

2010 Hyundai Genesis 3.8

2010 ENGINE General Information (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

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SPECIFICATIONS

GENERAL SPECIFICATIONS

			Specifications	Limit
Description			3.3L/3.8L	
General				
Type			V-type, DOHC	
Number of cylinders			6	
Bore			92mm (3.6220in.)/96mm (3.7795in.)	
Stroke			83.8mm (3.2992in.)/87.0mm (3.4252in.)	
Total displacement			3,342cc (203.94cu.in.)/3,778cc (230.55cu.in.)	
Compression ratio			10.4	
Firing order			1-2-3-4-5-6	
Valve timing				
Intake	Opens (ATDC)		14°(3.3L)/10°(3.8L)	
	Closes (ABDC)		66°	
Exhaust	Opens (BBDC)		52°	
	Closes (ATDC)		0°	
Cylinder head				
Flatness of gasket surface			Less than 0.05mm (0.0019in.) [Less than 0.02mm (0.0008in.)/150x150]	
Flatness of manifold mounting	Intake		Less than 0.1mm (0.0039in.) [Less than 0.03mm (0.001in.)/110x110]	
	Exhaust		Less than 0.1mm (0.0039in.) [Less than 0.03mm (0.001in.)/110x110]	
Camshaft				
Cam height	LH Camshaft	Intake	46.3mm (1.8228in.)/46.8mm (1.8425in.)	
		Exhaust	45.8mm (1.8031in.)	
	RH Camshaft	Intake	46.3mm (1.8228in.)/46.8mm (1.8425in.)	
		Exhaust	45.8mm (1.8031in.)	
		Intake	No. 1: 27.964 ~ 27.978mm (1.1009 ~ 1.1015in.)	

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Journal outer diameter	LH, RH camshaft		No. 2,3,4: 23.954 ~ 23.970mm (0.9430 ~ 0.9437in.)	
		Exhaust	No. 1: 27.964 ~ 27.978mm (1.1009 ~ 1.1015in.) No. 2,3,4: 23.954 ~ 23.970mm (0.9430 ~ 0.9437in.)	
Bearing oil clearance	LH, RH camshaft	Intake	No. 1: 0.027 ~ 0.057mm (0.0011 ~ 0.0022in.) No. 2,3,4: 0.030 ~ 0.067mm (0.0012 ~ 0.0026in.)	
		Exhaust	No. 1: 0.027 ~ 0.057mm (0.0011 ~ 0.0022in.) No. 2,3,4: 0.030 ~ 0.067mm (0.0012 ~ 0.0026in.)	
End play			0.02 ~ 0.18mm (0.0008 ~ 0.0071 in.)	
Valve				
Valve length	Intake		105.27mm (4.1445in.)	
	Exhaust		105.50mm (4.1535in.)	
Stem outer diameter	Intake		5.465 ~ 5.480mm (0.2151 ~ 0.2157in.)	
	Exhaust		5.458 ~ 5.470mm (0.2149 ~ 0.2153in.)	
Face angle			45.25° ~ 45.75°	
Thickness of valve head (margin)	Intake		1.56 ~ 1.86mm (0.06142 ~ 0.07323in.)	
	Exhaust		1.73 ~ 2.03mm (0.06811 ~ 0.07992in.)	
Valve stem to valve guide clearance	Intake		0.020 ~ 0.047mm (0.00078 ~ 0.00185in.)	0.07mm (0.00275in.)
	Exhaust		0.030 ~ 0.054mm (0.00118 ~ 0.00212in.)	0.09mm (0.00354in.)
Valve guide				
Inner diameter	Intake		5.500 ~ 5.512mm (0.2165 ~ 0.2170in.)	
	Exhaust		5.500 ~ 5.512mm (0.2165 ~ 0.2170in.)	
Length	Intake		41.8 ~ 42.2mm (1.6457 ~ 1.6614in.)	
	Exhaust		41.8 ~ 42.2mm (1.6457 ~ 1.6614in.)	
Valve seat				
Width of seat contact	Intake		1.15 ~ 1.45mm (0.05118 ~ 0.05709in.)	
	Exhaust		1.35 ~ 1.65mm (0.05315 ~ 0.06496in.)	

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Seat angle	Intake	44.75° ~ 45.20°	
	Exhaust	44.75° ~ 45.20°	
Valve spring			
Free length		43.86mm (1.7267in.)	
Load		19.3 ± 0.8kg/34.0mm (42.7 ± 1.8 lb/1.3386in.)	
		41.5 ± 1.3kg/24.2mm (91.5 ± 2.9 lb/0.9527in.)	
Out of squareness		Less than 1.5°	
MLA			
MLA outer diameter	Intake	34.964 ~ 34.980mm (1.3765 ~ 1.3772in.)	
	Exhaust	34.964 ~ 34.980mm (1.3765 ~ 1.3772in.)	
Cylinder head tappet bore inner diameter	Intake	35.000 ~ 35.025mm (1.3779 ~ 1.3789in.)	
	Exhaust	35.000 ~ 35.025mm (1.3779 ~ 1.3789in.)	
MLA to tappet bore clearance	Intake	0.020 ~ 0.061mm (0.0008 ~ 0.0024in.)	0.07mm (0.0027in.)
	Exhaust	0.020 ~ 0.061mm (0.0008 ~ 0.0024in.)	0.07mm (0.0027in.)
Valve clearance (At 20°C [68°F])			
Intake		0.17 ~ 0.23mm (0.0067 ~ 0.0090in.)	0.10 ~ 0.30mm (0.0039 ~ 0.0118in.)
Exhaust		0.27 ~ 0.33mm (0.0106 ~ 0.0129in.)	0.20 ~ 0.40mm (0.0078 ~ 0.0157in.)
Cylinder block			
Cylinder bore		92.00 ~ 92.03mm (3.6220 ~ 3.6232in.)/96.00 ~ 96.03mm (3.7795 ~ 3.7807in.)	
Flatness of gasket surface		Less than 0.05mm (0.0019in.) [Less than 0.02mm (0.0008in.)/150x150]	
Piston			
Piston outer diameter		91.96 ~ 91.99mm (3.6204 ~ 3.6216in.)/95.96 ~ 95.99mm (3.7779 ~ 3.7791 in.)	
Piston to cylinder clearance		0.03 ~ 0.05mm (0.0012 ~ 0.0020in.)	
Ring groove width	No. 1 ring groove	1.22 ~ 1.24mm (0.0480 ~ 0.0488in.)	1.26mm (0.0496in.)
	No. 2 ring groove	1.22 ~ 1.24mm (0.0480 ~ 0.0488in.)	1.26mm (0.0496in.)
	Oil ring groove	2.01 ~ 2.03mm (0.0791 ~ 0.0799in.)	2.05mm (0.0807in.)
Piston ring			

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Side clearance	No. 1 ring	0.03 ~ 0.07mm (0.0012 ~ 0.0027in.)	0.1mm (0.004in.)
	No. 2 ring	0.03 ~ 0.07mm (0.0012 ~ 0.0027in.)	0.1mm (0.004in.)
	Oil ring	0.06 ~ 0.15mm (0.0024 ~ 0.0059in.)	0.2mm (0.008in.)
End gap	No. 1 ring	0.17 ~ 0.32mm (0.0067 ~ 0.0126in.)	0.6mm (0.0236in.)
	No. 2 ring	0.32 ~ 0.47mm (0.0126 ~ 0.0185in.)	0.7mm (0.0275in.)
	Oil ring	0.20 ~ 0.70mm (0.0078 ~ 0.0275in.)	0.8mm (0.0315in.)
Piston pin			
Piston pin outer diameter		23.001 ~ 23.006mm (0.9055 ~ 0.9057in.)	
Piston pin hole inner diameter		23.016 ~ 23.021mm (0.9061 ~ 0.9063in.)	
Piston pin hole clearance		0.01 ~ 0.02mm (0.0004 ~ 0.0008in.)	
Connecting rod small end inner diameter		22.974 ~ 22.985mm (0.9045 ~ 0.9049in.)	
Connecting rod small end hole clearance		-0.032 ~ -0.016mm (-0.0012 ~ 0.0006in.)	
Connecting rod			
Connecting rod big end inner diameter		58.000 ~ 58.018mm (2.2834 ~ 2.2842in.)	
Connecting rod bearing oil clearance		0.038 ~ 0.056mm (0.0015 ~ 0.0022in.)	
Side clearance		0.1 ~ 0.25mm (0.0039 ~ 0.0098in.)	
Crankshaft			
Main journal outer diameter		68.942 ~ 68.960mm (2.7142 ~ 2.7149in.)	
Pin journal outer diameter		54.954 ~ 54.972mm (2.1635 ~ 2.1642in.)	
Main bearing oil clearance		0.022 ~ 0.040mm (0.0008 ~ 0.0016in.)	
End play		0.10 ~ 0.28mm (0.0039 ~ 0.0110in.)	
Oil pump			
Relief valve opening pressure		450 ~ 550kPa (4.59 ~ 5.61kgf/cm ² , 65.28 ~ 79.79psi)	
Engine oil			
Oil quantity (Total)		6.0L (6.34U.S.qts, 5.28Imp.qts)	When replacing a short engine or a block assembly
Oil quantity (Oil pan)		5.5L (5.81U.S.qts, 4.84Imp.qts)	
Oil quantity (Drain and refill)		5.2L (5.49U.S.qts, 4.58Imp.qts)	Including oil filter
Oil grade (Recommendation)		5W-20/GF4 & SM	If not available, refer to recommended API or ILSAC classification and SAE

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Oil grade (Classification)		API SL, SM or above ILSAC GF3, GF4 or above	viscosity number Satisfy the requirement of the API or ILSAC classification
Oil grade (SAE viscosity grade)		Recommended SAE viscosity number	Refer to the "Lubrication System"
Oil pressure (at 1,000 RPM)		130kPa (1.22kgf/cm ² , 18.77psi) or above	Oil temperature in oil pan: 110±2°C (230±36°F)
Cooling system			
Cooling method		Forced circulation with water pump	
Coolant quantity		8.4 ~ 8.6 L (8.9 ~ 9.1 us.qts, 7.4 ~ 7.6 Imp.qts)	
Thermostat	Type	Wax pellet type	
	Opening temperature	82 ± 2°C (179.6 ± 35.6°F)	
	Fully opened temperature	95°C (203°F)	
	Full lift	10mm (0.3937in.) MIN	
Radiator cap	Main valve opening pressure	93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm ² , 13.51 ~ 17.78psi)	
	Vacuum valve opening pressure	0 ~ 6.86 kpa (0 ~ 0.07kg/cm ² , 0 ~ 0.99psi)	
Water temperature sensor			
Type		Thermistor type	
Resistance	20°C (68°F)	2.31 ~ 2.59Kohms	
	80°C (176°F)	0.3222 Kohms	

TIGHTENING TORQUES

Item	Quantity	Nm	kgf.m	lb-ft
Crankshaft pulley bolt	1	284.4 ~ 304.0	29.0 ~ 31.0	209.8 ~ 224.2
Timing chain cover bolt B	17	18.6 ~ 21.6	1.9 ~ 2.2	13.7 ~ 15.9
Timing chain cover bolt C	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain cover bolt D	2	58.8 ~ 68.6	6.0 ~ 7.0	43.4 ~ 50.6
Timing chain cover bolt F	2	24.5 ~ 26.5	2.5 ~ 2.7	18.1 ~ 19.5
Timing chain cover bolt G	4	21.6 ~ 23.5	2.2 ~ 2.4	15.9 ~ 17.4
Timing chain cover bolt H	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain cover bolt I	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain cover bolt J	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain cover bolt K	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain cover bolt L	1	21.6 ~ 26.5	2.2 ~ 2.7	15.9 ~ 19.5
Timing chain auto tensioner bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7

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Timing chain auto tensioner nut	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain auto tensioner arm bolt	2	18.6 ~ 21.6	1.9 ~ 2.2	13.7 ~ 15.9
Timing chain guide bolt	4	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Oil pump chain cover bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pump chain tensioner bolt	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pump chain guide bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pump chain sprocket bolt	1	18.6 ~ 21.6	1.9 ~ 2.2	13.7 ~ 15.9
Lower oil pan bolt	13	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Drive belt auto tensioner bolt (M12)	1	81.4 ~ 85.3	8.3 ~ 8.7	60.0 ~ 62.9
Drive belt auto tensioner bolt (M8)	1	17.7 ~ 21.6	1.8 ~ 2.2	13.0 ~ 15.9
Drive belt idler bolt	1	53.9 ~ 57.9	5.5 ~ 5.9	39.8 ~ 42.7
OCV (oil control valve) bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Cylinder head bolt	16	(37.3 ~ 41.2) + (118 ~ 122°) + (88 ~ 92°)	(3.8 ~ 4.2) + (118 ~ 122°) + (88 ~ 92°)	(27.5 ~ 30.4) + (118 ~ 122°) + (88 ~ 92°)
Cylinder head bolt	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
CVVT & cam sprocket bolt	4	64.7 ~ 76.5	6.6 ~ 7.8	47.7 ~ 56.4
Camshaft bearing cap bolt	32	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Cylinder head cover bolt	38	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Connecting rod bearing bolt	12	(17.7 ~ 21.6) + (88 ~ 92°)	(1.8 ~ 2.2) + (88 ~ 92°)	(13.0 ~ 15.9) + (88 ~ 92°)
Main bearing cap inner bolt (M11)	8	49.0 + 90°	5.0 + 90°	36.2 + 90°
Main bearing cap outer bolt (M8)	8	19.6 + 120°	2.0 + 120°	14.5 + 120°
Main bearing cap side bolt (M8)	8	29.4 ~ 31.4	3.0 ~ 3.2	21.7 ~ 23.1
Oil drain cover bolt	6	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Rear oil seal case bolt	6	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Baffle plate bolt	12	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Upper oil pan bolt	16	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Knock sensor bolt	2	15.7 ~ 23.5	1.6 ~ 2.4	11.6 ~ 17.4
Drive plate bolt cap	8	71.54 ~ 75.46	7.3 ~ 7.7	52.80 ~ 55.69
Oil filter cap		24.5	2.5	18.1
Oil drain bolt cap	1	34.3 ~ 44.1	3.5 ~ 4.5	25.3 ~ 32.5
Oil pump bolt	3	20.6 ~ 22.6	2.1 ~ 2.3	15.2 ~ 16.6
Oil filter body bolt	10	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Water pump bolt (Timing chain cover bolt L)	1	21.6 ~ 26.5	2.2 ~ 2.7	15.9 ~ 19.5
Water pump bolt (Timing chain cover bolt K)	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7

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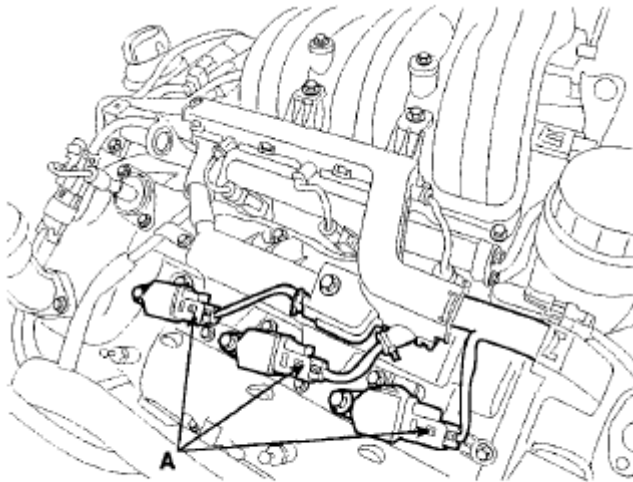
Water pump bolt (Timing chain cover bolt G)	4	21.6 ~ 23.5	2.2 ~ 2.4	15.9 ~ 17.4
Water pump pulley bolt	4	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Water temp, control nut	4	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Water temp, control bolt	2	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Water inlet pipe bolt	3	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
Air vent pipe bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Intake manifold bolt	6	26.5 ~ 31.4	2.7 ~ 3.2	19.5 ~ 23.1
Intake manifold nut	2	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Surge tank bolt (M6 x 36)	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Surge tank bolt (M6 x 128)	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Surge tank nut	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Breather pipe bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Surge tank stay bolt (M10 x 20)	2	27.5 ~ 31.4	2.8 ~ 3.2	20.3 ~ 23.1
ETC bracket bolt	2	15.7 ~ 25.5	1.6 ~ 2.6	11.6 ~ 18.8
Exhaust manifold nut	16	39.2 ~ 44.1	4.0 ~ 4.5	28.9 ~ 32.6
Heat protector bolt	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Front muffler nut	8	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Center muffler nut	4	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Main muffler nut	4	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Air cleaner assembly bolt	2	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Intake air hose clamp bolt	1	1.9 ~ 2.9	0.2 ~ 0.3	1.4 ~ 2.2
Resonator bolt	1	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2

INSPECTION

COMPRESSION PRESSURE

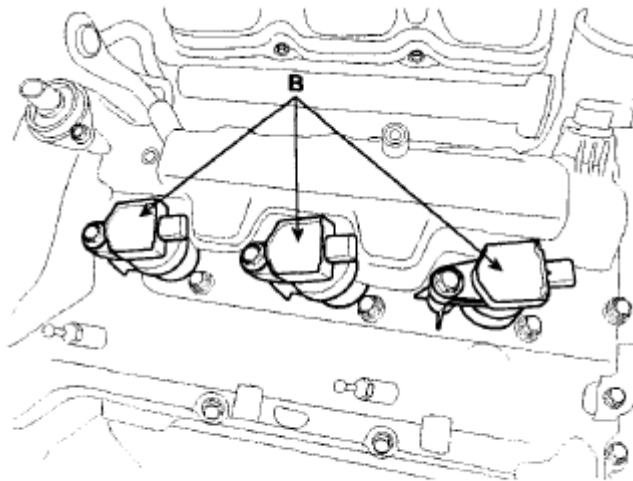
NOTE: If the there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. Warm up engine until the normal operating temperature (80~95°C (176-203°F)).
2. Remove the surge tank. Refer to **INTAKE AND EXHAUST SYSTEM (G6DB/G6DA - GSL 3.3/3.8)**.
3. Remove the ignition coil connectors (A) and ignition coils (B).



SBHEM8099D

Fig. 1: Identifying Ignition Coil Connectors
Courtesy of HYUNDAI MOTOR CO.



SBHEM8150D

Fig. 2: Identifying Ignition Coils
Courtesy of HYUNDAI MOTOR CO.

4. Remove the spark plugs.

Using a 16mm plug wrench, remove the 6 spark plugs.

5. Check cylinder compression pressure.
 1. Insert a compression gauge into the spark plug hole.
 2. Fully open the throttle.

3. Crank the engine over 7 times to measure compression pressure.

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

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

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

Compression pressure :

1,029kPa (10.5kgf/cm² , 149psi) (250~400 RPM)

Minimum pressure :

882kPa (9.0kgf/cm² , 128psi)

5. If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat step 1) through 3) for cylinders with low compression.
 - a. If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
 - b. If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.
6. Reinstall the spark plugs.
7. Install the ignition coils and ignition connectors.
8. Install the surge tank. Refer to **INTAKE AND EXHAUST SYSTEM (G6DB/G6DA - GSL 3.3/3.8)** .

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

NOTE: Inspect and adjust the valve clearance when the engine is cold (Engine coolant temperature : 20°C (68°F)) and cylinder head is installed on the cylinder block.

1. Remove the engine cover.
2. Remove the engine side cover.
3. Remove air cleaner assembly.
4. Remove the surge tank.
5. Remove the cylinder head cover. (Refer to **TIMING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS**).
6. Set No. 1 cylinder to TDC/compression.
 1. Turn the crankshaft pulley clockwise and align its groove with the timing mark "T" of the lower timing chain cover.

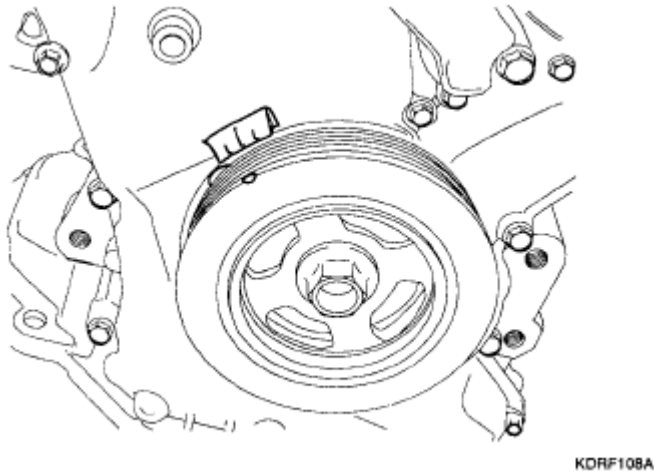


Fig. 3: Aligning Crankshaft Pulley Groove With Timing Mark "T" Of Lower Timing Chain Cover

Courtesy of HYUNDAI MOTOR CO.

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

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

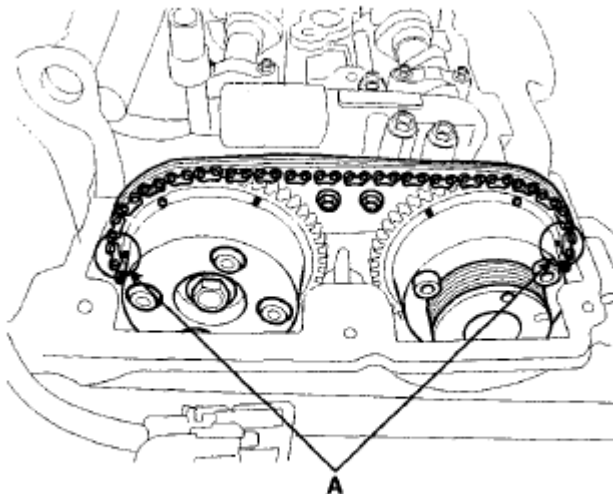
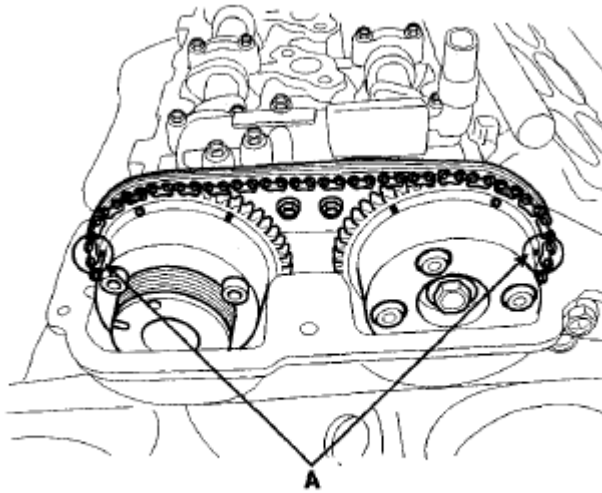


Fig. 4: Checking Mark (A) Of Camshaft Timing Sprockets Are In Straight Line On Cylinder Head Surface (1 Of 2)

Courtesy of HYUNDAI MOTOR CO.



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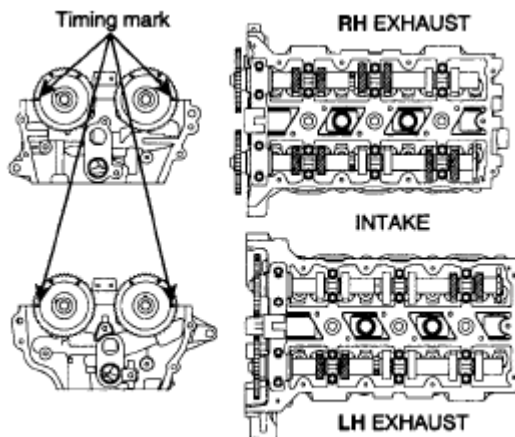
Fig. 5: Checking Mark (A) Of Camshaft Timing Sprockets Are In Straight Line On Cylinder Head Surface (2 Of 2)

Courtesy of HYUNDAI MOTOR CO.

NOTE: Do not rotate engine counterclockwise.

7. Inspect the valve clearance.

1. With No. 1 cylinder at TDC inspect clearances only on the valves shown in illustration below.



EDRF021A

Fig. 6: Inspecting Valve Clearance
Courtesy of HYUNDAI MOTOR CO.

Measurement method.

- a. Using a thickness gauge, measure the clearance between the tappet and the base circle of camshaft.

- b. Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting tappet.

Valve clearance

Specification

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

Limit

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

Exhaust: 0.20 ~ 0.40mm (0.0078 ~ 0.0157in.)

2. Turn the crankshaft pulley clockwise one revolution (360°) and align the groove with timing mark "T" of the lower timing chain cover.
3. With No. 4 cylinder at TDC inspect clearances only the valves shown in illustration below. (Refer to procedure step 1.)

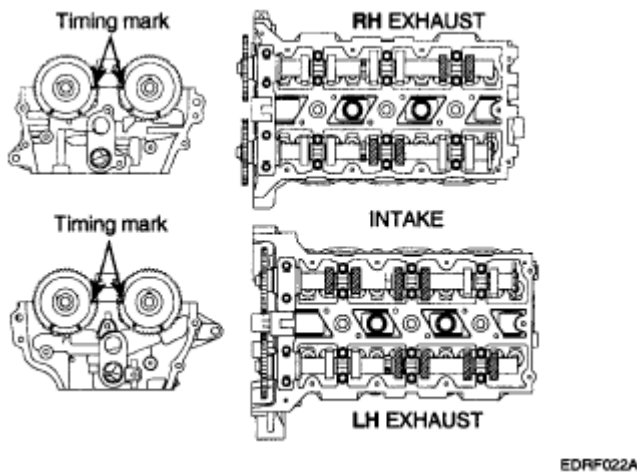
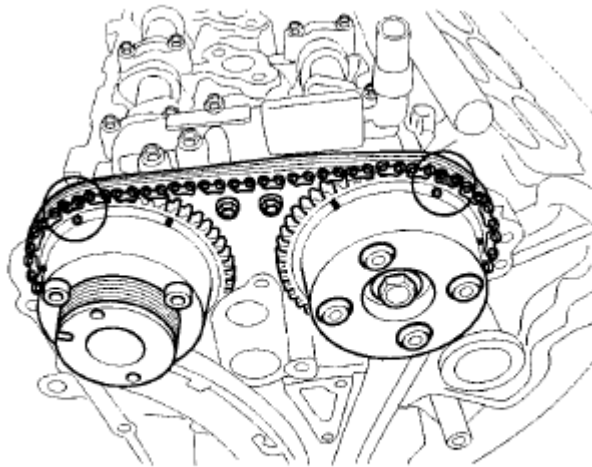


Fig. 7: Inspecting Valve Clearance
Courtesy of HYUNDAI MOTOR CO.

8. Adjust the intake and exhaust valve clearance.
 1. Set the No. 1 cylinder to the TDC/compression.
 2. Remove the timing chain.

NOTE: Before removing the timing chain, mark the RH/LH timing chain with an identification based on the location of the sprocket because the identification mark on the chain for TDC (Top Dead Center) can be erased.



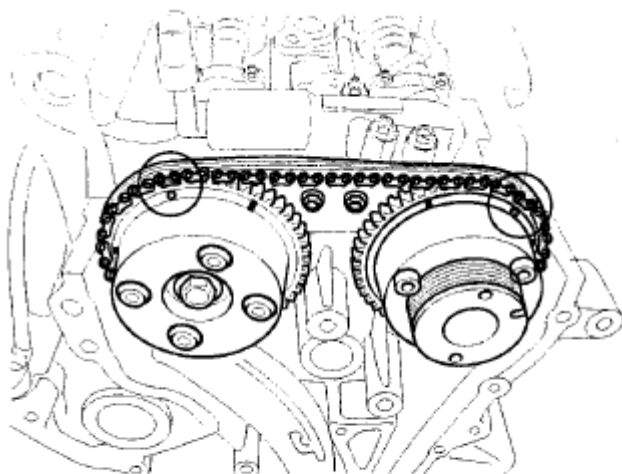
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Fig. 8: Identifying Timing Chain Mark (1 Of 4)
Courtesy of HYUNDAI MOTOR CO.



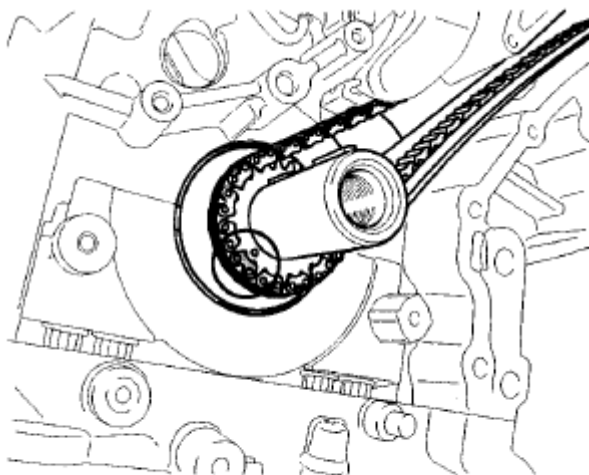
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Fig. 9: Identifying Timing Chain Mark (2 Of 4)
Courtesy of HYUNDAI MOTOR CO.



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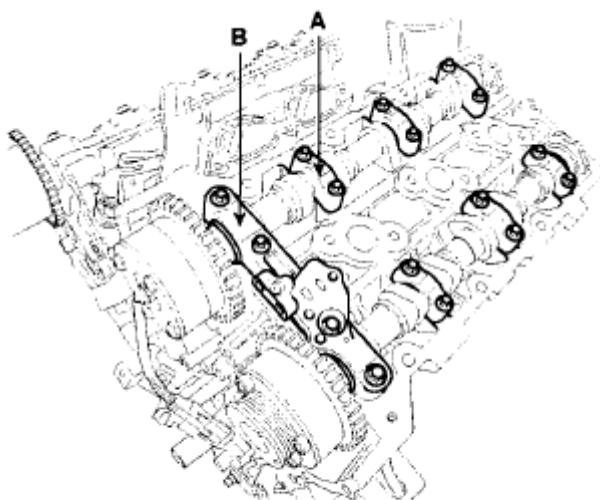
Fig. 10: Identifying Timing Chain Mark (3 Of 4)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8074D

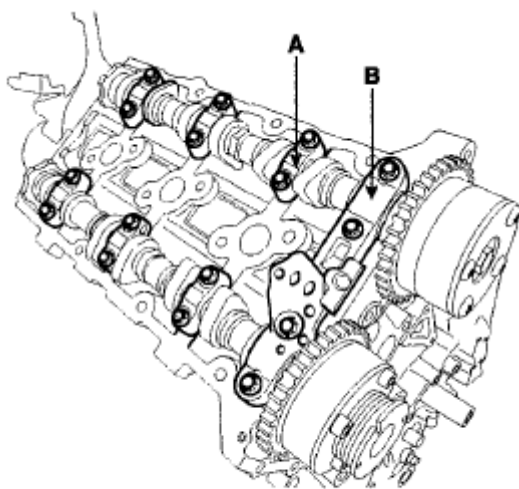
Fig. 11: Identifying Timing Chain Mark (4 Of 4)
Courtesy of HYUNDAI MOTOR CO.

3. Remove the LH/RH camshaft bearing cap (A) and thrust bearing cap (B).



SBHEM8070D

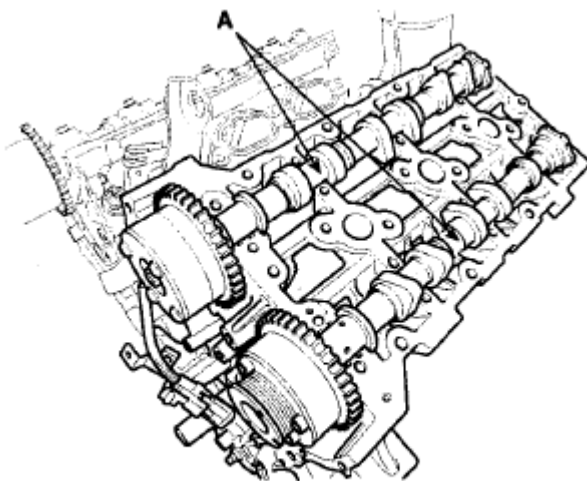
Fig. 12: Identifying Camshaft Bearing Cap And Thrust Bearing Cap (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8071D

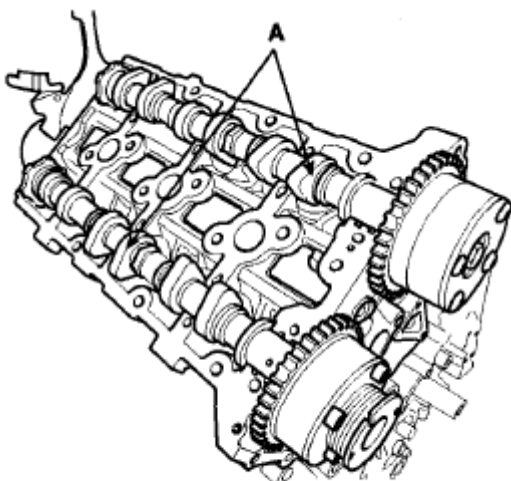
Fig. 13: Identifying Camshaft Bearing Cap And Thrust Bearing Cap (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

4. Remove the LH/RH camshaft assembly (A).



SBHEM8072D

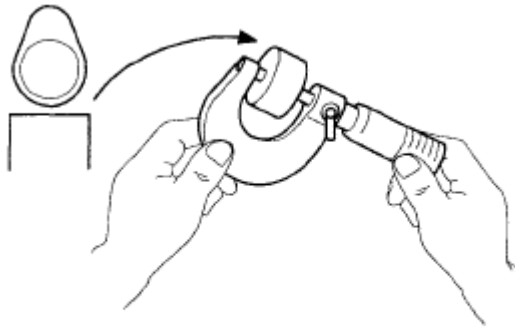
Fig. 14: Identifying LH Camshaft Assembly
Courtesy of HYUNDAI MOTOR CO.



SBHEM8073D

Fig. 15: Identifying RH Camshaft Assembly
Courtesy of HYUNDAI MOTOR CO.

5. Remove the tappets.
6. Measure the thickness of the removed tappet using a micrometer.



EDKE889D

Fig. 16: Measuring Thickness Of Removed Tappet Using Micrometer
Courtesy of HYUNDAI MOTOR CO.

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

T: Thickness of removed tappet

A: Measured valve clearance

N: Thickness of new tappet

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

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

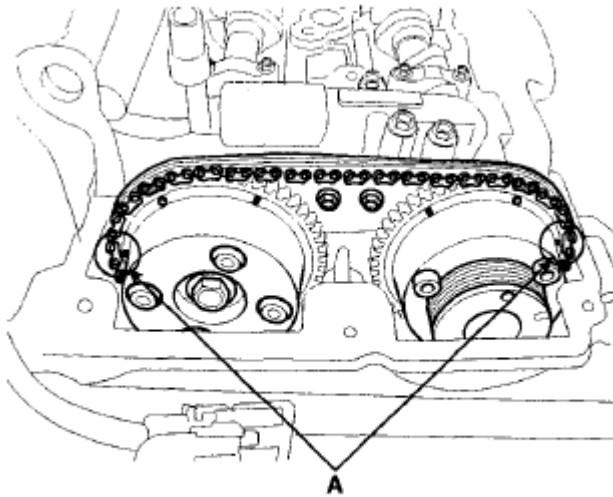
8. Select a new tappet with a thickness as close as possible to the calculated value.

NOTE: Shims are available in 41 size increments of 0.015mm (0.0006in.) from 3.00mm (0.118in.) to 3.600mm (0.1417in.)

9. Place a new tappet on the cylinder head.

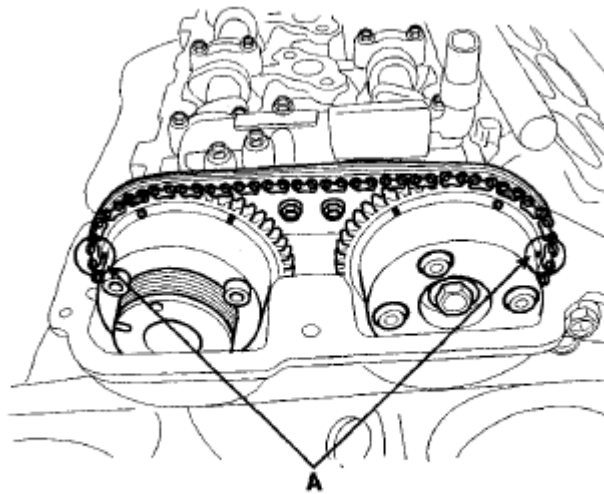
NOTE: Apply engine oil at the selected tappet on the periphery and top surface.

10. Install the intake and exhaust camshaft.
11. Install the bearing caps. (Refer to **CYLINDER HEAD ASSEMBLY (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS**)
12. Install the timing chain. (Refer to **TIMING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) - GENESIS**)
13. Turn the crankshaft two turns in the operating direction (clockwise) and realign crankshaft sprocket and camshaft sprocket timing marks (A).



SBHEM8060D

Fig. 17: Aligning Crankshaft Sprocket And Camshaft Sprocket Timing Marks (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8061D

Fig. 18: Aligning Crankshaft Sprocket And Camshaft Sprocket Timing Marks (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

14. Recheck the valve clearance.

Valve clearance (Engine coolant temperature : 20°C [68°F])

[Specification]

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

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

TROUBLESHOOTING

TROUBLESHOOTING CHART

Symptom	Suspect area	Remedy
Engine misfire with abnormal internal lower engine noises.	Worn crankshaft bearings. Loose or damaged engine drive plate.	Replace the crankshaft and bearings as required. Repair or replace the drive plate as required.
	Worn piston rings. (Oil consumption may or may not cause the engine to misfire.)	Inspect the cylinder for a loss of compression. Repair or replace as required.
	Worn crankshaft thrust bearings	Replace the crankshaft and bearings as required.
Engine misfire with abnormal valve train noise.	Stuck valves. (Carbon buildup on the valve stem)	Repair or replace as required.
	Excessive worn or mis-aligned timing chain.	Replace the timing chain and sprocket as required.
	Worn camshaft lobes.	Replace the camshaft and valve lifters.
Engine misfire with coolant consumption.	- Faulty cylinder head gasket and/or cranking or other damage to the cylinder head and engine block cooling system - Coolant consumption may or may not cause the engine to overheat.	- Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket. - Repair or replace as required.
Engine misfire with excessive oil consumption.	Worn valves, guides and/or valve stem oil seals.	Repair or replace as required.
	Worn piston rings. (Oil consumption may or may not cause the engine to misfire)	- Inspect the cylinder for a loss of compression. - Repair or replace as required.
Engine noise on start-up, but only lasting a few seconds.	Incorrect oil viscosity.	Drain the oil. Install the correct viscosity oil.
	Worn crankshaft thrust bearing.	- Inspect the thrust bearing and crankshaft. - Repair or replace as required.
Upper engine noise, regardless of engine speed.	Low oil pressure.	Repair or replace as required.
	Broken valve spring.	Replace the valve spring.

2010 Hyundai Genesis 3.8

2010 ENGINE General Information (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

	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.
	Worn drive belt, idler, tensioner and bearing.	Replace as required.
Lower engine noise, regardless of engine speed.	Low oil pressure.	Repair as required.
	Loose or damaged drive plate.	Repair or replace the drive plate.
	Damaged oil pan, contacting the oil pump screen.	- Inspect the oil pan. - Inspect the oil pump screen. - Repair or replace as required.
	Oil pump screen loose, damaged or restricted.	- Inspect the oil pump screen. - Repair or replace as required.
	Excessive piston-to-cylinder bore clearance.	- Inspect the piston, piston pin and cylinder bore. - Repair as required.
	Excessive piston pin-to-piston clearance.	- Inspect the piston, piston pin and the connecting rod. - Repair or replace as required.
	Excessive connecting rod bearing clearance	Inspect the following components and repair as required. - The connecting rod bearings. - The connecting rods. - The crankshaft pin journals.
	Excessive crankshaft bearing clearance.	Inspect the following components, and repair as required. The crankshaft bearings.

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2010 ENGINE General Information (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

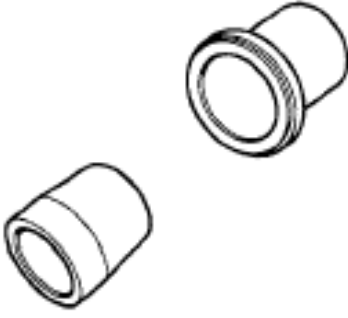
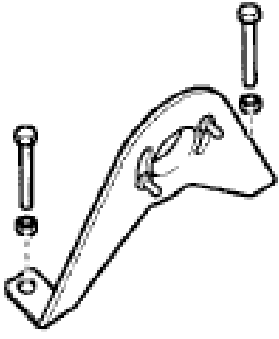
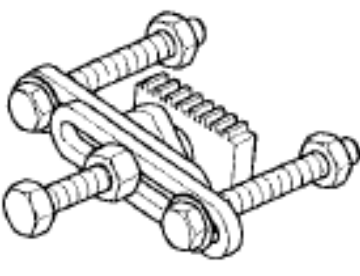
		• The crankshaft main journals. • The cylinder block.
	Incorrect piston, piston pin and connecting rod installation	• Verify the piston pins and connecting rods are installed correctly. • Repair as required.
Engine noise under load.	Low oil pressure	Repair or replace as required.
	Excessive connecting rod bearing clearance.	Inspect the following components and repair as required : • The connecting rod bearings. • The connecting rods. • The crankshaft.
	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 not rotate.	Hydraulically locked cylinder. • Coolant/antifreeze in cylinder. • Oil in cylinder. • Fuel in cylinder.	1. Remove spark plugs and check for fluid. 2. Inspect for broken head gasket. 3. Inspect for cracked engine block or cylinder head. 4. Inspect for a sticking fuel injector and/or leaking fuel regulator.
	Broken timing chain and/or timing chain and/or timing chain gears.	1. Inspect timing chain and gears. 2. Repair as required.
	Material in cylinder. • Broken valve • Piston material • Foreign material	1. Inspect cylinder for damaged components and/or foreign materials. 2. Repair or replace as required.
	Seized crankshaft or connecting rod bearings.	1. Inspect crankshaft and connecting rod bearing.

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2010 ENGINE General Information (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

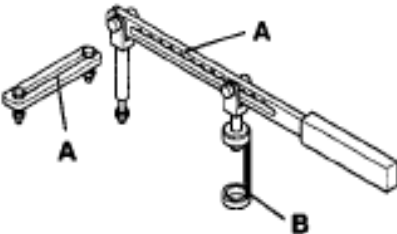
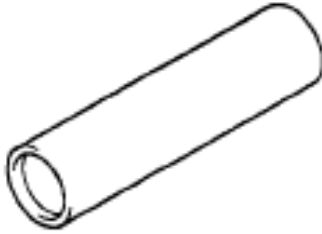
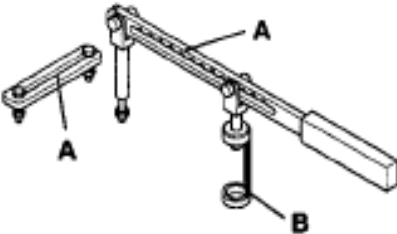
		2. Repair as required.
	Bent or broken connecting rod.	1. Inspect connecting rods. 2. Repair as required.
	Broken crankshaft.	1. Inspect crankshaft. 2. Repair as required.

SPECIAL SERVICE TOOLS

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09231-3C100)	 KDRF233A	Installation of the front oil seal
Crankshaft pulley holder (09231-3M100)	 SBHEM8200D	Removal and installation of the crankshaft pulley. (In vehicle use)
Flywheel stopper (09231-3C300)	 SHDEM6201D	Removal and installation of the flywheel and crankshaft pulley (Engine disassembly)
Torque angle adapter		Installation of bolts & nuts

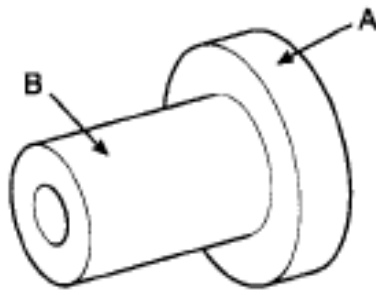
2010 Hyundai Genesis 3.8

2010 ENGINE General Information (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

(09221-4A000)	 ACJF125A	needing an angular method
Valve stem seal remover (09222-29000)	 ECRF003A	Removal of the valve stem seal
Valve stem seal installer (09222-3C100)	 LCAC030D	Installation of the valve stem seal
Valve spring compressor & holder (09222-3K000) (09222-3C300)	 ECRF003A	Removal and installation of the intake or exhaust valves a. 09222-3K000 b. 09222-3C300 (holder)
Crankshaft rear oil seal installer (09231-3C200) (09231-H1100)		Installation of the crankshaft rear oil seal a. 09231-3C200 b. 09231-H1100

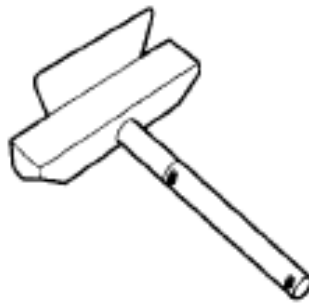
2010 Hyundai Genesis 3.8

2010 ENGINE General Information (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis



ACRF003A

Oil pan remover
(09215-3C000)



KDRF219A

Removal of oil pan

2010 ENGINE

Cylinder Block (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

CYLINDER BLOCK

COMPONENTS

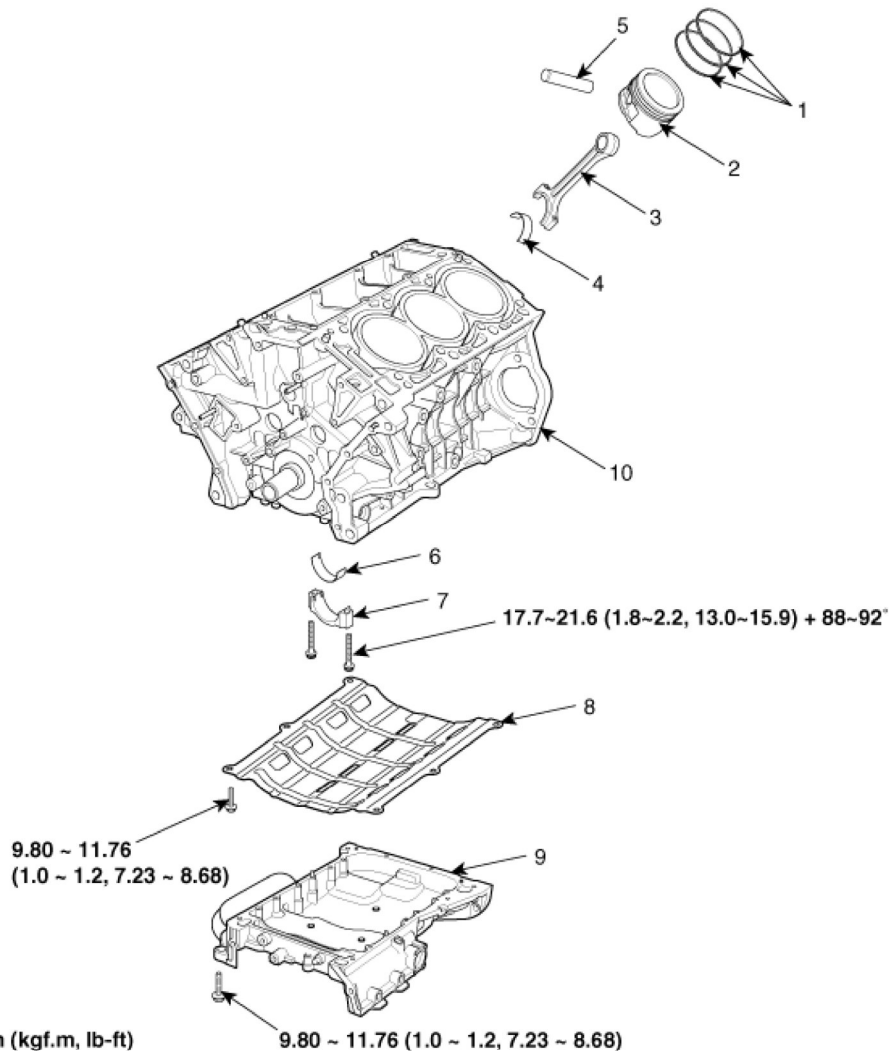


Fig. 1: Identifying Cylinder Block Components With Torque Specifications (1 Of 2)
 Courtesy of HYUNDAI MOTOR CO.

1. Piston ring	5. Piston pin	8. Baffle plate
2. Piston	6. Connecting rod lower bearing	9. Upper oil pan
3. Connecting rod	7. Connecting rod bearing cap	10. Cylinder block
4. Connecting rod upper bearing		

2010 Hyundai Genesis 3.8

2010 ENGINE Cylinder Block (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

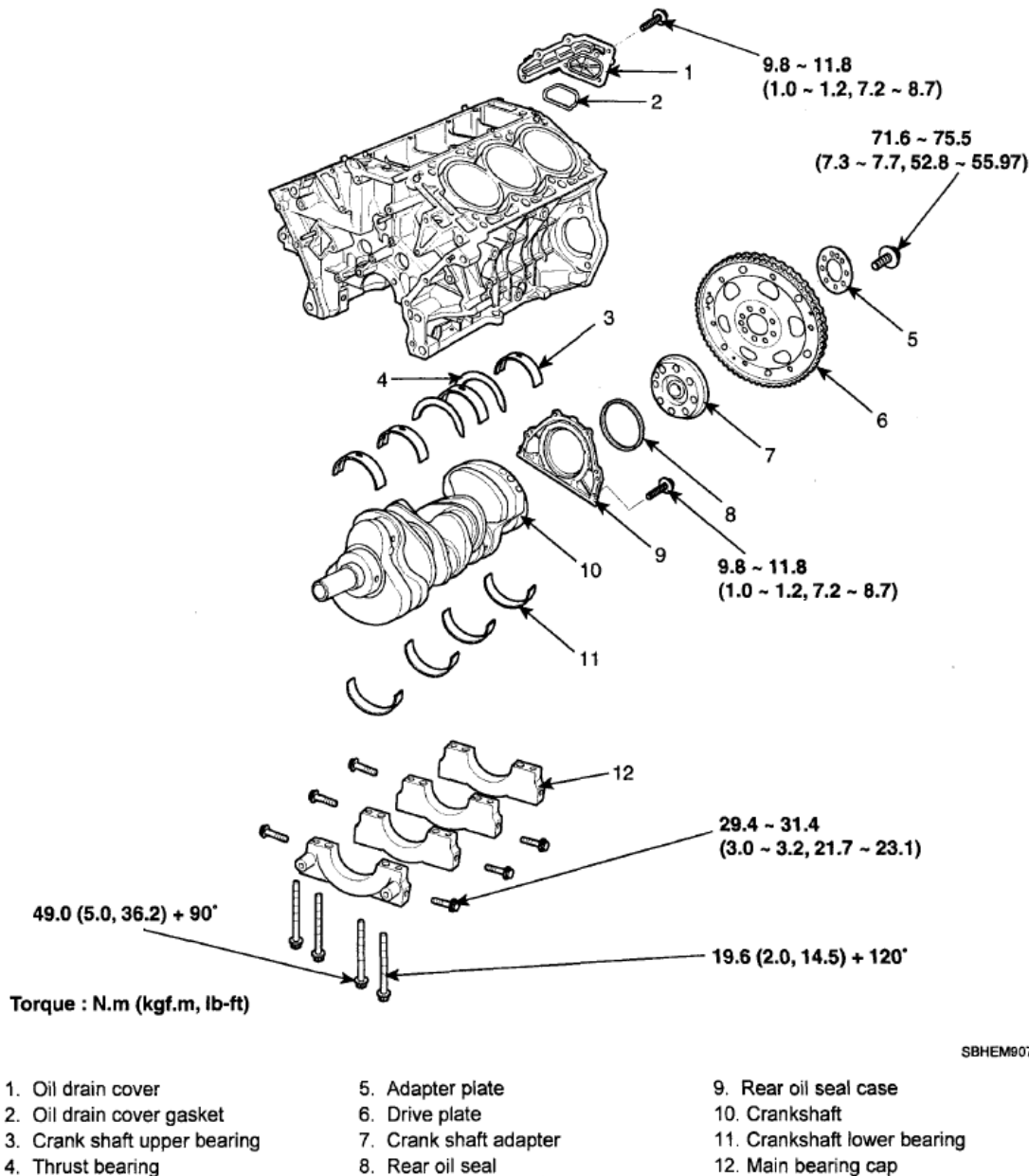


Fig. 2: Identifying Cylinder Block Components With Torque Specifications (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

CAUTION:

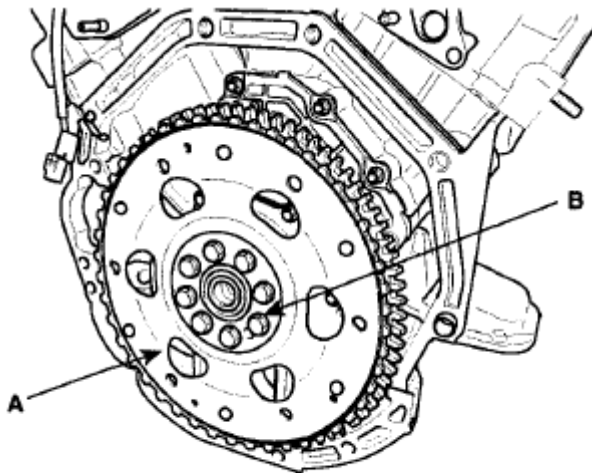
- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE:

- Mark all wiring and hoses to avoid misconnection.

- **Inspect the timing belt before removing the cylinder head.**
- **Turn the crankshaft pulley so that the No. 1 piston is at top dead center.**
- **Engine removal is required for this procedure.**

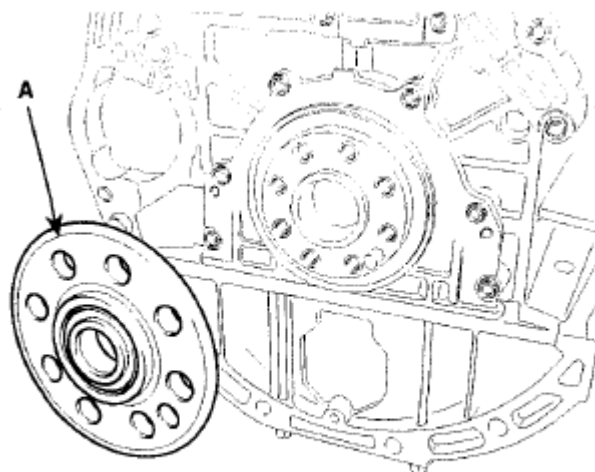
1. Remove the engine assembly from the vehicle. (Refer to **ENGINE AND TRANSMISSION ASSEMBLY**)
2. Install the engine to engine stand for disassembly.
3. Remove the intake manifold and exhaust manifold. (Refer to **INTAKE AND EXHAUST SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS**)
4. Remove the timing chain. (Refer to **TIMING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8))**)
5. Remove the water temperature control assembly. (Refer to **COOLING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS**)
6. Remove the cylinder head. (Refer to **CYLINDER HEAD ASSEMBLY (ENGINE (G6DB/G6DA - GSL 3.3/3.8))**)
7. Remove the oil pump. (Refer to **LUBRICATION SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) - GENESIS**)
8. Remove the oil filter assembly. (Refer to **LUBRICATION SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS**)
9. Remove the drive plate (A) and adapter plate (B).



SBHEM8079D

Fig. 3: Identifying Drive Plate (A) And Adapter Plate (B)
Courtesy of HYUNDAI MOTOR CO.

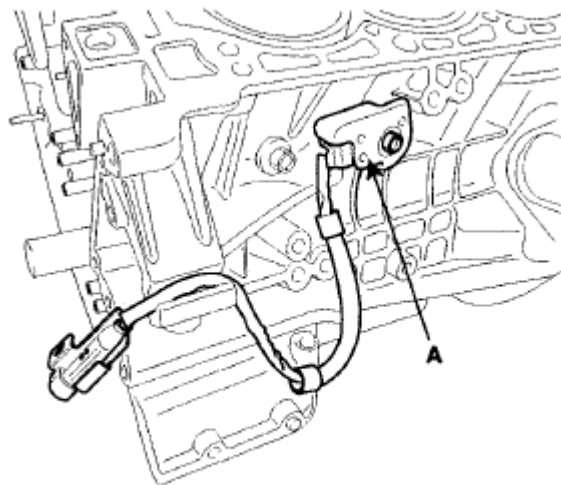
10. Remove the crankshaft adapter (A).



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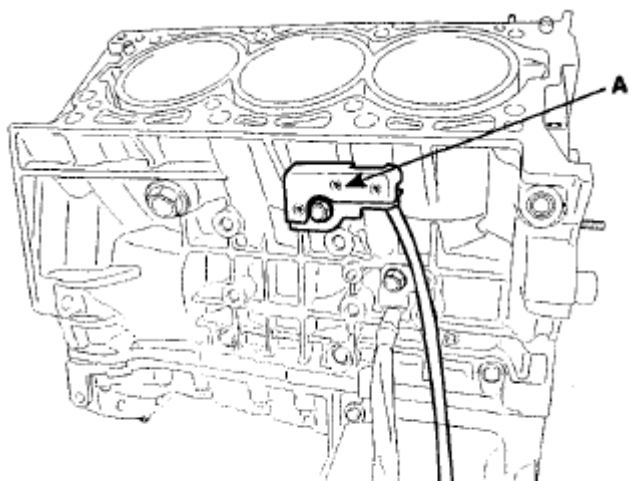
Fig. 4: Identifying Crankshaft Adapter (A)
Courtesy of HYUNDAI MOTOR CO.

11. Remove the knock sensor (A).



SBHEM8081D

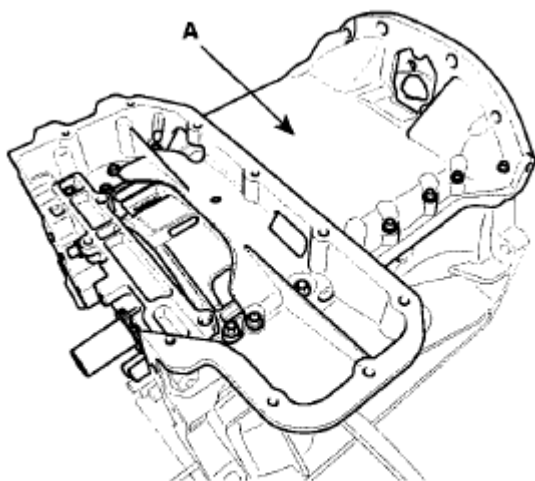
Fig. 5: Identifying Knock Sensor (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8082D

Fig. 6: Identifying Knock Sensor (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

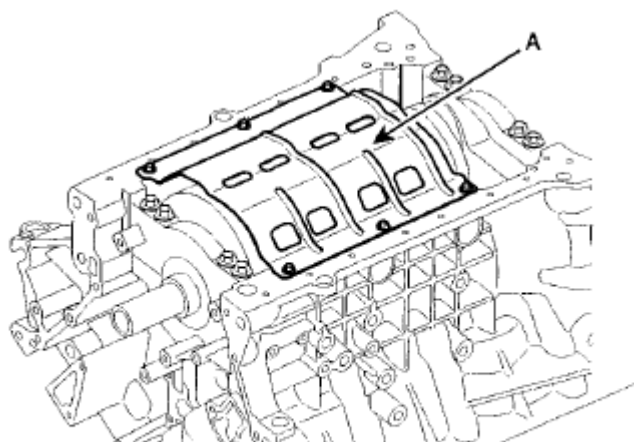
12. Remove the upper oil pan (A).



SBHEM8083D

Fig. 7: Identifying Upper Oil Pan (A)
Courtesy of HYUNDAI MOTOR CO.

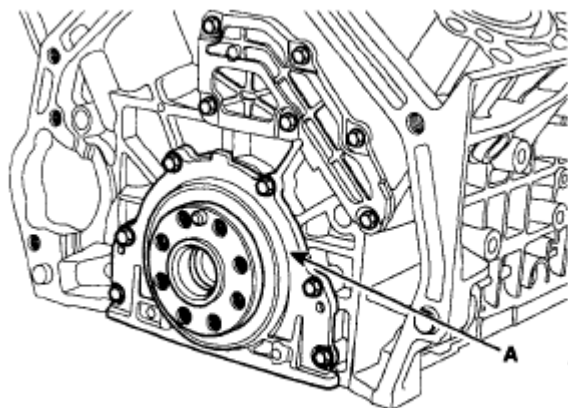
13. Remove the baffle plate (A).



SBHEM8206D

Fig. 8: Identifying Baffle Plate (A)
Courtesy of HYUNDAI MOTOR CO.

14. Remove the rear oil seal case (A).



KDRF208A

Fig. 9: Identifying Rear Oil Seal Case (A)
Courtesy of HYUNDAI MOTOR CO.

15. Remove the oil drain cover (A).

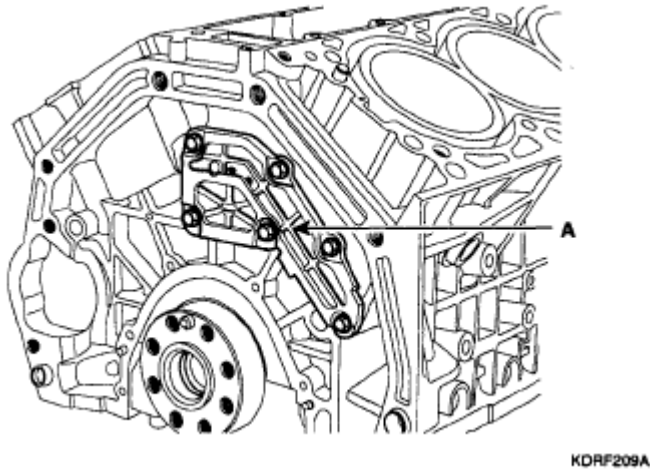


Fig. 10: Identifying Oil Drain Cover (A)
Courtesy of HYUNDAI MOTOR CO.

16. Check the connecting rod end play.
17. Check the connecting rod cap oil clearance.
18. Remove the piston and connecting rod assemblies.
 1. Using a ridge reamer, remove all the carbon from the top of the cylinder.
 2. Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

NOTE:

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

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

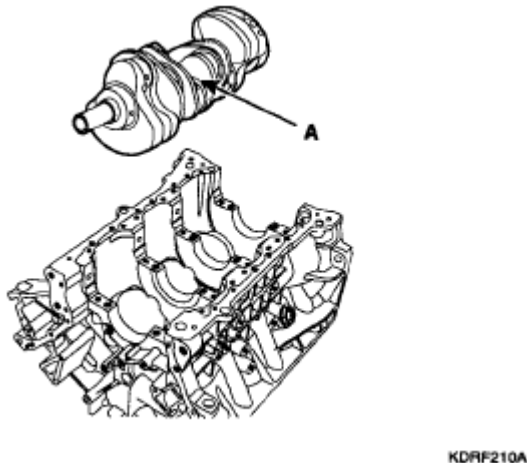


Fig. 11: Lifting Crankshaft (A) Out Of Engine
Courtesy of HYUNDAI MOTOR CO.

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

22. 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 piston and piston pin as a set.

23. Remove the 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.

24. Disconnect connecting rod from piston. Using a press, remove the piston pin from the piston.

Press-in load: 800 ~ 1400kg (1764 ~ 3086lb)

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.)

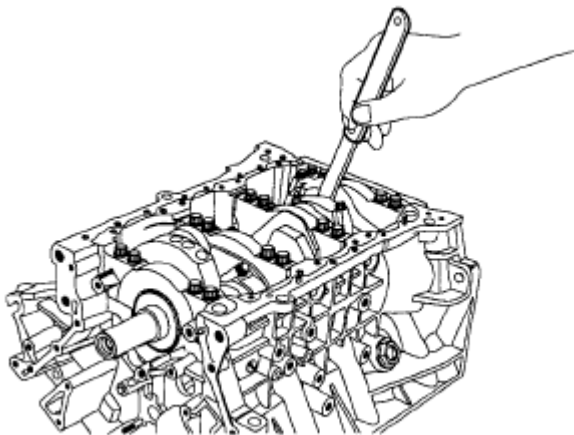


Fig. 12: Measuring End Play
Courtesy of HYUNDAI MOTOR CO.

- If out-of-tolerance, install a new connecting rod.
 - If still out-of-tolerance, replace the crankshaft.
2. Check the connecting rod bearing oil clearance.
 1. Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
 2. Remove 2 connecting rod cap bolts.
 3. Remove the connecting rod cap and bearing half.
 4. Clean the crank pin and bearing.
 5. Place plastigage across the crank pin.
 6. Reinstall the bearing half and cap, and torque the bolts.

Tightening torque

17.7~21.6Nm (1.8~2.2kgf.m, 13.0~15.9lb-ft) + 88~92°

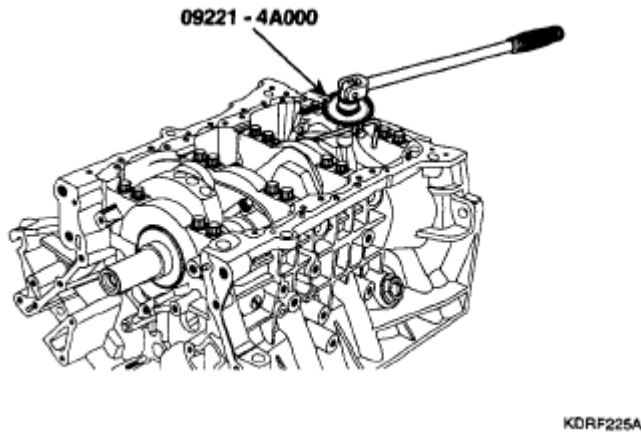


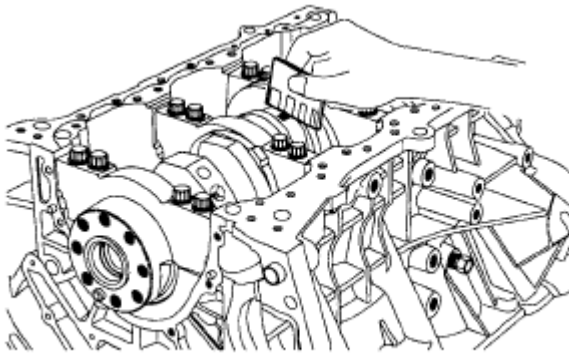
Fig. 13: Tightening Bearing Cap Bolts To Specified Torque
Courtesy of HYUNDAI MOTOR CO.

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

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

Standard oil clearance

0.038 ~ 0.056mm (0.0015 ~ 0.0022in.)



KDRF212A

Fig. 14: Measuring Plastigage
Courtesy of HYUNDAI MOTOR CO.

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.

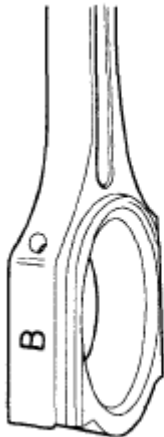
CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

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



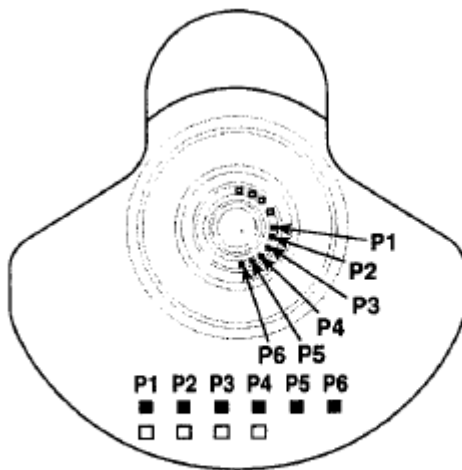
EDQF196A

Fig. 15: Identifying Connecting Rod Mark Location
Courtesy of HYUNDAI MOTOR CO.

Identification Of Connecting Rod

Class	Mark	Inside Diameter
0	a	58.000 ~ 58.006mm (2.2834 ~ 2.2837in.)
1	b	58.006 ~ 58.012mm (2.2837 ~ 2.2839in.)
2	c	58.012 ~ 58.018mm (2.2839 ~ 2.2842in.)

Crankshaft Pin Mark Location



SBHEM8112D

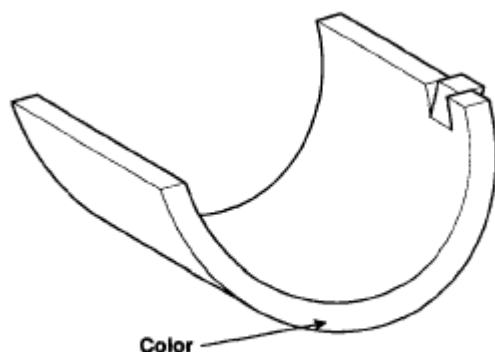
Fig. 16: Identifying Crankshaft
Courtesy of HYUNDAI MOTOR CO.

Discrimination Of Crankshaft

2010 Hyundai Genesis 3.8

2010 ENGINE Cylinder Block (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

Class	Mark	Outside Diameter Of Pin
I	1 or A	54.966 ~ 54.972mm (2.1640 ~ 2.1642in.)
II	2 or B	54.960 ~ 54.966mm (2.1638 ~ 2.1640in.)
III	3 or C	54.954 ~ 54.960mm (2.1635 ~ 2.1638in.)



ECRF021A

Fig. 17: Identifying Place Of Identification Mark (Connecting Rod Bearing)
 Courtesy of HYUNDAI MOTOR CO.

Identification Of Connecting Rod Bearing

Class	Mark	Thickness Of Bearing
E	BLUE	1.514 ~ 1.517mm (0.0596 ~ 0.0597in.)
D	BLACK	1.511 ~ 1.514mm (0.0595 ~ 0.0596in.)
C	BROWN	1.508 ~ 1.511mm (0.0594 ~ 0.0595in.)
B	GREEN	1.505 ~ 1.508mm (0.0593 ~ 0.0594in.)
A	YELLOW	1.502 ~ 1.505mm (0.0591 ~ 0.0593in.)

11. Selection

		Connecting Rod Identification Mark		
		0(a)	1(b)	2(c)
Crankshaft Identification Mark	1 or A	A (YELLOW)	B (GREEN)	C (BROWN)
	2 or B	B (GREEN)	C (BROWN)	D (BLACK)
	3 or C	C (BROWN)	D (BLACK)	E (BLUE)

3. Check the crankshaft bearing oil clearance.

1. To check main bearing-to-journal oil clearance, remove the main bearing caps and bearing halves.
2. Clean each main journal and bearing half with a clean shop towel.

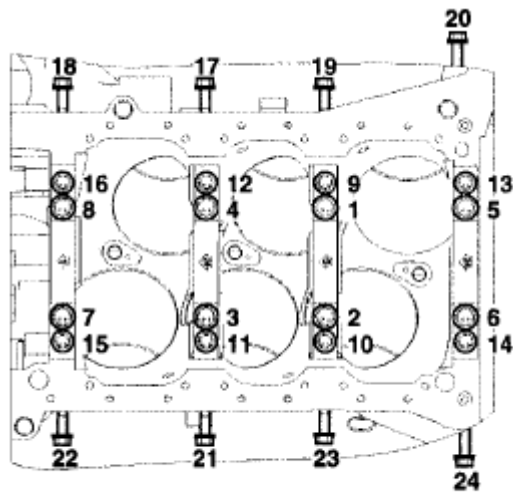
3. Place one strip of plastigage across each main journal.
4. Reinstall the bearings and caps, then torque the bolts.

Tightening torque

49.0Nm (5.0 kgf.m, 36.2lb-ft) + 90°

19.6Nm (2.0 kgf.m, 14.5lb-ft)+ 120°

29.4 ~ 31.4Nm (3.0 ~ 3.2 kgf.m, 21.7 ~ 23.1lb-ft)



SBHEM8113D

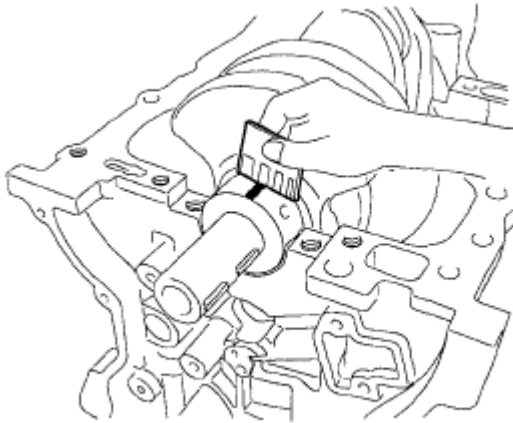
Fig. 18: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.

NOTE: Do not turn the crankshaft.

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

Standard oil clearance

0.022 ~ 0.040mm (0.0009 ~ 0.0016in.)



KCRF170A

Fig. 19: Measuring Widest Part Of Plastigage
Courtesy of HYUNDAI MOTOR CO.

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.

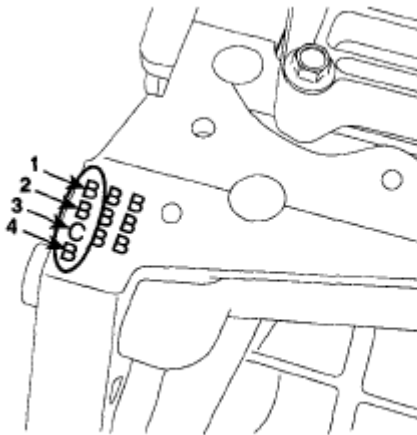
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

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.
Crankshaft bore mark location

Letters have been stamped on the block as a mark for the size of each of the 4 main journal bores.

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

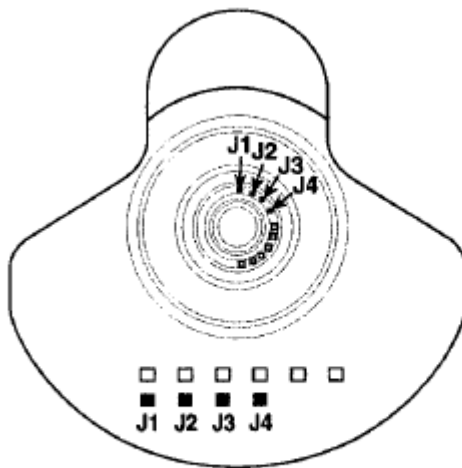


ECBF038A

Fig. 20: Identifying Letters Stamped On Block
Courtesy of HYUNDAI MOTOR CO.

Discrimination Of Cylinder Block

Class	Mark	Inside Diameter
a	A	73.500 ~ 73.506mm (2.8937 ~ 2.8939in.)
b	B	73.506 ~ 73.512mm (2.8939 ~ 2.8942in.)
c	C	73.512 ~ 73.518mm (2.8942 ~ 2.8944in.)



SBHEM8114D

Fig. 21: Identifying Crankshaft Journal Mark Location
Courtesy of HYUNDAI MOTOR CO.

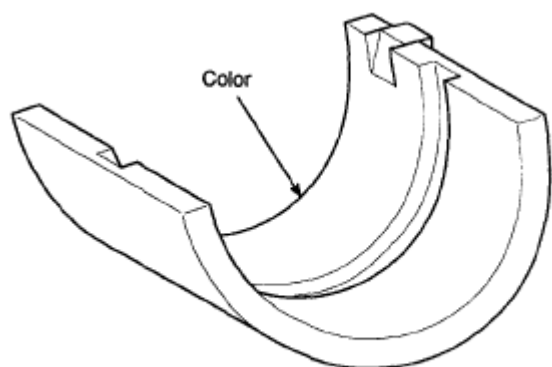
Discrimination Of Crankshaft

Class	Mark	Outside Diameter Of Journal
-------	------	-----------------------------

2010 Hyundai Genesis 3.8

2010 ENGINE Cylinder Block (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

I	1 or A	68.954 ~ 68.960mm (2.7147 ~ 2.7150in.)
II	2 or B	68.948 ~ 68.954mm (2.7145 ~ 2.7147in.)
III	3 or C	68.942 ~ 68.948mm (2.7142 ~ 2.7145in.)



ECRF022A

Fig. 22: Identifying Place Of Identification Mark (Crankshaft Bearing)
Courtesy of HYUNDAI MOTOR CO.

Discrimination Of Crankshaft Bearing

Class	Mark	Thickness Of Bearing
E	BLUE	2.277 ~ 2.280mm (0.0896 ~ 0.0897in.)
D	BLACK	2.274 ~ 2.277mm (0.0895 ~ 0.0896in.)
C	BROWN	2.271 ~ 2.274mm (0.0894 ~ 0.0895in.)
B	GREEN	2.268 ~ 2.271mm (0.0893 ~ 0.0894in.)
A	YELLOW	2.265 ~ 2.268mm (0.0892 ~ 0.0893in.)

Selection

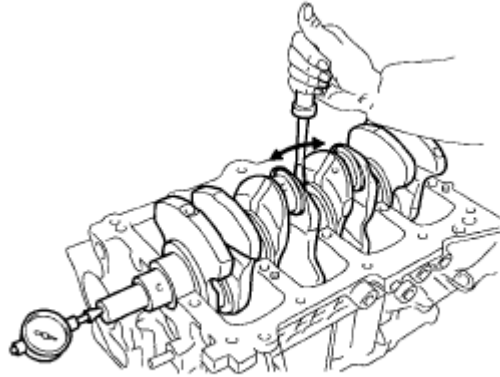
		Crankshaft Bore Identification Mark		
		a (A)	b (B)	c (C)
Crankshaft Identification Mark	1 or A	A (YELLOW)	B (GREEN)	C (BROWN)
	2 or B	B (GREEN)	C (BROWN)	D (BLACK)
	3 or C	C (BROWN)	D (BLACK)	E (BLUE)

4. Check crankshaft end play.

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

Standard end play

0.10 ~ 0.28mm (0.0039 ~ 0.0110in.)



ECKD001B

Fig. 23: Measuring Thrust Clearance
Courtesy of HYUNDAI MOTOR CO.

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

Thrust bearing thickness

2.41 ~ 2.45mm (0.0949 ~ 0.0964in.)

5. **Inspect main journals and crank pins**

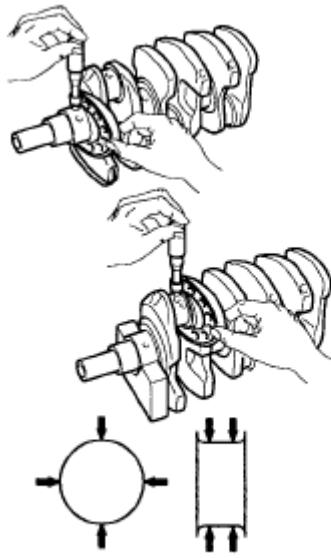
Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

68.942 ~ 68.960mm (2.7142 ~ 2.7149in.)

Crank pin diameter:

54.954 ~ 54.972mm (2.1635 ~ 2.1642in.)



ECKD001E

Fig. 24: Measuring Diameter Of Main Journal And Crank Pin
Courtesy of HYUNDAI MOTOR CO.

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

Cylinder Block

1. Remove the gasket material.

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

2. Clean the cylinder block

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

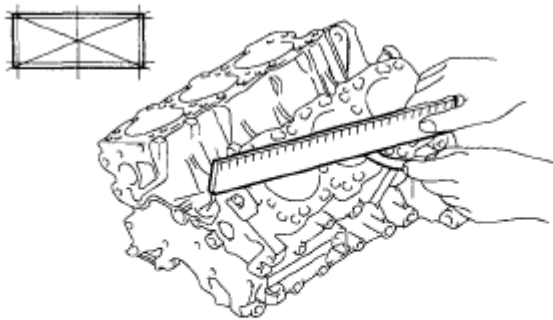
3. Inspect the top surface of the cylinder block for flatness.

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

Flatness of cylinder block gasket surface

Standard : Less than 0.05mm (0.0020 in.),

Less than 0.02mm (0.0008in.) /150 x 150



EDQF154A

Fig. 25: Measuring Surface Contacting Cylinder Head Gasket For Warpage
Courtesy of HYUNDAI MOTOR CO.

4. Inspect cylinder bore diameter

Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.

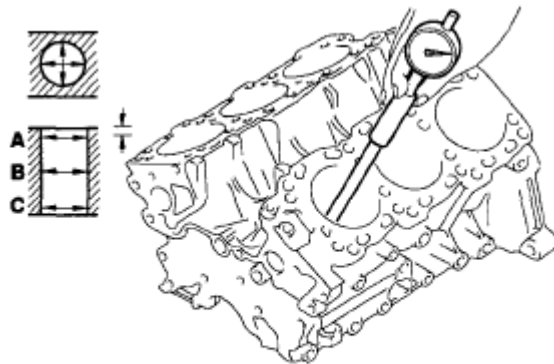
5. Inspect cylinder bore diameter

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

Standard diameter

[3.8L] 96.00 ~ 96.03mm (3.7795 ~ 3.7807in.)

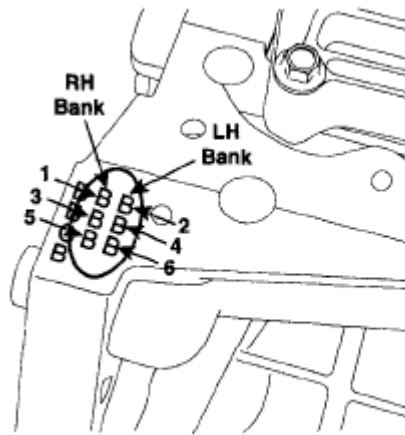
[3.3L] 92.00 ~ 92.03mm (3.6220 ~ 3.6232in.)



EDQF153A

Fig. 26: Measuring Cylinder Bore Diameter
Courtesy of HYUNDAI MOTOR CO.

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

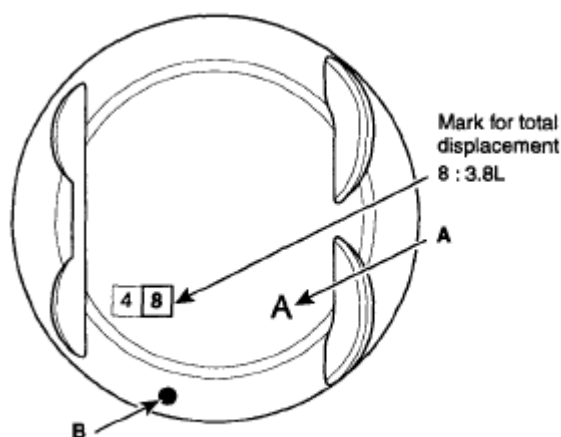


EC6F002A

Fig. 27: Locating Cylinder Bore Size Code On Cylinder Block
Courtesy of HYUNDAI MOTOR CO.

Class	Size code	Cylinder bore inner diameter	
		3.3L	3.8L
A	A	92.00 ~ 92.01 mm (3.6220 ~ 3.6224in.)	96.00 ~ 96.01 mm (3.7795 ~ 3.7799in.)
B	B	92.01 ~ 92.02mm (3.6224 ~ 3.6228in.)	96.01 ~ 96.02mm (3.7799 ~ 3.7803in.)
C	C	92.02 ~ 92.03mm (3.6228 ~ 3.6232in.)	96.02 ~ 96.03mm (3.7803 ~ 3.7807in.)

7. Check the piston size code (A) and the front mark (B) on the piston top face.



SGHEM7002N

Fig. 28: Checking Piston Size Code (A) And Front Mark (B) On Piston Top Face
Courtesy of HYUNDAI MOTOR CO.

Class	Size code	Piston outer diameter	
		3.3L	3.8L
A	A	91.96 ~ 91.97mm (3.6204 ~ 3.6208in.)	95.96 ~ 95.97mm (3.7779 ~ 3.7783in.)
B	B	91.97 ~ 91.98mm (3.6208 ~ 3.6212in.)	95.97 ~ 95.98mm (3.7783 ~ 3.7787in.)
C	C	91.98 ~ 91.99mm (3.6212 ~ 3.6216in.)	95.98 ~ 95.99mm (3.7787 ~ 3.7791 in.)

8. Select the piston related to cylinder bore class.

Clearance: 0.03 ~ 0.05mm (0.0012 ~ 0.0020in.)

Piston And Rings

- Clean piston
 - Using a gasket scraper, remove the carbon from the piston top.
 - Using a groove cleaning tool, clean the piston ring grooves.
 - Using solvent and a brush, thoroughly clean the piston.

NOTE: Do not use a wire brush.

- The standard measurement of the piston outside diameter is taken 14 mm (0.5512 in.) from the bottom of the piston.

Standard diameter

[3.8L] 95.96 ~ 95.99mm (3.7779 ~ 3.7791 in.)

[3.3L] 91.96 ~ 91.99mm (3.6204 ~ 3.6216in.)

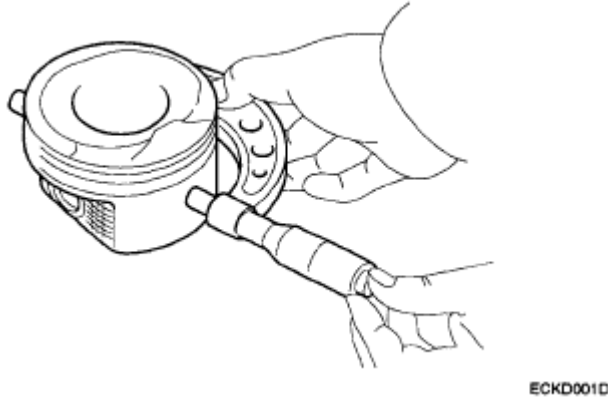


Fig. 29: Measuring Piston Outside Diameter
Courtesy of HYUNDAI MOTOR CO.

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

Piston-to-cylinder clearance

0.03 ~ 0.05mm (0.0012 ~ 0.0020in.)

4. Inspect the piston ring side clearance.

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

Piston ring side clearance

Standard

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

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

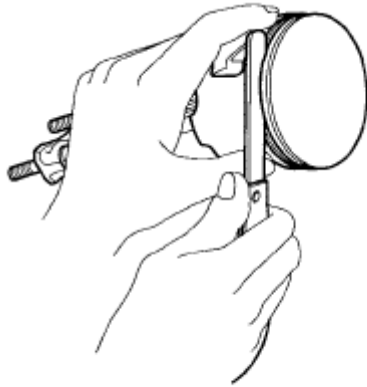
Oil ring: 0.06 ~ 0.15mm (0.0024 ~ 0.0059in.)

Limit

No. 1: 0.1mm (0.004in.)

No. 2: 0.1mm (0.004in.)

Oil ring: 0.2mm (0.008in.)



ECKD001G

Fig. 30: Measuring Clearance Between New Piston Ring And Wall Of Ring Groove
Courtesy of HYUNDAI MOTOR CO.

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 replaced.

Piston ring end gap

Standard

No. 1: 0.17 ~ 0.32mm (0.0067 ~ 0.0126in.)

No. 2: 0.32 ~ 0.47mm (0.0126 ~ 0.0185in.)

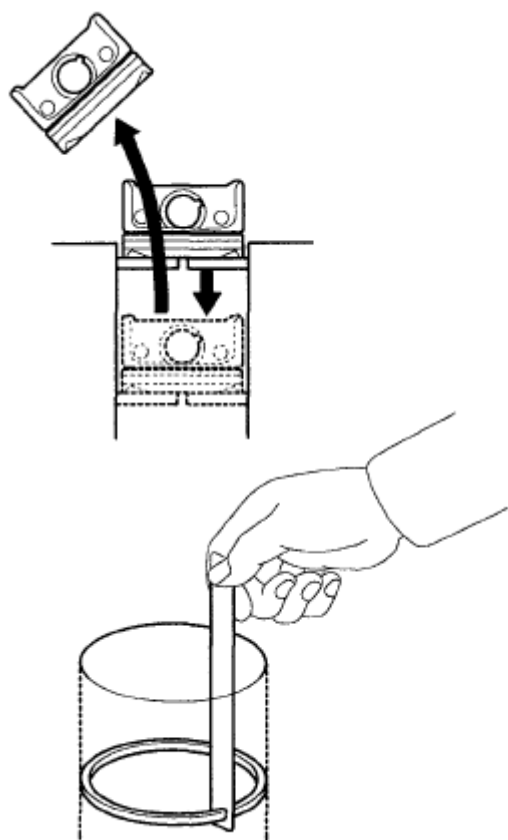
Oil ring: 0.20 ~ 0.70mm (0.0079 ~ 0.0275in.)

Limit

No. 1: 0.6mm (0.0236in.)

No. 2: 0.7mm (0.0275in.)

Oil ring: 0.8mm (0.0315in.)



ECKD001K

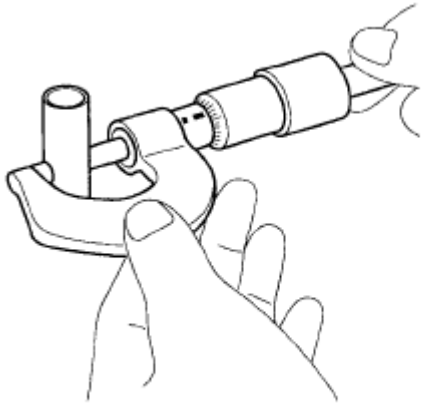
Fig. 31: Measuring Piston Ring End Gap
Courtesy of HYUNDAI MOTOR CO.

Piston Pins

1. Measure the diameter of the piston pin.

Piston pin diameter

23.001 ~ 23.006mm (0.9056 ~ 0.9057in.)



ECKD001Z

Fig. 32: Measuring Diameter Of Piston Pin
Courtesy of HYUNDAI MOTOR CO.

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

Piston pin-to-piston clearance

0.01 ~ 0.02mm (0.0004 ~ 0.0008in.)

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

Piston pin-to-connecting rod interference

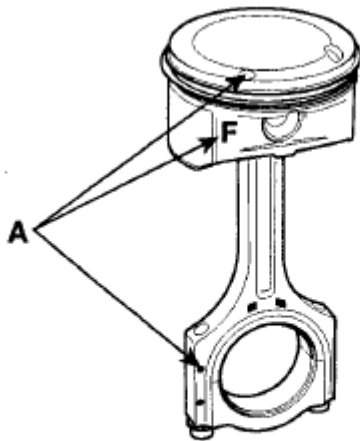
-0.032 ~ -0.016mm (-0.0012 ~ -0.0007in.)

REASSEMBLY

NOTE:

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

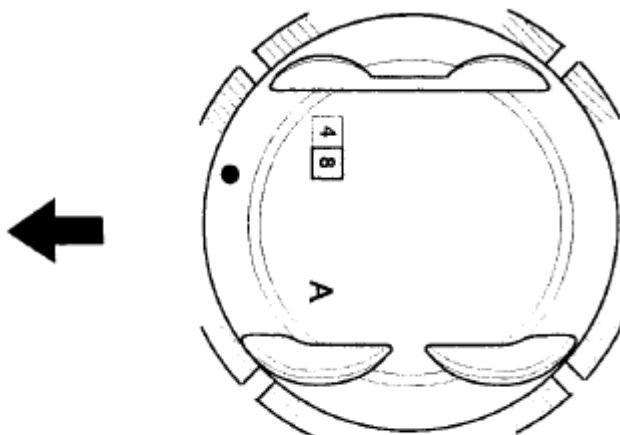
1. Assemble the piston and the connecting rod.
 1. Use a hydraulic press for installation.
 2. The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



SGHEM7012N

Fig. 33: Identifying Piston Front Mark And Connecting Rod Front Mark
Courtesy of HYUNDAI MOTOR CO.

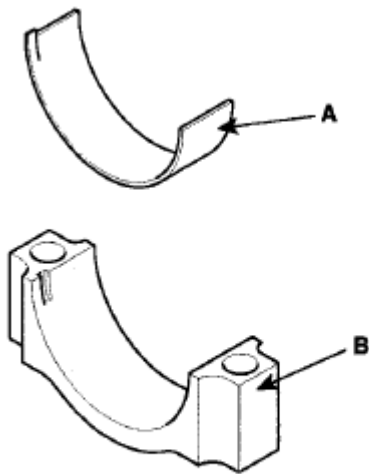
2. Install the piston rings.
 1. Install the oil ring spacer and 2 side rails by hand.
 2. Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
 3. Position the piston rings so that the ring ends are as shown.



SBHEM8153D

Fig. 34: Identifying Piston Ring End Positions
Courtesy of HYUNDAI MOTOR CO.

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



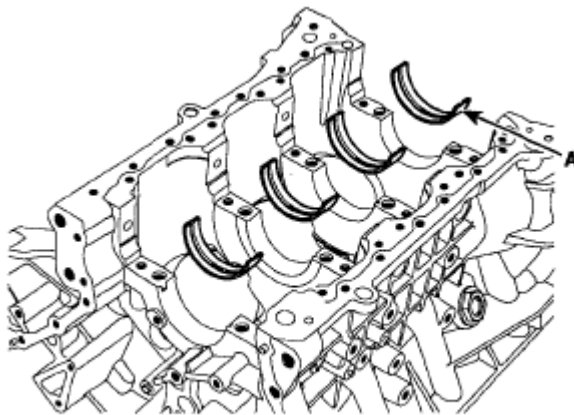
SGHEM7013N

Fig. 35: Identifying Connecting Rod Bearings (A) And Connecting Rod Cap (B)
Courtesy of HYUNDAI MOTOR CO.

4. Install the main bearings.

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

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



KDRF216A

Fig. 36: Aligning Bearing Claw With Claw Groove Of Cylinder Block
Courtesy of HYUNDAI MOTOR CO.

2. Align the bearing claw with the claw groove of the main bearing cap, and push in the 4 lower bearings.
5. Install the thrust bearings.

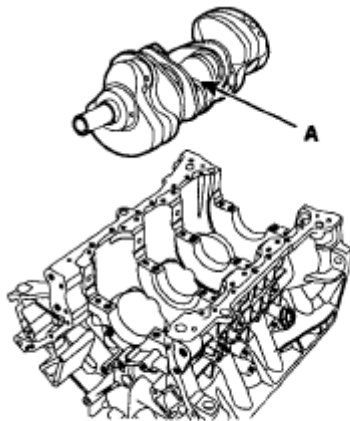
Install the 2 thrust bearings (A) under the No. 3 journal position of the cylinder block with the oil grooves facing outward.



ECKD324A

Fig. 37: Identifying Thrust Bearings
Courtesy of HYUNDAI MOTOR CO.

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



KDRF210A

Fig. 38: Placing Crankshaft (A) On Cylinder Block
Courtesy of HYUNDAI MOTOR CO.

7. Place the main bearing caps on cylinder block.
8. Install the main bearing cap bolts.
 1. Install and uniformly tighten the bearing cap bolts, in several passes, in the sequence shown.

Tightening torque

Main bearing cap bolt

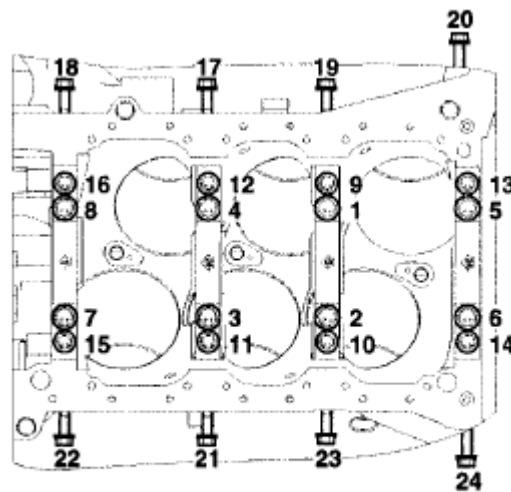
49.0 N.m (5.0 kgf.m, 36.2lb-ft) + 90° (1 ~ 8)

19.6 N.m (2.0 kgf.m, 14.5lb-ft) + 120° (9 ~ 16)

29.4 ~ 31.4 N.m (3.0 ~ 3.2 kgf.m, 21.7 ~ 23.1 lb-ft) (17 ~ 24)

NOTE:

- Always use new main bearing cap bolts.
- If any of the bearing cap bolts are broken or deformed, replace it.



SBHEM8113D

Fig. 39: Identifying Main Bearing Cap Bolts Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.

Use the SST (09221-4A000), install main bearing cap bolts.

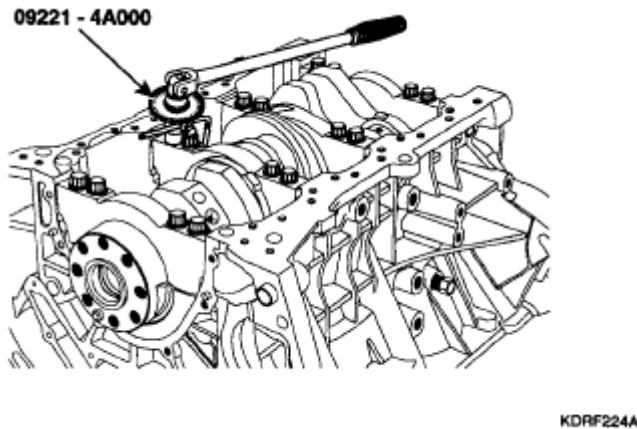


Fig. 40: Tightening Main Bearing Cap Bolts
Courtesy of HYUNDAI MOTOR CO.

2. Check that the crankshaft turns smoothly.
9. Check crankshaft end play.
10. Install the piston and connecting rod assemblies.

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

1. 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.
2. Stop after the ring compressor pops free, and check the connecting rod-to-check journal alignment before pushing the piston into place.
3. Apply engine oil to the bolt threads. Install the rod caps with bearings, and torque the bolts.

Tightening torque

17.7~21.6Nm (1.8~2.2kgf.m, 13.0~15.9lb-ft) + 88~92°

Use SST (09221-4A000), install connecting rod bearing cap bolts.

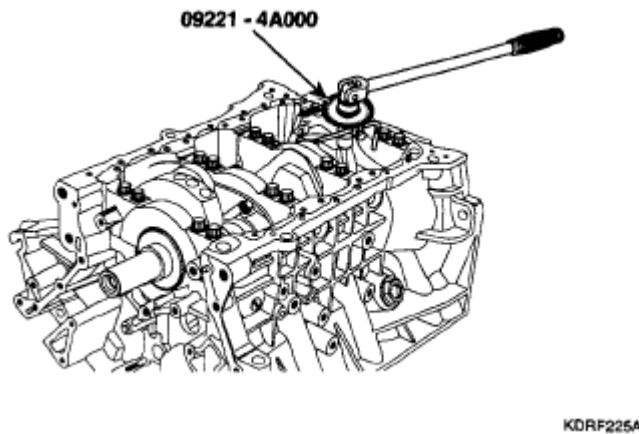


Fig. 41: Tightening Connecting Rod Bearing Cap Bolts
Courtesy of HYUNDAI MOTOR CO.

NOTE:

- Always use new connecting rod bearing cap bolts.
- Maintain downward force on the ring compressor to prevent the rings from expanding before entering the cylinder bore.

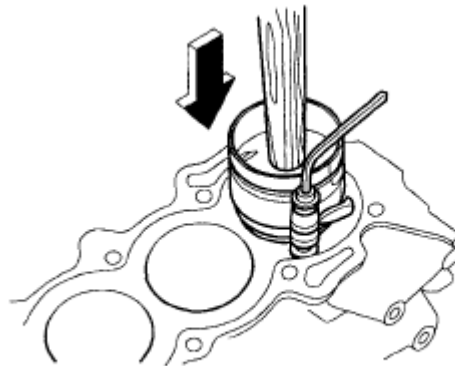


Fig. 42: Installing Connecting Rod And Piston Assembly Into Cylinder Bore
Courtesy of HYUNDAI MOTOR CO.

11. Check the connecting rod end play.
12. Install the oil drain cover (A).

Tightening torque

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

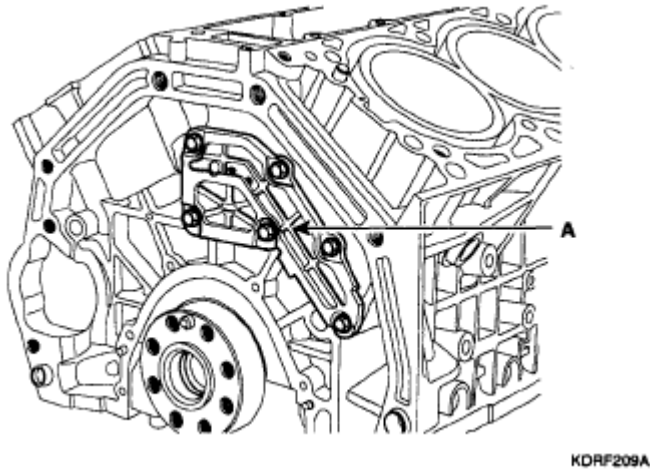
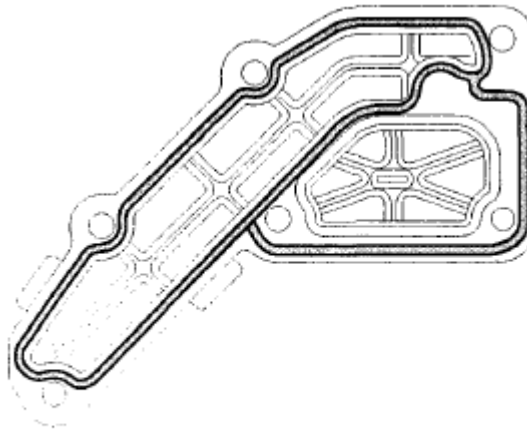


Fig. 43: Identifying Oil Drain Cover (A)
Courtesy of HYUNDAI MOTOR CO.

NOTE:

- Clean the sealing face before assembling two parts.
- Remove harmful foreign materials on the sealing face before applying sealant
- Before assembling oil drain cover, the liquid sealant TB1217H should be applied to the oil drain cover.
- The part must be assembled within 5 minutes after sealant was applied.
- Apply sealant to the inner threads of the bolt holes.



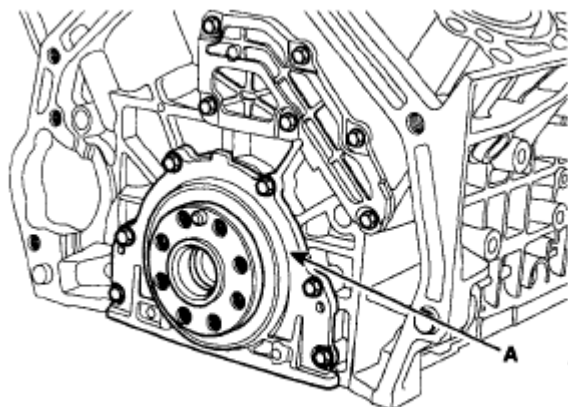
SBHEM8115D

Fig. 44: Applying Sealant To Oil Drain Cover
Courtesy of HYUNDAI MOTOR CO.

13. Install the rear oil seal case (A).

Tightening torque

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

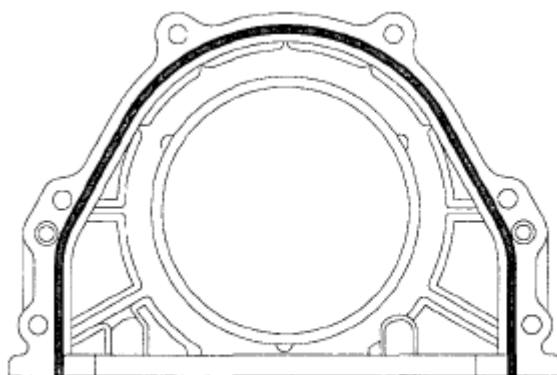


KDRF208A

Fig. 45: Identifying Rear Oil Seal Case (A)
Courtesy of HYUNDAI MOTOR CO.

NOTE:

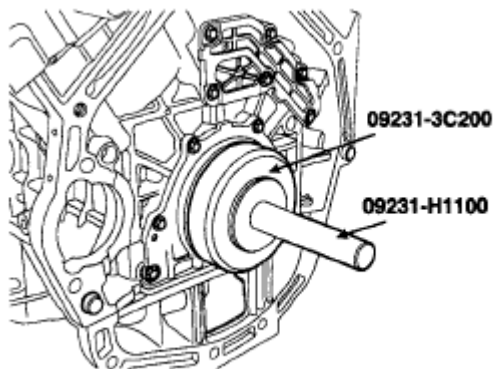
- Clean the sealing face before assembling two parts.
- Remove harmful foreign materials on the sealing face before applying sealant
- Before assembling rear oil seal case, the liquid sealant TB1217H should be applied to the rear oil seal case.
- The part must be assembled within 5 minutes after sealant was applied.
- Apply sealant to the inner threads of the bolt holes.



KDRF218A

Fig. 46: Applying Sealant To Rear Oil Seal Case
Courtesy of HYUNDAI MOTOR CO.

14. Using the SST (09231-3C200, 09231-H1100), install rear oil seal.



KDRF237A

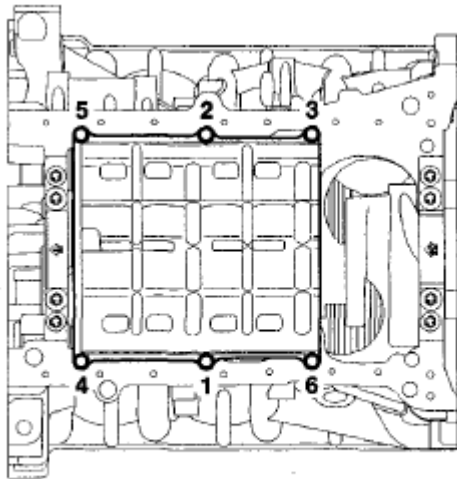
Fig. 47: Installing Rear Oil Seal
Courtesy of HYUNDAI MOTOR CO.

15. Install the baffle plate.

Install and uniformly tighten the baffle plate bolts, in several passes, in the sequence shown.

Tightening torque

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



SBHEM8118D

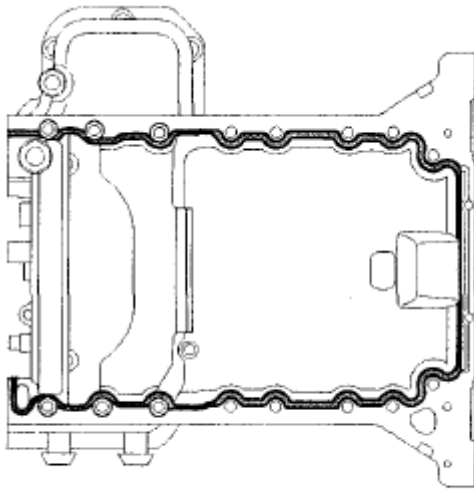
Fig. 48: Identifying Baffle Plate Bolts Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.

16. Install the upper oil pan.
 - a. Using a gasket scraper, remove all the old packing material from the gasket surfaces.

- b. Before assembling the oil pan, the liquid sealant TB1217H should be applied on upper oil pan.

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

Bead width: 2.5mm (0.1in.)



SBHEM8097D

Fig. 49: Applying Sealant To Upper Oil Pan
Courtesy of HYUNDAI MOTOR CO.

NOTE:

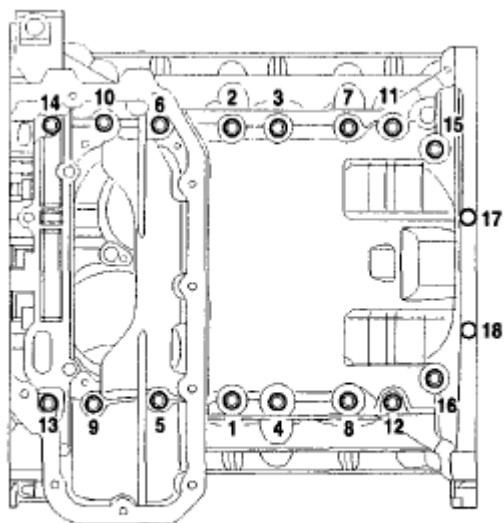
- Clean the sealing face before assembling two parts.
- Remove harmful foreign materials on the sealing face before applying sealant
- When applying sealant gasket, sealant must not protrude into the inside of oil pan.
- To prevent leakage of oil, apply sealant gasket to the inner threads of the bolt holes.

- c. Install the upper oil pan.

Uniformly tighten the bolts in several passes.

Tightening torque

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



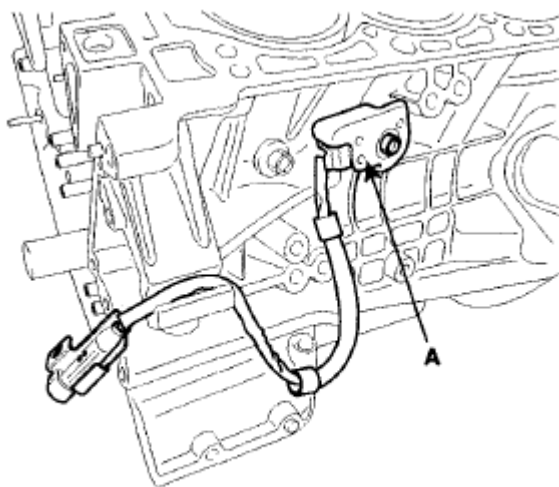
SBHEM8098D

Fig. 50: Identifying Upper Oil Pan Bolts Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.

17. Install the knock sensor (A).

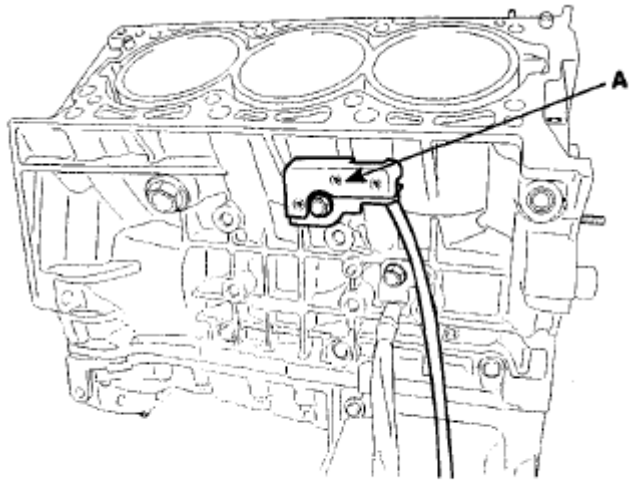
Tightening torque

15.7 ~ 23.5Nm (1.6 ~ 2.4kgf.m, 11.6 ~ 17.3lb-ft)



SBHEM8081D

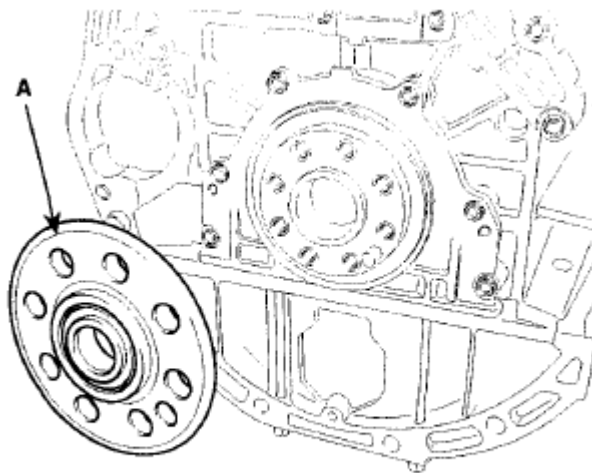
Fig. 51: Identifying Knock Sensor (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8082D

Fig. 52: Identifying Knock Sensor (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

18. Install the crankshaft adapter (A).



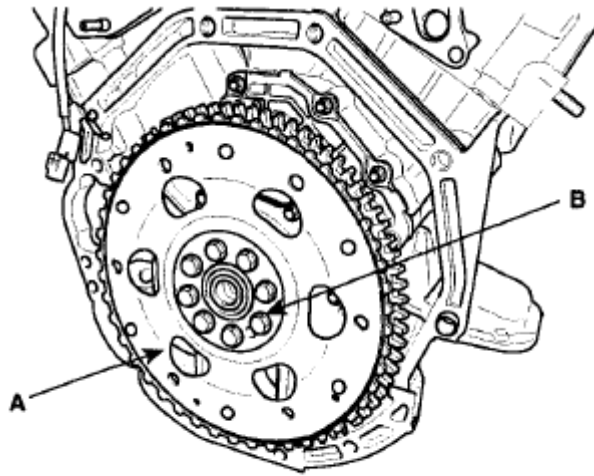
SBHEM8080D

Fig. 53: Identifying Crankshaft Adapter (A)
Courtesy of HYUNDAI MOTOR CO.

19. Install the drive plate (A) and adapter plate (B).

Tightening torque :

71.6 ~ 75.5 N.m (7.3 ~ 7.7kgf.m, 52.8 ~ 55.7lb-ft)



SBHEM8079D

Fig. 54: Identifying Drive Plate (A) And Adapter Plate (B)
Courtesy of HYUNDAI MOTOR CO.

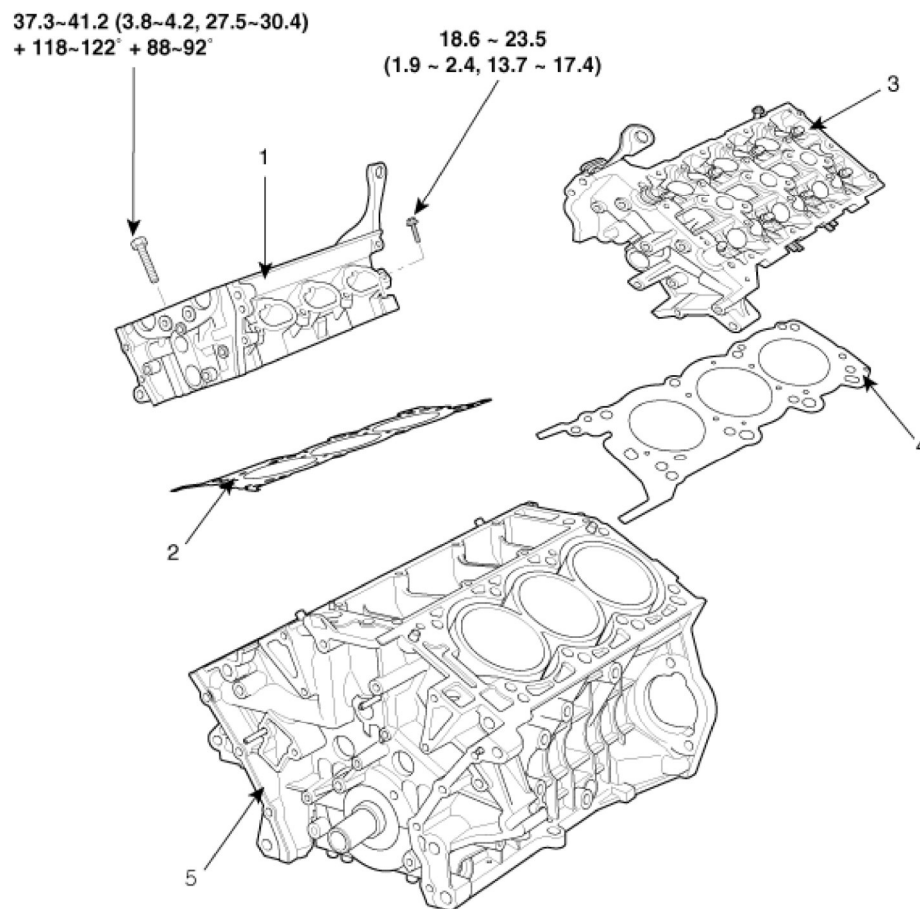
20. Install the oil filter assembly. (Refer to LUBRICATION SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS)
21. Install the oil pump. (Refer to LUBRICATION SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS)
22. Install the cylinder head. (Refer to CYLINDER HEAD ASSEMBLY (ENGINE (G6DB/G6DA - GSL 3.3/3.8)))
23. Install the water temperature control assembly. (Refer to COOLING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS)
24. Install the timing chain. (Refer to TIMING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)))
25. Install the intake manifold and exhaust manifold. (Refer to INTAKE AND EXHAUST SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8)) -- GENESIS)
26. Install the engine assembly to the vehicle. (Refer to ENGINE AND TRANSMISSION ASSEMBLY)

2010 ENGINE

Cylinder Head Assembly (Engine (G6DB/G6DA - GSL 3.3/3.8)) - Genesis

CYLINDER HEAD

COMPONENTS

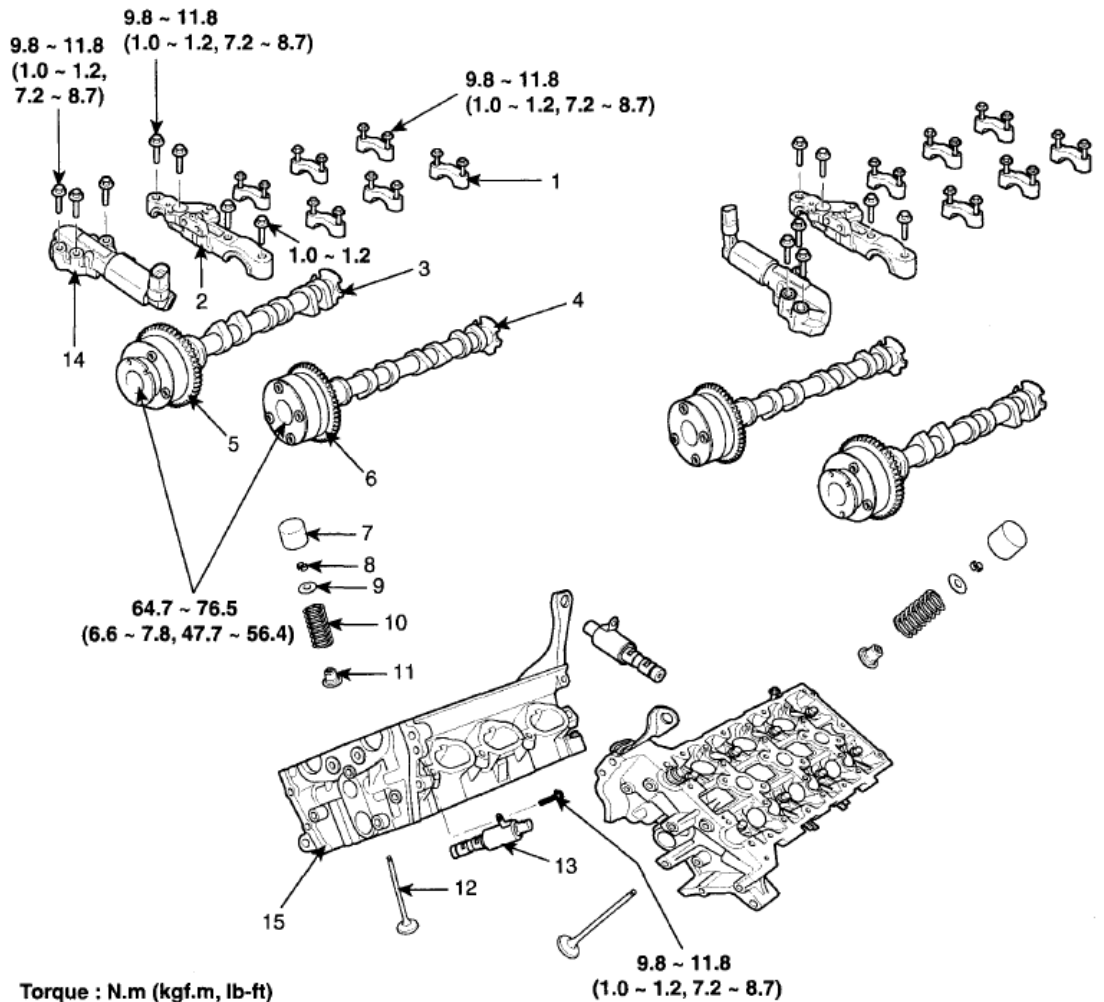


Torque : N.m (kgf.m, lb-ft)

Fig. 1: Identifying Cylinder Head Components With Torque Specifications (1 Of 2)
 Courtesy of HYUNDAI MOTOR CO.

1. RH Cylinder head
 2. RH Cylinder head gasket
 3. LH Cylinder head

4. LH Cylinder head gasket
 5. Cylinder block



SBHEM9077L

- | | | |
|--------------------------------|-----------------------------------|--------------------------|
| 1. Camshaft bearing cap | 6. Intake CVT assembly | 11. Valve stem seal |
| 2. Camshaft thrust bearing cap | 7. Mechanical lash adjuster (MLA) | 12. Valve |
| 3. Exhaust camshaft | 8. Retainer lock | 13. Exhaust camshaft OCV |
| 4. Intake camshaft | 9. Retainer | 14. Intake camshaft OCV |
| 5. Exhaust CVT assembly | 10. Valve spring | 15. Cylinder head |

Fig. 2: Identifying Cylinder Head Components With Torque Specifications (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

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 (20C [68°F]) before removing it.
- When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.
- To avoid damage, unplug the wiring connectors carefully while

holding the connector portion.

NOTE:

- Mark all wiring and hoses to avoid misconnection.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center.

1. Remove the timing chain. (Refer to **TIMING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8))**).
2. Disconnect the heater hoses (A) and brake vacuum hose (B).

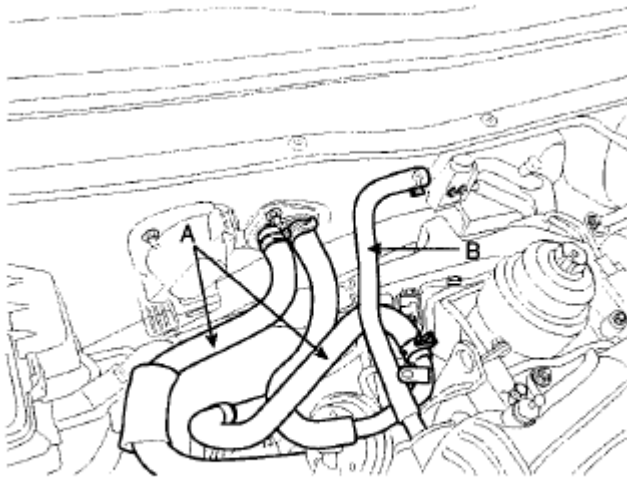
**SBHEM8006D**

Fig. 3: Identifying Heater Hoses (A) And Brake Vacuum Hose (B)
Courtesy of HYUNDAI MOTOR CO.

3. Remove the mounting bolts (B, C) and then remove the water temperature control assembly (A).

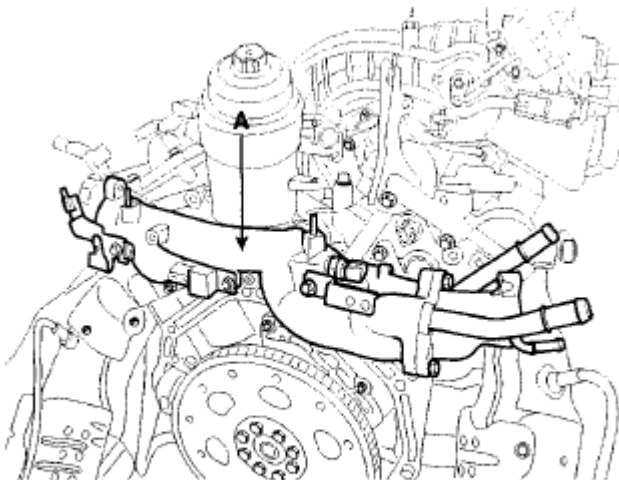
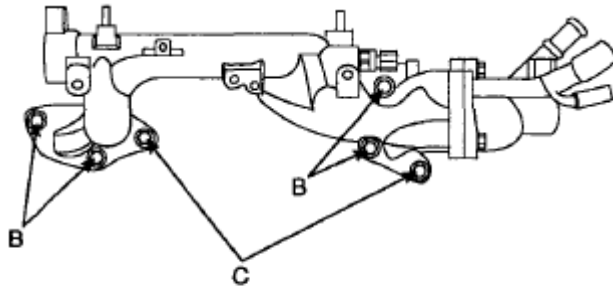
**SBHEM8041D**

Fig. 4: Identifying Water Temperature Control Assembly (A)
Courtesy of HYUNDAI MOTOR CO.



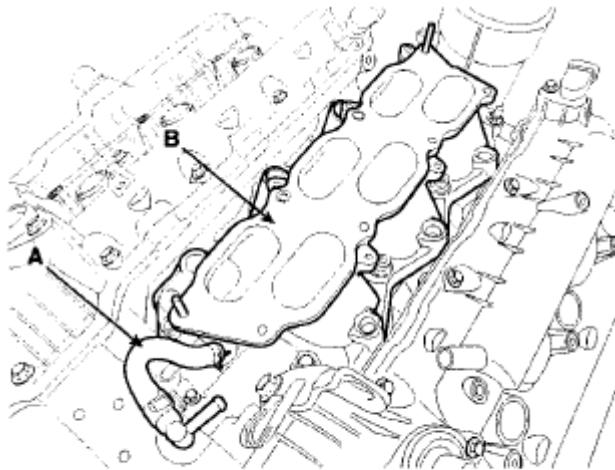
SBHEM8042D

Fig. 5: Identifying Mounting Bolts (B, C)
Courtesy of HYUNDAI MOTOR CO.

4. Disconnect the water vent hose (A) and then remove the intake the manifold (B).

CAUTION:

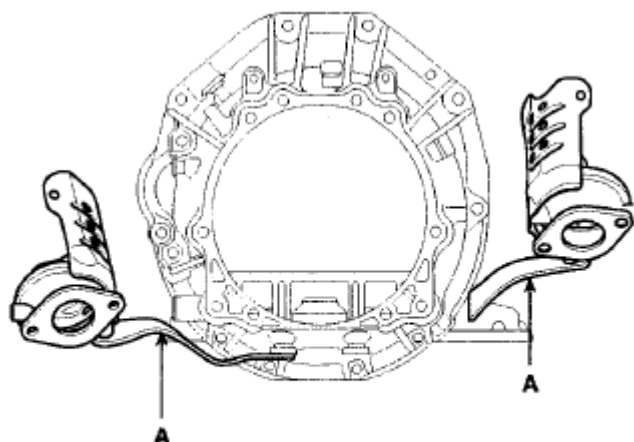
- Be sure to drain the engine coolant before removing the intake manifold.
- If any coolant drained from the cylinder head vent hole has entered the intake port. This can potentially lead to engine trouble.



SBHEM8148D

Fig. 6: Identifying Water Vent Hose (A) And Intake Manifold (B)
Courtesy of HYUNDAI MOTOR CO.

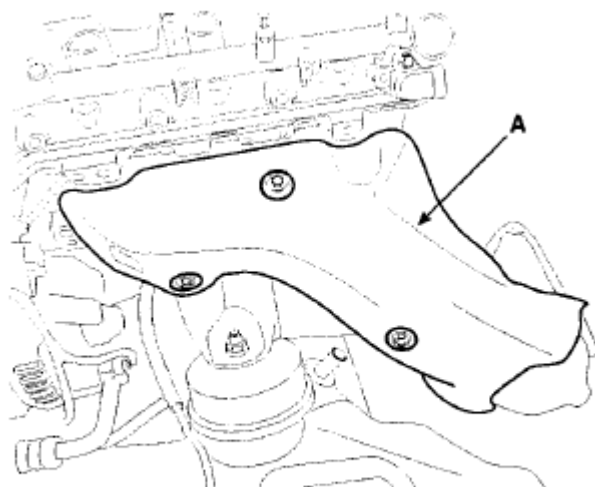
5. Remove the exhaust manifold stays (A).



SBHEM8204D

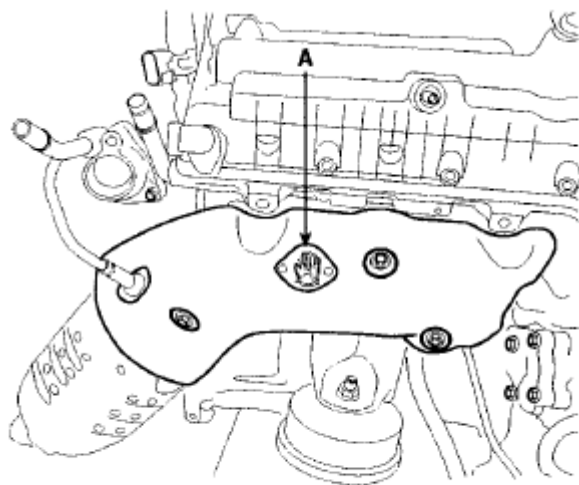
Fig. 7: Identifying Exhaust Manifold Stays (A)
Courtesy of HYUNDAI MOTOR CO.

6. Remove the LH/RH exhaust manifold heat protector (A).



SBHEM8046D

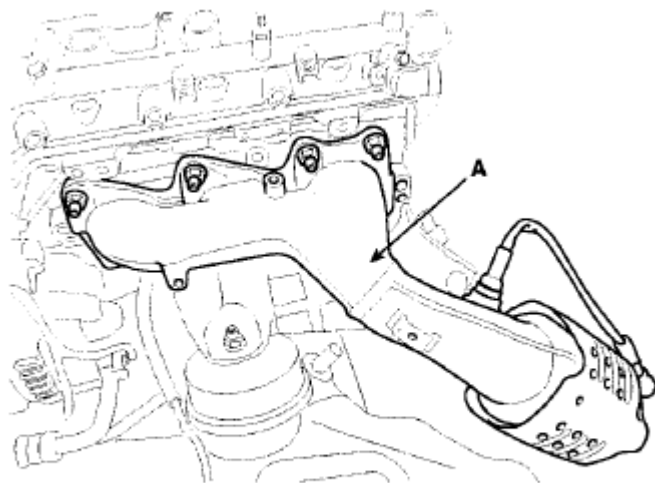
Fig. 8: Identifying LH Exhaust Manifold Heat Protector (A)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8047D

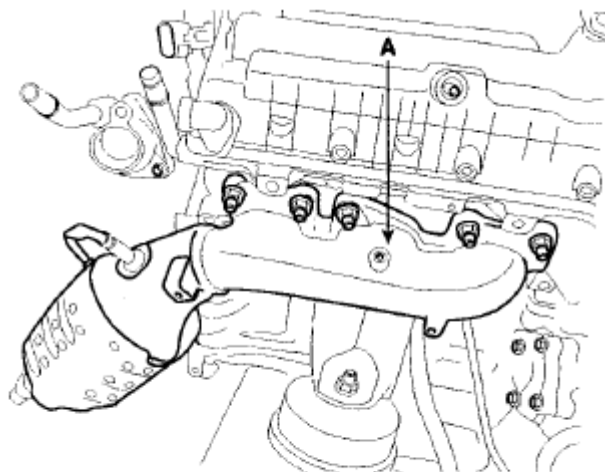
Fig. 9: Identifying RH Exhaust Manifold Heat Protector (A)
Courtesy of HYUNDAI MOTOR CO.

7. Remove the LH/RH exhaust manifold (A).



SBHEM8048D

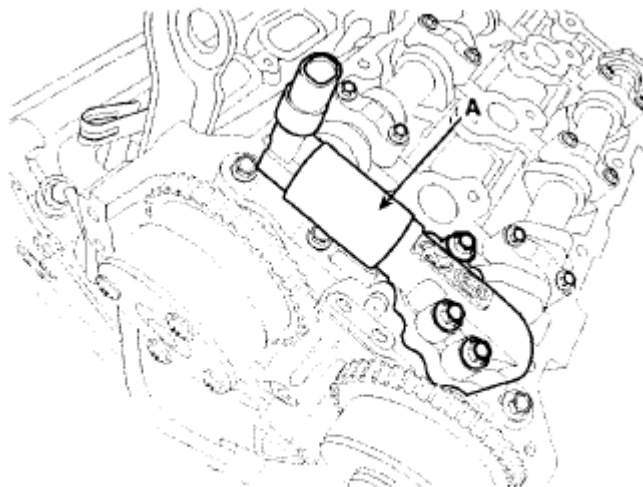
Fig. 10: Identifying LH Exhaust Manifold (A)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8049D

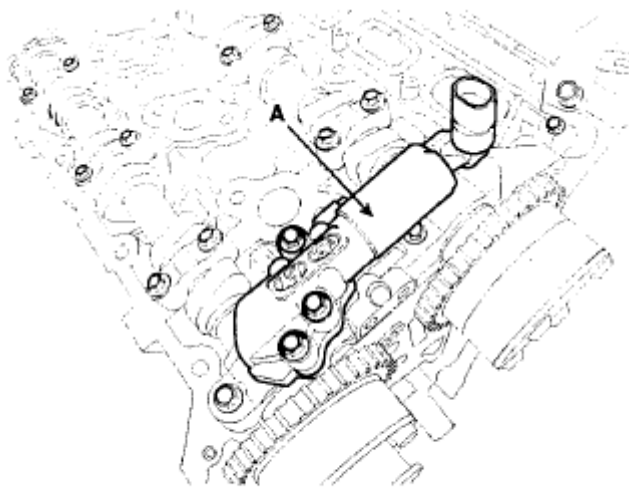
Fig. 11: Identifying RH Exhaust Manifold (A)
Courtesy of HYUNDAI MOTOR CO.

8. Remove the LH/RH exhaust camshaft OCV (A).



SBHEM8068D

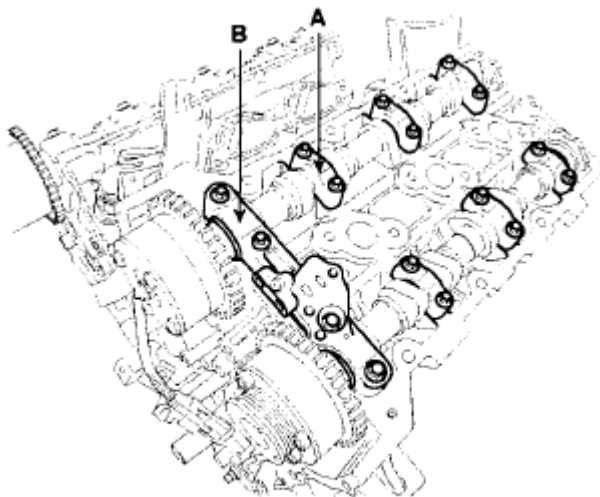
Fig. 12: Identifying LH Exhaust Camshaft OCV (A)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8069D

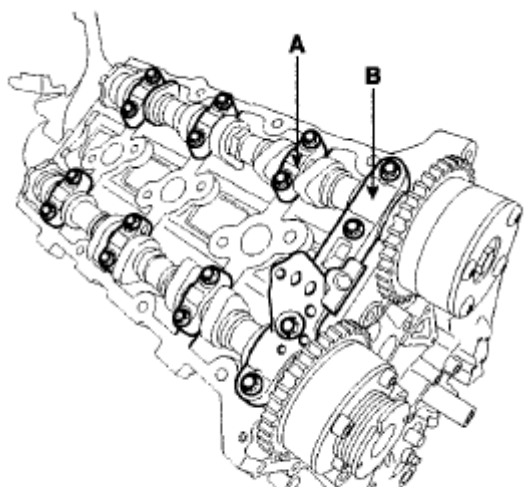
Fig. 13: Identifying RH Exhaust Camshaft OCV (A)
Courtesy of HYUNDAI MOTOR CO.

9. Remove the LH/RH camshaft bearing cap (A) and thrust bearing cap (B).



SBHEM8070D

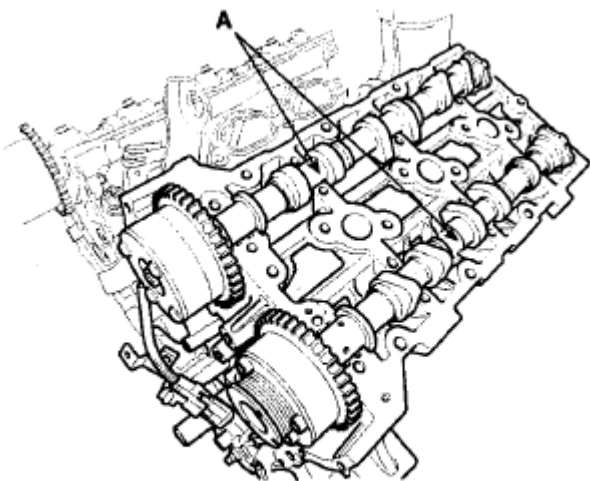
Fig. 14: Identifying LH Camshaft Bearing Cap (A) And Thrust Bearing Cap (B)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8071D

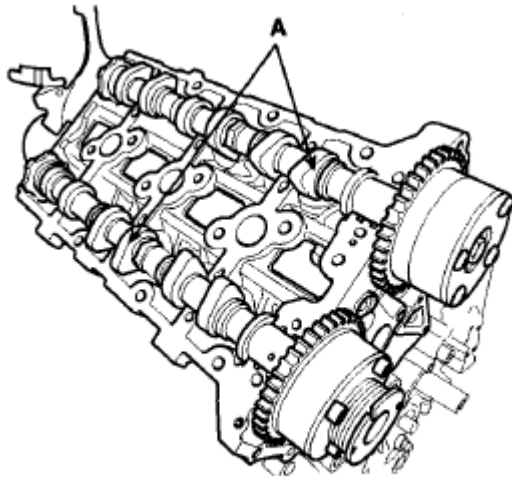
Fig. 15: Identifying RH Camshaft Bearing Cap (A) And Thrust Bearing Cap (B)
Courtesy of HYUNDAI MOTOR CO.

10. Remove the LH/RH camshaft assembly (A).



SBHEM8072D

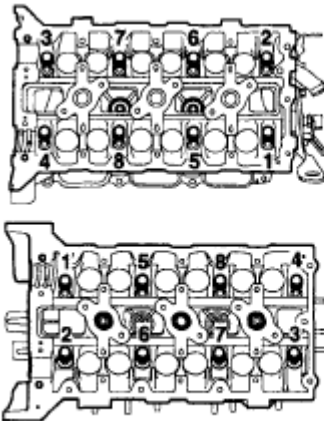
Fig. 16: Identifying LH Camshaft Assembly (A)
Courtesy of HYUNDAI MOTOR CO.



SBHEM8073D

Fig. 17: Identifying RH Camshaft Assembly (A)
Courtesy of HYUNDAI MOTOR CO.

11. Remove the cylinder head.
 1. Uniformly loosen and remove the cylinder head bolts, in several passes, in the sequence shown.



KDRF199A

Fig. 18: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of HYUNDAI MOTOR CO.

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.

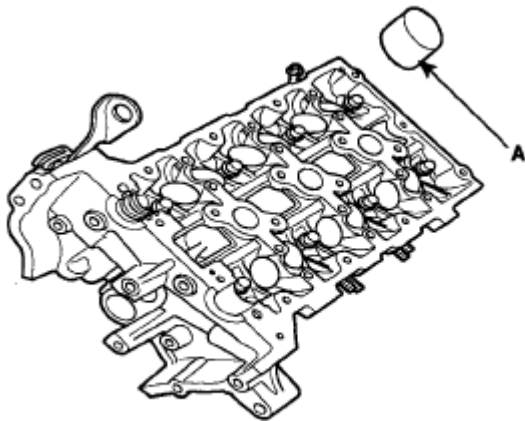
CAUTION: Be careful not to damage the contact surfaces of the cylinder

head and cylinder block.

DISASSEMBLY

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

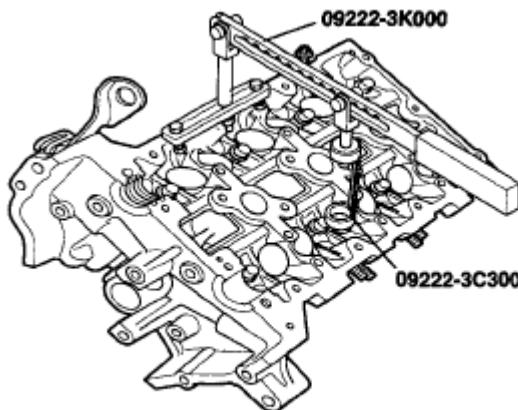
1. Remove the MLAs (A).



KDRF200A

Fig. 19: Identifying MLAs (A)
Courtesy of HYUNDAI MOTOR CO.

2. Remove the valves.
 1. Using the SST (09222-3K000, 09222-3C300), compress the valve spring and remove retainer lock.

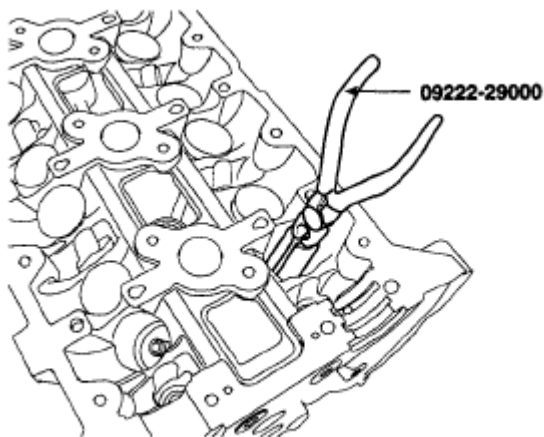


KDRF201A

Fig. 20: Compressing Valve Spring
Courtesy of HYUNDAI MOTOR CO.

2. Remove the spring retainer.

3. Remove the valve spring.
4. Remove the valve.
5. Using the SST (09222-29000), remove the valve stem seal.

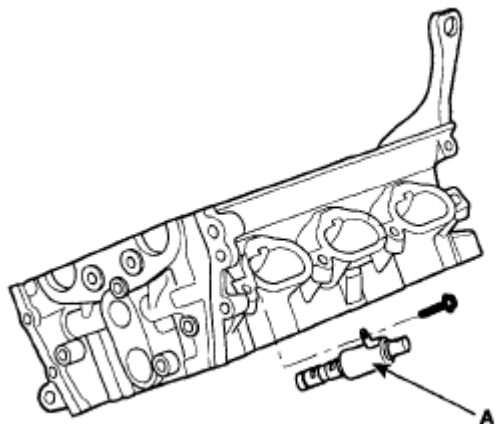


KDRF234A

Fig. 21: Removing Valve Stem Seal
Courtesy of HYUNDAI MOTOR CO.

NOTE: Do not reuse old valve stem seals.

3. Remove the OCV (A).



KDRF202A

Fig. 22: Identifying OCV (A)
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

Cylinder Head

1. Inspect for flatness.

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

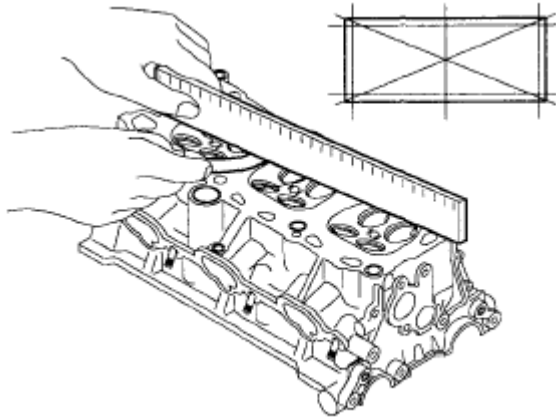
Flatness of cylinder head gasket surface

Standard: Less than 0.05mm (0.002in.)

[Less than 0.02mm (0.0008in.)/150x150]

Flatness of manifold gasket surface

Standard: Less than 0.03mm (0.001in)/110x110



EDQF160A

Fig. 23: Measuring Surface Contacting Cylinder Block And Manifolds For Warpage
Courtesy of HYUNDAI MOTOR CO.

2. Inspect for cracks.

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

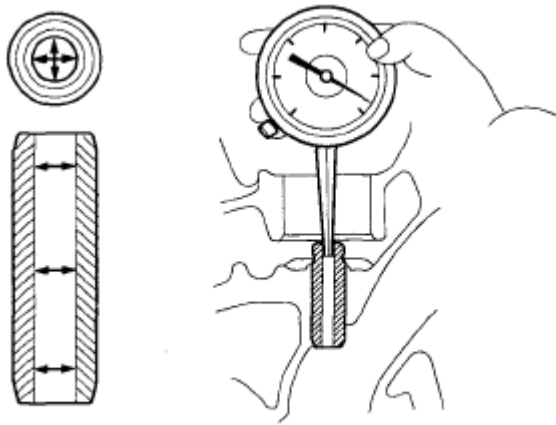
Valve And Valve Spring

1. Inspect valve stems and valve guides.

1. Using a caliper gauge, measure the inside diameter of the valve guide.

Valve guide I.D.

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



ECBF034A

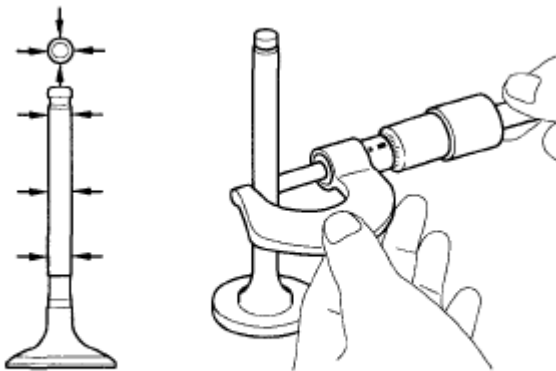
Fig. 24: Measuring Inside Diameter Of Valve Guide
Courtesy of HYUNDAI MOTOR CO.

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

Valve stem O.D.

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

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



KCRF227A

Fig. 25: Measuring Diameter Of Valve Stem
Courtesy of HYUNDAI MOTOR CO.

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

Valve stem-to-guide clearance

[Standard]

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

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

[Limit]

Intake: 0.07mm (0.0027in.)

Exhaust: 0.09mm (0.0035in.)

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.

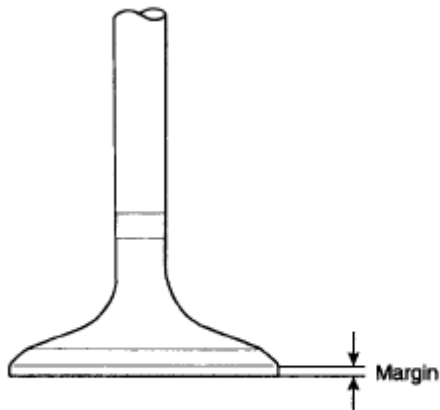
If the margin thickness is less than minimum, replace the valve.

Margin

[Standard]

Intake : 1.56 ~ 1.86mm (0.06142 ~ 0.07323in.)

Exhaust: 1.73 ~ 2.03mm (0.06811 ~ 0.07992in.)



ECK0221A

Fig. 26: Checking Valve Head Margin Thickness
Courtesy of HYUNDAI MOTOR CO.

4. Check the valve length.

Length

Intake: 105.27mm (4.1445in)

Exhaust: 105.50mm (4.1535in)

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

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

3. Inspect valve seats

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

If the valve seat is worn, replace cylinder head.

Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace cylinder head. 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.

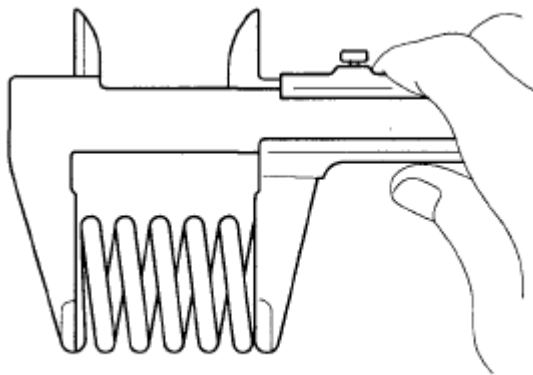
1. Using a steel square, measure the out-of-square of the valve spring.
2. Using vernier calipers, measure the free length of the valve spring.

Valve spring

[Standard]

Free height: 43.86mm (1.7267in.)

Out-of-square: 1.5°



KCRF205A

Fig. 27: Measuring Free Length Of Valve Spring
Courtesy of HYUNDAI MOTOR CO.

MLA

1. Inspect MLAs.

Using a micrometer, measure the MLA outside diameter.

MLA O.D.

Intake/Exhaust:

34.964 ~ 34.980mm (1.3765 ~ 1.3771 in.)

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

Intake/Exhaust:

35.000 ~ 35.025mm (1.3779 ~ 1.3789in.)

3. Subtract MLA outside diameter measurement from tappet bore inside diameter measurement.**MLA to tappet bore clearance**

[Standard]

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

[Limit]

Intake/Exhaust: 0.07mm (0.0027in.)

Camshaft**1. Inspect cam lobes.**

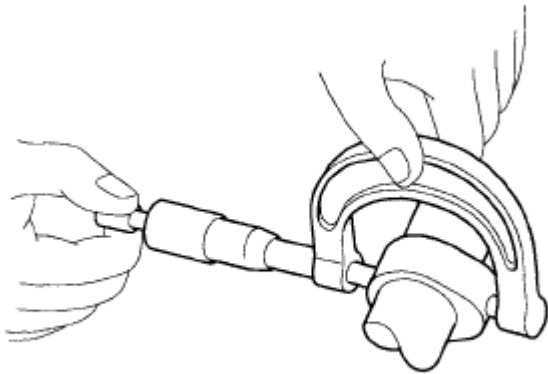
Using a micrometer, measure the cam lobe height.

Cam height

[Standard value]

Intake: 46.8mm (1.8425in.)

Exhaust: 45.8mm (1.8031 in.)

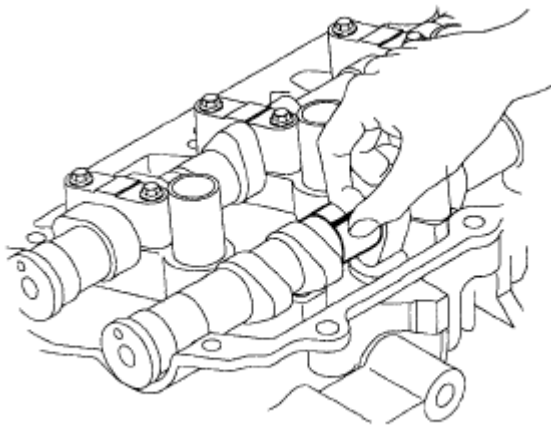


KCRF206A

Fig. 28: Measuring Cam Lobe Height
Courtesy of HYUNDAI MOTOR CO.

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

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



KCRF207A

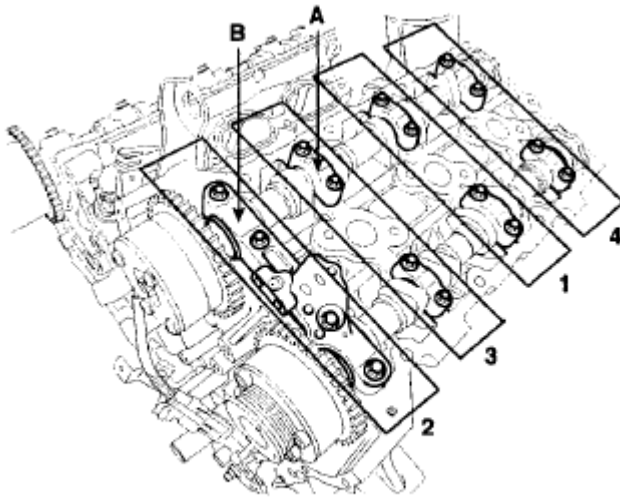
Fig. 29: Laying Strip Of Plastigage Across Each Of Camshaft Journals
Courtesy of HYUNDAI MOTOR CO.

4. Install the bearing cap (A) and thrust bearing cap (B) with specified torque.

Tightening torque :

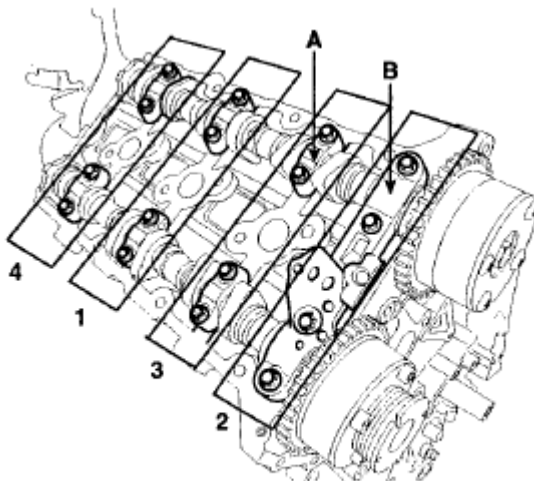
1st step: 5.8 N.m (0.6kgf.m, 4.3lb-ft)

2nd step: 9.8 ~ 11.8 N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



SBHEM8133D

Fig. 30: Identifying Bearing Cap (A) And Thrust Bearing Cap (B) Tightening Sequence (1 Of 2)
 Courtesy of HYUNDAI MOTOR CO.



SBHEM8134D

Fig. 31: Identifying Bearing Cap (A) And Thrust Bearing Cap (B) Tightening Sequence (2 Of 2)
 Courtesy of HYUNDAI MOTOR CO.

CAUTION: Do not turn the camshaft.

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

Bearing oil clearance

[Standard value]

Intake

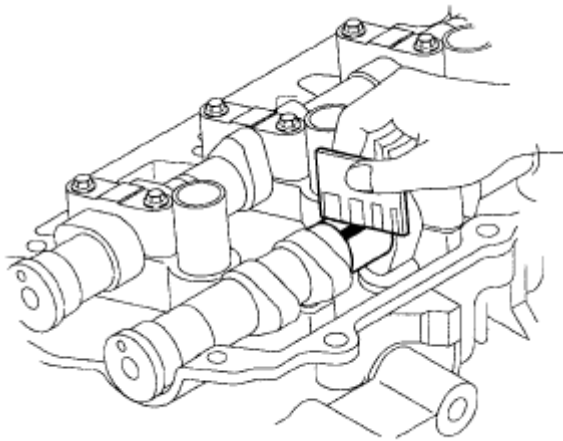
No. 1 journal: 0.020 ~ 0.057mm (0.0008 ~ 0.0022in.)

No. 2, 3, 4 journal: 0.030 ~ 0.067mm (0.0012 ~ 0.0026in.)

Exhaust

No. 1 journal : 0.027 ~ 0.057mm (0.0010 ~ 0.0022in.)

No. 2, 3, 4 journal : 0.030 ~ 0.067mm (0.0012 ~ 0.0026in.)



KCRF208A

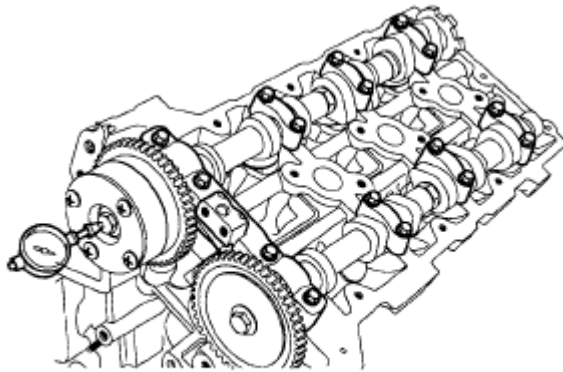
Fig. 32: Measuring Plastigage At Its Widest Point
Courtesy of HYUNDAI MOTOR CO.

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

7. Completely remove the plastigage.
8. Remove the camshafts.
3. Inspect the 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]: 0.02 ~ 0.18mm (0.0008 ~ 0.0071in.)



KDRF196B

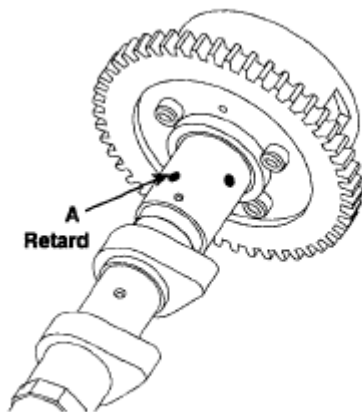
Fig. 33: Measuring End Play While Moving Camshaft Back And Forth
 Courtesy of HYUNDAI MOTOR CO.

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

3. Remove the camshafts.

CVVT Assembly

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



ECRF015A

Fig. 34: Applying Vinyl Tape To Retard Hole
 Courtesy of HYUNDAI MOTOR CO.

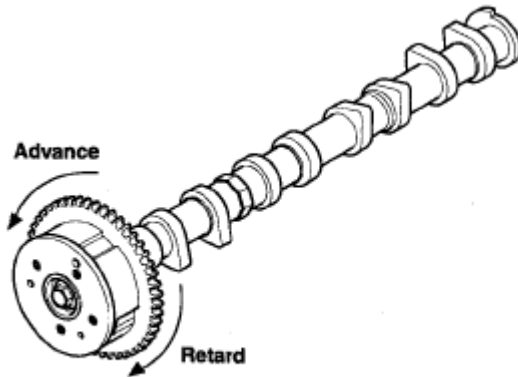
3. Wrap tape around the tip of the air gun and apply air of approx. 150kpa (1.5kgf/cm² , 21 psi) to the port of the camshaft.

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

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

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.



SGHEM7010N

Fig. 35: Identifying CVVT Assembly Advance And Retard
Courtesy of HYUNDAI MOTOR CO.

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 interference.

Standard: Movable smoothly in the range about 30°

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

REASSEMBLY

NOTE: Thoroughly clean all parts to be assembled.

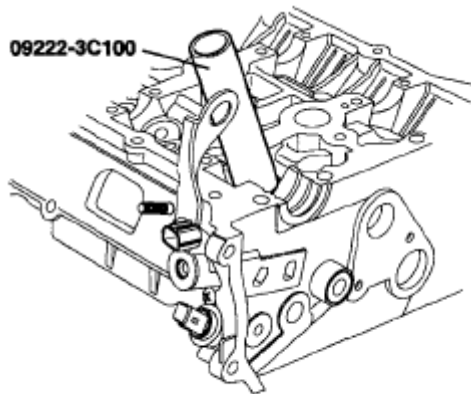
Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.

Replace oil seals with new ones.

1. Install the valves.
 1. Using the SST (09222-3C100), 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.



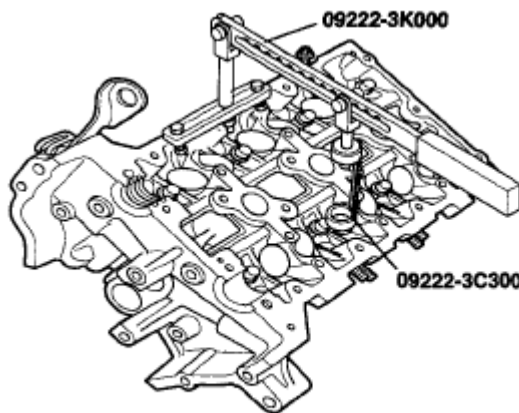
KCRF120B

Fig. 36: Pushing In Oil Seal
Courtesy of HYUNDAI MOTOR CO.

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

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

3. Using the SST (09222 - 3K000, 09222-3C300), 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.



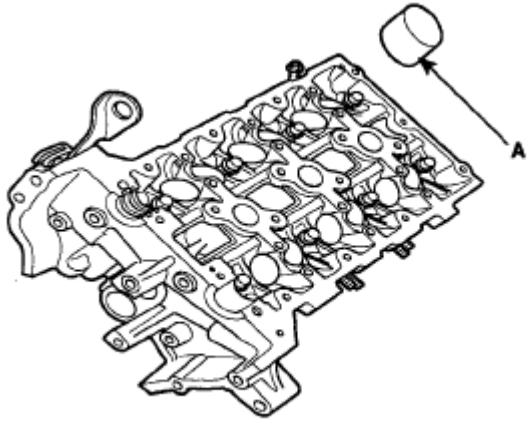
KDRF201A

Fig. 37: Compressing Spring
Courtesy of HYUNDAI MOTOR CO.

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

2. Install the MLAs.

Check that the MLA rotates smoothly by hand.



KDRF200A

Fig. 38: Identifying MLA

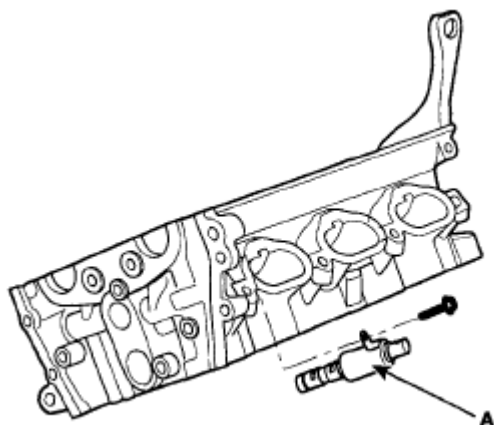
Courtesy of HYUNDAI MOTOR CO.

NOTE: MLA can be reinstalled in its original position.

3. Install the OCV (A).

Tightening torque

9.80 ~ 11.76Nm (1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)



KDRF202A

Fig. 39: Identifying OCV (A)

Courtesy of HYUNDAI MOTOR CO.

NOTE:

- Install OCV with gray colored connector into LH bank.
- Install OCV with black colored connector into RH bank.

CAUTION:

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

INSTALLATION

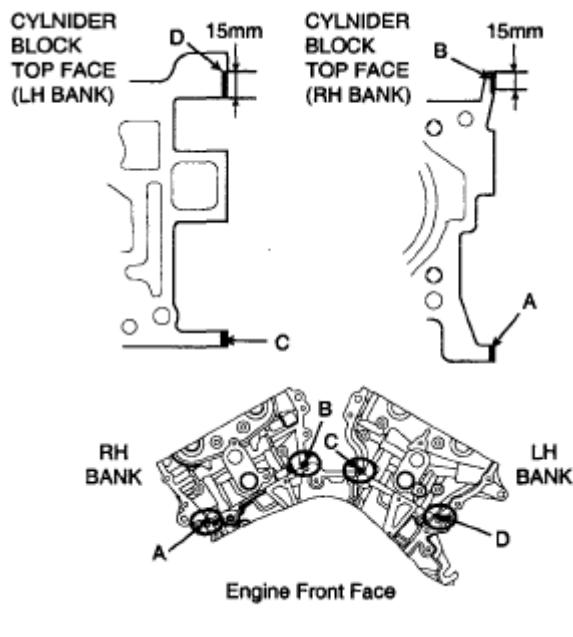
NOTE:

- 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.

- The sealant locations on cylinder head and cylinder block must be free of engine oil and ETC.
- Apply sealant on cylinder block top face before assembling cylinder head gaskets.

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



ECBF017A

Fig. 40: Identifying Sealant Locations On Cylinder Head And Cylinder Block
Courtesy of HYUNDAI MOTOR CO.

NOTE: Refer to below illustration to apply the sealant.

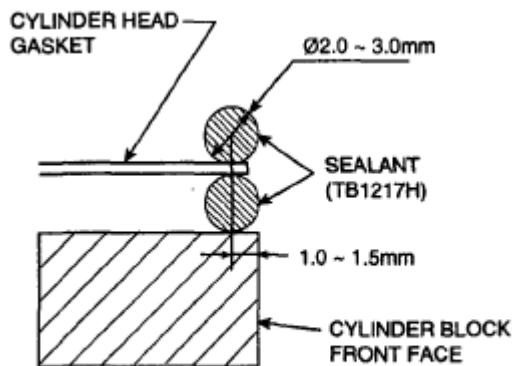
Bead width :

2.0 ~ 3.0 mm (0.078 ~ 0.118 in.)

Sealant locations :

1.0 ~ 1.5mm (0.039 ~ 0.059 in.) from block surface

Recommended sealant: Liquid sealant TB1217H



ECBF018A

Fig. 41: Applying Sealant On Cylinder Block Top Face Before Assembling Cylinder Head Gaskets

Courtesy of HYUNDAI MOTOR CO.

- c. Apply sealant on cylinder head gaskets after assembling cylinder head gaskets on cylinder block.

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

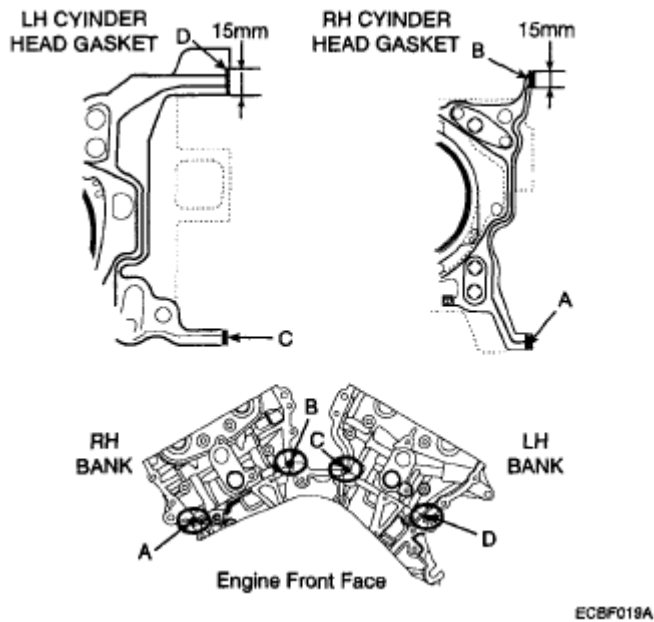


Fig. 42: Applying Sealant On Cylinder Head Gaskets After Assembling Cylinder Head Gaskets On Cylinder Block
 Courtesy of HYUNDAI MOTOR CO.

NOTE: Be careful of the installation direction.

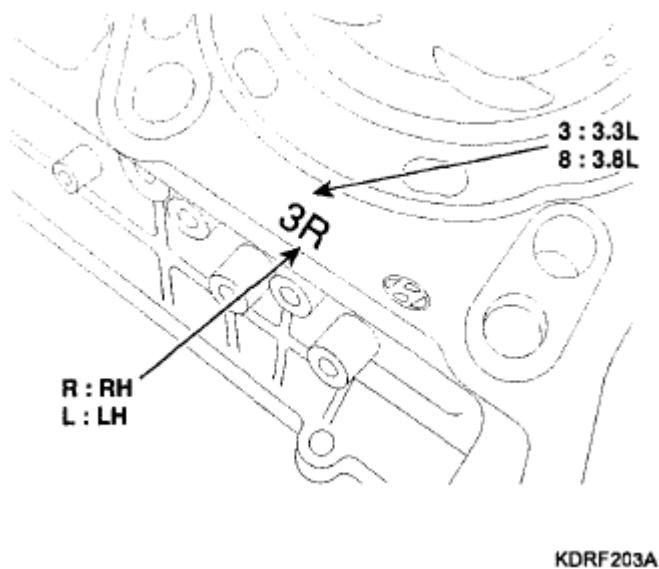
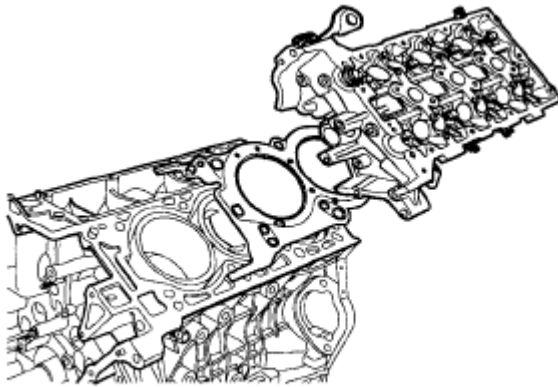


Fig. 43: Identifying Installation Direction
 Courtesy of HYUNDAI MOTOR CO.

d. Install the cylinder head.

NOTE: Remove the extruded sealant after assembling cylinder heads.



KDRF198A

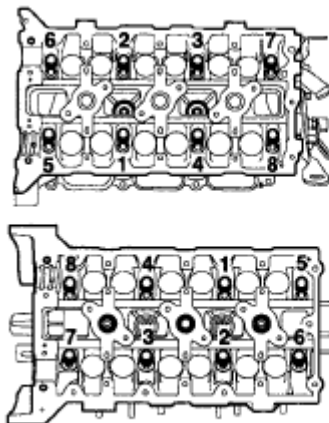
Fig. 44: Identifying Cylinder Head
Courtesy of HYUNDAI MOTOR CO.

2. Install cylinder head bolts.
 1. Do not apply engine oil on the threads and under the heads of the cylinder head bolts.
 2. Using SST (09221-4A000), install and tighten the cylinder head bolts and plate washers, in several passes, in the sequence shown.

Tightening torque

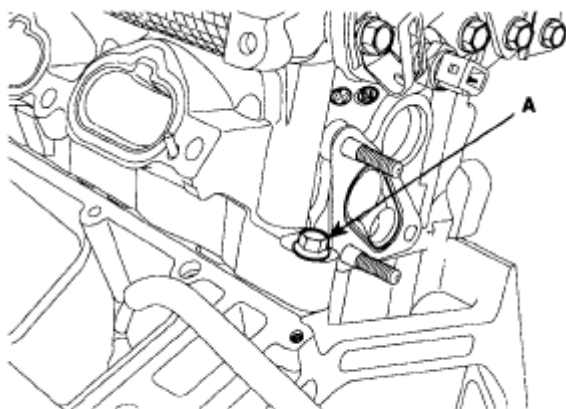
Head bolt: 37.3~41.2Nm (3.8~4.2kgf.m, 27.5~30.4lb-ft) + 118~122° + 88~92°

Bolt (A): 18.6 ~ 23.5Nm (1.9 ~ 2.4kgf.m, 13.7 ~ 17.4lb-ft)



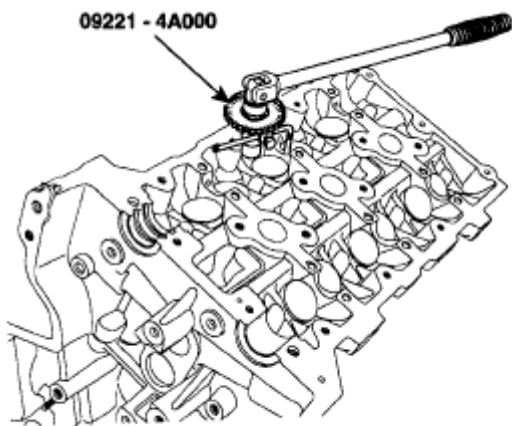
KDRF199B

Fig. 45: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.



ECBF035A

Fig. 46: Identifying Cylinder Head Bolt
Courtesy of HYUNDAI MOTOR CO.



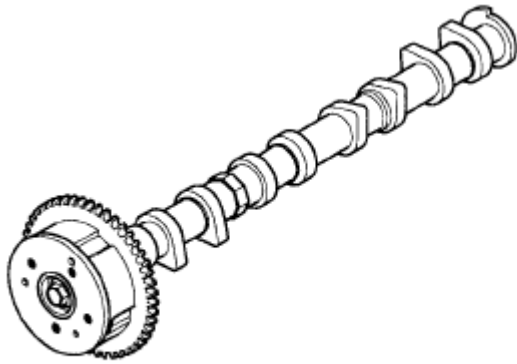
KDRF223A

Fig. 47: Tightening Cylinder Head Bolts To Specified Torque
Courtesy of HYUNDAI MOTOR CO.

3. Install the CVVT assembly.

Tightening torque:

64.7 ~ 76.5 N.m (6.6 ~ 7.8kgf.m, 47.7 ~ 56.4lb-ft)



KCRF122A

Fig. 48: Identifying CVVT Assembly
Courtesy of HYUNDAI MOTOR CO.

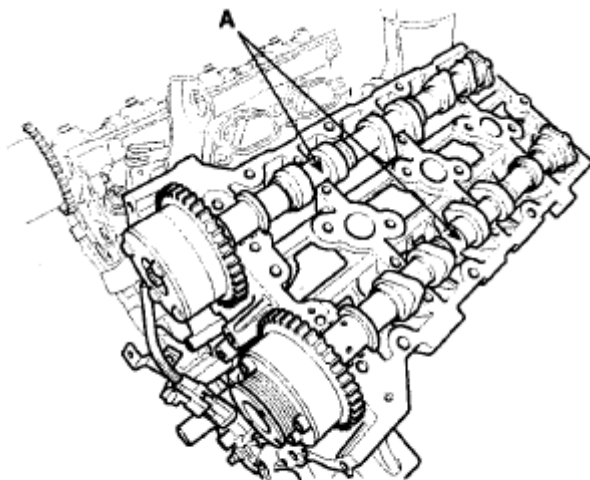
CAUTION:

- Install camshaft-inlet to dowel pin of CVVT assembly.

At this time, attend not to be installed to oil hole of camshaft-inlet.

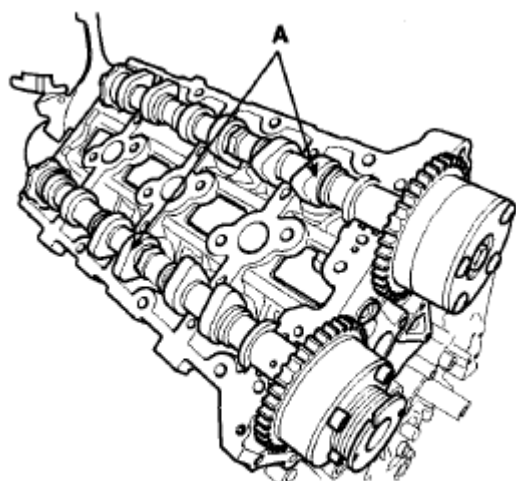
- Hold the hexagonal head wrench portion of the camshaft with a vise, and install the bolt and CVVT assembly.
- Do not rotate CVVT assembly when camshaft is installed to dowel pin of CVVT assembly.

4. Install the LH/RH camshaft assembly (A).



SBHEM8072D

Fig. 49: Identifying LH Camshaft Assembly (A)
Courtesy of HYUNDAI MOTOR CO.



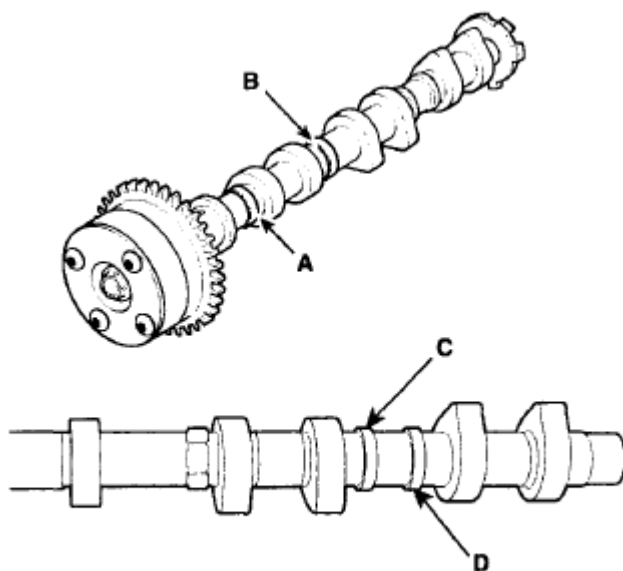
SBHEM8073D

Fig. 50: Identifying RH Camshaft Assembly (A)
 Courtesy of HYUNDAI MOTOR CO.

CAUTION:

- Apply a light coat of engine oil on camshaft journals.
- Assemble the key groove of camshaft rear side to the same level of head top surface.
- Be careful the right, left bank, intake, exhaust side before assembling.

Intake Camshaft



SENEM8006D

Fig. 51: Identifying Intake Camshaft
Courtesy of HYUNDAI MOTOR CO.

As for camshaft identification, refer to the table below.

INTAKE CAMSHAFT REFERENCE CHART

Displacement	Outer diameter	
	LH	RH
BH 3.3L Intake camshaft	A: 27mm (1.0630in.)	A: 27mm (1.0630in.)
	B: 30mm (1.1811in.)	B: 30mm (1.1811in.)
	C: 27mm (1.0630in.)	C: 30mm (1.1811in.)
	D: 27mm (1.0630in.)	D: 30mm (1.1811in.)
BH 3.8L Intake camshaft	A: 27mm (1.0630in.)	A: 27mm (1.0630in.)
	B: 30mm (1.1811in.)	B: 30mm (1.1811in.)
	C: 30mm (1.1811in.)	C: 27mm (1.0630in.)
	D: 27mm (1.0630in.)	D: 30mm (1.1811in.)

Exhaust Camshaft

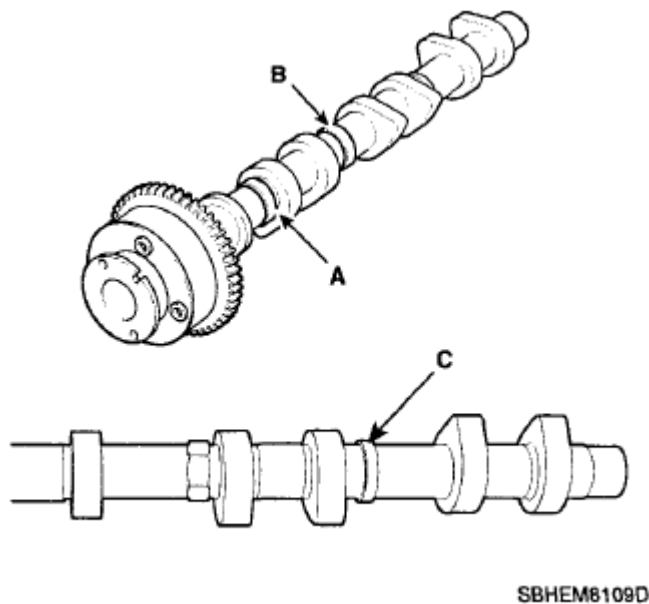


Fig. 52: Identifying Exhaust Camshaft
Courtesy of HYUNDAI MOTOR CO.

As for camshaft identification, refer to the table below.

EXHAUST CAMSHAFT REFERENCE CHART

Displacement	Outer diameter	
	LH	RH

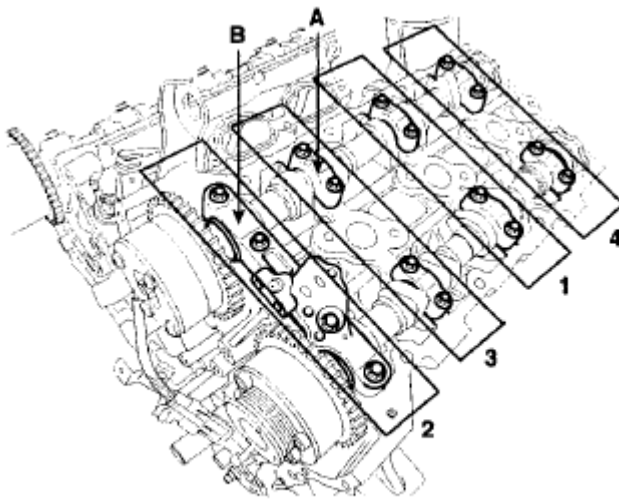
BH 3.3L/3.8L Exhaust camshaft	A: 27mm (1.0630in.)	A: 27mm (1.0630in.)
	B: 30mm (1.1811in.)	B: 30mm (1.1811 in.)
	C: 27mm (1.0630in.)	C: 30mm (1.1811in.)

5. Install the LH/RH camshaft bearing cap (A) and thrust bearing cap (B).

Tightening torque

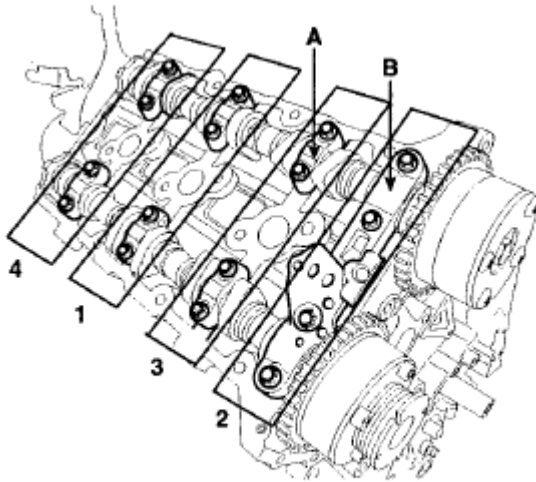
1st step : 5.8 N.m (0.6kgf.m, 4.3lb-ft)

2nd step : 9.8 ~ 11.8 N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



SBHEM8133D

Fig. 53: Identifying Bearing Cap (A) And Thrust Bearing Cap (B) Tightening Sequence (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

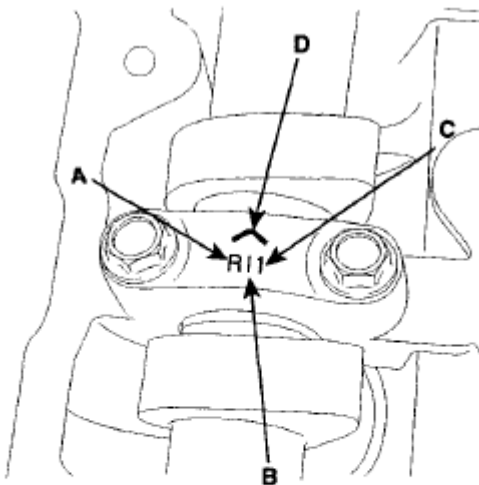


SBHEM8134D

Fig. 54: Identifying Bearing Cap (A) And Thrust Bearing Cap (B) Tightening Sequence (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

CAUTION: Be sure to install the thrust bearing cap bolts and the bearing cap bolts in the correct place.

NOTE: Be careful the right, left bank, intake, exhaust side before assembling.



ECBF036A

A : L(LH),R(RH)

B : I(Intake), None(Exhaust)

C : Journal number

D : Front mark

Fig. 55: Identifying Thrust Bearing Cap Number

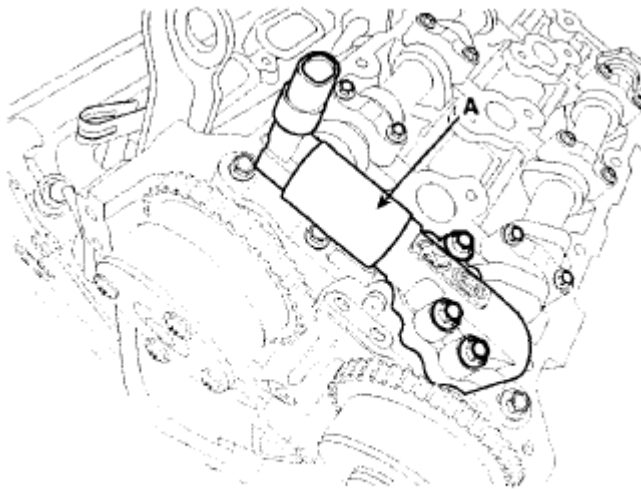
Courtesy of HYUNDAI MOTOR CO.

CAUTION: Rotate the crankshaft not to contact the valves to the pistons by making the pistons below 10mm (0.3937in.) from the top of cylinder block.

6. Install the LH/RH exhaust camshaft OCV (A).

Tightening torque :

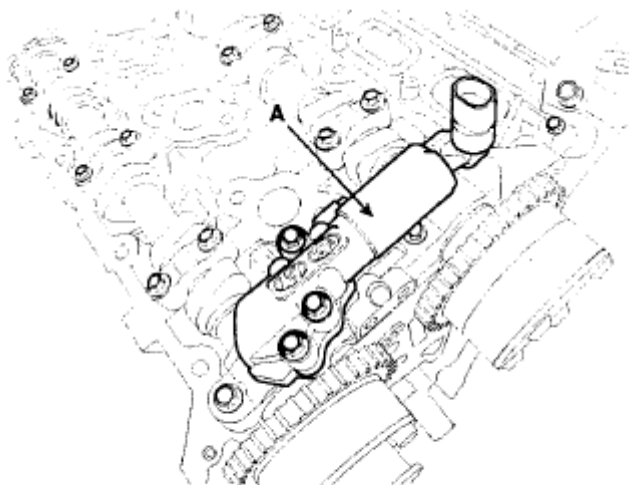
9.8 ~ 11.8 N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



SBHEM8068D

Fig. 56: Identifying LH Exhaust Camshaft OCV (A)

Courtesy of HYUNDAI MOTOR CO.



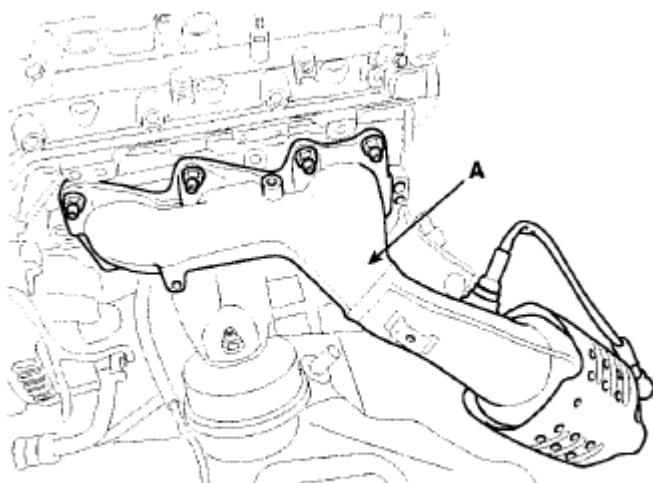
SBHEM8069D

Fig. 57: Identifying RH Exhaust Camshaft OCV (A)
Courtesy of HYUNDAI MOTOR CO.

7. Install the LH/RH exhaust manifold (A) with a new gasket.

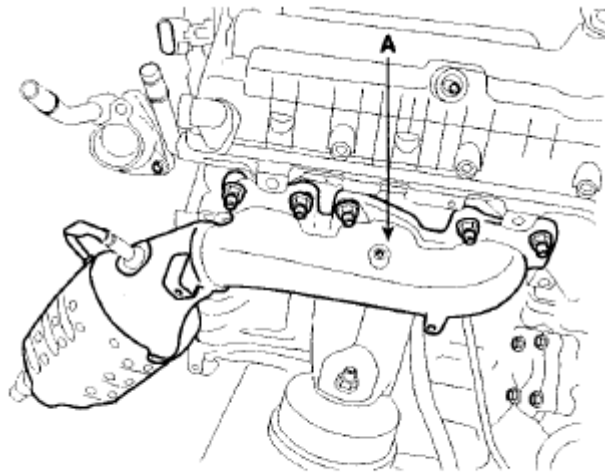
Tightening torque :

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



SBHEM8048D

Fig. 58: Identifying LH Exhaust Manifold (A)
Courtesy of HYUNDAI MOTOR CO.



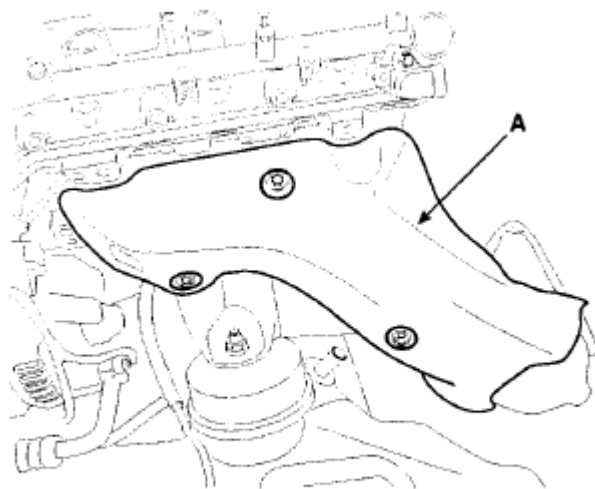
SBHEM8049D

Fig. 59: Identifying RH Exhaust Manifold (A)
Courtesy of HYUNDAI MOTOR CO.

8. Install the LH/RH exhaust manifold heat protector (A).

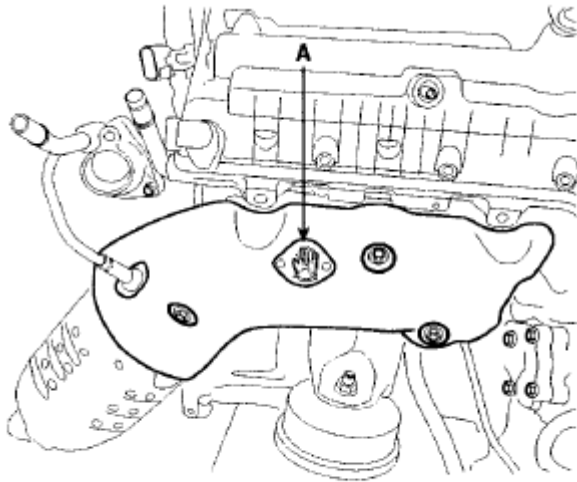
Tightening torque :

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



SBHEM8046D

Fig. 60: Identifying LH Exhaust Manifold Heat Protector (A)
Courtesy of HYUNDAI MOTOR CO.



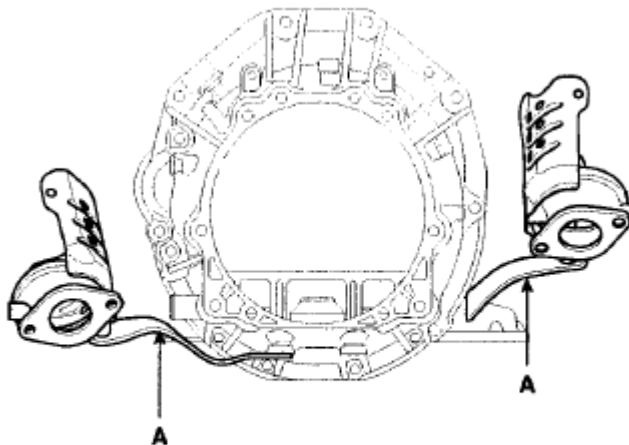
SBHEM8047D

Fig. 61: Identifying RH Exhaust Manifold Heat Protector (A)
 Courtesy of HYUNDAI MOTOR CO.

9. Install the exhaust manifold stays (A).

Tightening torque :

34.3 ~ 41.2 N.m (3.5 ~ 4.2kgf.m, 25.3 ~ 30.4lb-ft)



SBHEM8204D

Fig. 62: Identifying Exhaust Manifold Stays (A)
 Courtesy of HYUNDAI MOTOR CO.

10. Install the intake the manifold (B) with a new gasket, and connect the water vent hose (A).

CAUTION:

- Be sure to drain the engine coolant before removing the intake manifold.
- If any coolant drained from the cylinder head vent hole has entered the intake port. This can potentially lead to engine trouble.

Tightening torque

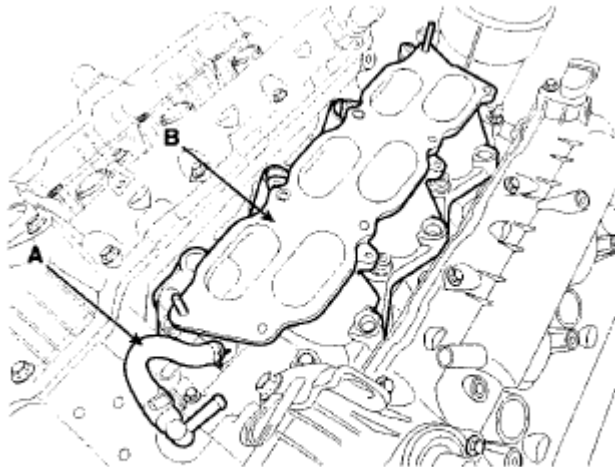
Step 1: 3.9 ~ 5.9 N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lb-ft)

Step 2:

Nut-18.62 ~ 23.52 N.m (1.9 ~ 2.4kgf.m, 13.74 ~ 17.36lb-ft)

Bolt-26.5 ~ 31.4 N.m (2.7 ~ 3.2 kgf.m, 19.5 ~ 23.1lb-ft)

Step 3: Repeat 2nd step twice or more.



SBHEM8148D

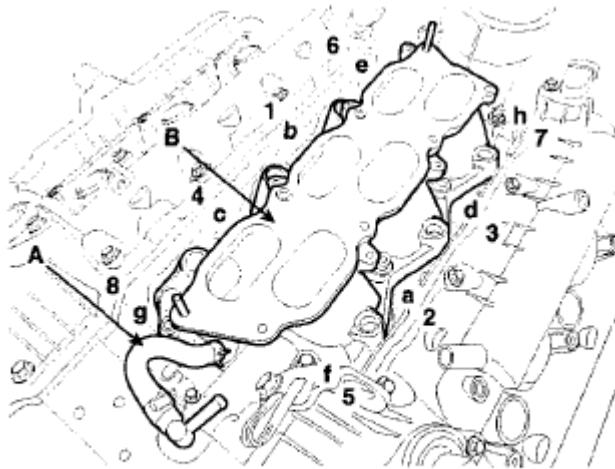
Fig. 63: Identifying Intake Manifold (B) And Water Vent Hose (A)
 Courtesy of HYUNDAI MOTOR CO.

a - h : 1st step order

1 ~ 8 : 2nd step order

NOTE:

Confirm the manifold gasket identification mark (LH, RH) and be careful of the installation direction.



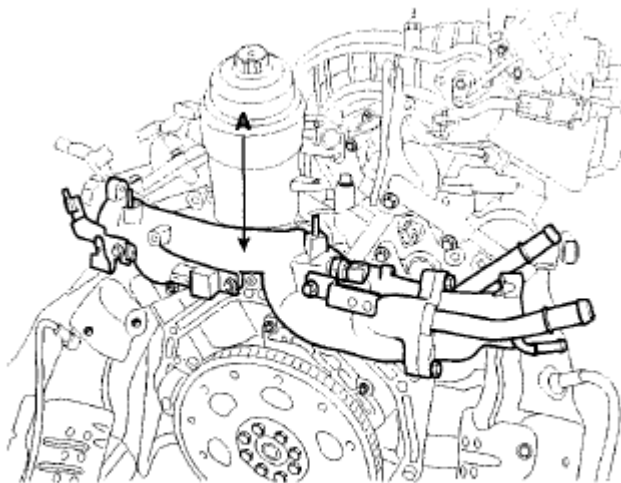
SBHEM8045D

Fig. 64: Identifying Intake Manifold Bolts Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.

11. Install the water temperature control assembly (A) with a new gasket.

Tightening torque:

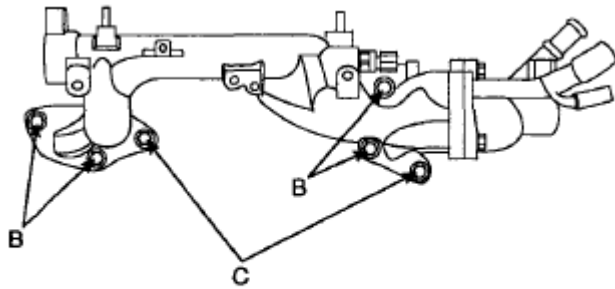
19.6 ~ 23.5Nm (2.0 ~ 2.4kgf.m, 14.5 ~ 17.4lb-ft)



SBHEM8041D

Fig. 65: Identifying Water Temperature Control Assembly (A)
Courtesy of HYUNDAI MOTOR CO.

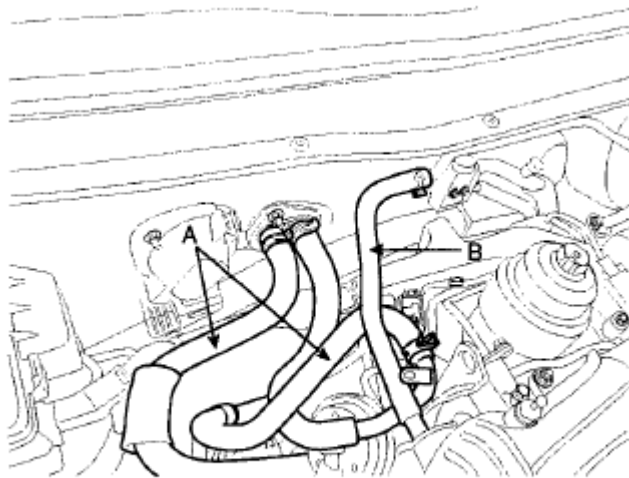
CAUTION: When tightening the bolt (C), use a ground bolt.



SBHEM8042D

Fig. 66: Identifying Mounting Bolts (B, C)
 Courtesy of HYUNDAI MOTOR CO.

12. Connect the heater hoses (A) and brake vacuum hose (B).



SBHEM8006D

Fig. 67: Identifying Heater Hoses (A) And Brake Vacuum Hose (B)
 Courtesy of HYUNDAI MOTOR CO.

13. Install the timing chain. (Refer to **TIMING SYSTEM (ENGINE (G6DB/G6DA - GSL 3.3/3.8))**)

NOTE:

- Refill engine oil.
- Clean the battery posts and cable terminals with sandpaper. Assemble and 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 lines.
- Refill radiator and reservoir tank with engine coolant.
- Bleed air from the cooling system.
 - Start engine and let it run until it warms up. (Until the radiator fan operates 3 or 4 times.)
 - Turn Off the engine. Check the level in the radiator, add coolant if needed. This will allow trapped air to be removed from the cooling system.
 - Put radiator cap on tightly, then run the engine again and check for leaks.