

2005 Kia Sportage EX

2005-06 ENGINE General - 2.0L - Sportage

2005-06 ENGINE**General - 2.0L - Sportage****GENERAL****SPECIFICATIONS****GENERAL SPECIFICATIONS**

Description		Specifications (2.0 CVVT)	Limit
General			
Type		In-line, DOHC	
Number of cylinders		4	
Bore		82mm (3.2283in)	
Stroke		93.5mm (8.6811 in)	
Total displacement		1,975 cc (120.5 cu.in)	
Compression ratio		10.1: 1	
Firing order		1-3-4-2	
Valve timing			
Intake valve	Opens (ATDC)	11°	
	Closes (ABDC)	59°	
Exhaust valve	Opens (BBDC)	42°	
	Closes (ATDC)	6°	
Cylinder head			
Flatness of gasket surface		Less than 0.03mm (0.0012in)	0.06mm (0.0024in)
Flatness of manifold mounting surface	Intake	Less than 0.15mm (0.0059in)	0.30mm (0.0118in)
	Exhaust	Less than 0.15mm (0.0059in)	0.30mm (0.0118in)
Valve guide hole diameter (Intake, Exhaust)	STD	11.000 ~ 11.018mm (0.4331 ~ 0.4338in)	
	0.05 OS	11.050 ~ 11.068mm (0.4350 ~ 0.4357in)	
	0.25 OS	11.250 ~ 11.268mm (0.4429 ~ 0.4436in)	
	0.50 OS	11.500 ~ 11.518mm (0.4528 ~ 0.4535in)	
	STD	33.000 ~ 33.025mm (1.2992 ~ 1.3002in)	

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Intake valve seat ring hole diameter	0.3 OS	33.300 ~ 33.325mm (1.3110 ~ 1.3120in)	
	0.6 OS	33.600 ~ 33.625mm (1.3228 ~ 1.3238in)	
Exhaust valve seat ring hole diameter	STD	28.500 ~ 28.521mm (1.1220 ~ 1.1229in)	
	0.3 OS	28.800 ~ 28.821mm (1.1339 ~ 1.1347in)	
	0.6 OS	29.100 ~ 29.121mm (1.1457 ~ 1.1465in)	

GENERAL SPECIFICATIONS

Description		Specifications (2.0 CVVT)	Limit
Camshaft			
Cam height	Intake	44.518 ~ 44.718mm (1.7527 ~ 1.7605in)	
	Exhaust	44.418 ~ 44.618mm (1.7487 ~ 1.7566in)	
Journal outer Diameter (Intake, Exhaust)		27.964 ~ 27.980mm (1.1009 ~ 1.1016in)	
Bearing oil clearance		0.02 ~ 0.061mm (0.0008 ~ 0.0024in)	0.1mm (0.0039in)
End play		0.10 ~ 0.20mm (0.0039 ~ 0.0079in)	
Valve			
Valve length	Intake	114.34mm (4.5016in)	
	Exhaust	116.8mm (4.5984in)	
Stem outer diameter	Intake	5.965 ~ 5.980mm (0.2348 ~ 0.2354in)	
	Exhaust	5.950 ~ 5.965mm (0.2343 ~ 0.2348in)	
Face angle		45° ~ 45°30'	
Thickness of Valve head (margin)	Intake	1.15mm (0.0453in)	0.8mm (0.0315in)
	Exhaust	1.35mm (0.0531 in)	1.0mm (0.0394in)
Valve stem to Valve guide clearance	Intake	0.020 ~ 0.050mm (0.0008 ~ 0.0020in)	0.10mm (0.0039in)
	Exhaust	0.035 ~ 0.065mm (0.0014 ~ 0.0026in)	0.13mm (0.0051 in)
Valve guide			
Length	Intake	45.8 ~ 46.2mm (1.8031 ~ 1.8189in)	
	Exhaust	54.3 ~ 54.6mm (2.1378 ~ 2.1496in)	
Valve seat			

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Width of seat contact	Intake	1.1 ~ 1.5mm (0.0433 ~ 0.0591 in)	
	Exhaust	1.3 ~ 1.7mm (0.0512 ~ 0.0669in)	
Seat angle	Intake	45° ~ 45°30'	
	Exhaust	45° ~ 45°30'	
Valve spring			
Free length		48.86mm (1.9236in)	
Load		18.8+/-0.9kg/39.0mm (41.4+/-2.0 lb/1.5354in)	
		41.0+/-1.5kg/30.5mm (90.4+/-3.3 lb/1.2008in)	
Out of squareness		Less than 1.5°	3°
Valve clearance			
Cold (20°C +/- 5°C) (68°F +/- 9°F)	Intake	0.20mm (0.0079in)	0.12~0.28mm (0.0047~0.0110in)
	Exhaust	0.28mm (0.0110in)	0.20~0.38mm (0.0079~0.0150in)
Cylinder block			
Cylinder bore		82.00 ~ 82.03mm (3.2283 ~ 3.2295in)	
Flatness of gasket surface		Total: Less than 0.05mm (0.0020in) Bore to bore: Less than 0.03mm (0.0012in)	
Piston			
Piston outer diameter		81.970 ~ 82.000mm (3.2272 ~ 3.2283in)	
Piston to cylinder clearance		0.020 ~ 0.040mm (0.0008 ~ 0.0016in)	
Ring groove width	No. 1 ring groove	1.23 ~ 1.25mm (0.0484 ~ 0.0492in)	
	No. 2 ring groove	1.22 ~ 1.24mm (0.0480 ~ 0.0488in)	
	Oil ring groove	2.51 ~ 2.53mm (0.0988 ~ 0.0996in)	
Piston ring			
Side clearance	No. 1 ring	0.04 ~ 0.08mm (0.0016 ~ 0.0031 in)	0.1mm (0.0039in)
	No. 2 ring	0.03 ~ 0.07mm (0.0012 ~ 0.0028in)	0.1mm (0.0039in)
	Oil ring	0.06 ~ 0.15mm (0.0024 ~ 0.0059in)	0.2mm (0.0079in)
End gap	No. 1 ring	0.23 ~ 0.38mm (0.0091 ~ 0.0150in)	1.0mm (0.0394in)
	No. 2 ring	0.33 ~ 0.48mm (0.0130 ~ 0.0189in)	1.0mm (0.0394in)
	Oil ring	0.20 ~ 0.60mm	1.0mm (0.0394in)

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		(0.0079 ~ 0.0236in)	
Piston pin			
Piston pin outer diameter		20.001 ~ 20.006mm (0.7874 ~ 0.7876in)	
Piston pin hole inner diameter		20.016 ~ 20.021mm (0.7880 ~ 0.7882in)	
Piston pin hole clearance		0.010 ~ 0.020mm (0.0004 ~ 0.0008in)	
Connecting rod small end hole inner diameter		19.974 ~ 19.985mm (0.7864 ~ 0.7868in)	
Connecting rod small end hole clearance		-0.032 ~ -0.016mm (-0.0013 ~ -0.0006in)	
Piston pin press-in load		350~1,350 kg (772~2,976 lb)	
Connecting rod			
Connecting rod big end inner diameter		48.000 ~ 48.018mm (1.8898 ~ 1.8905in)	
Connecting rod bearing oil clearance		0.024 ~ 0.044mm (0.0009 ~ 0.0017in)	
Side clearance		0.10 ~ 0.25mm (0.0039 ~ 0.0098in)	0.4mm (0.0157in)
Crankshaft			
Main journal outer diameter		56.942 ~ 56.962mm (2.2418 ~ 2.2426in)	
Pin journal outer diameter		44.946 ~ 44.966mm (1.7695 ~ 1.7703in)	
Main bearing oil clearance		0.028 ~ 0.048mm (0.0011 ~ 0.0019in)	0.1mm (0.0039in)
End play		0.06 ~ 0.260mm (0.0024 ~ 0.0102in)	0.3mm (0.0118in)
Flywheel			
Runout		0.1mm (0.0039in)	0.13mm (0.0051 in)
Oil pump			
Side clearance	Inner rotor	0.040 ~ 0.085mm (0.0016 ~ 0.0033in)	
	Outer rotor	0.040 ~ 0.090mm (0.0016 ~ 0.0035in)	
Body clearance		0.120 ~ 0.185mm (0.0047 ~ 0.0073in)	
Relief valve opening pressure		490+/-49.0kpa(5+/-0.5kg/cm ² , 71 +/-7.1 psi)	
	Free length	43.8mm (1.7244in)	
		3.7+/-0.4kg/40.1mm	

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Relief spring	Load	(8.2+/-0.9 lb/1.5787in) 9.7+/-0.4kg/34.3mm (21.4+/-0.9 lb/1.3504in)	
Engine oil			
Oil quantity (Total)		4.0 L (4.23 US qt, 3.52 imp qt)	
Oil quantity (Oil pan)		3.7 L (3.91 US qt, 3.26 imp qt)	
Oil quantity (Oil filter)		0.3 L (0.32 US qt, 0.26 imp qt)	
Oil quality		Above SL, SJ	
Oil pressure (Idle)		156.9kpa (1.6kg/cm ² , 22.8psi)	
Cooling system			
Cooling method		Forced circulation with cooling fan	
Coolant quantity		6.0 L (6.34 US qt, 5.28 imp qt)	
Thermostat	Type	Wax pellet type	
	Opening temperature	82+/-1.5°C(179.6+/-2.7°F)	
	Pull opening temperature	95°C (203°F)	
Radiator cap	Main valve opening pressure	93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm ² , 13.51 ~ 17.78psi)	
	Vacuum valve opening pressure	0.98 ~ 4.90 kpa (0.01 ~ 0.05kg/cm ² , 0.14 ~ 0.71 psi)	
Water temperature sensor			
Type		Thermister type	
Resistance	20°C (68°F)	2.45+/-0.14 kohm	
	80°C (176°F)	0.3222 kohm	

TIGHTENING TORQUE

TIGHTENING TORQUE SPECIFICATIONS

Item	Quantity	Tightening torque		
		N.m	kgf.m	lb-ft
Cylinder block				
Engine support (front) bracket bolt	3	34.3 ~ 49.0	3.5 ~ 5.0	25.3 ~ 36.2
Engine support (rear) bracket bolt	2	34.3 ~ 49.0	3.5 ~ 5.0	25.3 ~ 36.2
Engine support bracket stay plate bolt	1	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Engine mounting				
Engine mounting bracket and body fixing bolt	3	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Engine mounting insulator and engine mounting support bracket fixing nut	1	58.8 ~ 78.5	6.0 ~ 8.0	43.4 ~ 57.9
Engine mounting support bracket and engine support bracket fixing bolt	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0

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Engine mounting support bracket and engine support bracket fixing nut	2	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Transaxle mounting bracket and body fixing bolt	4	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Transaxle mounting insulator and transaxle support bracket fixing bolt	1	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Front roll stopper bracket and sub frame fixing bolt	3	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Front roll stopper insulator and front roll stopper support bracket fixing bolt, nut	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Rear roll stopper bracket and sub frame fixing bolt	3	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Rear roll stopper insulator and rear roll stopper support bracket fixing bolt, nut	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Main moving system				
Connecting rod cap nut	8	49.0 ~ 52.0	5.0 ~ 5.3	36.2 ~ 38.3
Crankshaft main bearing cap bolt	10	27.5~31.4+60°~64°	2.8~3.2+60°~64°	20.3~23.1+60°~64°
Flywheel bolt (M/T)	6	117.7 ~ 127.5	12.0 ~ 13.0	86.8 ~ 94.0
Drive plate bolt (A/T)	6	117.7 ~ 127.5	12.0 ~ 13.0	86.8 ~ 94.0
Timing belt				
Timing belt upper cover bolt	4	7.8 ~9.8	0.8 ~1.0	5.8 ~7.2
Timing belt lower cover bolt	5	7.8 ~9.8	0.8 ~1.0	5.8 ~7.2
Timing belt under cover bolt	3	9.8 ~11.8	1.0 ~1.2	7.2 ~8.7
Crankshaft pulley bolt	1	166.7 ~176.5	17.0 ~18.0	123.0 ~130.2
Camshaft sprocket bolt	1	98.1 ~117.7	10.0 ~12.0	72.3 ~86.8
Timing belt tensioner bolt	1	42.2 ~53.9	4.3 ~5.5	31.1 ~39.8
Timing belt idler bolt	1	42.2 ~53.9	4.3 ~5.5	31.1 ~39.8
Cylinder head				
Engine cover bolt	5	3.9 ~5.9	0.4 ~0.6	2.9 ~4.3
Cylinder head cover bolt	12	7.8 ~9.8	0.8 ~1.0	5.8 ~7.2
Camshaft bearing cap bolt	22	13.7 ~14.7	1.4 ~1.5	10.1 ~10.8
Exhaust camshaft and CVVT assembly fixing bolt	1	64.7 ~76.5	6.6 ~7.8	47.7 ~56.4
Timing chain auto tensioner bolt	2	7.8 ~9.8	0.8 ~1.0	5.8 ~7.2
OCV (oil control valve) bolt	1	9.8 ~11.8	1.0 ~1.2	7.2 ~8.7
OCV (oil control valve) filter	1	40.2 ~ 50.0	4.1 ~ 5.1	29.7 ~ 36.9
Cylinder head bolt (10 X 99)	8	22.6~26.5+60°~65°+60°~65°	2.3~2.7+60°~65°+60°~65°	16.6~19.5+60°~65°+60°~65°
Cylinder head bolt (12 X 151)	2	27.5~31.4+60°~65°+60°~65°	2.8~3.2+60°~65°+60°~65°	20.3~23.1+60°~65°+60°~65°
Cooling system				

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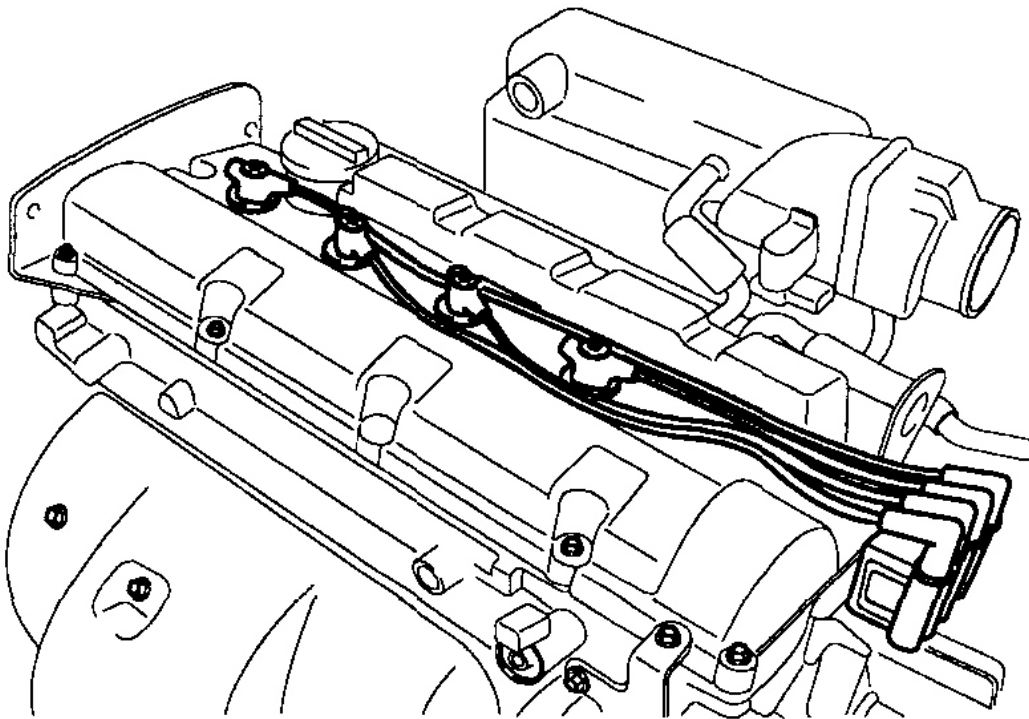
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Water pump pulley bolt	4	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Water pump bolt (8 X 20)	1	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Water pump bolt (8 X 35)	2	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Water pump and alternator brace fixing bolt (8 X 45)	2	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Alternator brace and cylinder block fixing bolt	2	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Thermostat housing bolt	1	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Thermostat housing nut	1	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Water temperature sensor	1	19.6 ~ 39.2	2.0 ~ 4.0	14.5 ~ 28.9
Water inlet fitting nut	2	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Lubrication system				
Oil filter	1	11.8 ~ 15.7	1.2 ~ 1.6	8.7 ~ 11.6
Front case bolt (8 X 20)	4	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Front case bolt (8 X 25)	1	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Front case bolt (8 X 38)	1	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Front case bolt (8 X 45)	2	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Oil pan bolt (6 X 16)	15	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan bolt (6 X 50)	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan bolt (6 X 118)	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan and transaxle fixing bolt	3	29.4 ~ 41.2	3.0 ~ 4.2	21.7 ~ 30.4
Oil pan drain bolt	1	39.2 ~ 44.1	4.0 ~ 4.5	28.9 ~ 32.5
Oil screen bolt	2	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Oil pressure switch	1	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Intake and exhaust system				
Intake manifold and cylinder head fixing nut	9	15.7 ~ 22.6	1.6 ~ 2.3	11.6 ~ 16.6
Intake manifold stay bolt	4	17.7 ~ 24.5	1.8 ~ 2.5	13.0 ~ 18.1
Exhaust manifold and cylinder head fixing nut	9	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
O2 sensor to exhaust manifold	1	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 43.4
Exhaust manifold heat cover and exhaust manifold fixing bolt	4	16.7 ~ 21.6	1.7 ~ 2.2	12.3 ~ 15.9
Air cleaner assembly fixing bolt	3	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Throttle body and surge tank fixing bolt	4	18.6 ~ 27.5	1.9 ~ 2.8	13.7 ~ 20.3
Exhaust manifold and front muffler fixing bolt	2	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Front muffler fixing clip bolt	1	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Front muffler and center muffler fixing nut	2	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Center muffler and main muffler fixing nut	2	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4

COMPRESSION PRESSURE INSPECTION

NOTE: If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

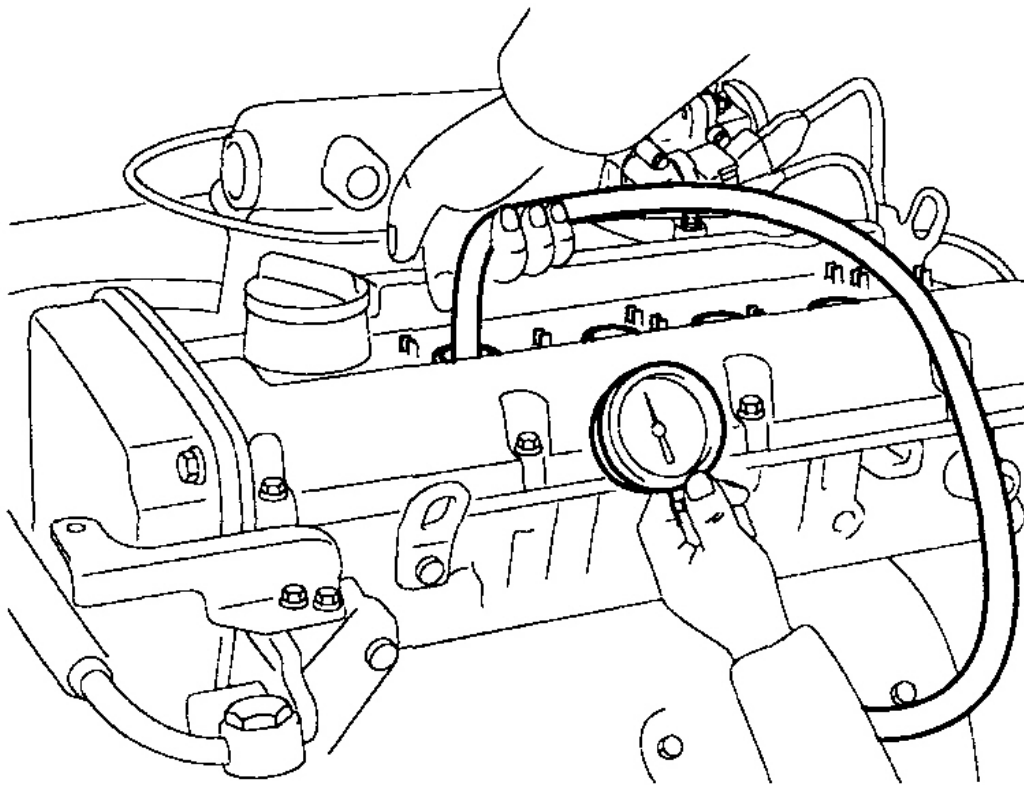
1. Start the engine and allow to warm up to operating temperature (about five minutes).
Stop the engine.
2. Disconnect the ignition coil connectors and the spark plug cables.



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Fig. 1: Disconnecting Ignition Coil Connectors And Spark Plug Cables
Courtesy of KIA MOTORS AMERICA, INC.

3. Remove the four spark plugs using a 16mm spark plug wrench.
4. Check the cylinder compression pressure.
 1. Insert a compression gauge into the spark plug hole.



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Fig. 2: Checking Cylinder Compression Pressure
Courtesy of KIA MOTORS AMERICA, INC.

2. Fully open the throttle.
3. While cranking the engine, measure the compression pressure.

NOTE: Always use a fully charged battery to obtain engine speed of 250rpm or more.

4. Repeat step 1 through 3 for each cylinder.

NOTE: This measurement must be done in as short a time as possible.

Compression pressure:

1,422kPa (14.5kg/cm² , 206psi) (250~400 RPM)

Minimum pressure:

1,275kPa (13.0kg/cm² , 185psi)

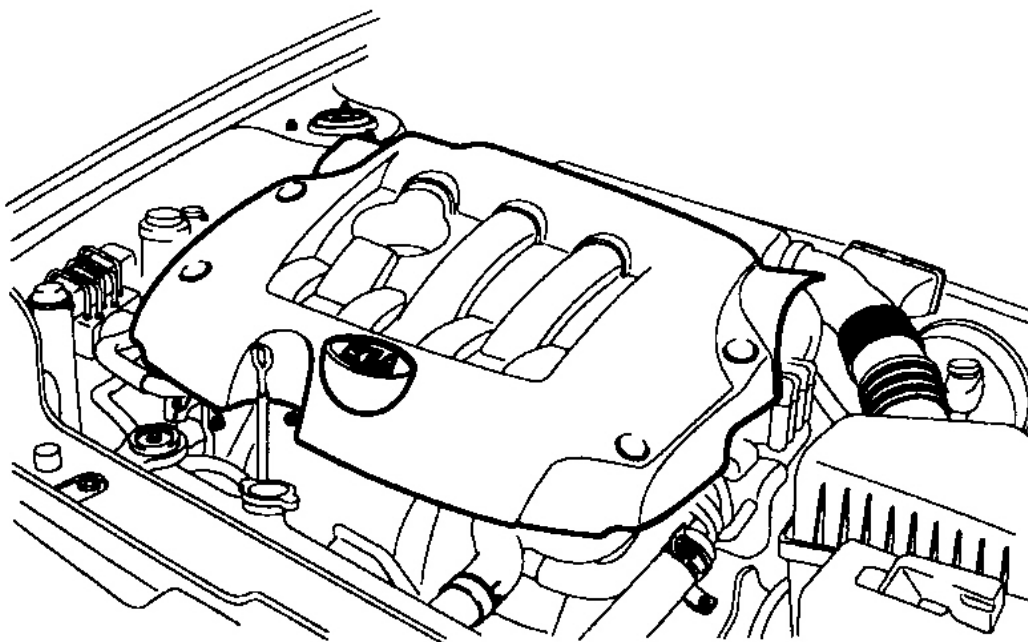
Difference between each cylinder:

98kPa (1.0kg/cm² , 14psi) or less

5. If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat step 1 through 3 for cylinders with low compression.
 - If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
 - If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.
5. Reinstall the spark plugs.
6. Connect the ignition coil connectors and the spark plug cables.

TIMING BELT TENSION ADJUSTMENT

1. Remove the engine cover.

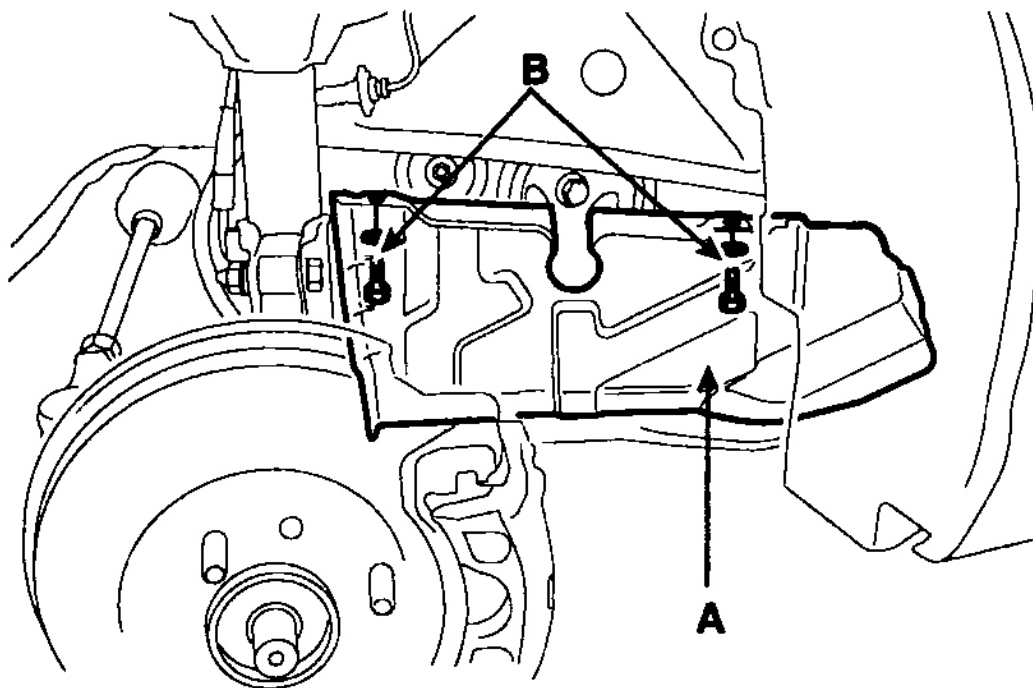


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Fig. 3: Removing Engine Cover

Courtesy of KIA MOTORS AMERICA, INC.

2. Remove the RH front wheel.
3. Remove the bolts (B) and RH side cover (A).



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Fig. 4: Removing Bolts And RH Side Cover
Courtesy of KIA MOTORS AMERICA, INC.

4. Loosen the water pump pulley bolts.

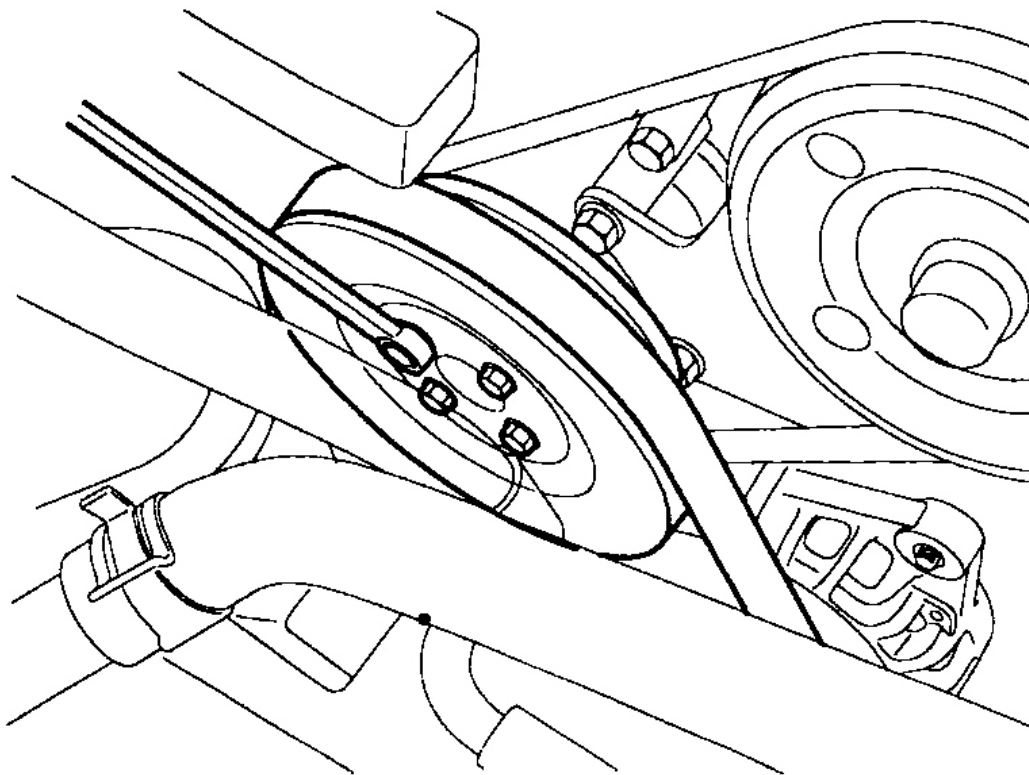
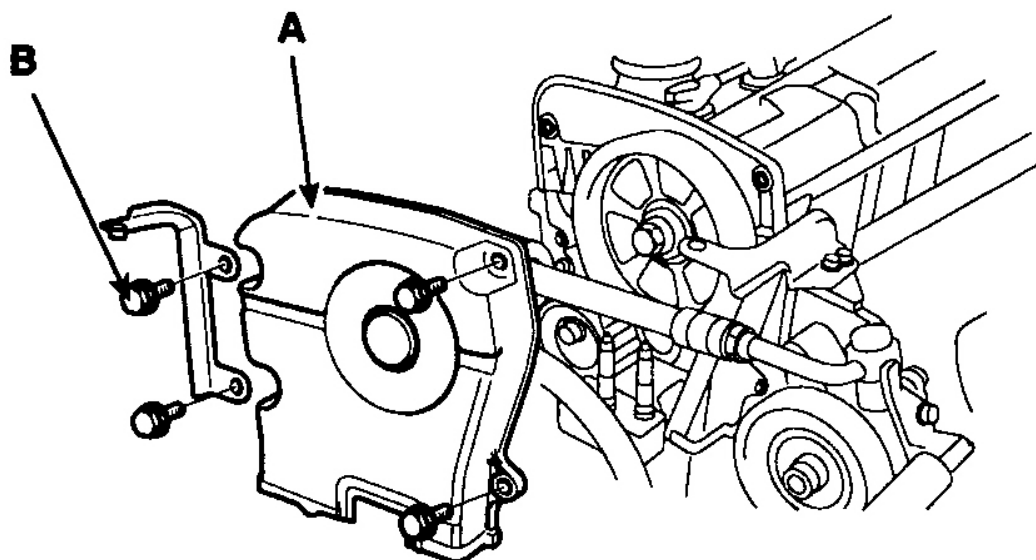
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Fig. 5: Loosening Water Pump Pulley Bolts
Courtesy of KIA MOTORS AMERICA, INC.

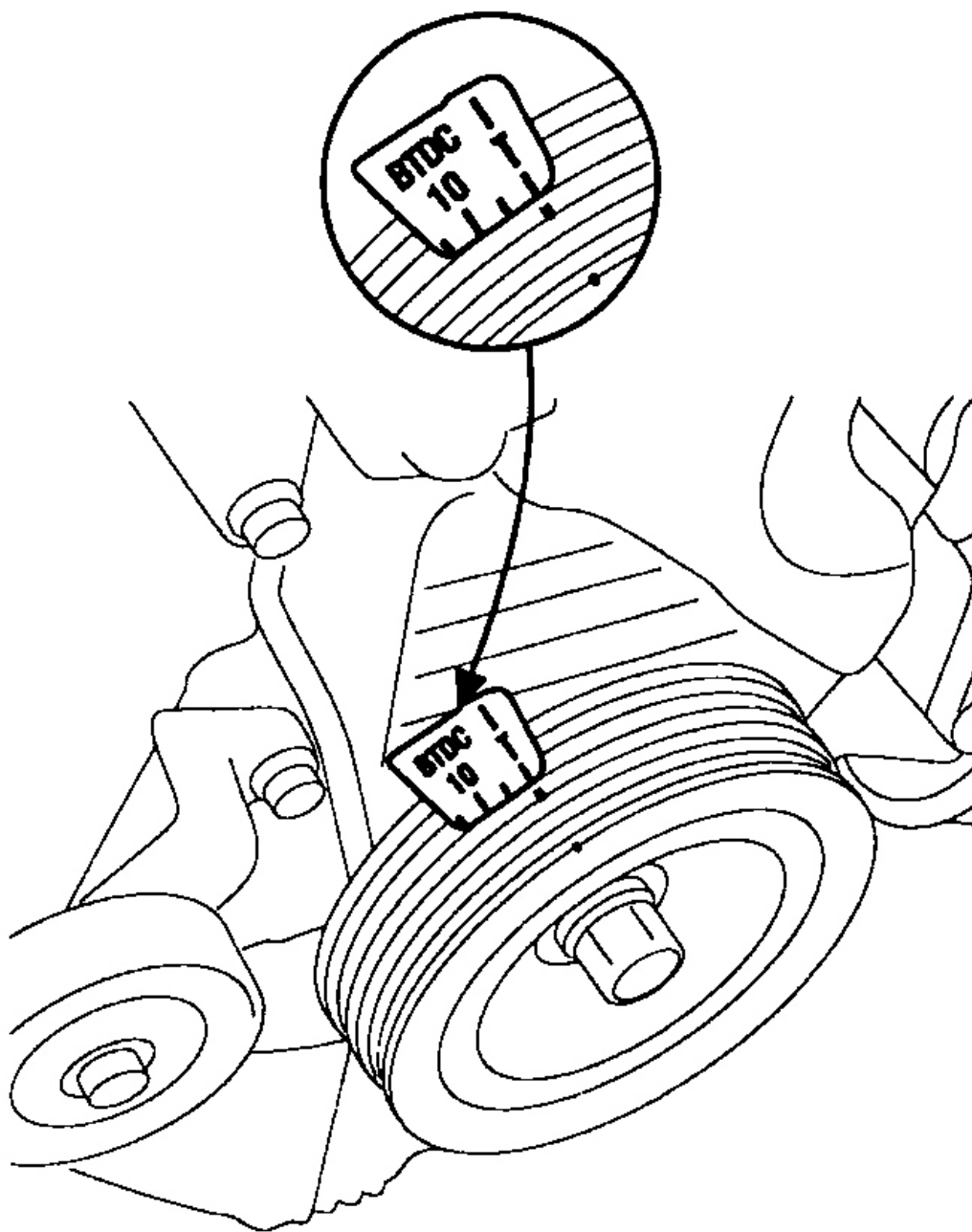
5. Remove the alternator drive belt. (See **CHARGING SYSTEM**)
6. Remove the air conditioner compressor drive belt. (See **DRIVE BELT**)
7. Remove the power steering pump drive belt. (See **CHECKING POWER STEERING BELT TENSION**)
8. Remove the water pump pulley.
9. Remove the 4 bolts (B) and timing belt upper cover (A).



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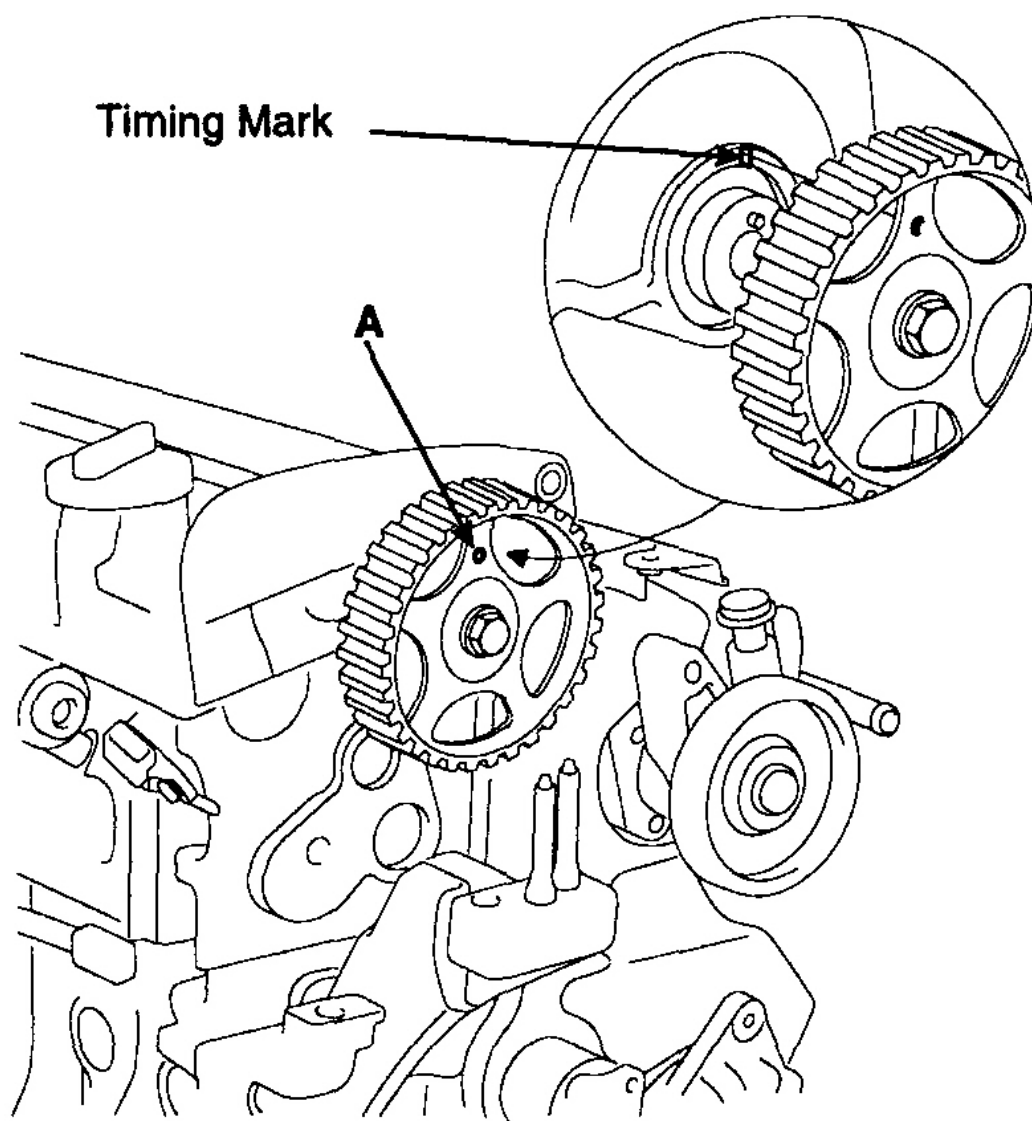
Fig. 6: Loosening Bolts And Timing Belt Upper Cover
Courtesy of KIA MOTORS AMERICA, INC.

10. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover. Check that the timing mark of camshaft sprocket is aligned with the timing mark of cylinder head cover. (No.1 cylinder compression TDC position)



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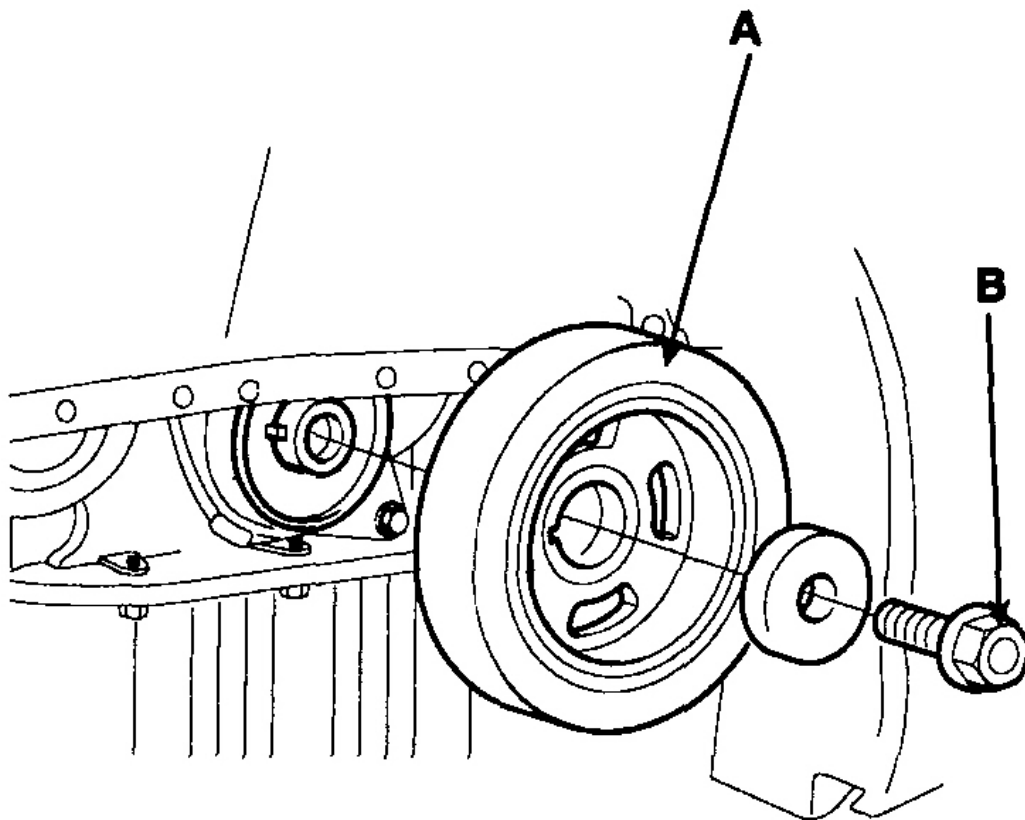
Fig. 7: Aligning Crankshaft Pulley Groove Marks With Timing Belt Cover Timing Mark (1 Of 2)
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Fig. 8: Aligning Crankshaft Pulley Groove Marks With Timing Belt Cover Timing Mark (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

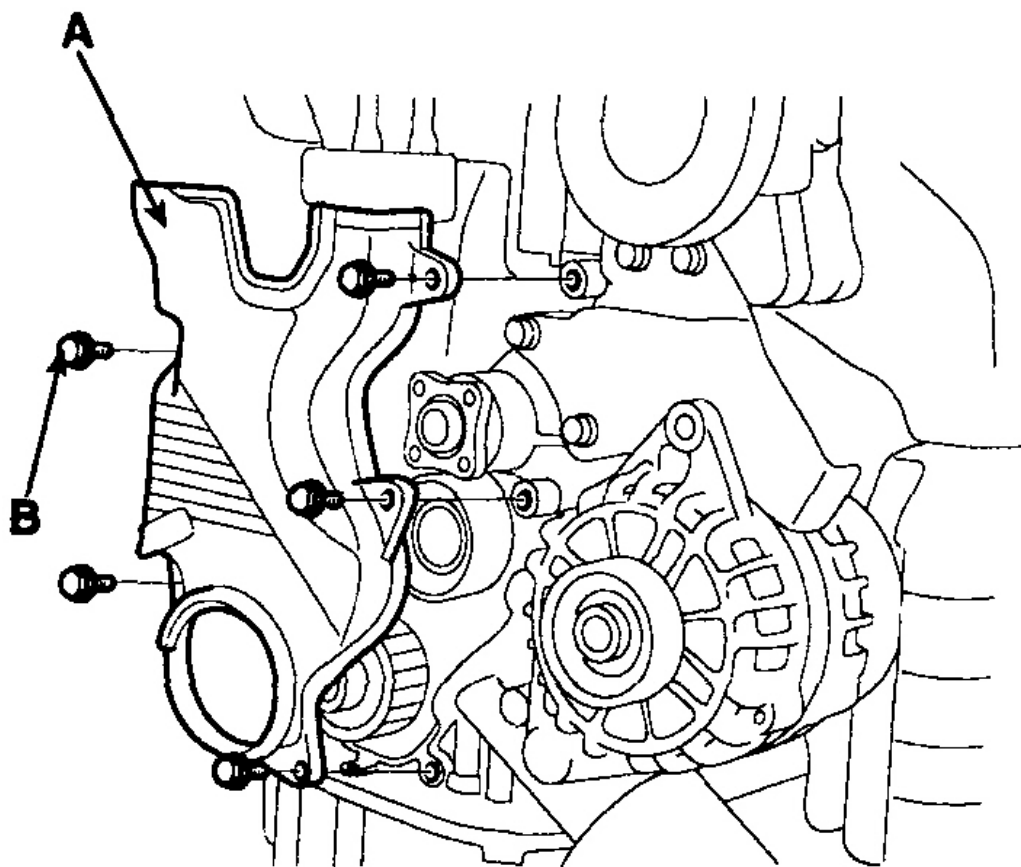
11. Remove the crankshaft pulley bolt (B) and crankshaft pulley (A).



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Fig. 9: Removing Crankshaft Pulley Bolt And Crankshaft Pulley
Courtesy of KIA MOTORS AMERICA, INC.

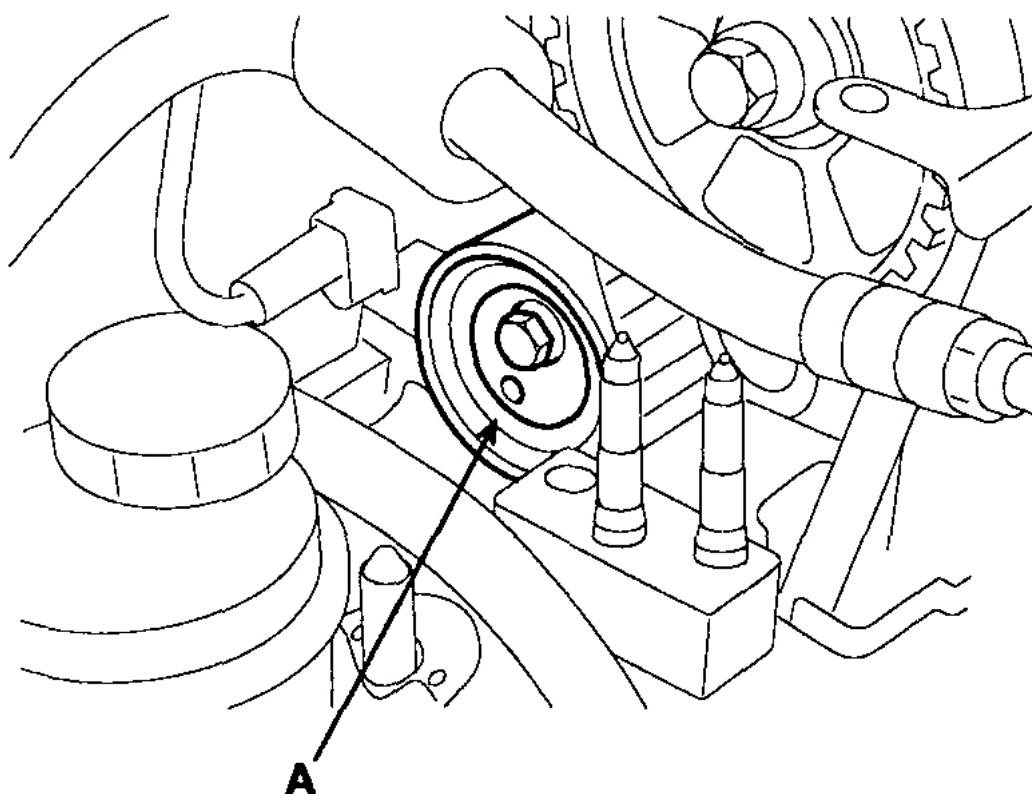
12. Remove the 5 bolts (B) and timing belt lower cover (A).



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Fig. 10: Removing Bolts And Timing Belt Lower Cover
Courtesy of KIA MOTORS AMERICA, INC.

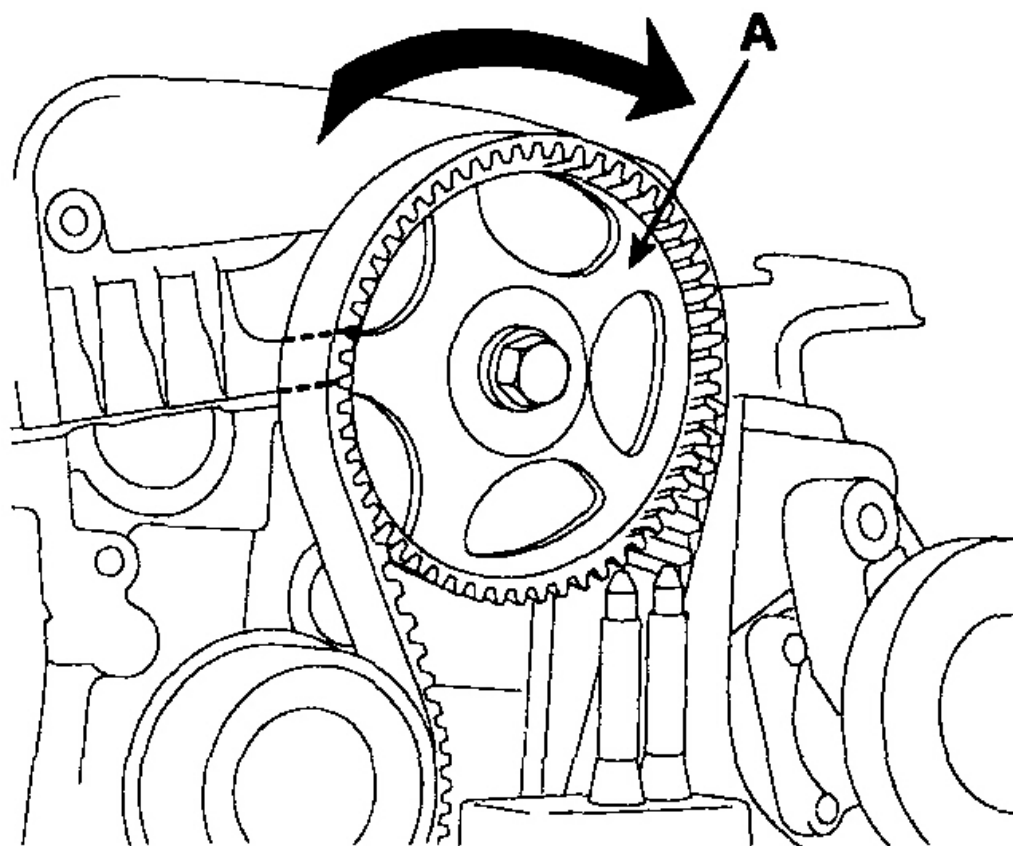
13. Temporarily loosen the tensioner pulley (A) by center bolt.



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Fig. 11: Loosening Tensioner Pulley By Center Bolt
Courtesy of KIA MOTORS AMERICA, INC.

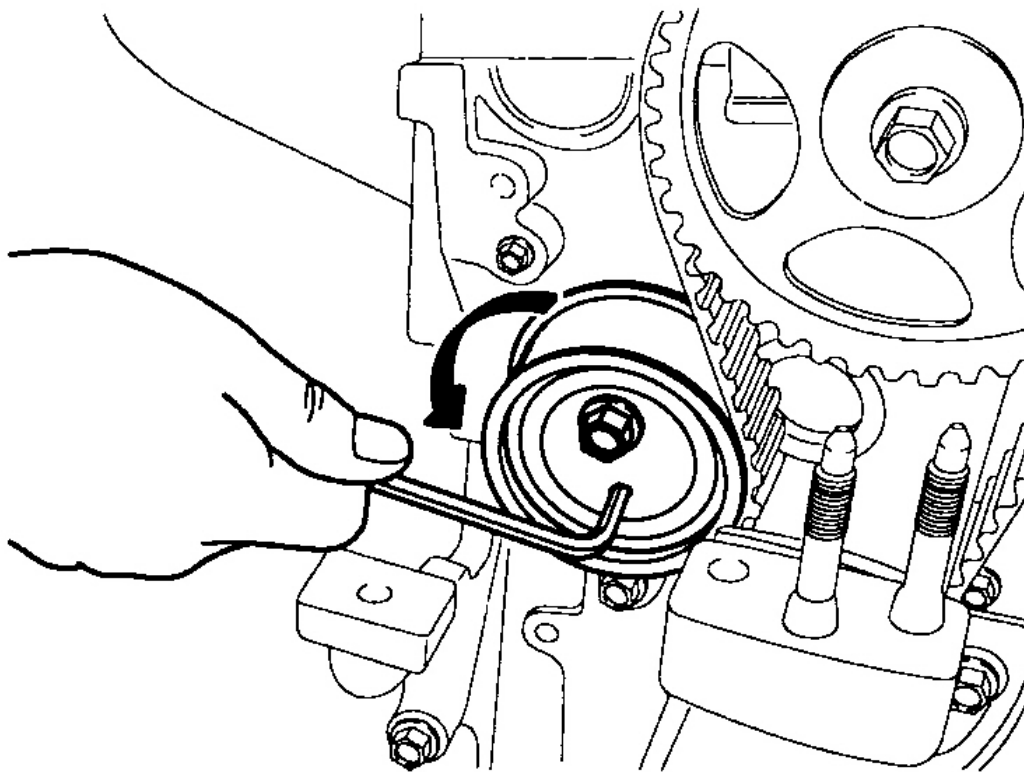
14. Adjust the timing belt tension.
 1. Rotate the crankshaft clockwise (view from the front) through angle equivalent to two teeth (18°) of camshaft sprocket (A).



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Fig. 12: Rotating Crankshaft Clockwise
Courtesy of KIA MOTORS AMERICA, INC.

2. Using a hex-wrench, apply tension to the timing belt in the clockwise direction so that there is no slack in the belt on the tension side.



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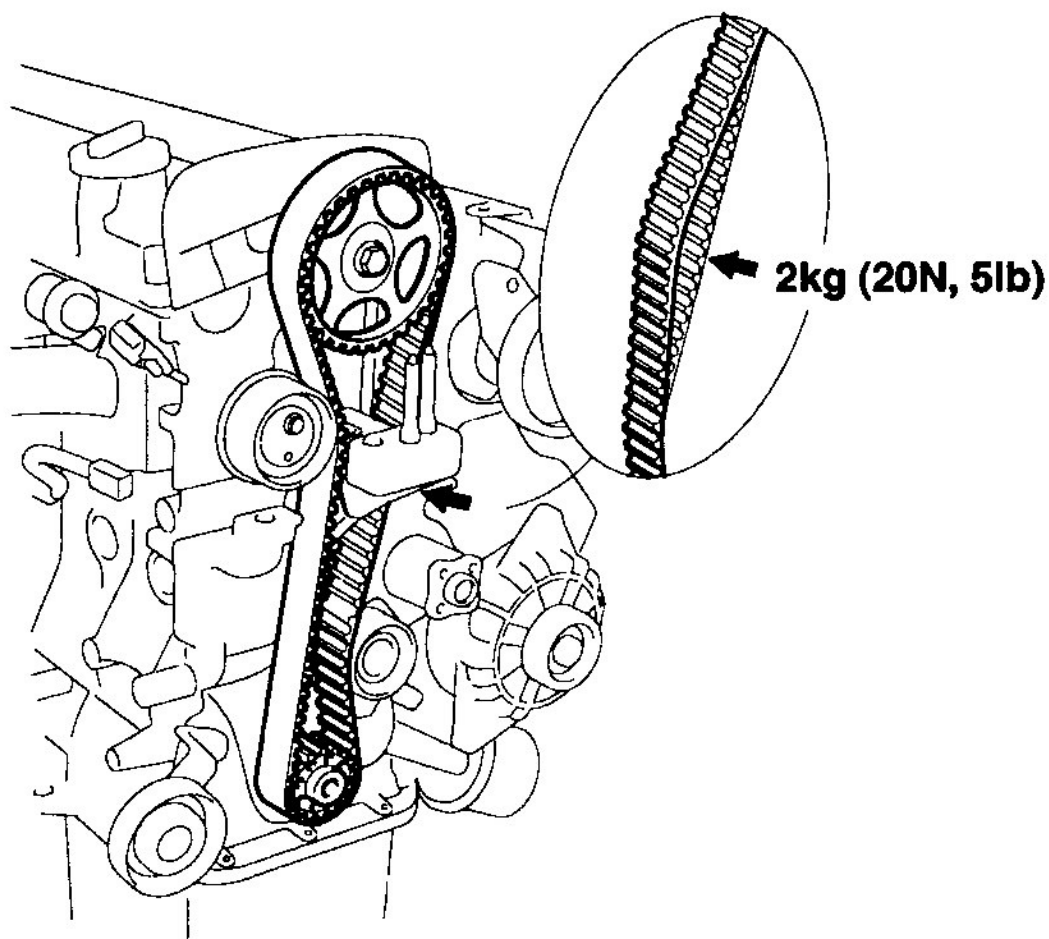
Fig. 13: Applying Tension To Timing Belt
Courtesy of KIA MOTORS AMERICA, INC.

3. Tighten the tensioner bolt.

Tightening torque:

42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lb-ft)

4. Recheck the belt tension. When applying about 5 lbs of force, the belt should move no more than 0.16 to 0.24 inch (4 to 6mm).



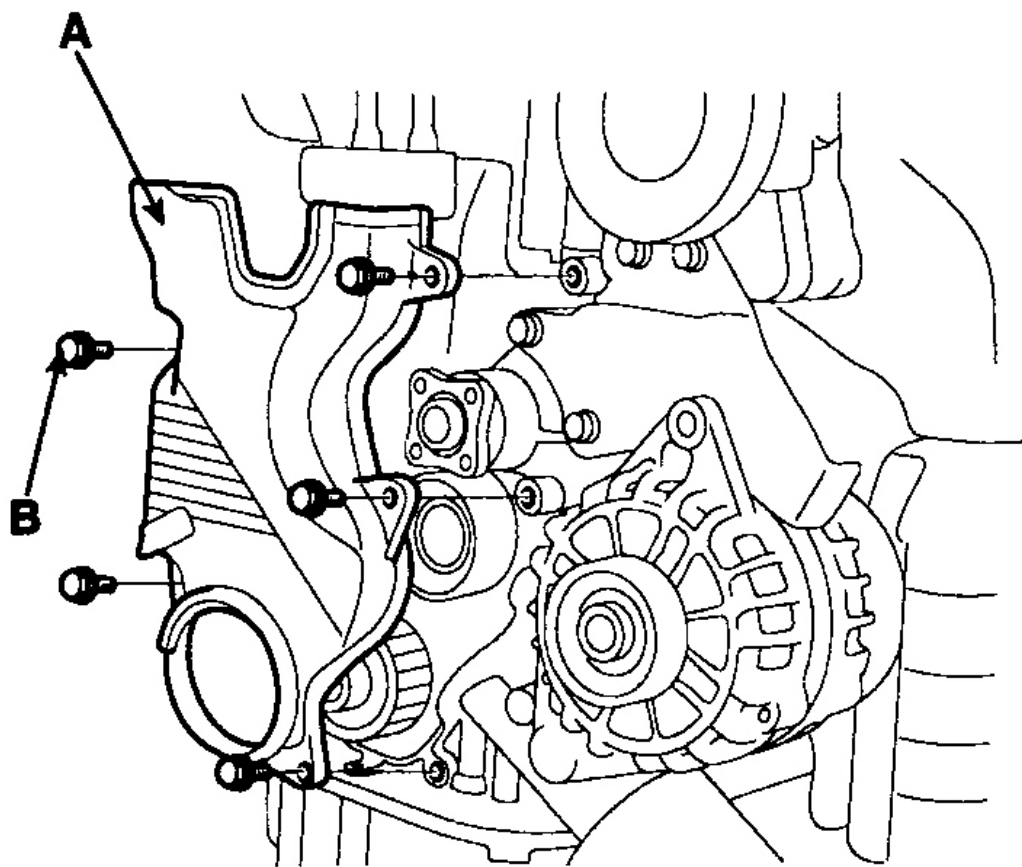
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Fig. 14: Rechecking Belt Tension**Courtesy of KIA MOTORS AMERICA, INC.**

15. Turn the crankshaft two turns in the operating direction (clockwise) and realign the crankshaft sprocket and camshaft sprocket timing mark.
16. Install the timing belt lower cover (A) with bolts (B).

Tightening torque:

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



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Fig. 15: Turning Crankshaft In Operating Direction
Courtesy of KIA MOTORS AMERICA, INC.

17. Install the crankshaft pulley (A) with bolt (B).

Tightening torque:

166.7 ~ 176.5N.m (17.0 ~ 18.0kgf.m, 123.0 ~ 130.2lb-ft)

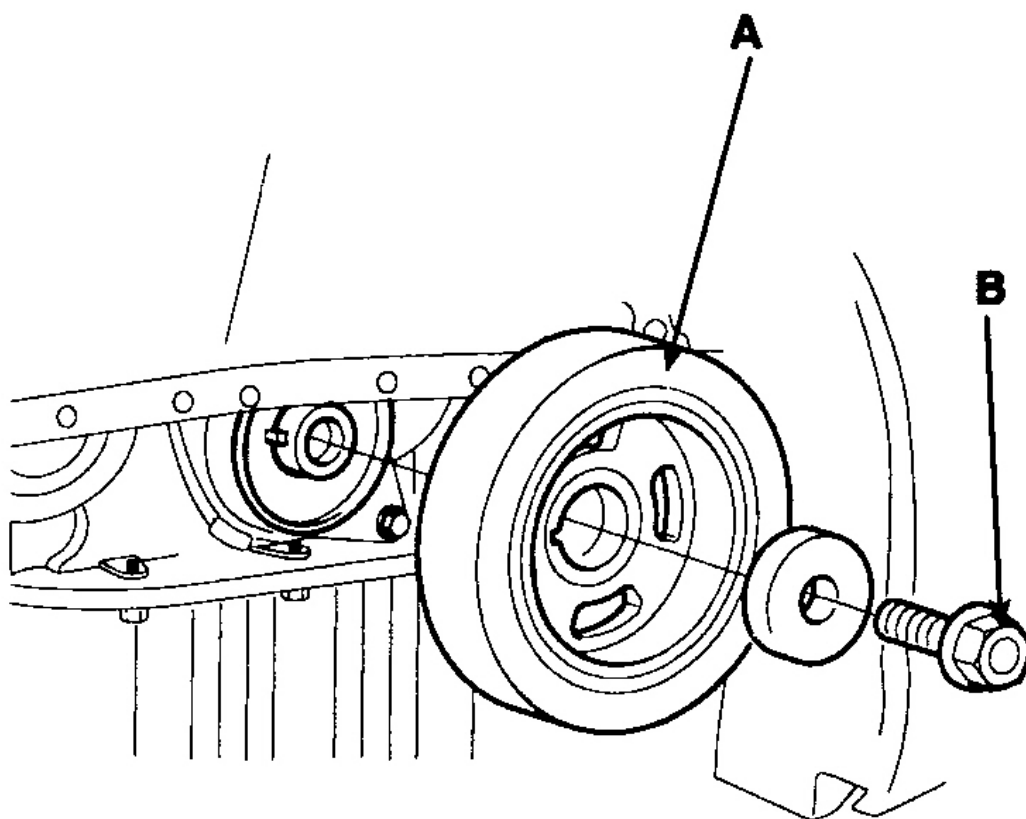
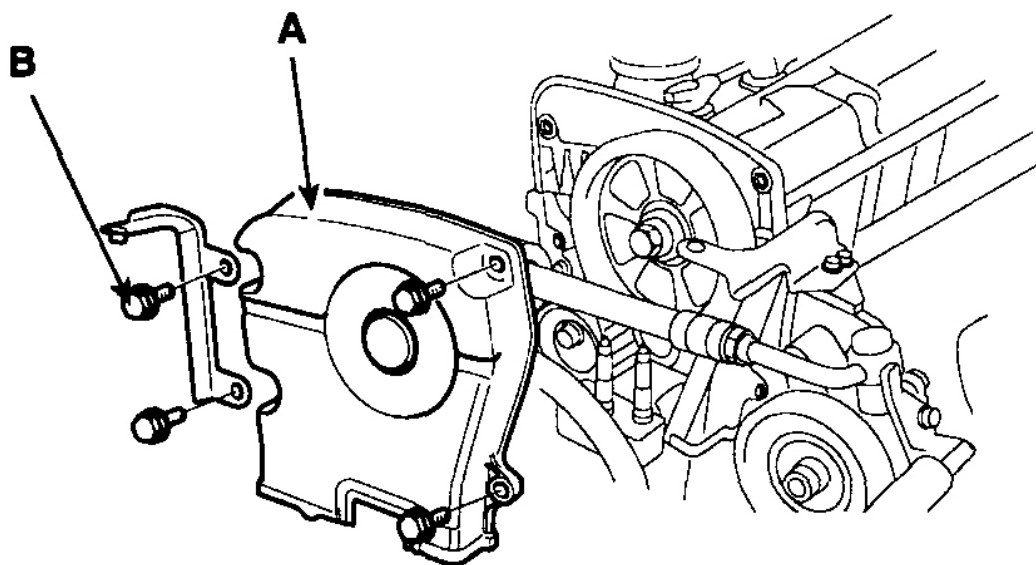
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Fig. 16: Installing Crankshaft Pulley With Bolt
Courtesy of KIA MOTORS AMERICA, INC.

18. Install the timing belt upper cover (A) with bolts (B).

Tightening torque:

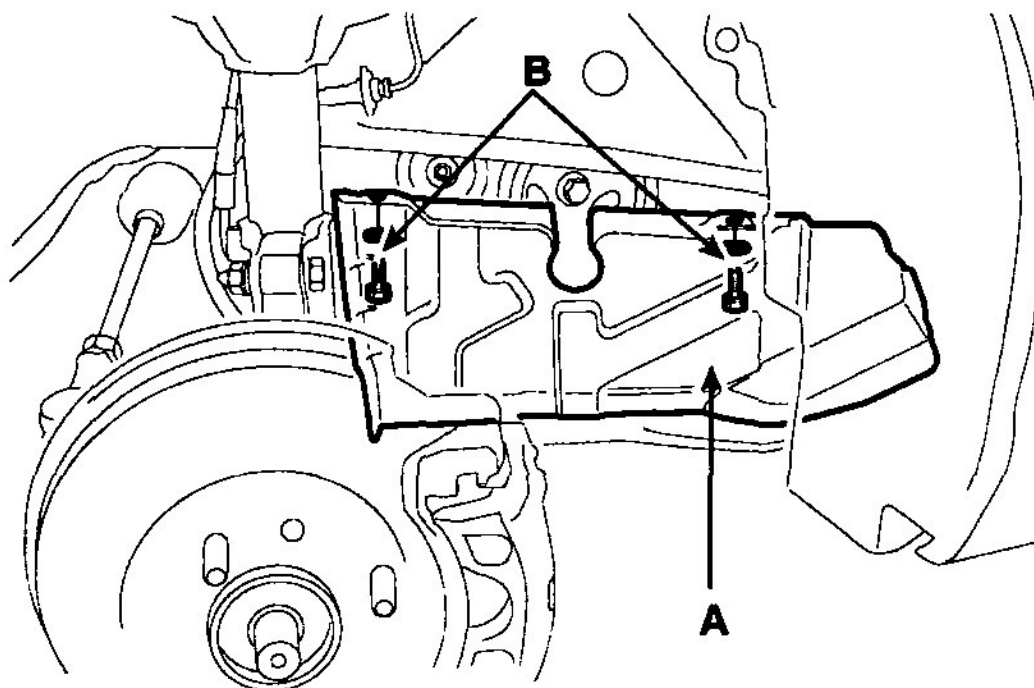
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



G03820965

Fig. 17: Installing Timing Belt Upper Cover With Bolts
Courtesy of KIA MOTORS AMERICA, INC.

19. Install the water pump pulley.
20. Install the power steering pump drive belt. (See **CHECKING POWER STEERING BELT TENSION**)
21. Install the air conditioner compressor drive belt. (See **DRIVE BELT**)
22. Install the alternator drive belt. (See **CHARGING SYSTEM**)
23. Install the RH side cover (A) with bolts (B)



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Fig. 18: Installing RH Side Cover With Bolts
Courtesy of KIA MOTORS AMERICA, INC.

24. Install the RH front wheel.

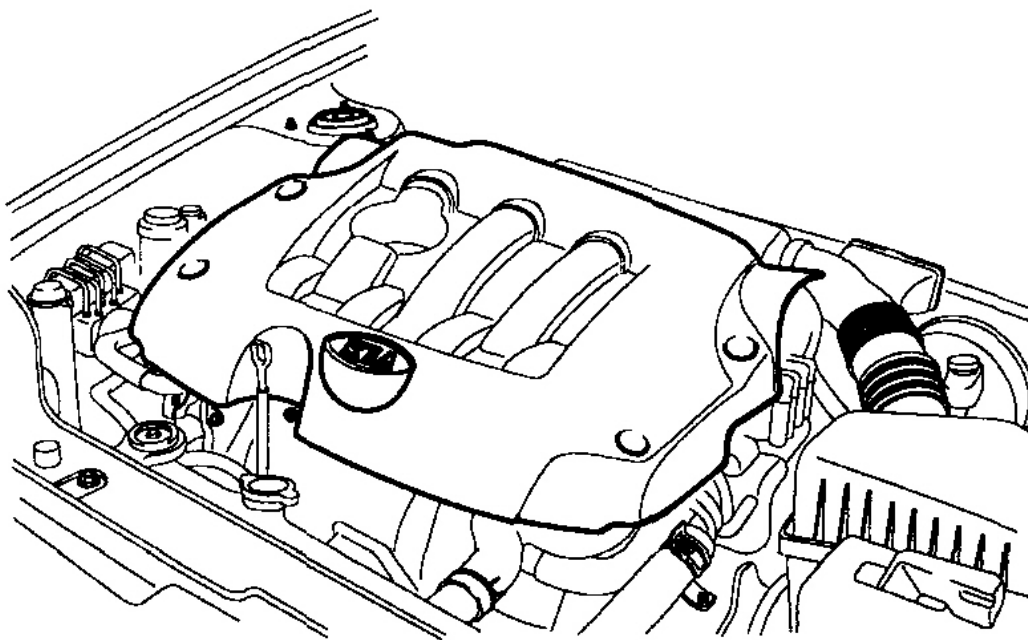
Tightening torque:

88.3 ~ 107.9N.m (9 ~ 11kgf.m, 65.1 ~ 79.6lb-ft)

25. Install the engine cover (A) with bolts.

Tightening torque:

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



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Fig. 19: Installing Engine Cover

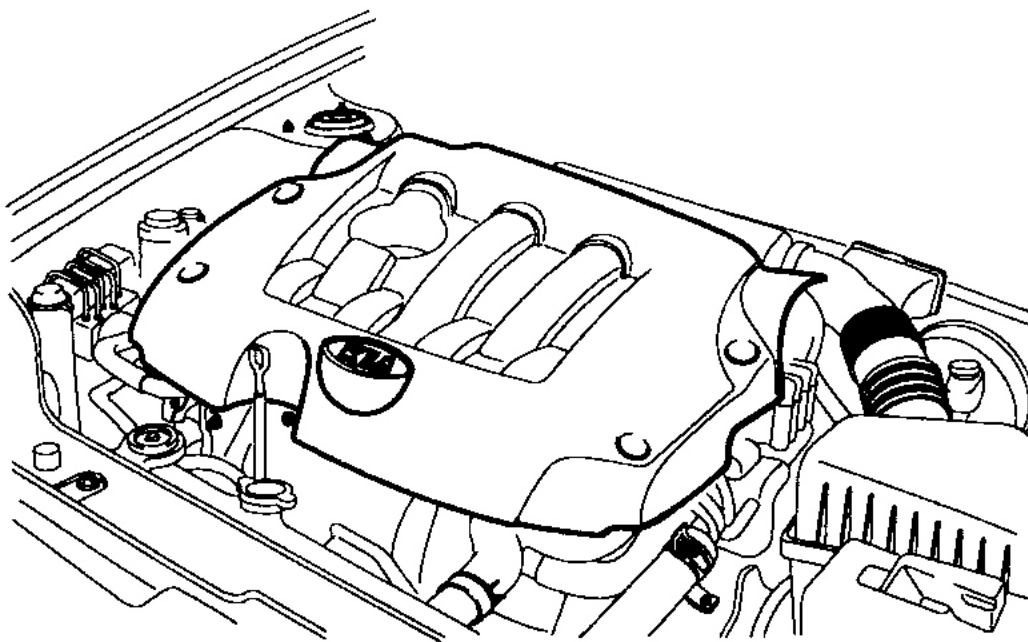
Courtesy of KIA MOTORS AMERICA, INC.

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

MLA (MECHANICAL LASH ADJUSTER)

NOTE: Inspect and adjust the valve clearance when the engine is cold (Engine coolant temperature: $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ [$68^{\circ}\text{F} \pm 9^{\circ}\text{F}$]) and cylinder head is installed on cylinder block.

1. Remove the engine cover.

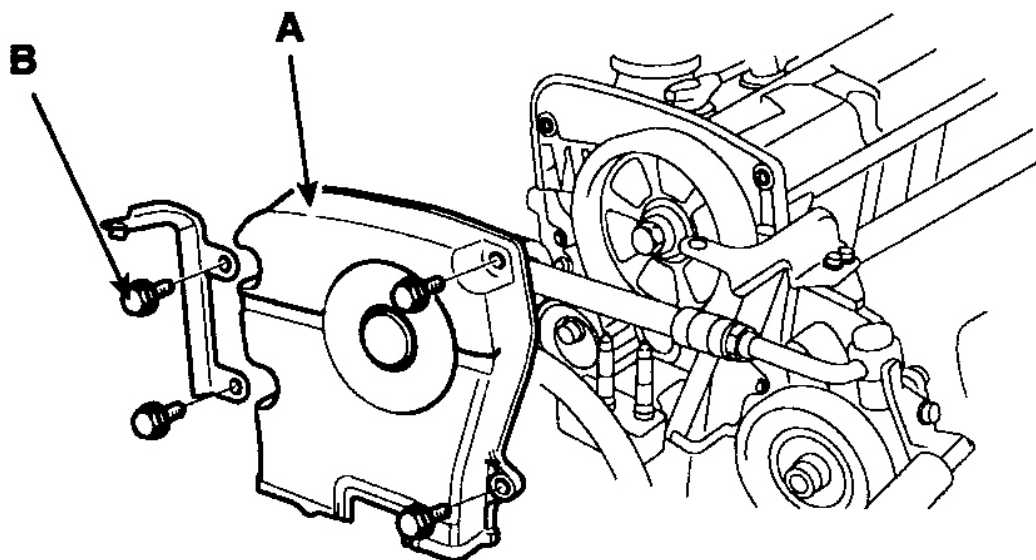


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Fig. 20: Removing Engine Cover

Courtesy of KIA MOTORS AMERICA, INC.

2. Remove the bolts (B) and timing belt upper cover (A).

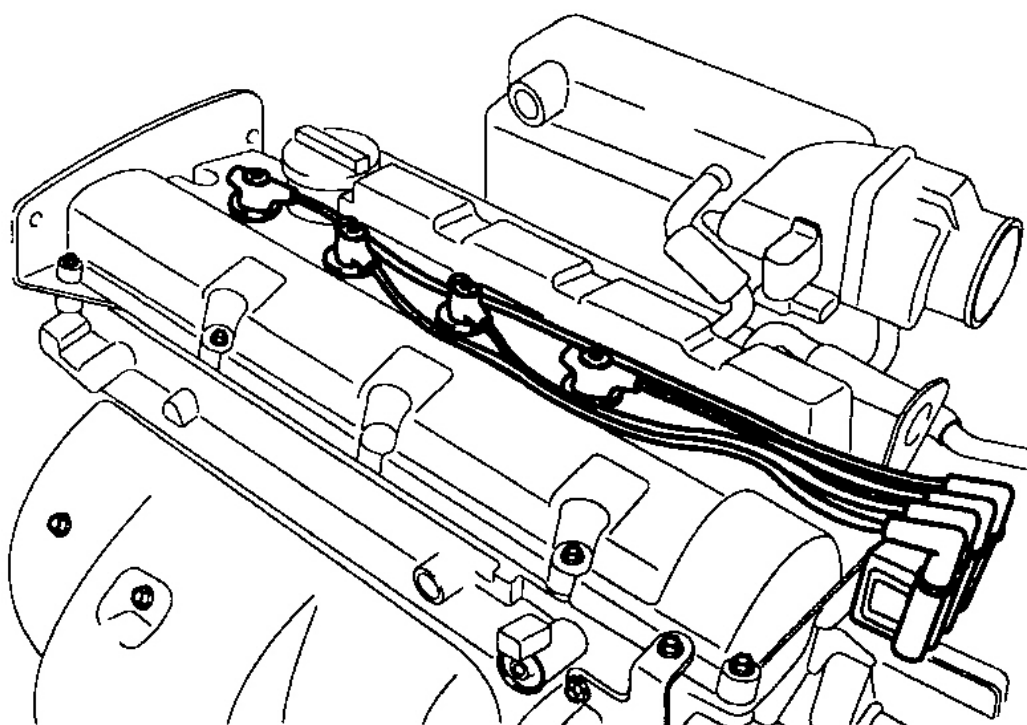


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Fig. 21: Removing Timing Belt Upper Cover
Courtesy of KIA MOTORS AMERICA, INC.

3. Remove the cylinder head cover.
 1. Disconnect the spark plug cables and do not pull on the cable by force.

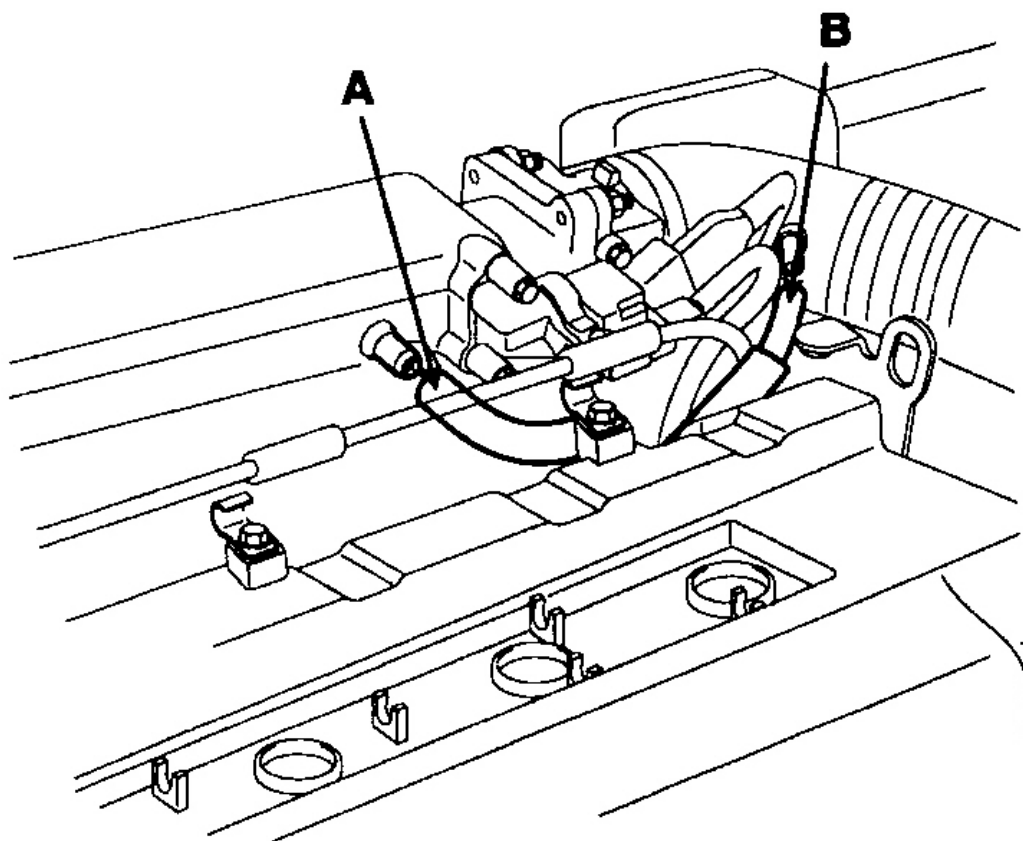
NOTE: Pulling on or bending the cables may damage the conductor inside.



G03820970

Fig. 22: Disconnecting Spark Plug Cables
Courtesy of KIA MOTORS AMERICA, INC.

2. Remove the PCV (Positive Crankcase Ventilation) hose (A) and the breather hose (B) from the cylinder head cover.

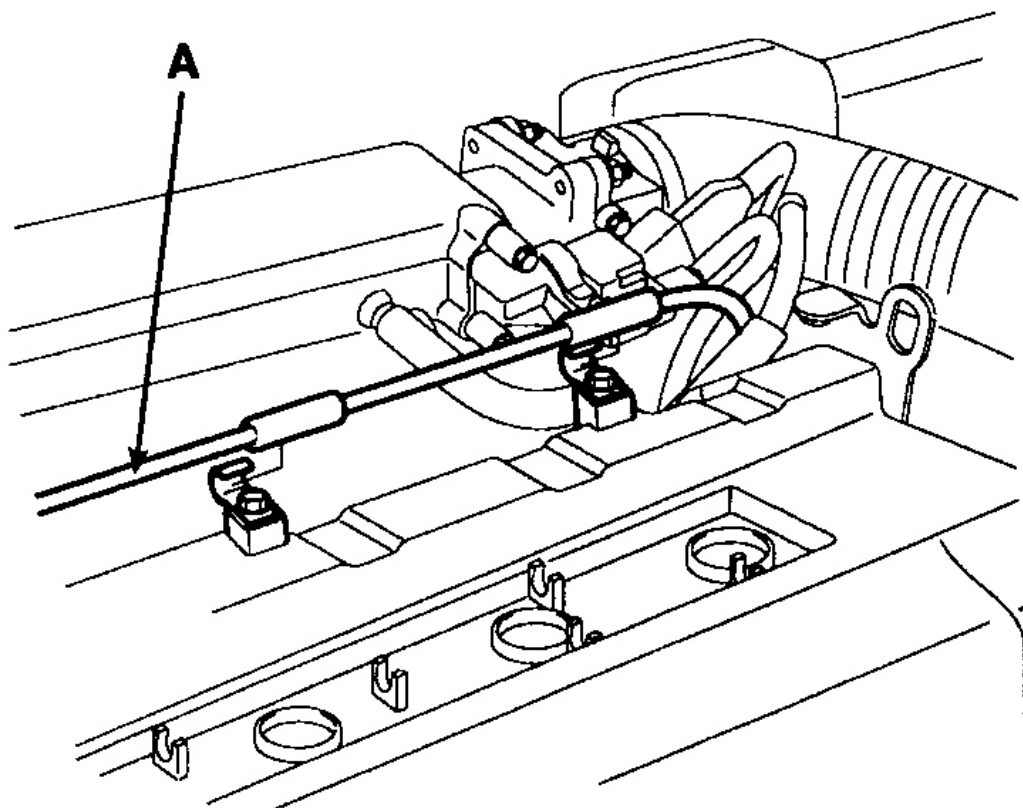


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Fig. 23: Removing Positive Crankcase Ventilation Hose And Breather Hose From Cylinder Head Cover

Courtesy of KIA MOTORS AMERICA, INC.

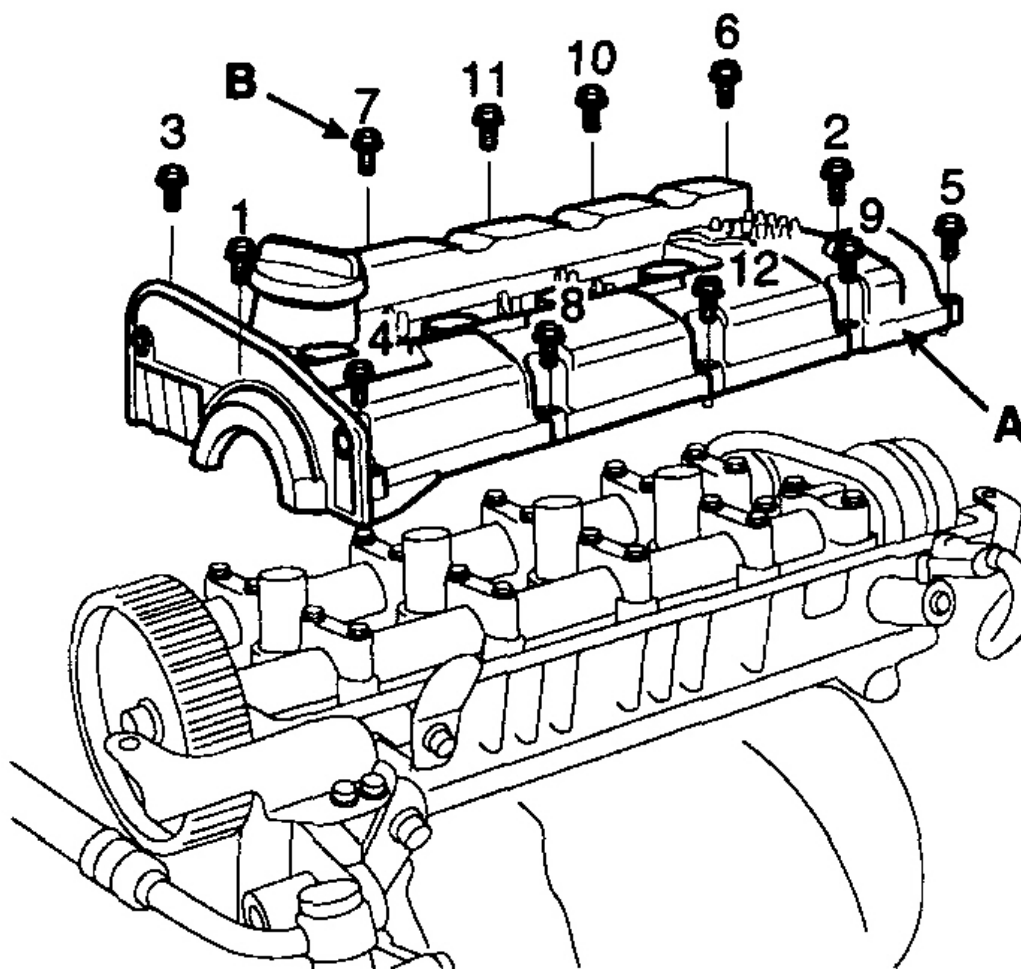
3. Remove the accelerator cable (A) from the cylinder head cover.



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Fig. 24: Removing Accelerator Cable From Cylinder Head Cover
Courtesy of KIA MOTORS AMERICA, INC.

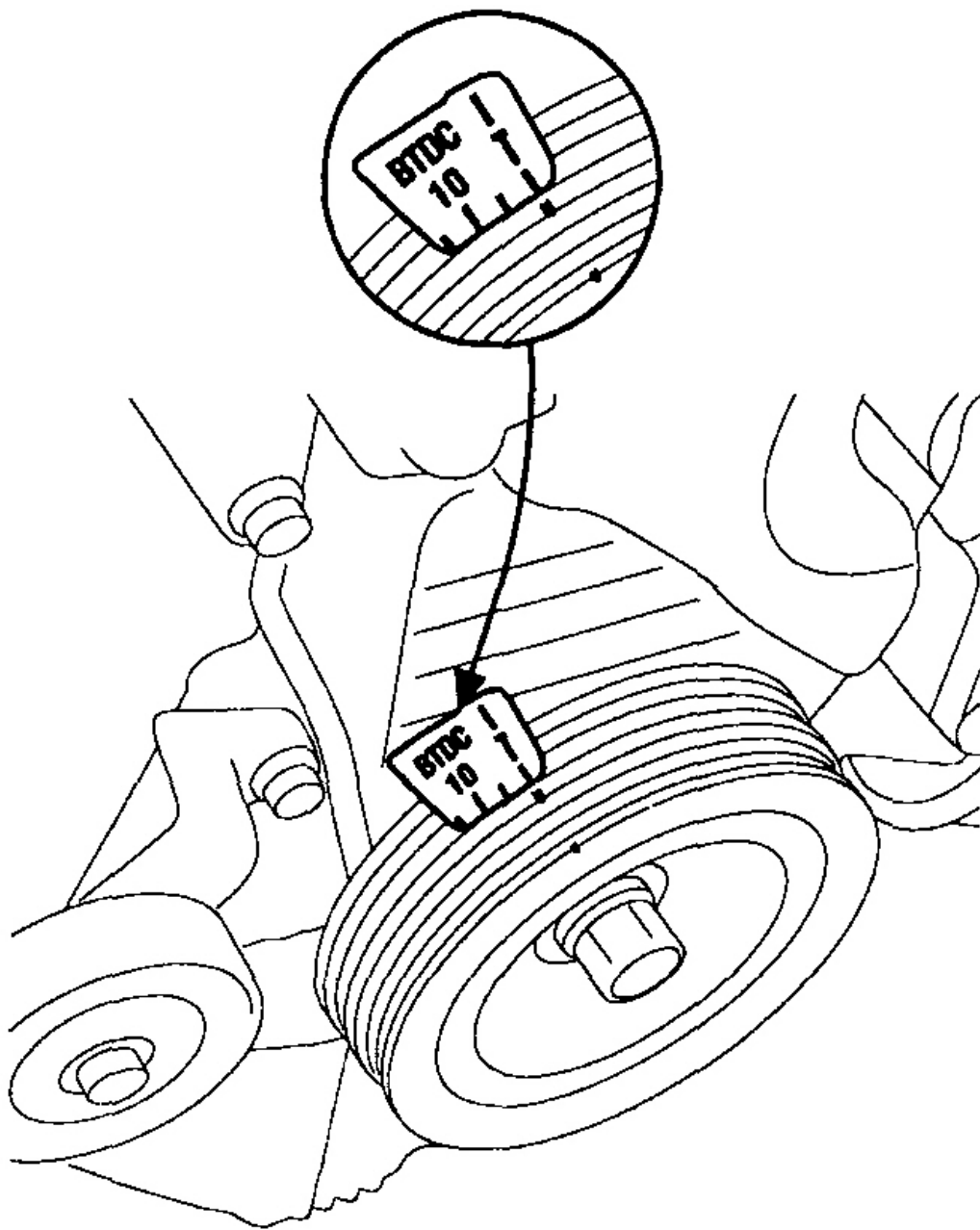
4. Loosen the cylinder head cover bolts (B) and then remove the cover (A) and gasket.



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Fig. 25: Removing Cylinder Head Cover And Gasket
Courtesy of KIA MOTORS AMERICA, INC.

4. Set No. 1 cylinder to TDC/compression.
 1. Turn the crankshaft pulley and align its groove with the timing mark "T" of the lower timing belt cover.



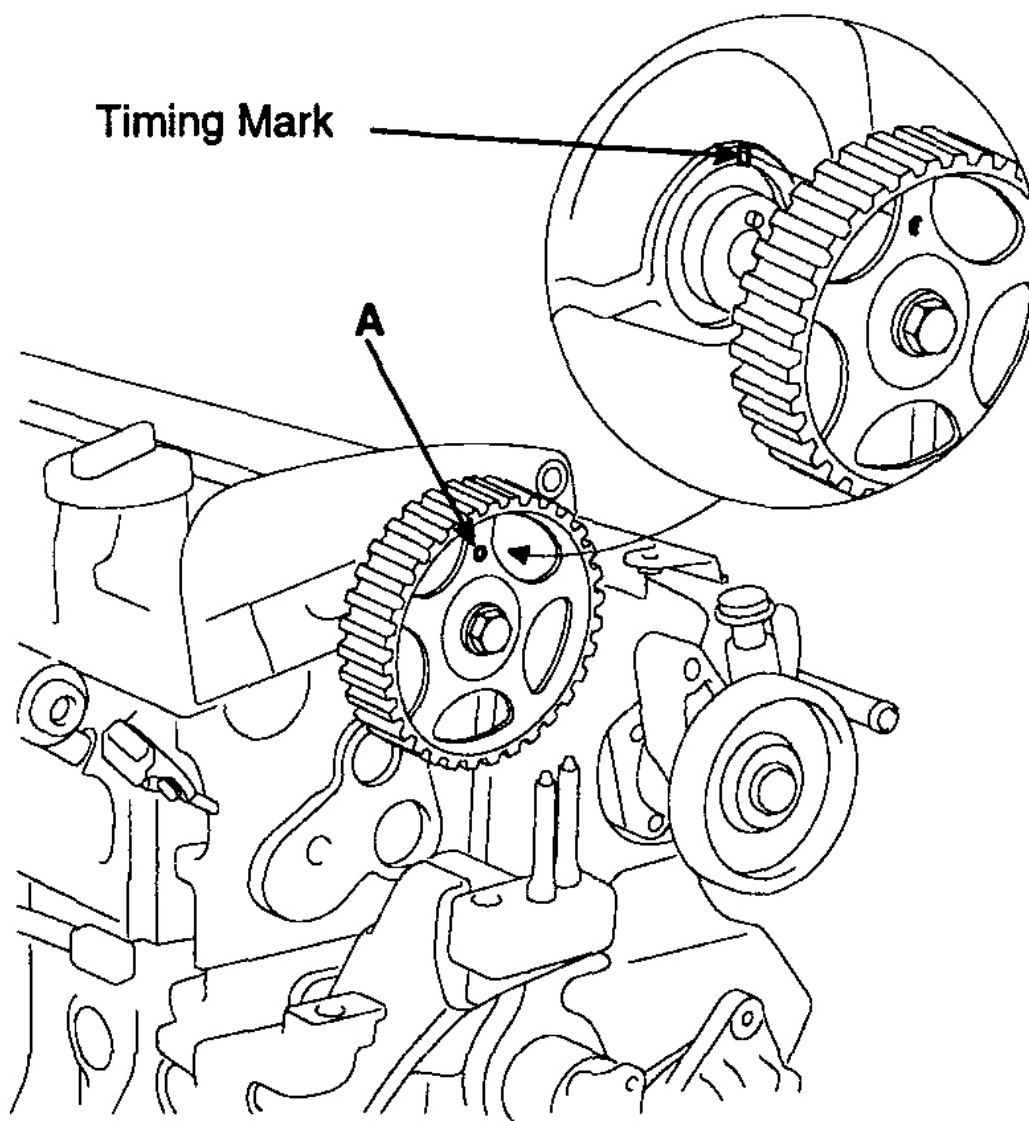
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Fig. 26: Aligning Crankshaft Pulley Groove Marks With Lower Timing Belt Cover Timing Mark (1 Of 2)

Courtesy of KIA MOTORS AMERICA, INC.

2. Check that the hole of the camshaft timing pulley (A) is aligned with the timing mark of the bearing cap.

If not, turn the crankshaft one revolution (360°).



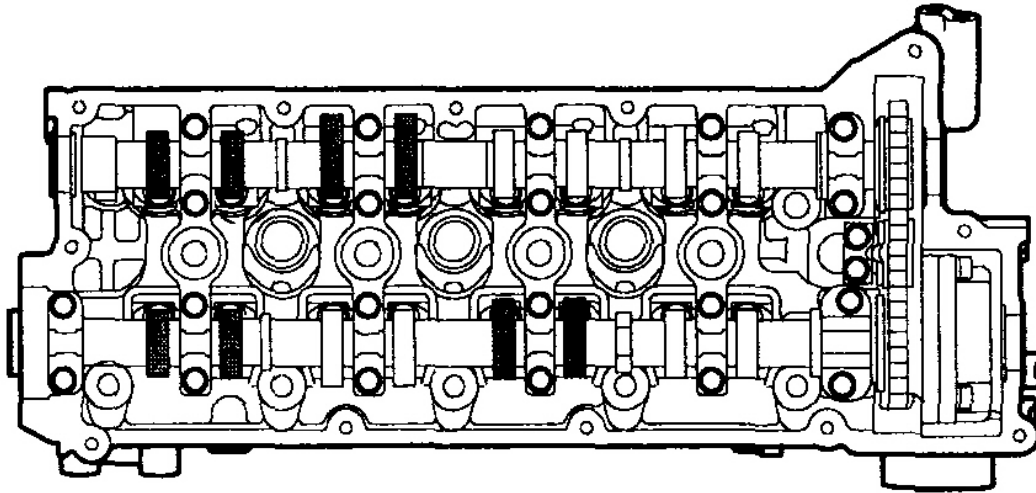
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Fig. 27: Aligning Crankshaft Pulley Groove Marks With Lower Timing Belt Cover Timing Mark (2 Of 2)

Courtesy of KIA MOTORS AMERICA, INC.

5. Inspect the valve clearance.

1. Check only the valve indicated as shown. [No. 1 cylinder: TDC/compression]. Measure the valve clearance.



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Fig. 28: Inspecting Valve Clearance (1 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

- Using a thickness gauge, measure the clearance between the tappet shim and the base circle of camshaft.
- Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance

[Specification]

Engine coolant temperature: (20°C +/- 5°C[68°F +/- 9°F])

Intake: 0.20mm (0.0079in)

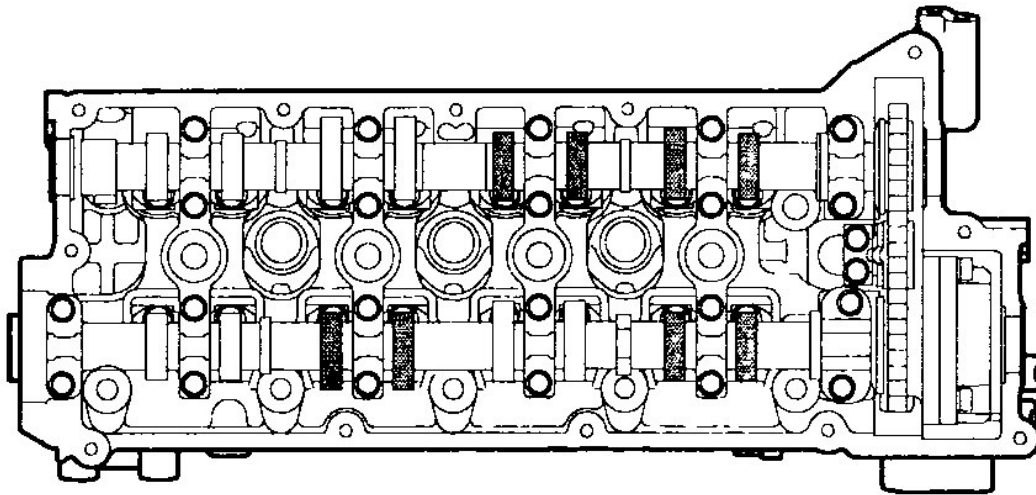
Exhaust: 0.28mm (0.0110in)

[Limit]

Intake: 0.12 ~ 0.28mm (0.0047 ~ 0.0110in)

Exhaust: 0.20 ~ 0.38mm (0.0079 ~ 0.0150in)

2. Turn the crankshaft pulley one revolution (360°) and align the groove with the timing mark "T" of lower timing belt cover.
3. Check only valves indicated as shown. [No. 4 cylinder: TDC/compression]. Measure the valve clearance. (See procedure step 1)



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Fig. 29: Inspecting Valve Clearance (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

6. Adjust the intake and exhaust valve clearance.
 1. Turn the crankshaft so that the cam lobe of the camshaft on the adjusting valve is upward.
 2. Using the SST(09220 - 2D000), press down the valve lifter and place the stopper between the camshaft and valve lifter and remove the special tool.

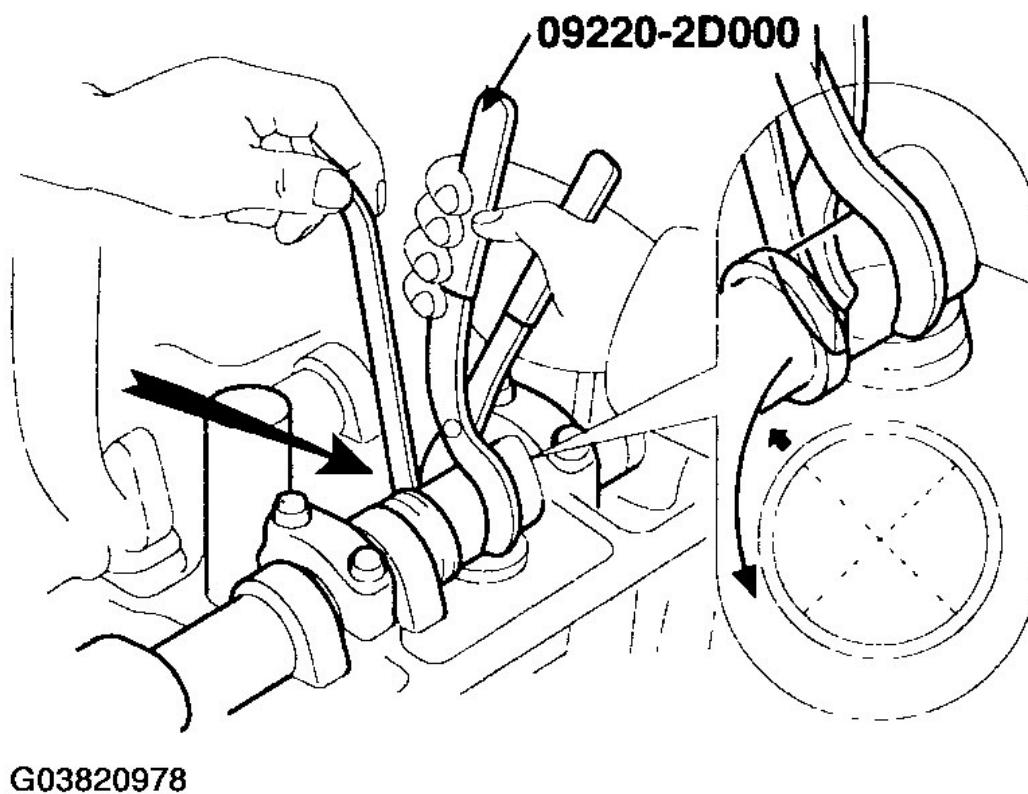
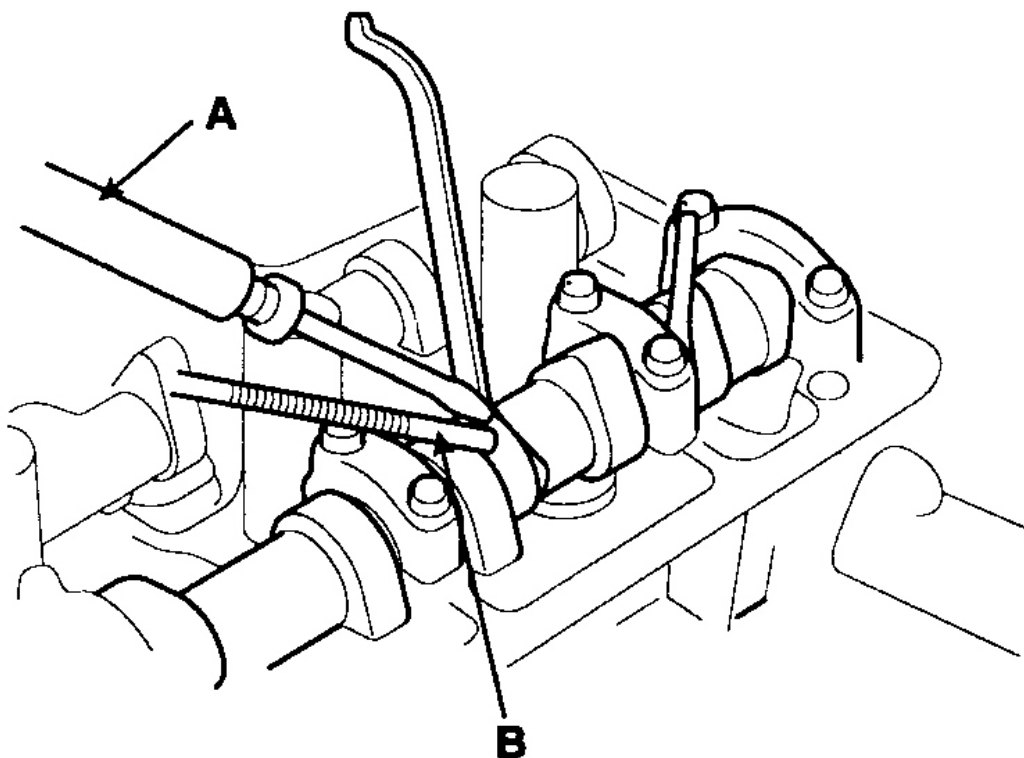


Fig. 30: Adjusting Intake And Exhaust Valve Clearance
Courtesy of KIA MOTORS AMERICA, INC.

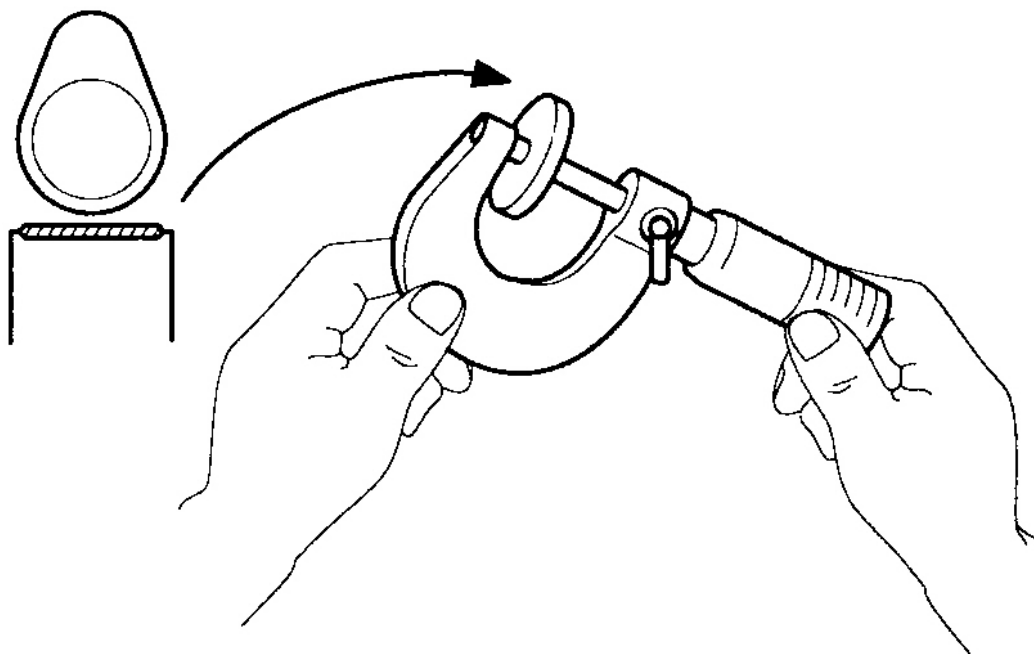
3. Remove the adjusting shim with a small screw driver (A) and magnet (B).



G03820979

Fig. 31: Removing Adjusting Shim And Magnet
Courtesy of KIA MOTORS AMERICA, INC.

4. Measure the thickness of the removed shim using a micrometer.



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Fig. 32: Measuring Shim Thickness

Courtesy of KIA MOTORS AMERICA, INC.

5. Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

Valve clearance

(Engine coolant temperature: 20°C +/- 5°C[68°F +/- 9°F])

T: Thickness of removed shim

A: Measured valve clearance

N: Thickness of new shim

Intake: $N = T + [A - 0.20\text{mm}(0.0079\text{in})]$ Exhaust: $N = T + [A - 0.28\text{mm}(0.0110\text{in})]$

6. Select a new shim with a thickness as close as possible to the calculated value. (Refer to **Fig. 33** and **Fig. 34**)

NOTE: Shims are available in 20 size increments of 0.04mm (0.0016in) from 2.00mm (0.0787in) to 2.76mm (0.1087in)

7. Place a new adjusting shim on the valve lifter.
8. Using the SST(09220 - 2D000), press down the valve lifter and remove the stopper.
9. Recheck the valve clearance.

Valve clearance

(Engine coolant temperature: 20°C +/- 5°C[68°F +/- 9°F])

[Specification]

Intake: 0.20mm (0.0079in)

Exhaust: 0.28 mm (0.0110in)

[Limit] (After adjusting valve clearance)

Intake: 0.17 ~ 0.23mm (0.0067 ~ 0.0091 in)

Exhaust: 0.25 ~ 0.31mm (0.0098 ~ 0.0122in)

2005 Kia Sportage EX

2005-06 ENGINE General - 2.0L - Sportage

Adjusting Shim Selection Chart (Exhaust)

Measured clearance mm (in.)	Installed shim thickness mm (in.)	Measured clearance mm (in.)	Installed shim thickness mm (in.)
0.000-0.020 (0.0000-0.0008)	2.00 (0.0787)	0.021-0.040 (0.0008-0.0016)	2.02 (0.0789)
0.021-0.040 (0.0008-0.0016)	2.04 (0.0803)	0.041-0.060 (0.0016-0.0024)	2.06 (0.0811)
0.041-0.060 (0.0016-0.0024)	2.08 (0.0819)	0.061-0.080 (0.0024-0.0031)	2.10 (0.0827)
0.061-0.080 (0.0024-0.0031)	2.12 (0.0835)	0.081-0.100 (0.0032-0.0039)	2.14 (0.0843)
0.081-0.100 (0.0032-0.0039)	2.16 (0.0851)	0.101-0.120 (0.0040-0.0047)	2.18 (0.0859)
0.101-0.120 (0.0040-0.0047)	2.20 (0.0867)	0.121-0.140 (0.0048-0.0055)	2.22 (0.0875)
0.121-0.140 (0.0048-0.0055)	2.24 (0.0883)	0.141-0.160 (0.0056-0.0063)	2.26 (0.0891)
0.141-0.160 (0.0056-0.0063)	2.28 (0.0899)	0.161-0.180 (0.0063-0.0071)	2.30 (0.0907)
0.161-0.180 (0.0063-0.0071)	2.32 (0.0915)	0.181-0.199 (0.0071-0.0078)	2.34 (0.0923)
0.181-0.199 (0.0071-0.0078)	2.36 (0.0931)	0.200-0.360 (0.0079-0.0142)	2.38 (0.0939)
0.200-0.360 (0.0079-0.0142)	2.40 (0.0947)	0.361-0.380 (0.0142-0.0150)	2.42 (0.0955)
0.361-0.380 (0.0142-0.0150)	2.44 (0.0963)	0.381-0.400 (0.0150-0.0157)	2.46 (0.0971)
0.381-0.400 (0.0150-0.0157)	2.48 (0.0979)	0.401-0.420 (0.0158-0.0165)	2.50 (0.0987)
0.401-0.420 (0.0158-0.0165)	2.52 (0.0995)	0.421-0.440 (0.0166-0.0173)	2.54 (0.1003)
0.421-0.440 (0.0166-0.0173)	2.56 (0.1011)	0.441-0.460 (0.0174-0.0181)	2.58 (0.1019)
0.441-0.460 (0.0174-0.0181)	2.60 (0.1027)	0.461-0.480 (0.0181-0.0189)	2.62 (0.1035)
0.461-0.480 (0.0181-0.0189)	2.64 (0.1043)	0.481-0.500 (0.0189-0.0197)	2.66 (0.1051)
0.481-0.500 (0.0189-0.0197)	2.68 (0.1059)	0.501-0.520 (0.0197-0.0205)	2.70 (0.1067)
0.501-0.520 (0.0197-0.0205)	2.72 (0.1075)	0.521-0.540 (0.0205-0.0213)	2.74 (0.1083)
0.521-0.540 (0.0205-0.0213)	2.76 (0.1091)	0.541-0.560 (0.0213-0.0220)	2.78 (0.1099)
0.541-0.560 (0.0213-0.0220)	2.80 (0.1107)	0.561-0.580 (0.0221-0.0229)	2.82 (0.1115)
0.561-0.580 (0.0221-0.0229)	2.84 (0.1123)	0.581-0.600 (0.0229-0.0236)	2.86 (0.1131)
0.581-0.600 (0.0229-0.0236)	2.88 (0.1139)	0.601-0.620 (0.0237-0.0244)	2.90 (0.1147)
0.601-0.620 (0.0237-0.0244)	2.92 (0.1155)	0.621-0.640 (0.0244-0.0252)	2.94 (0.1163)
0.621-0.640 (0.0244-0.0252)	2.96 (0.1171)	0.641-0.660 (0.0252-0.0259)	2.98 (0.1179)
0.641-0.660 (0.0252-0.0259)	3.00 (0.1187)	0.661-0.680 (0.0260-0.0268)	3.02 (0.1195)
0.661-0.680 (0.0260-0.0268)	3.04 (0.1203)	0.681-0.700 (0.0268-0.0276)	3.06 (0.1211)
0.681-0.700 (0.0268-0.0276)	3.08 (0.1219)	0.701-0.720 (0.0276-0.0283)	3.10 (0.1227)
0.701-0.720 (0.0276-0.0283)	3.12 (0.1235)	0.721-0.740 (0.0284-0.0291)	3.14 (0.1243)
0.721-0.740 (0.0284-0.0291)	3.16 (0.1251)	0.741-0.760 (0.0292-0.0299)	3.18 (0.1259)
0.741-0.760 (0.0292-0.0299)	3.20 (0.1267)	0.761-0.780 (0.0300-0.0307)	3.22 (0.1275)
0.761-0.780 (0.0300-0.0307)	3.24 (0.1283)	0.781-0.800 (0.0307-0.0315)	3.26 (0.1291)
0.781-0.800 (0.0307-0.0315)	3.28 (0.1299)	0.801-0.820 (0.0315-0.0323)	3.30 (0.1307)
0.801-0.820 (0.0315-0.0323)	3.32 (0.1315)	0.821-0.840 (0.0323-0.0331)	3.34 (0.1323)
0.821-0.840 (0.0323-0.0331)	3.36 (0.1331)	0.841-0.860 (0.0331-0.0339)	3.38 (0.1339)
0.841-0.860 (0.0331-0.0339)	3.40 (0.1347)	0.861-0.880 (0.0339-0.0346)	3.42 (0.1355)
0.861-0.880 (0.0339-0.0346)	3.44 (0.1363)	0.881-0.900 (0.0347-0.0354)	3.46 (0.1371)
0.881-0.900 (0.0347-0.0354)	3.48 (0.1379)	0.901-0.920 (0.0355-0.0362)	3.50 (0.1387)
0.901-0.920 (0.0355-0.0362)	3.52 (0.1395)	0.921-0.940 (0.0363-0.0370)	3.54 (0.1403)
0.921-0.940 (0.0363-0.0370)	3.56 (0.1411)	0.941-0.960 (0.0370-0.0378)	3.58 (0.1419)
0.941-0.960 (0.0370-0.0378)	3.60 (0.1427)	0.961-0.980 (0.0378-0.0386)	3.62 (0.1435)
0.961-0.980 (0.0378-0.0386)	3.64 (0.1443)	0.981-1.000 (0.0386-0.0394)	3.66 (0.1451)
0.981-1.000 (0.0386-0.0394)	3.68 (0.1459)	1.001-1.020 (0.0394-0.0402)	3.70 (0.1467)
1.001-1.020 (0.0394-0.0402)	3.72 (0.1475)	1.021-1.040 (0.0402-0.0409)	3.74 (0.1483)
1.021-1.040 (0.0402-0.0409)	3.76 (0.1491)	1.041-1.060 (0.0410-0.0417)	3.78 (0.1500)

Shim No.	Thickness	Shim No.	Thickness
1	2.00 (0.0787)	11	2.40 (0.0945)
2	2.04 (0.0803)	12	2.44 (0.0961)
3	2.08 (0.0819)	13	2.48 (0.0976)
4	2.12 (0.0835)	14	2.52 (0.0992)
5	2.16 (0.0850)	15	2.56 (0.1008)
6	2.20 (0.0866)	16	2.60 (0.1024)
7	2.24 (0.0882)	17	2.64 (0.1039)
8	2.28 (0.0898)	18	2.68 (0.1055)
9	2.32 (0.0913)	19	2.72 (0.1071)
10	2.36 (0.0929)	20	2.76 (0.1087)

Exhaust valve clearance (cold):
0.26 mm (Spec.), 0.20-0.36 mm (Limit)
Example: The 2.24 mm shim is installed, and the measured clearance is 0.450 mm.
Replace the 2.24 mm shim with a new No.11 shim.

HINT: New shims have the thickness in millimeters imprinted on the face

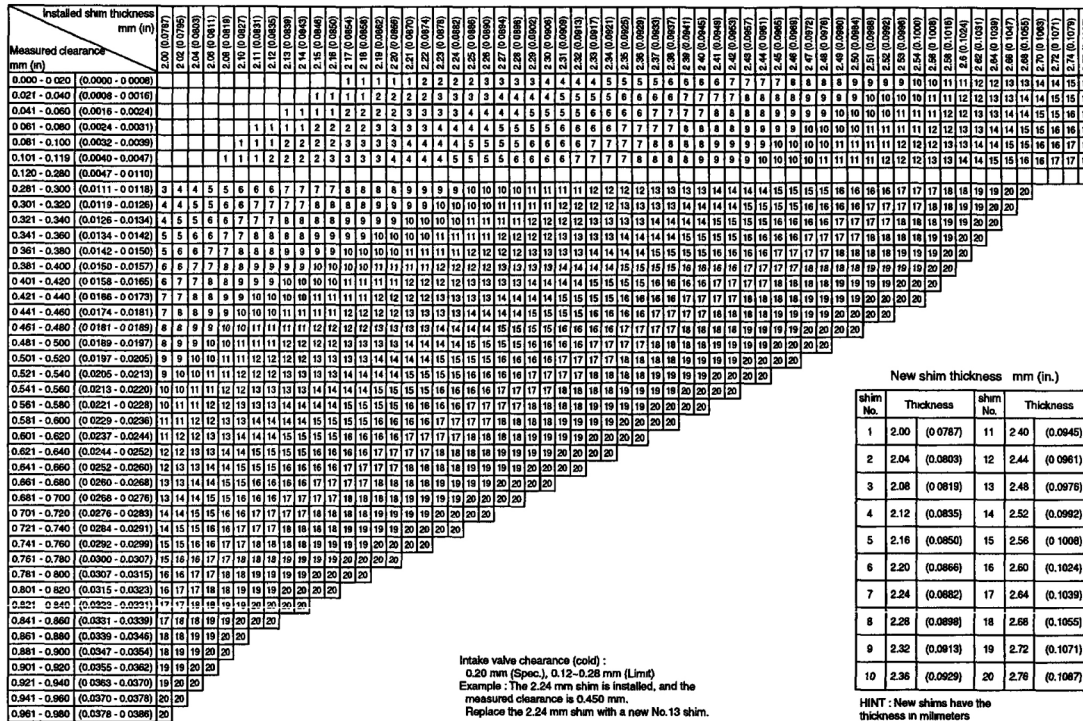
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Fig. 33: Adjusting Shim Selection Chart (Exhaust)
Courtesy of KIA MOTORS AMERICA, INC.

2005 Kia Sportage EX

2005-06 ENGINE General - 2.0L - Sportage

Adjusting Shim Selection Chart (Intake)



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Fig. 34: Adjusting Shim Selection Chart (Intake)
Courtesy of KIA MOTORS AMERICA, INC.

TROUBLESHOOTING

TROUBLESHOOTING

Symptom	Suspect area	Remedy
Engine misfire with abnormal internal lower engine noises.	Loose or improperly installed engine flywheel.	Repair or replace the flywheel as required.
	Worn piston rings. (Oil consumption may or may not cause the engine to misfire.)	Inspect the cylinder for a loss of compression. Repair or replace as required.
	Worn crankshaft thrust bearings.	Replace the crankshaft and bearings as required.
Engine misfire with abnormal valve train noise.	Stuck valves. (Carbon buildup on the valve stem can cause the valve not to close properly.)	Repair or replace as required.
	Excessive worn or mis-aligned timing chain.	Replace the timing chain and sprocket as required.
	Worn camshaft lobes.	Replace the camshaft and valve lifters.

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Engine misfire with coolant consumption	- Faulty cylinder head gasket and/or cracking or other damage to the cylinder head and engine block cooling system. - Coolant consumption may or may not cause the engine to overheat.	- Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket. - Repair or replace as required.
Engine misfire with excessive oil consumption	Worn valves, valve guides and/or valve stem oil seals.	Repair or replace as required.
	Worn piston rings. (Oil consumption may or may not cause the engine to misfire)	Inspect the cylinder for a loss of compression Repair or replace as required.
Engine noise on start-up, but only lasting a few seconds.	Incorrect oil viscosity.	Drain the oil. Refill with the correct viscosity oil.
	Worn crankshaft thrust bearing.	Inspect the thrust bearing and crankshaft. Repair or replace as required.
Upper engine noise, regardless of engine speed.	Low oil pressure.	Repair or replace as required.
	Broken valve spring.	Replace the valve spring.
	Worn or dirty valve lifters.	Replace the valve lifters.
	Stretched or broken timing chain and/or damaged sprocket teeth.	Replace the timing chain and sprockets.
	Worn timing chain tensioner, if applicable.	Replace the timing chain tensioner as required.
	Worn camshaft lobes.	Inspect the camshaft lobes. Replace the camshaft and valve lifters as required.
	Worn valve guides or valve stems.	Inspect the valves and valve guides, then repair as required.
	Stuck valves. (Carbon on the valve stem or valve seat may cause the valve to stay open.)	Inspect the valves and valve guides, then repair as required.
Lower engine noise,	Low oil pressure.	Repair or replace damaged components as required.
	Loose or damaged flywheel.	Repair or replace the flywheel.
	Damaged oil pan, contacting the oil pump screen.	Inspect the oil pan. Inspect the oil pump screen. Repair or replace as required.
	Oil pump screen loose, damaged or restricted.	Inspect the oil pump screen. Repair or replace as required.
	Excessive piston-to-cylinder bore clearance.	Inspect the piston and cylinder bore. Repair as required.
	Excessive piston pin-to-bore clearance.	Inspect the piston, piston pin and the connecting rod. Repair or replace as required.
		Inspect the following components

2005 Kia Sportage EX

2005-06 ENGINE General - 2.0L - Sportage

regardless of engine speed.	Excessive connecting rod bearing clearance.	and repair as required. • The connecting rod bearings. • The connecting rods. • The crankshaft. • The crankshaft journal.
	Excessive crankshaft bearing clearance.	Inspect the following components and repair as required. • The crankshaft bearings. • The crankshaft journals.
	Incorrect piston, piston pin and connecting rod installation.	Verify the piston pins and connecting rods are installed correctly. Repair as required.
Engine noise under load.	Low oil pressure.	Repair or replace as required.
	Excessive connecting rod bearing clearance.	Inspect the following components and repair as required. • The connecting rod bearings. • The connecting rods. • The crankshaft.
	Excessive crankshaft bearing clearance.	Inspect the following components and repair as required. • The crankshaft bearings. • The crankshaft journals. • The cylinder block crankshaft bearing bore.
Engine will not crank, (crankshaft will not rotate)	Hydraulically locked cylinder. • Coolant/antifreeze in cylinder. • Oil in cylinder. • Fuel in cylinder.	Remove spark plugs and check for fluid. Inspect for broken head gasket. Inspect for cracked engine block or cylinder head. Inspect for a sticking fuel injector and/or leaking fuel regulator.
	Broken timing chain and/or timing chain gears.	Inspect timing chain and gears. Repair as required.
	Foreign material in cylinder. • Broken valve. • Piston material. • Foreign material.	Inspect cylinder for damaged components and/or foreign materials. Repair or replace as required.
	Seized crankshaft or connecting rod	Inspect crankshaft and connecting

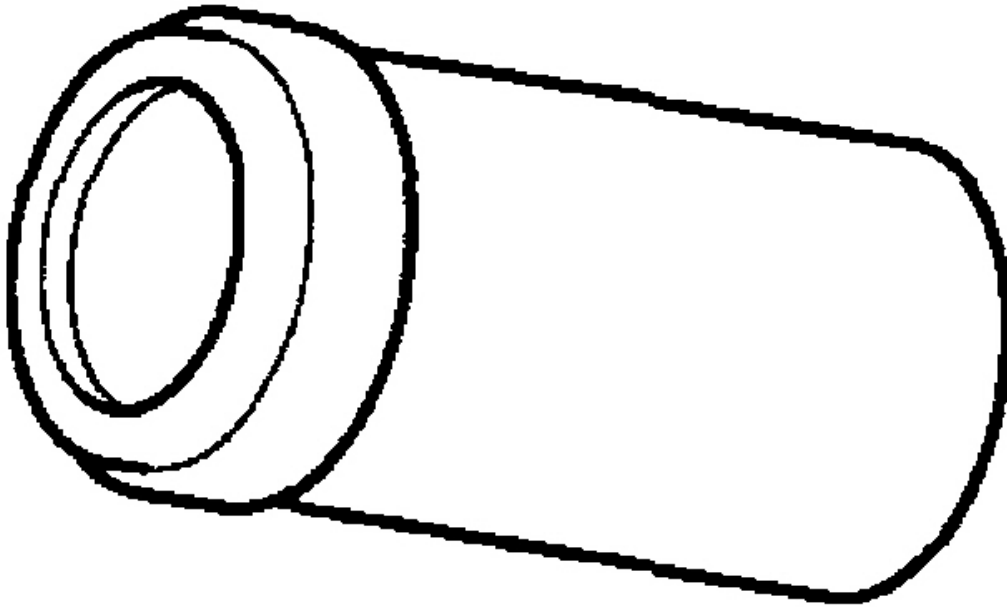
2005 Kia Sportage EX

2005-06 ENGINE General - 2.0L - Sportage

	bearings.	rod bearing. Repair or replace as required.
	Bent or broken connecting rod.	Inspect connecting rods. Repair or replace as required.
	Broken crankshaft.	Inspect crankshaft. Repair or replace as required.

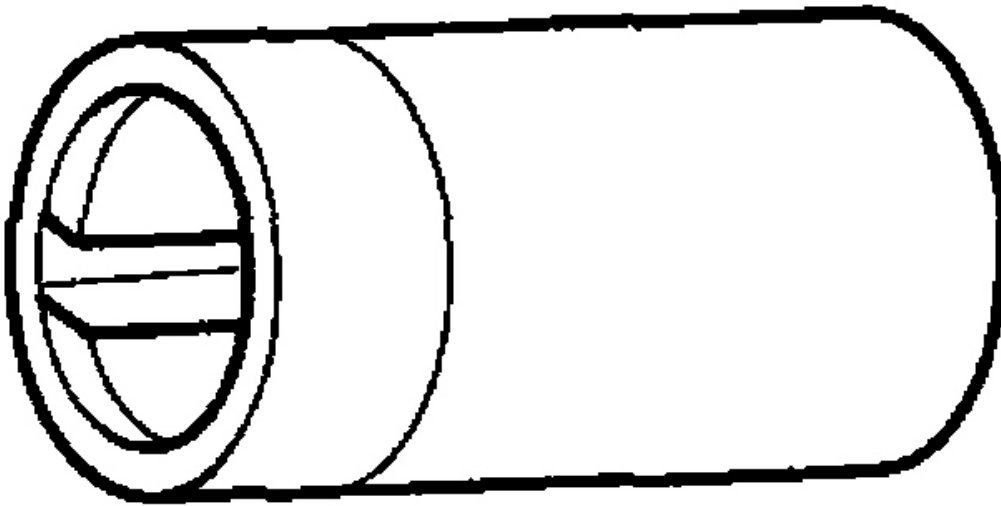
SPECIAL SERVICE TOOLS**SPECIAL SERVICE TOOLS DESCRIPTIONS**

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09214-32000)	Fig. 35	Installation of the front oil seal
Crankshaft front oil seal guide (09214-32100)	Fig. 36	Installation of the front oil seal
Valve clearance adjust tool set (09220-2D000)	Fig. 37	Removal and installation of the tappet shim
Camshaft oil seal installer (09221-21000)	Fig. 38	Installation of the camshaft oil seal
Valve guide remover (09221-3F100 (A)) Valve guide installer (09221-3F100 (B))	Fig. 39	Removal and installation of the valve guide
Valve stem oil seal installer (09222-22001)	Fig. 40	Installation of the valve stem oil seal
Valve spring compressor (09222-28000) Valve spring compressor adaptor (09222-28100)	Fig. 41	Removal and installation of the intake or exhaust valve
Crankshaft rear oil seal installer (09231-21000)	Fig. 42	Installation of the crankshaft rear oil seal



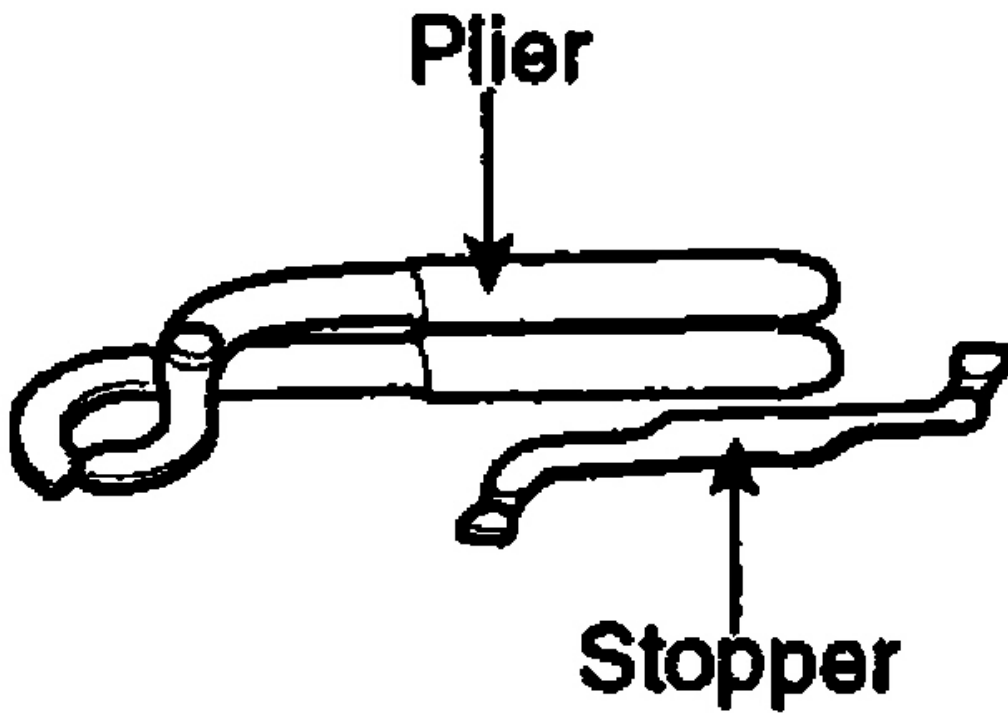
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Fig. 35: View Of Crankshaft Front Oil Seal Installer
Courtesy of KIA MOTORS AMERICA, INC.



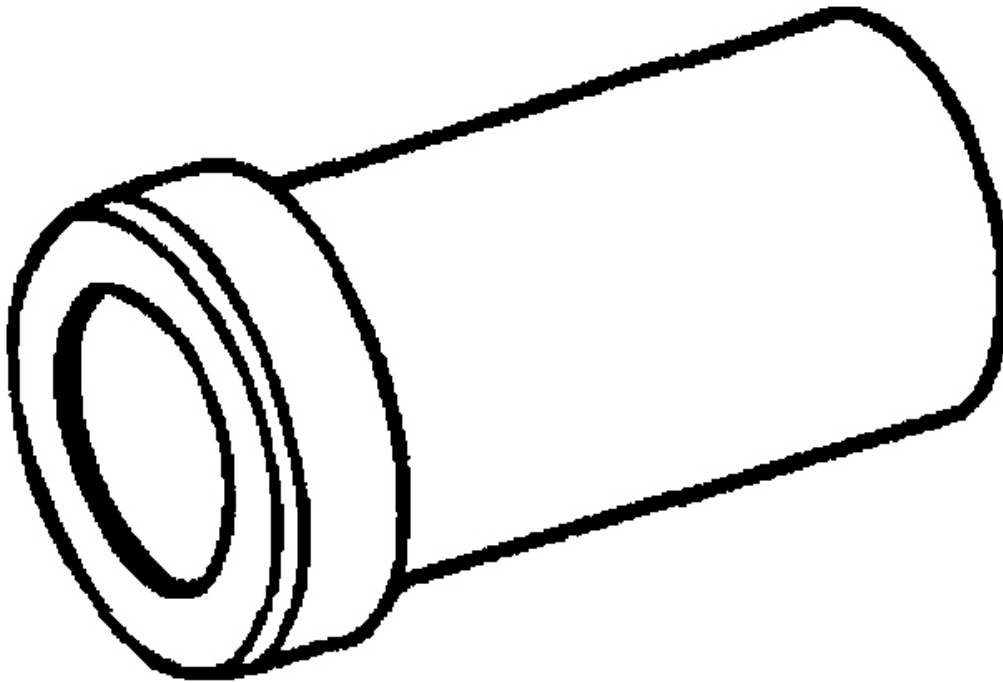
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Fig. 36: View Of Crankshaft Front Oil Seal Guide
Courtesy of KIA MOTORS AMERICA, INC.



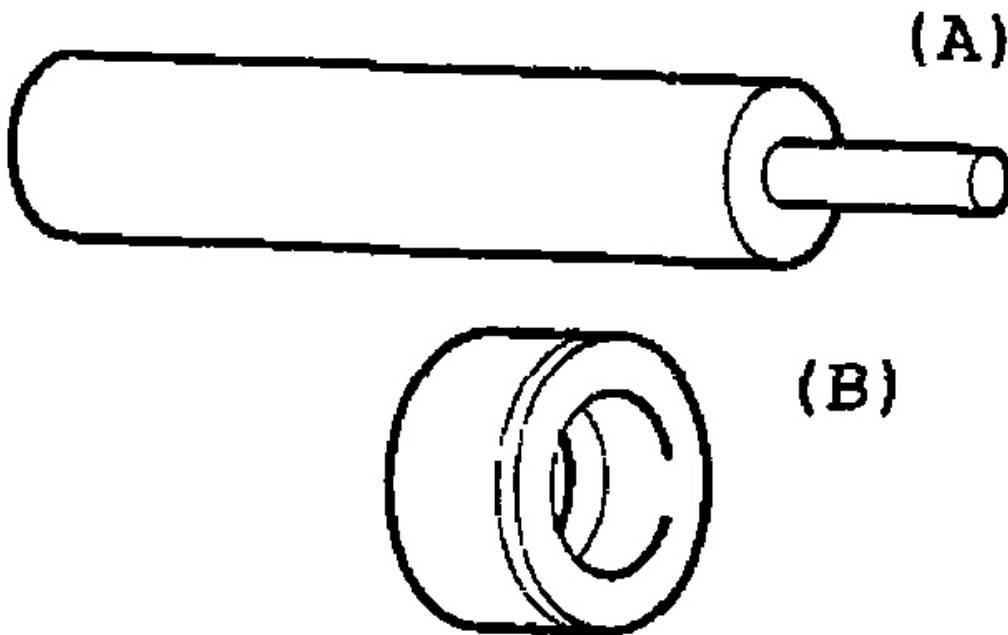
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Fig. 37: View Of Valve Clearance Adjust Tool Set
Courtesy of KIA MOTORS AMERICA, INC.



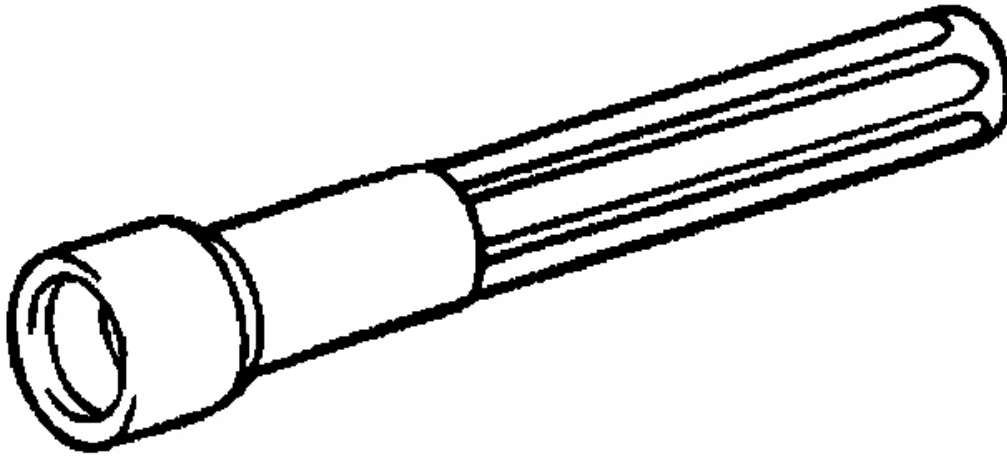
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Fig. 38: View Of Camshaft Oil Seal Installer
Courtesy of KIA MOTORS AMERICA, INC.



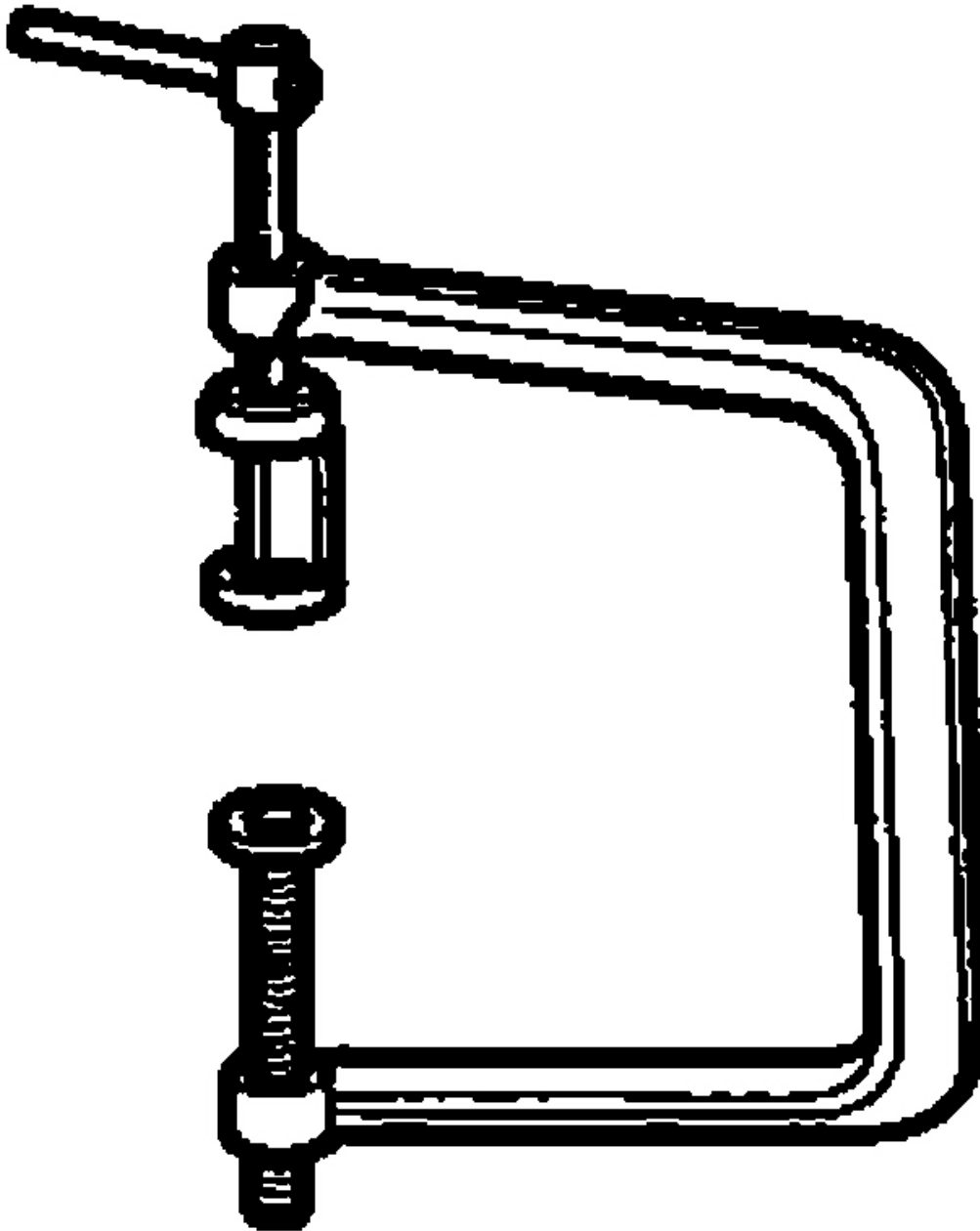
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Fig. 39: View Of Valve Guide Remover
Courtesy of KIA MOTORS AMERICA, INC.



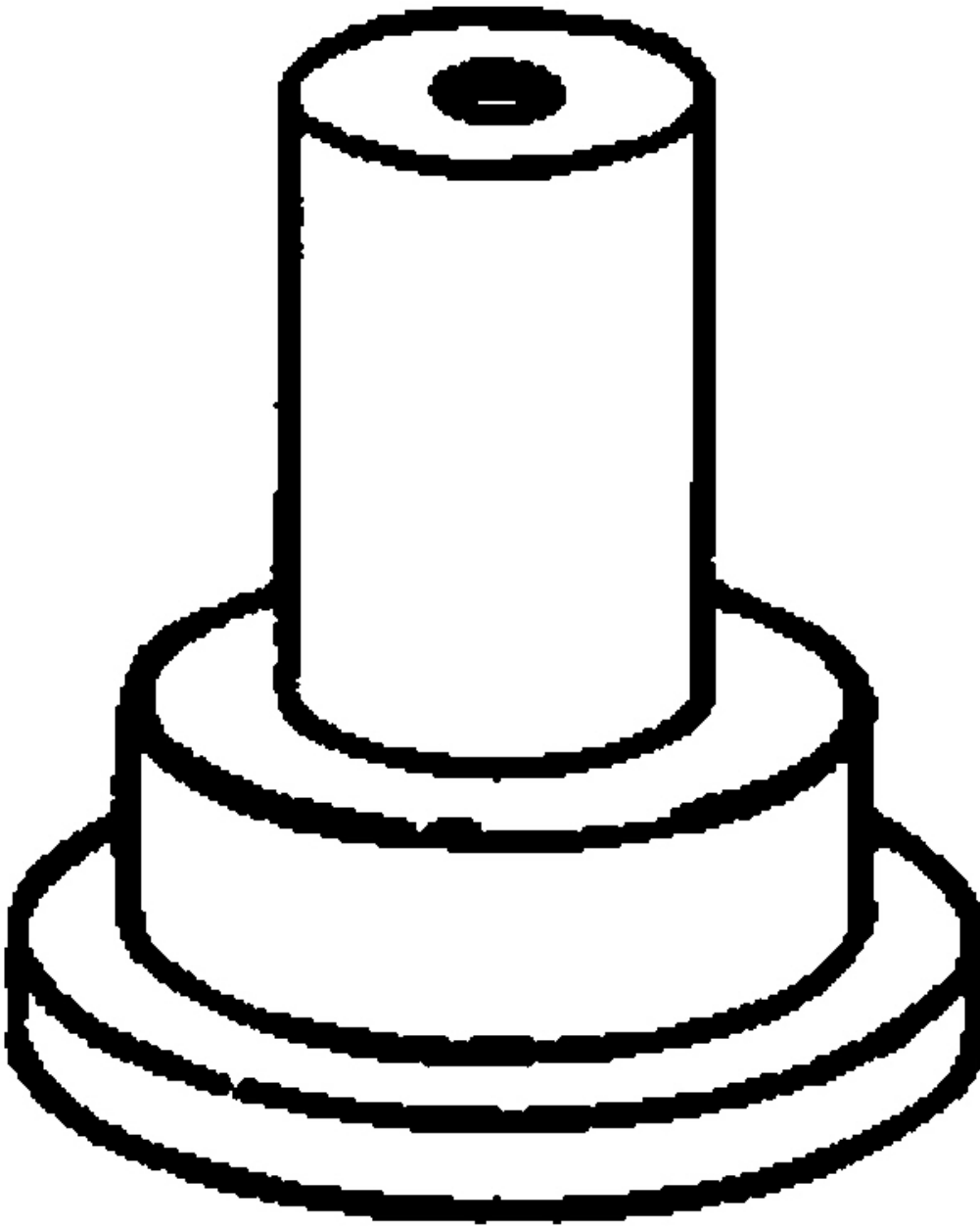
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Fig. 40: View Of Valve Stem Oil Seal Installer
Courtesy of KIA MOTORS AMERICA, INC.



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Fig. 41: View Of Valve Spring Compressor
Courtesy of KIA MOTORS AMERICA, INC.



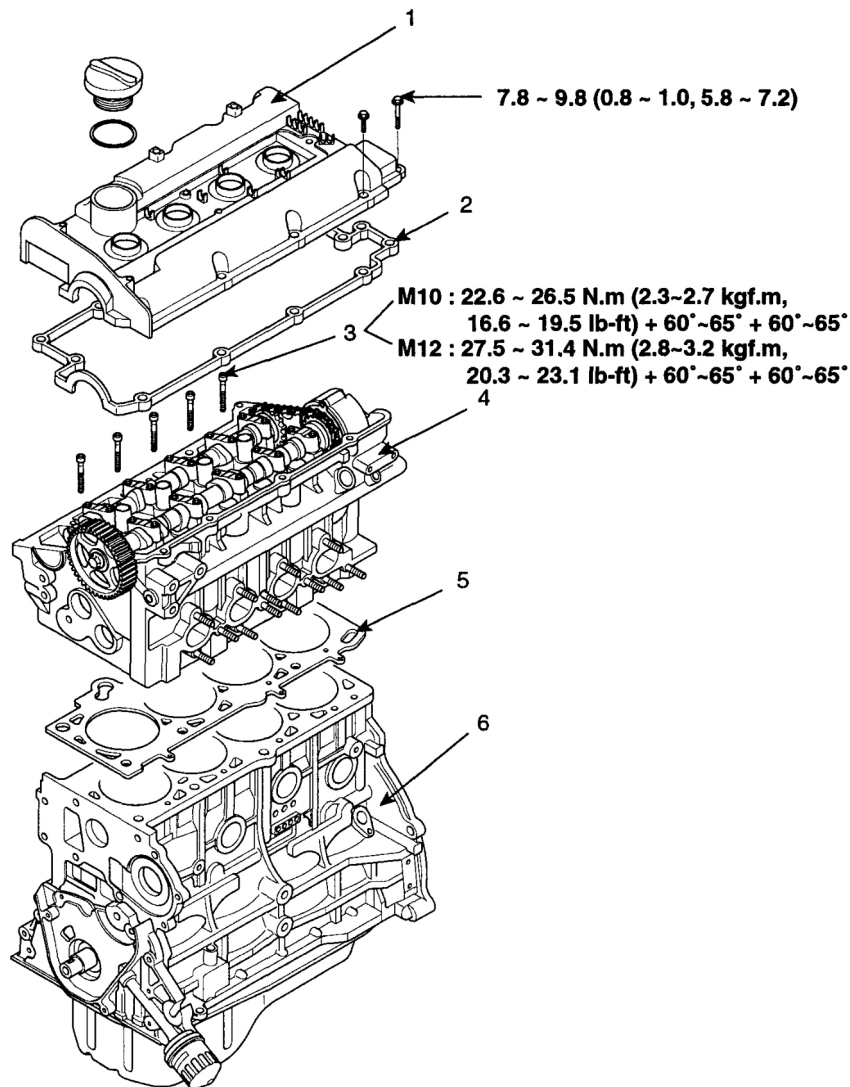
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Fig. 42: View Of Crankshaft Rear Oil Seal Installer
Courtesy of KIA MOTORS AMERICA, INC.

2005-06 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

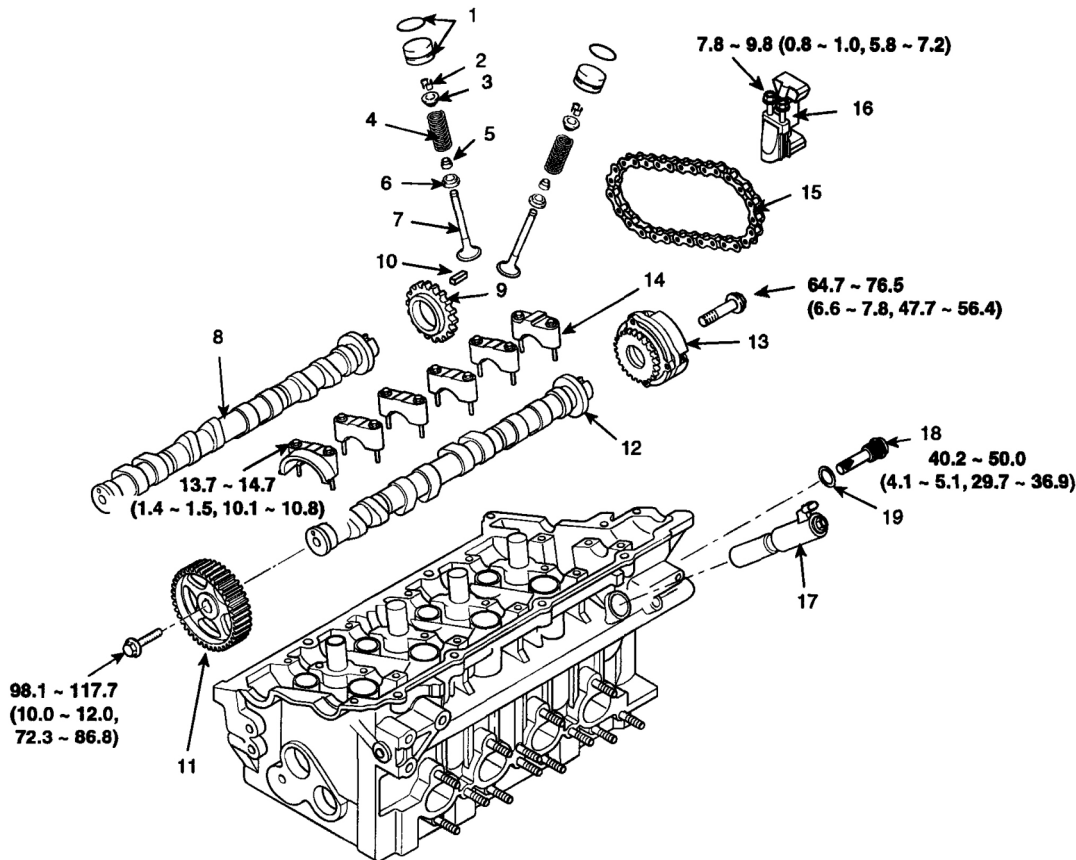
- 4. Cylinder head
- 5. Cylinder head gasket
- 6. Cylinder block

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

2005 Kia Sportage EX

2005-06 ENGINE Cylinder Head Assembly - 2.0L - Sportage



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 (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

REMOVAL

Engine removal is not required for this procedure.

CAUTION:

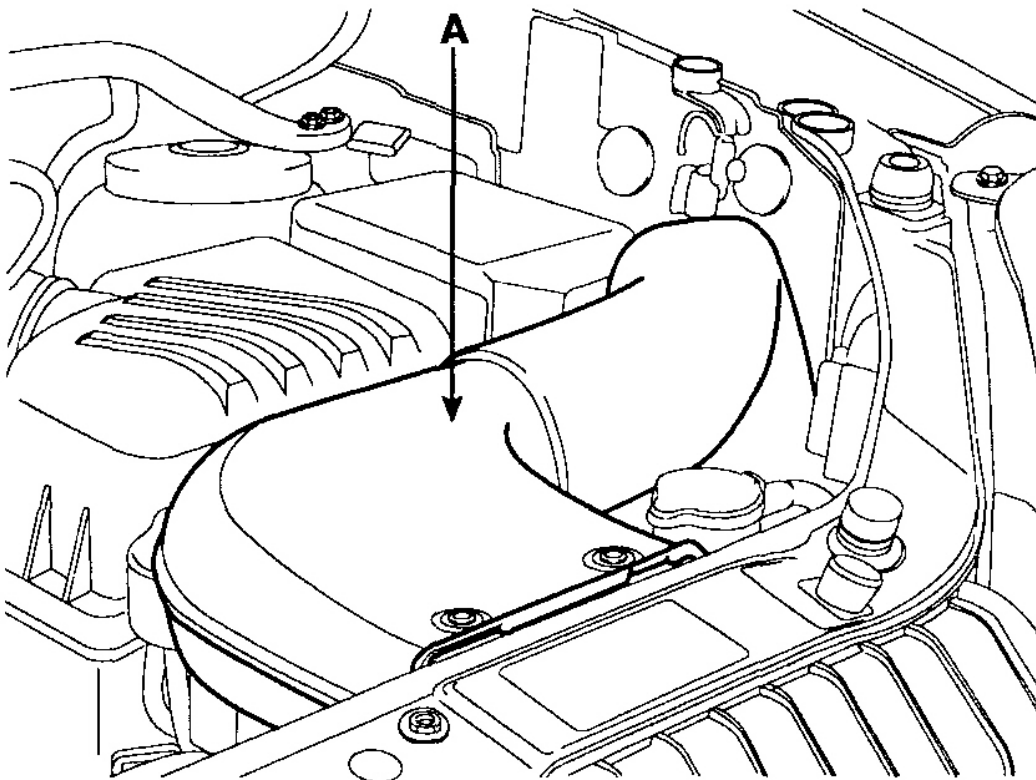
- Use Fender cover to avoid damaging painted surfaces.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.

- 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).

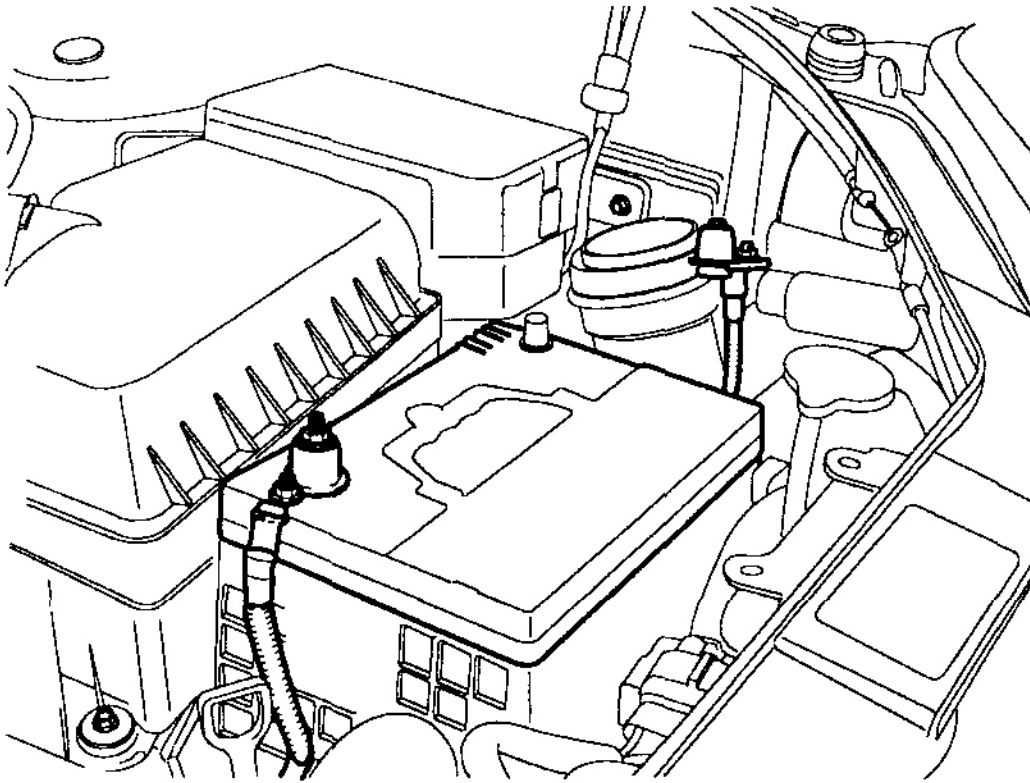


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Fig. 3: Removing Air Duct

Courtesy of KIA MOTORS AMERICA, INC.

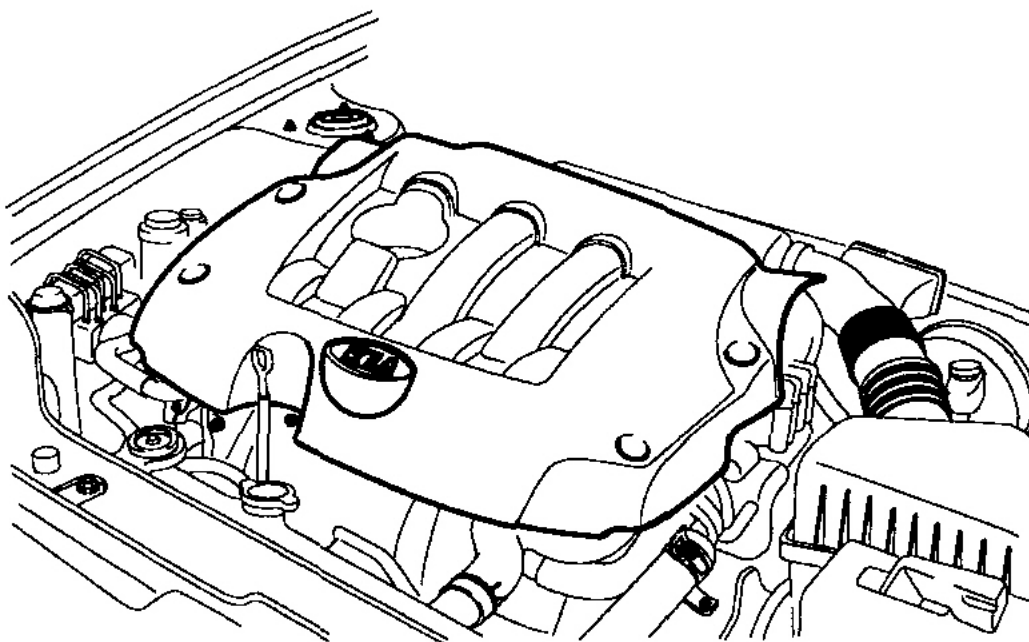
2. Disconnect the terminals (A) from battery.



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

3. Remove the engine cover.

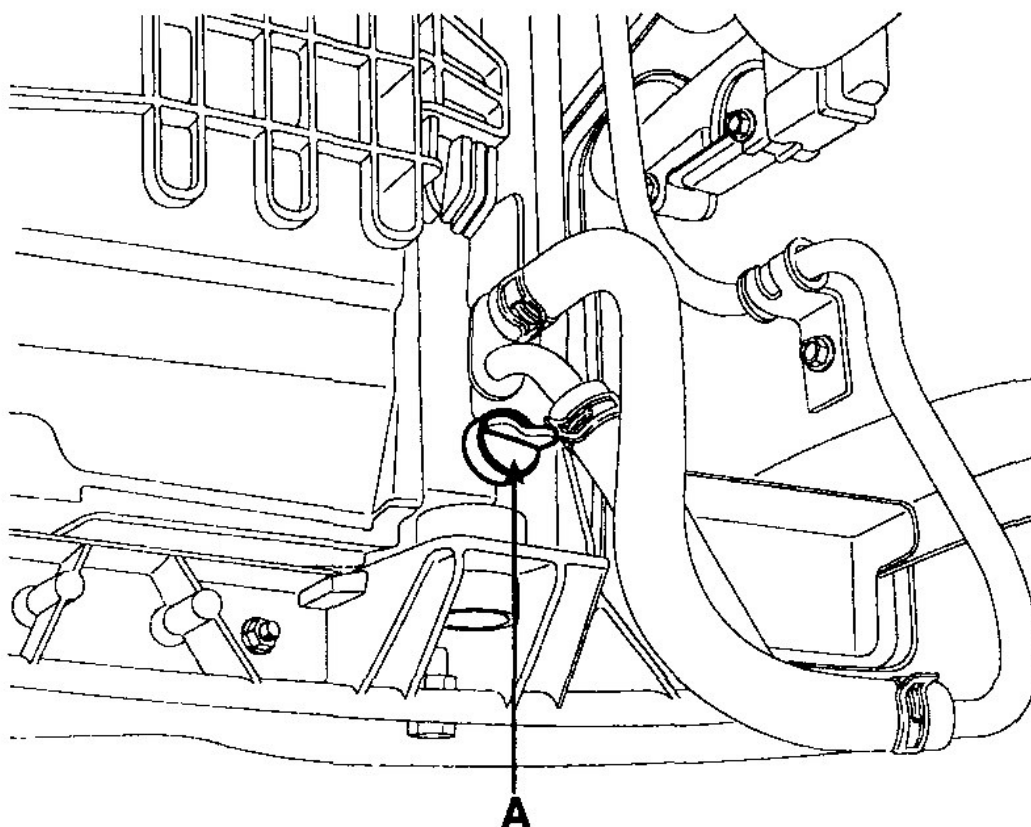


G03821039

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.

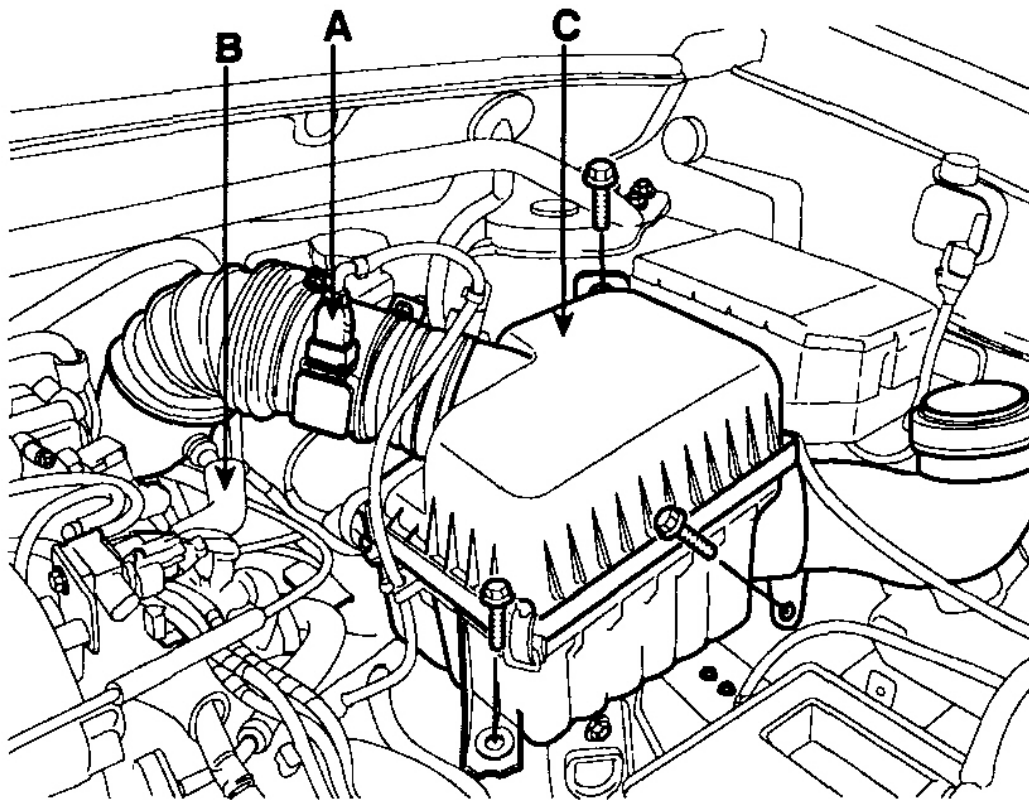


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Fig. 6: Draining Engine Coolant

Courtesy of KIA MOTORS AMERICA, INC.

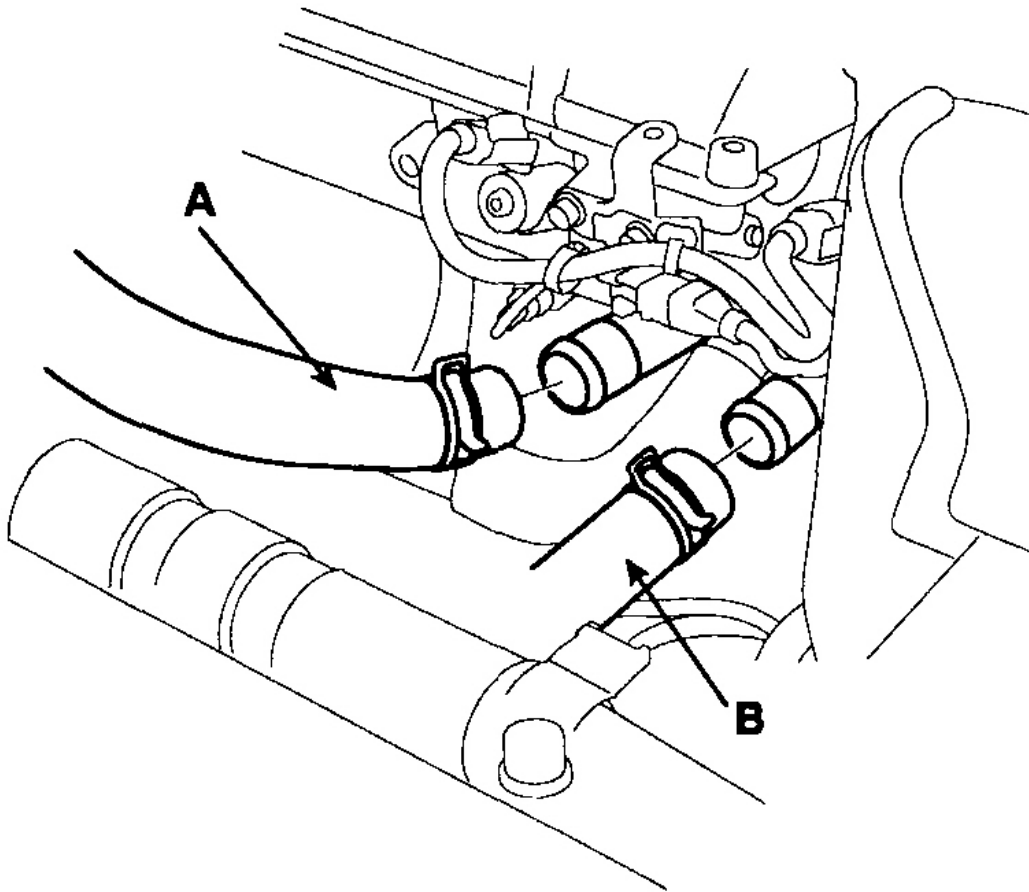
5. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS (Air Flow Sensor) connector (A).
 2. Disconnect the breather hose (B) from intake air hose.
 3. Remove the intake air hose and air cleaner assembly (C).



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

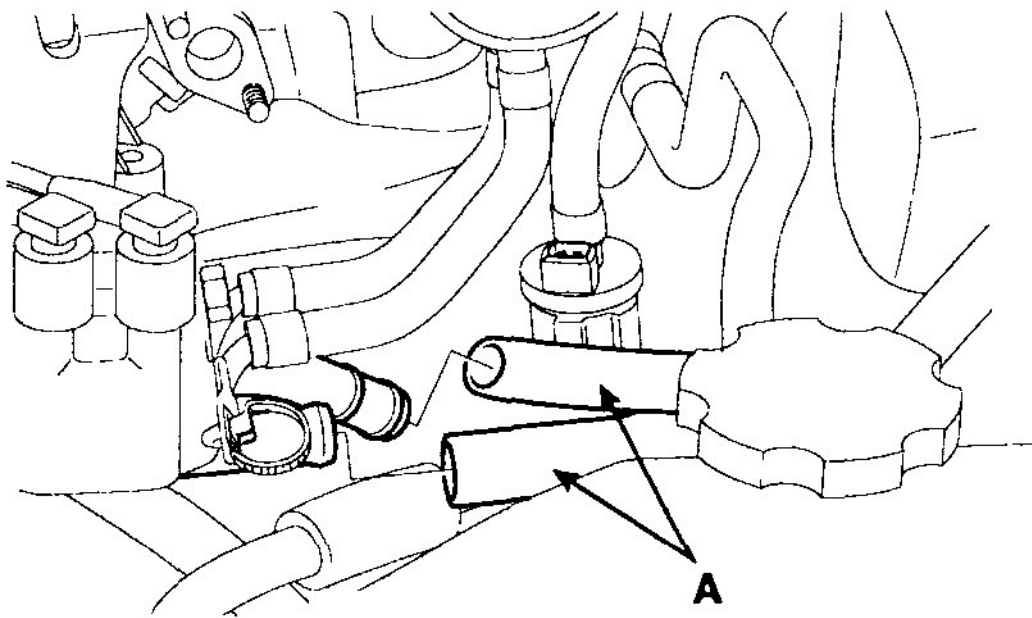
6. Remove the upper radiator hose (A) and lower radiator hose (B).



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

7. Remove the heater hoses (A).

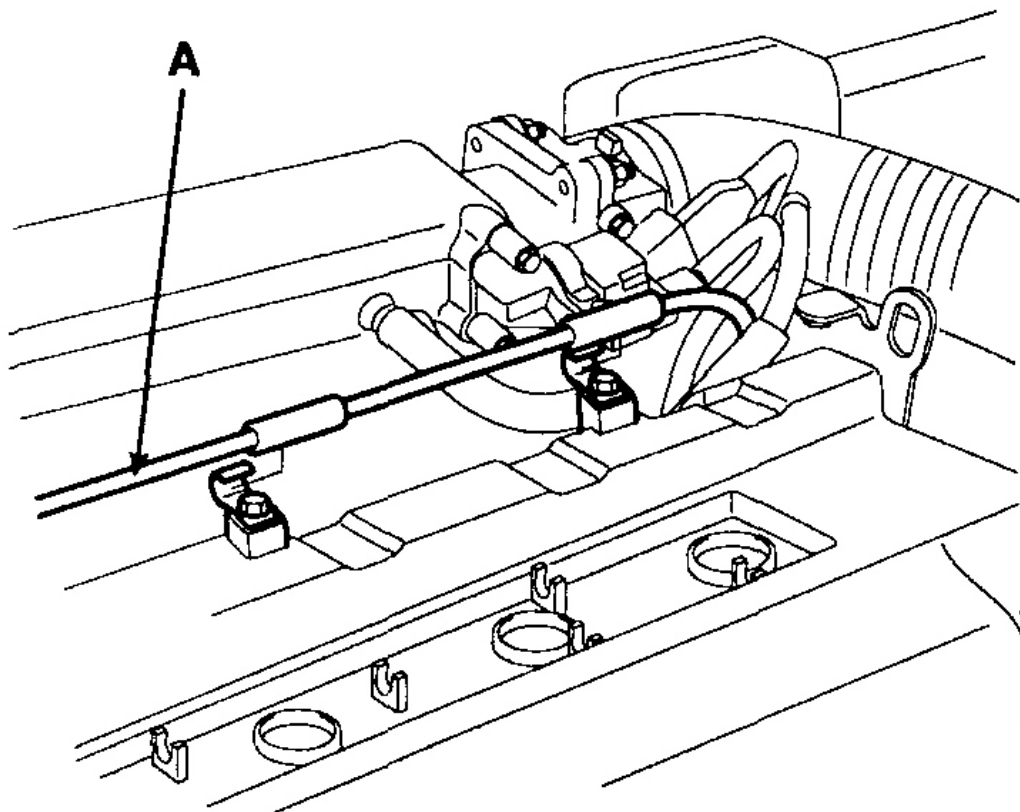


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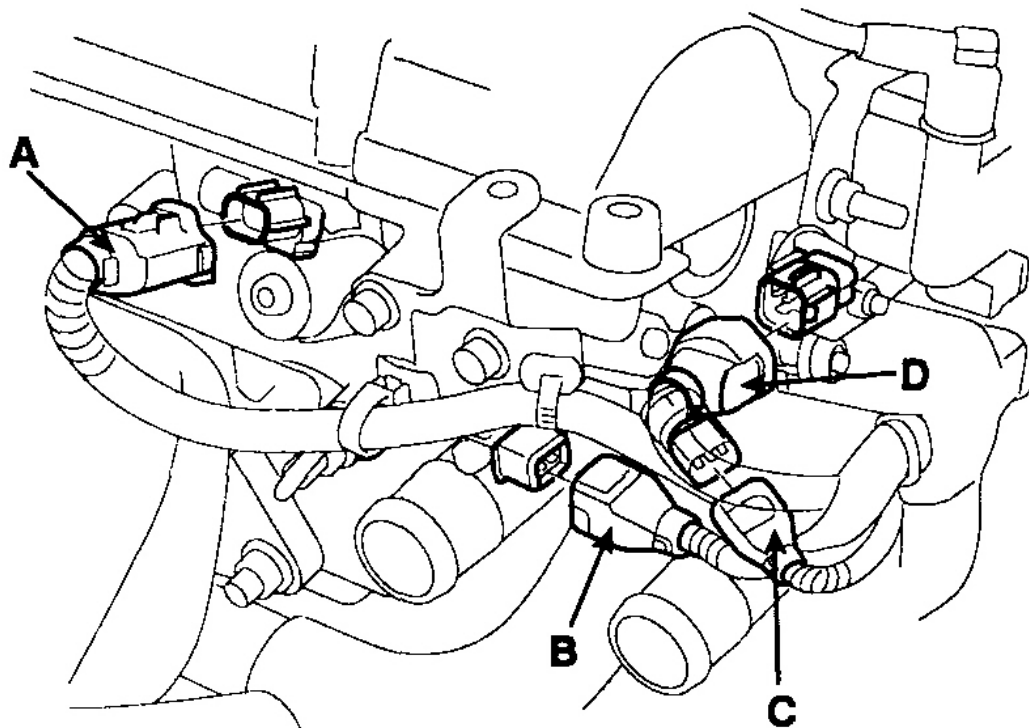
Fig. 9: Removing Heater Hoses

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.

**G03821044****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).



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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).

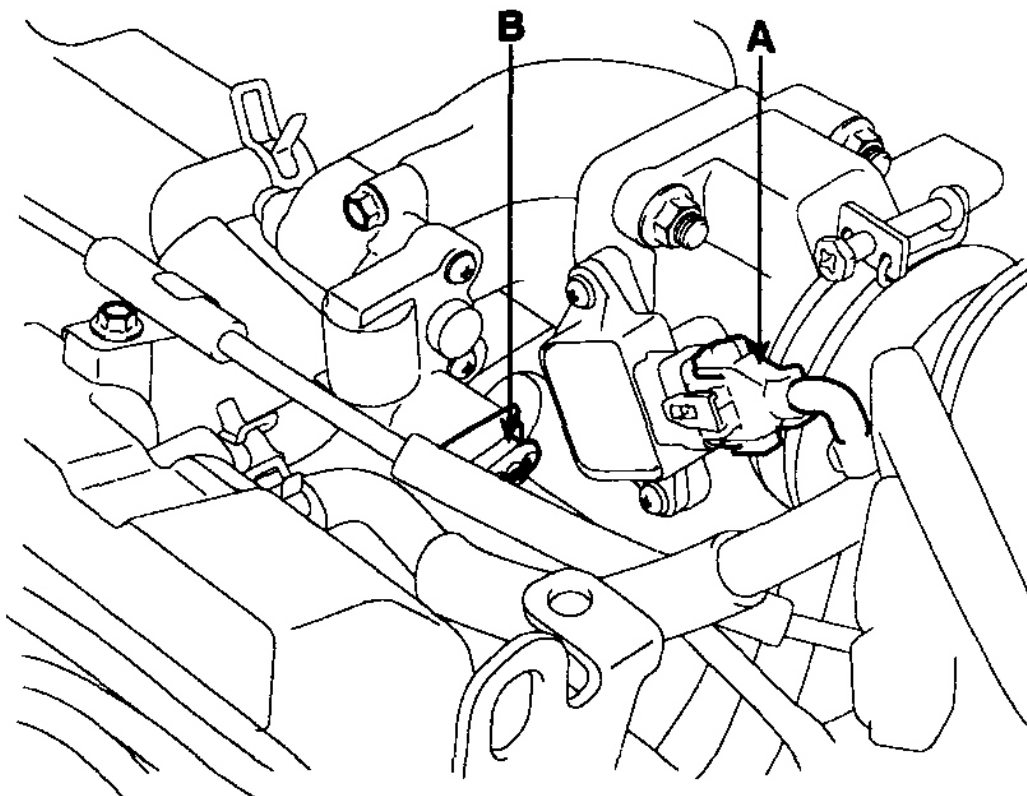
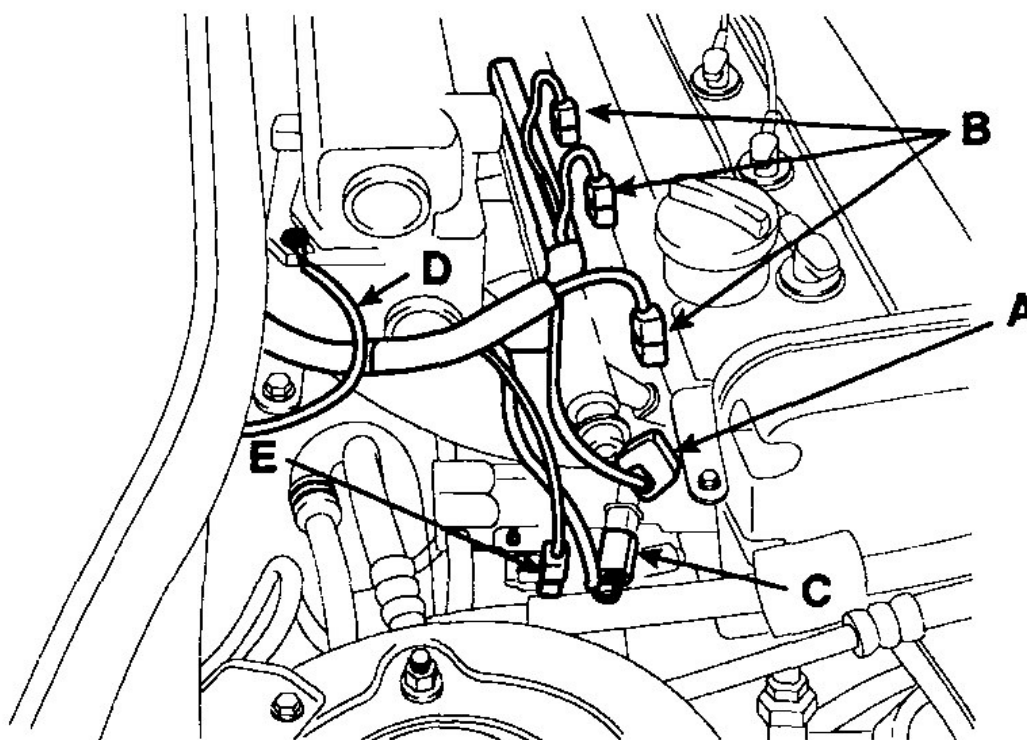
**G03821046**

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

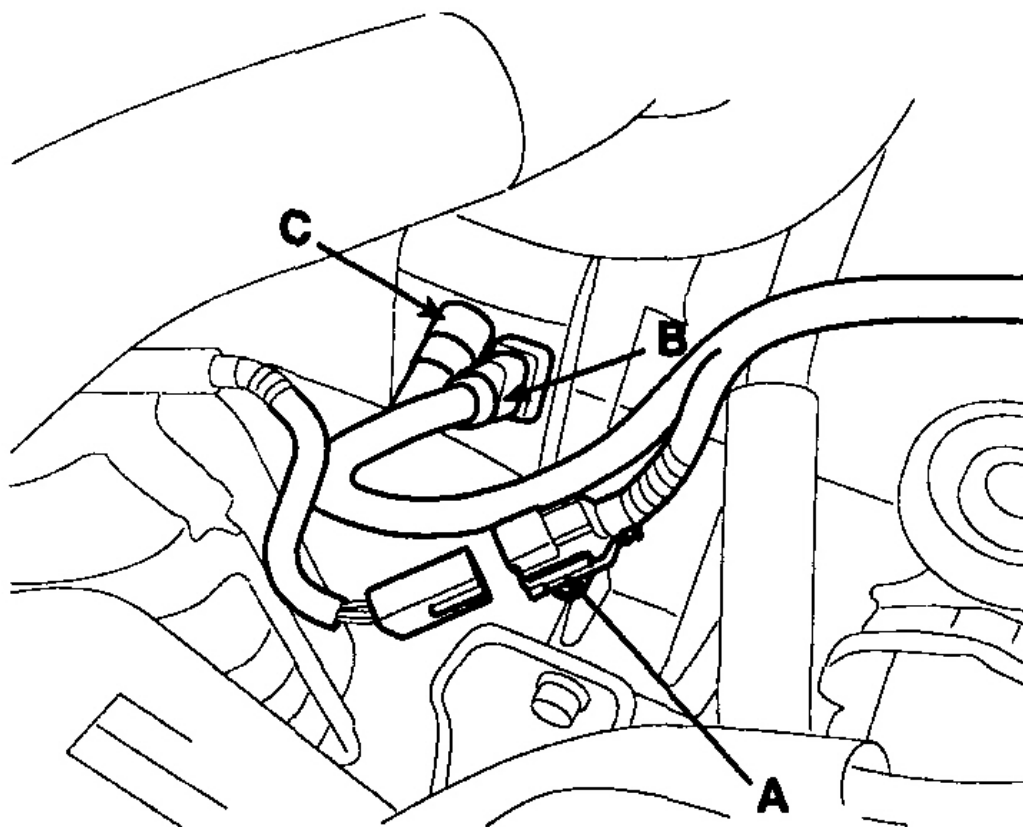
7. Disconnect the CMP (Camshaft Position Sensor) connector (A).
8. Disconnect the four injector connectors (B).
9. Disconnect the knock sensor connector (C).
10. Disconnect the ground cables (D) from the intake manifold.
11. Disconnect the air conditioner compressor switch connector (E).



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

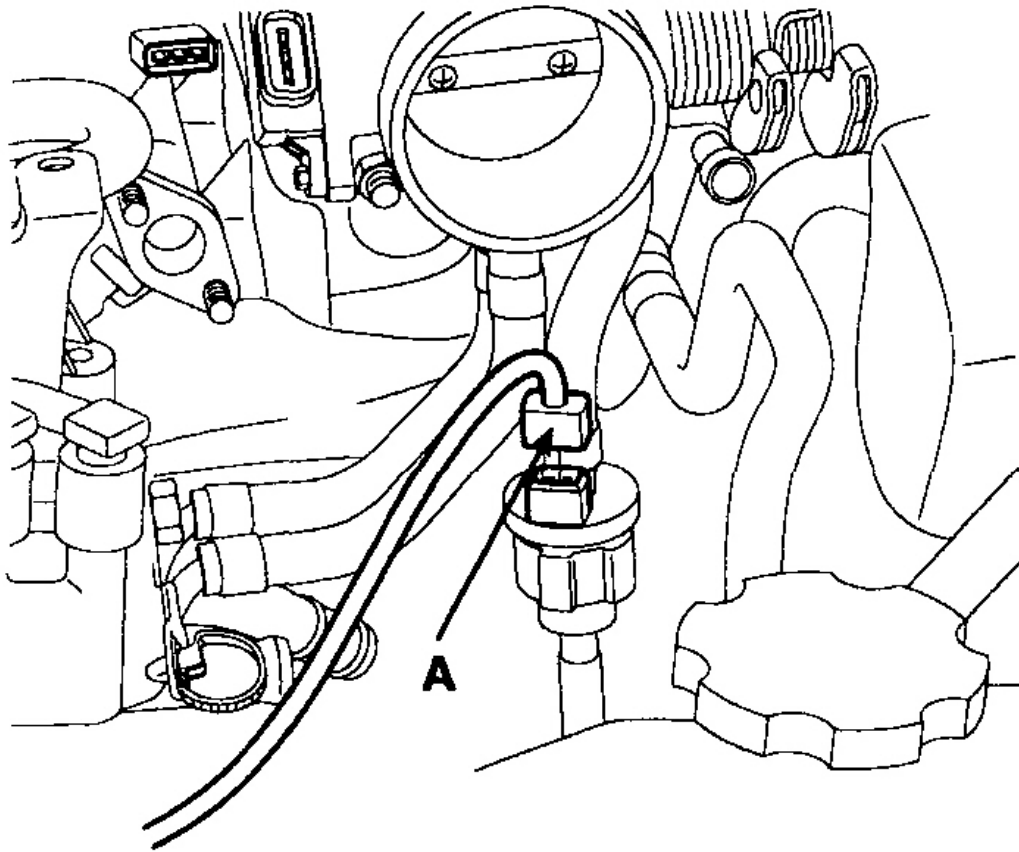
12. Disconnect the front heated oxygen sensor connector (A).
13. Disconnect the CKP (Crankshaft Position Sensor) connector (B).
14. Disconnect the oil pressure switch connector (C).



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

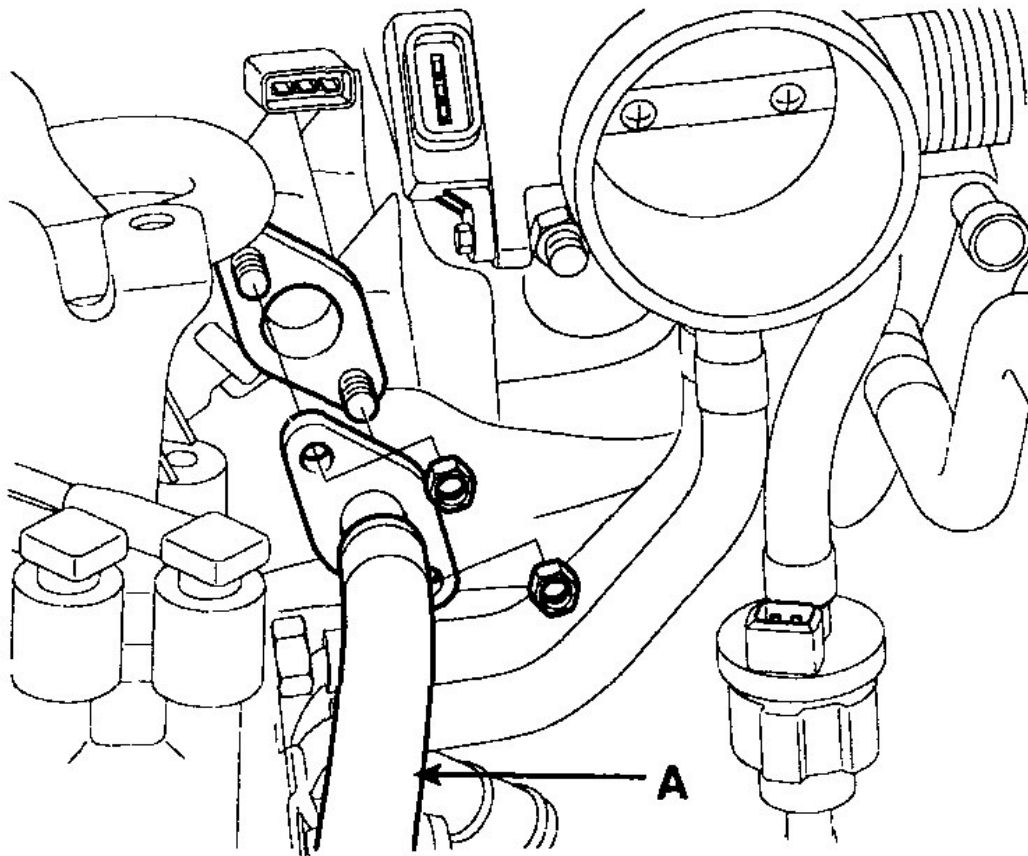
15. Disconnect the PCSV (Purge Control Solenoid Valve) connector (A).



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

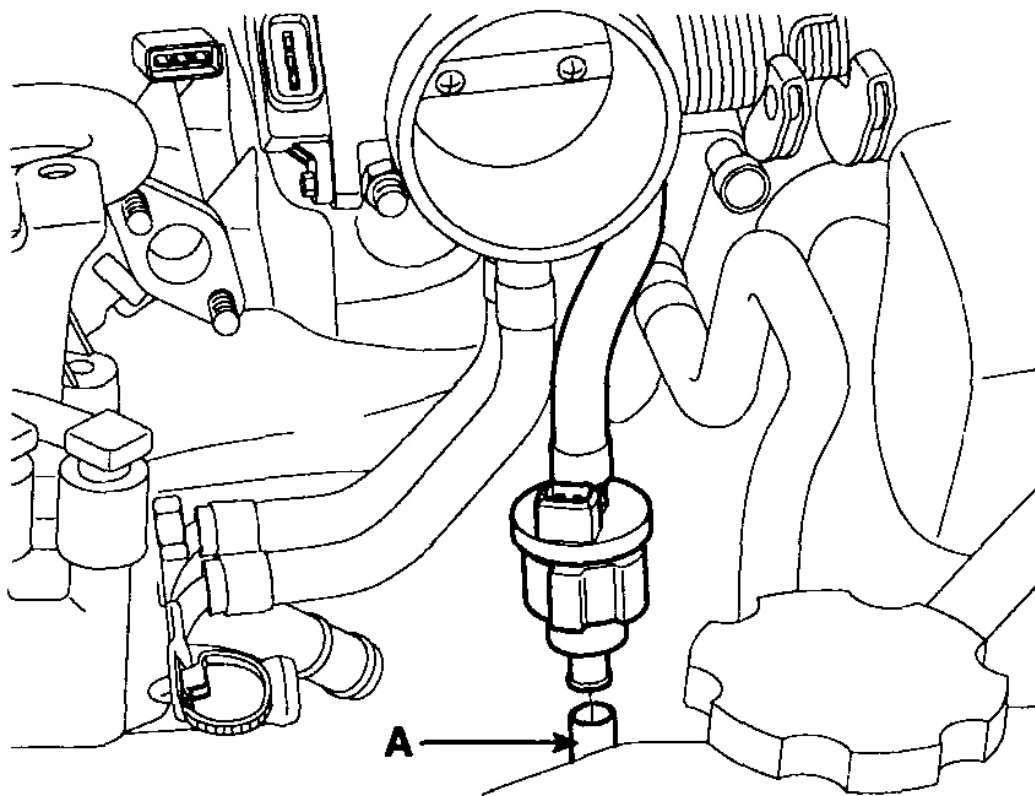
10. Disconnect the fuel inlet hose (A) of the delivery pipe side.



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

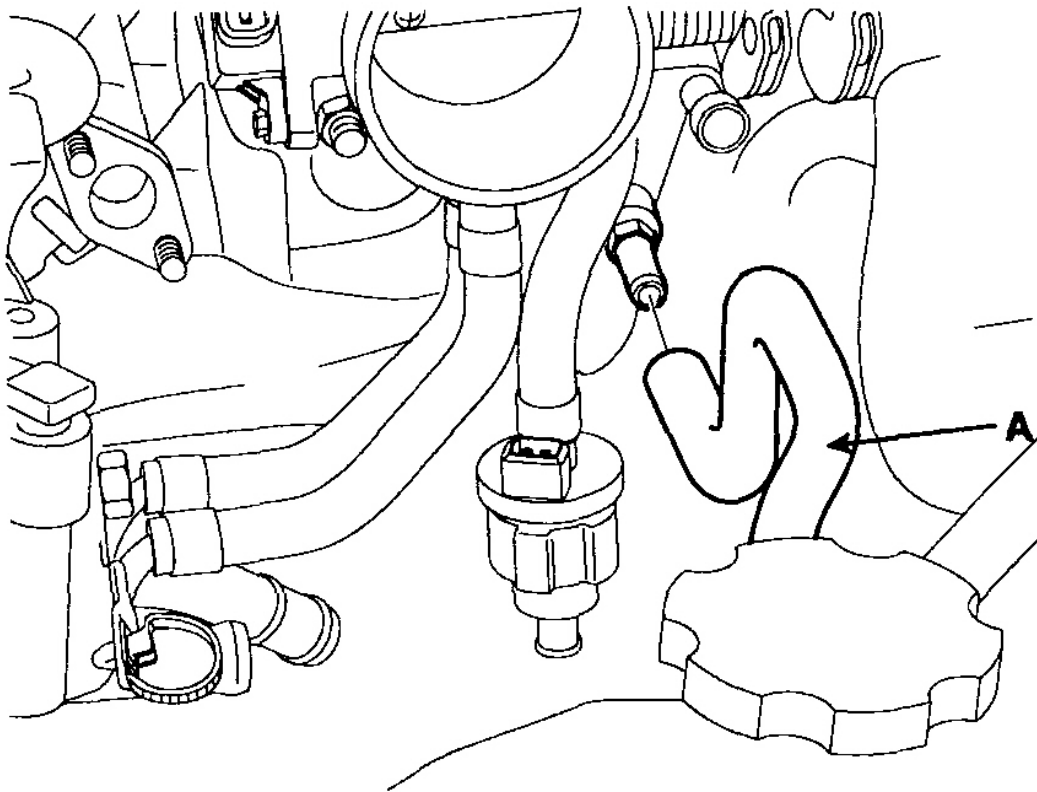
11. Disconnect the hose (A) of the PCSV (Purge Control Solenoid Valve) side.



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

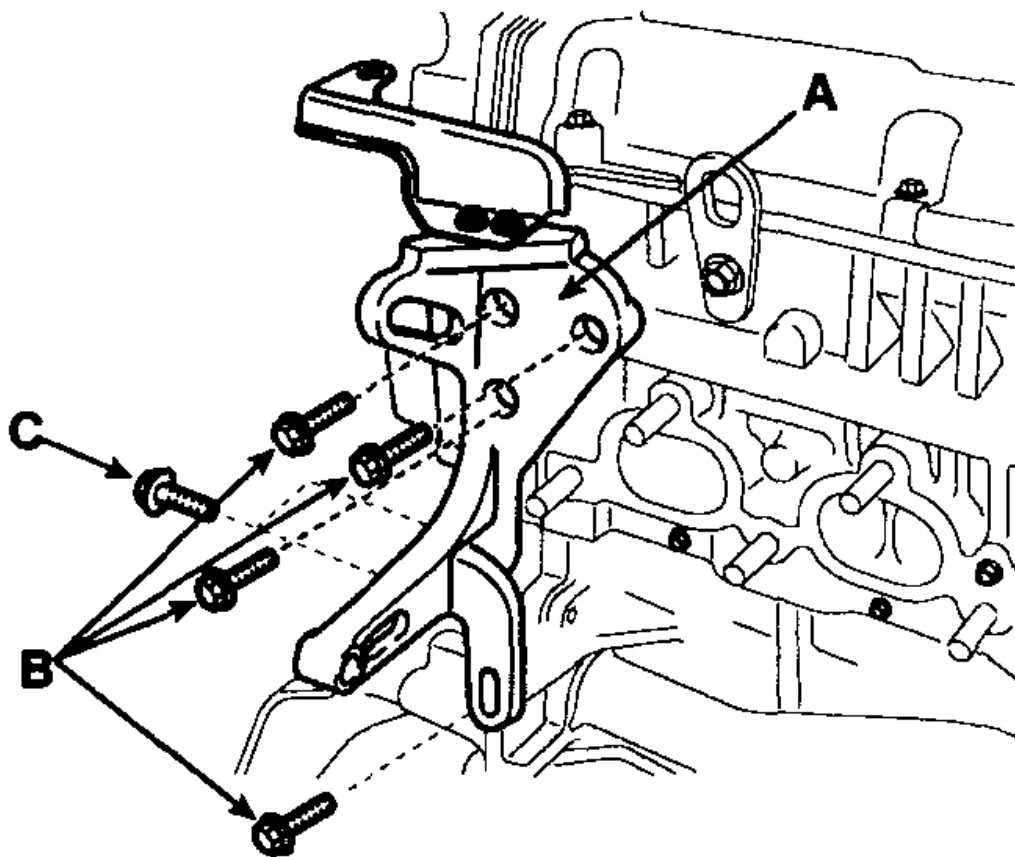
12. Remove the brake booster vacuum hose (A).



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

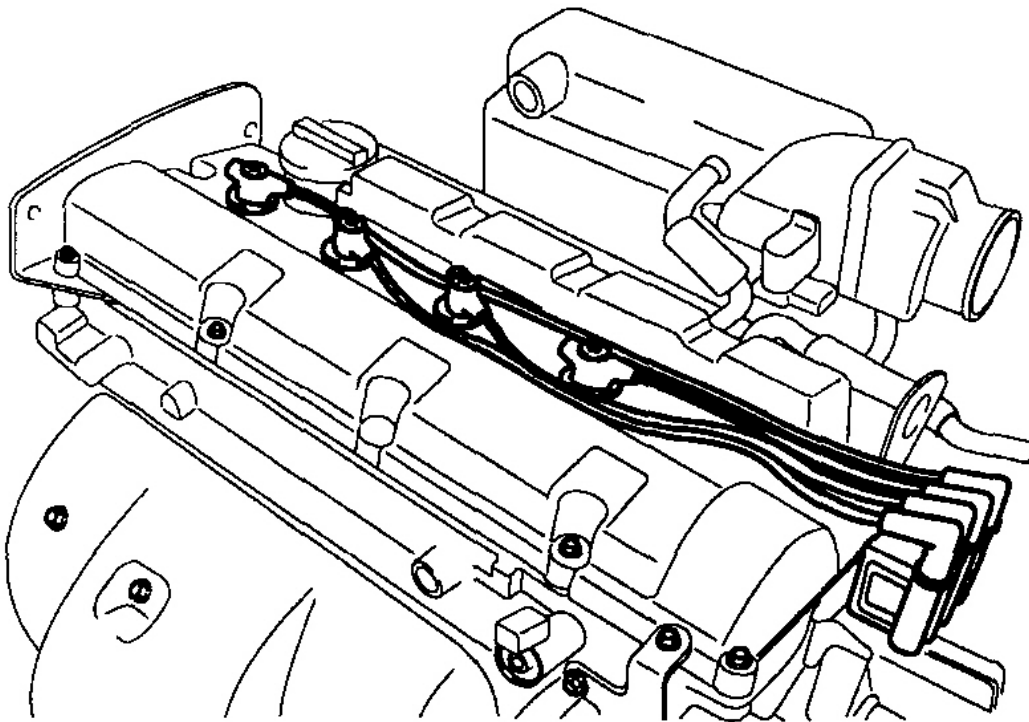
13. Remove the power steering pump drive belt.
14. Remove the power steering pump and fix the pump to vehicle with a wire. (See **MECHANICAL POWER STEERING SYSTEM**).
15. Remove the bolts (B, C) and power steering pump bracket (A).



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

16. Remove the spark plug cables.

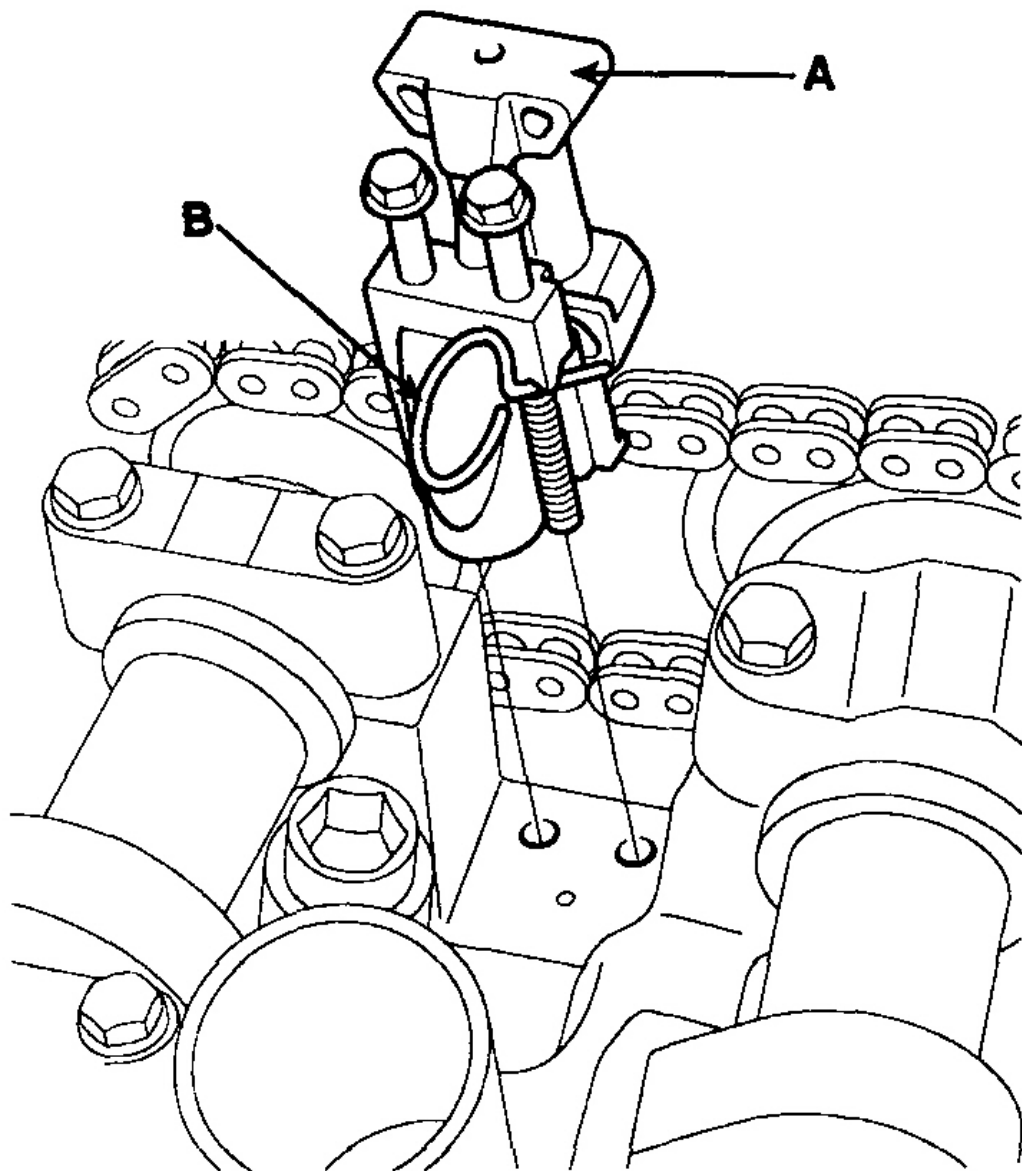


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Fig. 20: Removing Spark Plug Cables

Courtesy of KIA MOTORS AMERICA, INC.

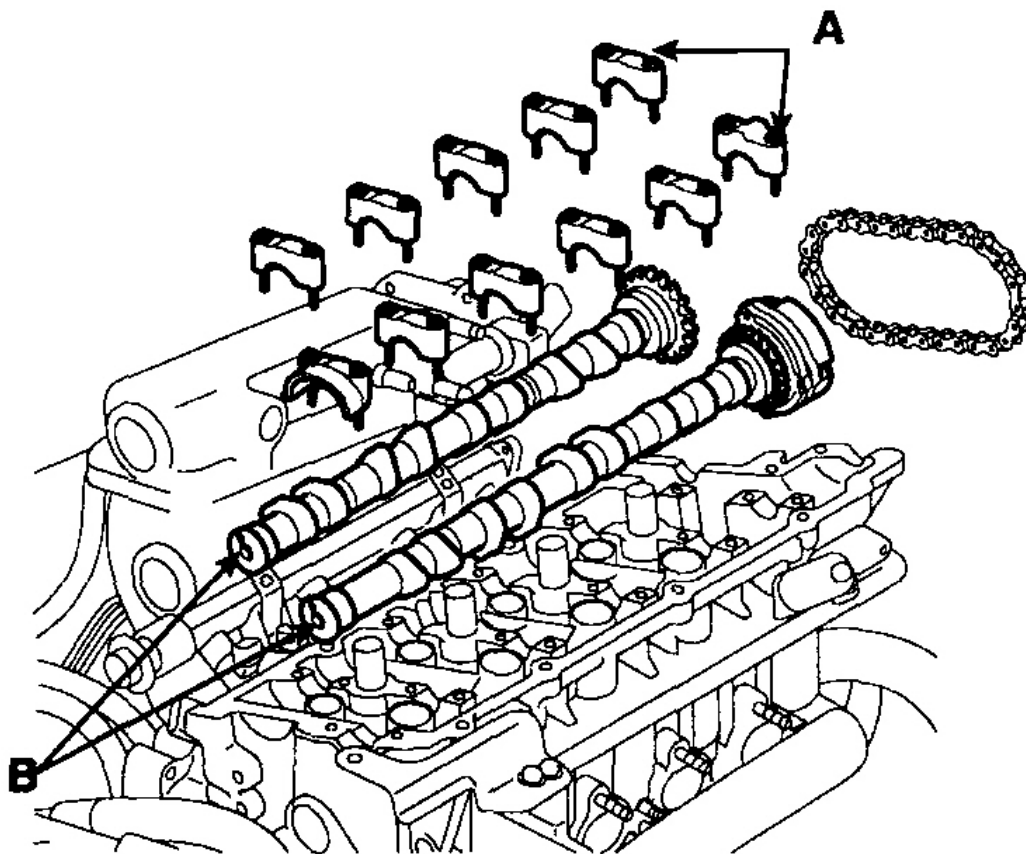
17. Remove the exhaust manifold. (Refer to **INTAKE AND EXHAUST SYSTEM - 2.0L**)
18. Remove the intake manifold. (Refer to **INTAKE AND EXHAUST SYSTEM - 2.0L**)
19. Remove the timing belt. (Refer to **REMOVAL** , step 2-15)
20. Remove the PCV (Positive Crankcase Ventilation) hose.
21. Remove the cylinder 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.



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

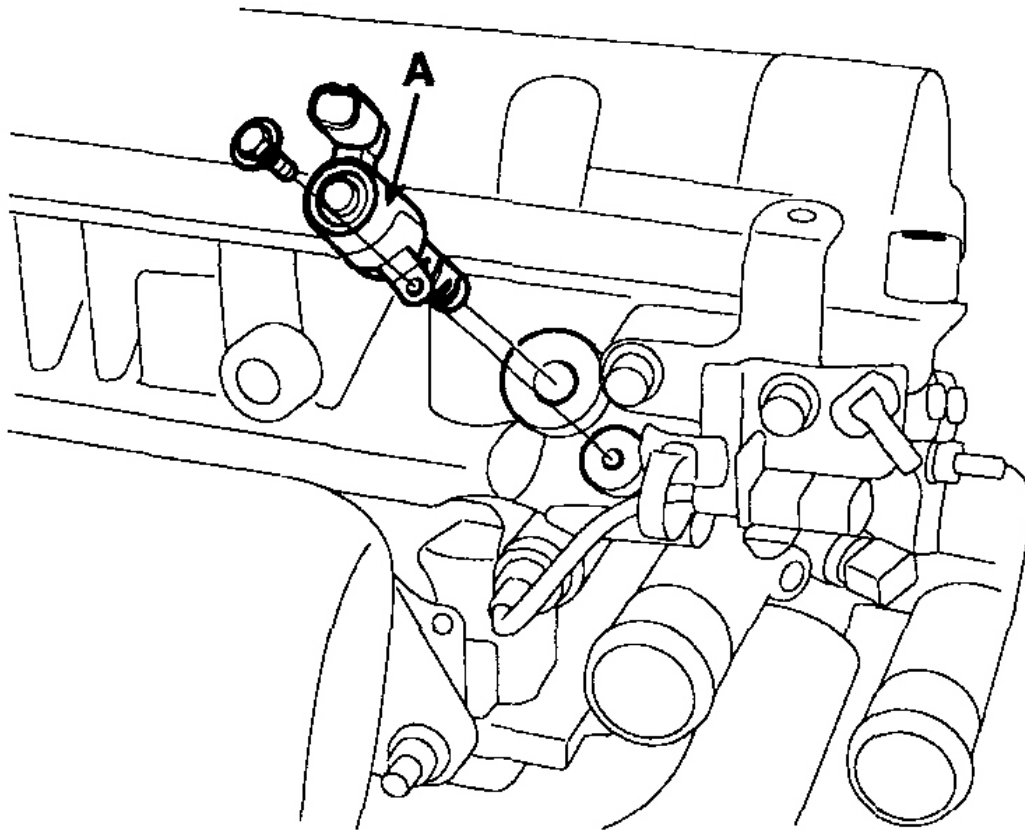
24. Remove the camshaft bearing caps (A) and camshafts (B).



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

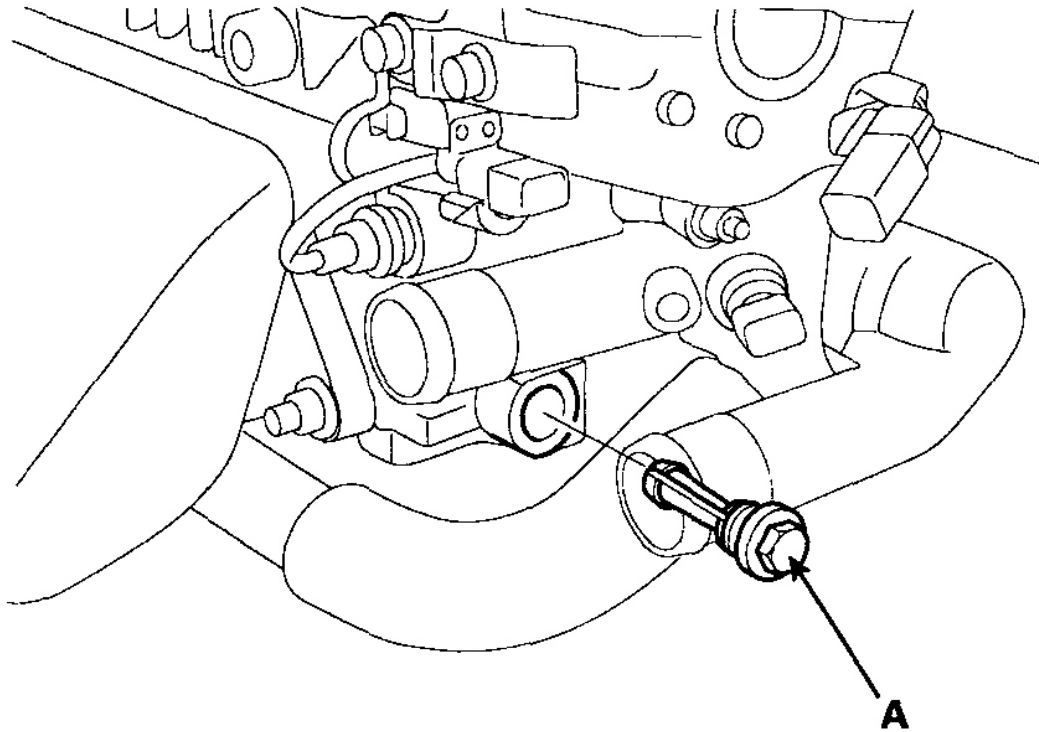
25. Remove the OCV (Oil Control Valve) (A).



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

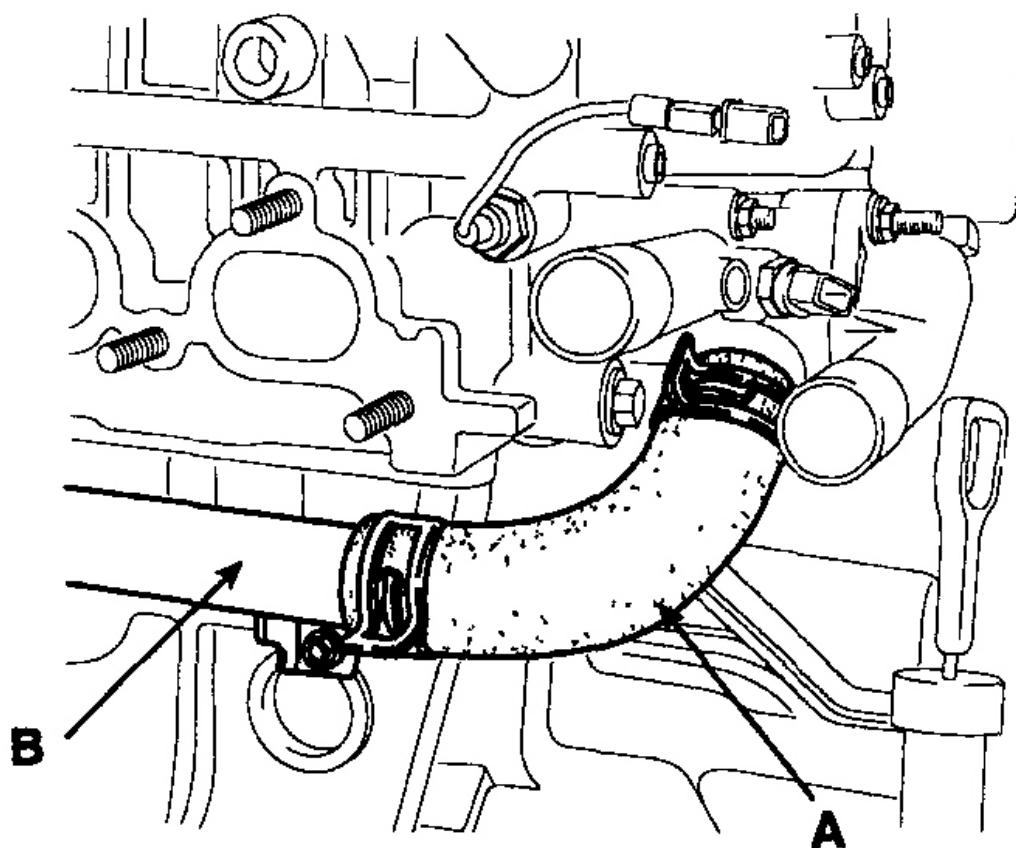
26. Remove the OCV (Oil Control Valve) filter (A).



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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.

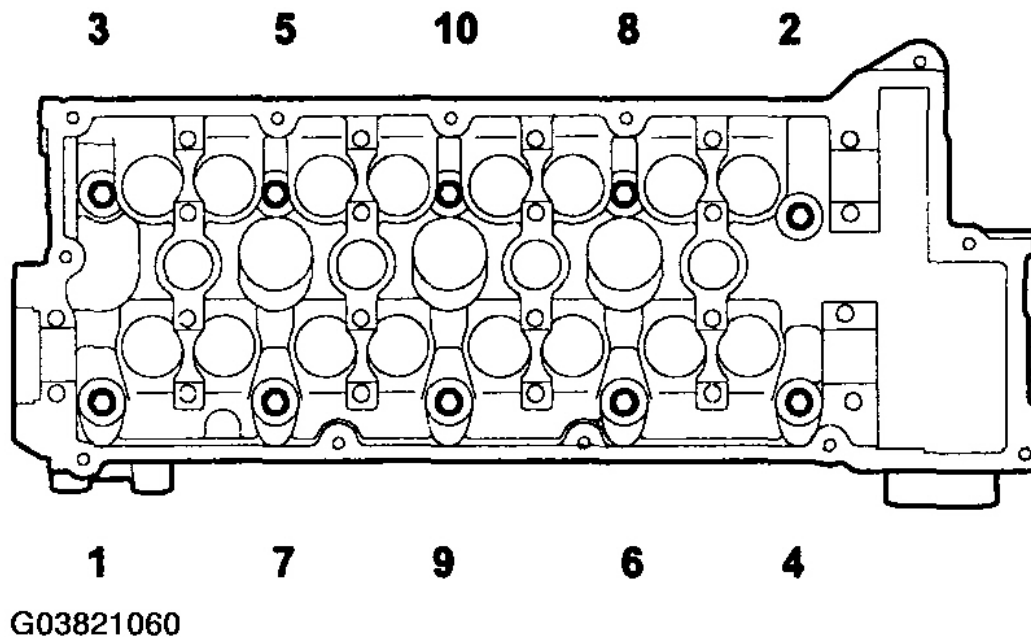


Fig. 26: Removing Cylinder Head Bolts And Plate Washers
Courtesy of KIA MOTORS AMERICA, INC.

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

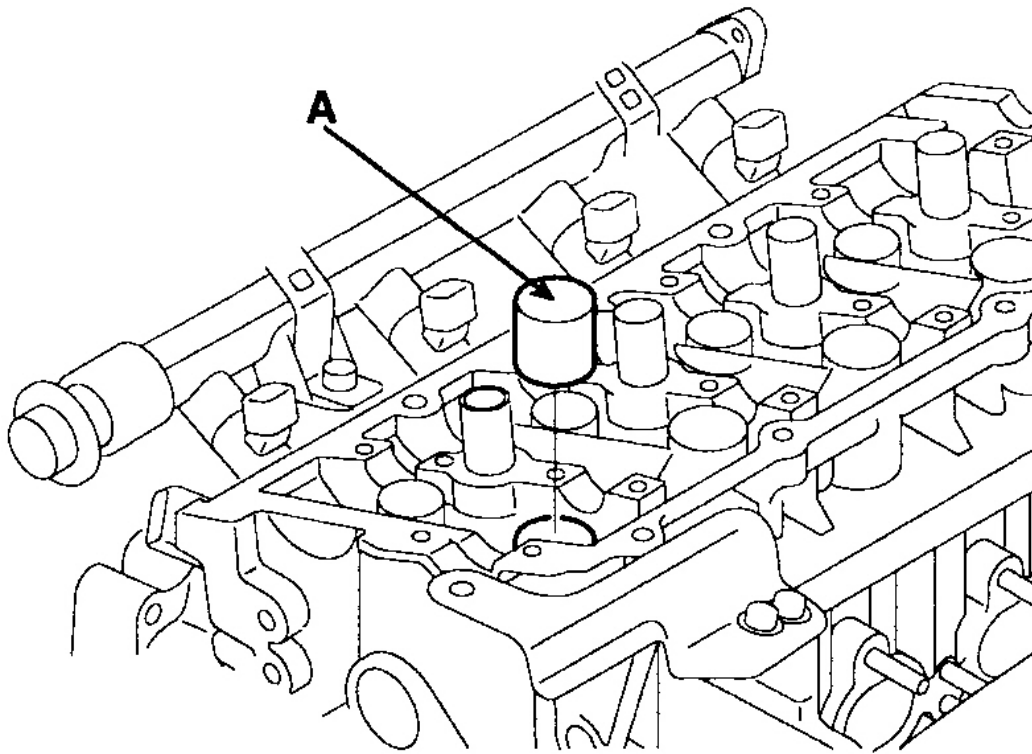
2. Lift the cylinder head from the dowels on the cylinder block and replace the cylinder head on wooden blocks on a bench.

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

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. 27: 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.

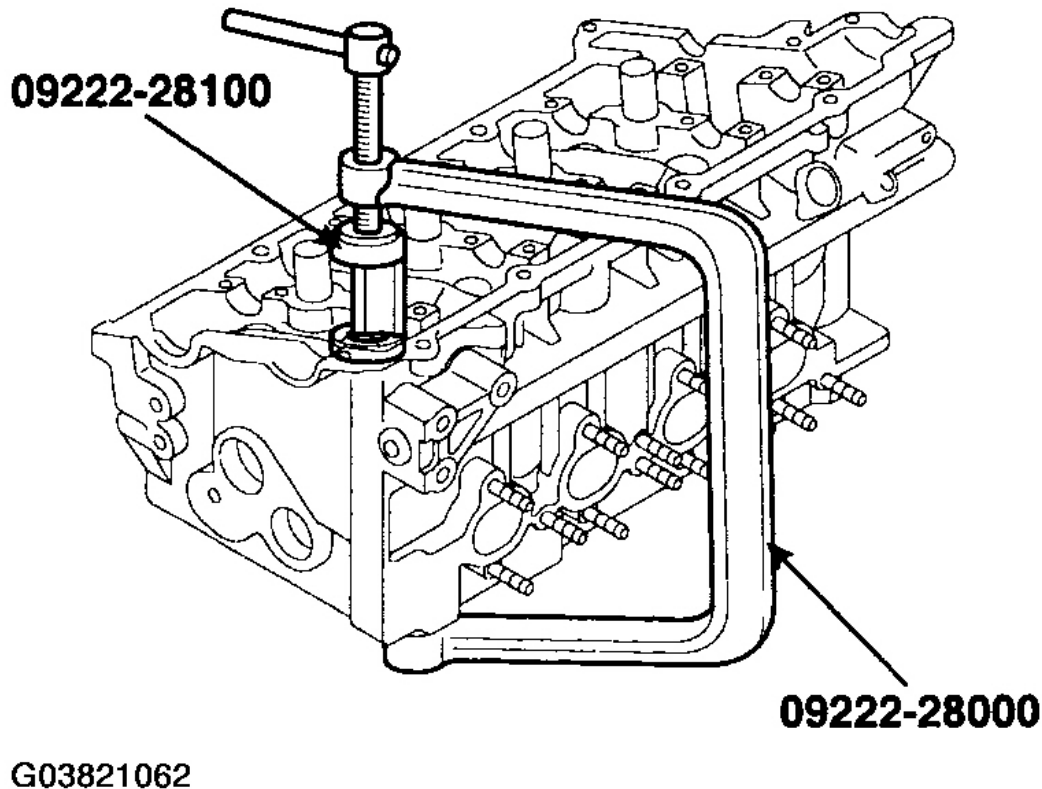


Fig. 28: Compressing Valve Spring And Removing Retainer Lock
Courtesy of KIA MOTORS AMERICA, INC.

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.

Flatness of cylinder head gasket surface

2005 Kia Sportage EX

2005-06 ENGINE Cylinder Head Assembly - 2.0L - Sportage

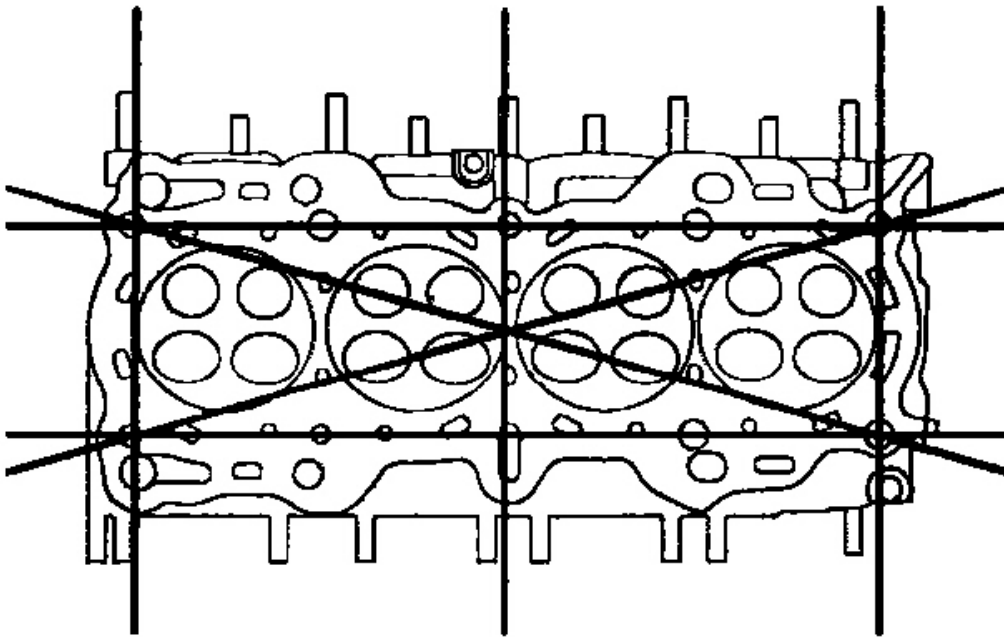
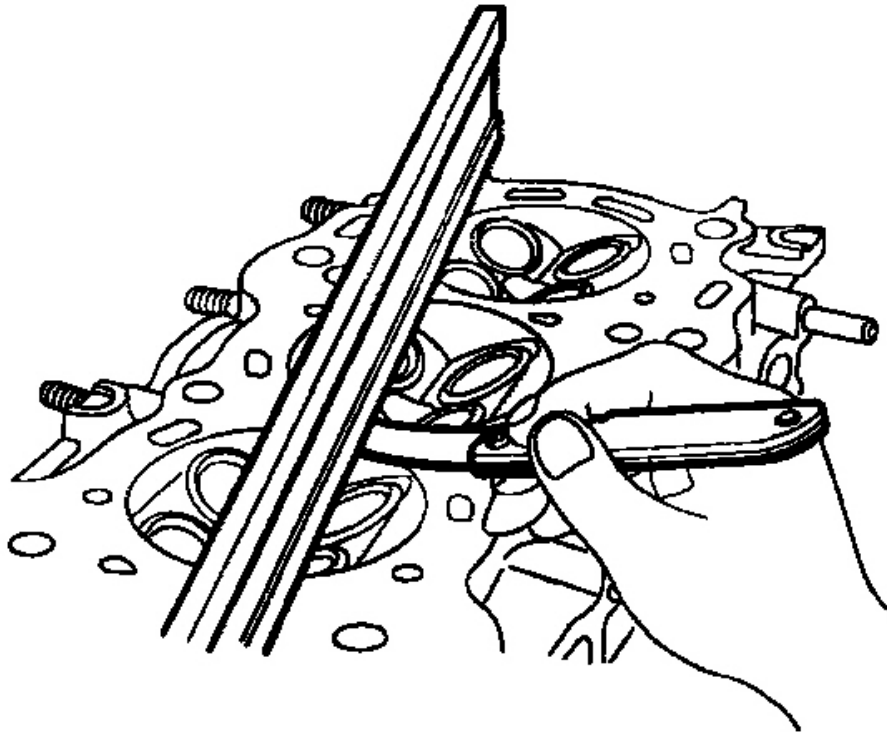
Standard: Less than 0.03mm (0.0012in)

Limit: 0.05mm (0.0020in)

Flatness of manifold mating surface

Standard: Less than 0.15mm (0.0059in)

Limit: 0.30mm (0.0118in)



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Fig. 29: Measuring Cylinder Block And Manifolds Warpage
Courtesy of KIA MOTORS AMERICA, INC.

2. Inspect for cracks.

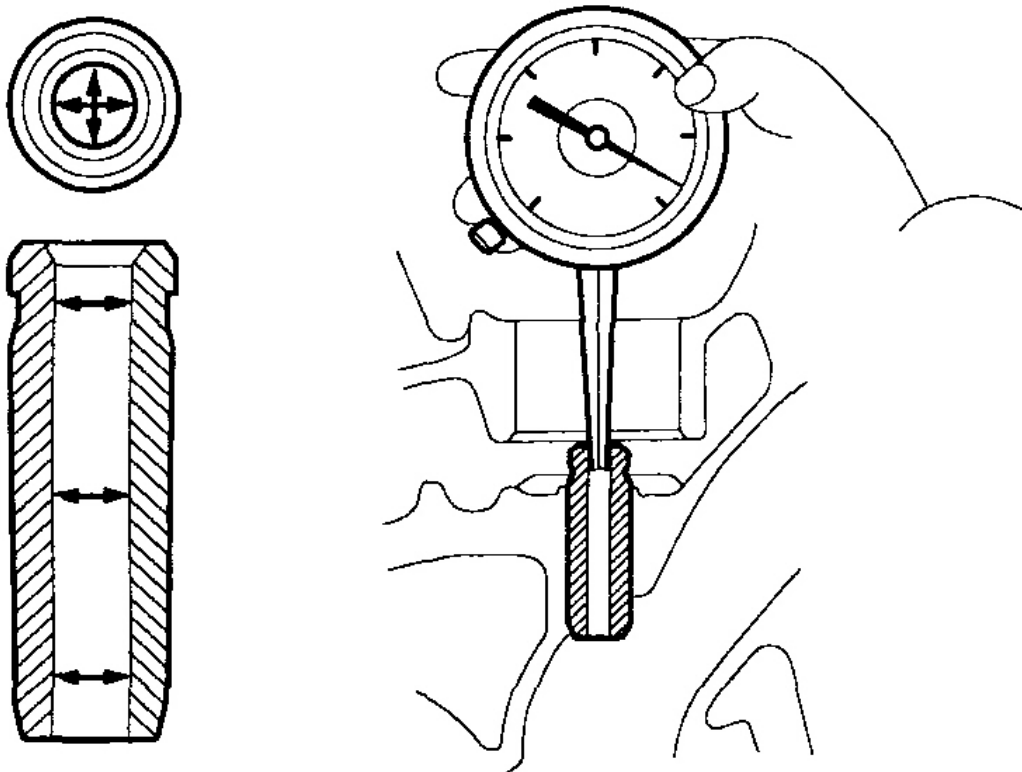
Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

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)



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Fig. 30: Measuring Valve Guide Inner Diameter

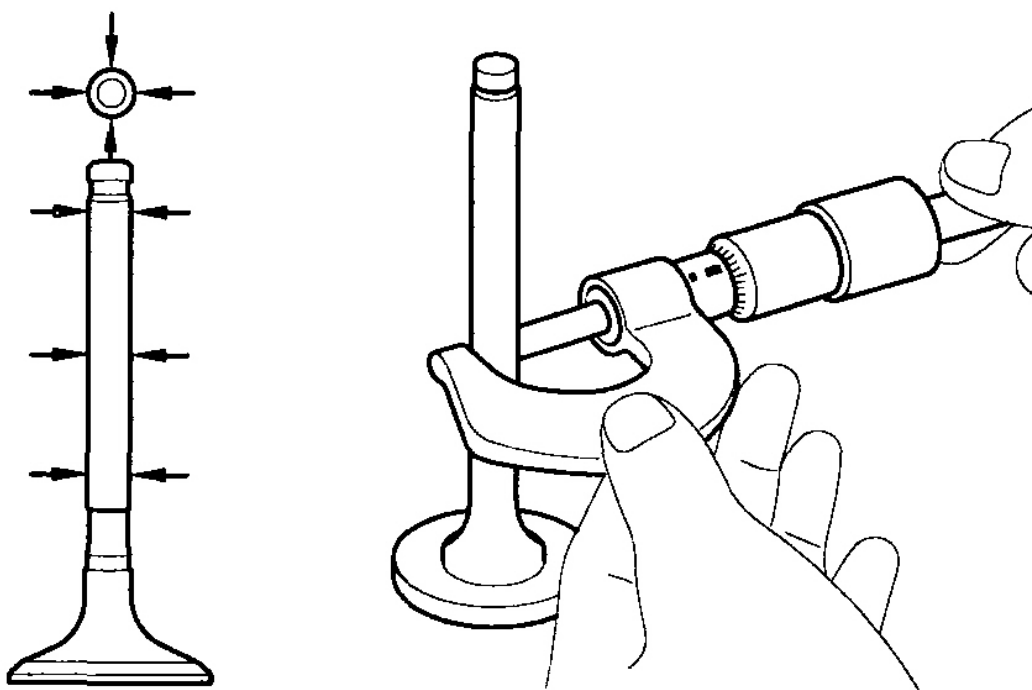
Courtesy of KIA MOTORS AMERICA, INC.

- 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. 31: Measuring Valve Stem Outer Diameter

Courtesy of KIA MOTORS AMERICA, INC.

- 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

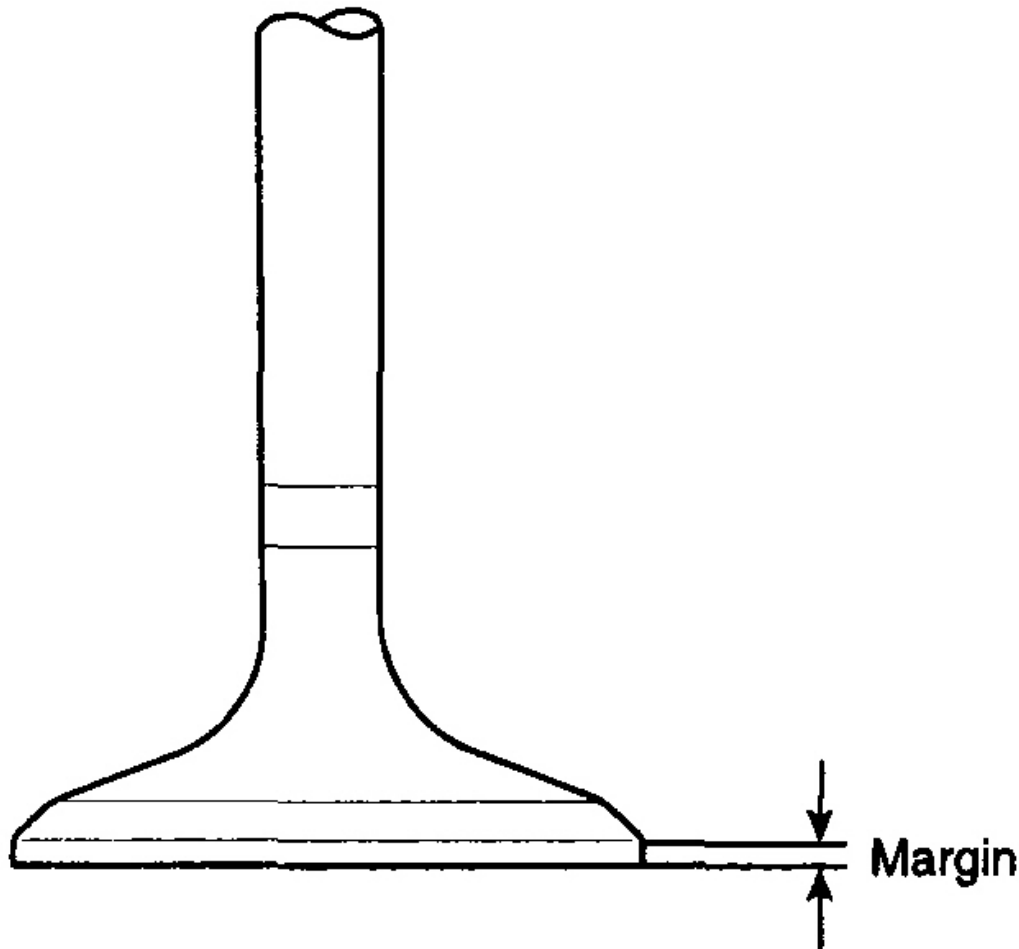
Intake: 1.15mm (0.0453in)

Exhaust: 1.35mm (0.0531 in)

Limit

Intake: 0.8mm (0.0315in)

Exhaust: 1.0mm (0.0394in)



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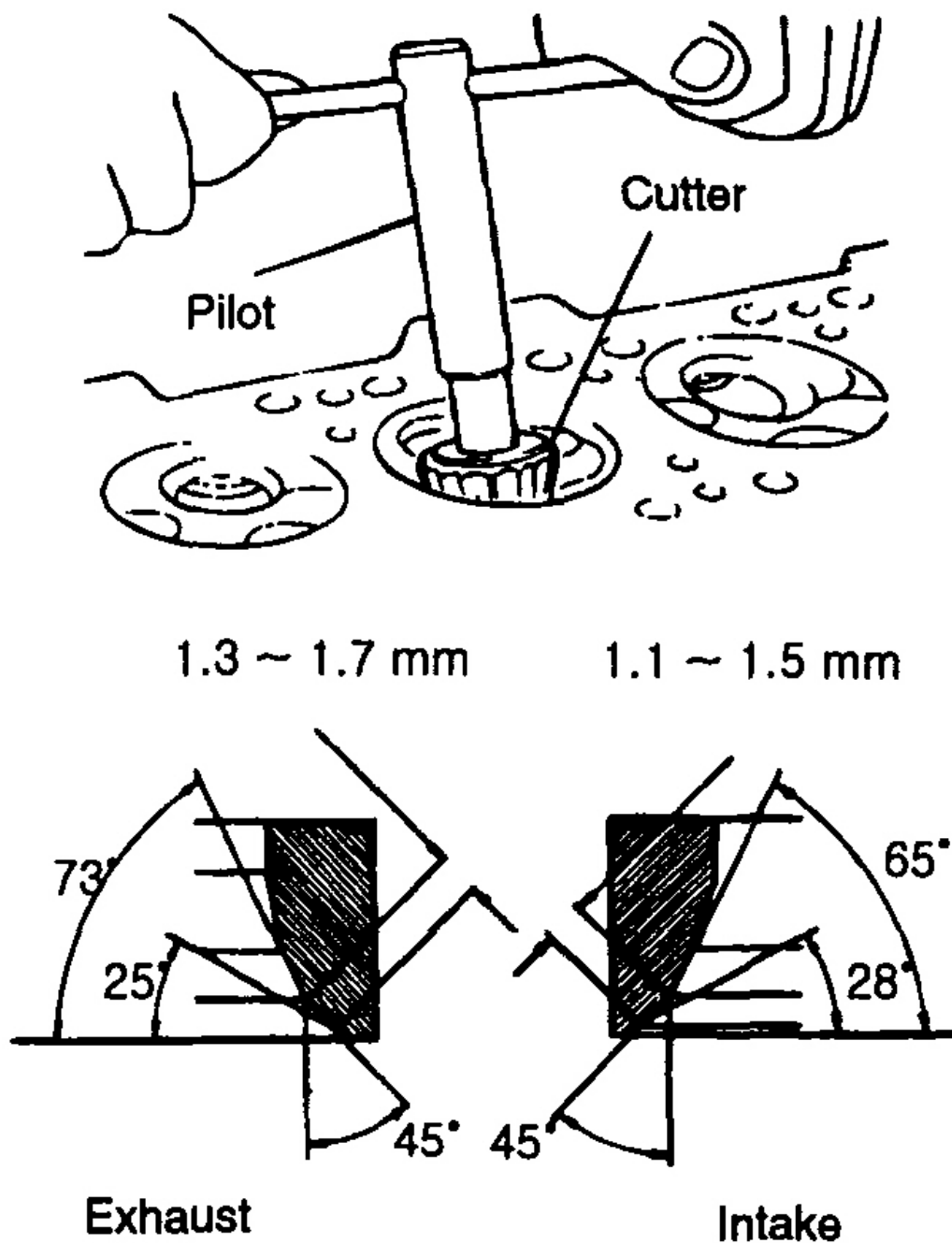
Fig. 32: Checking Valve Head Margin Thickness
Courtesy of KIA MOTORS AMERICA, INC.

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.



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Fig. 33: Reconditioning Valve Seat With Valve Seat Cutter

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)

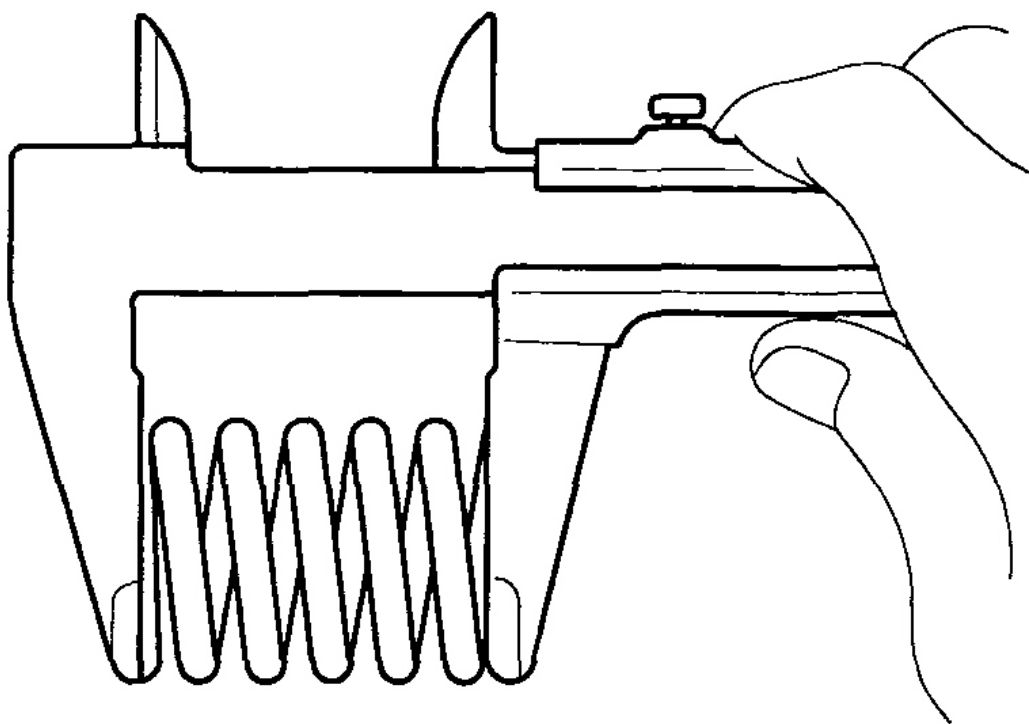
Load: 18.8+/-0.9kg/39.0mm (41.4+/-2.0lb/1.5354in)

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

Out of square: Less than 1.5°

Limit

Out of square: 3°



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Fig. 34: Measuring Valve Spring Free Length
Courtesy of KIA MOTORS AMERICA, INC.

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

CAMSHAFT

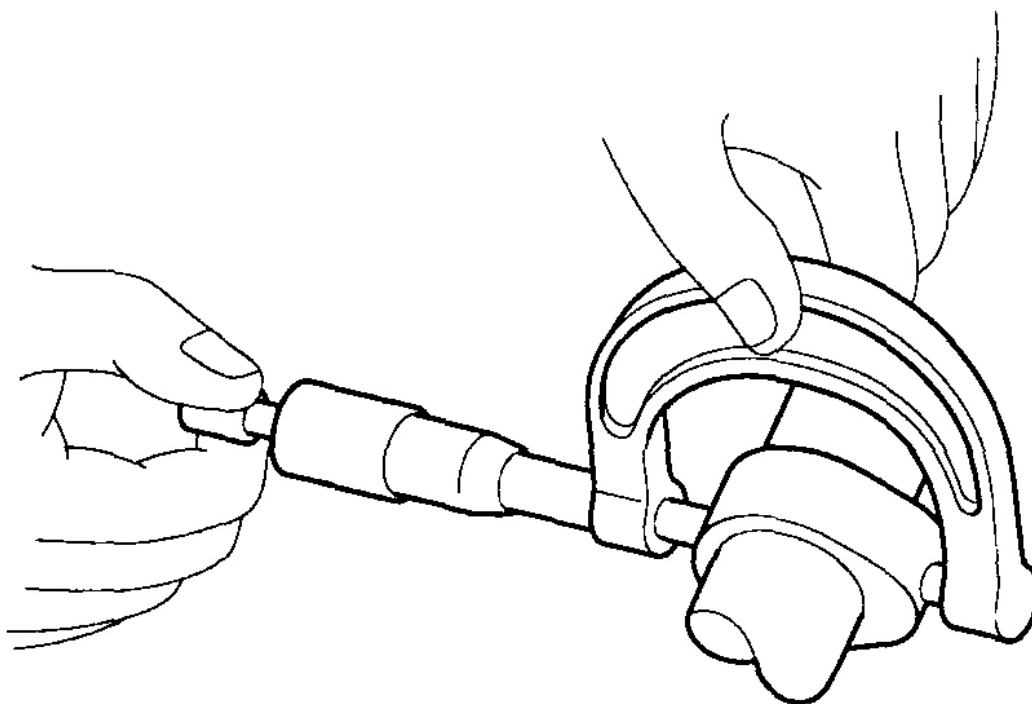
1. Inspect the cam lobes.

Using a micrometer, measure the cam lobe height.

Cam height

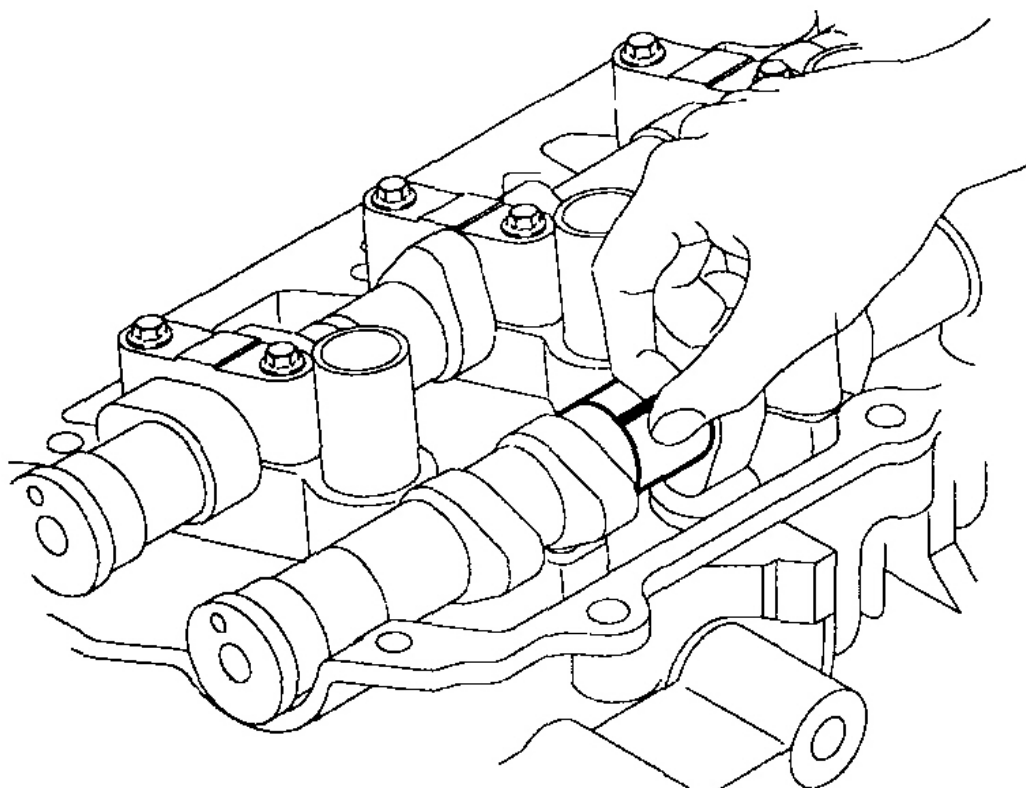
Intake: 44.518 ~ 44.718mm (1.7527 ~ 1.7605in)

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

**G03821069****Fig. 35: 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.



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Fig. 36: 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)

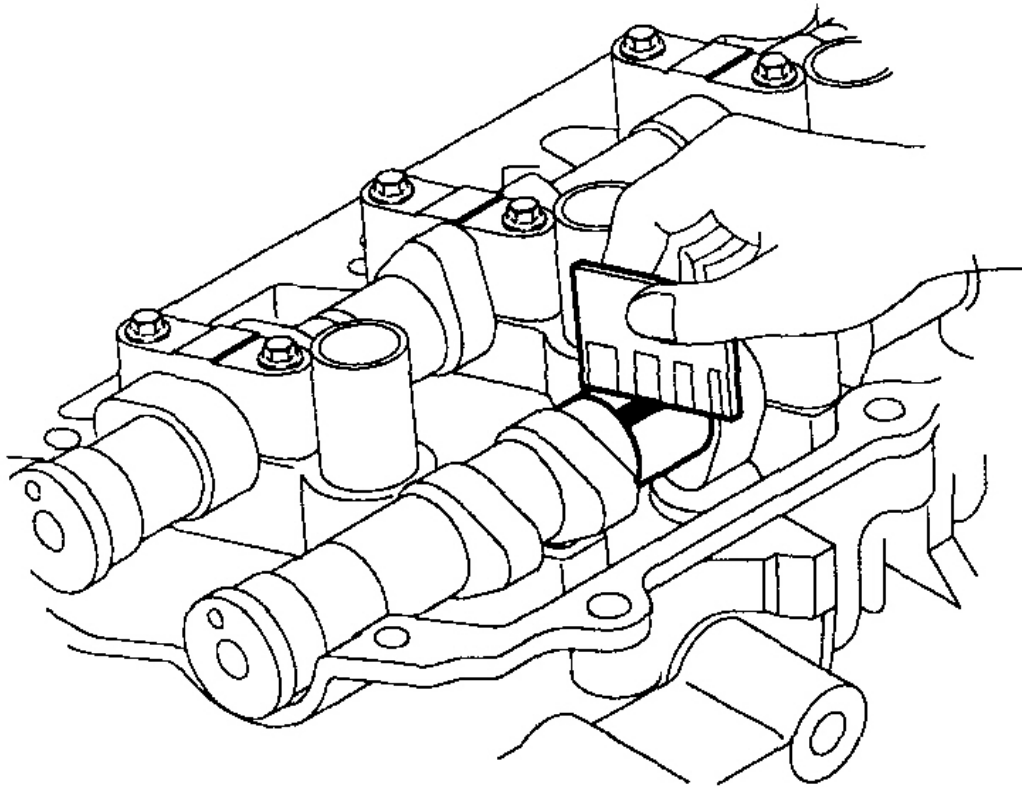
CAUTION: Do not turn the camshaft.

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. 37: 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)

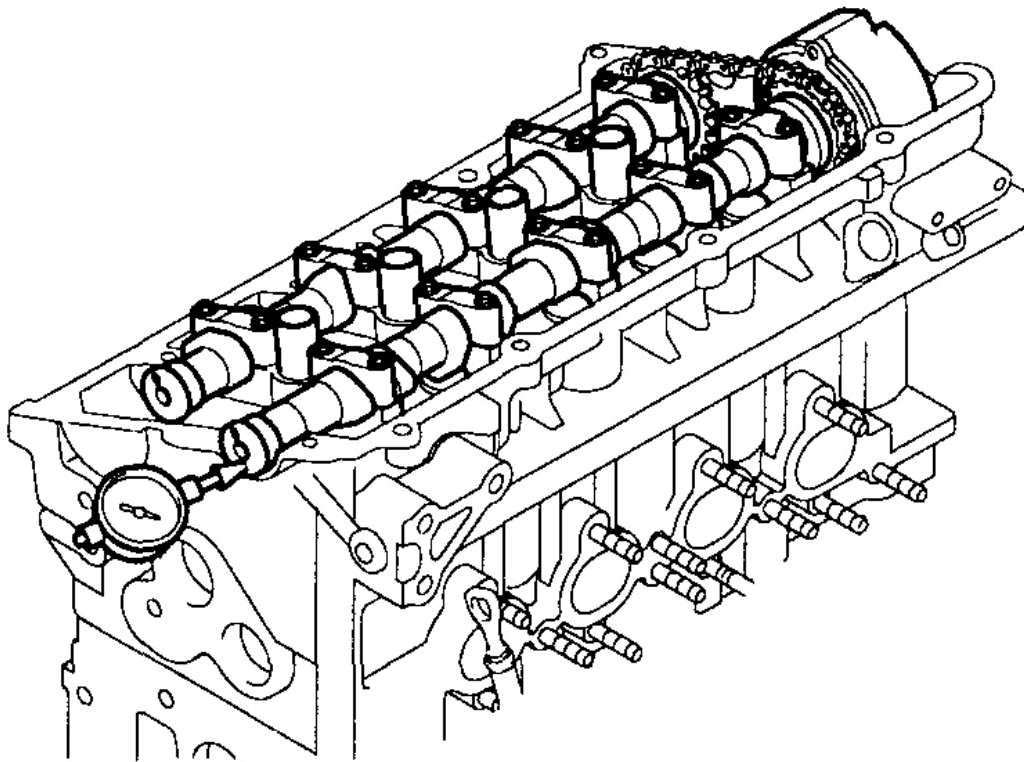
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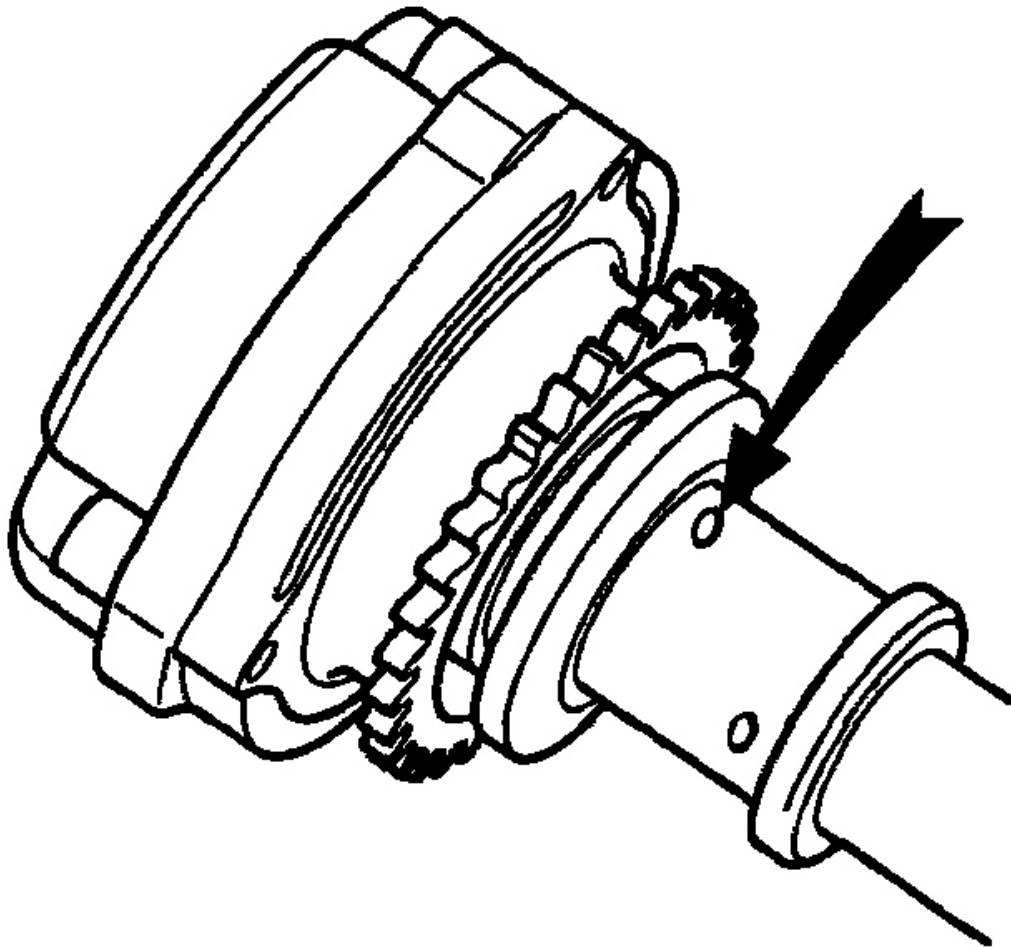
Fig. 38: Inspecting Camshaft End Play
Courtesy of KIA MOTORS AMERICA, INC.

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.



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Fig. 39: 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.

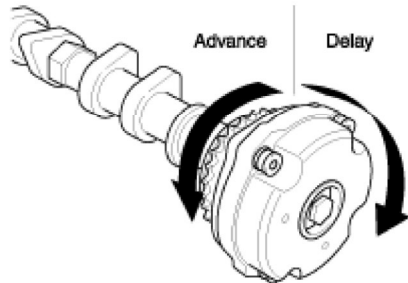


Fig. 40: Identifying Continuous Variable Valve Timing Movement
Courtesy of KIA MOTORS AMERICA, INC.

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.

REPLACEMENT

VALVE GUIDE

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

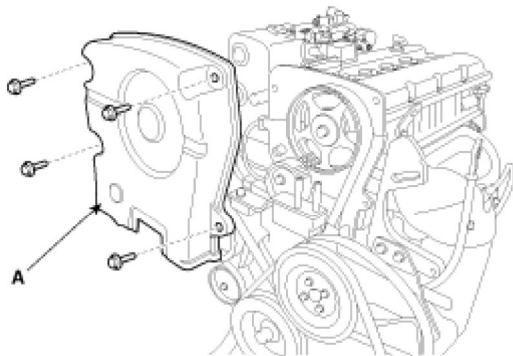


Fig. 41: Removing Valve Guide
Courtesy of KIA MOTORS AMERICA, INC.

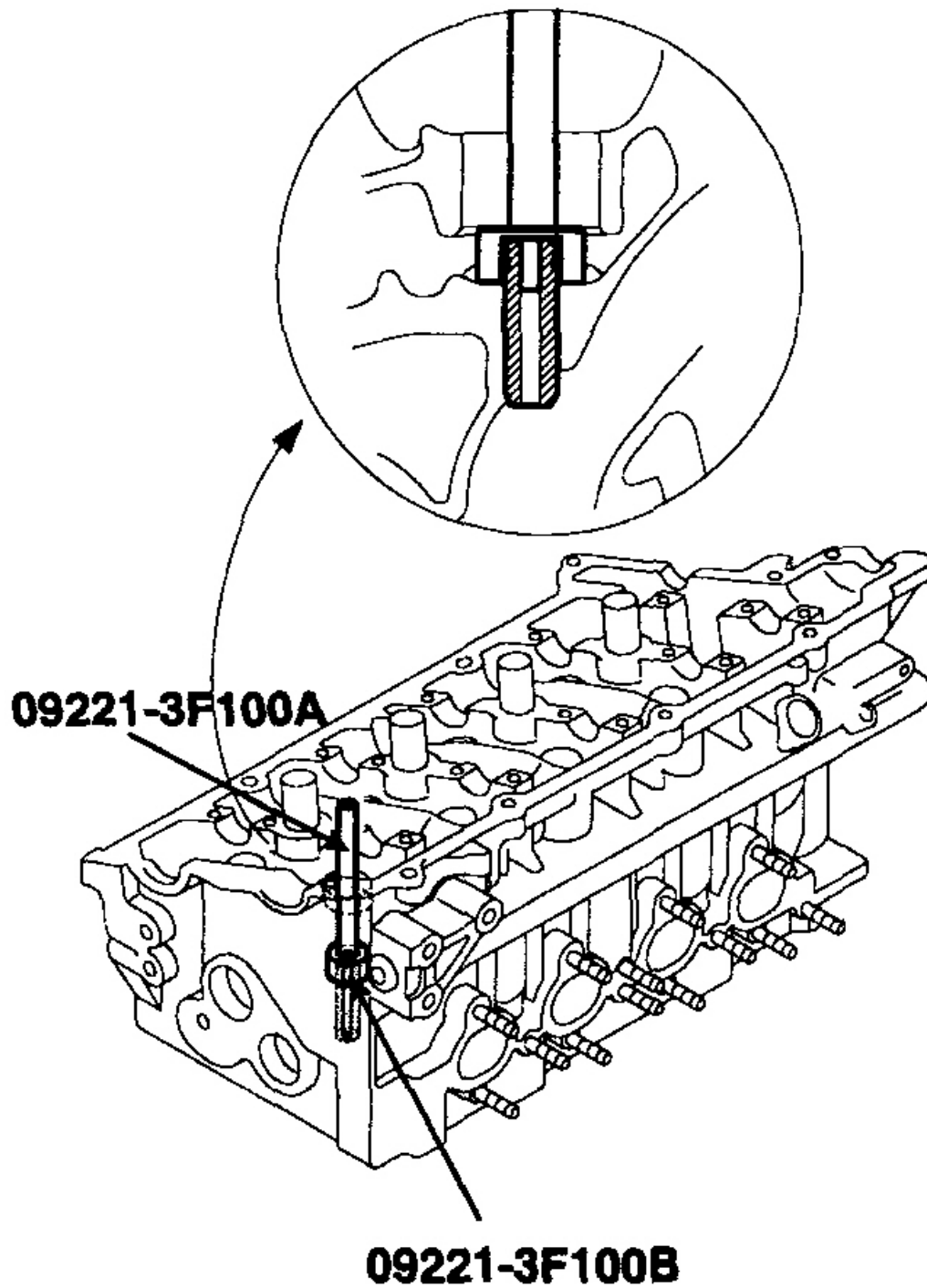
2. Recondition the valve guide hole of cylinder head so that it can match the newly press-fitted oversize valve guide.

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)



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Fig. 42: 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.

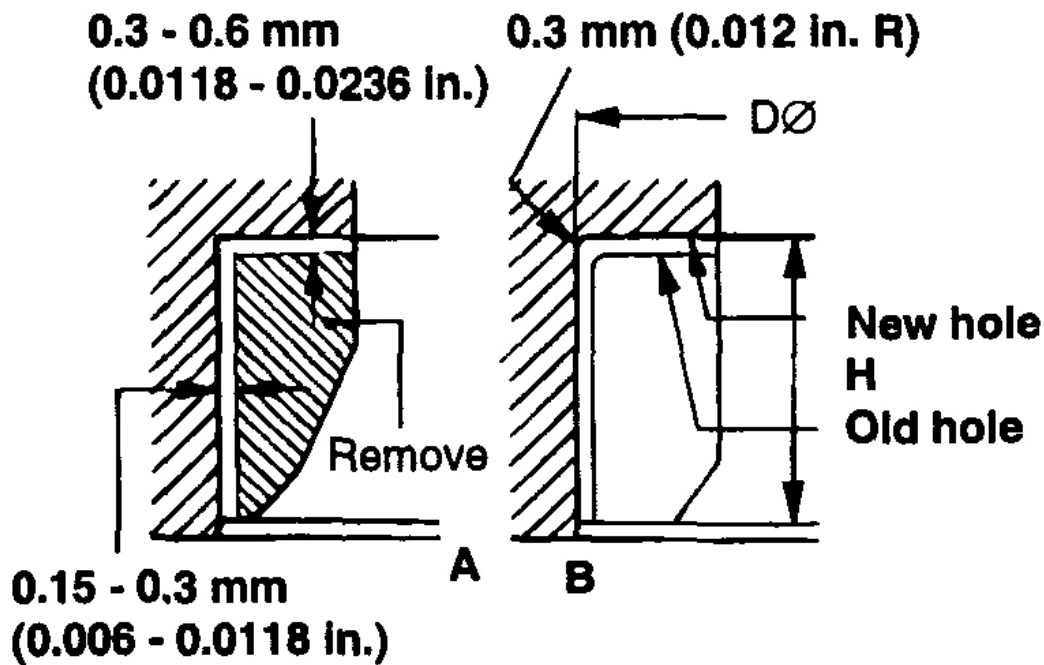
VALVE GUIDE OVERSIZE

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.



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Fig. 43: Identifying Valve Seat Ring Cutting Dimensions
 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

2005 Kia Sportage EX

2005-06 ENGINE Cylinder Head Assembly - 2.0L - Sportage

Exhaust valve seat ring	STD	-	~ 1.1229)	(1.1256 ~ 1.1262)	(0.3110 ~ 0.3189)
	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)

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.

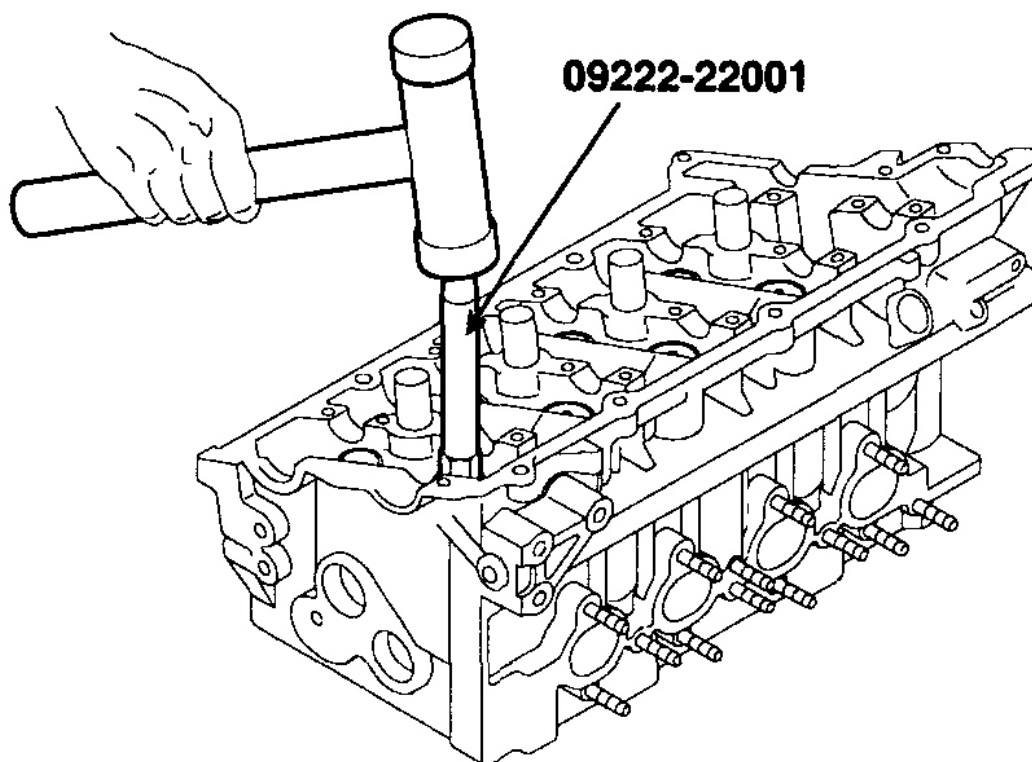
1. Install the valves.

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.



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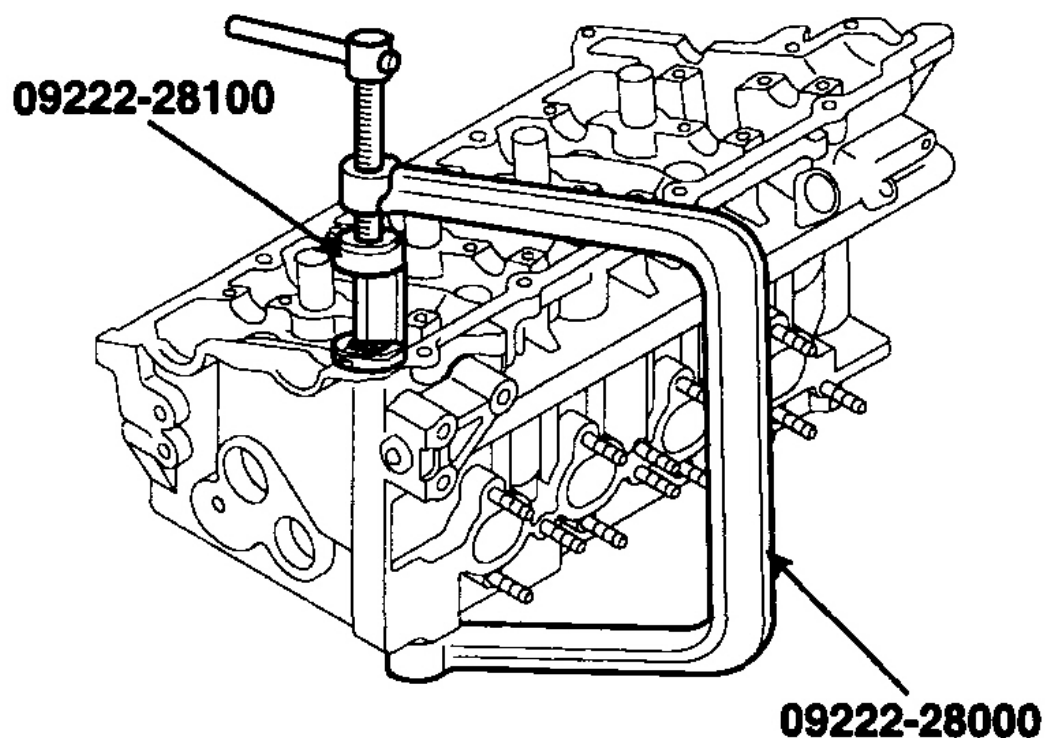
Fig. 44: Installing Valves

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.

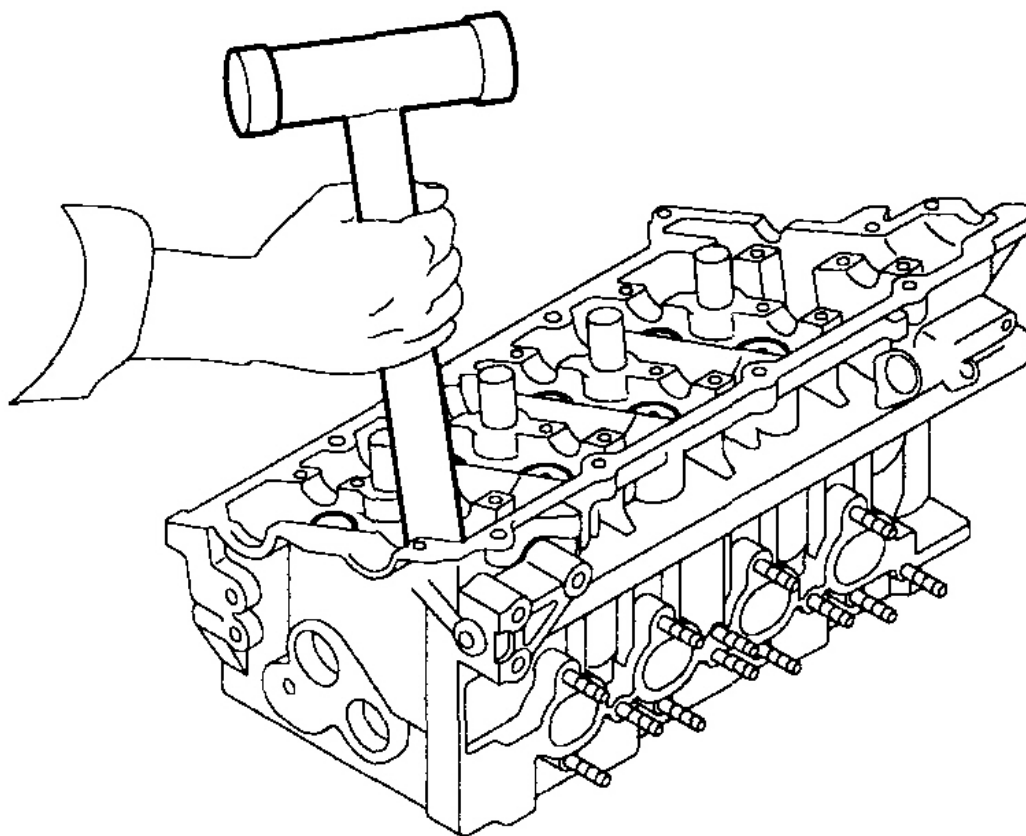
4. Using the SST(09222 - 28000, 09222 - 28100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.



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

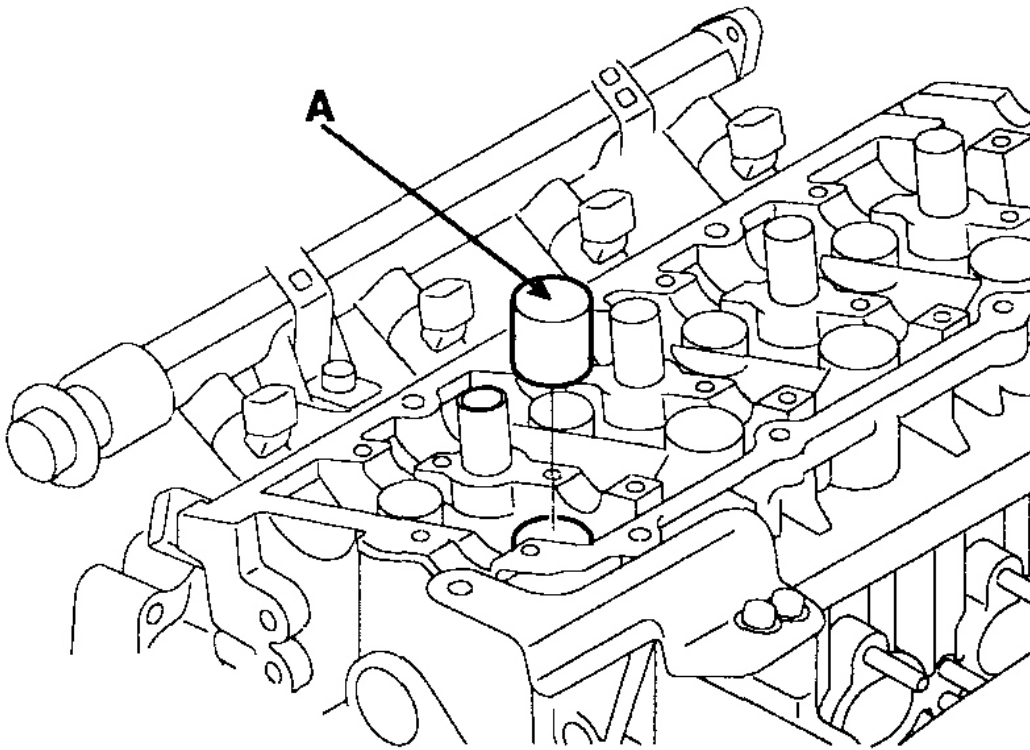
5. Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of the valve and retainer lock.



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.



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

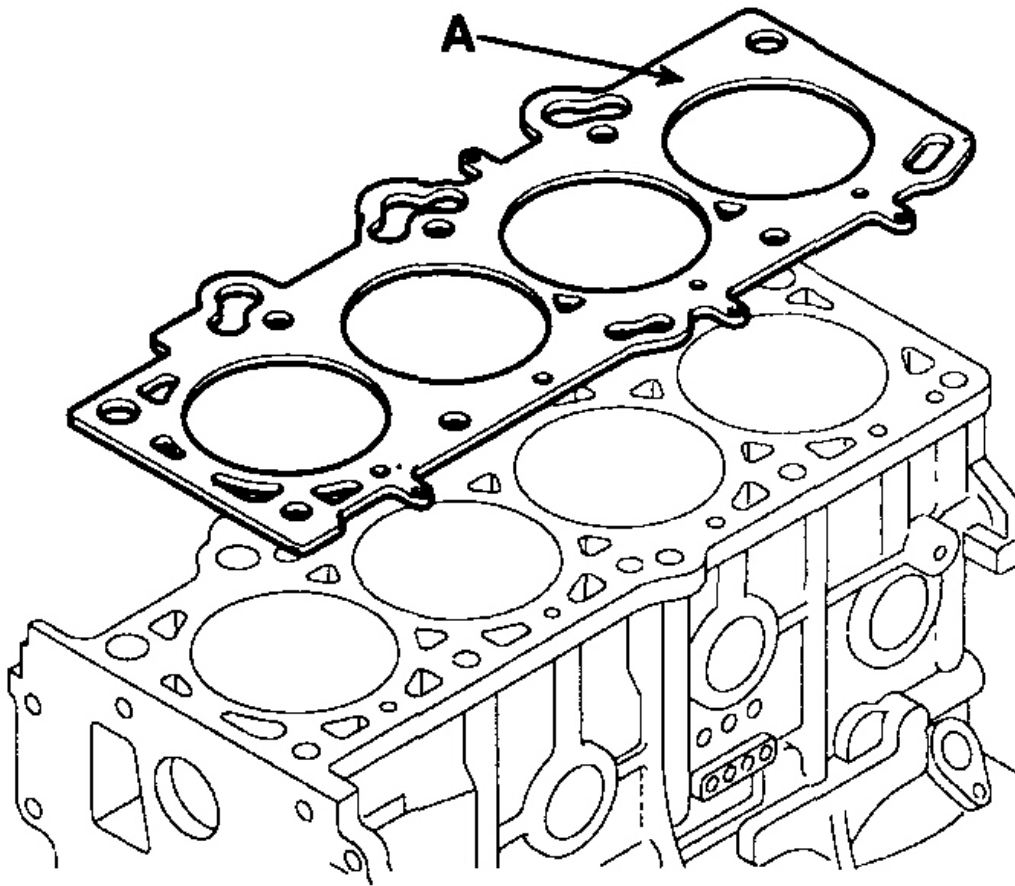
INSTALLATION

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°

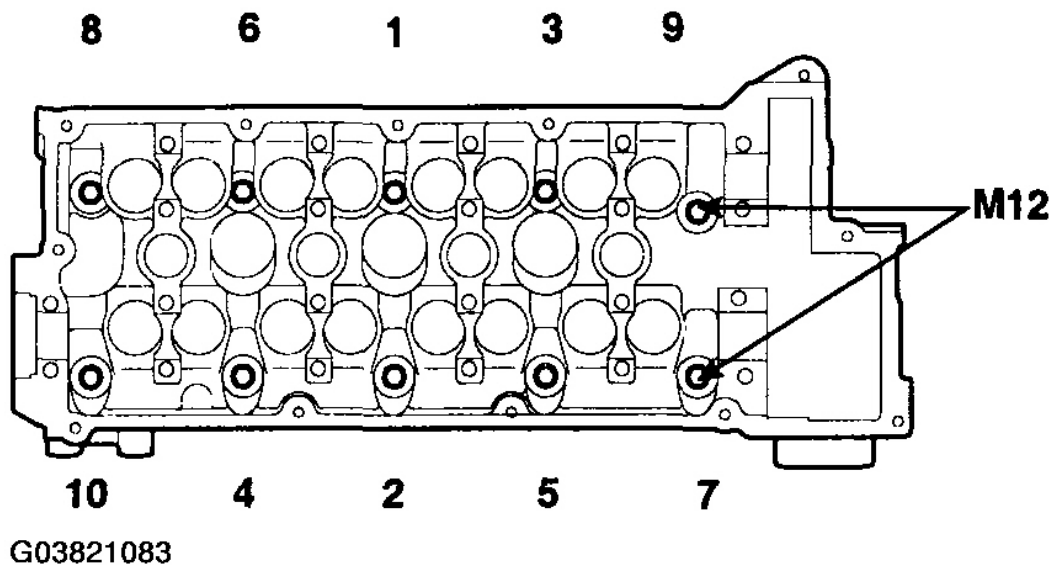
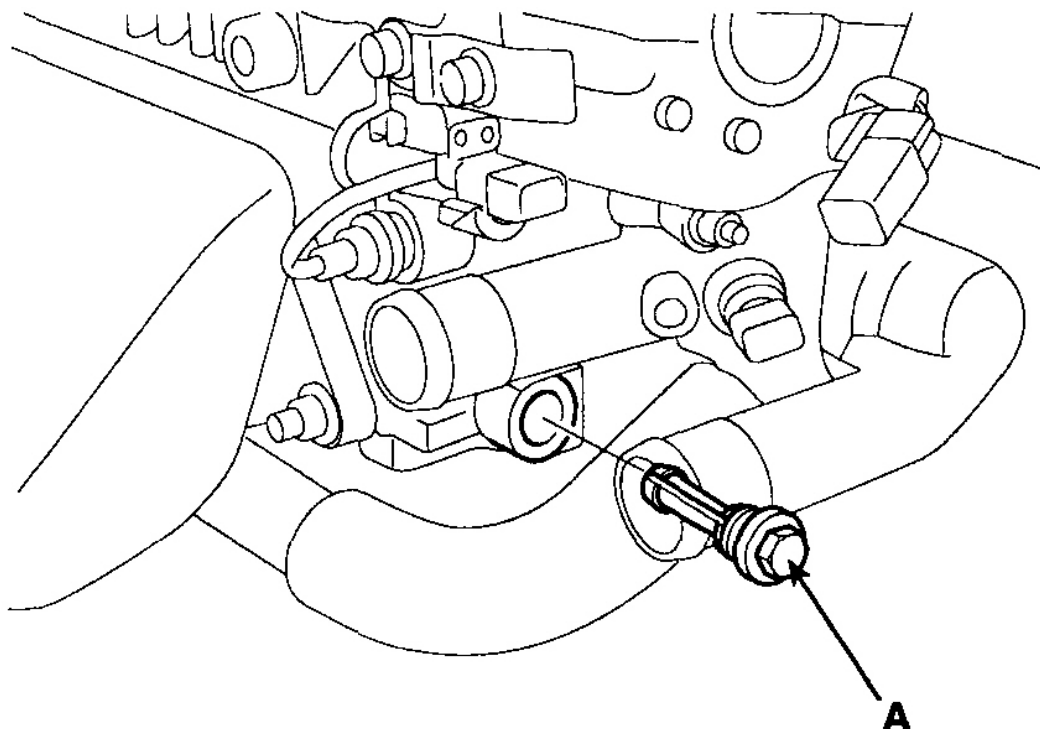


Fig. 49: Installing Cylinder Head Bolts
Courtesy of KIA MOTORS AMERICA, INC.

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)



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

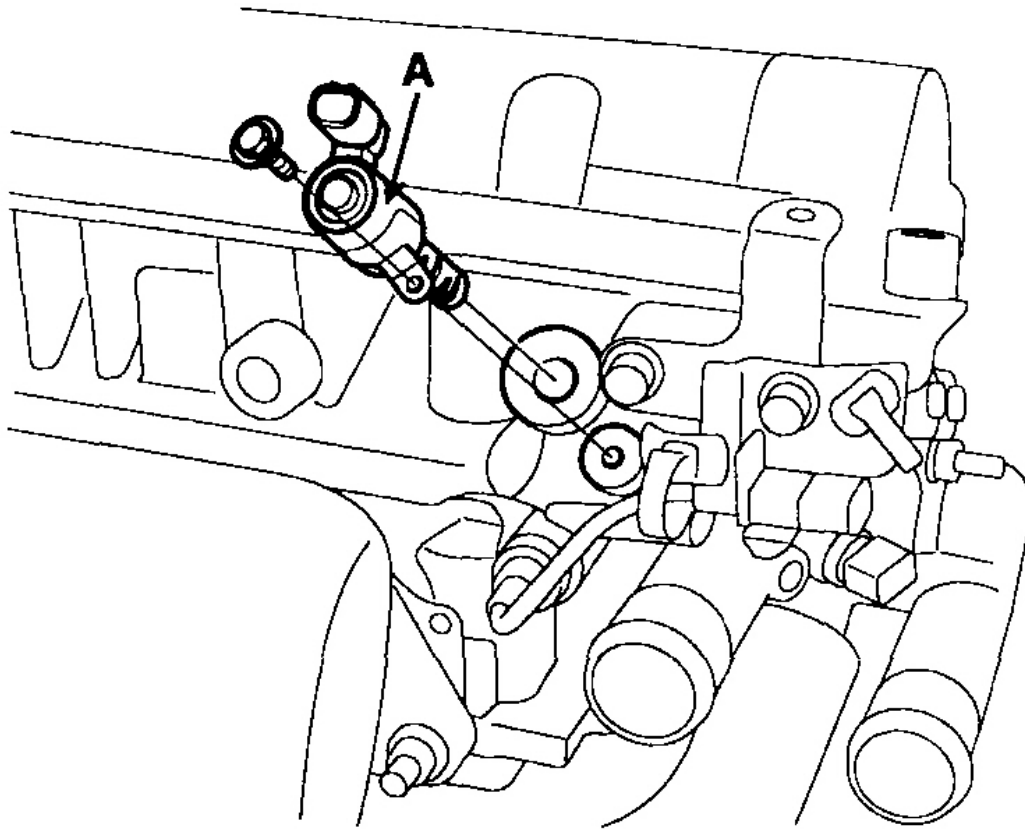
NOTE:

- 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)



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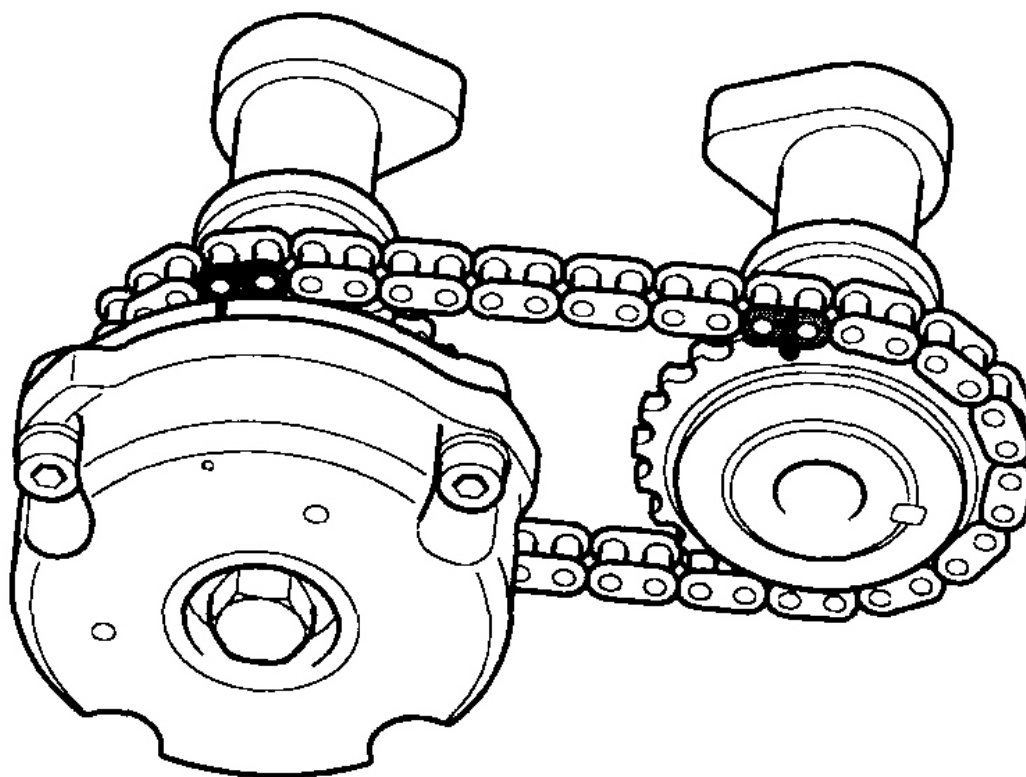
Fig. 51: Installing Oil Control Valve
Courtesy of KIA MOTORS AMERICA, INC.

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.



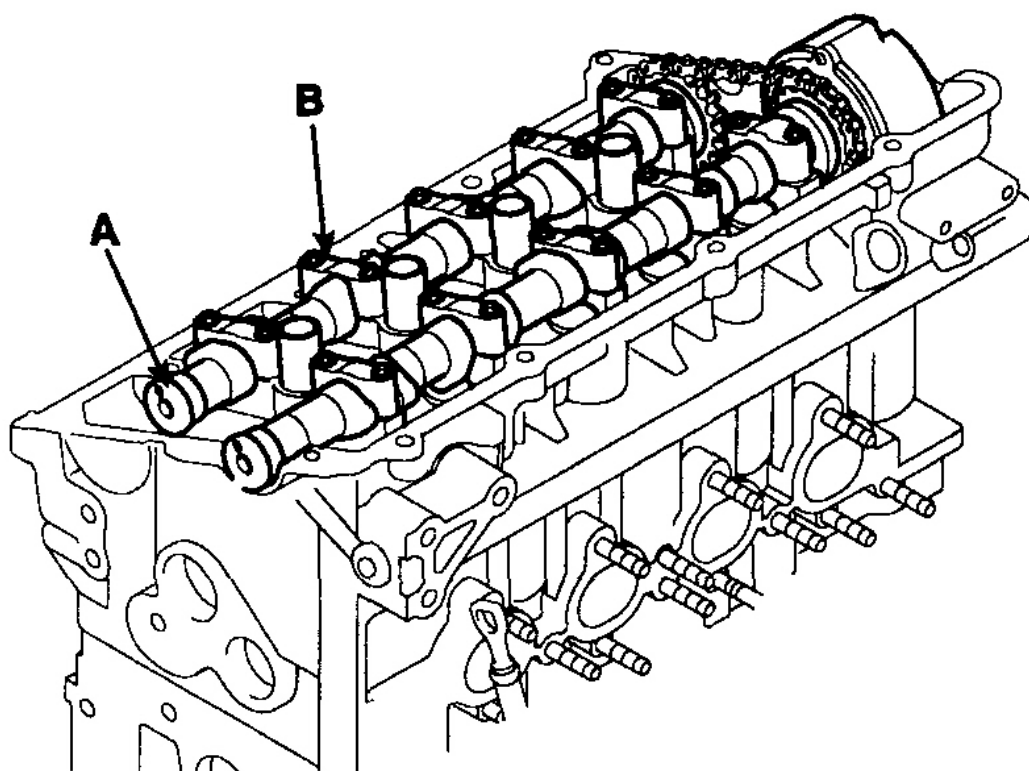
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Fig. 52: Aligning Camshaft Timing Chain With Intake And Exhaust Timing Chain Sprocket
Courtesy of KIA MOTORS AMERICA, INC.

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)



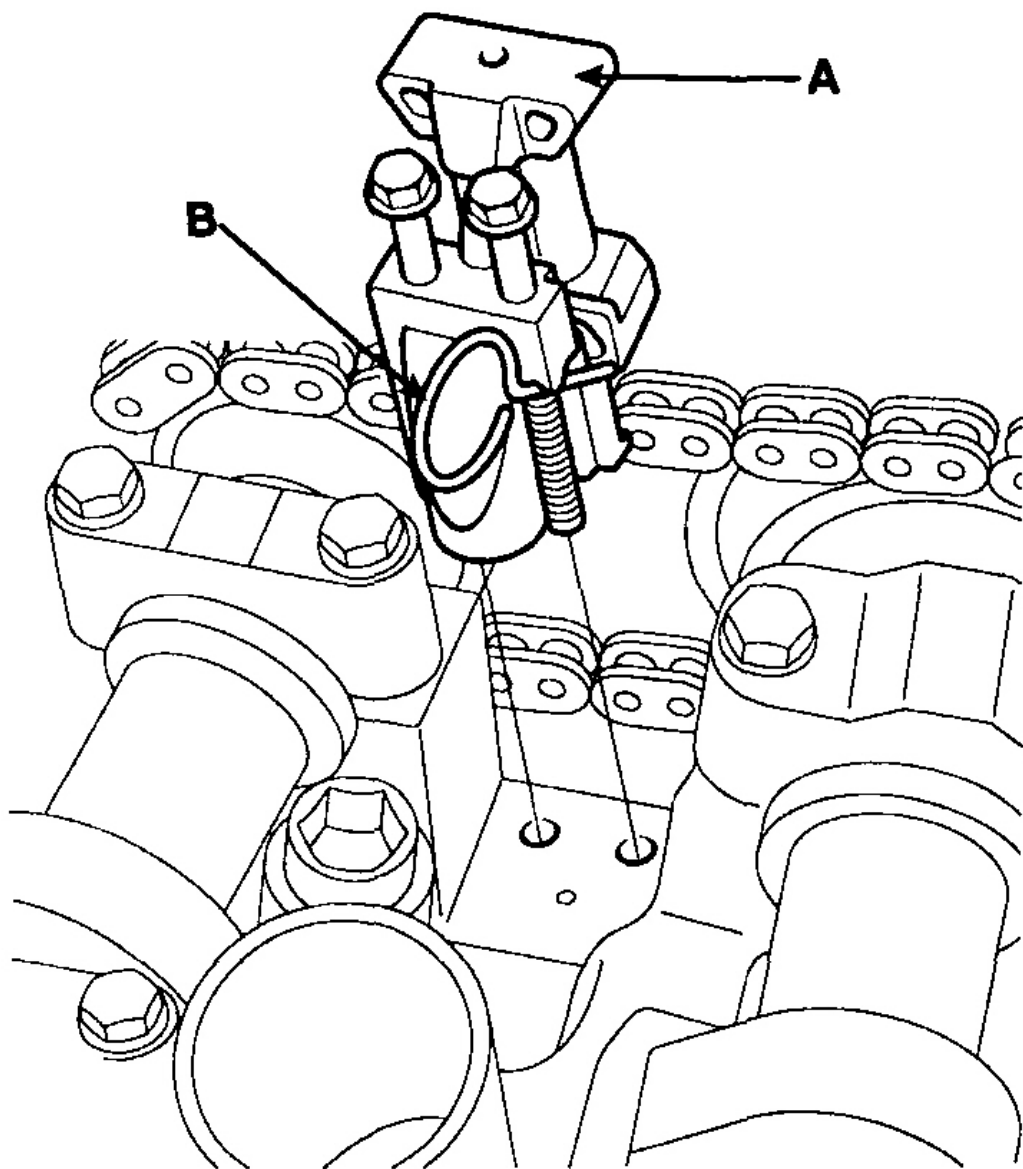
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Fig. 53: Installing Camshaft And Bearing Caps
Courtesy of KIA MOTORS AMERICA, INC.

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

Tightening torque:

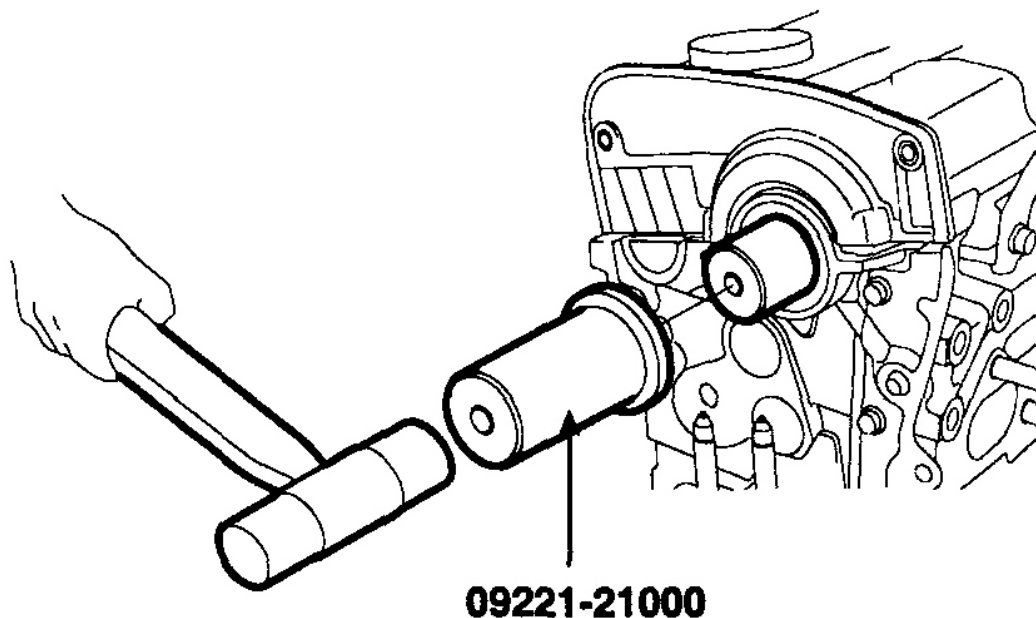
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



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

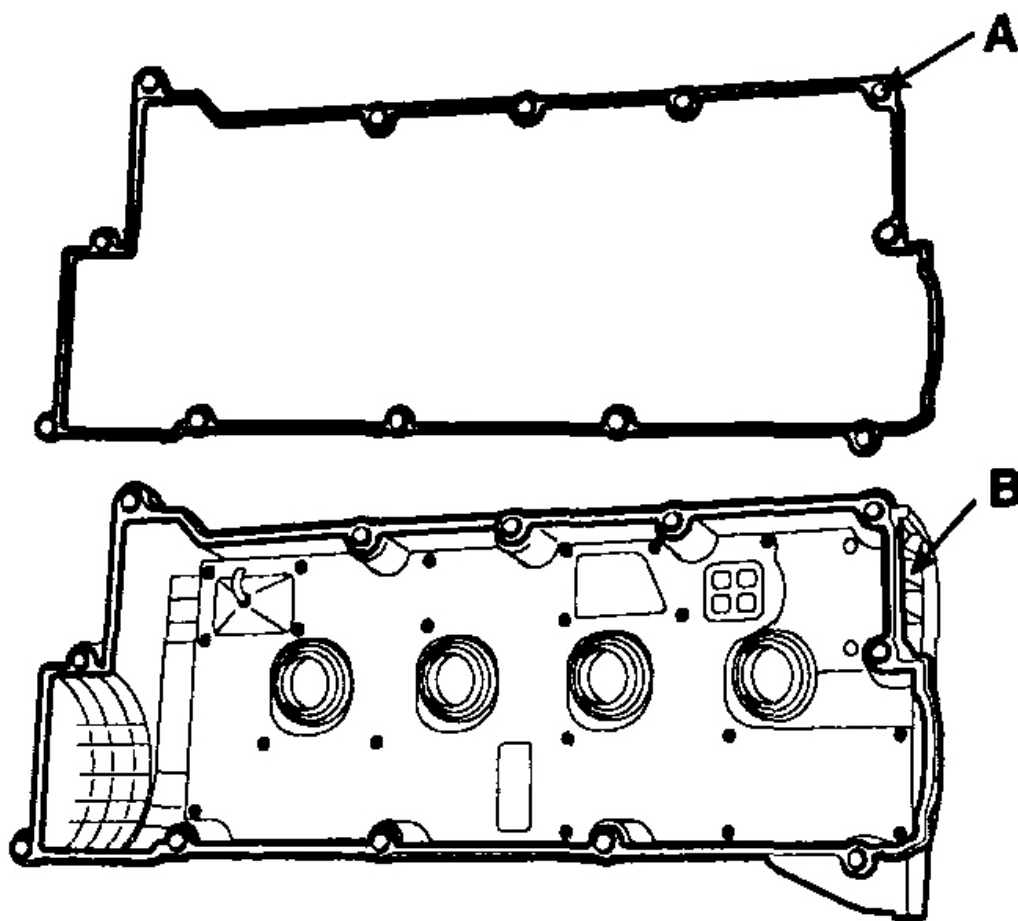
4. Remove the auto tensioner stopper pin (B).
7. Check and adjust valve clearance. (Refer to **VALVE CLEARANCE INSPECTION AND ADJUSTMENT**)
8. Using the SST (09221 - 21000), install the camshaft bearing oil seal.



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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).



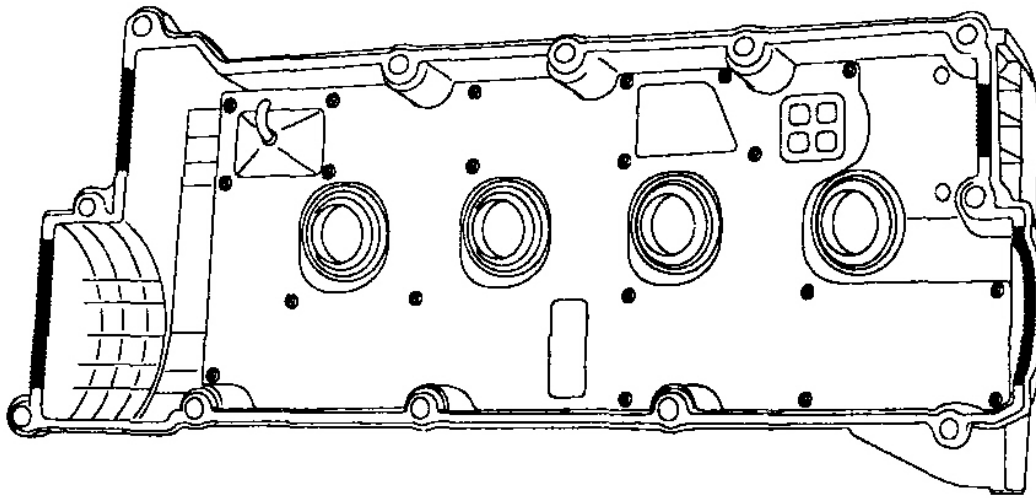
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Fig. 56: Installing Cylinder Head Cover Gasket In Cylinder Head Cover Groove
Courtesy of KIA MOTORS AMERICA, INC.

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.



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

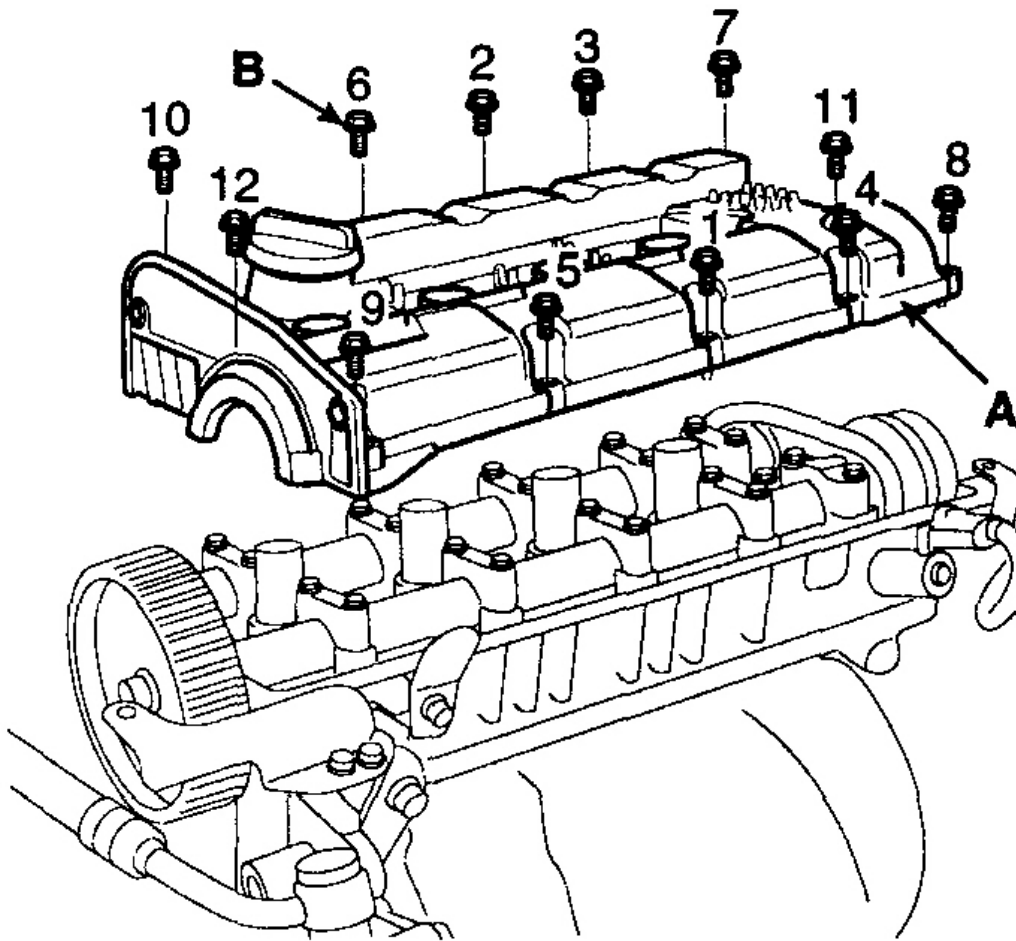
NOTE:

- 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)



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Fig. 58: Installing Cylinder Head Cover
 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.

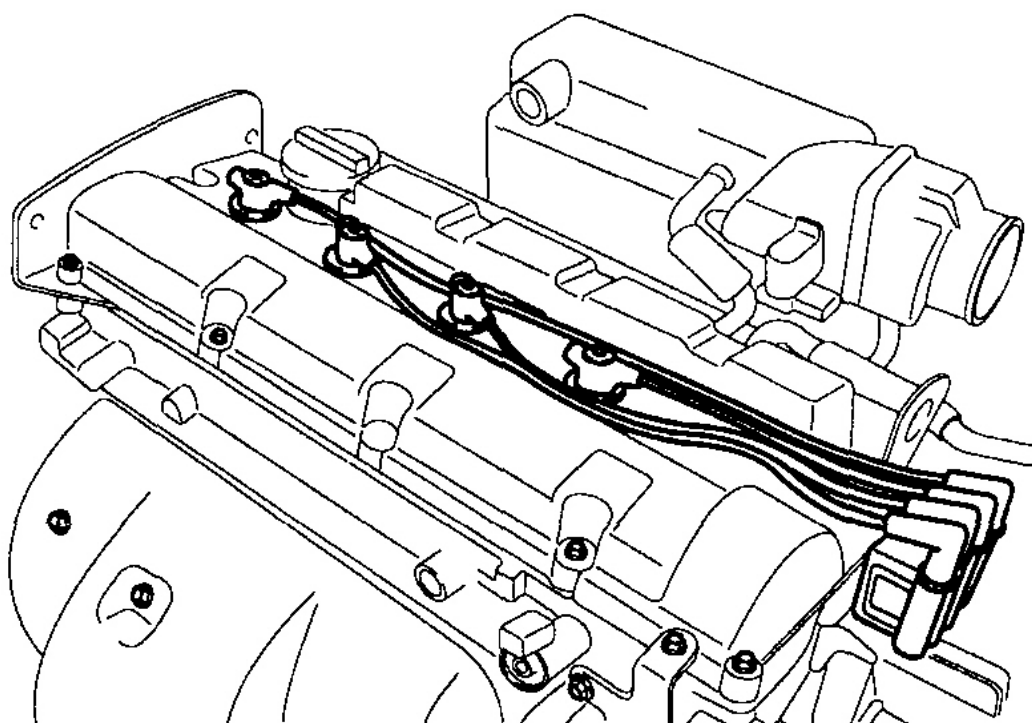
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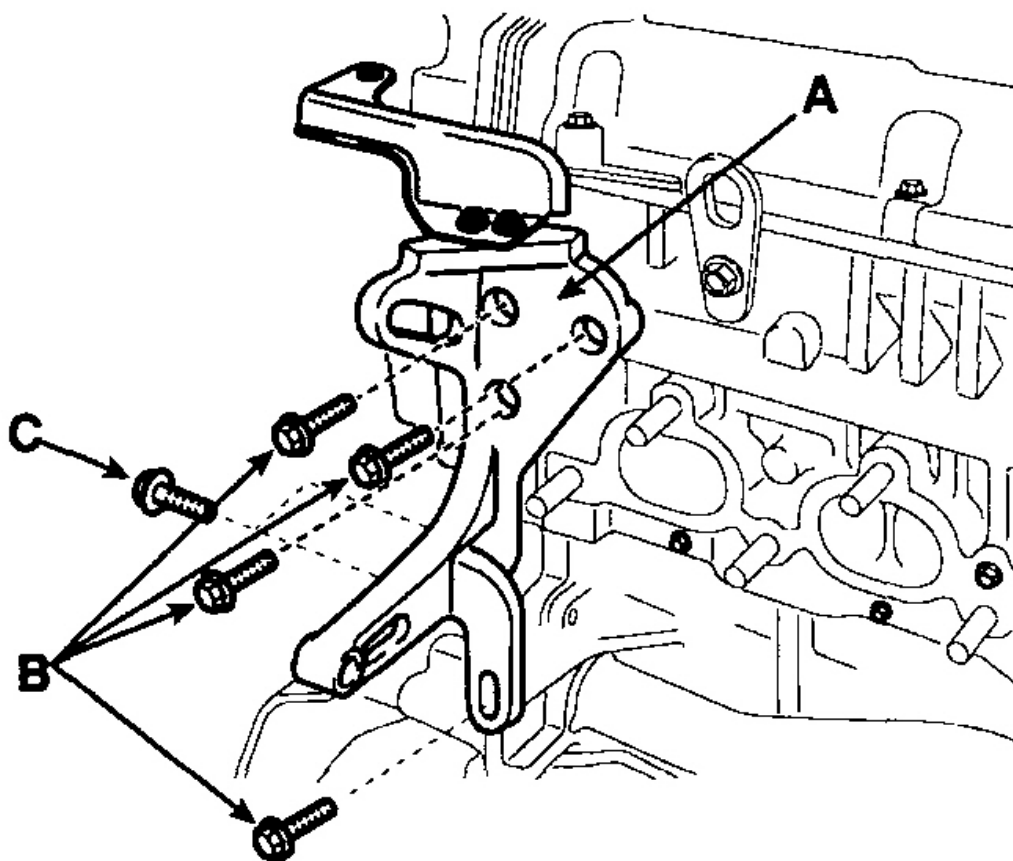
Fig. 59: Installing Spark Plug Cables
Courtesy of KIA MOTORS AMERICA, INC.

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)

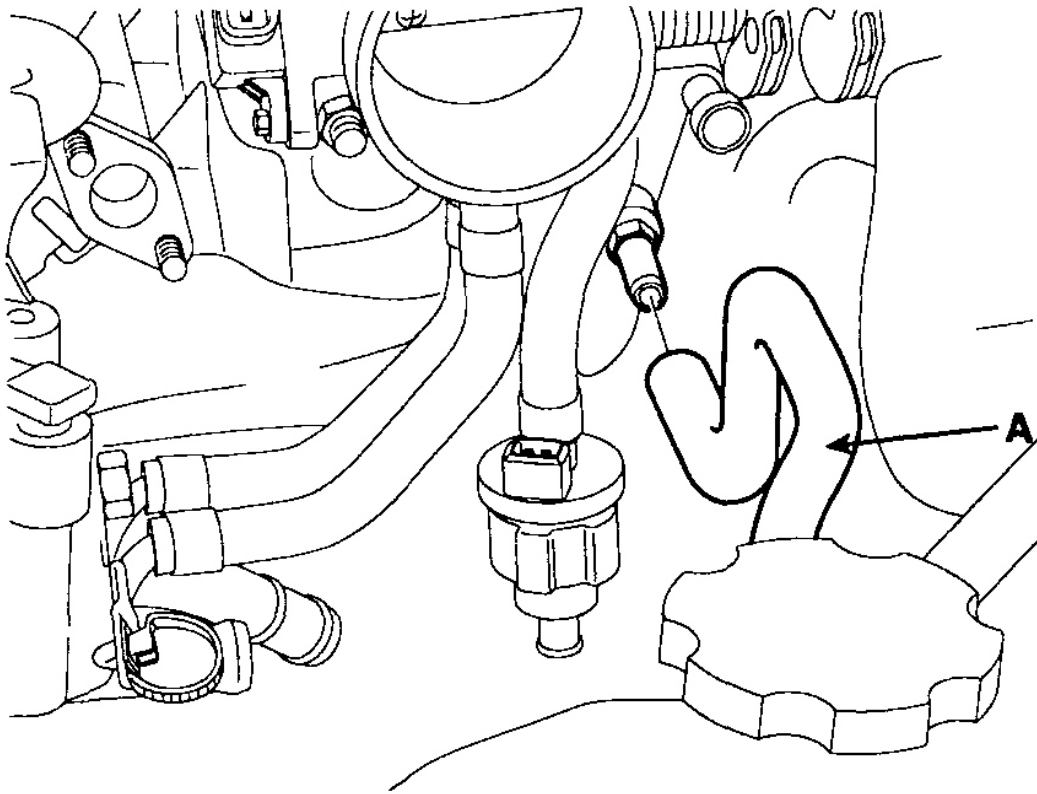
Bolt (C): 11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lb-ft)



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

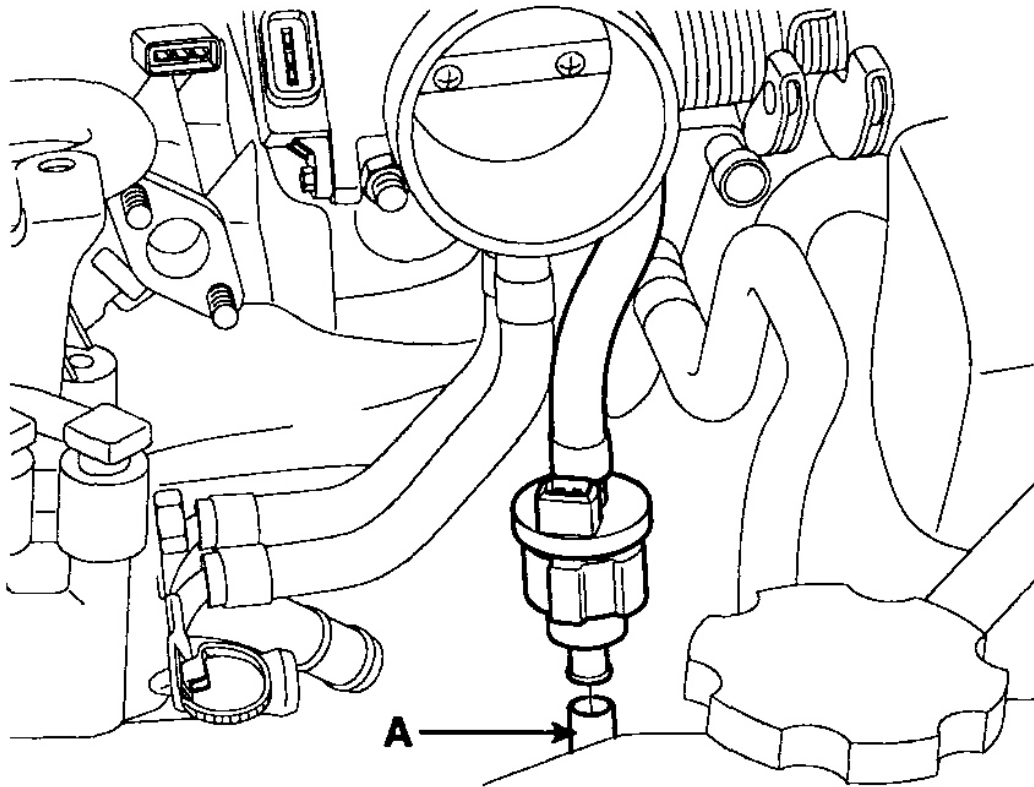
17. Install the power steering pump. (See **MECHANICAL POWER STEERING SYSTEM**)
18. Install the accelerator cable.
19. Install the brake booster hose (A).



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.



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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.

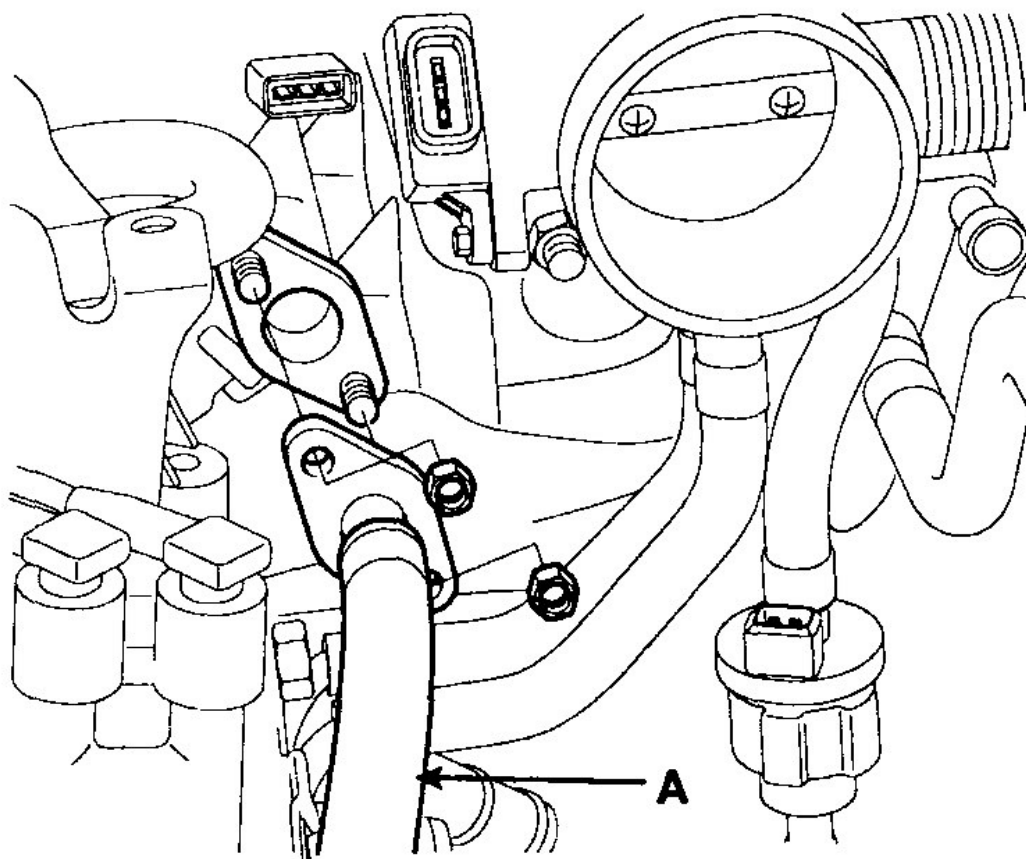
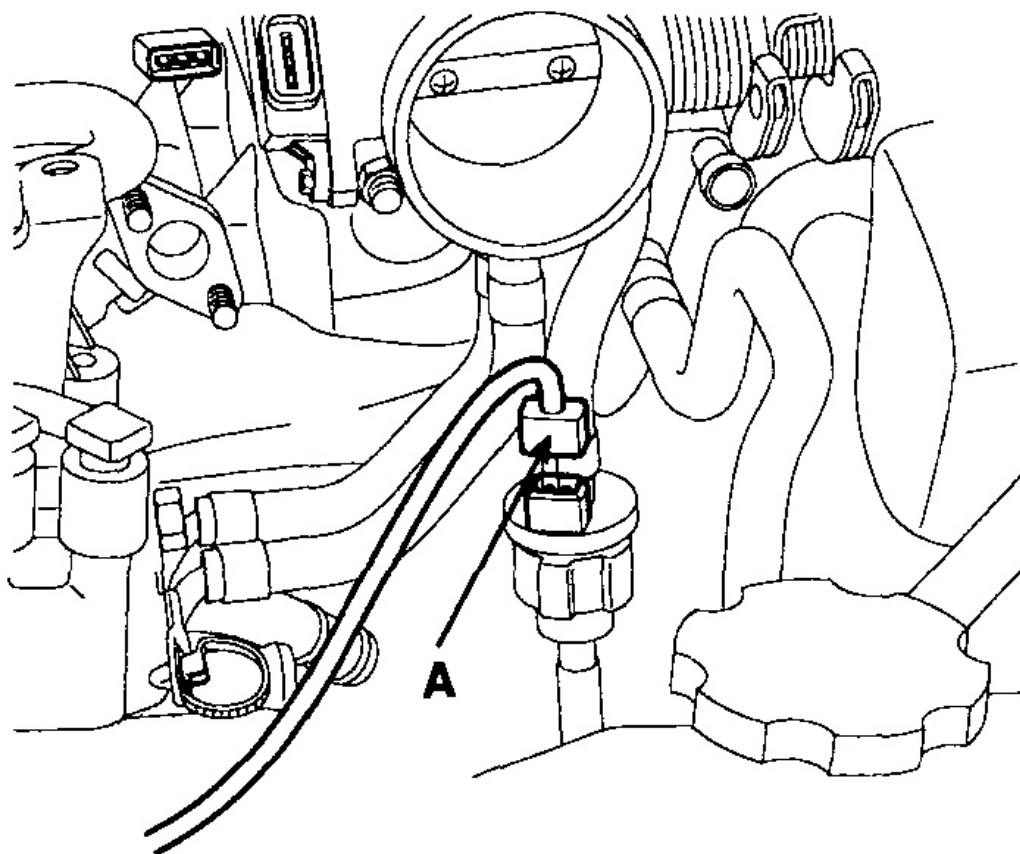
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Fig. 63: Connecting Delivery Pipe Side Fuel Inlet Hose
Courtesy of KIA MOTORS AMERICA, INC.

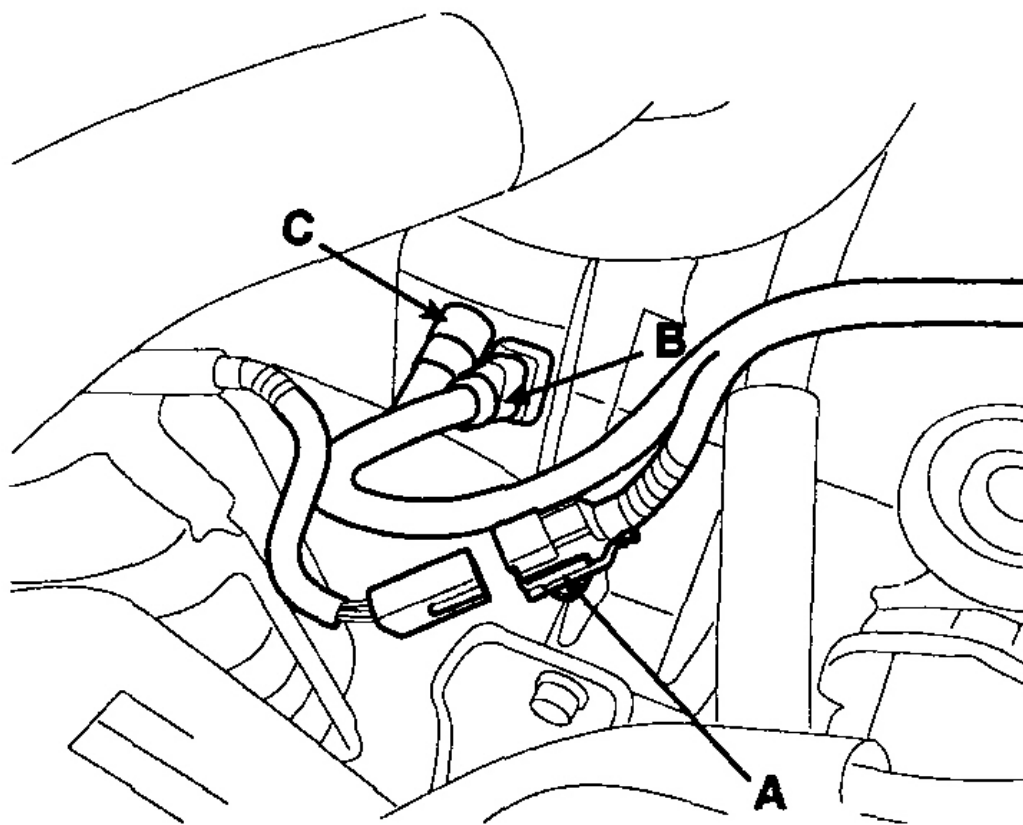
22. Install the engine wire harness connectors and wire harness clamps to the cylinder head and the intake manifold.
 1. Connect the PCSV (Purge Control Solenoid Valve) connector (A).



G03821098

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

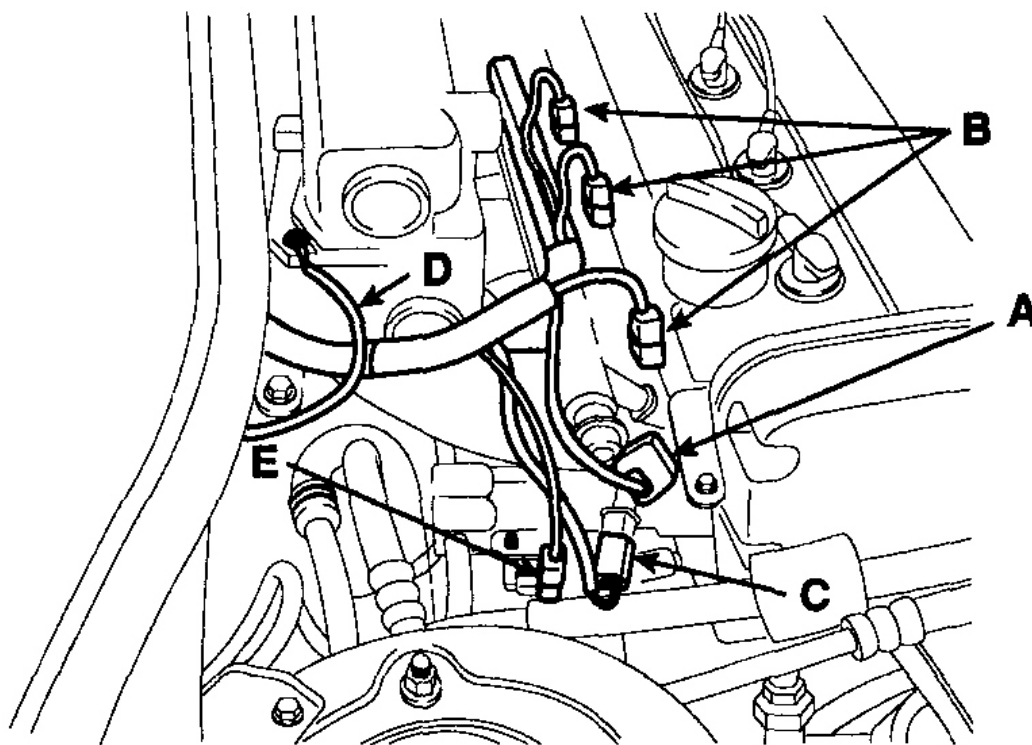
2. Connect the front heated oxygen sensor connector (A).
3. Connect the CKP (Crankshaft Position Sensor) connector (B).
4. Connect the oil pressure switch connector (C).



G03821099

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

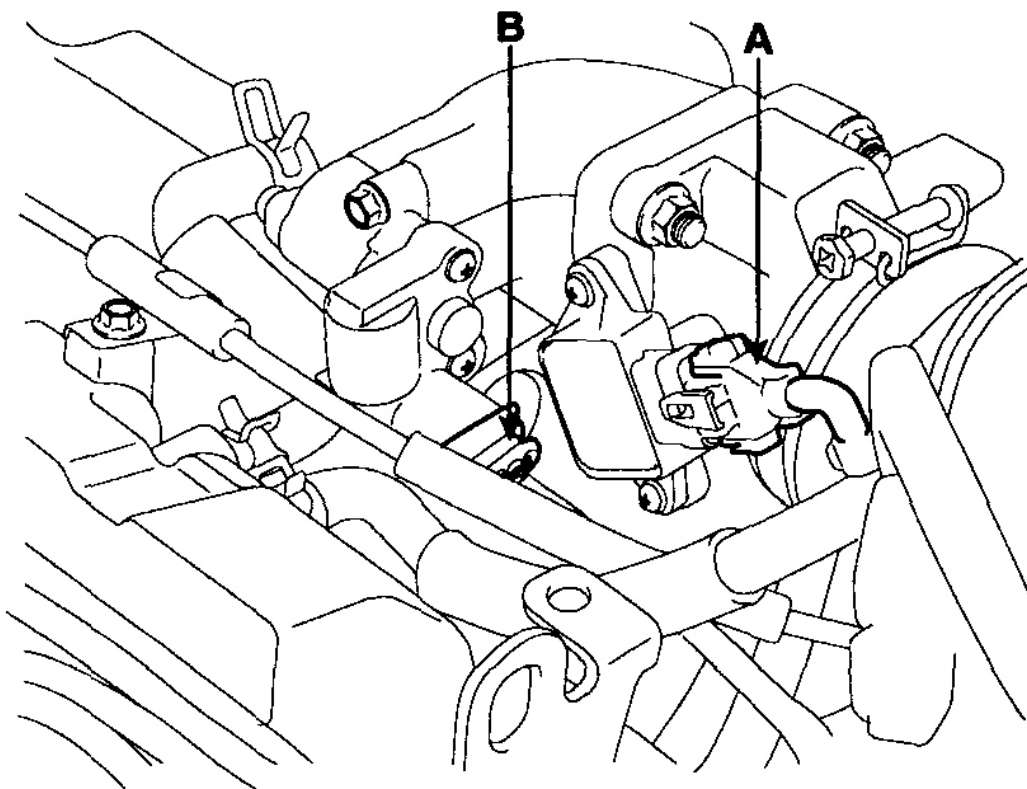
5. Connect the air conditioner compressor switch connector (E).
6. Connect the ground cables (D) to intake manifold.
7. Connect the knock sensor connector (C).
8. Connect the fuel injector connectors (B).
9. Connect the CMP (Camshaft position sensor) connector (A).



G03821100

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

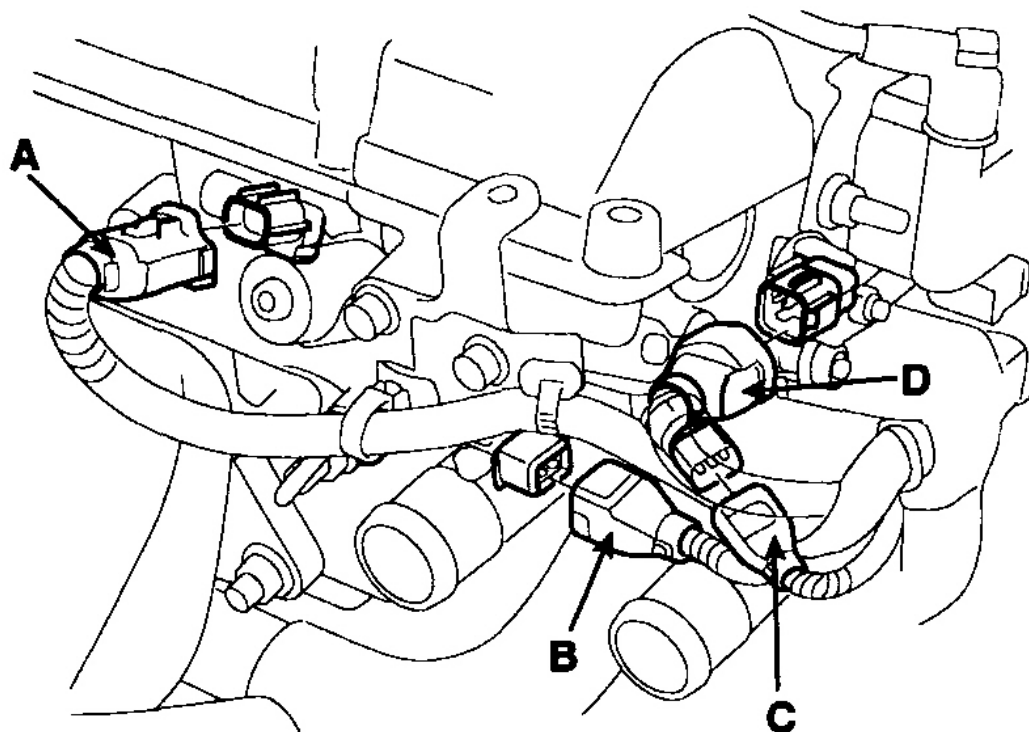
10. Connect the ISA (Idle Speed Actuator) connector (B).
11. Connect the TPS (Throttle Position Sensor) connector (A).



G03821101

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

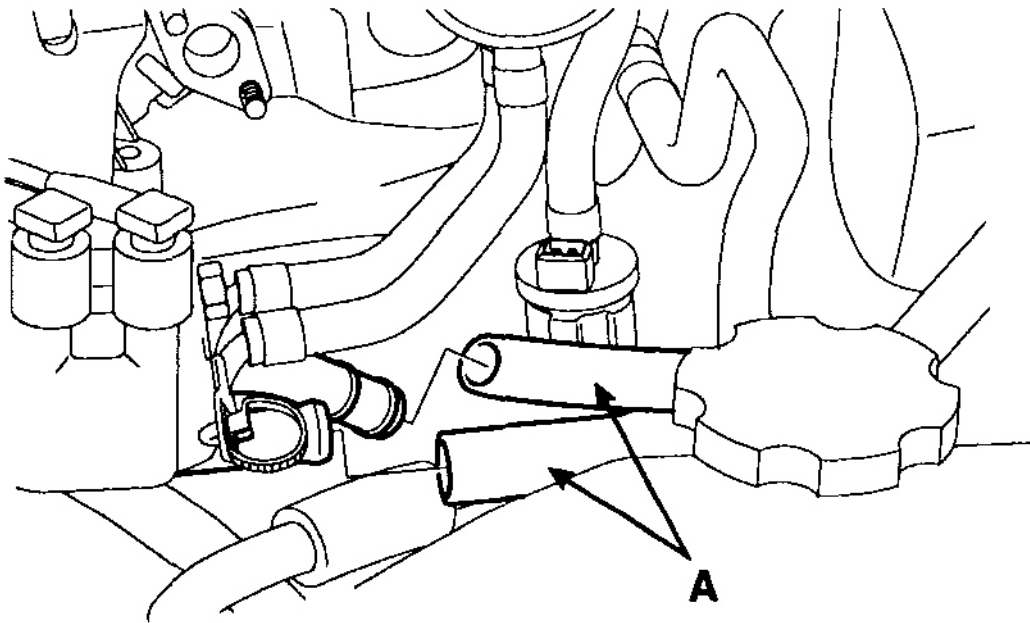
12. Connect the ignition coil connector (D).
13. Connect the ECT (Engine Coolant Temperature) connector (C).
14. Connect the oil temperature sensor connector (B).
15. Connect the OCV (Oil Control Valve) connector (A).



G03821102

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

23. Install the heater hose (A).

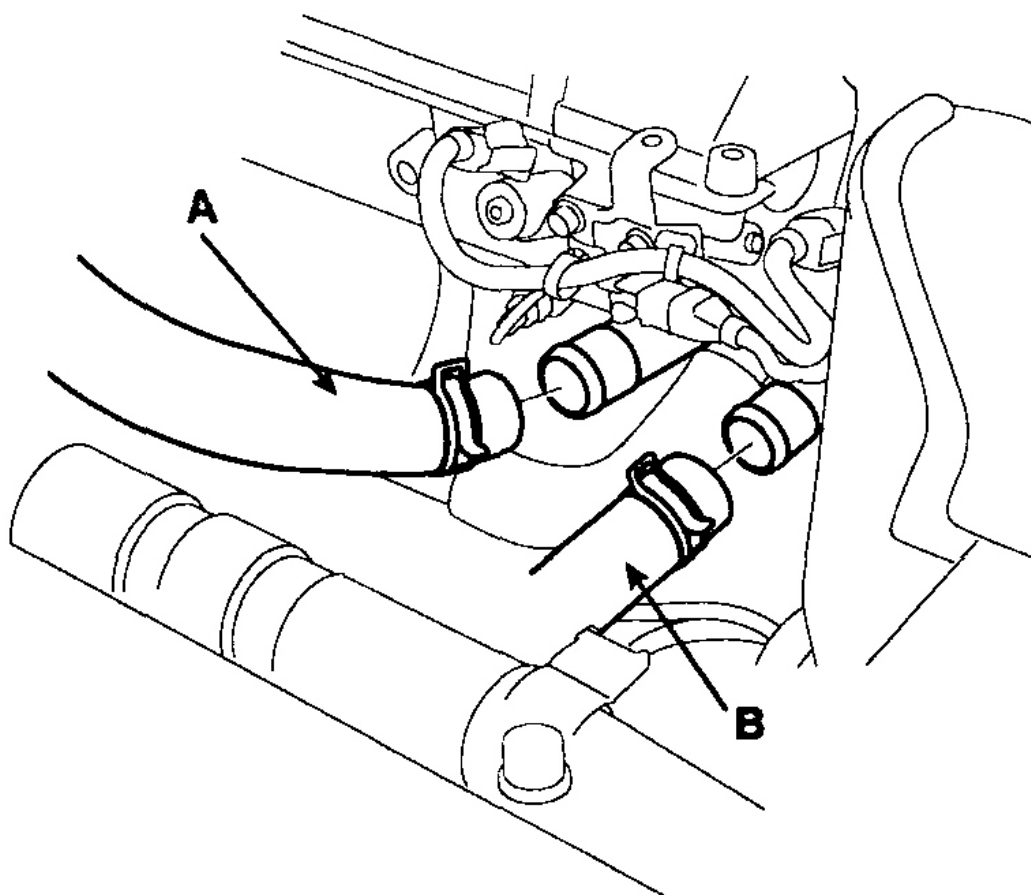


G03821103

Fig. 69: Installing Heater Hose

Courtesy of KIA MOTORS AMERICA, INC.

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



G03821104

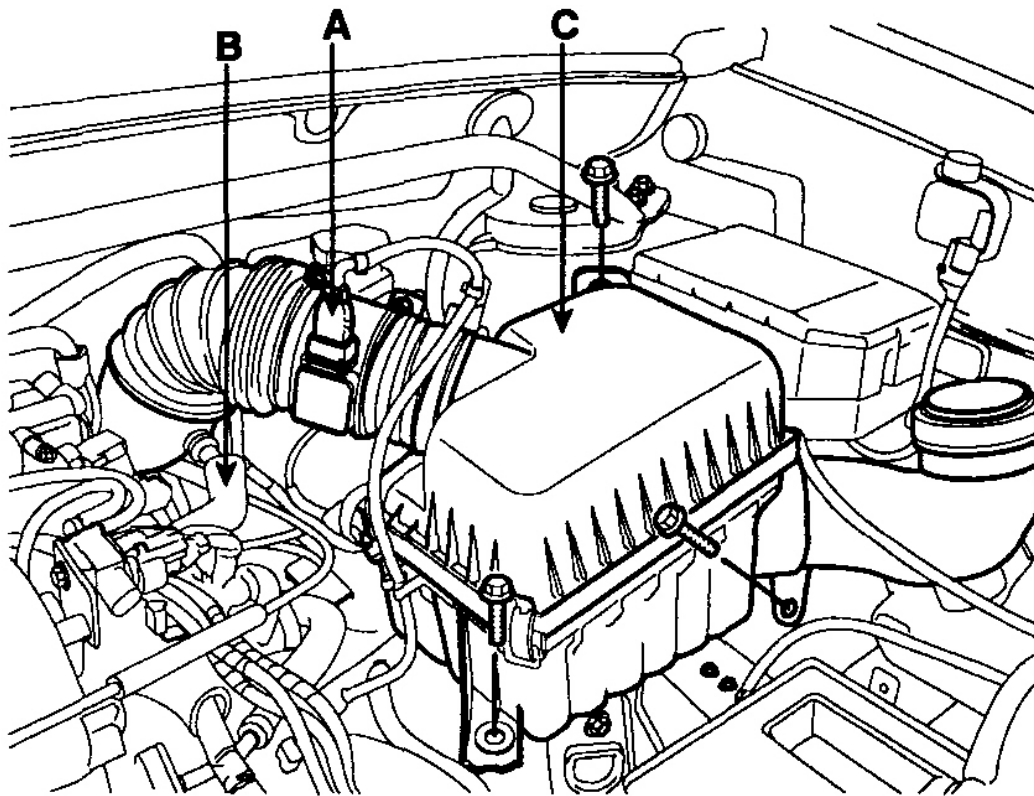
Fig. 70: Installing Upper And Lower Radiator Hose
Courtesy of KIA MOTORS AMERICA, INC.

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).



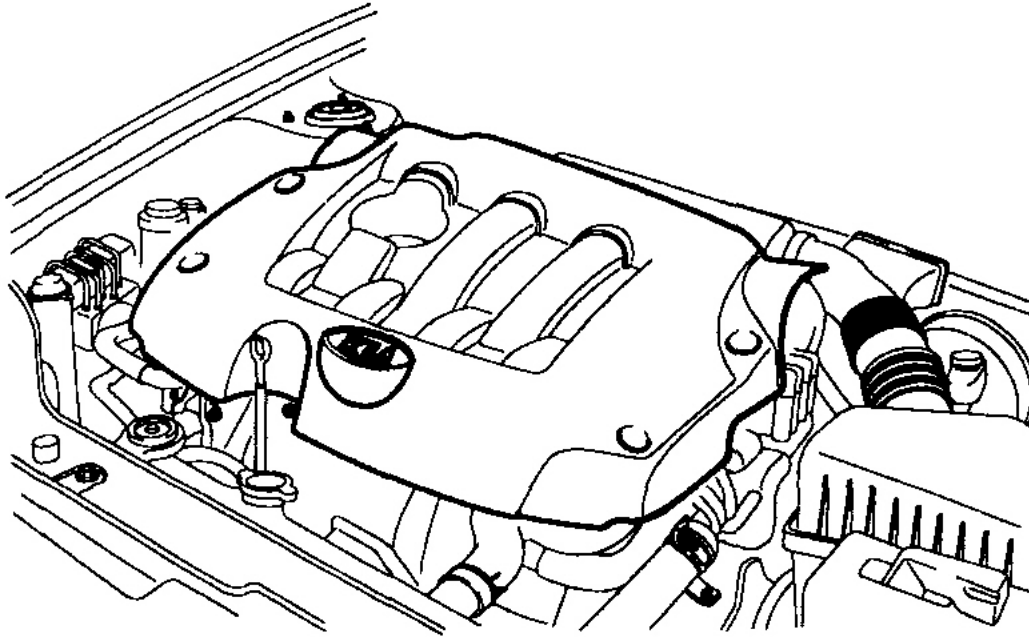
G03821105

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

26. Install the engine cover.

Tightening torque:

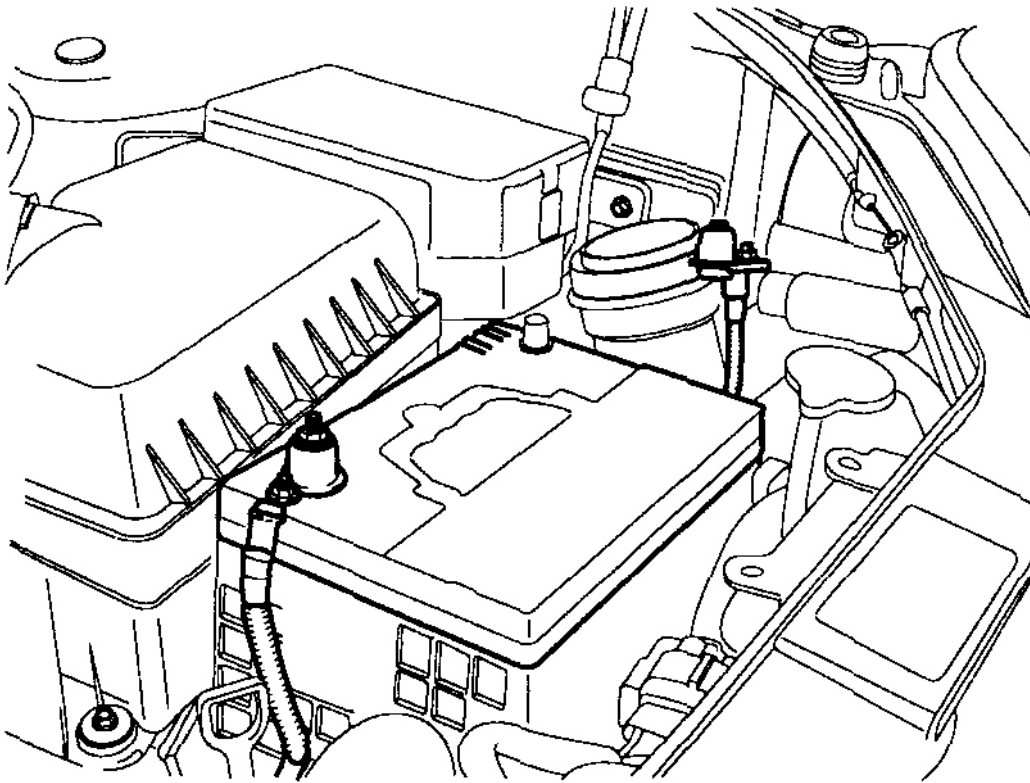
3.9 ~ 5.9N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lb-ft)



G03821106

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

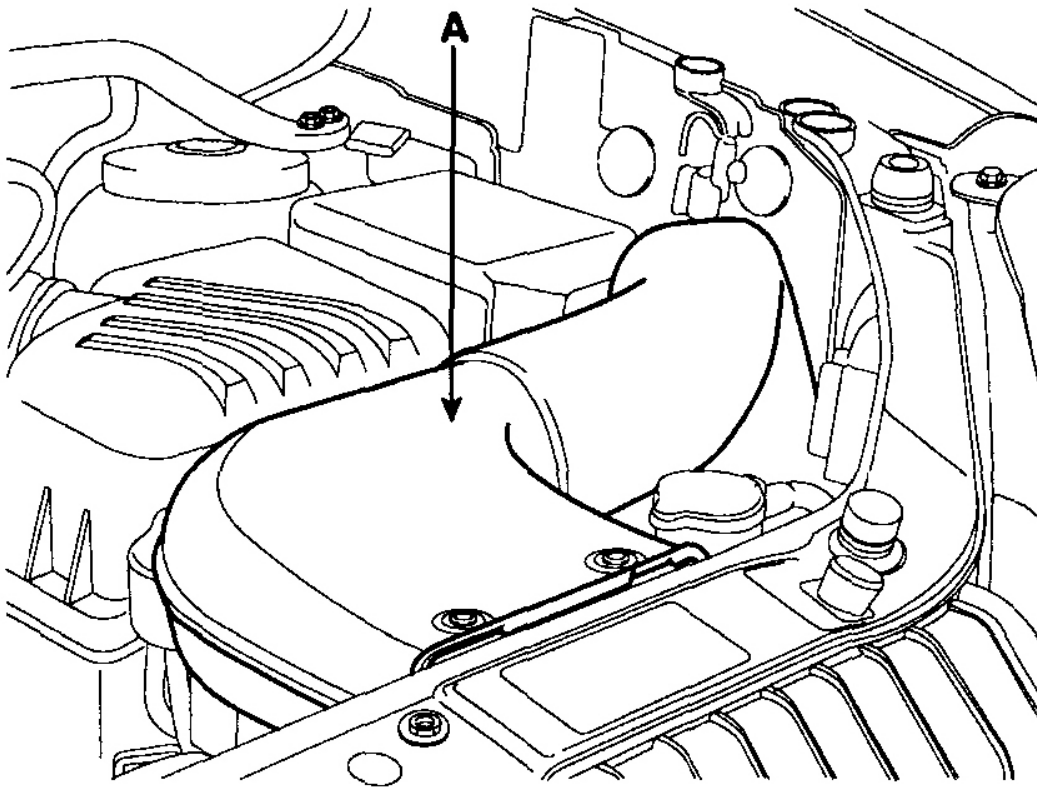
27. Reconnect the battery terminals (A).



G03821107

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

28. Install the air duct (A).



G03821108

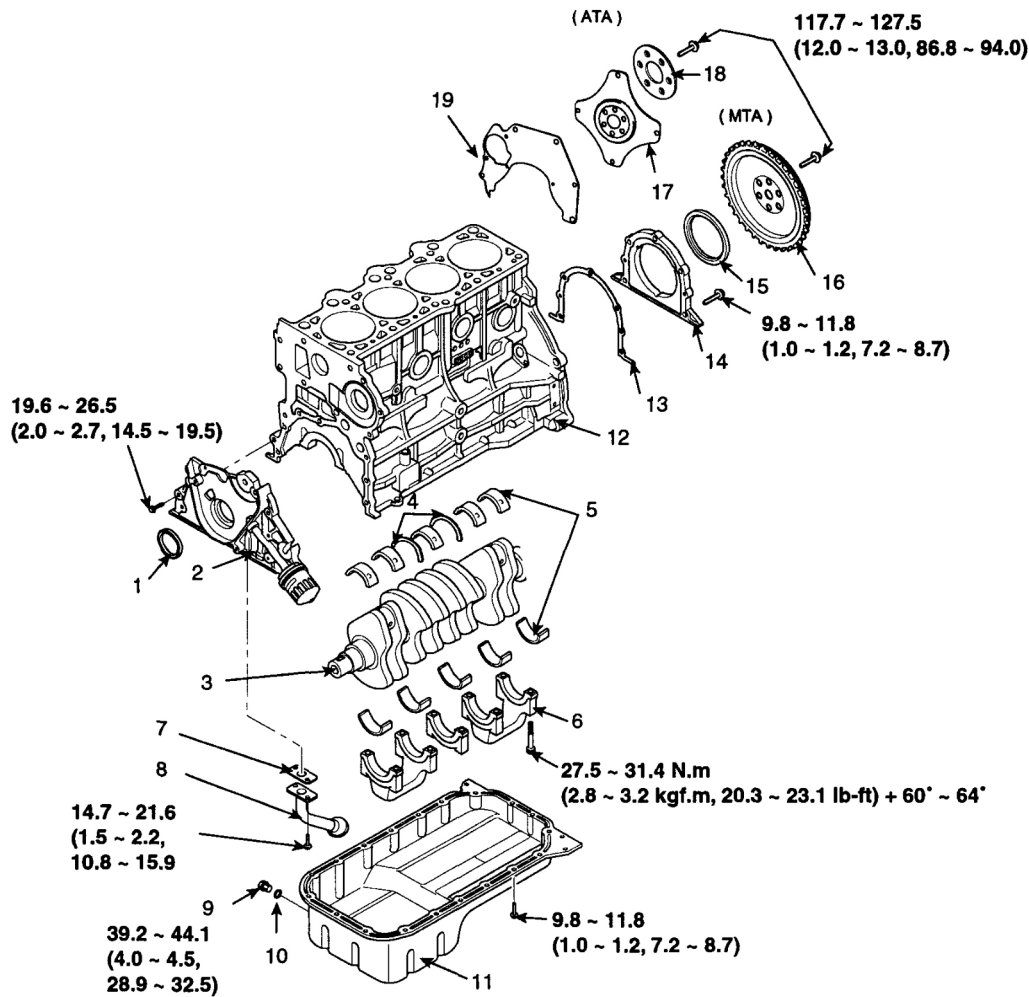
Fig. 74: Installing Air Duct
Courtesy of KIA MOTORS AMERICA, INC.

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

2005-06 ENGINE

Engine Block - 2.0L - Sportage

COMPONENT



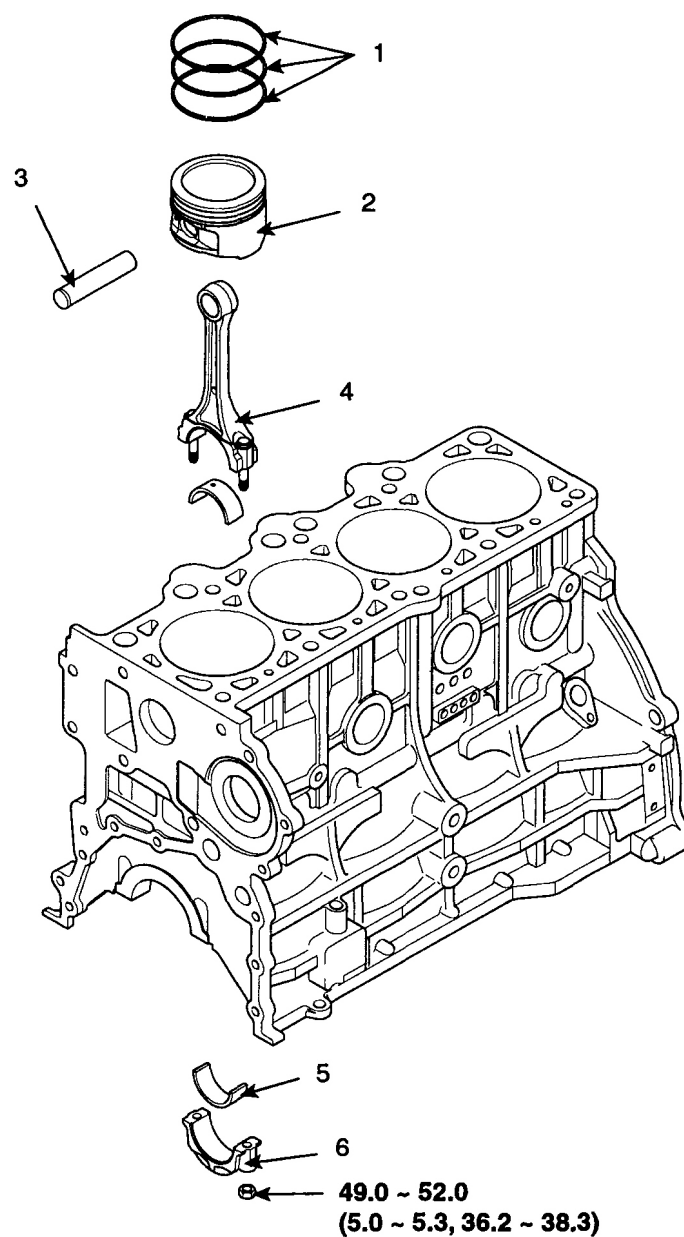
TORQUE : N.m (kgf.m, lb-ft)

- | | |
|---------------------|------------------------|
| 1. Oil seal | 11. Oil pan |
| 2. Front case | 12. Cylinder block |
| 3. Crank shaft | 13. Gasket |
| 4. Thrust bearing | 14. Rear oil seal case |
| 5. Main bearing | 15. Oil seal |
| 6. main bearing cap | 16. Fly wheel |
| 7. Gasket | 17. Drive plate |
| 8. Oil screen | 18. Washer |
| 9. Drain plug | 19. Rear plate |
| 10. Gasket | |

G03821144

Fig. 1: Exploded View Of Engine Block Components (1 Of 2)

Courtesy of KIA MOTORS AMERICA, INC.



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

- 1. Piston ring
- 2. Piston
- 3. Piston pin

- 4. Connecting rod
- 5. Connecting rod bearing
- 6. Connecting rod bearing cap

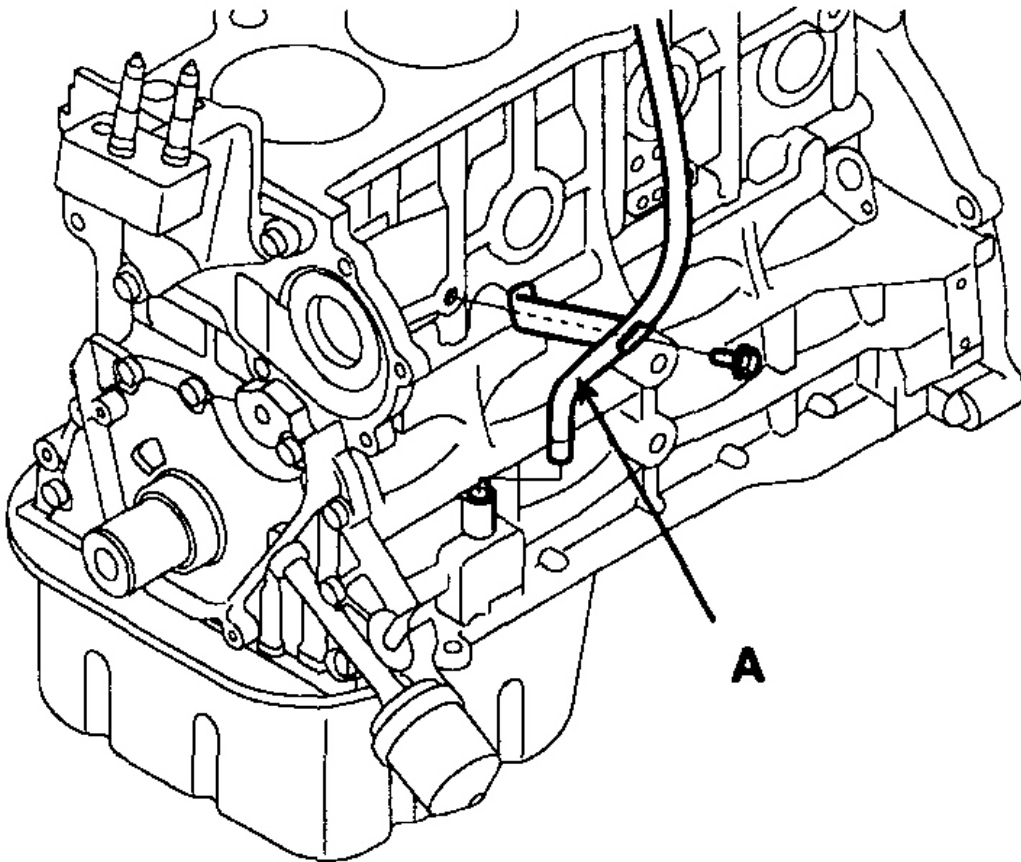
G03821145

Fig. 2: Exploded View Of Engine Block Components (2 Of 2)

Courtesy of KIA MOTORS AMERICA, INC.

DISASSEMBLY

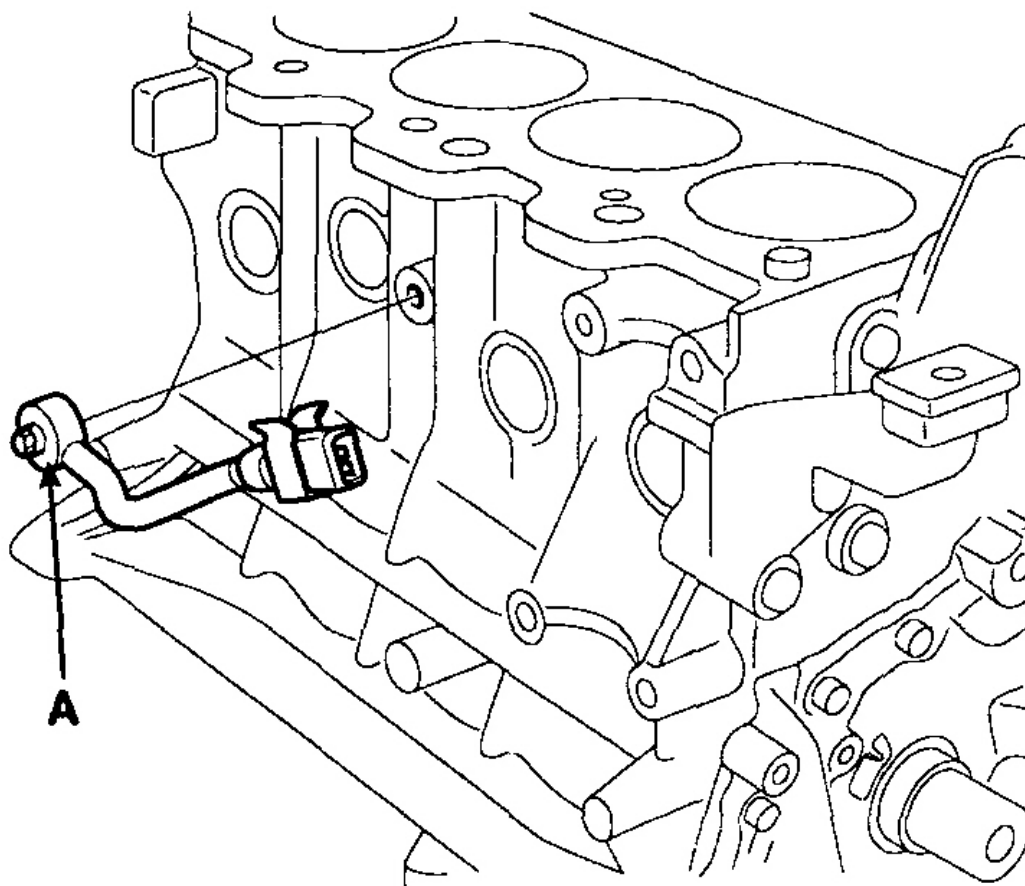
1. M/T: Remove the fly wheel.
2. A/T: Remove the drive plate.
3. Install the engine block onto an engine stand for disassembly.
4. Remove the timing belt. (Refer to **TIMING BELT REPLACEMENT - 2.0L - DOHC**)
5. Remove the cylinder head. (Refer to **CYLINDER HEAD ASSEMBLY - 2.0L**)
6. Remove the oil level gauge tube (A).



G03821146

Fig. 3: Removing Oil Level Gauge Tube
Courtesy of KIA MOTORS AMERICA, INC.

7. Remove the knock sensor (A).

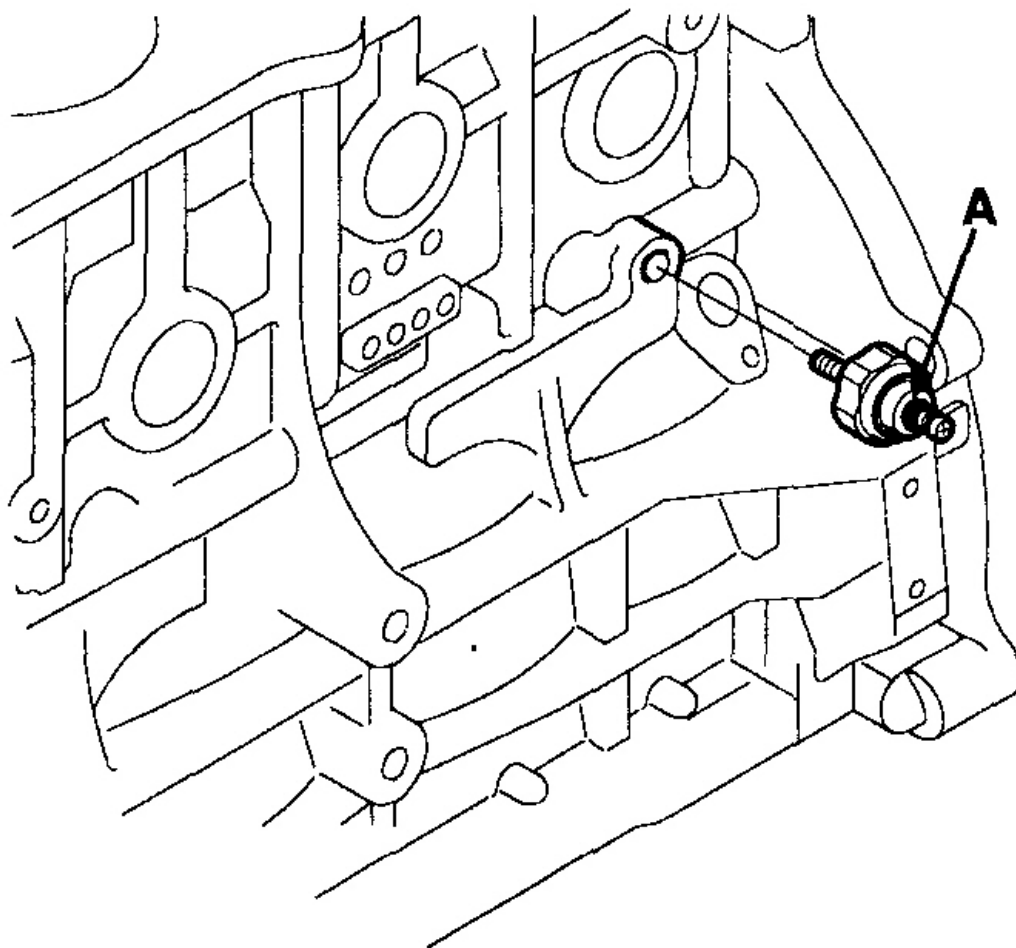


G03821147

Fig. 4: Removing Knock Sensor

Courtesy of KIA MOTORS AMERICA, INC.

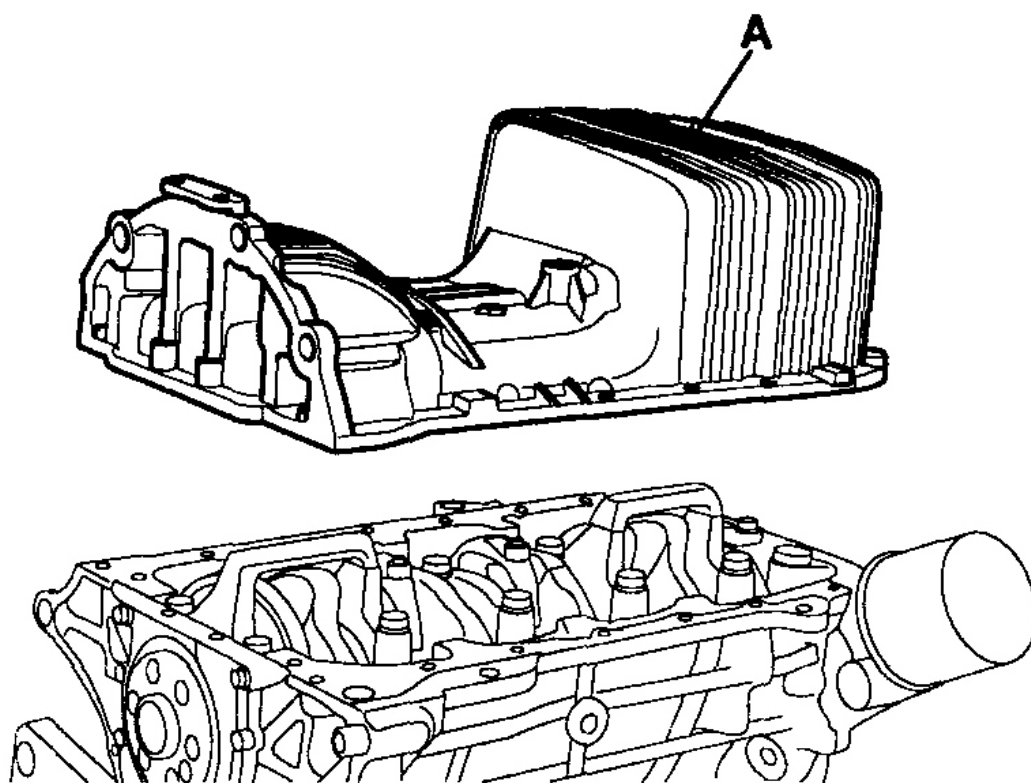
8. Remove the oil pressure switch (A).



G03821148

Fig. 5: Removing Oil Pressure Switch
Courtesy of KIA MOTORS AMERICA, INC.

9. Remove the water pump. (Refer to **WATER PUMP**)
10. Remove the oil pan (A).



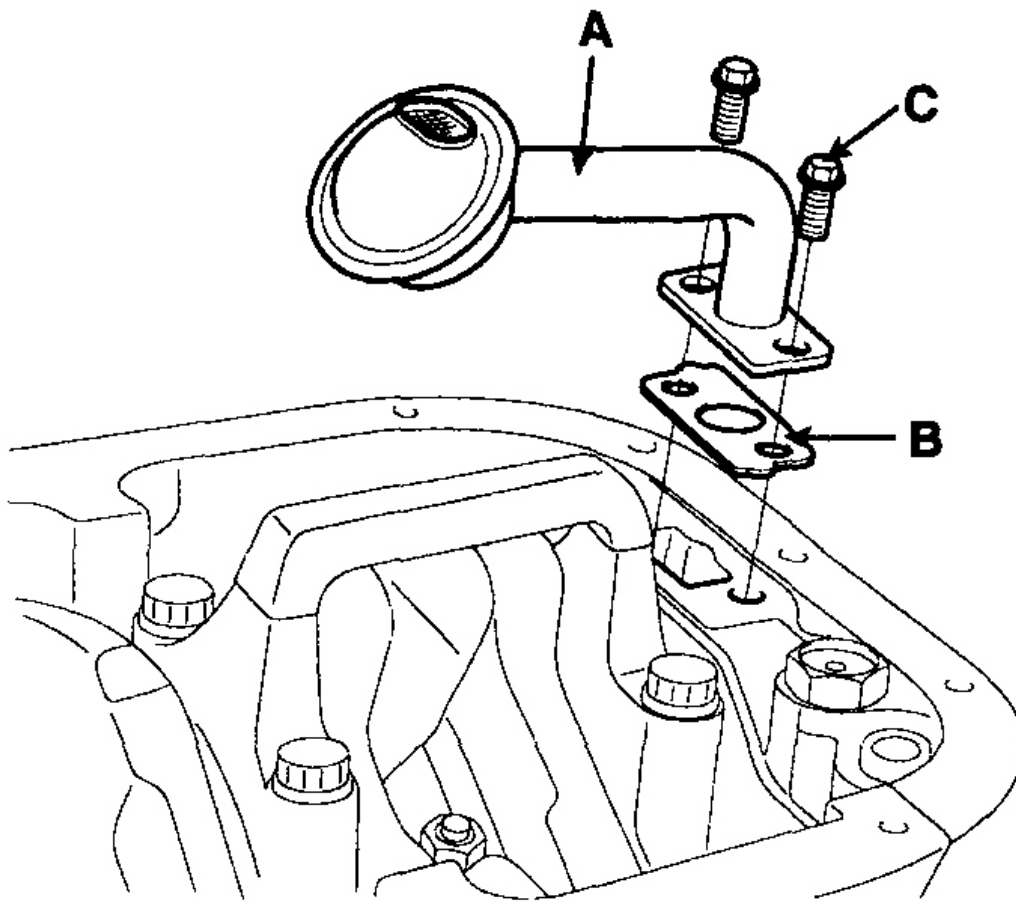
G03821149

Fig. 6: Removing Oil Pan

Courtesy of KIA MOTORS AMERICA, INC.

11. Remove the oil screen.

Remove the 2bolts (C), oil screen (A) and gasket (B).



G03821150

Fig. 7: Oil Screen And Gasket

Courtesy of KIA MOTORS AMERICA, INC.

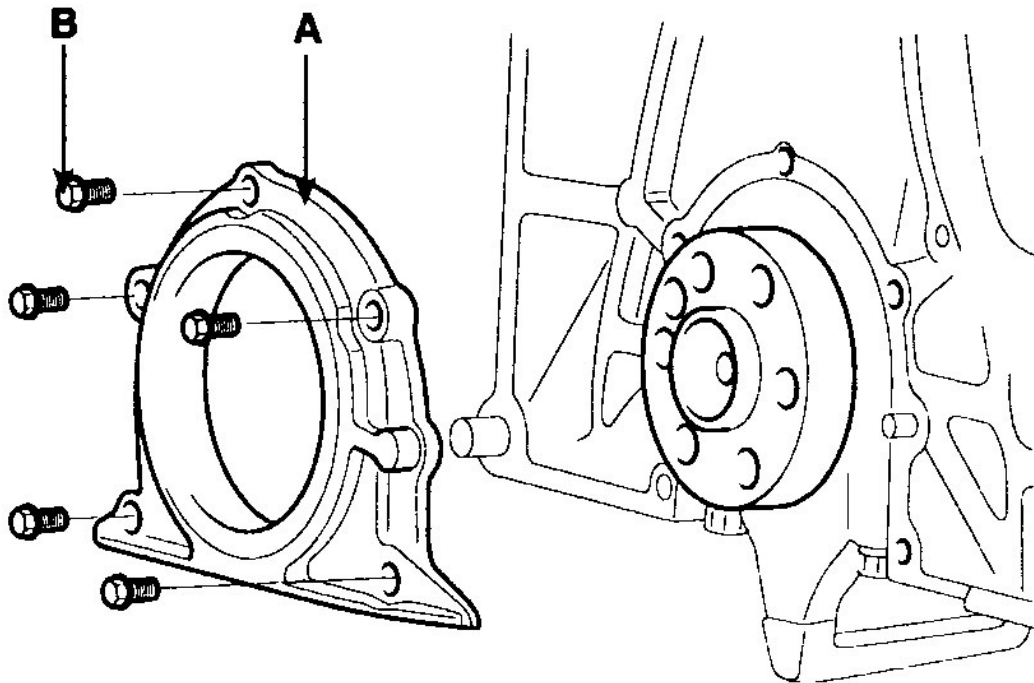
12. Check the connecting rod end play. (Refer to **INSPECTION** step 1)
13. Remove the connecting rod caps and check oil clearance. (Refer to **INSPECTION INSPECTION** step 2)
14. Remove the piston and connecting rod assemblies.
 1. Using a ridge reamer, remove all the carbon from the top of the cylinder.
 2. Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

NOTE:

- **Keep the bearings, connecting rod and cap together.**
- **Arrange the piston and connecting rod assemblies in the correct order.**

15. Remove the front case. (Refer to **DISASSEMBLY** step 8-9)
16. Remove the rear oil seal case.

Remove the 5bolts (B) and rear oil seal case (A).

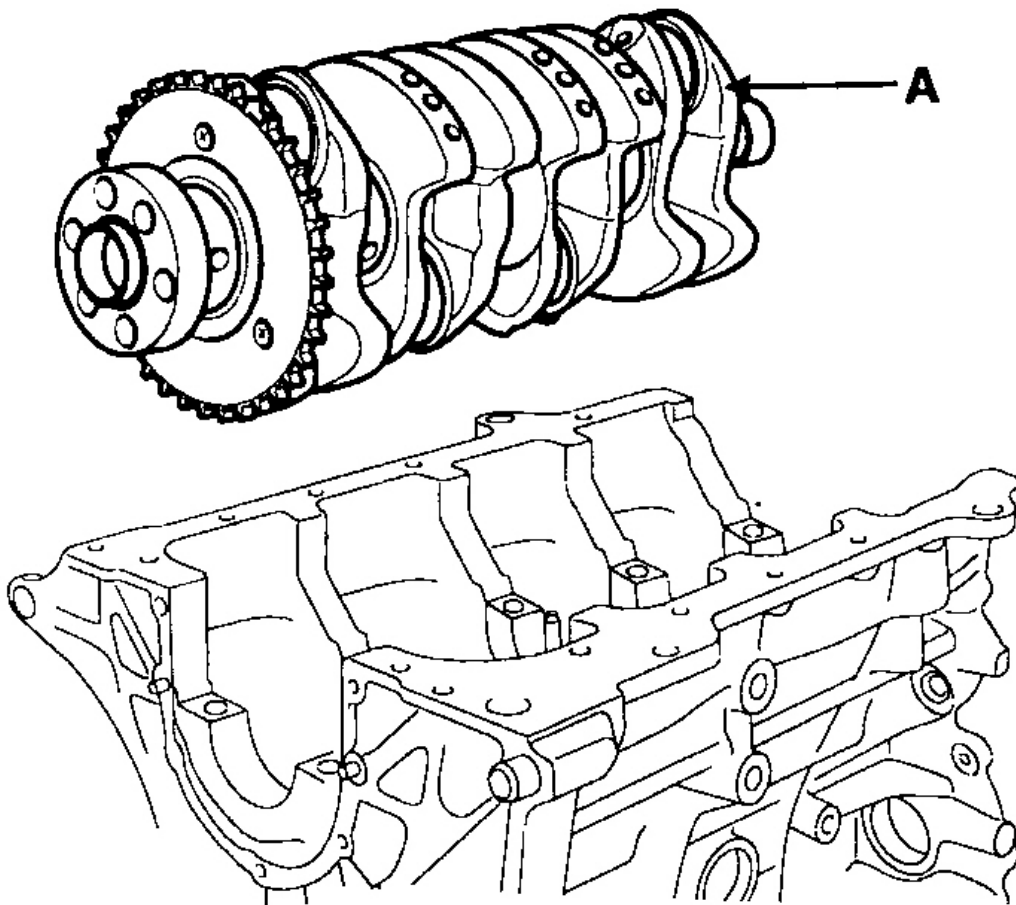


G03821151

Fig. 8: Removing Rear Oil Seal Case
Courtesy of KIA MOTORS AMERICA, INC.

17. Remove the crankshaft bearing cap and check oil clearance. (Refer to **INSPECTION** step 4)
18. Check the crankshaft end play. (Refer to **INSPECTION** step 5)
19. Lift the crankshaft (A) out of the engine, being careful not to damage journals.

NOTE: Arrange the main bearings and thrust bearings in the correct order.



G03821152

Fig. 9: Removing Crankshaft From Engine
Courtesy of KIA MOTORS AMERICA, INC.

20. Check fit between piston and piston pin.

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.

21. Remove the piston rings.
1. Using a piston ring expander, remove the 2 compression rings.
 2. Remove the 2 side rails and oil ring by hand.

NOTE: **Arrange the piston rings in the correct order only.**

22. Remove the connecting rod from the piston.

Using a press, remove the piston pin from piston. (Press-in load: 350 ~ 1,350kg(772~2,976lb))

INSPECTION

CONNECTING ROD AND CRANKSHAFT

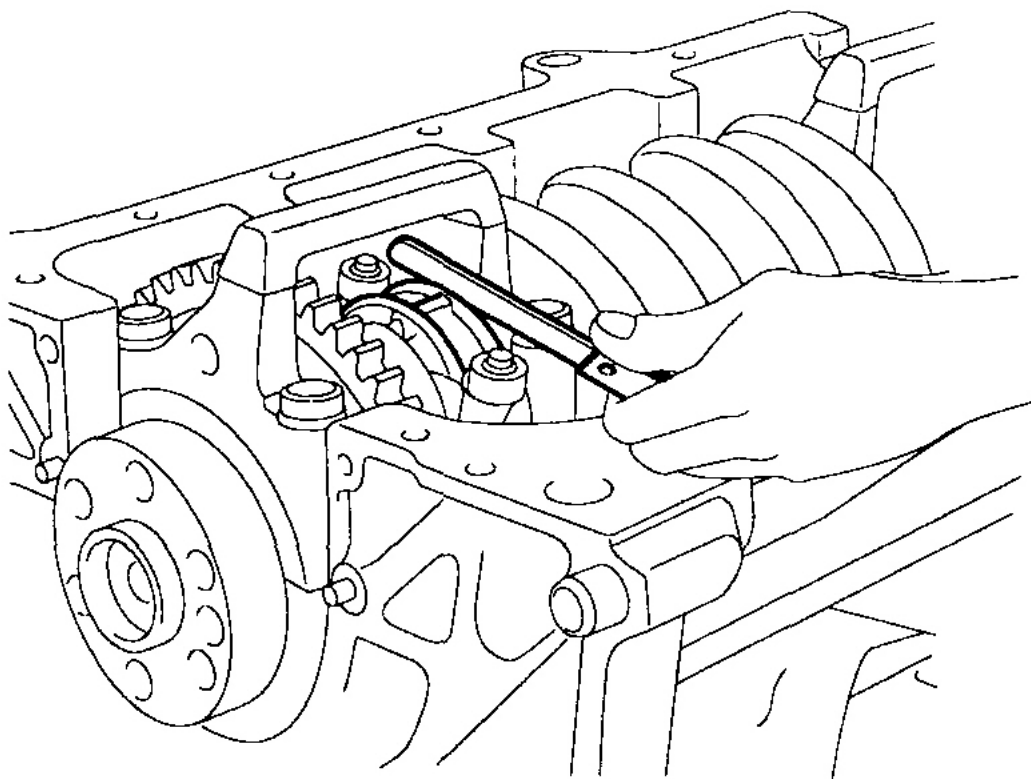
1. Check the connecting rod end play.

Using feeler gauge, measure the end play while moving the connecting rod back and forth.

End play

Standard: 0.1 ~ 0.25mm (0.0039 ~ 0.0098in)

Maximum: 0.4mm (0.0157in)



G03821153

Fig. 10: Measuring Connecting Rod End Play
Courtesy of KIA MOTORS AMERICA, INC.

- If out-of-tolerance, install a new connecting rod.
 - If still out-of-tolerance, replace the crankshaft.
2. Check the connecting rod bearing oil clearance.
 1. Check the match marks on the connecting rod and cap are aligned to ensure correct reassembly.
 2. Remove the 2 connecting rod cap nuts.
 3. Remove the connecting rod cap and lower bearing.
 4. Clean the crankshaft pin journal and bearing.
 5. Place a plastigage across the crankshaft pin journal.
 6. Reinstall the lower bearing and cap, and tighten the nuts.

Tightening torque:

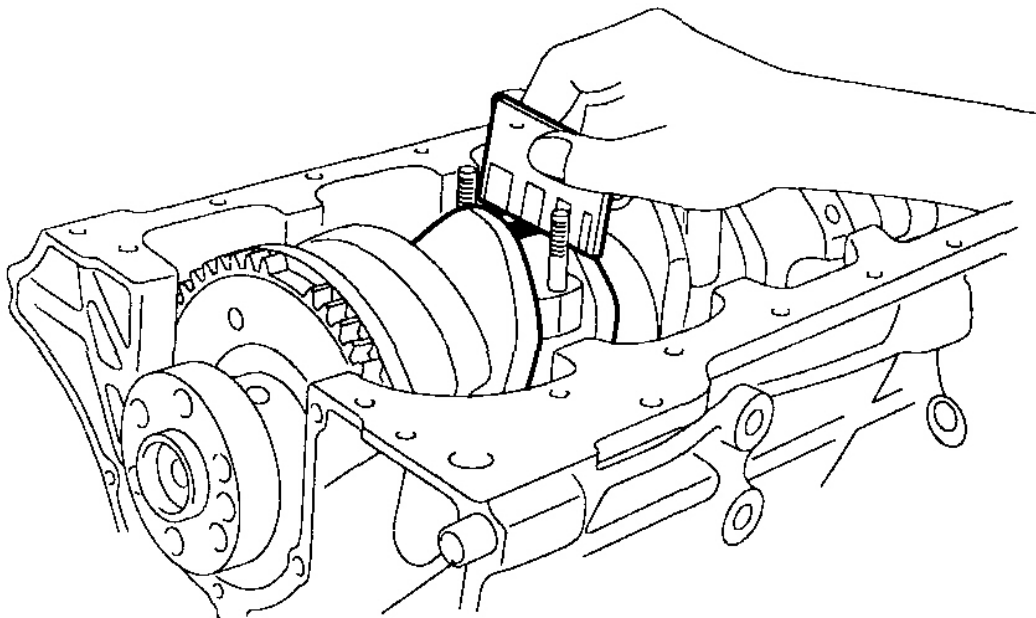
49.0 ~ 52.ON.m (5.0 ~ 5.3kgf.m, 36.2 ~ 38.3lb-ft)

NOTE: Do not turn the crankshaft.

7. Remove the 2nuts, connecting rod cap and lower bearing.
8. Measure the plastigage at its widest point.

Standard oil clearance

0.024 ~ 0.044mm (0.0009 ~ 0.0017in)



G03821154

Fig. 11: Measuring Plastigage At Widest Point
Courtesy of KIA MOTORS AMERICA, INC.

9. If the plastigage measures too wide or too narrow, remove the upper and lower bearing and then install a new bearings with the same color mark. (Refer to **CONNECTING ROD BEARING SELECTION TABLE**)

Recheck the oil clearance.

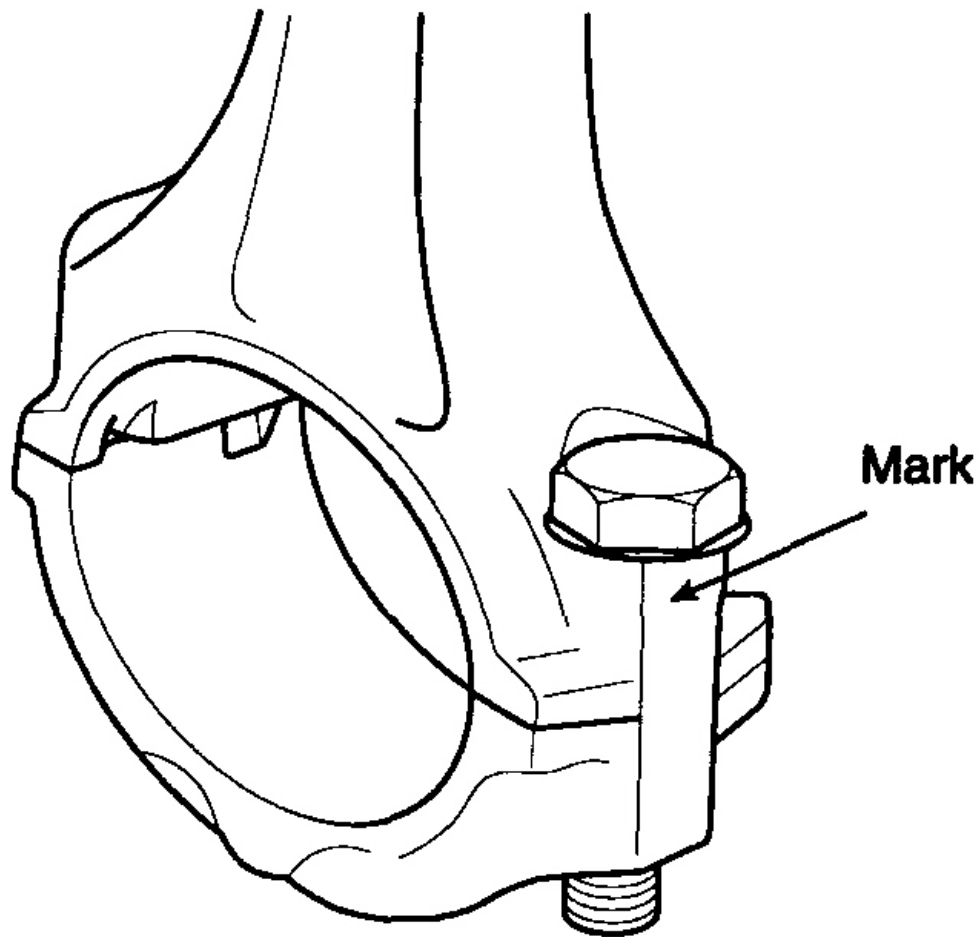
CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

10. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing. (Refer to **CONNECTING ROD BEARING SELECTION TABLE**) Recheck the oil clearance.

NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION: If the alignment marks are unreadable because of an accumulation of grease or grime, don't clean with a wire or abrasive cleaner. Clean only with correct cleaning solvent or detergent.

Connecting rod mark location



G03821155

Fig. 12: Identifying Connecting Rod Mark Location
Courtesy of KIA MOTORS AMERICA, INC.

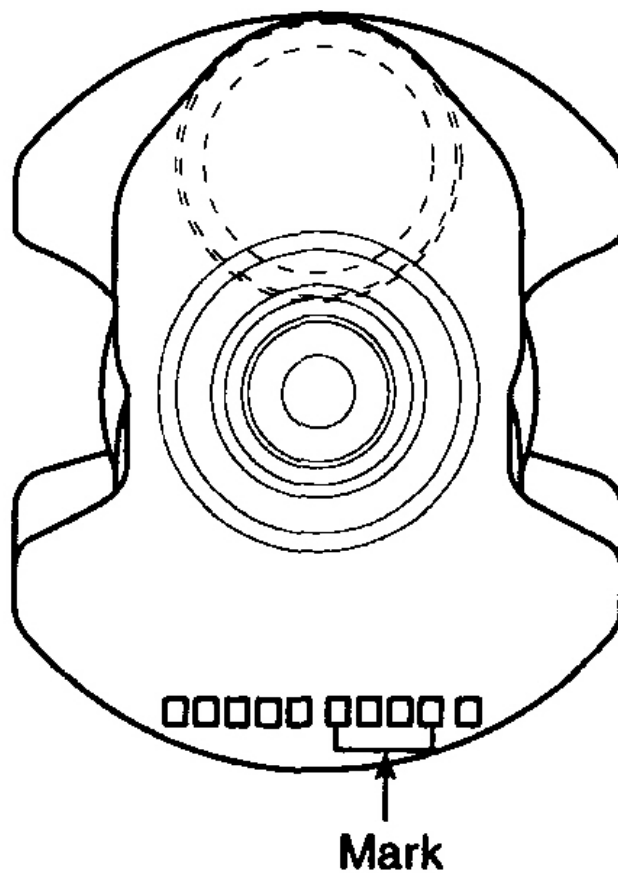
Discrimination of connecting rod

CONNECTING ROD DISCRIMINATION DETAILS

Mark	Connecting rod big-end inner diameter
	48.000 ~ 48.006mm

A	(1.8898 ~ 1.8900in)
B	48.006 ~ 48.012mm (1.8900 ~ 1.8902in)
C	48.012 ~ 48.018mm (1.8902 ~ 1.8905in)

Crankshaft pin journal mark location



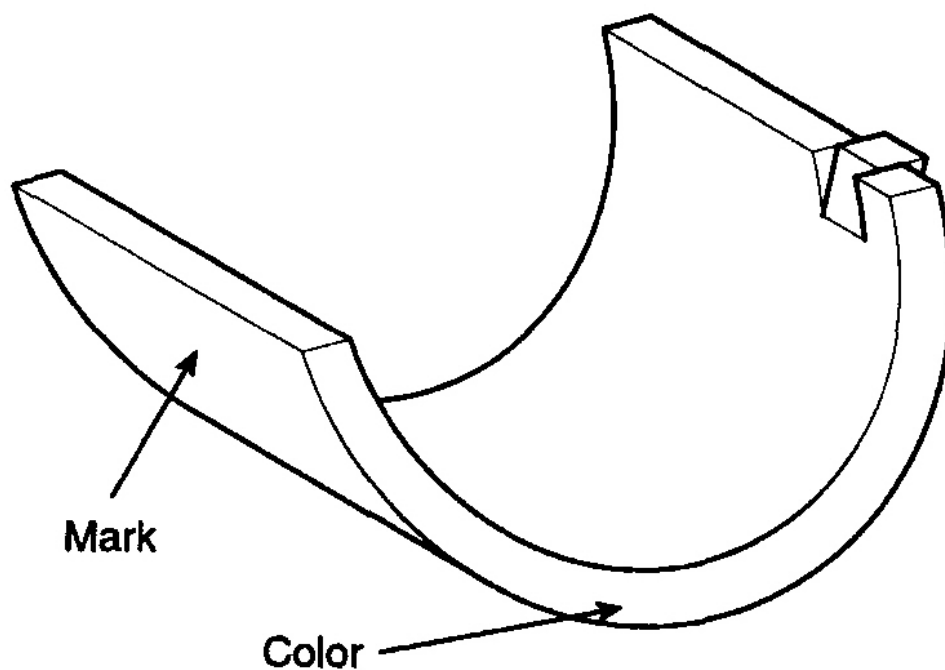
G03821156

Fig. 13: Identifying Crankshaft Pin Journal Mark Location
Courtesy of KIA MOTORS AMERICA, INC.

Discrimination of crankshaft pin journal

CRANKSHAFT PIN JOURNAL DISCRIMINATION DETAILS

Mark	Crankshaft pin journal outer diameter
1	44.960 ~ 44.966mm (1.7701 ~ 1.7703in)
2	44.952 ~ 44.960mm (1.7698 ~ 1.7701 in)
3	44.946 ~ 44.952mm (1.7695 ~ 1.7698in)

Connecting rod bearing mark location

G03821157

Fig. 14: Identifying Connecting Rod Bearing Mark Location
 Courtesy of KIA MOTORS AMERICA, INC.

Discrimination of connecting rod bearing**CONNECTING ROD BEARING DISCRIMINATION DETAILS**

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Mark	Color	Connecting rod bearing thickness
AA	Blue	1.514 ~ 1.517mm (0.0596 ~ 0.0597in)
A	Black	1.511 ~ 1.514mm (0.0595 ~ 0.0596in)
B	None	1.508 ~ 1.511mm (0.0594 ~ 0.0595in)
C	Green	1.505 ~ 1.508mm (0.0593 ~ 0.0594in)
D	Yellow	1.502 ~ 1.505mm (0.0591 ~ 0.0593in)

11. Select the bearing by using selection table.

Connecting rod bearing selection table

CONNECTING ROD BEARING SPECIFICATIONS

		Connecting rod mark		
		A (White)	B (None)	C (Yellow)
Crank shaft pin journal mark	1 (Yellow)	D (Yellow)	C (Green)	B (None)
	2 (None)	C (Green)	B (None)	A (Black)
	3 (White)	B (None)	A (Black)	AA (Blue)

3. Check the connecting rods.

- When reinstalling, make sure that cylinder numbers put on the connecting rod and cap at disassembly match. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
- Replace the connecting rod if it is damaged on the thrust faces at either end. Also if step wear or a severely rough surface of the inside diameter of the small end is apparent, the rod must be replaced as well.
- Using a connecting rod aligning tool, check the rod for bend and twist. If the measured value is close to the repair limit, correct the rod by a press. Any connecting rod that has been severely bent or distorted should be replaced.

Allowable bend of connecting rod:

0.05mm / 100mm (0.0020in / 3.94in) or less

Allowable twist of connecting rod:

0.1mm / 100mm (0.0039in / 3.94in) or less

4. Check the crankshaft bearing oil clearance.

- To check main bearing-to-journal oil clearance, remove the main bearing caps and lower bearings.

2. Clean each main journal and lower bearing with a clean shop towel.
3. Place one strip of plastigage across each main journal.
4. Reinstall the lower bearings and caps, then tighten the bolts.

Tightening torque: 27.5 ~ 31.4N.m

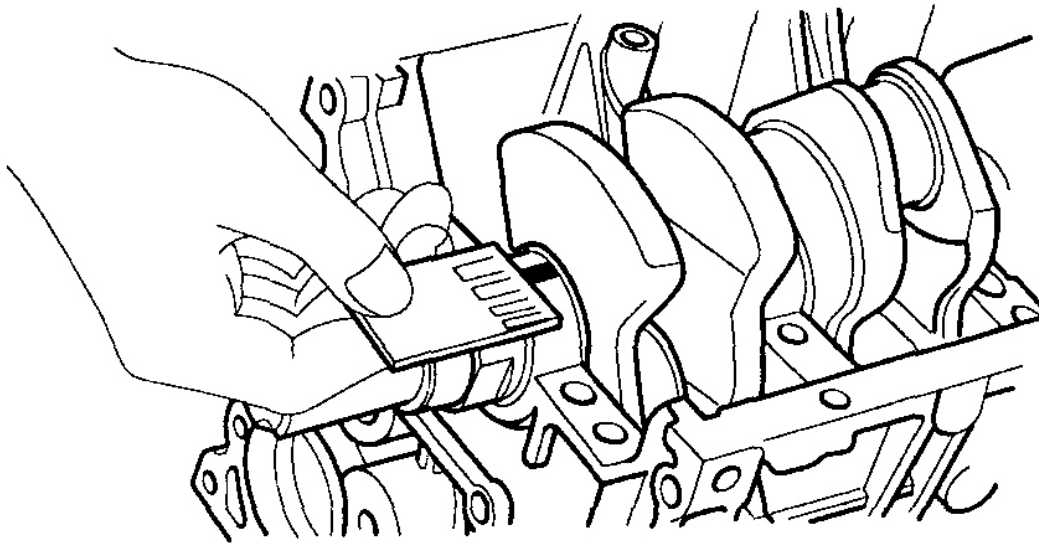
(2.8 ~ 3.2kgf.m, 20.3 ~ 23.1lb-ft)+60°~ 64°

NOTE: Do not turn the crankshaft.

5. Remove the cap and lower bearing again, and measure the widest part of the plastigage.

Standard oil clearance:

0.028 ~ 0.048mm (0.0011 ~ 0.0019in)



G03821158

Fig. 15: Measuring Widest Part Of Plastigage
Courtesy of KIA MOTORS AMERICA, INC.

6. If the plastigage measures too wide or too narrow, remove the upper and lower bearing and then install a new bearings with the same color mark. (Refer to step 8)

Recheck the oil clearance.

CAUTION: Do not file, shim, or scrape the bearings or the cap to adjust clearance.

7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing. (Refer to step 8)

Recheck the oil clearance.

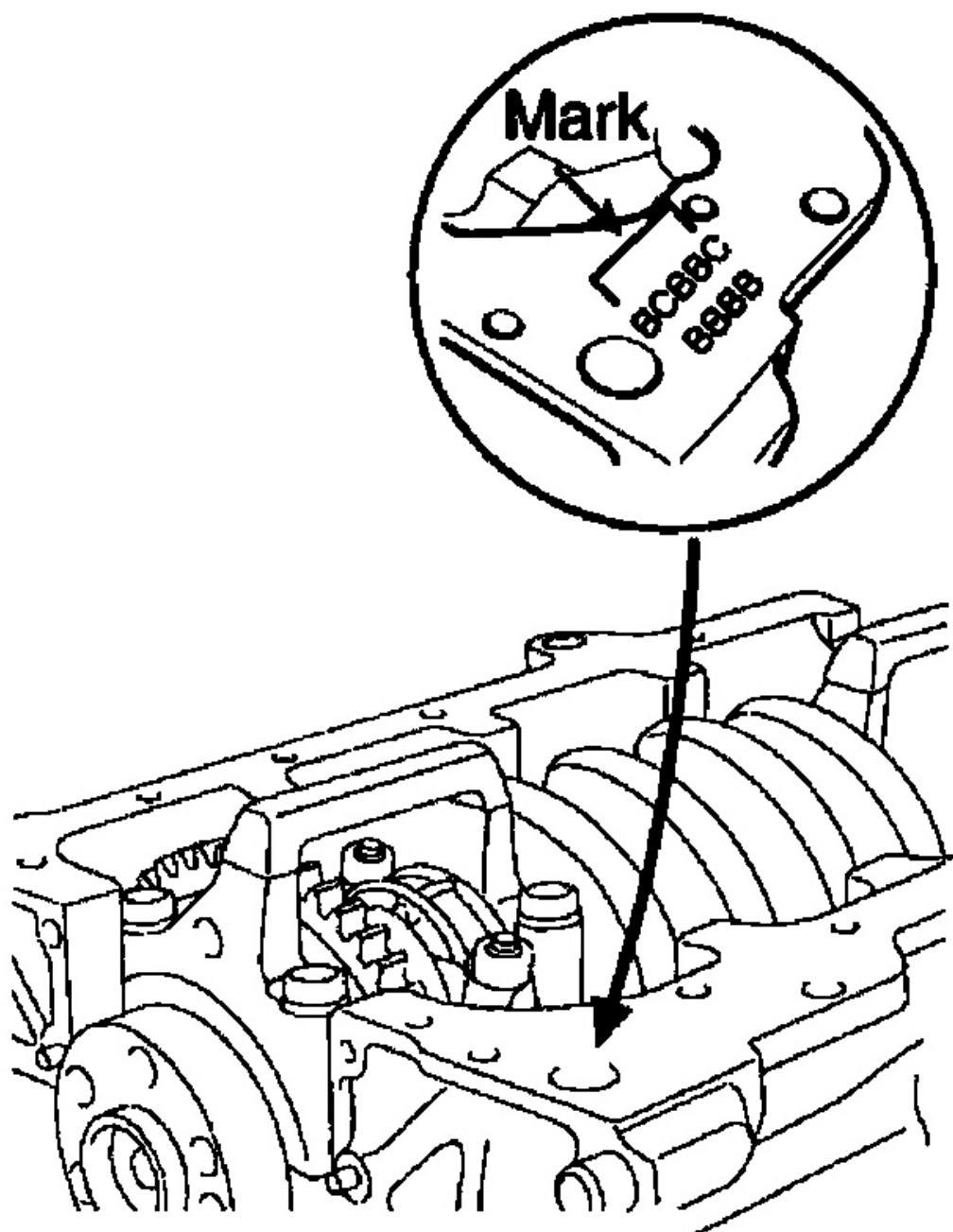
NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION: If the alignment marks are unreadable because of accumulation of grease or grime, don't clean with a wire or abrasive cleaner. Clean only with correct cleaning solvent or detergent.

Cylinder block crankshaft journal bore mark location

Letters have been stamped on the end of the block as a mark for the size of each of the 5 main journal bores.

Use them, and the numbers or letters stamped on the crank (marks for main journal size), to choose the correct bearings.

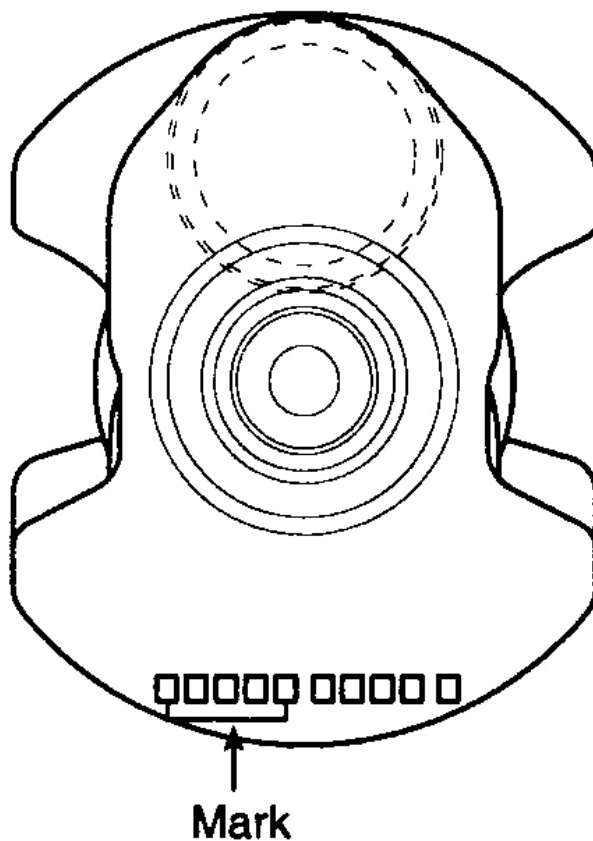


G03821159

Fig. 16: Locating Letters Stamped On Crank
Courtesy of KIA MOTORS AMERICA, INC.

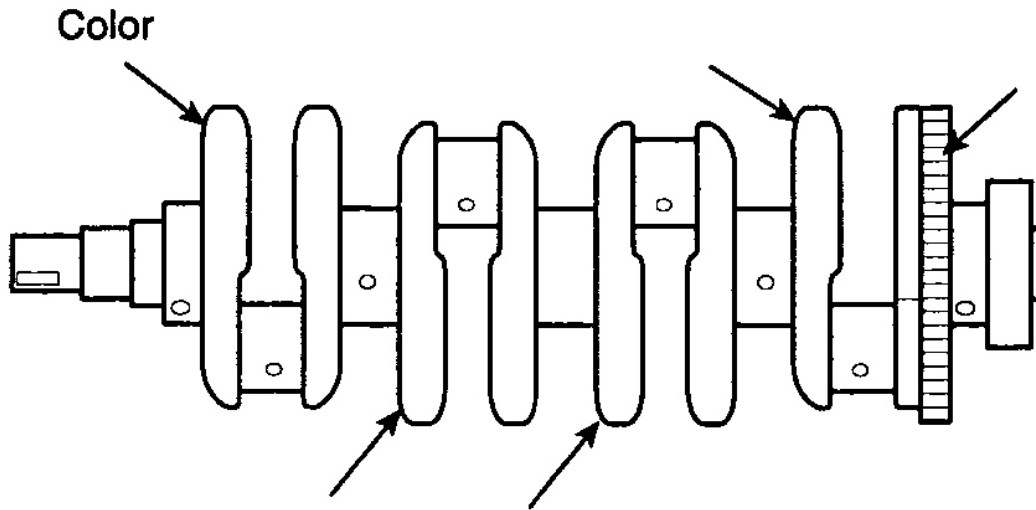
Discrimination of cylinder block crankshaft journal bore**CYLINDER BLOCK CRANKSHAFT JOURNAL BORE DISCRIMINATION DETAILS**

Mark	Cylinder block crankshaft journal bore inner diameter
A	61.000 ~ 61.006mm (2.4016 ~ 2.4018in)
B	61.006 ~ 61.012mm (2.4018 ~ 2.4020in)
C	61.012 ~ 61.018mm (2.4020 ~ 2.4023in)

Crankshaft main journal mark location

G03821160

Fig. 17: Identifying Crankshaft Main Journal Mark Location (1 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.



G03821161

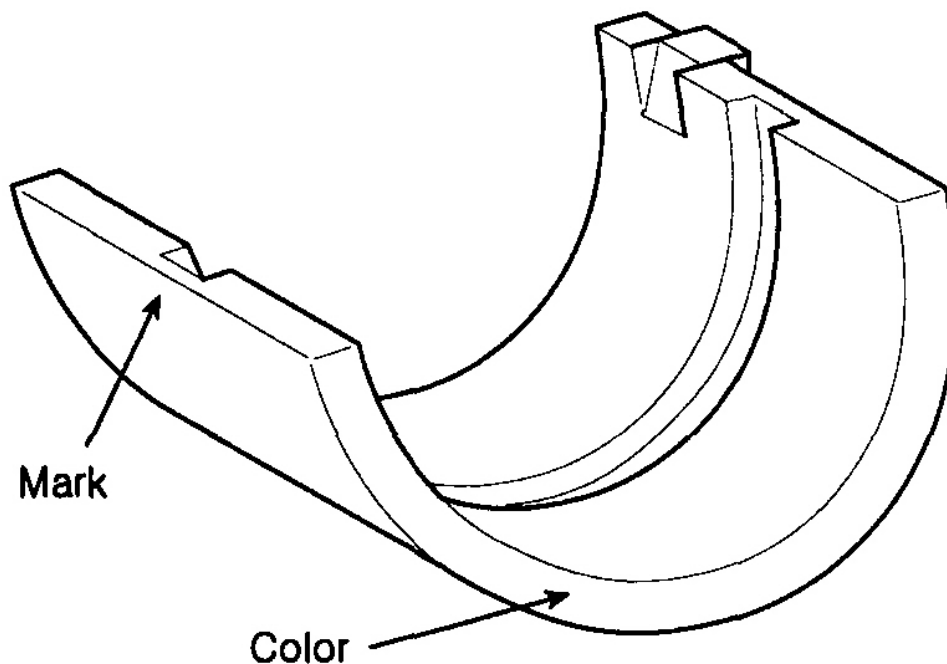
Fig. 18: Identifying Crankshaft Main Journal Mark Location (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

Discrimination of crankshaft main journal

CRANKSHAFT MAIN JOURNAL DISCRIMINATION DETAILS

Mark	Color	Crankshaft main journal outer diameter
1	Yellow	56.956 ~ 56.962mm (2.2424 ~ 2.2426in)
2	None	56.948 ~ 56.956mm (2.2420 ~ 2.2424in)
3	White	56.942 ~ 56.948mm (2.2418 ~ 2.2420in)

Crankshaft main bearing mark location



G03821162

Fig. 19: Identifying Crankshaft Main Bearing Mark Location
 Courtesy of KIA MOTORS AMERICA, INC.

Discrimination of crankshaft main bearing

CRANKSHAFT MAIN BEARING DISCRIMINATION DETAILS

Mark	Color	Crankshaft main bearing thickness
AA	Blue	2.014 ~ 2.017mm (0.0793 ~ 0.0794in)
A	Black	2.011 ~ 2.014mm (0.0792 ~ 0.0793in)
B	None	2.008 ~ 2.011mm (0.0791 ~ 0.0792in)
C	Green	2.005 ~ 2.008mm (0.0789 ~ 0.0791 in)
		2.002 ~ 2.005mm

D	Yellow	(0.0788 ~ 0.0789in)
---	--------	---------------------

8. Select the bearing by using selection table.

Crankshaft main bearing selection table

CRANKSHAFT MAIN BEARING SPECIFICATIONS

		Cylinder block crankshaft journal bore mark		
		A	B	C
Crank shaft main journal mark	1 (Yellow)	D (Yellow)	C (Green)	B (None)
	2 (None)	C (Green)	B (None)	A (Black)
	3 (White)	B (None)	A (Black)	AA (Blue)

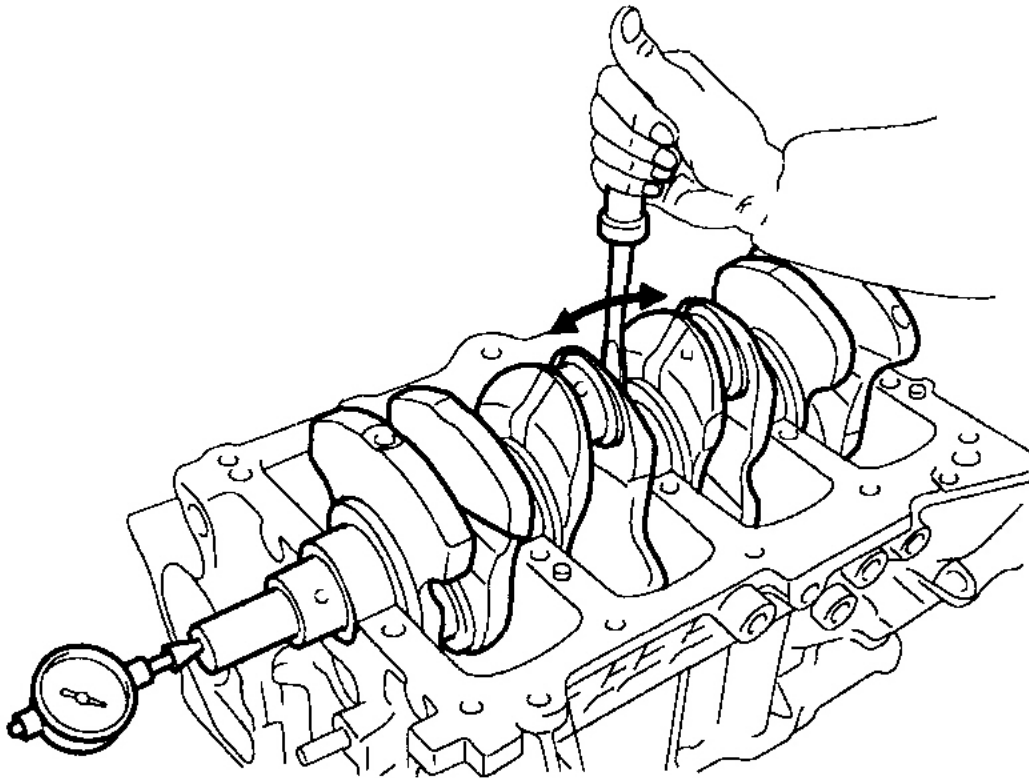
5. Check the crankshaft end play.

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

End play

Standard: 0.06 ~ 0.26mm (0.0024 ~ 0.0102in)

Limit: 0.30mm (0.0118in)



G03821163

Fig. 20: Measuring Crankshaft End Play
Courtesy of KIA MOTORS AMERICA, INC.

If the end play is greater than maximum, replace the thrust bearings as a set.

Thrust bearing thickness:

2.44 ~ 2.77mm (0.0961 ~ 0.0972in)

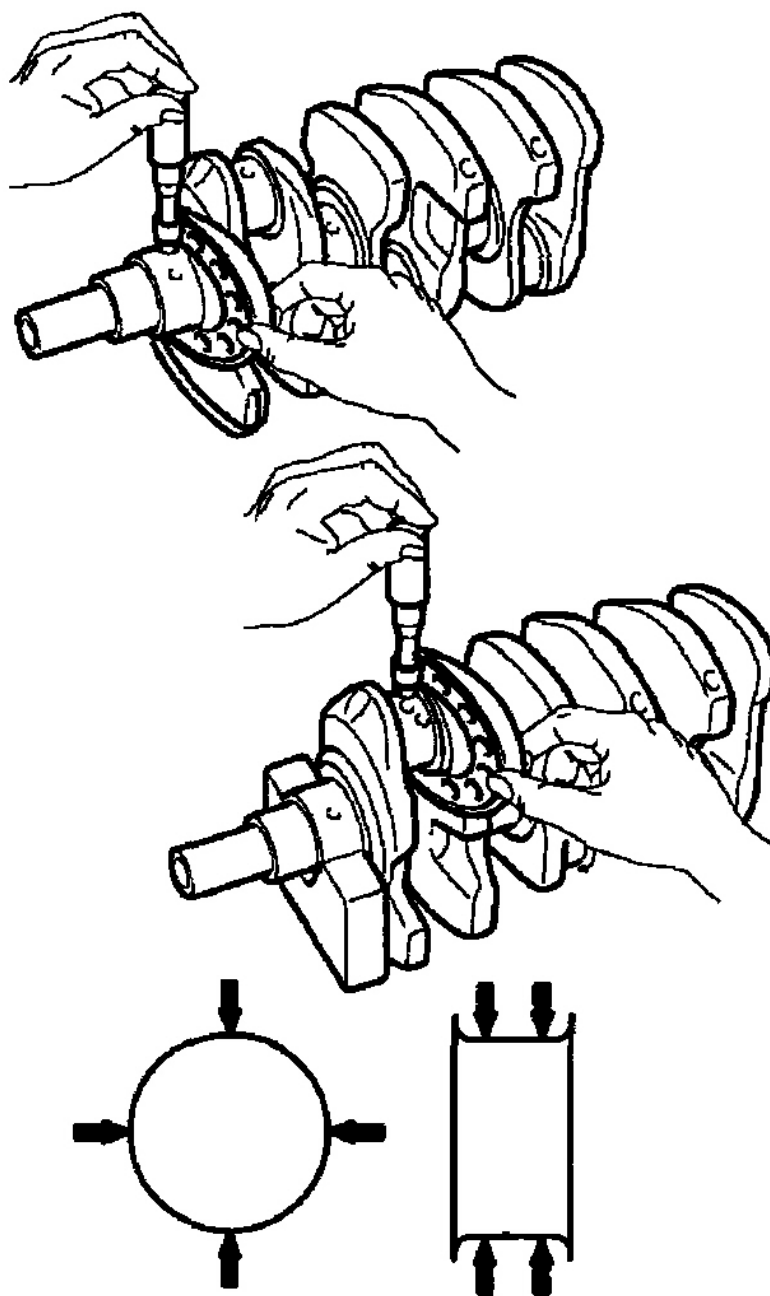
6. Inspect the crankshaft main journals and pin journals. Using a micrometer, measure the diameter of each main journal and pin journal.

Main journal diameter:

56.942 ~ 56.962mm (2.2418 ~ 2.2426in)

Pin journal diameter:

44.946 ~ 44.966mm (1.7695 ~ 1.7703in)



G03821164

Fig. 21: Measuring Main Journal Diameter
Courtesy of KIA MOTORS AMERICA, INC.

CYLINDER BLOCK

1. Remove the gasket material.

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

2. Clean the cylinder block.

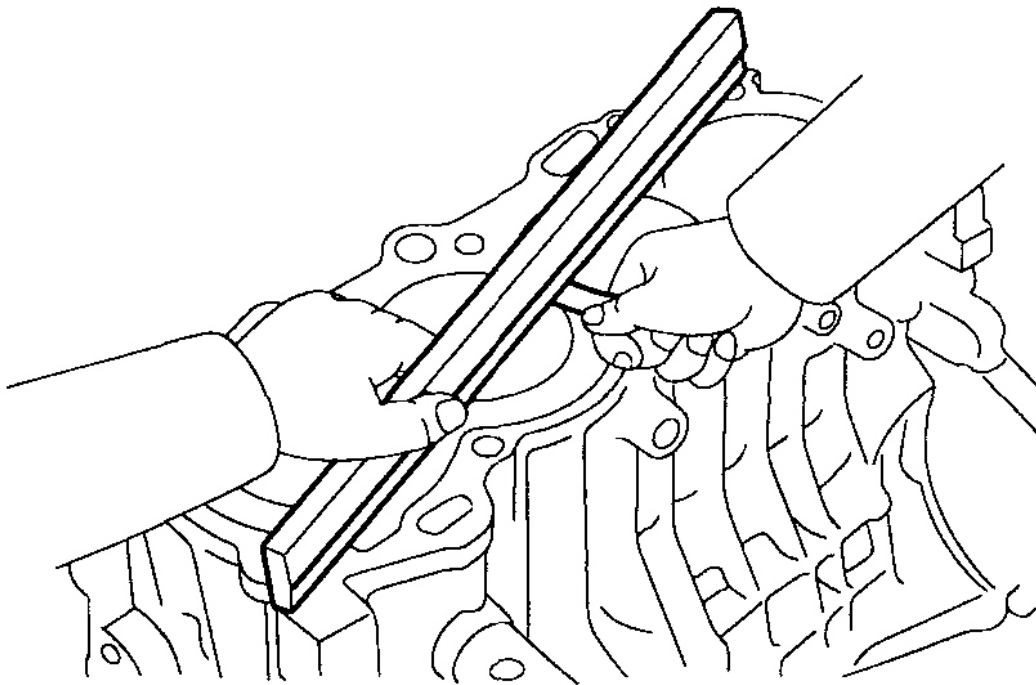
Using a soft brush and solvent, thoroughly clean the cylinder block.

3. Inspect the top surface of cylinder block for flatness. Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Flatness of cylinder block gasket surface

Total: Less than 0.05mm (0.0020in)

Bore to bore: Less than 0.03mm (0.0012in)



G03821165

Fig. 22: Inspecting Cylinder Block Gasket Surface Flatness
Courtesy of KIA MOTORS AMERICA, INC.

4. Inspect the cylinder bore.

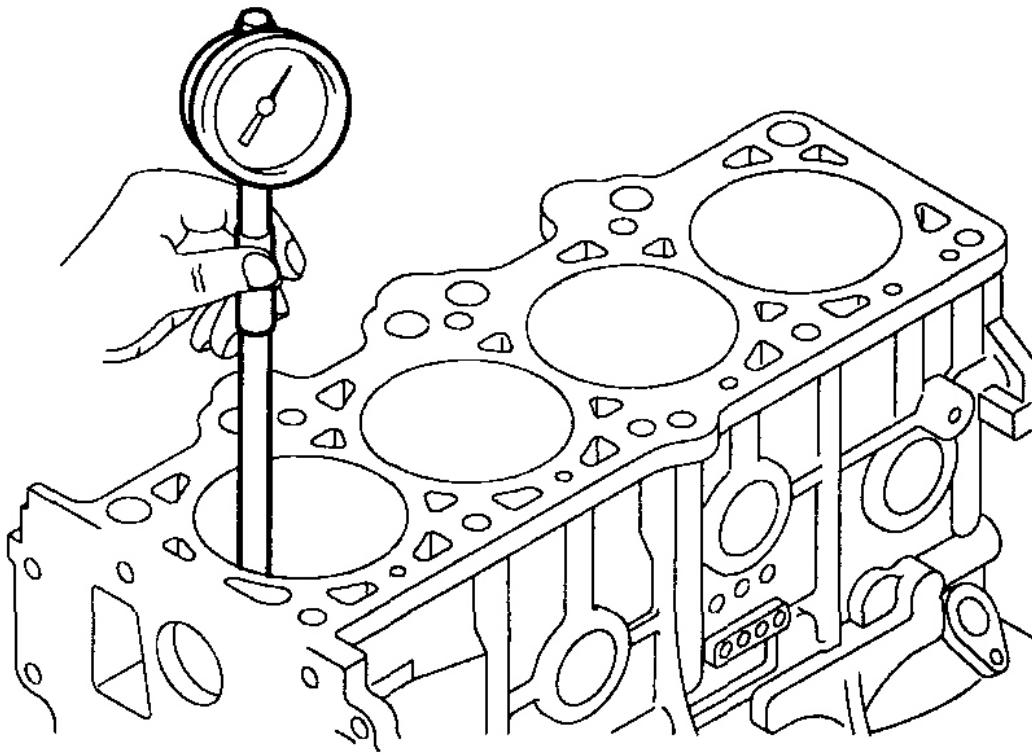
Visually check the cylinder for vertical scratches. If deep scratches are present, replace the cylinder block.

5. Inspect the cylinder bore diameter.

Using a cylinder bore gauge, measure the cylinder bore diameter at position in the thrust and axial direction.

Standard diameter:

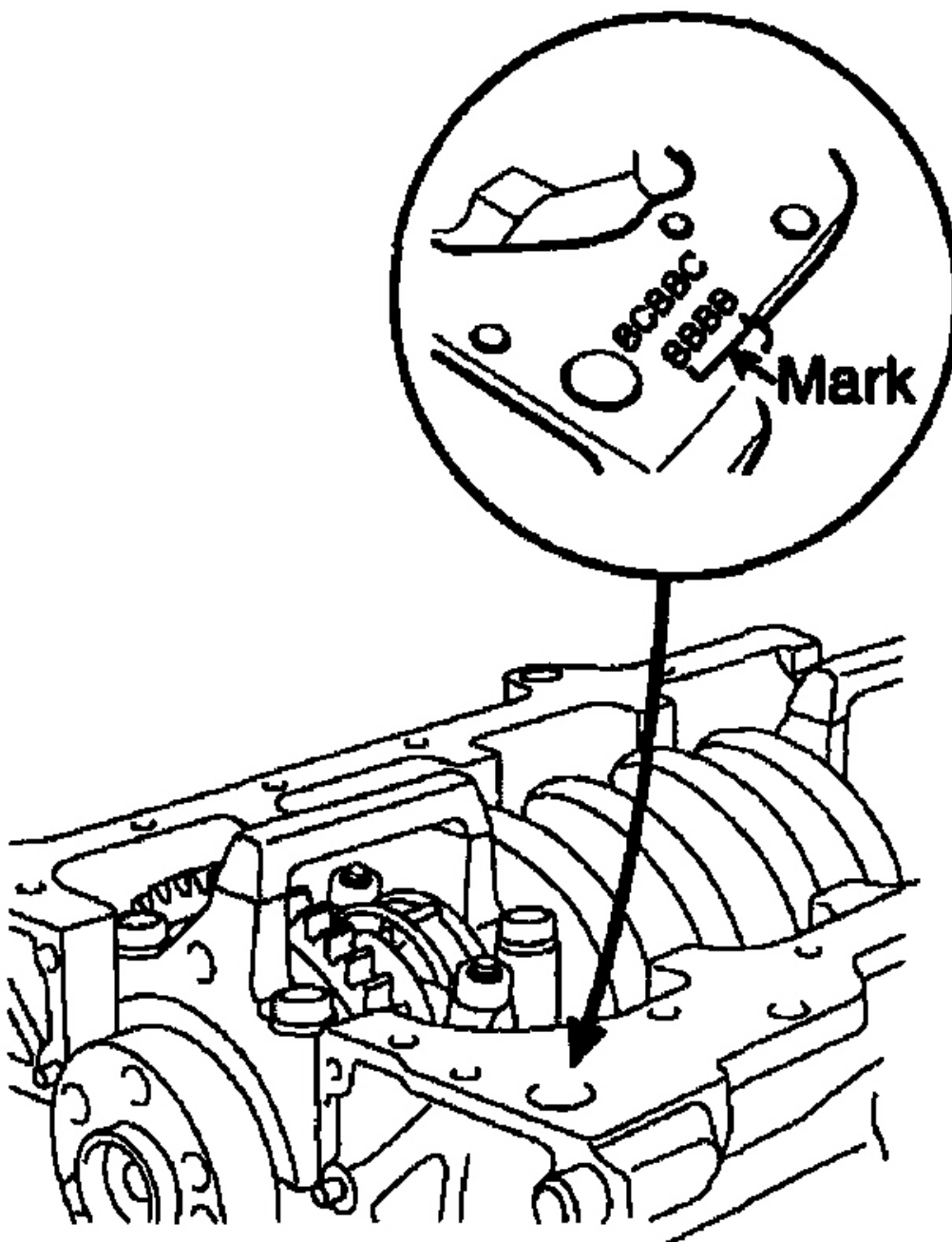
82.00 ~ 82.03mm (3.2283 ~ 3.2295in)



G03821166

Fig. 23: Measuring Cylinder Bore Diameter
Courtesy of KIA MOTORS AMERICA, INC.

6. Check the cylinder bore size code on the cylinder block bottom face.



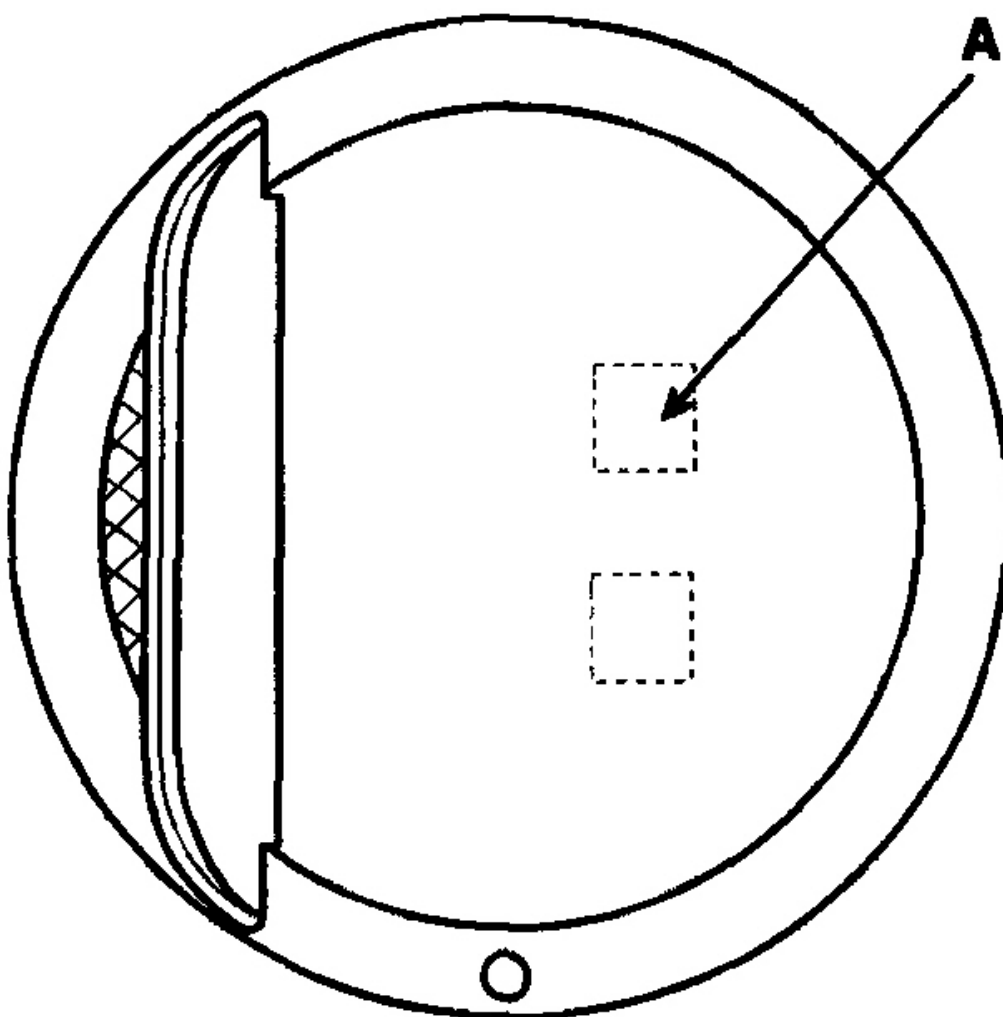
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Fig. 24: Checking Cylinder Bore Size Code On Cylinder Block Bottom Face
Courtesy of KIA MOTORS AMERICA, INC.

Discrimination of cylinder bore size**CYLINDER BORE SIZE DISCRIMINATION DETAILS**

Mark	Cylinder bore inner diameter
A	82.00 ~ 82.01mm (3.2283 ~ 3.2287in)
B	82.01 ~ 82.02mm (3.2287 ~ 3.2291 in)
C	82.02 ~ 82.03mm (3.2291 ~ 3.2295in)

7. Check the piston size mark (A) on the piston top face.



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Fig. 25: Checking Piston Size Mark On Piston Top Face
Courtesy of KIA MOTORS AMERICA, INC.

Discrimination of piston outer diameter

PISTON OUTER DIAMETER DISCRIMINATION DETAILS

Mark	Piston outer diameter
A	81.97 ~ 81.98mm (3.2272 ~ 3.2276in)
	81.98 ~ 81.99mm

None	(3.2276 ~ 3.2279in)
C	81.99 ~ 82.00mm (3.2279 ~ 3.2283in)

8. Select the piston related to cylinder bore class.

Piston-to-cylinder clearance:

0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

BORING CYLINDER

1. Oversize pistons should be selected according to the largest bore cylinder.

NOTE: The size of piston is stamped on top of the piston.

2. Measure the outside diameter of the piston to be used.
3. According to the measured O.D (Outer Diameter), calculate the new bore size.

New bore size = piston O.D + 0.02 to 0.04mm (0.0008 to 0.0016in) (Clearance between piston and cylinder) - 0.01mm (0.0004in) (honing margin.)

4. Bore each of the cylinders to the calculated size.

CAUTION: To prevent distortion that may result from temperature rise during honing, bore the cylinder holes in the firing order.

5. Hone the cylinders, finishing them to the proper dimension (piston outside diameter+gap with cylinder).
6. Check the clearance between the piston and cylinder.

Standard: 0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

NOTE: When boring the cylinders, finish all of the cylinders to the same oversize. Do not bore only one cylinder to the oversize.

PISTON AND PISTON RINGS

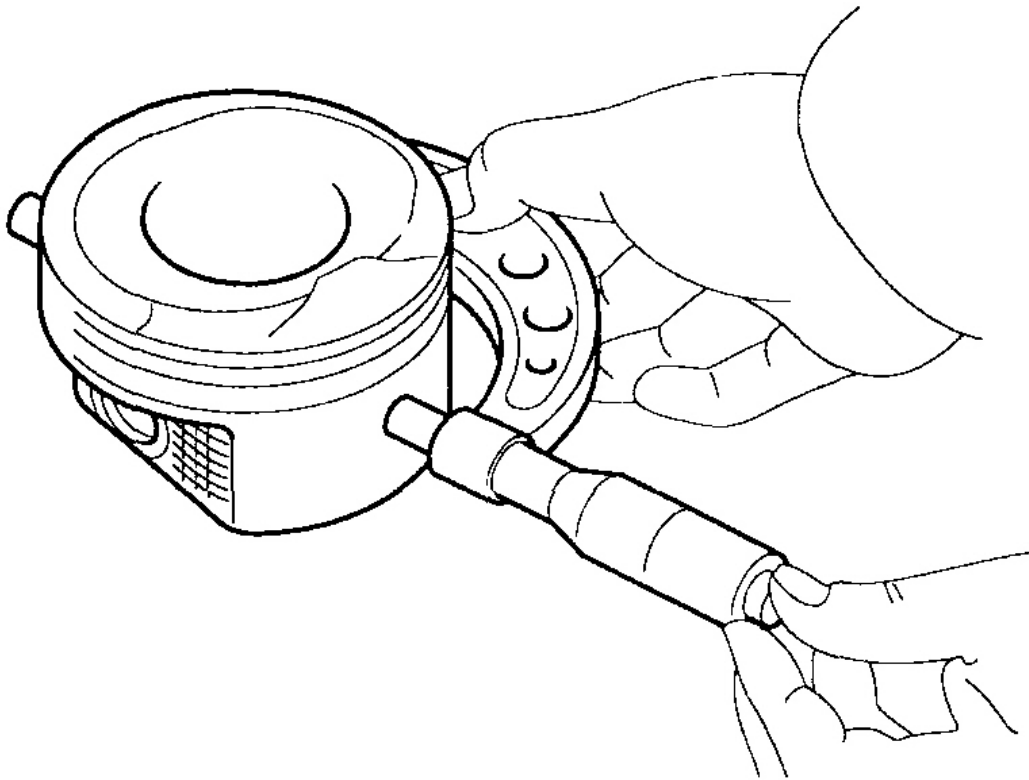
1. Clean the piston.
 1. Using a gasket scraper, remove the carbon from the piston top.
 2. Using a groove cleaning tool or broken ring, clean the piston ring grooves.
 3. Using solvent and a brush, thoroughly clean the piston.

NOTE: Do not use a wire brush.

2. The standard measurement of the piston outside diameter is taken 47mm (1.85in) from top land of the piston.

Standard diameter:

81.97 ~ 82.00mm (3.2272 ~ 3.2283in)



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Fig. 26: Measuring Piston Outside Diameter
Courtesy of KIA MOTORS AMERICA, INC.

3. Calculate the difference between the cylinder bore inner diameter and the piston outer diameter.

Piston-to-cylinder clearance:

0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

4. Inspect the piston ring side clearance.

Using a feeler gauge, measure the clearance between new piston ring and the wall of ring groove.

Piston ring side clearance

No.1: 0.04 ~ 0.08mm (0.0016 ~ 0.0031 in)

No. 2: 0.03 ~ 0.07mm (0.0012 ~ 0.0028in)

Oil ring: 0.06 ~ 0.15mm (0.0024 ~ 0.0059in)

Limit

No.1: 0.1mm (0.0039in)

No.2: 0.1mm (0.0039in)

Oil ring: 0.2mm (0.0079in)

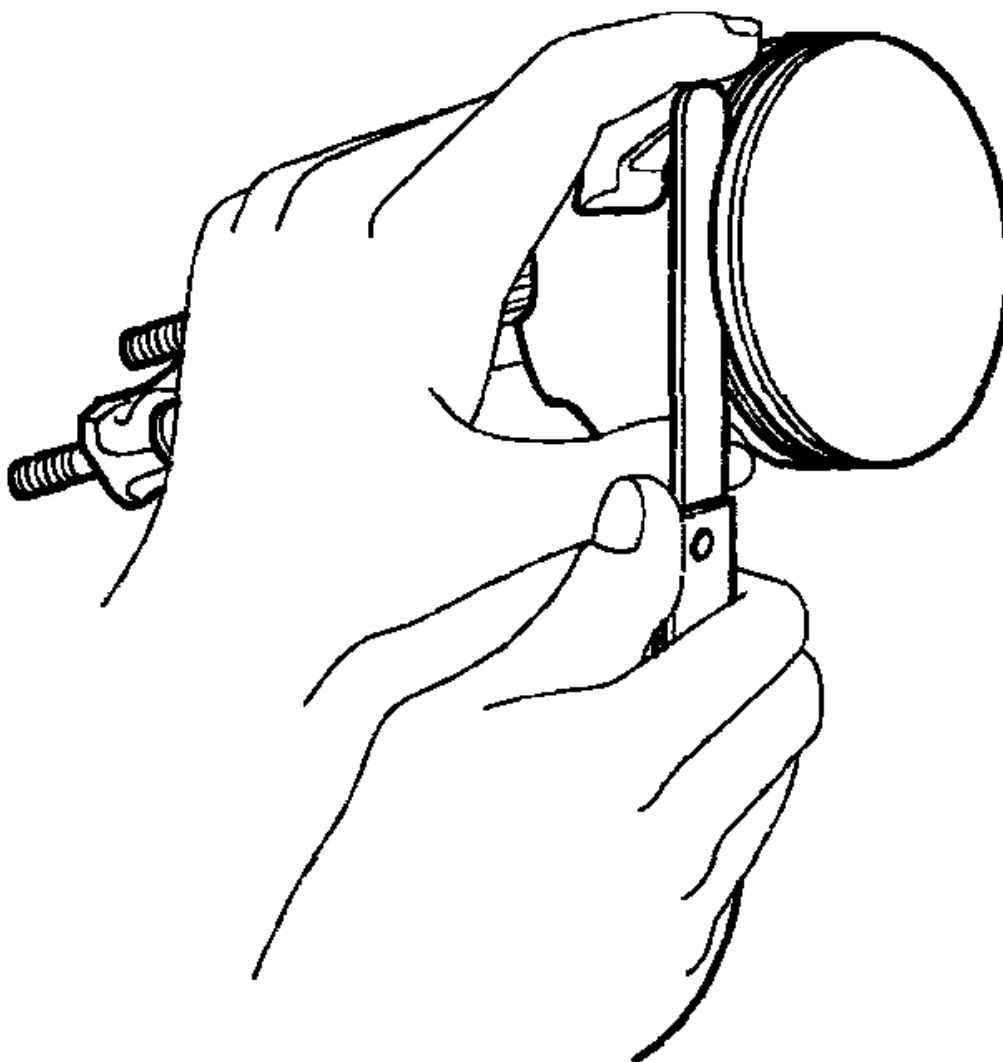
**G03821170**

Fig. 27: Measuring Piston Ring Side Clearance
Courtesy of KIA MOTORS AMERICA, INC.

If the clearance is greater than maximum, replace the piston.

5. Inspect the piston ring end gap.

To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge.

If the gap exceeds the service limit, replace the piston rings. If the gap is too large, recheck the cylinder bore inner diameter. If the bore is over the service limit, the cylinder block must be rebored. (Refer to **BORING CYLINDER**)

Piston ring end gap

Standard

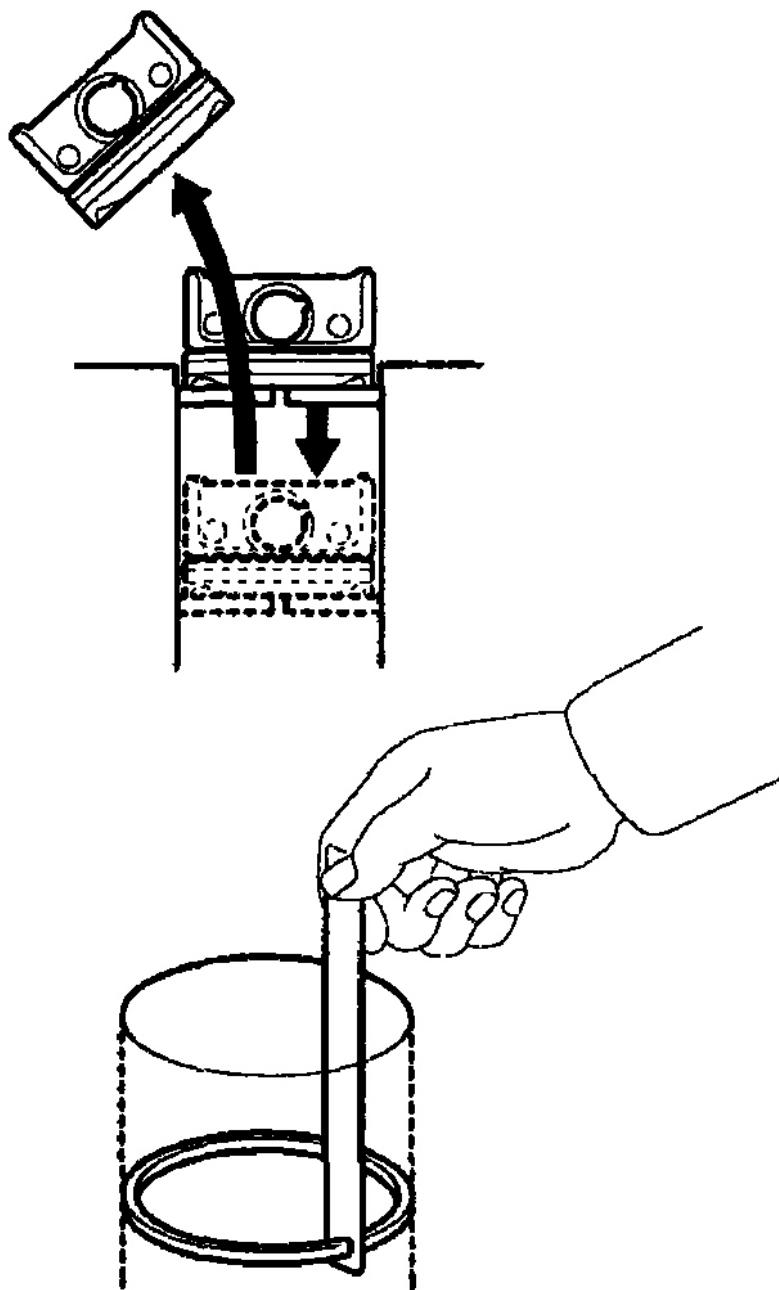
No.1: 0.23 ~ 0.38mm (0.0091 ~ 0.0150in)

No.2: 0.33 ~ 0.48mm (0.0130 ~ 0.0189in)

Oil ring: 0.20 ~ 0.60mm(0.0079 ~ 0.0236in)

Limit

No.1, 2, oil ring: 1.0mm(0.039in)



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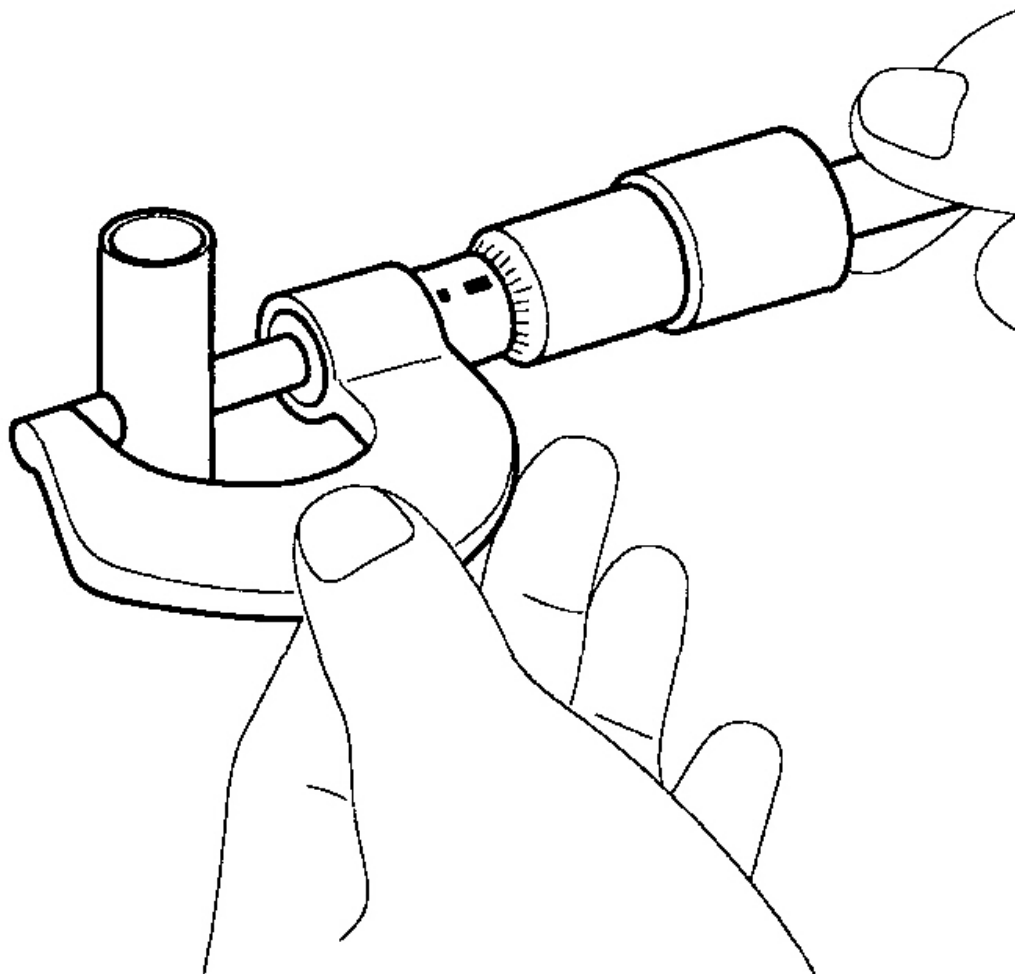
Fig. 28: Inspecting Piston Ring End Gap
Courtesy of KIA MOTORS AMERICA, INC.

PISTON PINS

1. Measure the outer diameter of piston pin.

Piston pin diameter:

20.001 ~ 20.006mm (0.7874 ~ 0.7876in)



G03821172

Fig. 29: Measuring Piston Pin Outer Diameter
Courtesy of KIA MOTORS AMERICA, INC.

2. Measure the piston pin-to-piston clearance.

Piston pin-to-piston clearance:

0.01 ~ 0.02mm (0.0004 ~ 0.0008in)

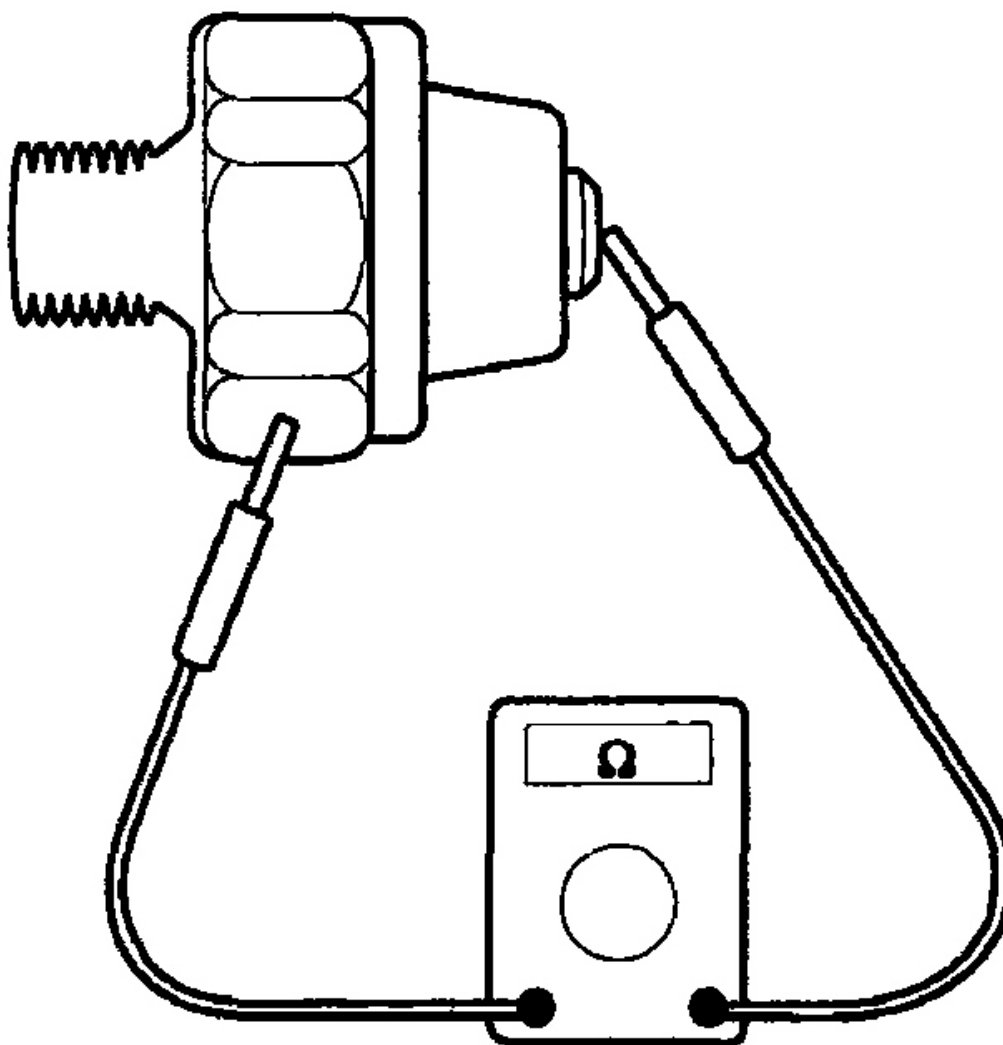
3. Check the difference between the piston pin outer diameter and the connecting rod small end inner diameter.

Piston pin-to-connecting rod interference:

-0.032 ~ -0.016mm (-0.0013 ~ -0.0006in)

OIL PRESSURE SWITCH

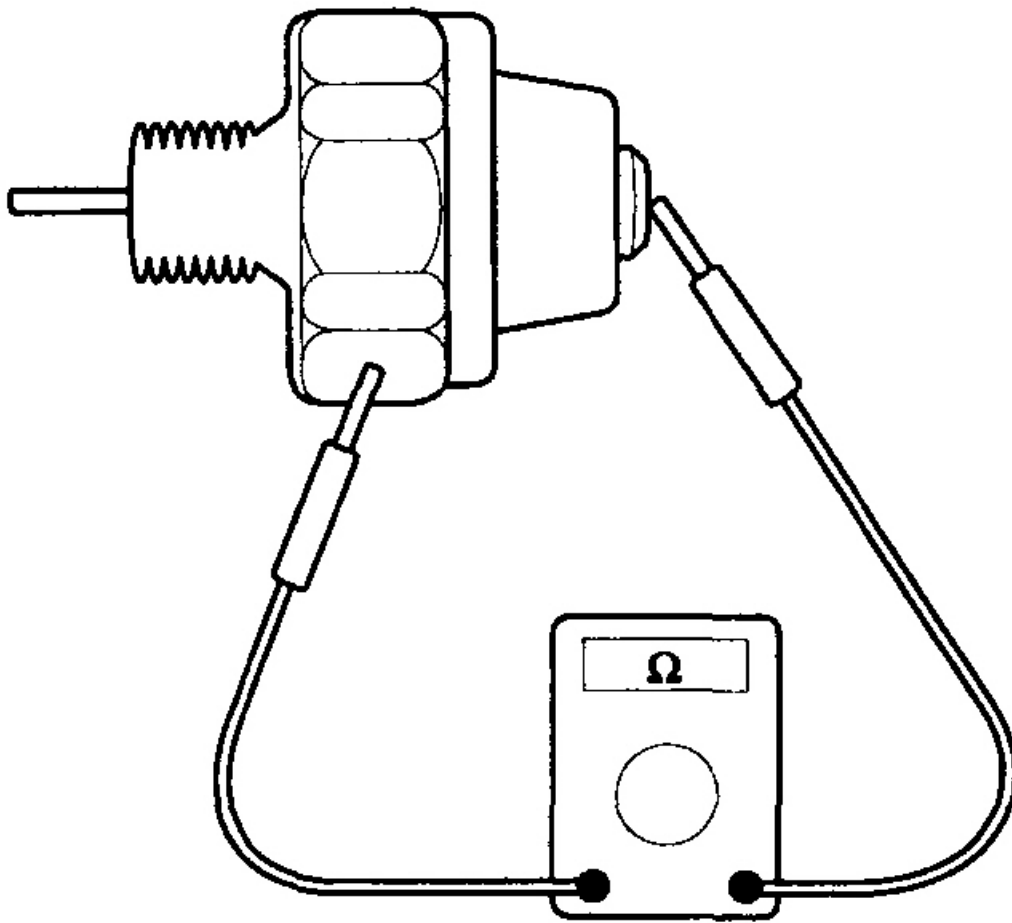
1. Check the continuity between the terminal and the body with an ohmmeter. If there is no continuity, replace the oil pressure switch.



G03821173

Fig. 30: Checking Continuity Between Oil Pressure Switch Terminal And Body (1 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

2. Check the continuity between the terminal and the body when the fine wire is pushed. If there is continuity even when the fine wire is pushed, replace the switch.



G03821174

Fig. 31: Checking Continuity Between Oil Pressure Switch Terminal And Body (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

3. If there is no continuity when a 49.0kpa (0.5kg/cm² , 7.1 psi) vacuum is applied through the oil hole, the switch is operating properly.

Check for air leakage. If air leaks, the diaphragm is broken. Replace it.

REASSEMBLY

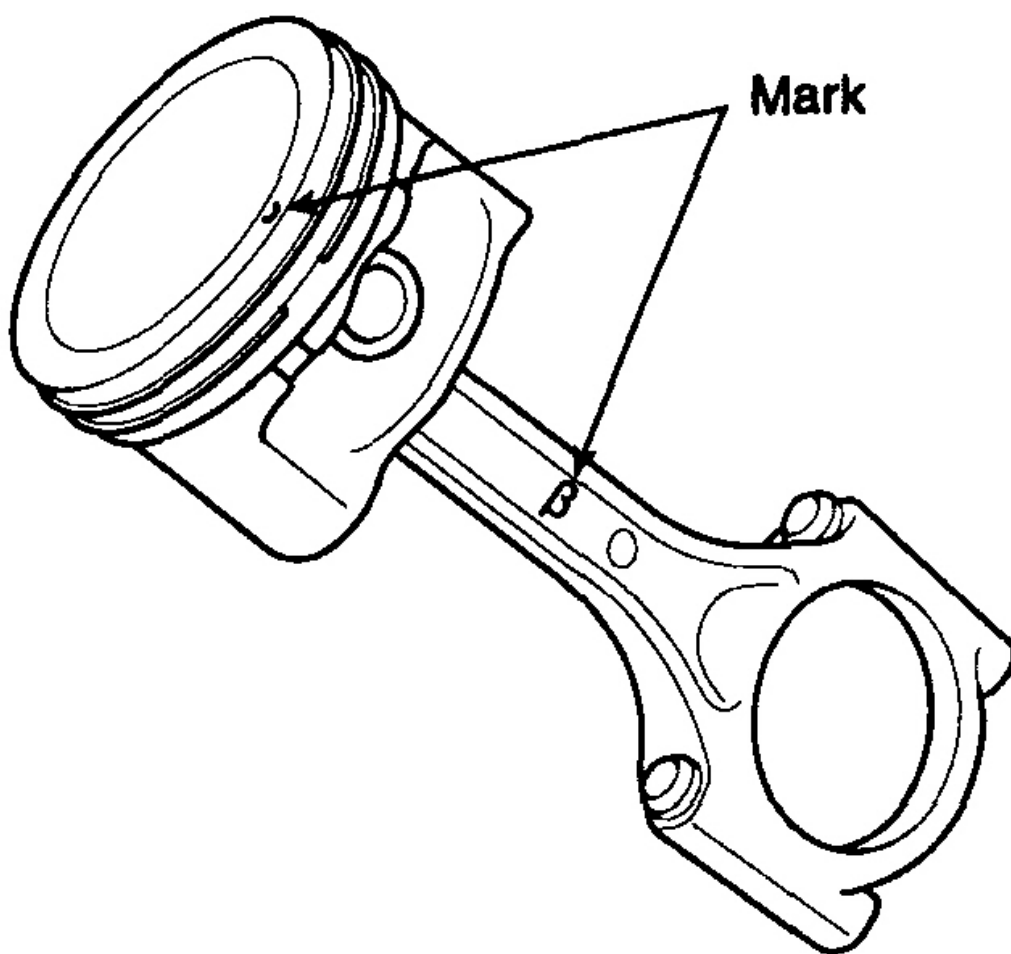
NOTE:

- Thoroughly clean all parts to assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating

surfaces.

- **Replace all gaskets, O-rings and oil seals with new parts.**

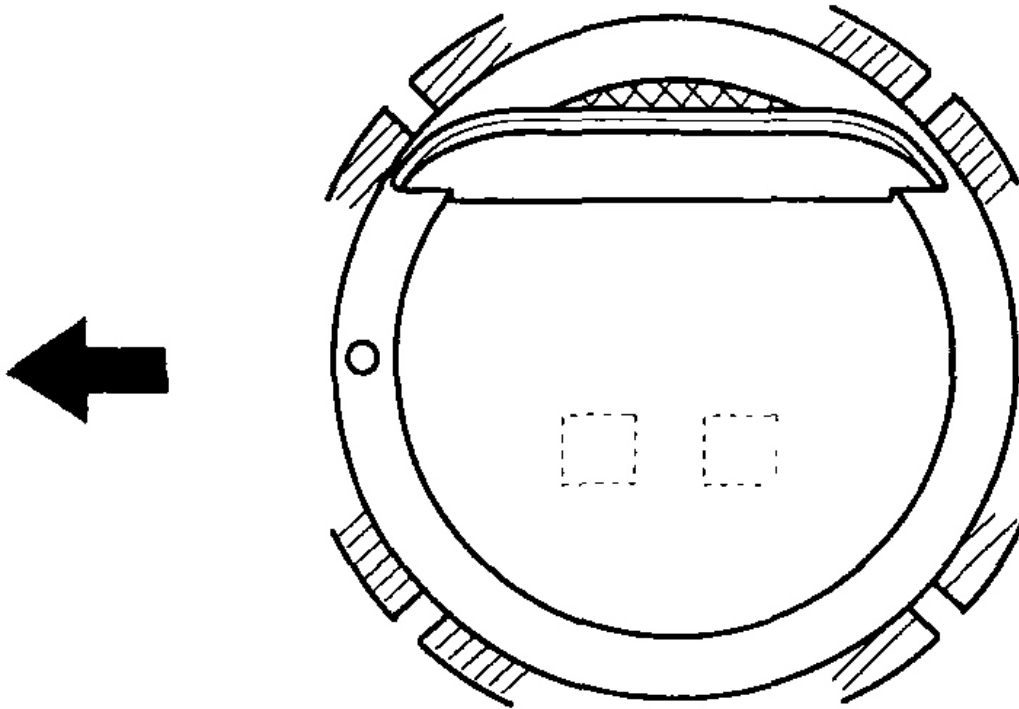
1. Assemble the piston and connecting rod.
 1. Use a hydraulic press for installation
 2. The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



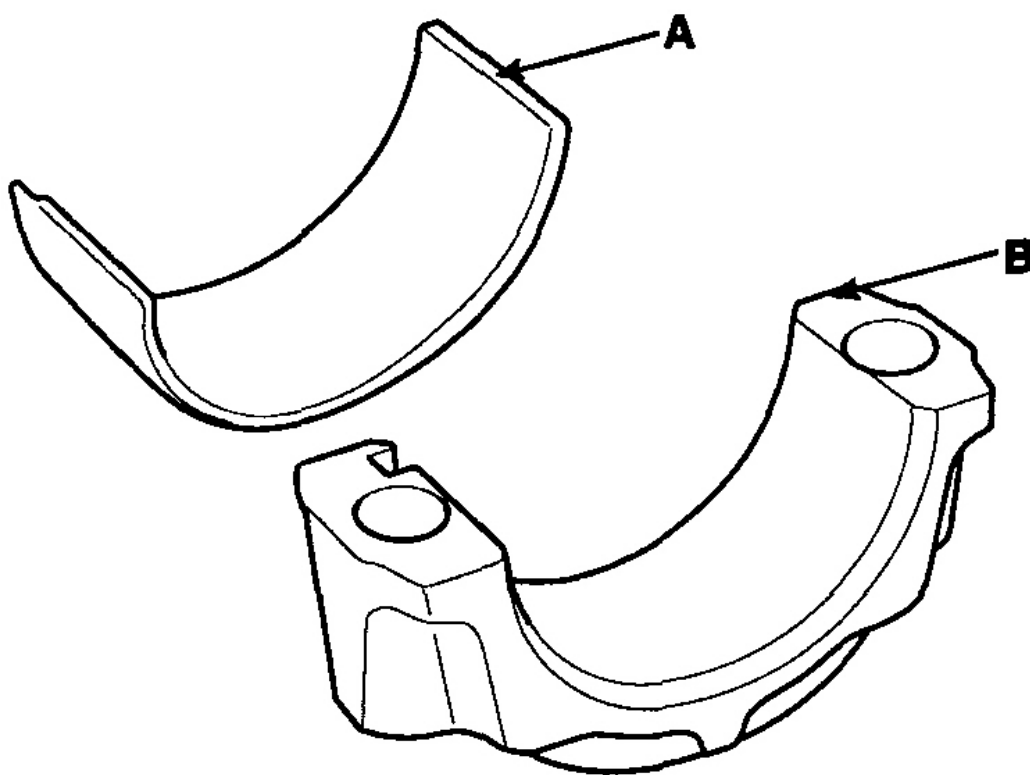
G03821175

Fig. 32: Assembling Piston And Connecting Rod
Courtesy of KIA MOTORS AMERICA, INC.

2. Install the piston rings.
 1. Install the oil ring spacer and 2 side rails by hand.
 2. Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
 3. Position the piston rings so that the ring ends are as shown.

**G03821176****Fig. 33: View Of Piston Ring****Courtesy of KIA MOTORS AMERICA, INC.**

3. Install the connecting rod bearings.
 1. Align the bearing claw with the groove of the connecting rod or connecting rod cap.
 2. Install the bearings (A) in the connecting rod and connecting rod cap (B).



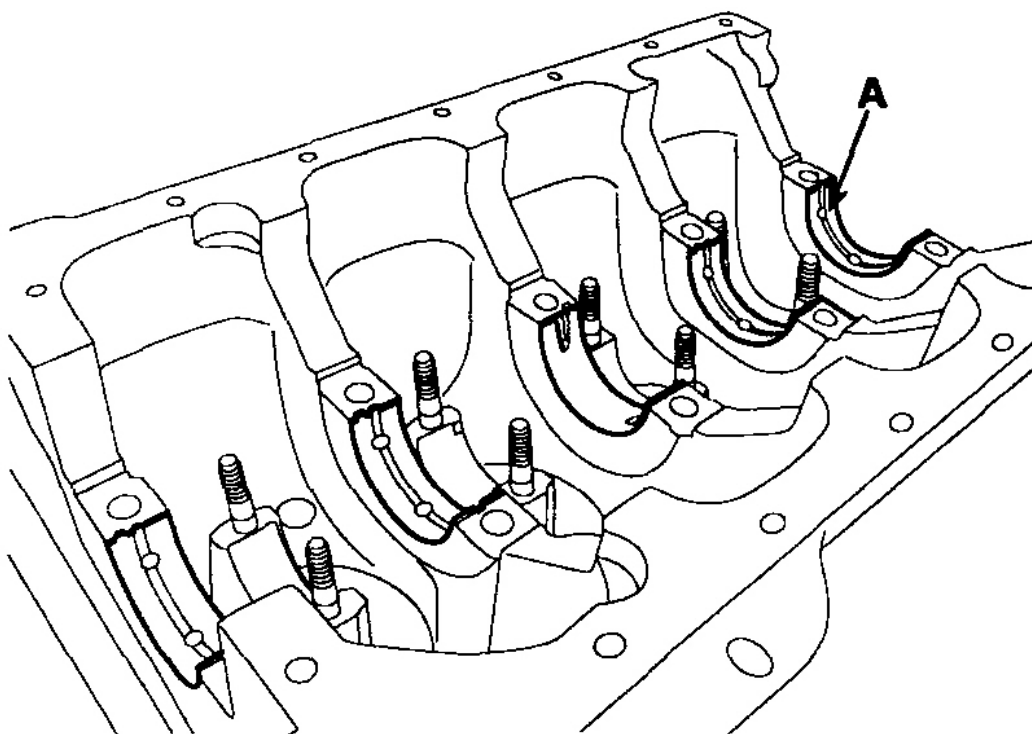
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Fig. 34: Installing Connecting Rod Bearings
Courtesy of KIA MOTORS AMERICA, INC.

4. Install the crankshaft main bearings.

NOTE: Upper 1, 2, 4, 5 bearings have an oil groove of oil holes; Lower bearings do not.

1. Align the bearing claw with the claw groove of the cylinder block, push in the 5 upper bearings (A).

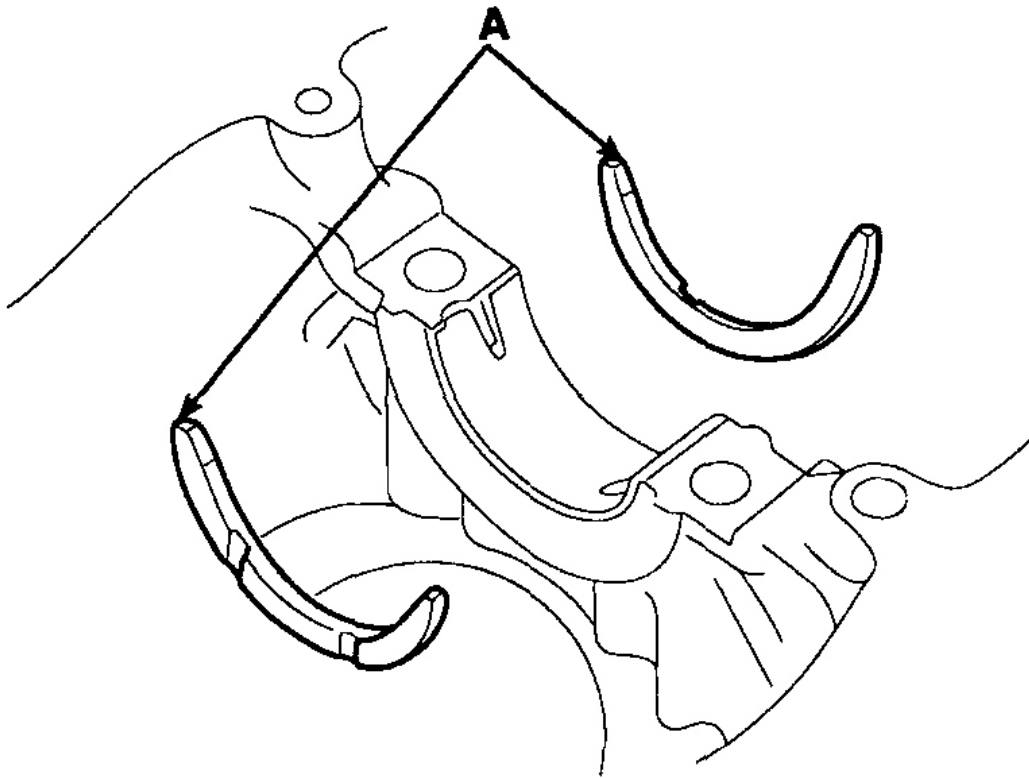


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Fig. 35: Installing Crankshaft Main Bearings
Courtesy of KIA MOTORS AMERICA, INC.

2. Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.
5. Install the thrust bearings.

Install the 2 thrust bearings (A) under the No.3 journal position of the cylinder block with the oil grooves facing outward.



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Fig. 36: Installing Thrust Bearings
Courtesy of KIA MOTORS AMERICA, INC.

6. Place the crankshaft on the cylinder block.
7. Place the main bearing caps on the cylinder block.
8. Install the main bearing cap bolts.

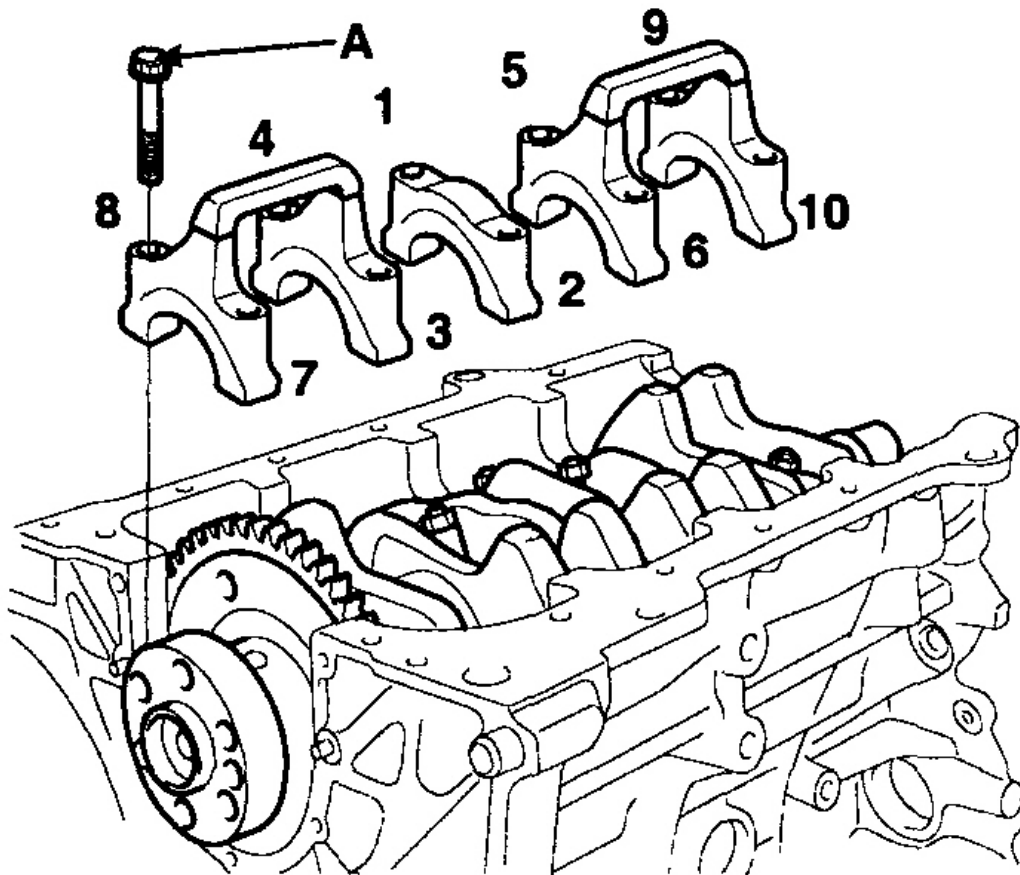
NOTE:

- The main bearing cap bolts are tightened in 2 progressive steps.
- If any of the bearing cap bolts is broken or deformed, replace it.

1. Apply a light coat of engine oil on the threads and under the bearing cap bolts.
2. Install and uniformly tighten the 10 bearing cap bolts (A), in several passes, in the sequence shown.

Tightening torque: 27.5 ~ 31.4N.m

(2.8 ~ 3.2kgf.m, 20.3 ~ 23.1lb-ft) + 60° ~ 64°



G03821180

Fig. 37: Installing Main Bearing Cap Bolts
 Courtesy of KIA MOTORS AMERICA, INC.

3. Check that the crankshaft turns smoothly.
9. Check the crankshaft end play. (Refer to **INSPECTION** step 5)
10. Install the piston and connecting rod assemblies.

NOTE: Before installing the piston, apply a coat of engine oil to the ring grooves and cylinder bores.

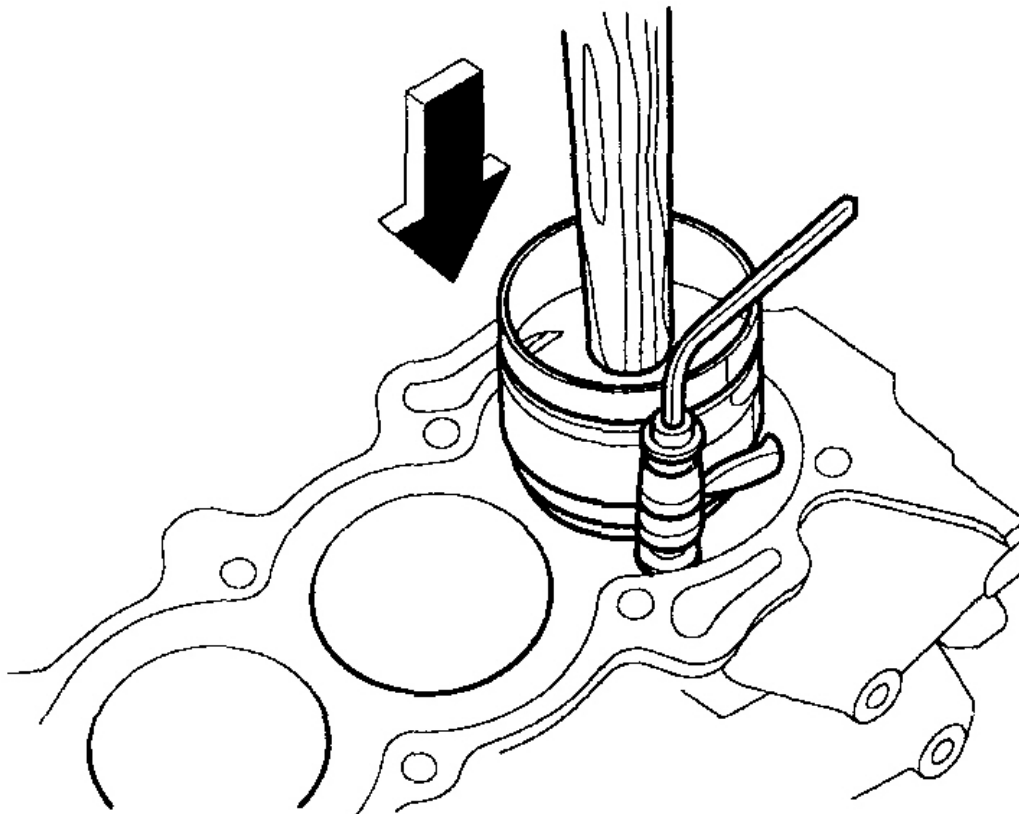
1. Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts
2. Install the ring compressor, check that the rings are securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.

3. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
4. Apply engine oil to the bolt threads, install the rod caps with bearings, and tighten the nuts.

Tightening torque:

49.0 ~ 52.0N.m (5.0 ~ 5.3kgf.m, 36.2 ~ 38.3lb-ft)

NOTE: Maintain downward force on the ring compressor to prevent the rings from expending before entering the cylinder bore.



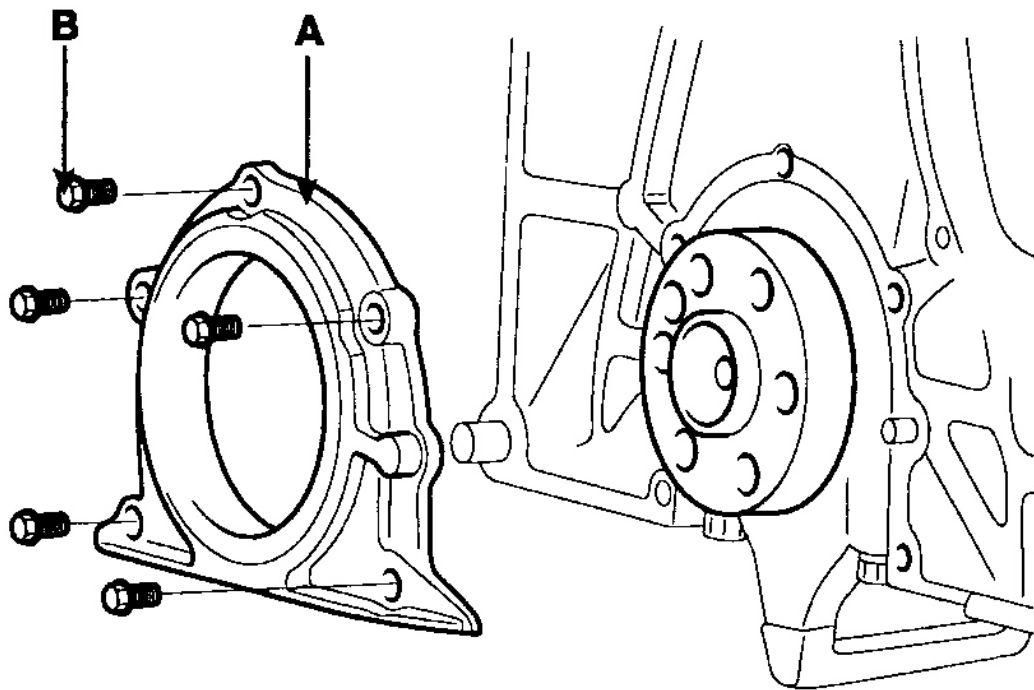
G03821181

Fig. 38: [Installing Piston Ring Compressor]
Courtesy of KIA MOTORS AMERICA, INC.

11. Install a new gasket and rear oil seal case (A) with 5 bolts (B).

Tightening torque:

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

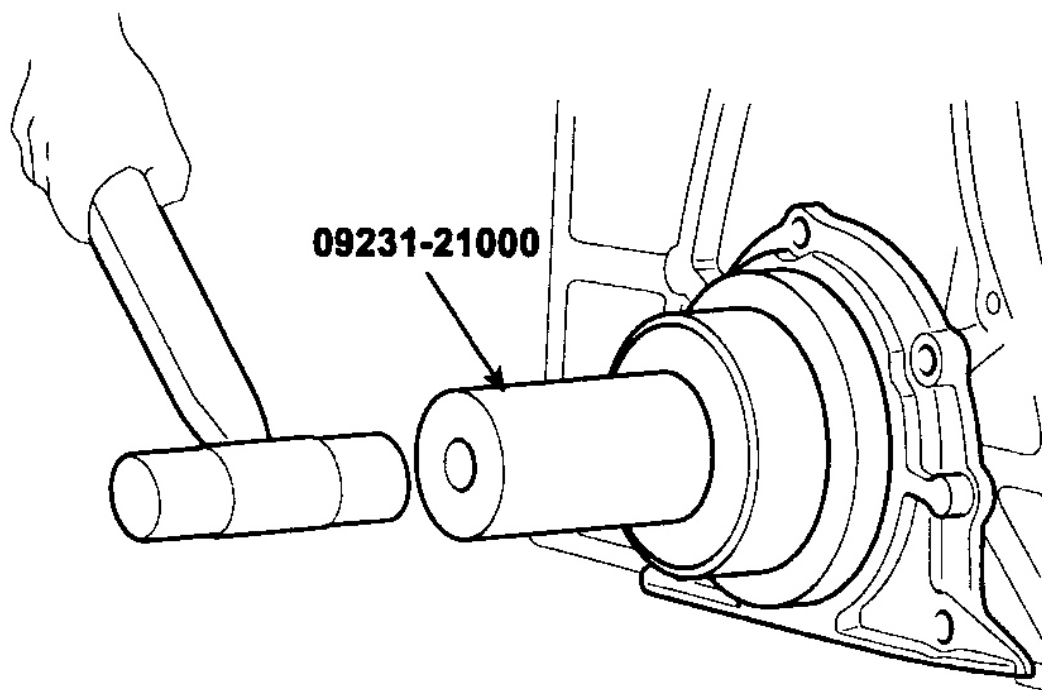


G03821182

Fig. 39: Installing Gasket And Rear Oil Seal Case
Courtesy of KIA MOTORS AMERICA, INC.

NOTE: Check that the mating surfaces are clean and dry.

12. Install the rear oil seal.
 1. Apply engine oil to a new oil seal lip.
 2. Using the SST(09231 -21000) and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.



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Fig. 40: Installing Rear Oil Seal

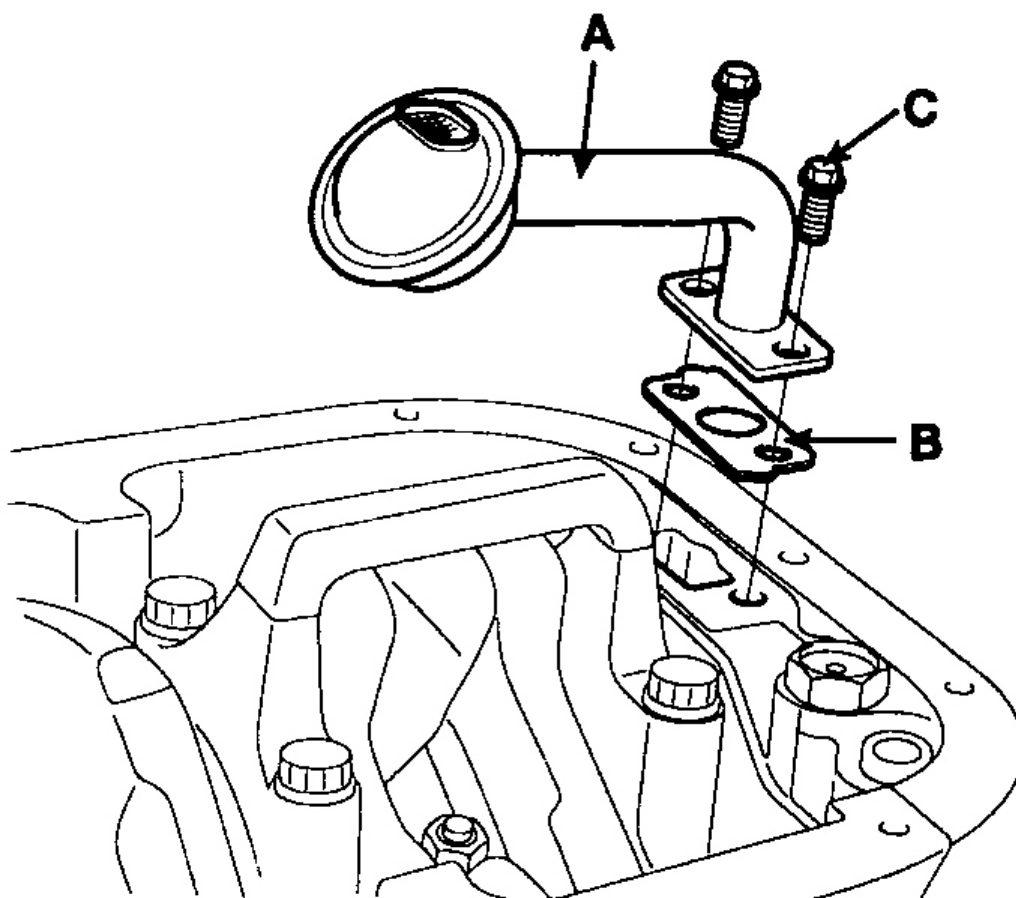
Courtesy of KIA MOTORS AMERICA, INC.

13. Install the front case. (Refer to **INSTALLATION** step 1~5)
14. Install the oil screen.

Install a new gasket (B) and oil screen (A) with 2 bolts (C).

Tightening torque:

14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)



G03821184

Fig. 41: Installing Oil Screen And Gasket
Courtesy of KIA MOTORS AMERICA, INC.

15. Install the oil pan.
 1. Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

NOTE: Check that the mating surfaces are clean and dry before applying liquid gasket.

2. Apply liquid gasket as an even bead, centered between the edges of the mating surface.

Liquid gasket: MS 721-40A or equivalent

NOTE:

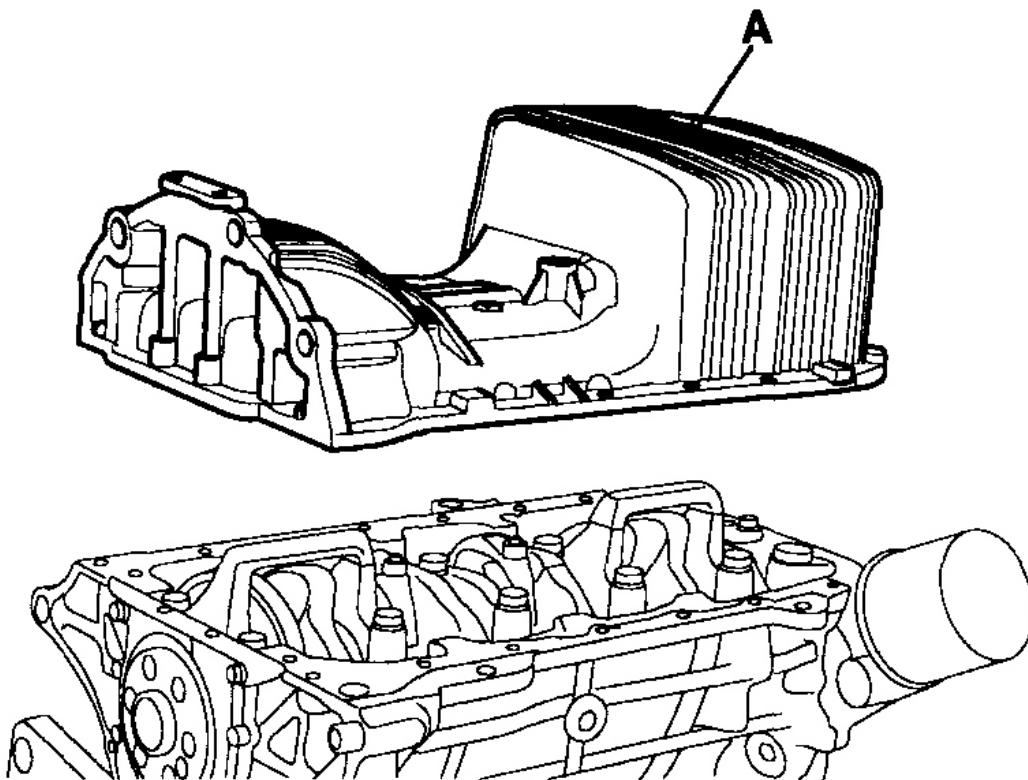
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

3. Install the oil pan (A) with the bolts.

Uniformly tighten the bolts in several passes.

Tightening torque:

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



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Fig. 42: Installing Oil Pan

Courtesy of KIA MOTORS AMERICA, INC.

16. Install the water pump. (Refer to **WATER PUMP**)

17. Install the oil pressure switch.

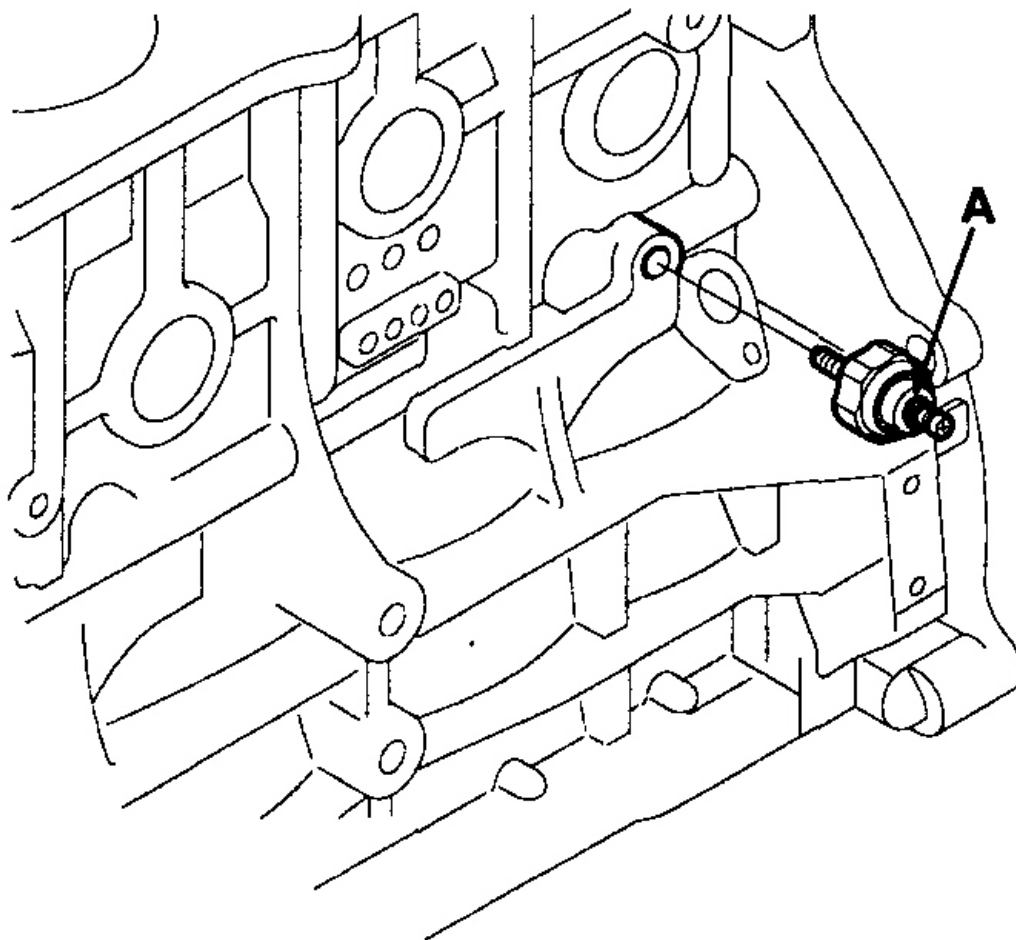
1. Apply adhesive to 2 or 3 threads.

Adhesive: MS 721 -39 (B) or equivalent.

2. Install the oil pressure switch (A).

Tightening torque:

14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)



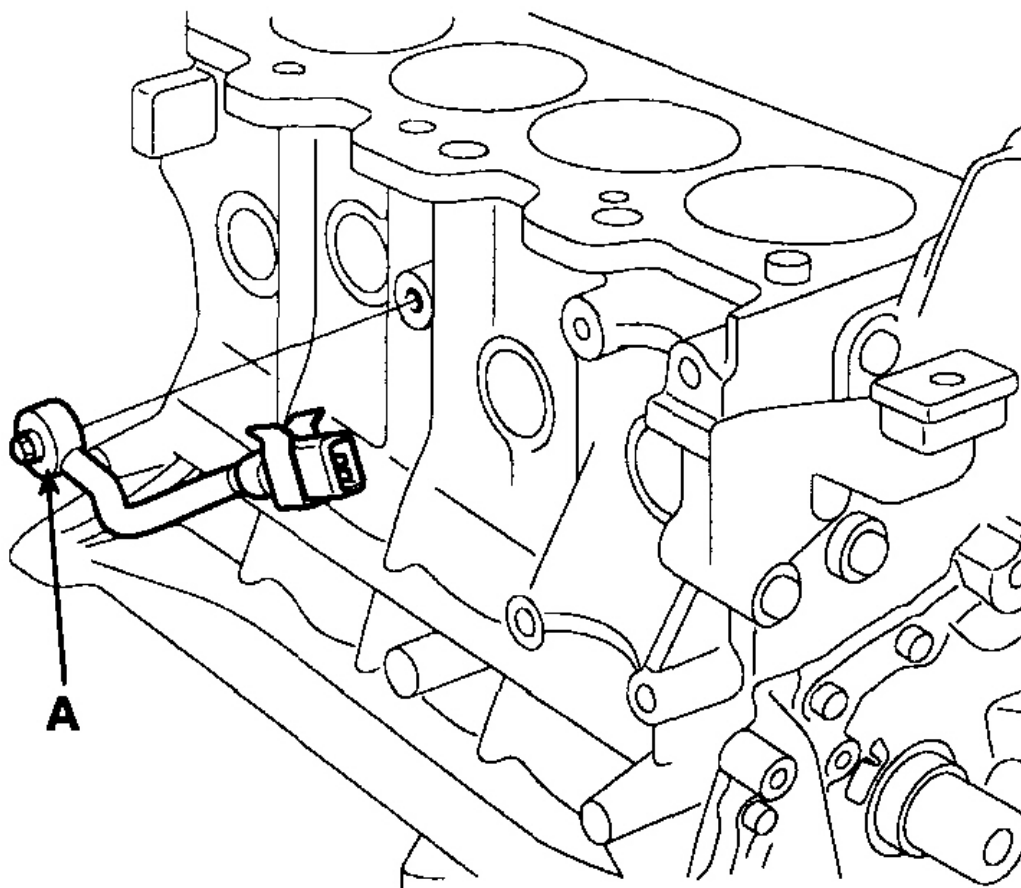
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Fig. 43: Installing Oil Pressure Switch
Courtesy of KIA MOTORS AMERICA, INC.

18. Install the knock sensor (A).

Tightening torque:

16.7 ~ 26.5N.m (1.7 ~ 2.7kgf.m, 12.3 ~ 19.5lb-ft)



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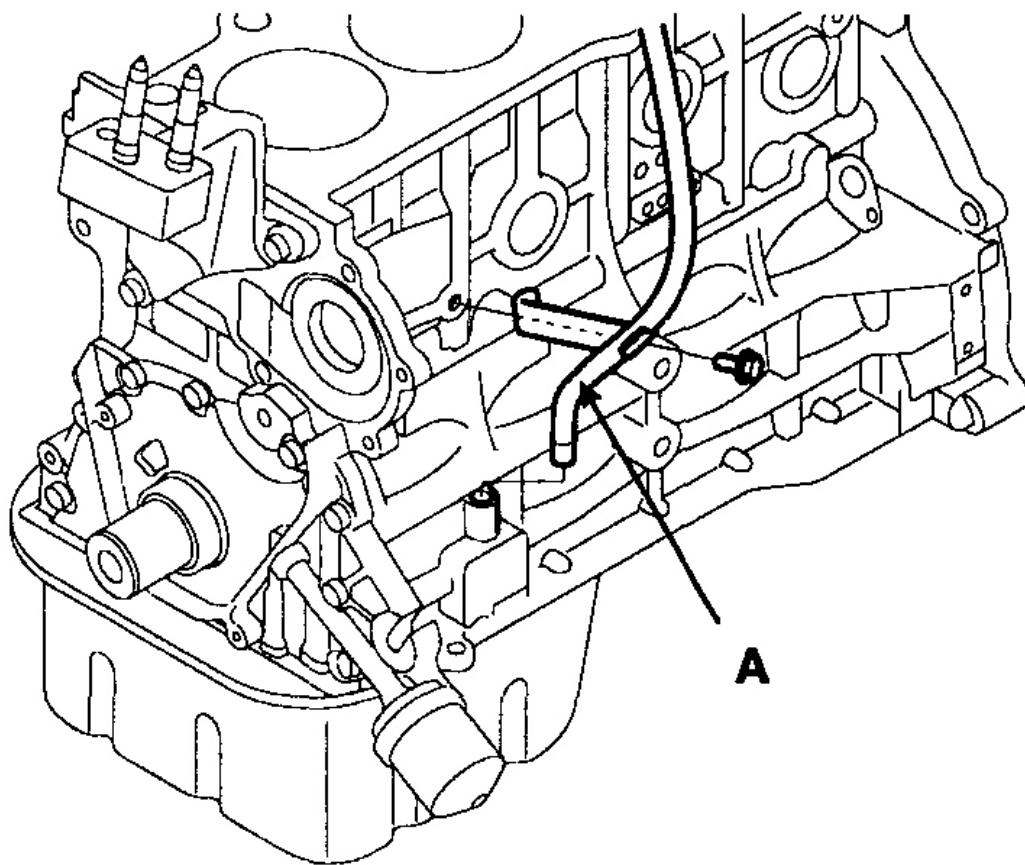
Fig. 44: Installing Knock Sensor

Courtesy of KIA MOTORS AMERICA, INC.

19. Install the oil level gauge tube (A).
 1. Install a new O-ring on the oil level gauge tube.
 2. Apply engine oil on the O-ring.
 3. Install the oil level gauge tube (A) with the bolt.

Tightening torque:

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



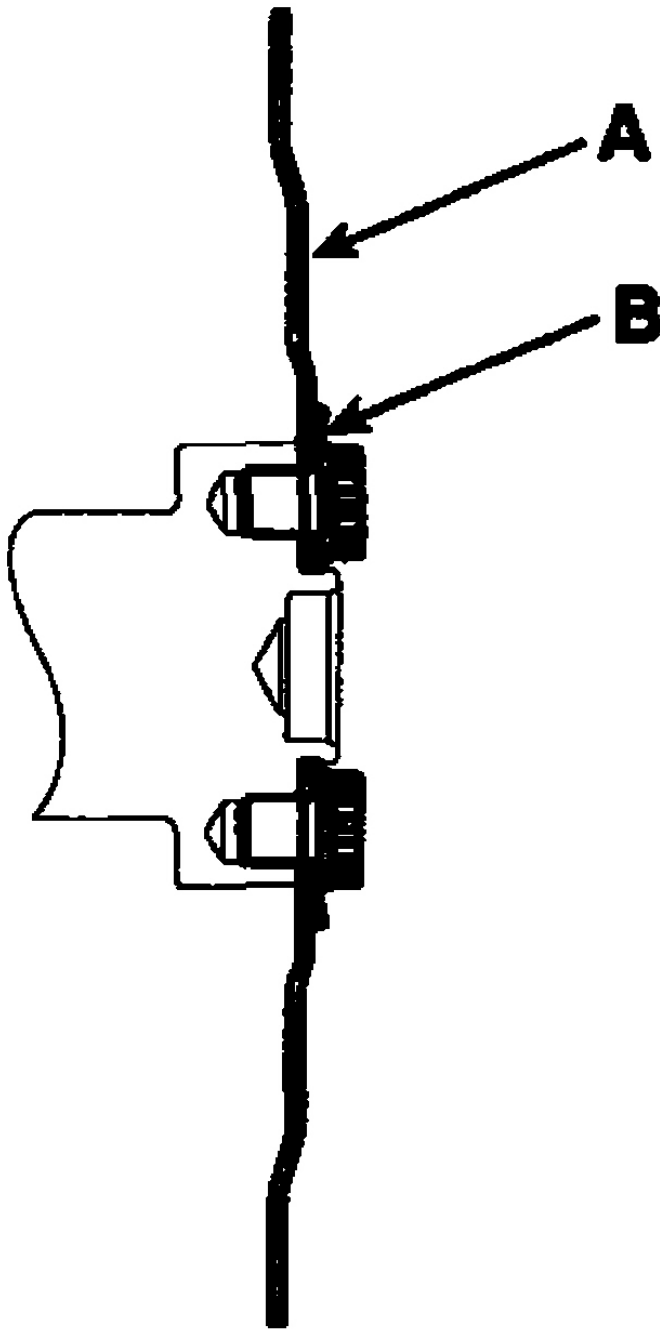
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Fig. 45: Installing Oil Level Gauge Tube
Courtesy of KIA MOTORS AMERICA, INC.

20. Install the cylinder head. (Refer to **CYLINDER HEAD ASSEMBLY - 2.0L**)
21. Install the timing belt. (Refer to **TIMING BELT REPLACEMENT - 2.0L - DOHC**)
22. Remove the engine stand.
23. A/T: install the drive plate (A) and washer (B).

Tightening torque:

117.7 ~ 127.5N.m (12.0 ~ 13.0kgf.m, 86.8 ~ 94.0lb-ft)



G03821189

Fig. 46: Installing Drive Plate And Washer (A/T)
Courtesy of KIA MOTORS AMERICA, INC.

24. M/T: install the fly wheel.

2005 Kia Sportage EX

2005-06 ENGINE Engine Block - 2.0L - Sportage

Tightening torque:

117.7 ~ 127.5N.m (12.0 ~ 13.0kgf.m, 86.8 ~ 94.0lb-ft)