

2008 Hyundai Tiburon GT

2008 ENGINE Engine Mechanical System (G4GC-GSL 2.0) - Tiburon

2008 ENGINE**Engine Mechanical System (G4GC-GSL 2.0) - Tiburon****GENERAL****SPECIFICATIONS****GENERAL SPECIFICATIONS**

Description		Specifications	Limit
General			
Type		In-line, Double Overhead Camshaft	
Number of cylinder		4	
Bore		82mm (3.228in)	
Stroke		93.5mm (3.681 in)	
Total displacement		1975cc (120.52cu.in)	
Compression ratio		10.1 : 1	
Firing order		1 - 3 - 4 - 2	
Valve timing			
Intake valve	Opens (ATDC)	11°	
	Closes (ABDC)	59°	
Exhaust	Opens (BBDC)	42°	
	Closes (ATDC)	6°	
Valve			
Valve length	Intake	114.34mm (4.5016in)	
	Exhaust	116.8mm (4.598in)	
Stem outer diameter	Intake	5.965 ~ 5.98mm (0.2348 ~ 0.2354in)	
	Exhaust	5.950 ~ 5.965mm (0.2343 ~ 0.2348in)	
Face angle thickness of valve head (Margin)			
Intake		1.6 ± 0.15mm (0.0630 ± 0.0059in)	0.8mm (0.031 in)
Exhaust		1.8 ± 0.15mm (0.0709 ± 0.0059in)	1.0mm (0.039in)
Valve stem to valve guide clearance			
Intake		0.02 ~ 0.05mm (0.0008 ~ 0.0019in)	0.10mm (0.0039in)
Exhaust		0.035 ~ 0.065mm (0.0014 ~ 0.0026in)	0.13mm (0.0051in)
Valve guide			
Installed dimension outer diameter	Intake	45.8~46.2mm (1.8031~1.8189in)	
	Exhaust	52.8~53.2mm (2.0787~2.0945in)	
		0.05, 0.25, 0.50mm (0.002, 0.010, 0.020in)	

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Service oversize		oversize	
Valve seat			
Width of seat contact	Intake	1.1 ~ 1.5mm (0.043 ~ 0.059in)	
	Exhaust	1.3 ~ 1.7mm (0.051 ~ 0.066in)	
Oversize		0.3, 0.6mm (0.012, 0.024in) oversize	
Valve spring			
Free length		48.86mm (1.9236in)	
Load		18.8k ± 0.9kg/39.0mm (41.4 ± 2.0lb/1.5354in) 41.0 ± 1.5kg/30.5mm (90.4 ± 3.3lb/1.2008in)	
Squareness		1.5° or less	
Valve clearance			
Cold (20°C[68°F])	Intake	0.20mm (0.0079in)	0.17~0.23mm (0.0067~0.0091 in)
	Exhaust	0.28mm (0.0110in)	0.25~0.31mm (0.0098~0.0122in)
Hot (80°C[176° F]): only for reference	Intake	0.29mm (0.014in)	
	Exhaust	0.34mm (0.0134in)	
Cylinder head			
Flatness of gasket surface		Max. 0.03mm (0.0012in)	0.06mm (0.0024in)
Flatness of manifold mounting surface		Max. 0.15mm (0.0059in)	0.03mm (0.0012in)
Oversize rework dimensions of valve seat hole			
Intake	0.3mm (0.012in) O.S.	33.300 ~ 33.325mm (1.3110 ~ 1.3120in)	
	0.6mm (0.024in) O.S.	33.600 ~ 33.625mm (1.3228 ~ 1.3238in)	
Exhaust	0.3mm (0.012in) O.S.	28.800 ~ 28.821mm (1.1338 ~ 1.1346in)	
	0.6mm (0.024in) O.S.	29.100 ~ 29.121mm (1.1456 ~ 1.1465in)	
Oversize rework dimensions of valve guide hole (both intake and exhaust)			
0.05mm (0.002in) O.S		11.05 ~ 11.068mm (0.435 ~ 0.4357in)	
0.25mm (0.010in) O.S		11.25 ~ 11.268mm (0.443 ~ 0.4436in)	
0.50mm (0.020in) O.S		11.50 ~ 11.518mm (0.453 ~ 0.4535in)	
Cylinder block			
Cylinder bore		82.00 ~ 82.03mm (3.2283 ~ 3.2295in)	
Out-of-round and taper of		Less than 0.01mm (0.0004in)	

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cylinder bore			
Clearance with piston (To set limits to new parts)		0.02 ~ 0.04mm (0.0008 ~ 0.0016in)	
Piston			
Outer diameter (To set limits to new parts)		81.97 ~ 82.00mm (3.2271 ~ 3.2283in)	
Service oversize		0.25, 0.50mm (0.010, 0.020in) oversize	
Piston ring			
Side clearance	No.1	0.04 ~ 0.08mm (0.0015 ~ 0.0031 in)	0.1mm (0.004in)
	No.2	0.03 ~ 0.07mm (0.0012 ~ 0.0027in)	
End gap	No.1	0.20 ~ 0.35mm (0.0079 ~ 0.0138in)	1mm (0.039in)
	No.2	0.37 ~ 0.52mm (0.0146 ~ 0.0205in)	1mm (0.039in)
Oil ring side rail		0.20 ~ 0.60mm (0.0078 ~ 0.0236in)	1mm (0.039in)
Service oversize		0.25, 0.50mm (0.010, 0.020in.) oversize	
Piston pin			
Outer diameter		20.001 ~ 20.006mm (0.7874 ~ 0.7876in)	
Hole inner diameter		20.016 ~ 20.021mm (0.7880 ~ 0.7882in)	
Hole clearance		0.010 ~ 0.020mm (0.0004 ~ 0.0008in)	
Connecting rod small end inner diameter		19.974 ~ 19.985mm (0.7864 ~ 0.7868in)	
Connecting rod			
Bend		0.05mm (0.0020in) or less	
Twist		0.1mm (0.004in) or less	
Connecting rod big end to crankshaft side clearance		0.100 ~ 0.250mm (0.0039 ~ 0.010in)	0.4mm (0.0157in)
Connecting rod bearing			
Oil clearance (To seat limits to new parts)		0.024 ~ 0.042mm (0.0009 ~ 0.0017in)	
Undersize		0.25mm (0.01 in)	
Camshaft			
Cam height	Intake	44.618mm (1.7566in)	44.518mm (1.7527in)
	Exhaust	44.518mm (1.7527in)	44.418mm (1.7487in)
Journal outer diameter		28mm (1.1023in)	
Bearing oil clearance		0.02 ~ 0.061mm (0.0008 ~ 0.0024in)	0.1mm (0.0039in)
End play		0.1 ~ 0.2mm (0.0040 ~ 0.0079in)	
Crankshaft			
Pin outer diameter		44.946 ~ 44.966mm (1.7695 ~ 1.7703in)	
Journal outer diameter		56.942 ~ 56.962mm (2.2418 ~ 2.2426in)	
Bend		0.03mm (0.0012in) or less	
Out-of-round, taper of journal and pin		0.01mm (0.0004in) or less	0.030mm (0.0012in)
End play		0.06 ~ 0.260mm (0.0023 ~ 0.010in)	

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Undersize rework dimension of pin	0.25mm (0.010in)	44.725 ~ 44.740mm (1.7608 ~ 1.7614in)	
Undersize rework dimension of journal	0.25mm (0.010in)	56.727 ~ 56.742mm (2.2333 ~ 2.2339in)	
Crankshaft bearing			
Oil clearance		0.028 ~ 0.046mm (0.0011. ~ 0.0018in)	
Flywheel			
Runout		0.1mm (0.0039in)	0.13mm (0.0051in)
Cooling method		Water-cooled, pressurized. Forced circulation with electrical fan	
Coolant			
Quantity		7 liter (7.4U.S qts, 6.16 Imp. qts)	
Radiator			
Type		Pressurized corrugated fin type	
Radiator cap			
Main valve opening pressure		93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm ² , 13.51 ~ 17.78psi)	
Vacuum valve opening pressure		MAX. 6.86 kpa (0.07kg/cm ² , 1.00 psi)	
Thermostat			
Type		Wax pellet type with jiggle valve	
Valve opening temperature		82°C (177°F)	
Valve closing temperature		77°C (170.6°F)	
Full-opening temperature		95°C (201°F)	
Coolant pump			
		Centrifugal type impeller	
Drive belt			
Type		V-ribbed belt	
Engine coolant temperature sensor			
Type		Heat-sensitive thermistor type	
Resistance		2.31 ~ 2.59kohms at 20°C (68°F) 0.3222kohms at 80°C (176°F)	
Oil pump			
Clearance between outer circumference and front case.		0.120 ~ 0.185mm (0.0049 ~ 0.0073in)	
Front case tip clearance		0.025 ~ 0.069mm (0.0009 ~ 0.0027in)	
Side clearance			
Inner gear		0.04 ~ 0.085mm (0.0016 ~ 0.0033in)	
Outer gear		0.04 ~ 0.09mm (0.0016 ~ 0.0035in)	
Engine oil pressure at 1500 RPM [Oil temperature is 90 to 110°C 194 to 230°F]		245KPa (2.5kg/cm ² , 35.5psi)	

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Engine oil

Oil quantity (Total)	4.1 L (4.33US qts, 3.60 Imp.qts)	When replacing a short engine or block assembly
Oil quantity (Oil pan)	3.7L (3.91 US qts, 3.26 Imp.qts)	When replacing an oil pan only
Oil quantity (Drain and refill including oil filter)	4.0L (4.23US qts, 3.52 Imp.qts)	
Oil quality	Above API SJ/SL or SAE 5W-20	

Relief spring

Free height	43.8mm (1.725in.)	
Load	3.7±0.4kg at 40.1mm (8.14±0.88lb/1.579in)	

Air cleaner

Type	Dry type	
Element		Unwoven cloth type

Exhaust pipe

Muffler	Expansion resonance type	
Suspension system	Rubber hangers	

SERVICE STANDARDS**SERVICE STANDARDS SPECIFICATIONS**

Standard value	
Antifreeze	Mixture ratio of anti-freeze in coolant
Ethylene glycol base for aluminum	50%

TIGHTENING TORQUES**TIGHTENING TORQUES SPECIFICATIONS**

Item	Nm	kgf.m	lb-ft
Cylinder Block			
Front engine support bracket bolt and nut	34.3 ~ 49.0	3.5 ~ 5.0	25.3 ~ 36.2
Front roll stopper bracket bolt	68.6 ~ 88.3	7.0 ~ 9.0	50.6 ~ 65.1
Rear roll stopper bracket bolt	68.6 ~ 88.3	7.0 ~ 9.0	50.6 ~ 65.1
Rear engine stopper bracket bolt	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.2
Engine Mounting			
Engine mounting insulator nut (large)	58.9 ~ 78.5	6.0 ~ 8.0	43.4 ~ 57.8
Engine mounting bracket bolts	39.2 ~ 49.1	4.0 ~ 5.0	28.9 ~ 36.2
Engine support bracket nuts & bolt	49.1 ~ 63.8	5.0 ~ 6.5	36.2 ~ 47.0

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Transmission insulator nut	88.3 ~ 107.9	9.0~11.0	65.1 ~ 79.5
Transmission insulator bracket to side member bolt	39.2 ~ 49.1	4.0 ~ 5.0	28.9 ~ 36.2
Rear roll insulator nut	49.1 ~ 63.8	5.0 ~ 6.5	36.2 ~ 47.0
Rear roll insulator bracket bolts	39.2 ~ 58.9	4.0 ~ 6.0	28.9 ~ 43.4
Front roll insulator nut	49.1 ~ 63.8	5.0 ~ 6.5	36.2 ~ 47.0
Front roll insulator bracket bolts	39.2 ~ 58.9	4.0 ~ 6.0	28.9 ~ 43.4
Main Moving			
Connecting rod cap nut	49.0 ~ 52.0	5.0 ~ 5.3	36.2 ~ 38.3
Crankshaft bearing cap bolt	27.5~31.4 + (60°~64°)	2.8~3.2 + (60°~64°)	20.3~23.1 + (60°~64°)
Fly wheel MAT bolt	117.7~ 127.5	12.0 ~13.0	86.8 ~ 94.0
Drive plate A/T bolt	117.7~127.5	12.0 ~ 13.0	86.8 ~ 94.0
Engine cover	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Heat protector	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~14.5
Water pipe bracket bolts	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Cooling system			
Alternator support bolt and nut	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Alternator lock bolt	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Alternator brace mounting bolt	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Coolant pump pulley bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Coolant pump bolts	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Coolant temperature sensor	19.6 ~ 39.2	2.0 ~ 4.0	14.5 ~ 28.9
Coolant inlet fitting nuts	14.7 ~ 19.6	1.5~2.0	10.8 ~ 14.5
Thermostat housing bolts and nuts	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Lubrication system			
Oil filter	11.8 ~ 15.7	1.2 ~ 1.6	8.7 ~ 11.6
Oil pan bolts	9.8 ~ 11.8	1.0 ~ 1.2.	7.2 ~ 8.7
Oil pan drain plug	39.2 ~ 44.1	4.0 ~ 4.5	28.9 ~ 32.5
Oil screen bolts	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Oil pressure switch	12.7 ~ 14.7	1.3 ~ 1.5	9.4 ~ 10.8
Intake and Exhaust system			
Air cleaner body mounting bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Resonator mounting bolts	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Intake manifold to cylinder head nuts and bolts	15.7 ~ 22.6	1.6 ~ 2.3	11.6 ~ 16.6
Intake manifold stay to cylinder block bolts	17.7 ~ 24.5	1.8 ~ 2.5	13.0 ~ 18.1
Throttle body to surge tank nuts	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Exhaust manifold to cylinder head nuts	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Exhaust manifold cover to exhaust manifold bolts	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5

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Oxygen sensor to front muffler	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 43.4
Oxygen sensor to exhaust manifold	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 43.4
Front exhaust pipe to exhaust manifold nuts	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Front exhaust pipe bracket bolts	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Front exhaust pipe to catalytic converter bolts	39.2 ~ 58.8	4.0~6.0	28.9 ~ 43.4
Main muffler hanger support bracket bolts	9.8 ~ 14.7	1.0 ~ 1.5	7.2 ~ 10.8
Cylinder head			
Cylinder head bolts - M10	22.6~26.5+(60°~65°)+(60°~65°)	2.3~2.7+(60°~65°)+(60°~65°)	16.6~19.5+(60°~65°)+(60°~65°)
Cylinder head bolts - M12.	27.5~31.4+(60°~65°)+(60°~65°)	2.8~3.2+(60°~65°)+(60°~65°)	20.3~33.1+(60°~65°)+(60°~65°)
Intake manifold nuts	17.7 ~ 24.5	1.8 ~ 2.5	13.0 ~ 18.1
Exhaust manifold nuts	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Cylinder head cover bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Camshaft bearing cap bolts	13.7 ~ 14.7	1.4 ~ 1.5	10.1 ~ 10.8
Oil control valve bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
OCV Filter	40.2 ~ 50.0	4.1 ~ 5.1	29.7 ~ 36.9
CVVT unit to exhaust camshaft bolt	64.7 ~ 76.5	6.6 ~ 7.8	47.7 ~ 56.4
Rear plate bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Timing Belt			
Crankshaft pulley bolt	156.9 ~ 166.7	16.0 ~ 17.0	115.7 ~ 123.0
Camshaft sprocket bolt	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Timing belt auto tensioner bolts	22.6 ~ 28.4	2.3 ~ 2.9	16.6 ~ 21.0
Timing belt cover bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2.
Front case bolts	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Timing belt idler bolt	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
M/T: Manual Transmission A/T: Automatic Transmission			

INSPECTION**COMPRESSION PRESSURE**

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

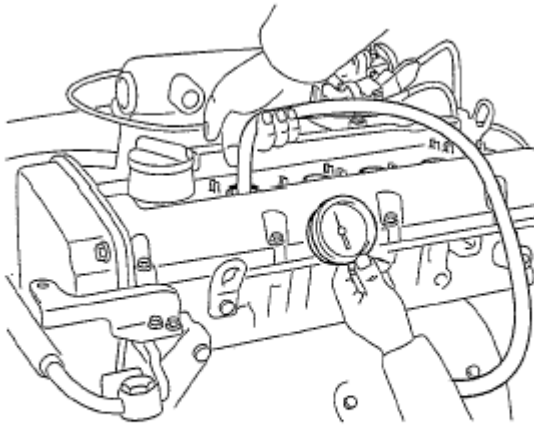
1. Warm up and stop engine.

Allow the engine to warm up to normal operating temperature.

2. Remove ignition coils. (Refer to **IGNITION SYSTEM**)
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.



ECKD001X

Fig. 1: Checking Cylinder Compression Pressure

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 250 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 :

1,420kPa (14.5kgf/cm² , 206psi)

Minimum pressure :

1,270kPa (13kgf/cm² , 184psi)

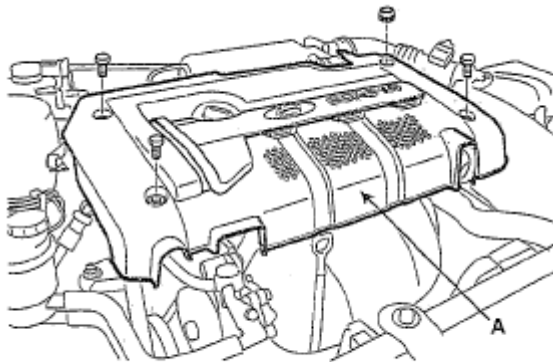
Difference between each cylinder:

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. (Refer to **IGNITION SYSTEM**)

TIMING BELT TENSION ADJUSTMENT

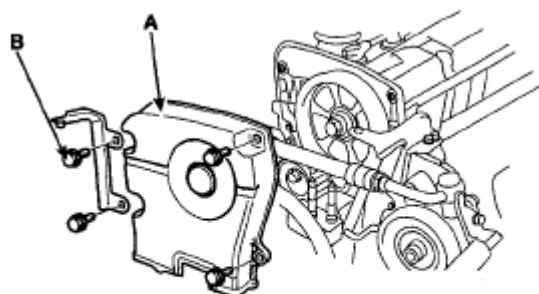
1. Remove the engine cover(A).



SGKEM7100N

Fig. 2: Identifying Engine Cover

2. Remove RH front wheel.
3. Remove the 4 bolts(B) and timing belt upper cover(A).



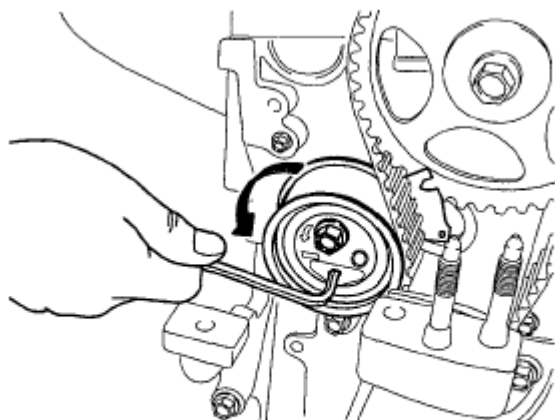
ECKD105A

Fig. 3: Identifying Timing Belt Upper Cover Bolts

4. Slacken the tensioner bolt.

NOTE: When check the timing belt tension or install the timing belt tensioner, must it the engine oil temperature is between 15°C (59°F) and 25°C (77°F).

5. Using a hex wrench, turn the adjuster counterclockwise to make the indicator of the arm (A) located at the center of the base notch.



SHDEM7002N

Fig. 4: Turning Adjuster Counterclockwise

CAUTION: Do not rotate the adjuster clockwise.
It will result in auto tensioner's functional problem.

6. Tightening tensioner bolt with fixing the indicator not to move.

Tightening torque

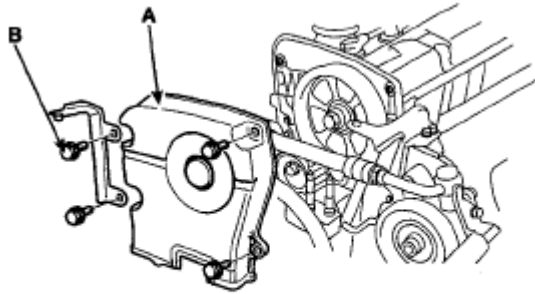
Tensioner bolt :

22.6 ~ 28.4Nm (2.3 ~ 2.9kg.m, 16.6 ~ 21.0lb-ft)

7. Turn the crankshaft two revolutions in the operating direction (clockwise) and check that the indicator is in the center of base.
8. If the indicator is not located at the center of base, slacken the bolt and repeat the above procedure.
9. Install the timing belt upper cover (A) with the four bolts (B).

Tightening torque :

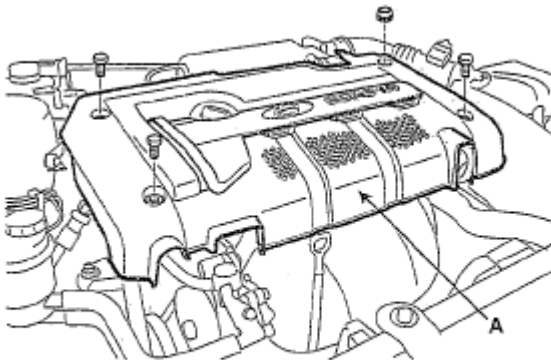
7.8 ~ 9.8Nm (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



ECKD105A

Fig. 5: Identifying Timing Belt Upper Cover Bolts

10. Install RH front wheel.
11. Install engine cover(A).



SGKEM7100N

Fig. 6: Identifying Engine Cover

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

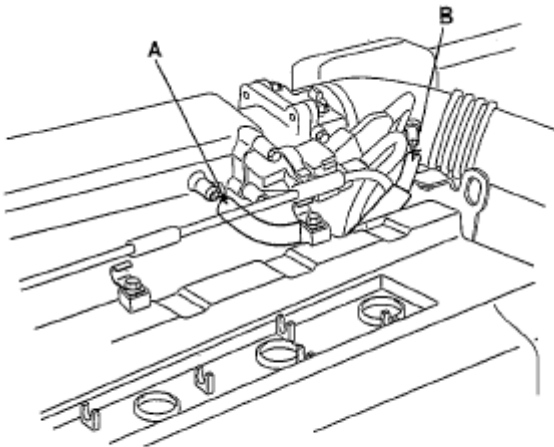
MLA (MECHANICAL LASH ADJUSTER)

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.
2. Remove the upper timing belt cover.
 1. Loosen the upper timing cover bolts and then remove the cover.
3. Remove the cylinder head cover.
 1. Disconnect the spark plug cables and do not pull on the spark plug by force.

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

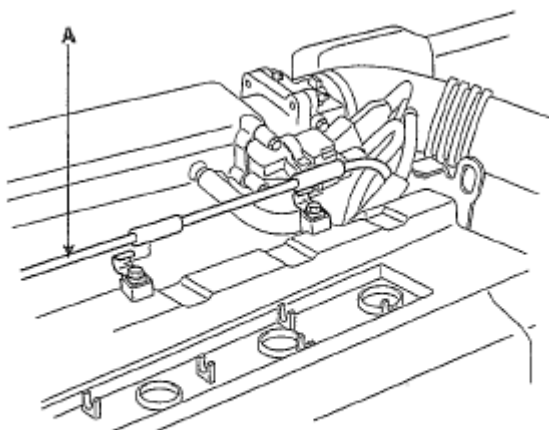
2. Disconnect the P.C.V hose(A) and the breather hose(B) from the cylinder head cover.



ECKD112A

Fig. 7: Identifying P.C.V Hose And Breather Hose

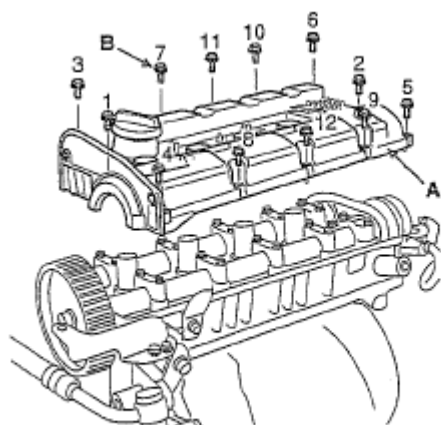
3. Disconnect the accelerator cable(A) from the cylinder head cover.



ECKD111A

Fig. 8: Identifying Accelerator Cable

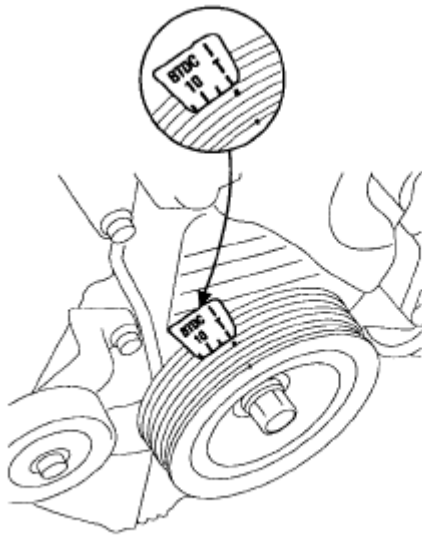
4. Loosen the cylinder head cover bolts(B) and then remove the cover(A) and gasket.



ADIE002A

Fig. 9: Identifying Cylinder Head Cover Bolts

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

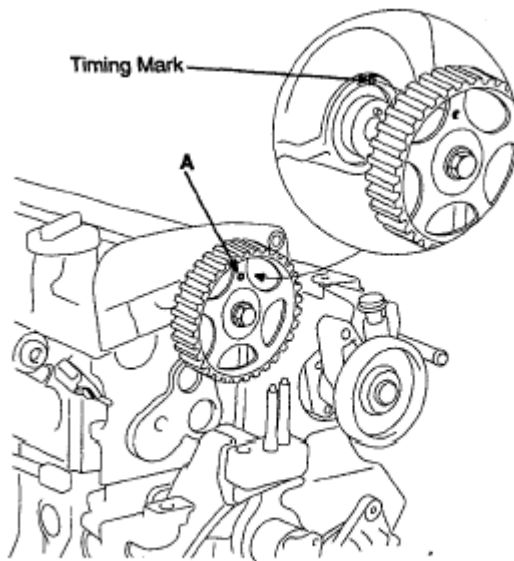


ECKD106A

Fig. 10: Identifying Timing Marks On Crankshaft Pulley

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

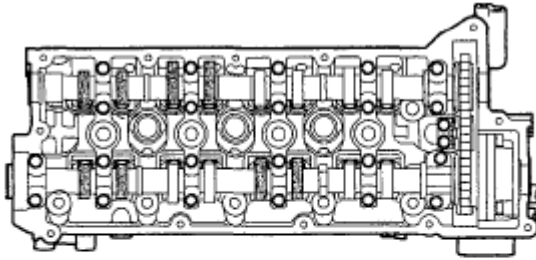
If not, turn the crankshaft one revolution (360°)



ECKD110B

Fig. 11: Identifying Timing Mark Of Bearing Cap

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



EDKD888B

Fig. 12: Identifying Valves

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

Valve clearance

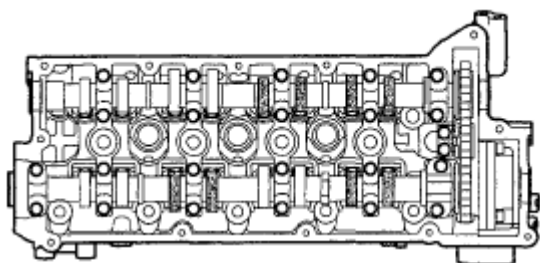
Specification Engine coolant temperature : 20°C

[68°F] Intake : 0.20mm (0.0079in.) Exhaust

: 0.28mm (0.0110in.)

Limit Intake : 0.12 ~ 0.28mm (0.0047 ~ 0.0110in.) Exhaust: 0.20 ~ 0.38mm (0.0079 ~ 0.0150in.)

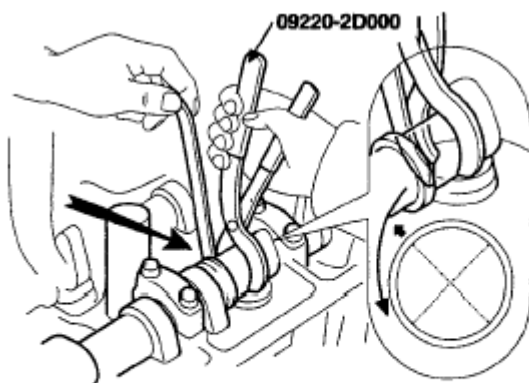
2. Turn the crankshaft pulley one revolution (360°) and align the groove with timing mark "T" of the lower timing belt cover.
3. Check only the valve indicated as shown. [No. 4 cylinder: TDC/Compression] measure the valve clearance.



EDKD886C

Fig. 13: Identifying Valves

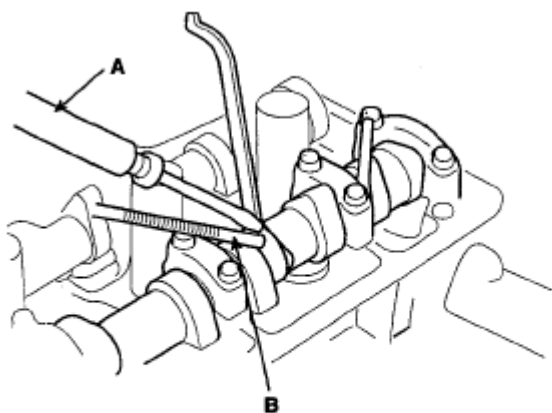
6. Adjust the intake and exhaust valve clearance.
 1. Turn the crankshaft so that the cam lobe of the camshaft on the adjusting valve is upward.
 2. Using the SST (09220-2D000), press down the valve lifter and place the stopper between the camshaft and valve lifter and remove the special tool.



EDKB689B

Fig. 14: Adjusting Intake And Exhaust Valve Clearance

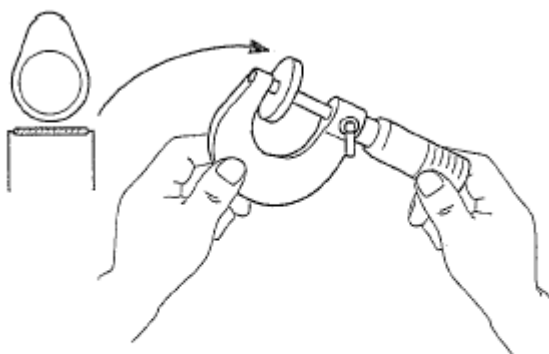
3. Remove the adjusting shim with a small screw driver(A) and magnet(B).



EDKB889C

Fig. 15: Removing Adjusting Shim With Small Screw Driver And Magnet

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



EDKB889D

Fig. 16: Measuring Thickness Of Removed Shim

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

Valve clearance (Engine coolant temperature : 20°C)

T: Thickness of removed shim

A: Measured valve clearance

N: Thickness of new shim

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

Exhaust: $N = T \pm [A - 0.28\text{mm} (0.0110\text{in.})]$

6. Select a new shim with a thickness as close as possible to the calculated value. [Refer to the Adjusting shim selection chart]

NOTE: Shims are available in 20 size increments of 0.04mm (0.0016in.) from 2.00mm (0.079in.) to 2.76mm (0.1087in.)

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

Valve clearance (Engine coolant temperature : 20°C)

[Specification]

Intake: 0.20mm (0.0079in.)

Exhaust: 0.28mm (0.0110in.)

[Limit] (After adjusting valve clearance)

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

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

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2008 ENGINE Engine Mechanical System (G4GC-GSL 2.0) - Tiburon

Adjusting Shim Selection Chart (Intake)

Install shim thickness mm (in.)	Measured clearance mm (in.)	Shim No.	Thickness	Shim No.	Thickness
0.000 - 0.020 (0.0000 - 0.0008)	0.000 - 0.020 (0.0000 - 0.0008)	1	2.00 (0.0787)	11	2.40 (0.0945)
0.021 - 0.040 (0.0008 - 0.0016)	0.021 - 0.040 (0.0008 - 0.0016)	2	2.04 (0.0803)	12	2.44 (0.0961)
0.041 - 0.060 (0.0016 - 0.0024)	0.041 - 0.060 (0.0016 - 0.0024)	3	2.08 (0.0819)	13	2.48 (0.0976)
0.061 - 0.080 (0.0024 - 0.0031)	0.061 - 0.080 (0.0024 - 0.0031)	4	2.12 (0.0835)	14	2.52 (0.0992)
0.081 - 0.100 (0.0032 - 0.0039)	0.081 - 0.100 (0.0032 - 0.0039)	5	2.16 (0.0850)	15	2.56 (0.1008)
0.101 - 0.119 (0.0040 - 0.0047)	0.101 - 0.119 (0.0040 - 0.0047)	6	2.20 (0.0866)	16	2.60 (0.1024)
0.120 - 0.280 (0.0047 - 0.0110)	0.120 - 0.280 (0.0047 - 0.0110)	7	2.24 (0.0882)	17	2.64 (0.1039)
0.281 - 0.300 (0.0111 - 0.0118)	0.281 - 0.300 (0.0111 - 0.0118)	8	2.28 (0.0898)	18	2.68 (0.1055)
0.301 - 0.320 (0.0119 - 0.0126)	0.301 - 0.320 (0.0119 - 0.0126)	9	2.32 (0.0913)	19	2.72 (0.1071)
0.321 - 0.340 (0.0126 - 0.0134)	0.321 - 0.340 (0.0126 - 0.0134)	10	2.36 (0.0929)	20	2.76 (0.1087)
0.341 - 0.360 (0.0134 - 0.0142)	0.341 - 0.360 (0.0134 - 0.0142)				
0.361 - 0.380 (0.0142 - 0.0150)	0.361 - 0.380 (0.0142 - 0.0150)				
0.381 - 0.400 (0.0150 - 0.0157)	0.381 - 0.400 (0.0150 - 0.0157)				
0.401 - 0.420 (0.0158 - 0.0165)	0.401 - 0.420 (0.0158 - 0.0165)				
0.421 - 0.440 (0.0166 - 0.0173)	0.421 - 0.440 (0.0166 - 0.0173)				
0.441 - 0.460 (0.0174 - 0.0181)	0.441 - 0.460 (0.0174 - 0.0181)				
0.461 - 0.480 (0.0181 - 0.0189)	0.461 - 0.480 (0.0181 - 0.0189)				
0.481 - 0.500 (0.0189 - 0.0197)	0.481 - 0.500 (0.0189 - 0.0197)				
0.501 - 0.520 (0.0197 - 0.0205)	0.501 - 0.520 (0.0197 - 0.0205)				
0.521 - 0.540 (0.0205 - 0.0213)	0.521 - 0.540 (0.0205 - 0.0213)				
0.541 - 0.560 (0.0213 - 0.0220)	0.541 - 0.560 (0.0213 - 0.0220)				
0.561 - 0.580 (0.0221 - 0.0228)	0.561 - 0.580 (0.0221 - 0.0228)				
0.581 - 0.600 (0.0229 - 0.0236)	0.581 - 0.600 (0.0229 - 0.0236)				
0.601 - 0.620 (0.0237 - 0.0244)	0.601 - 0.620 (0.0237 - 0.0244)				
0.621 - 0.640 (0.0244 - 0.0252)	0.621 - 0.640 (0.0244 - 0.0252)				
0.641 - 0.660 (0.0252 - 0.0260)	0.641 - 0.660 (0.0252 - 0.0260)				
0.661 - 0.680 (0.0260 - 0.0268)	0.661 - 0.680 (0.0260 - 0.0268)				
0.681 - 0.700 (0.0268 - 0.0276)	0.681 - 0.700 (0.0268 - 0.0276)				
0.701 - 0.720 (0.0276 - 0.0283)	0.701 - 0.720 (0.0276 - 0.0283)				
0.721 - 0.740 (0.0284 - 0.0291)	0.721 - 0.740 (0.0284 - 0.0291)				
0.741 - 0.760 (0.0292 - 0.0299)	0.741 - 0.760 (0.0292 - 0.0299)				
0.761 - 0.780 (0.0300 - 0.0307)	0.761 - 0.780 (0.0300 - 0.0307)				
0.781 - 0.800 (0.0307 - 0.0315)	0.781 - 0.800 (0.0307 - 0.0315)				
0.801 - 0.820 (0.0315 - 0.0323)	0.801 - 0.820 (0.0315 - 0.0323)				
0.821 - 0.840 (0.0323 - 0.0331)	0.821 - 0.840 (0.0323 - 0.0331)				
0.841 - 0.860 (0.0331 - 0.0339)	0.841 - 0.860 (0.0331 - 0.0339)				
0.861 - 0.880 (0.0339 - 0.0346)	0.861 - 0.880 (0.0339 - 0.0346)				
0.881 - 0.900 (0.0347 - 0.0354)	0.881 - 0.900 (0.0347 - 0.0354)				
0.901 - 0.920 (0.0355 - 0.0362)	0.901 - 0.920 (0.0355 - 0.0362)				
0.921 - 0.940 (0.0363 - 0.0370)	0.921 - 0.940 (0.0363 - 0.0370)				
0.941 - 0.960 (0.0370 - 0.0378)	0.941 - 0.960 (0.0370 - 0.0378)				
0.961 - 0.980 (0.0378 - 0.0386)	0.961 - 0.980 (0.0378 - 0.0386)				

Intake valve clearance (Cold):
0.20 mm (Spec.) 0.12 - 0.28mm (Limit)
Example: The 2.24 mm shim is installed, and the measured clearance is 0.450 mm. Replace the 2.24mm shim with a new No. 13 shim.

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

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

EDK08960

Fig. 17: Adjusting Shim Selection Chart (Intake)

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2008 ENGINE Engine Mechanical System (G4GC-GSL 2.0) - Tiburon

Engine misfire with coolant consumption	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. Worn piston rings. (Oil consumption may or may not cause the engine to misfire)	Repair or replace as required. - 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 Worn crankshaft thrust bearing.	- Drain the oil. - Install the correct viscosity oil. - 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.
	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.
	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.
		Inspect the piston, piston pin

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Lower engine noise, regardless of engine speed	Excessive piston pin-to-piston clearance	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.
	Incorrect piston, piston pin and connecting rod installation	• Verify the piston pins and connecting rods are installed correctly. • Repair as required.
Engine noise under load	Low oil pressure	Repair or replace as required.
	Excessive connecting rod bearing clearance	Inspect the following components and repair as required. • The connecting rod bearings. • The connecting rods. • The crankshaft
	Excessive crankshaft bearing clearance	Inspect the following components, and repair as required. • The crankshaft bearings. • The crankshaft main journals. • The cylinder block.
Engine will not crank-crankshaft will	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	1. Inspect cylinder for damaged

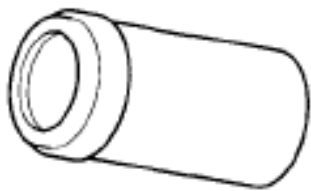
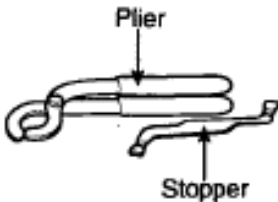
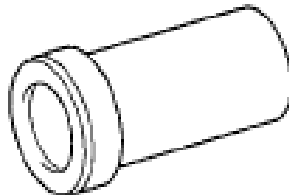
2008 Hyundai Tiburon GT

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not rotate	• Broken valve • Piston material • Foreign material	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.

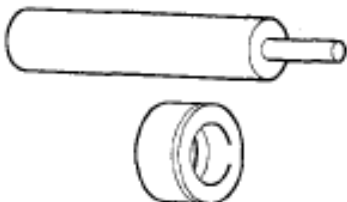
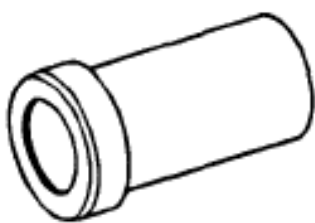
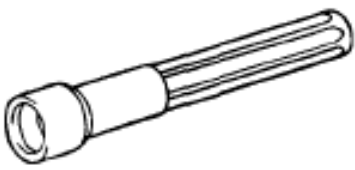
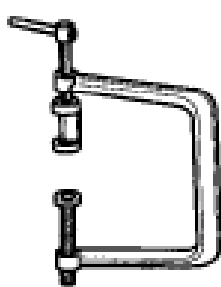
SPECIAL SERVICE TOOLS

SPECIAL SERVICE TOOLS DESCRIPTION

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09214-33000)	 EDKA010A	Installation of the front oil seal
Valve clearance adjust tool set (09220-2D000)	 EDKB001A	Removal and installation of the tappet shim
Camshaft oil seal installer (09221-21000)	 EDDA005B	Installation of the camshaft oil seal

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Valve guide installer (09221-3F100 A/B)	 ECKA010B	Remove and installation of the valve guide
Valve stem oil seal installer (09222-22001)	 EDDA005B	Installation of the valve stem oil seal
Valve spring compressor & adaptor (09222-28000, 09222-28100)	 ECKA010A	Removal and installation of the intake or exhaust valve
Crankshaft rear oil seal installer (09231-21000)	 EDDA005C	1. Installation of the engine rear oil seal 2. Installation of the crankshaft rear oil seal

ENGINE AND TRANSAXLE ASSEMBLY

REMOVAL

CAUTION:

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

NOTE:

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

1. Disconnect the negative terminal from the battery.

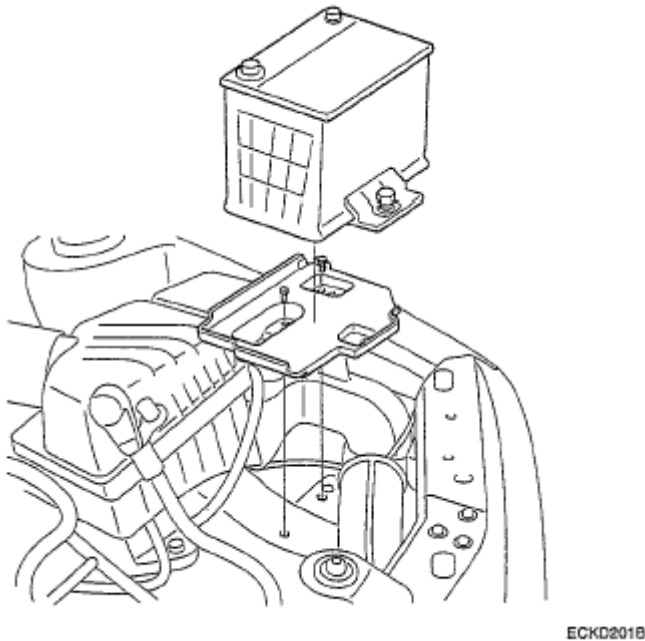
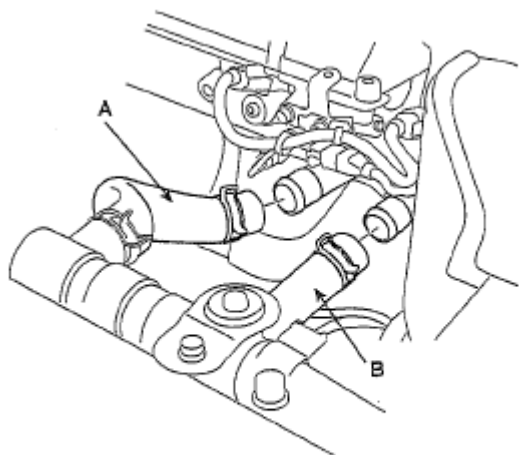


Fig. 19: Identifying Negative Terminal

2. Remove the engine cover.
3. Drain the engine coolant.

Remove the radiator cap to speed draining.

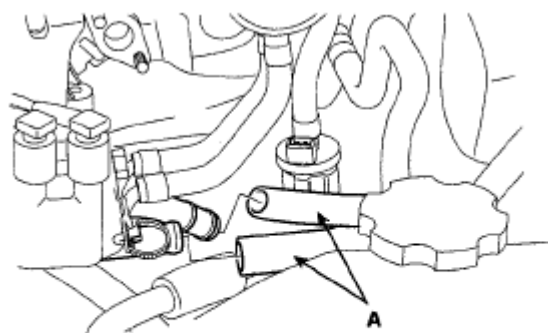
4. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS connector.
 2. Disconnect the breather hose from air cleaner hose.
 3. Remove the intake air hose and air cleaner.
5. Remove the upper radiator hose(A) and lower radiator hose(B).



ECKD201A

Fig. 20: Identifying Upper And Lower Radiator Hose

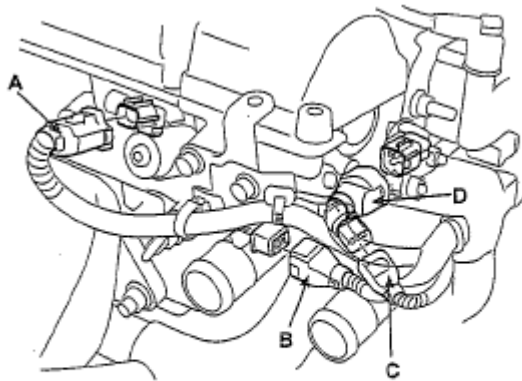
6. Remove the heater hoses(A).



ECKD202A

Fig. 21: Identifying Heater Hoses

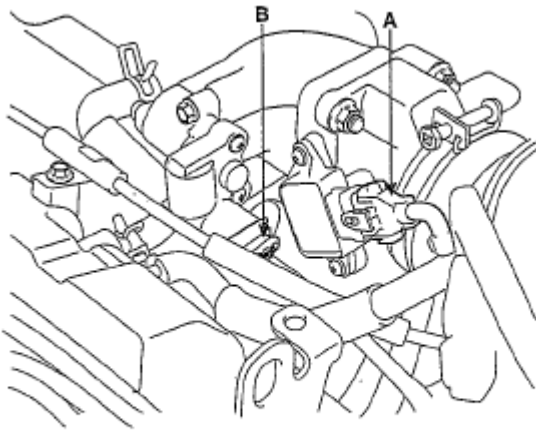
7. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 1. OCV (Oil Control Valve) connector(A).
 2. Oil temperature sensor connector(B).
 3. ECT(Engine Coolant Temperature) sensor(C) connector.
 4. Ignition coil connector(D).



ECKD203A

Fig. 22: Identifying OCV Connector, Oil Temperature Sensor Connector And ECT Sensor Connector

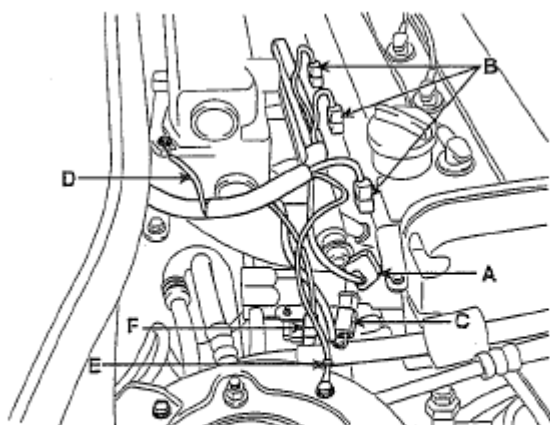
5. TPS (Throttle Position Sensor) connector(A).
6. ISA (Idle Speed Actuator) connector(B).



EDQF197A

Fig. 23: Identifying Throttle Position Sensor Connector And Idle Speed Actuator Connector

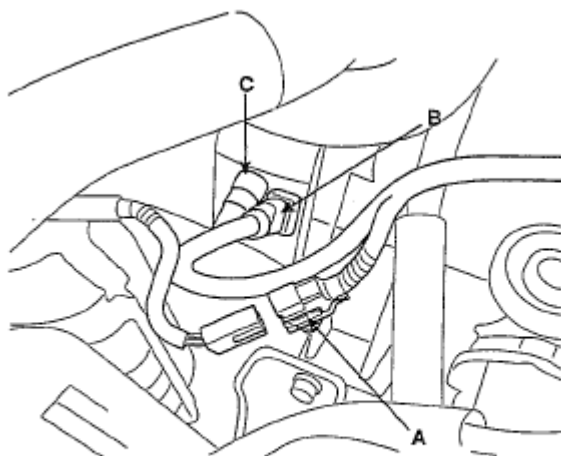
7. CMP(Camshaft Position Sensor) connector(A).
8. Four fuel injector connectors(B).
9. Knock sensor connector(C).
10. Disconnect ground cable(D) from the intake manifold.
11. Compressor switch(F).



ACGE006A

Fig. 24: Identifying CMP Connector, Fuel Injector Connectors And Knock Sensor Connector

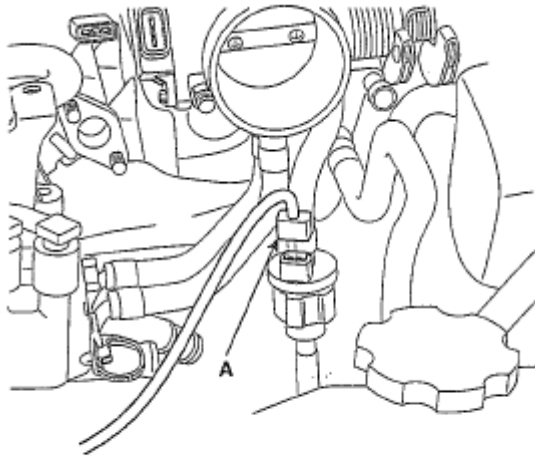
- 12. Front heated oxygen sensor(A) connector.
- 13. CKP sensor(B) connector.
- 14. Oil pressure switch(C) connector.



ACGE056A

Fig. 25: Identifying Front Heated Oxygen Sensor Connector, CKP Sensor Connector And Oil Pressure Switch Connector

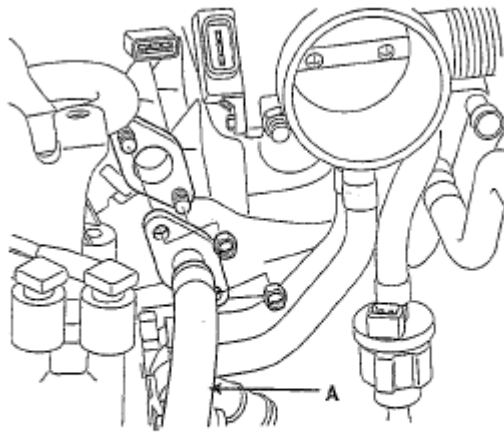
- 15. PCSV(Purge Control Solenoid Valve)(A) connector.



ECKD207A

Fig. 26: Identifying Purge Control Solenoid Valve Connector

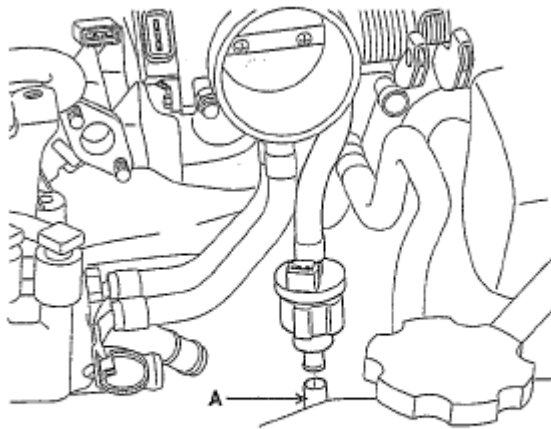
8. Remove the fuel inlet from delivery pipe(A).



ECKD208A

Fig. 27: Identifying Fuel Inlet From Delivery Pipe

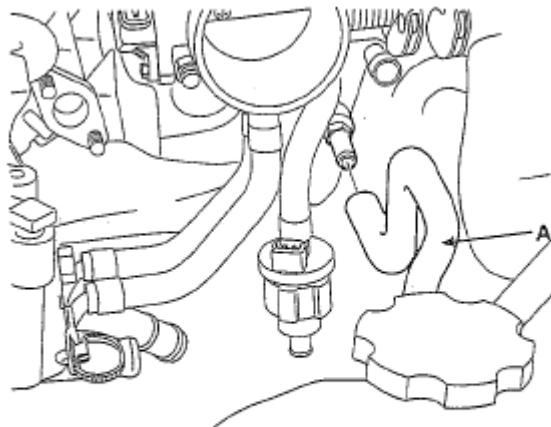
9. Remove the PCSV hose(A).



ECKD209A

Fig. 28: Identifying PCSV Hose

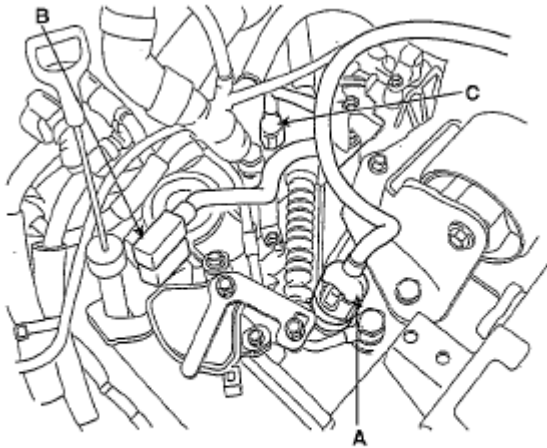
10. Remove the brake booster vacuum hose(A).



ECKD210A

Fig. 29: Identifying Brake Booster Vacuum Hose

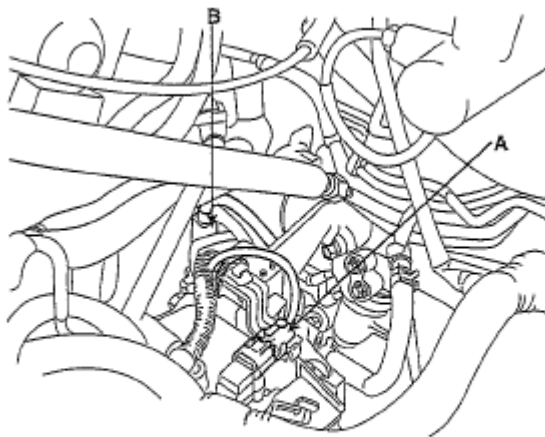
11. Remove the accelerator cable by loosening the lock-nut, then slip the cable end out of the throttle linkage.
12. Remove the power steering pump. (Refer to **POWER STEERING OIL PUMP**)
13. Remove the battery body bracket.
14. Disconnect the transaxle wire harness connector.
 1. Disconnect the inhibitor switch connector(A).
 2. Disconnect the transaxle range connector(B).
 3. Disconnect the input shaft speed connector(C).



EDQF035A

Fig. 30: Identifying Inhibitor Switch Connector, Transaxle Range Connector And Input Shaft Speed Connector

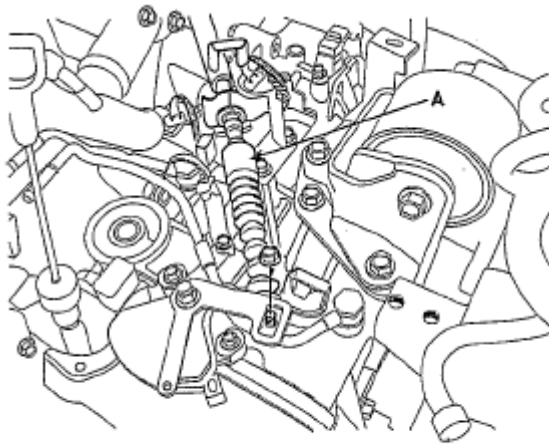
4. Disconnect the output shaft speed connector(A).
5. Disconnect the vehicle speed sensor connector(B).



EDQF031A

Fig. 31: Identifying Output Shaft Speed Connector And Vehicle Speed Sensor Connector

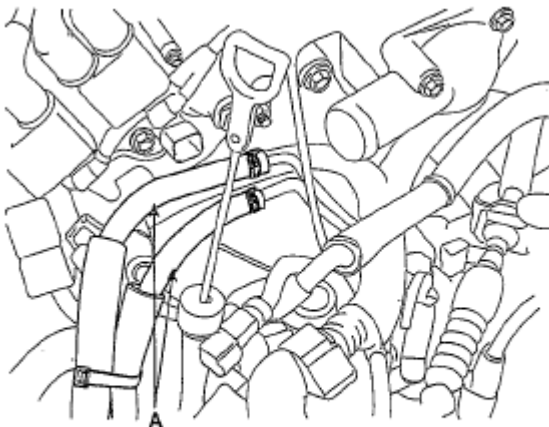
15. Remove the control cable(A) transaxle range switch.



EDQF018A

Fig. 32: Identifying Control Cable

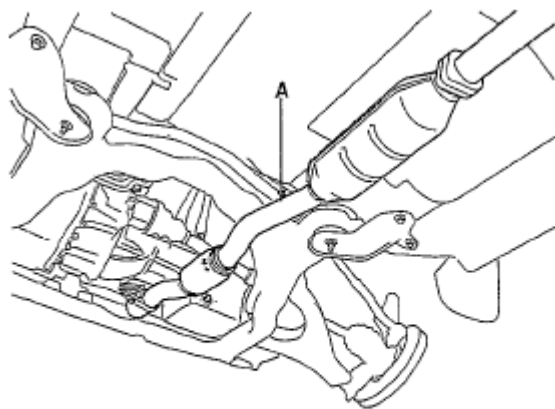
16. Remove the transaxle oil cooler hose(A) (A/T).



EDQF034A

Fig. 33: Identifying Transaxle Oil Cooler Hose

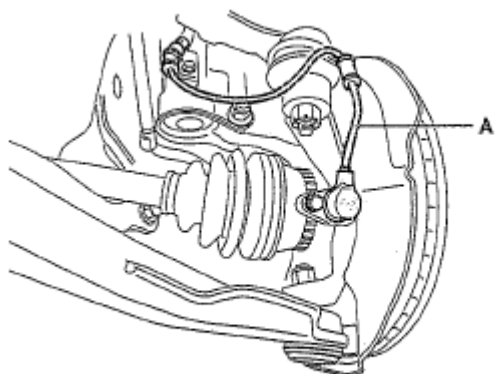
17. Remove the under cover.
18. Remove the front exhaust pipe(A).



EDQF192A

Fig. 34: Identifying Front Exhaust Pipe

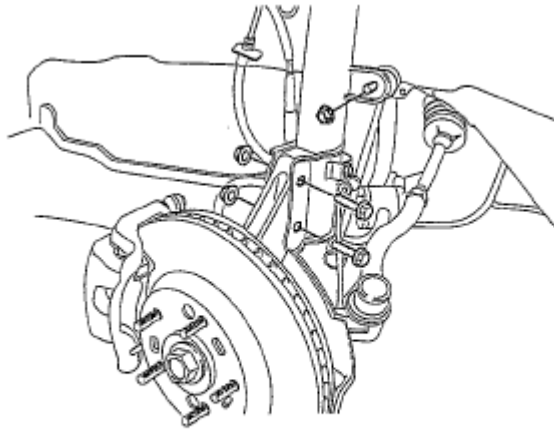
19. Disconnect the ABS wheel speed sensor(A) from both front knuckle. (Refer to **FRONT AXLE**)



KXDSE03A

Fig. 35: Identifying ABS Wheel Speed Sensor

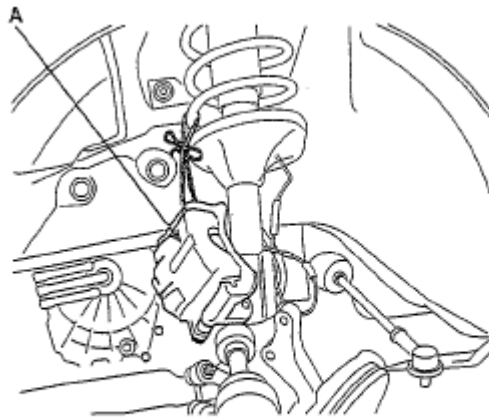
20. Remove the front strut lower mounting bolts and nuts. (Refer to **FRONT STRUT ASSEMBLY**)



EDQF023A

Fig. 36: Identifying Front Strut Lower Mounting Bolts And Nuts

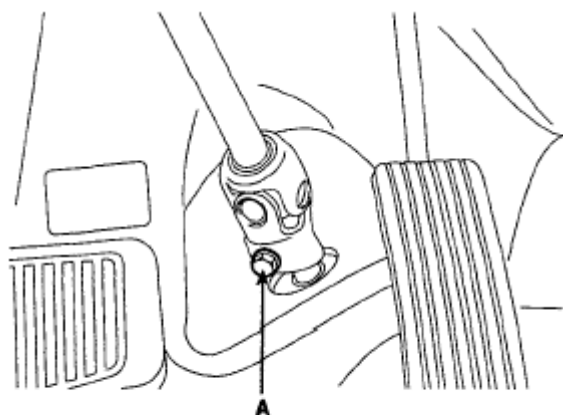
21. Remove the caliper and hang the caliper assembly(A).



ECKD612A

Fig. 37: Identifying Caliper Assembly

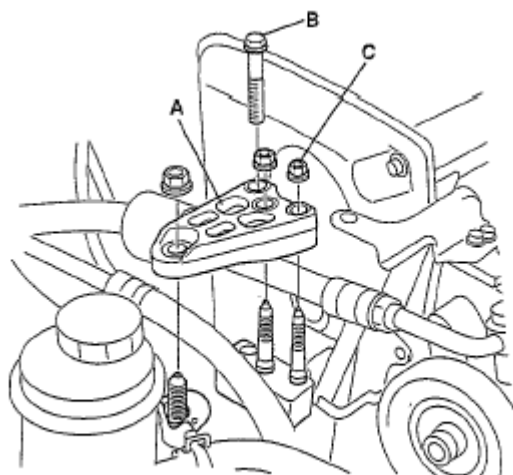
22. Remove the steering u-joint mounting bolt(A). (Refer to **GENERAL INFORMATION - STEERING**)



ECKD616A

Fig. 38: Identifying Steering U-Joint Mounting Bolt

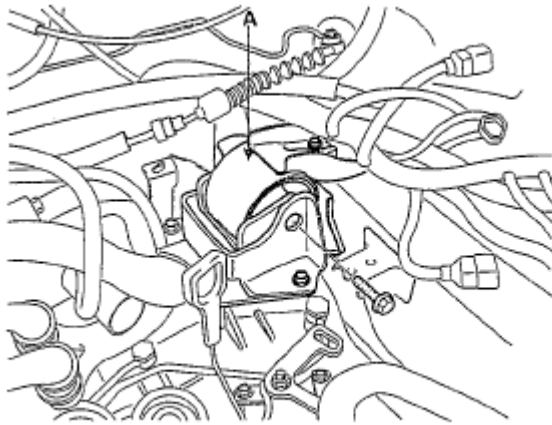
23. Install the jack for supporting engine and transaxle assembly.
24. Remove the engine mounting bracket(A).



ECKD103A

Fig. 39: Identifying Engine Mounting Bracket

25. Remove the transaxle mounting bracket(A).



EDQF016A

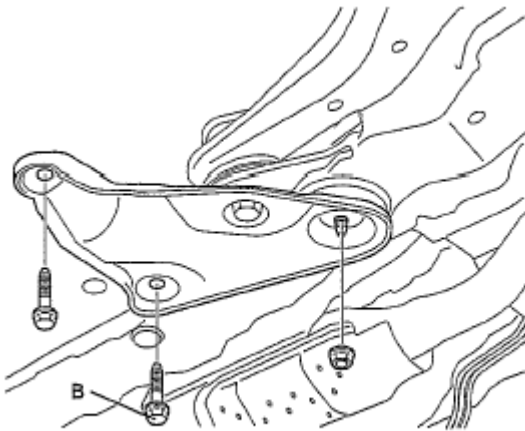
Fig. 40: Identifying Transaxle Mounting Bracket

26. Remove the sub frame mounting bolts and nuts.

Tightening torque

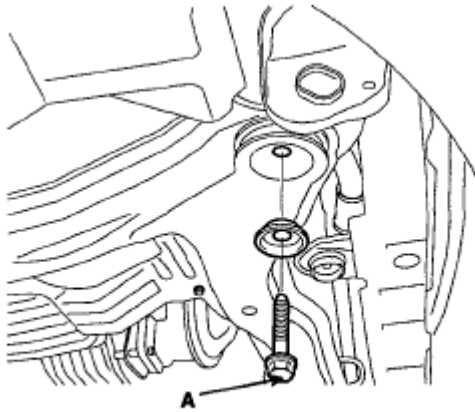
A: 156.9 ~ 176.5Nm (16.0 ~ 18.0kgf.m, 115.7 ~ 130.2lb-ft)

B: 68.6 ~ 88.3Nm (7.0 ~ 9.0kgf.m, 50.6 ~ 65.1lb-ft)



EDOF001A

Fig. 41: Identifying Sub Frame Mounting Bolts And Nuts (1 Of 2)



ECKD618A

Fig. 42: Identifying Sub Frame Mounting Bolts And Nuts (2 Of 2)

27. Jack up the vehicle.

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.
- Bleed air from the cooling system with the heater valve open.
- Clean the battery posts and cable terminals with sandpaper assemble them, then apply grease to prevent corrosion.
- Inspect for fuel leakage.

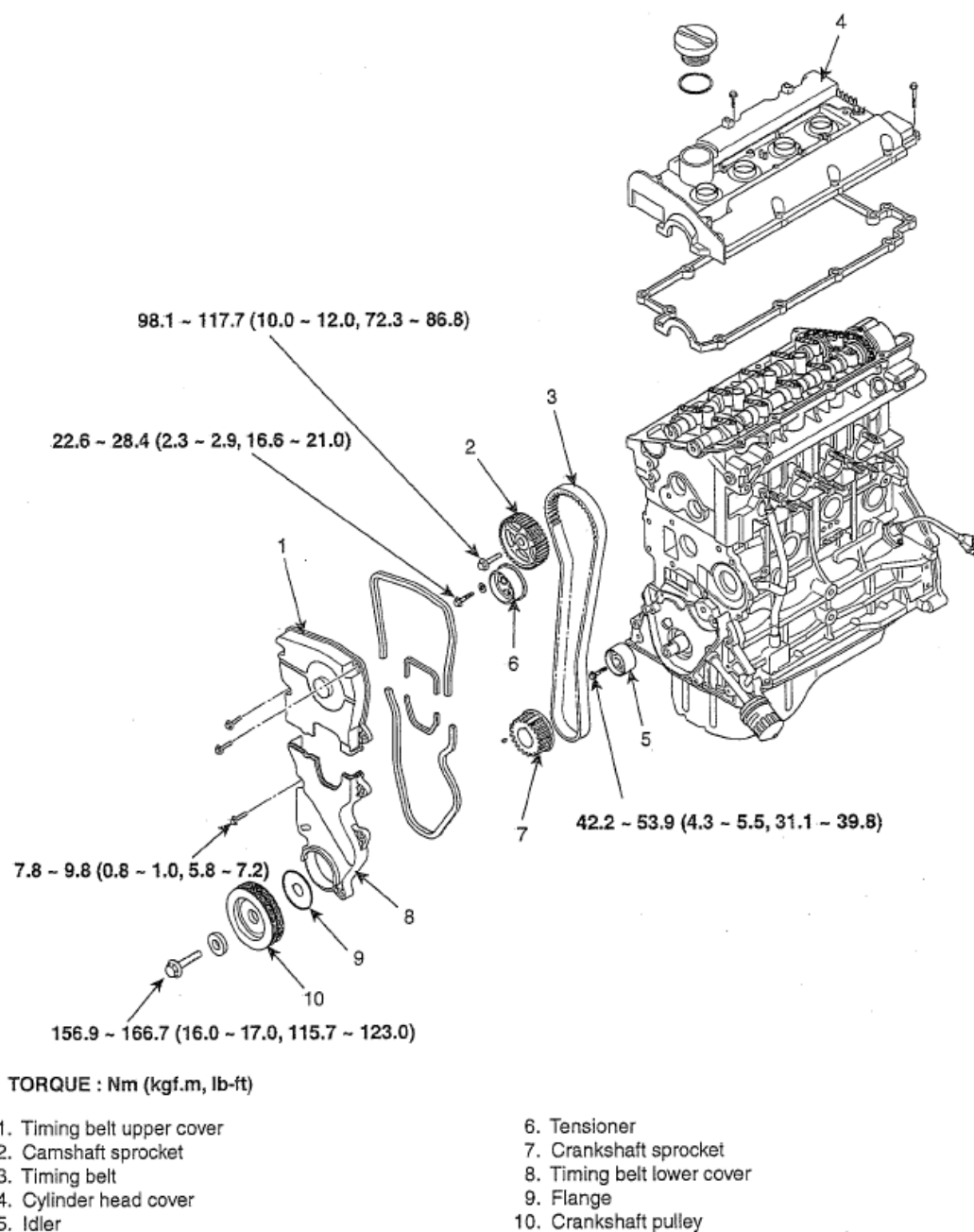
After assembling the fuel line, turn on the ignition switch (do not operate the starter) so that the fuel pump runs for approximately two seconds and fuel line pressurizes.

Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.

TIMING SYSTEM

TIMING BELT

COMPONENTS



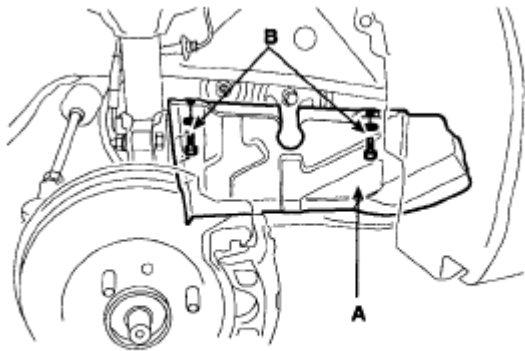
SHDM16300L

Fig. 43: Identifying Timing System Components With Torque Specifications

REMOVAL

Engine removal is not required for this procedure.

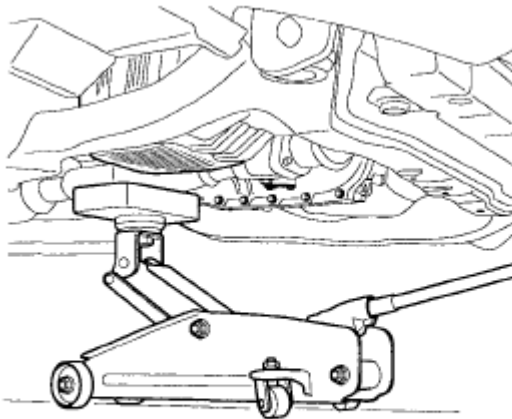
1. Remove the engine cover.
2. Remove RH front wheel.
3. Remove 2 bolts(B) and RH side cover(A).



KXDSE16A

Fig. 44: Identifying RH Side Cover Bolts

4. Remove the engine mount bracket.
 1. Set the jack to the engine oil pan.

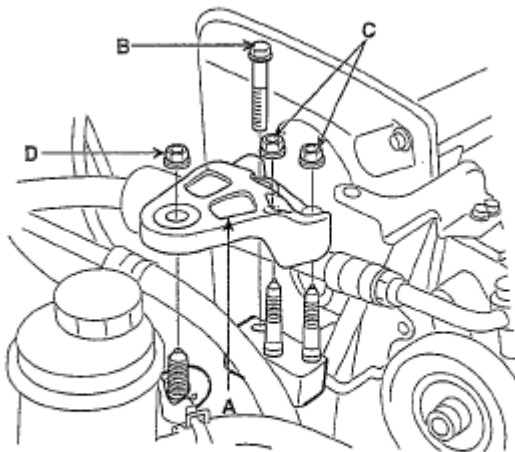


ECKD102A

Fig. 45: Supporting Engine Oil Pan With Jack

NOTE: Place wooden block between the jack and engine oil pan.

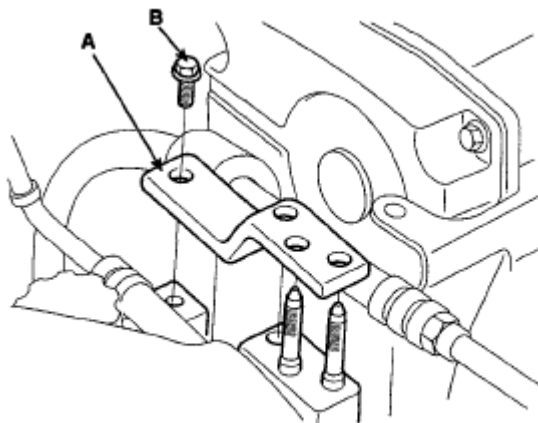
2. Remove the bolt(B), 3 nuts(C, D) and engine mount bracket(A).



ECHE105A

Fig. 46: Identifying Engine Mount Bracket Bolt And Nuts

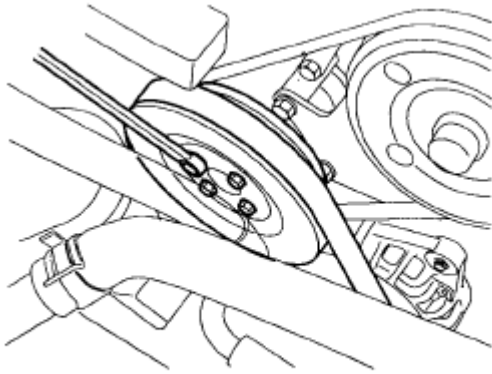
3. Remove the bolt(B) and stay plate(A).



ECKD104A

Fig. 47: Identifying Stay Plate & Bolt

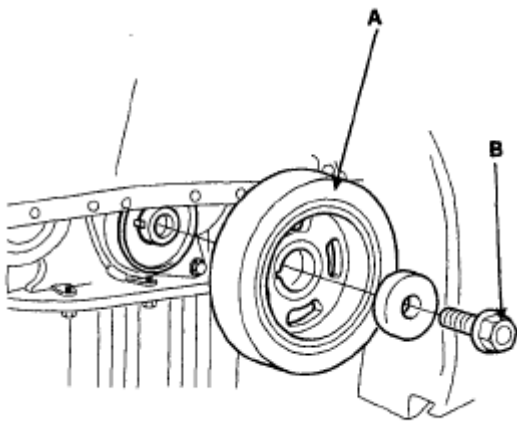
5. Temporarily loosen the water pump pulley bolts.



ECKD104B

Fig. 48: Identifying Water Pump Pulley Bolts

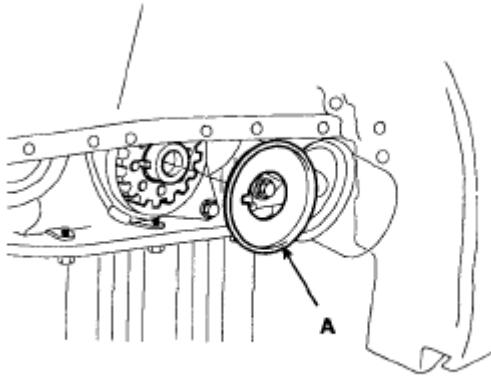
6. Remove alternator belt. (Refer to **ALTERNATOR**)
7. Remove air compressor belt. (Refer to **COMPRESSOR**)
8. Remove power steering belt. (Refer to **MECHANICAL POWER STEERING SYSTEM**)
9. Remove 4 bolts and water pump pulley.
10. Remove the 4 bolts and timing belt upper cover.
11. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover.
12. Remove the crankshaft pulley bolt(B) and crankshaft pulley(A).



ECKD107A

Fig. 49: Identifying Crankshaft Pulley Bolt And Crankshaft Pulley

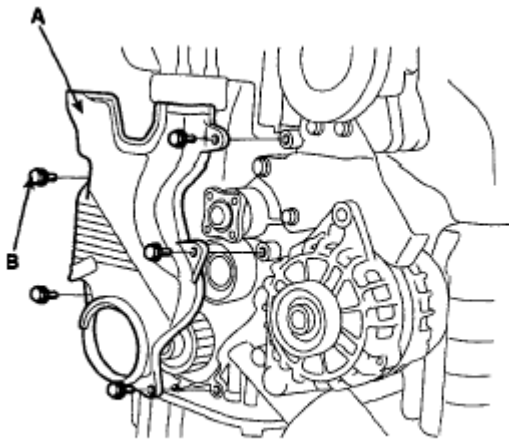
13. Remove the crankshaft flange(A).



ECKD108A

Fig. 50: Identifying Crankshaft Flange

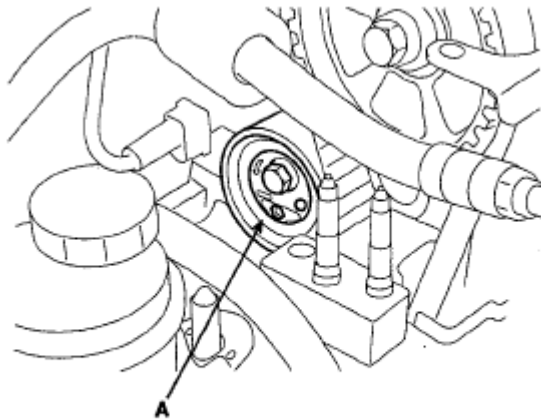
14. Remove the 5 bolts(B) and timing belt lower cover(A).



ECKD108B

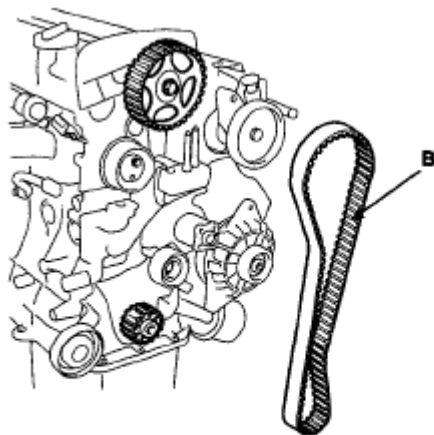
Fig. 51: Identifying Timing Belt Lower Cover Bolts

15. Remove the timing belt tensioner(A) and timing belt(B).



SHDM16316L

Fig. 52: Identifying Timing Belt Tensioner

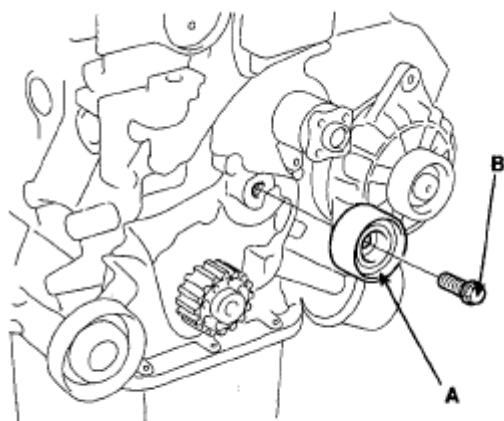


ECKD109B

Fig. 53: Identifying Timing Belt

NOTE: If the timing belt is reused, make an arrow indicating the turning direction to make sure that the belt is reinstalled in the same direction as before.

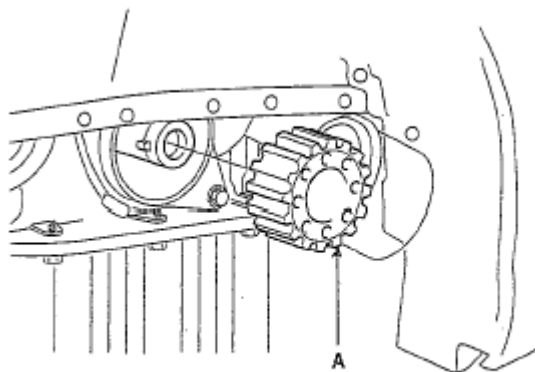
16. Remove the bolt(B) and timing belt idler(A).



ECKD109C

Fig. 54: Identifying Timing Belt Idler Bolt

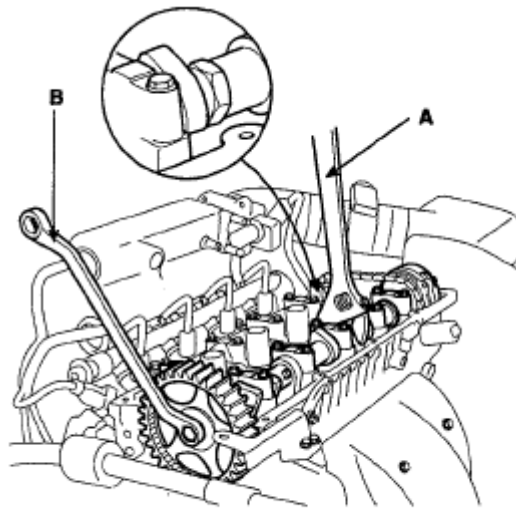
17. Remove the crankshaft sprocket(A).



ECKD110A

Fig. 55: Identifying Crankshaft Sprocket

18. Remove the cylinder head cover.
 1. Remove the spark plug cable.
 2. Remove the accelerator cable from the cylinder head cover.
 3. Remove the PCV(Positive Crankcase ventilation) hose and breather hose.
 4. Remove the 12 bolts and cylinder head cover.
19. Remove camshaft sprocket.
 1. Hold the hexagonal head wrench(A) portion of the camshaft with a wrench(B), and remove the bolt and camshaft sprocket(C).



ECKD114A

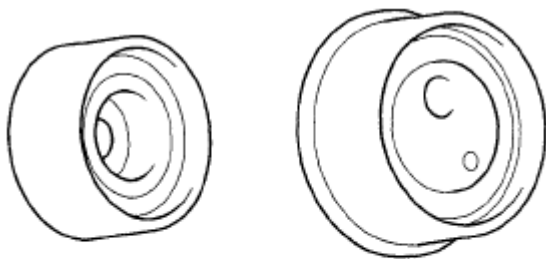
Fig. 56: Removing Camshaft Sprocket

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

INSPECTION

SPROCKETS, TENSIONER, IDLER

1. Check the camshaft sprocket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear, cracks, or damage. Replace as necessary.
2. Inspect the tensioner pulley and the idler pulley for easy and smooth rotation and check for play or noise. Replace as necessary.



ECKD115A

Fig. 57: Identifying Tensioner Pulley

3. Replace the pulley if there is a grease leak from its bearing.

TIMING BELT

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.

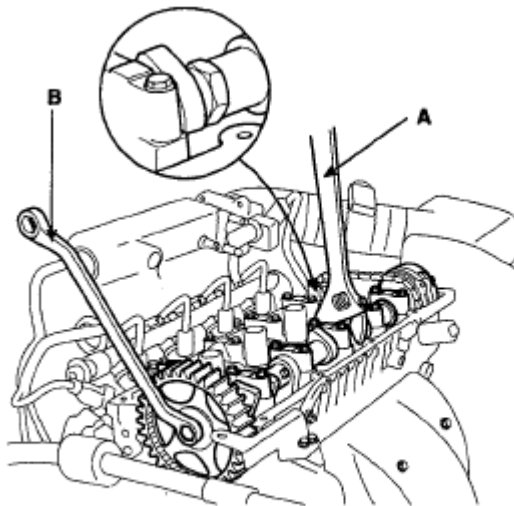
INSTALLATION

1. Install the camshaft sprocket and tighten the bolt to the specified torque.
 1. Temporarily install the camshaft sprocket bolt.
 2. Hold the hexagonal head wrench(A) portion of the camshaft with a wrench(B), and tighten the camshaft sprocket(C) bolt.

Tightening torque

Camshaft sprocket bolt

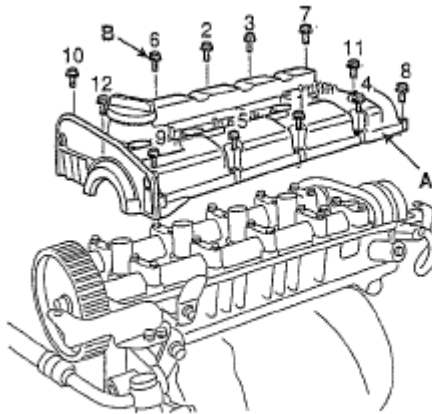
98.1 ~ 117.7Nm (10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



ECKD114A

Fig. 58: Installing Camshaft Sprocket

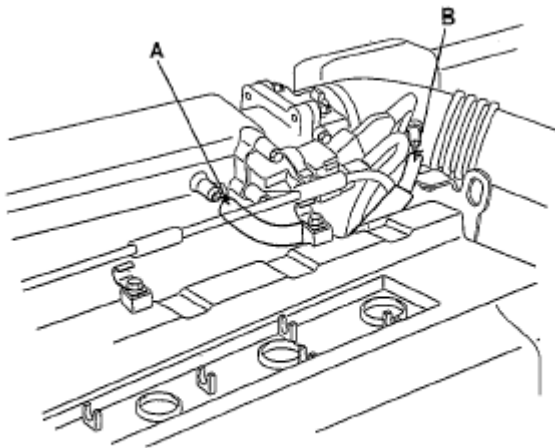
2. Install cylinder head cover.
 1. Install cylinder head cover(A) and 12 bolts(B).



ADIE063A

Fig. 59: Identifying Cylinder Head Cover Bolts

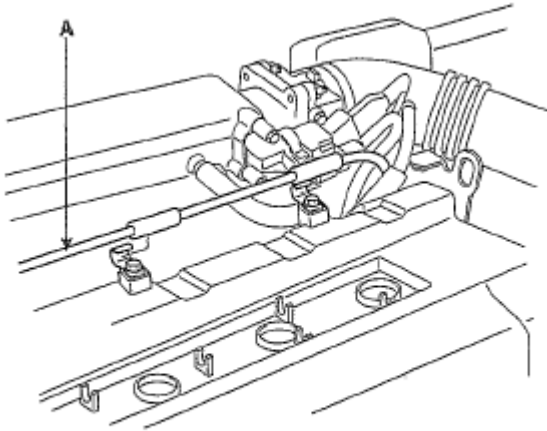
2. Install the PCV hose(A) and breather hose(B).



ECKD112A

Fig. 60: Identifying PCV Hose And Breather Hose

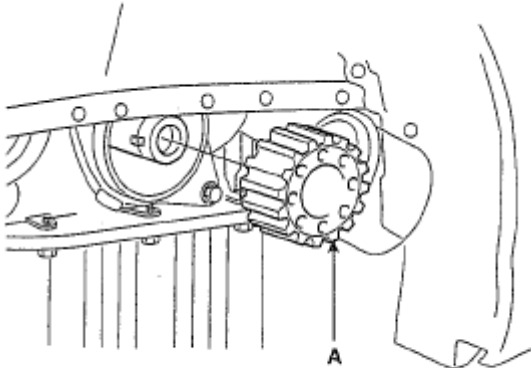
3. Install the accelerator cable(A) from the cylinder head cover.



ECKD111A

Fig. 61: Identifying Accelerator Cable

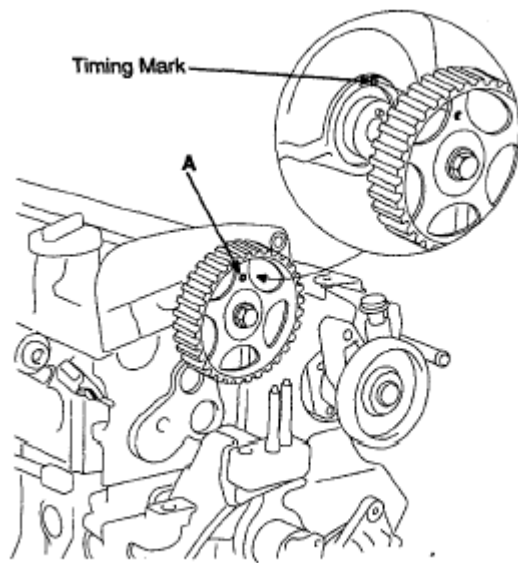
4. Install the spark plug cable.
3. Install the crankshaft sprocket(A).



ECKD110A

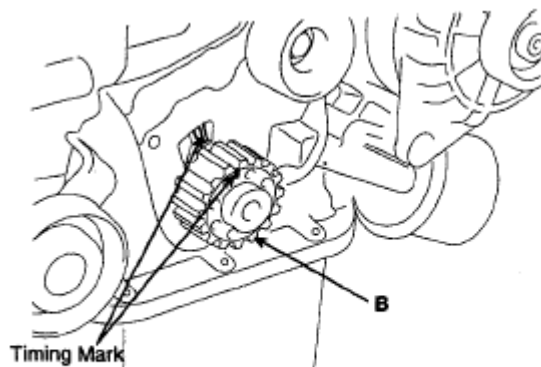
Fig. 62: Identifying Crankshaft Sprocket

4. Align the timing marks of the camshaft sprocket(A) and crankshaft sprocket(B) with the No.1 piston placed at top dead center and its compression stroke.



ECKD110B

Fig. 63: Identifying Timing Marks Of Camshaft Sprocket



ECKD110C

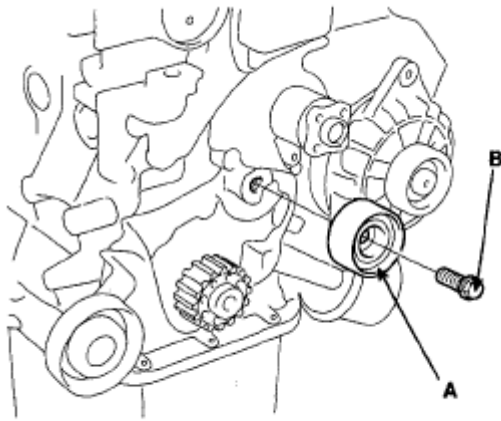
Fig. 64: Identifying Timing Marks Of Crankshaft Sprocket

5. Install the idler pulley(A) and tighten the bolt(B) to the specified torque.

Tightening torque

Idler pulley bolt

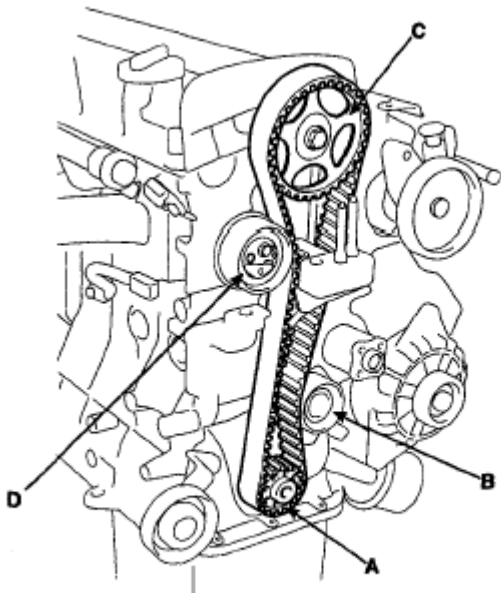
42.2 ~ 53.9Nm (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lb-ft)



ECKD109C

Fig. 65: Identifying Idler Pulley Bolt

6. Install the timing belt tensioner loosely enough for the adjuster to rotate. Make sure that the stopper of base is leaning against the lowering sealing cap on the cylinder head.
7. Belt so as not give slack at each center of shaft. Do as following procedures when installing timing belt. Crankshaft sprocket (A) --> Idler pulley (B) --> Camshaft sprocket (C) --> timing belt tensioner (D). (The tensioner can be installed after the timing belt.)

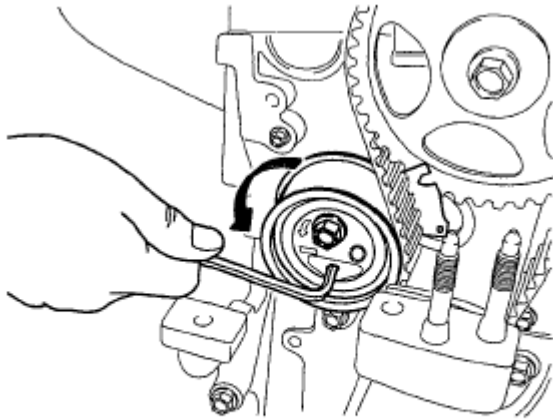


SHDM16302D

Fig. 66: Identifying Crankshaft Sprocket, Idler Pulley And Camshaft Sprocket

8. Check the alignment of the timing marks on each sprocket.
9. Remove the pin fixing the tensioner arm.
10. Using a hex wrench, turn the adjuster counterclockwise to make the indicator of the arm located at the

center of the base.



SHDEM7002N

Fig. 67: Turning Adjuster Counterclockwise

**CAUTION: Do not rotate the adjuster clockwise.
It will result in auto tensioner's functional problem.**

11. Tightening tensioner bolt with fixing the indicator not to move.

Tightening torque

Tensioner bolt :

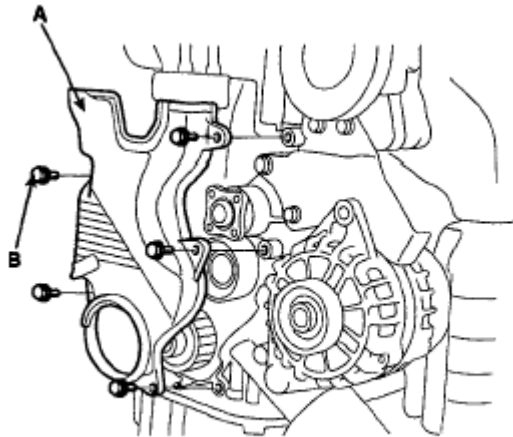
22.6 ~ 28.4Nm (2.3 ~ 2.9kgf.m, 16.6 ~ 21.0lb-ft)

12. Turn the crankshaft two revolutions in the operating direction (clockwise) and check that the indicator is in the center of base.
13. If the indicator is not located at the center of base, slacken the bolt and repeat the above procedure.
14. Install the timing belt lower cover(A) with 5 bolts(B).

Tightening torque

Tinning belt cover bolt

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



ECKD108B

Fig. 68: Identifying Timing Belt Lower Cover Bolts

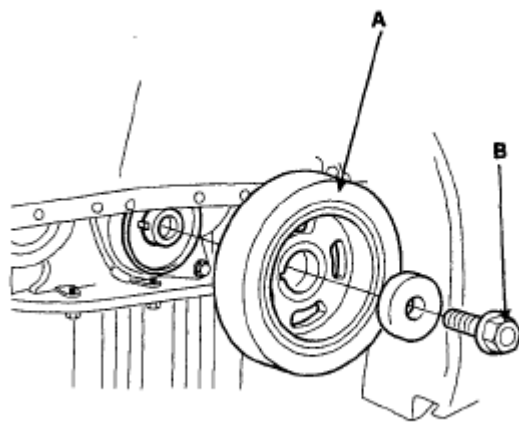
15. Install the flange and crankshaft pulley(A).

Make sure that crankshaft sprocket pin fits the small hole in the pulley.

Tightening torque

Crankshaft pulley bolt

156.9 ~ 176.5Nm (16.0 ~ 17.0kgf.m, 115.7 ~ 130.2lb-ft)



ECKD107A

Fig. 69: Identifying Crankshaft Pulley Bolt And Crankshaft Pulley

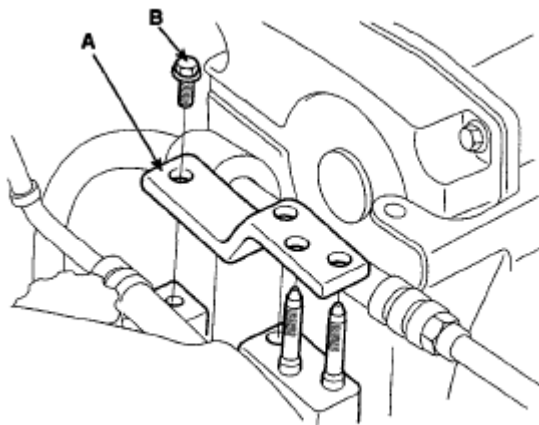
16. Install the timing belt upper cover with 4 bolts.
17. Install the coolant pump pulley with 4 bolts.
18. Install power steering belt. (Refer to **MECHANICAL POWER STEERING SYSTEM**)
19. Install air compressor belt. (Refer to **COMPRESSOR**)

20. Install alternator belt. (Refer to **ALTERNATOR**)
21. Install the engine mount bracket.
 1. Install the stay plate(A) with bolt(B).

Tightening torque

Stay plate bolt

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



ECKD104A

Fig. 70: Identifying Stay Plate & Bolt

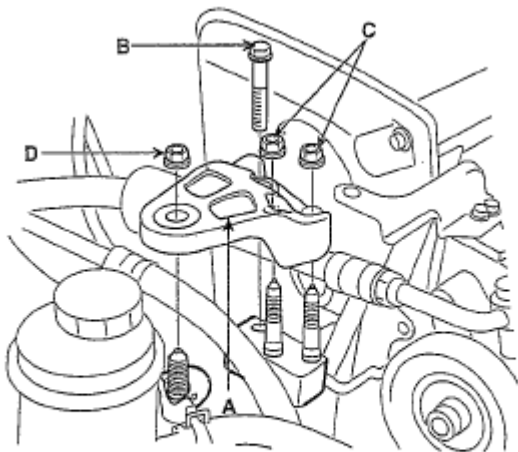
2. Install engine mount bracket(A) with 3 nuts and bolt.

Tightening torque

Bolt(B), Nuts(C)

49.0 ~ 58.8Nm (5.0 ~ 6.0kgf.m, 36.2 ~ 43.4lb-ft)

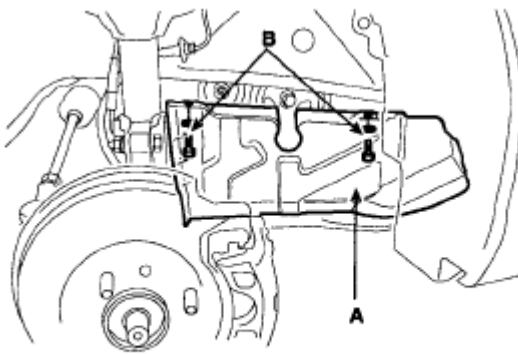
Nut(D): 58.8 ~ 78.5Nm (6.0 ~ 8.0kgf.m 43.4 ~ 57.9lb-ft)



ECHE105A

Fig. 71: Identifying Engine Mount Bracket Bolt And Nuts

22. Install RH side cover(A) with 2 bolts(B).



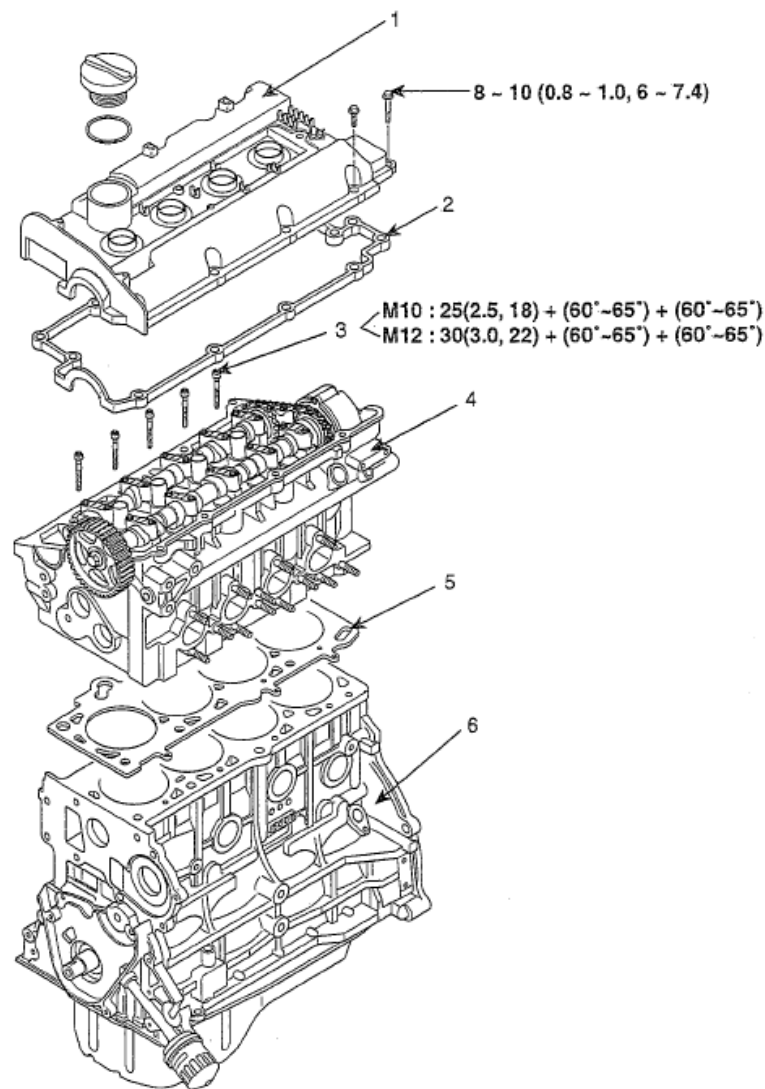
KXDSE16A

Fig. 72: Identifying RH Side Cover & Bolts

23. Install RH front wheel.
24. Install engine cover with 4 bolts.

CYLINDER HEAD ASSEMBLY

COMPONENTS

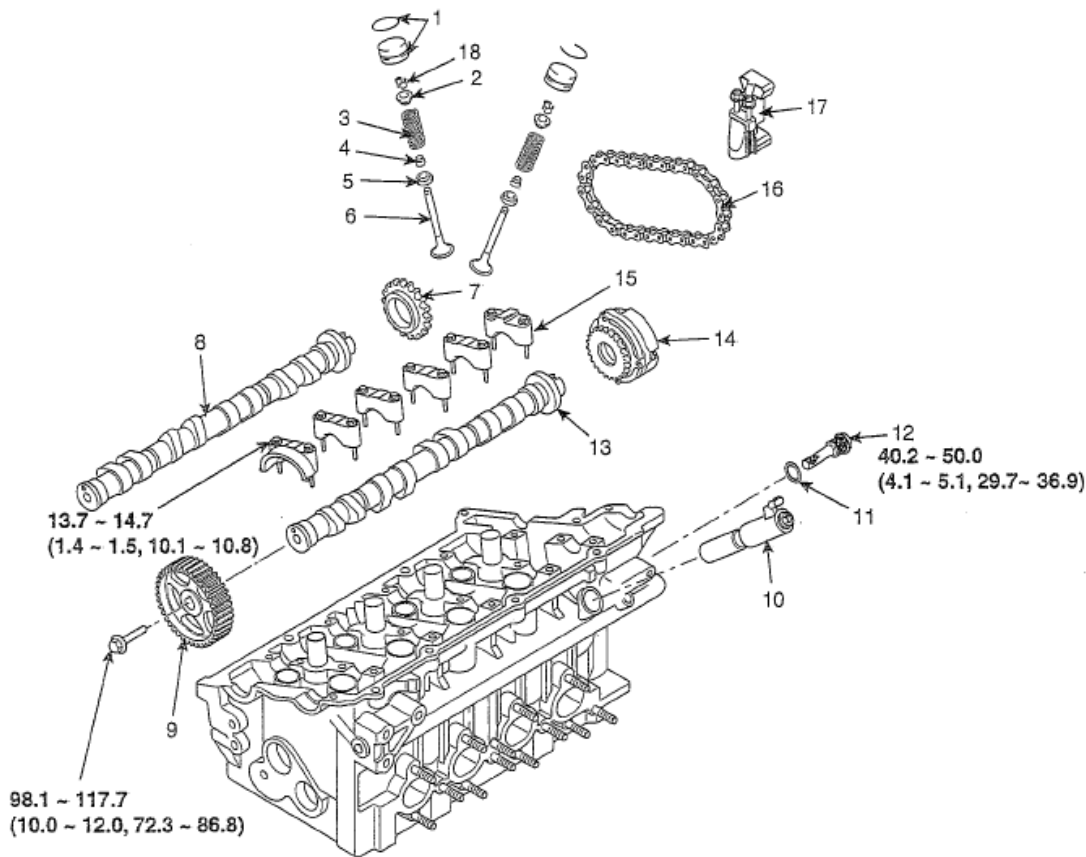


TORQUE : Nm (kgf.m, lb-ft)

- | | |
|------------------------|-------------------------|
| 1. Cylinder head cover | 4. Cylinder head |
| 2. Gasket | 5. Cylinder head gasket |
| 3. Cylinder head bolt | 6. Cylinder block |

SJMM17002N

Fig. 73: Identifying Cylinder Head Assembly Components With Torque Specifications (1 Of 2)



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

- | | |
|----------------------------------|----------------------------|
| 1. Mechanical lash adjuster(MLA) | 10. Oil control valve(OCV) |
| 2. Retainer | 11. Washer |
| 3. Valve spring | 12. OCV filter |
| 4. Stem seal | 13. Exhaust camshaft |
| 5. Spring seat | 14. CVVT assembly |
| 6. Valve | 15. Camshaft bearing cap |
| 7. Chain sprocket | 16. Timing chain |
| 8. Intake camshaft | 17. Auto Tensioner |
| 9. Camshaft sprocket | 18. Retainer lock |

SHDM16302L

Fig. 74: Identifying Cylinder Head Assembly Components With Torque Specifications (2 Of 2)

REMOVAL

Engine removal is not required for this procedure.

CAUTION:

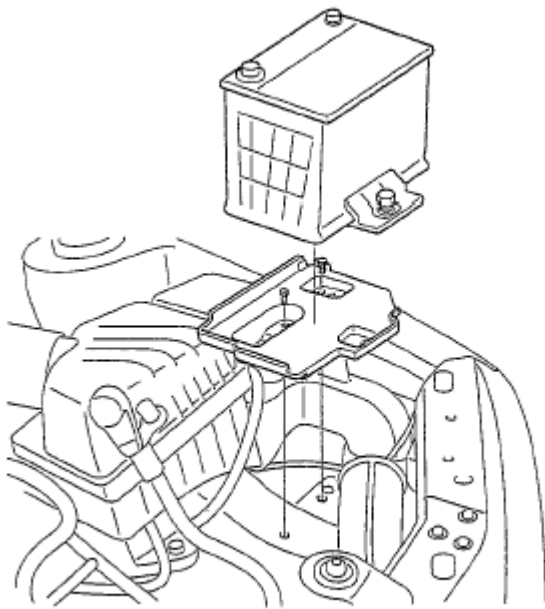
- Use fender covers to avoid damaging painted surfaces.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.
- When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.

- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE:

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

1. Disconnect the negative terminal from the battery.



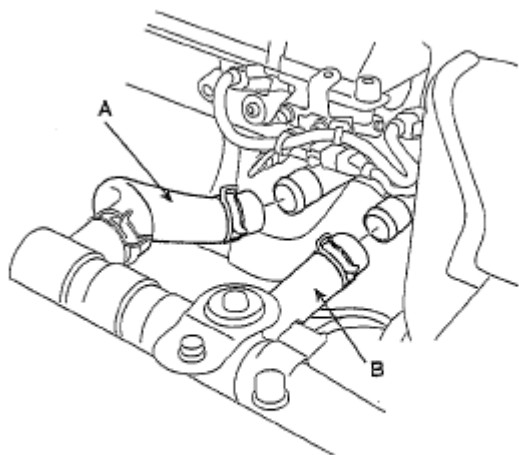
ECKD201B

Fig. 75: Identifying Negative Terminal

2. Remove the engine cover.
3. Drain the engine coolant.

Remove the radiator cap to speed draining.

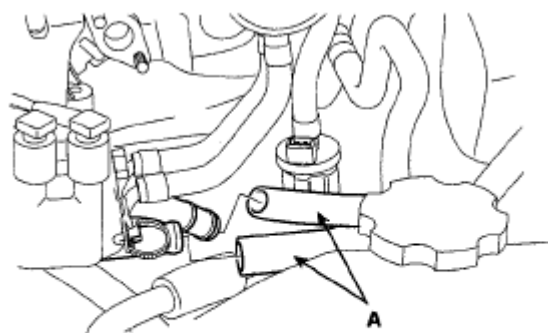
4. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS connector.
 2. Disconnect the breather hose from air cleaner hose.
 3. Remove the intake air hose and air cleaner assembly.
5. Remove the upper radiator hose(A) and lower radiator hose(B).



ECKD201A

Fig. 76: Identifying Upper And Lower Radiator Hose

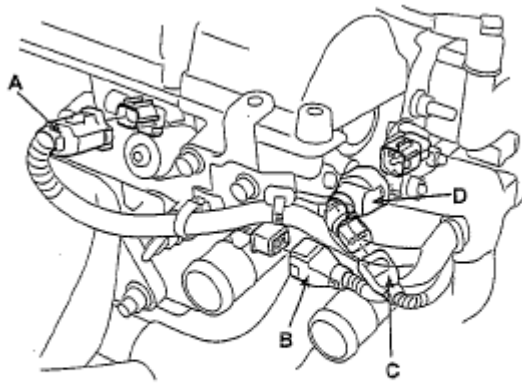
6. Remove the heater hoses(A).



ECKD202A

Fig. 77: Identifying Heater Hoses

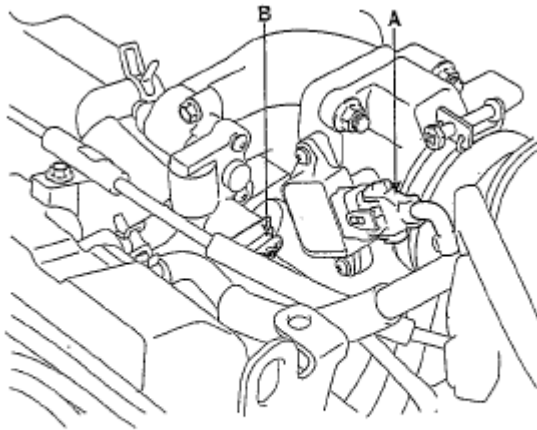
7. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 1. OCV(Oil Control Valve) connector(A).
 2. Oil temperature sensor connector(B).
 3. ECT(Engine Coolant Temperature) sensor connector(C).
 4. Ignition coil connector(D).



ECKD203A

Fig. 78: Identifying OCV Connector, Oil Temperature Sensor Connector And ECT Sensor Connector

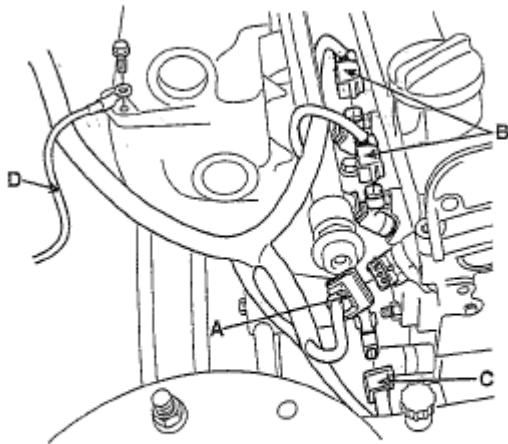
5. TPS (Throttle Position Sensor) connector(A).
6. ISA (Idle Speed Actuator) connector(B).



EDQF197A

Fig. 79: Identifying Throttle Position Sensor Connector And Idle Speed Actuator Connector

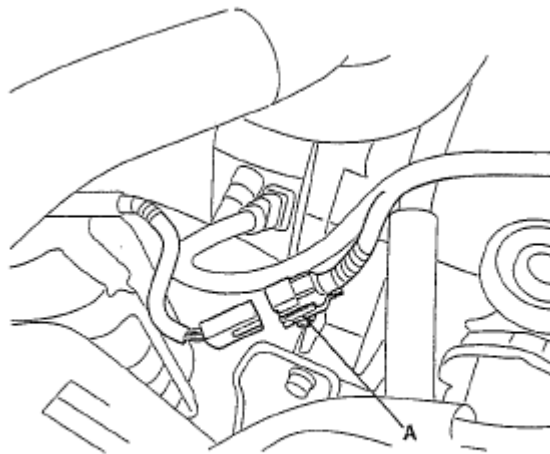
7. CMP(Camshaft Position Sensor) connector(A).
8. Four fuel injector connectors(B).
9. Knock sensor connector(C).
10. Disconnect ground cable(D) from the intake manifold.



ECKD205A

Fig. 80: Identifying CMP Connector, Fuel Injector Connectors And Knock Sensor Connector

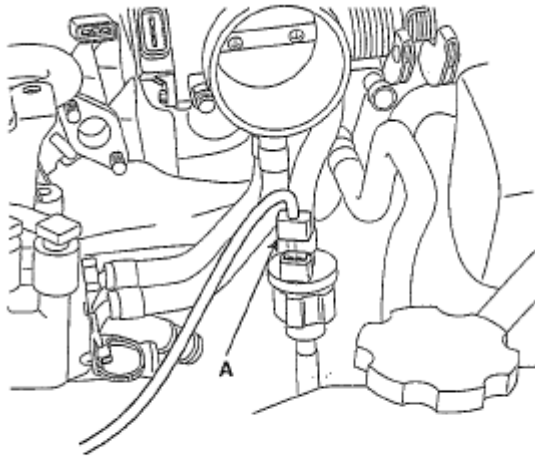
11. Front heated oxygen sensor connector(A).



ECKD206A

Fig. 81: Identifying Front Heated Oxygen Sensor Connector

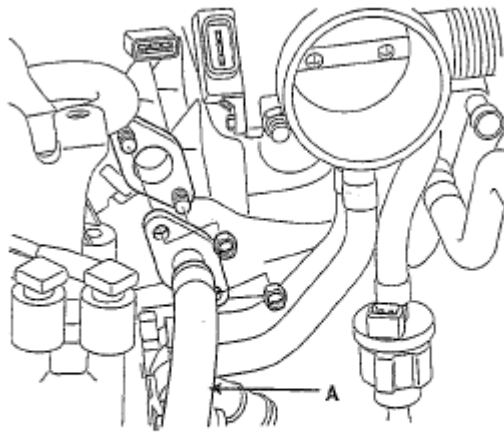
12. PCSV(Purge Control Solenoid Valve) connector(A).



ECKD207A

Fig. 82: Identifying Purge Control Solenoid Valve Connector

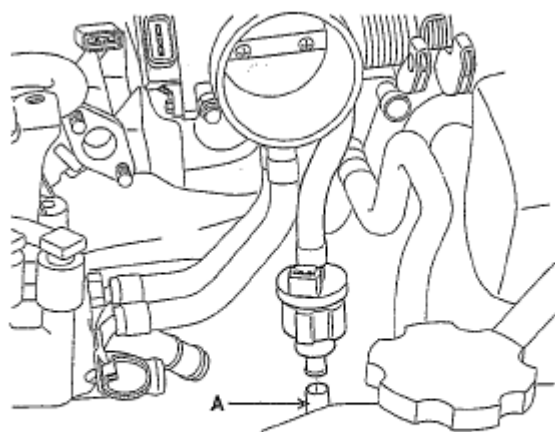
8. Remove the fuel inlet hose(A) from delivery pipe.



ECKD208A

Fig. 83: Identifying Fuel Inlet Hose

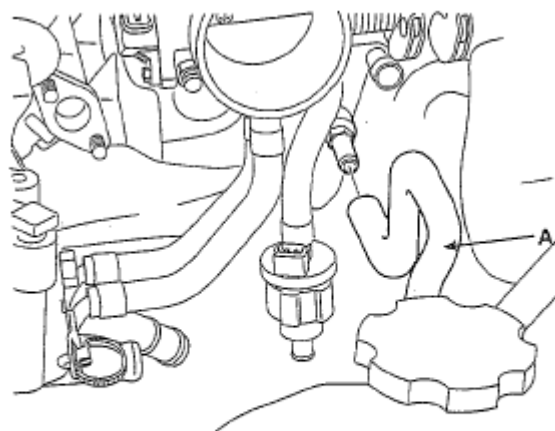
9. Remove the PCSV hose(A).



ECKD209A

Fig. 84: Identifying PCSV Hose

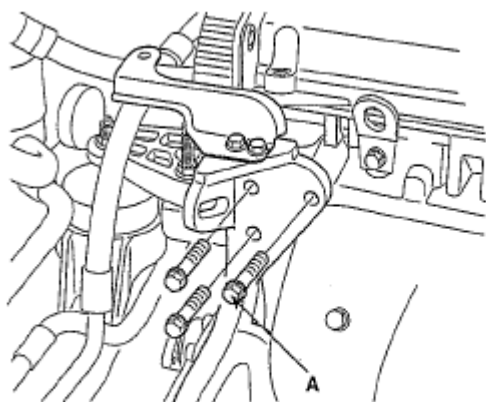
10. Remove the brake booster vacuum hose(A).



ECKD210A

Fig. 85: Identifying Brake Booster Vacuum Hose

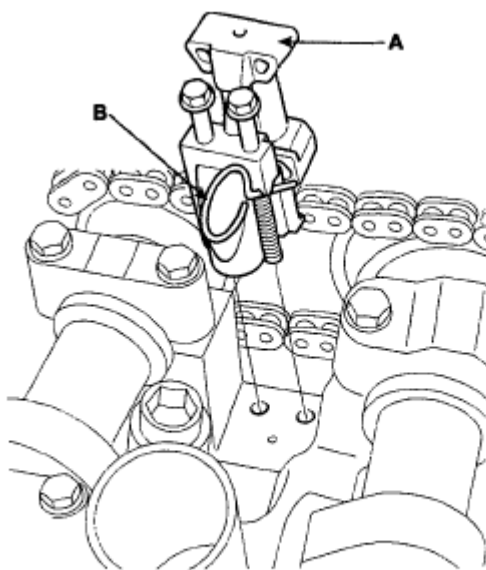
11. Remove the accelerator cable by loosening the lock-nut, then slip the cable end out of the throttle linkage.
12. Remove the power steering pump. (Refer to **POWER STEERING OIL PUMP**)
13. Remove the power steering pump bracket bolts(A).



ECKD211A

Fig. 86: Identifying Power Steering Pump Bracket Bolts

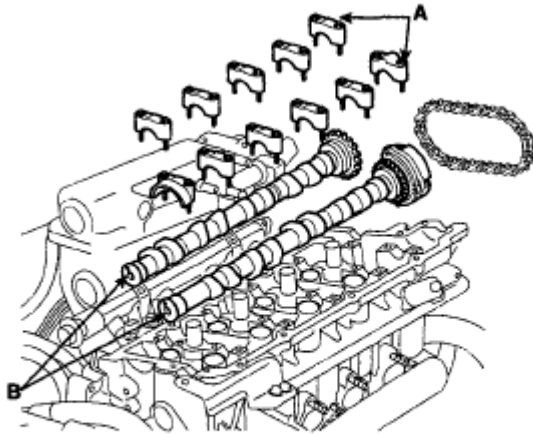
14. Remove the spark plug cable. (Refer to **IGNITION SYSTEM**)
15. Remove the PCV hose.
16. Remove the cylinder head cover.
17. Remove the timing belt.
18. Remove the exhaust manifold.
19. Remove the intake manifold.
20. Remove the camshaft sprocket.
21. Remove the timing chain auto tensioner(A).



ECKD212A

Fig. 87: Identifying Timing Chain Auto Tensioner

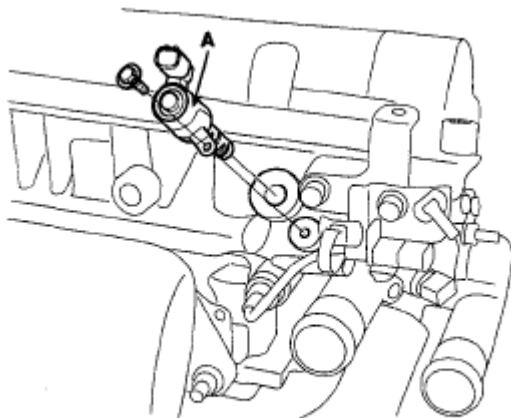
22. Remove the camshaft bearing caps(A) and camshafts(B).



ECKD213A

Fig. 88: Identifying Camshaft Bearing Caps And Camshafts

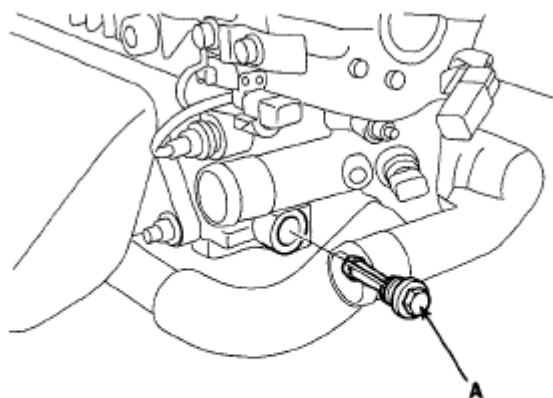
23. Remove the OCV(Oil control valve)(A).



ECKD214A

Fig. 89: Identifying Oil Control Valve

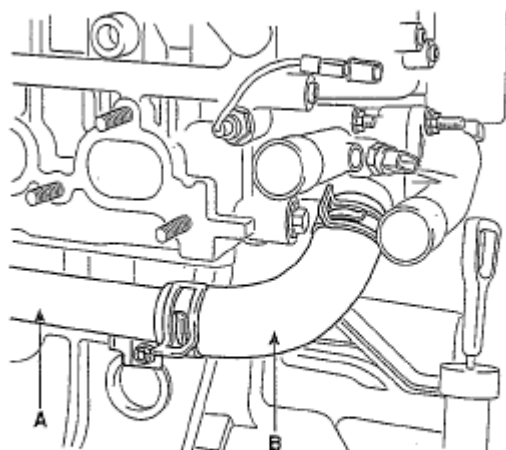
24. Remove the OCV(Oil Control Valve) filter(A).



ECKD215A

Fig. 90: Identifying Oil Control Valve Filter

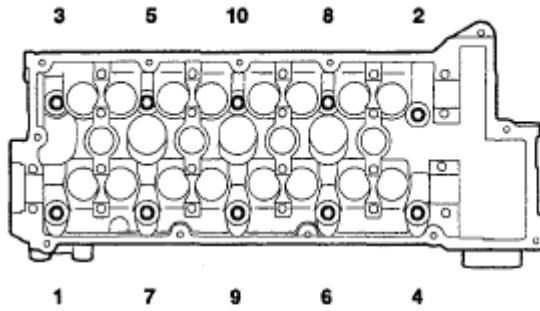
25. Remove the water hose(B) from the water pipe(A).



ACGE009A

Fig. 91: Identifying Water Hose And Water Pipe

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



ECKD216A

Fig. 92: Identifying Removal Sequence Of Cylinder Head Bolts

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

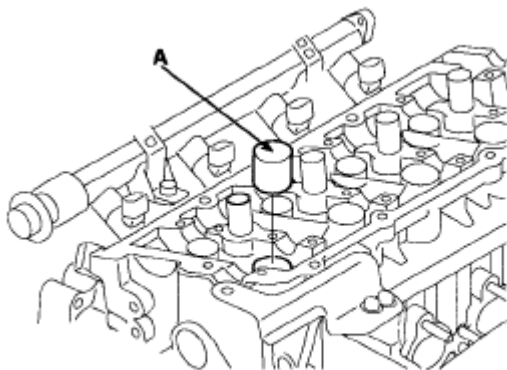
2. Lift the cylinder head from the dowels on the cylinder block and place the cylinder head on wooden blocks on a bench.

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.

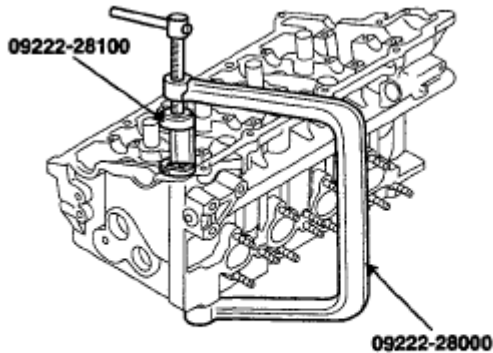
1. Remove MLAs(A).



ECKD217A

Fig. 93: Identifying Mechanical Lash Adjuster

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



ECKD218A

Fig. 94: Removing Retainer Lock

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

INSPECTION

CYLINDER HEAD

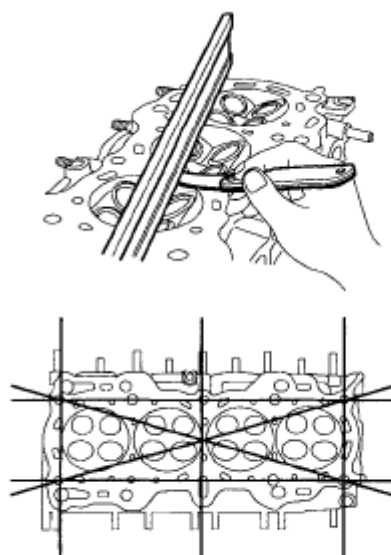
1. Inspect for flatness.

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

Flatness of cylinder head gasket surface

Standard: Less than 0.03mm(0.0012in.)

Limit: 0.05mm (0.0020in.)



ECKD001H

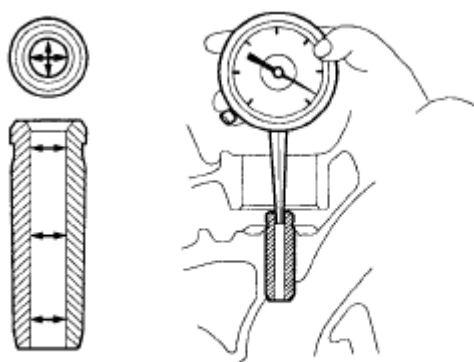
Fig. 95: Measuring Flatness Of Cylinder Head Gasket Surface

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

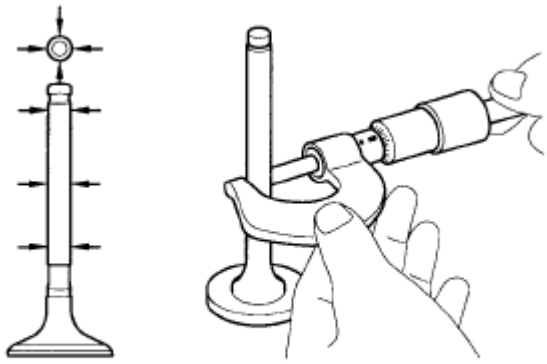
1. inspect valve stems and valve guides.
 1. Using a caliper gauge, measure the inside diameter of the valve guide.



ECKD219A

Fig. 96: Measuring Inside Diameter Or Valve Guide

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



ECKD220A

Fig. 97: Measuring Diameter Of Valve Stem

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

Valve stem-to-guide clearance

[Standard]

Intake: 0.02 ~ 0.05mm (0.0008 ~ 0.0020in.)

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

[Limit]

Intake: 0.1mm (0.0040in.)

Exhaust: 0.13mm (0.0051 in.)

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]

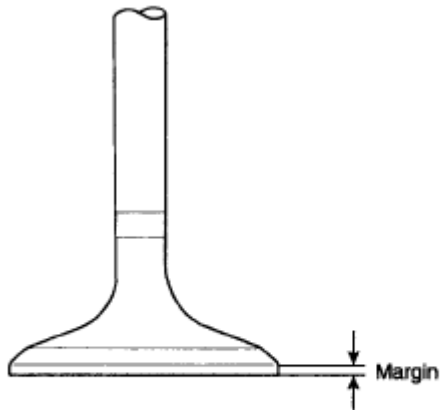
Intake: 1.15mm (0.0453in.)

Exhaust: 1.35mm (0.0531in.)

[Limit]

Intake: 0.8mm (0.0315in.)

Exhaust: 1.0mm (0.040in.)



ECKD221A

Fig. 98: Identifying Valve Head Margin Thickness

4. 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]

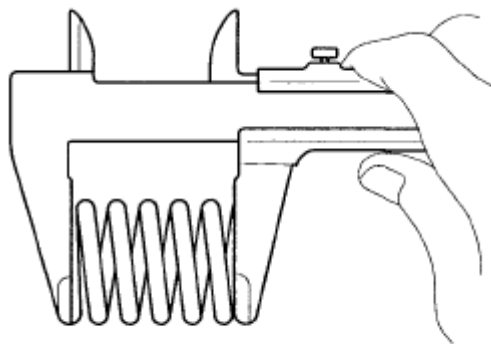
Free height : 48.86mm (1.9236in.)

Load: 18.8kg/39 mm (41.45lb/1.535in.)

[Limit]

Free height : -1.0mm(-0.0394in.)

Out-of-square : 3°



ECKD222A

Fig. 99: Measuring Free Length Of Valve Spring

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

CAMSHAFT

1. Inspect cam lobes.

Using a micrometer, measure the cam lobe height.

Cam height

[Standard value]

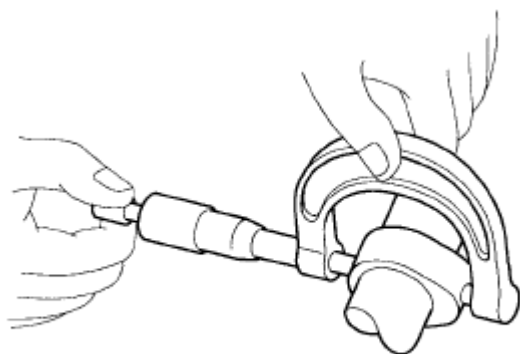
Intake: 44.618mm (1.7566in.)

Exhaust: 44.518mm (1.7527in.)

[Limit]

Intake: 44.518mm (1.7527in.)

Exhaust: 44.418mm (1.7487in.)

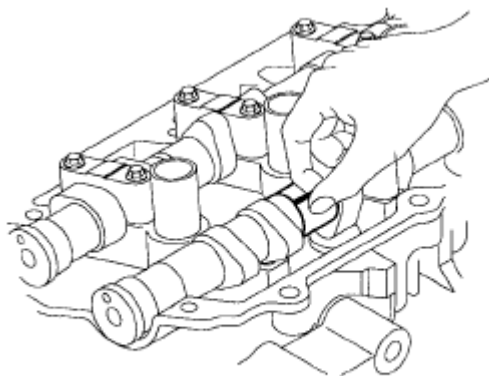


ECKD223A

Fig. 100: Measuring Cam Lobe Height

If the cam lobe height is less than minimum, 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. 101: Inspecting Camshaft Journal Clearance

4. Install the bearing caps.

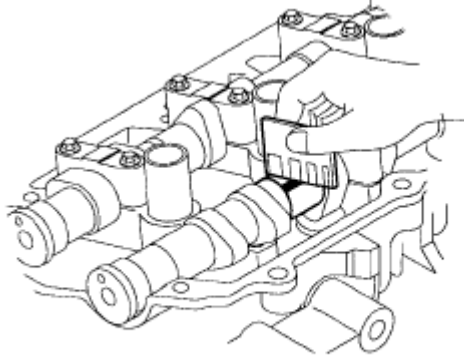
CAUTION: Do not turn the camshaft.

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

Bearing oil clearance

[Standard value]: 0.02 ~ 0.061 mm (0.0008 ~ 0.0024in.)

[Limit] : 0.1mm (0.0039in.)



ECKD225A

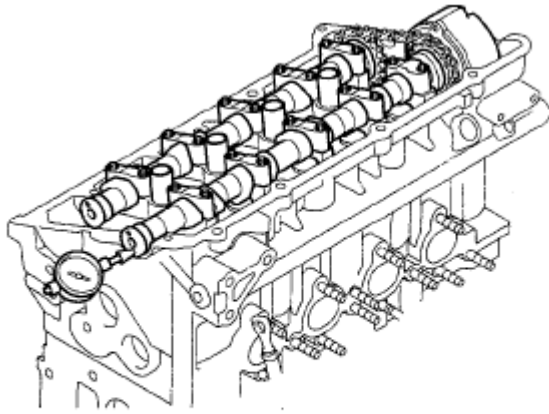
Fig. 102: Measuring Plastigage

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

7. Completely remove the plastigage.
8. Remove the camshafts.
3. Inspect 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]: 0.1 ~ 0.2mm(0.004 ~ 0.008in.)



ECKD226A

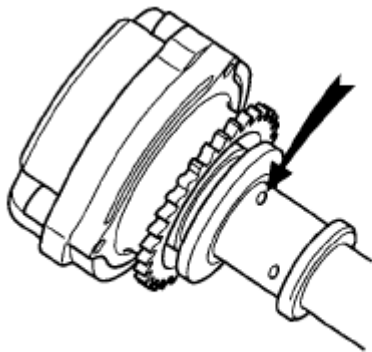
Fig. 103: Measuring Camshaft End Play

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

3. Remove the camshafts:

CVVT ASSEMBLY

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



EDKD270B

Fig. 104: Identifying CVVT Assembly

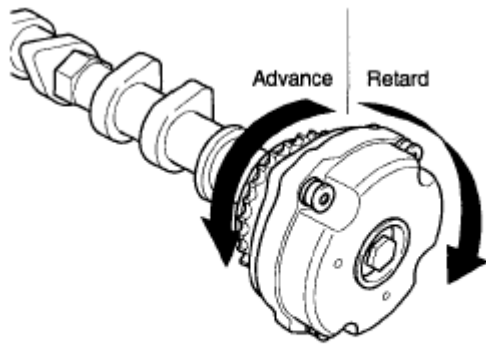
3. Wind tape around the tip of the air gun and apply air of approx. 100kpa(1 kgf/cm² , 14 psi) to the port of the camshaft.

(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.



BCGE010A

Fig. 105: Turning CVVT Assembly

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.

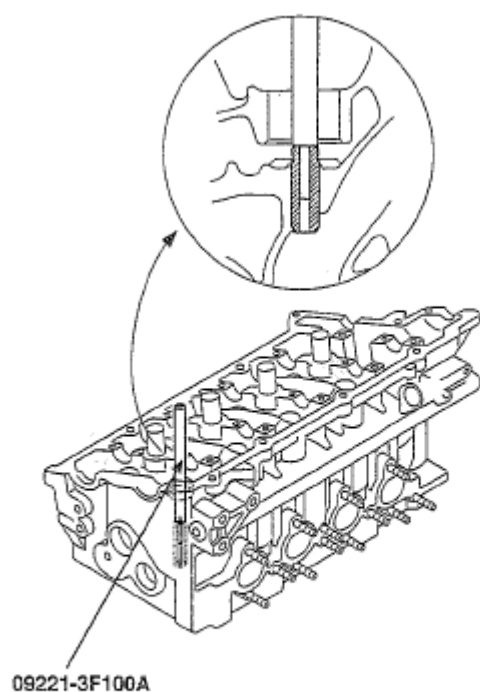
Standard: Movable smoothly in the range about 20°

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

REPLACEMENT

VALVE GUIDE

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



ECHE600A

Fig. 106: Removing Valve Guide

2. Recondition the valve guide hole so that it can match the newly press-fitted oversize valve guide.
3. Using the SST(09221-3F100A/B), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head. Keep in mind that the intake and exhaust valve guides are different in length.

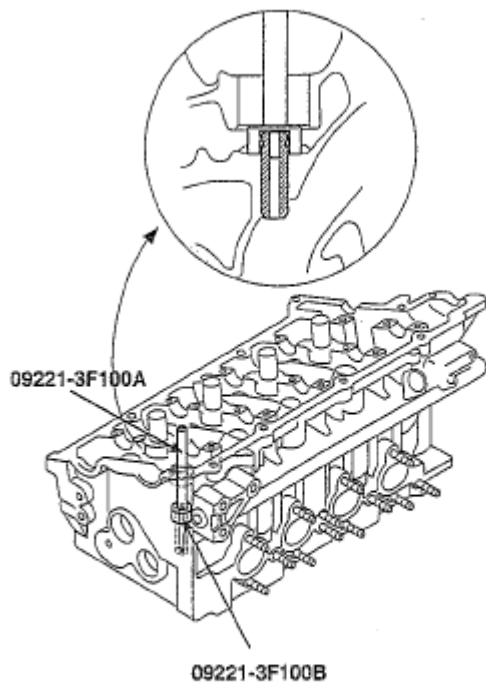
VALVE GUIDE SPECIFICATION

Over size mm(in.)	Size mark	Oversize valve guide hole size mm(in.)
0.05 (0.002)	5	11.05 ~ 11.068 (0.4350 ~ 0.4357)
0.25 (0.010)	25	11.25 ~ 11.268 (0.4429 ~ 0.4436)
0.50 (0.020)	50	11.50 ~ 11.518 (0.4528 ~ 0.4535)

Valve guide length

Intake: 46mm (1.8in.)

Exhaust: 54.5mm (2.15in.)



ECHE600B

Fig. 107: Installing Valve Guide

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

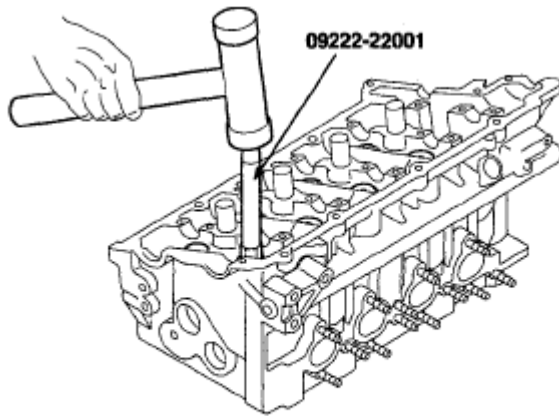
REASSEMBLY

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. Install the spring seats.
 2. Using SST(09222-22001), 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.



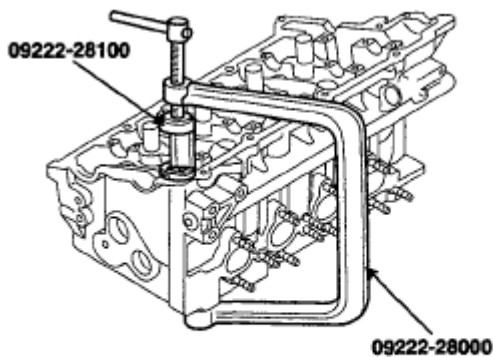
ECKD229A

Fig. 108: Installing Oil Seal

3. 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.

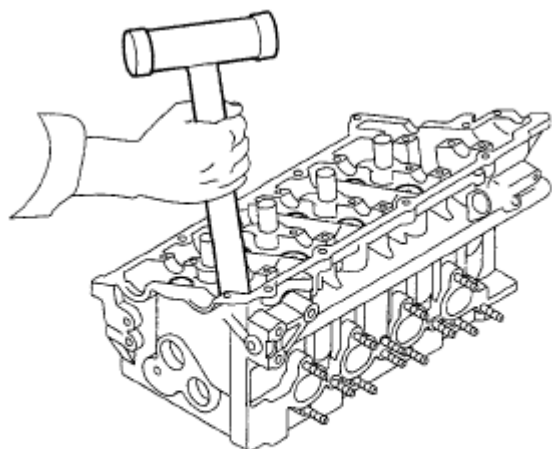
4. Using the SST(09222-28000, 09222-28100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.



ECKD218A

Fig. 109: Installing Retainer Locks

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.

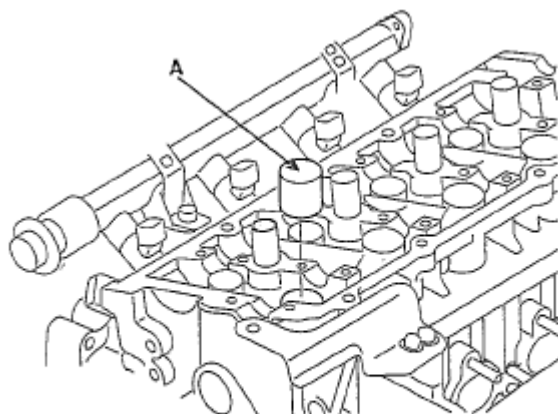


ECKD230A

Fig. 110: Tapping End Of Valve Stem

2. Install MLAs.

Check that the MLA rotates smoothly by hand.



ECKD217A

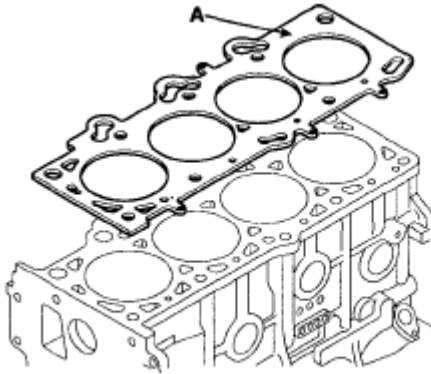
Fig. 111: Identifying Mechanical Lash Adjuster

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



ECKD231A

Fig. 112: Identifying Cylinder Head Gasket

NOTE: Be careful of the installation direction.

2. Place the cylinder head carefully in order not to damage the gasket with the bottom part of the end.
3. 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 8mm and 10mm hexagon wrench, install and tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

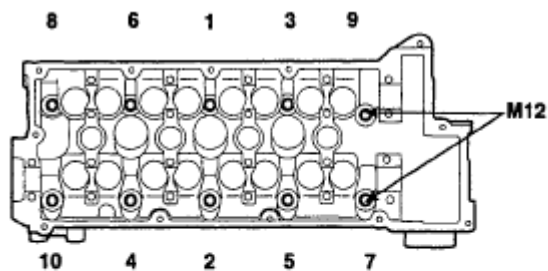
Tightening torque

M10 :

24.5Nm (2.5kgf.m, 18.1 lb-ft) + (60° ~ 65°) + (60° ~ 65°)

M12 :

29.4Nm (3.0kgf.m, 21.7lb-ft) + (60° ~ 65°) + (60° ~ 65°)



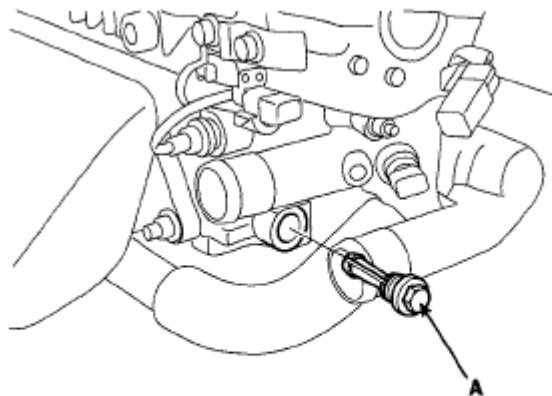
ECKD232A

Fig. 113: Identifying Tightening Sequence Of Cylinder Head Bolts

4. Install OCV filter(A).

Tightening torque

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



ECKD215A

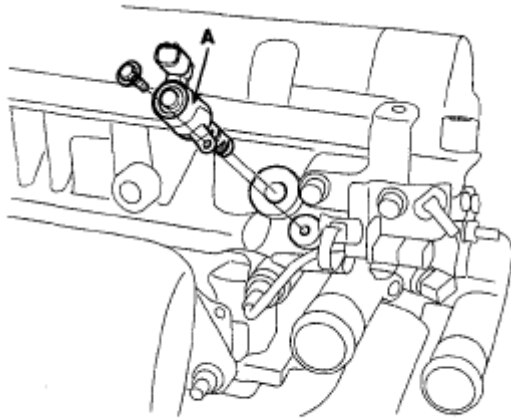
Fig. 114: Identifying Oil Control Valve Filter

NOTE: Always use a new OCV filter gasket.
Keep clean the OCV filter.

5. Install OCV(A).

Tightening torque

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



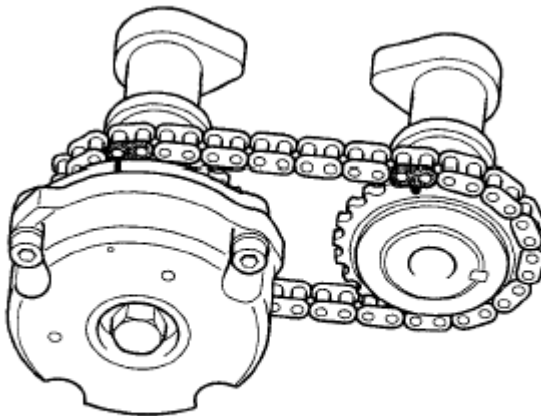
ECKD214A

Fig. 115: Identifying Oil Control Valve**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 camshafts.

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



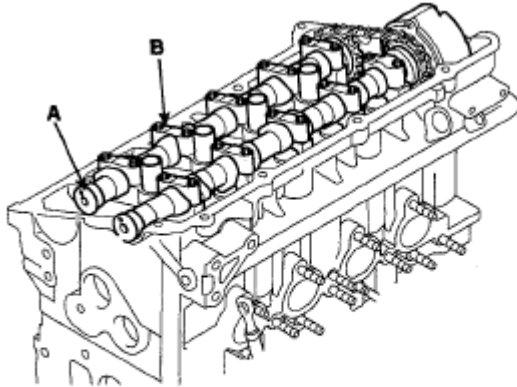
ECKD233A

Fig. 116: Identifying Camshaft Timing Chain And Timing Chain Sprocket

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

Tightening torque

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



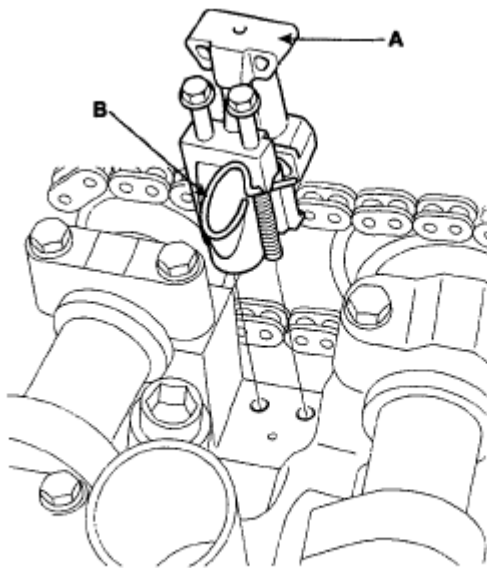
ECKD234A

Fig. 117: Identifying Camshafts And Bearing Caps

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

Tightening torque

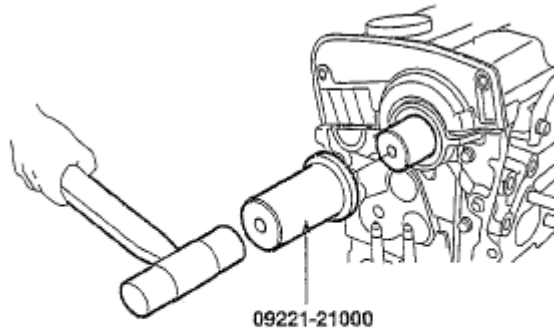
7.8 ~ 9.8Nm (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



ECKD212A

Fig. 118: Identifying Timing Chain Auto Tensioner

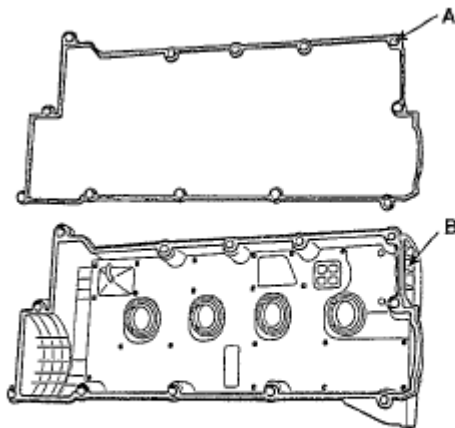
4. Remove the auto tensioner stopper pin(B).
7. Check and adjust valve clearance.
8. Using the SST(09221-21000), install the camshaft bearing oil seal.



ECKD235A

Fig. 119: Installing Camshaft Bearing Oil Seal

9. Install the camshaft sprocket.
10. Install the timing belt.
11. Install the cylinder head cover.
 1. Install the cylinder head cover gasket(A) in the groove of the cylinder head cover(B).



ECKD236A

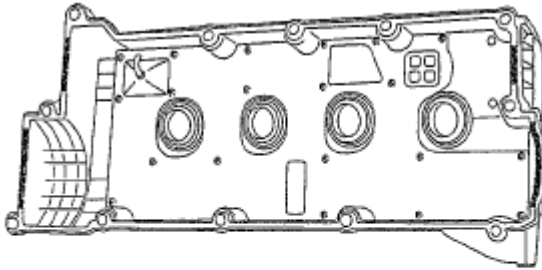
Fig. 120: Identifying Cylinder Head Cover Gasket And Cylinder Head Cover

NOTE:

- Before installing the head cover gasket, thoroughly clean the head cover gasket and the groove.

- **When installing, make sure the head cover gasket is seated securely in the corners of the recesses with no gap.**

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



ECKD237A

Fig. 121: Identifying Liquid Gasket Applying Area Of Head Cover Gasket

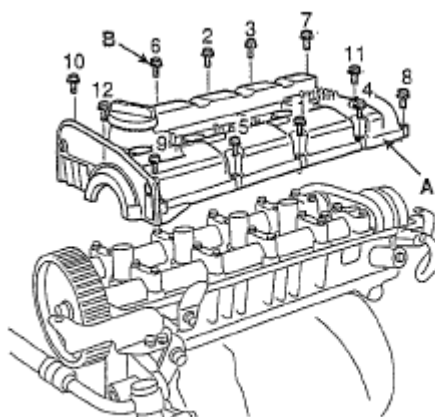
NOTE:

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

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

Tightening torque

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



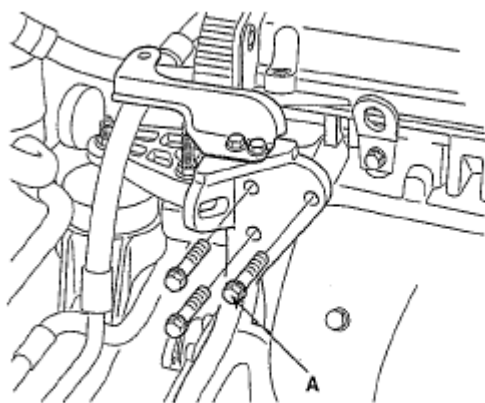
ADIE003A

Fig. 122: Identifying Tightening Sequence Of Cylinder Head Cover Bolts

12. Install the intake manifold.
13. Install the exhaust manifold.
14. Install the PCV.
15. Install the spark plug cable. (Refer to **IGNITION SYSTEM**)
16. Install the power steering pump bracket bolts(A).

Tightening torque

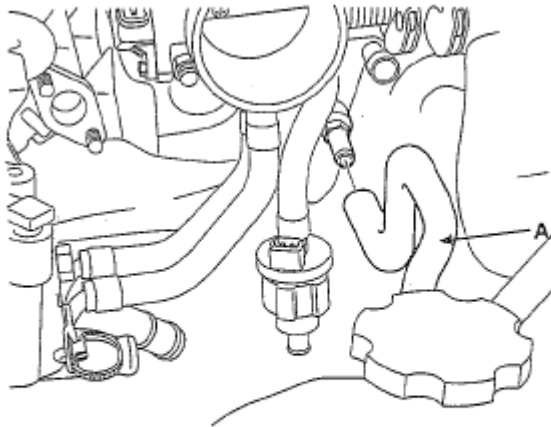
34.3 ~ 49.0Nm (3.5 ~ 5.0kgf.m, 25.3 ~ 36.2lb-ft)



ECKD211A

Fig. 123: Identifying Power Steering Pump Bracket Bolts

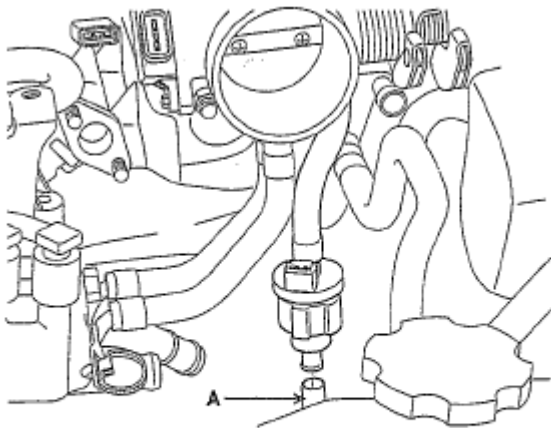
17. Install the power steering pump. (Refer to **POWER STEERING OIL PUMP**)
18. Install the accelerator cable.
19. Install the brake booster hose(A).



ECKD210A

Fig. 124: Identifying Brake Booster Vacuum Hose

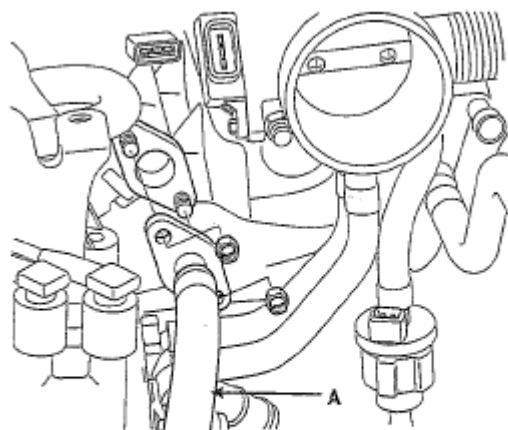
20. Install the PCSV hose(A).



ECKD209A

Fig. 125: Identifying PCSV Hose

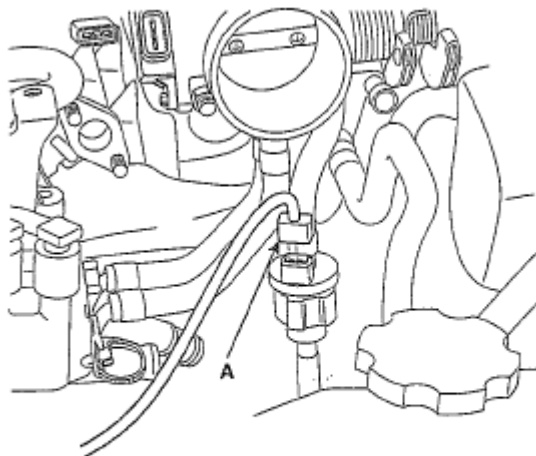
21. Install the fuel inlet hose(A).



ECKD206A

Fig. 126: Identifying Fuel Inlet Hose

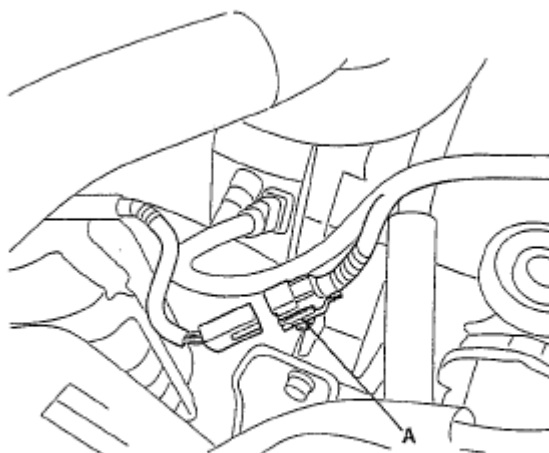
22. Install the engine wire harness connectors and wire harness clamps to the cylinder head and the intake manifold.
 1. PCSV connector(A).



ECKD207A

Fig. 127: Identifying Purge Control Solenoid Valve Connector

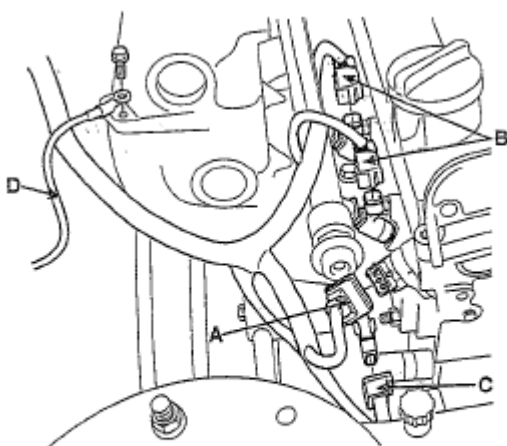
2. Front heated oxygen sensor connector(A).



ECKD206A

Fig. 128: Identifying Front Heated Oxygen Sensor Connector

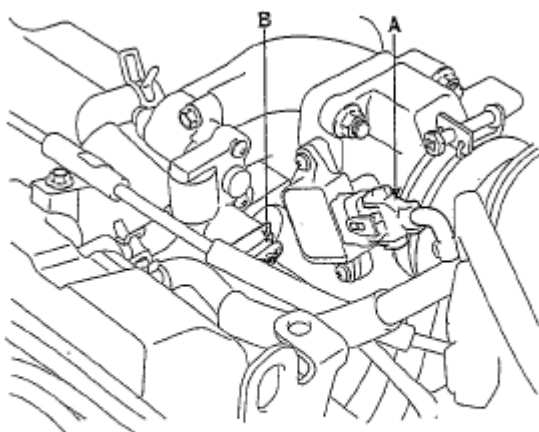
3. Connect the ground cable to the intake manifold(D).
4. Knock sensor connector(C).
5. Four fuel injector connectors(B).
6. CMP connector(A).



ECKD205A

Fig. 129: Identifying CMP Connector, Fuel Injector Connectors And Knock Sensor Connector

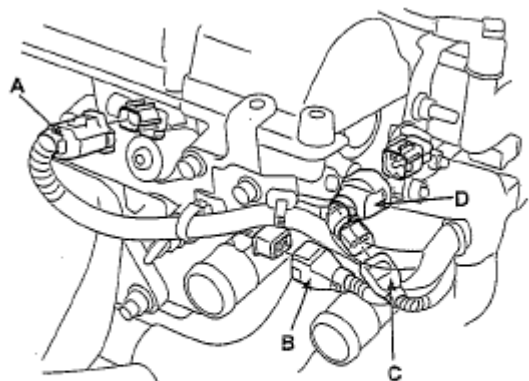
7. ISA connector(B).
8. TPS connector(A).



EDQF197A

Fig. 130: Identifying Throttle Position Sensor Connector And Idle Speed Actuator Connector

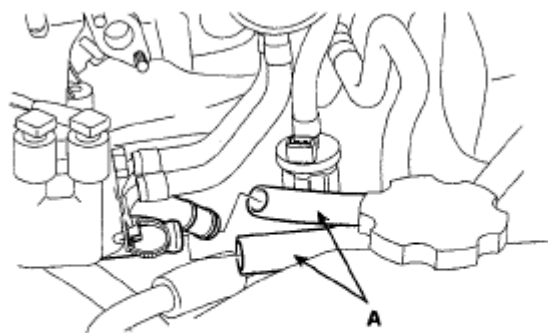
- 9. Ignition coil connector(D).
- 10. ECT sensor connector(C).
- 11. Oil temperature sensor connector(B).
- 12. OCV connector(A).



ECKD203A

Fig. 131: Identifying OCV Connector, Oil Temperature Sensor Connector And ECT Sensor Connector

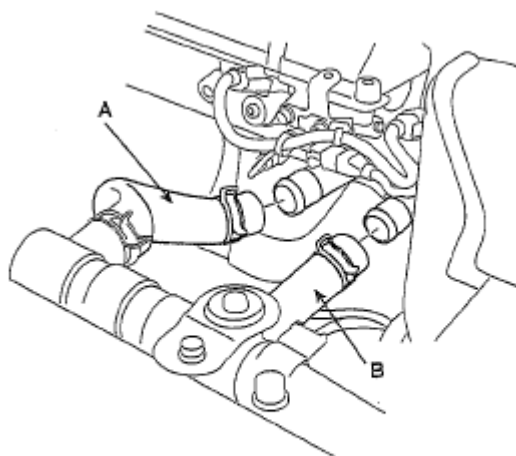
- 23. Install the heater hoses(A).



ECKD202A

Fig. 132: Identifying Heater Hoses

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



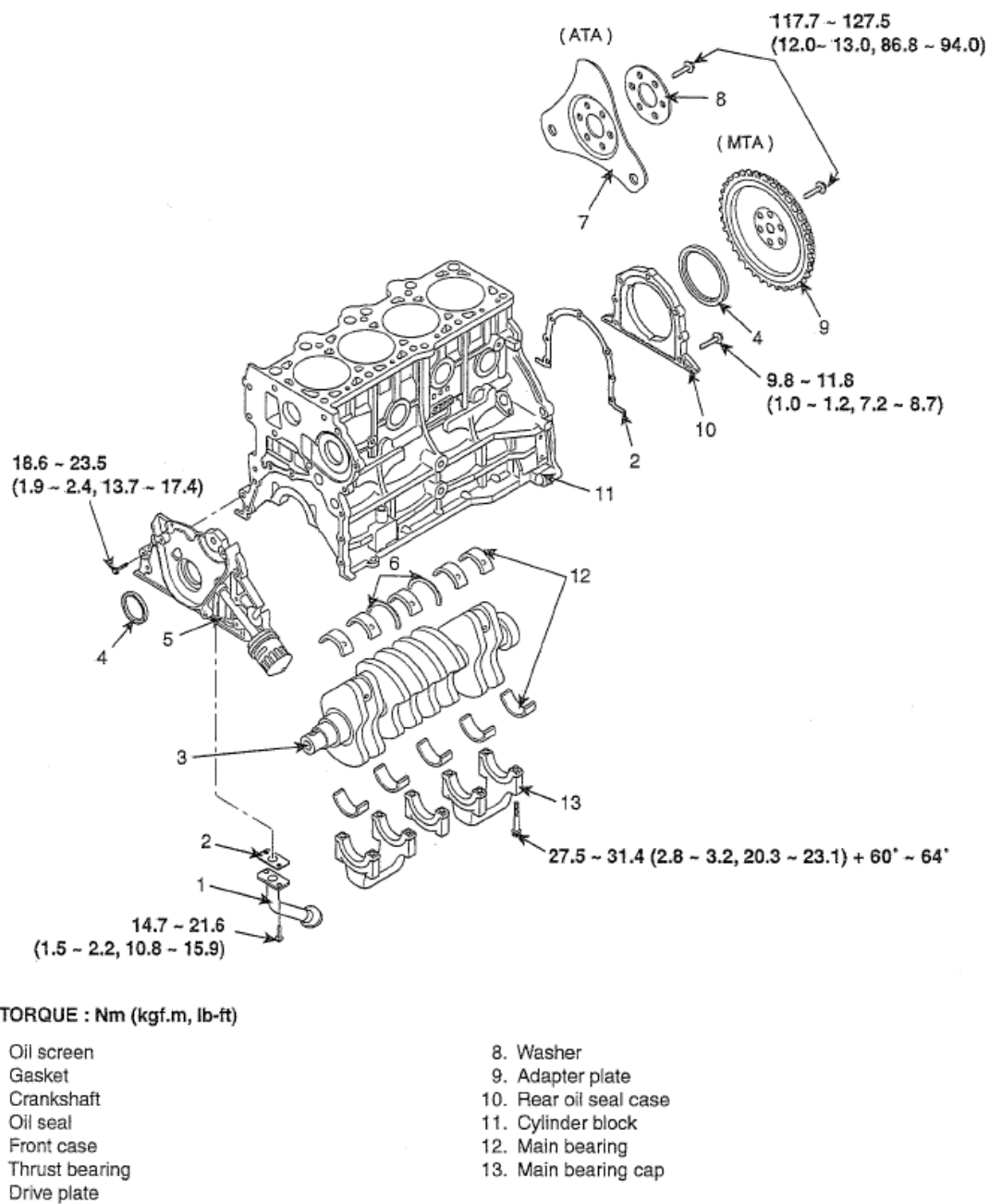
ECKD201A

Fig. 133: Identifying Upper And Lower Radiator Hose

25. Install the intake air hose and air cleaner assembly.
26. Install the engine cover.
27. Connect the negative terminal to the battery.
28. Fill with engine coolant.
29. Start the engine and check for leaks.
30. Recheck engine coolant level and oil level.

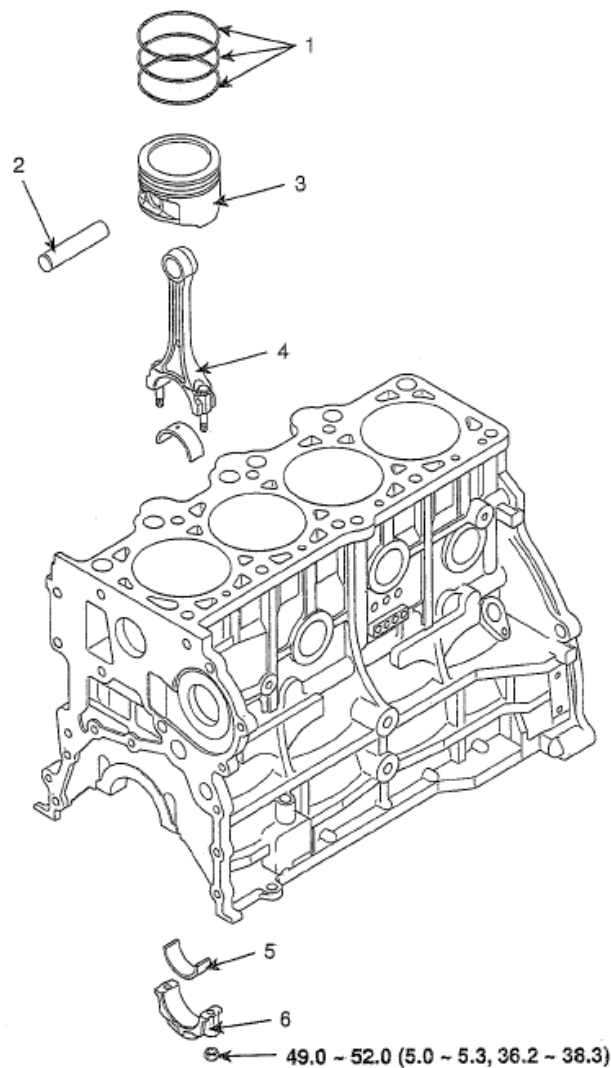
ENGINE BLOCK

COMPONENTS



SHDM16303L

Fig. 134: Identifying Engine Block Components With Torque Specifications (1 Of 2)



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

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

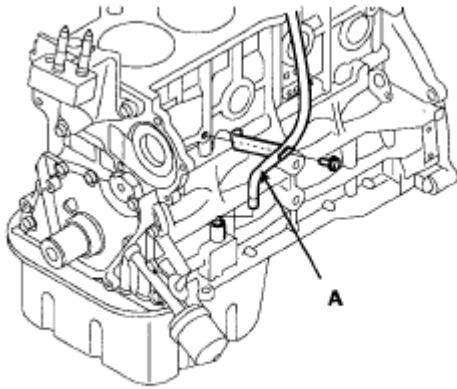
- 4. Connecting rod
- 5. Connecting rod bearing
- 6. Connecting rod bearing cap

SHDM16304L

Fig. 135: Identifying Engine Block Components With Torque Specifications (2 Of 2)

DISASSEMBLY

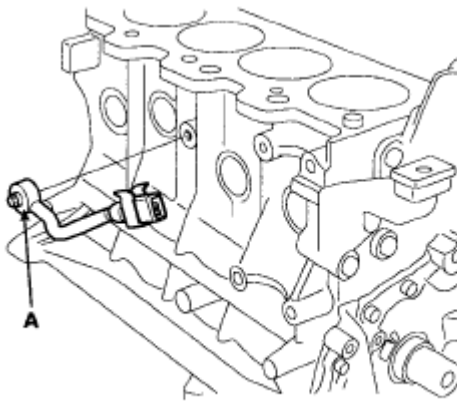
1. M/T : remove flywheel.
2. A/T : remove drive plate.
3. Install engine to engine stand for disassembly.
4. Remove timing belt.
5. Remove cylinder head.
6. Remove oil level gauge assembly(A).



ECKD301A

Fig. 136: Identifying Oil Level Gauge Assembly

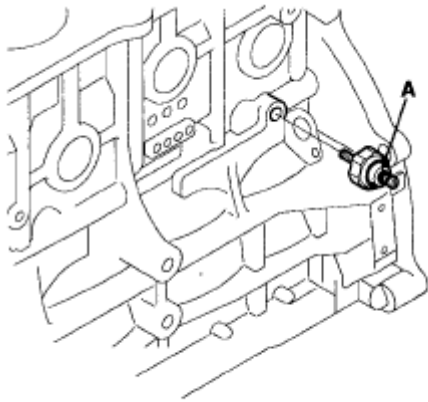
7. Remove knock sensor(A).



ECKD302A

Fig. 137: Identifying Knock Sensor

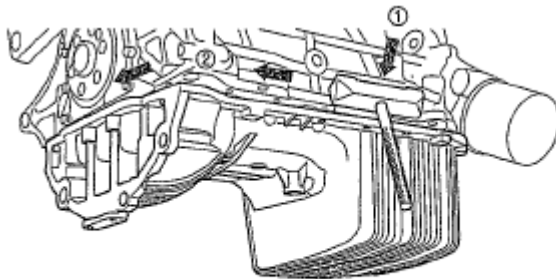
8. Remove oil pressure sensor(A).



ECKD303A

Fig. 138: Identifying Oil Pressure Sensor

9. Remove water pump.
10. Remove oil pan(A).



SGKEM7201N

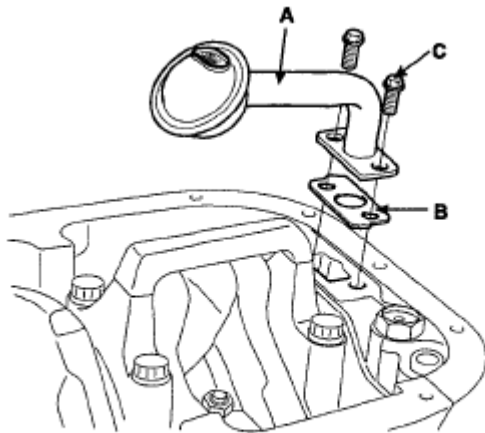
Fig. 139: Removing Oil Pan

CAUTION:

- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of 1 arrow.
- After tapping the SST with a plastic hammer along the direction of 2 arrow around more than 2/3 edge of the oil pan, remove it from the ladder frame.
- Do not turn over the SST abruptly without tapping. It is result in damage of the SST.

11. Remove oil screen.

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



ECKD305A

Fig. 140: Identifying Oil Screen And Gasket

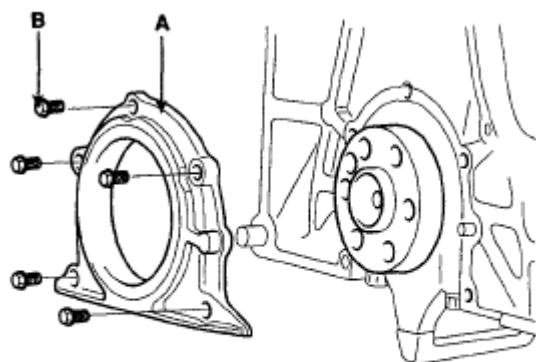
12. Check the connecting rod end play.
13. Remove the connecting rod caps and check oil clearance.
14. Remove piston and connecting rod assemblies.
 1. Using a ridge reamer, remove all the carbon from the top of the cylinder.
 2. Push the piston, connecting rod assembly and upper bearing through the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

15. Remove front case.
16. Remove rear oil seal case.

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

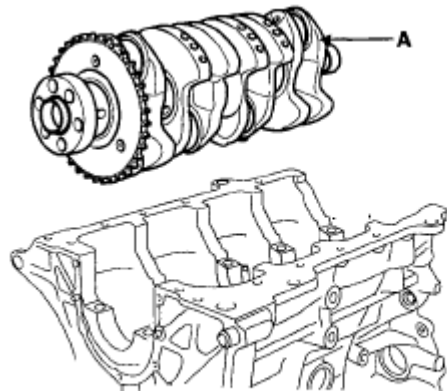


ECKD306A

Fig. 141: Identifying Rear Oil Seal Case Bolts

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

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



ECKD307A

Fig. 142: Identifying Crankshaft

20. Check fit between piston and piston pin.

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

21. Remove 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.

22. Disconnect connecting rod from piston.

INSPECTION

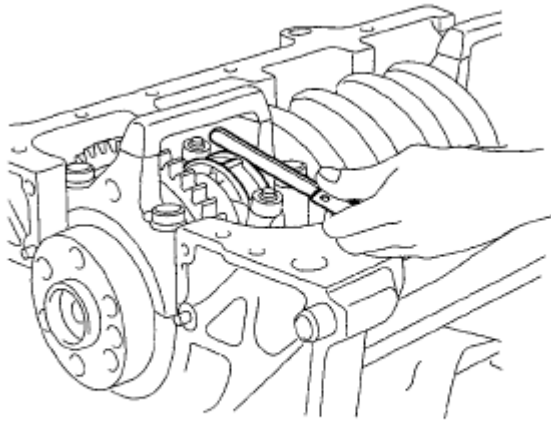
CONNECTING ROD AND CRANKSHAFT

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 : 0.4mm(0.016in.)



ECKD308A

Fig. 143: Checking Connecting Rod End Play

- 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 nuts.
 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 nuts.

Tightening torque

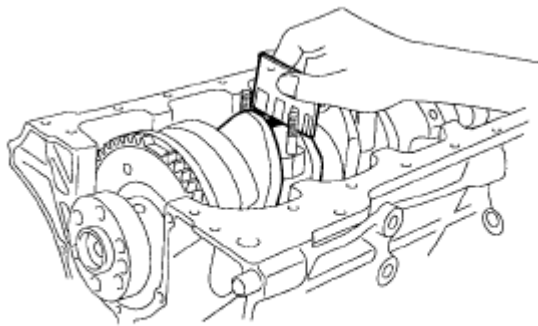
49.0 ~ 52.0Nm (5.0 ~ 5.3kgf.m, 36.2 ~ 38.3lb-ft)

NOTE: Do not turn the crankshaft.

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

Standard oil clearance

0.024 ~ 0.042mm(0.0009 ~ 0.0017in.)



ECKD309A

Fig. 144: Measuring Plastigage

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.

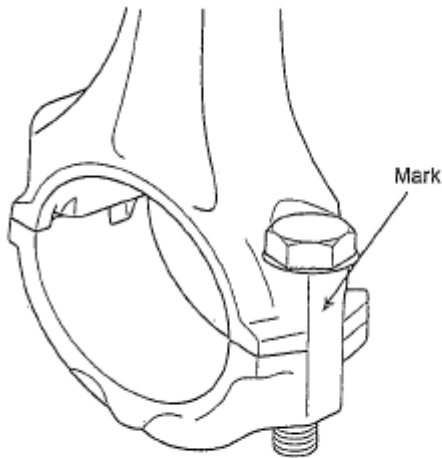
CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

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



BDQE003A

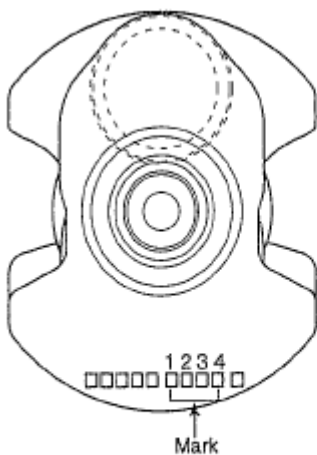
Fig. 145: Identifying Connecting Rod Mark Location

DISCRIMINATION OF CONNECTING ROD

DISCRIMINATION OF CONNECTING ROD

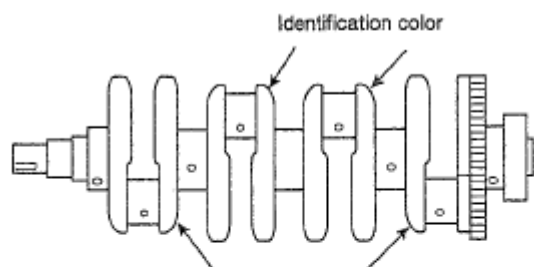
CLASS	MARK	INSIDE DIAMETER
a	A	48.00 ~ 48.006mm (1.8896 ~ 1.8899in.)
b	B	48.006 ~ 48.012mm (1.8899 ~ 1.8902in.)
c	C	48.012 ~ 48.018mm (1.8902 ~ 1.8904in.)

CRANKSHAFT PIN MARK LOCATION



SLDEM17005L

Fig. 146: Identifying Crankshaft Pin Mark Location



SLDEM17004L

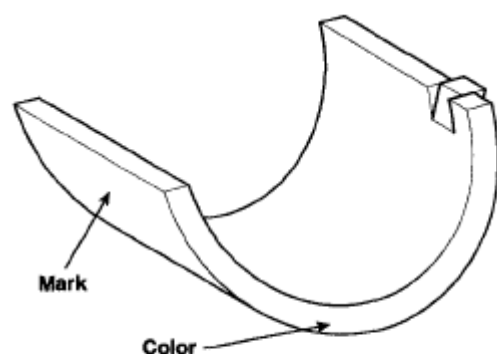
Fig. 147: Identifying Identification Color Location

DISCRIMINATION OF CRANKSHAFT

DISCRIMINATION OF CRANKSHAFT

CLASS	MARK	OUTSIDE DIAMETER OF PIN
I	1	44.960 ~ 44.966mm (1.7700 ~ 1.7703in.)
II	2	44.952 ~ 44.960mm (1.7698 ~ 1.7700in.)
III	3	44.946 ~ 44.952mm (1.7695 ~ 1.7698in.)

PLACE OF IDENTIFICATION MARK (CONNECTING ROD BEARING)



ECKD313A

Fig. 148: Identifying Place Of Identification Mark (Connecting Rod Bearing)

DISCRIMINATION OF CONNECTING ROD BEARING

DISCRIMINATION OF CONNECTING ROD BEARING

CLASS	MARK	THICKNESS OF BEARING
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2008 Hyundai Tiburon GT

2008 ENGINE Engine Mechanical System (G4GC-GSL 2.0) - Tiburon

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.)

Selection

CONNECTING ROD IDENTIFICATION MARK REFERENCE

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

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

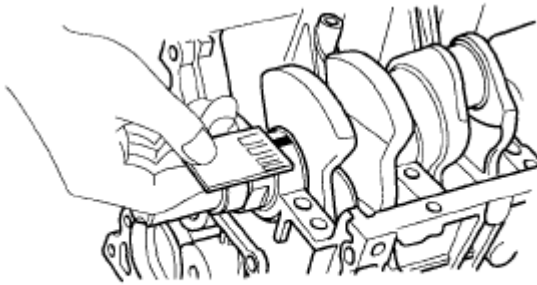
29.4Nm (3.0kgf.m, 21.7lb-ft) + 60° ~ 65°

NOTE: Do not turn the crankshaft.

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

Standard oil clearance

0.028 ~ 0.046mm (0.0011 ~ 0.0018in.)



ECKD0011

Fig. 149: Measuring Widest Part Of Plastigage

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

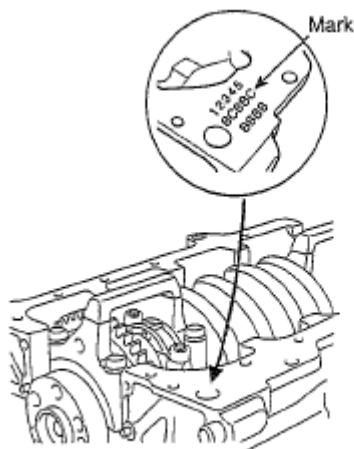
Allowable twist of connecting rod :

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

Crankshaft bore mark location

Letters have been stamped on the end of 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.



SLDEM7006L

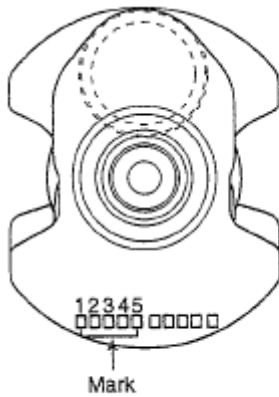
Fig. 150: Identifying Crankshaft Bore Mark Location

DISCRIMINATION OF CYLINDER BLOCK

DISCRIMINATION OF CYLINDER BLOCK

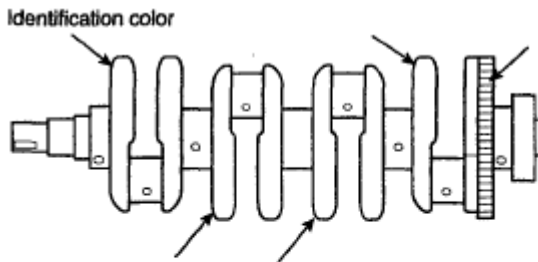
CLASS	MARK	INSIDE DIAMETER
a	A	61.000 ~ 61.006mm (2.4015 ~ 2.4018in.)
b	B	61.006 ~ 61.012mm (2.401 B ~ 2.4020in.)
c	C	61.012 ~ 61.018mm (2.4020 ~ 2.4023in.)

CRANKSHAFT JOURNAL MARK LOCATION



SLDEM7007L

Fig. 151: Identifying Crankshaft Journal Mark Location



SHDM16326L

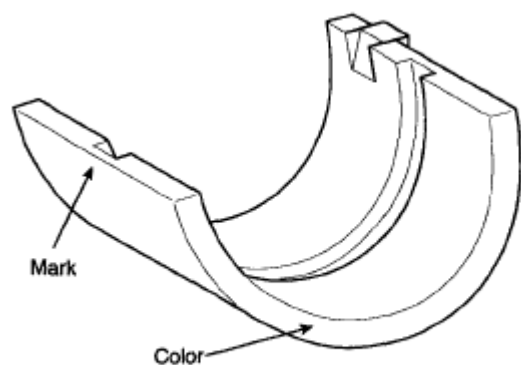
Fig. 152: Identifying Identification Color Location

DISCRIMINATION OF CRANKSHAFT

DISCRIMINATION OF CRANKSHAFT

CLASS	MARK	OUTSIDE DIAMETER OF JOURNAL
1	YELLOW	56.956 ~ 56.962mm (2.2423 ~ 2.2426in.)
11	NONE	56.948 ~ 56.956mm (2.2420 ~ 2.2423in.)
III	WHITE	56.942 ~ 56.948mm (2.2418 ~ 2.2420in.)

PLACE OF IDENTIFICATION MARK (CRANKSHAFT BEARING)



ECKD316A

Fig. 153: Identifying Place Of Identification Mark (Crankshaft Bearing)**DISCRIMINATION OF CRANKSHAFT BEARING****DISCRIMINATION OF CRANKSHAFT BEARING**

CLASS	MARK	THICKNESS OF BEARING
AA	BLUE	2.014 ~ 2.017mm (0.0793 ~ 0.0794in.)
A	BLACK	2.011 ~ 2.014mm (0.0791 ~ 0.0793in.)
B	NONE	2.008 ~ 2.011mm (0.0790 ~ 0.0791 in.)
C	GREEN	2.005 ~ 2.008mm (0.0789 ~ 0.790in.)
D	YELLOW	2.002 ~ 2.005mm (0.0788 ~ 0.0789in.)

SELECTION**CRANKSHAFT BORE IDENTIFICATION MARK REFERENCE**

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

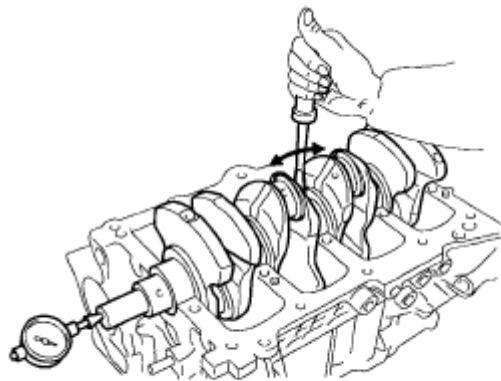
Check crankshaft end play.

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

Standard end play

0.06 ~ 0.26mm (0.0023 ~ 0.010in.)

Limit: 0.30mm (0.0118in.)



ECKD001B

Fig. 154: Checking Crankshaft End Play

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

Thrust bearing thickness

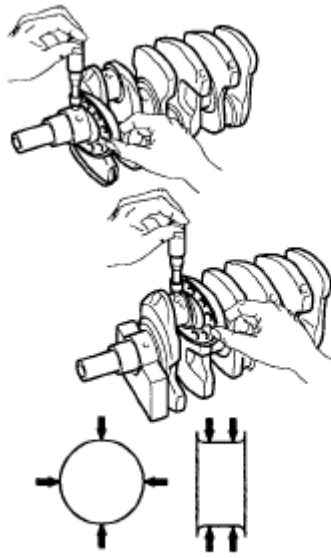
2.44 ~ 2.47mm (0.096 ~ 0.097in.)

Inspect main journals and crank pins

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

Main journal diameter: 57mm (2.165in.)

Crank pin diameter: 45mm (1.77in.)



ECKD001E

Fig. 155: Measuring Diameter Of Main Journal And Crank Pin

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.

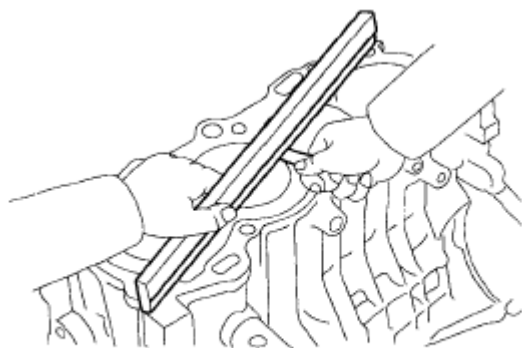
3. Inspect top surface of cylinder block for flatness.

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 0.03mm(0.0012 in.)

Limit: 0.05 mm (0.0020 in.)



ECKD001L

Fig. 156: Checking Flatness Of Cylinder Block Gasket Surface**4. Inspect cylinder bore diameter**

Visually check the cylinder for vertical scratch.

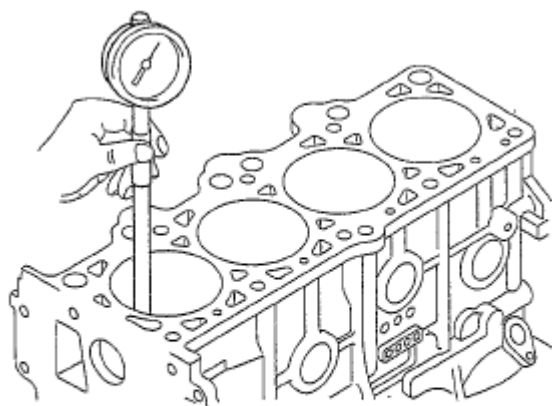
If deep scratches are present, replace the cylinder block.

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

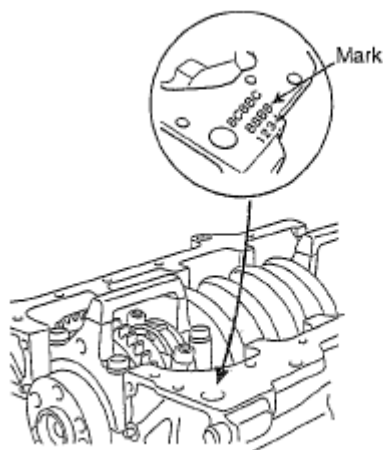
82.00 ~ 82.03mm (3.2283 ~ 3.2295in.)



ECKD318A

Fig. 157: Measuring Cylinder Bore Diameter

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



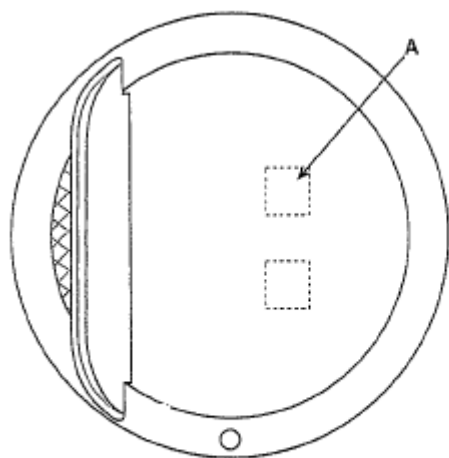
SLDEM7008L

Fig. 158: Identifying Cylinder Bore Size Code On Cylinder Block Bottom Face

CYLINDER BORE INNER DIAMETER SPECIFICATION

Class	Cylinder bore inner diameter	Size code
A	82.00 ~ 82.01mm (3.228 ~ 3.2287in.)	A
B	82.01 ~ 82.02mm (3.2287 ~ 3.2291 in.)	B
C	82.02 ~ 82.03mm (3.2291 ~ 3.2295in.)	C

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



ECKD320B

Fig. 159: Identifying Piston Size Code On Piston Top Face

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

PISTON OUTER DIAMETER SPECIFICATION

Class	Piston outer diameter	Size code
A	81.97 ~ 81.98mm (3.2271 ~ 3.2275in.)	A
B	81.98 ~ 81.99mm (3.2275 ~ 3.2279in.)	None
C	81.99 ~ 82.00mm (3.2279 ~ 3.2283in.)	C

- Select the piston related to cylinder bore class.

Clearance: 0.02 ~ 0.04mm (0.00078 ~ 0.00157in.)

BORING CYLINDER

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

PISTON SIZE SPECIFICATION

Identification Mark	Size
0.25	0.25mm (0.010in.)
0.50	0.50mm (0.020in.)

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

- Measure the outside diameter of the piston to be used.
- According to the measured O.D., calculate the new bore size.

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

- 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.

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

Standard: 0.02 ~ 0.04mm (0.0008 ~ 0.001 Sin.)

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

- Clean piston
 - 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

81.97 ~ 82.00mm (3.2272 ~ 3.2283in.)

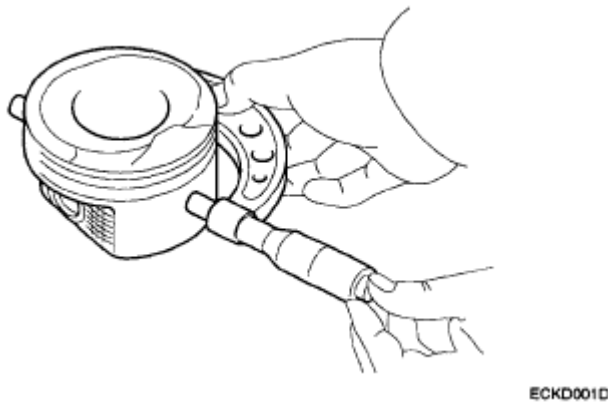


Fig. 160: Measuring Piston Outside Diameter

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

Piston-to-cylinder clearance

0.02 ~ 0.04mm(0.0008 ~ 0.0016in.)

4. Inspect the piston ring side clearance.

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

Piston ring side clearance

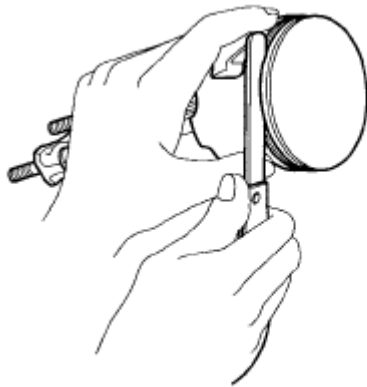
No. 1 : 0.04 ~ 0.08mm (0.0016 ~ 0.0031 in.)

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

Limit

No. 1 : 0.1mm (0.004in.)

No. 2 : 0.1mm (0.004in.)



ECKD001G

Fig. 161: Measuring Clearance Between Piston Ring And Wall Of Ring Groove

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 diameter against the wear limits. If the bore is over the service limit, the cylinder block must be rebored.

Piston ring end gap

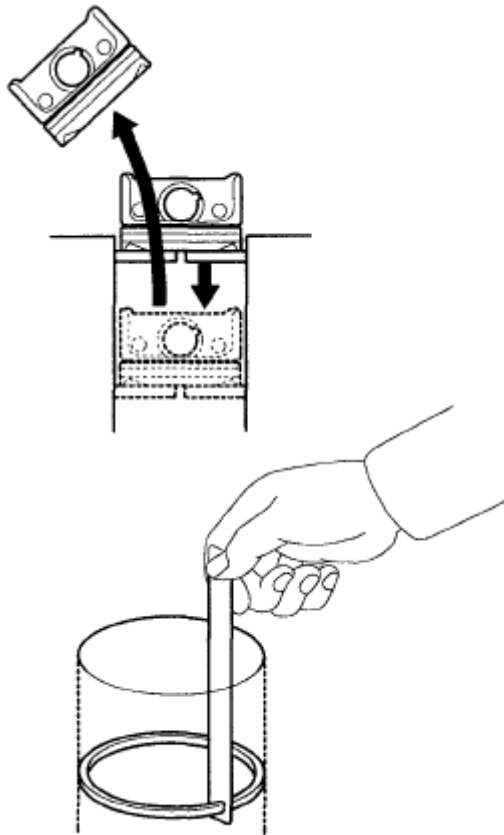
Standard

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

No.2 : 0.45 ~ 0.60mm (0.0177 ~ 0.0238in.)

Limit

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



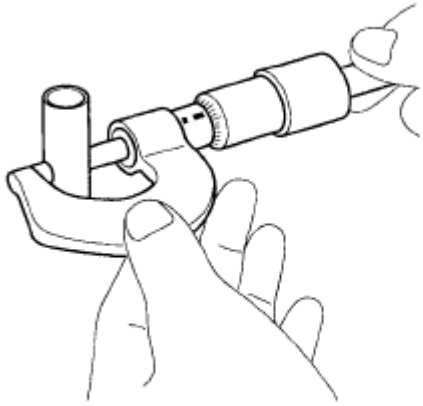
ECKD001K

Fig. 162: Measuring Piston Ring End Gap**PISTON PINS**

1. Measure the diameter of the piston pin.

Piston pin diameter

20.001 ~ 20.006mm (0.7874 ~ 0.7876in.)



ECKD001Z

Fig. 163: Measuring Diameter Of Piston Pin

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.

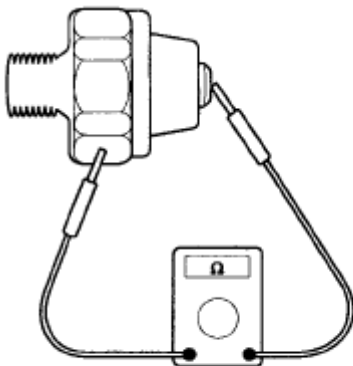
Piston pin-to-connecting rod interference

0.016 ~ 0.032mm (0.00063 ~ 0.00126in.)

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.

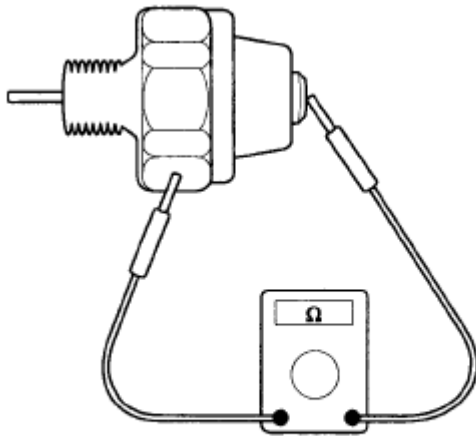


ECKD001W

Fig. 164: Checking Continuity Between Terminal And Body With Ohmmeter

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 (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

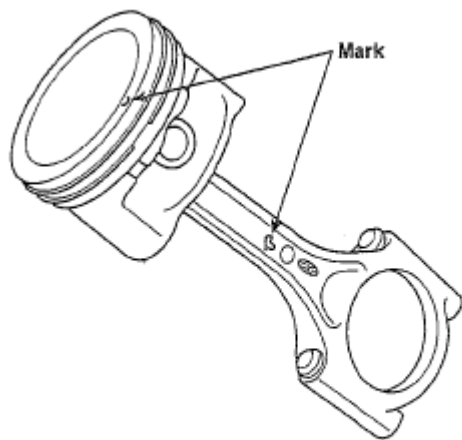
Fig. 165: Checking Continuity Between Terminal And Body

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.

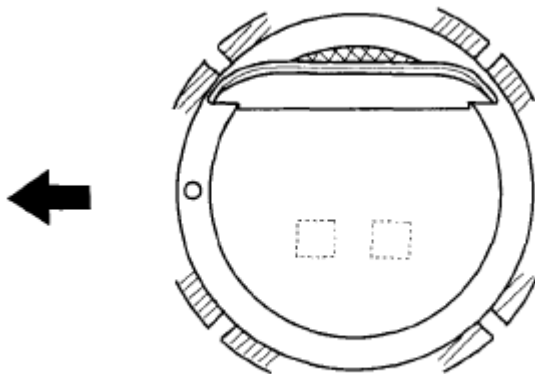
1. Assemble piston and connecting rod.
 1. Use a hydraulic press for installation.
 2. The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



BDGE001A

Fig. 166: Identifying Piston Front Mark And Connecting Rod Front Mark

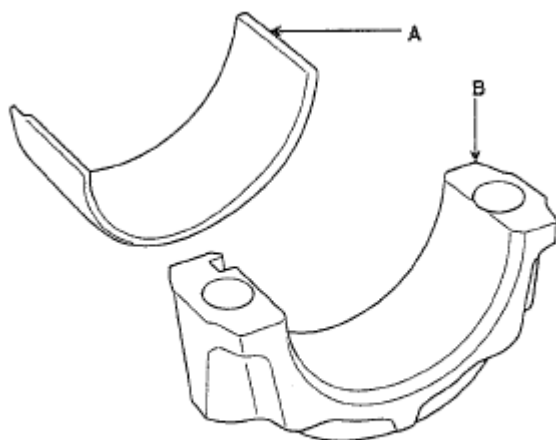
2. Install piston rings.
 1. Install the oil ring spacer and 2 side rails by hand.
 2. Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
 3. Position the piston rings so that the ring ends are as shown.



ECKD321A

Fig. 167: Identifying Piston Rings Ends

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).



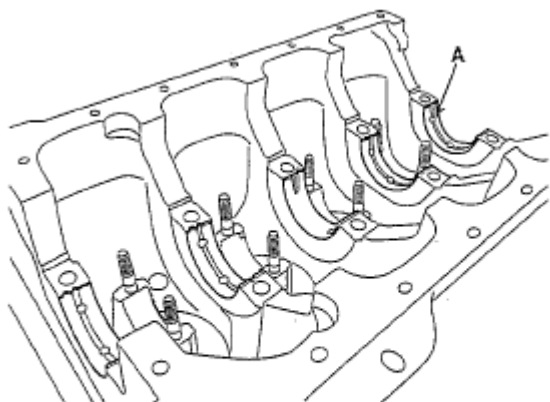
ECKD322A

Fig. 168: Identifying Bearings And Connecting Rod Cap

4. Install main bearings.

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

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



ECKD323A

Fig. 169: Identifying Upper Bearings

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

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

Tightening torque

Main bearing cap bolt

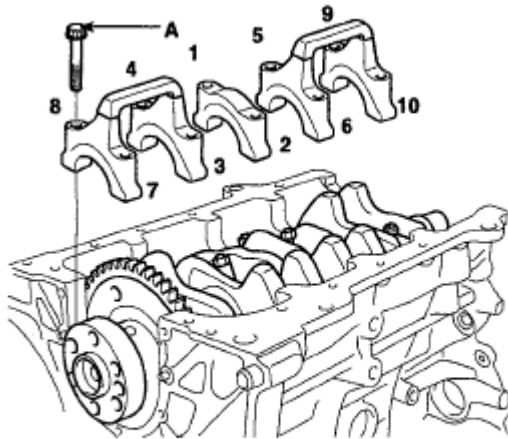
27.5 ~ 31.4Nm (2.8 ~ 3.2kgf.m, 20.3 ~ 23.1 lb-ft) + 60° ~ 64°

NOTE:

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

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

Tightening torque : 29.4Nm (3.0kgf.m, 21.7lb-ft)



ECHE200A

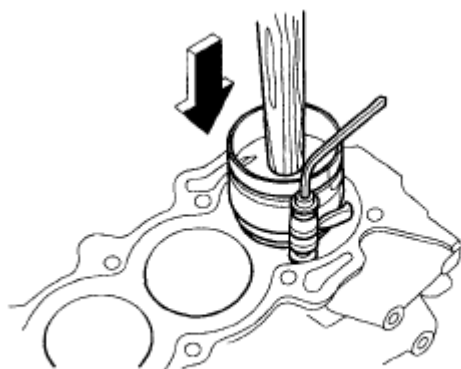
Fig. 171: Identifying Tightening Sequence Of Bearing Cap Bolts

3. Retighten the bearing cap bolts by 60°~65° in the numerical order shown.
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 nuts : 49.0 - 52.0Nm (5.0 ~ 5.3kgf.m, 36.2 ~ 38.3lb-ft)

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



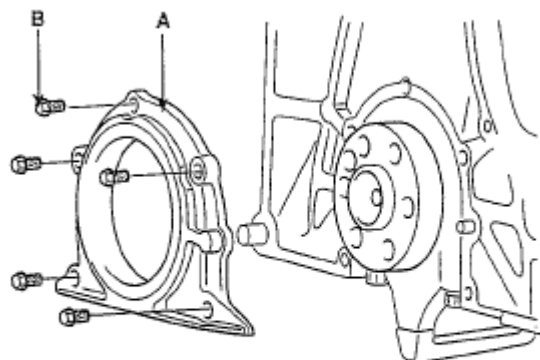
ECKD001F

Fig. 172: Installing Piston And Connecting Rod Assemblies

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

Tightening torque

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

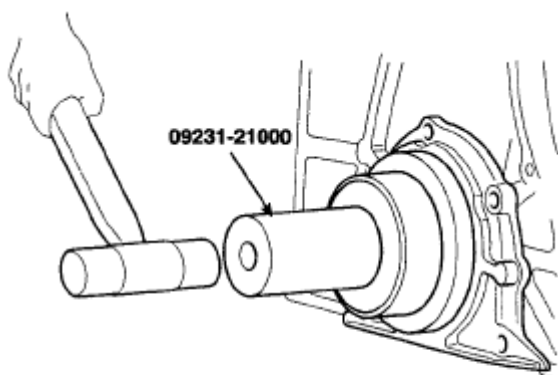


ECKD306A

Fig. 173: Identifying Oil Screen And Gasket

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

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



ECKD326A

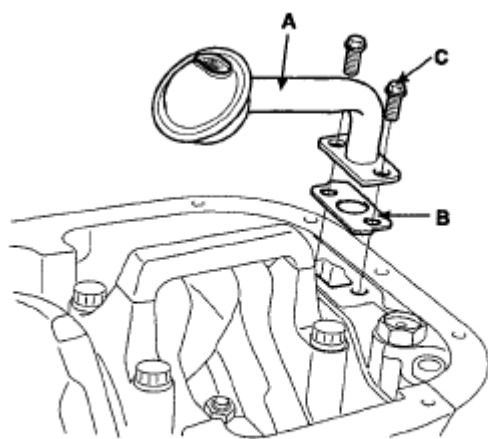
Fig. 174: Installing Oil Seal

13. Install front case.
14. Install oil screen.

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

Tightening torque

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



ECKD305A

Fig. 175: Identifying Oil Screen And Gasket

15. 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 MS 721-40A or equivalent.

NOTE:

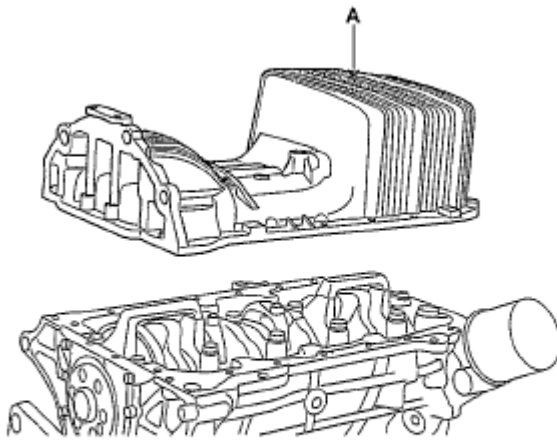
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling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

3. Install the oil pan(A) with the 19 bolts.

Uniformly tighten the bolts in several passes.

Tightening torque

9.8 ~ 11.8Nm (1.0 ~ 1.2kgf.m, 7. ~ 8.7lb-ft)



ECKD304A

Fig. 176: Identifying Oil Pan

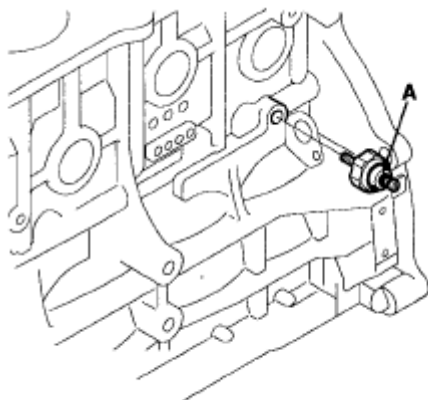
16. Install water pump.
17. Install oil pressure sensor.
 1. Apply adhesive to 2 or 3 threads.

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

2. Install the oil pressure sensor (A).

Tightening torque

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



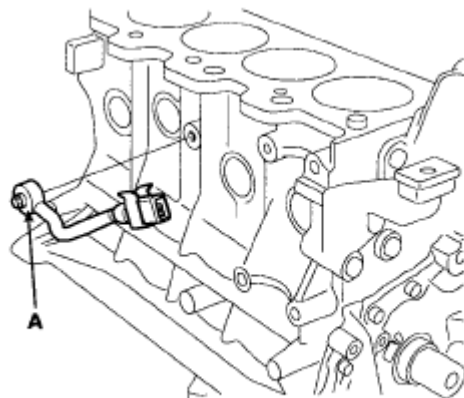
ECKD303A

Fig. 177: Identifying Oil Pressure Sensor

18. Install knock sensor(A).

Tightening torque

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



ECKD302A

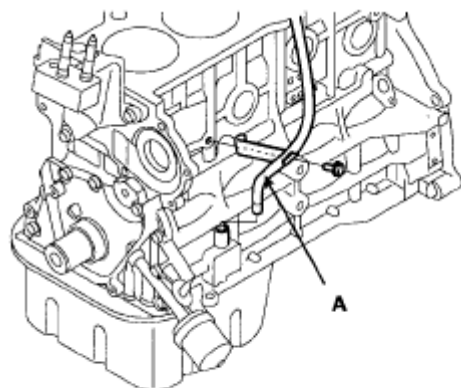
Fig. 178: Identifying Knock Sensor

19. 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

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



ECKD301A

Fig. 179: Identifying Oil Level Gauge Assembly

20. Install cylinder head.
21. Install timing belt.
22. Remove engine stand.
23. A/T : install drive plate.

Tightening torque

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

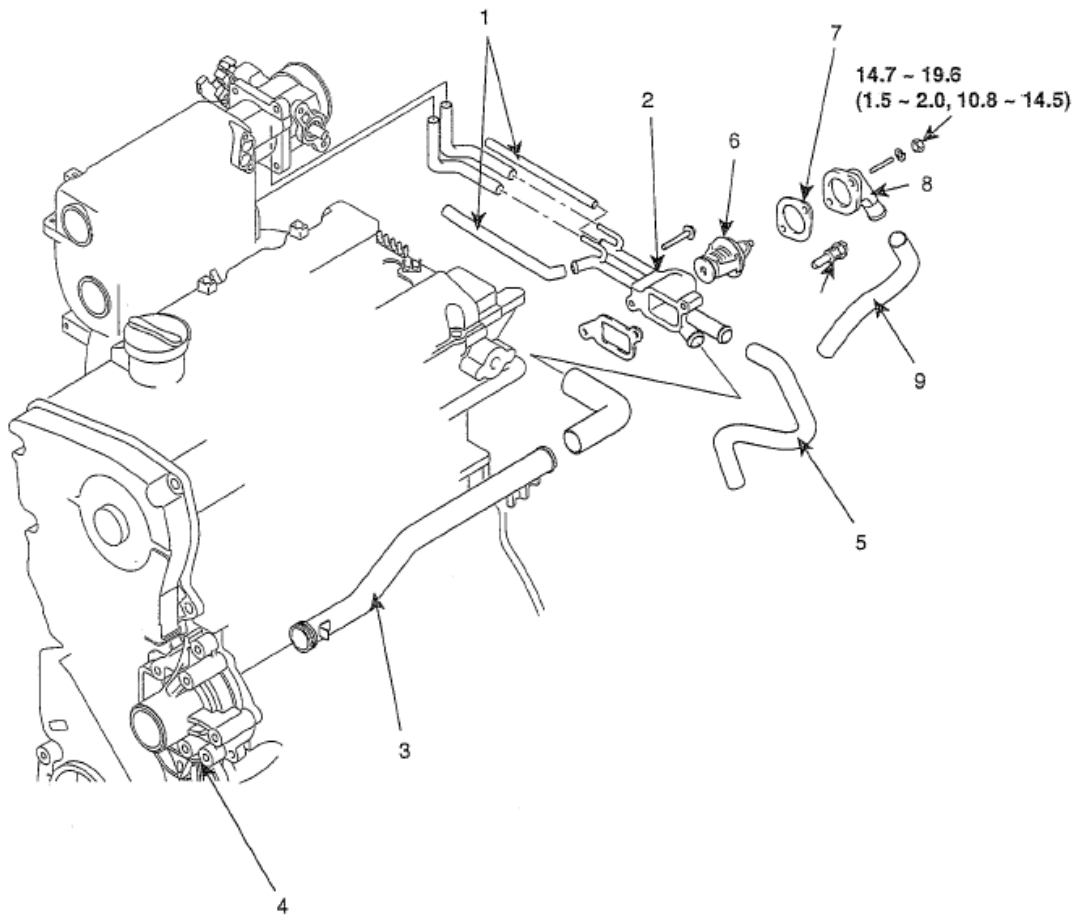
24. MAT: Install flywheel.

Tightening torque

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

COOLING SYSTEM

COMPONENTS



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

- | | |
|------------------------|--------------------------|
| 1. Heater hoses | 6. Thermostat |
| 2. Thermostat housing | 7. Gasket |
| 3. Coolant inlet pipe | 8. Coolant inlet fitting |
| 4. Water pump | 9. Radiator lower hose |
| 5. Radiator upper hose | |

SHDM16305L

Fig. 180: Identifying Cooling System Components With Torque Specifications

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. Slide the heater temperature control lever to maximum heat. 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 anti-rust 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.

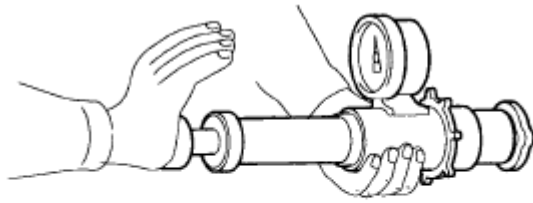
8. Repeat 7 until the cooling fan 3 ~ 5 times and bleed air sufficiently out of the cooling system.
9. Install the radiator cap and fill the reservoir tank to the "MAX" line with coolant.
10. Run the vehicle under idle until the cooling fan operates 2 ~ 3 times.
11. Stop the engine and wait coolant gets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

NOTE:

Recheck the coolant level in the reservoir tank for 2-3 days after replacing coolant.

CAP TESTING

1. Remove the radiator cap, wet its seal with engine coolant, then install it no pressure tester.



ECKD501X

Fig. 181: Checking Radiator Cap

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.

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.
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.

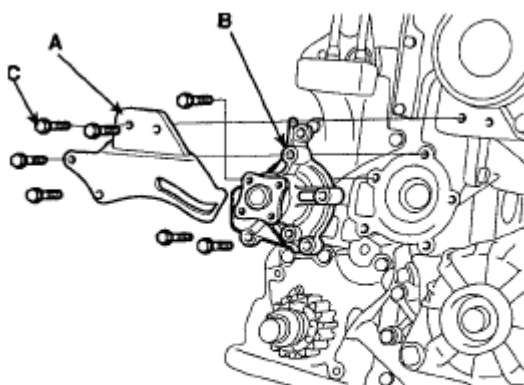
REMOVAL**WATER PUMP**

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 belts.
3. Remove the timing belt.
4. Remove the timing belt idler.
5. Remove the water pump.
 1. Remove the 4 bolts and pump pulley.
 2. Remove the 2 bolts(C), then remove the alternator brace(A).

3. Remove the water pump(B) and gasket.



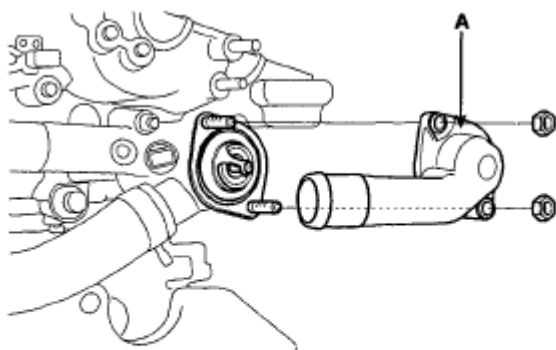
ECKD501A

Fig. 182: Identifying Alternator Brace, Water Pump And Pump Pulley

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), gasket and thermostat.



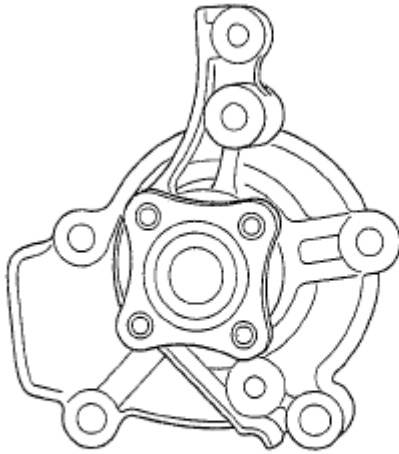
ECKD501B

Fig. 183: Identifying Water Inlet

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.



ECKD503A

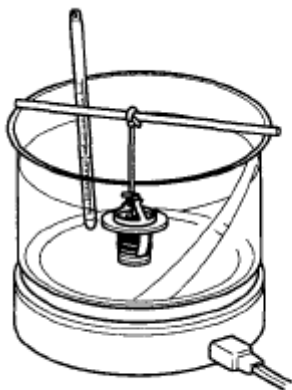
Fig. 184: Identifying Water Pump

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. 185: Checking Thermostat Valve Opening Temperature

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)

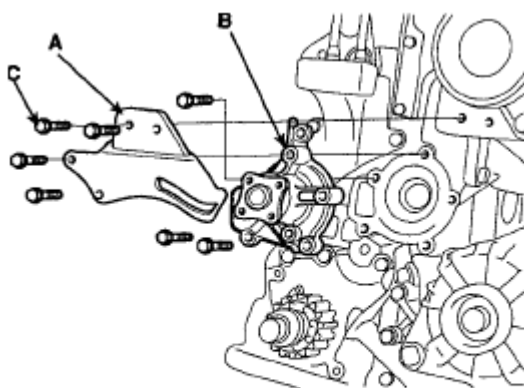
If the valve lift is not as specified, replace the thermostat.

INSTALLATION**WATER PUMP**

1. Install the water pump.
 1. Install the water pump(B) and a new gasket with the 3 bolts.

Tightening torque

19.6 ~ 23.5Nm (2.0 ~ 2.4kgf.m, 14.5 ~ 17.4lb-ft)



ECKD501A

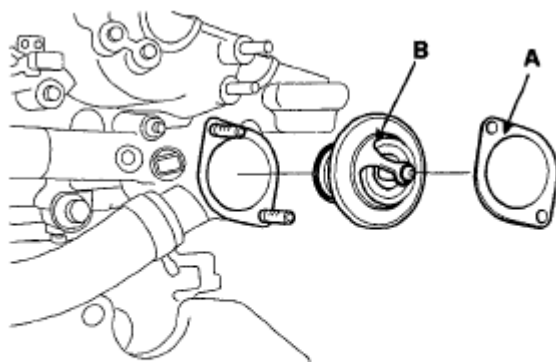
Fig. 186: Identifying Alternator Brace, Water Pump And Pump Pulley

2. Install the alternator brace(A) with the 2 bolts(C)
3. Install the 4 bolts and pump pulley.

2. Install the timing belt idler.
3. Install the timing belt.
4. Install drive belts.
5. Fill with engine coolant.
6. Start engine and check for leaks.
7. Recheck engine coolant level.

THERMOSTAT

1. Place thermostat in thermostat housing.
 1. Install the thermostat with the jiggle valve upward.
 2. Install a new gasket(A) to the thermostat(B).



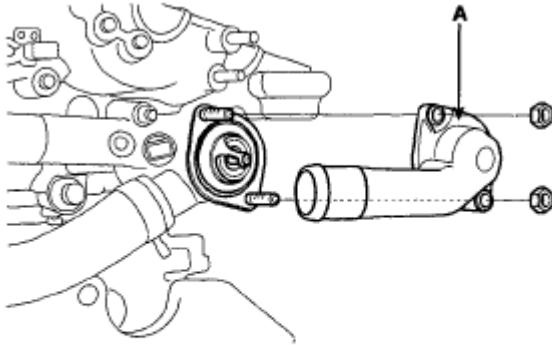
ECKD510A

Fig. 187: Identifying Gasket And Thermostat

2. Install water inlet(A).

Tightening torque

14.7 ~ 19.6Nm (1.5 ~ 2.0 kgf.m, 10.8 ~ 14.5lb-ft)



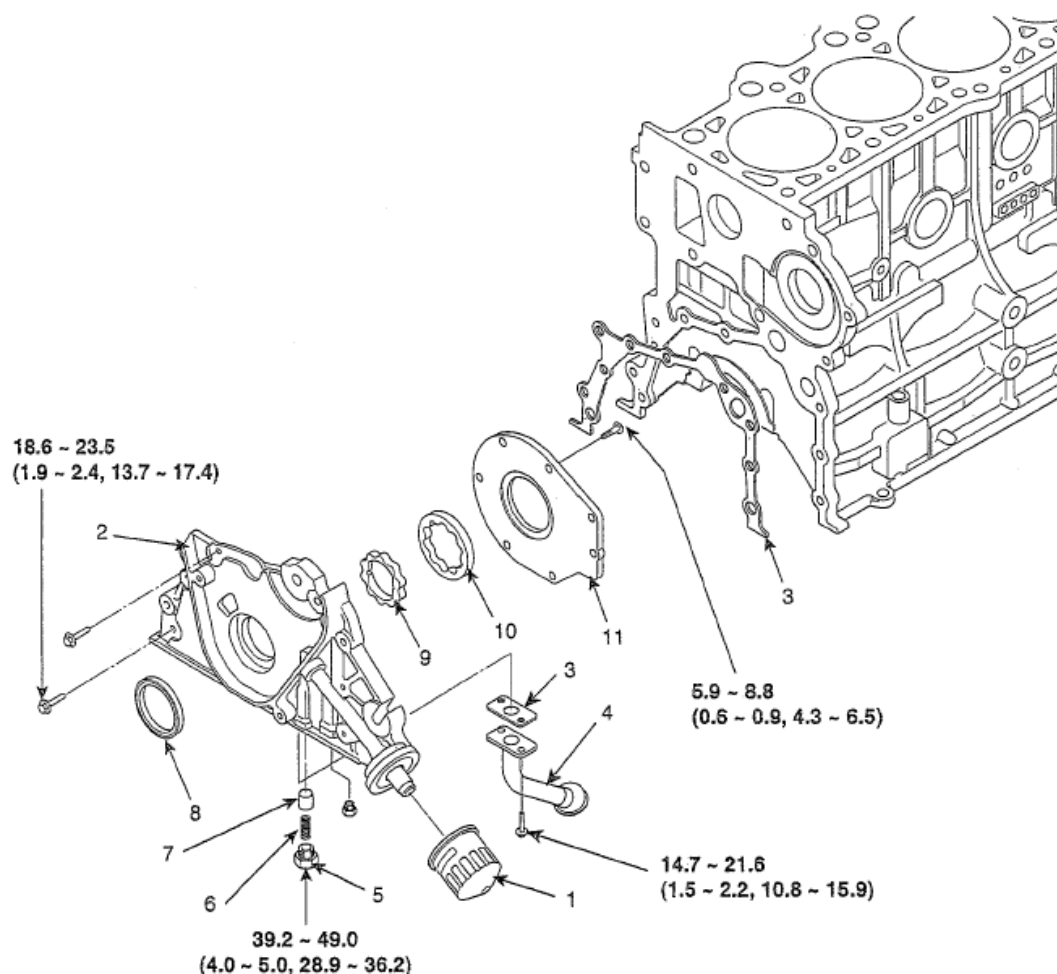
ECKD501B

Fig. 188: Identifying Water Inlet

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

LUBRICATION SYSTEM

COMPONENTS



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

- | | |
|------------------|-------------------|
| 1. Filter | 7. Relief plunger |
| 2. Front case | 8. Oil seal |
| 3. Gasket | 9. Inner rotor |
| 4. Oil screen | 10. Outer rotor |
| 5. Plug | 11. Pump cover |
| 6. Relief spring | |

SHDM16306L

Fig. 189: Identifying Lubrication System Components With Torque Specifications

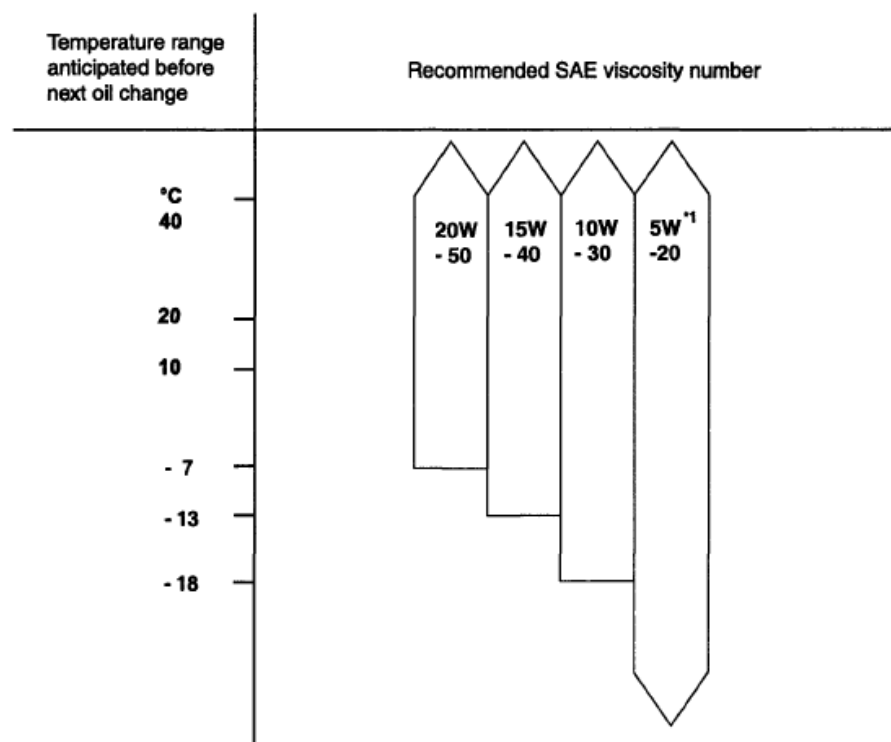
INSPECTION

SELECTION OF ENGINE OIL

Recommended ILSAC classification : GF3 OR ABOVE

Recommended API classification : SJ/SL OR ABOVE

Recommended SAE viscosity grades :



*1 : Recommended regardless of environment.
If not available, refer to the recommended SAE viscosity numbers.

LC8F002A

Fig. 190: Identifying SAE Viscosity Grades

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.

ENGINE OIL

1. Check engine oil quality

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

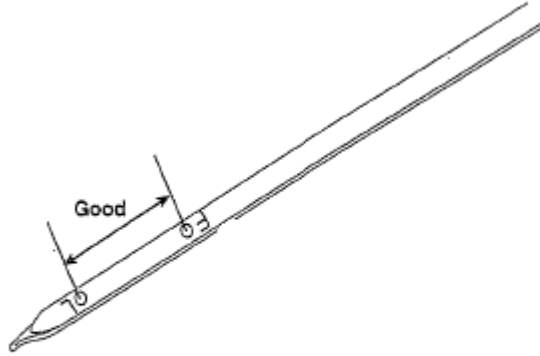
If the quality is visibly poor, replace the oil.

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.



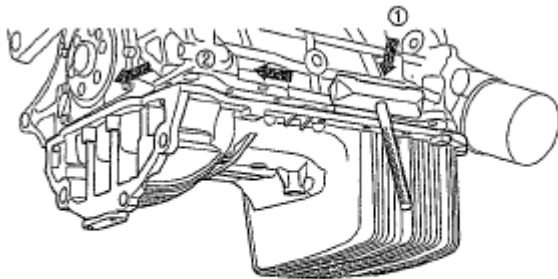
SBLEM6027L

Fig. 191: Identifying Engine Oil Level

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

REMOVAL

1. Drain engine oil.
2. Remove the drive belts.
3. Turn the crankshaft and align the white groove on the crankshaft pulley with the pointer on the lower cover.
4. Remove the timing belt.
5. Remove the oil pan(A) and oil screen.



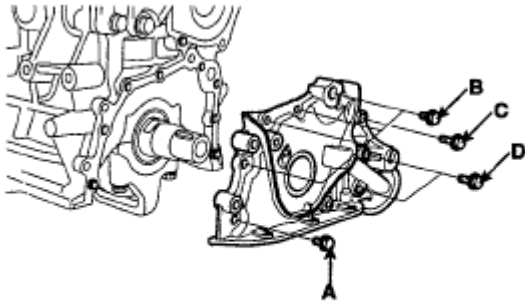
SGKEM7201N

Fig. 192: Removing Oil Pan

CAUTION:

- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of 1 arrow.
- After tapping the SST with a plastic hammer along the direction of 2 arrow around more than 2/3 edge of the oil pan, remove it from the ladder frame.
- Do not turn over the SST abruptly without tapping. It is result in damage of the SST.

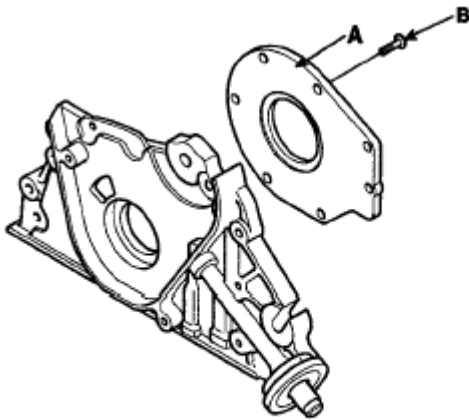
6. Remove the front case.



ECKD411A

Fig. 193: Identifying Front Case

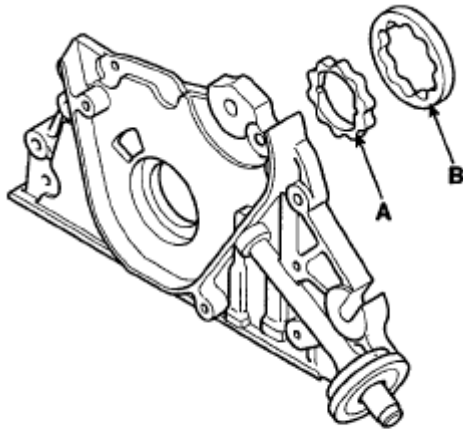
1. Remove the screws(B) from the pump housing, then separate the housing and cover(A).



ECKD401A

Fig. 194: Identifying Oil Pump Cover

2. Remove the inner(A) and outer(B) rotors.



ECKD402A

Fig. 195: Identifying Inner And Outer Rotors

REPLACEMENT

ENGINE OIL AND FILTER REPLACEMENT

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.
 6. Tighten it an additional 3/4 turn.

3. Refill with engine oil filter.

1. Clean and install the oil drain plug with a new gasket.

Tightening torque

39.2 ~ 44.1 Nm (4.0 ~ 4.5kgf.m, 28.9 ~ 32.1lb-ft)

2. Fill with fresh engine oil

Capacity

Total: 4.1 L (4.33US qts, 3.60 imp qts)

Oil pan : 3.7L (3.91U.S.qts, 3.26 imp qts)

Drain and refill including oil filter :

4.0L (4.23U.S.qts, 3.52 imp qts)

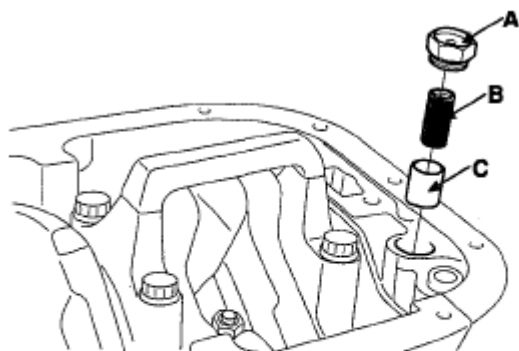
Oil quality : Above API SJ/SL or SAE 5W-20

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

DISASSEMBLY

1. Remove the relief plunger.

Remove the plug(A), spring(B) and relief plunger(C).



ECKD403A

Fig. 196: Identifying Plug, Spring And Relief Plunger**INSPECTION**

1. Inspect relief plunger.

Coat the valve with engine oil and check that it falls smoothly into the plunger hole by its own weight. If it does not, replace the relief plunger. If necessary, replace the front case.

2. Inspect relief valve spring.

Inspect for distorted or broken relief valve spring.

Standard value

Free height : 43.8mm. (1.724 in.)

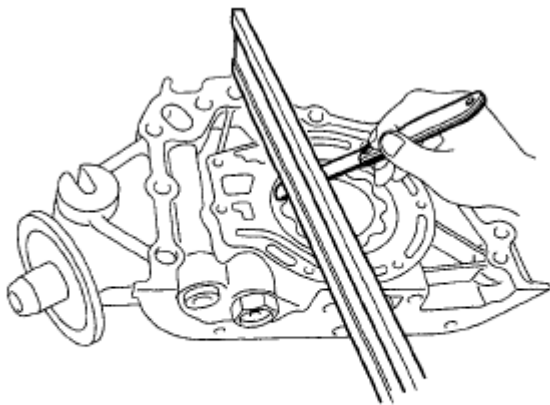
Load: 3.7±0.4kg/40.1mm (8.14±0.88lb/1.579 in.)

3. Inspect rotor side clearance.

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

ROTOR SIDE CLEARANCE SPECIFICATION

Side clearance	Outer gear	0.04 ~ 0.09mm (0.0016 ~ 0.0035in.)
	Inner gear	0.04 ~ 0.085mm (0.0018 ~ 0.0033in.)



ECKD404A

Fig. 197: Measuring Clearance Between Rotors And Precision Straight Edge

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front

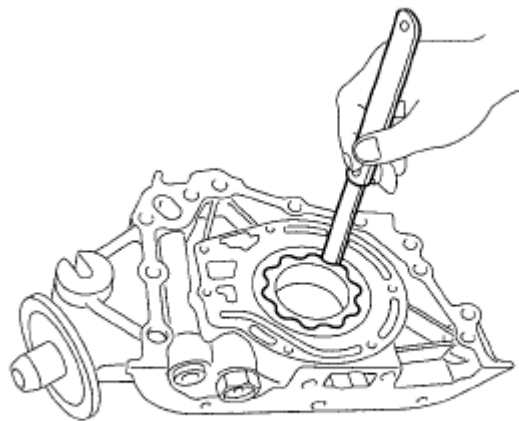
case.

4. Inspect rotor tip clearance.

Using a feeler gauge, measure the tip clearance between the inner and outer rotor tips.

Tip clearance

0.025 ~ 0.069 mm(0.0010 ~ 0.0027 in.)



ECKD405A

Fig. 198: Measuring Tip Clearance Between Inner And Outer Rotor Tips

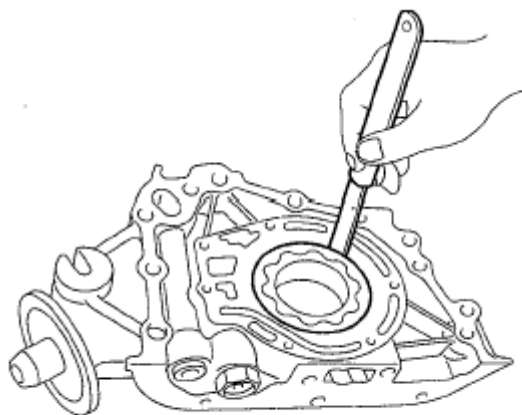
If the tip clearance is greater than maximum, replace the rotor as a set.

5. Inspect rotor body clearance.

Using a feeler gauge, measure the clearance between the outer rotor and body.

Body clearance

0.12 ~ 0.185 mm(0.0047 ~ 0.0073 in.)



ECKD406A

Fig. 199: Measuring Clearance Between Outer Rotor And Body

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.

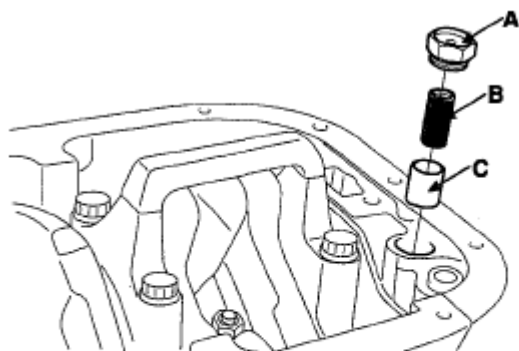
REASSEMBLY

1. Install relief plunger.

Install relief plunger(A) and spring(B) into the front case hole, and install the plug(A).

Tightening torque

39.2 ~ 49.0Nm (4.0 ~ 5.0kgf.m, 28.9 ~ 26.2lb-ft)



ECKD403A

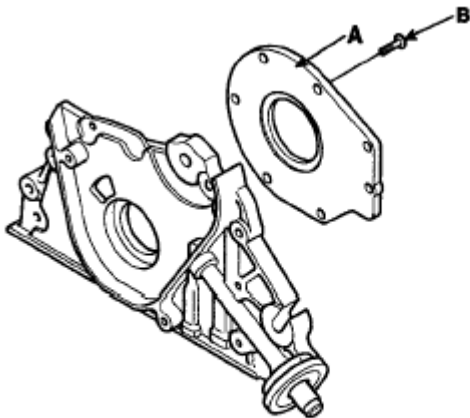
Fig. 200: Identifying Relief Plunger, Spring And Plug

INSTALLATION

1. Install oil pump.
 1. Place the inner and outer rotors into front case with the marks facing the oil pump cover side.
 2. Install the oil pump cover(A) to front case with the 7 screws(B).

Tightening torque

5.9 ~ 8.8Nm (0.6 ~ 0.9kgf.m, 4.3 ~ 6.5lb-ft)

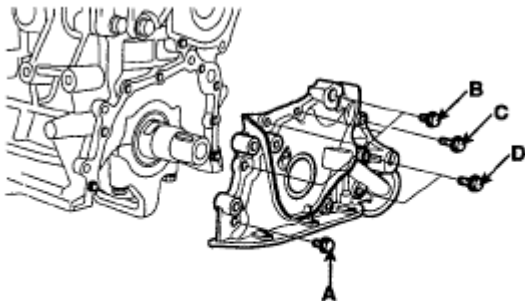


ECKD401A

Fig. 201: Identifying Oil Pump Cover

2. Check that the oil pump turns freely.
3. Install the oil pump on the cylinder block.

Place a new front case gasket on the cylinder block. Apply engine oil to the lip of the oil pump seal. Then, install the oil pump onto the crankshaft. When the pump is in place, clean any excess grease off the crankshaft and check that the oil seal lip is not distorted.



ECKD411A

Fig. 202: Identifying Front Case

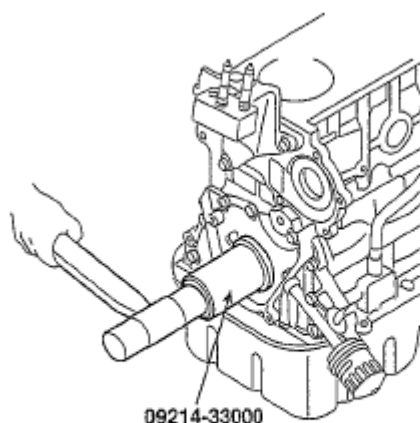
Body length

- A. : 25mm (0.98in)
- B. : 20mm (0.787in)
- C. : 38mm (1.496in)
- D. : 45mm (1.771 in)

Tightening torque

19.6 ~ 26.5Nm (2.0 ~ 2.7kg.m, 14.5 ~ 19.8lb-ft)

- 4. Apply a light coat of oil to the seal lip.
- 5. Using the SST(09214-33000), install the oil seal.



ECHE600C

Fig. 203: Installing Oil Seal

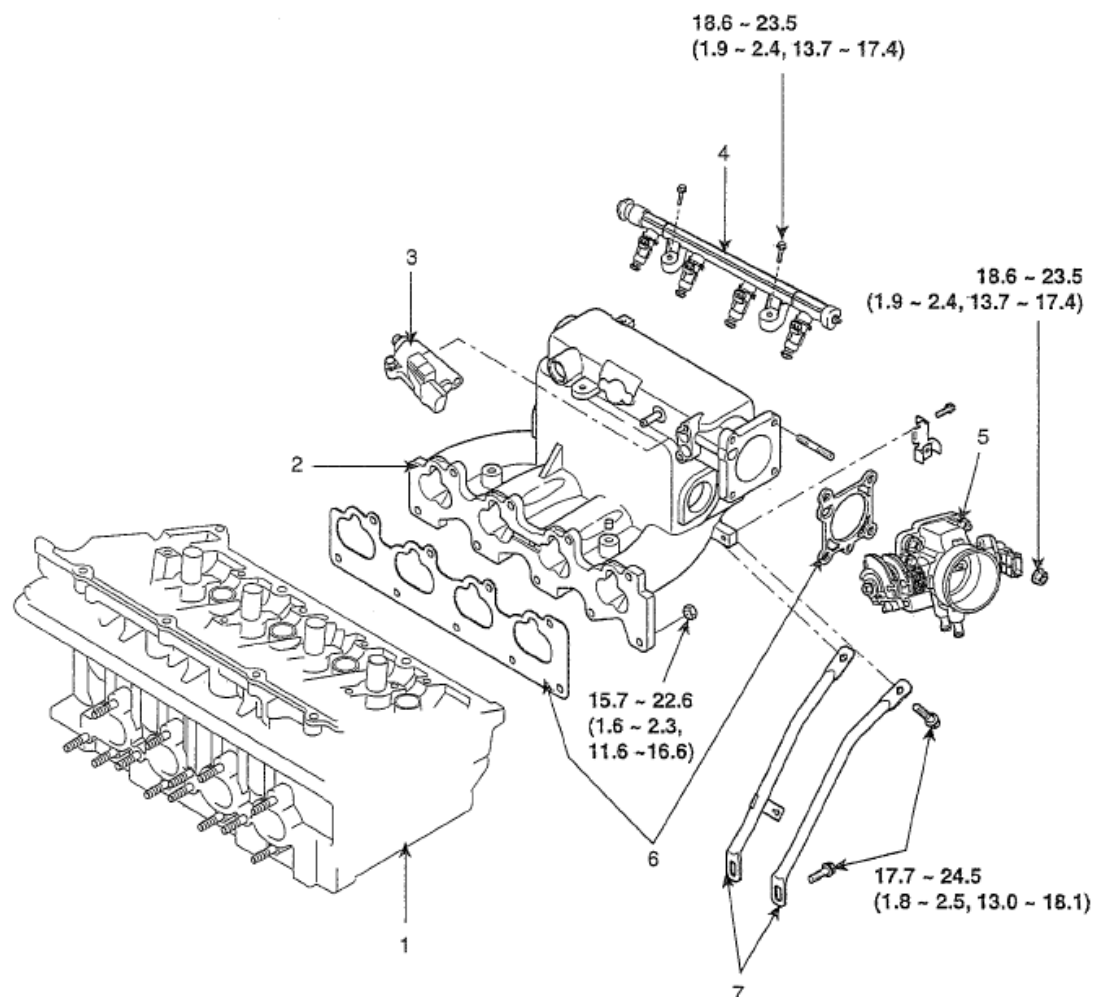
- 6. Install the oil screen.
- 7. Install the oil pan.

NOTE: Clean the oil pan gasket mating surfaces.

INTAKE AND EXHAUST SYSTEM

INTAKE MANIFOLD

COMPONENTS



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

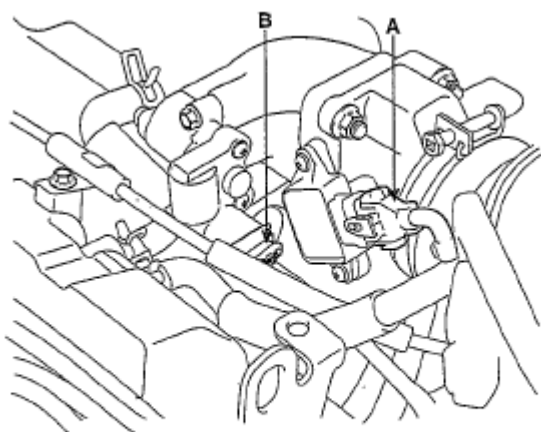
- | | |
|-----------------------------|---------------------------|
| 1. Cylinder head | 5. Throttle body assembly |
| 2. Intake manifold | 6. Gasket |
| 3. Idle speed actuator(ISA) | 7. Intake manifold stay |
| 4. Delivery pipe assembly | |

SGKEM7101N

Fig. 204: Identifying Intake Manifold Components

REMOVAL

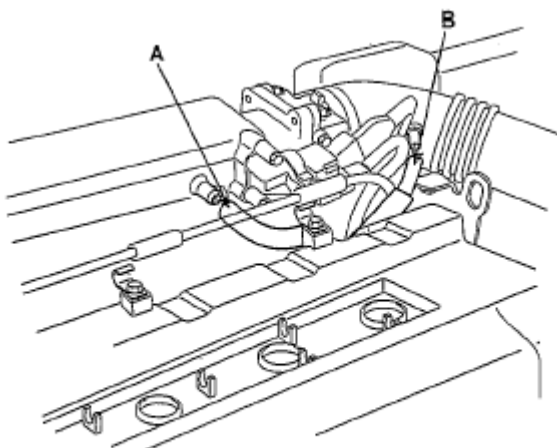
1. Remove the engine cover.
2. Disconnect the TPS connector(A) and ISA connector(B).



EDQF197A

Fig. 205: Identifying TPS Connector And ISA Connector

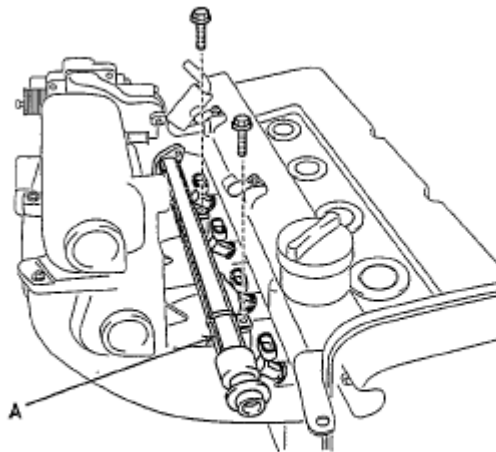
3. Remove the PCV hose(A) and breather hose(B).



ECKD112A

Fig. 206: Identifying PCV Hose And Breather Hose

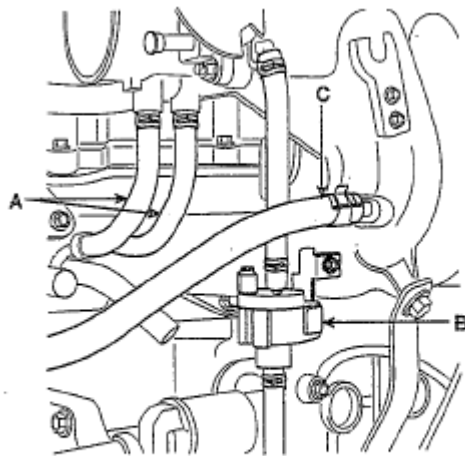
4. Remove the accelerator cable by loosening the lock-nut, then slip the cable end out of the throttle linkage.
5. Remove the delivery pipe(A).



ACGE030A

Fig. 207: Identifying Delivery Pipe

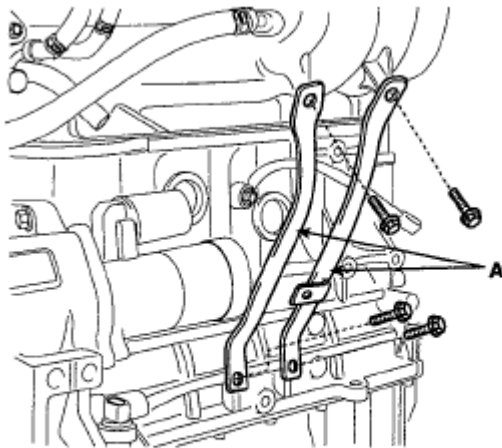
6. Remove the water hoses(A), PCSV {B), and brake vacuum hose(C).



ACGE031A

Fig. 208: Identifying Water Hoses, PCSV And Brake Vacuum Hose

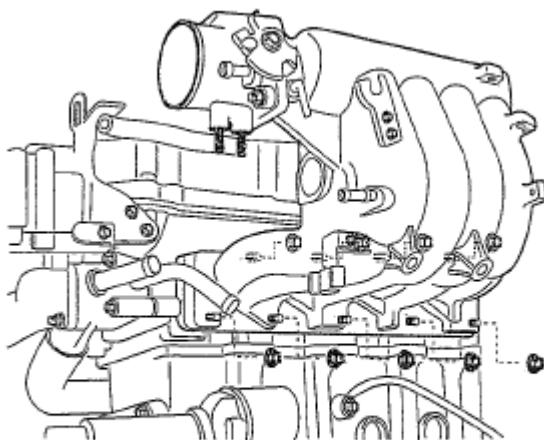
7. Remove the intake manifold stay(A).



ACGE032A

Fig. 209: Identifying Intake Manifold Stay

8. Remove the intake manifold.



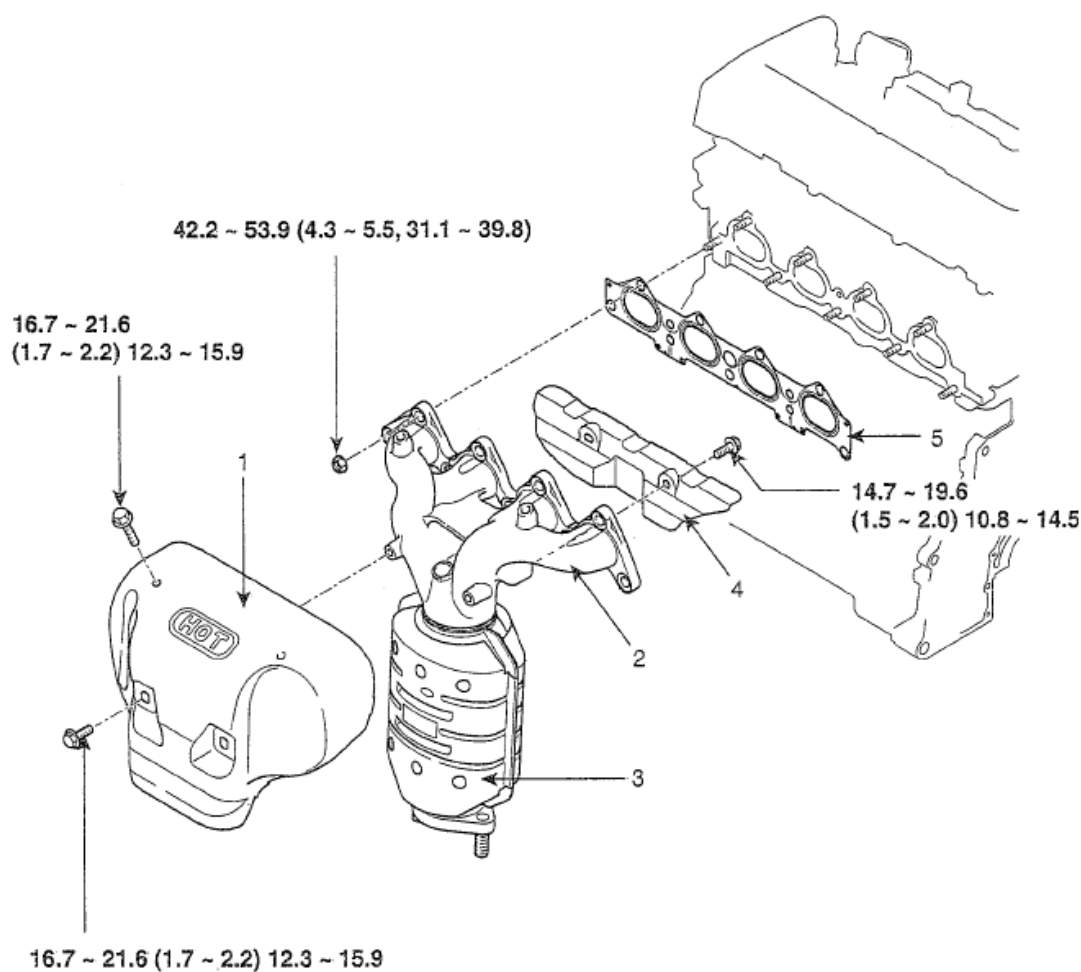
ACGE033A

Fig. 210: Identifying Intake Manifold

9. To install, reverse the removal procedure with new gasket.

EXHAUST MANIFOLD

COMPONENTS



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

- 1. Heat protector A
- 2. Exhaust manifold
- 3. Catalytic

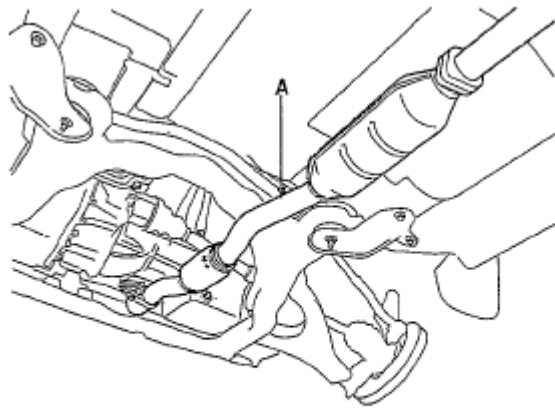
- 4. Heat protector B
- 5. Gasket

SGKEM7200N

Fig. 211: Identifying Exhaust Manifold Components With Torque Specifications

REMOVAL

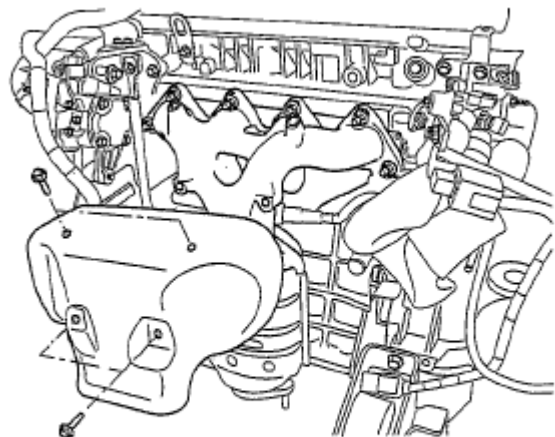
1. Remove the engine cover.
2. Remove the front oxygen sensor connector.
3. Remove the front muffler(A).



EDQF192A

Fig. 212: Identifying Front Muffler

4. Remove the heat protector.



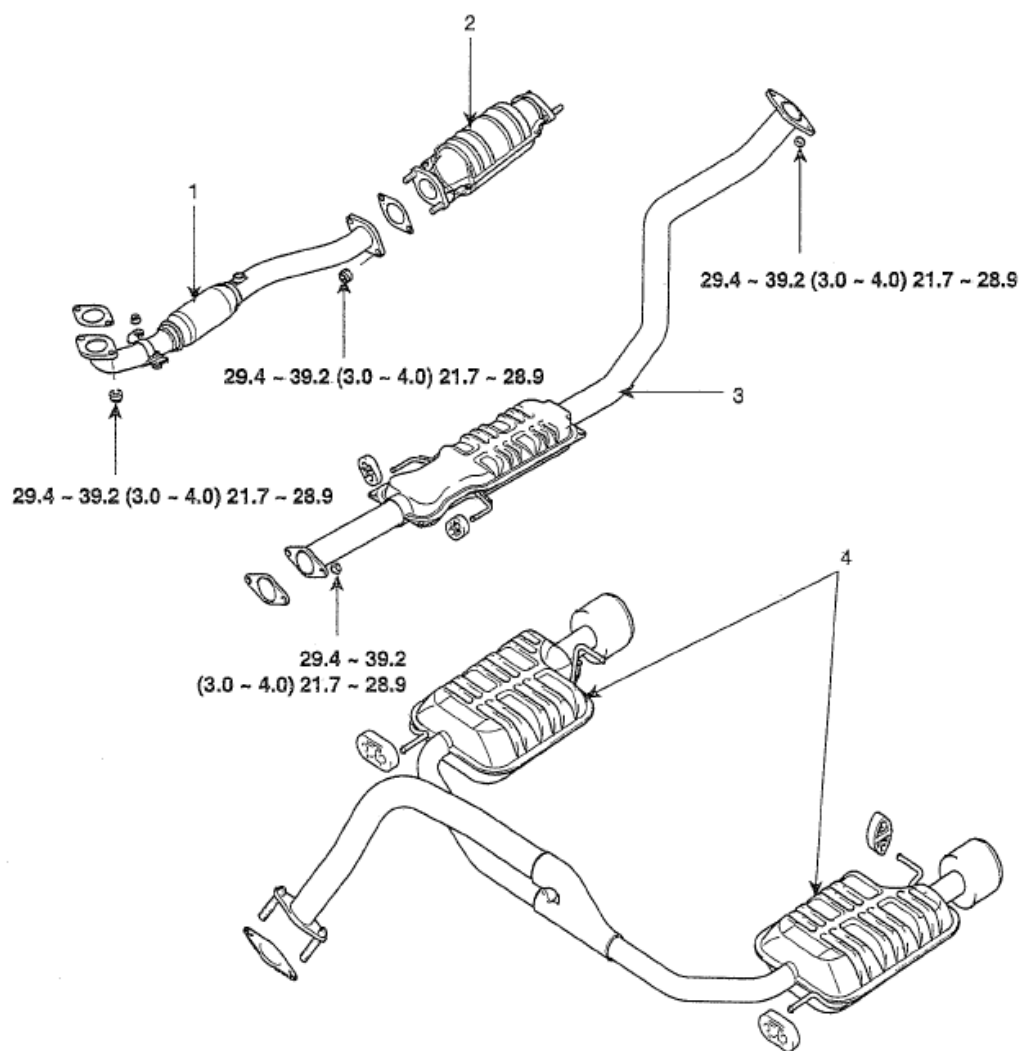
EDQF195A

Fig. 213: Identifying Heat Protector

5. To install, reverse the removal procedure with new gasket.

EXHAUST PIPE

COMPONENTS



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

1. Front muffler

2. Catalytic converter

3. Center muffler

4. Main muffler

SGKEM7102N

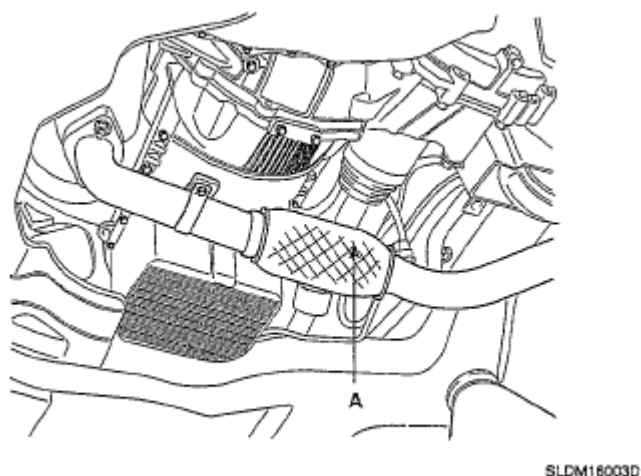
Fig. 214: Identifying Exhaust Pipe Components With Torque Specifications

REMOVAL

1. Remove the front muffler(A).

Tightening torque

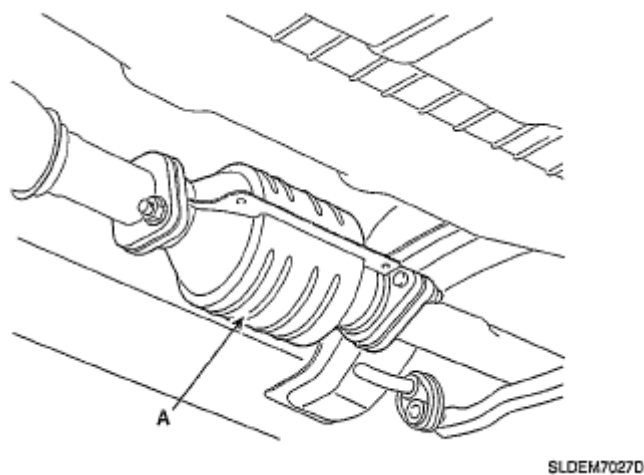
29.4 ~ 39.2N.m (3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)

**Fig. 215: Identifying Front Muffler**

2. Remove the catalytic converter(A).

Tightening torque

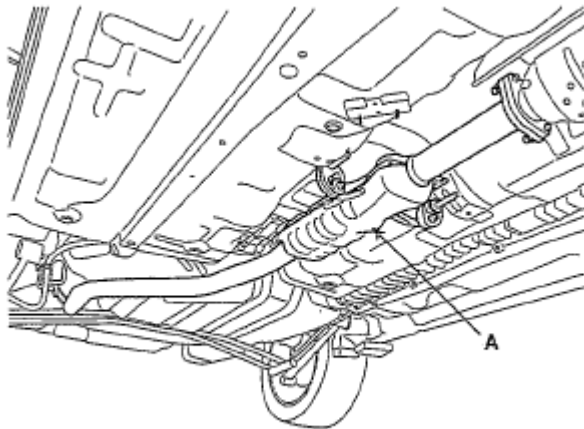
29.4 ~ 39.2N.m(3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)

**Fig. 216: Identifying Catalytic Converter**

3. Remove the center muffler(A).

Tightening torque

29.4 ~ 39.2N.m(3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)



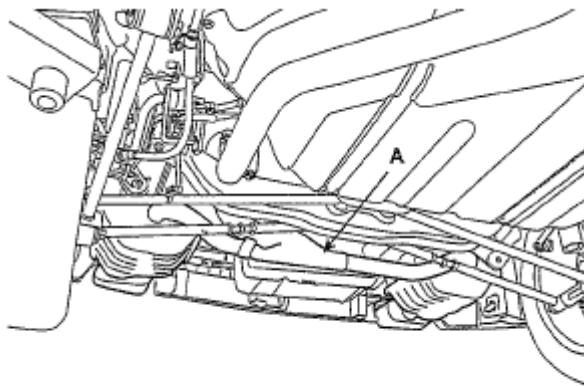
SGKM17014N

Fig. 217: Identifying Center Muffler

4. Remove the main muffler(A).

Tightening torque

29.4 ~ 39.2N.m(3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)



SGKM17015N

Fig. 218: Identifying Main Muffler