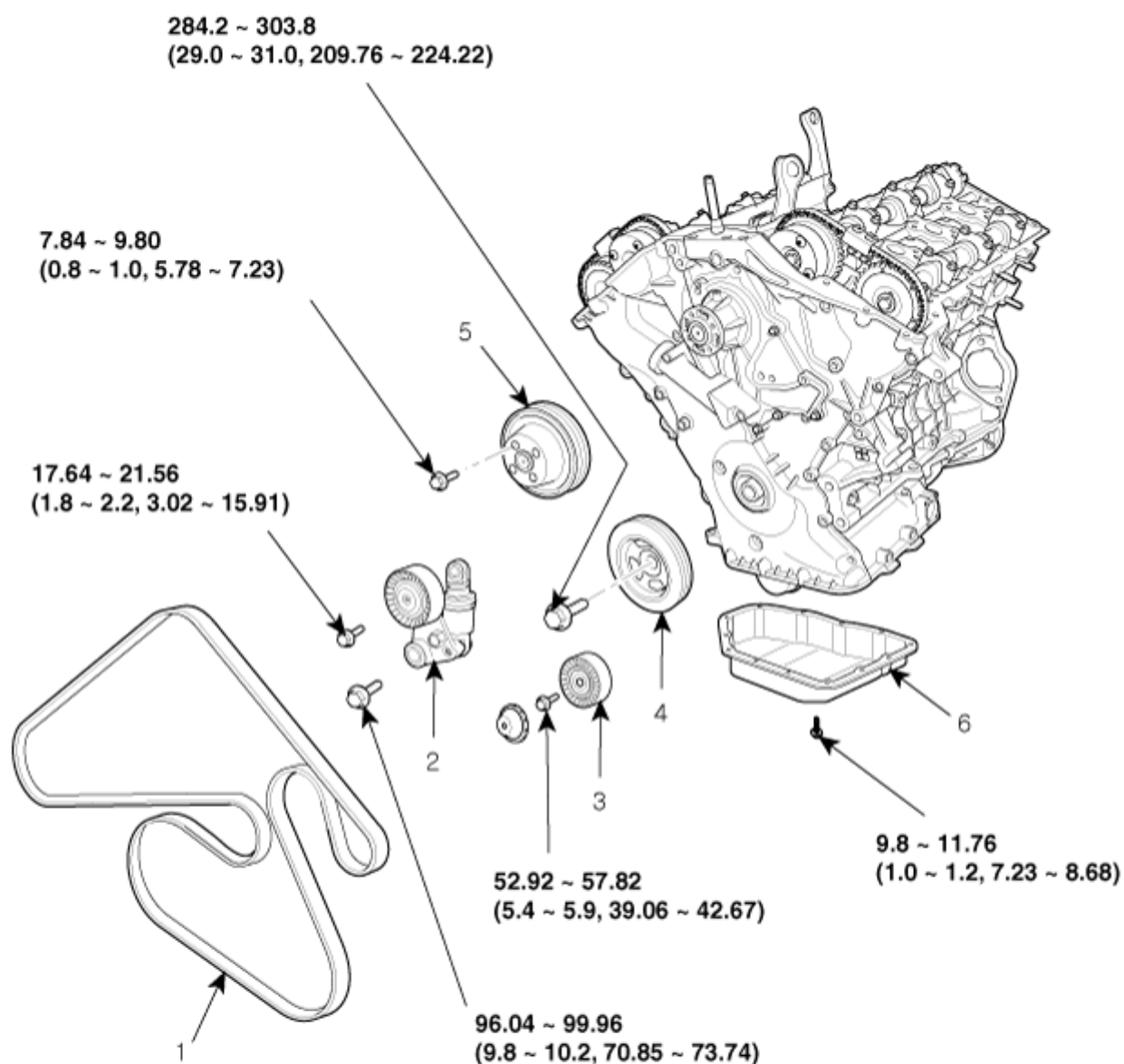


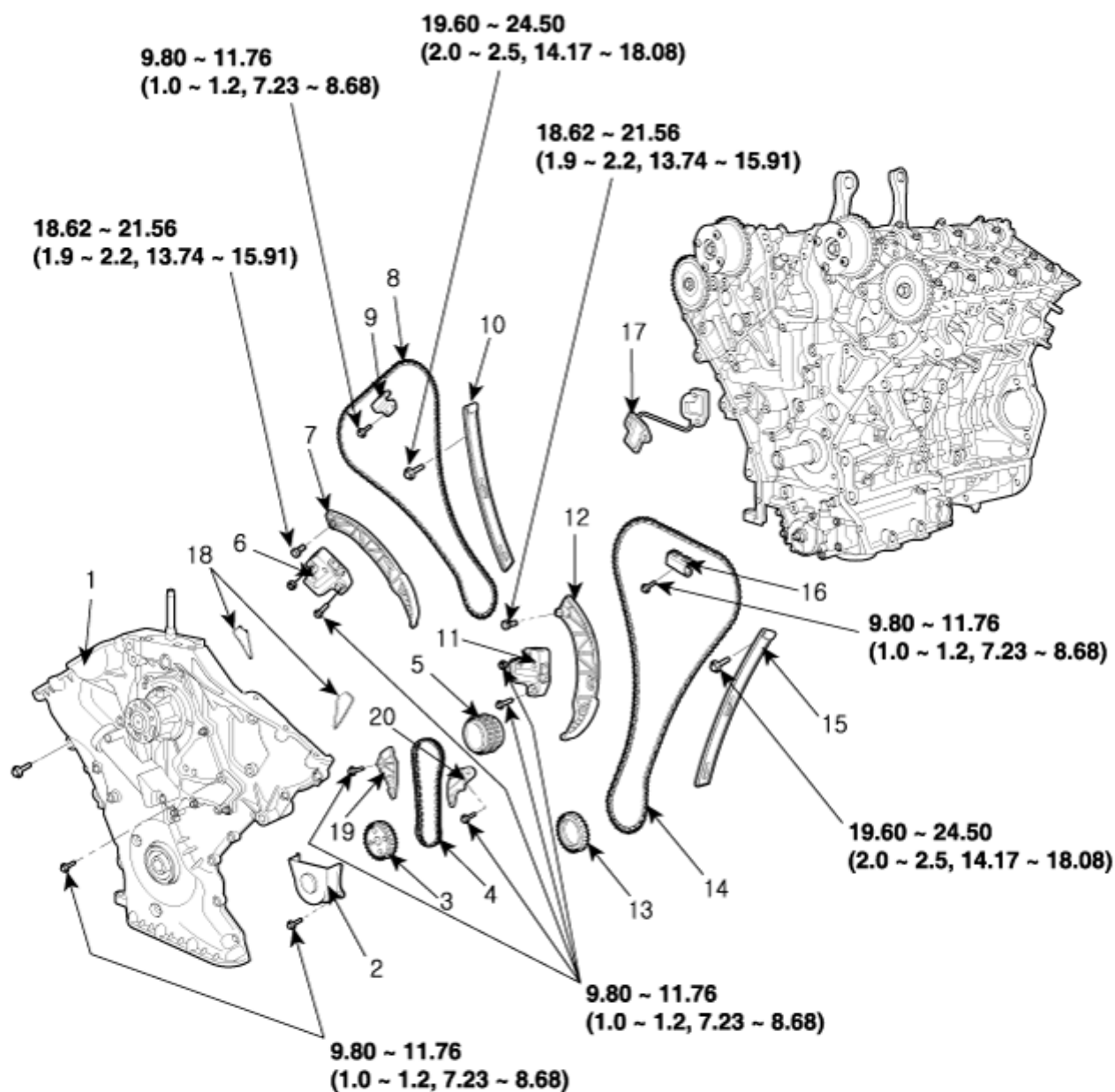
## COMPONENTS



**TORQUE : N.m (kgf.m, lbf.ft)**

1. Drive belt
2. Drive belt tensioner
3. Idler
4. Damper pulley

5. Water pump pulley
6. Oil pan



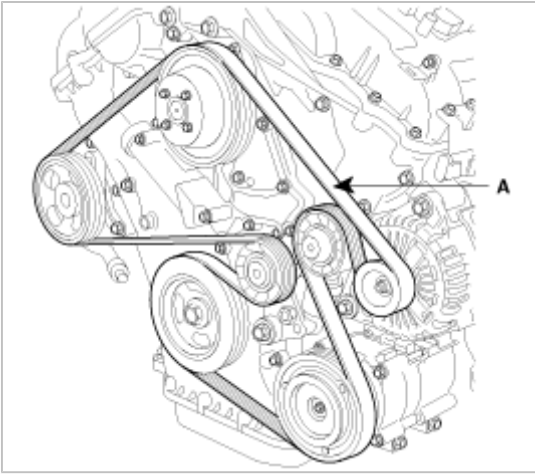
**TORQUE : N.m (kgf.m, lbf.ft)**

1. Timing chain cover	8. Timing chain	15. Timing chain guide
2. Oil pump chain cover	9. Cam to cam guide	16. Cam to cam guide
3. Oil pump sprocket	10. Timing chain guide	17. Tensioner adapter
4. Oil pump chain	11. Timing chain auto tensioner	18. Gasket
5. Crankshaft sprocket	12. Timing chain tensioner arm	19. Oil pump chain guide
6. Timing chain auto tensioner	13. Crankshaft sprocket	20. Oil pump tensioner assembly
7. Timing chain tensioner arm	14. Timing chain	

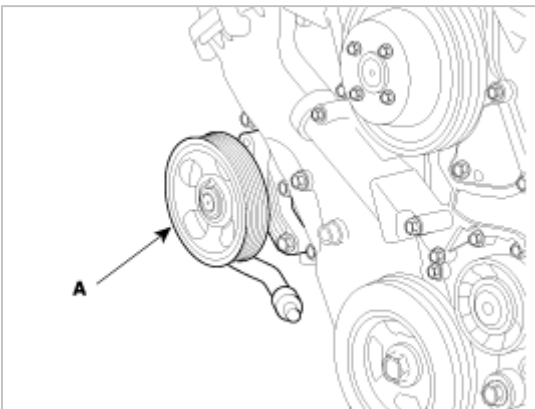
## REMOVAL

Radiator removal is required for this procedure. (Refer to 'Radiator removal')

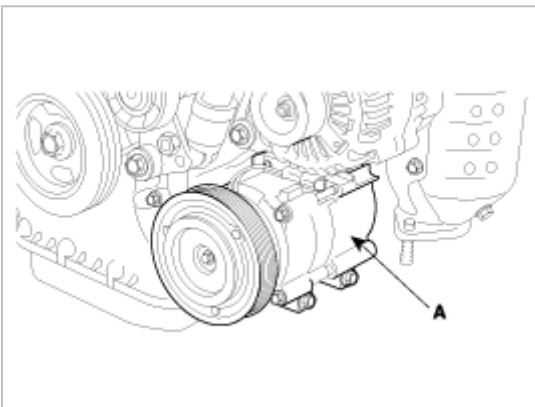
1. Remove the drive belt(A).



2. Remove the power steering pump(A).



3. Remove the air compressor(A).

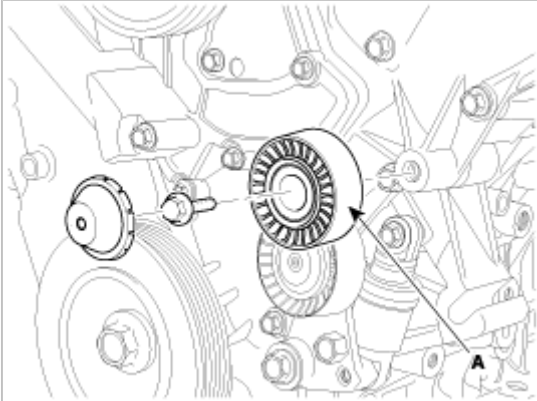


4. Remove the alternator(A).

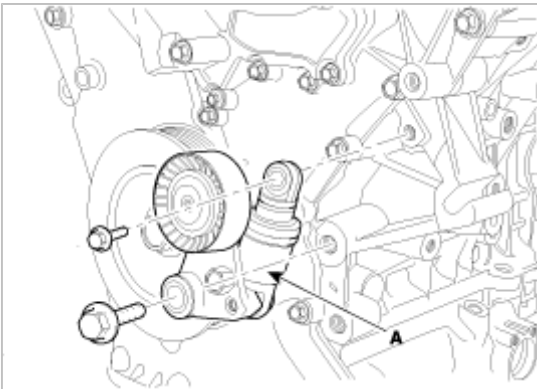




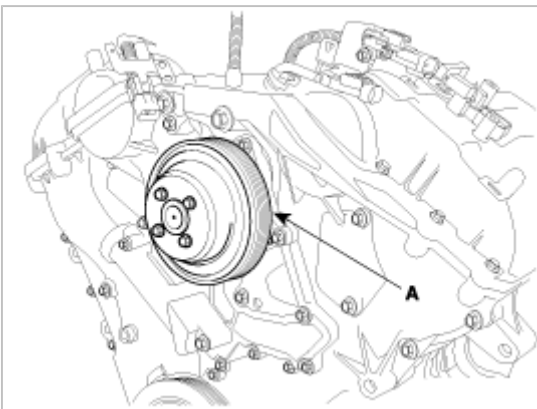
5. Remove drive belt idler(A).



6. Remove drive belt auto tensioner(A).



7. Remove water pump pulley(A).



8. Remove intake manifold.

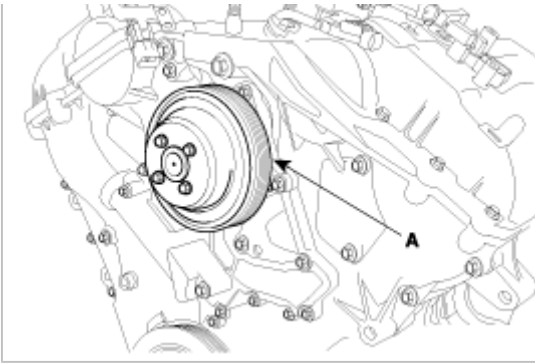
## INSTALLATION

1. Install intake manifold.
2. Install water pump pulley(A).

### Tightening torque

7.84 ~ 9.80Nm(0.8 ~ 1.0kgf.m, 5.78 ~ 7.23lb-ft)



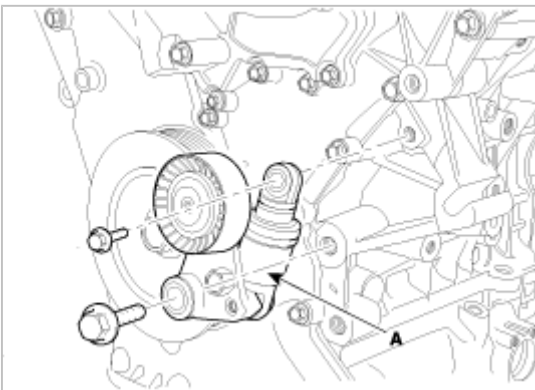


3. Install drive belt auto tensioner(A).

### Tightening torque

81.4 ~ 85.3Nm(8.3 ~ 8.7kgf.m, 60.0 ~ 62.9lb-ft)

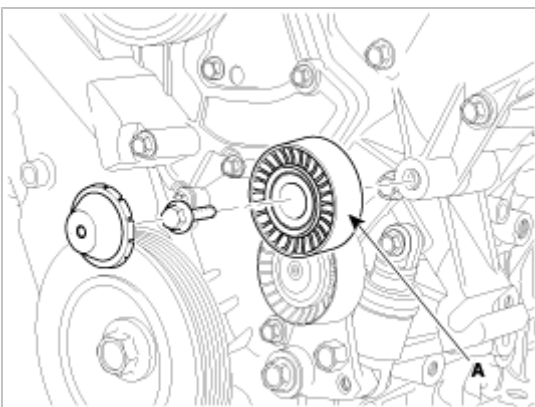
29.4 ~ 33.3Nm(3.0 ~ 3.4kgf.m, 21.7 ~ 24.6lb-ft)



4. Install drive belt idler(A).

### Tightening torque

52.92 ~ 57.82Nm(5.4 ~ 5.9kgf.m, 39.06 ~ 42.67lb-ft)



5. Install alternator

6. Install air compressor

7. Install power steering pump.

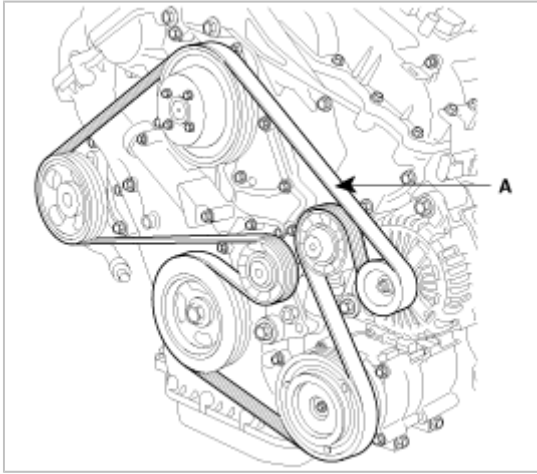
8. Install drive belt(A).

Crankshaft pulley → A/C pulley → idler pulley → alternator pulley → water pump pulley → P/S pump pulley → tensioner pulley.

Rotate auto tensioner arm in the counter-clockwise moving auto tensioner pulley belt with wrench

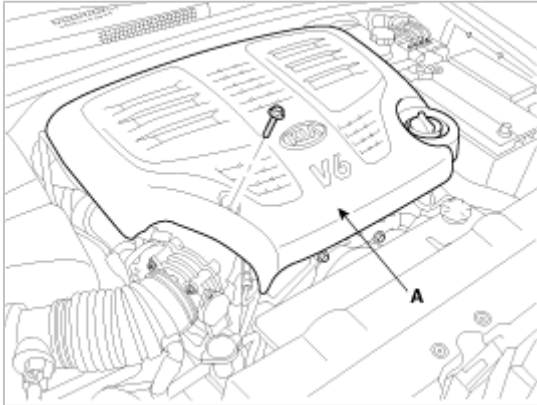


Rotate auto tensioner arm in the counter - clockwise moving auto tensioner pulley bolt with wrench.  
After putting belt on auto tensioner pulley, release the auto tensioner pulley slowly.

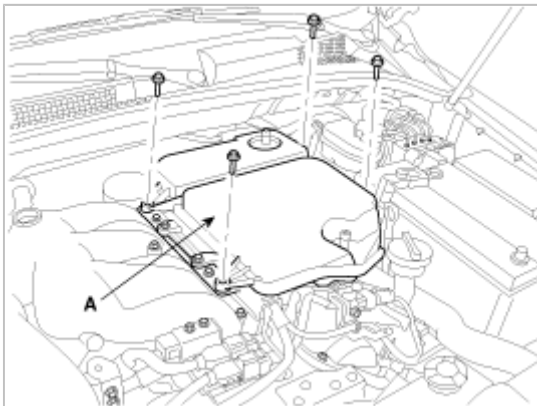


## DISASSEMBLY

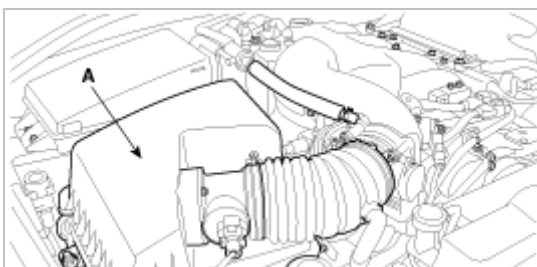
1. Remove the engine cover.



2. Remove the engine room resonator(A).

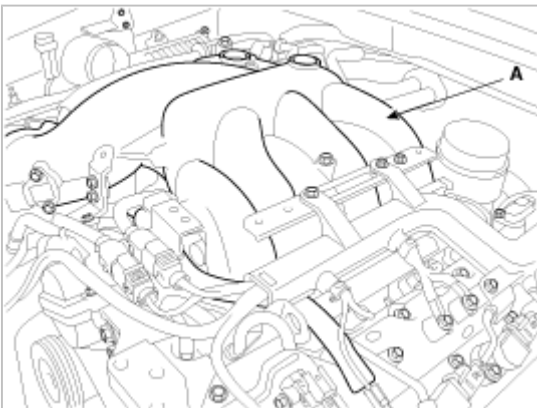
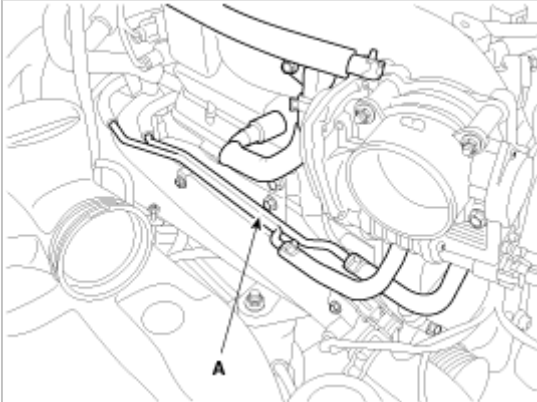


3. After disconnecting the MAF sensor connector(A) and the breather hose(B), remove the air cleaner assembly(C).





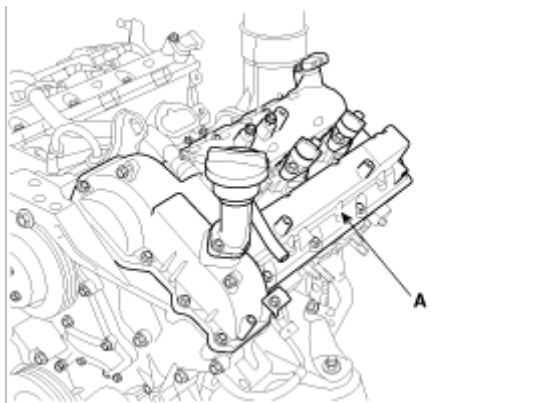
4. After disconnecting the other breather hose(A), the Purge Control Solenoid Valve(PCSV) hose(B), the Positive Crankcase Ventilation (PCV) hose(C) and the Electronic Throttle Control(ETC) cooling hoses(D), remove the surge tank assembly(E).



5. Remove the wiring over the surge tank.
- (1) Disconnect the injection harness connector(A).
  - (2) Disconnect the camshaft position sensor(CMP) harness connector(B).
  - (3) Disconnect the ground lines(C).
  - (4) Disconnect the ignition coil harness connector(D).
  - (5) Disconnect the condensor connector(E).
  - (6) Disconnect the oil control valve(OCV) harness connector(F).



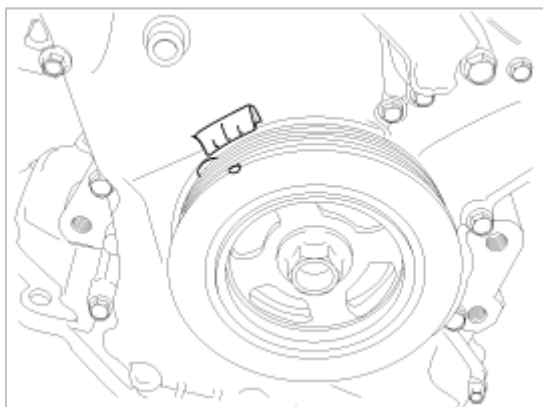
6. Loosen the cylinder head cover bolts and then remove the cover(A) and gasket.



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

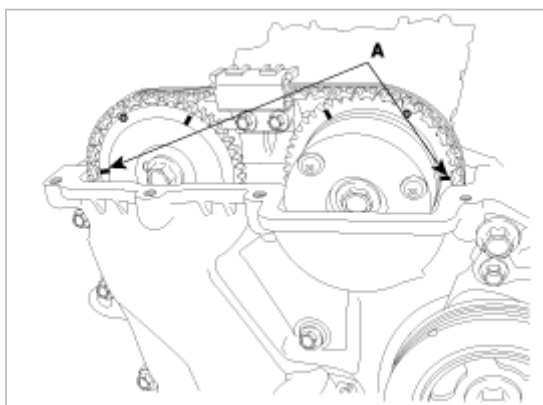
- A. Turn the crankshaft pulley and align its groove with the timing mark "T" of the lower timing chain cover.

Do not rotate engine counterclockwise.



- B. 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 one revolution (360°).

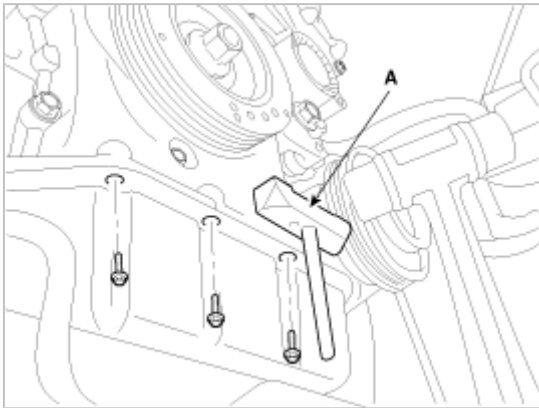


Do not rotate engine counterclockwise.

8. Remove the lower oil pan(A).

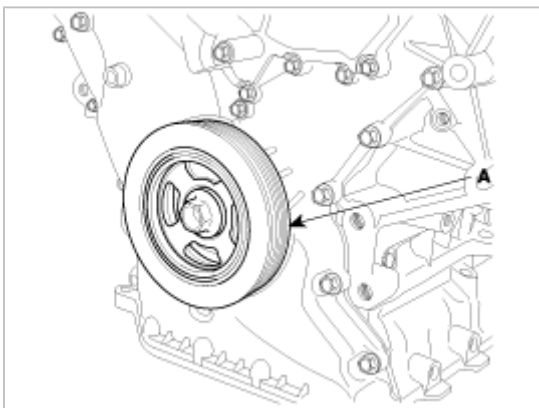
Insert the blade of SST(09215-3C000) between the upper oil pan and lower oil pan, and cut off applied sealer and removed lower oil pan.



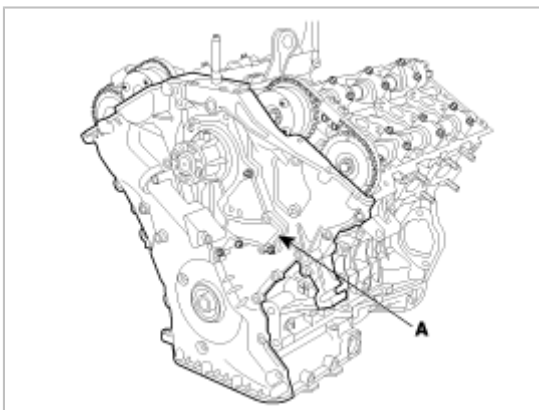


- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of ① arrow.
- After tapping the SST with a plastic hammer along the direction of ② arrow around more than 2/3 edge of the oil pan, remove it from the ladder frame.
- Do not turn over the SST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

9. Remove the crankshaft damper pulley(A).



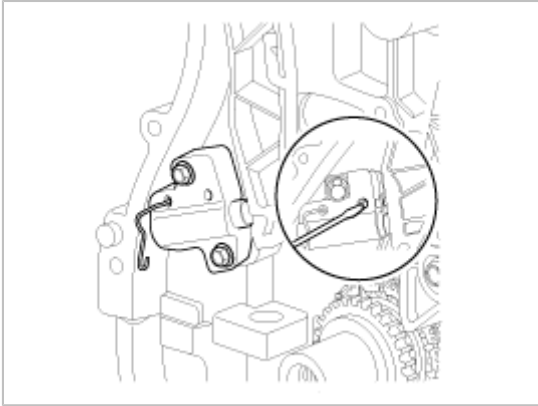
10. Remove the timing chain cover(A).



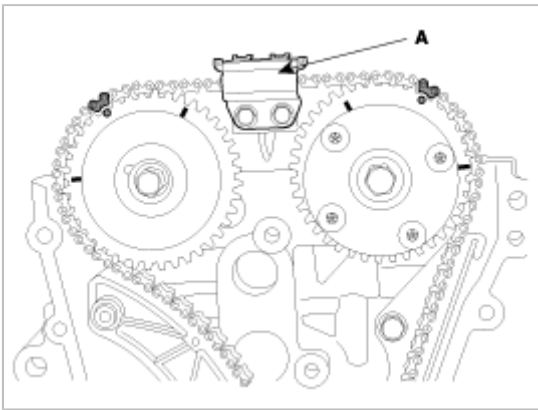
- Be careful not to damage the contact surfaces of cylinder block, cylinder head and timing chain cover.
- Mark on the timing chain on the basis of the marking on sprocket and CVVT.

11. Install a cot pin after compressing the timing chain tensioner.

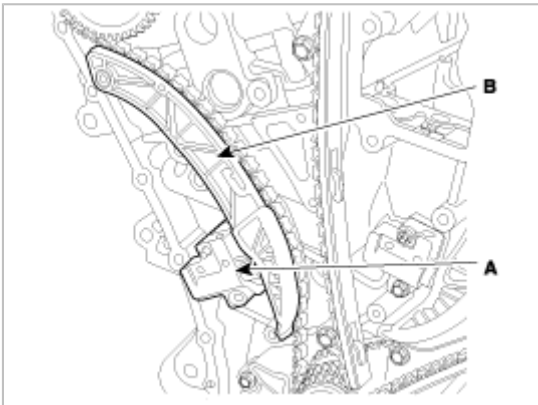
11. Install a set pin after compressing the timing chain tensioner.



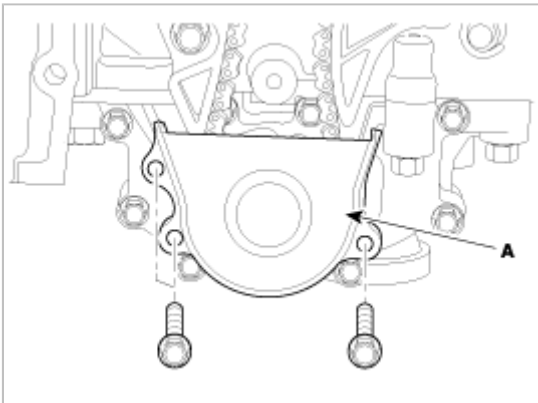
12. Remove RH cam-to-cam guide(A).



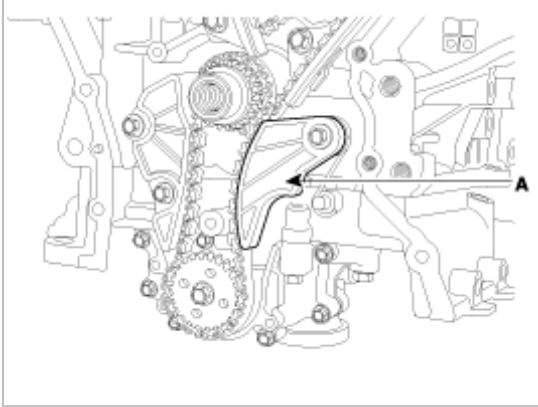
13. Remove RH timing chain auto tensioner(A) and RH timing chain tensioner arm(B).



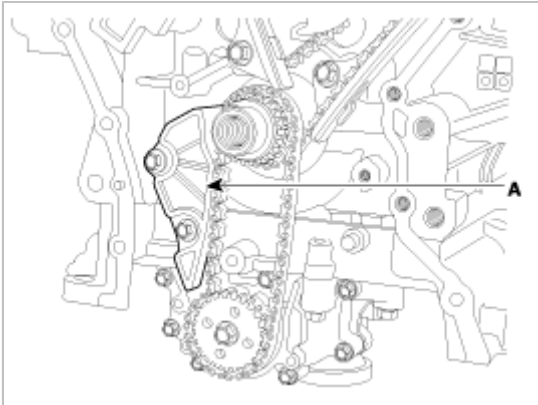
14. Remove oil pump chain cover(A).



15. Remove oil pump chain tensioner assembly(A).

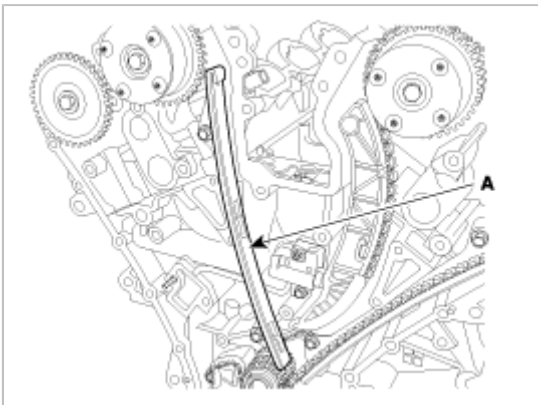


16. Remove oil pump chain guide(A).

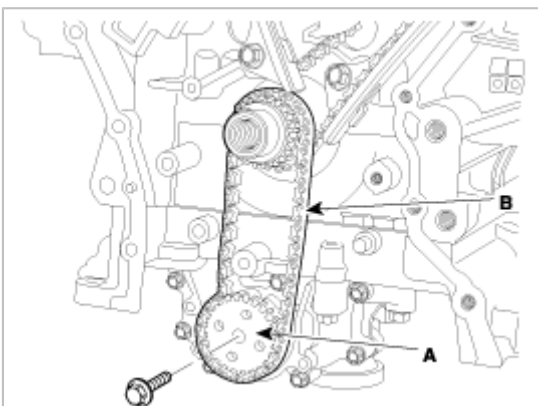


17. Remove RH timing chain.

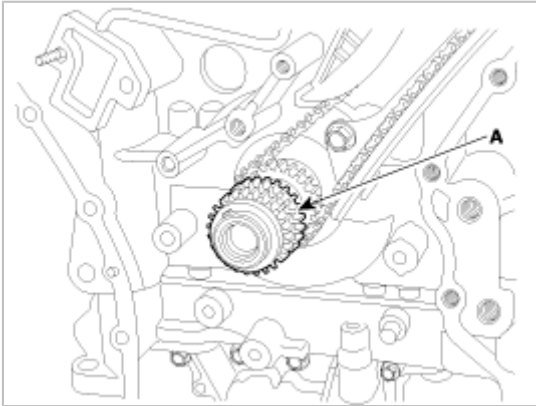
18. Remove RH timing chain guide(A).



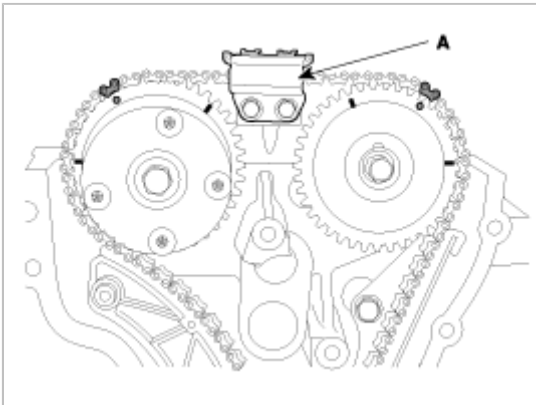
19. Remove oil pump chain sprocket(A) and oil pump chain(B).



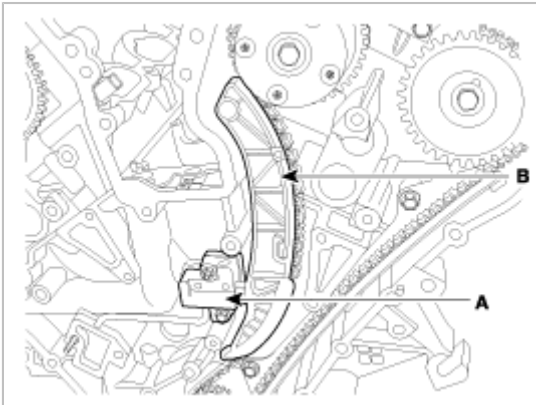
20. Remove crankshaft sprocket(A)(O/P & RH camshaft drive).



21. Remove LH cam-to-cam guide(A).

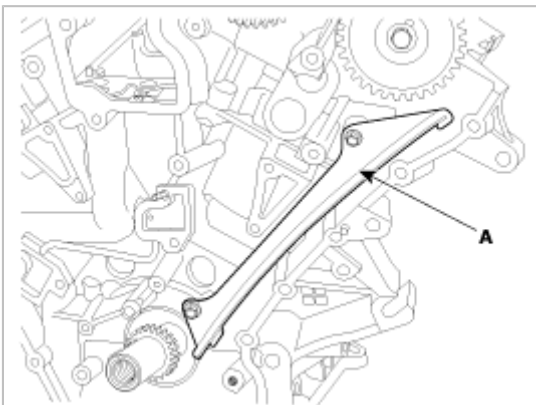


22. Remove LH timing chain auto tensioner(A) and LH timing chain tensioner arm(B).

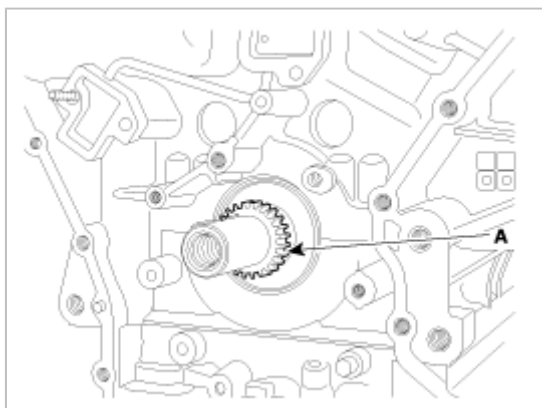


23. Remove LH timing chain.

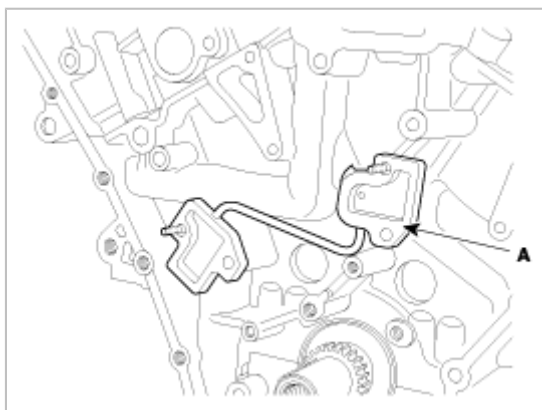
24. Remove LH timing chain guide(A).



25. Remove crankshaft sprocket(A)(LH camshaft drive).



26. Remove tensioner adapter assembly(A).



## INSPECTION

### SPROCKETS, CHAIN TENSIONER, CHAIN GUIDE, CHAIN TENSIONER ARM

1. Check the camshaft sprocket and crankshaft sprocket for abnormal wear, cracks, or damage. Replace as necessary.
2. Inspect the tensioner arm and chain guide for abnormal wear, cracks, or damage. Replace as necessary.
3. Check that the tensioner piston moves smoothly when the ratchet pawl is released with thin rod.

### BELT, IDLER, BELT TENSIONER, PULLEY

1. Check the belt for oil or dust deposits. Replace, if necessary.  
Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.
2. When the engine is overhauled or belt tension adjusted, check the belt carefully. If any of the following flaws are evident, replace the belt.

- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water and steam.

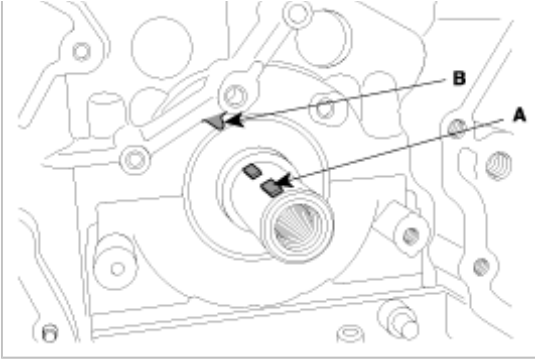
3. Inspect the idler for easy and smooth rotation and check for play or noise.

## REASSEMBLY

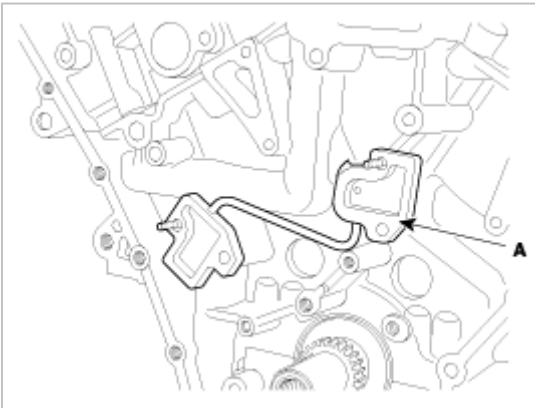
1. The key(A) of crankshaft should be aligned with the timing mark(B) of timing chain cover. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.



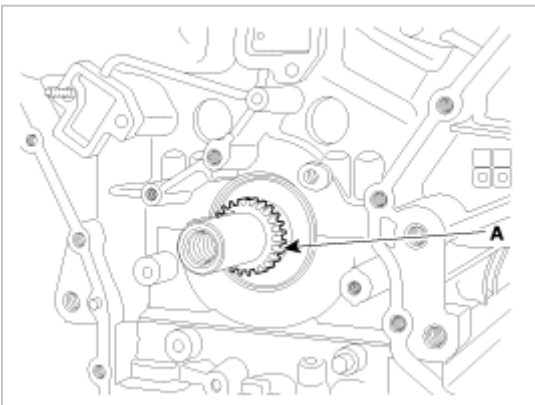




2. Install tensioner adapter assembly(A).



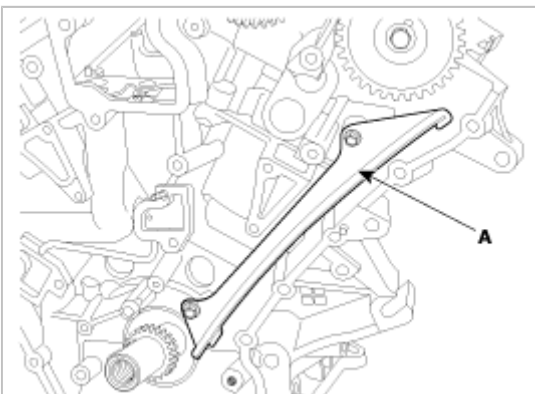
3. Install crankshaft sprocket(A)(LH camshaft drive).



4. Install LH timing chain guide(A).

### Tightening torque

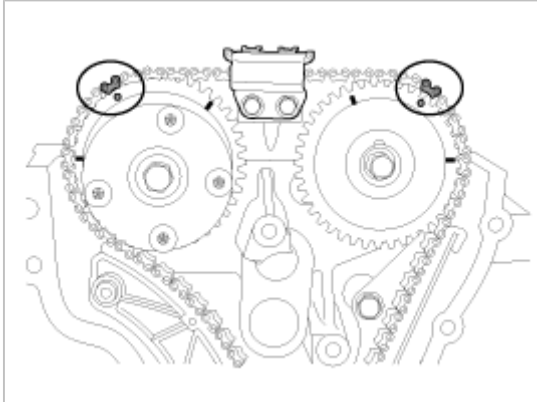
19.60 ~ 24.50Nm(2.0 ~ 2.5kgf.m, 14.17 ~ 18.08lb-ft)



5. Install LH 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) → Exhaust camshaft sprocket(C) → Intake camshaft sprocket(D).

The timing mark of each sprockets should be matched with timing mark (color link) of timing chain at installing timing chain.



6. Install LH timing chain tensioner arm(B).

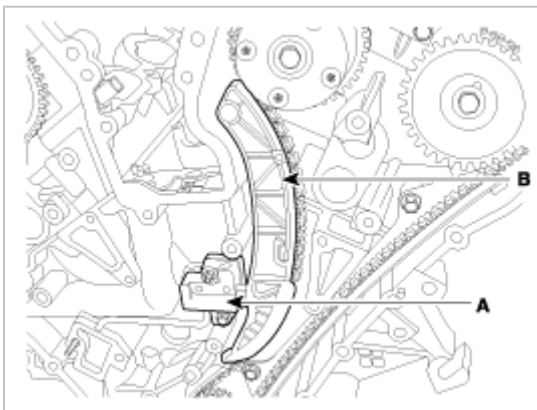
**Tightening torque**

18.62 ~ 21.56Nm(1.9 ~ 2.2kgf.m, 13.74 ~ 15.91lb-ft)

7. Install chain tensioner(A).

**Tightening torque**

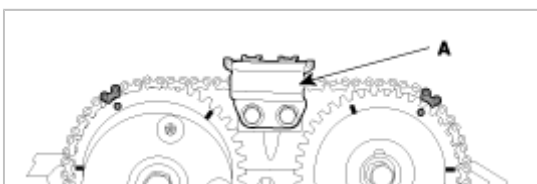
9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)



8. Install LH cam-to-cam guide(A).

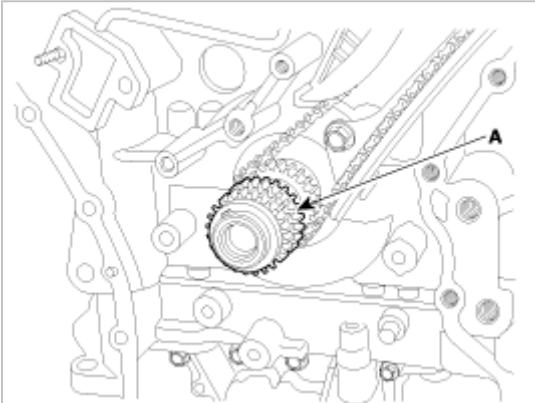
**Tightening torque**

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





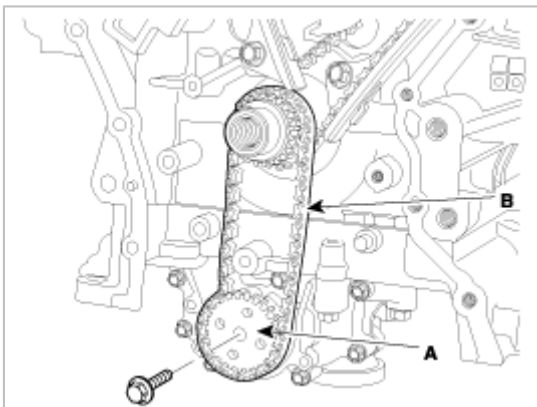
9. Install crankshaft sprocket(A)(O/P & RH camshaft drive).



10. Install oil pump chain(B) and oil pump sprocket(A).

#### Tightening torque

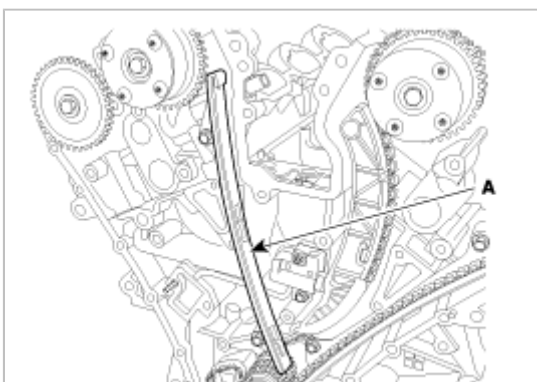
18.62 ~ 21.56Nm(1.9 ~ 2.2kgf.m, 13.74 ~ 15.91lb-ft)



11. Install RH timing chain guide(A).

#### Tightening torque

19.60 ~ 24.50Nm(2.0 ~ 2.5kgf.m, 14.17 ~ 18.08lb-ft)

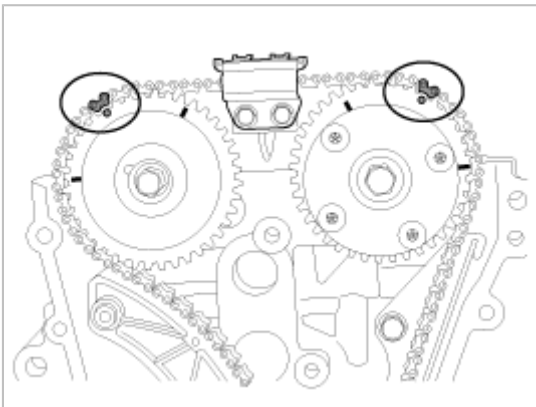


## 12. Install RH timing chain.

To install the timing chain with no slack between each shaft (cam, crank), follow the below procedure.

Crankshaft sprocket(A) → Intake camshaft sprocket(B) → Exhaust camshaft sprocket(C).

The timing mark of each sprockets should be matched with timing mark (color link) of timing chain at installing timing chain.

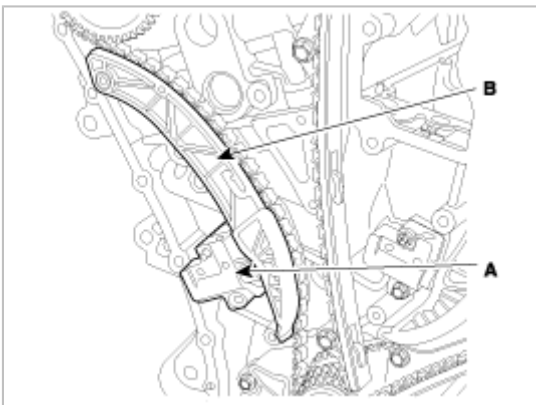


## 13. Install RH timing chain tensioner arm(B).

## 14. Install RH timing chain auto tensioner(A).

### Tightening torque

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

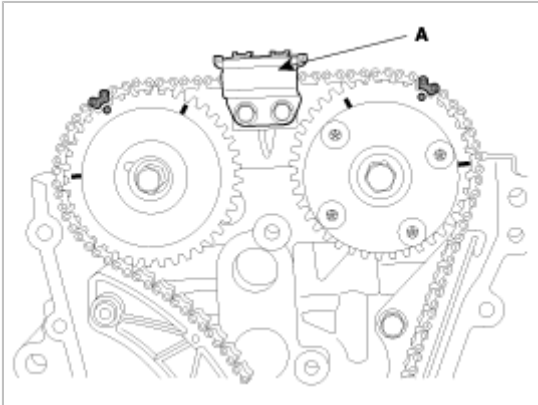


## 15. Install RH cam-to-cam guide(A).

### Tightening torque

### Tightening torque

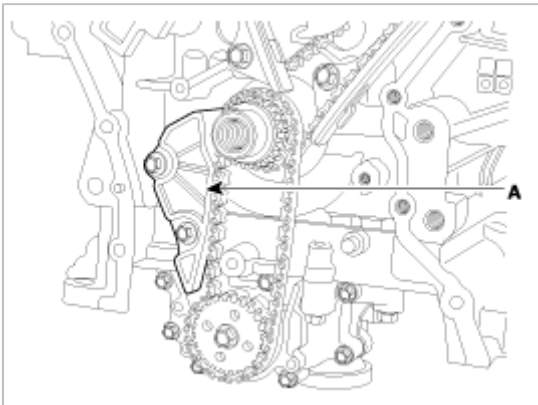
9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)



16. Install oil pump chain guide(A).

### Tightening torque

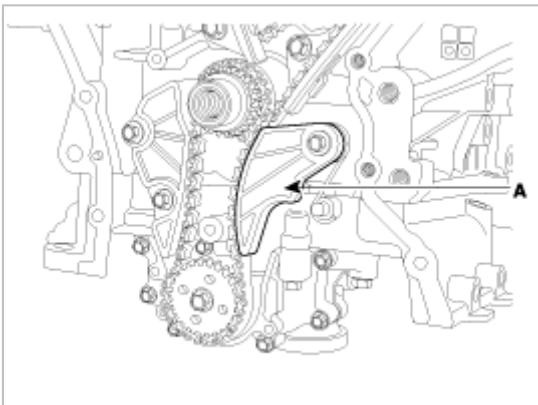
9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)



17. Install oil pump chain tensioner assembly(A).

### Tightening torque

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



18. Pull out the pins of hydraulic tensioner (LH & RH).

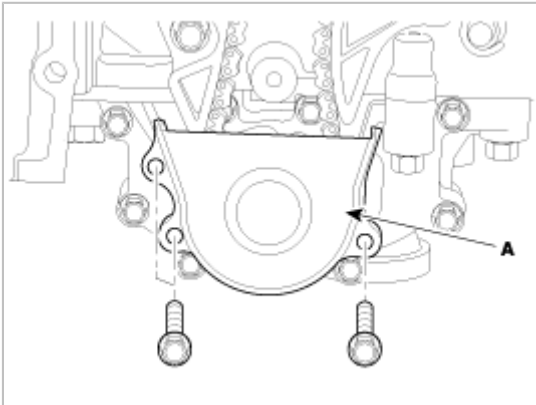
19. Install oil pump chain cover(A).

### Tightening torque



### Tightening torque

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



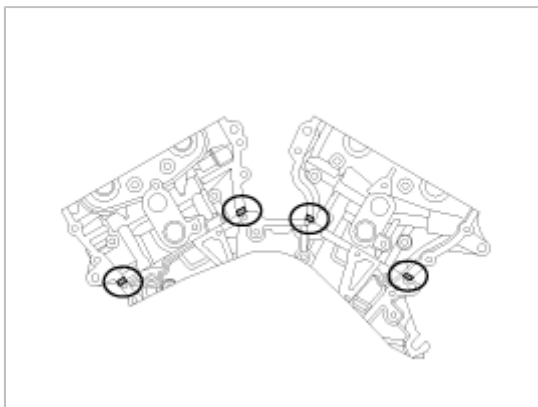
20. After rotating crankshaft 2 revolutions in regular direction(clockwise viewed from front), confirm the timing mark.

Always turn the crankshaft clockwise.

21. Install timing chain cover.

- A. The sealant locations on chain cover and on counter parts (cylinder head, cylinder block, and lower oil pan) must be free of engine oil and ETC.
- B. Before assembling the timing chain cover, the liquid sealant TB1217H should be applied on the gap between cylinder head and cylinder block  
The part must be assembled within 5 minutes after sealant was applied.

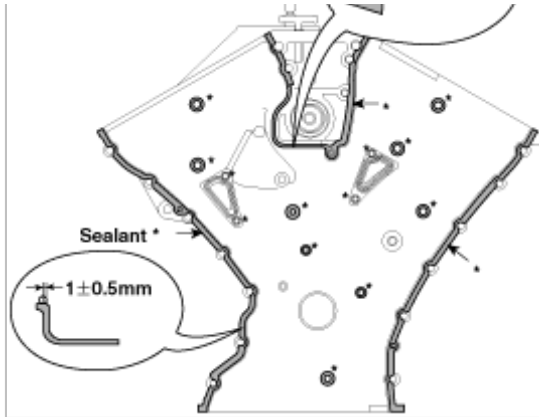
Bead width : 2.5mm(0.1in.)



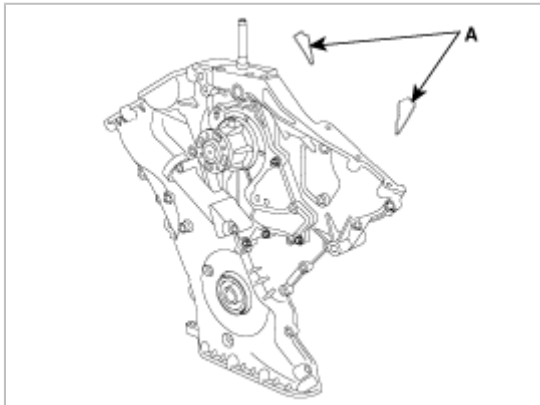
- C. After applying liquid sealant TB1217H on timing chain cover.  
The part must be assembled within 5 minutes after sealant was applied.  
Sealant should be applied without discontinuity.  
Sealant should also be applied all around the two holes of the dowel pins.

Bead width : 2.5mm(0.1in.)





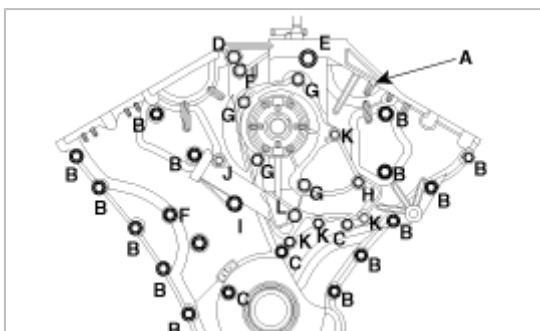
D. Install the new gasket(A) to the timing chain cover.



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

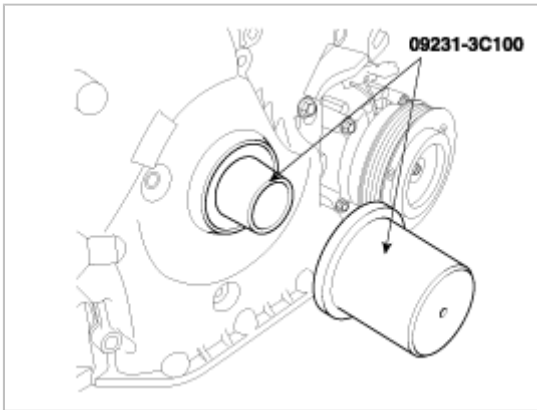
- B(17): 18.62 ~ 21.56Nm(1.9 ~ 2.2kgf.m, 13.74 ~ 15.91lb-ft)
- C(4): 9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)
- D(1): 58.80 ~ 68.80Nm(6.0 ~ 7.0kgf.m, 43.40 ~ 50.63lb-ft)
- E(1): 58.80 ~ 68.80Nm(6.0 ~ 7.0kgf.m, 43.40 ~ 50.63lb-ft)
- F(2): 24.50 ~ 26.46Nm(2.5 ~ 2.7kgf.m, 18.08 ~ 19.53lb-ft)
- G(4): 21.56 ~ 23.52Nm(2.2 ~ 2.4kgf.m, 15.91 ~ 17.36lb-ft)
- H(1): 9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)
- I(1): 9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)
- J(1): 9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)
- K(4): 9.80 ~ 11.76Nm(1.0 ~ 1.2kgf.m, 7.23 ~ 8.68lb-ft)
- L(1): 21.56 ~ 26.46Nm(2.2 ~ 2.7kgf.m, 15.91 ~ 19.53lb-ft) - New bolt





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

22. Using SST(09231-3C100), install timing chain cover oil seal.



23. Install lower 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 oil pan. The part must be assembled within 5 minutes after the sealant was applied.

Bead width : 2.5mm(0.1in.).



- Make clean the sealing face before assembling two parts.
- Remove harmful foreign matters on the sealing face before applying sealant.
- When applying sealant gasket, sealant must not be protruded into the inside of oil pan.
- To prevent leakage of oil, apply sealant gasket at the inner threads of the bolt holes.

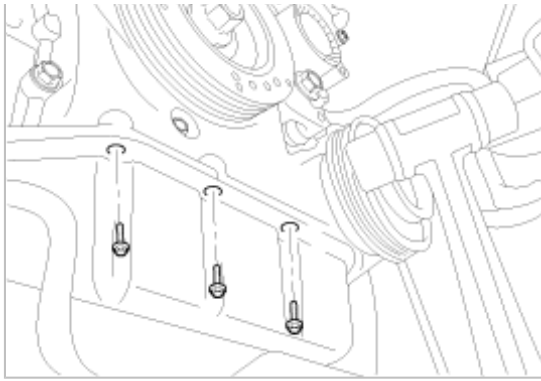
C. Install oil pan(A).

Uniformly tighten the bolts in several passes.

### Tightening torque

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

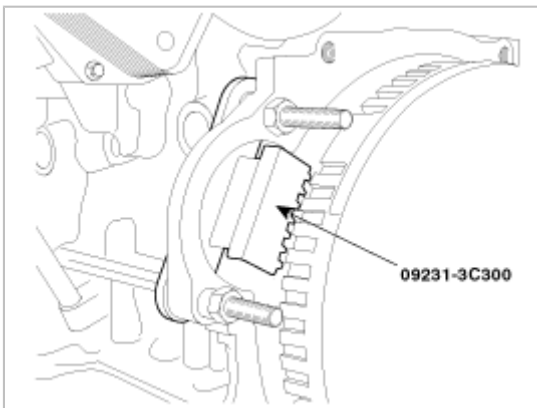
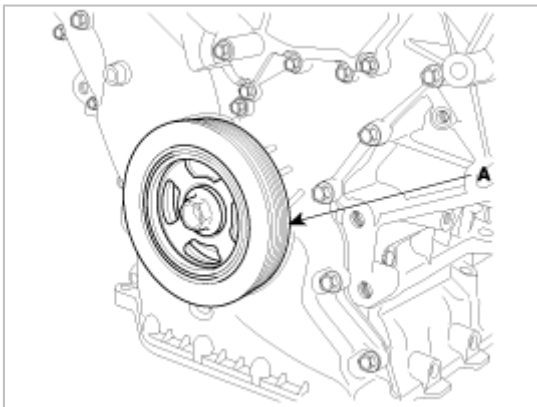




24. Using SST(09231-3C300) install crankshaft damper pulley(A).

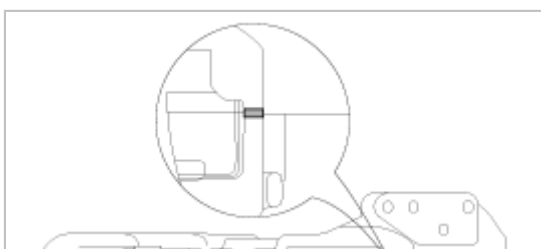
### Tightening torque

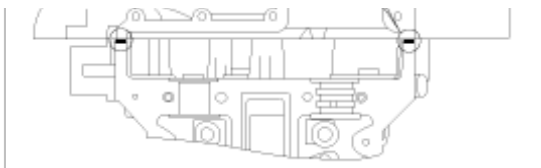
284.2 ~ 303.8Nm(29.0 ~ 31.0kgf.m, 209.76 ~ 224.22lb-ft)



25. Install cylinder head cover.

- A. The hardening sealant located on the upper area between timing chain cover and cylinder head cover should be removed before assembling cylinder head cover.
- B. After applying sealant(TB1217H), it should be assembled within 5 minutes.Bead width : 2.5mm (0.1in.)

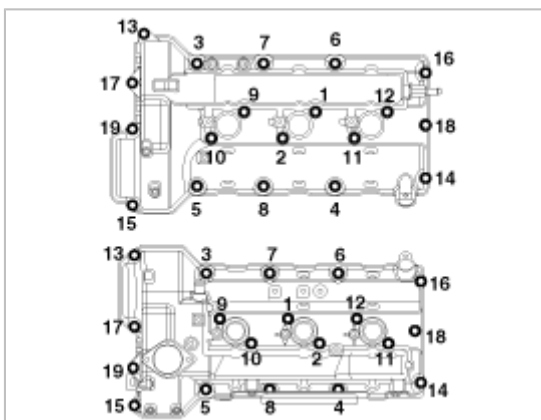




- C. The firing and/or blow out test should not be performed within 30 minutes after the cylinder head cover was assembled.
- D. Install the cylinder head cover bolts as following method.

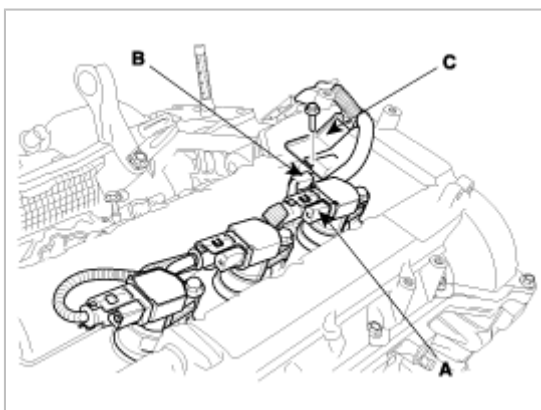
### Tightening torque

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



Do not reuse cylinder head cover gasket.

- E. Install ignition coil
- F. Connect RH ignition coil connector(A), condenser connector(B) and install wiring bracket(C).



- G. Install connector bracket from LH cylinder head cover.