VOGEL MANUFACTURING
1611 W WERNSING
EFFINGHAM, IL 62401
217-342-6949
VOGELMANUFACTURING.COM

TDC & DEGREEING A CAMSHAFT

Objective:

Locate Top Dead Center (TDC).
Synchronize the camshaft's position with the crankshaft. The camshaft controls the valve events in a 4-stroke engine, therefore critical to realizing performance.

Tools Required:

- Degree wheel
- Pointing device
- Dial indicator with 1" of travel @ 0.001" resolution
- Positive stop device

Finding Top Dead Center (TDC)
Stop Block Method

1- ***DISCONNECT THE BATTERY!!!***
Do not use the starter to perform any of these steps.

For a flat head engine, remove the cylinder head. For an OHV engine, remove the spark plug and valve cover.

2- Install the *degree wheel* to the end of the crankshaft

3- Mount the *pointing device* on the engine where it will not interfere with manual rotation. Position the piston approximately at the top of its stroke. Set up the *pointing device* to read zero or TDC on the *degree wheel.*

4- Rotate the crankshaft to move the piston down into the cylinder.

5- Install the *positive stop device* to prevent the piston from traveling through TDC during rotation.

6- Rotate the crankshaft, bringing the piston up until it stops against the *positive stop device.*

7- Record the number of degrees shown on the *degree wheel* at the *pointing device.*

8- Rotate the crankshaft in the opposite direction from step #6. Rotate the crankshaft until the piston descends, rises and stops on the *positive stop device* from the other direction.

9- Record this second reading of the *degree wheel* as indicated at the *pointing device.*

10- ADD the two *degree wheel* readings from step #7 and step #9 together. Divide the sum by 2.

The result of this calculation indicates what the *pointing device* will need to be adjusted to display.

11- While holding the crankshaft firmly against the *positive stop device*...

Adjust your *pointing device* to read the number of degrees revealed in the calculation in step #10.

-OR-

Loosen and twist the *degree wheel* to read the result from step #10 at the *pointing device.*

Re-clamp the *degree wheel* to prevent further movement.

12- Check TDC by rotating the crankshaft again. Using the *positive stop device*, make sure that the readings at the stop on each side of TDC are equal degrees from TDC. If so, the zero on the *degree wheel* is the true TDC point.

Repeat the process as needed.

13- Remove the *positive stop device* from the engine.

Tips:

Now is a good time to make a rigid timing pointer for the flywheel and permanently mark your flywheel for TDC. If your flywheel comes with timing tape apply it now by aligning TDC marks.

Intake Lobe Center

Finding the lobe center is most simply accomplished without valve springs or with very light valve springs temporarily installed.

1- Remove all valve lash (clearance).

2- For a flat head, place the *dial indicator* on the valve head. For an OHV engine, setup the *dial indicator* on the retainer. Be sure the setup of the *dial indicator* travels parallel to the center line of movement.

5- Rotate the crankshaft to TDC at the end of the compression stroke where both valves are closed. Zero the *dial indicator.*

6- Turn the crankshaft in its normal operating rotation until the *dial indicator* reads 0.050" lift from the zeroed position. Using the *degree wheel*, record the number of degrees @ 0.050" lift Before Top Dead Center (BTDC) that the intake opens.

7- Continue to slowly rotate the crankshaft in the normal operating rotation. The dial indicator should rise to full lift and then decline back to zero at the closing. On the *dial indicator*, locate 0.050" lift from *closing.* Using the *degree wheel*, record the degrees @ 0.050" lift After Bottom Dead Center (ABDC) that the intake closes.

Use the following steps to calculate the lobe center of the intake timing event:

1- (Intake opening degrees BTDC @ 0.050") + (Intake closing degrees ABDC @ 0.050") + (180°) = Intake event duration degrees @ 0.050"

2- (Intake event duration) divided by 2.

3- (Result from step #2) - (Intake opening degrees BTDC) = Intake lobe center

Exhaust Lobe Center

Setup the dial indicator on the exhaust valve but repeat the intake lobe center measurement procedure.

The exhaust normally opens Before Bottom Dead Center (BBDC) and the closing will occur After Top Dead Center (ATDC).

Use the following steps to calculate the lobe center of the exhaust events:

1- (Exhaust opening degrees BBDC @ 0.050") + (Exhaust closing degrees ATDC @ 0.050") + (180°) = Exhaust event duration degrees @ 0.050"

2- (Exhaust event duration) divided by 2.

3- (Result from step #2) - (Exhaust opening degrees BBDC) = Exhaust lobe center

Lobe Separation

1- (Intake lobe center) + (Exhaust lobe center)

2- (Answer from step #1) divided by 2 = Lobe separation.

Tips:

If timing adjustments are performed, REPEAT the lobe center measurements and calculations to confirm proper movement.

Measure and calculate several times for accuracy!