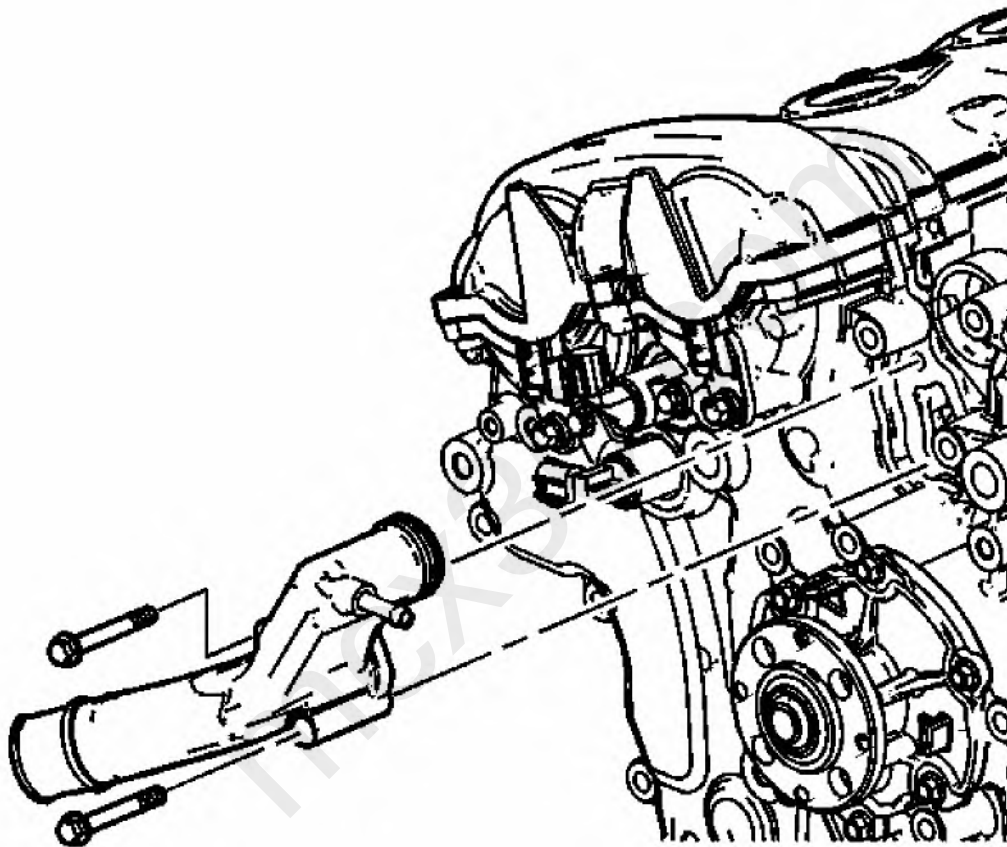


## 2006 ENGINE

### Engine Mechanical - 3.6L - STS (5 Of 5)

## WATER OUTLET INSTALLATION - OFF VEHICLE



**Fig. 1: View Of Water Outlet Housing**  
Courtesy of GENERAL MOTORS CORP.

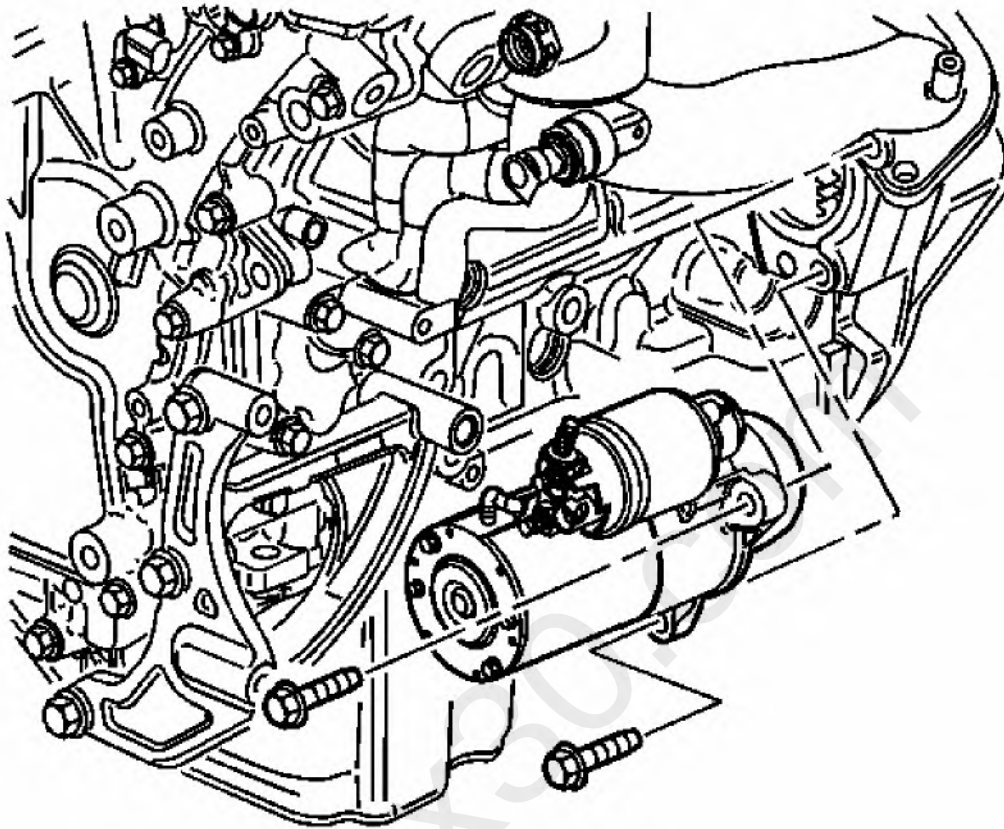
1. Place the water outlet and gaskets in position.

**NOTE:** Refer to Fastener Notice .

2. Install the water outlet bolts.

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

## STARTER INSTALLATION - OFF VEHICLE



**Fig. 2: View Of Starter Motor**  
Courtesy of GENERAL MOTORS CORP.

1. Install the starter motor.

**NOTE:** Refer to Fastener Notice .

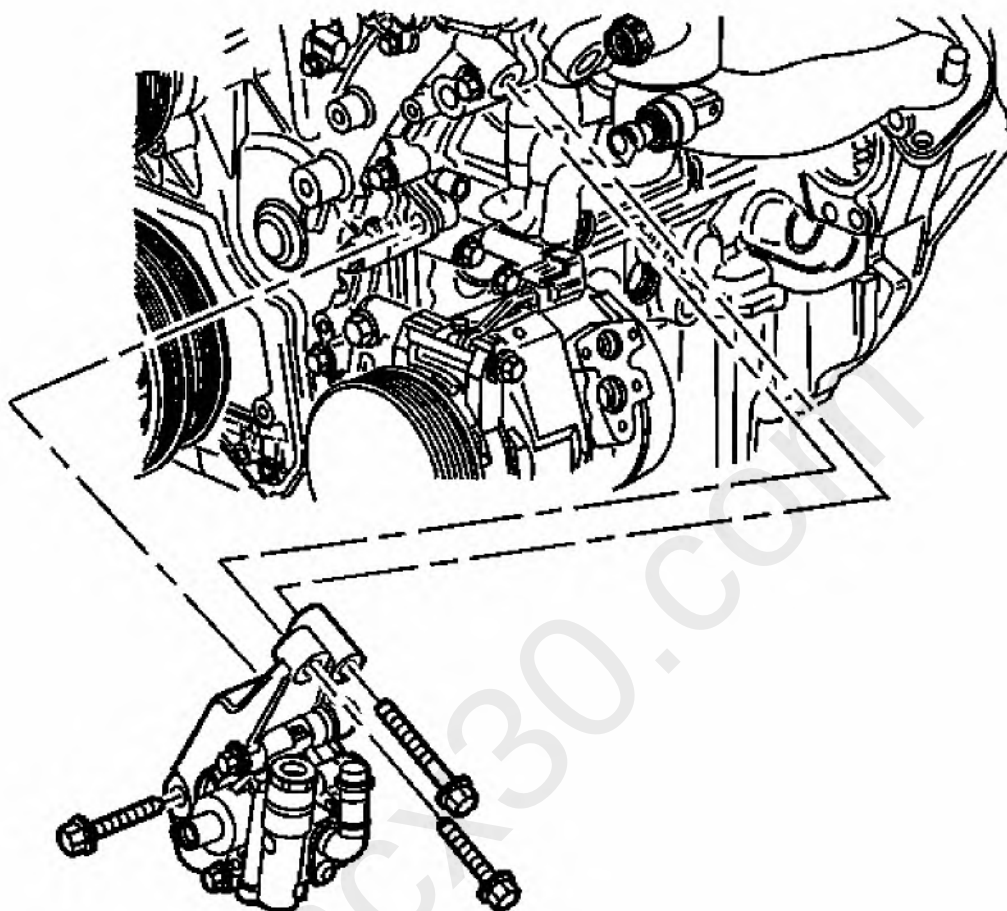
2. Install the starter motor bolts.

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

## **POWER STEERING PUMP INSTALLATION - OFF VEHICLE**

### **Tools Required**

**J 25033-C** Pulley Installer. See Special Tools .



**Fig. 3: 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.

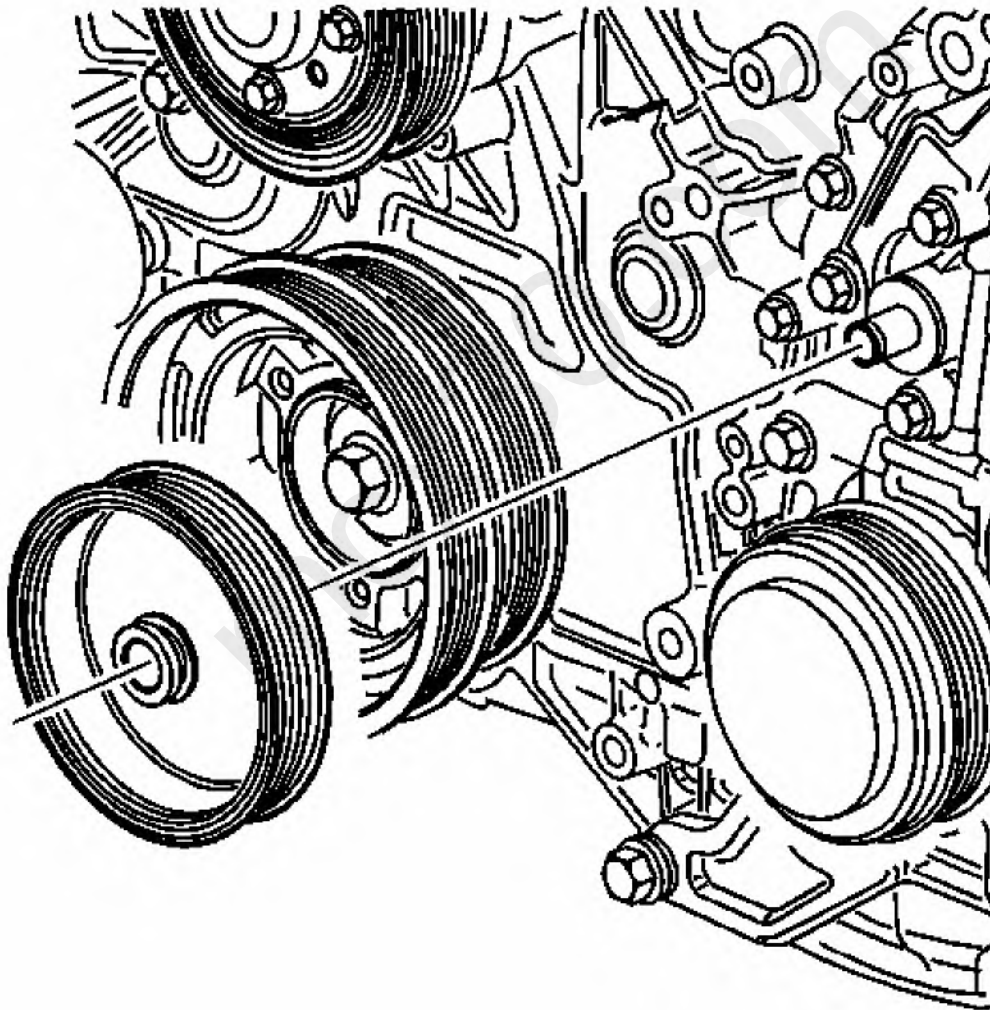
**NOTE:** Refer to **Fastener Notice** .

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).

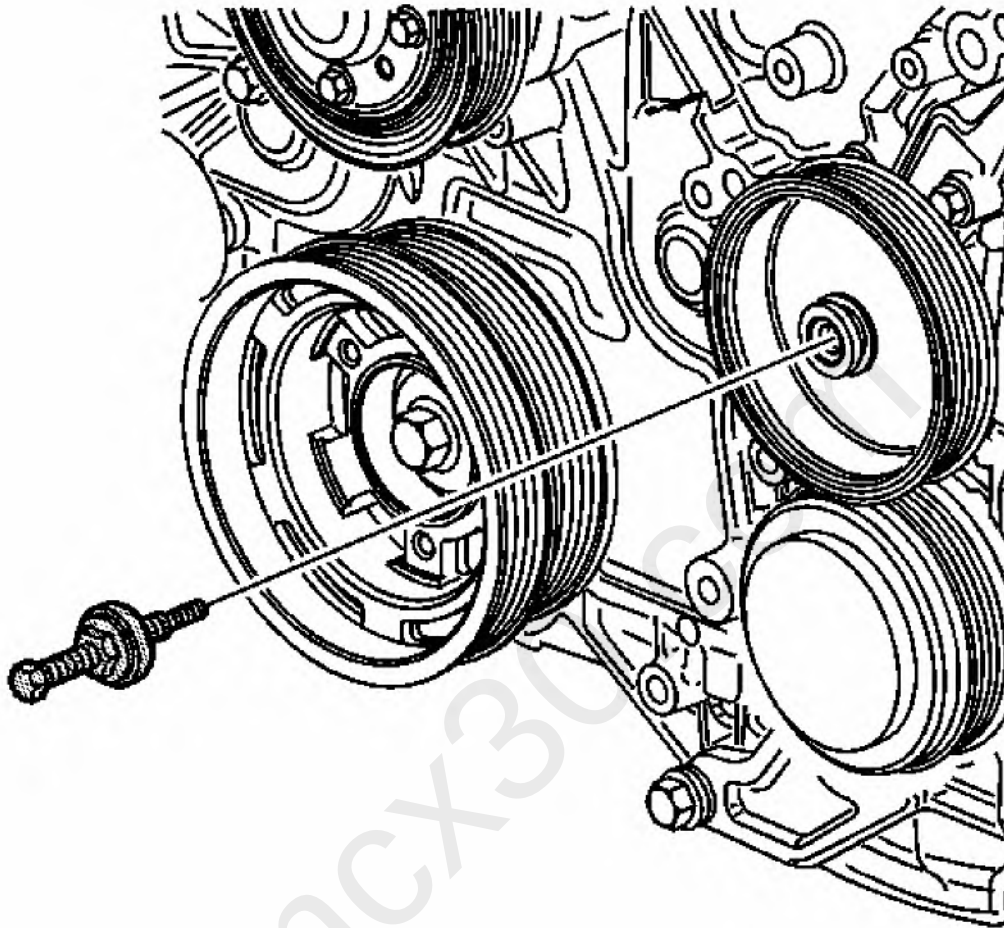
7. Install the power steering pump side bolts.

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



**Fig. 4: View Of Power Steering Pulley**  
Courtesy of GENERAL MOTORS CORP.

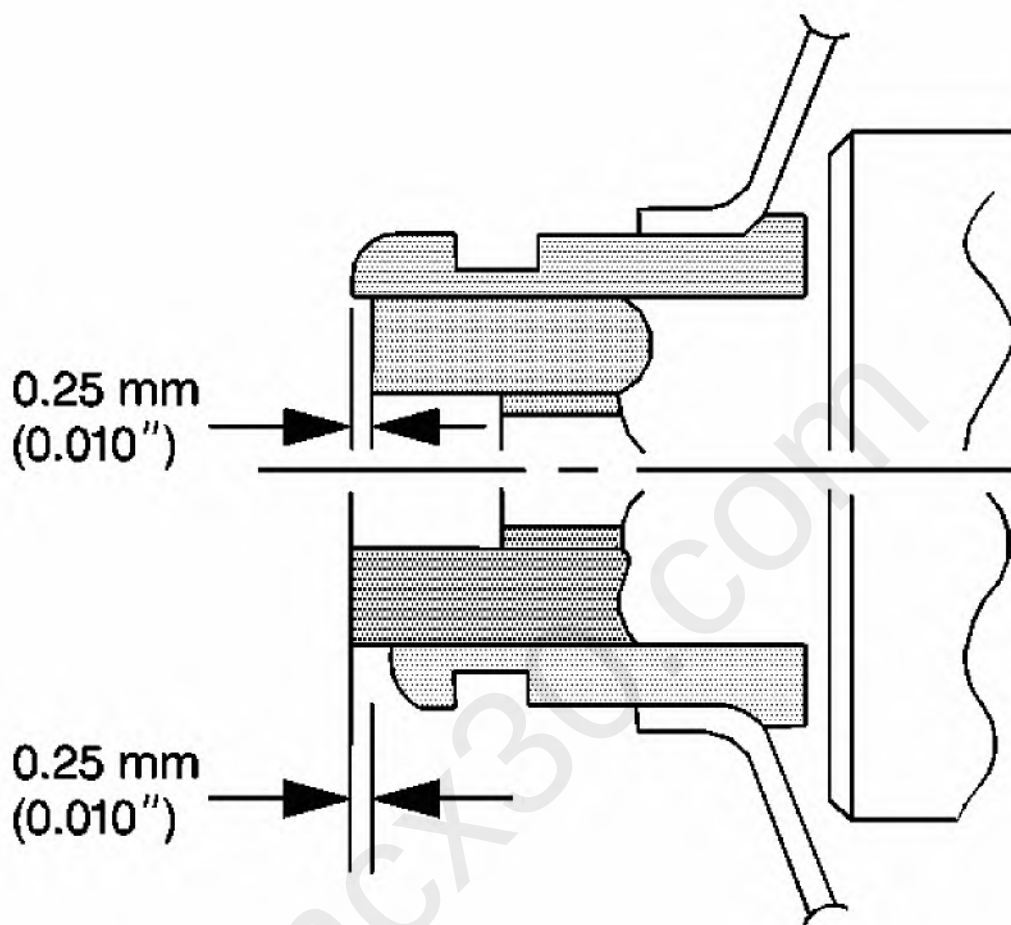
8. If removed, place power steering pulley in position to the power steering pump.



**Fig. 5: View Of J 25033-C**

**Courtesy of GENERAL MOTORS CORP.**

9. Install the **J 25033-C** into the threads of the power steering pump shaft. See **Special Tools** . Ensure the **J 25033-C** threads completely into the shaft of the power steering pump before the pressing components of the **J 25033-C** contact the power steering pulley. See **Special Tools** .

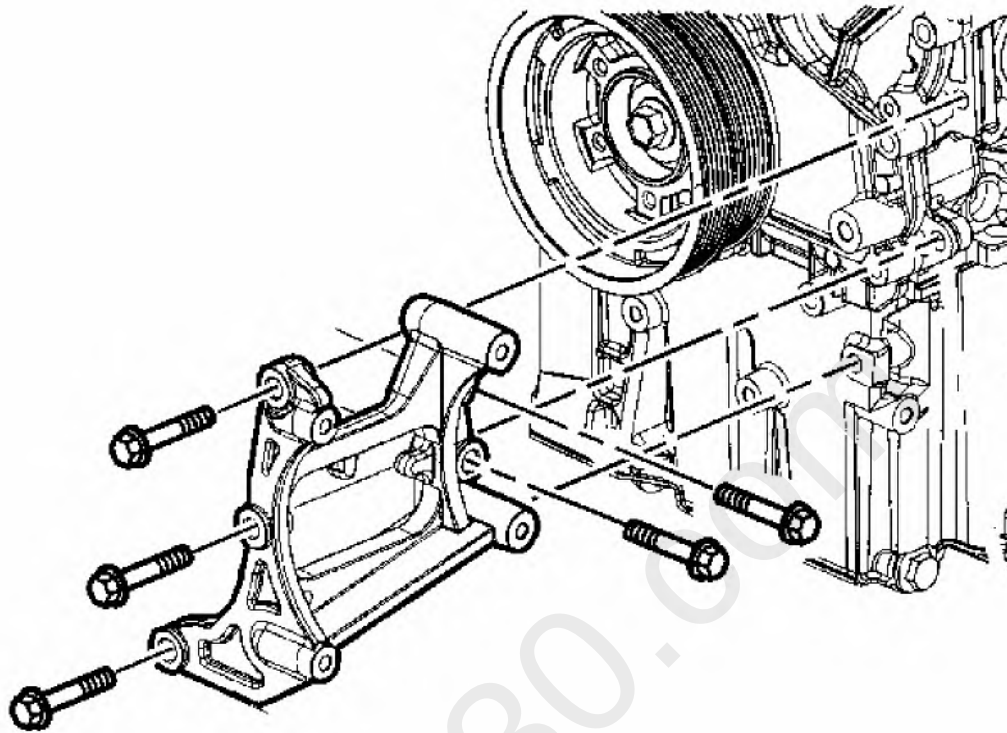


**Fig. 6: Measuring Axial Tolerance Of Power Steering Pulley On Pump**  
Courtesy of GENERAL MOTORS CORP.

10. Tighten the nut on the **J 25033-C** until the hub of the power steering pulley is flush with the end of the power steering pump shaft. See **Special Tools** .
11. Remove the **J 25033-C** . See **Special Tools** .

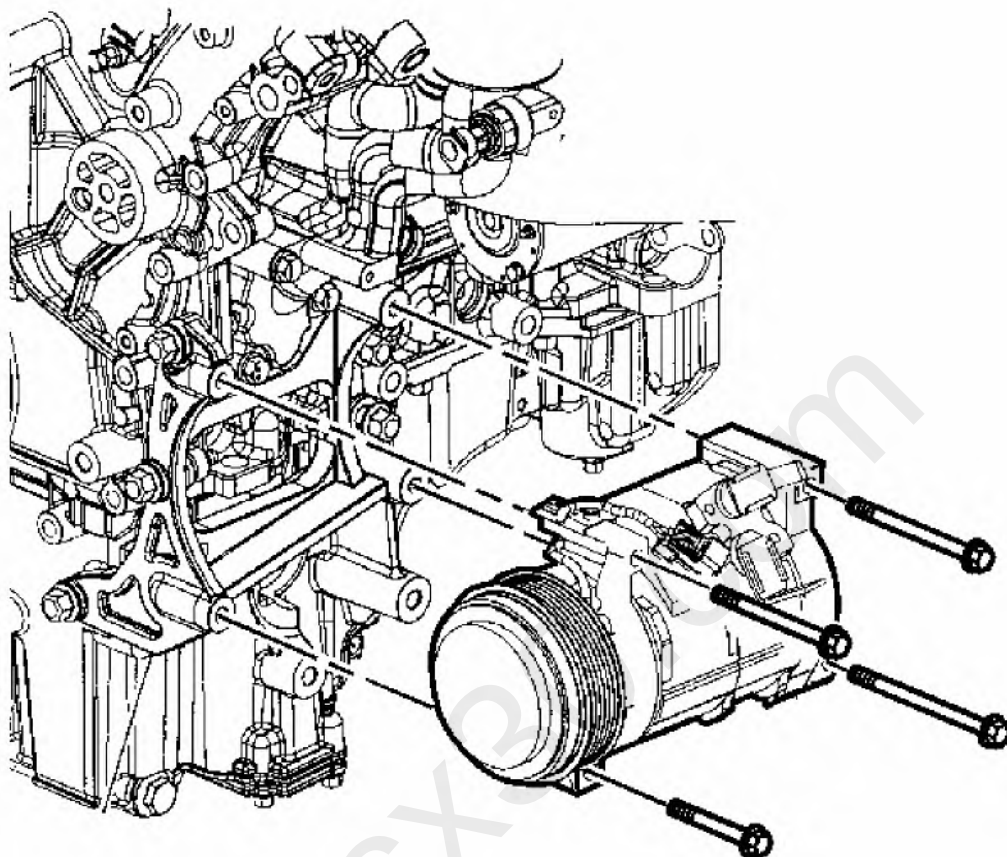
## **AIR CONDITIONING (A/C) COMPRESSOR INSTALLATION - OFF VEHICLE**

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



**Fig. 7: View Of A/C 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. 8: View Of 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 .

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. Install the A/C compressor bracket upper bolt.

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

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

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

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

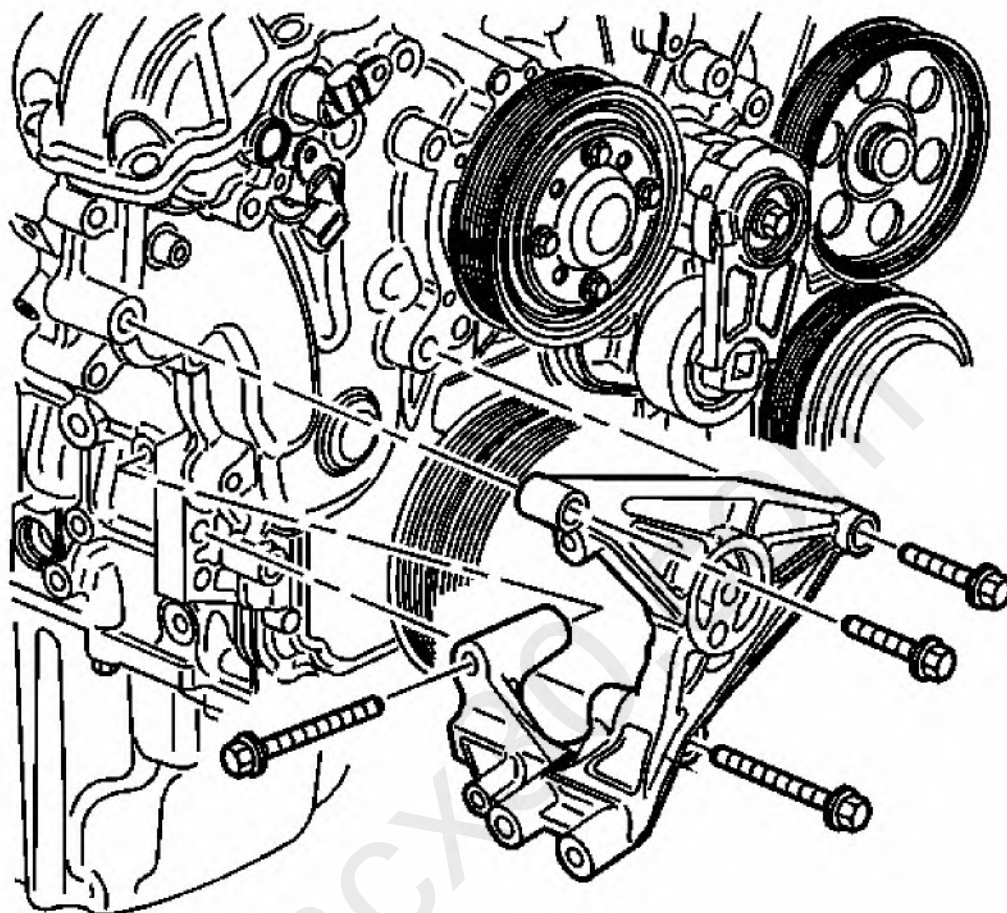
**Tighten:** Tighten the A/C compressor front upper and lower bolts to 23 N.m (18 lb ft).

9. Install the A/C compressor rear upper and lower bolts.

**Tighten:** Tighten the A/C compressor rear upper and lower bolts to 23 N.m (18 lb ft).

## GENERATOR INSTALLATION - OFF VEHICLE

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



**Fig. 9: 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 .

3. Tighten the front lower generator bracket bolt.

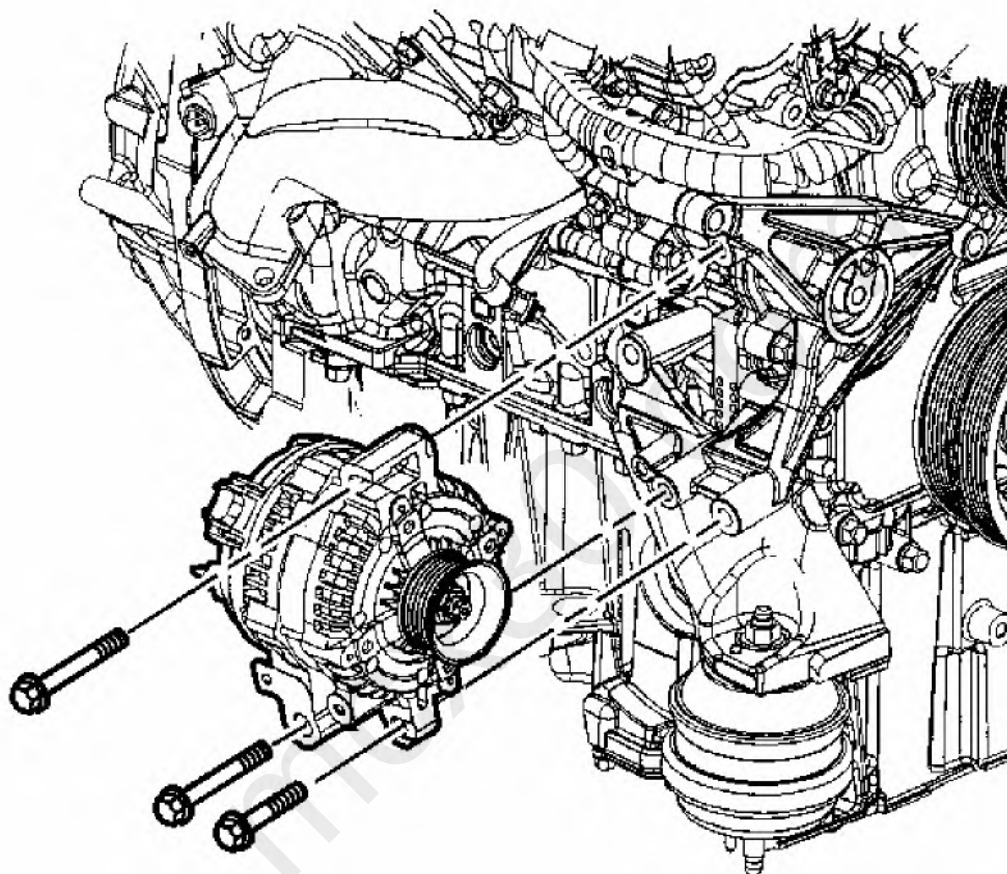
**Tighten:** Tighten the front lower generator bracket bolt to 50 N.m (37 lb ft).

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.

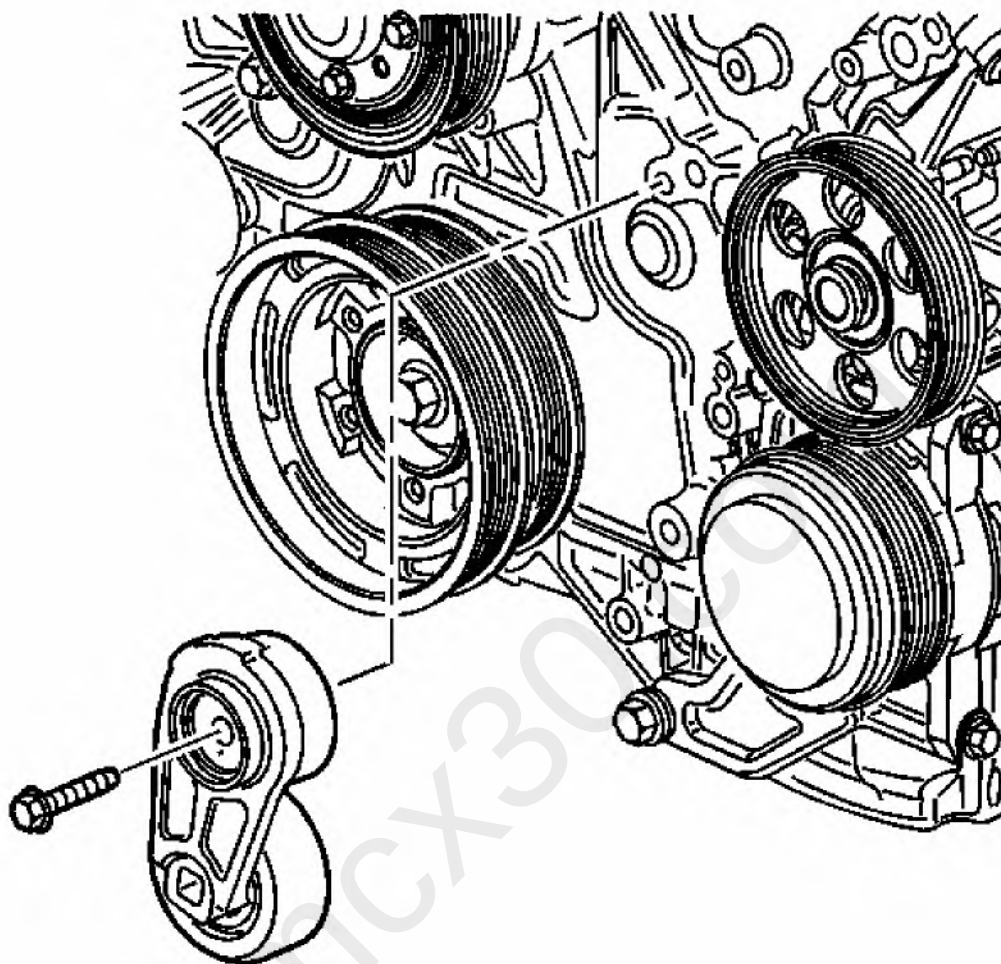
**Tighten:** Tighten the side generator bracket bolt to 22 N.m (16 lb ft).



**Fig. 10: View Of Generator**  
Courtesy of GENERAL MOTORS CORP.

6. Place the generator in position to the generator bracket.
7. Loosely install the generator side bolts. Ensure the short bolt is installed in the front lower 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. 11: View Of Left Drive Belt Tensioner**  
**Courtesy of GENERAL MOTORS CORP.**

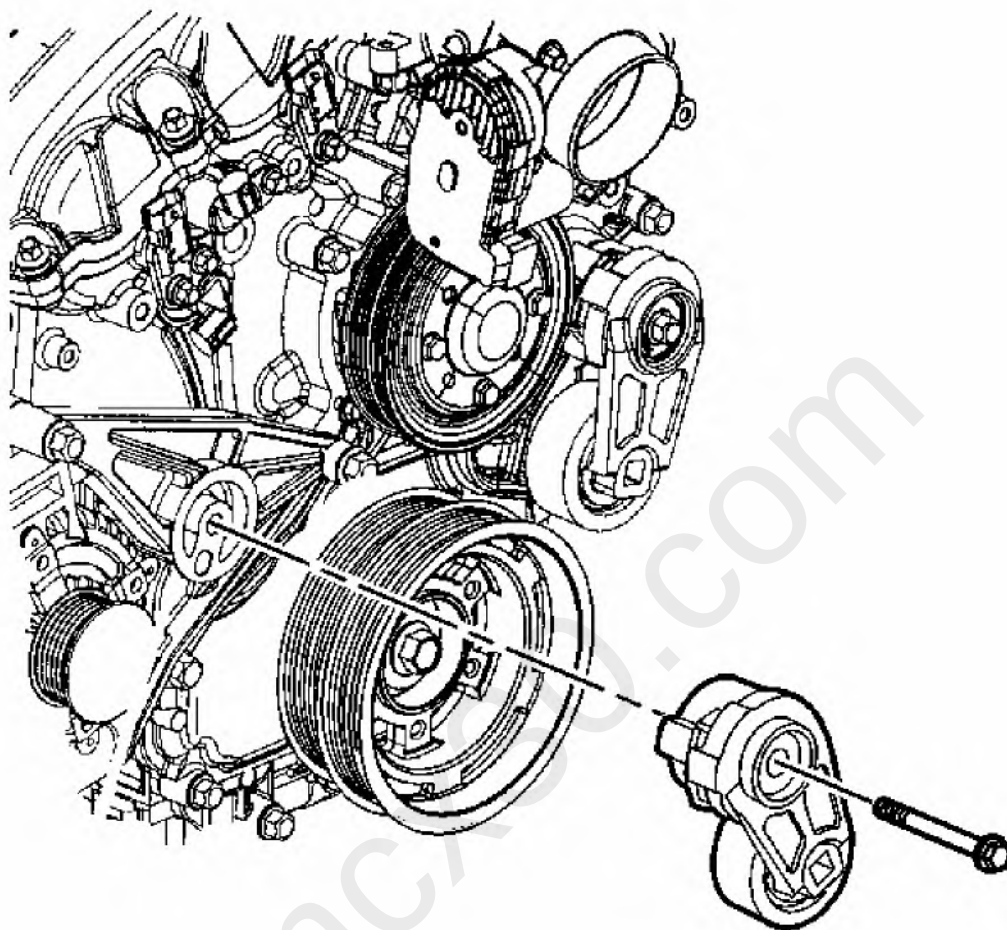
1. Place the left drive belt tensioner in position to the engine front cover.

**NOTE:** Refer to Fastener Notice .

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 SIDE - OFF VEHICLE**



**Fig. 12: View Of Right Drive Belt Tensioner**  
Courtesy of GENERAL MOTORS CORP.

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

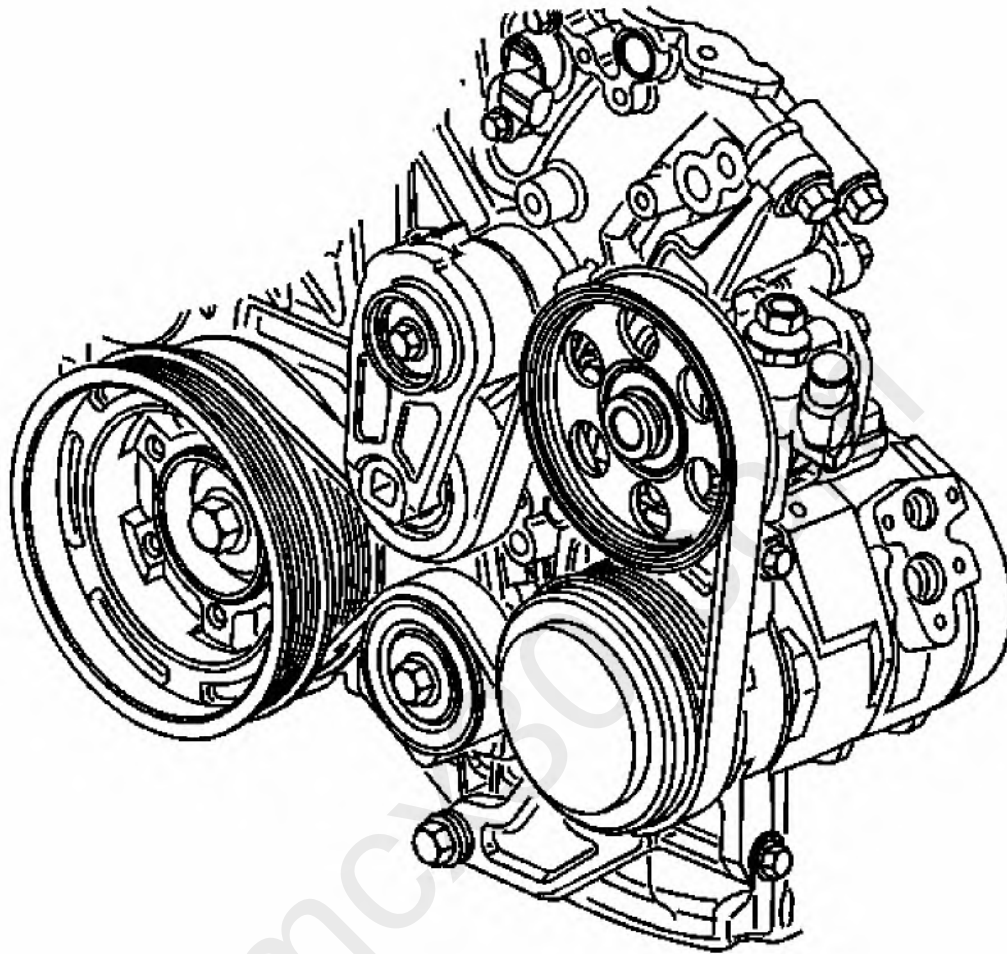
**NOTE:** Refer to Fastener Notice .

2. Install the right drive belt tensioner bolt.

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

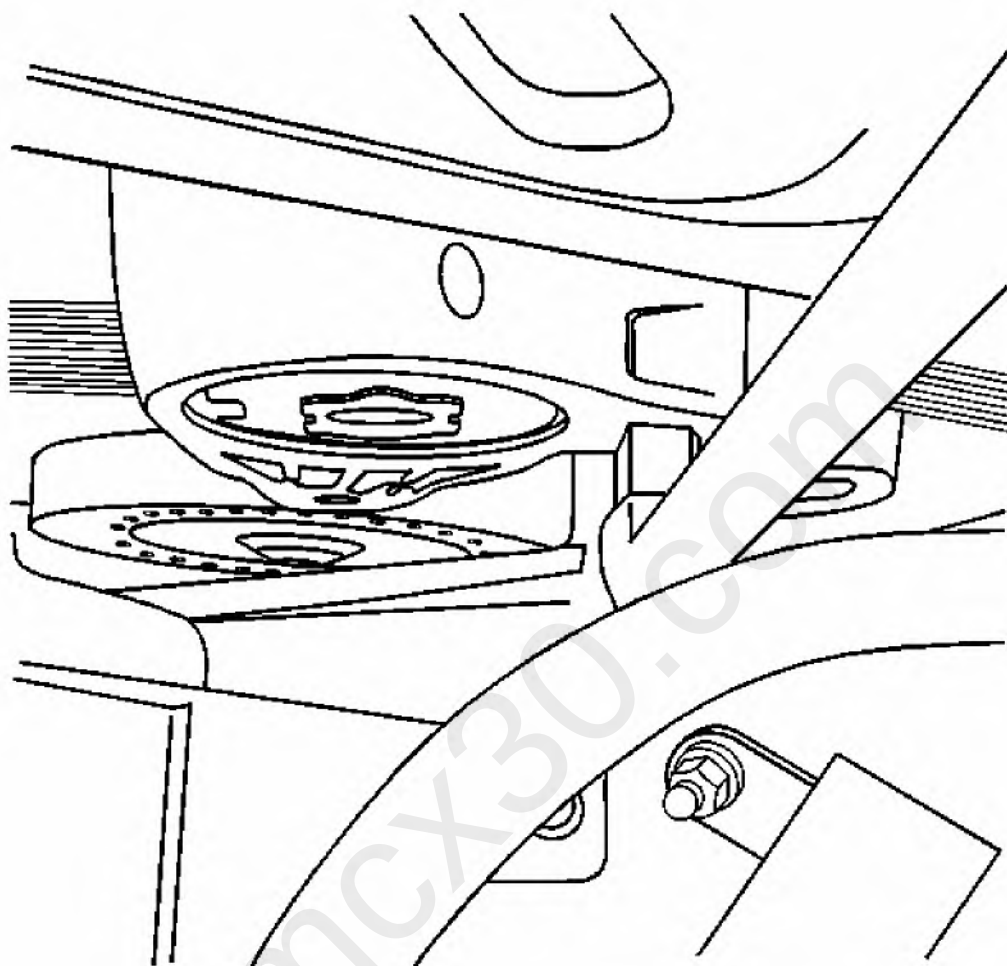
## DRIVE BELT INSTALLATION - OFF VEHICLE

### INNER DRIVE BELT



**Fig. 13: View Of Inner Drive Belt**  
**Courtesy of GENERAL MOTORS CORP.**

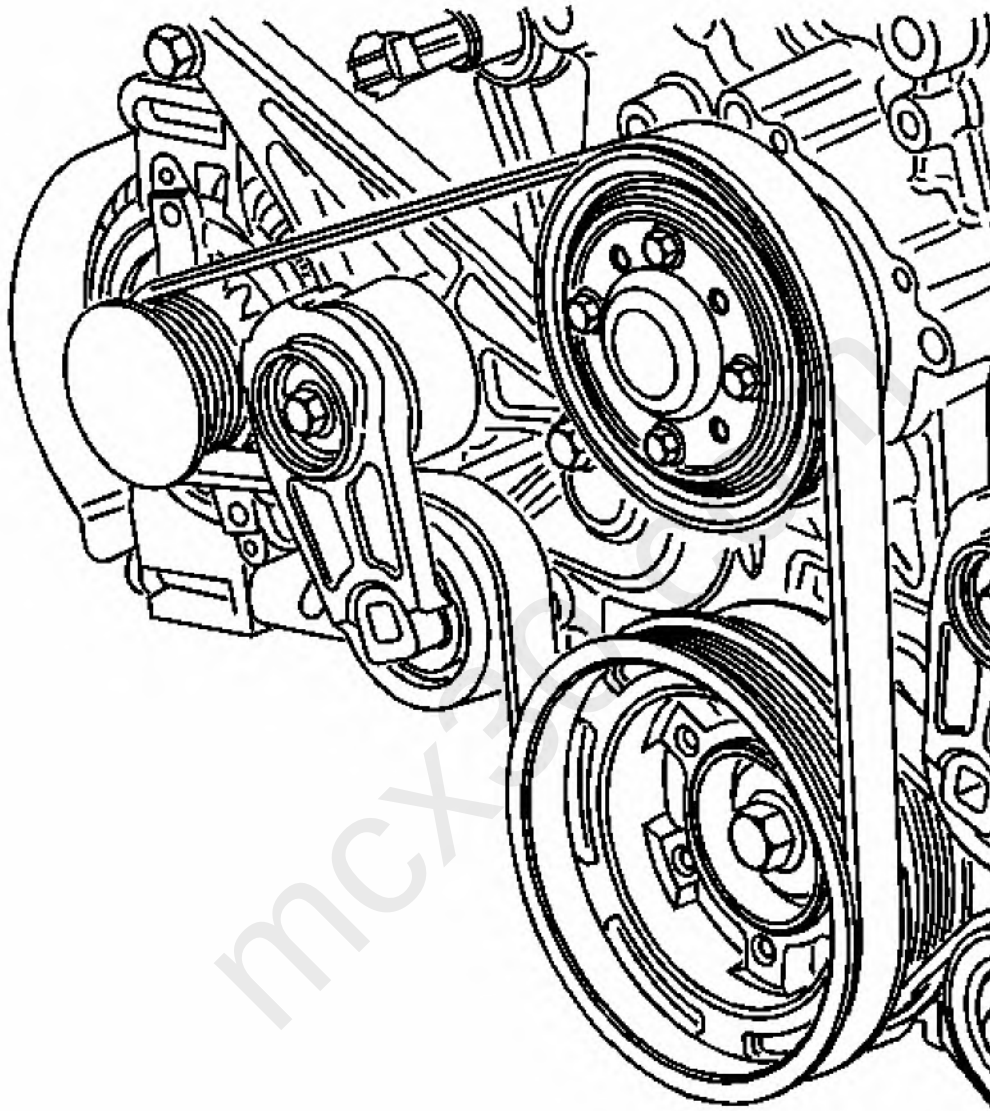
1. Route the inner drive belt around the following:
  - Crankshaft balancer
  - Air conditioning compressor
  - Drive belt tensioner
  - Power steering pump



**Fig. 14: View Of Drive Belt Tensioner & Pulleys**  
**Courtesy of GENERAL MOTORS CORP.**

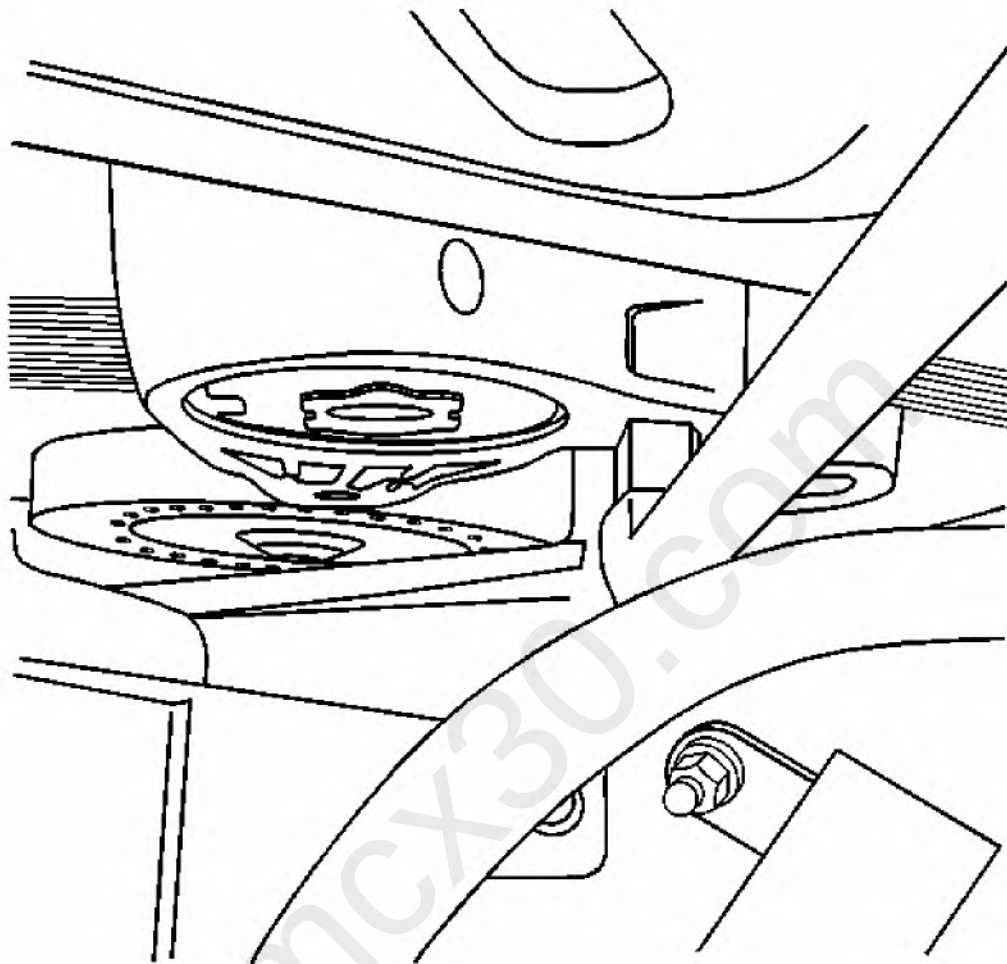
2. Insert a 1/2 inch drive ratchet into the inner drive belt tensioner.
3. Rotate the drive belt tensioner clockwise.
4. Route the remainder of the drive belt around the drive belt idler.
5. Slowly rotate the drive belt tensioner counter-clockwise until the drive belt is tight.
6. Remove the 1/2 inch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

#### **OUTER DRIVE BELT**



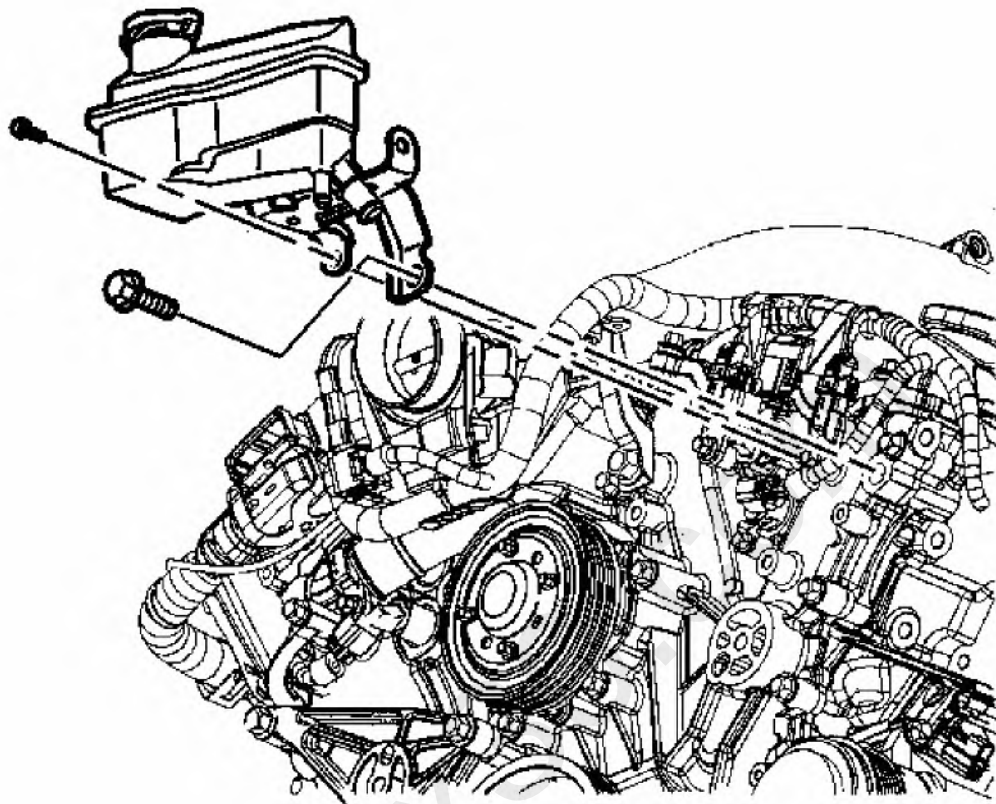
**Fig. 15: View Of Outer Drive Belt**  
**Courtesy of GENERAL MOTORS CORP.**

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



**Fig. 16: 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.



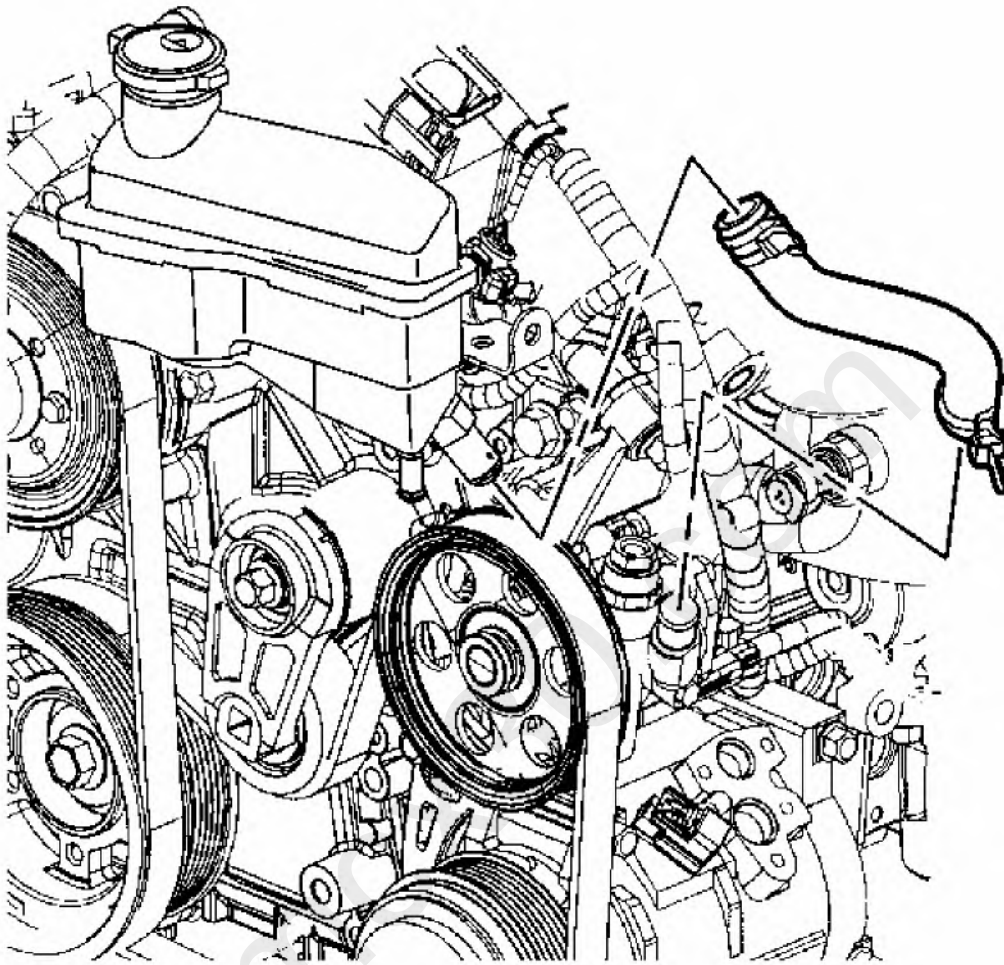
**Fig. 17: View Of Power Steering Pump Reservoir**  
Courtesy of GENERAL MOTORS CORP.

8. Place the power steering pump reservoir.
9. Install the upper inboard power steering pump reservoir bolt.

**Tighten:** Tighten the upper inboard power steering pump reservoir bolt to 10 N.m (89 lb in).

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

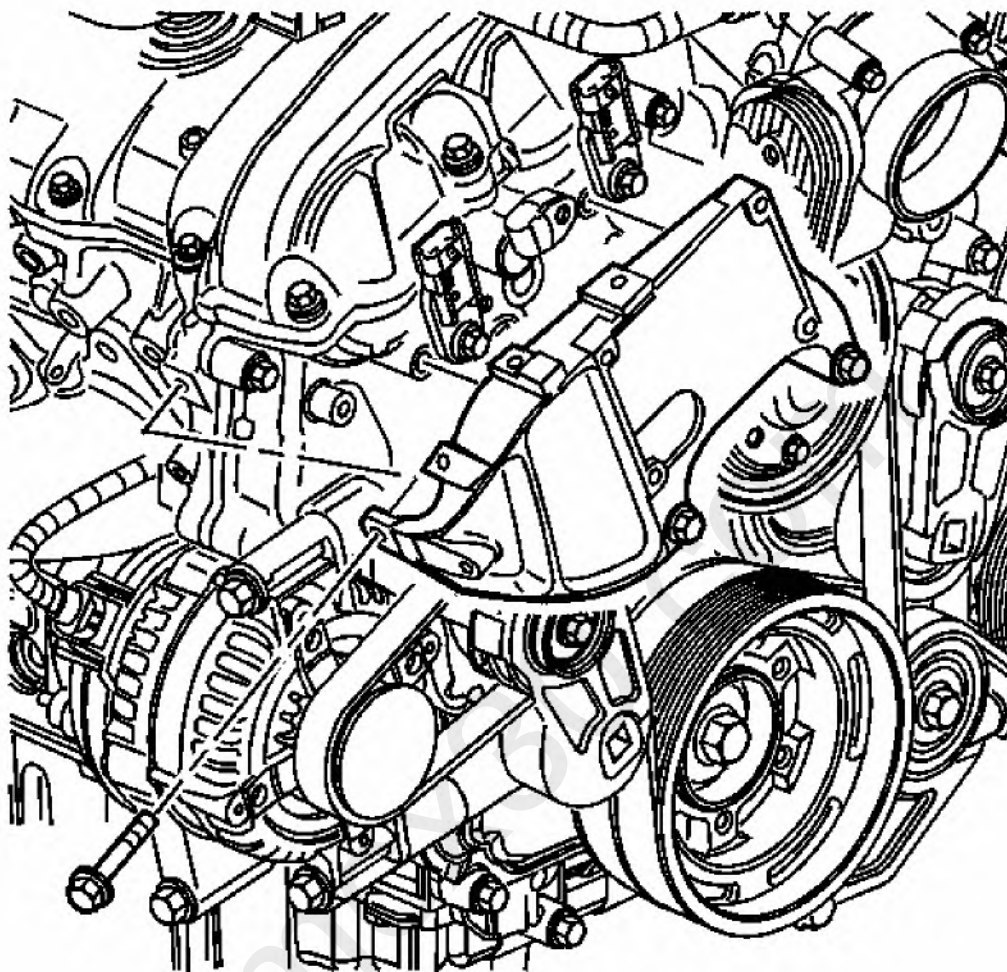
**Tighten:** Tighten the lower outboard power steering pump reservoir bolts to 40 N.m (30 lb ft).



**Fig. 18: View Of 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 - OFF VEHICLE**



**Fig. 19: View Of ECM Bracket**  
**Courtesy of GENERAL MOTORS CORP.**

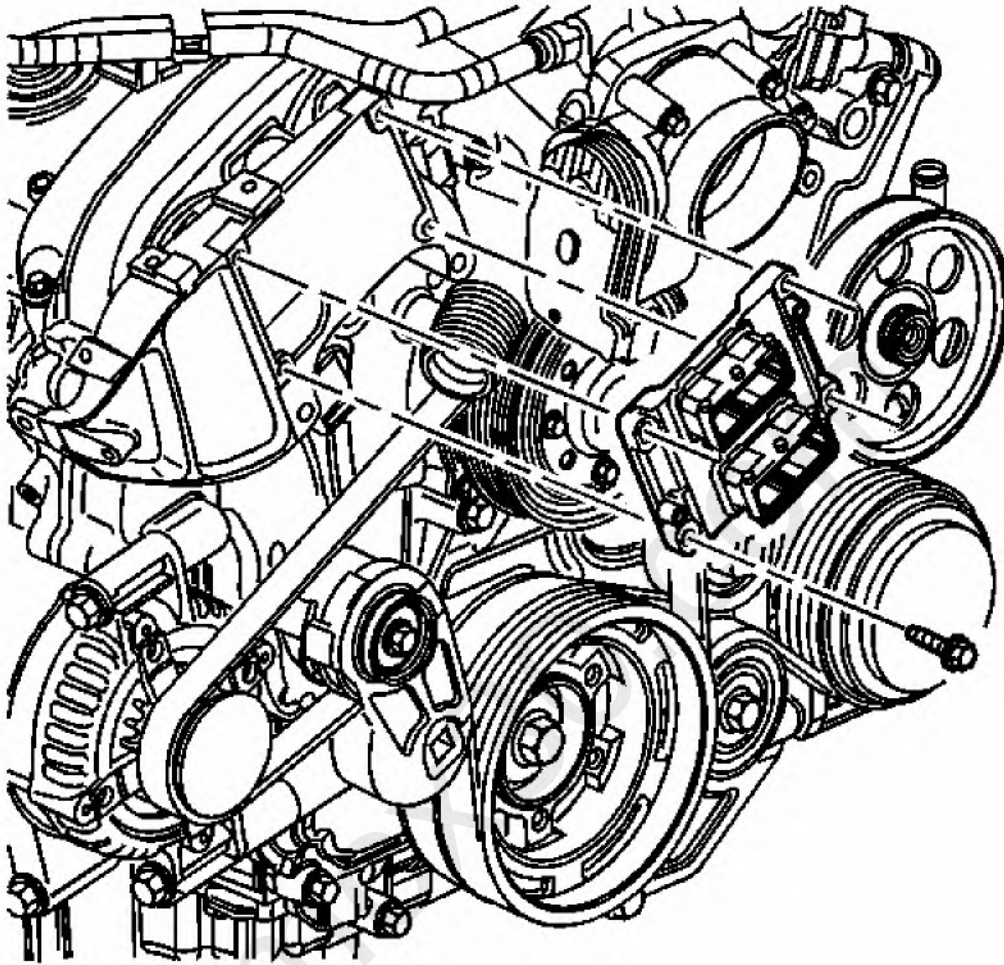
1. Install the engine control module (ECM) bracket.

**NOTE:**      **Refer to Fastener Notice .**

2. Loosely install the ECM bracket bolts.

**Tighten:**

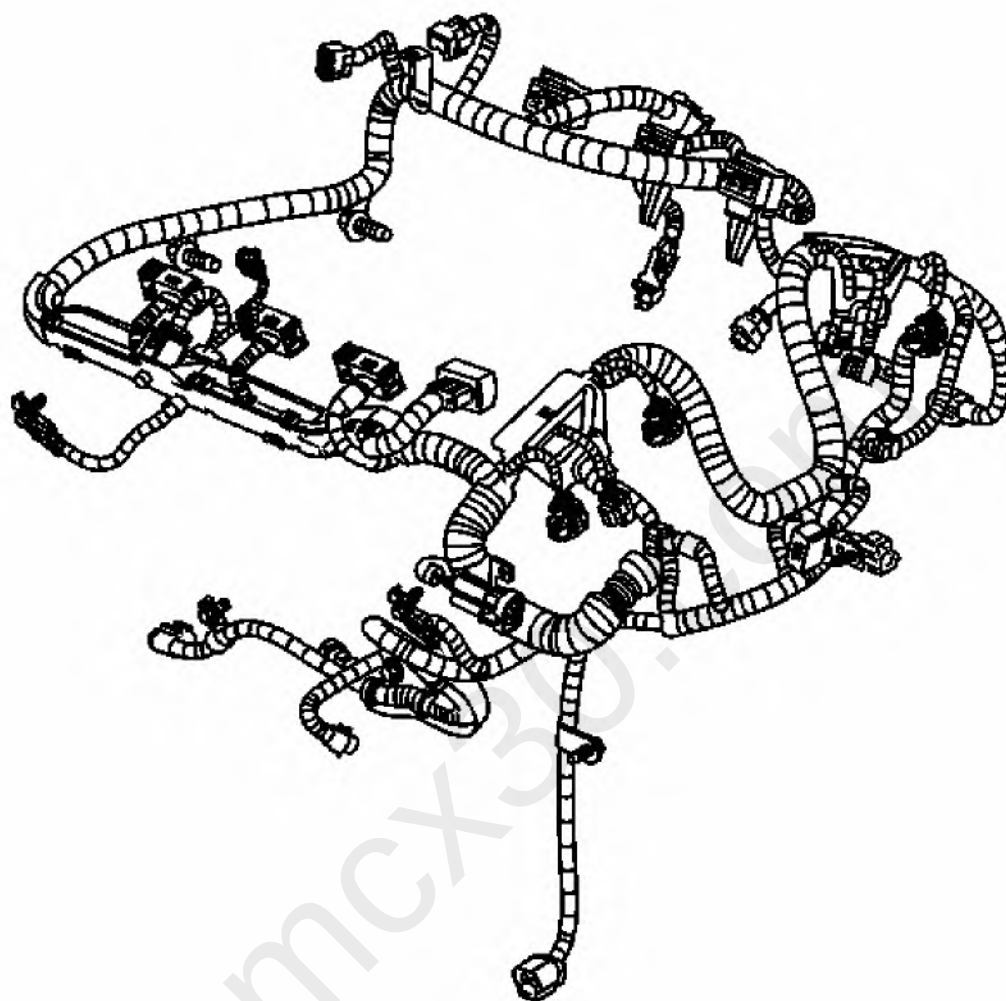
1. Tighten the side ECM bracket bolts to 10 N.m (89 lb in).
2. Tighten the front ECM bracket bolts to 23 N.m (17 lb ft).



**Fig. 20: View Of ECM Module**  
**Courtesy of GENERAL MOTORS CORP.**

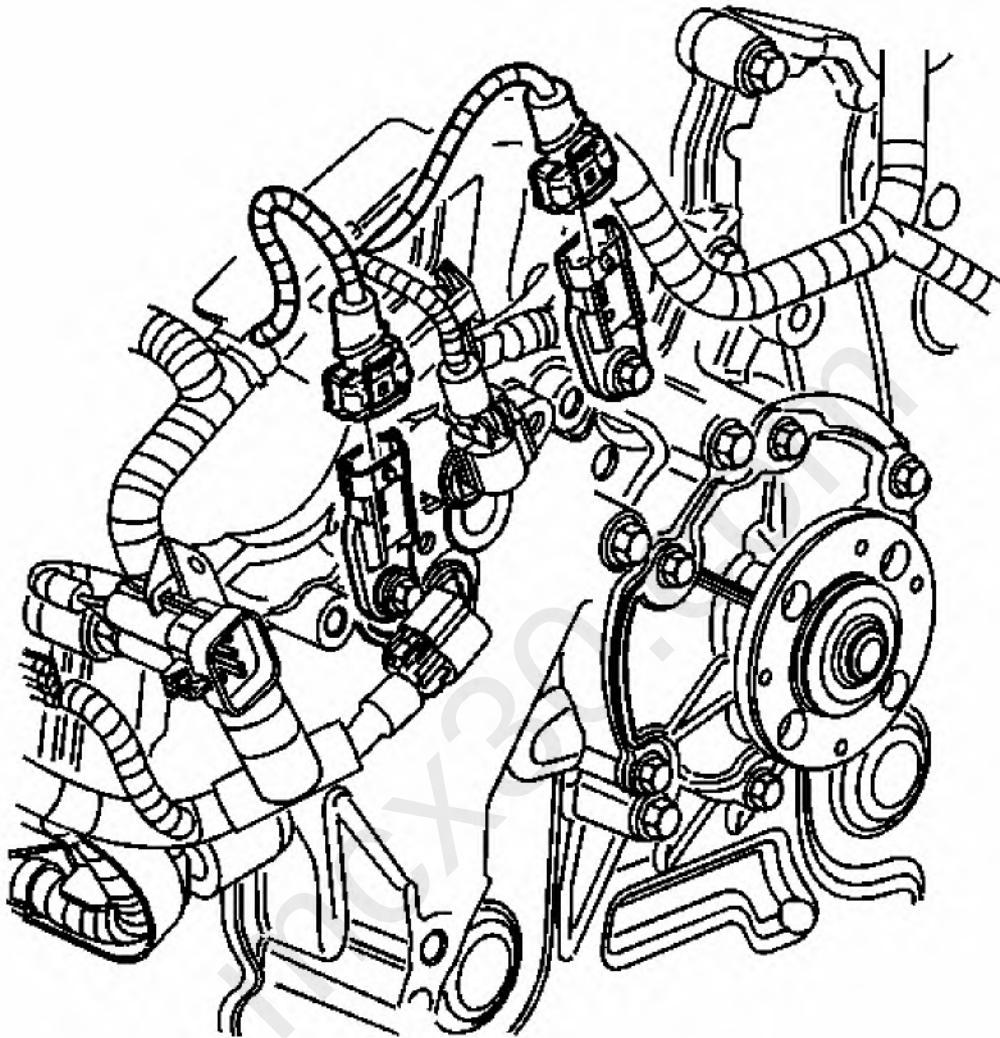
3. Install the ECM module to the ECM bracket.
4. Install the ECM module bolts.

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



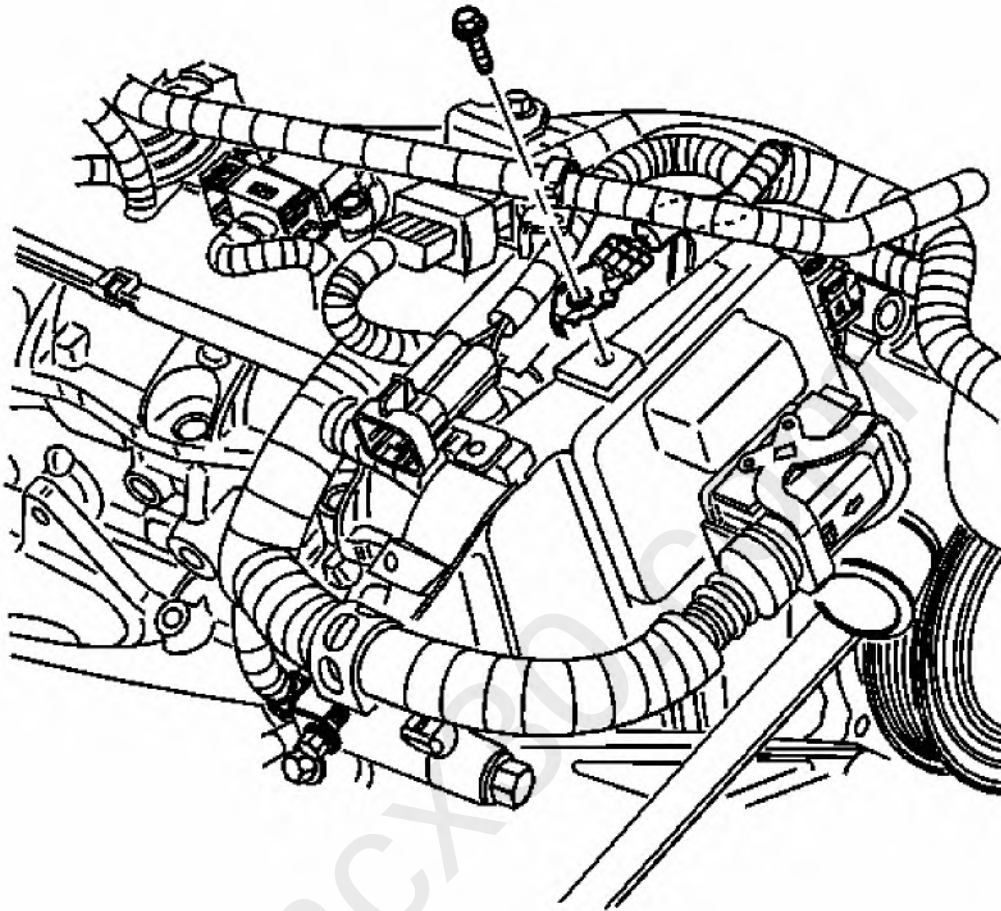
**Fig. 21: View Of Engine Wiring Harness**  
**Courtesy of GENERAL MOTORS CORP.**

5. Install the engine wiring harness to the engine.



**Fig. 22: View Of Right Camshaft Position Sensors Electrical Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

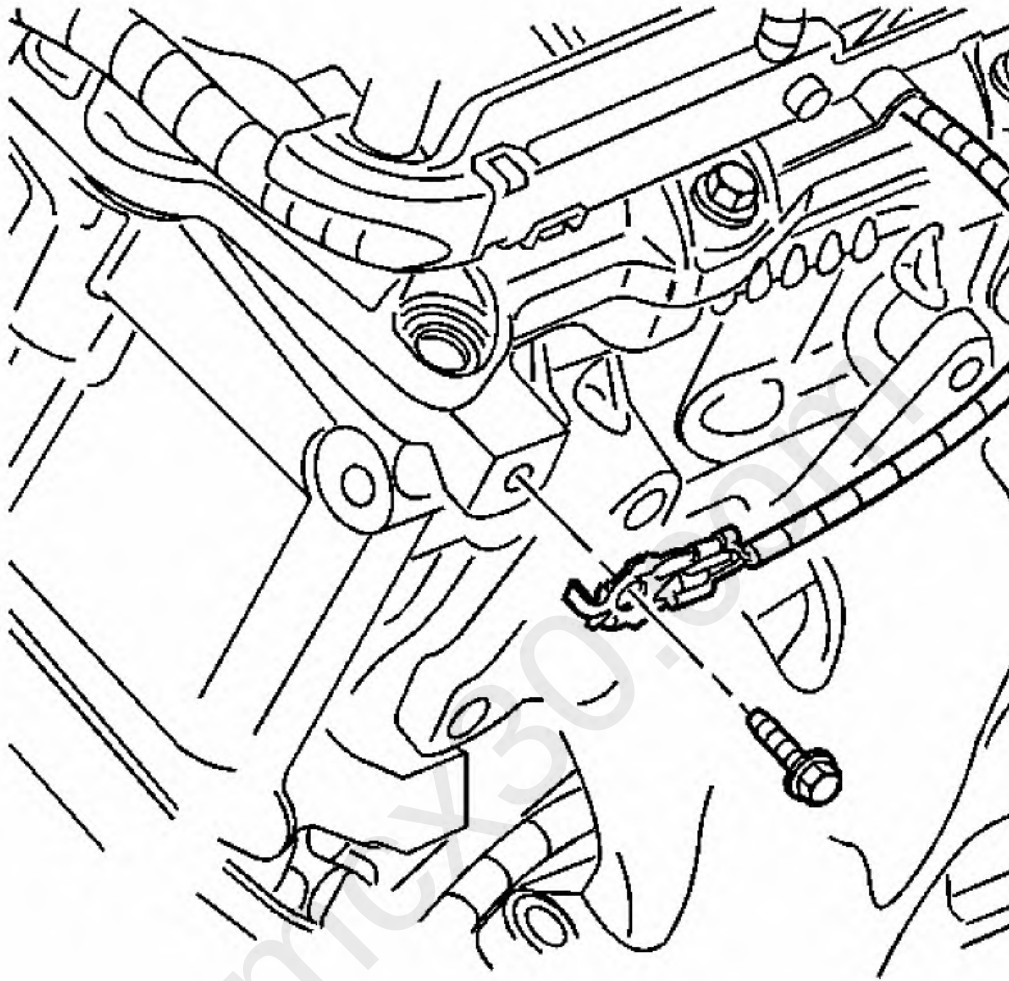
6. Connect the engine wiring harness to the right camshaft position sensors.



**Fig. 23: 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.

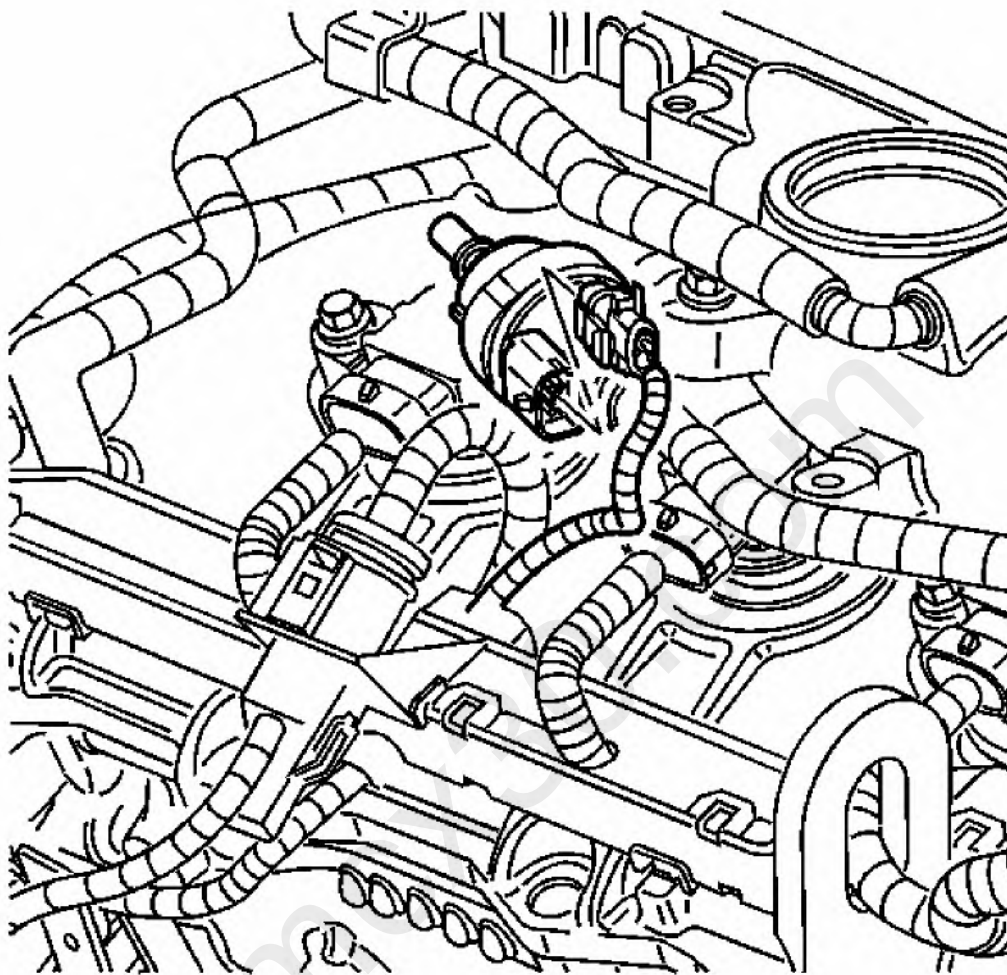
**Tighten:** Tighten the engine wiring harness ground bolt to 10 N.m (89 lb in).



**Fig. 24: View Of Wiring Harness Ground Bolt At Side Of Right Cylinder Head**  
Courtesy of GENERAL MOTORS CORP.

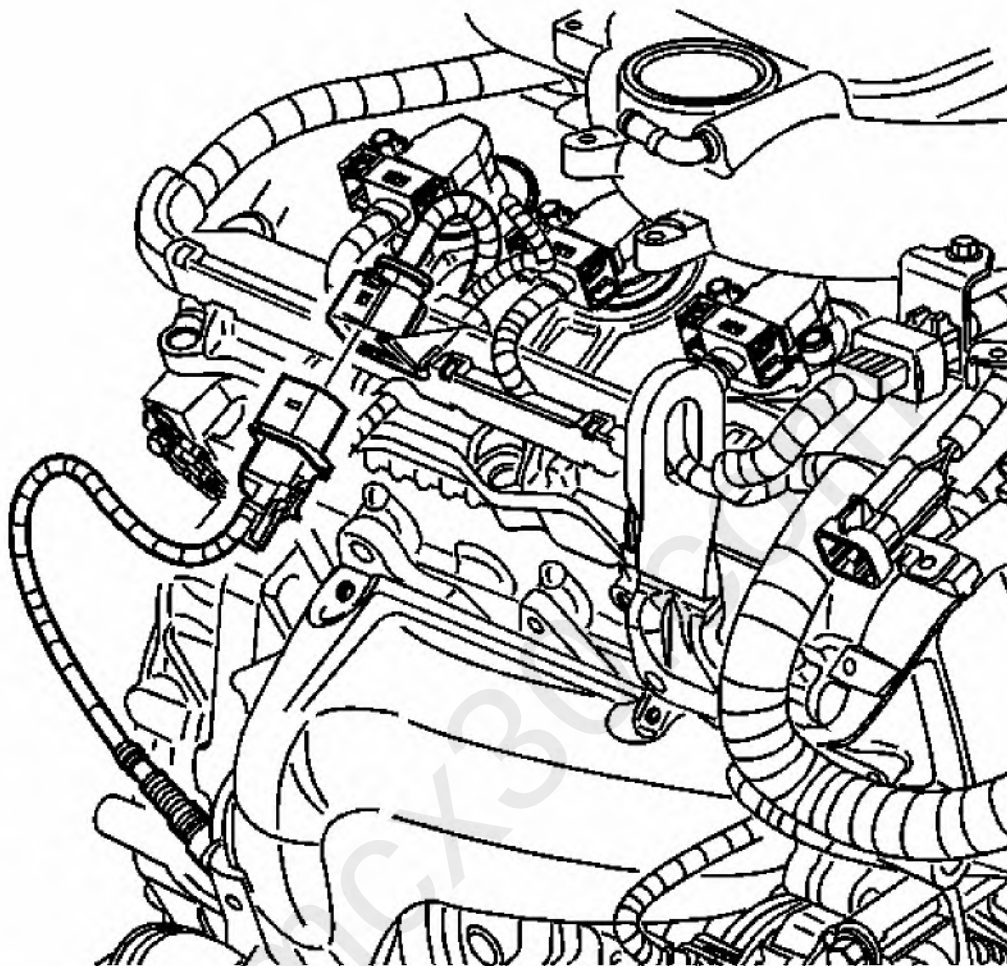
8. Install the engine wiring harness ground bolt to the side of the right cylinder head.

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



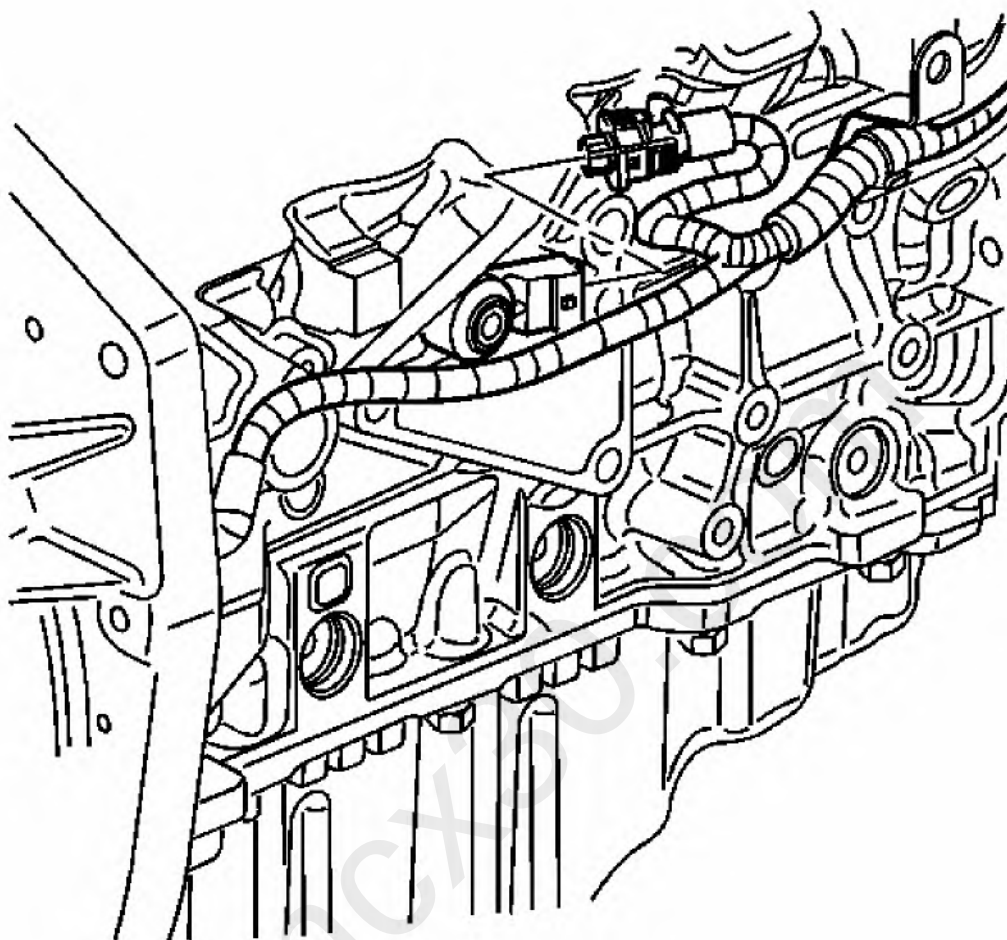
**Fig. 25: View Of EVAP Solenoid Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

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



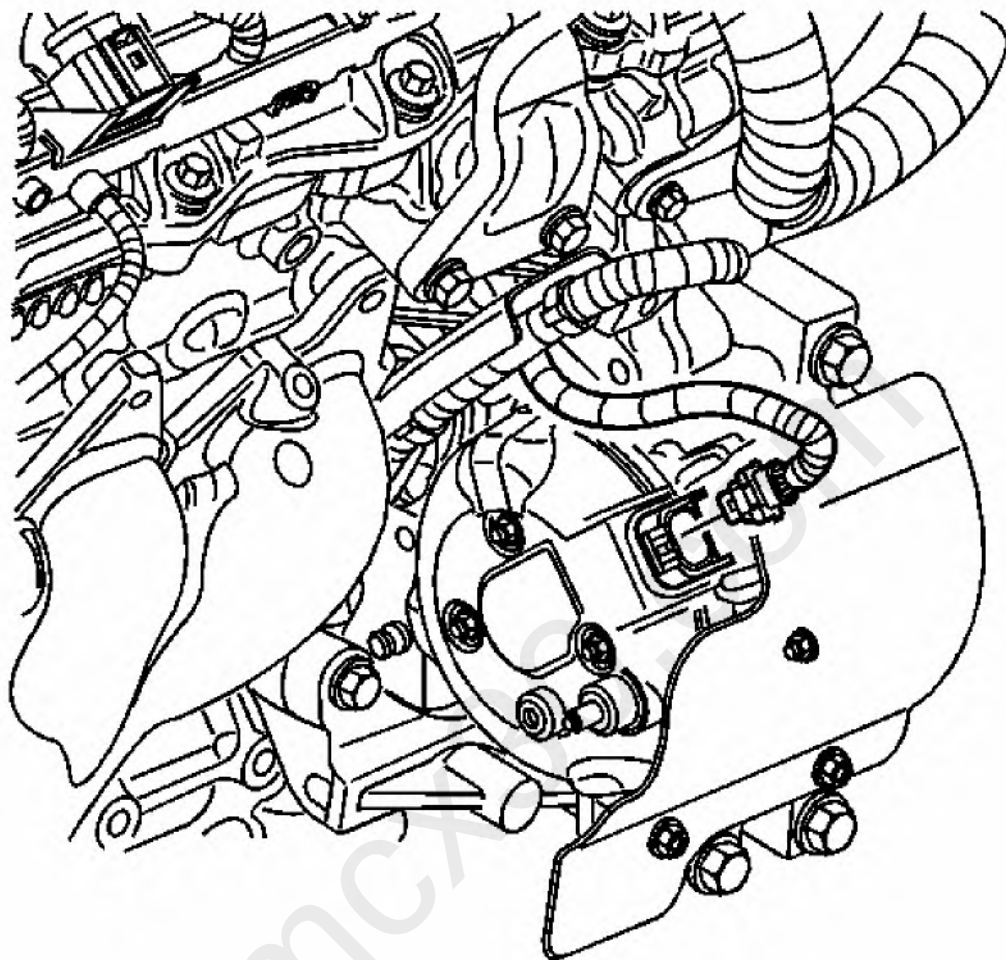
**Fig. 26: View Of Right Oxygen Sensor Harness Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

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



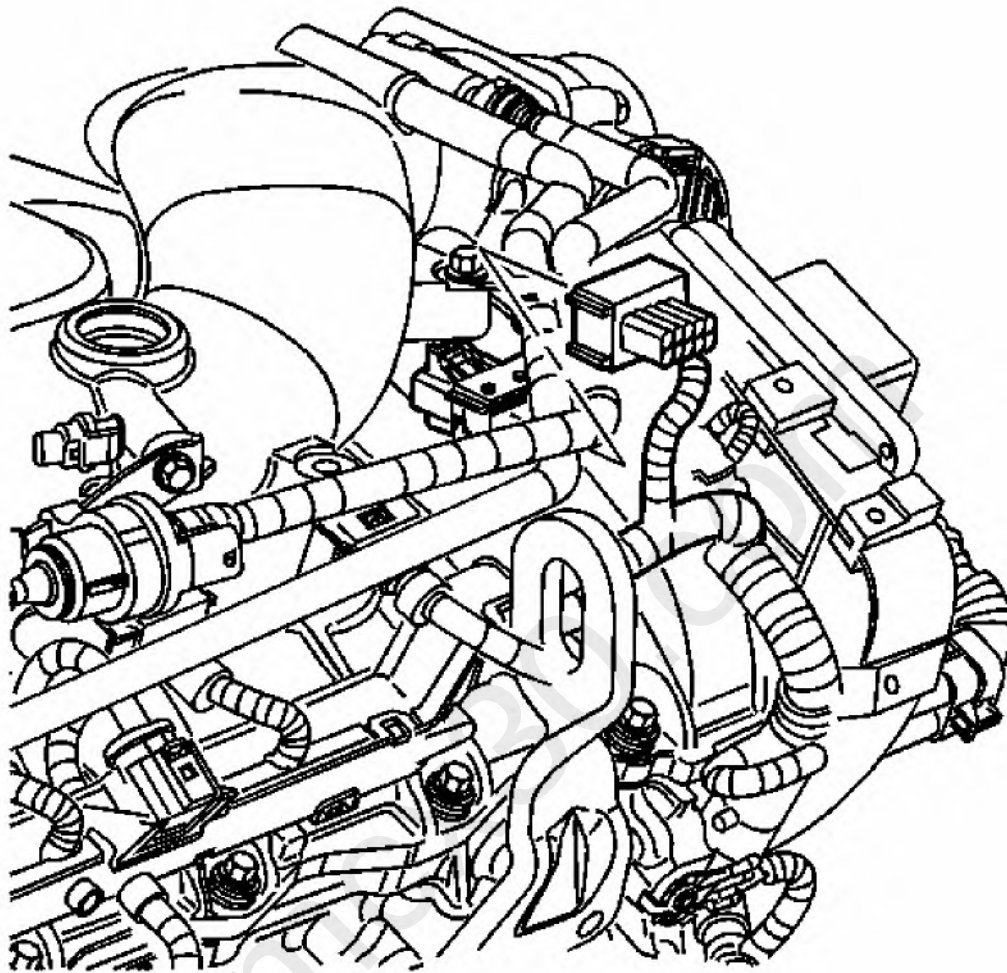
**Fig. 27: View Of Right Knock Sensor And Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

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



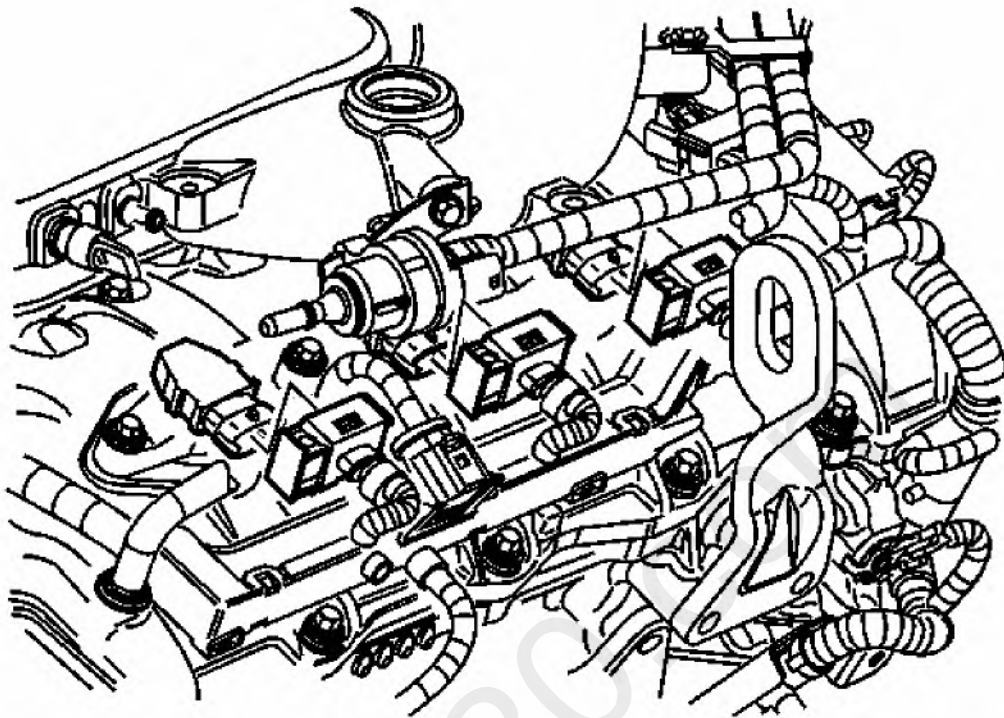
**Fig. 28: View Of Generator Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

12. Connect the engine wiring harness to the generator.



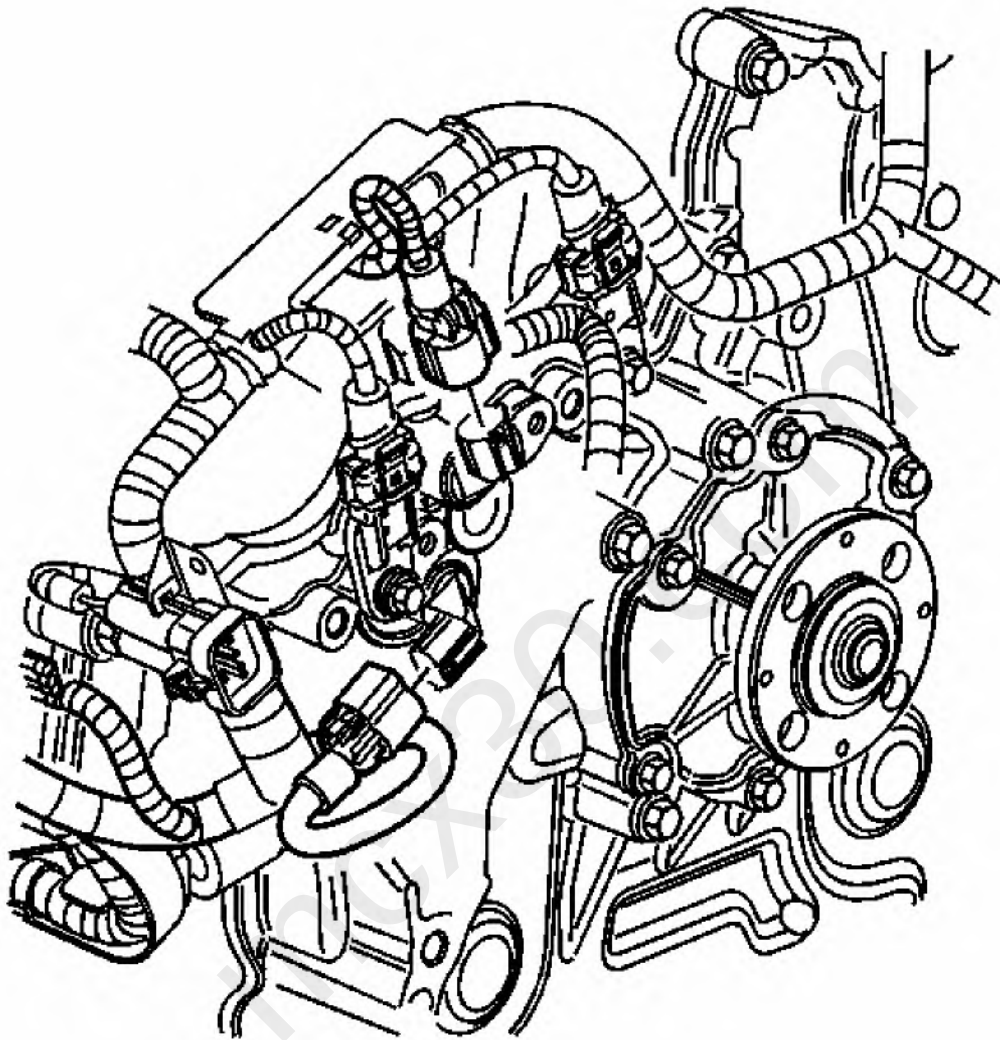
**Fig. 29: View Of Fuel Injector Harness Electrical Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

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



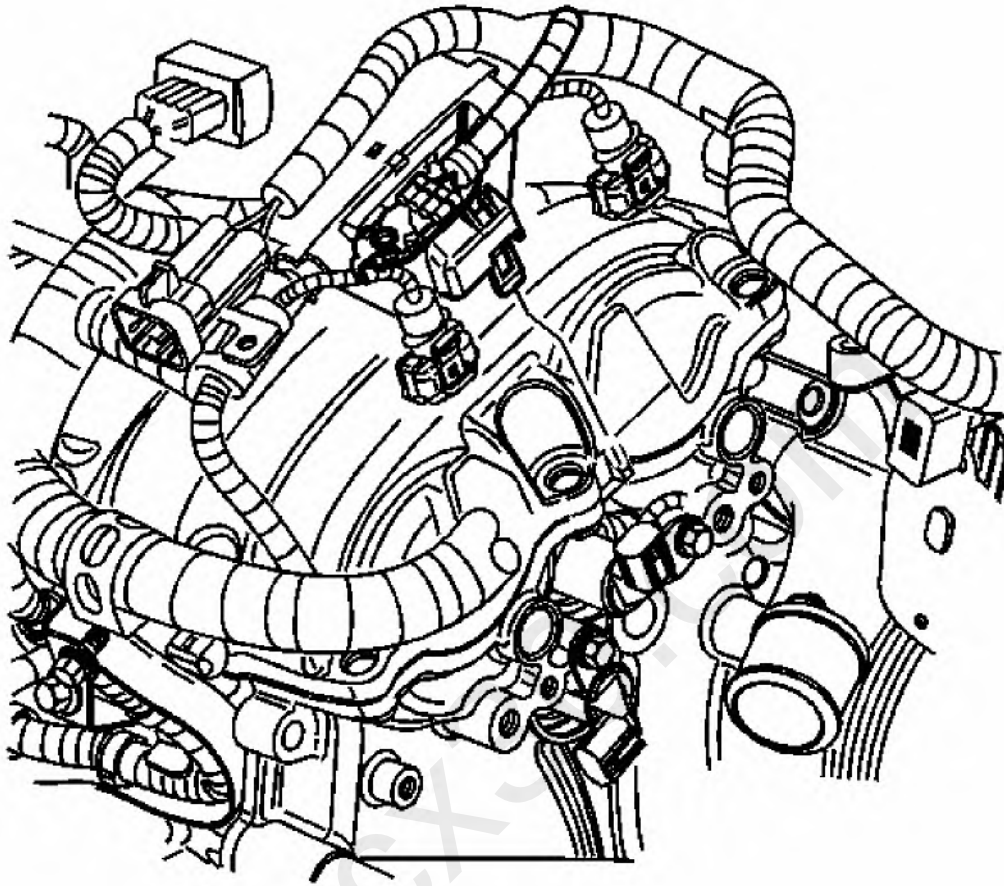
**Fig. 30: View Of Right Ignition Coils Electrical Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

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



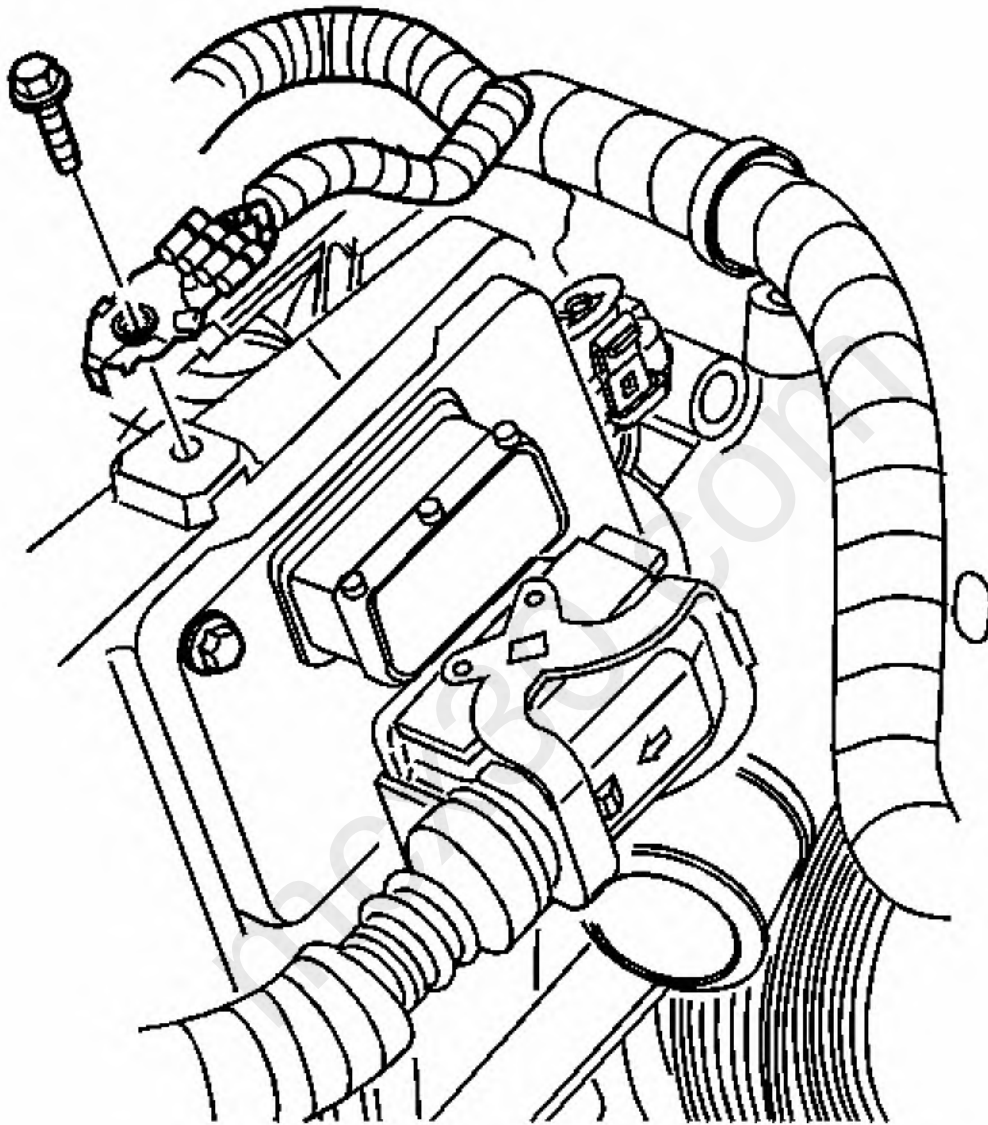
**Fig. 31: View Of Right Camshaft Position Actuator Valves Electrical Connectors**  
Courtesy of GENERAL MOTORS CORP.

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



**Fig. 32: View Of Right Camshaft Cover Wiring Harness Connector - Front**  
**Courtesy of GENERAL MOTORS CORP.**

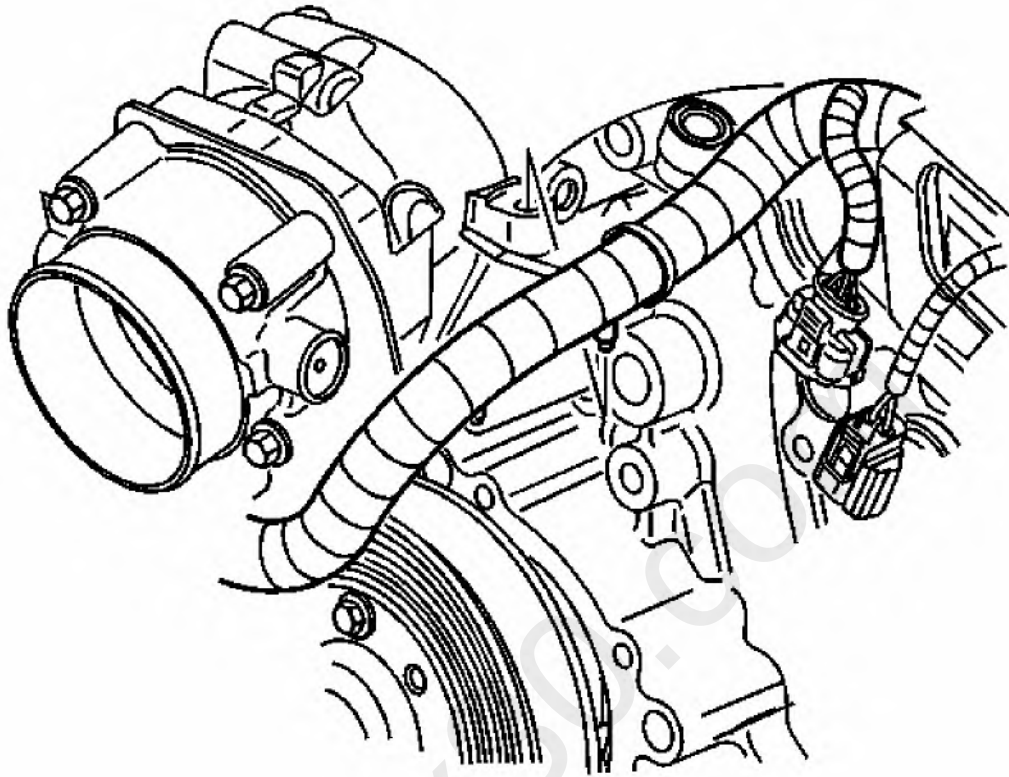
16. Connect the engine wiring harness to the front of the right camshaft cover.



**Fig. 33: 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.

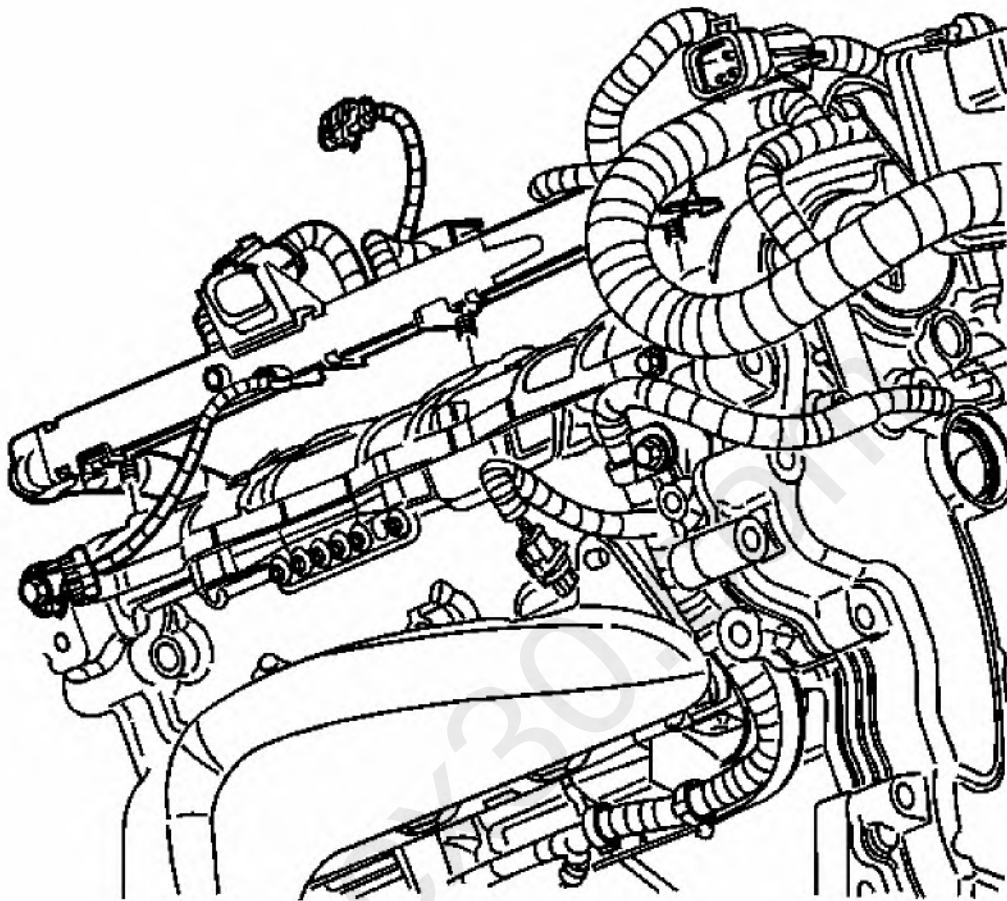
**Tighten:** Tighten the ECM ground harness ring terminal screw to 4.5 N.m (40 lb in).



**Fig. 34: View Of Engine Wiring Harness At Left Side Of Throttle Body/Intake Manifold**

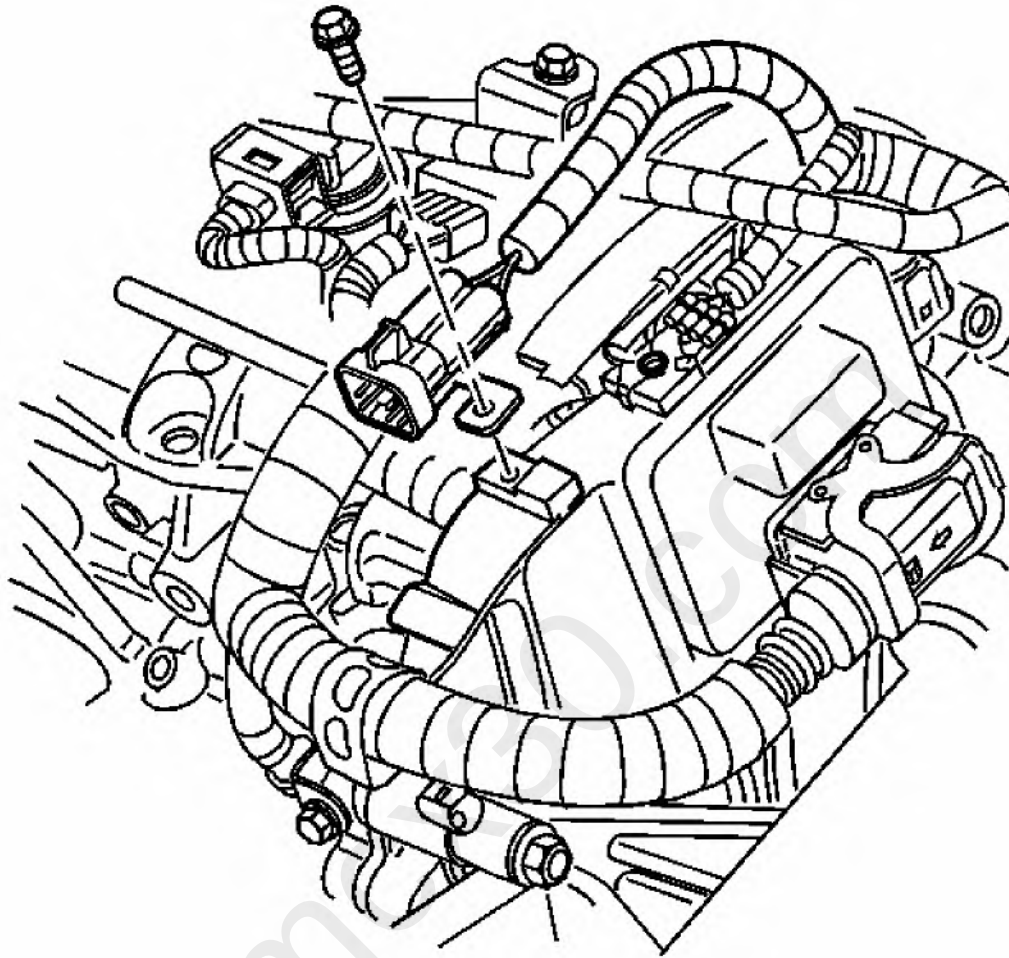
**Courtesy of GENERAL MOTORS CORP.**

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



**Fig. 35: View Of Right Camshaft Cover Wiring Harness Connector - Top**  
Courtesy of GENERAL MOTORS CORP.

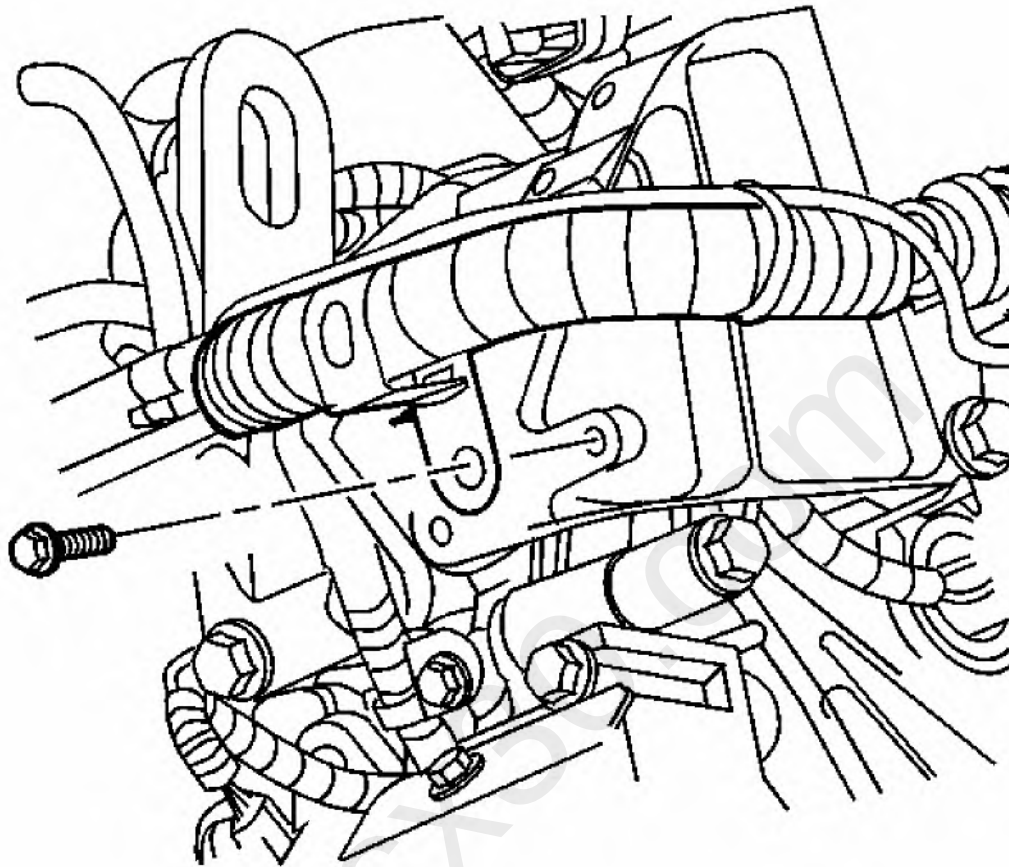
19. Connect the engine wiring harness to the top of the right camshaft cover.



**Fig. 36: 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.

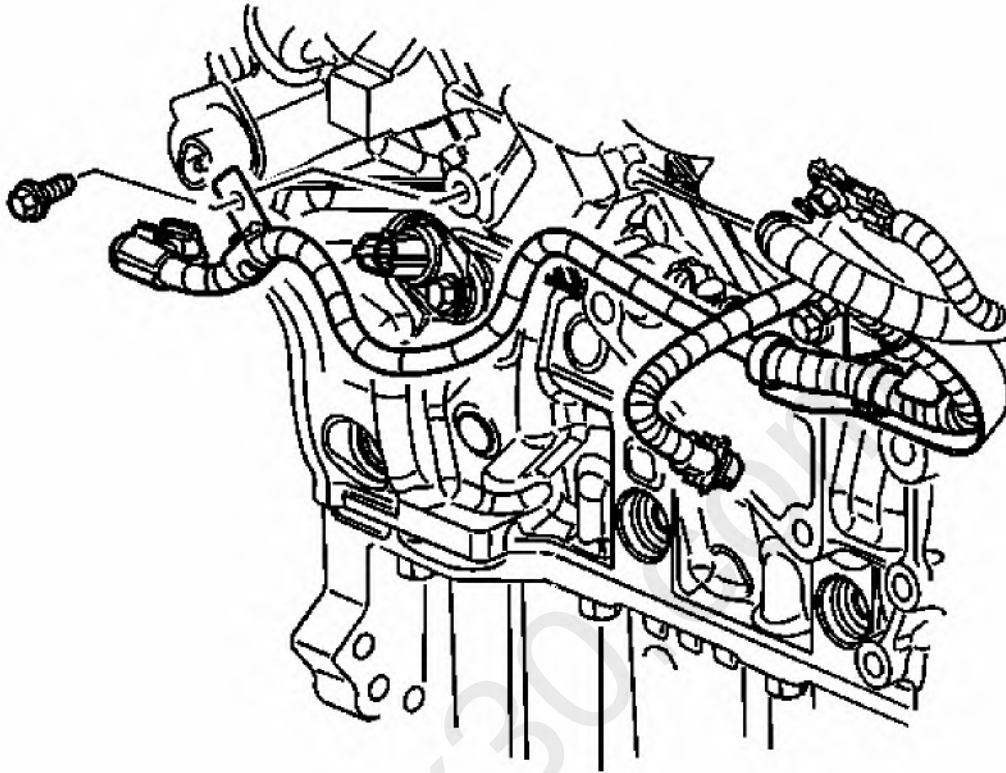
**Tighten:** Tighten the engine wiring harness bracket bolt to 10 N.m (89 lb in).



**Fig. 37: 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.

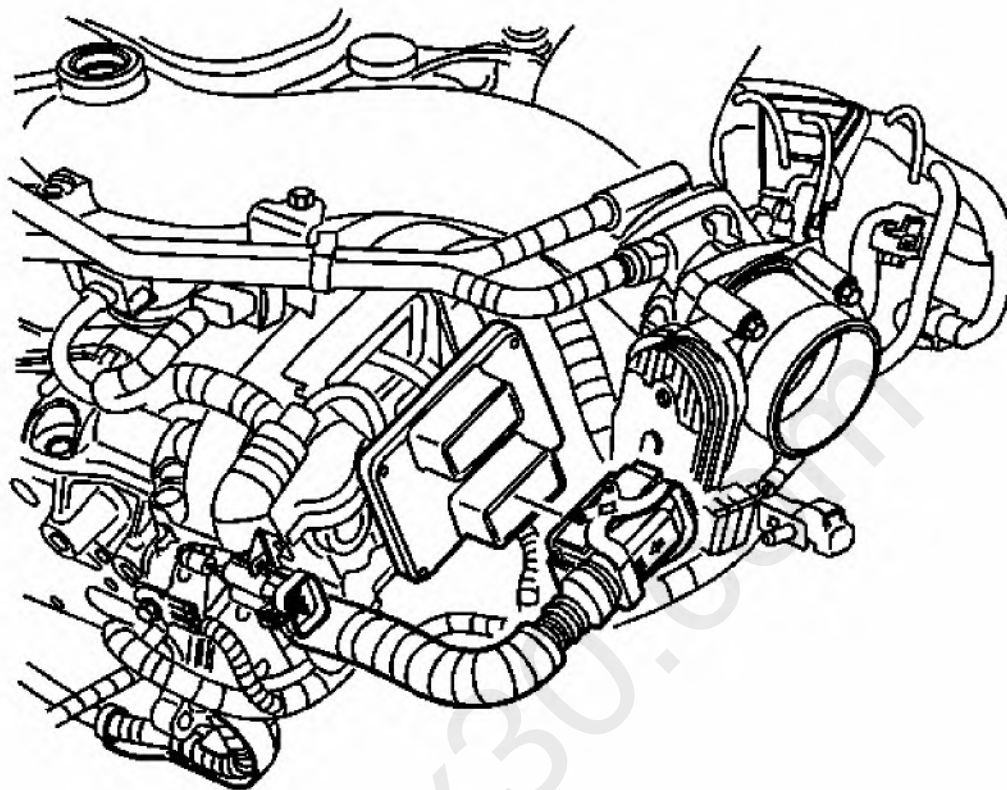
**Tighten:** Tighten the engine wiring harness bracket bolt to 23 N.m (17 lb ft).



**Fig. 38: View Of Engine Wiring Harness Bracket Bolt**  
Courtesy of GENERAL MOTORS CORP.

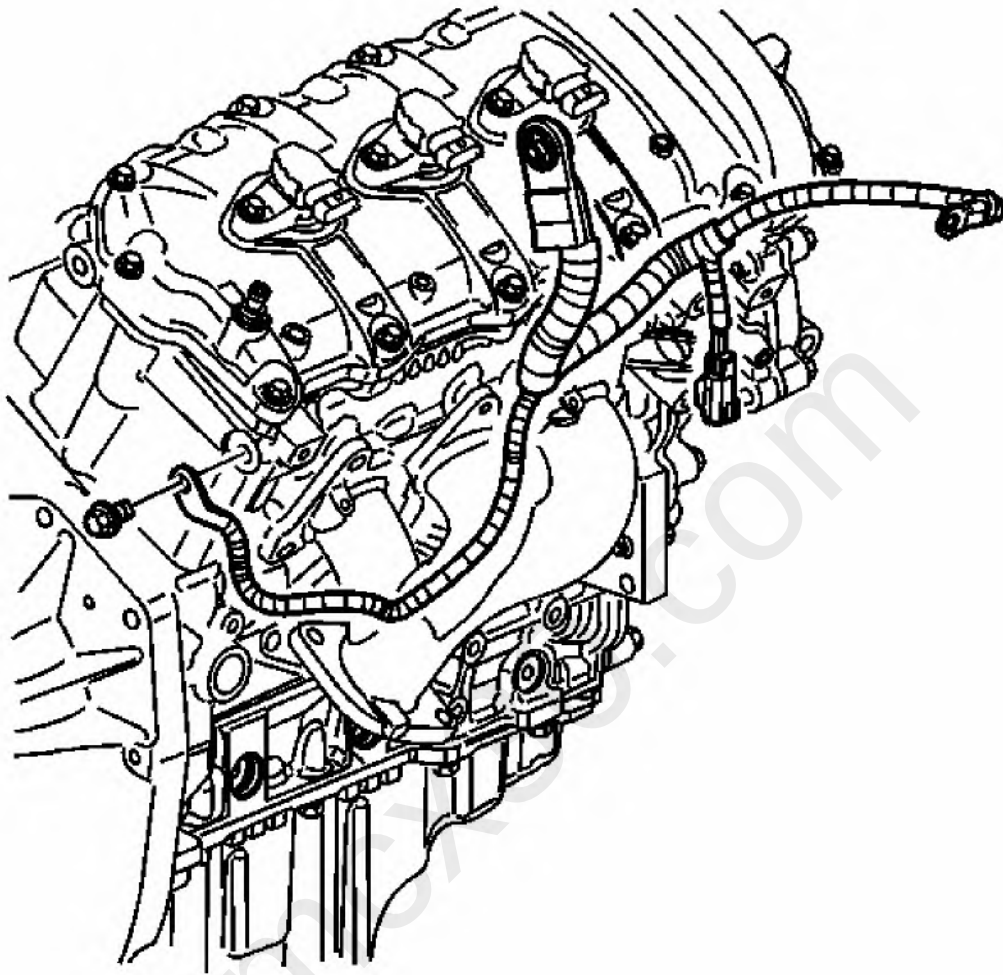
22. Connect the engine wiring harness to the crankshaft position sensor.
23. Install the engine wiring harness bracket bolt.

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



**Fig. 39: View Of ECM Wiring Harness Connector**  
Courtesy of GENERAL MOTORS CORP.

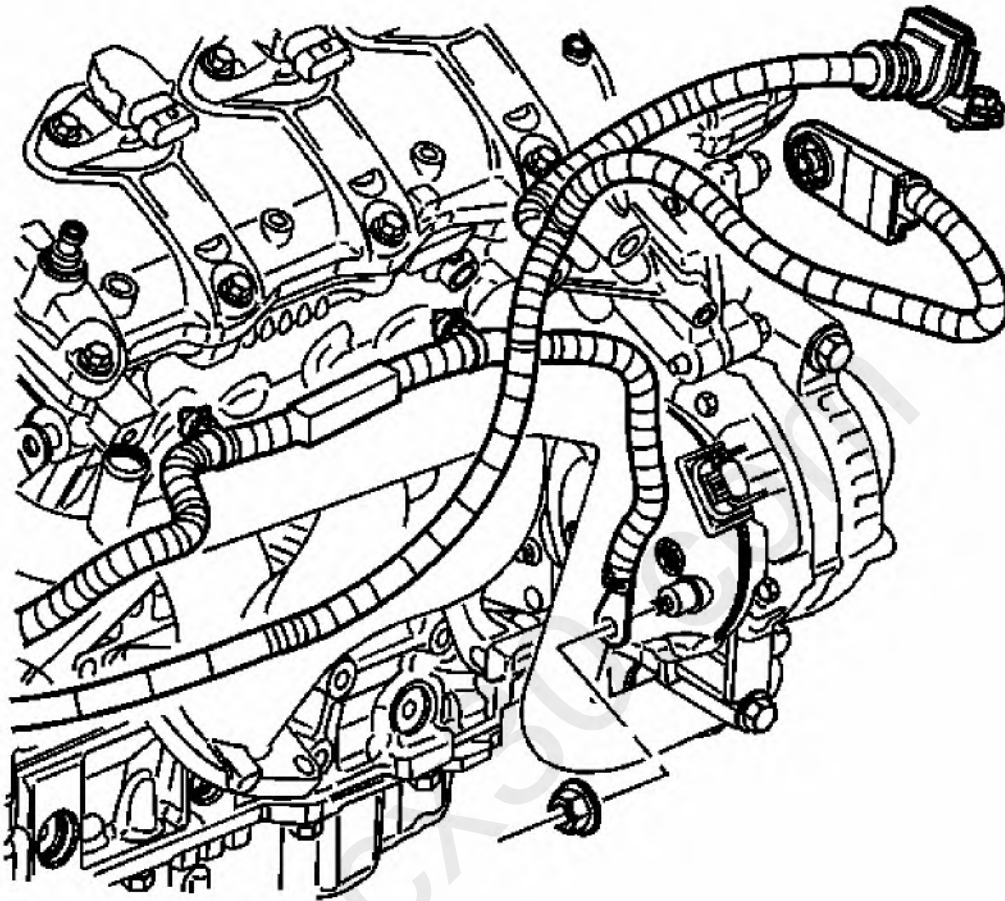
24. Connect the engine wiring harness to the ECM module.



**Fig. 40: 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.

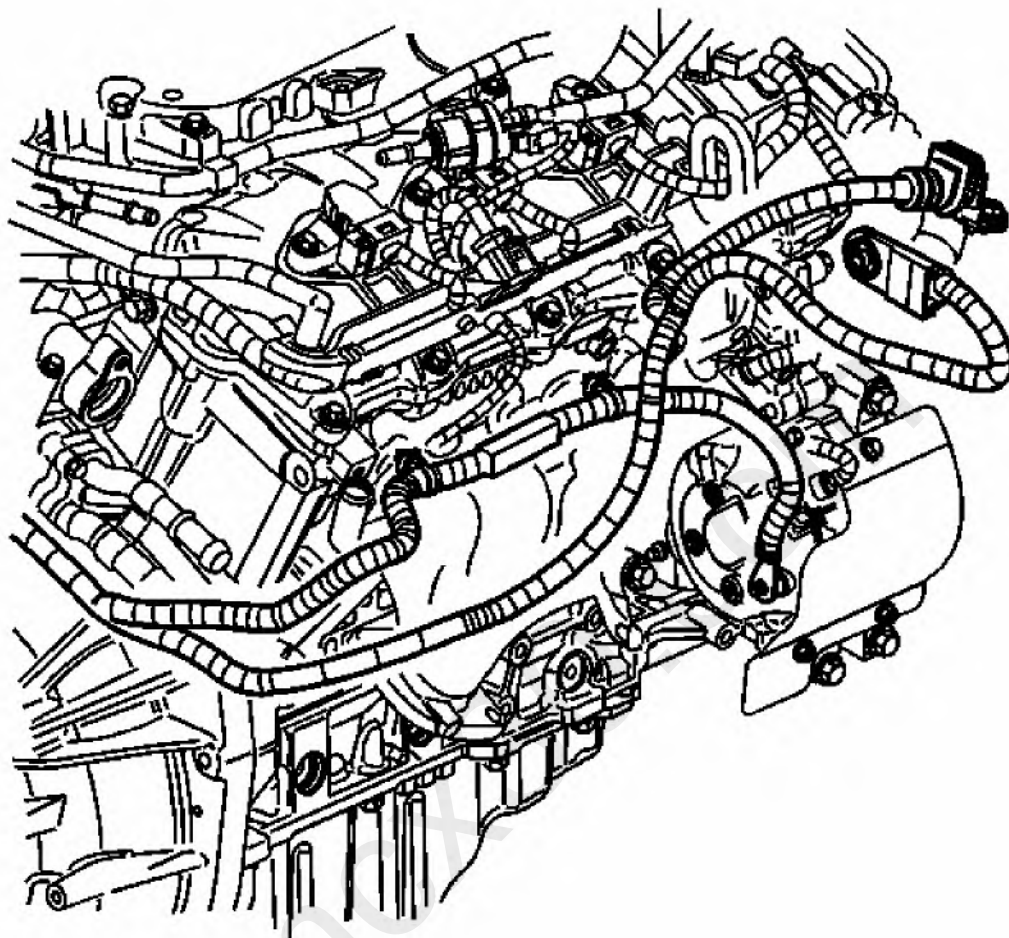
**Tighten:** Tighten the battery cable ground bolt to 50 N.m (37 lb ft).



**Fig. 41: View Of Generator Battery Cable**  
Courtesy of GENERAL MOTORS CORP.

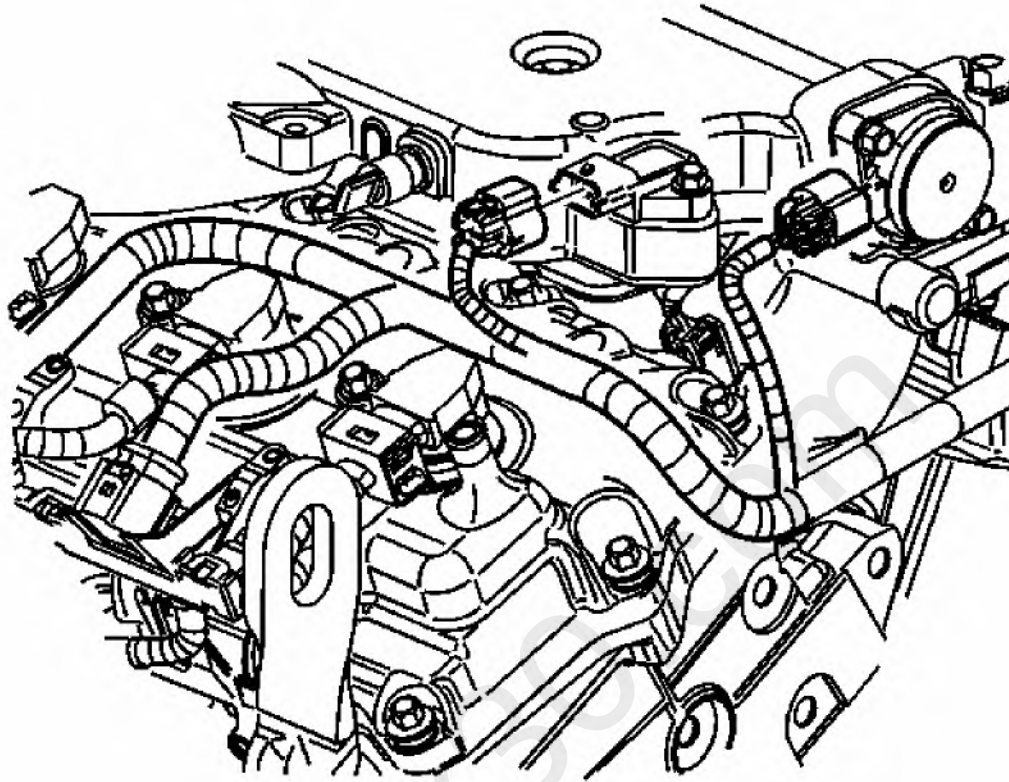
27. Connect the battery cable to the generator.
28. Install the battery cable/generator nut to the generator.

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



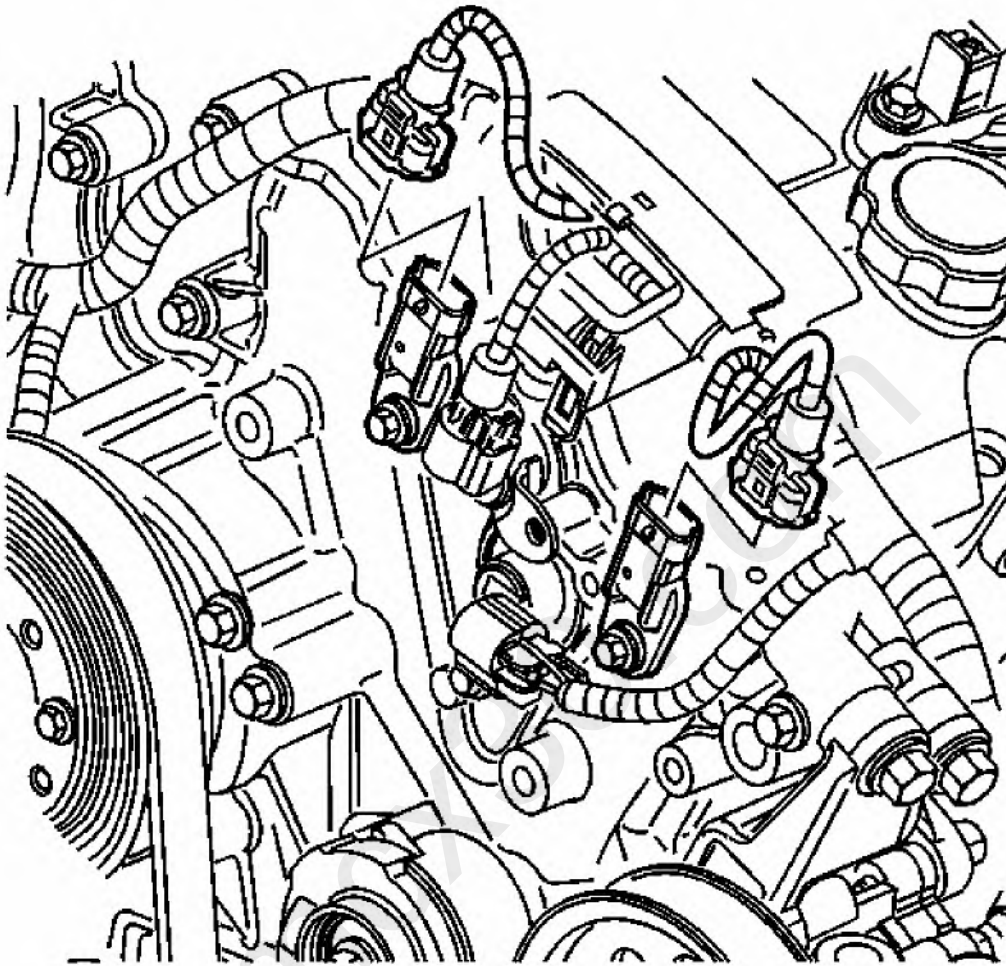
**Fig. 42: View Of Right Battery Cable Harness**  
**Courtesy of GENERAL MOTORS CORP.**

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



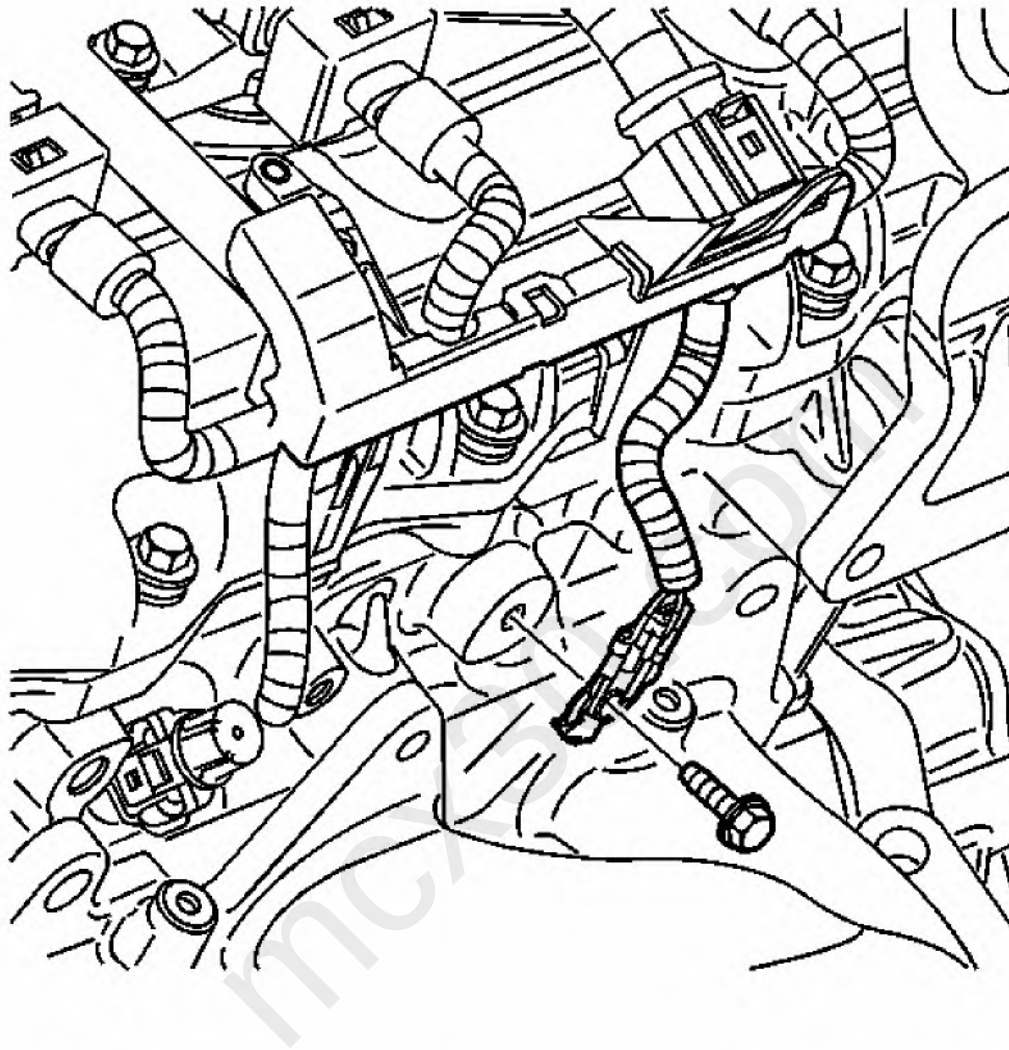
**Fig. 43: Identifying Barometric Pressure Sensor And Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

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



**Fig. 44: View Of Left Camshaft Position Sensors Electrical Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

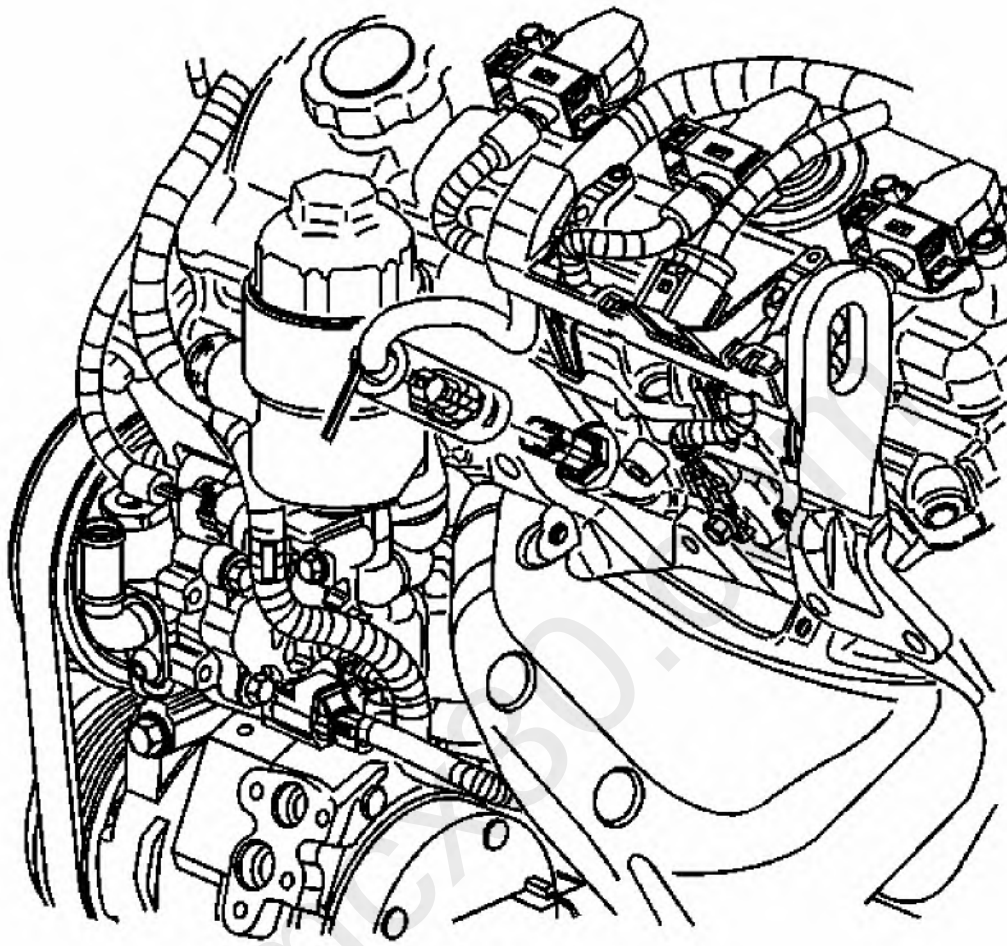
31. Connect the engine wiring harness to the left camshaft position sensors.



**Fig. 45: View Of Left Cylinder Head Wiring Harness Ground Bolt**  
Courtesy of GENERAL MOTORS CORP.

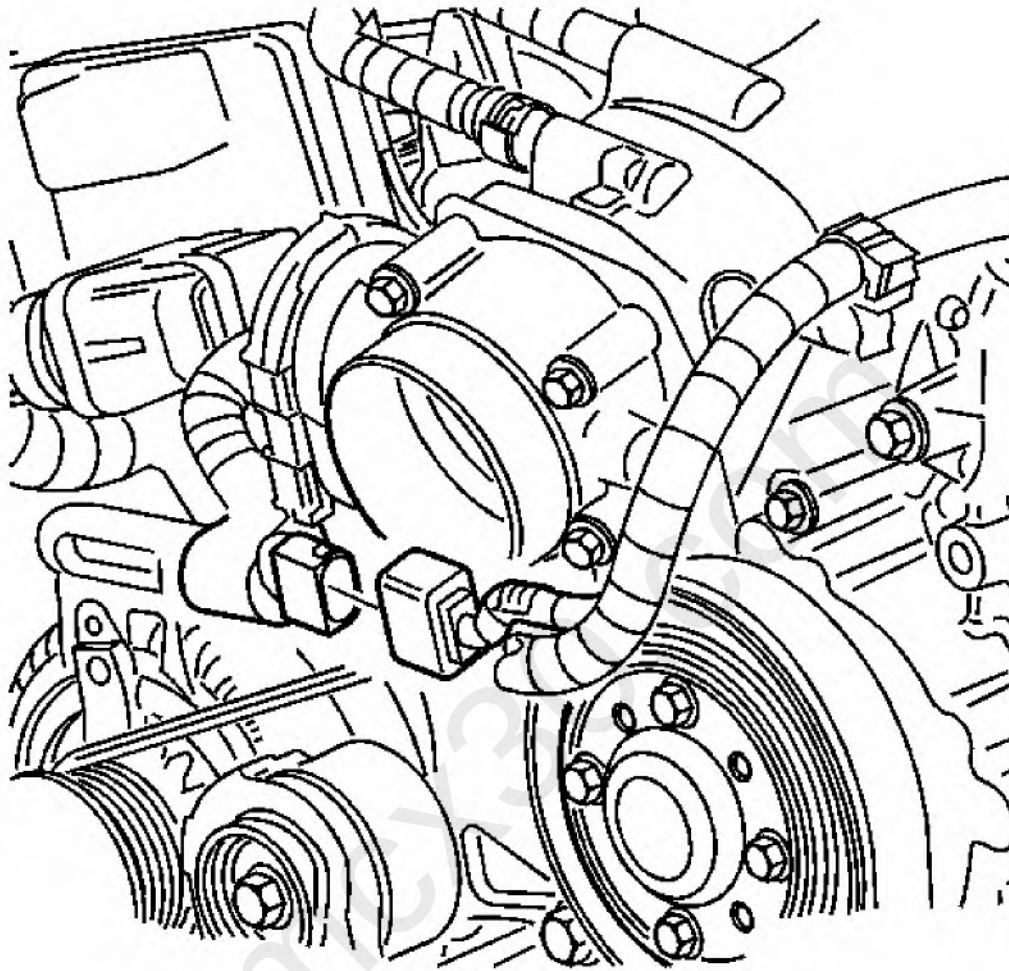
32. Install the engine wiring harness ground bolt to the left cylinder head.

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



**Fig. 46: View Of Coolant Temperature Sensor And Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

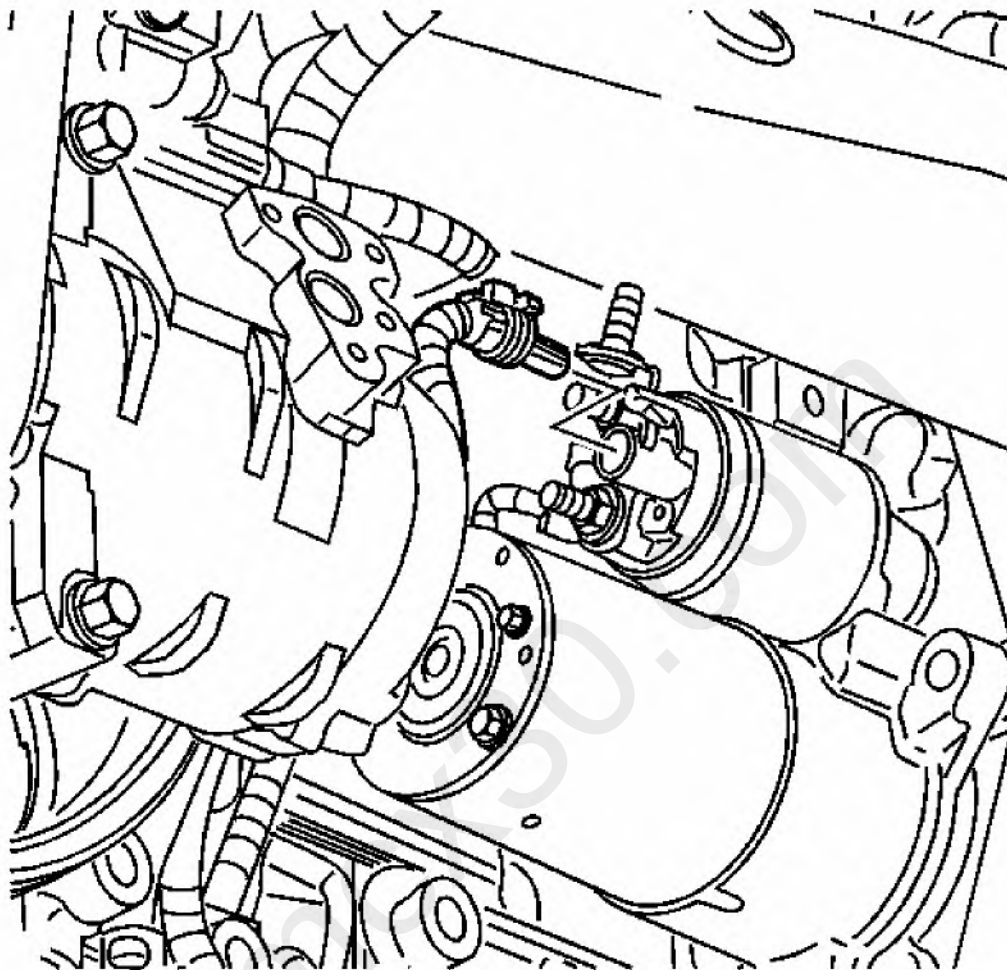
33. Connect the engine wiring harness to the engine coolant temperature (ECT) sensor.



**Fig. 47: View Of Throttle Body Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

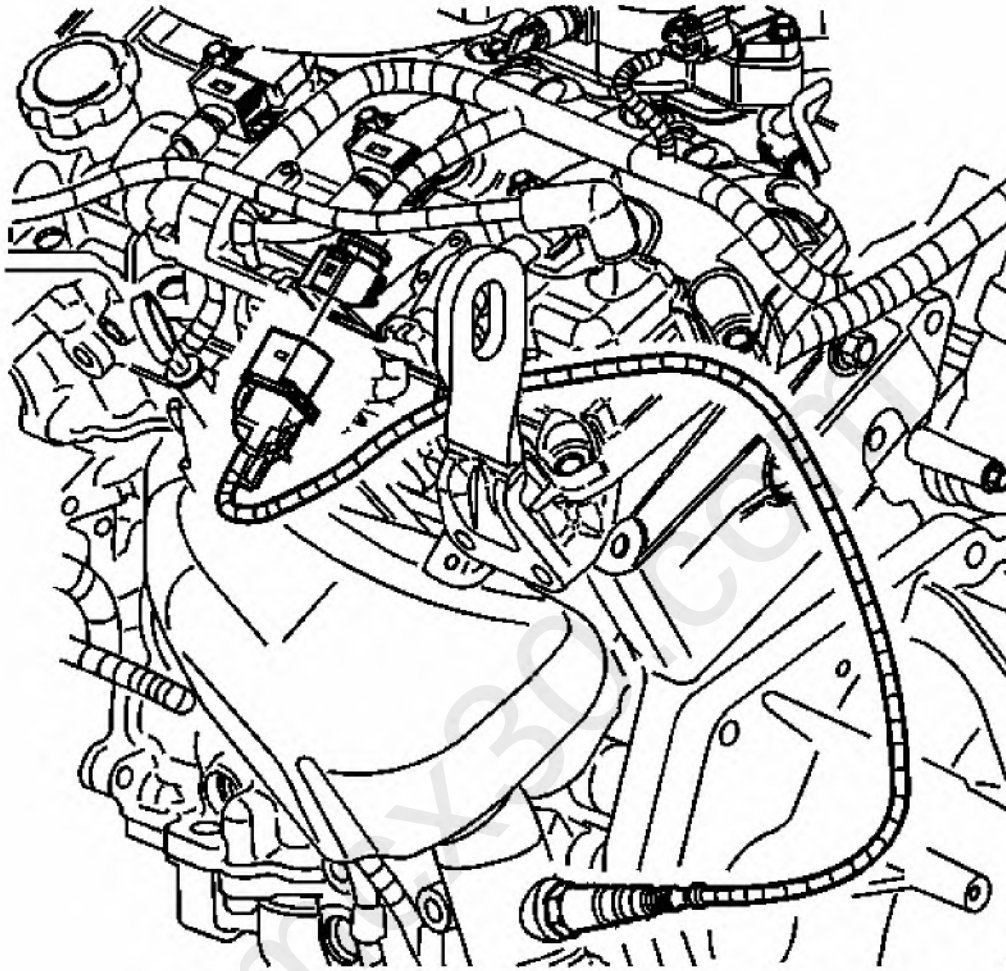
**NOTE:** Ensure proper engagement of the wiring harness connector. The wiring harness connector must be installed straight onto the component connector and firmly seated. Visually inspect the connector to ensure that the connector latches are engaged and locked. Any damage to the connector or wiring 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.



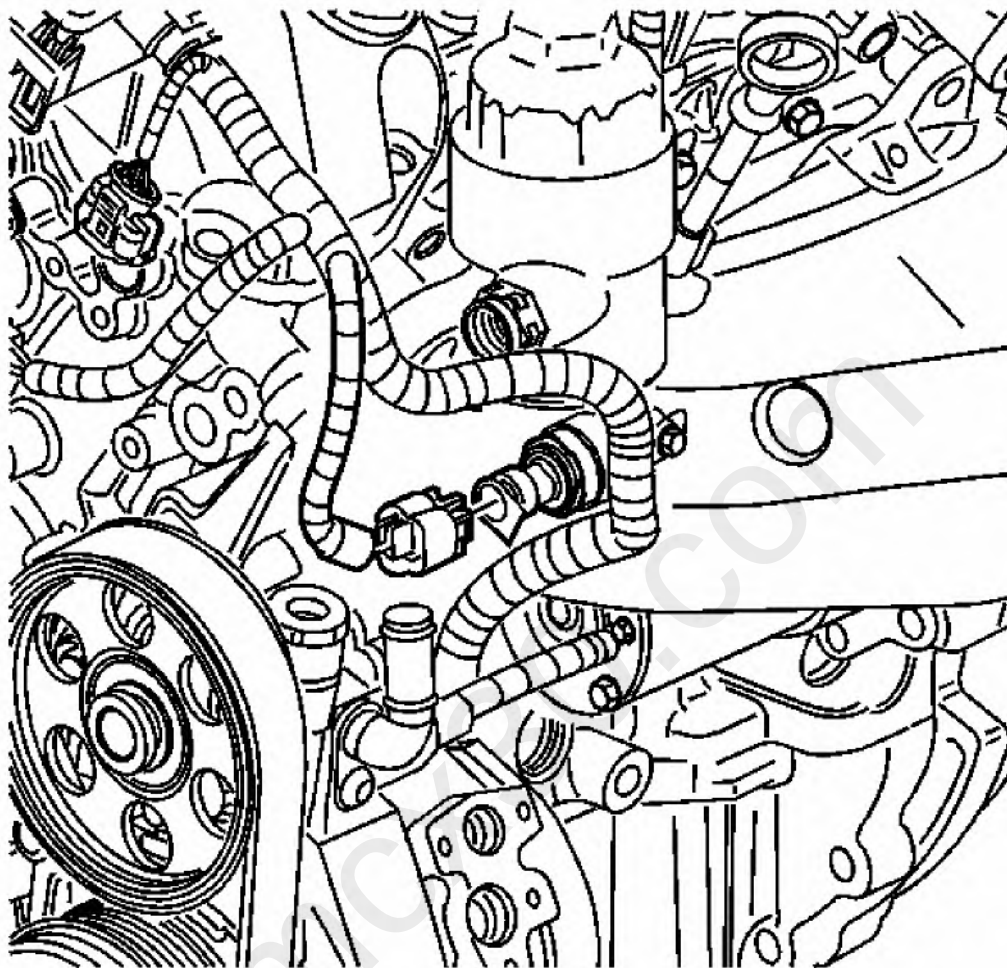
**Fig. 48: View Of Starter Motor Solenoid Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

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



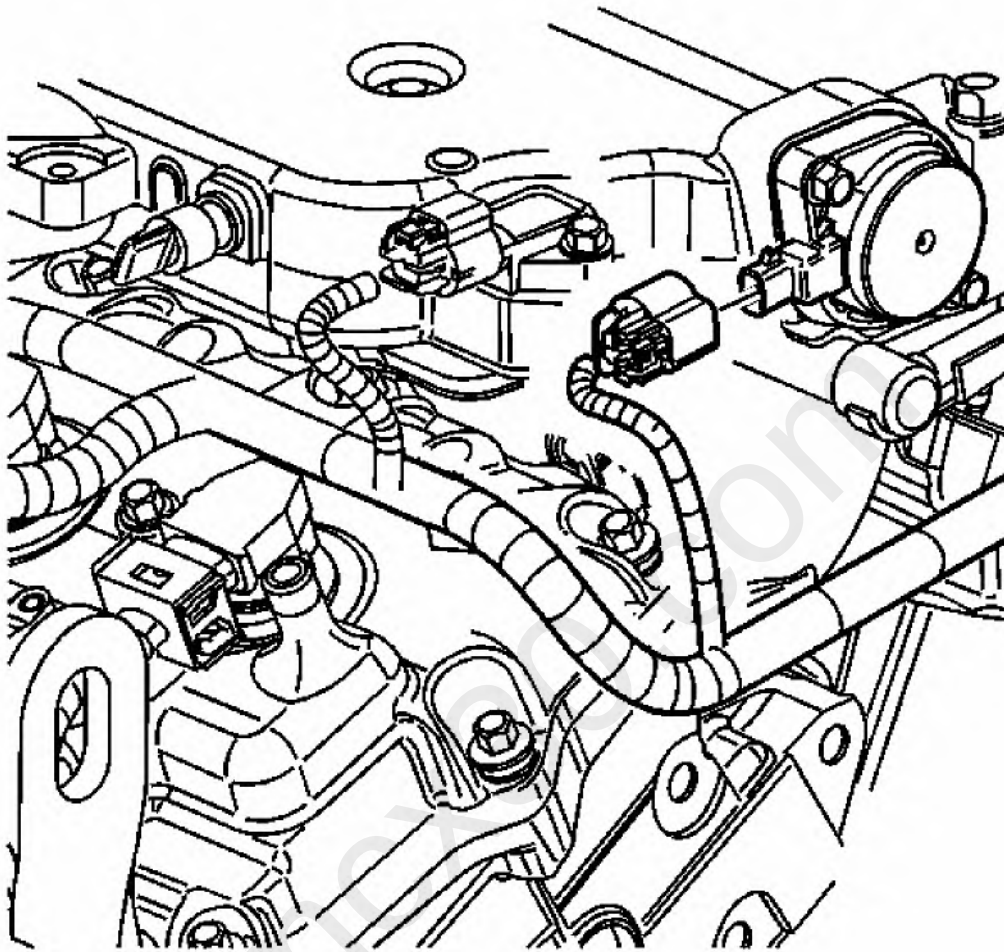
**Fig. 49: View Of Left Oxygen Sensor Harness Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

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



**Fig. 50: View Of Oil Pressure Sensor Wiring Harness**  
**Courtesy of GENERAL MOTORS CORP.**

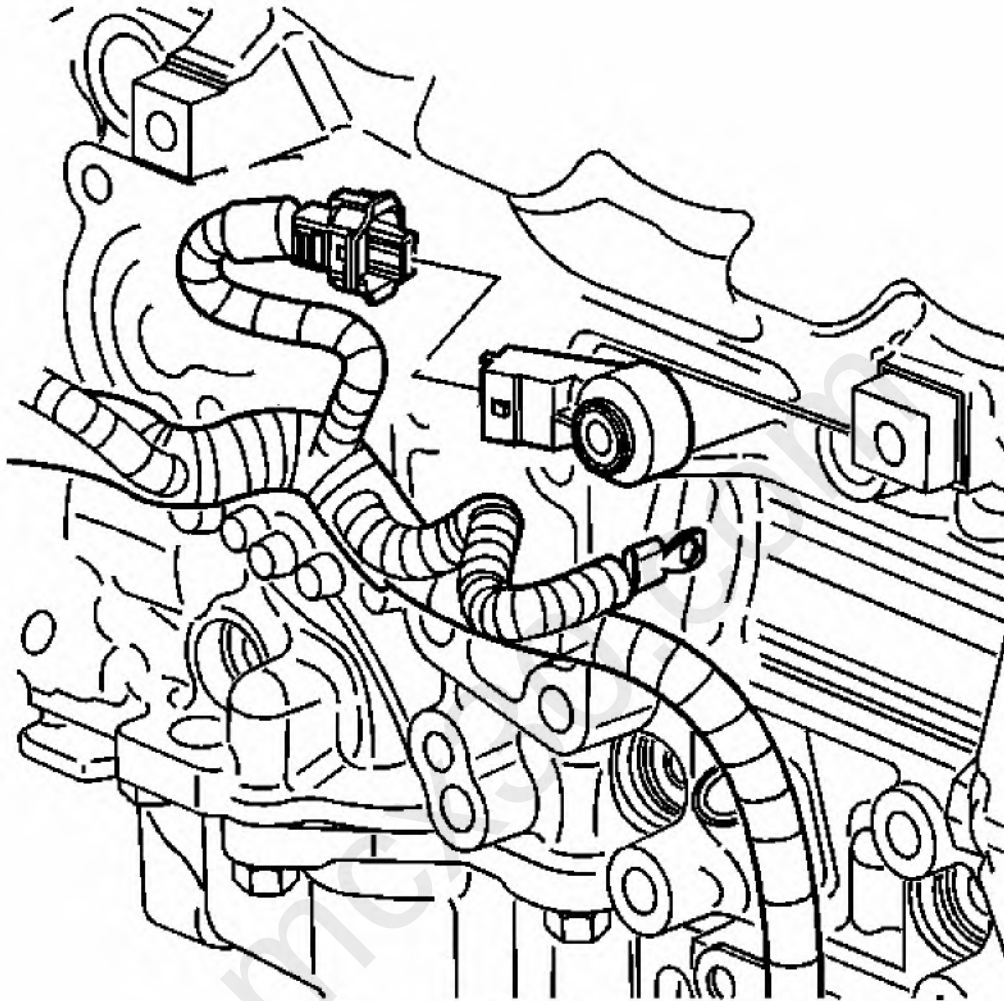
37. Connect the engine wiring harness to the oil pressure sender.



**Fig. 51: View Of Communicator And Intake Manifold Runner Control Solenoid Electrical Connectors**

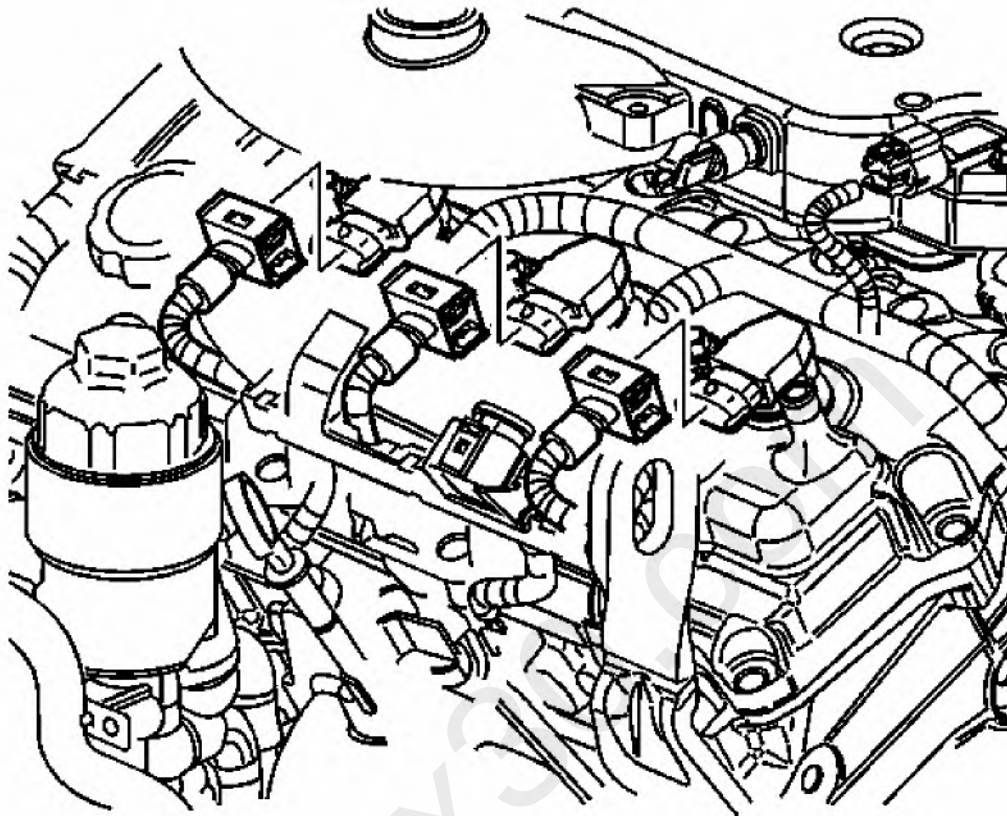
**Courtesy of GENERAL MOTORS CORP.**

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



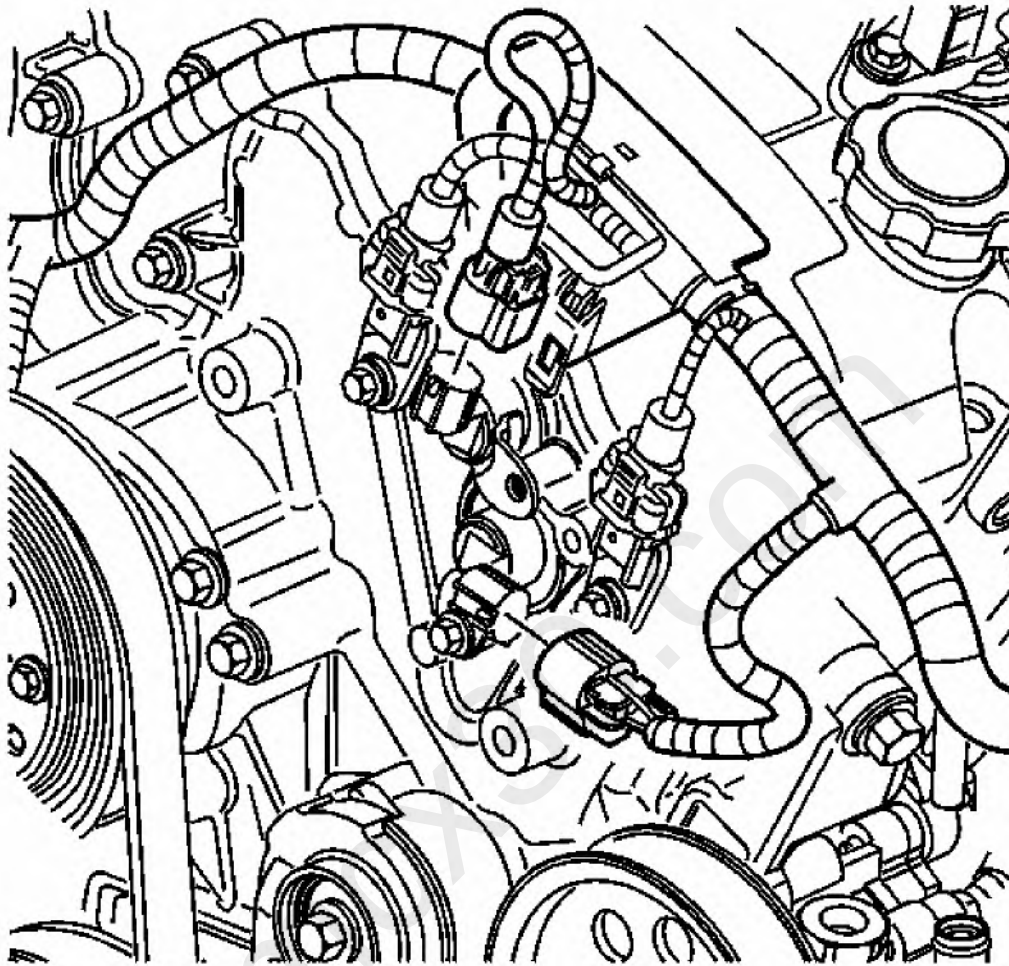
**Fig. 52: View Of Left Knock Sensor And Electrical Connector**  
**Courtesy of GENERAL MOTORS CORP.**

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



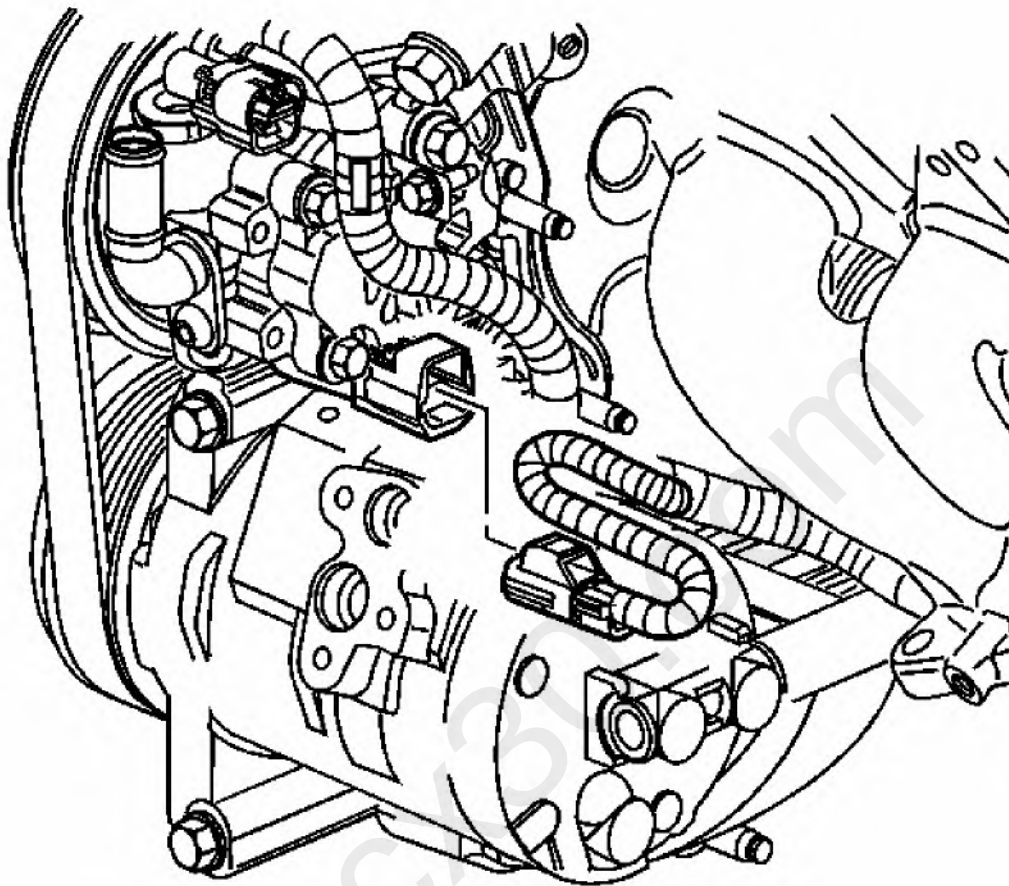
**Fig. 53: View Of Left Ignition Coils Wiring Harness Connectors**  
**Courtesy of GENERAL MOTORS CORP.**

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



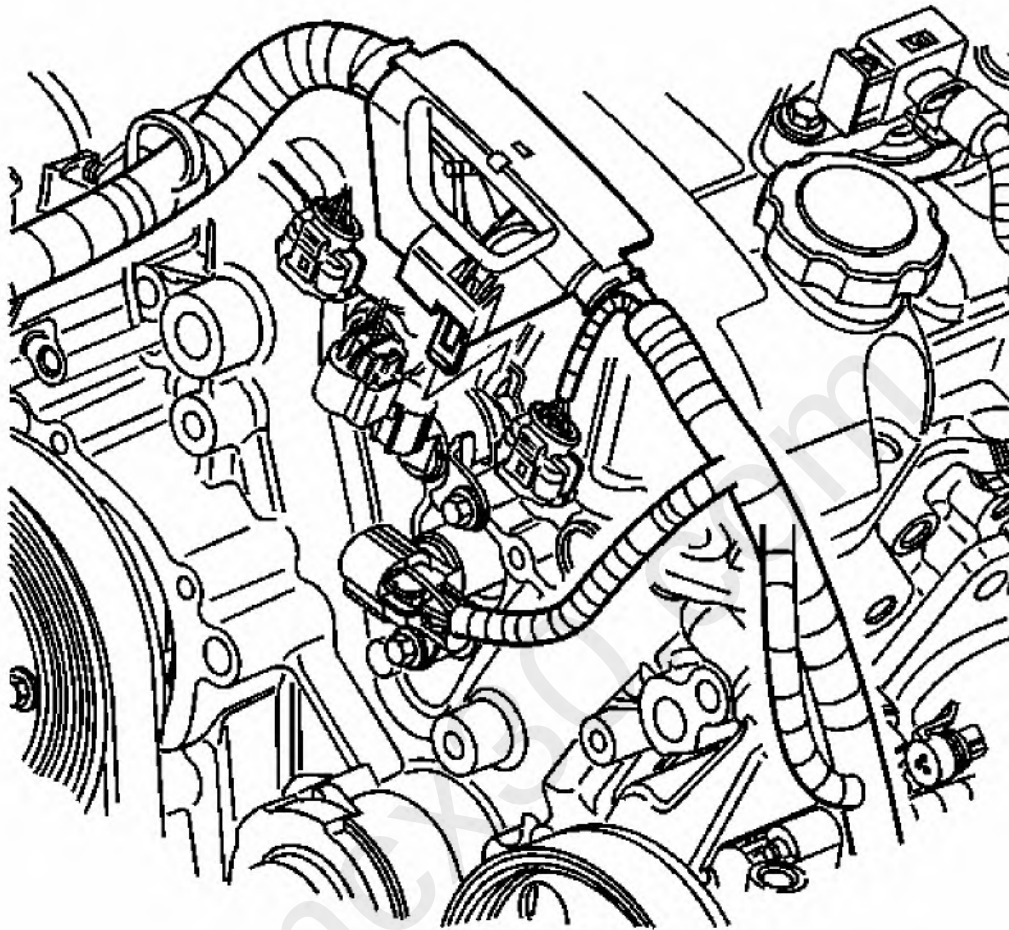
**Fig. 54: View Of Left Camshaft Position Actuator Valve Electrical Connectors**  
Courtesy of GENERAL MOTORS CORP.

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



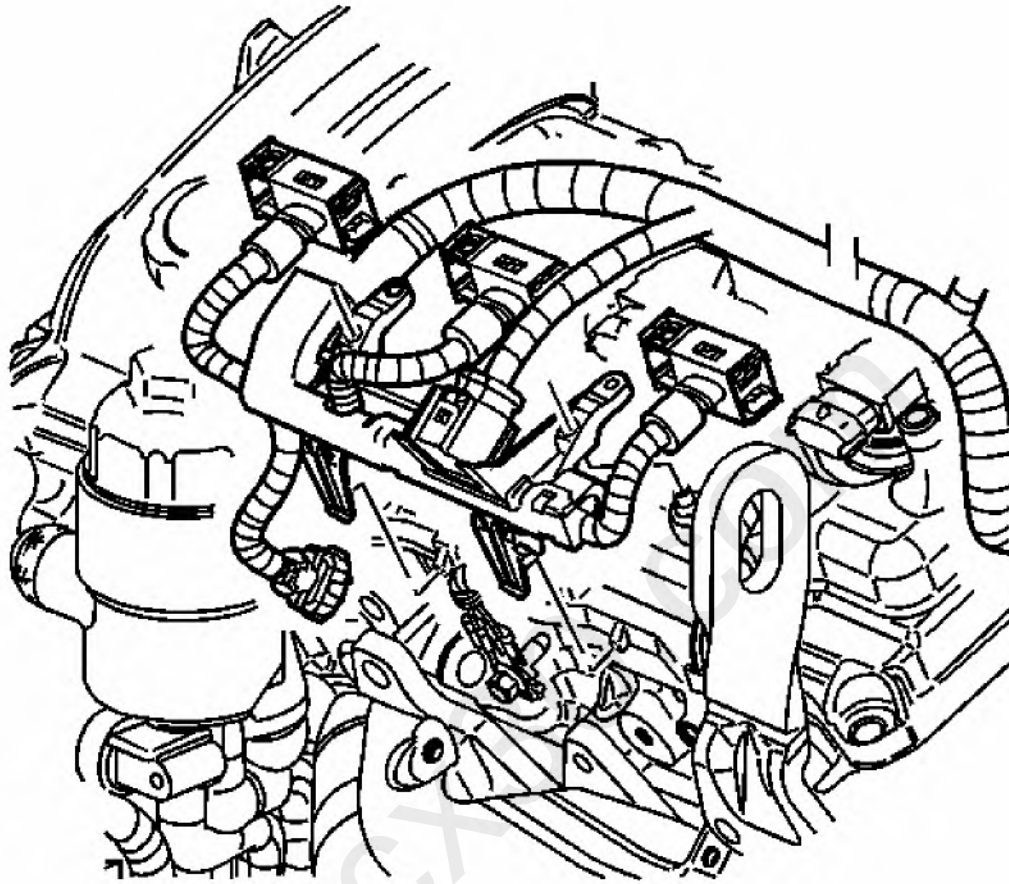
**Fig. 55: View Of A/C Compressor Electrical Connector**  
Courtesy of GENERAL MOTORS CORP.

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



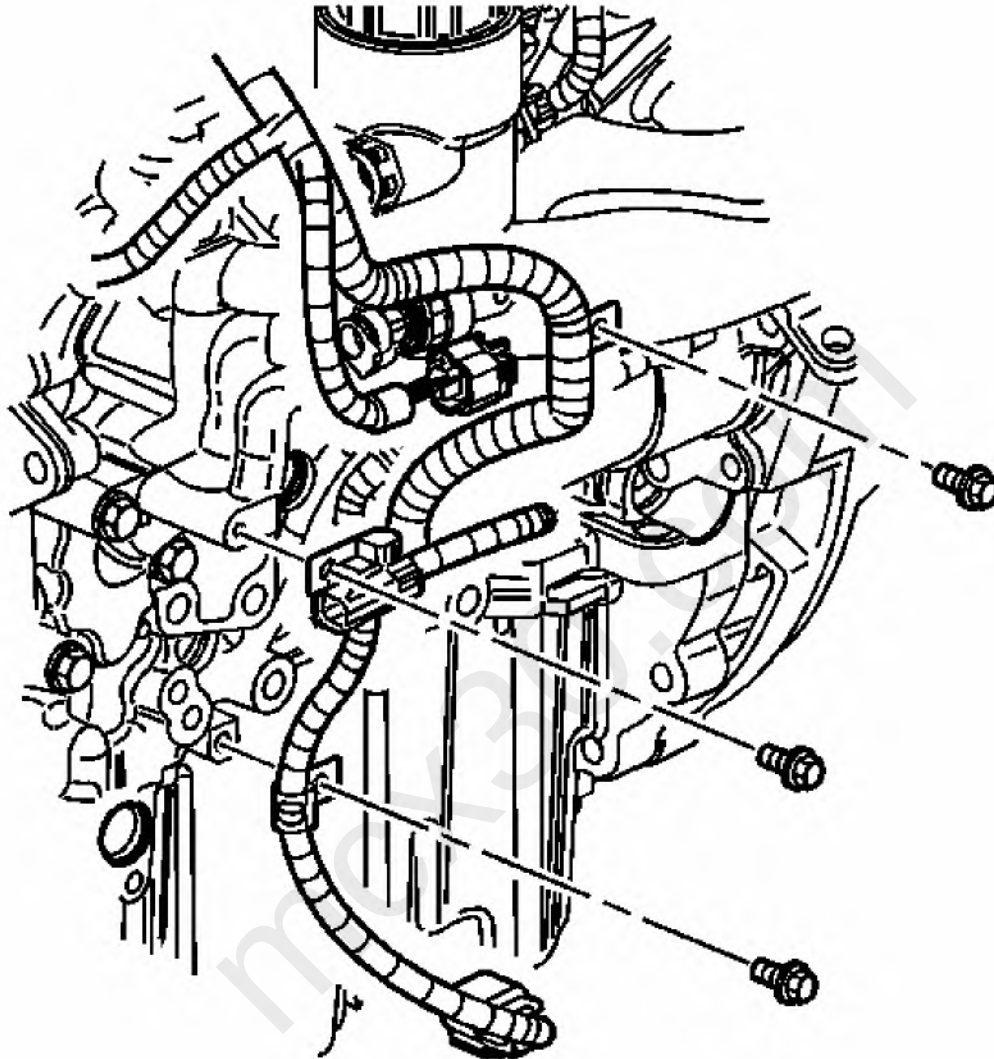
**Fig. 56: View Of Left Camshaft Cover Wiring Harness Connector - Front**  
**Courtesy of GENERAL MOTORS CORP.**

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



**Fig. 57: View Of Left Camshaft Cover Wiring Harness Connectors**  
Courtesy of GENERAL MOTORS CORP.

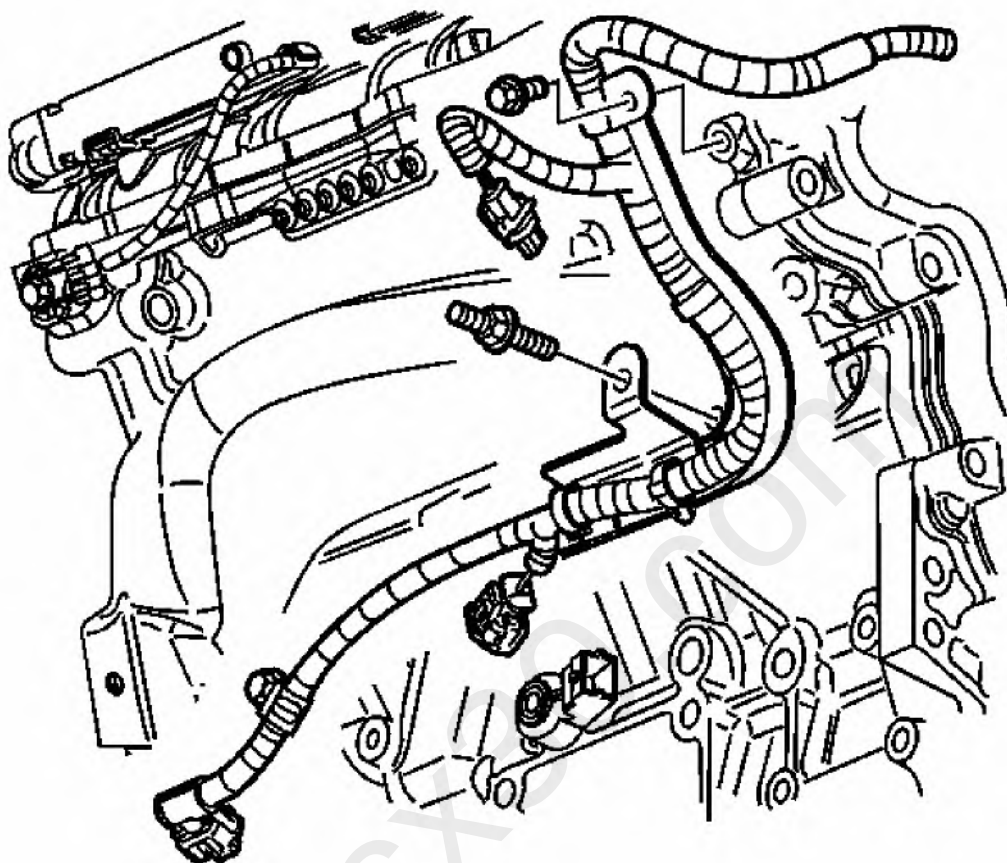
44. Connect the engine wiring harness to the top of the left camshaft cover.



**Fig. 58: 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. 59: Locating Engine Wiring Harness Bracket Bolt & Engine Wiring Harness Bracket Stud**

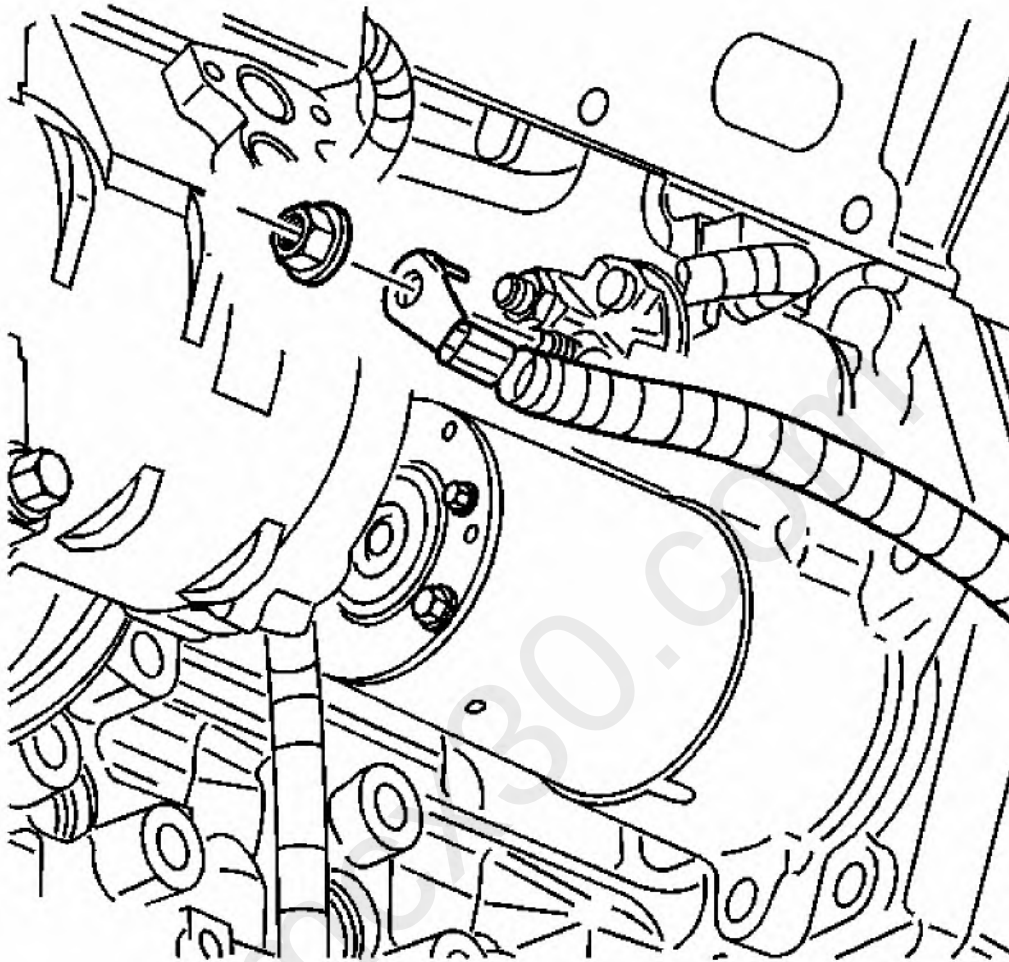
Courtesy of GENERAL MOTORS CORP.

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).

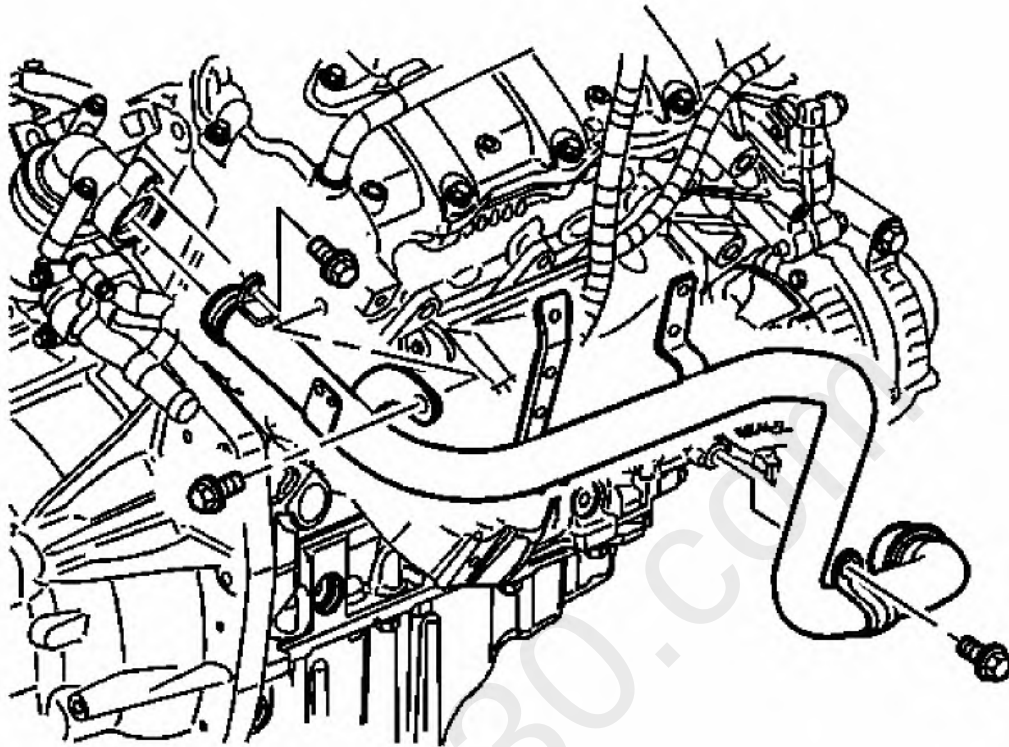
47. Install the engine wiring harness bracket stud to the lower right side of the engine.

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



**Fig. 60: View Of Battery Cable Harness**  
**Courtesy of GENERAL MOTORS CORP.**

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



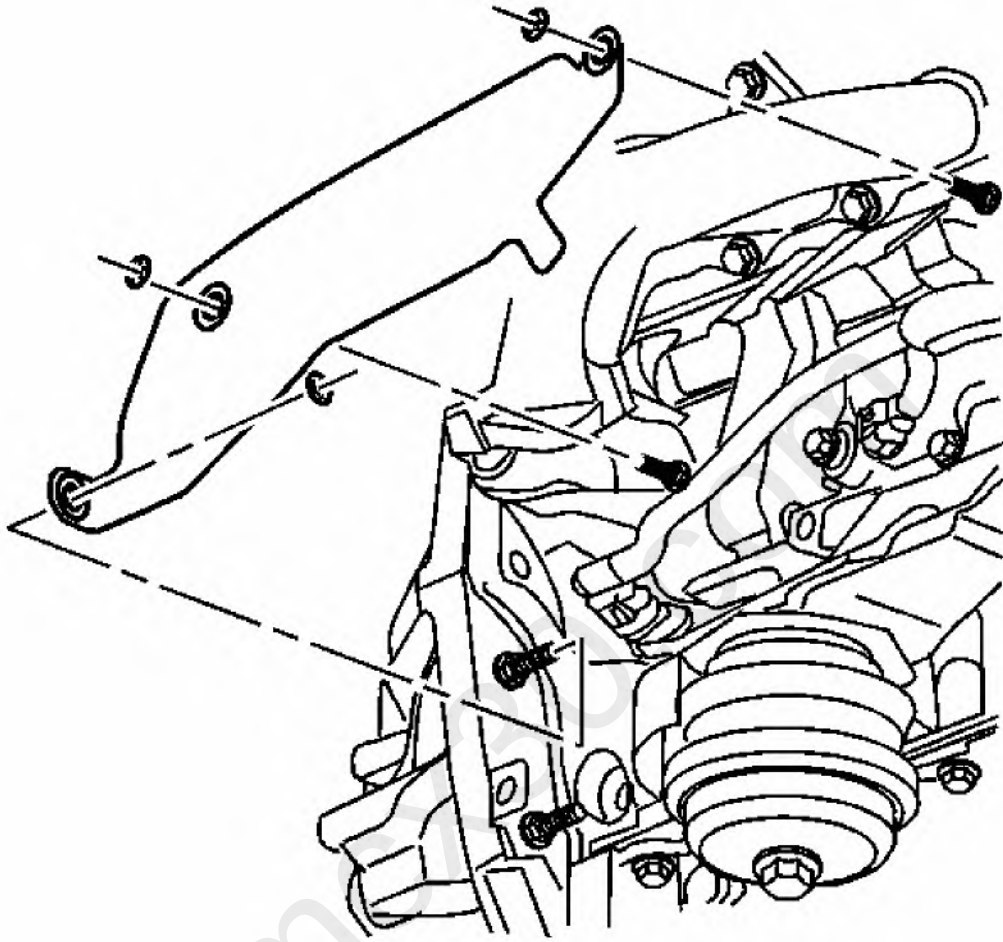
**Fig. 61: View Of Radiator Outlet Pipe & Bolt**  
Courtesy of GENERAL MOTORS CORP.

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.

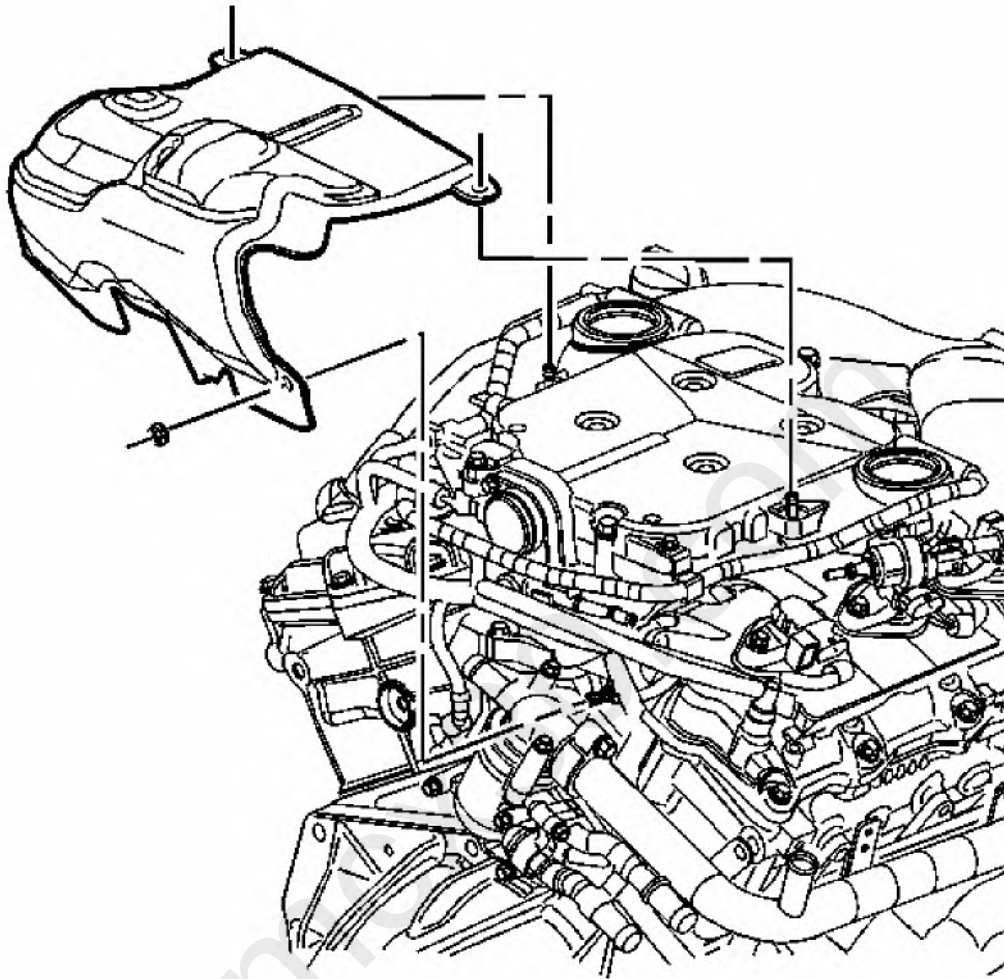
**Tighten:** Tighten the radiator outlet pipe bolt to 50 N.m (27 lb ft).



**Fig. 62: 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. 63: View Of Intake Manifold Insulator**  
Courtesy of GENERAL MOTORS CORP.

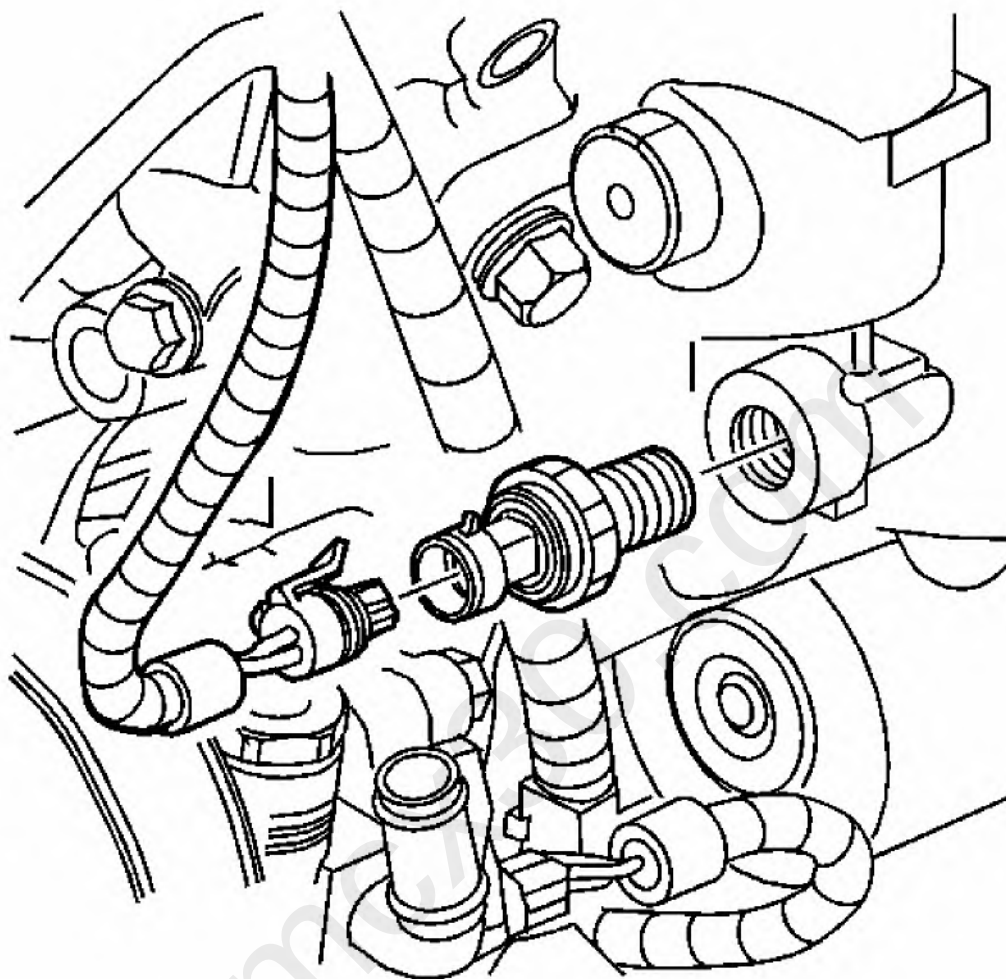
54. Install the intake manifold insulator.
55. Install the intake manifold insulator nut.

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

## ENGINE PRELUBING - OFF VEHICLE

### Tools Required

- J-21867-6 Oil Pressure Adapter Fitting. See Special Tools .
- J 45299 Engine Preluber. See Special Tools .



**Fig. 64: 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.

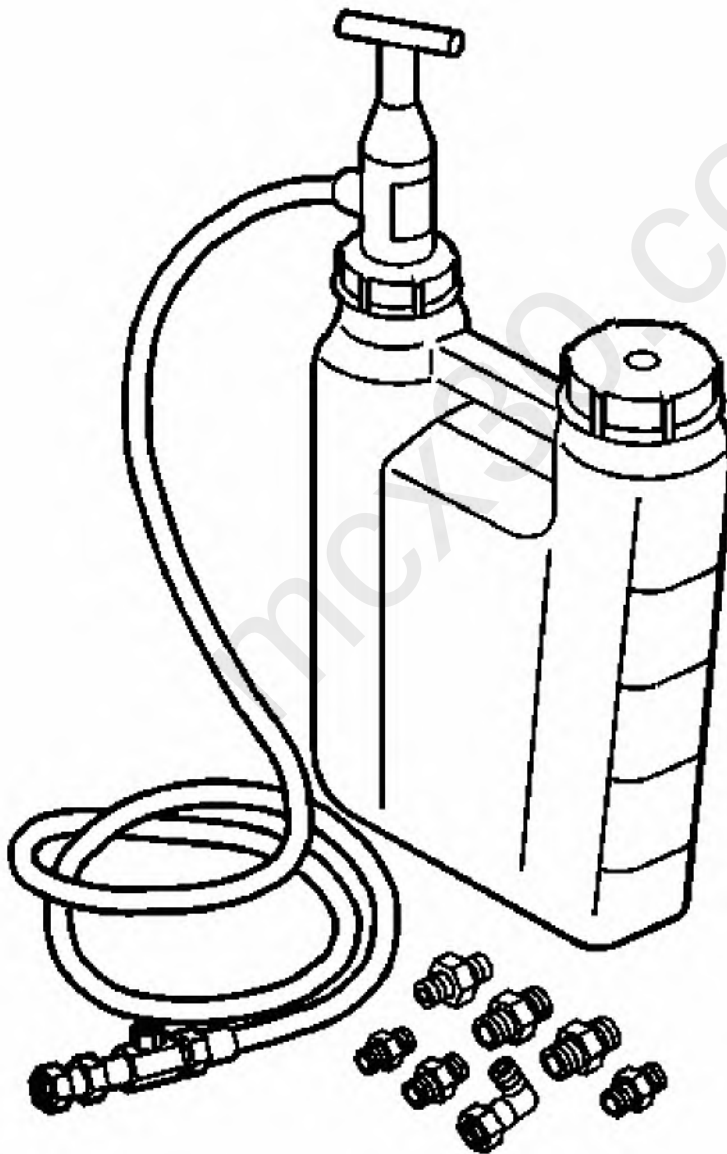
1. Remove the oil filter cap.
2. Install the NEW oil filter cartridge.
3. Lubricate the threads of the oil filter cap with clean engine oil.

**NOTE:** Refer to Fastener Notice .

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 **J-21867-6** . See **Special Tools** .



**Fig. 65: 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. See **Special Tools** .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.