

2006 Kia Magentis LX

2006-07ENGINE Mechanical (G4KC - GSL 2.4) - Optima & Magentis (Canadian)

2006-07ENGINE**Mechanical (G4KC - GSL 2.4) - Optima & Magentis (Canadian)****GENERAL****SPECIFICATIONS****GENERAL SPECIFICATION**

Description		Specifications	Limit
General			
Type		In-line, Double Overhead Camshaft	
Number of cylinders		4	
Bore		88mm (3.464in)	
Stroke		97mm (3.819in)	
Total displacement		2359cc (143.90cu.in)	
Compression ratio		10.5: 1	
Firing order		1-3-4-2	
Valve timing			
Intake valve	Opens (ATDC/BBDC)	11°-34°	
	Closes (ABDC)	22°-67°	
Exhaust valve	Opens (BBDC)	34°	
	Closes (ATDC)	10°	
Cylinder head			
Flatness of gasket surface		Less than 0.05mm (0.0020in)(0.02 mm (0.0008 in)/100 x 100)	
Flatness of manifold mounting surface	Intake	Less than 0.10mm (0.0039in)	
	Exhaust	Less than 0.10mm (0.0039in)	
Camshaft			
Cam height	Intake	43.80mm (1.7244in)	
	Exhaust	45.00mm (1.7716in)	
Journal outer Diameter (Intake, Exhaust)		No.1: 30mm (1.1811 in) (Intake) No.2,3,4,5: 24mm (0.9449in) (Intake, Exhaust)	
		No.1: 40mm (1.5748in) (Exhaust)	
Bearing oil clearance	Intake	No.1: 0.020-0.057mm (0.00078-0.00224in)	0.09mm (0.0035in)
		No.2,3,4,5: 0.045-0.082mm (0.00177-0.00323in)	0.12mm (0.0047in)
	Exhaust	No.1,2,3,4,5: 0.045-0.082mm (0.00177-0.00323in)	0.12mm (0.0047in)
End play		0.1-0.22mm (0.0039-0.0086in)	0.24mm

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			(0.0094in)
MLA			
MLA outer Diameter		31.964-31.980 mm (1.2584-1.2591 in)	
Cylinder head tappet bore inner diameter		32.000-32.025 mm (1.2598-1.2608 in)	
MLA to tappet bore clearance		0.020-0.061 mm (0.0008-0.0024 in)	0.7mm (0.0276in)
Valve			
Valve length	Intake	113.18mm (4.4559in)	112.93mm (4.4460in)
	Exhaust	105.89mm (4.1689in)	105.74mm (4.1629in)
Stem outer diameter	Intake	5.465-5.480mm (0.2151-0.2157in)	
	Exhaust	5.458-5.470mm (0.2149-0.2153in)	
Face angle		45.25°-45.75°	
Thickness of valve head (margin)	Intake	1.02mm (0.0401 in)	
	Exhaust	1.09mm (0.0429in)	
Valve stem to valve guide clearance	Intake	0.020-0.047mm (0.00078-0.00185in)	0.07mm (0.00275in)
	Exhaust	0.030-0.054mm (0.00118-0.00212in)	0.09mm (0.00354in)
Valve guide			
Length		43.8-44.2mm (1.7244-1.7401in)	
Inner diameter		5.500-5.512mm (0.2165-0.2170in)	
Valve seat			
Width of seat contact	Intake	1.16-1.46mm (0.0457-0.0575in)	
	Exhaust	1.35-1.65mm (0.0531-0.0649in)	
Seat angle		44.75°-45.10°	
Valve spring			
Free length		47.44mm (1.8677in)	
Load		19.0 ± 0.6kg/35.0mm (41.88±1.32lb/1.3779in)	
Squareness		39.8 ± 1.2kg/26.0mm(87.74 ± 2.64lb/1.0236 in)	
Out of squareness		Less than 1.5°	
Valve clearance			
Cold (20°C[68°F])	Intake	0.17-0.23mm (0.0067-0.0090in)	0.10-0.30mm (0.0039-0.0118in)
	Exhaust	0.27-0.33mm (0.0106-0.0129in)	0.20-0.40mm (0.0078-0.0157in)
Cylinder block			
Cylinder bore		88.00-88.03mm (3.4645-3.4657in)	
Flatness of gasket surface		Less than 0.05mm (0.0020in)(0.02 mm (0.0008 in)/100 x100)	

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Piston

Piston outer diameter		87.975-88.005mm (3.4636-3.4648 in)	
Piston to cylinder clearance		0.015-0.035mm (0.0028-0.0014in)	
Ring groove width	No. 1 ring groove	1.22-1.24mm (0.0006-0.0488in)	1.26mm (0.0496in)
	No. 2 ring groove	1.22-1.24mm (0.0480-0.0488in)	1.26mm (0.0496in)
	Oil ring groove	2.01-2.03mm (0.0791-0.0799in)	2.05mm (0.0807in)

Piston ring

Side clearance	No. 1 ring	0.03-0.07mm (0.0012-0.0028 in)	0.1mm (0.004in)
	No. 2 ring	0.03-0.07mm (0.0012-0.0028 in)	0.1mm (0.004in)
	Oil ring	0.06-0.15mm (0.0024-0.0059in)	0.2mm (0.008in)
End gap	No. 1 ring	0.15-0.30mm (0.0059-0.0118in)	0.6mm (0.0236in)
	No. 2 ring	0.30-0.45mm (0.0118-0.0177in)	0.7mm (0.0275in)
	Oil ring	0.20-0.70mm (0.0078-0.0275in)	0.8mm (0.0315in)

Piston pin

Piston pin outer diameter	21.001-21.006mm (0.8268-0.8270 in)	
Piston pin hole inner diameter	21.016-21.021mm (0.8274-0.8276 in)	
Piston pin hole clearance	0.010-0.020mm (0.0004-0.0008 in)	
Connecting rod small end inner diameter	20.974-20.985mm (0.8257-0.8262 in)	
Piston pin press-fit load	2451.7-12258.3N(250-1250kg, 551.2-2755.8 lb)	

Connecting rod

Connecting rod big end inner diameter	51.000-51.018mm (2.0079-2.0086 in)	
Connecting rod bearing oil clearance	0.028-0.046mm (0.0011-0.0018 in)	0.05mm (0.0019in)
Side clearance	0.10-0.25mm (0.0039-0.0098 in)	0.35mm (0.0138in)

Crankshaft

Main journal outer diameter	51.942-51.960mm (2.0449-2.0456in)	
Pin journal outer diameter	47.954-47.972mm (1.8879-1.8886in)	
Main bearing oil clearance	0.026-0.049mm (0.0010-0.0019 in)	0.1mm (0.004in)
End play	00.07-0.25mm (0.0027-0.0098in)	

Engine oil

Oil quantity (Total)	5.1 L (5.39 US qt, 4.49lmp qt)	
Oil quantity (Excluding oil filter)	4.0 L (4.23 US qt, 3.52 lmp qt)	
Oil quantity (Including oil filter)	4.3 L (4.54 US qt, 3.78 lmp qt)	
Oil type	5W-20(SL/GF-3)	

Cooling system

Cooling method	Forced circulation with cooling fan	
Coolant quality	6.4-6.9 L (6.76288-7.29US qt, 5.63136-	

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		6.07lmp qt)	
Thermostat	Type	Wax pellet type	
	Opening temperature	82±1.5°C (179.6±34.7°F)	
	Closing temperature	77°(176.9°F)	
	Pull opening temperature	95°C (201°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	6.86kpa (1psi, 0.07kg/cm ²) or less	
Water temperature sensor			
Type		Thermistor type	
Resistance	20°C (68°F)	2.45 ± 0.14kohms	
	80°C (176°F)	0.3222kohms	

TIGHTENING TORQUE

TIGHTENING TORQUE SPECIFICATION

Item	Quantity	N.m	kgf.m	lb-ft
Ladder frame bolts	10	23.52-27.44	2.4-2.8	17.35-20.24
Oil pump & balance shaft module bolts	4	16.66 + 60° + 60°	1.7 + 60° + 60°	12.29 + 60° + 60°
Timing chain cover bolts (M8)	6	18.62-22.54	1.9-2.3	13.74-16.63
Timing chain cover bolts (M6)	7	7.84-9.8	0.8-1.0	5.78-7.23
Oil pan bolts (M6 x 10)	16	9.8-11.76	1.0-1.2	7.23-8.67
Oil pan bolts (M8 x 103)	2	26.46-30.38	2.7-3.1	19.52-22.41
Engine support bracket bolt (M10 x 40)	1	39.2-44.1	4.0-4.5	28.92-32.53
Engine support bracket bolts (M10 x 45)	2	39.2-44.1	4.0-4.5	28.92-32.53
Engine support bracket bolt (M8 x 30)	1	19.6-24.5	2.0-2.5	14.46-18.07
Camshaft bearing cap bolts (M6)	16	10.78-12.74	1.1-1.3	7.95-9.39
Camshaft bearing cap bolts (M8)	4	27.44-31.36	2.8-3.2	20.24-23.14
Cylinder head bolts	10	34.3 + 90° + 90°	3.5 + 90° + 90°	25.3 + 90° + 90°
Engine hanger bolts	2	19.6-26.46	2.0-2.7	14.46-19.52
Cylinder head cover bolts	18	7.84-9.8	0.8-1.0	5.78-7.23
Crankshaft pulley bolt	1	166.6-176.4	17-18	122.9-130.13
Flywheel bolts	7	117.6-127.4	12-13	86.75-93.98
Drive plate bolts	7	117.6-127.4	12-13	86.75-93.98
Timing chain tensioner bolts	2	9.8-11.76	1.0-1.2	7.23-8.67
Timing chain tensioner arm bolt	1	9.8-11.76	1.0-1.2	7.23-8.67
Timing chain guide bolts	3	9.8-11.76	1.0-1.2	7.23-8.67
OCV bolt	1	9.8-11.76	1.0-1.2	7.23-8.67
CVVT & camshaft sprocket bolt	1	53.9-63.7	5.5-6.5	39.7-47.0
Balance shaft chain tensioner arm bolt	1	9.8-11.76	1.0-1.2	7.23-8.67

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Balance shaft chain guide bolts	2	9.8-11.76	1.0-1.2	7.23-8.67
Balance shaft chain tensioner bolts	2	9.8-11.76	1.0-1.2	7.23-8.67
Water pump bolts	5	19.6-26.46	2.0-2.7	14.46-19.52
A/C bracket bolts	4	19.6-33.0	2.0-3.36	14.46-24.3
P/S bracket bolts	2	44.1-53.9	4.5-5.5	32.53-39.70
Tensioner & idler bracket bolts	7	39.2-44.1	4.0-4.5	28.92-32.53
Water temp. control bolts	2	14.7-21.56	1.5-2.2	10.84-15.90
Water temp. control nut	1	19.6-26.46	2.0-2.7	14.46-19.52
Water inlet pipe bolts	2	19.6-26.46	2.0-2.7	14.46-19.52
Oil level gauge assembly bolt	1	7.84-11.76	0.8-1.2	5.78-8.67
Ignition coil bolts	4	3.92-5.88	0.4-0.6	2.89-4.34
Intake manifold bolts	3	18.62-27.44	1.9-2.8	13.73-20.24
Intake manifold nuts	2	18.62-27.44	1.9-2.8	13.73-20.24
Intake manifold stay bolts	4	18.62-27.44	1.9-2.8	13.73-20.24
Exhaust manifold heat protector bolts	4	18.62-27.44	1.9-2.8	13.73-20.24
Exhaust manifold nuts	7	39.2-44.1	4.0-4.5	28.92-32.53
Exhaust manifold stay bolts (M8)	2	18.62-27.44	1.9-2.8	13.74-20.24
Exhaust manifold stay bolt (M10)	1	42.2-53.9	4.3-5.5	31.1-39.8
Front muffler bolts	2	39.2-58.8	4.0-6.0	28.92-43.37
Engine cover nuts	2	3.92-5.88	0.4-0.6	2.89-4.34
Engine cover mounting bracket bolts	2	7.84-11.76	0.8-1.2	5.78-8.67
Crankshaft position sensor & cover bolt	1	3.92-5.88	0.4-0.6	2.89-4.34
Oxygen sensor	1	34.3-44.1	3.5-4.5	25.30-32.53
Knock sensor	1	16.66-25.48	1.7-2.6	12.29-18.79
Oil temperature sensor	1	19.6-39.2	2.0-4.0	14.46-28.92
Camshaft position sensor	1	3.92-5.88	0.4-0.6	2.89-4.34
Oil pressure switch	1	7.84-11.76	0.8-1.2	5.78-8.67
Main bearing cap bolts	10	26.46 + 45°	2.7 + 45°	19.52 + 45°
Oil filter	1	11.76-15.68	1.2-1.6	8.67-11.57
Connecting rod bearing cap bolts	8	19.6 + 90°	2.0 + 90°	14.46 + 90°
Engine mounting nut (M12 x 1.25 6T)	3	63.7-83.4	6.5-8.5	47.0-61.5
Engine mounting bolts (M12 x 1.25 10T)	1	63.7-83.4	6.5-8.5	47.0-61.5

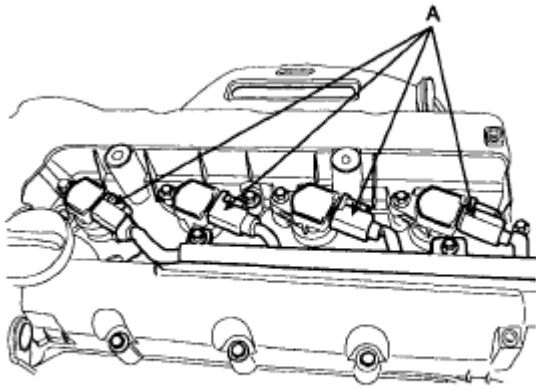
COMPRESSION

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

1. Warm up and stop engine.

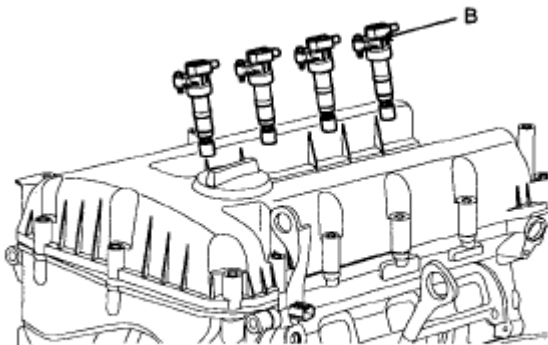
Allow the engine to warm up to normal operating temperature.

2. Remove ignition coils connects (A), ignition coils (B). (Refer to **IGNITION SYSTEM (ENGINE ELECTRICAL SYSTEM (G4KC - GSL 2.4))**).



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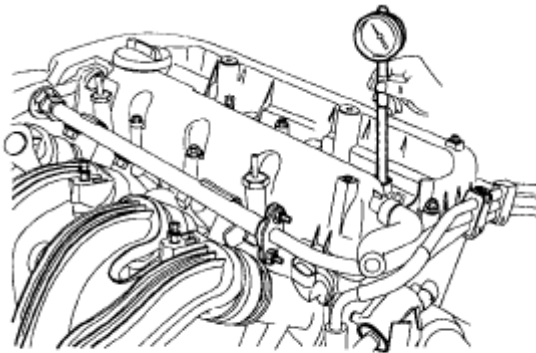
Fig. 1: Identifying Ignition Coil Connector
Courtesy of KIA MOTORS AMERICA, INC.



KCRF111B

Fig. 2: Identifying Ignition Coils
Courtesy of KIA MOTORS AMERICA, INC.

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



KCRF134B

Fig. 3: Identifying Compression Gauge In Spark Plug Hole
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 200 RPM or more.

4. Repeat steps (1) through (3) for each cylinder.

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

Compression pressure:

1,283kPa (13.0kgf/cm² , 185psi) (200-250rpm)

Minimum pressure:

1,135kPa (11.5kgf/cm² , 164psi)

Difference between each cylinder:

100kPa (1.0kgf/cm² , 15psi) 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 steps (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 spark plugs.
6. Install ignition coils, ignition coil connects. (Refer to **IGNITION SYSTEM (ENGINE ELECTRICAL SYSTEM (G4KC - GSL 2.4))**).

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°C) and cylinder head is installed on the cylinder block.

1. Remove the engine cover (A).

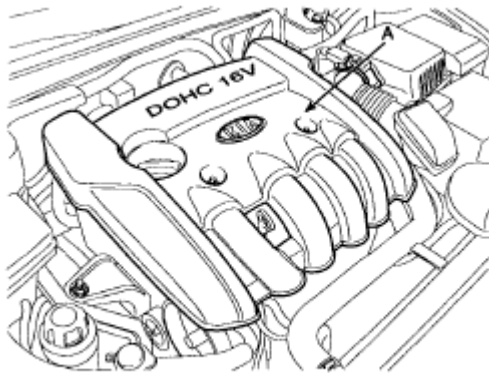


Fig. 4: Identifying Engine Cover
Courtesy of KIA MOTORS AMERICA, INC.

2. Remove the cylinder head cover.
 1. Disconnect the ignition coil connector (A) and remove the ignition coil.

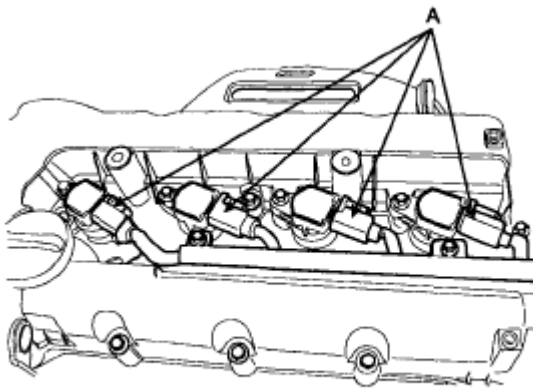
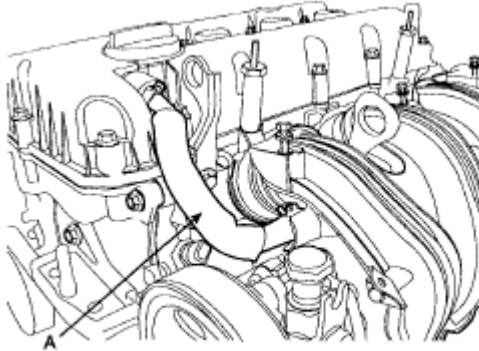


Fig. 5: Identifying Ignition Coil Connector

Courtesy of KIA MOTORS AMERICA, INC.

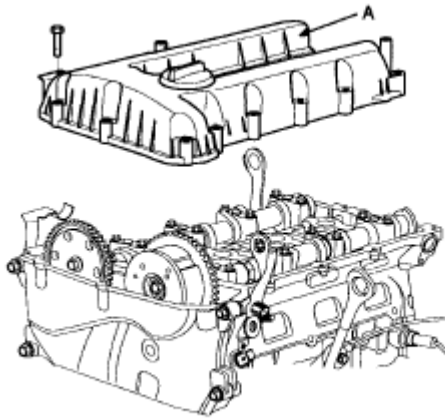
2. Disconnect the P.C.V hose (A) and the breather hose from the cylinder head cover.



KCRF141E

Fig. 6: Identifying P.C.V Hose And Breather Hose From Cylinder Head Cover
Courtesy of KIA MOTORS AMERICA, INC.

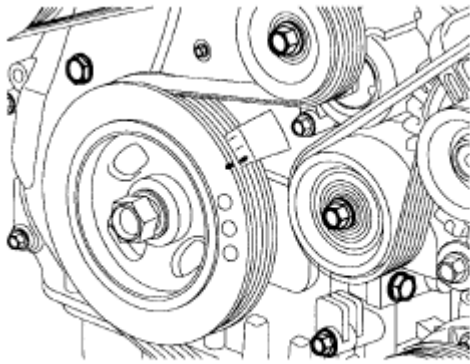
3. Loosen the cylinder head cover bolts and then remove the cover (A) and gasket.



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Fig. 7: Identifying Cylinder Head Cover Bolts And Gasket
Courtesy of KIA MOTORS AMERICA, INC.

3. 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 chain cover.

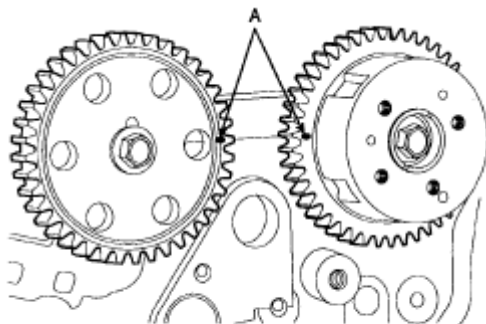


KCRF107A

Fig. 8: Identifying Crankshaft Pulley And Lower Timing Chain Cover
Courtesy of KIA MOTORS AMERICA, INC.

2. Check that the mark (A) of the camshaft timing sprockets are in straight line on the cylinder head surface as shown in the illustration.

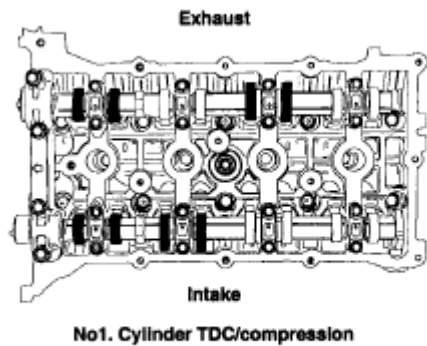
If not, turn the crankshaft one revolution (360°)



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Fig. 9: Identifying Mark Of Camshaft Timing Sprockets On Cylinder Head Surface
Courtesy of KIA MOTORS AMERICA, INC.

4. Inspect the valve clearance.
 1. Check only the valve indicated as shown in illustration. [No. 1 cylinder: TDC/Compression] measure the valve clearance.



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Fig. 10: Identifying No. 1 Cylinder TDC/Compression
Courtesy of KIA MOTORS AMERICA, INC.

- Using a thickness gauge, measure the clearance between the tappet 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 tappet.

Valve clearance

Specification

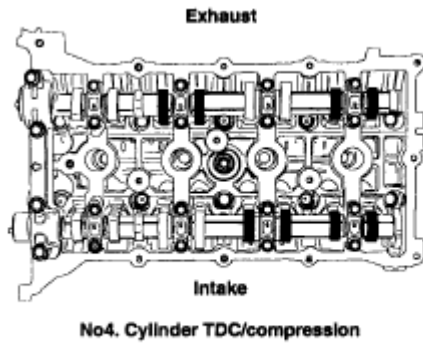
Engine coolant temperature: 20°C [68°F]

Limit

Intake: 0.10-0.30mm (0.0039-0.0118in.)

Exhaust: 0.20-0.40mm (0.0079-0.0157in.)

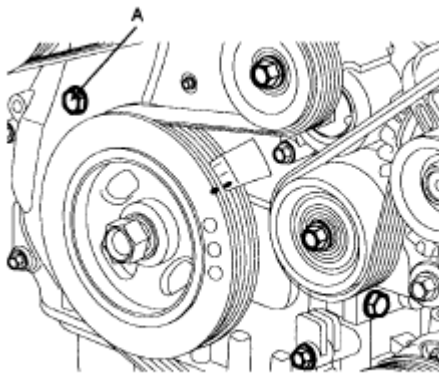
2. Turn the crankshaft pulley one revolution (360°) and align the groove with timing mark "T" of the lower timing chain cover.
3. Check only valves indicated as shown in illustration. [NO. 4 cylinder: TDC/compression]. Measure the valve clearance.



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Fig. 11: Identifying No. 4 Cylinder TDC/Compression
Courtesy of KIA MOTORS AMERICA, INC.

5. Adjust the intake and exhaust valve clearance.
 1. Set the No.1 cylinder to the TDC/compression.
 2. Marks on the timing chain and camshaft timing sprockets.
 3. Turn the crankshaft pulley 15° clockwise.
 4. Remove the service hole bolt (A) of the timing chain cover.

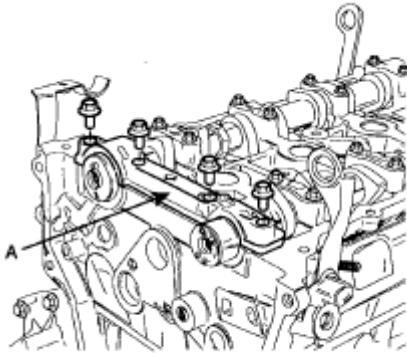


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Fig. 12: Identifying Service Hole Bolt Of Timing Chain Cover
Courtesy of KIA MOTORS AMERICA, INC.

CAUTION: The bolt must not be reused once it has been assembled.

5. Insert a thin rod in the service hole of the timing chain cover and release the ratchet.
6. Remove the front camshaft bearing cap (A).



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Fig. 13: Identifying Front Camshaft Bearing Cap
Courtesy of KIA MOTORS AMERICA, INC.

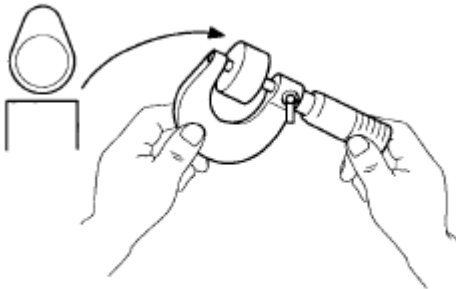
7. Remove the exhaust camshaft sprocket.
8. Remove the exhaust camshaft bearing cap and exhaust camshaft.
9. Remove the intake camshaft bearing cap and intake camshaft.

CAUTION: When disconnect the timing chain from the camshaft timing sprocket, hold the timing chain.

10. Secure the timing chain.

CAUTION: Be careful not to drop anything inside timing chain cover.

11. Measure the thickness of the removed tappet using a micrometer.



EDKE669D

Fig. 14: [Measuring Thickness Of Tappet Micrometer]
Courtesy of KIA MOTORS AMERICA, INC.

12. Calculate the thickness of a new tappet so that the valve clearance comes within the specified value.

Valve clearance (Engine coolant temperature: 20°C)

T: Thickness of removed tappet

A: Measured valve clearance

N: Thickness of new tappet

Intake: $N = T + [A - 0.20\text{mm}(0.0079\text{in.})]$ Exhaust: $N = T + [A - 0.30\text{mm}(0.0118\text{in.})]$

13. Select a new tappet with a thickness as close as possible to the calculated value.

NOTE: Tappets are available in 47size increments of 0.015mm (0.0006in.) from 3.00mm (0.118in.) to 3.690mm (0.1452in.)

14. Place a new tappet on the cylinder head.
 15. Hold the timing chain, and install the intake camshaft and timing sprocket assembly.
 16. Align the matchmarks on the timing chain and camshaft timing sprocket.
 17. Install the intake and exhaust camshaft.
 18. Install the front bearing cap.
 19. Install the service hole bolt.

Tightening torque

12-15N.m (1.2-1.5kgf.m, 8.8-11.0lb-ft)

20. Turn the crankshaft two turns in the operating direction (clockwise) and realign crankshaft sprocket and camshaft sprocket timing marks.
 21. Recheck the valve clearance.

Valve clearance (Engine coolant temperature: 20°C)

[Specification]

Intake: 0.17-0.23mm (0.0067-0.0090in.)

Exhaust: 0.27-0.33mm (0.0106-0.0129in.)

TROUBLESHOOTING**TROUBLESHOOTING CHART**

Symptom	Suspect area	Remedy
		Replace the crankshaft and bearings

2006 Kia Magentis LX

2006-07ENGINE Mechanical (G4KC - GSL 2.4) - Optima & Magentis (Canadian)

Engine misfire with abnormal internal lower engine noises.	Worn crankshaft bearings Loose or improperly engine flywheel	as required. 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)	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.
Engine misfire with coolant consumption	- Faulty cylinder head gasket and/or cranking 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, 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. - Install 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 timing camshaft and valve lifters as required.
	Worn valve guides or valve stems.	Inspect the valves and valve guides, then repair as required.

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	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.
	Worn drive belt, idler, tensioner and bearing.	Replace as required
Lower engine noise, regardless of engine speed	Low oil pressure	Repair or 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, piston pin and cylinder bore. - Repair as required.
	Excessive piston pin-to-piston clearance	- Inspect the piston, piston pin and the connecting rod. - 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 pin journals.
	Excessive crankshaft bearing clearance	Inspect the following components, and repair as required. - The crankshaft bearings. - The crankshaft main journals. - The cylinder block
	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
		Inspect the following components,

2006 Kia Magentis LX

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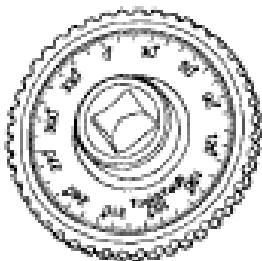
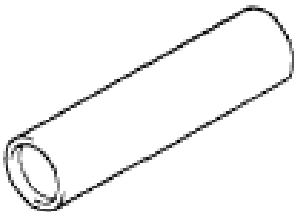
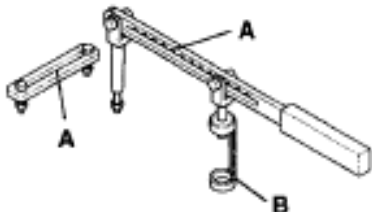
	Excessive crankshaft bearing clearance	and repair as required. • The crankshaft bearings. • The crankshaft main journals. • The cylinder block.
Engine will not crank-crankshaft will not rotate	Hydraulically locked cylinder • Coolant/antifreeze in cylinder. • Oil in cylinder. • Fuel in cylinder	1. Remove spark plugs and check for fluid. 2. Inspect for broken head gasket. 3. Inspect for cracked engine block or cylinder head. 4. Inspect for a sticking fuel injector and/or leaking fuel regulator.
	Broken timing chain and/or timing chain and/or timing chain gears.	1. Inspect timing chain and gears. 2. Repair as required.
	Material in cylinder • Broken valve • Piston material • Foreign material	1. Inspect cylinder for damaged components and/or foreign materials. 2. Repair or replace as required.
	Seized crankshaft or connecting rod bearings.	1. Inspect crankshaft and connecting rod bearing. 2. Repair as required.
	Bent or broken connecting rod.	1. Inspect connecting rods. 2. Repair as required.
	Broken crankshaft	1. Inspect crankshaft. 2. Repair as required.

SPECIAL SERVICE TOOLS**SPECIAL SERVICE TOOLS**

Tool (Number and name)	Illustration	Use
Torque angle adapter (09221-4A000)		Installation of bolts & nuts needing an angular method

2006 Kia Magentis LX

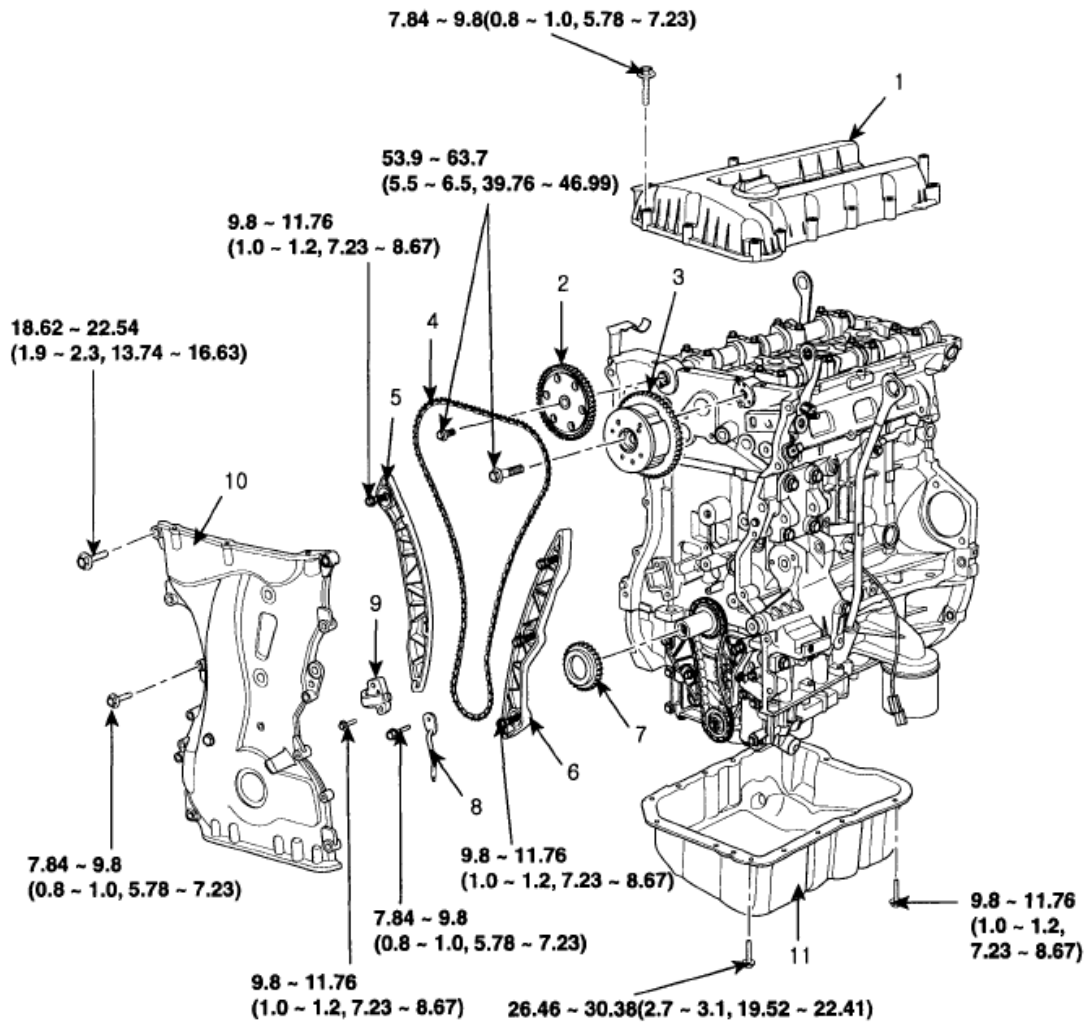
2006-07ENGINE Mechanical (G4KC - GSL 2.4) - Optima & Magentis (Canadian)

		
	LCAC030A	
Valve stem oil seal installer (09222-4A000)		Installation of the valve stem oil seal
	LCAD030D	
Valve spring compressor & holder (09222-3K000) (09222-3K100)		Removal and installation of the intake or exhaust valve A. A: 09222-3K000 B. B: 09222-3K100 (holder)
	ECRF003A	
Crankshaft front oil seal installer (09214 - 3K000) (09231 - H1100)		Installation of the front oil seal A. A: 09214 - 3K000 B. B: 09231 - H1100
	ACRF002A	

TIMING SYSTEM

TIMING CHAIN

COMPONENTS

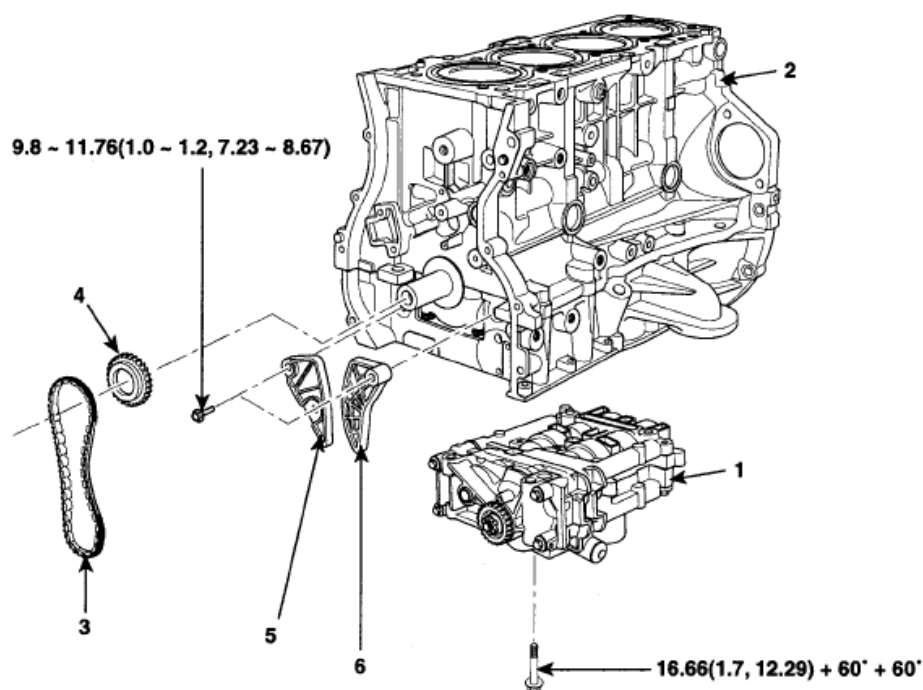


TORQUE : N.m (kgf.m, lb-ft)

- | | |
|-------------------------------|---------------------------|
| 1. Cylinder head cover | 7. Crankshaft sprocket |
| 2. Exhaust camshaft sprocket | 8. Oil jet |
| 3. CVVT assembly | 9. Timing chain tensioner |
| 4. Timing chain | 10. Timing chain cover |
| 5. Timing chain tensioner arm | 11. Oil pan |
| 6. Timing chain guide | |

SMGEM6012N

Fig. 15: Identifying Timing System Components (1 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.



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

- | | |
|-------------------------|--------------------------------------|
| 1. Balance shaft module | 4. Balance shaft chain sprocket |
| 2. Cylinder block | 5. Balance shaft chain guide |
| 3. Balance shaft chain | 6. Balance shaft chain tensioner arm |

SMGEM6013N

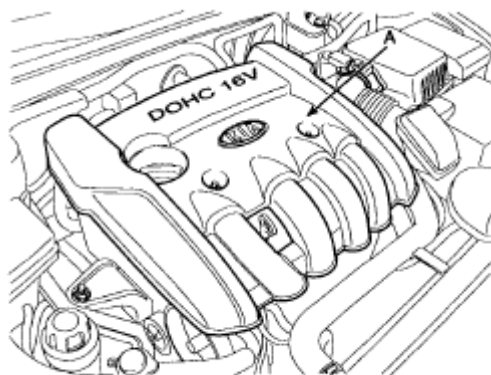
Fig. 16: Identifying Timing System Components (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

REMOVAL

Engine removal is not required for this procedure.

TIMING CHAIN

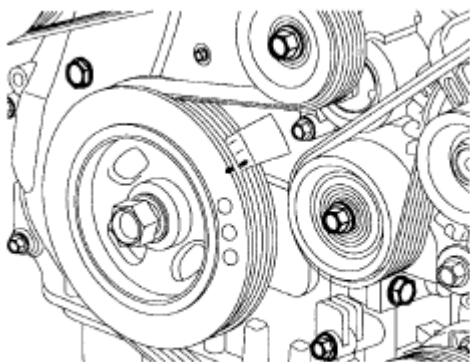
1. Remove the engine cover (A).



ACLG001A

Fig. 17: Identifying Engine Cover
Courtesy of KIA MOTORS AMERICA, INC.

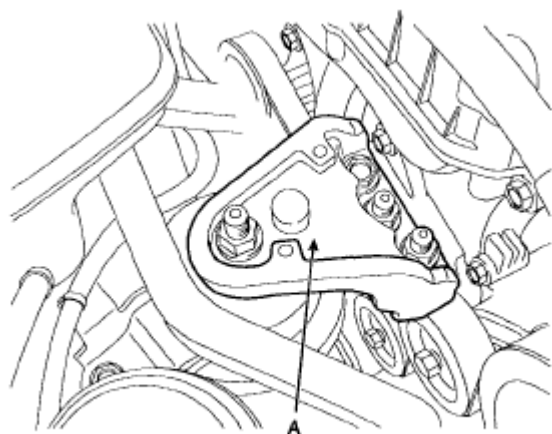
2. Remove RH front wheel.
3. Remove RH side cover.
4. Set No.1 cylinder to TDC/compression



KCRF107A

Fig. 18: Identifying Crankshaft Pulley And Lower Timing Chain Cover
Courtesy of KIA MOTORS AMERICA, INC.

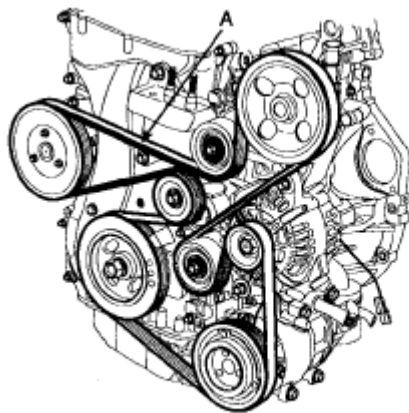
5. Remove the engine mount bracket (A).



SMGEM8010N

Fig. 19: Identifying Engine Mount Bracket
Courtesy of KIA MOTORS AMERICA, INC.

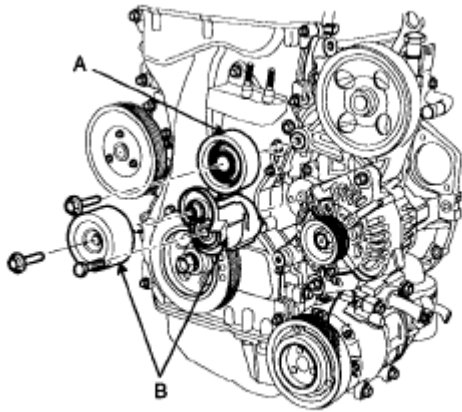
6. Remove drive belt (A).



ACLG031A

Fig. 20: Identifying Drive Belt
Courtesy of KIA MOTORS AMERICA, INC.

7. Remove the idler pulley (A).



ACLG032A

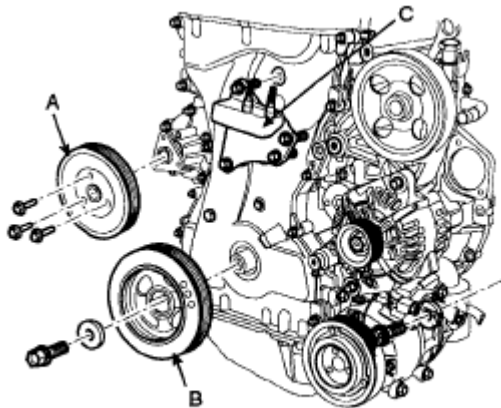
Fig. 21: Identifying Idler Pulley

Courtesy of KIA MOTORS AMERICA, INC.

8. Remove the drive belt tensioner (B).

NOTE: Tensioner pulley bolt is left - handed screw.

9. Remove the water pump pulley (A).

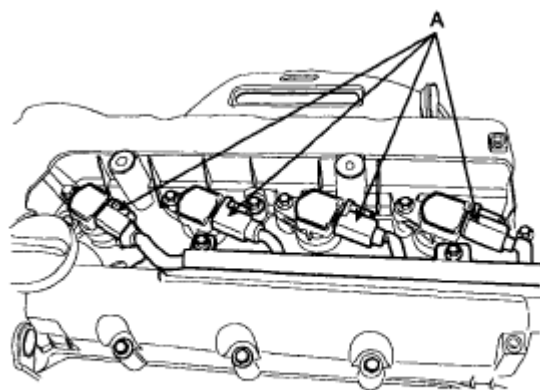


ACLG033A

Fig. 22: Identifying Water Pump Pulley

Courtesy of KIA MOTORS AMERICA, INC.

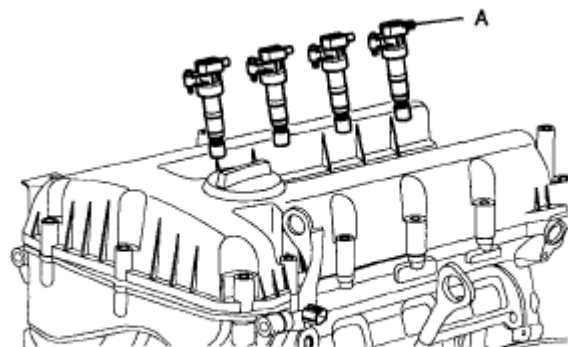
10. Remove the crankshaft pulley (B).
11. Remove the engine support bracket (C).
12. Disconnect the ignition coil connector (A).



KCRF131A

Fig. 23: Identifying Ignition Coil Connector
Courtesy of KIA MOTORS AMERICA, INC.

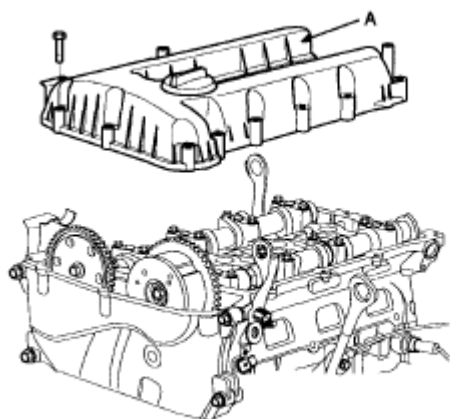
13. Remove the ignition coil (A).



KCRF111A

Fig. 24: Identifying Ignition Coil
Courtesy of KIA MOTORS AMERICA, INC.

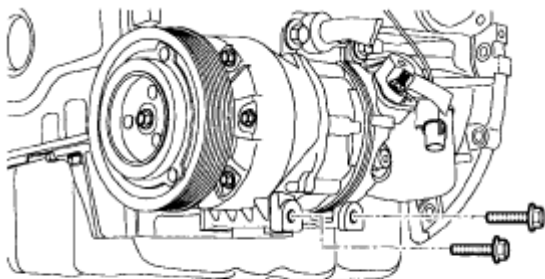
14. Remove the PCV hose and breather hose from the cylinder head cover.
15. Loosen the cylinder head cover bolts and then remove the cylinder head cover (A) and gasket.



KCRF115A

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

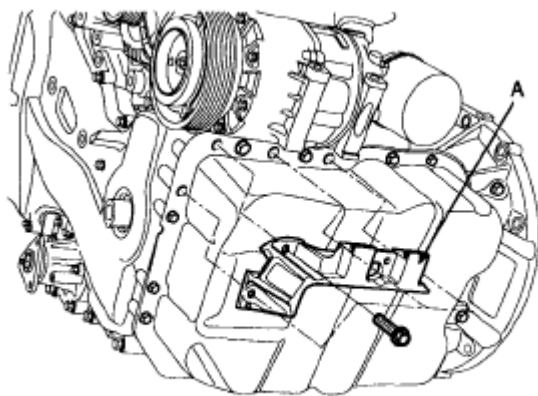
16. Remove the compressor lower bolts.



KCRF112A

Fig. 26: Identifying Compressor Lower Bolts
Courtesy of KIA MOTORS AMERICA, INC.

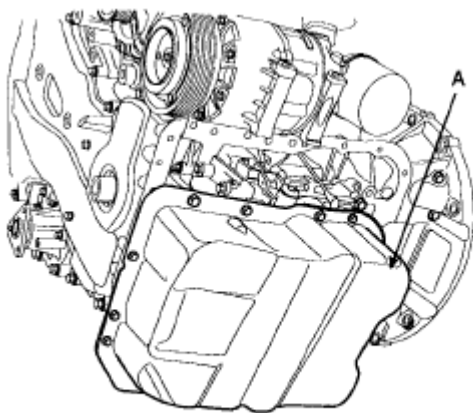
17. Remove the compressor bracket (A).



KCRF113A

Fig. 27: Identifying Compressor Bracket
Courtesy of KIA MOTORS AMERICA, INC.

18. Drain the engine oil.
19. Remove the oil pan (A).

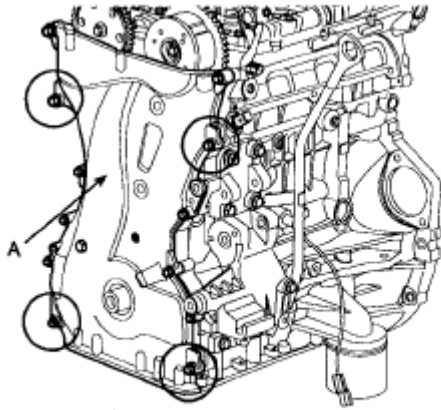


KCRF114A

Fig. 28: Identifying Oil Pan
Courtesy of KIA MOTORS AMERICA, INC.

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

20. Remove the timing chain cover (A) by prying the portions between the cylinder head and cylinder block with a screwdriver.

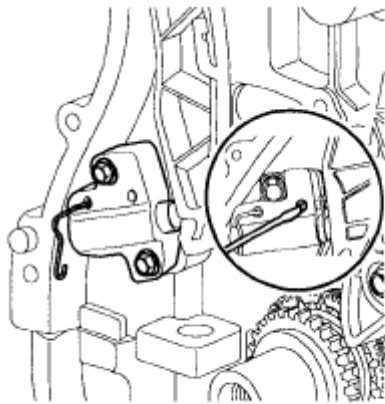


KCRF106A

Fig. 29: Identifying Timing Chain Cover
Courtesy of KIA MOTORS AMERICA, INC.

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

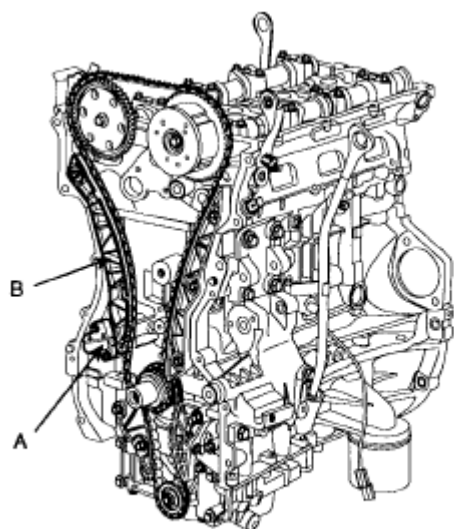
21. The key of crankshaft should be aligned with the mating face of main bearing cap. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.
22. Install a set pin after compressing the timing chain tensioner.



KCRF105A

Fig. 30: Identifying Pin Compressing Timing Chain Tensioner
Courtesy of KIA MOTORS AMERICA, INC.

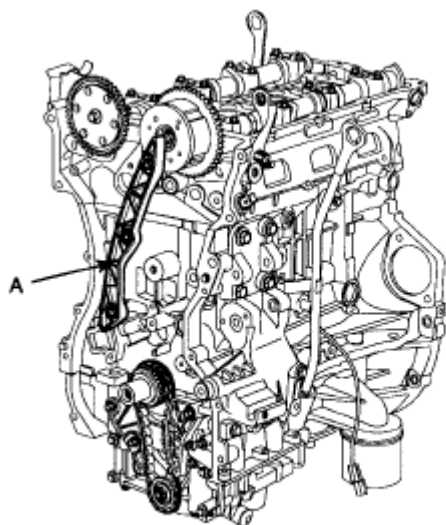
23. Remove the timing chain tensioner (A).



ACLG023A

Fig. 31: Identifying Timing Chain Tensioner
Courtesy of KIA MOTORS AMERICA, INC.

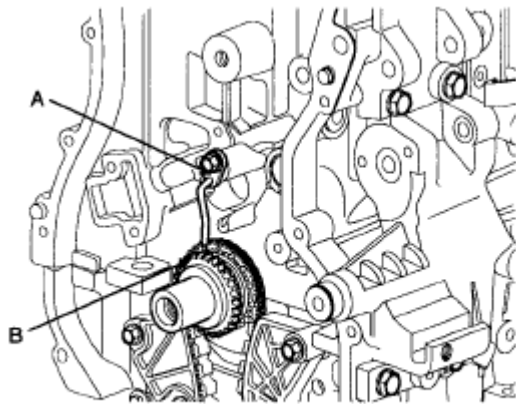
24. Remove the timing chain tensioner arm (B).
25. Remove the timing chain.
26. Remove the timing chain guide (A).



ACLG024A

Fig. 32: Identifying Timing Chain Guide
Courtesy of KIA MOTORS AMERICA, INC.

27. Remove the timing chain oil jet (A).



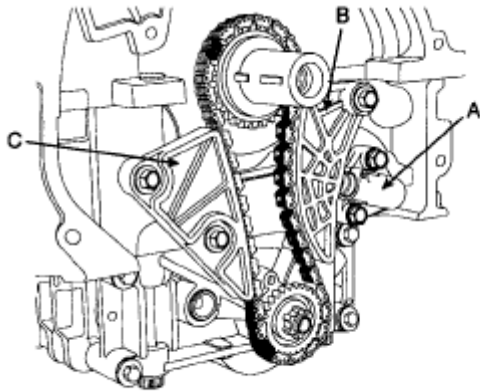
KCRF101A

Fig. 33: Identifying Timing Chain Oil Jet
Courtesy of KIA MOTORS AMERICA, INC.

28. Remove the crankshaft chain sprocket (B).

BALANCE SHAFT CHAIN

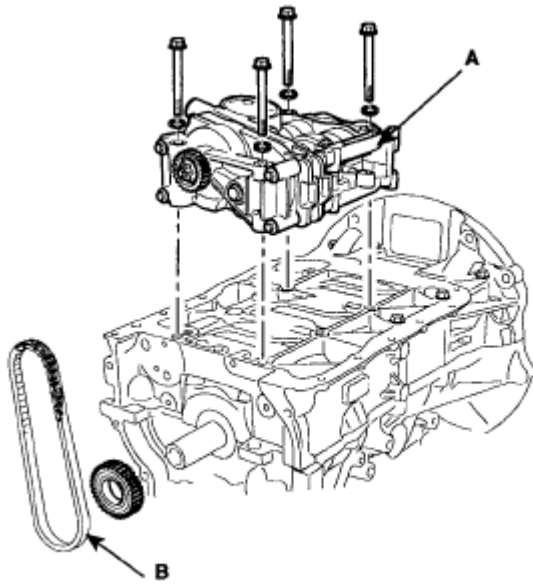
1. Remove the timing chain.
2. Install a set pin after compressing the balance shaft chain tensioner.
3. Remove the balance shaft chain tensioner (A).



KCRF117A

Fig. 34: Identifying Balance Shaft Chain Tensioner
Courtesy of KIA MOTORS AMERICA, INC.

4. Remove the balance shaft chain tensioner arm (B).
5. Remove the balance shaft chain guide (C).
6. Remove the balance shaft module (A) and balance shaft chain (B).



ACLG034A

Fig. 35: Identifying Balance Shaft Module And Balance Shaft Chain
Courtesy of KIA MOTORS AMERICA, INC.

INSPECTION

SPROCKETS, CHAIN TENSIONER, CHAIN GUIDE, CHAIN TENSIONER ARM

1. Check the camshaft sprocket and crankshaft sprocket for abnormal wear, cracks, or damage. Replace as necessary.
2. Inspect the tensioner arm and chain guide for abnormal wear, cracks, or damage.

Replace as necessary.

3. Check that the tensioner piston moves smoothly when the ratchet pawl is released with thin rod.

BELT, IDLER, BELT TENSIONER, PULLEY

1. Check the belt for oil or dust deposits.

Replace, if necessary.

Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.

2. When the engine is overhauled or belt tension adjusted, check the belt carefully. If any of the following flaws are evident, replace the belt.

NOTE:

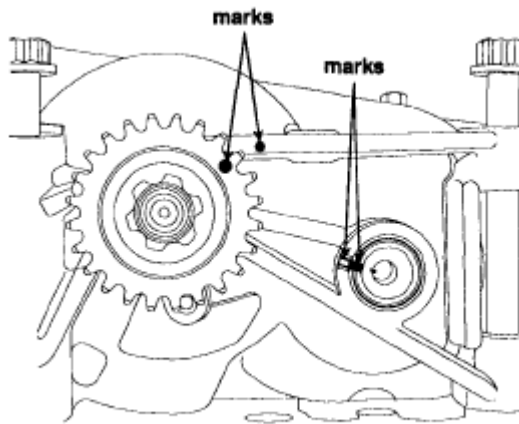
- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water and steam.

3. Inspect the idler for easy and smooth rotation and check for play or noise.

INSTALLATION

BALANCE SHAFT CHAIN

1. The key of crankshaft should be aligned with the mating face of main bearing cap. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.
2. Confirm the balance shaft module timing mark. Timing marks to be visually aligned with centers of adjacent cast timing notches.



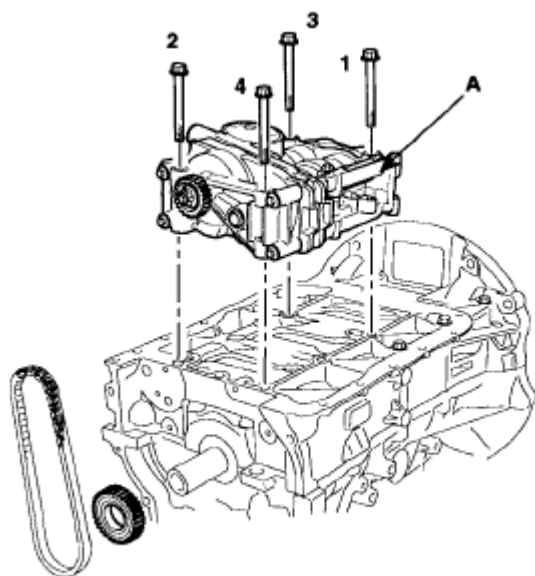
ECRF006A

Fig. 36: Identifying Balance Shaft Module Timing Mark
Courtesy of KIA MOTORS AMERICA, INC.

3. Install balance shaft module (A) that the timing mark of balance shaft module sprocket should be matched with the timing mark (color link) of balance shaft chain.

Tightening torque

16.66N.m(1.7kgf.m, 12.3lb-ft) + 60° + 60°



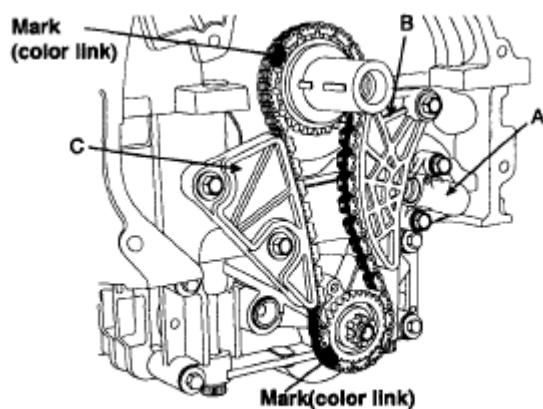
KCRF165B

Fig. 37: Identifying Balance Shaft Module
Courtesy of KIA MOTORS AMERICA, INC.

4. Install the balance shaft chain guide (C).

Tightening torque

9.8-11.76N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)



ECRF007A

Fig. 38: Identifying Balance Shaft Chain Guide
Courtesy of KIA MOTORS AMERICA, INC.

5. Install the balance shaft tensioner arm (B).

Tightening torque

9.8-11.76N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)

6. Install the balance shaft tensioner (A) and remove the set pin.

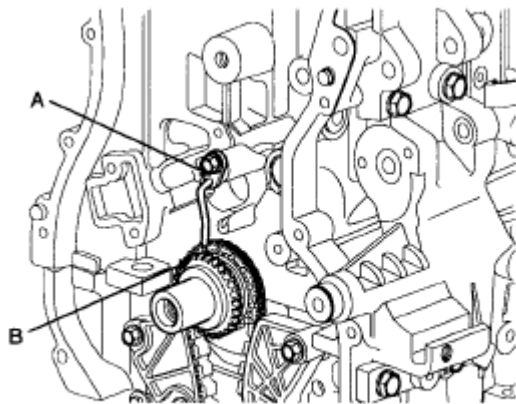
Tightening torque

9.8-11.76N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)

7. Confirm the timing marks.

TIMING CHAIN

1. Install crankshaft chain sprocket (B).



KCRF101A

Fig. 39: Identifying Timing Chain Oil Jet
Courtesy of KIA MOTORS AMERICA, INC.

2. Install timing chain oil jet (A).

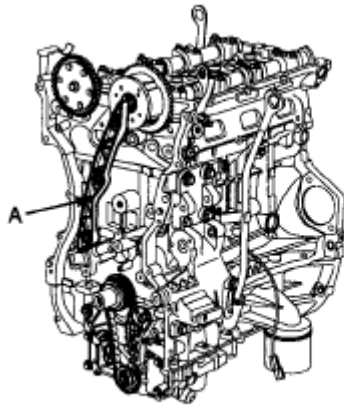
Tightening torque

7.84-9.8N.m(0.8-1.0kgf.m, 5.78-7.23lb-ft)

3. Set crankshaft that the key of crankshaft should be aligned with the mating surface of main bearing cap. Put the intake, exhaust camshaft assembly that the TDC mark of intake sprocket and exhaust sprocket should be aligned with the top surface of cylinder head. As a result of this, place the piston on No.1 cylinder at the top dead center on compression stroke.
4. install timing chain guide (A).

Tightening torque

9.8-11.6N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)



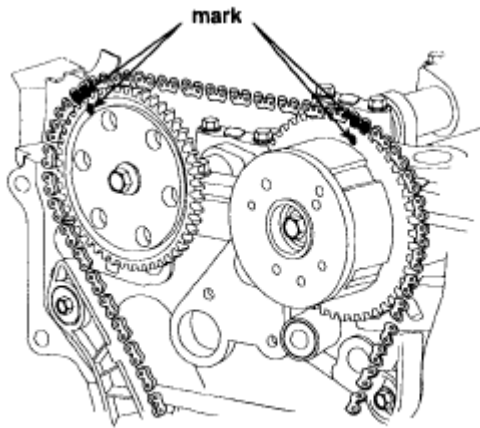
KCRF103A

Fig. 40: Identifying Timing Chain Guide
Courtesy of KIA MOTORS AMERICA, INC.

5. Install timing chain.

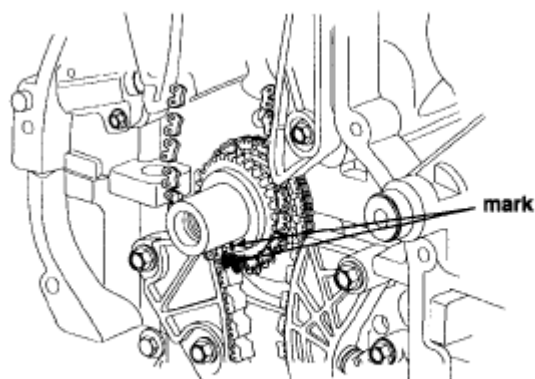
To install the timing chain with no slack between each shaft (cam, crank), follow the below procedure. Crankshaft sprocket (A) -> Timing chain guide (B) -> Intake camshaft sprocket (C) -> Exhaust camshaft sprocket (D).

The timing mark of each sprockets should be matched with timing mark (color link) of timing chain at installing timing chain.



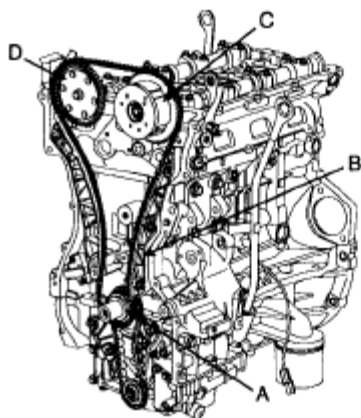
ECRF030A

Fig. 41: Identifying Timing Mark, Crankshaft Sprocket And Timing Chain Guide
Courtesy of KIA MOTORS AMERICA, INC.



ECRF031A

Fig. 42: Identifying Timing Mark, Crankshaft Sprocket And Timing Chain Guide
Courtesy of KIA MOTORS AMERICA, INC.



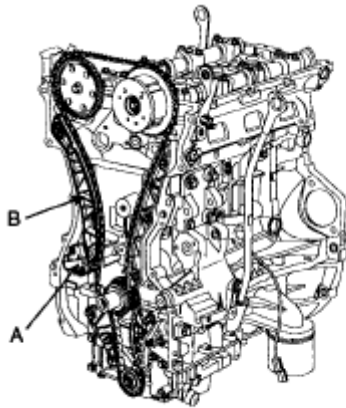
KCRF104B

Fig. 43: Identifying Camshaft Sprocket, Crankshaft Sprocket And Timing Chain Guide
Courtesy of KIA MOTORS AMERICA, INC.

6. Install timing chain tensioner arm (B).

Tightening torque

9.8-11.76N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)



KCRF104A

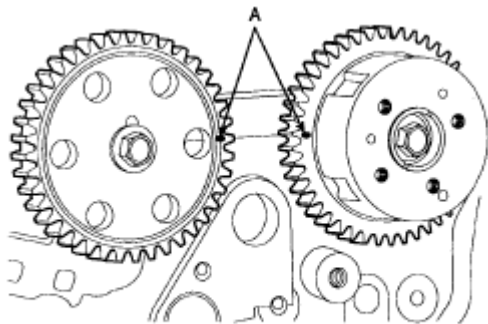
Fig. 44: Identifying Timing Chain Tensioner Arm
Courtesy of KIA MOTORS AMERICA, INC.

7. Install timing chain auto tensioner (A) and remove set pin.

Tightening torque

9.8-11.76N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)

8. After rotating crankshaft 2 revolutions in regular direction (clockwise viewed from front), confirm the timing mark.



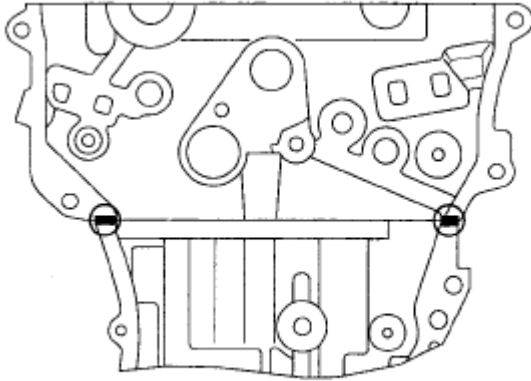
ACRF007A

Fig. 45: Identifying Mark Of Camshaft Timing Sprockets On Cylinder Head Surface
Courtesy of KIA MOTORS AMERICA, INC.

9. Install timing chain cover.
 1. The sealant locations on chain cover and on counter parts (cylinder head, cylinder block, and ladder frame) must be free of engine oil and ETC.
 2. Before assembling the timing chain cover, the liquid sealant Loctite 5900 should be applied on the gap between cylinder head and cylinder block.

The part must be assembled within 5 minutes after sealant was applied.

Bead width: 2.5mm(0.1in.)



ECRF008A

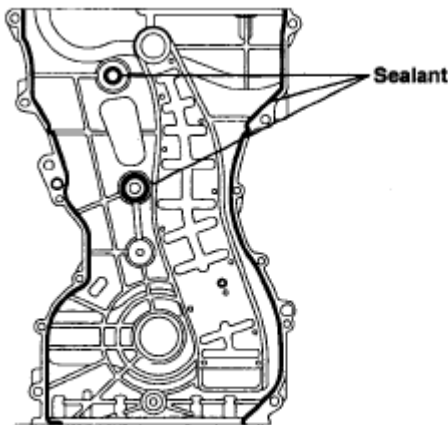
Fig. 46: Identifying Sealant Area Between Cylinder Head And Cylinder Block
Courtesy of KIA MOTORS AMERICA, INC.

3. After applying liquid sealant Loctite 5900 on timing chain cover.

The part must be assembled within 5 minutes after sealant was applied.

Sealant should be applied without discontinuity.

Bead width: 2.5mm(0.1in.)



ECRF008A

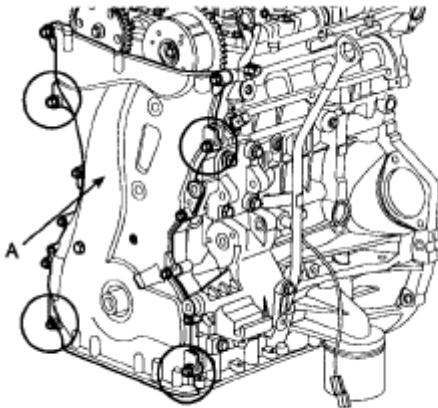
Fig. 47: Identifying Sealant On Timing Chain Cover
Courtesy of KIA MOTORS AMERICA, INC.

4. The dowel pins on the cylinder block and holes on the timing chain cover should be used as a reference in order to assemble the timing chain cover (A) to be in exact position.

Tightening torque

M6: 7.84-9.8N.m(0.8-1.0kgf.m, 5.78-7.23lb-ft)

M8: 18.62-22.54N.m(1.9-2.3kgf.m, 13.74-16.63lb-ft)



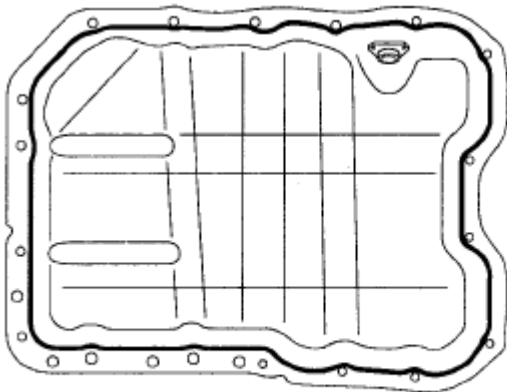
KCRF106A

Fig. 48: Identifying Timing Chain Cover
Courtesy of KIA MOTORS AMERICA, INC.

5. The firing and/or blow out test should not be performed within 30 minutes after the timing chain cover was assembled.
10. Install oil pan.
 1. Using a gasket scraper, remove all the old packing material from the gasket surfaces.
 2. Before assembling the oil pan, the liquid sealant Loctite 5900 should be applied on oil pan.

The part must be assembled within 5 minutes after the sealant was applied.

Sealant: Loctite 5900 or equivalent



KCRF179A

Fig. 49: Identifying Gasket Scraper And Oil Pan

Courtesy of KIA MOTORS AMERICA, INC.

CAUTION:

- When applying sealant gasket, sealant must not be protruded into the inside of oil pan.
- To prevent leakage of oil, apply sealant gasket to the inner threads of the bolt holes.

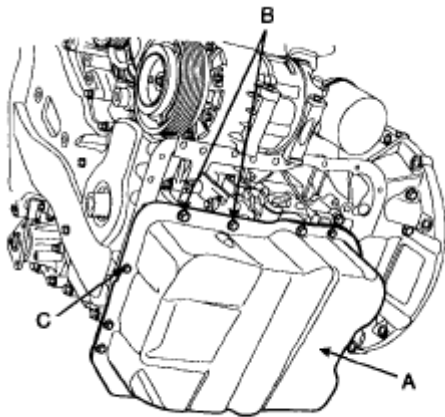
3. Install oil pan (A).

Uniformly tighten the bolts in several passes.

Tightening torque

M8(B): 26.46-30.38N.m(2.7-3.1kgf.m, 19.52-22.41lb-ft)

M6(C): 9.8-11.76N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)



KCRF114B

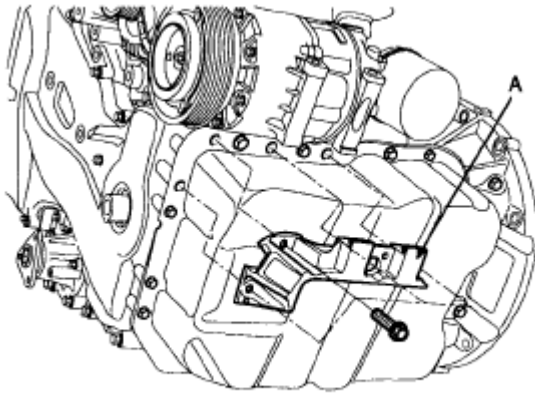
Fig. 50: Identifying Oil Pan

Courtesy of KIA MOTORS AMERICA, INC.

4. After assembly, wait at least 30 minutes before filling the engine with oil.
11. Install air compressor bracket (A).

Tightening torque

19.6-23.52N.m(2.0-2.4kgf.m, 14.46-17.35lb-ft)



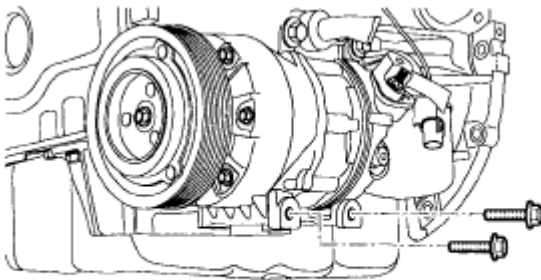
KCRF113A

Fig. 51: Identifying Compressor Bracket
Courtesy of KIA MOTORS AMERICA, INC.

12. Install air compressor bolt

Tightening torque

19.6-24.5N.m(2.0-2.5kgf.m, 14.46-18.07lb-ft)

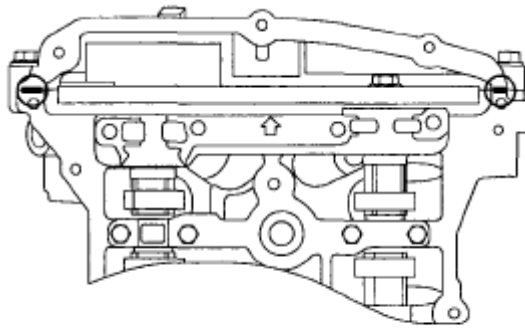


KCRF112A

Fig. 52: Identifying Compressor Lower Bolts
Courtesy of KIA MOTORS AMERICA, INC.

13. Install cylinder head cover.
1. The hardening sealant located on the upper area between timing chain cover and cylinder head should be removed before assembling cylinder head cover.
 2. After applying sealant, it should be assembled within 5 minutes.

Bead width: 2.5mm(0.1in.)



ECRF011A

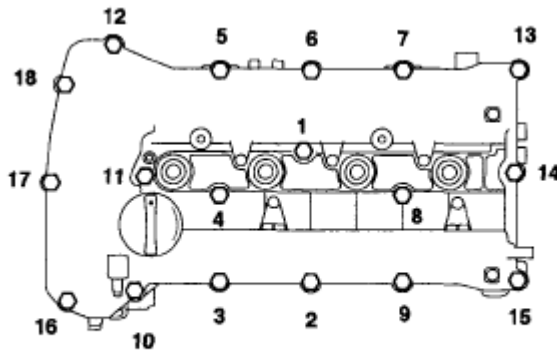
Fig. 53: Identifying Upper Area Between Timing Chain Cover And Cylinder Head
Courtesy of KIA MOTORS AMERICA, INC.

3. The firing and/or blow out test should not be performed within 30 minutes after the cylinder head cover was assembled.
4. Install the cylinder head cover bolts as following method.

Tightening torque

1st step: 3.92-5.88N.m(0.4-0.6kgf.m, 2.89-4.34lb-ft)

2st step: 7.84-9.8N.m(0.8-1.0kgf.m, 5.78-7.23lb-ft)

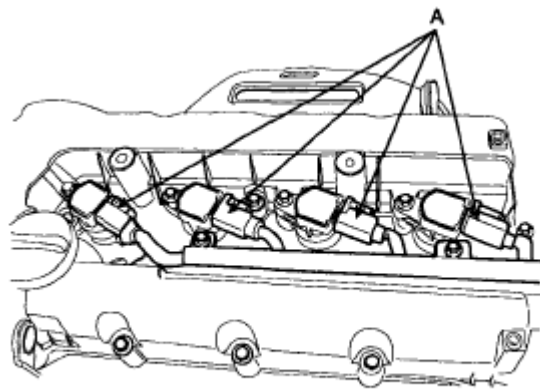


KCRF180A

Fig. 54: Identifying Cylinder Head Cover Bolts
Courtesy of KIA MOTORS AMERICA, INC.

CAUTION: Do not reuse cylinder head cover gasket.

14. Install ignition coil.
15. Connect ignition coil connector (A).



KCRF131A

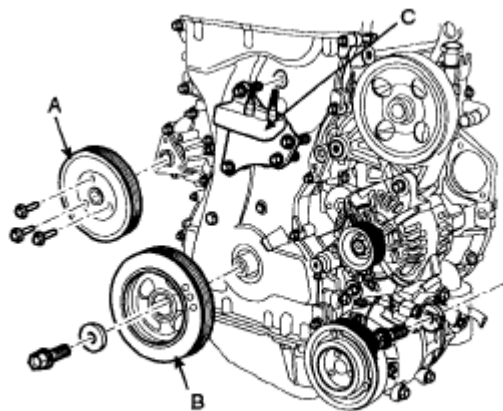
Fig. 55: Identifying Ignition Coil Connector
 Courtesy of KIA MOTORS AMERICA, INC.

16. Install engine support bracket (C).

Tightening torque

M10: 39.2-44.1N.m(4.0-4.5kgf.m, 28.92-32.53lb-ft)

M8: 19.6-24.5N.m(2.0-2.5kgf.m, 14.46-18.07lb-ft)



ACLG033A

Fig. 56: Identifying Water Pump Pulley
 Courtesy of KIA MOTORS AMERICA, INC.

17. Using flywheel stopper, install crankshaft pulley (B).

Tightening torque

166.6-176.4N.m(17-18kgf.m, 122.9-130.13lb-ft)

18. Install water pump pulley (A).

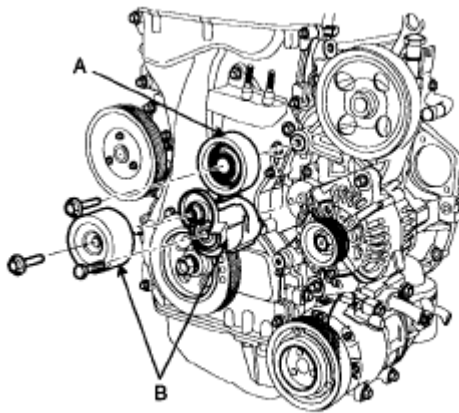
Tightening torque

7.84-9.8N.m(0.8-1.0kgf.m, 5.78-7.23lb-ft)

19. Install drive belt tensioner (B) and tensioner pulley.

Tightening torque

53.9-63.7N.m(5.5-6.5kgf.m, 39.7-47.0lb-ft)



ACLG032A

Fig. 57: Identifying Idler Pulley
Courtesy of KIA MOTORS AMERICA, INC.

NOTE: Tensioner pulley bolt is left-handed screw.

20. Install idler pulley (A)

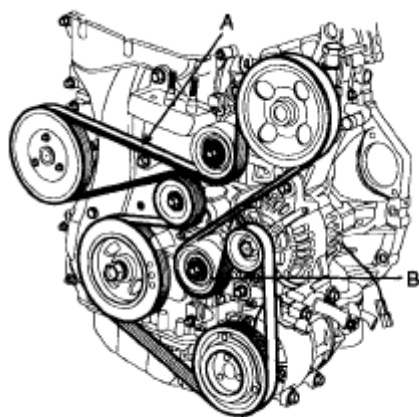
Tightening torque

53.9-63.7N.m(5.5-6.5kgf.m, 39.7-47.0lb-ft)

21. Install drive belt (A)

Crankshaft pulley --> A/C pulley --> alternator pulley --> idler pulley --> P/C pump pulley --> idler pulley --> water pump pulley --> tensioner pulley.

Rotate auto tensioner arm in the counter - clockwise moving auto tensioner pulley bolt with wrench. After putting belt on auto tensioner pulley, release the auto tensioner pulley slowly.



ACLG035A

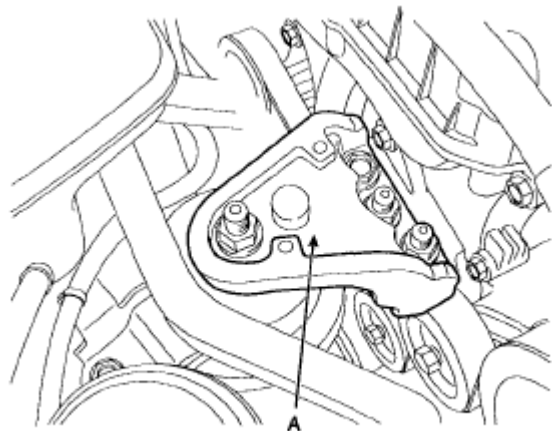
Fig. 58: Identifying Drive Belt

Courtesy of KIA MOTORS AMERICA, INC.

22. Install engine mounting bracket (A).

Tightening torque

63.7-83.3N.m(6.5-8.5kgf.m, 47.0-61.4lb-ft)



SMGEM6010N

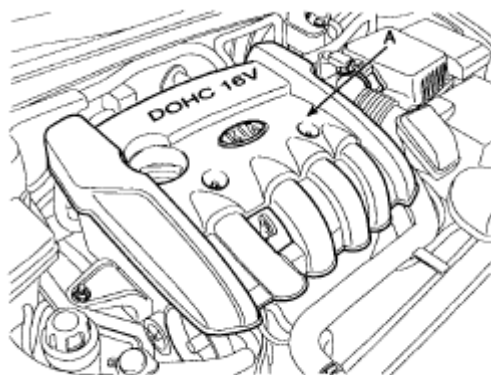
Fig. 59: Identifying Engine Mount Bracket

Courtesy of KIA MOTORS AMERICA, INC.

23. Install RH side cover.
24. Install RH front wheel.
25. Install engine cover (A).

Tightening torque

3.92-5.88N.m(0.4-0.6kgf.m, 2.89-4.34lb-ft)

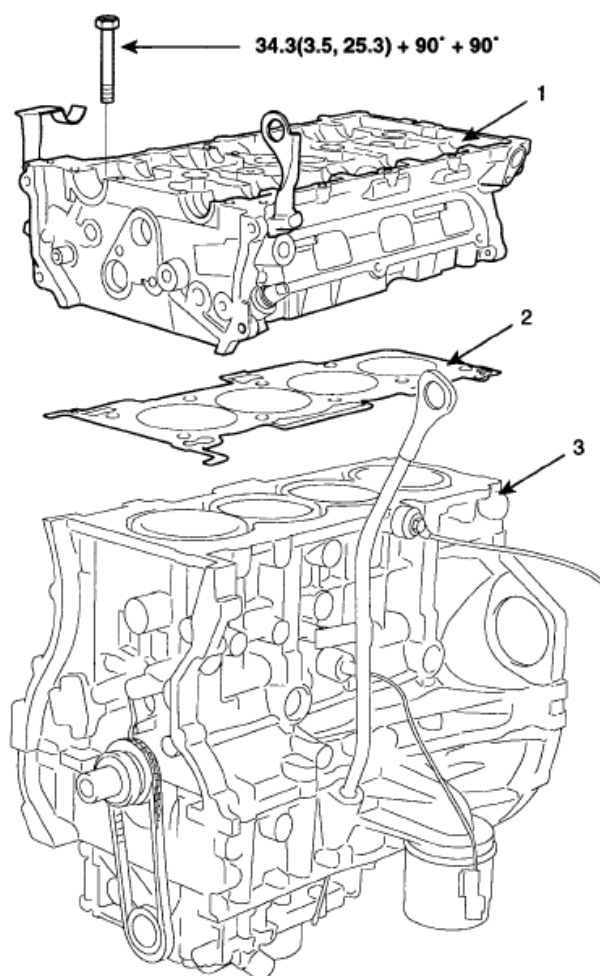


ACLG001A

Fig. 60: Identifying Engine Cover
Courtesy of KIA MOTORS AMERICA, INC.

CYLINDER HEAD ASSEMBLY

COMPONENTS

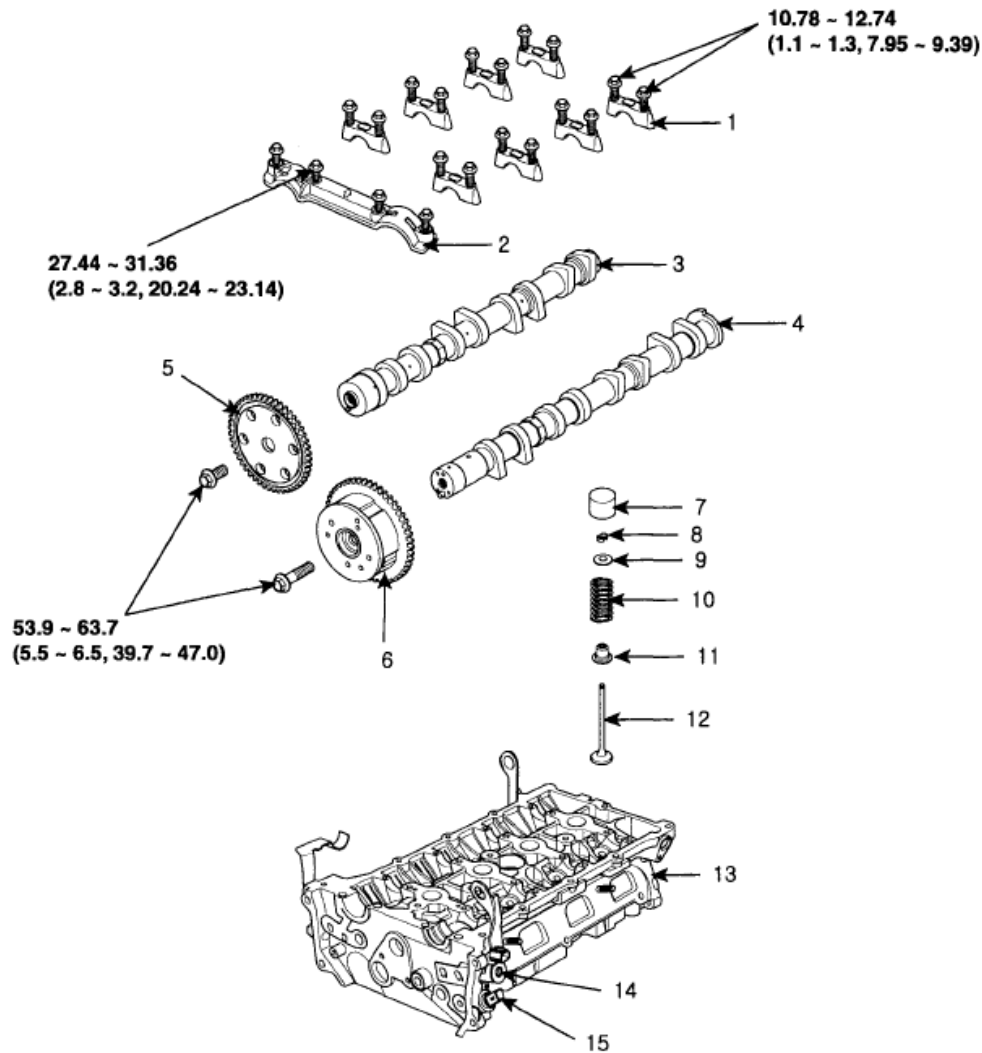


TORQUE : N.m (kgf.m, lb-ft)

- 1. Cylinder head
- 2. Cylinder head gasket
- 3. Cylinder block

SMGEM0014N

Fig. 61: Identifying Cylinder Head Assembly Components (1 Of 2)
 Courtesy of KIA MOTORS AMERICA, INC.



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

- | | | |
|-------------------------------|------------------|---------------------|
| 1. Camshaft bearing cap | 6. CVVT assembly | 11. Valve stem seal |
| 2. Camshaft front bearing cap | 7. MLA | 12. Valve |
| 3. Exhaust camshaft | 8. Retainer lock | 13. Cylinder head |
| 4. Intake camshaft | 9. Retainer | 14. OCV |
| 5. Exhaust camshaft sprocket | 10. Valve spring | 15. OTS |

SMGEM6015N

Fig. 62: Identifying 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 covers to avoid damaging painted surfaces.
 - To avoid damaging the cylinder head, wait until the engine coolant

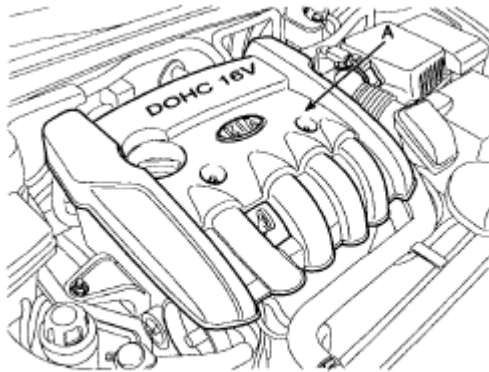
temperature drops below normal temperature before removing it.

- 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.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center.

1. Disconnect the negative terminal from the battery.
2. Remove engine cover (A).

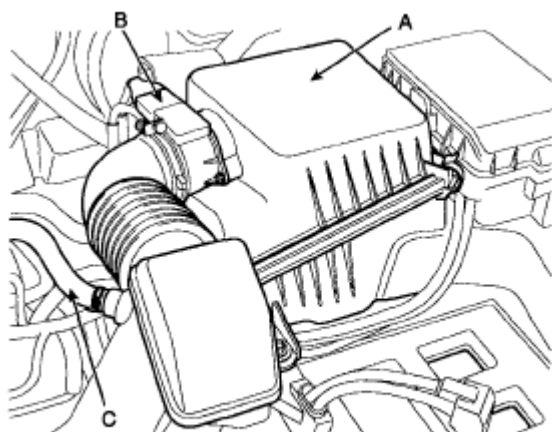


ACLG001A

Fig. 63: Identifying Engine Cover

Courtesy of KIA MOTORS AMERICA, INC.

3. Remove air duct.
4. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS (B) connector.
 2. Disconnect the breather hose (C) from air cleaner hose.
 3. Disconnect the ECU connector. (Refer to **FUEL DELIVERY SYSTEM (FUEL SYSTEM (G4KC - GSL 2.4L))**)
 4. Remove the intake air hose and air cleaner (A).



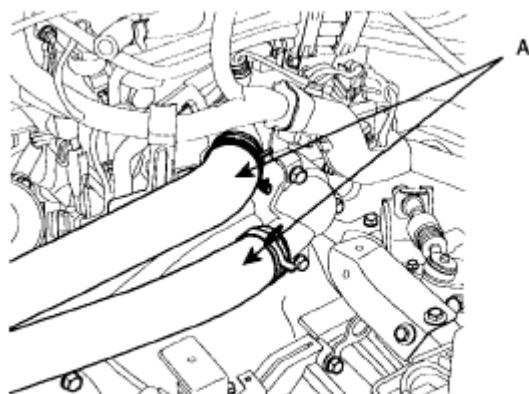
ACLG020A

Fig. 64: Identifying Intake Air Hose And Air Cleaner
Courtesy of KIA MOTORS AMERICA, INC.

5. Remove front wheels.
6. Remove under cover.
7. Drain the engine coolant.

Remove the radiator cap to speed draining.

8. Remove the upper and lower radiator hose (A).



KCRF124A

Fig. 65: Identifying Upper Radiator Hose And Lower Radiator Hose
Courtesy of KIA MOTORS AMERICA, INC.

9. Remove the heater hoses (A).

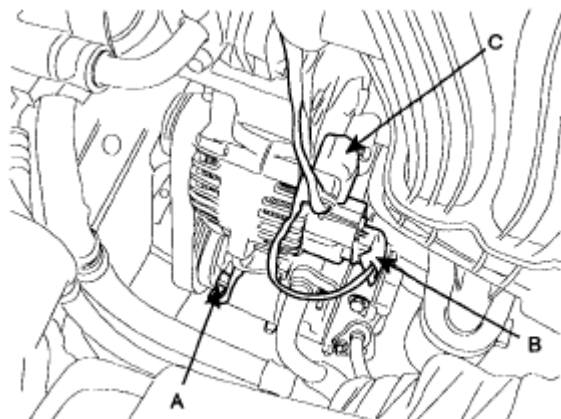


ACLG003A

Fig. 66: Identifying Heater Hoses

Courtesy of KIA MOTORS AMERICA, INC.

10. Disconnect A/C switch (A), alternator connector (B), and oil pressure switch (C).

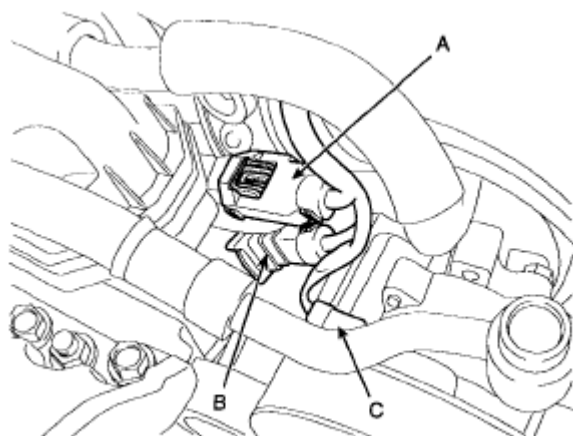


KCRF126A

Fig. 67: Identifying A/C Switch, Alternator Connector And Oil Pressure Switch

Courtesy of KIA MOTORS AMERICA, INC.

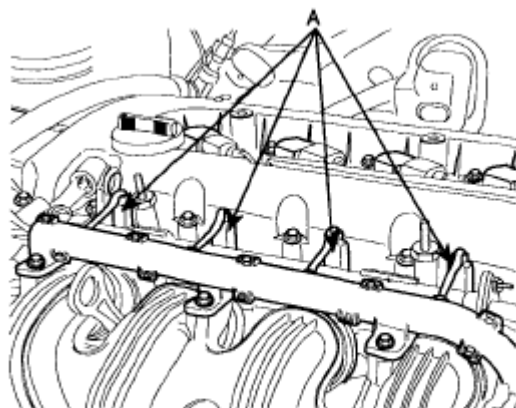
11. Disconnect OCV connector (A), OTS connector (B) and P/S switch connector (C).



ACLG004A

Fig. 68: Identifying OCV Connector, OTS Connector And P/S Switch Connector
Courtesy of KIA MOTORS AMERICA, INC.

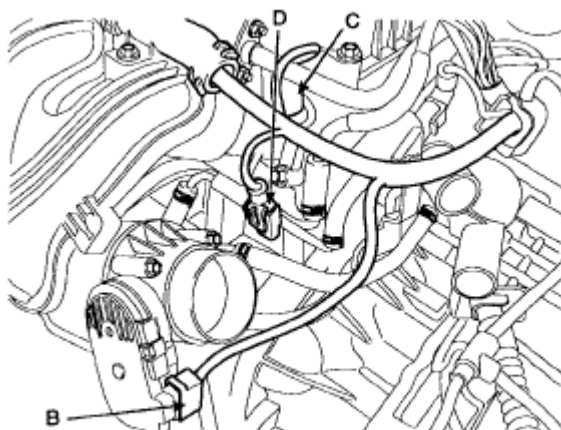
12. Disconnect injector connectors (A).



KCRF128A

Fig. 69: Identifying Injector Connectors
Courtesy of KIA MOTORS AMERICA, INC.

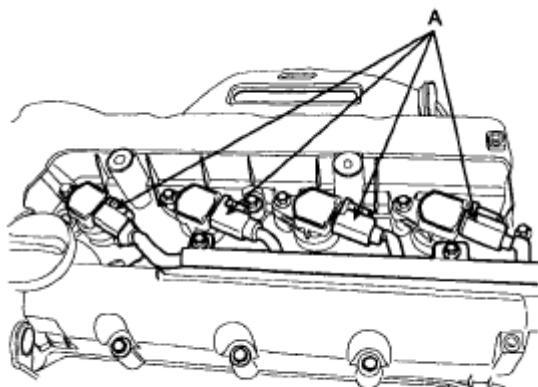
13. Disconnect the engine wire harness connectors.
 1. Remove the ETC connector (B), CMP connector (C), knock sensor connector (D).



ACLG005A

Fig. 70: Identifying ETC Connector, CMP Connector And Knock Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

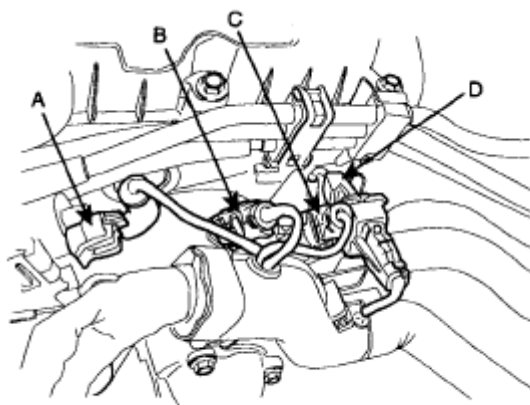
14. Disconnect ignition coil connectors (A).



KCRF131A

Fig. 71: Identifying Ignition Coil Connector
Courtesy of KIA MOTORS AMERICA, INC.

15. Disconnect PCSV connector (A), WTS connector (B), condenser connector (C), and CKP sensor connector (D).

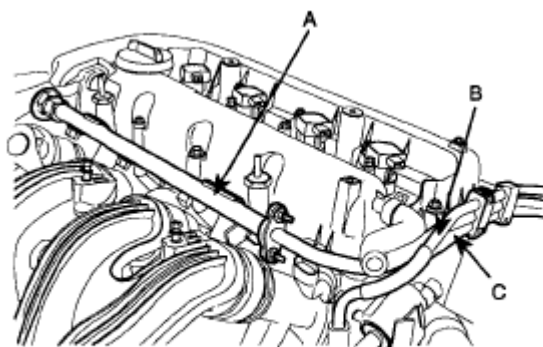


ACLG028A

Fig. 72: Identifying PCSV Connector, WTS Connector, Condenser Connector And CKP Sensor Connector

Courtesy of KIA MOTORS AMERICA, INC.

16. Remove delivery pipe (A), brake vacuum hose (B), and PCSV hose (C).

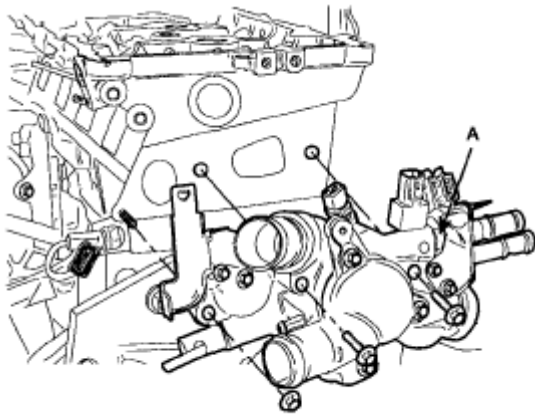


KCRF134A

Fig. 73: Identifying Delivery Pipe, Brake Vacuum Hose And PCSV Hose

Courtesy of KIA MOTORS AMERICA, INC.

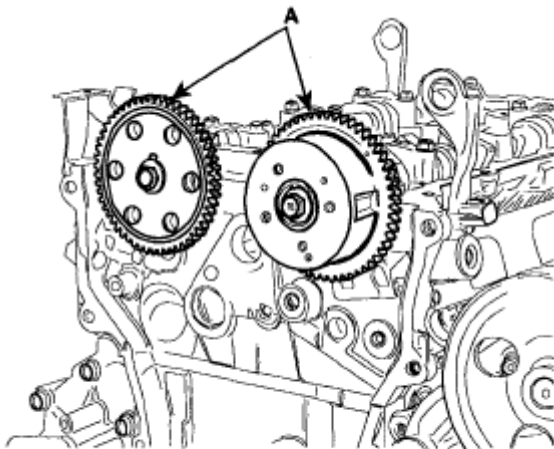
17. Remove water temp control assembly (A).



ACRF012A

Fig. 74: Identifying Water Temp Control Assembly
Courtesy of KIA MOTORS AMERICA, INC.

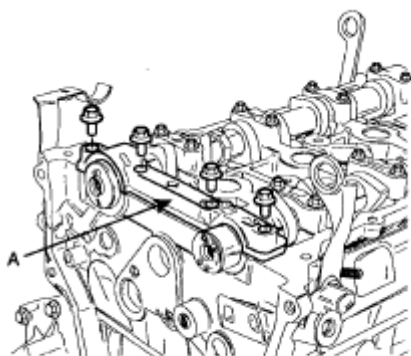
18. Remove intake manifold.
19. Remove exhaust manifold.
20. Remove timing chain.
21. Remove CVVT assembly and camshaft sprocket (A).



KCRF151A

Fig. 75: Identifying CVVT Assembly And Camshaft Sprocket
Courtesy of KIA MOTORS AMERICA, INC.

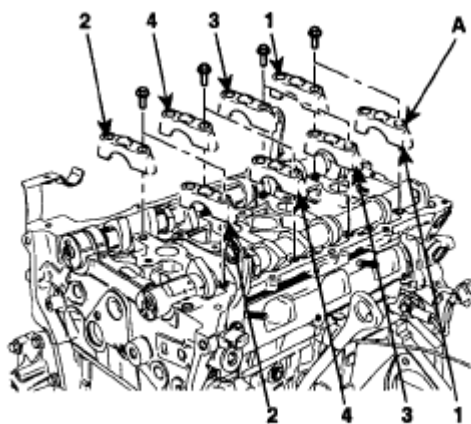
22. Remove camshaft.
 1. Remove front camshaft bearing cap (A).



KCRF153A

Fig. 76: Identifying Front Camshaft Bearing Cap
Courtesy of KIA MOTORS AMERICA, INC.

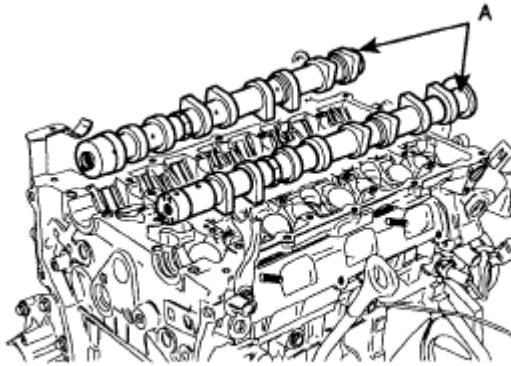
2. Remove camshaft bearing cap (A), in the sequence shown in illustration.



ACRF020A

Fig. 77: Identifying Camshaft Bearing Cap In Sequence
Courtesy of KIA MOTORS AMERICA, INC.

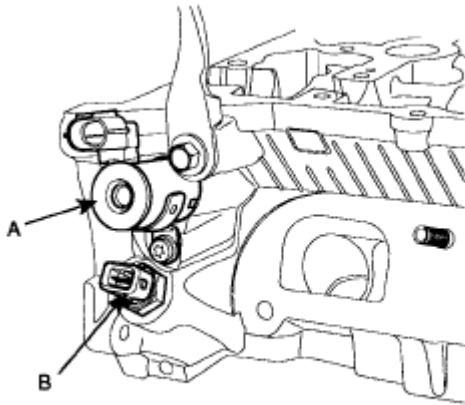
3. Remove camshafts (A)



KCRF155A

Fig. 78: Identifying Camshafts
Courtesy of KIA MOTORS AMERICA, INC.

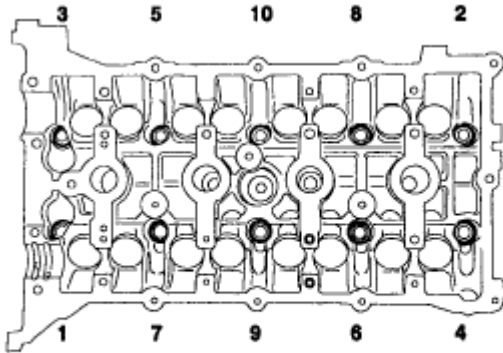
23. Remove OCV (A) and OTS (B).



KCRF119A

Fig. 79: Identifying OCV And OTS
Courtesy of KIA MOTORS AMERICA, INC.

24. Remove the cylinder head bolts, then remove the cylinder head.
1. Using triple square wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown in illustration. Remove the 10 cylinder head bolts and plate washers.



KCRF182A

Fig. 80: Identifying 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.

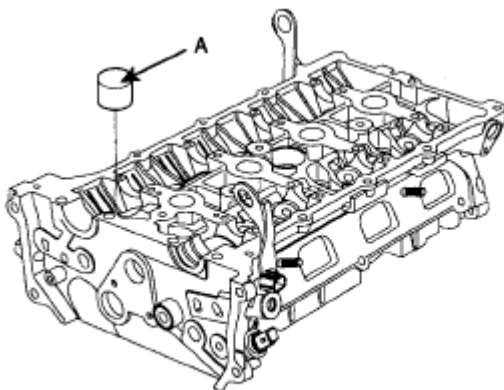
2. Lift the cylinder head from the dowels on the cylinder block and place the cylinder head on wooden blocks on a bench.

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.

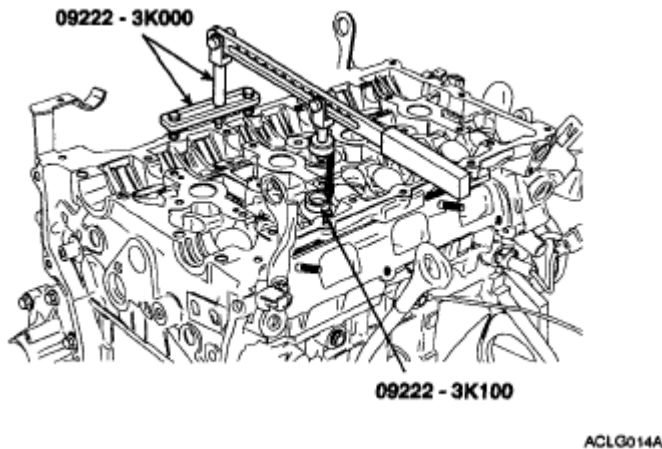
1. Remove MLAs (A).



KCRF125A

Fig. 81: Identifying MLAs**Courtesy of KIA MOTORS AMERICA, INC.**

2. Remove valves.
 1. Using SST (09222-3K000, 09222-3K100), compress the valve spring and remove retainer lock.

**Fig. 82: Identifying SST (09222-3K000, 09222-3K100), Compress Valve Spring And Retainer Lock****Courtesy of KIA MOTORS AMERICA, INC.**

2. Remove the spring retainer.
3. Remove the valve spring.
4. Remove the valve.
5. Using needle-nose pliers, remove the valve stem seal.

INSPECTION**CYLINDER HEAD**

1. Inspect for flatness.

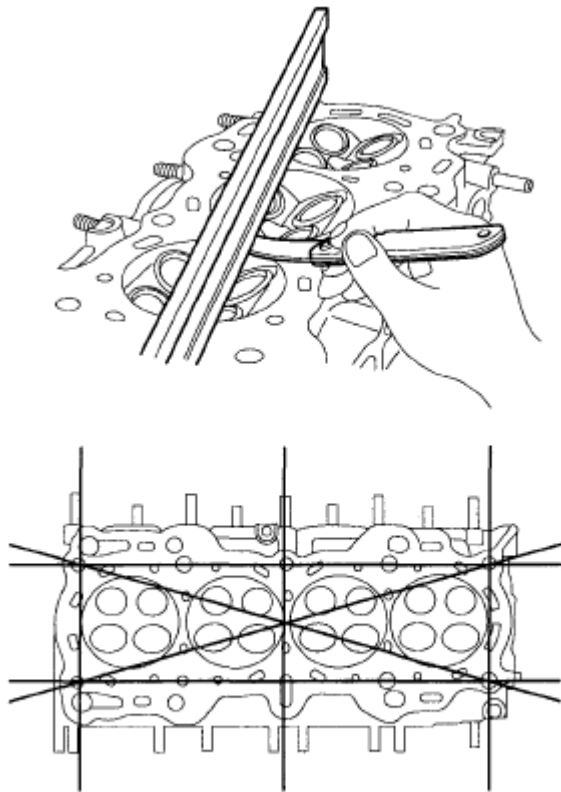
Using a precision straight edge and feeler gauge, measure the surface the contacting the cylinder block and the manifolds for warpage.

Flatness of cylinder head gasket surface

Standard: Less than 0.05mm(0.002in.) (0.02mm(0.0008in.)/100x100)

Flatness of manifold mounting surface

Standard: Less than 0.1mm(0.0039in.)



ECKD001H

Fig. 83: Measuring Surface Cylinder Block And Manifolds For Warpage
 Courtesy of KIA MOTORS AMERICA, INC.

2. Inspect for cracks.

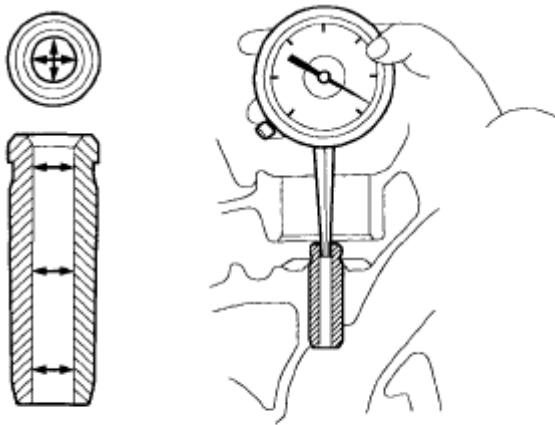
Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

VALVE AND VALVE SPRING

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

Valve guide I.D.

Intake / Exhaust: 5.500-5.512mm (0.216-0.217in.)



ECKD219A

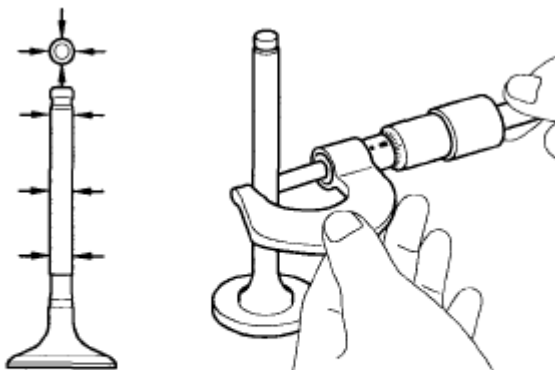
Fig. 84: Measuring Inside Diameter Of Valve Guide
Courtesy of KIA MOTORS AMERICA, INC.

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

Valve stem O.D.

Intake: 5.465-5.480mm (0.2151-0.2157in.)

Exhaust: 5.458-5.470mm (0.2149-0.2153in.)



ECKD220A

Fig. 85: Measuring Diameter Of Valve Stem
Courtesy of KIA MOTORS AMERICA, INC.

3. Subtract the valve stem diameter measurement from the valve guide inside diameter measurement.

Valve stem-to-guide clearance

[Standard]

Intake: 0.020-0.047mm (0.0008-0.0018in.)

Exhaust: 0.030-0.054mm (0.0012-0.0021 in.)

[Limit]

Intake: 0.07mm (0.0027in.)

Exhaust: 0.09mm (0.0035in.)

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

2. Inspect valves.

1. Check the valve is ground to the correct valve face angle.
2. Check that the surface of the valve for wear. If the valve face is worn, replace the valve.
3. Check the valve head margin thickness.

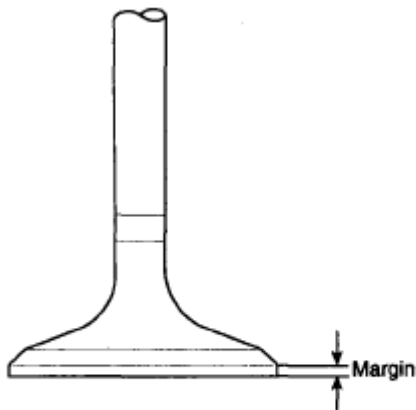
If the margin thickness is less than minimum, replace the valve.

Margin

[Standard]

Intake: 1.02mm(0.0401in.)

Exhaust: 1.09mm(0.0429in.)



ECKD221A

Fig. 86: Identifying Valve Head Margin Thickness
Courtesy of KIA MOTORS AMERICA, INC.

4. Check the valve length.

Valve length.

[Standard]

Intake: 113.18mm(4.4559in.)

Exhaust: 105.89mm(4.1689in.)

[Limit]

Intake: 112.93mm(4.4461in.)

Exhaust: 105.74mm(4.1630in.)

5. Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, replace the valve.

3. Inspect valve seats

Check the valve seat for evidence of overheating and improper contact with the valve face.

Replace the seat if necessary.

Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it, then recondition the seat. 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.

4. Inspect valve springs.

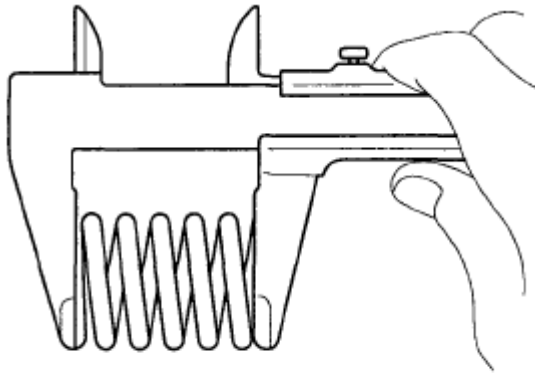
1. Using a steel square, measure the out-of-square of the valve spring.
2. Using a vernier calipers, measure the free length of the valve spring.

Valve spring

[Standard]

Free height: 47.44mm (1.8677in.)

Out-of-square: 1.5°



ECKD222A

Fig. 87: Measuring Free Length Of Valve Spring
Courtesy of KIA MOTORS AMERICA, INC.

If the free length is not as specified, replace the valve spring.

MLA

1. Inspect MLA.

Using a micrometer, measure the MLA outside diameter.

MLA O.D.

Intake/Exhaust: 31.964-31.980mm (1.2584-1.2590in.)

2. Using a caliper gauge, measure MLA tappet bore inner diameter of cylinder head.

Tappet bore I.D.

Intake/Exhaust: 32.000-32.025mm (1.2598-1.2608in.)

3. Subtract MLA outside diameter measurement from tappet bore inside diameter measurement.

MLA to tappet bore clearance

[Standard]

Intake/Exhaust: 0.020-0.061 mm(0.0008-0.0024in.)

[Limit]

Intake/Exhaust: 0.07mm(0.0027in.)

CAMSHAFT

1. Inspect cam lobes.

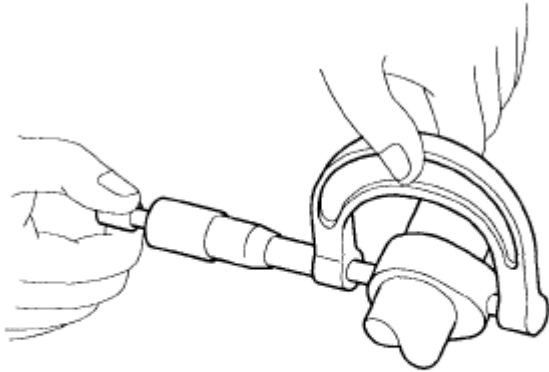
Using a micrometer, measure the cam lobe height.

Cam height

[Standard value]

Intake: 43.70-43.80mm (1.7204-1.7244in.)

Exhaust: 44.90-45.10mm (1.7677-1.7756in.)

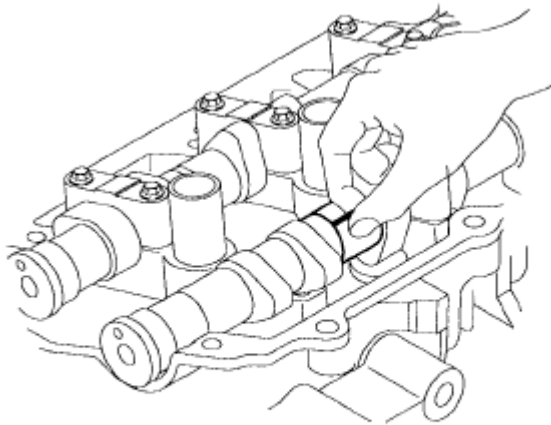


ECKD223A

Fig. 88: Measuring Cam Lobe Height
Courtesy of KIA MOTORS AMERICA, INC.

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

2. Inspect 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.



ECKD224A

Fig. 89: Identifying Camshafts On Cylinder Head
Courtesy of KIA MOTORS AMERICA, INC.

4. Install the bearing caps.

CAUTION: Do not turn the camshaft.

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

Bearing oil clearance

[Standard value]

Intake:

No.1 journal: 0.020-0.057mm (0.00078-0.00224in)

No.2,3,4,5: 0.045-0.082mm (0.00177-0.00323in)

Exhaust:

No. 1,2,3,4,5: 0.045-0.082mm (0.00177-0.00323in)

[Limit]

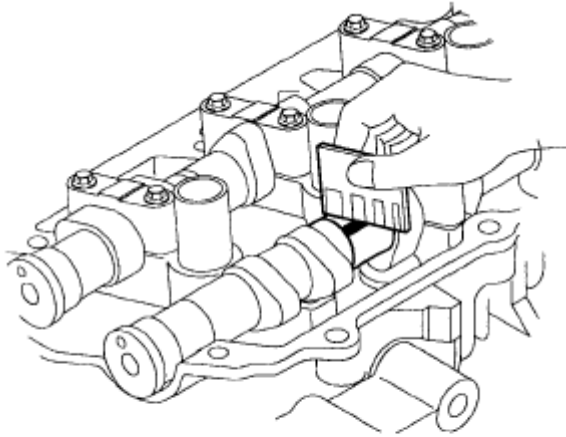
Intake:

No.1 journal: 0.09mm (0.0035in)

No.2,3,4,5: 0.12mm (0.0047in)

Exhaust:

No.1,2,3,4,5: 0.12mm (0.0047in)



ECKD225A

Fig. 90: Measuring Plastigage Widest Point
Courtesy of KIA MOTORS AMERICA, INC.

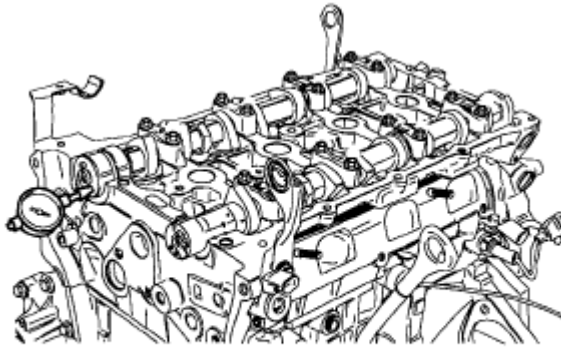
If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace cylinder head.

7. Completely remove the plastigage.
8. Remove the camshafts.
3. Inspect camshaft end play.
 1. Install the camshafts.
 2. Using a dial indicator, measure the end play while moving the camshaft back and forth.

Camshaft end play

[Standard value]: 0.10-0.22mm(0.004-0.0087in.)

[Limit]: 0.24mm (0.0094in.)



KCRF151B

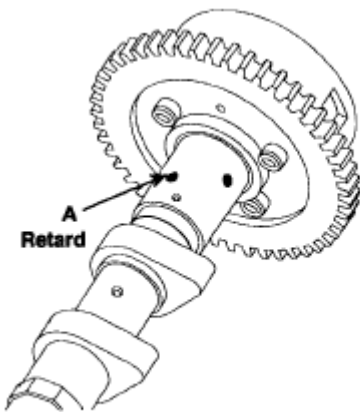
Fig. 91: Measuring End Play Camshaft Back And Forth
Courtesy of KIA MOTORS AMERICA, INC.

If the end play is greater than maximum, replace the camshaft. If necessary, replace cylinder head.

3. Remove the camshafts.

CVVT ASSEMBLY

1. Inspect CVVT assembly.
 1. Check that the CVVT assembly will not turn.
 2. Apply vinyl tape to the retard hole (A) except the one indicated by the arrow in the illustration.



ECRF015A

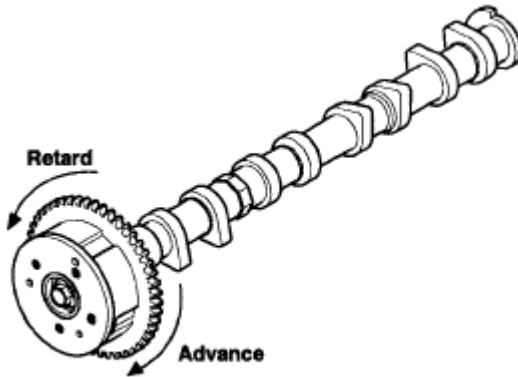
Fig. 92: Identifying Vinyl Tape To Retard Hole
Courtesy of KIA MOTORS AMERICA, INC.

3. Wind tape around the tip of the air gun and apply air of approx. 150kpa(1.5kgf/cm² , 21psi) to the port of the camshaft.

(Perform this order to release the lock pin for the maximum delay angle locking.)

NOTE: When the oil splashes, wipe it off with a shop rag and the likes.

4. Under the condition of (3), turn the CVVT assembly to the advance angle side (the arrow marked direction in the illustration) with your hand. Depending on the air pressure, the CVVT assembly will turn to the advance side without applying force by hand. Also, under the condition that the pressure can be hardly applied because of the air leakage from the port, there may be the case that the lock pin could be hardly released.



ECRF016A

Fig. 93: Identifying Retard And Advance Angle
Courtesy of KIA MOTORS AMERICA, INC.

5. Except the position where the lock pin meets at the maximum delay angle, let the CVVT assembly turn back and forth and check the movable range and that there is no disturbance.

Standard: Movable smoothly in the range about 22.5°

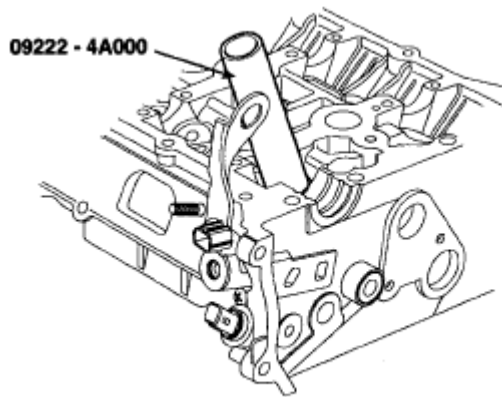
6. Turn the CVVT assembly with your hand and lock it at the maximum delay angle position (counter clockwise).

REASSEMBLY

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

1. Install valves.
 1. Using SST(09222-4A000), push in a new oil seal.

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



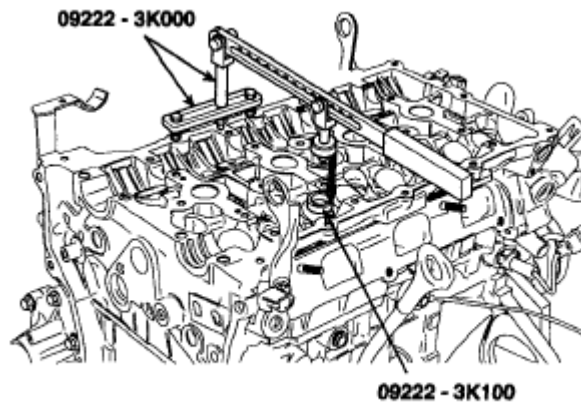
ACLG015A

Fig. 94: Identifying SST(09222-4A000) And Oil Seal
Courtesy of KIA MOTORS AMERICA, INC.

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

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

3. Using the SST(09222-3K000, 09222-3K100), 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.

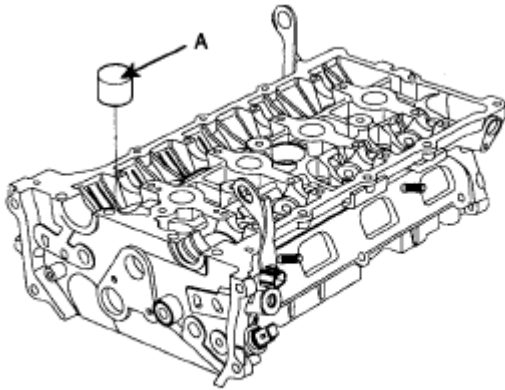


ACLG014A

Fig. 95: Identifying SST(09222-3K000, 09222-3K100), Compress Valve Spring And Retainer Lock
Courtesy of KIA MOTORS AMERICA, INC.

4. 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.
2. Install MLAs.

Check that the MLA rotates smoothly by hand.



KCRF125A

Fig. 96: Identifying MLAs

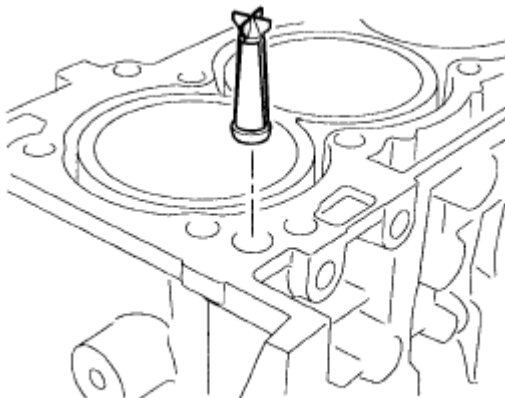
Courtesy of KIA MOTORS AMERICA, INC.

NOTE: MLA can be reinstalled in its original position.

INSTALLATION

- NOTE:**
- Thoroughly clean all parts to be assembled.
 - Always use a new 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 OCV filter.



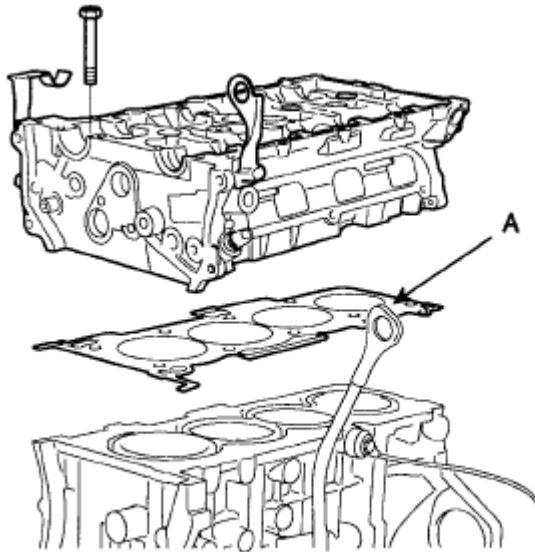
KCRF176A

Fig. 97: Identifying OCV Filter

Courtesy of KIA MOTORS AMERICA, INC.

NOTE: Keep the OCV filter clean.

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



KCRF163A

Fig. 98: Identifying Cylinder Head Gasket On Cylinder Block
Courtesy of KIA MOTORS AMERICA, INC.

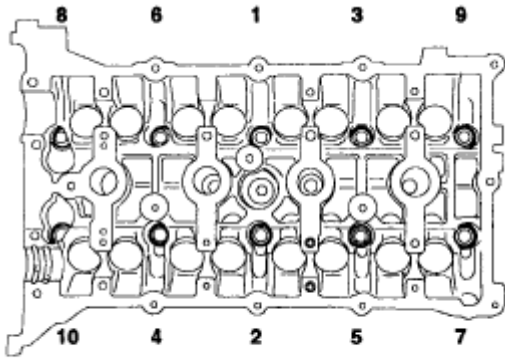
NOTE: Be careful of the installation direction.

3. Place the cylinder head carefully in order not to damage the gasket with the bottom part of the end.
4. Install 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 triple square hexagon wrench, install and tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown in illustration.

Tightening torque

34.3N.m (3.5kgf.m, 25.3lb-ft) + 90° + 90°

NOTE: Always use new cylinder head bolt.



KCRF102B

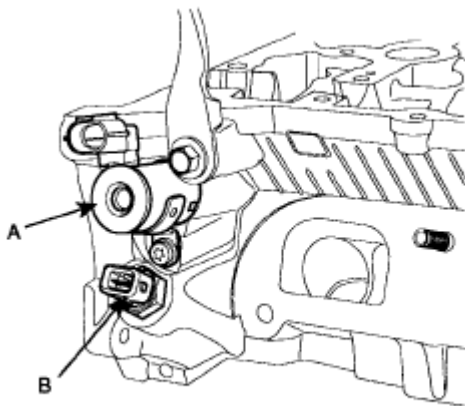
Fig. 99: Identifying Cylinder Head Bolt
Courtesy of KIA MOTORS AMERICA, INC.

5. Install OCV (A) and OTS (B).

Tightening torque

OCV: 9.8-11.76N.m(1.0-1.2kgf.m, 7.23-8.67lb-ft)

OTS: 19.6-23.52N.m(2.0-2.4kgf.m, 14.46-17.35lb-ft)



KCRF119A

Fig. 100: Identifying OCV And OTS
Courtesy of KIA MOTORS AMERICA, INC.

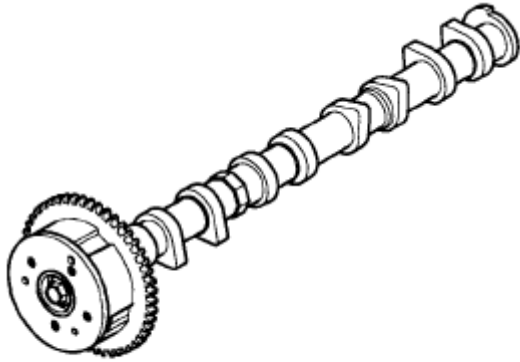
CAUTION:

- Do not reuse the OCV when dropped.
- Keep clean the OCV.
- Do not hold the OCV sleeve during servicing.
- When the OCV is installed on the engine, do not move the engine with holding the OCV yoke.

6. Install the CVVT and camshaft sprocket.

Tightening torque

53.9-63.7N.m(5.5-6.5 kgf.m, 39.7-47.0lb-ft)

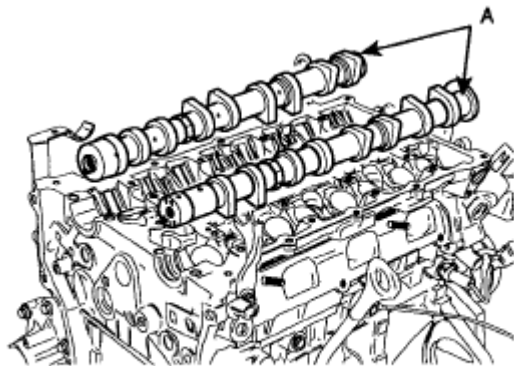


KCRF122A

Fig. 101: Identifying CVVT And Camshaft Sprocket
Courtesy of KIA MOTORS AMERICA, INC.

NOTE: Hold the hexagonal head wrench portion of the camshaft with a vise, and install the bolt and CVVT assembly.

7. Install camshafts (A).



KCRF155A

Fig. 102: Identifying Camshafts
Courtesy of KIA MOTORS AMERICA, INC.

NOTE: Apply a light coat of engine oil on camshaft journals.

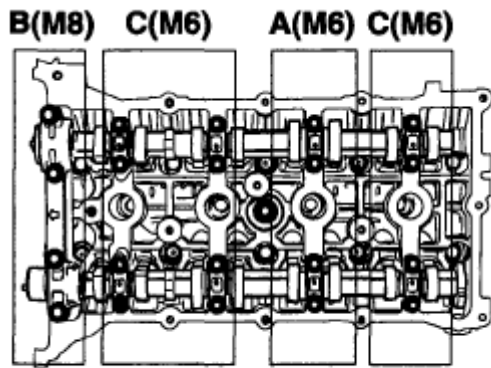
8. Install camshaft bearing caps in their proper locations. Tightening order.

Group A --> Group B --> Group C.

Tightening torque

M6: 10.78-12.74N.m(1.1-1.3kgf.m, 7.95-9.39lb-ft)

M8: 27.44-31.36N.m(2.8-3.2kgf.m, 20.24-23.14 lb-ft)



ECRF017A

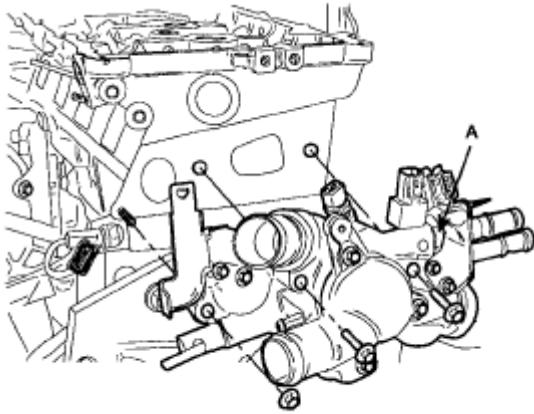
Fig. 103: Identifying Camshaft Bearing Caps (Group A, Group B, Group C)
Courtesy of KIA MOTORS AMERICA, INC.

9. Install timing chain.
10. Check and adjust valve clearance.
11. Install the exhaust manifold.
12. Install the intake manifold.
13. Install water temp control assembly (A).

Tightening torque

Bolt: 14.7-21.56N.m(1.5-2.2kgf.m, 10.84-15.90lb-ft)

Nut: 19.6-26.46N.m(2.0-2.7kgf.m, 14.46-19.52lb-ft)



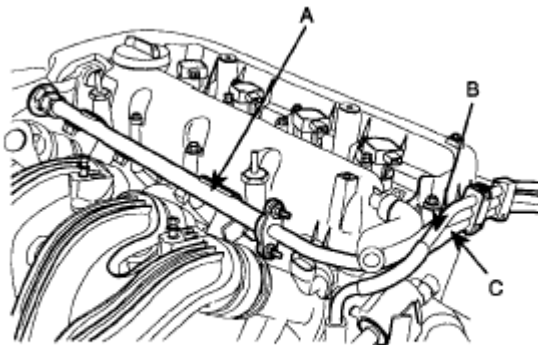
ACRF012A

Fig. 104: Identifying Water Temp Control Assembly
Courtesy of KIA MOTORS AMERICA, INC.

NOTE:

- Assemble water temp control assembly and water inlet pipe to water pump assembly before nuts for assembling of water inlet pipe to be tightened.
- Insert after wetting O-ring or inner surface of thermostat housing.
- Always use a new O-ring.

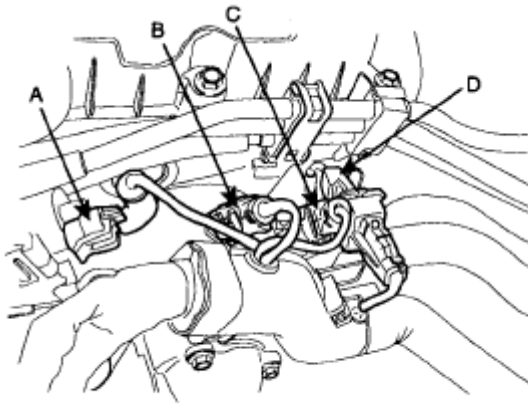
14. Install delivery pipe (A), brake hose (B), and PCSV hose (C).



KCRF134A

Fig. 105: Identifying Delivery Pipe, Brake Vacuum Hose And PCSV Hose
Courtesy of KIA MOTORS AMERICA, INC.

15. Install the PCSV connector (A), WTS connector (B), condenser connector (C), and CKP sensor connector (D).

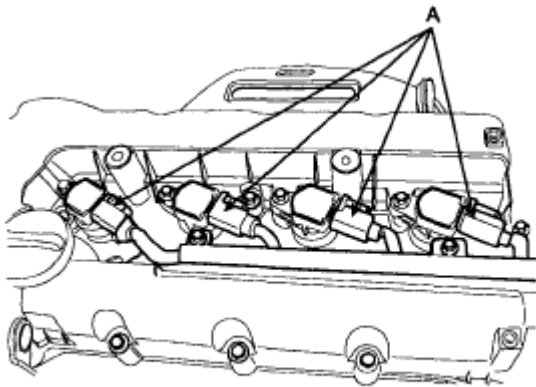


ACLG028A

Fig. 106: Identifying PCSV Connector, WTS Connector, Condenser Connector And CKP Sensor Connector

Courtesy of KIA MOTORS AMERICA, INC.

16. Install ignition coil connector (A).

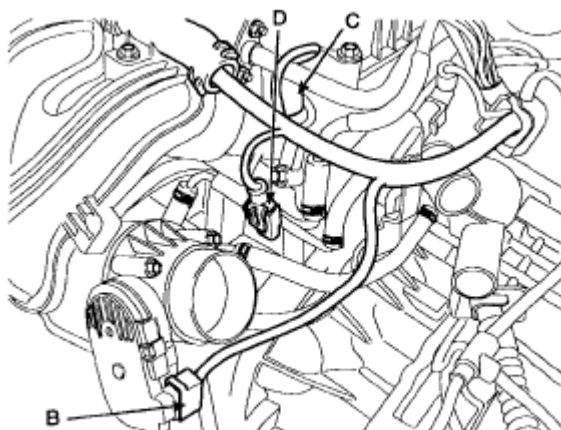


KCRF131A

Fig. 107: Identifying Ignition Coil Connector

Courtesy of KIA MOTORS AMERICA, INC.

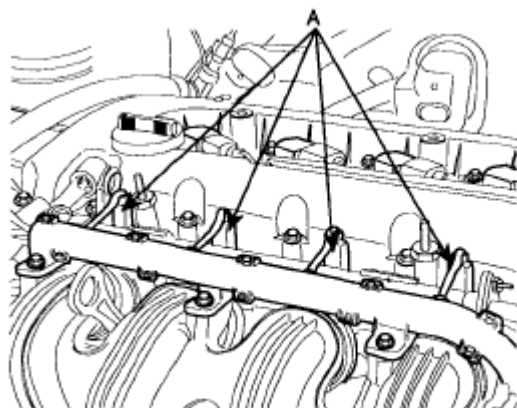
17. Install the engine wire harness connectors.
 1. Install the ETC connector (B), CMP connector (C), knock sensor connector (D).



ACLG005A

Fig. 108: Identifying ETC Connector, CMP Connector And Knock Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

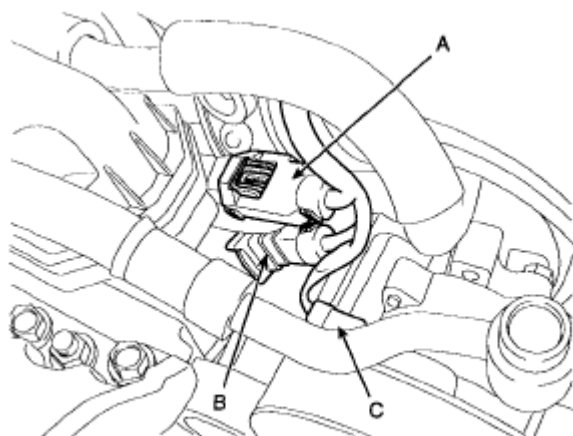
18. Install the injector connectors (A).



KCRF128A

Fig. 109: Identifying Injector Connectors
Courtesy of KIA MOTORS AMERICA, INC.

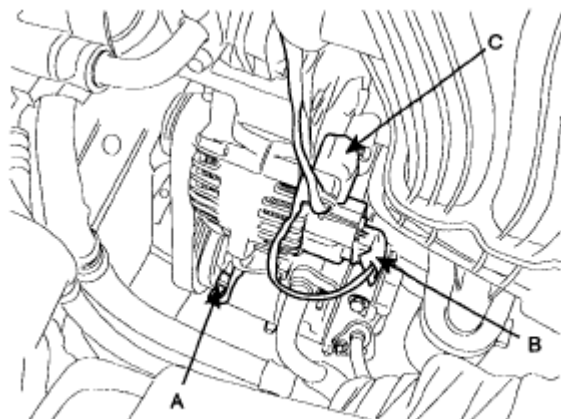
19. Install the OCV connector (A), OTS connector (B), P/S switch connector (C).



ACLG004A

Fig. 110: Identifying OCV Connector, OTS Connector And P/S Switch Connector
Courtesy of KIA MOTORS AMERICA, INC.

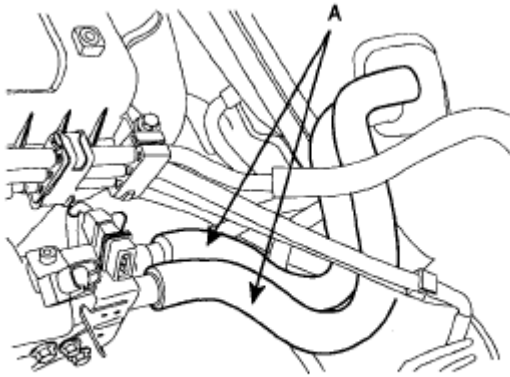
20. Install the A/C switch (A), alternator connect (B), and oil pressure switch (C).



KCRF126A

Fig. 111: Identifying A/C Switch, Alternator Connector And Oil Pressure Switch
Courtesy of KIA MOTORS AMERICA, INC.

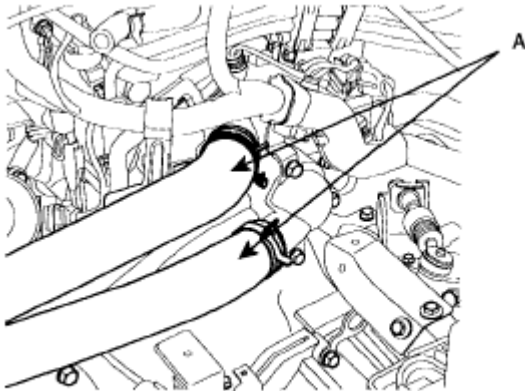
21. Install heater hoses (A).



KCRF133A

Fig. 112: Identifying Heater Hoses
Courtesy of KIA MOTORS AMERICA, INC.

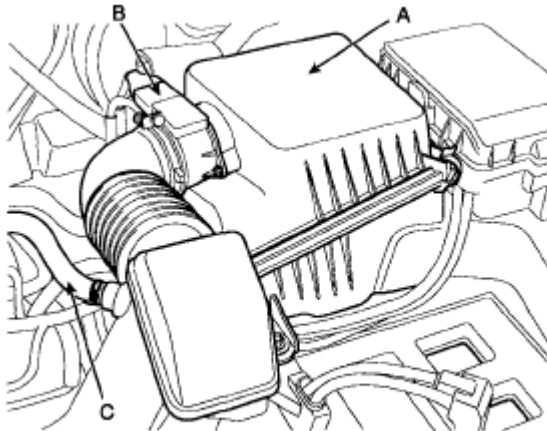
22. Install the upper radiator hose and lower radiator hose (A).



KCRF124A

Fig. 113: Identifying Upper Radiator Hose And Lower Radiator Hose
Courtesy of KIA MOTORS AMERICA, INC.

23. Install under cover.
24. Install the intake air hose and air cleaner assembly.
1. Install the AFS (B) connector.
 2. Install the breather hose (C) from air cleaner hose.
 3. Install the ECU connector.
 4. Install the intake air hose and air cleaner (A).



ACLG020A

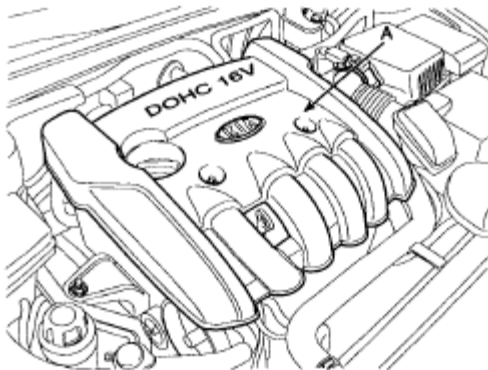
Fig. 114: Identifying Intake Air Hose And Air Cleaner
Courtesy of KIA MOTORS AMERICA, INC.

25. Install the engine cover.
26. Install the negative terminal to the battery.
27. Fill with engine coolant.
28. Start the engine and check for leaks.
29. Recheck engine coolant level and oil level.

ENGINE AND TRANSAXLE ASSEMBLY

REMOVAL

1. Remove the engine cover (A).



ACLG001A

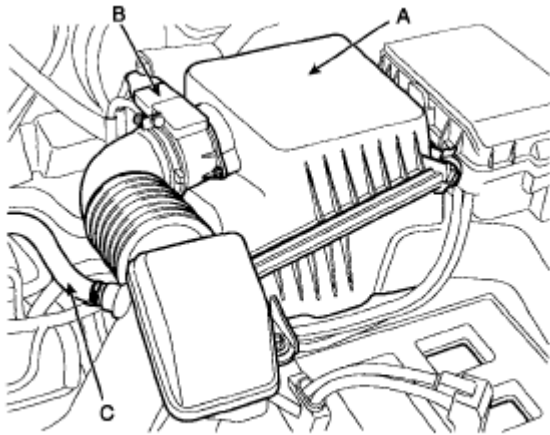
Fig. 115: Identifying Engine Cover
Courtesy of KIA MOTORS AMERICA, INC.

2. Recovering refrigerant.

3. Remove the air duct.
4. Disconnect the negative terminal first, then the positive terminal.

Remove the battery.

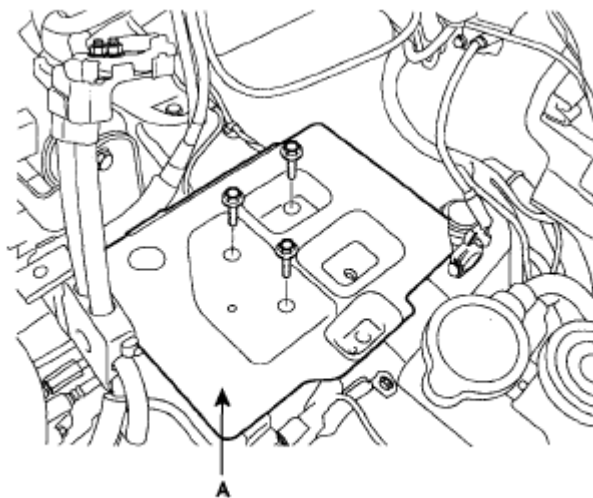
5. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS (B) connector.
 2. Disconnect the breather hose (C) from air cleaner hose.
 3. Disconnect the ECU connector. (Refer to **FUEL DELIVERY SYSTEM (FUEL SYSTEM (G4KC - GSL 2.4L))** .
 4. Remove the intake air hose and air cleaner (A).



ACLG020A

Fig. 116: Identifying Intake Air Hose And Air Cleaner
Courtesy of KIA MOTORS AMERICA, INC.

6. Remove the battery bracket (A).



KMRE006B

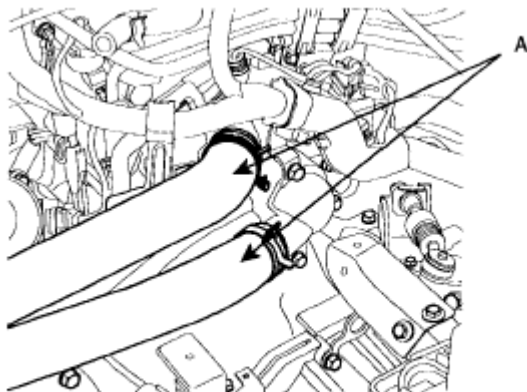
Fig. 117: Identifying Battery Bracket

Courtesy of KIA MOTORS AMERICA, INC.

7. Remove under cover.
8. Drain the engine coolant.

Remove the radiator cap to speed draining.

9. Remove the upper radiator hose and lower radiator hose (A).

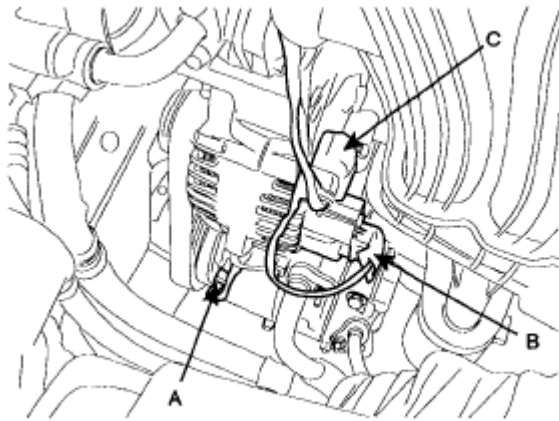


KCRF124A

Fig. 118: Identifying Upper Radiator Hose And Lower Radiator Hose

Courtesy of KIA MOTORS AMERICA, INC.

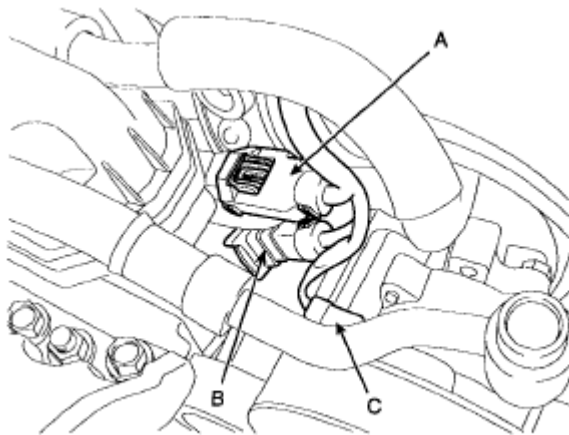
10. Remove the A/C switch (A), alternator connector (B) and pressure switch (C).



KCRF126A

Fig. 119: Identifying A/C Switch, Alternator Connector And Oil Pressure Switch
 Courtesy of KIA MOTORS AMERICA, INC.

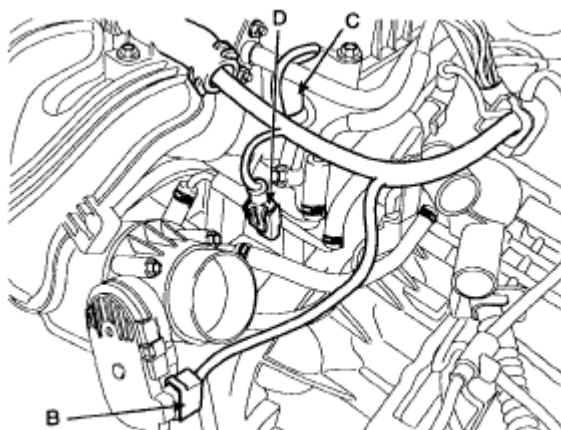
11. Remove the OCV connector (A), OTS connector (B), P/S switch connector (C).



ACLG004A

Fig. 120: Identifying OCV Connector, OTS Connector And P/S Switch Connector
 Courtesy of KIA MOTORS AMERICA, INC.

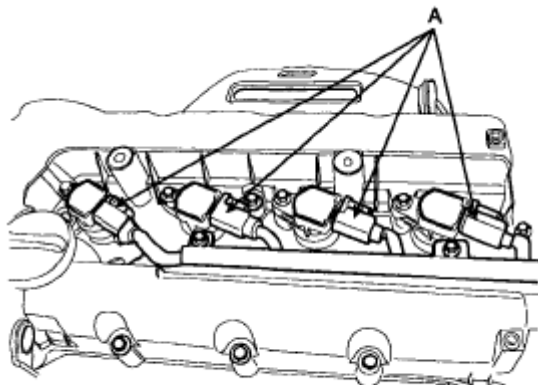
12. Remove the injector connectors (A).
13. Disconnect the engine wire harness connectors.
 1. Remove the ETC connector (B), CMP connector (C), knock sensor connector (D).



ACLG005A

Fig. 121: Identifying ETC Connector, CMP Connector And Knock Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

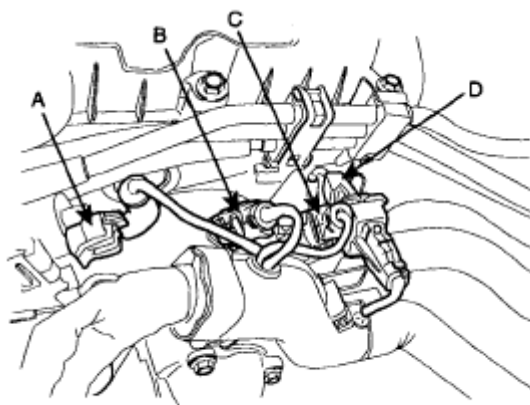
14. Remove the ignition coil connectors (A).



KCRF131A

Fig. 122: Identifying Ignition Coil Connector
Courtesy of KIA MOTORS AMERICA, INC.

15. Remove the PCSV connector (A), WTS connector (B), condenser connector (C), and CKP sensor connector (D).

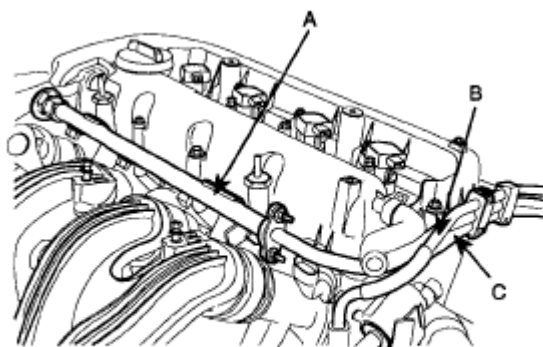


ACLG028A

Fig. 123: Identifying PCSV Connector, WTS Connector, Condenser Connector And CKP Sensor Connector

Courtesy of KIA MOTORS AMERICA, INC.

16. Remove delivery pipe (A), brake vacuum hose (B), and PCSV hose (C).



KCRF134A

Fig. 124: Identifying Delivery Pipe, Brake Vacuum Hose And PCSV Hose

Courtesy of KIA MOTORS AMERICA, INC.

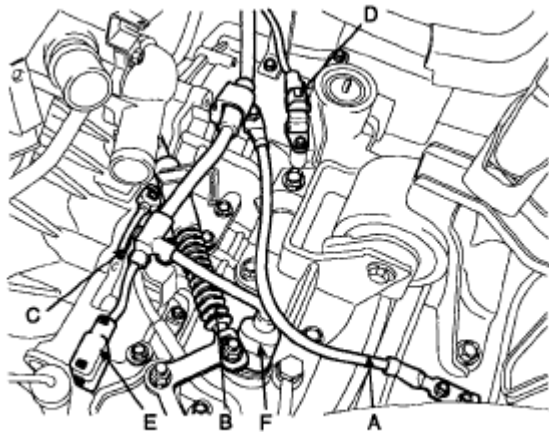
17. Remove the heater hoses (A).



ACLG003A

Fig. 125: Identifying Heater Hoses
Courtesy of KIA MOTORS AMERICA, INC.

18. Disconnect the transaxle wire harness connector and control cable.
 1. Remove the ground cable (A) from the transaxle.
 2. Remove the vehicle speed sensor connector.
 3. Remove the shaft cable assembly (B).
 4. Remove the input shaft speed connector (C).
 5. Remove the output shaft speed connector (D).
 6. Remove the inhibitor switch connector (E).
 7. Remove the solenoid valve connector (F).

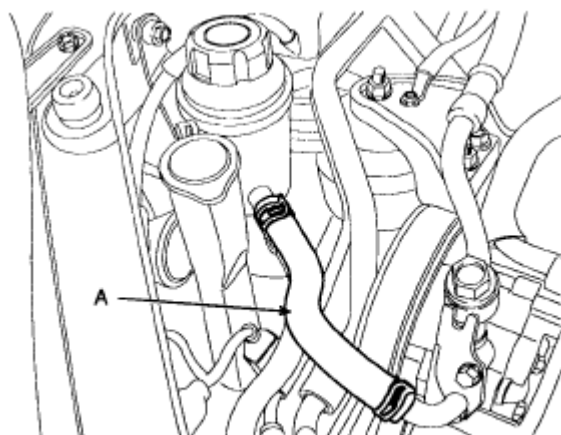


ACLG007A

Fig. 126: Identifying Input Shaft Speed Connector And Shaft Cable Assembly
Courtesy of KIA MOTORS AMERICA, INC.

8. Remove the hose from the A/T oil cooler tube.
19. Remove the steering u-joint mounting bolt. (Refer to **STEERING COLUMN AND SHAFT**).

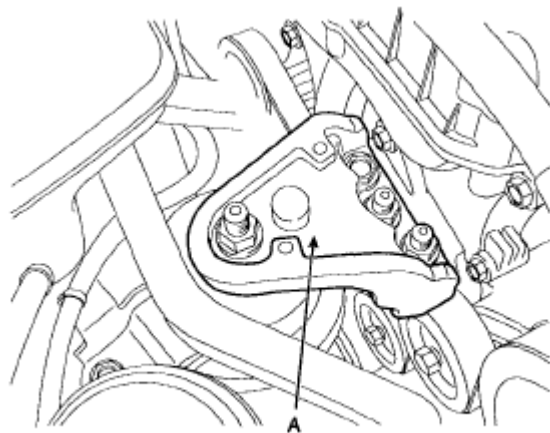
20. Remove the power steering oil hose (A).



ACLG006A

Fig. 127: Identifying Power Steering Oil Hose
Courtesy of KIA MOTORS AMERICA, INC.

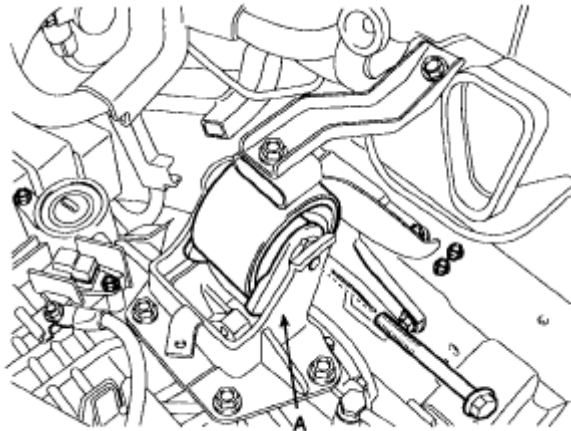
21. Remove the engine mounting bracket (A).



SMGEM6010N

Fig. 128: Identifying Engine Mount Bracket
Courtesy of KIA MOTORS AMERICA, INC.

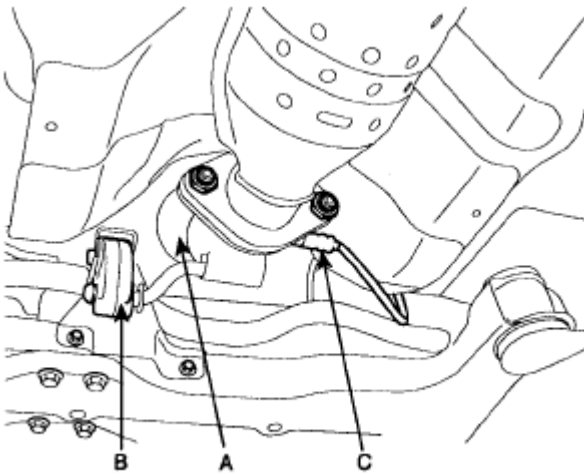
22. Remove the A/C pipe.
23. Remove the transaxle mounting bracket (A).



ACLG010A

Fig. 129: Identifying Transaxle Mounting Bracket
Courtesy of KIA MOTORS AMERICA, INC.

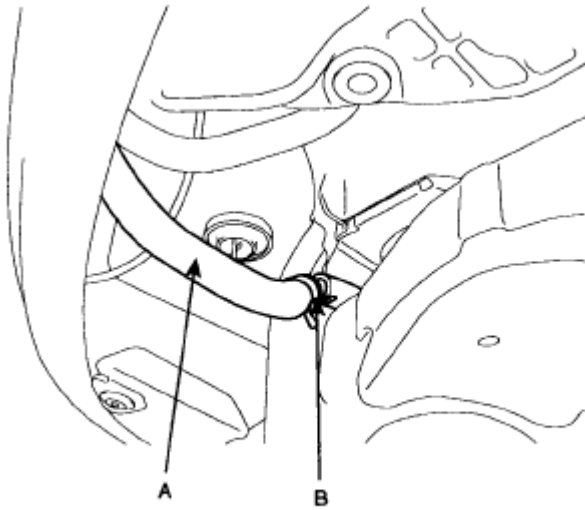
24. Remove the front tires.
25. Disconnect the wheel speed sensors (A) from both front knuckles. (Refer to **DRIVESHAFT**).
26. Remove the caliper and hang the caliper assembly (A). (Refer to **DRIVESHAFT**).
27. Remove the front strut lower mounting bolts and nuts. (Refer to **FRONT SUSPENSION SYSTEM**).
28. Remove the drive shaft cover, heat protector. (Refer to **DRIVESHAFT**).
29. Remove the exhaust pipe (A), hanger (B), and oxygen sensor (C).



KCRF031A

Fig. 130: Identifying Exhaust Pipe, Hanger And Oxygen Sensor
Courtesy of KIA MOTORS AMERICA, INC.

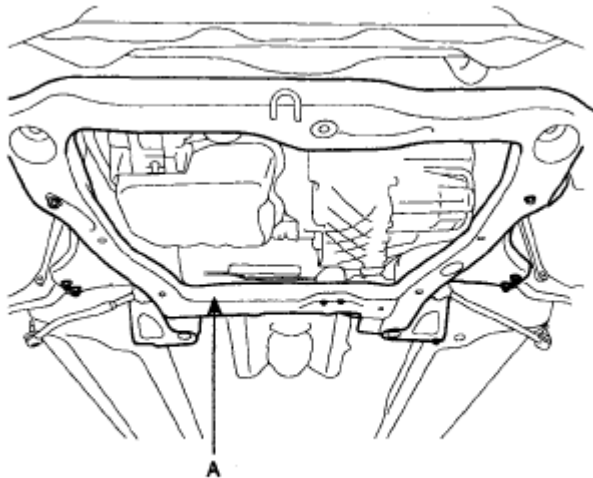
30. Remove power steering return hose (A) and drain power steering oil.



KMRE006J

Fig. 131: Identifying Power Steering Return Hose And Drain Power Steering Oil
 Courtesy of KIA MOTORS AMERICA, INC.

31. Remove the EPS connector. (Refer to **MECHANICAL POWER STEERING SYSTEM**).
32. Install jack and remove sub-frame (A).



KMRE006R

Fig. 132: Identifying Jack And Sub-Frame
 Courtesy of KIA MOTORS AMERICA, INC.

33. Remove drive shaft from transaxle. (Refer to **DRIVESHAFT**).
34. Separate the engine from the transaxle assembly by loosening mounting bolts.

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

INSTALLATION

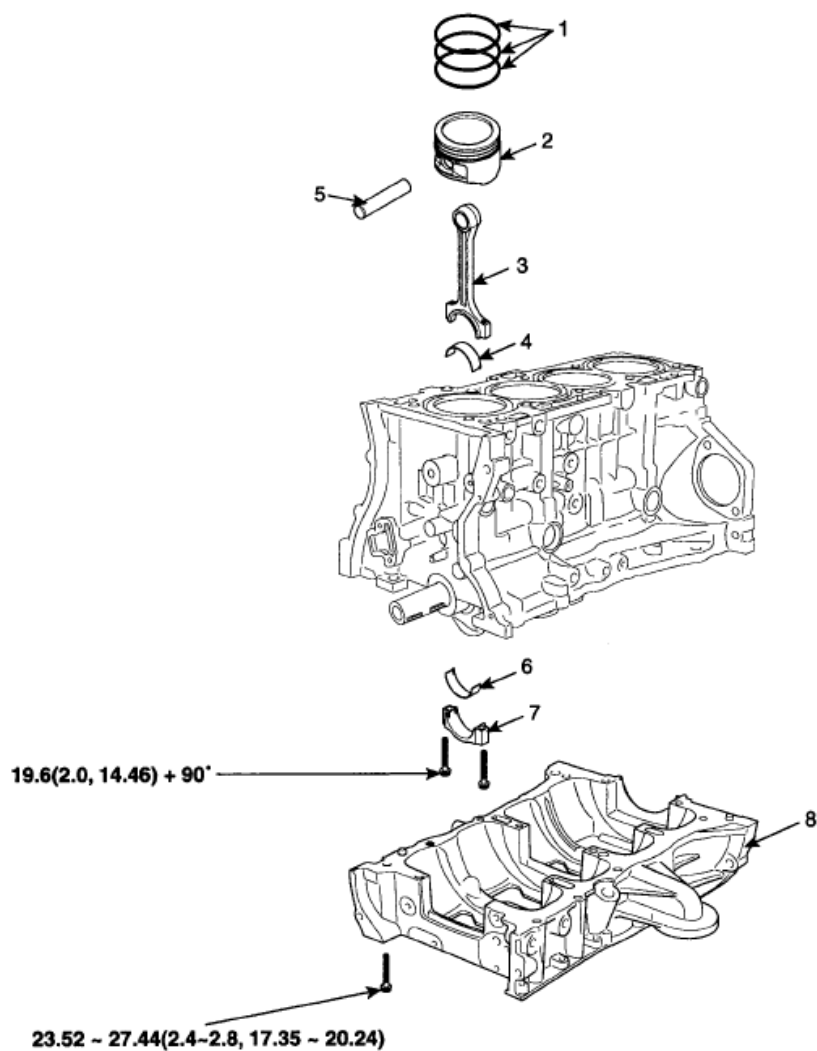
Installation is in the reverse order of removal.

Perform the following:

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

ENGINE BLOCK

COMPONENTS

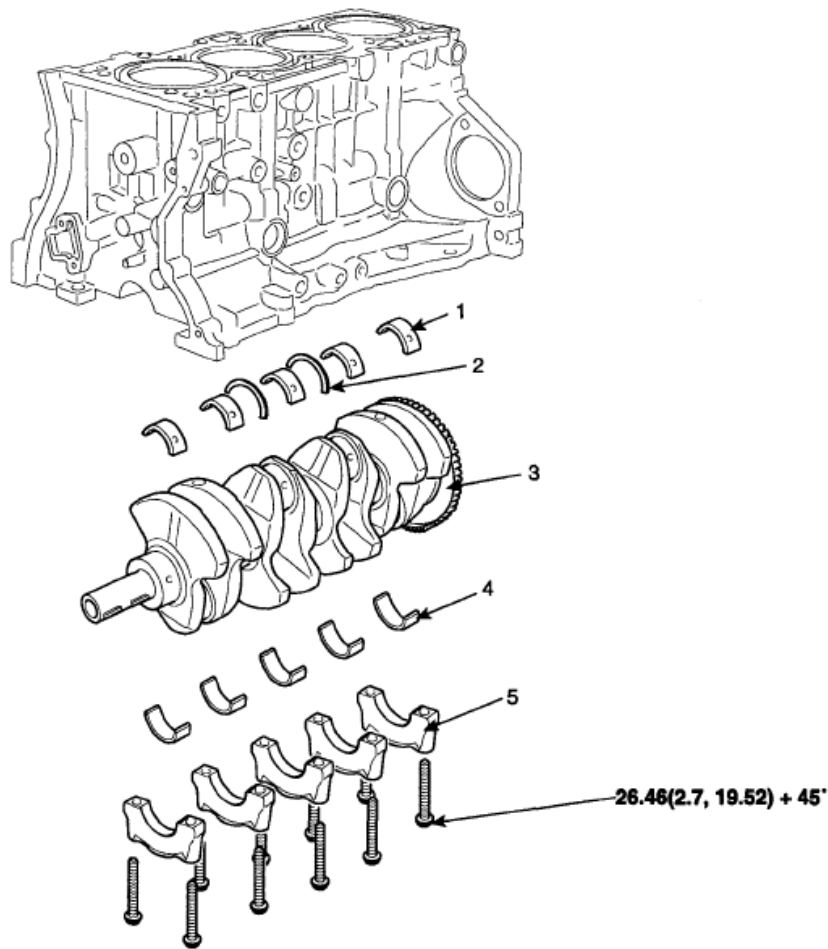


TORQUE : N.m (kgf.m, lb-ft)

- | | |
|---------------------------------|---------------------------------|
| 1. Piston ring | 5. Piston pin |
| 2. Piston | 6. Connecting rod lower bearing |
| 3. Connecting rod | 7. Connecting rod bearing cap |
| 4. Connecting rod upper bearing | 8. Ladder frame |

SMGEM8016N

Fig. 133: Identifying Engine Block Components (1 Of 2)
 Courtesy of KIA MOTORS AMERICA, INC.



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

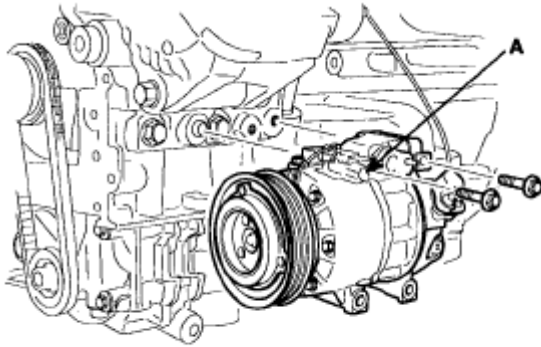
- | | |
|-----------------------------|-----------------------------|
| 1. Crankshaft upper bearing | 4. Crankshaft lower bearing |
| 2. Thrust bearing | 5. Main bearing cap |
| 3. Crankshaft | |

SMGEM8017N

Fig. 134: Identifying Engine Block Components (2 Of 2)
Courtesy of KIA MOTORS AMERICA, INC.

DISASSEMBLY

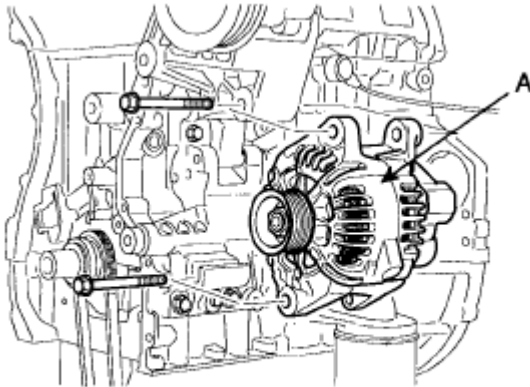
1. M/T: remove flywheel.
2. A/T: remove drive plate.
3. Install engine to engine stand for disassembly.
4. Remove timing chain.
5. Remove cylinder head.
6. Remove A/C compressor (A) from engine. (Refer to **AIR CONDITIONING SYSTEM**).



KCRF158A

Fig. 135: Identifying A/C Compressor From Engine
Courtesy of KIA MOTORS AMERICA, INC.

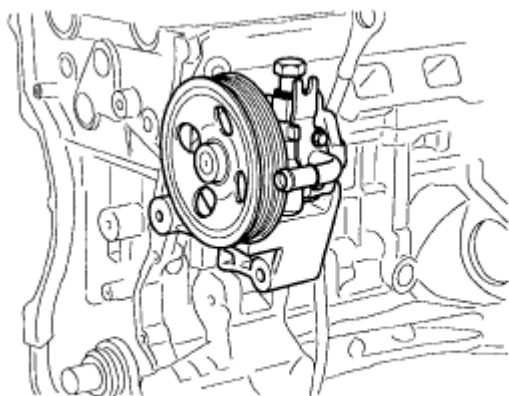
7. Remove alternator (A) from engine. (Refer to **CHARGING SYSTEM (ENGINE ELECTRICAL SYSTEM (G4KC - GSL 2.4))**).



KCRF158A

Fig. 136: Identifying Alternator From Engine
Courtesy of KIA MOTORS AMERICA, INC.

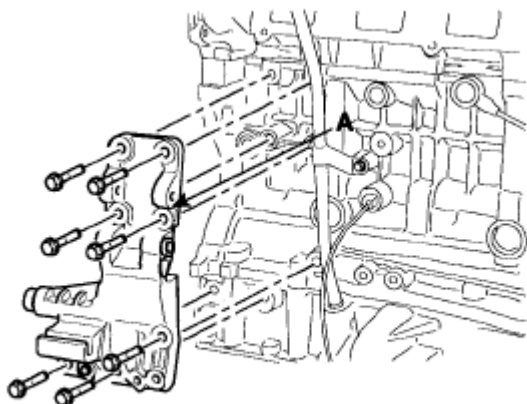
8. Remove power steering pump and bracket. (Refer to **MECHANICAL POWER STEERING SYSTEM**).



KCRF160A

Fig. 137: Identifying Power Steering Pump And Bracket
Courtesy of KIA MOTORS AMERICA, INC.

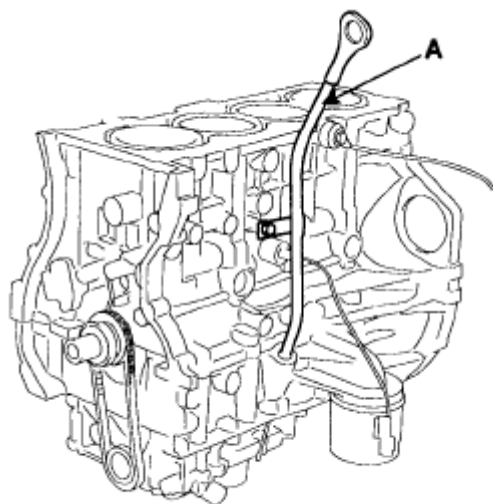
9. Remove tensioner assembly integrated bracket (A).



KCRF161A

Fig. 138: Identifying Tensioner Assembly Integrated Bracket
Courtesy of KIA MOTORS AMERICA, INC.

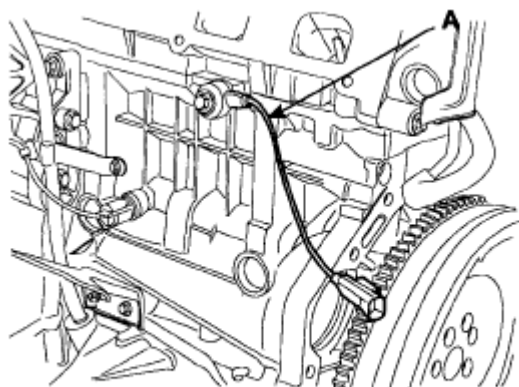
10. Remove oil level gauge assembly (A).



KCRF163B

Fig. 139: Identifying Oil Level Gauge Assembly
Courtesy of KIA MOTORS AMERICA, INC.

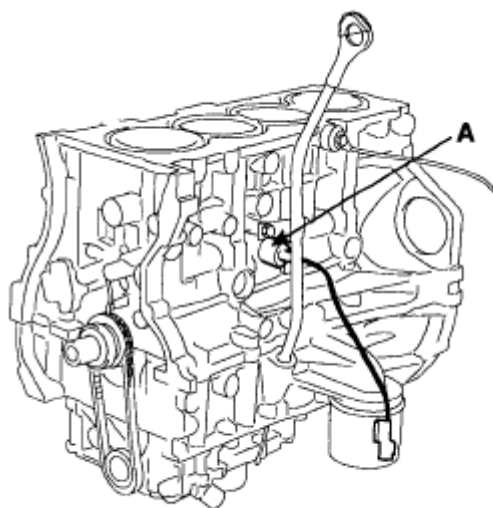
11. Remove knock sensor (A).



KCRF143A

Fig. 140: Identifying Knock Sensor
Courtesy of KIA MOTORS AMERICA, INC.

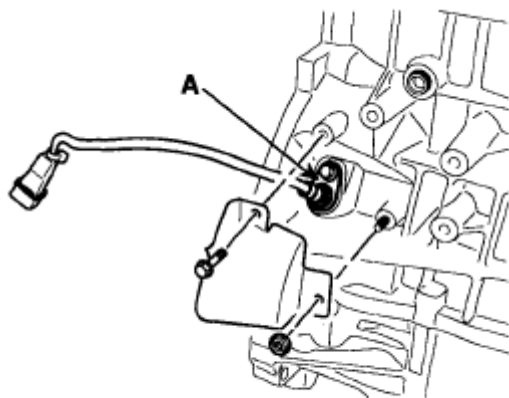
12. Remove oil pressure sensor (A).



KCRF183C

Fig. 141: Identifying Oil Pressure Sensor
Courtesy of KIA MOTORS AMERICA, INC.

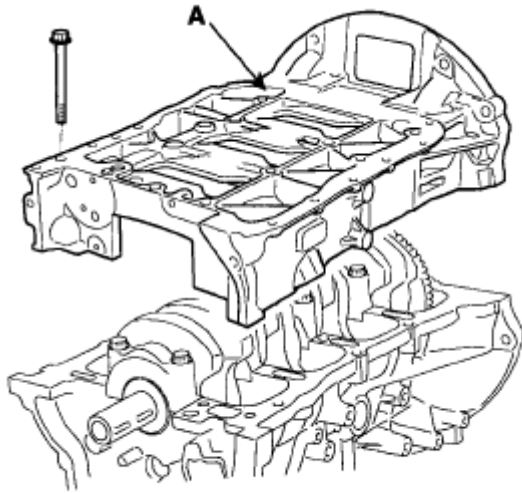
13. Remove CKP sensor (A).



KCRF184A

Fig. 142: Identifying CKP Sensor
Courtesy of KIA MOTORS AMERICA, INC.

14. Remove water pump.
15. Remove balance shaft module.
16. Remove ladder frame (A).



KCRF167A

Fig. 143: Identifying Water Pump And Ladder Frame
Courtesy of KIA MOTORS AMERICA, INC.

17. Check the connecting rod end play.
18. Remove the connecting rod caps and check oil clearance.
19. Remove 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.

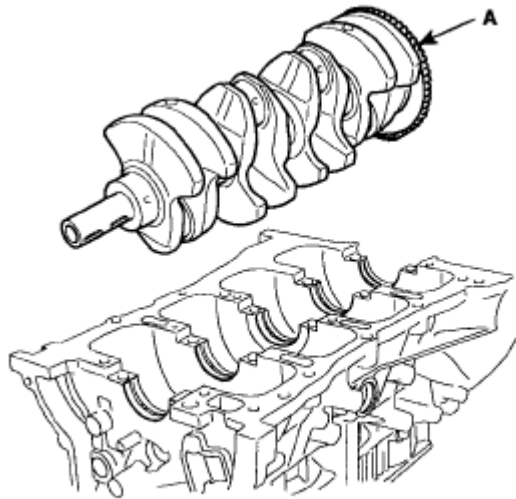
NOTE:

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

20. Remove crankshaft bearing cap and check oil clearance.
21. Check the crankshaft end play.
22. 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.



KCRF172A

Fig. 144: Identifying Crankshaft On Cylinder Block
Courtesy of KIA MOTORS AMERICA, INC.

23. 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.

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

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

25. Disconnect connecting rod from piston.

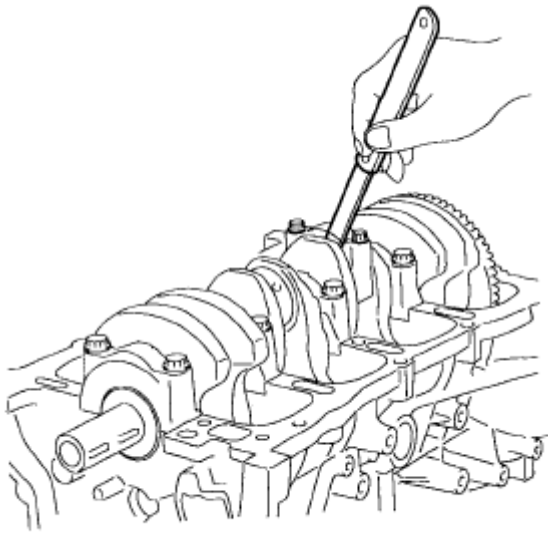
INSPECTION

CONNECTING ROD AND CRANKSHAFT

1. Check the connecting rod end play.

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

Standard end play: 0.1-0.25mm(0.004-0.010in.) Maximum end play: 0.35mm(0.0138in.)



KCRF169B

Fig. 145: Measuring End Play Rod Back And Forth
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 matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
 2. Remove 2 connecting rod cap bolts.
 3. Remove the connecting rod cap and bearing half.
 4. Clean the crank pin and bearing.
 5. Place plastigage across the crank pin.
 6. Reinstall the bearing half and cap, and torque the bolts.

Tightening torque

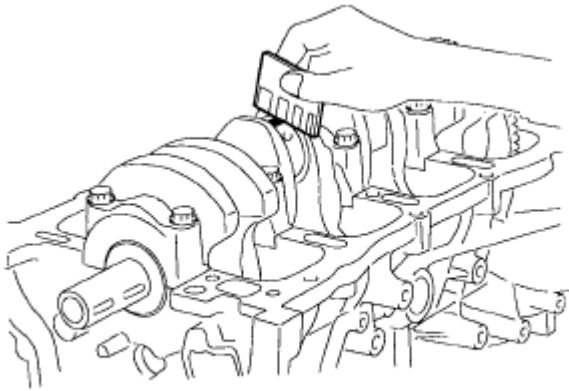
19.6N.m (2.0kgf.m, 14.46lb-ft) + 90°

NOTE: Do not turn the crankshaft.

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

Standard oil clearance

0.028-0.046mm (0.0011-0.0018in.)



KCRF169A

Fig. 146: Measuring Plastigage Widest Point
Courtesy of KIA MOTORS AMERICA, INC.

9. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color mark (select the color as shown in the next column), and recheck the clearance.

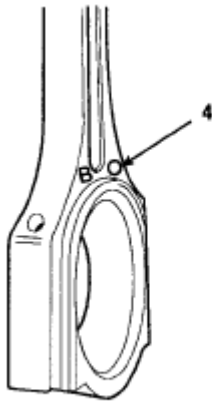
CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

10. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

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 marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

CONNECTING ROD MARK LOCATION



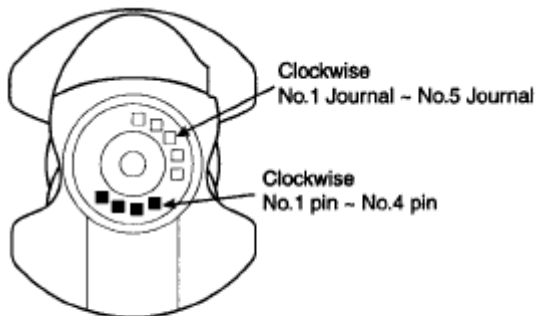
SMGEM6001N

Fig. 147: Identifying Rod Mark Location
Courtesy of KIA MOTORS AMERICA, INC.

DISCRIMINATION OF CONNECTING ROD

CLASS	MARK	INSIDE DIAMETER
a	A	51.000-51.006mm (2.0079-2.0081 in.)
b	B	51.006-51.012mm (2.0081-2.0083in.)
c	C	51.012-51.018mm (2.0083-2.0085in.)

CRANKSHAFT PIN MARK LOCATION DISCRIMINATION OF CRANKSHAFT



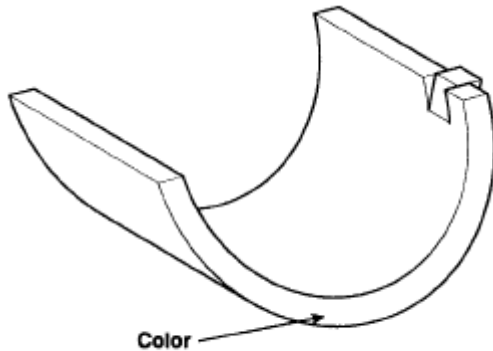
LCLG002A

Fig. 148: Identifying Crankshaft Pin Mark Location
Courtesy of KIA MOTORS AMERICA, INC.

DISCRIMINATION OF CRANKSHAFT

CLASS	MARK	OUTSIDE DIAMETER OF PIN
I	1	47.966-47.972mm (1.8884-1.8886in.)
II	2	47.960-47.966mm (1.8881-1.8884in.)
III	3	47.954-47.960mm (1.8879-1.8881in.)

PLACE OF IDENTIFICATION MARK (CONNECTING ROD BEARING) DISCRIMINATION OF CONNECTING ROD BEARING



ECRF021A

Fig. 149: Identifying Color
Courtesy of KIA MOTORS AMERICA, INC.

DISCRIMINATION OF CONNECTING ROD BEARING

CLASS	MARK	THICKNESS OF BEARING
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. Selection

REFERENCE CHART

CRANKSHAFT IDENTIFICATION MARK	CONNECTING ROD IDENTIFICATION MARK	ASSEMBLING CLASSIFICATION OF BEARING
I (1)	a (A)	D (YELLOW)
	b (B)	C (GREEN)
	c (C)	B (NONE)
II (2)	a (A)	C (GREEN)
	b (B)	B (NONE)
	c (C)	A (BLACK)
III (3)	a (A)	B (NONE)
	b (B)	A (BLACK)
	c (C)	AA (BLUE)

3. Check the connecting rods.

1. 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.

2. 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.
3. 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.
 1. To check main bearing-to-journal oil clearance, remove the main caps and bearing halves.
 2. Clean each main journal and bearing half with a clean shop towel.
 3. Place one strip of plastigage across each main journal.
 4. Reinstall the bearings and caps, then torque the bolts.

Tightening torque

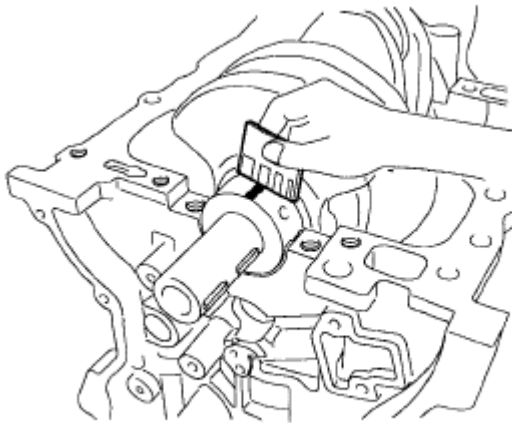
26.46 N.m (2.7kgf.m, 19.52lb-ft) + 45°

NOTE: **Do not turn the crankshaft.**

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

Standard oil clearance

0.026-0.048mm (0.0010-0.0019in.)



KCRF170A

Fig. 150: Measuring Widest Part Of Plastigage
Courtesy of KIA MOTORS AMERICA, INC.

6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color mark (select the color as shown in the next column), and recheck the clearance.

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

7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

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 marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

CONNECTING RODS

1. 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.
2. 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.
3. 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 (0.0020 in./3.94 in.) or less

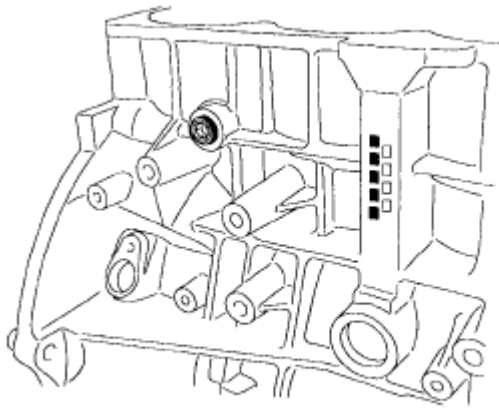
Allowable twist of connecting rod:

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

Crankshaft bore mark location

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

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



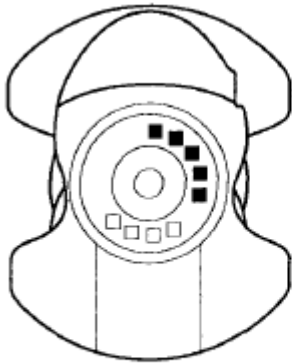
KCRF175C

Fig. 151: Identifying Crankshaft Bore Mark Location
Courtesy of KIA MOTORS AMERICA, INC.

DISCRIMINATION OF CYLINDER BLOCK

CLASS	MARK	INSIDE DIAMETER
a	A	56.000-56.006mm (2.2047-2.2049in.)
b	B	56.006-56.012mm (2.2049-2.2052in.)
c	C	56.012-56.018mm (2.2052-2.2054in.)

CRANKSHAFT JOURNAL MARK LOCATION DISCRIMINATION OF CRANKSHAFT



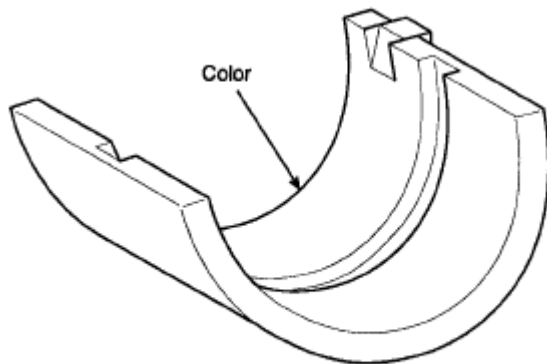
ACGE084Z

Fig. 152: Identifying Crankshaft Journal Mark Location
 Courtesy of KIA MOTORS AMERICA, INC.

DISCRIMINATION OF CRANKSHAFT

CLASS	MARK	OUTSIDE DIAMETER OF JOURNAL
I	1	51.954-51.960mm (2.0454-2.0456in.)
II	2	51.948-51.954mm (2.0452-2.0454.)
III	3	51.942-51.948mm (2.0449-2.0452in.)

PLACE OF IDENTIFICATION MARK (CRANKSHAFT BEARING) DISCRIMINATION OF CRANKSHAFT BEARING



ECRF022A

Fig. 153: Identifying Color
 Courtesy of KIA MOTORS AMERICA, INC.

DISCRIMINATION OF CRANKSHAFT BEARING

CLASS	MARK	THICKNESS OF BEARING
AA	BLUE	2.026-2.029mm (0.0797-0.0798in.)
A	BLACK	2.023-2.026mm (0.0796-0.0797in.)

2006 Kia Magentis LX

2006-07ENGINE Mechanical (G4KC - GSL 2.4) - Optima & Magentis (Canadian)

B	NONE	2.020-2.023mm (0.0795-0.0796in.)
C	GREEN	2.017-2.020mm (0.0794-0.795in.)
D	YELLOW	2.014-2.017mm (0.0793-0.0794in.)

REFERENCE CHART

CRANKSHAFT IDENTIFICATION MARK	CRANKSHAFT BORE IDENTIFICATION MARK	ASSEMBLING CLASSIFICATION OF BEARING
I (1)	a (A)	D (YELLOW)
	b (B)	C (GREEN)
	c (C)	B (NONE)
II (2)	a (A)	C (GREEN)
	b (B)	B (NONE)
	c (C)	A (BLACK)
III (3)	a (A)	B (NONE)
	b (B)	A (BLACK)
	c (C)	AA (BLUE)

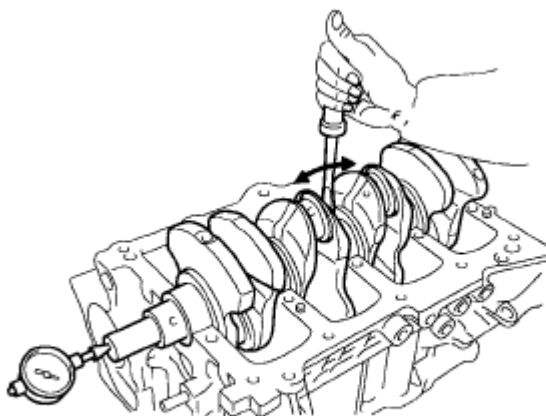
4. Check crankshaft end play.

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

Standard end play

0.07-0.25mm (0.0027-0.0098in.)

Limit: 0.30mm (0.0118in.)



ECKD001B

Fig. 154: Measuring Clearance Prying Crankshaft Back And Forth
Courtesy of KIA MOTORS AMERICA, INC.

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

Thrust bearing thickness

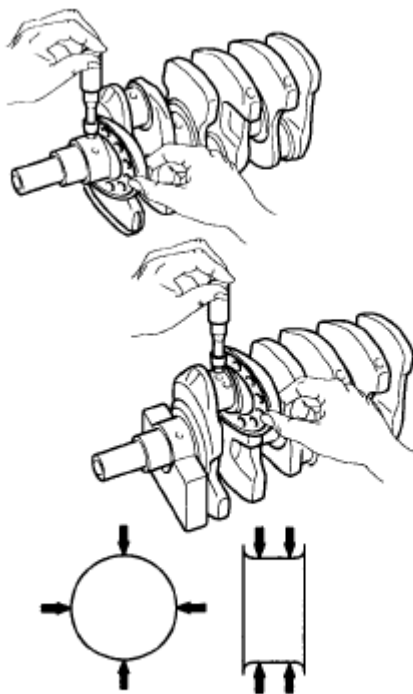
1.925-1.965mm (0.0758-0.07736in.)

5. Inspect main journals and crank pins

Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter: 51.942-51.960mm (2.0449-2.0456in.)

Crank pin diameter: 47.954-47.972mm (1.8879-1.8886in.)



ECKD001E

Fig. 155: Measuring Diameter Of Main Journal And Crank Pin
Courtesy of KIA MOTORS AMERICA, INC.

CYLINDER BLOCK

1. Remove gasket material.

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

2. Clean cylinder block

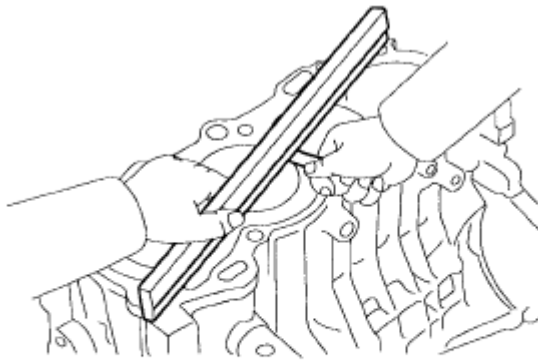
Using a soft brush and solvent, thoroughly clean the cylinder block.

3. Inspect 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

Standard: Less than 0.05mm(0.0020 in.)



ECKD001L

Fig. 156: Identifying Flatness Of Cylinder Block Gasket Surface
Courtesy of KIA MOTORS AMERICA, INC.

4. Inspect cylinder bore diameter

Visually check the cylinder for vertical scratches.

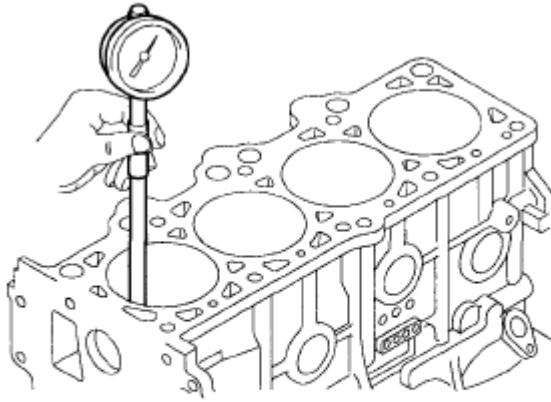
If deep scratches are present, replace the cylinder block.

5. Inspect cylinder bore diameter

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

Standard diameter

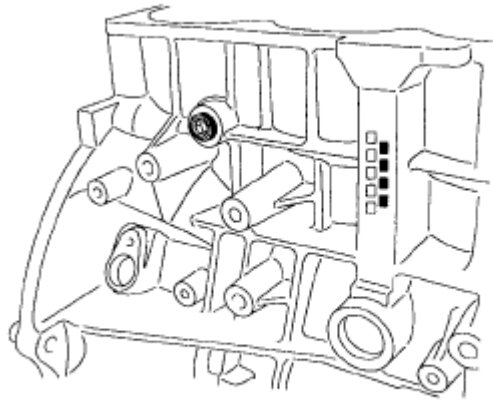
88.00-88.03mm (3.4645-3.4657in.)



ECKD318A

Fig. 157: Identifying Cylinder Bore Diameter
 Courtesy of KIA MOTORS AMERICA, INC.

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



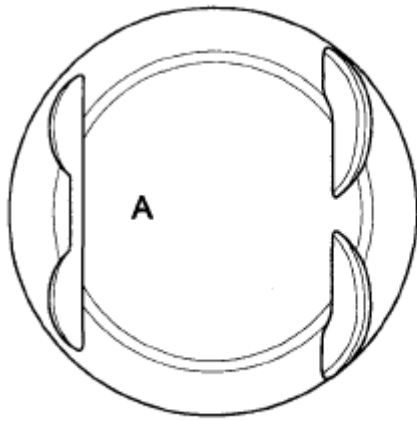
KCRF175B

Fig. 158: Identifying Cylinder Bore Size Code On Cylinder Block
 Courtesy of KIA MOTORS AMERICA, INC.

CYLINDER BORE INNER DIAMETER

Make	Cylinder bore inner diameter
	2.4
A	88.00-88.01mm (3.4645-3.4649in.)
B	88.01-88.02mm (3.4649-3.4653in.)
C	88.02-88.03mm (3.4653-3.4657in.)

7. Check the piston size code on the piston top face.



ECKE320B

Fig. 159: Identifying Piston Size Code On Piston Top Face
 Courtesy of KIA MOTORS AMERICA, INC.

NOTE: Stamp the grade mark of basic diameter with rubber stamp.

CYLINDER BORE INNER DIAMETER

Make	Cylinder bore inner diameter
	2.4
A	87.975-87.985mm (3.4636-3.4640in.)
None	87.985-87.995mm (3.4640-3.4644in.)
C	87.995-88.005mm (3.4644-3.4648in.)

8. Select the piston related to cylinder bore class.

Clearance: 0.015-0.035mm (0.0006-0.0014in.)

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. + 0.015 to 0.035mm (0.0006 to 0.0014in) (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: 0.015-0.035mm (0.0006-0.0014in)

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 RINGS

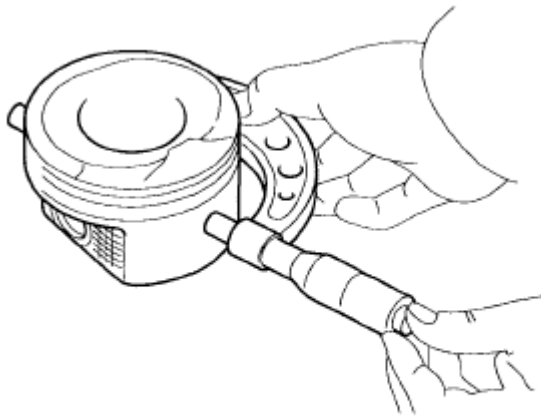
1. Clean piston
 1. Using a gasket scraper, remove the carbon from the piston top.
 2. Using a groove cleaning tool or broken ring, clean the piston ring grooves.
 3. Using solvent and a brush, thoroughly clean the piston.

NOTE: **Do not use a wire brush.**

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

Standard diameter

87.975-88.005mm (3.4636-3.4648in.)



ECKD001D

Fig. 160: Identifying Piston Outside Diameter
Courtesy of KIA MOTORS AMERICA, INC.

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

Piston-to-cylinder clearance

0.015-0.035mm(0.0006-0.0014in.)

4. Inspect the piston ring side clearance.

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

Piston ring side clearance

Standard

No.1: 0.03-0.07mm (0.0012-0.0027in.)

No.2: 0.03-0.07mm (0.0012-0.0027in.)

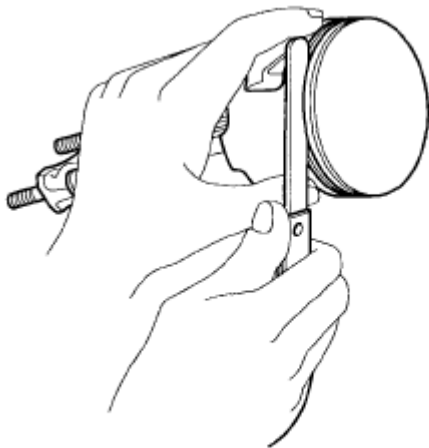
Oil ring: 0.06-0.15mm (0.0024-0.0059in.)

Limit

No.1: 0.1mm (0.004in.)

No.2: 0.1mm (0.004in.)

Oil ring: 0.2mm (0.008in.)



ECKD001G

Fig. 161: Measuring Clearance Between Piston Ring And Wall Of Ring Groove
Courtesy of KIA MOTORS AMERICA, INC.

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

5. Inspect 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 ring. 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.

Piston ring end gap**Standard**

No.1: 0.15-0.30mm (0.0059-0.0118in.)

No.2: 0.30-0.45m (0.0118-0.0177in.)

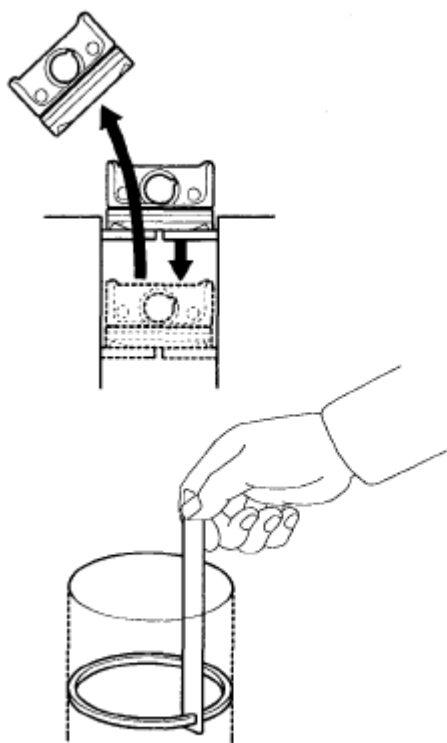
Oil ring: 0.20-0.70mm (0.0079-0.0275in.)

Limit

No.1: 0.6mm (0.0236in.)

No.2: 0.7mm (0.0275in.)

Oil ring: 0.8mm (0.0315in.)



ECKD001K

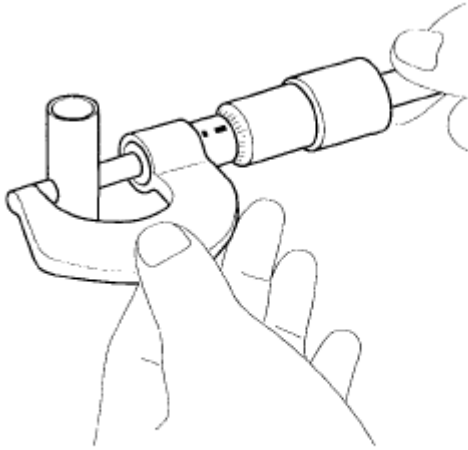
Fig. 162: Measuring Piston Ring End Gap
Courtesy of KIA MOTORS AMERICA, INC.

PISTON PINS

1. Measure the diameter of the piston pin.

Piston pin diameter

21.001-21.006mm (0.8268-0.8270in.)



ECKD001Z

Fig. 163: Measuring Diameter Of Piston Pin
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 diameter and the connecting rod small end diameter.

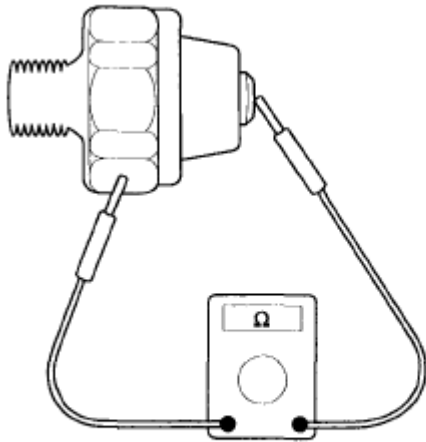
Piston pin-to-connecting rod interference

-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.

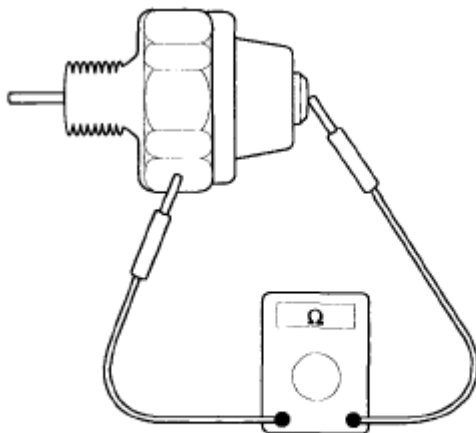


ECKD001W

Fig. 164: Checking Continuity Between Terminal And Body
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.
3. If there is no continuity when a 50kpa (0.5kg/cm², 7psi) 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.



ECKD001Y

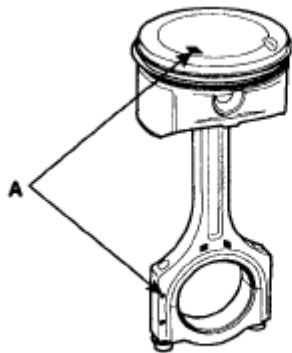
Fig. 165: Checking Continuity Between Terminal And Body
Courtesy of KIA MOTORS AMERICA, INC.

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.

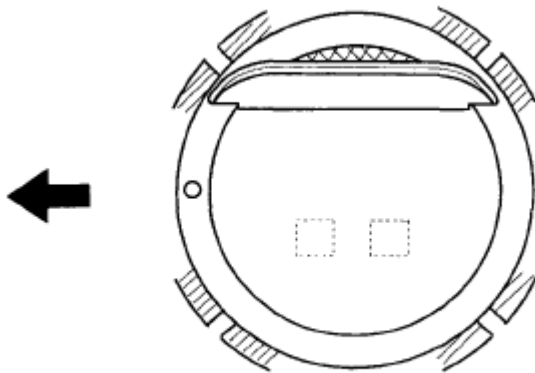
1. Assemble piston and connecting rod.
 1. Use a hydraulic press for installation.
 2. The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



KCRF168A

Fig. 166: Identifying Piston Front Mark And Rod
Courtesy of KIA MOTORS AMERICA, INC.

2. Install 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 in illustration.

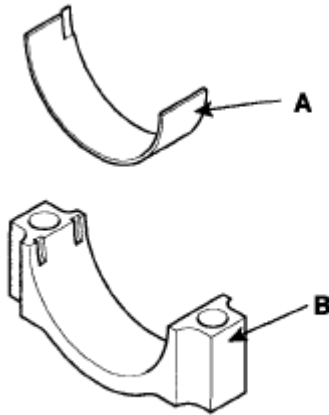


ECKD321A

Fig. 167: Identifying Piston Rings
Courtesy of KIA MOTORS AMERICA, INC.

3. Install 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).



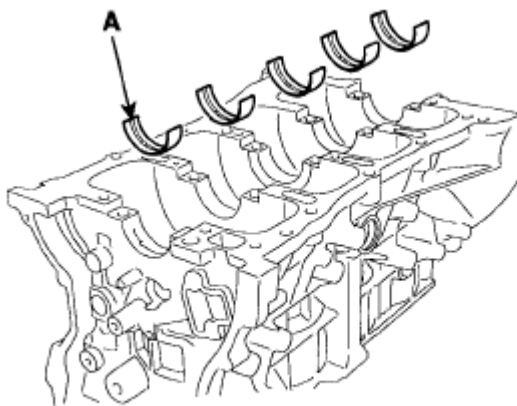
KCRF118B

Fig. 168: Identifying Bearings And Rod Cap
Courtesy of KIA MOTORS AMERICA, INC.

4. Install main bearings.

NOTE: Upper 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).



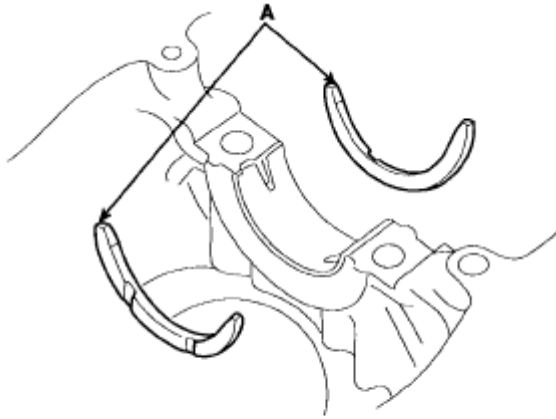
KCRF173A

Fig. 169: Identifying Upper Bearings Oil Groove
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 thrust bearings.

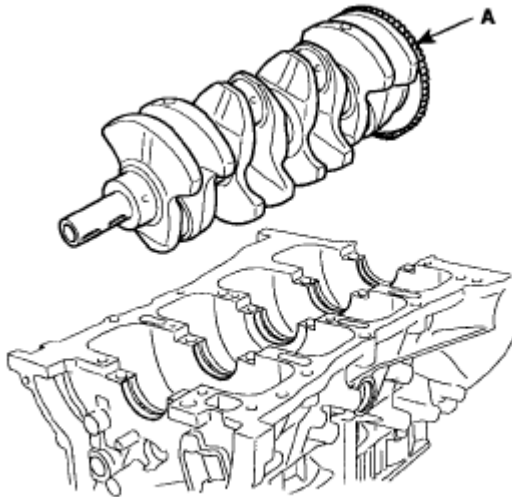
Install the 2 thrust bearings (A) under the No.3 journal position of the cylinder block with the oil grooves facing outward.



ECKD324A

Fig. 170: Identifying Thrust Bearings
Courtesy of KIA MOTORS AMERICA, INC.

6. Place crankshaft (A) on the cylinder block.



KCRF172A

Fig. 171: Identifying Crankshaft On Cylinder Block
Courtesy of KIA MOTORS AMERICA, INC.

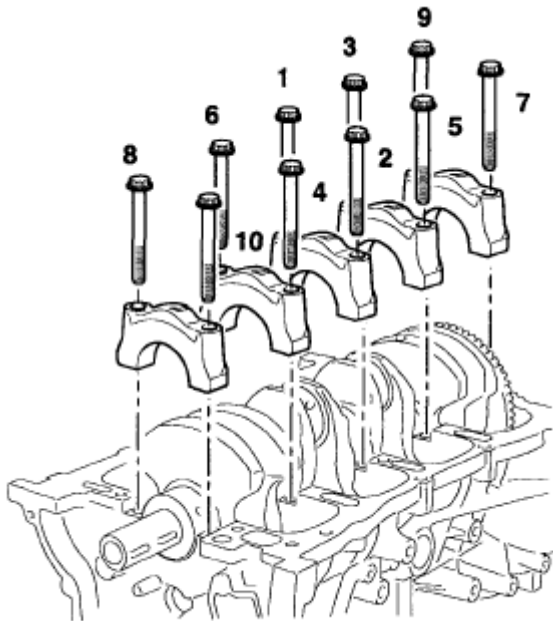
7. Place main bearing caps on cylinder block.
8. Install main bearing cap bolts.

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 in illustration.

Tightening torque: 26.46N.m (2.7kgf.m, 19.52lb-ft) + 45°



KCRF171A

Fig. 172: Identifying Bearing Cap Bolts In Tightening Sequence
Courtesy of KIA MOTORS AMERICA, INC.

3. Retighten the bearing cap bolts by 45° in the numerical order shown in illustration.
4. Check that the crankshaft turns smoothly.
9. Check crankshaft end play.
10. Install piston and connecting rod assemblies.

NOTE:

Before installing the pistons, 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 bearing is 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-check journal alignment

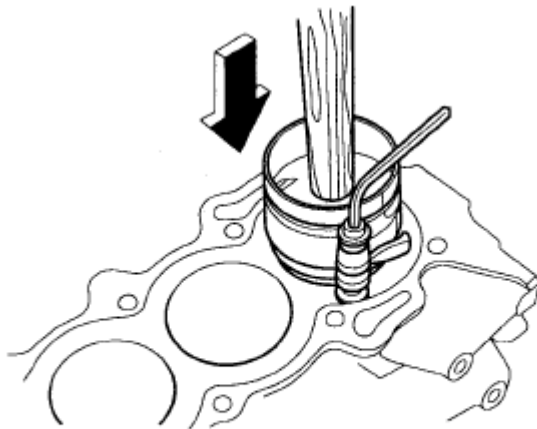
before pushing the piston into place.

4. Apply engine oil to the bolt threads. Install the rod caps with bearings, and torque the bolts.

Tightening torque

19.6N.m (2.0kgf.m, 14.46lb-ft) + 90°

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



ECKD001F

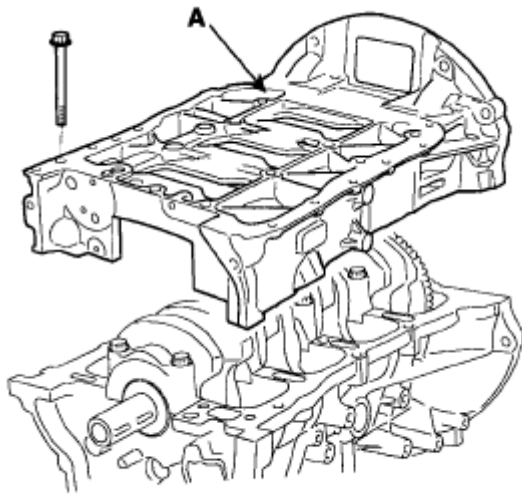
Fig. 173: Installing Pistons

Courtesy of KIA MOTORS AMERICA, INC.

11. Install ladder frame (A) with 10 bolts.

Tightening torque

23.52-27.44N.m (2.4-2.8kgf.m, 17.35-20.24lb-ft)

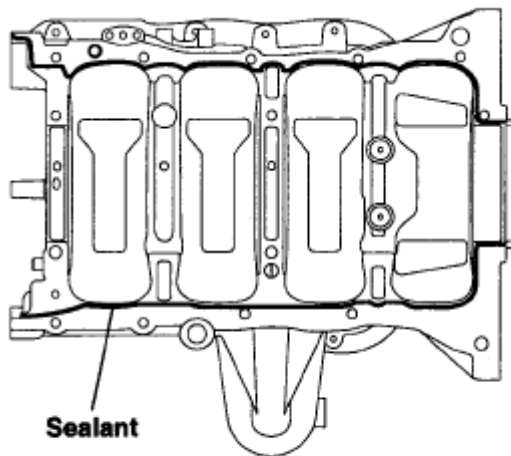


KCRF167A

Fig. 174: Identifying Water Pump And Ladder Frame
Courtesy of KIA MOTORS AMERICA, INC.

NOTE:

- Be assembling ladder frame, the liquid sealant Loctite 5900 should be applied ladder frame.
- The part must be assembled within 5 minutes after sealant was applied.
- Apply sealant to the inner threads of the bolt holes.



ECRF023A

Fig. 175: Identifying Sealant To Inner Threads Of Bolt Holes
Courtesy of KIA MOTORS AMERICA, INC.

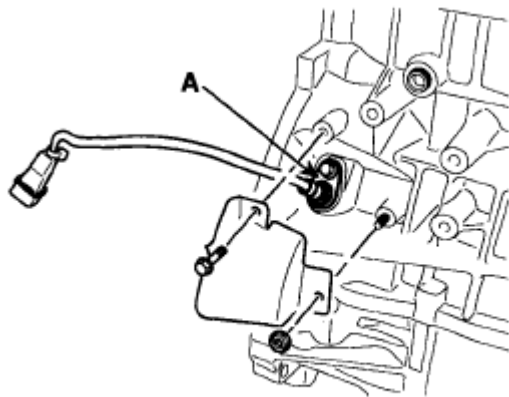
12. Install rear oil seal.

1. Apply engine oil to a new oil seal lip.

2. Using SST(09231-H1100, 09214-3K100) and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
13. Install balance shaft module.
14. Install water pump.
15. Install CKP sensor (A) and sensor cover.

Tightening torque

3.92-5.88N.m (0.4-0.6kgf.m, 2.89-4.34lb-ft)



KCRF184A

Fig. 176: Identifying CKP Sensor

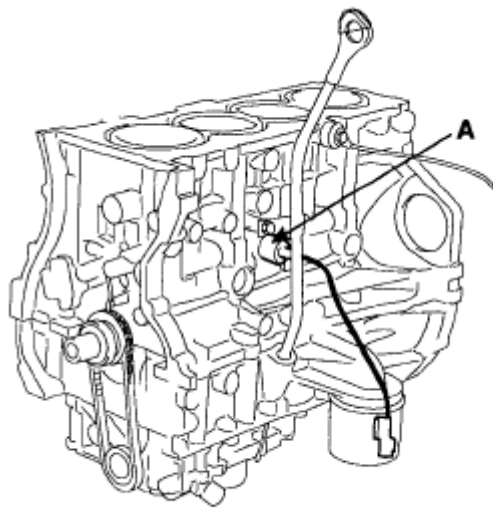
Courtesy of KIA MOTORS AMERICA, INC.

16. Install oil pressure sensor.
 1. Apply adhesive to 2 or 3 threads.

Adhesive: Three Bond 2310/2350 or equivalent.
 2. Install the oil pressure sensor (A).

Tightening torque

7.84-11.76N.m (0.8-1.2kgf.m, 5.78-8.67lb-ft)



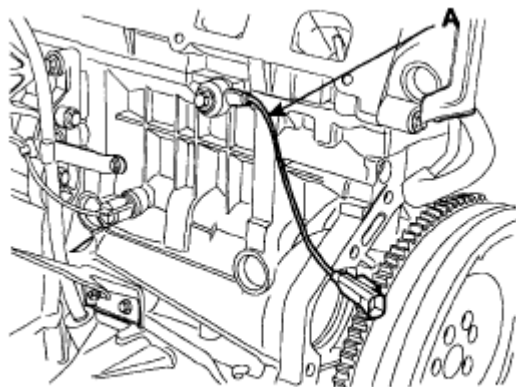
KCRF183C

Fig. 177: Identifying Oil Pressure Sensor
Courtesy of KIA MOTORS AMERICA, INC.

17. Install knock sensor (A).

Tightening torque

16.66-25.48N.m (1.7-2.6kgf.m, 12.29-18.78lb-ft)



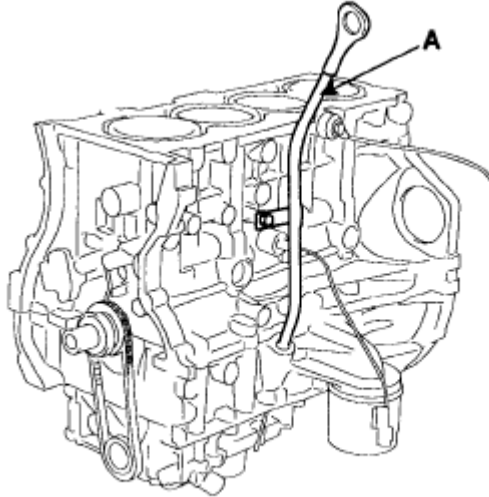
KCRF143A

Fig. 178: Identifying Knock Sensor
Courtesy of KIA MOTORS AMERICA, INC.

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

Tightening torque

7.84-11.76N.m (0.8-1.2kgf.m, 5.78-8.67lb-ft)



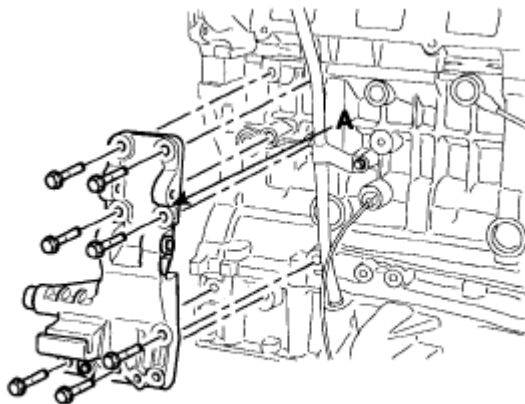
KCRF163B

Fig. 179: Identifying Oil Level Gauge Assembly
Courtesy of KIA MOTORS AMERICA, INC.

19. Install tensioner assembly integrated bracket (A).

Tightening torque

39.2-44.1N.m (4.0-4.5kgf.m, 28.92-32.53lb-ft)



KCRF161A

Fig. 180: Identifying Tensioner Assembly Integrated Bracket
Courtesy of KIA MOTORS AMERICA, INC.

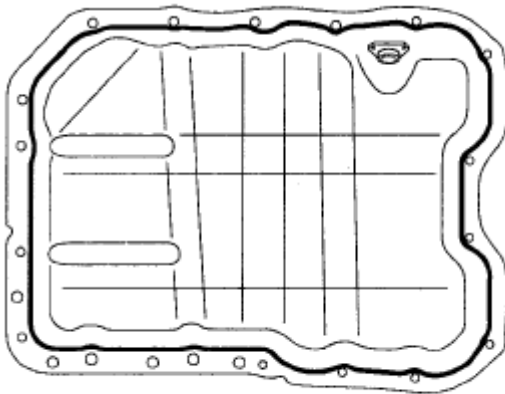
20. Install power steering pump bracket and power steering pump. (Refer to **MECHANICAL POWER**

STEERING SYSTEM).

21. Install alternator. (Refer to **CHARGING SYSTEM (ENGINE ELECTRICAL SYSTEM (G4KC - GSL 2.4))**).
22. Install A/C compressor. (Refer to **AIR CONDITIONING SYSTEM**).
23. Install cylinder head.
24. Install timing chain.
25. Install 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. Use liquid gasket LOCTITE5900 or equivalent.



KCRF179A

Fig. 181: Identifying Gasket Scraper And Oil Pan
Courtesy of KIA MOTORS AMERICA, INC.

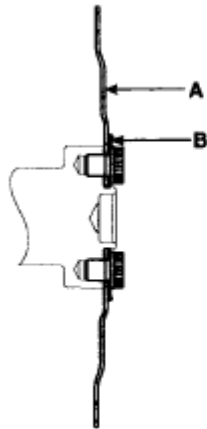
NOTE:

- 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.

26. Remove engine stand.
27. A/T: Install drive plate (A).

Tightening torque

117.6-127.4N.m (12-13kgf.m, 86.75-93.98lb-ft)



KCRF224A

Fig. 182: Identifying Drive Plate
Courtesy of KIA MOTORS AMERICA, INC.

28. M/T: Install flywheel.

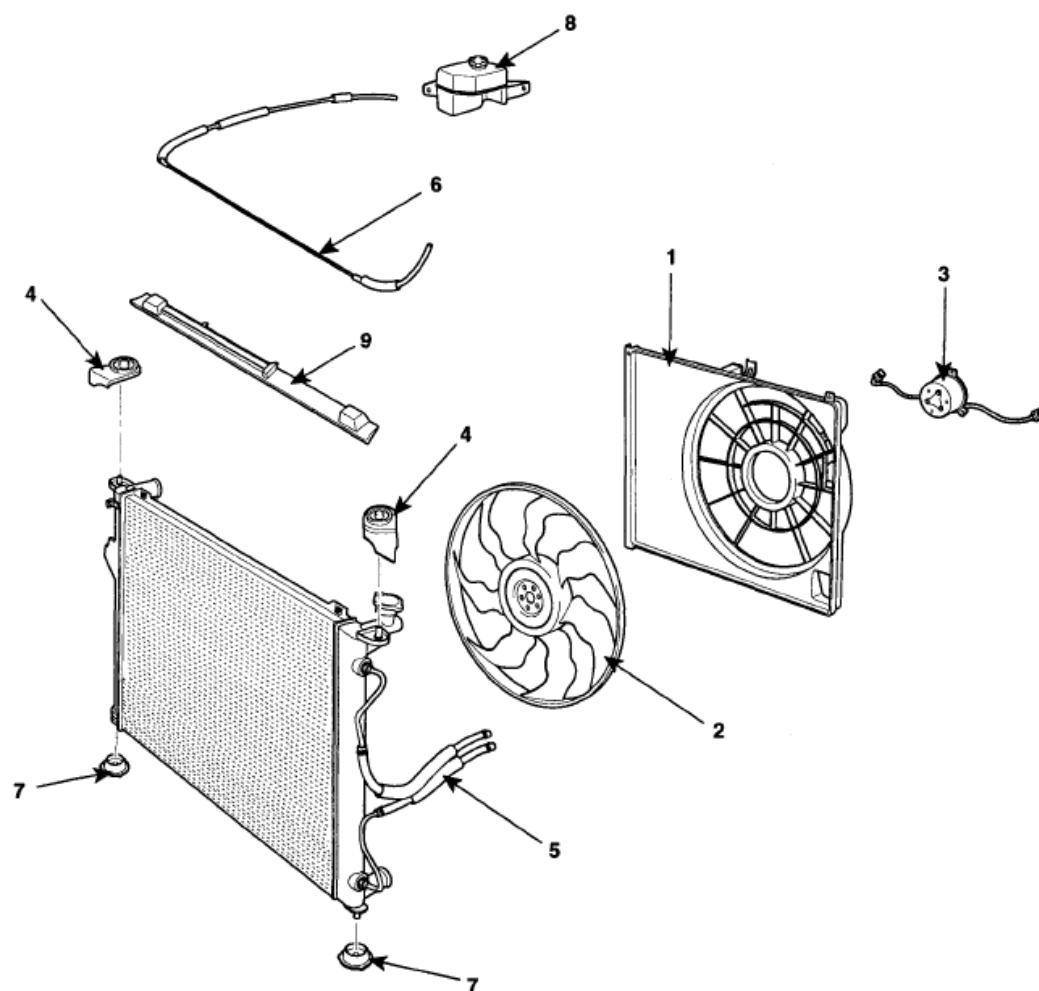
Tightening torque

117.6-127.4N.m (12-13kgf.m, 86.75-93.98lb-ft)

NOTE:

- Always use new flywheel (drive plate) bolts.
- Install and uniformly tighten the 7 bolts, in several passes.

COOLING SYSTEM**COMPONENTS**

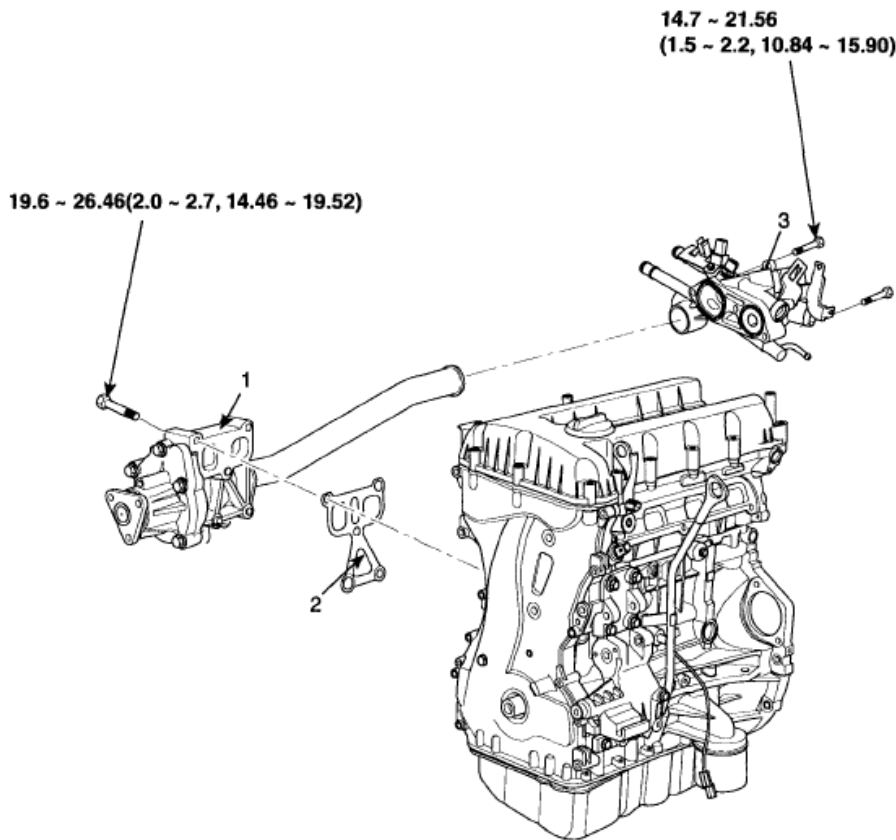


- 1. Pan shroud
- 2. Fan
- 3. Motor assembly
- 4. Radiator upper mounting bracket
- 5. Oil cooler assembly

- 6. Water pipe assembly
- 7. Radiator lower mounting insulator
- 8. Radiator reservoir
- 9. Cover

SMGEM6011N

Fig. 183: Identifying Cooling System Components (1 Of 2)
 Courtesy of KIA MOTORS AMERICA, INC.



SMOEM6016N

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

1. Water pump
2. Water pump gasket

3. Water temp control assembly

Fig. 184: Identifying Cooling System Components (2 Of 2)

Courtesy of KIA MOTORS AMERICA, INC.

ENGINE COOLANT REFILLING AND BLEEDING

WARNING: Never remove the radiator cap when the engine is hot. Serious scalding could be caused by hot fluid under high pressure escaping from the radiator.

CAUTION: When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on the electrical parts or the paint. If any coolant spills, rinse it off immediately.

1. Make sure the engine and radiator are cool to the touch.

2. Remove radiator cap.
3. Loosen the drain plug, and drain the coolant.
4. Tighten the radiator drain plug securely.
5. Remove, drain and reinstall the reservoir. Fill the tank halfway to the MAX mark with water, then up to the MAX mark with antifreeze.
6. Fill fluid mixture with coolant and water(4: 6) slowly through the radiator cap. Push the upper/lower hoses of the radiator so as bleed air easily.

NOTE:

- **Use only genuine antifreeze/coolant.**
- **For best corrosion protection, the coolant concentration must be maintained year-round at 50% minimum. Coolant concentrations less than 50% may not provide sufficient protection against corrosion or freezing.**
- **Coolant concentrations greater than 60% will impair cooling efficiency and are not recommended.**

CAUTION:

- **Do not mix different brands of antifreeze/coolants.**
- **Do not use additional rust inhibitors or antirust products; they may not be compatible with the coolant.**

7. Start the engine and run coolant circulates.

When the cooling fan operates and coolant circulates, refill coolant through the radiator cap.

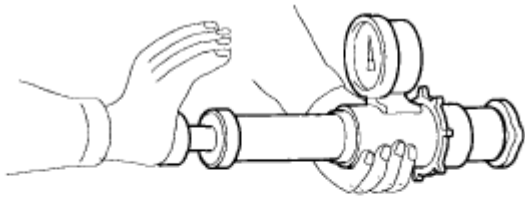
8. Repeat 7 until the cooling fan 3-5times and bleed air sufficiently out of the cooling system.
9. Install the radiator cap and fill the reservoir tank to the "MAX" line with coolant.
10. Run the vehicle under idle until the cooling fan operates 2-3 times.
11. Stop the engine and wait coolant gets cool.
12. Repeat 6 to 11 until the coolant level doesn't fall any more, bleed air out of the cooling system.

NOTE:

As it is to bleed air out to the cooling system and refill coolant when coolant gets cool completely, recheck the coolant level in the reservoir tank for 2-3 days after replacing coolant.

RADIATOR CAP TESTING

1. Remove the radiator cap, wet its seal with engine coolant, then install it on pressure tester.



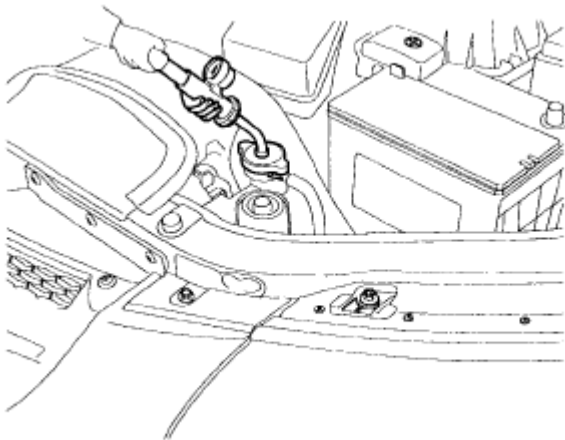
ECKD501X

Fig. 185: Identifying Radiator Cap, Wet Seal With Engine Coolant, On Pressure Tester
 Courtesy of KIA MOTORS AMERICA, INC.

2. Apply a pressure of 93-123kPa (0.95-1.25kgf/cm² , 14-19psi)
3. Check for a drop in pressure.
4. If the pressure drops, replace the cap.

RADIATOR LEAKAGE TESTING

1. Wait until engine is cool, then carefully remove the radiator cap and fill the radiator with engine coolant, then install it on the pressure tester.



KCRF184A

Fig. 186: Identifying Radiator Cap And Radiator With Engine Coolant, On Pressure Tester
 Courtesy of KIA MOTORS AMERICA, INC.

2. Apply a pressure tester to the radiator and apply a pressure of 93-123kPa (0.95-1.25kgf/cm² 14-18psi).
3. Inspect for engine coolant leaks and a drop in pressure.
4. Remove the tester and reinstall the radiator cap.

NOTE: Check for engine oil in the coolant and/or coolant in the engine oil.

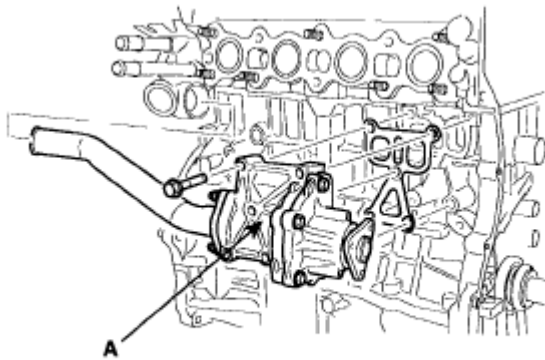
REMOVAL

WATER PUMP

1. Drain the engine coolant.

WARNING: System is under high pressure when the engine is hot. To avoid danger of releasing scalding engine coolant, remove the cap only when the engine is cool.

2. Remove drive belt.
3. Remove exhaust manifold.
4. Remove water inlet pipe nut.
5. Remove the water pump (A).



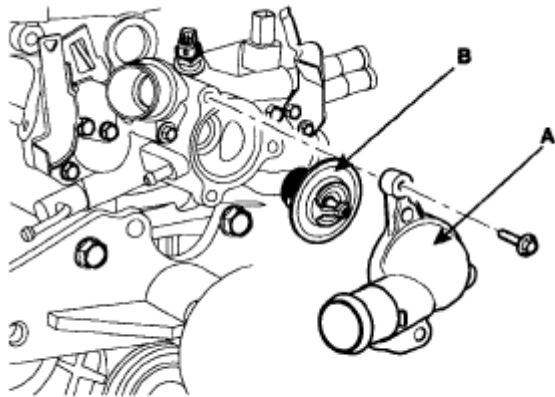
KCRF157A

Fig. 187: Identifying Water Pump
Courtesy of KIA MOTORS AMERICA, INC.

THERMOSTAT

NOTE: Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. Drain engine coolant so its level is below thermostat.
2. Remove water inlet (A) and thermostat (B).



KCRF123A

Fig. 188: Identifying Water Inlet And Thermostat
Courtesy of KIA MOTORS AMERICA, INC.

INSPECTION

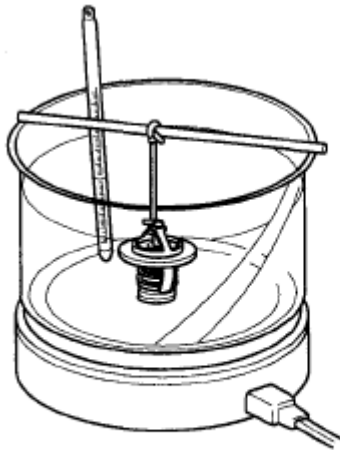
WATER PUMP

1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
2. Check the bearing for damage, abnormal noise and sluggish rotation, and replace the coolant pump assembly if necessary.
3. Check for coolant leakage. If coolant leaks from hole, the seal is defective. Replace the coolant pump assembly

NOTE: A small amount of "weeping" from the bleed hole is normal.

THERMOSTAT

1. Immerse the thermostat in water and gradually heat the water.



ECKD503B

Fig. 189: Identifying Thermostat In Water And Gradually Heat Water
Courtesy of KIA MOTORS AMERICA, INC.

2. Check the valve opening temperature.

Valve opening temperature: 82°C (177°F)

Full opening temperature: 95°C (205°F)

If the valve opening temperature is not as specified, replace the thermostat.

3. Check the valve lift.

Valve lift: 8mm (0.3in.) or more at 95°C (205°F)

If the valve lift is not as specified, replace the thermostat.

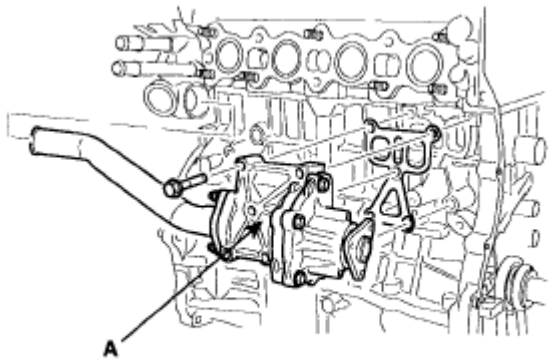
INSTALLATION

WATER PUMP

1. Install the water pump.
 1. Install the water pump (A) and a new gasket with the 5 bolts.

Tightening torque

19.6-26.46N.m (2.0-2.7kgf.m, 14.46-19.52lb-ft)



KCRF157A

Fig. 190: Identifying Water Pump

Courtesy of KIA MOTORS AMERICA, INC.

2. Install water inlet pipe nut.

Tightening torque

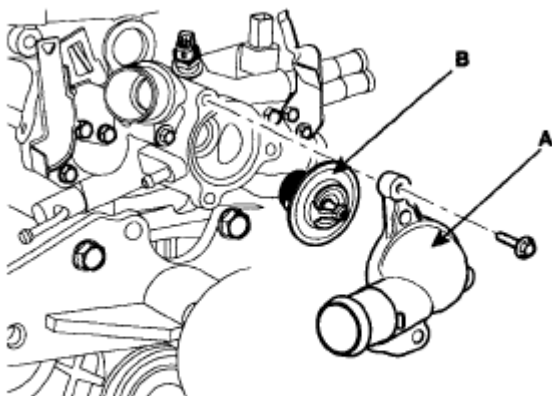
19.6-26.46N.m (2.0-2.7kgf.m, 14.46-19.52lb-ft)

3. Install exhaust manifold.
4. Install drive belt.
5. Fill with engine coolant.
6. Start engine and check for leaks.
7. Recheck engine coolant level.

THERMOSTAT

1. Place thermostat (B) in thermostat housing (A).

1. Install the thermostat with the jiggle valve up-ward.



KCRF123A

Fig. 191: Identifying Water Inlet And Thermostat
Courtesy of KIA MOTORS AMERICA, INC.

2. Install water inlet.

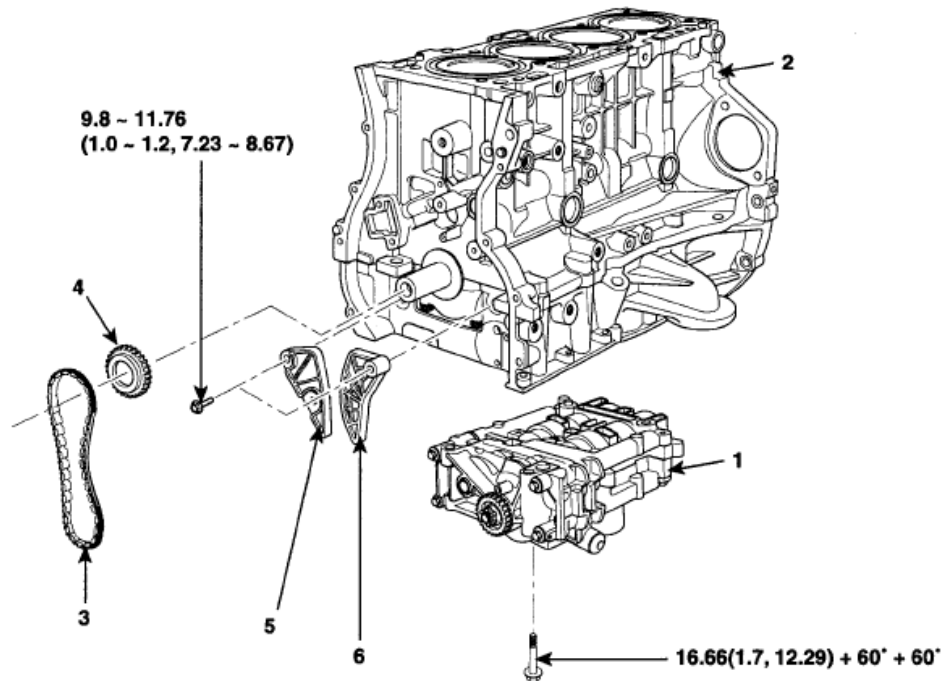
Tightening torque

14.7-21.56N.m (1.5-2.2kgf.m, 10.84-15.90lb-ft)

3. Fill with engine coolant.
4. Start engine and check for leaks.

LUBRICATION SYSTEM

COMPONENTS



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

- | | |
|-------------------------|--------------------------------------|
| 1. Balance shaft module | 4. Balance shaft chain sprocket |
| 2. Cylinder block | 5. Balance shaft chain guide |
| 3. Balance shaft chain | 6. Balance shaft chain tensioner arm |

SMGEM6019N

Fig. 192: Identifying Lubrication System Components
Courtesy of KIA MOTORS AMERICA, INC.

OIL AND FILTER**CAUTION:**

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.**

1. Drain engine oil.
 1. Remove the oil filter cap.
 2. Remove the oil drain plug, and drain the oil into a container.
2. Replace oil filter.
 1. Remove the oil filter.
 2. Check and clean the oil filter installation surface.
 3. Check the part number of the new oil filter is as same as old one.
 4. Apply clean engine oil to the gasket of a new oil filter.
 5. Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

Tightening torque

11.76-15.68N.m (1.2-1.6kgf.m, 8.67-11.57lb-ft)

3. Refill with engine oil filter.
 1. Clean and install the oil drain plug with a new gasket.

Tightening torque

39.2-44.1 N.m (4.0-4.5kgf.m, 28.9-32.5lb-ft)

2. Fill with fresh engine oil

Capacity

Total: 5.1 L (5.39US qt, 4.49imp qt)

Excluding oil filter: 4.0L (4.23US qt, 3.52imp qts)

Including oil filter: 4.3L (4.54US qt, 3.78imp qts)

4. Start engine and check for oil leaks.
5. Recheck engine oil level.

INSPECTION

1. Check engine oil quality

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

2. Check engine oil level.

After warming up the engine and then 5 minutes after the engine stop, oil level should be between the "L" and "F" marks on the dipstick.

If low, check for leakage and add oil up to the "F" mark.

NOTE: Do not fill with engine oil above the "F" mark.

SELECTION OF ENGINE OIL

Recommended API classification: SJ OR SL ABOVE

Recommended SAE viscosity grades: 5W-20

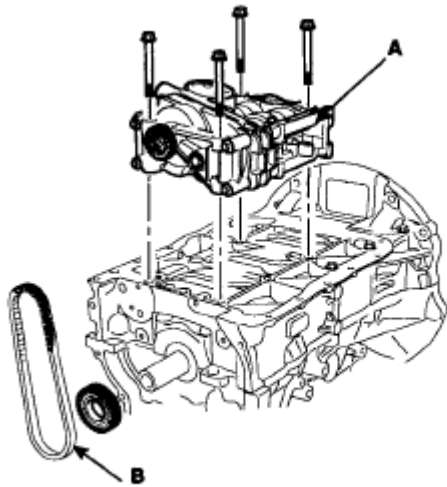
NOTE: For best performance and maximum protection of all types of operation, select only those lubricants which:

- **Satisfy the requirement of the API classification.**
- **Have proper SAE grade number for expected ambient temperature range.**

Lubricants that do not have both an SAE grade number and API service classification on the container should not be used.

REMOVAL

1. Drain engine oil.
2. Remove the drive belt.
3. Turn the crankshaft and align the white groove on the crankshaft pulley with the pointer on the lower cover.
4. Remove the oil pan.
5. Remove the timing chain.
6. Remove balance shaft chain (B) and balance shaft module (A).



KCRF165A

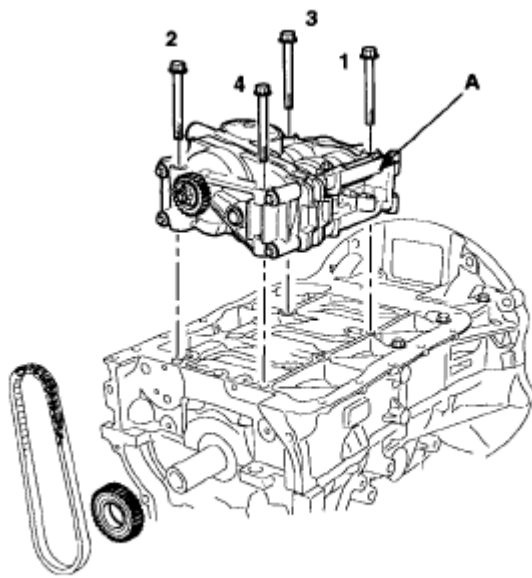
Fig. 193: Identifying Balance Shaft Chain And Balance Shaft Module
Courtesy of KIA MOTORS AMERICA, INC.

INSTALLATION

1. The key of crankshaft should be aligned with the mating face of main bearing cap. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.
2. Confirm the balance shaft module timing mark. Timing marks to be visually aligned with centers of adjacent cast timing notches.
3. Install balance shaft module (A) that the timing mark of balance shaft module sprocket should be matched with the timing mark (color link) of balance shaft chain.

Tightening torque

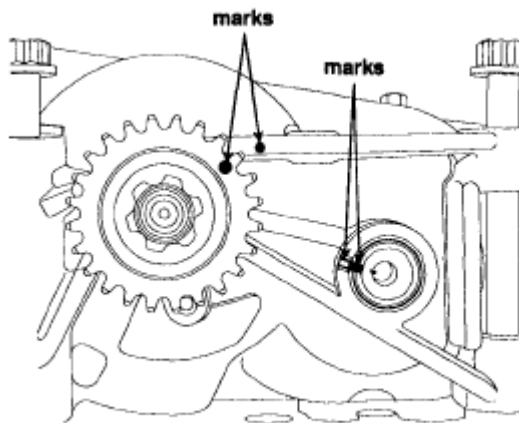
16.66N.m(1.7kgf.m, 12.3lb-ft) + 60° + 60°



KCRF165B

Fig. 194: Identifying Balance Shaft Module
Courtesy of KIA MOTORS AMERICA, INC.

4. Install the balance shaft chain guide.
5. Install the balance shaft tensioner arm.
6. Install the balance shaft tensioner and remove the set pin.
7. Install the timing set pin from the balance shaft module.
8. Confirm the timing marks.



ECRF006A

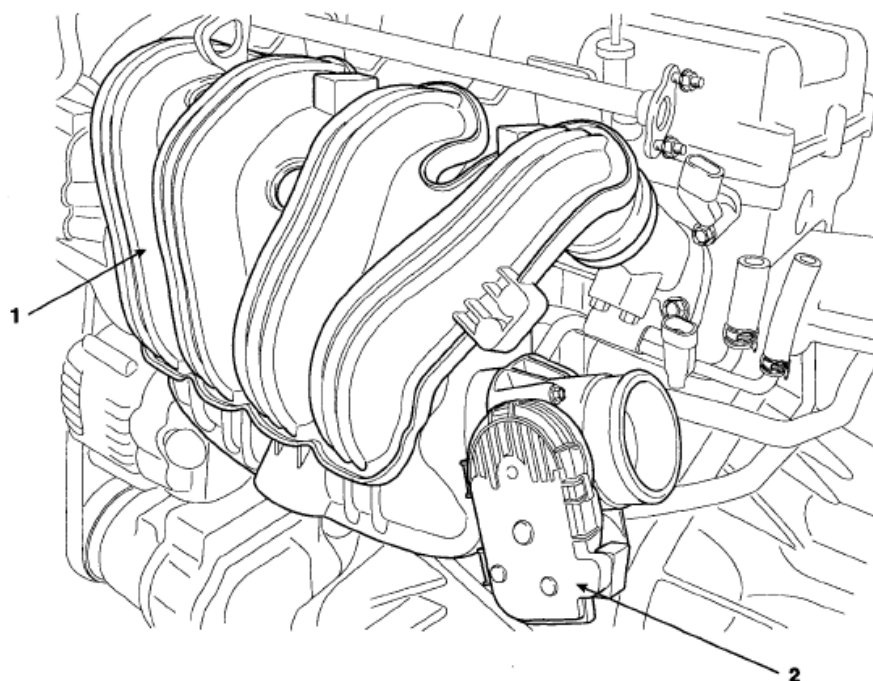
Fig. 195: Identifying Balance Shaft Module Timing Mark
Courtesy of KIA MOTORS AMERICA, INC.

9. Install oil pan.
10. Fill with engine oil.

INTAKE AND EXHAUST SYSTEM

COMPONENTS

INTAKE MANIFOLD

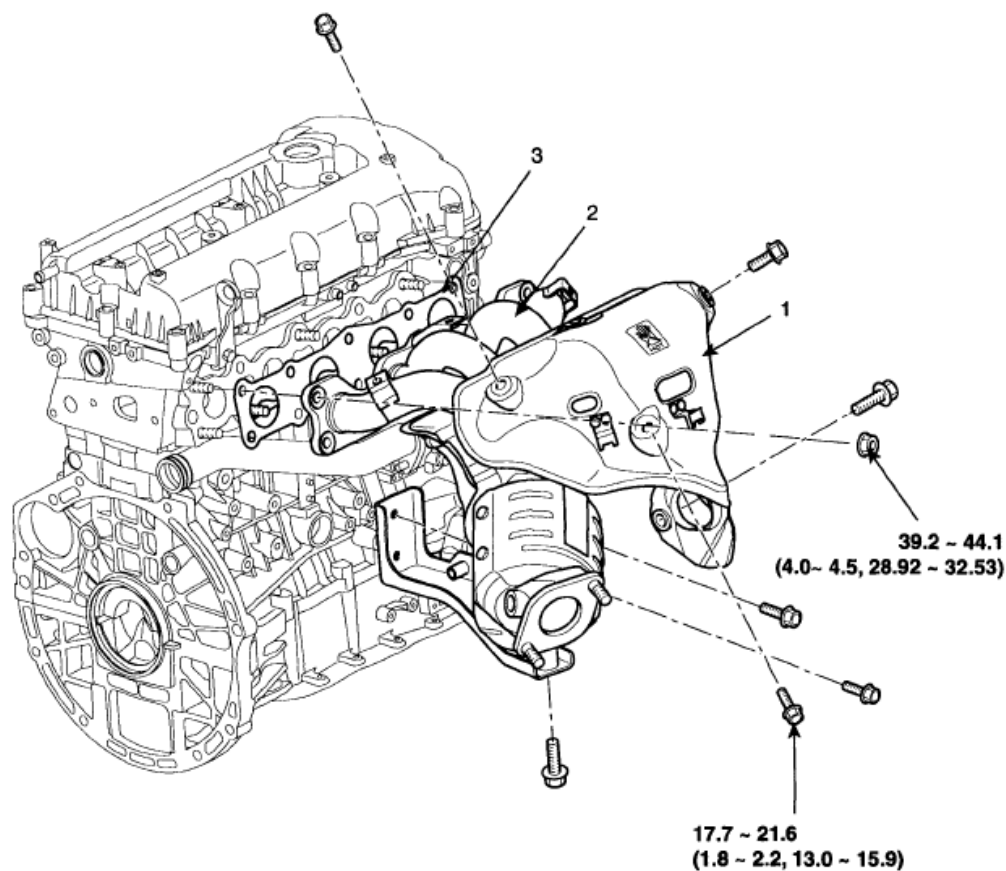


- 1. Intake manifold gasket
- 2. Electronic throttle body

SMGEM6002N

Fig. 196: Identifying Intake Manifold Components
Courtesy of KIA MOTORS AMERICA, INC.

EXHAUST MANIFOLD



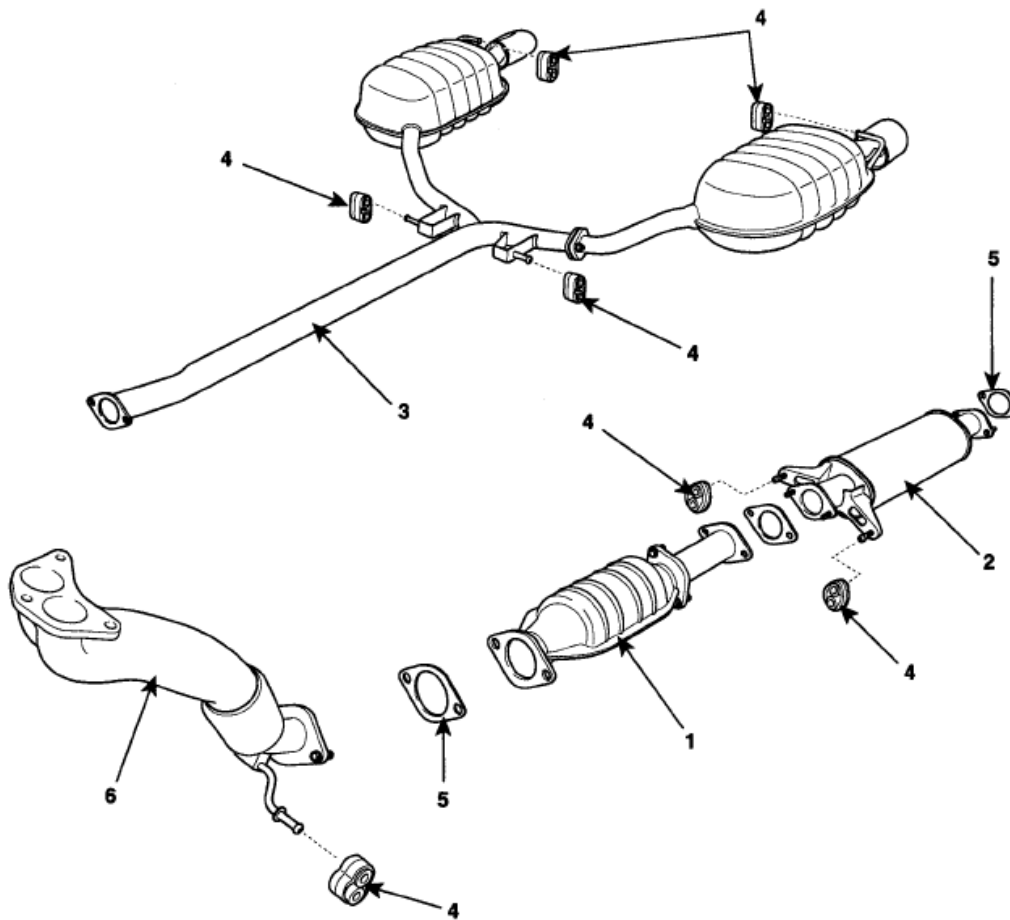
TORQUE : N.m (kgf.m, lb-ft)

1. Heat protector
2. Exhaust manifold
3. Exhaust manifold gasket

SMGEM6003N

Fig. 197: Identifying Exhaust Manifold Components
Courtesy of KIA MOTORS AMERICA, INC.

MUFFLER



1. Catalytic converter
2. Center muffler
3. Main muffler

4. Rubber hanger
5. Gasket
6. Front muffler

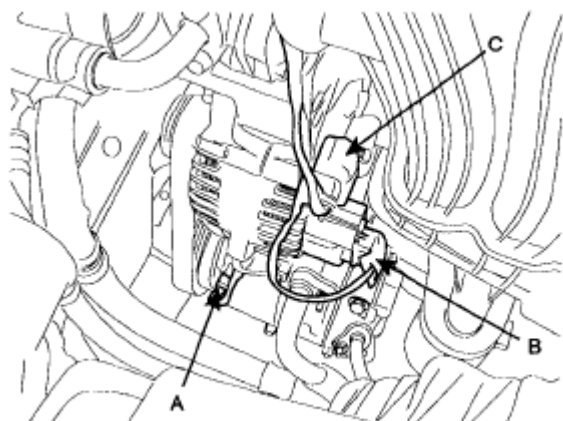
SMGEM6004N

Fig. 198: Identifying Muffler Components
Courtesy of KIA MOTORS AMERICA, INC.

REMOVAL

INTAKE MANIFOLD

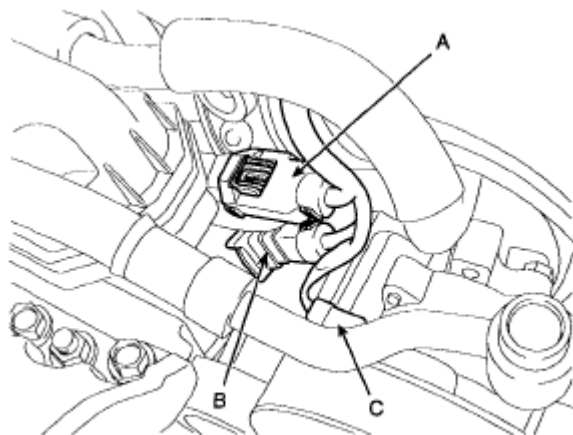
1. Remove the engine cover.
2. Remove the air cleaner assembly.
3. Remove the A/C switch connector (A), alternator connector (B) and oil pressure switch connector (C).



KCRF126A

Fig. 199: Identifying A/C Switch, Alternator Connector And Oil Pressure Switch
Courtesy of KIA MOTORS AMERICA, INC.

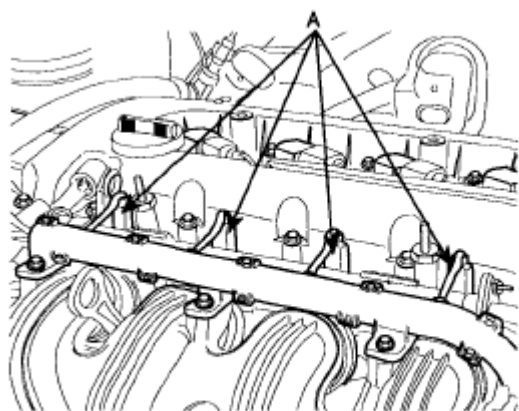
4. Remove the OCV connector (A), OTS connector (B), P/S switch connector (C).



ACLG004A

Fig. 200: Identifying OCV Connector, OTS Connector And P/S Switch Connector
Courtesy of KIA MOTORS AMERICA, INC.

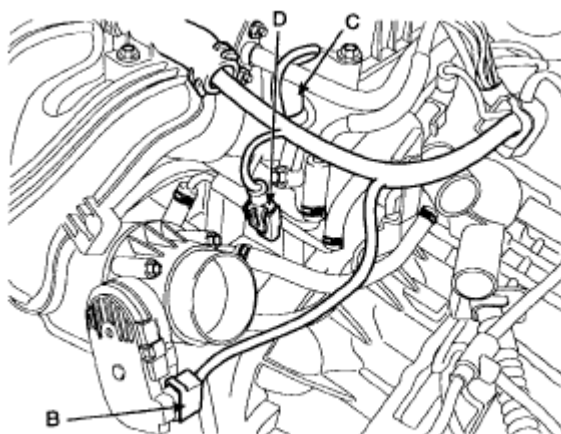
5. Remove the injector connector (A).



KCRF128A

Fig. 201: Identifying Injector Connectors
Courtesy of KIA MOTORS AMERICA, INC.

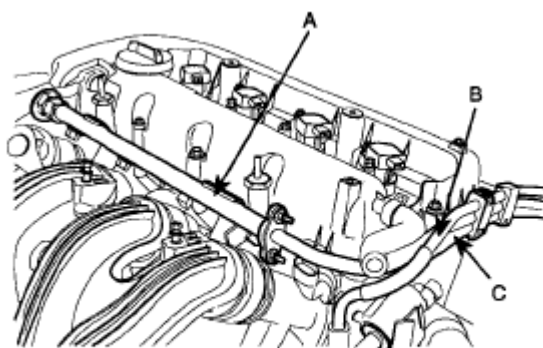
6. Disconnect the engine wire harness connectors.
 1. Remove the ETC connector (B), CMP connector (C), knock sensor connector (D).



ACLG005A

Fig. 202: Identifying ETC Connector, CMP Connector And Knock Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

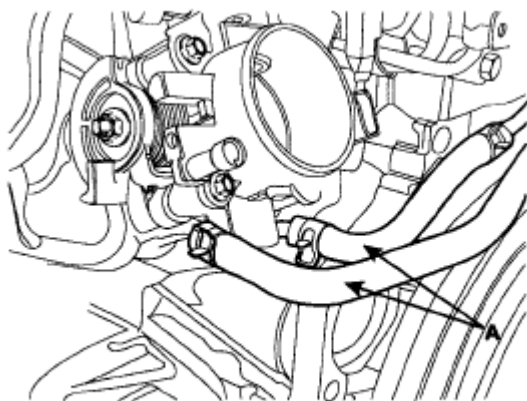
7. Remove the delivery pipe (A).



KCRF134A

Fig. 203: Identifying Delivery Pipe, Brake Vacuum Hose And PCSV Hose
Courtesy of KIA MOTORS AMERICA, INC.

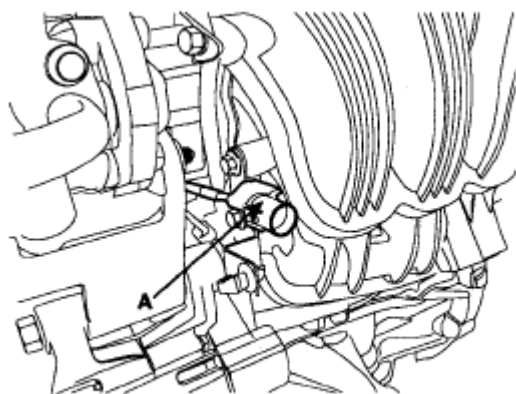
8. Remove the coolant hoses (A) from the throttle body.



KCRF141B

Fig. 204: Identifying Coolant Hoses From Throttle Body
Courtesy of KIA MOTORS AMERICA, INC.

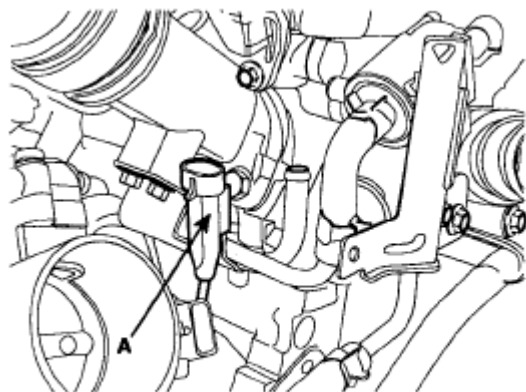
9. Remove the oil pressure switch connector (A) from the bracket.



KCRF141A

Fig. 205: Identifying Oil Pressure Switch Connector From Bracket
Courtesy of KIA MOTORS AMERICA, INC.

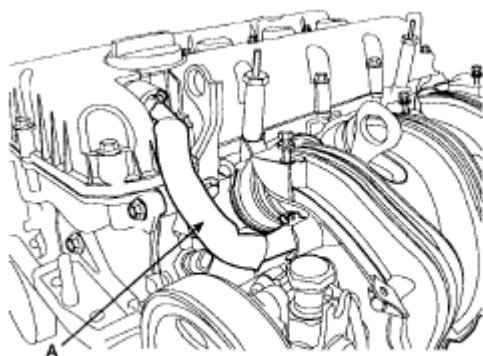
10. Remove the knock sensor connector (A) from the bracket.



KCRF141C

Fig. 206: Identifying Knock Sensor Connector From Bracket
Courtesy of KIA MOTORS AMERICA, INC.

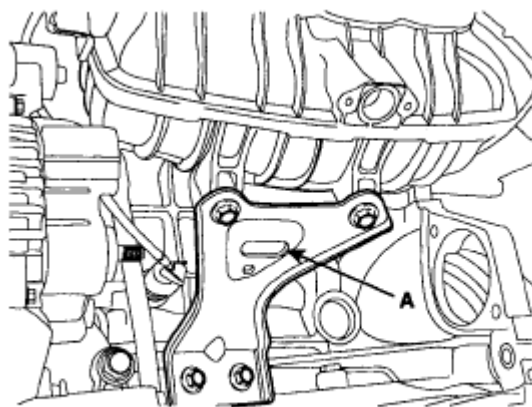
11. Remove the PCSV vacuum hose, brake vacuum hose.
12. Remove the PCV hose (A).



KCRF141E

Fig. 207: Identifying P.C.V Hose And Breather Hose From Cylinder Head Cover
Courtesy of KIA MOTORS AMERICA, INC.

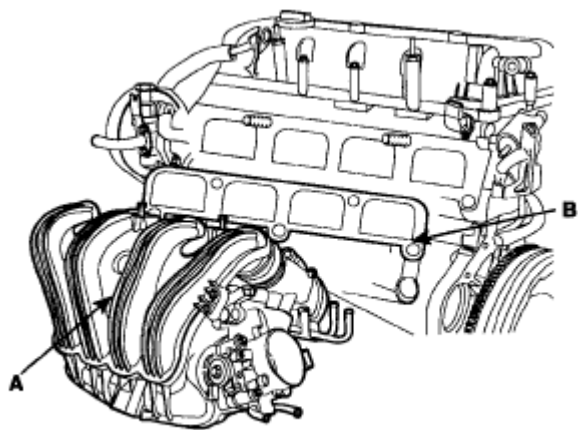
13. Remove the intake manifold stay (A).



KCRF141D

Fig. 208: Identifying Intake Manifold Stay
Courtesy of KIA MOTORS AMERICA, INC.

14. Remove the oil level gauge.
15. Remove the intake manifold (A) and gasket.

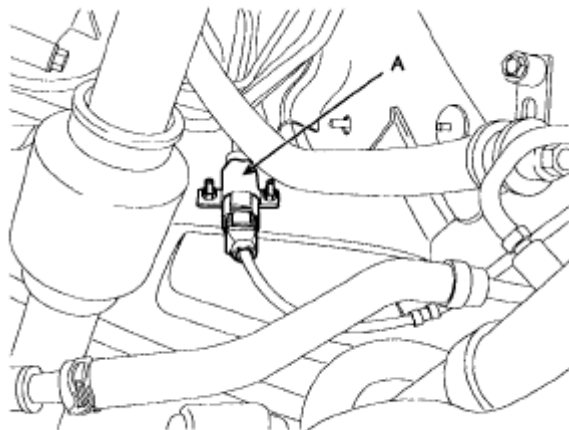


KCRF142A

Fig. 209: Identifying Intake Manifold And Gasket
Courtesy of KIA MOTORS AMERICA, INC.

EXHAUST MANIFOLD

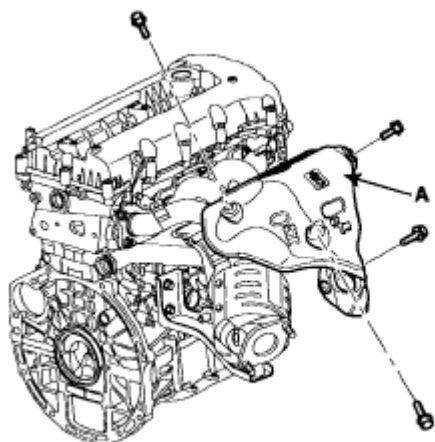
1. Remove the oxygen sensor connector (A).



ACLG008A

Fig. 210: Identifying Oxygen Sensor Connector
Courtesy of KIA MOTORS AMERICA, INC.

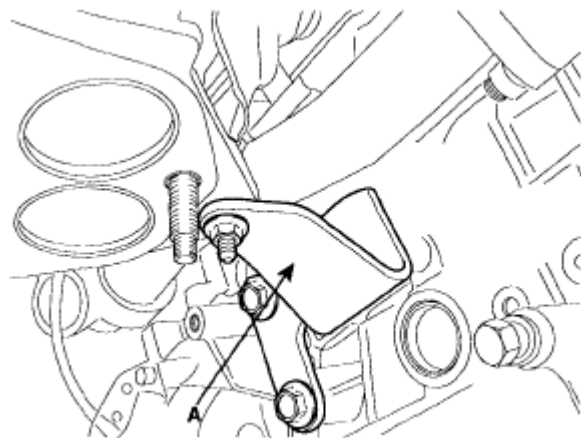
2. Remove the front muffler (A).
3. Remove the heat protector (A).



LCLG008A

Fig. 211: Identifying Front Muffler And Heat Protector
Courtesy of KIA MOTORS AMERICA, INC.

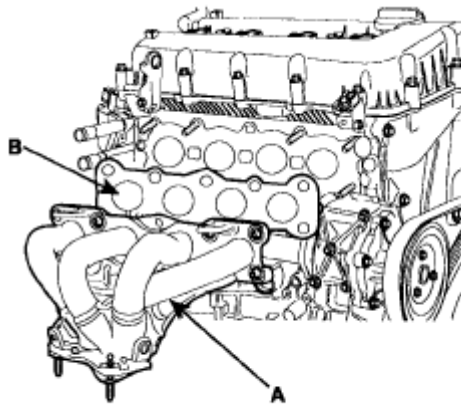
4. Remove the exhaust manifold stay (A).



ACRF019A

Fig. 212: Identifying Exhaust Manifold Stay
Courtesy of KIA MOTORS AMERICA, INC.

5. Remove the exhaust manifold (A) and gasket.



KCRF140A

Fig. 213: Identifying Exhaust Manifold And Gasket
Courtesy of KIA MOTORS AMERICA, INC.

INSTALLATION

INTAKE MANIFOLD

1. Install the intake manifold and gasket.

Tightening torque:

18.6-27.44N.m (1.9-2.8kgf.m, 13.7-20.2lb-ft)

2. Install the intake manifold stay.

Tightening torque:

18.6-27.44N.m (1.9-2.8kgf.m, 13.7-20.2lb-ft)

3. Install the PCV hose.
4. Install the PCSV vacuum hose, brake vacuum hose.
5. Install the knock sensor connector from the bracket.
6. Install the oil pressure switch connector from the bracket.
7. Install the coolant hoses from the throttle body.
8. Install the delivery pipe.
9. Install the engine wire harness connectors.
 1. Install the ETC connector, CMP connector, knock sensor connector.
10. Install the injector connector.
11. Install Remove the OCV connector, OTS connector, P/S switch connector.
12. Install the A/C switch connector, alternator connector and oil pressure switch connector.
13. Install the air cleaner assembly.

14. Install the engine cover.

EXHAUST MANIFOLD

1. Install the exhaust manifold.

Tightening torque:

39.2-44.1 N.m (4.0-4.5kgf.m, 28.92-32.53lb-ft)

2. Install the exhaust manifold stay.

Tightening torque:

Bolts: 18.6-27.44N.m (1.9-2.8kgf.m, 13.7-20.2lb-ft)

Nut: 42.2-52.0N.m (4.0-4.5kgf.m, 31.1-38.3lb-ft)

3. Install the heat protector.

Tightening torque:

17.7-21.6N.m (1.8-2.2kgf.m, 13.0-15.9lb-ft)

4. Install the front muffler.

Tightening torque:

39.2-58.8N.m (4.0-6.0kg-m, 28.92-43.37lb-ft)

5. Install the oxygen sensor connector