Appendix 10: New Features in v4.3 B

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), v3.8 (Appendix 5), v4.0 (Appendix 6) and now v4.3. Here is a listing of some of the new features for Version 4.3:

Cam Analyzer v4.3 actually has 5 different versions, which include:

- Cam Analyzer Basic (for analyzing cam data from either manual data entry or computer cam files)
- Cam Analyzer Plus (for more detailed analyzing of cam data from either manual data entry or computer cam files)
- Cam Analyzer Basic for use with the electronic Cam Test Stand (CTS) sensors
- Cam Analyzer Plus for use with the electronic Cam Test Stand sensors
- Cam Analyzer Plus for use with the electronic Cam Test Stand sensors, with advanced "Cam Grinder" features

Note that some of these new features apply only to the "Plus" version and/or "Cam Grinder" version of the software. Also note that the "Cam Grinder" version contains all Plus version features.

New Features for All Versions:

You can now flip the drawing of the camshaft on the main screen to now match how you have the cam on the Cam Test Stand. This makes it easier to keep track of what lobe you are measuring. Fig 10.1.

S96 files are now always generated where the highest lift (assumed to be the centerline) is placed at line 198 (center of the file). Some programs from other companies expected this to always be the case.

The program has some new Example Cam Layouts, including Ford Godzilla 7.3L, Ford OHC Modular V8, Ford 292/312 Y block, and more.

The program now remembers the size and position of the Main Screen and Graph Screen and restores them when the program is opened or the Graph Screen is reopened.

The Main Screen graph now fills the available screen if it is maximized.

The program has increased the number of significant figures in various screens, up to 8 in some cases. For profiles that have been measured, this was not really necessary. For profiles that have been generated by a cam design program, this does help show a designed file in good detail.

Now reports of duration at various lifts show blank duration, opening and closing events if the duration is 0 at those particular lifts. Previously the reports 'showed fictitious numbers as the opening and closing events, and 0 duration. These rows with all blanks are not included in the report, saving space on the screen and printouts. Fig 10.2.

Now the spacing of columns in reports are more correctly sized to show all columns, especially if the screen size is small and the number of columns is quite large.

The program will now "talk" to our Engine Log Book Pro v1.1D, so you can pull cam specs from a Cam Analyzer file into the Engine Log Book Pro. Fig 10.3 and 10.4.

Lash and Duration in Test/Cam Setup now are always shown to .000 inch or .1 mm decimal places.

You can now stop displaying the program's opening Warning screen by checking the "Don't show this again" box in the lower left corner.

New Features for the Plus Version Only:

A new report type has been added: TDC Lifts, Set Cam Timing to help time the cam you measured in the engine. This report will tell you what intake and exhaust tappet lift to look for at TDC to know how advanced or retarded the cam timing will be. Fig 10.5.

A new report type has been added: Lobe Analysis - Short similar to the Lobe Analysis report, but with fewer outputs. This report also includes a new output called “Drift Error”, and indication of measurement accuracy. Fig 10.6.

You can now specify up to 6 lobes for each cylinder. Fig 10.7.

You can now specify more details when creating a cam profile from .050" inputs, .040" inputs, etc. NOTE: Profiles generated this way are still not precise enough to use for grinding custom cams. Fig 10.8, 10.9 and 10.10.

When doing one of the OHC Rocker Arm layouts with the Virtual Follower feature, the program now draws the layout as it appears from the front of the engine for Clockwise and Counter Clockwise rotations. There is also a new choice of drawing the layout with the valve to the left or right of the cam, so 4 choices total. This will make it much easier to visualize the valve train layout. Fig 10.11 and 10.12.

The report of Seating Velocity is now titled Seating Velocity/Est. Lash to indicate it can do both functions.

There is a new method of estimating the valve lash point. Many modern cam designs do not have a zero velocity point for estimating the valve lash point. See Fig A59 on page 177. Finding zero velocity was the method of earlier versions of Cam Analyzer to find the lash point. Instead, the program now looks for a particular velocity point of tappet lift vs cam degrees. You can set this in Preferences, with 2 defaults provided if you do not have particular velocity you want to call the lash point. Lash points for both the new method and old method are given. If the old zero velocity method gives a reasonable lash point, it is likely based on the program finding a zero velocity point in the profile. This is probably the better lash point to go with. For more information on the Zero Velocity lash point, there is a FAQ on our website called “How can I tell if a cam is hydraulic or solid, and if solid, what lash it is designed for?” Fig 10.13.

There is now an option to remove several outputs on Cam Card to simplify it. This was requested by one particular cam grinder.

The program now has a Calc utility to calculate the radius of curvature for inputs in Virtual Follower screen.

There is now a Preference setting of “Report Asymmetry in” so you can choose the original of “Crank Degrees” or the new option of “Cam Degrees”.

The program has reduced the lower limit for "Valve End Pivot Radius" to 3 mm and 0.2 inches. This may help simulate certain OHC valve train geometries.

There is a new Preference called “Allow a Degree Offset When Finding TDC with Stops”. Set this to Yes and the program allows you to enter an offset for TDC when finding TDC with mechanical stops.

Output files are now giving results to 8 decimal places for writing smoother output files.

Now the Lobe Analysis and Lobe Analysis - Short reports for lobes which were not measured show blanks instead of fictitious numbers like 0 or 180.

Now the Lobe Analysis labels the 3 Indexes at the bottom of the report as “Hyd. Intensity”, “Minor Intensity”, and “Major Intensity”. These terms were developed by Harvey Crane to describe how quickly a cam profile got the tappet moving. In previous versions of Cam Analyzer these were just labeled an “Index”, but now these “Intensity” labels are included also. The smaller these numbers, the more quickly the tappet gets going. The Indexes or Intensities are calculated from the subtracting the duration at .050” from the duration at .004, .010 and .020 inches.

New Features for the “Cam Grinder” Version Only:

Now there are 2 new File options in the Graph screen for exporting graph data as displayed, one to export as a text file for Notepad, and one to export as a .csv file for MS Excel. This is similar to the ASCII File option in the Reports screen, but makes the necessary degree increments so it more directly imports into Excel. Fig 10.14.

You can now identify an individual base circle measurement for all lobes. If you have selected this option, the program now asks for base circle measurement before each lobe measurement. The program checks if the Individual Base Circle value is reasonable for calculating out a Virtual Follower. This feature was requested by someone measuring diesel cams. He wanted to measure the fuel injector cam profile, and told the program he had 2 intake profiles like a 4 valve motor would have. But because the fuel injector lobe was so different, he needed to specify a different base circle measurement for these lobes. Fig 10.15 and 10.16.

Now you can edit a cam profile (stretch and/or shrink the lift or duration) from data "Measured w Electronics" directly. This eliminates several steps that were required in previous version, where you had to convert to “Measured by Hand” data, do the edit you wanted, and then convert back to “Measured with Electronics”. Fig 10.17 and 10.18.

If you click on a section of a report while holding down the Ctrl key, the program presents options for making a small report of the data in that section with a small graph. This lets you quickly see if the data is has any trends, or spot data points which are quite different than the rest. Fig 10.19.

You can now generate a 3D.igs file with a particular thickness for the lobe. This will produce a file of 360 1 degree segments. If you need a Solidworks or Mastercam file consisting of arcs, there is an FAQ on our website for doing that. But, you will need to do some additional conversions once the file is in Solidworks or Mastercam. There is an FAQ on our website titled "How do I convert a cam file (CPP, S96, Cam Dr, etc) to a manufacturing type file (.p, .igs, .iges, X/Y, etc) for a CNC cam grinder." that goes into this in more detail. The first 4 pages go into converting a non-Cam Analyzer file into a Cam Analyzer file. Starting on page 5 it discusses how to do the conversion to a manufacturing type file from a Cam Analyzer file. Fig 10.20 and 10.21.

Figure 10.1 Flipping the Camshaft Layout Drawing

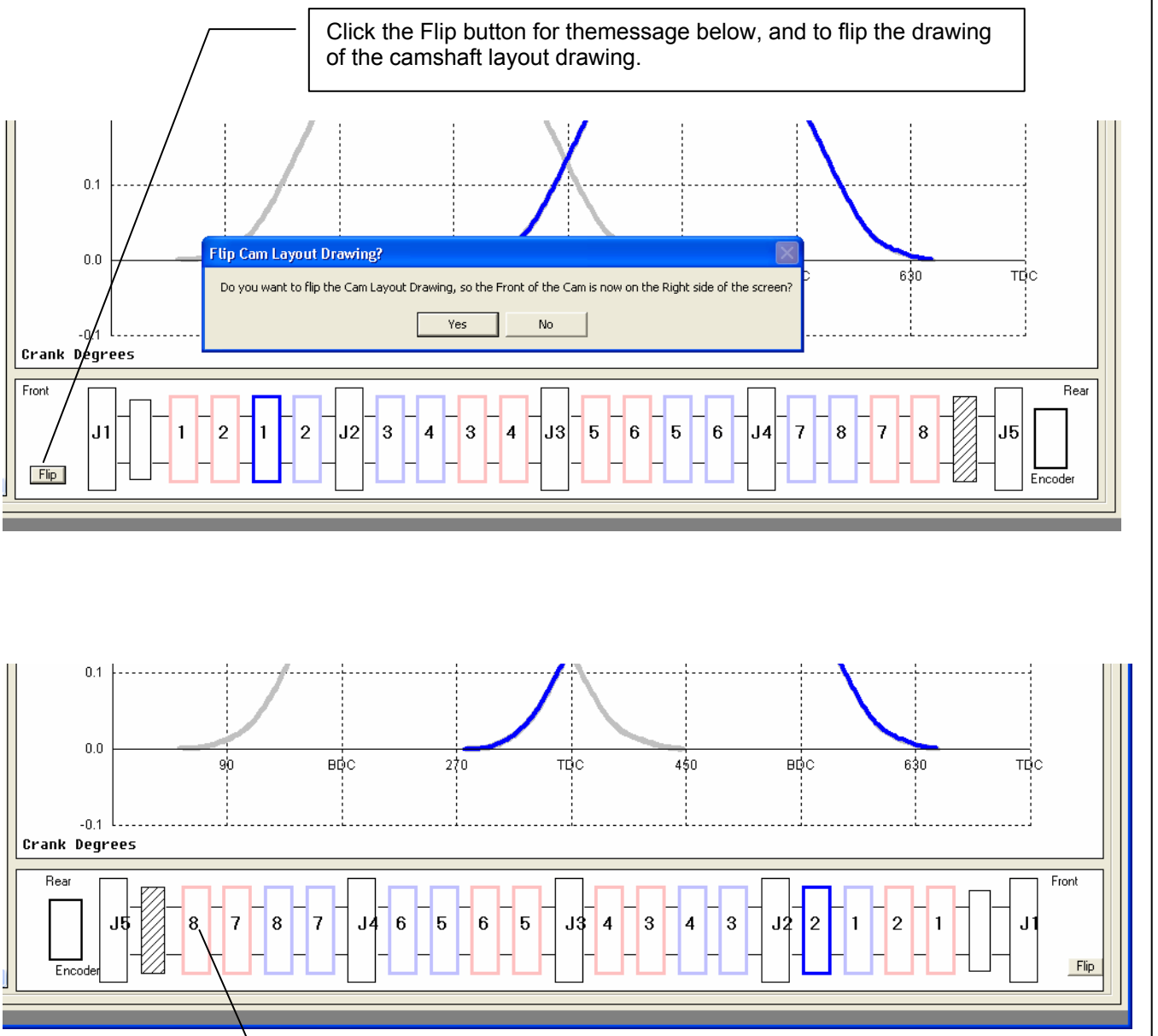


Figure 10.2 Duration Reports only show data for lifts with Duration Readings

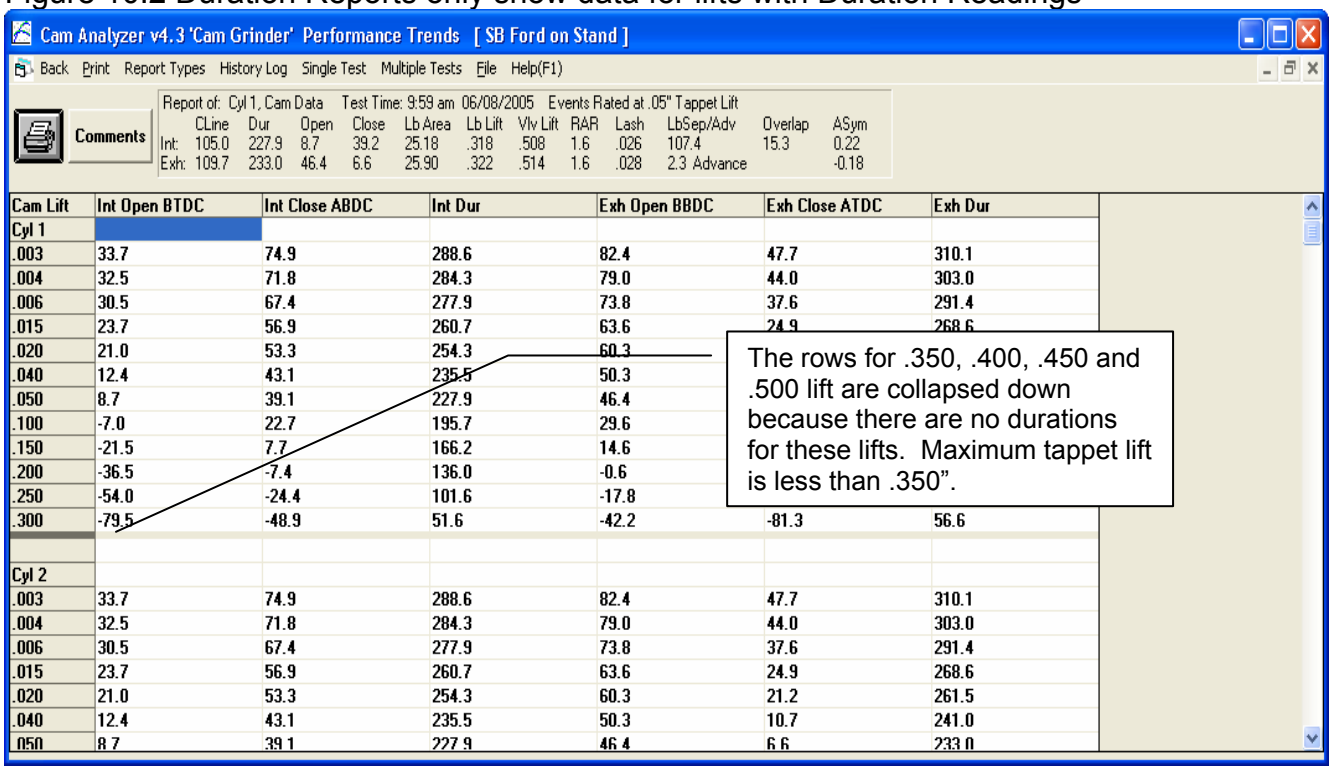


Figure 10.3 Engine Log Book Pro Pulling Data from Cam Analyzer v4.3 B

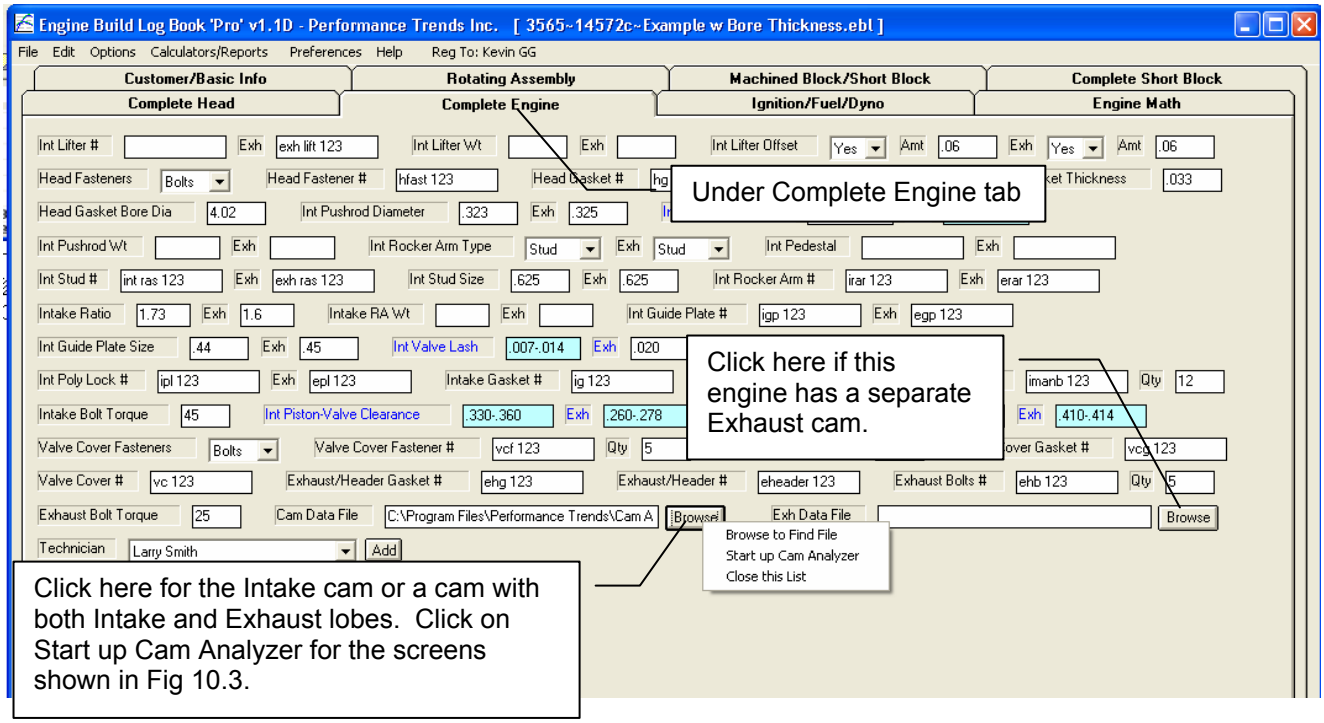
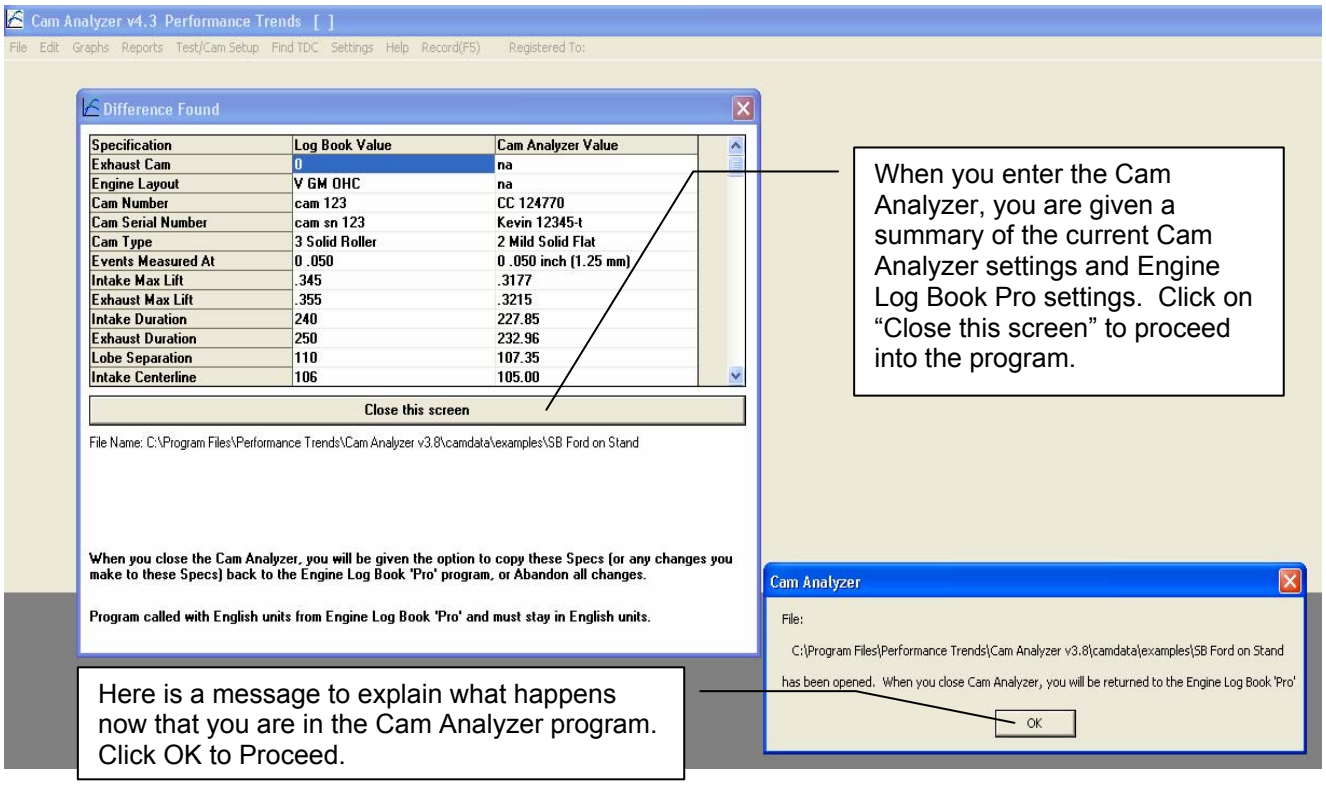
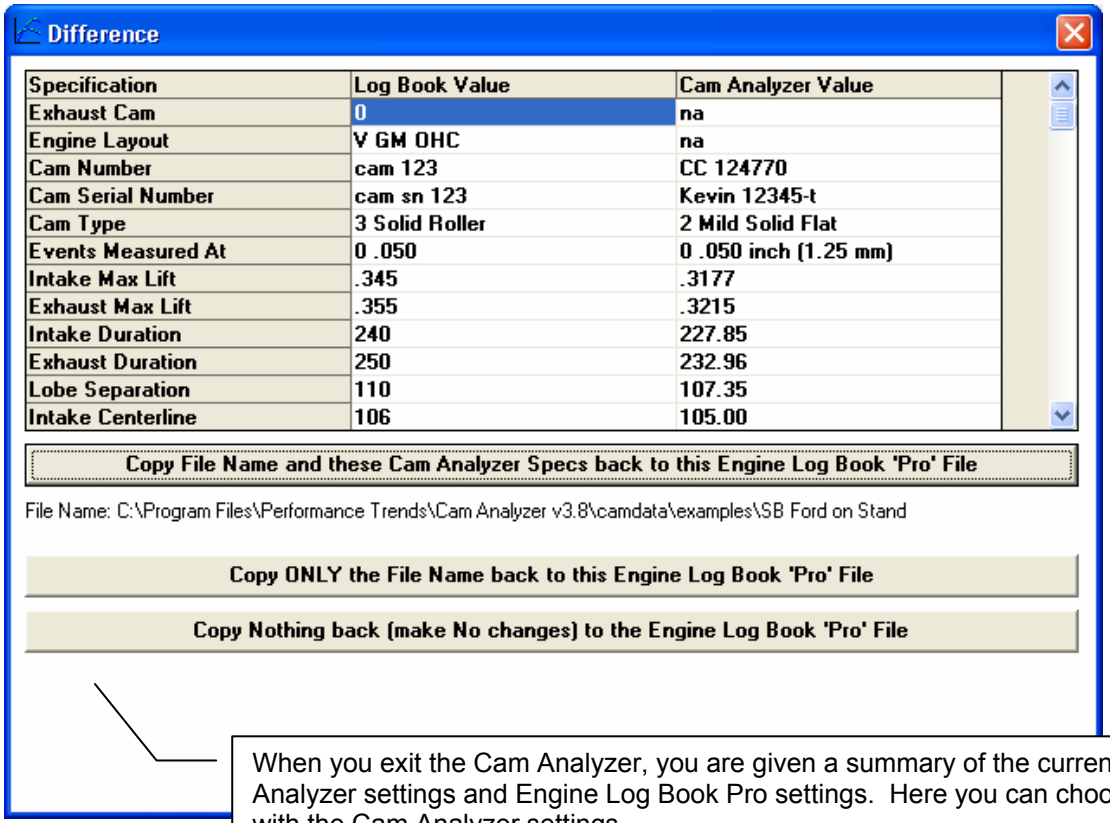


Figure 10.4 Engine Log Book Pro Pulling Data from Cam Analyzer v4.3 B, continued



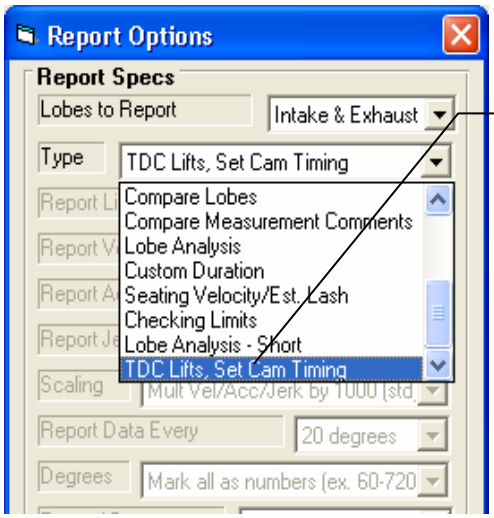
When you enter the Cam Analyzer, you are given a summary of the current Cam Analyzer settings and Engine Log Book Pro settings. Click on "Close this screen" to proceed into the program.

Here is a message to explain what happens now that you are in the Cam Analyzer program. Click OK to Proceed.



When you exit the Cam Analyzer, you are given a summary of the current Cam Analyzer settings and Engine Log Book Pro settings. Here you can choose what to do with the Cam Analyzer settings.

Figure 10.5 New Report Option – TDC Lifts, Set Cam Timing



New Report Option to set cam timing in the engine.

For this cam timing, set the lift at TDC for the lobes as shown.

Cam Analyzer v4.3B 'Cam Grinder' Performance Trends [SB Ford on Stand]

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

Comments

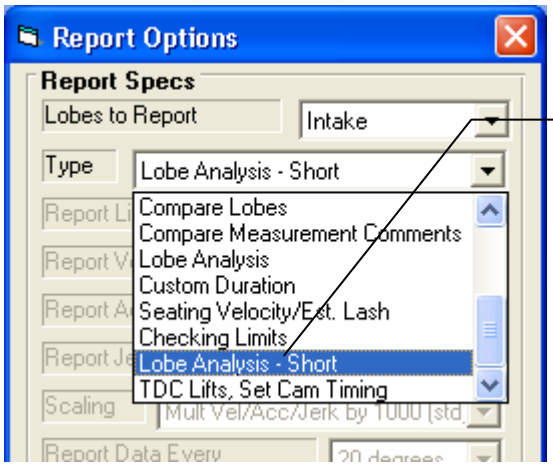
Report of: Cyl 1, Cam Data Test Time: 9:59 am 06/08/2005 Events Rated at .05" Tappet Lift

	CLine	Dur	Open	Close	Lb Area	Lb Lift	Vlv Lift	RAR	Lash	LbSep/Adv	Overlap
Int:	105.0	227.9	8.7	39.2	25.18	.318	.508	1.6	.026	107.4	15.3
Exh:	109.7	233.0	46.4	6.6	25.90	.322	.514	1.6	.028	2.3 Advance	

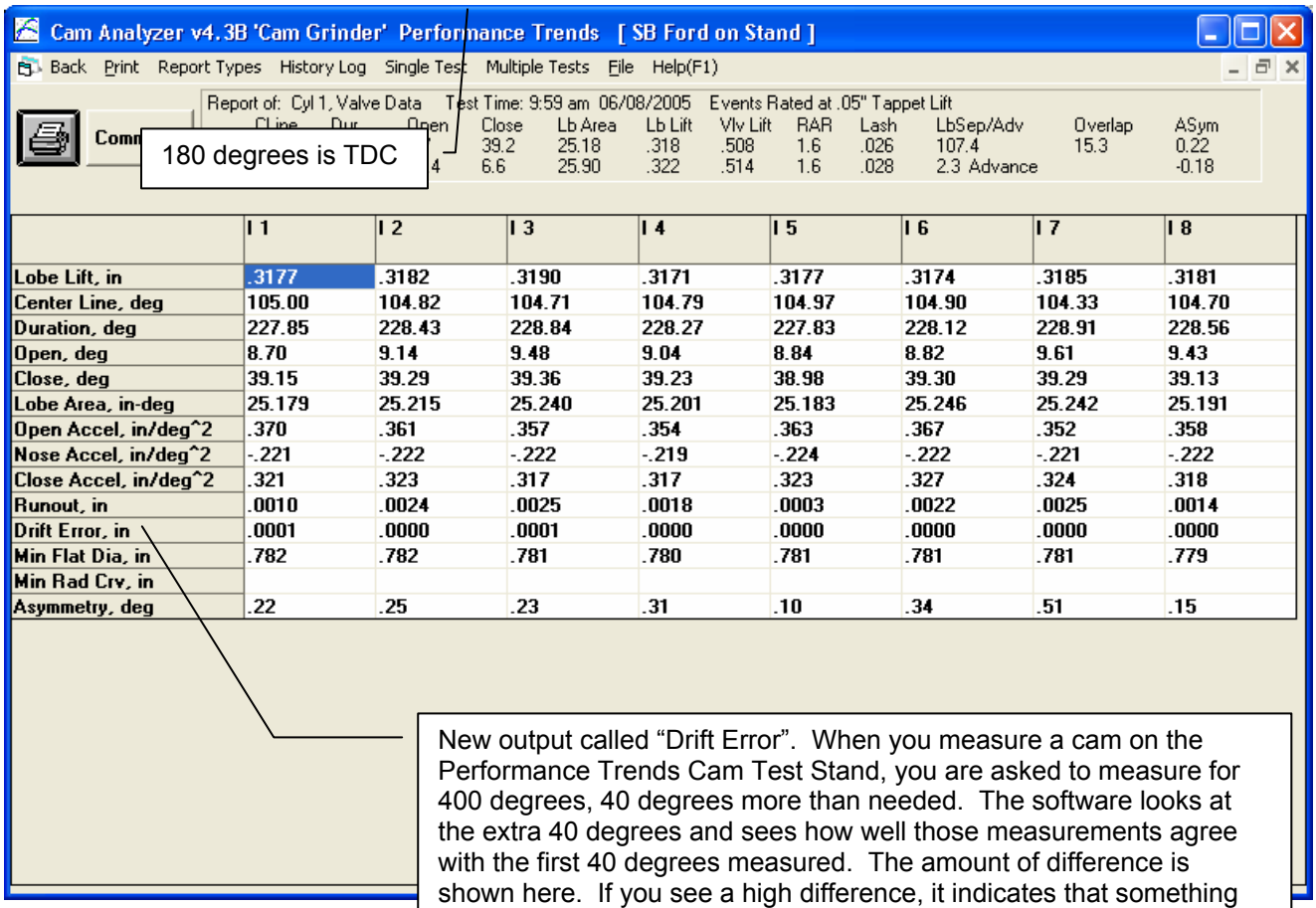
Int CL, deg	Int Lift @ TDC, inches	Exh CL, deg	Exh Lift @ TDC, inches	Cam Adv., deg
Cyl 1				
77.35	.0090	137.35	.1590	30.00
78.35	.0104	136.35	.1556	29.00
79.35	.0118	135.35	.1522	28.00
80.35	.0134	134.35	.1489	27.00
81.35	.0151	133.35	.1456	26.00
82.35	.0169	132.35	.1422	25.00
83.35	.0187	131.35	.1388	24.00
84.35	.0207	130.35	.1354	23.00
85.35	.0227	129.35	.1319	22.00
86.35	.0248	128.35	.1285	21.00
87.35	.0270	127.35	.1251	20.00
88.35	.0292	126.35	.1218	19.00
89.35	.0315	125.35	.1184	18.00
90.35	.0340	124.35	.1150	17.00
91.35	.0365		6	16.00
92.35	.0392		3	15.00
93.35	.0419		0	14.00
94.35	.0446		7	13.00
95.35	.0473		5	12.00
96.35	.0501		3	11.00
97.35	.0529		1	10.00
98.35	.0560	116.35	.0889	9.00
99.35	.0591	115.35	.0857	8.00
100.35	.0622	114.35	.0825	7.00
101.35	.0653	113.35	.0794	6.00
102.35	.0683	112.35	.0764	5.00
103.35	.0714	111.35	.0734	4.00
104.35	.0746	110.35	.0704	3.00
105.35	.0778	109.35	.0674	2.00
106.35	.0811	108.35	.0645	1.00
107.35	.0844	107.35	.0616	.00

For example, to set 4 deg advance, set the motor to TDC and adjust the cam to produce .0714 intake tappet lift, which should also be .0734 exhaust tappet lift.

Figure 10.6 New Report Option – Lobe Analysis - Short



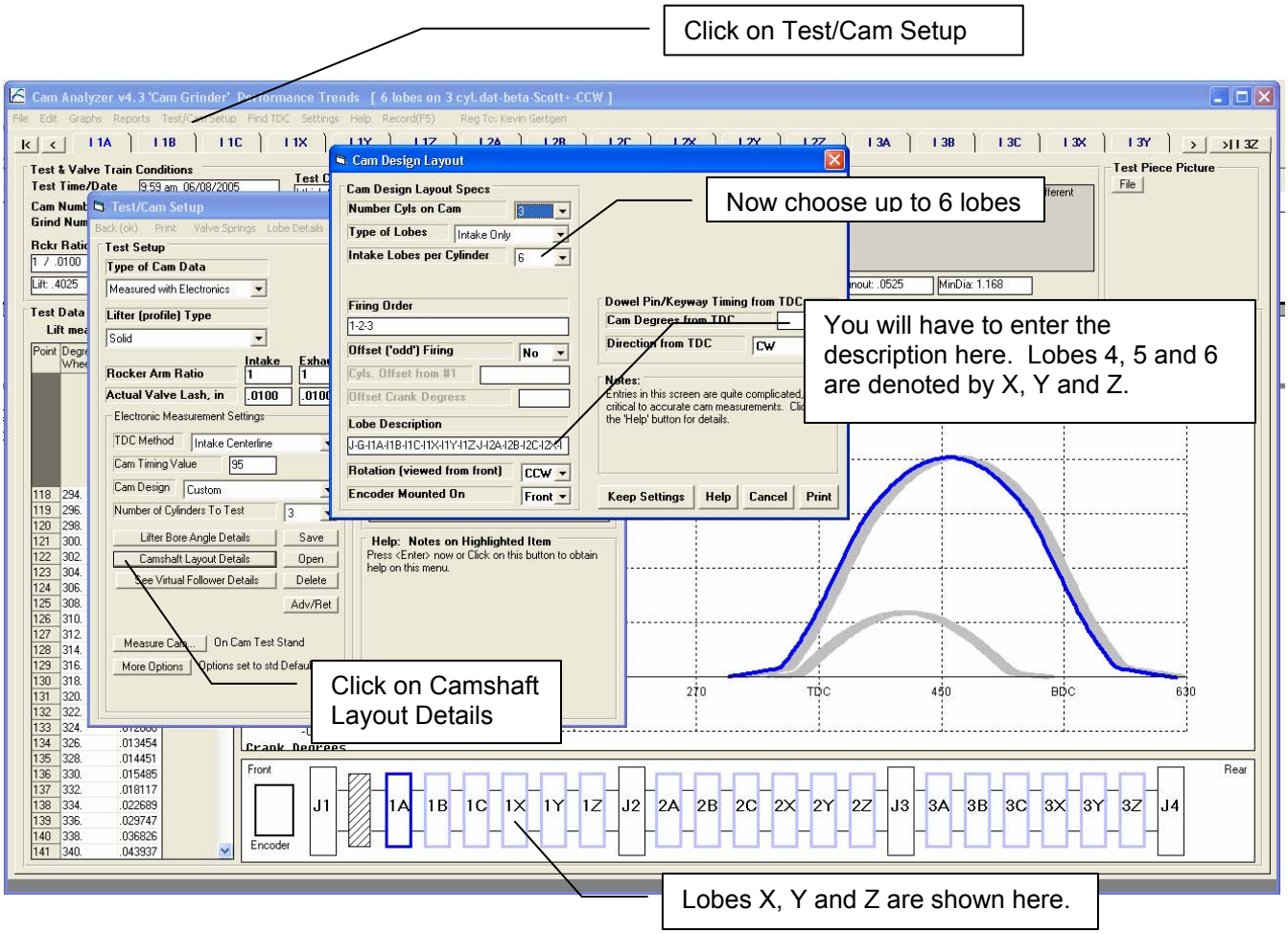
New Report Option to make a shorter Lobe Analysis report.



	I 1	I 2	I 3	I 4	I 5	I 6	I 7	I 8
Lobe Lift, in	.3177	.3182	.3190	.3171	.3177	.3174	.3185	.3181
Center Line, deg	105.00	104.82	104.71	104.79	104.97	104.90	104.33	104.70
Duration, deg	227.85	228.43	228.84	228.27	227.83	228.12	228.91	228.56
Open, deg	8.70	9.14	9.48	9.04	8.84	8.82	9.61	9.43
Close, deg	39.15	39.29	39.36	39.23	38.98	39.30	39.29	39.13
Lobe Area, in-deg	25.179	25.215	25.240	25.201	25.183	25.246	25.242	25.191
Open Accel, in/deg^2	.370	.361	.357	.354	.363	.367	.352	.358
Nose Accel, in/deg^2	-.221	-.222	-.222	-.219	-.224	-.222	-.221	-.222
Close Accel, in/deg^2	.321	.323	.317	.317	.323	.327	.324	.318
Runout, in	.0010	.0024	.0025	.0018	.0003	.0022	.0025	.0014
Drift Error, in	.0001	.0000	.0001	.0000	.0000	.0000	.0000	.0000
Min Flat Dia, in	.782	.782	.781	.780	.781	.781	.781	.779
Min Rad Crv, in								
Asymmetry, deg	.22	.25	.23	.31	.10	.34	.51	.15

New output called “Drift Error”. When you measure a cam on the Performance Trends Cam Test Stand, you are asked to measure for 400 degrees, 40 degrees more than needed. The software looks at the extra 40 degrees and sees how well those measurements agree with the first 40 degrees measured. The amount of difference is shown here. If you see a high difference, it indicates that something changed during the rotation (typically from the lift measurement) and the measurement may need to be run again. In this example, the error is .0001” or less, indicating very good data quality.

Figure 10.7 Specifying up to 6 Lobes per Cylinder



Porsche 4 valve, VVT intake cam with 3 lobes for each valve.

Figure 10.8 More Details for Generating a Cam Profile

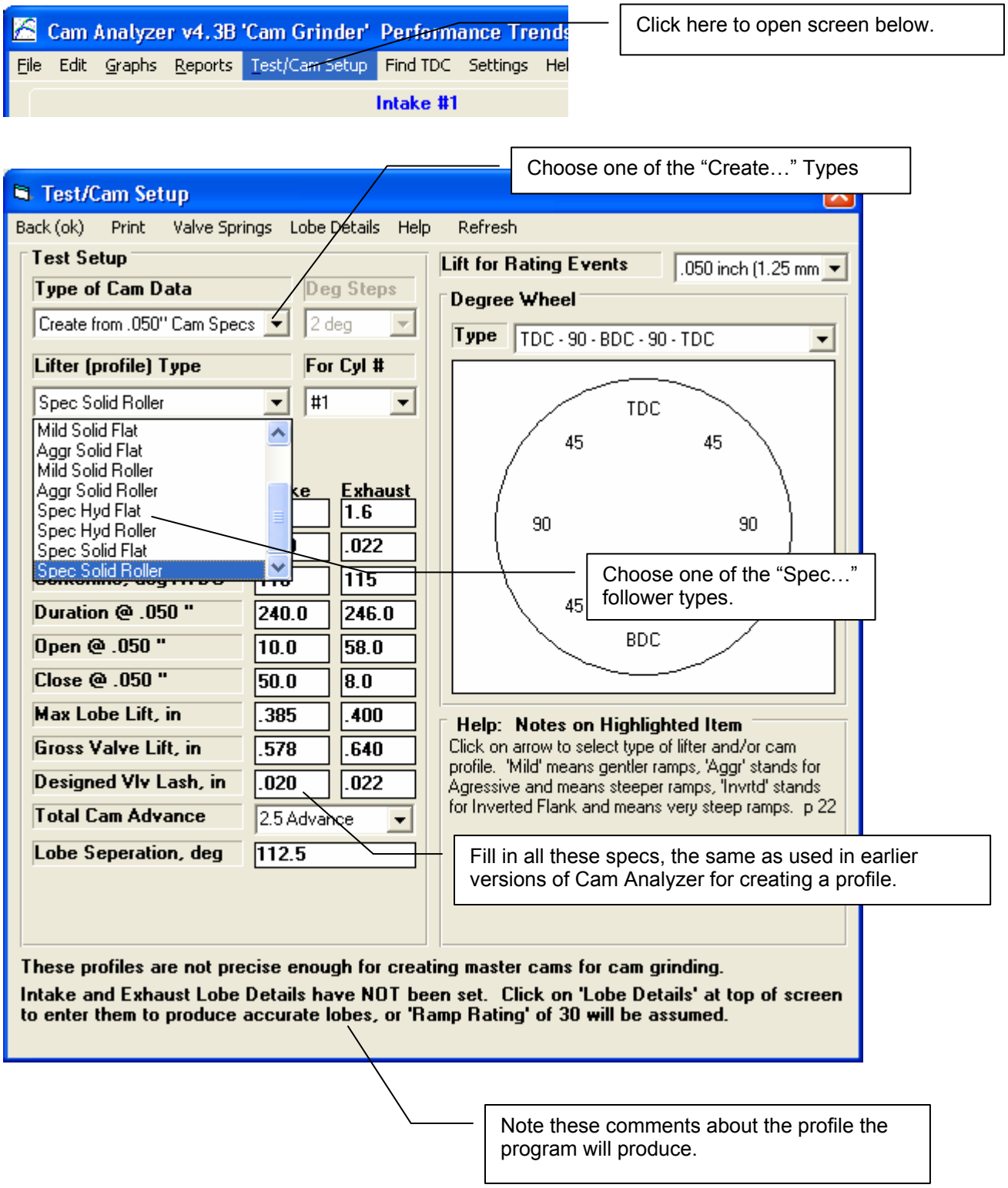
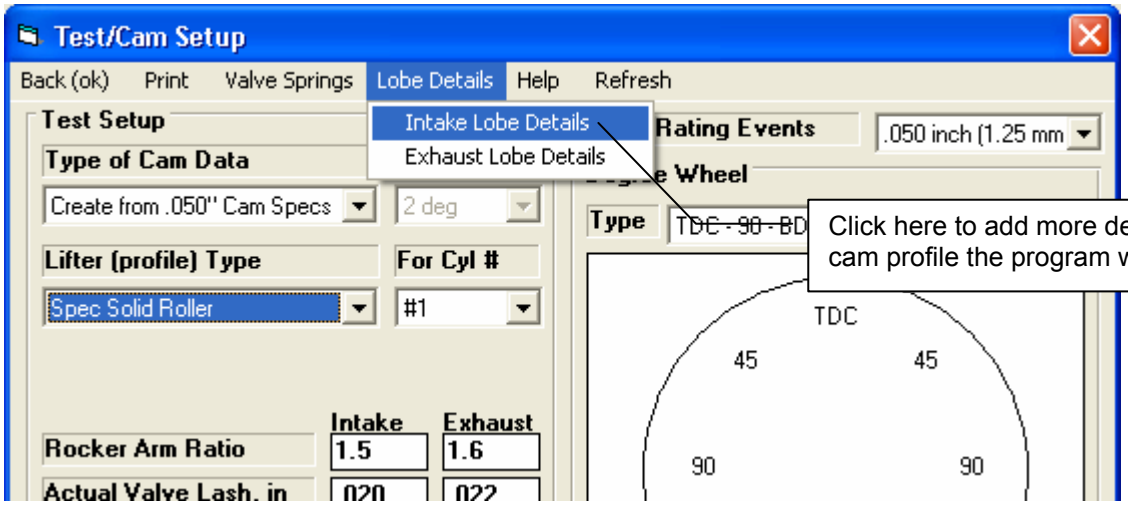


Figure 10.9 More Details for Generating a Cam Profile, cont



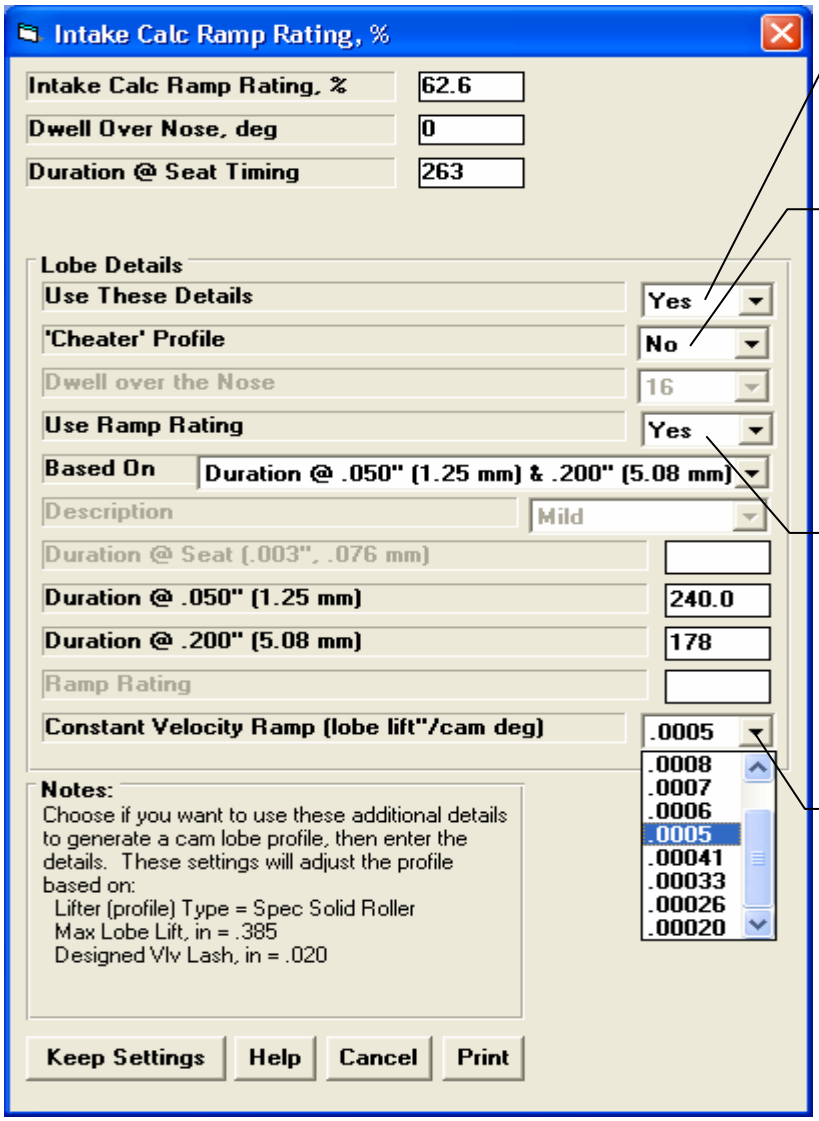


Figure 10.10 More Details for Generating a Cam Profile, cont

Here's a comparison of the lift curve for a profile created using the default "details" (the green graph) and one using the details shown in Figure 10.8 (the blue graph).

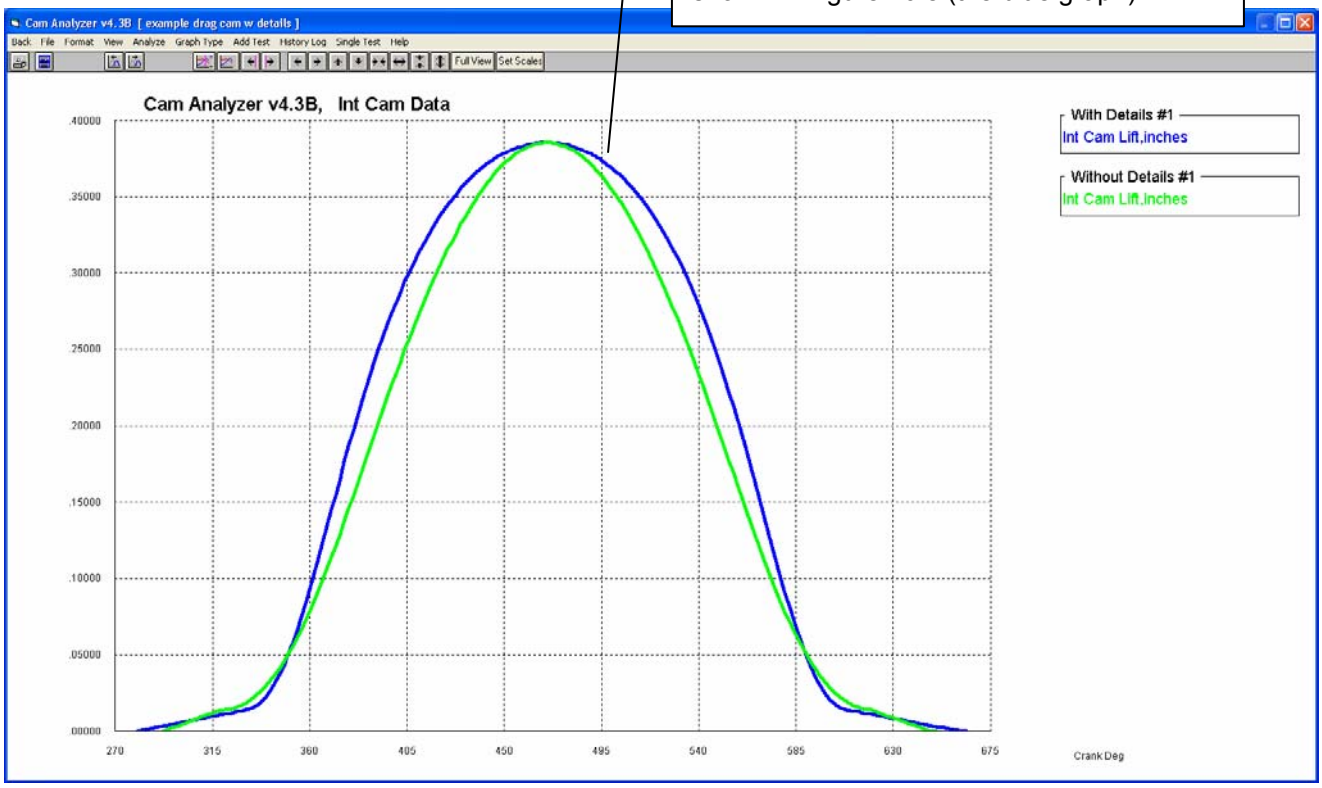


Figure 10.11 New “Rotation” Options for OHC Rocker Arm Virtual Follower Feature

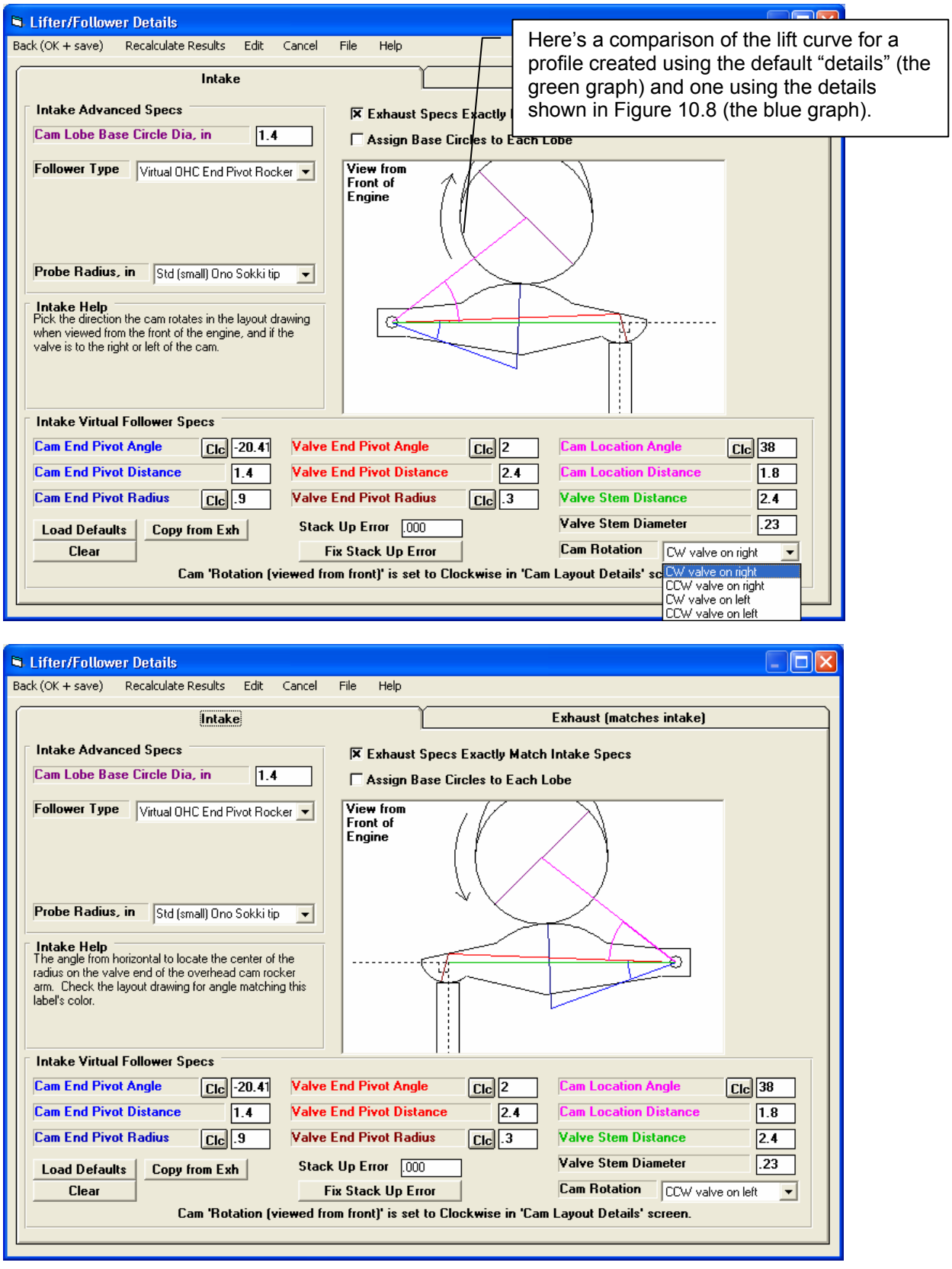


Figure 10.12 New “Rotation” Options for OHC Rocker Arm Virtual Follower Feature

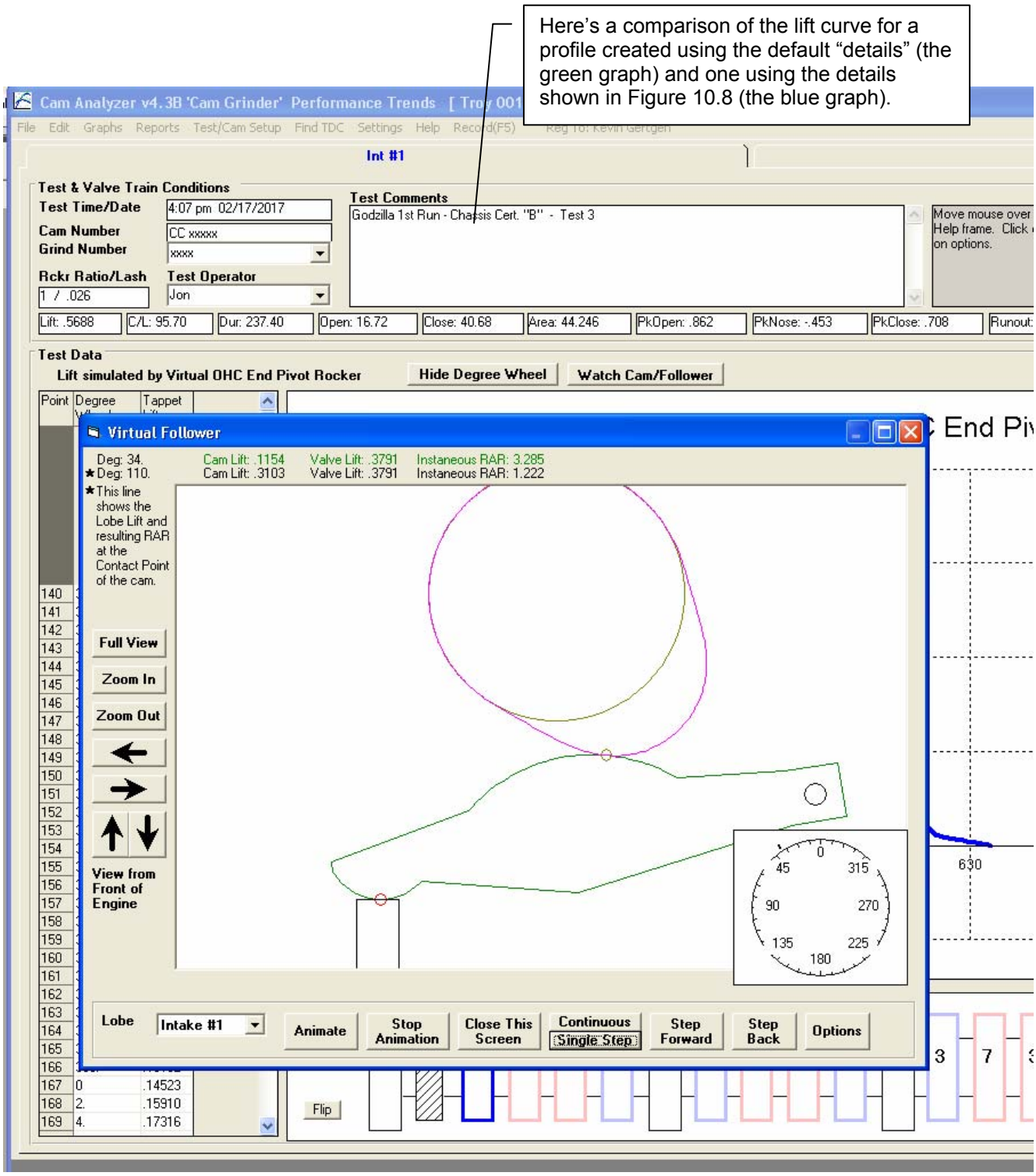
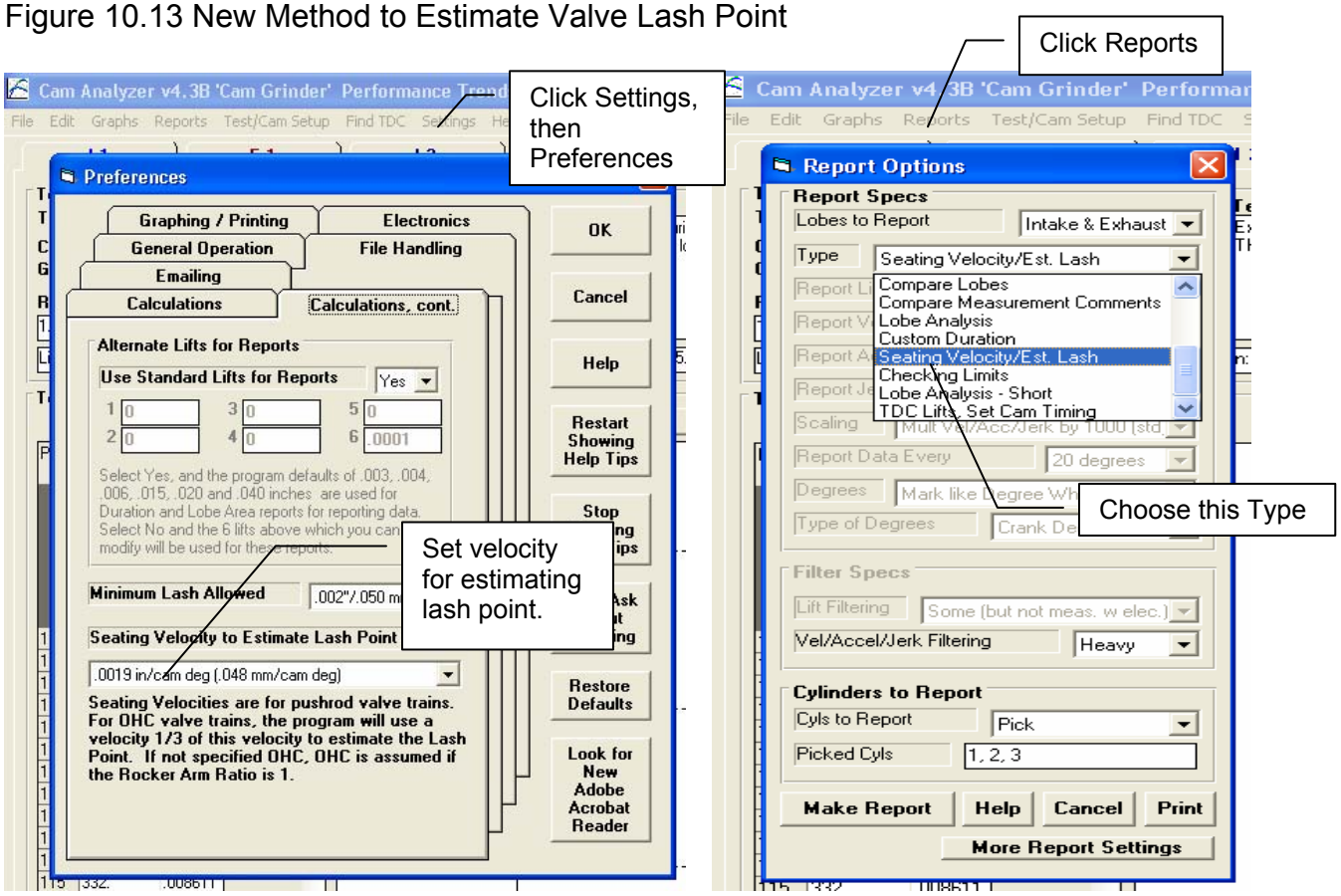
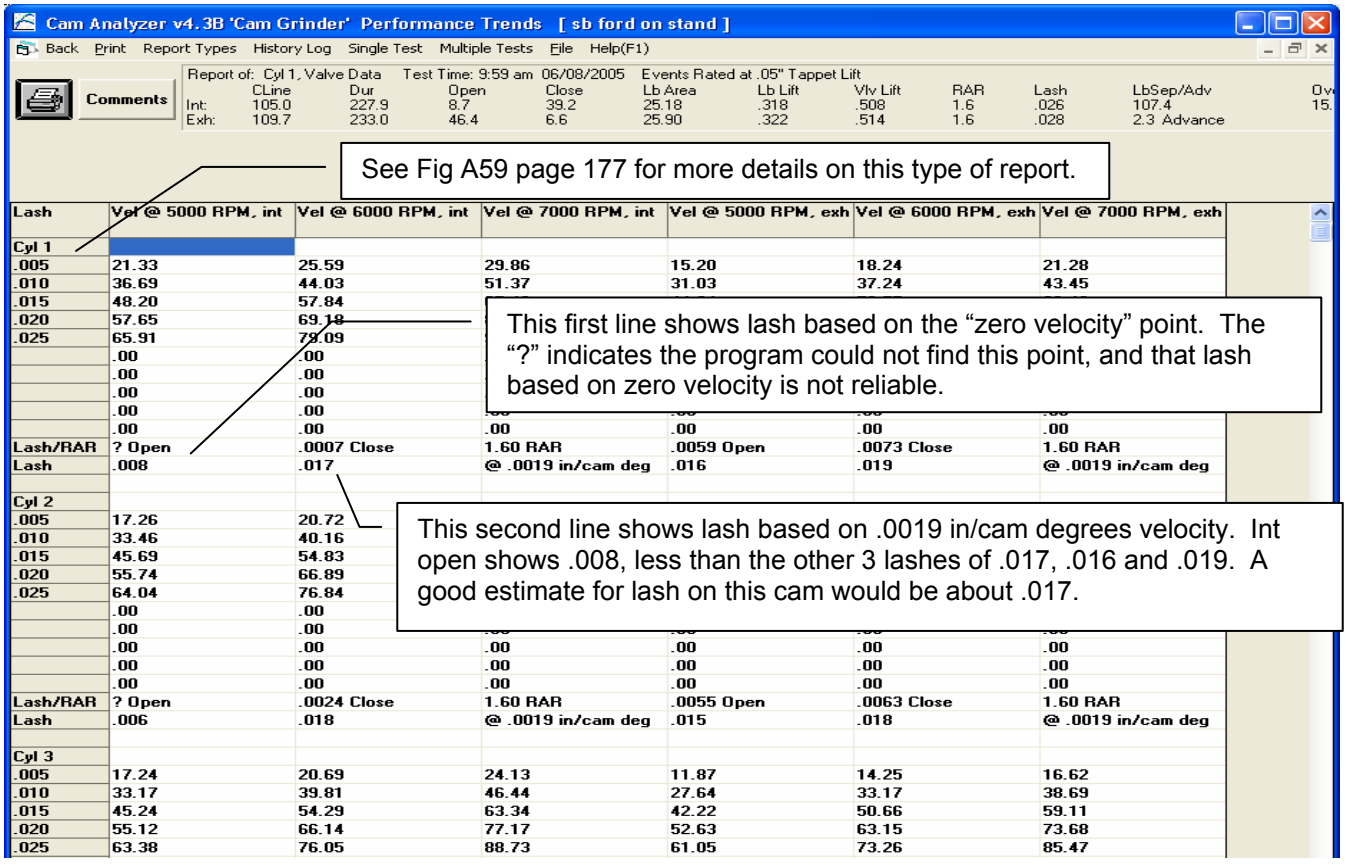


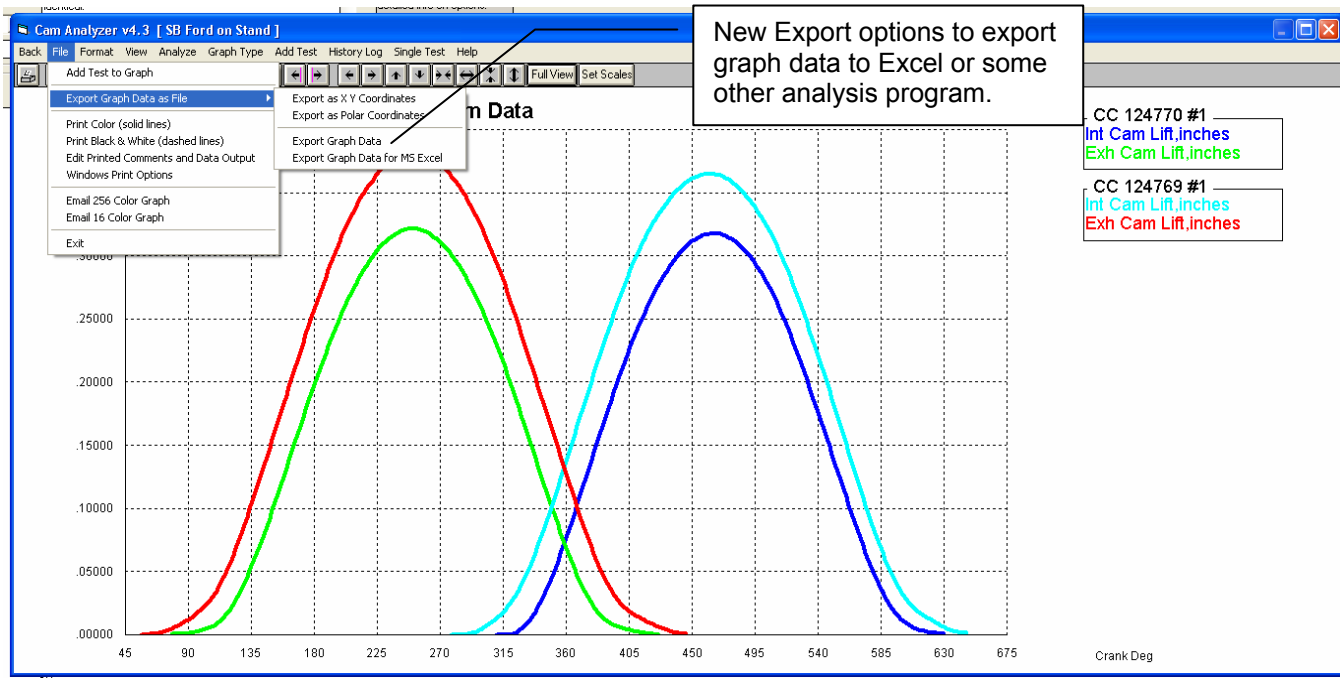
Figure 10.13 New Method to Estimate Valve Lash Point



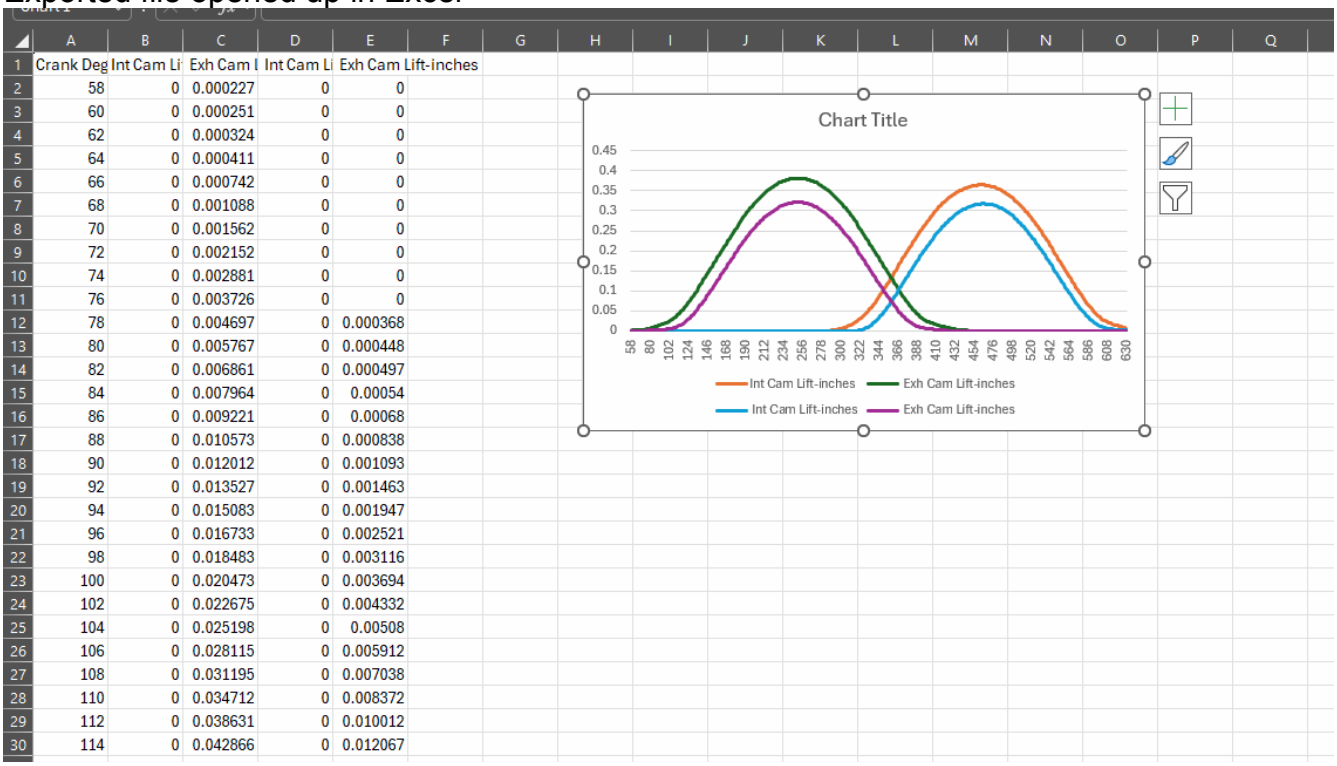


Lash	Vel @ 5000 RPM, int	Vel @ 6000 RPM, int	Vel @ 7000 RPM, int	Vel @ 5000 RPM, exh	Vel @ 6000 RPM, exh	Vel @ 7000 RPM, exh
Cyl 1						
.005	21.33	25.59	29.86	15.20	18.24	21.28
.010	36.69	44.03	51.37	31.03	37.24	43.45
.015	48.20	57.84				
.020	57.65	69.18				
.025	65.91	79.09				
	.00	.00				
	.00	.00				
	.00	.00				
	.00	.00				
	.00	.00	.00	.00	.00	.00
Lash/RAR	? Open	.0007 Close	1.60 RAR	.0059 Open	.0073 Close	1.60 RAR
Lash	.008	.017	@ .0019 in/cam deg	.016	.019	@ .0019 in/cam deg
Cyl 2						
.005	17.26	20.72				
.010	33.46	40.16				
.015	45.69	54.83				
.020	55.74	66.89				
.025	64.04	76.84				
	.00	.00				
	.00	.00				
	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
Lash/RAR	? Open	.0024 Close	1.60 RAR	.0055 Open	.0063 Close	1.60 RAR
Lash	.006	.018	@ .0019 in/cam deg	.015	.018	@ .0019 in/cam deg
Cyl 3						
.005	17.24	20.69	24.13	11.87	14.25	16.62
.010	33.17	39.81	46.44	27.64	33.17	38.69
.015	45.24	54.29	63.34	42.22	50.66	59.11
.020	55.12	66.14	77.17	52.63	63.15	73.68
.025	63.38	76.05	88.73	61.05	73.26	85.47

Figure 10.14 New Graph Export Options



Exported file opened up in Excel



	A	B	C	D	E
1	Crank Deg	Int Cam Li	Exh Cam I	Int Cam Li	Exh Cam Lift-inches
2	58	0	0.000227	0	0
3	60	0	0.000251	0	0
4	62	0	0.000324	0	0
5	64	0	0.000411	0	0
6	66	0	0.000742	0	0
7	68	0	0.001088	0	0
8	70	0	0.001562	0	0
9	72	0	0.002152	0	0
10	74	0	0.002881	0	0
11	76	0	0.003726	0	0
12	78	0	0.004697	0	0.000368
13	80	0	0.005767	0	0.000448
14	82	0	0.006861	0	0.000497
15	84	0	0.007964	0	0.00054
16	86	0	0.009221	0	0.00068
17	88	0	0.010573	0	0.000838
18	90	0	0.012012	0	0.001093
19	92	0	0.013527	0	0.001463
20	94	0	0.015083	0	0.001947
21	96	0	0.016733	0	0.002521
22	98	0	0.018483	0	0.003116
23	100	0	0.020473	0	0.003694
24	102	0	0.022675	0	0.004332
25	104	0	0.025198	0	0.00508
26	106	0	0.028115	0	0.005912
27	108	0	0.031195	0	0.007038
28	110	0	0.034712	0	0.008372
29	112	0	0.038631	0	0.010012
30	114	0	0.042866	0	0.012067

Figure 10.15 Specifying Individual Base Circle Measurements

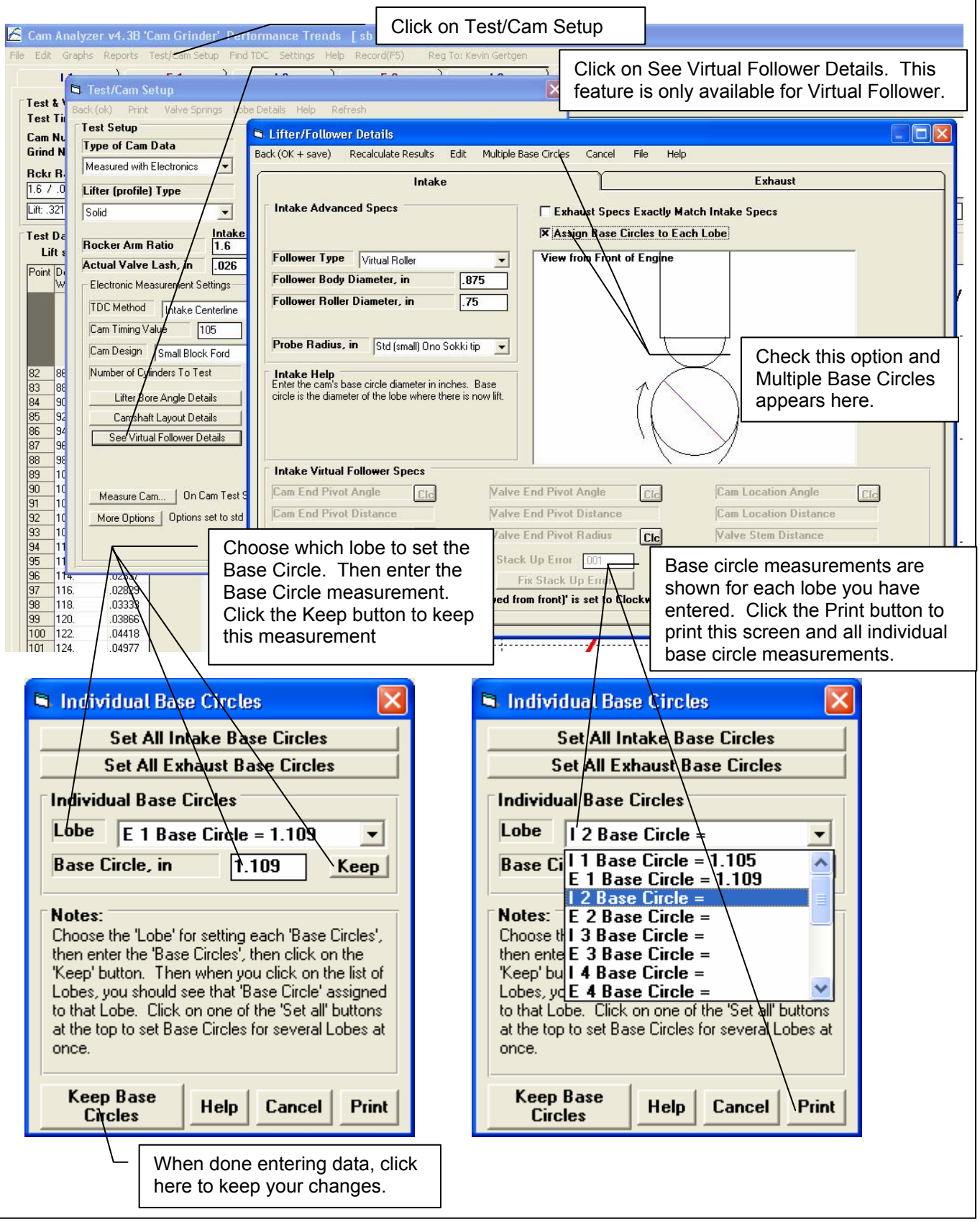


Figure 10.16 Specifying Individual Base Circle Measurements, cont

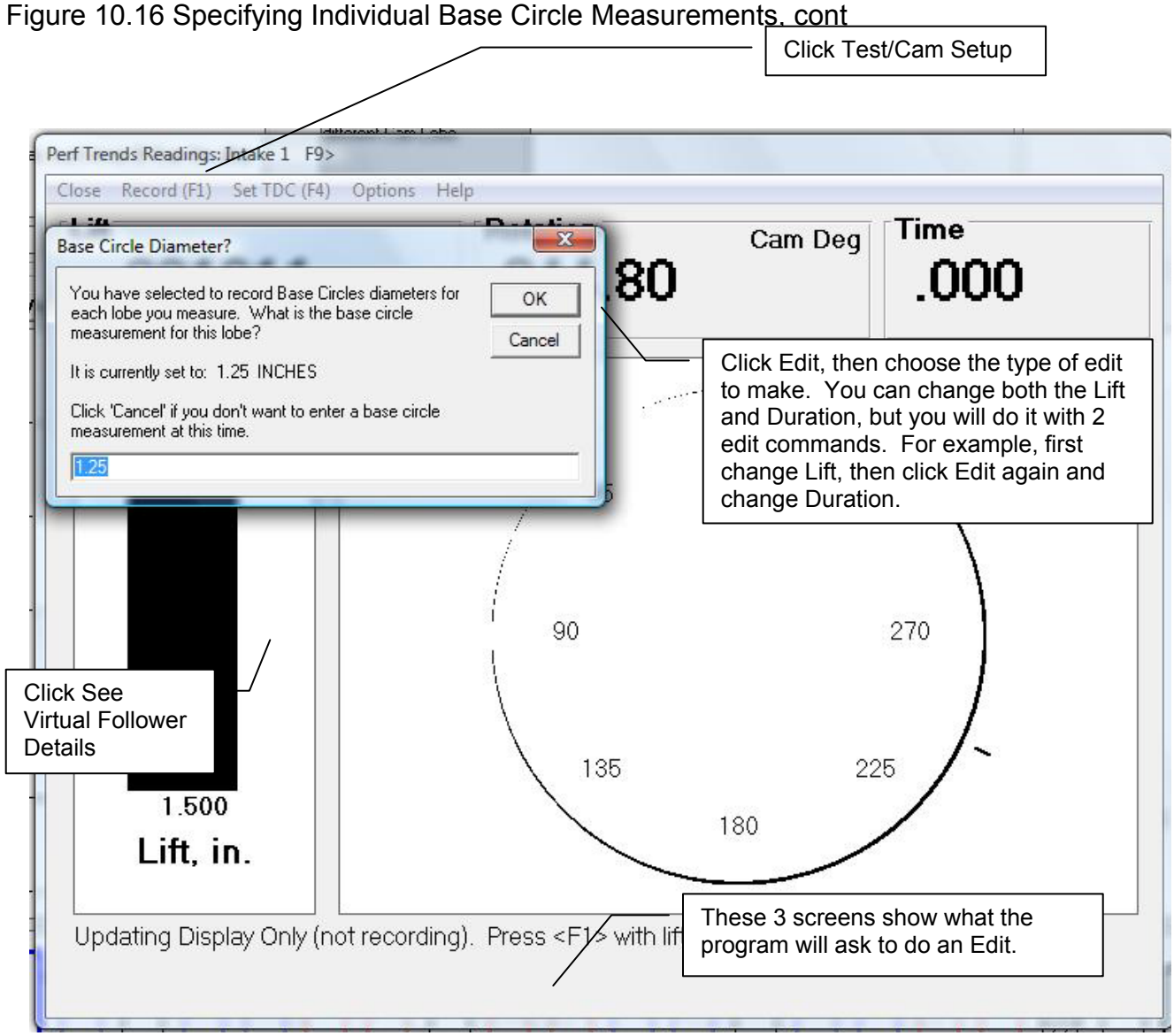


Figure 10.17 Editing a Profile Measured with Electronics

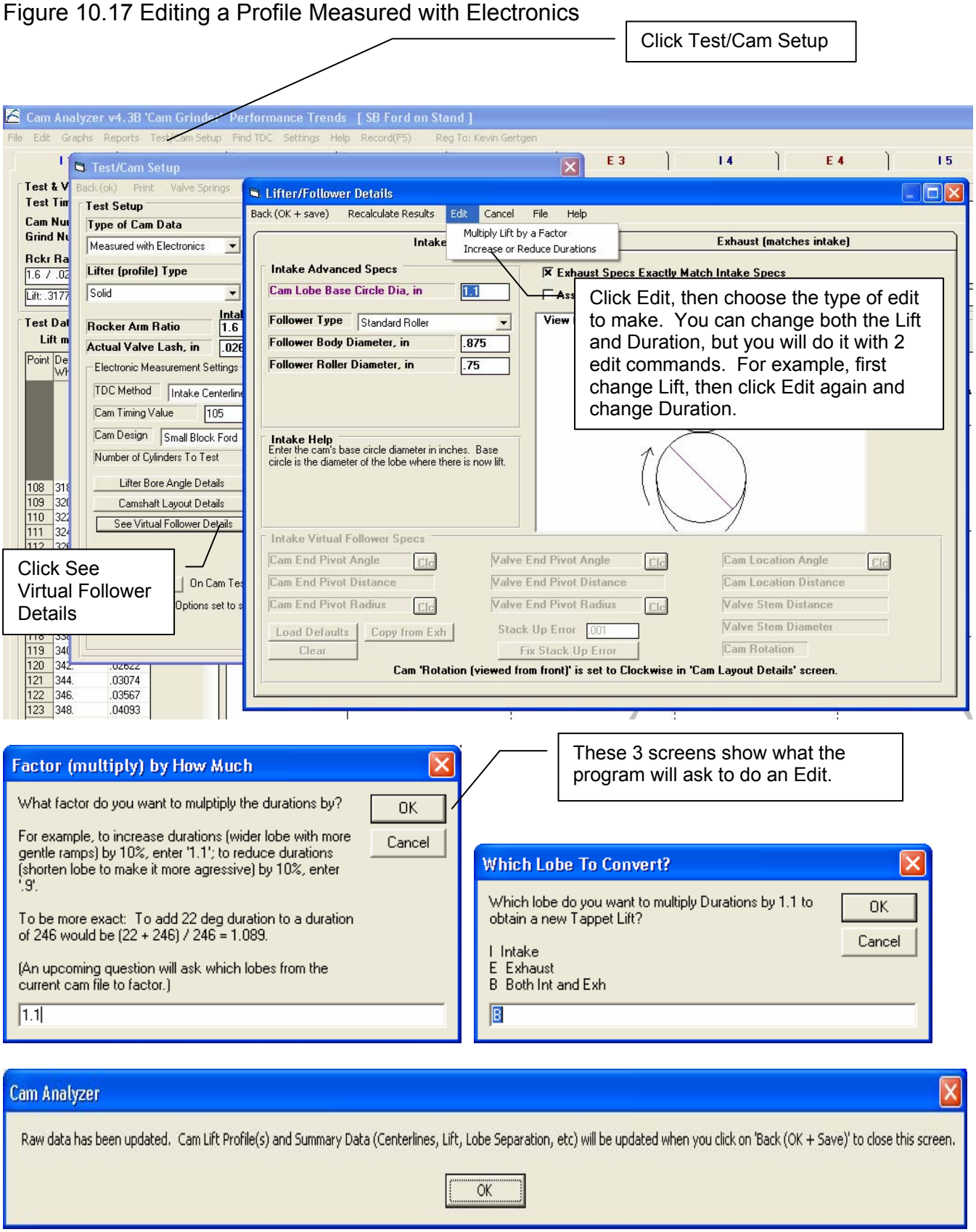
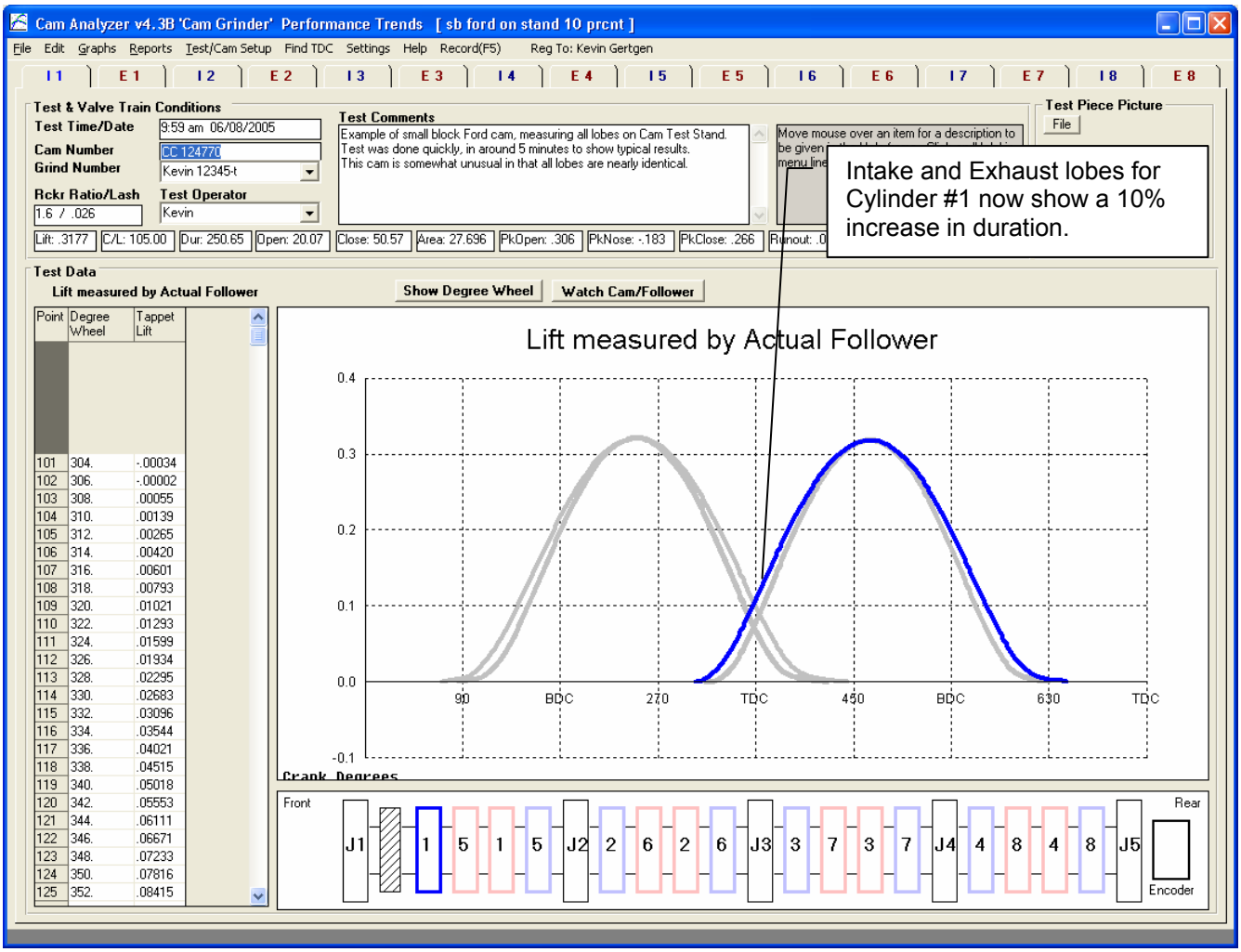


Figure 10.18 Editing a Profile Measured with Electronics, cont



Edits are only made for the first Intake and first Exhaust lobes.

#1 Intake Duration at .050” was 227.85 and is now 250.65, a 10% increase

#1 Exhaust Duration at .050” was 232.96 and is now 256.15, a 10% increase

Figure 10.19 Quick Graphing of Report Data

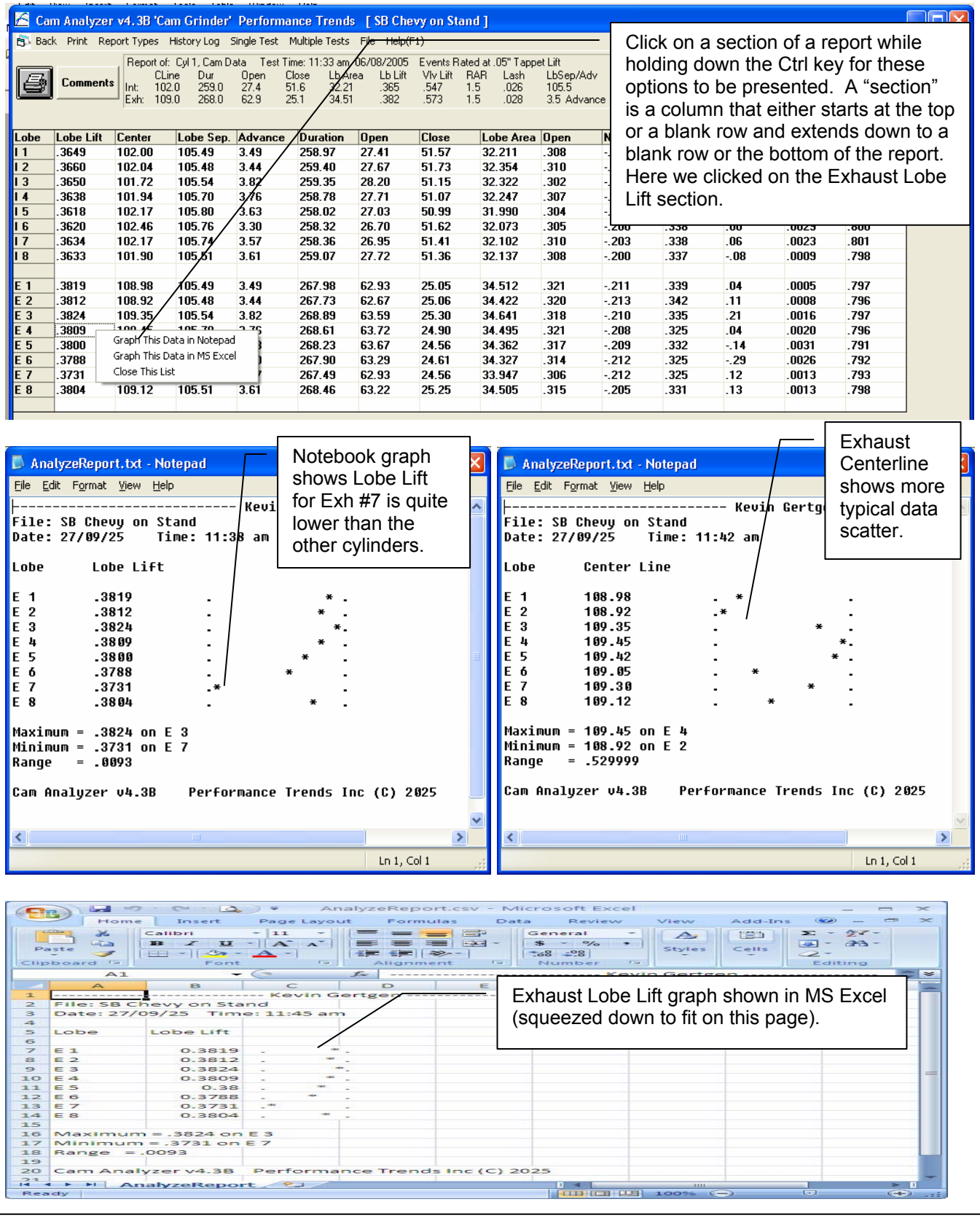
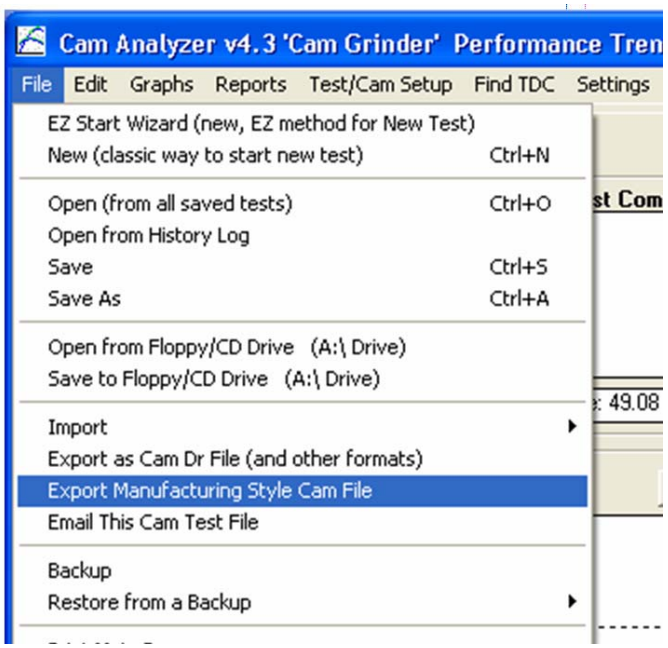
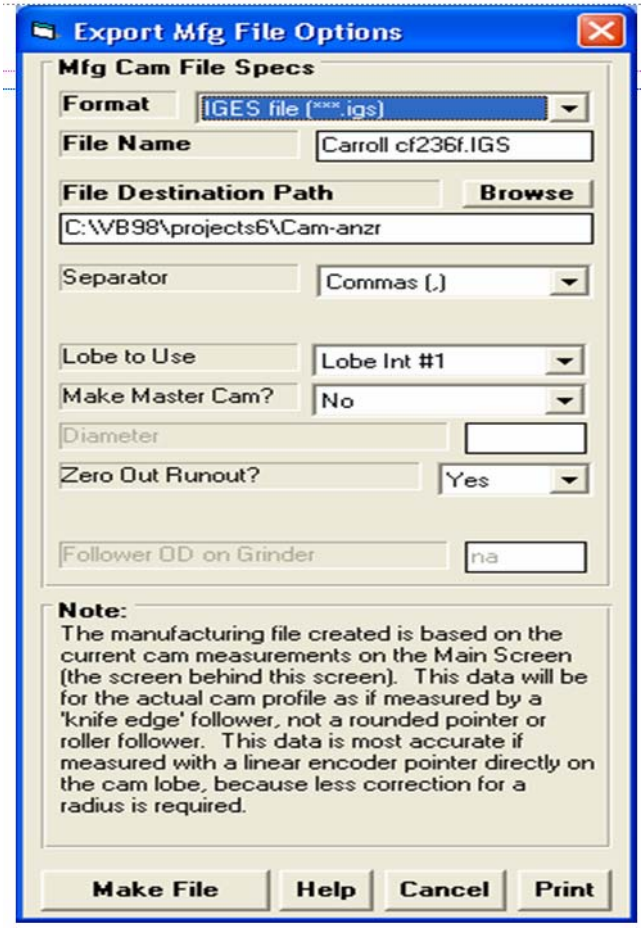
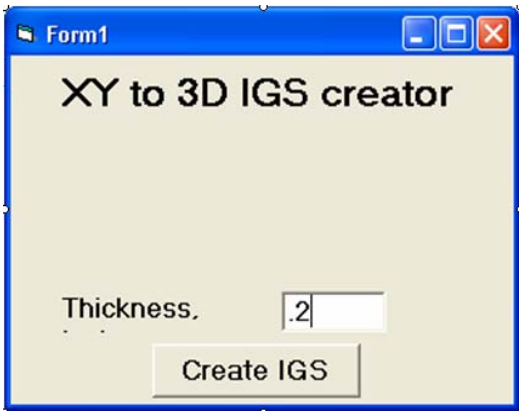


Figure 10.20 Generating 3D .igs Manufacturing Files







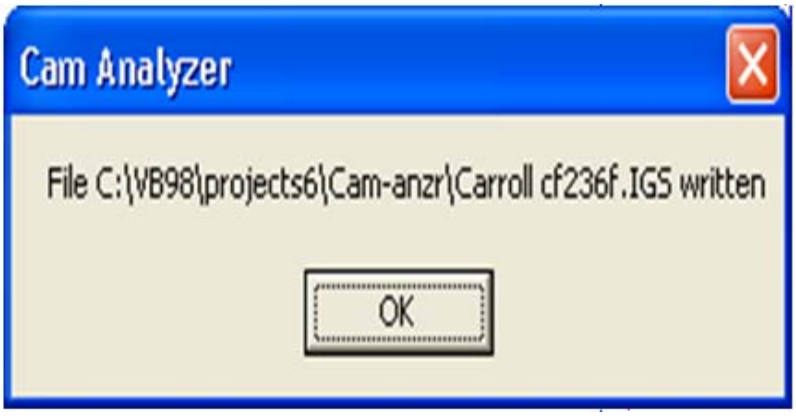


Figure 10.21 Generating 3D .igs Manufacturing Files, cont