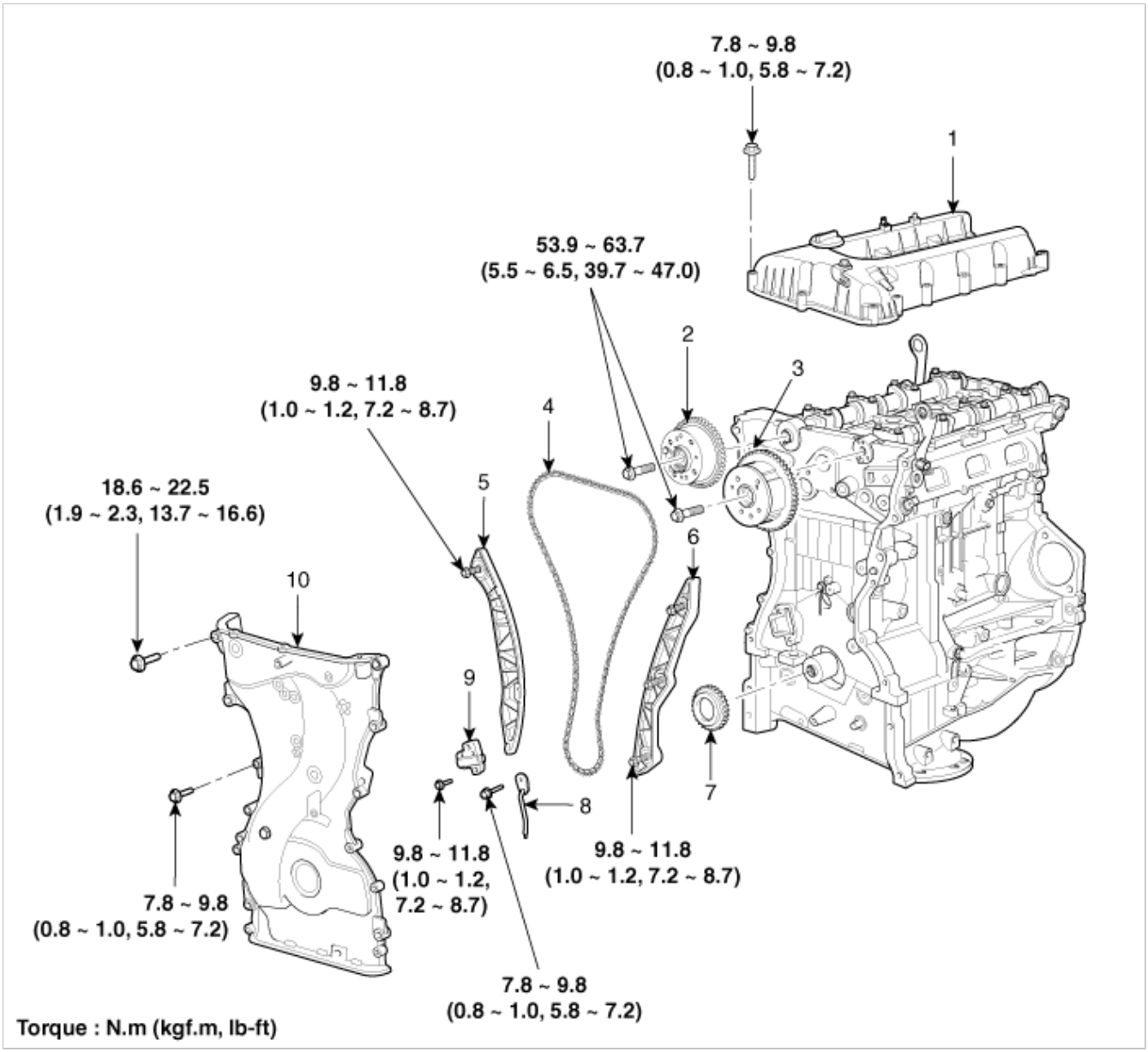
Components



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

Removal

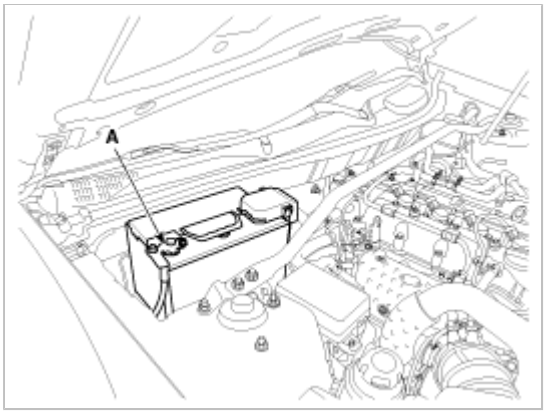
CAUTION

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

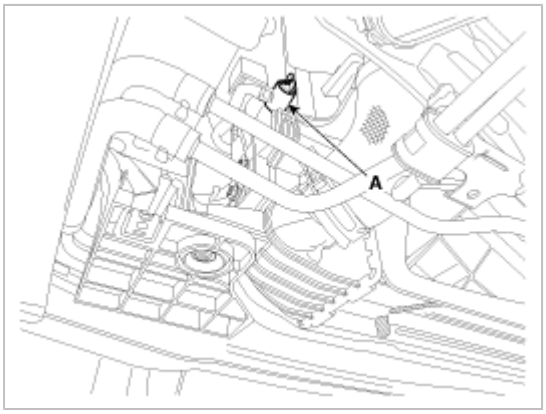
NOTE

Mark all wiring and hoses to avoid misconnection.

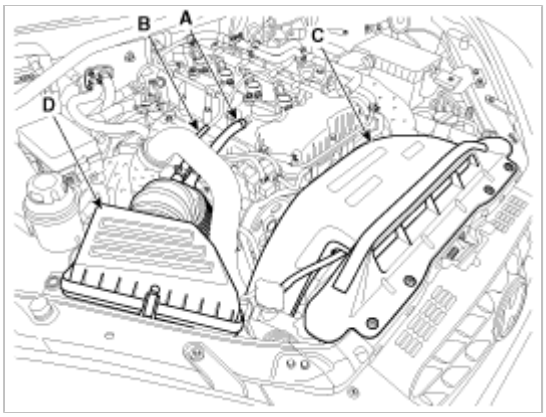
1. Disconnect the battery nagative cable (A).



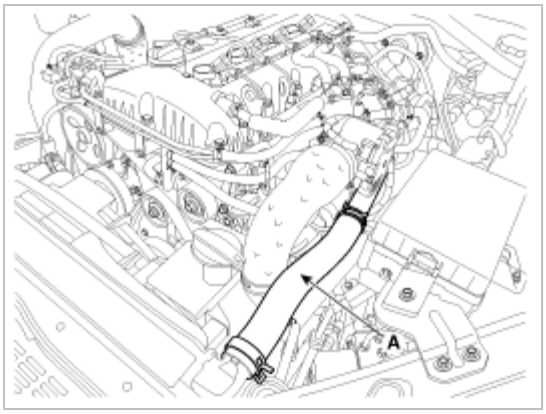
2. Loosen the drain plug (A) and drain the engine coolant.



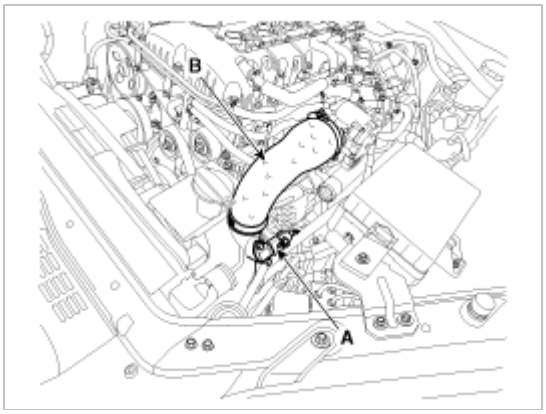
3. Disconnect the breather hose (A), vacuum hose (B). And remove the air duct (C) and air cleaner assembly (D).



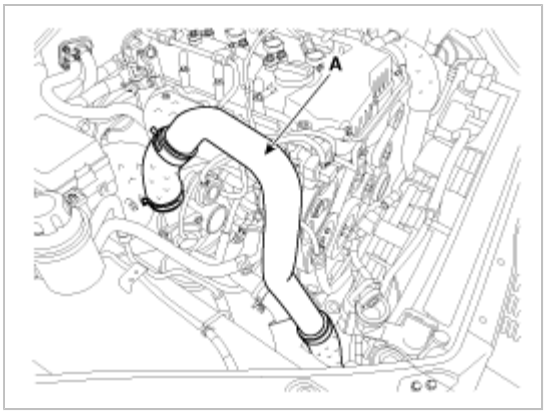
4. Remove the radiator upper hose (A).



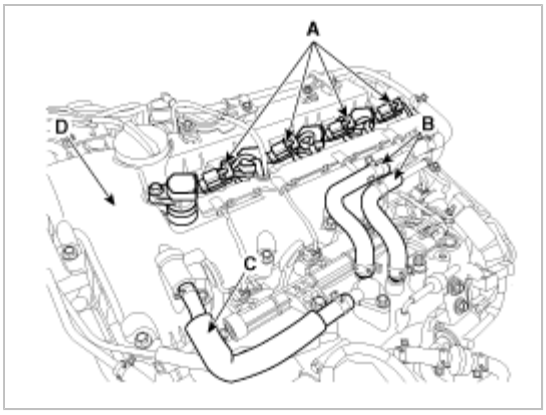
5. Remove the intercooler outlet hose (B) after disconnecting the BPS connector (A).



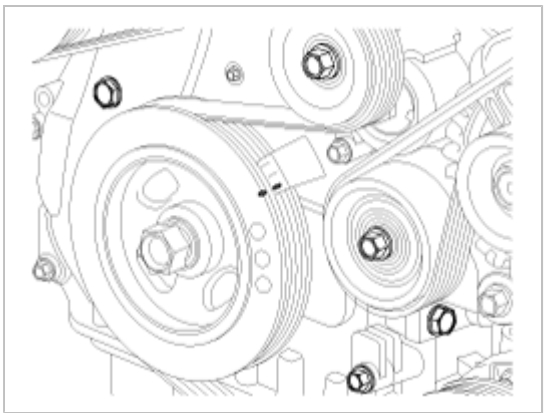
6. Remove the intercooler inlet hose (A).



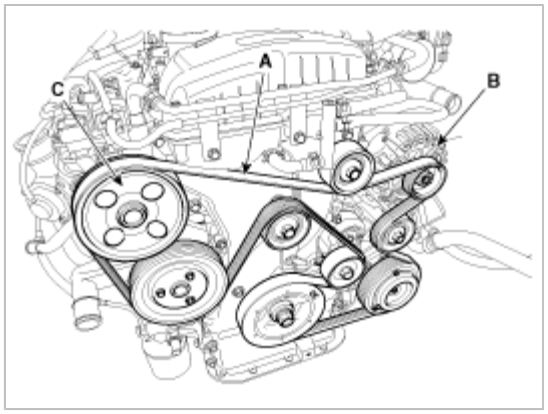
7. Disconnect the ignition coil connectors (A) and remove the ignition coils.
8. Remove the cylinder head cover (D) after removing the vacuum hoses (B) and PCV hose (C).



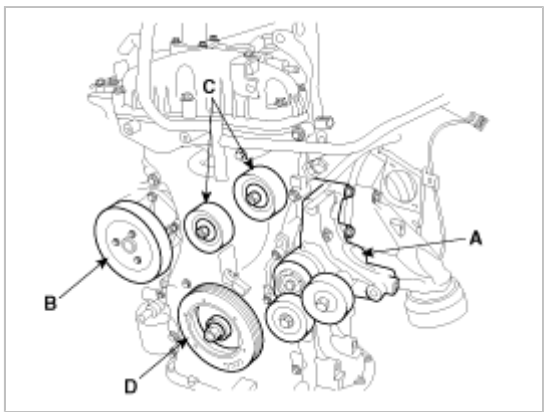
9. Set No.1 cylinder to TDC/compression.



10. Remove the drive belt (A), alternator (B) and power steering pump (C).



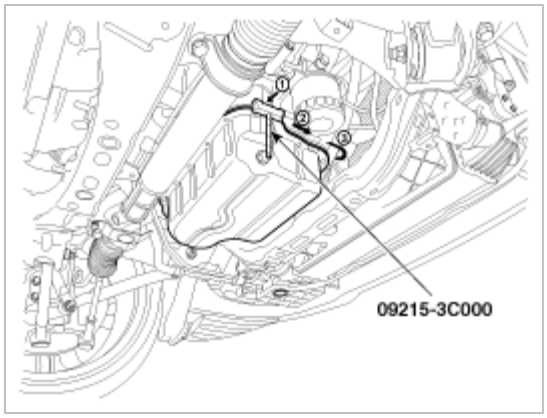
11. Remove the tensioner assembly (A), water pump assembly (B), idler (C) and crankshaft pulley (D).



NOTE

Use the SST (crankshaft pulley adapter and holder, 09231-2M100,09231-2J210,) to remove the crankshaft pulley bolt.

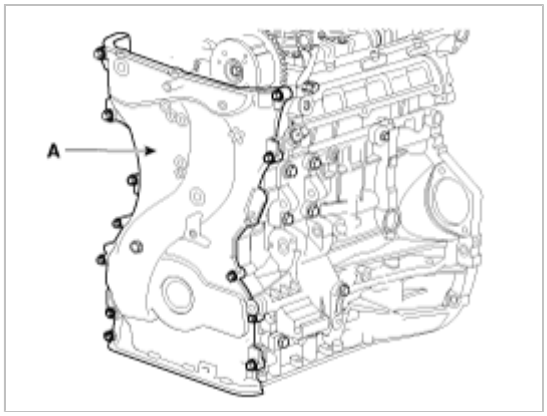
12. Remove the lower oil pan using the SST (09215-3C000).



NOTE

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

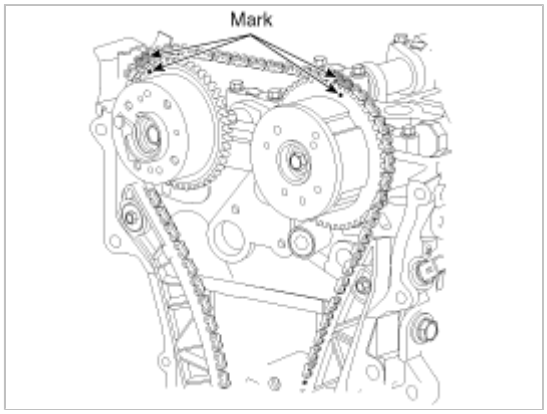
13. Remove the timing chain cover (A).

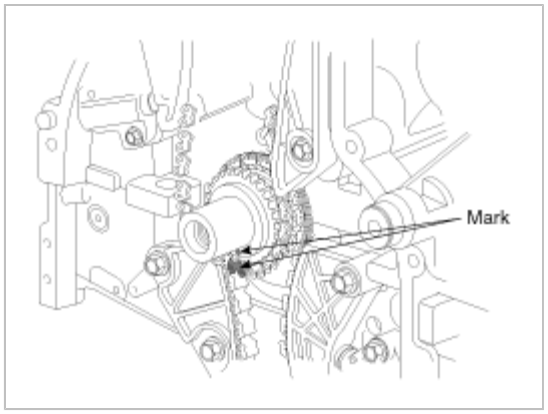


CAUTION

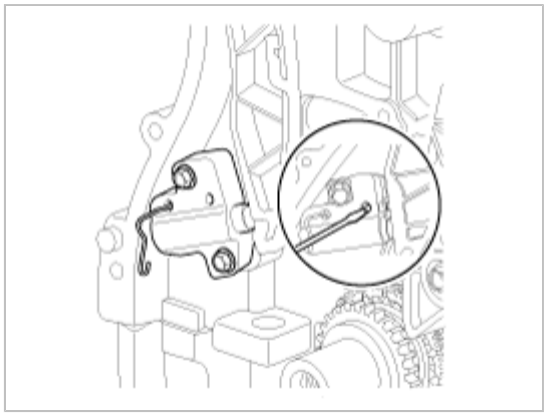
Be careful not to damage the contact surfaces of cylinder block, cylinder head and timing chain cover.

14. The key of crankshaft should be aligned with the mating face of main bearing cap. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.

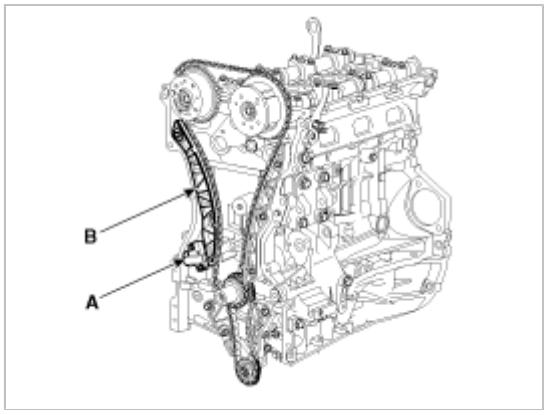




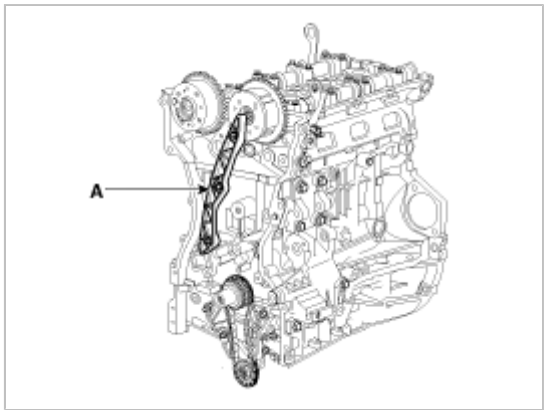
15. Install a set pin after compressing the timing chain tensioner.



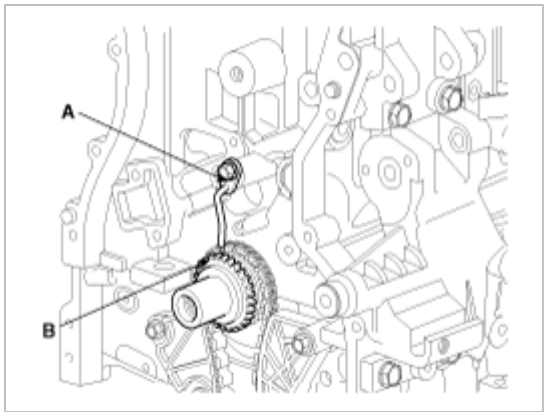
16. Remove the timing chain tensioner (A) and timing chain tensioner arm (B).



17. Remove the timing chain.
18. Remove the timing chain guide (A).



19. Remove the timing chain oil jet (A) and crankshaft sprocket (B).



20. Remove the balance shaft chain.
    (Refer to Lubrication system in this group)

Inspection

Sprockets, Hydraulic Tensioner, Chain Guide, Tensioner Arm

1. Check the CVVT sprocket, crankshaft sprocket teeth for abnormal wear, cracks or damage. Replace if necessary.
2. Check a contact surface of the chain tensioner arm and guide for abnormal wear, cracks or damage. Replace if necessary.
3. Check the hydraulic tensioner for its piston stroke and ratchet operation. Replace if necessary.

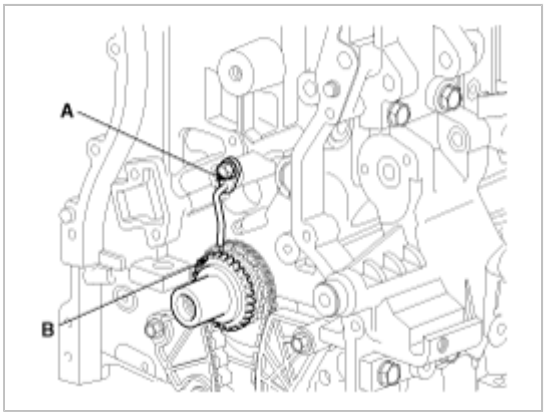
Belt, Idler, Pulley

1. Check the idler for excessive oil leakage, abnormal rotation or vibration. Replace if necessary.
2. Check belt for maintenance and abnormal wear of V-ribbed part. Replace if necessary.
3. Check the pulleys for vibration in rotation, oil or dust deposit of V-ribbed part. Replace if necessary.

Installation

1. Install the timing chain oil jet (A) and crankshaft sprocket (B).

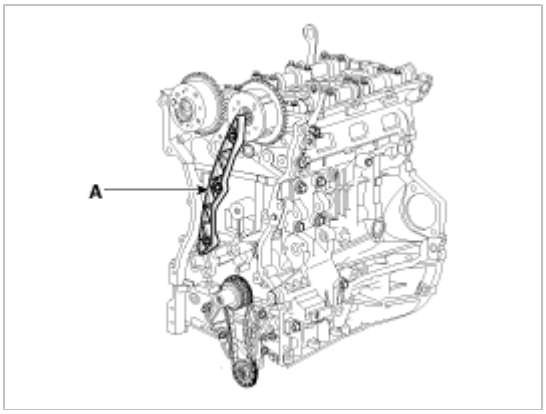
Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



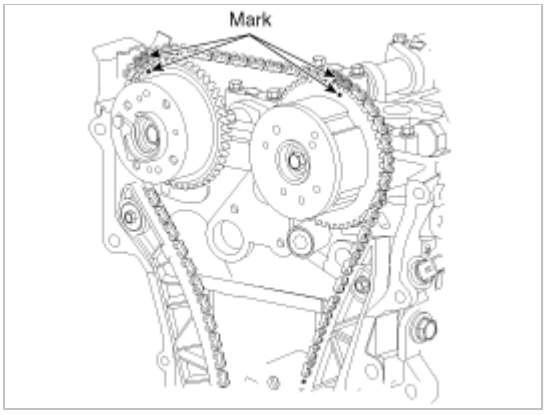
2. Set crankshaft that the key of crankshaft should be aligned with the mating surface of main bearing cap. Put the intake, exhaust camshaft assembly that the TDC mark of intake sprocket and exhaust sprocket should be aligned with the top surface of cylinder head. As a result of this, place the piston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

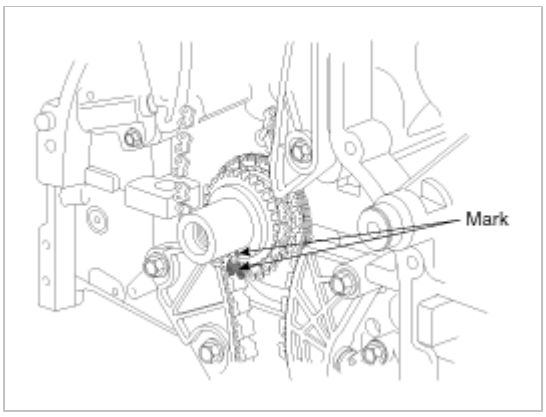
Tightening torque :

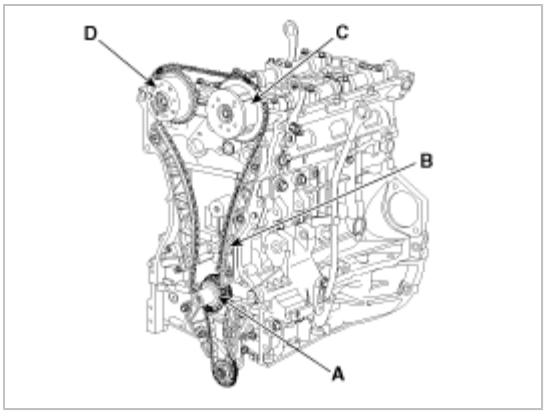
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



4. Install the timing chain.
   To install the timing chain with no slack between each shaft (cam, crank), follow the below procedure.Crankshaft sprocket (A) -> Timing chain guide (B) -> Intake CVVT assembly (C) -> Exhaust CVVT assembly (D).
   The timing mark of each sprockets should be matched with timing mark (color link) of timing chain at installing timing chain.





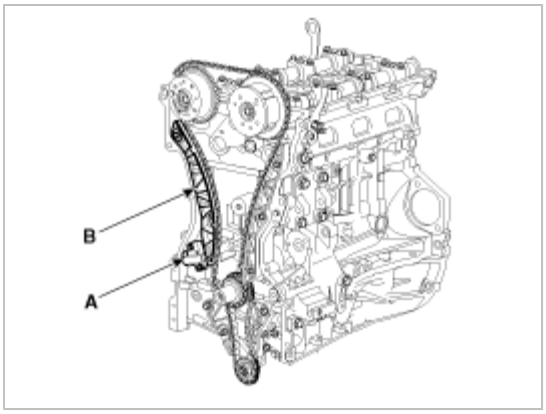


5. Install the timing chain tensioner arm (B).

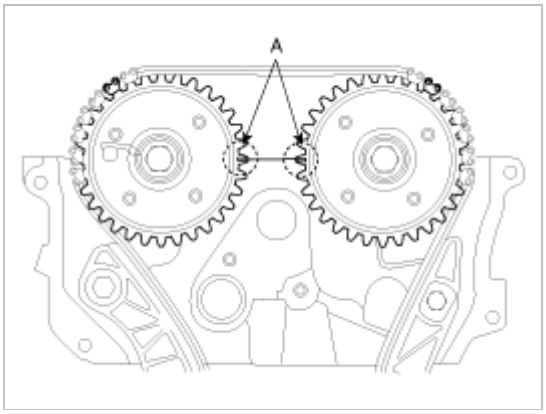
Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

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

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



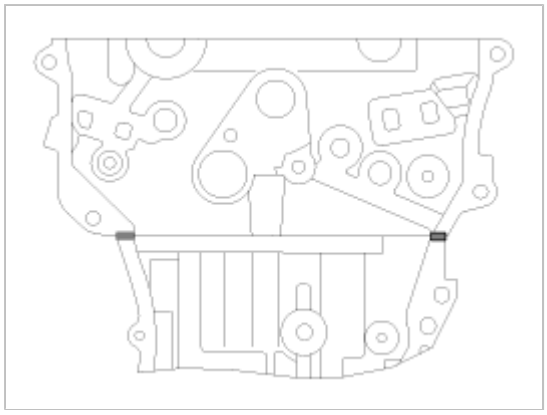
7. After rotating crankshaft 2 revolutions in regular direction (clockwise viewed from front), confirm the timing mark.



8. Install timing chain cover.
   A. Using a gasket scraper remove all the old packing meterial from the gasket surfaces.
   B. The sealant locations on chain cover and on counter parts (cylinder head, cylinder block, and ladder frame) must be free of engine oil and ETC.
   C. Before assembling the timing chain cover, the liquid sealant Loctite 5900H or THREEBOND 1217H should be applied on the gap between cylinder head and cylinder block.

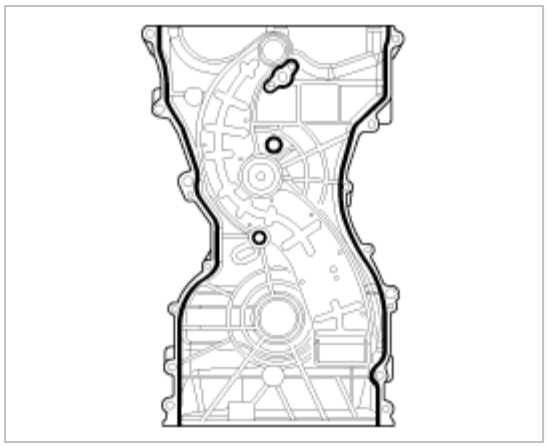
The part must be assembled within 5 minutes after sealant was applied.

Bead width : 2.5±0.5mm (0.098±0.019in.)



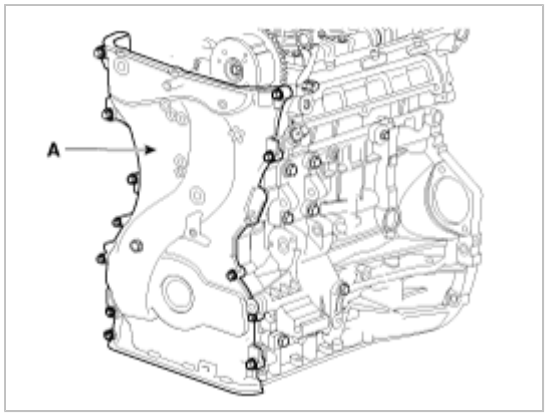
D. After applying liquid sealant Loctite 5900H on timing chain cover. The part must be assembled within 5 minutes after sealant was applied. Sealant should be applied without discontinuity.

Bead width : 3.0mm(0.12in.)



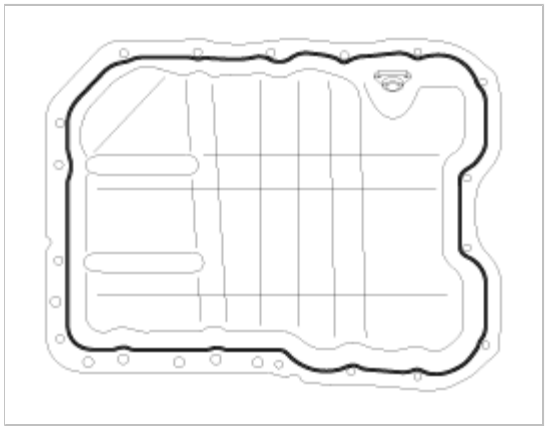
E. The dowel pins on the cylinder block and holes on the timing chain cover should be used as a reference in order to assemble the timing chain cover to be in exact position.

Tightening torque :
M6 : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
M8 : 18.6 ~ 22.5N.m (1.9 ~ 2.3kgf.m, 13.7 ~ 16.6lb-ft)



F. The firing and/or blow out test should not be performed within 30 minutes after the timing chain cover was assembled.

9. Install the 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 Loctite 5900H or THREEBOND 1217H should be applied on oil pan. The part must be assembled within 5 minutes after the sealant was applied.



CAUTION

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

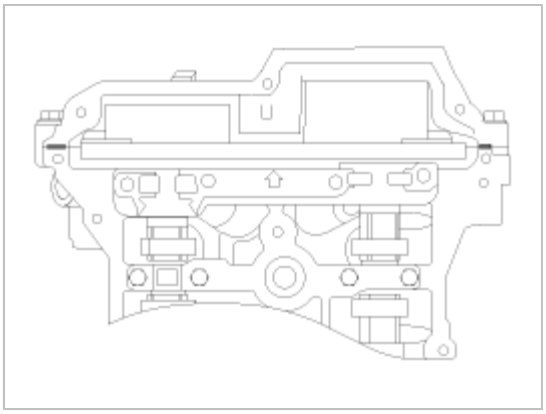
   C. Install the oil pan (A).
   Uniformly tighten the bolts in several passes.

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

   D. After assembly, wait at least 30 minutes before filling the engine with oil.

10. Install the cylinder head cover.
   A. The hardened sealant located on the upper area between timing chain cover and cylinder head should be removed before assembling cylinder head cover.
   B. After applying sealant (Loctite 5900H), it should be assembled within 5 minutes.

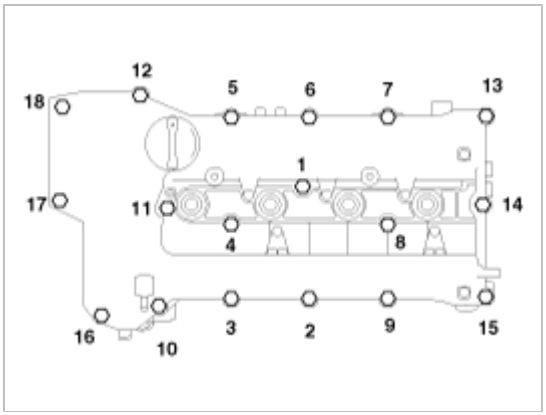
Bead width : 2.5±0.5mm (0.098±0.019in.)



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

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

Step 2 : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



CAUTION

Do not reuse cylinder head cover gasket.

11. Install the crankshaft pulley (D).

Tightening torque :
166.7 ~ 176.5N.m (17 ~ 18kgf.m, 122.9 ~ 130.2lb-ft)

NOTE

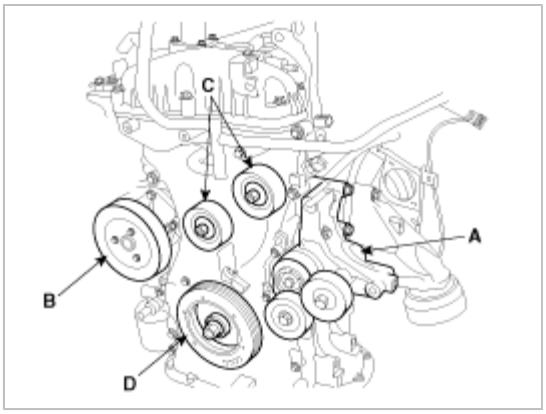
Fix the crankshaft using the SST (09231-2M000, 09231-2J210) when installing the crankshaft pulley bolt.

12. Install the water pump pulley (B) and Idler (C).

Tightening torque :
B: 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)
C: 53.9 ~ 63.7N.m (5.5 ~ 6.5kgf.m, 39.8 ~ 47.0lb-ft)

13. Install the tensioner bracket assembly (A).

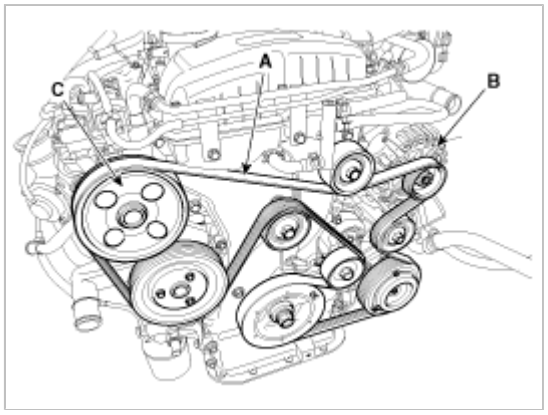
Tightening torque :
39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lb-ft)



14. Install the alternator (B), power steering pump (C) and drive belt (A).

Tightening torque :
B: 49.0 ~ 63.7N.m (5.0 ~ 6.5kgf.m, 36.1 ~ 47.0lb-ft)

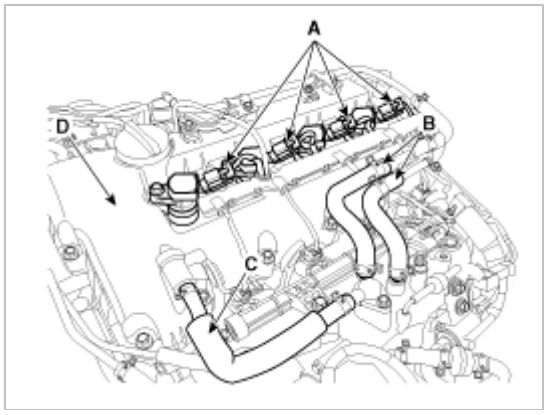
C: 16.6 ~ 19.6N.m (1.7 ~ 2.0kgf.m, 12.3 ~ 14.5lb-ft)



15. Install the ignition coil and connect the ignition coil connector (A).

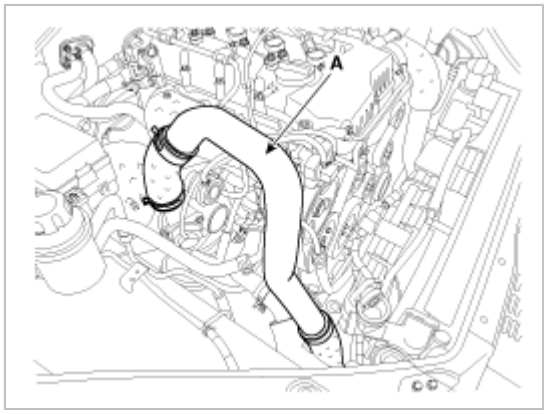
Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

16. Install the vacuum hose (B) and PCV hose (C).

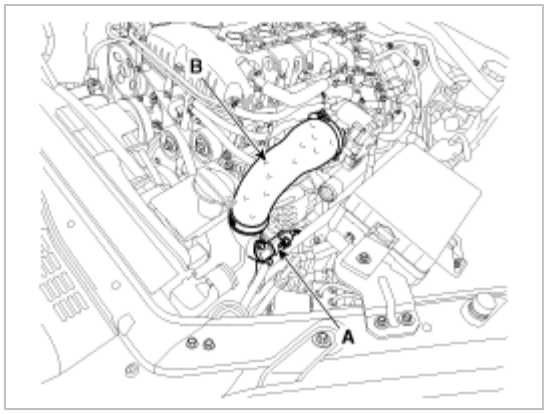


17. Install the intercooler inlet hose (A).

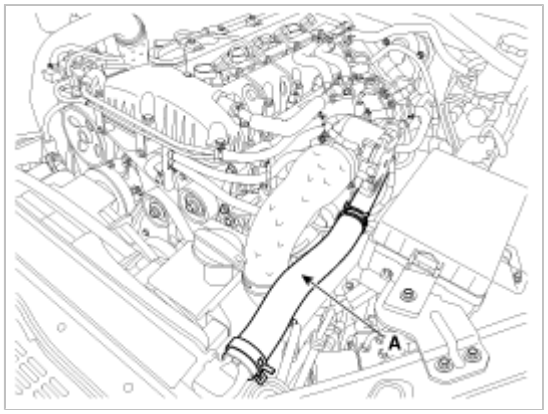
Tightening torque :
Bolt : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.4lb-ft)
Clamp : 4.9 ~ 6.8N.m (0.5 ~ 0.7kgf.m, 3.6 ~ 5.1lb-ft)



18. Install the intercooler outlet hose (B) and connect the BPS connector (A).

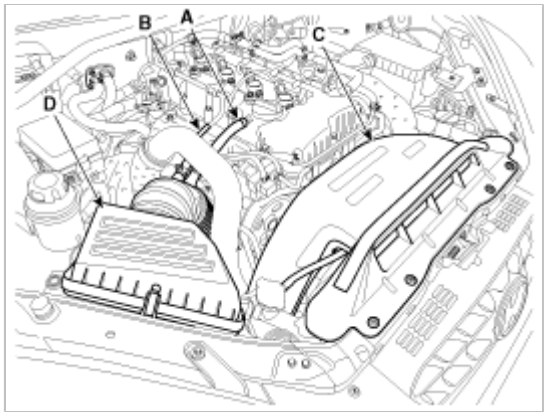


19. Install the radiator upper hose (A).

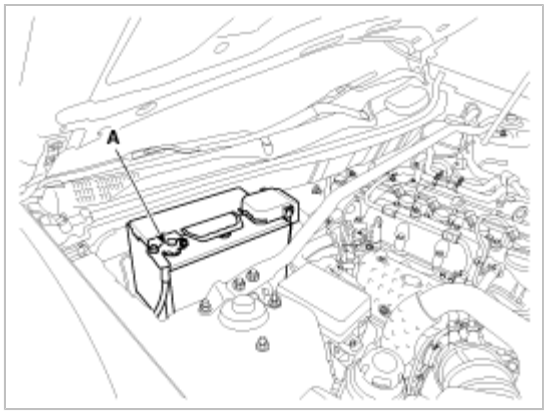


20. Install the air cleaner assembly (D) and air duct (C). And then connect the breather hose (A) and vacuum hose (B).

Tightening torque :
Bolt : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
Clamp : 2.9 ~ 4.9N.m (0.3 ~ 0.5kgf.m, 2.1 ~ 3.6lb-ft)



21. Connect the battery negative cable (A).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