# ThunderMax Throttle-by-wire (TBW) TMax I Tuner Tuning Manual

**SOFTWARE Version 2010.1.18 For
ThunderMax High Resolution ECM
For 2008-2010 Delphi®-Based Air Cooled Touring
Motorcycles**
Manual V.20100520

**Email Technical Questions to: ProductSupport@ZippersPerformance.com**
**www.Thunder-Max.com**

# Section 1: Introduction

# Section 2: Hardware and Software Installation

# Section 3: Learning the Basics of TMax Tuner Software

## Section 4: ThunderMax Tuning

## Section 5: Diagnostics and Troubleshooting

## Section 6: Updates

# Section 1:
# Introduction

# SYSTEM REQUIREMENTS

TMax Tuner software package is designed to run on personal computers using *Microsoft® Windows 2000™, Windows XP™, Windows Vista™ and Windows "7" ™* operating systems.  The computer system must have an adequate amount of free space on the hard drive for proper operation. TMax Tuner is approximately 140MB when installed. TMax Tuner does not support Windows 98™ or earlier operating systems.

**A high speed internet connection is required for updates to software, firmware, and Base Map Library updates; as well as the automated Module Data and Monitor Log Support Emails.**


# USER REQUIREMENTS


The TMax Tuner software requires basic computer skills to be able to effectively use the program and achieve your tuning goals. The operator must possess the following basic skills before attempting to use the software or calling Zipper's Technical Support:

    1.) **Basic Windows™ Skills**

    2.) **Ability to Copy and Paste** files from one folder to another

    3.) **Maneuver through a typical Windows™ environment**, storing files in folders and retrieving them when needed.

    4.) The ability to install a new piece of USB hardware, and direct Windows where to find the appropriate drivers.

# CONTENTS OF SUPPLIED DISC

The TMax Tuner software disc includes the following:

- **TMax Tuner Software**
  - Complete Base Map Library
  - Complete Tuning Manual accessible through the Help Menu (.PDF)
  - Link to the ThunderMax website
  - "What's New" guide
  - Automated Technical Support Options
    - Module Data Email
    - Monitor Log Email

- **TMax Tuner QuickStart Guide,** in PDF Format.
  **08-10 FL Big Twin (Touring)**

- **AutoTune Demo File** – Watch this sample video file of the AutoTune correcting for a 20% rich and a 20% lean condition. The video was created using a ThunderMax ECM with AutoTune on a load control dynamometer.

- **Driver files for USB communication** are now supplied within the software. Instruction is provided for installation in the following section.

If the TMax Tuner disc is not available, the TMax Tuner software with Tuning Manual can be downloaded from the www.Thunder-Max.com website, under the Support section.

# IMPORTANT NOTES

- The ThunderMax Tuning Manual contains a Glossary of Terms as well as an Appendix with a dialog on the menus and functions of the software. These features have been added to avoid any confusion over the terminology and functions used in TMax Tuner and in EFI tuning in general. Please refer to the end of this document for these valuable tools when needed.

- In addition, the speedometer calibration should always be confirmed during the installation for your year/model motorcycle. This is critical so that your speedometer is calibrated and functional before road testing your new ThunderMax ECM. In addition, anytime a map is reloaded or a new map is loaded onto your ECM, the speedometer calibration needs to be set to your application.

**NOTICE to Dealers and Tuners:** If you are a dealer, or an experienced tuner, contact your Zipper's representative to learn about Tuner Plus software authorization. The Tuner Plus software is specifically designed for the development of base maps.

The ThunderMax EFI Race controller is not legal for use or installation on motor vehicles operated on public highways, and may be restricted to closed-course competition use only, in the State of California and other States where similar emission control laws may apply.

The user shall determine suitability of the product for his or her use. Installation and use on a pollution-controlled vehicle, for highway use, constitutes tampering under the US EPA guidelines and can lead to substantial fines and penalties.

See www.thunder-max.com for more information.

# Section 2: **Hardware and Software Installation**

Steps to Install and setup your new ThunderMax ECM:

1.) Install Software (Page 9)
2.) Install Hardware (ECM & Sensors) (Page 13)
4.) Install USB Drivers (Page 23)
5.) Link to the Module (Page 48)
6.) Select and Load a Base Map (Page 41)
7.) Verify the Speedo Cal value (Page 83)
8.) TBW Module Initialization** (Page 38)
   **Please note the Module Initialization procedure is different from the previous non-TBW ThunderMax ECMs!

**Always pull the ECM fuse before disconnecting or reconnecting the battery! At any point if the ECM Fuse has been pulled, including during battery replacement, the ThunderMax ECM must be re-initialized.**

# TMAX TUNER SOFTWARE INSTALLATION

To install the software onto the computer system, take the following steps:

1. Exit any programs that are currently running.

2. Insert the TMax Tuner Software disc into the CD-ROM drive.

   If you've lost your software installation disc, the newest version can always be downloaded from the website www.Thunder-Max.com , select the "Software" icon at the bottom / right of the home page.

3. TMax Tuner will automatically begin the installation process; the following window will appear:
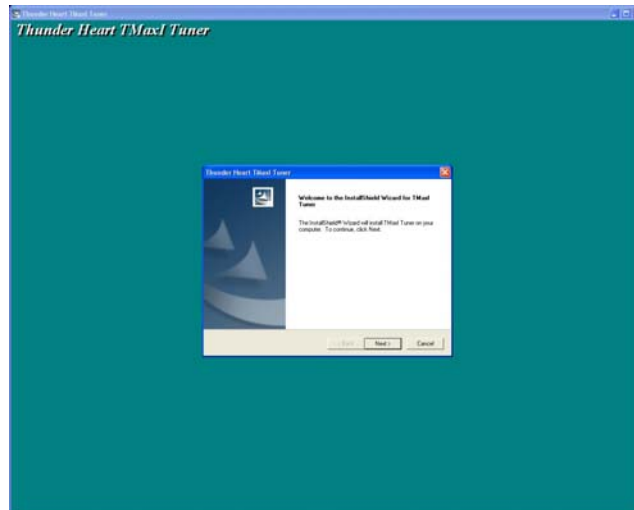


4. The TMax Tuner Installation Wizard will now guide you through the rest of the installation.

5. Once TMax Tuner is installed, a desktop icon named "TMax" will appear on your computer's desktop. Select this new icon to open TMax Tuner.

6. To ensure that you are using the latest software, after the installation is complete, open the software by selecting the "TMax" icon that is now on your desktop. Once opened, select **Configure > TMax Software Update**, as shown in the following picture. For complete instructions, see the "Updates" section in this manual.
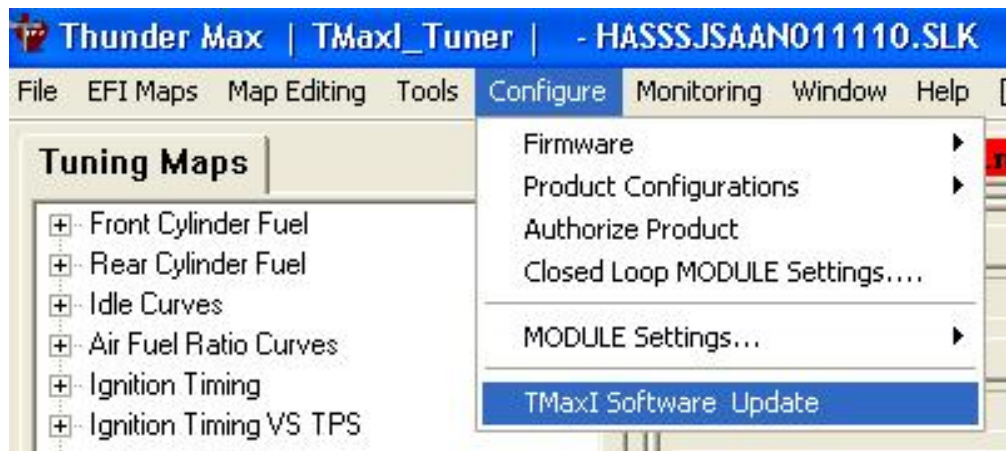
## Errors During Installation:

Windows errors during installation are not necessarily TMax Tuner software issues. Please uninstall TMax Tuner software and reinsert the CD-Rom if a problem occurs during installation.

# TMAX TUNER SOFTWARE REMOVAL

This section describes how to fully remove the TMax Tuner software. If an error occurs during the installation of TMax Tuner, it may be necessary to completely remove the software prior to reinstalling TMax Tuner.

**1.)** Save any custom maps and folders to your desktop.

**2.)** Select Start > Settings > Control Panel, or Start > Control Panel, depending on which Windows Start Menu you use.

**3.)** Select the Add / Remove programs option in the Control Panel. Find the "TMax Tuner" program, and remove it. The programs are all listed in alphabetical order, and the un-installation should be straightforward.

**4.)** The "InstallShield Wizard" will start to run, and a box with three options will appear on your screen. Select "Remove" as shown below.
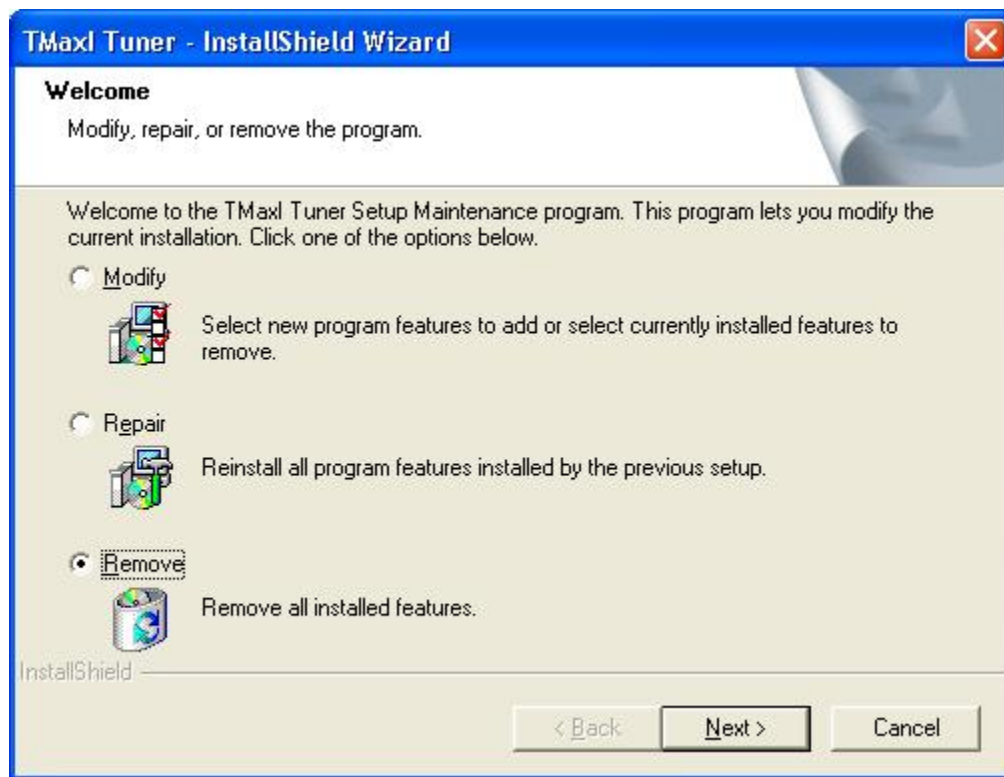


**5.)** Follow the remaining InstallShield Wizard instructions and remove all of the TMax Tuner application.

**6.) Restart your computer!**

**7.)** Once Windows has reloaded, you need to remove a folder of information left behind in the Program Files directory. The folder to remove is titled "Thunder Heart". This contains your Base Map library, please take the time to save any custom maps to your desktop now (if you didn't in step 1), otherwise they will be deleted.
If you have a 32-bit operating system (Windows XP or Vista), the folder to delete is named <u>Thunder Heart</u> and is found at the following location:

**C:\Program Files\Thunder Heart**

If you have a 64-bit operating system, the folder to remove is found at the following location:

**C:\Program Files (x86)\Thunder Heart**

**8.)** Lastly, a second folder needs to be deleted to fully remove the TMax Tuner software. It is also titled "Thunder Heart".

If you have either version of Windows XP, 32 or 64 bit, the folder to remove is found at the following location:

**C:\Documents and Settings\All Users\Shared Documents\Thunder Heart**

If you have either version of Windows Vista or Windows 7, 32 or 64 bit, the folder to remove is found at the following location:

**C:\Users\Public\Public Documents\Thunder Heart**

**9.)** You've now 100% removed the TMax Tuner software, and all of the files and folders created by it. Restart your computer and you're ready to reinstall a new version of TMax Tuner. Follow the instructions to install a new version of TMax Tuner. The latest version of TMax Tuner can always be found on the www.Thunder-Max.com website, under the "Support" heading.

# HARDWARE INSTALLATION TIPS

 Aftermarket exhaust systems may or may not have the appropriate sensor bungs welded in place. **The Bosch wide band oxygen sensors supplied with ThunderMax TBW will fit 08-09 OEM head pipe systems with adequate clearance, yet you should always** make sure the sensor does not rub the frame, transmission or any parts of the motorcycle that could damage the sensor.

**Difficult Oxygen Sensor Removal** – Work the sensor back and forth, carbon from the exhaust process gets caught in the threads between the oxygen sensor and the sensor bung; it can damage the threads if forced out. If the exhaust system is cold, spray carburetor cleaner, or any penetrating fluid, at the sensor threads to help break down the carbon build up.

**Wide Band Oxygen Sensor Clearance Issue** – Large volume users may want to make a tool or "bending bar" which allows you to alter the angle of the sensor bungs in any  exhaust pipe that may lack proper clearance. The threads are 18mm x 1.5 mm, which is the same as an 18mm spark plug.

**International Motorcycles** – All international model motorcycles are equipped from the factory with active intake and exhaust systems. The ThunderMax does not support the operation of these items. No trouble codes will be present if the active exhaust is unplugged from the harness with the ThunderMax system. External devices to "trick" the ECU from creating an error code are unnecessary when using the ThunderMax system.

# TBW HARDWARE INSTALLATION
## ThunderMax ECM for '08-Up Throttle-By-Wire H-D Models ONLY

**Step 1.** Remove seat and both side covers.

**Step 2.** Remove the ECM fuse from the fuse box behind the left side cover. Push up on the bottom of the fuse box cover to remove the cover (located on the left side of the bike), then remove the ECM fuse from the fuse box.
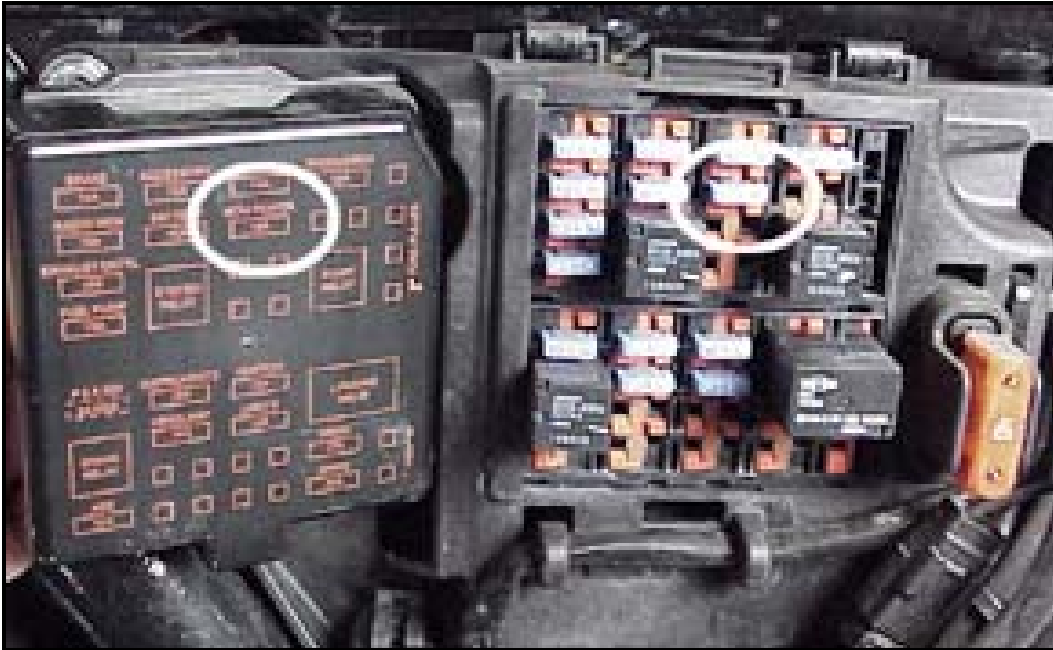


**Step 3.** Remove the narrow band sensors from the exhaust pipe, '08-'09 models are located at the top of the head pipe, 2010 models (smaller) 12 mm sensors are located at the base of the head pipe.

- If retaining the factory headpipes on 2010 models, 18mm bungs will need to be added to the headpipes.  Bungs should be located no more than 3-4" from the head/pipe connection (for ideal location, refer to the factory location on '07-'09 models).  Weld-in bungs are available from Zipper's (#272-200, straight; #272-202, angled).  See Video on adding new bungs at: www.thunder-max.com/Support/Instructions/FuelInjectionVideos.aspx
- Better aftermarket exhaust systems will offer o/2 sensor bungs in both locations.  Be sure to install 12 mm caps (Zipper's # 272-204 / set of 2) when you remove the 12 mm o/2 sensors.

**Step 4.** Install the supplied wide-band sensors into the pipes; route the front sensor along the cross brace on the frame in front of the engine and down the lower frame rail on the right side of the motorcycle.
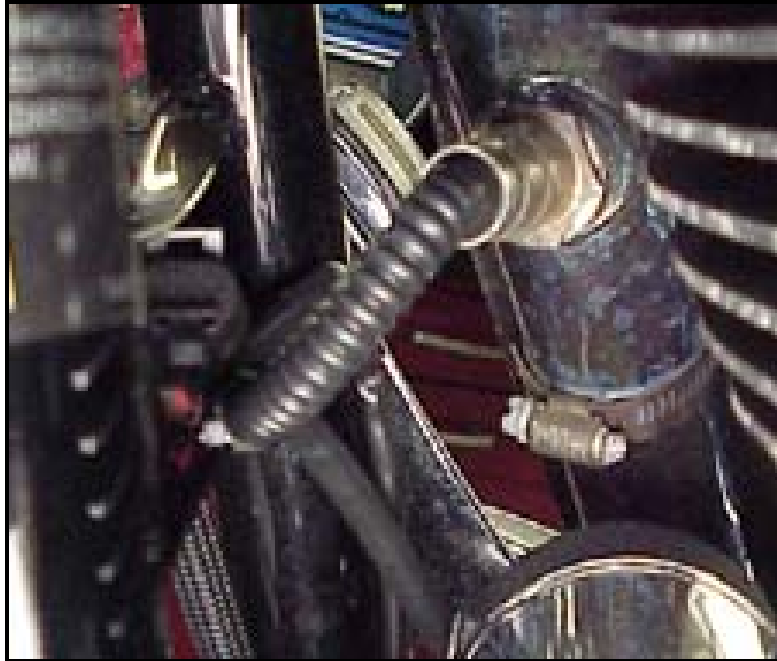


**Step 5.** Route the rear sensor lead between transmission top cover and the starter, then towards the ABS caddy located under the right side cover. Tuck the sensor connector under the ABS caddy.
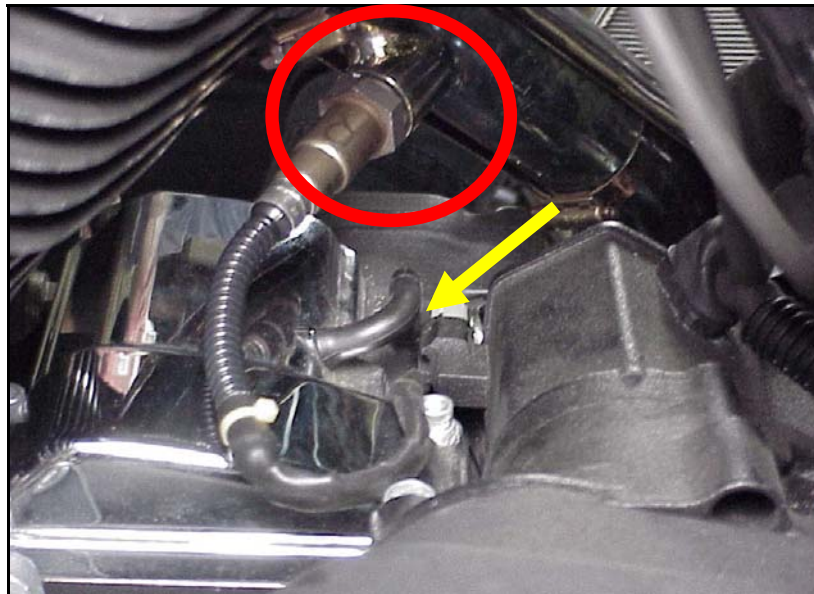
**Step 6.** Remove the factory ECM from the caddy by spreading the plastic caddy latches at the sides of the ECM.  Lift the ECM up and to the right to release it from the caddy.
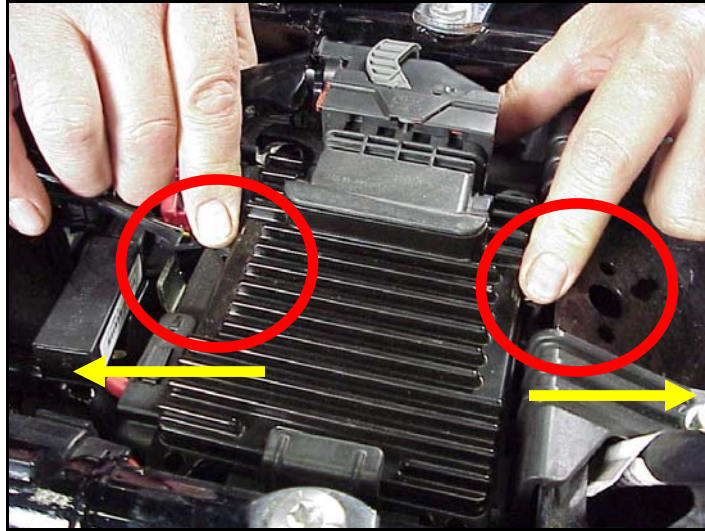


**Step 7.** Disconnect the ECM from the connector as per the following procedure: Depress button on socket housing of the connector; rotate locking bar until it reaches the full rearward position (the index pin on locking bar will engage the rear notch in the socket housing).



Depress button

Rotate locking bar fully towards rear of bike until index pin reaches notch

The connector internal latches are not fully disengaged until the locking bar on the connector is seated to the full rearward position to complete removal of the connector. If you force the socket housing with latches partially engaged, it will result in damaging the connector. Once index pin is fully seated, with steady yet careful attention, pull apart the connector from the factory ECM and remove it from the motorcycle.

**Step 8.** With the factory ECM removed, route the AutoTune harness thru the opening on right side of the frame below the down tube for the seat, towards the ECM caddy.



**Step 9**. If equipped with factory alarm, detach alarm antenna from ECM caddy clip by lifting slightly and sliding to the right of bike (do not disconnect).

**Step 10.** Locate the orange package of dielectric grease included with communication cable. Spread a small amount of grease on the AutoTune harness plug inboard of the mounting flange to allow the plug to easily slide into the ThunderMax ECM, with ThunderMax logo on harness plug facing up. Attach with screws provided.



**Step 11**. Install main harness connector to ThunderMax ECM. Before installing connector, lightly spread some dielectric grease on harness connector terminals, and on the inside lip of the connector port opening of the ECM to allow the rubber weather seal in the connector plug to slide into place without binding.
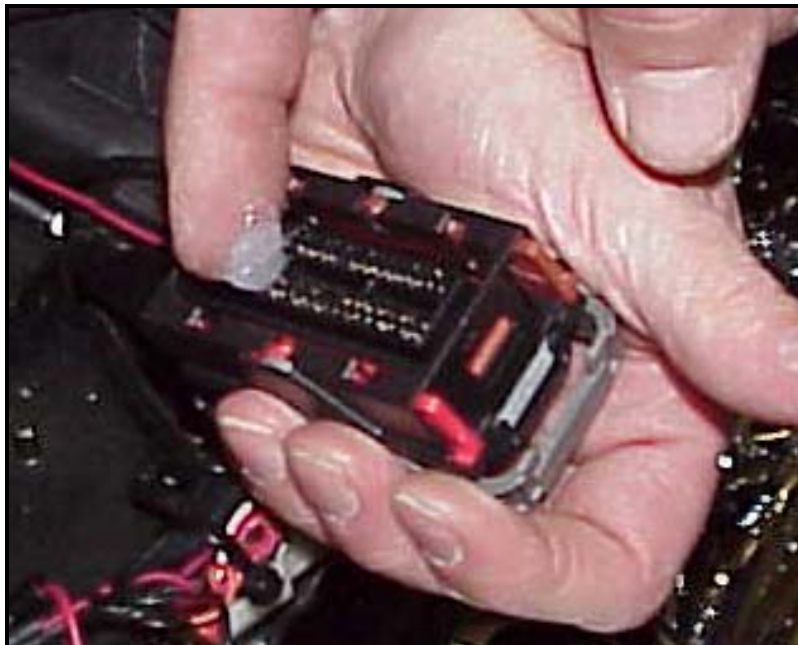
Before connecting, verify that the locking bar is in the fully open, rearward position (locking bar index pin is fully engaged with rear notch in the socket housing).



Fully open position: Index pin engaged with rearward notch

Sliding colored cam locks in fully open position towards rear of bike

***Important Note:*** If the socket housing with grounding pin is not properly aligned during connector installation damage to the grounding pin will likely occur, which will require you to return the ThunderMax ECM for repair to the damaged pin.

Rotate the locking bar forward to engage the connector. Observe that the colored cam locks are moving with the locking bar; proper execution will show both colored cam locks visible in equal amounts on the forward-facing side of the connector when the locking bar is in its fully seated position with the button lock engaged, as in the image below **(do not force the locking bar)**. Index pin will engage front notch in socket housing.



Fully closed position: Index pin engaged with forward notch

Sliding colored cam locks in fully closed position towards front of bike
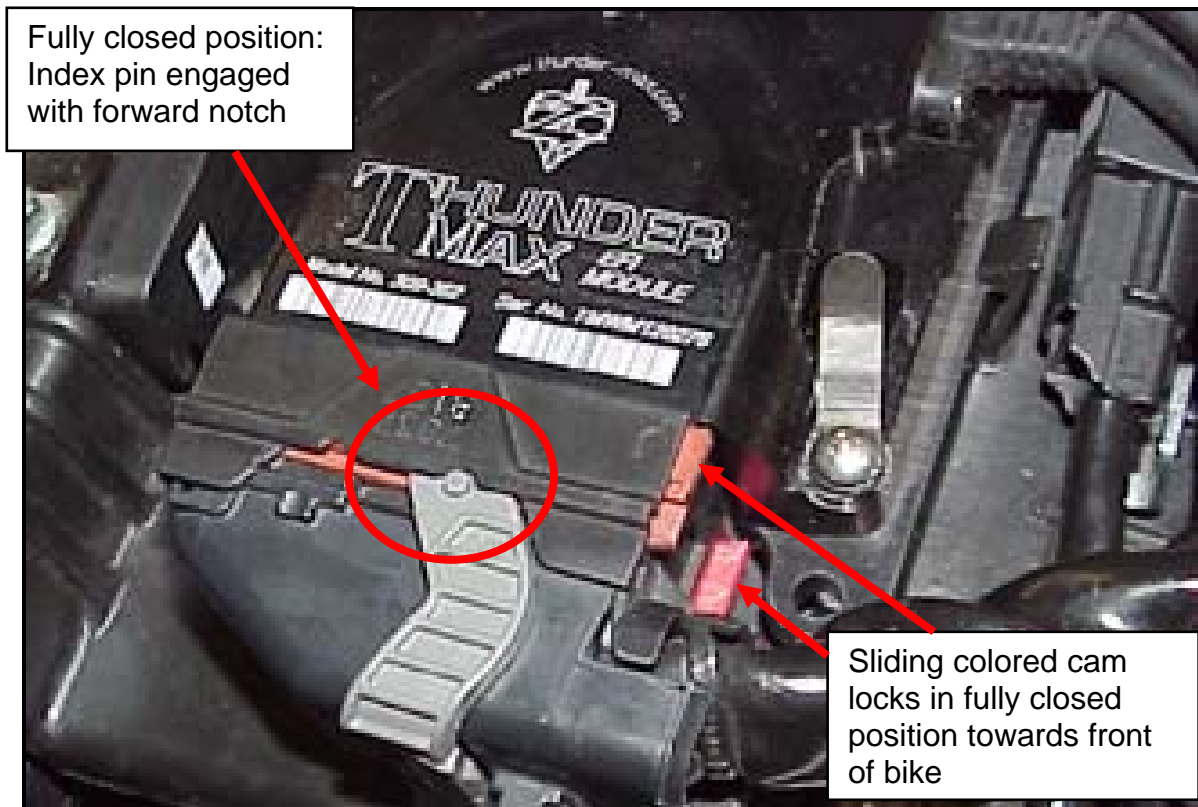
***Important Note:*** Pin and socket housing of the connector must be fully engaged before you rotate the locking bar to the forward position. Forcing the locking bar forward before the connector is fully engaged will damage the connector and/or the ECM

**Step 12.** Place the ThunderMax ECM into the ECM caddy. If equipped, position alarm antenna as shown.
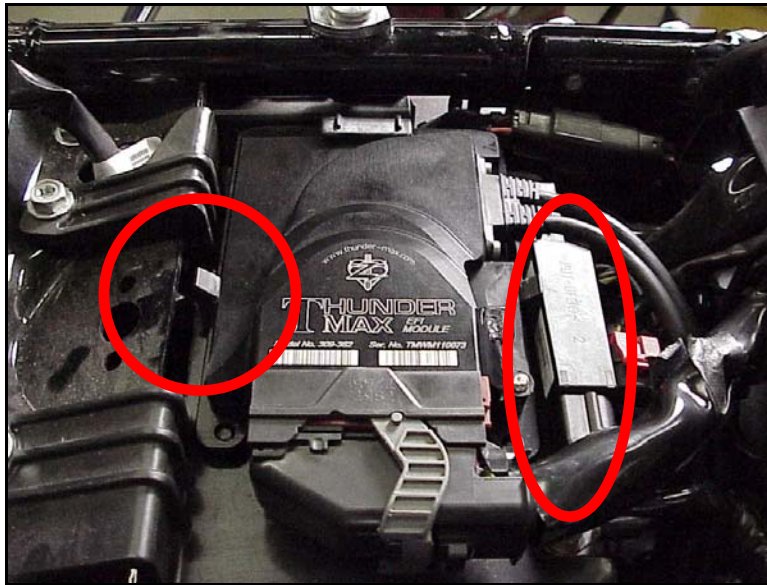


**Step 13.** Connect the oxygen sensor harnesses to the AutoTune harness. Carefully wire tie the leads to the motorcycle. Take extra care to ensure wire leads are safe from rubbing or chaffing on the motorcycle. Use all supplied wire ties; add extra ties if needed to properly secure wiring on your installation.

**Step 14.** Position the rear connector under the ABS caddy and attach with wire ties provided as shown.

**Step 15** Position front connector above lower frame rail between engine and transmission. Attach to existing harness with provided wire ties. Inspect all wiring to make sure it is clear of moving parts and excessive heat.
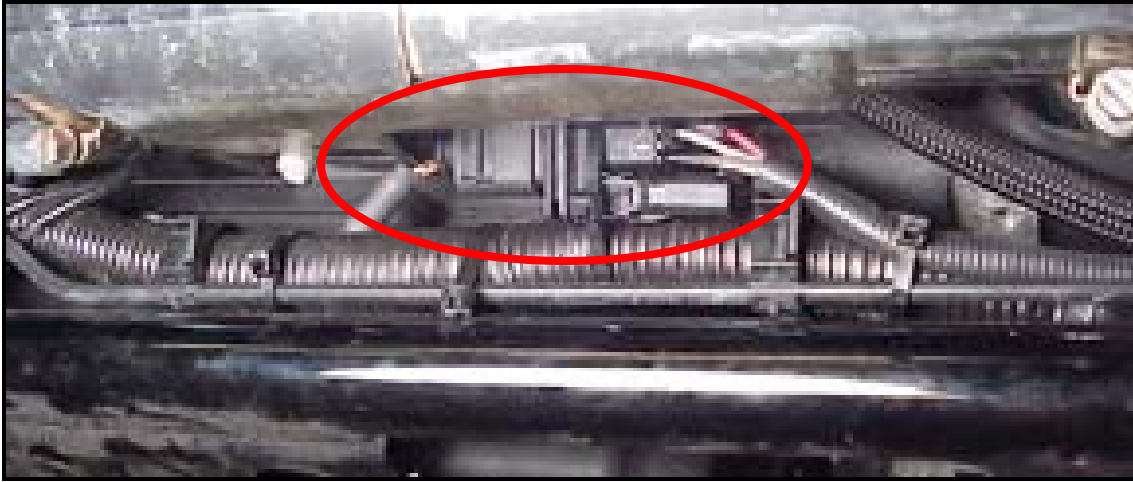


**Step 16.** Re-install the ECM fuse and replace the side covers.

**Step 17.** Turn on the main power and the rocker switches, **but do not start the engine.** Leave both of these switches on for a full 20 seconds, uninterrupted. Turn off main power switch.

You are now ready to install the USB drivers so that a connection to the ThunderMax ECM can be made. Be certain that you follow the appropriate procedure for your computer's operating system. A complete instruction set follows for each of the supports operating systems.

# USB DRIVER INSTALLATION GUIDE

Not all PCs will recognize "New Hardware" automatically (in this case the USB connection required for communicating to the ThunderMax Module). In the event that your PC does not initiate the New Hardware installation, the following steps are required.

## Turn the Run switch ON and the Ignition switch OFF

1) **Close all programs open on your PC except for TMaxI_Tuner**. Minimize the TMaxI_Tuner software if necessary.

2) From the **Start** menu, **Right Click once** on:
   a)  My Computer (XP) or
   b) Computer (Windows 7 &Vista).

3) From the drop down menu that appears, **Left Click once** on **Properties.**

4) A window named **System Properties** will appear.
   a) *XP Users:* **Left Click once** on the **Hardware** tab and then select **Device Manager**
   b) *Windows 7 & Vista Users:* Select **Device Manager** directly from the upper left of the **System Properties** window.

5) With the **Device Manager** window open, switch the motorcycle's ignition switch **ON** and watch for the *"Unknown Device"* or *"USB Device"* to appear (with a yellow exclamation mark beside it) in the **Device Manager**.

6) **Double Click** on this *"Unknown Device"* . When the next window opens, select **Update** Driver, **Install** Driver or **Re-install** Driver, which ever appears.

7) **From this point on, use the instructions provided in the following guides for your specific Windows operating system to locate and select the TMax USB Driver for installation.** The order of the initial windows that appear in the guides can vary from PC to PC. All possible views have been included for reference.

Three separate instruction sections are available for installing the USB Driver Installation, depending on the operating system you are using.

## USB Port Note:

**Remember to use the same USB port on your PC to connect each time to the ThunderMax module.** To use alternate USB ports, the driver installation process must be repeated for each additional USB port. This is a Windows® issue and is not related to the TMaxI_Tuner software or USB driver.

# Windows® XP® USB DRIVER INSTALLATION

The new TMax Tuner software for the ThunderMax Throttle by Wire EFI system creates a folder with the correct drivers for the USB interface. Once the USB cable is connected to your PC, the New Hardware Installation Wizard will prompt you to select an option for finding the correct driver.

The following instructions will direct you to the path for locating the driver folder.

**Step 1.** Connect the communication cable to your PC and to the ThunderMax module. With the Run switch and ignition switch in the "ON" position, the following "Found New Hardware Wizard" window will appear. Select "No, not at this time" and click Next to proceed.

**Step 2.** Choose "Install from a list or specific location (Advanced)" and click Next as shown on the next window.



**Step 3.** In the next window, select the options shown below and click "Browse" to locate the folder that contains the USB driver.
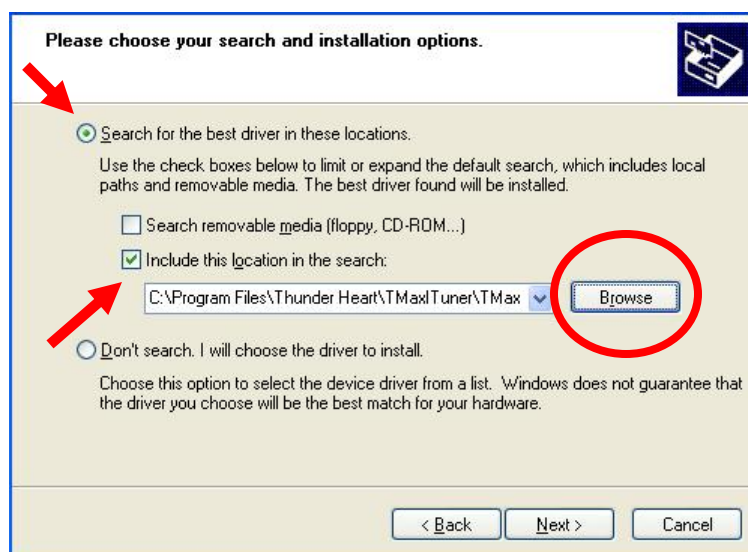


**Step 4.** Once the "Browse" option is selected, the following windows will appear where you'll choose the path to the driver. Starting with **"My Computer"**, the path is as follows:

 **C:\Program Files \ Thunder Heart \ TMaxITuner \ TMaxUsbDriver**

**Step 4. (a)** Open **My Computer** and then open **Local Disk (C:)** and scroll down to **Program Files**.
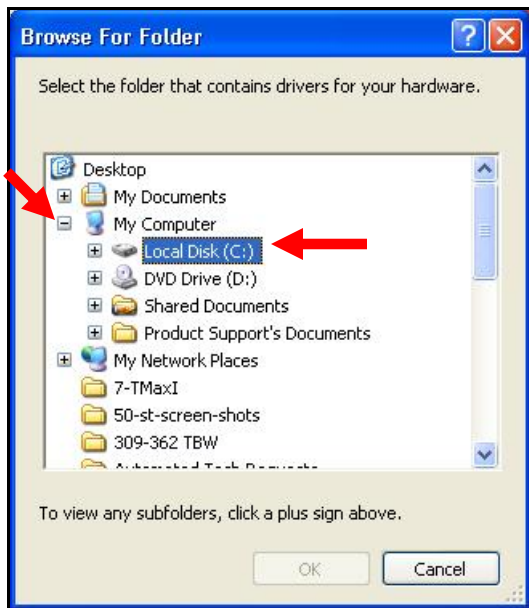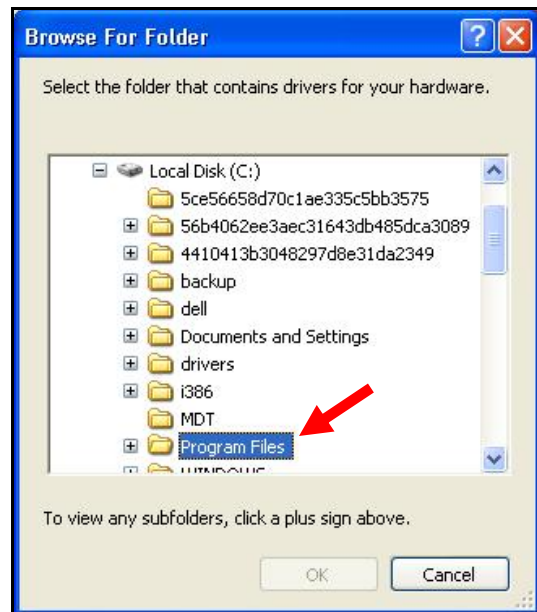


**(b)** Open **Program Files** and scroll down to **Thunder Heart**.



**(c)** Open **Thunder Heart** and scroll down to **TMaxITuner**.



**(d)** Open **TMaxITuner** and scroll down to **TMaxUsbDriver**.
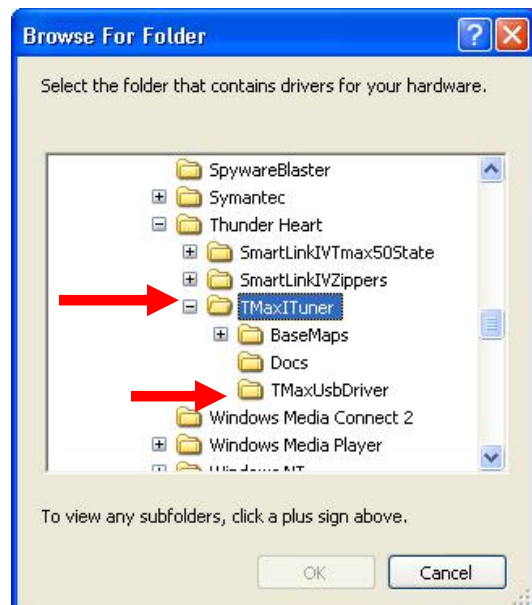
**(e) <u>Select</u>** TMaxUsbDriver and click **OK**.
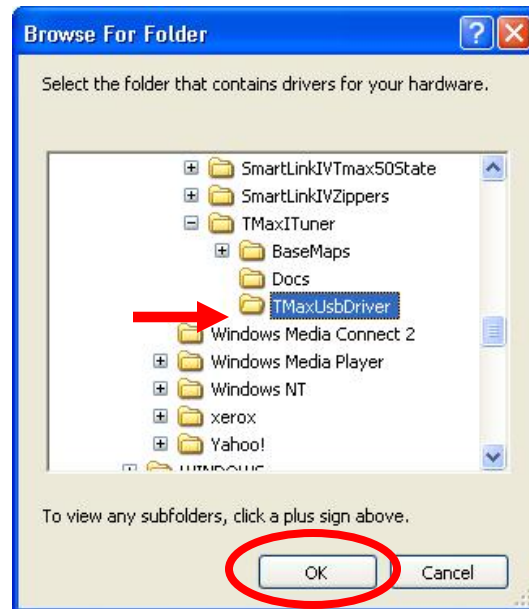


**<u>Step 5.</u>** Windows may display the following message, warning that this software has not passed their testing. There is no danger in using this driver. Select "Continue Anyway".
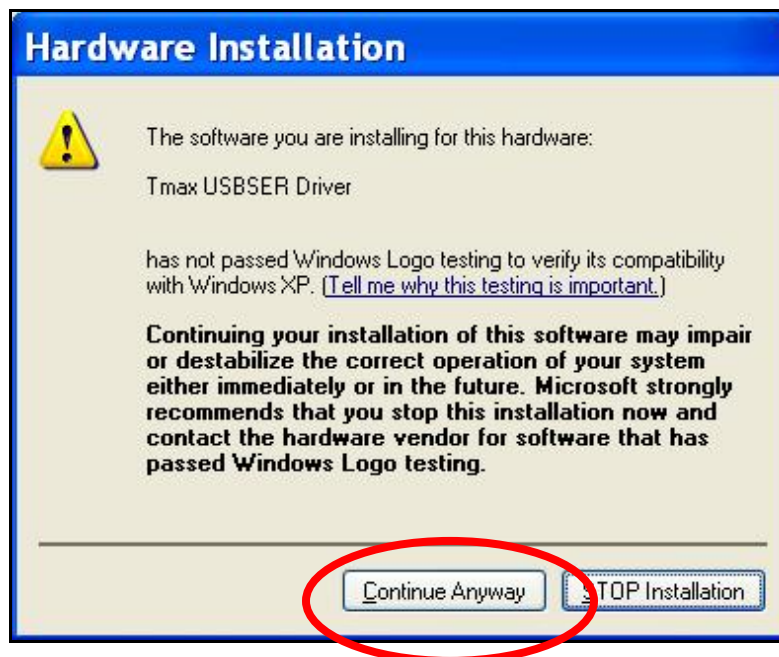
**Step 6.** The following window will be displayed while the driver is installing.



**Step 7.** Once the installation has completed successfully, the window below will appear. Select "Finish" to complete the installation. You will now be able to link to the ThunderMax module.



If any problems are encountered, reinstall the driver by following these instructions – starting at **Step 1**. If additional assistance is needed, contact

**ProductSupport@ZippersPerformance.com**

**Call (410) 579-2828 ext. 120. Monday thru Friday, 9am to 6pm EST**

# Windows® Vista® USB DRIVER INSTALLATION

The new TMax Tuner software for the ThunderMax Throttle by Wire EFI system contains a folder with the correct drivers for the USB interface. Once the USB cable is connected to your PC, the Found New Hardware window will prompt you to select an option for finding the correct driver.

The following instructions will illustrate the path for locating the driver folder.

**Step 1.** Connect the communication cable to your PC and to the ThunderMax module. With the Run switch and ignition switch in the "ON" position, the following "Found New Hardware" window will appear. Select "Locate and install driver software (recommended)" to proceed.
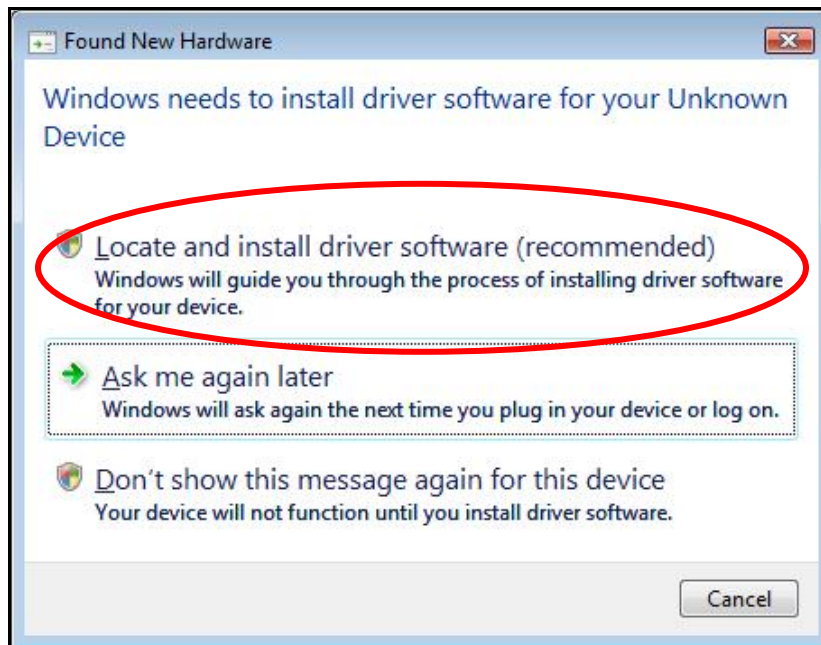
**Step 2.** Select "Browse my computer for driver software (advanced)" as shown below.
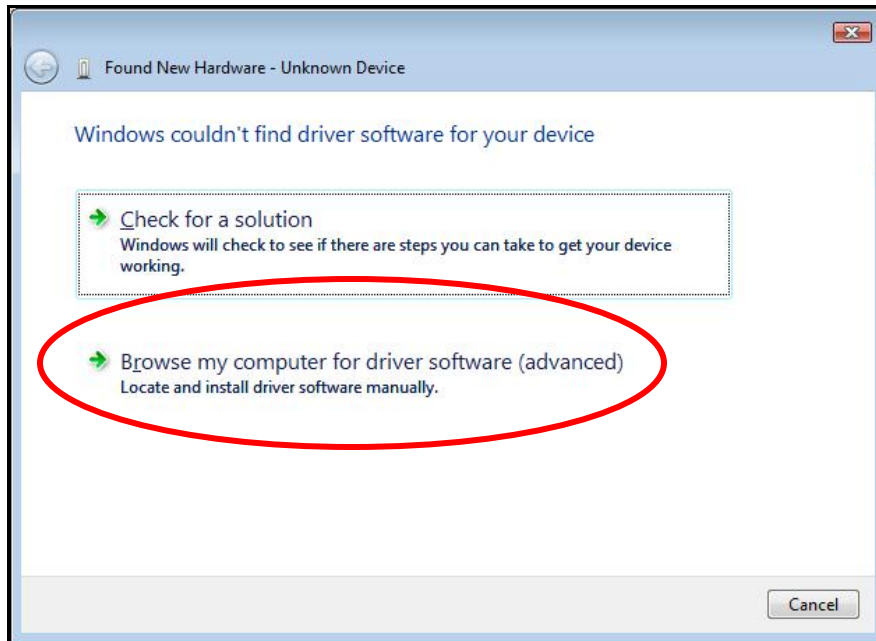


**Step 3.** In the next window select "Browse" to locate the folder that contains the USB driver. Be sure to check the box "Include subfolders".
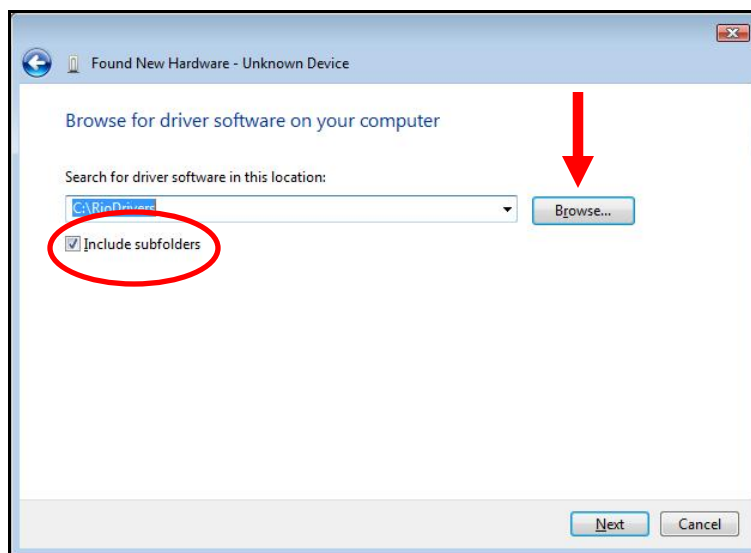
**Step 4.** Once the "Browse" option is selected, the following windows will appear where you'll choose the path to the driver. Starting with **"Computer"**, the path is as follows:
**C:\Program Files \ Thunder Heart \ TMaxITuner \ TMaxUsbDriver**

**(a)** Open **Computer** then open **(C:)** and scroll down to **Program Files**.
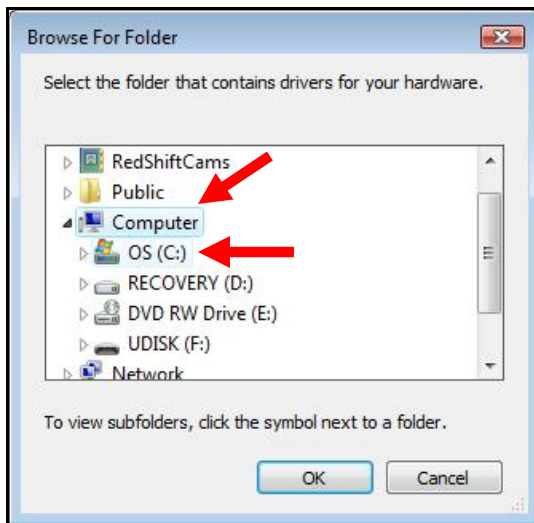
**(b)** Open **Program Files** and scroll down to **Thunder Heart**.
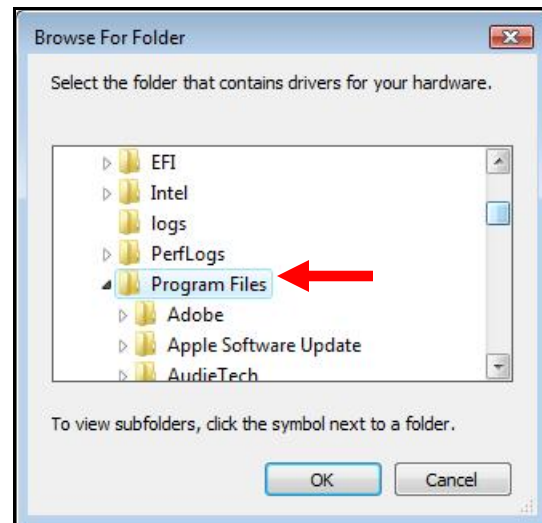




**(c)** Open **Thunder Heart** and scroll down to **TMaxITuner**.
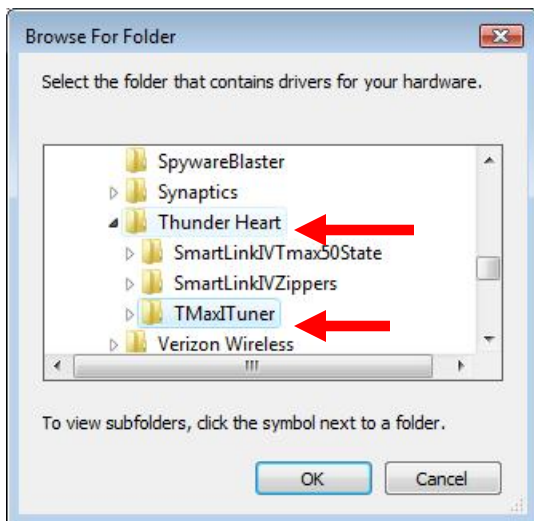
**(d)** Open **TMaxITuner** and scroll down to **select TMaxUsbDriver** and click **OK**.
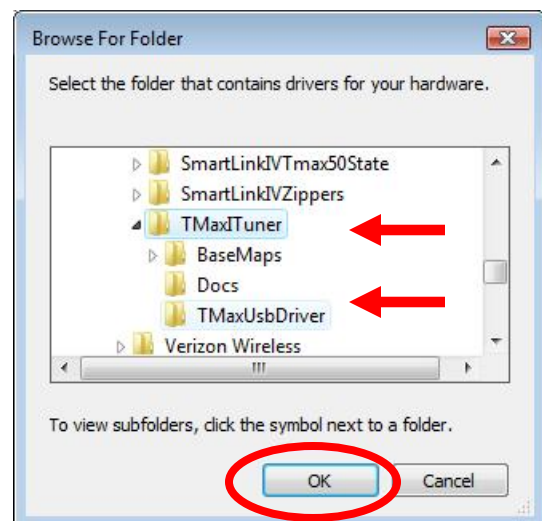
**Step 5.** The following window will appear confirming the chosen path for your computer, to find the correct driver. Check the box to "Include subfolders". Select "Next" to continue.
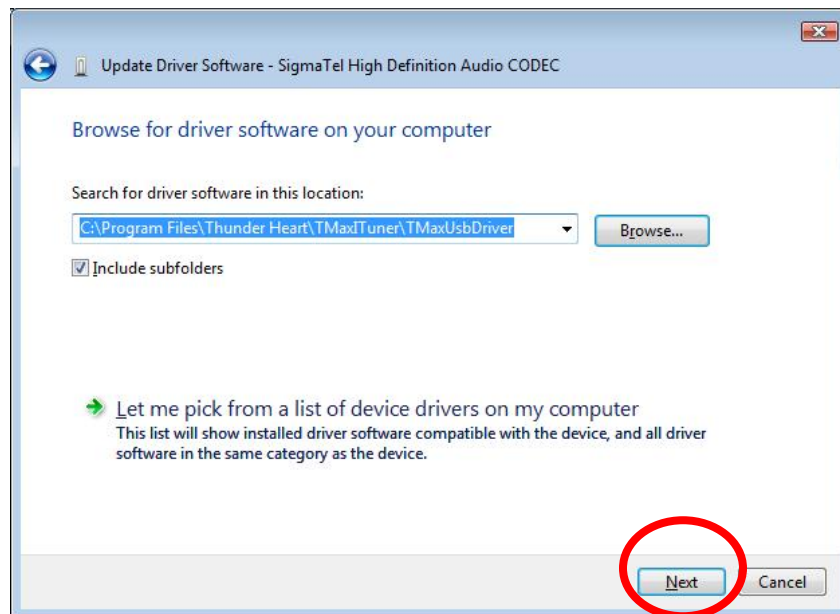


**Step 6.** Windows will display the following message showing the name and publisher of the driver. Select "Install" to continue.
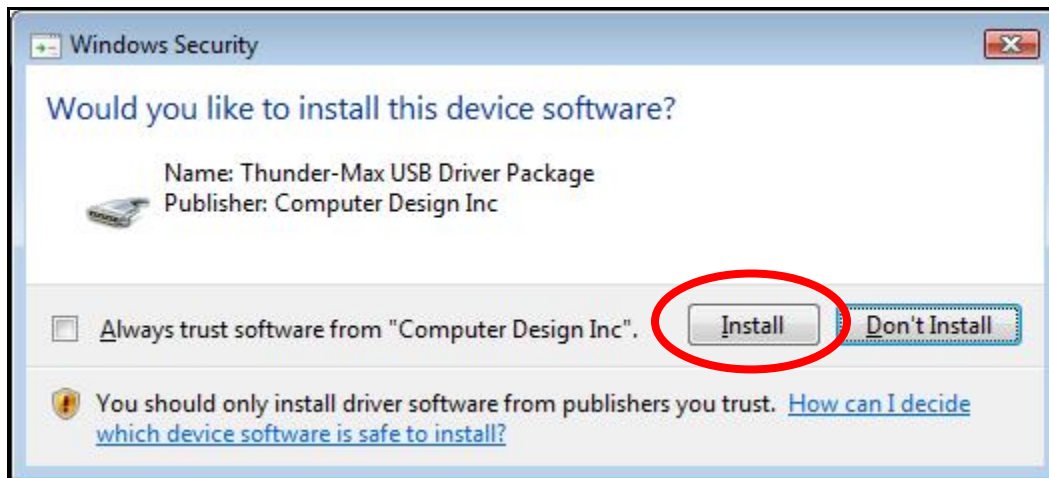
**Step 7.** The window below will appear as the driver is being installed.



**Step 8.** The following window will appear once the driver is successfully installed. Select "Close" to complete the installation. You will now be able to link to the ThunderMax module.
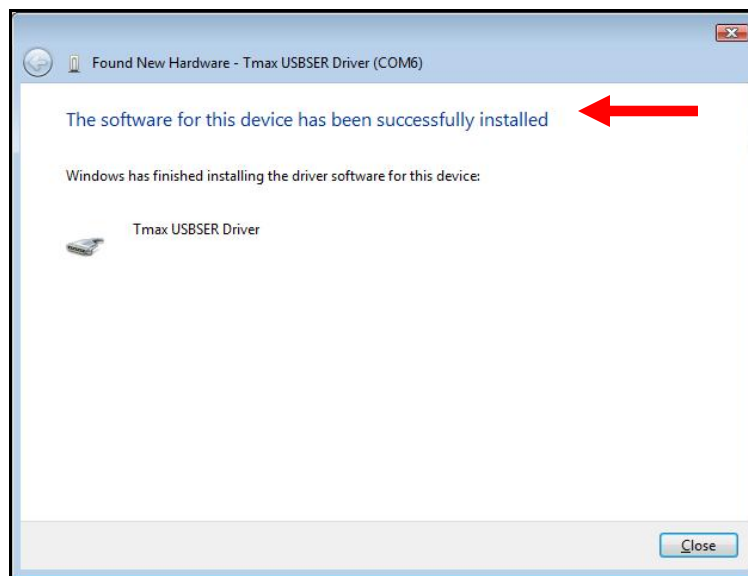


If any problems are encountered, reinstall the driver by following these instructions – starting at **Step 1**. If additional assistance is needed, contact
**ProductSupport@ZippersPerformance.com**
**Call (410) 579-2828 ext. 120. Monday thru Friday, 9am to 6pm EST**

# Windows® 7® USB DRIVER INSTALLATION

The new TMax Tuner software for the ThunderMax Throttle by Wire EFI system contains a folder with the correct drivers for the USB interface. Once the USB cable is connected to your PC and your bike, the hardware installation program will prompt you to select an option for finding the correct driver.

The following instructions will direct you to the path for locating the driver folder.

**Step 1.** Connect the communication cable to your PC and to the ThunderMax module. With the Run switch and ignition switch in the "ON" position, the following window will appear. Select "Browse my computer for driver software" to proceed.
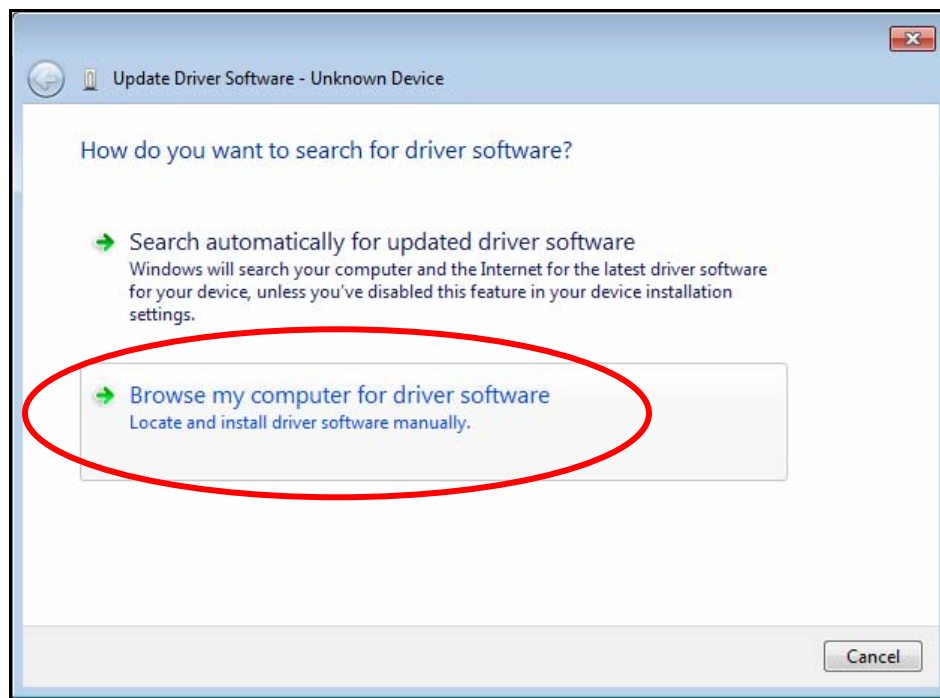
**Step 2.** Once the "Browse" option is selected, the following windows will appear where you will choose the path to the driver. Starting with **"Computer"**, the path is as follows:

**C:\Program Files (x86) \ Thunder Heart \ TMaxITuner \ TMaxUsbDriver**

**(a)** Left Click once on the arrow head to the left of "**Computer**" to <u>open</u> and view the subfolders.
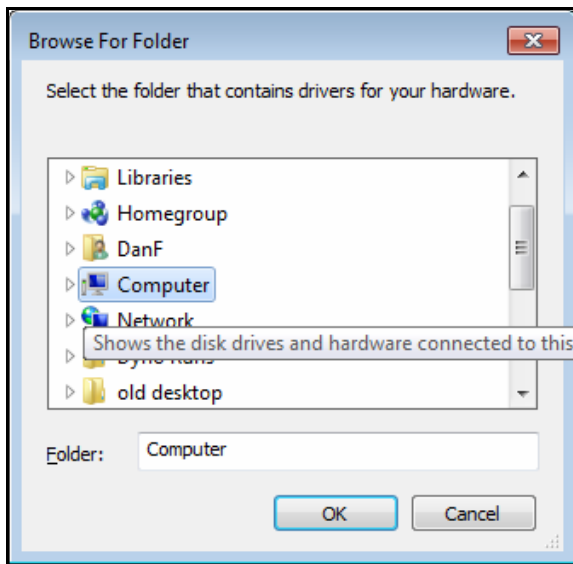
**(b)** Under **Computer**, Left Click once to open the **"(C:)"** drive next.
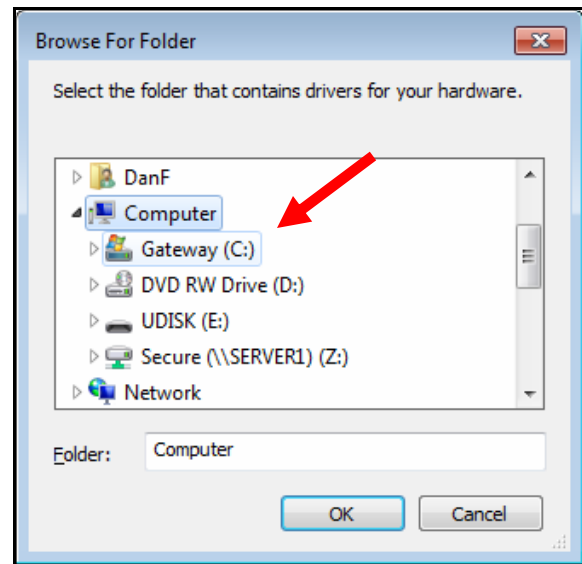




**(c)** Open **"Program Files"** and then open the **"Thunder Heart"** folder.
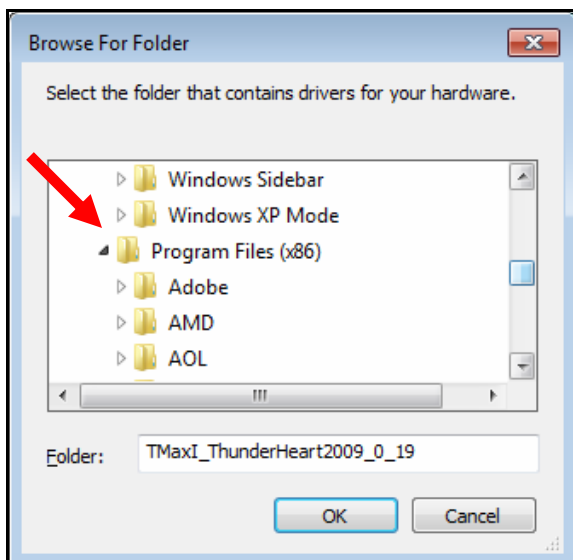
**(d)** Under the **"Thunder Heart"** folder, find and open the **"TMaxITuner"** folder.
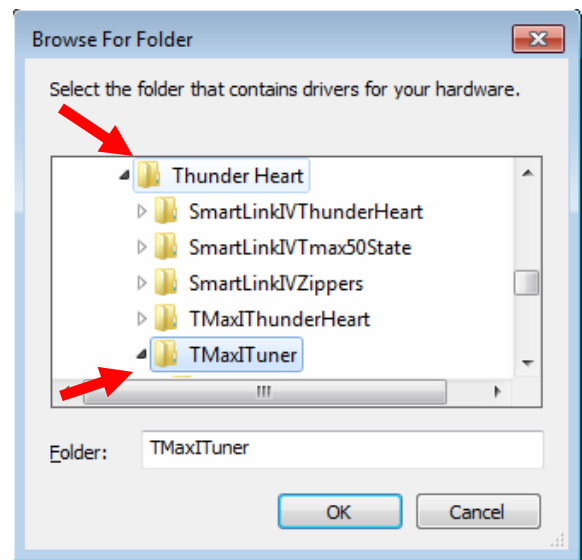
**(e)** Under **"TMaxITuner"**, find and <u>select</u> the **"TMaxUsbDriver"** folder and click OK as illustrated below.
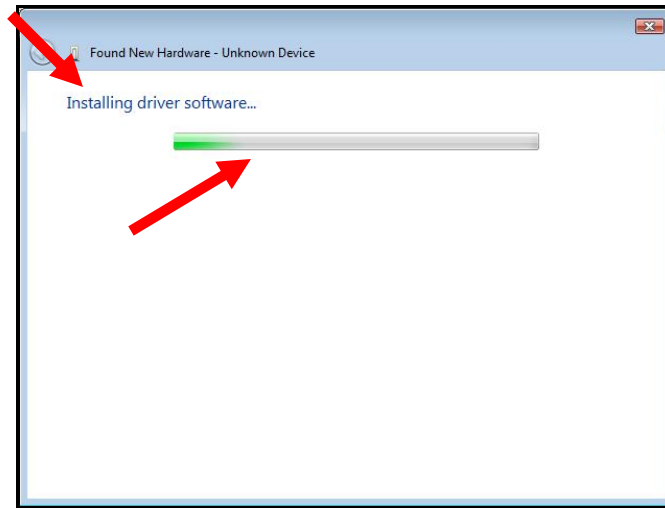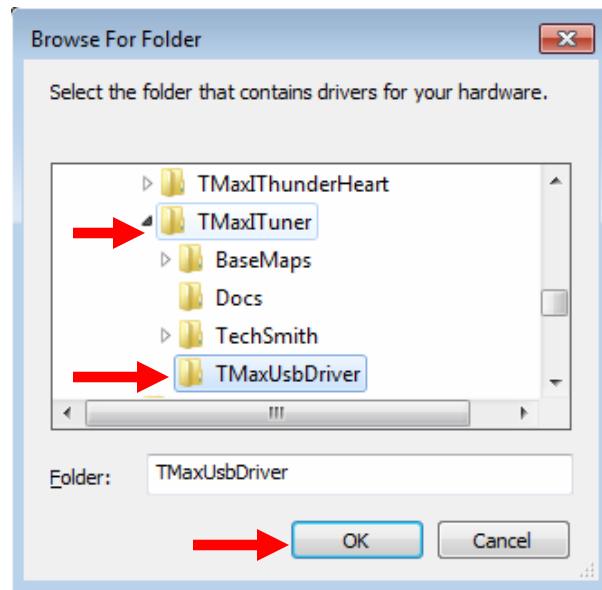


**Step 3.** The following window will appear, confirming the chosen path for your computer to find the correct driver. Make sure to check the box to "Include subfolders". Select "Next" to continue.
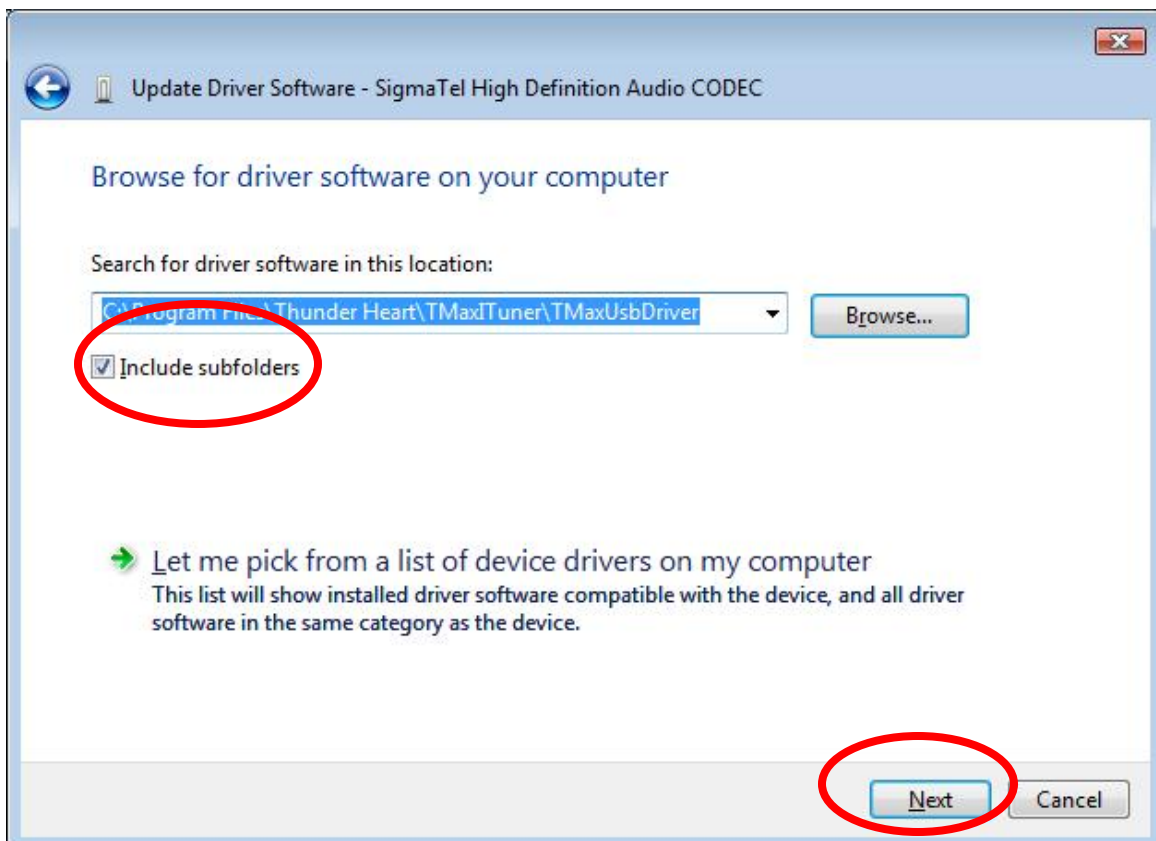
**Step 4.** Windows will display the following message showing the name and publisher of the driver. Select "Install" to continue.
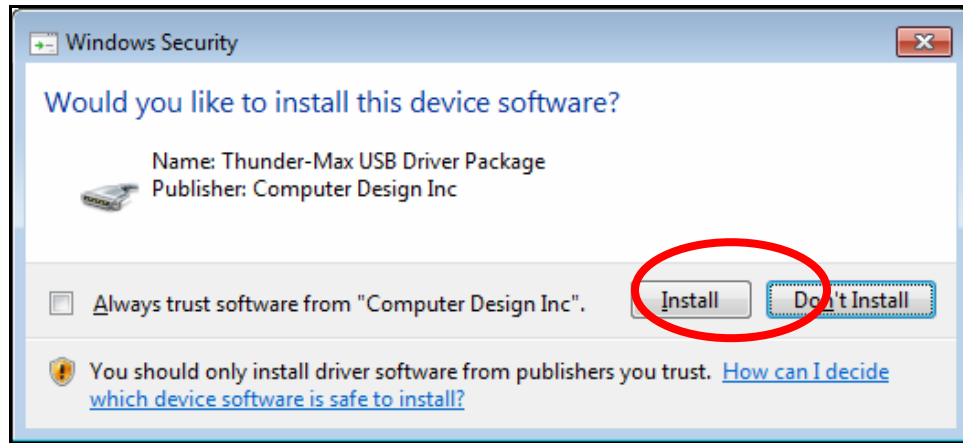


**Step 5.** The message below will appear to verify that the driver installation was successful. You can now select "Close" to finish. Open TMax Tuner software and the software will automatically "Link" to the ThunderMax module with the bike turned ON.
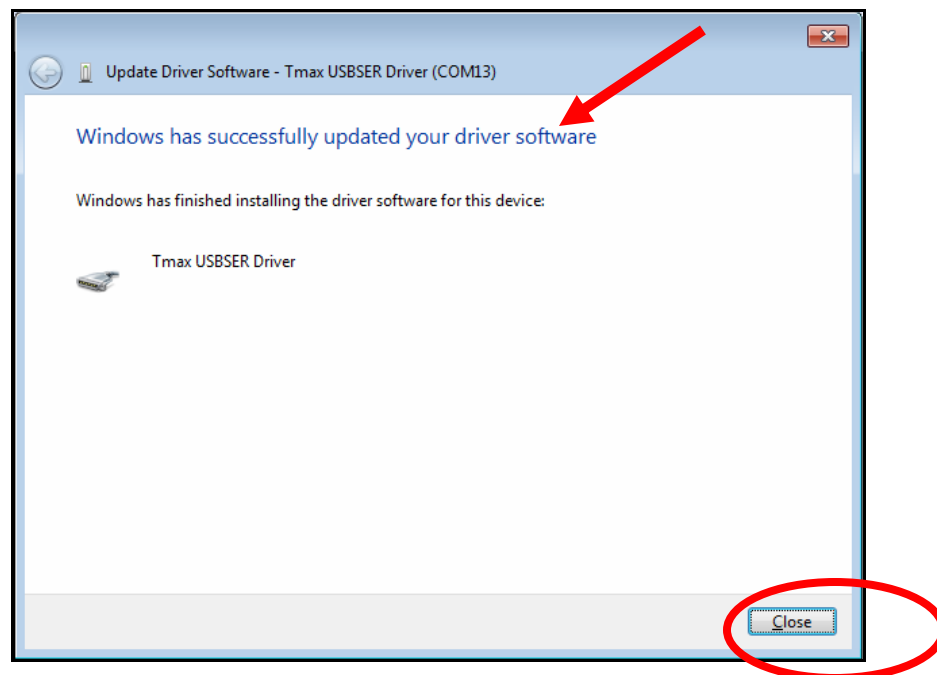


If any problems are encountered, reinstall the driver by following these instructions – starting at **Step 1**. If additional assistance is needed, contact

**ProductSupport@ZippersPerformance.com**
**Call (410) 579-2828 ext. 120. Monday thru Friday, 9am to 6pm EST**

# TBW MODULE INITIALIZATION

Please note that the Throttle by Wire  Module Initialization is different than the throttle cable versions of the ThunderMax ECM.

Required for all new  module installations, or when interruption of 12v power takes place.

Examples: Removal of Battery, ECM, or Maxi-Fuse

1. Turn on the main power and rocker switch for 20 seconds uninterrupted.
2. Cycle the main switch off and on, and then start the engine.
3. Let the motorcycle idle on its own for 15 seconds.
4. Cycle the ignition off and restart the motorcycle which should now run at the target RPM on the Idle RPM (offset) vs. Engine Temperature page. (Cold start would be approximately 1200 rpm).

The installation is now complete for your Touring model motorcycle. Proceed to the TMax Tuner Software Installation Section.

# Section 3:
# Learning the Basics of TMax Tuner software

Although the size of the instruction manual may be intimidating, please take a moment to scan through the entire document to get a feel for the layout.

The ThunderMax Tuning Manual is meant to be a comprehensive Reference Guide for any skill level user.

In an effort to make the large document easier to navigate, a Table of Contents, Index, Glossary, and an Appendix with a "Visual Index" are included for quick navigation.

# TMAX TUNER SOFTWARE LAYOUT

## DROP DOWN MENUS
- These menus contain valuable features which include browsing the Base Map Library, saving your tuning work, and Read / Write commands for ECM communication.

## MAP IN USE IN TMax Tuner

## BASE MAP FILE ID
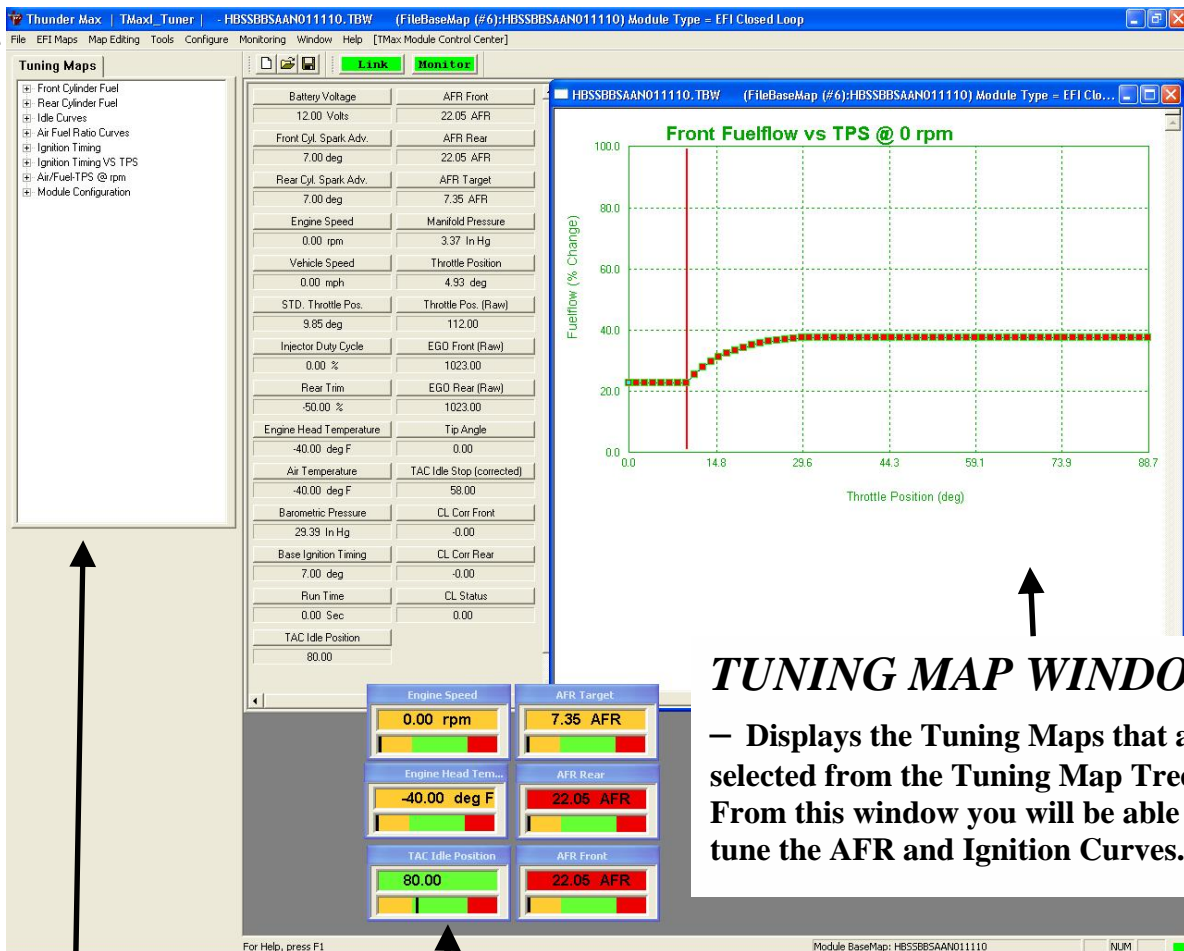


## TUNING MAP WINDOW
– Displays the Tuning Maps that are selected from the Tuning Map Tree. From this window you will be able to tune the AFR and Ignition Curves.

## TUNING MAPS TREE
- This is always visible for quick map page selection & map toggling during tuning sessions.

## MONITOR VIEW / GAUGES – Live Data from the ThunderMax ECM – Customizable Display & Gauge Features

## MODULE BASE MAP ID – When Linked to the module, the Base Map ID is displayed in the Status Bar.

# SELECTING A BASE MAP FILE FROM THE TMAX TUNER DATABASE

The TMax Tuner EFI Map Database will help you chose the closest Base Map for your specific installation. To find the TMax Tuner EFI Map Database, select **EFI Maps > EFI Map Listings / Definitions**, as shown below.
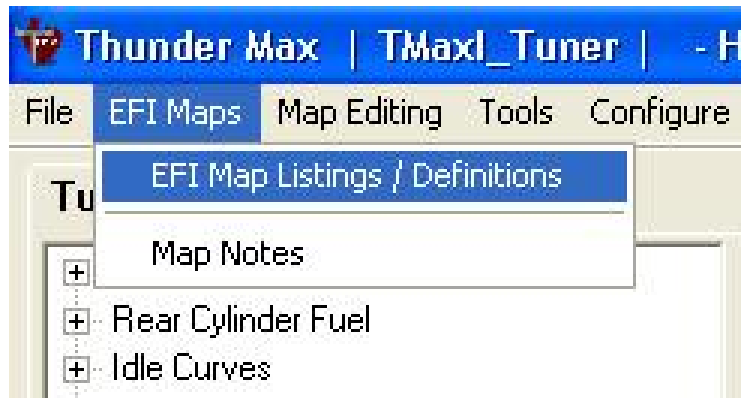


The following window should appear, with the title "Base Map Definitions".



| Ite... | Manufacturer | EngineType | Family | Throttle | Exhaust | Muffler | A |
|---|---|---|---|---|---|---|---|
| 0 | Harley Davidson | 110 | TwinCam CVO | Stock | D&D 2 into 1 FatCat (No Cats) | (Exhaust Includes Muffler) | Hi Flo |
| 1 | Harley Davidson | 96 | TwinCam | Stock | True Dual Rinehart (No Cats) | (Exhaust Includes Muffler) | Hi Flo |
| 2 | Harley Davidson | 96 | TwinCam | Stock | Stock FL Head Pipe (No Cats) | D&D Slip Ons | Hi Flo |
| 3 | Harley Davidson | 96 | TwinCam | Stock | Stock FL Head Pipe (No Cats) | D&D Slip Ons | Hi Flo |
| 4 | Harley Davidson | 96 | TwinCam | Stock | Stock FL Head Pipe (No Cats) | D&D Slip Ons | Hi Flo |
| 5 | Harley Davidson | 96 | TwinCam | Stock | Stock FL Head Pipe (No Cats) | Vance & Hines Slip Ons | Hi Flo |
| 6 | Harley Davidson | 103 | TwinCam | Stock | Vance & Hines 2 into 1 (No Cats) | (Exhaust Includes Muffler) | Hi Flo |

Clear Filters    Close    Excel Export

To select the closest Base Map for your engine combination, please read the following section on Key Elements. This will help you quickly narrow down the vast selection of available Base Maps and find the right one for your starting point.

## Base Map "Key Elements":

The reason for selecting a Base Map by "Key Elements" is to find the closest Base Map available for your combination, by the most critical components. The most critical elements for selecting a Base Map are:

a) **Engine Displacement** - Bore & Stroke. A correct match to the engine's stroke is far more important than an exact match of engine displacement. For example, stroke and cam timing influence pumping pressures. The correct shape of spark curves in the base map is what you are attempting to match.

b) **Throttle Body / Injector Size & Style** - Currently all TBW base maps were developed for stock Throttle bodies and injectors.  Expansion to oversize injectors will be coming soon; if you are using something different please contact product support for map selection.

c) **Exhaust System Design** – There is no need for concern if an exact match does not appear in the Base Map library. Simply select the Base Map with the closest style of exhaust system. Even if brand is not an option, choosing the closest style will yield excellent results. Group your exhaust system in one of the following three categories:

  i. Factory Head Pipe with Crossover – Dual exhaust systems with a cross over pipe that connects the front and rear exhaust pipes. Typically kept with slip on mufflers.
  ii. Dual Exhaust – 100% separate exhaust pipes, short or long.
  iii. 2 into 1 Collector – Both head pipes converge into one collector.
  iv. Comments about use of Catalysts as mentioned in the exh pipe map notes

The AutoTune system allows you to choose a Base Map that isn't a perfect match and still have excellent results. The closer that the Base Map is to your combination, the faster the system will achieve the desired AFR Targets. This simply means less time to establish and maintain a great tune. Even if your combination isn't listed, select the closest match and let the AutoTune start creating your custom Base Map while you ride. Use the Auto Map feature to create your custom base map.

## Base Map File Browsing / Selection:

Now that you have the Base Map Definition window open, you may begin narrowing down the list of maps for your application. To sort the map files by a particular key element, click on the column heading.

Select "Engine Type", the Base Map Definitions will be sorted by the engine displacement, which is the first Key Element you need to match to your combination. All of the column headings can be used for sorting purposes.



Column Heading – Click here to sort by Engine Displacement

Right Click to hide ALL other Base Maps, except 96 ci Engines

To filter the TMax Tuner EFI Maps Database, RIGHT click on the engine displacement that matches your engine, as described in the Key Elements section. Right clicking will hide all other options for that particular category. If you right click on "96 c.i", all of the other options are temporarily hidden, as shown in the following picture.



Notice that the "Clear Filters" button is now selectable. If you want to go back to the complete library listing, select the "Clear Filters" button and you will start over with all Base Map Files displayed.

Now that an engine displacement has been selected, and all the other maps are hidden, move to the second Key Element, Throttle Body / Injectors. For a 96 ci engine, all of the available Base Map choices were created with factory installed throttle bodies and 25$^{\circ}$

injectors. Since there aren't any additional options, move on to the third Key Element, which is the exhaust system. If you have a factory head pipe with slip-on mufflers, right click on "Stock HD FL Head pipe" to hide all other exhaust options, as shown below.
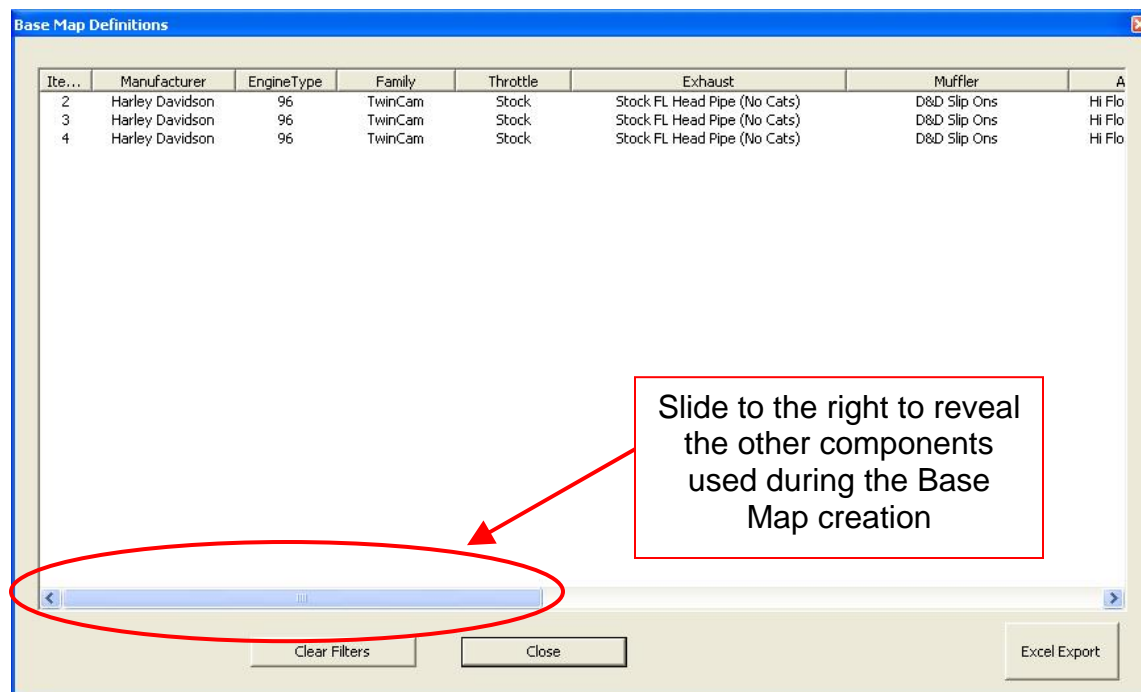


All 3 Key Elements have now been satisfied, the engine displacement, throttle body / injectors, and the exhaust system. As the picture above shows, there are still 3 choices for a Base Map for your engine combination. The ThunderMax with AutoTune system has more than enough resolution to use any of these Base Maps to correctly tune your engine. Remember, Base Maps are starting points that the AutoTune system corrects for your specific engine and riding conditions.

Continue selecting options until you have the library narrowed down to the fewest number of maps as possible. Several options may still remain; always select the Base Map with the latest build date. Double left click to select this Base Map.



If you're still unsure of which Base Map to select, please email the specifications of your Key Elements to ProductSupport@ZippersPerformance.com. Please title the email "**Base Map Selection**" for a faster response.

## Loading the Base Map File:

Now that you've selected the appropriate Base Map file for your engine combination, you need to load this selected Base Map into TMax Tuner. Once the Base Map you've chosen has been double Left clicked, the following window will appear, titled "Base Map Name Encoding."



**Loading the map into TMax Tuner does not <u>Write</u> the map onto the ECM.**

Select the "Load Base Map" button on the "Base Map Name Encoding" window, as shown above. Once selected, TMax Tuner will load this Base Map and return to the Air / Fuel Ratio vs. TPS page.

Now that the map is loaded into the TMax Tuner software; you must write the map to your ThunderMax ECM. If you are installing a new Base Map in an already used ThunderMax ECM, please remember to clear all of the offsets from the system's previous Base Map, and double check the Basic Settings.



Proceed forward with the Tuning Manual, **remembering that a new base map file will require the ECM to be initialized**, the Basic Settings need to be checked, and all offsets must be cleared from the previous map.

## Base Map Definitions Updates:

To ensure that you have the complete, and up-to-date, Base Map Library, select the "**Check Internet for Updates**" button on the "Base Map Name Encoding" window, as shown below.
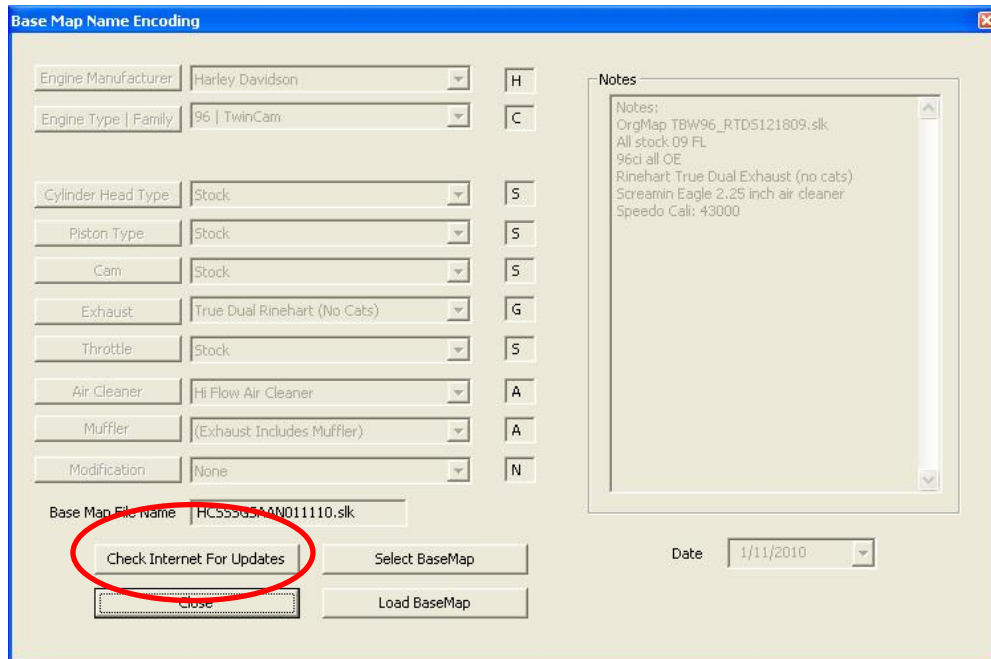


## Base Map Updates:

TMax Tuner now downloads all of the new base map files when you update the Base Map library. Previously only the Base Map library list was updated, so if you selected a map from an updated library list, TMax Tuner needed to download the map from the internet before you could proceed. Now the Base Map files are all downloaded during the update, which simply means that the newest Base Maps are always stored on your computer.

The following window will appear if any new maps exist in the Internet database, but do NOT exist on your system:
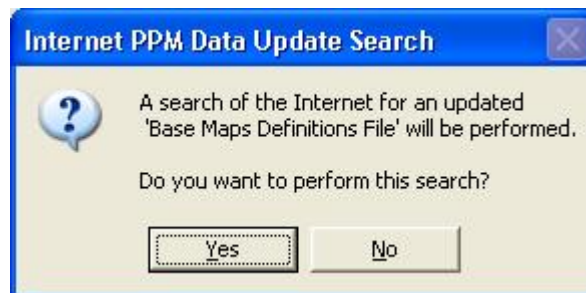


You will be provided an ESTIMATE of the download time required to perform this task.

It is simply good practice to update the definition file when searching for a new Base Map file. Not only are new maps constantly being created, but the older Base Maps are updated occasionally as well. Once updated, you may proceed with selecting an appropriate Base Map for the current engine combination you are working with. When the Base Map Library is up to date, the following window will appear:



If you are satisfied with the operation of your current Base Map, chances are a new Base Map will not make a significant difference to the operation of the motorcycle. Updated maps could contain spark curve or fuel management changes, or even fuel economy strategies.
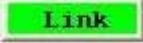
**If you are unsure how to select a map after reading this section, contact a Zipper's representative for assistance. This step is critical in the optimization of the power, economy, and overall drive-ability of your motorcycle. Zipper's Performance Products is committed to customer satisfaction, so please do not hesitate to ask for assistance.**

# LINKING TO THE THUNDERMAX ECM

**1.** Install the communication cable from the PC to ECM.

**NOTE:** Make certain that the communication cable is not resting on or near any part of the motorcycle that generates heat.

**2.** Turn the ignition on, making sure the OFF/ RUN switch is in the "Run" position, but do not start the engine. The software will automatically **Link** to the ECM when power is detected. The red background will turn green when successfully linked, indicating that the PC and ECM are now ready to begin communication (see picture below).



**NOTE: <u>NEVER attempt to load or reload a complete map with the engine running.</u>**

If you are **NOT** successful in linking to the system for the first time, please double check everything on the following list to verify your setup. TMax Tuner automatically finds the proper Com Port to use, so linking issues are generally rare and unrelated to the software itself.

     a.) Are the cables properly installed from the ECM to the USB port on the computer? Remove the cables and reinstall to be certain the connection is solid.

     b.) Does the system have power? **Is the ignition in the "ON" position with the OFF / RUN rocker switch in the "Run" Position?**

     c.) Is the driver installed correctly for the ThunderMax system? See the **USBSER Driver Installation Guide** in the Help section for details.

     d.) Try a different USB port on your computer. Remove / re-insert cable.

     e.) Disable your Anti-Virus Software to see if a conflict exists.

     f.) If unable to solve the problem, please contact the Zipper's Technical Support team for assistance.

# SYNCHRONIZING TMAX TUNER TO THE THUNDERMAX ECM

Once you have successfully linked to the ThunderMax ECM, select the Monitor button to activate live gauge readings. A window will appear that alerts you of any differences between the map that's currently opened in TMax Tuner, and the map that's loaded in the ThunderMax ECM. Select "Yes" to synchronize (read) the map and allow monitoring.
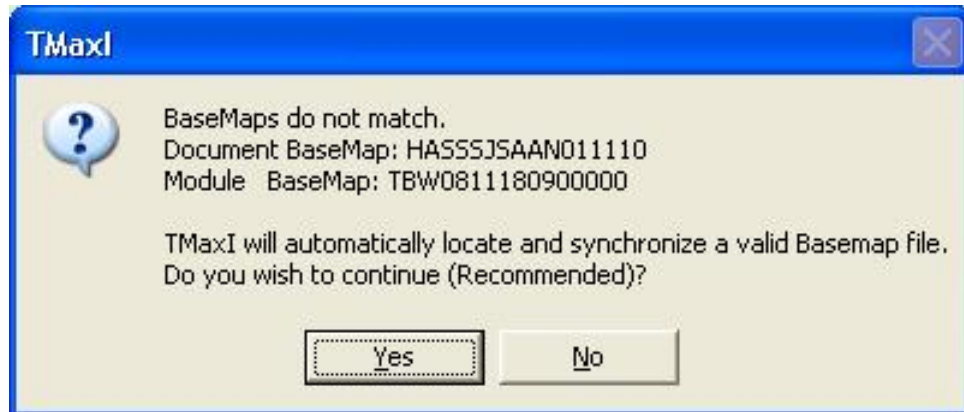


If you select "Yes," TMax Tuner will prompt you to save the map currently open in the software.
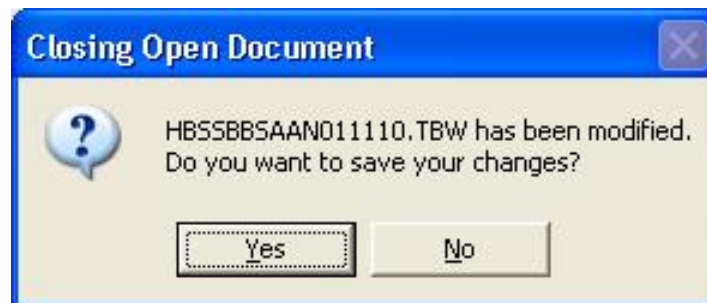


This notice is to help prevent changes or edits from being made to an OPEN MAP which may NOT be intentional. The notice will appear when the program is closed or when a new map is loaded. It is highly recommended to save your map before closing the program or loading another map by selecting **File > Save as** and creating a dedicated folder for your maps. Renaming the file by changing the date code (last 6 digits) will help you track your work.

# WRITING A BASE MAP FILE TO THE THUNDERMAX ECM

Select **File > WRITE Module Maps and Settings**, as shown in the following picture.
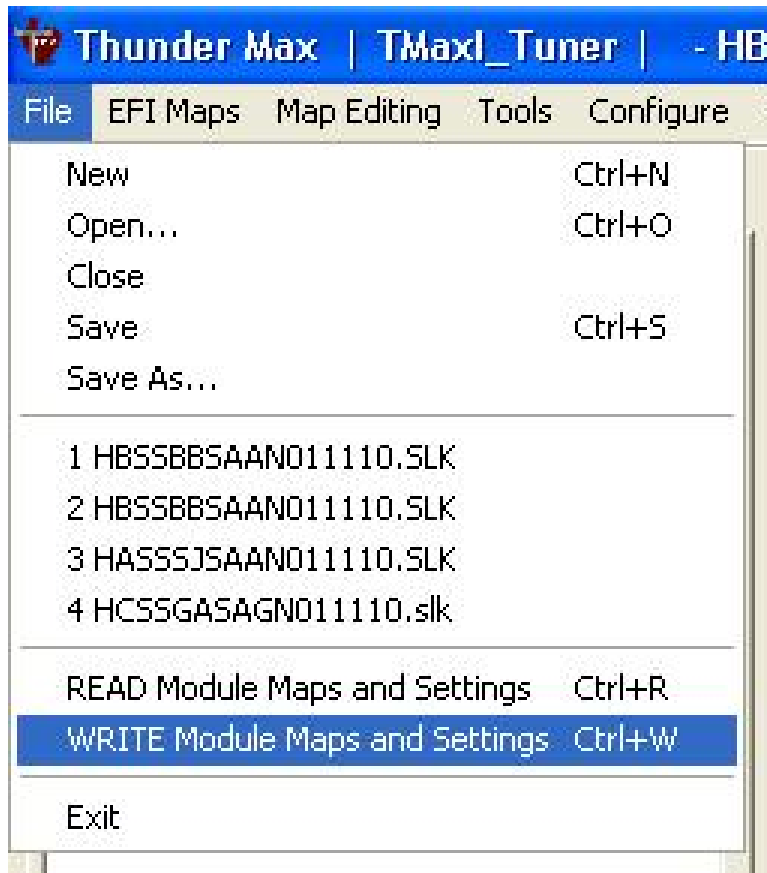


After the transfer bar completes, the map is loaded into the module. Re-initialize the system according to instructions.



**DO NOT START THE ENGINE** or move the throttle during the initialization process. In addition, the monitor gauges still need to be set to display the parameters that you wish to watch during the run session.

# READING FROM THE THUNDERMAX ECM

To read a map that was previously installed on a ThunderMax ECM, select **File > READ Module Maps and Settings**, as shown in the following picture.
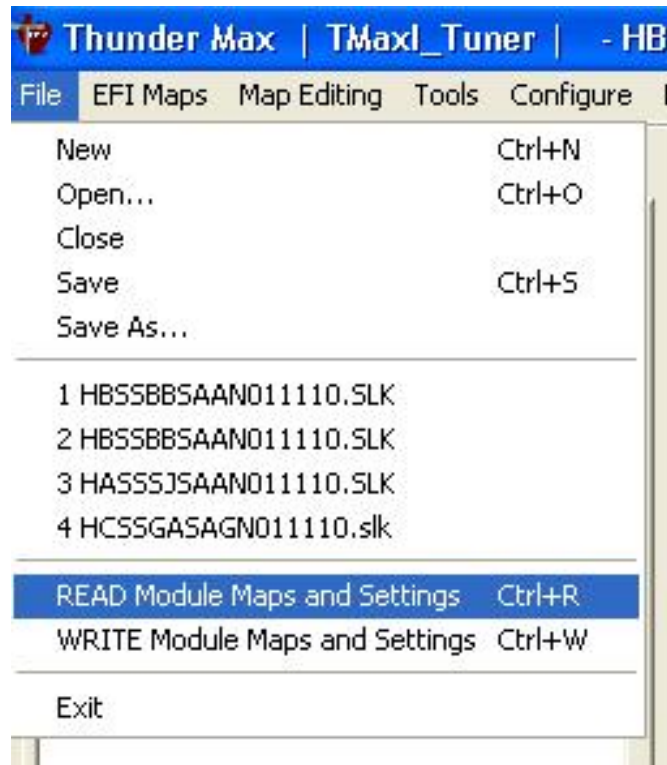


This will start a Progress Bar window while the settings in the onboard ECM are being brought to the screen. Wait until the Progress Bar is complete before attempting to work in TMax Tuner. This may take 15-30 seconds depending on the speed of your computer.

Once READ, the ECM's current map and settings will be displayed in TMax Tuner. The Air/Fuel vs. TPS window automatically opens first.



**IMPORTANT NOTE:** Any time you are connected (linked and powered up) to the module, any changes you make are *LIVE* and affect the system settings and maps immediately. You will have effectively modified the original base map in the module, but not the base map file that is saved on your hard drive or in the Base Map data base.

This modified map with changes should be saved to your hard drive as a renamed version of the original base map file. If you unlink from the system without saving the changes to your modified maps folder, you can access/view those changes by re-linking to the module and selecting **File > READ Module Maps and Settings.**

# TMAX TUNER FILE MANAGEMENT

Proper file management is crucial to the identification and organization of data. In order to access maps with unique changes and special tuning work, naming and saving maps is critical. Although this is a relatively simple procedure, if it is not addressed and understood before the tuning process is begun, loss of maps with valuable tuning time is inevitable.

TMax Tuner uses "Base Map" files that save the fuel curves, ignition curves, even the basic settings for the Speedometer Calibration, idle RPM and the Rev limiter. All of this data is stored in one file which makes management of the maps relatively simple. All TMax Tuner map files have a file extension of "**.slk**." Each map file name is made up of 16 characters, the first 10 letters designate the original engine combination that the map was made for, and the last six numbers refer to the date on which it was created, updated, or last modified.

It is imperative that as changes are made to the map file, the file is renamed and saved. Zipper's retains all of the original map files if you lose or misplace the map given to you at the time of the sale. **However when changes are made to a map to tune the ECM to a specific application, it is up to the user to save this edited base map file.**

You can create subfolders inside the "TMaxI" maps folder to save each combination that is mapped with TMax Tuner. The more TMax Tuner map files that you save; the easier it will be to map different combinations in the future. Even though every engine is different, if you build a library of map files in addition to the TMax Tuner Map Database, chances are good that any combination that arrives at your doorstep can be mapped by altering the closest match.

As more changes are implemented, do not delete the previous modified base map file; simply create another map file with an updated date / name. This can save an Enormous amount of time if changes are made and the tune goes in the wrong direction. It will always be easier to reload a known good running map than try to manipulate a modified map back to a previous condition.

If a base map is edited and not saved, TMax Tuner will prompt you to save the map when closing the program, as shown below. If the map has been renamed, the edits will be saved to the renamed map. If the map was opened from "Base Map Definitions" or from the "TMaxI" folder in Basemaps, the edits will NOT be saved to the original base map in your TMax Tuner library. Use caution when prompted to save the base map.
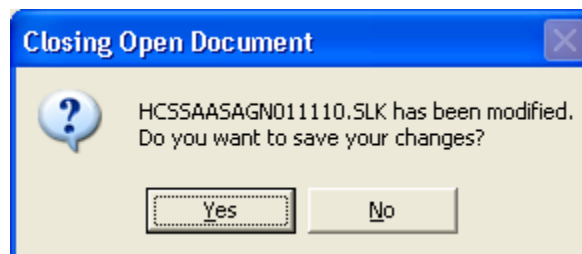
# MAP NOTES

A "Map Notes" function is available for keeping track of tuning changes directly in the map. Select **EFI Maps > Map Notes** as shown below, to reveal the "Map Notes" window. In this window you have a virtual "notepad" to record your map changes and test results. This is a great way of logging the changes made to the Base Map File or values changed in the Module Configuration. **Map File Notes entries are only saved when the map is saved!**
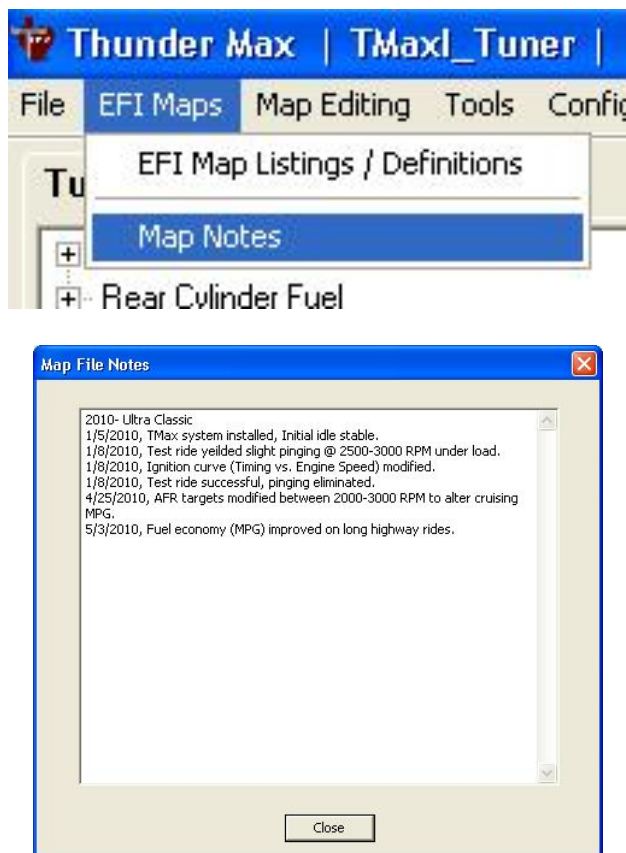




Zipper's is continually increasing and improving the TMax Tuner Map Database to aide in tuning the vast array of engine combinations in the marketplace today. It is virtually impossible to create perfect matches for every combination of custom pipes, throttle bodies, or engine modifications, which is the basis of why the AutoTune system was created. In most cases, the ThunderMax will AutoTune for the exact component variations without your intervention once given a relatively close base map.

# SAVING AN ALTERED MAP AS A NEW FILE

Now that you know how to load an existing map file, it is very important to know how to save the base map in a new folder. In this new folder all modified versions of the base map file can be stored for future use. This will allow you to make changes to your base map file and still have the ability to reload the original base map file if the new base map file does not operate as well as the provided base map file.

To save the loaded map as a new file, select **File > Save As…** as shown in the picture below.
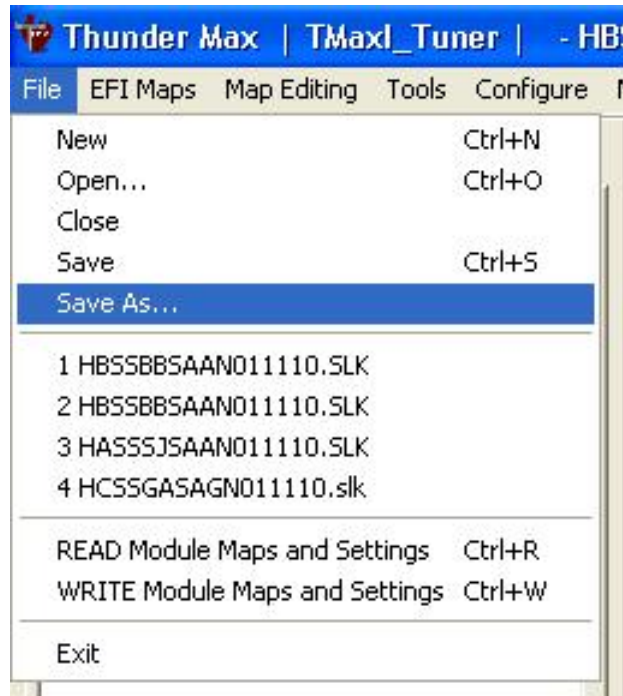


The following "Save As" window will appear:

The folder that is opened by default is called "TMaxI." The easiest way to store and manage the new modified maps is by creating a new folder titled "My TMax Basemaps" in this "TMaxI" directory. To do this, select the "New Folder" button as shown below, circled in red. A new folder will appear, simply type "My TMax Basemaps" and hit the Enter button on the keyboard.
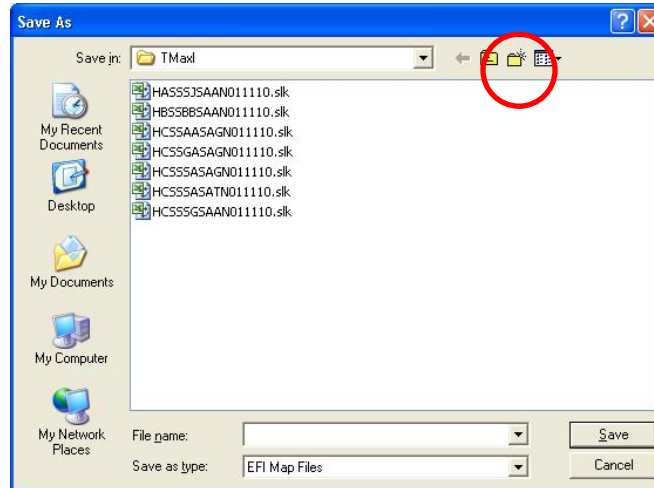


Select the new folder that was created and type the base map file name that you have loaded. For example: if "HCSSSGSAAN011110.slk" is loaded into TMax Tuner, enter the Base map file name in the "**File Name:**" box and select the "Save" button.



A duplicate base map file will be created in this folder. As you make changes to the tuning blocks and test the outcomes, save the tested base map files in this same location. **The last six digits of the file name should be changed to the date that the map file was modified, (MM, DD, YY).** This will allow you to make multiple changes to the base map file's tune-up, while retaining your previous tune-ups. By maintaining the original first 10 digits of the base map file name, the map can still be identified by the name to reveal the engine combination that the base map file was originally intended for.

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# MAP EDITING WITH TMAX TUNER
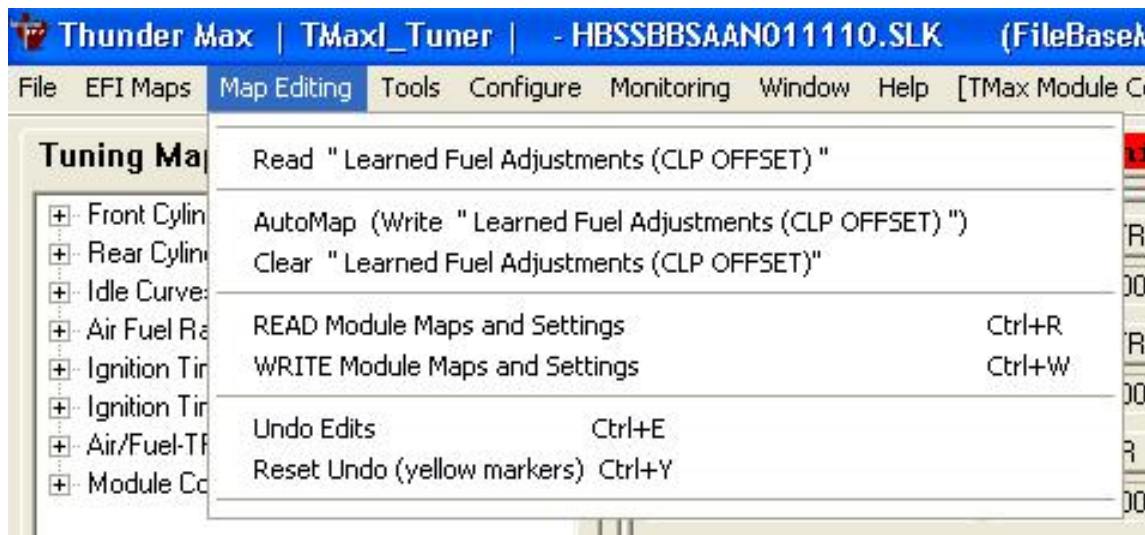


Map Editing in TMax Tuner software is based on fuel offsets created by the AutoTune system, and reading and writing maps in the ThunderMax ECM. After describing the individual functions, instructions will follow in this section that explains how to use this as an **"Accelerated Auto Map Generator"**.

## Read "Learned Fuel Adjustments (CLP OFFSET)":

The Read Learned Fuel Adjustment function downloads all of the Base Map Learned Fuel Offsets, generated by the AutoTune system, into the TMax Tuner software. This function allows the user or tuner to then see the offsets that the AutoTune has generated from the base map, to meet the specified Target AFR.

## AutoMap (Write "Learned Fuel Adjustments (CLP OFFSET)"):

Converts the fuel flow (learned) offsets to base map points- Resets the Auto Tune range for extended learning.

## Clear "Learned Fuel Adjustments (CLP OFFSET)":

The "Clear Learned Fuel Adjustments" option **ERASES ALL** of the offsets learned by the AutoTune system from the ThunderMax ECM. This option is necessary when changing Base Map files in the ThunderMax ECM, but can be useful in the following scenarios:

1.) Sensor Problem – After replacing the bad sensor, clear the errant offsets that were created.
2.) Air Leak - After repairing an induction side air leak, clear the offsets that were created.

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## READ Module Maps and Settings:

Reads the Module Base Map from the ThunderMax ECM and loads it into the TMax Tuner software.

## WRITE Module Maps and Settings:

Uploads and synchronizes the selected base map calibration from the TMax Tuner software to the ThunderMax ECM.

## Undo Edits:

Returns adjusted map points back to the yellow markers (historic map points).

## Reset Undo (Yellow Markers):

Resets all yellow markers (historic map points) in the map to mark the current map points.

## Tuning Experience Benefits

If your engine combination does not closely match the available base maps, or your engine performance or fuel mileage is lacking, the Map Editing functions will easily benefit you. Variances that can be easily handled by the Accelerated Auto Map to correct the following:

- Different Exhaust Pipes
- Injector Flow Rates, Spray Angles, or Throttle Body design
- Fuel Pressure – the factory service manual says 7 lbs of variance of Fuel Pressure is acceptable!
- Different cams
- Various Air Filter kits

The performance of your engine, as well as the fuel mileage, should always be excellent with the ThunderMax with AutoTune. If you are not happy with the performance or are experiencing excessive fuel consumption, use the TMax Control Center for advice to correct these issues. The AutoTune system creates "offset points" dynamically as you ride. Using these Read / Write functions will apply the offset points to the "Entire Map Point Set" as needed. **This takes your learned points, and creates a custom Base Map for your application.**

This powerful new feature provides cutting edge map tuning at your disposal. Virtually any engine or exhaust pipe combination can be improved with the use of the AutoTune system and these Map Editing functions. The following simple procedure explains how to use these functions to bring almost any engine combination into tune by using the Auto Map generator function.

## Accelerated Auto Map Procedure:

1.) Link to the module, Select **Map Editing > Read Module Maps and Settings.**

2.) Select **TMax Control Center** from the tool bar.

3.) Review the information listed under the **Auto Tune Checkup** to evaluate the progress of the "Learned Fuel Adjustments"

4.) If advised**,** select **Run AutoMap.** The Learned Fuel Adjustments will be written to become the new map points.

5.) **Do not disturb this process!** TMax Tuner is converting the Learned Fuel Offsets into Base Map Fuel Points.

6.) Once the process is complete, the base map has been successfully revised and smoothed; now simply test the results.

7.) If an improvement was made, but the tuning is not complete, ride the motorcycle to generate additional fuel offsets, and repeat this process. It may take a few cycles of this Accelerated Auto Map Procedure to fully create a custom Base Map for your application. At least 2 cycles of riding and writing the offsets is recommended for any application.

# TMAX MODULE CONTROL CENTER
## New Features with the TMax Control Center
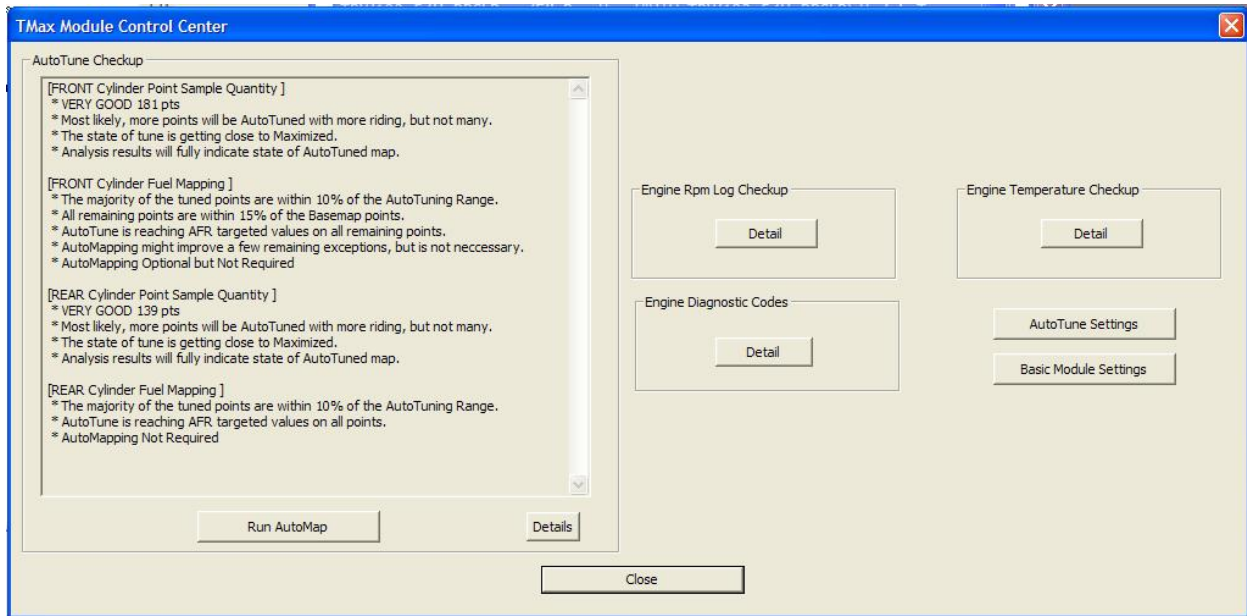


The TMax Control Center is a one stop source for information on the most critical system functions. A unique element of this feature is the feedback provided on the state of your tune via the Auto Tune Checkup. After logging some time on the ThunderMax system, this feature will list a progress report and advice on performing any steps needed to optimize performance. If fuel adjustments are approaching the maximum learning limit, there is now detection to quickly review the condition of the tune of each engine. Information and advice are provided on the following critical system functions:

- Progress of the Auto-Tune system fuel adjustments.
- Engine RPM and Temperature Logs.
- Engine Diagnostic Codes.
- Auto-Tune Settings.
- Basic Module Settings.

The **AutoMap (Map Editing)** function can now be executed within the TMax Control Center by selecting the **Run AutoMap** button. When Using the **AutoMap** function, all fuel base map points are reset and smoothed to the learned offset values. The AutoMap feature refines the base map fuel calibration based on "Learned Parameters" established during engine run cycles. Applying learned map refinements allows the system to continue making further refinements as the engine is operated in varying ambient conditions.

# Fuel Adjustment Offset Summary



**Fuel Adjustment (Offset) Summary**

Front Cylinder Fueling Adjustments

| | |
|---|---|
| Fuel Adjustments | 181 pts. |
| Fuel Increased | 115 pts. |
| Fuel Decreased | 66 pts. |
| Average Increase | 2.18% |
| Average Decrease | -1.76% |
| Adjusted 0% - 2% (Perfect!) | 120pts (66%) |
| Adjusted 2% - 5% (Excellent) | 40pts (22%) |
| Adjusted 5% - 10% (Very Good) | 20pts (11%) |
| Adjusted 10% - 15% (Acceptable) | 1pts (1%) |
| Adjusted 15% - 20% (OK- In Range) | 0pts (0%) |
| Adjusted 20% - 30% (Run AutoMap) | 0pts (0%) |
| WARNING! Over 30% | 0pts (0%) |

Rear Cylinder Fueling Adjustments

| | |
|---|---|
| Fuel Adjustments | 139 pts. |
| Fuel Increased | 51 pts. |
| Fuel Decreased | 88 pts. |
| Average Increase | 1.41% |
| Average Decrease | -2.05% |
| Adjusted 0% - 2% (Perfect!) | 99pts (71%) |
| Adjusted 2% - 5% (Excellent) | 30pts (22%) |
| Adjusted 5% - 10% (Very Good) | 10pts (7%) |
| Adjusted 10% - 15% (Acceptable) | 0pts (0%) |
| Adjusted 15% - 20% (Ok - In Range) | 0pts (0%) |
| Adjusted 20% - 30% (Run AutoMap) | 0pts (0%) |
| WARNING! Over 30% | 0pts (0%) |

\* Total Fuel Points = All FUEL map points (0 - 7936 rpm)
\* Fuel Adjustments = Total fuel points which have been adjusted (Offset).
\* Fuel Increased/Decreased = Total fuel points which had fuel ADDED/REMOVED
\* Average Fuel Increase/Decrease = Average fuel percent change for all points which had fuel ADDED/REMOVED
\* Adjusted 5% - 10% = Number of points adjusted between 5% and 10%

WARNING Adjustment Over 30% = BaseMap Modification Highly recommended.

What does it mean?
1. Only fuel map points which were analyzed and REQUIRED adjustment are in the summary.
2. 250 - 350 adjusted points is VERY NORMAL
3. A heavy balance of adjusted points in the 0% - 10% range is optimal.
4. A small number of points (10 - 20 pts.) at 15% - 20% adjusment is NORMAL.
5. \*\*User CHANGES to AFR vs TPS @ RPM maps WILL CAUSE MOVEMENT in all adjusted points.

[ Close ]

The Fuel Adjustment Offset Summary window appears when the **Details** button is selected under the Auto-Tune Checkup section. Here you'll find details of the number of adjusted points, averages, increased, decreased, percentage ranges, and descriptions of the meaning of these values. Fuel adjustments in the 15-20% range are approaching the maximum offset which could influence fuel mileage or limit the engines power output. AutoMap will quickly correct these conditions.

The AutoMap feature will likely improve the performance of most any ThunderMax system in use.  We strongly encourage feedback from all to report their experience with this new feature and any other products or software.

The Product Support team stands ready to assist our customers with any questions or concerns and we welcome comments and suggestions on how to improve your experience. productsupport@zippersprefomance.com

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# ENGINE MONITOR VALUES & GAUGES

The "Engine Monitor" function is a helpful tool to use while performing live tuning, and to keep a watchful eye on the vital engine data while amending maps. In addition, it is very helpful to diagnose problems or to make adjustments with sensors or components. This will allow you to view all of the important sensor values on the same screen as the map page while the engine is running and being tuned.



**NOTE:** The **Engine Monitor Values** will only be **Live** when the ECM is powered up, linked to the computer, and the "Monitor" button selected.

To display the monitor data from the ECM, click the **Monitor** button, which is next to the **Link** button on the toolbar. The "**Monitor**" button will turn green when active, exactly like the "**Link**" button does.



The engine monitor buttons and values are always to the right of the "Tuning Maps" tree. The monitor values will always be in this location. If a map page window is maximized, these values will be hidden behind the window. **To toggle between the "Tuning Map" and "Monitor View", select "Window > Monitor View."**
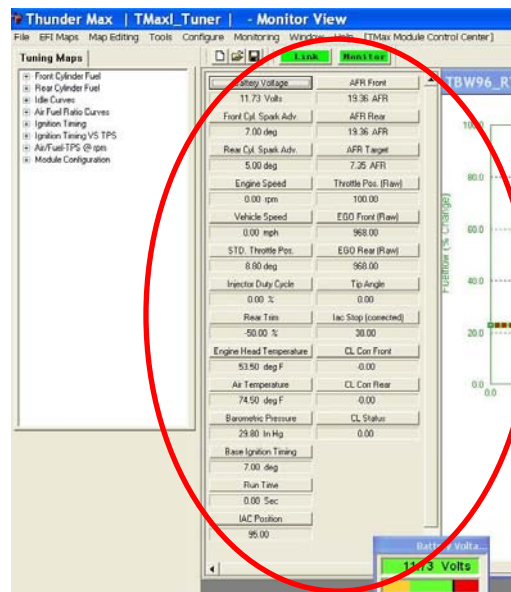
To select the values that you wish to monitor in the "Monitor View" portion of the TMax Tuner layout, select **Monitoring > Monitor Setup…** as shown below.
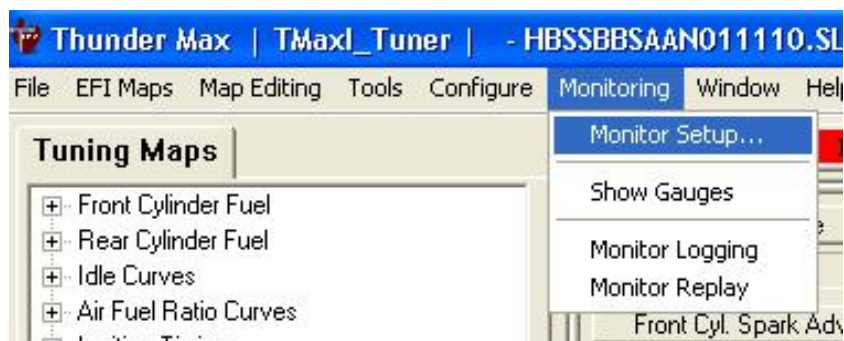


The following screen will appear, with check boxes beside each Monitored Value. Each engine monitor with a check mark will be displayed on the "Monitor Views" section of the TMax Tuner layout. To return to the Monitor Gauge view, select **Monitoring > Monitor Setup** again. The "Monitor Setup…" button will toggle between the Monitor Gauge / Setup windows.
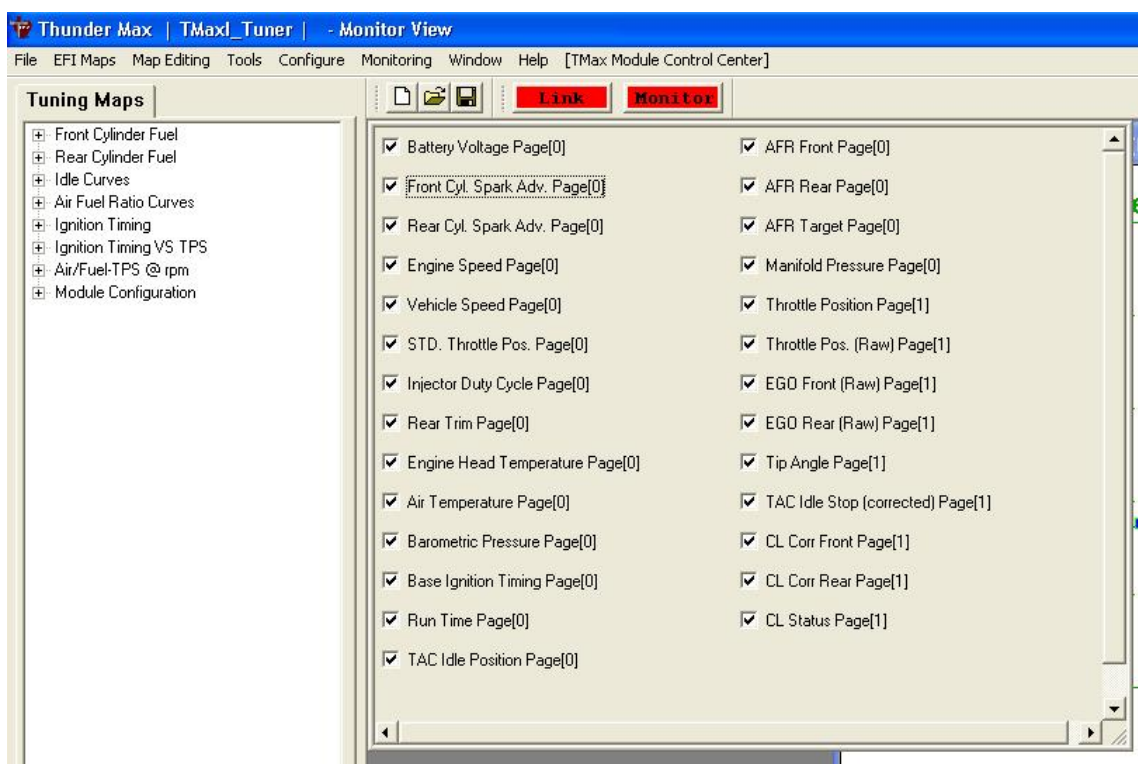


Please note that when the "**Monitor Setup…**" is selected, TMax Tuner automatically terminates the current Monitor session. Selecting "**Monitor Setup…**" should be performed prior to starting a live tuning session. Zipper's recommends that you keep all of the values selected for the Monitor View section; this will allow you to set up the

Monitor Gauges without toggling back and forth between the Monitor View section and the "**Monitor Setup…**"

## Default Monitor Gauges:

The most commonly used Monitor Gauges now automatically appear when monitoring, without having to specifically tell TMax Tuner to display these individual gauges. The following gauges will now appear by default when "Monitoring" is selected:

> **Engine Speed**
> **Engine Head Temperature**
> **Battery Voltage**
> **IAC Position**
> **AFR Front**
> **AFR Rear**
> **AFR Target**
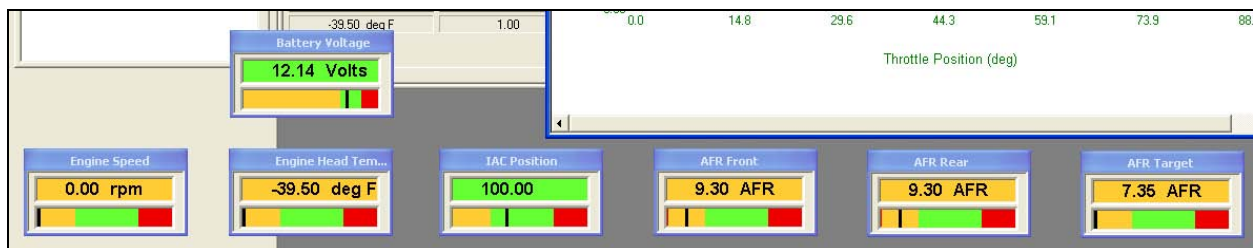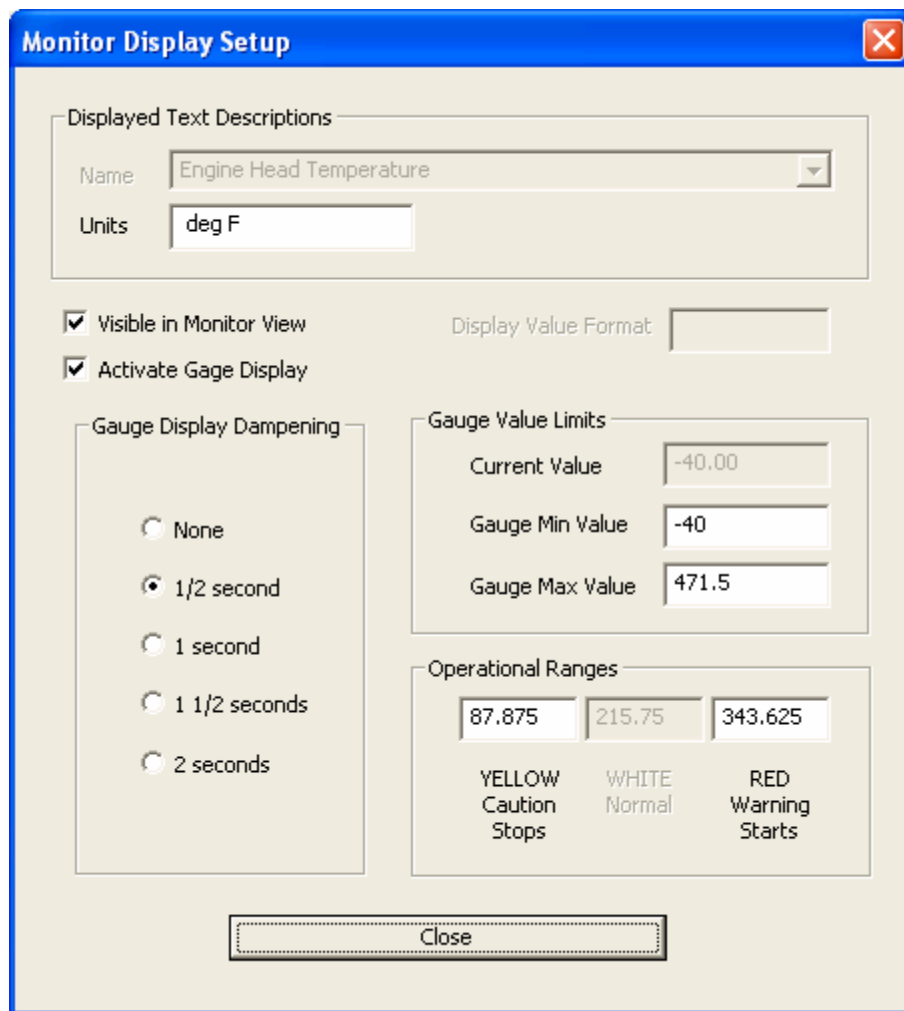


You can always activate additional gauges as needed, or remove the default gauges if necessary. Keeping a watchful eye on these default gauges is recommended anytime the motorcycle is running and you're linked to the ThunderMax ECM.

The following section will explain how to activate, and de-activate monitor gauges in general. The engine monitoring values can be customized into individual gauges to highlight the parameters that you wish to monitor during the run session. To create and customize the gauges, select the name of the gauge (individually) that you wish to monitor.
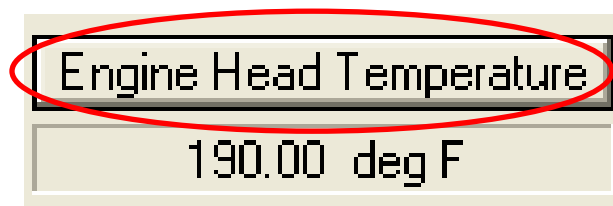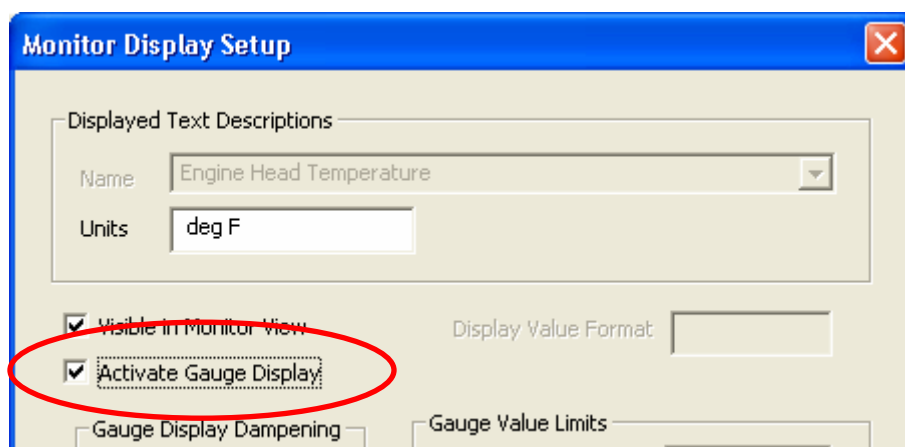


More than one gauge can be open at once; however each parameter must be selected individually. For example, if the "Engine Head Temp" button is selected, the following window will appear.

In this dialog, select the box next to the "**Activate Gauge Display**" gauge option. Checking this option tells TMax Tuner that you want the gauge values shown for easy viewing during the tuning process.

This will tell the gauge to appear whenever monitoring is in effect OR whenever gauges are toggled from the menu bar, as shown below. To toggle the visibility of the gauges, select **Monitoring > Show Gauges.**
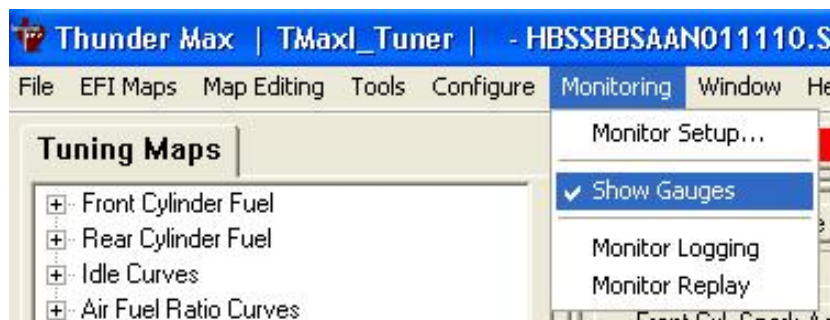


Also within the Monitor Display Setup dialog you can custom design gauges to represent low, normal and high ranges as desired, and set each range of the individual gauges you want to monitor.  Colors will read on your computer monitor (yellow, green and red respectively) as set by your parameters.
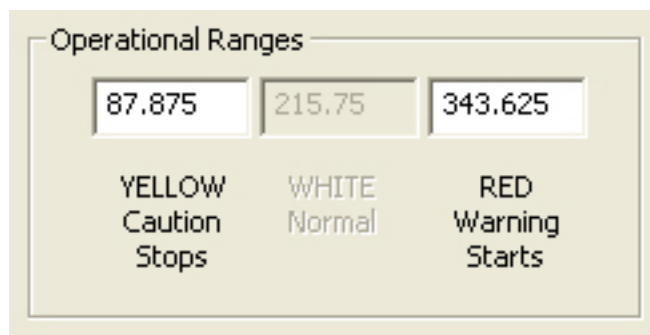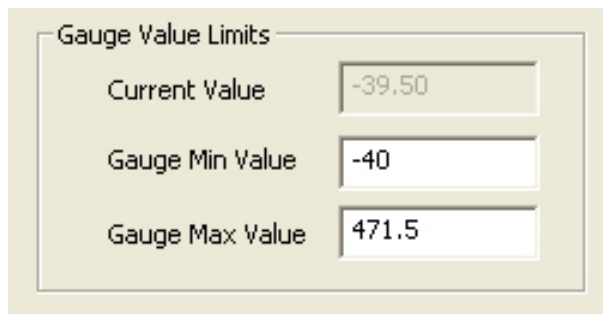


The "Operational Ranges" parameters are entered as values based on the "normal" units of the selected monitor.  In this case "degrees F" are the units and the low range (yellow) is from -40 to 87.875 degrees F and the high range (red) will be anything above 343.625 degrees F.  That leaves the green range (which is listed as white) as 87-343 degrees F.  If you enter invalid entries, the software will make corrections and let you verify the changes.  This occurs when you OK the dialog box.

The following monitor gauge represents what you have just created. When the temperature rises above the 343° limit, the gauge turns from Green to Red and begins flashing, to immediately bring your attention to the temperature of the cylinder head. Although TMax Tuner cannot prevent an engine from overheating, if used properly, the Monitor Gauge function will alert you well in advance that the temperature is too high to continue operation.
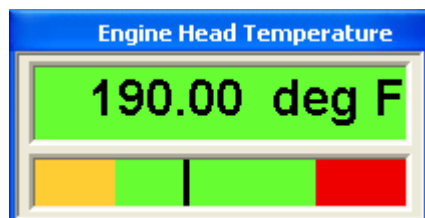
The next portion of the Monitor Display Setup is the Gauge Value Limits section. From here you will set the minimum and maximum ranges the gauge will represent.
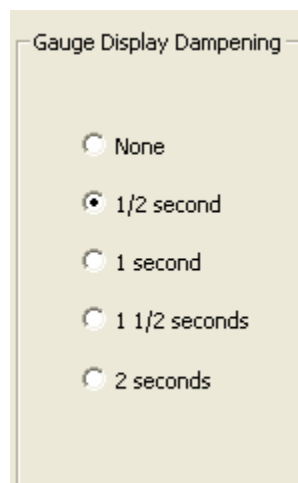


In this case the gauge limits are from -40 – 471.5 degrees F.

More appropriate limits and ranges may be desired. Experiment with these values to see how they affect the gauges.  All Gauge Value Limits, gauge visibility and the gauge location are saved upon exit of the TMax Tuner program.

The final section of the Monitor Display Setup is called **"Gauge Display Dampening".** You will notice after using TMax Tuner for the first time that some of the gauges are constantly changing or varying between a series of values. This is in part due to the sensitivity and sampling rate of the sensors used in the ThunderMax system. ThunderMax samples and records data much faster than the human eye can process the changes. To slow down the data that is being displayed, a timeframe can be imposed on the gauge to limit the refresh rate by up to two seconds. By default the Gauges are set to ½ second dampening. Experiment with these values to find the proper dampening for your application and preference.

Once the option of "Activate Gauge Display" is selected and the gauge limits are set, one of two things will now happen. The "Engine Head Temp" box will appear on your screen as shown in the following picture, if the **"Link"** and **"Monitor"** buttons have been activated (green background).
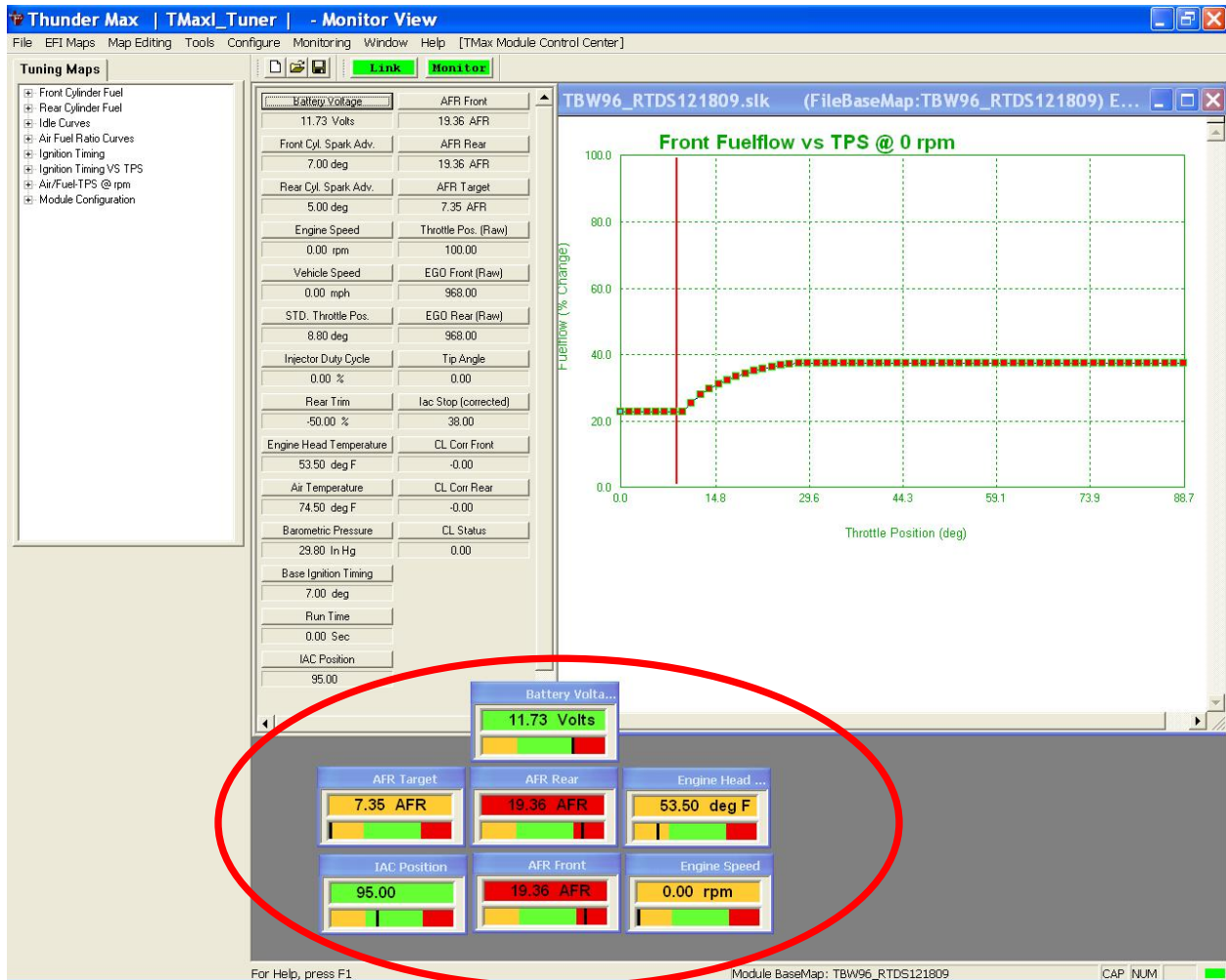


If the monitor gauges do not appear, select **Monitoring > Show Gauges** as previously described.  Drag the gauges around your screen to customize the gauge location to your preferences. To drag a Monitor Gauge, move your mouse arrow over the blue bar of the Monitor Gauge and then hold down the left mouse button to drag the monitor gauge to a convenient location.

# MONITOR LOGGING / REPLAY

The monitor logging capability allows you to record data during tuning and riding sessions. This feature is extremely useful for reviewing the stability of your AFRs or when troubleshooting a tuning issue, an electrical problem (faulty sensor), or a mechanical problem like a clogged fuel filter. The Monitor Logging feature will record all of the vital engine operation data, and allow you to save and replay the operating session. This data can be emailed to Zipper's Technical Support for analysis and recommendations for tuning issues. In a Closed Loop application, with the AutoTune system installed, you can replay the front and rear cylinder AFRs as well as the corresponding throttle positions.

**Sending a monitor log session to the Product Support team is the same as having a technician next to your motorcycle, reviewing the monitor gauge readings and analyzing the results.**

## How to Manually Create and Save a Monitor Log

1. Update your TMax Tuner software to the latest version from **Configure > TMax Software Update**. Internet connection is needed for this update.

2. Establish a Link to the ThunderMax ECM through TMax Tuner.

   a. Install the communications cable between the ThunderMax ECM and your computer.

   b. Move the handlebar switch to the **RUN** position and turn the Ignition **ON**.

   

   c. Open TMax Tuner and select the red **"Link"** button which will turn green.

   

3. Select "**READ Module Maps and Settings**" from the "**File**" menu. **Learned Fuel Adjustments** will be read automatically when using the latest software.

4. Select the  button, which will turn from red to green .

5.  If your pre-selected Monitor Gauges did not appear, select **Monitoring > Show Gauges** to activate.

6.  Now select **Monitoring** > **Monitor Logging** as shown below.



At this time the Monitor Logging session will begin, with or without the engine running. The following window will appear when the Monitor Logging session has begun.



**OPTIONAL:** To check the Throttle Position Sensor function, twist the throttle wide open and then closed one time **BEFORE** starting the engine.

7.  Start the engine and allow the head temperature to rise to a normal operating temperature (260-285° F), and observe the gauge activity. All data is being logged during engine operation. Proceed with Monitor Logging as long as necessary to record any activity for evaluation.



This may require a loaded road test or dyno pull to reveal the tuning problem. Road testing may not be practical unless you own a laptop and have adequate means of attaching and protecting the computer while the motorcycle is in operation. Please use caution and good sense when determining if a road test can be safely performed.

8.  Once you are complete with your Monitor Logging session, select "Stop Monitor Logging" or select the **Monitor** button again to close the monitor session.

## How to Replay a Monitor Log:

1.) Now that TMax Tuner has created a Monitor Log file, you can open it for viewing by selecting **Monitoring > Monitor Replay**, as shown below.
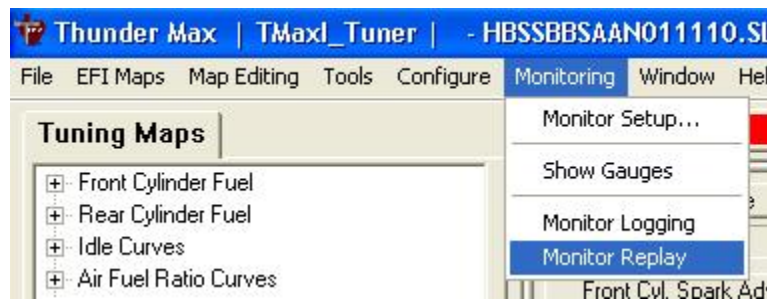


2.) The following window entitled "**Monitor Playback Control**" will appear.
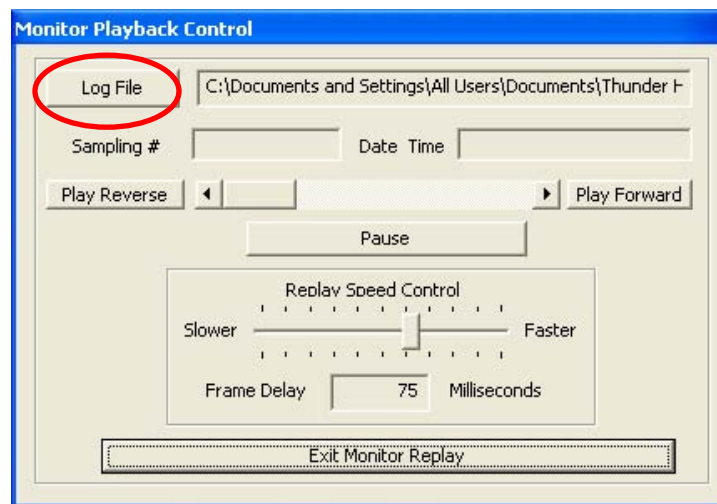


3.) Select the "**Log File**" button, which is circled in red above, and select the appropriate monitor log file.

4.) By default the Monitor Logs are saved by the date and time that the log started; which ensures that none of your previous monitor logs are accidentally overwritten. The following window will appear:
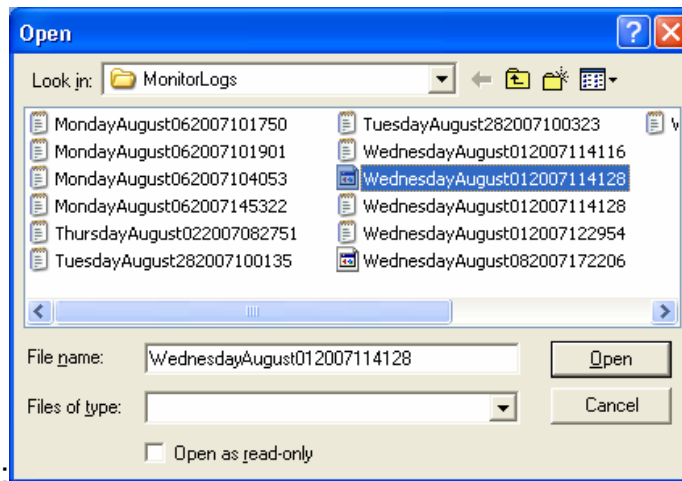
Choose the appropriate Log File and select the "**Open**" button.

5.) Select the "**Play Forward**" Button, as shown below, and the monitor replay will begin in the background. Drag the "Monitor Playback Control" window out of the way of the map window and the monitor gauges.
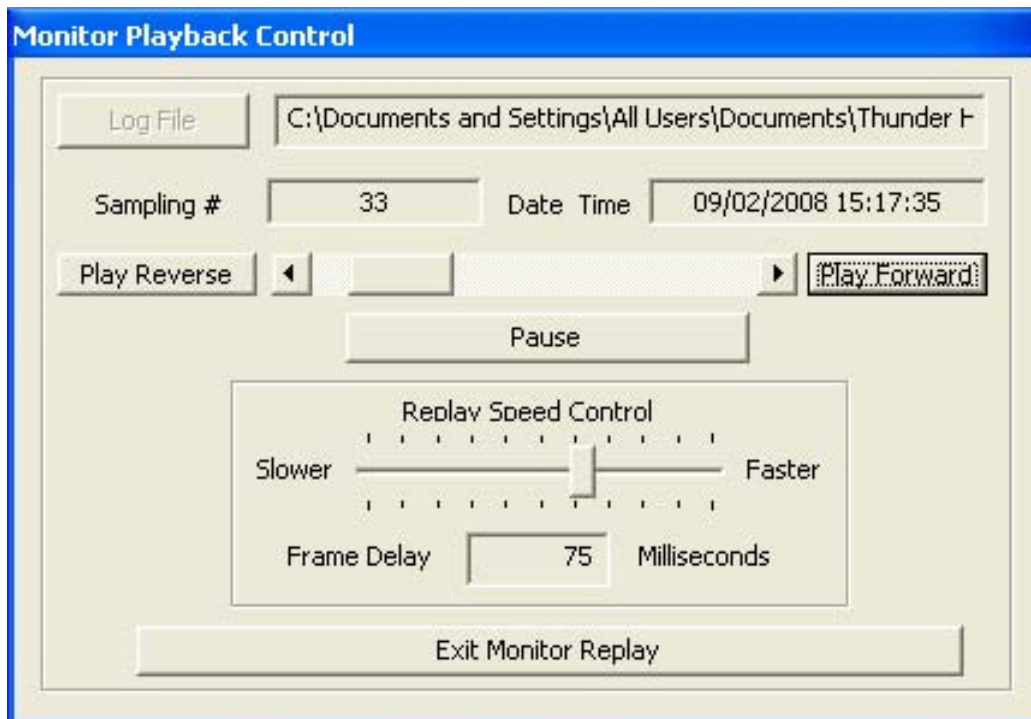


Since TMax Tuner is replaying the monitor log like a video, you may fast forward or rewind the monitor session by dragging the slider or using the arrow buttons. A "Replay Speed Control" slider allows you to control the speed at which the log is replayed.

## Where are my Monitor Logs saved?

The monitor logs are stored in the "All Users or Public" folder. A folder titled "ThunderHeart" has been created in this directory. In this instance, TMax Tuner saved the Monitor Log titled "**WednesdayJanuary132010114128.txt**" in the following location on my computer:

**For Windows XP**
**C:\Documents and Settings\All Users\Shared Documents\Thunder Heart\TMaxITuner \MonitorLogs\WednesdayJanuary132010114128.txt.**

**For Windows Vista & "7"**
**C:\Users\Public\Public Documents\Thunder Heart\ TMaxITuner \ MonitorLogs\WednesdayJanuary132010114128.txt.**

## How do I send a Monitor Log to Zipper's for Review?

A simple method of creating monitor logs has been added to help the majority of TMax Tuner software users. Now you can create a monitor log and TMax Tuner will automatically package the file in an email with the Base Map from your module.

Simply select **Help > Create and Send, Monitor Log Email**, and follow the instructions in the next section.

# CREATE AND SEND MONITOR LOG EMAIL

The second major support tool that has been added to TMax Tuner is similar in operation to the "Prepare and Send Module Data" function. However, this function will allow you to create and save a monitor log session and TMax Tuner will email the data to Product Support for you providing that you use an email client such as MS Outlook or Outlook Express. The email program must be open to complete the send function.

This function will only work if an email client is loaded onto your computer. Web- based email users can duplicate this entire process and submit monitor logs for review, however additional steps are required. Please see instructions on how to manually email a monitor log to the Product Support Team.

To access the function, select **Help > Create and Send, Monitor Log Email.**
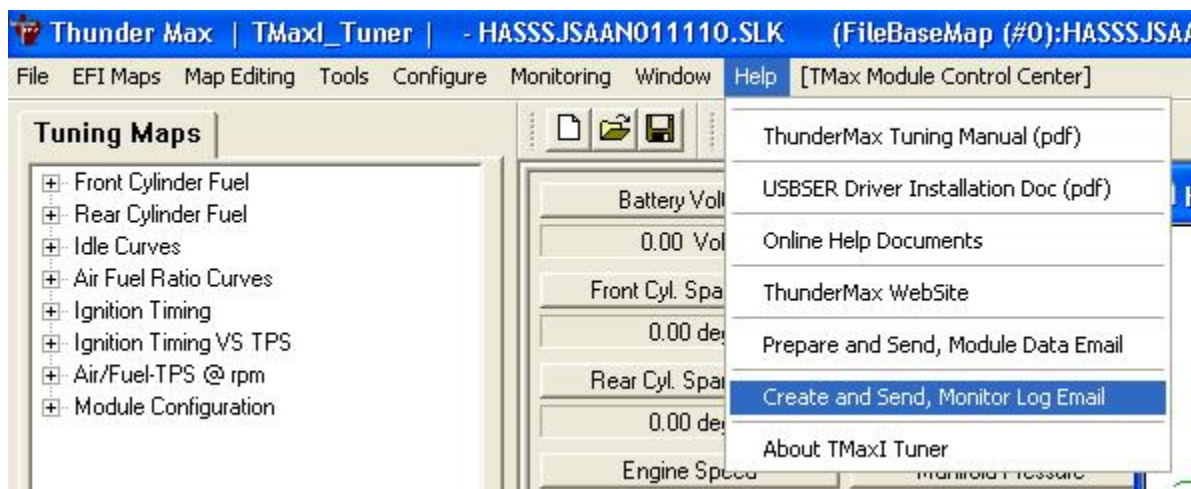


The following box will appear:



Select "Yes" to continue in creating a Monitor Log, and emailing it to Product Support. If "Yes" is selected, the following box will appear:

Once activated, the monitor logging session begins. Use the monitor logging feature to record oddities in the operation of the ThunderMax ECM. The combination of a monitor log and a module data email Base Map file with Learned Fuel Offsets, submitted to the Product Support Team, is almost as good as having a ThunderMax technician evaluate the operation of your motorcycle first hand.

Once the logging session is complete, the following window will appear:

At a minimum, fill in your name, phone number, the basic information on your motorcycle, and the nature of the issue in this window. **The more information that's given up front, the faster the Product Support Team can fulfill your request for assistance.** Help us help you!

Once you've filled in as much information as possible, select the "OK" button on the "Support Email Creation" window. The following box may appear:

**Microsoft Office Outlook**

A program is trying to automatically send e-mail on your behalf.
Do you want to allow this?

If this is unexpected, it may be a virus and you should choose "No".

[ Yes ]  [ No ]  [ Help ]

This is a warning that was generated by Microsoft Outlook, due to TMax Tuner creating and attempting to send an email on its own. If you choose "No", a box will appear that simply says "Failed." If you choose "yes" and allow TMax Tuner to send an email for you, the following will appear if successfully sent. To ensure that the email was successfully sent, double check the contents of your "Sent Items" folder in Outlook.

**SmartLink**

Support EMail Message Sent

[ OK ]

If you do not have an email client loaded on your computer, this function cannot send any emails. The following error will appear if a supported email client is not found;

**SmartLink**

Unable to logon to email client

[ OK ]

**Web-Based Email:**

If you do not have an email client loaded on your computer, you can still send a Monitor log or a map for review through any web-based email. However, a few additional steps are required. The monitor log files are saved in the following directory:

**For Windows XP**
**C:\Documents and Settings\All Users\Shared Documents\Thunder Heart\ TMaxI_Tuner \Monitor Logs\ WednesdayJanuary132010114128.txt.**

**For Windows Vista**
**C:\Users\Public\Public Documents\Thunder Heart\ TMaxI_Tuner\Monitor Logs\ WednesdayJanuary132010114128.txt.**

The location of the monitor log is important if you need to <u>manually</u> submit your Monitor Log to Zipper's Product Support for review. When submitting a monitor log for review, please include the following items:

1.) The **Monitor Log File; only the .txt file is needed**.

2.) The **Module Map File installed in your ThunderMax ECM**. You must save the map from your ThunderMax ECM, and email the .SLK map file with the Monitor Log File. The AutoTune offsets and learned data that are stored in the map file must accompany the .txt file for proper monitor log review.

3.) The **Version Number** of the **TMax Tuner** software that you are using.

To find the TMax Tuner version, select **Help > About TMax Tuner…**, as shown below.
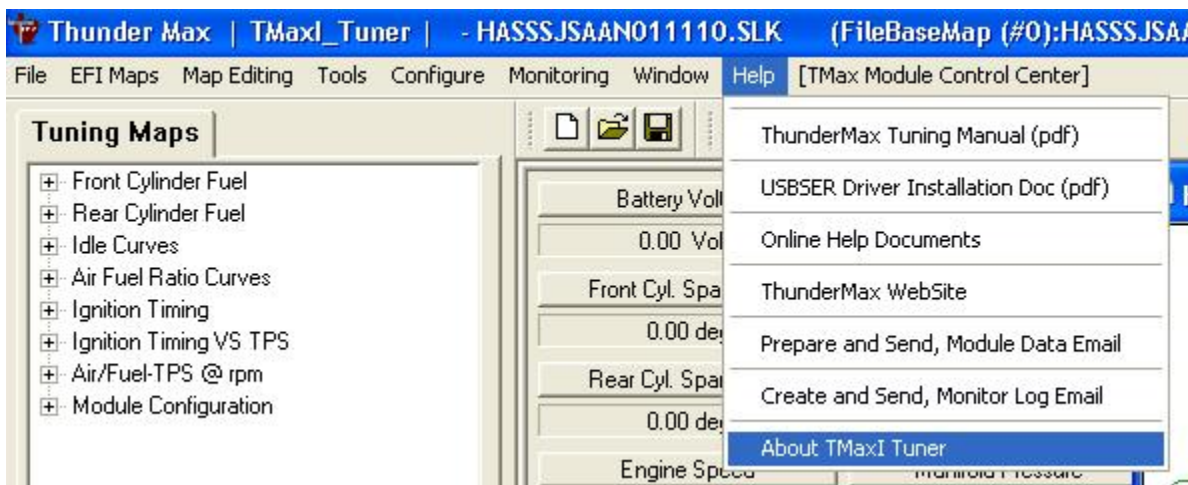
In the window below you'll find the software version as well as the firmware version in your module.

ThunderMax

ThunderMax Version 2010.1.3

Firmware Rel. Date: 02-05-2010

Firmware Version: 1.6

Module Identity: ThunderMax

Firmware Id #: TBW BigTwin

Module Serial #: 703000349

Module BaseMap: HBSSBBSAAN011110

OK

Copyright Thunder Heart Performance Corp. (C) 2003-2009
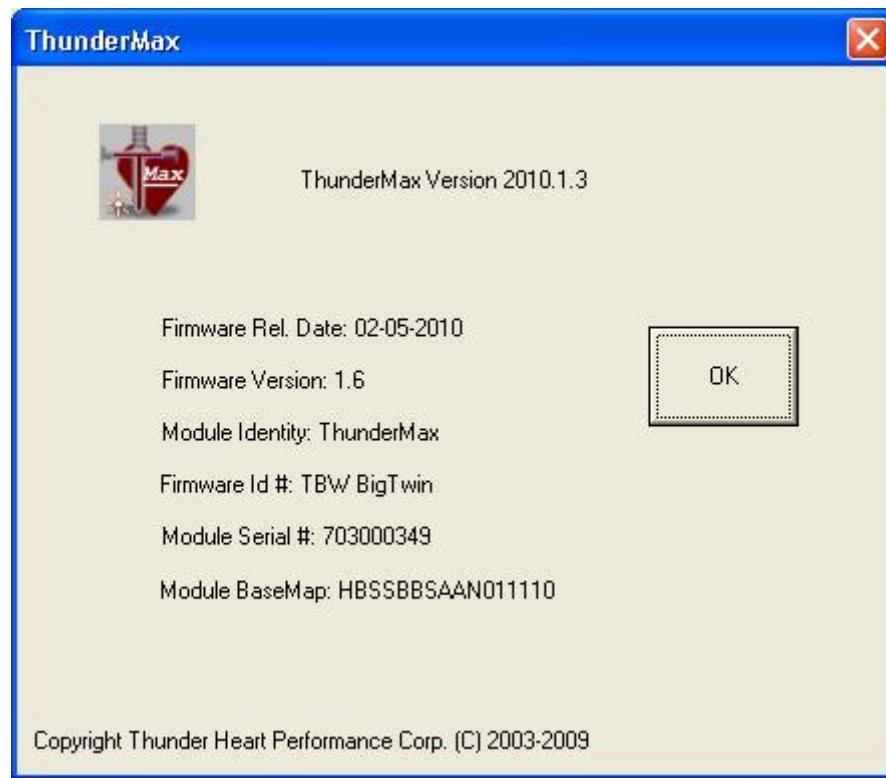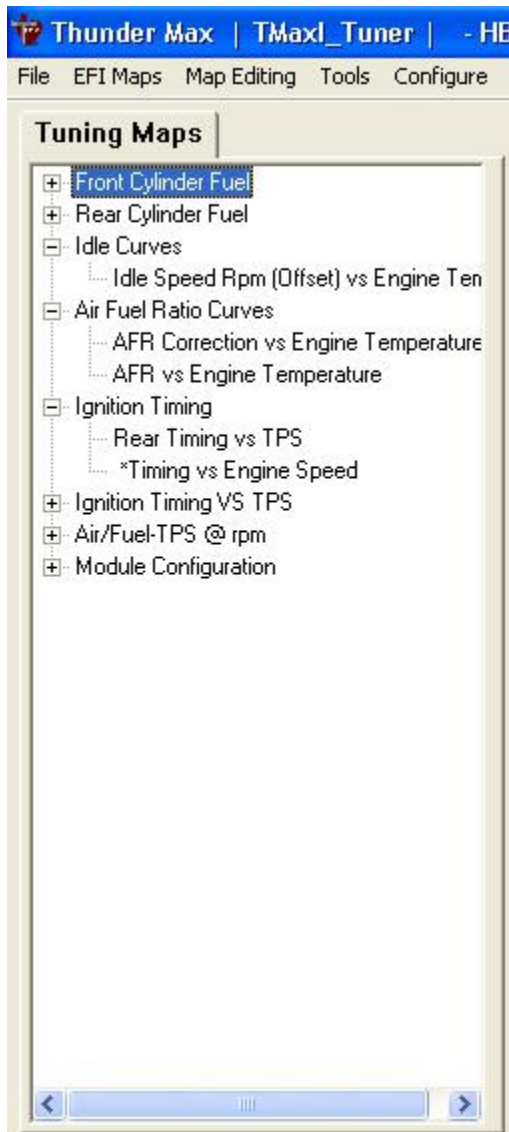
# TUNING MAPS TREE

The Tuning Maps Tree is located on the far left of the TMax Tuner layout, and is used to access different tuning and configuration pages of the software. Clicking on each of these tree titles opens a window to allow editing of a particular function:

## Front Cylinder Fuel:

All Fuel Flow map pages are now displayed for viewing. These map pages show the **Front Fuelflow vs. TPS** curves for each **RPM** page. All fuel offsets made by the AutoTune system can be viewed on these pages.

## Rear Cylinder Fuel:

These map pages show the **Rear Cylinder Trim vs. TPS** rpm map pages. These map pages will contain the AutoTune fuel offsets, once they are read from the ECM.

**Idle Curves-** The **Idle Speed Rpm (Offset) vs. Engine Temperature** map page is used to control the Idle Speed at specific engine temperatures, for example note the difference between idle speed during a cold start warm-up period vs. normal engine operational temperature

## Air Fuel Ratio Curves:

1.) The **AFR Correction vs. Engine Temperature map** page allows the adjustment of the AFR correction at specific operating temperatures.

2.) The **AFR vs. Engine Temperature map** page is only for Closed Loop Auto-Tune applications. This gives the Auto-Tune system AFR targets for specific operating temperatures.

## Ignition Timing Maps:

There are now 34 map pages for complete spark curve modification at any RPM or throttle position. The first 32 map pages are called "Timing vs. TPS @ RPM" map pages. These pages show the complete spark curves for every 256 RPM, and every throttle position.

In addition to the complete spark curve map pages, two separate map pages have been created called "Rear Timing vs. TPS" and "Timing vs. Engine Speed." The "Rear Timing vs. TPS" map page allows you to modify the timing in the rear cylinder only, to combat issues of spark knock that occurs only on the rear cylinder. The "Timing vs. Engine Speed" map page is a composite timing map page. This table allows you to make quick changes to the master spark curve maps at specific RPMs. This map page is very effective in dealing with spark knock problems in particular RPMs. See the Ignition Timing Maps section, for a complete discussion on how to tune the Ignition Timing Maps.

## Air/Fuel-TPS @ RPM: (AFR Targets)

With ThunderMax the engines actual Air/ fuel ratio is derived from settings on these pages. The settings (targets) are at designated throttle positions and specific RPMs on the pages within the software.

When the tuner makes changes to any of the A/F targets the AutoTune system will honor the new targets as the engine is operated on a dyno or during actual riding conditions. Any ThunderMax equipped motorcycle can be tuned for specific changes of desired economy and maximum performance all within one base map.

## Module Configuration:

1.) **Basic Settings** – The Basic Settings page is used for editing the Idle Speed, RPM limit, Speedometer Calibration, Accel Fuel (accelerator pump simulation), Initial fuel pulse,  IAC Home Position and other settings

2.) **Warranty Information** – The ThunderMax ECM is constantly data logging while you ride and tune the motorcycle. The purpose of this page is to log the time that you spend at certain RPM ranges, as well as head temperatures, cycle time per riding session, and even how many times the Rev Limiter has been hit. This may sound intimidating, but the information is extremely valuable to you. These functions will aide any technician in determining why a certain failure occurred. The more data that you can provide to Technical Support the easier (and quicker!) it will be for them to help you.

3.) **Diagnostic Trouble Codes** – The ThunderMax ECM can quickly tell you if any of the 38 sensor functions are operating properly or not. If a sensor has failed, or a problem with the electrical system exists you will immediately see what the problem is on these pages.

# MODULE CONFIGURATION
# BASIC SETTINGS OVERVIEW

As described in the previous section, open the Module Configuration pages in the Tuning Maps Tree. Select the **"Basic Settings"** page under the "**Module Configuration**" heading to open.  The following window will appear.

| Basic Settings | | |
|---|---|---|
| **Rev Limit** | **Gear 6 Min Tps** | **Decel Post Fuel Enrichement** |
| 6016 rpm | 40 tps | 6.27 % fuel |
| **Accel Fuel** | **Initial Fuel Pulse** | **Engine temp alarm threshold** |
| 10.0 msec | 290 % | 334.63 deg F |
| **Speedo Cal** | **Cranking Fuel** | *AutoTune Low Temp |
| 43000 | 8.5 msec | 200 deg F |
| **Idle Rpm** | **Decel Fuel Cut** | *AutoTune High Temp |
| 896 rpm | 0 on/off | 280 deg F |
| **IAC Home Position** | **Decel Fuel Cut Rpm Low** | |
| 95 steps | 1888 rpm | |
| **Final Drive Ratio.** | **Decel Fuel Cut Rpm High** | |
| 87 units | 2560 rpm | |
| **Read Module Settings** | **Write Module Settings** | **Close** |
| Green == Actual Module Value | Yellow == Map/User Value | |
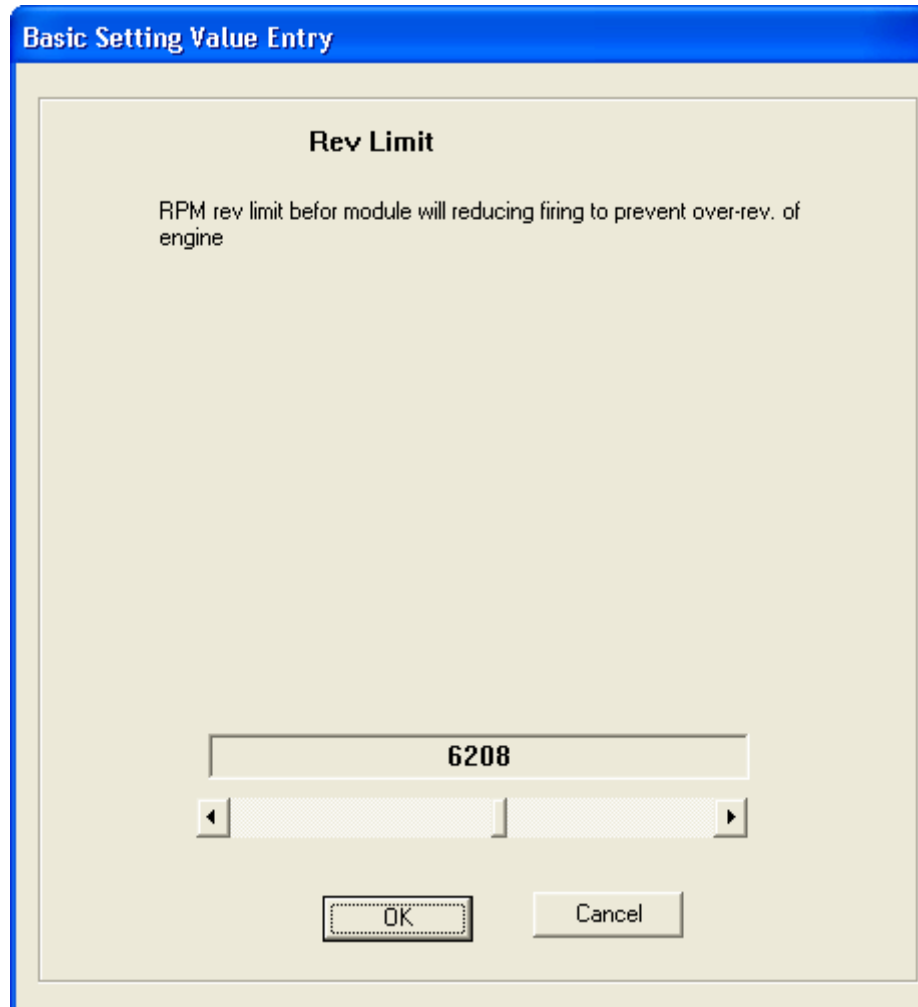
Notice that the selections on the right-hand portion of the "Basic Settings" window are grey and non-selectable. The features are only available in the Tuner Plus version of TMax Tuner.

**Read the map from the module before making adjustments to the Basic Settings. After making a change to any of the Basic Settings, click OK to close that window. The background will remain green and show the new value for that field providing that you stay linked. If the link is interrupted, the field will be yellow. Re-link and select <u>Write Module Settings</u> to complete the change.**

To change the values of the Basic Settings, simply click on the name of the function that needs to be changed. For example, if "Rev Limit" is selected, the "**Basic Setting Value Entry"** box will appear with a slider to adjust the value, as shown below.



It is recommended that at this time you make any necessary adjustments to the basic settings for the ECM/ motorcycle you are working with. The next section is titled "**Configuring the Basic Settings**." This section will teach you how to adjust each of the functions in the "Basic Settings" window, along with a tutorial on what each of these functions performs. Remember, if you do not understand some of the terminology that is being presented to you in the manual; refer to the **Glossary of Terms** at the end of the **ThunderMax Tuning Manual** for assistance**.**

# CONFIGURING THE BASIC SETTINGS

## Rev Limit:

**At the Rev Limit RPM setting, the system will begin to cut spark to one or both cylinders as required to bring engine speed back down below this RPM.**

**Rev Limit Tip:** Know the peak RPM that the engine configuration is designed for. Most V-Twin engines are not designed to run much over 6,200 RPM. Use caution with this setting, as a limit that is too high may allow mechanical damage to occur to the engine.

## Accel Fuel:

This function is similar to an accelerator pump in a carburetor. As the number increases, more fuel is delivered to the engine during rapid throttle changes. This setting is pre-set to optimum specifications during the creation of the base map; yet differences in injector flow rates, changing closed loop targets, or other variables may require some adjustment to optimize throttle response. Zipper's recommends a base setting for Accel fuel to be a value of 8 to 14. The Accel Fuel function is meant to be used to optimize the off-idle throttle response.

*Accel Fuel Tuning Tip* - If you experience a pop or misfire in the intake tract while blipping the throttle at lower RPMs, lower the Accel fuel value until the situation improves.

## Speedo Cal:

This setting is a calibration value, which differs in relation to certain years and/or models of motorcycles. Note that an incorrect speedometer calibration can also affect other electronic accessory functions. Check the Speedo Cal for your year and model motorcycle. If the tire diameter or drive pulley size has changed from stock, contact Zipper's Product Support for information on how to re-calculate the speedometer to a new value.

This step must be performed before attempting to ride the motorcycle for the first time. Zippers cannot be held responsible for an inaccurate speedometer calibration if this step is not followed or neglected. Traffic violations may result if your speedometer does not match your local traffic authority's radar gun. The entry can be from 1 to 65,535. At this time, the known base numbers are as follows:

| | | |
|---------|------|-------|
| Touring | 2008 | 42450 |
| | 2009 | 43000 |
| | 2010 | 44750 |

## Idle RPM:

This setting reflects the idle speed at normal operating temperature.  This is used to adjust idle speed once the engine reaches full operating temperature.

## TAC Home Position:

The TAC Home Position setting will determine how much air is required to pass by the throttle blade for the engine to start without assistance of moving the throttle plate. This value indicates the position (in "counts") of the Idle Air Control (IAC) with the key in "RUN", without the engine running.  This setting affects the amount of air the engine receives while cranking.  The TAC Home Position range is from 0 (fully closed) to 255 (fully open) counts.

## Final Drive Ratio:

A setting for "Final Drive Ratio" may only be required if a significant wheel size or gearing change is performed and the 6$^{th}$ gear indicator lamp does not illuminate. **The default value of 87 should work on all vehicles**. Please note that this value is merely a compensation factor for the calibration needed to activate the light, not the actual Final Drive Ratio of the motorcycle. Please disregard this function if you do not have a 6$^{th}$ gear indicator lamp.

## Gear 6 MIN TPS:

This value represents the smallest value of throttle position that will allow the 6$^{th}$ gear display to illuminate. This function is only used on motorcycles equipped with OEM 6 speed transmissions and a 6$^{th}$ gear indicator light on the instrument cluster. If your application does not have a 6$^{th}$ gear indicator light, set the value to 0.

**The default value for bikes equipped with this feature is 40.** For any reason, if your 6$^{th}$ gear indicator light is inoperable, please confirm that the value in the 6$^{th}$ gear min TPS is 40. If not, enter this value and write it to the module.

## Initial Fuel Pulse:

This setting will affect the way that the motorcycle starts when the engine is cold. When the ignition is turned on, the ThunderMax ECM tells the injector to spray a defined amount of fuel to prime the cylinders. The default setting is 199 for most maps. We suggest small changes to find the ideal setting for quick starting. Typically when properly tuned to the application, the engine will fire "immediately" and eliminate the strain on your battery from excessive cranking.

The Initial Fuel Pulse will only pulse the injector once before the engine is started. If you lower the setting too much, the function will provide less of an aide in cold starting the engine.

## Cranking Fuel:

This allows you the option to richen or lean the fuel mixture during cranking conditions only. The Cranking Fuel option helps the engine start easier by delivering a richer fuel mixture to the engine, to promote a quicker initial combustion.

## Decel Fuel Cut:

The "Decel Fuel Cut" option is the ON / OFF switch for the Decel Fuel Features.

Using a value of (0) turns the feature off, and a value of (1) turns on this option. For example, if your motorcycle does not currently pop on deceleration, it is not recommended to activate this feature. **If you are experiencing deceleration popping, set this value to (1) and proceed forward to setting the Decel Fuel options.**

## Decel Fuel Cut Rpm Low:

**The "Decel Fuel Cut RPM Low" setting should reflect the lowest RPM where the deceleration popping is occurring.** This feature is set at 2048 RPM by default however the setting is adjustable from 1280 to 3040 RPM. Simply take note of the RPM where the popping stops and set the "Decel Fuel Cut Rpm Low" value approximately 50 RPM below this point. This is where the fuel cut process is terminated. Fuel delivery is returned to normal below this RPM.

## Decel Fuel Cut Rpm High:

**The "Decel Fuel Cut RPM High" setting should reflect the highest RPM where the deceleration popping occurs.** This feature is set at 2400 RPM by default; however the High setting is adjustable from 2048 to 4064 RPM. Simply take note of the RPM where the popping begins and set the Decel Fuel Cut Rpm High value approximately 50 RPM above that RPM. This setting will be the RPM at which the Decel Fuel Cut is triggered during acceleration.

The following graph depicts three scenarios to aide in your understanding of the Decel Fuel Cut function.

　　　　**"Action 1"** represents a situation where both the Low and High Fuel Cut RPMs are achieved; the Decel Fuel Cut is triggered, activated, and deactivated.
　　　　**"Action 2"** shows a situation where the High RPM was NOT achieved, and the Decel Fuel Cut is neither triggered nor activated.
　　　　**"Action 3"** shows how once the Decel Fuel function is triggered, it will not deactivate until after the engine RPM falls below the Decel Fuel Cut Low RPM.
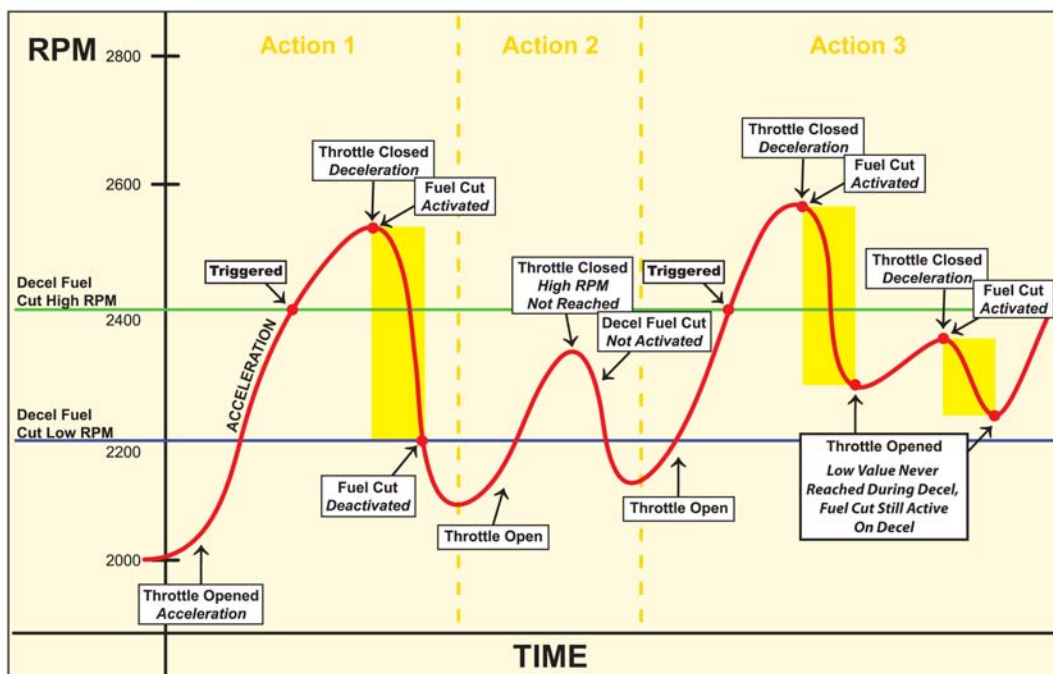
## Decel Post Fuel Enrichment:

The Decel Post Fuel Enrichment feature is similar to an accelerator pump on a carburetor. **This enrichment feature smoothes the transition from an OFF to ON throttle condition and makes it as seamless as possible.** This seamless transition is achieved by not allowing the manifold to enter a "dry" condition that can occur on long periods of deceleration, which may cause a pause, or a lag, in throttle response once the blade is opened. The Decel Post Fuel Enrichment has a range from 0 to 100, with the default setting of 16.08.

## Engine Temp Alarm Threshold:

An adjustable Engine temperature alarm threshold is a feature that allows you to set the cylinder head temperature when the "Check Engine" light turns on, to warn that the cylinder head temperature is starting to overheat.

All of the individual models of motorcycles produce different amounts of heat, as well as dissipate the heat differently. If you are riding a motorcycle that shrouds the airflow from the cylinder heads, the engine will maintain a higher operational temperature over the models that do not obstruct the air from the engine. These are air-cooled engines, if the air is not flowing past the engine, the engine cannot dissipate the heat.

Now you can select at what temperature you want to be warned, either raising the value for motorcycles that are constantly tripping the "Check Engine" light, or lowering the value if you want an early warning of a heat build up situation.

## Auto Tune Low and High Temp Settings:

This setting is non-adjustable, and the value is built into the Base Map. Example: An air cooled vs. water cooled engine requires a different temperature threshold for the AutoTune to function, the values are set accordingly.

If your application requires a special temperature threshold, please contact product support.

## Read/Write Module Settings:

The buttons at the bottom of the Module Configuration window allow you to immediately save the changes made to the ECM. This is also useful when attempting to read the current Module Configuration settings in a module that has already been in operation.

Any changes made when you're not linked to your ThunderMax ECM will result in a value with a yellow background. This simply means that the value is on your computer, but not updated to your ECM. In the following example the Decel Fuel Cut option was turned on, but not while linked to the ECM.

# SERVICE DATA

The Service Data window displays the amount of time that you've spent at particular RPM ranges, as well as the head temperatures that your engine has seen. This is extremely useful information when tuning the motorcycle. You will now be able to see what RPM ranges are most frequently used by your riding style. This will allow you to focus your tuning effort to the most frequently used ranges.

The following window will appear when the "Service Data" option is selected. Select the "Read Module" button to update the logged data into the TMax Tuner software.

## Service Data

| | | | | |
|---|---|---|---|---|
| Genaral Log Data | Rpm Log 500-8400 | Rpm Log 8500-16400 | Head Temp Log | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 500 Rpm | 1148:22:39 | 2100 Rpm | 993671:37: | 3700 Rpm | 1055387:45 | 5300 Rpm | 993671:37: | 6900 Rpm | 00:00:41 |
| 600 Rpm | 00:00:41 | 2200 Rpm | 993671:37: | 3800 Rpm | 531:26:01 | 5400 Rpm | 993671:37: | 7000 Rpm | 767:33:24 |
| 700 Rpm | 767:33:24 | 2300 Rpm | 993671:37: | 3900 Rpm | 244:23:02 | 5500 Rpm | 993671:37: | 7100 Rpm | 1055387:45 |
| 800 Rpm | 1055387:45 | 2400 Rpm | 993671:37: | 4000 Rpm | 3176:23:15 | 5600 Rpm | 993671:37: | 7200 Rpm | 531:26:01 |
| 900 Rpm | 531:26:01 | 2500 Rpm | 993671:37: | 4100 Rpm | 1557:39:49 | 5700 Rpm | 993671:37: | 7300 Rpm | 244:23:02 |
| 1000 Rpm | 244:23:02 | 2600 Rpm | 993671:37: | 4200 Rpm | 1557:39:49 | 5800 Rpm | 993671:37: | 7400 Rpm | 3176:23:15 |
| 1100 Rpm | 3176:23:15 | 2700 Rpm | 993671:37: | 4300 Rpm | 1557:38:24 | 5900 Rpm | 993671:37: | 7500 Rpm | 1557:39:49 |
| 1200 Rpm | 1557:39:49 | 2800 Rpm | 993671:37: | 4400 Rpm | 15:16:58 | 6000 Rpm | 993671:37: | 7600 Rpm | 1557:39:49 |
| 1300 Rpm | 1557:39:49 | 2900 Rpm | 993671:37: | 4500 Rpm | 993671:37: | 6100 Rpm | 993671:37: | 7700 Rpm | 1557:38:24 |
| 1400 Rpm | 1557:38:24 | 3000 Rpm | 993671:37: | 4600 Rpm | 993671:37: | 6200 Rpm | 993671:37: | 7800 Rpm | 15:16:58 |
| 1500 Rpm | 15:16:58 | 3100 Rpm | 993671:37: | 4700 Rpm | 993671:37: | 6300 Rpm | 993671:37: | 7900 Rpm | 993671:37: |
| 1600 Rpm | 993671:37: | 3200 Rpm | 993671:37: | 4800 Rpm | 993671:37: | 6400 Rpm | 993671:37: | 8000 Rpm | 993671:37: |
| 1700 Rpm | 993671:37: | 3300 Rpm | 993671:37: | 4900 Rpm | 993671:37: | 6500 Rpm | 993671:37: | 8100 Rpm | 993671:37: |
| 1800 Rpm | 993671:37: | 3400 Rpm | 993671:37: | 5000 Rpm | 993671:37: | 6600 Rpm | 993671:37: | 8200 Rpm | 993671:37: |
| 1900 Rpm | 993671:37: | 3500 Rpm | 993671:37: | 5100 Rpm | 993671:37: | 6700 Rpm | 993671:35: | 8300 Rpm | 993671:37: |
| 2000 Rpm | 993671:37: | 3600 Rpm | 993671:37: | 5200 Rpm | 993671:37: | 6800 Rpm | 199374:51: | 8400 Rpm | 993671:37: |

| Read Module | Clear Module | Save To File | Load From File | Close |
|---|---|---|---|---|

---

## Service Data

| | | | | |
|---|---|---|---|---|
| Genaral Log Data | Rpm Log 500-8400 | Rpm Log 8500-16400 | Head Temp Log | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8500 Rpm | 993671:37: | 10100 Rpm | 3176:23:15 | 11700 Rpm | 993671:37: | 13300 Rpm | 1557:39:49 | 14900 Rpm | 993671:37: |
| 8600 Rpm | 993671:37: | 10200 Rpm | 1557:39:49 | 11800 Rpm | 993671:37: | 13400 Rpm | 1557:39:49 | 15000 Rpm | 993671:37: |
| 8700 Rpm | 993671:37: | 10300 Rpm | 1557:39:49 | 11900 Rpm | 993671:37: | 13500 Rpm | 1557:38:24 | 15100 Rpm | 993671:37: |
| 8800 Rpm | 993671:37: | 10400 Rpm | 1557:38:24 | 12000 Rpm | 993671:37: | 13600 Rpm | 15:16:58 | 15200 Rpm | 993671:37: |
| 8900 Rpm | 993671:37: | 10500 Rpm | 15:16:58 | 12100 Rpm | 993671:37: | 13700 Rpm | 993671:37: | 15300 Rpm | 993671:37: |
| 9000 Rpm | 993671:37: | 10600 Rpm | 993671:37: | 12200 Rpm | 993671:37: | 13800 Rpm | 993671:37: | 15400 Rpm | 993671:37: |
| 9100 Rpm | 993671:37: | 10700 Rpm | 993671:37: | 12300 Rpm | 993671:37: | 13900 Rpm | 993671:37: | 15500 Rpm | 993671:37: |
| 9200 Rpm | 993671:37: | 10800 Rpm | 993671:37: | 12400 Rpm | 993671:37: | 14000 Rpm | 993671:37: | 15600 Rpm | 993671:37: |
| 9300 Rpm | 993671:37: | 10900 Rpm | 993671:37: | 12500 Rpm | 993671:37: | 14100 Rpm | 993671:37: | 15700 Rpm | 993671:37: |
| 9400 Rpm | 993671:37: | 11000 Rpm | 993671:37: | 12600 Rpm | 993671:37: | 14200 Rpm | 993671:37: | 15800 Rpm | 993671:37: |
| 9500 Rpm | 993671:37: | 11100 Rpm | 993671:37: | 12700 Rpm | 993671:37: | 14300 Rpm | 993671:37: | 15900 Rpm | 993671:35: |
| 9600 Rpm | 993671:37: | 11200 Rpm | 993671:37: | 12800 Rpm | 993671:35: | 14400 Rpm | 993671:37: | 16000 Rpm | 199374:51: |
| 9700 Rpm | 993671:37: | 11300 Rpm | 993671:37: | 12900 Rpm | 199374:51: | 14500 Rpm | 993671:37: | 16100 Rpm | 199374:49: |
| 9800 Rpm | 993671:37: | 11400 Rpm | 993671:37: | 13000 Rpm | 199374:49: | 14600 Rpm | 993671:37: | 16200 Rpm | 197804:58: |
| 9900 Rpm | 993671:37: | 11500 Rpm | 993671:37: | 13100 Rpm | 197804:58: | 14700 Rpm | 993671:37: | 16300 Rpm | 197804:56: |
| 10000 Rpm | 993671:37: | 11600 Rpm | 993671:37: | 13200 Rpm | 197804:56: | 14800 Rpm | 993671:37: | 16400 Rpm | 196235:05: |

| Read Module | Clear Module | Save To File | Load From File | Close |
|---|---|---|---|---|

**Service Data**

Genaral Log Data | Rpm Log 500-8400 | Rpm Log 8500-16400 | Head Temp Log

| | | | |
|---|---|---|---|
| 184 Deg | 750 | 312 Deg | 1023 |
| 192 Deg | 1023 | 320 Deg | 1023 |
| 200 Deg | 1023 | 328 Deg | 1023 |
| 208 Deg | 1023 | 336 Deg | 1023 |
| 216 Deg | 1023 | 344 Deg | 1023 |
| 224 Deg | 1023 | 352 Deg | 1023 |
| 232 Deg | 1023 | 360 Deg | 1023 |
| 240 Deg | 1023 | 368 Deg | 1023 |
| 248 Deg | 1023 | 376 Deg | 1018 |
| 256 Deg | 1023 | 384 Deg | 791 |
| 264 Deg | 1023 | 392 Deg | 784 |
| 272 Deg | 1023 | 400 Deg | 778 |
| 280 Deg | 1023 | 408 Deg | 771 |
| 288 Deg | 1023 | 416 Deg | 765 |
| 296 Deg | 1023 | 424 Deg | 758 |
| 304 Deg | 1023 | 432 Deg | 751 |

| Read Module | Clear Module | Save To File | Load From File | Close |
|---|---|---|---|---|

If you are experiencing problems viewing the Warranty Information, please verify that the DPI Setting (**D**ots **P**er **I**nch) on your computer is set at "Normal Size", which is 96 DPI. Any value other than 96 DPI may not allow this window to open properly. Generally a higher DPI value will eliminate all of the buttons found at the bottom of the window. If you don't see the "Read Module" button, double check the DPI setting.

The warranty information function is viewed as three separate logs, one based on General Log Data, one on RPM and one based on Head Temperature. To toggle between the logs, simply select which log you wish to view from the separate tabs at the top of the window.

If the "Head Temp Log" tab is selected, the following window will appear.



## Saving the Warranty Information Data:

To save the Warranty Information data that is stored in the ThunderMax ECM, first select the "Save to File" button at the bottom of the "Service Data" window, as shown above.

Once the "Save to File" button is selected, a window will appear titled "Save As."



Select "Save" and an Excel spreadsheet will be created in the directory "C:\Documents and Settings\All Users\Documents\Thunder Heart\TMaxI_Tuner\Warranty Data."

Two files will be created when a Warranty Data Log is saved. The first file is an Excel Spreadsheet that contains ALL of the data displayed on the "Service Data" windows, including both Head Temperature and RPM logs. This Excel spreadsheet can be printed out for your reference.

The second file that is created is an .SSD file which can be opened through TMax Tuner. If you select the "Load from File" button, as shown below, TMax Tuner will open the Warranty Data folder for you to choose a saved warranty log for viewing.
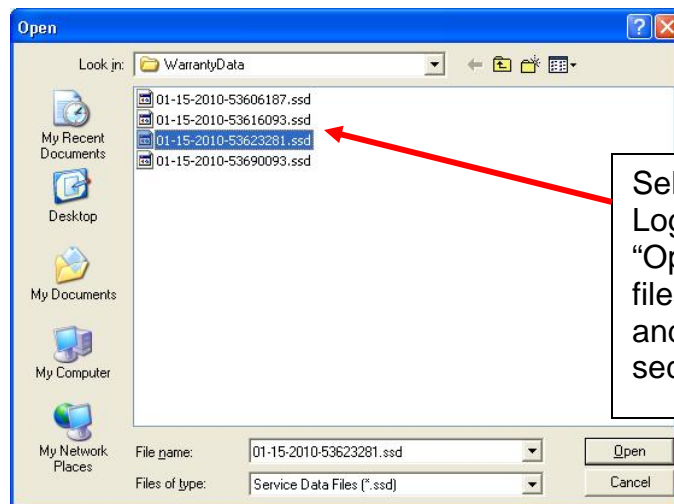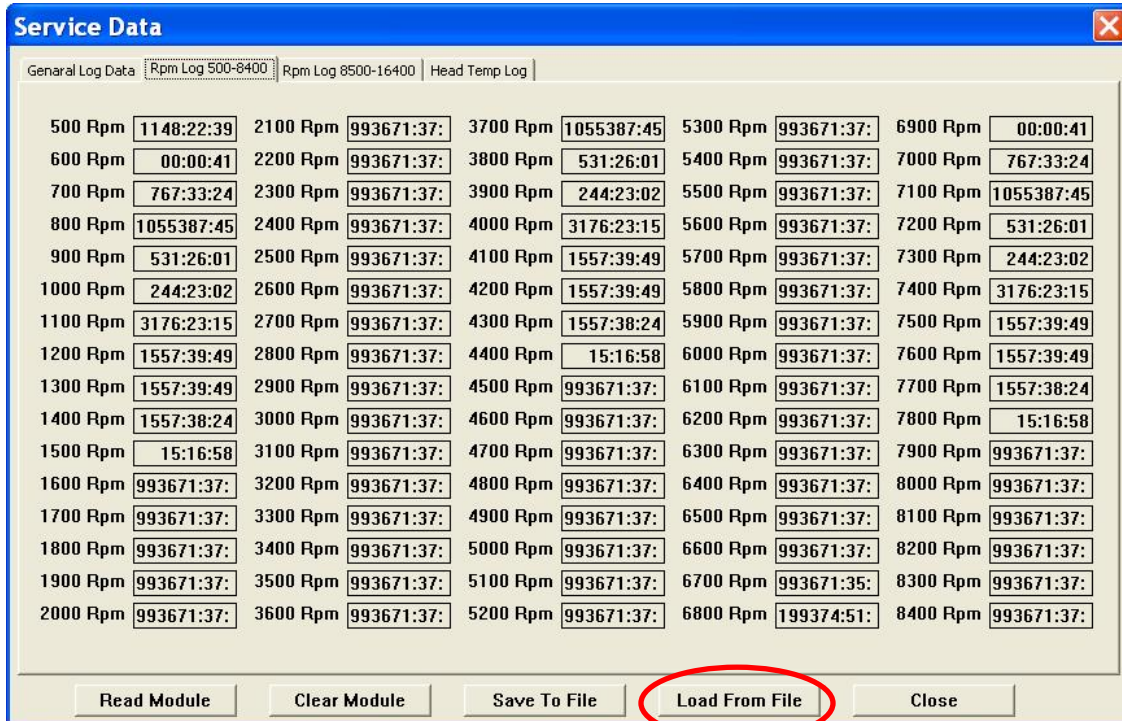




Select a Warranty Data Log file and click "Open" to view. These files are listed by date and time, down to the second.

# DIAGNOSTIC TROUBLE CODES

When the Diagnostic Codes option is selected from the Tuning Maps Tree (Subcategory of Module Configuration), the following window will appear:

**Trouble Codes**

Code Page 1 | Code Page 2 | Code Page 3 | Code Page 4

| OK | OK | OK | 605 Module Flash Low | OK | OK | OK | 641 5v Vref1 Out Of Range |
|---|---|---|---|---|---|---|---|
| OK | OK | OK | 603 Module Eeprom Low | OK | OK | OK | 651 5v Vref2 Out Of Range |
| OK | OK | OK | U1300 ECM Serial Data Low | OK | OK | OK | 373 Crank Pos Sensor Intermitt |
| OK | OK | OK | U1301 ECM Serial Data High | OK | OK | OK | 107 Map Sensor Lo |
| OK | OK | OK | U1097 Lost Speedo Serial Data | OK | OK | OK | 108 Map Sensor Hi |
| OK | OK | OK | U1064 Lost TSSM Serial Data | OK | OK | OK | 374 Crank Sensor Sync Error |
| OK | OK | OK | 1003 Sys Relay Contacts Open | OK | OK | OK | 1600 EFI Module Internal Fault |
| OK | OK | OK | 1002 Sys Relay Coil Hi | OK | OK | OK | 1270 TGS Validation Error |
| OK | OK | OK | 1001 Sys Relay Coil Lo | OK | OK | OK | 2107 EFI Module Internal Error |
| OK | OK | OK | 1004 Sys Relay Contacts Close | OK | OK | OK | 2122 TGS1 Lo |
| OK | OK | OK | 1009 Incorrect Password | OK | OK | OK | 2123 TGS1 Hi |
| OK | OK | OK | 1010 Missing Password | OK | OK | OK | 2127 TGS2 Lo |

Close | Clear Diagnostic Codes

**Trouble Codes**

Code Page 1 | Code Page 2 | Code Page 3 | Code Page 4

| OK | OK | OK | 2128 TGS2 Hi | OK | OK | OK | 2102 TAC Lo |
|---|---|---|---|---|---|---|---|
| OK | OK | OK | 2138 TGS Correlation Error | OK | OK | OK | 2103 TAC Hi |
| OK | OK | OK | 120 TPS1 Range Error | OK | OK | OK | 661 Intake Solenoid Lo |
| OK | OK | OK | 220 TPS2 Range Error | OK | OK | OK | 662 Intake Solenoid Hi |
| OK | OK | OK | 122 TPS1 Lo | OK | OK | OK | 2176 TAC Closed Pos Not Lear |
| OK | OK | OK | 123 TPS1 Hi | OK | OK | OK | 1514 Air Flow Fault |
| OK | OK | OK | 222 TPS2 Lo | OK | OK | OK | 2105 Efi Forced Engine Shutdo |
| OK | OK | OK | 223 TPS2 Hi | OK | OK | OK | 1501 Jiffy Stand Lo |
| OK | OK | OK | 2135 TPS Correlation Error | OK | OK | OK | 1502 Jiffy Stand Hi |
| OK | OK | OK | 2119 TAC Range Performance | OK | OK | OK | 572 Brake Switch Lo |
| OK | OK | OK | 2100 TAC Motor Open | OK | OK | OK | 117 Engine Temp Sensor Lo |
| OK | OK | OK | 2101 TAC Actuation Error | OK | OK | OK | 118 Engine Temp Sensor Hi |

Close | Clear Diagnostic Codes

## Trouble Codes

Code Page 1 | Code Page 2 | Code Page 3 | Code Page 4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OK | OK | OK | 112 Intake Air Temp Sensor Lo | OK | OK | OK | 562 Battery Voltage Lo |
| OK | OK | OK | 113 Intake Air Temp Sensor Hi | OK | OK | OK | 563 Battery Voltage Hi |
| OK | OK | OK | 1351 Front Ign Coil Lo | OK | OK | OK | 501 Vehicle Speed Sensor Lo |
| OK | OK | OK | 1354 Rear Ign Coil Lo | OK | OK | OK | 502 Vehicle Speed Sensor Hi |
| OK | OK | OK | 1352 Front Ign Coil Hi | OK | OK | OK | 1356 Rear No Combustion |
| OK | OK | OK | 1355 Rear Ign Coil Hi | OK | OK | OK | 1353 Front No Combustion |
| OK | OK | OK | 1357 Front Combustion Intermit | OK | OK | OK | 505 Idle Response |
| OK | OK | OK | 1358 Rear Combustion Intermitt | OK | OK | OK | 444 Purge Sol Lo |
| OK | OK | OK | 261 Front Injector Lo | OK | OK | OK | 445 Purge Sol Hi |
| OK | OK | OK | 263 Rear Injector Lo | OK | OK | OK | 1475 Exhaust Act Pos error |
| OK | OK | OK | 262 Front Injector Hi | OK | OK | OK | 1477 Exhaust Act Lo |
| OK | OK | OK | 264 Rear Injector Hi | OK | OK | OK | 1478 Exhaust Act Hi |

Close     Clear Diagnostic Codes

## Trouble Codes

Code Page 1 | Code Page 2 | Code Page 3 | Code Page 4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OK | OK | OK | 131 Front O2 Sensor Lo | OK | OK | OK | Baro Sensor Lo |
| OK | OK | OK | 151 Rear O2 Sensor Lo | OK | OK | OK | Baro Sensor Hi |
| OK | OK | OK | 132 Front O2 Sensor Hi | | | | |
| OK | OK | OK | 152 Rear O2 Sensor Hi | | | | |
| OK | OK | OK | 134 Front O2 Sensor Inactive | | | | |
| OK | OK | OK | 154 Rear O2 Sensor Inactive | | | | |
| OK | OK | OK | 1510 EFI Limited Performance | | | | |
| OK | OK | OK | 1511 EFI Power Management M | | | | |
| OK | OK | OK | 1512 EFI Forced Idle Mode | | | | |
| OK | OK | OK | 577 Cruise Control Input Hi | | | | |
| OK | OK | OK | 1655 Acr Lo | | | | |
| OK | OK | OK | 1656 Acr Hi | | | | |

Close     Clear Diagnostic Codes

**Open the Diagnostic Trouble Codes window when linked to your ThunderMax ECM to view the Diagnostic Trouble Codes status.**

The Diagnostic Trouble Codes window displays **counts, current** and **historical errors** for all of the sensors and devices that are necessary for the proper operation of your motorcycle. These windows eliminate the need for the factory scan tool for reading trouble codes. Instead of outputting a trouble code, this window will display the status of the electronic system.

Three types of messages are given in the DTC window, **(1) Counts** which are not DTC, **(2) Current errors**, **(3) Historic Errors**

## Trouble Codes

Code Page 1 | Code Page 2 | Code Page 3 | Code Page 4

| | | | |
|---|---|---|---|
| OK | OK | Historic Fault | 605 Module Flash Low |
| OK | OK | OK | 603 Module Eeprom Low |
| OK | OK | OK | U1300 ECM Serial Data Low |

**Counts** – This is the test mode counting - scanning system integrity.

A numeric value listed within the left column (counts) is not a DTC fault code.

**Current Fault** – A fault is occurring with the sensor in question. A TPS Low "Current Fault" simply means that the sensor voltage is currently too low to operate correctly.

**Historic Fault** – A fault has previously occurred in the past, or is a present problem if "Current Fault" is displayed. If **only** the Historic Fault is shown, and no issues are found with the motorcycle, the fault will eventually clear itself.

Low battery voltage will result in a Fault Code as well due to low return voltage from the sensors. With an extended session of linking without the engine running, a charger may be <u>properly</u> connected to the battery <u>before</u> prolonged link sessions, but only with the engine off. Otherwise you may have a weak battery when you try to crank the engine over. Removal of the headlight fuse will greatly reduce battery drain while linked.

The Diagnostic Trouble Codes are useful when troubleshooting electrical issues with your motorcycle. Most all problems we have encountered thru development are related to ECM connector problems, faulty wiring, adding incompatible electrical accessories, faulty TSSM. If an error is occurring with a sensor, but you only see a Historic Code, use the "Clear Diagnostic Codes" button to clear the historic codes. If the code is current and it re-appears after you clear it, start your inspection of new devises added to the cycle or work thru the factory manual to locate the problem in the system.

The DTC uses abbreviations for the sensor names, and it will show if the sensor voltage is too high, or too low for the normal operating range.

**TPS Low / High** = Throttle Position Sensor
**MAT Low / High** = Manifold Air Temperature
**Head Temp Low / High** = Cylinder Head Temperature
**Barometer Low / High** = Barometric Pressure Sensor in the ECM
**EGO Front / Rear** = Oxygen Sensor Front / Rear Status – The engine must be operating for this function to correctly diagnose the oxygen sensors.
**Battery Low / High** = Main 12v Battery Voltage
**Sensor Power Low / High** = Voltage across the low power sensor circuit (Factory equipped 5 volt sensor circuitry)
**Crank Sensor** = Crank Position Sensor (CPS)
**Vehicle Speed** = Vehicle Speed Sensor (VSS)
**Calibration Integrity** = Reserved for future upgrades, currently non-functional
**Firmware Integrity** = Reserved for future upgrades, currently non-functional

# CLOSED LOOP MODULE SETTINGS

The Closed Loop Module Settings are used in conjunction with the ThunderMax ECM.

The ThunderMax ECM processes feedback from the wideband oxygen sensors to adjust the fuel volume at all points, by creating learned "Offset" points from the installed 'Base Map' fuel points. These 'learned offset points' are stored within the ThunderMax ECM and are used in conjunction with the base map. The base map is dynamically used by the ThunderMax ECM Auto-Tune's active (closed loop) feedback system. The 'base map' fuel points are not being adjusted by the ThunderMax AutoTune system.

To view the Closed Loop MODULE Settings window, select **Configure > Closed Loop MODULE Settings…** as shown below.
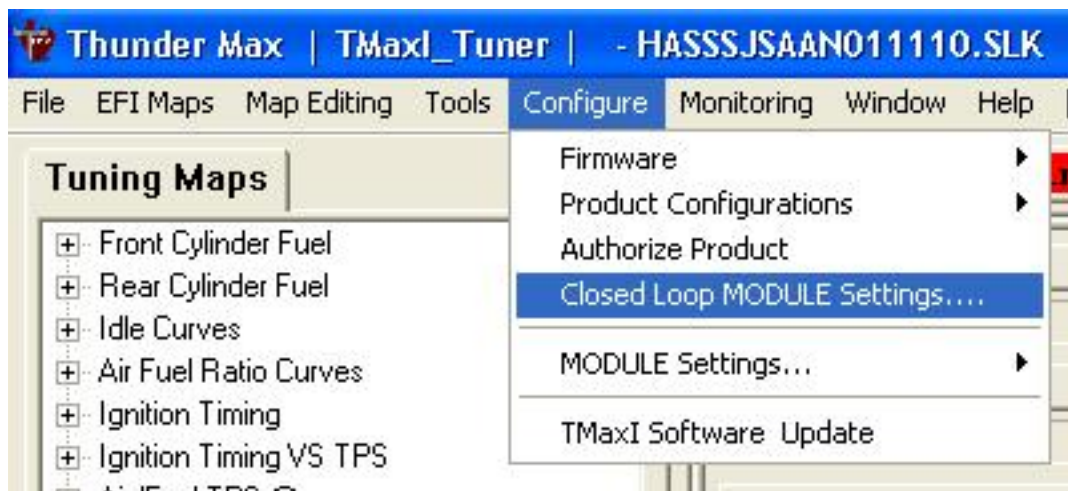
## Closed Loop Configuration Layout:

The Closed Loop Configuration window is broken into two distinct columns, one for the Module settings, and one for the Map settings.

**Right Side (Map Side)**

Closed Loop Settings saved to the Map file on your computer.

Any changes made to the Map side must be written to the ECM before the changes are implemented by the ThunderMax ECM.

**Left Side (Module Side)**

Closed Loop Settings saved in your ThunderMax ECM.

Changes made to the Module side are only saved if Linked to an ECM.



**Closed Loop Configuration**

(Module) Closed Loop Settings

☑ AutoTune (Module)

Air Fuel Ratio Override (Module)

☐ AFR Override Enabled (Module)

AFR (Module) | N/A

Max CLP Offset (Module)

Session (Module) | N/A

Link/Read (Module)

(Map) File Closed Loop Settings

☑ AutoTune (Map)

Air Fuel Ratio Override (Map)

☐ AFR Override Enabled (Map)

AFR (Map) | 13.0 AFR

Maximum CLP Offsets (Map)

Session (Map) | 5 %

Write (Map) Settings To ( Module)

CLOSE

## Enabling Closed Loop Operation:

1.) Establish a communications Link to the ThunderMax ECM.
2.) Select Configure > Closed Loop Module Settings…
3.) **Check the "Auto Tune (Module)" and "Auto Tune (Map)" options** as shown below, if not already checked.
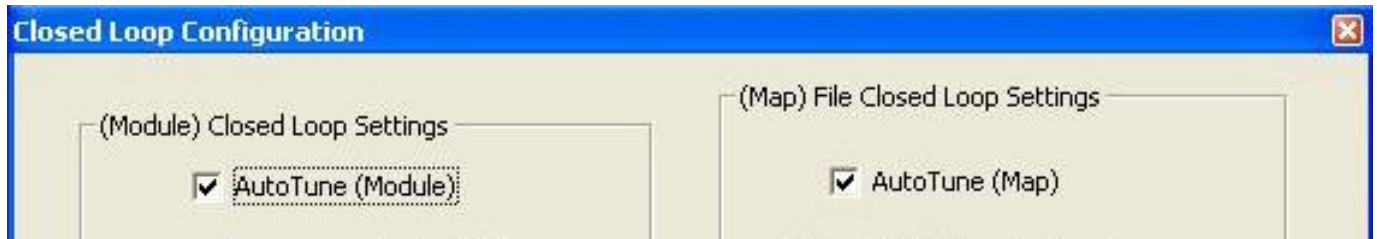


4.) Select the "Write (Map) Settings to (Module)" button at the bottom of the Closed Loop Configuration window.

## Air Fuel Ratio Override: Race Mode

The Air Fuel Ratio Override function overrides **ALL** 'Air/Fuel Ratio vs. TPS' pages at **ALL** RPMs when you check the AFR Override Enabled box.



The following box will appear to allow you to change your Target AFR. Once adjusted, select OK and "Write (Map) Settings To (Module)" to update the ThunderMax ECM.

To target *specific* Air/Fuel Ratio RPM ranges and throttle positions, leave this box unchecked and edit the individual 'Air/Fuel-TPS @ rpm' map pages located under the 'Tuning Maps' tree.

## Max Session CLP Offsets:

The Maximum CLP Offsets section allows you to adjust the amount of Closed Loop learning corrections. This simply means that you can alter the range that the Auto-Tune unit can tune away from the Base Map file, with a limit on allowed tuning per session, as well as an overall limit regardless of time.
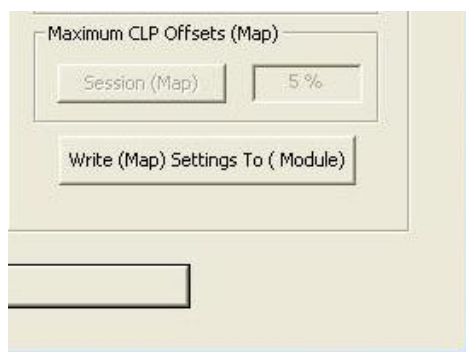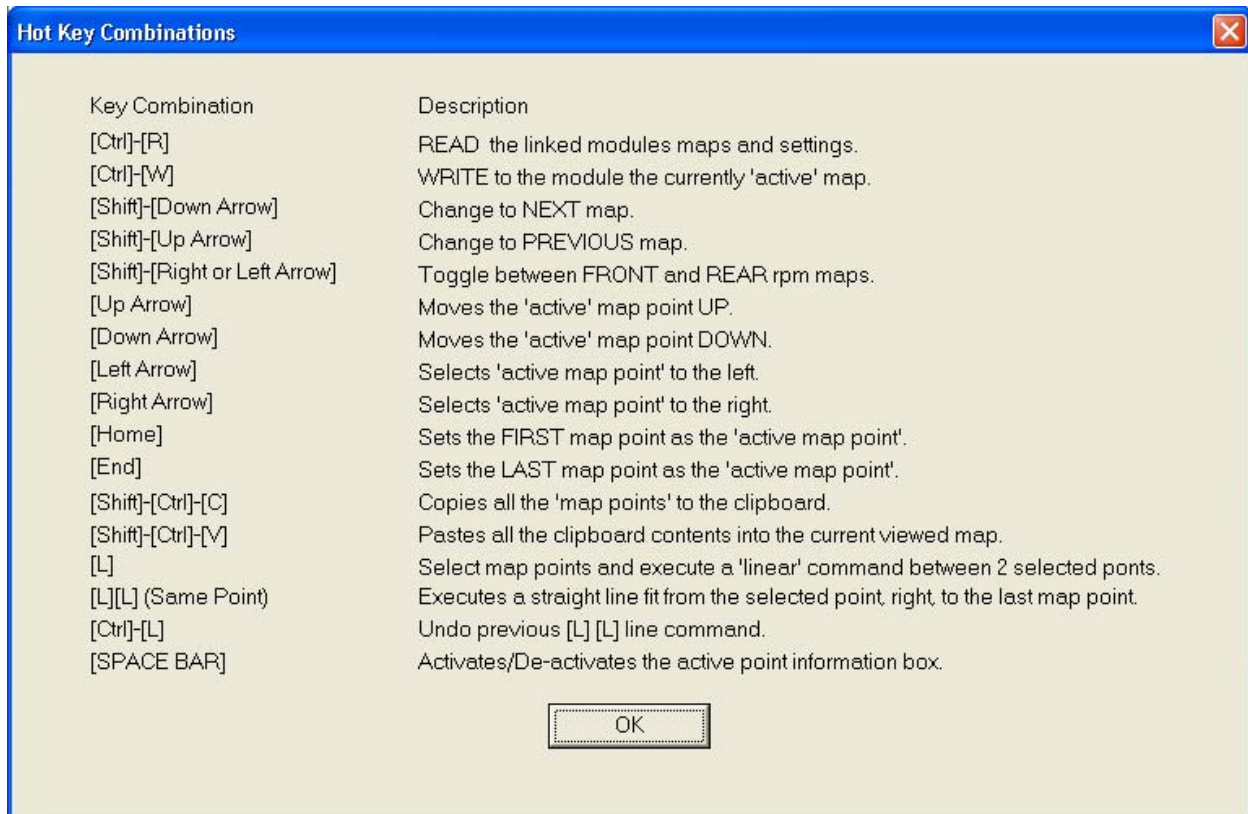


The **"Session (Map)"** button sets the AFR *maximum learning correction* from the Base Map's fuel setting, *per session;* by percentage (range is 1-10%).  A 'session' is defined as the period of time from engine on to engine off (per cycle). The "Use Max Session Default" option sets the session learning to the maximum percentage of 10%. This option must be written to the module, if selected, using the "Write (Map) Settings To (Module)" button.

The **"Maximum (Map)"** button sets the *total* AFR maximum learning correction from the base map's fuel setting by percentage (regardless of number of sessions; range is 0-10%).

# TMAX TUNER HOT KEY COMBINATIONS

At any point when TMax Tuner is open, if you select the "**F2**" button, the following display will appear, titled "Hot Key Combinations". Draw focus to (left click inside) any tuning map graph and select **F2** to open the hot keys window.



The TMax Tuner Hot Keys are meant for users who are comfortable with the layout and features of the software, but are looking for a quicker means of navigating the software.

## Essential TMax Tuner Hot Keys:

**[Home]** – The Home key will select the FIRST tuning block map point on the displayed map file page. (Leftmost map point)
**[End]** – The End key will select the LAST tuning block map point on the displayed map file page. (Rightmost map point)
**[Spacebar]** – The spacebar will toggle the "Tuning Block Details" box, which displays the live data associated with each tuning block.
**[◄►]** – The left and right arrow keys, ◄►, allow you to move between highlighted, or active, tuning blocks.

**[▲▼]** – The up and down arrow keys, ▲▼, allow you to move a highlighted tuning block either up or down. Quite simply it's the arrow keys that allow you to

navigate through the Base Map File map pages and make adjustments to the tuning blocks.

## Tuning Related TMax Tuner Hot Keys:

**[L]** - To create a linear line between two points, tap the L key on the first point, then move to the second point and tap the L key.

**[L][L]** – To create a horizontal line from a selected tuning block to the end of the map page (right-hand side), tap the L key twice in a row.

**[CTRL] [L]** – If you decide to undo an [L][L] command, holding down the Control [CTRL] key and selecting the L key again will undo the last linear line command.

# TMAX TUNER HELP SECTION
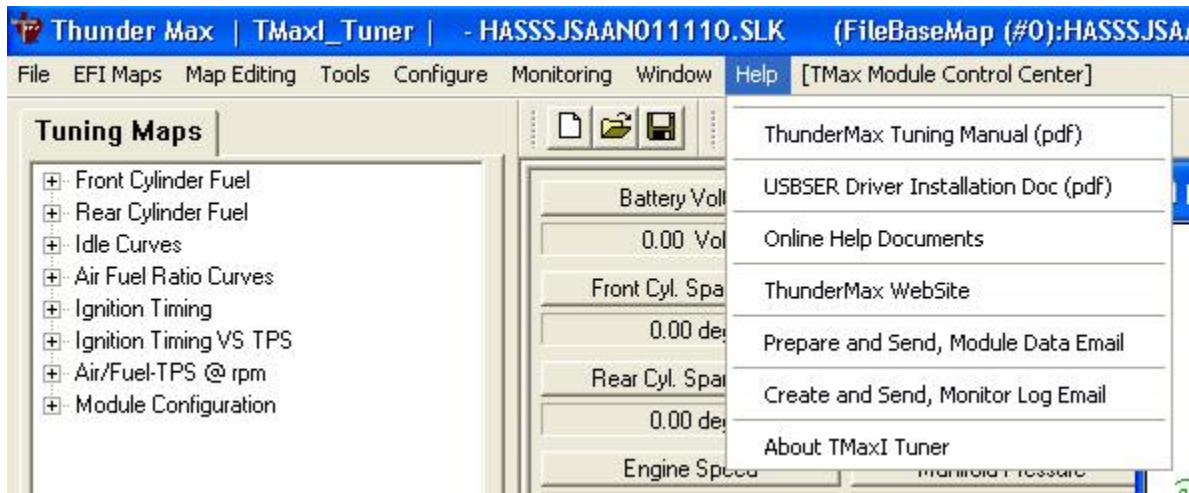


**TMax Tuner Help Menu Breakdown:**

1.) **ThunderMax Tuning Manual** – A complete Reference Guide to installing the ThunderMax TBW ECM, navigating through the TMax Tuner Software, and Tuning / Troubleshooting a ThunderMax ECM.

2.) **USBSER Driver installation guide-** A complete Reference Guide to installing the driver for USB interface between the ECM and your PC.

3.) **Online Help Documents** – External Link for Online documentation / software– www.Thunder-Max.com

4.) **ThunderMax Website** - External Link for the ThunderMax website www.Thunder-Max.com

5.) **Prepare and Send, Module Data Email** – This function will download the Base Map and all offsets from your ThunderMax ECM, package the contents into an email, and send it to the ThunderMax Product Support Team for review.

6.) **Create and Send, Monitor Log Email** – This feature works in conjunction with the Monitor Logging process. When selected, this feature will start a Monitor Logging session, and email it to the ThunderMax Product Support Team upon completion of the session.

7.) **About TMax Tuner …** - As mentioned before, this window displays the current version of TMax Tuner software, as well as the firmware version and date, if linked to a ThunderMax ECM.

# PREPARE AND SEND MODULE DATA EMAIL

In an effort to greatly reduce the time from problem identification to solution, a very powerful tool has been added to TMax Tuner. The "Prepare and Send, Module Data Email" function was developed to maximize the data from the End User to the Product Support team upfront. With the proper data known in advance, most problems or issues can be resolved in a minimal amount of down time to the user.

An email client must be installed on your computer for this function to work, i.e. Microsoft Outlook, or Outlook Express. If you only have a web-based email address, you can still send your map to Product Support; however it will take a few additional steps. Complete step by step instructions are available at the end of this section.

To send your Base Map to the Product Support team, you must be linked to your ThunderMax ECM through TMax Tuner. Select **Help > Prepare and Send, Module Data Email**, as shown below.
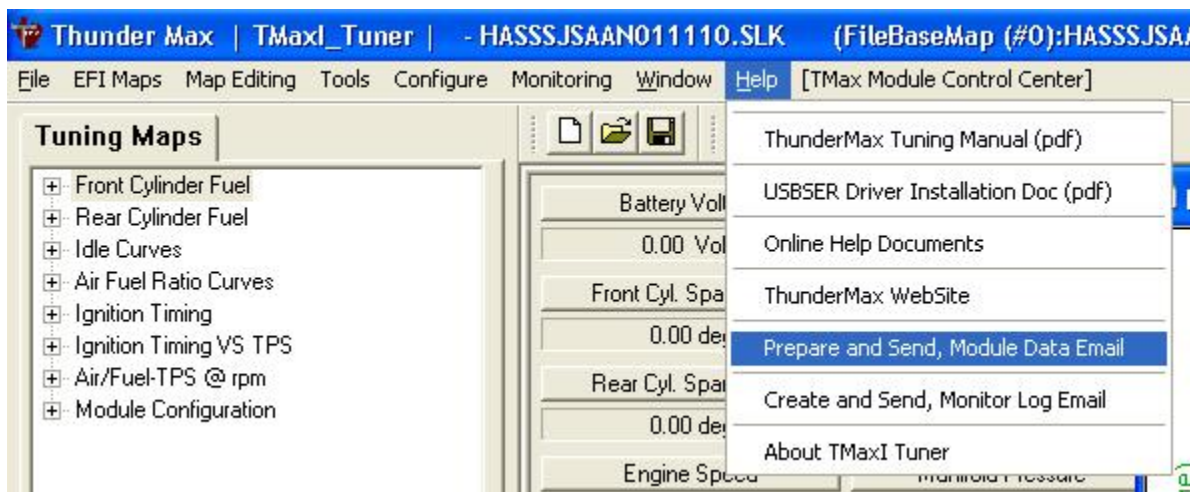


The following prompt will appear; simply select YES to continue:
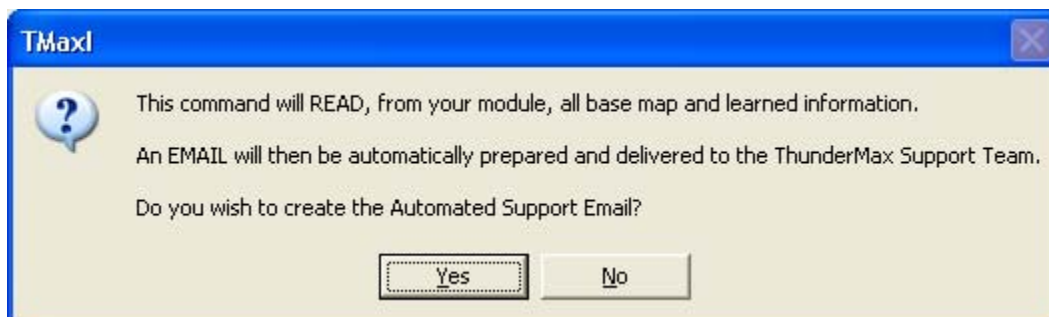
The process will begin automatically. First the following box will appear and the Module Maps and settings will be read from the ThunderMax ECM.
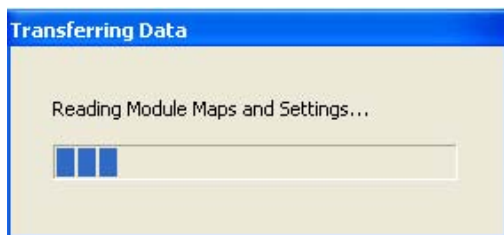


Next, the following window will appear as the Learned Fuel Offsets saved in your ECM are downloaded and recorded.
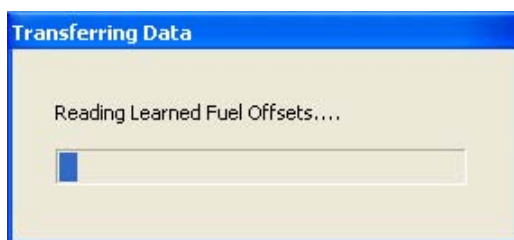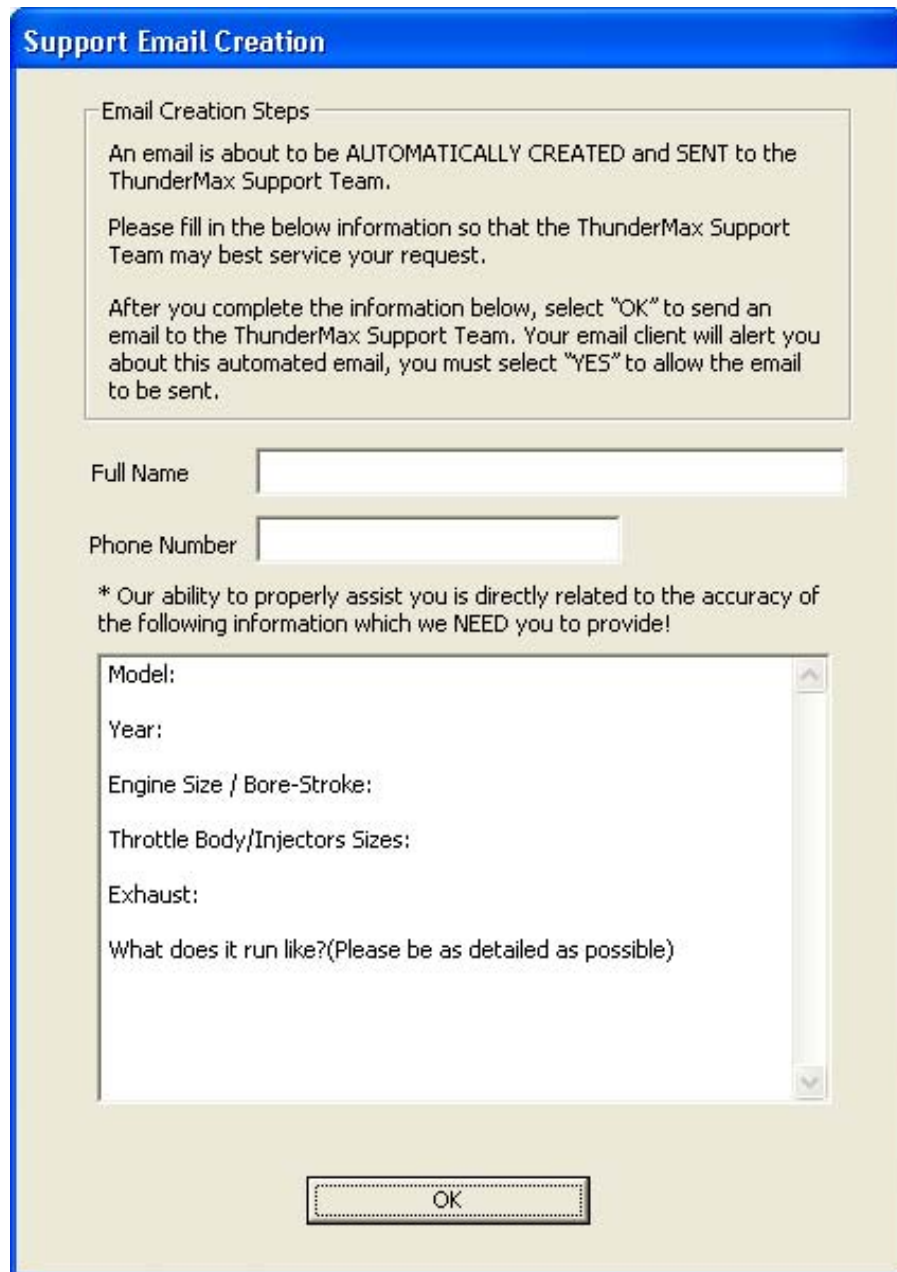


While reading the Learned Fuel Offsets, the software will begin displaying the Front Cylinder Fuel Flow map pages, one by one as the offsets are downloaded and displayed. Once a particular RPM map has downloaded and the Learned Fuel Offsets appear, TMax Tuner will immediately move on to the next RPM page.

ALL of these Learned Fuel Offsets can be read individually through the software after this is complete; this is not the only chance that you'll get to be able to view the offsets. A typical screenshot of what appears on your screen while downloading the Learned Fuel Offsets is shown below:
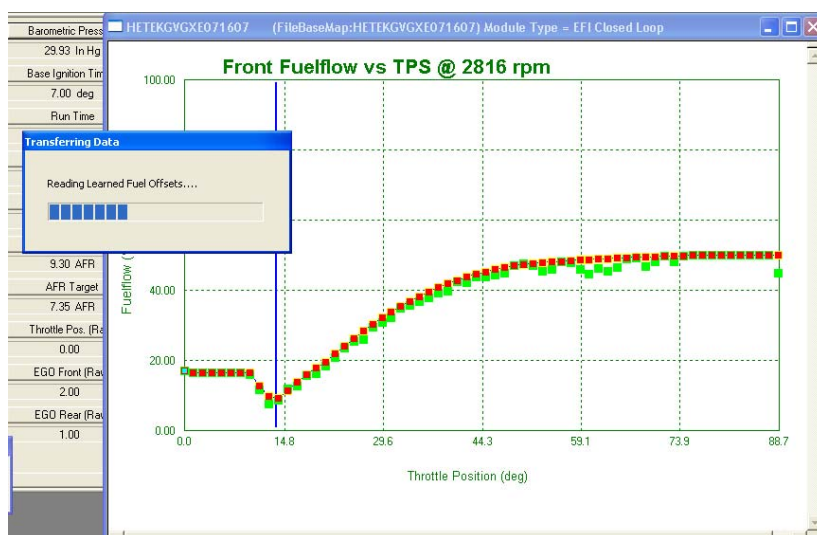
Once the Base Map, Module Settings, and Learned Fuel Offsets are downloaded from your ECM, the following window will appear, titled "Support Email Creation."



At a minimum, fill in your name, phone number, and the basic information on your motorcycle, and issue, in the box on this window. **The more information that's given upfront, the faster the Product Support Team can fulfill your request for help.** Help us help you!

Once you've filled in as much information as possible, select the "OK" button on the "Support Email Creation" window. The following box may appear:



This is a warning that was generated by Microsoft Outlook, due to TMax Tuner creating and attempting to send an email on its own. If you choose "No", a box will appear that simply says "Failed." If you choose "yes" and allow TMax Tuner to send an email for you, the following will appear if successfully sent. To ensure that the email was successfully sent, double check the contents of your "Sent Items" folder in Outlook.



If you do not have an email client loaded on your computer, this function cannot send any emails. The following error will appear if a supported email client is not found;

If you do not have an email client loaded onto your computer, you can 100% replicate this function by yourself with a few additional steps. The "Prepare and Send Module Data" function simply does steps 2-5 for you.

**Web-Based Email:** (G-mail®, Yahoo®, etc.):

1.) **Link** to the ThunderMax ECM

2.) **Read Module Maps and Settings from the File menu**

3.) **Read Learned Fuel Adjustments from the Map Editing menu (if not automatically read).**

4.) **Using the "Save As" menu option**, save the file onto your desktop, altering the last 6 digits of the Base Map name to the date that you're sending the email, (MM, DD, YY). For example, if you're using Base Map HBSSBBSAAN011110.slk, simply change the 011110 to HBUSSXSGUG<u>012710</u>, for Jan. 27<sup>th</sup>, 2010.

5.) **Attach this saved map file to an email** in your web-based email client, and send to <u>ProductSupport@ZippersPerformance.com</u>. **Please put the following in the e-mail's subject line "TMax Tuner Support Request."**

In the body of the email, please list the following information:

a.) Year and model motorcycle
b.) Engine Displacement (Bore and Stroke, if known)
c.) Exhaust System Style / Brand (True Duals, Factory head pipes with slip-ons, 2 into 1, etc.)
d.) Issue, problem, question, etc. The more information you can relay to the Product Support team, the better chance we have of solving your problems in a timely manner.

# CREATE AND SEND MONITOR LOG EMAIL

The second major support tool that has been added to TMax Tuner is similar in operation to the "Prepare and Send Module Data Email" feature. This function will allow you to create and save a monitor log session and TMax Tuner will email the data to Product Support for you.

This function will only work if an email client is loaded onto your computer. Web- based email users can duplicate this entire process and submit monitor logs for review, however additional steps are required. Please see instructions on how to manually email a monitor log to the Product Support team.

To access the function, select **Help > Create and Send, Monitor Log Email.**



The following box will appear:



Select "Yes" to continue in creating a Monitor Log, and emailing it to Product Support. If "Yes" is selected, the following box will appear:

**Monitor Logging Activated**

Monitor Logging In Progress....
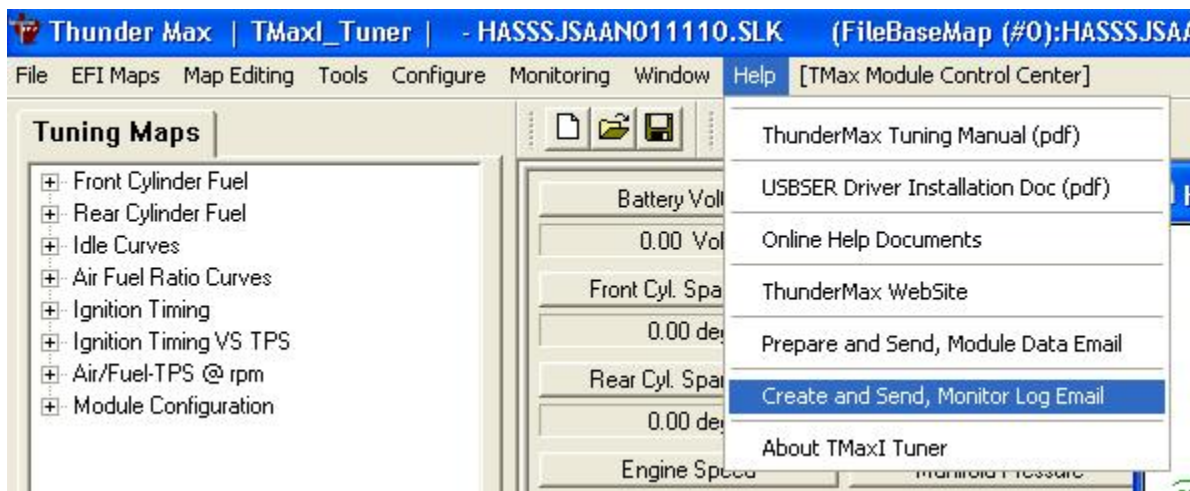
[ Stop Monitor Logging ]

Once activated, the monitor logging session begins. Use monitor logging to record oddities in operation of the ThunderMax ECM.  Allow monitor logging to continue long enough to capture any unusual events (or from cold start to operating temp. 275°). To end the log session, select "Stop monitor Logging". The combination of a monitor log and a saved Base Map file with Learned Fuel Offsets is almost as good as having a ThunderMax technician evaluate the operation of your motorcycle first hand.

Once the logging session is complete, the following window will appear:

**Support Email Creation**

Email Creation Steps

An email is about to be AUTOMATICALLY CREATED and SENT to the ThunderMax Support Team.

Please fill in the below information so that the ThunderMax Support Team may best service your request.

After you complete the information below, select "OK" to send an email to the ThunderMax Support Team. Your email client will alert you about this automated email, you must select "YES" to allow the email to be sent.

Full Name

Phone Number

* Our ability to properly assist you is directly related to the accuracy of the following information which we NEED you to provide!

Model:

Year:

Engine Size / Bore-Stroke:

Throttle Body/Injectors Sizes:

Exhaust:

What does it run like?(Please be as detailed as possible)

[ OK ]

At a minimum, fill in your name, phone number, and the basic information on your motorcycle, and issue, in the box on this window. **The more information that's given upfront, the faster the Product Support Team can fulfill your request for help.** Help us help you!

Once you've filled in as much information as possible, select the "OK" button on the "Support Email Message" window. The following box may appear:



This is a warning that was generated by Microsoft Outlook, due to TMax Tuner creating and attempting to send an email on its own. If you choose "No", a box will appear that simply says "Failed." If you choose "yes" and allow TMax Tuner to send an email for you, the following will appear if successfully sent. To ensure that the email was successfully sent, double check the contents of your "Sent Items" folder in Outlook.



If you do not have an email client loaded on your computer, this function cannot send any emails. The following error will appear if a supported email client is not found.



If you use a web-based email, see instructions on how to manually send a monitor log to the Product Support Team.

**This window appears if no link is found to the module.**
Follow the steps listed in this window to establish a link to the module.

**Link Attempt Failed**

Failed to establish module connection.

This message will automatically clear when a LINK
with the module is established.  If the link
continues to fail, check the following conditions.

1.  Make sure LINK cable is properly connected.

2.  Turn POWER/KILL switch off then BOTH MUST BE ON

3. Close and re-open TMax Software.

4.  Confirm that the TMax USBSER Driver is properly installed.
(See TMax USBSER Driver Installation)

OK

**This window quickly follows.**

**TMaxI**

Unable to create Monitor Log Email.

A link to a module MUST be available to begin Monitor Log Email Creation.

OK
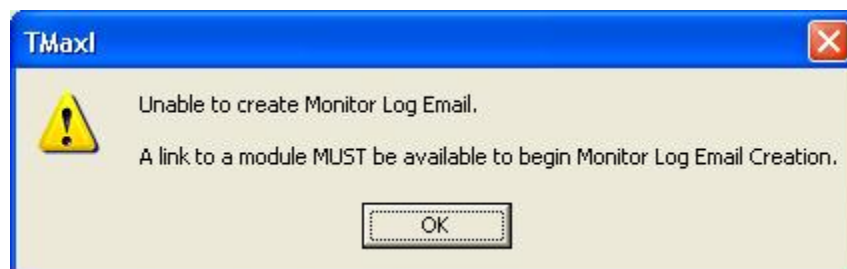
# Section 4:
# ThunderMax Tuning

# TUNING OVERVIEW

ThunderMax TBW system is the most advanced tuning system available. This package will save you or your tuner significant time and money in properly tuning your engine, and maintain the proper tune regardless of changes in ambient conditions you operate your engine under.

# IMPORTANT NOTE

**If you desire to change the A/F at specific RPMs or throttle positions you must alter the corresponding A/F target, example page is listed below. These targets are the commands which the ThunderMax system will honor during engine operation even as ambient conditions change. Learned fuel offsets created by ThunderMax system are applied between 200-280 degrees engine temperature. , Dyno tuning, power sampling or driving the engine under normal riding conditions, must be performed at the above engine temperature to record the fuel adjustments.**

The "Tuning Blocks" can be moved either up, or down by using the Arrow Keys (▲ ▼) on your keyboard.

The left or right Arrow Keys (◄ ►) change the selected Tuning Block.
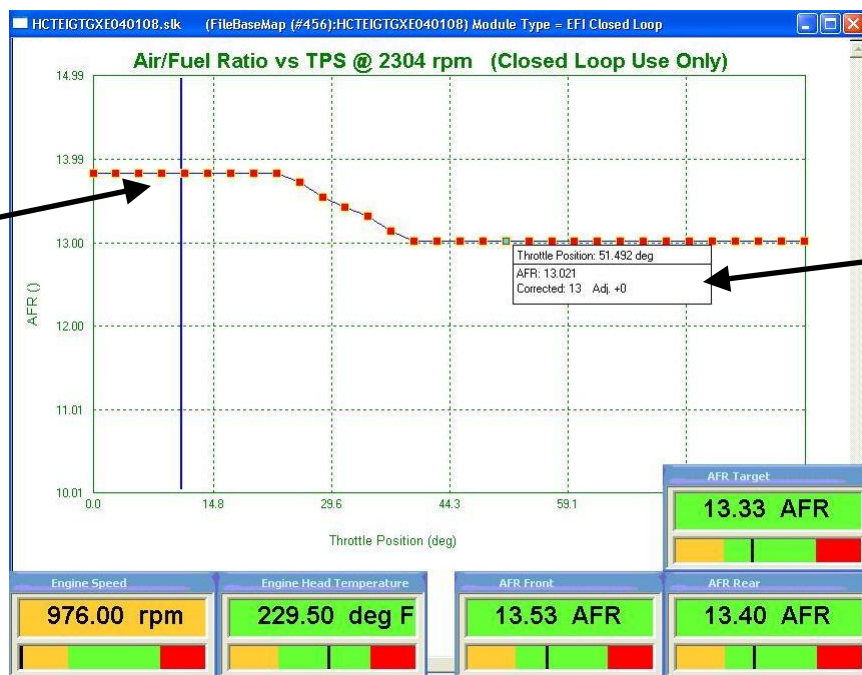
Select the Map page with your mouse to Draw Focus to the window.

Tap the SPACEBAR on your keyboard to enable / disable the "Tuning Block Details" window.

Active Monitor Gauge Display

# TMAX CLOSED LOOP AUTOTUNE

The ThunderMax TBW with AutoTune uses rapid feedback from wideband oxygen sensors to achieve given AFRs as requested in the base map. The fuel added, or removed, from the Base Map is commonly referred to as "fuel offsets." These fuel offsets are constantly being created and adjusted by the TMax AutoTune system.

Even without a dynamometer, it is possible to tune almost any engine combination with ThunderMax simply by allowing the AutoTune system to create fuel offsets from a chosen Base Map. To accelerate the efficiency and speed the learning of the AutoTune system, it is highly recommended that you link to your ECM, and perform an "AutoMap" process to the Base Map.. This simply means that you run the motorcycle with the closest Base Map then use the "AutoMap" process to write these learned offsets as your new Base Map. Now the AutoTune system is adjusting around the new Base Map points. If your engine combination is significantly different than the Base Map, it may take 2-3 "AutoMap" sessions to fully generate a custom Base Map.

## Accelerated Auto Map Procedure:

1.) Select **TMax Control Center** and observe the information given in the **Auto Tune Checkup window** for advice on the maps status.

**2.)** Select **Run AutoMap** to initiate the process and follow the prompts to complete AutoMap.

3.) **Do not disturb this process!** TMaxI is converting the Learned Fuel Offsets into Base Map Fuel Points.

4.) The base map has been successfully revised and smoothed, now simply test the results.

If an improvement was made, but the tuning is not complete, ride the motorcycle to generate additional fuel offsets, and repeat this process. It may take a few cycles of this Accelerated Auto Map Procedure to fully create a custom Base Map for your application. At least 2 cycles of riding and writing the offsets is recommended for any application.

# FRONT CYLINDER FUEL
## (Front Fuel Flow vs. TPS)



The Front and Rear cylinder Fuel Flow tables are visible in TMaxI. These are the map pages that define how much fuel is required to maintain the Target AFR for the base map. All of these curves were generated on a load-cell dynamometer for a specific base map.

Shown above is a 2816 RPM map page with a typical fuel curve. The red blocks are the Base Map fuel points, and the green boxes represent a Learned Fuel Offset. The AutoTune system creates, and constantly adjusts the green Learned Fuel offsets to maintain the Target AFR. On the 2816 example shown above, the Base Map is a close match to the engine combination chosen, which can be seen by the tightly held offsets to the Base Map points. An alteration in the AFR vs. TPS map pages will result in additional movement of the green Learned Fuel Offsets. Don't be alarmed if your offset points are farther away from the Base Map than the example shown. This is simply the AutoTune working to customize your map to your motorcycle.

# REAR CYLINDER FUEL
## (Rear Cylinder Trim vs. TPS)
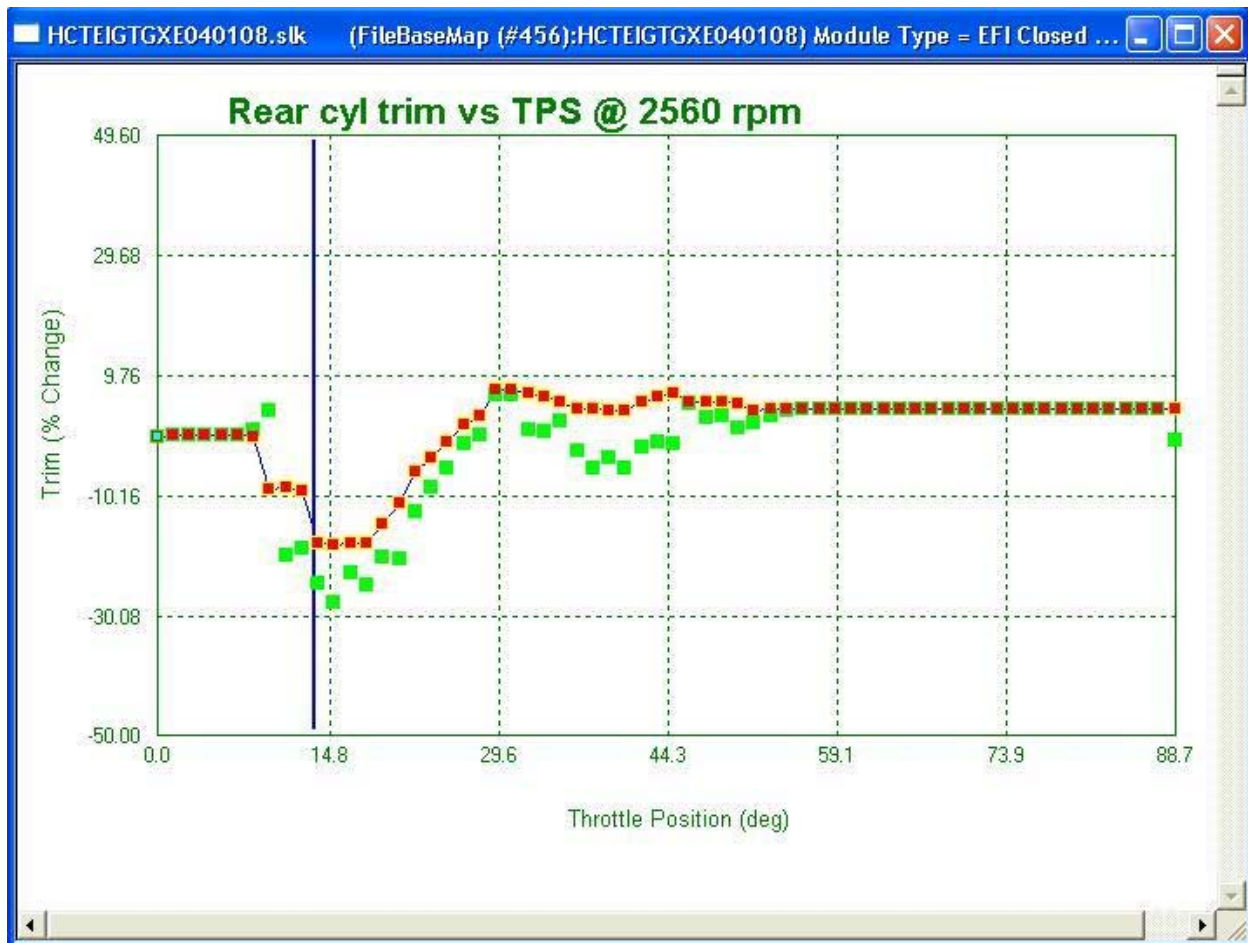


The rear cylinder fuel flow is seen as a "trim" to the front cylinder fuel flow. The front and rear cylinders are adjusted individually to maintain the proper AFR Target in each individual cylinder. The theory behind this operation is very simple, the front and rear cylinders always require a different amount of fuel flow to maintain the same Target AFR. Many of our competitors do not understand this, or they simply chose to ignore it. **Tuning both cylinders individually is the only way to properly tune a V-Twin engine.** The AutoTune / ThunderMax system not only understands this, it does all of the hard work for you!

With a shared manifold that's optimized for space instead of individual cylinder fill requirements, the cross talk in the intake tract, coupled with particular exhaust pipe designs, on an HD engine, creates a large difference in fuel flow requirements at specific throttle positions and RPM. The rear cylinder trim system, coupled with the AutoTune system, stabilizes each cylinder under any conditions.

**Warning**: The trim curves for rear cylinders may look quite unusual in comparison to the front cylinder's fuel curves. Expect offsets on the rear cylinder at much greater amplitudes than the Learned Fuel Offsets from the front cylinder. This is typical! If you

are concerned with the results that you're seeing, please go to the correct manual section and read about the "Prepare and Send Module Data" function. A trained Product Support technician will be able to assist you in evaluating your Learned Fuel offsets.

You may also proceed to the "TMax Control Center > Details" button for an immediate summary (Fuel Adjustment "Offset" Summary) of exactly how many offsets have been created and how far they've moved. This information may also be accessed from the "Tools" menu, under the "Auto Tuned Points Analyzer" selection.

# IDLE SPEED RPM (OFFSET) VS ENGINE TEMP



The Idle Speed vs. Engine Temperature map page is a graph comparing the engine temperature to a designated RPM. Generally speaking as the engine temperature rises, the idle RPM will decrease.

The ThunderMax ECM uses this page to dictate the idle RPM of your engine. **The Idle Speed vs. Engine Temperature map page is changed by the Idle RPM value in the Basic Settings window.** Changes to the "Basic Settings" Idle Rpm will change this Idle Speed vs. Engine Temperature map page for you in the normal operating temperature range.

**Idle Speed adjustment-** Most of the base maps in the ThunderMax data base are calibrated to idle between 900-950 RPM. To reduce the idle speed, the low speed map pages must be recalibrated. This is done by lowering the idle speed in increments of no more than 100 RPMs and running the engine to allow learning of the map pages. Once the AFR becomes stable, you can further lower the idle speed until the desired RPM is reached.

If you decide to change the Idle RPM of your engine, please note that changes are automatically made to the "Idle Speed vs. Engine Temperature" map page. Changing the Idle RPM in the "Basic Settings" Window only changes the Idle Speed vs. Engine Temperature map page in normal operating conditions. Make any further adjustments manually, if necessary, after you have reached your desired Idle RPM. Please examine the following map page shown; this is an example of what happens when you alter the Idle RPM from 928 to 864.
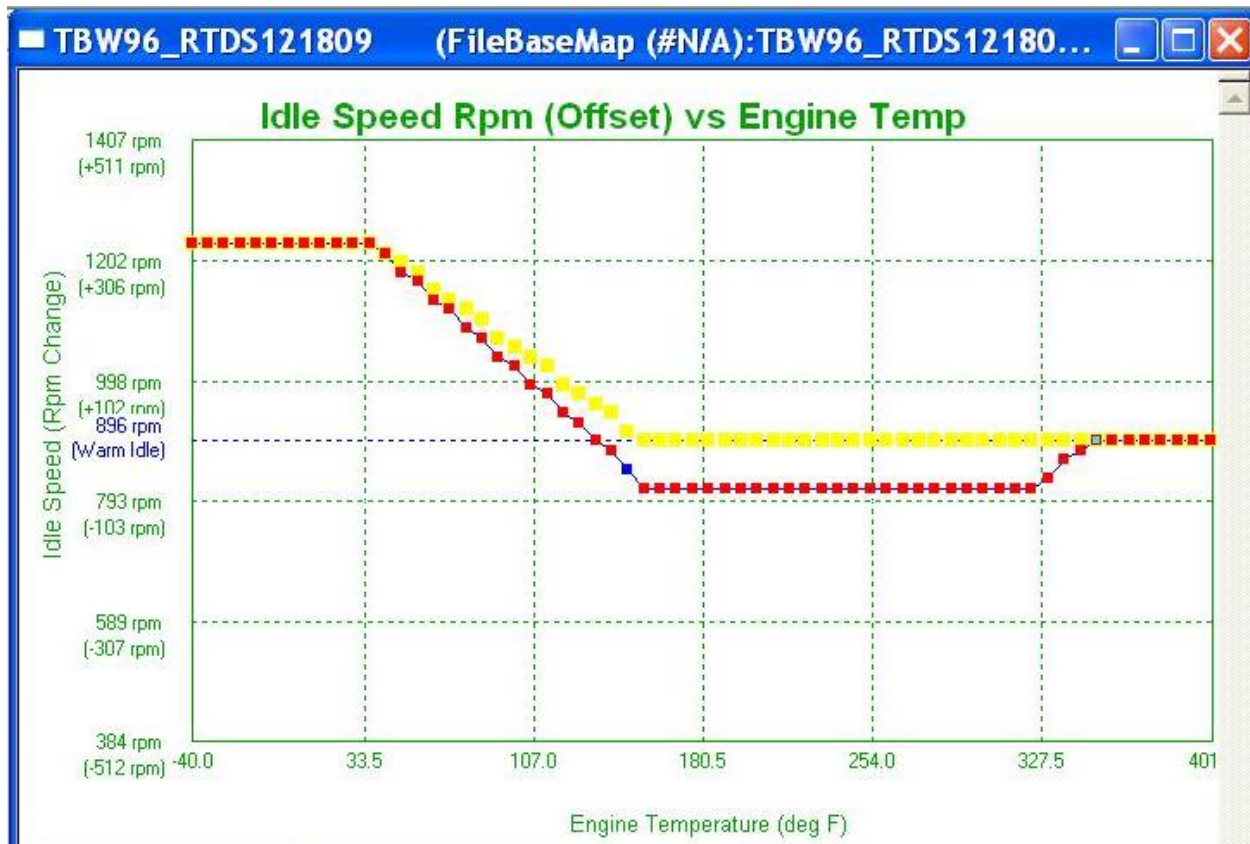


The Idle Speed vs. Engine Temperature map page now shows the current and previous positions of the tuning blocks. At 303 degrees, the map begins to climb back up to the default Idle RPM. It is recommended to blend the end of the curve to match the normal operating temperature Idle RPM. Select the 303 degree map point, then select the "L" button twice to activate the TMaxI Hot Key [L][L] Straight Line fit function. The curve should now follow the normal operating temperature Idle to the right side of the map page, as shown below. Manually moving the blocks into a straight line will achieve the same results.

Idle Speed Rpm (Offset) vs Engine Temp
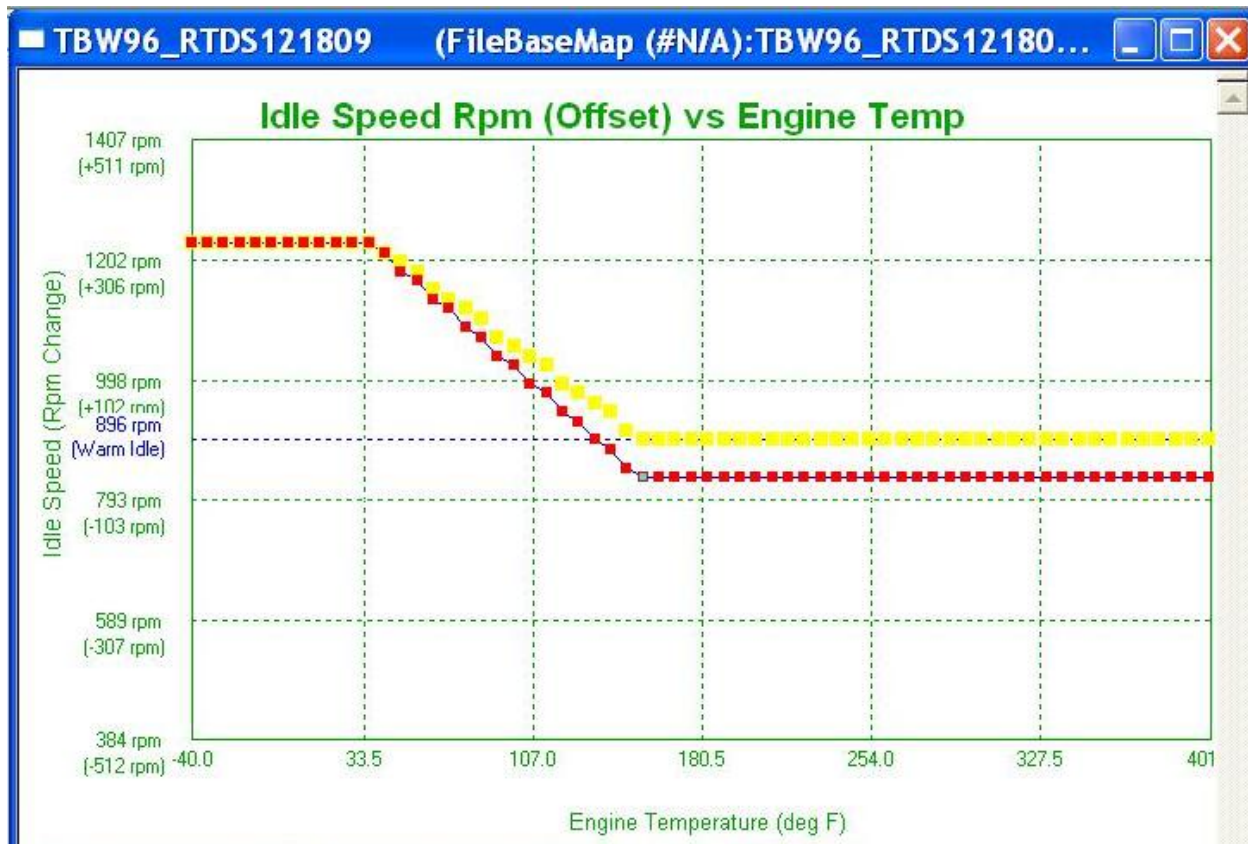
The reason for reducing the Idle RPM in a high heat situation is quite simple. A lower Idle RPM produces less heat. This will slow down the build up of heat, which reduces engine power, prematurely wears key engine parts, and ultimately can cause a catastrophic failure.

# AFR CORRECTION VS ENGINE TEMPERATURE
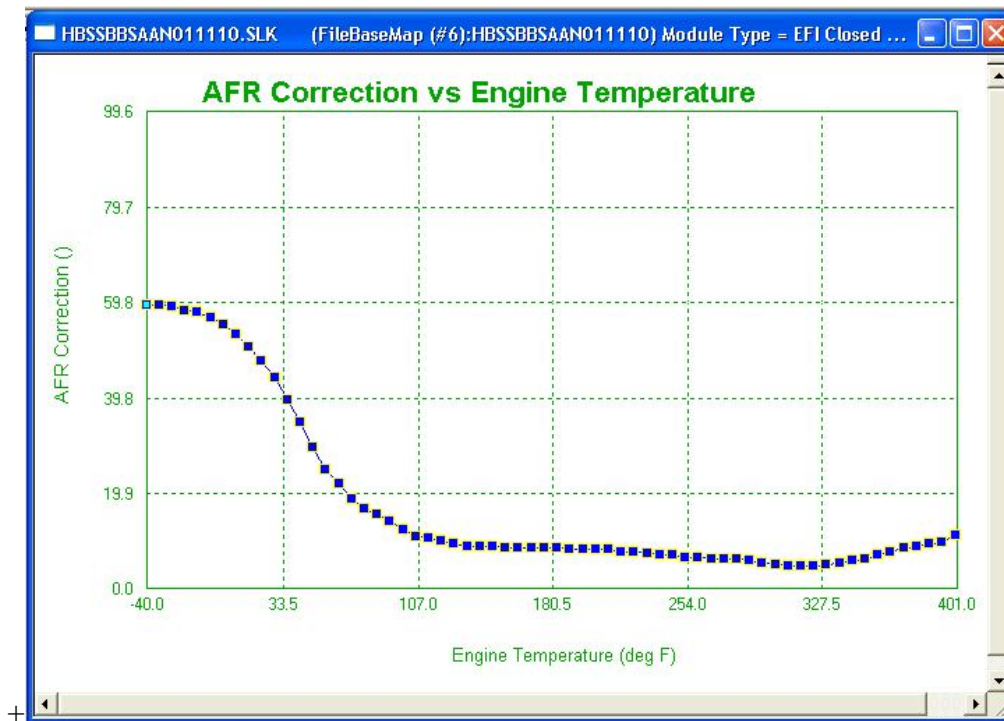


**Select the Map page with your mouse to Draw Focus to the graph before making changes.**

The AFR Correction vs. Engine Temperature map page should not be used as a "tuning map" page; rather it should be used as a tool to remedy problems relating to AFR stability at specific warm up head temperatures. If the engine is acting erratically at certain temperatures during warm up, usually in cold weather, but it returns to normal operation by the end of the warm up period, you may need to alter the AFR Correction value at those specific temperatures to remedy the A/F problem.

The AFR Correction vs. Engine Temperature page allows you to make changes at specific temperatures where the problem may exist, without changing the AFR at normal operating temperature.

**Never adjust the entire map structure at all temperatures,** doing so will affect all engine operating temperatures, which will alter the AFR during normal operating conditions. Before adjusting this page, make sure that you have a stable and equal AFR at idle, while at normal operating temperature.

If the idle is not stable when fully warmed up or at all temperatures adjust the fuel points on the front cylinder fuel page, keep adjusting the points until you can make the A/F stabile then with the motorcycle in neutral and on the kickstand. Turn the throttle until the engine RPM is approximately 1280 and observe the AFR, then repeat at approximately 1536 RPM. If the engine is erratic at idle, but stable at the two higher RPM points, then the AFR Correction is not the culprit of the instability. Modify the Front Fuelflow vs. TPS page at the idle RPM to correct this issue. If the same instability is

present at the 1280 and 1536 RPM pages, then the issue can be solved by the AFR Correction value.

Let the engine cool down, use a fan to speed up the process, if the vehicle can be checked again by allowing it to sit overnight, while linked to the motorcycle, start the engine and carefully observe the AFR on both cylinders. The engine should be operating within the A/F target, approx. 12:1 to 12.5:1 range during warm up, from the coldest point to 160 degrees F. Somewhere between 160 and 180 degrees cylinder head temperature, the AFR should achieve the Target AFR as set on the AFR vs. TPS pages.

During the warm up period, from cold start to 160 degrees, if you observe the AFR move outside of this 12:1 to 12.5:1 range, record the temperature range that this occurs in, as well as the AFR value that it shifts to. Minor variations are acceptable, just monitor the idle stability and focus on the problematic region. With this data, you can now modify the AFR Correction vs. Engine Temperature map page.

Let the engine cool down again, and bring it back up to the problematic temperature range. As the engine is warming up and the AFR is outside of the 12:1 to 12.5:1 range, move the AFR Correction blocks up or down to correct the AFR in real time. By knowing in advance the problematic temperature range, you'll have a much better chance of correcting it the first time. The motorcycle warms up pretty quickly, so the timeframe to make these adjustments is relatively small. If you pass the problematic spot without fully correcting the AFR, you will need to cool the engine back down below that region, and start over.

With the Closed Loop AutoTune system, it is unlikely that this page will ever need to be adjusted. The AutoTune system has enough adjustment to correct any potential Idle Speed issues. If you are experiencing an unstable Idle, please double check that you've loaded the closest Base Map to your application, and that your module has been properly initialized.

In a Closed Loop AutoTune application, it is recommended that you increase the closed loop session limit to 10% prior to attempting to modify the AFR Correction vs. Engine Temperature map page. This will expand the allowable AutoTune range, which should correct any warm up issues. However, if you do need to modify the AFR Correction vs. Engine Temperature map page, always monitor the front & rear cylinder AFR's in the TMaxI software to observe what AFR changes need to be made, and then to measure the results of your changes.

# AFR VS ENGINE TEMPERATURE
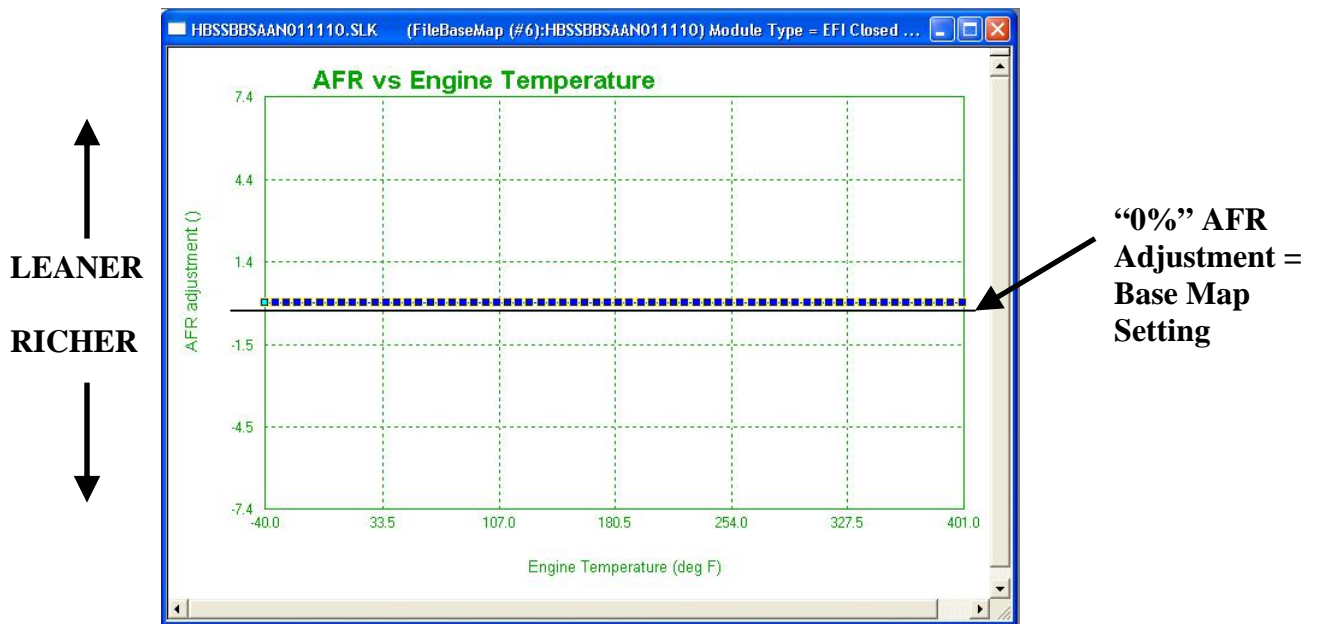


The AFR vs. Engine Temperature Map Page works in conjunction with the AFR Target pages, adding correction to the AFRs at specific engine temperatures.

For example, if you observe the AFR in both cylinders, in conjunction with the AFR target window on the monitor page, you will notice the target AFR leans out as the engine approaches normal operating temperature. This phenomenon is the AFR vs. Engine Temperature at work.

To observe the correction applied at a particular engine temperature, select the appropriate tuning block and press the space bar to read values. Lowering the blocks richens the measured AFR, and raising the blocks leans the AFR. If the measured AFR is too rich or too lean during lower temperature operation, adjust the blocks accordingly on this page to achieve the AFR correction to the AFR Target page.

It is not recommend that changes be made to this map page unless instructed by Zipper's Technical Support.

# IGNITION TIMING MAPS

There are many variables associated with proper ignition timing; for this reason, it is impossible for the ThunderMax Base Maps to be a perfect match for every situation. The good thing is that the adjustability of the ThunderMax ECM allows the user or tuner to set the ignition timing for his / her individual motorcycle. The key to correcting a pinging issue is to identify the severity of the problem. Would you consider the pinging issue to be light to moderate, with an occasional occurrence, or do you have a severe pinging problem? Do you know at what RPM the pinging is occurring?

## Severe Pinging:

If you have a severe pinging problem, a change needs to be made immediately to your ThunderMax ECM. It is not recommended to continue operating the motorcycle if the pinging problem is severe, damage to the engine can occur if the issue is left unattended.

      1.) The first thing to do with a severe pinging problem is to double check that the Base Map you're using is close enough for your application. Use the instructions for choosing a map to determine if you have the closest Base Map for your application following the "Key Elements" listed. If you find a closer Base Map, try using it before modifying anything.

      2.) If you already have the closest Base Map for your engine combination, you should immediately begin retarding the timing on the "Timing vs. Engine Speed" map page. Knowing an approximate RPM range of the pinging will help you correct the problem quickly. If you do know the RPM range of the problem, simply remove several degrees of timing in the area of the pinging in an attempt to minimize it. Repeat until the majority of the pinging has been eliminated from normal use. If you do not know an RPM range, start removing 1-2 degrees of spark timing across the operating range of the engine. Repeat until the pinging has been greatly reduced.

      3.) Once you've removed enough timing to control most of the pinging, move to the next section titled "Light or Occasional Pinging." Now that you've gotten the ignition timing much closer and removed most of the pinging, the following section will help you determine what is causing the issue, and how to address it.

## Light or Occasional Pinging:

A light or occasional pinging problem can be caused by many variables, from the components used in the engine (cams, compression, exhaust system) to the overall motorcycle setup (passengers, trailers, cargo / gear, trike conversion kits). In addition to the motorcycle setup, the terrain you're traveling on greatly effects the loading of the engine, which is a variable in ignition timing and spark knock control. The ThunderMax ECM, unlike most of its competitors, gives the user complete control of the ignition timing for your engine. The key to solving spark knock is in identifying the RPM that the pinging occurs and the AFR that the engine is achieving at that point. To aide in solving

a light to moderate pinging problem, read the following 2 scenarios, and follow the instructions of the scenario that best describes your issue. The first scenario is a new ThunderMax installation with little to no ride time, or a change has been made to the engine or motorcycle (weight) on a good running ThunderMax installation. The second scenario is when pinging is only experienced while riding long distances, or on high mileage out of town trips.

**1.) A new ThunderMax installation with little to no ride time or a change has been made to the engine or motorcycle (weight).**

If you've just installed the ThunderMax ECM, or have only ridden the motorcycle a few times prior to installing, the AutoTune system is still working on achieving the set AFR Targets. Continue riding the motorcycle to see if the situation improves. Several riding sessions, and a few hundred miles should be ridden before any major changes are made. Use the "Accelerated AutoMap Procedure" section for instructions on how to Read & Write your fuel offsets as the Base Map. The AutoTune system may solve the occasional pinging issue simply by achieving the proper AFR Target.

If an engine modification has been made to a known good running motorcycle, and pinging is a result, you may need to load a new Base Map, or modify the "Timing vs. Engine Speed" page. Camshafts, big bore kits, and compression changes can have a large effect on required ignition timing. If weight is added to the motorcycle, the loading of the engine changes dramatically. Trailers, passengers, heavy cargo, and trike conversion kits all change the overall vehicular weight, and will force you into different throttle positions for the same speed range.

View the TMax Control Center or the AutoTune Points Analyzer for clues to the amount of offsets generated by the AutoTune system. If the information there is telling you to choose a new Base Map, see the instructions on Base Map Selection. Otherwise, proceed to the Ignition Timing Maps section for an explanation on how to modify the "Timing vs. Engine Speed" map page.

If the AutoTune Points Analyzer (TMax Module Control Center) only leaves you with more questions, see the instructions on how to use the "Prepare and Send Module Data Email" function. This will send your map and offsets to the Product Support Team for review. In this situation, a new Base Map may be suggested, or a modified version of your current Base Map may be returned to you.

If you believe that you have the proper Base Map, you may begin modifying the "Timing vs. Engine Speed" map page, as described in the Ignition Timing Maps section. If you know the RPM range of the pinging issue, start by removing several degrees of ignition timing from this area. If this does not fully remove the pinging, you may need to modify the AFR Targets in this same RPM range to fully remove the pinging.

To modify the AFR Targets at the RPM of the pinging, use the "AFR vs. TPS" pages, as described in the AIR FUEL RATIO VS TPS @ RPM PAGES section of this manual. Adding fuel to the areas of spark knock will help cool the combustion chamber, which will reduce the pinging. Adding fuel by itself is a help yet rarely the solution, but a

combination of increased fuel and decreased ignition timing will yield the best results. Try setting the AFR Override at 12:1 to see if the problem goes away. If it does, turn off the AFR Override and begin modifying the AFR vs. TPS Target Pages to 12:1 in the RPM range, and throttle position, of the pinging. Knowing where the pinging is occurring is always the key to eliminating it

**2.) Pinging is only experienced while riding long distances, or on high mileage out of town trips.**

Due to the regional differences in fuel blending, you may only be experiencing a spark knock situation due to a poorer quality of fuel than you're normally used to. In addition, if you're traveling with a passenger and / or gear, you have changed the weight of the vehicle enough to alter the loading of the engine. Terrain changes may amplify the problem if you're heavily loaded with gear, and now you're going uphill, which adds even more load on the engine. If you're on the road and have no way of linking to the ECM, when possible reduce the load to the engine and try a higher quality gasoline and / or a bottle of octane booster. This may help reduce the pinging.

**TMaxI Timing Control Features:**

1.) **Full "Timing Curve" Map Pages** - A map page is available for every 256 RPM, showing the full ignition curve for each RPM, 32 pages total. These shapes were created on a load-cell dynamometer with the specific parts listed in the Base Map definitions. It is best that changes made to these pages are attempted last, after modifying the "Timing vs. Engine Speed" page, and only with the knowledge of the live AFRs. Significant alteration of these pages should be performed on a load-cell dyno by a trained technician.

2.) **Rear Cylinder Adjustment** – A page titled "Rear Timing vs. TPS" is now available, this page allows you to make fine adjustments on the Rear cylinder only to offset any situations where the rear cylinder requires a different timing. **Most cases will not require Rear cylinder adjustment,** only make changes to this page if you've validated that your rear cylinder requires a timing adjustment on a dynamometer. **No data = no adjustment.**

3.) **Timing vs. Engine Speed** – This composite timing map allows for a quick view of the overall timing scheme, and eases adjustment with an easier to understand map page. This page shows the wide open throttle curve; adjustments to this page move all 64 points on each particular RPM curve map page.

## Timing vs. TPS @ RPM; Full Timing Curve Map Pages:
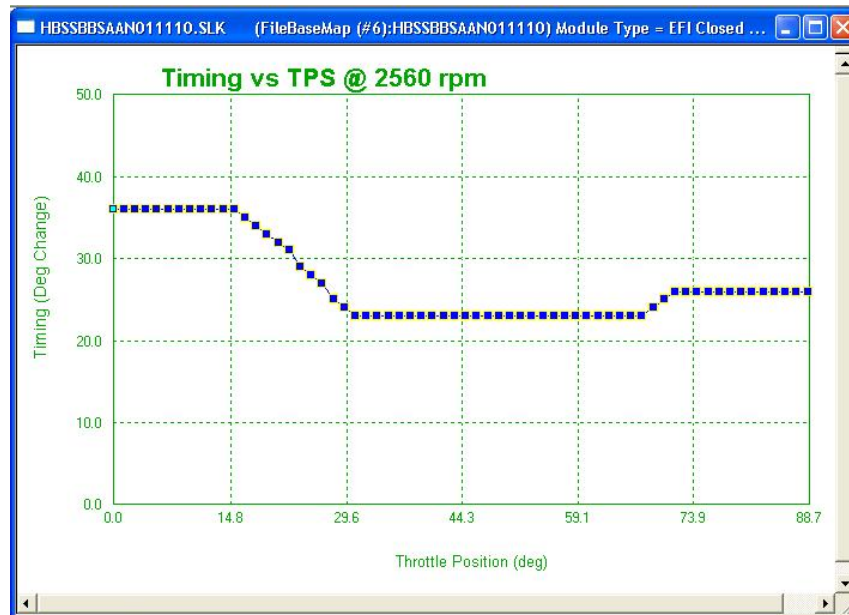


**Select the Map page with your mouse to Draw Focus to the graph before making changes.**

The 32 Map pages that display the Timing vs. TPS @ RPM are now available to all users of TMaxI. These pages contain the complete timing curves used by the ThunderMax ECM. Remember that each page is a static RPM page, relating the Timing in degrees to the Throttle Position.

You can cause serious engine damage if the timing is set too aggressively. If timing changes are being tested on a road environment, great care must be taken in watching your surroundings and staying safe.

Since the Timing vs. TPS @ RPM map pages were developed at Zipper's on dynamometers using sophisticated equipment, it is impossible for Zipper's to help you customize each individual map page for every conceivable combination. If you only need a slight timing adjustment at a specific RPM, consider using the Timing vs. Engine Speed Map page, as described in the next section.

## Timing Vs Engine Speed Map Page:

This map page is for making quick adjustments to the ignition timing map.  It allows ignition timing adjustments in one-degree increments at every 256 RPM from the base setting of the installed map.



**ADVANCE**

**RETARD**
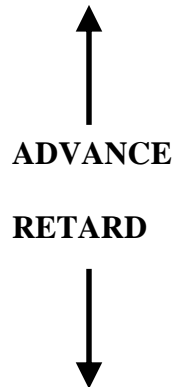
**Wide Open Throttle Timing Display**

**Each point change moves all 64 points on the corresponding Timing vs. TPS @ Rpm Map Page.**

Each point in the **Timing vs. Engine Speed** map page allows the tuner to adjust the spark timing for a particular RPM range. Moving a tuning block on this page will move every point on the corresponding RPM map page. For example, if you adjust the 2560 RPM tuning block up one degree, ALL throttle position points on the 2560 RPM page will move up one block.

If the knock is slight at a particular RPM, you may be able to remedy the situation by removing 1-2 degrees of timing at the Timing vs. Engine Speed page at the specific RPM it occurs. If the knock is more pronounced you may need to remove additional timing at specific throttle positions on the Timing Vs TPS pages at the specific RPM value you want to adjust then road test to review the changes.

**Attempt to adjust the timing on this composite page before altering the curves on the Timing vs. TPS @ RPM map pages.**

**NOTE:** Higher values of spark advance can improve response, efficiency, and power until you reach the point of detonation, which reduces power and can damage the engine.

**WARNING! BEWARE OF DETONATION!** Severe pre-ignition or detonation can cause severe engine damage. If spark knock is heard or detonation is found by reading your spark plugs, immediately stop testing and retard the ignition timing at that RPM to remedy the situation.

## Rear Timing vs. TPS (Rear Cylinder Timing Correction):



**ADVANCE**

**RETARD**

**Select the Map page with your mouse to Draw Focus to the graph before making changes.**

The Rear Timing vs. TPS page was added to eliminate any oddities between the front and rear cylinder operation. The ThunderMax AutoTune system individually monitors and alters the fuel setting for each cylinder for optimum operation. Now you have the ability to individually adjust the rear cylinder's timing in comparison to the front cylinder as well. Due to the differences associated with the operation of the two cylinders, the rear cylinder adjustment allows you to modify the spark for optimum operating conditions.

Modifying the Rear Timing vs. TPS page does not alter the Timing vs. TPS @ RPM map pages. This page only offsets the output of the main spark curves, but does not affect the front cylinder timing at all.

This page will always start as a straight line at 0% Timing Adjustment. Any adjustments made to this page are recorded as % Timing Adjustment by Throttle position.

 **Most cases will not require Rear cylinder adjustment, only make changes to this page if you've validated that your rear cylinder requires a timing adjustment on a dynamometer. No data = no adjustment.**

## Smoothing the Blocks:

It is important to "smooth" the surrounding blocks to avoid abrupt changes in timing settings. The following figure shows a smooth spark curve adjustment change. Since the Timing vs. Engine Speed page has changed from a straight line showing the percentage of change to the generalized spark advance curve, it should be easier to smooth the blocks and see the changes that are being made to the Base Map timing curves. Remember you can always check each of the individual timing curves (Timing vs. TPS) map pages to see the effect that has occurred. If in doubt, test the new setup, record your findings, and make changes as needed.



## How to find Throttle Position of Detonation (Spark Knock or Pinging):

If you are attempting to tune with or without the benefit of a load control dynamometer, you may find the following suggestion helpful.  Link to the module without starting the engine with the monitoring function enabled, open the Air/Fuel vs. TPS window and observe the red vertical bar indicating active throttle position.  Twisting the throttle through its range will move this vertical bar.  Using masking tape; wrap tape around the throttle grip, at the edge closest to the switch housing.  Apply another piece of tape to the switch housing (base) alongside of the grip tape.  Make a mark across both pieces of tape indicating the throttle position at idle. See the pictures on the next page for clarification.

Using the vertical bar as a guide, make marks on the grip tape even with the base idle mark at ¼, ½, ¾ and full throttle.  When you can identify the location of the throttle position and the associated RPM during a drivability issue, you will find it very easy to pinpoint and make adjustments to the areas that need help. The following pictures show an example of how to use tape to tell an approximate TPS where the detonation is taking place.

**WARNING:  ANY TUNING OPERATION INVOLVING ACTUAL OPERATION OF THE MOTORCYCLE ON PUBLIC STREETS OR HIGHWAYS IS DANGEROUS!  FULL ATTENTION TO TRAFFIC CONDITIONS SHOULD ALWAYS BE YOUR FIRST FOCUS ANYTIME YOU ARE OPERATING A MOTORCYCLE ON PUBLIC ROADS. INATTENTION TO CONDITIONS CAN LEAD TO ACCIDENTS AND PERSONAL INJURY INCLUDING DEATH.**

Closed Throttle – Marked "0"

¾ Throttle – Marked "3"

**Timing Troubleshooting:**

Here are a few common scenarios that have been seen several times by Product Support. The first thing you need to do before you adjust the base map is to verify you have selected the correct map. Selecting a map with incorrect parameters is usually the source for spark knock problems. Take the time to verify the best possible base map has been selected for your application.

**1.)** If you have not experienced any spark knock or detonation problems, **but pinging develops after your last fuel stop,** do you need to adjust your timing? As long as spark knock has not been experienced before, continue operation of the motorcycle, and purchase fuel from a different source before making any changes to your map.

It is common for gasoline to be blended differently in different regions of the country. Touring riders will experience this much more so than riders that stay in one region of the country.

**2.)** If the gasoline has not made a difference in the operation of the motorcycle, check that your intake & exhaust seals are not leaking, your AutoTune system is turned on, as well as reading the spark plugs. If excessive oil is found on the plugs, you may have a head gasket leak. A head gasket leak can cause detonation by depleting the octane rating of the fuel, allowing a build up of gasoline in the combustion chamber, and igniting the rich mixture when the temperature reaches a high enough level to pre-ignite.

# CUSTOMIZING FUEL TARGETS

# AIR FUEL RATIO VS TPS @ RPM PAGES, "AFR TARGET PAGES"

**LEANER**

**RICHER**



**Select the Map page with your mouse to Draw Focus to the window.**
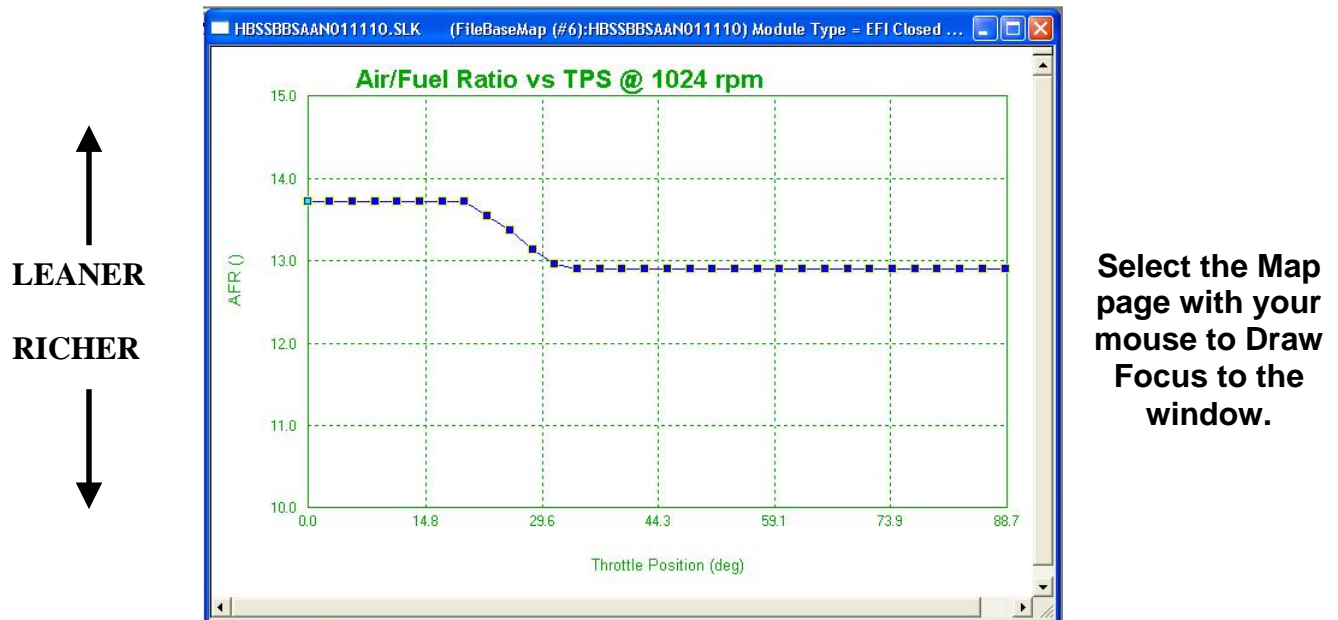
The "AFR Target" pages are the **most important pages in the software** for managing a highly efficient, well tuned engine. It's the AFR Target pages that allow you to make maximum power and maximum fuel economy at the same time. Since the throttle positions are drastically different between a maximum power scenario and a best MPG scenario, you can dial in each section independently, and achieve both.

Simply put, these are the "AFR Target Pages" that the AutoTune system is working to achieve during Closed Loop Tuning. To explain the strategy, there are 32 target points of adjustments (throttle position) per map page, with a map page for every 256 RPM. Each base map has default values which you can change to improve fuel economy at cruising speeds or richen up for more power at the race track. The AutoTune system works to maintain these targets as all of the ambient conditions involved change.

There are two options for setting the AFRs in your ThunderMax ECM.

1.) The first technique, which is the preferred method, takes more time to setup, yet allows you to vary the AFR targets for different RPM and Throttle Positions. This allows you to fine tune the AFR for economy at light loads (leaner AFR during lower throttle positions) at the same time as tuning for peak power in high throttle positions (richer AFR during heavy load or acceleration). The pay off is worth the effort, for increased throttle response, maximum power, and excellent fuel economy can all be achieved

simultaneously. The end result will be a perfect balance of power and economy even as conditions change.

2.) Another technique in setting up the AFR Targets, which is recommended for racing or other special applications, can be achieved very simply in the "Closed Loop Module Settings" window. The option of "AFR Override" allows you to set (1) specific AFR for the ThunderMax ECM to target at all points and conditions. This is discussed in the Closed Loop Module Settings section. This choice is most popular with racers or dynamometer tuning for Base Map generation or just simply tuning for maximum measured power output. Choosing this option will affect the warm-up AFR as well, which may adversely effect the operation of the motorcycle.

Note: It will require several sessions for these targets to be achieved provided you operate the engine at these specific RPMs and throttle positions at operating temperature.

## AFR Target Tuning Aides:

To simplify tuning the 32 Air/Fuel Ratio vs. TPS @ RPM map pages, "copy" and "paste" functions have been added to TMax Tuner. For example, if you modify your normal cruising RPM map page and are pleased with the results, you can now copy this curve and paste it into other RPM map pages. Select "Shift-Control-C" to copy the map page. Now scroll to the next map page and select "Shift-Control-V" to paste the copied RPM map page onto the new RPM map page. Select "F2" at any point to view the TMax Tuner Hot Keys. For example, start by modifying the 768 RPM Map Page, then paste that curve on all of the map pages up to the 3584 rpm page.

# Section 5: Diagnostics and Troubleshooting

# BASIC DIAGNOSTIC TIPS

When trying to determine a problem with the motorcycle, it's noteworthy that the bulk of all ECM returns to Zipper's are not faulty ECMs; rather the wrong map was selected, maps were changed without learned offsets being cleared, a factory sensor has failed, or wiring to the sensors is unplugged or rubbed thru bare. Every ThunderMax ECM is quality tested before the final packaging, which includes linking to the module and starting an actual engine. If you just installed the ECM and your engine won't start, something is likely wrong with the installation (hardware or software) or something may be wrong with your motorcycle; reinstall your factory ECM to validate that the problem is on the motorcycle, not the ThunderMax ECM. The following is a quick guide on what to check when a problem occurs.

There are a few basic steps that should be taken when attempting to troubleshoot problems encountered when using the ThunderMax EFI system. Before altering the base map in the ECM, inspect all of the components that were installed, altered or otherwise handled during the system installation. Loose connections, damaged wires, or worn / melted coverings can cause significant problems and are difficult to diagnose. A simple check of the wiring can save you enormous amounts of time troubleshooting if the culprit is wiring related.

Confirm the I.D. number of the map installed in your ECM and make sure you are using the latest module firmware and software. Zipper's receives support calls about performance problems regularly only to find out that the correct map was not loaded or the default test map was still installed in the module. **Make certain that you've written the selected map to the ECM; simply loading it in TMax Tuner software does not write the map to the ECM.**

If you installed a ThunderMax ECM to solve an operational problem on your motorcycle, and the problem still exists after installing the ThunderMax ECM, it is likely that there is a problem with your motorcycle, not your ECM. **If your motorcycle didn't start or idle properly before installing the ThunderMax ECM and the problem still exists, please state this upfront with Zipper's Product Support; <u>clear information upfront will save you time.</u>** If the problem was pre-existing and the issues are stated clearly to Product Support, the chances of solving the issue quickly are dramatically increased.

Create a monitor log.
We suggest you bring the engine to normal operating temperature, review and log the values using the **"Engine Monitors" & "Monitor Logging"** functions of the software. These values are vital in troubleshooting a problem that may be keeping the engine from operating properly. With the Monitor Logging feature, you can log an operating session and email the data to Zipper's Technical Support for review.

If either AFR values are not displaying correctly (or at all) in the monitor gauges, there may be a problem with the following:

> **(1) Damaged wiring on the closed loop system**
> **(2) Damaged Wiring or connector on the oxygen sensor**

**(3) An oxygen sensor is unplugged**
**(4) An oxygen sensor is damaged or dirty**

To test that the oxygen sensors are active and properly working, turn the ignition on, yet do not start the engine. Link to the module & monitor the AFR of the Front and Rear cylinders using the Monitor Gauges. Read the AFR Values for the Front & Rear cylinders, without starting the engine. After approx. 10 seconds, the sensors should be calibrated. Once calibrated to the ambient air, the oxygen sensors should warm up to a value of **19.36** for each sensor in the AFR monitor gauge windows.

**If you cannot replicate the value of 19.36, your oxygen sensors are not calibrating correctly. This will cause corrupt data to influence the effectiveness of the ThunderMax Auto-Tune system in properly following the targets on the tuning pages.**

If steps 1-4 are found to be in good order, remove the sensors and inspect for soot build up. You can clean the sensors with a product like CRC brand "QD electronic cleaner" (Permatex® part# 24378) then reinstall sensors and re-perform tests.

If the sensors now work correctly, or you have to replace them, you should trouble shoot to determine if the wrong map has been selected or the map pages need to be adjusted. Excessively rich AFRs during the warm up procedure, or at normal operating temperatures, will ultimately coat the sensors in soot (carbon). Once the sensors are dirty, they may not operate correctly, which can cause corrupt data to influence the Auto-Tune ECM's tuning.

If your motorcycle is operating properly, and the tune up begins degrading, it is highly likely that a mechanical issue is influencing the Auto-Tune system. This is actually a great warning system; for example, let's assume that your intake seals start leaking. In a Closed Loop Auto-Tune system, the ECM will continue adding fuel to maintain the AFR targets. Eventually you will notice a loss in power, lower fuel economy, and a loss in idle stability.

Since the Auto-Tune system is adding fuel for the additional air provided by the leak, the engine never gets a chance to over-heat or cause significant engine damage. Since this is a learning system, if you feel that the tune up is deteriorating, more than likely the system is over-correcting for a mechanical problem that must be fixed.

Another issue that can create problems is corrosion on electrical connections, fuse spades and sockets or the ECM connector. Any or all of these conditions can create abnormal results that are difficult to replicate or reproduce when troubleshooting yet the remedy is a straight forward, removal of scale or corrosion to the contaminated area.

**When cleaning your motorcycle, you should never directly wash the ECM compartment or fuse panel with water!** Excessive water can create a host of bizarre

technical problems. The ECM is designed to keep water out; however, with pressurized water it is possible to soak the factory wiring harness connector to ECM connection.

If a problem occurs after filling up your motorcycle with gas, make certain that the gas isn't the culprit before you change anything in the ThunderMax ECM. It is not uncommon for fuel blending to vary in different regions of the country.

Another common scenario is related to old gas. If you start a new riding season with last season's gas still in the tank, the first thing you need to do is drain the old gas and replace it with fresh gasoline. Due to the increasing amounts of alcohol in the gasoline that's being refined and blended today, the shelf life has gone down on common gasoline. The alcohol separates from the gasoline and changes the properties of the gasoline. If you think you may be experiencing a problem related to old gas, change the gasoline before putting any additional time into it. Low octane fuels are not recommended for these engines, and will cause tuning issues if used.

In addition you should always work from the Harley-Davidson® **Electrical Diagnostic Manual**. These manuals are model-specific and contain valuable information in troubleshooting issues with TBW equipped Touring model motorcycles. If the problem is not related to the ThunderMax ECM, you will need to refer to the service and diagnostic manuals for the specific model in question.

# GENERAL PERFORMANCE PROBLEMS

EFI equipped engines need the same basic elements to function properly as carbureted engines. If you are experiencing a performance problem, first review all installation instructions and verify all steps were followed, then:

- **Electrical Issues -** <u>Check for loose battery cables</u> or other loose electrical connections. Then check for a failed sensor / view the Diagnostic Trouble Codes.
- **Spark -** Check the spark plugs wires to verify they are not rubbing thru a decorative cover on the motorcycle. Some aftermarket wires make leak excessive amounts of RFI causing problems with the proper operation of your motorcycle. If the plugs are full of soot; make sure the correct map is loaded, If the motorcycle had an operational issue before installing the ThunderMax ECM, it is likely that there's another problem on the motorcycle that needs to be solved before proceeding with tuning.
- **Air / Fuel Quality -** Ensure the engine is receiving clean air and good fuel. If the fuel is from last season or has been varnishing for several months, drain, flush and start over with fresh fuel. Do you have adequate fuel pressure?
- **Mechanical Issues** - Check for a mechanical issues such as loose hardware on the throttle body, improper throttle blade setting, leaking intake manifold seals, fuel delivery problems (in-tank fuel filter and fuel line), injector problems, wiring, wet sumping, or poor ring seal.

# GENERAL INSTALLATION NOTES

**Engine Light:** If the engine light illuminates at high temperature during operation of the motorcycle, the ThunderMax ECM is warning you that the cylinder head temperature has reached the temp alarm threshold. Adjust the setting for the temperature that the warning light illuminates with a default value of 350 degrees. **Continued operation (without a cool down period) could cause severe engine damage! Read DTC when you observe a Check Engine light.**

**DTE:** A firmware release will be available in the spring of 2010 which will enable this function, until then the DTE function is inoperable.

**Low Fuel Light (Up to 2007 models) -** The low fuel light will operate exactly the same whether you are using the ThunderMax ECM or the factory ECM. Our in house testing has found that the low fuel light does not activate at the same time on every tank. What this means is that the volume of fuel left in the tank when the low fuel light comes on, varies almost every time it is activated. This inconsistency is not related to the ThunderMax ECM or any other ECM on the market.

**Removing, Changing or Charging the Battery:** When installing the ECM for the first time, remove the fuse for the ECM before disconnecting or reconnecting the battery. Hot-swapping components could promote a premature failure, which could result in damage to the ECM. Don't forget to re-initialize the module whenever you interrupt 12v power

  **We recommend to always remove the ECM fuse before disconnecting or reconnecting the battery!**

# ABOUT THUNDERMAX

The ThunderMax EFI is a complete, stand alone system with Wide Band AutoTune operation for all injected H-D model motorcycles. This high-resolution Alpha/N-based system is the most advanced engine management system available. The ThunderMax ECM is not a post-fuel devise, or a "signal modifier", it is a complete factory ECM replacement.

The ThunderMax EFI system is a joint development and distribution project between two industry leaders, **Zipper's Performance Products** and **Thunder Heart Performance Corp**. **Zipper's Performance Products** is a leading developer and producer of engine kits and performance components for the H-D aftermarket industry. **Thunder Heart Performance Corporation** engineers, designs and manufactures high technology systems and components for original equipment and aftermarket applications in the motorcycle industry.

Our companies are committed to developing and improving the best engine management and fuel injection products in the industry. Our staff is dedicated to customer support.

The ThunderMax comes with a 3 year limited warranty.

For additional information including ThunderMax Cams by Red Shift as well as software and instruction updates, please visit the ThunderMax website, www.Thunder-Max.com .

# Section 6: Updates

An Internet Connection is required for all updates.

# TMAX TUNER UPDATES OVERVIEW

There are two methods of updating the software, firmware, and EFI Map library; through the TMax Tuner software's update features, and through the ThunderMax website. **Occasionally some customers have issues updating their software through the integrated TMax Tuner update functions; however it is rarely the fault of the TMax Tuner software.** The main reason for problems is quite simple, for some reason, your computer is not allowed to send and receive automatic requests for information from an outside FTP server. Since this is a function that's automatically contacting an FTP server for information, some networks or computers will deny the TMax Tuner request for data transfer before it's even allowed to contact the FTP server.

Key reasons for not being able to update through the integrated Update functions are as follows:

 1.) Your network is highly secured and does not allow automatic requests for unknown FTP servers.

 2.) Your computer has a security or firewall setting that is not allowing TMax Tuner to automatically send information to and receive from the ThunderMax FTP server.

 3.) You are using your office computer that was setup by your professional IT department. Many of the updating problems that are seen by Product Support are related to "business" computers where the user (you) does not have administrator privileges, and many network features are locked out.

These are simply problems that the TMax Tuner support staff cannot help you with, given the number of operating systems in use today, and the complexity of modern network security. If your computer is administered by your IT department, you need to make them aware of the problem, but only if they are ok with you having personal (non business related) programs installed on the computer. Otherwise, you will need to purchase your own computer, and your own internet connection, to take advantage of the automatic update functions. However, this is completely unnecessary! ALL updates are available through any web browser.

**If you are experiencing problems with the automatic update functions through the software, you are not out of luck!** Simply go to the ThunderMax website; **http://www.thunder-max.com** and manually download the latest Software, Firmware, or Tuning Manual release. It is not worth the effort if you cannot get the update function to work and do not know enough about your computer or network to correct the problem. If you do not control the computer or network settings, you will never solve the problem on your own, and there's nothing that the Product Support team can do to help.
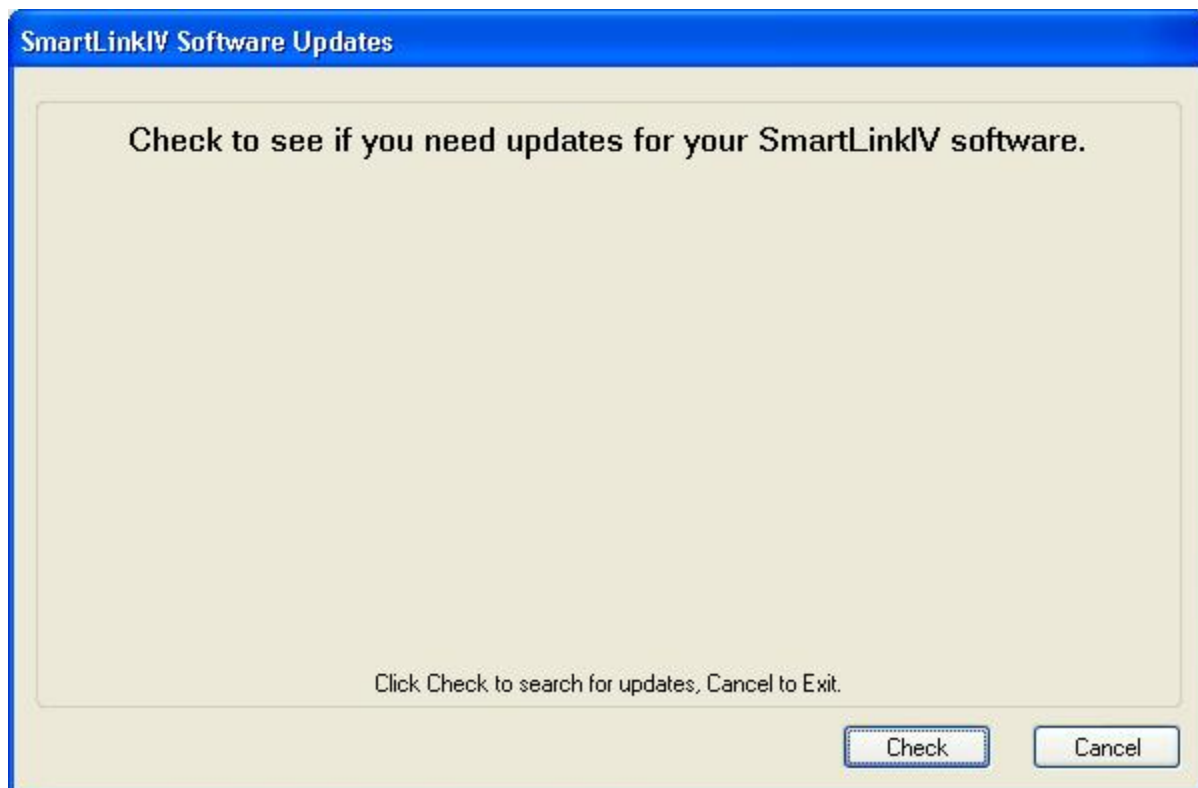
# UPDATING THE TMAX TUNER SOFTWARE

To maintain the most current version of TMax Tuner, use the update function in the software. **An Internet Connection is required for all updates.**

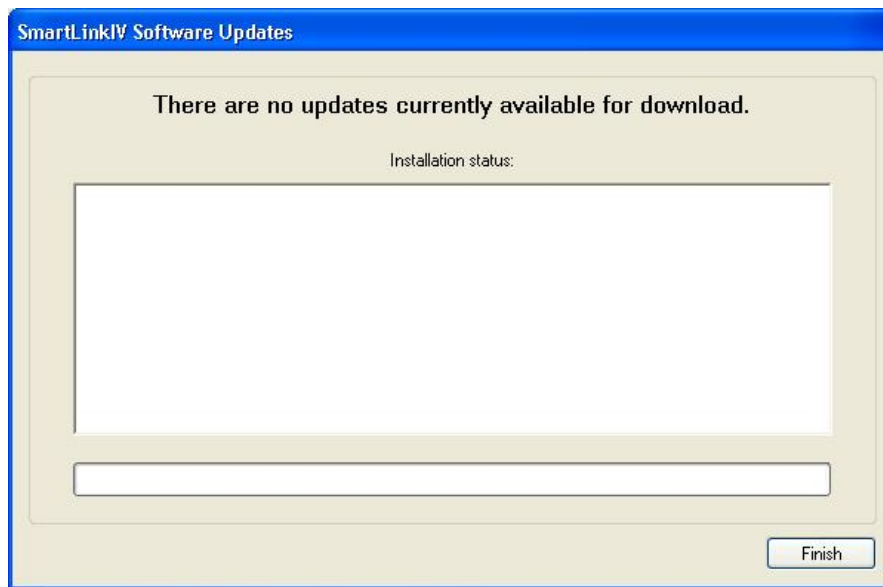Select **Configure > TMax Tuner Update** to begin the update process, as shown below.
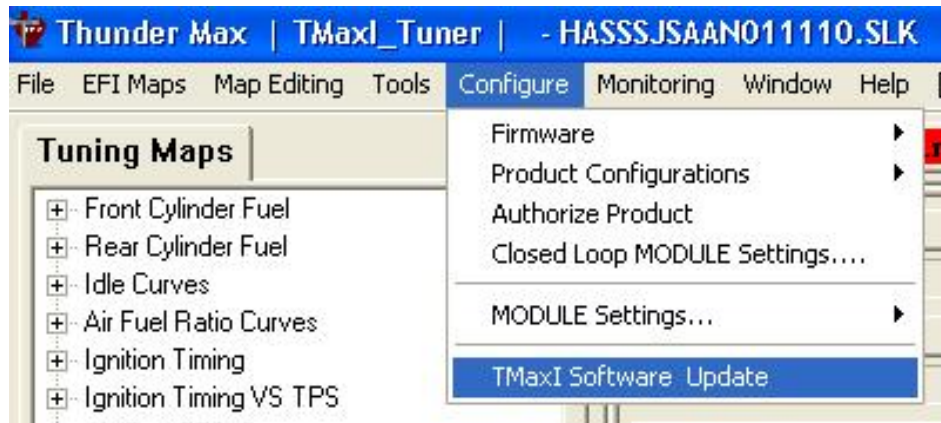


The following window will appear:
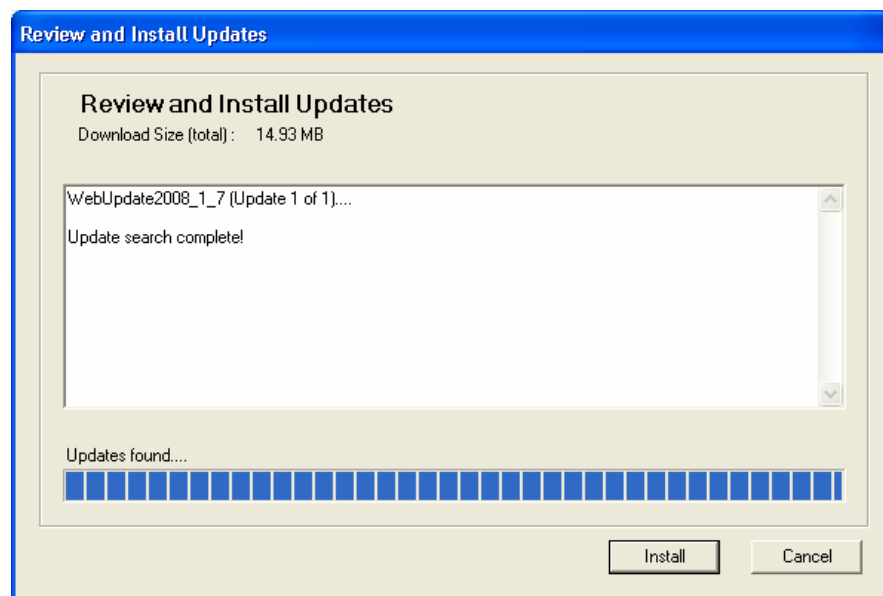


One of two windows will appear:

**Software is up to date!**

**No action required.**

SmartLinkIV Software Updates

There are no updates currently available for download.

Installation status:

Finish

**New Software Available!**

**Proceed Forward with the Update Process**

Review and Install Updates

Review and Install Updates
Download Size (total) : 14.93 MB

WebUpdate2008_1_7 (Update 1 of 1)....

Update search complete!

Updates found....

Install     Cancel

Follow the instructions provided by the TMax Tuner update windows to update your version of TMax Tuner. When complete, open TMax Tuner and select **Help > About TMax Tuner…** to check the version number that is currently installed on your computer.

# UPDATING THE BASE MAP DEFINITIONS

To ensure that you have the complete and up to date Base Map Library, select the "Check Internet for Updates" button on the "Base Map Name Encoding" window, as shown below.



**You must be connected to the internet to update the Base Map Definitions as well as retrieving any available new Base Maps.** The TMax Tuner Installation CD does contain the base map library; however it is only as current as the CD itself.

It is simply good practice to update the definition file when searching for a new Base Map file. Not only are new maps constantly being created, but the older Base Maps are updated occasionally as well. Once updated, you may proceed with selecting an appropriate Base Map for the current engine combination you are working with.

If you are satisfied with the operation of your current Base Map, chances are a new Base Map will not make a significant difference to the operation of the motorcycle. Updated maps could contain spark curve or fuel management changes, or even different fuel economy strategies.

# UPDATING THE FIRMWARE IN YOUR THUNDERMAX ECM

You can update the firmware, if an update is available, through the TMax Tuner software. **An Internet connection is required to download the Firmware.** Once the firmware file is downloaded to your PC, you do not have to be connected to the internet to upload the new Firmware to the ThunderMax ECM. You must be linked to the ThunderMax ECM to update the firmware in the module. There are two stages in updating the Firmware in the ThunderMax ECM.

> **Stage 1:** Check for an update, and download the latest Firmware onto your computer.

> **Stage 2:** Link to the ThunderMax ECM and follow the prompts to upload the new Firmware to the ThunderMax module.

Both stages are fully covered in the following pages. Both require that you are linked to the ThunderMax ECM. The latest software will automatically link and read the module map and settings when the upgrade is initiated.

## Stage 1: Downloading an Updated Firmware

Select Configure > Firmware > Check for Firmware Upgrade to see if there is an updated Firmware available for your ThunderMax ECM.

If an updated firmware is available for your ThunderMax ECM, the following window will appear:
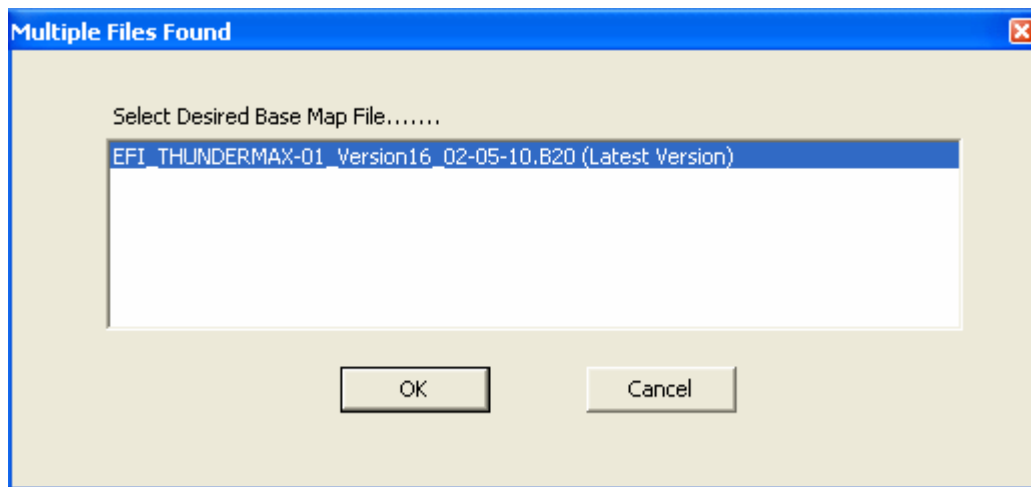


If you select the "OK" button, the firmware download will begin. Once completed, the following window will appear.
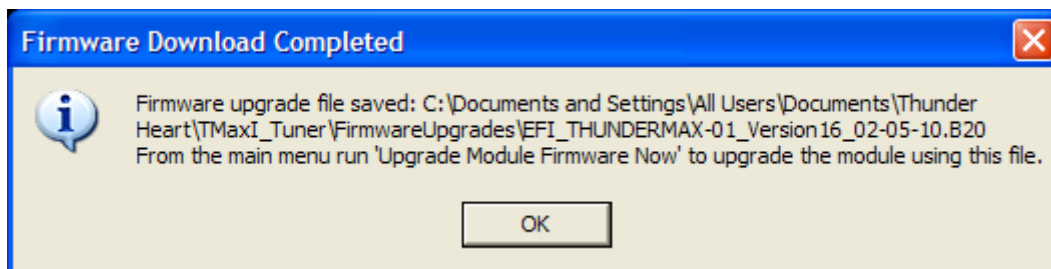
## Stage 2: Uploading a New Firmware Version into the ThunderMax ECM

**Note:** Removal of the headlight fuse is optional during the firmware upgrade. This will prevent unnecessary battery draw during the upgrade process. The image below shows the location of the headlight fuse (circled in red) behind the left side panel.
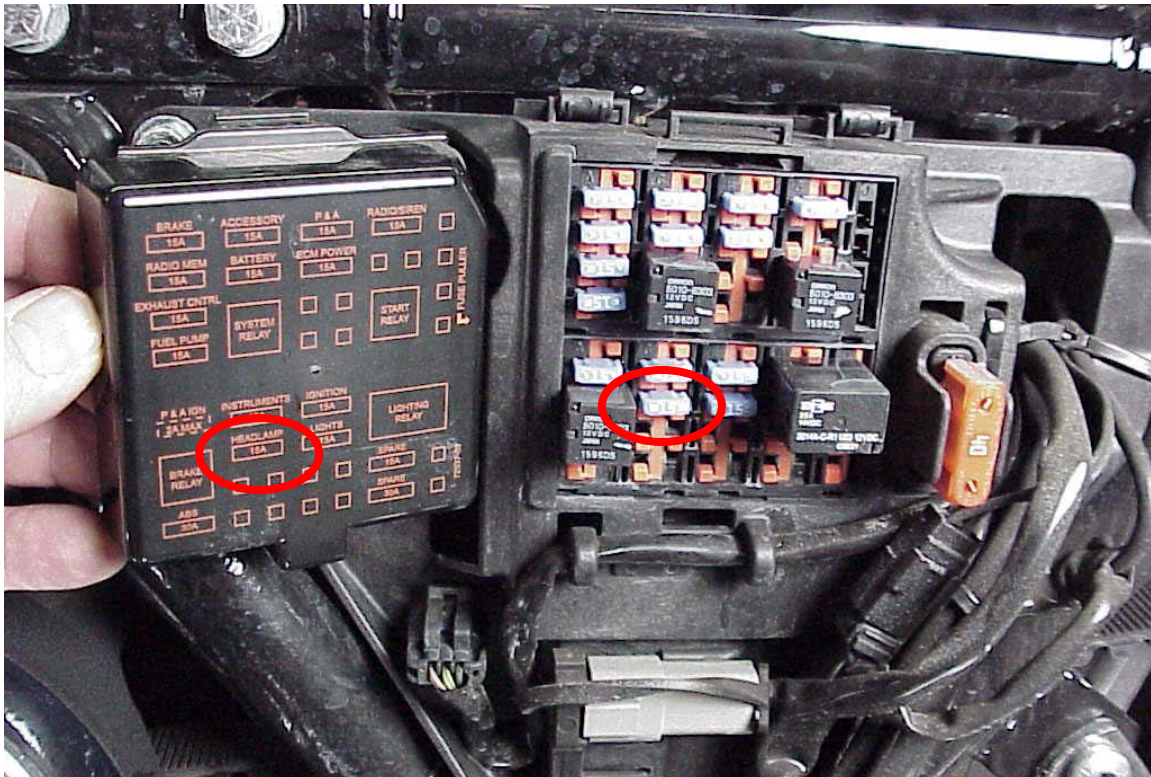


**Link**    **Link to the ThunderMax ECM**.

**You must be linked to the ThunderMax ECM to perform any firmware upgrades.** To upload the new Firmware to the ThunderMax ECM, select Configure > Firmware > Upgrade Module Firmware Now, as shown below.
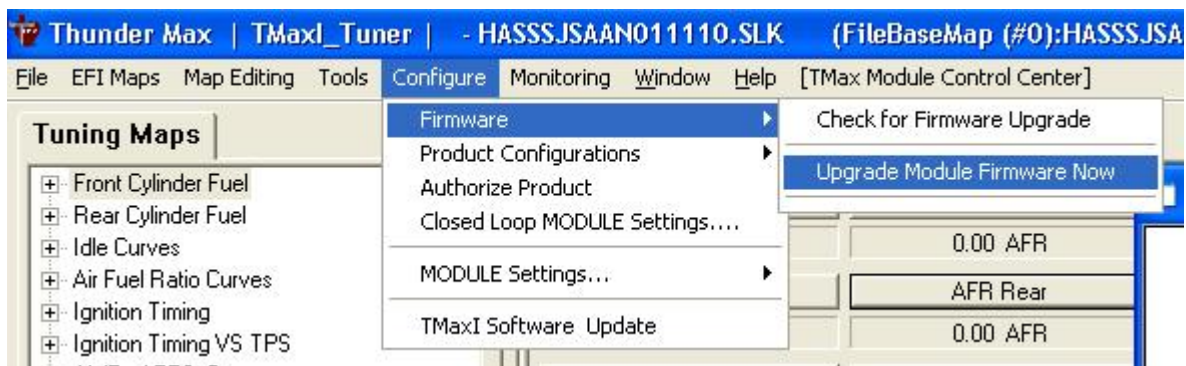
The following notice with suggestions to complete the firmware upgrade will appear:
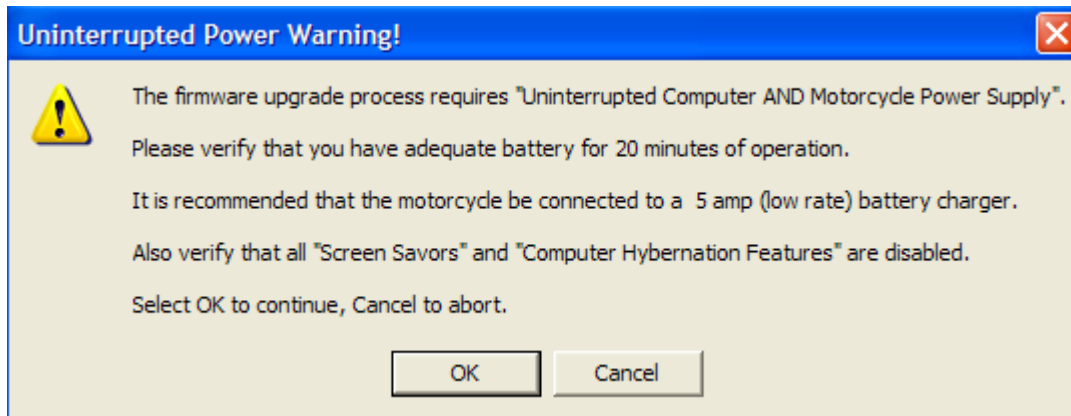


Once you have read this prompt and made any changes necessary to your PC, click ok and the prompt below will appear.
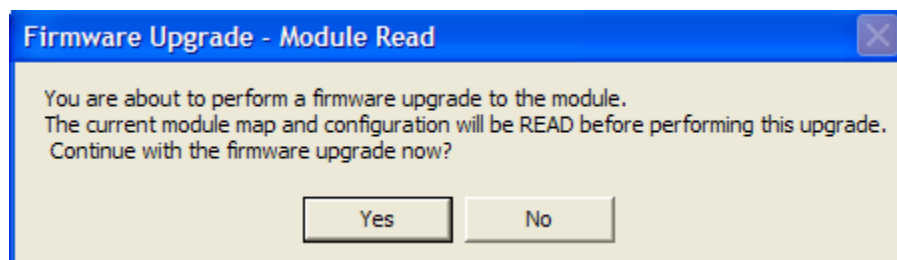


TMax Tuner will automatically read the map from your ECM when the upgrade is initiated as shown below.
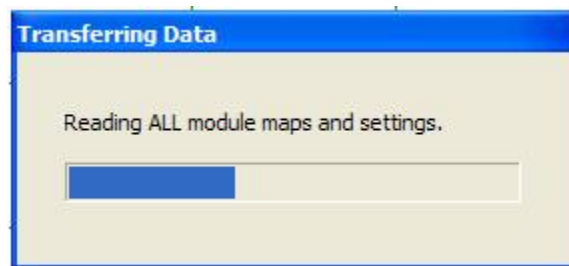
Select the most recent version of the firmware by date from the next window and then click the "Open" button.
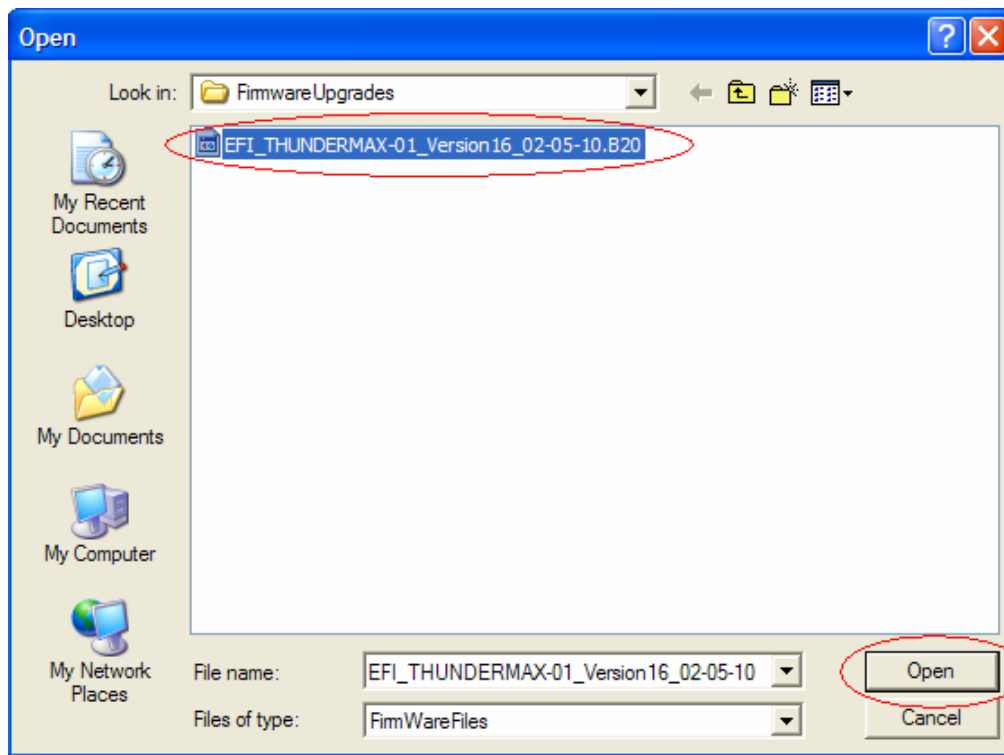


Once the file has been opened, the following window will appear titled "Module Detection." Follow the prompts to continue the firmware upgrade.
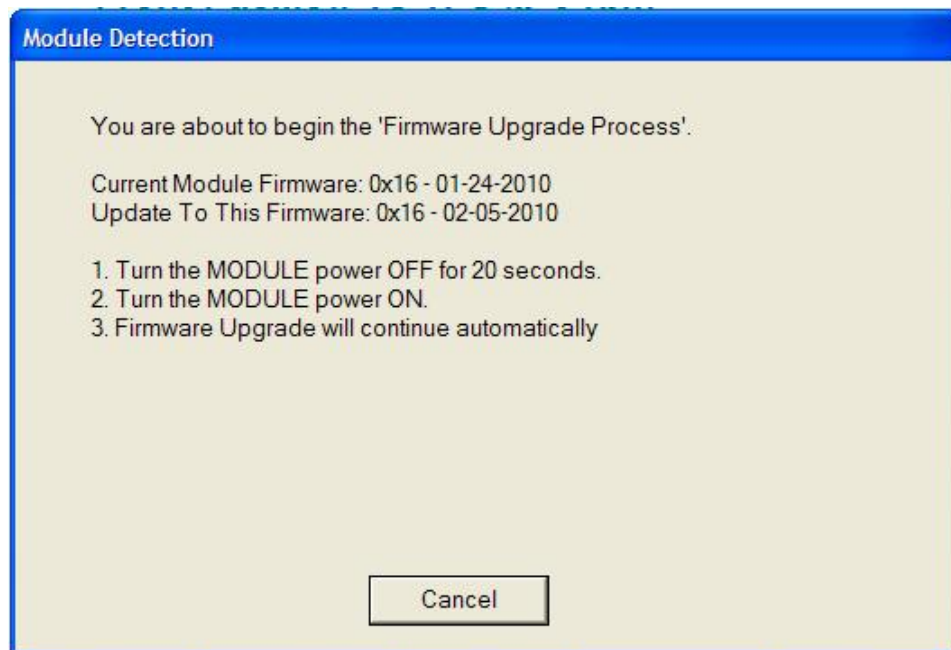
When the module power is turned back on after 20 seconds the firmware download to the module will begin as shown by the progress bar below. This could take as long as 5 minutes to complete.

**Transferring Data**

Firmware Download
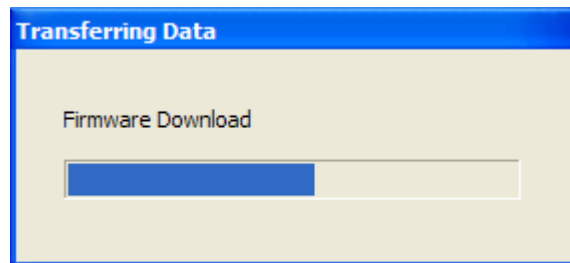
Once the transfer completes, the "Module Detection" window will appear again with a progress bar showing the initialization of the new firmware and time remaining count down to completion.

**Module Detection**

Initializing New Firmware Upgrade....

The Thunder-Max module is now re-initializing.
This initialization process may take up to several minutes.
When the module has completed this process.
This dialog will close.

PLEASE STAND BY!

Time Remaining          4:52
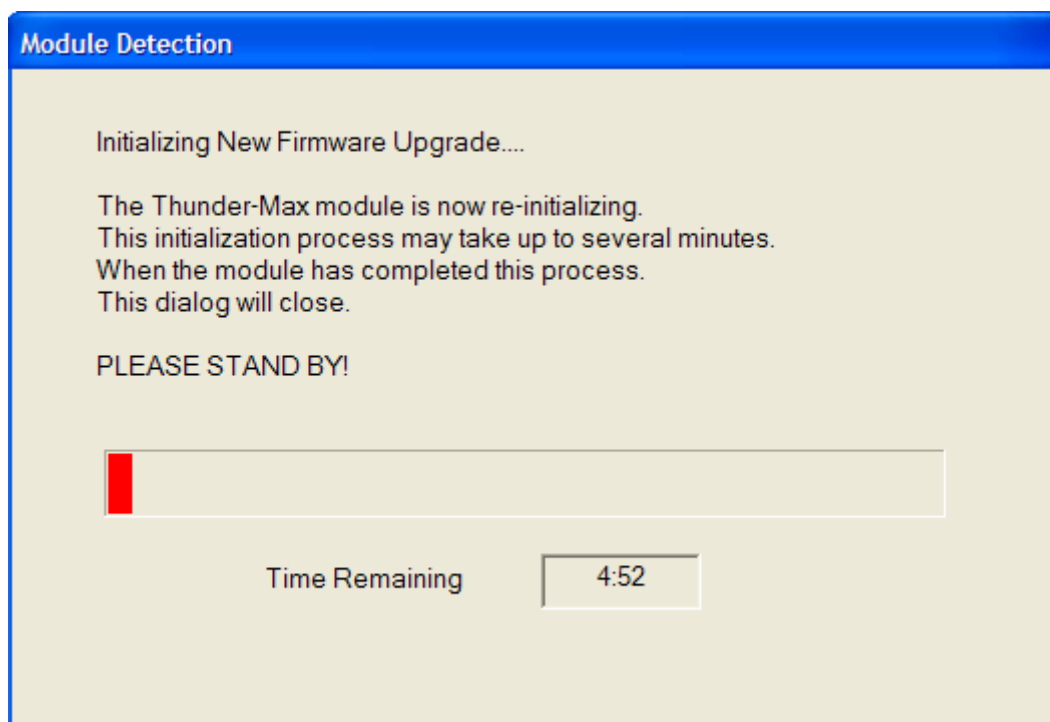
Once the initialization completes, the "Module Detection" window will appear again.

**Module Detection**

1. Turn SWITCH POWER (Ignition Key Switch) OFF for 20 seconds.
2. Turn SWITCH POWER (Ignition Key Switch) ON

After the SWITCH POWER (Ignition Key Switch) has been cycled, this dialog will automatically close.

Cancel
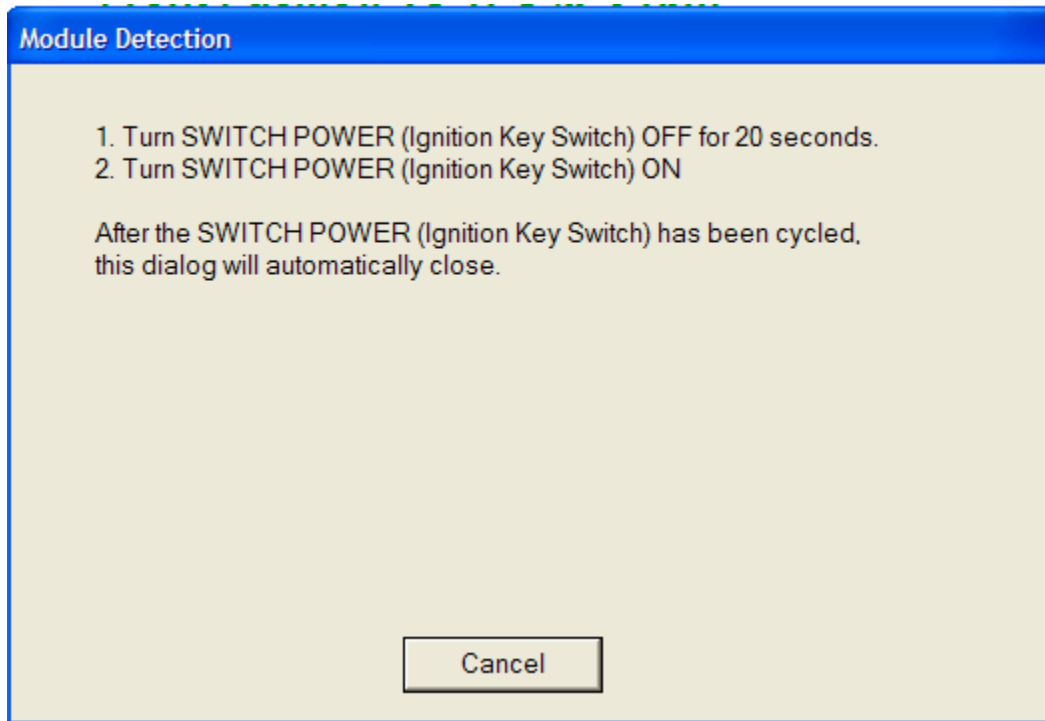
Follow the instructions on the "Module Detection" window:
  1.) Turn off the Ignition Switch for 20 seconds.
  2.) Turn on the Ignition Switch. The message below will confirm "Firmware Upgrade Process Has Completed.

**Firmware Upgrade**

Firmware Upgrade Process Has Completed.

OK
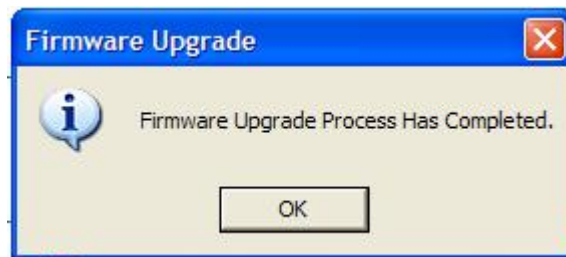
The software will automatically re-write the **"Module Maps and Settings"** to complete the upgrade process.

**Transferring Data**

Writing ALL maps...

156
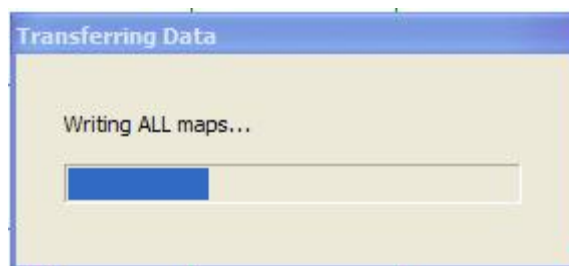
The Firmware is now upgraded in your ThunderMax ECM. To confirm the firmware version on your ThunderMax ECM, simply open TMax Tuner, Link to the ECM, and select **Help > About TMaxl Tuner** as shown below. The "ThunderMax" window that pops up will display the current software and firmware versions. You must remain linked to view the firmware version.
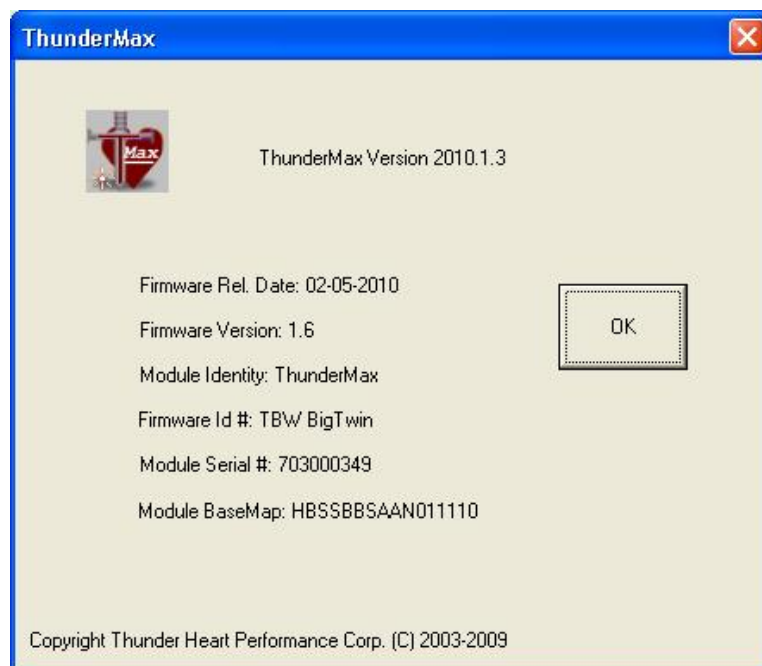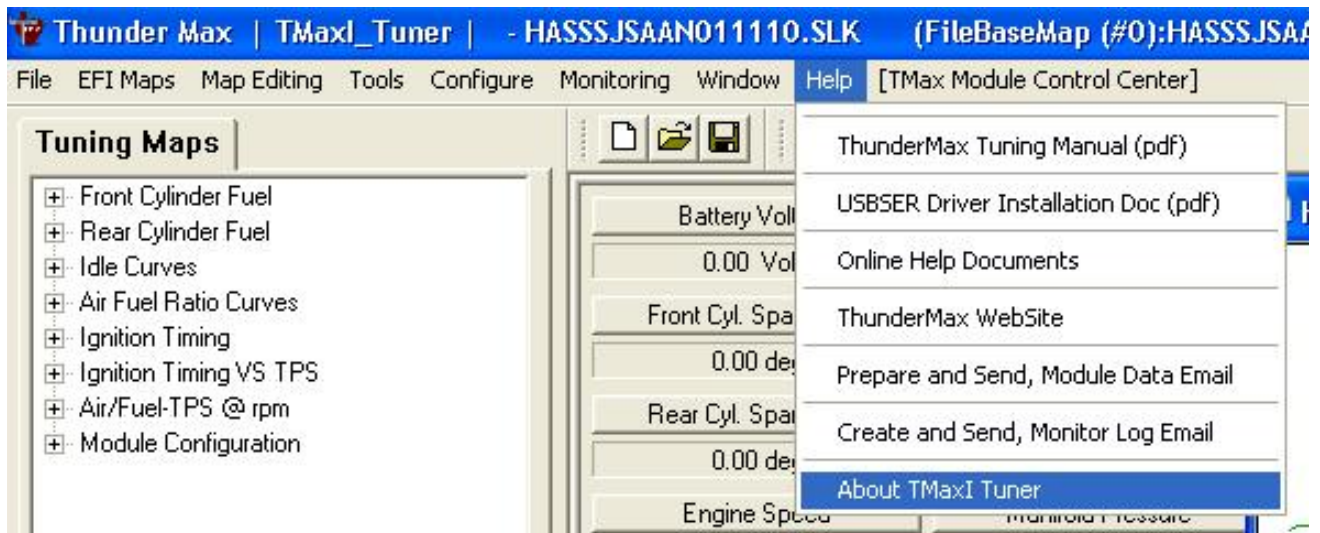
# GLOSSARY OF TERMS USED

**Accel Fuel** – Factor of fuel enrichment during rapid throttle movement.

**AFR (Air Fuel Ratio)** – Percentage of air and fuel as measured from a single engine cycle. Example an AFR of 14: 1 = 14 parts of air per 1 part of fuel by weight.

**AFR Correction** – Percentage of additional or reduced fuel to the base map at a specific operating condition.

**AFR Override** – Allows a single AFR variance from the map target AFR settings on each closed loop map page.

**Auto-Tune** – A feature of the ThunderMax ECM, allowing the use of closed loop feed back to make lasting adjustments to the base fuel map. These adjustments may be needed due to degradation of fuel components, manufacturing tolerances in the throttle body, IAC motor, TPS, injectors, or any other component variations.

**Barometric Pressure** – The measured atmospheric pressure at the ECM, this is a variable factor relative to absolute atmospheric pressure, and ultimately effects the AFR in your engine.

**Base Ignition Timing** – This displays the calculated ignition timing from the base map before corrections are applied.

**Base Map** – A set of curves that determine the amount of fuel and ignition timing required for each operating condition, for one engine configuration.

**Base Map Definitions** – The Base Map Definitions are the strings of data that display the parts used in each Base Map File. This is updateable with a high speed internet connection. The update will reveal any new Base Maps added to the Base Map Library by Zipper's.

**Basic Settings -** A window used to observe / change the basic module settings such as Idle RPM, Speedometer Calibration and IAC learning offsets, etc.

**CL (Closed Loop)** – Meaning the use of feedback or reference of set point value to adjust Offsets to adjust the fueling output.

**CL Corr Front** – Front cylinder percentage Adjustment Pre & Post Auto Tune

**CL Corr Rear** –   Rear cylinder percentage Adjustment Pre & Post Auto Tune

**CL Status** – A value which can be helpful with tech support to diagnose a problem related to the closed loop feedback system.

**Closed Loop Processing** – The use of a feedback sensor (oxygen sensor) to correct fuel delivery based on past air/fuel ratio readings.

**CLP Offset** – The deviation of fueling values from the base map as a result of Auto tune corrections.

**Cranking Fuelflow** – % of fuel supplied during engine startup mode.

**Crank Position Sensor** – Determines the precise location and speed of the crank shaft.

**DTC Warnings** – Diagnostic Troubleshooting Code Warnings

**ECM** – Electronic Control Module (or Engine Control Module or Electronic Control Unit (ECU) –

**EFI** – Electronic Fuel Injection

**EGO** –Exhaust Gas Oxygen (the oxygen content of exhaust gases)

> **EGO Front** – Front cylinder real time Exhaust Gas Oxygen reading
>
> **EGO Rear** –  Rear cylinder real time Exhaust Gas Oxygen reading
>
> **EGO Target** – The desired target as per map settings

**Engine Monitor Gauge** – A display window selected from the monitor page

**Final Drive Ratio** – The option of "Final Drive Ratio" is only used on motorcycles with a 6$^{th}$ Gear Indicator light.

**Firmware** – The internal program which directs the functions of the ECM for fuel control, spark control etc. The Firmware is updateable with a high speed internet connection.

**Normal Operating Temperature** – Cylinder head temperature between 240-285 degrees Fahrenheit.

**Gear 6 Min Tps** – Smallest value of throttle position that will allow 6$^{th}$ gear display, this setting is only used on 2007 and newer motorcycles.

**TAC Home Position** – A value which is used to increase or decrease the amount of by-pass air ffom the throttle blade, used during the starting function only.

**Idle Speed** – The target in the software for desired engine speed at idle when at normal operating temperature.

**Ignition Timing** – A variable point at which ignition spark occurs, measured by degrees of advance or retard relative to top dead center position of the piston.

**Initial Fuel Pulse** – An adjustable setting that primes the cylinders for optimum starting time. This only occurs one time per ignition start cycle.

**Initialization (Module)** –The process which calibrates the TAC position to the module.

**Injector Duty Cycle** – Percentage of time the injector is powered by the ECM per combustion stroke.

**Injector Size Compensation-** Used to apply a fueling compensation to ALL fueling maps based on the ratio of the "Map Injector Size" versus the "New Injector Size".

**Link** –A term referring to the communication between the software and the module.

**Load Control Dynamometer** – A modern Load Control "dyno" has an electronically controlled brake or loading devise added to allow tuning at specific RPM targets. This is the ideal setup for tuning EFI engines.

**Learned Fuel Adjustments** – Offsets that have been learned by the ECM to correct the AFR at particular RPM and Throttle Positions.

**MAP sensor** – A Manifold Air Pressure sensor is used in forced induction applications.

**NADS Nitrous** – Nitrous Assist Dry System – An electronic "Dry" nitrous system that uses the ThunderMax ECM to add fuel like a Wet system. This is a plug and play add-on to the ThunderMax ECM.

**Narrow-Band Oxygen Sensor** – An oxygen sensor used to measure the amount of unburned oxygen in the exhaust stream of an operating engine. The term narrow band refers to the small range of AFRs that the sensor can report to the ECM.  A factory sensor is a narrow band, typically a 1, 3 or 4 wire oxygen sensor.

**Oxygen Sensor** – An electronic sensor that measures the proportion of ($O_2$) in gas being analyzed.

**Rear Trim** – Rear Trim is the percentage of fuel being trimmed from the rear cylinder injector's pulse width to match the front and rear cylinder AFRs.

**Rev Limit** – A "Basic Settings" value which limits the engine rpm. Please consult the manufacturer of your engine to find the maximum RPM recommended. This is meant to be a safeguard against potential damage caused by over-revving the engine beyond its mechanical capabilities.

**Session (Tuning)** – Also known as a "Key Cycle Event". Every time the ignition switch is powered off, then powered on again, a new tuning session begins.

**TMax Tuner Update** – Allows user to check for updates, and when available, update the TMax Tuner software through a high speed connection.

**Speedometer Calibration** – The Speedo Calibration is a number that is used by the ECM to determine the vehicle's speed. This value is a function of the vehicle transmission, rear pulley, tire diameter, etc.

**Stoichiometric Air-Fuel Ratio (Stoichiometry) –** This is the Ideal balance of reactants and products for the chemical equation associated with the operation of combustion. For gasoline applications, a stoichiometric mixture is found to have an air-fuel ratio (AFR) of 14.7:1, or 6.8% Fuel.

**Tip Angle** – Also known as Bank Angle, refers to a sensor which detects if the bike is tipped or banked to one side more than 45 degrees for longer than one second. Power is interrupted to Turn Signals, Starter Motor, Ignition Controller, Fuel Pump and Coil when this sensor is tripped.

**TMax Tuner Map Database** – The TMax Tuner Map Database is a database of pre-made, professionally tuned Base Maps that currently span from a 96" stock engine to a 110" SE engine.

**TMCC** – Refers to the TMax Control Center, the one stop window for monitoring the most critical system data.

**TPS (Raw)** - An unfiltered voltage signal which can assist with adjusting throttle blade settings.

**TPS (Throttle Position Sensor)** – A potentiometer attached to the throttle shaft which communicates throttle position to the ECM using a voltage signal.

**Tuning Map Tree** – The Tuning Map Tree is located in the upper left part of the TMax Tuner Layout. This is where all of the individual tuning maps and module configuration options are located.

**Wide-Band Oxygen Sensor** – A type of sensor which is capable of precisely measuring exact air/fuel ratios.

# APPENDIX

# Drop Down Menus

The following section is to be used as a quick reference when using TMax Tuner. All of the menus are dissected and a quick explanation of each option is given which references the section in this manual that fully covers the topic.

**Appendix Index:**

**A1: File**
**A2: EFI Maps**
**A3: Map Editing Tools**
**A4: Tools**
**A5: Configure**
**A6: Monitoring**
**A7: Window**
**A8: Help**
**A9: TMax Control Center**

# Appendix A1: File
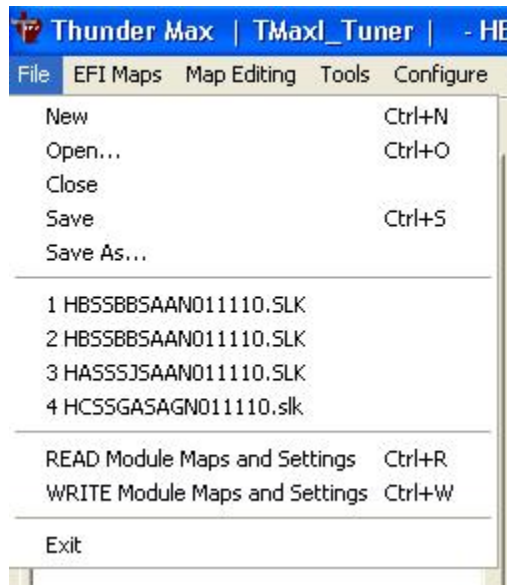


The "File" Menu contains the standard menu options of New, Open, Save and Exit. In addition to the standard options, communication to the ECM can be performed through this menu with the Read / Write functions.

- The "New" option will allow you to open an "Untitled" Base Map File. Although you cannot create a new Base Map with the software, the "Untitled" Base Map is necessary when linking to a ThunderMax ECM with an unknown Base Map File loaded onto it.

- The "Open" option allows you to open a Base Map File, if you already know the name of the file that you need. When selected, the Base Map folder on your computer will be displayed, with all of the current Base Maps listed. If you do not know which Base Map file you need, please see the EFI Maps section in Appendix A2.

- The "Close" option will close the Base Map file that is currently opened in TMax Tuner. By default, if changes have been made, TMax Tuner will ask if you want to save your changes.

- The "Save" option saves the map that is currently displayed in TMax Tuner, along with changes made to the Base Map File, using the current file name.

- The "Save As…" option allows you to save your tuning work to your computer under a new name. The ThunderMax ECM records any changes made instantly, but it is a good idea to save your modified Base Map File under a new name for easy reference and to prevent overwriting the previous version.

- The "History" function of TMax Tuner will always be displayed between the "Save As…" option and the "READ Module Maps and Settings" option. This section will display the names of the last four Base Map Files that have been opened in this particular installation of TMax Tuner.

- The "READ Module Maps and Settings" option is used for synchronizing TMax Tuner to the ThunderMax ECM's Base Map File. This particular function will read the ECM's Base Map and display it in TMax Tuner.

- The "WRITE Module Maps and Settings" option is also used for synchronizing TMax Tuner with the ThunderMax ECM. However, this option will write the map displayed in TMax Tuner to the ThunderMax ECM.

# Appendix A2: EFI Maps



The "EFI Maps" Menu contains all of the functions that you need to find a Base Map File for your application.

- The "EFI Map Listings / Definitions" option opens the Base Map Definitions window. This provides you with full access to browsing the Base Map File Database, loading a chosen Base Map into TMax Tuner, as well as an option to update your current Base Map File Definitions.

- The "Map Notes" option will display a window called Map Notes. If you haven't used this feature before, it will load as a blank window. Please use this window to save any notes on the changes that have been made from the Base Map File.

# Appendix A3: Map Editing
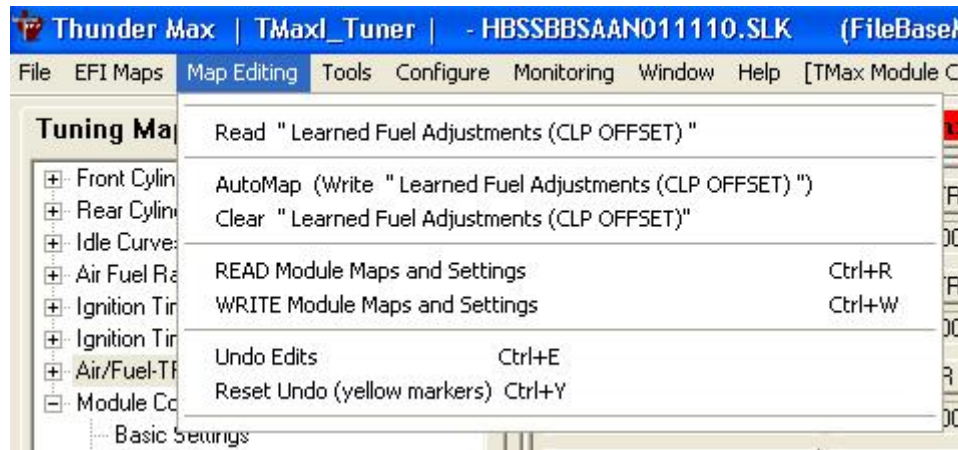


The "Map Editing" menu allows you to use the learning functions of the ThunderMax ECM to quickly improve the operation of your motorcycle.

- The Read "Learned Fuel Adjustments (CLP OFFSET)") function retrieves all of the fuel offsets from the ThunderMax ECM and synchronizes the ECM to the map being viewed in TMax Tuner. This is necessary for viewing offsets, as well as using the Auto-Tuned Points Analyzer.

- The AutoMap (Write "Learned Fuel Adjustments (CLP OFFSET)" option allows you to set the previously learned fuel points as the Module Map File. This will update your Module Map and allow you to refresh-expand the AutoTune learning ranges.

- Clear "Learned Fuel Adjustments (CLP OFFSET)"" will erase ALL learned offsets that the AutoTune system has created.

- The "READ Module Maps and Settings" option is used for synchronizing TMax Tuner to the ThunderMax ECM's Base Map File. This particular function will read the ECM's Base Map and display it in TMax Tuner.

- The "WRITE Module Maps and Settings" option is also used for synchronizing TMax Tuner with the ThunderMax ECM. However, this option will write the map displayed in TMax Tuner to the ThunderMax ECM.

- The "Undo Edits" option returns any learned map points back to the original map point, as shown by yellow tracers. Simply put, the tuning blocks will return to the yellow tracers.

- **The "Reset Undo (yellow markers)" option is used for altering the Base Map file in the ThunderMax ECM. This option lets you set the learned and adjusted map tuning blocks as the Module Map File points.  Simply put, the yellow tracers are reset to reflect the ECM's adjustments.**

# Appendix A4: Tools
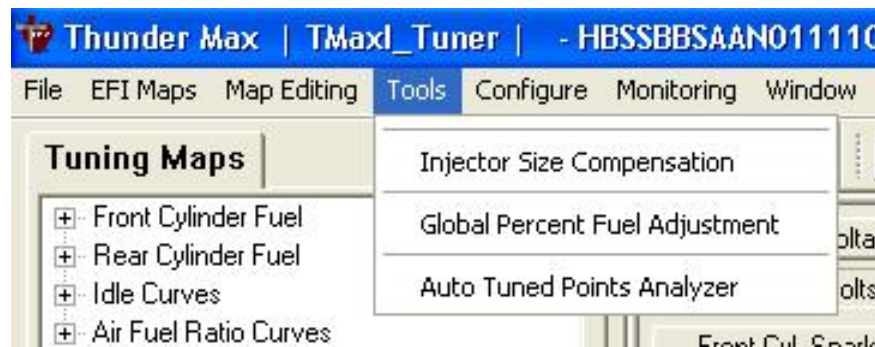


The "Tools" menu is primarily used when a change occurs to the engine combination that the ThunderMax ECM has already been used with.

- **The "Injector Size Compensation" option opens up a window that will ask for the size of the existing injector (used in the map) and the new injector. This feature will determine the percentage fuel change between the two injectors, and adjust ALL of the map points by this factor.**

- **The Global Percent Fuel Adjustment allows you to raise or lower ALL fuel points in the entire map.**

- **The Auto-Tuned Points Analyzer now serves as a link to the TMax Control Center .**

# Appendix A5: Configure
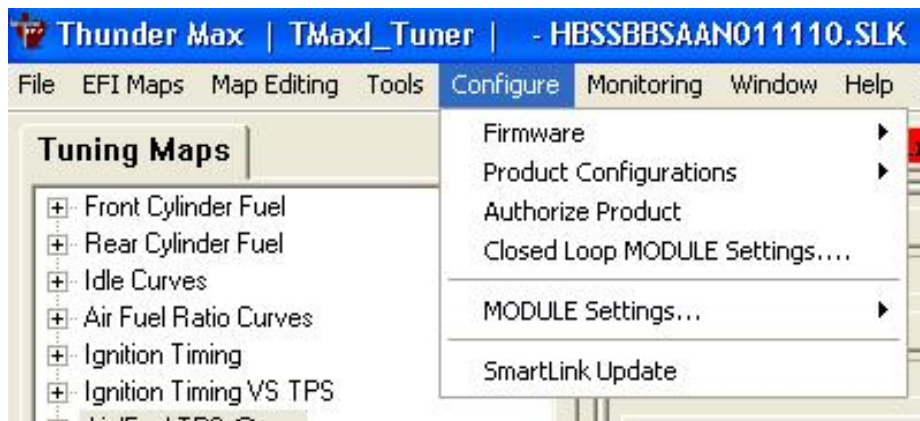


The "Configure" Menu contains options pertaining to the settings of the ThunderMax ECM as well as TMax Tuner software.

- The "Firmware" option allows you to check for new firmware and upgrade the firmware that is used in the ThunderMax ECM.

- The Product Configuration option allows you to switch between Tuner and Tuner Plus software.

- 
- The "Authorize Product" option is only used when upgrading from Tuner software to Tuner Plus. This will only be used by tuners who have successfully been approved by Zipper's to use the Tuner Plus software. The Tuner Plus Software is used in the creation of new Base Maps.

- The "Closed Loop MODULE Settings…" option will open a window that gives you several choices for settings of the Closed Loop system on your application.

- The "MODULE Settings" option allows you to activate and control the NADS nitrous system and any supercharger system. These settings allow you to make changes to account for these power adders. The "TMax Software Update" option allows you to check and see if a newer version of TMax Tuner is available. You will need an internet connection to check for updates.

- The "TMax Tuner Update" option; this software package is constantly being refined and upgraded, no matter what version you may have purchased, a free upgrade is always available as the software improves.

# Appendix A6: Monitoring
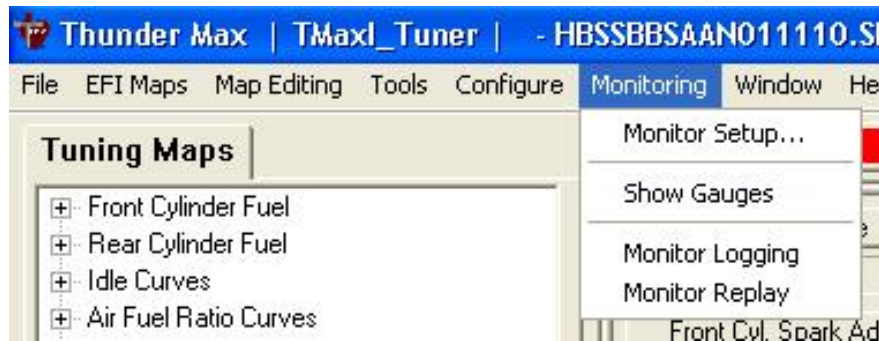


**TMax Tuner Monitoring is used while performing live tuning, to keep a watchful eye on the vital engine data. Also the monitoring function allows you to customize your gauge layout, and record an operating session.**

- **The "Monitor Setup…" option allows you to choose which monitored values you want displayed on the main Monitor View page.**

- **The "Show Gauges" options allows you to toggle the visibility of the customized Monitor Gauges.**

- **The "Monitor Logging" option allows TMax Tuner to record a tuning or operating session for later review or replaying. Very useful when a tuning issue arises.**

- **The "Monitor Replay" option allows you to open recorded Monitor Logs for review. This is a great tuning aide when troubleshooting operating issues.**

# Appendix A7: Window
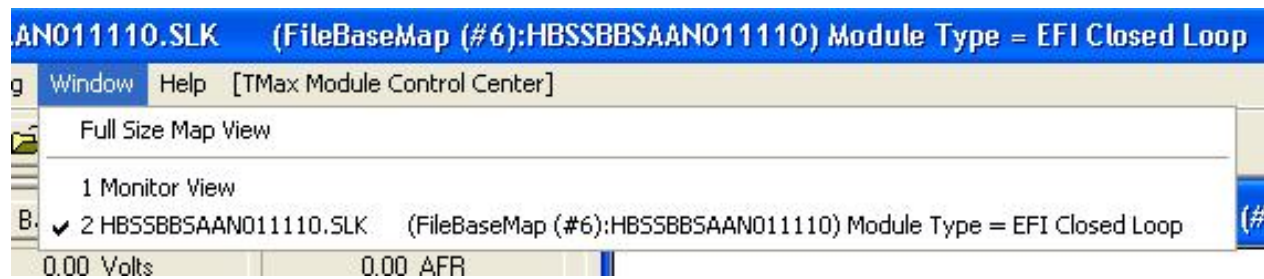


**The Window menu allows you to maximize the Tuning Map window and toggle with the monitor gauges for on-top view.**

# Appendix A8: TMax Control Center
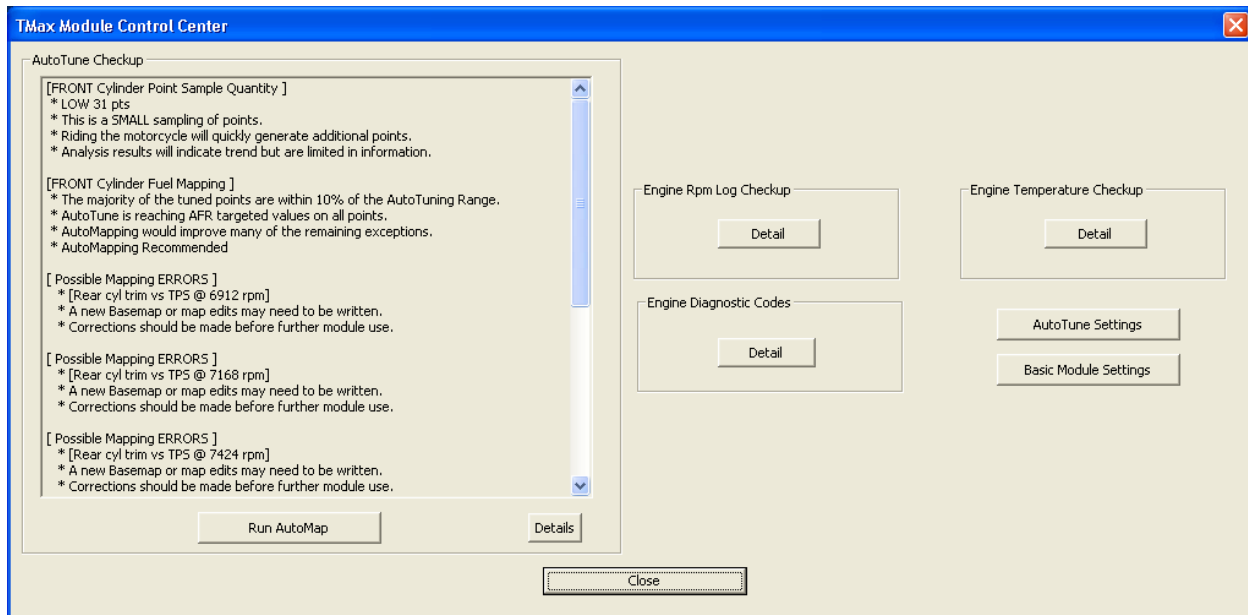


- **The "TMax Control Center" is an easy to use, one stop resource center for software navigation of the most commonly used ThunderMax functions. Located in the top tool bar of your Smart Link software, TMax Control Center allows easy access to:**

  - Progress of the Auto-Tune system fuel adjustments
  - IAC Calibration integrity
  - Engine RPM and Temperature Logs
  - Engine Diagnostic Codes
  - Auto-Tune Settings
  - Basic Module Settings (Basic Settings)

# Appendix A9: Help
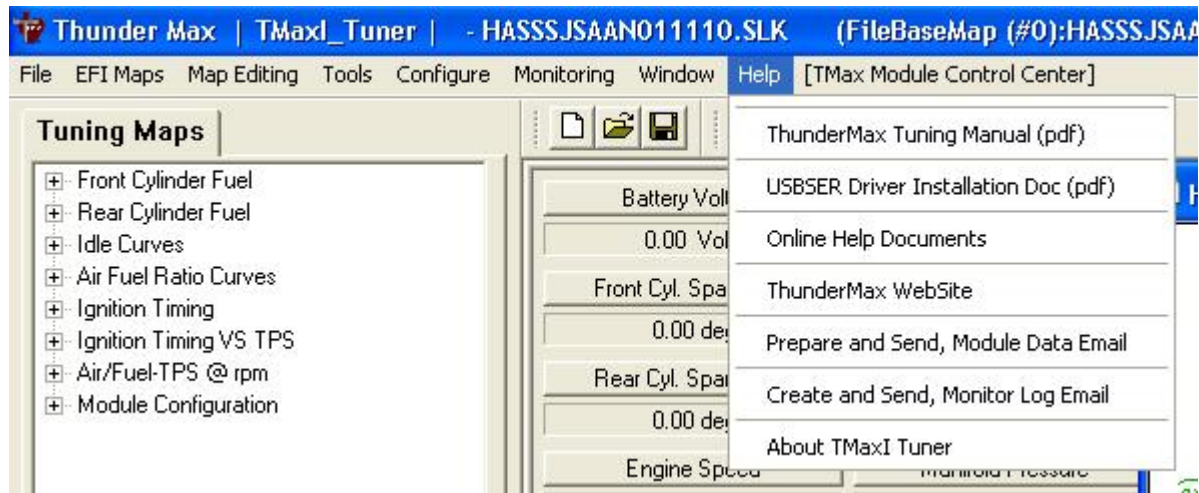


**The Help menu has seven options which all relate to technical support for the ThunderMax ECM and TMax Tuner.**

- **The ThunderMax Tuning Manual (pdf) is now easier to find; simply select this option and the latest Full Tuning Manual will open in Adobe Reader.**

- **The "USBSER Driver Installation Document" provides detailed instructions for installing the driver for USB communication between the ECM and your PC.**

- **The "Online Help Documents" is a link that takes you directly to the Instructions section of the ThunderMax website. Any additional support documents can be downloaded from this site.**

- **Simply select "ThunderMax Website" and now your default web browser will open directly to the ThunderMax site. The website contains all of the supporting documents, as well as information about additional ThunderMax products, Nitrous kits, larger throttle bodies, ThunderMax Cams by Red Shift.**

- **The "Prepare and Send, Module Data Email" is a new feature that packages your Base Map file, the Learned Fuel and creates and sends an email to the ThunderMax Product Support Team with your information.**

- **The "Create and Send, Monitor Log Email" feature will save a monitor log run, and automatically email it to the ThunderMax Product Support team.**

- **The "About TMax Tuner…" option will display the current TMax Tuner version number, as well as the current ThunderMax ECM Firmware version when linked to a module.**