2010 ENGINE

General Information - Engine Mechanical - G3.5 DOHC - Santa Fe

SPECIFICATIONS

ENGINE MECHANICAL SYSTEM SPECIFICATIONS

Description			Specifications	Limit
General				
Type			V-type, DOHC	
Number of cylinders			6	
Bore			92mm (3.6220in.)	
Stroke			87.0mm (3.4252in.)	
Total displacement			3,470cc (211.75cu.in.)	
Compression ratio			10.6	
Firing order			1-2-3-4-5-6	
Valve timing				
Intake	Opens (ATDC)		10°	
	Closes (ABDC)		74°	
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	47.2mm (1.8582in.)	
		Exhaust	45.8mm (1.8031in.)	
	RH Camshaft	Intake	47.2mm (1.8582in.)	
		Exhaust	45.8mm (1.8031in.)	
Journal outer diameter	LH, RHcamshaft	Intake	No. 1: 27.964 ~ 27.978mm (1.1009 ~ 1.1015in.) No. 2,3,4: 23.954 ~ 23.970mm (0.9430 ~ 0.9437in.)	
			No. 1: 27.964 ~ 27.978mm	

		(88~92°)		(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
Oil jet bolt	3	27.5 ~ 31.3	2.8 ~ 3.2	20.2 ~ 23.1
Rear oil seal case bolt	6	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Baffle plate bolt	6	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	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	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	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil cover bolt	4	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
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	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Water temp. control bolt	2	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Water inlet pipe bolt	3	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
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)	3	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
Surge tank stay bolt (M10 x 20)	2	27.5 ~ 31.4	2.8 ~ 3.2	20.3 ~ 23.1
Exhaust manifold nut	16	39.2 ~ 44.1	4.0 ~ 4.5	28.9 ~ 32.6
Exhaust manifold stay bolt	4	24.5 ~ 35.3	2.5 ~ 3.6	18.1 ~ 26.0
Heat protector bolt	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Front muffler bolt	2	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8

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** .)

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. (Refer to **INTAKE AND EXHAUST SYSTEM** .)
5. Remove the cylinder head cover. (Refer to **TIMING SYSTEM** .)
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.

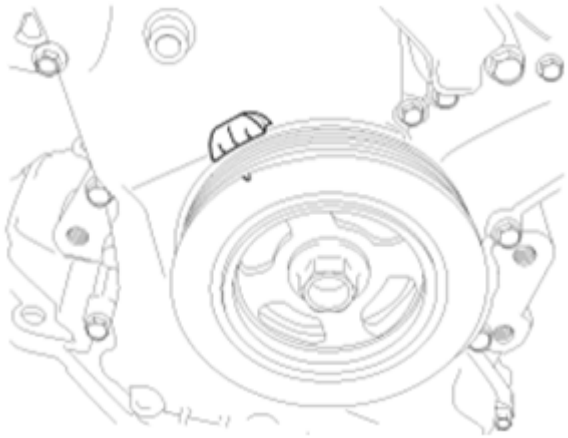

Fig. 3: Identifying Crankshaft Pulley Grove
Courtesy of HYUNDAI MOTOR CO.

    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°).

and camshaft sprocket timing marks (A).

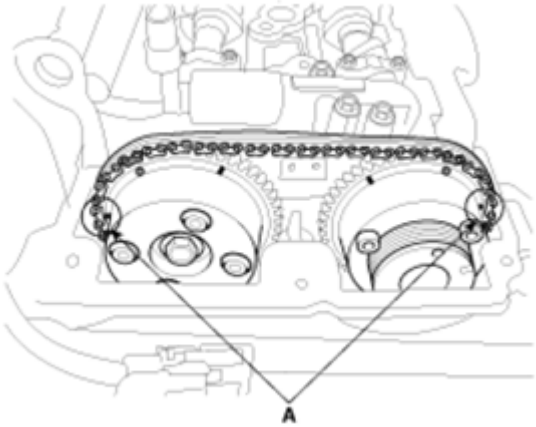

Fig. 19: Identifying Crankshaft Sprocket And Camshaft Sprocket Timing Marks
Courtesy of HYUNDAI MOTOR CO.

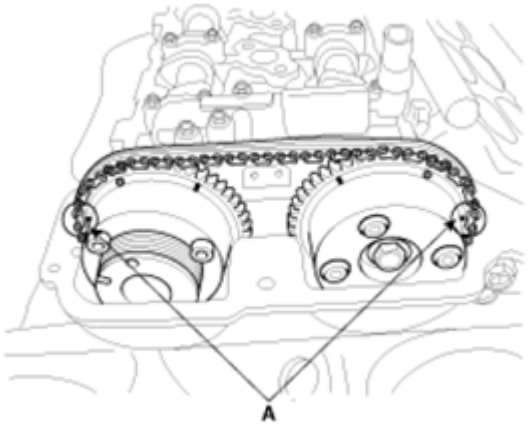

Fig. 20: Identifying Crankshaft Sprocket And Camshaft Sprocket Timing Marks
Courtesy of HYUNDAI MOTOR CO.

15. 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

ENGINE MECHANICAL SYSTEM TROUBLESHOOTING

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.)

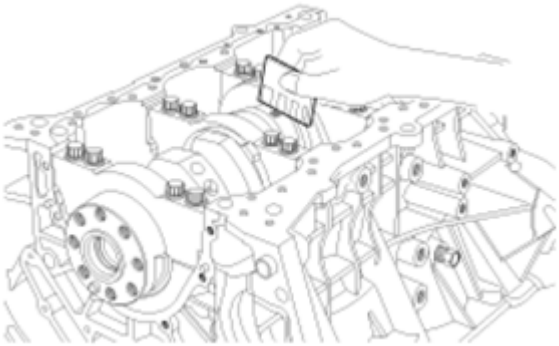

Fig. 14: Measuring Plastigage At Widest Point
Courtesy of HYUNDAI MOTOR CO.

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

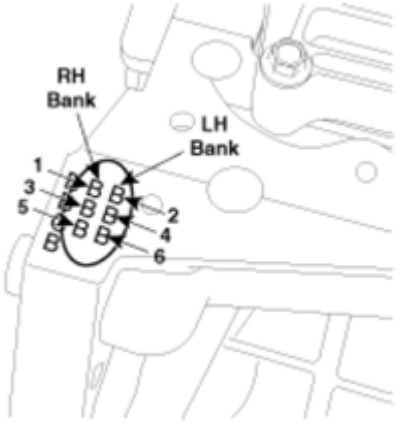

Fig. 27: Identifying Cylinder Bore Size Code
Courtesy of HYUNDAI MOTOR CO.

CYLINDER BORE SIZE CODES

Class	Size code	Cylinder bore inner diameter
A	A	92.00 ~ 92.01mm (3.6220 ~ 3.6224in.)
B	B	92.01 ~ 92.02mm (3.6224 ~ 3.6228in.)
C	C	92.02 ~ 92.03mm (3.6228 ~ 3.6232in.)

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

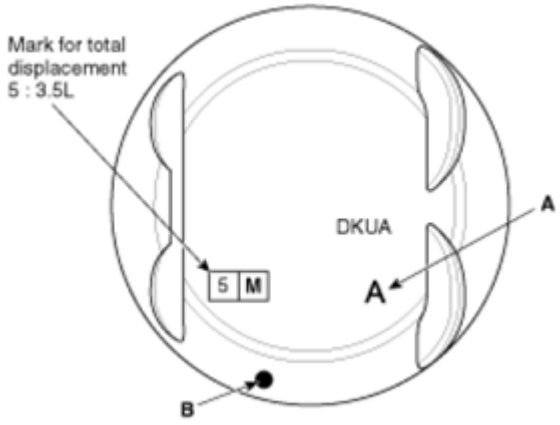

Fig. 28: Identifying Piston Size Code And Piston Top Face Mark
Courtesy of HYUNDAI MOTOR CO.

PISTON SIZE CODES

Class	Size code	Piston outer diameter
A	A	91.96 ~ 91.97mm (3.6204 ~ 3.6208in.)
B	B	91.97 ~ 91.98mm (3.6208 ~ 3.6212in.)
C	C	91.98 ~ 91.99mm (3.6212 ~ 3.6216in.)

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

Fig. 37: Identifying Main Bearings
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.

6. 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.

Fig. 38: Identifying Thrust Bearings
Courtesy of HYUNDAI MOTOR CO.

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

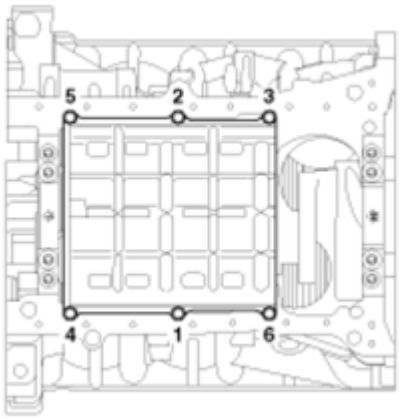

Fig. 48: Identifying Baffle Plate Bolts
Courtesy of HYUNDAI MOTOR CO.

17. 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.)

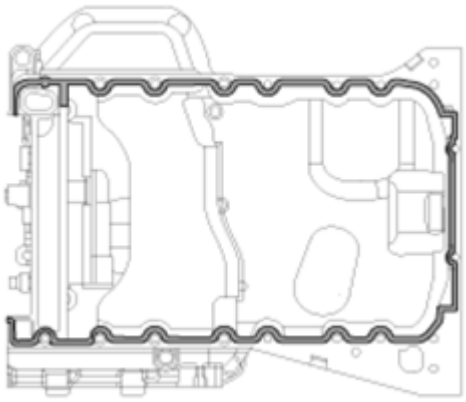

Fig. 49: Identifying Liquid Sealant (TB1217H) On Upper Oil Pan
Courtesy of HYUNDAI MOTOR CO.

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.**

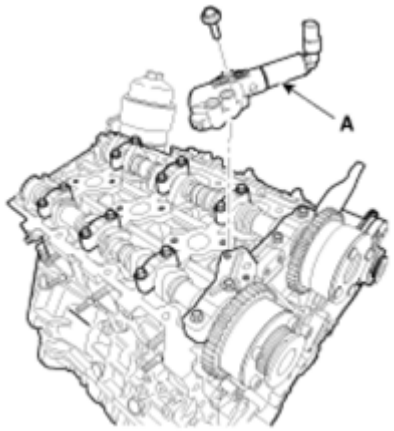

Fig. 5: Identifying LH/RH Exhaust Camshaft OCV
Courtesy of HYUNDAI MOTOR CO.

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

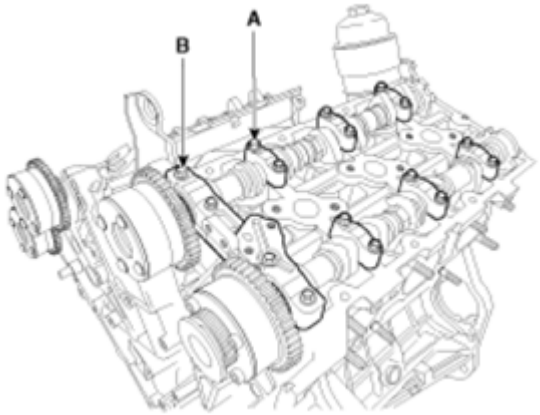

Fig. 6: Identifying LH/RH Camshaft Bearing Cap And Thrust Bearing Cap
Courtesy of HYUNDAI MOTOR CO.

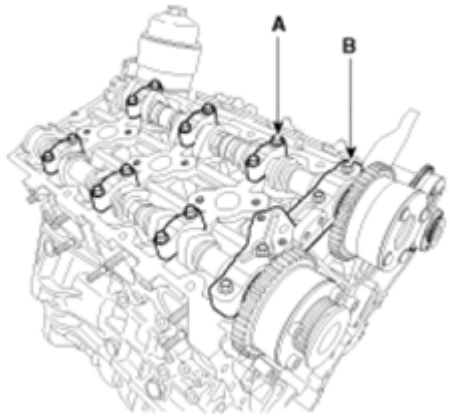

Fig. 7: Identifying LH/RH Camshaft Bearing Cap And Thrust Bearing Cap

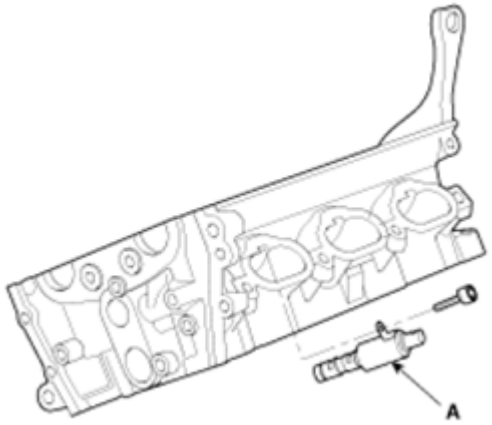

Fig. 16: Identifying Intake Camshaft OCV
Courtesy of HYUNDAI MOTOR CO.

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

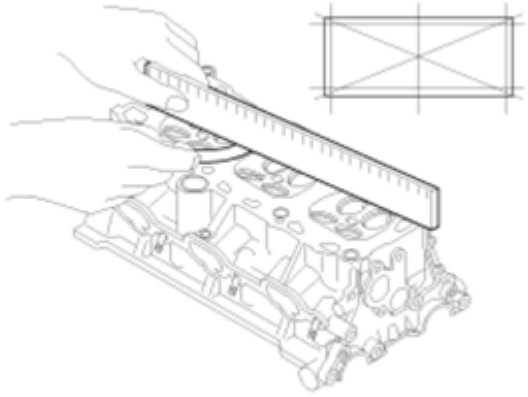

Fig. 17: Measuring Cylinder Block Contacting Surface Using Straight Edge And Feeler Gauge

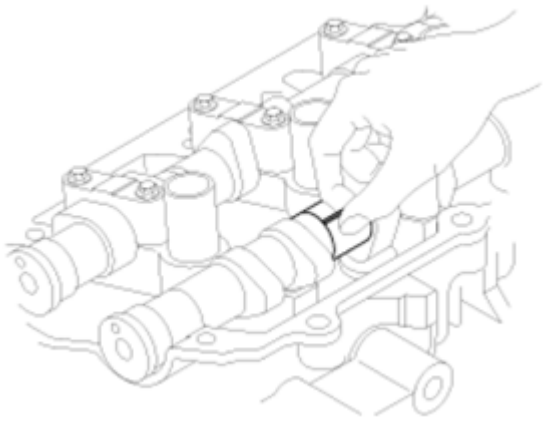

Fig. 23: Inspecting Camshaft Journal Clearance
Courtesy of HYUNDAI MOTOR CO.

4. Install the bearing cap (A) and thrust bearing cap (B) with specified torque. (Refer to **CYLINDER HEAD**.)

   Tightening torque :

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

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

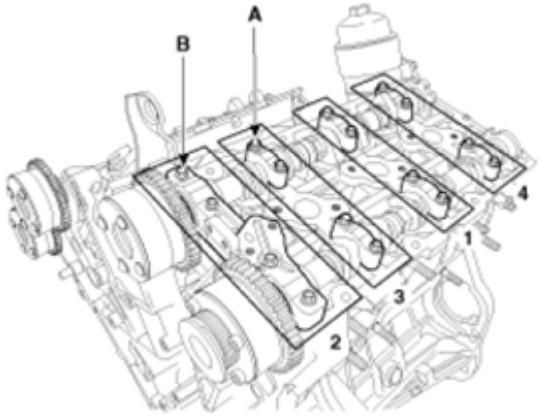

Fig. 24: Identifying Camshaft Bearing Cap And Thrust Bearing Cap
Courtesy of HYUNDAI MOTOR CO.

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.

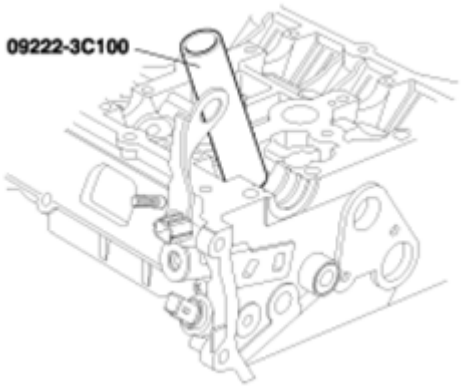

Fig. 34: Pushing New Oil Seal Using SST (09222-3C100)
Courtesy of HYUNDAI MOTOR CO.

   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, 09222-3K100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.

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

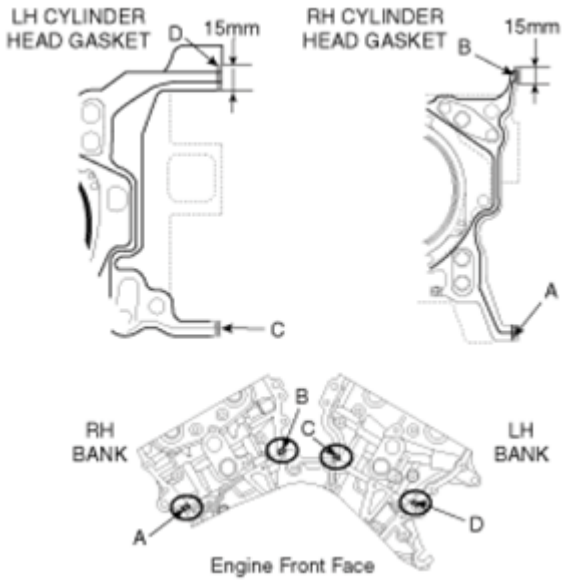

Fig. 40: Identifying Cylinder Head Gasket Sealant Applying Portion (Right And Left)
Courtesy of HYUNDAI MOTOR CO.

NOTE: Be careful of the installation direction.

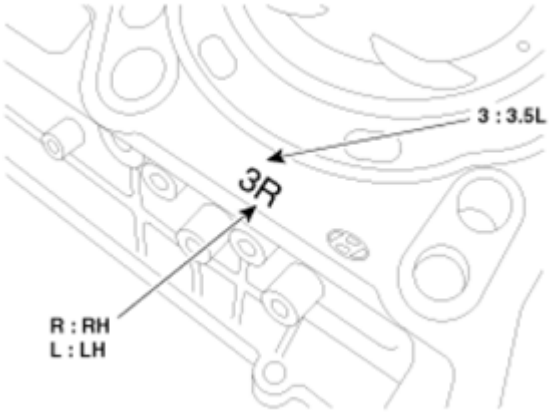

Fig. 41: Identifying Cylinder Head Mark
Courtesy of HYUNDAI MOTOR CO.

D. Install the cylinder head.

NOTE: Remove the extruded sealant after assembling cylinder heads.

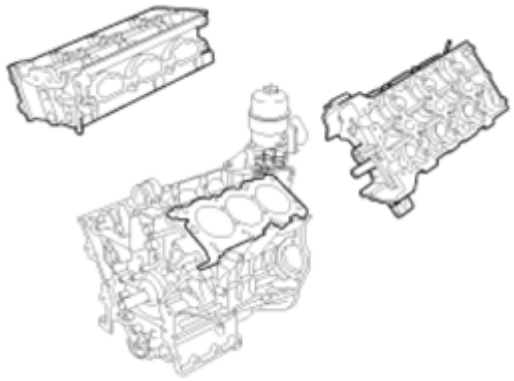

Fig. 42: Identifying Cylinder Head
Courtesy of HYUNDAI MOTOR CO.

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.

CAUTION: Always use a new cylinder head bolts.

Tightening torque

Head bolt: 37.3~41.2N.m (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)

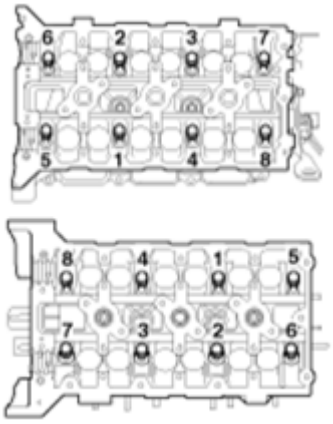

Fig. 43: Identifying Cylinder Head Bolts Installing Sequence
Courtesy of HYUNDAI MOTOR CO.

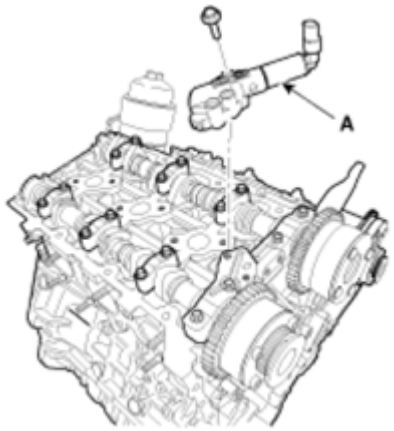

Fig. 55: Identifying LH/RH Exhaust Camshaft OCV
Courtesy of HYUNDAI MOTOR CO.

7. Install the water temperature control assembly (B).

Tightening torque :

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

8. Connect the oil cooler hoses (A).

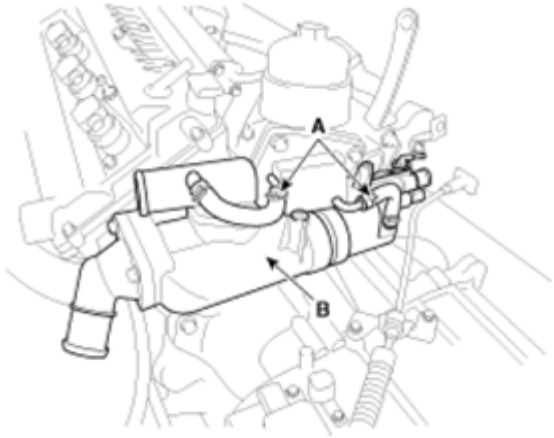

Fig. 56: Identifying Water Temperature Control Assembly With Oil Cooler Hoses
Courtesy of HYUNDAI MOTOR CO.

9. Install the timing chain. (Refer to **TIMING SYSTEM** .)
10. Install the intake manifold and exhaust manifolds. (Refer to **INTAKE AND EXHAUST SYSTEM** .)

NOTE:

- **Refill engine oil.**
- **Clean the battery posts and cable terminals with sandpaper. Assemble and then apply grease to prevent corrosion.**