



Tuner Program Reference Manual

Revision H

Table of Contents

Introduction.....	4
Program Installation.....	4
Minimum PC Requirements	5
What You Need To Begin Tuning.....	5
ECM Definition Files.....	6
Obtaining An ECM Definition File	6
Selecting An ECM Definition File	6
Installing An ECM Definition File	7
ECM Definition File Version.....	7
ECM Definition File Help	8
ECM Definition File Password.....	9
ECM Calibration Files	10
Opening A Calibration File.....	10
Saving A Calibration File	12
Calibration Tables.....	14
Switch Type Calibration Table	14
Constant Type Calibration Table	14
2D and 3D Calibration Tables	15
Opening A Calibration Table.....	16
Viewing Calibration Table Graphs	17
Changing 2D Graph Views.....	19
Changing 3D Graph Views.....	21
Editing Calibration Values.....	21
Editing Switch Type Calibration Table Values	22
Editing Constant Type Calibration Table Values	22
Selecting 2D and 3D Table Cells.....	24
Editing 2D and 3D Table Values.....	25
Increment/Decrement.....	26
Add.....	26
Subtract	26
Fill	27
Scale.....	27
Drag Graph Points.....	27
Copy and Paste Table Values	28
Undo / Redo Functions	30
Importing Table Values	31
Restore Table Values	32
Calibration Tools	33
Speed Calibration.....	33
VIN Information	35
Calibration Notes	36
Read PCM.....	36
Program PCM	39
Comparing ECM Calibration Files	41
Opening A Compare ECM Calibration File	42
Viewing A Calibration Table in Compare Mode.....	43

Generating Reports 45

 Printing An ECM Calibration Table 45

 Printing An ECM Calibration Table Graph 45

 Print All ECM Calibration Tables 46

 Printer Setup..... 47

 Print All ECM Calibration Tables To A File..... 48

Default Path 49

Program Options 50

Window Arrangement..... 54

Comments and Problem Reports 55

Software License, Copyright And Warranty 55

Software Registration..... 56

Program Updates..... 56

Appendix A – Recovering and Reseting the PCM 58

Appendix B - PCM Read/Program Communications Errors 59

Appendix C – Supported ECMs And PCMs..... 61

Appendix D – LT5 ECM Definition Files 64

Appendix E - RT Tuner Instruction Addendum 65

 Introduction..... 65

 Background Calibration Updates..... 65

 Quick Start 65

 Program Startup 66

 Calibration Synchronization 67

 New Tools Menu..... 67

 New Toolbar Buttons..... 68

 New Options 68

 Status Bar 68

 Real-Time Calibration Changes..... 69

Introduction

The OBDI. Tuner program is a Windows based utility developed to easily make changes to GM ECM/PCM engine and transmission control parameters. The program is designed to run on Windows XP and later operating systems.

The program provides the ability to change ECM/PCM calibration values without working through tens of thousands of binary bytes to determine which are computer instructions, and which are data tables, and what engine parameters these data control. You can tune a computer-controlled engine with no knowledge about the actual ECM/PCM software.

The C.A.T.S. Tuner program presents all the important tuning parameters in clear easy to understand tables that can be directly edited via keyboard and mouse commands. Once you have made the desired changes, the program rebuilds a valid ECM/PCM file that can be used to program the ECM/PCM.

A configuration file is required for each unique ECM/PCM. Additional configuration files can be installed and accessed via the ECM pull-down menu. See the C.A.T.S. web page at www.tunercat.com for a list of the ECM configuration files currently available.

Program Installation

To install the Tuner program, download the setup program from the 'Downloads' page on the C.A.T.S. web site (www.tunercat.com).

Once you have downloaded the setup program double click on it to begin the installation. To complete the installation, follow the on-screen instructions. You may be asked to restart your computer after the installation is complete. Once the installation is complete, you can delete the setup file from your PC's desktop.

If you are installing the Tuner program on a PC running Windows 7, 8, 10 or 11 then please install the program as follows:

1. Log on to your PC as an administrator.
2. Now double click on the setup program to install the Tuner program and follow the on-screen instructions to complete the installation.
3. After completing the installation, set the Tuner program to run in compatibility mode. To do so, right click on the Tuner icon on your Desktop, Select 'Properties' from the pop-up menu and then click the 'Compatibility' tab. On the Compatibility screen check the 'Run this program in compatibility mode for' box, select the default Windows XP SP3, check the 'Run as administrator' box, click on the 'Apply' button and then click on the 'OK' button.

If you purchased the software on a CD ROM you can run the setup program right from the CD. To do this place the C.A.T.S. CD into your CD ROM drive and the program should auto start. If it doesn't, navigate to your CD ROM drive and double click on the 'autorun.exe' program to start the installation process.

If you are installing the Tuner program on a PC running Windows 7, 8, 10 or 11 then after completing the installation set the Tuner program to run in compatibility mode. To do so, right click on the Tuner icon on your Desktop, Select 'Properties' from the pop-up menu and then click the 'Compatibility' tab. On the Compatibility screen click on the 'Run the program in compatibility mode, select the default Windows XP SP3, check the 'Run as administrator' box, click on the 'Apply' button and then click on the 'OK' button.

Minimum PC Requirements

The Tuner program will run on virtually any PC running Windows XP or later.

What You Need To Begin Tuning

To tune a vehicle, you'll need the Tuner program and the appropriate ECM Definition File for the vehicle you are working on. Go to the 'ECMs Supported' page on our web site (www.tunercat.com) for a list of the vehicles that are currently supported.

In addition to the above software, you'll also need some additional hardware. For all the ECMs that used a removable EPROM to store the calibration information you have two basic options:

Option 1:

Purchase one of our OBD1-Tune-Kits that includes everything you'll need to tune your vehicle.

Option 2:

Purchase a standard EPROM programmer and an EPROM eraser. Virtually any EPROM programmer will work with the EPROMs used in these ECMs. We recommend the Pocket Programmer from Transtronics (<https://secure.transtronics.com>). It is very reasonably priced and works well. Like the programmer, almost any EPROM eraser will work. Transtronics also carries an inexpensive eraser that works fine.

In the case if the 1994 – 95 LT1 cars and the 1994 – 95 L32 and L82 V6 cars, the PCMs did not use a removable EPROM like the earlier ECMs and you won't need an EPROM programmer or eraser. These PCMs used FLASH memory that is read and programmed over the ALDL diagnostics port. To connect your PC to the vehicle for reading and programming the PCM, you'll need one of our USB/ALDL cable sets.

We offer complete tuning kits for these cars as well. For the 1994 – 95 LT1 cars these kits include the Tuner program, the \$EE ECM Definition File and the ALDL interface cable you need to read and reprogram the car's computer. This cable connects you PC to the car's ALDL (diagnostic) connector under the dash. Two different ALDL connectors were used in these cars; an OBDI style 12 pin connector and an OBDII style 16 pin connector.

There are three different versions of these kits available. Which version you'll need depends on the type of ALDL connector in your car:

LT1-Tune-1: This kit includes an OBDI style ALDL interface cable for cars with the OBDI style 12 pin ALDL connector.

LT1-Tune-2: This kit includes an OBDII style ALDL interface cable for cars with the OBDII style 16 pin ALDL connector.

LT1-Tune-Y: This kit includes an ALDL interface cable that will work with both types of ALDL connectors.

Similarly, the tuning kits for the 1994 – 95 L32 and L82 cars include the Tuner program, the V6 ECM Definition File and the ALDL interface cable you need to read and reprogram the car's computer. There are three different versions of these kits available as well. Which version you'll need depends on the type of ALDL connector in your car:

V6-Tune-1: This kit includes an OBDI style ALDL interface cable for cars with the OBDI style 12 pin ALDL connector.

V6-Tune-2: This kit includes an OBDII style ALDL interface cable for cars with the OBDII style 16 pin ALDL connector.

V6-Tune-Y: This kit includes an ALDL interface cable that will work with both types of ALDL connectors.

ECM Definition Files

The C.A.T.S. Tuner program uses a unique ECM Definition File to define the ECM parameters for each unique type of ECM. A wide variety of ECM Definition Files are available. See the C.A.T.S. web page at www.tunercat.com for a list of the ECM Definition Files currently available.

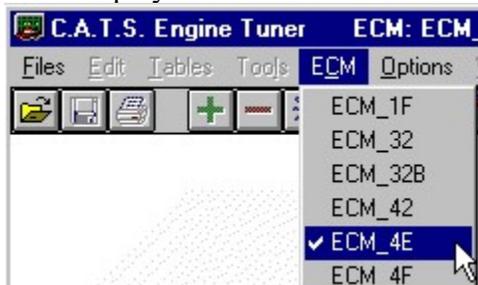
To insure proper operation the correct ECM Definition File must be selected before viewing or editing an ECM calibration file.

Obtaining An ECM Definition File

You can also purchase ECM Definition Files on-line from the C.A.T.S. web site at www.tunercat.com.

Selecting An ECM Definition File

To display a list of all the installed ECM Definition Files, click on the *ECM* drop-down menu on the main display.



To select a definition file, click on the desired file. This will activate the selected definition file and close the drop-down list. The definition file currently in use is displayed in the title bar of the main screen.

Note: If you only have one ECM Definition File installed, the file will automatically be selected when the program starts and the 'ECM' drop-down menu will be disabled.

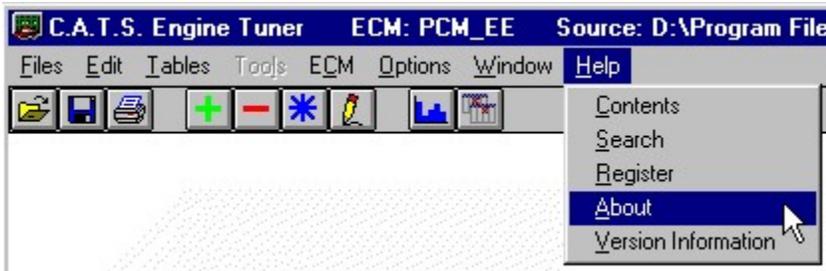
Installing An ECM Definition File

To make an ECM Definition File accessible to the C.A.T.S. Tuner Program, simply place the definition file into the C.A.T.S. Tuner Program subdirectory (normally *c:\Program Files\CATS\Tuner* but may be different if you are running a 64-bit version of Windows).

ECM Definition File Version

C.A.T.S. is continually updating and adding capabilities to the Tuner program. In many cases this includes changes to the ECM Definition Files. To keep track of these changes, each ECM Definition File carries a version letter which is advanced with each modification.

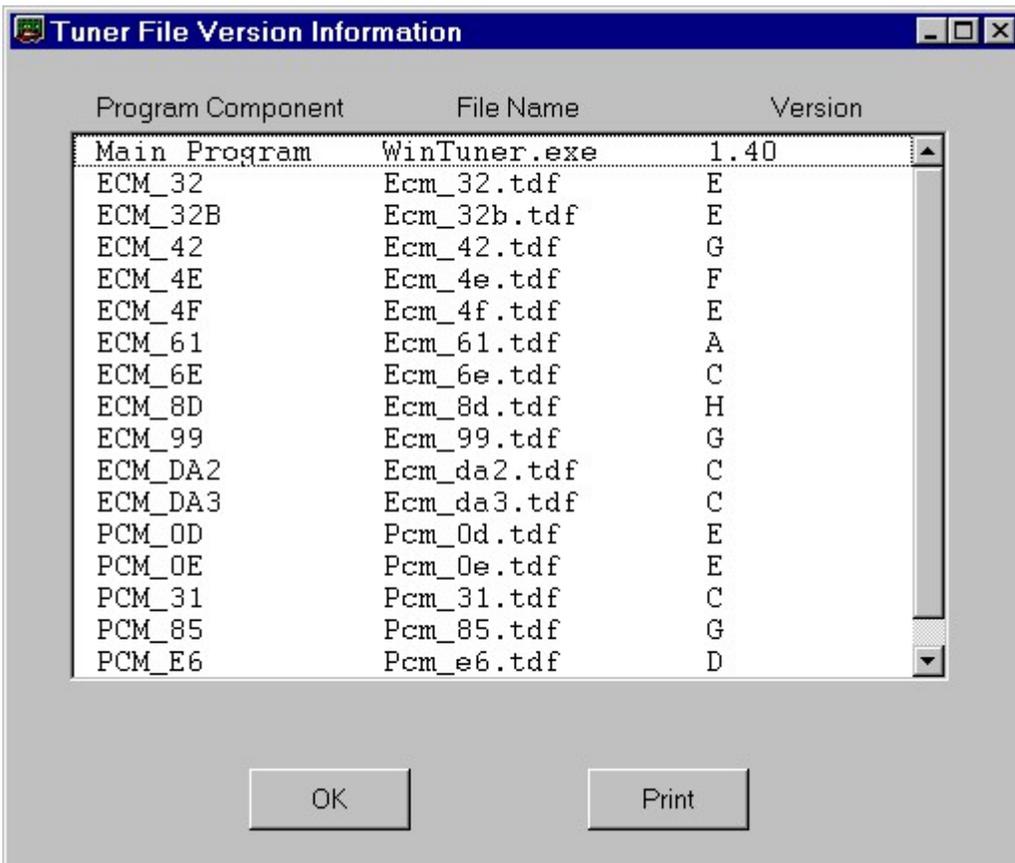
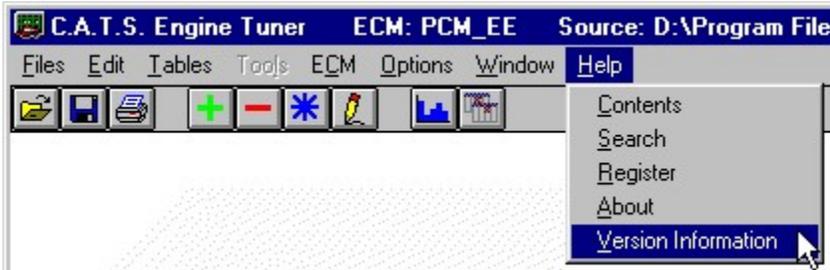
To view the version of the ECM definition Files currently being used, select *About* from the *Help* menu.



This will display the about screen which shows various program information including the ECM definition File version letter.



If you have multiple ECM Definition Files installed, you can view the version of all your definition files. To display this report, select *Version Information* from the *Help* menu.



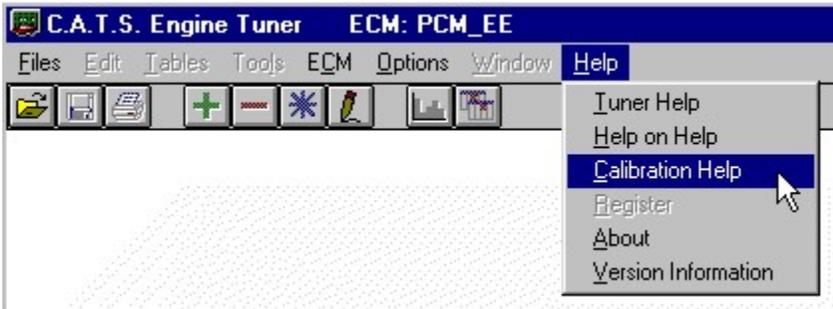
To create a hard copy of the version report, click on the *Print* button.

A list of all the current file versions is available on the C.A.T.S. web page. If you need an update to one of your ECM Definition Files, please send us an e-mail to request the latest version.

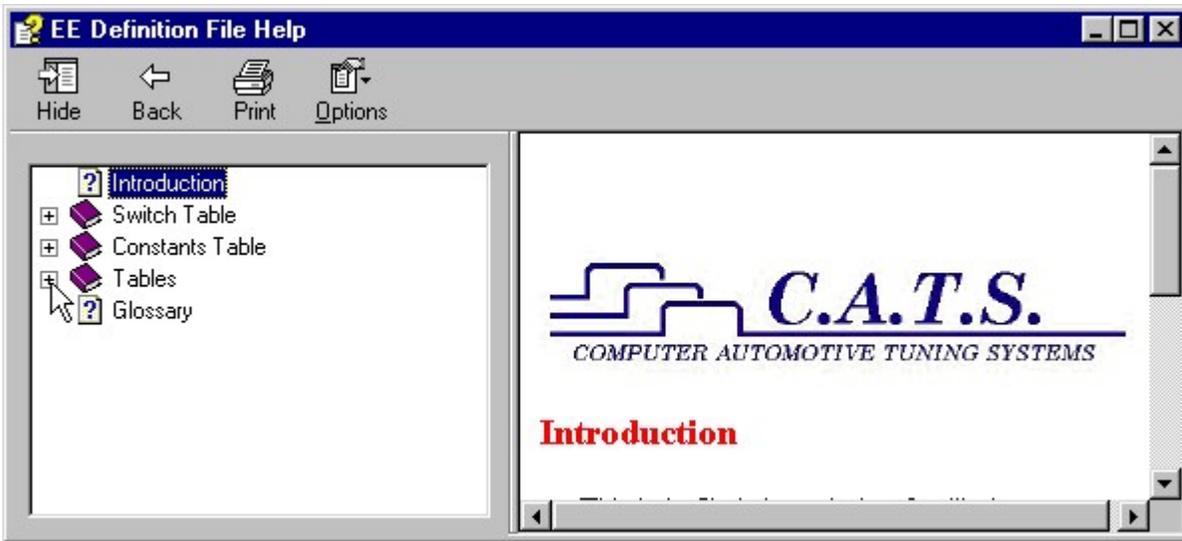
ECM Definition File Help

If an ECM Definition File help file for the Definition File you are using is installed, you can access the Definition File help from the '*Help*' menu.

To access the Definition File help, select '*Calibration Help*' from the '*Help*' menu.



This will display the Definition File help screen.



Use the navigation keys on the help screen toolbar to move around in the help file. Click on the '+' next to the categories in the contents box to expand them.

ECM Definition File Password

If the ECM Definition File that you have selected has been password protected, the password input screen will be displayed.



To begin using the ECM Definition File enter the correct password and click on the 'OK' button.

ECM Calibration Files

An ECM calibration file is a binary format file created by reading the EPROM from your vehicle's ECM. This is accomplished using an appropriate EPROM programming device. **To be compatible with the C.A.T.S. Tuner Program, the ECM Calibration File, must be saved in binary format with the .BIN file extension.**

In the case of the 1994 – 95 LT1 FLASH PCM's supported by the \$EE ECM Definition File, the program will also accept .lt1 format files.

Opening A Calibration File

To open an ECM Calibration file select 'Open File' from the *File* menu or click on the Open File  button on the tool bar at the top of the screen.

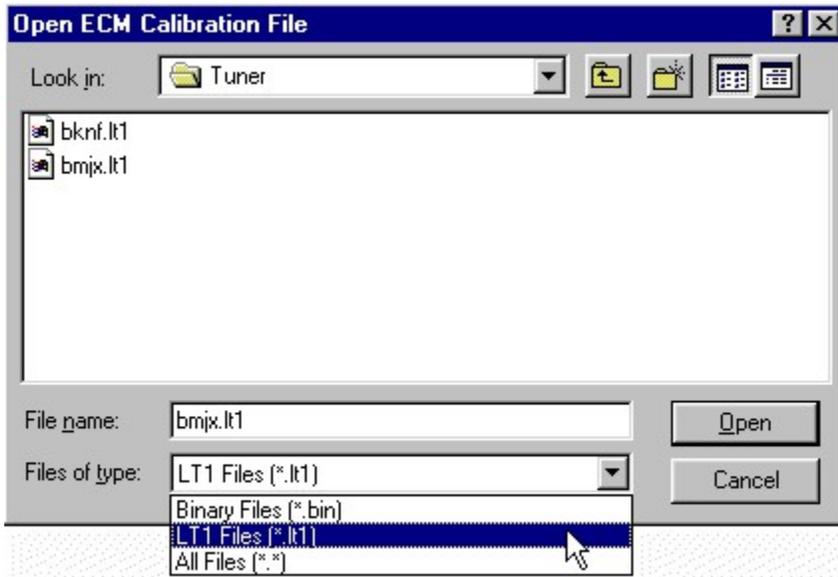


This will display the 'Open File' dialog box. Select the desired file and click the 'OK' button.

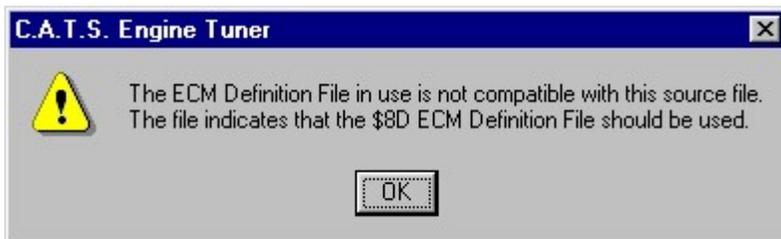


If you are using the \$EE ECM Definition File, the Tuner program can also open .lt1 format files.

To open an .lt1 format file, click on the drop-down arrow to the right of the 'Files of type' box and select lt1 Files (*.lt1) from the drop-down list.

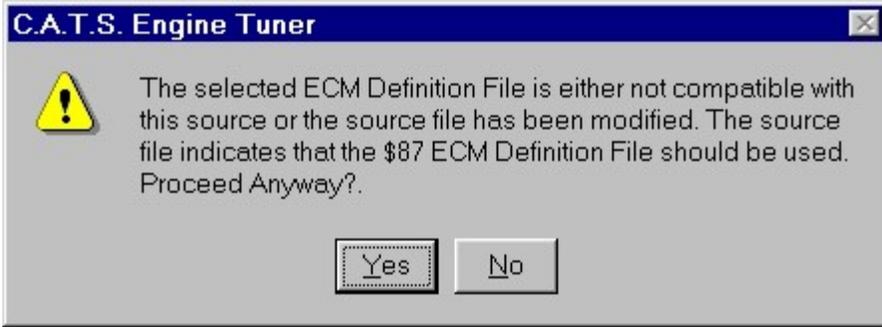


When you select a calibration file, the program will verify that it is a valid calibration file and that the correct ECM Definition File has been selected. If the incorrect configuration file has been selected, the following error message will be displayed. If possible, the program will indicate which ECM Definition File is required for the selected calibration.



To open the selected calibration file, note which definition file is indicated and click the 'OK' button. Click on the 'ECM' drop-down menu and select the correct ECM Definition File (if installed) and then re-open the desired calibration file.

It is relatively common for custom chip manufacturers to change the Program ID when they create a new calibration. This will make the Tuner program think it should use a different ECM Definition File. If the calibration file is the correct length but a different ECM Definition File is indicated, you will receive the following message when you try to open the calibration file:

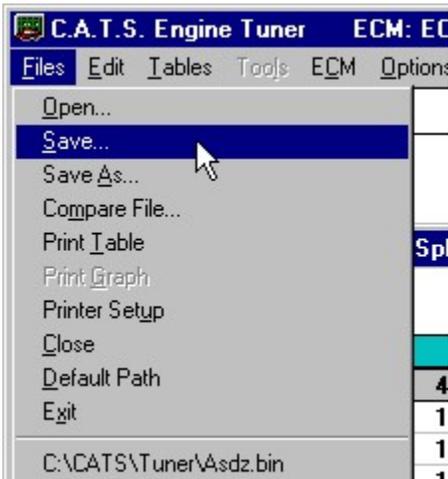


If you believe that you have selected the correct ECM Definition File, you can click on the 'Yes' button to continue and the Tuner program will open the selected calibration file.

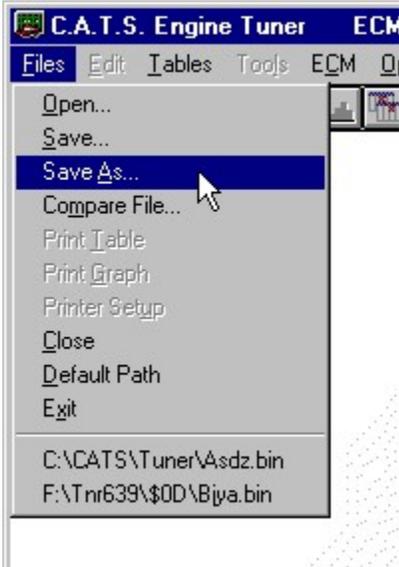
Note: There are a few ECM Calibrations Files that the program can not distinguish between such as the \$32 and the \$32B or the \$DA2 and \$DA3 definition files). In these cases, the program will indicate \$32 or \$DA as the correct ECM Definition File and the user will have to make the final decision.

Saving A Calibration File

To save an ECM Calibration file after editing back to the same file name, select *Save* from the *File* menu or click on the save file button  on the tool bar at the top of the screen.



To save the edited calibration file to a different file, select 'Save As' from the 'File' menu.

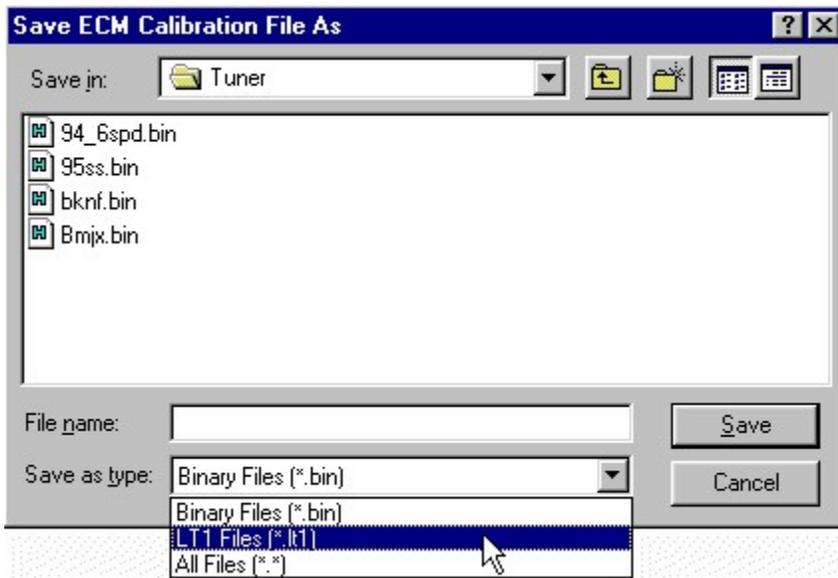


This will display the 'Save As' dialog box. Select another file or type in a new file name and click the 'Save' button.



If you are using the \$EE ECM Definition File, you can also save the edited file in .lt1 format instead of binary.

To save the file in .lt1 format, click on the drop-down arrow to the right of the 'Files of type' box and select lt1 Files (*.lt1) from the drop-down list. Type in a file name and click 'Save'.



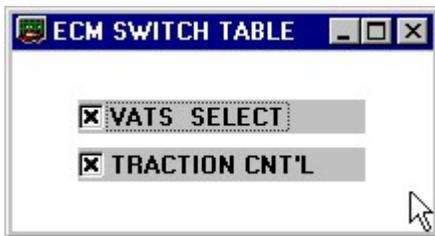
Before saving the ECM calibration file, the program recalculates the necessary checksums and builds a valid ECM calibration file that can be used to program an EPROM for the ECM.

Calibration Tables

The C.A.T.S. Tuner program uses three different formats of calibration tables to display the various ECM calibration values.

Switch Type Calibration Table

The switch type calibration table will contain all the calibration items that can only have two values or states such as on or off, or Enabled or Disabled. This type of table will contain calibration items such as V.A.T.S. enabled/disabled.

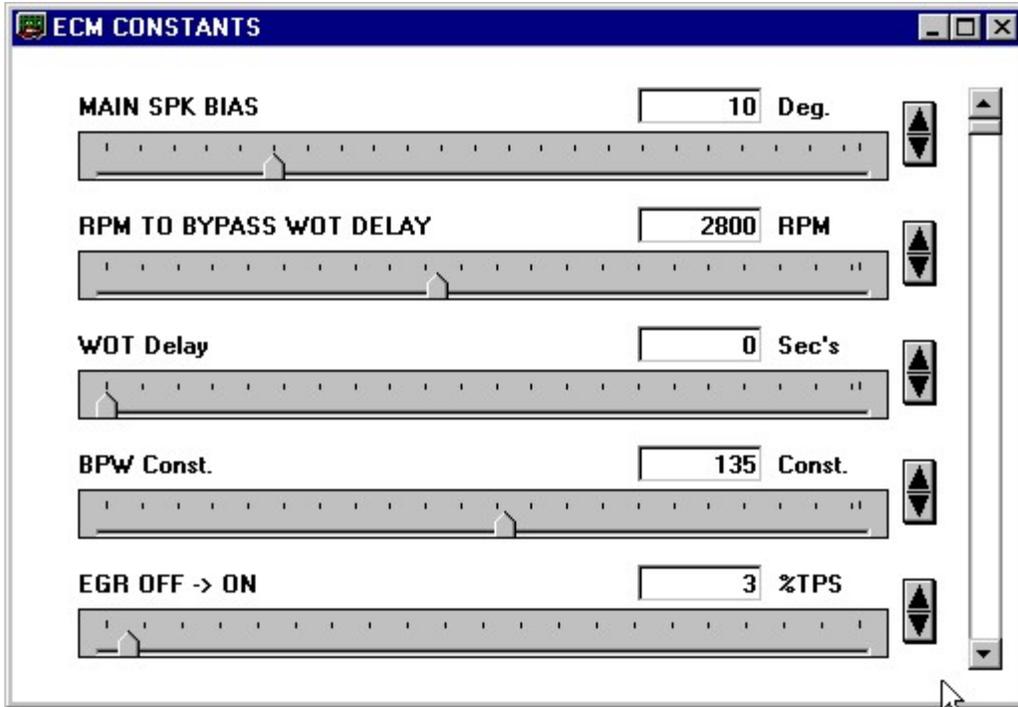


Each ECM calibration file will only have one Switch table that will contain all the appropriate calibration values.

Note: Some ECMs do not have any switch type calibration values in which case the Switch Table will be empty.

Constant Type Calibration Table

The Constant Table is used to present calibration values that represent single values or calibration constants such as fuel cutoff RPM or injector flow rates.



Like the Switch table, each ECM calibration file will contain one Constants Table that will contain all the constants for that ECM.

2D and 3D Calibration Tables

The majority of the ECM Calibration Tables will be either 2D or 3D tables. These tables are used to display a series of values that depend on one (2D tables) or 2 other parameters (3D tables).

An example of a 2D table might be the Target Idle RPM versus Coolant Temperature.

Deg c	RPM
55	600
65	600
75	575
85	525
95	525
100	525
115	575
120	625
135	650

A good example of a common 3D table would be the Main Spark Advance versus RPM versus Manifold

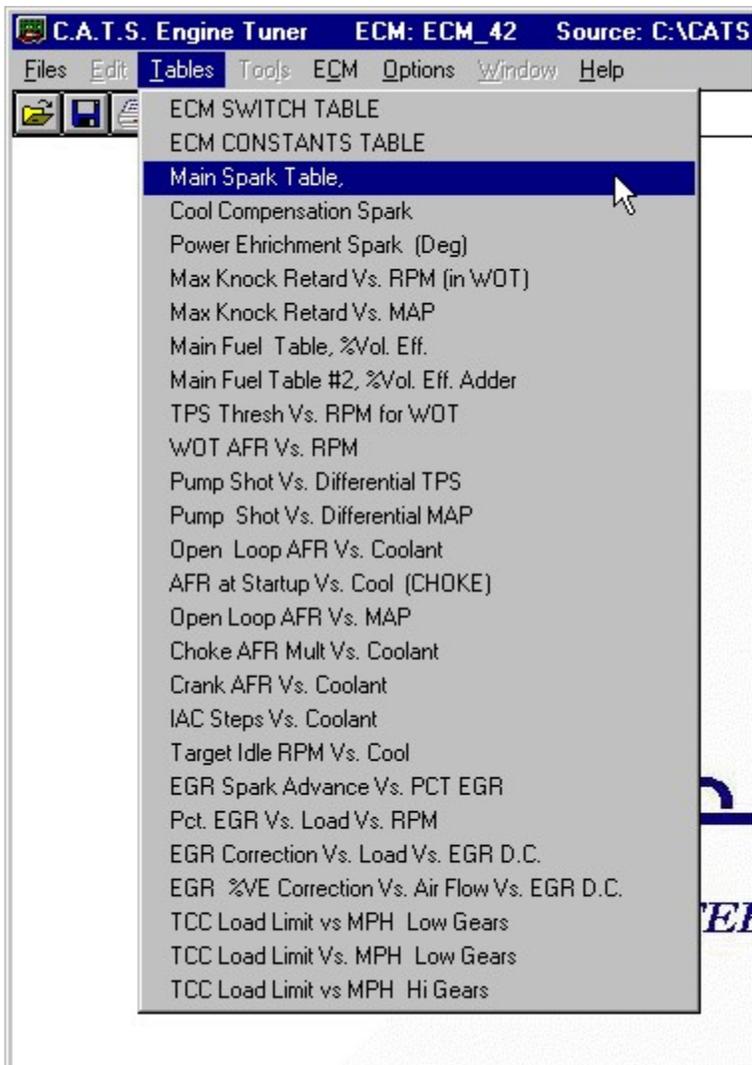
Pressure.

RPM	KPA MAP														
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
400	16	16	16	16	16	14	12	9	6	4	2	0	-2	-3	-4
600	16	16	16	16	16	14	12	9	6	4	2	0	0	0	0
800	16	16	16	16	16	14	12	9	7	4	2	1	0	0	0
1000	19	18	18	18	16	14	12	9	7	4	2	1	0	-1	-1
1200	21	20	16	15	14	12	10	10	9	7	5	5	4	2	2
1400	23	21	17	16	14	12	10	12	11	8	7	7	5	3	3
1600	24	22	18	17	15	13	11	14	14	11	10	9	7	5	4
1800	25	23	21	19	17	16	14	14	12	12	10	10	9	7	6
2000	26	24	22	20	18	17	16	14	14	13	10	10	9	6	5
2200	26	24	22	20	18	17	16	14	14	14	11	11	9	8	7
2400	27	25	23	21	19	18	17	16	16	16	16	12	9	8	8
2800	28	26	24	22	20	19	18	17	16	15	14	14	12	9	9
3200	28	26	25	23	21	20	20	20	20	20	19	13	12	10	10
3600	29	27	26	24	23	22	22	22	22	22	16	15	13	13	13

Opening A Calibration Table

Once an ECM Calibration File has been opened, you can view a calibration table by clicking on the *Tables* menu and then selecting the desired table from the drop-down list.

This list will contain all the tables available for the selected ECM Definition File.



To make the calibration tables easy to understand and more convenient to edit, the C.A.T.S. Tuner program displays all table values in correct engineering units rather than the binary values actually stored in the calibration file.

You may view as many tables at once as you want. To view another table, simply select it from the drop-down list. To close a table, click on the window close box (X) in the upper right hand corner of the table.

Note: You will **NOT** lose any changes that have been made to a table by closing it.

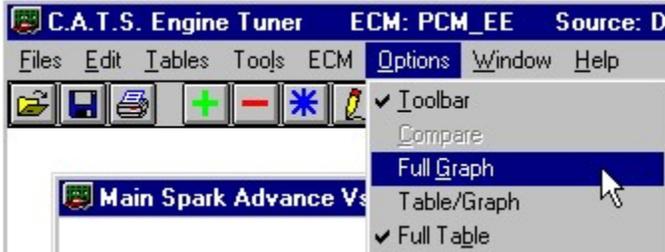
The displayed table can be sized in height or width by clicking on an edge and dragging it to the desired size. Use the 'Windows' menu to arrange the tables you have open.

Viewing Calibration Table Graphs

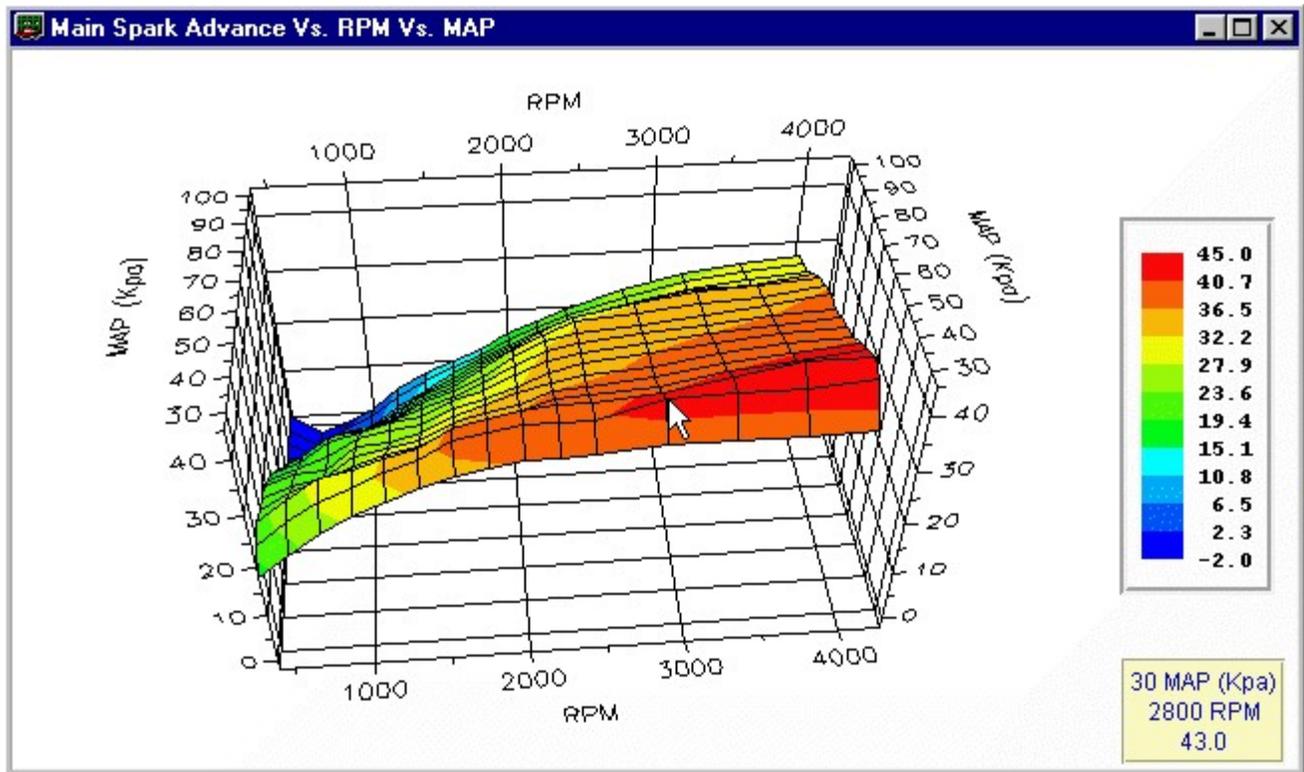
In addition to viewing the 2D or 3D ECM tables in tabular form, each table can be displayed graphically

(This feature is not active for the Switches and Constants tables). Two-dimensional tables are graphed using two-dimensional graphs and three-dimensional tables use three-dimensional graphs. The graph can be viewed by itself or along with the table.

To view a table graphically, open the desired table and click on the '*Graph Only*'  button on the toolbar. Alternately you can select '*Full Graph*' from the '*Options*' menu.



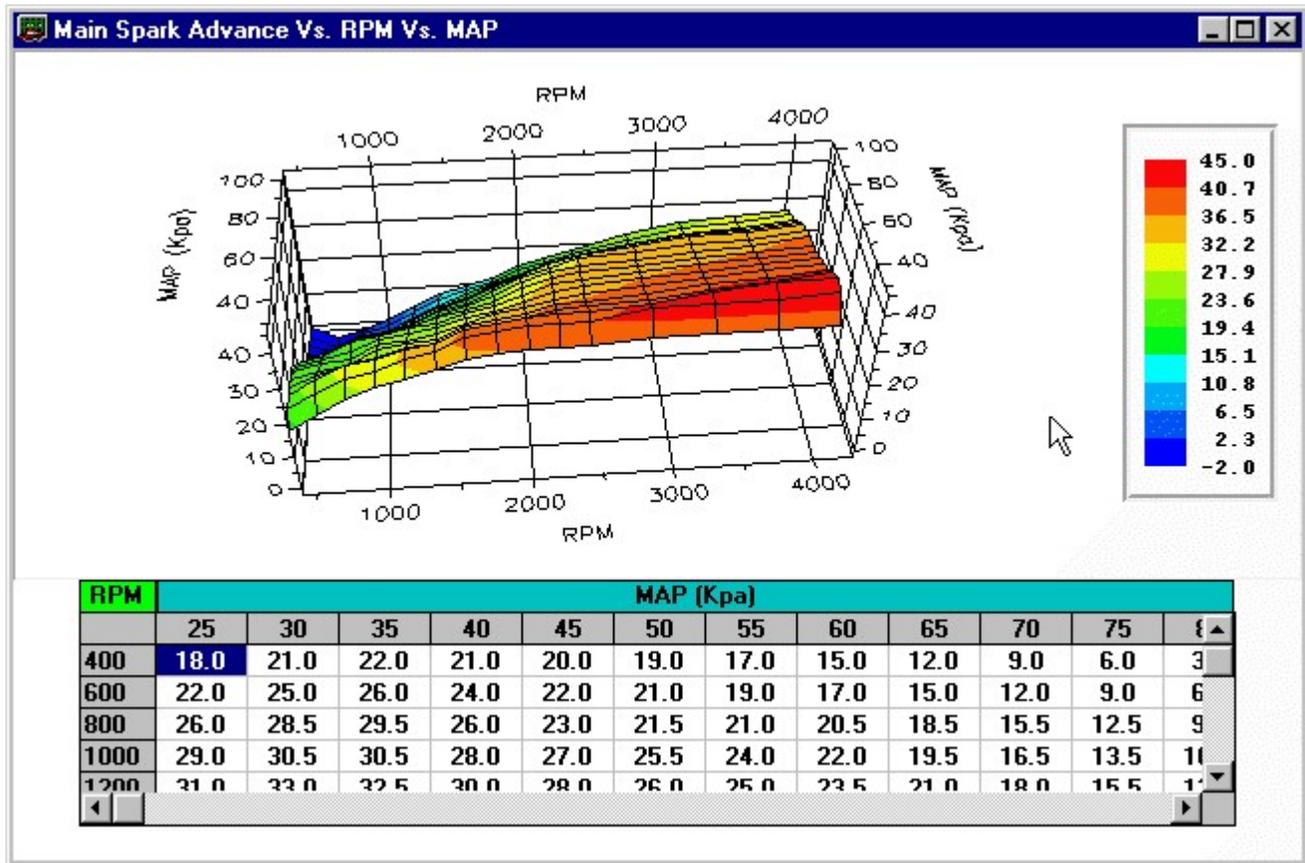
This will display the table as a graph as shown below.



Note the data box in the lower right corner of the screen. This box shows the information about the data point at the cursor position on the graph and is updated continuously as you move the cursor over the graph.

To view the graph and the table at the same time, click on the '*Graph and Table*' button  or select '*Table/Graph*' from the '*Options*' menu.

This will display a graph of the table above the numerical table. The graph will be sized to fit into the current table window. To make the graph larger, increase the size of the table window.



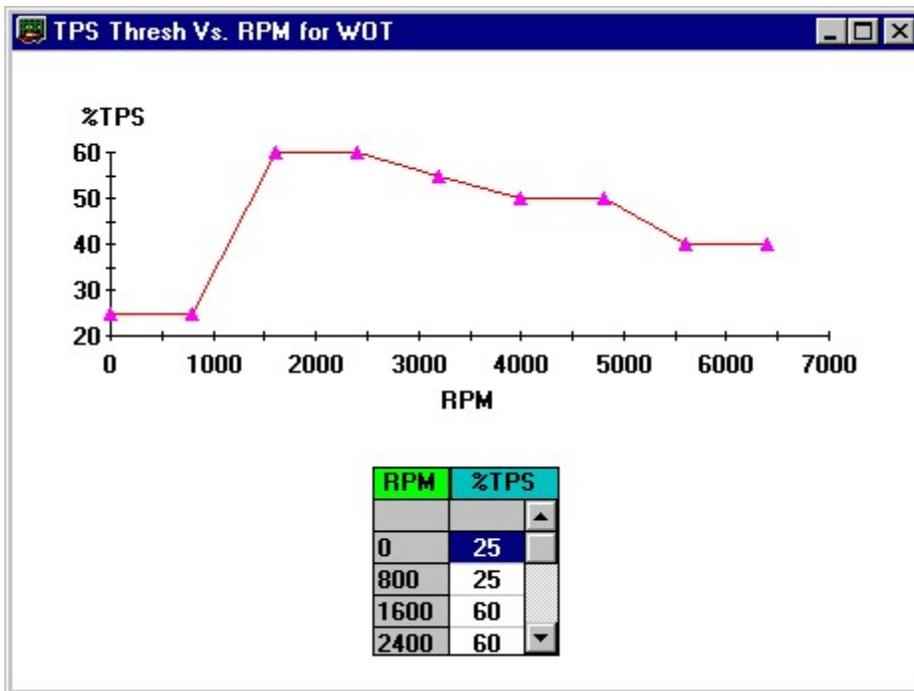
You can change a table value from the graph by clicking on the data point you want to change and dragging the point while holding down the left mouse button.

You can change the view of the graph by rotating, moving, zooming or scaling the graph with the keyboard and you mouse. See the [Changing 3D Graph Views](#) and [Changing 2D Graph Views](#) sections for details.

To return to the table only view, click the 'Table Only'  button or select 'Full Table' from the 'Options' menu.

Changing 2D Graph Views

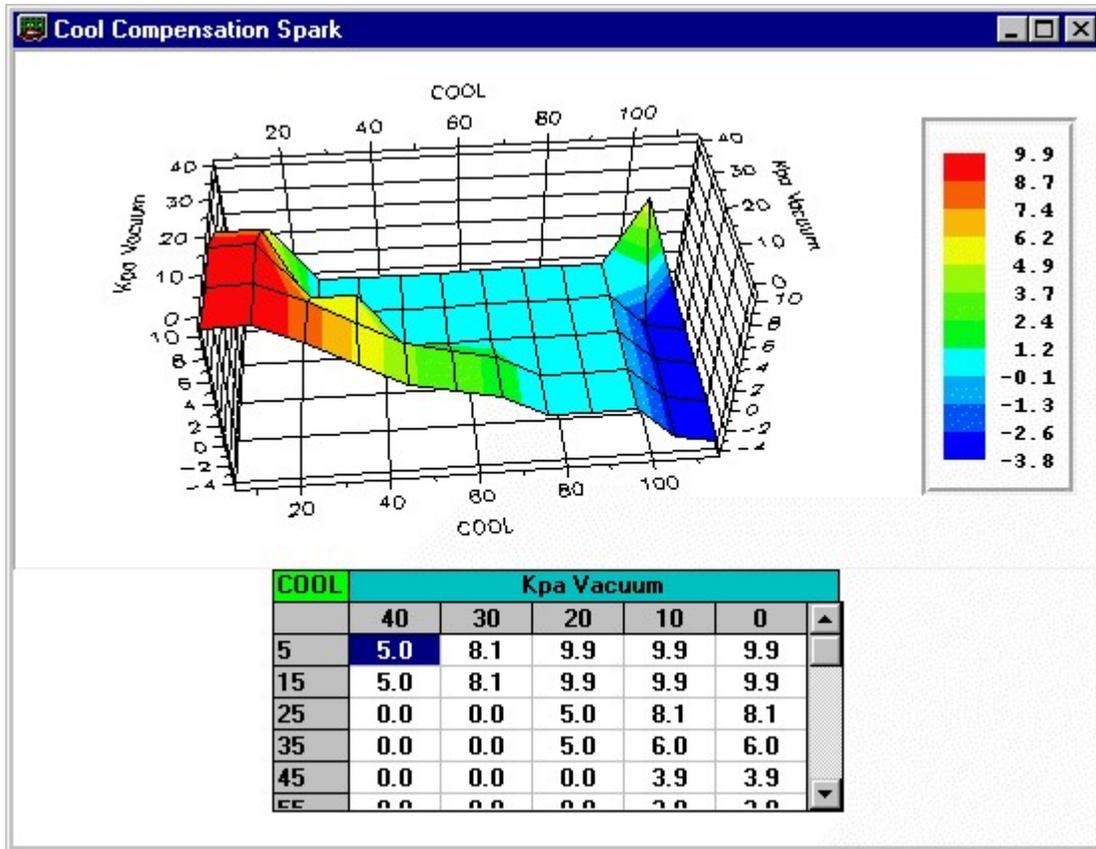
The view of the 2D graph can be changed to make it easier to view the table data points by using keyboard and mouse commands. The following commands are available for 2D graphs:



Zoom Graph Window To zoom in on a particular area of the graph, hold down the Control key and the left mouse button and drag the mouse over the area to zoom. Press the R to return to the original zoom level. **Move Graph** To move the entire graph within the table window, hold down the Shift key and the right mouse button and drag the graph in the desired direction. **Scale Graph** To scale the entire graph, hold down the Alt key and the left mouse button and drag the mouse up to make the graph bigger or down to make the graph smaller.

Changing 3D Graph Views

The view of the 3D graph can be changed to make it easier to view the table data points by using keyboard and mouse commands. The following commands are available for 3D graphs:



Rotate Graph To rotate a 3D graph, hold down the Shift key and the left mouse button and drag the mouse to rotate the graph. Moving the mouse up and down rotates the graph about the x axis; moving the mouse left and right rotates the graph about the z axis; and moving the mouse diagonally rotates the graph about the y axis.

Rotating the graph will allow you to view and edit points that would otherwise not be visible.

Zoom Graph Window To zoom in on a particular area of the graph, hold down the Control key and the left mouse button and drag the mouse over the area to zoom. Press the R key to return to the original zoom level. **Move Graph** To move the entire graph within the table window, hold down the Shift key and the right mouse button and drag the graph in the desired direction. **Scale Graph** To scale the entire graph, hold down the Alt key and the left mouse button and drag the mouse to make the graph bigger or down to make the graph smaller.

Editing Calibration Values

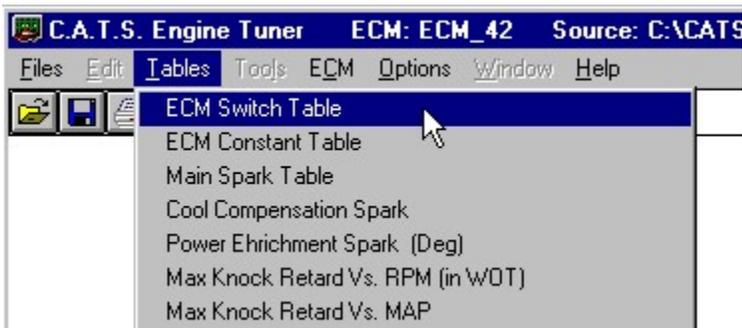
The main function of the C.A.T.S. Tuner program is to allow you to easily edit the calibration values in an ECM calibration file. There are a variety of tools provided for editing depending on whether you're editing a Switch Table, a Constants Table or a 2D or 3D Table. To begin editing a table, select the

desired table from the 'Tables' menu.

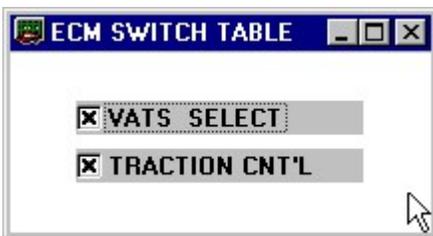


Editing Switch Type Calibration Table Values

To edit Switch calibration values, open the Switches table.



By definition, Switch values can be either On (enabled) or Off (disabled). To change the state of a Switch value, click on the box to the left of the switch label.

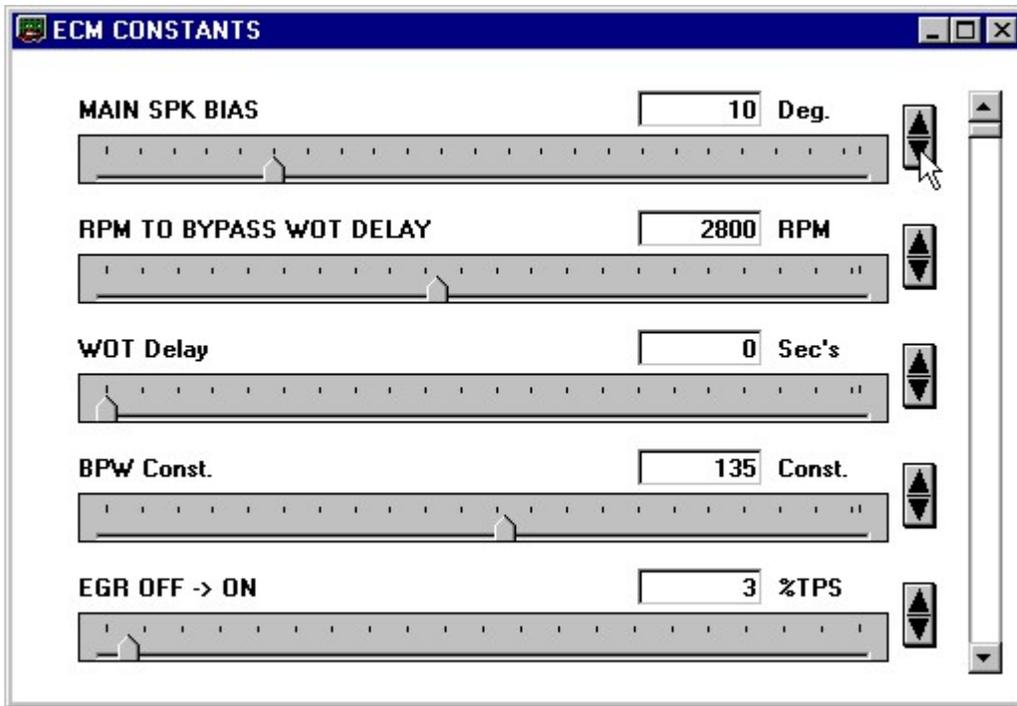


If there is an X in this box, then the corresponding Switch is enabled. If the box is empty, then the Switch is disabled.

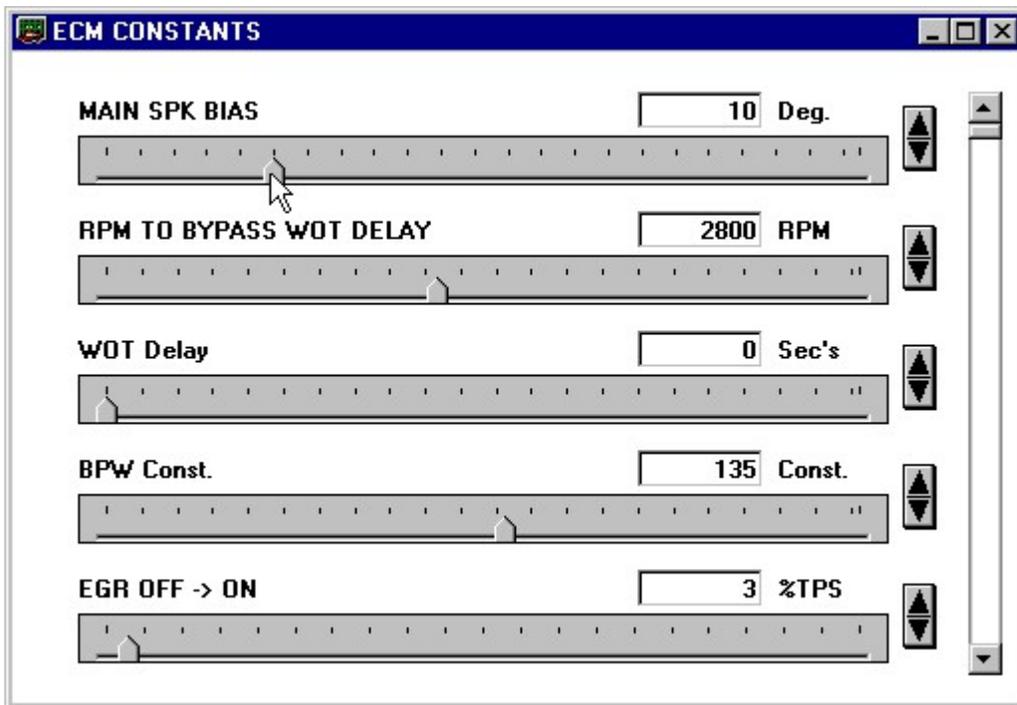
Editing Constant Type Calibration Table Values

After opening the Constants Table, there are three ways you can change the values of the Constants.

To make small changes, you can click on the up/down arrows to the right of the Constant name. Each time you click the up arrow the Constant value will be incremented by one edit step. Clicking the down arrow will decrement the value by one edit step.



To make larger changes, click on the slide control below the Constant name and drag the slide control up or down. The value will change as you drag the slide. Stop when you reach the desired value.



You can also simply click on the value box and type in a new value. While you can type in any value, the program will convert the value you typed in to the nearest valid value for this constant.

There are minimum and maximum allowable values for each Constant. When using the slide control or

the up/down arrows, the program will prevent you from exceeding these limits. If you type in a number less than the allowable minimum, you will receive the following error message:



To use the minimum allowable value, click OK . Click Cancel to return to the previous value. Similarly, if you type in a value greater than the allowable maximum, you will receive an error message that will ask you if you would like to use the maximum allowable value.

Selecting 2D and 3D Table Cells

To edit values in the tables, you must first select the cell or cells containing the values to be changed. To select a single table cell, simply click on the desired cell with the left mouse button.

To select a range of cells, click on the first cell with the left mouse button and drag the mouse while holding down the left mouse button to highlight the desired range of cells.

RPM	KPA MAP														
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
400	16	16	16	16	16	14	12	9	6	4	2	0	-2	-3	-4
600	16	16	16	16	16	14	12	9	6	4	2	0	0	0	0
800	16	16	16	16	16	14	12	9	7	4	2	1	0	0	0
1000	19	18	18	18	16	14	12	9	7	4	2	1	0	-1	-1
1200	21	20	16	15	14	12	10	10	9	7	5	5	4	2	2
1400	23	21	17	16	14	12	10	12	11	8	7	7	5	3	3
1600	24	22	18	17	15	13	11	14	14	11	10	9	7	5	4
1800	25	23	21	19	17	16	14	14	12	12	10	10	9	7	6
2000	26	24	22	20	18	17	16	14	14	13	10	10	9	6	5
2200	26	24	22	20	18	17	16	14	14	14	11	11	9	8	7
2400	27	25	23	21	19	18	17	16	16	16	16	12	9	8	8
2800	28	26	24	22	20	19	18	17	16	15	14	14	12	9	9
3200	28	26	25	23	21	20	20	20	20	20	19	13	12	10	10
3600	29	27	26	24	23	22	22	22	22	22	16	15	13	13	13

To select an entire column, click on the column heading with the left mouse button. The selected column will be highlighted.

Main Spark Table, Deg Spk.															
RPM	KPA MAP														
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
400	16	16	16	16	16	14	12	9	6	4	2	0	-2	-3	-4
600	16	16	16	16	16	14	12	9	6	4	2	0	0	0	0
800	16	16	16	16	16	14	12	9	7	4	2	1	0	0	0
1000	19	18	18	18	16	14	12	9	7	4	2	1	0	-1	-1
1200	21	20	16	15	14	12	10	10	9	7	5	5	4	2	2
1400	23	21	17	16	14	12	10	12	11	8	7	7	5	3	3
1600	24	22	18	17	15	13	11	14	14	11	10	9	7	5	4
1800	25	23	21	19	17	16	14	14	12	12	10	10	9	7	6
2000	26	24	22	20	18	17	16	14	14	13	10	10	9	6	5
2200	26	24	22	20	18	17	16	14	14	14	11	11	9	8	7
2400	27	25	23	21	19	18	17	16	16	16	16	12	9	8	8
2800	28	26	24	22	20	19	18	17	16	15	14	14	12	9	9
3200	28	26	25	23	21	20	20	20	20	20	19	13	12	10	10
3600	29	27	26	24	23	22	22	22	22	22	16	15	13	13	13

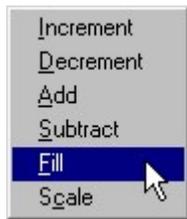
To select an entire row, click on the row header. This will highlight the selected row.

Main Spark Table, Deg Spk.															
RPM	KPA MAP														
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
400	16	16	16	16	16	14	12	9	6	4	2	0	-2	-3	-4
600	16	16	16	16	16	14	12	9	6	4	2	0	0	0	0
800	16	16	16	16	16	14	12	9	7	4	2	1	0	0	0
1000	19	18	18	18	16	14	12	9	7	4	2	1	0	-1	-1
1200	21	20	16	15	14	12	10	10	9	7	5	5	4	2	2
1400	23	21	17	16	14	12	10	12	11	8	7	7	5	3	3
1600	24	22	18	17	15	13	11	14	14	11	10	9	7	5	4
1800	25	23	21	19	17	16	14	14	12	12	10	10	9	7	6
2000	26	24	22	20	18	17	16	14	14	13	10	10	9	6	5
2200	26	24	22	20	18	17	16	14	14	14	11	11	9	8	7
2400	27	25	23	21	19	18	17	16	16	16	16	12	9	8	8
2800	28	26	24	22	20	19	18	17	16	15	14	14	12	9	9
3200	28	26	25	23	21	20	20	20	20	20	19	13	12	10	10
3600	29	27	26	24	23	22	22	22	22	22	16	15	13	13	13

Editing 2D and 3D Table Values

Once one or more table cells are selected, there are several ways to change the values in these cells. You can increment, decrement, add subtract, scale (multiply) or fill the selected cells.

If the table graph is displayed you can also drag the points on the graph to change the table values.



All the edit functions are available by clicking on the *'Edit'* menu or by right-clicking on the selected cells.

Increment/Decrement

You can increment or decrement the values in the selected cells by a predefined edit step size. In addition to selecting *'Increment'* or *'Decrement'* from the *'Edit'* menu you can also click on the , , buttons on the toolbar or you can use the keyboard '+' and '-' keys.

Add

Selecting *'Add'* from the *'Edit'* menu displays the *'Add Value'* screen which allows you to enter a value that will be added to the values in the selected cells.

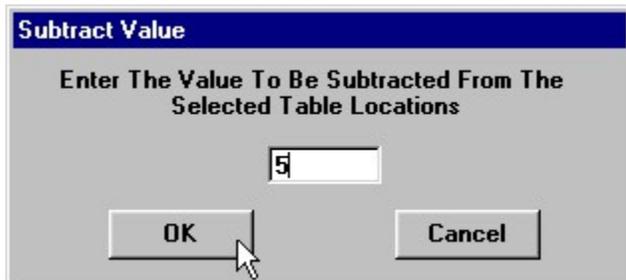
Click *'OK'* to add the value or *'Cancel'* to keep the original cell values.



Subtract

Selecting *'Subtract'* from the *'Edit'* menu displays the *'Subtract Value'* screen which allows you to enter a value that will be subtracted from the values in the selected cells.

Click *'OK'* to subtract the value or *'Cancel'* to keep the original cell values.



Fill

Selecting '*Fill*' from the '*Edit*' menu or clicking on the 'Fill button'  on the toolbar displays the 'Fill With Value' screen which allows you to enter a value that will be used to fill all the selected cells.

Click 'OK' to use the new values or 'Cancel' to keep the original cell values.

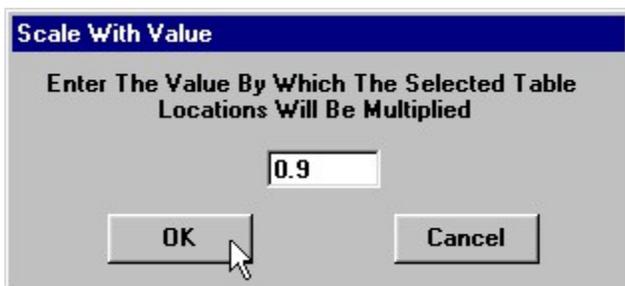


To quickly enter a value into a single cell, double click on the cell. This will display the 'Fill With Value' screen.

Scale

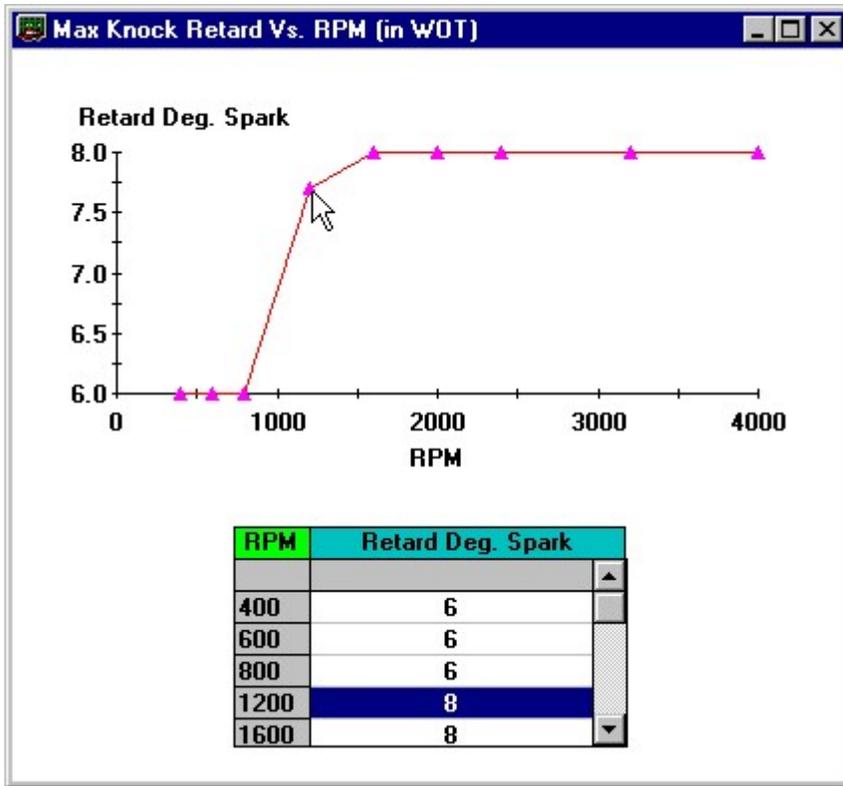
Selecting '*Scale*' from the '*Edit*' menu or clicking on the 'Scale button'  on the toolbar displays the 'Scale Value' screen which allows you to enter a value by which all the selected cells will be multiplied.

Click 'OK' to multiply the values or 'Cancel' to keep the original cell values.



Drag Graph Points

If the table graph is being displayed, table values can be changed by clicking on a point on the graph and dragging the point up and down. The corresponding value in the table will change as you drag the point on the graph.



While you can type in, fill, add or subtract or multiply by any value, the program will convert the resulting value to the nearest valid value for this table.

There are minimum and maximum allowable values for each table. When using the increment/decrement buttons or when dragging a point on the graph, the program will prevent you from exceeding these limits. By entering a value directly, or using the fill, add, subtract or scale functions, the resulting values may be outside the allowable range. If any of the resulting values are less than the allowable minimum, you will receive the following error message:



To use the minimum allowable value, click OK .
Click Cancel to return to the previous value(s).

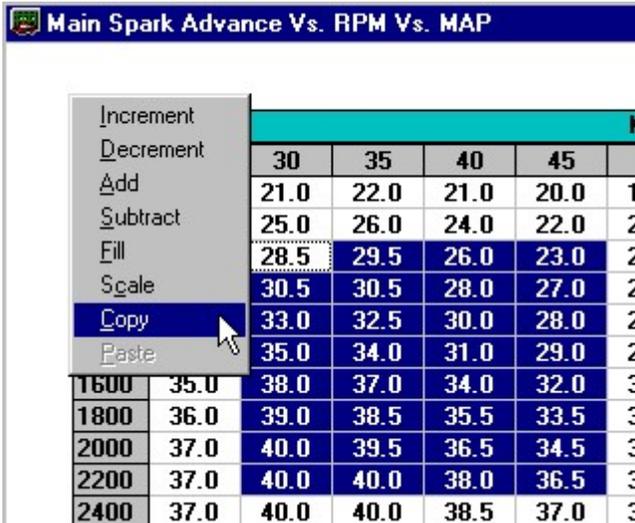
Similarly, if any of the resulting values are greater than the allowable maximum, you will receive a similar error message that will ask you if you would like to use the maximum allowable value(s).

Copy and Paste Table Values

Using the copy and paste function you can copy table values from 2D and 3D tables and paste these values into another portion of the same table, into a different table or even into the table from another calibration file. You can also copy and paste tables values to and from other Windows programs that

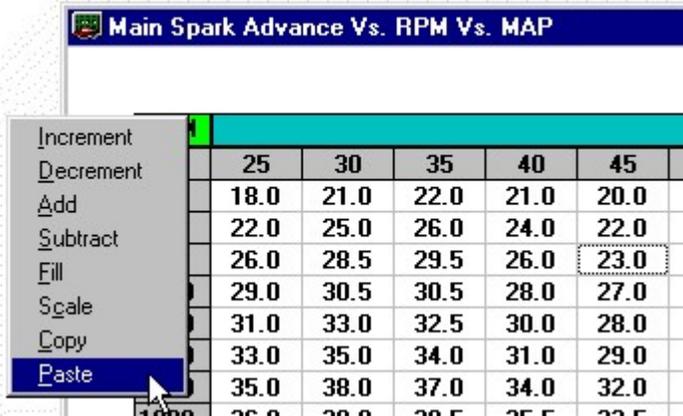
support the standard Windows clipboard function such as Microsoft Excel and Word.

To copy table values, select the values from the source table and then select 'Copy' from the 'Edit' menu or right click on the selected values and select 'Copy' from the popup menu. You can also use the Copy button  on the toolbar or you can use the standard 'ctrl-c' Windows shortcut.



		30	35	40	45	
	Increment					
	Decrement					
	Add	21.0	22.0	21.0	20.0	1
	Subtract	25.0	26.0	24.0	22.0	2
	Fill	28.5	29.5	26.0	23.0	2
	Scale	30.5	30.5	28.0	27.0	2
	Copy	33.0	32.5	30.0	28.0	2
	Paste	35.0	34.0	31.0	29.0	2
1600	35.0	38.0	37.0	34.0	32.0	3
1800	36.0	39.0	38.5	35.5	33.5	3
2000	37.0	40.0	39.5	36.5	34.5	3
2200	37.0	40.0	40.0	38.0	36.5	3
2400	37.0	40.0	40.0	38.5	37.0	3

To now paste these values into the another table, right click on the first cell of the paste area (cell in the new table that corresponds to the top, leftmost cell of the source selection) and select 'Paste' from the popup menu (or click on the target cell and select 'Paste' from from the 'Edit' menu. You can also click on the Paste button  on the toolbar or use the standard 'ctrl-v' Windows shortcut.



		25	30	35	40	45
	Increment					
	Decrement					
	Add	18.0	21.0	22.0	21.0	20.0
	Subtract	22.0	25.0	26.0	24.0	22.0
	Fill	26.0	28.5	29.5	26.0	23.0
	Scale	29.0	30.5	30.5	28.0	27.0
	Copy	31.0	33.0	32.5	30.0	28.0
	Paste	33.0	35.0	34.0	31.0	29.0
		35.0	38.0	37.0	34.0	32.0

This will paste the values from the source table into the target table or target application.

Note: If you highlight an area in the target table (not just the first cell), then you must highlight an area that is the same size and shape as the area selected from the source table. If the source and target areas do not match, you will receive the following error message:

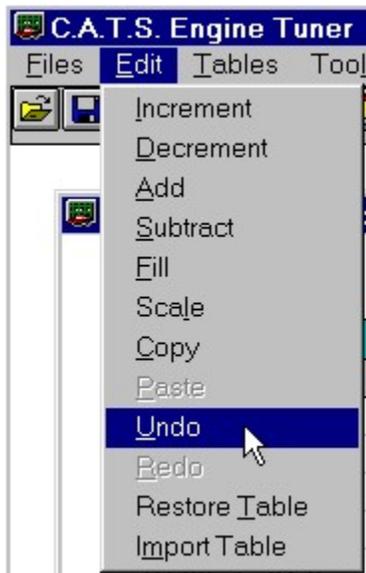


Similarly, if you select a start cell in the target table that does not allow the same number of cells to the left of and down from the start cell (ie. target table not big enough), you will receive this same error message.

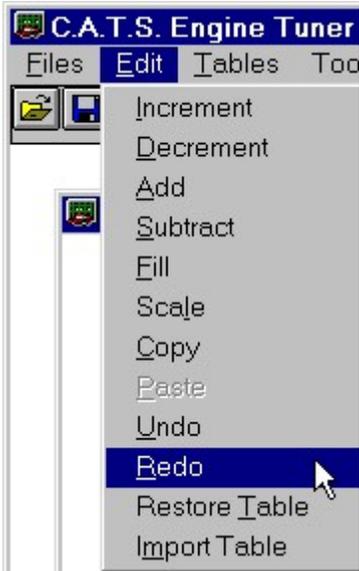
Undo / Redo Functions

Regardless of the type of table being editing, the Tuner program provides 'Undo' and 'Redo' functions. The 'Undo' function will reverse the changes made by the last edit. You can undo up to ten changes. If you undo a change and then decide you really wanted to use that change, you can use the 'Redo' function to re-apply the last change that was reversed using Undo.

To undo the last change, click on the Undo button  or select 'Undo' from the 'Edit' menu.

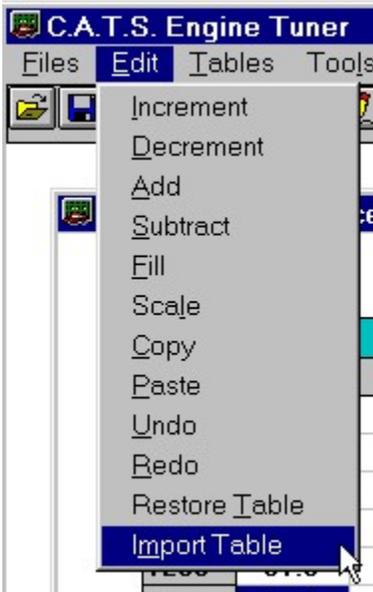


Similarly, to redo a change, click on the Redo button  or select 'Redo' from the 'Edit' menu.

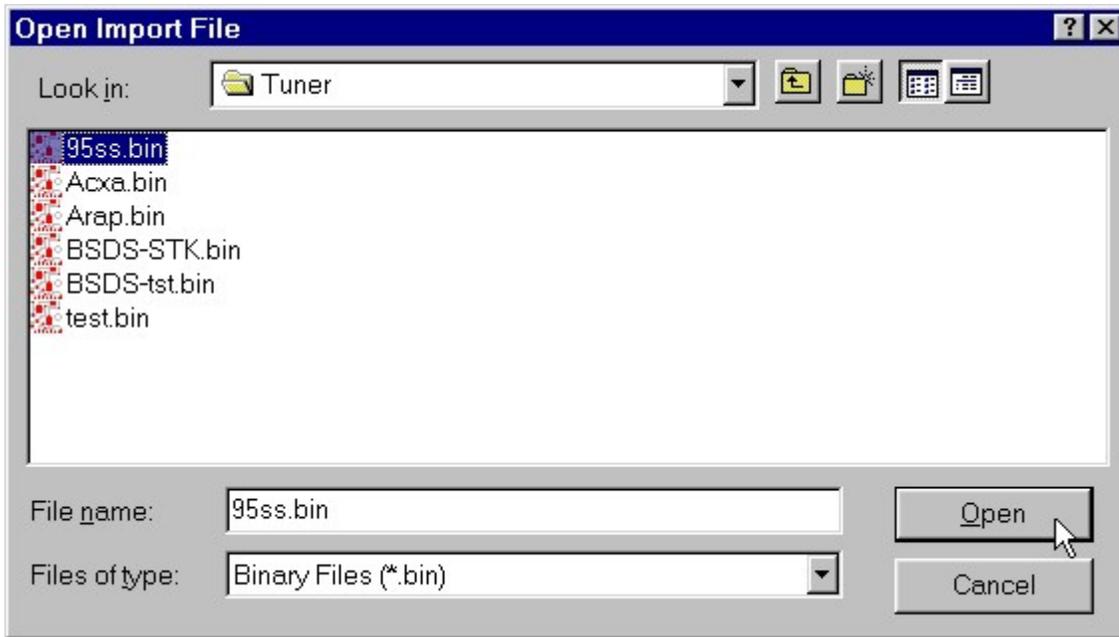


Importing Table Values

The import function allows you to import the table values from another calibration file of the same type. To import table values, select '*Import*' from the '*Edit*' menu.



This will display a standard file open dialog box. Select the desired calibration file from the dialog box and click on the '*Open*' button.



The table values will then be read from the selected calibration file and inserted into the active table. Only the active table is changed. No other tables, open or not are altered.

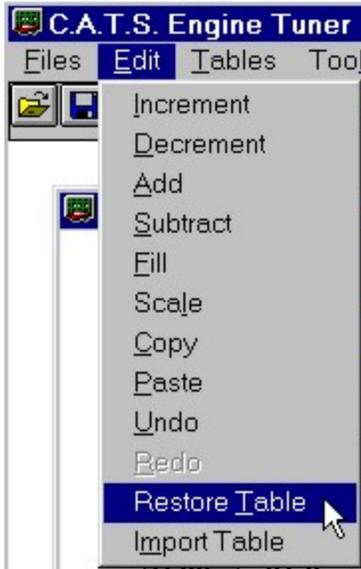
You can not import values from a calibration file of a different type. If you open a different type calibration file by mistake, you will receive the following error message.



Restore Table Values

If you make several changes to table values and decide that you do not want to keep any of these changes, you can restore the table values to the last saved values using the Restore Table function.

To restore the values in a table, select '*Restore Table*' from the '*Edit*' menu.



This will restore the tables values to the values that were in the table when you last saved the calibration file to disk. Only the active table is affected.

Calibration Tools

The 'Tools' menu provides several useful calibration utilities that are active when you are using the \$EE ECM Definition File.

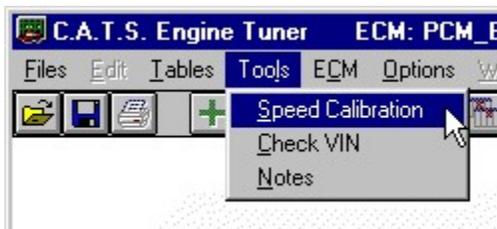
The following utilities are accessed from this menu:

- Speedometer Calibration
- VIN Information
- Calibration Notes
- Read PCM
- Program PCM

Note: The 'Tools' menu will be inactive when you are using any other ECM Definition File.

Speed Calibration

The Tuner program includes a speed calibration utility that can help you calculate the calibration parameters that determine the speed calibration. These calibration parameters need to be changed if you change the rear-end ratio or tire size. To access this utility, select '*Speed Calibration*' from the 'Tools' menu.



The Speedometer Calibration screen will then be displayed.

Speedometer Calibration

Tire Information

Tire Size

Revolutions/Mile

Speed Sensor Information

Stock Speed Sensor

Pulses Per Driveshaft Rev.

Car Type

Y - Car

F or B - Car

Transmission Type

Automatic

Manual

Gear Information

Rear End Ratio: :1

New Calibration Values

Speedometer Scaler:

Speedometer Scaler Fraction:

Speedometer Scaler Scantool:

Time Between Pulses for Stop:

Pulses Per Driveshaft Rev:

Current Calibration Values

Speedometer Scaler:

Speedometer Scaler Fraction:

Speedometer Scaler Scantool:

Time Between Pulses For Stop:

Pulses Per Driveshaft Rev:

There are two ways to calculate the speed calibration parameters; by tire size or by the number of revolutions per mile of the tire. The most accurate way is to determine the actual revs per mile for your vehicle but you can enter the tire size and the program will calculate an approximate revs per mile.

To use tire size, click on the 'Tire Size' option button and enter the tire size in the boxes provided. To use revolutions per mile, click on this option button and enter the appropriate revs per mile.

To properly calculate the vehicle speed, the PCM also needs to know how many pulses per revolution of the driveshaft are generated by the speed sensor. If you are using the original transmission, click on the 'Stock Speed Sensor' option button in the Speed Sensor Information Box' and then select the appropriate 'Car Type' and 'Transmission Type'. The Tuner program will then insert the correct value of pulses per revolution.

If you are using a non-standard transmission, then you will have to enter in the correct number of pulses per driveshaft revolution for the speed sensor that is being used. To enter in this value directly click on the 'Pulses Per Driveshaft Rev.' option button. This will disable the 'Stock Speed Sensor', 'Car Type' and 'Transmission Type' option buttons and enable the 'Pulses Per Driveshaft Rev.' text box. Enter in the correct value of pulses per revolution for your speed sensor.

Finally enter in your rear end ratio.

To calculate the new speed calibration parameters, click on the 'Calculate' button. The 'New Calibration Values' box will now display the speed calibration parameters. The 'Current Calibration Values' box displays the current calibration parameters stored in the calibration file for comparison.

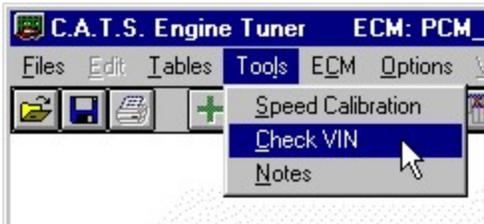
When you are satisfied with the new values, click on the '*Apply*' or the '*OK*' buttons to enter these new parameters into the calibration file (just as if you changed them from the Constants Table.) The '*Apply*' button applies the changes but leaves the Speedometer Calibration screen open. Clicking on the '*OK*' button also applies the changes but closes the Speedometer Calibration screen.

Click on the '*Cancel*' button to close the Speedometer Calibration screen without making any changes to the calibration file.

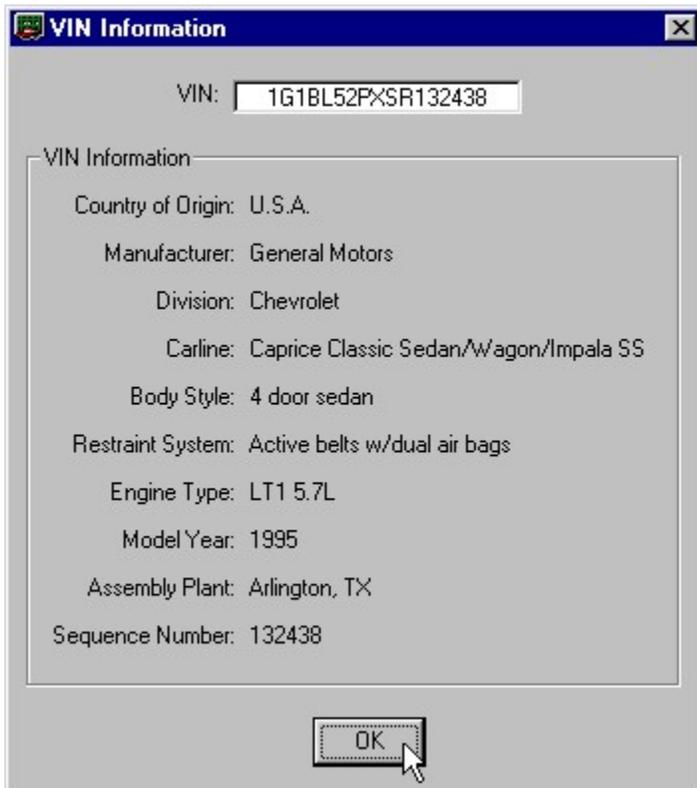
If you use tire size, you should get close to the correct calibration values but you may have to make some corrections after testing. To then fine tune the speedometer calibration further, use revs per mile to make small adjustments.

VIN Information

Type \$EE calibration files contain a copy of the VIN which can be read by the Tuner program. Select 'Check VIN' from the 'Tools' menu to view the VIN from the calibration file.



This will display the VIN information screen which shows the actual VIN number along with all the information that is contained within the VIN.

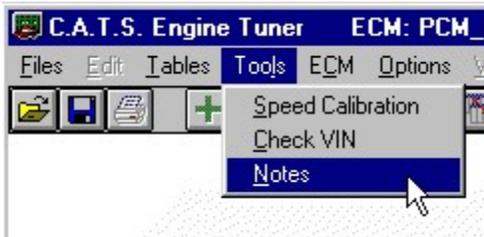


Note: The actual VIN is stored in EEPROM on the microprocessor and cannot be changed by editing the copy that appears in the calibration file from the FLASH memory.

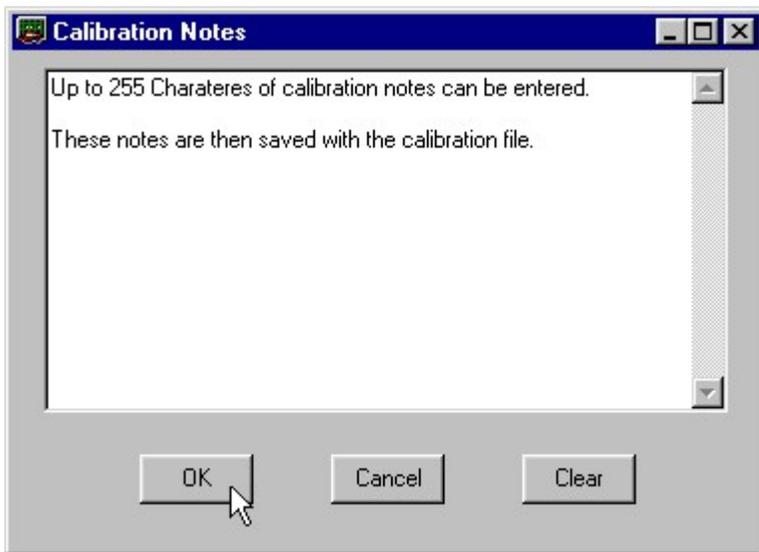
Calibration Notes

If you are working with the \$EE ECM Definition File, you can add calibration notes directly to the calibration file. These notes are stored in an area that is not used by the PCM and have no effect on the calibration. The notes field can contain up to 255 ASCII characters.

To view, edit or add new calibration notes to your calibration file select '*Notes*' from the '*Tools*' menu.



This will display the Notes screen.

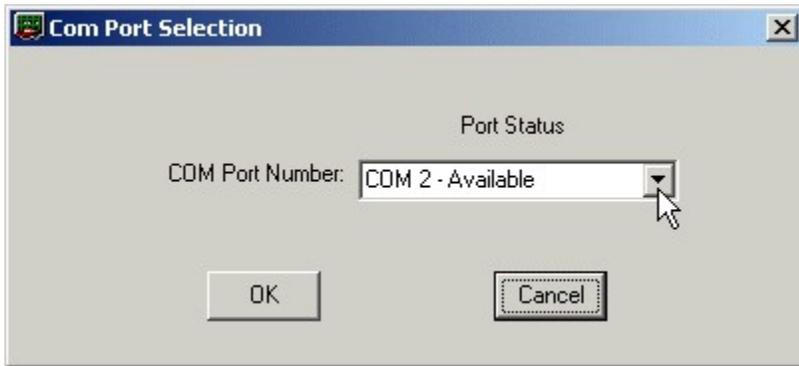


You can type into and edit directly in the Notes box. To completely erase the current notes, click on the '*Clear*' button. When you are finished editing the notes, click on the '*OK*' button to save your changes or the '*Cancel*' button to discard any changes you have made.

Read PCM

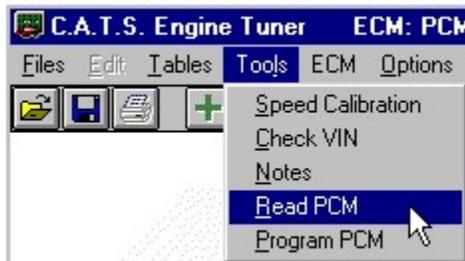
The 1994 – 95 LT1 PCM and the 1994 – 95 L32 and L82 V6 PCM do not use a removable EPROM to store the calibration information like the older GM ECM's. These PCM's use FLASH memory that must be read and reprogrammed using the car's ALDL connector.

Before proceeding be sure you have specified the correct Comm port that you will be using to communicate with the PCM. To set the correct Comm port, select '*Comm Port Setup*' from the '*Options*' menu. This will display the following screen:

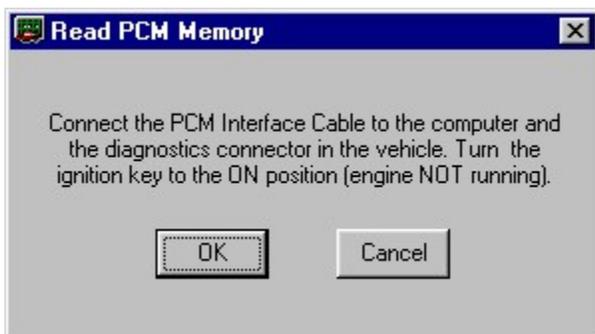


Select the Comm port you wish to use and click '*OK*'. The program will save this selection so you don't have to set the Comm port again unless you want to change to a different port.

To read the calibration currently stored in the PCM, select '*Read PCM*' from the '*Tools*' menu.



This will display the read PCM start screen.



Before proceeding, connect the RS-232 to ALDL converter interface cable to the Comm port on your PC. If your PC has more than one Comm port, make sure you connect the converter to the com port that you specified on the Comm Port Setup screen.

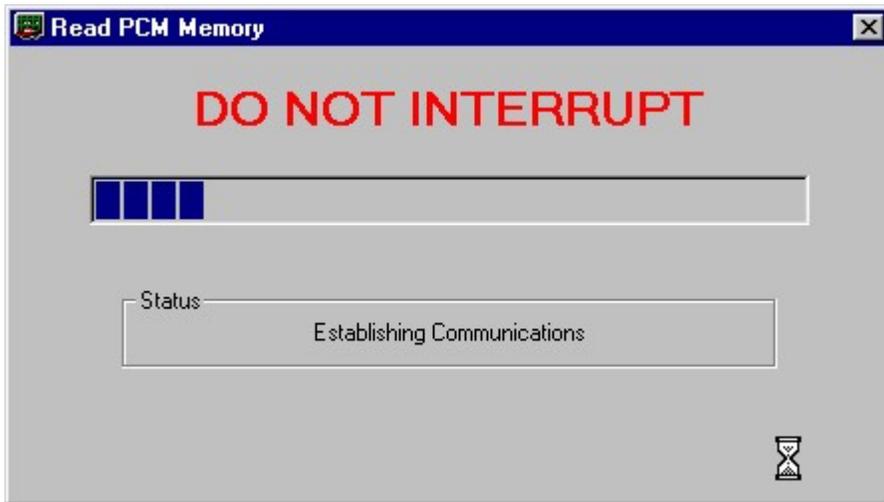
Connect the other end of the converter to the ALDL diagnostics connector on the vehicle.

Once the cable is connected, turn the ignition key on but DO NOT start the engine. After turning on the

ignition, wait about 10 to 15 seconds to clear the GM security delay before proceeding with programming.

Now click on 'OK' to begin the PCM read process. If all the connections have been properly made, the program will begin communicating with the PCM, sending the necessary instructions to start the memory read process.

The following status window will be displayed during the read process:



The progress meter shows the progress on the reading of the PCM as it proceeds and the Status window describes what part of the process is currently underway. Depending on the PC you are using, the programming will usually take about five minutes. If the process does not complete correctly for some reason, an error message will be displayed in the Status window. See Appendix B for a description of the possible error messages.

If the read process gets interrupted before completion, you may have to reset the PCM before it will function correctly. Refer to [Appendix A – Recovering and Resetting the PCM](#) for details.

When the FLASH read process is complete, the message shown below will be displayed:



Click 'OK' to complete the PCM read and close the Read Complete message box.

The calibration from your PCM will now be loaded into the Tuner program and you can now view and edit the calibration parameters as needed.

NOTE: It's a good idea to save a copy of the original stock calibration to your hard disk before making

any changes. This way, you'll have a baseline to return to if necessary. For details see the section on [Saving A Calibration File](#).

Program PCM

The 1994 – 95 LT1 PCM and the 1994 – 95 L32 and L82 V6 PCM do not use a removable EPROM to store the calibration information like the older GM ECM's. These PCMs use FLASH memory that must be read and reprogrammed using the car's ALDL connector.

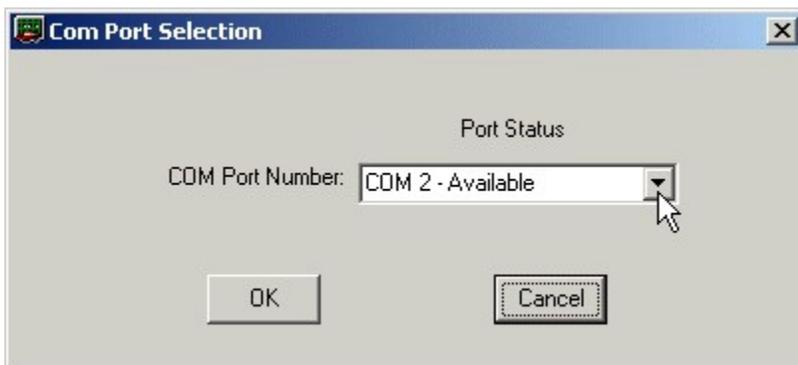
WARNING

If the programming process does not complete successfully it is possible to damage the PCM. Under no circumstances should you interrupt the programming process once it is started.

The following are recommendations for the successful programming of your PCM:

- Before programming the PCM, make sure you can successfully read the PCM. This is a very similar process and if that is successful, then the programming should also work fine. **YOU CAN NOT DAMAGE YOUR PCM BY READING IT.**
- Make sure the car battery is in good condition and fully charged. **DO NOT** try to program the PCM with a battery charger connected to the car battery. The correct range of the battery voltage for PCM programming is relatively narrow.
- If you're using a laptop, make sure the laptop battery is fully charged.
- Make sure you have good connections between the PC, ALDL connector and the interface cable and that they are not likely to be unintentionally disconnected during the programming process.
- Disable all power management functions on your PC.
- Disable all screen savers on the PC.
- Make sure there are no other applications (programs) running on your PC, including virus checkers.

Before proceeding be sure you have specified the correct Comm port that you will be using to communicate with the PCM. To set the correct Comm port, select '*Comm Port Setup*' from the '*Options*' menu. This will display the following screen:

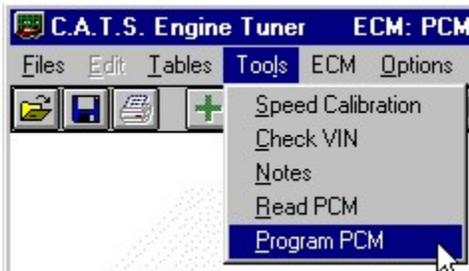


Select the Comm port you wish to use and click '*OK*'. The program will save this selection so you don't

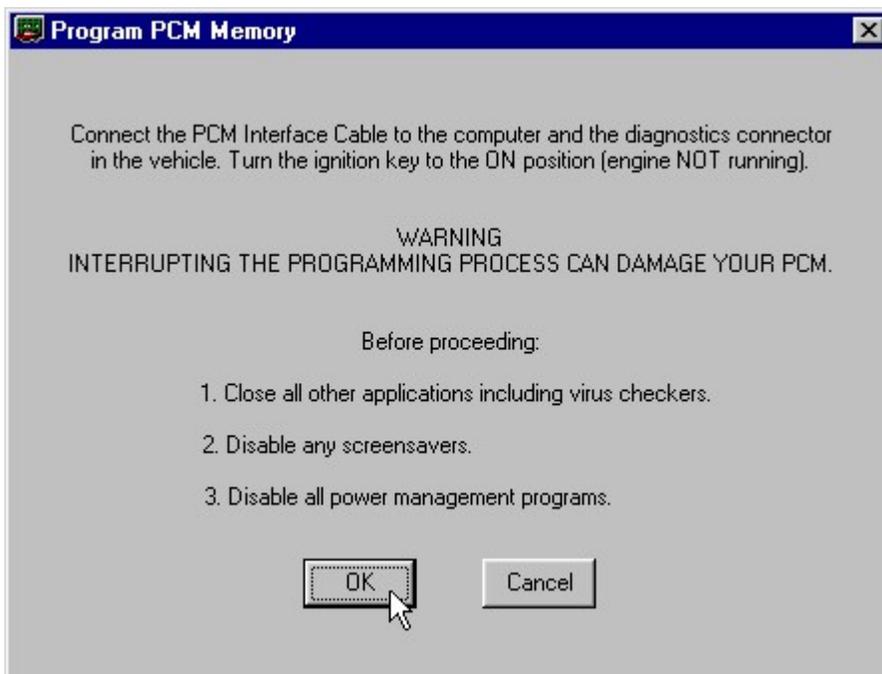
have to set the Comm port again unless you want to change to a different port.

The PCM will be programmed with the calibration that is currently loaded into the Tuner program. See the [Opening A Calibration File](#) section for details. Note: Any changes made since opening the calibration file will be included in the calibration when the PCM is programmed.

To program a new calibration into the PCM, select '*Program PCM*' from the '*Tools*' menu.



This will display the Program PCM start screen.



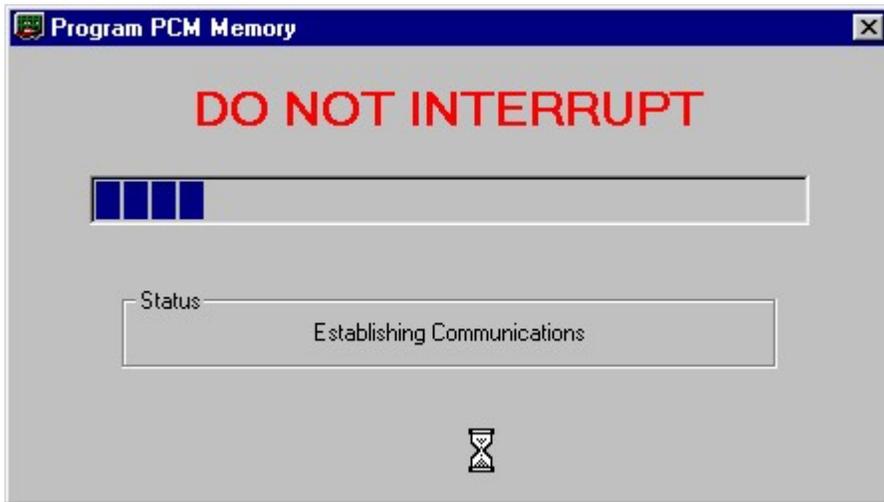
Before proceeding, connect the RS-232 to ALDL converter interface cable to the Comm port on your PC. If your PC has more than one Comm port, make sure you connect the converter to the Comm port that you specified on the Comm Port Setup screen.

Connect the other end of the converter to the ALDL diagnostics connector on the vehicle.

Once the cable is connected, turn the ignition key on but DO NOT start the engine. After turning on the ignition, wait about 10 to 15 seconds to clear the GM security delay before proceeding with programming.

Now click on '*OK*' to begin the PCM programming process. If all the connections have been properly

made, the program will begin communicating with the PCM, sending the necessary instructions to start the memory programming process. The following status window will be displayed during the read process:



The progress meter shows the progress on the programming as it proceeds and the Status window describes what part of the process is currently underway. Depending on the PC you are using, the programming will usually take about five minutes. If the process does not complete correctly for some reason, an error message will be displayed in the Status window. See Appendix B for a description of the possible error messages.

If the programming process gets interrupted before completion, you may be able to recover the PCM. Refer to [Appendix A – Recovering and Resetting the PCM](#) for details.

When the FLASH programming process is complete, the message shown below will be displayed:



Click 'OK' to complete the PCM programming and close the Programming Complete message box.

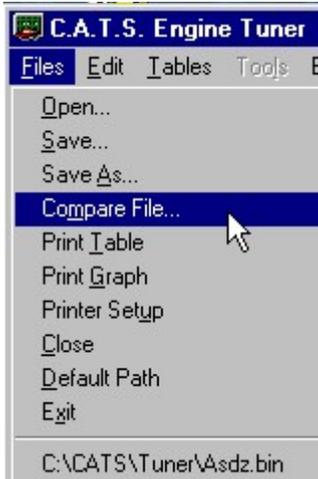
The calibration that was loaded into the Tuner program has now been transferred to the PCM and is ready for testing.

Comparing ECM Calibration Files

A unique and useful feature of the C.A.T.S. Tuner program is the ability to compare two ECM calibration files. When the Compare function is enabled, the values in all tables will represent the difference between the primary ECM Calibration file and the Compare ECM Calibration File (primary file value - compare file value).

Opening A Compare ECM Calibration File

To use the Compare function, you must open a Compare ECM Calibration file after opening your primary (the calibration file you are going to edit) ECM Calibration File.



To open the compare file, select '*Compare File*' from the '*Files*' menu.

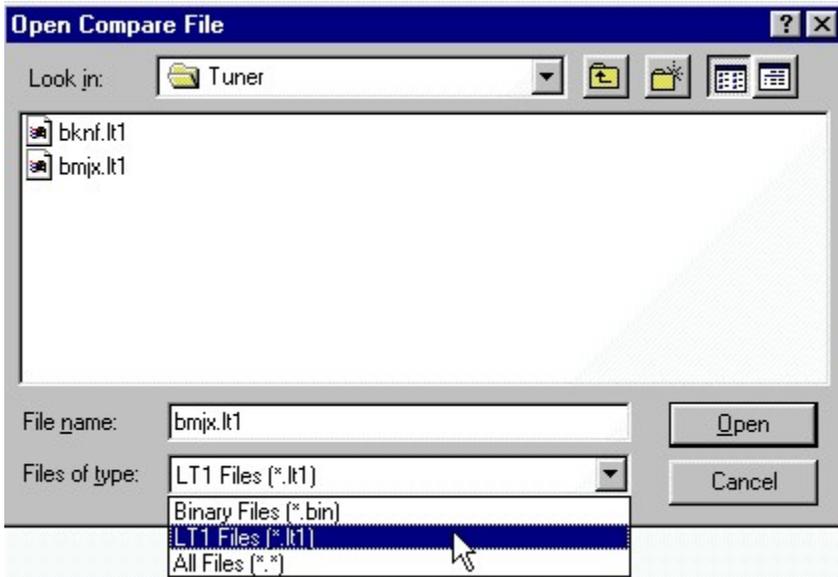
This will display the '*Open File*' dialog box. Select the desired compare file and click the '*Open*' button.



If you are using the \$EE ECM Definition File, the Tuner program will accept .lt1 format files as well as standard binary format files as compare files. You can even compare an .lt1 file to a binary file.

To open an .lt1 format file as the compare file, click on the drop-down arrow to the right of the 'Files of type' box and select lt1 Files (*.lt1) from the drop-down list.

The file box will then show all the available .lt1 files in the current subdirectory.



Viewing A Calibration Table in Compare Mode

After opening an ECM Calibration compare file, you can view any table in the compare mode by opening the desired table and then clicking on the Compare  button on the toolbar or selecting 'Compare' from the 'Options' menu.

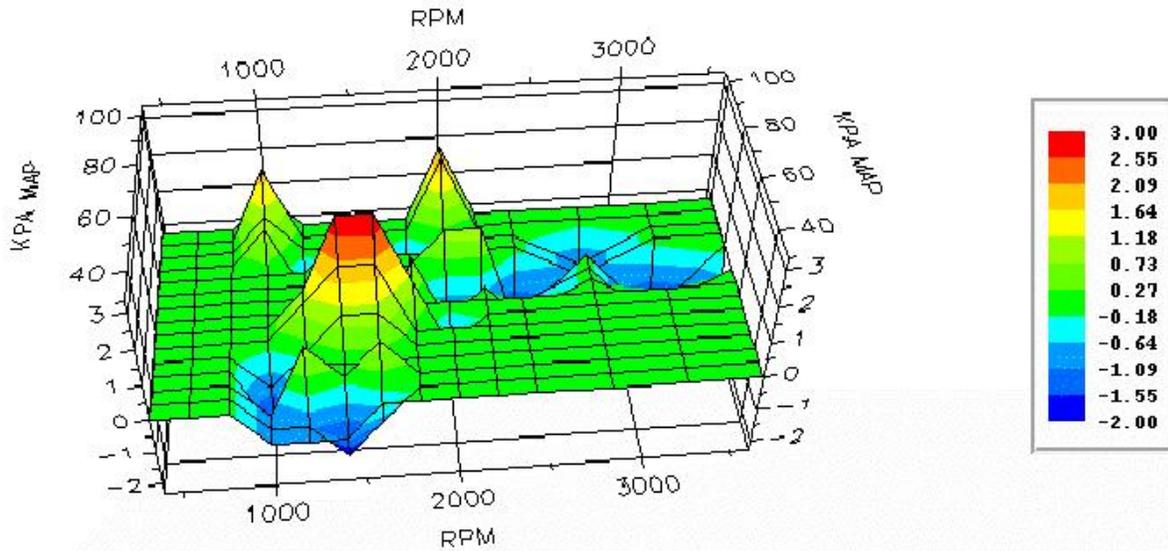


The values displayed in the table will now be the difference between the values from the two calibration files. In the case of the *Switch Table*, if a Switch is not set the same in both calibration files, the Switch name will be displayed in *Italics* to designate that the two files are different.

Main Spark Table, Deg Spk. (COMPARE ON)

RPM	KPA MAP														
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	-1	-1	-1	-2	-1	0	0	0	0	0	0	1	1	2	1
1200	-1	-1	1	0	0	1	1	0	0	0	0	-1	0	0	0
1400	-1	-2	0	0	1	2	3	0	-1	1	1	0	0	0	0
1600	0	-1	1	0	1	2	3	-1	-2	0	0	0	0	0	0
1800	0	0	0	0	0	0	1	0	1	0	0	0	-1	0	0
2000	0	0	0	0	0	0	-1	0	-1	-1	1	0	0	2	2
2200	0	0	0	0	0	0	0	0	0	-1	1	0	0	0	0
2400	0	0	0	0	0	0	0	0	-1	-1	-2	0	0	0	0
2800	0	0	0	0	0	0	0	0	0	0	0	-1	-1	0	0
3200	0	0	0	0	0	0	0	0	-1	-2	-2	0	0	0	0
3600	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0

Main Spark Table, Deg Spk. (COMPARE ON)



RPM	KPA MAP														
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	-1	-1	-1	-2	-1	0	0	0	0	0	0	1	1	2	1
1200	-1	-1	1	0	0	1	1	0	0	0	0	-1	0	0	0
1400	-1	-2	0	0	1	2	3	0	-1	1	1	0	0	0	0
1600	0	-1	1	0	1	2	3	-1	-2	0	0	0	0	0	0
1800	0	0	0	0	0	0	1	0	1	0	0	0	-1	0	0

If the table graph is displayed, the graph will show the differences as well.

To switch back to normal view mode, click the Compare  button again.

You can also edit the table values when in the compare mode allowing you to see you changes relative to the Compare file.

Note: When a table value is edited in the Compare mode, only the primary calibration value is being changed. **No changes are made to the Compare Calibration file.**

Generating Reports

Printing An ECM Calibration Table

To print a calibration table, first open the table then either click on the Print  button on the toolbar or select 'Print Table' from the 'Files' menu. The selected table will be scaled to fit the page and printed as it appears on the screen.



Printing An ECM Calibration Table Graph

To print a 2D or 3D calibration table graph, display the graph and then select 'Print Graph' from the 'Files' menu. The selected table graph will be scaled to fit the page and printed as it appears on the display.



Print All ECM Calibration Tables

This function allows you to print all the calibration tables at once in text format and quickly creates a compact hardcopy of your calibration.

To print all the calibration tables in the open calibration file select '*Print All*' from the '*Files*' menu.



The following message will then be displayed giving you the option to continue or to cancel the printing:



To continue with the printing click 'OK'. To cancel the print click on the 'Cancel' button.

All the calibration tables (including the Switch Table and the Constants Table) will be printed (as many tables per page as will fit) in text format similar to that shown below.

Source File: D:\Program Files\CATS\Tuner95ss.bin
8/3/01

Main Spark Advance Vs. RPM Vs. MAP

RPM	MAP (Kpa)															
	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
400	18.0	21.0	22.0	21.0	20.0	19.0	17.0	15.0	12.0	9.0	6.0	3.0	2.0	2.0	2.0	2.0
600	22.0	25.0	26.0	24.0	22.0	21.0	19.0	17.0	15.0	12.0	9.0	6.0	2.0	-1.0	-2.0	-2.0
800	26.0	28.5	29.5	26.0	23.0	21.5	21.0	20.5	18.5	15.5	12.5	9.5	6.0	4.0	2.0	0.0
1000	29.0	30.5	30.5	28.0	27.0	25.5	24.0	22.0	19.5	16.5	13.5	10.5	7.0	5.0	4.0	3.0
1200	31.0	33.0	32.5	30.0	28.0	26.0	25.0	23.5	21.0	18.0	15.5	13.0	11.0	9.0	8.0	7.0
1400	33.0	35.0	34.0	31.0	29.0	27.5	26.0	24.5	23.0	21.0	19.0	17.0	14.5	12.0	11.0	10.0
1600	35.0	38.0	37.0	34.0	32.0	30.0	28.5	27.0	25.0	23.0	21.0	19.0	17.0	15.0	13.5	12.0
1800	36.0	39.0	38.5	35.5	33.5	32.0	30.0	28.5	27.0	25.5	24.0	22.0	20.0	17.5	15.5	14.0
2000	37.0	40.0	39.5	36.5	34.5	33.5	32.0	31.0	30.0	29.0	27.5	25.0	22.5	20.0	18.5	17.0
2200	37.0	40.0	40.0	38.0	36.5	35.0	34.0	33.5	32.5	31.5	30.0	28.0	25.0	22.5	20.5	19.0
2400	37.0	40.0	40.0	38.5	37.0	36.0	35.5	34.5	33.5	32.5	32.0	30.0	27.0	24.5	22.5	21.0
2800	38.0	43.0	41.0	39.0	38.0	37.0	36.5	35.5	34.5	33.5	33.0	32.0	29.5	27.0	25.5	24.5
3200	38.0	43.0	43.0	41.0	39.5	38.5	37.5	36.5	35.5	34.5	34.0	33.5	31.5	29.0	28.0	27.0
3600	38.0	43.0	45.0	42.0	40.5	39.5	38.5	37.5	36.5	35.5	34.5	34.0	31.5	30.0	29.0	28.0
4000	38.0	44.0	45.0	43.5	41.5	40.0	39.0	38.0	37.0	37.0	36.0	35.0	33.0	31.0	30.0	29.0

Extended Spark Advance Vs. RPM Vs. MAP

RPM	MAP (Kpa)															
	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
4000	38.0	44.0	45.0	43.5	41.5	40.0	39.0	38.0	37.0	37.0	36.0	35.0	33.0	31.0	30.0	29.0
4500	38.0	44.0	46.0	45.0	42.5	40.5	39.5	38.5	37.5	36.5	35.5	34.0	32.0	31.0	30.0	29.0
5000	38.0	44.0	46.0	45.0	42.5	40.5	39.5	38.5	37.5	36.5	35.5	35.0	34.0	31.5	30.5	29.5
5500	37.0	43.0	46.0	45.0	42.5	40.5	39.5	38.5	37.5	36.5	35.5	35.0	34.0	31.5	30.5	29.5
6000	37.0	40.0	42.0	41.0	39.0	38.0	37.0	36.0	35.0	34.0	33.0	32.0	31.0	30.0	29.0	28.0
6500	37.0	40.0	42.0	41.0	39.0	38.0	37.0	36.0	35.0	34.0	33.0	32.0	30.0	28.0	28.0	27.0
7000	37.0	40.0	42.0	41.0	39.0	38.0	37.0	36.0	35.0	34.0	33.0	32.0	30.0	28.0	28.0	27.0

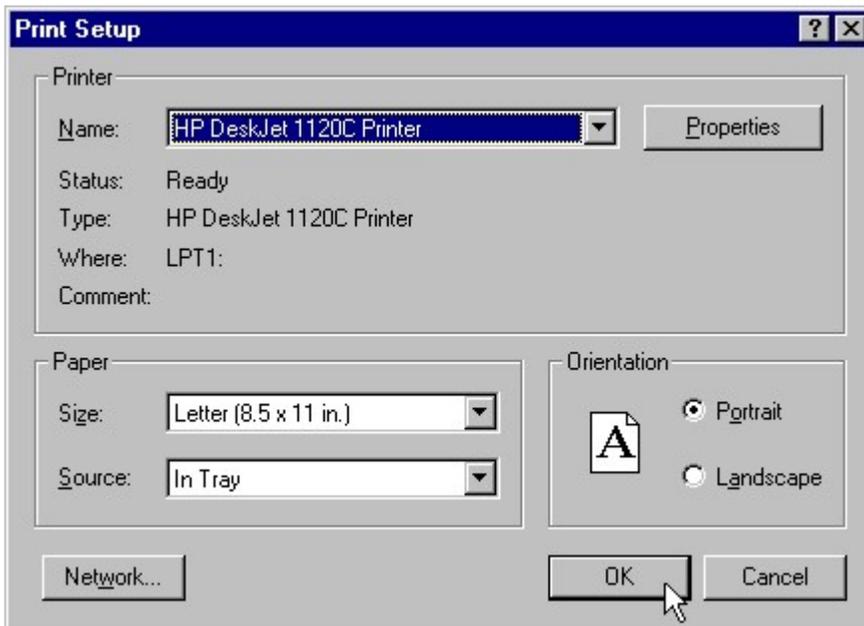
Page 3

Printer Setup

To change the printer properties such as the selected printer, paper size and orientation, select 'Print Setup' from the 'Files' menu.



This will display the standard Windows printer setup screen.



Make the desired changes and click on the 'OK' button to apply the changes or click on 'Cancel' maintain the current settings.

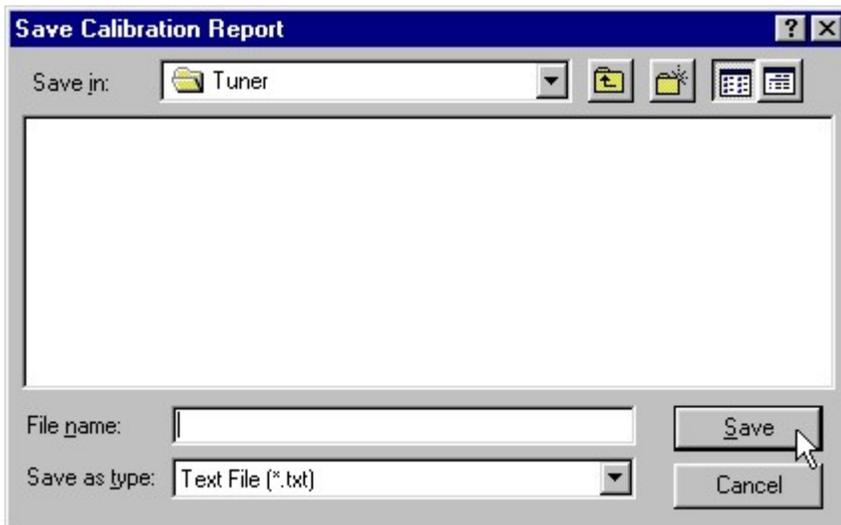
Print All ECM Calibration Tables To A File

This function allows you to print all the calibration tables at once in text format to a text file rather than creating a hardcopy on your printer. The resulting text file is a convenient way to document you calibrations and can be easily edited to add comments or can be embedded into other documents.

To print all the calibration tables in the open calibration file to a text file, select '*Print All*' from the '*Files*' menu.



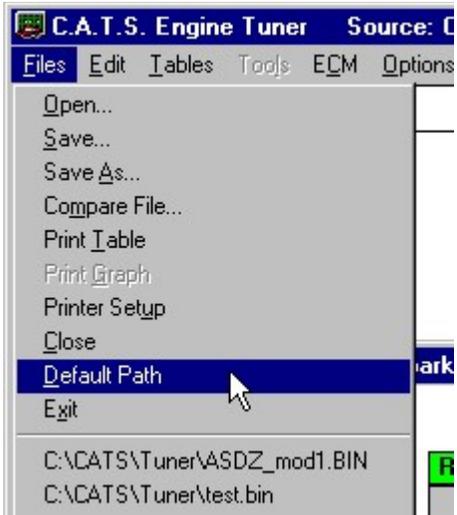
A standard file save dialog box will be displayed to allow you to enter a file name to be used to save the file.



Enter the desired file name and click on the 'Save' button to complete the print all to file function.

Default Path

If you wish you may setup the program to go to a default directory for any file operation.



To specify a default path for the program, select '*Default Path*' from the '*Files*' menu.

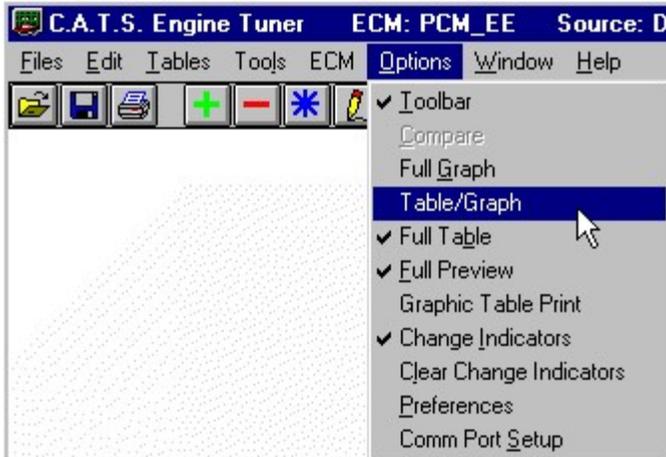


The default path window will be displayed. Select the desired default path and click on the '*OK*' button.

This default path will be saved and will be active until another default path is selected.

Program Options

The '*Options*' menu provides some choices on how the Tuner program operates. The first four entries in the '*Options*' menu allow you to toggle four program functions on and off; Toolbar display, Calibration Table Compare, Calibration Table Graph display, and Full Preview. The '*Preferences*' selection from the menu allows you to set the number of files listed in the history file list in the '*Files*' menu and to control the number or items listed in each column of the program drop-down menus.



If the **'Toolbar'** option is unchecked, the toolbar is removed from the top of the screen giving you a larger view window for the calibration tables.

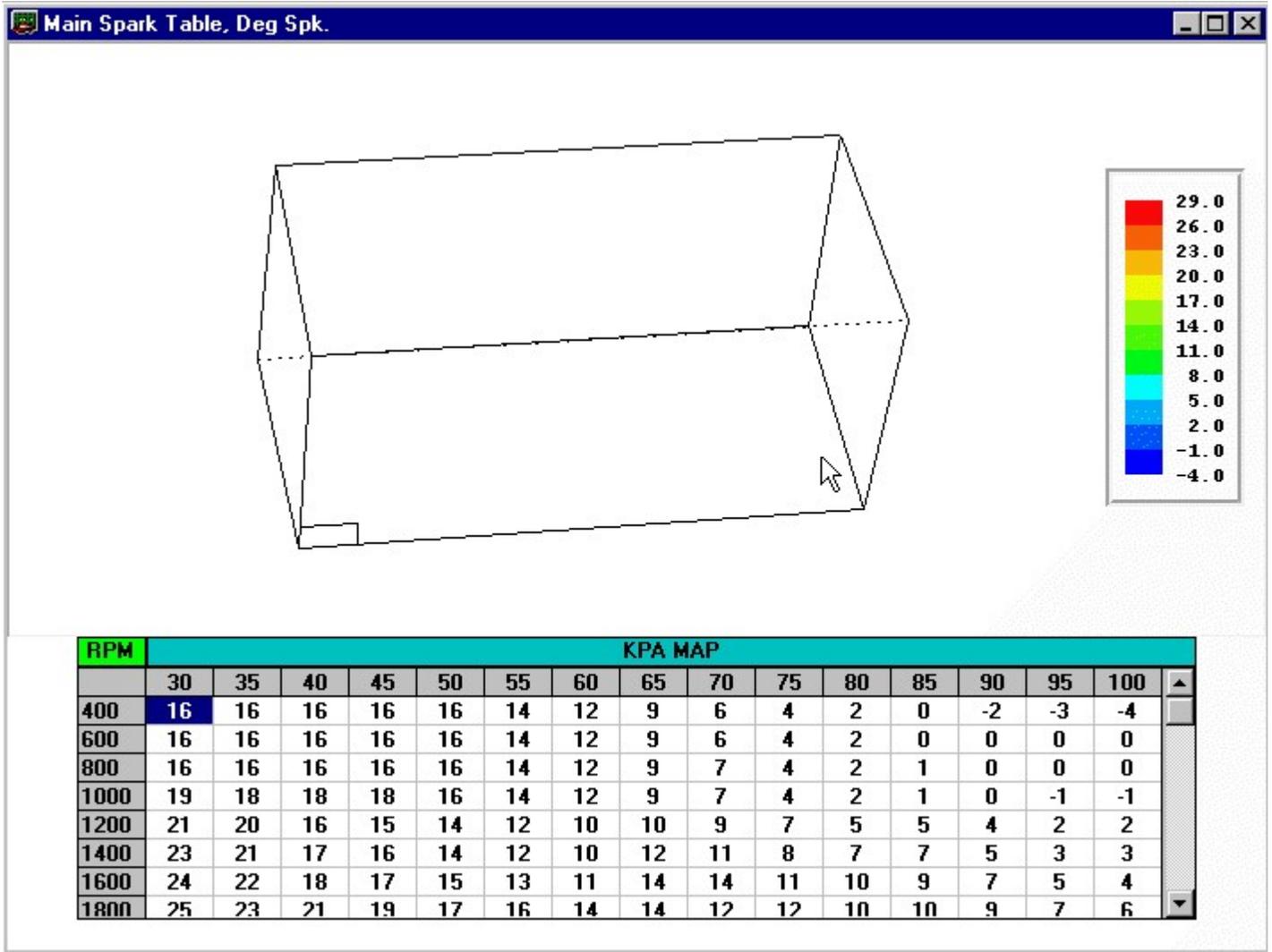
Checking the **'Compare'** selection activates the compare display mode and has the same function as the **'Compare'**  button on the toolbar. The option is only active if a Compare File is open.

Checking the **'Full Graph'** selection displays a graph of the calibration table currently being viewed. This has the same function as the **Graph Only**  button on the toolbars. The option is only active if you are viewing a 2D or 3D Calibration Table.

Checking the **'Table/Graph'** selection displays a graph along with the tabular view of the calibration table currently being viewed. This has the same function as the **Graph and Table**  button on the toolbars. The option is only active if you are viewing a 2D or 3D Calibration Table.

Checking the **'Full Table'** selection displays the table currently being viewed in tabular form only. This has the same function as the **Table Only**  button on the toolbars. The option is only active if you are viewing a 2D or 3D Calibration Table.

The next selection in the **'Options'** menu is **'Full Preview'**. If this selection is checked, a 3D Calibration Table graph will be fully displayed while you are changing the orientation of the graph. When this selection is unchecked, a wire frame representation of the graph axes is displayed when changing the orientation of the graph.



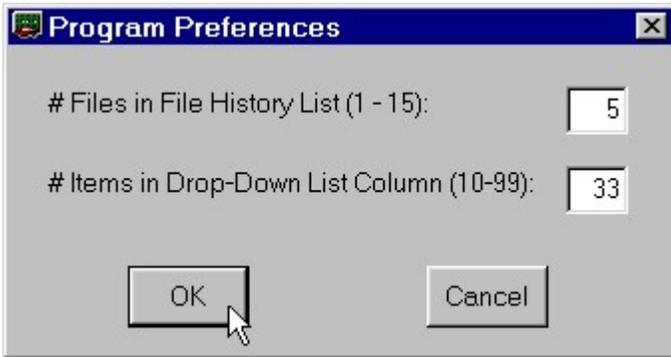
This function is useful on slower computers where changing the graph orientation may be unacceptably slow with *'Full Preview'* selected.

The currently selected table can be printed in either test form or in graphic form. If the *'Graphic Table Print'* option is selected, then the table will be printed as it appears on the screen.

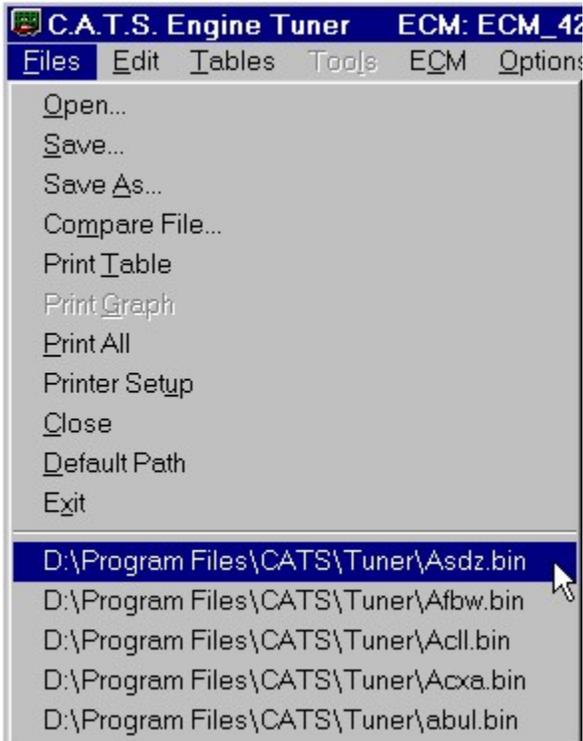
Normally whenever you make a change to a value in a table, the value will be displayed in red to indicate the value has been edited. Unchecking the *'Change Indicators'* option turns off this function.

When change indicators are enabled, the edited values will remain red until the file is closed and re-opened. Just saving the file while editing does not clear the change indicators. If you wish to clear the change indicators during an editing session, click on the *'Clear Change Indicators'* selection in the menu. See the Editing Calibration Values section for more details.

Selecting *'Preferences'* from the *'Options'* menu will display the Program Preferences screen.



From this screen you can change to number of files that are listed in the file history list in the '*Files*' menu. You can set this number at any value from 1 to 15. The default value is five and as shown in the example below, this will display the five most recently opened calibration files at the bottom of the '*Files*' menu.

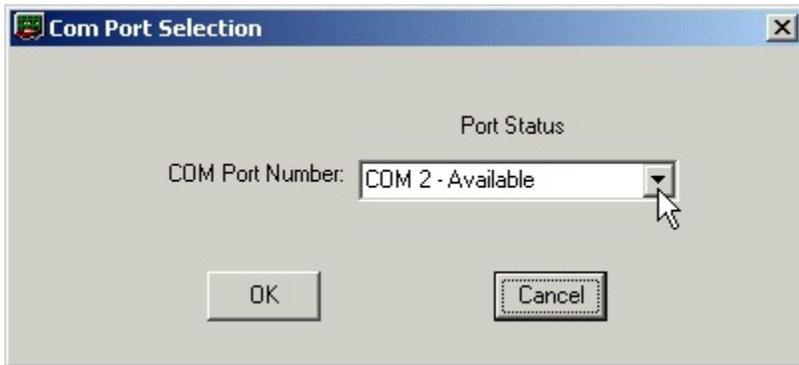


The Program Preferences screen also allows you to set the number of items that will be displayed in each column of a drop-down menu. Depending on your computer monitors size and resolution, the longer drop-down menus may run off the bottom of the screen. This function allows you to set the maximum number of items in a drop-down menu column. If there are more items in a drop down menu, then a second column is displayed as shown below:



This value can be set from 10 to 99 items column. The default is 33.

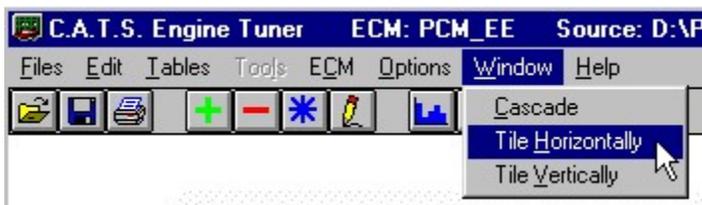
If you are using the \$EE or V6 ECM Definition Files, then the '*Comm Port Setup*' selection will be visible in the '*Options*' menu. Clicking on this item will display the Comm Port Setup Screen:



This screen allows you to select which comm port on your PC will be used when communicating with the PCM for reading and programming the PCMs FLASH memory. To select the desired comm port, click on that port and then click '*OK*'.

Window Arrangement

The '*Window*' menu gives you several options for arranging multiple calibration tables that you have open.



The '*Cascade*' selection, overlays all the open tables on top of each other so that the title bars of each table are visible.

The '*Tile Vertically*' selection displays each open table side by side on the screen.

The *'Tile Horizontally'* selection will display each open table the full width of the main window and divide the window vertically evenly for each open table.

Comments and Problem Reports

We at C.A.T.S. are continually trying to improve our products and to do so we rely heavily on inputs from users and we welcome all comments and suggestions. Please e-mail us at tc@.tunercat.com with any comments or suggestions and to report any operational problems.

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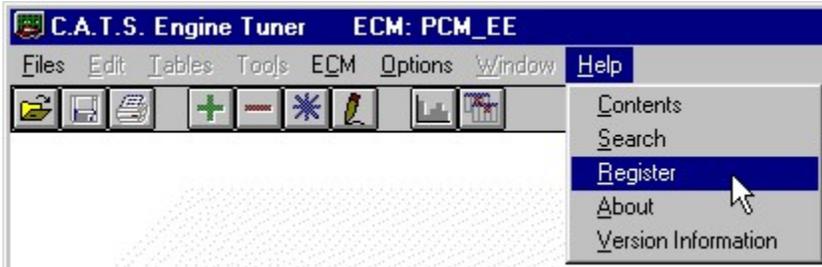
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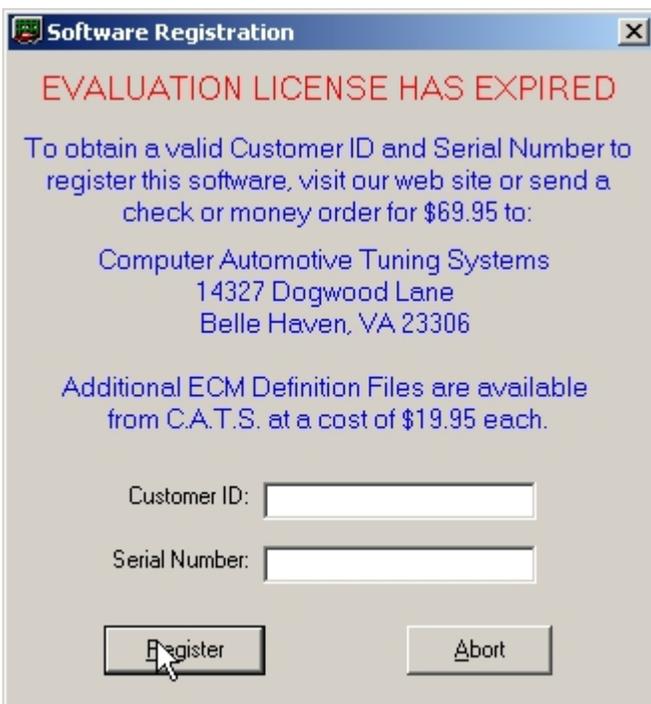
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Software Registration

When you purchase the Tuner program you will receive your program registration information. To register your copy of this software start the program and select 'Register' from the 'Help' menu.



When the registration form appears, enter your Customer ID and Serial Number into the appropriate boxes. Note that the Customer ID is case sensitive and should be entered exactly as received. Enter your Serial Number carefully. Also note that all letters in the Serial Number are all upper case.



Note: If your evaluation period has expired, the registration form will be displayed automatically when you run the program.

Program Updates

As a registered user, you are entitled to free updates to the Tuner program and any ECM Definition Files you have purchased.

Check the 'Version Information' page on our web site (www.tunercat.com) to see a list of the current versions of the Tuner program and all the ECM Definition Files.

You can download the latest version of the Tuner program from the 'Downloads' page on our web site (www.tunercat.com). If you install the latest version of the Tuner program into the same folder as you current version, you won't need to re-enter you registration information or move you ECM Definition Files.

To obtain the latest version of an ECM Definition File, just send us an e-mail at tc@tunercat.com and request the ECM Definition File updates you need. We will then e-mail the latest version of the ECM Definition File to you.

Appendix A – Recovering and Resetting the PCM

If the PCM read process is interrupted before completion at certain times during the process, the PCM may no longer communicate and thus will not function correctly. To recover from this, you'll need to completely reset the PCM.

To reset the PCM, you must remove all power from the PCM for about 10 to 15 minutes. To do this you can either disconnect the main battery cable from the battery or you can disconnect the four connectors going to the PCM. This should reset the PCM and it should function normally afterward.

If the PCM programming process is interrupted before completion, you may still be able to recover depending on at what stage the interruption occurred. If the programming process does get interrupted for some reason, FIRST just retry the programming process BEFORE turning off the ignition. If that doesn't work try resetting the PCM as described above. Sometimes, this will recover the PCM and it will work properly or at least work enough to program it again.

If after trying the reset, the PCM will still not communicate, then it has most likely been damaged and will have to be repaired or replaced. You can use your damaged PCM as a core and get a replacement from the dealer or you can have the PCM repaired. C.A.T.S. offers a repair service for these PCM's.

Appendix B - PCM Read/Program Communications Errors

The following is a list of the possible error messages that may occur when you are reading or programming your PCM.

NO MESSAGE SENT - CABLE FAILURE – You will receive this error message whenever your PC is unable to communicate with the RS-232 to ALDL Signal Converter. This can be the result of not having the converter connected to the PC, having it connected to the wrong Comm port or a hardware failure in the converter.

INVALID COM PORT SELECTED – This error message will be displayed if you select a Comm port that does not exist on your PC.

NO RESPONSE FROM PCM – If the program receives no communications from the PCM, the message will result. This is generally caused by not having the RS-232 to ALDL Signal Converter connected to the diagnostic connector or not having the ignition on.

ENGINE IS RUNNING – You will receive this error message if you attempt to read or program the PCM when the engine is running.

BATTERY VOLTAGE OUT OF RANGE – Before programming your PCM, the program checks the battery voltage. If the battery voltage is out of the acceptable range (too low or too high), this error message will be displayed.

SECURITY VIOLATION – If you receive this error message, you didn't wait long enough after turning on the ignition to try to read or program the PCM. Part of GM's security system is a delay after power-up during which you can not access the PCM. Turn off the ignition key and wait for about 30 seconds to reset security violation status flags. Before attempting to program the PCM again, turn on the ignition and wait about 15 seconds before proceeding with the programming of the PCM.

INCORRECT MESSAGE SENT – This error message indicates that the message that was actually sent to the PCM is not the message the program is trying to send. This indicates that there is a problem with the RS-232 to ALDL Signal Converter or the connection to the PC or there is some local source of electrical noise interfering with the communications.

TOO MANY WAIT MESSAGES – This error message will be displayed if the program was unable to erase the PCM's FLASH memory. This is most likely caused by a problem in the PCM.

PROCESSOR RESET ERROR – This message indicates that the program was unable to reset the PCM after reading or programming memory. If you receive this message remove power from the PCM to reset the PCM before using it. This can be done by either disconnecting the connectors from the PCM or disconnecting one of the battery terminals.

PCM HARDWARE FAILURE – This message occurs if the PCM sends a hardware error message. This indicates an internal problem in the PCM.

PCM MEMORY PROGRAMMING ERROR – This error message indicates that the program was unable to program the PCM correctly.

A CHECKSUM ERROR HAS OCCURRED – This error message is displayed if the program receives a message from the PCM that has an incorrect checksum

INCORRECT RESPONSE FROM PCM – This error occurs if the program receives an unexpected or unknown message from the PCM indicating that the PCM may not be compatible with this program.

INVALID RESPONSE FROM PCM – If the program receives a message from the PCM that is not of the correct message format, this error message will be displayed. This may be caused by hardware problems with the PCM or the RS-232 to ALDL Signal Converter or the interconnections. This message may also occur if the PCM is not compatible with this program.

FLASH MEMORY CHECKSUM ERROR – After programming the PCM memory, the programming utility requests a checksum from the PCM and compares it to the checksum that was calculated during the programming process. These values should agree. If these values do not agree, then this message is displayed and indicates that the FLASH memory may not have been programmed correctly.

Appendix C – Supported ECMs And PCMs

This table lists the ECM Definition Files and the ECMs and PCMs that each Definition File supports.

Chevy and GMC Trucks:

PROGRAM ID BYTE	ECM P/N	PLATFORM
\$27	1227137	86 Astro/Safari Van, LB4, 4.3L
\$76	1228934	85 - 93 C/K, Commercial Truck (HD), LB4 4.3L Manual
\$42	1227747	87 - 91 C/K Truck, Van, 4.3L, 5.7L & 7.4L
\$4F	1228747	87 - 92 C/K Truck, Van, 5.7L & 7.4L (HD)
\$4E	1228062	89 - 90 4.3L LB4, 2.8L LL2 S-10
\$A0	16144288	91 - 92 4.3L S-10 & C/K Truck
\$58	1227749	91 - 93 Syclone & Typhoon
\$85	16147060 or 16127470	91 - 93 C/K Truck, Van, 5.7L & 7.4L (HD)
\$53	1227165	89 S10 Truck, 2.5L, LN8
\$94	1227165 or 16156647	91 - 93 S10 Truck, 2.5L, L38
\$D3	16128420	92 - 93 C/K Diesel Truck L65, Auto Trans, TCM
\$D5	16156647	92 S10 Truck, Astrovan 4.3L L35 CPI
\$99	16146299	92 C/K Truck, Van, 4.3L, 5.7L & 7.4L
\$9A	16156480, 16196396 or 16171199	93 - 95 C/K Truck, Van, 5.0L & 5.7L, Manual Trans.
\$E6	16168625	93 C/K Truck, Van, 4.3L, 5.0L & 5.7L
\$0D	16196395 or 16197427	94 - 95 C/K Truck, Van, 4.3L, 5.7L & 7.4L
\$0DA	16196395 or 16197427	94 - 95 Truck, Van, 4.3L L35 CPI
\$0E	16196395 or 16197427	94 C/K Truck, Van, 5.7L & 7.4L (HD)
\$31	16197427 or 16156930	95 C/K Truck, Van, 5.7L & 7.4L (HD)
\$8C	16245358	95 C/K Truck, Van, 4.3L
\$8CA	16245358	95 Truck, Van, 4.3L L35 CPI

Chevy Cars:

PROGRAM ID BYTE	ECM P/N	PLATFORM
\$1F	1226870	85 Y CAR 5.7L TPI (L98) 85 F CAR 5.0L TPI (LB9)
\$32	1227165	86 Y & F CAR 5.0L / 5.7L TPI
\$32B	1227165	87 - 88 Y & F CAR 5.0L / 5.7L TPI
\$3A	1227302	86 - 89 F CAR LB6/LB8 V6
\$41	1227746	87 Caprice/Monte Carlo 4.3L LB4
\$4D	1228063	88 F CAR 5.0L LO3 TBI
\$61	1228746	89 - 92 F & B Cars, LO3 & LO5 Eng.
\$6E	1227165	89 Y & F CAR 5.0L & 5.7L
\$88	1227730	90 - 92 F CAR LH0 V6
\$8D	1227727 or 1227730	90 - 91 Y CAR 5.7L TPI 90 - 92 F CAR 5.0L & 5.7L TPI
\$8E	1228331	90 Corvette ZR1 (LT5)
\$AF	1228331	91 Corvette ZR1 (LT5)
\$62	16136965	91- 93 Caprice, LB4, L03 & L05 Eng.
\$D0	16163860 or 16163993	92 Corvette ZR1 (LT5)
\$DA2	16159278	92 - 93 Y CAR 5.7L, LT1
\$DA3	16159278	93 F CAR 5.7L, LT1
\$F0	16163993 or 16196394	93 - 95 Corvette ZR1 (LT5)
\$EE **	16181333 or 16188051	94 - 95 Y, F & B CAR, Cadillac 5.7L, LT1 (FLASH) (incl. 'Rev B')

** Note: The Rev B type \$EE calibration was used in some early 1994 LT1s and requires the use of a separate ECM Definition File, the \$EEB ECM Definition File.

Buick/Pontiac Cars:

PROGRAM ID BYTE	ECM P/N	PLATFORM
\$1D	1226459	84 - 85 LM9 3.8L V6 Turbo Buick/Pontiac
\$24A	1226869	85 Pontiac Fiero 2.8L V6
\$24	1227170	86 - 88 Pontiac Fiero 2.8L V6
\$T31	1227148	86 - 87 Turbo Buick
\$48	1227748	87 - 88 Pontiac Fiero 2.5L 4 Cyl. LR8 87 - 90 Celebrity, 6000, Cutlass, Ciera, Century 2.5L 4 Cyl. LR8

\$58A	1227749	87 - 90 Sunbird, Grand Am, 2.0L, LT3 Turbo
\$5B1	1228253	88 Buick / Pontiac LN3, 3800, V6
\$5B2	1228253	89 - 91 Buick / Pontiac LN3, 3800, V6
\$5B3	16141470	91 Buick / Pontiac L27, 3800, V6
\$5B4	16141470	92 - 93 Buick / Pontiac L67, 3800, Supercharged
\$5B5	16132792 or 16141470	90 - 92 Pontiac W-Body L27, 3800, V6
\$5B	16183247 or 16197428	94 - 95 Buick / Pontiac L67, 3800, Supercharged
\$6D	1227730	87 - 89 Buick / Pontiac LB6, 2.8L, V6 89 - 90 Buick / Pontiac LH0, 3.1L, V6
\$8F	1227727	89 - 90 Buick / Pontiac LG5 3.1L V6 MFI Turbo
\$A1	1227730	91 - 93 J, L, W Cars LH0 3.1L V6
\$DF	16149396	91 - 94 Buick / Pontiac LQ1 3.4L V6 93 - 94 Buick / Pontiac LH0 3.1L V6

Australian Holden:

PROGRAM ID BYTE	ECM P/N	PLATFORM
\$5D	1227808	88 Australian Holden

Edelbrock Pro-Flow Systems:

PROGRAM ID BYTE	ECM P/N	PLATFORM
3500	Edelbrock	Edelbrock Pro-Flow Systems

Appendix D – LT5 ECM Definition Files

The Tuner program uses the calibration program ID to identify the calibration. Generally GM used the program ID to uniquely identify a calibration template and all calibrations with the same Program ID always had the calibration parameters were the same and located at the same place so the same ECM Definition could be used.

Unfortunately, they did not follow this convention with the LT5 calibrations. There were two slightly different versions of each of the four program ID's. Each version had some of the calibration parameters in different locations so two different versions of each ECM Definition File, a 'standard' version and an 'A' version.

The correct ECM Definition file that should be used depends on the particular calibration you are working with. The following table should be used to determine which version of the ECM Definition File should be used. To determine which version should be used determine the broadcast code of the calibration you are working with. The broadcast code is a four letter code that GM uses to uniquely identify each calibration. The broadcast code is usually printed on the ECM label and on the small silver label on top of the EPROM itself. Look up the broadcast code in the BC column of the table and find the corresponding ECM Definition File in the TDF column.

MY	ECM PN	BC	TDF	Scan ID	Chip PN	Rel Date	Disp	Eng RPO
90	1228331	ANHX	8E	5111	16129717	05/23/89	5.70	LT5
90	1228331	AUAH	8E	8441	16148554	09/27/89	5.70	LT5
90	1228331	AYBK	8EA	3921	16163905	11/03/93	5.70	LT5
91	1228331	ARZR	AF	8371	16148990	03/19/90	5.70	LT5
91	1228331	AXFK	AF	291	16160276	09/11/90	5.70	LT5
91	1228331	BFXB	AFA	3431	16193416	11/10/93	5.70	LT5
92	16163993	AYWT	D0	8001	16168043	06/14/91	5.70	LT5
92	16163993	AZZC	D0	2611	16172698	11/26/91	5.70	LT5
92	16163993	BATL	D0	5921	16175910	12/10/91	5.70	LT5
92	16163860	BPPA	D0A	9991	16219916	03/13/95	5.70	LT5
93	16163993	BAZJ	F0	7401	16177557	05/21/92	5.70	LT5
93	16163993	BFDM	F0A	641	16190633	11/09/92	5.70	LT5
93	16196394	BKKR	F0	1461	16201452	11/12/93	5.70	LT5
93	16196394	BMCB	F0	9011	16209008	07/05/94	5.70	LT5
94	16163993	BFDM	F0A	641	16190633	11/09/92	5.70	LT5
94	16196394	BKKR	F0	1461	16201452	11/12/93	5.70	LT5
94	16196394	BMCB	F0	9011	16209008	07/05/94	5.70	LT5
95	16163993	BFDM	F0A	641	16190633	11/09/92	5.70	LT5
95	16196394	BKKR	F0	1461	16201452	11/12/93	5.70	LT5
95	16196394	BMCB	F0	9011	16209008	07/05/94	5.70	LT5

Appendix E - RT Tuner Instruction Addendum

Introduction

The C.A.T.S. RT Tuner was developed to allow 'real-time' ECM tuning when connected to the Transtronics (<https://secure.transtronics.com>) Romulator EPROM emulator or the Moates.net (www.moates.net) Ostrich or AutoProm emulators. With the emulator replacing the ECM's original EPROM, you can make calibration changes while the engine is running and the changes will take effect immediately.

Note: For the RT Tuner program to be compatible, you must have firmware version 1.09 or later in your Romulator. If you have any earlier version, please contact Transtroics for information on updating your Romulator.

The RT Tuner program functions exactly the same as our standard Tuner program, except that whenever you make a calibration change the RT Tuner program sends the change (or changes) to the emulator.

Note: The Romulator I only supports EPROM's up to 256K in size. If you select an ECM Definition File for a calibration that uses a larger EPROM, such as the \$0D ECM Definition File, the program will immediately disconnect from the Romulator and revert to normal 'off-line' (non-real-time) operation and function just like the standard Tuner program. The Romulator II supports EPROM's up to 512K in size. The Romulator also does not support the FLASH based PCM's supported by the \$EE ECM Definition File.

When you run the RT Tuner for the first time, you will notice a new 'Tools' menu, some additional items in the 'Options' menu, a few new buttons in the toolbar and a new status bar at the bottom of the main screen.

Background Calibration Updates

The operation of the RT Tuner in real-time mode uses the emulator's background update capability which allows the emulator's memory to be updated in the background so that the update can be done while the ECM is running normally. Other than the calibration value change itself, the update is completely transparent to the ECM since the update to the emulator memory is done when the ECM is not accessing the emulator memory.

Warning: Some functions can not be performed in background mode, specifically connecting to the emulator, reading the emulator and programming the emulator. As a result these functions should ONLY be performed with the engine stopped and the ignition turned off. Otherwise, the ECM will set error codes and damage to you engine could result.

Quick Start

The first time you use the emulator with you ECM, you have to make a few minor modifications to you ECM to allow you to be able to connect the Romulator to the ECM.

1. Remove the ECM from the vehicle.
2. Remove the access cover over the calibration chip or MEMCAL.
3. If your ECM is an older ECM with a calibration chip in a plastic PROM carrier:
 - A. Remove the PROM carrier and calibration chip.

- B. Remove the circuit board from the metal housing
 - C. Carefully unsolder and remove the special socket that the PROM carrier plugs into and replace it with a standard IC socket. Using a standard IC socket has the added benefit that you will no longer need the plastic PROM carrier (these part are obsolete and very difficult to find) so now you can just plug in a standard EPROM. Note: **Make a note of pin 1 of the EPROM before removing the original socket to make sure you install the new socket correctly.**
 - D. Carefully remove the original EPROM from the PROM carrier and read it with your EPROM programmer. Save this file from the EPROM programmer software to your PC's hard drive in binary format. This is the stock calibration file that you will use as your baseline calibration to which you'll make the desired calibration modifications.
 - E. Reinstall the circuit board into the metal housing.
4. If your ECM is a newer ECM with a MEMCAL:
- A. Remove the MEMCAL from the ECM
 - B. Carefully unsnap the cover from the MEMCAL (its usually blue or brown).
 - C. Carefully unsolder the EPROM that's now accessible from the MEMCAL. Note: **Make a note of the orientation of the EPROM before removing it.**
 - D. Solder a standard IC socket in place of the original EPROM noting the correct orientation.
 - E. Reinstall the MEMCAL in the ECM.
 - F. Read the EPROM that you removed with your EPROM programmer. Save this file from the EPROM programmer software to your PC's hard drive in binary format. This is the stock calibration file that you will use as your baseline calibration to which you'll make the desired calibration modifications.

You've now completed the necessary modifications to your ECM which you only need to do once. You're now ready to connect the Romulator to your ECM. **Note: Make sure the vehicles ignition is OFF during these next steps.**

1. Plug the emulator connector into the socket that you've just installed in your ECM noting the proper orientation (pin 1 if the connector is at the end with the red stripe on the emulator cable).
2. Reconnect the ECM to the vehicle.
3. Connect the serial cable to the emulator and to an available serial port on your PC.
4. Run the RT Tuner program and wait for the program to connect to the emulator.
5. Load the calibration file that you created by reading the original EPROM from the ECM above into the RT Tuner program by selecting 'Open' from the 'Files' menu (or clicking on the *Open File* button  on the toolbar. Select the calibration file that you created and click on 'Open'.
6. Now program this calibration into the emulator. To program the emulator, you can either select 'Program Emulator' from the 'Tools' menu or you can click on the *Program Emulator* button  in the main toolbar.

You're now ready to start real-time tuning. Start the engine and start tuning. Any calibration changes you make from the RT Tuner program will be sent immediately to the emulator so you can see the effect of your changes in real time.

Program Startup

When you start the RT Tuner program, the program will automatically attempt to connect to the emulator by searching all available serial ports. The first time you run the RT Tuner program, this may take a little while.

Once the program finds the emulator it will remember what serial ports is being used so the next time you start the RT Tuner program it will connect very quickly unless you move the emulator to a different port.

If you want to cancel the search for the emulator, click on the '*Cancel*' button and after a few seconds, the search will stop.

If you don't want the program to automatically connect the emulator each time you star the RT Tuner program, click on the '*Options*' menu and uncheck the '*Auto Connect*' option. If you disable the Auto Connect feature, then you will have to manually connect to the emulator when you want to work in real-time mode. To manually connect to the emulator, select '*Connect to Emulator*' from the '*Tools*' menu or click on the *Connect to Emulator* button  in the main toolbar.

Calibration Synchronization

For the RT Tuner program to function properly in real-time mode, it is very important for the calibration currently in RT Tuner program to be synchronized with the calibration stored in the emulator. That is these calibrations must be identical.

There are two ways to synchronize the two calibrations:

1. You can load a calibration file into the RT Tuner program by selecting '*Open*' from the '*Files*' menu and then use this calibration to program the emulator. To program the emulator, you can either select '*Program Emulator*' from the '*Tools*' menu or you can click on the Program Emulator button  in the main toolbar.
2. If you have a valid calibration already stored in the emulator, you can read the calibration in the emulator into the RT Tuner program by selecting '*Read Eomulator*' from the '*Tools*' menu or click on the *Read Emulator* button  in the main toolbar.

Once the RT Tuner program and the emulator are synchronized, the RT Tuner program will automatically send any calibration changes you make to the emulator to maintain synchronization unless you've turned off (unchecked) the '*Auto Update*' feature in the '*Options*' menu.

New Tools Menu

The RT Tuner has a new '*Tools*' menu containing three functions. **Note: Do not perform any of these functions with the engine running.**

1. *Connect to Emulator*: Clicking this function will force the RT Tuner program to connect to the Romulator.
2. *Read Emulator*: Clicking on this selection with transfer the calibration stored in the emulator into the RT Tuner program. The RT Tuner program will check that the calibration stored in the emulator is valid and that you have selected the correct ECM Definition File.
3. *Program Emulator*: This menu selection programs the emulator memory with the calibration that you currently have open in the RT Tuner program. If you don't have a calibration open in the RT Tuner program, this function will be inactive.

New Toolbar Buttons

Three new toolbar button have been added to the main program toolbar. These buttons are the *Connect to Emulator* button , the *Read Emulator* button , and the *Program Emulator* button . The buttons give you quick access to the corresponding functions in the ‘Tools’ menu as described above.

New Options

Three new options have been added to the options menu.

1. *Comm Port Setup*: This option allows you to force the RT Tuner program to use the specified port as the first serial port on which to search for the emulator.
2. *Auto Update*: Normally whenever you make a calibration change from the RT Tuner program, the program will immediately send the change to the emulator. If you need to multiple changes before sending the changes to the emulator, then you can uncheck this option and no changes will be sent until you update the emulator using the Program Emulator function.
3. *Auto Connect*: When Auto Connect is enabled (checked), the RT Tuner program will attempt to connect to the emulator when you start the program. If you uncheck this option, the program will not auto connect and you will have to manually connect to the emulator when its needed.

Status Bar

The RT Tuner program has a new status bar at the bottom of the main screen. This status bar provides information about the status of the connection to the emulator.



The status bar contains three sections.

1. **Calibration Status**: The calibration status section of the status bar is the section to the left and contain an indicator light and a description. This section describes the status of the calibration changes you have made from the RT Tuner program. There are four states that you may see.
 - A. **Synchronized – Green**: This state indicates that the calibration information in the RT Tuner program and the emulator are the same.
 - B. **Not Synchronzied – Red**: This indicates that the RT Tuner and the emulator do not have the same calibration information. The RT Tuner will not send real-time updates to the emulator if the calibration information is not synchronized.
 - C. **Busy – Yellow**: This state means that the RT Tuner program is in the process of sending changes to the emulator. As soon as the process is completed successfully, the status will return to Synchronized.
 - D. **Change Pending – Orange**: This shows that you are in the process of making a calibration change that has not yet been sent to the emulator.
2. **General Messages**: The center of the status bar gives you general messages regarding the emulator and the connection. When you first connect to the emulator, this section will show the emulator ID and the firmware version.
3. **Connection Status**: Like the first, the third section contains an indicator light and a description area. This section shows the status of the connection to the emulator and has three states:
 - A. **Connected-Auto Update On – Green**: This indicates that the RT Tuner program is connected to the emulator and the Auto Update function is enabled.
 - B. **Connected-Auto Update Off – Yellow**: This indicates that the RT Tuner program is connected to the emulator but that the Auto Update function is disabled.

- C. Not Connected – Red: This state will be displayed if the RT Tuner program is not connected to the emulator.

Real-Time Calibration Changes

Each time you ‘complete’ a calibration change from the RT Tuner program, the program automatically send the change to the emulator and the change takes effect as soon as the transfer is complete.

When a calibration change is ‘completed’ depends on how you make the change from the Tuner program. In general if you are using the mouse to make changes such as by using the slider bar or the ‘up/down’ arrows to adjust a constant, the change is complete as soon as you release the mouse button. Similarly, if your making a change by dragging a point on a graph, the change is not complete until you release the mouse button.

If you are changing table values using the table cell edit, add, subtract, fill or scale functions, the change is complete when you click on the ‘OK’ button.

One special case is when you are editing a constant by typing a new value directly into the constant value box. There are several things that complete this change so the program can send the new value to the emulator. The following events will complete this type of change:

1. You press the ‘Enter’ key.
2. You click on another constant in the Constants table.
3. Your click on the ‘Update Emulator’ button  located in the top left hand corner of the Constants table screen.
4. Click on another open table
5. Close the Constants table.

Until one of these events occurs the new value will not be sent to the emulator and the Calibration Status with show and orange light and say ‘Change Pending’.