Engine (G4ED/G4EE - GSL 1.6/1.4)

EM

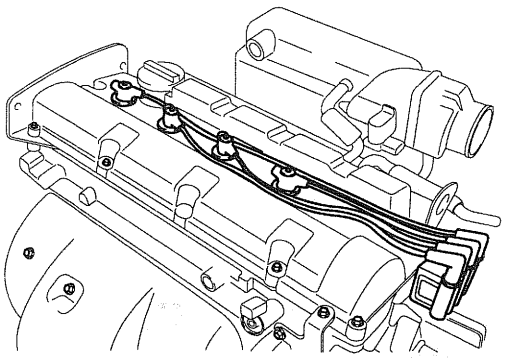
Description		Specifications		Limit
		1.4 DOHC	1.6 DOHC	
Side clearance	No.1 ring	0.04 ~ 0.085mm (0.0016 ~ 0.0033in)		0.1 mm (0.0039in)
	No.2 ring	0.04 ~ 0.085mm (0.0016 ~ 0.0033in)		0.1 mm (0.0039in)
	Oil ring	0.08 ~ 0.175mm (0.0031 ~ 0.0069in)		
End gap	No. 1 ring	0.20 ~ 0.35mm (0.0079 ~ 0.0138in)	0.15 ~ 0.30mm (0.0059 ~ 0.0118in)	1.0mm (0.0394in)
	No. 2 ring	0.37 ~ 0.52mm (0.0146 ~ 0.0205in)	0.35 ~ 0.50mm (0.0138 ~ 0.0197in)	1.0mm (0.0394in)
	Oil ring	0.20 ~ 0.70mm (0.0079 ~ 0.0276in)	0.20 ~ 0.70mm (0.0079 ~ 0.0276in)	1.0mm (0.0394in)
Piston pin				
Piston pin outer diameter		18.001 ~ 18.007mm (0.7087 ~ 0.7089in)		
Piston pin hole inner diameter		18.016 ~ 18.021mm (0.7093 ~ 0.7095in)		
Piston pin hole clearance		0.011 ~ 0.018mm (0.0004 ~ 0.0007in)		
Connecting rod small end hole inner diameter		17.974 ~ 17.985mm (0.7076 ~ 0.7081in)		
Connecting rod small end hole clearance		-0.033 ~ -0.016mm (-0.0013 ~ -0.0006in)		
Piston pin press-in load		500~1,500 kg (1,102 ~ 3,306 lb)		
Connecting rod				
Connecting rod big end inner diameter		48.000 ~ 48.018mm (1.8898 ~ 1.8905in)		
Connecting rod bearing oil clearance		0.018 ~ 0.036mm (0.0007 ~ 0.0014in)		
Side clearance		0.10 ~ 0.25mm (0.0039 ~ 0.0098in)		0.4mm (0.0157in)
Crankshaft				
Main journal outer diameter		49.950 ~ 49.968mm (1.9665 ~ 1.9672in)		
Pin journal outer diameter		44.954 ~ 44.972mm (1.7698 ~ 1.7705in)		
Main bearing oil clearance	No. 1, 2, 4, 5	0.022 ~ 0.040mm (0.0009 ~ 0.0016in)		0.1mm (0.0039in)
	No. 3	0.028 ~ 0.046mm (0.0011 ~ 0.0018in)		0.1mm (0.0039in)
End play		0.05 ~ 0.175mm (0.0020 ~ 0.0069in)		0.2mm (0.0079in)
Flywheel				
Runout		0.1mm (0.0039in)		0.13mm (0.0051in)
Oil pump				
Side clearance	Inner rotor	0.040 ~ 0.085mm (0.0016 ~ 0.0033in)		
	Outer rotor	0.040 ~ 0.090mm (0.0016 ~ 0.0035in)		
Body clearance		0.060 ~ 0.090mm (0.0024 ~ 0.0035in)		
Relief valve opening pressure		500±49.0kpa (5.1±0.5kg/cm², 72.5±7.1psi)		
Relief spring	Free length	46.6mm (1.8346in)		
	Load	6.1±0.4kg/40.1mm (13.4±0.9 lb/1.5787in)		
Engine oil				
Oil quantity (Total)		3.3 L (3.49 US qt, 2.90 Imp qt)		

COMPESSION PRESSURE INSPECTION EEF8AA76

NOTE

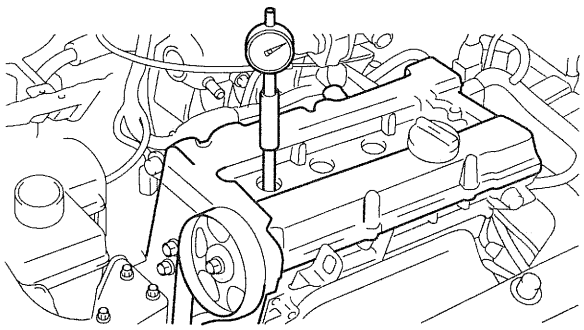
If the there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. Warm up and stop engine.
   Allow the engine to warm up to normal operating temperature.
2. Disconnect the ignition coil connectors and the spark plug cables. (Refer to EE group - ignition system)



KCPF020A

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



KDPC001B

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

NOTE

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

   4) Repeat step 1) through 3) for each cylinder.

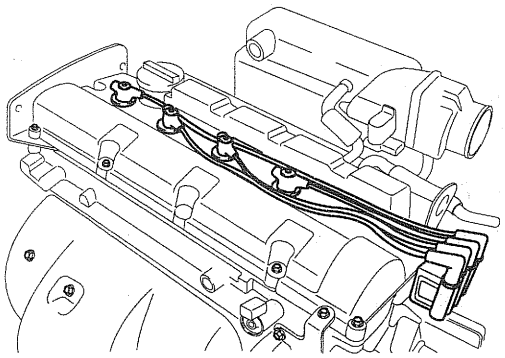
NOTE

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

Compression pressure Standard : 1,618kPa (16.5kg/cm², 235psi) (250~400 rpm) Minimum : 1,471kPa (15.0kg/cm², 213psi) Difference between each cylinder : 98kPa (1.0kg/cm², 14psi) or less

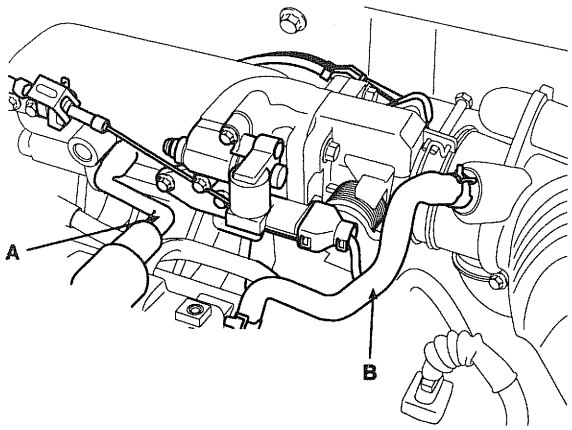
16. Remove the cylinder head cover.

1) Remove the ignition coil.



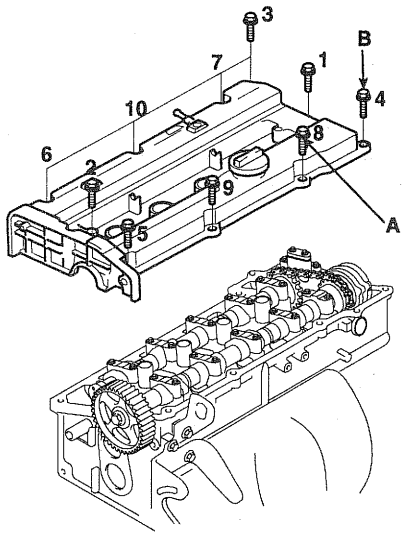
KCPF024A

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



KCPF025A

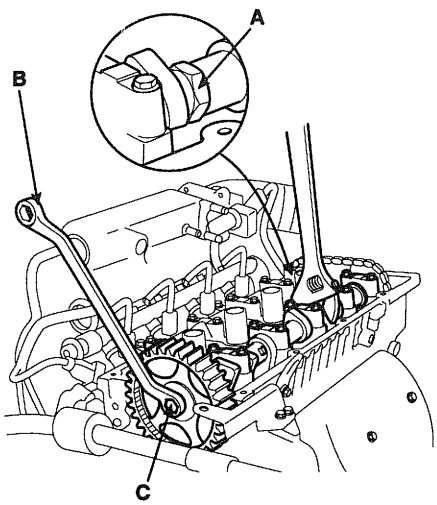
3) Loosen the cylinder head cover bolts(B) and then remove the cover(A) and gasket.



KCPF026A

17. Remove the camshaft sprocket.

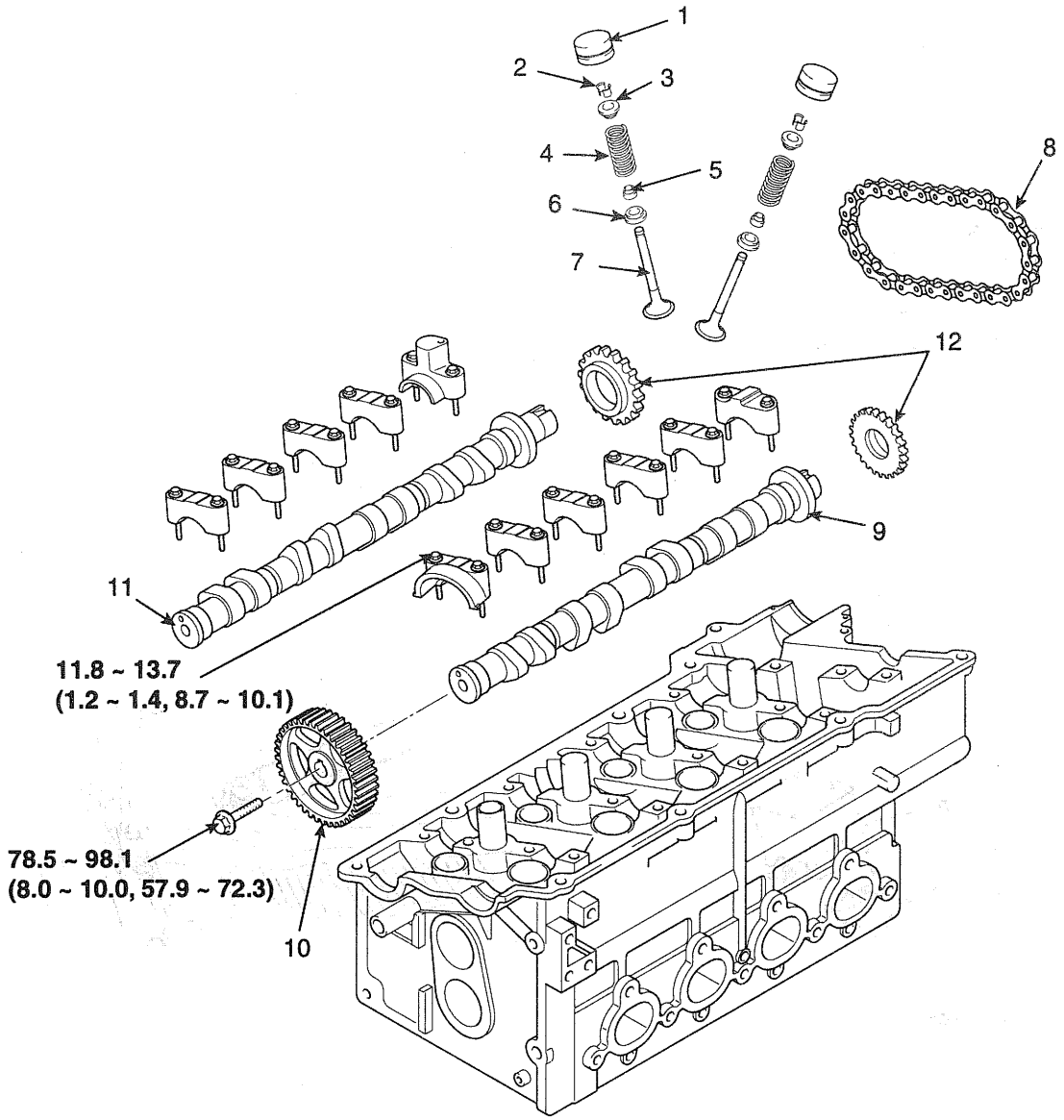
1) Hold the portion(A) of the camshaft with a hexagonal wrench, and remove the bolt(C) with a wrench(B) and remove the camshaft sprocket.



ADGE002A

⚠ ***CAUTION***

Be careful not to damage the cylinder head and valve lifter with the wrench.



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

1. HLA (Hydraulic Lash Adjuster)
2. Retainer lock
3. Retainer
4. Valve spring
5. Stem seal
6. Spring seat
7. Valve
8. Timing chain
9. Exhaust camshaft
10. Camshaft sprocket
11. Intake camshaft
12. Chain sprocket

ECPF003A

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

Valve stem- to-guide clearance
Standard
Intake : 0.03 ~ 0.06mm (0.0012 ~ 0.0024in)
Exhaust : 0.05 ~ 0.08mm (0.0020 ~ 0.0031in)
Limit
Intake : 0.10mm (0.0039in)
Exhaust : 0.15mm (0.0059in)

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

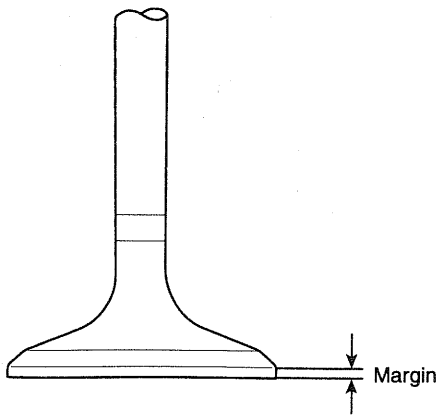
2. Inspect the valves.

1) Check the valve is ground to the correct valve face angle.

2) Check that the surface of 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 : 1.1mm (0.0433in)
Exhaust : 1.3mm (0.0512in)
Limit
Intake : 0.8mm (0.0315in)
Exhaust : 1.0mm (0.0394in)



ECKD221A

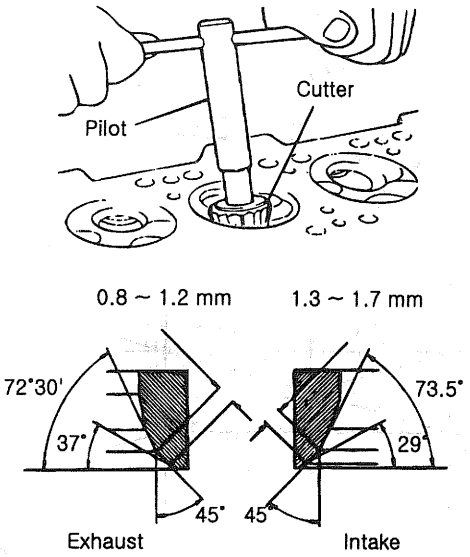
4) Check the surface of valve stem tip for wear.
If the valve stem tip is worn, replace the valve.

3. Inspect the valve seats.

1) Check the valve seat for evidence of overheating and improper contact with the valve face.
Replace the seat if necessary.

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

3) Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should be within specifications and centered on the valve face.



LCGE005A

REASSEMBLY E12B1DA8

NOTE

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

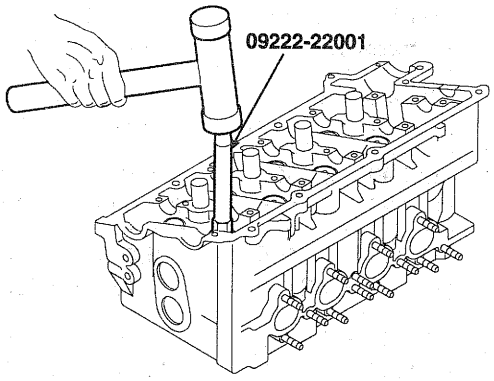
1. Install the valves.

   1) Install the spring seats.

   2) Using the SST (09222 - 22001), push in a new oil seal.

NOTE

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



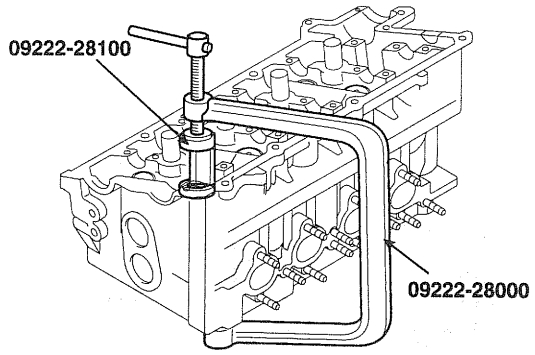
KCPF043A

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

NOTE

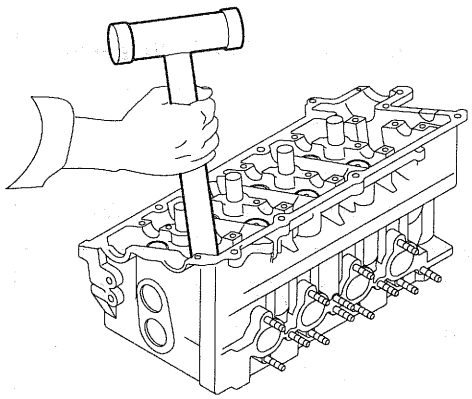
Place the valve springs so that the side coated with enamel faces toward the valve spring retainer and then installs the retainer.

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



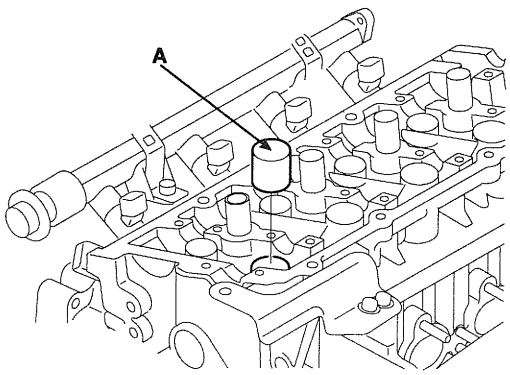
KCPF044A

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



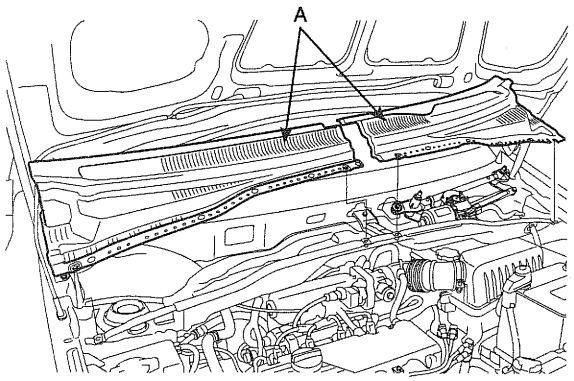
KCPF050A

2. Install the HLA(Hydraulic Lash Adjuster)s. Check that the HLA rotates smoothly by hand.



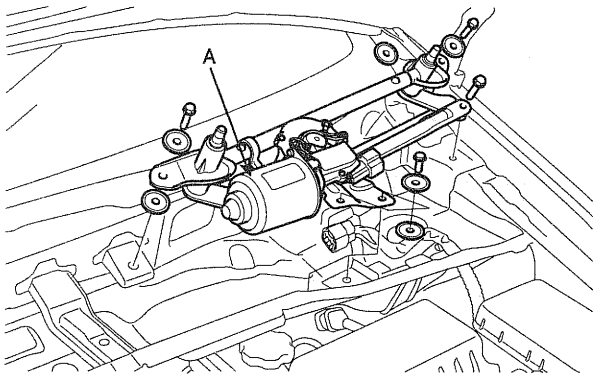
ECKD217A

6. Remove the cowl top cover(A).



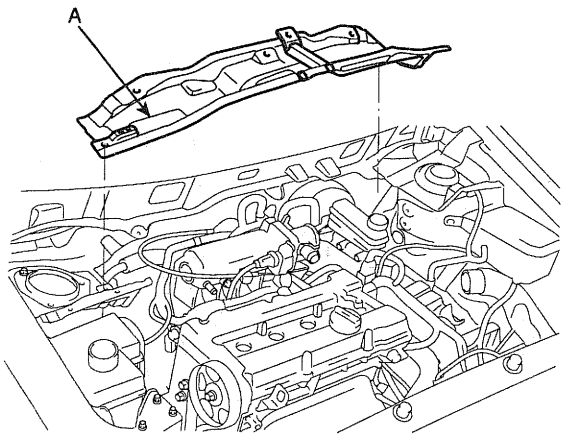
KCPF033A

7. Remove the wiper motor link assembly (A).



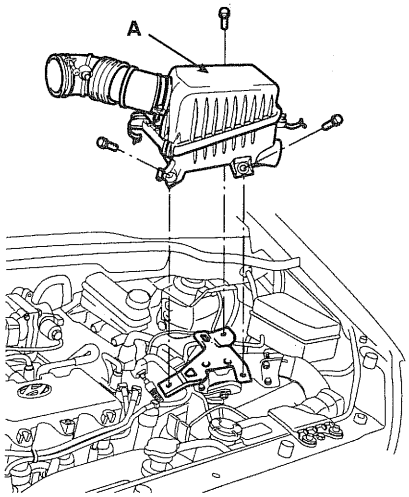
KCPF034A

8. Remove the cowl under panel (A).



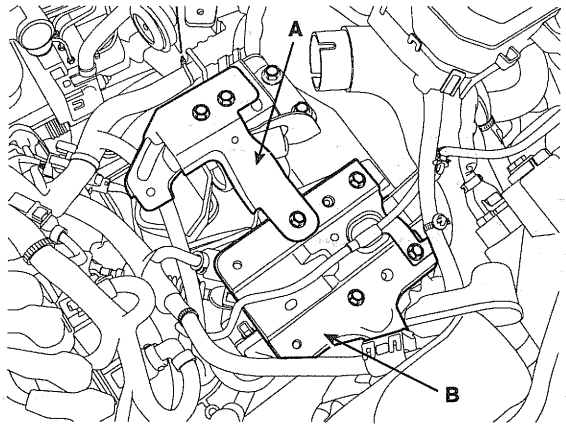
KCPF035A

9. Remove the air cleaner assembly (A).



KCPF036A

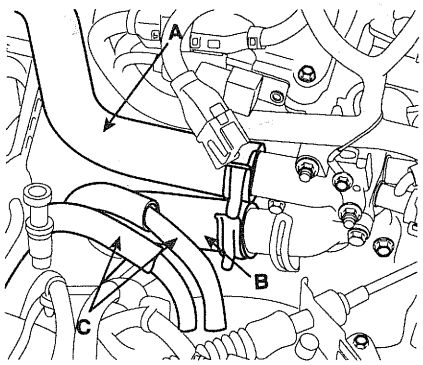
10. Remove the air cleaner bracket(A) and battery tray bracket(B).



KCPF004A

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

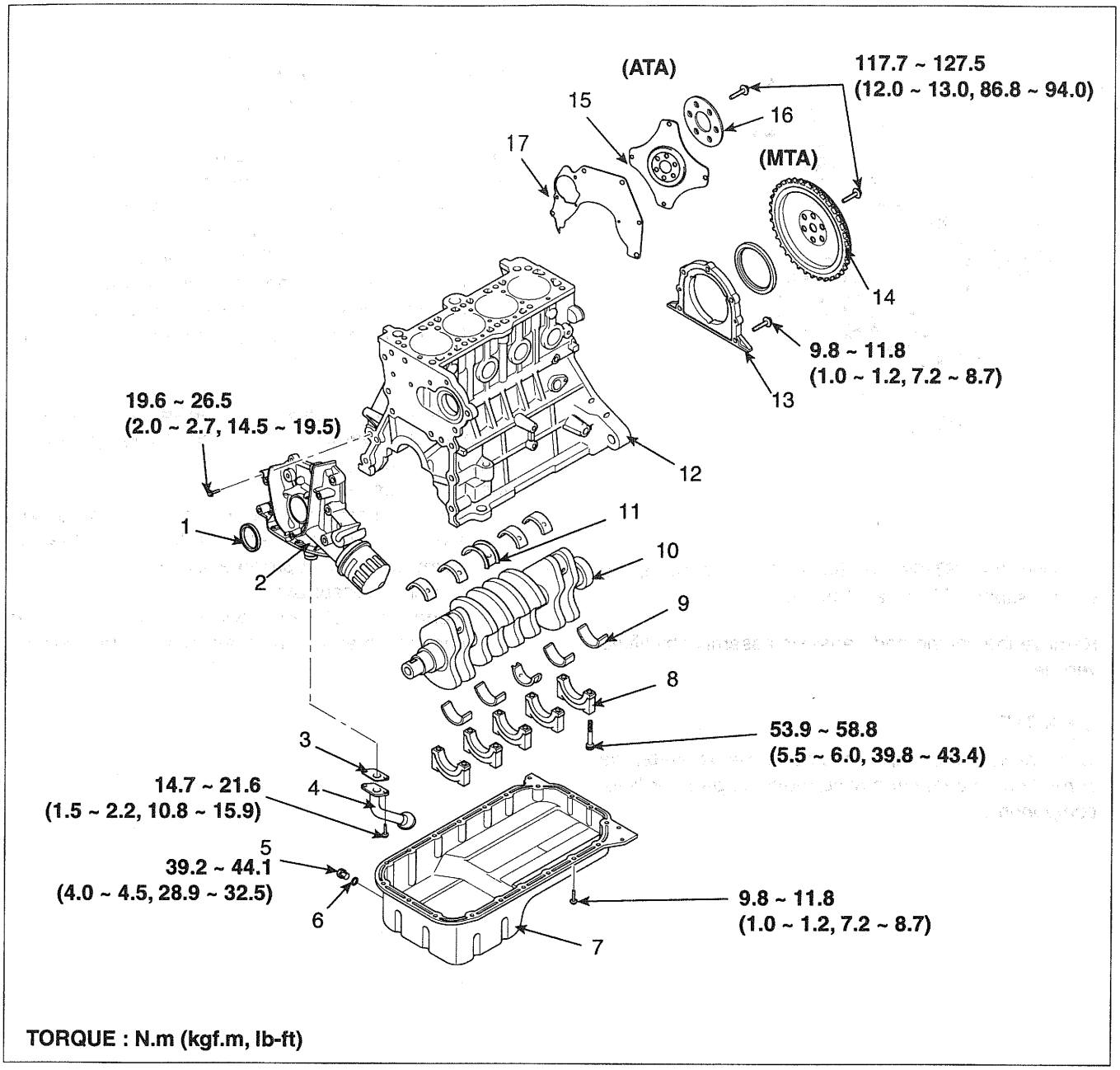
12. Remove the ATF oil cooler hoses(C).



KCPF051A

ENGINE BLOCK

COMPONENT ECFECE33



1. Oil seal
2. Front case
3. Gasket
4. Oil screen
5. Drain plug
6. Gasket
7. Oil pan
8. Main bearing cap
9. Main bearing
10. Crankshaft
11. Center bearing
12. Cylinder block
13. Rear oil seal case
14. Flywheel
15. Drive plate
16. Washer
17. Rear plate

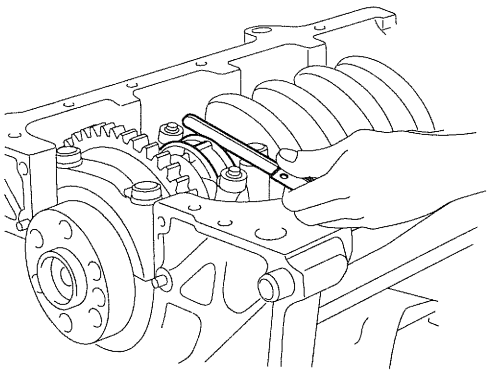
LCJF008A

INSPECTION E762AAE1

CONNECTING ROD AND CRANKSHAFT

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

End play
Standard : 0.1 ~ 0.25mm (0.0039 ~ 0.0098in)
Maximum : 0.4mm (0.0157in)



EDKD145A

- If out-of-tolerance, install a new connecting rod.
- If still out-of-tolerance, replace the crankshaft.

2. Check the connecting rod bearing oil clearance.
   1) Check the match marks on the connecting rod and cap are aligned to ensure correct reassembly.
   2) Remove the 2 connecting rod cap nuts.
   3) Remove the connecting rod cap and lower bearing.
   4) Clean the crankshaft pin journal and bearing.
   5) Place a plastigage across the crankshaft pin journal.
   6) Reinstall the lower bearing and cap, and tighten the nuts.

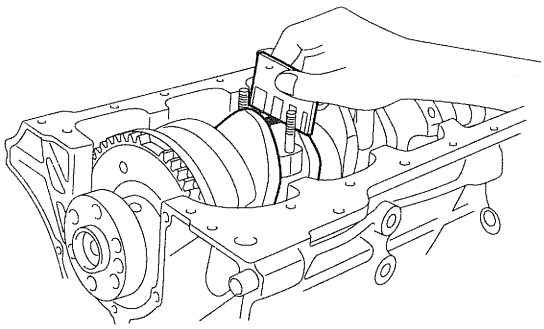
Tightening torque :
31.4 ~ 34.3N.m (3.2 ~ 3.5kgf.m, 23.1 ~ 25.3lb-ft)

NOTE

Do not turn the crankshaft.

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

Standard oil clearance
0.018 ~ 0.036mm (0.0007 ~ 0.0014in)



ECKD309A

   9) If the plastigage measures too wide or too narrow, remove the upper and lower bearing and then install a new bearings with the same color mark. (Refer to EM - 65, connecting rod bearing selection table)
      Recheck the oil clearance.

CAUTION

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

   10) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing. (Refer to EM - 65, connecting rod bearing selection table)
       Recheck the oil clearance.

NOTE

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

CAUTION

If the 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.

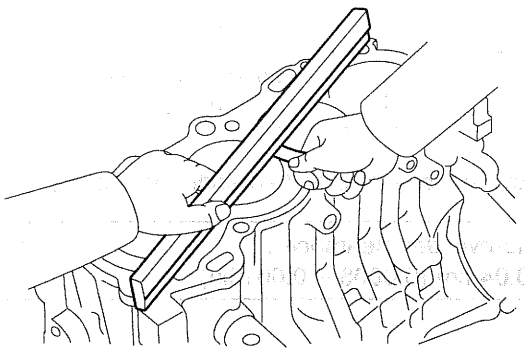
CYLINDER BLOCK

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

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

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

Flatness of cylinder block gasket surface
Standard : Less than 0.05mm (0.0020in)

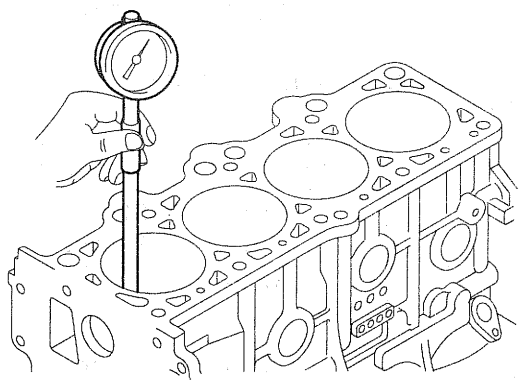


ECKD001L

4. Inspect the cylinder bore.
   Visually check the cylinder for vertical scratchs.
   If deep scratchs are present, replace the cylinder block.

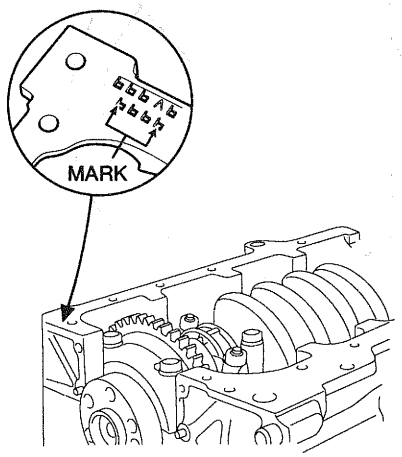
5. Inspect the cylinder bore diameter.
   Using a cylinder bore gauge, measure the cylinder bore diameter at position in the thrust and axial direction.

Standard diameter :
1.6 DOHC : 76.50 ~ 76.53mm (3.0118 ~ 3.0130in)
1.4 DOHC : 75.50 ~ 75.53mm (2.9724 ~ 2.9736in)



ECKD318A

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



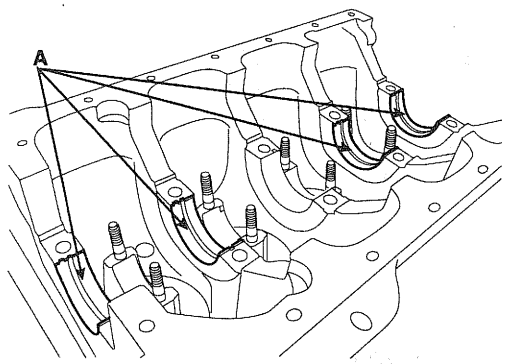
LCGE010A

4. Install the crankshaft main bearings.

NOTE

Upper bearings have an oil groove of oil holes ; Lower bearings do not.

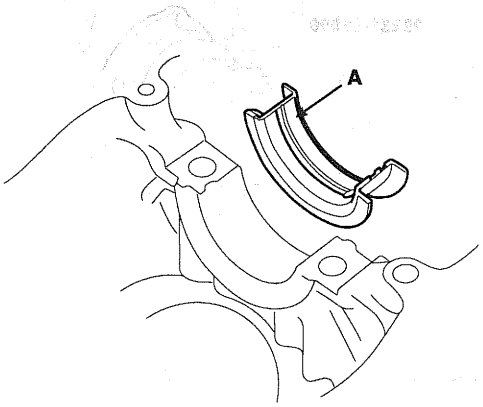
1) Align the bearing claw with the claw groove of the cylinder block, push in the 4 upper bearings(A).



EDKD149A

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

5. Install the center bearing.
Install the center bearing(A) under the No.3 journal position of the cylinder block with the oil grooves facing outward.



EDKD150A

6. Place the crankshaft on the cylinder block.

7. Place the main bearing caps on the cylinder block.

8. Install the main bearing cap bolts.

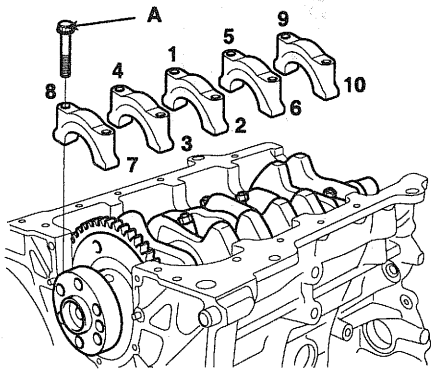
NOTE

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

1) Apply a light coat of engine oil on the threads and under the bearing cap bolts.

2) Install and uniformly tighten the 10 bearing cap bolts(A),in several passes, in the sequence shown.

Tightening torque :
53.9 ~ 58.8N.m (5.5 ~ 6.0kgf.m, 39.8 ~ 43.4lb-ft)



ADGE063A

3) Check that the crankshaft turns smoothly.

9. Check the crankshaft end play. (Refer to EM - 68)

10. Install the piston and connecting rod assemblies.

NOTE

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

1) Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts

2) Install the ring compressor, check that the rings are securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.

ENGINE COOLANT REFILLING AND BLEEDING E8D464DF

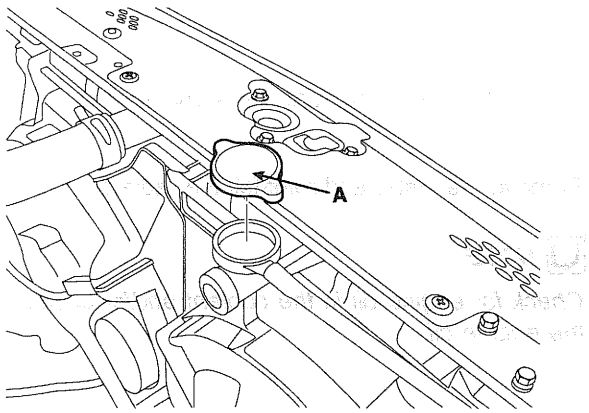
WARNING

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

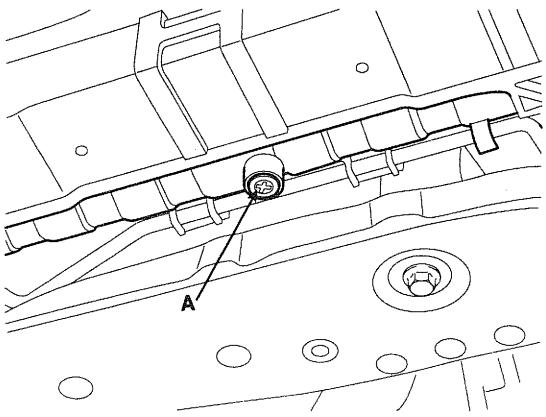
When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on the electrical parts of the paint. If any coolant spills, rinse it off immediately.

1. Slide the heater temperature control lever to maximum heat. Make sure the engine and radiator are cool to the touch.
2. Remove the radiator cap(A).



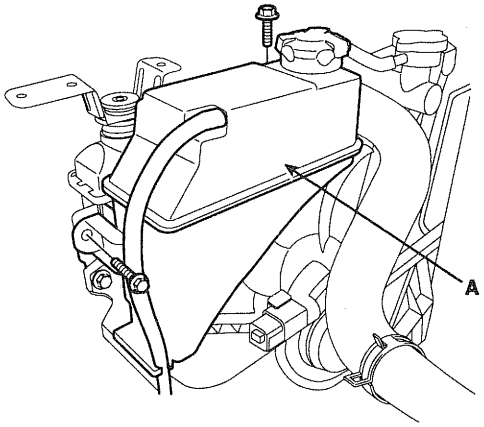
ACJF034A

3. Loosen the drain plug(A), and drain the coolant.



ACJF036A

4. Tighten the radiator drain plug(A) securely.
5. Remove the coolant reservoir tank. Drain the coolant and reinstall the coolant reservoir tank. Fill the coolant reservoir tank to the MAX mark with the coolant.



KCPF016A

6. Fill the coolant into the radiator to the base of filler neck. Gently squeeze the upper/lower hoses of radiator so as to bleed air easily.

NOTE

- *Mix the recommended antifreeze with an equal amount of water in a clean container.*
- *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 of freezing.*
- *Coolant concentrations greater then 60% will impair cooling efficiency and are not recommended.*

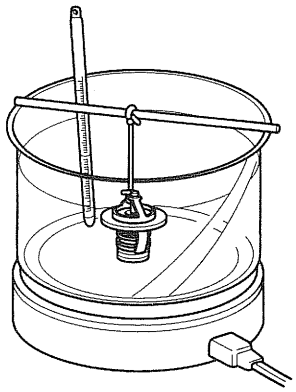
CAUTION

- ***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 allow coolant to circulates. When the cooling fan operates and coolant circulates, refill coolant through the radiator filler neck.
8. Repeat 7 until the cooling fan 3~5 times 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.

THERMOSTAT

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



ECKD503B

2. Check the valve opening temperature.

Valve opening temperature : 82±1.5°C (179.6±2.7°F)
Full opening temperature : 95°C (203°F)

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

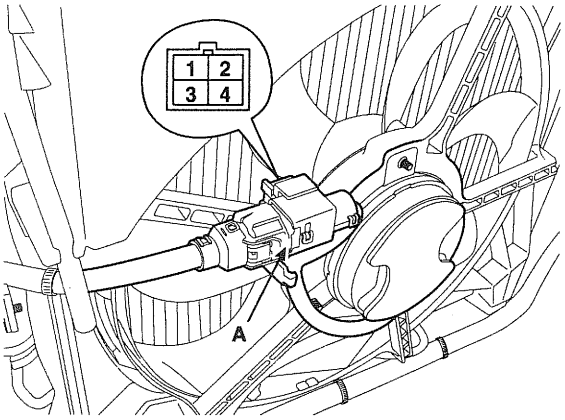
3. Check the valve lift.

Valve lift : 8mm(0.3in) or more at 95°C (203°F)

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

COOLING FAN (1 FAN TYPE)

1. Disconnect the cooling fan motor connector.



KCPF014A

2. Check that the radiator fan rotates when battery voltage is applied between the terminals.

Cooing fan inspection		Cooling fan motor connector				Action
		1	2	3	4	
Battery	+	O				Low speed
	-			O		
Battery	+		O			High speed
	-			O		

OIL AND FILTER REPLACEMENT EF6282B6

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 the engine oil.
   1) Remove the oil filler cap.
   2) Remove the oil drain plug, and drain the oil into a container.
2. Replace the 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.
   6) Tighten it an additional 3/4 turn.
3. Refill with engine oil.
   1) Clean and install the oil drain plug with a new gasket.

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

   2) Fill with fresh engine oil.

Oil Capacity
Total : 3.3 L (3.49 US qt, 2.90 Imp qt)
Oil pan : 3.0 L (3.17 US qt, 2.64 Imp qt)
Oil filter : 0.3 L (0.32 US qt, 0.26 Imp qt)

   3) Install the oil filler cap.
4. Start engine and check for oil leaks.
5. Recheck the engine oil level.

INSPECTION

1. Check the engine oil quality.
   Check the oil deterioration, entry of water, discoloring of thinning.
   If the quality is visibly poor, replace the oil.
2. Check the engine oil level.
   After warning up the engine and then 5 minutes after the engine stop, oil level should be between the "L" and "F" marks in 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.