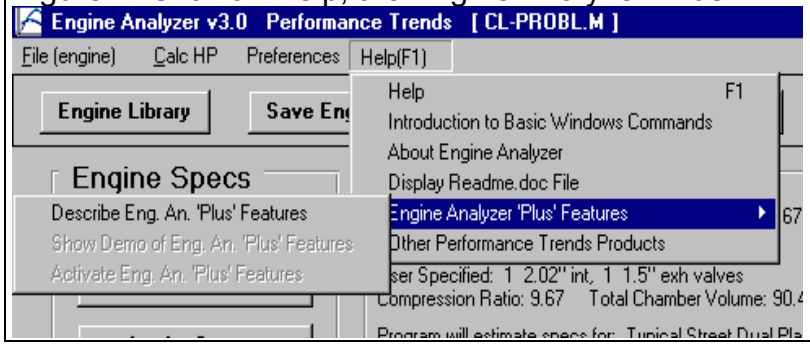
Engine Analyzer ‘Plus’ Features

The Engine Analyzer Plus is a package of features the owners of the standard Engine Analyzer can add to their program. This package can be added either at the time of the original purchase or after they have purchased a standard program. See Figure 1 for obtaining information, activating your ‘Plus’ version, or running a demo of the ‘Plus’ features.

Figure 1 Click on Help, the Engine Analyzer ‘Plus’



Major Features:

- Calculate up to 20 RPMs.
- Calculate performance for alternate fuels like Diesel, propane or CNG (compressed natural gas).
- Estimate Piston-to-Valve Clearance.
- More graphing features.
- The ‘Optimize’ feature which lets you pick and modify most any engine specs and watch the effect on the torque and power curve right on the screen. This is great for quickly finding which specs have the most effect on your engine’s performance.
- Use Full Flow Curve for cylinder head ports (New to Version 3.2)
- Pick a Desired Piston-to-Valve clearance for that calculation (New to Version 3.2)
- Use Millimeters (instead of inches) to enter engine dimensions (New to Version 3.2)
- Hide certain calculated output that you think is not important (New to Version 3.2)
- Choose different colors for graph lines, which can also effect the print quality when printing color graphs. (New to Version 3.2)

Calculate More RPMs
Alternate Fuels

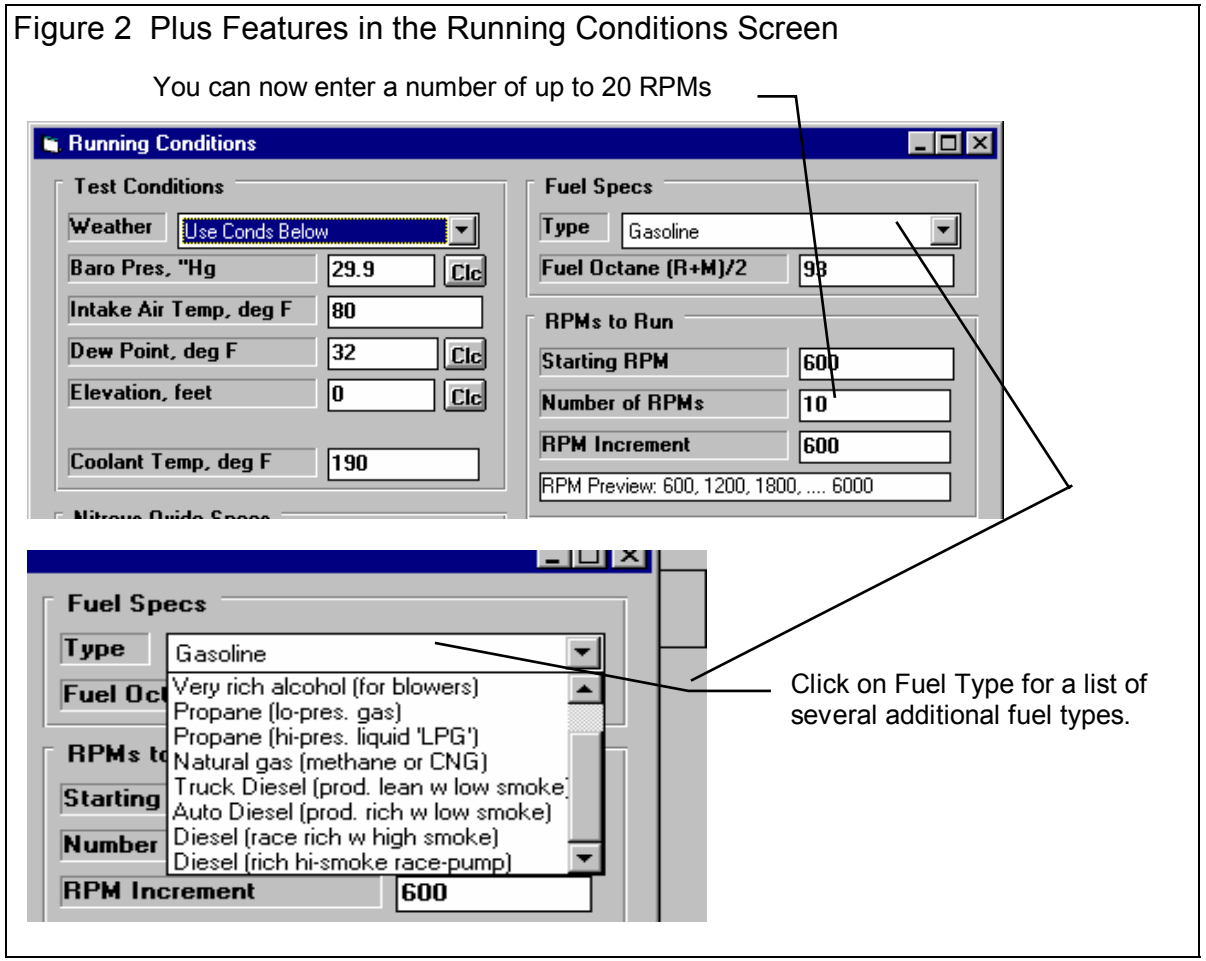
These 2 features are available in the Running Conditions screen. There, you can increase 'Number of RPMs' to calculate up to 20 for more detailed power curves. See Figure 2.

There are also many additional 'Fuel Types':

1. Propane (lo-pres. gas) is a typical vapor propane system. If you specify a Carburetor in the Intake System specs, the program assumes you will use a venturi type of 'mixer', which usually has to be fairly small (restrictive with low CFM rating) to work correctly. If you specify an EFI system, the program assumes you are injecting propane vapor, which does not require the restrictive 'mixer'.

2. Propane (hi-pres. liquid 'LPG') is a special high pressure, liquid injection EFI system.
3. Natural gas (methane or CNG) is a typical vapor methane system. If you specify a Carburetor in the Intake System specs, the program assumes you will use a venturi type of 'mixer', which usually has to be fairly small (restrictive with low CFM rating) to work correctly. If you specify an EFI system, the program assumes you are injecting methane vapor, which does not require the restrictive 'mixer'.
4. Truck Diesel (prod w low smoke) is a typical production Diesel Truck, running from about 23:1 to 30:1 A/F (very lean) at full load to avoid smoke. A/F is assumed to lean out at higher RPMs.
5. Auto Diesel (prod w low smoke) is a typical production car Diesel, running about 20:1 A/F (very lean) at full load to avoid smoke.
6. Diesel (race rich w high smoke) is a rich Diesel run in tractor pulls, and other types of racing. The engine exhausts thick, black smoke running this rich but increases its power.
7. Diesel (rich hi-smoke race-pump) is a rich Diesel run in tractor pulls, and other types of racing. The engine exhausts thick, black smoke running this rich but increases its power. It also uses a special, "quick delivery" pump which shortens the injection time, speeding up combustion time. This pump allows the Diesel to run a higher than normal RPMs.

Figure 2 Plus Features in the Running Conditions Screen



Estimate Piston-to-Valve Clearance

This screen will estimate how close the valves get to the piston. Although this is NO substitute to checking piston clearance with clay, it will let you try different cam profiles, rod lengths, strokes, head designs, etc to see how piston-to-valve clearance is likely to change.

Assumptions:

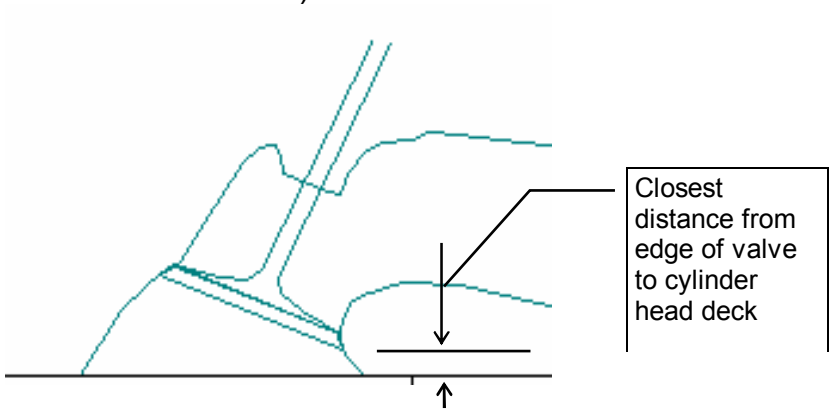
- The program assumes a FLAT TOP piston. Clearances for domed pistons will be much tighter than shown here.
- The program assumes NO rod stretch and NO valve tossing or valve train bending. Therefore, clearances at high RPM are likely to be CLOSER than indicated here.

The clearances calculated are the closest the piston is to the valve, checked every 4 degrees of rotation. If the clearance is less than .100, the clearance is printed in red.

Negative (-) clearances mean the valve is extending into the piston that amount. For example, if clearance is -.048 and you want .100 clearance, you must notch the piston .148 inches.

Definitions of input dimensions:

Figure 3 Illustration of Deck/Valve Clearance (Inches from Valve to Head Surface)



Gasket Thickness:
Thickness of head gasket torqued to spec.

Deck Ht Clearance:
Distance from piston top at TDC to block deck. If piston travels above the deck at TDC, enter an negative (-) number.

Valve angles:
Largest angle between valve stem and line perpendicular (90 deg) to the deck surface. For 23 degree Chevy heads, this would be 23.

Deck/Valve Clearance:
Closest distance between edge of valve and the head surface. If the valve(s) extend beyond the head surface (ex. valve touches table top when head sits on table), enter a negative (-) number for the amount of distance the valve edge extends beyond the head surface. See Figure 3.

Click on Save Specs and these dimensions are saved with the engine file.

Examples of dimensions for some typical heads are shown in Table 1.

Table 1 Examples of Typical Head Specs

Head Description	Int Valve Dia	Exh Valve Dia	Int Valve Angle	Int Deck/Valve Clearance	Exh Valve Angle	Exh Deck/Valve Clearance
Stock SB Chevy 186, 492, etc	2.02	1.60	23	.01	23	.08
Brodix -8 SB Chevy	2.08	1.625	23	.10	23	.14
Merlin Cast Iron BB Chevy	2.19	1.88	27	.01	7	.55
Stock SB Ford 351 W	1.84	1.54	20	.08	20	.10
Stock Cleveland Ford 351 C	2.19	1.71	11	.13	11	.27
Stock Pontiac 400, 455, etc	2.11	1.77	14	.13	14	.20

IMPORTANT: These example specs may NOT exactly match your heads. Use with caution!

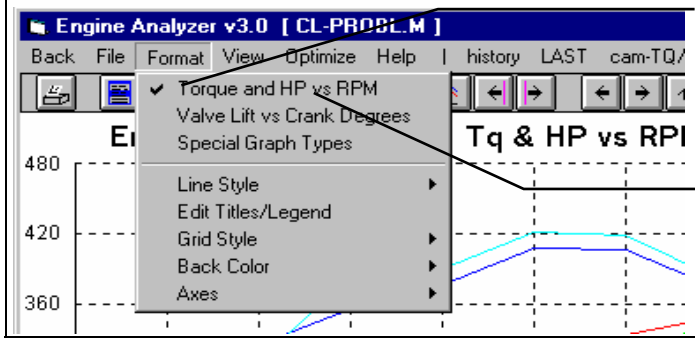
Graphing Features

The 'Plus' features add 2 powerful features to the Graph Screen, shown in Figure 4:

1. Click on 'Format', then 'Special Graph Types' for a menu to graph most any calculated output vs RPM, like BSFC, Spark Advance, etc.
2. Click on 'Optimize' to display several options at the bottom of the graph screen to modify most any engine specs and see the effect immediately on the torque and HP graph.

These options are not visible unless you have the 'Plus' version or a displaying the 'Plus' version demo. Click on Help at the Main Screen, then 'Engine Analyzer 'Plus' Features' to turn on the demo. See Figure 1.

Figure 4 Graphing Features



Click on Format, then Special Graph Types for screen of Figure 5.

Click on Optimize of the Optimize Feature shown in Figure 7.

Special Graphs

This menu lets you graph up to 4 different types of data on the same graph, for example Torque, HP and Spark Advance vs RPM.

First, select 'RPM Data, Use Specs Below' as the Graph Type.

Then select the # of Data Types to include in the graph, from 1 to 4. The appropriate # of graph specs will now be enabled.

Now you can select from the Data Types available, Torque, HP, BSFC, etc.

Then select the 'Multiplier' for each data type. For example, BSFC only ranges from say .4 to .5 but torque and HP may range from 100 to 500. BSFC would only show as a straight line a 500 HP scale. However, if you multiply BSFC x 1000, BSFC would now range from 400 to 500 and show up clearly. Therefore, select large multipliers for small data values.

Figure 5 Special Graphs Menu

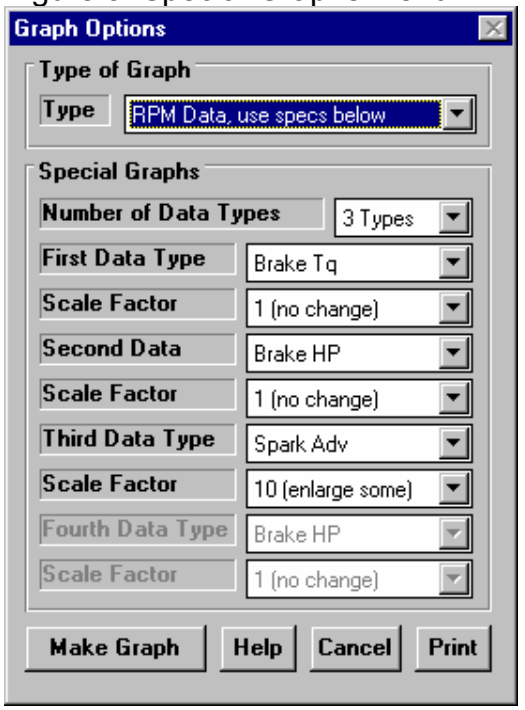
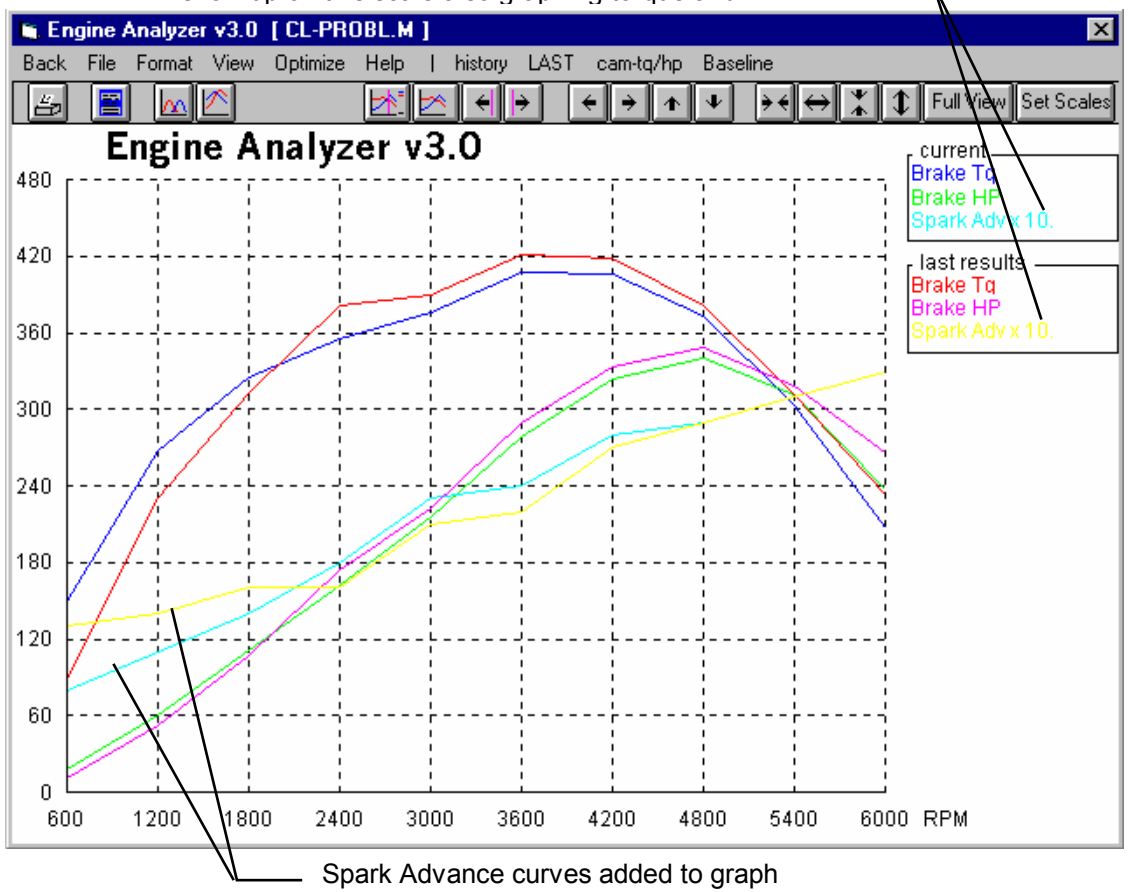


Figure 6 Special Graph Created from Specs of Figure 5



Optimize

The Optimize feature lets you modify most any engine specs and immediately see the effect on performance. See Figure 7.

First, select the 'Component' you want to modify.

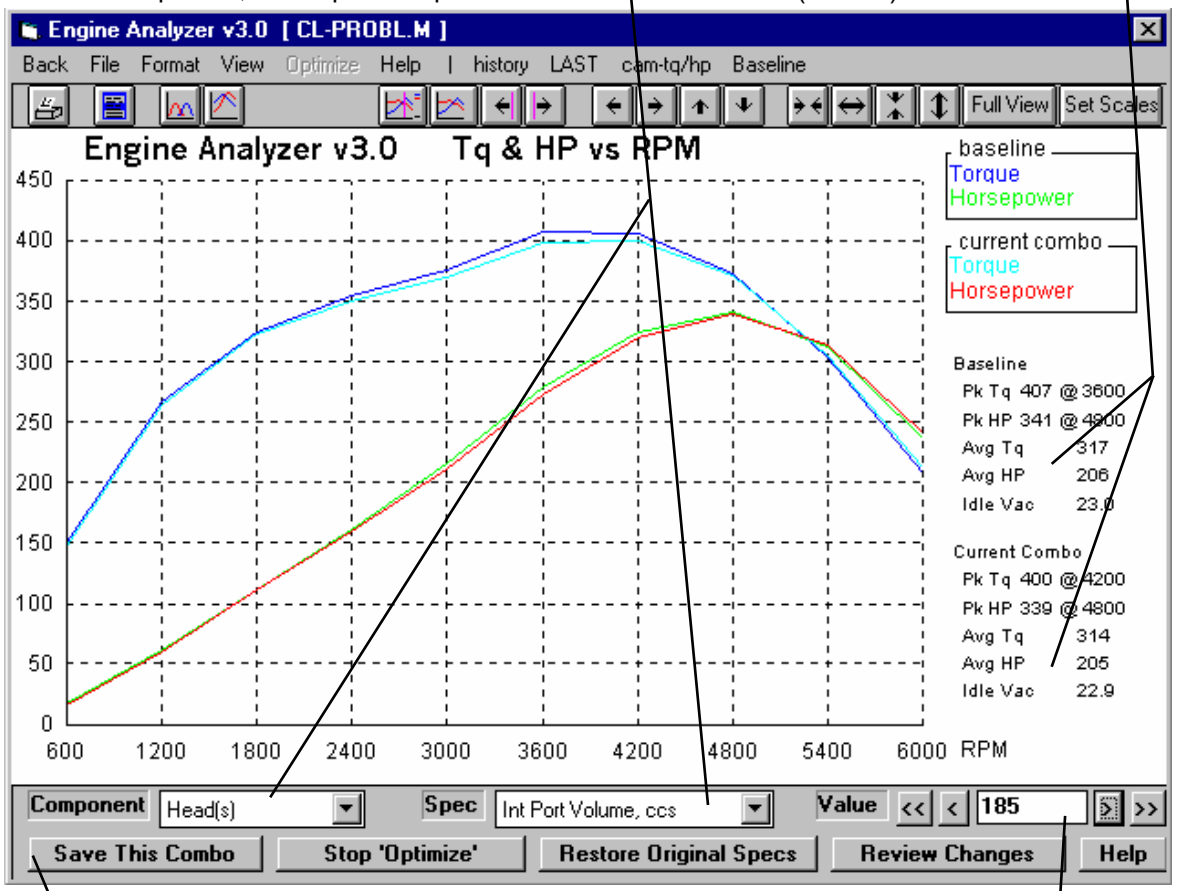
Then, select the 'Spec' for that Component.

Depending on the type of Spec you selected, you will have a list of settings, or a text box where you can type in a new setting. Each time you make a change to the setting, a new Torque and HP curve will be drawn so you can see the effect of this change.

The Optimize feature lets you modify just 1 spec or many specs for various components. For example, say you start by modifying Intake Cam Centerline from the original 110 deg to 104 degrees. Then you select to modify Intake Port Volume on the Head from the original 186 to 220 ccs.

Click on 'Save This Combo' to save any changes you have made to the Engine File you are working with. Note that you are not asked if you want to save to a New Name, meaning these changes overwrite the current specs for the current Engine File. Therefore, you may want to save your Engine to a New Name BEFORE you use the Optimize feature.

Figure 7 Graphing Optimize Screen

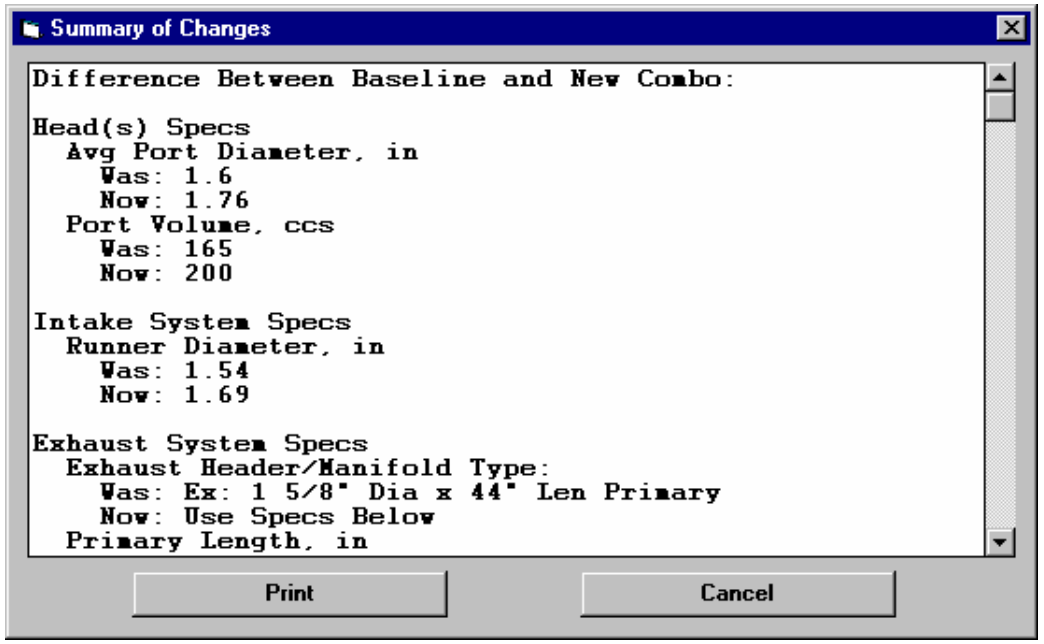


Click on 'Stop Optimize' to return to the normal graph screen and abandon any changes you have made.

Click on 'Restore Original Specs' to return all modified specs back to their original settings.

Click on 'Review Changes' and you will see a history of all changes you have made. Printing these changes is a convenient way to remember these changes. Then you can return to the Main Screen and make these changes and see the effects on other calculated output, like Spark Advance, or Exhaust Pressure, etc. See Figure 8.

Figure 8 Screen to Review Changes

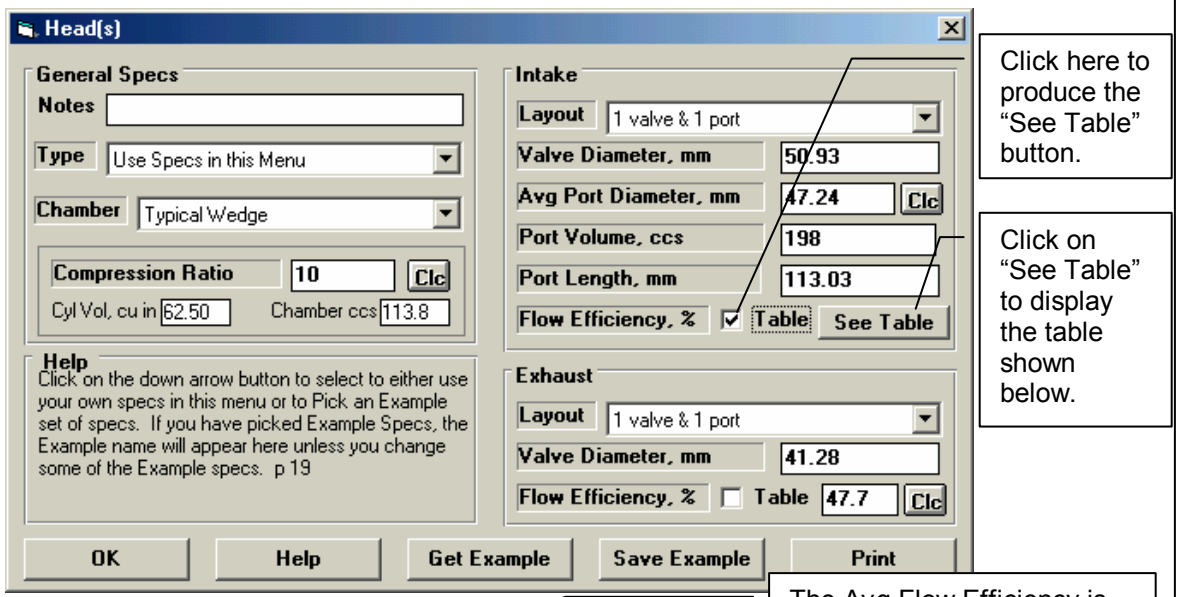


New Plus Features in Version 3.2

Use Full Flow Curve or Flow Table

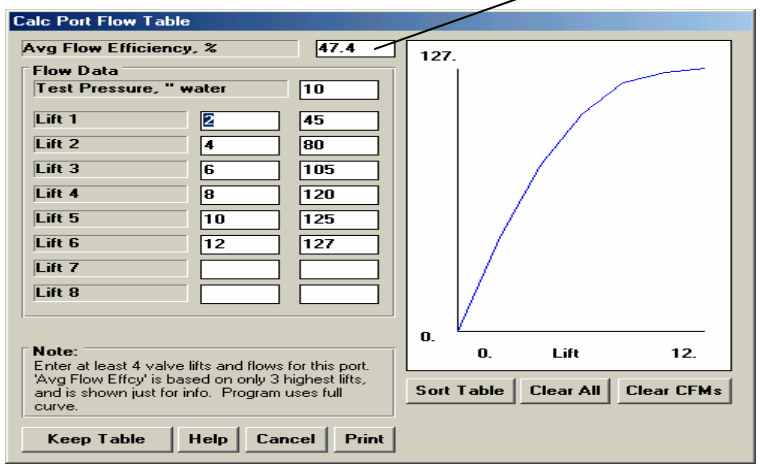
In the Head Specs menu, there is a check box to let you use the Avg Flow Efficiency for the port, or a Flow Table if you check the check box.

Figure 9 Flow Table Feature in Head Specs



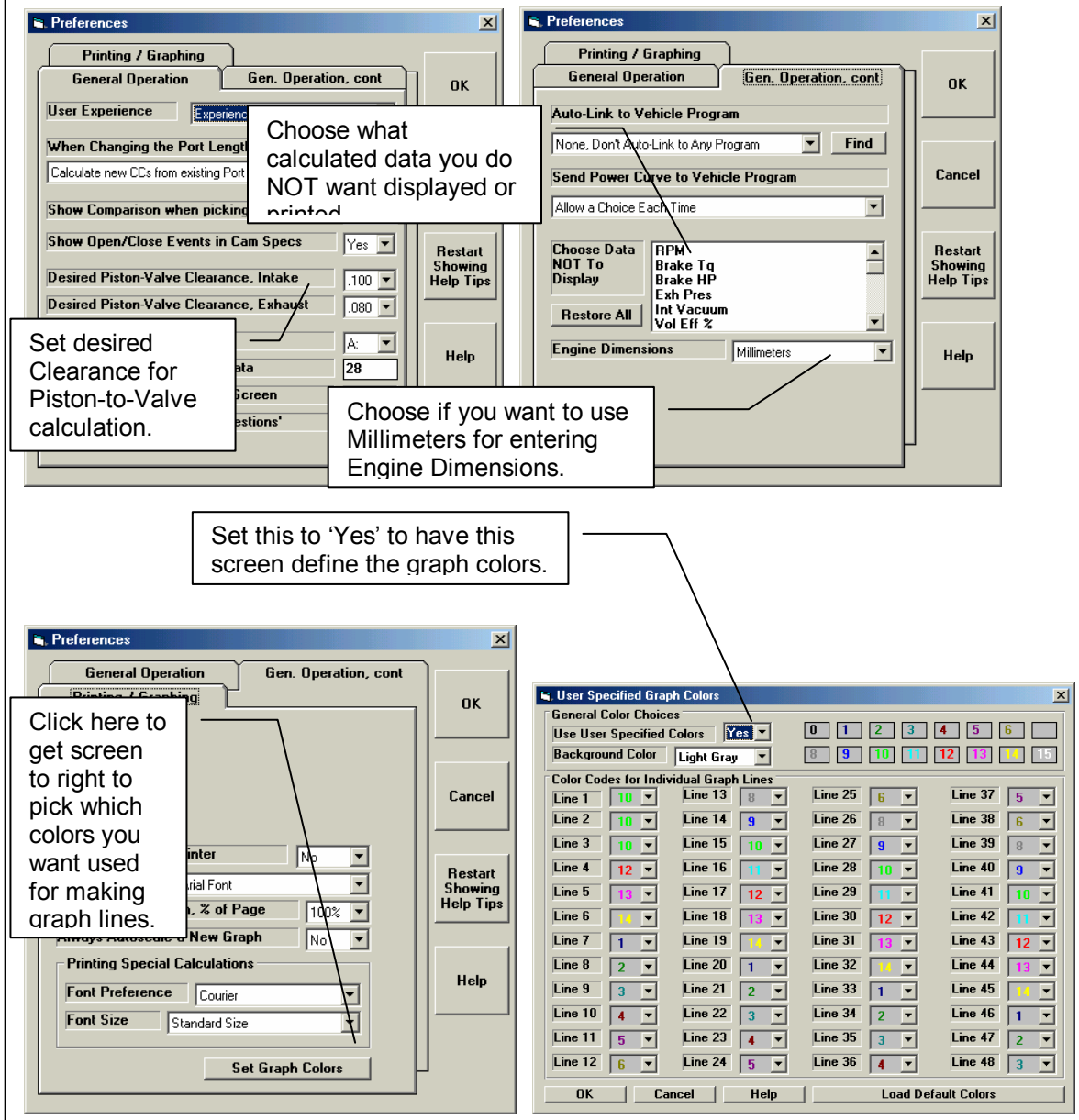
Click here to produce the "See Table" button.

Click on "See Table" to display the table shown below.



The Avg Flow Efficiency is calculated from the 3 highest lift points you've entered, and is displayed for your information, so you have a sense of how good a port this is. You must enter at least 4 points before this is displayed. The program uses all points entered

Figure 10 Preferences for Plus Features



Use Millimeters

Figure 10 shows where you can select to use Millimeters to enter engine dimensions like Bore, Cam Lift, etc. Note that these dimensions are changed if a file was saved in inches and the Preference is now set to MM. If you switch back and forth between inches and MM, the actual measurements may change slightly due to this conversion and rounding errors.

Desired Piston-to-Valve Clearance

Figure 10 shows where you can select a Desired Piston-to-Valve Clearance from the drop-down list. Most engine builders use .100" clearance for the intake and exhaust, but you can select anything you want here. Because you can now select a clearance, the calculation menu for Piston-to-Valve Clearance is now different than in the earlier v3.0.

Hide Output

Some users have requested that certain output be eliminated, that it can add to confusion to customers reading the output. Figure 10 shows where you can now select which outputs are not displayed or printed.

Choose Different Graph Colors

Figure 10 also shows how you can select each color for each graph line. For example, if Yellow does not show up well on your printer, you can change each occurrence of yellow to, say pink. This screen also lets you change the background color.