

# Appendix 5: New Features in v3.8

Cam Analyzer has had many updates since this user manual was written for the original v2.0 for Windows. These include 3.2A (Appendix 3), 3.2B (Appendix 4) and now v3.8 (Appendix 5). Here is a brief listing of some of the features new since v3.2B was released, including Version 3.8's new features.

Cam Analyzer v3.8 actually has 4 different versions now, which include:

- Cam Analyzer Basic
- Cam Analyzer Plus
- Cam Analyzer Basic with features to use the electronic Cam Test Stand sensors
- Cam Analyzer Plus with features to use the electronic Cam Test Stand sensors

Prior to this, all versions communicated to the Cam Test Stand, however the Plus version added very little to the user who did *not* have the Test Stand. Now the Plus version *does* add several features for users *not* using the Cam Test Stand.

**Note that some of these new features apply only to the Plus Version of the software.**

## New Features for General Program Operation:

- The program now has an “EZ Start Wizard” to walk beginners through the steps of starting a new test. (Fig A20) This feature should greatly aid the user to understand all options which can affect the various tests they can run.
- Added several features for emailing graphs, files and PDF reports (if you have the full Adobe Acrobat™ or some other software which offers a “PDF” printer option). (Fig A21)
- Click on File at top main screen and you will see new Import and Export options. The Export command is similar to the old Create Cam Dr or Comp Cams files. The new v3.8 also includes creating S96 format files, “raw” data files for data from cams “Measured with Electronics”, exporting raw data at 1 crank degree (0.5 cam degree) intervals, and default location for the Engine Analyzer Pro v3.5's Cam Files. There are 2 raw data export options, Raw ‘As Measured’ data which is the measured data before any conversions, and Raw Converted data is the profile after any conversions (like virtual follower conversions) have been done. The Import command has 3 options, mainly explaining how you can open files of several different cam file formats, and one discussed in the paragraph below. (Fig A22)
- Program will automatically look for old v3.2 files and copy them over to this new v3.8. You can also do this manually by clicking on File at top main screen, then Import, then Import All Files from a Cam Analyzer Program. (Fig A22)
- Program now has a 'Website' button in the About screen for jumping to [www.performancetrends.com](http://www.performancetrends.com) website.
- Program has added some new 'Edit' commands for copying cam data to and from the Cam Analyzer to other analysis programs.
  - One is the ability to right click on the top of the data columns in the lower left corner of the main screen, and select to copy the Lift Only or Lift and Degree data to the Windows Clipboard.
  - More include to click on Edit at top of main screen, then:
    - “Add To/Subtract From” to add or subtract a user defined amount of lift.
    - Make Mirror Image
    - Make Centerlines Equal (zero advanceSee Fig A23.
- The Preferences screen has grown, so we've now redone the layout to include tabs for the various groups of Preferences. (Fig A24)
- Now when you switch between Inches and Millimeters for the Lift Increments in Preferences, the program also converts:
  - Specified lifts for the standard duration reports is also converted to the new lift units.
  - Dimensions in the Cam/Test Setup screen.
  - Dimensions in the Virtual Follower screen.
- Program now has added Backup and Restore commands under File at the main screen. (Fig A22)

- The main screen now displays better for screen resolutions greater than 600 x 800.
- The screen colors are now more compatible with Windows XP.
- Now when you click on a graphed point on the main screen, the row for that data point gets highlighted in the table of results.
- Program now better remembers the printer type and printer page orientation when you make changes to the Windows Printer Setup.
- Program now has new preference to let you pick a Company Logo graphics file to appear in your printouts. The logo prints out in Graph printouts also. (Fig A24) Plus Version Only.
- There have been several refinements to the program to produce better looking printouts for graphs and reports.
- Updated the routine to locate an appropriate version of Adobe Acrobat™ to view the PDF files for the user manual.
- A new Preference has been added to allow you to change the line colors used for graphing and printing graph lines. (Fig A24)
- New Format option to Open/Save/Edit a particular graph format. This allows you to save the graph type, graph scales, etc to a particular name. Then you can easily Open these saved formats to reproduce a graph format in the future. This is available by clicking on Format, then Open/Save/Edit Graph Format. (Fig A25)
- The Graph screen now has a Format feature to display the “Legend” (line labels) on the right side in a larger font, and scroll up and down through the labels. Since the font is larger, not all labels can be displayed on the screen if several data types are being graphed. (Fig A26)
- The Graph screen can now accommodate up to 72 individual graph lines (data types). (Fig A26)
- Added several new features for writing ASCII files from reports. (Fig A27)
  - Report names can now include the path.
  - Now you can browse to find or create a file name and path for writing the ASCII file.
  - ASCII reports can now include the test comments.
  - Program now remembers ASCII file settings.
- The Preference which allows you to choose a default Floppy/CD drive has been expanded to include letter drives from A to Z.
- Program now prints headers of graphs and reports the same, and modifies the spacing to better ensure that long test file names are printed completely. As mentioned earlier, you can also include a company logo graphic image in the Plus Version.
- Made graph line flash rate independent of computer speed (.2 second flash rate).

## New Outputs (Features for Graphs and Reports):

**Note: All these new features apply Only to the Plus Version of Cam Analyzer.**

- You can now Advance and Retard the cam profile after it has been “Measured with Electronics”. This is a very powerful feature for making adjustments and analysis after the cam has been measured. Plus Version Only. (Fig A28)
- You can convert most any cam data to the Cam Analyzer format of “Measured with Electronics. This format has several of additional analysis options available (like the several new Report Types below), and also enables you to use the Virtual Follower calculations. This means that you can measure a cam profile by hand with the dial indicator directly on the cam lobe (no follower), convert it to this format, and then use the Virtual Follower calculations to see what this cam would do with various roller diameter followers, or OHC Rocker Arm geometries. This also means that you can *import* a cam profile measured by some other system (Andrews, Cam Dr, Cam Pro Plus, etc) with the encoder directly on the cam lobe (no follower), and do the same Virtual Follower calculations. Plus Version Only. (Fig A29)
- A new calculated output has been added of Asymmetry. Asymmetry is the measure of how much more aggressive the intake opening profile is than the exhaust closing profile. For a symmetric lobe, the opening and closing profiles are the same (Asymmetry = 0). If the opening profile is more steep (aggressive), then the lobe may have, say, 4 degrees of asymmetry at a particular lift, say .050” lift. Technically this means the centerline at .050” lift is retarded from the centerline at the maximum lift point. Plus Version Only. (Fig A30)

- Several new Report Types have been added for the Plus Version Only, which include:
  - Lobe Analysis Report, similar to the Cam Profile Evaluation Program reports in Don Hubbard's book "Camshaft Reference Handbook" (Fig A31)
  - Custom Duration Report, which lets you specify up to 20 lifts at which to measure duration, opening and closing events. It also has options for the lifts to be tappet lift (like the standard duration report) or Valve Lift (correcting for lash and rocker arm ratio), and whether to include the new Asymmetry calculation. (Fig A32)
  - Seating Velocity Report, which calculates the valve closing velocity at several valve lashes of your choosing and 3 RPMs of your choosing. Don Hubbard's book "Camshaft Reference Handbook" gives some "rules of thumb" for acceptable seating velocities, which are included in the program. (Fig A33)
  - Checking Limits Report, which lets you design several checks to be made on the cam profile, like duration/opening event/closing event at a particular lift, maximum lift, centerline and lobe separation. This is a particularly useful report if you are checking cams to meet some quality control specs or to see if they are legal for particular race classes. (Fig A34)
- Added feature for doing Comparison Reports of one test versus another. (Fig A35) Plus Version Only.
- A new Graph menu option is "Analyze". At this time the only option under this heading is "Find Difference Between Lobes". If you have graphed the same type lobes (intake or exhaust) from 2 different tests, the program will find the matched pairs of lobes, like Intake #2 for both tests. It will then go through the difference in lift of both lobes at every 0.1 degrees and save the largest difference. Then it will advance or retard the second lobe with respect to the first lobe and do this comparison again until it finds the advance and retard which produces the lowest maximum difference. It will then report this maximum difference for each lobe pair. (Fig A36) Plus Version Only.
- A new "Watch Cam/Follower" screen lets you watch how the Virtual Follower is interacting with the measured cam profile. This new screen shows the instantaneous lift and rocker ratio both at each cam degree for the *cam* and now for the *actual contact point on the cam*. Data for the actual contact point shows more accurate instantaneous rocker arm ratios. (Fig A37) Plus Version Only.
- The Cam Card now includes duration at either .200 inches or 5 mm lift. (Fig A38) Plus Version Only.

## New Features for Various Types of Cams, Cam Measurement Setups, and Electronics:

Note: Many new features in this section only apply to the Cam Analyzer version which has had the "Cam Test Stand" features activated.

- Two new methods of indexing the rotary encoder have been added. (Fig A39) These new methods are used instead of you specifying a particular event occurs at a particular degree for the #1 Intake Lobe, typically, say, 106 deg Centerline. These methods are:
  - User Finds TDC with Stops.
  - User Finds TDC with Sensor (typically for using the Performance Trends TDC Bridge) Plus Version Only.

For either method you will have a "Set TDC <F4>" option in the electronics Recording screen. You will click on the option or press <F4> key and the program will direct you through a series of steps to find TDC.

"User Finds TDC with Stops" is useful for measuring cams in the engine with a piston stop, or where you can place the rotary encoder exactly at TDC (for example by using the TDC mark on the engine damper). If you select this method, the program will ask you to rotate the crank or cam (and therefore the encoder as well) until the piston encounters the stop. Then it will ask you to rotate it the other way until it encounters the stop again. The program will split the difference and now know exactly where TDC occurs. If you can place the cam, crank or encoder at exactly TDC, you will do that for the first stop, and then *not* move the cam, crank or encoder at all and call it the second point. Splitting the difference of these 2 same points will produce these same 2 points as TDC.

"User Finds TDC with Sensor" is typically used with the Performance Trends TDC Bridge. It lets you turn the dowel pin or keyway used for timing the cam into a cam lobe. The Bridge is now a flat tappet follower. You place the linear encoder on the bridge, press <F4> and follow the program instructions. It finds the "centerline" of the dowel pin or key way and indexes the rotary encoder appropriately. Plus Version Only

## Notes:

Most dowel pins or key ways are NOT positioned at TDC, but some degrees CW or CCW from TDC. You will need to know that positioning to use this feature. For some popular cam designs, Performance Trends has provided that timing in the Cam Layout Details screen.

Many aftermarket cams are NOT timed to the production timing of the dowel pin or keyway.

- The Cam Design Layout now has spots for entering the location of the dowel pin or keyway from TDC in so many degrees, and whether it is CW or CCW. See point immediately above. (Fig A40)
- The program now has several new Cam Types preloaded, like the 427 SOHC Ford, more generic 4 and 6 cylinder engines, more GM V-8s, etc.
- The program has had several refinements for better and more accurate operation with Millimeter lift increments, including:
  - Conversion of more data and settings from inches to millimeters and vice versa when you change the Millimeters/Inches Preference.
  - You can now create standard cam profiles from simple inputs like Lift, Duration at 1 mm, etc using Millimeters.
  - Virtual Follower features now work with Millimeter dimensions and lift measurements.
- The program can now better handle cams with just intake lobes, just exhaust lobes, or most any combination of lobes of up to 3 lobes for each cylinder, intake or exhaust. These options are required for DOHC and other more modern engine designs. Multiple lobes for the particular cylinder and designated A, B and C, like Int 1A, Int 1B, etc. (Fig A41)
- There is now a separate option for telling the program the cam you are measuring in either on the Cam Test Stand or In the Engine. The main difference are that if the cam is in the engine:
  - You do not need to know the Lifter Bore Angle Details. That is because the engine block and/or heads have the followers angled appropriately.
  - There is a good chance the linear encoder may *extend* when you are measuring lift, which could be on the valve itself or the follower. On the stand the encoder always *retracts* (is pushed in) as the follower is lifted.
  - There is a chance the rotary encoder could be mounted on the crankshaft or some other rotating component instead of the camshaft.

The first option can be selected in the Test/Cam Setup screen. If this is selected, then everything is done the same *except* the Lifter Bore Angle Details are not used for timing when the lobes for the different cylinders. However, the program may warn you that you should check the other 2 settings.

The second 2 options are available for setting in the Electronics Recording screen. If you select "Rotary Encoder Mounting as "Other Rotating Component", then the program will ask you to rotate the cam until it sees the cam lobe repeat a second time. Then it will determine how many encoder rotations are equal to 1 cam rotation. All these options are available in the Basic Version except "Other Rotating Component". (Fig A40)

- The Plus version allows you to set some "More (advanced) Options" from the Test/Cam Setup screen. (Fig A42) These 3 options are:
  - Typical Cam Lobe (opens and closes once) – default
  - or Cam Lobe may have 2 "bumps" (may open and close twice)
  - Just show data for Actual Lobe – default
  - or Show All data measured (all 400 deg)
  - Zero Lift is Average Lift Measured on Base Circle – default
  - or Zero Lift is Lowest Lift Measured on Base Circle

"Typical Cam Lobe (opens and closes once) – default" is a typical cam lobe with one opening and one closing profile. "Cam Lobe may have 2 "bumps" (may open and close twice)" is used when the lobe has 2 opening and closing profiles. This typically is used for Briggs and Stratton cams which have a small "Easy Pull" decompression lobe occur during the compression stroke.

When you record a cam lobe with electronics, the Cam Analyzer measures a full cam rotation plus 40 degrees more (360+40=400 cam degrees). The extra 40 degrees is to check for measurement accuracy. The program then goes through all this data and tries to find where the base circle stops and the opening and closing ramps exactly start. Typically you are

not interested in graphing the base circle measurements because it takes up space on the graphs and reports. Then you would select "Just show data for Actual Lobe – default". If you want to view all 400 degrees of measured data, you would select "Show All data measured (all 400 deg)". One case in particular is when you have selected the option "Cam Lobe may have 2 "bumps" (may open and close twice)".

Base circle of the cam is not exactly zero lift. There is some small variation in the base circle lift and this is caused "runout". Up to now, the Cam Analyzer has used the AVERAGE base circle runout as the zero lift setting. Then you see small amounts of both positive and negative lift on base circle. For example if base circle runout was .002 inches, you should see lifts from -.001 to +.001 inches. That is the option of "Zero Lift is Average Lift Measured on Base Circle – default". However, there are times you may want the very lowest lift measured on base circle to be zero lift, or "Zero Lift is Lowest Lift Measured on Base Circle". One case in particular is when you have selected the option "Cam Lobe may have 2 "bumps" (may open and close twice)".

- Added new label to the Valve Train Layout, where you can pick whether the cam rotates CW or CCW in the layout drawing. If you say the cam rotates CW in the drawing and the cam turns CW in the Cam Layout Details, then a label appears that the view of the valve train layout is from the Front of the engine. If you say the cam rotates CCW in the drawing and the cam turns CW in the Cam Layout Details, then a label appears that the view of the valve train layout is from the Rear of the engine.
- Added new 'Clc' button in the Valve Train Layout screen to allow you to calculate the required of Angle and Distance for various pivot points based on X and Y dimensions.
- Added option to customize the calibration of the linear (lift) sensor in the Tester Calibration screen.
- The program will now work with some models of the Cam Pro Plus™ electronics.
- Program now does more extensive checking of valid com ports for communicating to a FlowCom or Performance Trends Black Box and Black Box II. It checks up to Com Port 16, and gives better suggestions at valid ports. There is also a "Find" button in the Test Calibration specs screen to find your electronics by checking all available Com Ports. This feature is in the Basic version also, but only with the Measure with Electronic Sensors feature added.

Fig A20 Starting a New Test Using the EZ Start Wizard

Click on File, the EZ Start Wizard to start a new flow test using the "Wizard"

You will be presented with a series of screens with questions, explanations and possible settings, to make starting a new test as easy as possible. "Back" button at bottom lets you easily back up to previous steps.

Figure A 21 Emailing Options

Set email options in Preferences. Click on Help button on right for explanation of these features.

Email options in Graph screen. The Email 16 Color Graph requires you to find MS Paint utility on your computer and will create a smaller file for emailing with very little loss in picture quality.

Email as PDF File in the Print Options in the Report Screen.

Email a Test File from the Main Screen, so someone else with Cam Analyzer can view it.

Figure A22 Some New Features on the Main Screen

**New Import Commands to import Cam Dr, Cam Pro Plus, Doctor Dr, Andrews, S96 files and import files from an earlier version of Cam Analyzer, like v3.2. This makes it easy to pull all your v3.2 files over to the new version 3.8.**

**Raw Data options for cams "Measured with Electronics"**

**New Options for exporting Raw data**

**New Backup and Restore Commands.**

**Export File Options**

**Cam File Specs**

Format: Raw Converted data

File Name: Scott Evans.txt

Include .MSU and .DES Files: Yes

Lobe to Use: Cylinder 5

Create data for every Crank Deg: No

Limit to One Cam Rev: Yes

Include: Lift, line # and Cr Deg

Note: The Cam Dr or Comp Cams file created is based

Figure A23 Options to Edit, Copy or Paste Data

**Left click on each column heading for different Edit options to be presented, like the one to the right.**

**Right click on the top of a data column for these Options. If you select "Other" you get the screen below.**

**Several new Options if you click on Edit at top of main screen.**

**Edit Test Data**

Erase Column

Advance

Retard

Cancel

Use This Data

Cancel

Click into Text Box above to place cursor there. Then do a 'Ctrl-C' to copy the lift data there. Click on the 'Use This Data' button to copy lift data to lift column for this lobe.

**Edit Test Data**

Copy to Clipboard

Erase Column

Paste from Another Program

Paste from Clipboard

Cancel

'Copy to Clipboard' lets you copy these lifts to some other lobe (int or exh) to this or any other cam file.

Click into Text Box above to place cursor there. Then do a 'Ctrl-C' to copy the lift data there. Click on the 'Use This Data' button to copy lift data to lift column for this lobe.

**Cam Analyzer v3.8 'Plus'**

File Edit Graphs Reports Test/Cam Setup Find TDC Set

Copy or Swap Lobes

Add/Delete Rows of Data

Adv/Ret/Delete Deg Wheel Readings

Copy/Delete/Paste Tappet Lifts

Convert Lift Inches to Millimeters

Convert Lift Millimeters to Inches

Multiply Lift by a Factor

Add to/Subtract from Lift

Round Off Lift

Make Centerlines Equal (0 advance)

Make Mirror Image

Point Degree Tappet Wheel Lift

Figure A24 Printing Company Logo on Graphs and Reports

In Preferences, set text to be included in Printouts.

Use Browse button to find your graphics file on this computer.

Click here for a new screen, where you can change the colors used to graph and print data lines on the graphs.

Graphics file is drawn here on printed reports.

Two lines of text from Preferences is printed here in printouts.

*Your Logo Goes Here* Cam Koehler Injection This Report Printed:  
 Test: www.koehlerinjection.com 9:20 am 06-30-08  
 Folder: EXAMPLES Performance Trends (c) 2008 Page: 1

Report of:	Cyl 1, Cam Data	Test Time:	12:42 PM	02/07/1994	Events Rated at	.05" Tappet Lift					
CLine	Dur	Open	Close	Lb Area	Lb Lift	Vlv Lift	RAR	Lash	LbSep/Adv	Overlap	ASym
Int: 103.8	279.7	36.2	63.6	42.23	.470	.705	1.5	.020	105.1	76.8	-.13
Exh: 106.3	293.0	72.4	40.6	40.89	.423	.677	1.6	.022	1.2	Advance	.39

Figure A25 Opening and Saving a Graph Format

Click here to allowing Saving of the current graph settings as a Format.

To open a saved format, click on the format name from the list, then click on OK. Do the same but click on Delete to delete that saved Format.

Type in a name for the current graph settings, then click on Save to save them under that name and add it to the list.

Figure A 26 Larger Graph Legend and Graphing up to 72 Data Types

This graph shows Intake and Exhaust Lift and Acceleration for 2 V-8 Cams (64 Data Types)

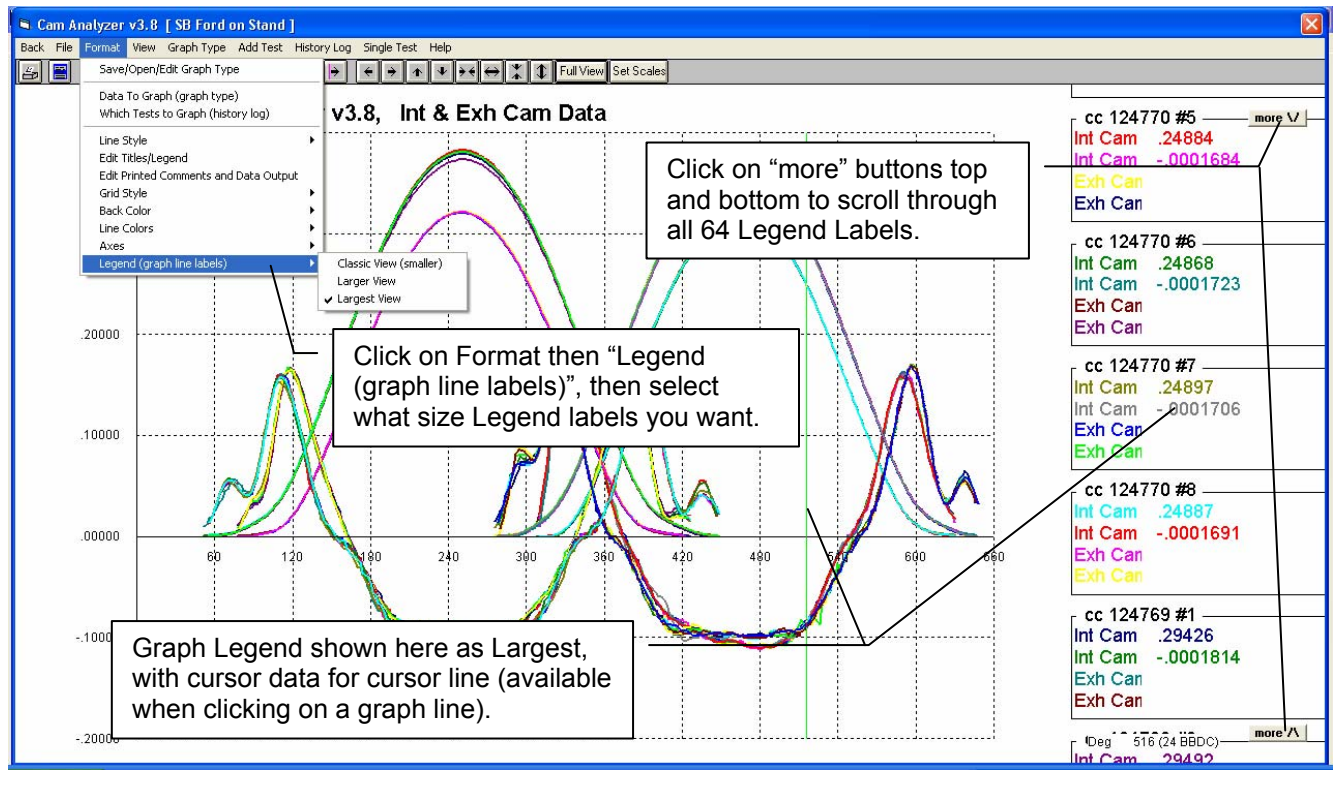


Figure A27 New Features for Writing ASCII Files of Report Data

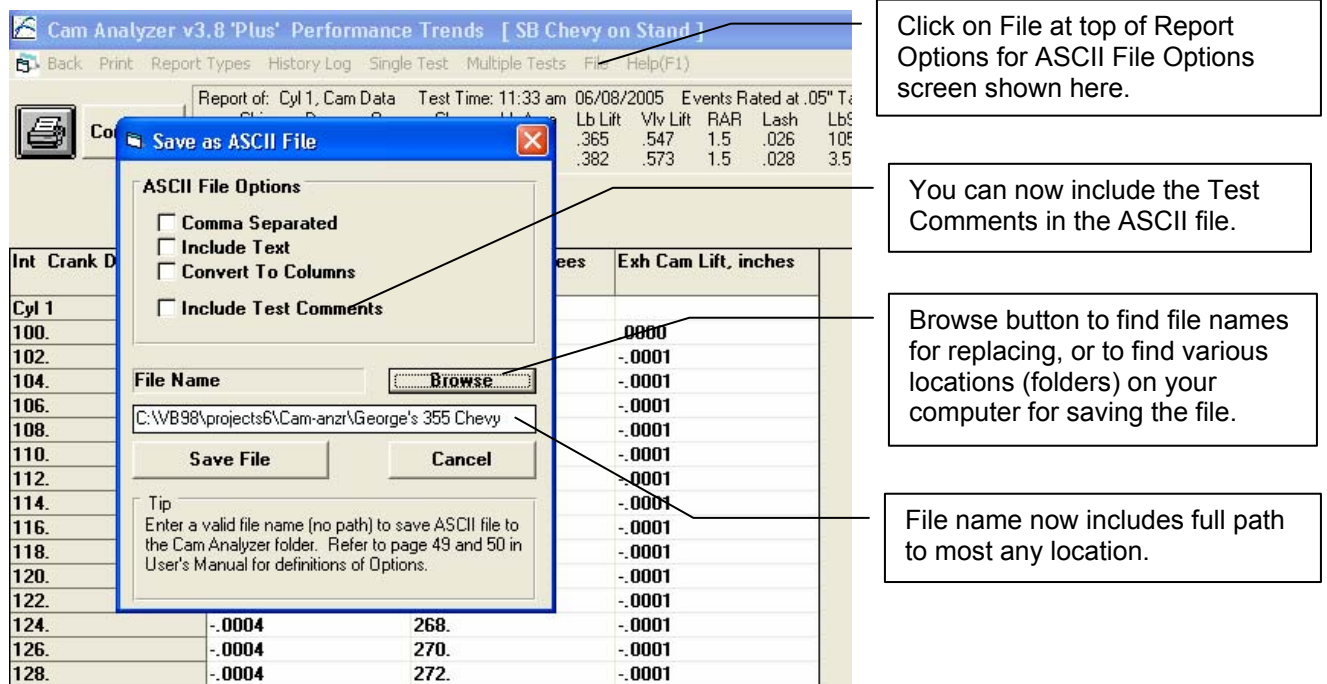


Figure A28 Advancing and Retarding Measured Data, and other Test/Cam Setup Options

These options are only available if the cam has been "Measured with Electronics", or has been converted from another format with the Plus Version's conversion.

Click here for More Advanced Options (listed in descriptions in the text on a previous page. You must turn On a Preference first before this "More Options" button is displayed.

Click here to specify if the cam is being measured on the Cam Test Stand or In the Engine.

Click on the Advance/Retard button for options shown. Select "Allow..." to allow input to the left of the button, where you specify the amount you want to Advance or Retard the "as measured" data. The data will be Advanced or Retarded when you back out of this screen. The amount you enter here is the Total change from when the data was recorded. If you specify Adv of 3 degrees, then several days later a Retard of 1.5 degrees, the total change at that time will be Retarding it 4.5 degrees.

Figure A29 Converting Cam Data to "Measured with Electronics"

Select "Measured with Electronics" to start converting to that format. The program will warn you and then ask if you want to continue in screen below.

If you answer Yes, the conversion starts as shown here.

Please wait while the conversion is being made  
Converting profiles.

**Change Type of Cam Data Anyway?**

The program will now convert your data to a format much like it was Measured with Electronic Sensors (800 crank degrees, 2 deg increments, etc). This will be a major change to the data, but will allow you to do additional types of analysis. After this change, you will NOT be able to return to the original data.

It is recommended you save this data, and then save again to a New Name before you continue. That way you CAN go back to your old data file if need be.

Are you sure you want to make this change to the Type of Cam Data now?

Yes No

After the conversion, some of the features available to data actually "Measured with Electronics" are now available. These include the Virtual Follower features, and the More Options, and many other types of Reports.

The program shows here that the data was NOT actually "Measured with Electronics", but converted from another type of data.

Back at the Main Screen, a generic 1 cylinder cam with 1 Intake and 1 Exhaust Lobe. Here also the program shows that the data was NOT actually "Measured with Electronics", but converted from another type of data.

Figure A30 Definition of Asymmetry

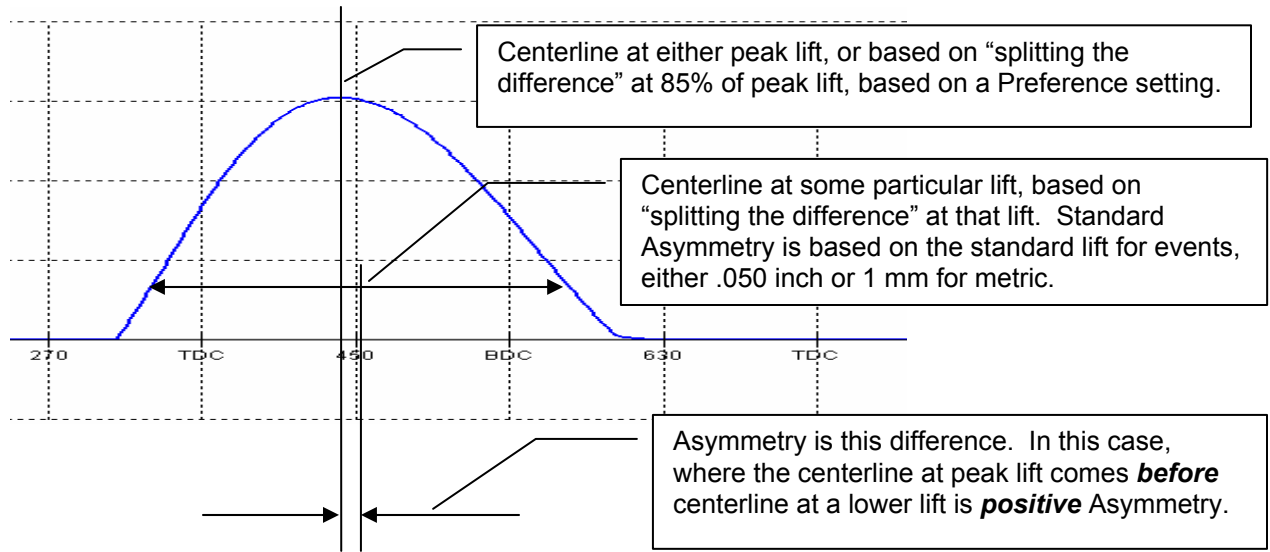


Figure A31 Lobe Analysis Report of **Cam Lobe** Data

		Cam Analyzer v3.8		Koehler Injection		This Report Printed:					
Test: SB Chevy on Stand Folder: EXAMPLES		www.koehlerinjection.com		Performance Trends (c) 2008		2:13 pm 06-30-08					
Report of: Cyl 1, Valve Data		Test Time: 11:33 am		06/08/2005		Events Rated at .05" Tappet Lift					
CLine	Dur	Open	Close	Lb Area	Lb Lift	Viv Lift	RAR	Lash	LbSep/Adv	Overlap	ASym
Int: 102.0	259.0	27.4	51.6	32.21	.365	.547	1.5	.026	105.5	52.5	0.08
Exh: 109.0	268.0	62.9	25.1	34.51	.382	.573	1.5	.028	3.5 Advance		0.04
			I 1	E 1							
Max Tappet Lift, in			.3649	.3819							
Centerline (int=ATDC, exh=BTDC)			102.00	108.98							
Base Circle Runout, in			.0018	.0005							
Max Opening Vel, in/deg			6.991	6.957							
Max Closing Vel, in/deg			7.012	6.930							
Min Radius of Curvature, in											
Min Rad. Curv. occurs at											
Contact Pt Movement (open), in											
Contact Pt Movement (close), in											
Opening at .006, in			57.94	99.57							
Closing at .006, in			90.02	66.45							
Opening Vel at .006, in/deg			1.51	1.10							
Closing Vel, .006, in/deg			-.97	-.88							
Opening at .01, in			52.86	92.85							
Closing at .01, in			83.34	58.73							
Opening Vel at .01, in/deg			1.75	1.35							
Closing Vel, .01, in/deg			-1.27	-1.12							
Opening at .02, in			43.33	80.48							
Closing at .02, in			69.85	43.56							
Opening Vel at .02, in/deg			2.85	2.24							
Closing Vel, .02, in/deg			-2.19	-2.09							
Opening at .050, in			27.41	62.93							
Closing at .050, in			51.57	25.05							
Asymetry at .050, in			0.08	0.04							
Opening at .200, in			-17.87	16.99							
Closing at .200, in			5.98	-21.02							
Asymetry at .200, in			-.07	-.02							
Max Opening Accel, in/deg^2			.308	.321							
Max Accel over Nose, in/deg^2			-.203	-.211							
Max Closing Accel, in/deg^2			.334	.339							
Area Above .050 in, in-deg			24.98	26.91							
Duration at .004 in, in-deg			335.42	354.27							
Duration at .006 in, deg			327.96	346.02							
Duration at .01 in, deg			316.20	331.58							
Duration at .02 in, deg			293.18	304.04							
Duration at .050 in, deg			258.97	267.98							
Duration at .100 in, deg			225.45	233.95							
Duration at .200 in, deg			168.12	175.96							
Duration at .300 in, deg			103.44	114.37							
4-50 Index, deg			76.45	86.29							
10-50 Index, deg			57.23	63.60							
20-50 Index, deg			34.21	36.06							

Basic "summary" of these lobes

These outputs are not calculated unless you have measured the cam with the linear encoder **directly** and then used the Virtual Follower feature to calculate the lobe.

Data for estimating performance of opening and closing ramps, at some standard lifts. Remember these are **cam** lifts and not **valve** lifts so are not equal to these valve lash settings.

Events at more standard lifts, and Asymmetry. Velocities not given because these lifts are not close to typical valve lash settings.

More standard measurements for these lobes.

The Indexes are calculated from the subtracting the duration at .050" from the duration at .004, .010 and .020 inches. The larger these number, the more "gentle" the ramp at that lift.

Figure A 32 Custom Duration Report

**Report Options**

Report Specs  
**Lobes to Report** Intake & Exhaust  
**Type** Custom Duration  
**Report** LArea+Dur Report  
 Cam Card  
 Compare Lobes  
 Compare Measurement Comments  
 Lobe Analysis  
**Custom Duration**  
 Seating Velocity  
 Checking Limits  
**Scaling** Mult Vel/Acc/Jerk by 1000 [std]  
**Report Data Every** 2 degrees  
**Degrees** Mark like Degree Wheel

Filter Specs  
**Lift Filtering** Some  
**Vel/Accel/Jerk Filtering** Moderate

Cylinders to Report  
**Cyls to Report** #1 Only  
**Picked Cyls** 1

**Make Report** **Help** **Cancel** **Print**

**More Report Settings**

**More Report Options**

Custom Duration		Seating Velocity		Checking Limits	
Lift 1	.004	Lift 11	.014		
Lift 2	.005	Lift 12	.015		
Lift 3	.006	Lift 13	.016		
Lift 4	.007	Lift 14	.017		
Lift 5	.008	Lift 15	.018		
Lift 6	.009	Lift 16	.019		
Lift 7	.200	Lift 17	.020		
Lift 8	.011	Lift 18	.021		
Lift 9	.012	Lift 19	.022		
Lift 10	.013	Lift 20	.050		

**Valve or Cam Lifts?** Cam  
**Include Asymetry Calculation** Yes

**Help**  
 Enter a lift for which this report will find the Duration, Opening Event and Closing Event (and Asymetry if requested).

**OK** **Cancel** **Help** **Get Settings** **Save Settings** **Print**

Here you can select the type of report to make.

For the Advanced Reports (bottom 3 in the drop down list shown on this screen), a "More Report Settings" button is displayed. Click on it for the "More Report Options screen shown to the upper right.

Cam Analyzer v3.8 'Plus' Performance Trends [ SB Chevy on Stand ]

Back Print Report Types History Log Single Test Multiple Tests File Help(F1)

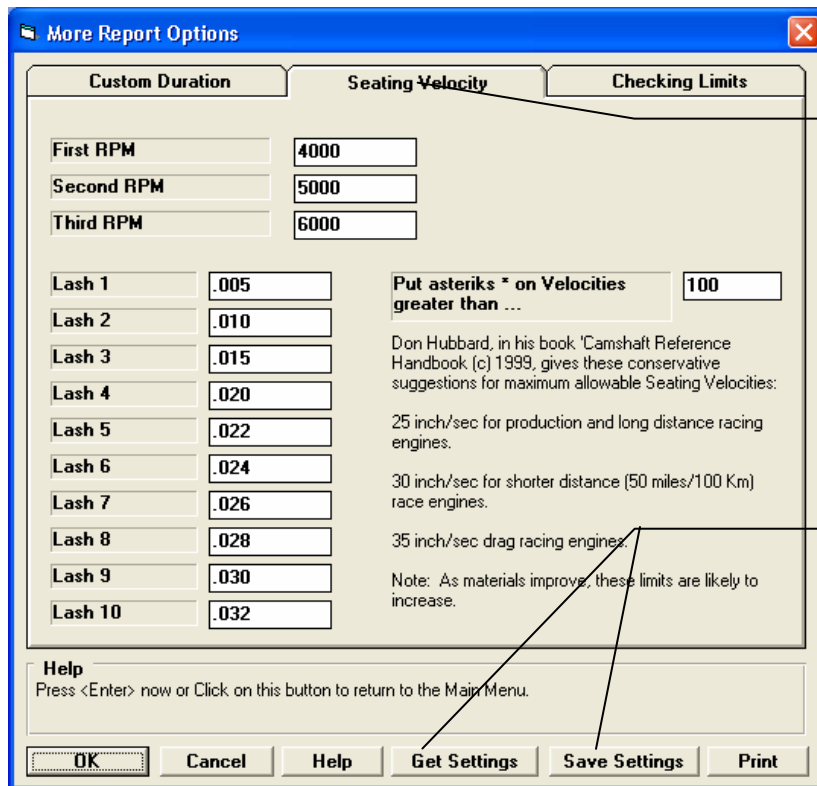
Report of Cyl 1, Cam Data Test Time: 11:33 am 06/08/2005 Events Rated at .05" Tappet Lift

	CLine	Dur	Open	Close	Lb Area	Lb Lift	Vlv Lift	RAP	Lash	LbSep/Adv	Overlap	ASym
Int:	102.0	259.0	27.4	51.6	32.21	365	547	1.5	.026	105.5	52.5	0.08
Exh:	109.0	268.0	62.9	25.1	34.51	382	573	1.5	.028	3.5 Advance		0.04

Cam Lift	Int Open BTDC	Int Close ABDC	Int Dur	Int Asym	Exh Open BBDC	Exh Close ATDC	Exh Dur	Exh Asym
Cyl 1								
.004	61.2	94.2	335.4	4.5	103.4	70.8	354.3	2.7
.005	59.5	91.9	331.4	4.2	101.4	68.5	349.9	2.5
.006	57.9	90.0	328.0	4.1	99.6	66.4	346.0	2.4
.007	56.6	88.3	324.8	3.9	97.7	64.5	342.2	2.4
.008	55.3	86.5	321.8	3.6	95.9	62.5	338.5	2.3
.009	54.0	84.9	318.9	3.5	94.4	60.5	334.9	2.0
.200	-17.9	6.0	168.1	-1	17.0	-21.0	176.0	.0
.011	51.7	81.7	313.5	3.0	91.4	56.9	328.3	1.7
.012	50.7	80.1	310.8	2.7	90.0	55.1	325.2	1.5
.013	49.6	78.7	308.3	2.6	88.7	53.4	322.1	1.3
.014	48.6	77.3	305.9	2.4	87.4	51.8	319.2	1.2
.015	47.7	75.9	303.5	2.1	86.1	50.2	316.3	1.0
.016	46.7	74.5	301.2	1.9	84.9	48.7	313.6	.9
.017	45.8	73.2	299.0	1.7	83.7	47.3	311.0	.8
.018	45.0	72.0	297.0	1.5	82.6	45.9	308.5	.6
.019	44.1	70.9	295.0	1.4	81.5	44.7	306.2	.6
.020	43.3	69.8	293.2	1.3	80.5	43.6	304.0	.5
.021	42.6	68.9	291.4	1.2	79.5	42.5	302.0	.5
.022	41.8	67.9	289.7	1.1	78.6	41.5	300.1	.4
.050	27.4	51.6	259.0	.1	62.9	25.0	268.0	.0

Figure A33 Seating Velocity Report



This screen has 3 tabs for the 3 different Report Types which use these additional settings.

You can either Save settings, or Get some previously Saved settings by clicking on these buttons. You will only Save or Open settings for one particular tab. That means if you save Seating Velocity settings, you are not saving Custom Duration or Checking Limits settings.

Cam Analyzer v3.8 'Plus' Performance Trends [ SB Chevy on Stand ]

Back Print Report Types History Log Single Test Multiple Tests File Help(F1)

Report of: Cyl 1, Valve Data Test Time: 11:33 am 06/08/2005 Events Rated at .05" Tappet Lift

	CLine	Dur	Open	Close	Lb Area	Lb Lift	Vlv Lift	RAR	Lash	LbSep/Adv	Overlap	ASym
Int:	102.0	259.0	27.4	51.6	32.21	.365	.547	1.5	.026	105.5	52.5	0.08
Exh:	109.0	268.0	62.9	25.1	34.51	.382	.573	1.5	.028	3.5 Advance		0.04

Lash	Vel @ 4000 RPM, int	Vel @ 5000 RPM, int	Vel @ 6000 RPM, int	Vel @ 4000 RPM, exh	Vel @ 5000 RPM, exh	Vel @ 6000 RPM, exh
Cyl 1						
.005	57.68	72.10	86.52	60.79	75.98	91.18
.010	62.33	77.92	93.50	65.39	81.74	98.08
.015	66.44	83.05	99.66	69.14	86.43	103.72 *
.020	69.78	87.22	104.66 *	72.51	90.63	108.76 *
.022	71.00	88.75	106.51 *	73.66	92.08	110.49 *
.024	72.23	90.29	108.35 *	74.82	93.52	112.23 *
.026	73.38	91.73	110.07 *	75.97	94.97	113.96 *
.028	74.47	93.08	111.70 *	77.07	96.34	115.61 *
.030	75.55	94.44	113.32 *	78.11	97.64	117.17 *
.032	76.63	95.79	114.95 *	79.15	98.94	118.72 *

Check out Don Hubbard's book "Camshaft Reference Handbook" for lots of cam design suggestions. In it he talks about seating velocity and choosing an acceptable one for durability. The velocity in inches per second (or mm per second) changes with the engine RPM you are running. That is why you can enter up to 3 RPMs for checking. The Valve Lashes you enter are actual valve lash, and not tappet lifts. These valve lashes will change as you change the Rocker Arm Ratio setting in the Test/Cam Setup screen.

Figure A34 Checking Limits Report

Check	What to Check	Which Lobe(s)	At this Lift	Min Limit	Max Limit
Check 1	Duration	Exhaust	.100	230	240
Check 2	Centerline	Intake		101.8	102.2
Check 3	Close Event	Intake	.200	4	6
Check 4	Lobe Separation	Intake & Exhaust		104.5	105.5
Check 5	None				
Check 6	Peak Lift				
Check 7	Centerline				
Check 8	Lobe Separation				
Check 9	Duration				
Check 10	Open Event				
Check 11	Close Event				
Check 12	None				

Choose which type of check you want to make, or choose "None" for no check.

Choose if you want the check done on the Intake, Exhaust or both lobes.

Enter the Minimum and Maximum values which are acceptable. Values outside this range will be flagged out in the report.

Depending on your choice, you may be able to enter an "At this Lift" value, like Duration at .100 tappet lift.

Cam Analyzer v3.8 'Plus' Performance Trends [ SB Chevy on Stand ]

Report of: Cyl 1, Valve Data Test Time: 11:33 am 06/08/2005 Events Rated at .05" Tappet Lift

	CLine	Dur	Open	Close	Lb Area	Lb Lift	Vlv Lift	RAR	Lash	LbSep/Adv	Overlap	ASym
Int:	102.0	259.0	27.4	51.6	32.21	.365	.547	1.5	.026	105.5	52.5	0.08
Exh:	109.0	268.0	62.9	25.1	34.51	.382	.573	1.5	.028	3.5 Advance		0.04

"Pass" means the value is within limits

	Int Centerline	Int Close Event (.200)	Exh Duration (.100)	Exh Lobe Separation
Cyl 1	102.00 = Pass	5.98 = Pass		
Cyl 2	102.04 = Pass	6.24 > 6	233.77 = Pass	105.48 = Pass
Cyl 3	101.72 < 101.8	5.71 = Pass	234.59 = Pass	105.54 > 105.5
Cyl 4	101.94 = Pass	5.76 = Pass		
Cyl 5	102.17 = Pass	5.40 = Pass	234.09 = Pass	105.80 > 105.5
Cyl 6	102.46 > 102.2	5.99 = Pass	233.69 = Pass	105.76 > 105.5
Cyl 7	102.17 = Pass	5.76 = Pass	233.39 = Pass	105.73 > 105.5
Cyl 8	101.90 = Pass	5.71 = Pass	234.18 = Pass	105.51 > 105.5

If the value is greater than the limit, the greater than sign ">" is given with the acceptable limit it violated.

If the value is less than the limit, the less than sign "<" is given with the acceptable limit it violated.

Figure A35 Comparison Reports Between Different Test Files

Report of: Cyl 1, Cam Data, Test Time  
 CLine Dur Open Close  
 Int: 102.0 259.0 27.4 51.6  
 Exh: 109.0 268.0 62.9 25.1

Click on History Log to display History Log below to pick which tests to include in the comparison report.

Cam Lift	Int Open BTDC	Int Close ABDC	Int Dur	Exh Open BBDC	Exh Close ATDC	Exh Dur
Cyl 1						
.001	68.6	107.9	356.4	112.5	81.6	374.1
.000	72.0	235.3	487.3	253.6	180.8	614.4
.000	72.0	235.3	487.3	253.6	180.8	614.4
.000	72.0	235.3	487.3	253.6	180.8	614.4
.000	72.0	235.3	487.3	253.6	180.8	614.4
.000	72.0	235.3	487.3	253.6	180.8	614.4
.050	27.4	51.6	259.0	62.9	25.0	268.0
.100	10.8	34.7	225.4	45.9	8.1	234.0
.150	-3.6	20.2	196.6	31.4	-6.6	204.7
.200	-17.9	6.0	168.1			
.250	-32.7	-8.8	138.5			
.300	-50.3	-26.3	103.4			

Click in this "Graph?" column to include that particular test in the comparison report.

Test File and Path	Graph?	Std Graph Title	Save?	Cam #	# Cyl	Cyl to Graph	Int Lift	Dur	Test Date	Exh Lift	Dur	File Type
...ata\examples\SB Chevy on Stand	Yes	cc 124769		CC 124769	8	1	.373"	259.1	06/08/2005	.380"	268.5	Measured with Electronics
...camdata\Honda\SB Ford on Stand		cc 124770		CC 124770	1	1	.305"	256.6	06/08/2005	.000"	.0	Measured by Hand
...data\examples\SB Ford on Stand	Yes	cc 124770		CC 124770	8	1	.320"	228.6	06/08/2005	.321"	232.8	Measured with Electronics
...nrz\camdata\examples\DRAG.PTI		compcam00457		CompCam00457	1	1	.470"	279.7	02/07/1994	.423"	293.1	Measured by Hand
...ronics Conversions\DRAG.PTI		compcam00457		CompCam00457	1	1	.470"	330.5	02/07/1994	.423"	338.0	Measured with Electronics
...nics Conversions\DRAG.PTI 002		compcam00457		CompCam00457	1	1	.000"	.0	06/26/2008	.000"	.0	Measured with Electronics
...ans\EVD VIII FP 271 Intake da								1.3	01/28/2008	.000"	.0	Measured with Electronics
...My-Tests\sb ford on stand 001									06/27/2008	.000"	.0	Measured with Electronics
...ts\Try built in Dowel Pin info									06/27/2008	.000"	.0	Measured with Electronics
...anz\camdata\My-Tests\Pontiac		cc 124769		CC 124769	8	1	.373"	259.1	06/08/2005	.380"	268.5	Measured with Electronics
...nics Conversions\DRAG.PTI 001		compcam00457		CompCam00457	1	1	.300"	199.7	06/27/2008	.333"	222.0	Measured with Electronics
...nz\camdata\Wizard\Kevin 001		kevin2		Kevin2	8	1	.000"	.0	06/27/2008	.000"	.0	Measured with Electronics
...Cam-anrz\camdata\Wizard\Kevin		kevin2		Kevin2	1	1	.000"	.0	06/27/2008	.000"	.0	Measured with Electronics
...My-Tests\sb chevy on stand 009		cc 124769		CC 124769	8	1	.000"	.0	06/27/2008	.000"	.0	Measured with Electronics
...My-Tests\sb chevy on stand 008		cc 124769		CC 124769	8	1	.000"	.0	06/27/2008	.000"	.0	Measured with Electronics
...my-tests\sb chevy on stand 007		cc 124769		CC 124769	8	1	.000"	.0	06/25/2008	.000"	.0	Measured with Electronics

Then click on "Graph Tests Marked Yes"

Report of: Cyl 1, Cam Data, Test Time  
 CLine Dur Open Close  
 Int: 102.0 259.0 27.4 51.6  
 Exh: 109.0 268.0 62.9 25.1

Click on Multiple Tests and choose which type to make. In this example, we're including the "Difference" calculation.

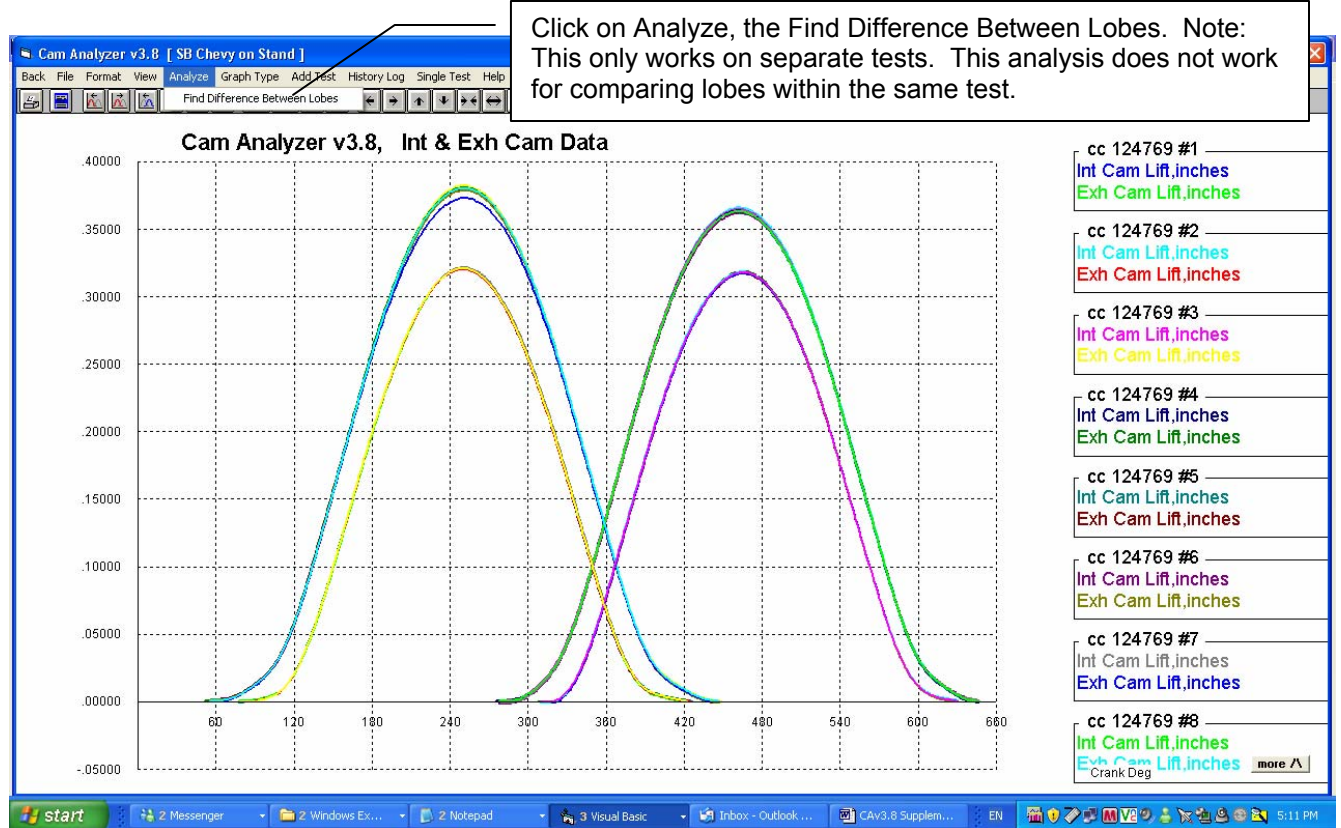
Cam Lift	SB Chevy on Stand	SB Ford on Stand	Dif.
Cyl 1			
.003	63.0	33.7	-29.3
.004	61.2	32.5	-28.7
.006	57.9	30.5	-27.4
.015	47.7	23.7	-24.0
.020	43.3	21.0	-22.3
.040	31.6	12.4	-19.2
.050	27.4	8.7	-18.7
.100	10.8	-7.0	-17.8
.150	-3.6	-21.5	-17.9
.200	-17.9	-36.5	-18.6
.250	-32.7	-54.0	-21.3
.300	-50.3	-79.5	-29.2
.350	-77.6		

Click on Single Test to turn Off Multiple Tests.

Cam Lift	Int Close ABDC	Int Close ABDC	Dif.
Cyl 1			
.003	96.8	74.9	-21.9
.004	94.2	71.8	-22.4
.006	90.0	67.4	-22.6
.015	75.9	56.9	-19.0
.020	69.8	53.3	-16.5
.040	56.0	43.1	-12.9
.050	51.6	39.1	-12.5
.100	34.7	22.7	-12.0
.150	20.2	7.7	-12.5
.200	6.0	-7.4	-13.4
.250	-8.8	-24.4	-15.6
.300	-26.3	-48.9	-22.6
.350	-53.2		

Cam Lift	Int Dur	Int Dur	Dif.
Cyl 1			
.003	339.8	288.6	-51.2
.004	335.4	284.3	-51.1

Figure A36 Analyze Feature on Graph Screen



```
AnalyzeCam.txt - Notepad
File Edit Format View Help
Comparing Graph Data:
Baseline: SB Chevy on Stand
Comparison: SB Ford on Stand

Baseline: cc 124769 #1
Comparison: cc 124770 #1
Base: Int Cam Lift,inches .23426 at 536. deg
Comp: Int Cam Lift,inches .18024 at 538.6 deg
Max Difference .05403 at 2.6 deg Advance

Base: Exh Cam Lift,inches .30054 at 194. deg
Comp: Exh Cam Lift,inches .23743 at 193.2 deg
Max Difference .06311 at 0.8 deg Retard

Baseline: cc 124769 #2
Comparison: cc 124770 #2
Base: Int Cam Lift,inches .24158 at 534. deg
Comp: Int Cam Lift,inches .18753 at 536.4 deg
Max Difference .05405 at 2.4 deg Advance

Base: Exh Cam Lift,inches .28302 at 314. deg
Comp: Exh Cam Lift,inches .21927 at 312.6 deg
Max Difference .06375 at 1.4 deg Retard

Baseline: cc 124769 #3
Comparison: cc 124770 #3
Base: Int Cam Lift,inches .23977 at 534. deg
```

The Difference found are given in a Notepad text file so you can choose to print them, save them or copy them as needed.

Ln 1, Col 1

Figure A37 Watch Virtual Follower Screen

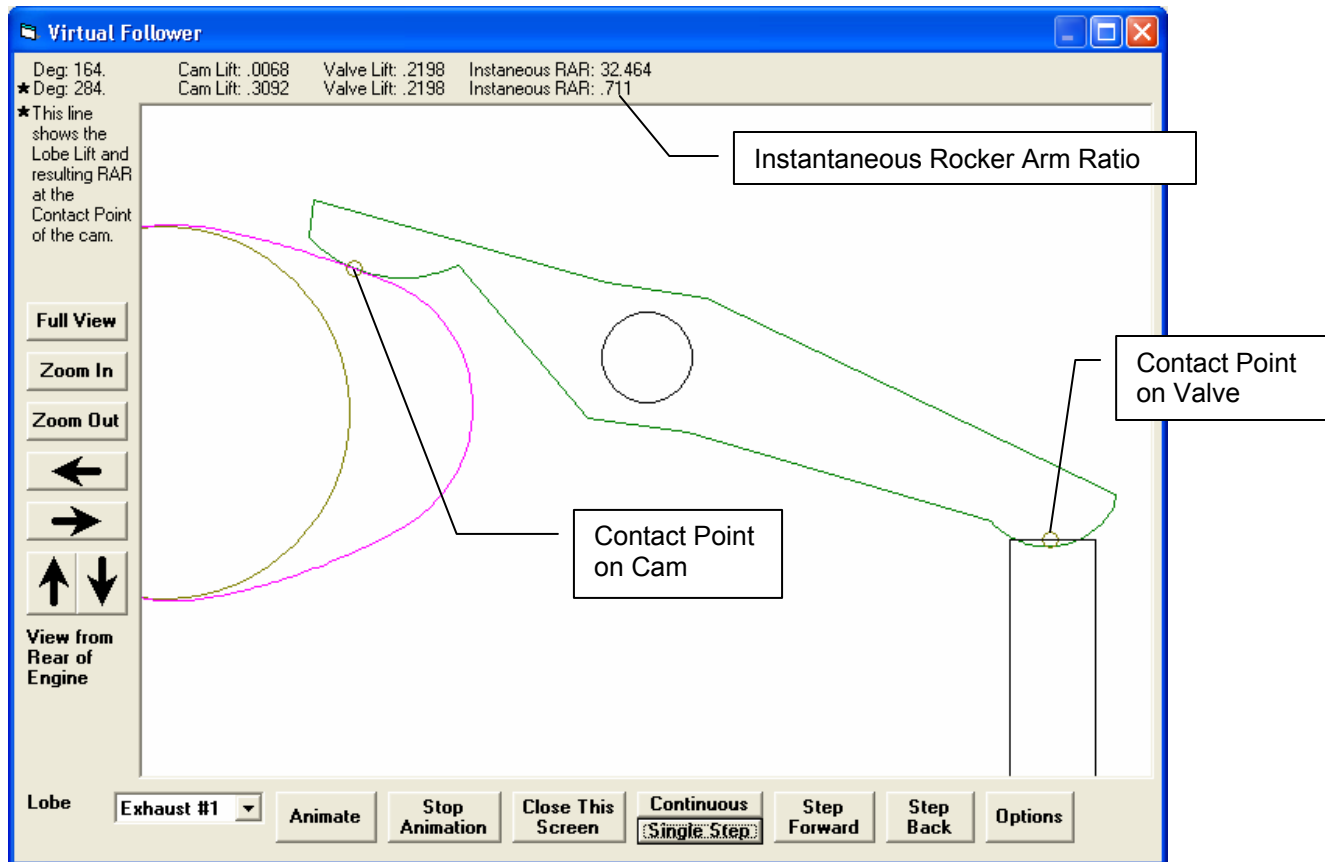
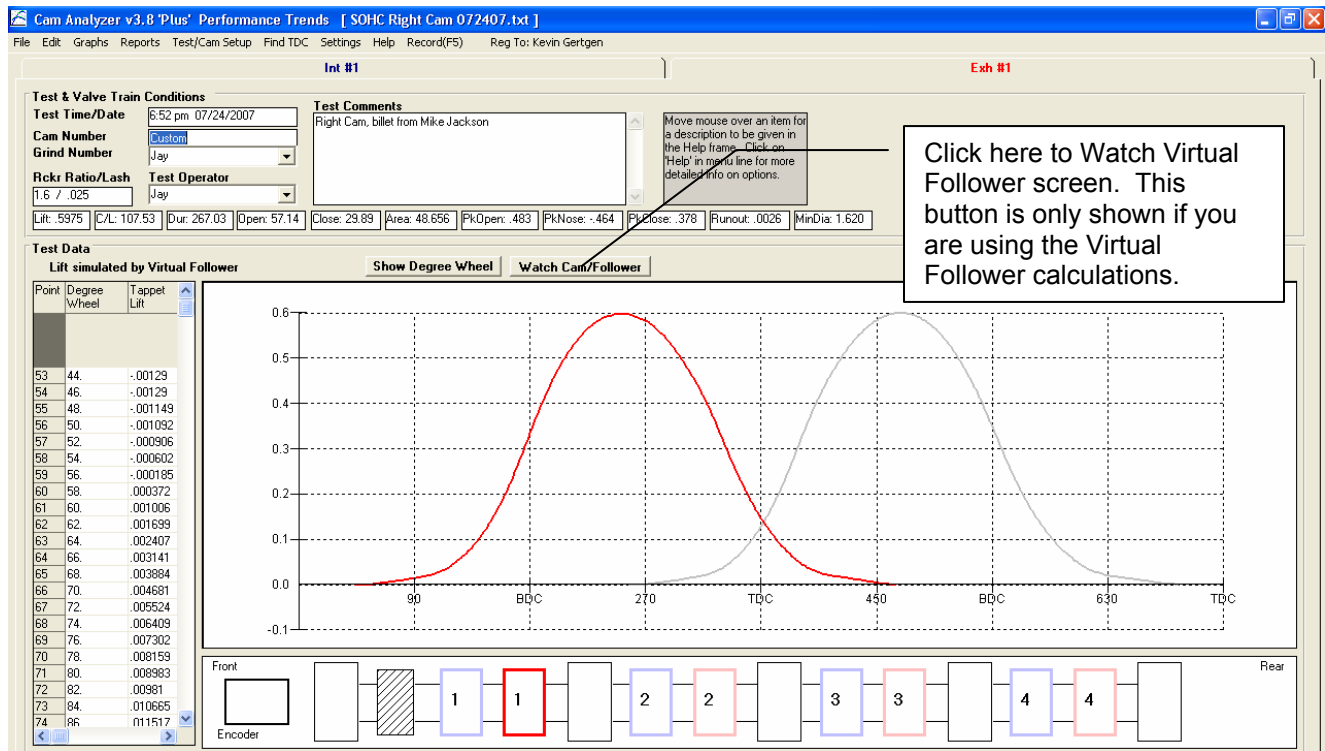


Figure A38 Cam Card Report

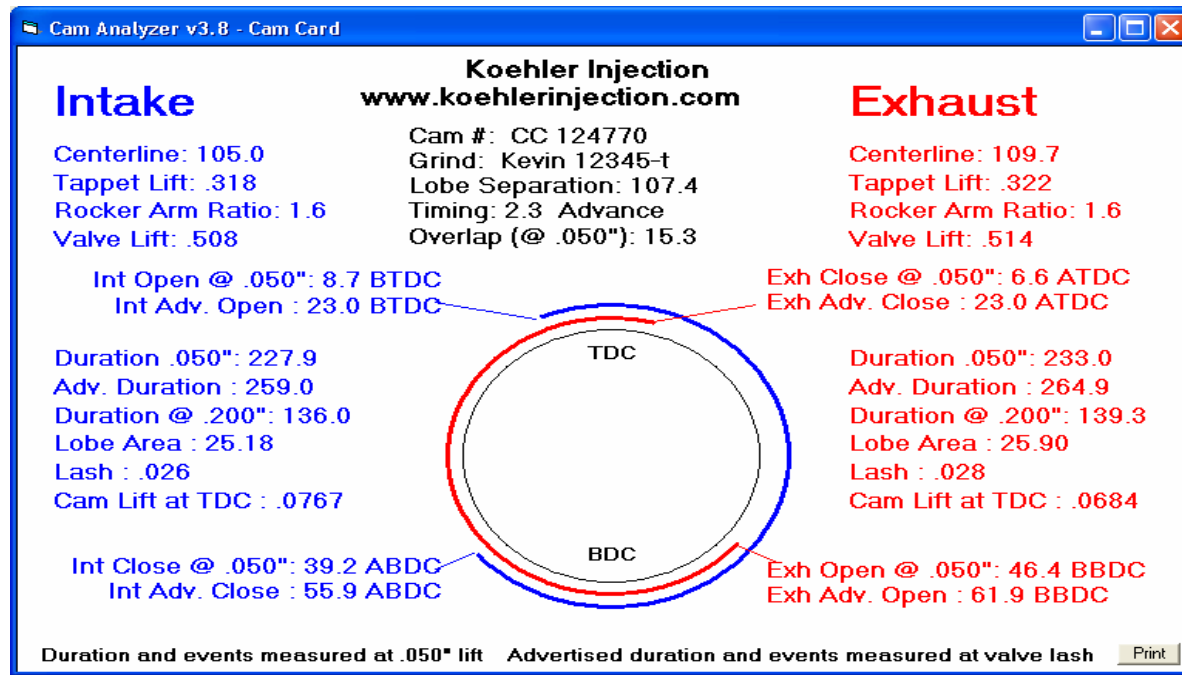


Figure A39 New Methods for Finding TDC and Indexing the Rotary Encoder

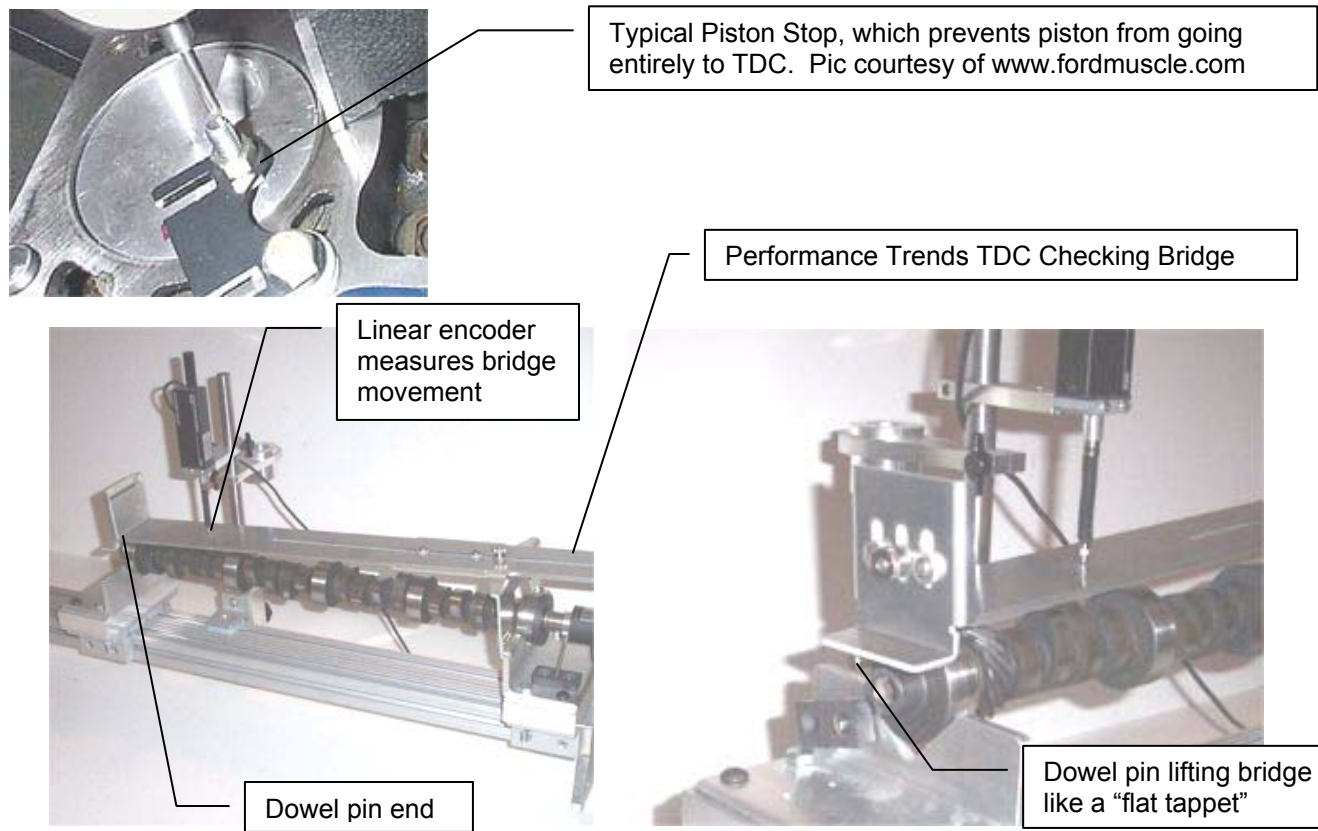


Figure A40 Dowel Pin or Keyway Location Input in Cam Design Layout Specs

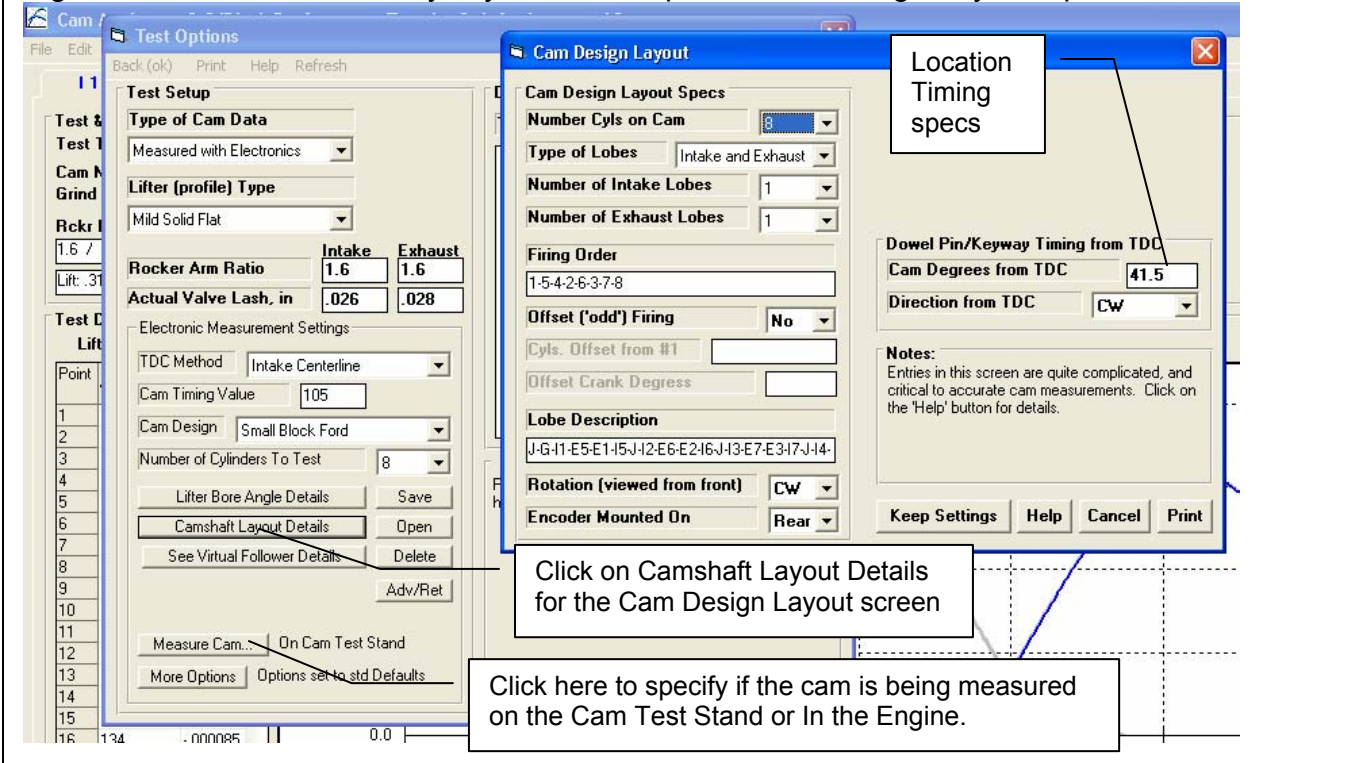


Figure A41 Example of More Cam Layout Choices, DOHC Exhaust 4 Cylinder Cam

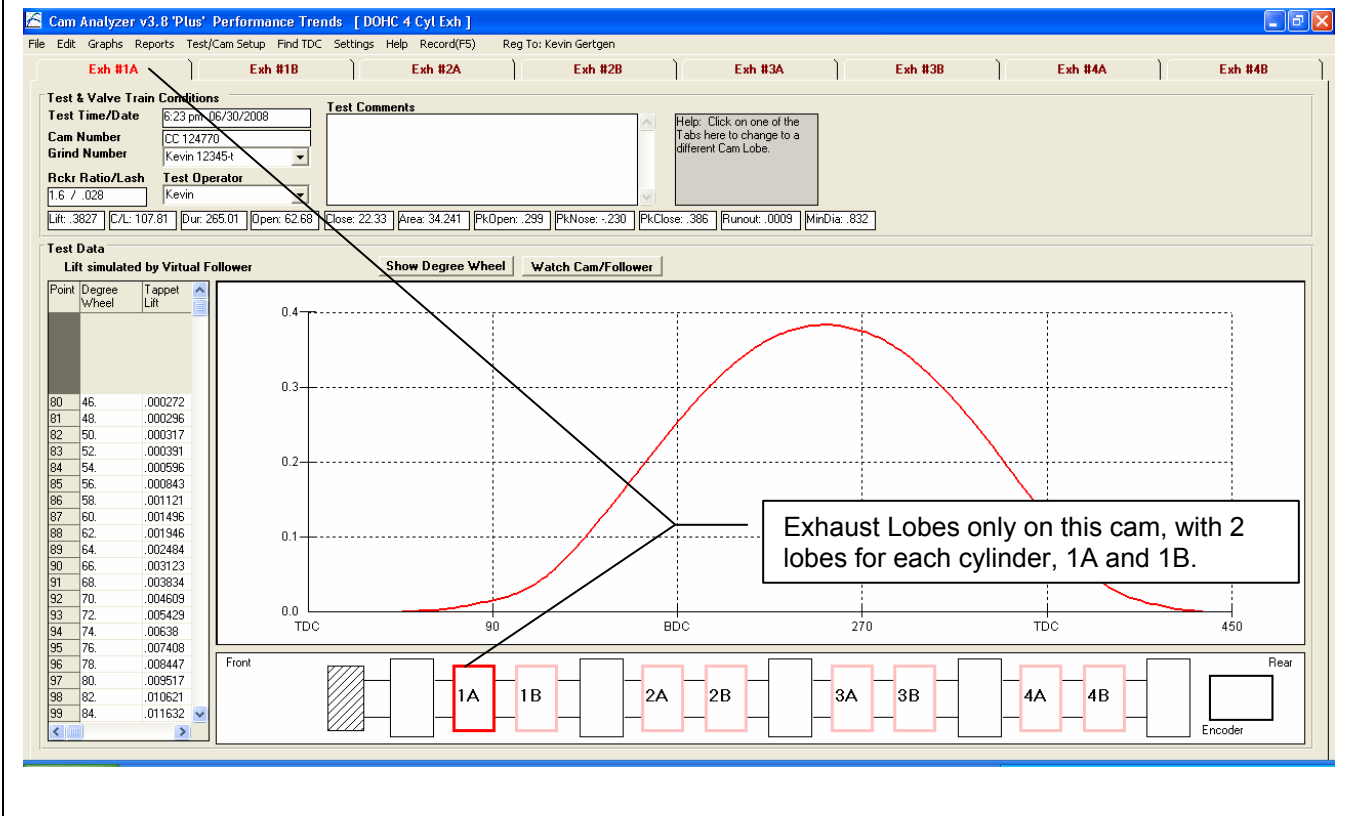
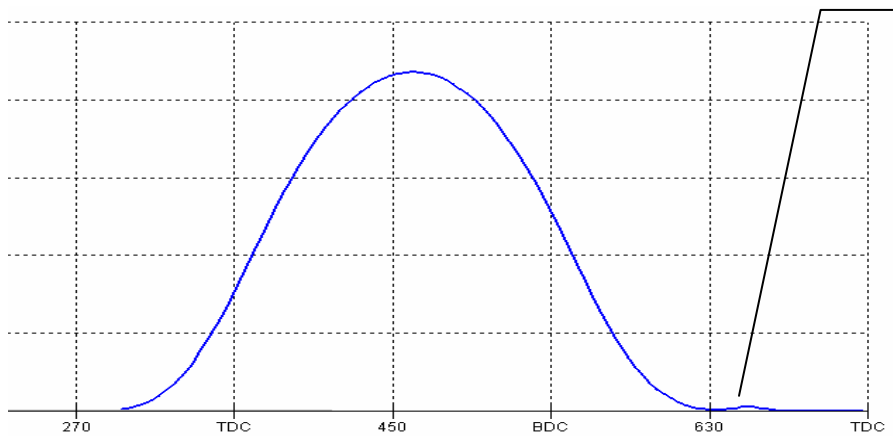


Figure A42 Advanced Options Required for Some Lobes



Second "lobe" or bump designed into cam profile. If you don't use some of the More (advanced) Options, this bump will be included in base circle runout and greatly distort the measured cam data.

In this situation, you want to select the "2 'bumps'" and "Zero Lift is Minimum Lift" options.

