

C.A.T.S. RT Tuner Instruction Addendum For Current Tuner Users

Introduction

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

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 AutoProm supports EPROMs up to 512K in size.

The Romulator and AutoProm emulators do not support the '94/95 LT1 FLASH based PCMs 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 that 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 updates 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 cannot 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 emulator 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 that you only need to do once. You're now ready to connect the emulator 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 Romulator' from the 'Tools' menu or you can click on the *Program Romulator* 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 start 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 Romulator' from the 'Tools' menu or click on the *Connect to Romulator* 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 Romulator' from the 'Tools' menu or you can click on the *Program Romulator* button  in the main toolbar.
2. If you have a valid calibration already stored in the emulator, you can read the calibration in the Romulator into the RT Tuner program by selecting 'Read Romulator' from the 'Tools' menu or click on the *Read Romulator* 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 Romulator*: Clicking this function will force the RT Tuner program to connect to the emulator.
2. *Read Romulator*: Clicking on this selection will 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 Romulator*: 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 buttons have been added to the main program toolbar. These buttons are the *Connect to Romulator* button , the *Read Romulator* button , and the *Program Romulator* 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.

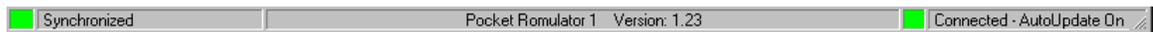
1. *Comm Port Setup*: This option allows you to force the RT Tuner program to use the specified port as the first serial port on which to search for the emulator.
2. *Auto Update*: Normally whenever you make a calibration change from the RT Tuner program, the program will immediately send the change to the emulator. If you need to make 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 contains 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 Synchronized – 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 Romulator' 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'.

C.A.T.S.
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