

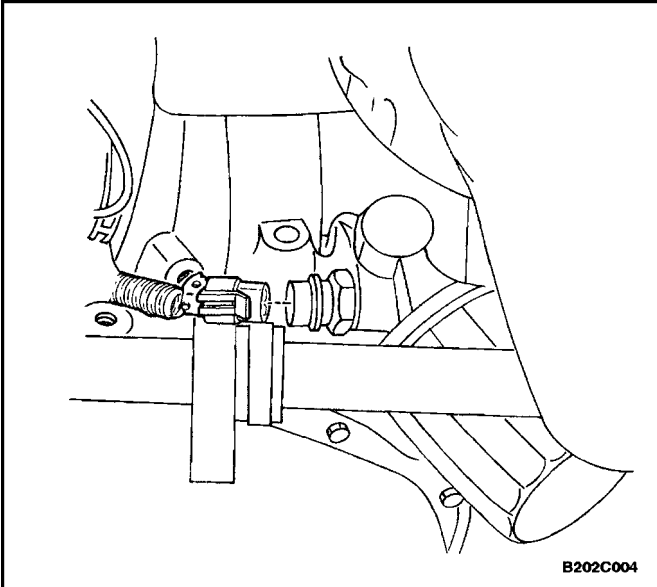
## OIL PUMP

### Tools Required

KM-498-B Pressure Gauge  
KM-135 Adapter

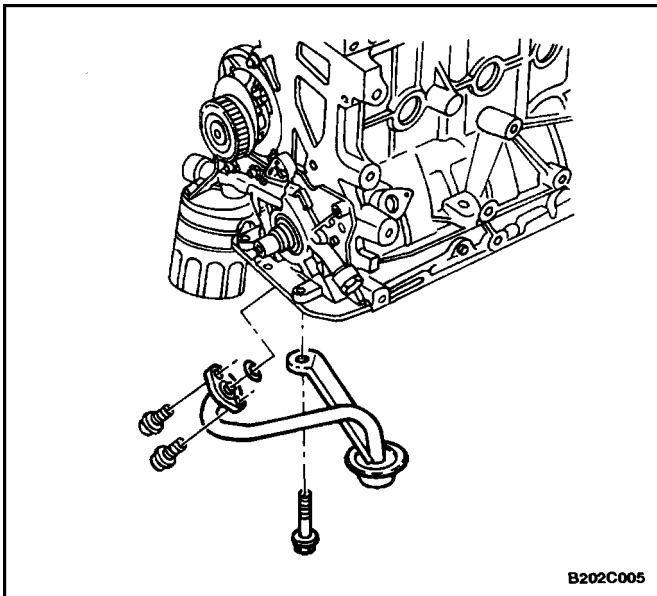
### Engine Oil Pressure Inspection Procedure

1. Remove the right front wheel well splash shield. Refer to *Section 9R, Body Front End*.
  2. Remove the oil pressure switch connector.
  3. Install the adapter KM-135 in place of the oil pressure switch.
  4. Connect the pressure gauge KM-498-B to the adapter.
  5. Start the engine and check the oil pressure at idle speed and an engine temperature of 80°C (176°F). The minimum oil pressure should be 30 kPa (4.35 psi).
  6. Stop the engine and remove the oil pressure gauge KM-498-B and the adapter KM-135.
  7. Install the oil pressure switch.
- Tighten**  
Tighten the oil pressure switch to 40 N•m (30 lb–ft).
8. Connect the electrical connector to the oil pressure switch.
  9. Install the right front wheel well splash shield. Refer to *Section 9R, Body Front End*.
  10. Check the oil level. Fill the oil reservoir to the full mark.

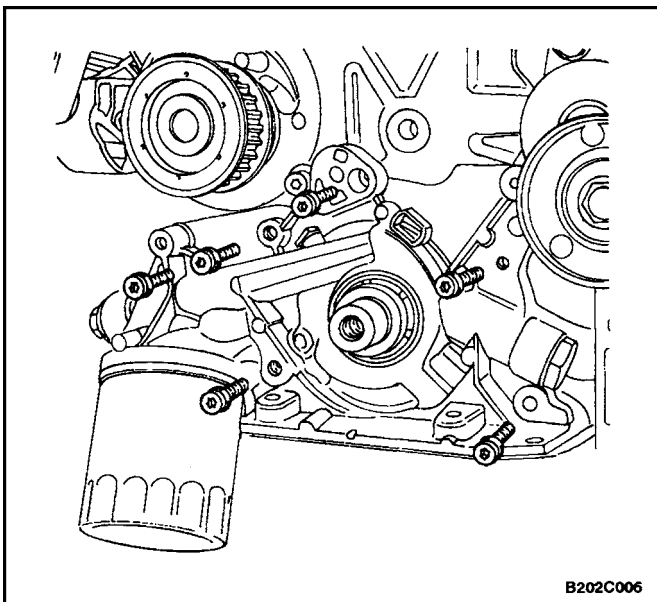


### Removal Procedure

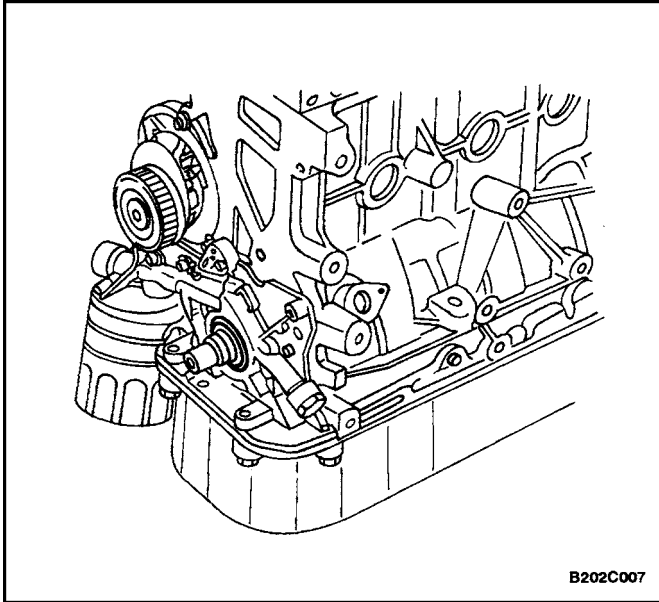
1. Disconnect the negative battery cable.
2. Remove the timing belt. Refer to "Timing Belt" in this section.
3. Remove the rear timing belt cover. Refer to "Rear Timing Belt Cover" in this section.
4. Disconnect the oil pressure switch connector.



5. Remove the oil pan. Refer to "Oil Pan" in this section.
6. Remove the oil pump pickup tube and support bracket bolts.
7. Remove the oil pump pickup tube.

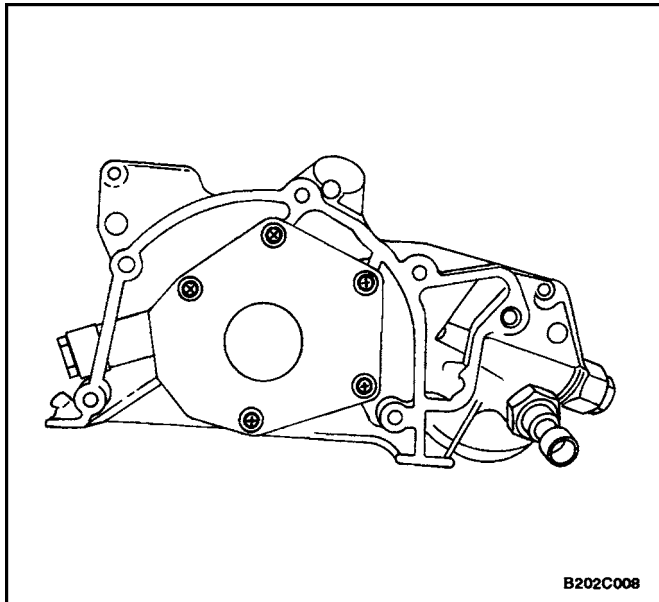


8. Remove the oil pump retaining bolts.
9. Carefully separate the oil pump and the gasket from the engine block and the oil pan.
10. Remove the oil pump.

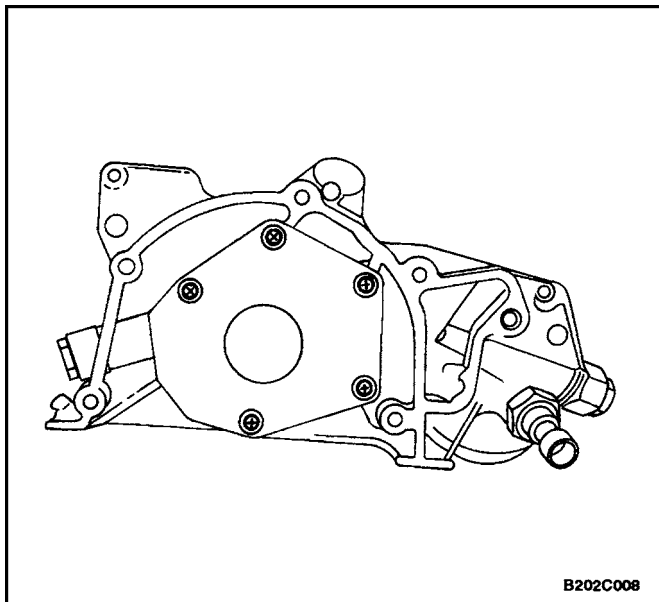


## Inspection Procedure

1. Clean the oil pump and the engine block gasket mating surfaces.
2. Remove the safety relief valve bolt.
3. Remove the safety relief valve and the spring.
4. Remove the oil pump-to-crankshaft seal.



5. Remove the oil pump rear cover bolts.
6. Remove the rear cover.



7. Clean the oil pump housing and all the oil pump parts.
8. Inspect all the oil pump parts for signs of wear. Refer to "Engine Specifications" in this section. Replace the worn oil pump parts.

**Notice :** Pack the oil pump gear cavity with petroleum jelly to ensure an oil pump prime, or engine damage could result.

9. Coat all the oil pump parts with clean engine oil. Install the oil pump parts.
10. Apply Loctite® 242 to the oil pump rear cover bolts and install the rear cover and the bolts.

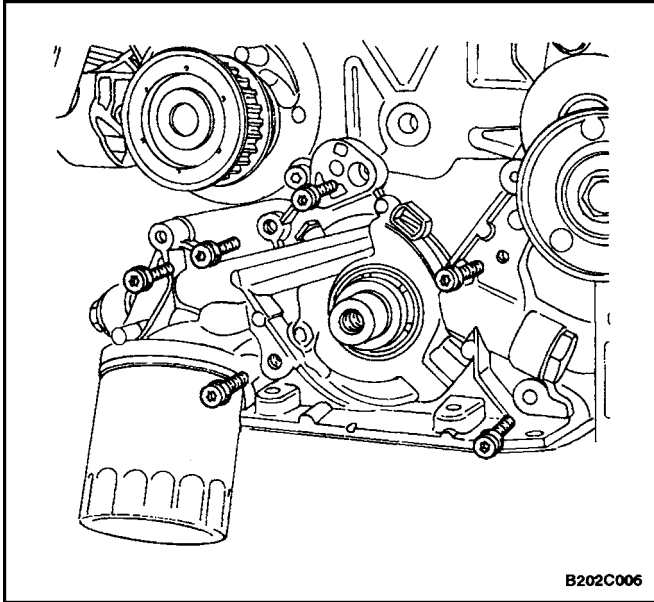
### Tighten

Tighten the oil pump rear cover bolts to 6 N•m (53 lb-in).

11. Install the safety relief valve, the spring, the washer, and the bolt.

### Tighten

Tighten the safety relief valve bolt to 30 N•m (22 lb-ft).

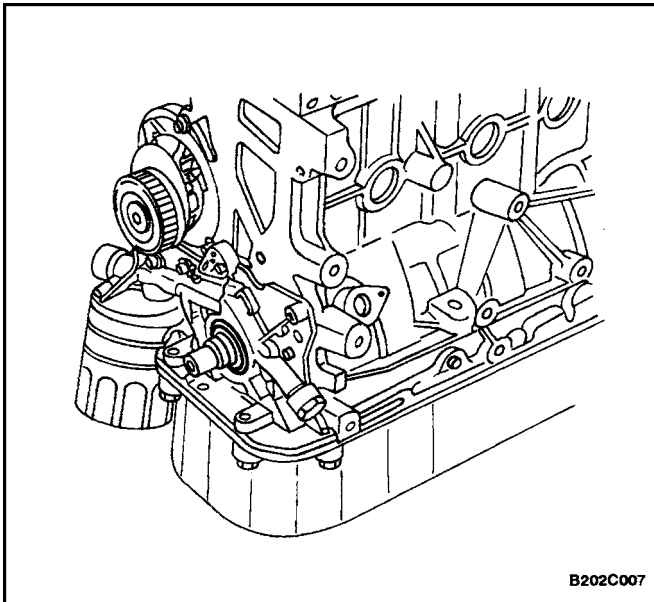


### Installation Procedure

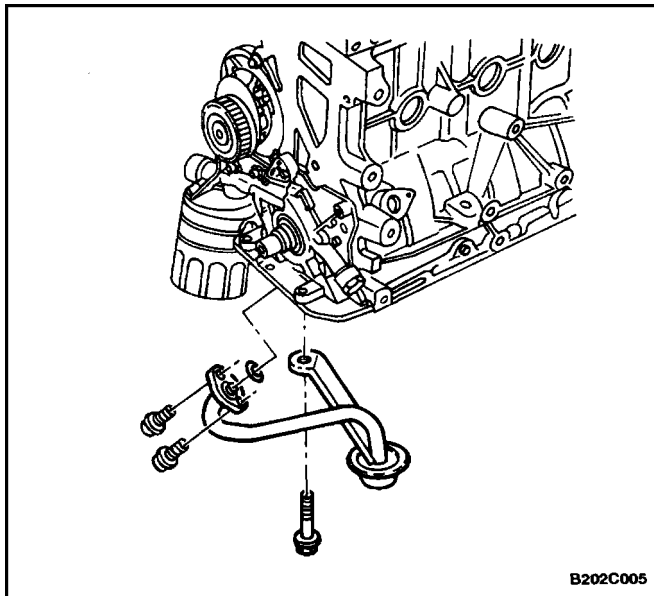
1. Apply Loctite® 242 to the oil pump bolts and room temperature vulcanizing (RTV) sealant to the new oil pump gasket.
2. Install the gasket to the oil pump and install the oil pump to the engine block with the bolts.

#### Tighten

Tighten the oil pump retaining bolts to 10 N•m (89 lb-in).



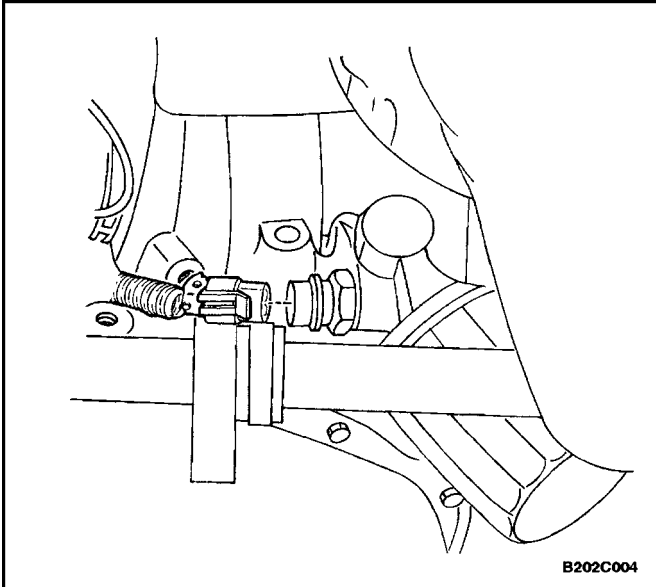
3. Install a new oil pump-to-crankshaft seal. Coat the lip of the seal with a thin coat of grease.



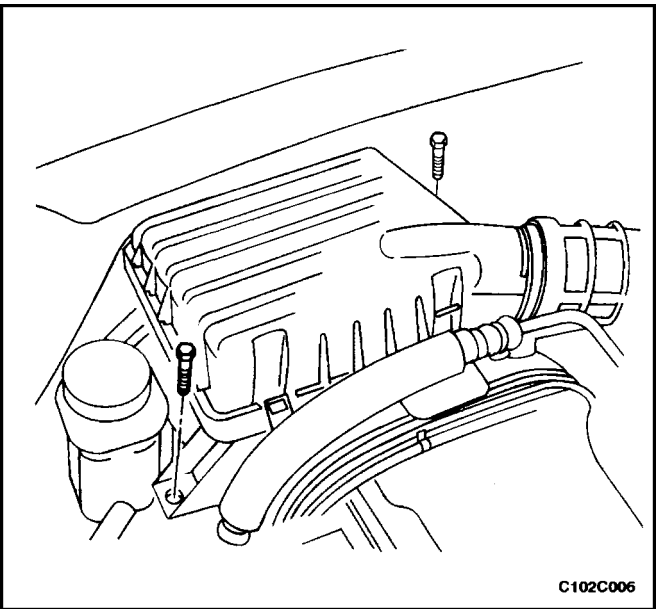
4. Coat the threads of the oil pump pickup tube and the support bracket bolts with Loctite® 242.
5. Install the oil pump pickup tube to the support bracket with the bolts.

#### Tighten

Tighten the oil pump pickup tube bolts to 8 N•m (71 lb-in) and oil pump pickup tube support bracket bolt to 10 N•m (89 lb-in).



6. Install the oil pan. Refer to "Oil Pan" in this section.
7. Connect the oil pressure switch connector.
8. Install the rear timing belt cover. Refer to "Rear Timing Belt Cover" in this section.
9. Install the timing belt. Refer to "Timing Belt" in this section.
10. Connect the negative battery cable.



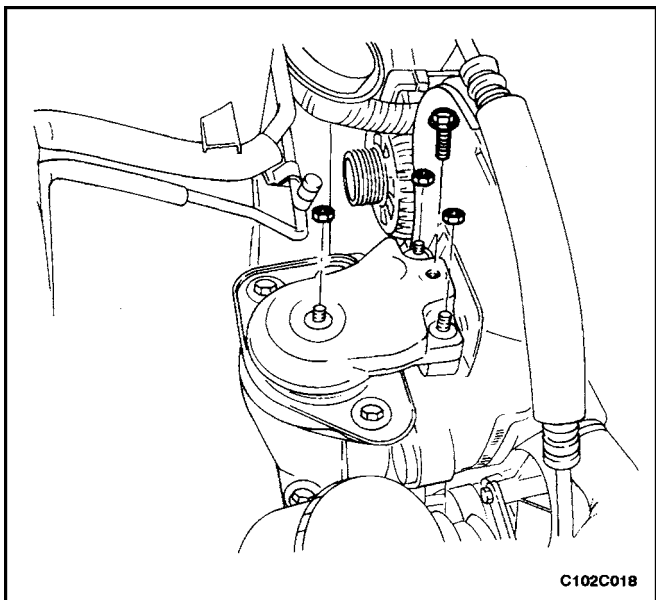
## ENGINE MOUNT, RIGHT SIDE

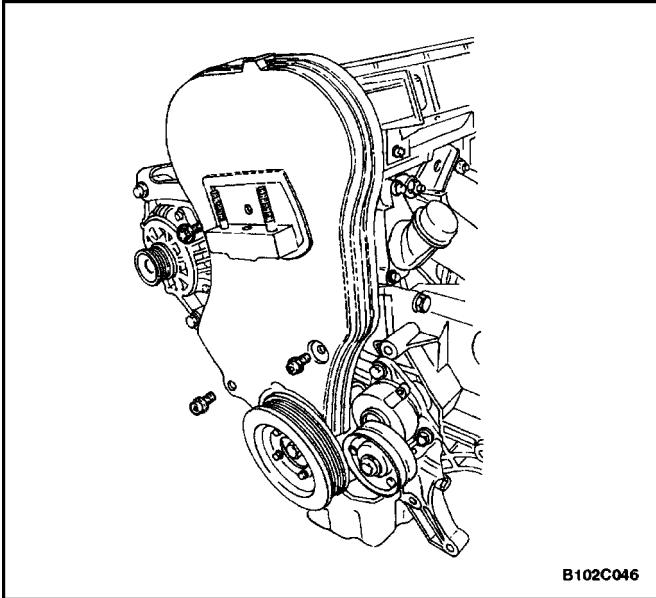
### Tools Required

J-28467-B Engine Support Fixture

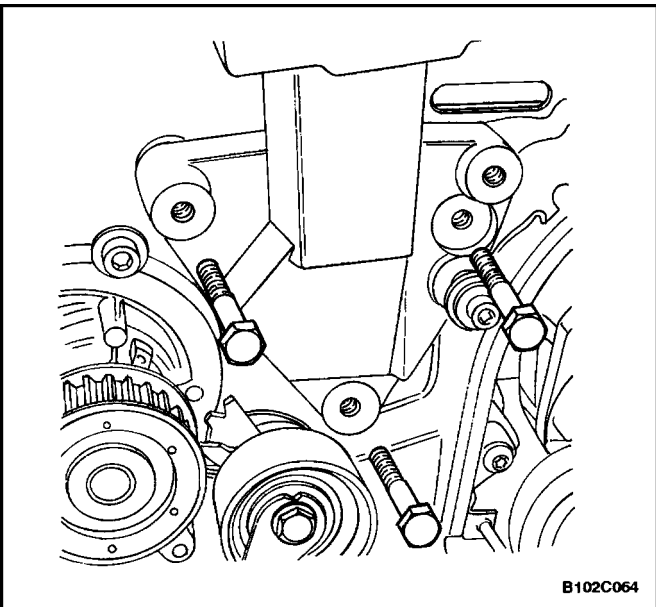
### Removal Procedure

1. Disconnect the negative battery cable.
2. Support the engine assembly using the engine support fixture J-28467-B.
3. Remove the right front wheel well splash shield. Refer to *Section 9R, Body Front End*.
4. Remove the air filter housing assembly bolts.
5. Remove the air filter housing assembly.
6. Remove the engine mount bracket retaining bolts.
7. Remove the engine mount bracket.
8. Remove the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.





9. Remove the front timing belt cover bolts and the front timing belt cover.
10. Turn the crankshaft gear bolt to align the timing mark pointer on the crankshaft pulley with the timing marks on the rear cover of the camshaft gears.
11. Loosen the timing belt automatic tensioner bolt.
12. Turn the hex-key tab to relieve belt tension.
13. Remove the timing belt idler pulley nuts.
14. Remove the timing belt idler pulley.
15. Remove the engine mount retaining bolts.
16. Remove the engine mount.

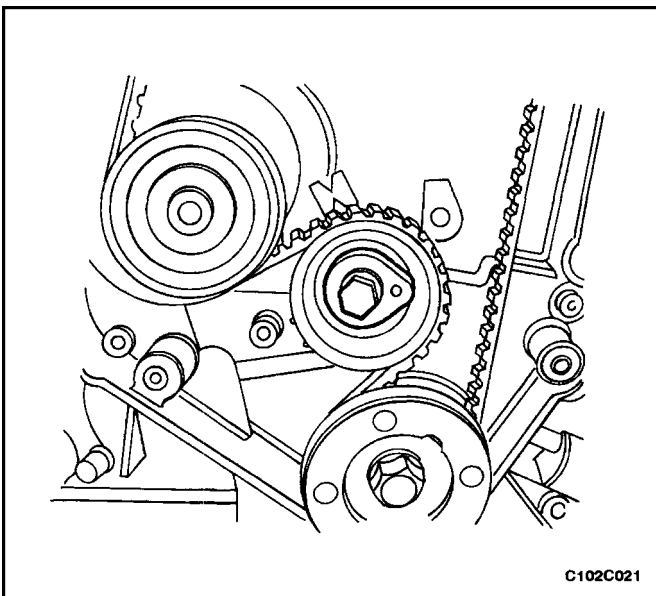


### Installation Procedure

1. Install the engine mount.
2. Install the engine mount retaining bolts.

#### Tighten

Tighten the engine mount bolts to 60 N•m (44 lb–ft).



3. Install the timing belt idler pulleys.
4. Install the timing belt idler pulley nuts.

#### Tighten

Tighten the timing belt idler pulley nuts to 25 N•m (18 lb–ft).

5. Increase the tension on the timing belt by turning the timing belt automatic tensioner hex-key tab counterclockwise until the pointer is aligned to the indicator.

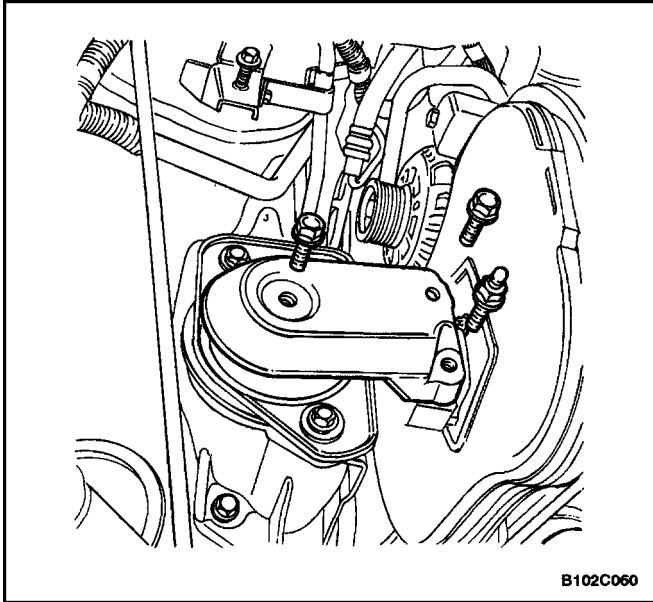
#### Tighten

Tighten the timing belt automatic tensioner bolt to 25 N•m (18 lb–ft).

6. Install the front timing belt cover.
7. Install the front timing belt cover bolts.

#### Tighten

Tighten the front timing belt cover bolts to 6 N•m (53 lb–in).



8. Install the engine mount bracket and retaining bolts.

### **Tighten**

Tighten the engine mount bolts to 60 N•m (44 lb–ft).

9. Remove the engine support fixture J–28467–B.
10. Install the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.
11. Install the air filter housing assembly with the bolts.

### **Tighten**

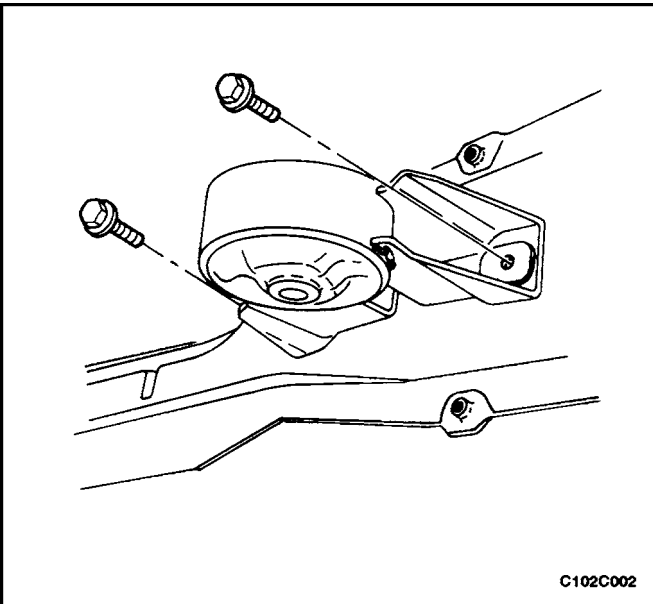
Tighten the air filter housing bolts to 8 N•m (71 lb–in).

12. Install the right front wheel well splash shield. Refer to *Section 9R, Body Front End*.
13. Connect the negative battery cable.

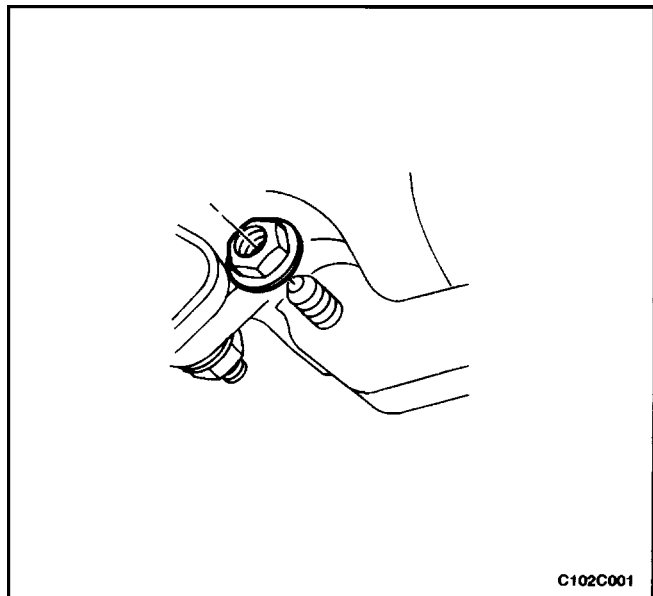
## **ENGINE MOUNT, FORWARD**

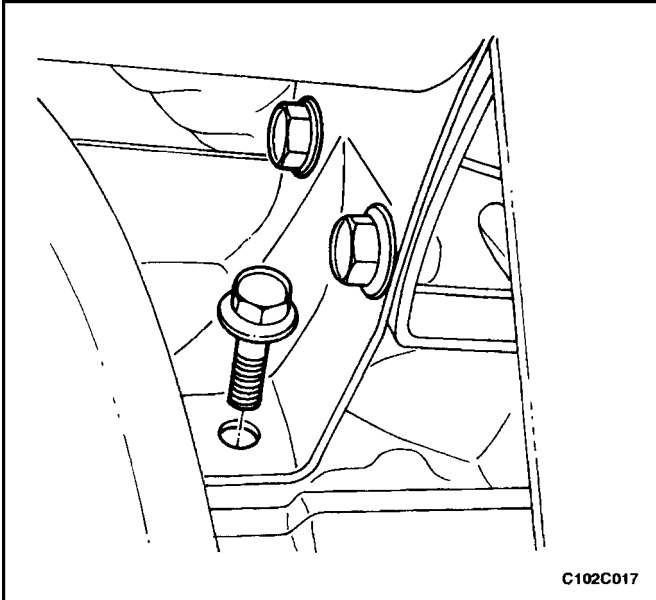
### **Removal Procedure**

1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle.
3. Remove the center member. Refer to *Section 9N, Frame and Underbody*.
4. Remove the bolts that secure the engine mount to the center member.
5. Remove the engine mount.

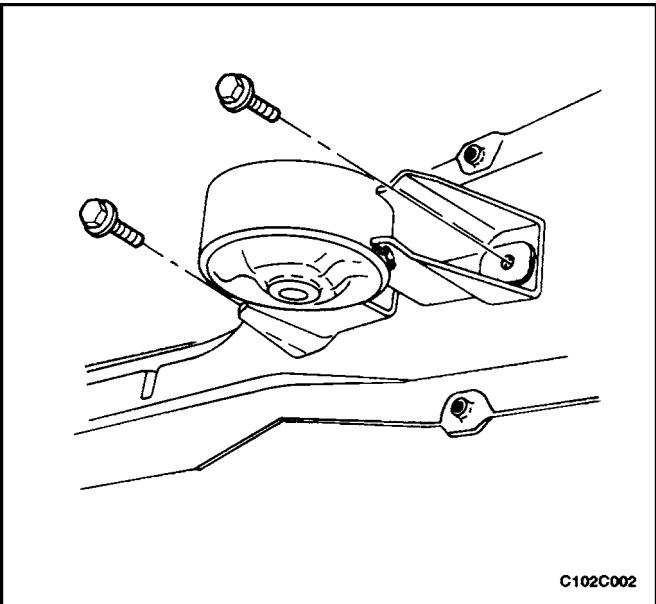


6. Remove the engine mount bracket-to-engine block nuts.





7. Remove the engine mount bracket-to-engine block bolts.
8. Remove the engine mount bracket.

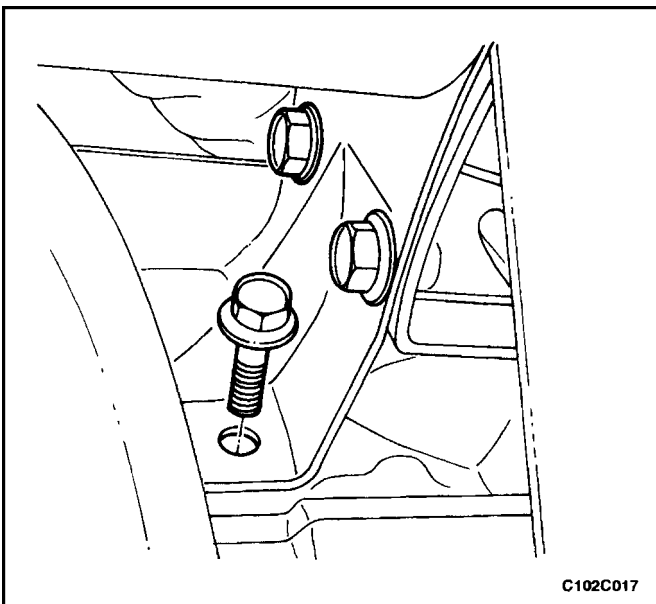


### Installation Procedure

1. Install the engine mount and bolts to the center member.

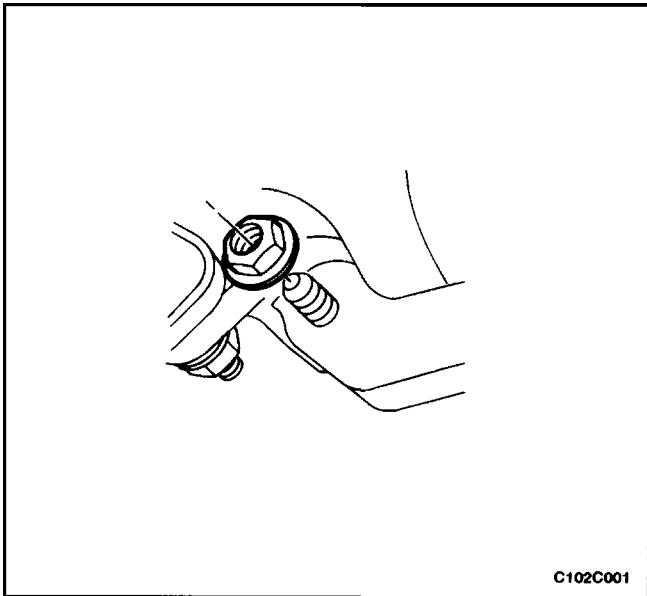
#### **Tighten**

Tighten the engine mount bolts to 60 N•m (44 lb–ft).



2. Install the engine mount bracket-to-engine block bolts.



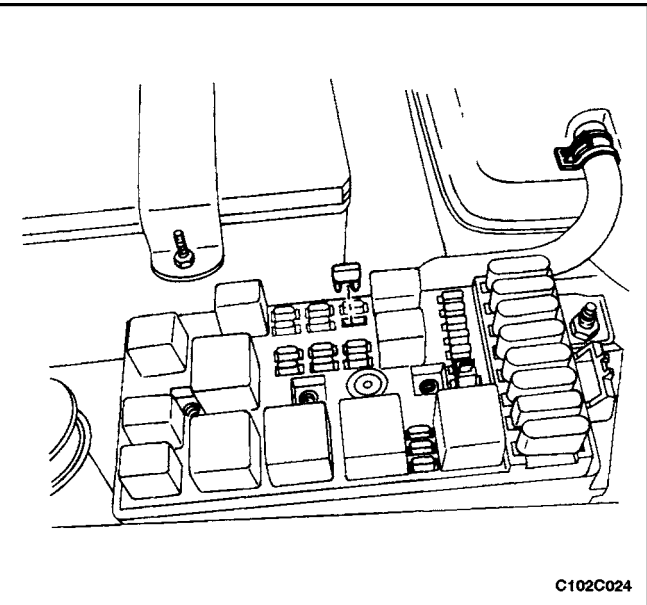


3. Install the engine mount bracket-to-engine block nuts.

### **Tighten**

Tighten the engine mount bracket-to-engine block bolts and nuts to 90 N•m (66 lb–ft).

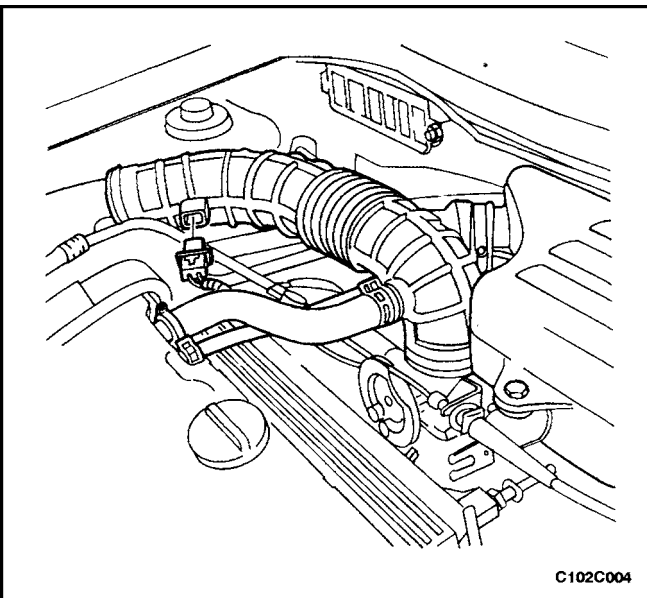
4. Install the center member. Refer to Section *Section 9N, Frame and Underbody*.
5. Lower the vehicle.
6. Connect the negative battery cable.



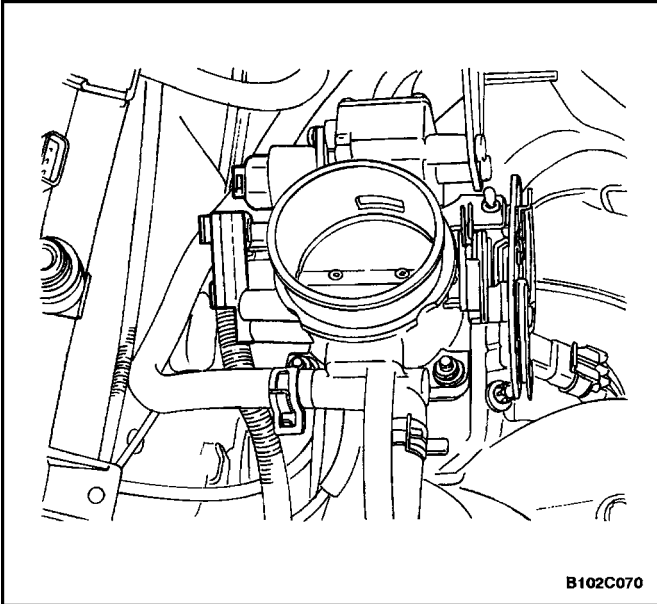
## **INTAKE MANIFOLD**

### **Removal Procedure**

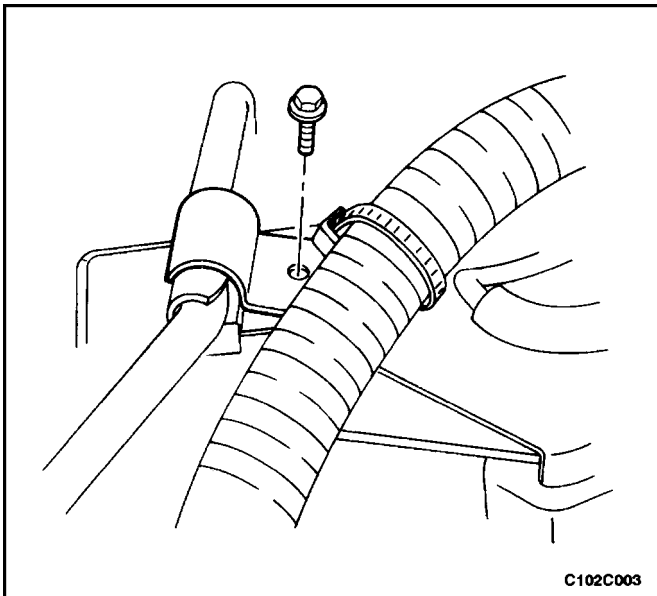
1. Remove the fuel pump fuse.
2. Start the engine. After it stalls, crank the engine for 10 seconds to rid the fuel system of fuel pressure.
3. Disconnect the negative battery cable.
4. Disconnect the evaporative (EVAP) emission canister purge solenoid from the intake manifold and loosen the bracket bolt.
5. Drain the engine coolant. Refer to *Section 1D, Engine Cooling*.



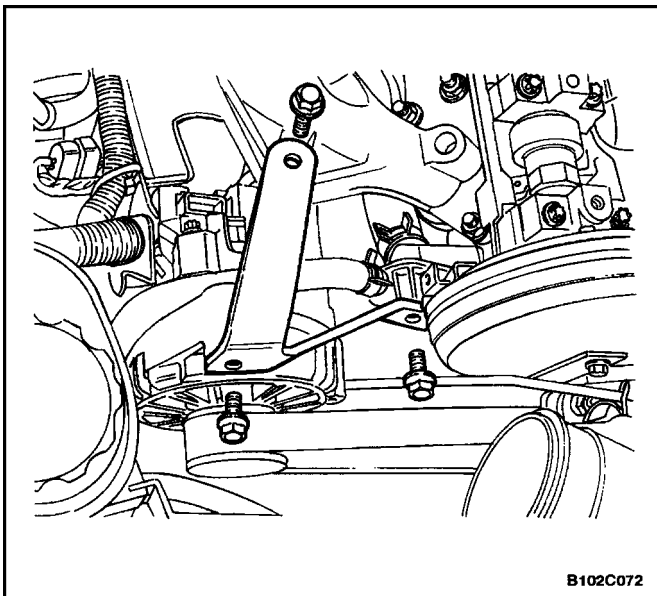
6. Disconnect the intake air temperature (IAT) sensor connector.
7. Disconnect the air intake tube from the throttle body.



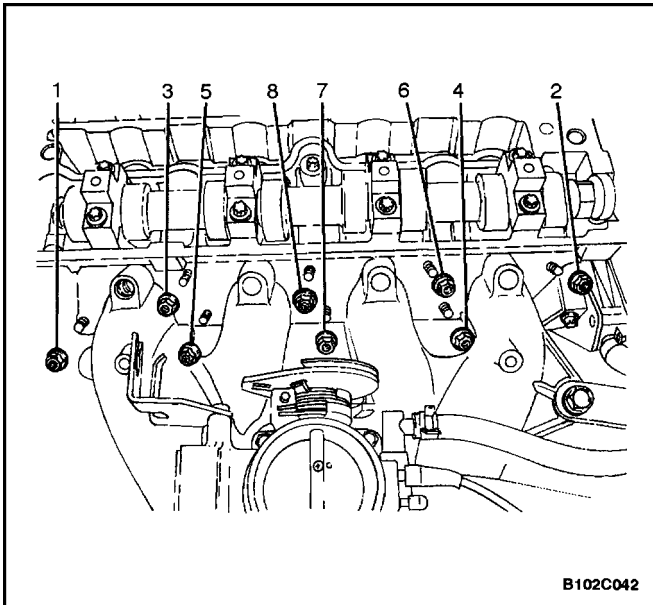
8. Disconnect the idle air control (IAC) valve connector.
9. Disconnect the throttle position sensor (TPS) connector.
10. Disconnect the manifold absolute pressure (MAP) sensor connector.
11. Disconnect the coolant hoses at the throttle body.



12. Disconnect the vacuum hoses as needed, including the vacuum hose at the fuel pressure regulator and the brake booster vacuum hose at the intake manifold.
13. Disconnect the throttle cable from the throttle body and the intake manifold.
14. Remove the throttle cable bracket bolts from the intake manifold.
15. Remove the throttle cable bracket.
16. Remove the generator-to-intake manifold strap bracket bolts and the strap.
17. Remove the power steering hose clamp bolt, and position the hose clear of the repair area.

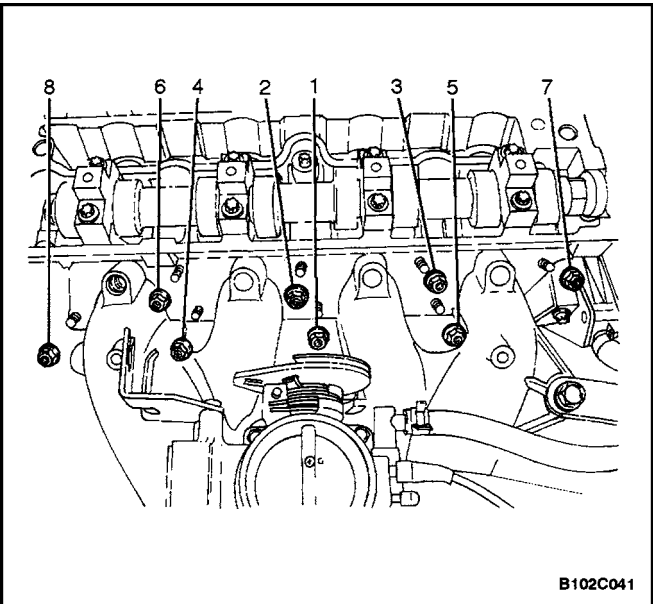


18. Remove the fuel rail and the injector cover as an assembly. Refer to *Section 1F, Engine Controls*.
19. Remove the generator-to-intake manifold support bracket bolts.
20. Remove the generator-to-intake manifold support bracket.
21. Remove the intake manifold support bracket bolt at the engine block and the intake manifold.
22. Remove the intake manifold support bracket.



B102C042

23. Remove the intake manifold retaining bolts and the nuts in the sequence shown.
24. Remove the intake manifold.
25. Remove the intake manifold gasket.
26. Clean the sealing surfaces of the intake manifold and the cylinder head.



B102C041

## Installation Procedure

1. Install the intake manifold gasket.
2. Install the intake manifold.
3. Install the intake manifold retaining bolts and the nuts in the sequence shown.

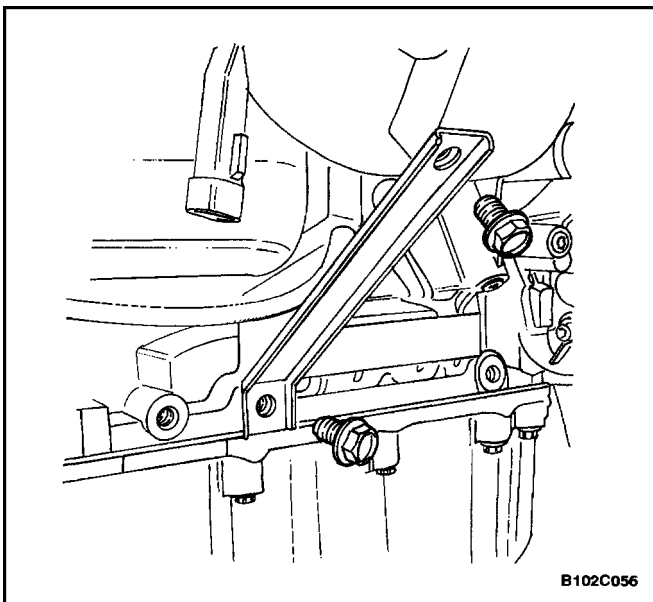
### Tighten

Tighten the intake manifold retaining bolts and the nuts to 18 N•m (13 lb–ft).

4. Install the generator-to-intake manifold strap bracket and bolts.

### Tighten

Tighten the generator-to-intake manifold strap bracket bolts to 20 N•m (15 lb–ft).



B102C056

5. Install the intake manifold support bracket.
6. Install the intake manifold support bracket upper bolts to the intake manifold.

### Tighten

Tighten the intake manifold support bracket upper bolts to 20 N•m (15 lb–ft).

7. Install the intake manifold support bracket lower bolt to the engine block.

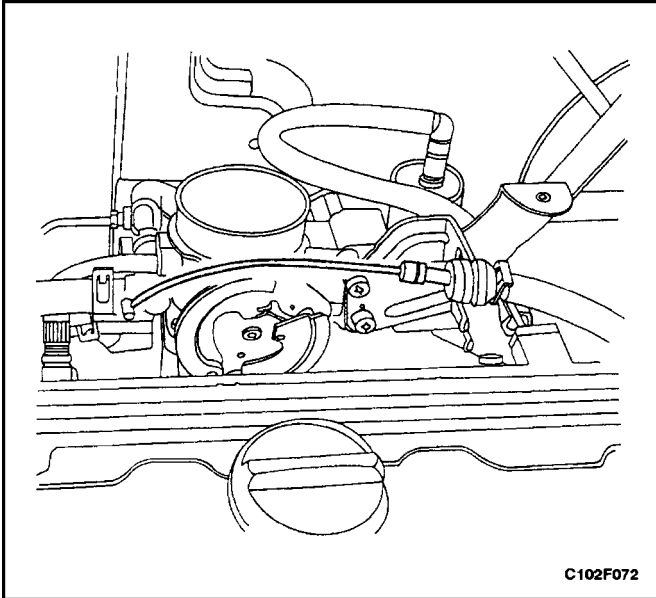
### Tighten

Tighten the intake manifold support bracket lower bolt to 20 N•m (15 lb–ft).

8. Install the generator-to-intake manifold support bracket and bolts.

### Tighten

Tighten the generator-to-intake manifold support bracket bolts to 35 N•m (26 lb–ft).

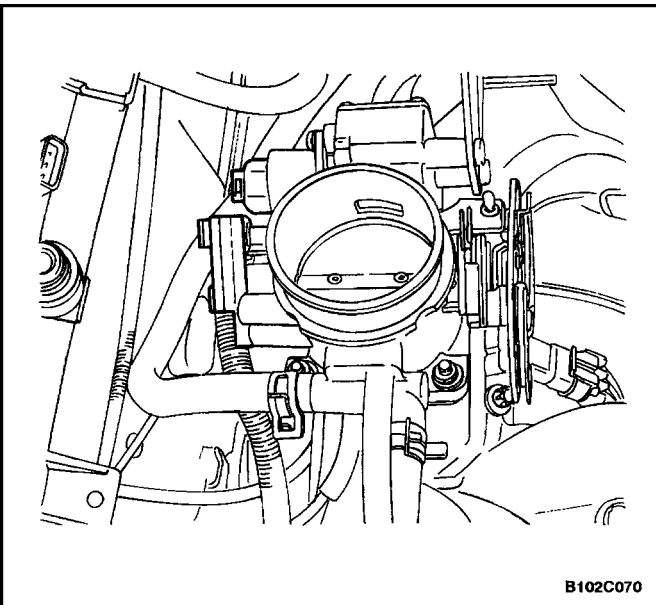


9. Install the fuel rail and the injector cover as an assembly. Refer to *Section 1F, Engine Controls*.
10. Install the throttle cable bracket.
11. Install the throttle cable bracket bolts.

### **Tighten**

Tighten the throttle cable bracket bolts to 8 N•m (71 lb-in).

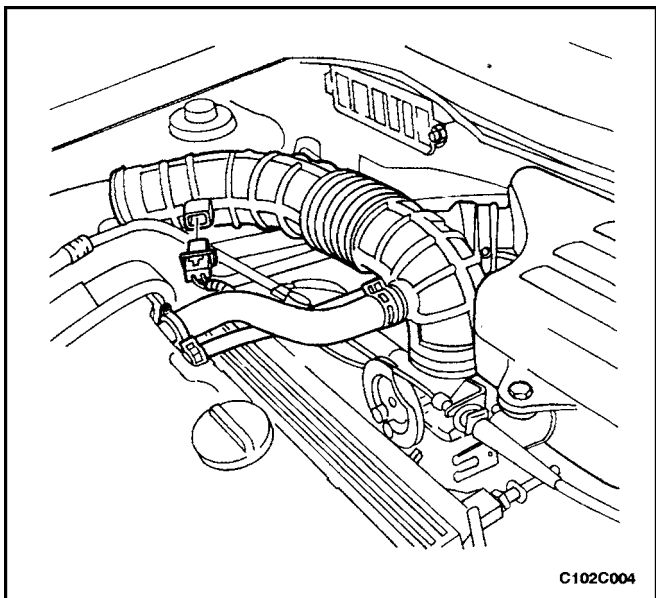
12. Connect the throttle cable to the intake manifold and the throttle body.
13. Connect all the previously disconnected vacuum lines.



14. Connect the MAP sensor connector.
15. Connect the coolant hoses to the throttle body.
16. Connect the IAC valve connector.
17. Connect the TPS connector.
18. Position the power steering hose in place and install the clamp bolt.

### **Tighten**

Tighten the power steering hose clamp bolt to 8 N•m (71 lb-in).

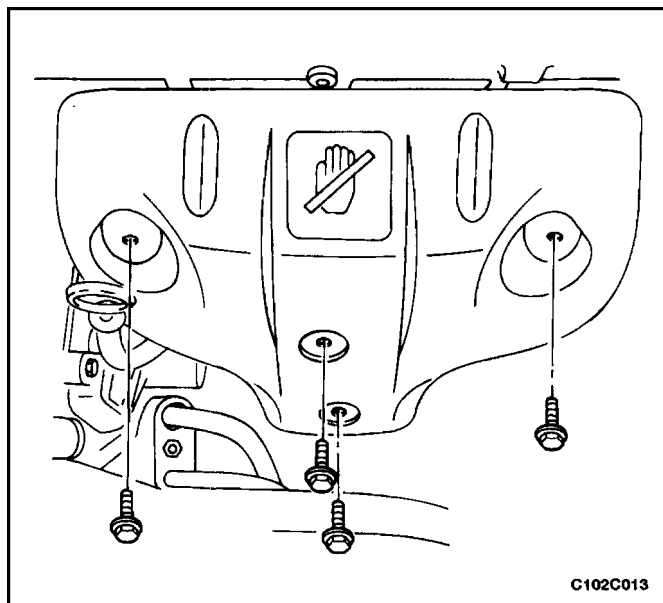


19. Connect the air intake tube to the throttle body.
20. Connect the IAT sensor connector.
21. Connect the EVAP emission canister purge solenoid at the intake manifold and tighten the bracket bolt.

### **Tighten**

Tighten the canister purge solenoid bracket bolt to 5 N•m (44 lb-in).

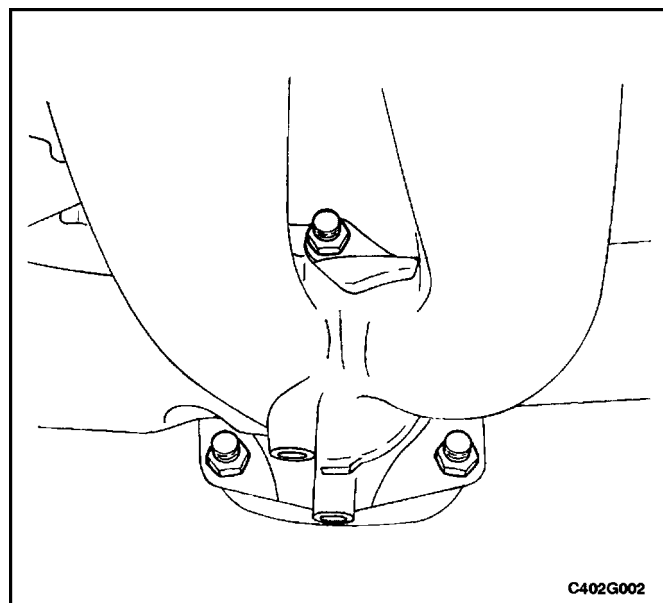
22. Install the fuel pump fuse.
23. Connect the negative battery cable.
24. Refill the engine cooling system. Refer to *Section 1D, Engine Cooling*.



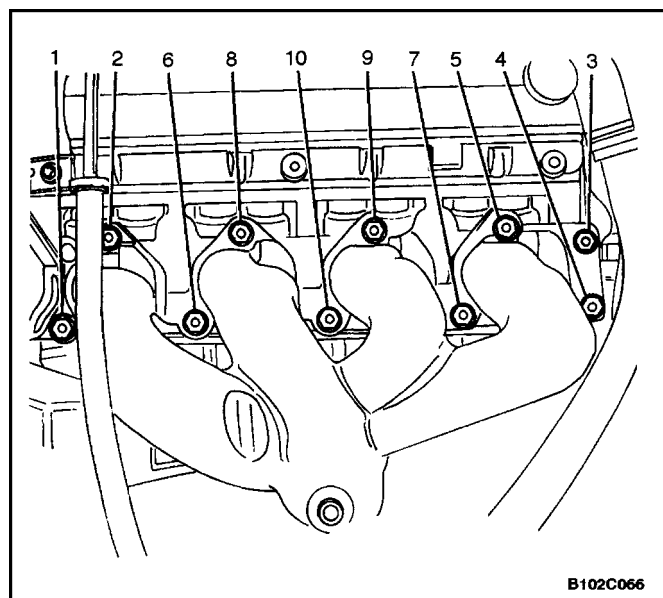
## EXHAUST MANIFOLD

### Removal Procedure

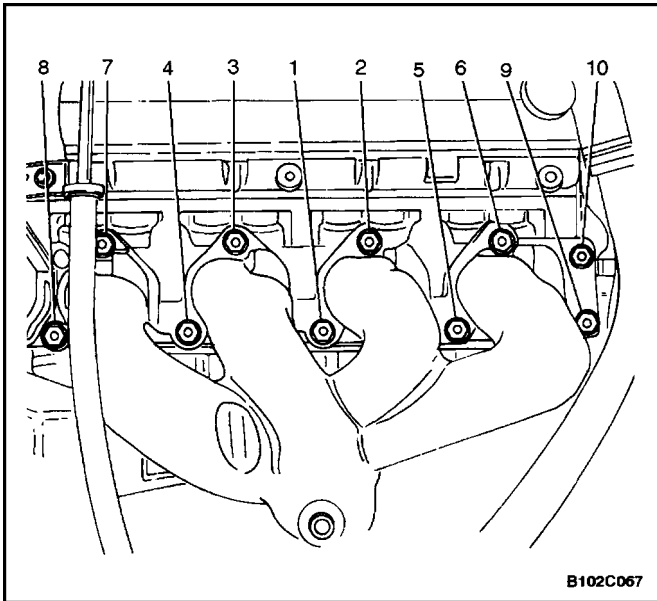
1. Disconnect the negative battery cable.
2. Disconnect the oxygen sensor connector.
3. Remove the exhaust manifold heat shield bolts.
4. Remove the exhaust manifold heat shield.



5. Remove the auxiliary catalytic converter upper flange nuts.



6. Remove the exhaust manifold retaining nuts in the sequence shown.
7. Remove the exhaust manifold.
8. Remove the exhaust manifold gasket.
9. Clean the sealing surfaces of the exhaust manifold and the cylinder head.

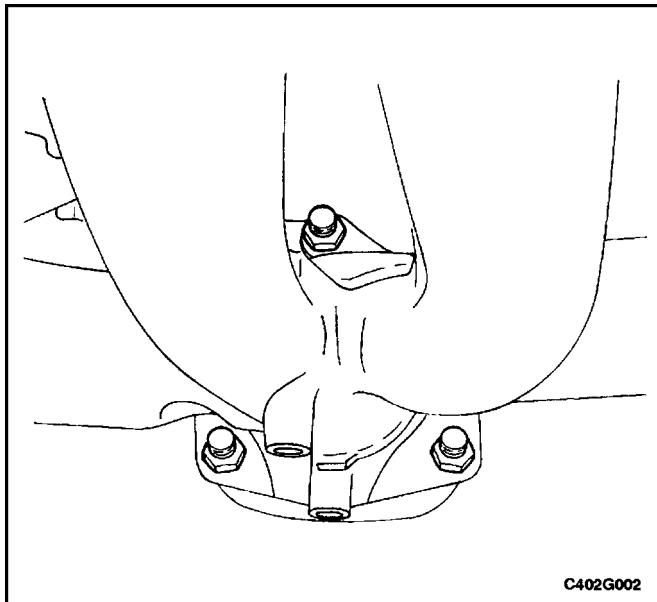


### Installation Procedure

1. Install the exhaust manifold gasket.
2. Install the exhaust manifold.
3. Install the exhaust manifold retaining nuts and tighten in the sequence shown four complete passes and tighten 1,2 and 3 bolt one more time.

#### Tighten

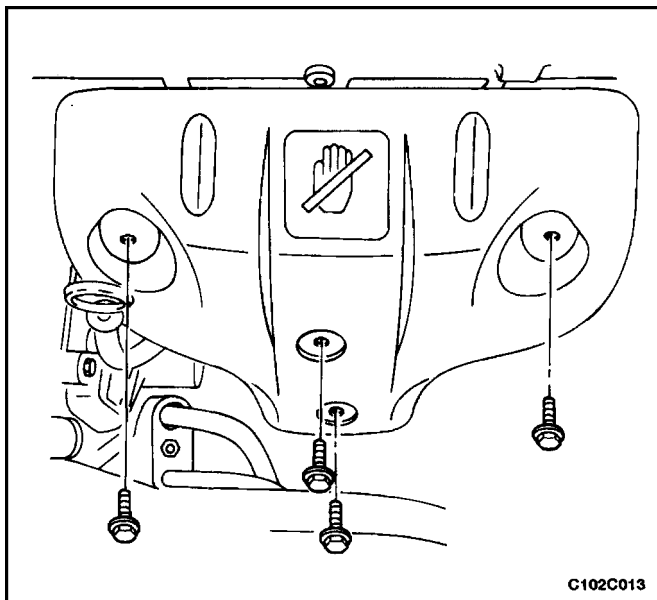
Tighten the exhaust manifold retaining nuts 15 N•m (11 lb–ft).



4. Install the auxiliary catalytic converter upper flange nuts.

#### Tighten

Tighten the auxiliary catalytic converter-to-exhaust manifold nuts to 40 N•m (30 lb–ft).

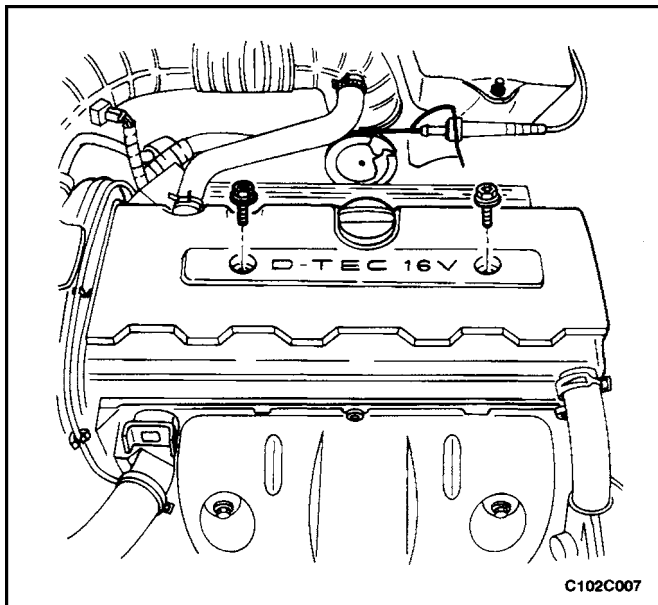


5. Install the exhaust manifold heat shield.
6. Install the exhaust manifold heat shield bolts.

#### Tighten

Tighten the exhaust manifold heat shield bolts to 8 N•m (71 lb–in).

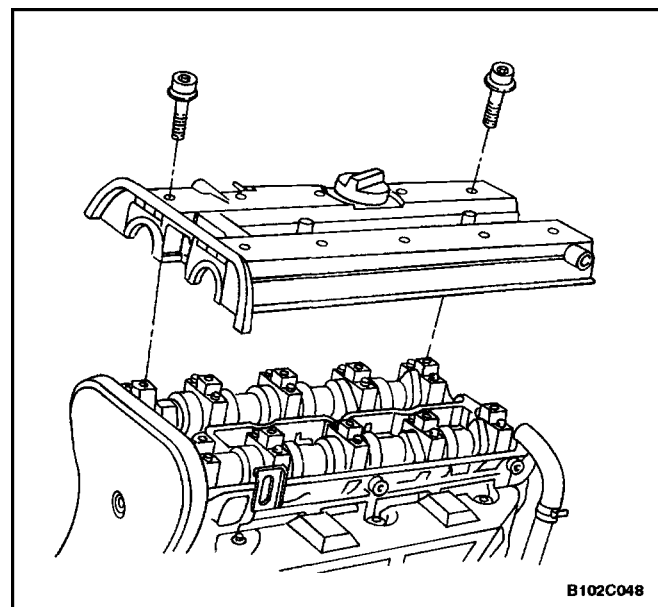
7. Connect the oxygen sensor connector.
8. Connect the negative battery.



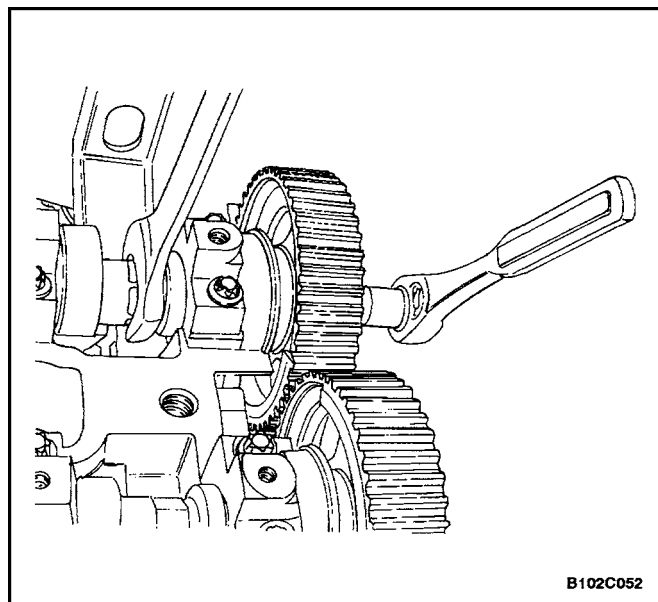
## CAMSHAFT GEARS

### Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the timing belt. Refer to "Timing Belt" in this section.
3. Remove the spark plug cover bolts.
4. Remove the spark plug cover.
5. Disconnect the ignition wires from the spark plugs.
6. Disconnect the crankcase breather tubes from the valve cover.

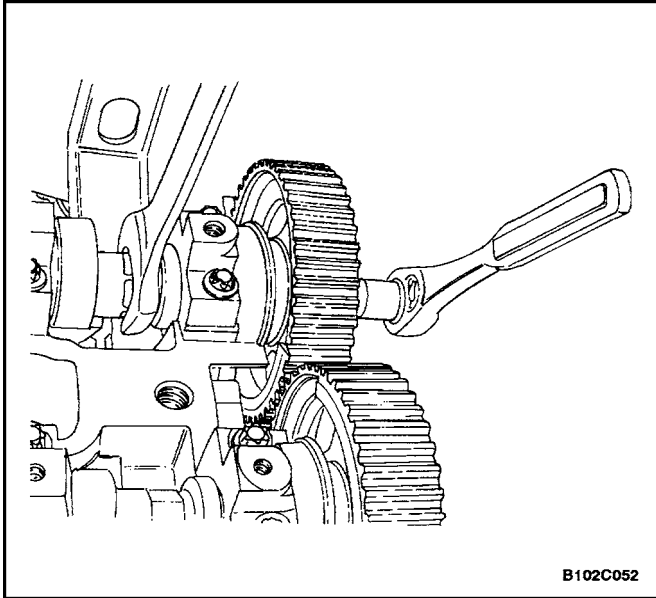


7. Remove the valve cover bolts.
8. Remove the valve cover washers.
9. Remove the valve cover and the valve cover gasket.



**Notice :** Take extreme care to prevent any scratches, nicks, or damage to the camshafts.

10. While holding the intake camshaft firmly in place, remove the intake camshaft gear bolt.
11. Remove the intake camshaft gear.
12. While holding the exhaust camshaft firmly in place, remove the exhaust camshaft gear bolt.
13. Remove the exhaust camshaft gear.



## Installation Procedure

**Notice :** Take extreme care to prevent any scratches, nicks, or damage to the camshafts.

1. Install the intake camshaft gear.
2. While holding the intake camshaft firmly in place, install the intake camshaft gear bolt.

### Tighten

Tighten the intake camshaft gear bolt to 50 N•m (37 lb–ft). Using the angular torque gauge KM–470–B, tighten the bolt an additional turn of 60 degrees, plus another turn of 15 degrees.

3. Install the exhaust camshaft gear.
4. While holding the exhaust camshaft firmly in place, install the exhaust camshaft gear bolt.

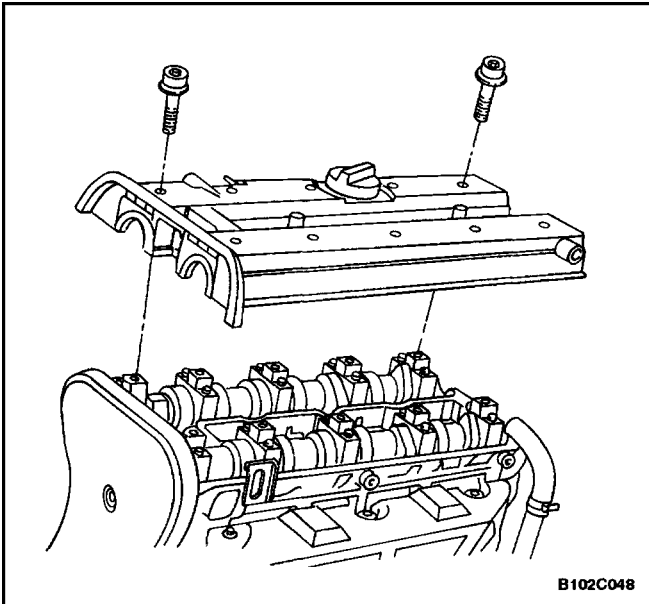
### Tighten

Tighten the exhaust camshaft gear bolt to 50 N•m (37 lb–ft). Using the angular torque gauge KM–470–B, tighten the bolt an additional turn of 60 degrees, plus another turn of 15 degrees.

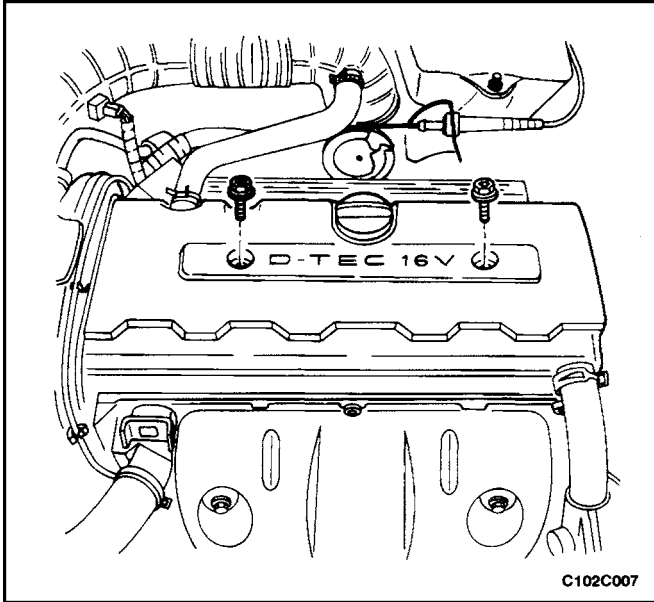
5. Apply a small amount of gasket sealant to the corners of the front camshaft caps and to the top of the rear valve cover–to–cylinder head seal.
6. Install the valve cover and the valve cover gasket.
7. Install the valve cover washers.
8. Install the valve cover bolts.

### Tighten

Tighten the valve cover bolts to 8 N•m (71 lb–in).







9. Connect the crankcase breather tubes to the valve cover.
10. Connect the ignition wires to the spark plugs.
11. Install the spark plug cover.
12. Install the spark plug cover bolts.

### **Tighten**

Tighten the spark plug cover bolts to 3 N•m (27 lb-in).

13. Install the timing belt. Refer to "Timing Belt" in this section.
14. Connect the negative battery cable.

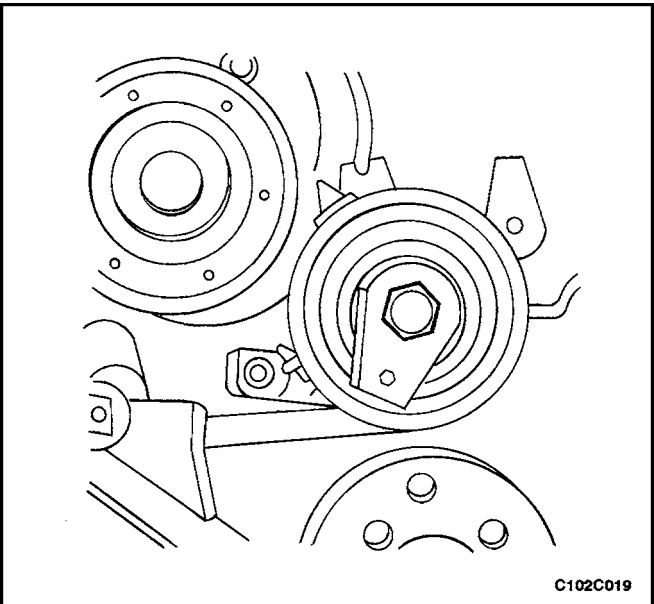
## **REAR TIMING BELT COVER**

### **Tools Required**

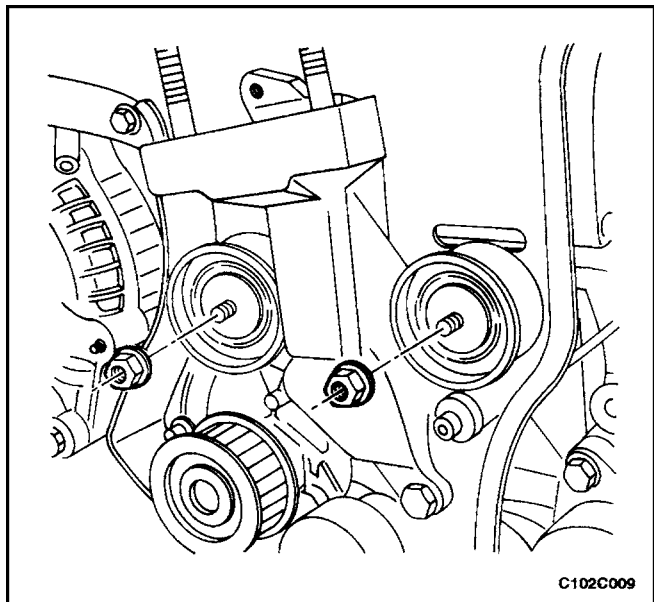
KM-470-B Torque Angular Gauge

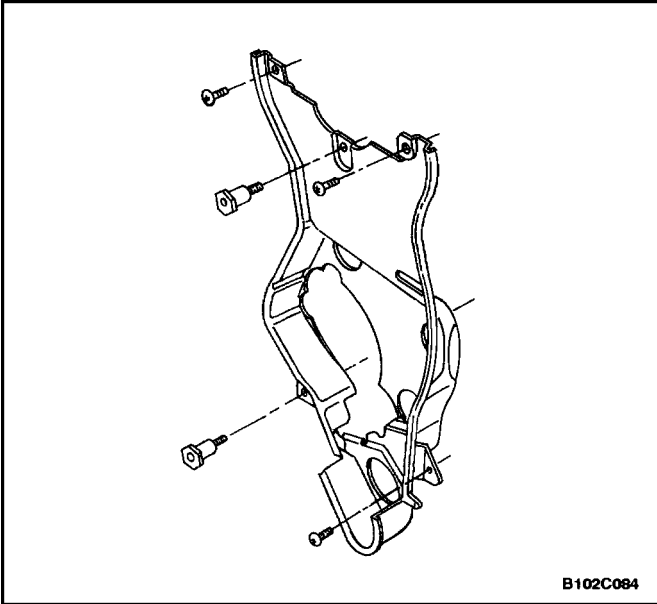
### **Removal Procedure**

1. Disconnect the negative battery cable.
2. Remove the timing belt. Refer to "Timing Belt" in this section.
3. Remove the camshaft gears. Refer to "Camshaft Gears" in this section.
4. Remove the timing belt automatic tensioner bolt.
5. Remove the timing belt automatic tensioner.

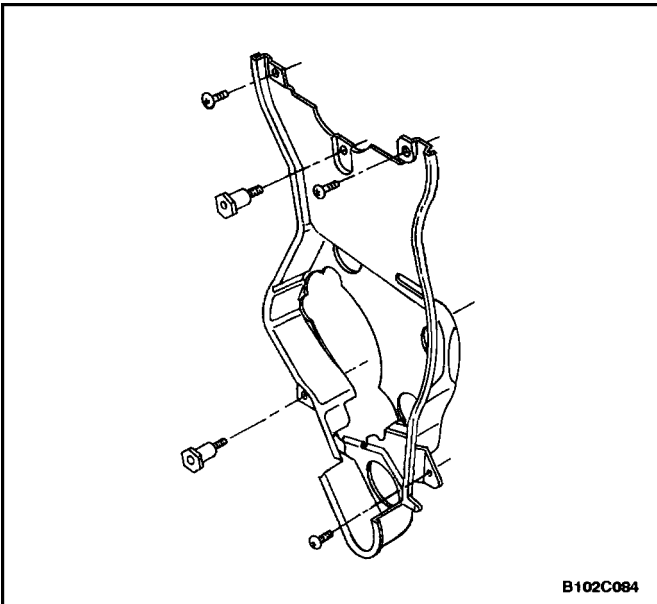


6. Remove the timing belt idler pulley nuts.
7. Remove the timing belt idler pulleys.
8. Remove the engine mount retaining bolts.
9. Remove the engine mount.
10. Remove the crankshaft timing belt drive gear bolt.
11. Remove the crankshaft gear.





12. Remove the rear timing belt cover bolts.
13. Remove the rear timing belt cover.



### Installation Procedure

1. Install the rear timing belt cover.
2. Install the rear timing belt cover bolts.

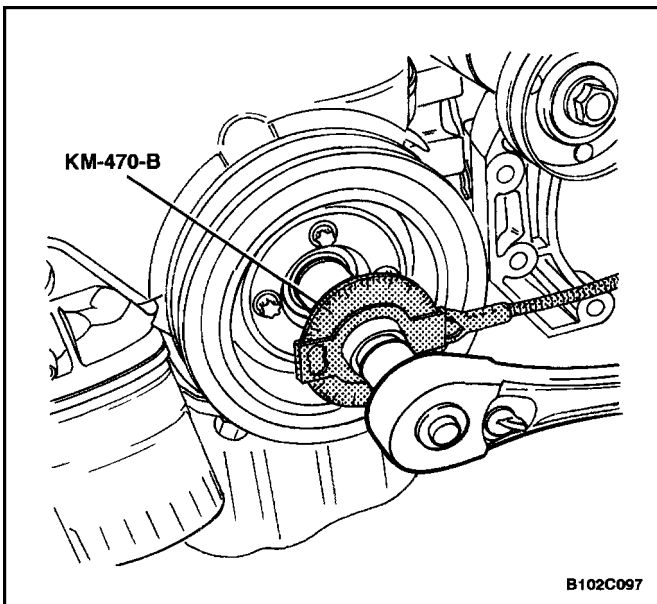
#### **Tighten**

Tighten the rear timing belt cover bolts to 6 N•m (53 lb-in).

3. Install the engine mount and the retaining bolts.

#### **Tighten**

Tighten the engine mount bolts to 60 N•m (44 lb-ft).



4. Install the timing belt idler pulleys.
5. Install the timing belt idler pulley nuts.

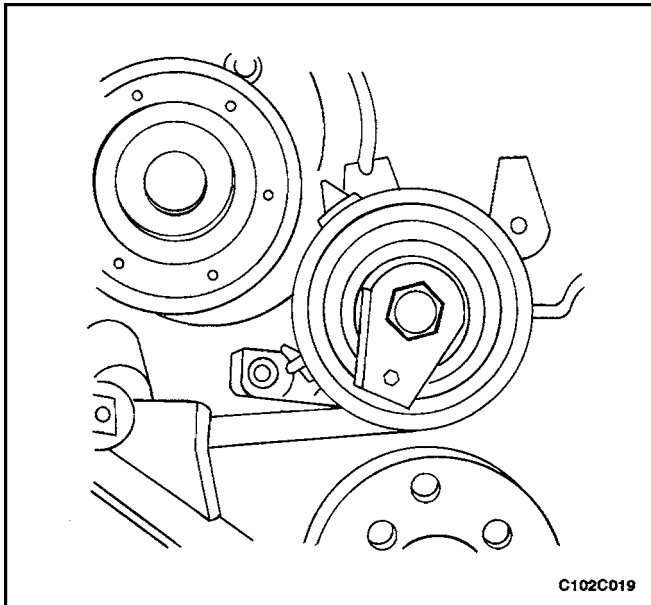
#### **Tighten**

Tighten the timing belt idler pulley nuts to 25 N•m (18 lb-ft).

6. Install the crankshaft timing belt drive gear and bolt.

#### **Tighten**

Tighten the crankshaft timing belt drive gear bolt to 130 N•m (96 lb-ft) plus 40 to 50 degrees using the angular torque gauge KM-470-B.

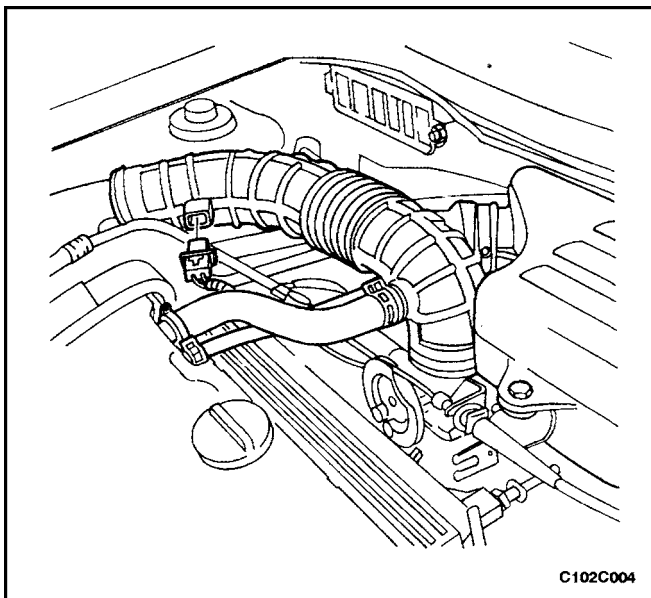
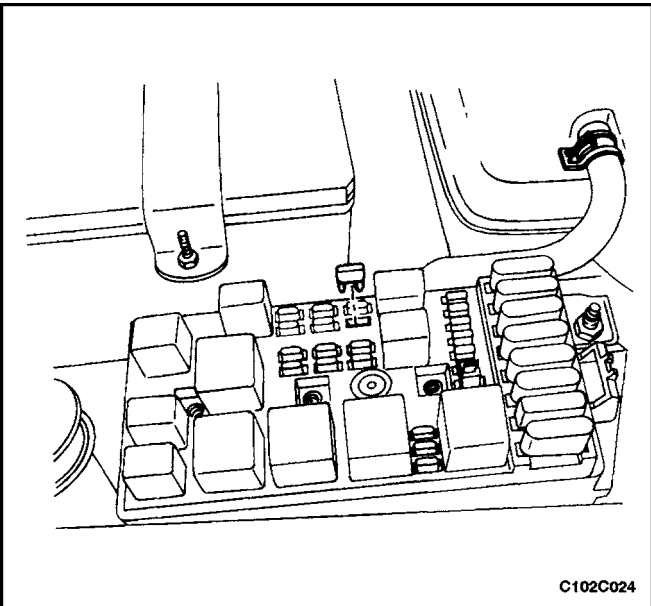


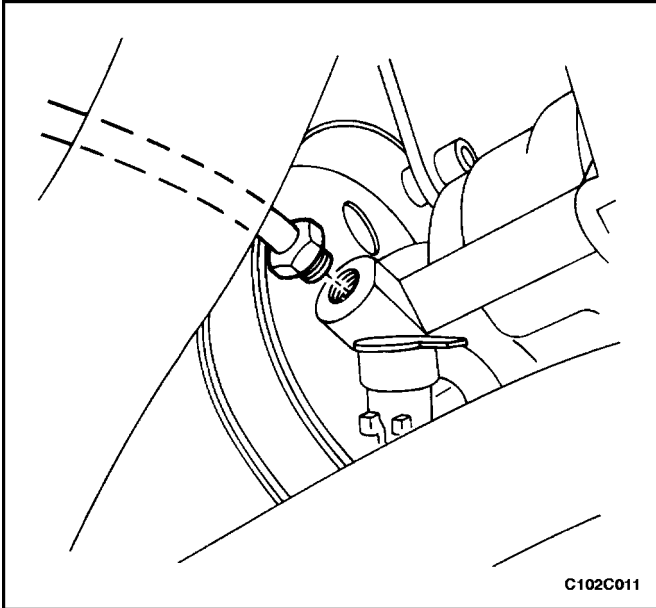
7. Install the timing belt automatic tensioner and bolt.  
**Tighten**  
Tighten the timing belt automatic tensioner bolt to 25 N•m (18 lb–ft).
8. Install the camshaft gears. Refer to "Camshaft Gears" in this section.
9. Install the timing belt and timing belt cover. Refer to "Timing Belt" in this section.
10. Connect the negative battery cable.

## ENGINE

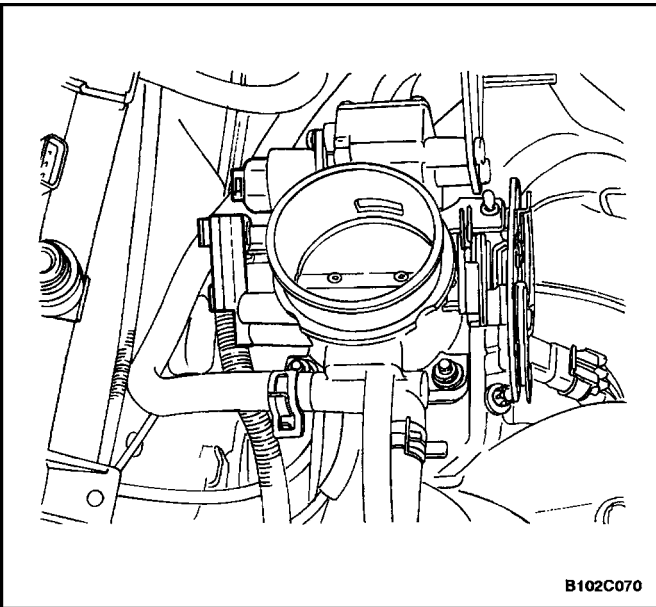
### Removal Procedure

1. Remove the fuel pump fuse.
2. Start the engine. After it stalls, crank the engine for 10 seconds to rid the fuel system of fuel pressure.
3. Remove the hood. Refer to *Section 9R, Body Front End*.
4. Drain the engine oil.
5. Disconnect the negative battery cable.
6. Discharge the air conditioning (A/C) system, if equipped. Refer to *Section 7B, Manual Control Heating, Ventilation, and Air Conditioning System*.
7. Disconnect the intake air temperature (IAT) sensor connector.
8. Remove the air intake tube.
9. Disconnect the breather tubes from the valve cover.
10. Remove the right front wheel. Refer to *Section 2E, Tires and Wheels*.
11. Remove the right front wheel well splash shield. Refer to *Section 9R, Body Front End*.
12. Remove the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.

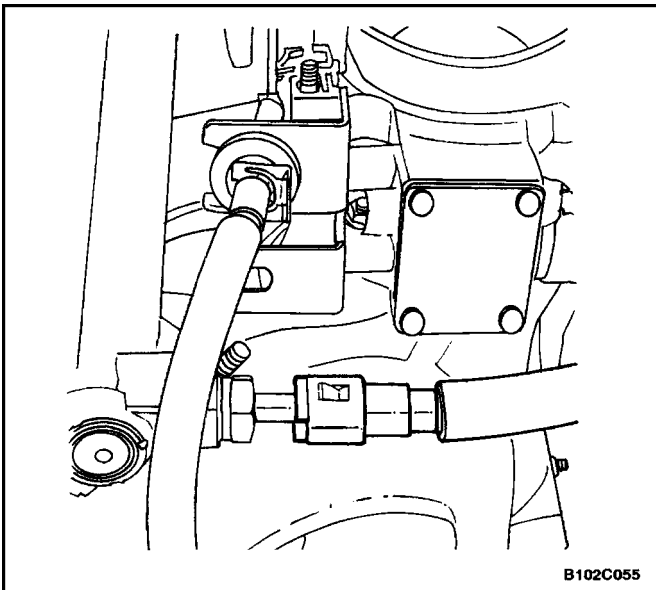




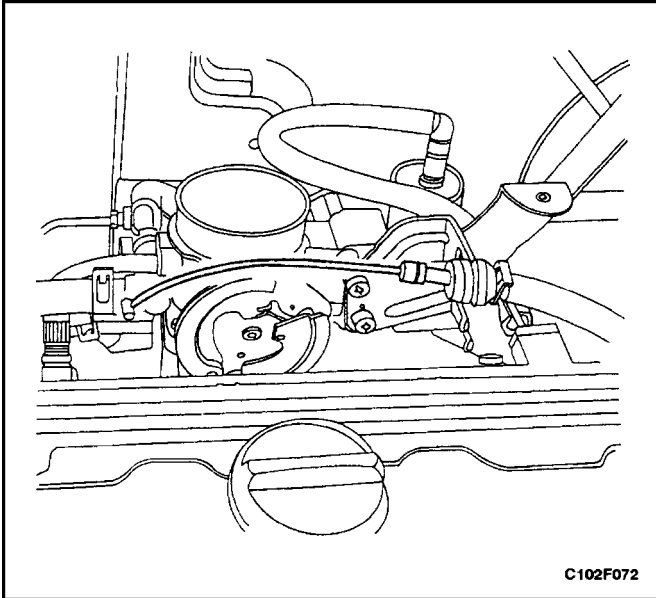
13. Drain the engine coolant. Refer to *Section 1D, Engine Cooling*.
14. Remove the cooling system radiator and the engine cooling fans. Refer to *Section 1D, Engine Cooling*.
15. Disconnect the upper radiator hose from the thermostat housing.
16. Disconnect the power steering return hose from the power steering pump. Collect the oil in a suitable container.
17. Disconnect the power steering pressure hose from the power steering pump. Collect the oil in a suitable container.
18. Disconnect the electrical connector at the electronic ignition (EI) system ignition coil and the engine control module (ECM) ground terminal.



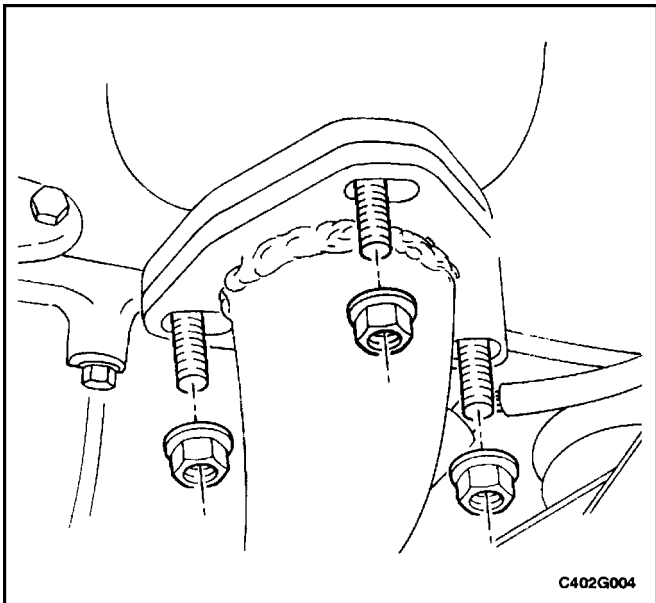
19. Disconnect the oxygen sensor connector.
20. Disconnect the idle air control (IAC) valve connector and the manifold absolute pressure (MAP) sensor connector.
21. Disconnect the throttle position sensor (TPS) connector.
22. Disconnect the engine coolant temperature (ECT) sensor connector.
23. Disconnect the coolant temperature sensor (CTS) connector.
24. Disconnect the generator voltage regulator connector and the power lead.
25. Disconnect the camshaft position (CMP) sensor connector.



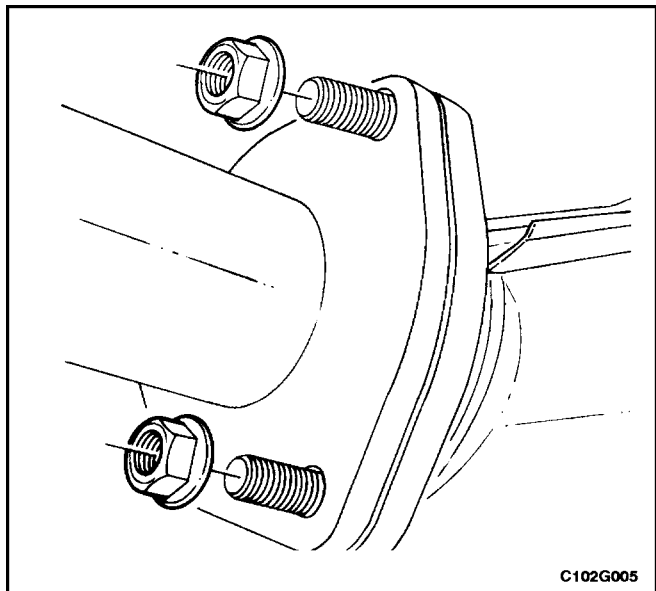
26. Disconnect the vacuum lines, as needed, including the brake booster vacuum hose.
27. Disconnect the fuel return line at the fuel pressure regulator.
28. Disconnect the fuel feed line at the fuel rail.
29. Remove the fuel rail and the injector channel cover as an assembly. Refer to *Section 1F, Engine Controls*.



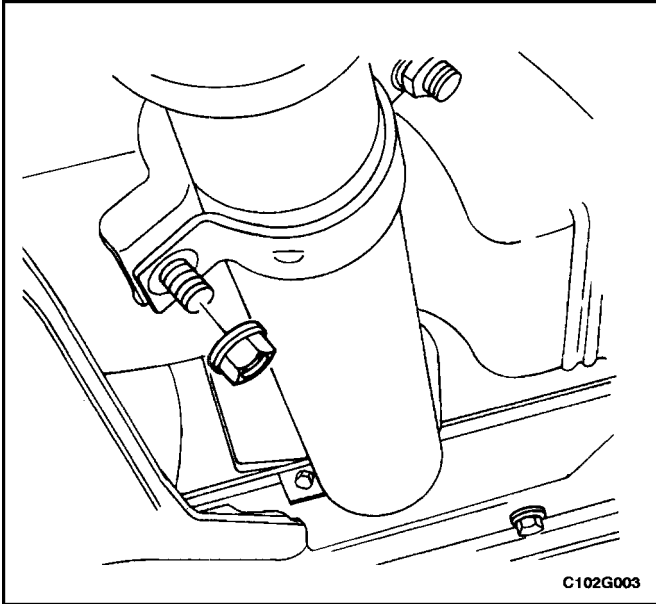
30. Disconnect the throttle cable from the throttle body and the intake manifold bracket.
31. Disconnect the coolant hose at the throttle body.
32. Disconnect the heater outlet hose at the coolant pipe.
33. Disconnect the coolant bypass hose from the cylinder head.
34. Disconnect the surge tank coolant hose from the coolant pipe.
35. Disconnect the lower radiator hose from the coolant pipe.
36. Disconnect the starter solenoid "S" terminal wire and the power lead.
37. Remove the A/C compressor. Refer to *Section 7B, Manual Control Heating, Ventilation, and Air Conditioning System*.



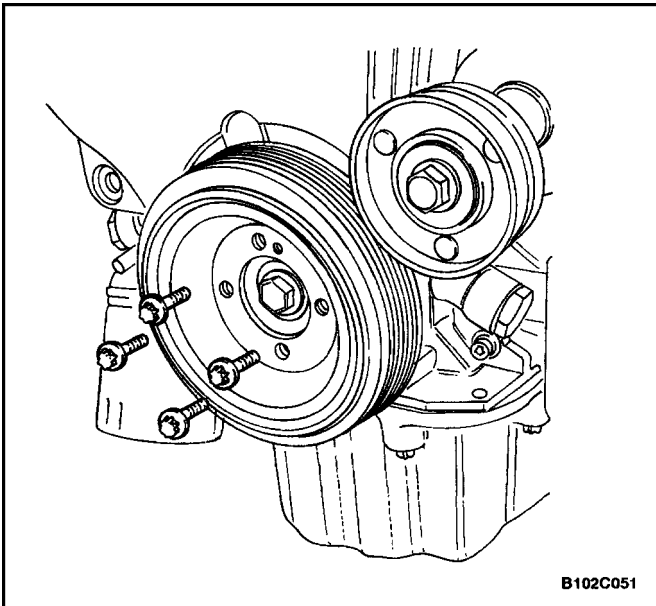
38. Remove the auxiliary catalytic converter lower flange nuts.



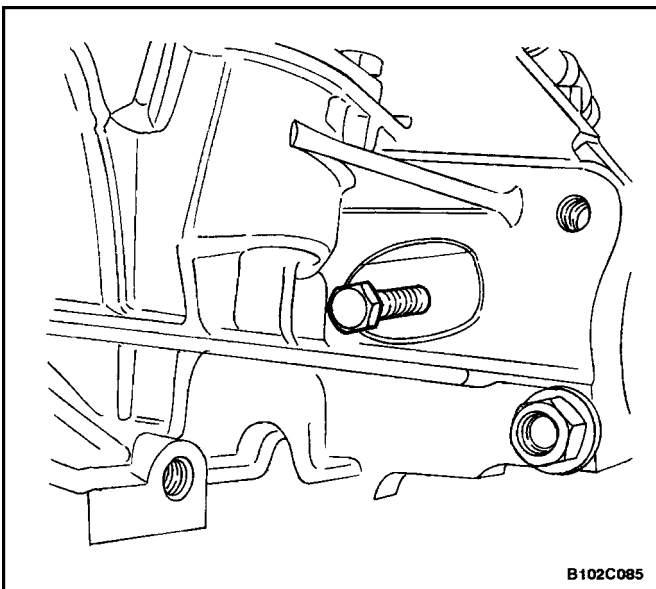
39. Remove the nuts that secure the front muffler pipe to the main catalytic converter.
40. Remove the rubber hangers that attach the connecting pipe to the vehicle.



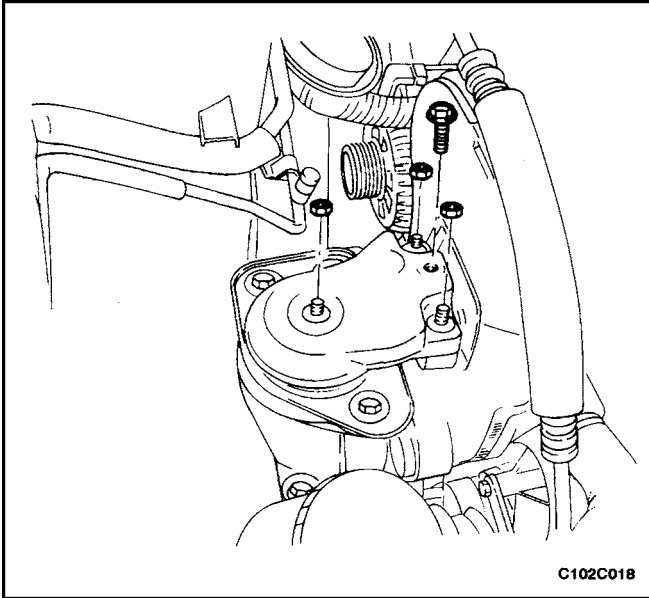
41. Remove the connecting pipe mounting bracket nuts and the bracket.
42. Remove the main catalytic converter and the connecting pipe.



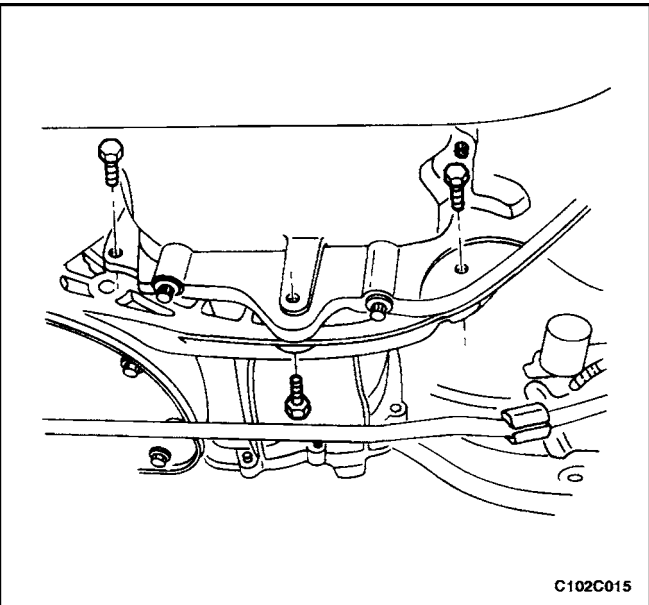
43. Remove the crankshaft pulley bolts.
44. Remove the crankshaft pulley.
45. Disconnect the vacuum lines at the evaporative (EVAP) emission canister purge solenoid.
46. Disconnect the electrical connector at the EVAP canister purge solenoid.
47. Disconnect the electrical connector at the oil pressure switch.
48. Disconnect the crankshaft position (CKP) and the knock sensor connectors.
49. Support the transaxle with a floor jack.
50. Remove the center member. Refer to *Section 9N, Frame and Underbody*.
51. Install the engine lifting device.



52. Remove the transaxle torque converter bolts from a vehicle with an automatic transaxle.
53. Remove the transaxle bell housing bolts and the oil pan flange bolts.
54. Remove the right engine mount bracket. Refer to *Section 5B, Five-Speed Manual Transaxle*, or *Section 5A, AW50-40LE Automatic Transaxle*.
55. Remove the resonator bolts and the resonator.
56. Remove the air filter housing and the bolts.



57. Disconnect the right engine mount bracket from the engine mount and the engine by removing the retaining bolts.
58. Separate the engine block from the transaxle. Remove the engine.



### Installation Procedure

1. Install the engine into the engine compartment.
2. Align the engine alignment pins to the transaxle.
3. Install the transaxle bell housing bolts.

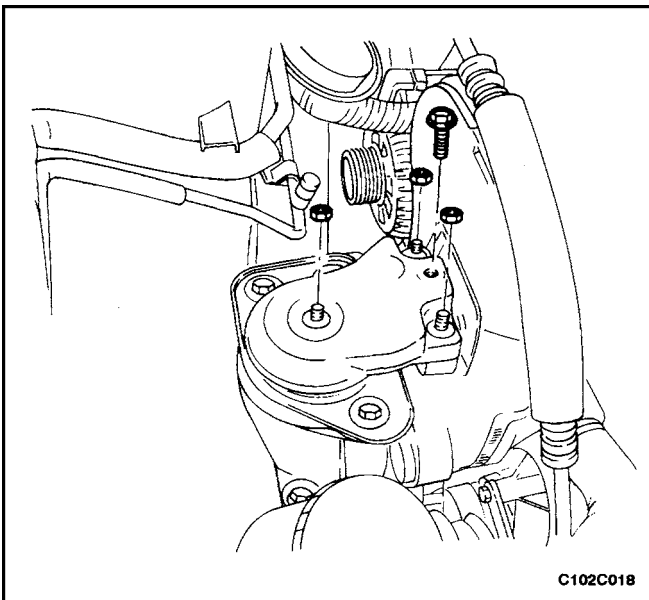
#### Tighten

Tighten the transaxle bell housing bolts to 75 N•m (55 lb–ft).

4. Install the oil pan flange-to-transaxle retaining bolts.

#### Tighten

Tighten the oil pan flange-to-transaxle retaining bolts to 40 N•m (30 lb–ft).

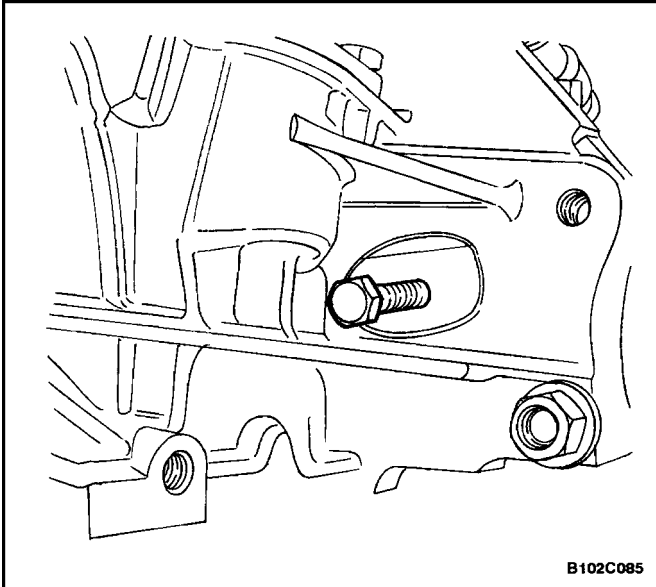


5. Install the right engine mount bracket to the engine block mount and the frame mount.
6. Install the right engine mount bracket retaining bolts and the nuts.

#### Tighten

Tighten the engine mount bolts to 60 N•m (44 lb–ft).

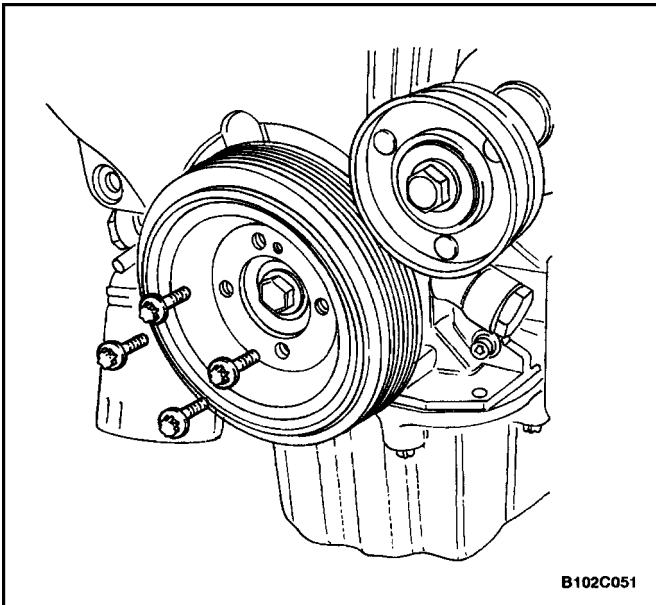
7. Install the rear engine/transaxle mount bracket. Refer to *Section 5A, AW 50–40LE Automatic Transaxle*, or *Section 5B, Five-Speed Manual Transaxle*.
8. Install the center member. Refer to *Section 9N, Frame and Underbody*.



9. Remove the floor jack used for support of the trans-axle.
10. Remove the engine lifting device.
11. Install the transaxle torque converter bolts on a vehicle with an automatic transaxle.

### **Tighten**

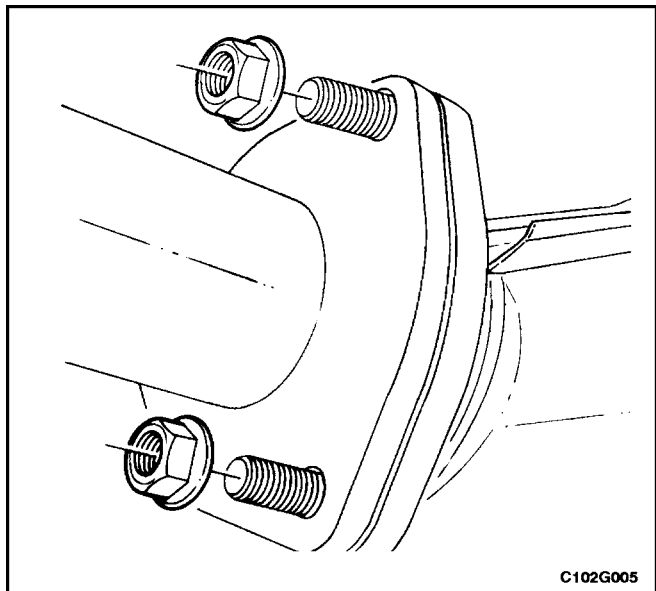
Tighten the transaxle torque converter bolts to 60 N•m (44 lb–ft).



12. Connect the vacuum lines at the EVAP emission canister purge solenoid.
13. Connect the electrical connectors to the EVAP emission canister purge solenoid.
14. Connect the oil pressure switch connector.
15. Install the crankshaft pulley.
16. Install the crankshaft pulley bolts.

### **Tighten**

Tighten the crankshaft pulley bolts to 20 N•m (15 lb–ft) using a torque wrench.

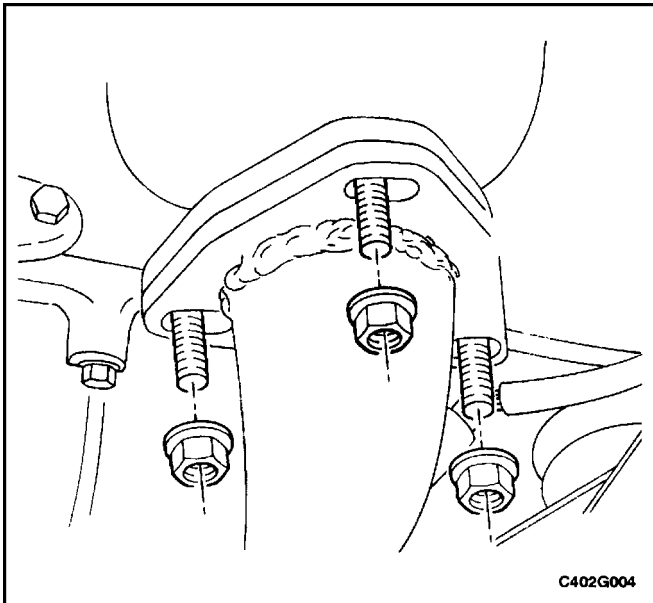


17. Connect the CKP and the knock sensor connectors.
18. Insert the main catalytic converter bolts into the front muffler flange.
19. Install the rubber hangers that attach the connecting pipe to the vehicle.
20. Install the nuts to secure the front muffler pipe to the main catalytic converter.

### **Tighten**

Tighten the front muffler pipe-to-main catalytic converter nuts to 30 N•m (22 lb–ft).

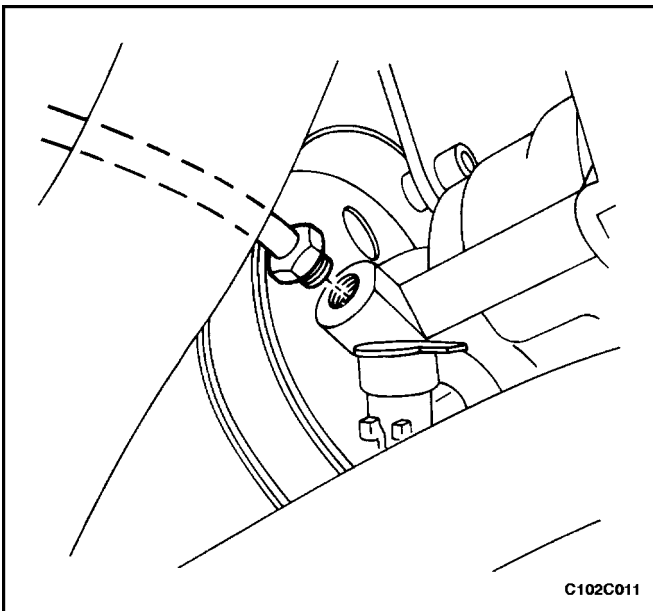




21. Install the auxiliary catalytic converter lower flange bolts.

**Tighten**

Tighten the auxiliary catalytic converter-to-connecting pipe nuts to 40 N•m (30 lb–ft).

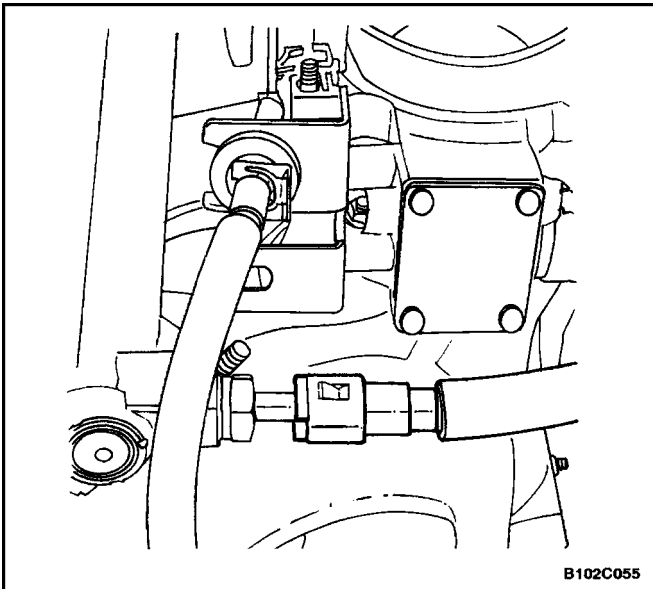


22. Install the connecting pipe mounting bracket and nuts.

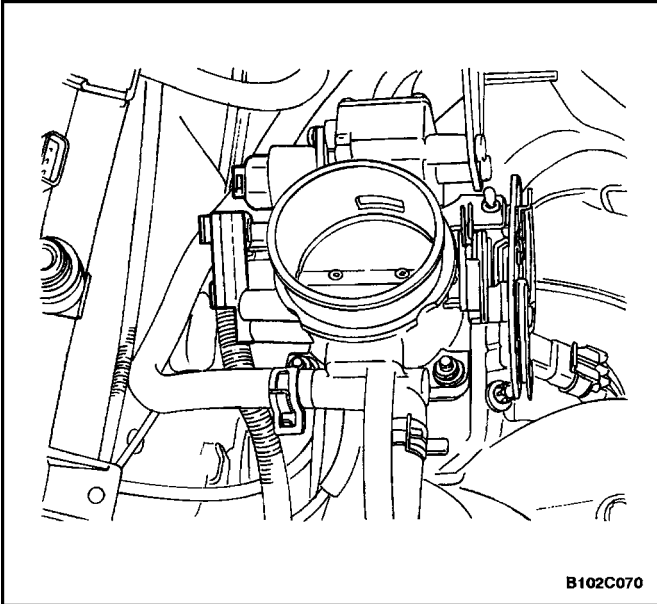
**Tighten**

Tighten the connecting pipe mounting bracket nuts to 30 N•m (22 lb–ft).

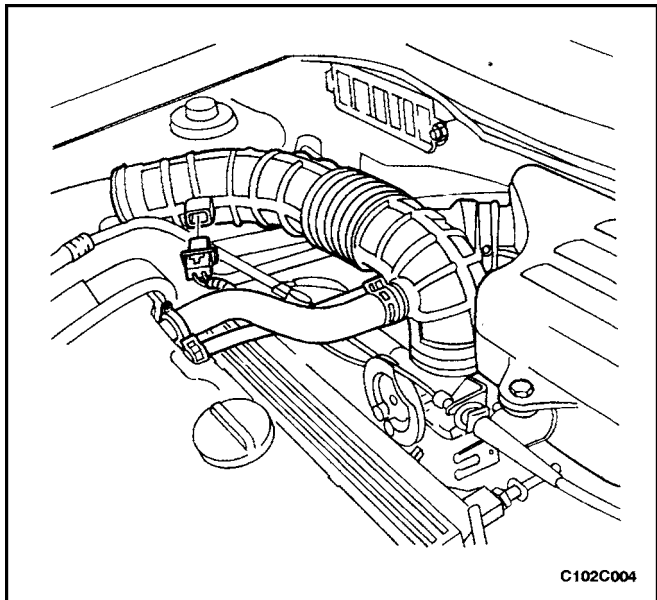
23. Connect the powersteering pressure hose.  
 24. Connect the powersteering return hose.  
 25. Install the A/C compressor, if equipped. Refer to *Section 7B, Manual Control Heating, Ventilation, and Air Conditioning System*.



26. Install the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.  
 27. Install the right front wheel well splash shield. Refer to *Section 9R, Body Front End*.  
 28. Install the right front wheel. Refer to *Section 2E, Tires and Wheels*.  
 29. Connect the fuel feed line to the fuel rail.  
 30. Connect the fuel return line to the fuel pressure regulator.  
 31. Install the fuel rail and the injector channel cover as an assembly. Refer to *Section 1F, Engine Controls*.



32. Connect all the previously disconnected vacuum lines, including the brake booster vacuum hose.
33. Connect the oxygen sensor connector.
34. Connect the starter solenoid "S" terminal wire and the power lead.
35. Connect the generator voltage regulator connector.
36. Connect the CTS connector.
37. Connect the ECT sensor connector.
38. Connect the TPS connector.
39. Connect the IAC valve connector.
40. Connect the MAP sensor connector.
41. Connect the CMP sensor connector.



42. Connect the electrical connector at the EI system ignition coil and the ECM ground terminal.
43. Install the air intake tube.
44. Install the air filter housing and the bolts.

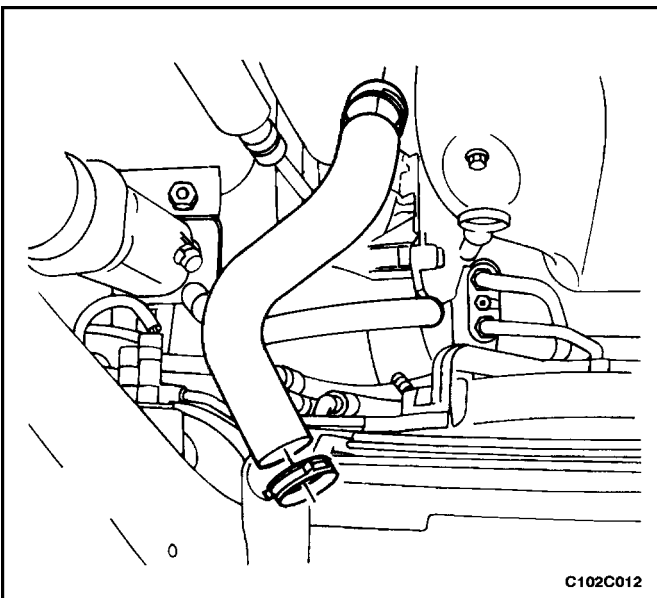
#### **Tighten**

Tighten the air filter housing bolts to 8 N•m (71 lb-in).

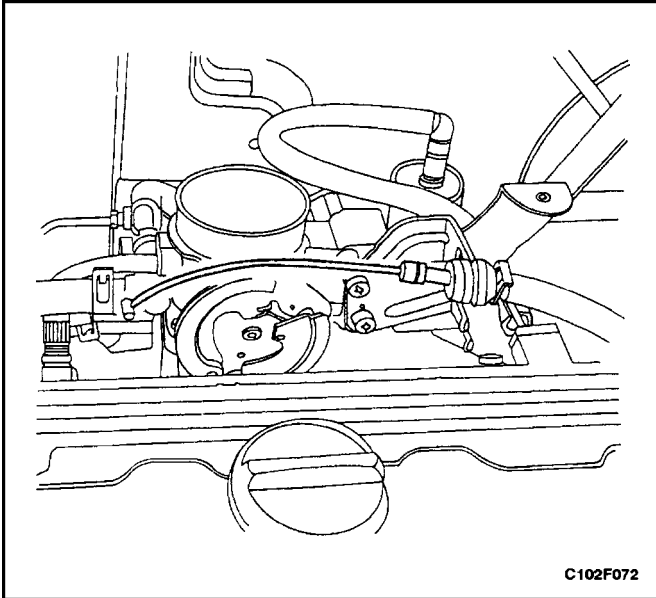
45. Connect the breather tubes to the valve cover.
46. Connect the IAT sensor connector.
47. Install the cooling system radiator and the engine cooling fans. Refer to *Section 1D, Engine Cooling*.
48. Install the resonator and the retaining bolts.

#### **Tighten**

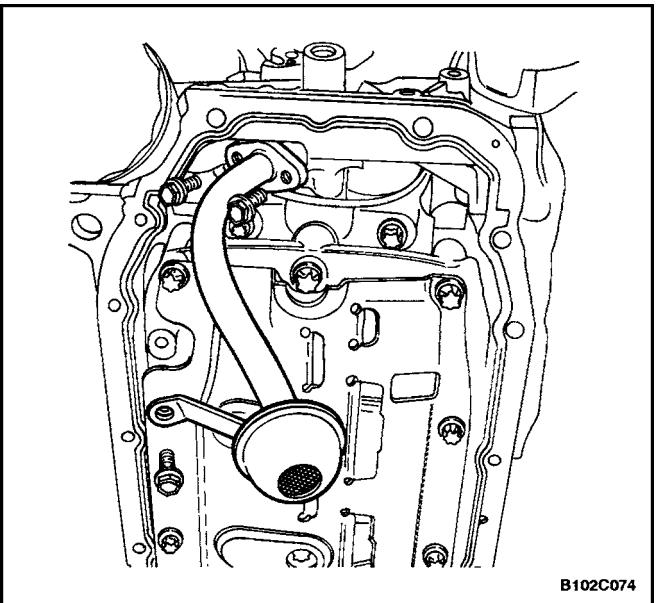
Tighten the resonator retaining bolts to 8 N•m (71 lb-in).



49. Connect the lower radiator hose to the coolant pipe.
50. Connect the upper radiator hose to the thermostat housing.
51. Connect the heater inlet hose to the cylinder head.
52. Connect the heater outlet hose to the coolant pipe.
53. Connect the coolant surge tank hose to the coolant pipe.
54. Connect the coolant hose to the throttle body.



55. Connect the throttle cable to the throttle body and the intake manifold bracket.
56. Install the fuel pump fuse.
57. Connect the negative battery cable.
58. Refill the engine crankcase with engine oil.
59. Refill the engine coolant system. Refer to *Section 1D, Engine Cooling*.
60. Fill and bleed the power steering system. Refer to *Section 6A, Power Steering System*.
61. Refill the A/C refrigerant system, if equipped. Refer to *Section 7B, Manual Control Heating, Ventilation, and Air Conditioning System*.
62. Install the hood. Refer to *Section 9R, Body Front End*.



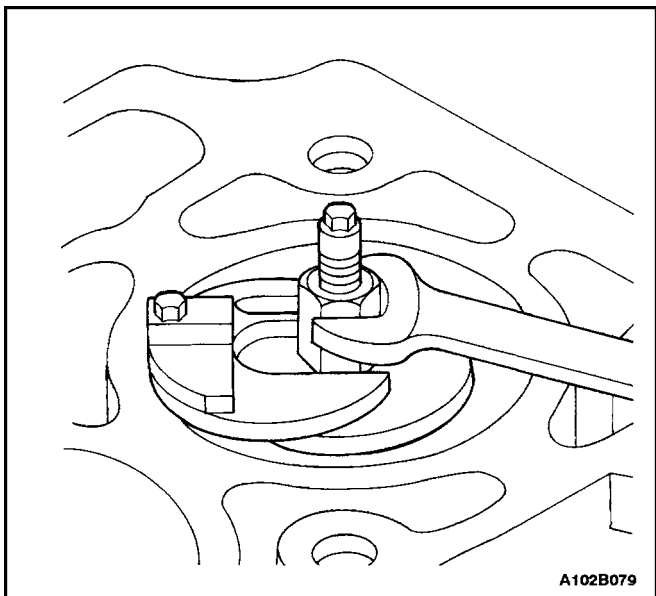
## PISTONS AND CONNECTING RODS

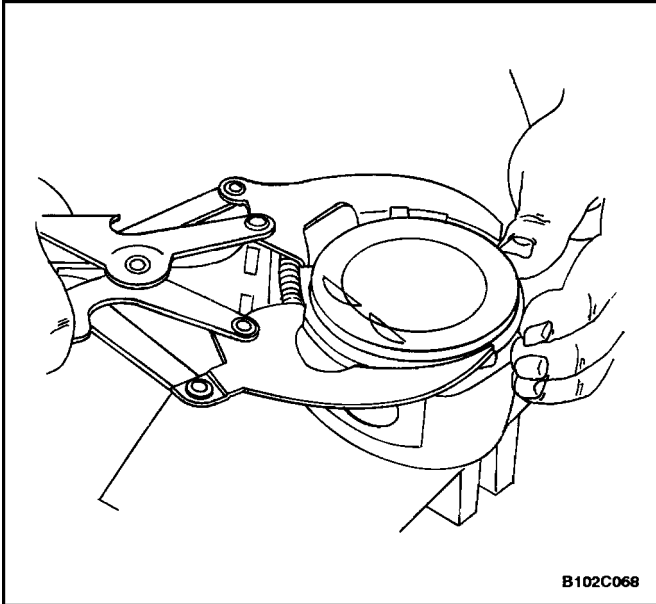
### Tools Required

J-8037 Universal Piston Ring Compressor  
 J-8087 Cylinder Bore Check Gauge  
 KM-427 Piston Pin Service Set  
 KM-470-B Angular Torque Gauge

### Removal Procedure

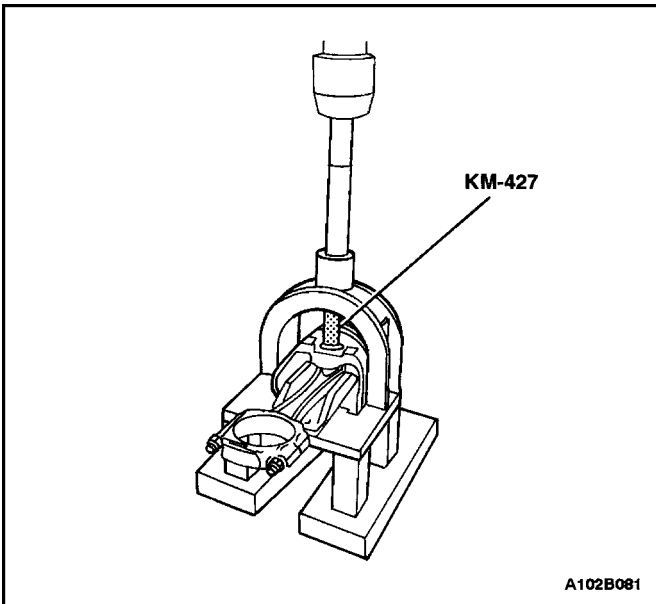
1. Remove the cylinder head with the intake manifold and the exhaust manifold attached. Refer to "Cylinder Head and Gasket" in this section.
2. Remove the oil pan. Refer to "Oil Pan" in this section.
3. Remove the oil pump pickup tube bolts.
4. Remove the oil pump pickup tube.
5. Remove the engine block lower support and the splash shield bolts.
6. Remove the engine block lower support and the splash shield.
7. Move the piston to the bottom of the piston stroke.
8. Mark the connecting rod cap for position.
9. Remove the connecting rod cap bolts.
10. Remove the connecting rod cap and the lower connecting rod bearing.
11. Remove the upper piston connecting rod bearing.
12. Ridge ream the cylinder wall.



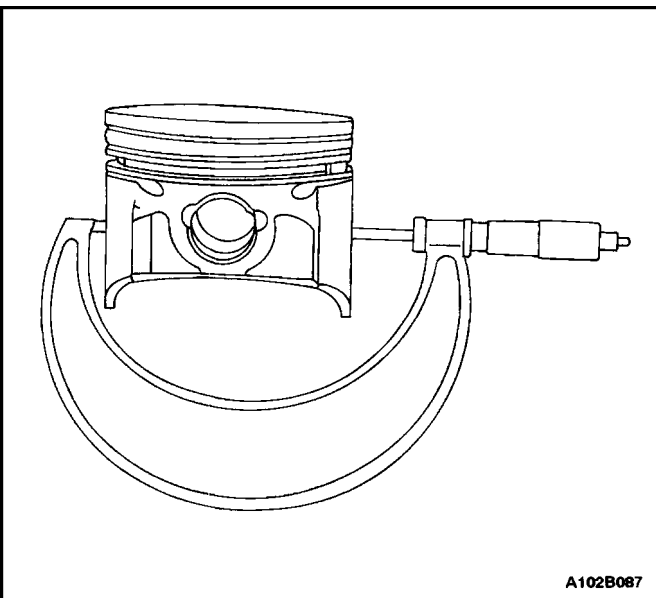


**CAUTION :** Use care when handling the piston. Worn piston rings are sharp and may cause injury.

13. Remove the piston.
14. Use a piston ring expander tool to expand the piston rings.
15. Remove the piston rings.

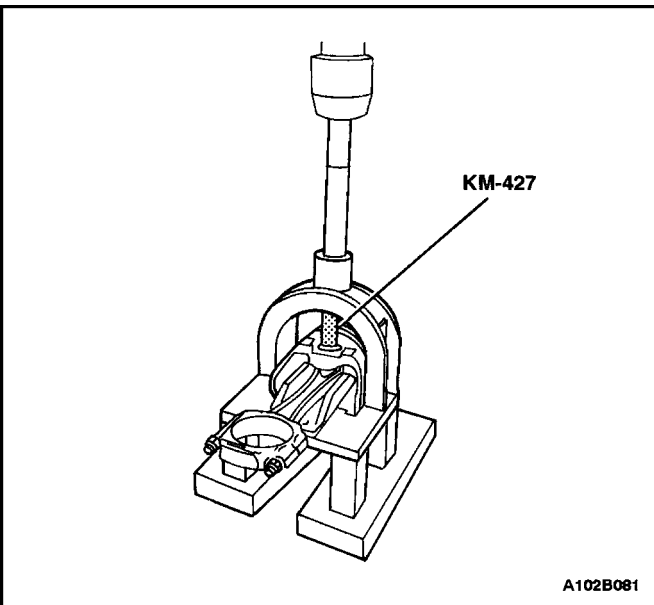
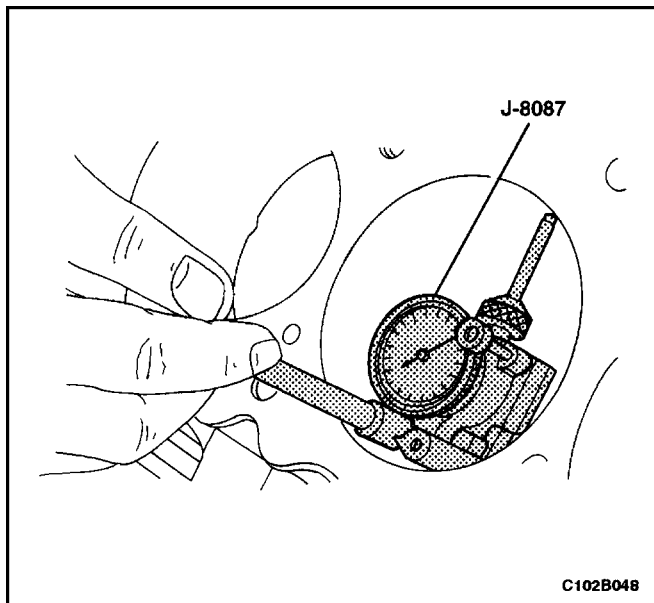
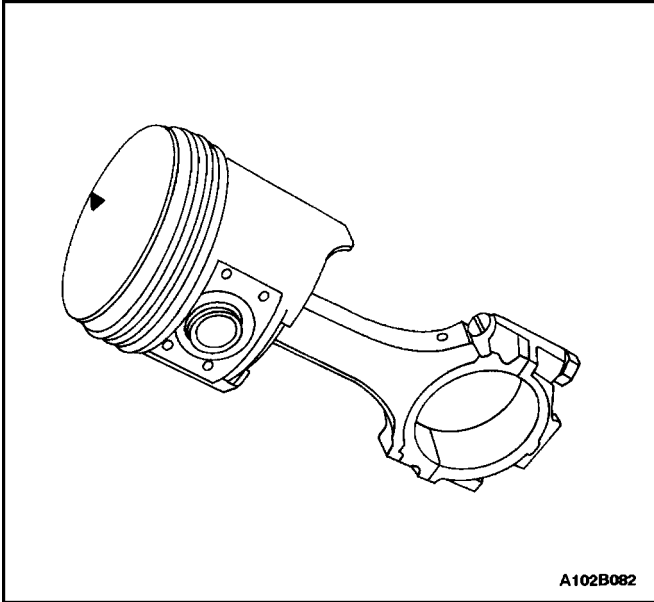


16. Remove the piston pin from the piston and connecting rod assembly using the piston pin service set KM-427.
17. Separate the piston from the connecting rod.



### Inspection Procedure

1. Inspect the connecting rod for bending or twisting. If the connecting rod is bent or twisted, replace the connecting rod.
2. Inspect the connecting rod bearings.
3. Inspect the connecting rod lower end for wear.
4. Inspect the connecting rod upper end for scoring.
5. Inspect the crankshaft rod bearing journal for wear. Refer to "Engine Specifications" in this section.
6. Inspect the piston for scoring, cracks, and wear.
7. Inspect the piston for taper using a micrometer.



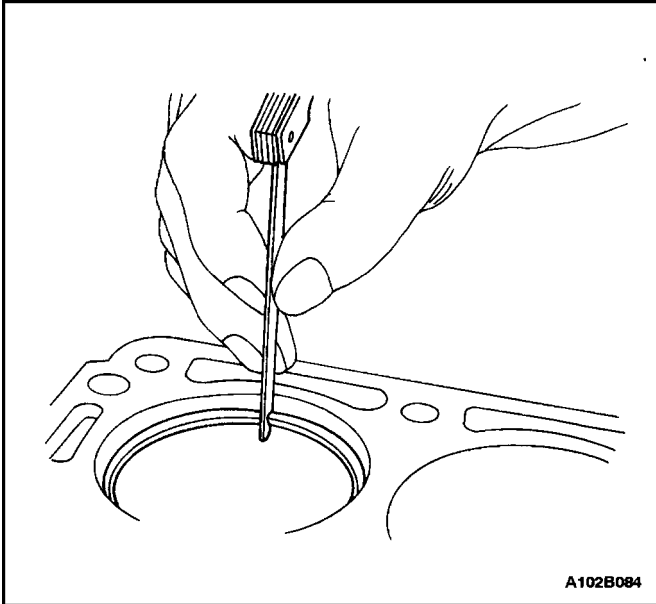
8. Inspect the piston for fit to the connecting rod.

9. Inspect the engine block deck surface for flatness using a straight edge and a feeler gauge. Refer to "Engine Specifications" in this section.
10. Inspect the bearing bore for concentricity and alignment using cylinder bore check gauge J-8087. Refer to "Engine Specifications" in this section. If the bearing bore is beyond specifications, replace the engine block.
11. Inspect the engine block cylinder bore for wear, runout, ridging, and taper using a bore gauge. Refer to "Engine Specifications" in this section.
12. Inspect the engine block cylinder bore for glazing. Lightly hone the cylinder bore as necessary.

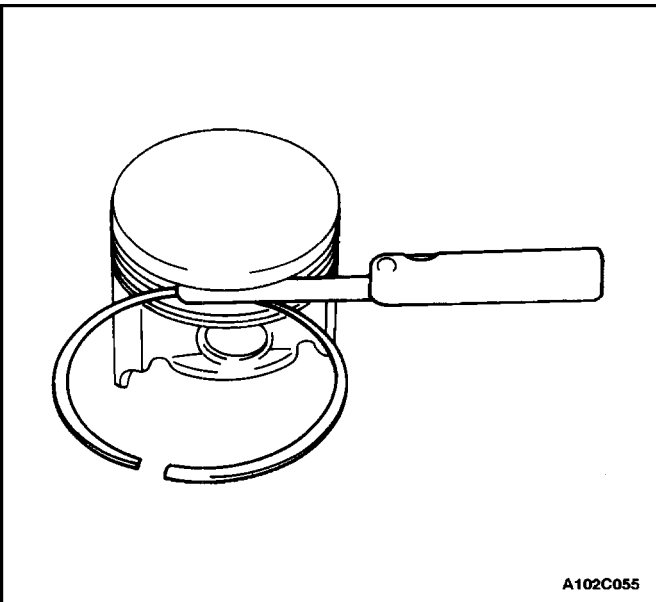
## Installation Procedure

**Important :** For ease of installation of the piston pin, the connecting rod should be heated to 280°C (536°F). Heat the upper connecting rod only. Use commercial thermocolor material to determine the correct temperature. When the thermocolor material changes from black to green, the temperature is correct for installation.

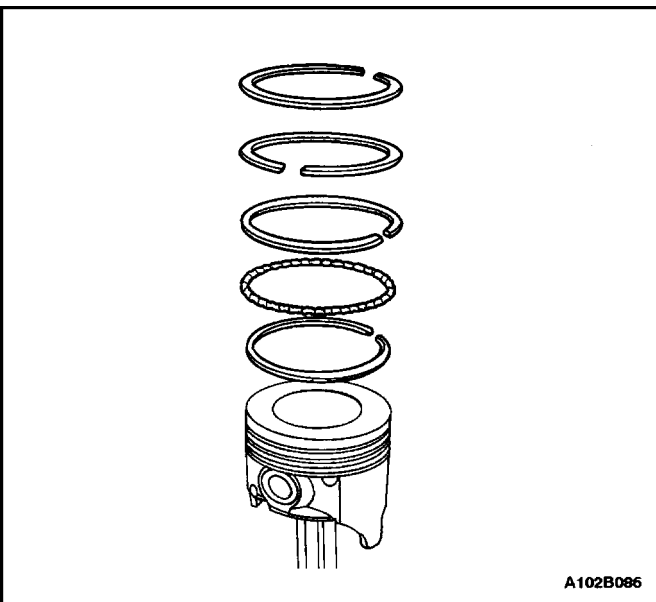
1. Align the notch on the piston and the connecting rod so that the proper sides will be facing the front of the engine.
2. Install the piston pin guide through the piston and the connecting rod.
3. Coat the piston pin with clean oil.
4. Install the piston pin into the opposite side of the piston.
5. Install the piston pin into the piston and the connecting rod assembly using the piston pin service set KM-427.



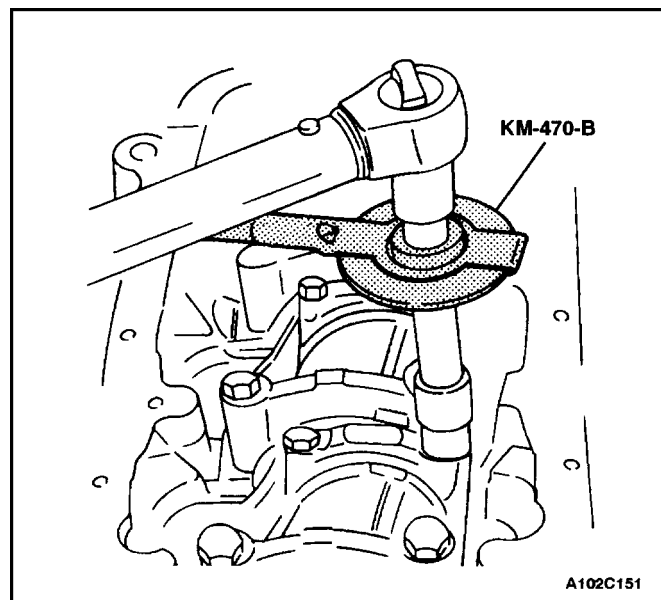
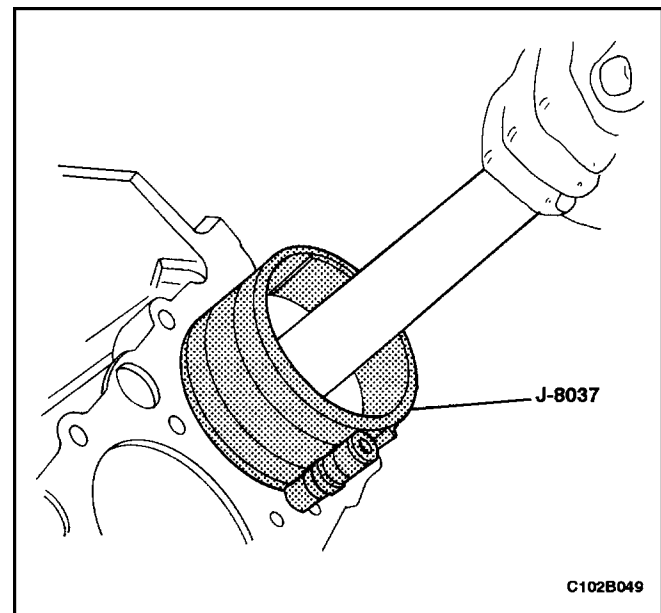
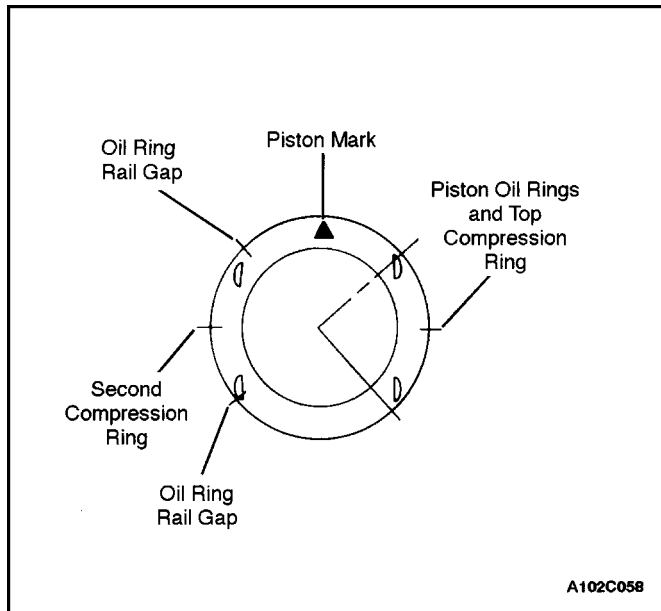
6. Select a set of new piston rings.
7. Measure the piston ring gap using a feeler gauge. Refer to "Engine Specifications" in this section.
8. Increase the piston ring gap by carefully filing off excess material if the piston ring gap is below specifications.



9. Measure the piston ring side clearance using a feeler gauge. Refer to "Engine Specifications" in this section.
10. If the piston ring is too thick, try another piston ring.
11. If no piston ring can be found that fits to specifications, the piston ring may be ground to size with emery paper placed on a sheet of glass.



12. Install a piston oil ring, the expander, then the second piston oil ring to the bottom ring groove of the piston.
13. Install the second compression ring to the middle ring groove of the piston.
14. Install the top compression ring to the top ring groove of the piston.



15. Use a piston ring expander to install the piston rings. Do not expand the piston rings beyond the expansion necessary for installation.
16. Stagger the piston oil rings, the oil ring rail gaps, the second compression ring, and the top compression ring in relation to the notch on the top of the piston.

17. Lubricate the cylinder wall and the piston rings with clean engine oil.
18. Install the piston using the universal piston ring compressor J-8037 and a wood handle. Guide the lower connecting rod end to prevent damaging the crankshaft journal.
19. Install the connecting rod cap and bearings. Refer to "Crankshaft Bearings and Connecting Rod Bearings – Gauging Plastic" in this section.

20. Install the connecting rod cap bearing bolts.

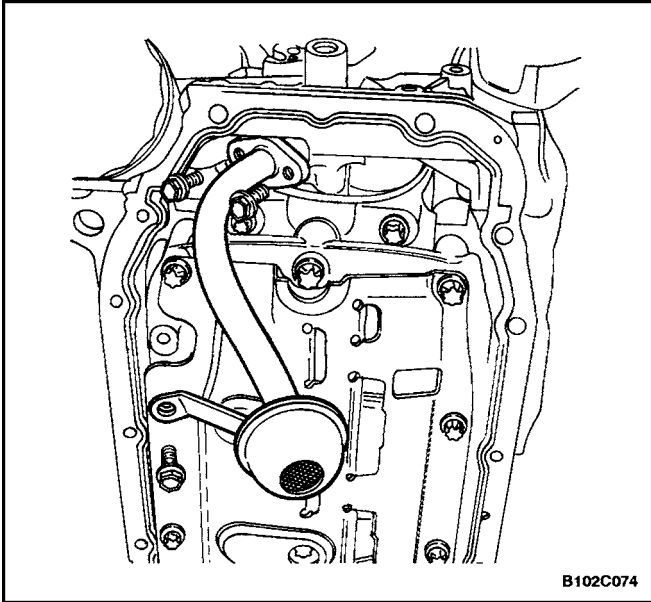
### **Tighten**

Tighten the connecting rod cap bearing bolts to 35 N•m (26 lb–ft). Using the angular torque gauge KM-470-B, tighten the bolts one turn of 45 degrees plus 15 degrees.

21. Install the engine block lower support bracket/splash shield bolts.

### **Tighten**

Tighten the engine block lower support bracket/splash shield bolts to 35 N•m (26 lb–ft).



22. Install the oil pump pickup tube.
23. Install the oil pump pickup tube bolts.

**Tighten**

Tighten the oil pump pickup tube bolts to 8 N•m (71 lb-in).

24. Install the oil pan. Refer to "Oil Pan" in this section.
25. Install the cylinder head with the intake manifold and exhaust manifold attached. Refer to "Cylinder Head and Gasket" in this section.