



## Degreeing Your Cams

Degreeing your camshaft means, synchronizing the camshaft's position with the crankshaft. A few degrees of misalignment can affect the engine's operation dramatically. If there were no manufacturing tolerances, you would only need to line up the marks on the timing chain sprockets then the cam would be degreeed. With a group of components (the camshaft, crankshaft, timing chain, and sprockets) all with their own standards and tolerances that when installed, can stack up against you. You can never be sure that the cam is in its correct position, always degree in your Spears Racing Cams for the best performance.

The basic tools required are, a degree wheel, a stable pointer that can be mounted to the engine, a dial indicator with at least a half inch of travel in .001" increments, a stand that mounts it to the engine, and a positive stop device to locate T.D.C.

**DISCONNECT THE BATTERY.** Do not use the starter to perform many of these steps. To find Top Dead Center use a piston stop to stop the piston in the same position on either side of TDC. and take readings from the degree wheel. You will then split the difference in these readings and move the pointer this amount, making it the true TDC point. First mount the degree wheel on the end of the crankshaft, and rotate the engine to approximate TDC. Mount the pointer and line it up to zero on the degree wheel. Now rotate the engine to move the piston down into the cylinder. Install your positive stop device into the spark plug hole and extend the bolt. Now hand turn the engine, rotating it until the piston comes up and stops against the piston stop bolt. Look at the degree wheel and write down the number of degrees shown by the pointer. Hand-turn the engine in the opposite direction until the piston comes up and stops on the piston stop bolt again. Go back to the degree wheel and write down the degrees it now reads. Add these two readings together and divide the answer by two. Now either move your pointer by this many degrees, or carefully loosen the degree wheel (without disturbing the position of the crankshaft) and move the wheel this required amount. Re-tighten the bolts, and rotate the engine again making sure that the readings on each side of TDC are equal degrees away from zero. If they are, the zero on the degree wheel will now be the true TDC point. Remove the positive stop device from the spark plug hole. After you're done finding TDC proceed with the following:

Remove ALL lash. With your dial indicator on the retainer or follower, rotate the engine in the direction it would normally turn, and come up to .050 inches of lift. Write down that figure from the degree wheel. This is your opening figure. This is when the intake opens BEFORE TDC. Example would be 10 degrees on the degree wheel BTDC.

Now go over the top on the lobe until your indicator is .050 inches off the Base Circle. Now you should be where the intake closes AFTER BDC. Keep in mind to continue turning the engine in the same direction it runs and DO NOT BACKUP. Example would be 39 degrees on the degree wheel ABDC.



Now you can calculate your duration. The valve opens at 10 degrees, plus it closes 39 degrees, plus 180 degrees (the distance in degrees between TDC and BDC). Your duration at .050 inches of lift would be 229 degrees. ( $10 + 39 + 180 = 229$ ) Now you can calculate your lobe center. Divide your total duration by 2 and subtract your intake opening figure, (This would normally be the smaller number of the two) ( $229 / 2$ )  
 $-10 = 104.5$ . This is your lobe center.

You may move the cam to the desired lobe center and check again. If you move the lobe centers closer together, it would normally give you more low to mid range. If you move the lobe centers apart, it would normally give you more mid to top range. Not all engines can handle tight lobe centers. Certain applications require wider lobe centers, such as stock fuel injected engines. For our best recommendation, please call Spears Racing directly. Always check all clearances and check for coil bind when de-greeing in cams. Check the exhaust in the same way.

Please note: Spears Racing recommends that you start on the front cylinder, when you're finished resetting your degree wheel. Then start all over on the rear cylinder by finding Top Dead Center, and remember this is a 90 degree twin, treat it like two separate cylinders.

If you have a low overlap cam, the intake opening may be AFTER TDC. If so, you will have to SUBTRACT that figure from the closing number and add 180. This will be the duration at .050 inches of lift. ( $39 - 10 + 180 = 209$ ) Divide the number by two, and add back in the opening number. ( $209 / 2$ )  $+10 = 114.5$  this will equal lobe center. The same thing may happen on the exhaust side with your closing number, it could close Before TDC. If you need any assistance, please contact us.

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