Camshaft Timing Chain, Sprocket, and Tensioner Installation

Tools Required

- J 45027 Tensioner Tool
- J 45059 Angle Meter

1. Install the timing chain drive sprocket to the crankshaft with the timing mark in the 5 o'clock position.
Important:

- There are three colored links on the timing chain. Two links are of matching color, and one link is of a unique color. Use the following procedure to line up the links with the sprockets. Orient the chain so that the colored links are visible.
- Always use new sprocket bolts.

2. Assemble the intake camshaft sprocket to the timing chain with the timing mark lined up with the uniquely colored link (1). Hand tighten a new intake camshaft sprocket bolt.
3. Lower the timing chain through the opening in the cylinder head. Use care to ensure that the chain goes around both sides of the cylinder block bosses (1,2).
4. Route the timing chain around the crankshaft sprocket and line up the first matching colored link (2) with the timing mark on the crankshaft sprocket, in approximately the 5 o'clock position.
Notice: Refer to Fastener Notice.

5. Install the adjustable timing chain guide through the opening in the cylinder head and install the adjustable timing chain bolt.

Tighten:

Tighten the adjustable timing chain guide bolt to 10 [n·m] (89 lb in).
Important: Always install new sprocket bolts.

6. Install the exhaust camshaft sprocket and a new bolt loosely onto the exhaust camshaft.
7. Align the timing mark on the sprocket with the last matching colored link (3). Install the bolt finger tight.
Notice: Do not rotate either camshaft more than half turn in either direction with crankshaft at top dead center (TDC). To do so may cause valve to piston contact resulting in a damaged valve and/or a damaged piston.

8. If the camshaft is 180 degrees out of time, use the following procedure to re-align the cam.

   Using a 24 mm wrench, first turn the intake camshaft until the alignment feature on the back of the camshaft sprocket seats in the notch in the front of the intake camshaft.

   1.1. Turn the crankshaft 45 degrees in either direction.
   1.2. Turn the intake cam to the appropriate location.
   1.3. Turn the crankshaft back to top dead center.

9. When the sprocket seats on the cam, tighten the sprocket bolt hand tight.
10. Verify that all of the colored links and the appropriate timing marks are still aligned. If they are not, repeat the portion of the procedure necessary to align the timing marks.
11. Install the fixed timing chain guide.

    Tighten:
    
    Tighten the fixed timing chain guide bolts to 10 [n-m] (89 lb in).
12. Install the upper **timing chain** guide.

**Tighten:**

Tighten the upper **timing chain** guide bolts to 10 [n-m] (89 lb in).
13. Using a 24 mm wrench, engage the hex on the intake camshaft and using a torque wrench, tighten the camshaft sprocket bolt.

Tighten:

Tighten the intake camshaft sprocket bolt to 85 [n-m] (63 lb ft), plus 30 degrees using the J 45059.

14. Using a 24 mm wrench, engage the hex on the exhaust camshaft and using a torque wrench, tighten the camshaft sprocket bolt.

Tighten:

Tighten the exhaust camshaft sprocket bolt to 85 [n-m] (63 lb ft), plus 30 degrees using the J 45059.
15. Inspect the timing chain tensioner. If the timing chain tensioner seal is damaged, replace the seal.
16. Measure the timing chain tensioner assembly from end to end.

A new tensioner should be supplied in the fully compressed non-active state. A tensioner in the compressed state will measure 72 mm (2.83 in) (a) from end to end. A tensioner in the active state will measure 85 mm (3.35 in) (a) from end to end.
17. If the timing chain tensioner is not in the compressed state, perform the following steps:
   1.1. Remove the piston assembly from the body of the timing chain tensioner by pulling it out.
   1.2. Install the J 45027-2 (2) into a vise.
   1.3. Install the notch end of the piston assembly into the J 45027-2 (2).
   1.4. Using the J 45027-1 (1), turn the ratchet cylinder into the piston.
18. Inspect the bore of the tensioner body for dirt, debris, and damage. If any damage appears, replace the tensioner. Clean dirt or debris out with a lint free cloth.

19. Install the compressed piston assembly back into the timing chain tensioner body until it stops at the bottom of the bore. Do not compress the piston assembly against the bottom of the bore. If the piston assembly is compressed against the bottom of the bore, it will activate the tensioner, which will then need to be reset again.

20. At this point the tensioner should measure approximately 72 mm (2.83 in) (a) from end to end. If the tensioner does not read 72 mm (2.83 in) (a) from end to end repeat steps 17.1 and 17.4.
21. Inspect to ensure all dirt and debris is removed from the timing chain tensioner threaded hole in the cylinder head.

**Important:** Make sure the timing chain tensioner seal is centered throughout the torque procedure to eliminate the possibility of an oil leak.

22. Install the new timing chain tensioner assembly.

   Tighten:
   
   Tighten the timing chain tensioner to 75 [n-m] (55 lb ft).

23. The timing chain tensioner is released by compressing it 2 mm (0.079 in) which will release the locking mechanism in the ratchet. To release the timing chain tensioner, use a suitable tool with a rubber tip on the end. Feed the tool down through the cam drive chest to rest on the cam chain. Then give a sharp jolt diagonally downwards to release the tensioner.
24. Install the **timing chain** oiling nozzle.

   Tighten:

   Tighten the **timing chain** oiling nozzle bolt to 10 [n-m] (89 lb in).
25. Apply sealant GM P/N 12345382 (Canadian P/N 10953489) or equivalent to the thread, and install the timing chain guide bolt access hole plug.

Tighten:

Tighten the access hole plug to 90 [n-m] (66 lb ft).