

Customer: _____

FAX: _____

"Degreeing-In" Your Camshaft

The **Donovan Gear Drive** is simple in nature, using three meshed gears to drive the camshaft at one-half the speed of the crankshaft, while allowing both shafts to rotate in the same direction.

Installation requires detailed knowledge of cam timing and common engine building practices. This involves the proper checking and setting of the front-to-rear cam position in the block, by aligning the lifter lobes to the centers of the lifter bores, as well as checking for necessary endplay.

It is the installer's responsibility to insure that all parts fit correctly and rotate properly without interference or binding that would cause damage.

Different cam manufacturers may have different specifications that must be adhered to. The following information, though basic in nature, offers an initial understanding in the function of the gear drive and cam timing.

FINDING "TDC"

1. Install the **DONOVAN** gear drive assembly, but leave the cam gear off – for now.
2. Install a degree wheel on the crankshaft and a pointer on the block.
3. Put a dial indicator on top of the #1 piston and rotate assembly until the piston is at the highest point of travel. Set pointer to TDC.
4. Rotate crankshaft counterclockwise until piston has traveled down .100".
NOTE READING ON DEGREE WHEEL.
5. Rotate crankshaft clockwise past TDC until piston has once again traveled down .100".
Again, **NOTE READING ON DEGREE WHEEL.**
6. The single point, halfway between the two readings is your actual TDC. Rotate the crankshaft to this point and readjust the pointer to read TDC.
7. Next, check for front-to-rear alignment of cam lifters/lobes. If cam lobes are positioned too far back from the lifter bores, the camshaft can be shimmed forward with an additional .032" bronze thrust washer (not supplied).

ESTABLISHING START POSITION AND PHASING CAM WITH CRANKSHAFT (using the Intake Lobe Centerline Method)

To avoid any valve-to-piston contact, it is preferable to have cylinder heads removed in order to take indicator readings directly off lifter.

1. Have cover and idler gear removed and the seven cam-gear bolts, finger tight.

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2. Rotate the cam in normal (forward) direction, and position to maximum lift on intake lobe. The dial indicator will peak, then change direction at the point of maximum lift.
3. Referring to cam timing specs, rotate crankshaft to desired intake centerline degrees.
Example: 110° centerline after top dead center
4. Carefully, and without moving cam or crankshaft position, install cover with idler gear.
NOTE: This is only a starting point to more accurately time the cam.
5. Rotate the crankshaft backward (opposite normal rotation) until indicator reads .100". Rotate crankshaft in forward direction until indicator reads .050" before maximum lift and record degree wheel reading.
6. Continue to rotate crankshaft in forward direction until the indicator goes past zero (maximum lift) to .050" on the closing side of maximum lift. Again, record the degree wheel reading.
7. Add the two numbers together and divide by 2. That number will be the actual location of maximum lift of the intake lobe in relation to the crank and piston. This is the centerline of the cam.
Example: The first degree reading was 96°. The second reading was 124°. These two numbers (96 & 124) added together will be 220. This total (220) divided by 2 will equal 110. Referring to the cam specs, if it designates 110° intake lobe centerline the cam is correctly degreed-in. Always recheck readings by rotating in forward direction to eliminate backlash clearance between gears, and to insure accuracy.
8. Match the bolt holes in the cam GEAR to the holes in the cam HUB for the closest alignment. Install and tighten the bolts to 30 lbs/ft torque.

CHANGING VALVE TIMING

Keep in mind that to advance the cam, you must lower the intake centerline.

Example: If the cam has a lobe separation of 110°, the cam is "straight up" when the intake centerline is 110°. Moving the centerline to 106° advances the cam 4°. If we change the centerline to 112°, this would be 2° retarded.

1. Set cam intake centerline position. Refer to Step 7 in previous section.
2. Carefully remove the seven finger-tight cam-gear bolts and remove the cam gear.
3. Without cam gear and without moving cam, rotate crankshaft to desired degree position.
4. With crankshaft in desired degree position, reinstall the cam gear by visually lining up any seven bolt holes in the cam gear to the bolt holes in the cam hub, while meshing into the idler gear without moving the camshaft or crankshaft. Install bolts finger tight to check and recheck readings.
5. Disregard any timing marks on gear. The "vernier" effect takes place when the cam gear is relocated on a different hole position due to an odd number of bolt holes with an even number of gear teeth.
6. Tighten all bolts when done.

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