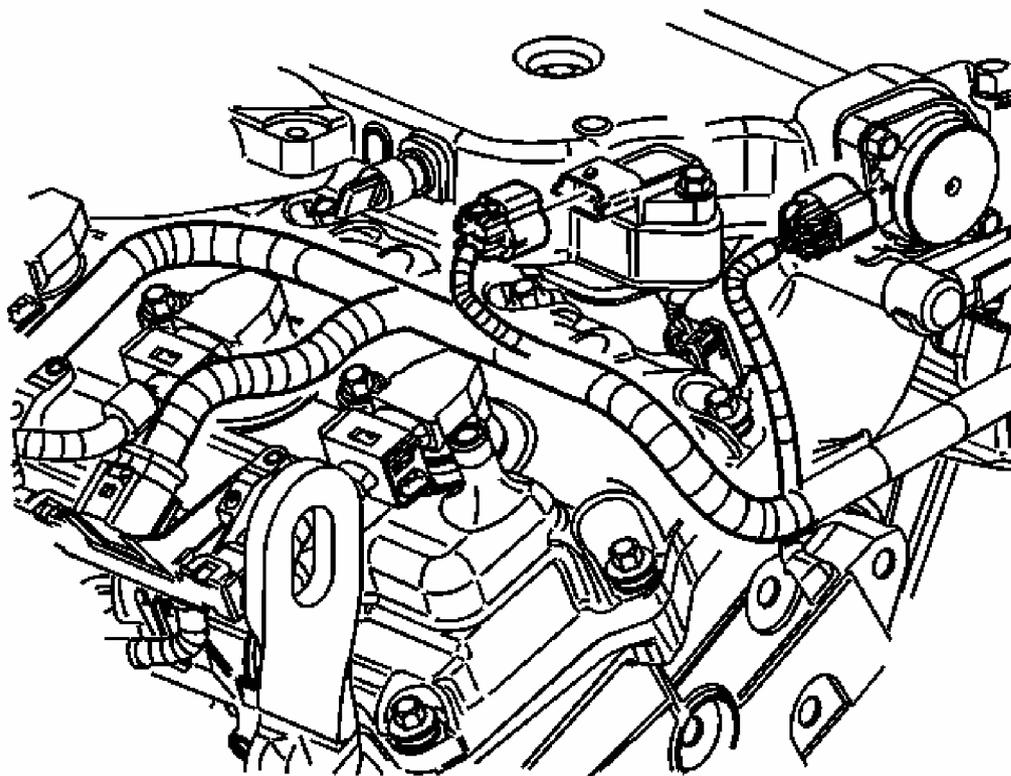
27. Connect the battery cable to the generator.
28. Install the battery cable/generator nut to the generator.

**Tighten:** Tighten the battery cable/generator nut to 13 N.m (115 lb in).



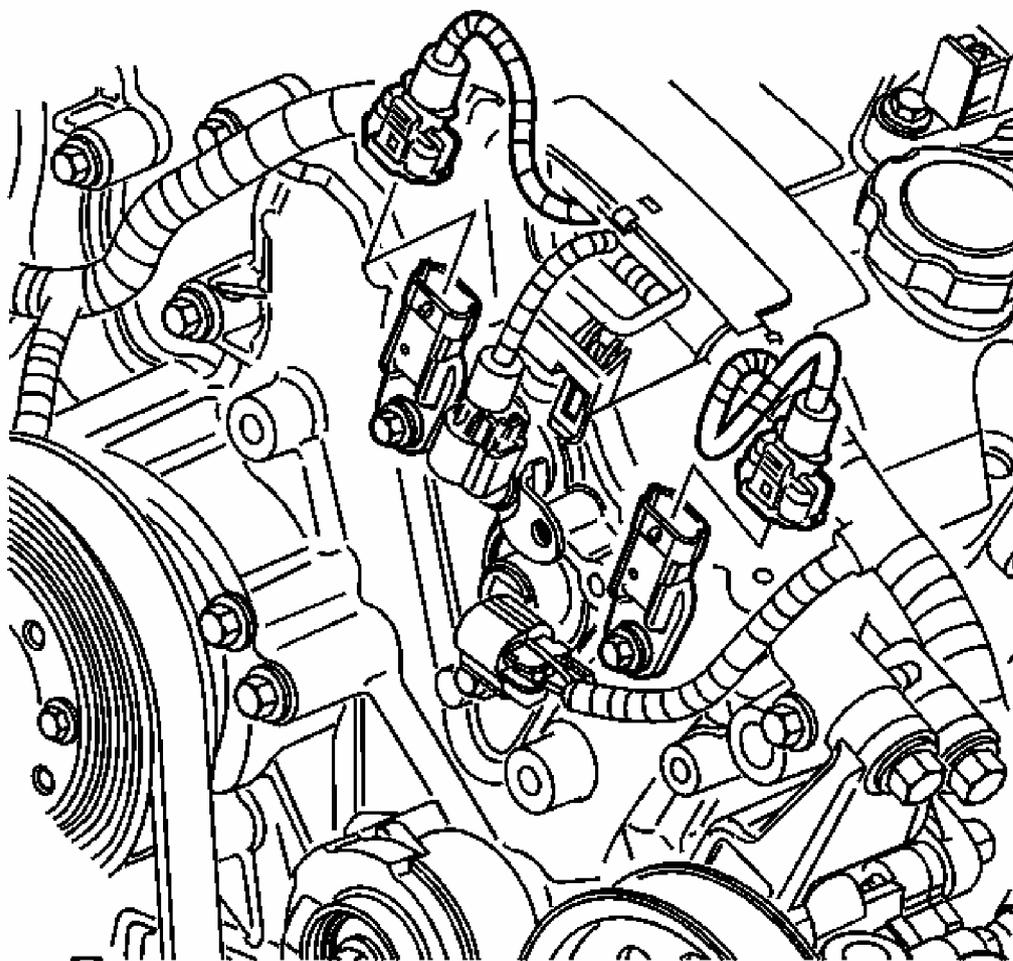
**Fig. 56: View Of Right Battery Cable Harness**  
**Courtesy of GENERAL MOTORS CORP.**

29. Connect the battery cable harness to the right side of the engine.



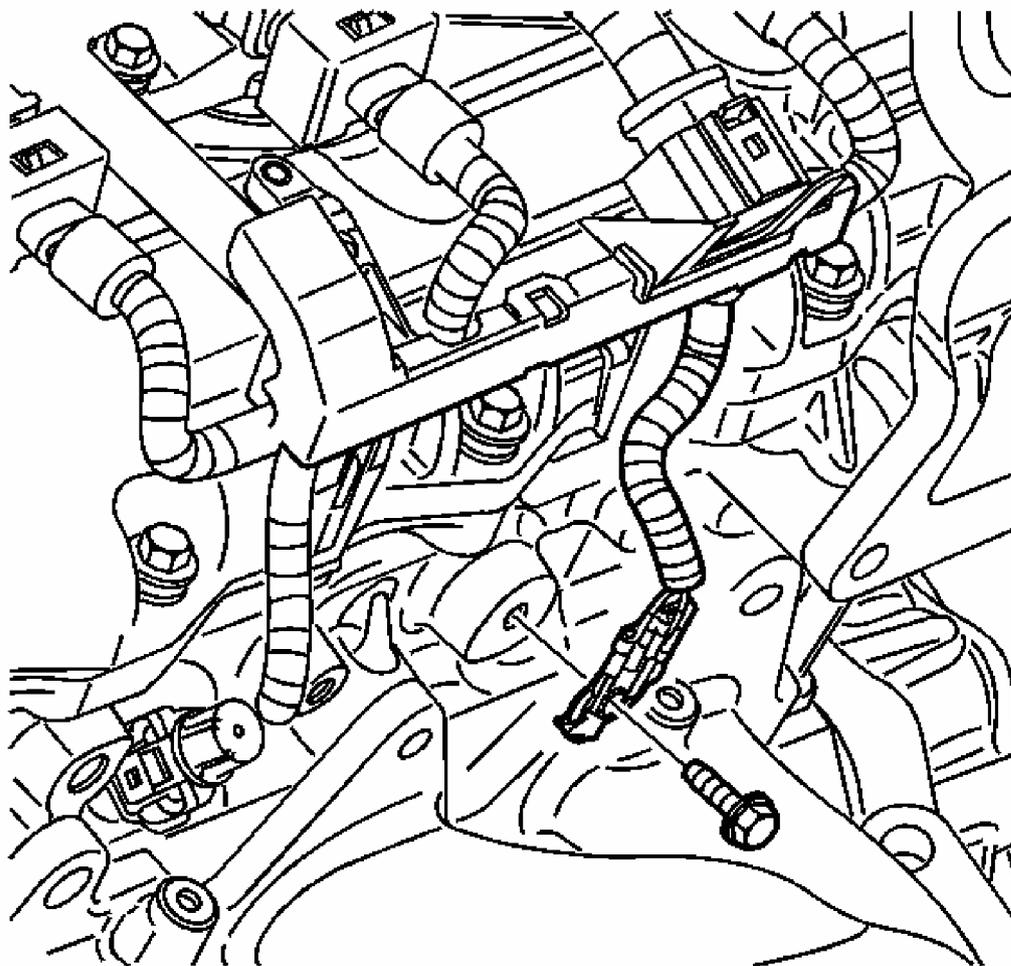
**Fig. 57: Identifying Barometric Pressure Sensor And Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

30. Connect the engine wiring harness to the barometric pressure (BARO) sensor.



**Fig. 58: View Of Left Camshaft Position Sensors Electrical Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

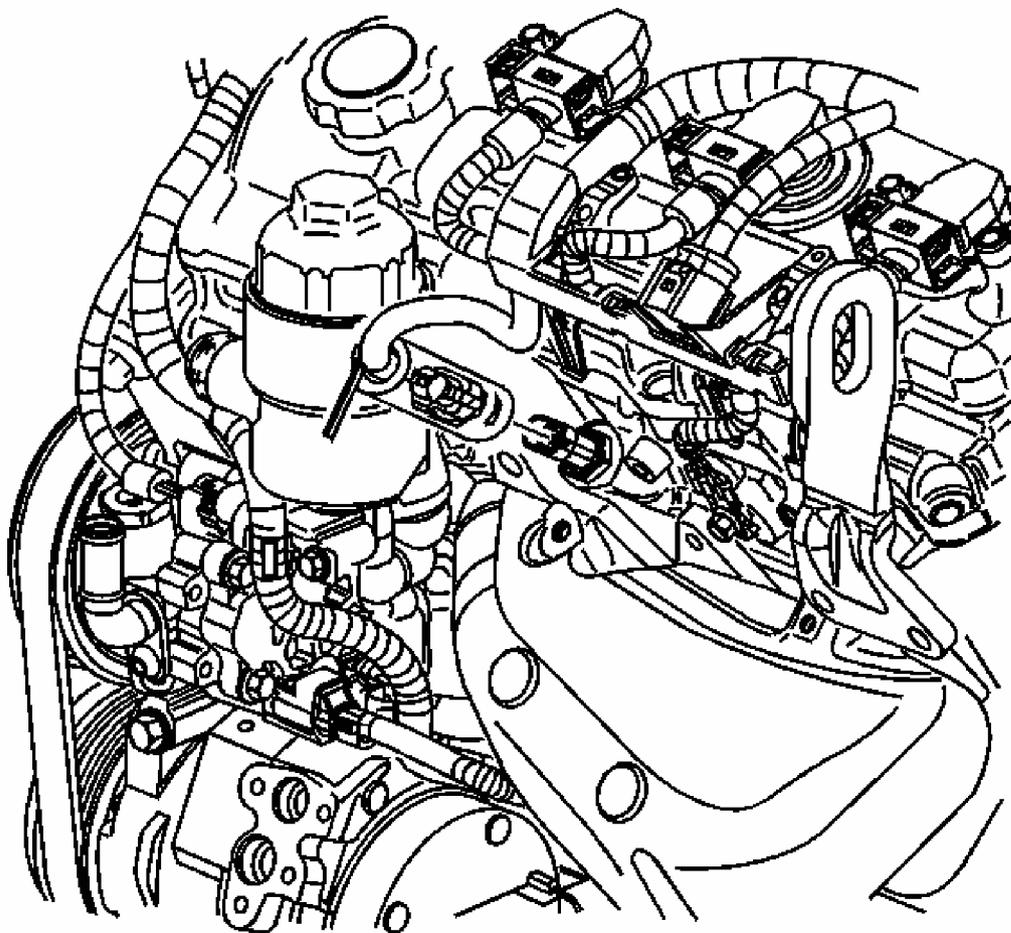
31. Connect the engine wiring harness to the left camshaft position sensors.



**Fig. 59: View Of Left Cylinder Head Wiring Harness Ground Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

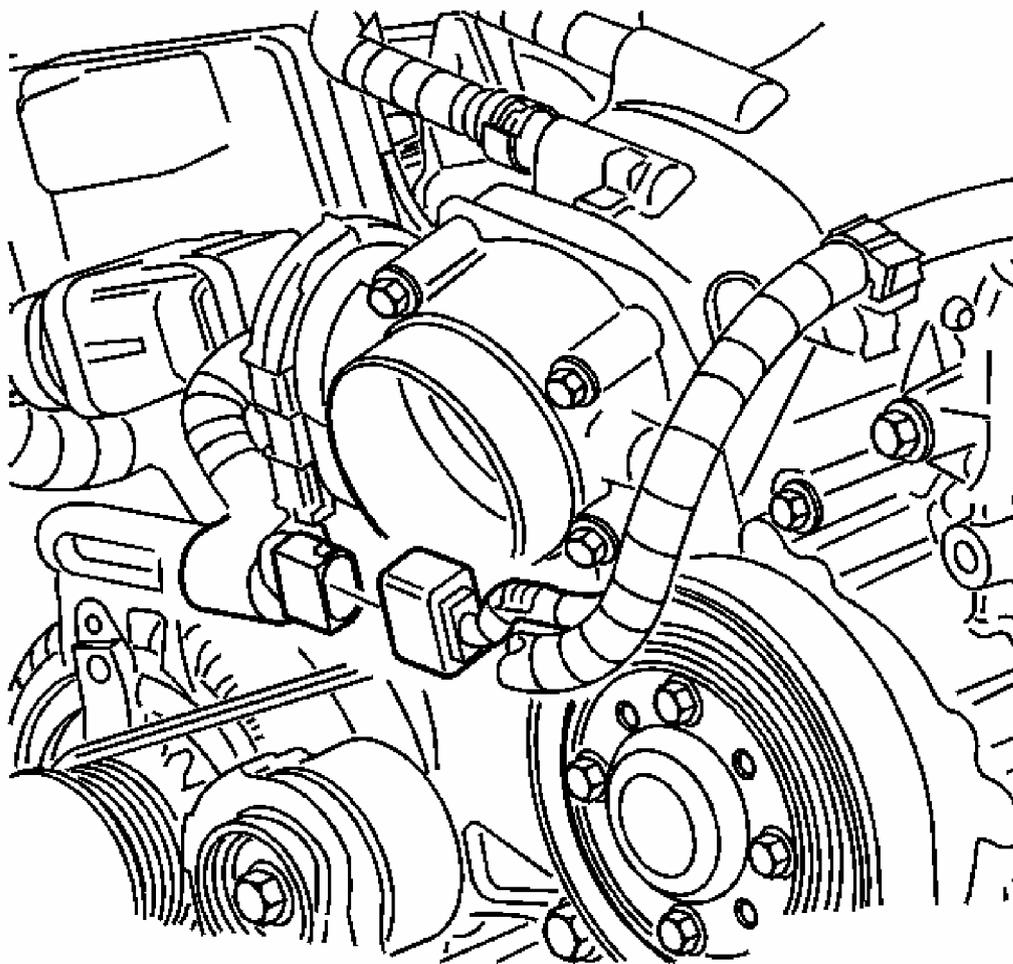
32. Install the engine wiring harness ground bolt to the left cylinder head.

**Tighten:** Tighten the engine wiring harness ground bolt to 10 N.m (89 lb in).



**Fig. 60: View Of Coolant Temperature Sensor And Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

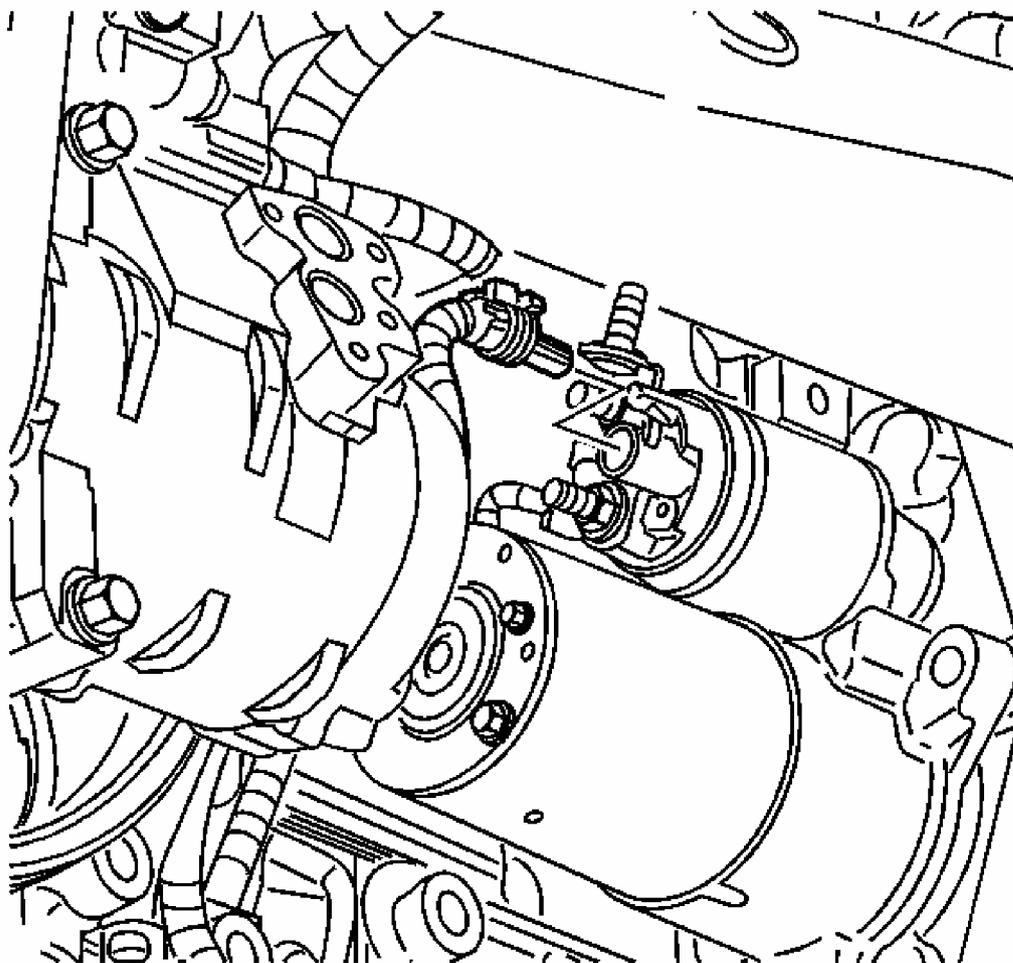
33. Connect the engine wiring harness to the engine coolant temperature (ECT) sensor.



**Fig. 61: View Of Throttle Body Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

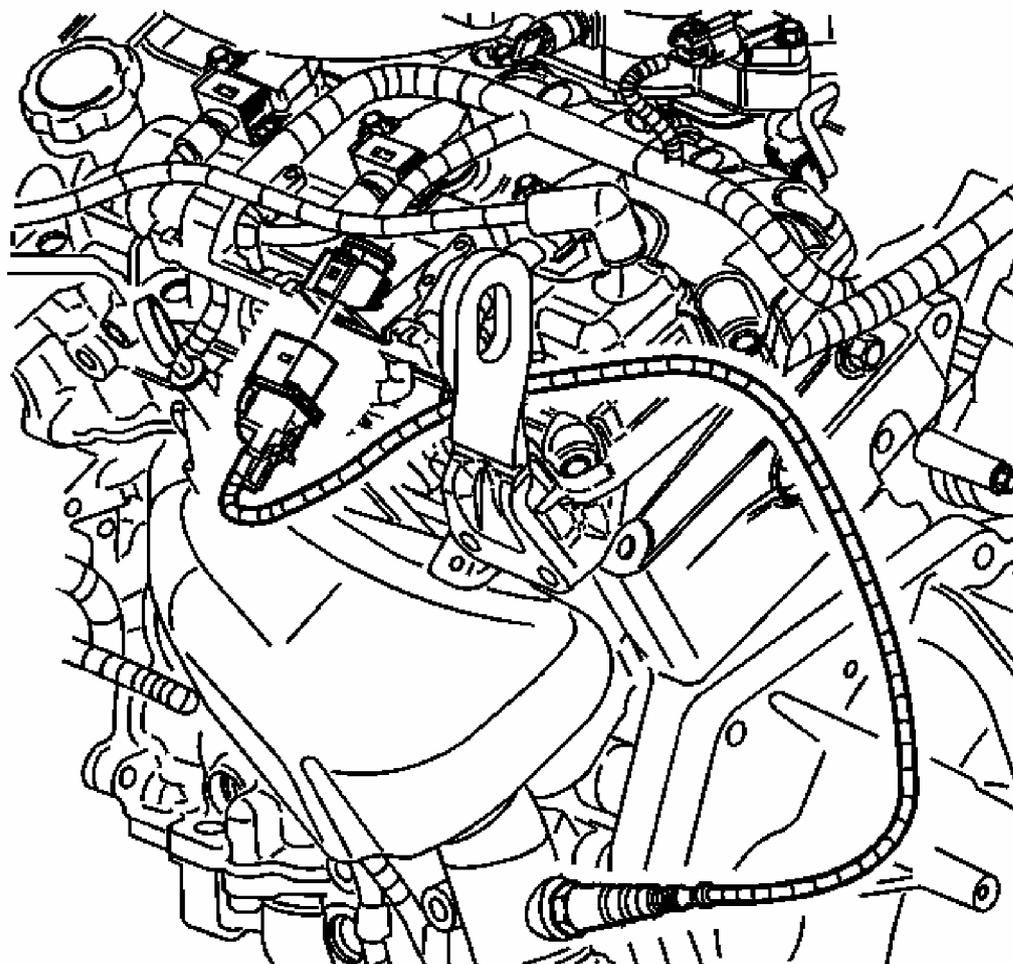
**NOTE:** Ensure proper engagement of the wiring harness connector. The wiring harness connector must be installed straight onto the component connector and firmly seated. Visually inspect the connector to ensure that the connector latches are engaged and locked. Any damage to the connector or wiring must be repaired. Failure to follow this procedure can lead to an intermittent electrical connection, driveability concerns, and/or wiring harness or wiring harness connector damage or failure.

34. Connect the engine wiring harness to the throttle body connector.



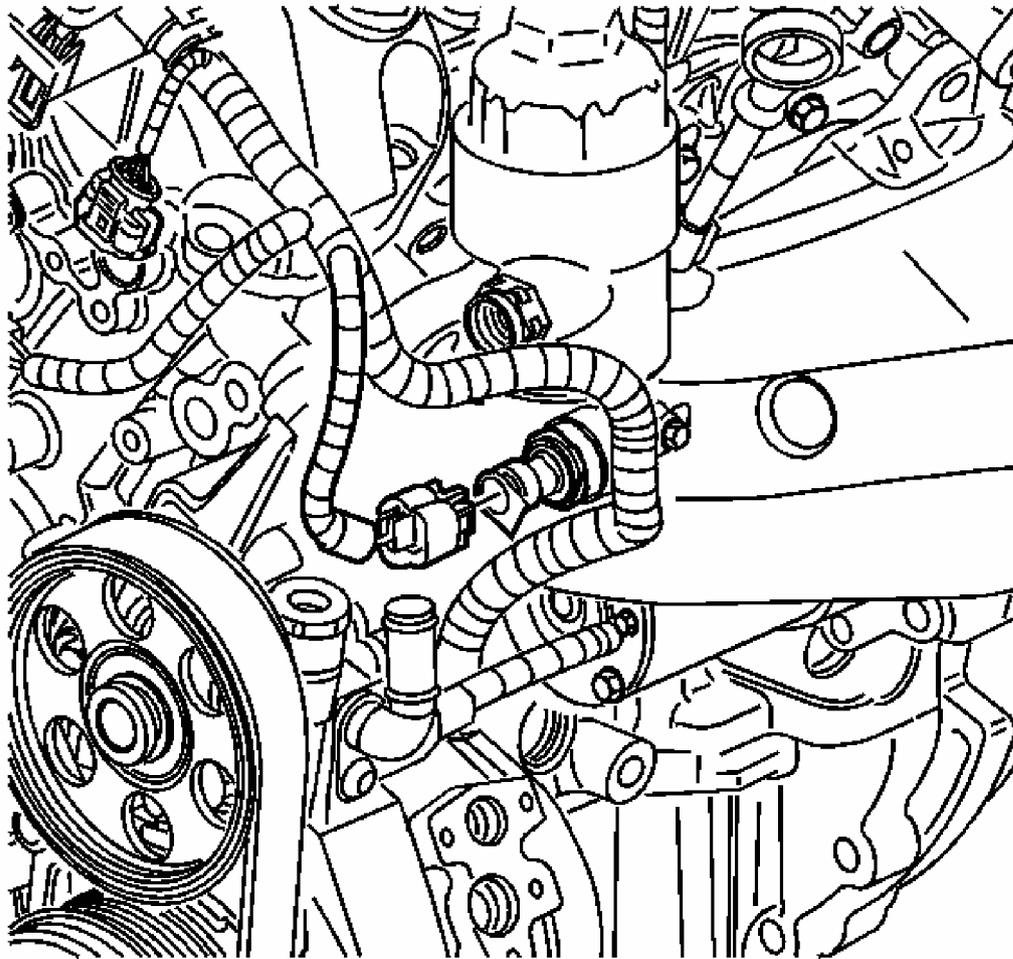
**Fig. 62: View Of Starter Motor Solenoid Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

35. Connect the engine wiring harness to the starter motor solenoid.



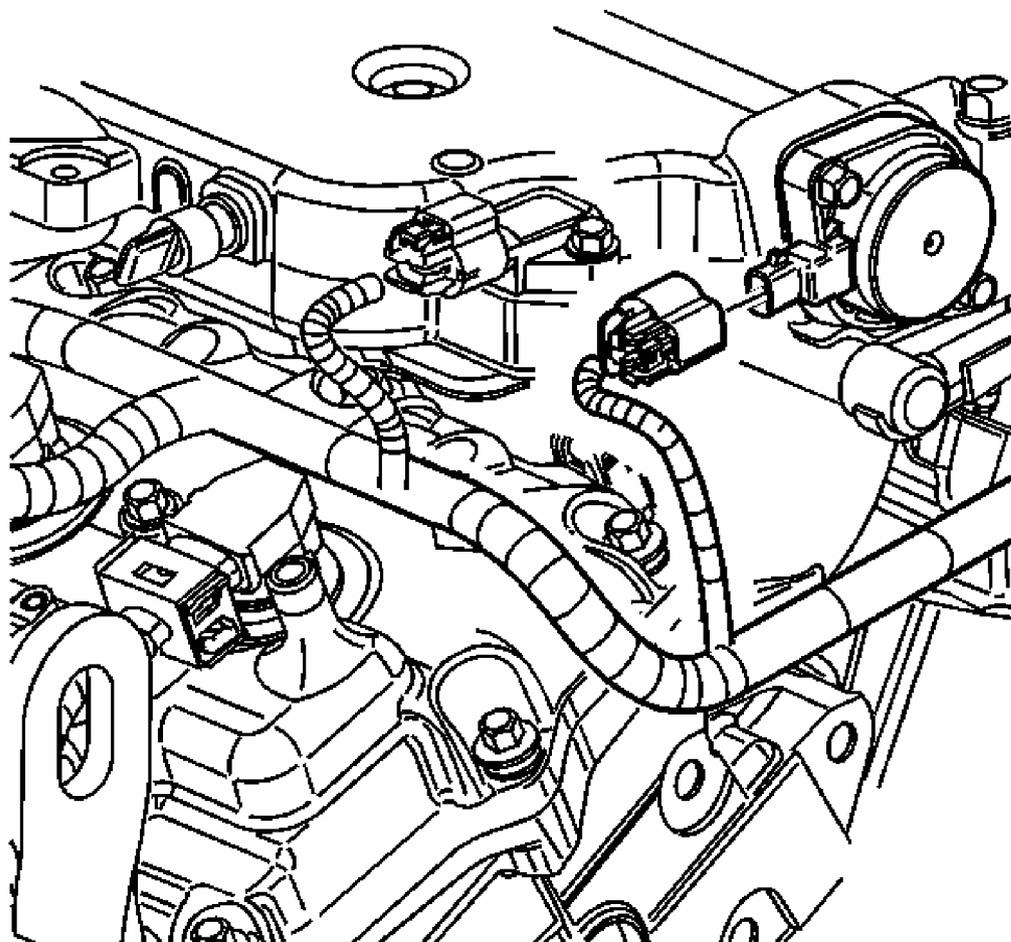
**Fig. 63: View Of Left Oxygen Sensor Harness Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

36. Connect the engine wiring harness to the left oxygen sensor harness.



**Fig. 64: View Of Oil Pressure Sensor Wiring Harness**  
**Courtesy of GENERAL MOTORS CORP.**

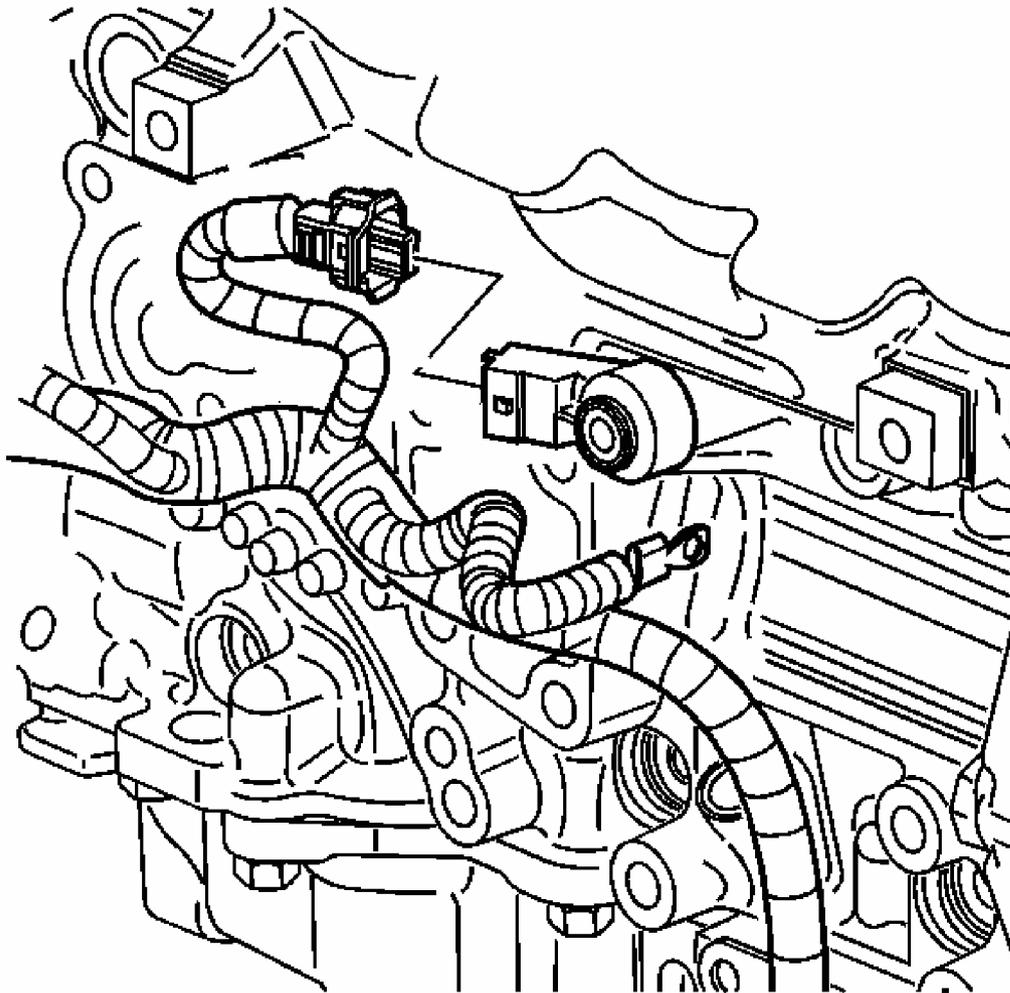
37. Connect the engine wiring harness to the oil pressure sender.



**Fig. 65: View Of Communicator And Intake Manifold Runner Control Solenoid Electrical Connectors**

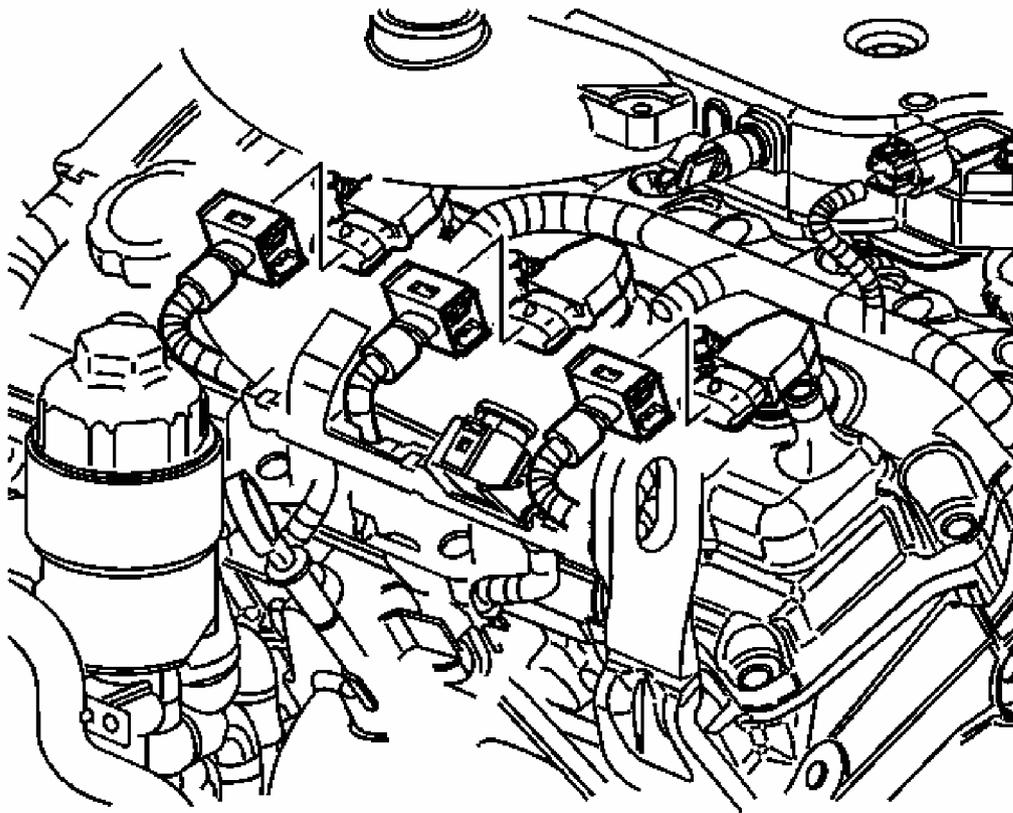
**Courtesy of GENERAL MOTORS CORP.**

38. Connect the engine wiring harness to the communicator valve.



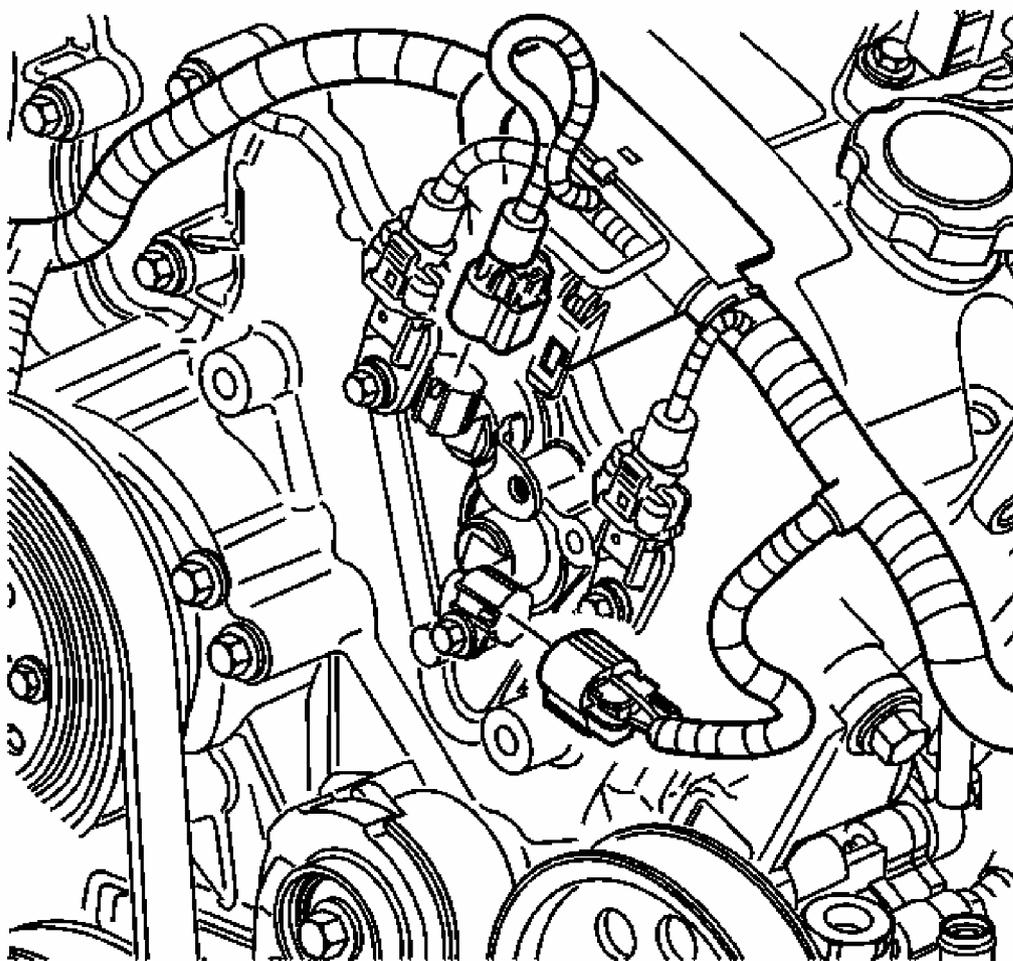
**Fig. 66: View Of Left Knock Sensor And Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

39. Connect the engine wiring harness to the left knock sensor.



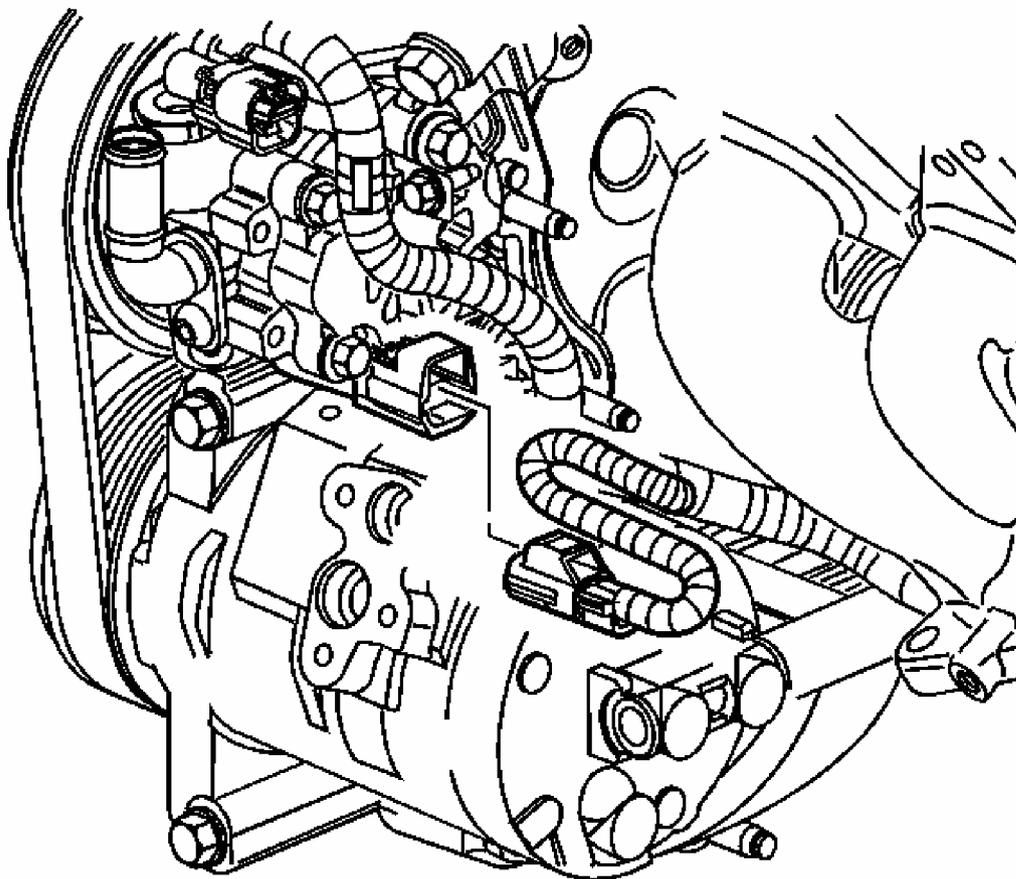
**Fig. 67: View Of Left Ignition Coils Wiring Harness Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

40. Connect the engine wiring harness to the left ignition coils.



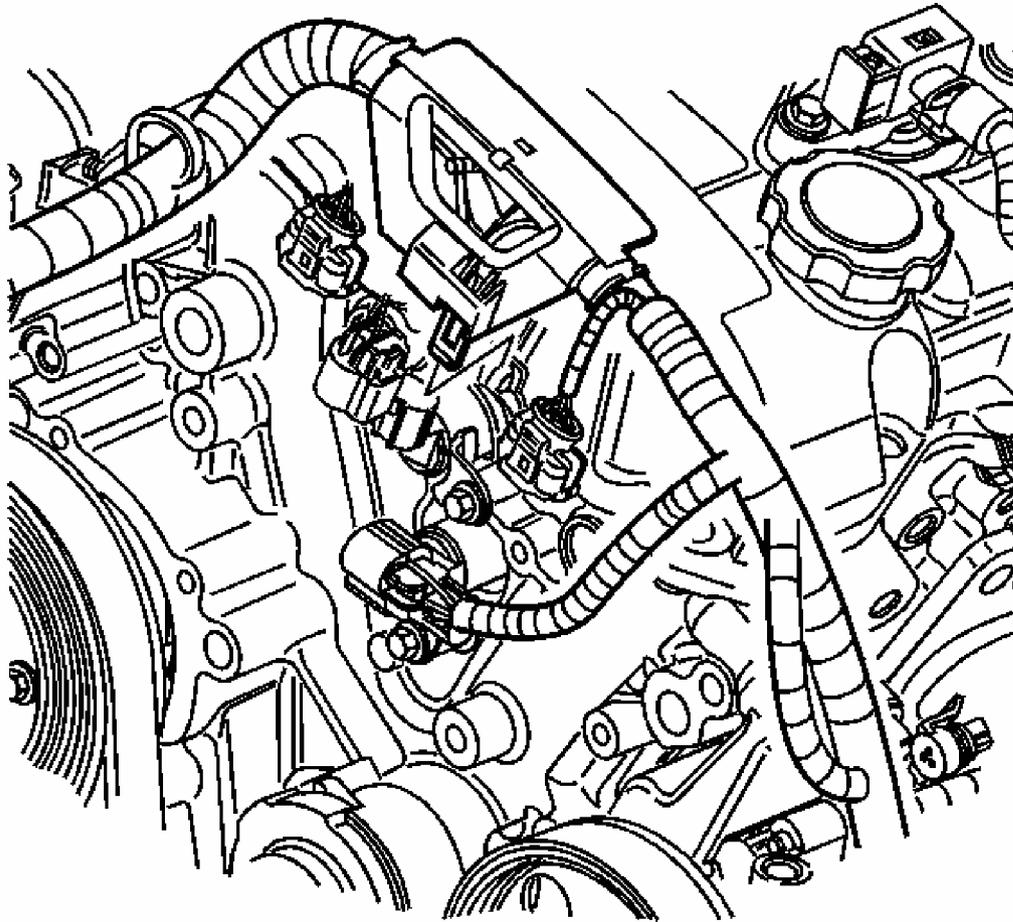
**Fig. 68: View Of Left Camshaft Position Actuator Valve Electrical Connectors**  
Courtesy of GENERAL MOTORS CORP.

41. Connect the engine wiring harness to the left camshaft position actuator valves.



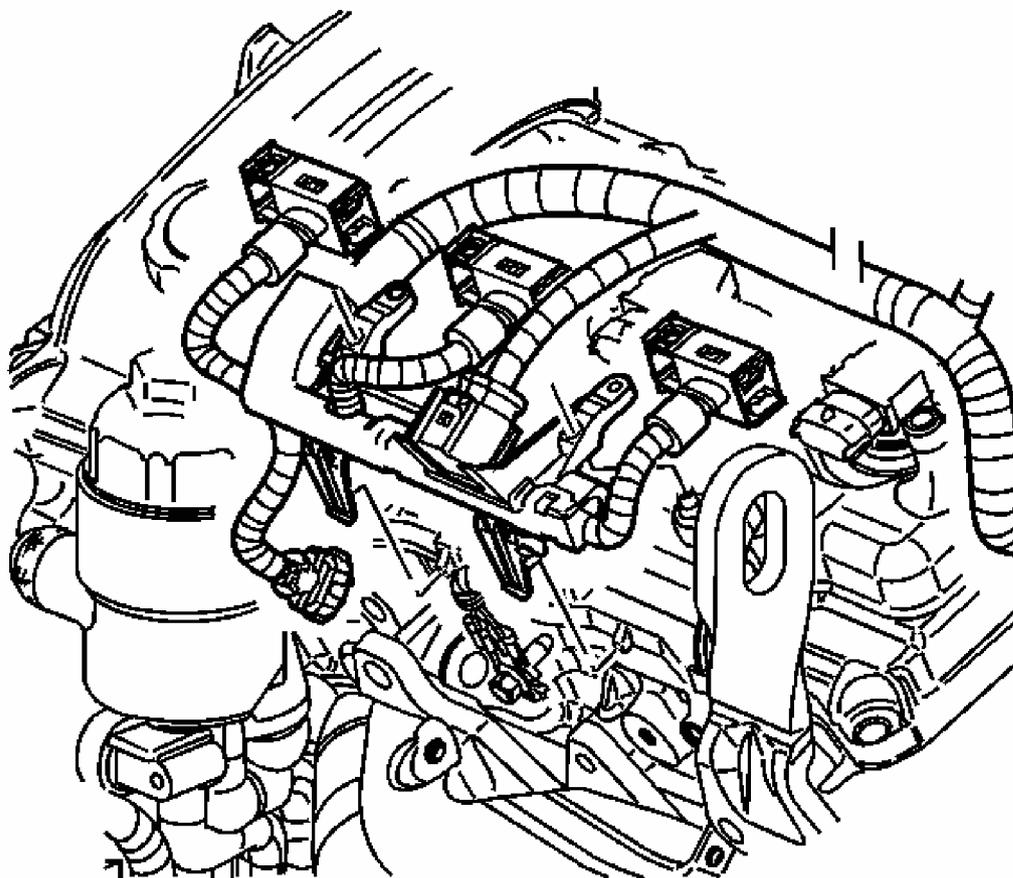
**Fig. 69: View Of A/C Compressor Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

42. Connect the engine wiring harness to the A/C compressor.



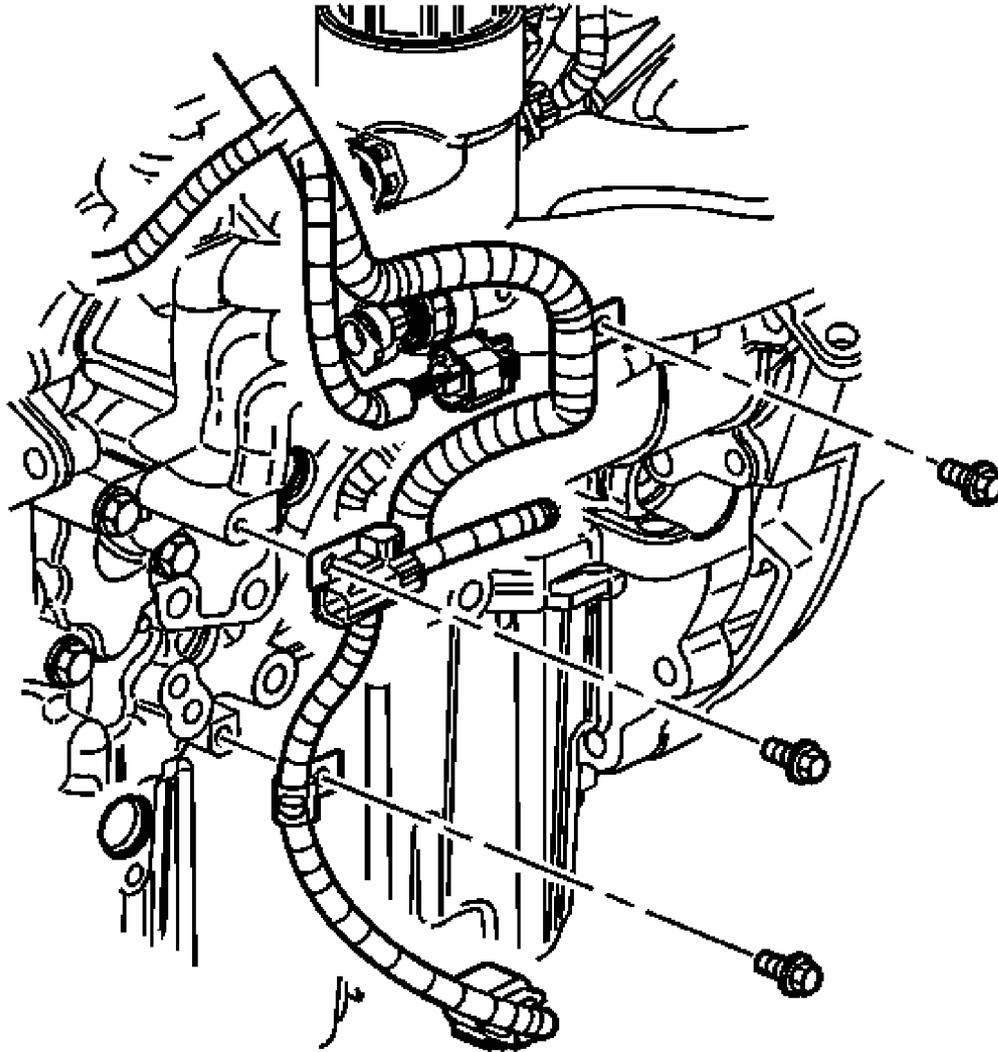
**Fig. 70: View Of Left Camshaft Cover Wiring Harness Connector - Front**  
**Courtesy of GENERAL MOTORS CORP.**

43. Connect the engine wiring harness to the front of the left camshaft cover.



**Fig. 71: View Of Left Camshaft Cover Wiring Harness Connectors**  
Courtesy of GENERAL MOTORS CORP.

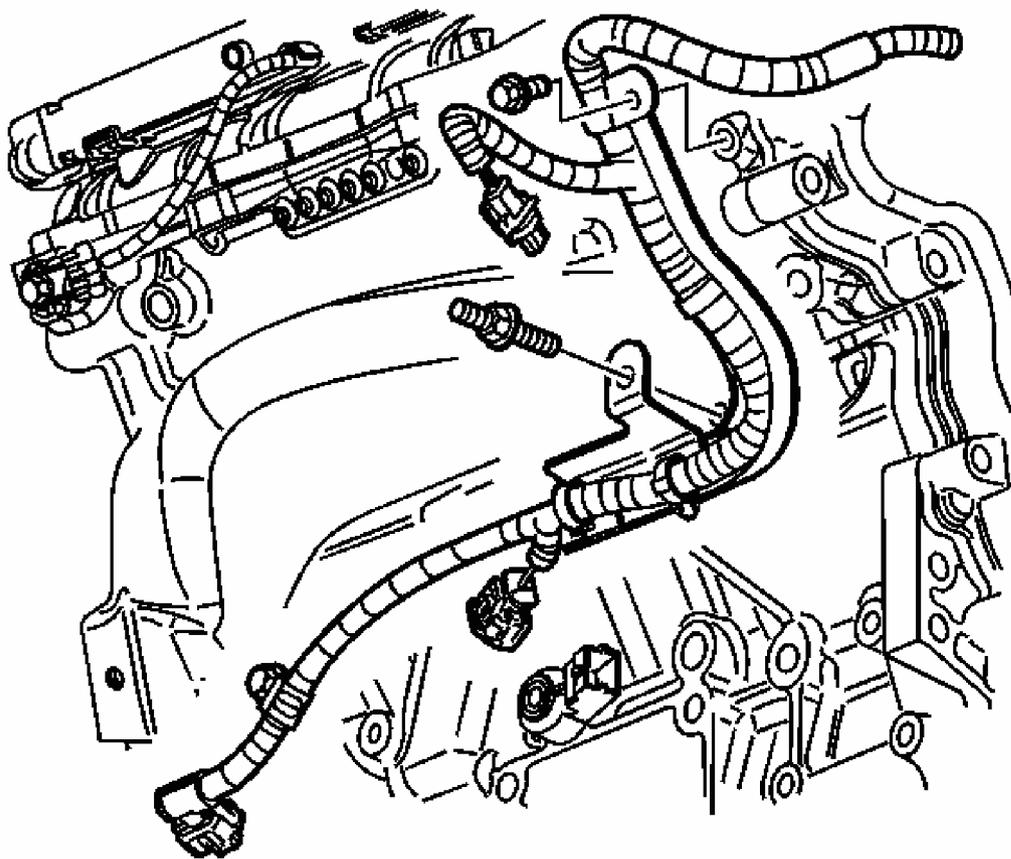
44. Connect the engine wiring harness to the top of the left camshaft cover.



**Fig. 72: View Of Left Wiring Harness Conduit**  
Courtesy of GENERAL MOTORS CORP.

45. Install the engine wiring harness bracket bolts to the lower left side of the engine.

**Tighten:** Tighten the engine wiring harness bracket bolts to 10 N.m (89 lb in).



**Fig. 73: Locating Engine Wiring Harness Bracket Bolt & Engine Wiring Harness Bracket Stud**

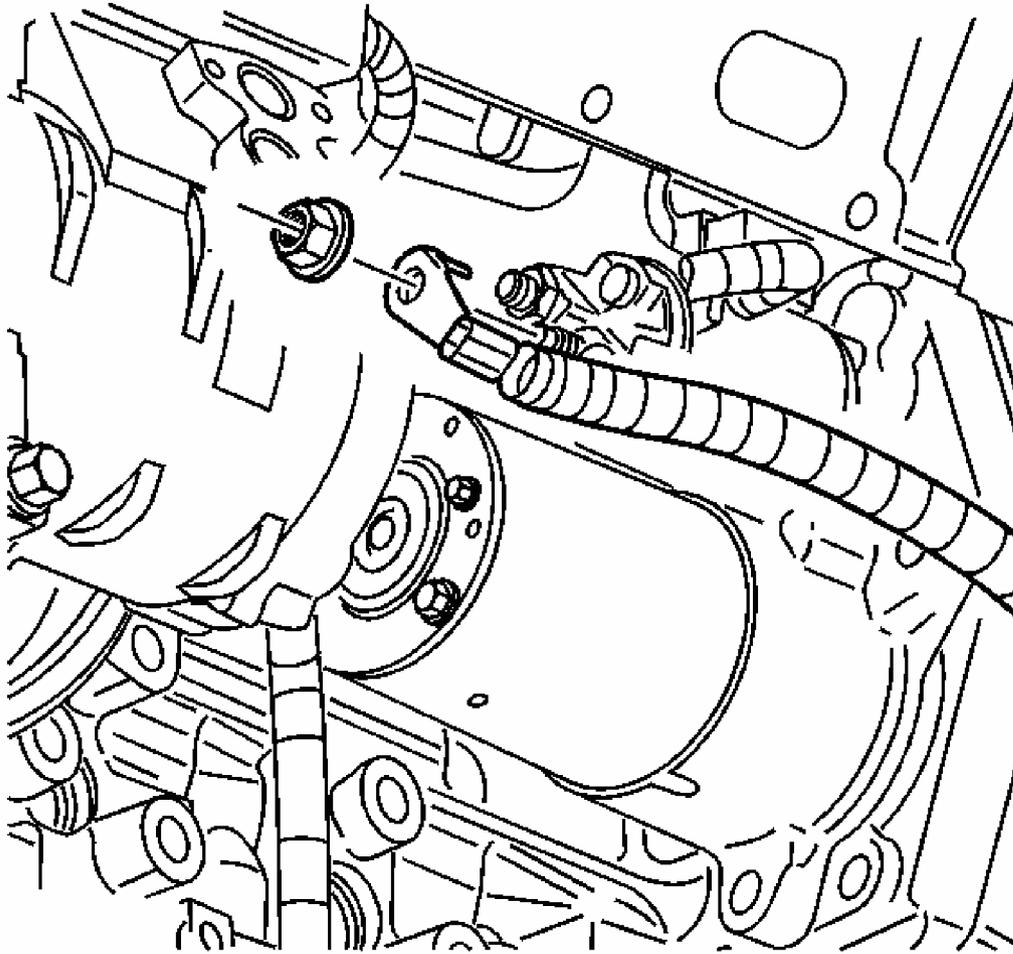
Courtesy of GENERAL MOTORS CORP.

46. Install the engine wiring harness bracket bolt to the lower right side of the engine.

**Tighten:** Tighten the engine wiring harness bracket bolt to 10 N.m (89 lb in).

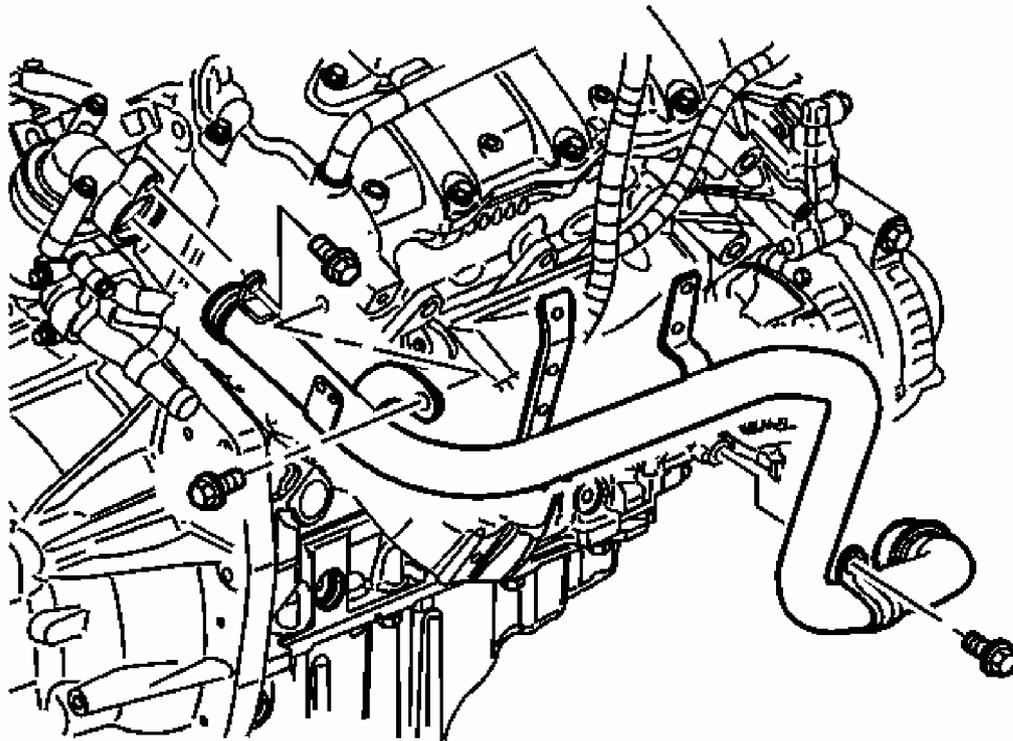
47. Install the engine wiring harness bracket stud to the lower right side of the engine.

**Tighten:** Tighten the engine wiring harness bracket stud to 22 N.m (16 lb ft).



**Fig. 74: View Of Battery Cable Harness At Starter Motor**  
**Courtesy of GENERAL MOTORS CORP.**

48. Connect the battery cable harness to the starter motor.



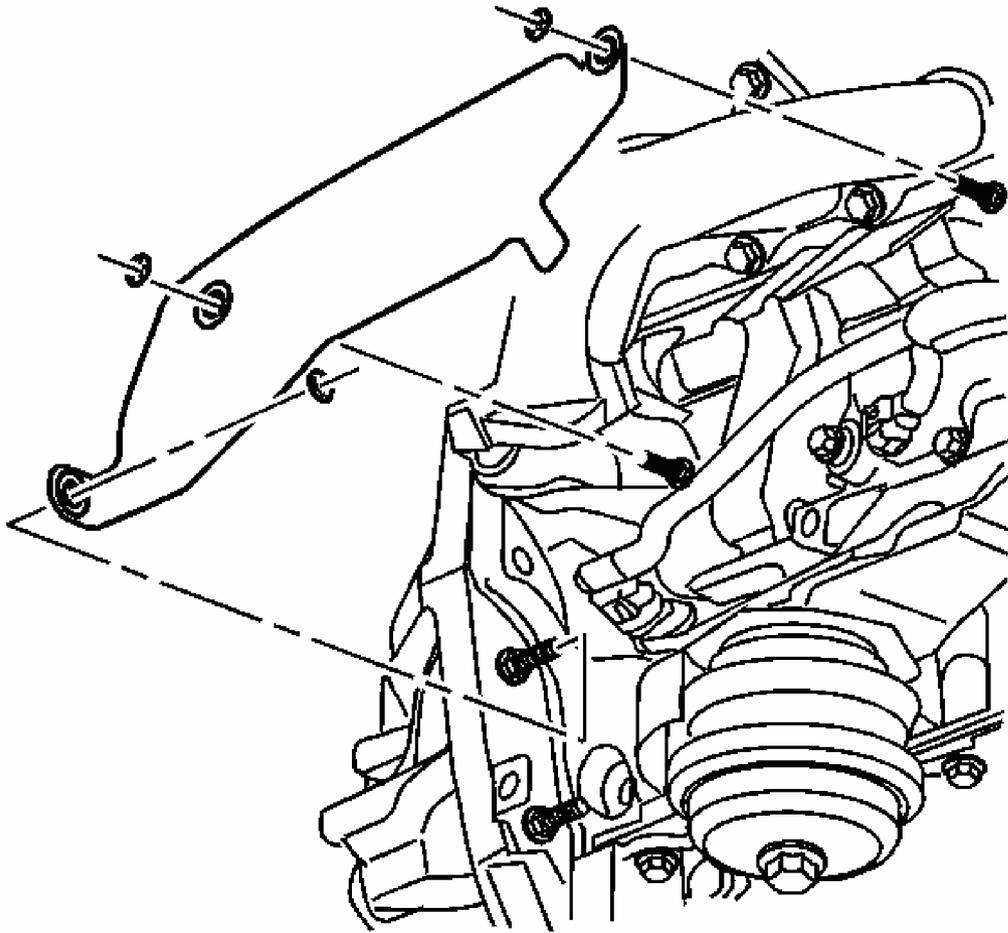
**Fig. 75: View Of Radiator Outlet Pipe & Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

49. Install the radiator outlet pipe.
50. Install the radiator outlet pipe bolt to the thermostat housing and the generator bracket.

**Tighten:** Tighten the radiator outlet pipe bolt to the thermostat housing and the generator bracket to 10 N.m (89 lb in).

51. Install the radiator outlet pipe bolt to the rear of the right cylinder head.

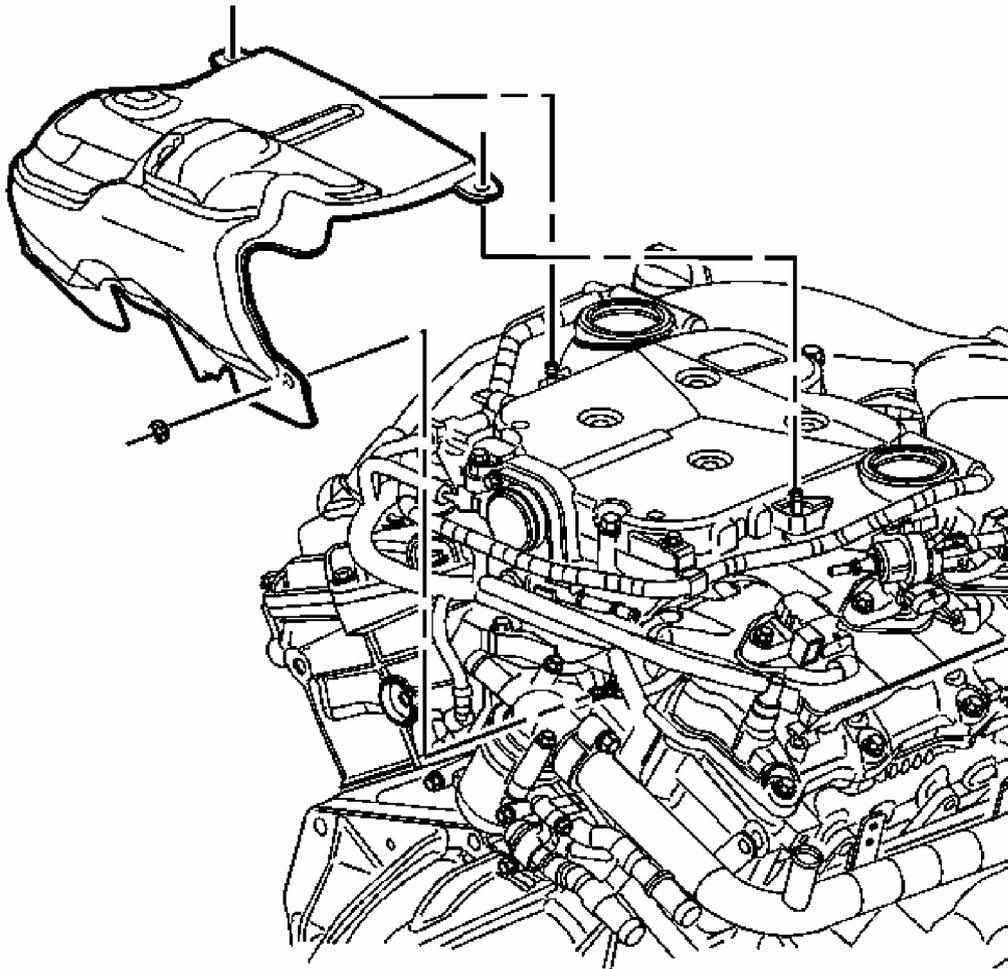
**Tighten:** Tighten the radiator outlet pipe bolt to 50 N.m (27 lb ft).



**Fig. 76: View Of Exhaust Manifold Lower Insulator Shield**  
**Courtesy of GENERAL MOTORS CORP.**

52. Install the right exhaust manifold lower insulator.
53. Install the right exhaust manifold lower insulator nuts.

**Tighten:** Tighten the right exhaust manifold lower insulator nuts to 10 N.m (89 lb in).



**Fig. 77: View Of Intake Manifold Insulator**  
**Courtesy of GENERAL MOTORS CORP.**

54. Install the intake manifold insulator.
55. Install the intake manifold insulator nut.

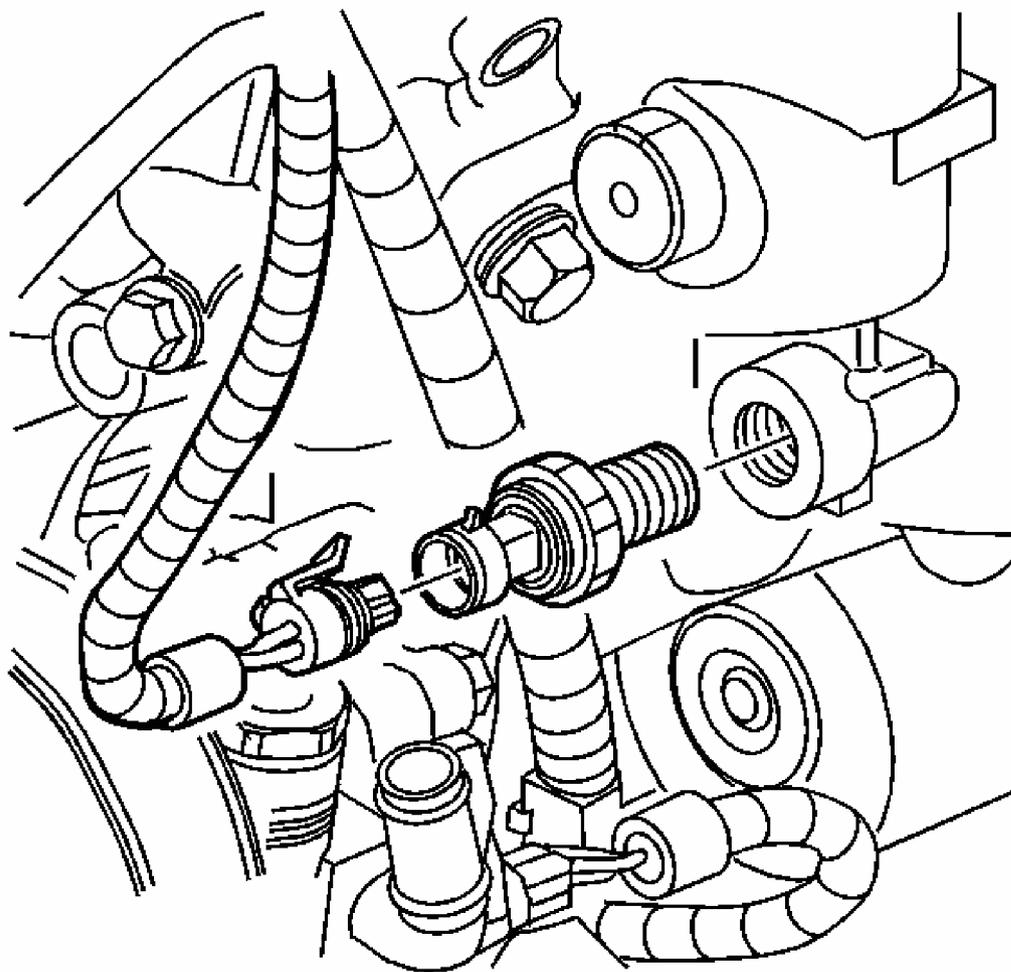
**Tighten:** Tighten the intake manifold insulator nut to 10 N.m (89 lb in).

## **ENGINE PRELUBING**

### **Tools Required**

**J 45299** Engine Preluber

### **Prelubing Procedure**



**Fig. 78: View Of Oil Pressure Sending Unit**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** A constant and continuous flow of clean engine oil is required in order to properly prime the engine. Be sure to use an approved engine oil as specified in the owners manual.

1. Remove the oil filter cap.
2. Install the NEW oil filter cartridge.
3. Lubricate the threads of the oil filter cap with clean engine oil.

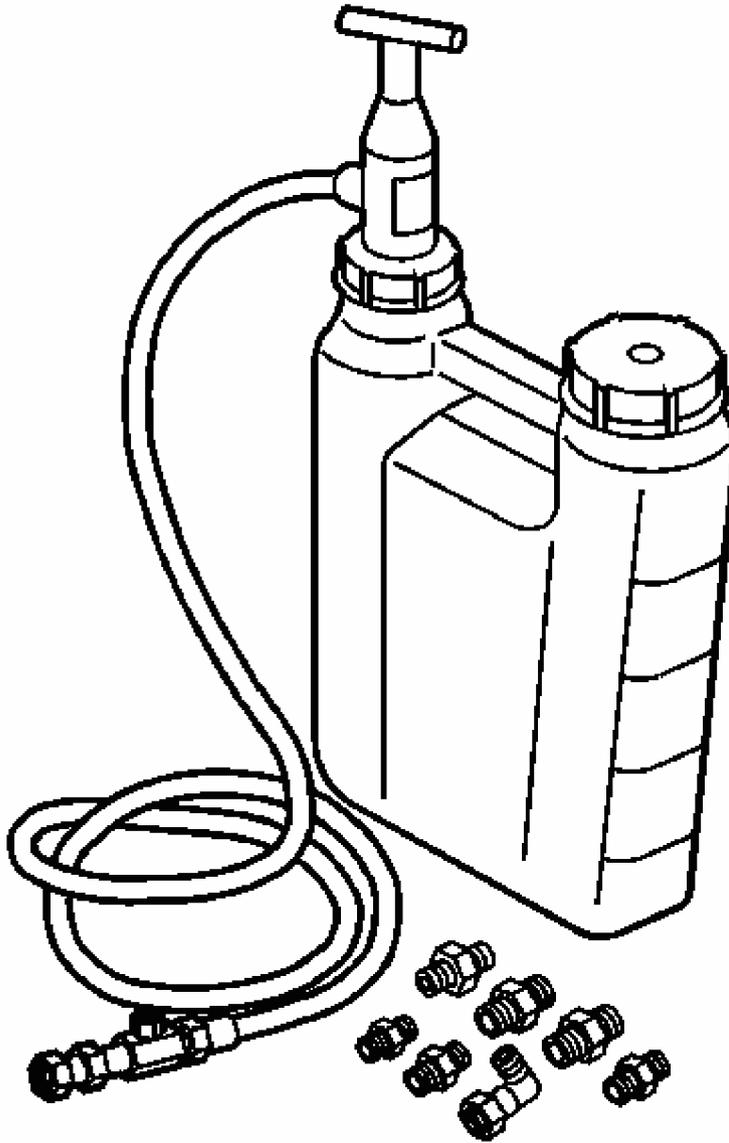
**NOTE:** Refer to Fastener Notice in Cautions and Notices.

4. Install the oil filter cap.

**Tighten:** Tighten the oil filter cap to 25 N.m (18 lb ft).

5. Remove the oil pressure sending unit from the oil filter adapter.

6. Install the 14 x 1.5 mm adapter P/N 219433.



**Fig. 79: Identifying Engine Preluber J 45299**

**Courtesy of GENERAL MOTORS CORP.**

7. Install the flexible hose to the adapter and open the valve.
8. Pump the handle on the **J 45299** in order to flow a minimum of 1-1.9 liters (1-2 quarts) of engine oil. Observe the flow of engine oil through the flexible hose and into the engine assembly.
9. Close the valve and remove the flexible hose and adapter from the engine.
10. Install the oil pressure sending unit.

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

11. Top-off the engine oil to the proper level.

