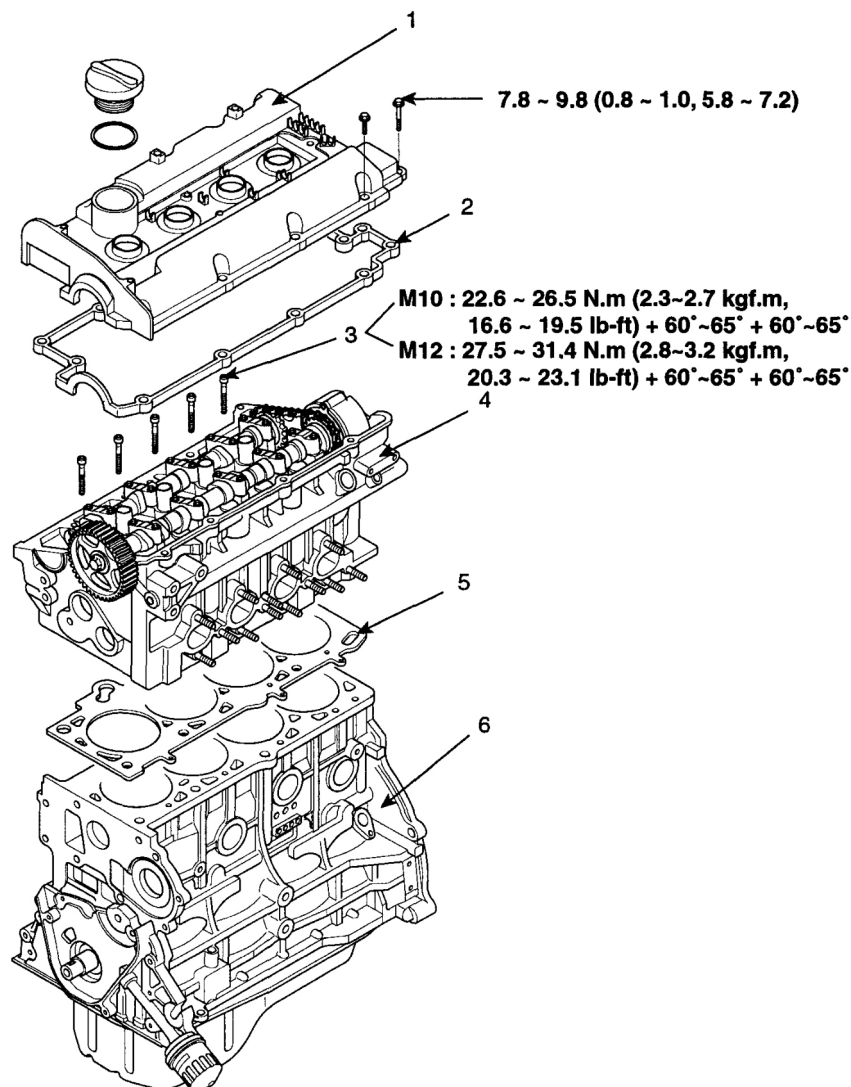


2009 ENGINE

Cylinder Head Assembly - 2.0L - Sportage

COMPONENT



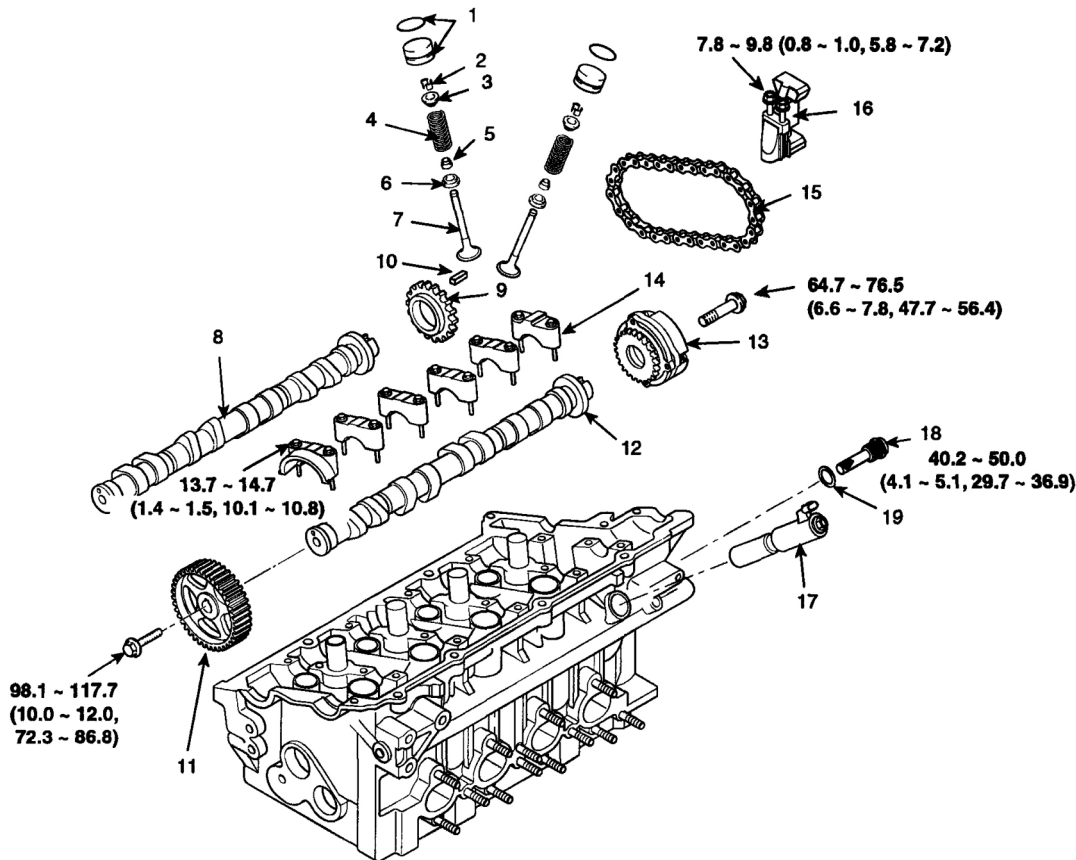
TORQUE : N.m (kgf.m, lb-ft)

1. Cylinder head cover
2. Gasket
3. Cylinder head bolt

4. Cylinder head
5. Cylinder head gasket
6. Cylinder block

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Fig. 1: Exploded View Of Cylinder Head Assembly Components - With Torque Specifications (1 Of 2)
 Courtesy of KIA MOTORS AMERICA, INC.



TORQUE : N.m (kgf.m, lb-ft)

- | | |
|------------------------------------|--|
| 1. MLA (Mechanical Lash Adjuster) | 11. Camshaft sprocket |
| 2. Retainer lock | 12. Exhaust camshaft |
| 3. Retainer | 13. CVVT (Continuously Variable Valve Timing) assembly |
| 4. Valve spring | 14. Camshaft bearing cap |
| 5. Stem seal | 15. Timing chain |
| 6. Spring seat | 16. Auto tensioner |
| 7. Valve | 17. OCV (Oil Control Valve) |
| 8. Intake camshaft | 18. OCV (Oil Control Valve) filter |
| 9. Chain sprocket | 19. Washer |
| 10. Key | |

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Fig. 2: Exploded View Of Cylinder Head Assembly Components - With Torque Specifications (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

REMOVAL

Engine removal is not required for this procedure.

CAUTION:

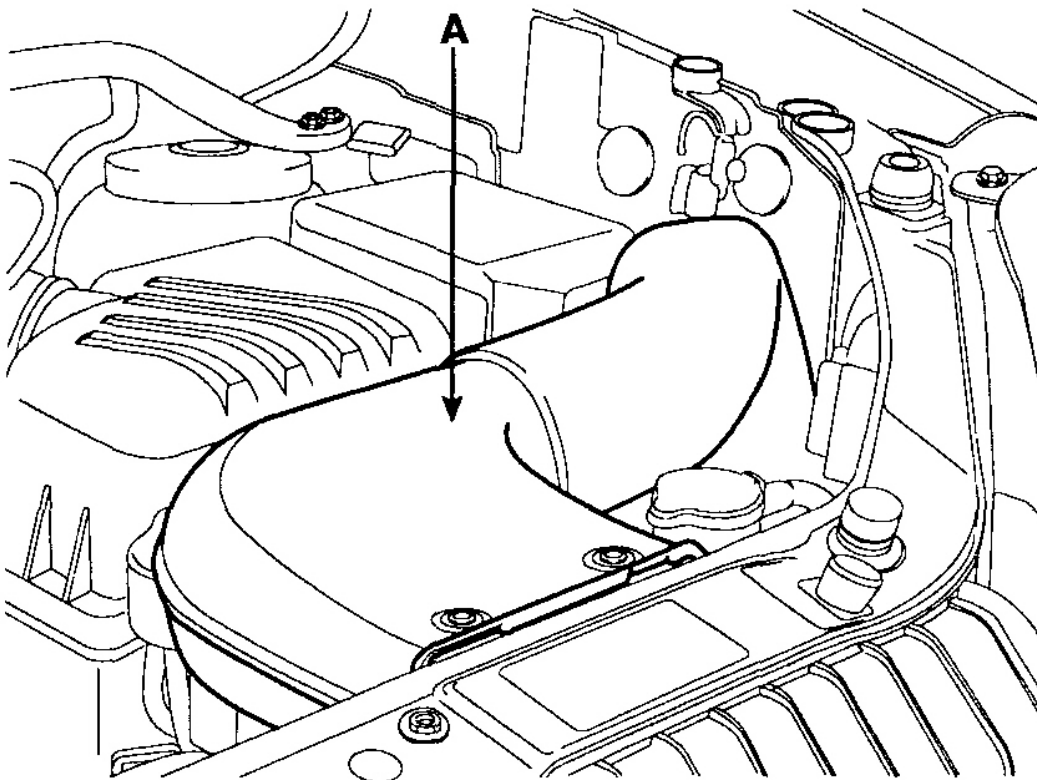
- Use Fender cover to avoid damaging painted surfaces.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.

- When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE:

- Mark all wiring and hoses to avoid misconnection.
- Inspect the timing belt before removing the cylinder head.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center.

1. Remove the air duct (A).

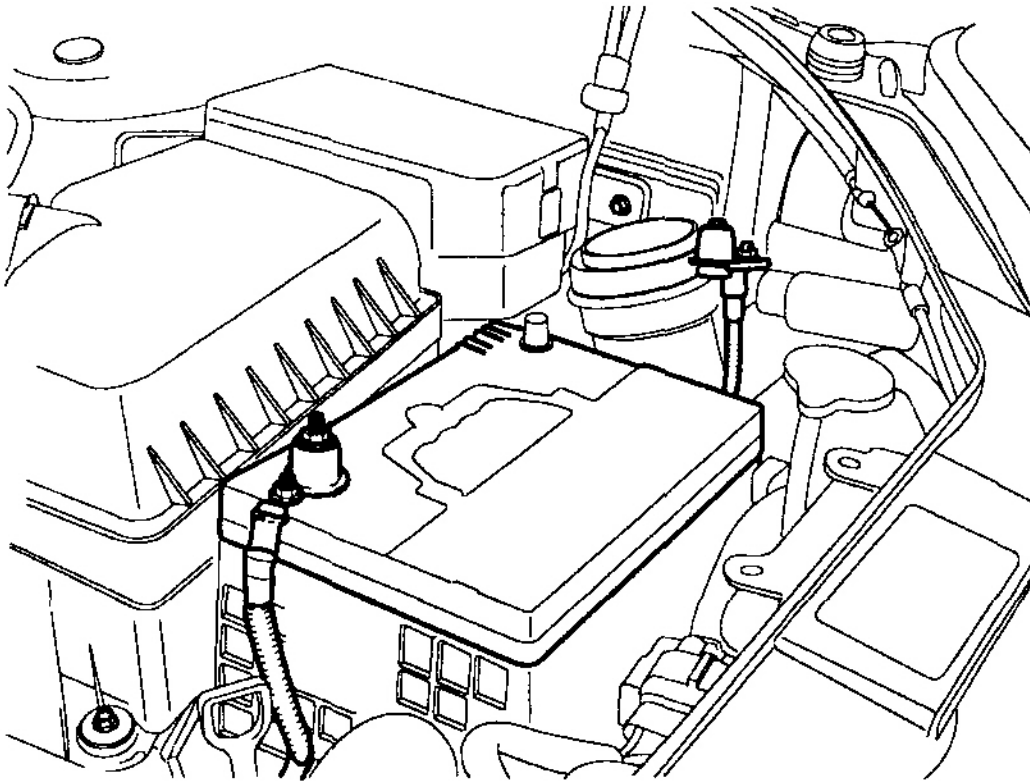


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Fig. 3: Removing Air Duct

Courtesy of KIA MOTORS AMERICA, INC.

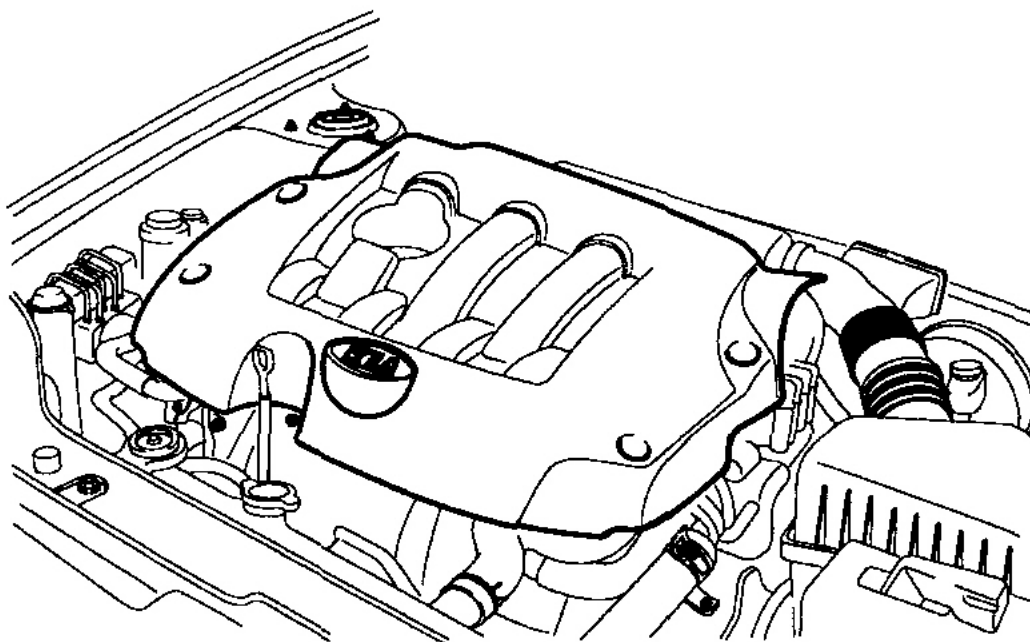
2. Disconnect the terminals (A) from battery.



G03821038

Fig. 4: Disconnecting Terminals From Battery
Courtesy of KIA MOTORS AMERICA, INC.

3. Remove the engine cover.

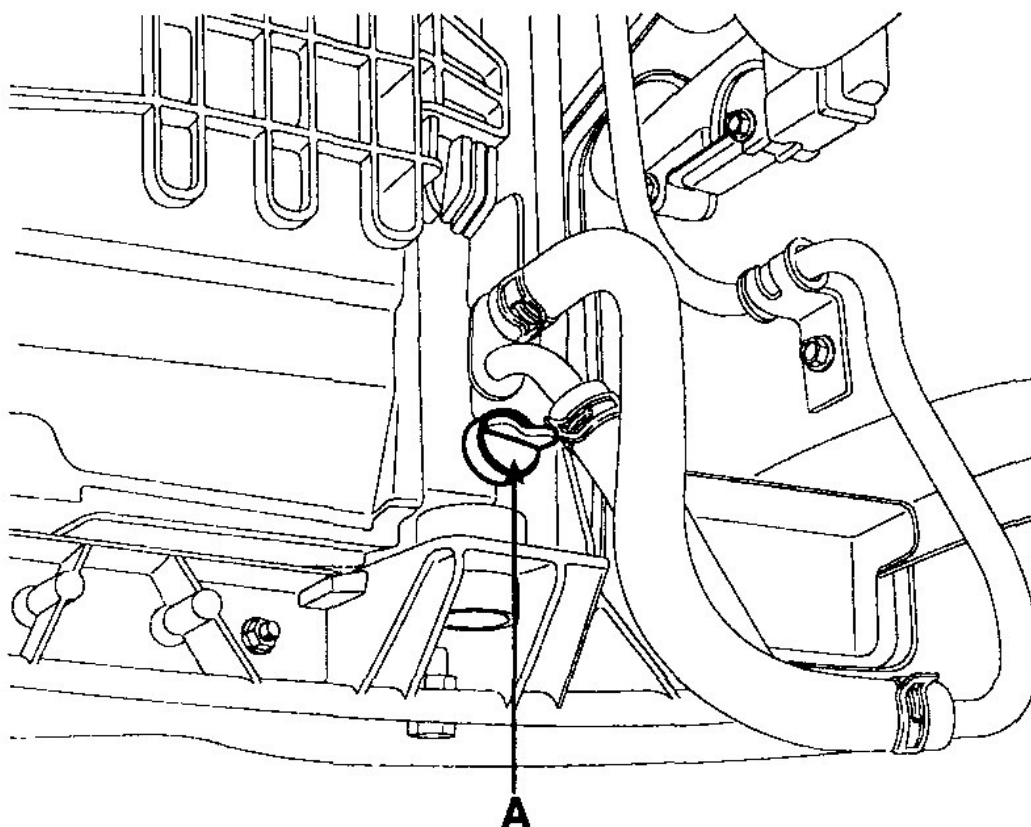


G03821039

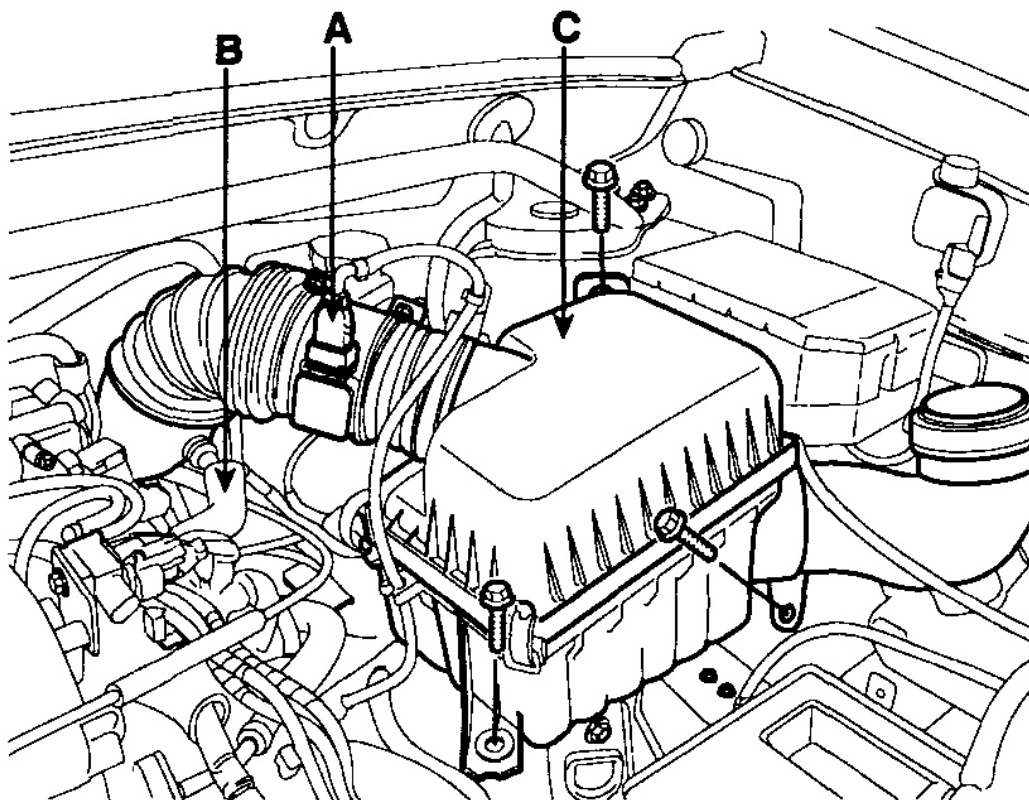
Fig. 5: Removing Engine Cover

Courtesy of KIA MOTORS AMERICA, INC.

4. Drain the engine coolant. (Refer to **ENGINE COOLANT REFILLING AND BLEEDING**) Remove the radiator cap to speed draining.

**G03821040****Fig. 6: Draining Engine Coolant****Courtesy of KIA MOTORS AMERICA, INC.**

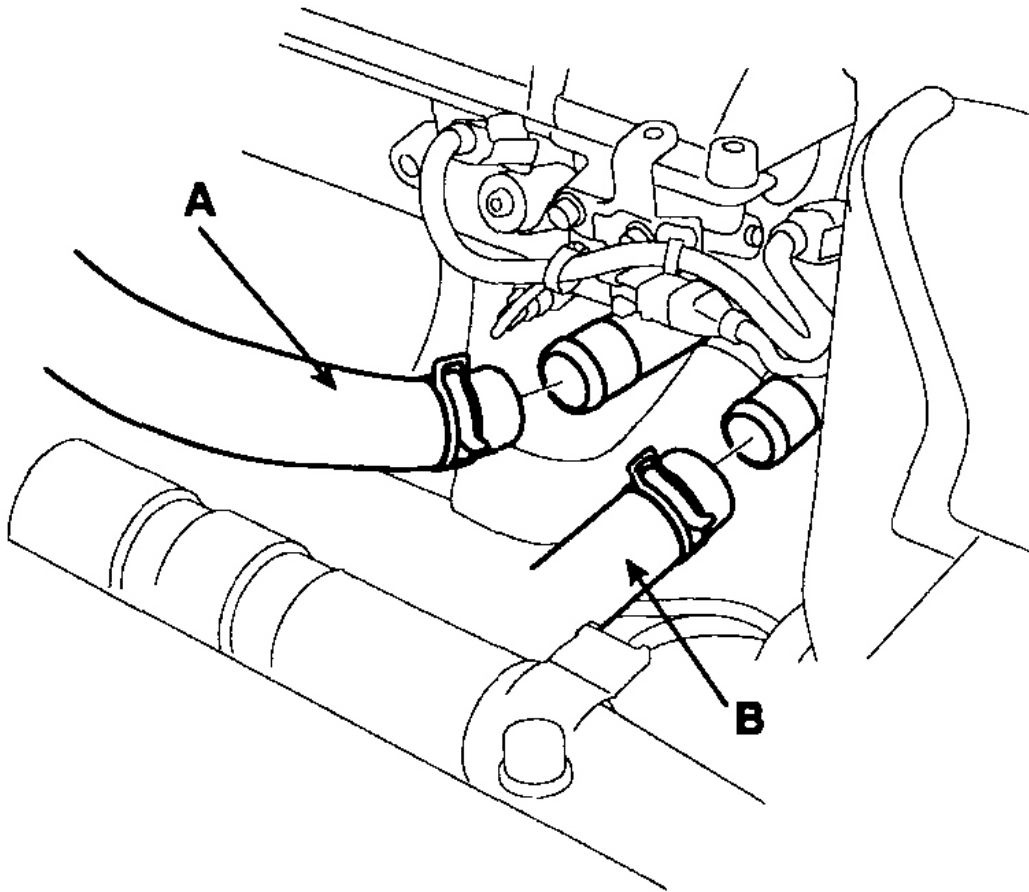
5. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS (Air Flow Sensor) connector (A).
 2. Disconnect the breather hose (B) from intake air hose.
 3. Remove the intake air hose and air cleaner assembly (C).



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Fig. 7: Removing Intake Air Hose And Air Cleaner Assembly
Courtesy of KIA MOTORS AMERICA, INC.

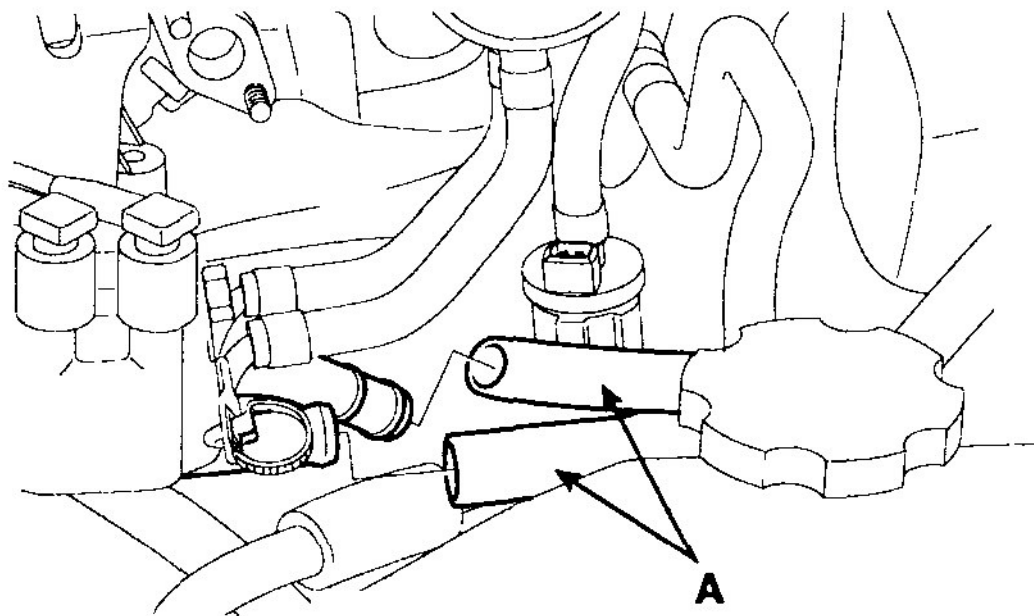
6. Remove the upper radiator hose (A) and lower radiator hose (B).



G03821042

Fig. 8: Removing Upper And Lower Radiator Hose
Courtesy of KIA MOTORS AMERICA, INC.

7. Remove the heater hoses (A).

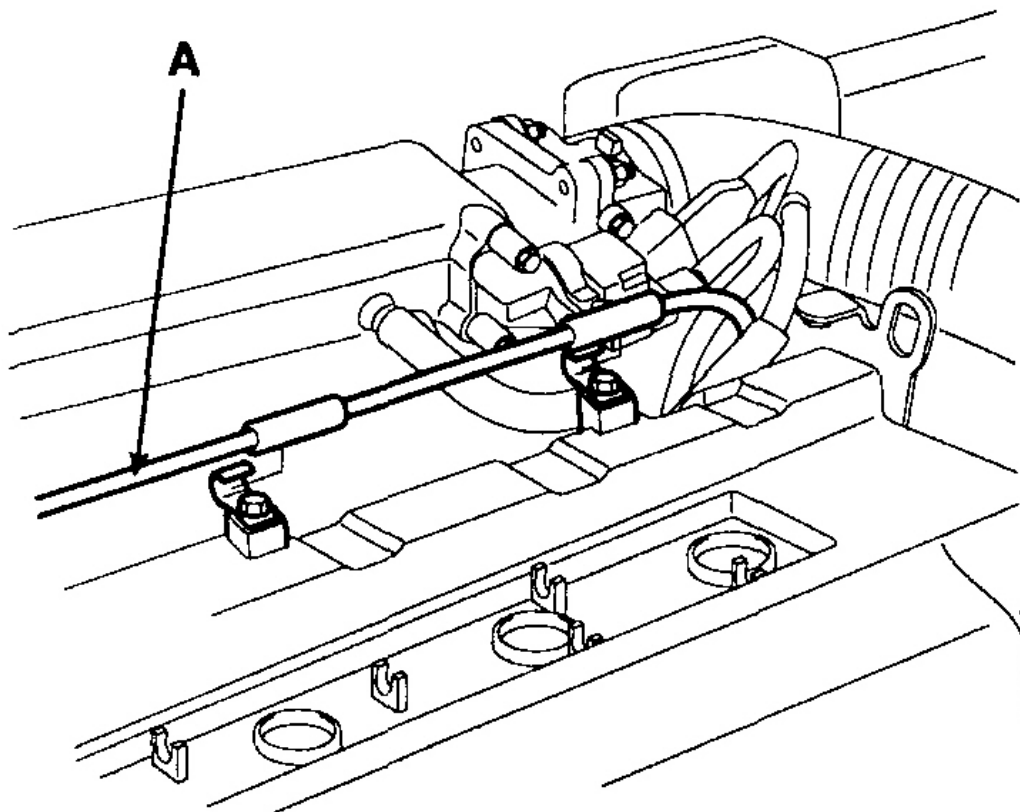


G03821043

Fig. 9: Removing Heater Hoses

Courtesy of KIA MOTORS AMERICA, INC.

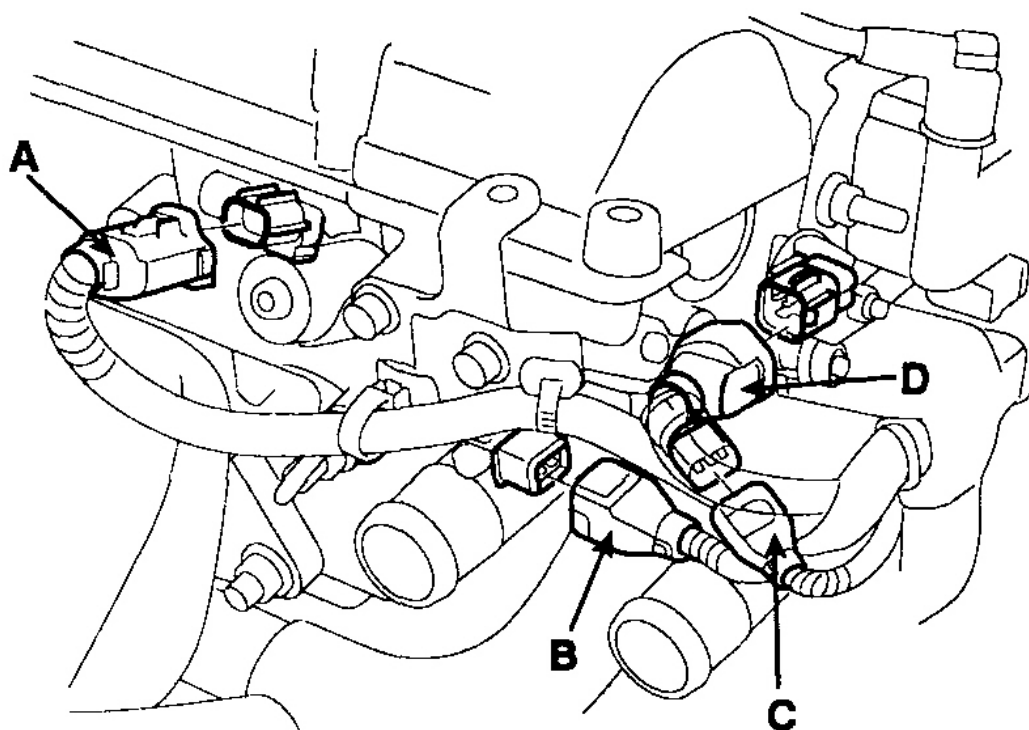
8. Remove the accelerator cable (A) by loosening the lock-nut, then slip the cable end out of the throttle linkage.



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Fig. 10: Removing Accelerator Cable
 Courtesy of KIA MOTORS AMERICA, INC.

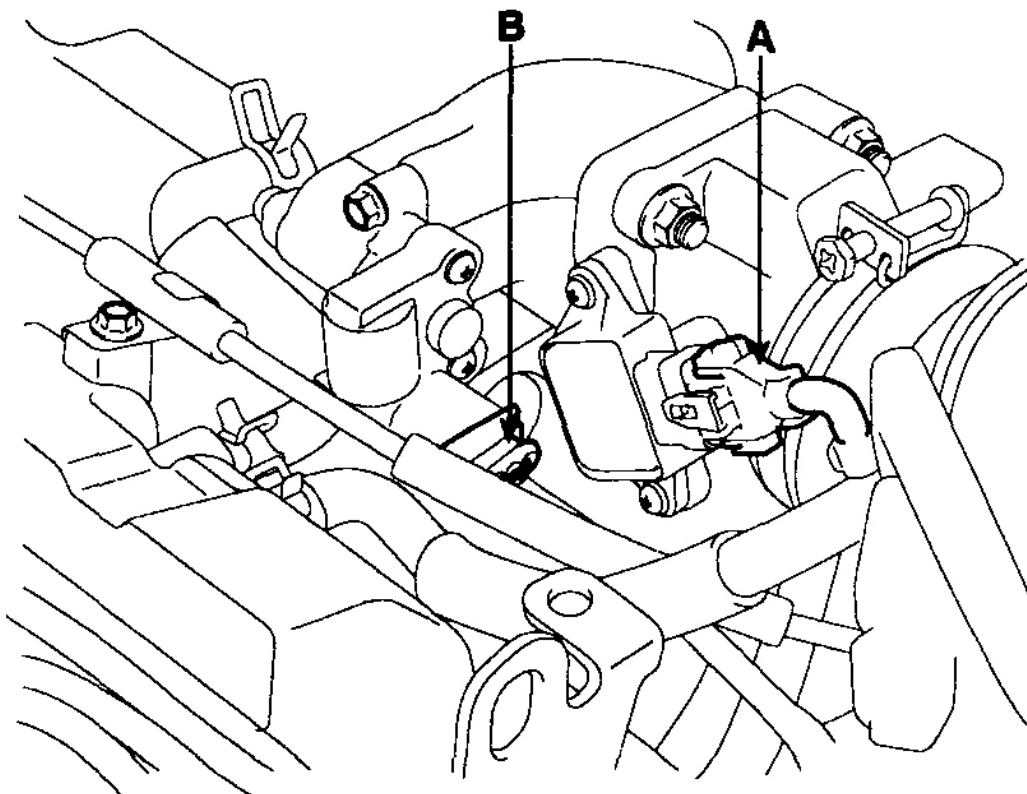
9. Remove the engine wire harness connectors and wire harness clamps from cylinder head and the intake manifold.
 1. Disconnect the OCV (Oil Control Valve) connector (A).
 2. Disconnect the oil temperature sensor connector (B)
 3. Disconnect the ECT (Engine Coolant Temperature) sensor connector (C).
 4. Disconnect the ignition coil connector (D).



G03821045

Fig. 11: Disconnecting Ignition Coil Connector
Courtesy of KIA MOTORS AMERICA, INC.

5. Disconnect the TPS (Throttle Position Sensor) connector (A).
6. Disconnect the ISA (idle Speed Actuator) connector (B).



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Fig. 12: Disconnecting Idle Speed Actuator Connector
Courtesy of KIA MOTORS AMERICA, INC.

7. Disconnect the CMP (Camshaft Position Sensor) connector (A).
8. Disconnect the four injector connectors (B).
9. Disconnect the knock sensor connector (C).
10. Disconnect the ground cables (D) from the intake manifold.
11. Disconnect the air conditioner compressor switch connector (E).

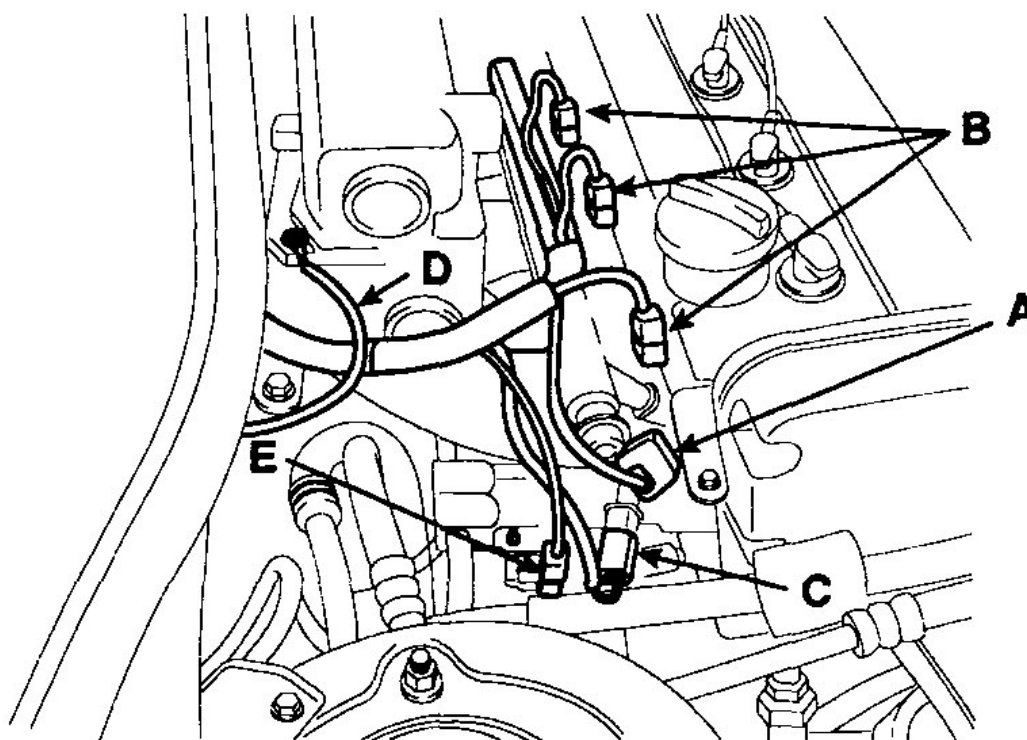
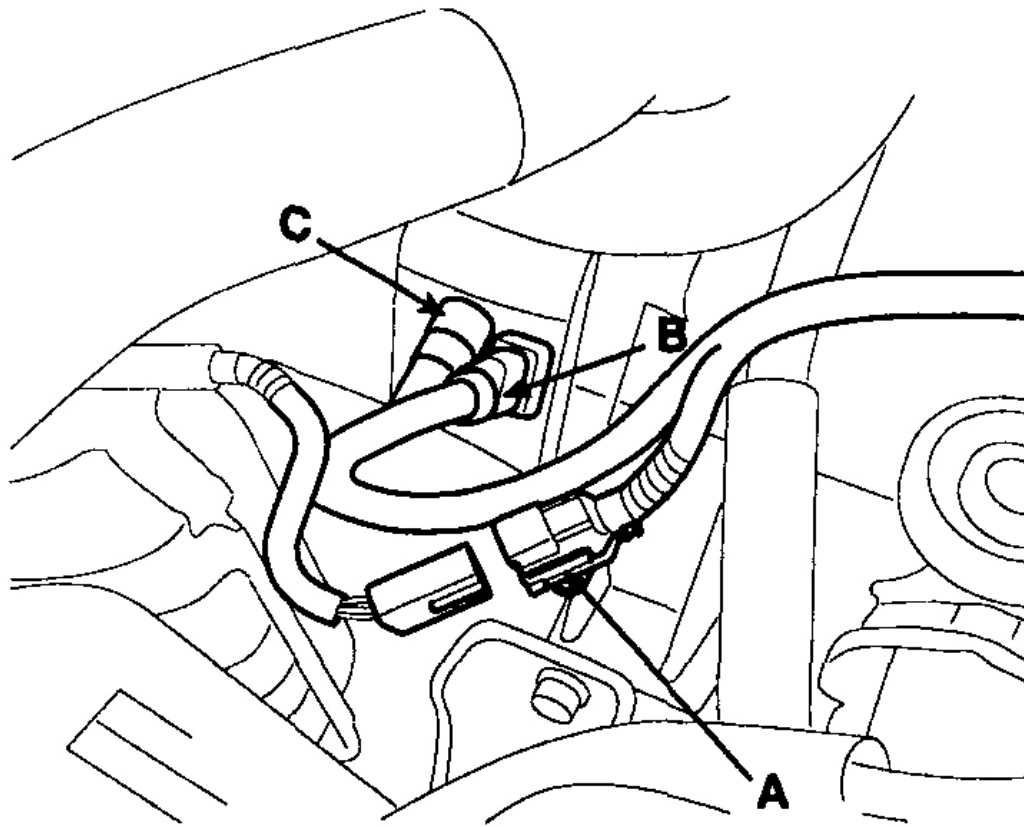
**G03821047**

Fig. 13: Disconnecting Air Conditioner Compressor Switch Connector
Courtesy of KIA MOTORS AMERICA, INC.

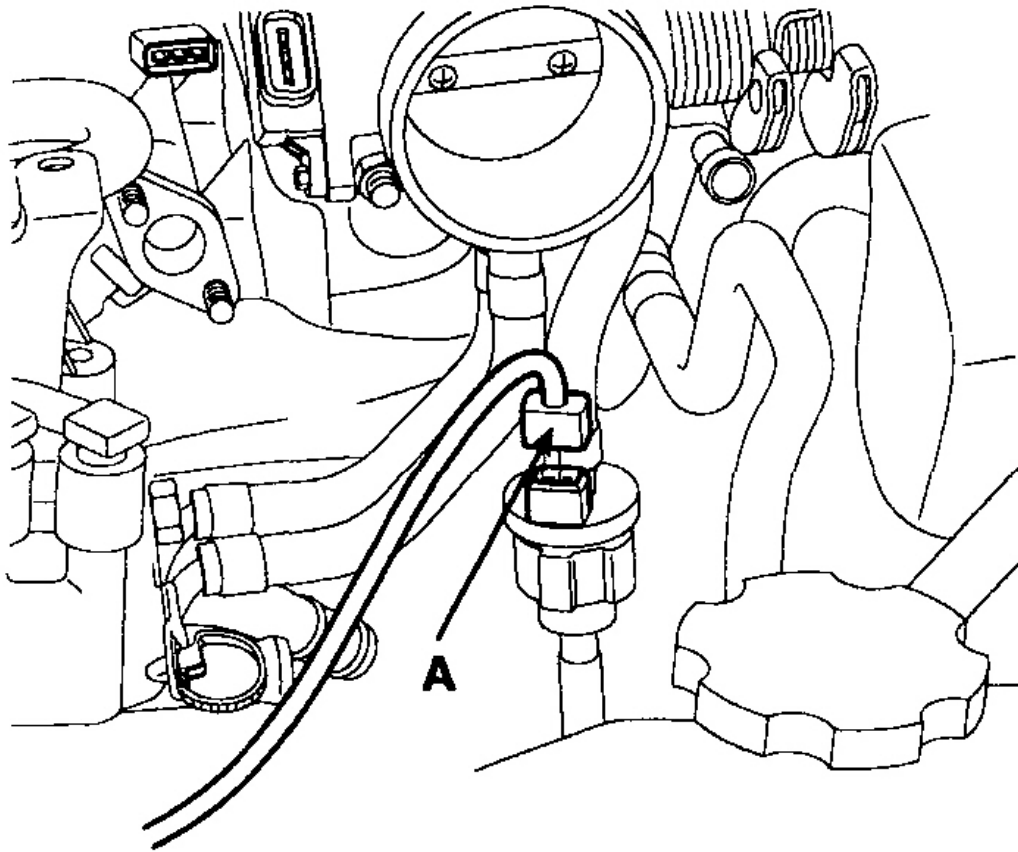
12. Disconnect the front heated oxygen sensor connector (A).
13. Disconnect the CKP (Crankshaft Position Sensor) connector (B).
14. Disconnect the oil pressure switch connector (C).



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Fig. 14: Disconnecting Oil Pressure Switch Connector
Courtesy of KIA MOTORS AMERICA, INC.

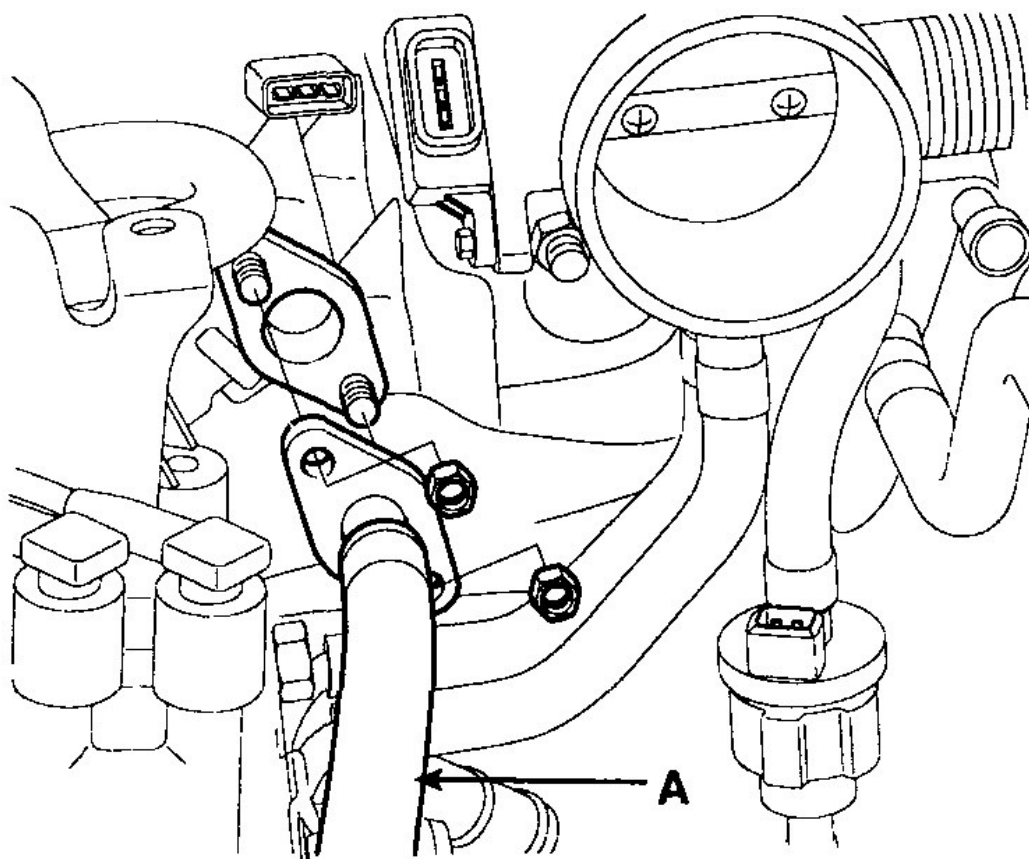
15. Disconnect the PCSV (Purge Control Solenoid Valve) connector (A).



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Fig. 15: Disconnecting Purge Control Solenoid Valve Connector
Courtesy of KIA MOTORS AMERICA, INC.

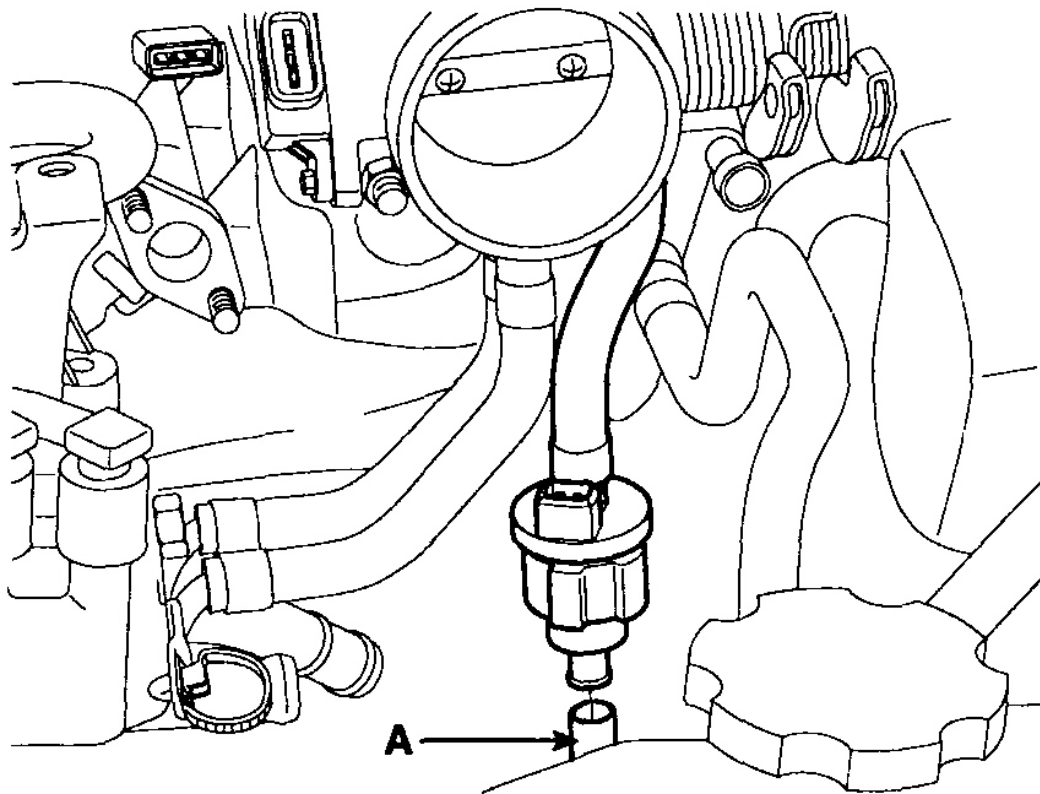
10. Disconnect the fuel inlet hose (A) of the delivery pipe side.



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Fig. 16: Disconnecting Fuel Inlet Hose Of Delivery Pipe Side
Courtesy of KIA MOTORS AMERICA, INC.

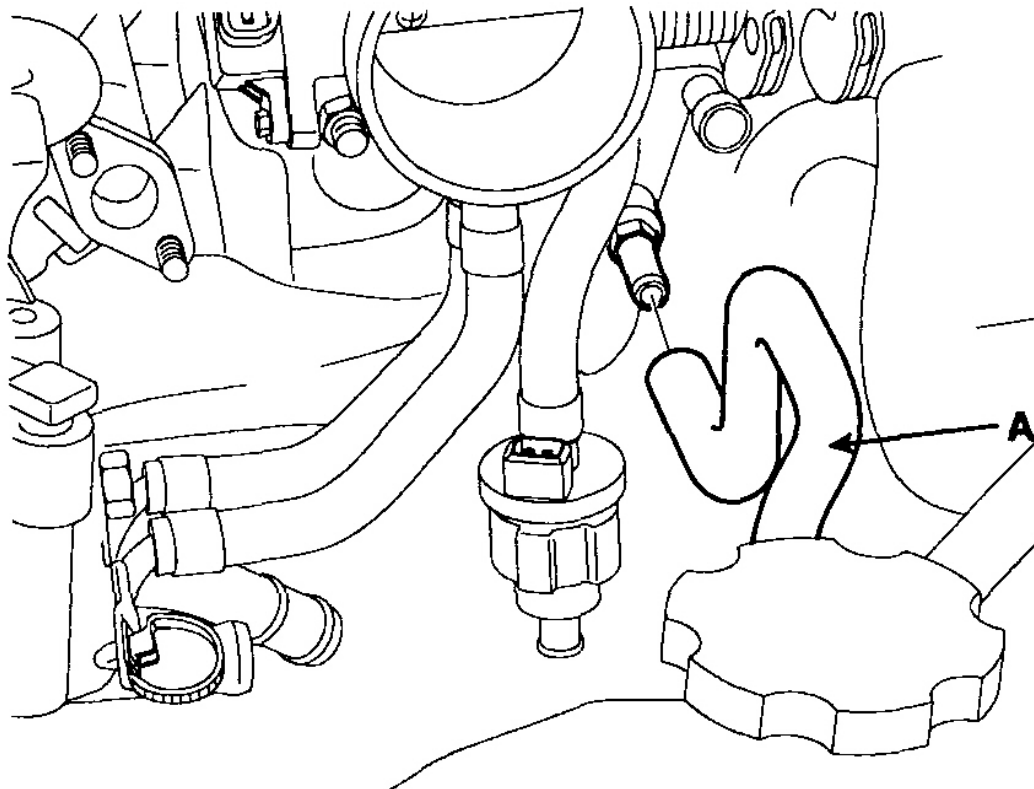
11. Disconnect the hose (A) of the PCSV (Purge Control Solenoid Valve) side.



G03821051

Fig. 17: Disconnecting Purge Control Solenoid Valve Side Hose
Courtesy of KIA MOTORS AMERICA, INC.

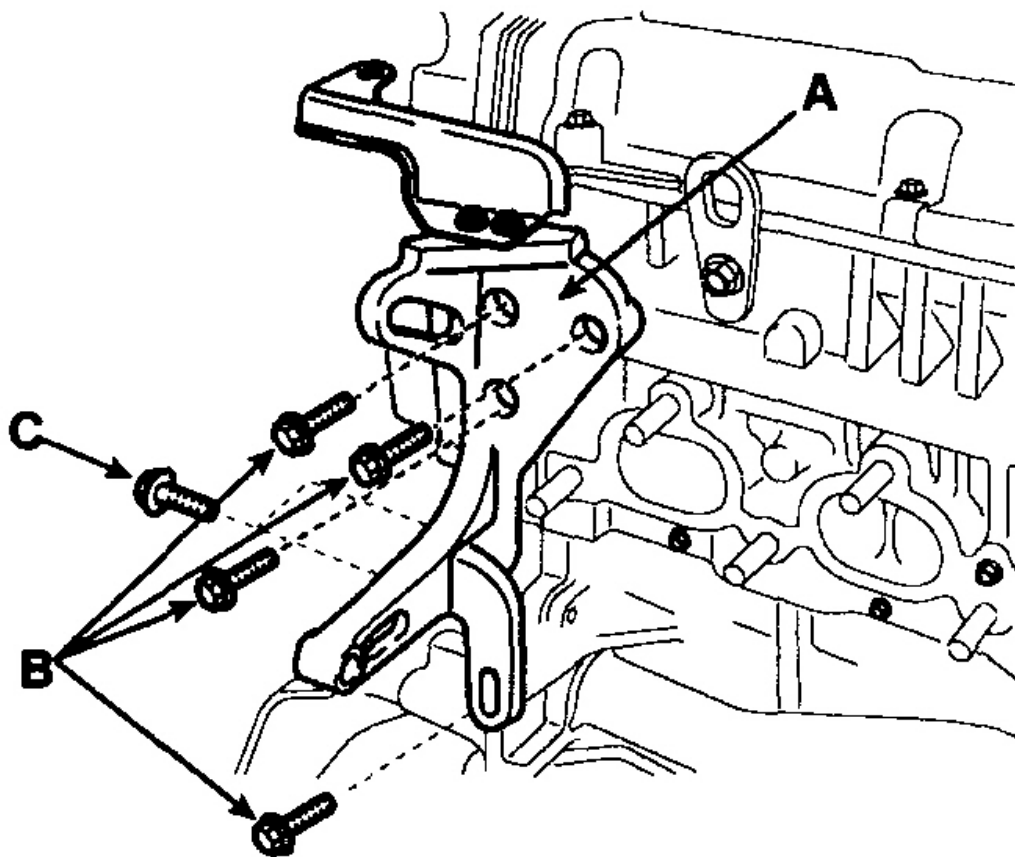
12. Remove the brake booster vacuum hose (A).



G03821052

Fig. 18: Removing Brake Booster Vacuum Hose
Courtesy of KIA MOTORS AMERICA, INC.

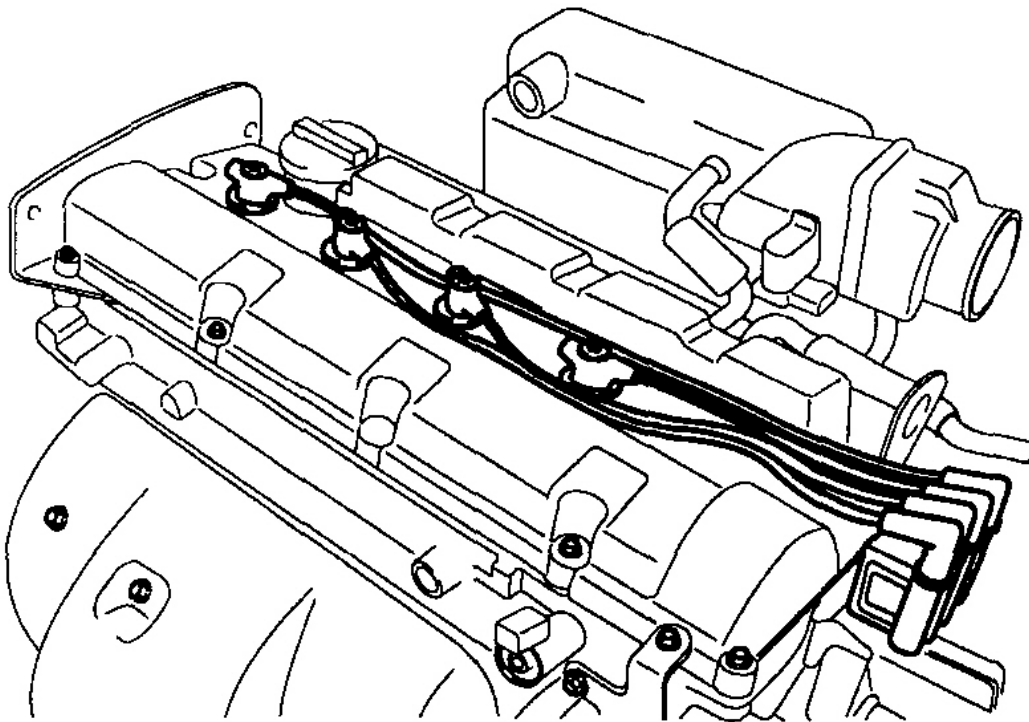
13. Remove the power steering pump drive belt.
14. Remove the power steering pump and fix the pump to vehicle with a wire. (See **MECHANICAL POWER STEERING SYSTEM**).
15. Remove the bolts (B, C) and power steering pump bracket (A).



G03821053

Fig. 19: Removing Power Steering Pump Bracket
Courtesy of KIA MOTORS AMERICA, INC.

16. Remove the spark plug cables.

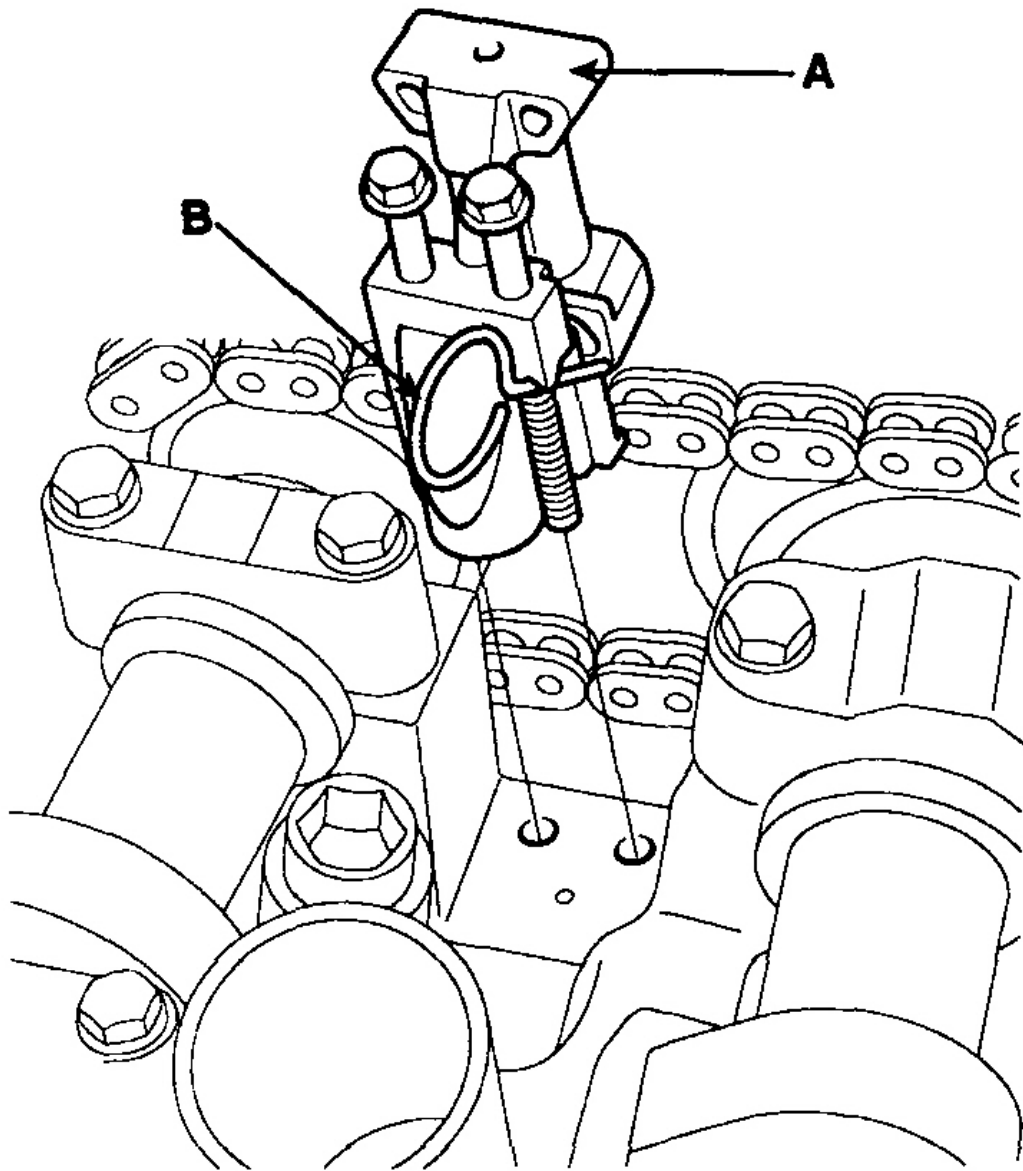


G03821054

Fig. 20: Removing Spark Plug Cables

Courtesy of KIA MOTORS AMERICA, INC.

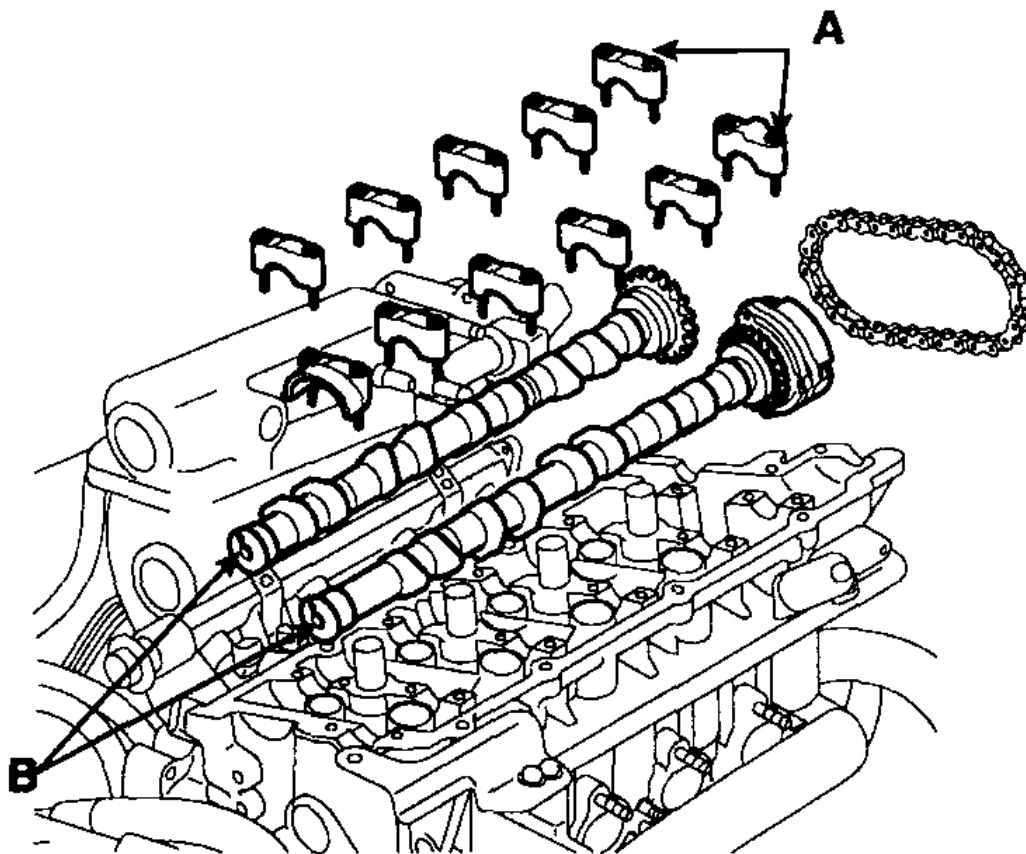
17. Remove the exhaust manifold. (Refer to **INTAKE AND EXHAUST SYSTEM - 2.0L**)
18. Remove the intake manifold. (Refer to **INTAKE AND EXHAUST SYSTEM - 2.0L**)
19. Remove the timing belt. (Refer to **TIMING SYSTEM -- 2.0L** , step 2-15)
20. Remove the PCV (Positive Crankcase Ventilation) hose.
21. Remove the cylinder head cover. (Refer to **REMOVAL** , step 18)
22. Remove the camshaft sprocket. (Refer to **REMOVAL** , step 19)
23. Insert a stopper pin or other device into timing chain auto tensioner and remove the auto tensioner.



G03821055

Fig. 21: Removing Auto Tensioner
Courtesy of KIA MOTORS AMERICA, INC.

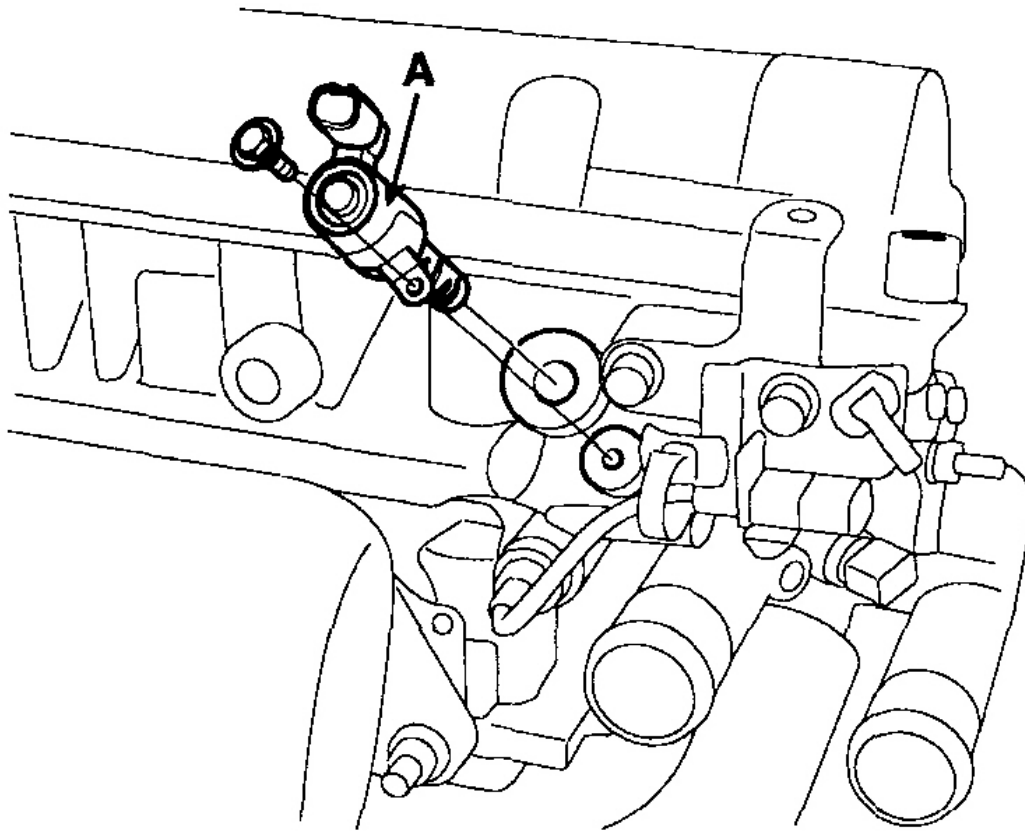
24. Remove the camshaft bearing caps (A) and camshafts (B).



G03821056

Fig. 22: Removing Camshaft Bearing Caps And Camshafts
Courtesy of KIA MOTORS AMERICA, INC.

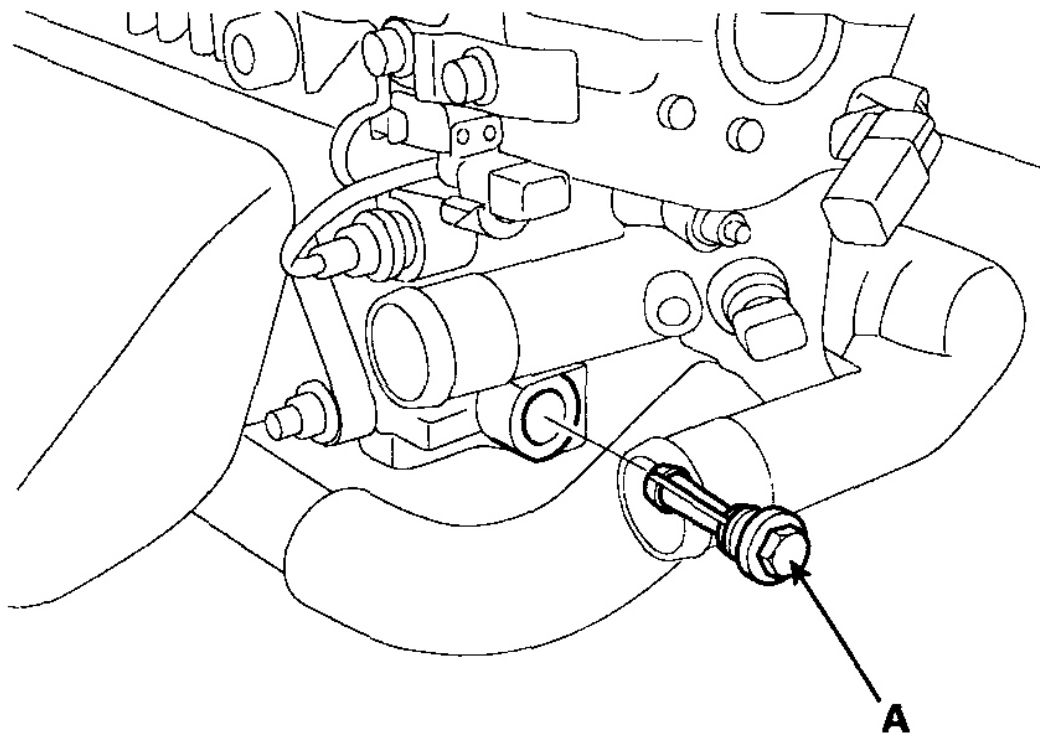
25. Remove the OCV (Oil Control Valve) (A).



G03821057

Fig. 23: Removing Oil Control Valve
Courtesy of KIA MOTORS AMERICA, INC.

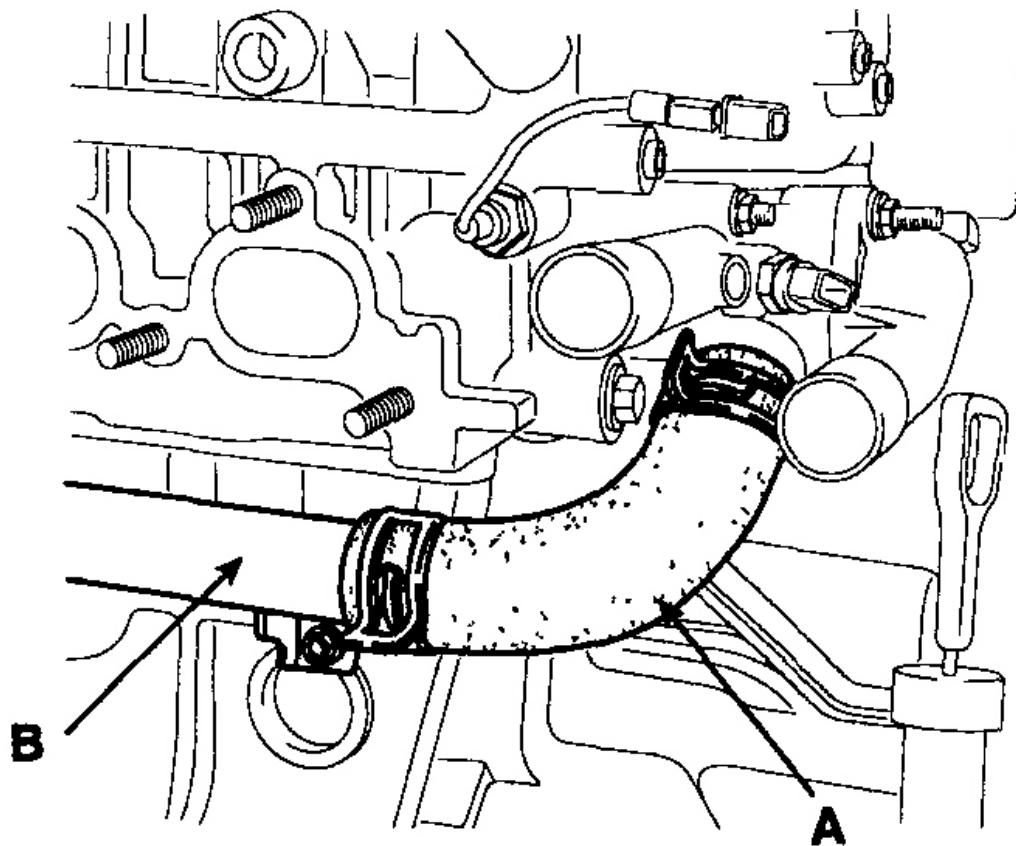
26. Remove the OCV (Oil Control Valve) filter (A).



G03821058

Fig. 24: Removing Oil Control Valve Filter
Courtesy of KIA MOTORS AMERICA, INC.

27. Remove the water hose (A) from water pipe (B).

**G03821059****Fig. 25: Removing Water Hose From Water Pipe****Courtesy of KIA MOTORS AMERICA, INC.**

28. Remove the cylinder head bolts, then remove the cylinder head.
 1. Using 8mm and 10mm hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown. Remove the 10 cylinder head bolts and plate washers.

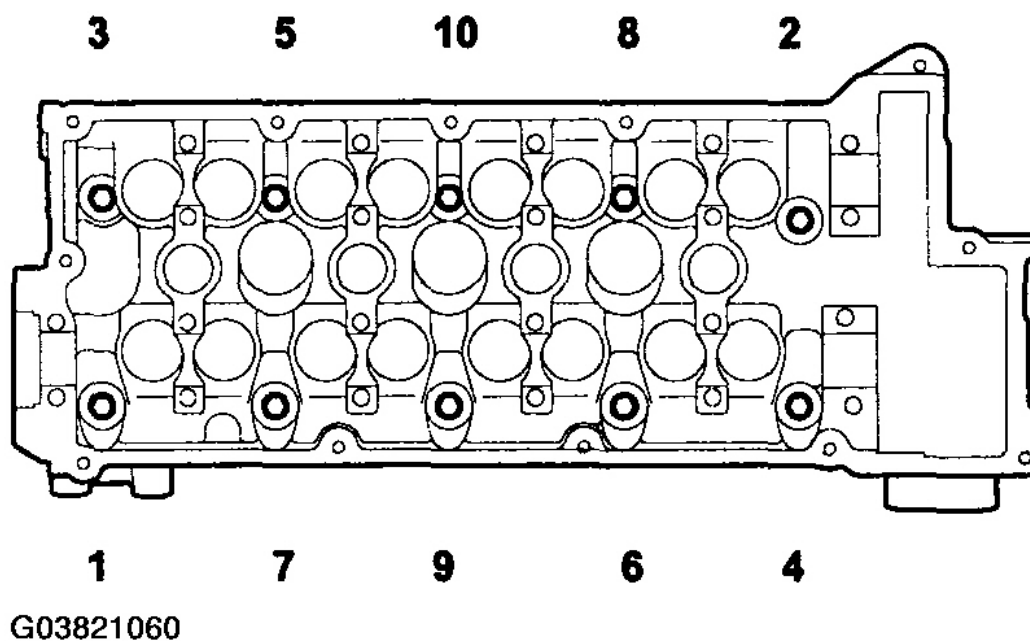


Fig. 26: Cylinder Head Bolts & Plate Washers Removal Sequence
Courtesy of KIA MOTORS AMERICA, INC.

CAUTION: Head warpage or cracking could result from removing bolts in an incorrect order.

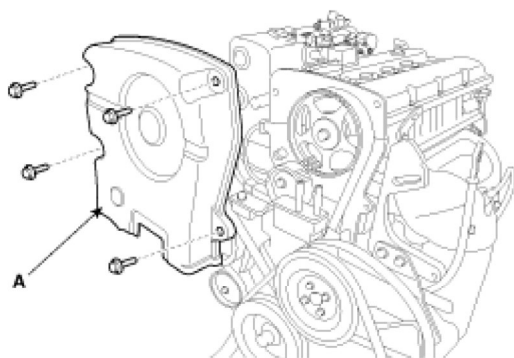
2. Lift the cylinder head from the dowels on the cylinder block and replace the cylinder head on wooden blocks on a bench.

CAUTION: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

REPLACEMENT

VALVE GUIDE

1. Using the SST(09221 - 3F100A), withdraw the old valve guide toward the bottom of cylinder head.

**Fig. 27: Removing Valve Guide**

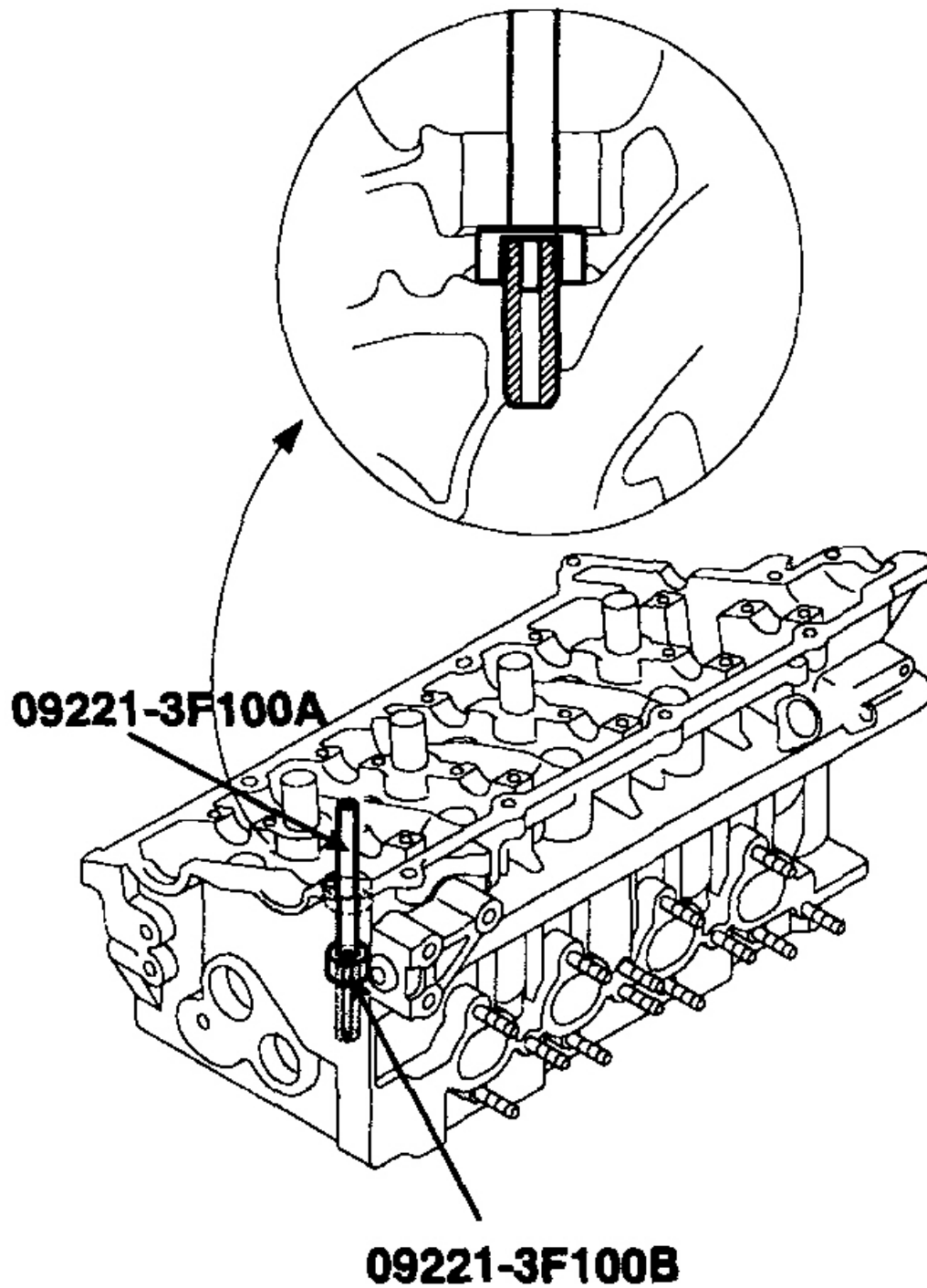
Courtesy of KIA MOTORS AMERICA, INC.

2. Recondition the valve guide hole of cylinder head so that it can match the newly press-fitted oversize valve guide.
3. Using the SST (09221 - 3F100 A/B), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head. Keep in mind that the intake and exhaust valve guides are different in length.

Valve guide length

Intake: 45.8 - 46.2mm (1.8031 ~ 1.8189in)

Exhaust: 54.3 ~ 54.7mm (2.1378 ~ 2.1535in)



G03821076

Fig. 28: Installing Valve Guide

Courtesy of KIA MOTORS AMERICA, INC.

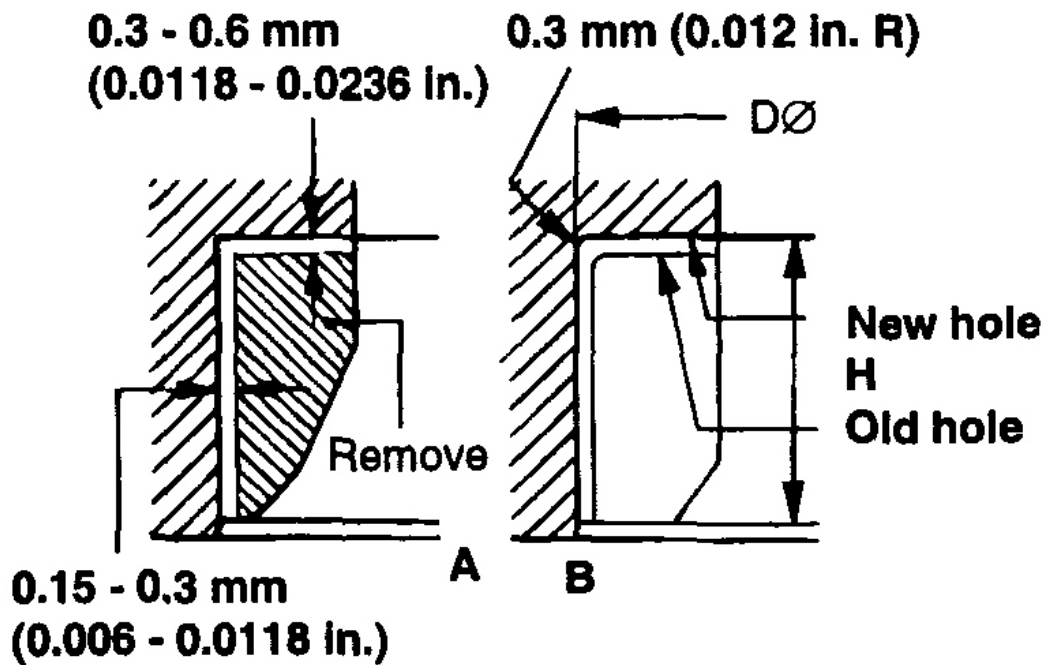
4. After the valve guide is press-fitted, insert a new valve and check for proper stem-to-guide clearance.
5. After the valve guide is replaced, check that the valve is seated properly. Recondition the valve seats as necessary.

VALVE GUIDE OVERSIZE**VALVE GUIDE OVERSIZE SPECIFICATIONS**

Item	Oversize [mm (in)]	Size mark	Valve guide hole inner diameter [mm (in)]	Valve guide outer diameter [mm (in)]	Valve guide protrusion height [mm (in)]
Valve guide	STD	-	11.000 ~ 11.018 (0.4331 ~ 0.4338)	11.040 ~ 11.050 (0.4346 ~ 0.4350)	14.000 (0.5512)
	0.05 (0.002) OS	5	11.050 ~ 11.068 (0.4350 ~ 0.4357)	11.090 ~ 11.100 (0.4366 ~ 0.4370)	
	0.25 (0.010) OS	25	11.250 ~ 11.268 (0.4429 ~ 0.4436)	11.290 ~ 11.300 (0.4445 ~ 0.4449)	
	0.50 (0.020) OS	50	11.500 ~ 11.518 (0.4528 ~ 0.4535)	11.540 ~ 11.550 (0.4543 ~ 0.4547)	

VALVE SEAT RING

1. Cut away the inner face of the valve seat to reduce the wall thickness.



G03821077

Fig. 29: Identifying Valve Seat Ring Cutting Dimensions (With Specifications)
Courtesy of KIA MOTORS AMERICA, INC.

2. Enlarge the seat ring hole of cylinder head so that matches the specified cylinder head hole inner diameter of new valve seat ring.
3. Heat the cylinder head to about 250°C(480°F) and press-fit an oversize seat ring for the cylinder head hole size.
4. Using lapping compound, lap the valve to the new seat.

VALVE SEAT RING OVERSIZE

VALVE SEAT RING OVERSIZE SPECIFICATIONS

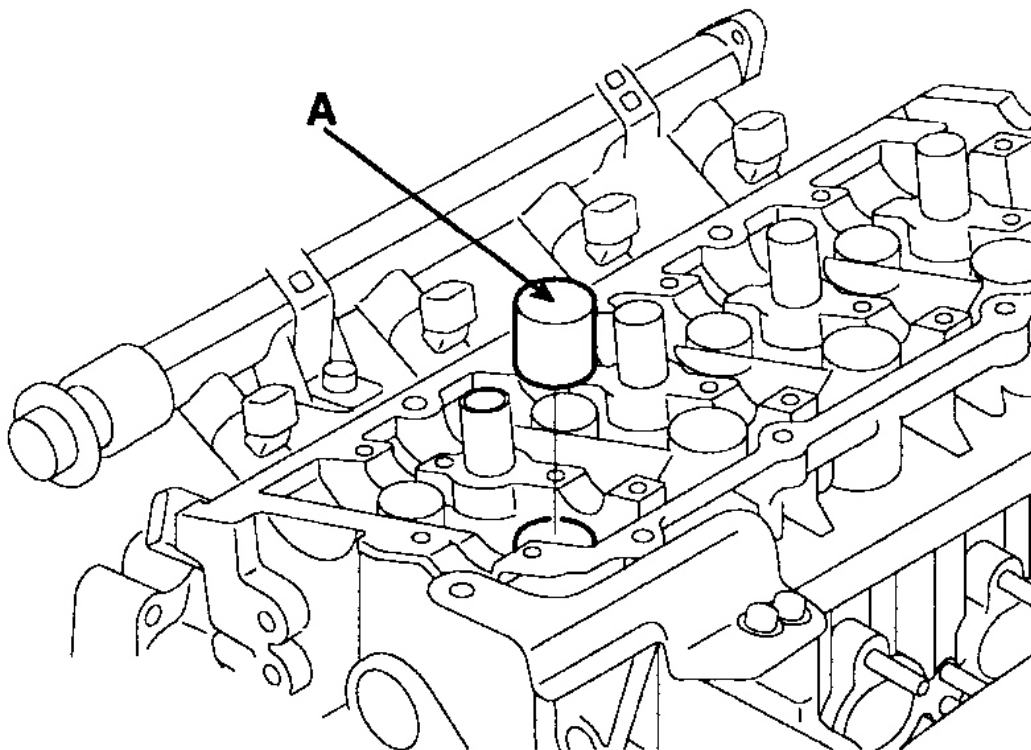
Item	Over size mm(in.)	Size mark	Seat ring hole inner diameter [mm(in)]	Seat ring outer diameter [mm(in)]	Seat ring height [mm(in)]
Intake valve seat ring	STD	-	33.000 ~ 33.025 (1.2992 ~ 1.3002)	33.090 ~ 33.105 (1.3028 ~ 1.3033)	7.200 ~ 7.400 (0.2835 ~ 0.2913)
	0.3(0.012) OS	30	33.300 ~ 33.325 (1.3110 ~ 1.3120)	33.390 ~ 33.405 (1.3146 ~ 1.3152)	7.500 ~ 7.700 (0.2953 ~ 0.3031)
	0.6(0.024) OS	60	33.600 ~ 33.625 (1.3228 ~ 1.3238)	33.690 ~ 33.705 (1.3264 ~ 1.3270)	7.800 ~ 8.000 (0.3071 ~ 0.3150)
			28.500 ~ 28.521 (1.1220	28.590 ~ 28.605	7.600 ~ 7.800

	STD	-	~ 1.1229)	(1.1256 ~ 1.1262)	(0.3110 ~ 0.3189)
Exhaust valve seat ring	0.3(0.012) OS	30	28.800 ~ 28.821 (1.1339 ~ 1.1347)	28.890 ~ 28.905 (1.1374 ~ 1.1380)	7.900 ~ 8.100 (0.3110 ~ 0.3189)
	0.6(0.024) OS	60	29.100 ~ 29.121 (1.1457 ~ 1.1465)	29.190 ~ 29.205 (1.1492 ~ 1.1498)	8.200 ~ 8.400 (0.3228 ~ 0.3307)

DISASSEMBLY

NOTE: Identify MLA (Mechanical Lash Adjuster), valves, valve springs as they are removed so that each item can be reinstalled in its original position.

1. Remove the MLAs (A).



G03821061

Fig. 30: Removing Mechanical Lash Adjuster
Courtesy of KIA MOTORS AMERICA, INC.

2. Remove the valves.
 1. Using the SST (09222 - 28000, 09222 - 28100), compress the valve spring and remove the retainer

lock.

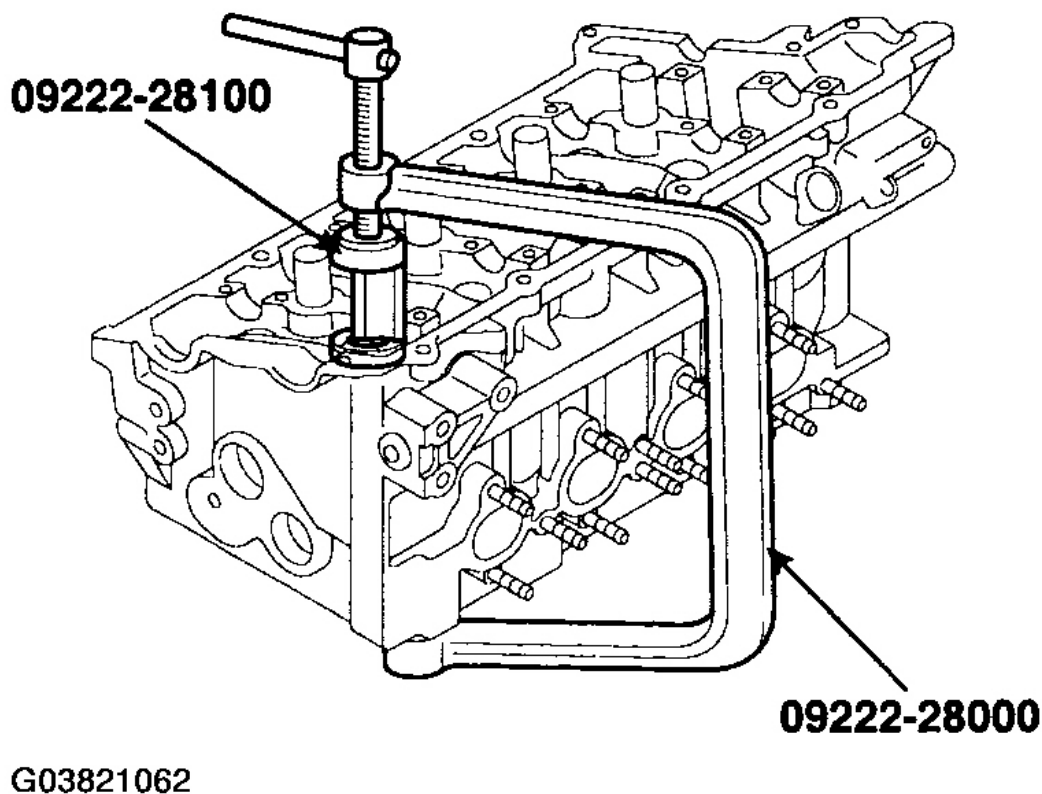


Fig. 31: Compressing Valve Spring And Removing Retainer Lock
Courtesy of KIA MOTORS AMERICA, INC.

2. Remove the spring retainer.
3. Remove the valve spring.
4. Remove the valve.
5. Using a needle-nose pliers, remove the oil seal.
6. Using a magnetic finger, remove the spring seat.

INSPECTION

CYLINDER HEAD

1. Inspect for flatness.

Using a precision straight edge and feeler gauge, measure the surface the contacting the cylinder block and the manifolds for warpage.

2009 Kia Sportage EX

2009 ENGINE Cylinder Head Assembly - 2.0L - Sportage

Flatness of cylinder head gasket surface

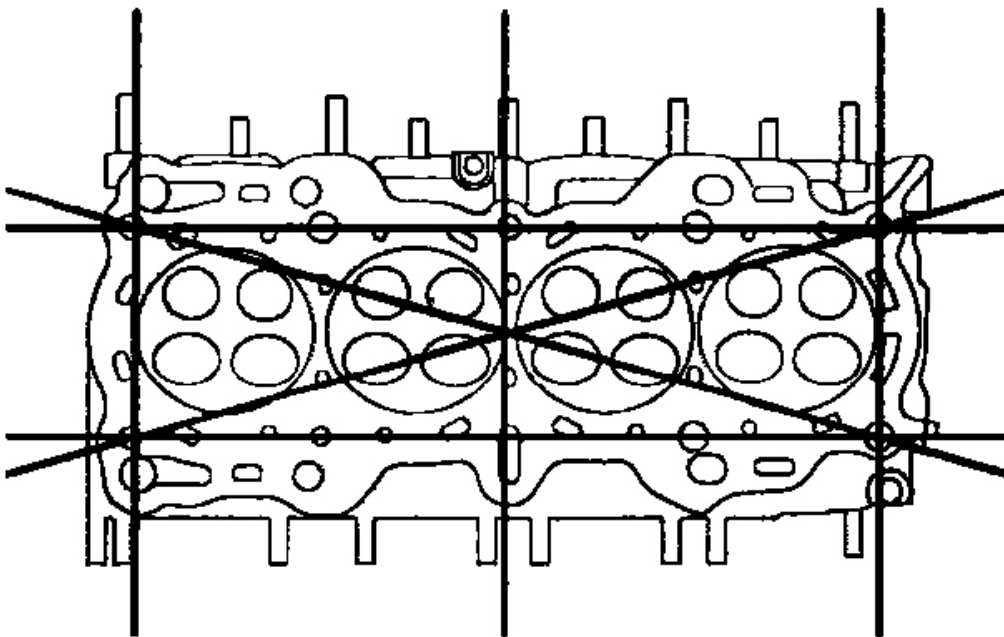
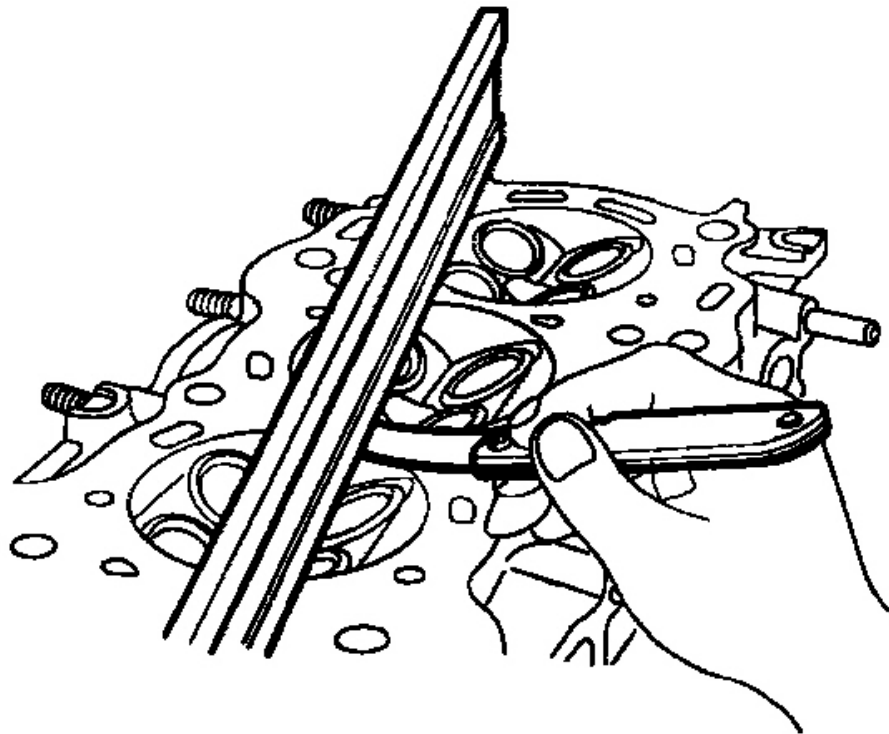
Standard: Less than 0.03mm (0.0012in)

Limit: 0.05mm (0.0020in)

Flatness of manifold mating surface

Standard: Less than 0.15mm (0.0059in)

Limit: 0.30mm (0.0118in)



G03821063

Fig. 32: Measuring Cylinder Block And Manifolds Warpage
Courtesy of KIA MOTORS AMERICA, INC.

2. Inspect for cracks.

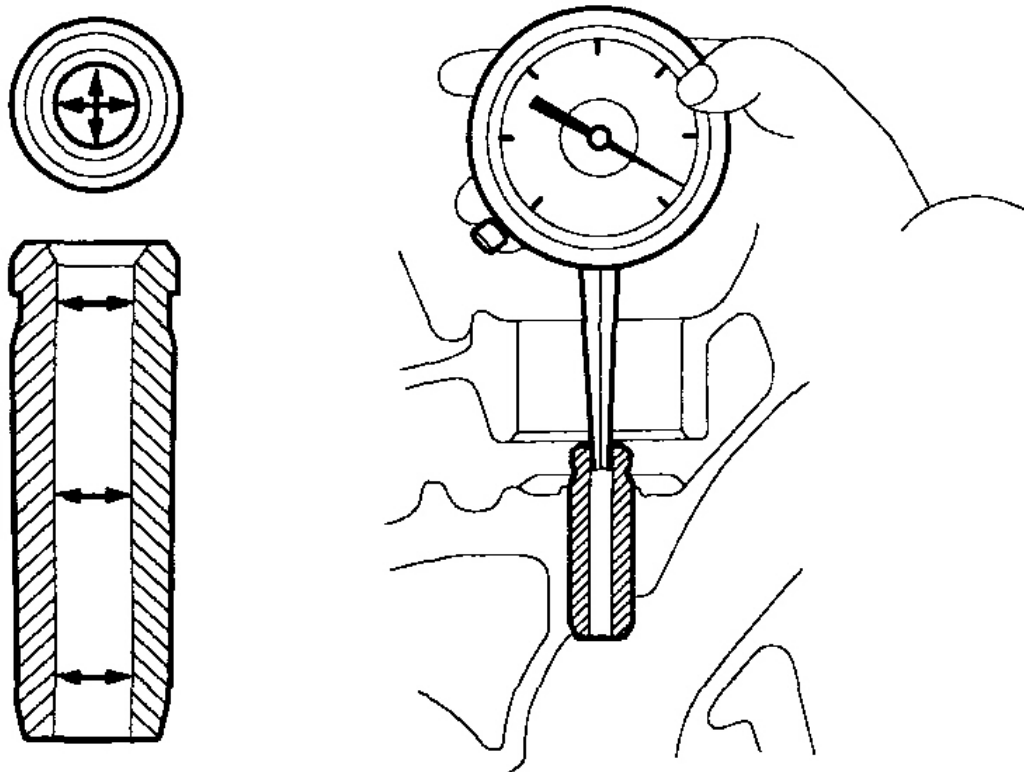
Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

VALVE AND VALVE SPRING

1. Inspect the valve stems and valve guides.
 1. Using a caliper gauge, measure the inner diameter of valve guide.

Valve guide inner diameter:

6.000 ~ 6.015mm (0.2362 ~ 0.2368in)



G03821064

Fig. 33: Measuring Valve Guide Inner Diameter

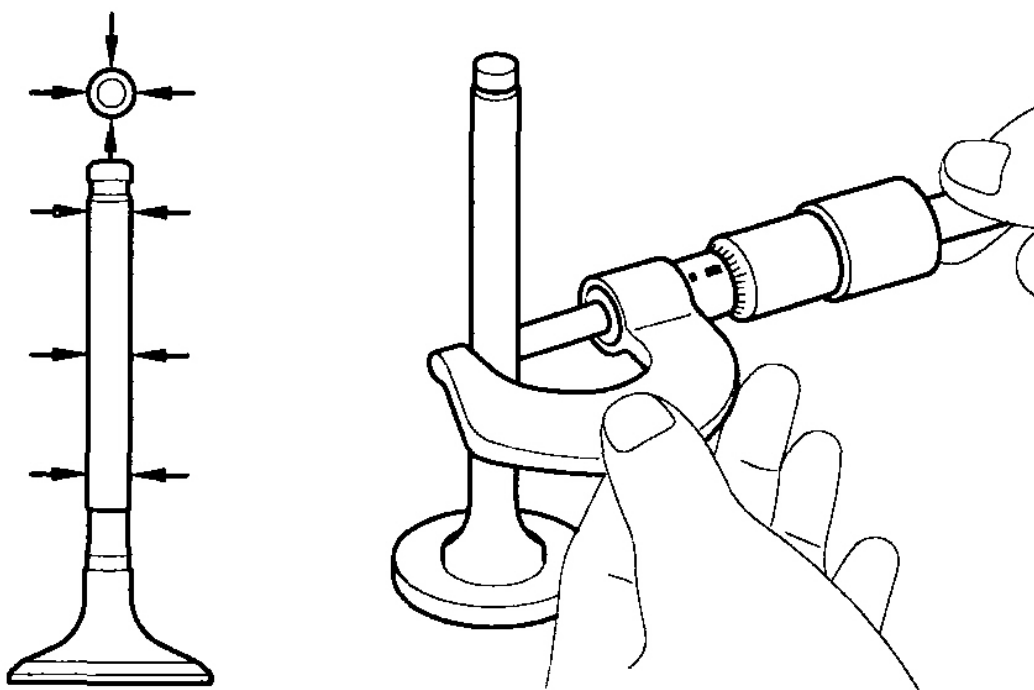
Courtesy of KIA MOTORS AMERICA, INC.

2. Using a micrometer, measure the outer diameter of valve stem.

Valve stem outer diameter

Intake: 5.965 ~ 5.980mm (0.2348 ~ 0.2354in)

Exhaust: 5.950 ~ 5.965mm (0.2343 ~ 0.2348in)



G03821065

Fig. 34: Measuring Valve Stem Outer Diameter
Courtesy of KIA MOTORS AMERICA, INC.

3. Subtract the valve stem outer diameter measurement from the valve guide inner diameter measurement.

Valve stem- to-guide clearance

Standard

Intake: 0.020 ~ 0.050mm (0.0008 ~ 0.0020in)

Exhaust: 0.035 ~ 0.065mm (0.0014 ~ 0.0026in)

Limit

Intake: 0.10mm (0.0039in)

Exhaust: 0.13mm (0.0051 in)

If the clearance is greater than maximum, replace the valve and valve guide.

2. Inspect the valves.

1. Check the valve is ground to the correct valve face angle.
2. Check the surface of the valve face for damage or wear.

If the valve face is damaged or worn, replace the valve.

3. Check the valve head margin thickness.

If the margin thickness is less than minimum, replace the valve.

Margin

Standard

Intake: 1.15mm (0.0453in)

Exhaust: 1.35mm (0.0531 in)

Limit

Intake: 0.8mm (0.0315in)

Exhaust: 1.0mm (0.0394in)

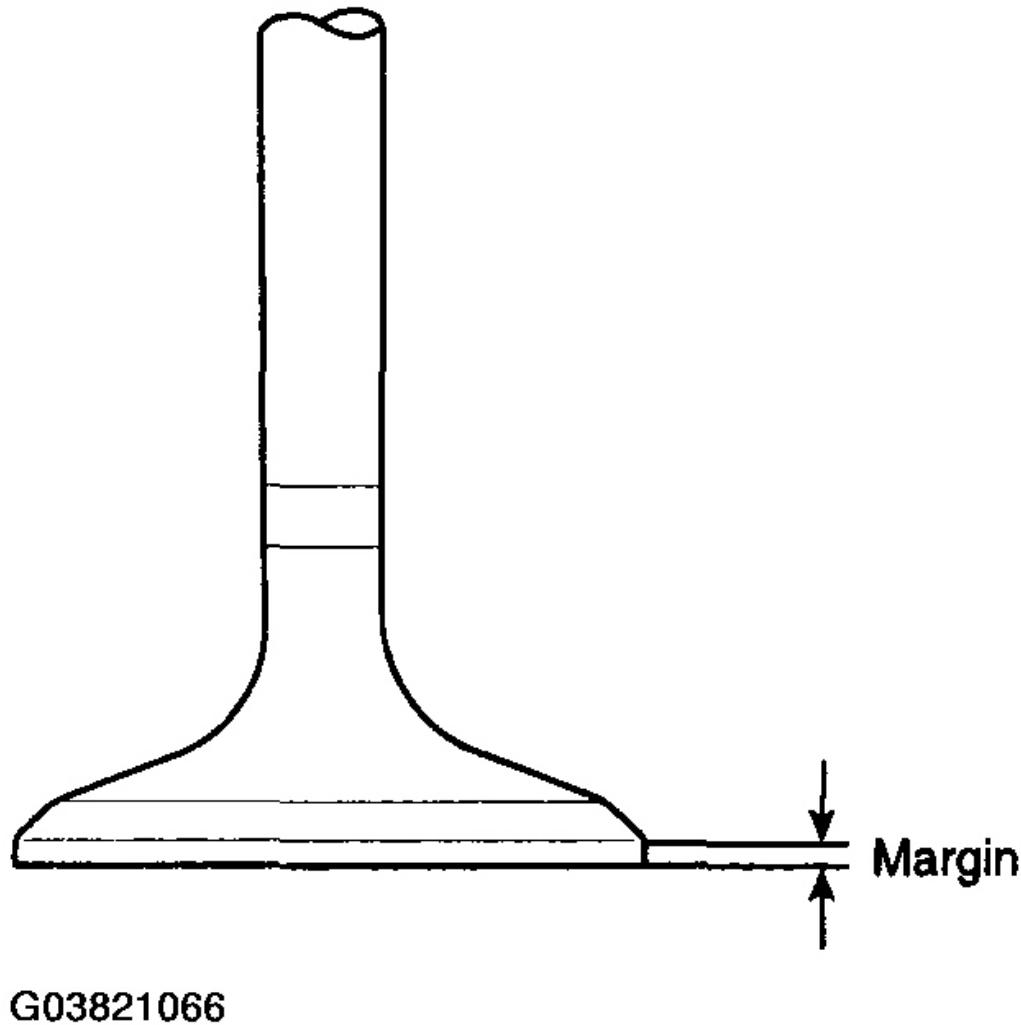


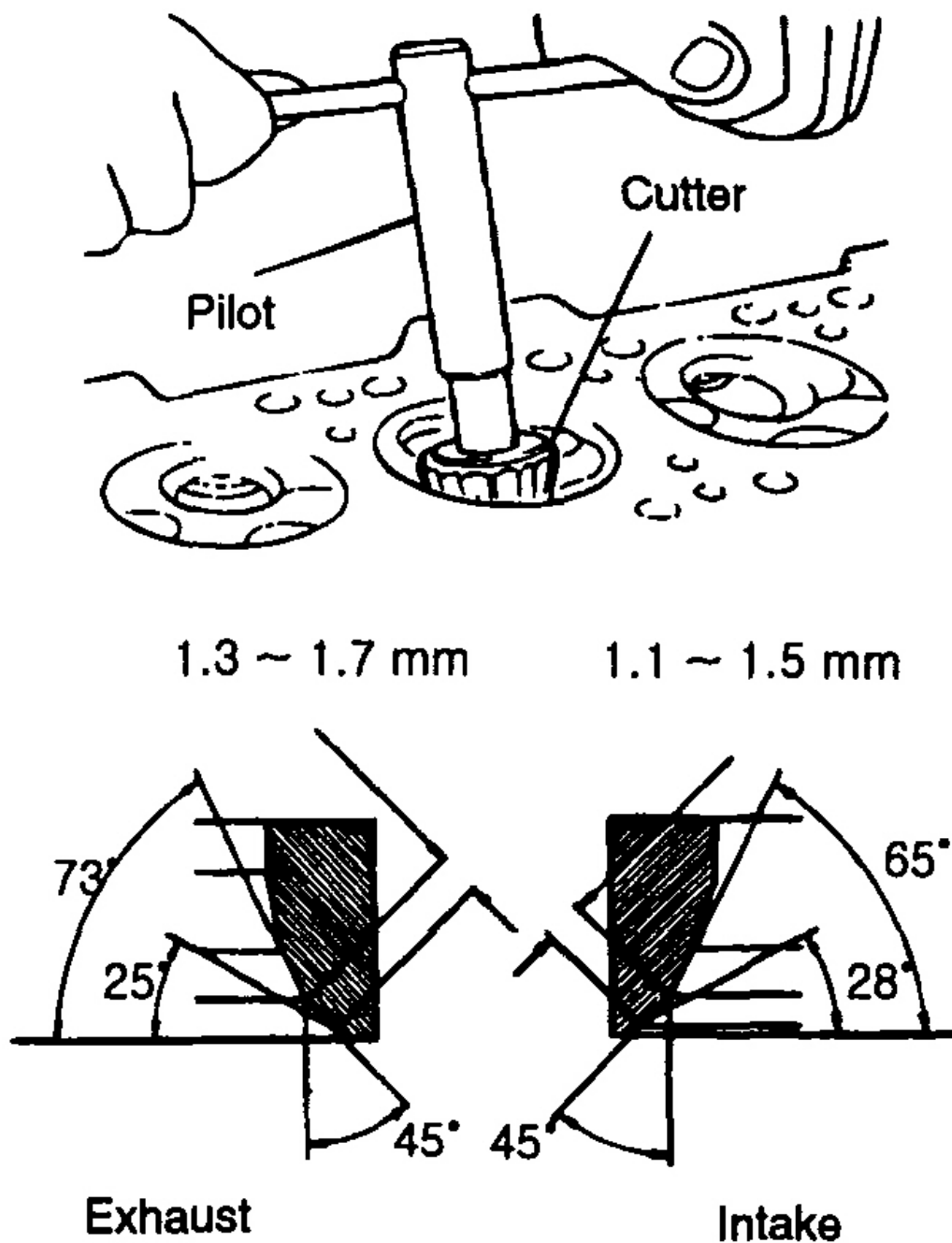
Fig. 35: Checking Valve Head Margin Thickness
 Courtesy of KIA MOTORS AMERICA, INC.

4. Check the surface of valve stem tip for wear. If the valve stem tip is worn, replace the valve.
3. Inspect the valve seats.
 1. Check the valve seat for evidence of overheating and improper contact with the valve face.

Replace the seat if necessary.

2. Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it, then recondition the seat.
3. Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should

be within specifications and centered on the valve face.



G03821067

Fig. 36: Reconditioning Valve Seat With Valve Seat Cutter (With Specifications)

Courtesy of KIA MOTORS AMERICA, INC.

4. Inspect the valve springs.
 1. Using a steel square, measure the out-of-square of valve spring.
 2. Using vernier calipers, measure the free length of valve spring.

Valve spring

Standard

Free height: 48.86mm (1.9236in)

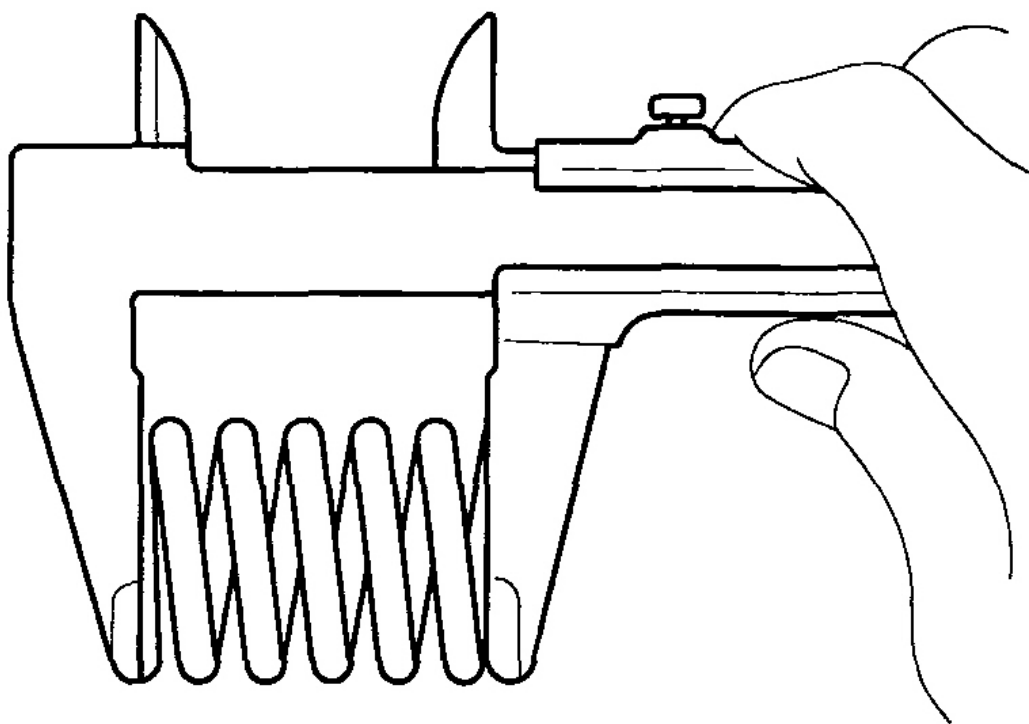
Load: 18.8+/-0.9kg/39.0mm (41.4+/-2.0lb/1.5354in)

41.0+/-1.5kg/30.5mm (90.4+/-3.3lb/1.2008in)

Out of square: Less than 1.5°

Limit

Out of square: 3°



G03821068

Fig. 37: Measuring Valve Spring Free Length
Courtesy of KIA MOTORS AMERICA, INC.

If the loads is not as specified, replace the valve spring.

CAMSHAFT

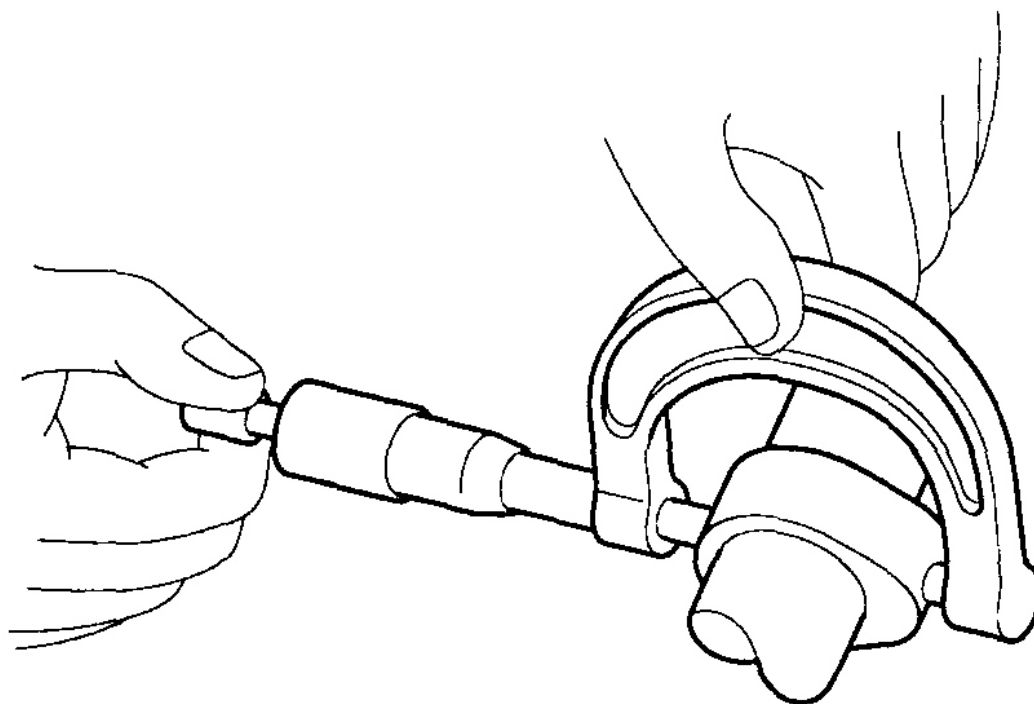
1. Inspect the cam lobes.

Using a micrometer, measure the cam lobe height.

Cam height

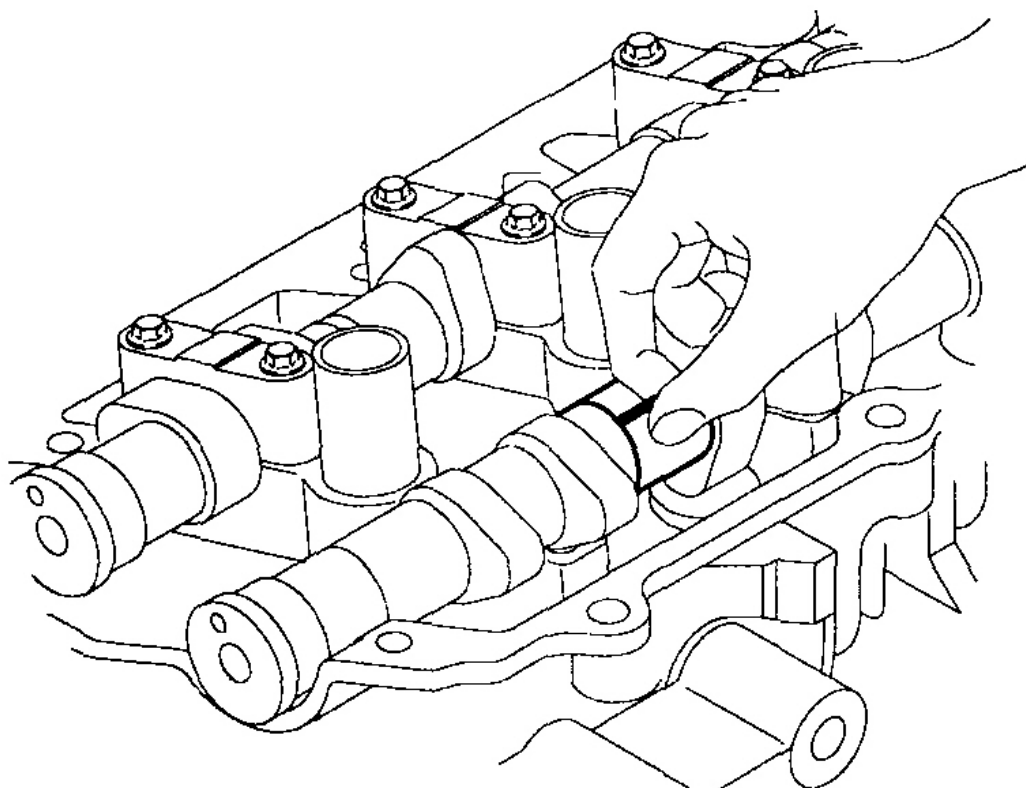
Intake: 44.518 ~ 44.718mm (1.7527 ~ 1.7605in)

Exhaust: 44.418 ~ 44.618mm (1.7487 ~ 1.7566in)

**G03821069****Fig. 38: Inspecting Cam Lobes****Courtesy of KIA MOTORS AMERICA, INC.**

If the cam lobe height is less than minimum, replace the camshaft.

2. Inspect the camshaft journal clearance.
 1. Clean the bearing caps and camshaft journals.
 2. Place the camshafts on the cylinder head.
 3. Lay a strip of plastigage across each of the camshaft journal.



G03821070

Fig. 39: Inspecting Camshaft Journal Clearance
Courtesy of KIA MOTORS AMERICA, INC.

4. Install the bearing caps and tighten the bolts with specified torque. (Refer to **INSTALLATION**, step 6)

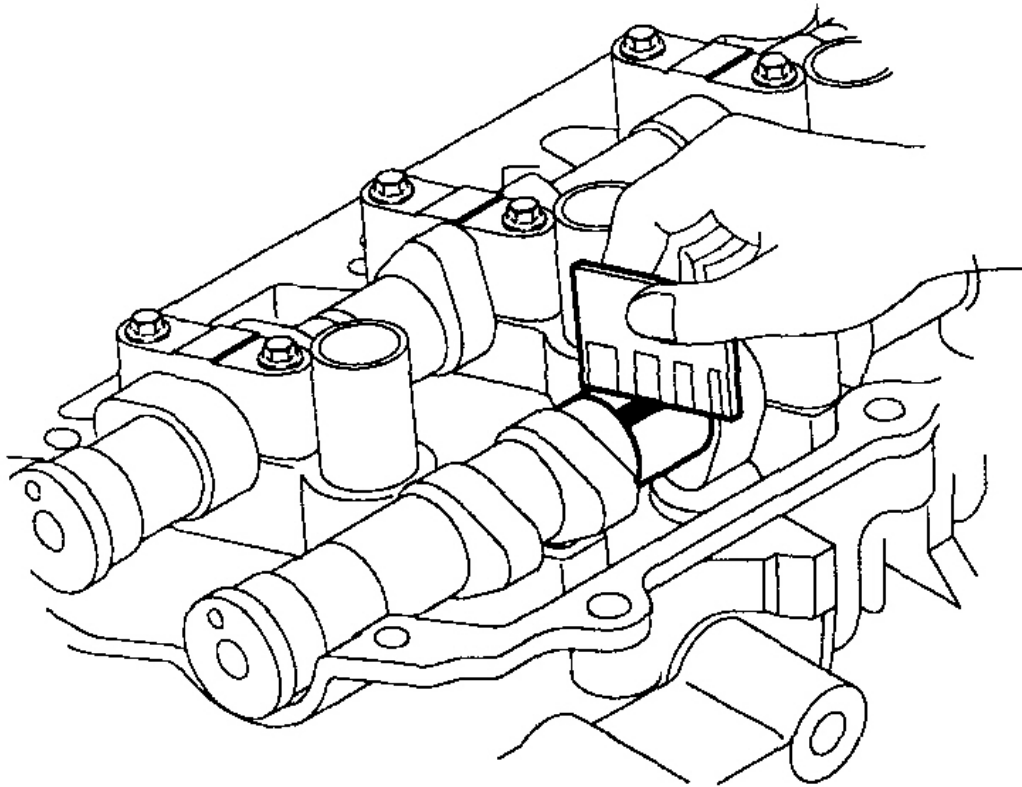
CAUTION: Do not turn the camshaft.

5. Remove the bearing caps.
6. Measure the plastigage at its widest point.

Bearing oil clearance

Standard: 0.020 ~ 0.061mm (0.0008 ~ 0.0024in)

Limit: 0.1mm (0.0039in)



G03821071

Fig. 40: Measuring Plastigage At Widest Point
 Courtesy of KIA MOTORS AMERICA, INC.

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

7. Completely remove the plastigage.
8. Remove the camshafts.
3. Inspect the camshaft end play.
 1. Install the camshafts. (Refer to **INSTALLATION** step 6)
 2. Using a dial indicator, measure the end play while moving the camshaft back and forth.

Camshaft end play

Standard: 0.1 ~ 0.2mm (0.0039 ~ 0.0079in)

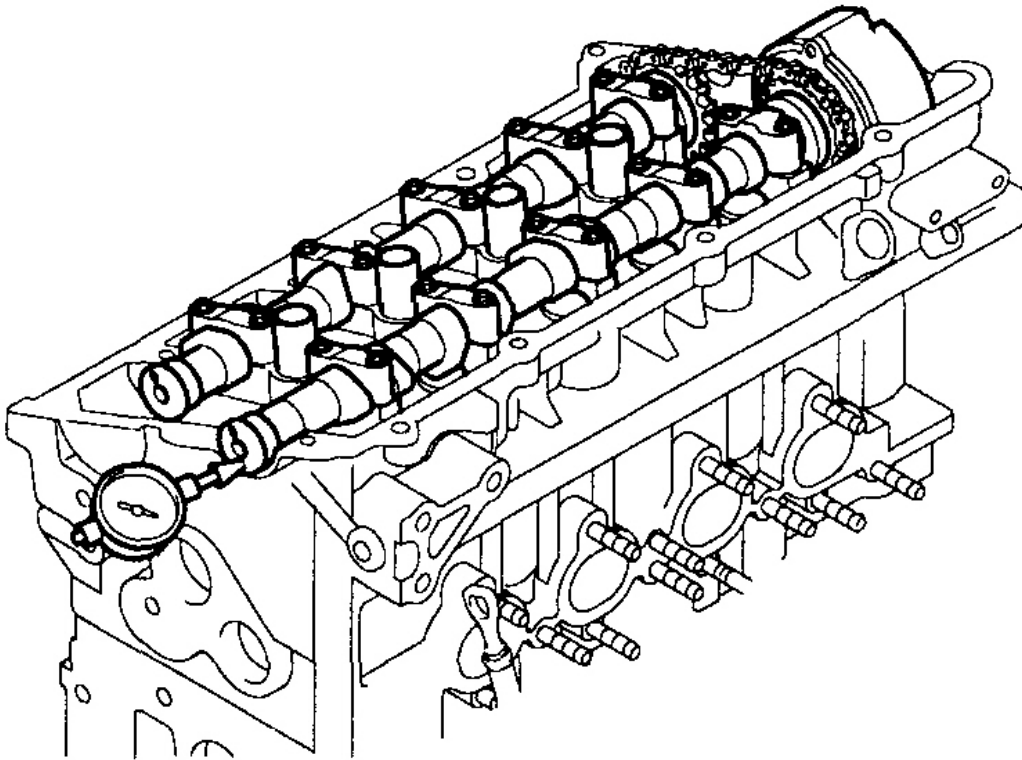
**G03821072**

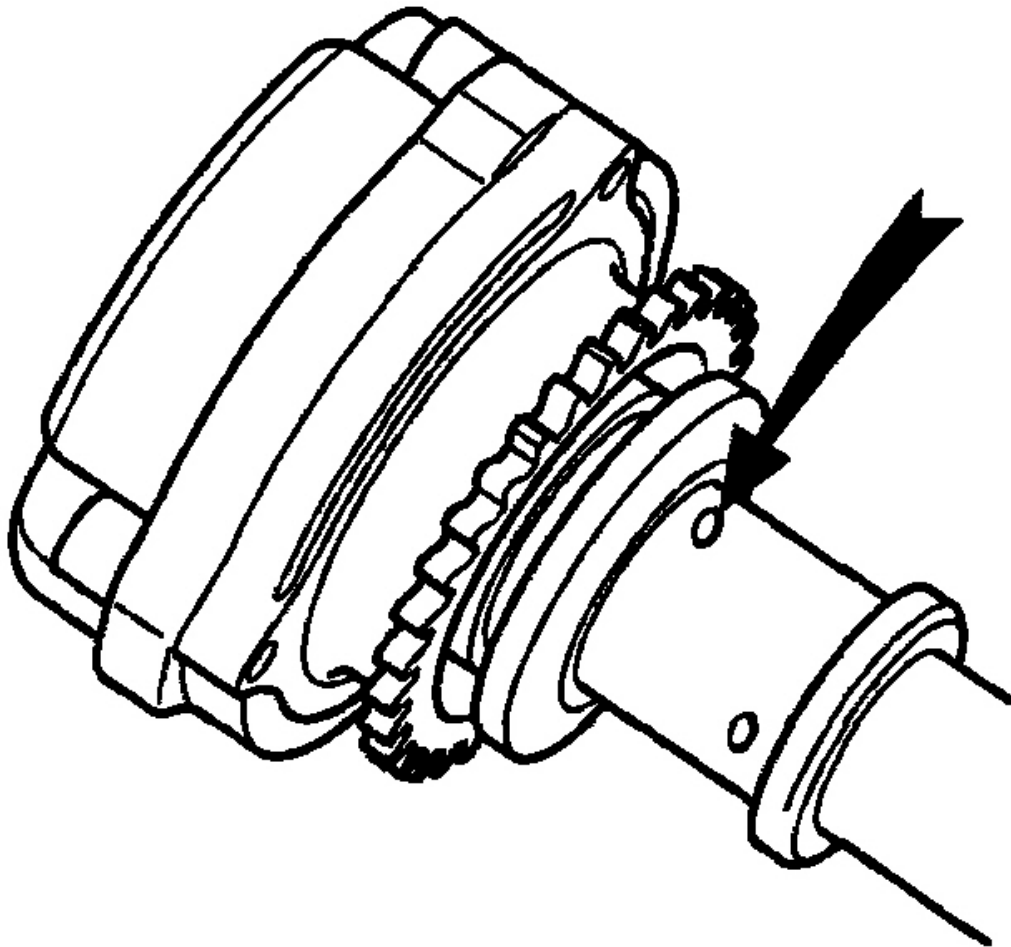
Fig. 41: Inspecting Camshaft End Play
Courtesy of KIA MOTORS AMERICA, INC.

If the end play is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

3. Remove the camshafts.

CVVT (CONTINUOUS VARIABLE VALVE TIMING) ASSEMBLY

1. Inspect the CVVT (Continuous Variable Valve Timing) assembly.
 1. Check that the CVVT (Continuous Variable Valve Timing) assembly will not turn.
 2. Apply vinyl tape to all the parts except the one indicated by the arrow in the illustration.



G03821073

Fig. 42: Inspecting Continuous Variable Valve Timing Assembly
Courtesy of KIA MOTORS AMERICA, INC.

3. To release the CVVT lock pin, wrap some tape around the tip of an air pressure adapter and apply low air pressure (About 14 psi) to the exposed camshaft port.

NOTE: **Wrap a shop towel or rag around the CVVT because residual oil may leak out of the unit when applying air pressure.**

4. With low air pressure applied, turn the CVVT to the ADVANCE direction as indicated in the illustration.
 - With the low air pressure applied, the CVVT should turn to the ADVANCE side.

- If too much air leaks when applying the low air pressure, the CVVT lock pin may not release and the CVVT may not turn.

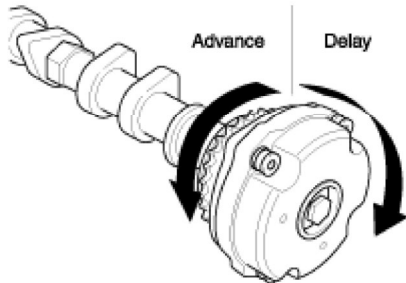


Fig. 43: Identifying Continuous Variable Valve Timing Movement
Courtesy of KIA MOTORS AMERICA, INC.

5. Allow the CVVT assembly to move in the ADVANCE and RETARD directions to ensure there is no binding and that it moves freely.

Standard: Movable smoothly in the range about 20°

6. Turn the CVVT by hand and make sure it locks in the maximum retard angle position.

REASSEMBLY

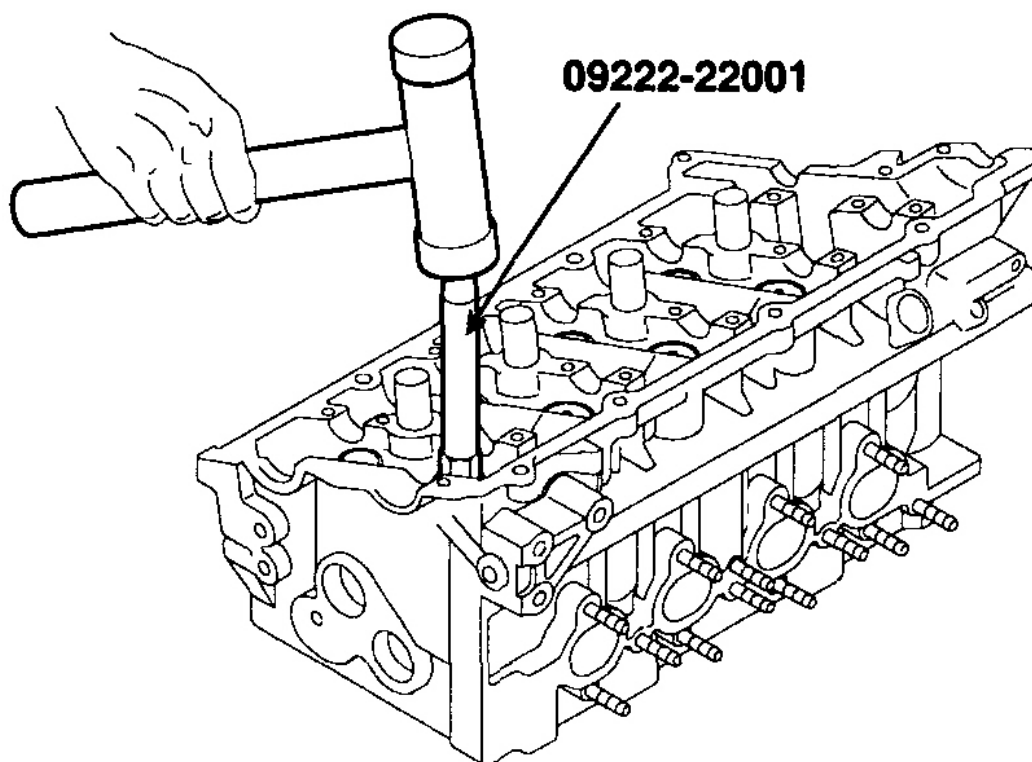
NOTE:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surface.
- Replace oil seals with new ones.

1. Install the valves.
 1. Install the spring seats.
 2. Using the SST (09222 - 22001), push in a new oil seal.

NOTE:

Do not reuse old valve stem oil seals. Incorrect installation of the seal could result in oil leakage past the valve guides.



G03821078

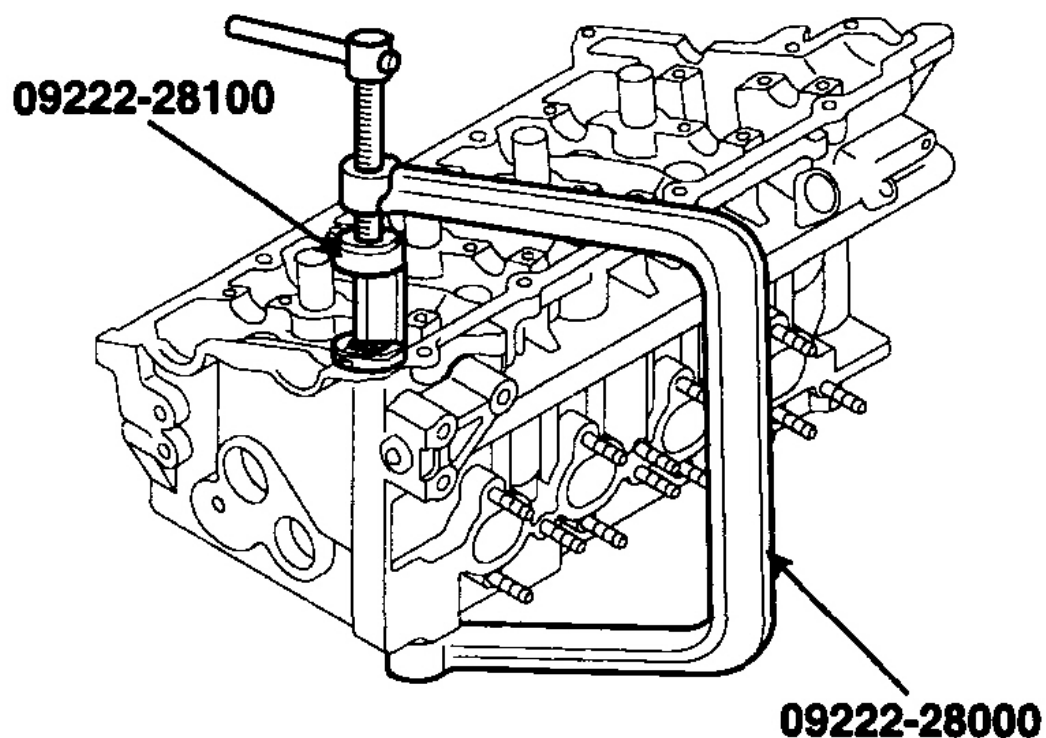
Fig. 44: Installing Valves

Courtesy of KIA MOTORS AMERICA, INC.

3. Install the valve, valve spring and spring retainer.

NOTE: Place the valve springs so that the side coated with enamel faces toward the valve spring retainer and then installs the retainer.

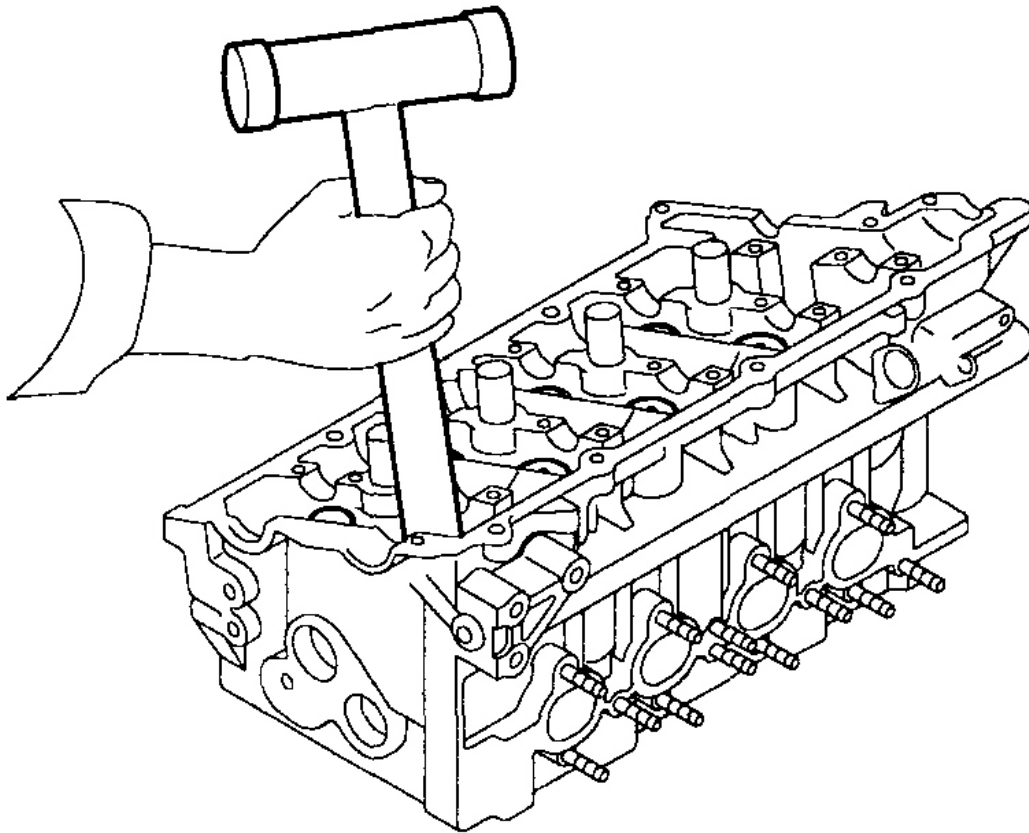
4. Using the SST(09222 - 28000, 09222 - 28100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.



G03821079

Fig. 45: Compressing Spring And Installing Retainer Locks
Courtesy of KIA MOTORS AMERICA, INC.

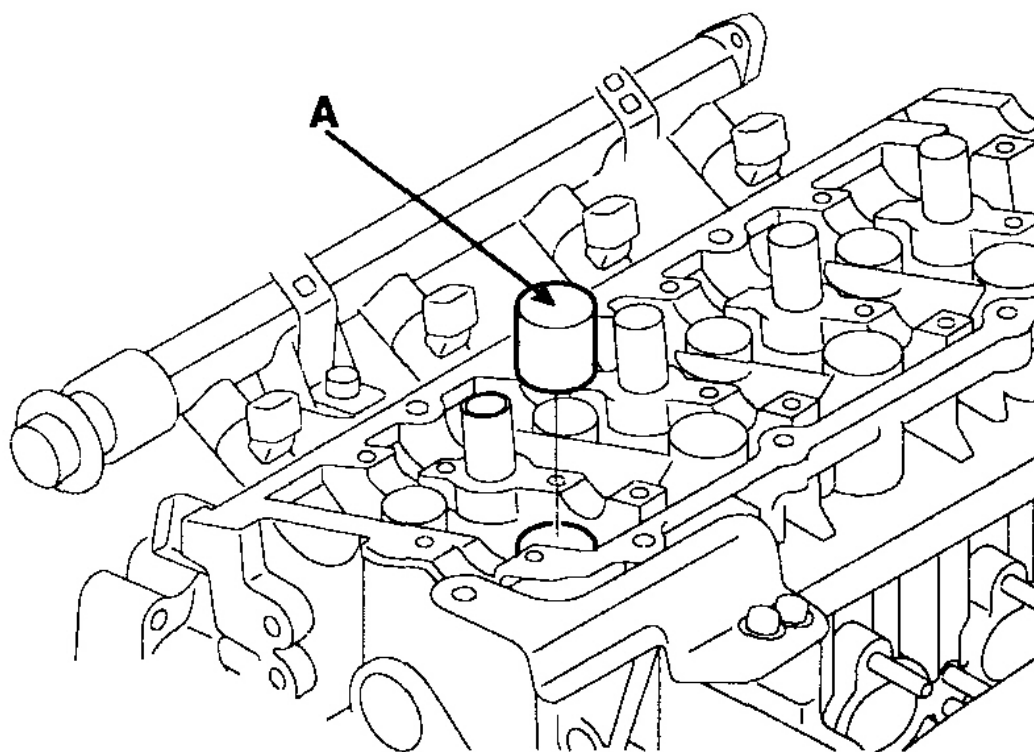
5. Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of the valve and retainer lock.



G03821080

Fig. 46: Tapping Valve Stem End
Courtesy of KIA MOTORS AMERICA, INC.

2. Install the MLA (Mechanical Lash Adjuster)s. Check that the MLA rotates smoothly by hand.



G03821081

Fig. 47: Installing Mechanical Lash Adjuster
Courtesy of KIA MOTORS AMERICA, INC.

INSTALLATION

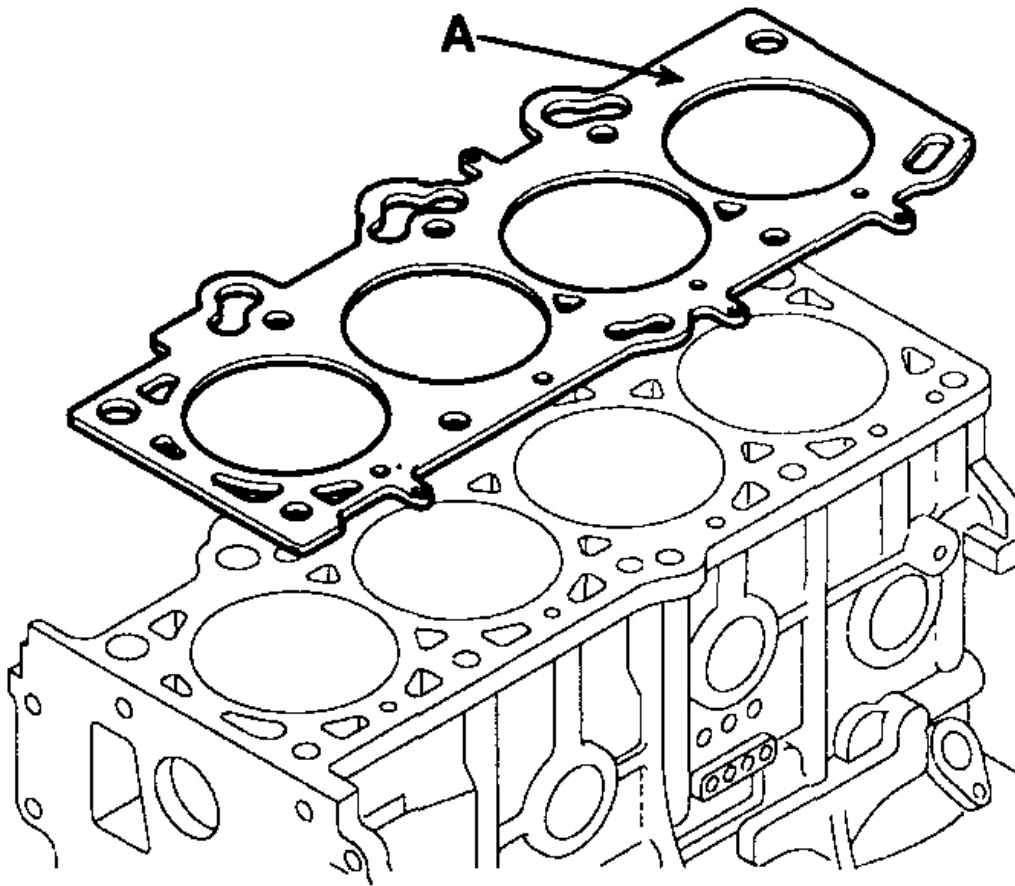
NOTE:

- Thoroughly clean all parts to be assembled.
- Always use a new cylinder head and manifold gasket.
- The cylinder head gasket is a metal gasket. Take care not to bend it.
- Rotate the crankshaft, set the No. 1 piston at TDC.

1. Install the cylinder head gasket (A) on the cylinder block.

NOTE:

Be careful of the installation direction.



G03821082

Fig. 48: Installing Cylinder Head Gasket On Cylinder Block
Courtesy of KIA MOTORS AMERICA, INC.

2. Place the cylinder head onto the block carefully in order to prevent damaging the gasket. If the gasket is damaged, fluid leakage could occur.
3. Install the cylinder head bolts.
 1. Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
 2. Using 8mm and 10mm hexagon wrench, install and tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

Tightening torque:

M10: 22.6~26.5N.m (2.3~2.7kgf.m, 16.6~19.5lb-ft)+60°~65° + 60°~65°

M12: 27.5~31.4N.m (2.8~3.2kgf.m, 20.3~23.1 lb-ft)+60°-65° + 60°~65°

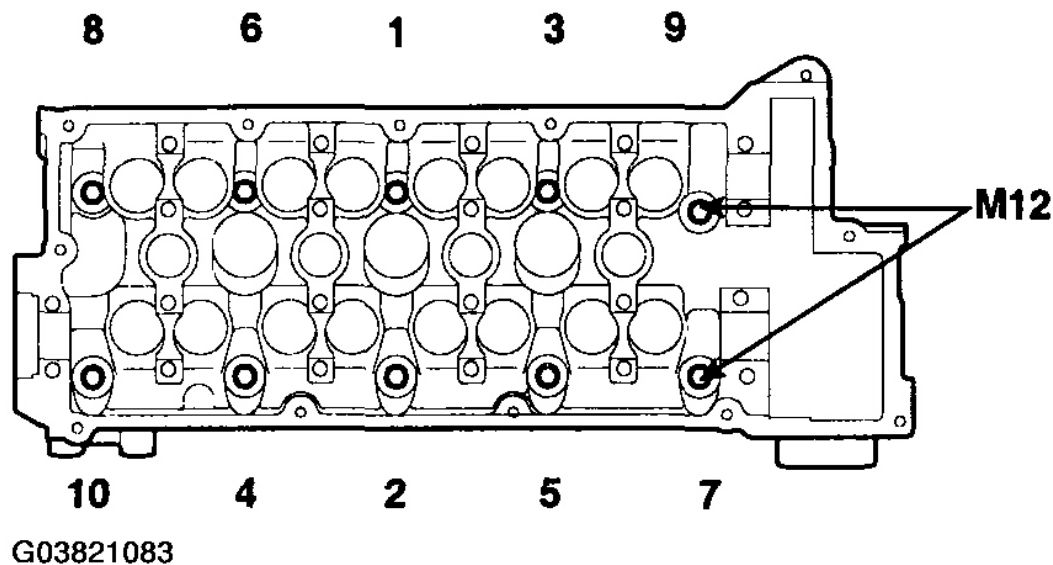
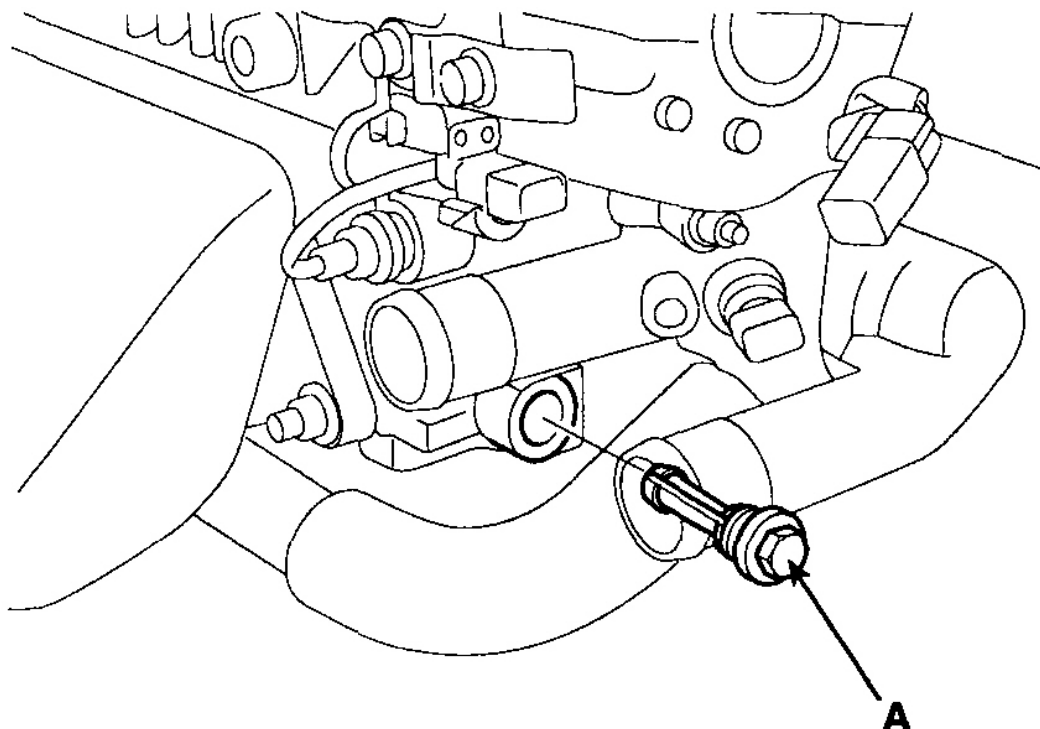


Fig. 49: Cylinder Head Bolts Tightening Sequence
Courtesy of KIA MOTORS AMERICA, INC.

4. Install the OCV (Oil Control Valve) filter (A).

Tightening torque:

40.2 ~ 50.0N.m (4.1 ~ 5.1kgf.m, 29.7 ~ 36.9lb-ft)



G03821084

Fig. 50: Installing Oil Control Valve Filter
Courtesy of KIA MOTORS AMERICA, INC.

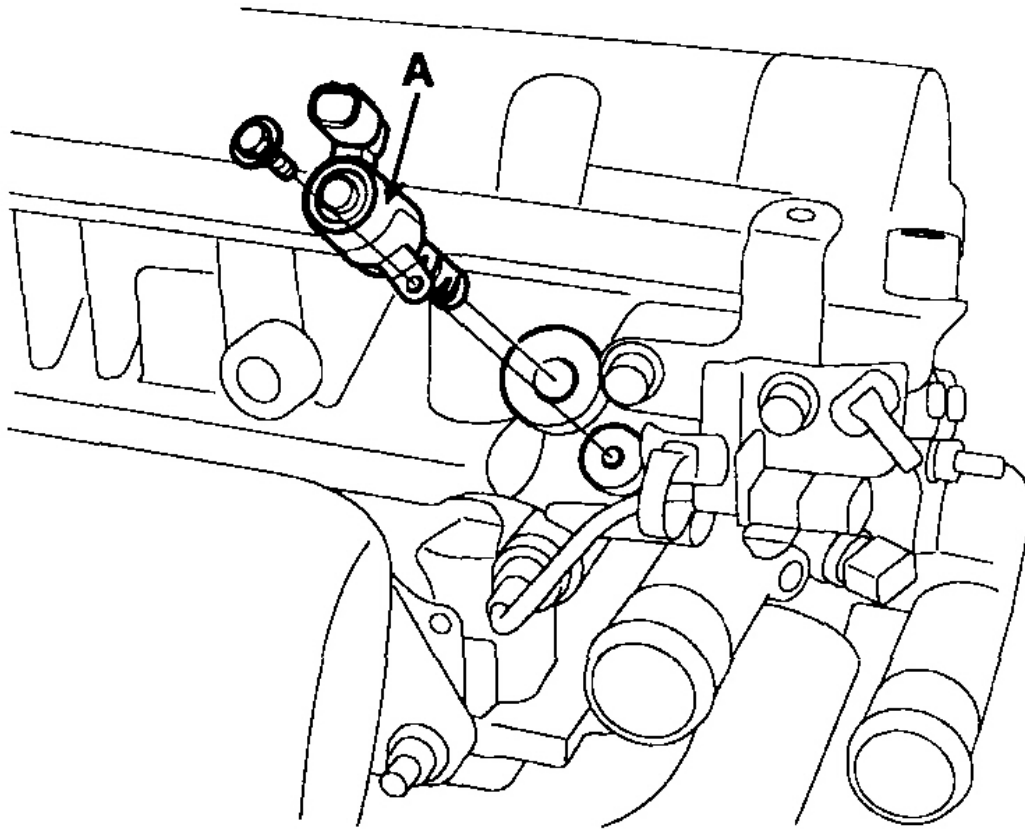
NOTE:

- Always use a new OCV (Oil Control Valve) filter gasket.
- Keep the OCV filter clean.

5. Install the OCV (Oil Control Valve) (A).

Tightening torque:

9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



G03821085

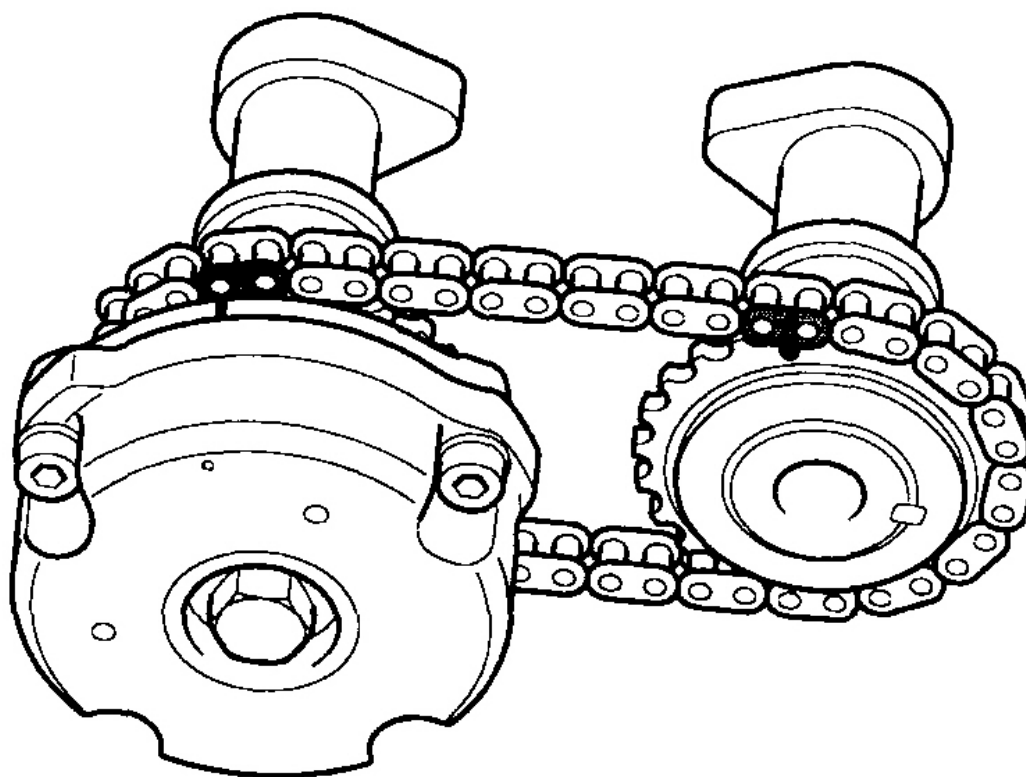
Fig. 51: Installing Oil Control Valve
Courtesy of KIA MOTORS AMERICA, INC.

CAUTION:

- Do not reuse the OCV (Oil Control Valve) when dropped.
- Keep the OCV clean.
- Do not hold the OCV (Oil Control Valve) sleeve during servicing.
- When the OCV is installed on the engine, be careful not to rotate the engine while holding the OCV.

6. Install the camshafts.

1. Align the camshaft timing chain with the intake timing chain sprocket and exhaust timing chain sprocket as shown.



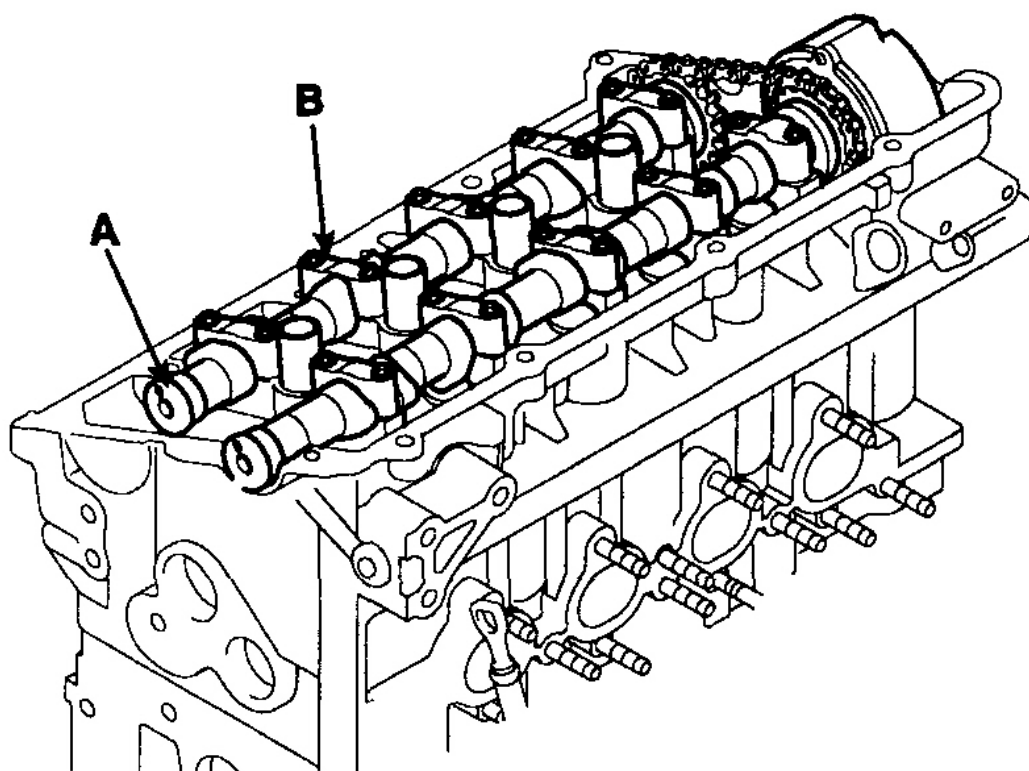
G03821086

Fig. 52: Aligning Camshaft Timing Chain With Intake And Exhaust Timing Chain Sprocket
Courtesy of KIA MOTORS AMERICA, INC.

2. Install the camshaft (A) and bearing caps (B).

Tightening torque:

13.7 ~ 14.7N.m (1.4 ~ 1.5kgf.m, 10.1 ~ 10.8lb-ft)



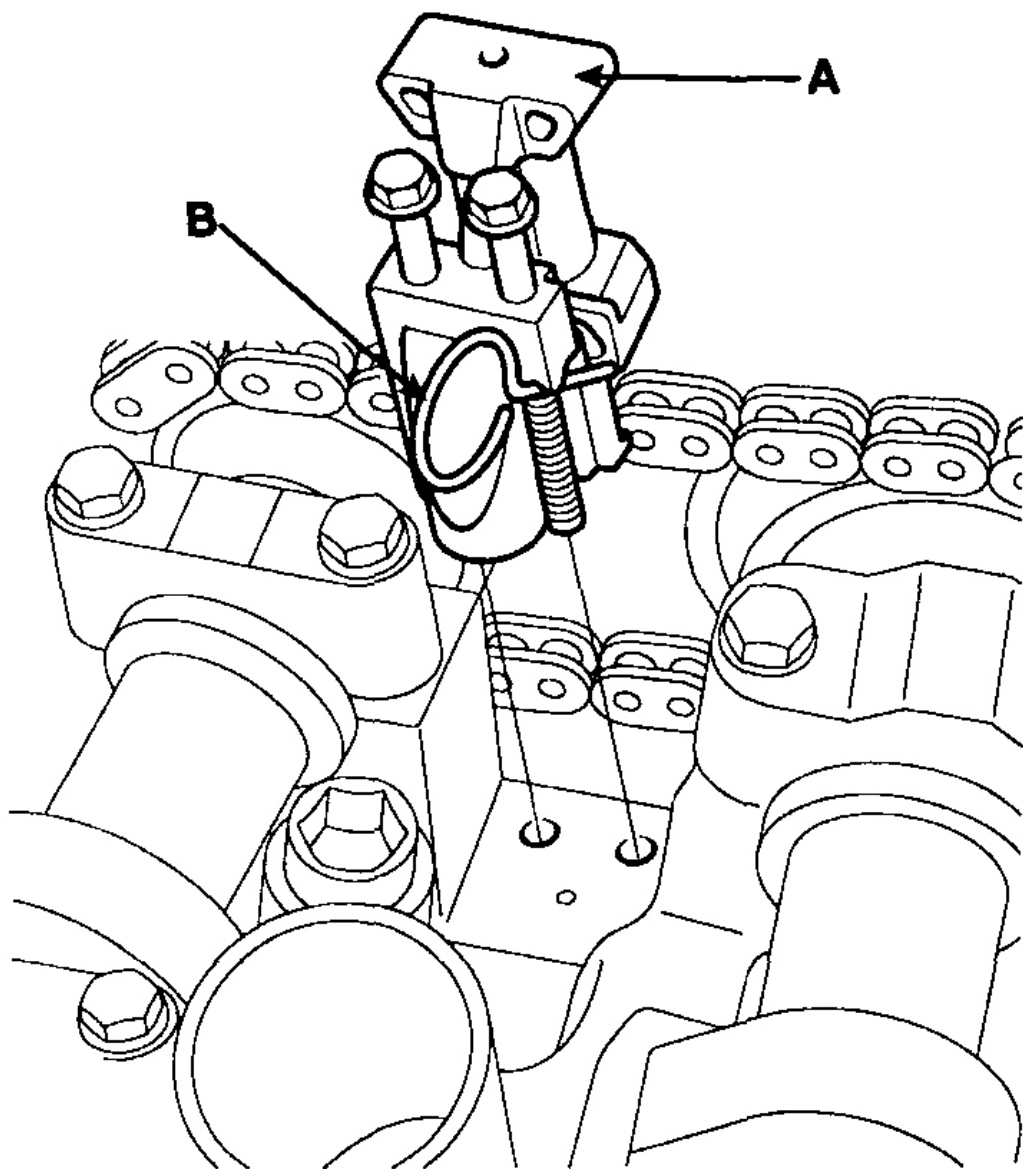
G03821087

Fig. 53: Installing Camshaft And Bearing Caps
Courtesy of KIA MOTORS AMERICA, INC.

3. Install the timing chain auto tensioner (A).

Tightening torque:

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



G03821088

Fig. 54: Installing Timing Chain Auto Tensioner
Courtesy of KIA MOTORS AMERICA, INC.

4. Remove the auto tensioner stopper pin (B).
7. Check and adjust valve clearance. (Refer to **VALVE CLEARANCE INSPECTION AND ADJUSTMENT**)
8. Using the SST (09221 - 21000), install the camshaft bearing oil seal.

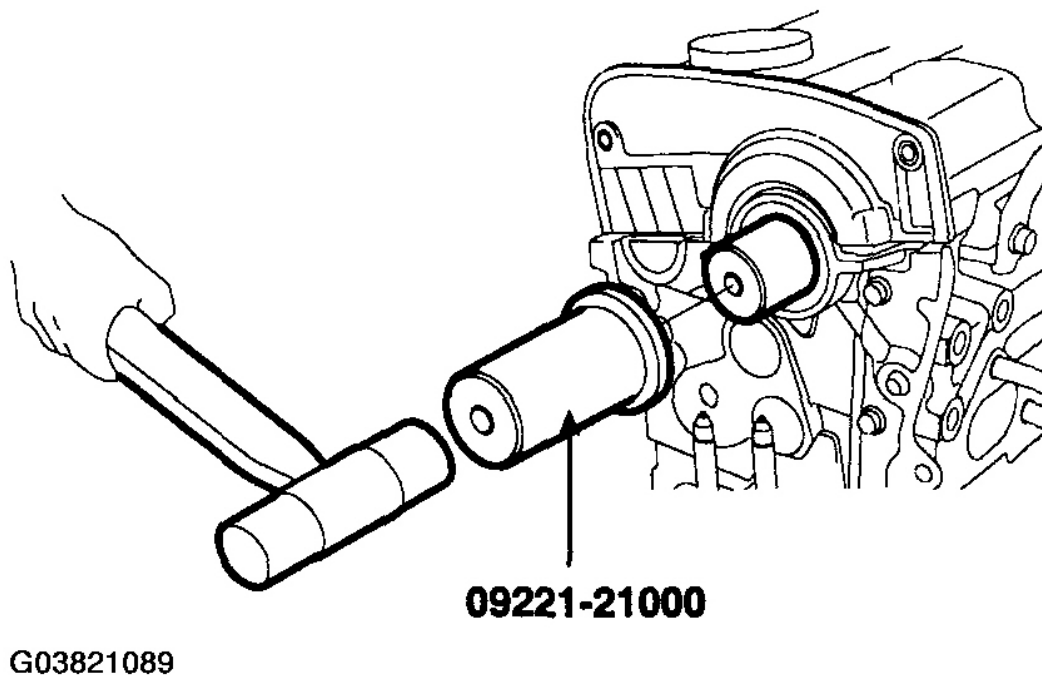
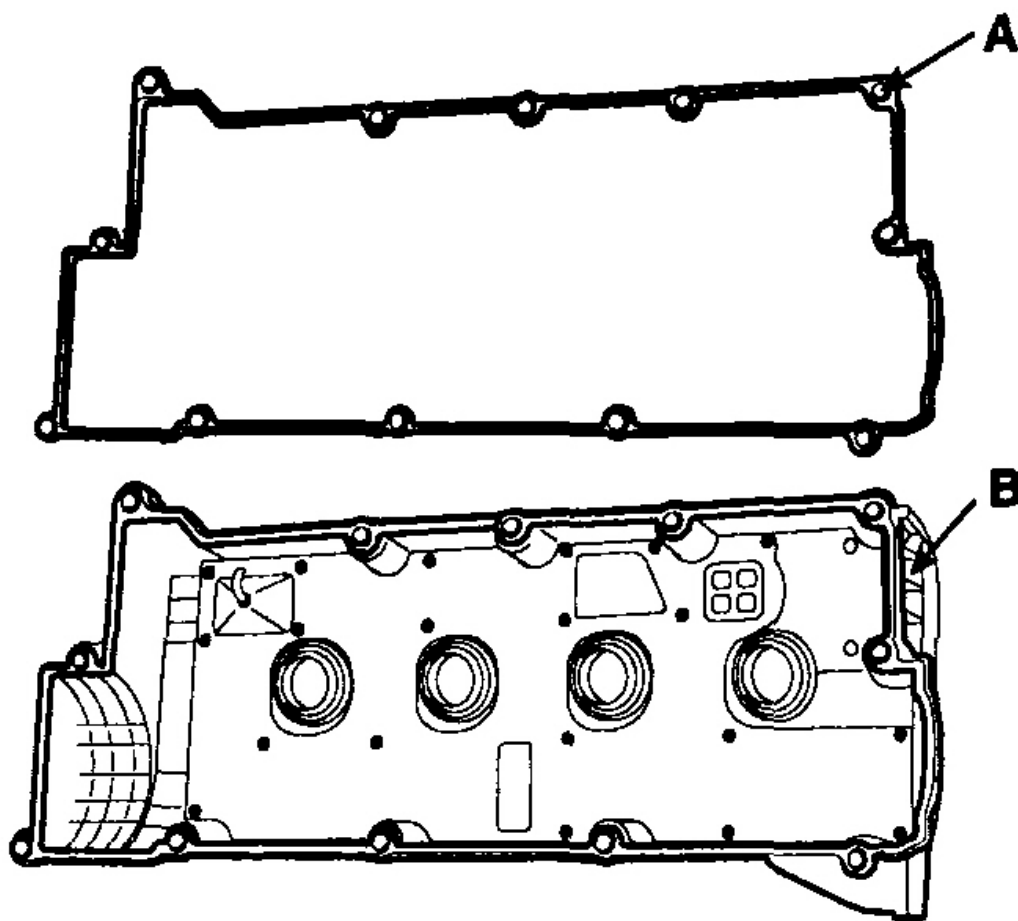


Fig. 55: Installing Camshaft Bearing Oil Seal
Courtesy of KIA MOTORS AMERICA, INC.

9. Install the camshaft sprocket. (Refer to **INSTALLATION** , step 1)
10. Install the cylinder head cover.
 1. Install the cylinder head cover gasket (A) in the groove of the cylinder head cover (B).



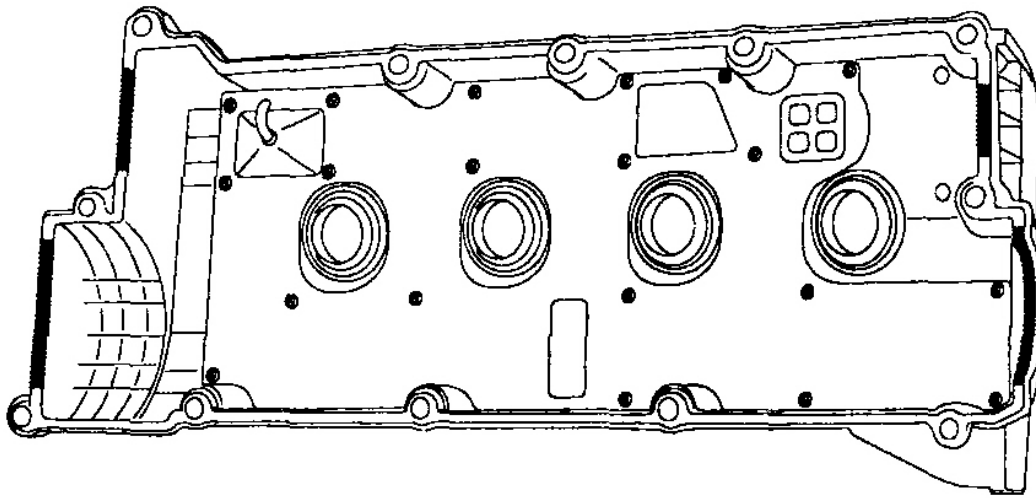
G03821090

Fig. 56: Installing Cylinder Head Cover Gasket In Cylinder Head Cover Groove
Courtesy of KIA MOTORS AMERICA, INC.

NOTE:

- Before installing the cylinder head cover gasket, thoroughly clean the cylinder head cover and the groove.
- When installing, make sure the cylinder head cover gasket is seated securely in the corners of the recesses with no gap.

2. Apply liquid gasket to the head cover gasket at the corners of the recess.



G03821091

Fig. 57: Applying Liquid Gasket To Head Cover Gasket
Courtesy of KIA MOTORS AMERICA, INC.

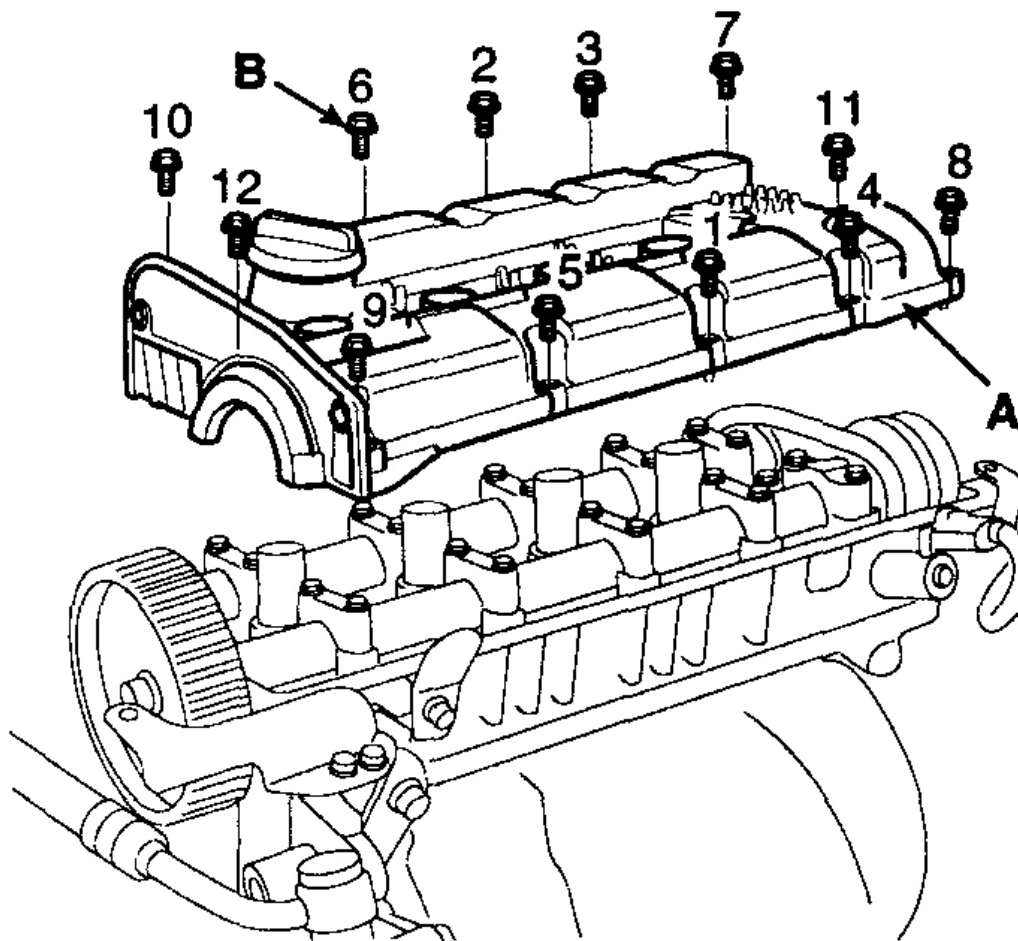
NOTE:

- Use liquid gasket, loctite No. 5999.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- After assembly, wait at least 30 minutes before filling the engine with oil.

3. Install the cylinder head cover (A) with the 12 bolts (B). Uniformly tighten the bolts in several passes.

Tightening torque:

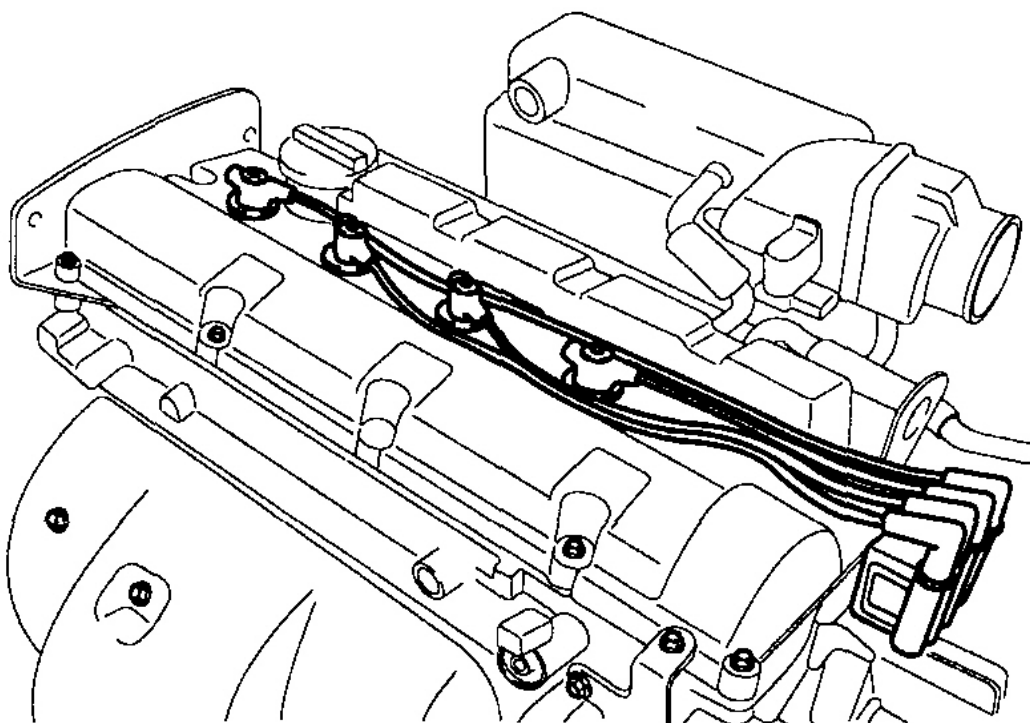
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



G03821092

Fig. 58: Cylinder Head Cover Tightening Sequence
 Courtesy of KIA MOTORS AMERICA, INC.

11. Install the PCV (Positive Crankcase Ventilation) hose. (Refer to **INSTALLATION** , step 2))
12. Install the timing belt. (Refer to **INSTALLATION** , step 4-21)
13. Install the intake manifold. (Refer to **INTAKE AND EXHAUST SYSTEM - 2.0L**)
14. Install the exhaust manifold. (Refer to **INTAKE AND EXHAUST SYSTEM - 2.0L**)
15. Install the spark plug cables.



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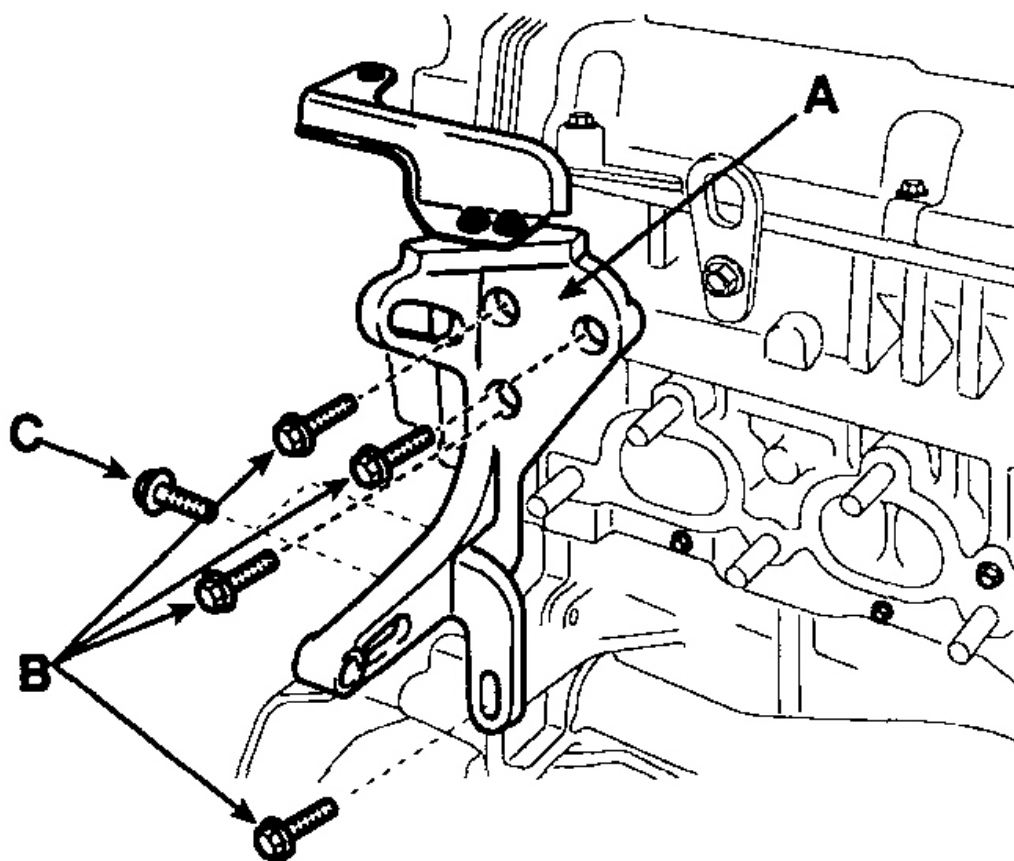
Fig. 59: Installing Spark Plug Cables
Courtesy of KIA MOTORS AMERICA, INC.

16. Install the power steering pump bracket (A) and bolts (B, C).

Tightening torque:

Bolt (B): 34.3 ~ 49.0N.m (3.5~ 5.0kgf.m, 25.3 ~ 36.2lb-ft)

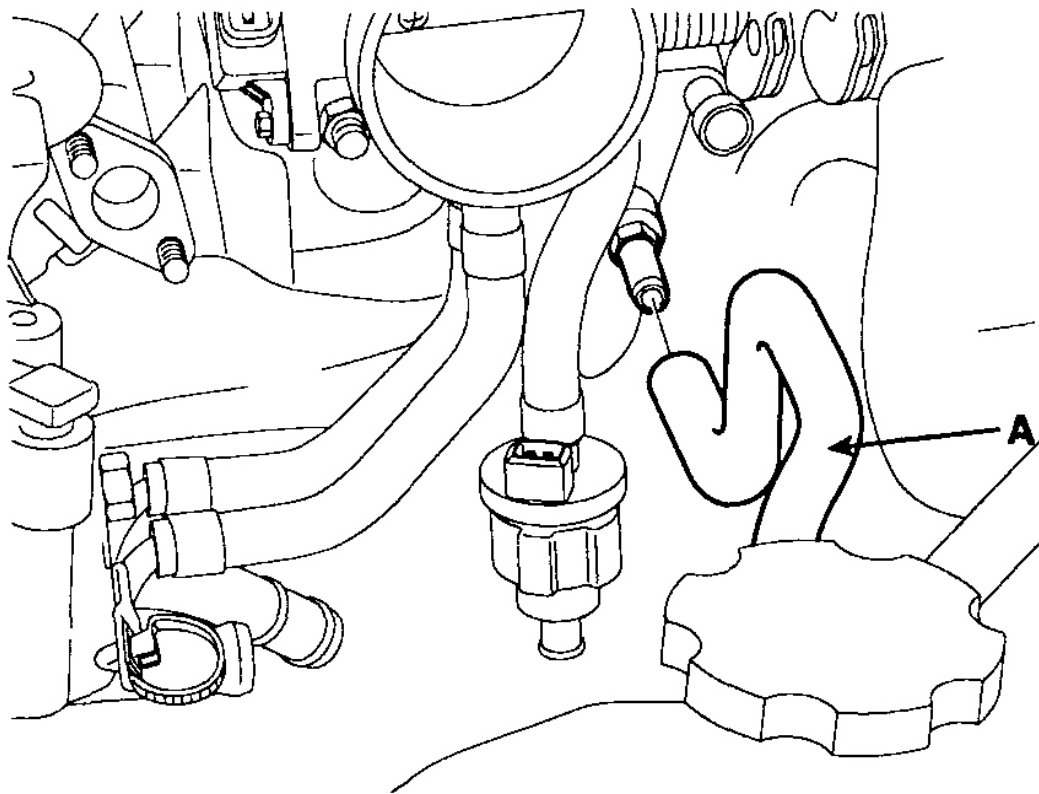
Bolt (C): 11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lb-ft)



G03821094

Fig. 60: Installing Power Steering Pump Bracket
Courtesy of KIA MOTORS AMERICA, INC.

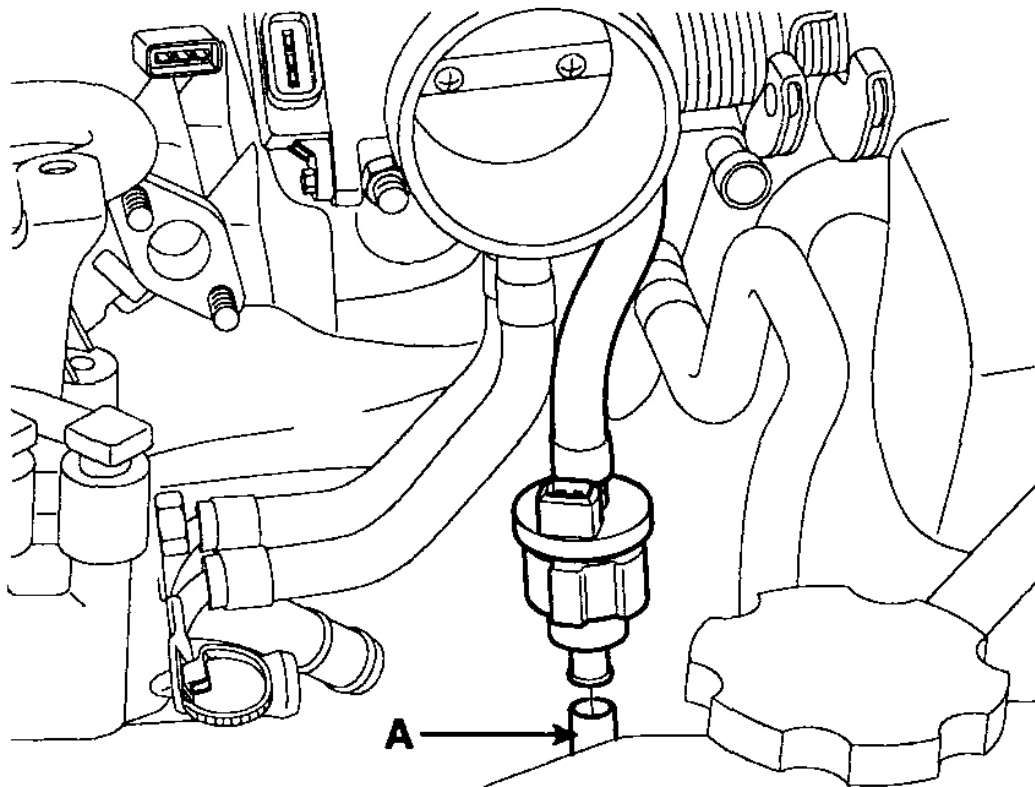
17. Install the power steering pump. (See **MECHANICAL POWER STEERING SYSTEM**)
18. Install the accelerator cable.
19. Install the brake booster hose (A).



G03821095

Fig. 61: Installing Brake Booster Hose
Courtesy of KIA MOTORS AMERICA, INC.

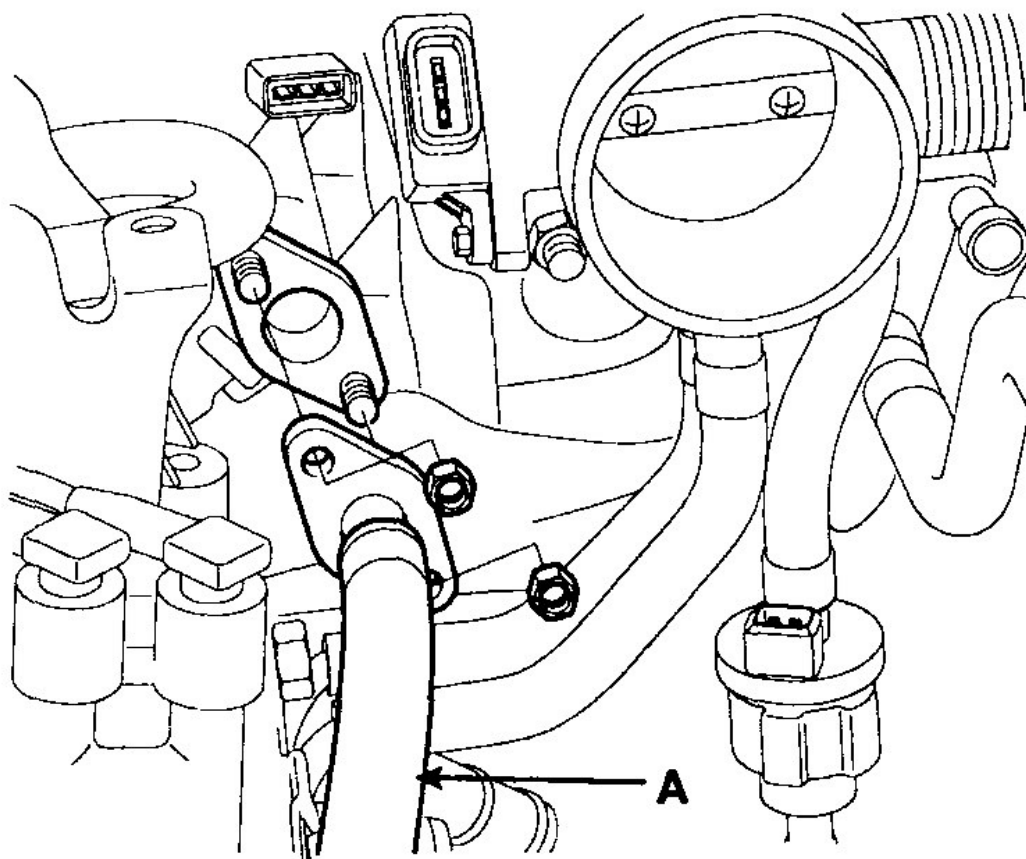
20. Connect the hose (A) of the PCSV (Purge Control Solenoid Valve) side.



G03821096

Fig. 62: Connecting Purge Control Solenoid Valve Side Hose
Courtesy of KIA MOTORS AMERICA, INC.

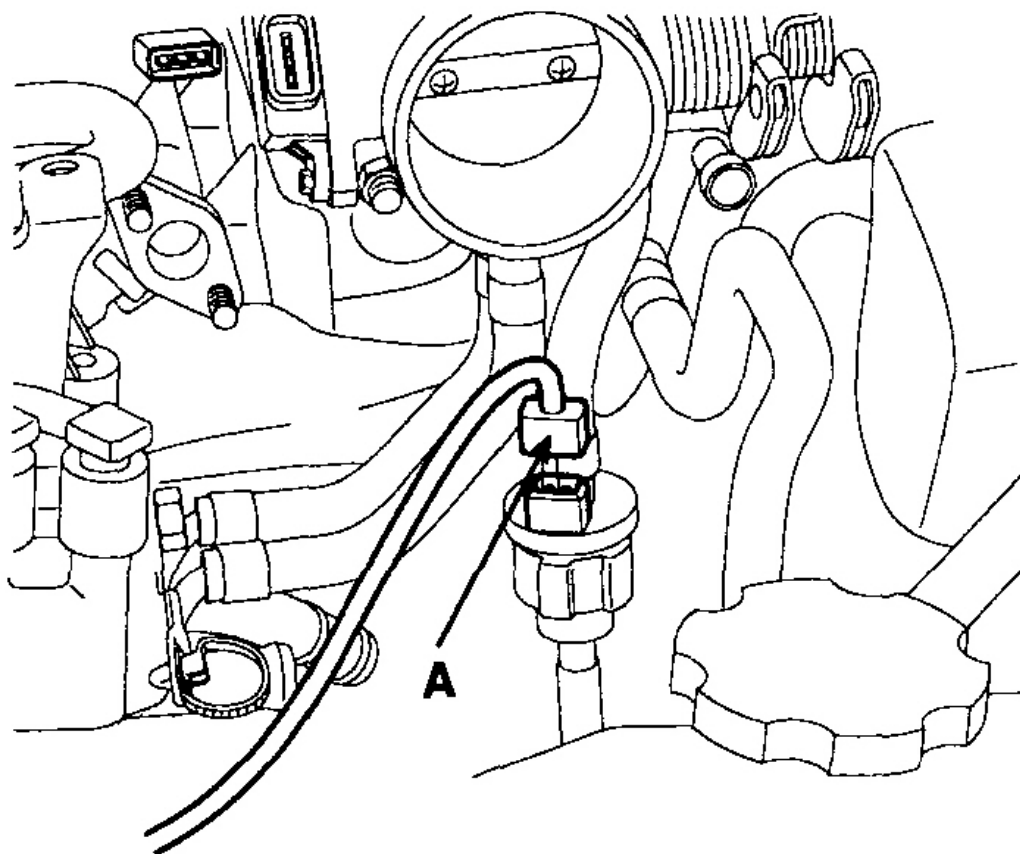
21. Connect the fuel inlet hose (A) of the delivery pipe side.



G03821097

Fig. 63: Connecting Delivery Pipe Side Fuel Inlet Hose
Courtesy of KIA MOTORS AMERICA, INC.

22. Install the engine wire harness connectors and wire harness clamps to the cylinder head and the intake manifold.
 1. Connect the PCSV (Purge Control Solenoid Valve) connector (A).



G03821098

Fig. 64: Connecting Purge Control Solenoid Valve Connector
Courtesy of KIA MOTORS AMERICA, INC.

2. Connect the front heated oxygen sensor connector (A).
3. Connect the CKP (Crankshaft Position Sensor) connector (B).
4. Connect the oil pressure switch connector (C).

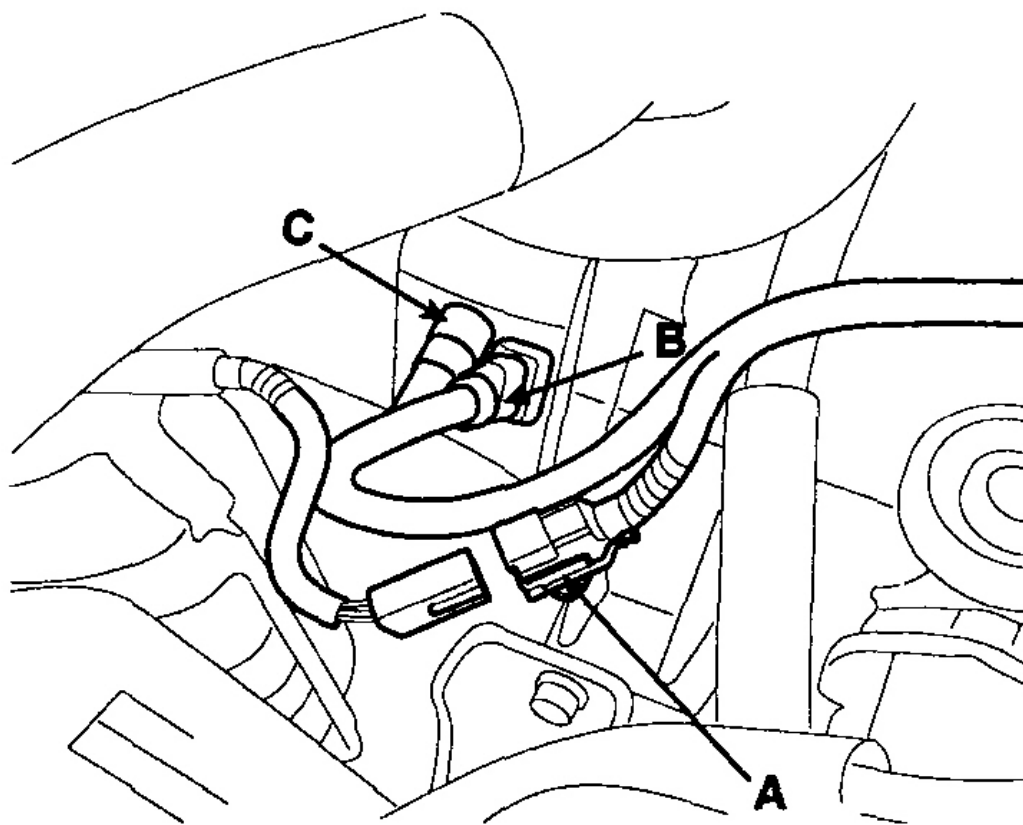
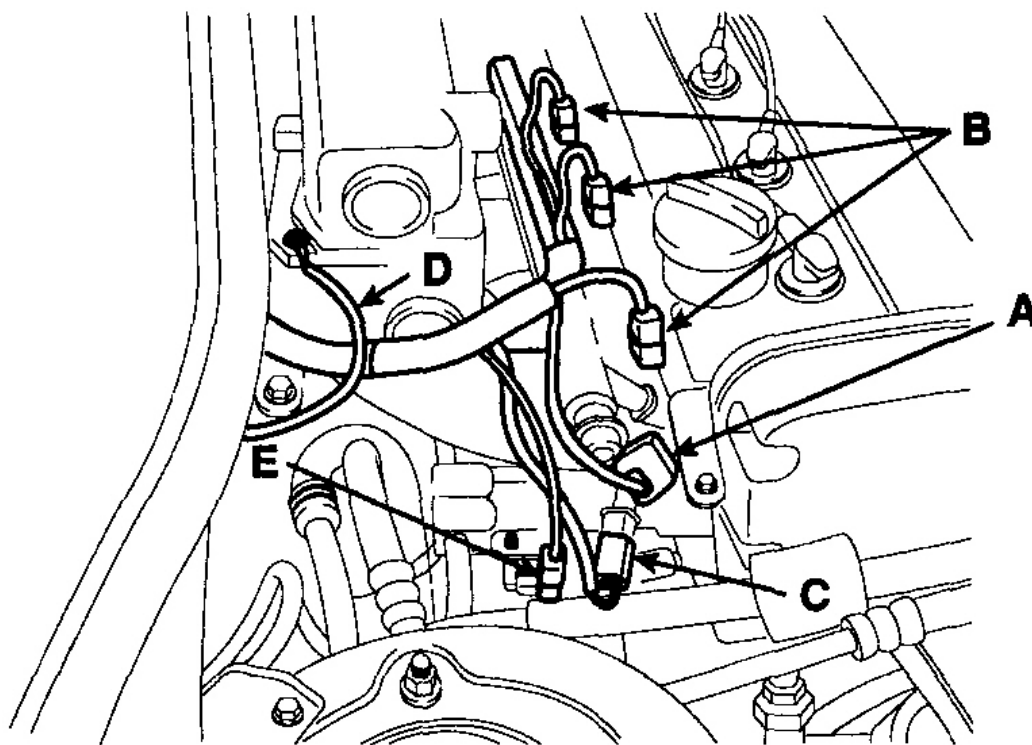
**G03821099**

Fig. 65: Connecting Oil Pressure Switch Connector
Courtesy of KIA MOTORS AMERICA, INC.

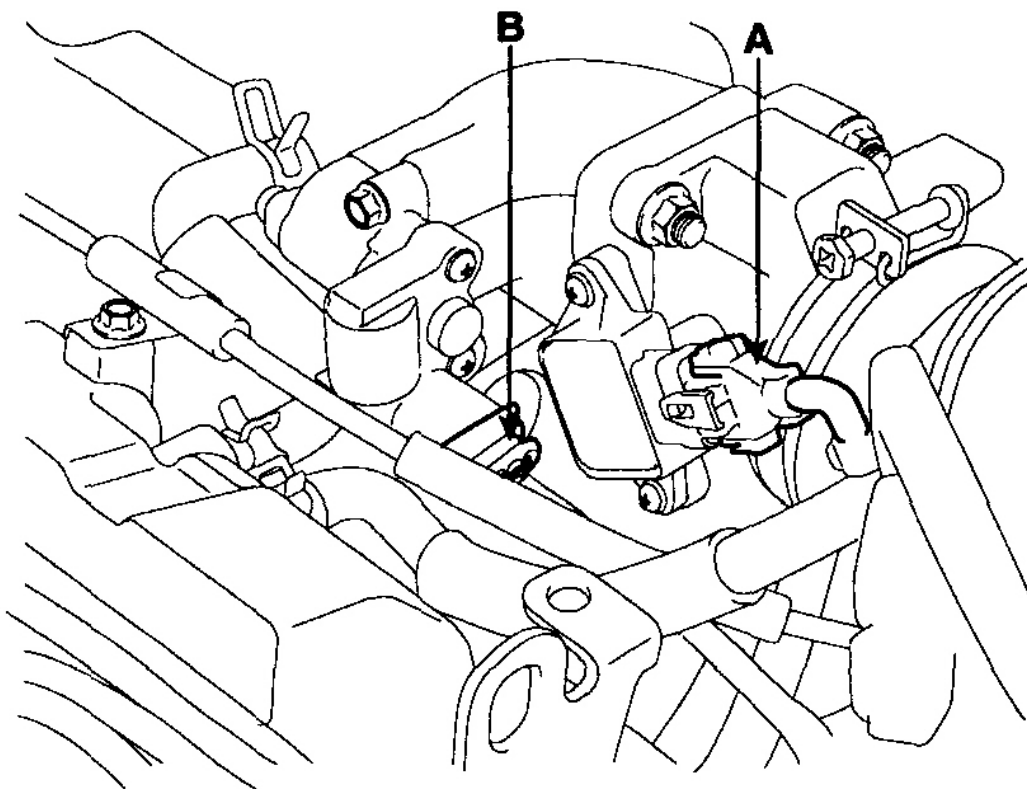
5. Connect the air conditioner compressor switch connector (E).
6. Connect the ground cables (D) to intake manifold.
7. Connect the knock sensor connector (C).
8. Connect the fuel injector connectors (B).
9. Connect the CMP (Camshaft position sensor) connector (A).



G03821100

Fig. 66: Connecting Camshaft Position Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

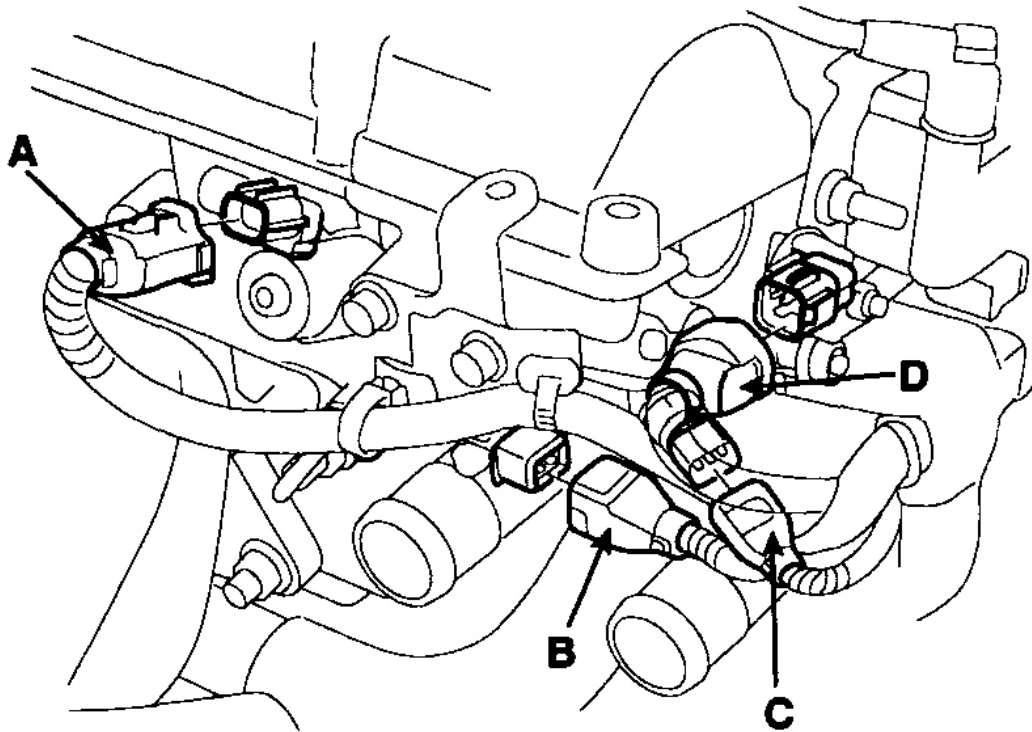
10. Connect the ISA (Idle Speed Actuator) connector (B).
11. Connect the TPS (Throttle Position Sensor) connector (A).



G03821101

Fig. 67: Connecting Throttle Position Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

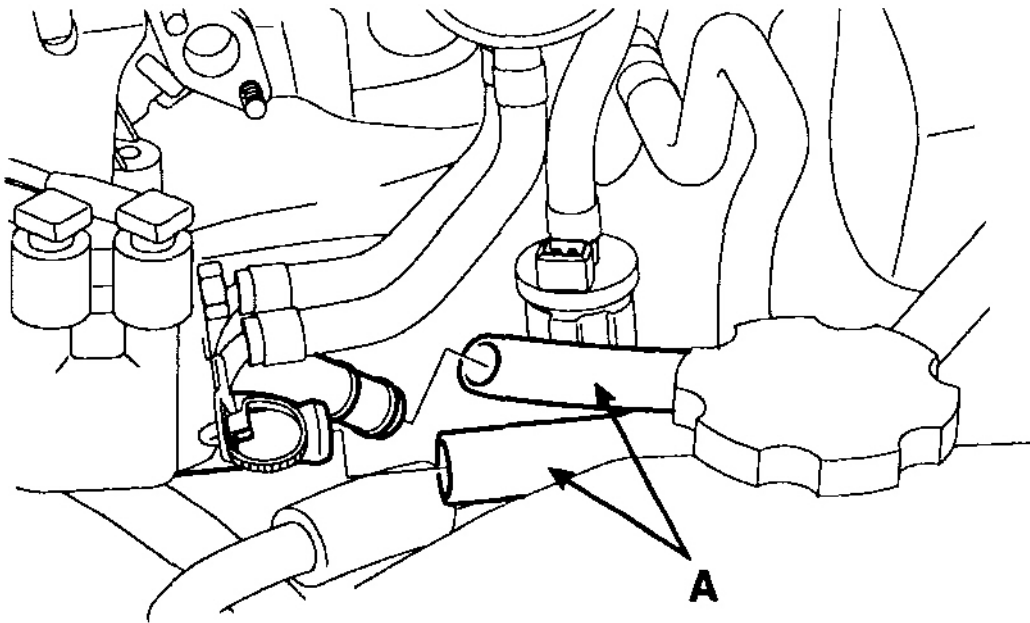
12. Connect the ignition coil connector (D).
13. Connect the ECT (Engine Coolant Temperature) connector (C).
14. Connect the oil temperature sensor connector (B).
15. Connect the OCV (Oil Control Valve) connector (A).



G03821102

Fig. 68: Connecting Oil Control Valve Connector
Courtesy of KIA MOTORS AMERICA, INC.

23. Install the heater hose (A).

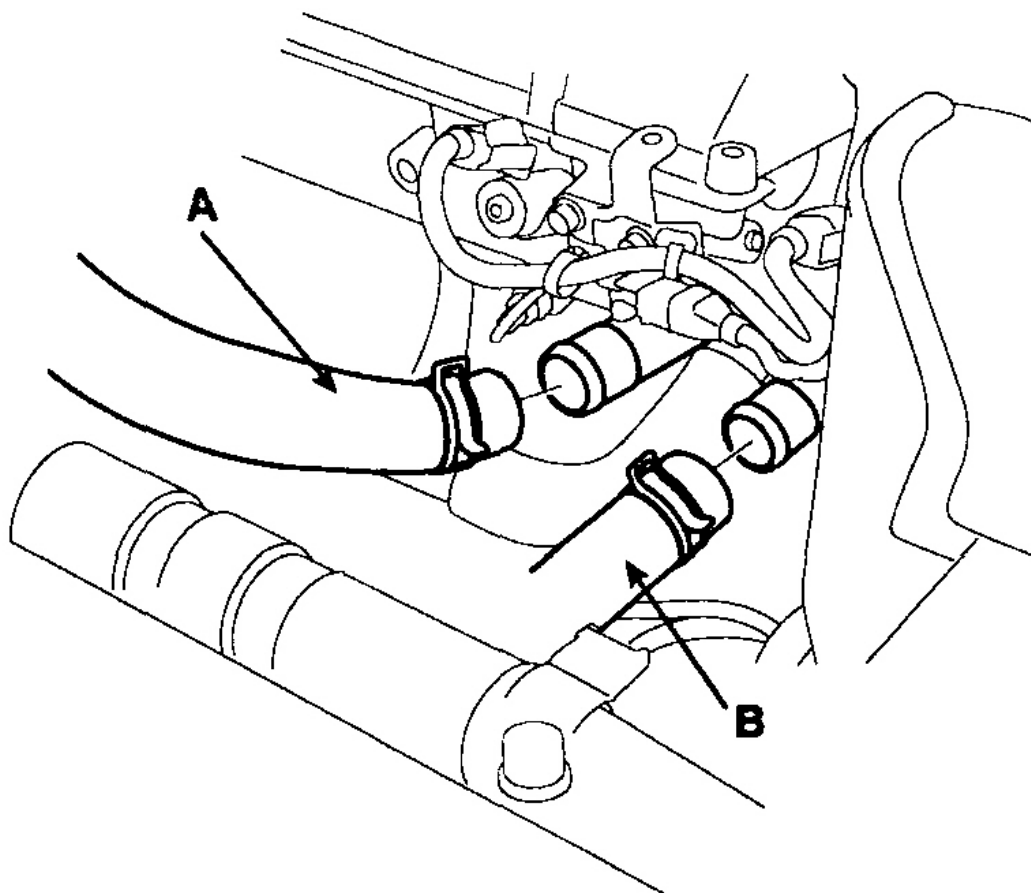


G03821103

Fig. 69: Installing Heater Hose

Courtesy of KIA MOTORS AMERICA, INC.

24. Install the upper radiator hose (A) and lower radiator hose (B).



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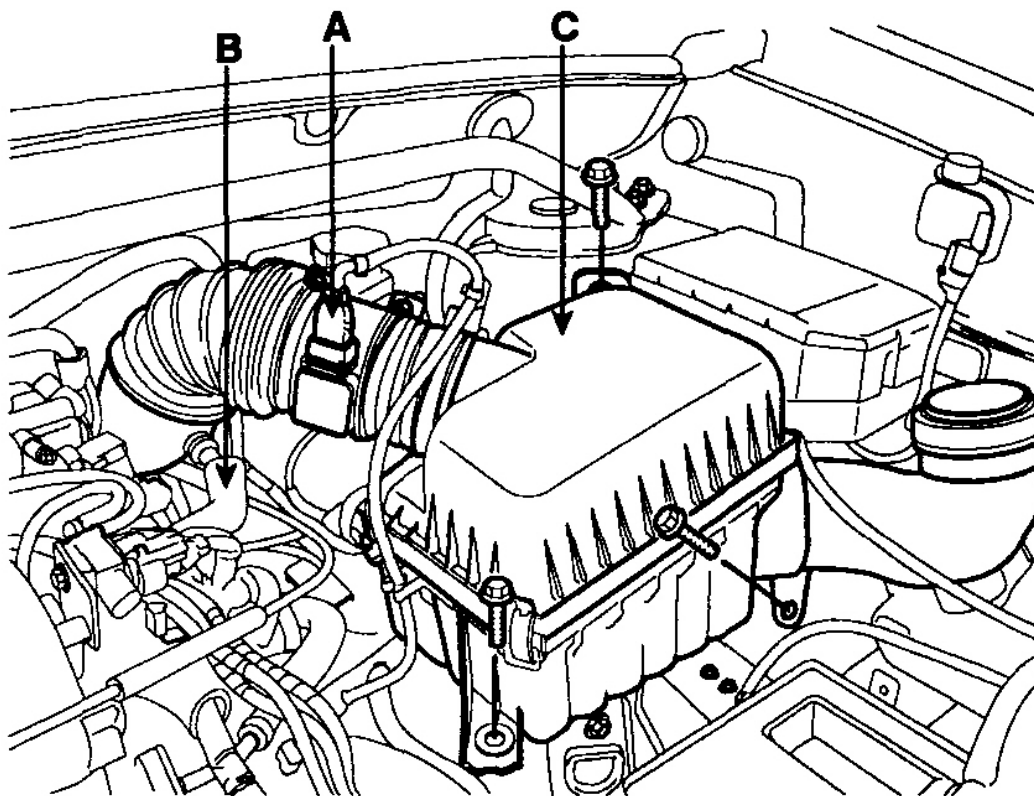
Fig. 70: Installing Upper And Lower Radiator Hose
Courtesy of KIA MOTORS AMERICA, INC.

25. Install the intake air hose and air cleaner assembly.
 1. Install the intake air hose, air cleaner assembly (C) and bolts.

Tightening torque:

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

2. Install the breather hose (B) to intake air hose.
3. Connect the AFS (Air Flow Sensor) connector (A).



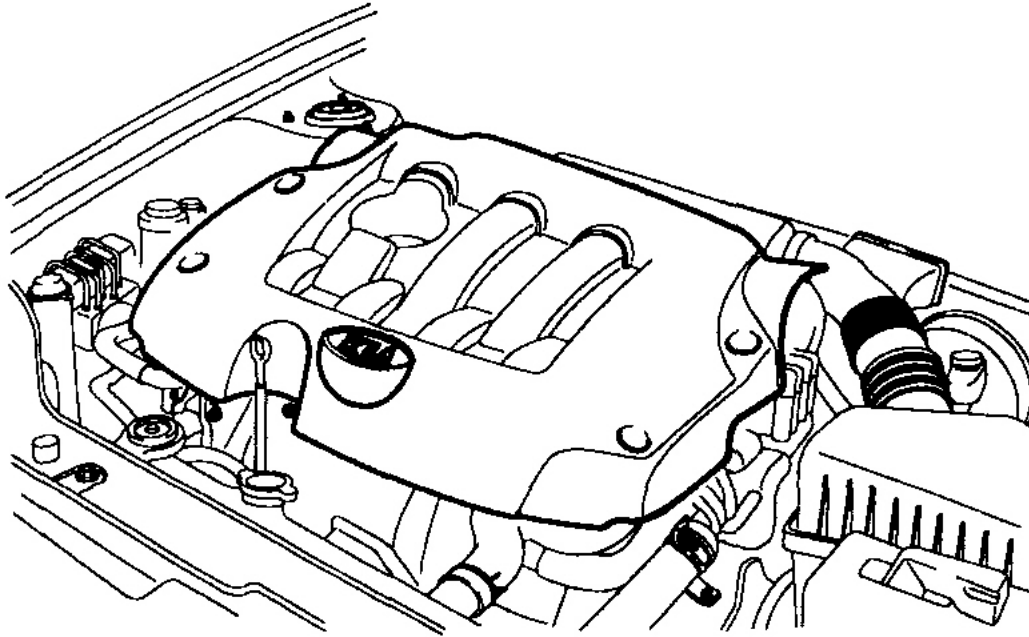
G03821105

Fig. 71: Connecting Air Flow Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

26. Install the engine cover.

Tightening torque:

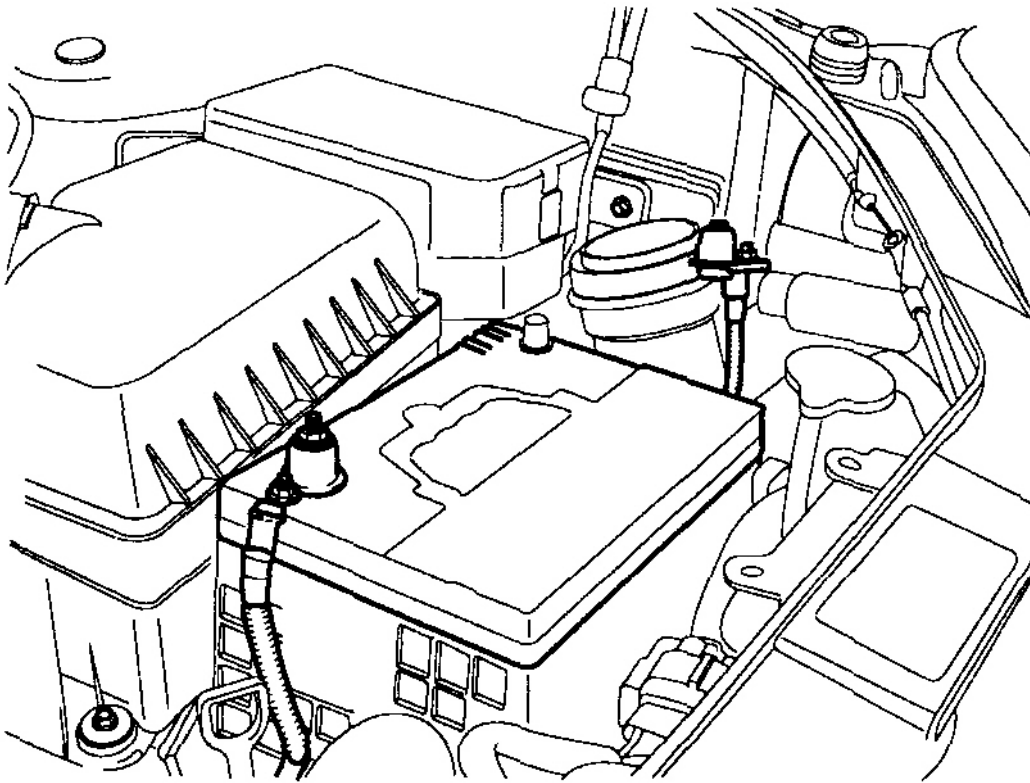
3.9 ~ 5.9N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lb-ft)



G03821106

Fig. 72: Installing Engine Cover
Courtesy of KIA MOTORS AMERICA, INC.

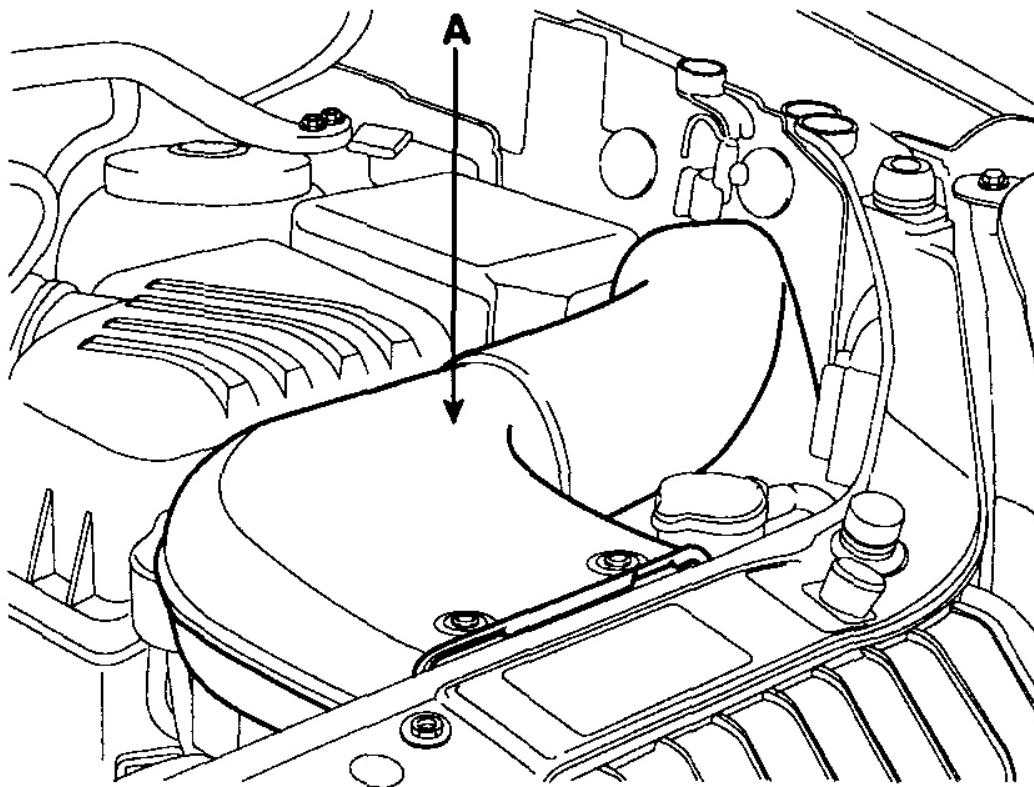
27. Reconnect the battery terminals (A).



G03821107

Fig. 73: Connecting Battery Terminals
Courtesy of KIA MOTORS AMERICA, INC.

28. Install the air duct (A).



G03821108

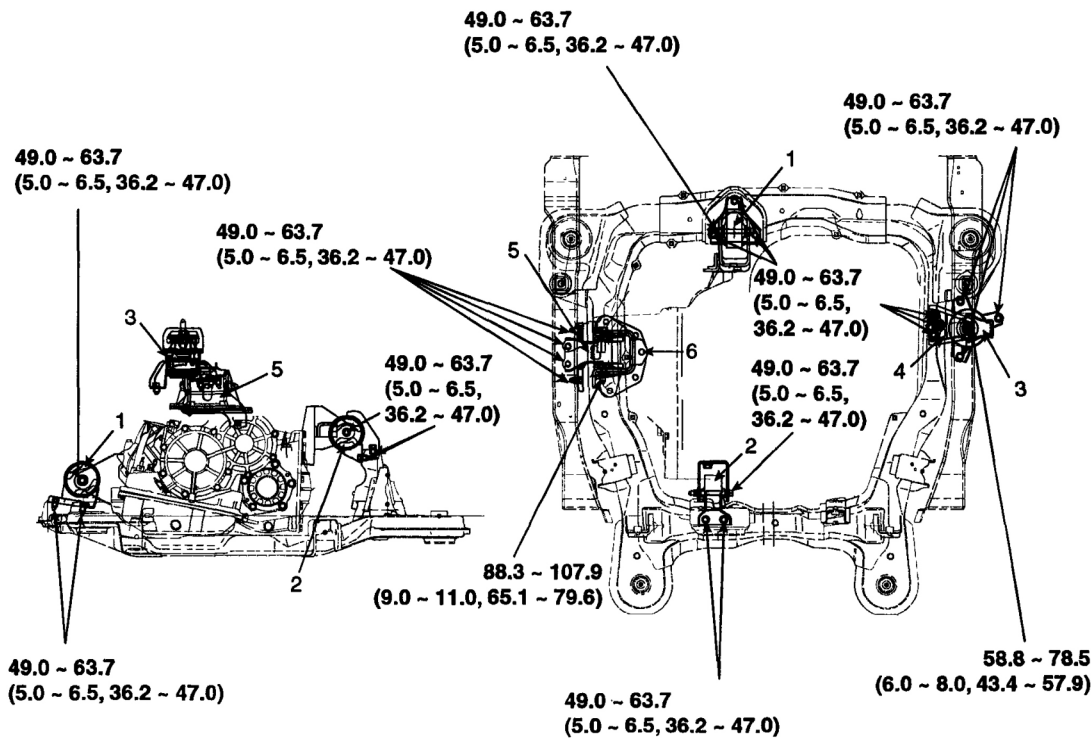
Fig. 74: Installing Air Duct
Courtesy of KIA MOTORS AMERICA, INC.

29. Fill with engine coolant.
30. Start the engine and check for leaks.
31. Recheck engine coolant level and oil level.

2009 ENGINE

Engine And Transaxle Assembly - 2.0L - Sportage

COMPONENT



TORQUE : N.m (kgf.m, lb-ft)

1. Front roll stopper
2. Rear roll stopper
3. Engine mounting bracket

4. Engine mounting support bracket
5. Transaxle mounting bracket
6. Transaxle support bracket

G03821109

Fig. 1: Identifying Engine And Transaxle Assembly Components Dimensions (With Torque Specifications)

Courtesy of KIA MOTORS AMERICA, INC.

REMOVAL

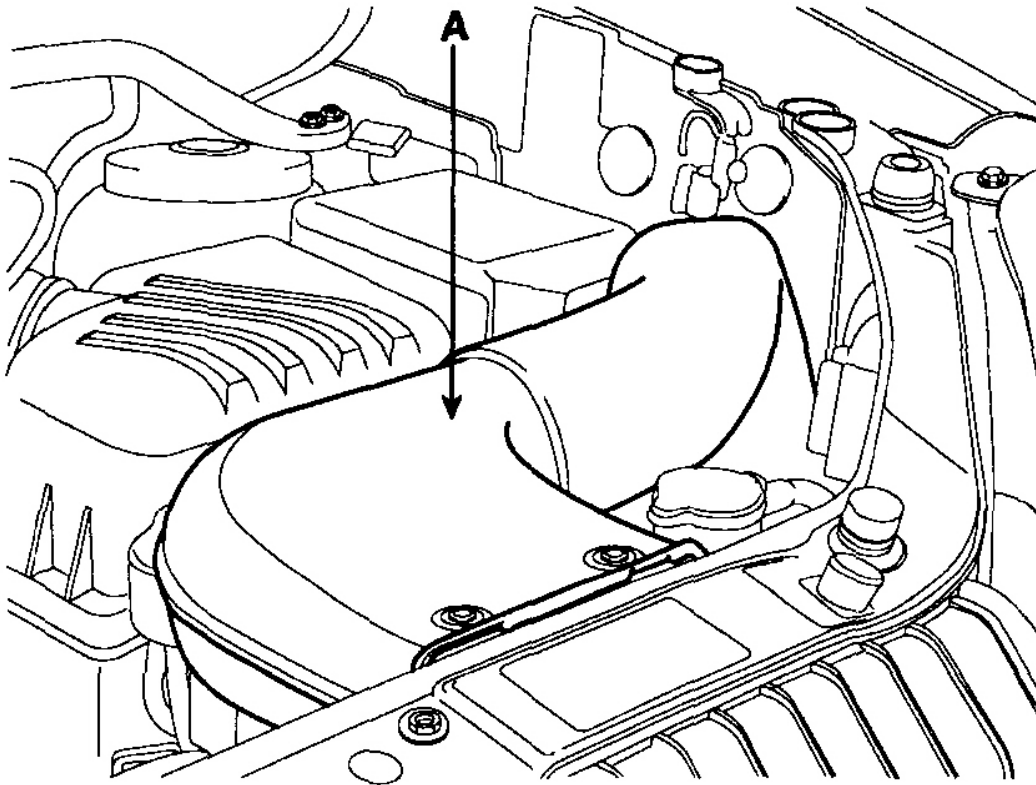
CAUTION:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE:

- Mark all wiring and hoses to avoid misconnection.

1. Remove the air duct (A).

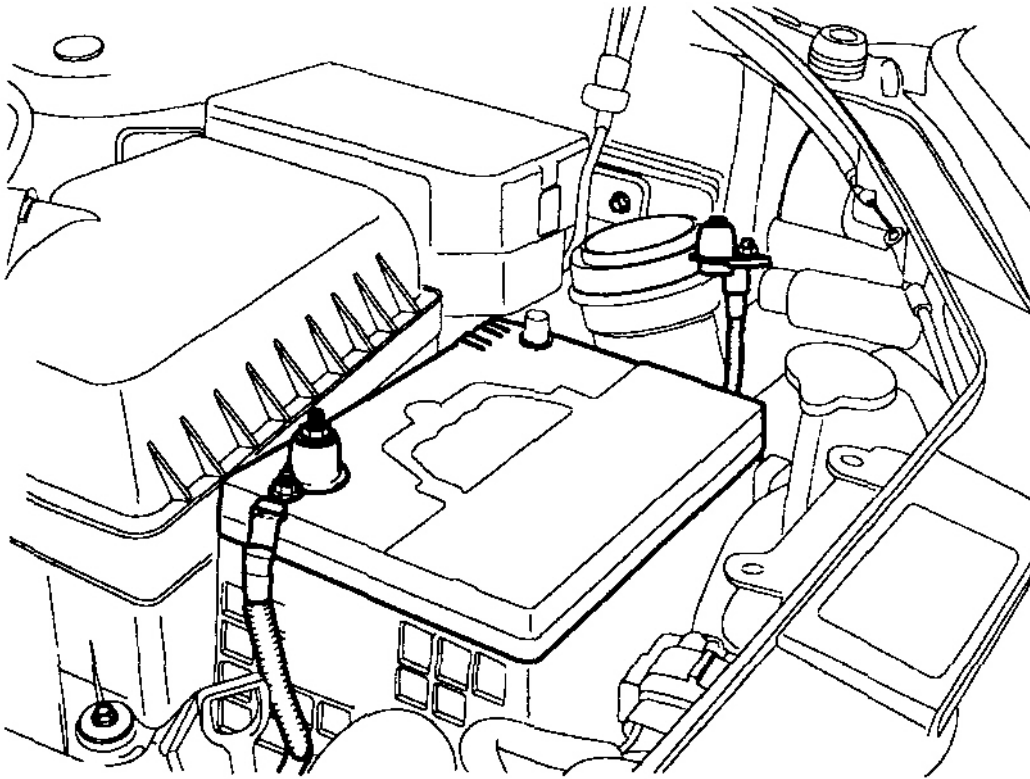


G03821110

Fig. 2: Removing Air Duct

Courtesy of KIA MOTORS AMERICA, INC.

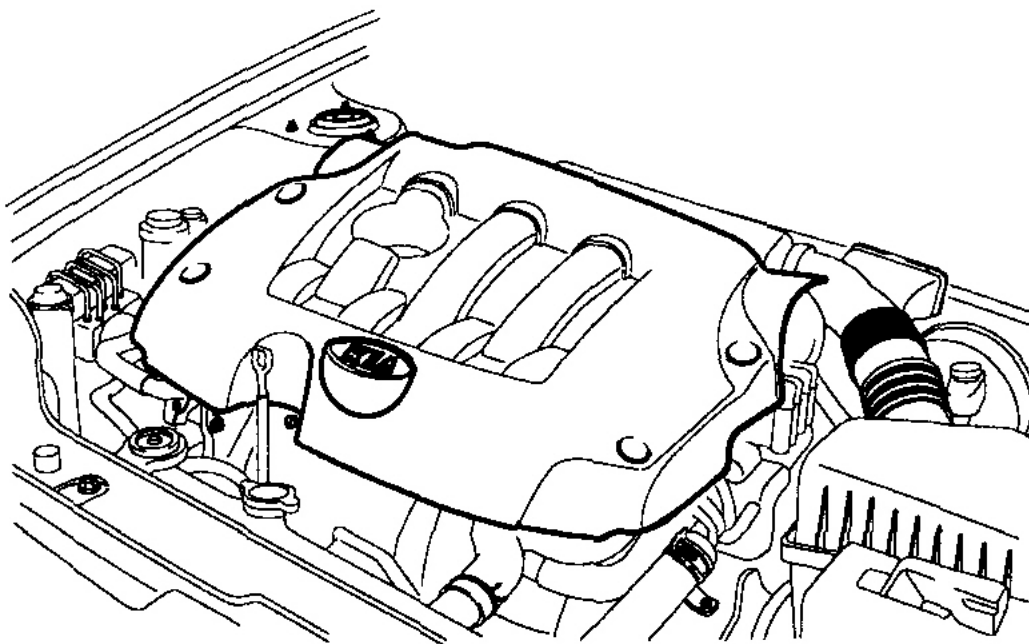
2. Disconnect the battery terminals (A) and remove the battery.



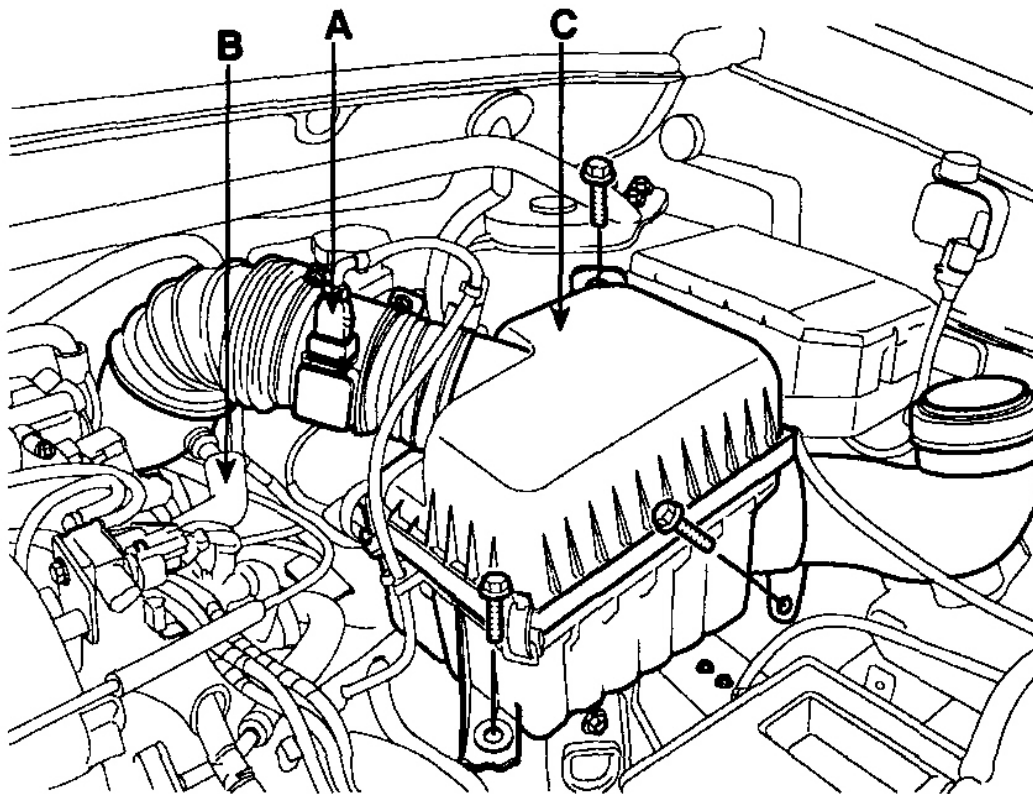
G03821111

Fig. 3: Disconnecting Battery Terminals And Removing Battery
Courtesy of KIA MOTORS AMERICA, INC.

3. Remove the engine cover.

**G03821112****Fig. 4: View Of Engine Cover****Courtesy of KIA MOTORS AMERICA, INC.**

4. Drain the engine coolant. (Refer to **ENGINE COOLANT REFILLING AND BLEEDING**) Remove the radiator cap to speed draining.
5. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS (Air Flow Sensor) connector (A).
 2. Disconnect the breather hose (B) from intake air hose.
 3. Remove the intake air hose and air cleaner assembly (C).

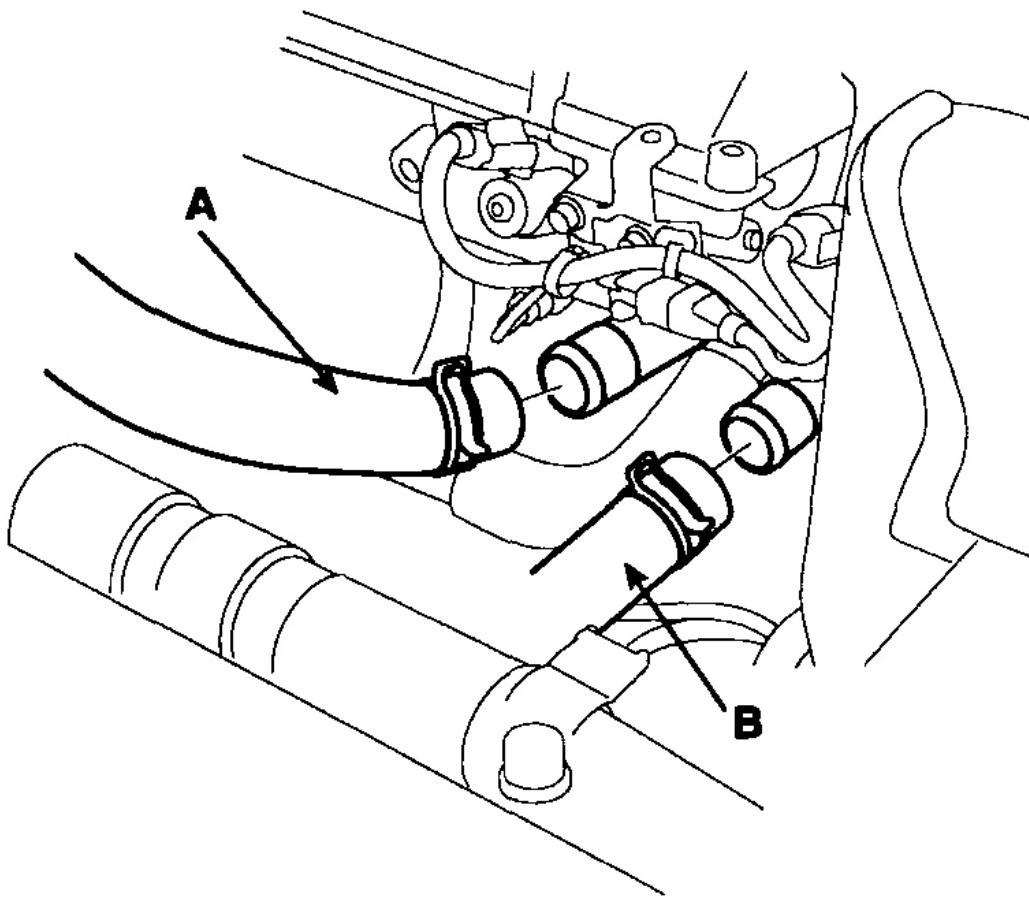


G03821113

Fig. 5: Identifying Air Flow Sensor Connector, Breather Hose, Intake Air Hose And Air Cleaner Assembly

Courtesy of KIA MOTORS AMERICA, INC.

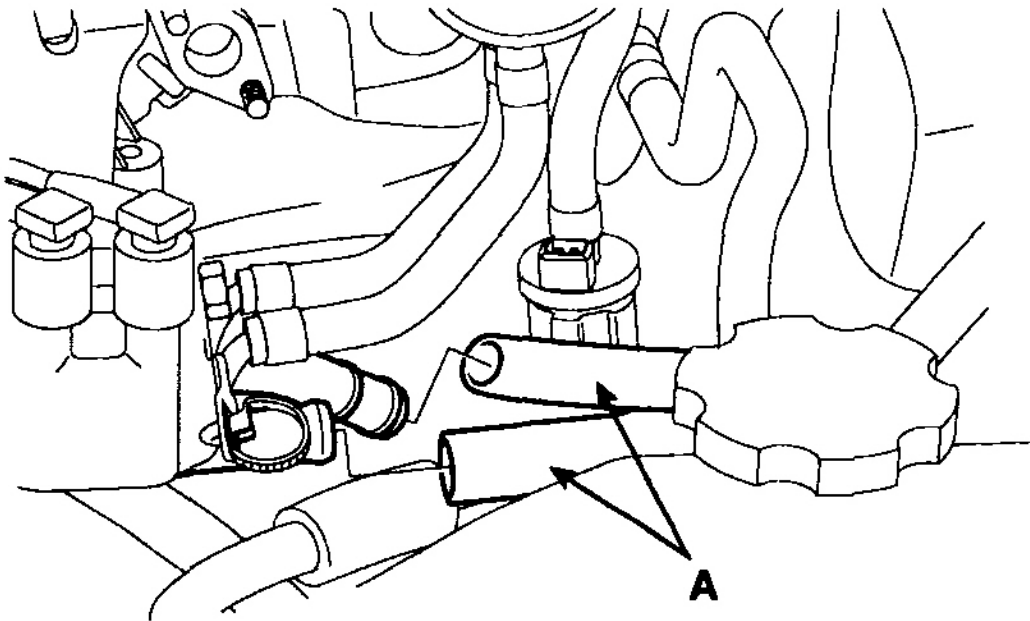
6. Remove the upper radiator hose (A) and lower radiator hose (B).



G03821114

Fig. 6: Identifying Upper & Lower Radiator Hose
Courtesy of KIA MOTORS AMERICA, INC.

7. Remove the heater hose (A).

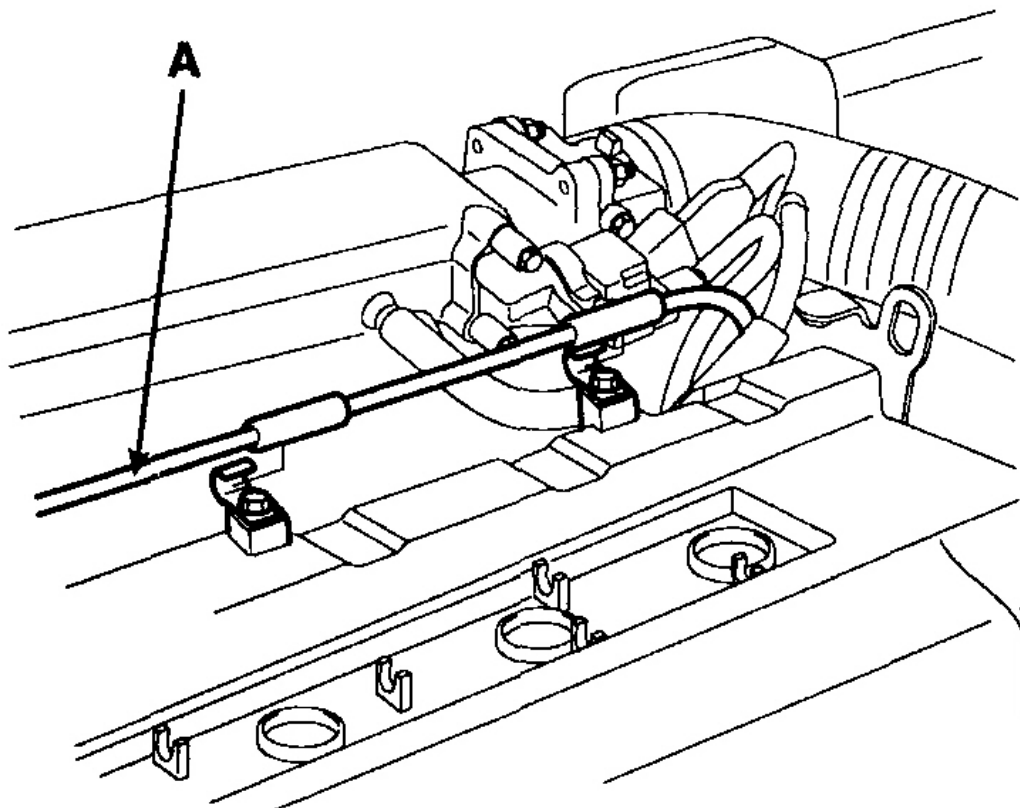


G03821115

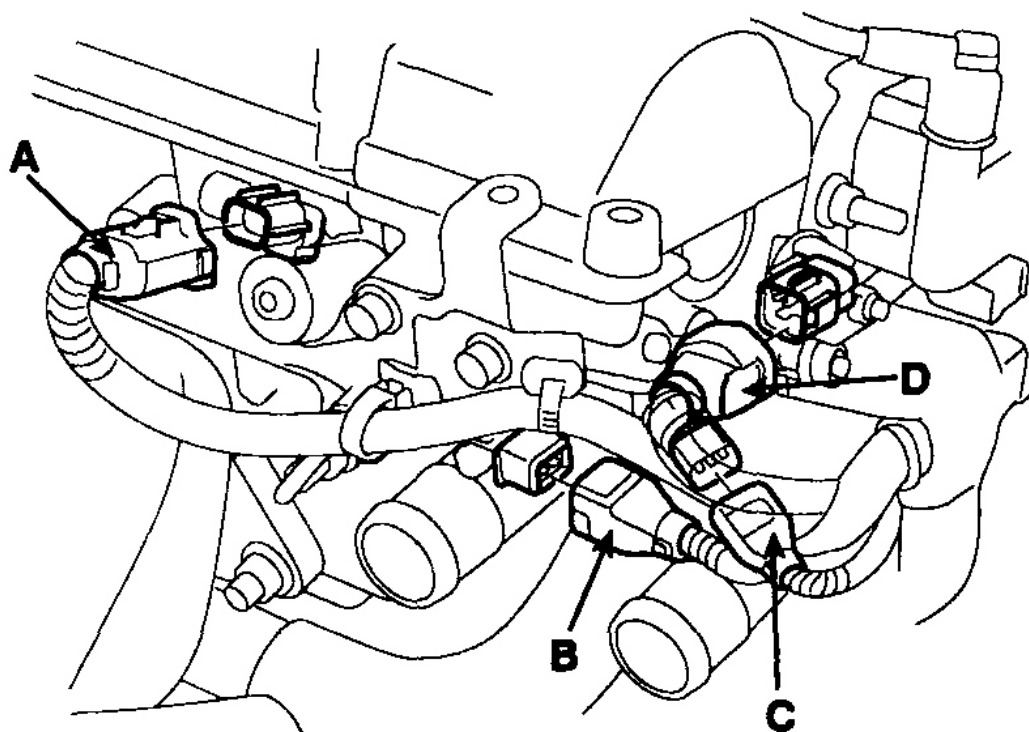
Fig. 7: Identifying Heater Hose

Courtesy of KIA MOTORS AMERICA, INC.

8. Remove the accelerator cable (A).

**G03821116****Fig. 8: Identifying Accelerator Cable****Courtesy of KIA MOTORS AMERICA, INC.**

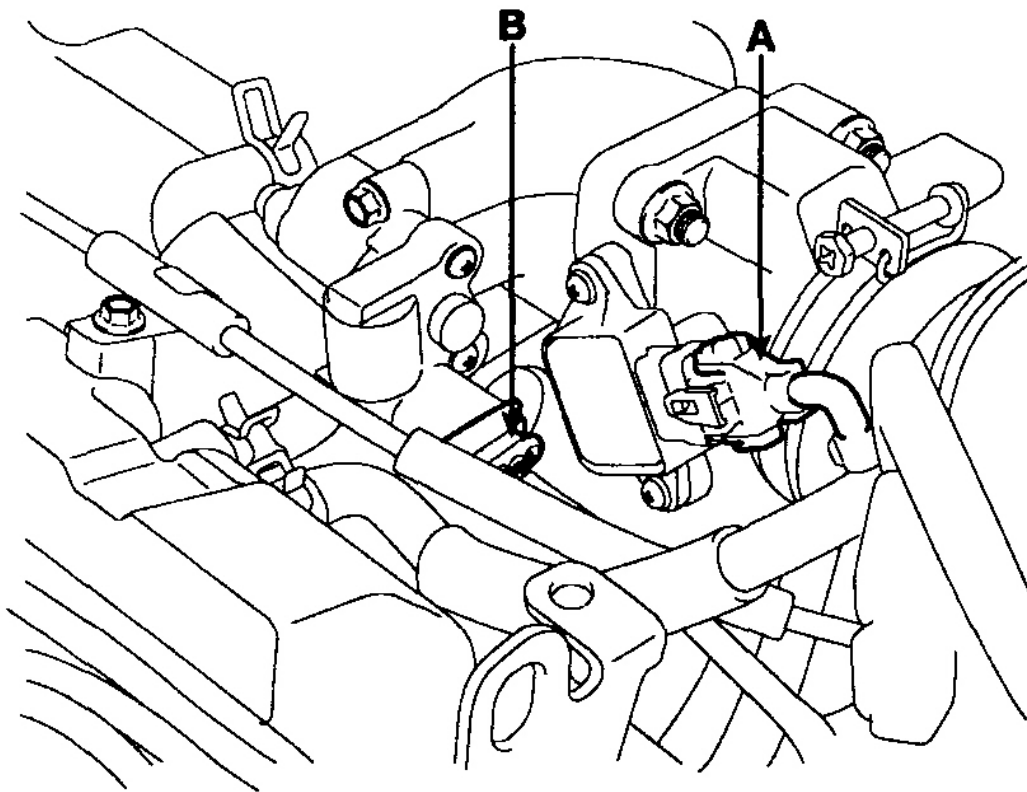
9. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 1. Disconnect the OCV (Oil Control Valve) connector (A).
 2. Disconnect the oil temperature sensor connector (B).
 3. Disconnect the ECT (Engine Coolant Temperature) sensor connector (C).
 4. Disconnect the ignition coil connector (D).



G03821117

Fig. 9: Identifying Engine Wire Harness Connectors & Clamps
Courtesy of KIA MOTORS AMERICA, INC.

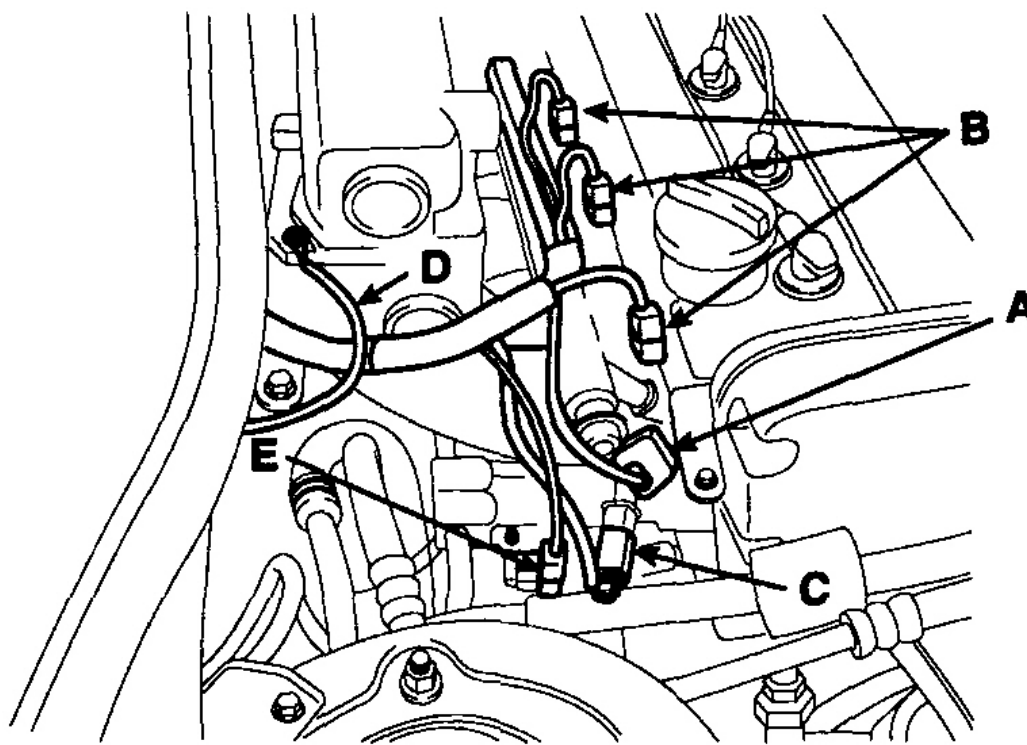
5. Disconnect the TPS (Throttle Position Sensor) Connector (A).
6. Disconnect the ISA (Idle Speed Actuator) connector (B).



G03821118

Fig. 10: Identifying Throttle Position Sensor & Idle Speed Actuator Connectors
Courtesy of KIA MOTORS AMERICA, INC.

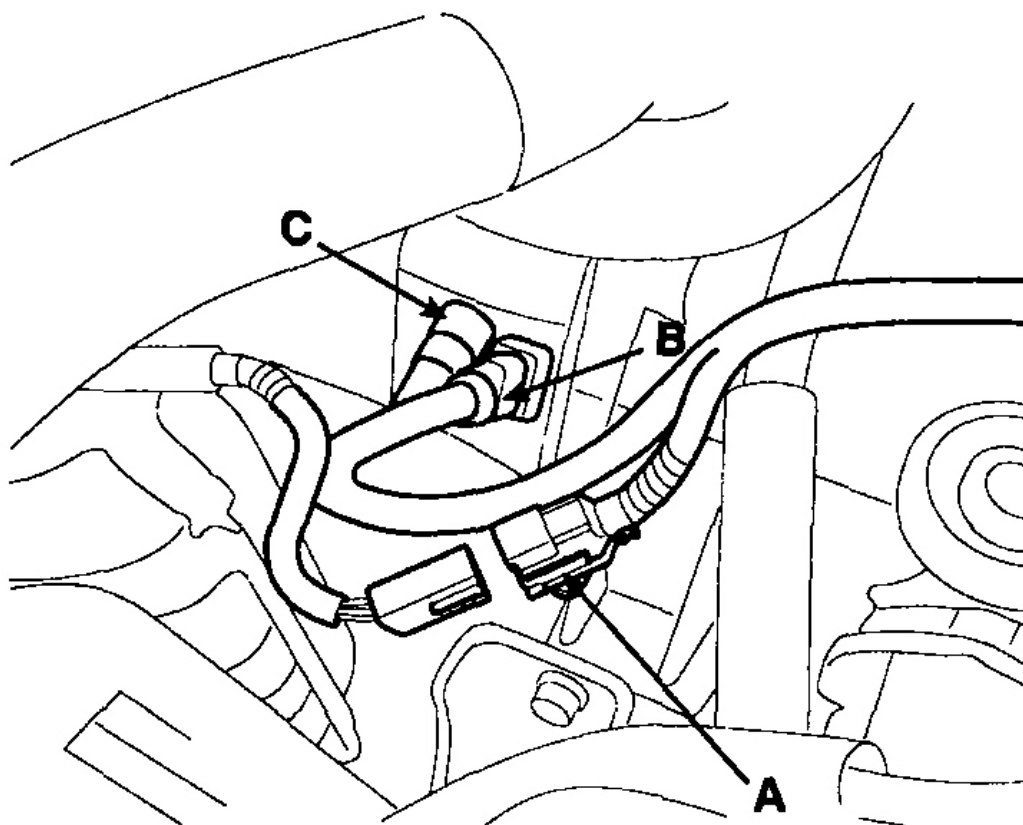
7. Disconnect the CMP (Camshaft Position Sensor) connector (A).
8. Disconnect the four fuel injector connectors (B).
9. Disconnect the knock sensor connector (C).
10. Disconnect the ground cables (D) from the intake manifold and vehicle's body.
11. Disconnect the air conditioner compressor switch (E).



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Fig. 11: Identifying Engine Connectors & Switches
Courtesy of KIA MOTORS AMERICA, INC.

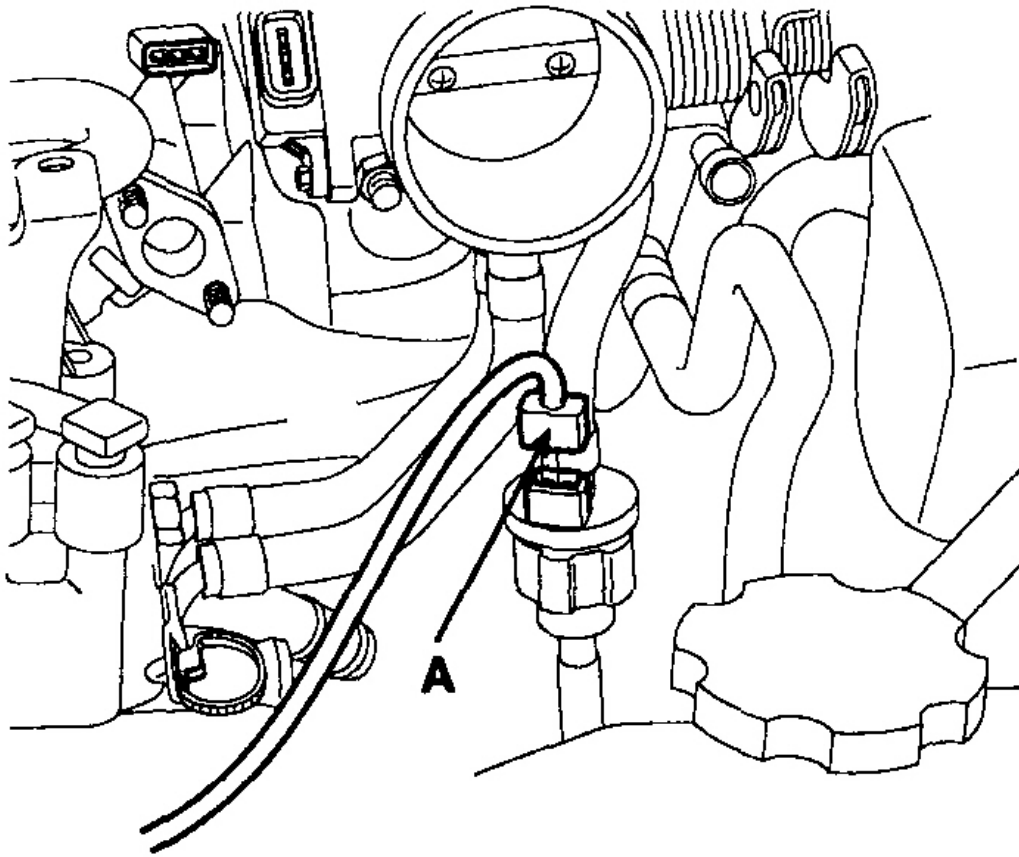
12. Disconnect the front heated oxygen sensor connector (A).
13. Disconnect the CKP (Crankshaft Position Sensor) connector (B).
14. Disconnect the oil pressure switch connector (C).



G03821120

Fig. 12: Identifying Oxygen Sensor, CKP Sensor & Oil Pressure Switch Connectors
Courtesy of KIA MOTORS AMERICA, INC.

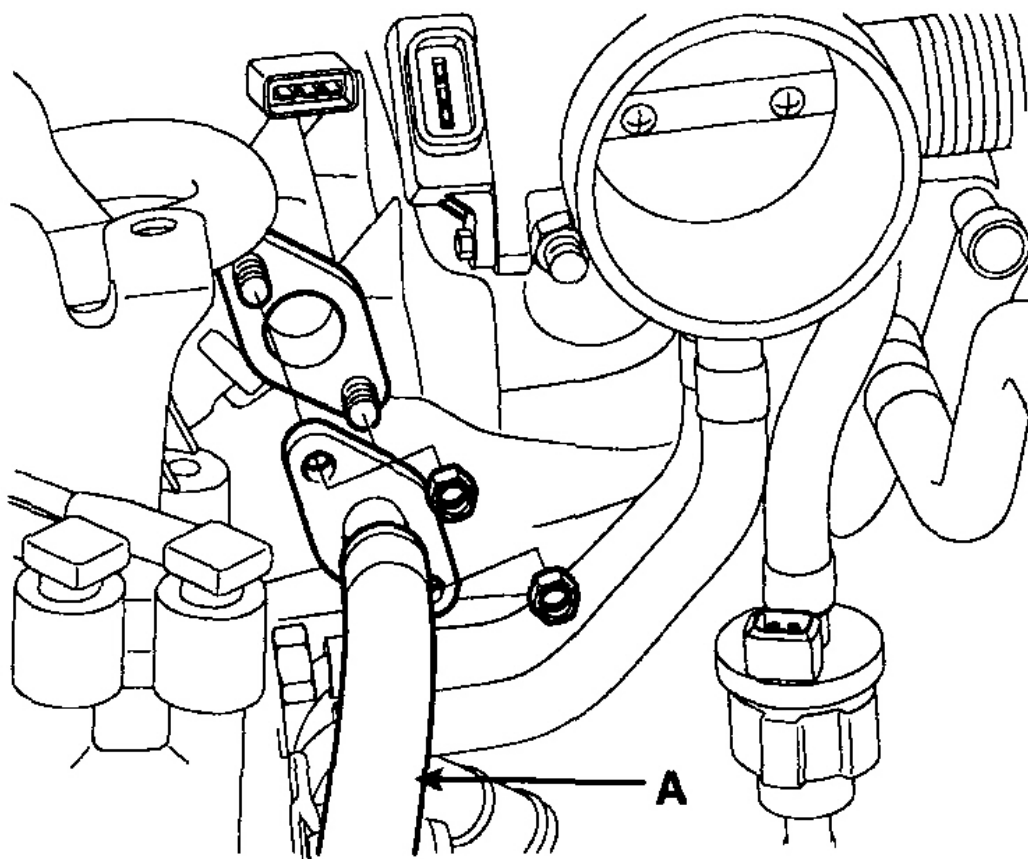
15. Disconnect the PCSV (Purge Control Solenoid Valve) connector (A).



G03821121

Fig. 13: Identifying Purge Control Solenoid Valve Connector
Courtesy of KIA MOTORS AMERICA, INC.

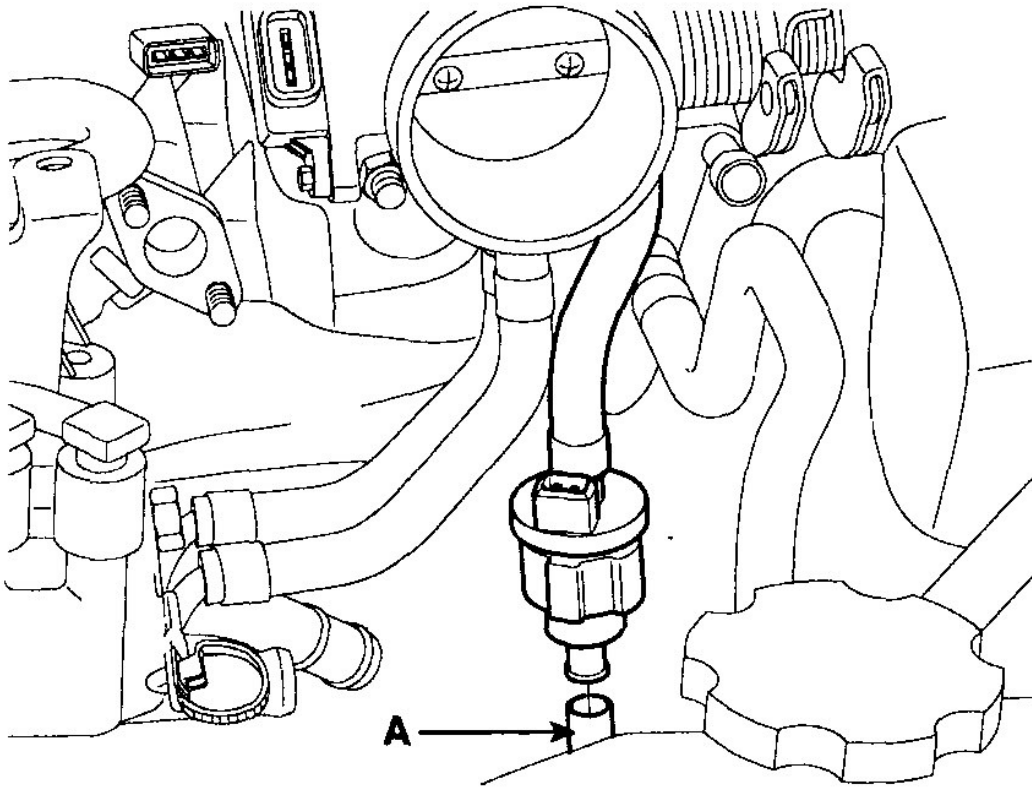
10. Disconnect the fuel inlet hose (A) of the delivery pipe side.



G03821122

Fig. 14: Disconnecting Delivery Pipe Side Fuel Inlet Hose
Courtesy of KIA MOTORS AMERICA, INC.

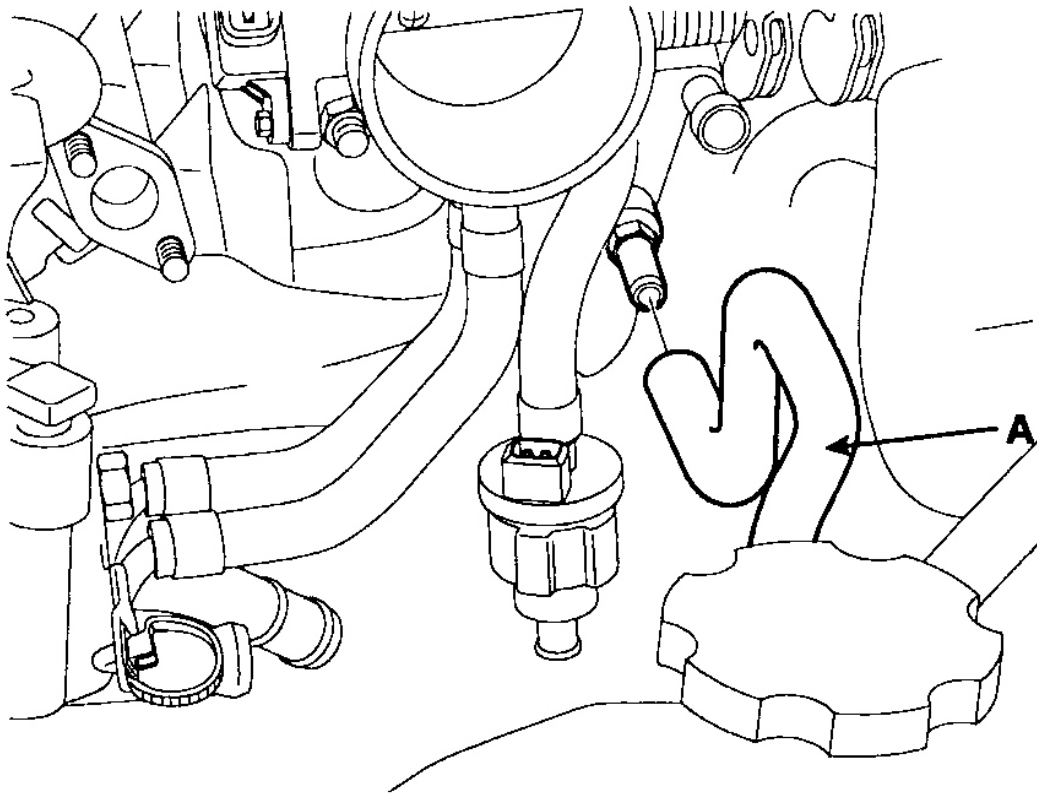
11. Disconnect the hose (A) of the PCSV (Purge Control Solenoid Valve) side.



G03821123

Fig. 15: Identifying Purge Control Solenoid Valve Side Hose
Courtesy of KIA MOTORS AMERICA, INC.

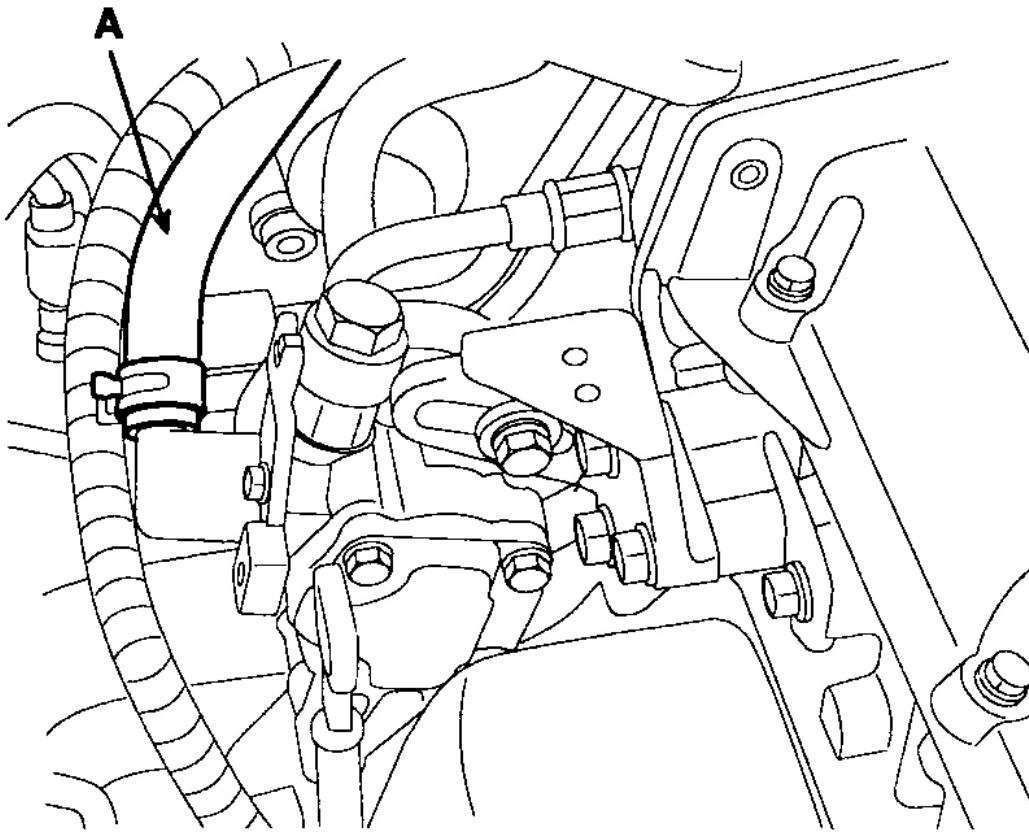
12. Remove the brake booster vacuum hose (A).



G03821124

Fig. 16: Identifying Brake Booster Vacuum Hose
Courtesy of KIA MOTORS AMERICA, INC.

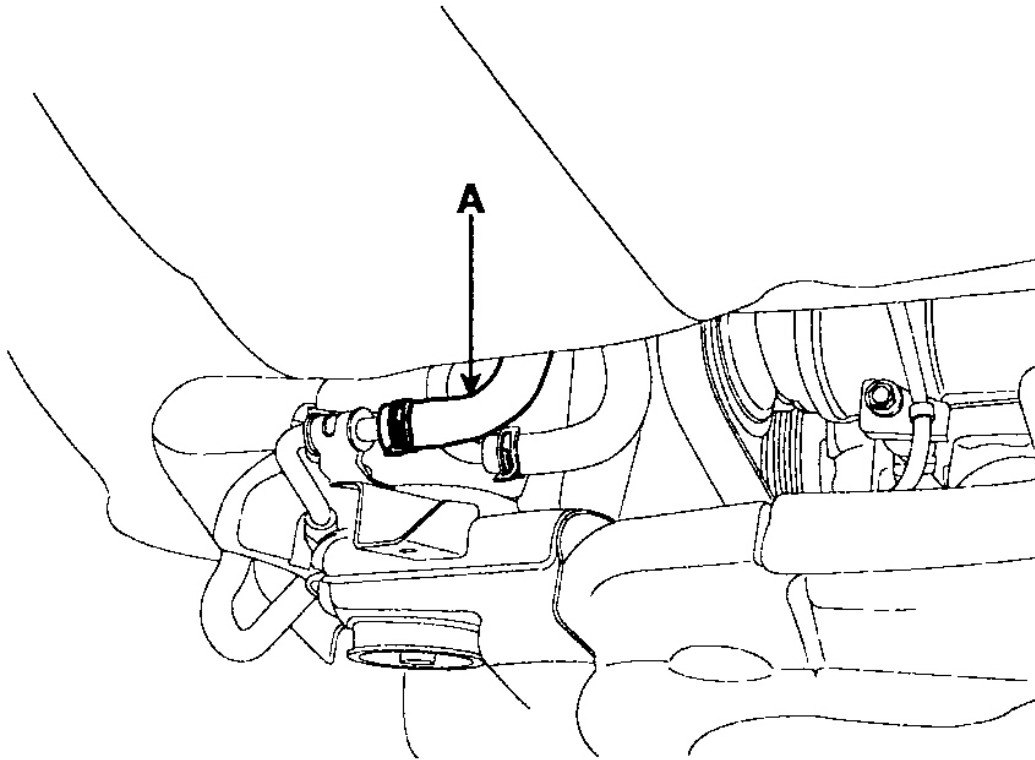
13. Remove the power steering oil hose (A) from the power steering pump.



G03821125

Fig. 17: Identifying Power Steering Oil Hose From Power Steering Pump
Courtesy of KIA MOTORS AMERICA, INC.

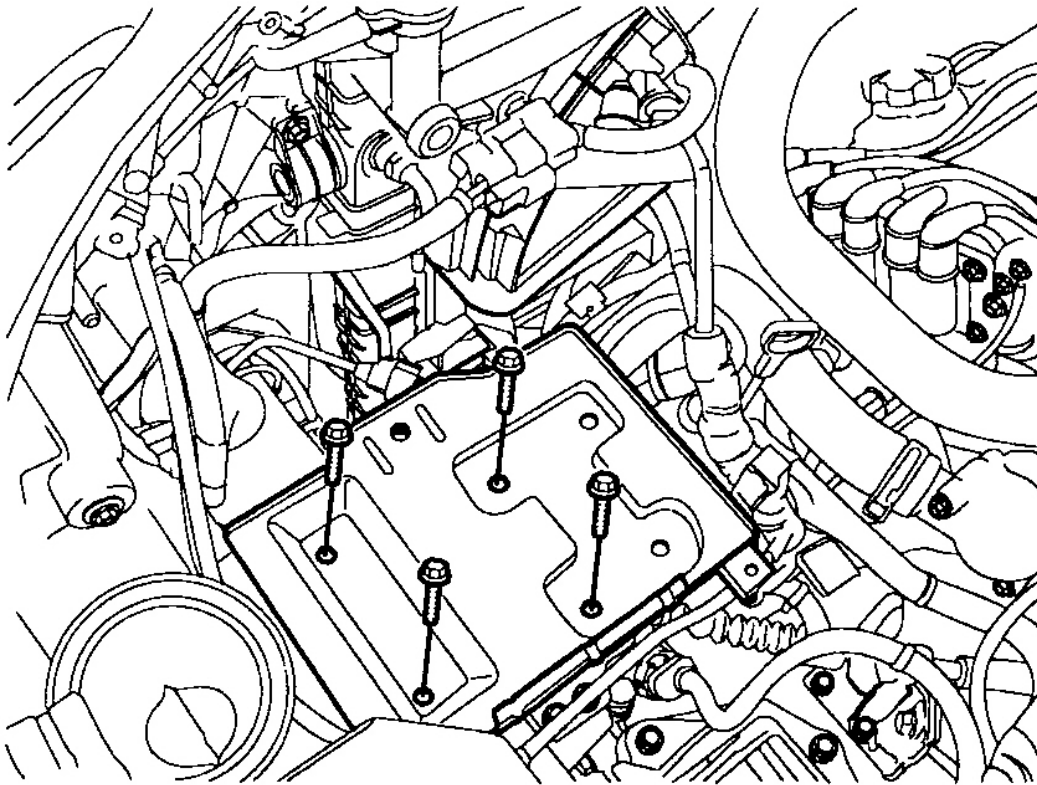
14. Remove the power steering lower oil hose (A).



G03821126

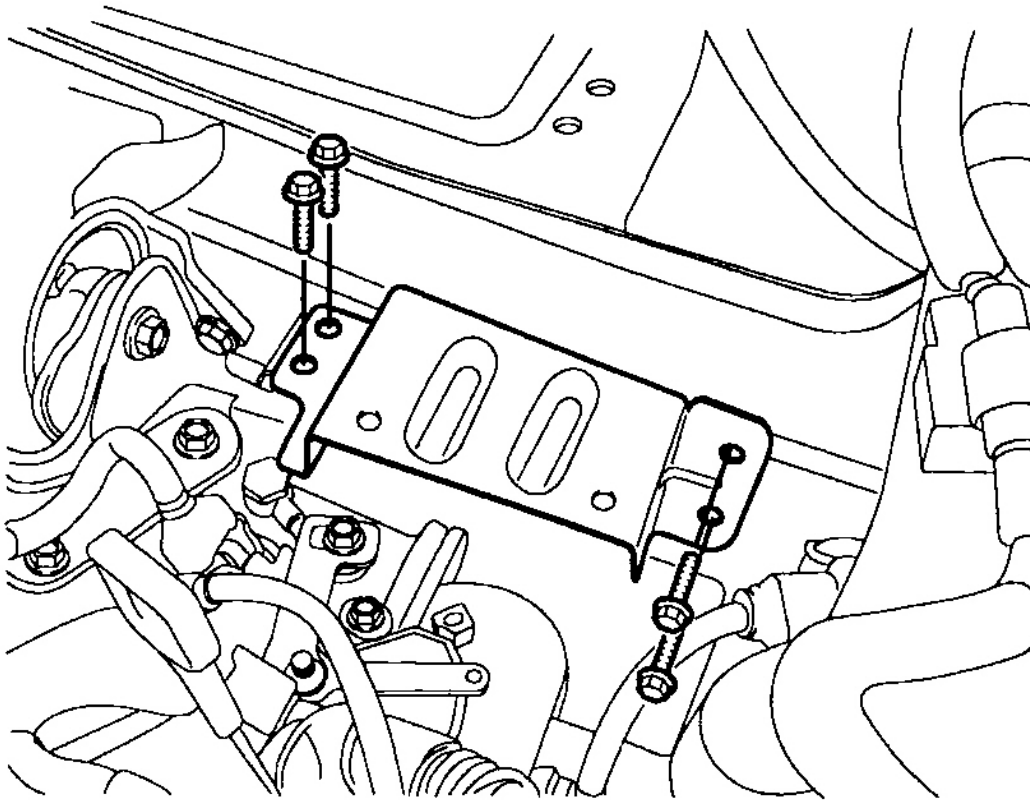
Fig. 18: Identifying Power Steering Lower Oil Hose
Courtesy of KIA MOTORS AMERICA, INC.

15. Remove the battery tray bracket.



G03821127

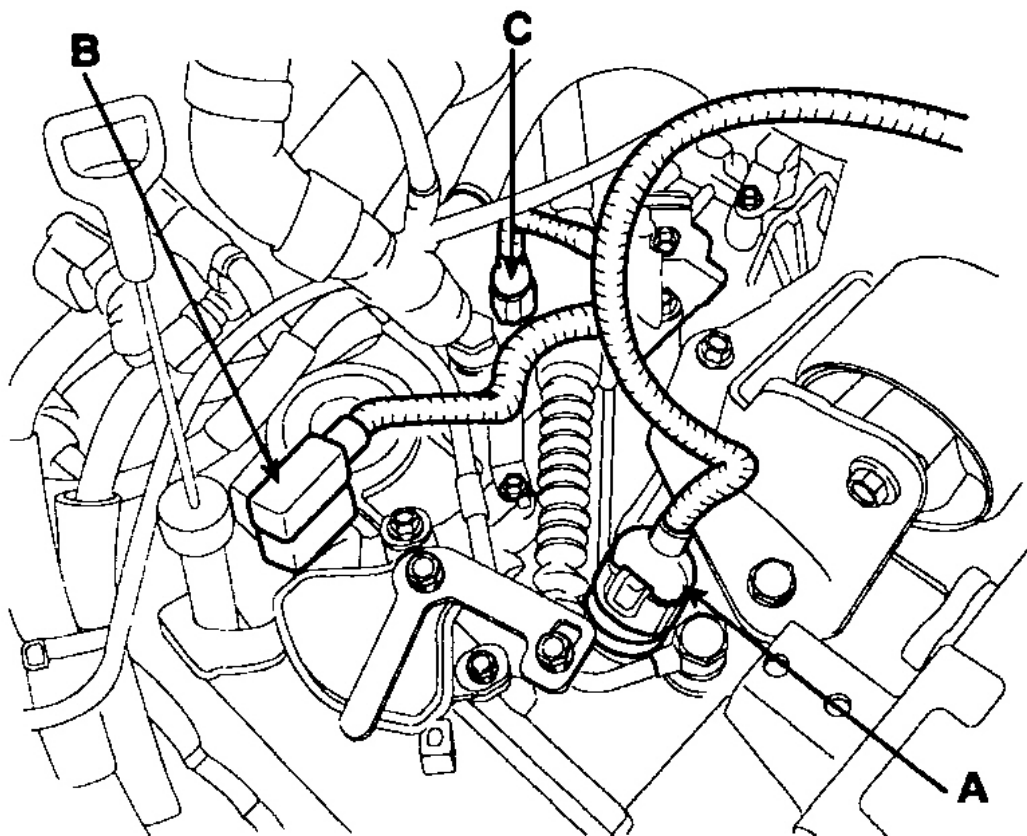
Fig. 19: Identifying Battery Tray Bracket (1 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.



G03821128

Fig. 20: Identifying Battery Tray Bracket (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

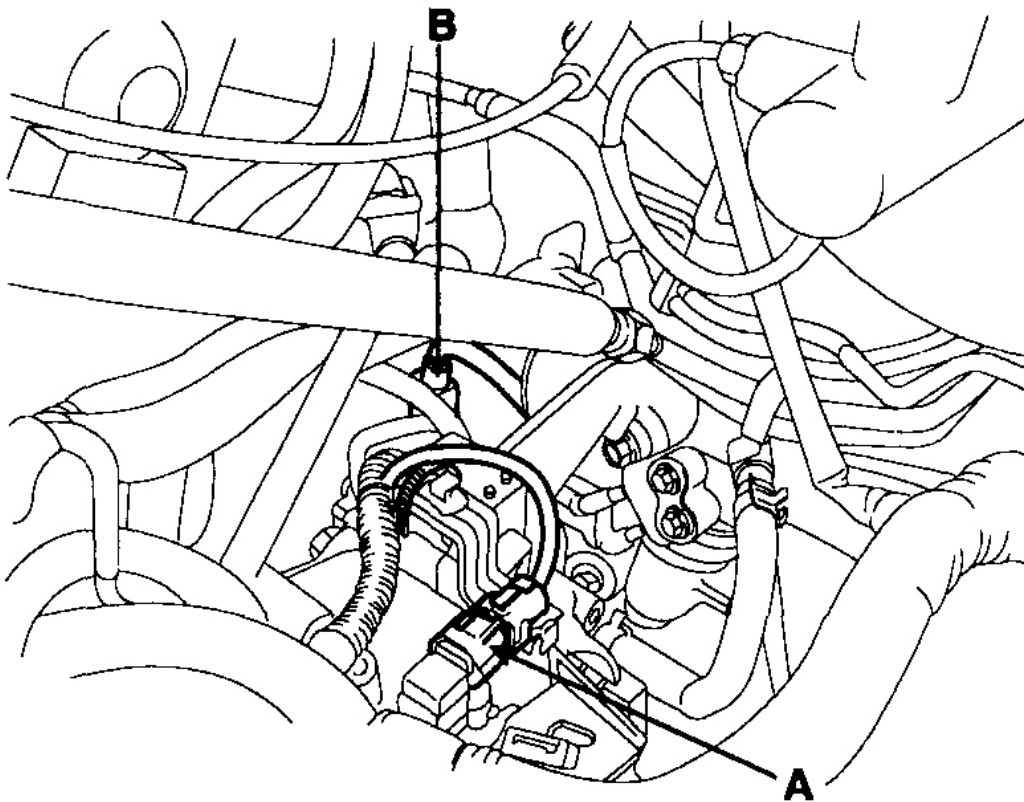
16. Remove the transaxle wire harness connectors and control cable from transaxle (A/T).
 1. Disconnect the solenoid valve connector (A).
 2. Disconnect the transaxle range switch connector (B).
 3. Disconnect the input shaft speed sensor connector (C).



G03821129

Fig. 21: Identifying Transaxle Wire Harness Connectors And Control Cable
Courtesy of KIA MOTORS AMERICA, INC.

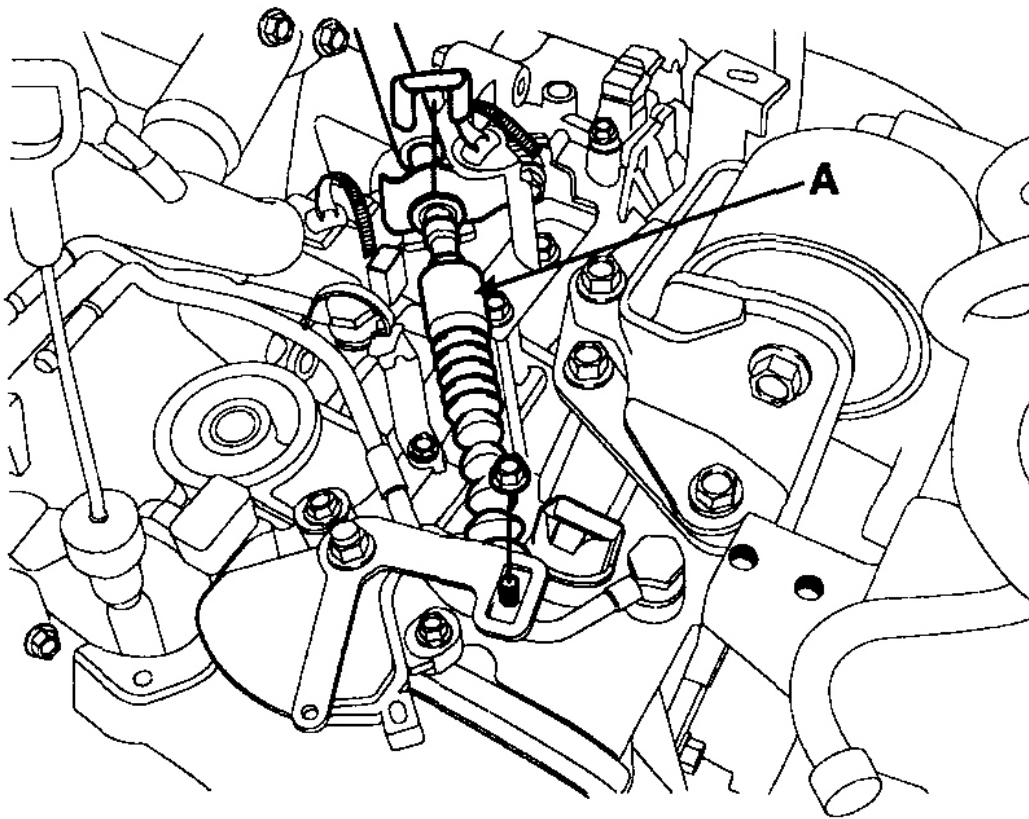
4. Disconnect the output shaft speed sensor connector (A).
5. Disconnect the vehicle speed sensor connector (B).



G03821130

Fig. 22: Identifying Speed Sensor Connectors
Courtesy of KIA MOTORS AMERICA, INC.

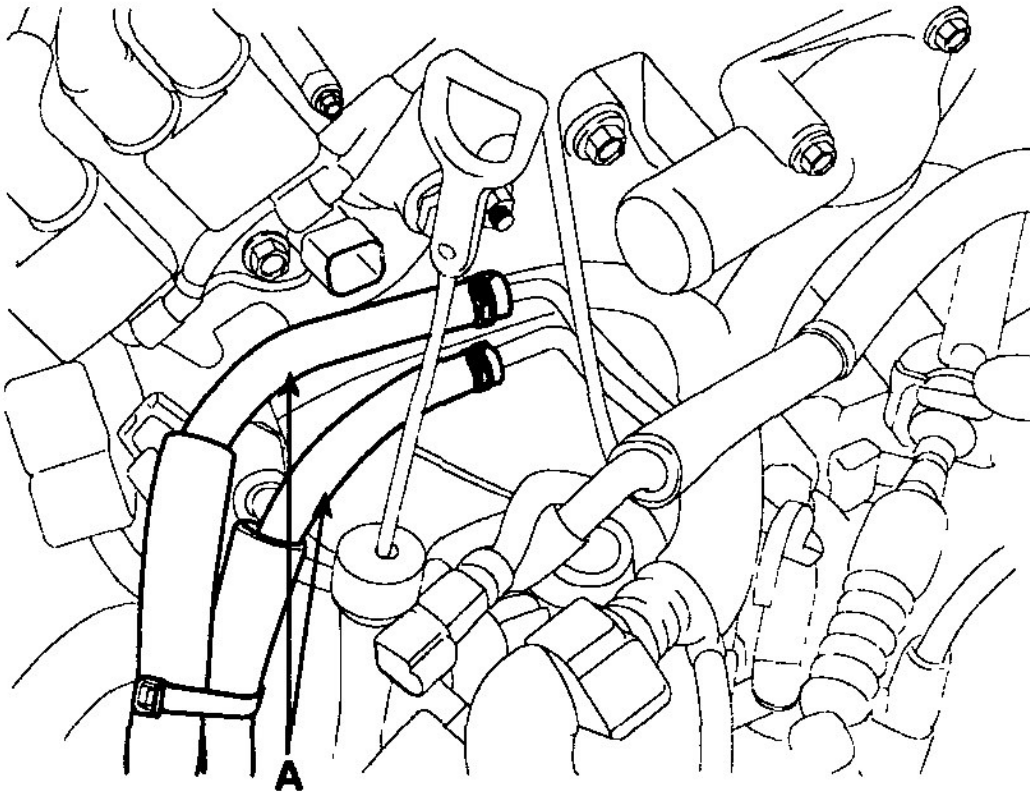
6. Remove the control cable (A).



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Fig. 23: Identifying Control Cable
Courtesy of KIA MOTORS AMERICA, INC.

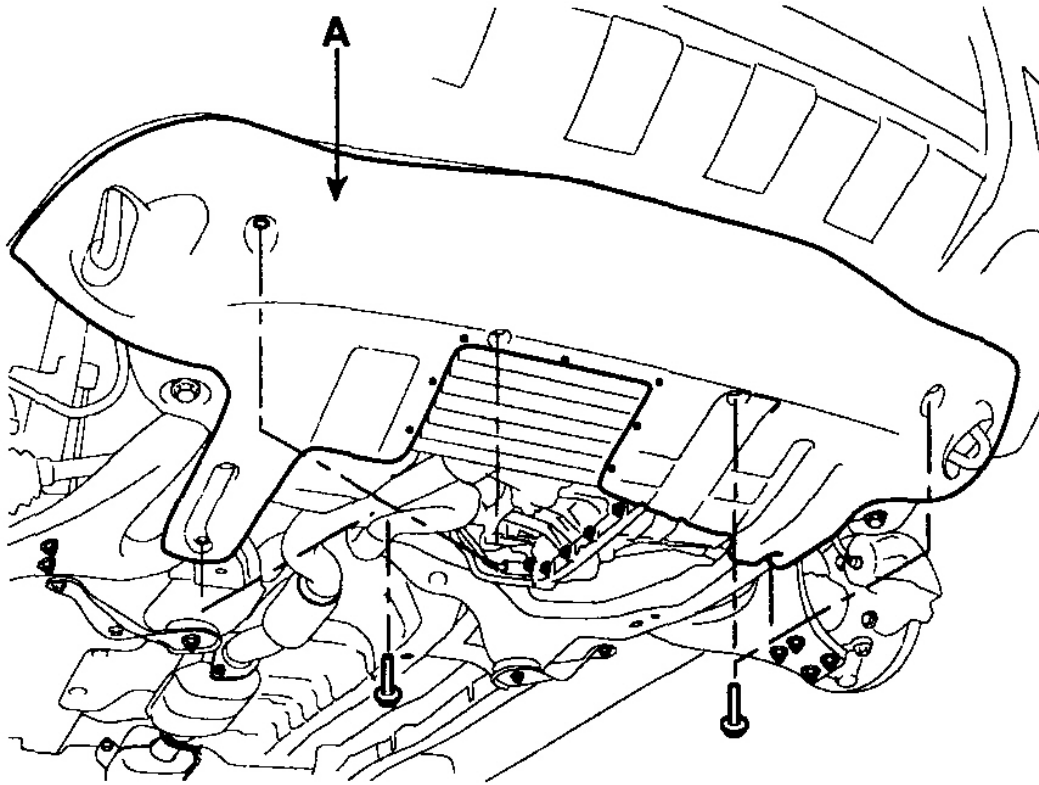
17. Remove the transaxle oil cooler hose (A) (AT).



G03821132

Fig. 24: Identifying Transaxle Oil Cooler Hoses
Courtesy of KIA MOTORS AMERICA, INC.

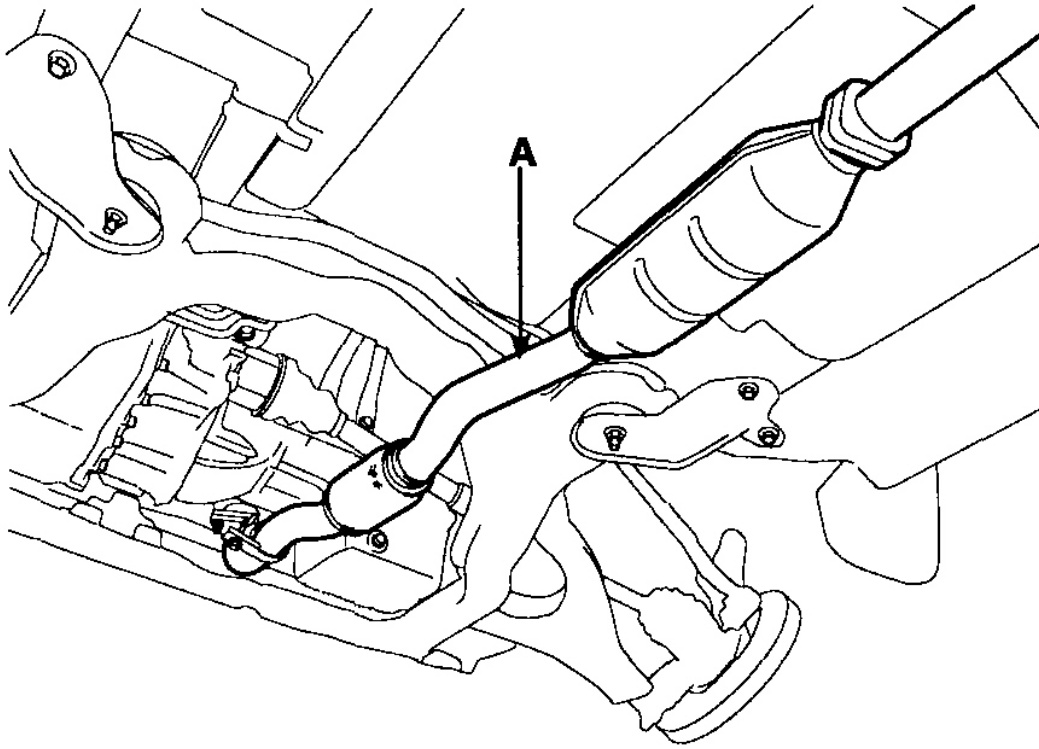
18. Remove the under cover (A).



G03821133

Fig. 25: Identifying Under Cover
Courtesy of KIA MOTORS AMERICA, INC.

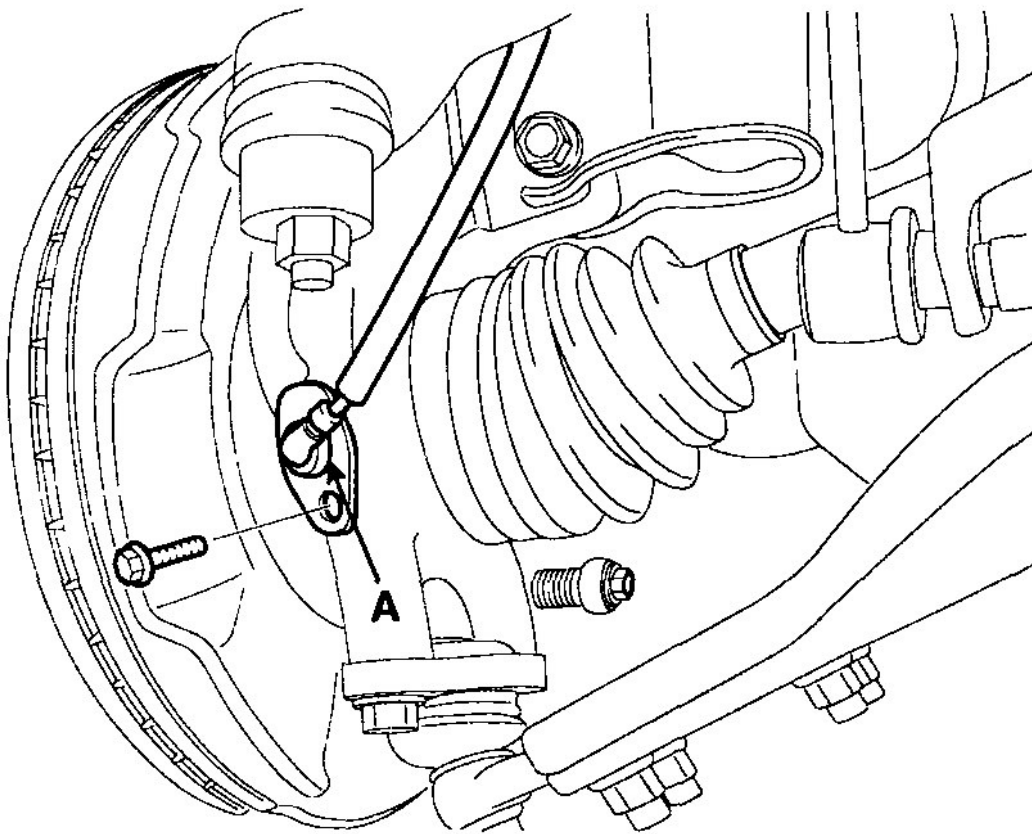
19. Remove the front exhaust pipe (A).



G03821134

Fig. 26: Identifying Front Exhaust Pipe
Courtesy of KIA MOTORS AMERICA, INC.

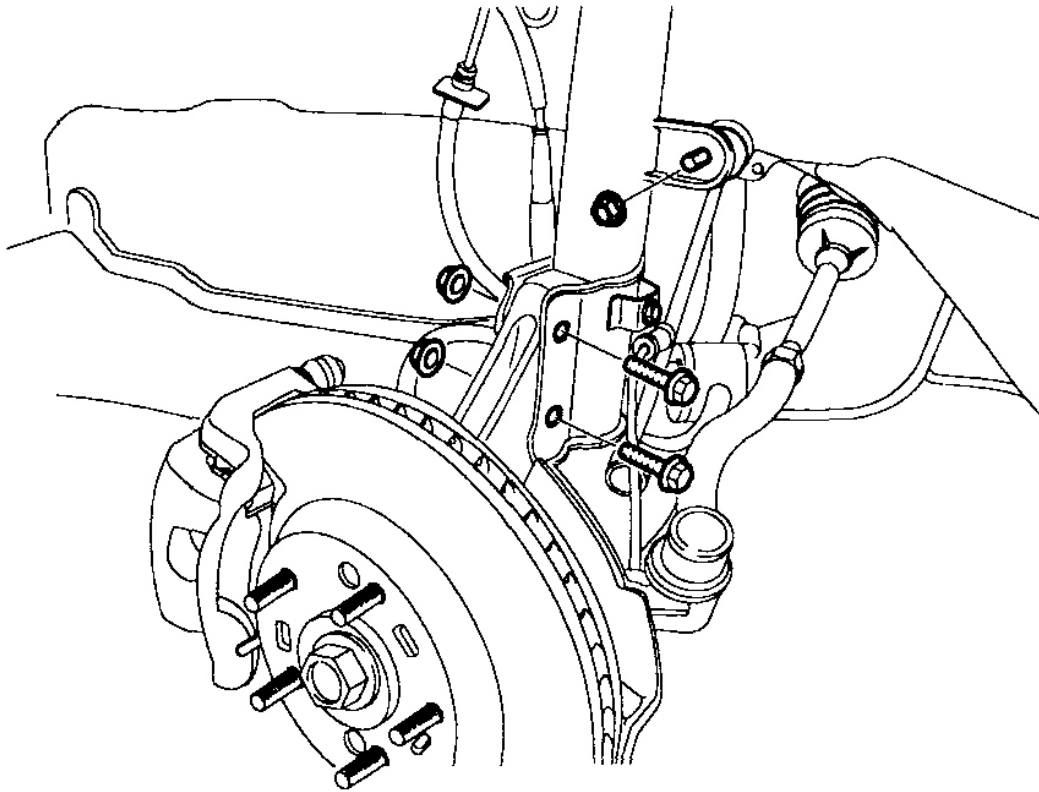
20. Disconnect the ABS wheel speed sensor (A) from both front knuckle. (See **FRONT AXLE**)



G03821135

Fig. 27: Identifying ABS Wheel Speed Sensor
Courtesy of KIA MOTORS AMERICA, INC.

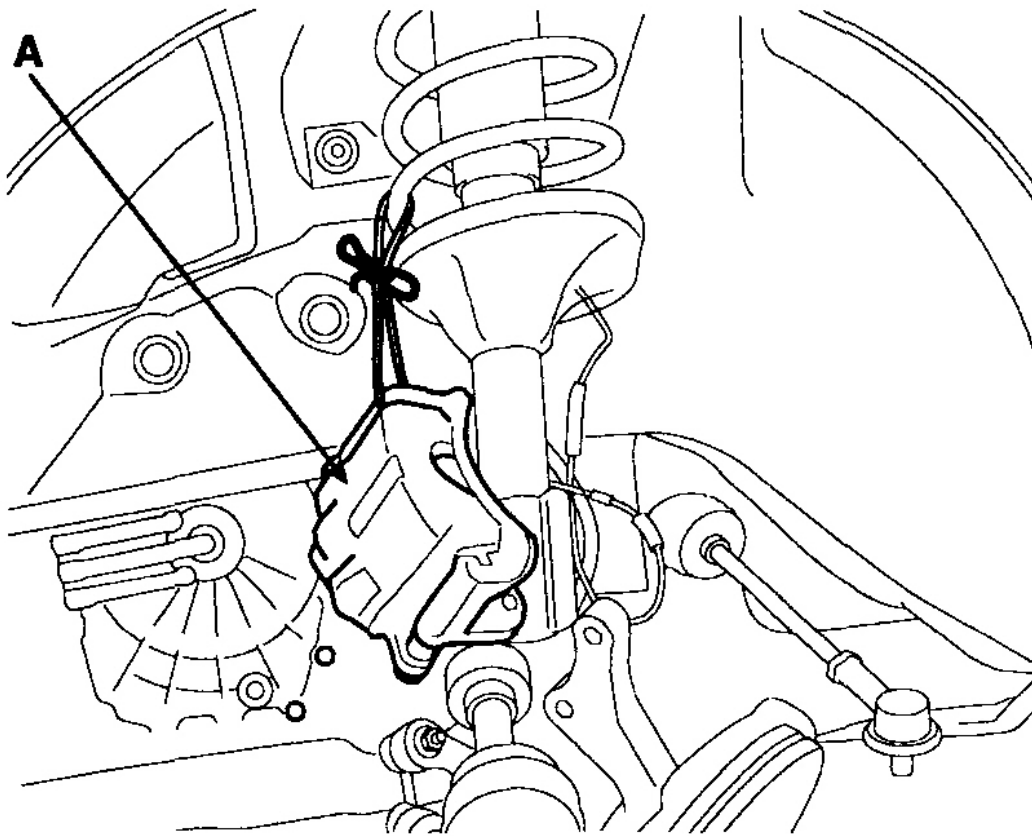
21. Remove the front strut lower mounting bolts and nuts. (See **FRONT STRUT ASSEMBLY**)



G03821136

Fig. 28: View Of Front Strut Lower Mounting Bolts And Nuts
Courtesy of KIA MOTORS AMERICA, INC.

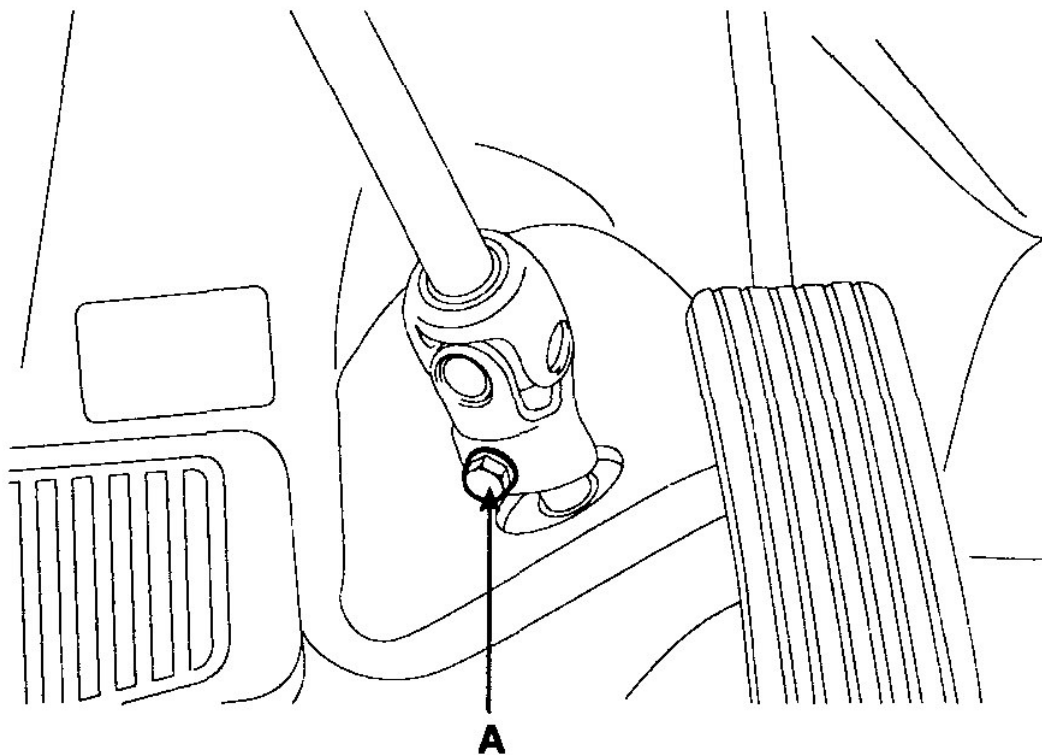
22. Remove the caliper and hang the caliper assembly (A).



G03821137

Fig. 29: Hanging Caliper Assembly
Courtesy of KIA MOTORS AMERICA, INC.

23. Remove the steering u-joint mounting bolt (A). (See **MECHANICAL POWER STEERING SYSTEM**)



G03821138

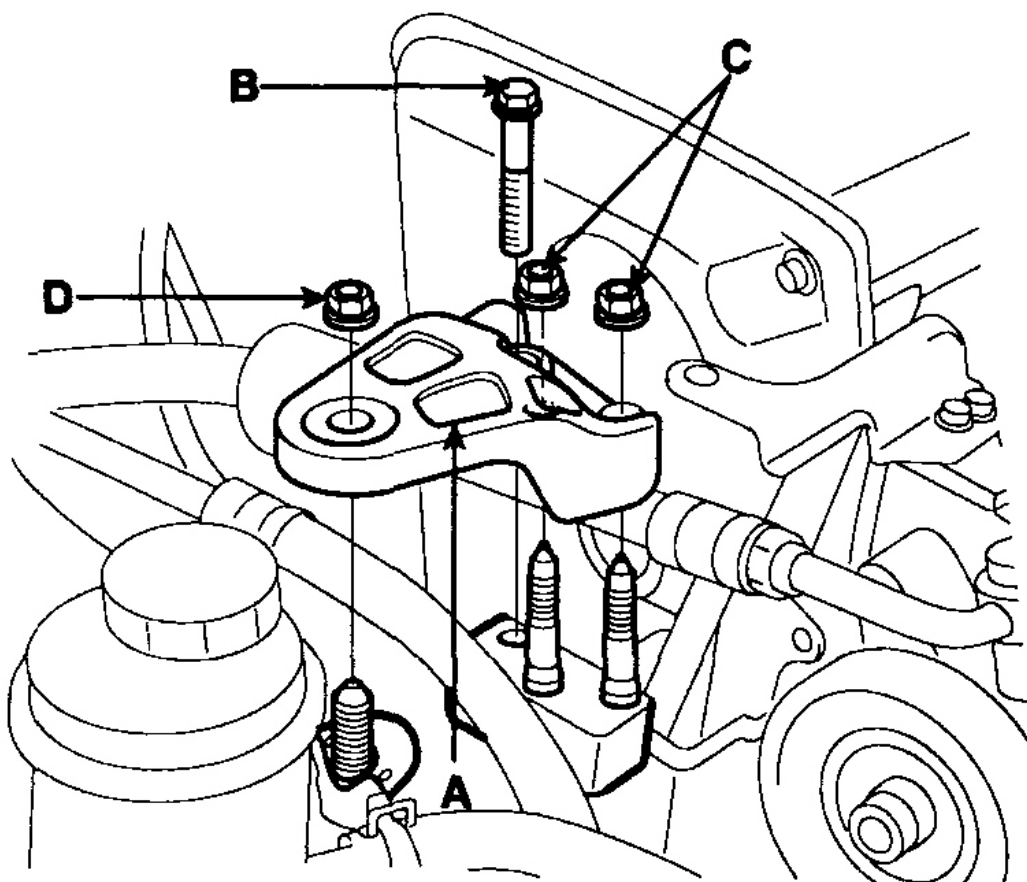
Fig. 30: Identifying Steering U-Joint Mounting Bolt
Courtesy of KIA MOTORS AMERICA, INC.

24. Install the jack for supporting engine and transaxle assembly.
25. Remove the engine mounting bracket (A).

Tightening torque:

Nut (D): 58.8 - 78.5 N.m (6.0 - 8.0 kgf.m, 43.4 - 57.9 lb-ft)

Bolt (B), Nut (C): 49.0 - 63.7 N.m (5.0 - 6.5 kgf.m, 36.2 - 47.0 lb-ft)



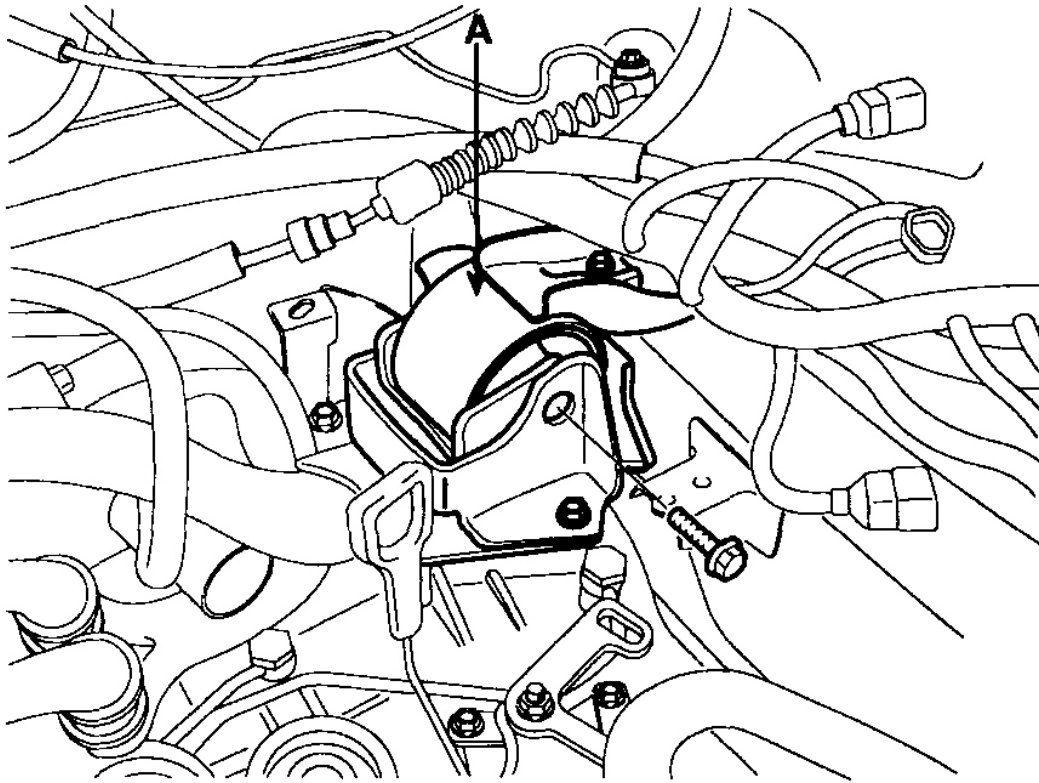
G03821139

Fig. 31: Identifying Engine Mounting Bracket Bolts & Nuts
 Courtesy of KIA MOTORS AMERICA, INC.

26. Remove the transaxle mounting bracket (A).

Tightening torque:

Bolt (B): 88.3 - 107.9 N.m (9.0 - 11.0 kgf.m, 65.1 - 79.6 lb-ft)



G03821140

Fig. 32: Identifying Transaxle Mounting Bracket
Courtesy of KIA MOTORS AMERICA, INC.

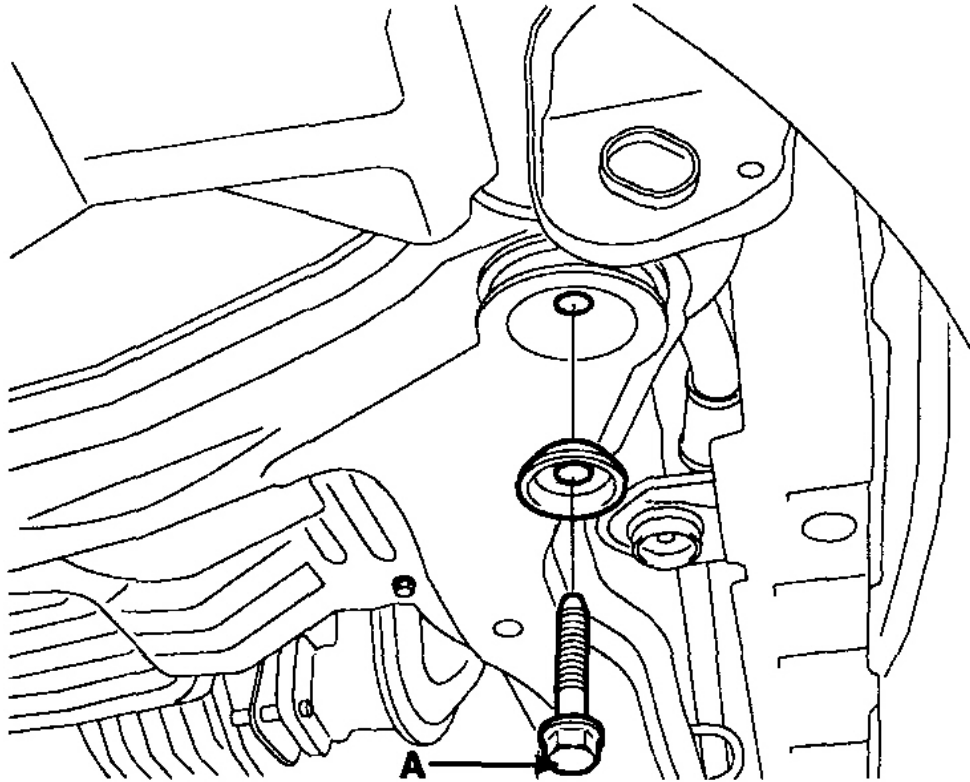
27. Remove the sub frame mounting bolts and nuts.

Tightening torque:

Bolt (A): 156.9 - 176.5 N.m (16.0 - 18.0 kgf.m, 115.7 - 130.2 lb-ft)

Bolt, Nut (B): 68.6 - 88.3 N.m (7.0 - 9.0 kgf.m, 50.6 - 65.1 lb-ft)

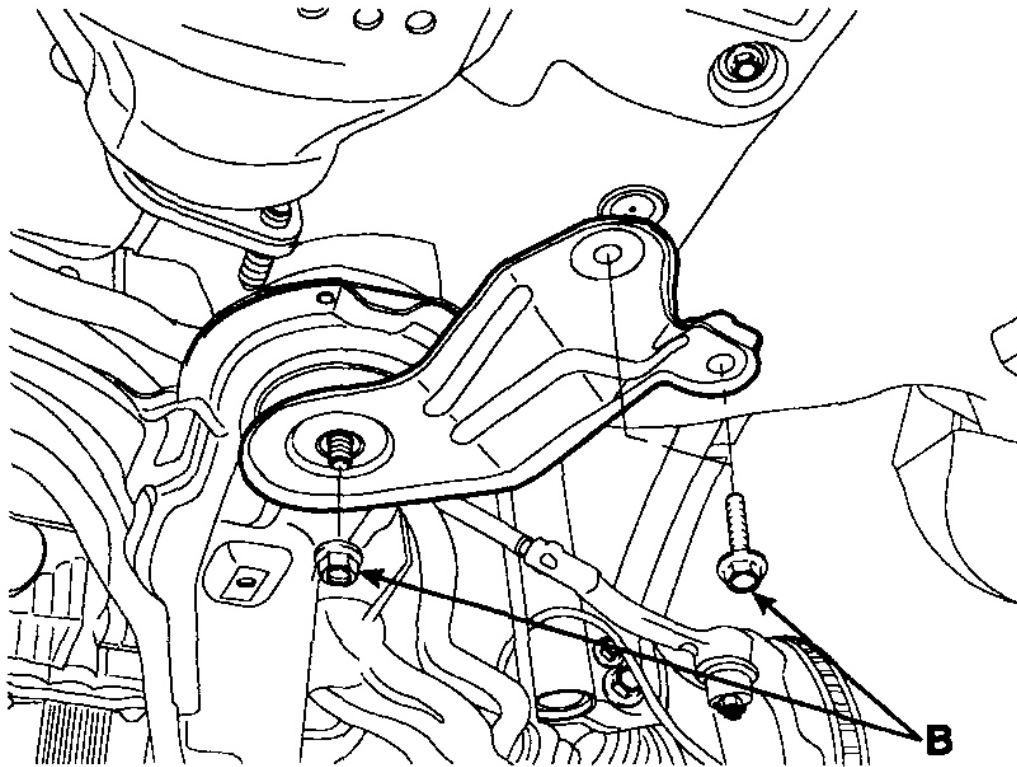
■ Front



G03821141

Fig. 33: Identifying Front Sub Frame Mounting Bolt
Courtesy of KIA MOTORS AMERICA, INC.

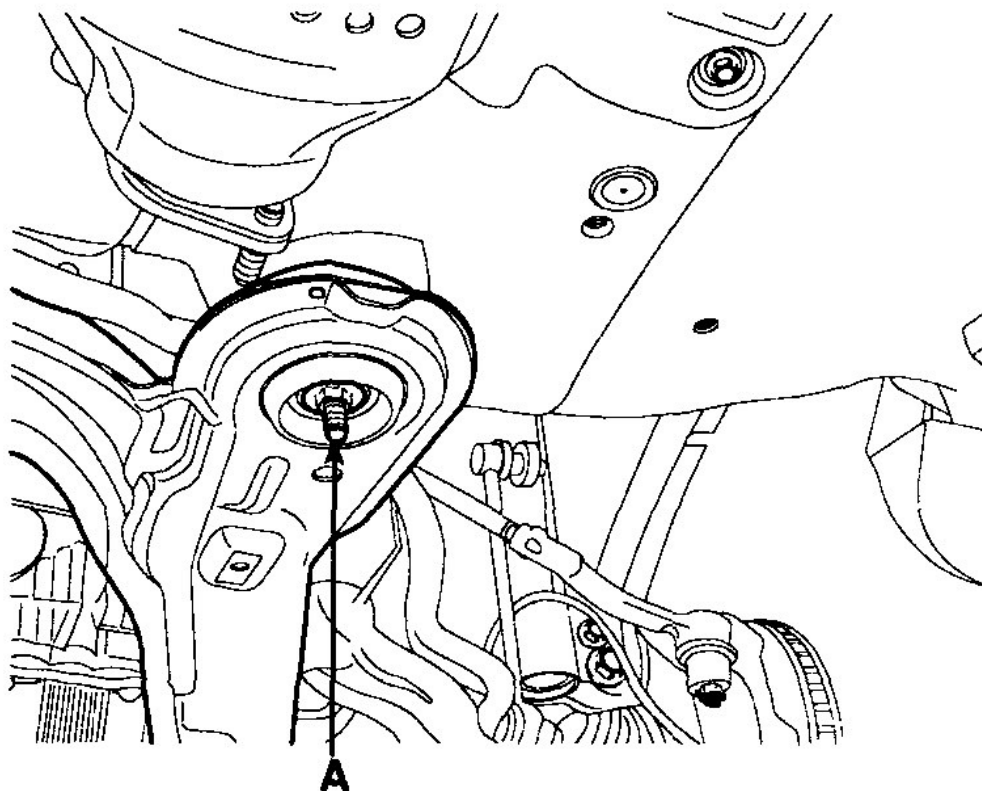
■ Rear



G03821142

Fig. 34: Identifying Rear Sub Frame Mounting Bolts And Nuts
Courtesy of KIA MOTORS AMERICA, INC.

■ Rear



G03821143

Fig. 35: Identifying Rear Sub Frame Mounting Bolt
Courtesy of KIA MOTORS AMERICA, INC.

28. Remove the engine and transaxle assembly by lifting vehicle.

CAUTION: When remove the engine and transaxle assembly, be careful not to damage any surrounding parts or body components.

INSTALLATION

Installation is in the reverse order of removal.

Perform the following:

- Adjust the shift cable.

- Adjust the throttle cable.
- Refill the engine with engine oil.
- Refill the transaxle with fluid.
- Refill the radiator and reservoir tank with engine coolant.
- Place the heater control knob on "HOT" position.
- Bleed air from the cooling system
 - Start engine and let it run until it warms up. (until the radiator fan operates 3 or 4 times.)
 - Turn Off the engine. Check the level in the radiator, add coolant if needed. This will allow trapped air to be removed from the cooling system.
 - Put the radiator cap on tightly, then run the engine again and check for leaks.
- Clean the battery posts and cable terminals with sandpaper assemble them, then apply grease to prevent corrosion.
- Inspect for fuel leakage.
 - After assemble the fuel line, turn on the ignition switch (Do not operate the starter) so that the fuel pump runs for approximately two seconds and fuel line pressurizes.
 - Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.