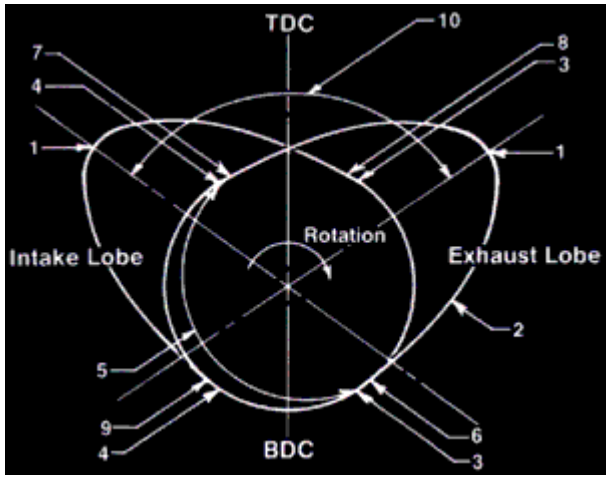
The following information is provided to help you understand some of the terminology related to camshaft specifications, and information.

1. Max Lift or Nose
2. Flank
3. Opening Clearance Ramp
4. Closing Clearance Ramp
5. Base Circle
6. Exhaust Opening Timing Figure
7. Exhaust Closing Timing Figure
8. Intake Opening Timing Figure
9. Intake Closing Timing Figure
10. Lobe Separation



CAM TERMINOLOGY

ABDC:
After **B**ottom **D**ead **C**enter. Measured in degrees.

ASYMMETRICAL:
Not identical on both sides of the lobe. In most cases, the opening side of the lobe being much more aggressive than the closing side. This difference is only visible in some overhead cams.

ATDC:
After **T**op **D**ead **C**enter. Measured in degrees.

BASE CIRCLE:
The concentric or round portion of the cam lobe where the valve lash adjustments are made. A high spot in this area is called BASE CIRCLE RUNOUT.

BBDC:
Before **B**ottom **D**ead **C**enter. Measured in degrees.

BILLETS:
The blank shafts that the camshafts are made from.

BTDC:
Before **T**op **D**ead **C**enter. Measured in degrees.

CAM FOLLOWER / TAPPET:
Usually a flat faced or roller companion to the camshaft that transfers the action of the camshaft to the rest of the valve train by sliding or rolling on the cam lobe.

CAM LIFT:
This is the maximum distance that the cam pushes the follower when the valve is open. This is different from valve lift. See Gross Valve Lift.

CAM LOBE:
The parts of the camshaft that create the valve movement.

CAM MASTER:
Design of the cam transferred to a template or master. The master is then installed in the cam grinding machine to generate the shape of the lobes of the production cam.

CAM PROFILE:
The actual shape of the camshaft lobe.

CAMSHAFT:
A shaft containing many cams that covert rotary motion to reciprocating (lifting) motion. For every 2 revolutions of the crankshaft, the camshaft rotates 1 revolution. The lobes on the camshaft actuate the valve train in relation to the piston movement in an internal combustion engine. The camshaft determines when the valves open and close, how long they stay open and how far they open.

CARBURIZING:
Gas carburizing is a method to heat treat steel camshaft billets. In this method, the camshaft is placed in a carbon gas atmosphere furnace and heated to the proper temperature. When the shaft has absorbed the proper amount of carbon, it is removed from the furnace and quenched (cooled in oil) to the proper temper.

CAST BILLET:
A term used to describe a camshaft which is made from a casting. The material for the casting is a special grade of iron alloy called "Proferal."

CHEATER CAMS:
See Improved Stock Cams.

CHILLED IRON LIFTER:
A cam follower made from high quality iron alloy that is heat treated by pouring the molten iron into a mold with a chilled steel plate at the bottom to heat treat the face of the lifter. It is compatible with steel and hardface overlay cams only.

CLEARANCE RAMPS:
The portion of the cam lobe adjacent to the base circle which lifts at a constant slow speed. It's purpose, is to compensate for small deflections and take up the slack in the valve train created by the valve lash. The opening ramp takes up all clearances in the valve train and causes the valve to be on the verge of opening. The closing ramp begins when the valve touches the valve seat and ends when the tappet returns to the base circle. Ramp designs have a tremendous effect on power output and valve train reliability.

COIL BIND:

A valve spring that has been compressed to the point where the coils are stacked solid and there is no space left between the coils. The valve cannot open any further when this happens.

CONCENTRIC:
Running true or having the same center. In camshaft terminology, the cam bearings and lobes are concentric to each other when the cam is straight and there is .001" or less runout between all the cam lobes and bearings.

CORE DIAMETER:
The diameter of the camshaft measured between the cam lobes.

DEGREEING YOUR CAMSHAFT:
Degreeing In Your Camshaft means synchronizing the camshaft's position with the crankshaft. A few degrees of misalignment can affect the engine's operation dramatically.

DOHC:
Double **O**ver**H**ead **C**am. A pair of overhead camshafts, one to operate the intake valves and the other to operate the exhaust valves.

DUAL PATTERN:
A camshaft having different grinds on the intake and exhaust lobes. There are various opinions on whether or not there is an increase in performance over a single pattern camshaft. Unfortunately there is no fair way to compare the two styles. Both types work quite well and there is no benefit to turning down one style of camshaft in favor of the other on this basis alone.

DURATION:
The length of time that the valve is held off the seat by the cam. This is measured by the degrees that the crankshaft rotates. More degrees of duration will make the engine operate in a higher rpm range.

DURATION AT .050":
The distance measured in degrees of crankshaft rotation from when the valve is open .050" far until it is .050" from closing.

FLAME HARDENING:
A heat treating process whereby a camshaft is exposed to an open flame and then quenched (cooled in oil).

FLANKS:
The sides of the cam lobe or the portion of the lobe that lies between the nose and the base circle on either side. They are also called the opening and closing ramps.

GROSS VALVE LIFT:
This is obtained by multiplying the cam lift by the rocker arm ratio. Rocker arm production tolerances can vary this figure by as much as +/- .015".

HARDENING:
Achieved by heating the material and quenching it in oil to give durability. Flame hardening and Induction hardening are two methods used.

HARDENABLE IRON LIFTERS:
A cam follower made from high quality iron alloy. This special alloy is compatible with cast iron billet camshafts.

The entire body of the hardenable iron lifter is hard as compared to the chilled iron lifter where only the base is hardened.

HYDRAULIC VALVE LIFTERS:
These lifters are designed to maintain zero lash in the valve train mechanism by use the engine's oiling system to automatically adjust the valve lash (clearance) to zero.. Hydraulic lifters do maintain a constant pressure on the camshaft lobe, which solid lifters do not. Their advantages include quieter engine operation and elimination of the periodic adjustment required to maintain proper lash as with solid valve lifters.

IMPROVED STOCK CAMS (CHEATER CAMS):
The improved stock cam has stock lift and duration but the flanks are modified so that they are faster acting. This process adds about a 5% increase in the area under the lift curve. This means there will be a power increase during the entire rpm range of the engine. This type of grind works very well in engines that have fuel injection systems that run off of manifold vacuum and are therefore very sensitive to camshaft duration changes.

LOBE:
The lobe is eccentric to the cam bearings of the camshaft and transmits a lifting motion through the valve train to operate the valves. The design of the lobe determines the usage of the camshaft. (i.e. street use or all out competition).

LOBE AREA:
Used for comparison only. The figure is obtained by adding the lift at every degree of rotation.

LOBE CENTERS:
The distance measured in degrees between the centerline of the intake lobe and the centerline of the exhaust lobe in the same cylinder.

LOBE CENTERLINES-VALVE:
The point at which the valve is fully open. For example, full intake lobe lift at 110 deg. ATDC. full exhaust lobe lift at 110 deg. BTDC. This camshaft was ground with 110 deg. lobe centers and is timed straight up. It is neither advanced or retarded. Another example, full intake lobe lift at 105 deg. ATDC. full exhaust lobe lift at 115 deg. BTDC. This camshaft was ground also on 110 deg. lobe centers but is advanced 5 crankshaft degrees.

LOBE TAPER:
This is the amount by which the diameter of the front of the base circle is different from the diameter of the rear of the base circle. The amount of taper can be anywhere from zero to .003" depending on the engine. If the forward side of lobe is greater than the rear side we say that the cam has taper left (TL). If the back side of the lobe is greater than the front side then we say that the cam has taper right (TR). Lobe taper has a dramatic effect on the speed of rotation of the lifter. If the lifter does not rotate at the proper speed, premature lifter and cam wear will occur.

NET VALVE LIFT:
The actual lift of the valve. This lift can be determined by subtracting the valve lash dimension from the gross valve lift figure. Rocker arm production tolerances can vary this figure by much as +/-.015".

NITRIDING:
Gas nitriding is a surface heat treatment which leaves a hard case on the surface of the cam. This hard case is

typically twice the hardness of the core material up to .010" deep. This process is accomplished by placing the cam into a sealed chamber that is heated to approximately 950 degrees F and filled with ammonia gas. At this temperature a chemical reaction occurs between the ammonia and the cam metal to form ferrous nitride on the surface of the cam. During this reaction, diffusion of the ferrous-nitride into the cam occurs which leads to the approximate .010" case depth. The ferrous-nitride is a ceramic compound which accounts for its hardness. It also has some lubricity when sliding against other parts. The nitriding process raises and lowers the chamber temperature slowly so that the cam is not thermally shocked. Because of its low heat treat temperature no loss of core hardness is seen. Gas nitriding was originally conceived where sliding motion between two parts takes place repeatedly so is therefore directly applicable to solving camshaft wear problems.

NOSE OF THE LOBE:
The highest portion of the cam lobe from the base circle with the highest lift.

OHC:
Overhead **C**am **E**ngine. A camshaft in an automotive engine that is located in the cylinder head over the engine block rather than in the block.

OHV:
Overhead **V**alve **E**ngines. In this type of engine the camshaft is positioned beneath the valves.

OVERLAP:
A situation where both the intake and exhaust valves are open at the same time when the piston is at top dead center on the exhaust stroke. The greater the seat duration is on the intake and exhaust lobes, the greater the overlap will be in degrees.

PARKERIZING:
A thermo-chemical application whereby a nonmetallic, oil-absorptive coating is applied to the outside surface of the camshaft. This protects the cam lobes during the break-in period.

PRELOAD:
The type of adjustment for hydraulic lifters. When the clearance is removed from the valve train the rocker arms, or adjustable pushrods, are tightened an additional turn to "preload" the hydraulic lifter.

RATE OF LIFT:
The speed that the valve opens and closes. Cams with a higher rate of lift have more lobe area to provide performance gains. Also known as ramp rate.

REFINISHING:
Restoring the cam lobe to its original shape (except slightly smaller) when there is only minimal wear.

ROLLER TAPPET:
The roller tappet performs the same function as the mechanical or hydraulic tappet. However, instead of sliding on the cam face, the lifter contains a roller bearing which rolls over the cam surface.

SEAT DURATION:
The total time in degrees of crankshaft rotation that the valve is off of its valve seat from when it opens until when it closes.

SPLIT OVERLAP:

An occurrence when both the intake valve and the exhaust valve are off their seats at the same time by the same amount.

SPRING FATIGUE:
Valve springs have a tendency to lose their tension after being run in an engine for certain periods of time, because of the tremendous stress they are under. At 6,000 rpm, for example, each spring must cycle 50 times per second. The tremendous heat generated by this stress eventually effects the heat-treating of the spring wire and causes the springs to take a slight drop in pressure.

SPRING SURGE:
The factor which causes unpredictable valve spring behavior at high reciprocating frequencies. It's caused by the inerita effect of the individual coils of the valve spring. At certain critical engine speeds, the vibrations caused by the cam movement excite the natural frequency characteristics of the valve spring and this surge effect substantially reduces the available static spring load. In other words, these inertia forces oppose the valve spring tension at critical speeds.

VALVE FLOAT:
When the speed of the engine is too great for the valve springs to control the valve. The valves will stay open and/or "bounce" on their seats. The clearance in the valve train created by valve float will also cause hydraulic lifters to "pumpup" as they try to eliminate the valve clearance.

VALVE LASH:
This is the clearance between the base circle of the camshaft lobe and the camshaft follower or tappet.

VALVE TRAIN:
The "train" of parts leading from the cam lobe to the valve.

VARYING LOBE SEPARATION ANGLE

Tighten	Widen
Moves Torque to Lower RPM	Raise Torque to Higher RPM
Increases Maximum Torque	Reduces Maximum Torque
Narrow Powerband	Broadens Power Band
Builds Higher Cylinder Pressure	Reduce Maximum Cylinder Pressure
Increase Chance of Engine Knock	Decrease Chance of Engine Knock
Increase Cranking Compression	Decrease Cranking Compression
Increase Effective Compression	Decrease Effective Compression
Idle Vacuum is Reduced	Idle Vacuum is Increased

Idle Quality Suffers	Idle Quality Improves
Open Valve-Overlap Increases	Open Valve-Overlap Decreases
Closed Valve-Overlap Increases	Closed Valve-Overlap Decreases
Natural EGR Effect Increases	Natural EGR Effect is Reduced
Decreases Piston-to-Valve Clearance	Increases Piston-to-Valve Clearance

LOBE SEPARATION ANGLE

Above 114 Deg. = Extremely Wide

114-112 Deg. = Wide

112-110 Deg. = Moderately Wide

110-108 Deg. = Moderate

108-106 Deg. = Moderately Tight

106-104 Deg. = Tight

Below 104 Deg. = Extremely Tight

ADVANCING / RETARDING CAM TIMING

ADVANCING	RETARDING
Begins Intake Event Sooner	Delays Intake Event Closes Intake
Open Intake Valve Sooner	Keeps Intake Valve Open Later
Builds More Low-End Torque	Builds More High-End Power
Decrease Piston-Intake Valve Clearance	Increase Piston-Intake Valve Clearance
Increase Piston-Exhaust Valve Clearance	Decrease Piston-Exhaust Valve Clearance