

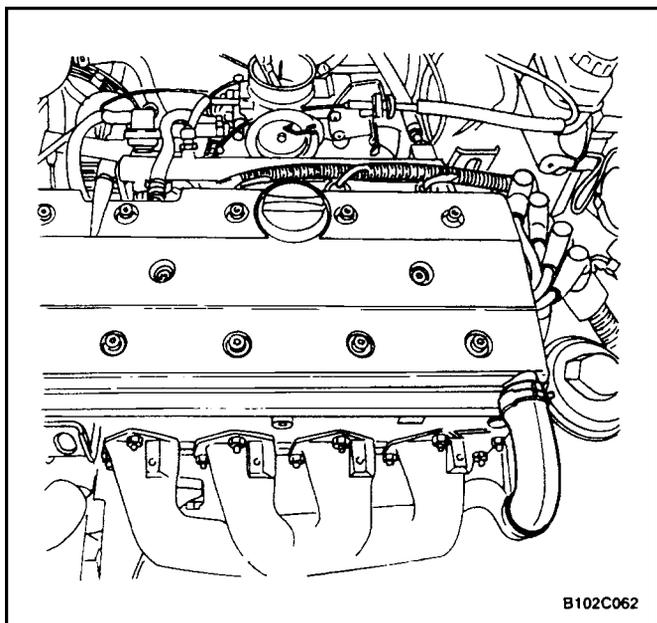
## MAINTENANCE AND REPAIR

### ON-VEHICLE SERVICE

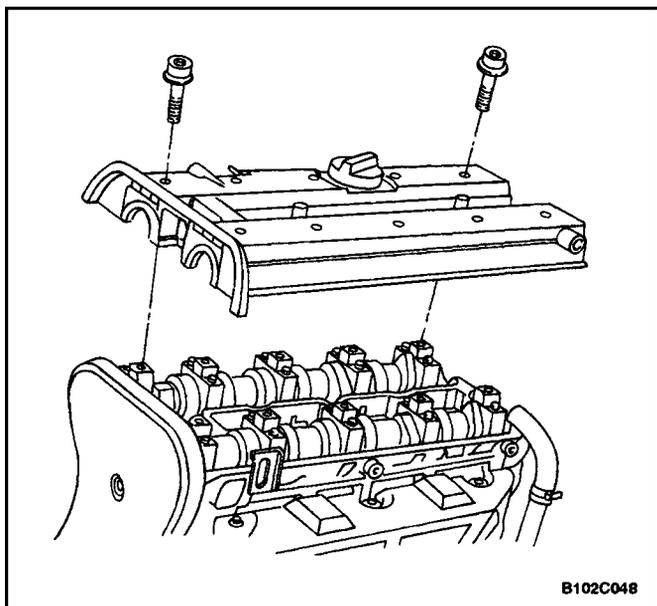
#### VALVE COVER

##### Removal Procedure

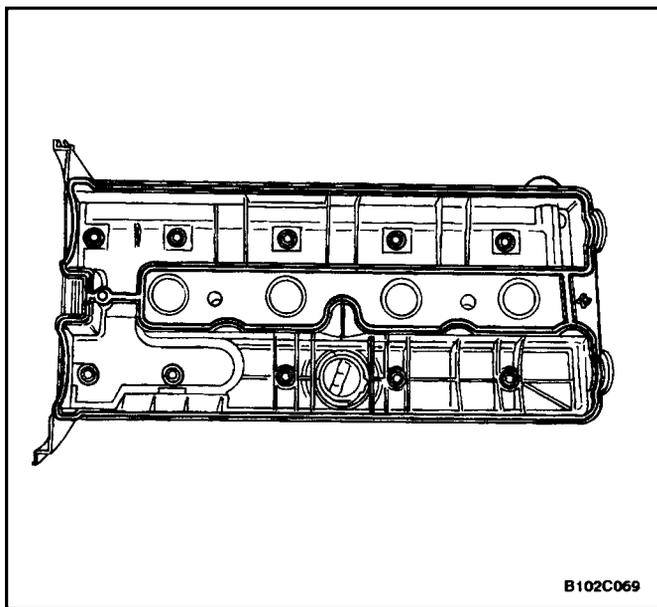
1. Disconnect the negative battery cable.
2. Disconnect the breather tube from the valve cover.
3. Disconnect the camshaft position sensor.



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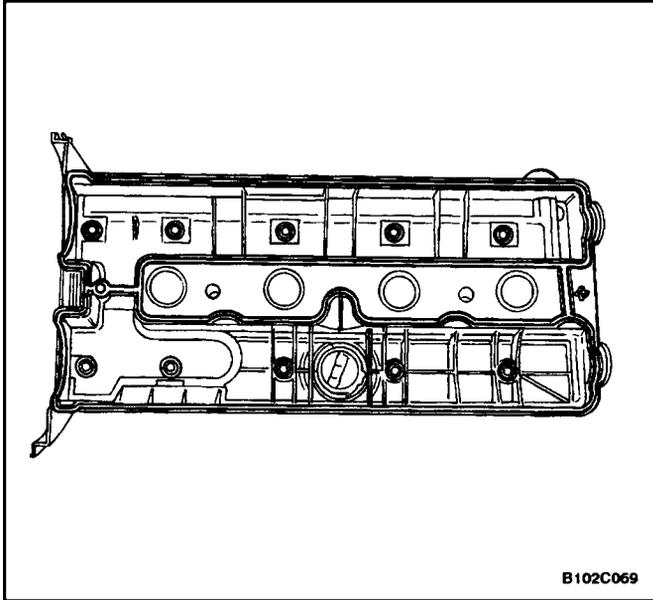
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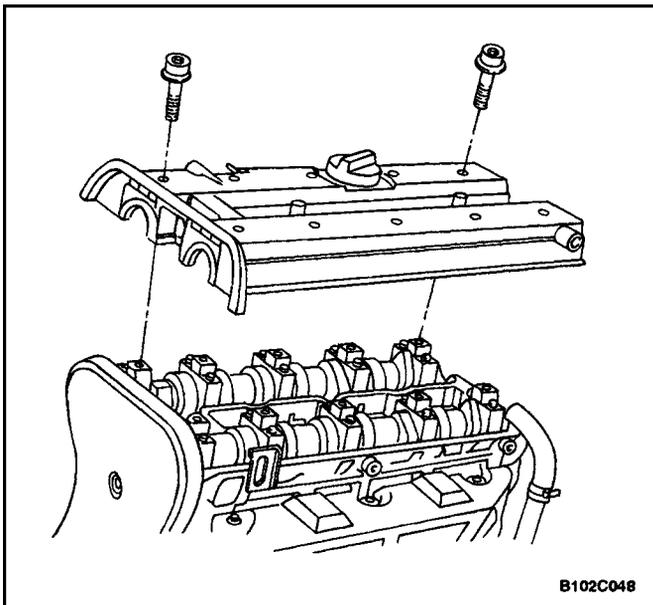
4. Disconnect all of the necessary vacuum lines.
5. Remove the spark plug cover bolts.
6. Remove the spark plug cover.
7. Disconnect the ignition wires from the spark plugs.
8. Remove the valve cover bolts.
9. Remove the valve cover washers.

10. Remove the valve cover.
11. Remove the valve cover gasket from the valve cover.



## Installation Procedure

1. Apply a small amount of gasket sealant to the corners of the front camshaft caps and the top of the rear valve cover-to-cylinder head seal.
2. Install the new valve cover gasket to the valve cover.

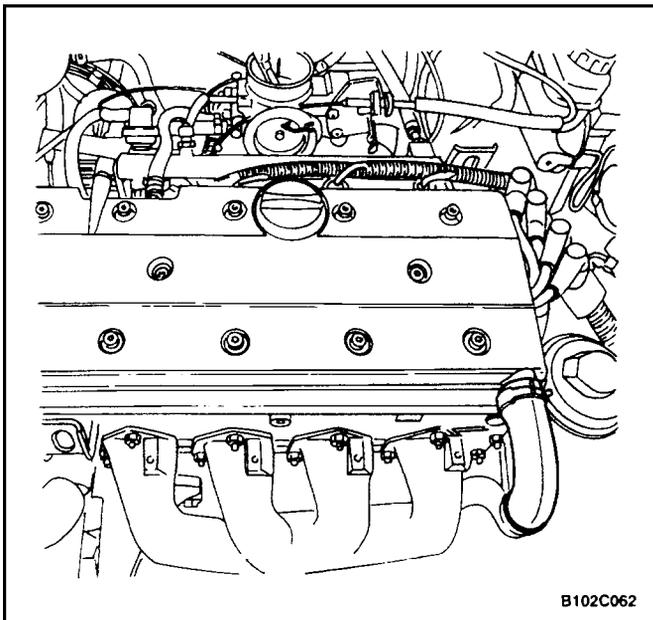


3. Install the valve cover.
4. Install the valve cover washers.
5. Install the valve cover bolts.

### Tighten

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

6. Connect the camshaft position sensor.

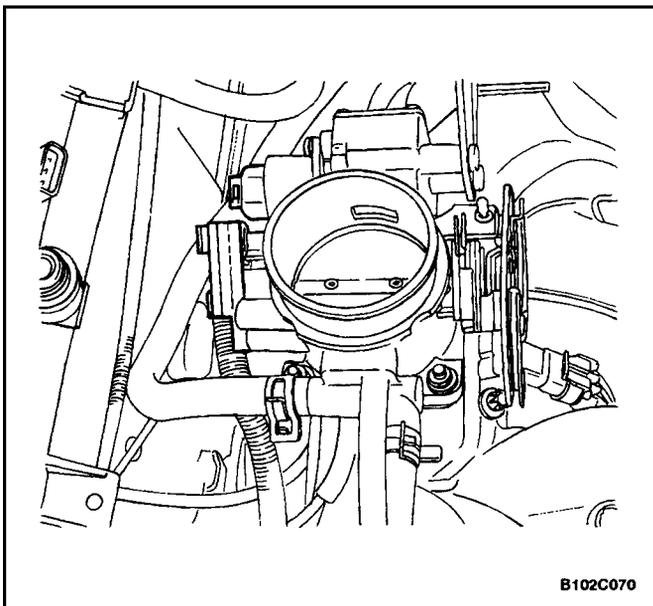
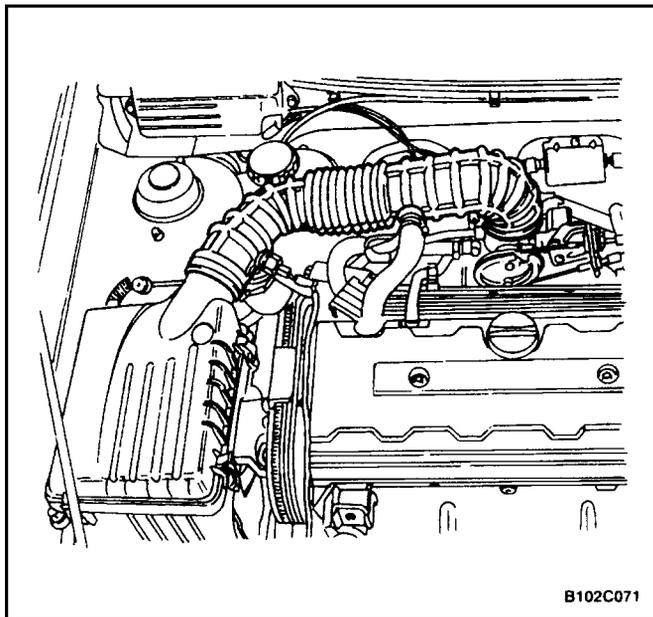
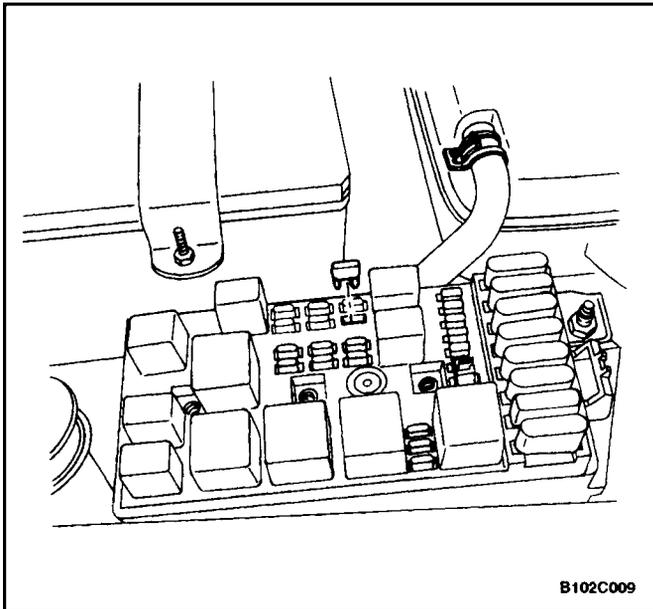


7. Connect the ignition wires to the spark plugs.
8. Install the spark plug cover.
9. Install the spark plug cover bolts.

### Tighten

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

10. Connect all of the necessary vacuum lines.
11. Connect the breather tube to the valve cover.
12. Connect the negative battery cable.



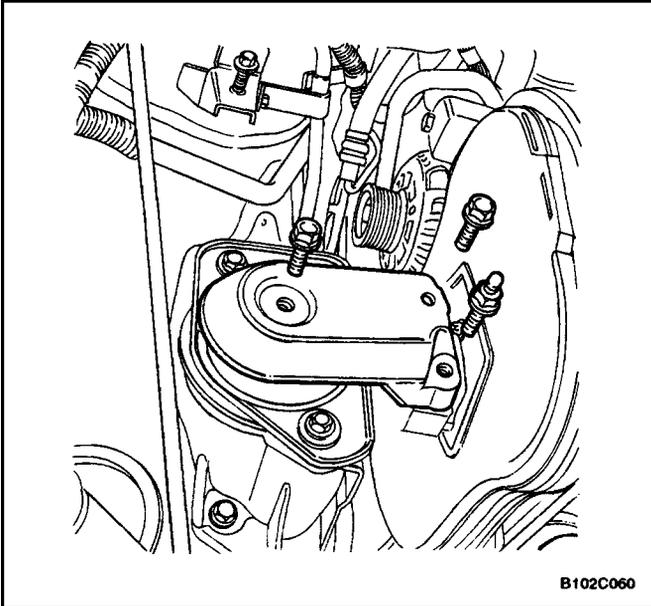
## CYLINDER HEAD AND GASKET

### Tools Required

KM-470-B Angular Torque Gauge  
J-28467-B Engine Assembly Lift Support

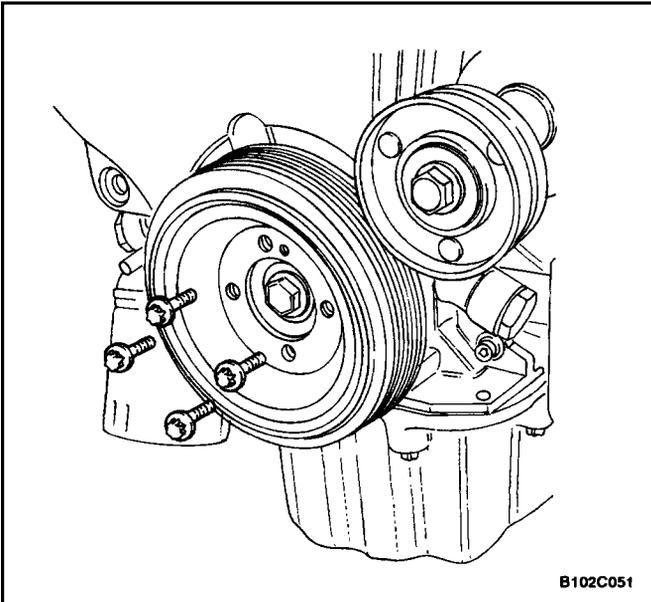
### Removal Procedure

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 powertrain control module (PCM)/engine control module (ECM) ground terminal.
5. Drain the engine coolant. Refer to *Section 1D, Engine Cooling*.
6. Disconnect the intake air temperature sensor connector.
7. Disconnect the breather tube from the valve cover.
8. Disconnect the air intake tube from the throttle body.
9. Disconnect the electronic ignition system (EI system) ignition coil connector.
10. Disconnect the pre-converter oxygen sensor connector.
11. Disconnect the idle air control valve connector.
12. Disconnect the throttle position sensor connector.
13. Disconnect the engine coolant temperature sensor connector.
14. Disconnect the coolant temperature sensor connector.
15. Disconnect the camshaft position sensor.



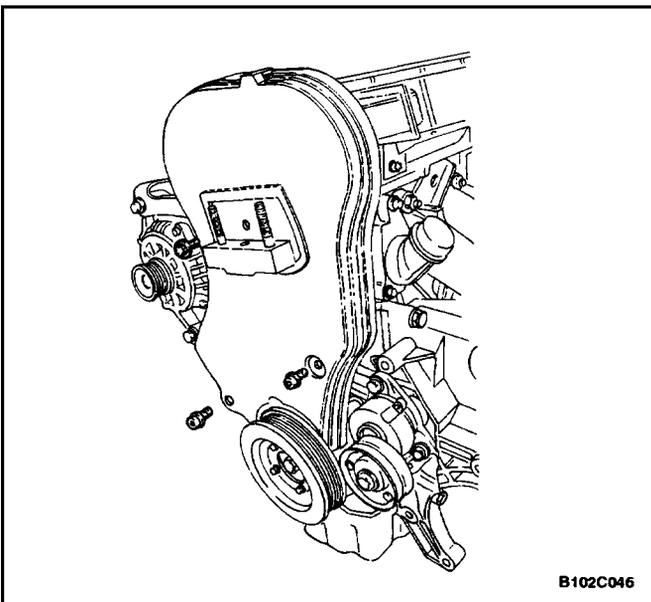
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16. Remove the air filter housing bolts.
17. Remove the air filter housing.
18. Remove the right front wheel. Refer to *Section 2E, Tires and Wheels*.
19. Remove the right front splash shield.
20. Install the engine assembly lift support J-28467-B.
21. Remove the right engine mount bracket and bolts.



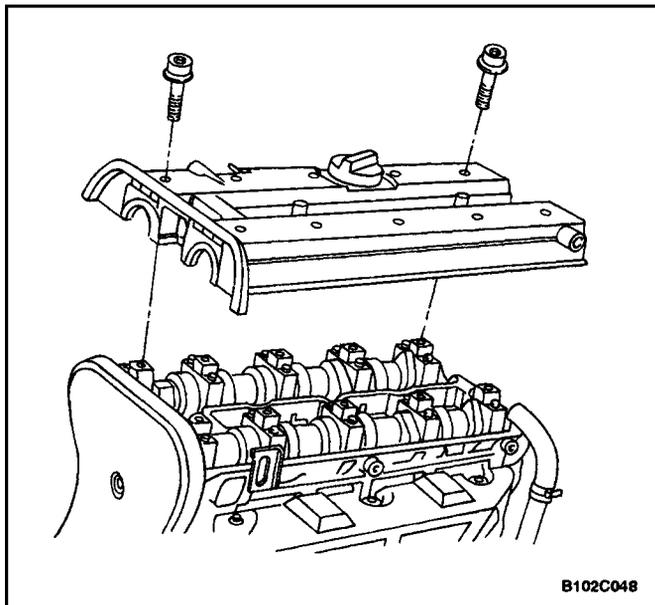
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22. Disconnect the upper radiator hose at the thermostat housing.
23. Remove the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.
24. Remove the crankshaft pulley bolts.
25. Remove the crankshaft pulley.

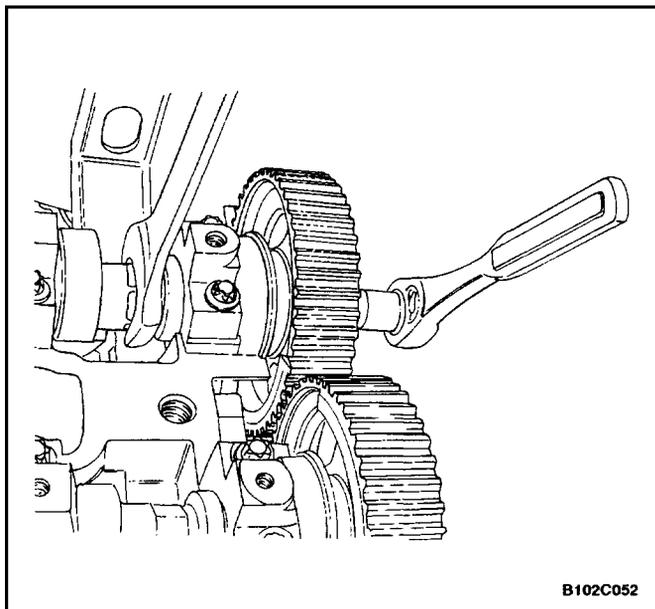


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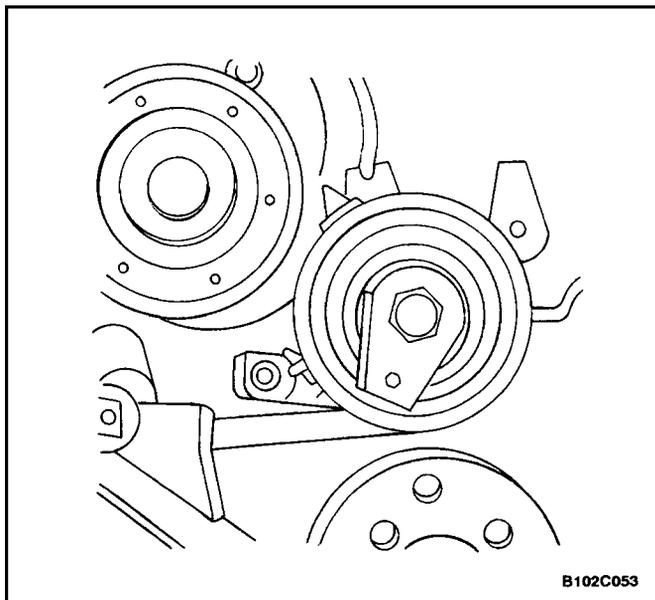
26. Remove the front timing belt cover bolts.
27. Remove the front timing belt cover.



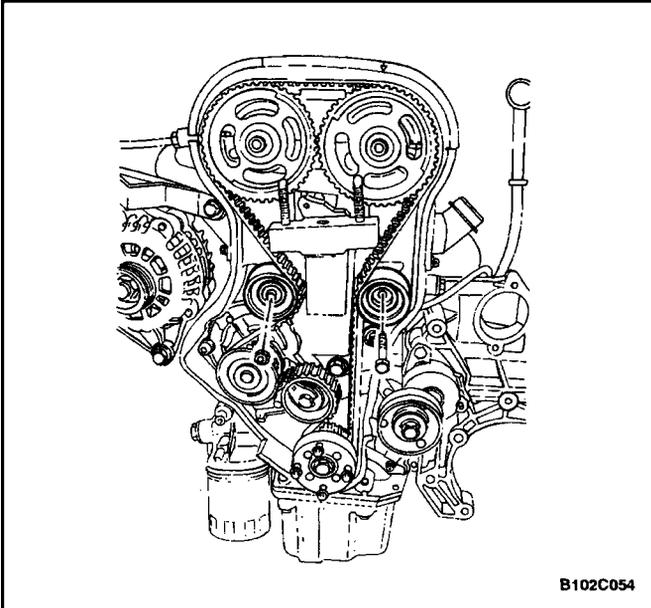
28. Remove the timing belt. Refer to "Timing Belt" in this section.
29. Disconnect the breather tube at the valve cover.
30. Remove the spark plug cover bolts.
31. Remove the spark plug cover.
32. Disconnect the ignition wires from the spark plugs.
33. Remove the valve cover nuts.
34. Remove the valve cover washers.
35. Remove the valve cover and the valve cover gasket.



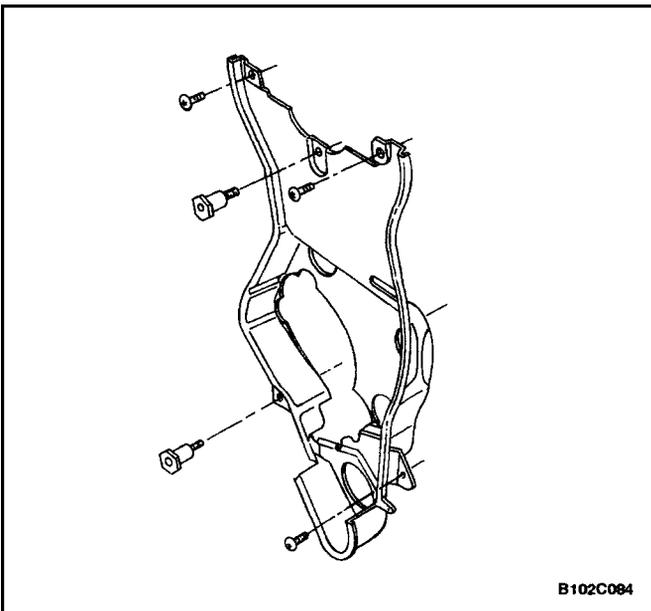
- Notice :** Take extreme care to prevent any scratches, nicks or damage to the camshafts.
36. While holding the intake camshaft firmly in place, remove the intake camshaft gear bolt.
  37. Remove the intake camshaft gear.
  38. While holding the exhaust camshaft firmly in place, remove the exhaust camshaft gear bolt.
  39. Remove the exhaust camshaft gear.



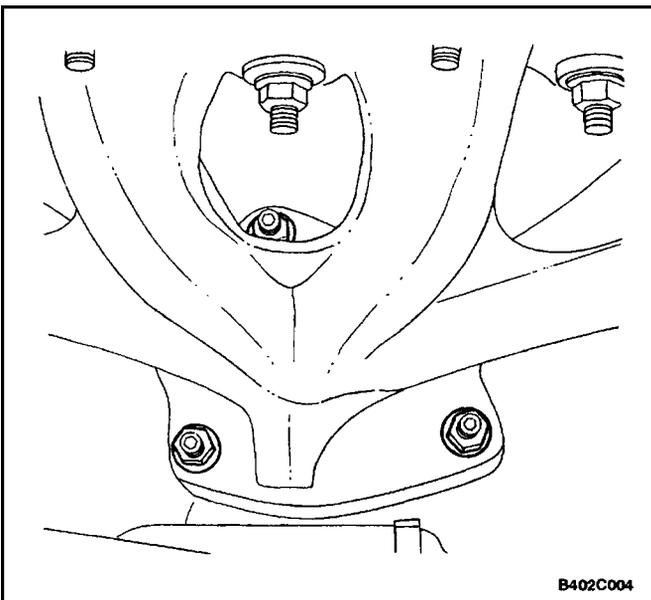
40. Remove the timing belt automatic tensioner bolts.
41. Remove the timing belt automatic tensioner.



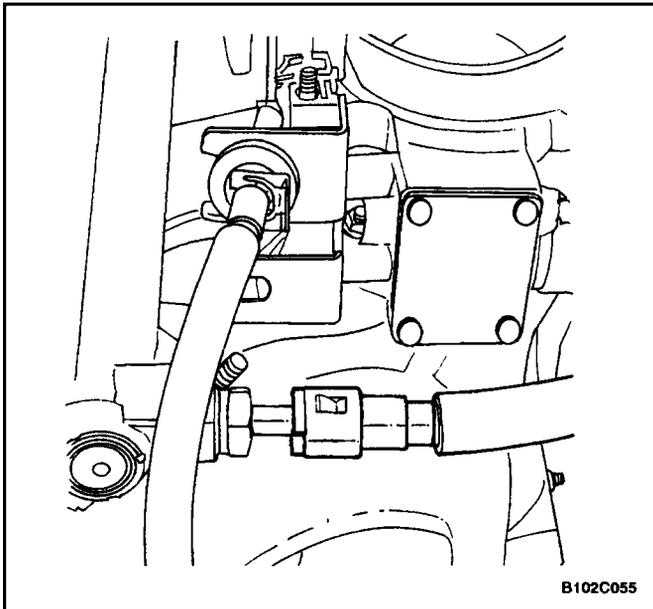
42. Remove the timing belt idler pulley bolt and nut.
43. Remove the timing belt idler pulleys.
44. Remove the engine mount bolts.
45. Remove the engine mount.



46. Remove the rear timing belt cover bolts.
47. Remove the rear timing belt cover.

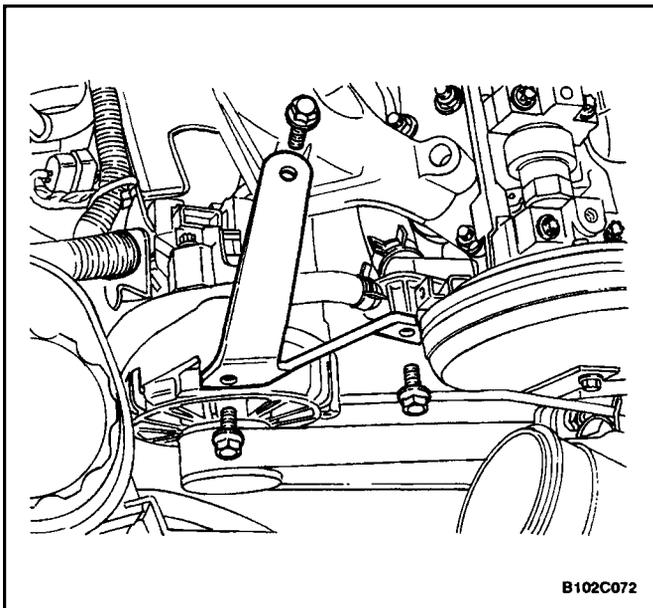


48. Remove the auxiliary catalytic converter nuts at the exhaust manifold.
49. Disconnect all of the necessary vacuum hoses.



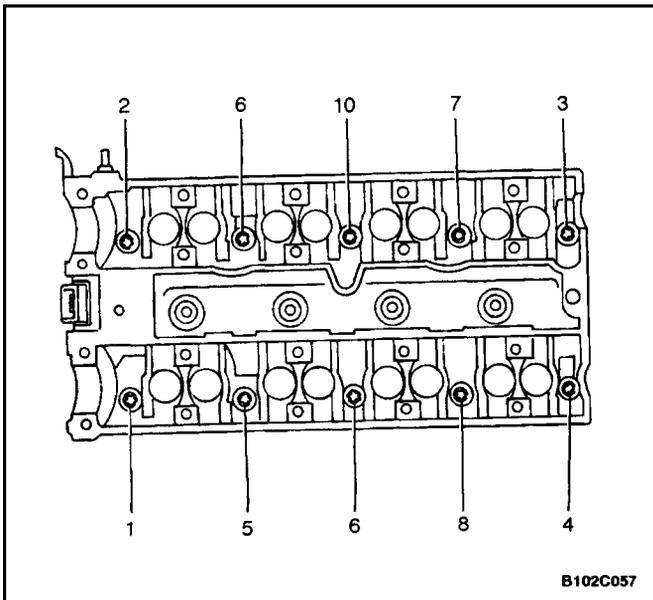
B102C055

50. Disconnect the fuel return line at the fuel pressure regulator.
51. Disconnect the fuel feed line at the fuel rail.
52. Remove the generator adjusting bracket retaining bolt and the bracket.
53. Disconnect the coolant hose at the rear cylinder head and ignition coil exhaust gas recirculation (EGR) bracket.
54. Disconnect the surge tank coolant hose at the throttle body.
55. Remove the fuel rail assembly. Refer to *Section 1F, Engine Controls*.



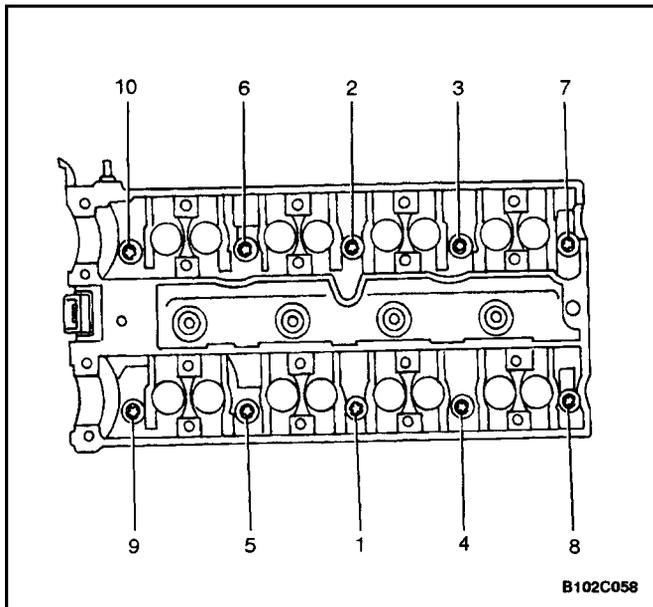
B102C072

56. Remove the generator-to-intake manifold support bracket bolts at the cylinder head and the intake manifold.
57. Remove the generator support bracket.
58. Remove the intake manifold-to-generator strap bracket bolt and loosen the bolt on the generator.
59. Move the strap clear of the intake manifold.
60. Remove the evaporative emission canister purge solenoid bracket bolt and move the bracket clear.



B102C057

61. Disconnect the throttle cable at the throttle body and the intake manifold.
  62. Loosen all of the cylinder head bolts gradually and in the sequence shown.
  63. Remove the cylinder head bolts.
  64. Remove the cylinder head with the intake manifold and the exhaust manifold attached.
- Notice :** Prevent any engine oil or coolant from entering the cylinders when removing the cylinder head.
65. Remove the cylinder head gasket.



### Cleaning Procedure

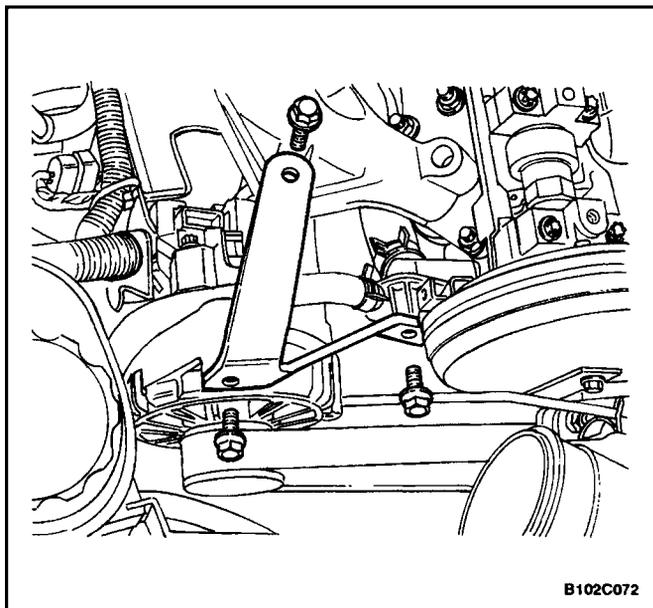
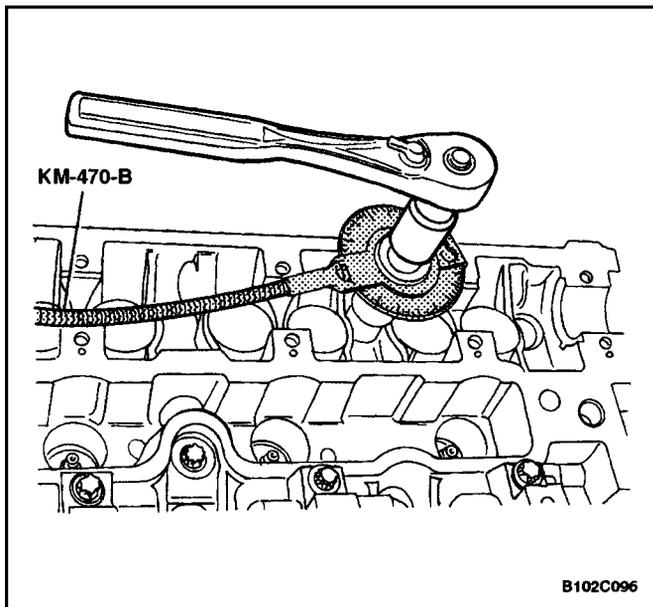
1. Clean the gasket surfaces of the cylinder head and the engine block.
2. Make sure the gasket surfaces of the cylinder head and the engine block are free of nicks and heavy scratches.
3. Clean the cylinder head bolts.
4. Inspect the cylinder head for warpage. Refer to "Cylinder Head and Valve Train Components" in this section.

### Installation Procedure

1. Install the cylinder head gasket.
2. Install the cylinder head with the intake manifold and the exhaust manifold attached.
3. Install the cylinder head bolts.
4. Tighten the cylinder head bolts gradually and in the sequence shown.

#### Tighten

Tighten the cylinder head bolts to 25 N•m (18 lb–ft) and turn the bolts another 3 turns of 90 degrees using the angular torque gauge KM-470-B.



5. Connect the throttle cable at the throttle body and the intake manifold.
6. Install the generator-to-intake manifold support bracket.
7. Install the intake generator-to-manifold support bracket bolts.

#### Tighten

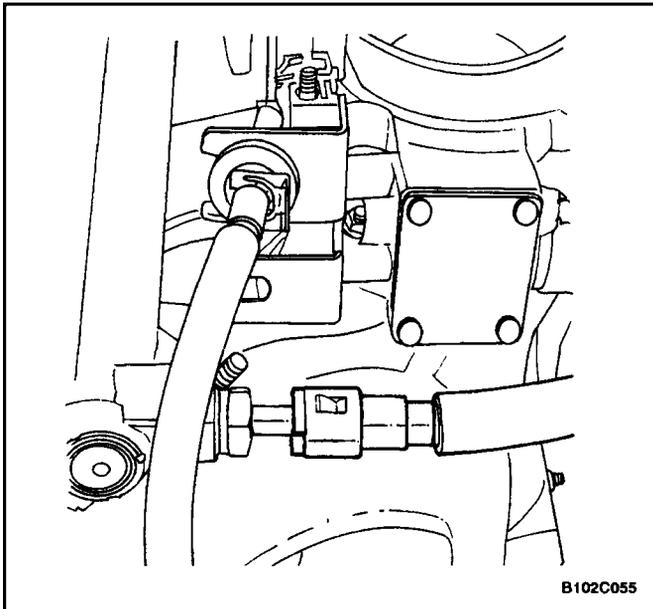
Tighten the generator-to-intake manifold support bracket bolts to the intake manifold to 35 N•m (26 lb–ft).

8. Install the intake manifold support bracket bolt to the generator.

#### Tighten

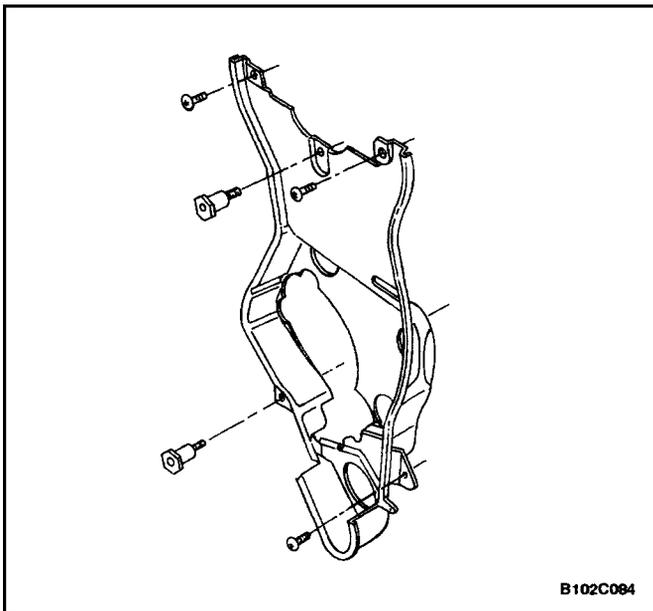
Tighten the intake manifold support bracket bolt at the generator to 20 N•m (15 lb–ft).

9. Connect the surge tank coolant hose at the throttle body.
10. Connect the coolant hose to the rear cylinder head and ignition coil EGR bracket.



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11. Connect the fuel feed line at the fuel rail.
12. Connect the fuel return line at the fuel rail.
13. Connect all of the necessary vacuum hoses.
14. Install the fuel rail assembly. Refer to *Section 1F, Engine Controls (DOHC)*.



B102C084

15. Install the auxiliary catalytic converter nuts at the exhaust manifold flange.

**Tighten**

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

16. Install the rear timing belt cover.
17. Install the rear timing belt cover bolts.

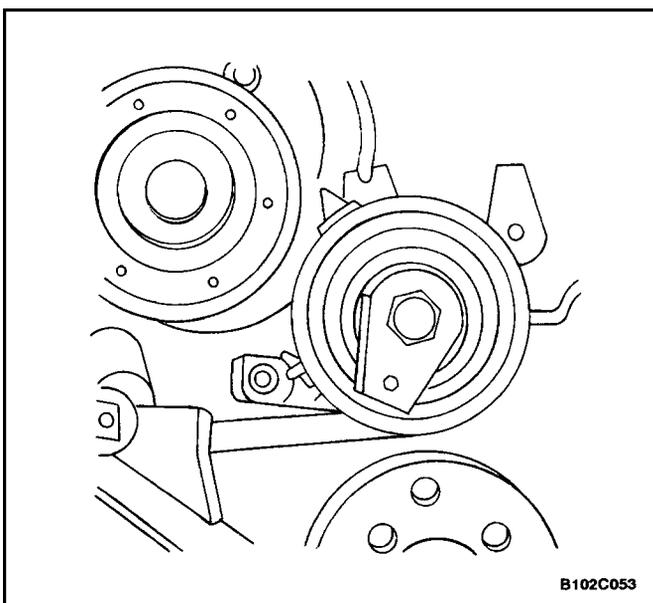
**Tighten**

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

18. Install the engine mount and retaining bolts.

**Tighten**

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



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19. Install the timing belt automatic tensioner.
20. Install the timing belt automatic tensioner bolt.

**Tighten**

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

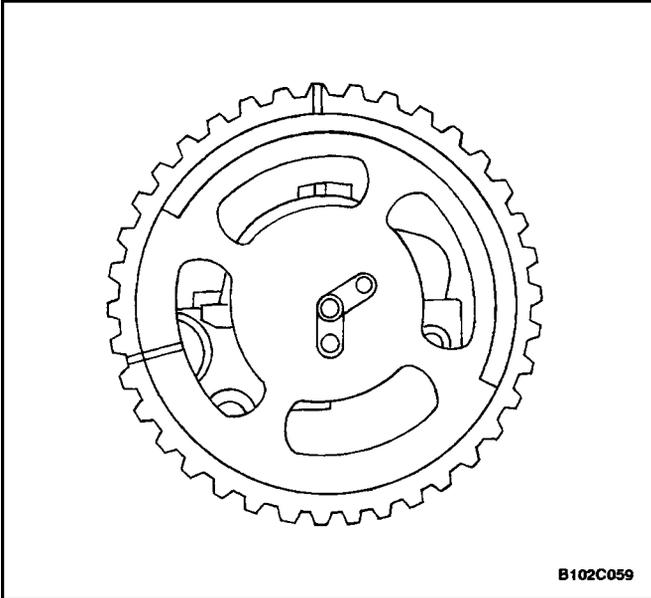
21. Install the timing belt idler pulleys.
22. Install the timing belt idler pulley nuts.

**Tighten**

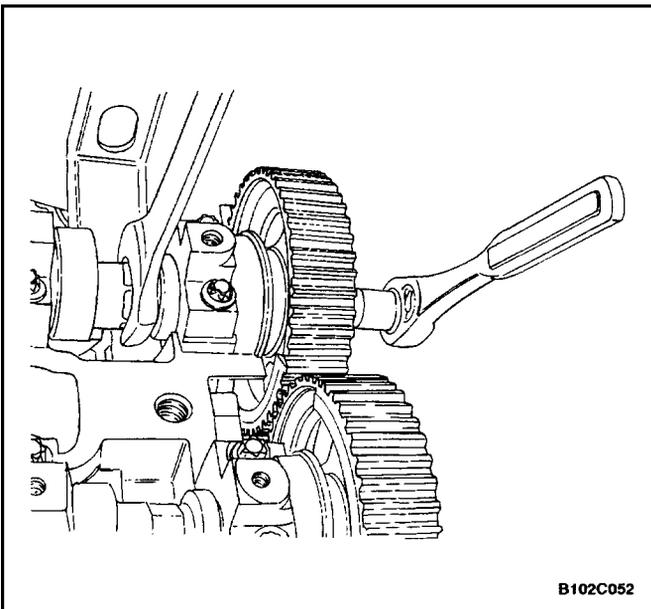
Tighten the timing belt idler pulley bolt to 25 N•m (18 lb–ft).

**Tighten**

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



23. Install the camshaft gears with the timing marks at the front.
24. Insert the guide pin of the intake camshaft into the "IN" bore.
25. Insert the guide pin of the exhaust camshaft into the "EX" bore.



26. Install the camshaft gears by counterholding on the hex of the camshaft with an open-ended wrench.
27. Install the camshaft gear with a new bolt to the camshaft.

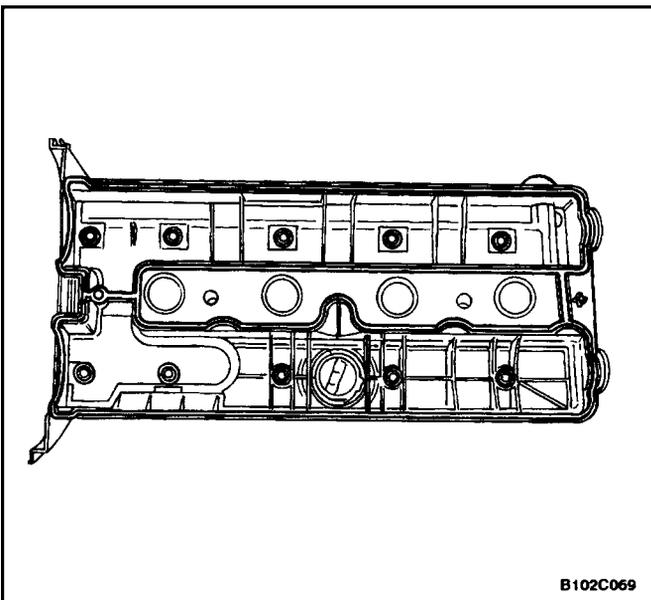
#### **Tighten**

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

28. While holding the exhaust camshaft firmly in place, install the exhaust camshaft gear bolt.

#### **Tighten**

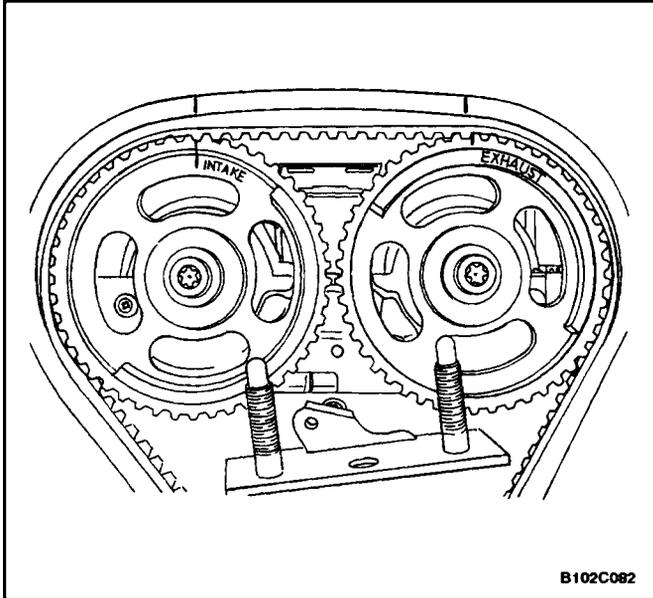
Tighten the exhaust camshaft gear bolt to 50 N•m (37 lb–ft). Using the angular torque gauge KM–470–B, tighten the bolt another 60 degrees plus 15 degrees.



29. 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.
30. Install the valve cover and the valve cover gasket.
31. Install the valve cover washers.
32. Install the valve cover bolts.

#### **Tighten**

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

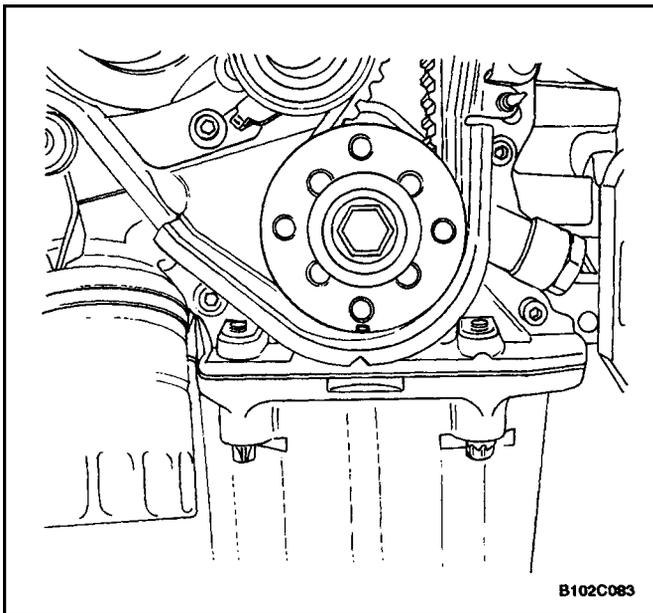


33. Connect the ignition wires to the spark plugs.
34. Install the spark plug cover.
35. Install the spark plug cover bolts.

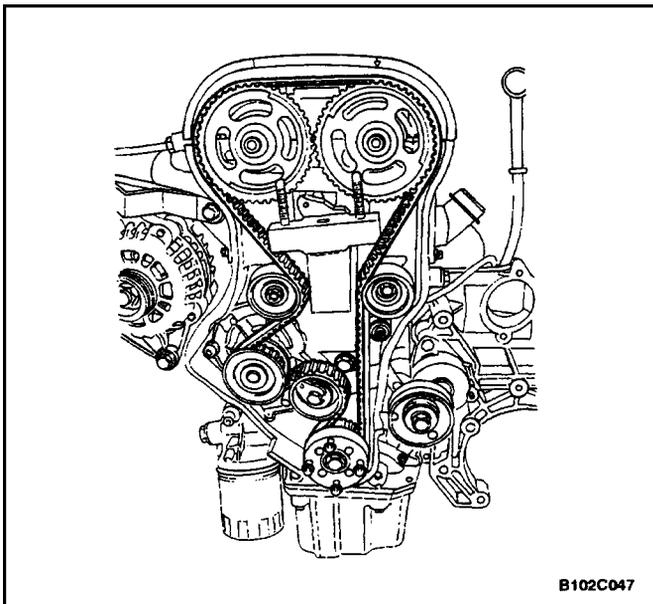
**Tighten**

Tighten the spark plug cover bolts to 8 N•m (71 lb-in).

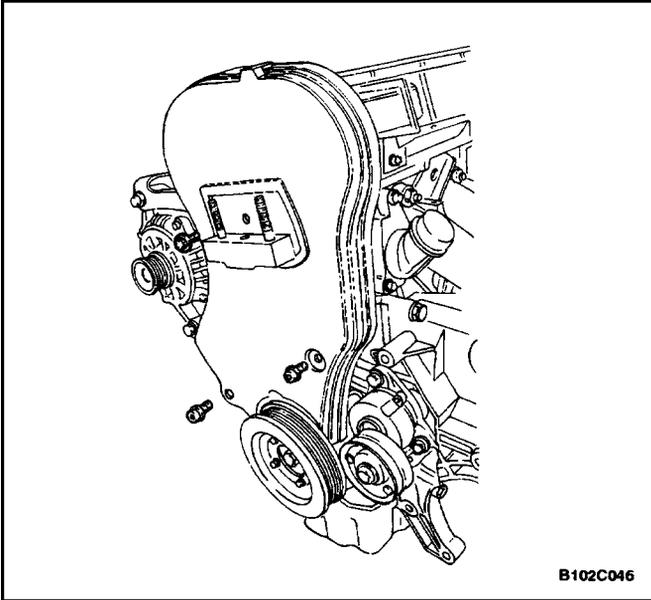
36. Connect the breather tube to the valve cover.
37. Align the timing marks on the camshaft gears to the notches on the valve cover, using the intake gear mark for the intake gear and the exhaust gear mark for the exhaust gear.



38. Align the mark on the crankshaft gear with the notch at the bottom of the rear timing belt cover.



39. Install the timing belt.
40. Check and adjust the timing belt tension. Refer to "Timing Belt Check and Adjust" in this section.



41. Install the front timing belt cover.
42. Install the front timing belt cover bolts.

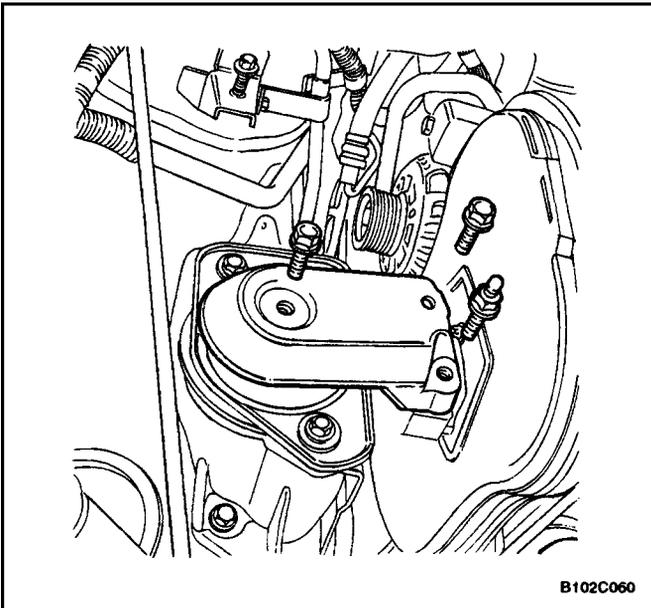
### Tighten

Tighten the upper and lower front timing belt cover bolts to 6 N•m (53 lb-in).

43. Install the crankshaft pulley.
44. Install the crankshaft pulley bolts.

### Tighten

Tighten the crankshaft pulley bolts to 20 N•m (15 lb-ft).

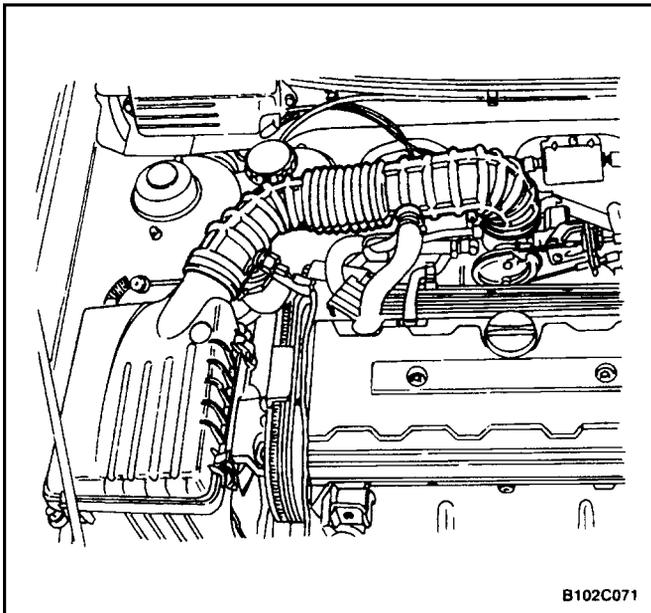


45. Install the right engine mount bracket and retaining bolts.

### Tighten

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

46. Remove the engine assembly lift support J-28467-B.
47. Install the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.
48. Connect the upper radiator hose to the thermostat housing.
49. Install the right front splash shield.
50. Install the right front wheel. Refer to *Section 2E, Tires and Wheels*.

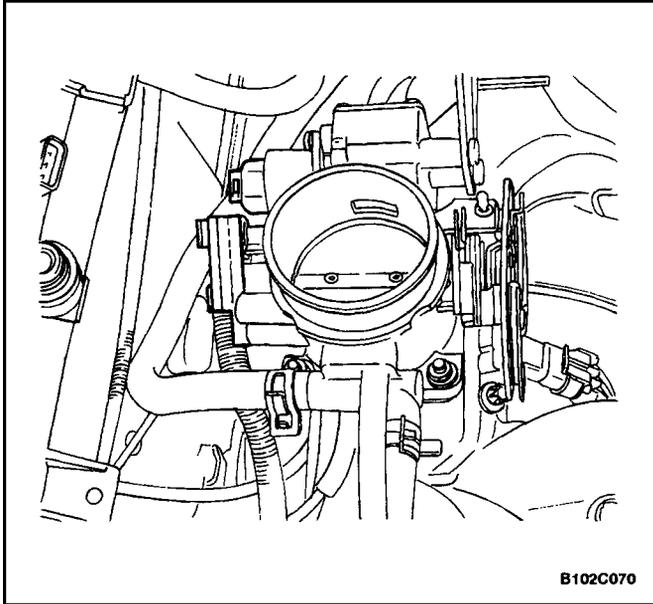


51. Install the air filter housing.
52. Install the air filter housing bolts.

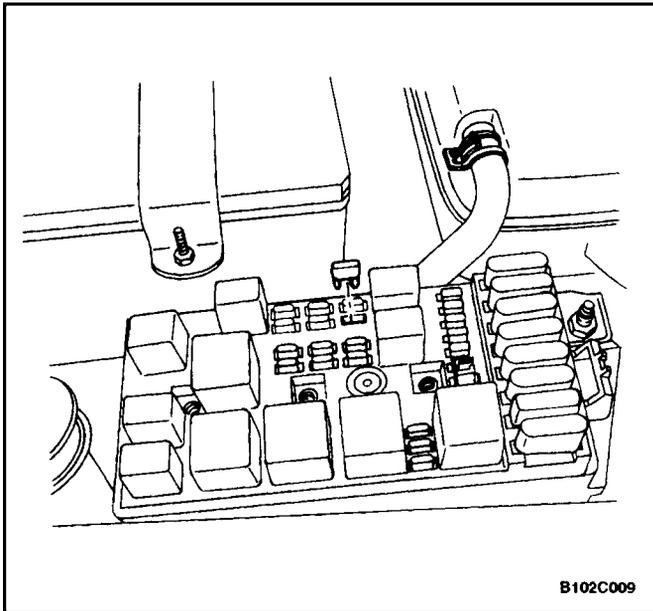
### Tighten

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

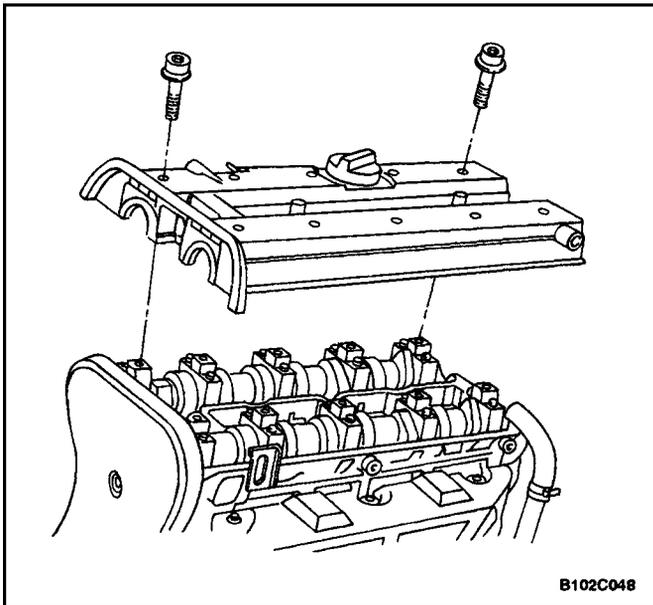
53. Connect the air intake tube to the throttle body.
54. Connect the breather tube to the valve cover.
55. Connect the intake air temperature sensor connector.
56. Connect the camshaft position sensor.



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57. Connect the coolant temperature sensor connector.
58. Connect the engine coolant temperature sensor connector.
59. Connect the idle air control valve connector.
60. Connect the throttle position sensor connector.
61. Install the evaporative emission canister purge solenoid bracket bolt.

**Tighten**

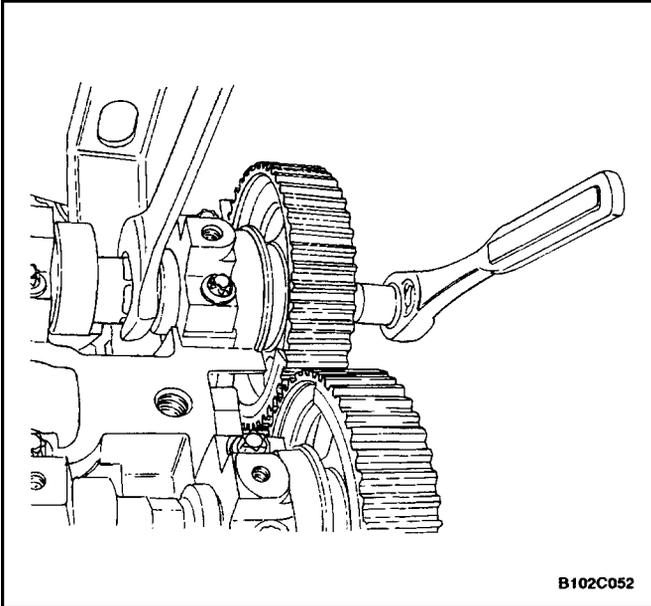
Tighten the evaporative emission canister purge solenoid bracket bolt to 5 N•m (44 lb-in).

62. Connect the EI system ignition coil connector.
63. Connect the pre-converter oxygen sensor connector.
64. Connect the PCM/ECM ground terminal.
65. Install the fuel pump fuse.
66. Connect the negative battery ground cable.
67. Refill the engine cooling system. Refer to *Section 1D, Engine Cooling*.

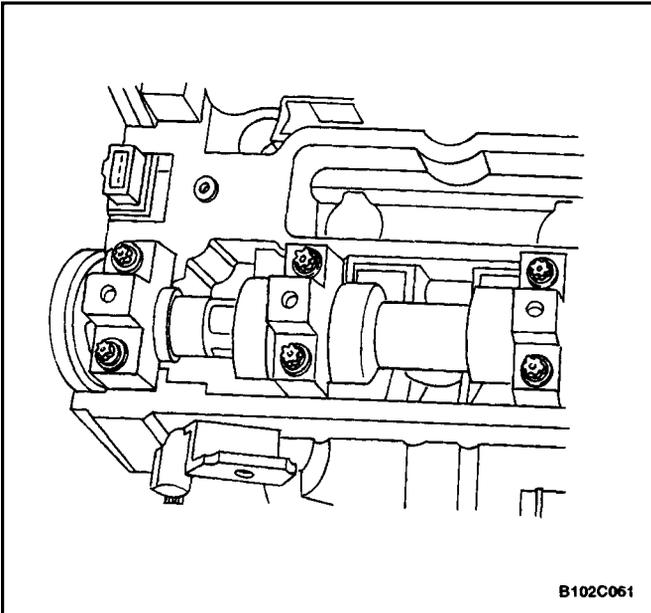
**CAMSHAFTS**

**Removal Procedure**

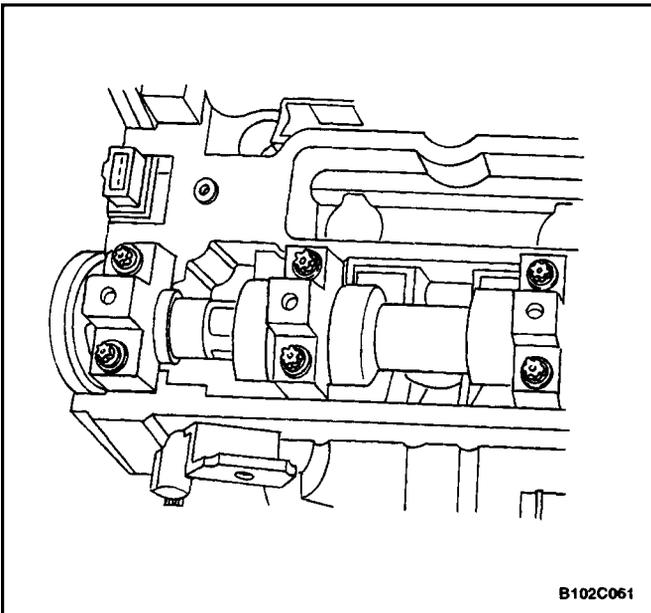
1. Remove the timing belt. Refer to "Timing Belt" in this section.
2. Disconnect the breather tube at the valve cover.
3. Disconnect the crankcase ventilation tube at the valve cover.
4. Remove the spark plug cover bolts.
5. Remove the spark plug cover.
6. Disconnect the ignition wires from the spark plugs.
7. Disconnect the camshaft position sensor.
8. Remove the valve cover bolts.
9. Remove the valve cover washers.
10. Remove the valve cover and the valve cover gasket.



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B102C061



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

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

15. Loosen the camshaft bearing cap bolts in stages of one-half to one turn.
16. Remove the camshaft bearing cap bolts from the cylinder head.
17. Remove the camshafts.
18. Remove the seal ring from the camshafts.

**Important :** The camshaft must detach evenly from the bearing seats in the front guide bearing.

19. Check the camshaft and bearing seats for wear and replace them if necessary.

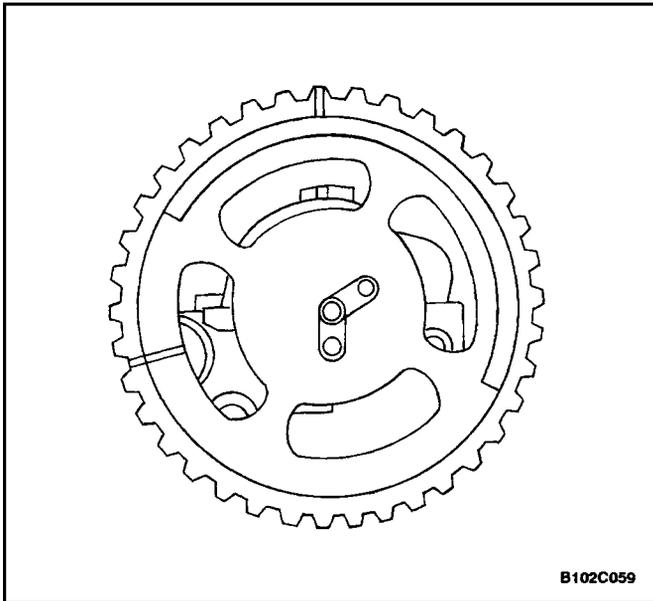
## Installation Procedure

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

1. Lubricate the camshaft journals and the camshaft caps with engine oil.
2. Install the intake camshaft.
3. Install the intake camshaft bearing caps in their original positions.
4. Install the intake camshaft bearing cap bolts.
5. Install the exhaust camshaft.
6. Install the exhaust camshaft bearing caps in their original positions.
7. Install the exhaust camshaft bearing cap bolts.
8. Tighten the camshaft cap bolts gradually and in the sequence shown for each camshaft bearing cap.

### Tighten

Tighten the camshaft cap bolts to 8 N•m (71 lb-in).

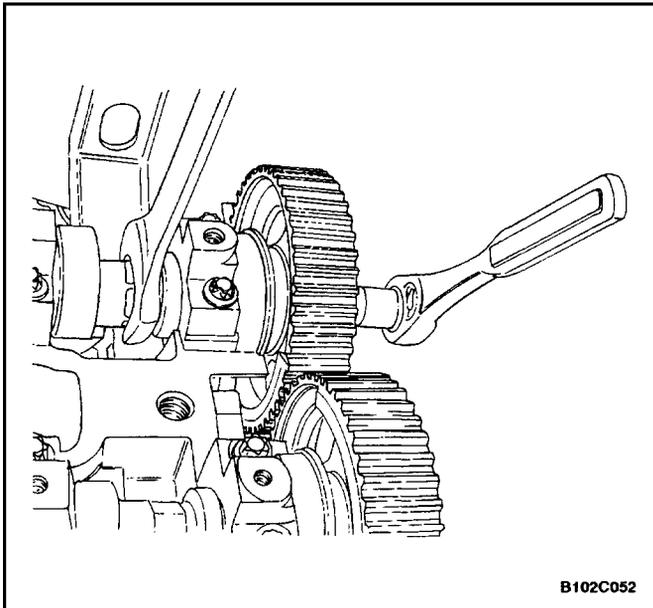


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9. Measure the intake camshaft end play and the exhaust camshaft end play. Refer to "Engine Specifications" in this section.
10. Install the intake camshaft gear.
11. While holding the intake camshaft firmly in place, install the intake camshaft gear 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 another 60 degrees plus 15 degrees.

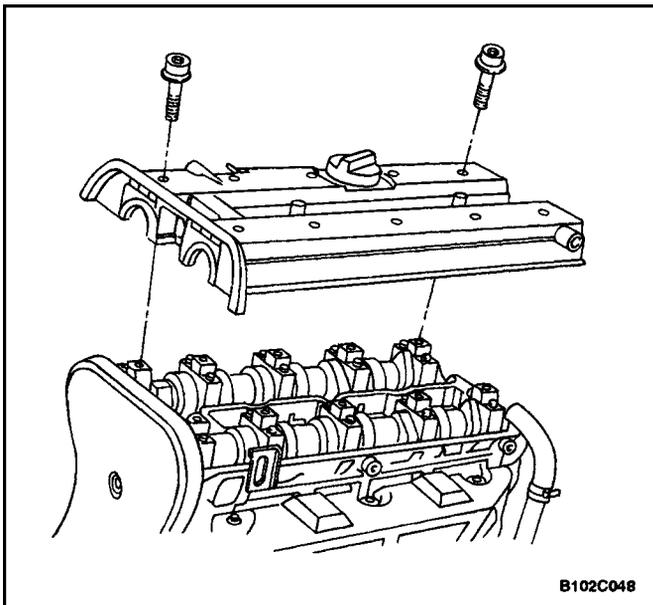


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12. Install the exhaust camshaft gear.
13. While holding the exhaust camshaft firmly in place, install the exhaust camshaft gear bolt.

**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 another 60 degrees plus 15 degrees.



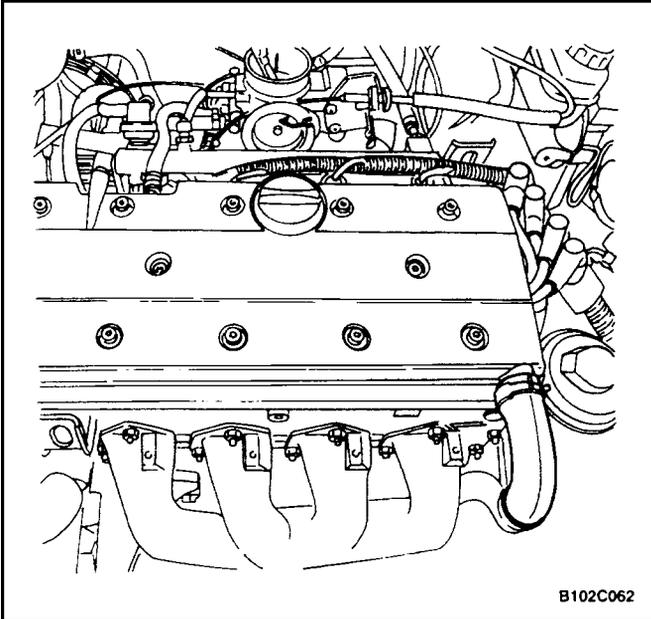
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14. Install the valve cover and the valve cover gasket.
15. Install the valve cover washers.
16. Install the valve cover bolts.

**Tighten**

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

17. Connect the camshaft position sensor.

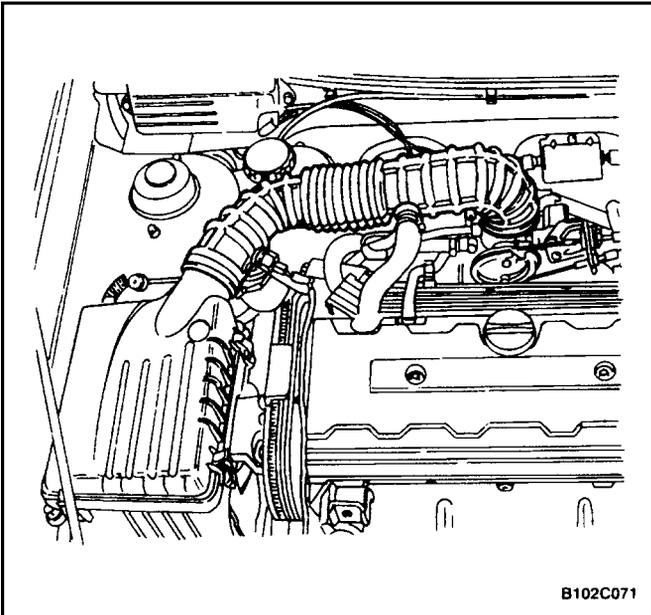


18. Connect the ignition wires to the spark plugs.
19. Install the spark plug cover.
20. Install the spark plug cover bolts.

### Tighten

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

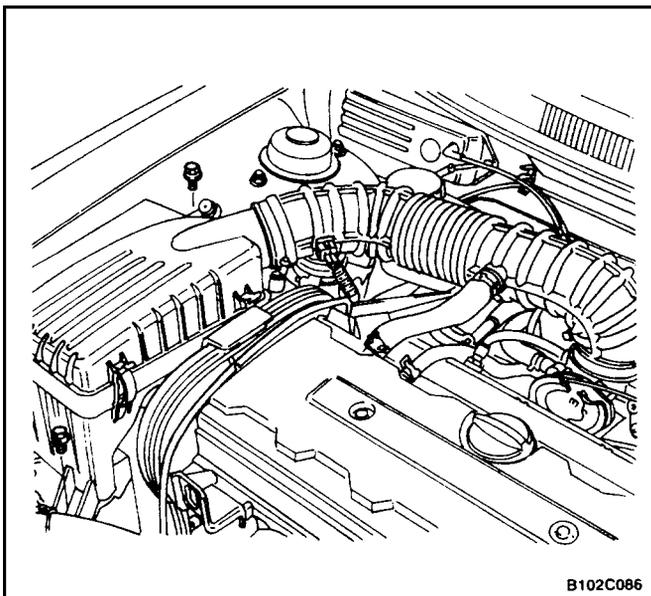
21. Connect the breather tube to the valve cover.
22. Connect the crankcase ventilation tube to the valve cover.
23. Install the timing belt. Refer to "Timing Belt" in this section.

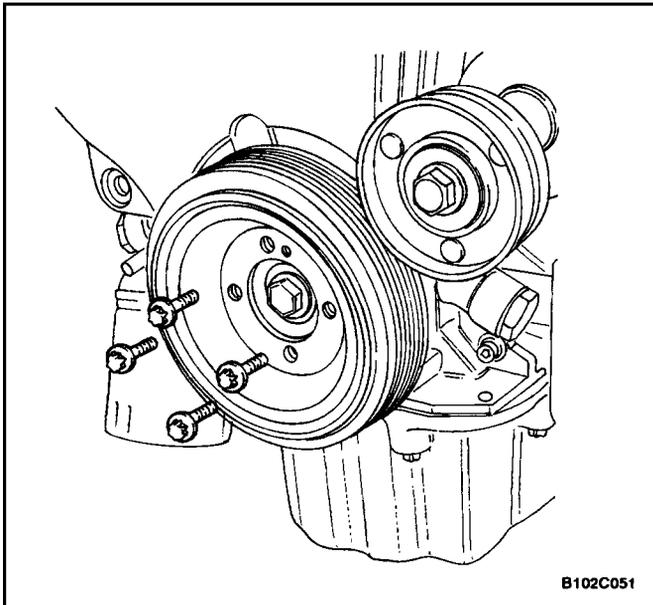


## TIMING BELT CHECK AND ADJUST

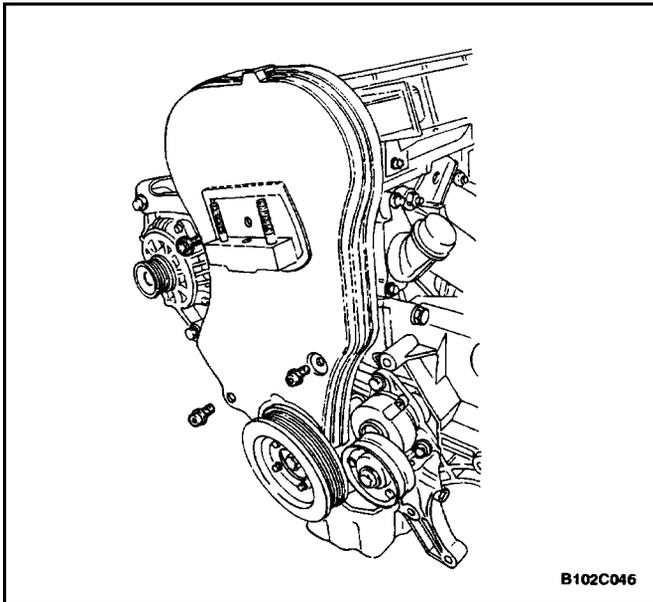
### Adjustment Procedure

1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature sensor connector.
3. Remove the air intake tube from the throttle body.
4. Remove the breather tube from the valve cover.
5. Remove the air filter housing bolts.
6. Remove the air filter housing.
7. Remove the right front wheel. Refer to *Section 2E, Tires and Wheels*.
8. Remove the right front splash shield.

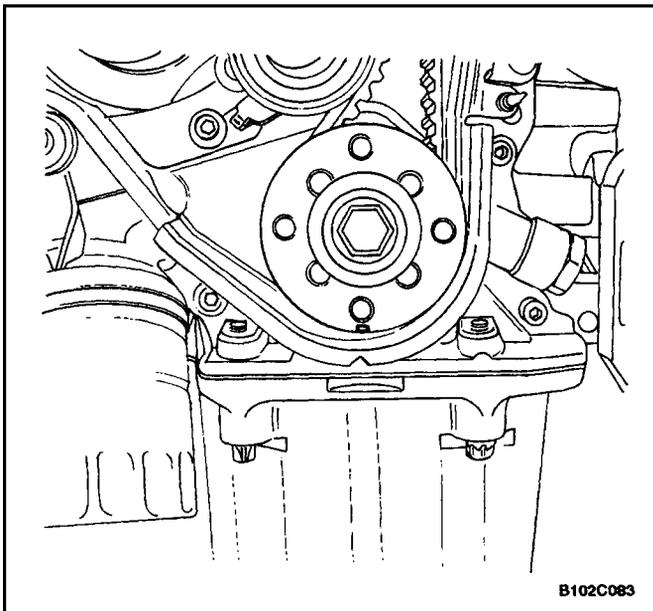




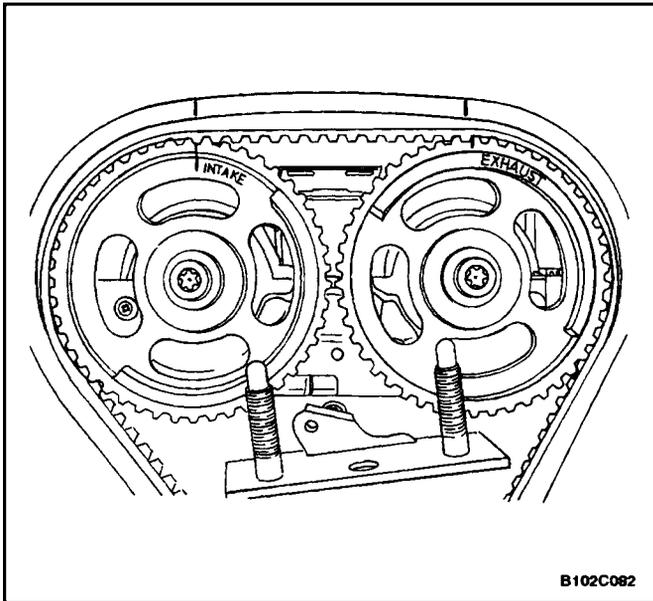
9. Remove the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.
10. Remove the crankshaft pulley bolts.
11. Remove the crankshaft pulley.
12. Remove the right engine mount bracket. Refer to "Engine Mount" in this section.



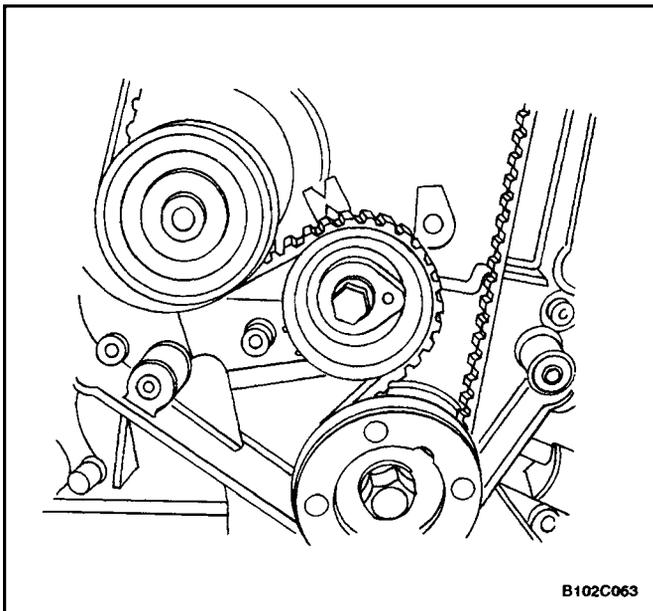
13. Remove the front timing belt cover bolts.
14. Remove the front timing belt cover.



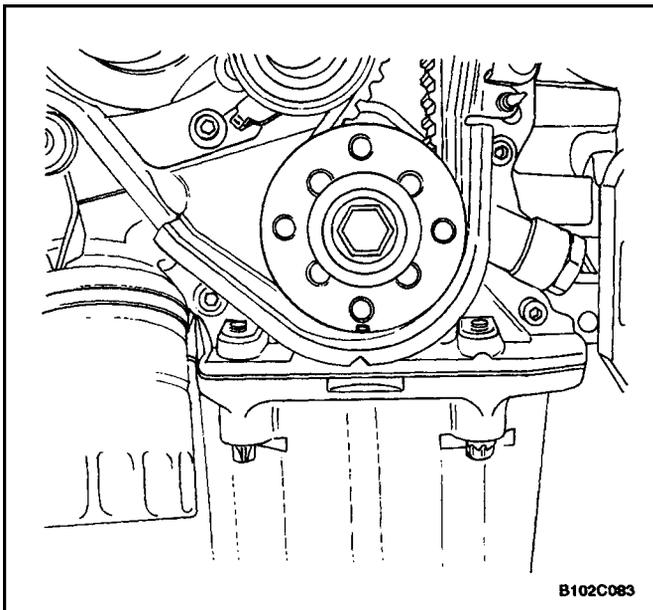
15. Rotate the crankshaft at least one full turn clockwise using the crankshaft gear bolt.
16. Align the mark on the crankshaft gear with the notch at the bottom of the rear timing belt cover.



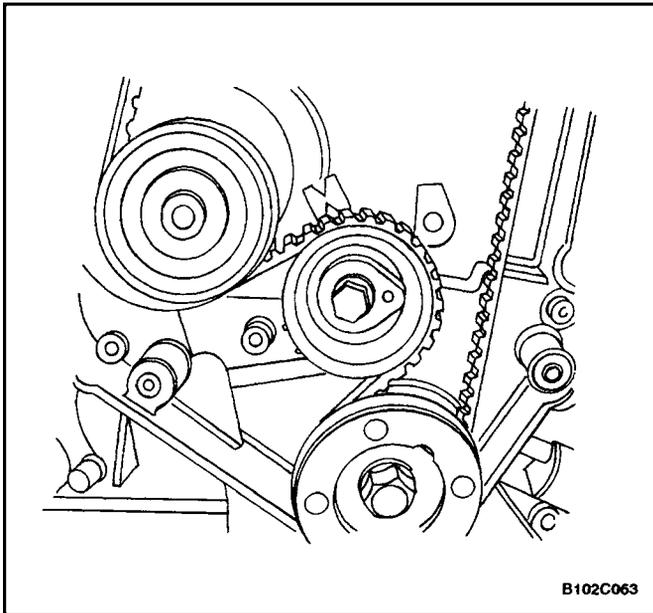
17. Align the camshaft gear timing marks. Use the exhaust gear mark for the exhaust gear and the intake gear mark for the intake gear, since the gears are interchangeable



18. Loosen the automatic tensioner bolt. To relieve the belt tension, turn the hex-key tab counterclockwise.
19. Rotate the automatic tensioner hex-key tab clockwise until the adjust arm pointer of the timing belt automatic tensioner is aligned with the notch in the timing belt automatic tensioner bracket.



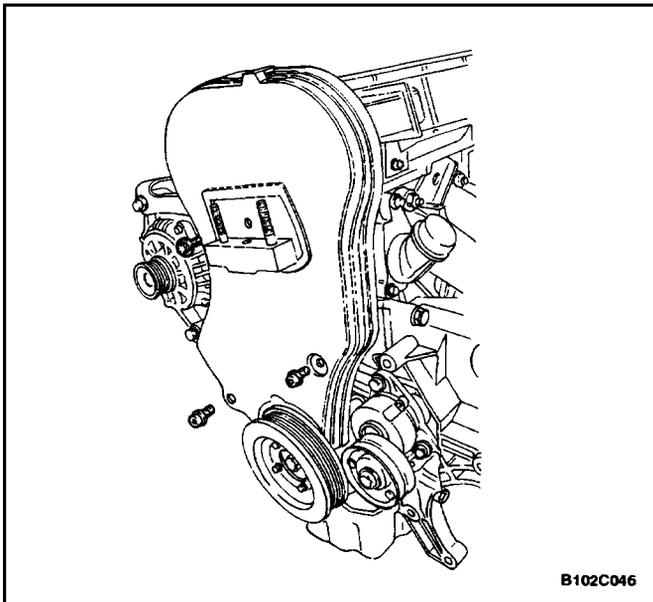
20. Tighten the automatic tensioner bolt.
21. Rotate the crankshaft two full turns clockwise using the crankshaft gear bolt.
22. Check the automatic tensioner pointer.



23. When the adjust arm pointer of the timing belt automatic tensioner is aligned with the notch on the timing belt automatic tensioner bracket, the belt is tensioned correctly.

**Tighten**

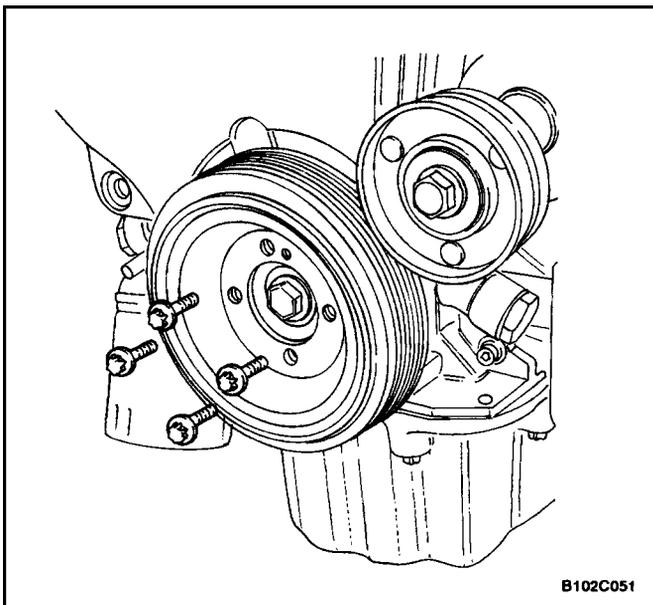
Tighten the automatic tensioner bolt to 25 N•m (18 lb-ft).



24. Install the front timing belt cover.
25. Install the front timing belt cover bolts.

**Tighten**

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

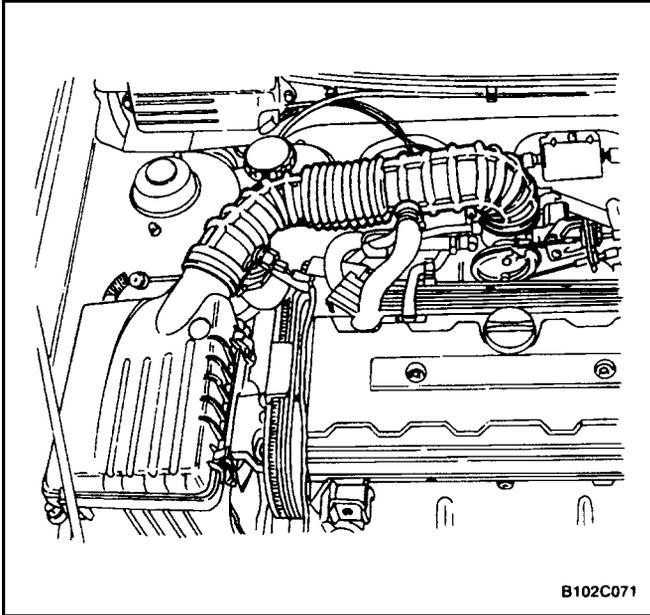


26. Install the crankshaft pulley.
27. Install the crankshaft pulley bolts.

**Tighten**

Tighten the crankshaft pulley bolt to 20 N•m (15 lb-ft).

28. Install the right engine mount bracket. Refer to "Engine Mount" in this section.
29. Install the serpentine accessory drive belt. Refer to Section 6B, Power Steering Pump.

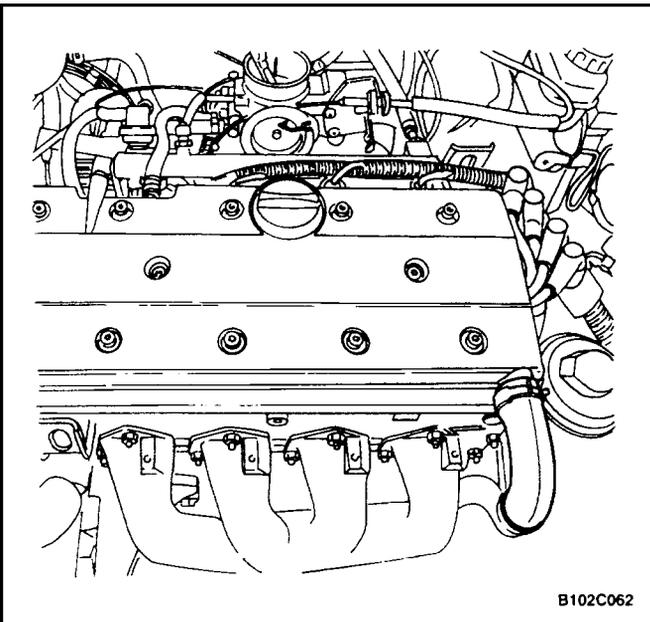


30. Install the right front splash shield.
31. Install the right front wheel. Refer to *Section 2E, Tires and Wheels*.
32. Install the air filter housing.
33. Install the air filter housing bolts.

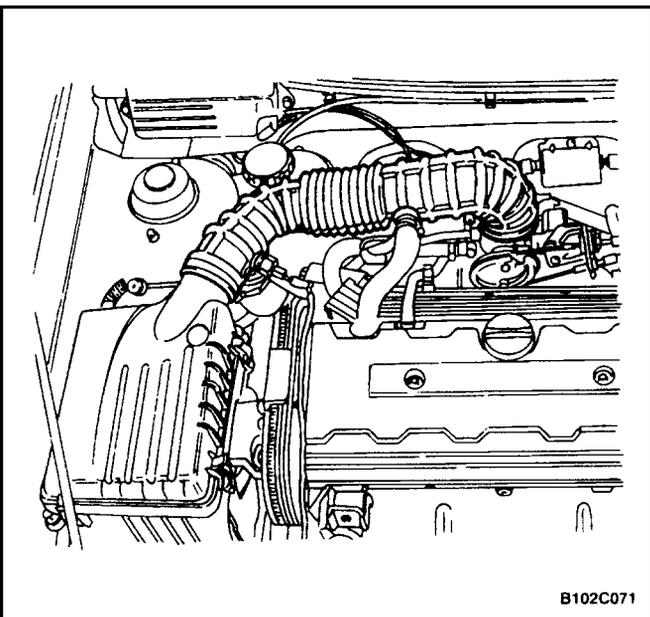
### Tighten

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

34. Connect the air intake tube to the throttle body.



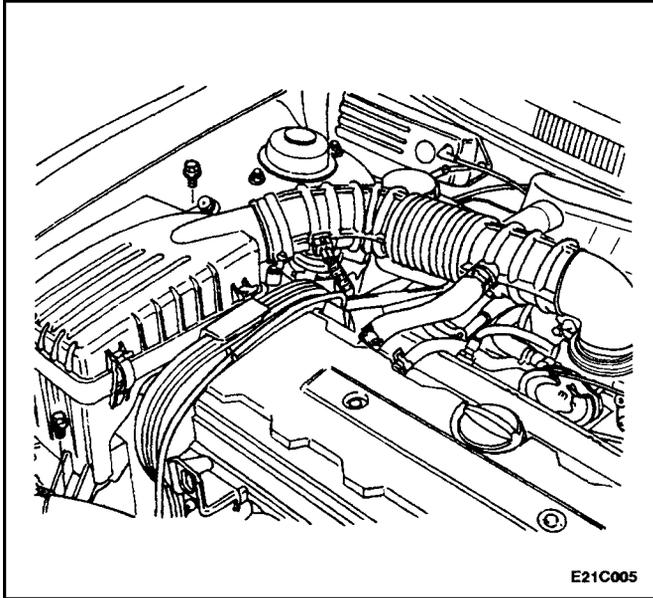
35. Connect the breather tube to the valve cover.
36. Connect the intake air temperature sensor connector.
37. Connect the negative battery cable.



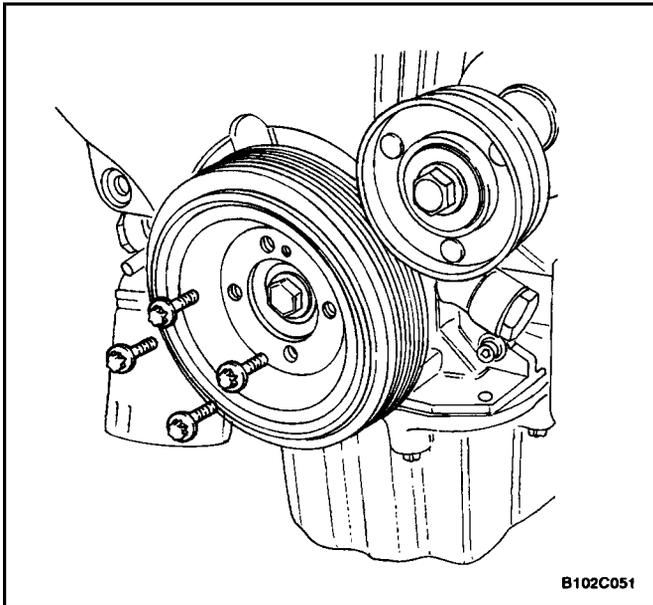
## TIMING BELT

### Removal Procedure

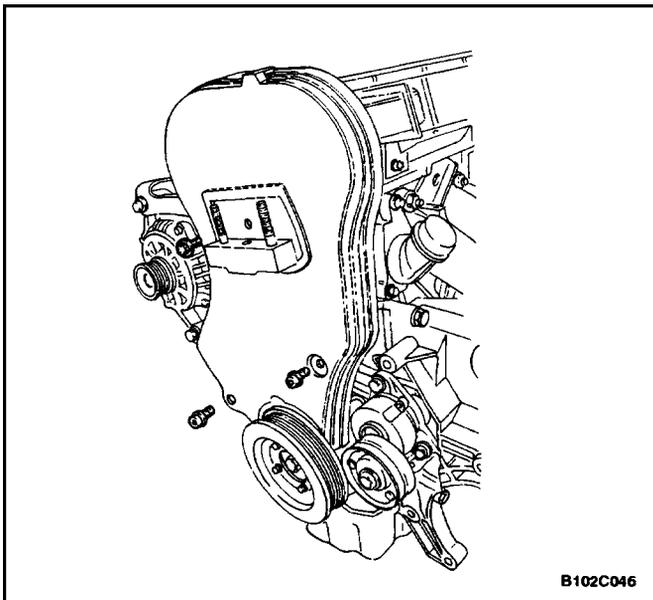
1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature sensor connector.
3. Disconnect the air intake tube from the throttle body.
4. Disconnect the breather tube from the valve cover.



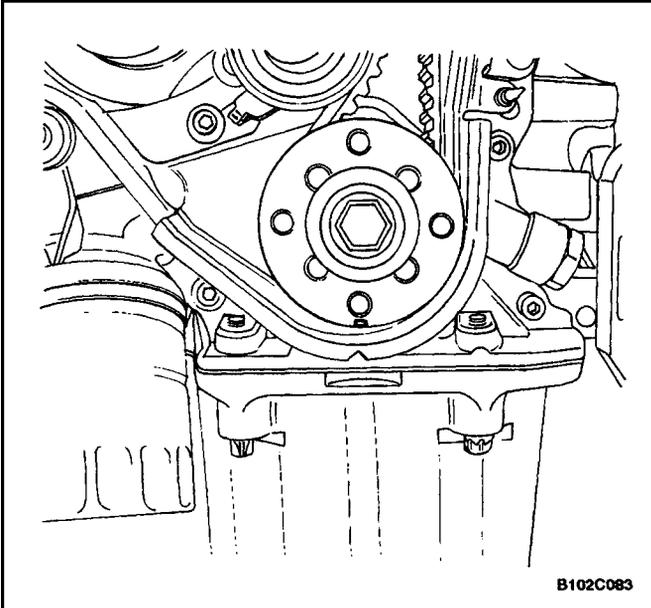
5. Remove the air filter housing bolts.
6. Remove the air filter housing.
7. Remove the right front wheel. Refer to *Section 2E, Tires and Wheels*.
8. Remove the right front splash shield.



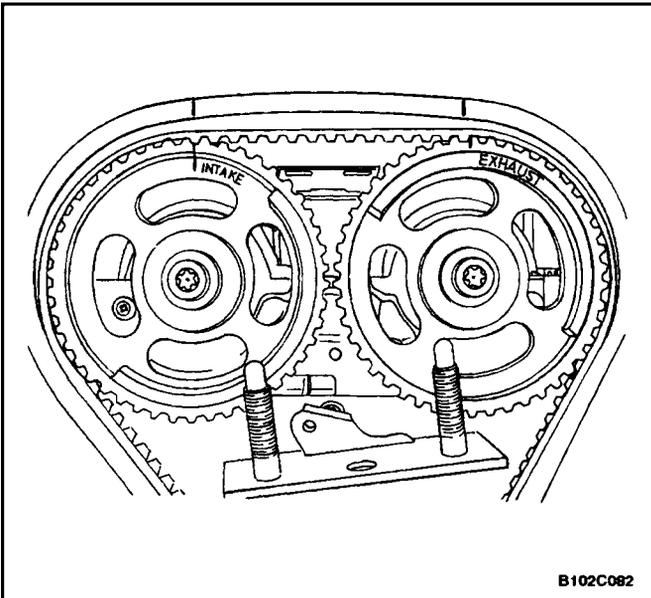
9. Remove the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.
10. Remove the crankshaft pulley bolts.
11. Remove the crankshaft pulley.
12. Remove the right engine mount bracket. Refer to "Engine Mount" in this section.



13. Remove the front timing belt cover bolts.
14. Remove the front timing belt cover.



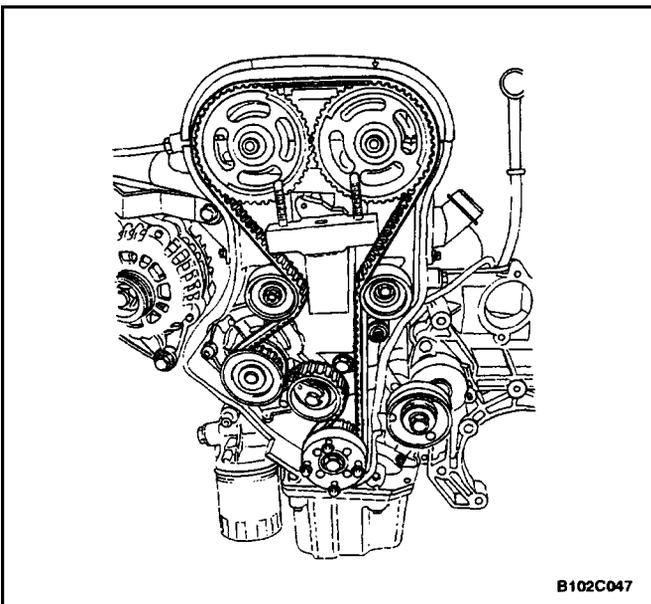
15. Using the crankshaft gear bolt, rotate the crankshaft clockwise until the timing mark on the crankshaft gear is aligned with the notch at the bottom of the rear timing belt cover.



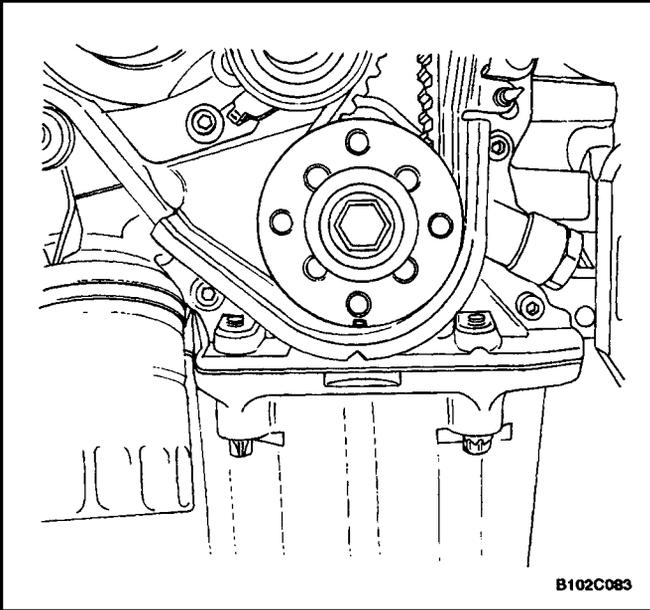
**Notice :** The camshaft gears must align with the notch on the valve cover or damage to the engine could result.

16. Align the camshaft gears with the notch on the valve cover.

**Important :** Use the intake gear mark for the intake camshaft gear and the exhaust gear mark for the exhaust camshaft gear since both gears are interchangeable.

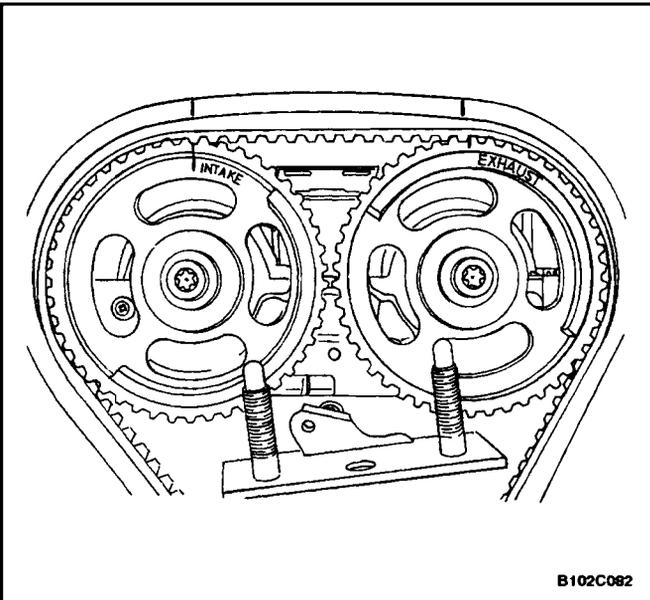


17. Remove the timing belt.
18. Loosen the automatic tensioner bolt. Turn the hexkey tab to relieve belt tension.

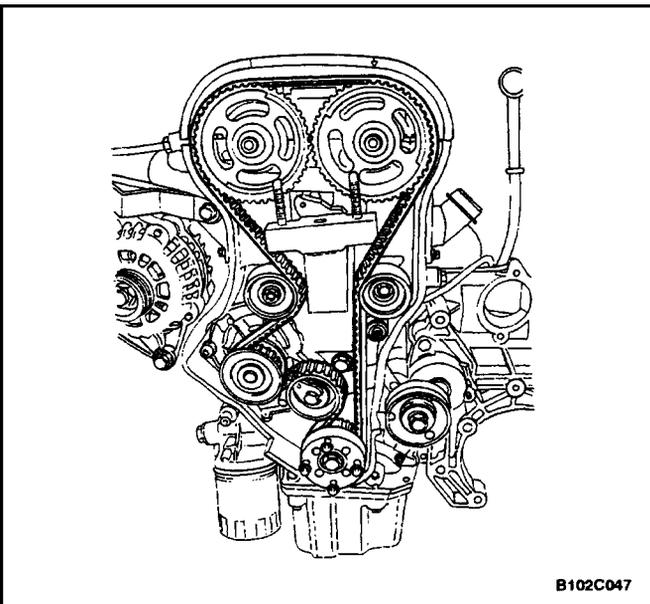


## Installation Procedure

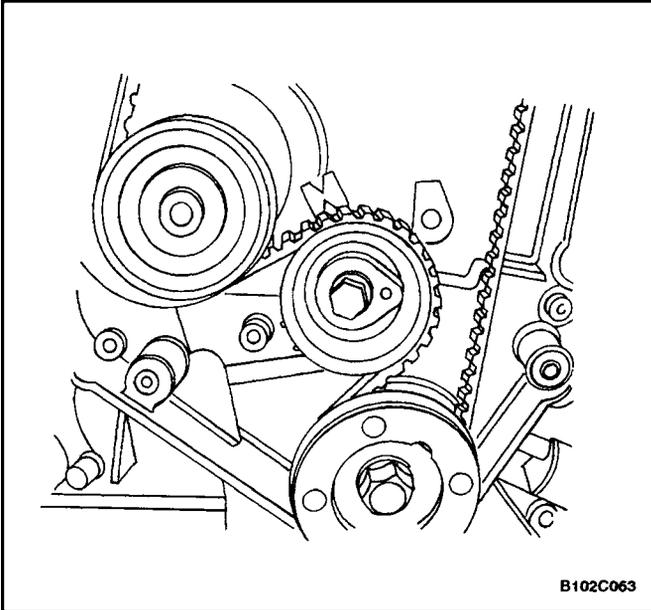
1. Align the timing mark on the crankshaft gear with the notch on the bottom of the rear timing belt cover.



2. Align the timing marks on the camshaft gears, using the intake gear mark for the intake gear and the exhaust gear mark for the exhaust gear.



3. Install the timing belt.

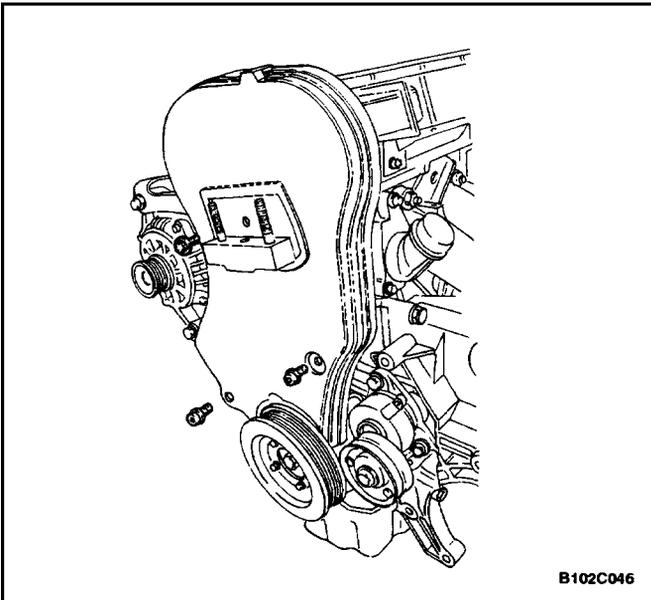


4. Turn the hex-key tab in a clockwise direction to tension the belt. Turn until the pointer aligns with the notch.
5. Install the automatic tensioner bolt.

### **Tighten**

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

6. Rotate the crankshaft two full turns clockwise using the crankshaft pulley bolt.
7. Recheck the automatic tensioner pointer.

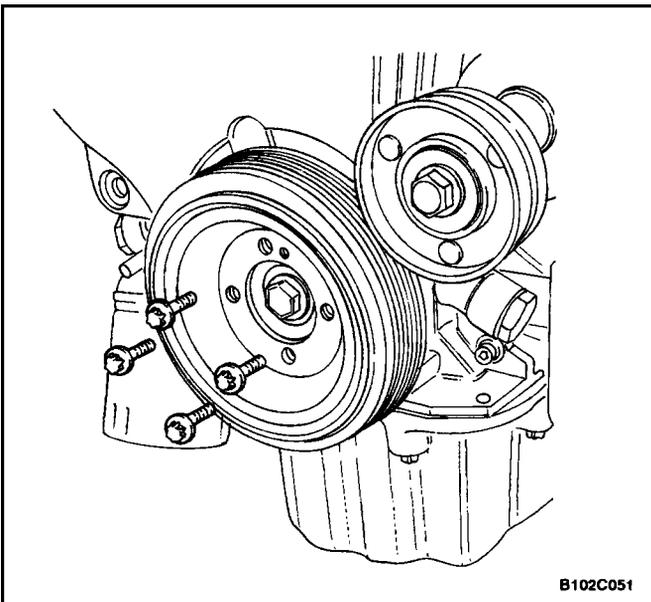


8. Install the front timing belt cover.
9. Install the front timing belt cover bolts.

### **Tighten**

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

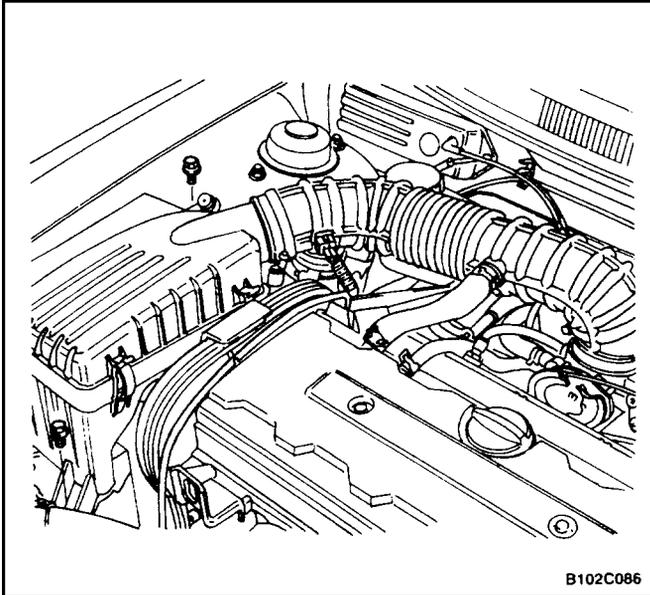
10. Install the right engine mount bracket. Refer to "Engine Mounts" in this section.



11. Install the crankshaft pulley.
12. Install the crankshaft pulley bolts.

### **Tighten**

Tighten the crankshaft pulley bolts to 20 N•m (15 lb-ft).

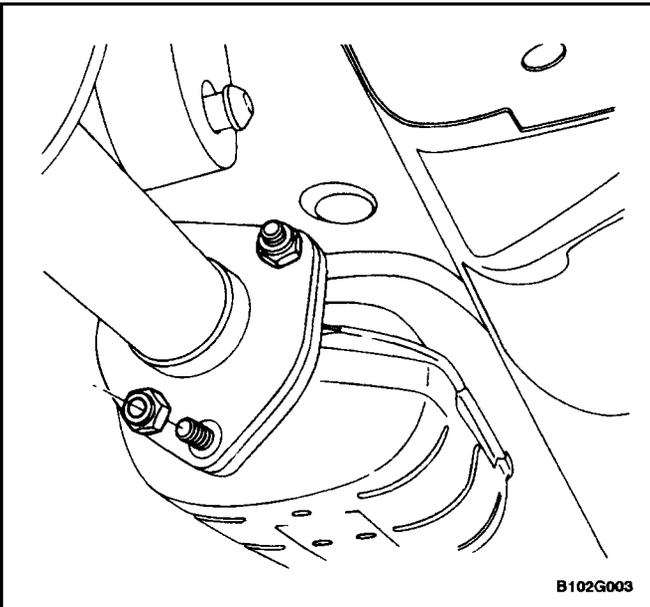


13. Install the serpentine accessory drive belt. Refer to Section 2E, Tires and Wheels.
14. Install the right front splash shield.
15. Install the right front wheel. Refer to Section 6B, Power Steering Pump.
16. Install the air filter housing.
17. Install the air filter housing bolts.

**Tighten**

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

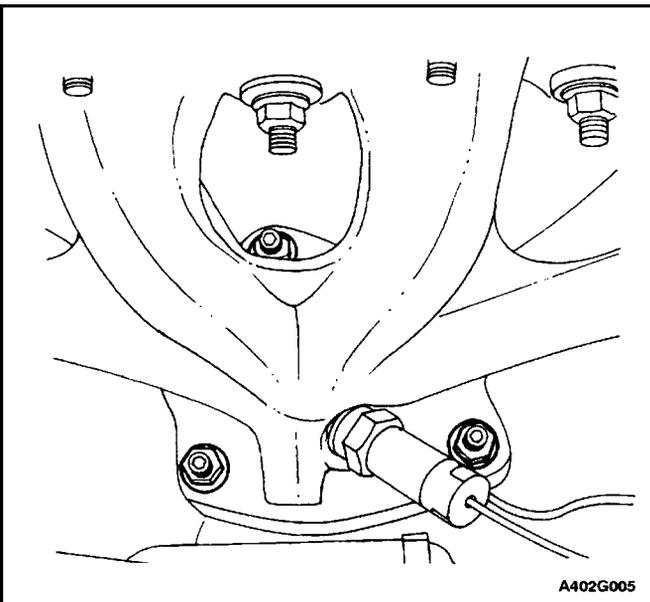
18. Connect the air intake tube to the throttle body.
19. Connect the breather tube to the valve cover.
20. Connect the intake air temperature sensor connector.
21. Connect the negative battery cable.



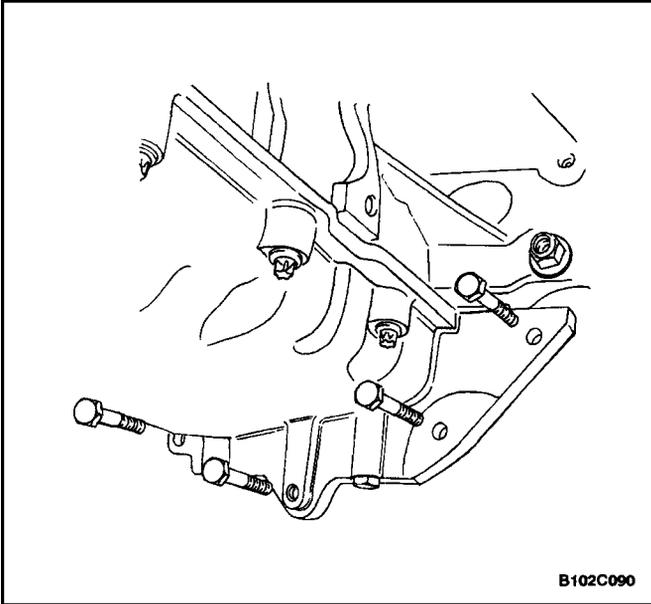
**OIL PAN**

**Removal Procedure**

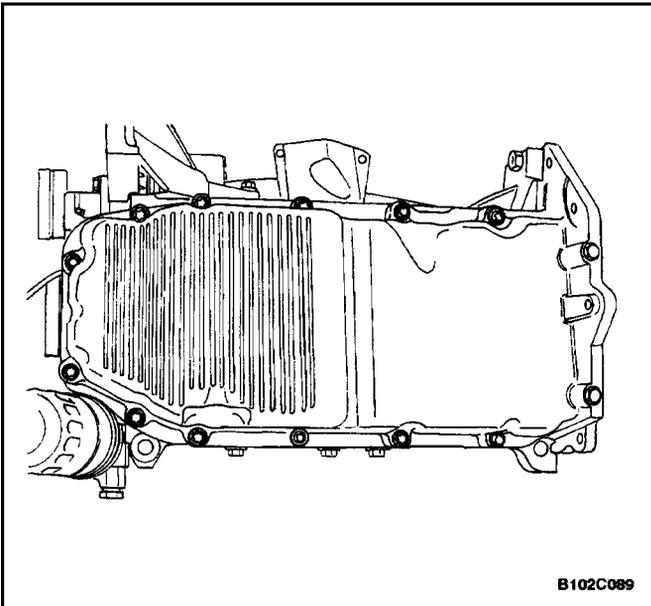
1. Disconnect the negative battery cable.
2. Drain the engine oil from the engine crankcase.
3. Disconnect the post-converter heated oxygen sensor.
4. Remove the auxiliary catalytic converter upper flange nuts from the exhaust manifold and the support bracket bolts.



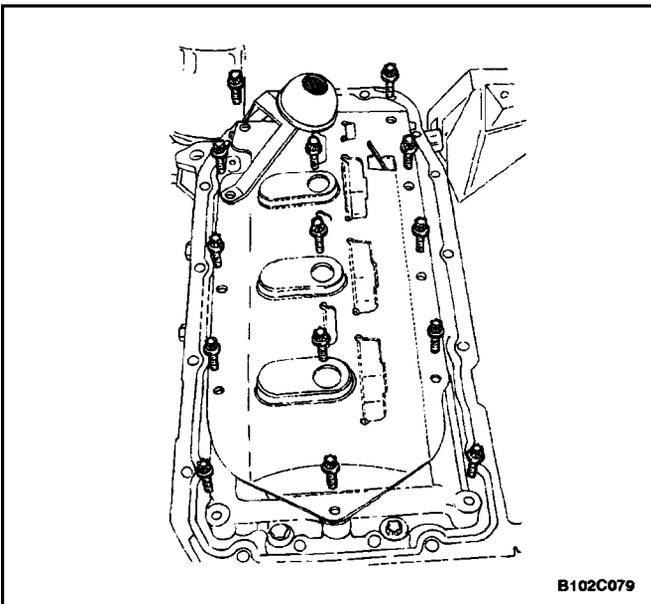
5. Remove the front muffler pipe retaining nuts from the main catalytic converter.
6. Remove both catalytic converters as a unit.



7. Remove the oil pan flange-to-transaxle retaining bolts.

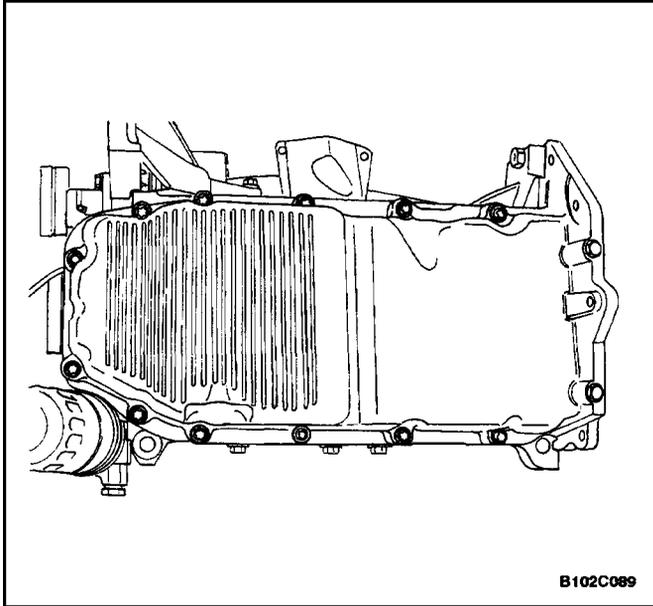


8. Remove the oil pan retaining bolts.
9. Remove the oil pan from the engine block.



### Cleaning Procedure

1. Clean the oil pan sealing surface.
2. Clean the engine block sealing surface.
3. Clean the oil pan retaining bolts.
4. Clean the oil pan attaching bolt holes in the engine block.
5. Clean the oil pan splash shield.

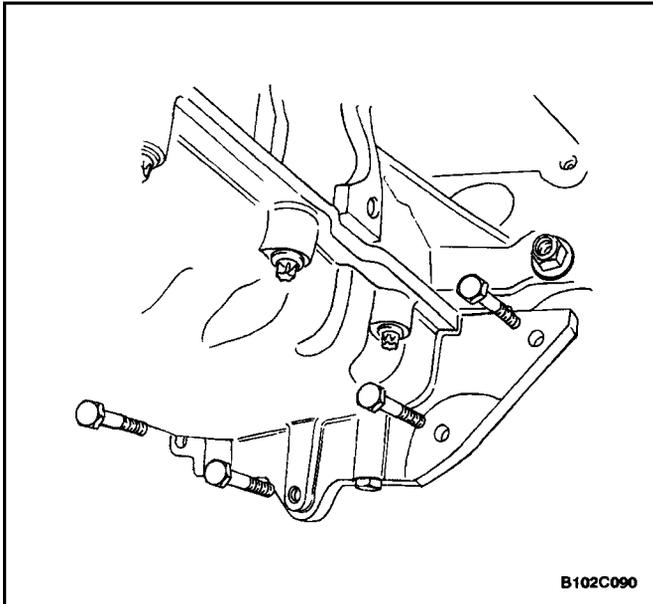


### Installation Procedure

1. Coat the new oil pan gasket with sealant.  
**Important :** Install the oil pan within 5 minutes after applying the liquid gasket to the oil pan.
2. Install the oil pan to the engine block.
3. Install the oil pan retaining bolts.

#### Tighten

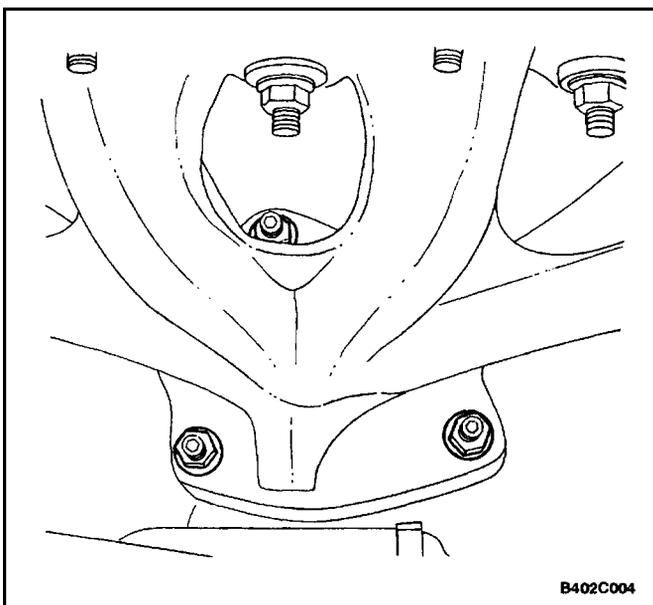
Tighten the oil pan retaining bolts to 10 N•m (89 lb-in).



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

#### Tighten

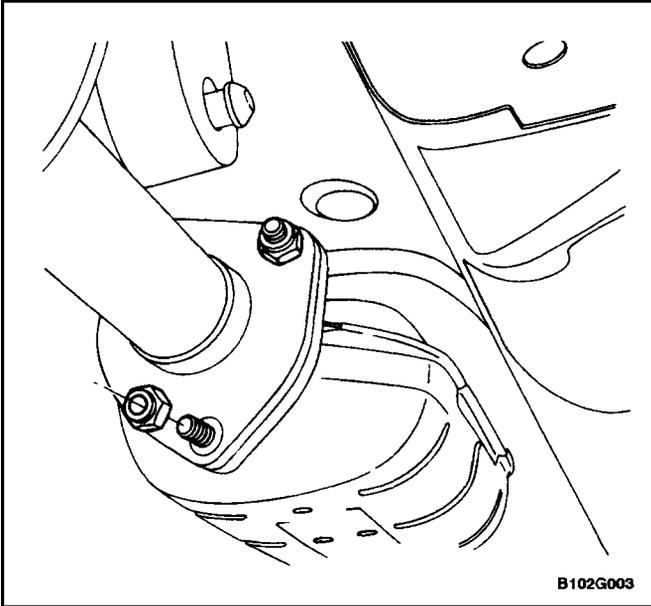
Tighten the oil pan flange-to-transaxle bolts to 40 N•m (30 lb-ft).



5. Install the catalytic converters.

#### Tighten

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

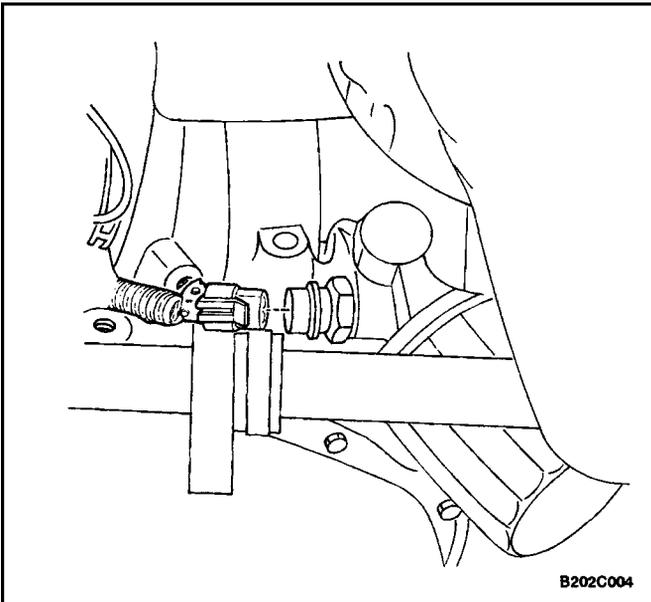
**Tighten**

Tighten the exhaust pipe support bracket bolts to 40 N•m (30 lb–ft).

**Tighten**

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

6. Connect the post-converter oxygen sensor.
7. Connect the negative battery cable.
8. Refill the engine crankcase with engine oil.

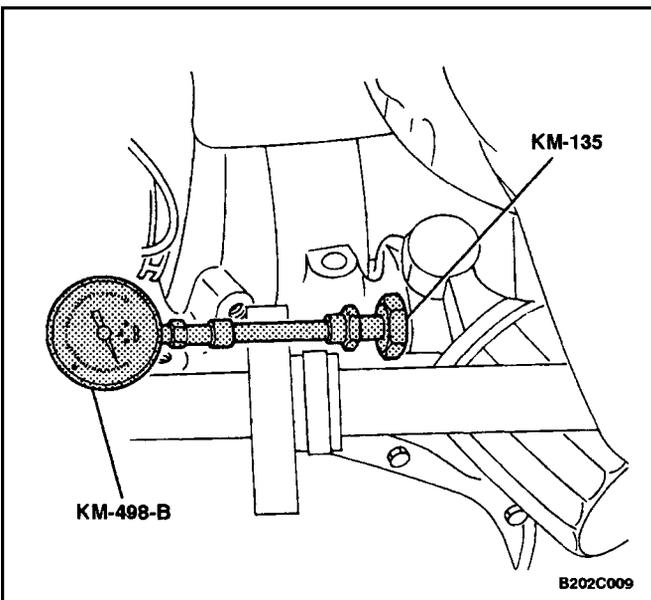
**OIL PUMP****Tools Required**

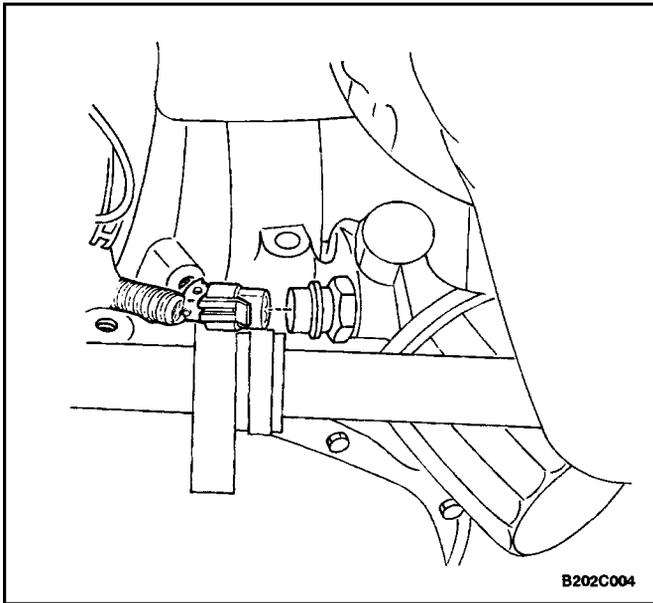
KM-498-B Pressure Gauge

KM-135 Adapter

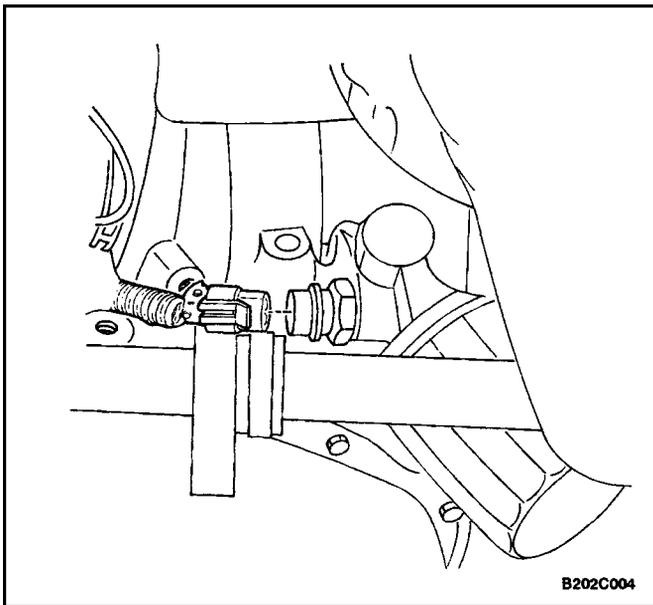
**Engine Oil Pressure Inspection Procedure**

1. Remove the right front wheel well splash shield.
2. Disconnect 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 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 pressure gauge KM-498-B and the adapter KM-135.

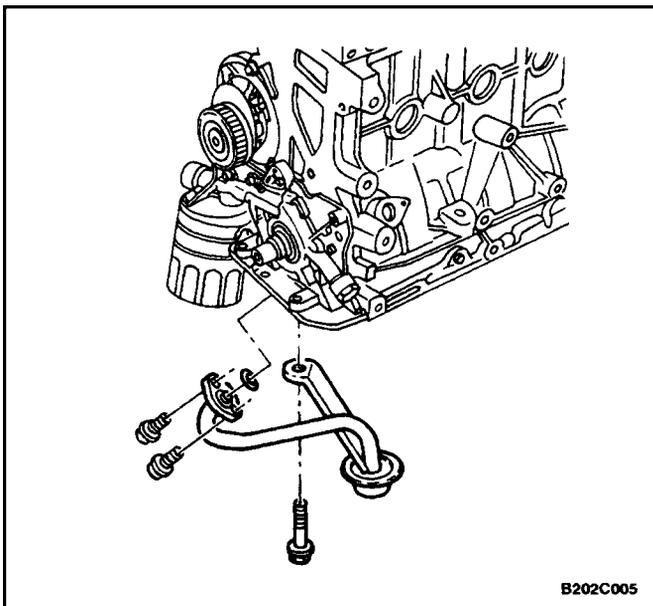




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7. Install the oil pressure switch.

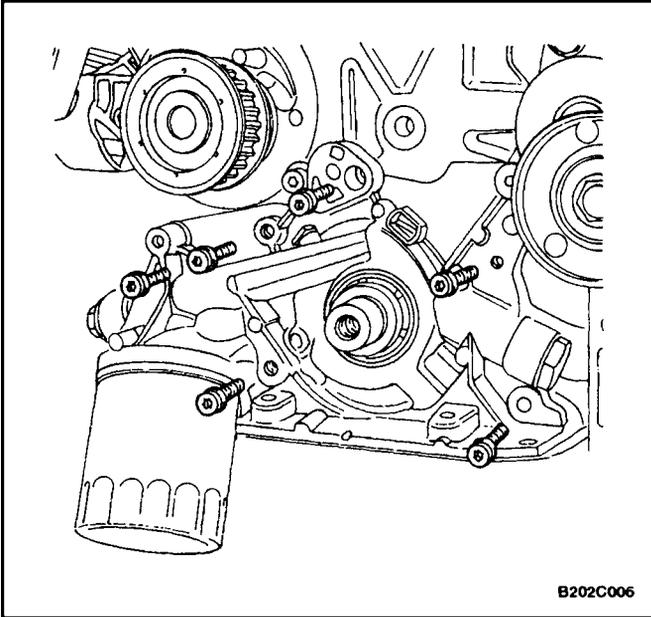
**Tighten**

Tighten the oil pressure switch to 40 N•m (30 lb–ft).

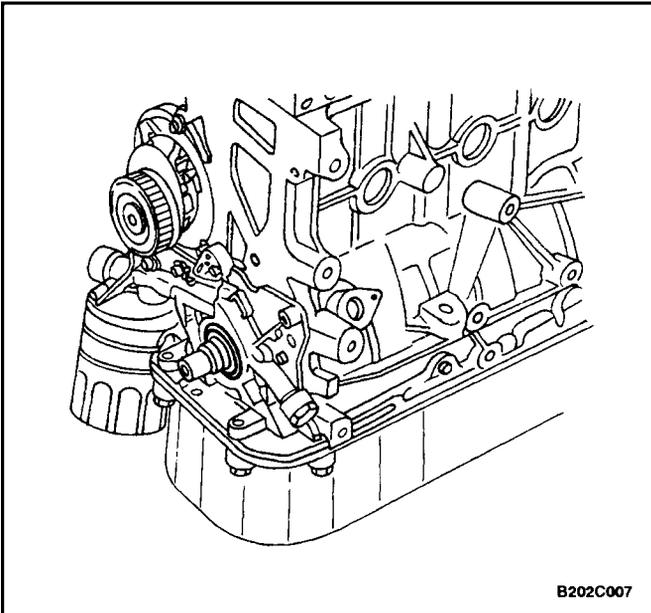
8. Connect the oil pressure switch connector.
9. Install the right front wheel well splash shield.
10. Check the oil level. Add oil until it reaches the full mark.

**Removal Procedure**

1. Disconnect the negative battery cable.
2. Remove the rear timing belt cover. Refer to "Rear Timing Belt Cover" in this section.
3. Disconnect the oil pressure switch connector.
4. Remove the oil pan. Refer to "Oil Pan" in this section.
5. Remove the oil pump/pickup tube and support bracket bolts.
6. Remove the oil pump/pickup tube.

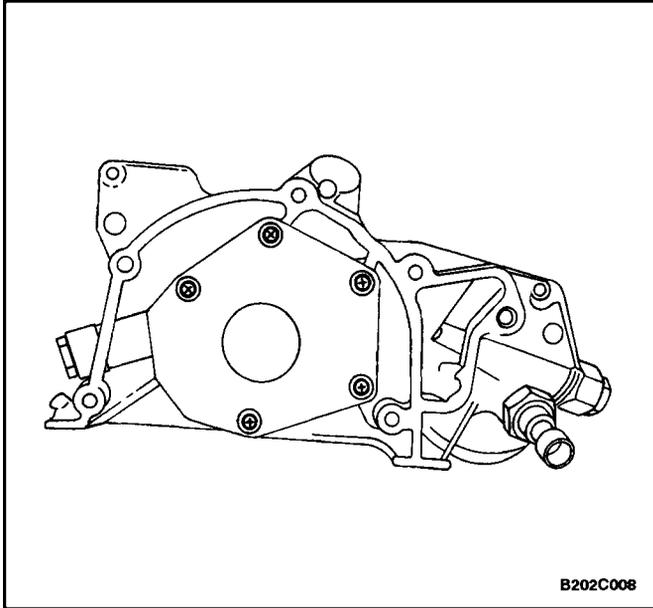


7. Remove the oil pump retaining bolts.
8. Carefully separate the oil pump and gasket from the engine block and oil pan.
9. Remove the oil pump.



### Inspection Procedure

1. Clean the oil pump and the engine block gasket mating surface areas.
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 cover and bolts.

**Tighten**

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

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

**Tighten**

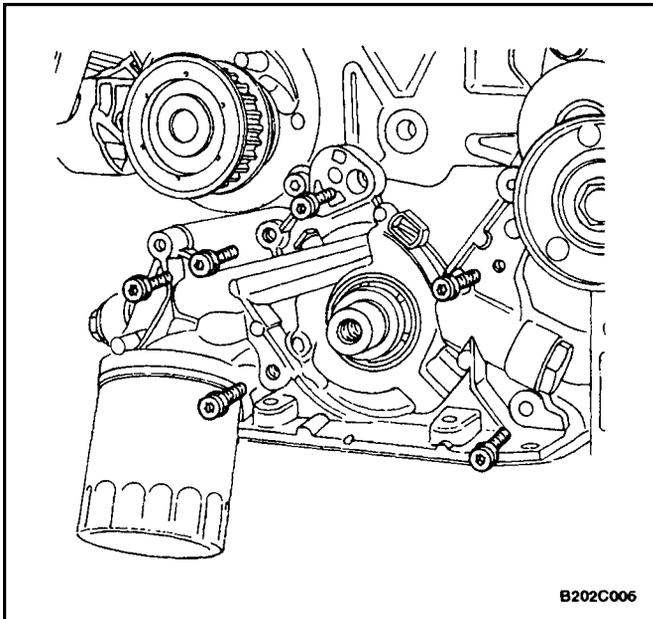
Tighten the safety relief valve bolt to 30 N•m (22 lb-ft).

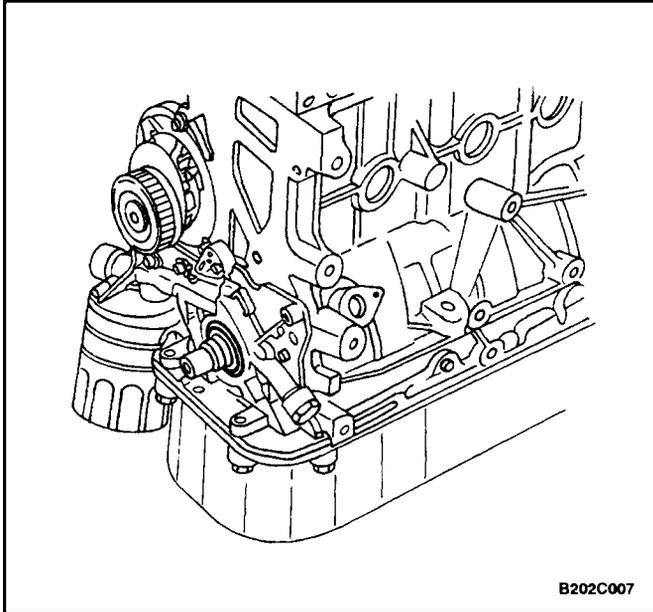
**Installation Procedure**

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.

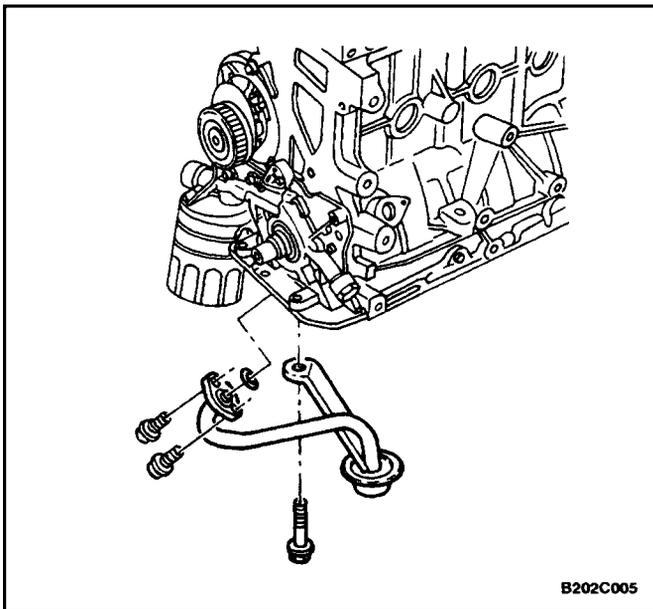
**Tighten**

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





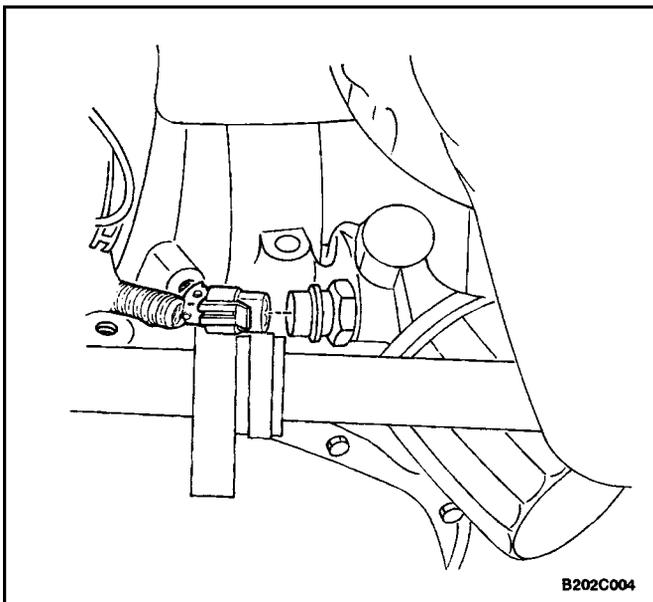
3. Install a new oil pump-to-crankshaft seal. Coat the lip of the seal with a thin coat of grease.



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

#### **Tighten**

Tighten the oil pump/pick-up tube and support bracket bolts 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. Connect the negative battery cable.