CAUTION:

The magnetic timing wheels (1) must not come in contact with magnets (pickup tools, trays, etc.) or any other strong magnetic field. This will destroy the timing wheels ability to correctly relay camshaft position to the camshaft position sensor.
CAUTION:

When the timing chain is removed and the cylinder heads are still installed, Do not forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION:

DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.
1. Remove the upper intake manifold, all ignition coils, all spark plugs, left cylinder head cover and left cam phasers. Refer to ASSEMBLY, VARIABLE VALVE TIMING, PHASER / OIL CONTROL VALVE, REMOVAL.

2. Rotate the camshafts counterclockwise to position the alignment holes (1) approximately 30° before top-dead-center. This places the camshafts in the neutral position (no valve load).

   **NOTE:**
   
   Camshaft bearing caps should have been marked during engine manufacturing. For example, the number one exhaust camshaft bearing cap is marked "1E->". The caps should be installed with the notch forward.

3. Loosen the camshaft bearing cap bolts in the sequence shown in illustration.

   **NOTE:**
   
   When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing the camshaft.

4. Remove the camshaft bearing caps and the camshafts.

**CYLINDER HEAD > CAMSHAFT, ENGINE > REMOVAL > RIGHT**
Fig 1: Magnetic Timing Wheels

⚠️ CAUTION:

The magnetic timing wheels (1) must not come in contact with magnets (pickup tools, trays, etc.) or any other strong magnetic field. This will destroy the timing wheels ability to correctly relay camshaft position to the camshaft position sensor.
![Camshaft Bearing Cap Bolts Removal Sequence - Right](image)

CAUTION:

When the timing chain is removed and the cylinder heads are still installed, Do not forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION:

DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.
1. Remove the upper intake manifold, all ignition coils, all spark plugs, right cylinder head cover and right cam phasers. Refer to ASSEMBLY, VARIABLE VALVE TIMING, PHASER / OIL CONTROL VALVE, REMOVAL.

**NOTE:**

*Camshaft bearing caps should have been marked during engine manufacturing. For example, the number one exhaust camshaft bearing cap is marked "1E->". The caps should be installed with the notch forward.*

2. Loosen the camshaft bearing cap bolts in the sequence shown in illustration.

**NOTE:**

*When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing the camshaft.*

3. Remove the camshaft bearing caps and the camshafts.

**CYLINDER HEAD > CAMSHAFT, ENGINE > INSTALLATION > LEFT**
Fig 1: Magnetic Timing Wheels

![Diagram of magnetic timing wheels]

Courtesy of CHRYSLER GROUP, LLC

⚠️ **CAUTION:**

The magnetic timing wheels (1) must not come in contact with magnets (pickup tools, trays, etc.) or any other strong magnetic field. This will destroy the timing wheels ability to correctly relay camshaft position to the camshaft position sensor.
1. Lubricate the camshaft journals with clean engine oil.

2. Install the left side camshaft(s) with the alignment holes (1) positioned approximately 30° before top-dead-center. This will place the camshafts at the neutral position (no valve load) easing the installation of the camshaft bearing caps.

3. Install the camshaft bearing caps and hand tighten the retaining bolts to 2 N.m (18 in. lbs.).

**NOTE:**

Caps are identified numerically (1 through 4), intake or exhaust (I or E) and should be installed from the front to the rear of the engine. All caps should be installed with the notch forward so that the stamped arrows (<) on the caps point toward the front of the engine.
4. Tighten the bearing cap retaining bolts in the sequence shown in illustration to 9.5 N.m (84 in. lbs.).

Fig 3: Positioning Camshaft Alignment Holes Vertically

5. Rotate the camshafts clockwise to top-dead-center by positioning the alignment holes (1) vertically.

6. Install the left cam phasers, cylinder head cover, spark plugs, ignition coils and the upper intake manifold. Refer to ASSEMBLY, VARIABLE VALVE TIMING, PHASER / OIL CONTROL VALVE, INSTALLATION.

NOTE:
The Cam/Crank Variation Relearn procedure must be performed using the scan tool anytime there has been a repair/replacement made to a powertrain system, for example: flywheel, valvetrain, camshaft and/or crankshaft sensors or components.
CAUTION:

The magnetic timing wheels (1) must not come in contact with magnets (pickup tools, trays, etc.) or any other strong magnetic field. This will destroy the timing wheels ability to correctly relay camshaft position to the camshaft position sensor.
1. Lubricate camshaft journals with clean engine oil.

2. Install the right side camshaft(s) at top-dead-center by positioning the alignment holes (1) vertically. This will place the camshafts at the neutral position (no valve load) easing the installation of the camshaft bearing caps.

3. Install the camshaft bearing caps and hand tighten the retaining bolts to 2 N.m (18 in. lbs.).

**NOTE:**

*Caps are identified numerically (1 through 4), intake or exhaust (I or E) and should be installed from the front to the rear of the engine. All caps should be installed with the notch forward so that the stamped arrows (<) on the caps point toward the front of the engine.*
4. Tighten the bearing cap retaining bolts in the sequence shown in illustration to 9.5 N.m (84 in. lbs.).

5. Install the right cam phasers, cylinder head cover, spark plugs, ignition coils and the upper intake manifold. Refer to ASSEMBLY, VARIABLE VALVE TIMING, PHASER / OIL CONTROL VALVE, INSTALLATION.

**NOTE:**

The Cam/Crank Variation Relearn procedure must be performed using the scan tool anytime there has been a repair/replacement made to a powertrain system, for example: flywheel, valvetrain, camshaft and/or crankshaft sensors or components.