

Appendix 12: New Features in v 3.9 Enterprise Edition

The Enterprise Edition of Engine Analyzer Pro has some very advanced features the typical user would not use. These include:

- You can use a full compressor map to define the performance of a turbocharger compressor. Figs A57 and A58.
- You can specify a particular turbocharger boost level, intake manifold temperature (after the turbocharger compressor), and exhaust backpressure level. This gives you more freedom to simulate some particular situation which may be difficult to simulate using the turbocharger compressor and turbine model specs in the program. Fig A59.
- You can view the compressor map when calculations are being performed to see what area of the map is being used. Fig A60.
- You can use a full compressor map to define the performance of a centrifugal supercharger compressor. Figs A61 and A62.
- You can design a system where a centrifugal supercharger feeds into a roots blower supercharger. Fig A63.
- You can interface to the Compression Ratio Calculator program and transfer data back and forth between them. Figs A64 through A67.
- You can run a part throttle performance “map”. This map can be useful for calibrating electronic engine controllers, or just understanding part throttle performance. Fig A68 and A69.
- There is a new Preference which lets you choose a different language for certain labels in the program. Fig A70.
- Two new Preferences are provided to adjust the valve train dynamics calculations. One allows you to increase the stiffness of the lifter/cam interface. The other allows you to increase the stiffness of the rocker arm for Overhead Rocker Arm styles of valve trains. The factor you pick is multiplied by the default stiffness. For example, if you pick 1.5, the default stiffness is increased 50%. Fig A70.
- A Preference has been added to allow for adjusting intake runner wall friction for the Intake Runner and Port. The program picks a certain amount of wall friction based on manifold type, Runner Flow Coef, etc. Your choice here will change it by the percentage you pick. Fig A70.
- A Preference has been added to let you adjust how much valve toss (separation between follower and cam) will be called Valve Toss in the tabular results. The default used by the program for many years is .020”. If the program sees more than .020” separation between cam lobe and follower, it is flagged as Valve Toss in the calculated results. Your choices will let you pick a certain percentage of the lobe’s maximum lift. Fig A70.

Figure A57 Using a Full Compressor Map for Turbochargers

1st Stage Turbocharger Specs

Surge CFM: 180
Exh Turbine Eff, %: 65% Typical
Turbine Nozzle Dia, in: 1.1

General Turbocharger Specs

Throttle Location: Draw Through
Max Boost Limit, PSI: 10
Turbos/Stages: 1 Single Turbo
Intercooler Eff, %: 0% No Intercooler
Intercooler CFM Rating: 100000
Wastegate Is...: Before Intercooler

Force to Boost Conditions

Boost, psi: [] Int Temp: [] Exh Pres: []
Force These Conditions: No

Full Compressor Map

Use Compressor Map: Yes
File: @C:\WB98\projects6\EAAPROX\CENTMAP\Gar
View

Comments

Approximate specs for single Rajay 300F trim with 10 psi limit on wastegate.

Help

CFM where the surge line intersects pressure ratio of 2.0. p 59

Buttons: OK, Help, Retrieve from Lib

Callouts:

- Note that some specs are not needed when you choose to use a Map.
- Current Map File Name
- Click on View for screen below, to enter, open or edit Map settings.
- Set to Yes and then you can choose a Map File to describe the turbocharger compressor.

Pressure Ratio Range (rows)

Highest Pressure Ratio: 5.00
Pres. Ratio Step Size: 0.125
Preview: 1.00, 1.13, 1.25, ... 5.00

CFM Flow Range (columns)

Highest CFM: 290
CFM Step Size: 14.524
Preview: 15, 29, 44, ... 290

Surge CFM: 35
Update Graph
Print Table

| Pres Ratio | 15 | 29 | 44 | 58 | 73 | 87 |
|------------|----|----|----|----|----|----|
| 1.00 Eff% | 45 | 45 | 50 | 50 | 50 | 50 |
| 1.13 Eff% | 48 | 50 | 55 | 55 | 55 | 55 |
| 1.25 Eff% | 50 | 55 | 60 | 65 | 65 | 62 |
| 1.38 Eff% | 55 | 60 | 65 | 65 | 68 | 68 |
| 1.50 Eff% | 55 | 60 | 65 | 68 | 70 | 73 |
| 1.63 Eff% | 55 | 60 | 65 | 68 | 71 | 74 |
| 1.75 Eff% | 55 | 60 | 65 | 68 | 71 | 74 |
| 1.88 Eff% | 55 | 65 | 65 | 68 | 70 | 74 |
| 2.00 Eff% | 55 | 60 | 65 | 68 | 69 | 72 |
| 2.13 Eff% | 55 | 60 | 65 | 65 | 68 | 72 |
| 2.25 Eff% | 55 | 60 | 65 | 65 | 68 | 72 |
| 2.38 Eff% | 55 | 60 | 65 | 65 | 68 | 71 |

Graph: A compressor map showing efficiency contours (80, 75, 70, 65, 60, 55, 50, 45 Eff%) plotted against Pressure Ratio (1.0 to 5.0) and CFM (0 to 305). A shaded region indicates the operating range.

Buttons: OK (keep changes), Cancel Changes, Save As (new name), Open, New (blank out)

Callouts:

- Choose settings which describe how large the Map will be and how many "cells" you have to fill in for the Map, the smaller the "Step Size", the more cells.
- Surge CFM is still used with Map and drawn on Map.
- The Graph is not automatically updated with each change you make. Click here to update the graph.
- Click on a grid cell to enter the Thermal Efficiency at that Pressure Ratio and CFM flow, then press <Enter> to advance to next cell.

Figure A58 More Compressor Map Features

The screenshot shows the 'S/C Map [Garrett GT1241 50 Trim.CMP]' window. It features a grid of efficiency values (Eff%) based on pressure ratio and CFM flow. The grid is as follows:

| Pres Ratio | 15 | 29 | 44 | 58 | 73 | 87 |
|------------|----|----|----|----|----|----|
| 1.00 Eff% | 45 | 45 | 50 | 50 | 50 | 50 |
| 1.13 Eff% | 48 | 50 | 55 | 55 | 55 | 55 |
| 1.25 Eff% | 50 | 55 | 60 | 65 | 65 | 62 |
| 1.38 Eff% | 55 | 60 | 65 | 65 | 68 | 68 |
| 1.50 Eff% | 55 | 60 | 65 | 68 | 70 | 73 |
| 1.63 Eff% | 55 | 60 | 65 | 68 | 71 | 74 |
| 1.75 Eff% | 55 | 60 | 65 | 68 | 71 | 74 |
| 1.88 Eff% | 55 | 65 | 65 | 68 | 70 | 74 |
| 2.00 Eff% | 55 | 60 | 65 | 68 | 69 | 72 |
| 2.13 Eff% | 55 | 60 | 65 | 65 | 68 | 72 |
| 2.25 Eff% | 55 | 60 | 65 | 65 | 68 | 72 |
| 2.38 Eff% | 55 | 60 | 65 | 65 | 68 | 71 |

Control panels include 'Pressure Ratio Range (rows)' with 'Highest Pressure Ratio' at 5.00 and 'Pres. Ratio Step Size' at 0.125. 'CFM Flow Range (columns)' has 'Highest CFM' at 290 and 'CFM Step Size' at 14.524. A 'Surge CFM' field is set to 35. Buttons for 'Update Graph' and 'Print Table' are present. A file selection dialog is open, listing files like 'Cent Map Nov 2012.CMP', 'Garrett GT1241 50 Trim.CMP', 'Garrett GT3582R 56 Trim.CMP', 'Turbonetics T04S-60-1.CMP', and 'Turbonetics T61.CMP'. The dialog has 'Open This File' and 'Cancel Open' buttons. The main window has 'OK (keep changes)', 'Cancel Changes', 'Save As (new name)', 'Open', and 'New (blank out)' buttons.

Click on a saved Map file, then click on Open This File button to open it. Turbocharger Map files are saved in the CENTMAP folder with a ".CMP" file extension. Centrifugal Supercharger Map files are saved in the same folder with a .CMC extension.

Click this Open button to display the list of saved files shown above.

Click here to save this Map to a new name.

Current Map file name. Note: A Map file is just the specs you see in this screen. It is just a part of the total Turbocharger component file.

Figure A59 User Specified Turbo Boost and Backpressure

The screenshot shows a dialog box titled "Turbocharger Specs for: RAJAY-30.0F". It contains several input fields and a "Comments" text area. A callout box points to the "Exh Pres" field with the text: "Exhaust pressure is typically close to the Boost pressure. In a very efficient, turbo which is well matched to the engine, the exhaust pressure can be less than boost pressure. In an inefficient system, exhaust pressure will be higher. If you are not sure, set this equal to Boost pressure." Another callout box points to the "Force These Conditions" dropdown menu with the text: "Choose Yes and you can produce most any intake and exhaust conditions you want. You will notice that all other turbocharger settings are not shown to indicate they will have not affect on the results, just these 3 inputs." The dialog box also has "OK", "Help", "Retrieve from Library", and "Save" buttons.

Turbocharger Specs for: RAJAY-30.0F

Force to Boost Conditions

| | | |
|------------|----------|----------|
| Boost, psi | Int Temp | Exh Pres |
| 100 | 411 | 85 |

Force These Conditions: Yes

Comments
Approximate specs for single Rajay 300F trim with 10 psi limit on wastegate.

Help
Enter the Intake Boost Pressure you want the program to force into this intake manifold. The program will produce much more or less boost than this.

Buttons: OK, Help, Retrieve from Library, Save

Click on this Clc button for the screen to the left, where you can enter some inputs about the turbo system and get a good estimate of the Intake Air Temperature going into the engine after the turbocharger.

The screenshot shows a dialog box titled "Calc Intake Temperature". It contains several input fields for temperature and pressure, and a section for intake conditions. A "Use Calc Value" button is highlighted with a dashed border. The dialog box also has "Help", "Cancel", and "Print" buttons.

Calc Intake Temperature

| | |
|--------------------------------|-------|
| Calc Intake Temperature, Deg F | 411 |
| Outside Air Temperature, Deg F | 77 |
| Barometric Pres, inches HG | 29.66 |

Intake Conditions

| | |
|------------------------------|----------|
| Boost Level, PSI | 100 |
| Turbo Efficiency | 70% Good |
| Turbo Efficiency, % | |
| Intercooler | Yes |
| Intercooler Effectiveness, % | 40 |

Buttons: Use Calc Value, Help, Cancel, Print

Figure A60 Watching the Compressor Map during Calculations

If you are using a Map file, this button will appear on the Progress Form. If you select to Show S/C Map, you have choices to show continuously or Pause at different steps.

For most situations, "Pause Each RPM" is a good choice.

Click mouse button down on the blue title bars of these small screens and **hold down** to grab these screens. While holding mouse button down, slide mouse to place where you want to see what you need.

Current conditions shown here as numbers and graphed on Map as dot.

Dots are shown for each intermediate step. Note that these dots top out at a pressure ratio of about 2.0 because of the Max Boost setting of 30" in the Turbocharger Specs screen.

At the end of each step, click on these new buttons to advance to the next step, print the Map, or go back to Continuous running.

| Parameter | Value |
|------------------|--------|
| Engine RPM | 2000 |
| Brk Tq, ft-lbs | 342.4 |
| Brake HP | 130.4 |
| Exh Pres, PSI | 10.4 |
| Boost, PSI | 16.7 |
| Vol Eff, % | 155.7 |
| Actual CFM | 159 |
| Fuel Flow, lb/hr | 55.38 |
| Nitrous, lb/hr | .00 |
| Ntrs Fuel, lb/hr | .00 |
| BMEP, PSI | 293.50 |
| A/F Mxtr Qty, % | 100.0 |
| BSFC, lb/HP-hr | 4.25 |
| Thermal Eff, % | 33.20 |

| Parameter | Value |
|-----------------------------|---|
| Calculating for: | 3000 RPM |
| Step | 2 of 5 |
| Percent Complete, All RPMs | 0% |
| Percent Complete, Pass # 16 | 0% |
| Approx VEs | 152 161 171 180 176 168 166 168 171 174 174 |

| Parameter | Value |
|-----------|-----------|
| RPM | 3000 RPM |
| CFM | CFM = 273 |
| PR | PR = 2.55 |

Figure A61 Centrifugal Supercharger using Full Compressor Map

Click here to choose to use a full map.

Click here to bring up screen shown below

Click here to show the RPM Graph.

| Pres Ratio | 200 | 400 | 600 | 800 | 1000 |
|------------|-------|-------|-------|-------|-------|
| 1.00 RPM | 5000 | 5000 | 5000 | 5000 | 5000 |
| 1.00 Eff% | 10 | 20 | 20 | 10 | 10 |
| 1.20 RPM | 26000 | 31000 | 39500 | 50000 | 80000 |
| 1.20 Eff% | 70 | 60 | 38 | 28 | 10 |
| 1.40 RPM | 35500 | 37500 | 43000 | 52000 | 70000 |
| 1.40 Eff% | 67 | 75 | 61 | 40 | 30 |
| 1.60 RPM | 43500 | 43500 | 47500 | 53500 | 70000 |
| 1.60 Eff% | 62 | 75 | 72 | 50 | 35 |
| 1.80 RPM | 49000 | 48500 | 51500 | 55500 | 70000 |
| 1.80 Eff% | 58 | 73 | 72 | 61 | 42 |
| 2.00 RPM | 54500 | 53000 | 54000 | 59000 | 75000 |
| 2.00 Eff% | 55 | 68 | 73 | 64 | 50 |
| 2.20 RPM | 60000 | 56500 | 57500 | 62000 | 90000 |
| 2.20 Eff% | 50 | 65 | 70 | 60 | 50 |

The Map is very similar to the Turbocharger Map except you also need an RPM to go with each Thermal Efficiency at each Pressure Ratio and CFM flow data point. For example, this point shows the blower is spinning at 49000 RPM and produces 58% efficiency at a Pressure Ratio of 1.80 at a CFM of 200.

Figure A62 Centrifugal Supercharger using Full Compressor Map, RPM Graph

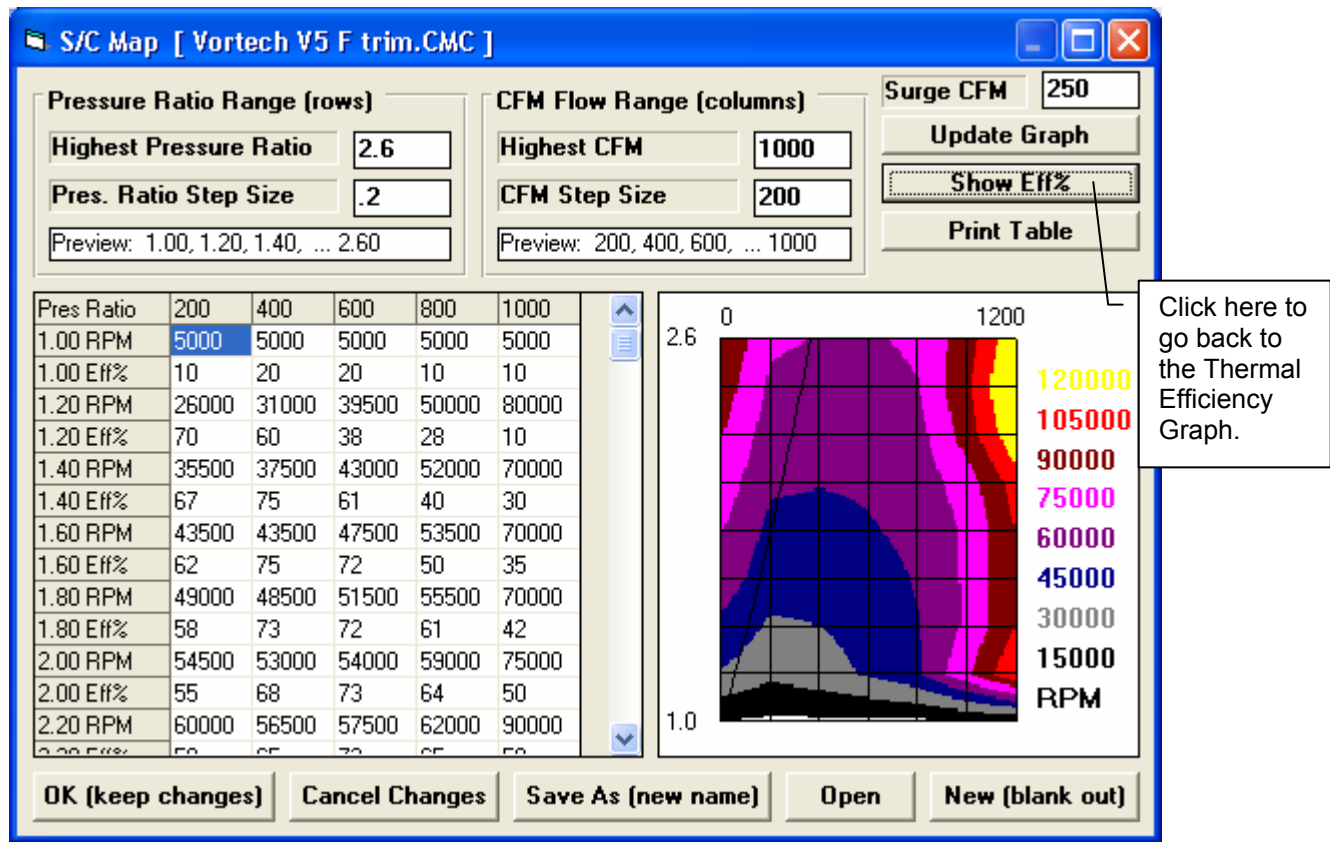


Figure A63 New Supercharger Type, Centrifugal Feeding into a Roots Supercharger

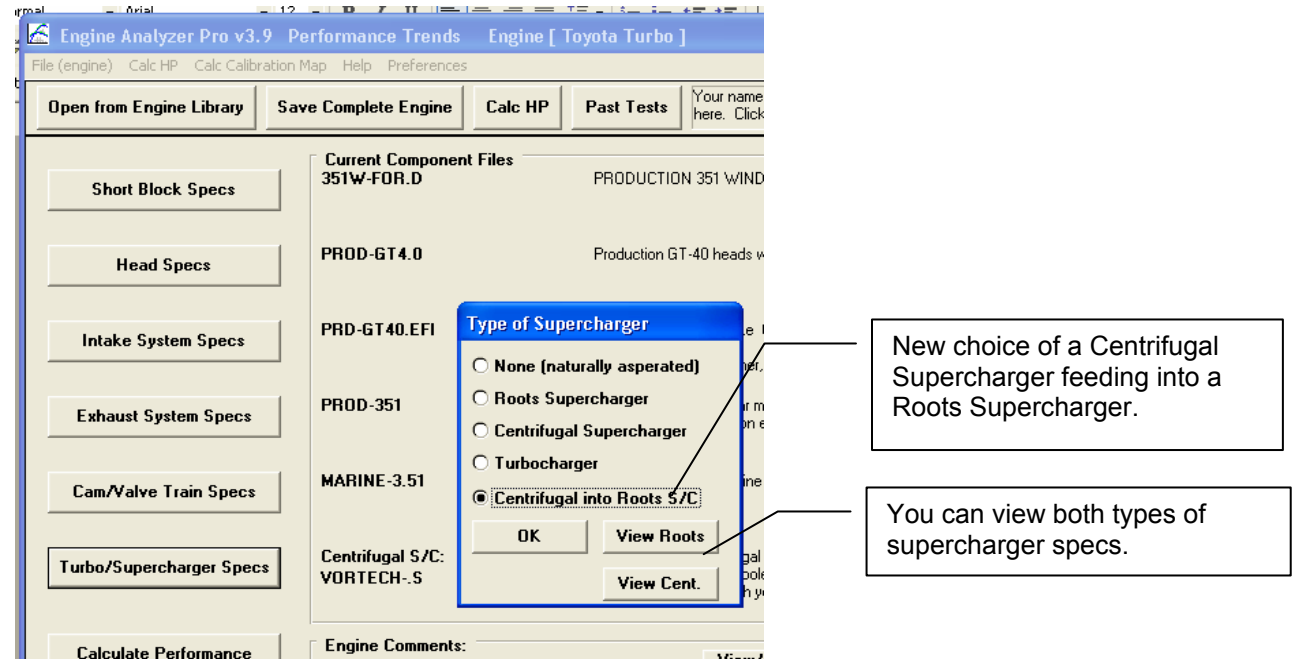


Figure A64 "Talking" to the Compression Ratio Calculator, Short Block Specs

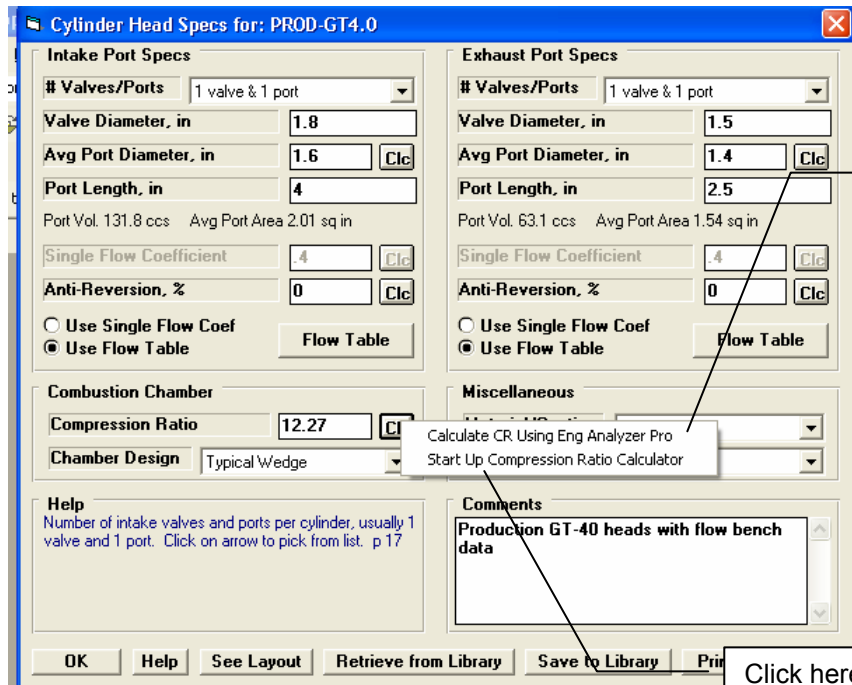
Starting up the Compression Ratio Calculator is shown if Figures A65 and A66

Total Small End Weight includes the piston, wrist pin and keepers, and rings in addition to just the small end of the rod. This is used in the Compression Ratio Calculator to estimate loads on the rod bolts at a particular RPM.

Current Stroke and Rod Length used for the Deck Height Clearance calculation.

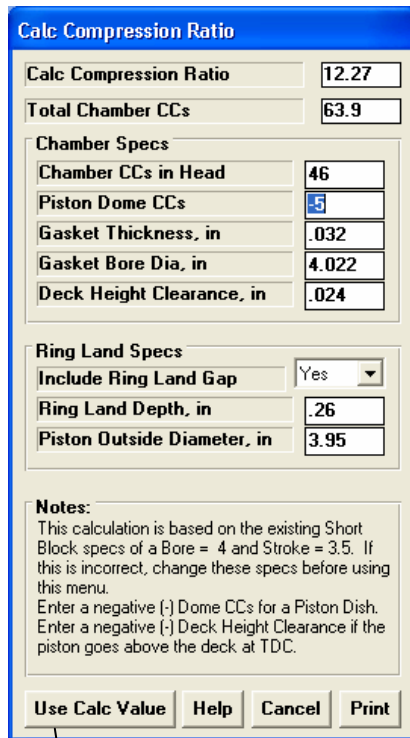
Current Deck Height Clearance which has been set in the Compression Ratio utility menu in the Heads Specs screen. See Figure A64. Ideally you will adjust specs either on this screen or the Compression Ratio utility screen to get these to match each other.

Figure A65 "Talking" to the Compression Ratio Calculator, Cylinder Head Specs

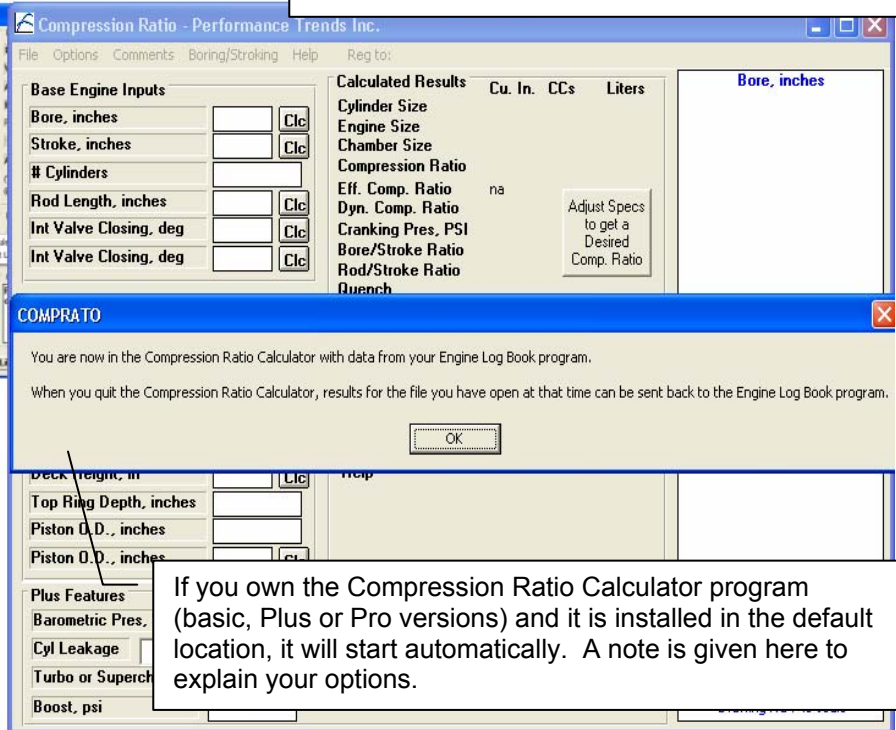


Two options from the Cylinder Head Specs screen. The top option shows the same Compression Ratio utility screen in the standard Engine Analyzer Pro. However, in the Enterprise Edition, now these inputs are saved when you leave this screen so they can be transferred to the Compression Ratio Calculator program.

Click here to start up the Compression Ratio Calculator program shown below.



Compression Ratio utility screen in Engine Analyzer Pro (standard version and Enterprise Edition).



If you own the Compression Ratio Calculator program (basic, Plus or Pro versions) and it is installed in the default location, it will start automatically. A note is given here to explain your options.

Figure A66 Actual Compression Ratio Calculator Program Called from Engine Analyzer Pro Enterprise Edition

You will see most all your numbers from the Engine Analyzer Pro transferred over to the Compression Ratio Calculator. Now you can do any other detailed calculations as shown here.

Base Engine Inputs

| | | |
|------------------------|-------|-----|
| Bore, in | 4 | Clc |
| Stroke, in | 3.5 | Clc |
| # of Cylinders | 8 | |
| Rod Length, in | 5.5 | Clc |
| Int Valve Closing, deg | | Clc |
| Deck Height, in | 8.672 | Clc |

Chamber/Piston Inputs

| | | |
|-----------------------|----------|-----|
| Chamber CCs in Head | 46 | Clc |
| Piston Design | Dish Top | |
| Piston Dish, ccs | 5 | Clc |
| Gasket Thickness, in | .032 | Clc |
| Gasket Bore Dia, in | 4.022 | Clc |
| Deck Ht Clearance, in | .024 | Clc |
| Piston Ring Depth, in | .26 | |
| Piston Top O.D., in | 3.95 | |
| Compression Ht, in | 1.398 | Clc |

Plus Features

| | | |
|-----------------------|----------------------|--|
| Barometric Pres, "Hg | 29.6 | |
| Cyl Leakage | Typical (production) | |
| Turbo or Supercharged | No | |
| Boost, psi | | |

Calculated Results

| | | | |
|--------------------|---------|-------|--------|
| Cylinder Size | Cu. In. | CCs | Liters |
| Engine Size | 43.98 | 720.9 | 0.721 |
| Chamber Size | 351.86 | 5767 | 5.767 |
| Compression Ratio | 3.9 | 63.9 | 0.064 |
| Eff. Comp. Ratio | 12.27 | | |
| Dyn. Comp. Ratio | na | | |
| Cranking Pres, PSI | na | | |
| Bore/Stroke Ratio | 1.143 | | |
| Rod/Stroke Ratio | 1.571 | | |
| Quench | .056 | | |

Volume Contributions

| | | | |
|--------------|---------|------|------------|
| | Cu. In. | CCs | % of Total |
| Head Chamber | 2.807 | 46 | 71.9 |
| Gasket | 0.407 | 6.66 | 10.4 |
| Deck | 0.302 | 4.94 | 7.7 |
| Piston Dish | 0.305 | 5 | 7.8 |
| Piston O.D. | 0.081 | 1.33 | 2.1 |

Help
The amount of volume in the cylinder head's combustion chamber, measured in cubic centimeters.

Adjust Specs to get a Desired Comp. Ratio

If things do not "add up" as far as deck height stackup, a message is given as shown here and Deck Height Clearance is adjusted to make it "add up". NOTE: The Engine Analyzer Pro does not force these numbers to "add up" as most do not affect engine performance.

Deck Height Clearance Adjusted

Deck Height Clearance will be adjusted to be consistent with the current Stroke, Rod Length, Deck Height and Compression Ht.

If this is not what you want to have done, click on one of the Calc buttons by the spec you want adjusted to fit the other specs (after you click on OK on this message).

(This notice given only once for each program startup.)

OK

When leaving the Compression Ratio Calculator, you are given these 3 options.

Keep Your Changes?

This file and all current settings will now be loaded back to the 'Engine Log Book'. Is this what you want to do?

Click on 'Cancel' to stop shutting down this Compression Ratio Calculator program.

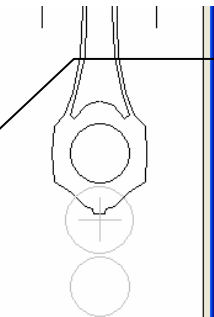
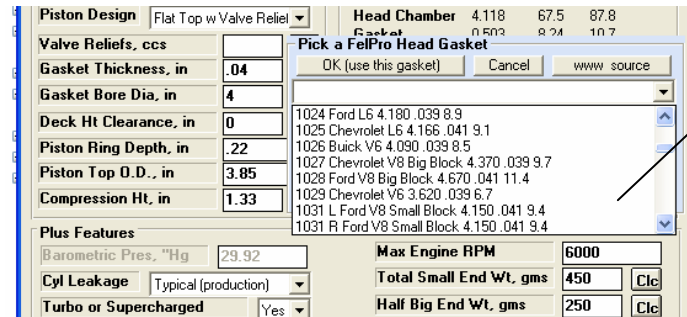
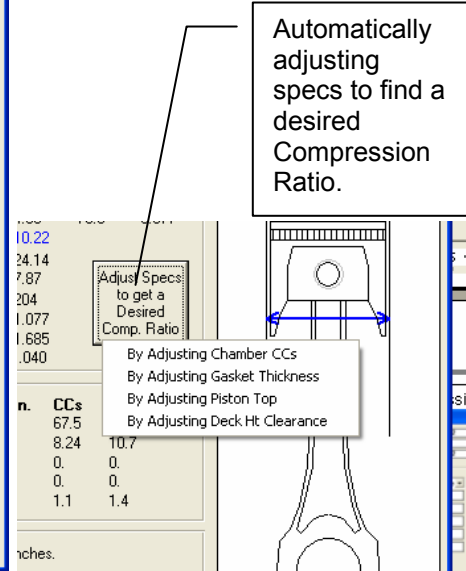
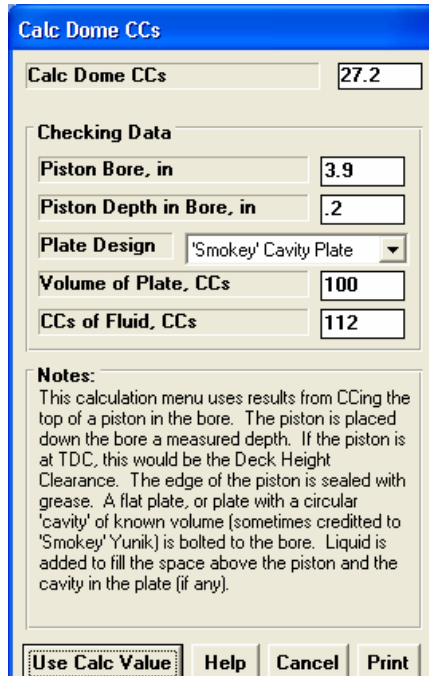
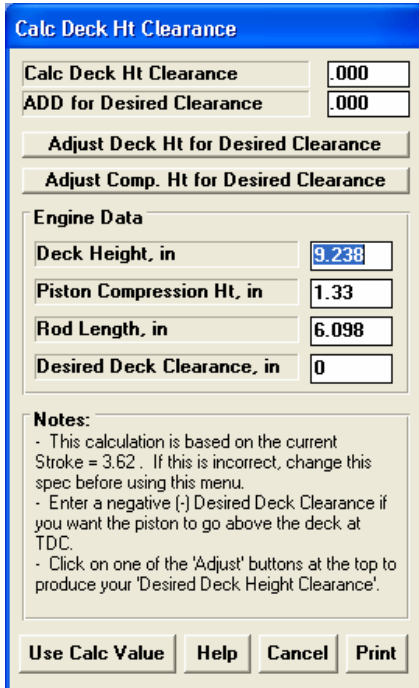
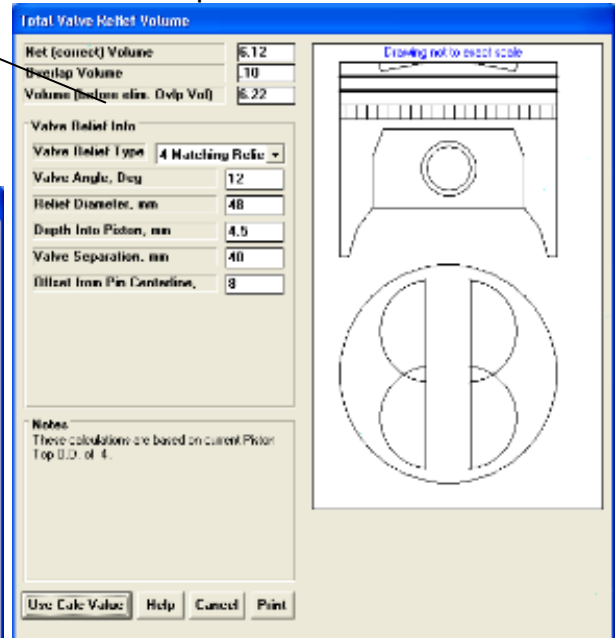
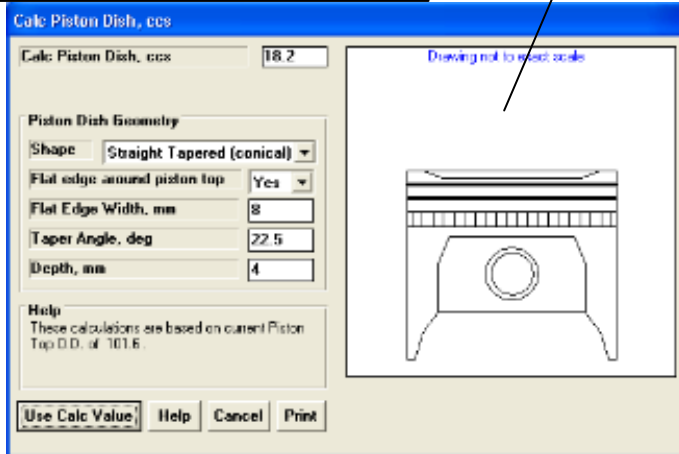
Click on 'No' to return to the Engine Log Book program but abandon any changes you've made in this program.

Yes No Cancel

If you choose Yes, you will see the numbers from the Compression Ratio Calculator transferred back to the EA Pro.

Figure A67 Some of the Advanced Features in the Actual Compression Ratio Calculator

These 2 screens (and several others for calculating volumes from geometry) are only available in **Pro version** of Compression Ratio Calculator.



Picking gasket specs from pre-loaded list of gaskets.

Figure A68 Calculating a Part Throttle "Calibration" Map

Click here at top of main screen for these options.

Calibration Map

Calibration Map

MAP Steps, psi: 2 psi

Highest Map, psi: Full Power, WOT

Lowest Map, psi: 4

Keep Specs Help Cancel Print

Here's the Map Details, which is basically the starting and ending MAP (manifold absolute pressure) points and increments. The RPMs which are run are set the same as for WOT (wide open throttle) performance, in the Calculate Performance screen.

Click on ASCII File to produce the 2 types of files shown in Figure A68. You will be asked for a file name and folder for storing the files. Then the program will write 2 files, a ".csv" or comma separated variable file which imports to Excel, or a ".txt" file which is tab delimited and reads better in

Here's the MAP for each section of results. The first section was a WOT, so map changes as manifold vacuum changes.

| Engine RPM | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Brk Tq, ft-lbs | 284.21 | 308.29 | 321.89 | 332.44 | 352.29 | 358.92 | 341.86 | 304.79 | 257.02 | 210.09 |
| Brake HP | 54.11 | 88.05 | 122.58 | 158.24 | 201.23 | 239.19 | 260.37 | 261.15 | 244.69 | 220.01 |
| MAP, psi | 14.5 | 14.5 | 14.5 | 14.5 | 14.4 | 14.4 | 14.3 | 14.3 | 14.3 | 14.3 |
| Vol Eff, % | 72.8 | 75.3 | 78.6 | 82.3 | 88.5 | 92.3 | 90.9 | 85.7 | 76.5 | 73.7 |
| BSEFC, lb/HP-hr | .479 | .456 | .456 | .462 | .469 | .480 | .496 | .525 | .556 | .655 |
| Injctr Dty Cyc, % | 17.036 | 26.412 | 36.764 | 48.139 | 62.146 | 75.586 | 85.040 | 90.238 | 89.456 | 94.825 |
| Inj Plse Wdth, ms | 20.443 | 21.129 | 22.058 | 23.107 | 24.859 | 25.915 | 25.512 | 24.063 | 21.469 | 20.689 |
| A/F Mxtr Qlty, % | 93.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Knock Index | 2.6 | 2.3 | 2.2 | 1.9 | 1.9 | 1.8 | 1.6 | 1.3 | 1.0 | .8 |
| Spark Advnc, deg | 20.2 | 22.5 | 24.1 | 25.4 | 26.3 | 27.2 | 28.5 | 29.9 | 31.9 | 33.5 |
| Fuel Flow, lb/hr | 25.89 | 40.15 | 55.88 | 73.17 | 94.46 | 114.89 | 129.26 | 137.16 | 135.97 | 144.13 |
| Brk Tq, ft-lbs | 268.57 | 292.71 | 306.29 | 317.75 | 337.49 | 345.95 | 330.63 | 296.36 | 248.51 | 203.65 |
| Brake HP | 51.14 | 83.60 | 116.64 | 151.25 | 192.78 | 230.54 | 251.81 | 253.93 | 236.58 | 213.27 |
| MAP, psi | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| Vol Eff, % | 69.7 | 72.1 | 75.5 | 79.3 | 85.6 | 89.6 | 88.5 | 83.7 | 74.7 | 72.1 |
| BSEFC, lb/HP-hr | .484 | .460 | .460 | .466 | .474 | .484 | .500 | .527 | .562 | .661 |
| Injctr Dty Cyc, % | 16.296 | 25.318 | 35.322 | 46.366 | 60.087 | 73.409 | 82.856 | 88.069 | 87.408 | 92.781 |
| Inj Plse Wdth, ms | 19.555 | 20.254 | 21.193 | 22.255 | 24.035 | 25.169 | 24.857 | 23.485 | 20.978 | 20.248 |
| A/F Mxtr Qlty, % | 93.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Knock Index | 2.4 | 2.2 | 2.1 | 1.9 | 1.8 | 1.7 | 1.5 | 1.3 | 1.0 | .8 |
| Spark Advnc, deg | 20.4 | 22.8 | 24.4 | 25.7 | 26.5 | 27.4 | 28.6 | 30.0 | 32.2 | 33.7 |
| Fuel Flow, lb/hr | 24.77 | 38.48 | 53.69 | 70.48 | 91.33 | 111.58 | 125.94 | 133.87 | 132.86 | 141.03 |
| Brk Tq, ft-lbs | 211.98 | 232.04 | 243.80 | 254.20 | 271.16 | 277.60 | 263.61 | 233.25 | 191.09 | 152.92 |
| Brake HP | 40.36 | 66.27 | 92.84 | 121.00 | 154.89 | 185.00 | 200.77 | 199.86 | 181.92 | 160.14 |
| MAP, psi | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Vol Eff, % | 58.1 | 60.2 | 63.2 | 66.5 | 72.0 | 75.4 | 74.2 | 69.8 | 62.1 | 59.8 |
| BSEFC, lb/HP-hr | .512 | .485 | .484 | .489 | .496 | .507 | .525 | .559 | .607 | .731 |
| Injctr Dty Cyc, % | 13.591 | 21.144 | 29.588 | 38.902 | 50.529 | 61.708 | 69.405 | 73.518 | 72.659 | 76.961 |

Figure A69 Part Throttle "Calibration" Map Written to ASCII Files (see Fig A67)



Notepad displaying the .txt format file.

| Engine RPM | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Brk Tq; ft-lbs | 284 | 308 | 322 | 332 | 352 | 359 | 342 | 305 | 257 | 210 |
| Brake HP | 54.1 | 88.1 | 122.6 | 158.2 | 201.2 | 239.2 | 260.4 | 261.1 | 244.7 | 220.0 |
| MAP; psi | 14.5 | 14.5 | 14.5 | 14.5 | 14.4 | 14.4 | 14.3 | 14.3 | 14.3 | 14.3 |
| Vol Eff; % | 72.8 | 75.3 | 78.6 | 82.3 | 88.5 | 92.3 | 90.9 | 85.7 | 76.5 | 73.7 |
| BSFC; lb/HP-hr | .479 | .456 | .456 | .462 | .469 | .480 | .496 | .525 | .556 | .655 |
| Injctr Dty Cyc; % | 17.036 | 26.412 | 36.764 | 48.139 | 62.146 | 75.586 | 85.040 | 90.238 | 89.456 | 94.825 |
| Inj Plse Wdth; ms | 20.443 | 21.129 | 22.058 | 23.107 | 24.859 | 25.915 | 25.512 | 24.063 | 21.469 | 20.689 |
| A/F Mxtr Qlty; % | 93.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Knock Index | 2.6 | 2.3 | 2.2 | 1.9 | 1.9 | 1.8 | 1.6 | 1.3 | 1.0 | .8 |
| Spark Advnc; deg | 20.2 | 22.5 | 24.1 | 25.4 | 26.3 | 27.2 | 28.5 | 29.9 | 31.9 | 33.5 |
| Fuel Flow; lb/hr | 25.89 | 40.15 | 55.88 | 73.17 | 94.46 | 114.89 | 129.26 | 137.16 | 135.97 | 144.13 |
| Brk Tq; ft-lbs | 269 | 293 | 306 | 318 | 337 | 346 | 331 | 296 | 249 | 204 |
| Brake HP | 51.1 | 83.6 | 116.6 | 151.3 | 192.8 | 230.5 | 251.8 | 253.9 | 236.6 | 213.3 |
| MAP; psi | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| Vol Eff; % | 69.7 | 72.1 | 75.5 | 79.3 | 85.6 | 89.6 | 88.5 | 83.7 | 74.7 | 72.1 |
| BSFC; lb/HP-hr | .484 | .460 | .460 | .466 | .474 | .484 | .500 | .527 | .562 | .661 |
| Injctr Dty Cyc; % | 16.296 | 25.318 | 35.322 | 46.366 | 60.087 | 73.409 | 82.856 | 88.069 | 87.408 | 92.781 |
| Inj Plse Wdth; ms | 19.555 | 20.254 | 21.193 | 22.255 | 24.035 | 25.169 | 24.857 | 23.485 | 20.978 | 20.243 |
| A/F Mxtr Qlty; % | 93.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S |
|----|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|---|---|---|---|---|---|
| 1 | Engine RPM | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | |
| 3 | Brk Tq; ft-lbs | 284.21 | 308.29 | 321.89 | 332.44 | 352.29 | 358.92 | 341.86 | 304.79 | 257.02 | 210.09 | | | | | | | | |
| 4 | Brake HP | 54.11 | 88.05 | 122.58 | 158.24 | 201.23 | 239.19 | 260.37 | 261.15 | 244.69 | 220.01 | | | | | | | | |
| 5 | MAP; psi | 14.5 | 14.5 | 14.5 | 14.4 | 14.4 | 14.4 | 14.3 | 14.3 | 14.3 | 14.3 | | | | | | | | |
| 6 | Vol Eff; % | 72.8 | 75.3 | 78.6 | 82.3 | 88.5 | 92.3 | 90.9 | 85.7 | 76.5 | 73.7 | | | | | | | | |
| 7 | BSFC; lb/HP-hr | 0.479 | 0.456 | 0.456 | 0.462 | 0.469 | 0.480 | 0.496 | 0.525 | 0.556 | 0.655 | | | | | | | | |
| 8 | Injctr Dty Cyc; % | 17.036 | 26.412 | 36.764 | 48.139 | 62.146 | 75.586 | 85.04 | 90.238 | 89.456 | 94.825 | | | | | | | | |
| 9 | Inj Plse Wdth; ms | 20.443 | 21.129 | 22.058 | 23.107 | 24.859 | 25.915 | 25.512 | 24.063 | 21.469 | 20.689 | | | | | | | | |
| 10 | A/F Mxtr Qlty; % | 93.9 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | | | | | | | |
| 11 | Knock Index | 2.6 | 2.3 | 2.2 | 1.9 | 1.9 | 1.8 | 1.6 | 1.3 | 1 | 0.8 | | | | | | | | |
| 12 | Spark Advnc; deg | 20.2 | 22.5 | 24.1 | 25.4 | 26.3 | 27.2 | 28.5 | 29.9 | 31.9 | 33.5 | | | | | | | | |
| 13 | Fuel Flow; lb/hr | 25.89 | 40.15 | 55.88 | 73.17 | 94.46 | 114.89 | 129.26 | 137.16 | 135.97 | 144.13 | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | |
| 15 | Brk Tq; ft-lbs | 268.57 | 292.71 | 306.29 | 317.75 | 337.49 | 345.95 | 330.63 | 296.36 | 248.51 | 203.65 | | | | | | | | |
| 16 | Brake HP | 51.14 | 83.6 | 116.64 | 151.25 | 192.78 | 230.54 | 251.81 | 253.93 | 236.58 | 213.27 | | | | | | | | |
| 17 | MAP; psi | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | | | | | | | | |
| 18 | Vol Eff; % | 69.7 | 72.1 | 75.5 | 79.3 | 85.6 | 89.6 | 88.5 | 83.7 | 74.7 | 72.1 | | | | | | | | |
| 19 | BSFC; lb/HP-hr | 0.484 | 0.46 | 0.46 | 0.466 | 0.474 | 0.484 | 0.5 | 0.527 | 0.562 | 0.661 | | | | | | | | |
| 20 | Injctr Dty Cyc; % | 16.296 | 25.318 | 35.322 | 46.366 | 60.087 | 73.409 | 82.856 | 88.069 | 87.408 | 92.781 | | | | | | | | |
| 21 | Inj Plse Wdth; ms | 19.555 | 20.254 | 21.193 | 22.255 | 24.035 | 25.169 | 24.857 | 23.485 | 20.978 | 20.243 | | | | | | | | |

Microsoft™ Excel displaying the .csv format file.

Figure A70 Language Translation and Other Preferences

New tab of Enterprise Edition Preferences

Choose amount you want these "stiffnesses" to be increased beyond the program's default assumptions. Typically increasing the stiffness improves valve train dynamics.

You can choose a different language here. See below.

Changing the Valve Toss Threshold will change the point at which you see warnings about Valve Toss in the output as shown here.

| Engine RPM | 5000 | 6000 | 7000 | 8000 |
|--------------------|--------|---------|---------|---------|
| Coolant HP | 121.00 | 120.00 | 55.30 | 5.52 |
| Blow By, CFM | 4.9 | 4.3 | 3.0 | 1.7 |
| In Tun Pres, PSI | 6.9 | 4.9 | .7 | -1.0 |
| Avg In Vel, ft/sec | 292 | 351 | 409 | 468 |
| Avg Ex Vel, ft/sec | 358 | 430 | 502 | 573 |
| Mach # | .655 | .667 | .702 | .798 |
| Act In FlowArea, % | 98.1 | 115.5 | 128.0 | 128.8 |
| Act Ex FlowArea, % | 97.2 | 101.2 | 113.8 | 120.8 |
| Valve Toss | None | In&Ex | In&Ex | In&Ex |
| Knock Index | 4.6 | 1.8 | .1 | .0 |
| Spark Advnc, deg | 37.3 | 38.8 | 39.5 | 41.4 |
| Injctr Dty Cyc, % | 91.888 | 101.293 | 109.998 | 100.835 |
| Inj Plse Wdth, ms | 22.053 | 20.259 | 18.857 | 15.125 |
| Calc Error | 0 | 0 | 1 | 0 |

Valve Flow & Cam Calculations
Overlap Area. deg*sq-in 0.4

Changing language changes descriptions of inputs, and also brings up Balloon showing description in "Help"

If you change language, not all labels and choices are

Description in Help Frame.

Engine Analyzer Pro v3.9 Tip

Jedes Mal, wenn Sie Hilfe benötigen, an einem Eingang:

- Klicken Sie auf das spec Namen oder
- Klicken Sie auf das Eingabefeld

Und eine kurze Definition wird hier mit einer Seite # im Handbuch für weitere Informationen gegeben.

Don't show this again

Most critical "Tip" messages are also given in the chosen language. As we receive feedback from users, more items in the program will be translated, and the translations are likely to