

Rollmaster

HIGH PERFORMANCE TIMING CHAIN SETS

DEGREEING IN YOUR CAMSHAFT

Degreeing in Your Camshaft means synchronizing the camshaft's position with the crankshaft and valve opening and closing sequences. A few degrees of misalignment can affect the engine's performance and operation dramatically. If there were no manufacturing tolerances, you would only need to line up the marks on the timing chain sprockets and the cam would be degreeed, but with a group of components (the camshaft, crankshaft, timing chain, and sprockets) all with their own standards and tolerances, when installed, can stack up against you.

You can never be sure that the cam is in its correct position. Whenever possible, always degree in your cam. 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 one inch of travel in .001" increments with a stand that mounts to the engine, and a positive stop device to locate TDC on the top of the piston.

1. DISCONNECT THE BATTERY! Do not use the starter to perform any 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 at 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 or device. Now hand turn the engine rotating until the piston comes up and stops against the bolt or device. 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 bolt or device 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. Retighten 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.

2. The best method for degreeing in a cam is the duration at .050" lift method. Because most modern lobes are asymmetrical, with the opening side of the lobe being much more aggressive than the closing side, this is the most accurate method. If you make a mistake and rotate the engine past the point, you wished to take a reading, do not back up the rotation. If you do, any slack in the timing chain or lash in the gears will affect the readings, causing an error. If you miss your stopping point, just continue rotating the engine in the normal direction until you return to the desired point.

Mount the dial indicator securely to the engine. Hand rotate the engine in a normal direction (clockwise, when standing in front of the engine) until the intake valve is closed, (the lifter is down on the base circle of the cam lobe). Make sure the angle of the dial indicator plunger is the same angle as the lifter or pushrod's travel. We want to read "straight line" linear movement of lifter or pushrod, so the plunger must be aligned properly.

Be careful not to be trapped by hydraulic lifters, as they can collapse even under slight pressure from the dial indicator's pressure. Make certain you read from a solid position on the lifter or pushrod entered into the lifter. With the indicator in position, set the dial indicator to zero. Hand rotate the engine in its normal direction of rotation while watching the dial indicator. As the lifter starts to move up the opening side of the lobe, the reading on the dial indicator will start to increase. Continue rotating the engine until the dial indicator shows .050" of rise. Stop and take a reading on the degree wheel and write it down.

As you continue to rotate the engine, the reading on the dial indicator will rise up to the maximum lobe lift. The lifter is now on the top of the lobe. (The maximum lobe lift is shown on the spec card and can be verified at this point if you wish.) Continue the rotation and the lifter will start down the closing side of the lobe. Carefully watch the dial indicator as the numbers descend. When the indicator descends back to the .050" reading, stop, take a reading from the degree wheel, and write it down also. Rotate the engine and return to the base circle of the lobe. The dial indicator must read zero again to be sure the process was correctly done.

You now have the two important readings from the degree wheel, both taken when the dial indicator read .050". One reading as the indicator was ascending on the opening side, the other when it was descending on the closing side. Compare these numbers to those on your camshaft inspection card to verify the position of the intake lobe, identified as "Cam timing at .050" Tappet or Lift". If you are within a degree, your camshaft is installed in the correct position.

You can follow exactly the same procedure on the exhaust lobe to determine its opening and closing degree points at .050" of tappet (or lifter rise), and compare these readings to those on the cam specification card.

If you also check the exhaust lobe, you will have four points of reference (intake opening and closing, and the exhaust opening and closing) to go by. Remember, if you are plus or minus one degree of these readings, your cam is in the correct location.

Since you have found TDC with the degree wheel, set the crank back to TDC and check to see if the pointer on the engine indicates zero on the harmonic balancer. If the balancer is old, an error could indicate failure of the rubber in the balancer. If the balancer is good, correct the pointer to indicate TDC for future reference or mark the harmonic balance in the correct TDC position.

Rollmaster manufacture crank sprockets with either nine, seven or one keyway in the crank sprocket and one or multi dowel pinholes in the cam sprocket if an overhead cam engine. Multiple crank keyways are in 2-degree increments at the crankshaft resulting in a 1-degree change at the camshaft. Multi dowel pinholes in overhead camed engines are at 1-degree increments as standard. Also, be aware engines like Chevrolet small block use a dot to identify the standard keyway on a nine-keyway sprocket and the standard timing tooth on the sprocket.

Do not get confused by these offset identification marks. Always time from the sprocket tooth timing mark.

Be certain of what you are about to do, have the correct tools, and camshaft specifications on hand.

**Thank you for purchasing our Rollmaster Performance
Timing Chain Set.**