CompCams, Inc.
3400 Democrat Road
Memphis, TN 38118
Voice: 901-795-7400
www.CompCams.com

CamQuest 6™

Cam-Selection Simulation

Selection Report v.6.0.040508, Release 3

Monday, August 01, 2011
10:25 PM

Engine/Vehicle Application Test File:

CamQuest1

Testing Performed By: John Doe

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CamQuest1

Recommended Camshaft

Selected Usage: 3 - Truck - High Torque, Good Economy, Idle, Overall Performance

Part Number: 11-203-3 **Grind:** 260H

Lifter Type: Hydraulic Lifter

Cam RPM Range: 1200 to 5200 **Match Accuracy:** Great Fit

Camshaft Family: High Energy™ Hydraulic Flat Tappet Camshafts

Camshaft Description: Hydraulic-Good torque & power. Excellent towing in 454 c.i. with manual or automatic with 3.73 or higher axle ratios. Smooth idle.

	INTAKE	EXHAUST
Duration (0.050-Inch):	212.0	212.0
Duration (Seat-To-Seat):	260.0	260.0
Valve Lift (Std Rockers):	0.475	0.475
Valve Lash:	Hyd.	Hyd.
Timing Open/Close (0.050-Inch):	0.0 / 32.0	40.0 / -8.0
Timing Open/Close (Seat-To-Seat):	24.0 / 56.0	64.0 / 16.0
Lobe Center Angle:	110.0	Intake Centerline: 106.0

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Recommended Accessories

Recommended Stall Speed Rpm Range: 1100.0 To 1900.0

ACCESSORY	PART NUMBER	ACCESSORY	PART NUMBER
Complete K-Kit:	K11-203-3	Valve Springs:	911-16
***:	***	Steel Retainers:	744-16
Small SK-Kit:	SK11-203-3 [7]	Valve Locks:	603-16 [75]
Cam & Lifter CL-Kit:	CL11-203-3 [7]	Valve Seals:	504-16
Rocker-PushRod RP-Kit:	RP1411-16	***:	***
Lifter Kit:	812-16	***:	***
Timing Set:	3210	***:	***
***:	***	***:	***
Rocker Arms:	1411-16 [17,18]	***:	***
Push Rods:	7854-16 [16]	***:	***

Accessory Installation Notes

[2] Requires machining on cylinder heads. [7] Stock springs cannot be used. [16] Truck engines have .400” taller block. [17] Mark V and Mark VI heads must use kit w/studs. [18] 50-state legal for ‘93 & earlier B.B. Chevrolet V8, 396-454 c.i., C.A.R.B. E.O. #D-279-4. [75] Most aluminum heads come standard with 11/32” valve stems. Use appropriate valve locks, retainers, and seals.

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Overall Application Specs

Intended Usage: 3 - Truck - High Torque, Good Economy, Idle, Overall Performance

Application: Truck | Vehicle Weight: 5000.00

Fuel Metering: Carburator | Forced Induction: No | Nitrous: No

Engine Shortblock Specs

Short Block: Chevy 454

Number Of Cylinders: 8 | Bore: 4.251 in | Stroke: 4.000 in

Cylinder Volume: 930.32 cc | Total Volume: 454.2 ci

Cylinder Head Specs

Cylinder Head Type: 2-Valve, Wedge, Low Perf/Stock Ports & Valves

Intake Valves/Port: 1 | Exhaust Valves/Port: 1

Intake Valve Dia: 2.080 in | Exhaust Valve Dia: 1.730 in

Compression Ratio Specs

Compression Ratio: 8.50 | CR Calculation Method: ***

Cylinder Head Vol: *** | Head Gasket Volume: ***

Dome Vol (Known): *** | Deck Volume (Both Methods): ***

Relief Vol (Known): *** | Piston Down Bore (Burrette): *** (Arbitrary Distance)

Deck Clear (Known): *** | Measured Volume (Burrette): *** (Measured Volume)

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Induction Specs

Manifold Type: Dual-Plane High-Flow

Induction Flow: 750.0 cfm @ 1.50 inHg Flow Coef: 0.04041

Forced Induction: None No. Turbos: NA

Turbine Size: NA Turbine A/R Ratio NA

Internal Ratio: NA Belt Ratio: NA

Boost Limit: NA Intercooler Eff: None IC Press Drop: None

Fuel System Specs

Fuel Type: Gasoline

Nitrous HP Boost: 0.0 HP

Exhaust System Specs

Exhaust Model: Large-Tube Headers, Mufflers WO/Cat

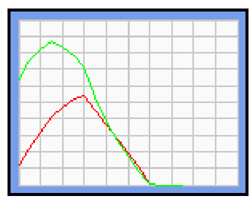
Engine Performance

Peak Horsepower: 324.9 @ 4000

Average Horsepower: 73.3

Peak Torque: 518.6 @ 2500

Average Torque: 135.4



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_TESTENGINE

Glossary

0.050-Inch Cam Timing Method—See **Cam Timing**, @ 0.050-inch.

ABDC or After Bottom Dead Center—Any position of the piston in the cylinder bore after its lowest point in the stroke (BDC). ABDC is measured in degrees of crankshaft rotation after BDC. For example, the point at which the intake valve closes (IVC) may be indicated as 60-degrees ABDC. In other words, the intake valve would close 60 degrees after the beginning of the compression stroke (the compression stroke begins at BDC).

Air-Fuel Ratio—The proportion of air to fuel: by weight: that is produced by the carburetor or injector.

ATDC or After Top Dead Center—Any position of the piston in the cylinder bore after its highest point in the stroke (TDC). ATDC is measured in degrees of crankshaft rotation after TDC. For example, the point at which the exhaust valve closes (EVC) may be indicated as 30-degrees ATDC. In other words, the exhaust valve would close 30 degrees after the beginning of the intake stroke (the intake stroke begins at TDC).

Atmospheric Pressure—The pressure created by the weight of the gases in the atmosphere. Measured at sea level this pressure is about 14.69psi.

Back Pressure: A pressure developed when a moving liquid or gaseous mass passes through a restriction. "Backpressure" often refers to the pressure generated within the exhaust system from internal restrictions from tubing and tubing bends, mufflers, catalytic converters, tailpipes, or even turbochargers.

BBDC or Before Bottom Dead Center—Any position of the piston in the cylinder bore before its lowest point in the stroke (BDC). BBDC is measured in degrees of crankshaft rotation before BDC. For example, the point at which the exhaust valve opens (EVO) may be indicated as 60-degrees BBDC. In other words, the exhaust valve would open 60 degrees before the exhaust stroke begins (the exhaust stroke begins at BDC).

Big-Block—A generic term that usually refers to a V8 engine with a displacement that is large enough to require a physically "bigger" engine block. Typical big-block engines displace over 400 cubic inches.

Blowdown or Cylinder Blowdown—Blowdown occurs during the period between exhaust valve opening and BDC. It is the period (measured in crank degrees) during which residual exhaust gases are expelled from the engine before the exhaust stroke begins. Residual gasses not discharged during blowdown must be physically "pumped" out of the cylinder during the exhaust stroke, lowering power output from consumed "pumping work."

Bore or Cylinder Bore—The internal surface of a cylindrical volume used to retain and seal a moving piston and ring assembly. "Bore" is commonly used to refer to the cylinder bore diameter, unusually measured in inches or millimeters. Bore surfaces are machined or ground precisely to afford an optimum ring seal and minimum friction with the moving piston and rings.

Brake Horsepower (bhp)—Brake horsepower (sometimes referred to as shaft horsepower) is always measured at the flywheel or crankshaft by a "brake" or absorbing unit. Gross brake horsepower describes the power output of an engine in stripped-down, "race-ready" trim. Net brake horsepower measures the power at the flywheel when the engine is tested with all standard accessories attached and functioning. Also see Horsepower, Indicated Horsepower, Friction Horsepower, and Torque.

Brake Mean Effective Pressure (bmep)—A theoretical average pressure that would have to be present in each cylinder during the power stroke to reproduce the force on the crankshaft measured by the absorber (brake) on a dynamometer. The bmep present during the power stroke would produce the same power generated by the varying pressures in the cylinder throughout the entire four-cycle process.

BTDC or Before Top Dead Center—Any position of the piston in the cylinder bore before its highest point in the stroke (TDC). BTDC is measured in degrees of crankshaft rotation before TDC. For example, the point at which the intake valve opens (IVO) may be indicated as 30-degrees BTDC. In other words, the intake valve would open 30 degrees before the intake stroke begins (the intake stroke begins at TDC).

Cam Timing @ 0.050-Lift—This method of determining camshaft valve timing is based on 0.050 inches of tappet rise to pinpoint timing events. The 0.050-inch method was developed to help engine builders accurately install camshafts. Lifter rise is quite rapid at 0.050-inch lift, allowing the cam to be precisely indexed to the crankshaft. Camshaft timing events are always measured in crankshaft degrees, relative to TDC or BDC.

Cam Timing @ Seat-To-Seat—This method of determining camshaft timing uses a specific valve lift (determined by the cam manufacturer) to define the beginning or ending of valve events. There is no universally accepted valve lift used to define seat-to-seat cam timing, however, the Society of Automotive Engineers (S.A.E) has accepted 0.006-inch valve lift as its standard definition. Camshaft timing events are always measured in crankshaft degrees, relative to TDC or BDC.

Camshaft Advance/Retard—This refers to the amount of advance or retard from the manufacturers recommended timing that the cam is installed in the engine. Focusing on intake timing, advancing the cam closes the intake valve earlier. This setting typically increases low-end performance. Retarded cam timing closes the intake valve later which tends to help top end performance.

Camshaft Lift—The maximum height of the cam lobe above the base-circle diameter. A higher lobe opens the valves further, often improving engine performance. Lobe lift must be multiplied by the rocker ratio (for engines using rocker arms) to obtain total valve lift. Lifting the valve more than 1/3 the head diameter generally yields little additional performance. Faster valve opening rates add stress and increase valvetrain wear but can improve performance. High lift rates usually require specially designed, high-strength components.

Centerline—An imaginary line running through the center of a part along its axis, e.g., the centerline of a crankshaft running from front-to-back directly through the center of the main-bearing journals.

Duration or **Valve Duration**—The number of crankshaft degrees (or much more rarely, camshaft degrees) of rotation through which the valve lifter or cam follower is raised above a specified height; either seat-to-seat valve duration measured at 0.006-, 0.010-inch or other valve lifts (even 0.020-inch lifter rise), or duration measured at 0.050-inch lifter rise, called 0.050-inch duration. Intake duration is a measure of all intake lobes, and exhaust duration indicates the exhaust timing for all exhaust lobes. Longer cam durations hold the valves open longer, often allowing increased cylinder filling or scavenging at higher engine speeds.

Exhaust Center-Angle/Centerline or **ECA—**The distance in crank degrees from the point of maximum exhaust valve lift (on symmetric cam profiles) to TDC during the valve overlap period.

Exhaust Valve Closing or **EVC**—The point at which the exhaust valve returns to its seat, or closes. This valve timing point usually occurs early in the intake stroke. Although EVC does not have substantial effects on engine performance, it contributes to valve overlap (the termination point of overlap) that can have a significant effect on engine output.

Exhaust Valve Opening or **EVO**—The point at which the exhaust valve lifts off of its seat, or opens. This valve timing point usually occurs late in the power stroke. EVO usually precedes BDC on the power stroke to assist exhaust-gas *blowdown*. The EVO timing point can be considered the second most important cam timing event from a performance standpoint.

Filling & Emptying Simulation—This engine simulation technique includes multiple models (e.g., thermodynamic, kinetic, etc.), and by dividing the intake and exhaust passages into a finite series of sections it describes mass flow into and out of each section at each degree of crank rotation. The Filling And Emptying method can accurately predict average pressures within sections of the intake and exhaust system and dynamically determine VE and engine power. However, the basic Filling And Emptying model can not account for variations in pressure *within* individual sections due to gas dynamic effects.

Four-Cycle Engine—Originally devised by Nikolaus Otto in 1876, the four-cycle engine consists of a piston moving in a closed cylinder with two valves (one for inlet and one for outlet) timed to produce four separate strokes, or functional cycles: Intake, Compression, Power, and Exhaust. Sometimes called the "suck, squeeze, bang, and blow" process, this technique—combined with a properly atomized air/fuel mixture and a precisely timed spark ignition—produced an engine with high efficiency and power potential. The Motion-PC Dyno is designed to simulate the functional processes of a four-cycle engine.

Horsepower—Torque measures how much work (an engine) *can* do; and power is the rate-based measurement of *how fast* the work is being done. Starting with the static force applied at the end of a torque arm (torque), then multiplying this force by the swept distance through which the same force would rotate the torque arm one full revolution determines the power per revolution: Power Per Revolution = Force or Weight x Swept Distance. James Watt (1736-1819) established the current value for one horsepower: 33,000 pound-feet per minute or 550 pound-feet per second. So horsepower is currently calculated as: Horsepower = Power Per Revolution/33,000, which is the same as Horsepower = (Torque x 2 x Pi x RPM)/33,000, or simply: Horsepower = (Torque x RPM)/5,252. The horsepower being calculated by these equations is just one of several ways to rate engine power output. Various additional methods for calculating or measuring engine horsepower are commonly used (to derive friction horsepower, indicated horsepower, etc.), and each technique provides additional information about the engine under consideration.

Induction Airflow—The airflow rating (a measurement of restriction) of a carburetor or fuel injection system. Standard automotive four-barrel carburetors are rated by the measured airflow when the device is subjected to a pressure drop equal to 1.5-inches of mercury. Two-barrel carburetors are tested at 3.0-inches of mercury.

Intake Centerline Angle—The distance in crank degrees from the point of maximum intake valve lift (on symmetric cam profiles) to TDC during the valve overlap period.

Intake Stroke—One of the four 180-degree full "sweeps" of the piston moving in the cylinder of a four-stroke, internal-combustion engine (originally devised by Nikolaus Otto in 1876). During the intake stroke, the piston moves from *TDC* to *BDC* and inducts (draws in by lowering the pressure in the cylinder) air/fuel mixture through the induction system. Note: The 180-degree duration of the intake stroke is commonly shorter than the period during which the intake valve is open, sometimes referred to as the true "Intake Cycle." The intake stroke is followed by the compression stroke.

Intake Valve Closing or **IVC**—Considered the most important cam timing event from a performance standpoint. The point at which the intake valve returns to its seat, or closes. This valve timing point usually occurs early in the compression stroke. Early IVC helps low-end power by retaining air/fuel mixture in the cylinder and reducing charge reversion at lower engine speeds. Late IVC increases high-speed performance (at the expense of low speed power) by allow additional charge to fill the cylinder from the ram-tuning effects of the induction system at higher engine speeds.

Intake Valve Opening or **IVO**—The point at which the intake valve lifts off of its seat, or opens. This valve timing point usually occurs late in the exhaust stroke. Although IVO does not have a substantial effect on engine performance, it contributes to valve overlap (the beginning point of overlap) that can have a significant effect on engine output.

Lobe-Center Angle or **LCA**—The angle in cam degrees from maximum intake lift to maximum exhaust lift. Typical LCAs range from 100 to 116 camshaft degrees (or 200 to 232 crank degrees).

Normally Aspirated—When the air-fuel mix is inducted into the engine solely by the lower pressure produced in the cylinder during the intake stroke; aspiration not aided by a supercharger.

Otto-Cycle Engine—See Four-Cycle Engine

Overlap or **Valve Overlap**—The period, measured in crank degrees, when both the exhaust valve and the intake valve are open. Valve overlap allows the negative pressure scavenge wave to return from the exhaust system and begin the inflow of air/fuel mixture into the cylinder even before the intake stroke begins. The effectiveness of the overlap period is dependent on engine speed and exhaust "tuning."

RPM—Revolutions Per Minute. A unit of measure for angular speed. As applied to the IC engine, rpm indicates the instantaneous rotational speed of the crankshaft described as the number of crank revolutions that would occur every minute if that instantaneous speed was held constant throughout the measurement period. Typical idle speeds are 300 to 800rpm, while peak engine speeds can reach as high as 10,000rpm or higher in some racing engines.

Simulation and **Engine Simulation**—A engine simulation process or program attempts to predict real-world responses from specific component assemblies by applying fundamental physical laws to "duplicate" or simulate the processes taking place within the components.

Smallblock—A generic term that usually refers to a V8 engine with a displacement small enough to be contained within a "small" size engine block. Typical smallblock engines displace under 400 cubic inches.

Stroke—The maximum distance the piston travels from the top of the cylinder (at TDC) to the bottom of the cylinder (at BDC), measured in inches or millimeters. The stroke is determined by the design of the crankshaft (the length of the stroke arm).

Top Dead Center or **TDC**—The position of the piston in the cylinder bore at its uppermost point in the stroke. Occurs twice within the full cycle of a four-stroke engine; at the start of the intake stroke and 360 degrees later at the end of the compression stroke.

Torque—The static twisting force produced by an engine. Torque varies with the length of the "arm" over which the twisting force is measured. Torque is a force *times* the length of the measurement arm: *Torque = Force x Torque Arm*, where *Force* is the applied or the generated force and *Torque Arm* is the length through which that force is applied. Typical torque values are ounce-inches, pound-feet, etc.

Valve Head and **Valve Diameter**—The large end of an intake or exhaust valve that determines the working diameter. Valve head temperature can exceed 1200 degrees(F) during engine operation and a great deal of that heat is transferred to the cylinderhead through the contact surface between the valve face and valve seat.

Valve Lift—The distance the valve head raises off of the valve seat as it is actuated through the valvetrain by the camshaft. Maximum valve lift is the greatest height the valve head moves off of the valve seat; it is the lift of the cam (lobe height minus base-circle diameter) multiplied by the rockerarm ratio (in engines equipped with rockerarms).

Valve Motion Curve or **Valve Displacement Curve**—The movement (or lift) of the valve relative to the position of the crankshaft. Different cam styles (i.e., flat, mushroom, or roller) typically have different displacement curve acceleration rates. Engine simulation programs calculate a valve motion curve from valve event timing, maximum valve lift, and other cam timing specifications.

Volumetric Efficiency—An engine measurement calculated by dividing the mass of air inducted into the cylinder between IVO and IVC by the mass of air that would fill the cylinder at atmospheric pressure (with the piston at BDC). Typical values range from 0.6 to 1.2, or 60% to 120%. Peak torque always occurs at the engine speed that produced the highest volumetric efficiency.