



R4 Engine Programming Software

Description:

The R4 software is a Windows[™] based software package that provides the user interface for a variety of Split Second engine management products. It controls the AIC additional injector, PSC programmable Calibrator and FTC Fuel/Timing Calibrator families of products. It operates on a Windows[™] 95/98 platform.

An unlimited number of user or customer files can be created. Within these files are the three dimensional maps and settings that are used to control fuel delivery, ignition timing, EGO sensor offset and a variety of other engine parameters.

The primal control input can be boost pressure, vacuum /pressure or voltage. The secondary control function is RPM. The map tables contain cell values that form a third dimension, which is the control output. The array of cell values is edited numerically and can be viewed in 3-D graphical form.

The R4 provides real time display of the 2 primary control inputs such as pressure and RPM. Additional parameters such as current cell value and corresponding information are summarized on the real time screen. The active cell is also indicated as a highlight on the map table. This is effective in determining the active cell for editing purposes.

The R4 software supports several advanced features. These features may or may not be used by a given end product. These features include 3 controlled outputs, 4 input channels of data acquisition and data recording with numeric and graphical playback.

The R4 software uses the COM port on the PC to communicate with the controller. Connection is made with a standard 9-pin straight-through cable with female DB-9 on one end and male on the other.

Installing the Software:

Insert the R4 CD ROM into your computer. Double click on the setup file contained on the disk. Follow the instructions provided by the installation wizard.

Launching the Software:

To start the program, click on the R4 application located in the start menu. The R4 programmer will display the Split Second splash screen, which identifies the version of the R4 software. After about four seconds, the main form will be displayed.

Setting Up A Customer:

The screenshot shows the 'SPLIT SECOND R4 - Harry Turbo.mdb' application window. The menu bar includes 'File', 'RealTime', 'Maps', 'View', 'Options', and 'Help'. The 'Customer Data' section on the left contains input fields for 'Name' (filled with 'Harry Turbo'), 'Address' (filled with '180 Fast Lane, Santa Ana, CA 92705'), 'Phone' (filled with '1-800-try-this'), 'Email', and 'Notes'. The 'Connect to ECU' section on the right features a 'Com 1' dropdown, a 'FirmWare Version' field with 'Unknown', and a 'Record Data' section with two disabled icons and a 'Standing By' status. A date field at the bottom left shows 'Thursday, May 02, 2002'.


If this is a new application, select **File** then **New Customer** from the main form to create a new customer. Type in the customer name and save. When you return to the main screen, select **File** and **Open Customer** to open the customer file that you just created. Once you open a customer file, the customer name will be displayed at the top of the form.

Once the customer is open, the **Maps**, **View**, **Options** and **Help** tabs become active. Whenever you write new data to the ECU, all settings and mapping will automatically be saved under the current customer name. You can fill in the various fields such as name, address etc. if you like.

Use different customer names to save different files for the same application. When tuning a vehicle, it is always a good idea to save a file that works well. Do your additional tuning under a different name so if you really mess up the tables, you can get back to a map that works. A simple way to do this is to copy the customer file to a different directory, rename it, then move it back to your working directory.

Connections:

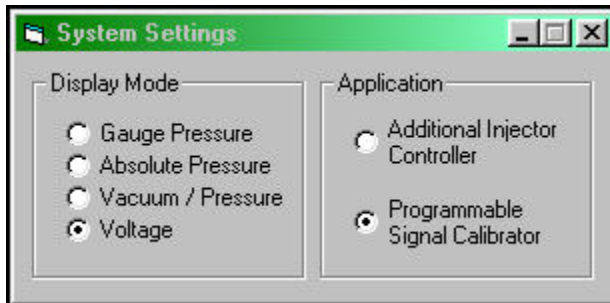
Select the proper COM port for the serial connector on your computer. Connect the controller to the computer using a 9-pin serial cable. The cable must be a straight-through type with a male plug on one end and a female on the other. Once the serial cable is plugged in and the controller

is powered up, you may connect by selecting the Connect to ECU icon . Once communication has been established with the ECU, the **Real Time** pull down becomes active.

If you are unable to connect, it is usually due to one of the following reasons:

- A) The wrong COM port is selected.
- B) The cable is not a straight-through type.
- C) The controller is not properly powered up.

Programming:



Use the **Options** pull down and **Systems Settings** option to select the desired primary control function. It can be gauge pressure, absolute pressure, vacuum/pressure or voltage. Which you choose depends on which controller you are using. If you are using an AIC, select Additional Injector Controller. Otherwise select Programmable Signal Calibrator.

Gauge Pressure

Display of manifold pressure relative to ambient pressure from -4 PSI to 26 PSI, with a resolution of .1 PSI.

Absolute Pressure

Display of manifold pressure relative to an absolute vacuum expressed in PSI. Ambient pressure is expressed as 14.7 PSI at sea level. As elevation increases, the ambient pressure reading goes down.

Vacuum/Pressure

Display of absolute pressure expressed as vacuum/pressure calculated based on an ambient pressure of 14.7 PSI. Vacuum is expressed as -inHg and ranges from -28.5 to 0. Pressure is in PSI and ranges to 16 PSI. As elevation increases, the ambient pressure reading goes down into the vacuum region.

Voltage

Display of input voltage ranging from zero to 5.0V.

Use the **Options** pull down and **Engine Settings** to select the number of cylinders of the engine. Use the **Maps** pull down to access the fuel map tables. There are two map tables in the R4 program. Which tables you use depends on the specific controller you are using.

Use the **Options** pull down and **Output Settings** to select active options for the particular controller used. Some FTC1 controllers have a provision for activating an open loop mode of engine operation. This feature is controlled by output B. It can be set to activate at a certain RPM, a certain pressure or both.

Real Time:

The real time option is only available if a connection to a controller is established. The sampling time is 10ms for storage to a file and 100ms for screen updates.

RPM

Display of RPM from 10 to 10000 RPM, with a resolution of 10 RPM.

Pressure/Voltage

The displayed pressure or voltage is determined by the selection made under **Options** and **System Settings**

Vacuum

Only active in when gauge pressure is selected. Display of manifold Vacuum from 0 InHg to 14.8 InHg, with a resolution of .1 InHg.

Cell Value A

Display of cell value on the A map. Depending on the application this reading may indicate injector on time in milliseconds, output in volts or timing retard in degrees. The cell value ranges from zero to 25.5 with 0.1 resolution. In AIC mode, injector duty cycle is also displayed. In PSC mode the equivalent voltage corresponding to the cell value is displayed.

Cell Value B

Display of cell value on the B map. Depending on the application this reading may indicate injector on time in milliseconds, output in volts or timing retard in degrees. The cell value ranges from zero to 25.5 with 0.1 resolution. In AIC mode, injector duty cycle is also displayed. In PSC mode the equivalent voltage corresponding to the cell value is displayed.

Aux A

Display Data acquisition channel A. The name, reading and resolution depends on the setup information contained on the Aux Input Settings form. By default the name would be AUX A and the voltage range is 0 to 5 Vdc with a resolution of 0.01 Vdc.

Aux B

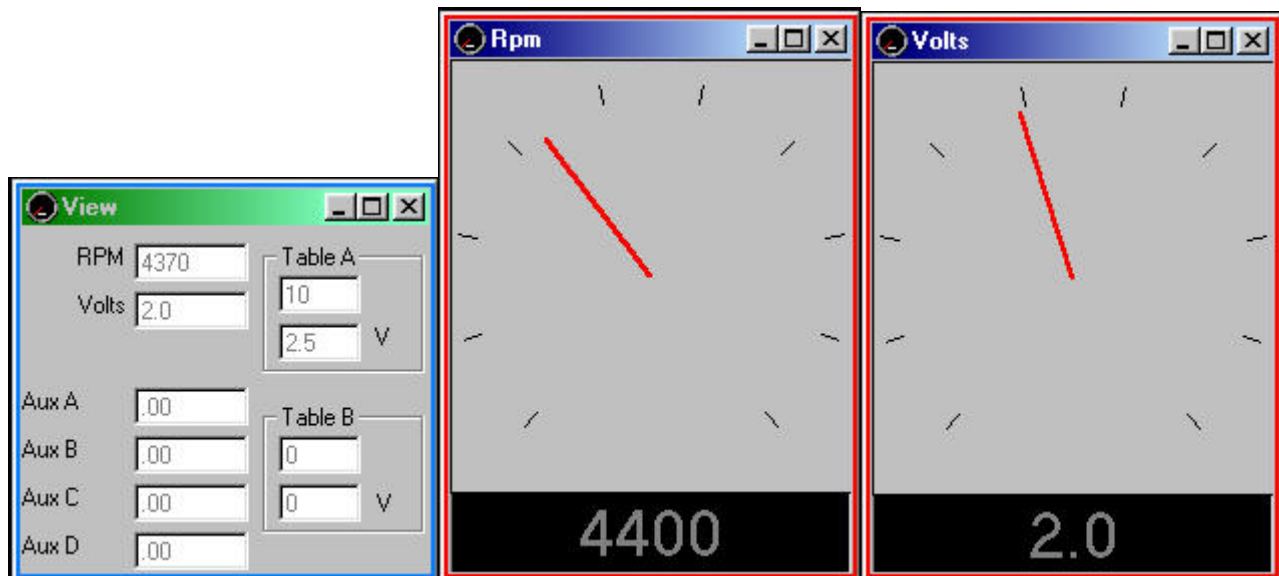
Display Data acquisition channel A. The name, reading and resolution depends on the setup information contained on the Aux Input Settings form. By default the name would be AUX B and the voltage range is 0 to 5 Vdc with a resolution of 0.01 Vdc.

Aux C

Display Data acquisition channel A. The name, reading and resolution depends on the setup information contained on the Aux Input Settings form. By default the name would be AUX C and the voltage range is 0 to 5 Vdc with a resolution of 0.01 Vdc.

Aux D

Display Data acquisition channel A. The name, reading and resolution depends on the setup information contained on the Aux Input Settings form. By default the name would be AUX D and the voltage range is 0 to 5 Vdc with a resolution of 0.01 Vdc.



The **All** option brings up a window that displays boost pressure and RPM as well as cell value and duty cycle for both A and B channels. The All window can be enlarged to full screen size to make it easy to read while working on the engine. The **RPM** and **Pressure** options display

analog gauges that show those parameters. The **All**, **RPM** and **Pressure** options can all be displayed simultaneously. These gauges as well as the real time summary box are very handy to display during engine tuning sessions.

Chart Recorder:

The chart recorder is used to view RPM, pressure/voltage, cell value and data acquisition channels in real time. All of the values are scaled to fit the screen. The colors reflect the following:

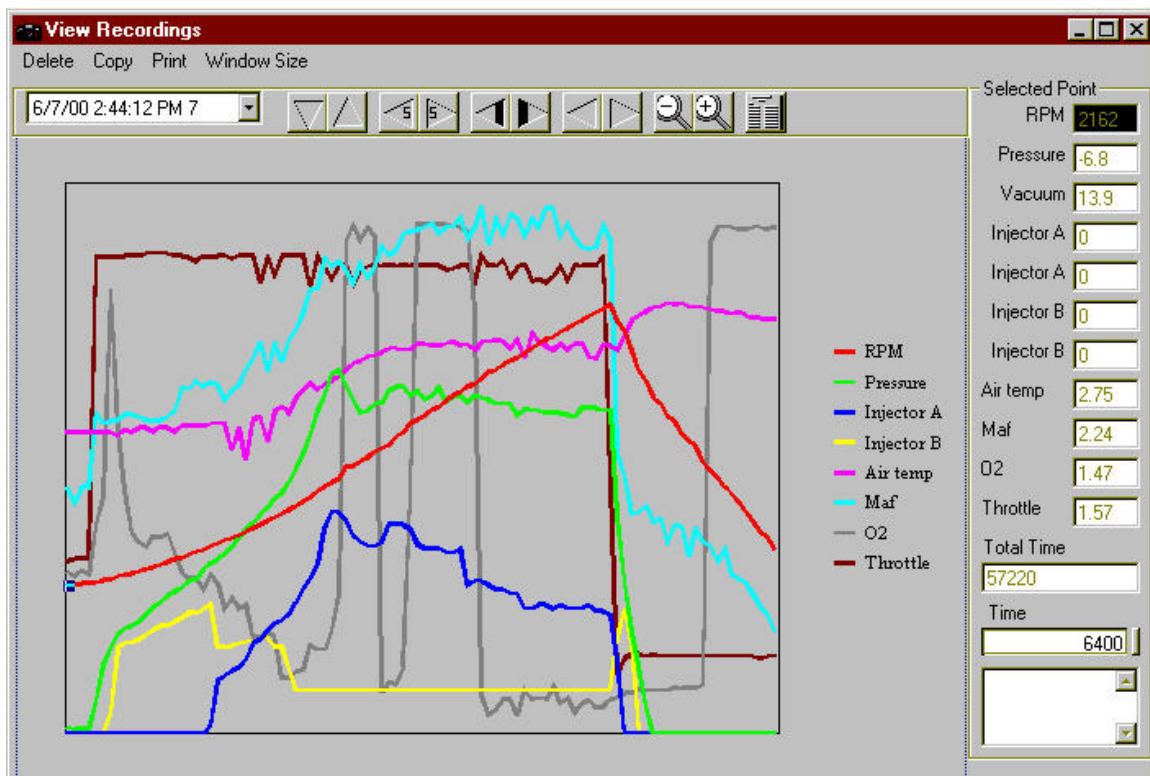
Red:	RPM
Green:	Pressure/Voltage
Blue:	Cell value map A
Yellow:	Cell value map B
Magenta:	Aux A
Cyan:	Aux B
Black:	Aux C
Brown:	Aux D

View Recordings:














The start and stop recording icons on the main from control the data recorder. Data record sessions are stored according to time and date. In order to view previously recorded data, go to **View Recordings** and select the time/date of the desired session

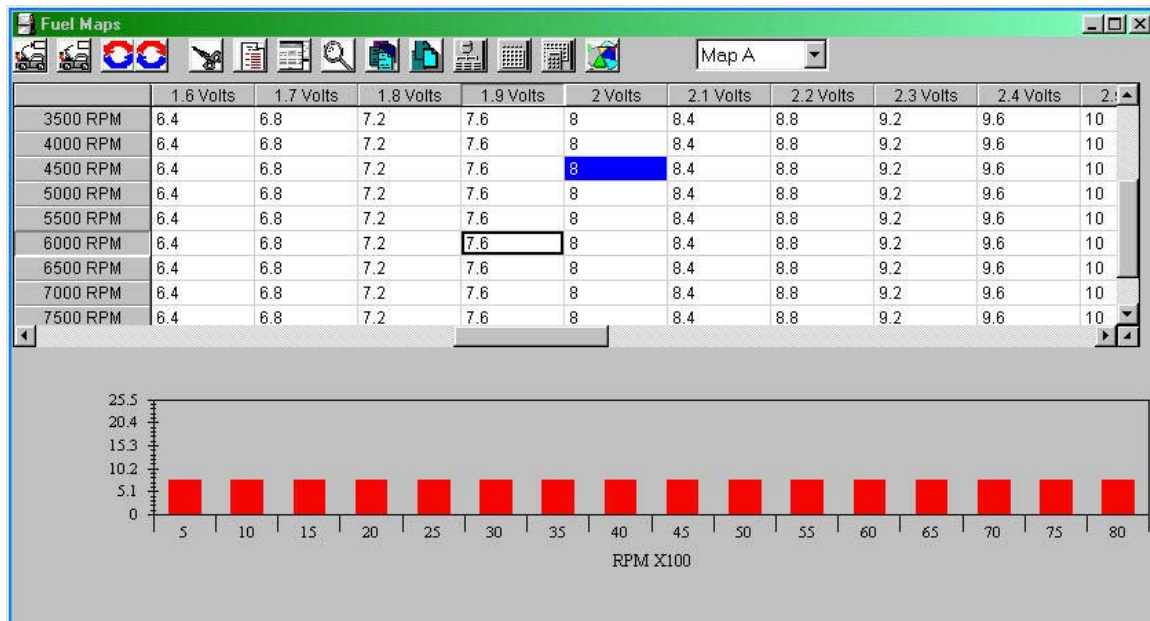
After a recording is selected the data will be show on the graph.



Click on the channel labels to the right of the graph to turn channels on and off. Moving the graph view can be done in various ways.

1. To move to the beginning of the recording click this  or press the Home key while holding down the Shift key.
2. To move to the end of the recording click this  or press the End key while holding down the Shift key.
3. To move to the previous sample point click  or press the left arrow key while holding down the Alt key.
4. To move to the next sample point, click  or press the right arrow key while holding down the Alt key.
5. To move one screen to the left click  or press the left arrow key while holding down the Ctrl key.
6. To move one screen to the right click  or press the right arrow key while holding down the Ctrl key.
7. To move the screen one sample to the left, click  or press the left arrow key while holding down the Shift key.
8. To move the screen one sample to the right, click  or press the right arrow key while holding down the Shift key.
9. To zoom out click  or press the Pg Up key.
10. To zoom in click  or press the Pg Dn key.
11. To set the view back to the standard defaults, click .
12. Select a sample by clicking the data point on the graph. The sample that is selected will show the data for all the acquisition channels on the right side of the screen.

Map Tables:



The map tables contain the numeric information used to control a specific engine parameter. The specific parameter depends on the controller being used and whether you are in map table A or B. For example, when programming an additional injector controller, the cell value represents the injector on time in milliseconds.

The injector time is displayed two different ways. The first is a spreadsheet at the top of the form and this is how values are modified. The second display method is a bar graph at the bottom of the form. The bar graph shows the injector times for all RPM at a single pressure. The cell that was clicked last on the spreadsheet is the range that is shown on the bar graph. If you click on a bar in the bar graph the cell it represents will be selected on the spreadsheet.






Each point in the spreadsheet represents the injector time at a particular manifold pressure and RPM. The data in a cell is the injector time in milliseconds from 0 to 25.5. The upper left corner shows the injector duty cycle for the selected cell. The color of a cell indicates the duty cycle. If the cell is black the duty cycle is below 85%. If the cell is green then the duty cycle is over 85%. If the cell is red then the duty cycle is over 100%.



If the map is being used for a programmable signal calibrator operated in signal modify mode, the cell value represents the amount that the signal is shifted. A cell value of 10.0 is neutral meaning no change. A cell value of 20.0 results in the maximum amount that a signal may be shifted positive which is 2.5V. A cell value of 0 results in the maximum negative shift of -2.5V. The minimum cell value increment is 0.1, which corresponds to 0.025V.

When used to control ignition timing, the cell value represents degrees of timing retard from the stock timing map. The cell value can range from zero to 20.0. A cell value of 4.5 results in four and a half degrees less timing advance.

Editing the Map Tables:


General editing can be done in various ways:

1. To select a complete RPM band click on the RPM to your far left. You can also press and hold the shift key while you click to select a range and you can press and hold the Ctrl key to select or un-select a RPM band.
2. To select a complete pressure band click on the pressure at the top. You can also press and hold the shift key while you click to select a range and you can press and hold the Ctrl key to select or un-select a pressure band.
3. To select a cell click the cell. You can also press and hold the shift key while you click to select a range and you can press and hold the Ctrl key to select or un-select a cell.
4. To select all of the cells click on the select all button  or click the duty cycle value in the upper left corner.
5. To unselect all of the cells click on the unselect all button  or click the duty cycle value in the upper left corner.
6. To move the selection drag it with the mouse to the new location. The previous selected cells will be filled with zeros.
7. To copy the selection, click the copy button . Now select the first cell where you want the data to go and click the paste button .
8. To delete the selection, click the cut button . The deleted cells will be filled with zero.


9. To delete the selection and paste it to a new location, click the cut button . The deleted cells will be filled with zero. Now select the first cell where you want the data to go and click the paste button .
10. To move to the next cell after you enter a value press the enter key or click on the next cell. You can also press one of the arrows keys after you enter a value in a cell. This will move to the next cell in that direction. This will also tell the spreadsheet that you want to move in that same direction when the enter key is pressed the next time.
11. To move one RPM and one pressure band you can click the small arrow in the lower right.

You can use the same methods to copy from one fuel map to another. You can also use the cut, copy and paste method to transfer data between an Excel spread sheet or other programs.


Undo:

Click the undo button  to undo the last changes in the spreadsheet. There are 10 levels of undo.


Redo:

Click the redo button  to redo the last undo in the spreadsheet. There are 10 levels of redo.


Cut:

Click the cut button  to delete the selected cells from the spreadsheet. The deleted cells will be filled with zero.

Copy:

Click the copy button  to copy the selected cells from the spreadsheet to the clipboard. The copied data can be pasted back into a new location on the spreadsheet or into another program. Copy is a very handy way to duplicate the same cell values in map tables A and B.

Paste:



Click the Paste button  to paste the clipboard data into the selected cells on the spreadsheet. The clipboard data can be from a previous cut, copy or data from another program. If you are pasting the contents of one map table to another, be sure to place the cursor over and click the correct starting cell location. When Pasting a range of cells, the starting cell is in the upper left hand corner.

Find:

Click this button  to bring up the find form.

How to use find:


1. Enter the value you wish to find in the "Find What" field.

2. Enter the value you want to replace it with in the "Replace With" field. This field can be left blank if you are not using the replace mode.
3. Click the find button to find the first occurrence. Each time you click the find button the next occurrence will be shown.
4. If you want to change the selected cell click the change button  .
5. If you want to change all occurrences to the new value click the change all button  .


Select All:

To select all the cells click on the select all button  or click the duty cycle value in the upper left corner.


Unselect All:

To unselect all the cells click on the unselect all button  or click the duty cycle value in the upper left corner.


Change By:

Click this button  to change the selected cells by a percent. For example, if you want to decrease all the cell values in a selected range by ten percent, enter -10. To increase by ten percent, enter 10.

Fill Selected:

Click this button  to fill the selected cells with a set value.

Auto Fill:


Click this button  to fill the selected cells with a liner extrapolation based on the values that are in the four corner cells in the selected region.

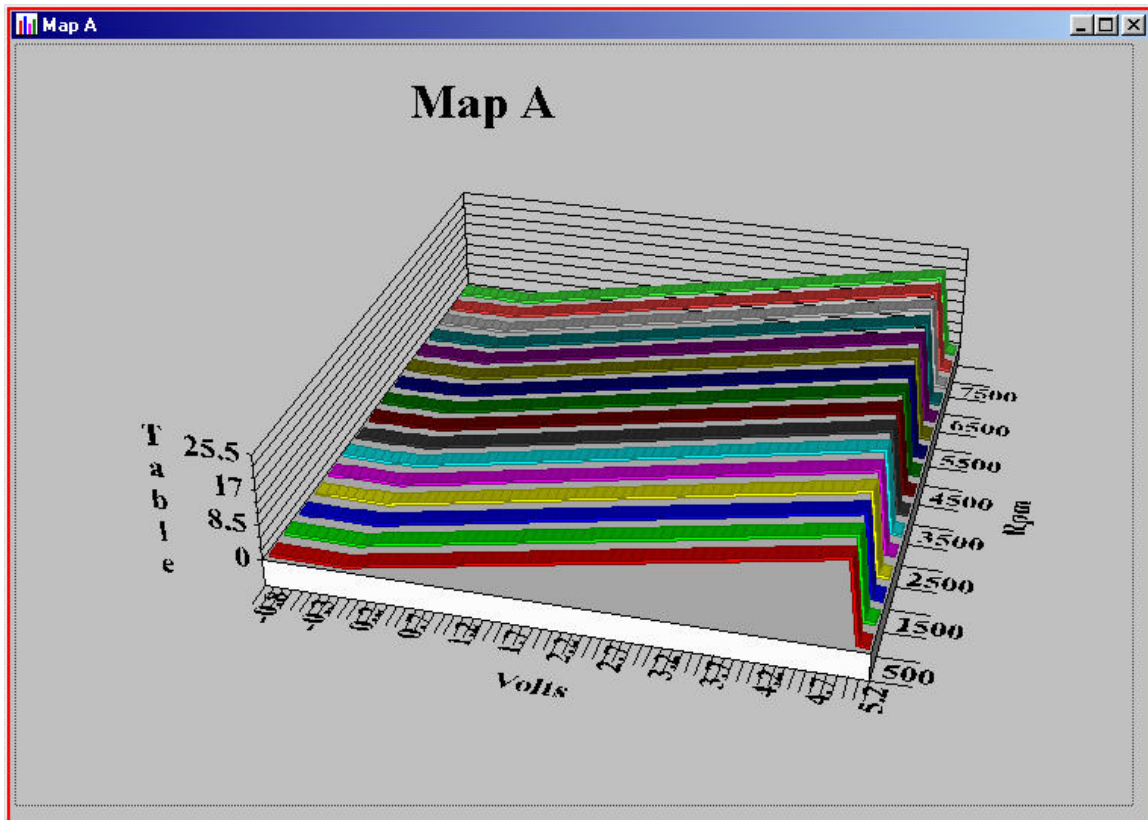
Use this function to quickly fill in data for a base fuel map.

How do I use this?


1. Enter the starting values in the four corners of the area that you want to fill in.
2. Select the area that you want to fill in.
3. Click the Auto-fill button.

3-D Map:

Click this button  to view the fuel map in three dimensions. All data points for the selected fuel map can be viewed this way. You can rotate the view by holding the Ctrl key and dragging the mouse. The 3D map can be expanded to full screen size for viewing.




Write Data To the ECU:

Click the write data button . This will write the data to the ECU. This button will not be available without a current connection with the ECU. The ignition should be on, but the motor not running.

All of the data in the ECU will be replaced. There is no undo for this function.

Read Data From The ECU:

Click the read data button . This will read the data from the ECU and place it into the customer file that is open. This button will not be available without a current connection with the ECU. The ignition should be on, but the motor not running.

All of the data in the open customer file will be replaced. There is no undo for this function.



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