Part 1: Module Installation

THUNDER MAX WAVE TUNE

#309-312 95-98 Marelli® FL (stock throttle body)

#309-313 99-01 Marelli® FL (stock throttle body)

mechanical speedo bikes require part # HA0313-6

Thank you for purchasing a ThunderMax ECM! Please read through the following instructions before beginning the installation procedure. Following these instructions will ensure that the ECM is installed and setup properly for optimal results. If you have any problems or questions, please refer to the TMax Tuner .pdf Manual, included on the CD (Help Menu) with this package. Record serial number NOW, in the space below for later use registering your ECM.

Serial # TMMM_____

If you don't have an HD® service manual for the year and model of the motorcycle you are working on, get one before starting the installation to use for reference.

The factory ECM you are replacing is triggered by signals from the cam position *and* crankshaft position sensor (CPS), while the ThunderMax, like the later Delphi® system, uses only the signal from the crankshaft position sensor. We recommend disconnecting the cam position sensor and installing a new crankshaft sensor and in-tank fuel filter on your (at least) 15-year old motorcycle during installation. Verify charging system operation and battery condition; check both ends of battery cables for clean, tight connections.

Oxygen Sensor Installation Tips

The ThunderMax kit includes robust Wide-Band oxygen sensors that report data from every cylinder combustion event to the ThunderMax ECM for automatic air/fuel corrections. 1995-2002 models will require the addition of 18mm sensor bungs to the exhaust header pipes if yours don't currently have them installed. Installation of the wide band sensors into most bung-equipped headpipes presents no clearance problems; however, some pipe brands may require exhaust pipe modification or sensor bung relocation for interference-free installation.The sensors must mount freely without contacting surrounding components.

If this is not possible, do not attempt to bend or modify the sensor in any way as it is a sensitive electronic component and will be damaged if you do. Modify the pipe if required for clearance. Weld-in bungs are available for exhaust systems not equipped with bungs or if current bungs present clearance issues. Bungs should be located no more than 3-4" from the head/pipe connection (for ideal location, refer to the 2007 FL model factory location). Weld-in bungs are available in straight or angled style from many industry sources. After installation, route the sensor harness away from the engine and along the frame when possible,above the lowest frame point to avoid the possibility of dragging ground during operation. *Avoid routing harnesses where engine movement or sharp edges can contact and cut into the harness or connector plugs.*
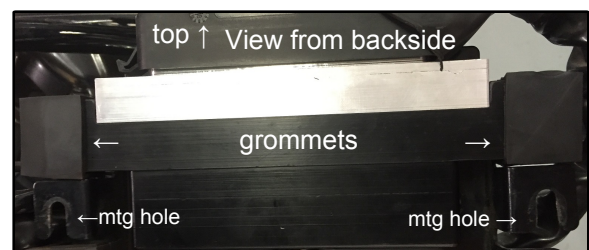
Installation

FL-A: Remove the seat, right saddlebag and side cover from the bike. Locate the fuse box that contains the ECM fuse, remove fuse labeled "ECM POWER".

FL-B: If the exhaust system you are using is not equipped with oxygen sensor bungs, bungs will need to be added to the exhaust pipes. Bungs must be located within 3"- 4" from the cylinder head. Install supplied wide band oxygen sensors in the front and rear exhaust pipes. Route and tie down the sensor harness away from the engine.

FL-C: Dis-connect the ECM connector and remove the factory ECM from the motorcycle, remove the 2 nuts that retain the ECM bracket. The ECM is attached to the bracket with rubber grommets, just slip the ECM housing tabs out of the grommets. If there are any other previously installed ancillary tuning device, remove it at this time.

top ↑ View from backside

grommets

←mtg hole   mtg hole →

FL-D: Route the Autotune harness (single small connector end) through the frame opening behind the transmission before positioning the ECM for installation. Route the rear O2 sensor connector back through this opening as well. Be sure to secure the O2 sensor wire away from heat and abrasion. Pull the rear O2 harness lead connector into the opening and push the 2 connectors together listening for a locking "CLICK". Tie up excess wire along the bottom of the ECM caddy and protect from heat, pinching and abrasion from the rear tire.

FL-E: Apply dielectric grease to the oxygen harness connector and insert into the ECM with the imprinted "ThunderMax" logo facing inward (as pictured). Tighten the (2) Phillips connector screws. Connect the mini usb cable to communicate with the module (picture show cable locked into place to stay on bike). You can also remove the cable and seal with attached plug after setup is complete. Install the ThunderMax ECM to the ECM caddy by inserting ECM housing tabs into the bracket grommets. Use dielectric grease on the ECM connector and snap it back into place, then position the rubber connector boot over the connector. Dielectric grease aids in assembly and helps to maintain a good connection.
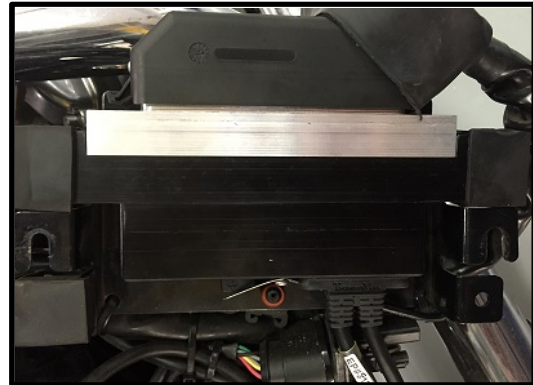
FL-F: Route oxygen sensor lead from front pipe along right frame rail and connect to 'front' O2 harness plug.   Route front harness connector behind oil filler spout. Position connector along   lower   frame   rail between engine and transmission. Push the 2 connectors together and listen for a loud "CLICK".

Securely tie harnesses to the frame and/or other harnesses with supplied wire ties. Avoid sharp turns while routing harnesses and avoid areas where engine movement, sharp edges,exhaust systems or hot engine components can contact and cut into the harnesses or connectors.

95-98 models: Mount bank angle sensor as shown below. Route tip sensor harness into the battery area and plug into accessory port.(do not use data link port). Insert the Green/Black wire terminal into the ECM harness pin slot number 7.
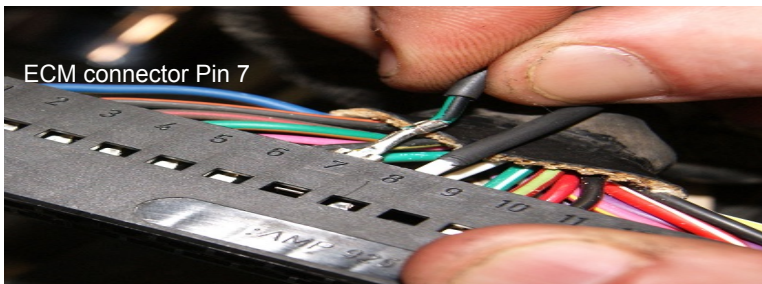
97-98 models: Drill 1/4" hole for bottom bolt/nut. The tab post goes in the top hole.

95-96 Bank angle sensor


97-98   Bank angle sensor
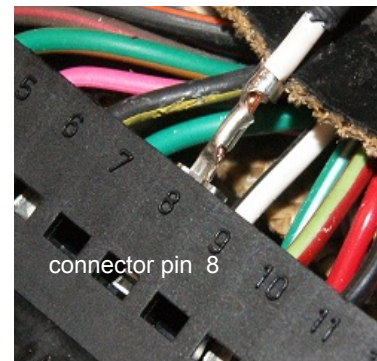

ECM connector Pin 7

Accessory

Port

95-99 models: Locate speed sensor connector in front of battery. Disconnect, then plug supplied speed sensor harness inline (male/female connector with white wire). Remove screw in ECM connector cover, slide cover off. Remove the terminal cover, insert the White wire terminal into the ECM harness pin slot number 8.
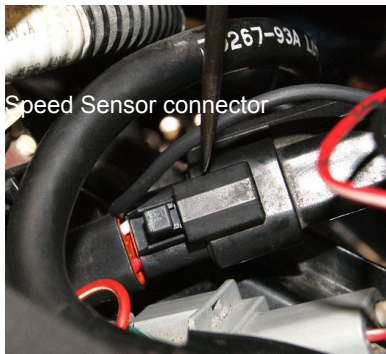

Speed Sensor connector

ECM connector

connector pin 8

00-01 models: Remove screw and slide connector cover off. (pics above). Insert the supplied speed signal wire (single Green / White wire) with the square style terminal into the ECM harness pin slot number 8. Then Install the round terminal end of the speed signal wire in the main harness connector pin location 5 (as shown below)

under right side cover
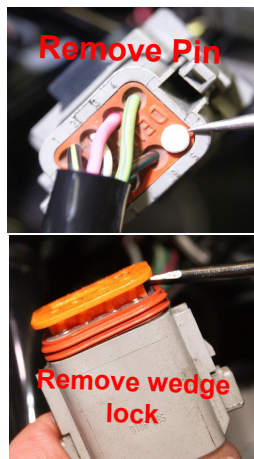

Remove Pin

Remove wedge lock

Insert socket through the connector seal, it will lock in place.

Slide wedge lock back in place.

Reconnect the to the harness connector.

ALL models with mechanical speedo: Install ecm side of green and white wire into ecm terminal 8 (See pic in 95-99). Run wire along existing bike wiring under tank and through fairing. Remove outer fairing, locate the 12 Deutsch connector, it has a white and green wire in terminal 11 on one end and nothing on the other. Unplug connector and release secondary lock. Install the Deutsch pin from the green and white wire into the empty slot in of the connector at terminal 11.
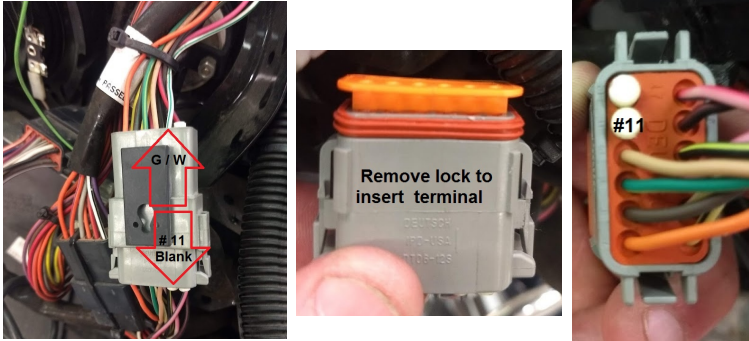
ALL models: There are several relays in the wiring system. Locate and remove the "ECM Power Relay" usually under seat (some models on ECM bracket). This will be replaced with **supplied relay** AFTER the battery cable is reconnected. This specially modified relay is configured with a "stay alive" circuit, required for your new ECM. After the ECM is plugged in, connect the battery positive cable, then install the new ECM Power Relay. If the lights come on or the fuel pump runs upon relay connection, the wrong relay was replaced. (correct this).

ALL models: Push the IAC plunger inward until it stops. Lightly rotate linkage to check for play. If there is any play, use the set screw to adjust the play out of the linkage assembly.
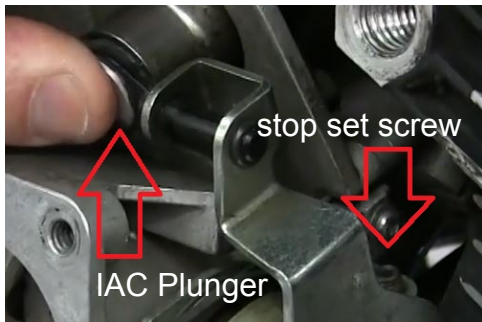

ALL models: Check to see if the bellcrank throttle stop is against the stop set screw. If not tighten screw (you may have to heat up to turn) until it just contacts the bell crank throttle stop. Be sure not to over tighten it will move partiaaly open the throttle. If screw turns freely remove, install loctite and readjust until the screw lightly contacts.

NOTE: Speedo calibrations 95-98 40960 99-01 4352
all mechanical speedo's use speedo calbration 4352

After your map is loaded, speedo calibration is set and you have initialized your system, start the bike and link to the ECM and click the Monitor button. If you don't have the following gauges visible (Std Throttle Pos, TPS 1 Raw,TAC Idle Position, Engine Head Temperature, Engine Speed, CL Corr Front, CL Corr Rear slide the map display to the side. Click on the gauge banner, click the box by activate gauge display. Look at the TPS 1 Raw value displayed it should be between 20 - 100. Crank bike watch the Engine Head Temperature gauge when it gets over 205 degrees the CL Corr gauges should show 0, the AFR front/rear will show readings.
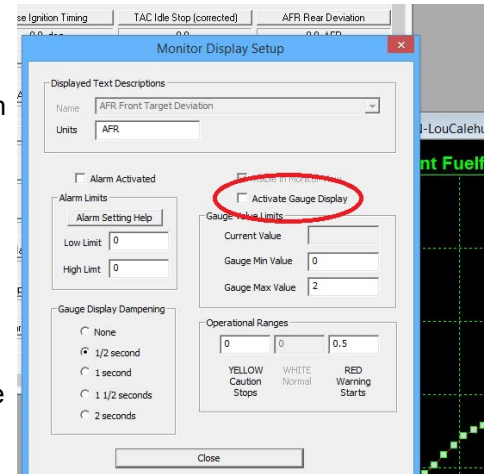
Look at the Standard Throttle position it should be between 3 - 7 degrees. Now look at the TAC Idle Position it should be between 20 - 40. If the TAC Idle Position is below 10 the Air bleed screws will need to be adjusted. The may be expoxy in the pocket covering the air bleed screws. If so shut the engine off and dig the expoxy out, then restart to proceed. When adjusting turn the both equally in 1/4 or 1/2 turn adjustments.

There is a video of this adjusment procedure located at www.thunder-max.com > Support > Support Videos.

NOTE: After Part 2 setup is complete, remove mini usb cable and tighten nuts on ECM caddy. Finish re-assembling bike.

Part 2: Software Setup Guide

#309-XXX ThunderMax Tuner Software setup / map loading

Thank you for purchasing a ThunderMax ECM! Please read through the following instructions before beginning the installation procedure. Following these instructions will ensure that the ECM setup properly for optimal results. If you have any problems or questions, please refer to the TMax Tuner.pdf Manual, in the software (under the Help Menu).

Step 1: Download Software and install software

Go to www.thunder-max.com , click on support tab, then software tab, now click TMax Tuner (yellow/top disc) Click save file and then ok, the file will start to download. When completed locate and open the file folder and double click on the setup (Application file or .exe file depends on Windows version). The Install Shield Wizard will automatically open and guide you through installing the software on your computer. After installing and opening the software the first time, you will be prompted to install the driver for the USB connection. The TMax Tuner software is designed to run on computers using Microsoft® Windows 2000™, XP™, Vista™and 7, 8 & 10 operating systems. Your computer must have an adequate amount of free space on the hard drive for proper operation. TMax Tuner is approx.140MB when installed. TMax Tuner is not compatible with any other operating systems.

Step 2: Linking and Installing a Map

The TMax Tuner software for the ThunderMax EFI systems contains the correct drivers required for USB interface with the ECM. Connect the USB cable to the specific port on your PC that the driver will be configured to and the ThunderMax
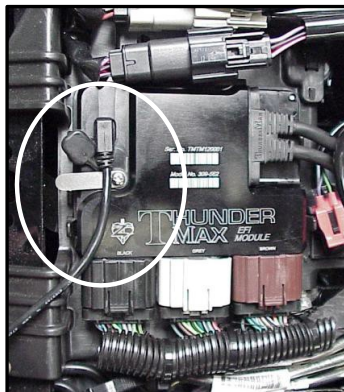

ECM communication connection located under the retainer plate (loosen retainer screw, rotate retainer plate and open rubber weather seal). Open the TMax Tuner software and turn the bike's ignition and handlebar switches to the on/run positions. Follow the prompt instructions for installing the driver. Turn off ignition when finished.

(There is no need to be linked to the module at this time). This section is only to ensure you are working with the latest version of TMax Tuner software and have the most up-to-date selection of base maps. It is suggested that you establish an Internet connection and click **[Configure]** on the tool bar, then **[TMaxI Software Update]** and follow prompts.
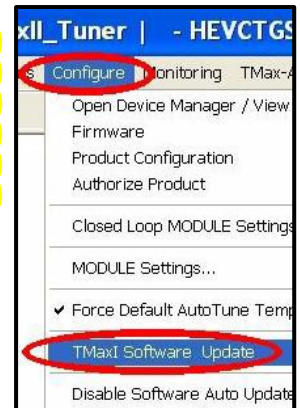
After uploading latest software (if found), next click **[EFI Maps] [EFI Map Listings (Throttle By Wire)]**, double-click any map; when the Base Map Name Encoding window appears, click the **[Check Internet For Updates]** button and follow the prompts. Close window after updating.
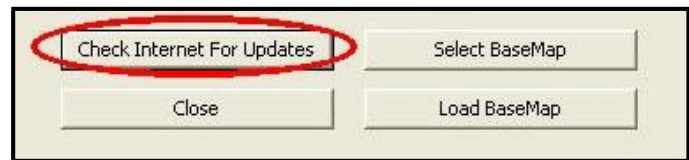
Step 3: Enter VIN Number and Product Registration

With the communication cable connected to your computer and the ThunderMax ECM, cycle the ignition switch to the 'on' Position (be sure kill switch is in the run position) and linking to the ThunderMax

will occur automatically. (Red **[Link]** button turns green).

You will be prompted to enter the bike serial number (VIN); answer **[OK]** and enter your motorcycle's serial number (CAPITAL LETTERS ONLY), click **[OK]** then **[Close]**.

Now click **[Yes]** when the product registration prompt appears. When the product registration window opens, fill in the requested fields then click **[Close]**. Unlink (click green

[Link] button) and turn off ignition when finished. Once your software and map databases are verified as up-to-date and your module is registered, move to selecting and loading your base map.

Selecting A Base Map File from the Database
If you purchased a pre-mapped system, you may skip the map installation process.

The TMax Tuner EFI Map Database will help you chose a Base Map for your application. To open the Map Database, select from the toolbar **[EFI Maps] then your application (Throttle by Wire), (Throttle Cable) or (VRod).**

Available base maps will be shown (if the **[Show All Maps]** button at the lower left of the screen is highlighted, click it to clear any filtered maps so all maps will be shown).
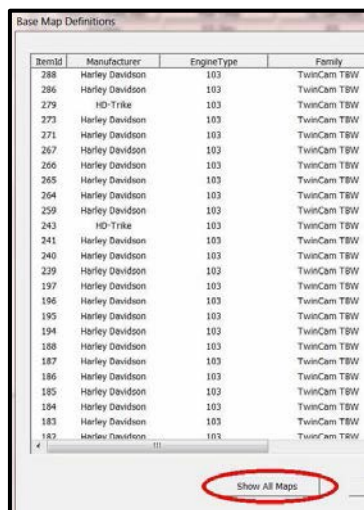
You will now be able to select the closest Base Map for your engine combination. Please read the following section on Key Elements, this will help you quickly narrow down the selection of available Base Maps and find the right one for your application.

Base Map "Key Elements"

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

Engine Size. A correct match to the engine's stroke is more important than an exact match of engine displacement. Stroke and cam timing influence engine pumping pressures. The correct shape of spark curves in the base map will be best matched by engine stroke.

Throttle Body / Injector Size. Choose the throttle body and injectors being used for your application (most applications will be "stock" unless performance parts have been installed).

Camshaft. Many popular short duration aftermarket cams (less than 240° intake duration) perform well when using a stock-cam base map. With broader timing cams (more than 240° intake duration) you may find that choosing a base map calibration developed for an aftermarket cam to be a better choice.

Exhaust System Design. There is no need for concern if an exact *brand* match does not appear in the Base Map library. Simply select the Base Map with the closest *style* of exhaust system (Slip-ons, 2:1, True Duals). Choosing the closest style will yield excellent results. Group your exhaust system in one of the following three categories:

Factory Head Pipe with Crossover: Dual exhaust systems with a cross over pipe that connects the front and rear exhaust pipes (includes 'X' pipes). Typically used with accessory slip-on mufflers. **Bikes with catalyst-equipped mufflers or headpipes require maps designed for use with catalyst-equipped systems or damage to the catalyst can result.** ThunderMax maps for use with 96, 103 and 110" internally stock engines are catalyst-safe maps.

2 into 1: Both head pipes converge into one collector.

(True) Dual Exhaust: 100% separate exhaust pipes.

ThunderMax's AutoTune system allows you to choose a Base Map that isn't an exact match of components and still have excellent results. Even if your combination isn't listed, select the closest Map match and let the AutoTune create your custom Base Map while you ride. The closer match 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. Once you have allowed the system to establish custom AFR fuel-flow adjustments, you can use the AutoMap function to create an all-new Base Map based upon the Auto Tuned learned adjustments. To use the AutoMap feature, see the tuning manual for the procedure on how to create your custom base map using AutoMap.

Base Map File Browsing / Selection

With your Base Map Definitions window open, you may begin narrowing down the list of maps for your application. To sort the map files by a particular key element, left-click on the column heading to arrange the column in alpha/numeric order. All of the columns can be sorted in this manner for filtering purposes. Filter the maps to identify the base map that best matches your application by following these easy steps:

First (in order of importance) place your curser over the **'Family'** heading and left-click to change the sort order of that column. Scroll down the list and place your mouse pointer over you bike's family match and right-click to filter out no-match applications from the list.

Tip - After any filtering, notice that the **[Show All Maps]** button at the bottom left is now selectable. At any time if you want to return to the complete library listing, left-click the **[Show All Maps]** button and you will start over with all Base Map Files in the library displayed.

Second, right-click the engine size under **'Engine Type'** that matches your engine. All maps that do not match your selection will be filtered from the screen.

Third, place your curser over the **'Throttle'** column and right click your match (injector size is more important than throttle body size if you have to choose).

Fourth, right-click the **'Cam'** that closest matches your application.

Fifth, right click the **'Exhaust'** that closest matches your application.

Keep right-clicking the application columns until you have located the best map match (in the case of identical maps, choose the latest date). Highlight the map you've chosen (left-click; blue bar indicates selected map) and click the **[Close]** button.

Step 4: This brings you to the 'Base Map Name Encoding' page, from which you can review the map parameters. Once verified, click the **[Load BaseMap]** button to load the map into the software.

Note - If you're still unsure of which Base Map to select, please email the specifications of your Key Elements to Support@Thunder-Max.com. Please title the email "Base Map Selection" for a faster response.

Step 5: Next, go to the **[Tuning Maps]** Tree and click the **[+]** sign next to **[Module Configuration]** to reveal the **[Basic Settings] tab.** Open the Basic Settings window and click the **[Speedo Cal]** button (list window appears).

Verify that the Speedometer Calibration is set for your year motorcycle based on the chart. If it is, click **[Cancel]**; if it is not, enter the correct value and click **[OK]**, then **[Close]** the Basic Settings window. *If your bike doesn't have Automatic Compression Releases (ACR'S) toggle the Compression Release Control to 0 to Deactivate. If this isn't toggled you will get a "1655 ACR low code". Unless it is a CVO model, most bikes prior to 2011 models do not have "ACR's". (Normally on 103" & up)*

Step 6: **Now that the Base Map is loaded into the TMax Tuner software; you must 'Write' (transfer) the Base Map to your ThunderMax ECM.** With the communication cable connected, linking to the module is now automatically performed with the TMax Tuner software when the handle bar and key switch are in the on/run positions. Turn the ignition switch on; the red **[Link]** button will turn green to indicate a successful link. Once linked, from the toolbar click **[File] [Write Module Maps and Settings]**, answer **[OK]** to the 'To Running Position' command in the 'Module Configuration Write Options' window that opens. When the system recognizes your motorcycle model through the VIN number entered earlier, you will receive

a prompt that the chosen map has settings applied for either an air or liquid cooled engine; only if the system does not recognize your model through the VIN, the following window will appear: Choose the correct application and click **[OK]**.
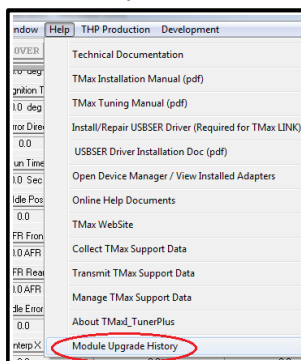

Cooling System Type

The transfer bar then appears during the map load. Once the Base Map has been written to the module, clear any active Diagnostic Code readings and Learned Fuel Adjustments that may have been created during the live module testing session that each ThunderMax module must pass. While linked, from the Tuning Tree select **[Module Configuration] [Diagnostic Codes]**. When the Diagnostic Codes window appears, select [Clear Diagnostic Codes]. After completing this step, proceed to **[Map Editing]** menu on the tool bar and select **[Clear "Learned Fuel Adjustments (CLP OFFSET)"]**.

These steps ensure you will be starting with a "clean slate" Base Map.
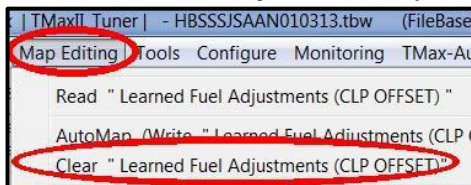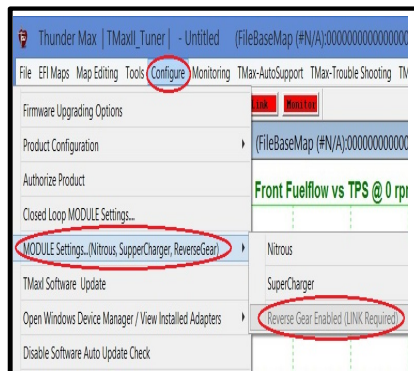

Step 6a: **Skip if not a trike or Freewheeler or if your Firmware is version 5.12 or higher (Reverse is controlled by the VIN with newer firmware).**
Link to verify firmware version click Help then Module Upgrade History. For reverse; go to the **[Configure]** Tree and then click **[Module Settings, Nitrous, Super Charger, Reverse Gear]** tab to reveal the listed options to choose. While linked (Link button is green) click Reverse Gear enabled option.

Verify firmware version   **Toggle on reverse**

Need Help?
We have included many easy-to-use features for supporting and enriching your ThunderMax experience. A full tuning manual, links to online support documents and sites as well as the ability for you to easily attach a map or recorded engine monitoring log to an email directly to our support department are found here. In the future to assist with tech support help, please follow the instructions on performing a data collection to send to our tech support staff via email. This information is valuable to help diagnose any issue.

Step 7: Initialization Procedure

IMPORTANT STEP BEFORE STARTING

This step is required for new module installation, or when interruption of 12v power to the ECM takes place. Example: battery change, removal of battery, ECM or maxi fuse, etc. Turn the ignition switch on with the handlebar rocker switch to the run position for 20 seconds, uninterrupted. After 20 seconds, cycle the ignition switch off, repeat 3 times. Then turn ignition on and start the engine. Let the motorcycle idle on its own for 15 seconds. Cycle the ignition off and restart the motorcycle; normal idle speed should be attained depending on engine termperature. Warm-up cycle will have slightly elevated idle speed (approximately 1200 rpm) until engine reaches operating temperature. To disconnect from the PC, click the Unlink button (turns to red), remove the USB cable and snap the weather seal plug into the USB cable port. Position the retainer plate over the weather seal and tighten the retainer plate screw.

Congratulations!
You have successfully installed and set up your ThunderMax ECM. Now it's time to ride the bike and let ThunderMax optimize your EFI system! Several riding sessions that allow the engine to reach normal operating temperature should be completed with as much variation in terrain and RPM as possible. Your ThunderMax customizes your map based on your engine, ambient conditions and your riding habits. For an automatic evaluation of your systems tuning, after several sessions have been logged, you can link to your ThunderMax and select **[TMax Module Control Center]** for a complete analysis of the *Air Fuel Ratio* adjustments that have been made. If more optimization is suggested just follow prompts to complete the process.