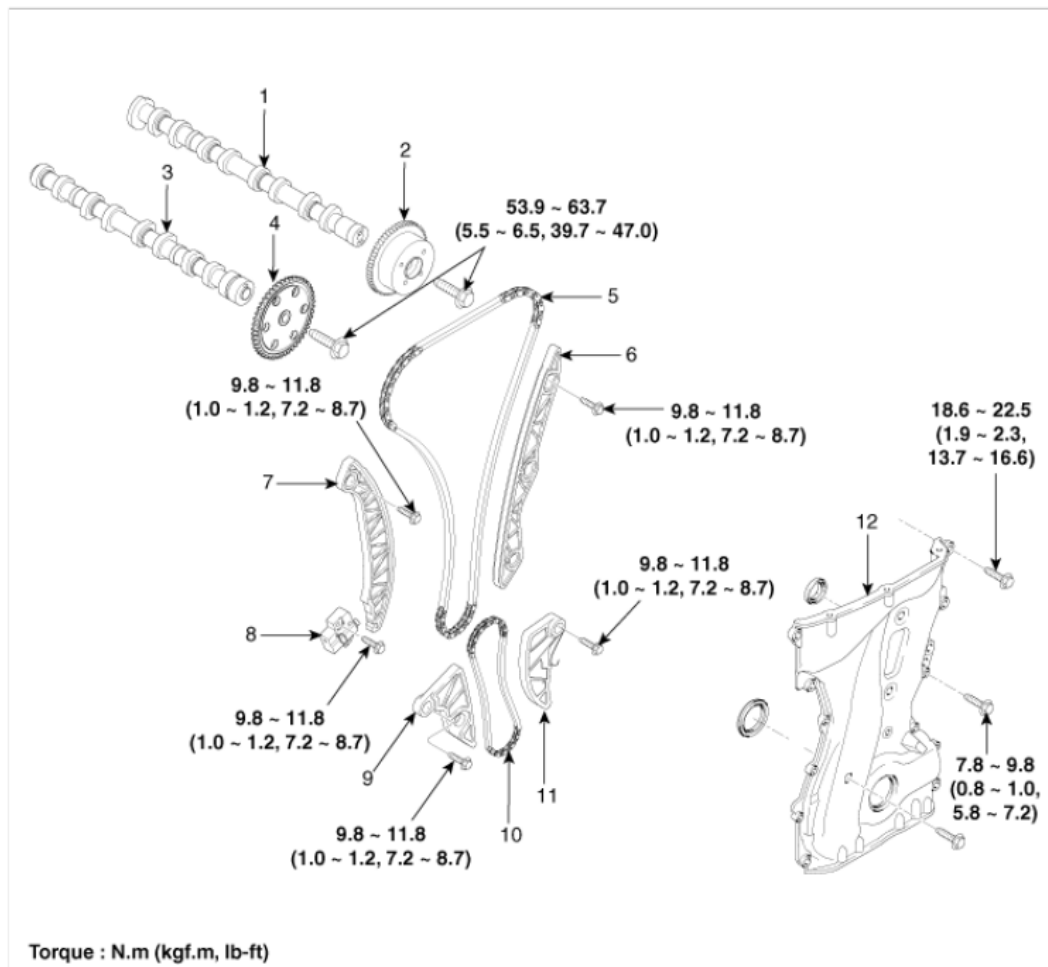


TIMING CHAIN

COMPONENTS

[2.0 ULEV - Single CVVT]



1. Intake camshaft
2. Intake CVVT assembly
3. Exhaust camshaft
4. Exhaust camshaft sprocket

5. Timing chain
6. Timing chain tensioner arm
7. Timing chain tensioner guide
8. Timing chain tensioner

9. Oil pump chain guide
10. Oil pump chain
11. Oil pump chain tensioner arm
12. Timing chain cover

Fig. 1: Identifying Timing Chain Components With Torque Specifications (2.0 ULEV - Single CVVT)
 Courtesy of KIA MOTORS AMERICA, INC.

[Dual CVVT]

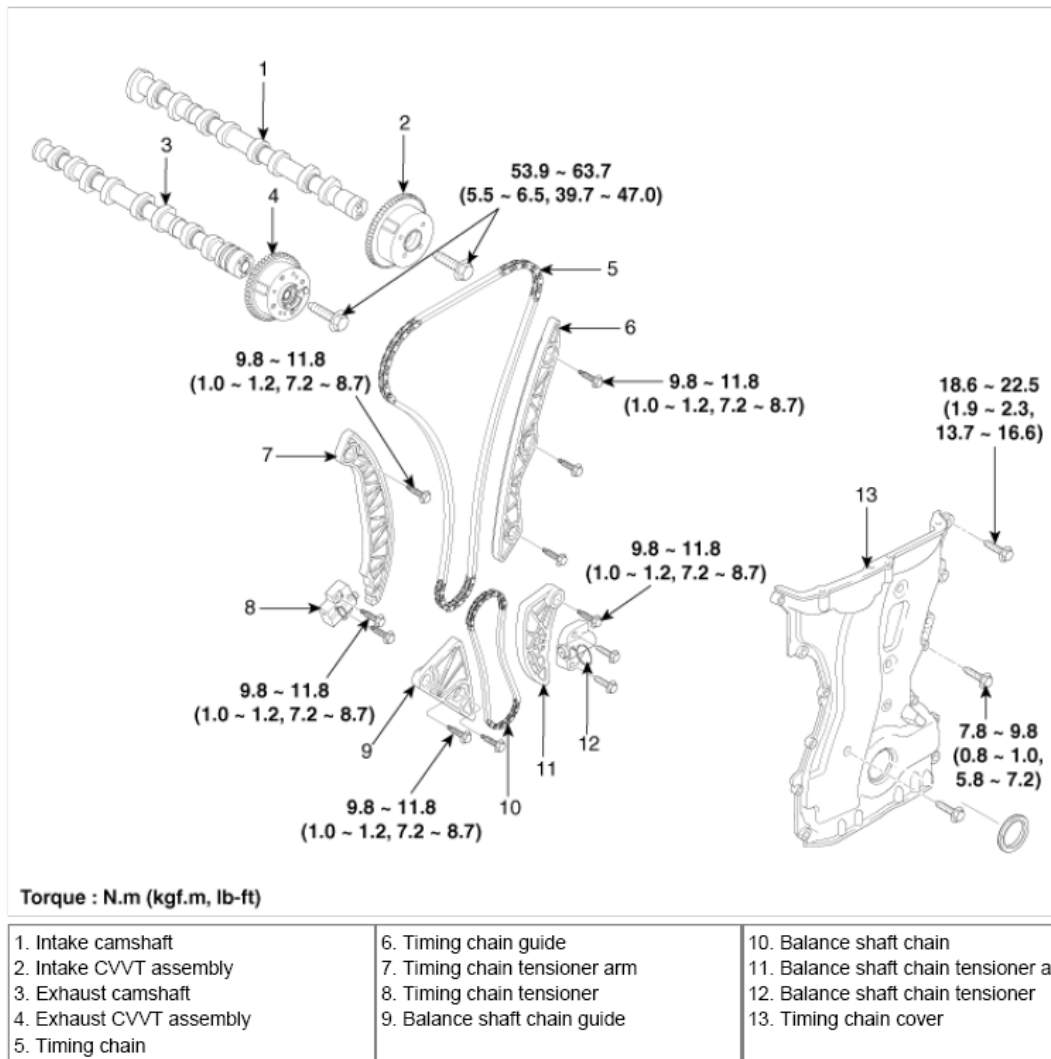


Fig. 2: Identifying Timing Chain Components With Torque Specifications (Dual CVVT)
 Courtesy of KIA MOTORS AMERICA, INC.

REMOVAL

1. Disconnect the battery negative cable (A) .
2. Remove the engine cover (B) .

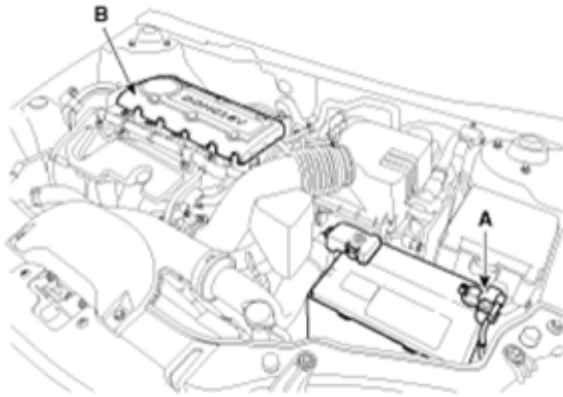


Fig. 3: Identifying Engine Cover & Battery Negative Cable
Courtesy of KIA MOTORS AMERICA, INC.

3. Remove RH front wheel.
4. Remove RH side cover.
5. Set No. 1 cylinder to TDC/compression.

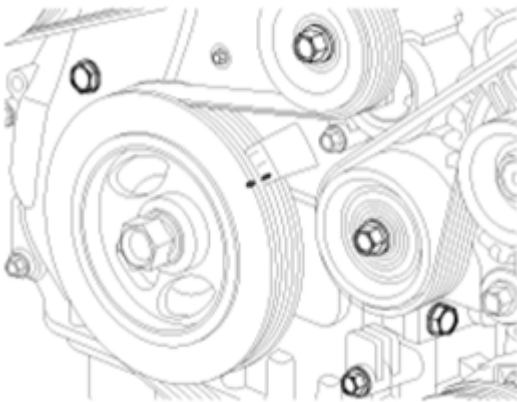


Fig. 4: Identifying Timing Marks
Courtesy of KIA MOTORS AMERICA, INC.

6. Drain the engine oil, and then set a jack to the oil pan.

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

7. Disconnect the ground line and then remove the engine mounting bracket (A) .

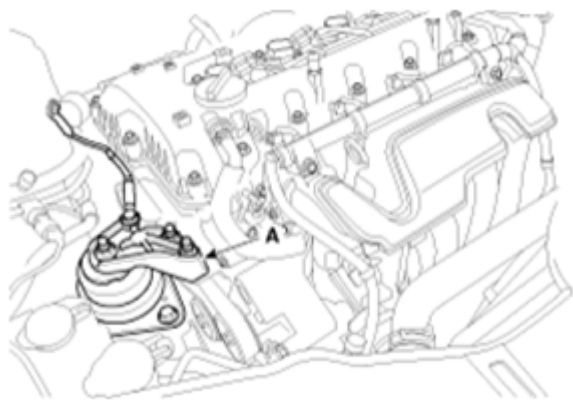


Fig. 5: Identifying Engine Mounting Bracket
Courtesy of KIA MOTORS AMERICA, INC.

8. Remove the drive belt (A) .

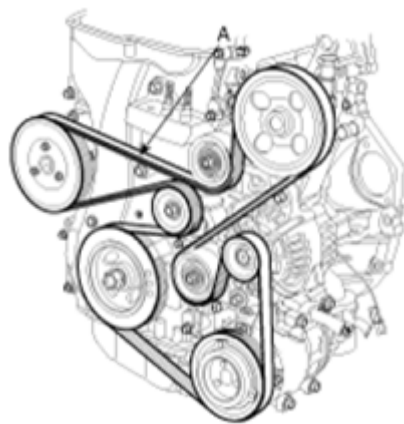


Fig. 6: Identifying Drive Belt
Courtesy of KIA MOTORS AMERICA, INC.

9. Remove the idler (A) and drive belt tensioner (B) .

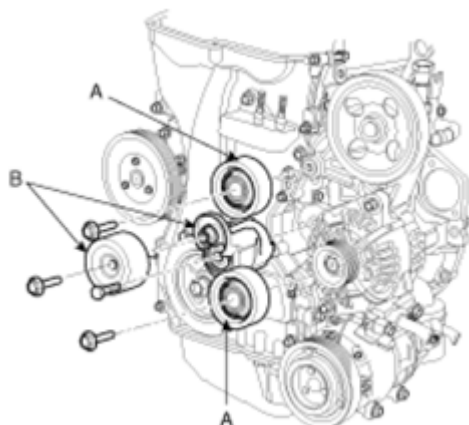


Fig. 7: Identifying Idler & Drive Belt Tensioner
Courtesy of KIA MOTORS AMERICA, INC.

CAUTION: Tensioner pulley bolt is left - handed screw.

10. Remove the water pump pulley (A) , crankshaft pulley (B) and engine support bracket (C) .

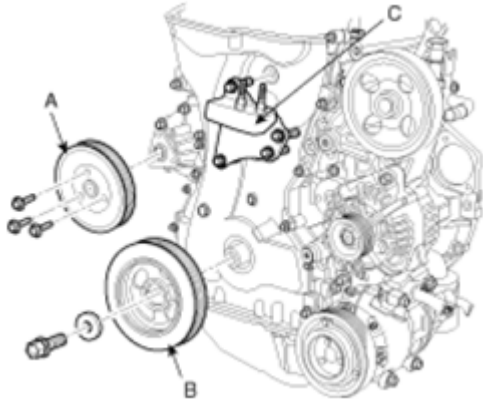


Fig. 8: Identifying Water Pump Pulley, Crankshaft Pulley, & Engine Support Bracket
Courtesy of KIA MOTORS AMERICA, INC.

NOTE: Use the SST (flywheel stopper, 09231-3K000) to remove the crankshaft pulley bolt, after remove the starter.

11. Disconnect the ignition coil connectors (A) and remove the ignition coils.



Fig. 9: Identifying Ignition Coil Connectors
Courtesy of KIA MOTORS AMERICA, INC.

12. Remove the cylinder head cover (A) .

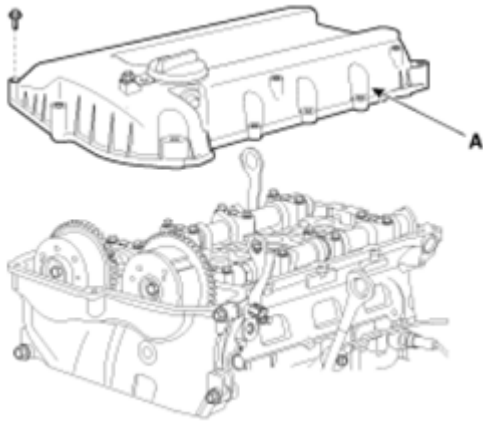


Fig. 10: Identifying Cylinder Head Cover
Courtesy of KIA MOTORS AMERICA, INC.

13. Remove the compressor lower bolts.

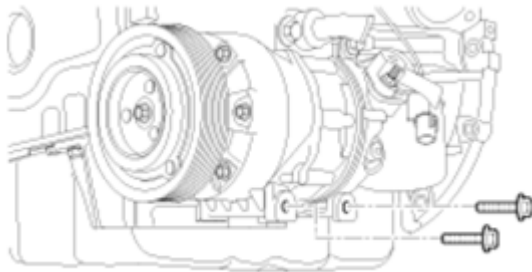


Fig. 11: Identifying Compressor Lower Bolts
Courtesy of KIA MOTORS AMERICA, INC.

14. Remove the compressor bracket.
15. Remove the oil pan.

CAUTION: Be careful not to damage the contact surfaces of cylinder block and oil pan.

16. Remove the timing chain cover (A) by gently prying the portions between the cylinder head and cylinder block.

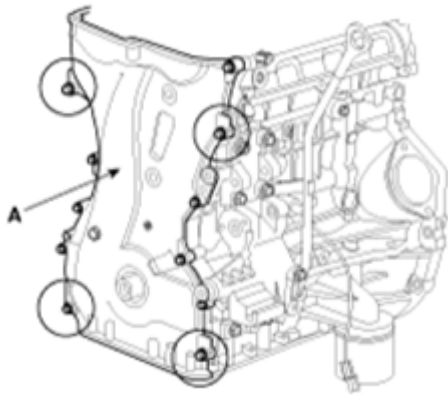


Fig. 12: Identifying Timing Chain Cover
Courtesy of KIA MOTORS AMERICA, INC.

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

17. 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.

NOTE: Before removing the timing chain, mark the 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.

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

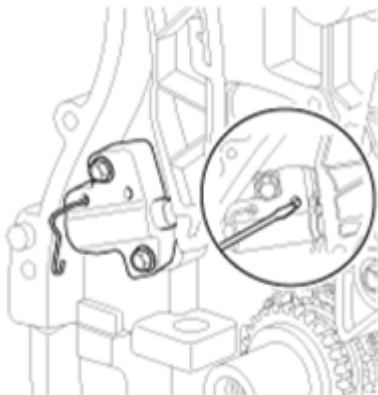


Fig. 13: Installing Set Pin
Courtesy of KIA MOTORS AMERICA, INC.

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

[Single CVVT]

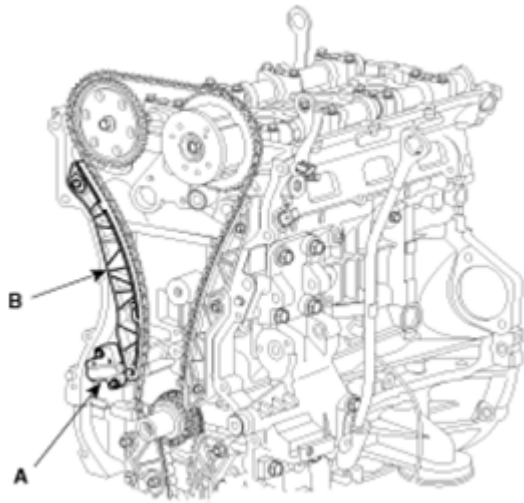


Fig. 14: Identifying Timing Chain Tensioner & Tensioner Arm (Single CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

[Dual CVVT]

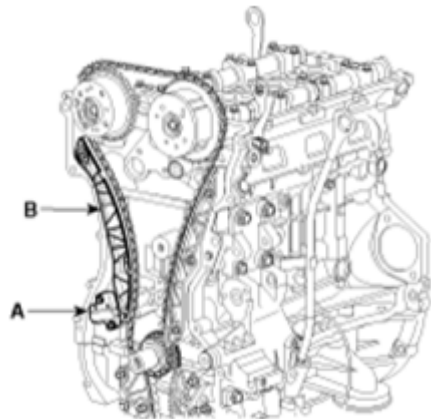


Fig. 15: Identifying Timing Chain Tensioner & Tensioner Arm (Dual CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

20. Remove the timing chain.
21. Remove the timing chain guide (A) .

[Single CVVT]

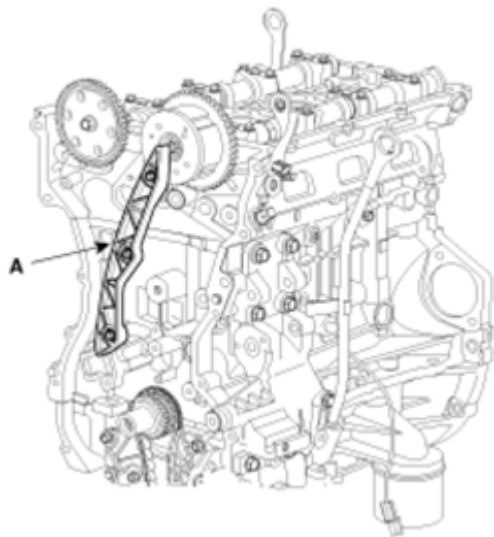


Fig. 16: Identifying Timing Chain Guide (Single CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

[Dual CVVT]

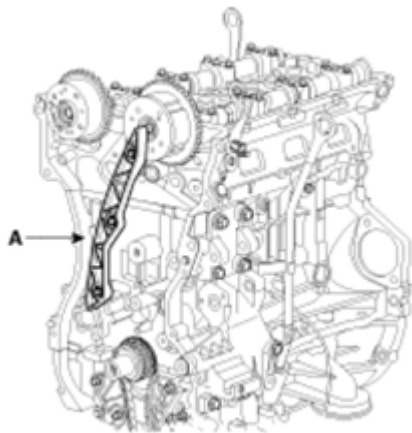


Fig. 17: Identifying Timing Chain Guide (Dual CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

22. Remove the timing chain oil jet (A) .
23. Remove the crankshaft chain sprocket (B) .

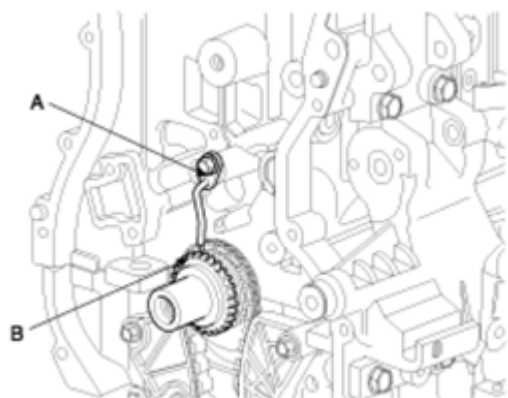


Fig. 18: Identifying Timing Chain Oil Jet & Crankshaft Chain Sprocket
Courtesy of KIA MOTORS AMERICA, INC.

24. Remove the oil pump chain.

(Refer to **LUBRICATION SYSTEM**)

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.

Drive 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 oil pump chain.

(Refer to **LUBRICATION SYSTEM**)

2. Install the crankshaft sprocket (B) .
3. Install the timing chain oil jet (A) .

Tightening torque:

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

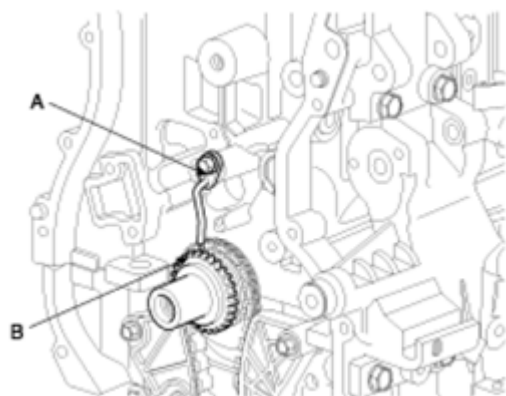


Fig. 19: Identifying Crankshaft Sprocket & Timing Chain Oil Jet
Courtesy of KIA MOTORS AMERICA, INC.

4. 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 CVVT sprocket and exhaust camshaft 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.
5. Install the timing chain guide (A) .

Tightening torque:

9.8 ~ 11.6N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

[Single CVVT]

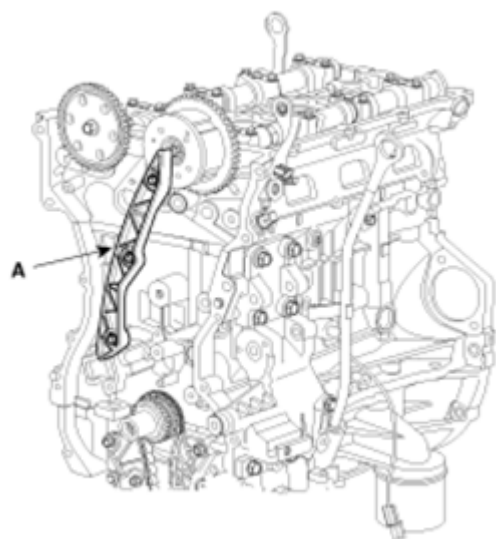


Fig. 20: Identifying Timing Chain Guide (Single CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

[Dual CVVT]

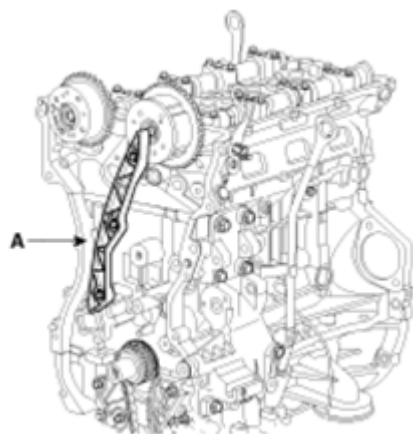


Fig. 21: Identifying Timing Chain Guide (Dual CVVT)

Courtesy of KIA MOTORS AMERICA, INC.

6. Install the timing chain.

To install the timing chain with no slack between each shaft (cam, crank), use the following procedure:

Crankshaft sprocket (A) --> Timing chain guide (B) --> Intake CVVT sprocket (C) --> Exhaust CVVT sprocket or camshaft sprocket (D) .

[Single CVVT]

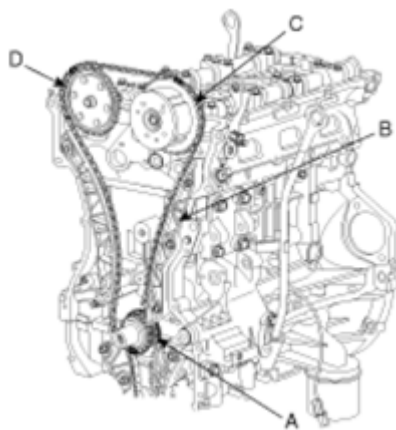


Fig. 22: Installing Timing Chain (Single CVVT)

Courtesy of KIA MOTORS AMERICA, INC.

[Dual CVVT]

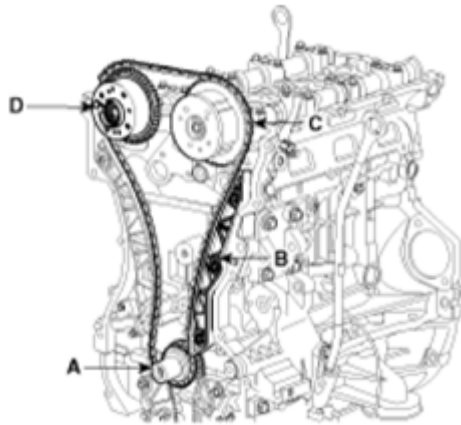


Fig. 23: Installing Timing Chain (Dual CVVT)

Courtesy of KIA MOTORS AMERICA, INC.

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

[Single CVVT]

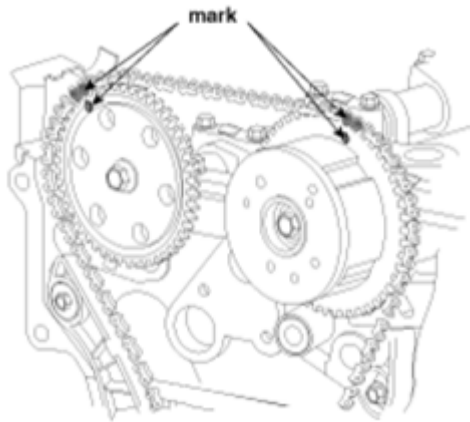


Fig. 24: Identifying Timing Marks (Single CVVT)

Courtesy of KIA MOTORS AMERICA, INC.

[Dual CVVT]

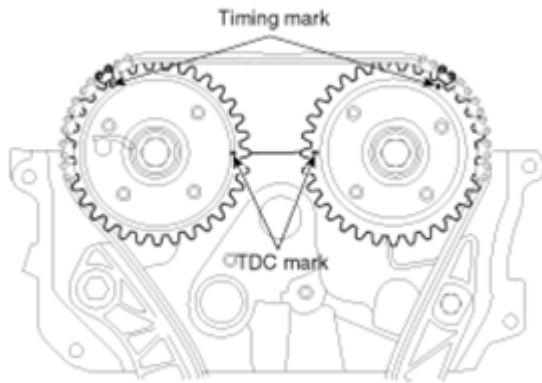


Fig. 25: Identifying Timing Marks (Dual CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

7. Install timing chain tensioner arm (B) .

Tightening torque:

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

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

Tightening torque:

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

[Single CVVT]

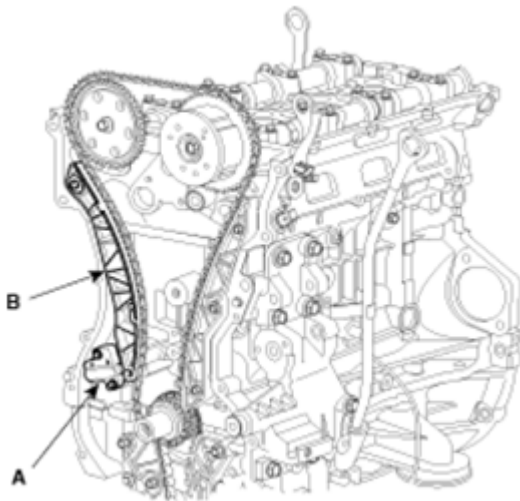


Fig. 26: Identifying Timing Chain Auto Tensioner & Tensioner Arm (Single CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

[Dual CVVT]

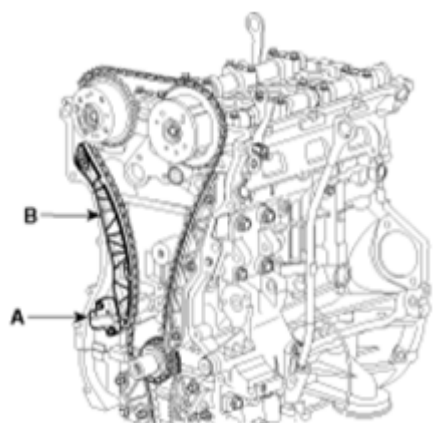


Fig. 27: Identifying Timing Chain Auto Tensioner & Tensioner Arm (Dual CVVT)
Courtesy of KIA MOTORS AMERICA, INC.

9. After rotating crankshaft 2 revolutions in regular direction (clockwise viewed from front) , confirm the timing mark.
10. Install timing chain cover.
 1. Using a gasket scraper, remove all the old packing material from the gasket surfaces.
 2. 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.
 3. 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 : 2.5mm (0.1in.)

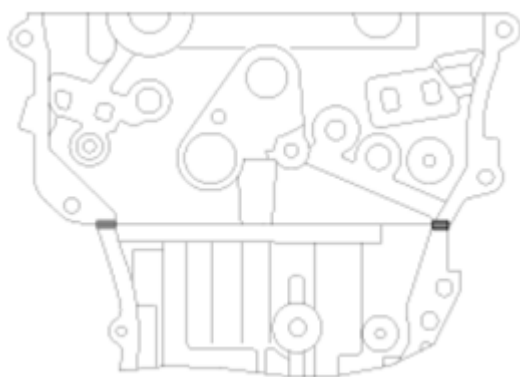


Fig. 28: Identifying Liquid Sealant Application Area
Courtesy of KIA MOTORS AMERICA, INC.

4. 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 : 2.5mm (0.1in.)



Fig. 29: Identifying Liquid Sealant Application Area
Courtesy of KIA MOTORS AMERICA, INC.

5. 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: 7.84 ~ 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)

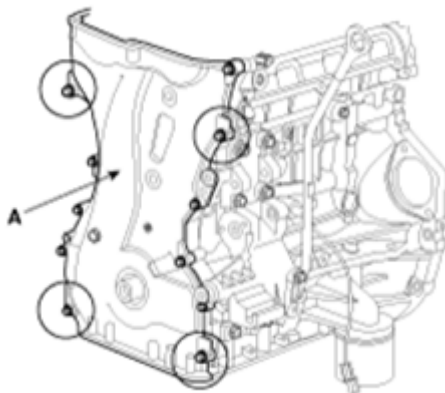


Fig. 30: Identifying Cylinder Block Dowel Pins
Courtesy of KIA MOTORS AMERICA, INC.

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

11. Install oil pan.

1. Using a gasket scraper, remove all the old packing material from the gasket surfaces.
2. Before assembling the oil pan, the liquid sealant Loctite 5900H should be applied on oil pan.

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

Sealant : Loctite 5900H or equivalent

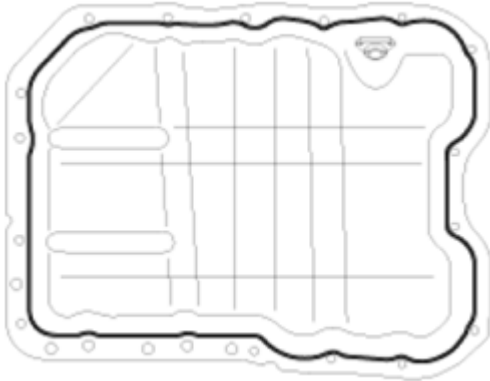


Fig. 31: Identifying Sealant Application Area
Courtesy of KIA MOTORS AMERICA, INC.

CAUTION:

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

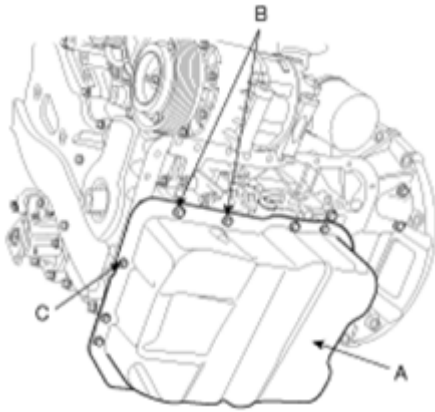
3. Install oil pan.

Uniformly tighten the bolts in several passes.

Tightening torque

M8 bolts : 26.5 ~ 30.4N.m (2.7 ~ 3.1kgf.m, 19.5 ~ 22.4lb-ft)

M6 bolts : 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

**Fig. 32: Installing Oil Pan**

Courtesy of KIA MOTORS AMERICA, INC.

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

12. Install the air compressor bracket.

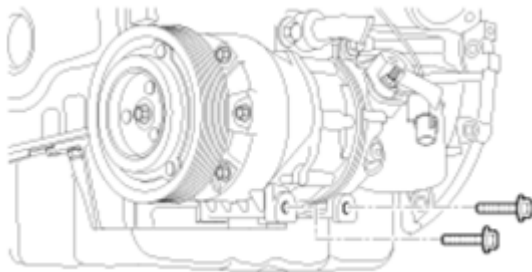
Tightening torque:

19.6 ~ 23.5N.m (2.0 ~ 2.4kgf.m, 13.7 ~ 14.5lb-ft)

13. Install the compressor lower bolts.

Tightening torque:

19.6 ~ 24.5N.m (2.0 ~ 2.5kgf.m, 13.7 ~ 18.1lb-ft)

**Fig. 33: Identifying Compressor Lower Bolts**

Courtesy of KIA MOTORS AMERICA, INC.

14. Install cylinder head cover.

1. The hardening sealant located on the upper area between timing chain cover and cylinder head should be removed before assembling cylinder head cover.
2. After applying sealant, it should be assembled within 5 minutes.

Bead width : 2.5mm (0.1in.)

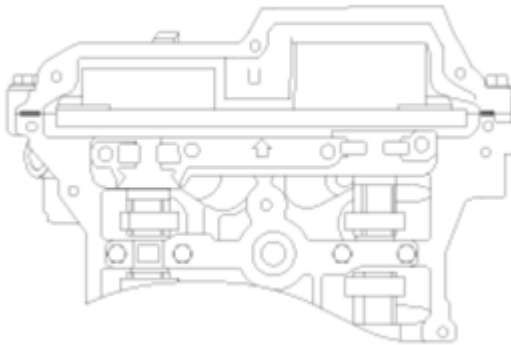


Fig. 34: Identifying Sealant Application Area
 Courtesy of KIA MOTORS AMERICA, INC.

3. Install the cylinder head cover bolts as following method.

Tightening torque

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

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

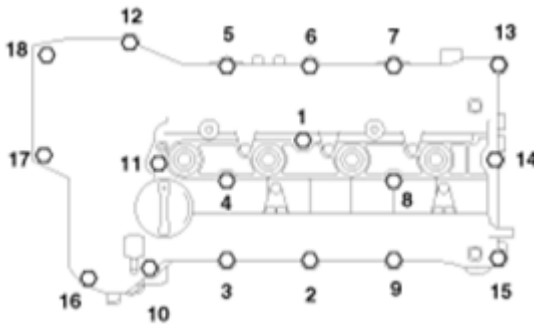


Fig. 35: Identifying Tightening Sequence Of Cylinder Head Cover Bolts
 Courtesy of KIA MOTORS AMERICA, INC.

CAUTION:

- Do not reuse cylinder head cover gasket.
- The firing and/or blow out test should not be performed within 30 minutes after the cylinder head cover was assembled.

15. Install the ignition coils and connect the ignition coil connectors (A) .



Fig. 36: Identifying Ignition Coil Connectors
Courtesy of KIA MOTORS AMERICA, INC.

16. Install the engine support bracket (C) .

Tightening torque:

M10 : 39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lb-ft)

M8 : 19.6 ~ 24.5N.m (2.0 ~ 2.5kgf.m, 14.5 ~ 18.1lb-ft)

17. Install the crankshaft pulley (B) .

Tightening torque:

166.6 ~ 176.4N.m (17.0 ~ 18.0kgf.m, 122.9 ~ 130.1lb-ft)

NOTE: Use the SST (flywheel stopper, 09231-3K000) to install the crankshaft pulley bolt, after remove the starter.

18. Install the water pump pulley (A) .

Tightening torque:

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

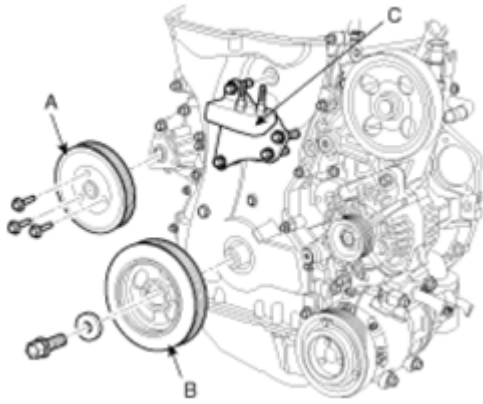


Fig. 37: Installing Engine Support Bracket, Crankshaft Pulley, & Water Pump Pulley
Courtesy of KIA MOTORS AMERICA, INC.

19. Install the drive belt tensioner and tensioner pulley (B).

Tightening torque:

53.9 ~ 63.7N.m (5.5 ~ 6.5kgf.m, 39.7 ~ 47.0lb-ft)

NOTE: Tensioner pulley bolt is left-handed screw.

20. Install idler pulley (A) .

Tightening torque:

53.9 ~ 63.7N.m (5.5 ~ 6.5kgf.m, 39.7 ~ 47.0lb-ft)

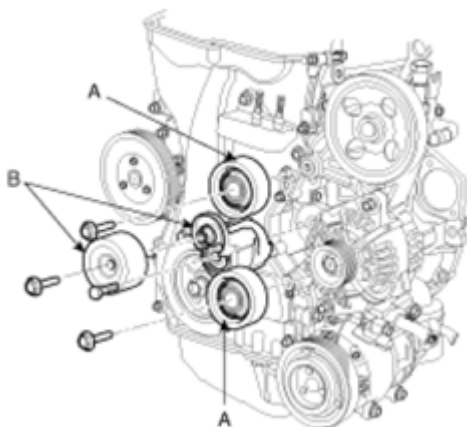


Fig. 38: Installing Drive Belt Tensioner, Tensioner Pulley, & Idler Pulley
Courtesy of KIA MOTORS AMERICA, INC.

21. Install the drive belt (A) .

Crankshaft pulley --> A/C pulley --> Alternator pulley --> Idler pulley --> P/S pump pulley --> Idler pulley --> Water pump pulley --> Tensioner pulley.

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.

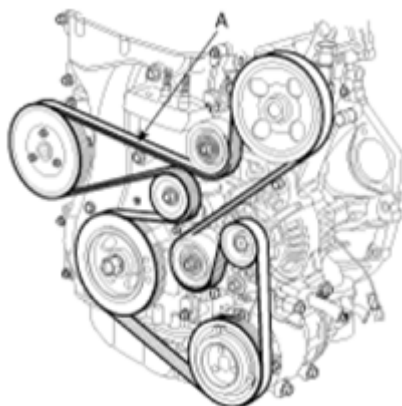


Fig. 39: Identifying Drive Belt

Courtesy of KIA MOTORS AMERICA, INC.

22. Install the engine mounting bracket (A) and then connect the ground cable.

Tightening torque:

63.7 ~ 83.4N.m (6.5 ~ 8.5kgf.m, 47.0 ~ 61.5lb-ft)

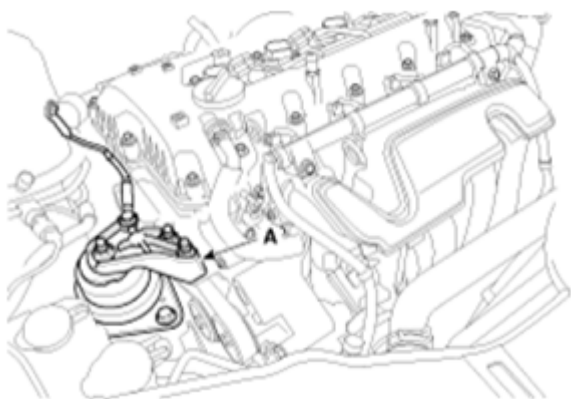


Fig. 40: Identifying Engine Mounting Bracket

Courtesy of KIA MOTORS AMERICA, INC.

23. Remove the RH side cover.

Tightening torque:

8.8 ~ 10.8N.m (0.9 ~ 1.1kgf.m, 6.5 ~ 7.9lb-ft)

24. Install the RH front wheel.

Tightening torque:

88.3 ~ 107.9N.m (9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

25. Install the engine cover (B) .

26. Connect the battery negative cable (A) .

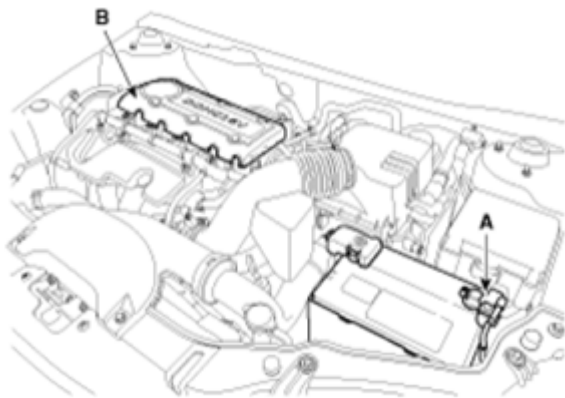


Fig. 41: Identifying Engine Cover & Battery Negative Cable
Courtesy of KIA MOTORS AMERICA, INC.