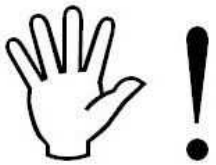
Instruction Manual

PERFORMANCE ELECTRONICS

30-71XX
Infinity
Quick Start Guide



STOP!

THIS PRODUCT HAS LEGAL RESTRICTIONS.
READ THIS BEFORE INSTALLING/USING!

WARNING! THIS IS A RACE ONLY PRODUCT MANUFACTURED AND SOLD FOR INSTALLATION ON VEHICLES DESIGNED TO BE USED SOLELY FOR COMPETITION PURPOSES. ONCE THIS PART IS INSTALLED, THE VEHICLE MAY NEVER BE USED, OR REGISTERED OR LICENSED FOR USE, ON A PUBLIC ROAD OR HIGHWAY. IF YOU INSTALL THIS PART ON YOUR VEHICLE AND USE THE VEHICLE ON A PUBLIC ROAD OR HIGHWAY, YOU WILL VIOLATE THE CLEAN AIR ACT AND MAY BE SUBJECT TO PERSONAL CIVIL OR CRIMINAL LIABILITY, INCLUDING FINES OF UP TO $4,819 PER DAY.

IT IS THE RESPONSIBILITY OF THE INSTALLER AND/OR USER OF THIS PRODUCT TO ENSURE THAT IT IS USED IN COMPLIANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. IF THIS PRODUCT WAS PURCHASED IN ERROR, DO NOT INSTALL AND/OR USE IT. THE PURCHASER MUST ARRANGE TO RETURN THE PRODUCT FOR A FULL REFUND.

THIS POLICY ONLY APPLIES TO INSTALLERS AND/OR USERS WHO ARE LOCATED IN THE UNITED STATES; HOWEVER CUSTOMERS WHO RESIDE IN OTHER COUNTRIES SHOULD ACT IN ACCORDANCE WITH THEIR LOCAL LAWS AND REGULATIONS.

WARNING!

Improper installation and/or adjustment of this product can result in major engine/vehicle damage. For technical assistance visit our dealer locator to find a professional installer/tuner near you.

Note: AEM holds no responsibility for any engine damage or personal injury that results from the misuse of this product, including but not limited to injury or death.

AEM Performance Electronics
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Instruction Part Number: 10-71XX_Series3
Document Build 1/20/2021

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Wiring Harness

Introduction

Software Download Notice

The latest Infinity Tuner PC software is available for download at http://www.aemelectronics.com/?q=products/support/software-downloads.

The latest AEMData analysis software is available for download at http://www.aemelectronics.com/?q=products/support/software-downloads

The latest firmware for your Infinity ECU is available at http://www.aeminfinity.com. Follow the instructions in this manual to install InfinityTuner and AEMData (optional) then go directly to aeminfinity.com to download your firmware.

12 Month Limited Warranty

AEM Performance Electronics warrants to the consumer that all AEM ELECTRONICS products will be free from defects in material and workmanship for a period of twelve months from date of the original purchase. Products that fail within this 12-month warranty period will be repaired or replaced when determined by AEM that the product failed due to defects in material or workmanship. This warranty is limited to the repair or replacement, at AEM's discretion, of the AEM Electronics part. In no event shall this warranty exceed the original purchase price of the AEM ELECTRONICS part nor shall AEM ELECTRONICS be responsible for special, incidental or consequential damages or cost incurred due to the failure of this product.
Warranty claims to AEM ELECTRONICS must be transportation prepaid and accompanied by dated proof of purchase. This warranty applies only to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 12-month warranty period. Improper use or installation, accident, abuse, unauthorized repairs or alterations voids this warranty.
AEM ELECTRONICS disclaims any liability for consequential damages due to breach of any written or implied warranty on all products manufactured by AEM ELECTRONICS.
Warranty returns will only be accepted by AEM ELECTRONICS when accompanied by a valid Return Merchandise Authorization (RMA) number. Product must be received by AEM ELECTRONICS within 30 days of the date the RMA is issued. UEGO oxygen sensors are considered wear items and are not covered under warranty.
Please note that before AEM ELECTRONICS can issue an RMA for any electronic product, it is first necessary for the installer or end user to contact the tech line at 1-800-423-0046 to discuss the problem. Most issues can be resolved over the phone. Under no circumstances should a system be returned, or an RMA requested before the above process transpires. AEM ELECTRONICS will not be responsible for products that are installed incorrectly, installed in a non-approved application, misused, or tampered with.
Fuel Pumps installed with incorrect polarity (+&- wires crossed) will not be warranted. Proper fuel filtration before and after the fuel pump are essential to fuel pump life. Any pump returned with contamination will not be warranted.
Any AEM ELECTRONICS product, excluding discontinued products, can be returned for repair if it is out of the warranty period. There is a minimum charge for inspection and diagnosis of AEM ELECTRONICS parts which are out of warranty. Parts used in the repair of AEM ELECTRONICS electronic components will be extra. AEM ELECTRONICS will provide an estimate of repairs and must receive written or electronic authorization before repairs are made to the product.
Need additional help? Contact the AEM Performance Electronics tech department at 1-800-423-0046 or email us at tech@aemelectronics.com.

Kit Contents

Infinity Series 3 Contents

Background

The Infinity platform is very different from previous generation AEM EMS products. The hardware (circuit board assembly) is designed around a very advanced automotive grade microcontroller (processor or “chip”). Several layers of software reside on this chip that allow for real time firmware programming without the need to write computer code. This technology has allowed AEM to develop advanced control models never before used on other AEM EMS products. We’ve listened to our customers over the years and have attempted to simplify the tuning process by employing an airflow based fuel control model eliminating many of the lookup and trim tables from previous generation ECUs. The look and feel is very different and it may take some time to adjust to the new tuning environment.

Our new tuning tool, Infinity Tuner is also a brand new product built from the ground up to interface with the new hardware. It features a modular design that allows users and developers to build completely customized templates and even design “plug in” applications that can automate many tuning tasks. Unlike previous AEM Setup Wizards in older products like AEM Pro and AEM Tuner, the Infinity Tuner Setup Wizard “plug in” is a completely stand-alone application that will evolve with Infinity Tuner. It is much more integrated with the ECU hardware and performs complex validation checks for all requested changes.

Among other things, Infinity Tuner is a powerful math processor. In addition to supporting standard global units and math functions, special features allow users to create completely custom conversion channels for table data. Virtually any function can be employed to display data in different formats or units. Math functions are also used for table edits. ANY MATH function can be used not just a list of pre-defined selections. Advanced users will really enjoy the flexibility this feature adds.

A built-in logging playback/controls synchronization feature allows tuners to view live plot data and make changes to their calibration values on the fly, knowing exactly where the ECU was accessing table data. For more detailed post processing of data, AEM offers its new analysis package, AEMdata.

Software

Software Installation

Minimum computer requirements:

OS - Windows XP with .NET 4.0 framework installed
Ram - 2GB
Processor - 1 GHz
Free HD space - 600 Mb
Connectivity - USB 2.0

All current Infinity Tuner software installations are available for download from AEM at http://www.aemelectronics.com/support/SoftwareDownloads
All current firmware pakgrp files are available for download from AEM at http://www.aeminfinity.com. ***You must download and save a valid pakgrp file before proceeding with the firmware update process.***

1. Run the setup.exe. Hit Next> and follow the instructions on each page.

2. Read and accept the terms of agreement and pick your desired location for Infinity Tuner to be installed. Hit Next> and allow the software to complete installation.

3. You may now exit the Infinity Tuner installer. You can now run Infinity Tuner.

FAQ

What are the basic sensors needed?
In order to use the Infinity to its full potential you will need the following; Intake Air Temperature Sensor, Manifold Air Pressure Sensor, Coolant Temperature and a Wide Band Air/Fuel Ratio sensor.

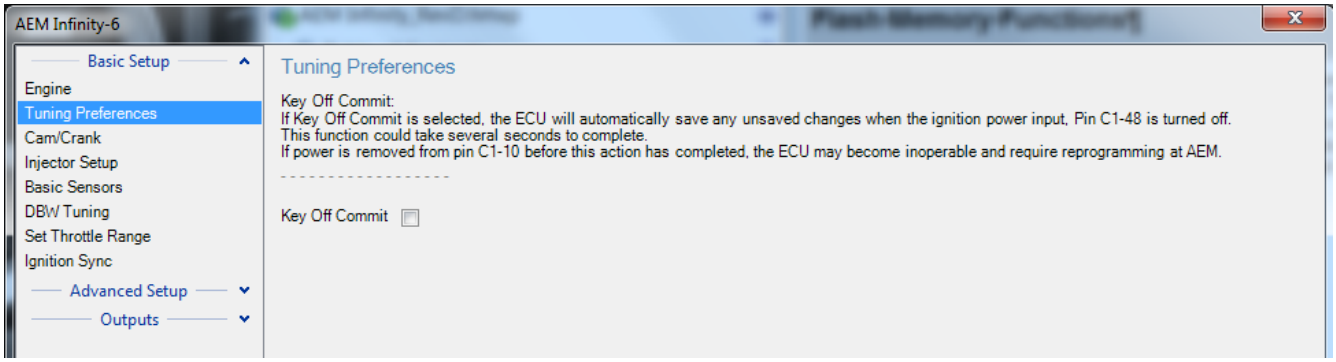
Why doesn't the Infinity work with (insert vehicle or engine description here)?
We have not had the opportunity to map the Cam and Crank profiles of that engine yet. If your cam and crank matches another vehicle we do have, it will work.

What do you mean by matching the cam and crank profile to another car?
The number of teeth on a crank trigger and cam trigger let the Infinity know where the engine position is exactly. Based on that the infinity will know when to spark, and inject fuel.

Is the Infinity Waterproof?
The enclosure includes an o-ring seal. The connectors are rated to IP67. The harness side mating connectors must be assembled in accordance with Molex recommended practices to maintain this rating. See Wiring section for more information.

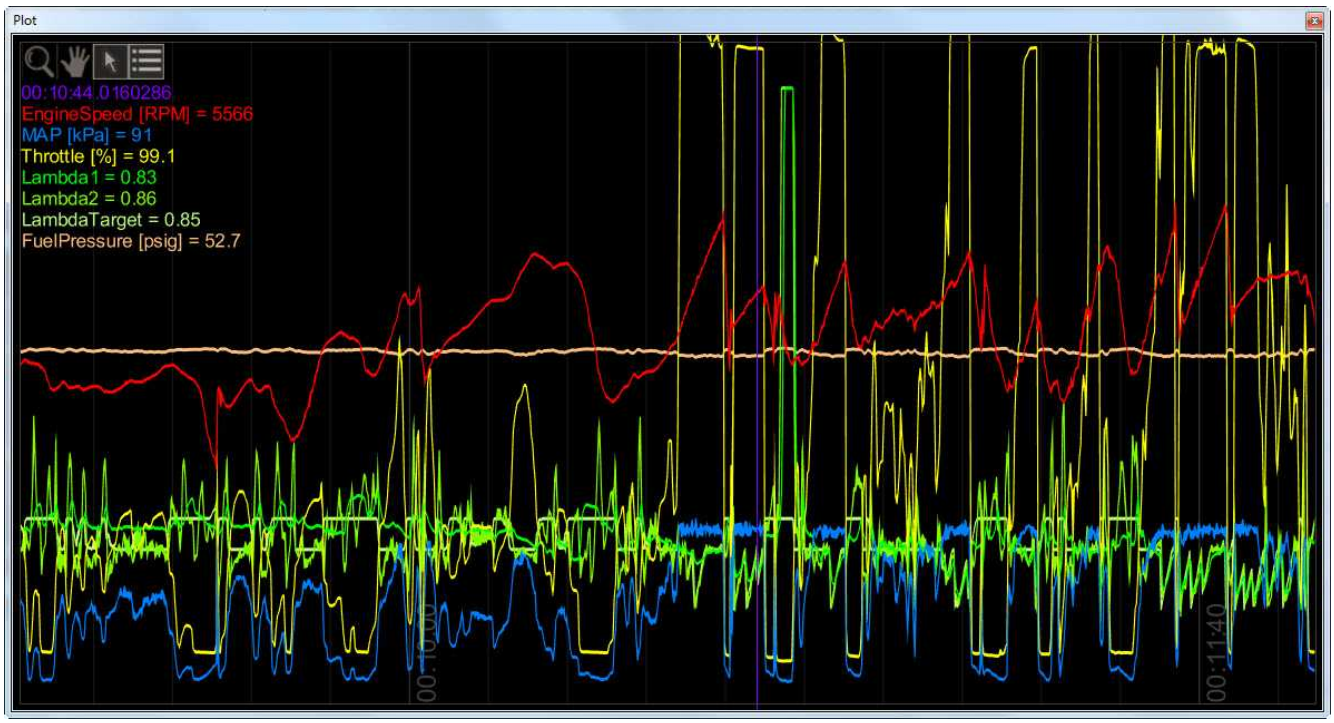
Flash Memory Functions

Changes made to calibration tables are stored on the ECU in a temporary memory location and applied immediately. In other words, while tuning live, all changes take effect immediately. They are not however immediately saved to ECUs flash memory. The menu function ECU – Commit modifications (Hot Key – CTRL + SHIFT + C) is used to save all current changes to the flash. This feature allows the user to choose what changes to save to the ECU during a tuning session. ECU – Revert modifications (Hot Key – CTRL + SHIFT + R) removes any changes not previously saved. At key off, the system will automatically commit all unsaved changes if the Key Off Commit option is checked in the Tuning Preferences Setup Wizard page. ***AEM recommends disabling the Key Off Commit options once all tuning changes are made***.



Plot Data and Control

AEM supplied layout files will come pre-loaded with several “Plot Control” windows. (Users can always add, delete or edit them as desired.) These are special controls that allow real time data logging and playback. To begin a PC log, go to the Log menu and select Start recording or hit the “CTRL + L” hot key. Select Stop recording or hit the “CTRL + L” hot key again to stop logging. A dialog will ask if you want to save the data or not. If you select “Yes,” you will be prompted to save the current session file. A session file contains all the current configuration and calibration data along with a log file. If you open that session file again, the file will be loaded and all plot controls will be populated with the recorded data.



Plot Window Tools

 Selection tool: Choose this icon by clicking on it then left click and drag through the plot window to view current data values.

 Pan tool: Choose this icon by clicking on it then left click and drag through the plot window to pan the data left or right. Hot Key – Left/Right arrow

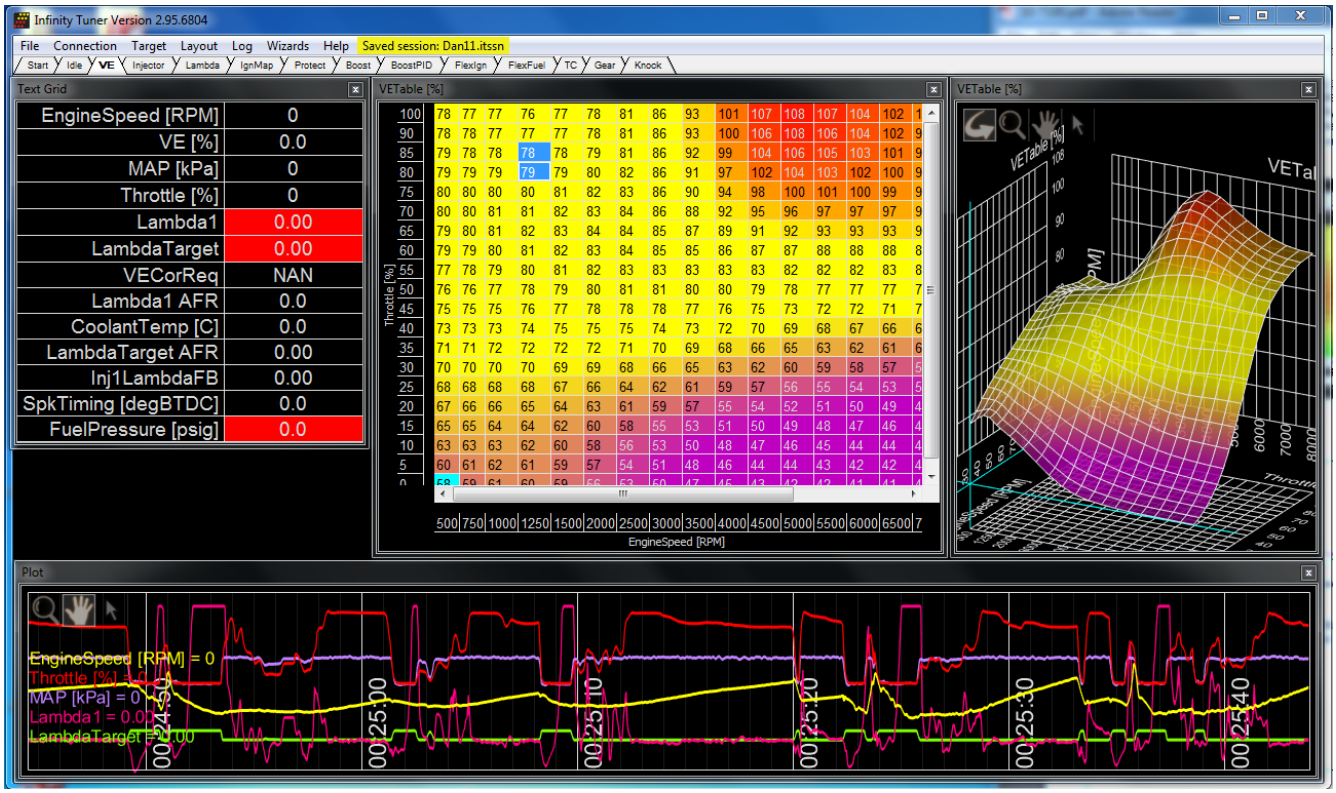
 Zoom tool: Choose this icon by clicking on it then left click and drag up and down to zoom in and out. Alternatively, a mouse scroll wheel can be used after selecting the zoom tool. Hot Key – Up arrow/Page up, Down arrow/Page down

 Show legend: Displays or hides the data legend.

Additional hot keys available in plot control window:

Home – Brings you to the start of the log
End – Brings you to the end of the log
For Home and End, the current display range is kept, so if viewing 10 seconds worth of data, Home will display the first 10 seconds while End will display the last 10 seconds.

Controls Synchronization
When the plot control is populated with data, using the selection tool and dragging through the plot will cause Infinity Tuner to synchronize all control windows to the plot data. This happens when connected to the simulator offline or when connected to the ECU via USB. To go back to viewing “live” data, go to the *Log* menu and select *Goto live data*.



The image above shows plot data sync'd to control windows. All table cursors update with their position relative to the logged data in the plot control. Note that in this mode, table edits are still possible.

Infinity Hot Keys - Quick Reference

Commonly used Hot Keys.

Action	Default Key
Open saved session	CTRL + SHIFT + O
Save session	CTRL + SHIFT + S
Open layout	CTRL + O
Save layout	CTRL + S
Connect USB	CTRL + SHIFT + U
Disconnect USB	CTRL + SHIFT + D
Go to main window	ESC
Toggle to next control window	TAB
Toggle to previous control window	SHIFT + TAB
Next layout page	CTRL + TAB

Previous layout page	CTRL + SHIFT + TAB
Start/stop PC logging	CTRL + L
Commit modifications	CTRL + SHIFT + C
Revert modifications	CTRL + SHIFT + R
Select all	CTRL + A
Increase selected cells by 1%	=
Decrease selected cells by 1%	—
Increase selected cells by 5%	SHIFT + =
Decrease selected cells by 5%	SHIFT + —
Increase selected cells by 10%	CTRL + =
Decrease selected cells by 10%	CTRL + —
Add 1 to selected cells	U
Subtract 1 from selected cells	D
Add 10 to selected cells	CTRL + U
Subtract 10 from selected cells	CTRL + D
Smoothing using four neighboring cells	CTRL + 0
Smoothing using eight neighboring cells	CTRL + 1
Simple horizontal interpolation for 2D tables	H
Simple vertical interpolation for 2D tables	V
Simple horizontal interpolation for 1D tables	X
Two-way interpolation using selection corners	C
Two-way interpolation using selection edges	E

Hardware

Serial Number

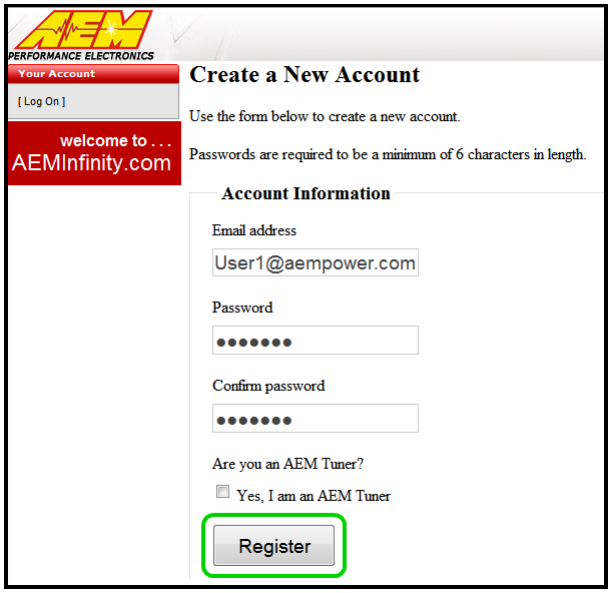
All Infinity ECUs are serialized. Be sure this identification tag stays intact. Write the number down to be safe. Infinity ECUs are programmed with cryptographically secure firmware files and each ECU has a unique file set. The serial number is used to identify the correct files for your ECU.

Account Registration

Note: Hardware part numbers shown in the screen shots below are examples only. Refer to your individual ECU part number and serial number when filling out registration information.

1) Go to http://www.aeminfinity.com and click on the “Register Here” button.

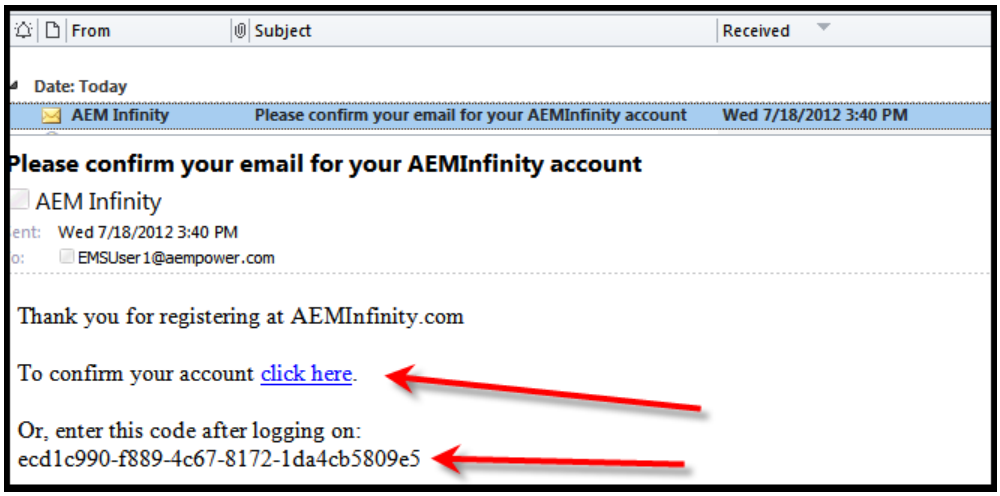
2) Enter required information and click the "Register" button.



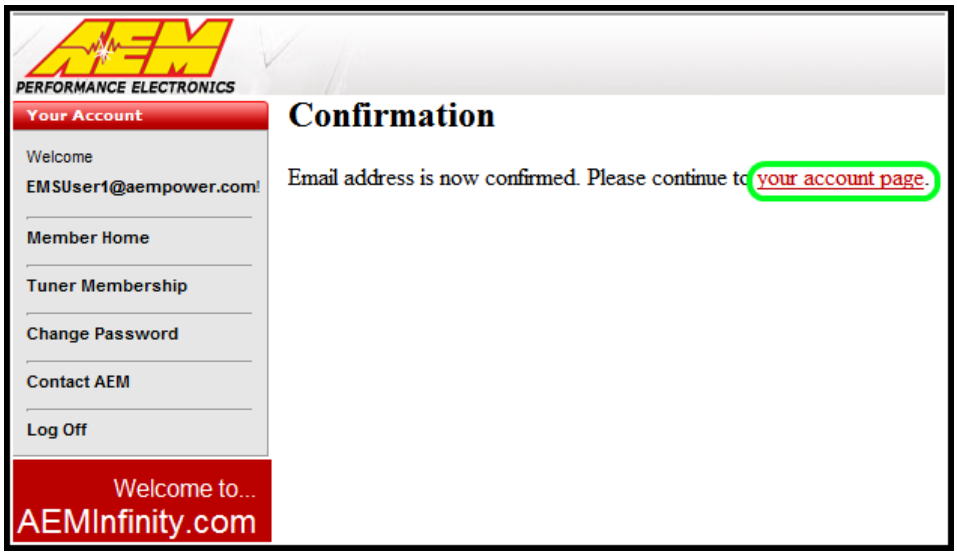
A confirmation email will be sent to the supplied email address. Choose one of the following options:

a. Click on the "click here" link.

b. Or, copy the code and enter it into the Confirmation Code Box.



3) After entering the code, click on the “Confirm” button.

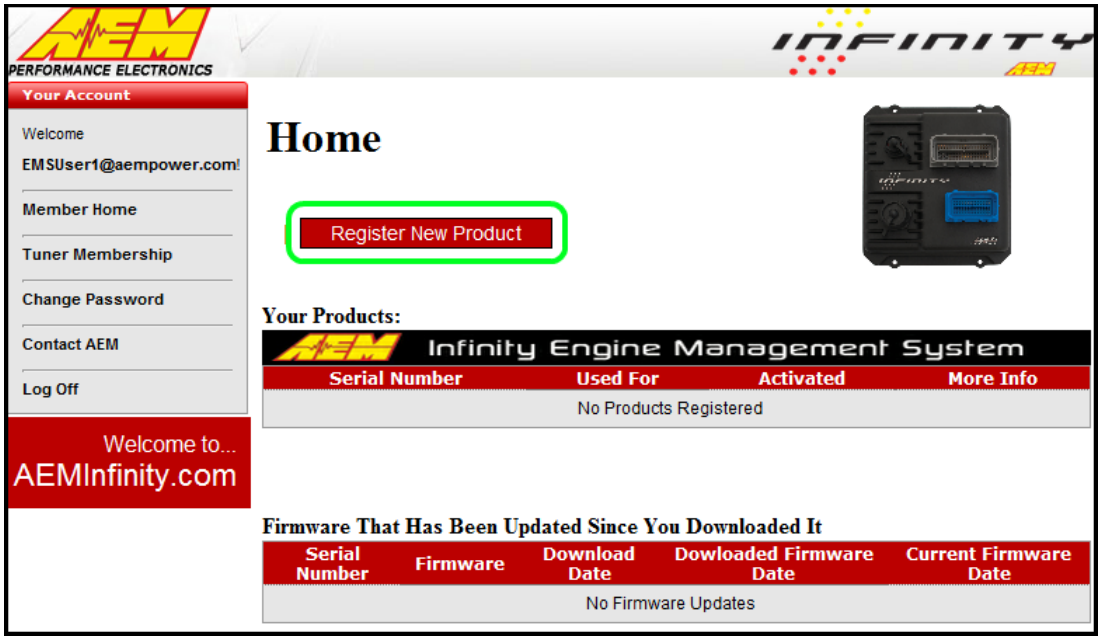


4) Click on the “your account page” to continue with ECU registration; otherwise click the “Log Off” button.

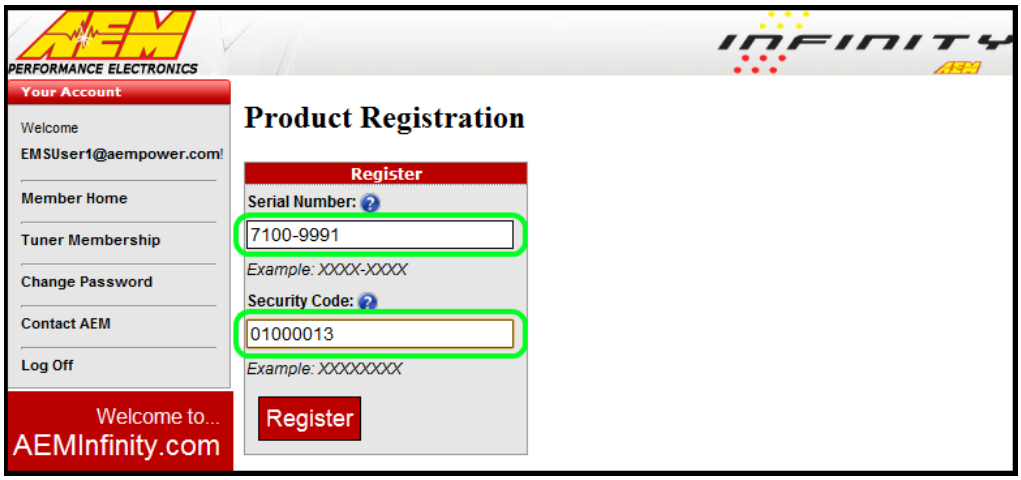
AEM Infinity ECU Registration

1) Go to http://www.aeminfinity.com and log in to your account.

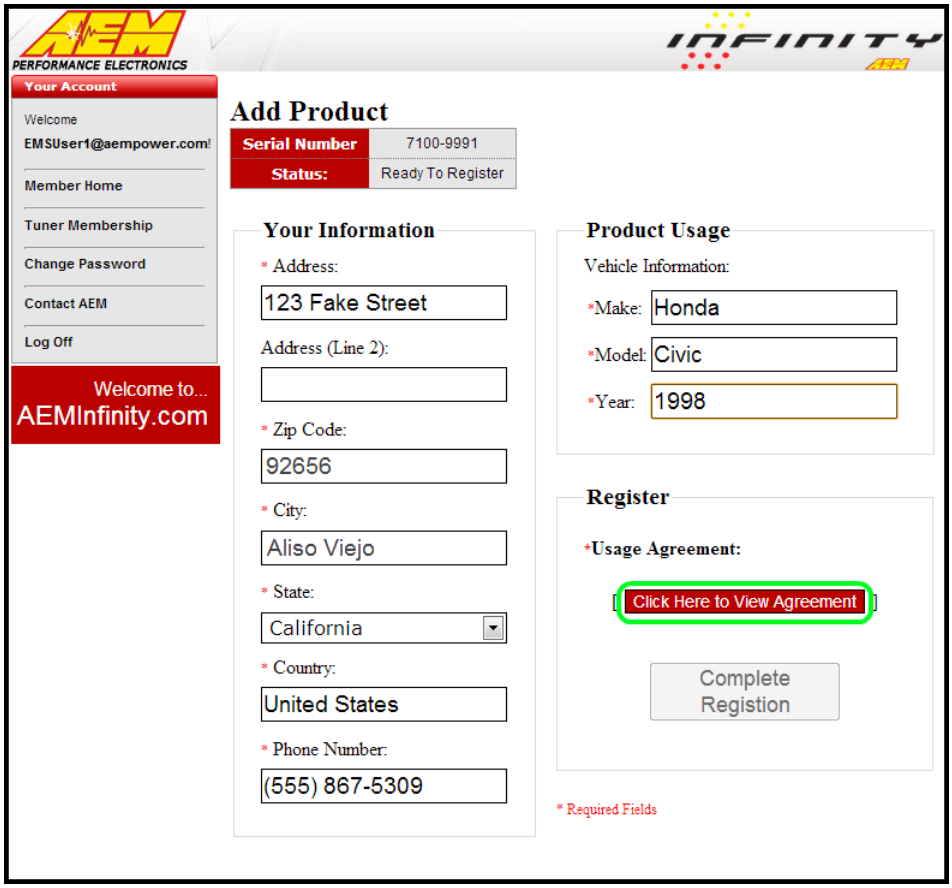
2) Click on the “Register New Product” button.



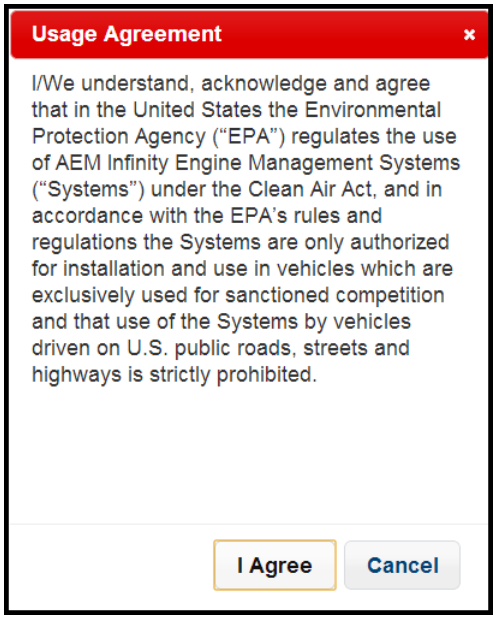
3) Enter the Serial Number and Security Code. Serial Number is found on sticker on ECU case. Security Code is included in ECU packaging.



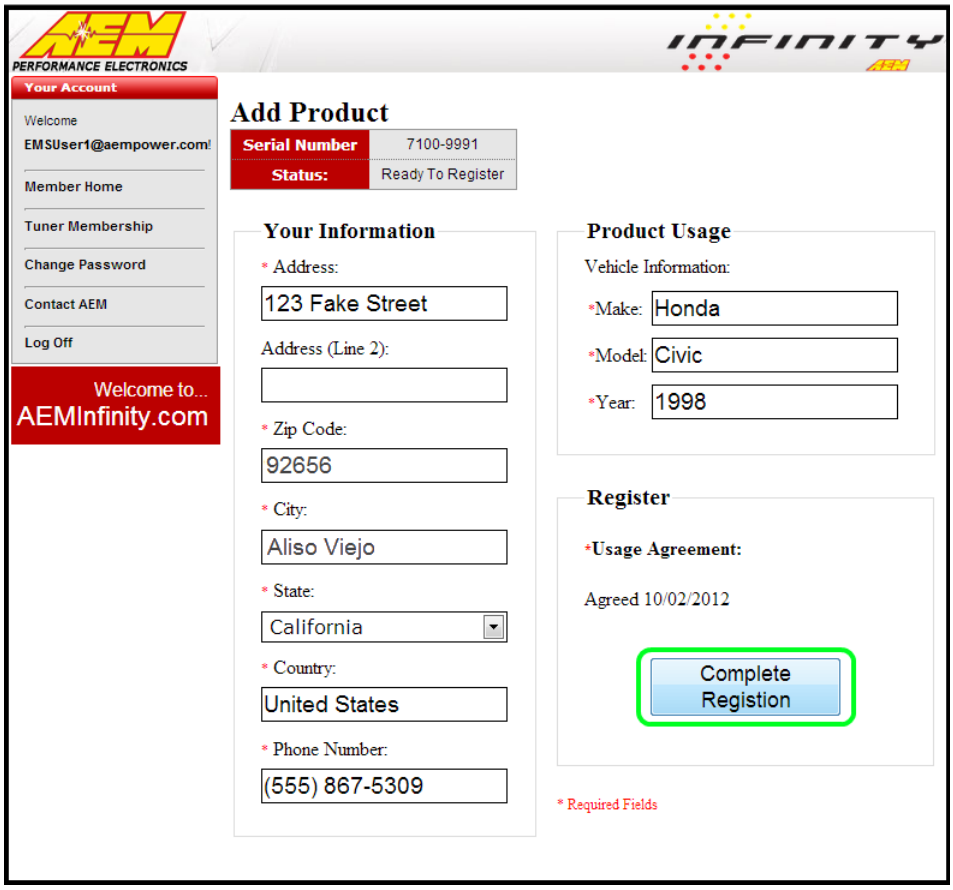
4) Enter Product Registration Information. You must first read and accept the Agreement before completing registration.



5) Read and then accept Usage Agreement by selecting the “I Agree” button.



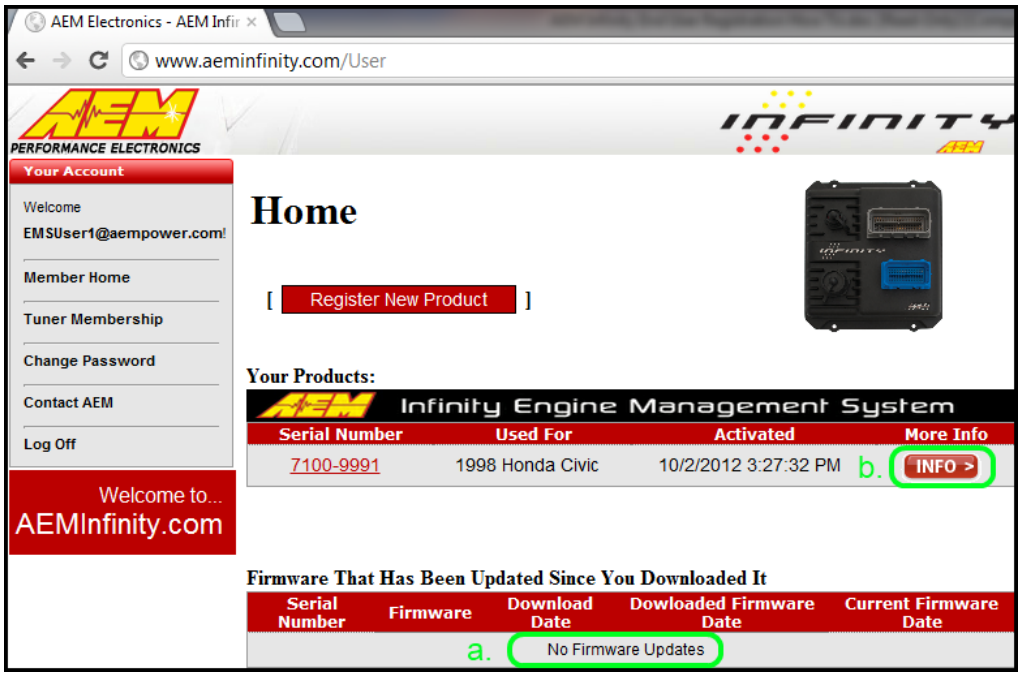
6) Click the "Complete Registration" button once the Usage Agreement has been accepted.



Firmware and Configuration Updates

1) Go to http://www.aeminfinity.com and log in to your account.

2) Locate Firmware and Configuration updates. Check for Firmware Updates since last downloaded. Click the "INFO" button to locate Firmware and Configuration files.



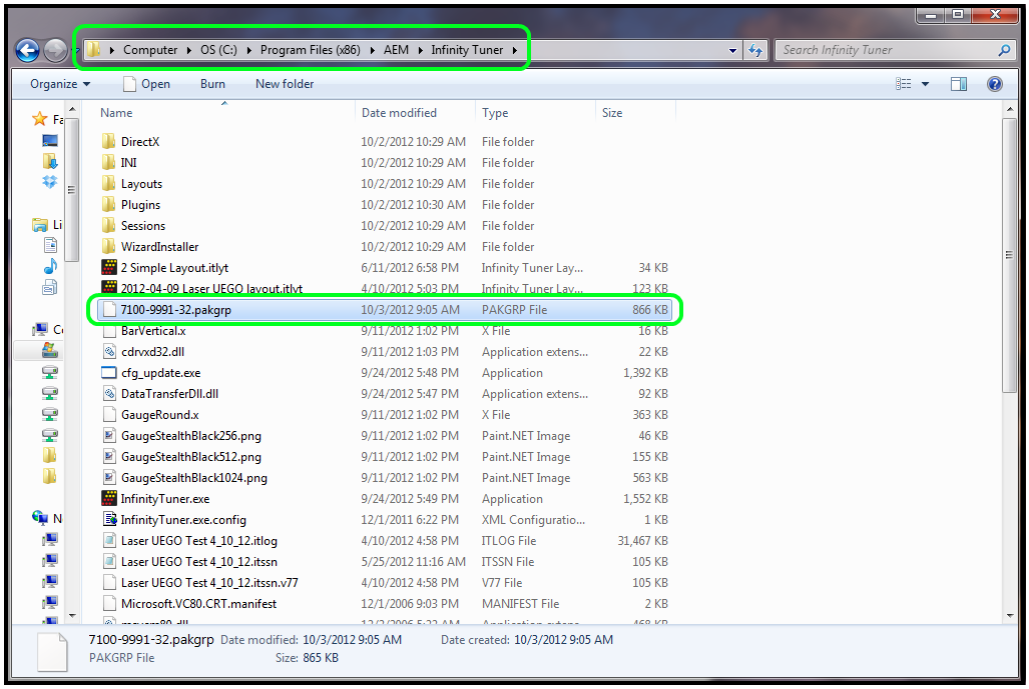
3) Locate the desired Configuration file and click the "Download" button. The Configuration file includes the Firmware and the Configuration files as a .pakgrp file.

Available Software:

Infinity Engine Management System

File	Configuration	Created
Download	v96.1 Inf-10 Universal	5/20/2015 2:49:43 PM
Download	v96.1 Inf-10 Semi-Seq	5/20/2015 2:49:43 PM
Download	v96.1 Inf-10 Ford Coyote	5/20/2015 2:49:42 PM
Download	v96.1 Inf-10 Diagnostics	5/20/2015 2:49:42 PM
Download	pre-v96.1 Legacy Peripheral Firmware	5/20/2015 2:49:42 PM
Download	Infinity-10 Ford Coyote V96	11/10/2014 2:59:49 PM
Download	Infinity-10 Semi-Sequential V96	11/10/2014 2:19:05 PM
Download	Infinity-10 Output Diagnostic V96	11/10/2014 2:19:05 PM
Download	Infinity-10 Universal V96	11/10/2014 2:19:05 PM

4) Save the .pakgrp file in the AEM Infinity Tuner directory: C:/Program Files (x86)/AEM/Infinity Tuner



aeminfinity.com file descriptions

Description of files available on aemfinity.com

The following example shows a typical list of available files on aeminfinity.com. This particular examples shows files available for an Infinity-10 ECU (now called Infinity Series 7 part number 30-7100). **The list of available files varies by ECU type and firmware release version. Your list may be different.**

Available Software:

Infinity Engine Management System

File	Configuration	Created
Download	v96.1 Inf-10 Universal	5/20/2015 2:49:43 PM
Download	v96.1 Inf-10 Semi-Seq	5/20/2015 2:49:43 PM
Download	v96.1 Inf-10 Ford Coyote	5/20/2015 2:49:42 PM
Download	v96.1 Inf-10 Diagnostics	5/20/2015 2:49:42 PM
Download	pre-v96.1 Legacy Peripheral Firmware	5/20/2015 2:49:42 PM
Download	Infinity-10 Ford Coyote V96	11/10/2014 2:59:49 PM
Download	Infinity-10 Semi-Sequential V96	11/10/2014 2:19:05 PM
Download	Infinity-10 Output Diagnostic V96	11/10/2014 2:19:05 PM
Download	Infinity-10 Universal V96	11/10/2014 2:19:05 PM

v96.1 files (the latest version)

Peripheral Micro firmware compatible with older versions

Old v96 files

The files listed in the top highlighted box are an example of the latest files with all latest features available for this hardware platform. There are four options.

1. v96.1 Inf-10 Universal - A universal pakgrp file that will work on a wide variety of different sequentially injected applications supporting up to 10 injectors and 10 coil outputs.

2. v96.1 Inf-10 Semi Seq - Same universal above but able to support semi-sequential injection setups with no cam sync

3. v96.1 Inf-10 Ford Coyote - Same as universal above but able to support certain unique hardware I/O requirements of the Ford Coyote engine

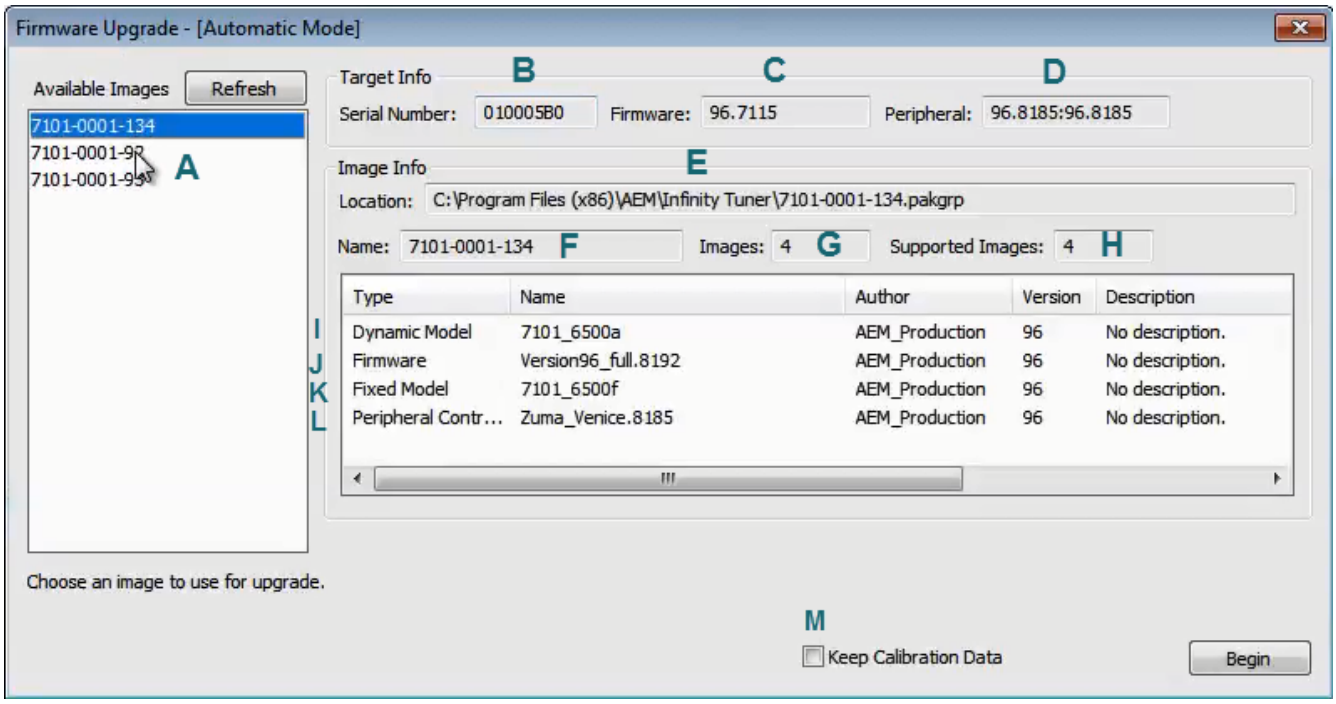
4. v96.1 Inf-10 Diagnostics - Unique model designed to provide custom diagnostics features for the Infinity-10 ECU.

The file listed in the second highlighted box is peripheral microcontroller firmware that is only necessary if reverting to older firmware versions after upgrading past v96.1.

The files listed on the third highlighted box are older files still available for download for this hardware platform. They do not have the latest features.

Firmware Update Window Layout

Firmware update window layout and definitions



(A) - Available Images
A list of configuration (pakgrp) files compatible with a particular ECU. Each Infinity ECU is unique. Pakgrp files from one Infinity ECU can not be used on another Infinity ECU. Several pakgrp files are usually available for each Infinity hardware part number. Selecting one of the items in this list will populate the Image Info window with the descriptions of all files contained in the pakgrp. **Appropriate files for your application must be downloaded from aeminfinity.com and saved on your PC in order to appear in this list. Only files appropriate for your ECU will be presented to you on aeminfinity.com.**

(B) - Serial Number
This is a unique hardware identifier number for the ECU. Although they are related, it is not the same as the ECU serial number included on the serial number sticker.

(C) - Firmware
The version of the firmware on the primary microcontroller in the Infinity ECU. This is not necessarily the version of the firmware being loaded into the ECU. It is the version being upgraded from. In the example image above, the firmware version currently loaded on the ECU is 96.7115. The version being loaded into the ECU is 96.8192.

(D) - Peripheral
The Infinity ECU includes two different microcontrollers that require firmware. This is the version of the firmware loaded into the peripheral microcontroller.

(E) - Location
The directory location of the selected pakgrp file

(F) - Name
The file name of the selected pakgrp file

(G) - Images
The number of files or "images" contained within the selected pakgrp file

(H) - Supported Images
The number of valid supported images contained within the selected pakgrp file

(I) - Dynamic Model
Infinity control model files are typically broken into two parts. The dynamic model file primarily contains tuning table data and calibration constants.

(J) - Firmware
The firmware for the primary microcontroller contained within the pakgrp file. This is the version being upgraded to.

(K) - Fixed Model
Infinity control model files are typically broken into two parts. The fixed model file primarily contains control logic math expressions and non-modifiable tuning constants.

(L) - Peripheral Controller
The firmware for the peripheral microcontroller contained within the pakgrp file. This is the version being upgraded to.

(M) - Keep Calibration Data
Select to keep the existing calibration data and import it into the new configuration during the upgrade process.

****

Pakgrp files are available to registered Infinity users at aeminfinity.com. You must download and save your pakgrp file before proceeding with the firmware update process below.

****

Firmware Update

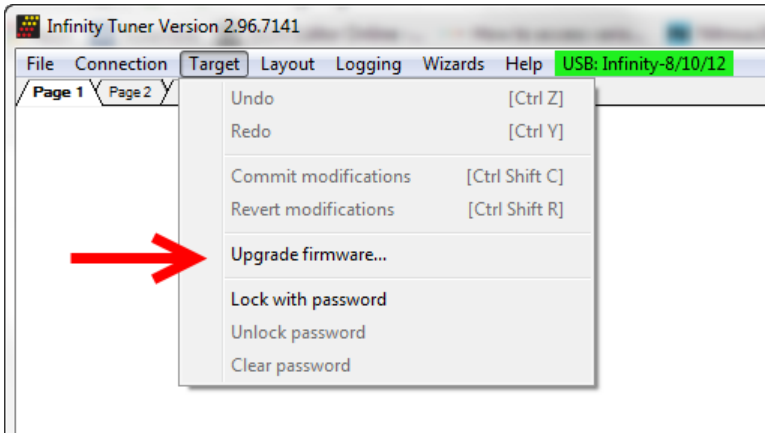
BEFORE beginning the update process, be sure to have a saved copy of your tuned session file (if needed). If a power failure occurs during the update process, this is the only way to ensure that the calibration data is not lost. A power failure at certain critical points in this process could render the ECU inoperative, requiring return and repair at AEM. Ensure the PC has a full battery charge and/or is connected to AC power. This process can take UP TO 4 MINUTES to complete, especially if the peripheral microcontroller is updated at the same time.

If the firmware version on the ECU is older than the version supported by your current version of Infinity Tuner, a firmware upgrade will be required when you connect. Otherwise, follow the procedure outlined below.

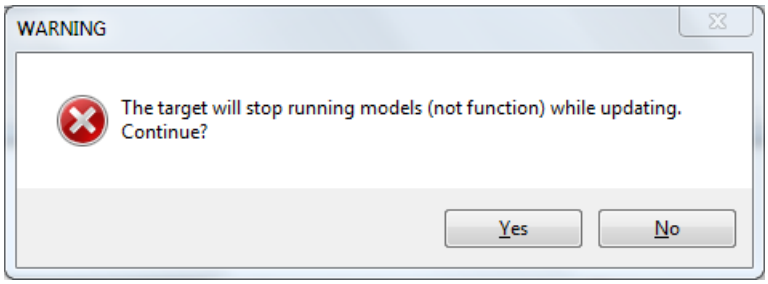
Note: The firmware update utility is periodically revised and may not match the descriptions below. In the event of a conflict, please follow the instructions provided in the dialog windows themselves or supplemental instructions provided by AEM.

1) Connect to Infinity Tuner.
   a. Plug the USB cable from the ECU into your computer USB port and key ignition ON.
   b. Open Infinity Tuner.

2) Click the ECU drop-down list and select “Upgrade firmware…”

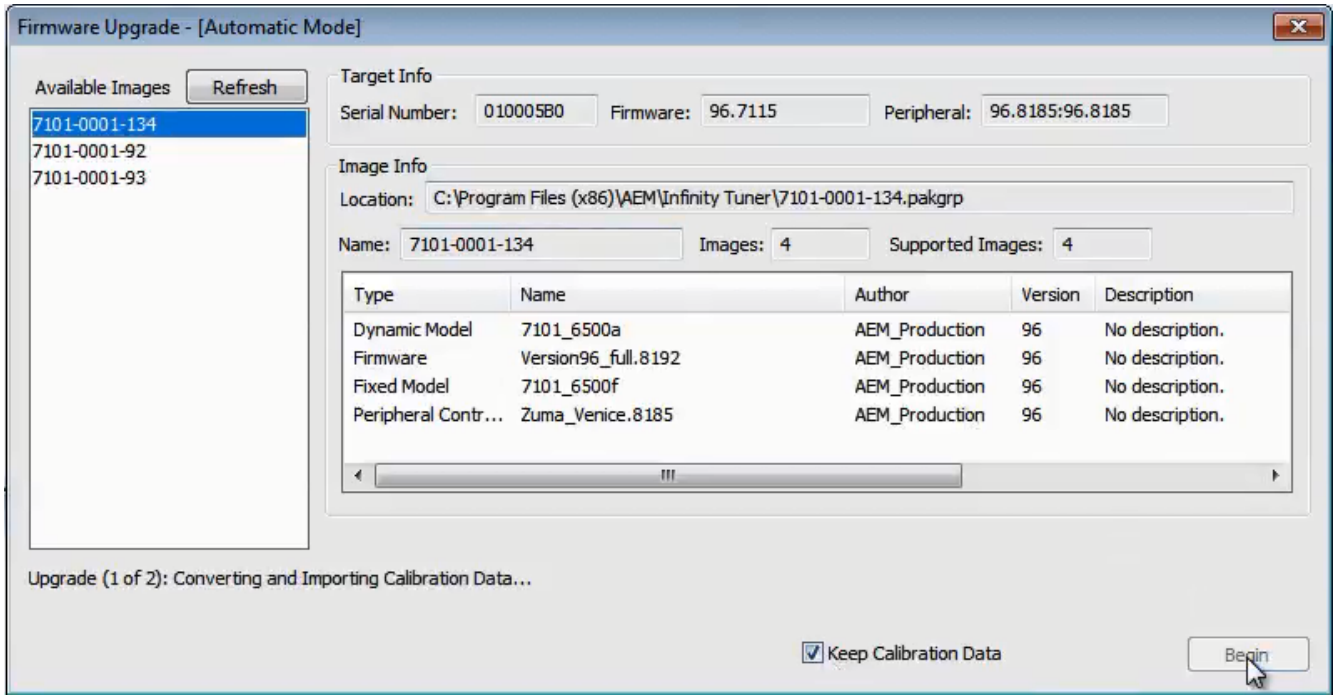


3) The ECU should not be running an engine at this time. Select “Yes” when the warning message appears.

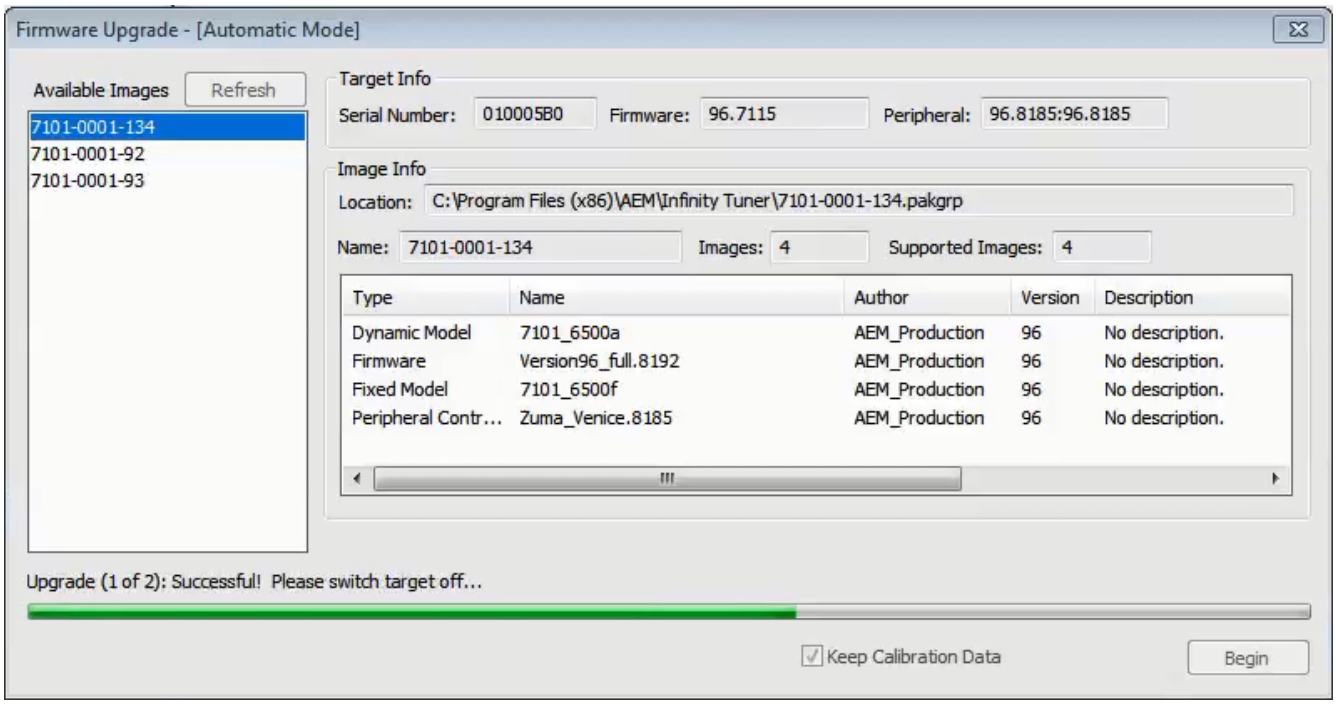


Begin the Firmware Upgrade process.

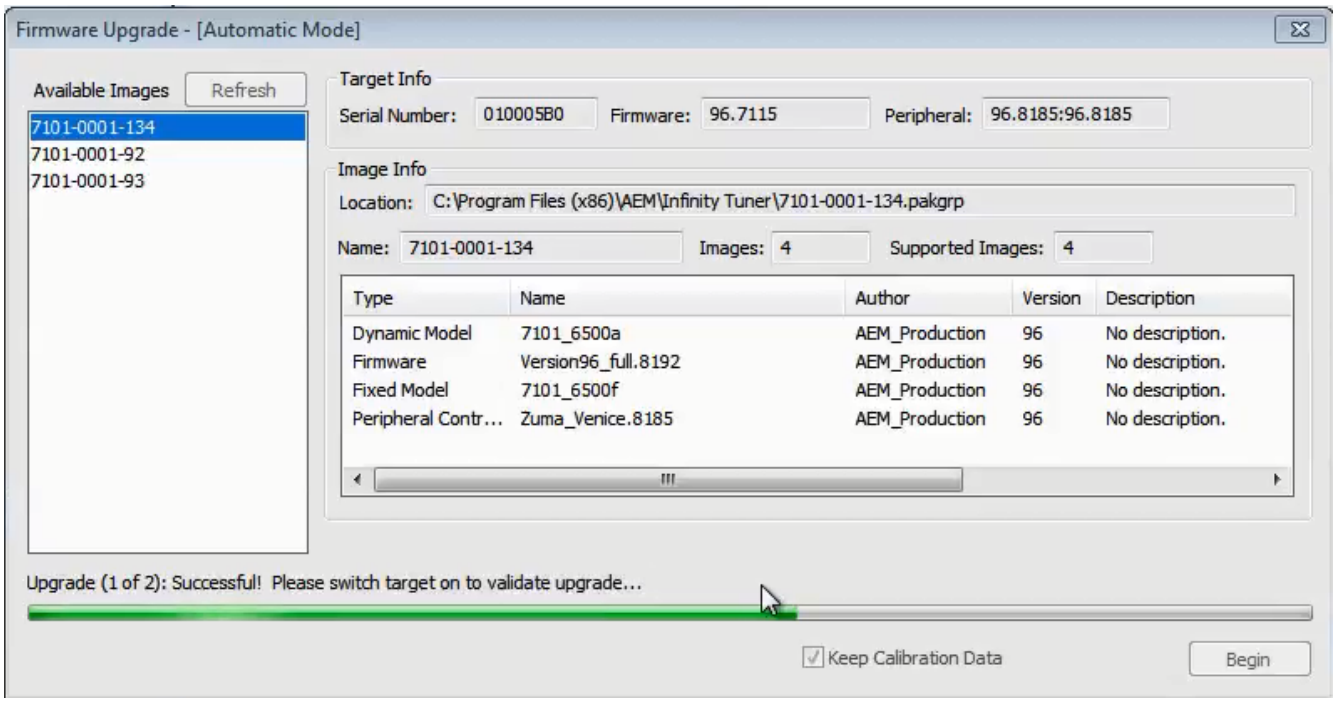
a. Select the desired Configuration “Image” on the left.
   i. If no images are present check C:\Program Files (x86)\AEM\Infinity Tuner\ and verify .pakgrp file is there. If not, visit http://www.aeminfinity.com, log in, and download appropriate file.
b. Ensure "Keep Calibration Data" check-box is marked to save current calibration.
c. Click the “Begin” button to start the upgrade process.



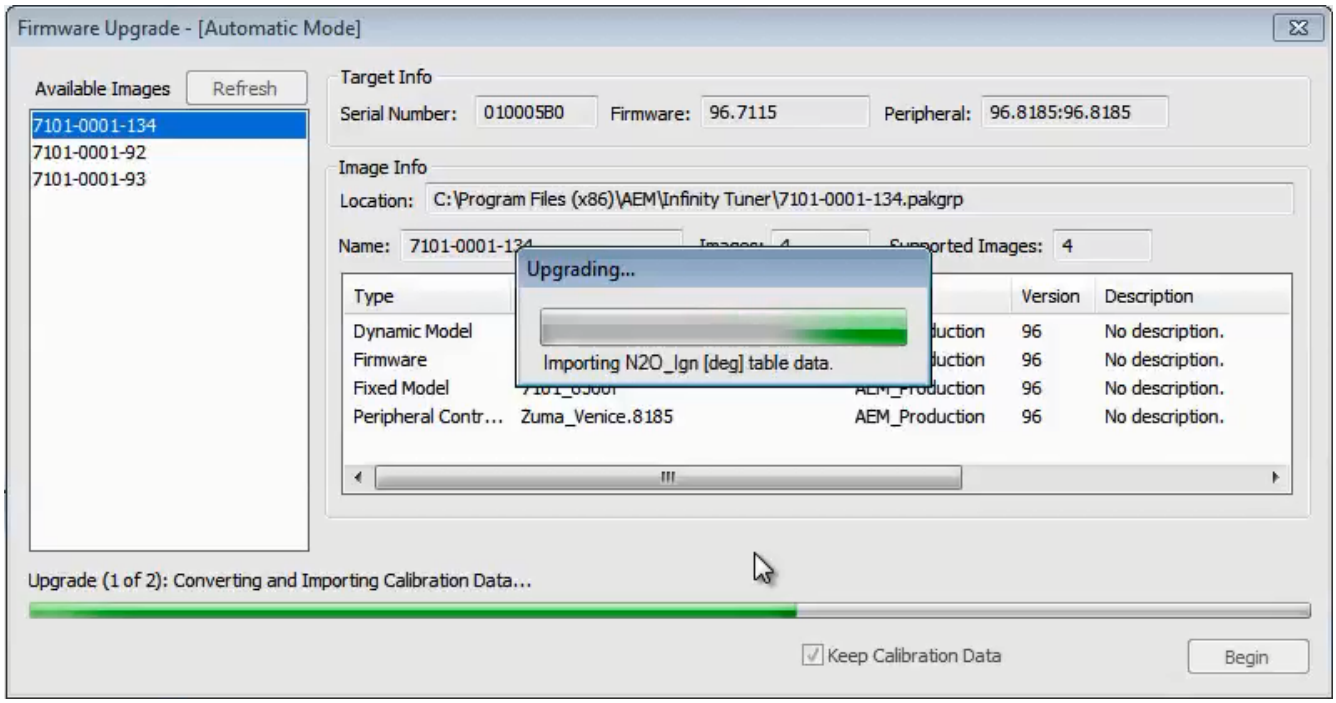
4) Follow the message at the bottom, and turn the ignition switch OFF when instructed to do so.

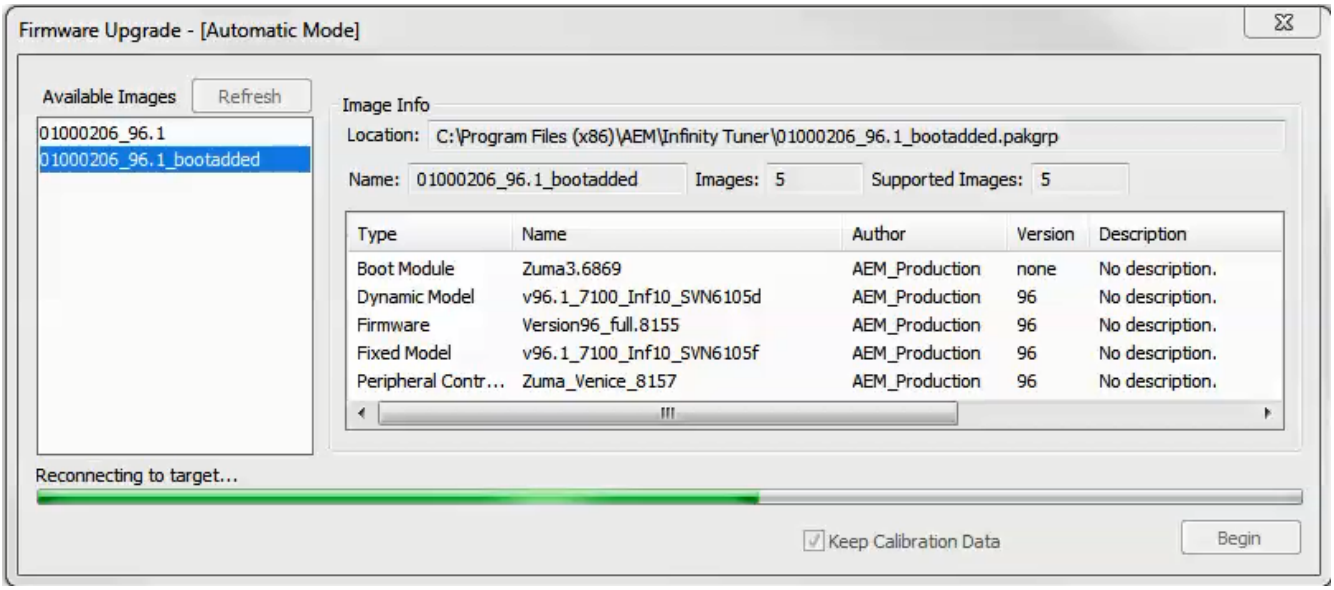


5) Follow the message at the bottom, and turn the ignition switch back ON when instructed to do so.

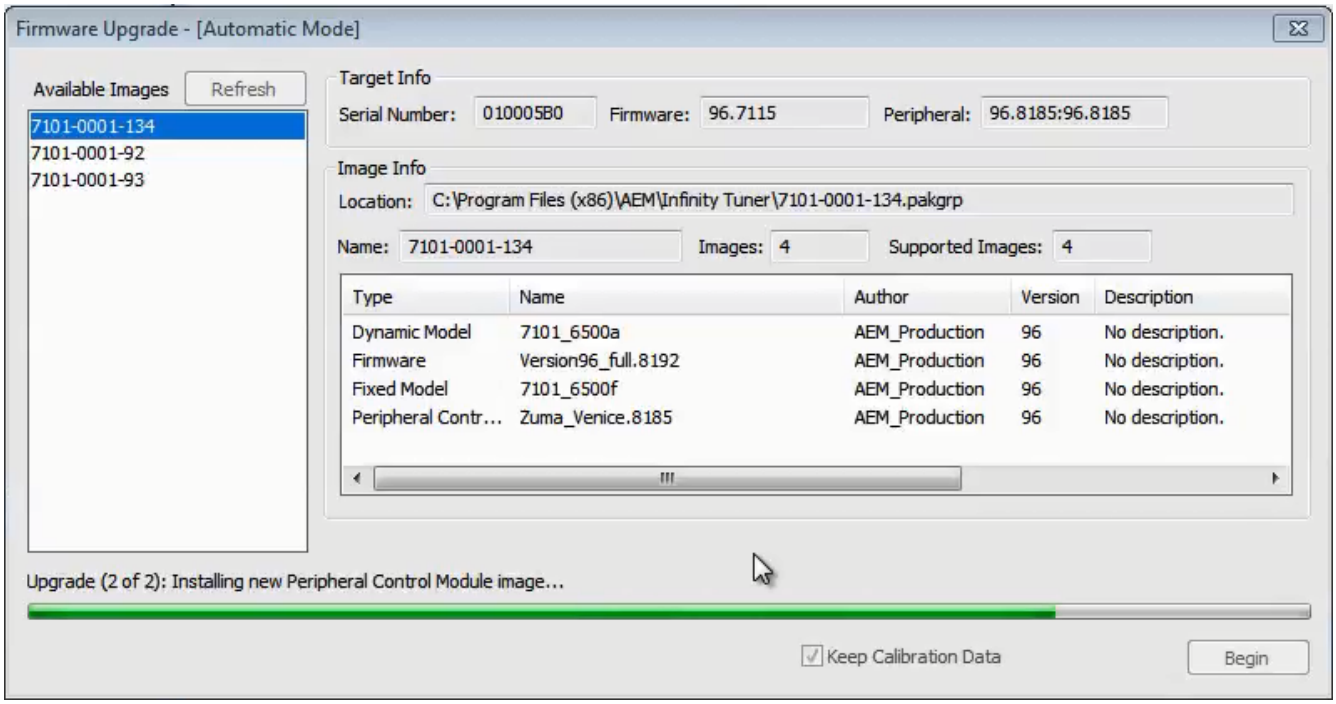


If Keep Calibration Data is checked, the system will upgrade and load all usable calibration data as shown below.

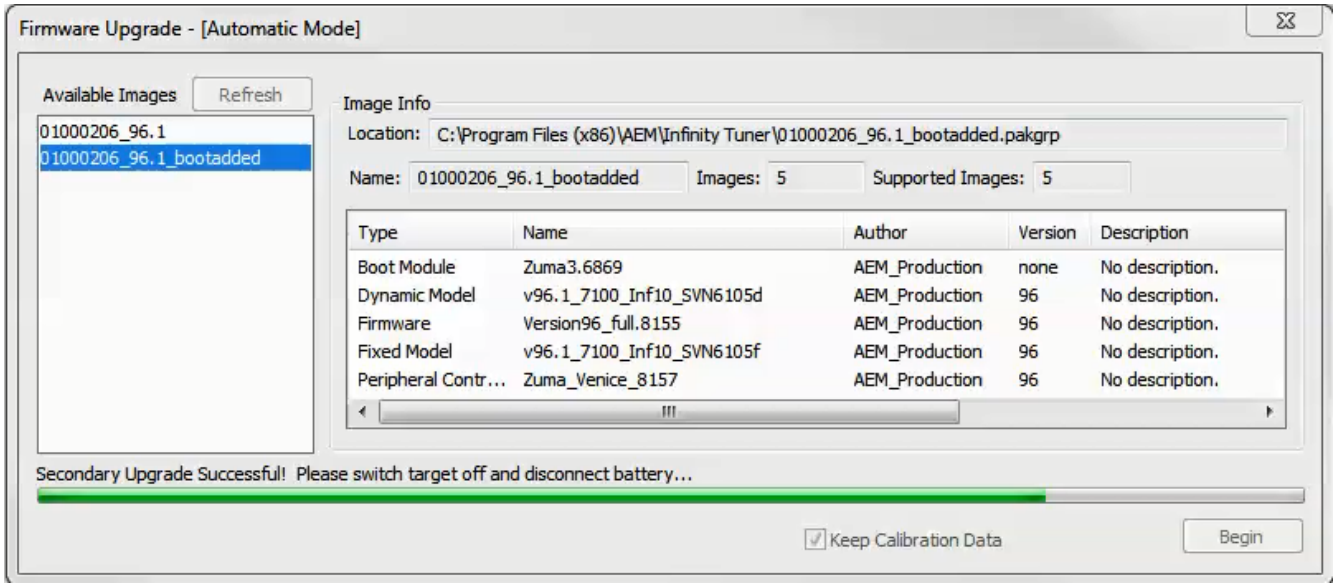




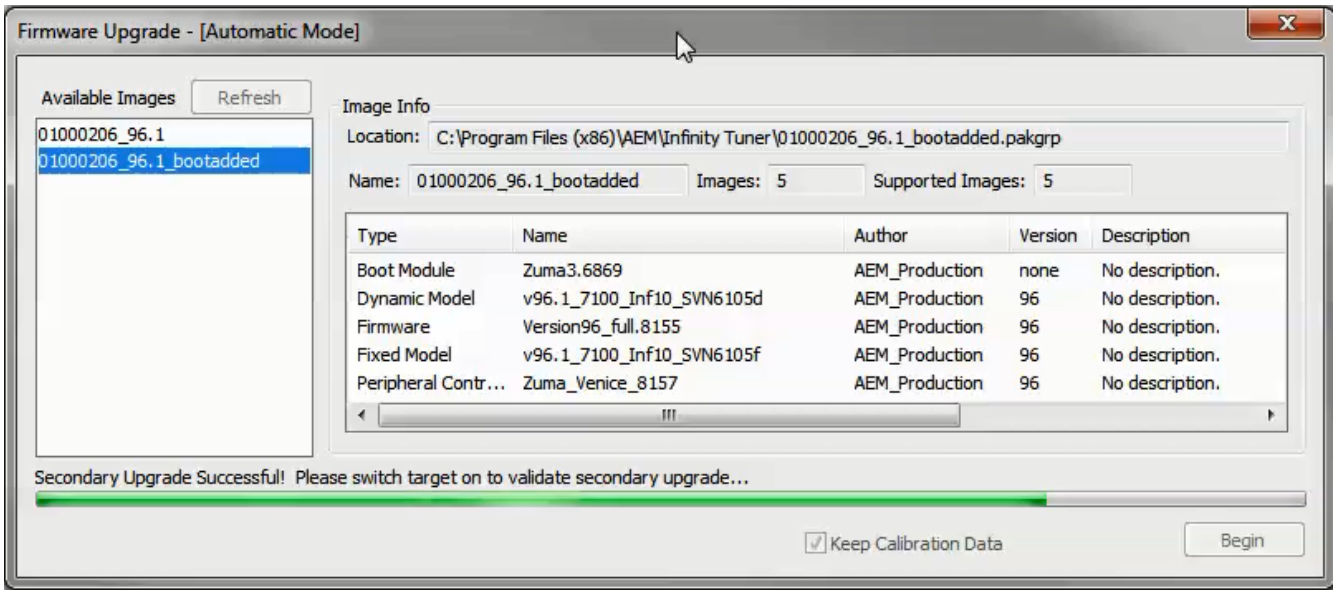
Note: at certain points in the process, the Infinity ECU will re-boot and attempt to connect with the PC. The time it takes to connect might vary for different PCs. If the process appears to hang at this stage, simply unplug and replug the USB comms connector. Often this will force the PC to re-enumerate the USB port and connect.



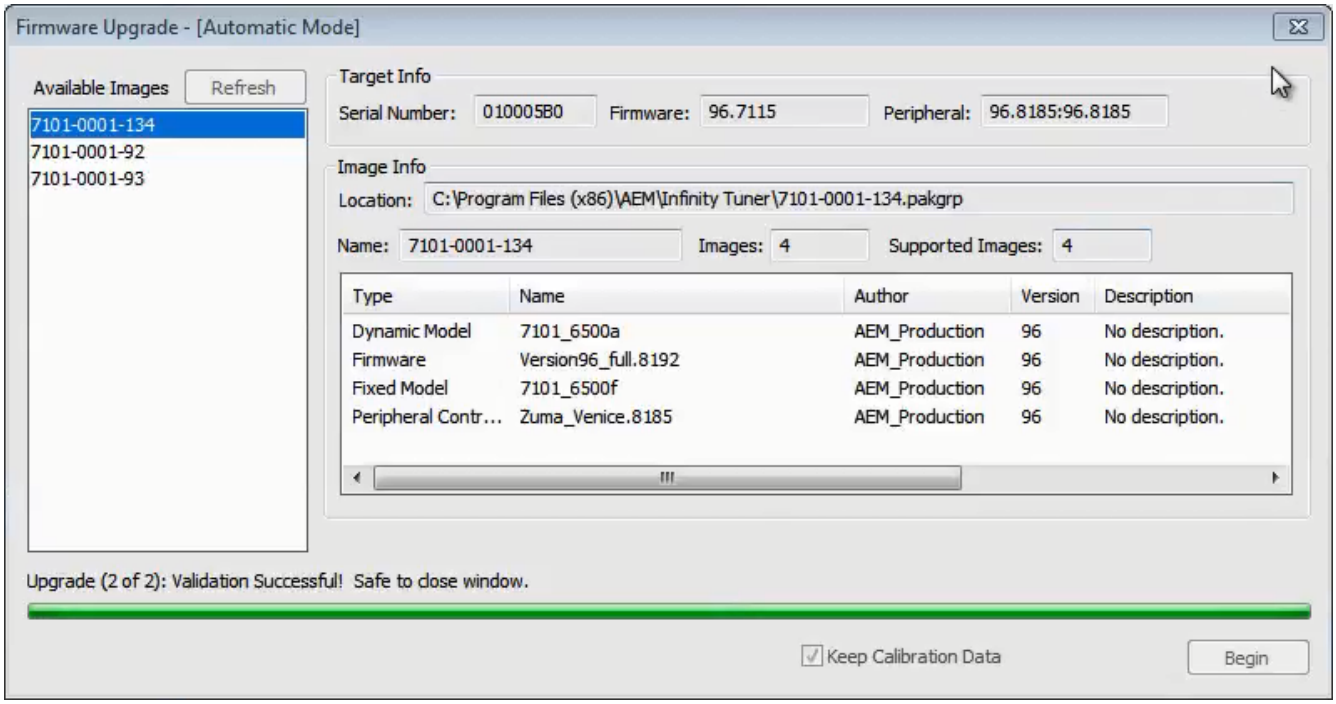
6. When the "Peripheral Control Module image" is updated, a full power reset may be required meaning either the battery needs to be disconnected and re-connected or all harness connectors need to be removed from the ECU for at least 5 seconds, then re-connected.



7. When the message below is displayed, turn the ignition switch back on.



8. When the message at the bottom indicates that it's safe to close the window, click "X" button on the top right of the window.



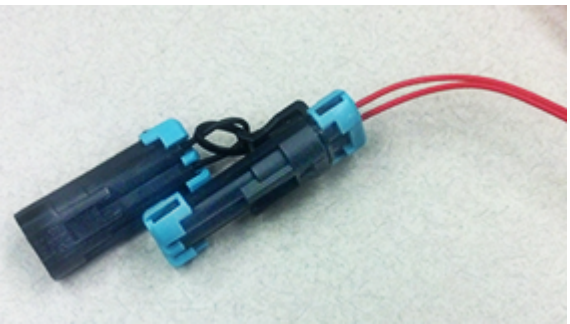
Once the update is complete, it's good practice to cycle the ignition switch to reset the hardware. Once that is done, you can connect and begin monitoring data and/or tuning again. **For applications that use a stepper motor idle valve, it's important that a full power reset be done prior to starting the engine. Turn the key off and wait at least 20 seconds before starting. This will allow the stepper valve to park and reset.**

A firmware update will erase the USB log channel list stored in the ECU memory. This channel list will need to be reset before USB logging will function correctly. Go to Logging>USB Logging – Channel Setup. This dialog allows the user to select channels for USB logging. Manually select channels by left clicking on the check box or alternately by using the arrow keys to scroll through the list and the space bar key to select. Logging lists can be saved for later use by using the Save button. The Load button will load previously saved lists of channels. The Append button will append a different list of channels onto the existing list of selected channels. Note that the list of channels for logging is saved in ECU memory. Channels can't be selected offline. They can only be selected when connected to an ECU.

ECU recovery using Flash Enable connector

Although very rare, there are sometimes situations where the ECU becomes unresponsive. In most of these cases, the ECU can be recovered using the flash enable process. When Flash Enable is used, the ECU is forced into a state where it's only function is to accept firmware files and perform no other function.

1. Ensure ignition switch is off
2. Locate Flash Enable jumper included on most AEM made wiring harnesses – plug jumper into Flash Enable connector



3. Turn ignition switch on – PC should 'chime' indicating a USB connection has been established and software will display green "Unknown Board" status bar.

USB: Unknown Board

4. Go ECU>Upgrade Firmware – firmware update window will open. Notice that ECU is in manual firmware update mode.
5. Firmware update window will show list of applicable firmware files – select desired firmware file (typically latest release version)
6. Click Begin to start firmware upload process – status bar at bottom will monitor update progress
7. Because the ECU is in manual firmware update mode, only the first of two firmware files will be loaded. This is normal and will require re-uploading the firmware again without using Flash Enable.
8. Once the firmware update process is complete, exit the firmware update window and then turn the ignition switch off. ECU should shut down immediately with no main relay shutdown delay.
9. With ignition still off, remove Flash Enable jumper.
10. Turn ignition back on and reload firmware again. Notice that when not using Flash Enable, firmware update window will indicate being in Automatic Mode and both of the firmware files will be uploaded automatically.

Firmware Upgrade - [Automatic Mode]

11. One firmware update process is fully completed, import latest saved session file.

USB & Logging Connectors

The Infinity ECU includes high quality weatherproof bulkhead USB communications. The smaller connector is for PC communications. The larger connector is for logging to a USB stick on Series 5 and Series 7 ECUs only. Series 3 ECUs do not have a USB logging capability. Plug one end of a standard USB extension cable (included) into the smaller ECU connector and the other end into an open USB port on the PC. Communication is possible only when the ECU is powered up.

CAUTION

Use care when routing USB extension cables through or around hood opening and door jambs. Cable abuse that causes an internal short can cause ECU damage.

Tuning Guide

Basic Tuning

Calibration Data

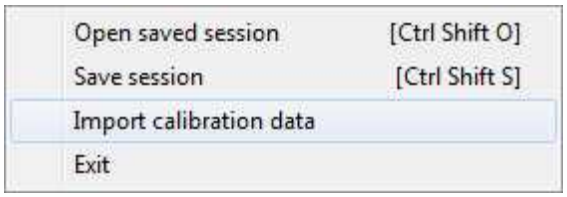
Connecting, Saving and Importing Session Data

1) With the Ignition in the ON position and InfinityTuner Running, click on the Connection menu item and select Connect to USB from the dropdown list. A progress bar will be displayed as the laptop gets the calibration info from the ECU.

2) Open a layout file by clicking on the Layout menu item and select Open. Layout files have a .itlyt extension and should be saved in the \Documents\AEM\Infinity Tuner\Layouts folder.

3) Save the session file by selecting File – Save session. Session files have a .itssn extension and should be saved in the \Documents\AEM\Infinity Tuner\Sessions\Base Sessions folder.

The default calibration data provided by AEM should be sufficient to start an engine with similar displacement, sensor setup, and injectors. Every vehicle must be tuned before use. AEM provided base calibration data is installed to the My Documents\AEM\Infinity Tuner\Sessions folder. To import calibration data from a saved session file, go to File > Import calibration data.



Wait a few moments for the operation to complete. Status messages are displayed during the process notifying the user of each step along the way. If the import function is done while connected to an ECU, after the import is complete:

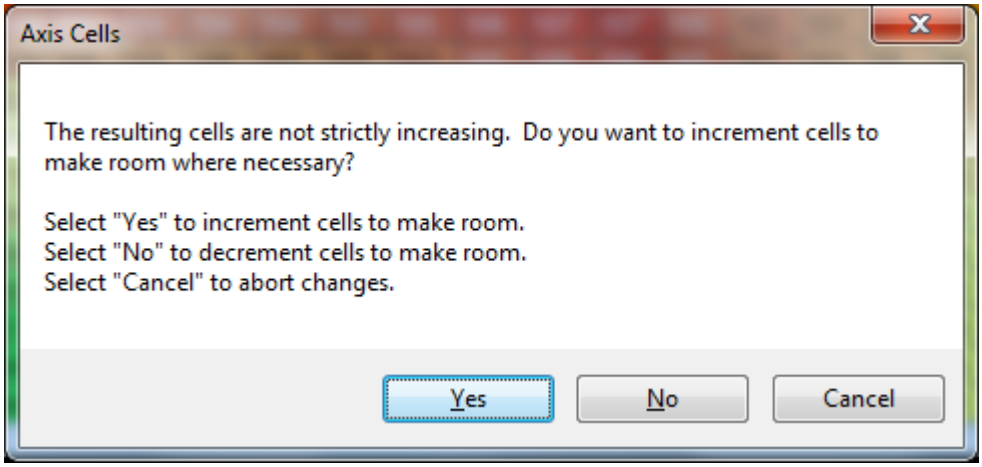
1) Turn the key off and wait for the main relay to power down completely. This usually takes about 10 seconds but depends on the model.

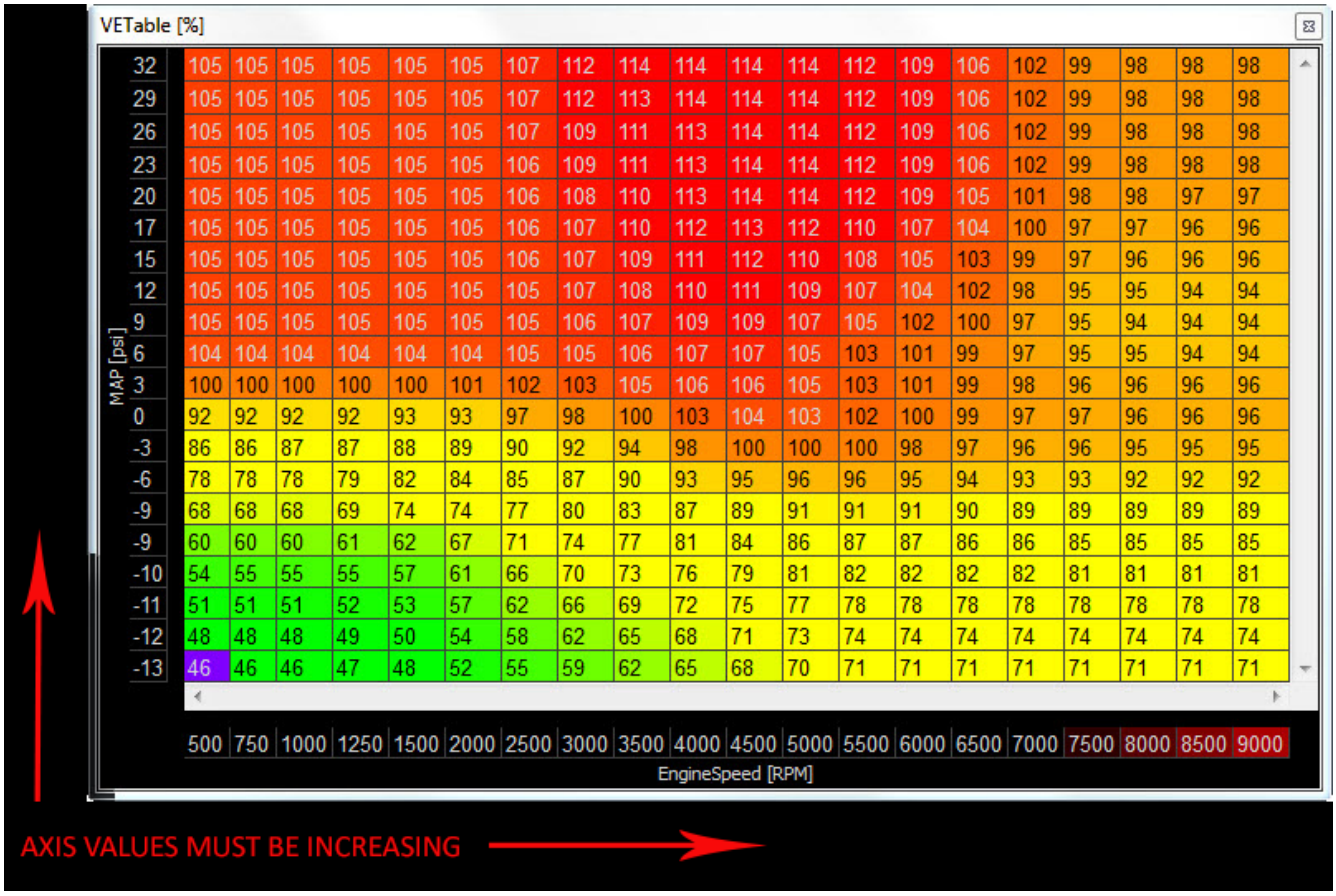
2) Turn the key back on.

Certain applications with CAN dash requirements must be powered down completely and restarted after an import calibration. If this is not done, error lights may appear on the dash.

Table axes

Table axis data must be strictly increasing. If the user attempts to enter values that do not follow this rule, Infinity Tuner will notify and attempt to solve the problem.





MAP [psi]	500	750	1000	1250	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000
32	105	105	105	105	105	105	107	112	114	114	114	114	112	109	106	102	99	98	98	98
29	105	105	105	105	105	105	107	112	113	114	114	114	112	109	106	102	99	98	98	98
26	105	105	105	105	105	105	107	109	111	113	114	114	112	109	106	102	99	98	98	98
23	105	105	105	105	105	105	106	109	111	113	114	114	112	109	106	102	99	98	98	98
20	105	105	105	105	105	105	106	108	110	113	114	114	112	109	105	101	98	98	97	97
17	105	105	105	105	105	105	106	107	110	112	113	112	110	107	104	100	97	97	96	96
15	105	105	105	105	105	105	106	107	109	111	112	110	108	105	103	99	97	96	96	96
12	105	105	105	105	105	105	105	107	108	110	111	109	107	104	102	98	95	95	94	94
9	105	105	105	105	105	105	105	106	107	109	109	107	105	102	100	97	95	94	94	94
6	104	104	104	104	104	104	105	105	106	107	107	105	103	101	99	97	95	95	94	94
3	100	100	100	100	100	101	102	103	105	106	106	105	103	101	99	98	96	96	96	96
0	92	92	92	92	93	93	97	98	100	103	104	103	102	100	99	97	97	96	96	96
-3	86	86	87	87	88	89	90	92	94	98	100	100	100	98	97	96	96	95	95	95
-6	78	78	78	79	82	84	85	87	90	93	95	96	96	95	94	93	93	92	92	92
-9	68	68	68	69	74	74	77	80	83	87	89	91	91	91	90	89	89	89	89	89
-9	60	60	60	61	62	67	71	74	77	81	84	86	87	87	86	86	85	85	85	85
-10	54	55	55	55	57	61	66	70	73	76	79	81	82	82	82	82	81	81	81	81
-11	51	51	51	52	53	57	62	66	69	72	75	77	78	78	78	78	78	78	78	78
-12	48	48	48	49	50	54	58	62	65	68	71	73	74	74	74	74	74	74	74	74
-13	46	46	46	47	48	52	55	59	62	65	68	70	71	71	71	71	71	71	71	71

These fail safes can be circumvented by importing .csv table data from Excel and/or importing calibration data from a session file that contains improper axis data. If this happens, the ECU will stop processing the model. If you suspect something like this may have happened, try importing a previously known, working session file.

Please be aware of cross-platform differences that may require additional attention after importing calibration data.

The following section describes the available base sessions for the Series 3 Infinity-308 and Infinity-358. Compare your setup to the descriptions in the tables below.

358 Dodge Hemi BBK TB.itssn	
Make	Dodge
Model	Gen III Hemi
Disp	370CID/6.1L
Bore	4.060"
Stroke	3.580"
Cyl Heads	Stock
Comp Ratio	10.3:1
Cam	Stock
Intake Manifold	Stock
Throttle Body	BBK 87mm (1792)
Idle Air Control	PWM; 2003 Durango 4.7L (4861522AC)
Fuel Injectors	Stock 300cc/min
TPS Sensor	2003 Durango 4.7L (5017479AA)
MAP Sensor	Stock
CLT Sensor	Stock
IAT Sensor	Stock
Ignition	Stock
Exhaust	TTI Headers (61HC)
Firing Order	1-8-4-3-6-5-7-2
Fuel	CA 91 oct pump gas
VE Table Load Ref	MAP

358 Dodge Hemi FAST TB.itssn	
Make	Dodge
Model	Gen III Hemi
Disp	370CID/6.1L
Bore	4.06"
Stroke	3.58"

Cyl Heads	Stock
Comp Ratio	10.3:1
Cam	Stock
Intake Manifold	Stock
Throttle Body	FAST 87mm (54089)
Idle Air Control	Stepper; GM LS-type (ACDelco 17113598)
Fuel Injectors	Stock 300cc/min
TPS Sensor	GM LS-type (ACDelco 17123852)
MAP Sensor	Stock
CLT Sensor	Stock
IAT Sensor	Stock
Ignition	Stock
Exhaust	TTI Headers (61HC)
Firing Order	1-8-4-3-6-5-7-2
Fuel	CA 91 oct pump gas
VE Table Load Ref	MAP

308 Chevy LS 24X Small Cam.itssn	
Make	Chevy
Model	LS1 (24x)
Disp	383CID/6.3L
Bore	3.905"
Stroke	4.000"
Cyl Heads	CNC ported 243 heads
Comp Ratio	10.9:1
Cam	Isky 218/227 @ .050 .605/.585 114LSA
Intake Manifold	FAST LSXR 102mm (146302)
Throttle Body	FAST 102mm (54102)
Idle Air Control	Stepper; GM LS-type (ACDelco 17113598)

Fuel Injectors	Siemens Deka 80lb
TPS Sensor	GM LS-type (ACDelco 17123852)
MAP Sensor	GM 1Bar (12219927)
CLT Sensor	Stock
IAT Sensor	Stock
Ignition	Stock
Exhaust	Stepped dyno header, 3.5" collector
Firing Order	1-8-7-2-6-5-4-3
Fuel	CA Pump Gas 91
VE Table Load Ref	MAP

308 Chevy LS 24X Big Cam.itssn	
Make	Chevy
Model	LS1 (24x)
Disp	383CID/6.3L
Bore	3.905"
Stroke	4.000"
Cyl Heads	AFR 230 small bore (1660)
Comp Ratio	11.2:1
Cam	Isky 236/246 @.050 .615/.578 113LSA
Intake Manifold	FAST LSXR 102mm (146302)
Throttle Body	FAST 102mm (54102)
Idle Air Control	Stepper; GM LS-type (ACDelco 17113598)
Fuel Injectors	Siemens Deka 80lb
TPS Sensor	GM LS-type (ACDelco 17123852)
MAP Sensor	GM 1Bar (12219927)
CLT Sensor	Stock
IAT Sensor	Stock
Ignition	Stock
Exhaust	Stepped dyno header, 3.5" collector
Firing Order	1-8-7-2-6-5-4-3

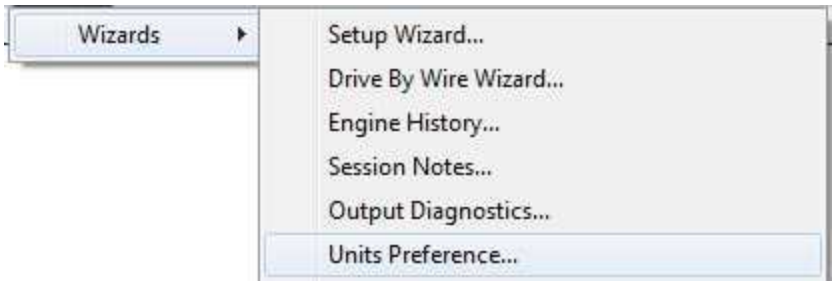
Fuel	CA Pump Gas 91
VE Table Load Ref	TPS

308 Chevy LS 24X Supercharged MEFI.itssn	
Make	Chevy
Model	LS1 (24x)
Disp	345CID/5.7L
Bore	3.898"
Stroke	3.620"
Cyl Heads	Stock
Comp Ratio	Stock
Cam	Stock
Intake Manifold	Eaton M112 Supercharger, non-intercooled
Throttle Body	Stock
Idle Air Control	Stepper; GM LS-type (ACDelco 17113598)
Fuel Injectors	375cc/min, batch fired through MEFI 4 wiring harness
TPS Sensor	Stock
MAP Sensor	GM 2Bar (12615136)
CLT Sensor	Stock
IAT Sensor	Stock
Ignition	Stock
Exhaust	Stepped dyno header, 3.5" collector
Firing Order	1-8-7-2-6-5-4-3
Fuel	CA Pump Gas 91
VE Table Load Ref	MAP

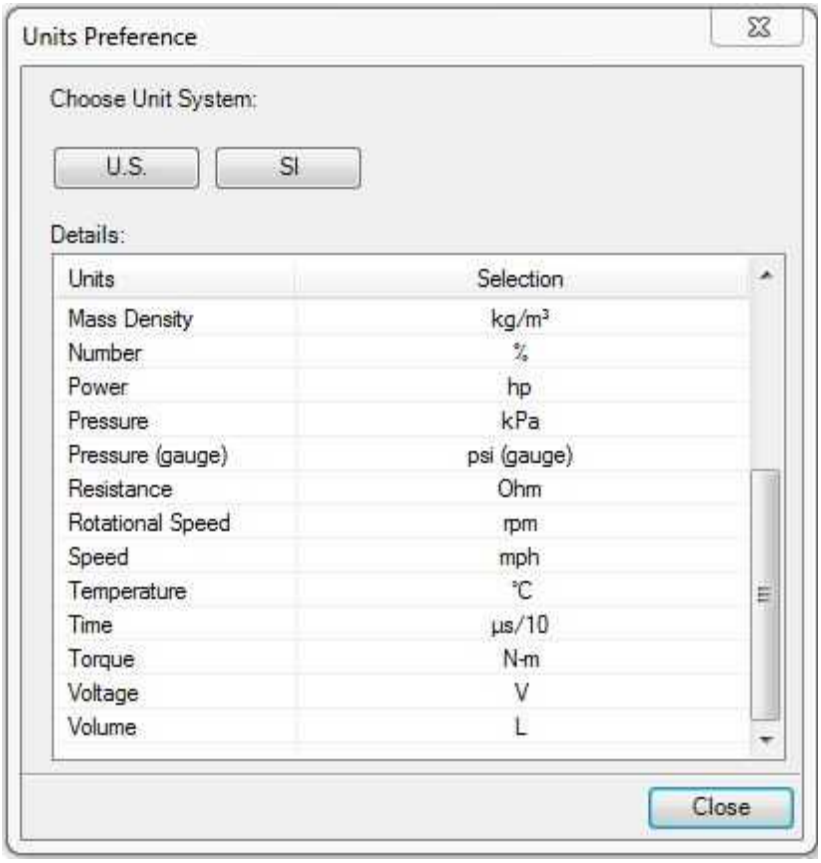
358 Ford 2v SOHC.itssn	
Make	Ford
Model	2v Mod Motor
Disp	293CID/4.8L
Bore	3.572"

Stroke	3.649" (Coyote crankshaft)
Cyl Heads	TFS Twisted Wedge 185
Comp Ratio	10.5:1
Cam	Bullet TF02 266/268-110H
Intake Manifold	Edelbrock Victor Jr EFI (28385)
Throttle Body	Edelbrock 90mm (3818)
Idle Air Control	n/a
Fuel Injectors	Dodge Hemi 6.1L 300cc/min
TPS Sensor	Stock
MAP Sensor	AEM 1Bar 30-2130-15
CLT Sensor	AEM 30-2013
IAT Sensor	AEM 30-2014
Ignition	Stock
Exhaust	Bassani 54150LC
Firing Order	1-3-7-2-6-5-4-8
Fuel	CA 91 oct pump gas
VE Table Load Ref	MAP

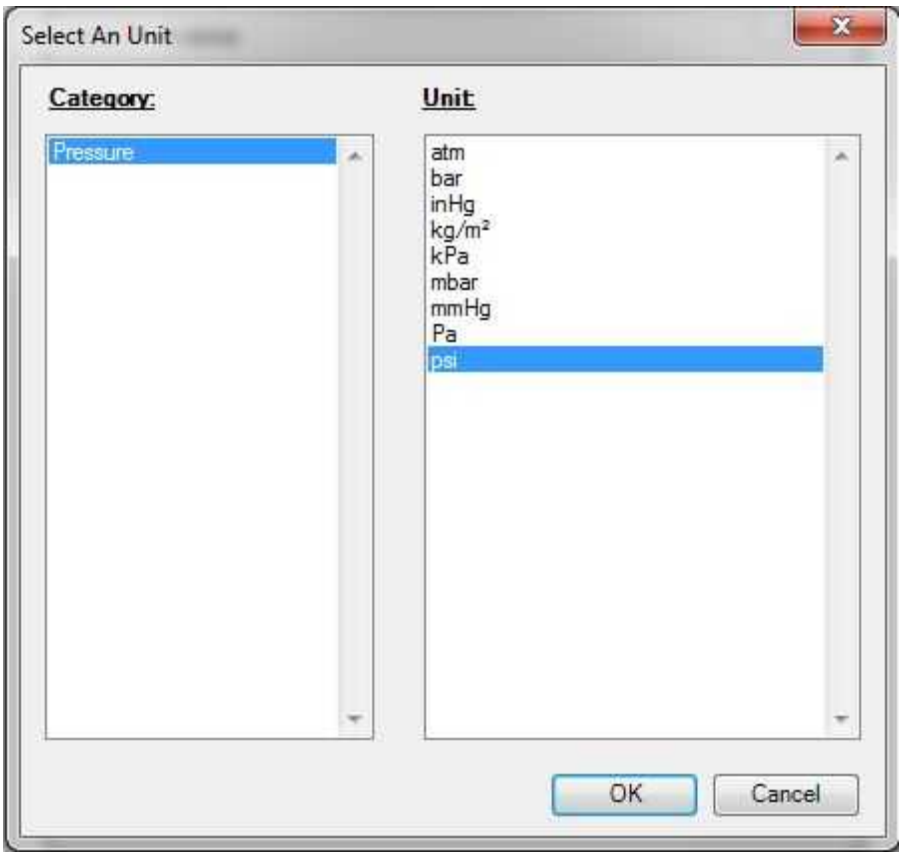
Unit Preferences



The user can select global unit preferences by going to the menu item Wizard > Units Preference...



Choose a global unit system (U.S. or SI) or alternately double click on each unit category and select from available options as shown below for pressure.



Wizard Basic Setup

Wizard Design

The ECU setup wizard is designed to simplify the initial configuration of the Infinity ECU. ***AEM recommends using the wizard only when connected to the ECU via USB with the power on.*** Most of the setup wizards require the engine to NOT be running. Exceptions will be clearly stated in the function descriptions.

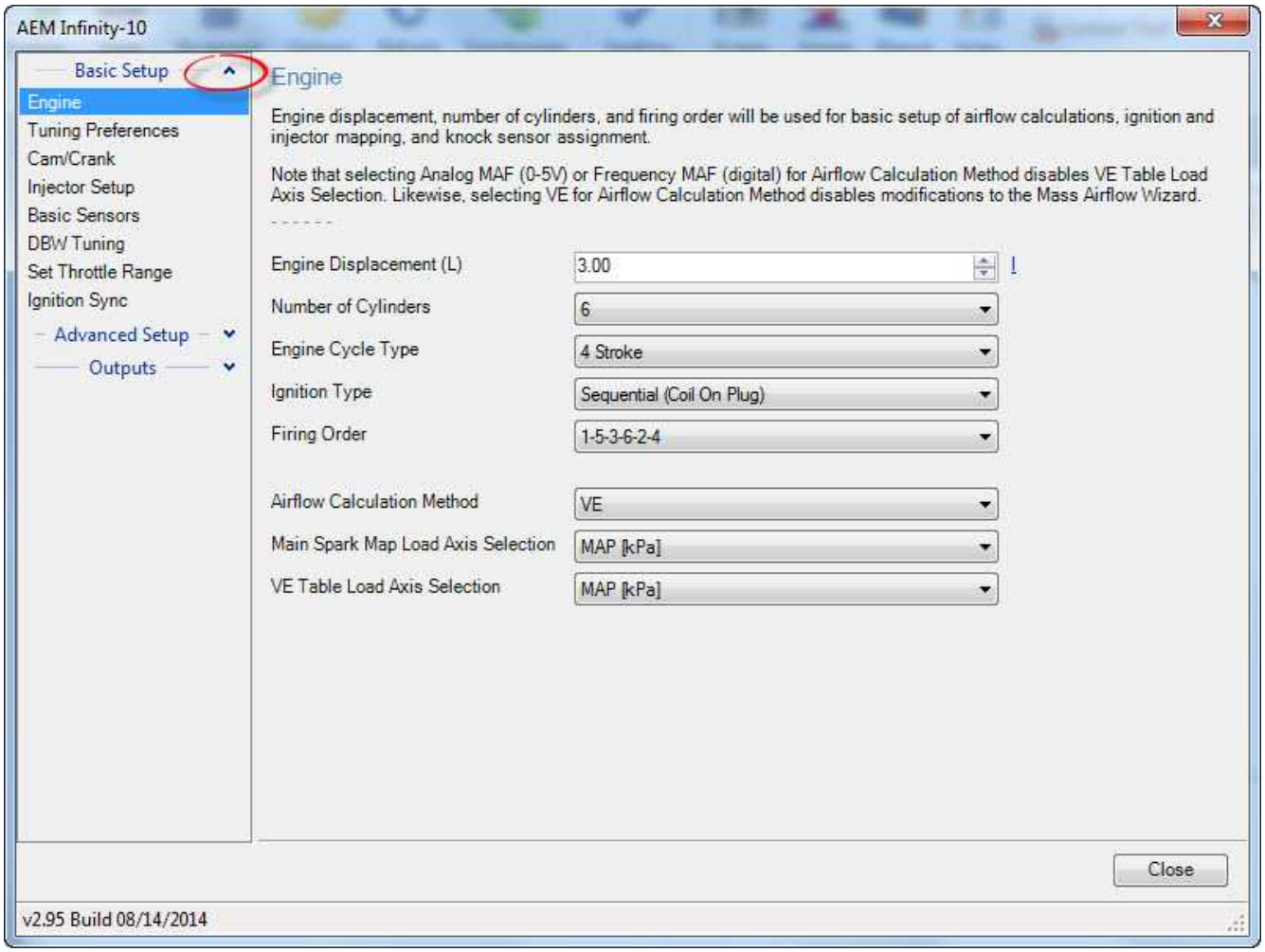
The setup wizard contains general and detailed descriptions with each major function. The most imperative functions are discussed below. Use the descriptions in the wizard to assist in the completion of all other setup features. New setup wizard features are being added constantly. Please follow the written descriptions on each wizard page as this document may not accurately represent the features included in the most recent versions.

The Setup Wizard is a stand alone application that runs in conjunction with Infinity Tuner. This software is updated periodically and its appearance and features may not completely match the descriptions below. In the event of a conflict, refer to the descriptions and instructions on the Setup Wizard pages themselves.

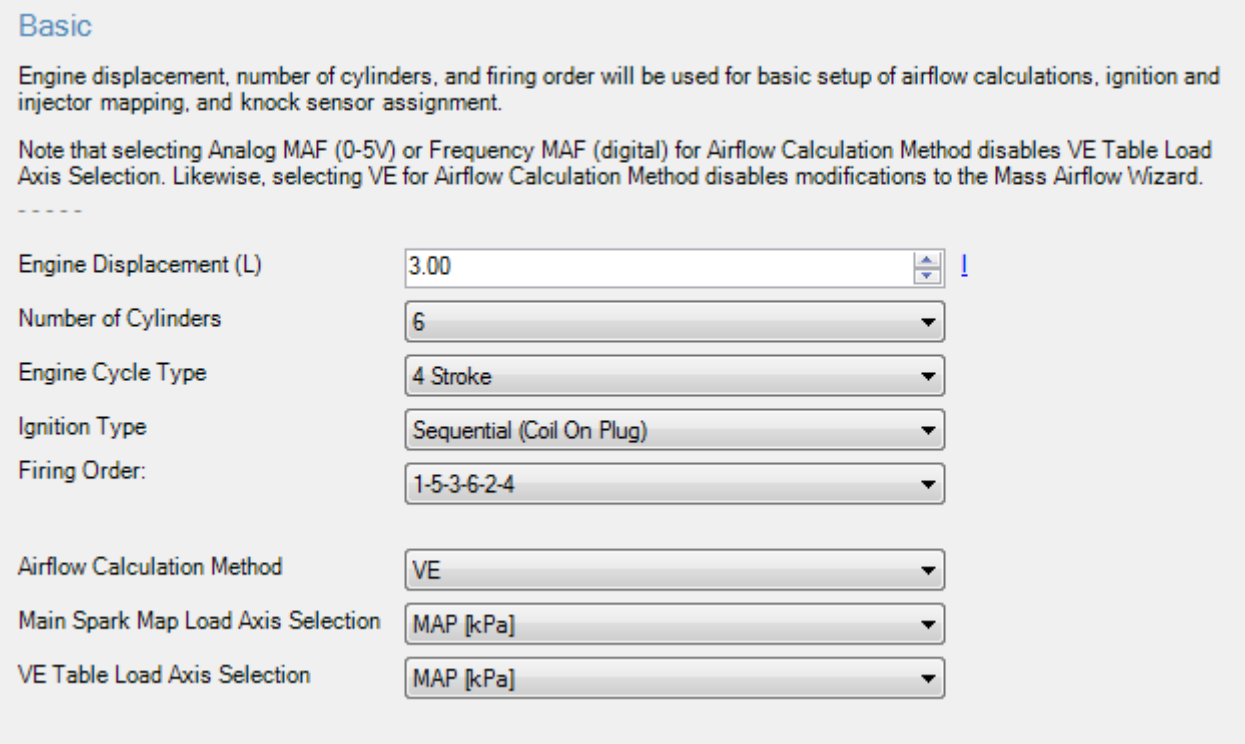
With the laptop connected to the Infinity ECU via USB and InfinityTuner connected, go to the Wizard menu at the top of the InfinityTuner layout and select Setup Wizard. Alternately, the hot key combination [ALT]-[w]-[w]-[w] will launch the setup wizard.

Wizard Organization

The wizard is organized into different sections with expandable menu items on the left hand pane. Use the highlighted arrow below in each section to expand the available sections.



Engine



Note: This wizard can not be used when the engine is running.

Engine Displacement (L)
Enter the engine displacement in liters.
Min value = 0.250, Max value = 10.0

Number of Cylinders:
Enter the number of cylinders within the engine.
Min value = 1, Max value = 10
Possible values: 1,2,3,4,5,6,8,10

Engine Cycle Type:
Enter the engine type: 2 Stroke or 4 Stroke.

Firing Order:
Select the firing order of the engine.

Airflow Calculation Method:
Select how the airflow calculation is processed. There are 3 options:

> **VE:** This is the default configuration. Airflow is calculated using the speed density algorithm.
>
> **0–5V MAF**: Airflow is calculated using a 1-axis lookup table that has an analog (0–5V) input from a typical OEM MAF sensor.
>
> **Frequency MAF:** Airflow calculated using a 1-axis lookup table that has a digital input from a typical OEM MAF sensor

Main Spark Map Load Axis Selection:
This selection will set the load (y-axis) of the ignition maps. Note: The BaseIgnMap and FlexIgnMap must have the same load channel.

Load Axis Channels:

MAP [kPa]
Throttle [%]
MassAirflow [gms/s]
MassAirflow [gms/rev]
MAP/EBP
MAP/Baro

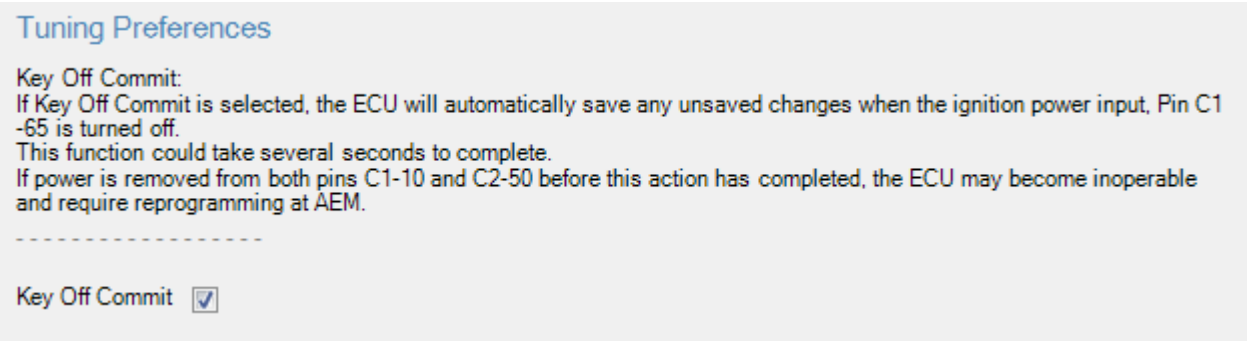
VE Table Load Axis Selection:
This is only available if the Airflow Calculation Method is selected. It will set the load (y-axis) of the VE Table.

Load Axis Channels:

MAP [kPa]
Throttle [%]
MassAirflow [gms/s]
MassAirflow [gms/rev]
MAP/EBP
MAP/Baro
DBW_APP1 [%] Filtered

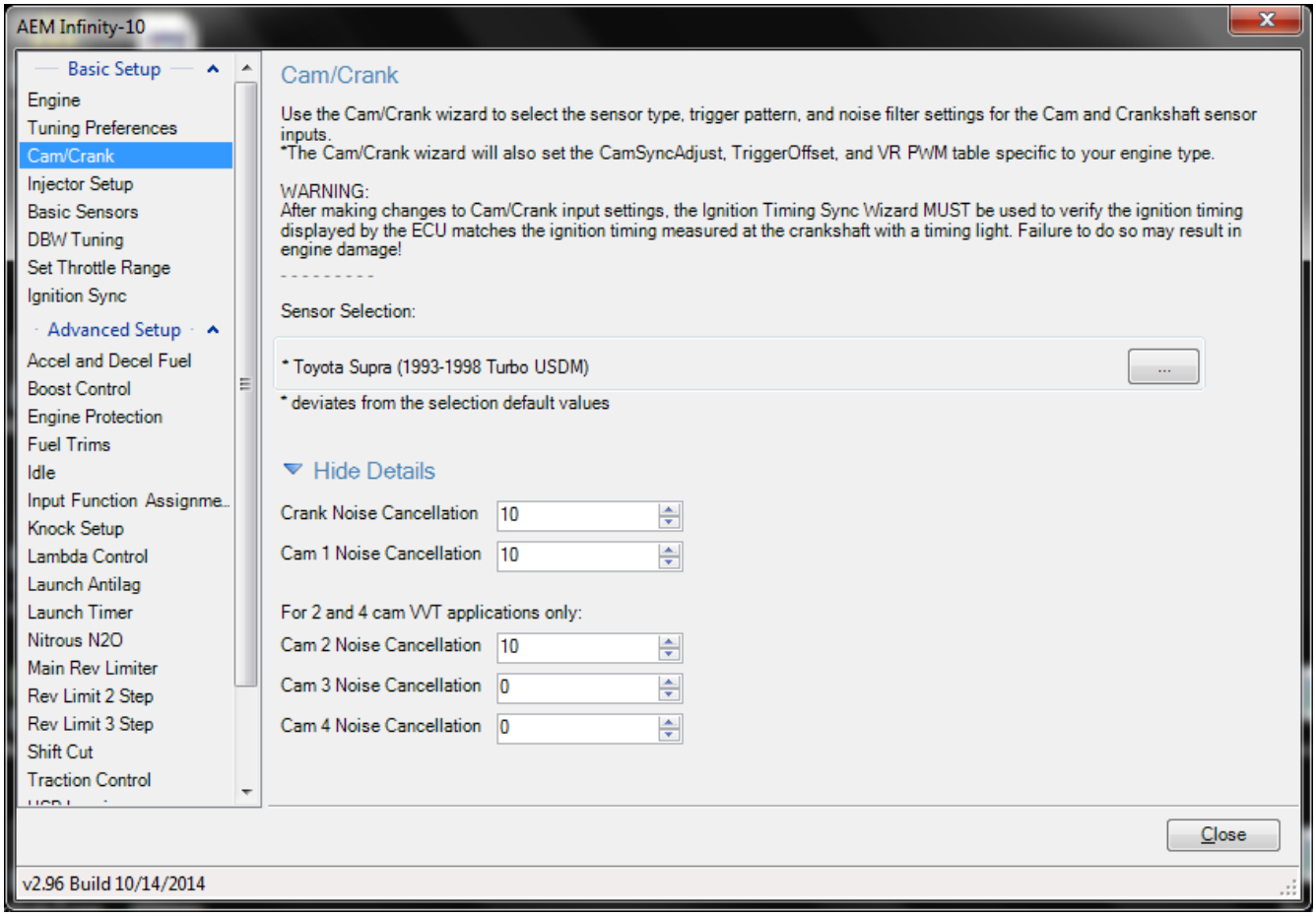
Tuning Preferences

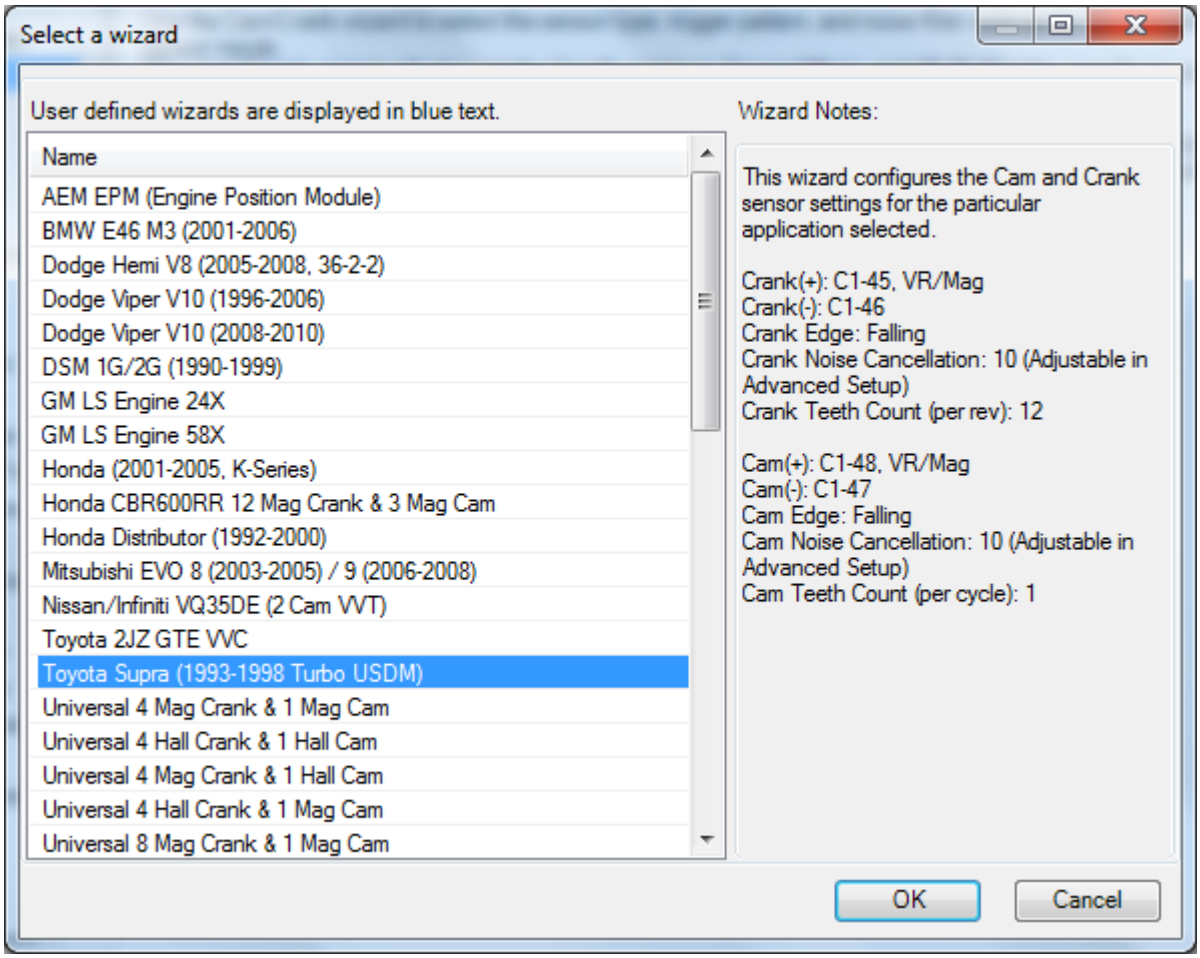
Calibration data is automatically saved to ECU flash memory at key off if the "Key Off Commit" function is selected in the Tuning preferences wizard page. Proper power sequencing is critical in order to avoid problems. If power is removed from both pins C1-10 and C2-50 (Infinity 8/10/12 hardware) before this action is completed, the ECU may become inoperable and require reprogramming at AEM.



Cam/Crank

Choose the Cam/Crank timing type that will be used. The description field notes important information about edge selections and wiring requirements.





Additional settings exist to adjust noise cancellation. For more details see Noise Cancellation

Injector Setup

Injector Setup

The Injector Setup defines the quantity of primary and secondary injectors, fuel types, 02 feedback selection, and injector phasing. There is a fixed offset of 540 degrees for each injector, meaning that Injector 1 has a Phasing of 540 rather than 0 degrees. The phasing for each injector needs to be less than 720. Selecting 'Has Secondary Injectors' enables a drop-down list for each injector Type, allowing the user to designate each injector as primary or secondary. Use the O2 Feedback drop-down lists to assign Lambda feedback to each injector.

- - - - - - - - - - - - - -

Primary Fuel Pressure Regulator Reference: Manifold Vacuum Reference

Primary Injector Flow Wizard Selection:

No wizard is selected or matched. Click the Browse button to select one.

Primary Injector Duty Limit: 95 %

Number of Injectors: 8

Has Secondary Injectors: ☐

Primary Fuel Type: Gasoline

Hide Fuel Properties

Primary Injector Fuel Specific Gravity: 0.750

Primary Injector Fuel Stoichiometric Ratio: 14.70

Injector	Type	Phasing	O2 Feedback
Injector 1	Primary	0.00	Lambda1
Injector 2	Primary	0.00	Lambda1
Injector 3	Primary	0.00	Lambda1
Injector 4	Primary	0.00	Lambda1
Injector 5	Primary	0.00	Lambda1
Injector 6	Primary	0.00	Lambda1
Injector 7	Primary	0.00	Lambda1
Injector 8	Primary	0.00	Lambda1

Primary Injector Duty Limit
Limits the maximum duty applied to primary injectors.
Min value = 0, Max value = 100

Number of Injectors
The drop down box allows the user to select the desired Number of Injectors.
Min value = 2, Max value = 12

Has Secondary Injectors

If secondary injectors will be used, select this check box. A new fuel type menu is now visible labeled Fuel Type (Secondary Injectors).

See Staged Injection for additional tuning information.

Note: If secondary injectors are being used, the option *Has Secondary Injectors* must be selected and the table must be filled out indicating any injector number greater than the number of engine cylinders as secondary. These selections must be made before restarting the ECU and closing the form; otherwise an error will occur. See image below for a typical 6 cylinder engine setup with 6 additional injectors classified as secondary. Note also the option to select a different fuel type for primary and secondary.

Fuel Type

This drop down menu contains the following setup information for primary (and secondary fuel types, if selected).

-Gasoline
-Ethanol
-Methanol
-E85
-Flex Fuel

Fuel Properties

Fuel properties can be manually edited rather than selecting from the drop down above. Use these settings if your fuel does not match any of the default setups.

Phasing

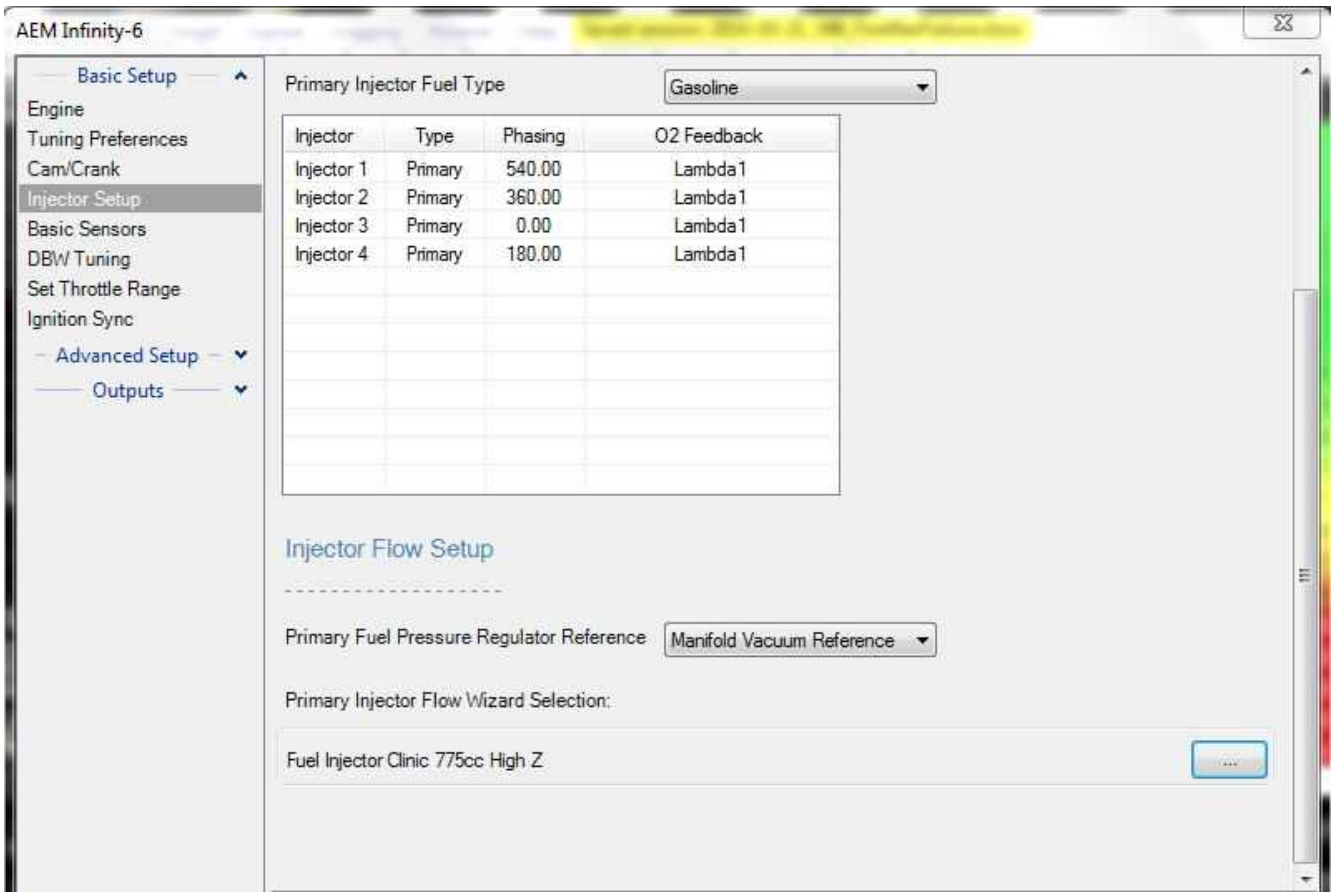
The default injector phasing for the primary injectors is determined from the Firing Order information from the Ignition Wizard. There is a fixed offset of 540 for injectors. After this offset is added, the system checks to see if the result is less than 720. If the result of the calculation is greater than or equal to 720, it is subtracted by 720 from that result

Example:

4 cylinder 1-3-4-2 firing order:
Injector 1 phasing = 0 + 540 (offset) = 540
Injector 3 phasing = 180 + 540 (offset) = 0
Injector 4 phasing = 360 + 540 (offset) = 180
Injector 2 phasing = 540 + 540 (offset) = 360

O2 Feedback

Lambda sensor assignment is determined by assigning a value of 1 or 2 to the InjXLambdaFB channels. A value of 1 will assign the Lambda 1 sensor and a value of 2 will assign the Lambda 2 sensor. Min value = 1, Max value = 2

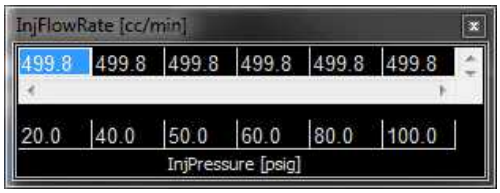


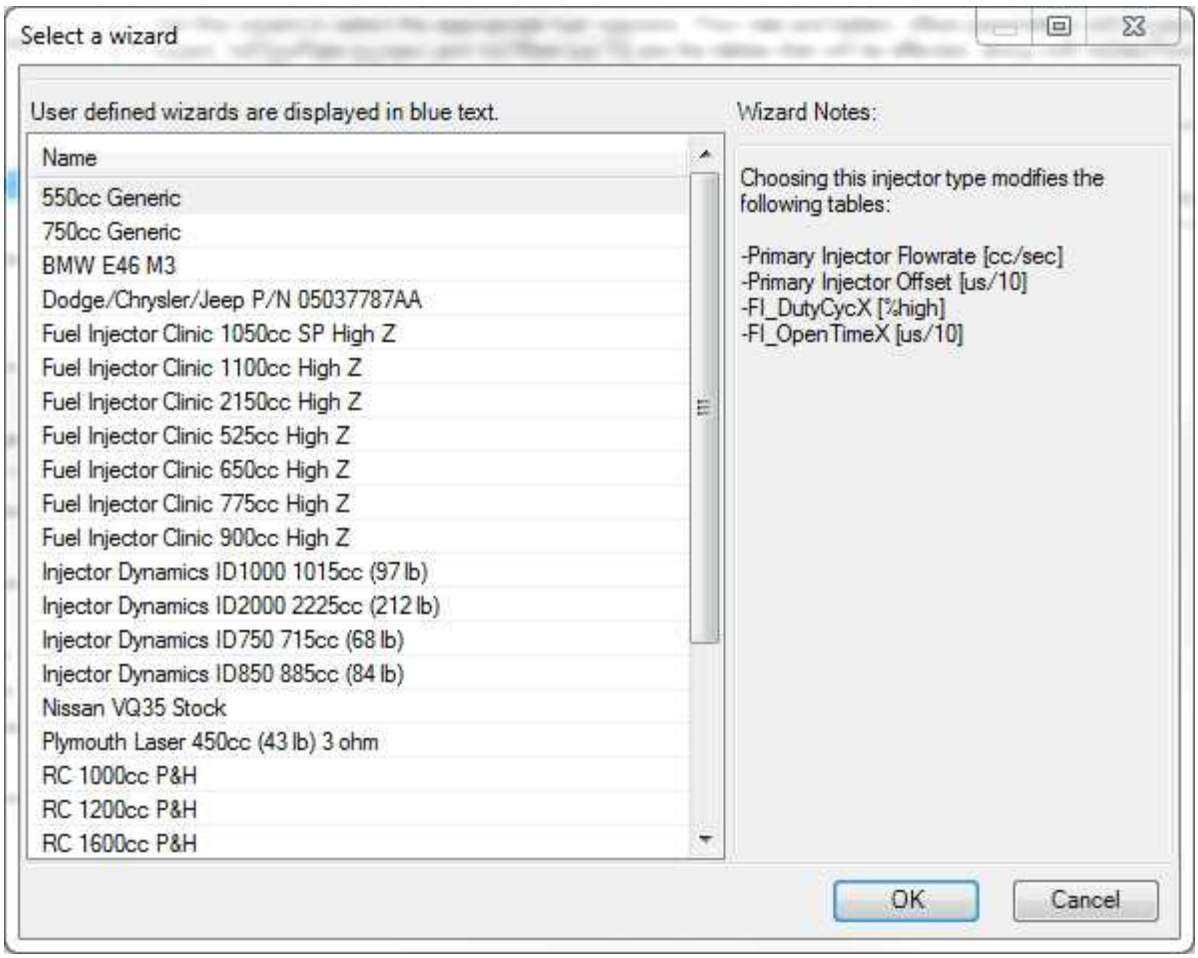
Fuel Pressure Regulator Reference

Allows the user to choose the proper reference pressure for the fuel pressure regulator. The drop down menu has the following options:

Manifold Vacuum Reference: This should be selected if the fuel pressure regulator's port is connected to a vacuum or vacuum/boost source.

Atmospheric Reference: This should be selected if the fuel pressure regulator's port is open to atmosphere or if a dead end fuel system is used where fuel pressure is constant.





Primary Injector Flow Selection

This database allows the user to select proper primary injector flow data.

InjFlowRate [cc/sec], 1-Axis lookup table of flow vs injector pressure.

InjOffset [us/10], 2-Axis lookup table of PW offset vs battery voltage and injector pressure

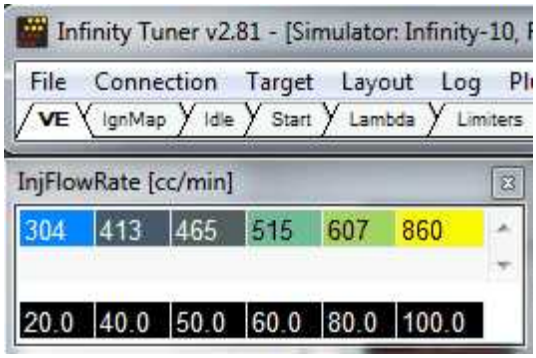
Secondary Injector Flow Selection

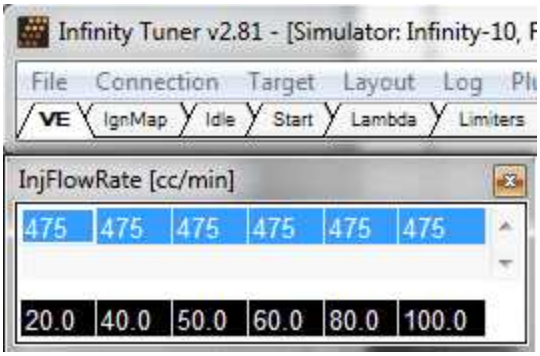
If Secondary Injectors were selected in the Injector Setup Wizard, this Secondary Injector Flow Selection database will be enabled. This allows the user to select proper secondary injector flow data.

InjSecFlowRate [cc/sec], 1-Axis lookup table of flow vs injector pressure.

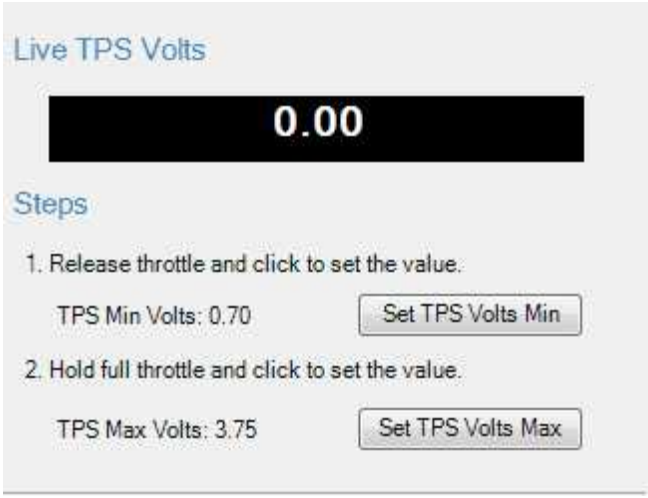
InjSecOffset [us/10], 2-Axis lookup table of PW offset vs battery voltage and injector pressure

NOTE: If the Setup Wizard does not contain your specific fuel injector type, you can modify the InjFlowRate table manually. If you do not know the different flow rates at different fuel pressures, choose a flow rate (based on Manufacturers specs) at a known pressure and populate the entire row with that value. For example, you have a fuel injector that is not listed in the Wizard Selection. You know that it flows 475 cc/min at 45 psi. Select the cells in the upper row of the InjFlowRate [cc/min] table and manually input 475. This will suffice to get the car up and running, though proper flow data is ideal.





Set Throttle Range



The wizard displays a warning message to the user if the software is not connected to a hardware target.

Live TPS Volts

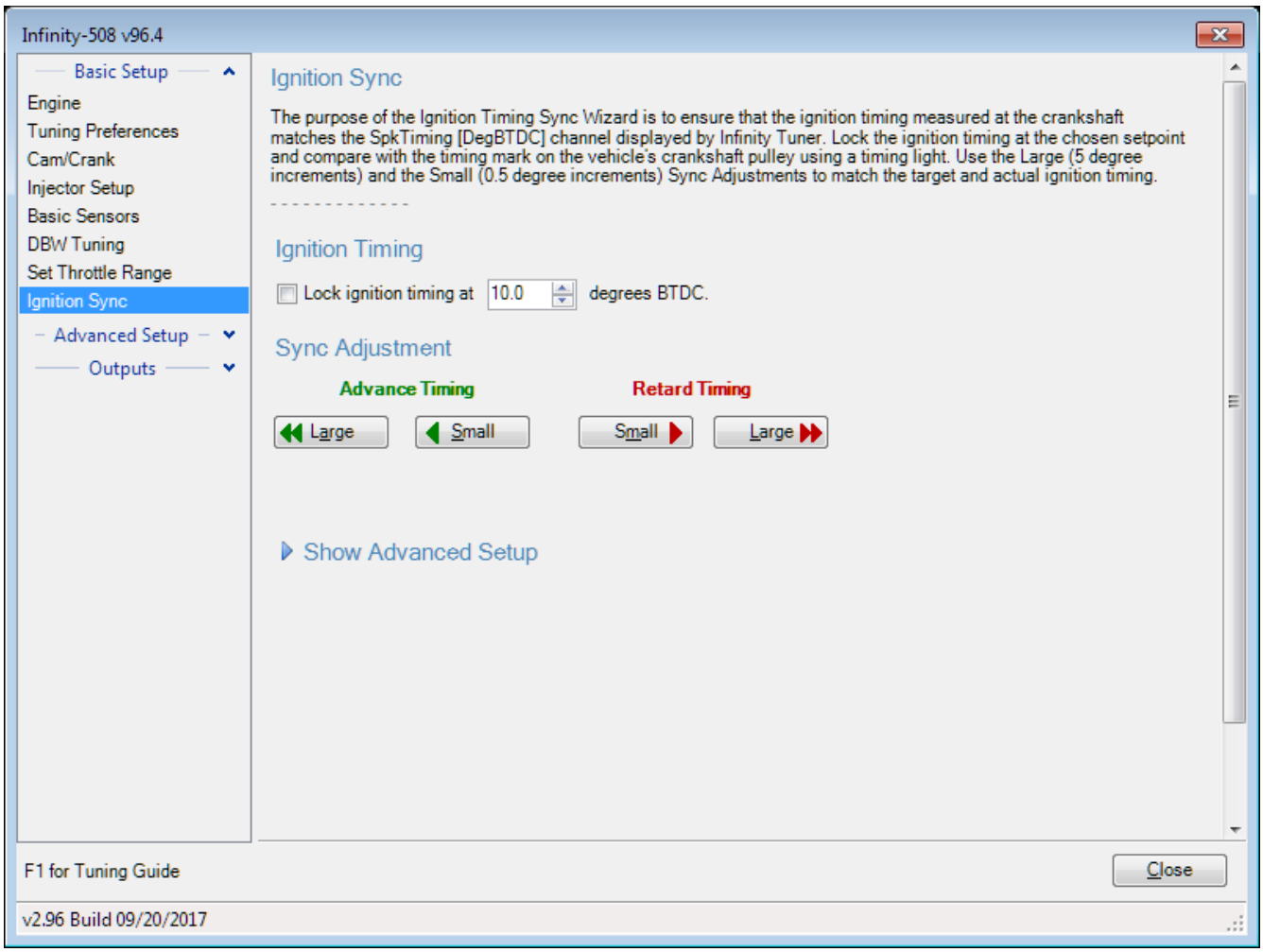
Text and graphical representation of the raw analog voltage is shown.

Steps

Set TPS Volts Min
Press this button when the throttle pedal is fully released. This will write the current value of Analog7 [V] to the Throttle_raw [%] Analog In conditioner and display the resultant value on the TPS Min Volts: X.XX display.

Set TPS Volts Max
Press this button after the throttle pedal is fully depresses. This will write the current value of Analog7 [V] to the Throttle_raw [%] Analog In conditioner and display the resultant value on the TPS Max Volts: X.XX display.

Ignition Sync



The engine's ignition timing must be synchronized with the Infinity Tuner's ignition timing display. This is crucial with older vehicles that have adjustable distributors, adjustable cam angle sensors, etc. Most modern engines do not utilize a manual adjustment for ignition timing. However, this wizard should always be used for verification as sensors can be frequently installed backwards or upside down. This can catch a problem before damage occurs.

Note: This wizard can only be used when the engine speed is greater than 50 RPM. The ignition timing will automatically unlock when the window is closed reverting back to the normal calculated value.

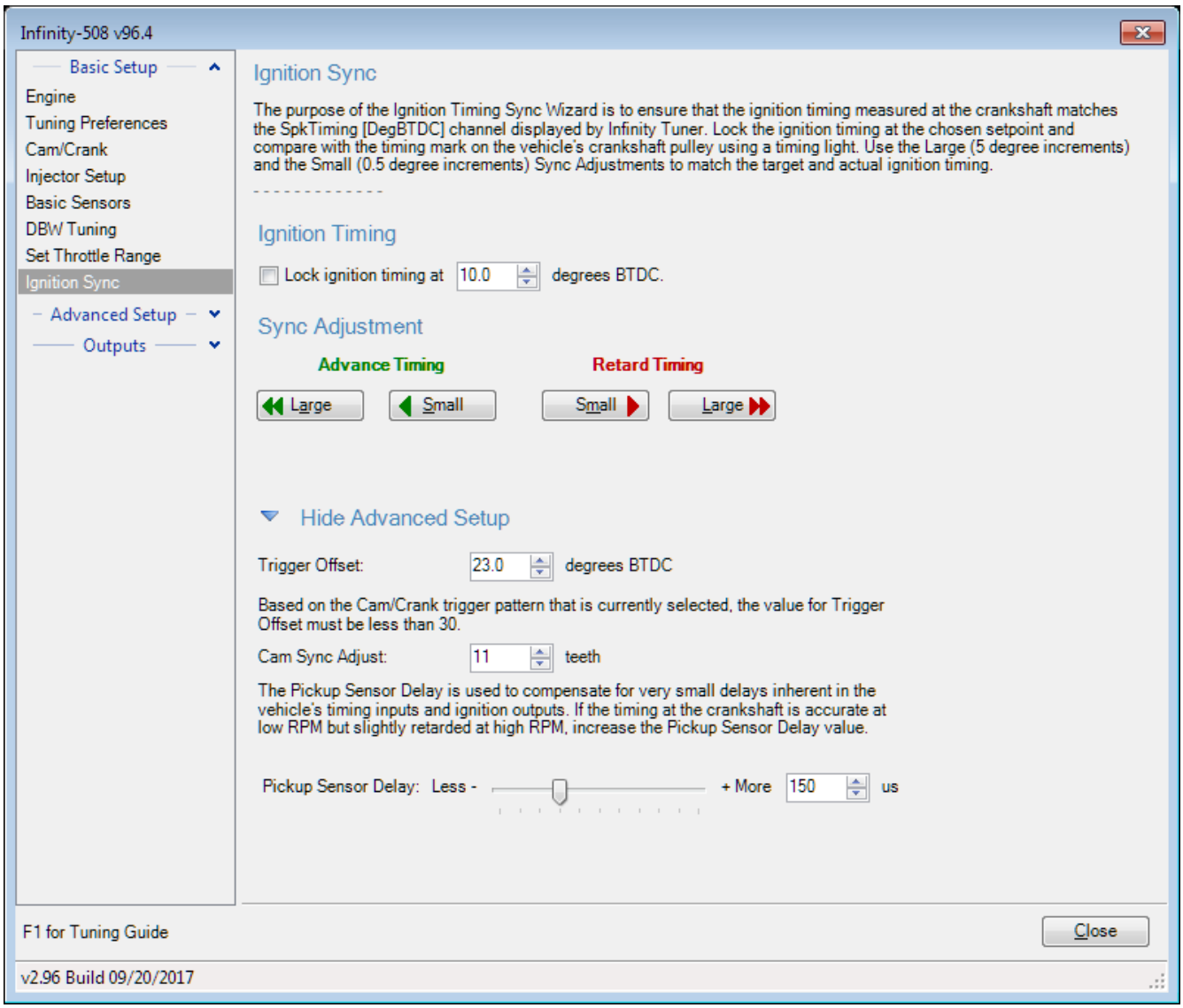
Ignition Timing

For synchronizing, the ignition timing can be locked by checking the box.
Allowable values: Min value = 0, Max value = 45

Sync Adjustment

The window includes 4 buttons for adjusting the ignition sync settings.

The button labeled Large edits the TrigOffset [degBTDC] channel in 5 degree steps. The button labeled Small edits the TrigOffset [degBTDC] channel in 0.5 degree steps.



Advanced Setup

Trigger Offset
This is the fine adjustment to the sync reference point, in crank degrees. Larger numbers will make the coils fire earlier (more advanced). If sync requires an offset beyond the closest crank tooth, the wizard will adjust the Cam Sync Adjust value to compensate. This will require an engine restart.

Cam Sync Adjust
This is the coarse adjustment to the sync reference point, in crank teeth. For example, each step will adjust the sync reference by 30 degrees for a 12-tooth crank trigger wheel, or 10 degrees for a 36-tooth crank trigger wheel, or 90 degrees for a 4-tooth crank trigger wheel. Larger numbers will make the coils fire earlier (more advanced). The ECU needs to be reset after making adjustments to this value, the software will notify the user when a shutdown and ECU reset is necessary.

Pickup sensor delay
This compensates for delays inherent in the crank sensor, ECU circuitry, and/or ignition system outputs. If this is not set correctly, the actual timing measured with a timing light will advance or retard by a few degrees at high RPM. Larger amounts of 'timing drift' indicate a problem with the VR crank sensor polarity, or the ignition system is not configured to work with the ECU's coil outputs. The More and Less buttons increase/decrease the SpkDelayComp [us] value in increments/decrements of 5.
Min value = 0, Max value = 500

Two separate procedures are required depending on the Infinity application: Plug and Play or Universal Application.

Plug and Play
a. In the Ignition Sync wizard, select the checkbox “Lock ignition timing at” and set the “degrees BTDC” (10.0 deg BTDC is the default).
b. Start the engine and use a timing light to verify that the crankshaft timing matches the locked ignition timing set point (10.0 deg BTDC if using the default setting).
c. If there is a deviation between the locked set point and the actual timing observed with the timing light, use the Sync Adjustment arrows to match the wizard-displayed value with the actual value. As the Sync Adjustment arrows are advanced or retarded, the timing observed on the crankshaft will change, while the “Lock ignition timing at 10.0 degrees BTDC” will remain constant.

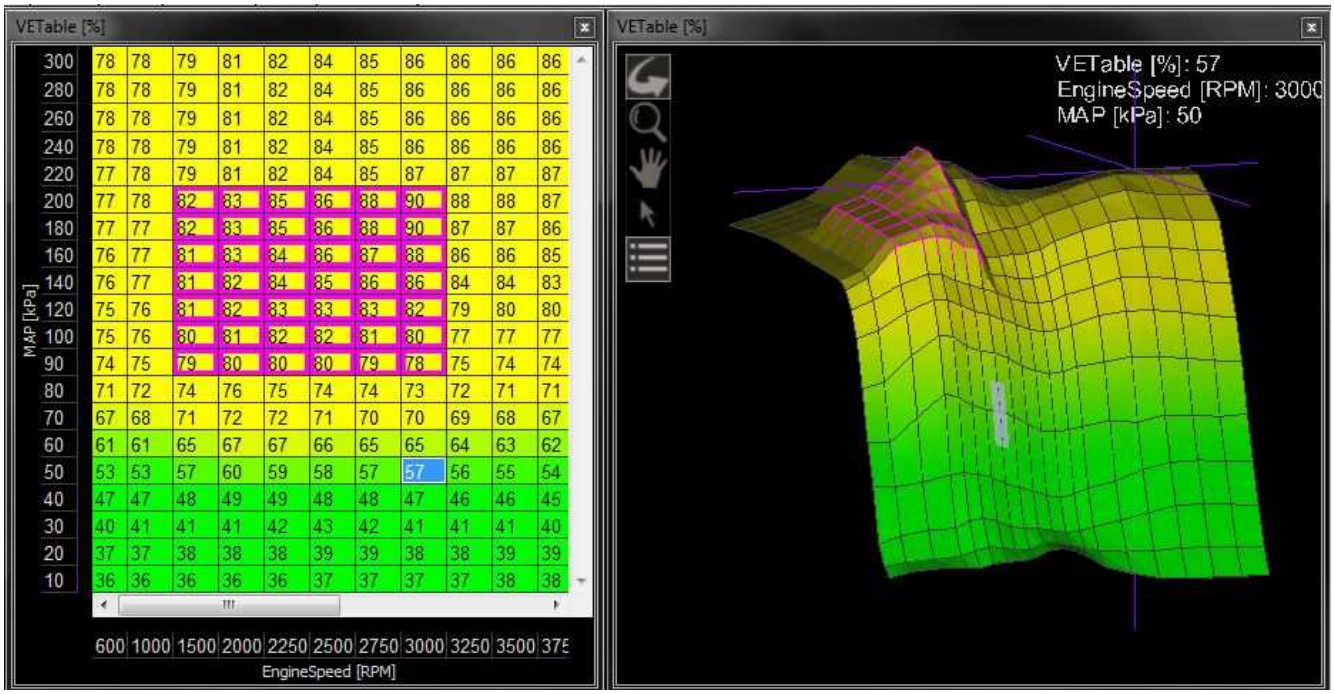
Universal Application
a. In the Ignition Sync wizard, select the checkbox “Lock ignition timing at” and set the “degrees BTDC” (10.0 deg BTDC is the default).
b. Do NOT attempt to start the engine. Disable (unplug) the fuel injectors and/or fuel pump.
c. While cranking the engine, use a timing light to verify that the crankshaft timing matches the locked ignition timing set point (10.0 deg BTDC if using the default setting).
d. If there is a deviation between the locked set point and the actual timing observed with the timing light, use the Sync Adjustment arrows to match the wizard-displayed value with the actual value. As the Sync Adjustment arrows are advanced or retarded, the timing observed on the crankshaft will change, while the “Lock ignition timing at 10.0 degrees BTDC” will remain constant.
e. If the Trigger Offset exceeds a maximum that is dependent on your timing type, an adjustment to the Cam Sync Adjust is necessary. The wizard will calculate this value and set it for you. An engine shut down and ECU reset will be necessary. Repeat this process until proper sync is achieved.
f. Reconnect the fuel injectors and fuel pump.
g. Once the remaining Setup Wizards have been configured, repeat the Ignition Sync process with the engine running to ensure that the crankshaft timing matches the locked ignition timing set point.

Modified Values

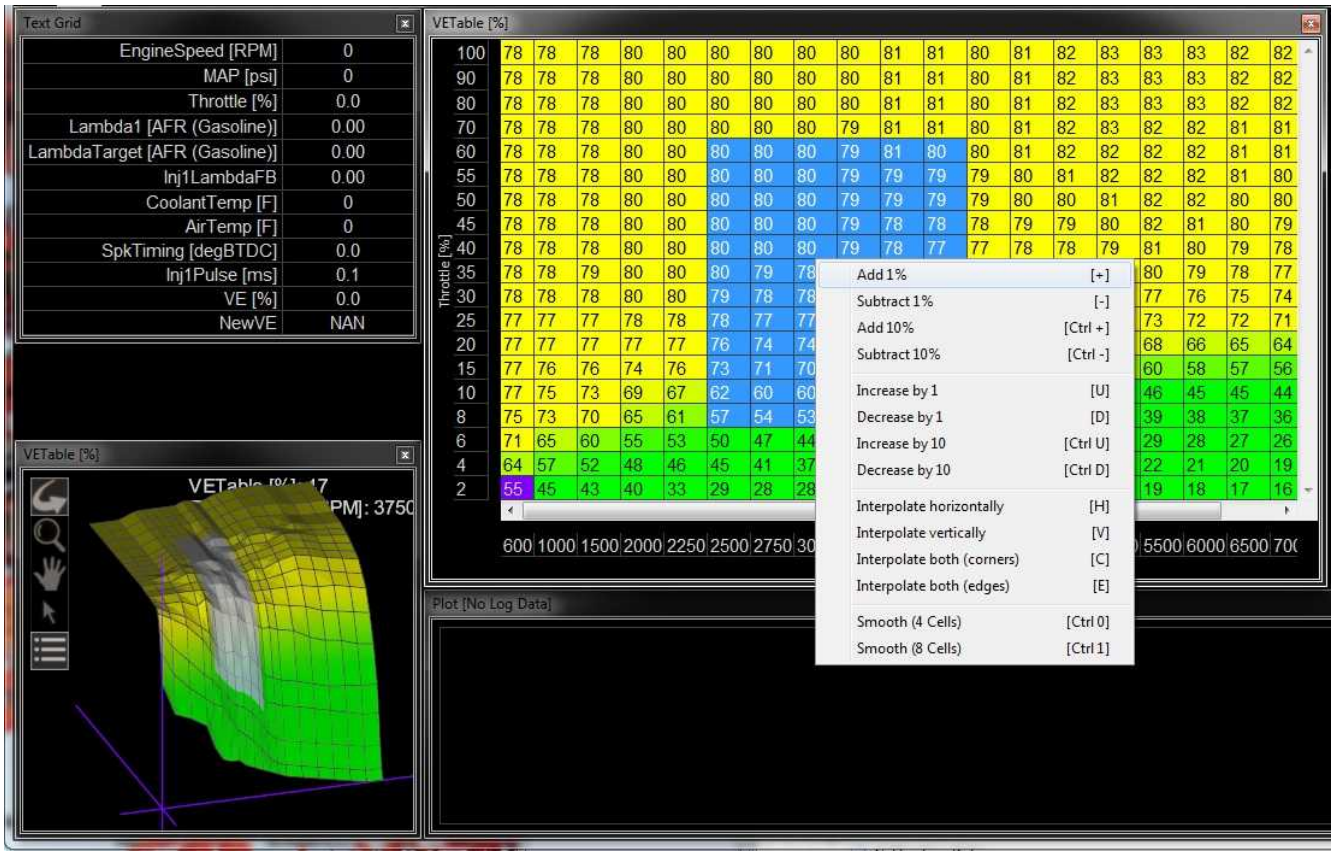
Calibration table changes that haven't been committed to flash memory are highlighted as shown below. Conditions that will reset the display are as follows:

1. Manually committing changes through the ECU > Commit modifications menu command
2. Manually committing changes using the hot key combination [Ctrl Shift C]
3. Opening and closing the Setup Wizard. Note the Setup Wizard automatically commits ALL changes to memory every time it is closed.

4. Turning the ignition switch off when the tuning preference Key Off Commit is selected



Right Click Editing



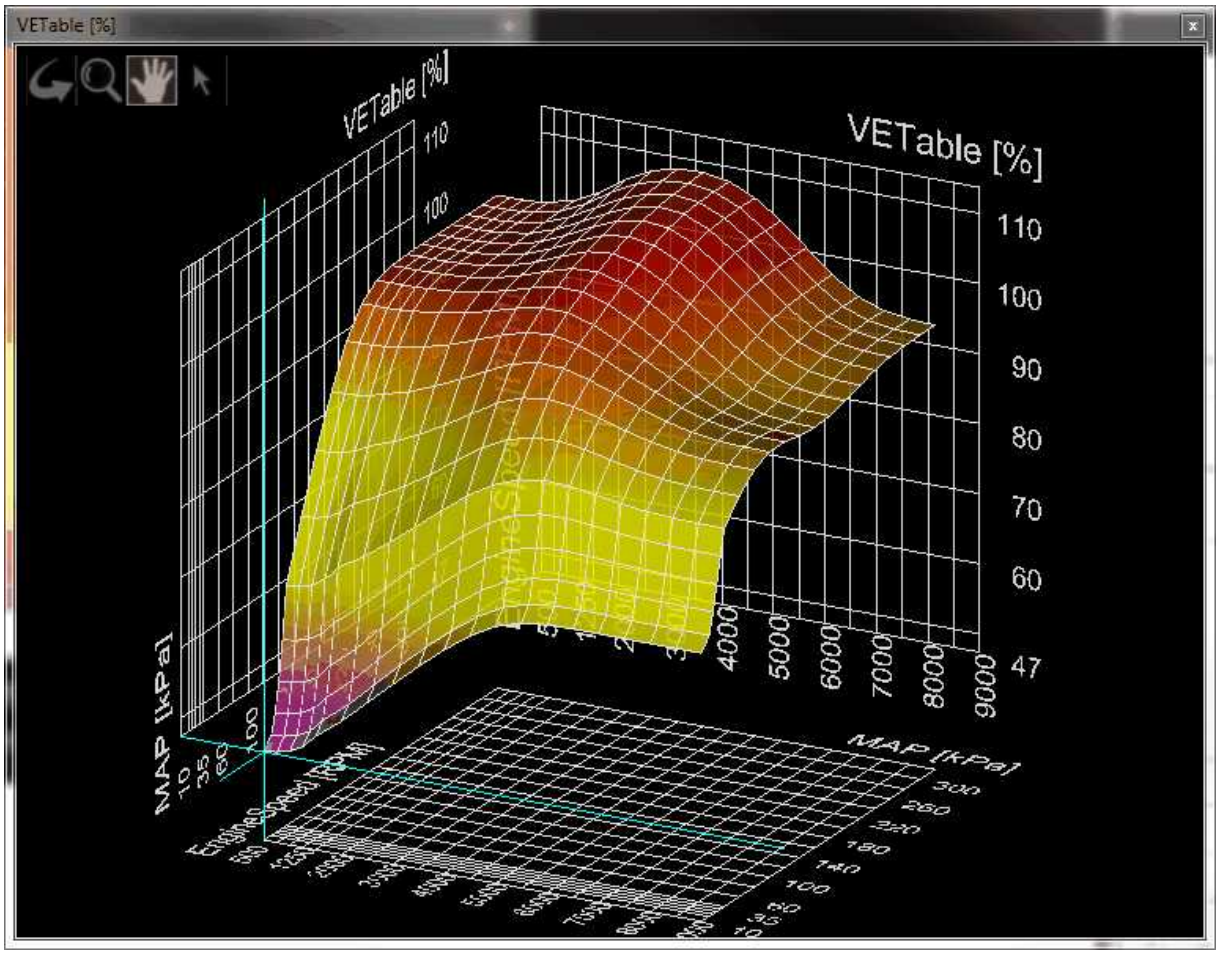
To use the right click menu for editing table values, select a portion of the table and right click. Choose from available options.

VE & Airflow Based Tuning

The Infinity ECU uses significantly different methods of calculating the fuel delivery requirements and outputs than previous AEM products.

Measured data from sensors, i.e., Manifold Absolute Pressure (MAP [kPa]), Air Temperature, Coolant Temperature, and Engine RPM, are acquired. The ECU uses this sensor data in combination with Volumetric Efficiency (VE%) to estimate airflow.

The Volumetric Efficiency is a percentage of air and fuel that actually enters the cylinder during induction relative to the volumetric capacity (rated displacement) of the cylinder under static conditions. The VE lookup table is a 2-axis lookup table, with load values (typically MAP [kPa]) versus Engine RPM. In each table cell, the Engine RPM corresponds with a specific MAP [kPa], and a Volumetric Efficiency is defined for that cell.



The Volumetric Efficiency is combined with temperature sensor data to estimate a compensated Mass Airflow. The ChargeTempBlend table dictates what ratio of air temperature to coolant temperature is used at specific Engine RPM to adjust the density of the inducted air. A higher number gives priority to Coolant Temperature, and is seen at lower Engine RPM.

ChargeTempBlend

0.800	0.800	0.800	0.700	0.600	0.500	0.400	0.300	0.200	0.100	0.100	0.100	0.100	0.100	0.100	0.100

500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000

EngineSpeed [RPM]

Once Mass Airflow has been calculated using the tables above, the Infinity ECU will look up the Target Lambda (AFR) and then calculate the fuel requirements. Target AFR will be used as a main parameter in determining fuel injector flow rate. The LambdaTargetTable (below Left) and AFR Target Table conversion table (below Right) will have default values. Based on the calculated Mass Airflow, the Infinity ECU will attempt to add enough fuel to hit the target AFR.

Note: The calculated LambdaTarget influences the fuel delivered to the engine at all times, even when closed-loop 02 feedback is disabled.

LambdaTargetTable

MAP [kPa]	500	1000	1500	2000	2500	3000	3500	4000	6000	8000
220	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
200	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
175	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
150	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
125	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
100	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
80	0.920	0.920	0.940	0.990	0.990	0.990	0.920	0.920	0.920	0.920
60	0.950	0.950	0.980	0.990	0.990	0.990	0.920	0.920	0.920	0.920
40	0.980	0.980	0.980	0.990	0.990	0.990	0.920	0.920	0.920	0.920
30	0.980	0.980	0.980	0.990	0.990	0.990	0.920	0.920	0.920	0.920

EngineSpeed [RPM]

AFRTargetTable Gasoline

MAP [PSIG]	500	1000	1500	2000	2500	3000	3500	4000	6000	8000
17	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
14	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
11	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
7	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
3	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
-0	12.41	12.41	12.41	12.41	12.41	12.41	12.41	12.41	12.41	12.41
-3	13.43	13.43	13.72	14.45	14.45	14.45	13.43	13.43	13.43	13.43
-6	13.87	13.87	14.31	14.45	14.45	14.45	13.43	13.43	13.43	13.43
-9	14.31	14.31	14.31	14.45	14.45	14.45	13.43	13.43	13.43	13.43
-10	14.31	14.31	14.31	14.45	14.45	14.45	13.43	13.43	13.43	13.43

EngineSpeed [RPM]

The suggested tuning method is to set the AFR using the LambdaTargetTable or AFR Target Table to a value safe and suitable for the engine. For normally aspirated engines a value of 13.0:1 or 0.887 lambda is usually sufficient at all operating conditions. For boosted applications, the operating conditions dictate a safe AFR. Please consult a tuner knowledgeable in your engine's requirements for help. Once the target lambda (AFR) values are chosen, run the engine at as many operating conditions as possible and adjust the VE Table to reach the AFR Target Table values. Once the VE Table has been tuned to accurately reach the AFR Target Table values at all operating ranges, then you can change the AFR Target Table to use different AFR settings later. Never adjust VETable to run a different AFR, only to achieve the LambdaTarget value.

The Injector Flowrate is very important in determining the fuel requirements. The Infinity ECU uses actual Injector Flowrate [cc/min] to determine the proper injector pulse width. The InjFlowRate [cc/min] table is calibrated from the Setup Wizard: Injector Flow, however the table can be modified manually for unlisted injectors.

InjFlowRate [cc/min]

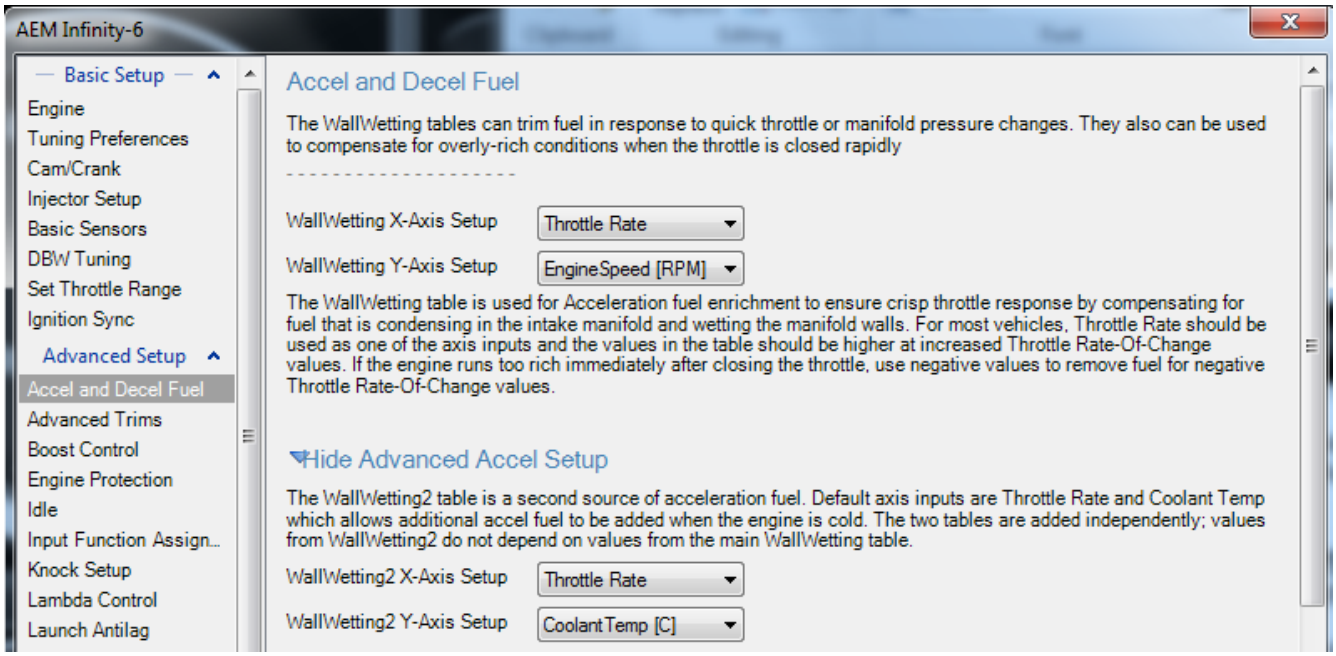
20.0	40.0	50.0	60.0	80.0	100.0
499.8	499.8	499.8	499.8	499.8	499.8

InjPressure [psig]

Now that the base injector flow rate has been determined, the Infinity ECU applies a few more compensating factors. Wall Wetting is a function of fuel condensing in the intake manifold at the injection point. At different rates of change in the MAP [kPa] values, and at different Coolant Temperatures, fuel enrichment compensations are used to prevent lean and rich conditions during rapid manifold pressure changes. Note that this table has several different functions. It can be used for dynamic transients by nature of its "MAP Rate" x-axis. It can also be used for more steady state compensations by adjusting the values in the "middle band" of the table where MAP rate changes are very small. Positive numbers in this table will effectively add fuel to enrichen the mixture. Negative numbers have the opposite effect.

The X and Y axis inputs of the WallWetting table can be set to several different variables. These settings are found in the Setup Wizard page for Accel and Decel Fuel. Axis selections include:

Map Rate
Throttle Rate
Coolant Temp
MAP [kPa]
EngineSpeed [RPM]
DBW_APP Rate



LamdaAfterStartTrim is a 2-axis table that is used to modify the Lambda (AFR) for specified time after starting the engine. This table adds a lambda offset for a small period of time after the engine is started. By allowing a slightly richer mixture target, it will keep the engine from stalling or running rough immediately after starting and the lambda correction to a minimum. The last column should be populated with “0” trim at operating temperatures to prevent a continuous lambda offset.

Target Lambda

To control the engine's fuel delivery system, the Infinity can be programmed to run open loop and/or closed loop O2 feedback. Closed loop uses feedback from the oxygen sensor to make temporary, but immediate, corrections to the injection to maintain a target air fuel ratio (AFR) or lambda. The type of the O2 sensor will determine how lambda target can be controlled. Due to the nature of standard narrow band O2 sensors, the only accurate measurement that can be maintained in closed loop is Lambda 1.0. However, wideband O2 sensors can be used in almost every feedback condition.

Note that 14.64:1 is called the stoichiometric AFR for gasoline. It is the ratio where all available fuel is burned completely. For most performance applications, it is not the ideal AFR to operate the engine at all the time nor is it the AFR that creates the most power or even economy under all conditions.

When the fuel system is open loop, the O2 sensor is ignored and the injector pulse width relies on the VE Table and fuel compensators to adjust injection duration. Open loop is necessary during engine starts, when the O2 sensor has cooled below its operating temperature. It may also be necessary when coolant temperatures are low. In this state, the fuel vaporization is poor and the engine will require a richer mixture to properly operate. When under heavy load, the engine typically requires an air fuel ratio that is out of a narrow band oxygen sensor's standard range and open loop will be necessary. When the accelairflow function is triggered during hard accelerations, open loop may be necessary to help stabilize the Target Lambda. Also, when the deceleration function cuts fuel completely, target lambda will not be necessary.

<u>LambaTargetTable</u>
Units: Engine Load vs Engine Speed vs Lambda
Description: This table sets the target lambda for various engine conditions.

LambdaTargetTable

:Pa]	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
220.0	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710
200.0	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710
175.0	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710
150.0	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710
125.0	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710	0.710
100.0	0.820	0.820	0.820	0.820	0.820	0.820	0.820	0.820	0.820	0.820
80.0	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990
60.0	0.940	0.940	0.940	0.980	0.950	0.940	0.940	0.940	0.940	0.940
40.0	0.940	0.940	0.940	0.980	0.950	0.940	0.940	0.940	0.940	0.940
30.0	0.940	0.940	0.940	0.980	0.950	0.940	0.940	0.940	0.940	0.940

EngineSpeed [RPM]

Tuning Target Lambda
The first step before tuning:

1. Open **Infinity Tuner** and connect to the ECU.
2. Open the **Lambda Tab** and confirm the **Lambda1Cal Table** is set up for the oxygen sensor used.
3. Open the **Lambda Control Wizard** and check the **Lambda 1 Feedback Enable** and/or **Lambda Feedback Enable** boxes.
4. Set the **Lambda Feedback Max Speed**. Wideband O2 sensors are accurate in most situations so this can be activated all the time, if need be.
5. Set the **Lambda Feedback After Start Delay** (typical –10 seconds).

The Infinity Tuner functions are located in the **TargetLambda** tab.

1. Use the **Lambda Control Proportional Gain** by itself and set the **Lambda Control Integral Gain** and **Lambda Control Derivative Gain** to zero.
2. Log the channels **Lambda1** (or 2) and **ErrorLambda1** (or 2).
3. Increase the **Lambda Control Proportional Gain** until the point of instability or a sustained oscillation is reached.
4. From here, the ultimate proportional (Ku) is found.
5. From the log, measure the period of oscillation from peak to peak, in seconds, to obtain the critical time constant or ultimate period (Pu).
6. Once the values for Ku and Pu are obtained, the PID parameters can be calculated from the following equations.

Proportional, Integral, and Derivative Feedback
Lambda Control Proportional Gain = 0.60 (Ku)
Lambda Control Integral Gain = 2 (Kp) / Pu
Lambda Control Derivative Gain = (Kp)(Pu) / 8

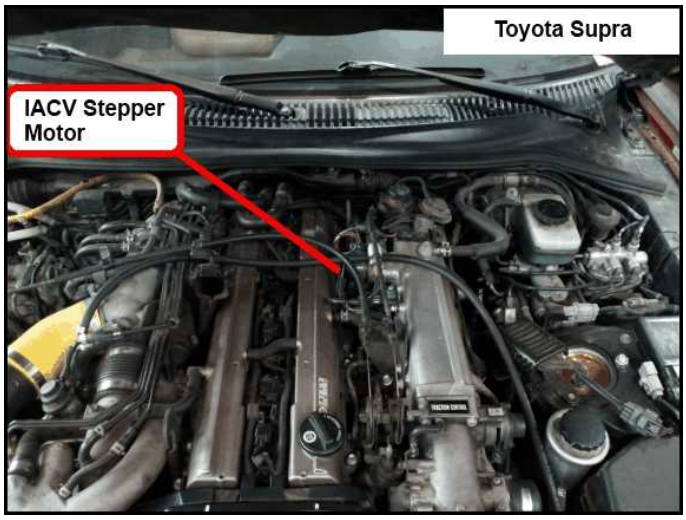
Note that these values are not optimal values and additional fine tuning may be required to obtain the best target lambda performance.

Wiring Harness

Wiring

Idle Air Control Valve Requirements

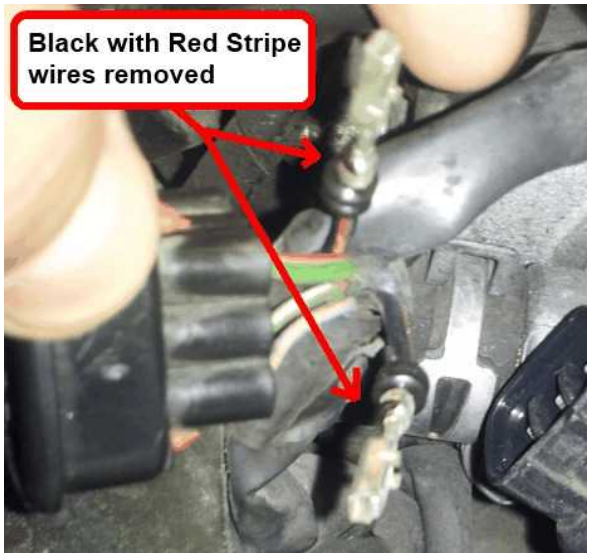
Many Toyota, Mitsubishi, and other vehicles use an Idle Air Control Valve with a Unipolar Stepper Motor (6-pin connector) and MUST be modified. See picture below. A Bipolar Stepper Motor (e.g., GM) will have a 4-pin connector and DOES NOT need to be modified. *This info does not apply to vehicles that utilize IACV solenoids.



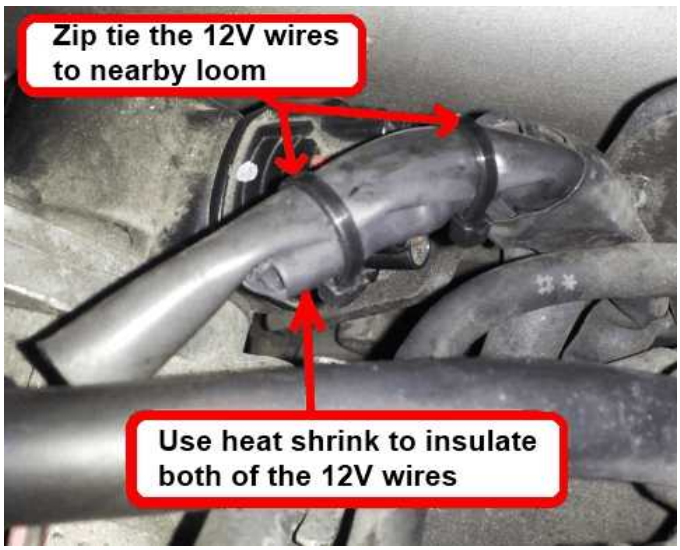
The 2 center pins (Black-Red wires) supply 12V power to the stepper motor in the factory setup, however these pins MUST BE DISCONNECTED before powering on the AEM Infinity ECU.

Step 1: Disconnect connector from IACV housing and gently remove the retainer from the connector.

Step 2: Use a small flat-blade screwdriver/pick to move the terminal locks while pulling the Black-Red wires out from the backside of the connector.



Step 3: Use heat shrink to insulate both 12V wires and then zip-tie the insulated wires to a nearby loom.



Step 4: Reinstall the retainer, and then plug the connector back into the IACV.