

THUNDER MAX

EFI made simple.

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 SmartLink Tuning .pdf Manual, included on the CD with this package.

Step 1 Insert the SmartLink CD into your computer. SmartLink will automatically open the InstallShield Wizard when the computer finds the CD-Rom. Follow the instructions and install the software on your



computer. The authorization code is 85MDN1ZJXXPF-4. If you do not have a serial port on your computer for the communication cable, you will need to use a USB to Serial converter (an inexpensive converter is available from Zipper's, #372-000). Install the drivers at this time; follow the instructions given by the manufacturer of the converter.

Step 2 Install the ThunderMax and AutoTune (if equipped) modules.

Touring and Softail® Models - Locate the fuse box that contains the ECM fuse, remove fuse labeled "ECM POWER". FL models (shown below), fuse block is to the right of the ECM, located under the right side cover. Softail models, the ECM and fuse block are located under the seat.

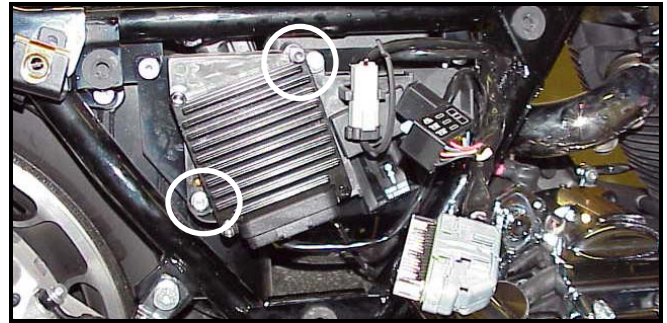


Installation / Setup Guide

Please Note: This product is Legal in California only for racing vehicles which may never be used upon a highway. The user shall determine suitability of the product for his or her use. Installation and use on a pollution-controlled vehicle constitutes tampering under the U.S. EPA guidelines and can lead to substantial fines and penalties. Review your application and check your local laws before installing.

Step 2a Unplug the ECM wiring harness from the factory ECM (FL model shown).

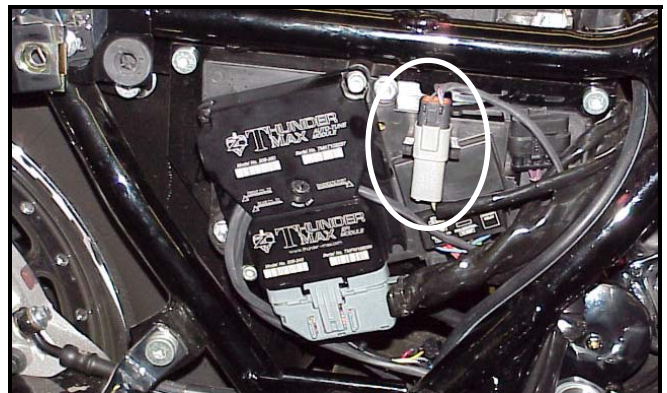
Step 2b Remove the factory ECM from the motorcycle, the ECM is held to the electrical caddy by socket head cap screws. The screws have a locking agent on them and can be difficult to remove. Work the screws back and forth slowly to break them loose.



Step 2c Install the ECM wiring harness to the ThunderMax ECM. Do not install the ECM onto the motorcycle at this point. If the ECM is mounted onto the electrical caddy at this step, it is difficult to get the fuse box in place.

Step 2d Route the AutoTune harnesses (if equipped) through the frame opening before positioning the ECM for installation. Re-install the ECM fuse and secure the fuse box back into position on the electrical caddy.

Step 2e Mount the ThunderMax ECM onto the electrical caddy using the two factory socket head cap screws. Plug the AutoTune harness into the data port (shown).

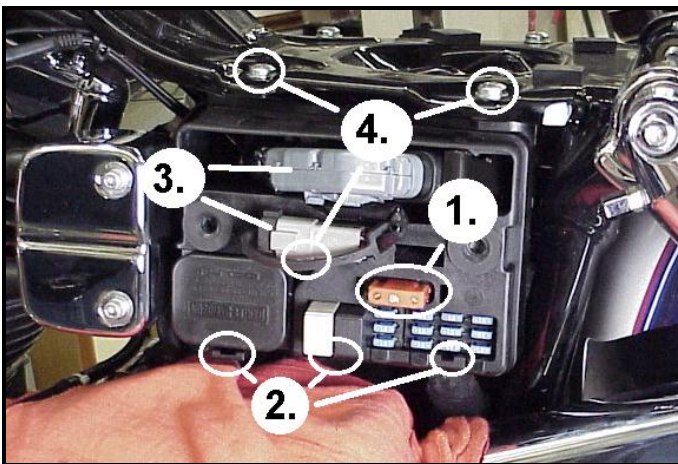


FXST model shown below. Data port is located on the left side of the bike next to the fuse box cover.

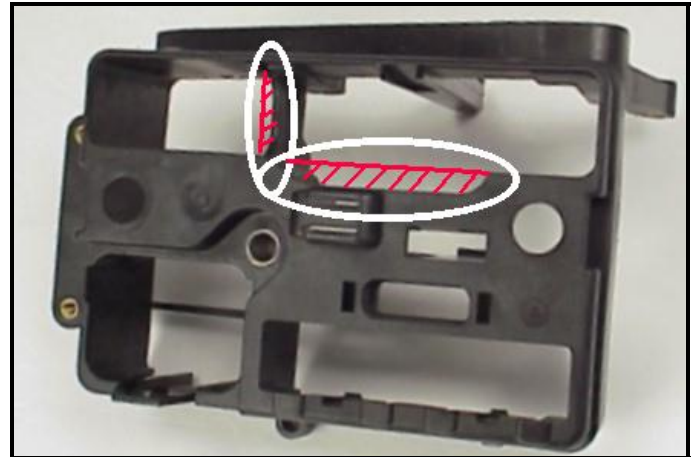


FXD (Dyna®) Models – Remove the left side cover to reveal the electrical caddy.

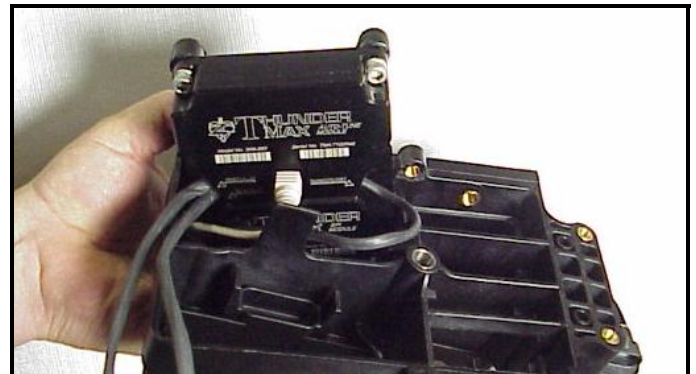
Step 2f Remove the main fuse (1). Use a small screwdriver to release the catches holding the fuse block, relay block and TSSM module to the electrical caddy (2). Unplug the main harness from the ECM and remove the data plug from its holder (3). Remove the 2 hex head and 1 socket head mounting bolts to free the caddy for removal (4). Unplug the plug wires and harness from the coil and remove the caddy.



Step 2g Remove the stock ECM from the electrical caddy. The caddy must be slightly modified for additional harness plug clearance. Use a Dremel or Roto-Zip tool to provide additional clearance for the harness plug catch; also remove approximately 3/8" from the partition support as shown.

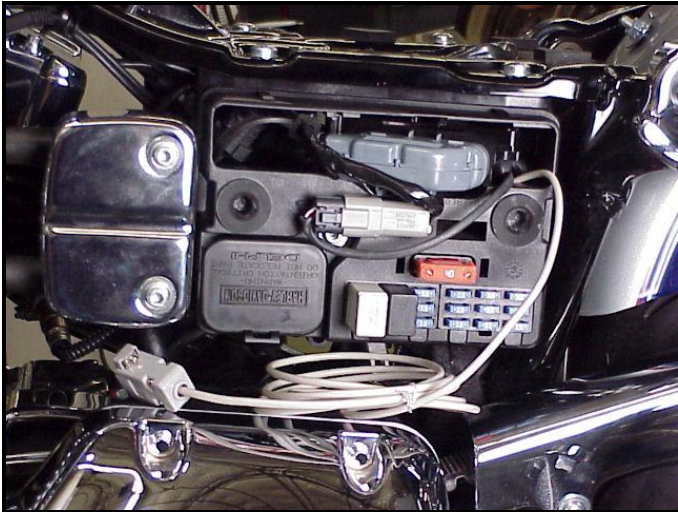


Step 2h Because of the impossibility of connecting the communication cable without disassembly once assembled on FXD models, the cable should be permanently installed to the ThunderMax ECM. Feed the communication cable, and if equipped with AutoTune, the AutoTune power harness through the ECM plug port of the caddy and mount the ECM to the caddy as shown. The oxygen sensor harnesses should exit towards the opposite side of the caddy.



Step 2i If equipped with AutoTune, before reinstalling the caddy, feed the front cylinder oxygen sensor harness through to the right side of the bike, over the top and to

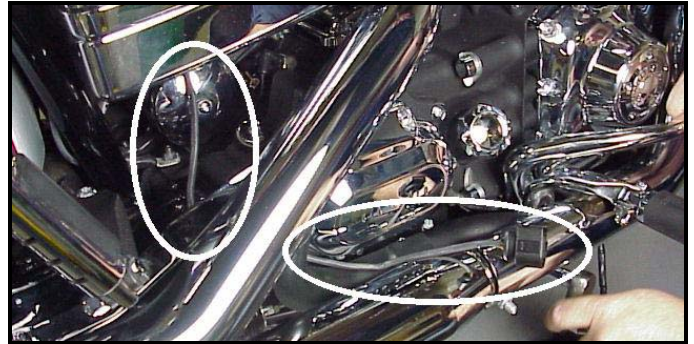
the rear of the starter motor. Reinstall the caddy with fuse and relay blocks in place. Reconnect the TSSM, coil and ECM harnesses. If equipped with AutoTune, plug the closed loop module into the data link on the bike. It is through the data port that data from the AutoTune module is transferred to the ThunderMax. A 'Y' harness is available (# 309-343) to keep an open data port if desired. After programming and setup, the communication cable can be coiled up and kept under the caddy cover.



Step 2j If equipped with AutoTune, install supplied wide band oxygen sensors in the front and rear exhaust pipes. If your bike is a 2006 FXD or 2007 (all) model, remove the factory narrow band sensors and install the wide band units in the stock location. 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 4"-6" from the cylinder head. Since the wide band sensors are longer than the factory narrow band sensors, some brands of exhaust with bungs pre-installed may have clearance issues with other components. In some cases, modifications must be made to accommodate the sensors. In extreme cases, bungs may have to be relocated for proper clearance. Weld-in bungs are available from Zipper's (# 272-200). After installation, route the sensor harness away from the engine and along the frame when possible. Avoid routing harnesses where moving parts can contact and damage the harnesses or plugs.

Step 2k Connect the sensors to the closed loop module. The sensor wiring harness for the rear cylinder sensor is shorter and can be easily identified by black tracers on all of its wires. It is very important to install these correctly or the engine will perform poorly!

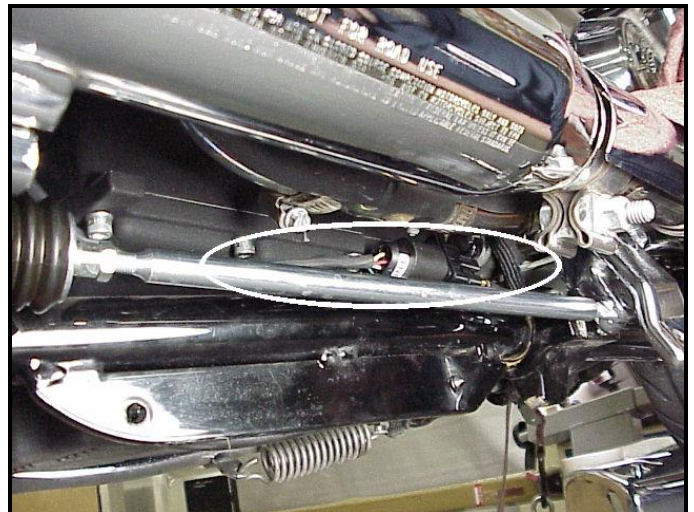
FXD Tips: The rear harness mounts easily, just coil the excess wires and locate them above the transmission. The front harness should travel from the AutoTune module, over and to the rear of the starter motor, behind the exhaust support bracket and between the crossover pipe and the transmission, as shown.



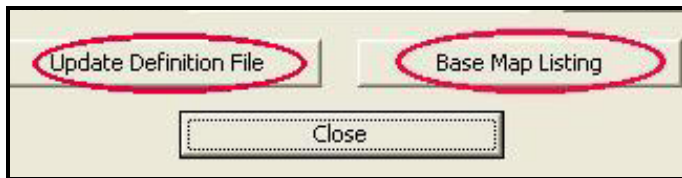
Remove the footpeg/brake pedal bracket mounting bolts and move the assembly towards the exhaust pipe. Route the front exhaust sensor harness under the cam cover exhaust support bracket and behind the brake pedal; connect it to AutoTune harness.



The sensor plug and harness will drop down to the frame rail with a little brake pedal wiggling where it can be zip-tied to the frame rail, out of sight and out of harm's way.



Step 3 Load a Base Map to your ThunderMax module. Loading a base map to your ThunderMax is easy thanks to the filtering system in the SmartLink software. Open SmartLink; from the toolbar choose **[EFI Maps] [EFI Map Listings / Definitions]**. You should first update the Map Definitions file to ensure you have the latest available maps. Click the **[Update Definition File]** button (requires internet connection). After updating, select **[Base Map Listing]**.



Available base maps will be shown (if the **[Clear Filters]** button at the lower left of the screen is highlighted, click it to clear filtered maps so all maps will be shown).

ItemID	Manufacturer	EngineType	Family	Throttle	Exhaust	Muffler	AirCleaner
199	HarleyDavidson	88ci	TwinCam A&B	Stock HD TC 06-07 25° Inj	Stock HD FL HD Pipe	KW HP+ Mufflers	H-Flow/2.75" Deep
198	HarleyDavidson	88ci	TwinCam A&B	Stock HD TC 06-07 25° Inj	Rinehart FL True Duals	N/A	H-Flow/2.75" Deep
197	HarleyDavidson	95ci	TwinCam A&B	Stock HD TC 06-07 25° Inj	Thunderheader FL Long	N/A	H-Flow/2.75" Deep
196	HarleyDavidson	88ci	TwinCam A&B	Stock HD 06 8" Inj	D+D Fat Cat	Model = Dynia	H-Flow/2.25" Deep
195	HarleyDavidson	103ci	TwinCam A&B	Stock HD TC 06-07 25° Inj	Rinehart FL True Duals	N/A	H-Flow/2.25" Deep
194	HarleyDavidson	103ci	TwinCam A&B	Stock HD TC 06-07 25° Inj	D+D Fat Cat	Model = Softall	H-Flow/2.75" Deep
192	HarleyDavidson	103ci	TwinCam A&B	Stock HD TC 06-07 25° Inj	Y&H Big Shot w/PC	Model = Softall	H-Flow/2.75" Deep
191	HarleyDavidson	95ci	TwinCam A&B	Stock HD TC 06-07 25° Inj	Rinehart FL True Duals	N/A	H-Flow/2.75" Deep
189	HarleyDavidson	88ci	TwinCam A&B	Stock HD 06 8" Inj	Stock HD F&D HD Pipe	KW HP+ Mufflers	H-Flow/2.25" Deep

Filter the maps to locate a base map that best matches your application by placing your cursor **first** over any 'Engine Type' that matches your engine and right-click it. All maps that do not match your selection will be filtered from the screen.

Item...	Manufacturer	EngineType	Family	Thro
211	HarleyDavidson	103ci	TwinCam A&B	50mm Z
212	HarleyDavidson	103ci	TwinCam A&B	50mm Z
208	HarleyDavidson	103ci	TwinCam A&B	50mm Z

Second, place your cursor over the 'Throttle' column and right click your match.

Family	Throttle	Exhaust
winCam A&B	Stock HD TC 06-07 25° Inj	D+D Fat Cat
winCam A&B	Stock HD TC 06-07 25° Inj	Rinehart FL True Duals
winCam A&B	Stock HD TC 06-07 25° Inj	Rinehart FL True Duals

Third, right-click the 'Exhaust' type that closest matches your application.

Throttle	Exhaust	Muffler
Stock HD 01-05	Rinehart FL True Duals	N/A
50mm Zippers	Rinehart FL True Duals	N/A
k HD TC 06-07 25° Inj	Rinehart FL True Duals	N/A
k HD TC 06-07 25° Inj	Rinehart FL True Duals	N/A

Fourth, right click the 'Muffler' column if further definition of the exhaust system is required (depends on exhaust application). Keep right-clicking the application columns until you have located the best map match. Highlight the map (left-click; blue bar indicates selected map) and click the **[Close]** button. This brings you to the 'Base Map Name Encoding' page, from which you can review the map parameters.

Base Map Name Encoding

Engine Manufacturer: H

Engine Type | Family: E

Cylinder Head Type: V

Piston Type: C

Cam: T

Exhaust: G

Throttle: V

Air Cleaner: G

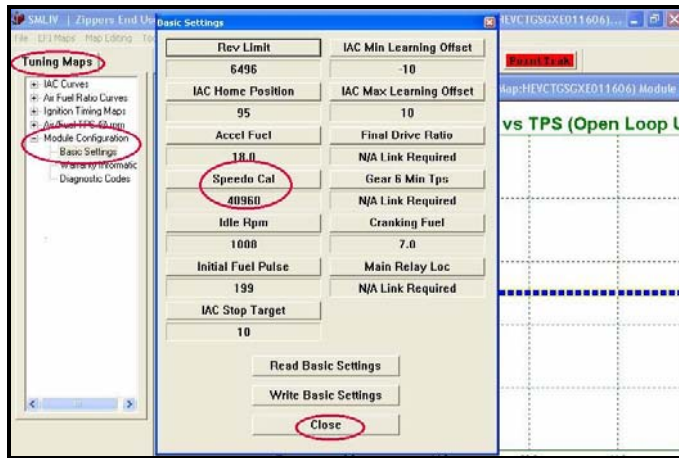
Muffler: X

Modification: E

Base Map File Name:

From this page you can load the base map into the software by clicking the **[Load Base Map]** button. **[Close]** this page to view the open map page. From the 'Tuning Maps' Tree, click the + sign next to **[Module**

Configuration], then double-click **'Basic Settings'**. The basic settings page opens. Check to see if the

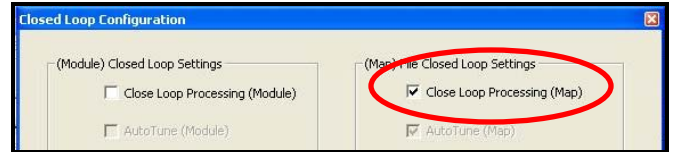


[Speedo Cal] calibration setting matches your year and model; if not, click the button, enter the correct value as shown, then click **[Close]**.

Speedometer Calibration Settings

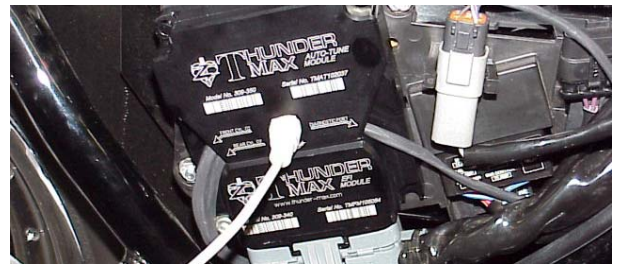
Dyna	2004-2005	40960
	2006-2007	45900
Softail®	2001-2003	4352
	2004-2006	40960
	2007	42450
Touring	2002	4352
	2003	20480
	2004-2006	40960
	2007 (16")	42450
	2007 (17")	42000
XL 883	2007	48400
XL 1200	2007	46000

Step 4 Next is to configure the module for open or closed loop operation (closed loop operation requires the AutoTune module and wide band sensors). Most maps will initially open as 'Closed Loop Configured' by default. To change or edit these settings, select **[Configure]** **[Closed Loop MODULE Settings]** from the toolbar to open the dialog page. This page is divided into two halves, the left side controlling the 'Module' settings while the right side controls the 'Map' settings. The 'Map' side is used to store the settings you desire the base map to dictate to the module. The 'Module' side, editable only when linked to the module, can be used later to override the map settings if desired.

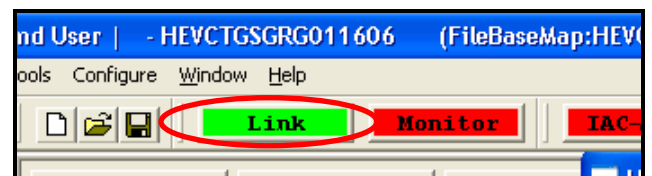


For closed loop (AutoTune) operation, click the 'Closed Loop Processing' box. For open loop operation, this box should not be checked (click checkmark to un-check). Close the window. Once linked, the system detects if an AutoTune module exists on the bike and will inform you via screen message if there is a mismatch.

Step 5 Now you are ready to 'Link' and 'Write' the map to the ECM. Attach the communication cable from your computer to the ThunderMax module, making certain that the cable is routed away from any part of the motorcycle that generates heat.

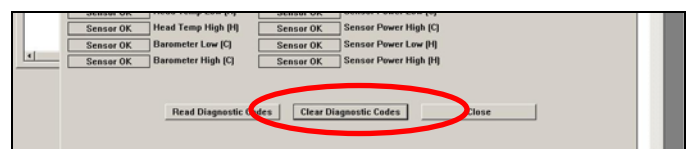


Step 6 To link to the module, turn the key switch to the "Ignition" position, making certain the "RUN / OFF" rocker switch (Kill Switch) on the handlebar controls is in the "RUN" position. Select the "Link" Button in the SmartLink software. The button turns green to indicate a successful link.

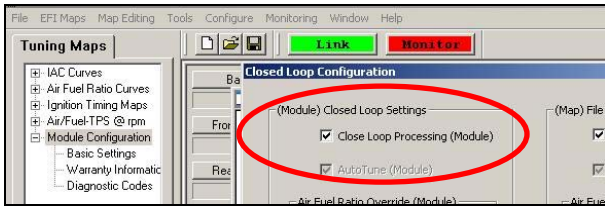


From the toolbar, click **[File]** **[Write Module Maps and Settings]**, answer OK to the message that informs you that you are about to overwrite the current map in the module, and the transfer bar appears while the map is loading.

Step 7 Verify Module Settings. Before performing this step, clear any active Diagnostic Code readings. While linked, from the Tuning Tree select **[Module Configuration]** **[Diagnostic Codes]**.



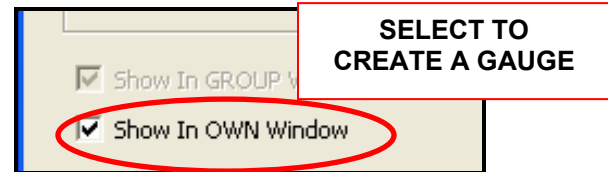
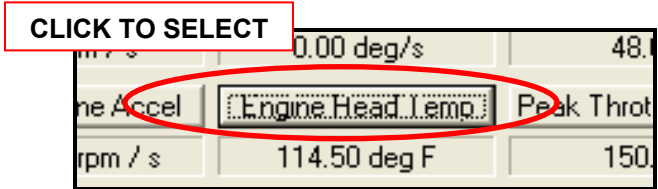
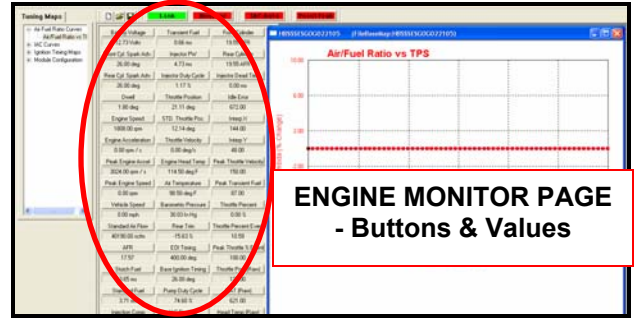
When the Diagnostic Codes window appears, select [Clear Diagnostic Codes]. After completing this step, select Basic Settings from the Module Configuration menu and verify that the speedometer calibration is correct and if the bike is a 2007 or later model the 6th gear indicator settings are correctly set (Final drive ratio [87], Gear 6 Min TPS [40]). After verifying these settings, click [Write Basic Settings]. If the installation is to be operated in closed loop mode (with AutoTune module), select [Configuration] from the toolbar menu and click [Closed Loop Configuration]. Verify that the [Closed Loop Processing] and [AutoTune] boxes are checked on the left (module) side of the window.



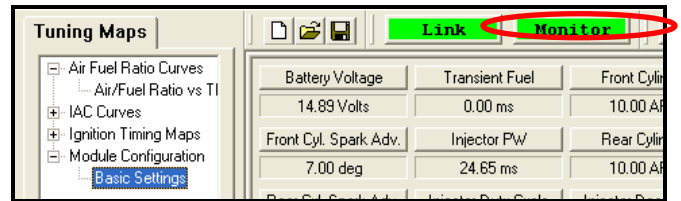
Next, initialize the new ThunderMax ECM. Initializing establishes 'home' positions for the TPS and IAC. With the handlebar switch in the 'ON' position, cycle the key switch on and off 3 times, leaving the ignition on and off for 30 seconds each cycle. DO NOT start the engine or move the throttle during this process. After 3 on/off cycles, start the bike 2 times, letting it settle at idle for 10 seconds; the idle should be smooth and steady. Some engines may require several on/off engine starts to initialize properly. After initialization, shut off the engine (cycle handlebar switch), but stay linked for step 8.



Step 8 Before restarting the engine, grab the open map page's focus (blue) bar with the mouse and drag it to the right of the screen, exposing the Engine Monitor Gauges & Values page. From here you can set up the gauges that you may wish to monitor while the engine is running. The "IAC Position", "Engine Head Temp", and "Engine Speed" gauges are highly recommended. To select the gauges you wish to view, click on the Monitor Gauge name (Button), and select "Activate Gauge Display" when the Monitor Display Setup appears. To show the gauges on the screen, from toolbar click [Monitoring] [Show Gauges]. You may select any gauges that you deem important; if too many are chosen your screen will be cluttered. Experiment with the gauges but always display the three that were mentioned above.



Step 9 Select the "Monitor" button to activate the gauges. It is located beside the "Link" button and will turn green when the monitor gauge function is live. The gauges will be displayed if they were not already on the screen.



Step 10 Make certain that the motorcycle is in neutral and the engine is cold, and then start the engine. Let it warm up at idle, without moving the throttle, to normal operating temperature of 245-285 degrees. After reaching normal operating temperature, shut off the engine.

Step 11 Unlink the SmartLink software from the ECM, turn off the ignition and remove the communication cable from the ThunderMax ECM. Use the 'Save As' command to create a folder and save the map to your hard drive. The motorcycle is now ready to be ridden. Several riding sessions that allow the engine to reach normal operating temperature (245-285 degrees) should be completed. During this process, the IAC virtual stops will automatically be adjusted to the IAC target values set within the map's basic settings. This feature automatically adjusts how the engine comes back to the

specified idle speed. If the IAC stops are set too low, the engine will dip below the specified idle speed during certain transient conditions. If the IAC stops are above the IAC position, the engine will idle above the idle rpm specified in the idle speed vs. engine temperature page. If it determined that these automatic adjustments have not resulted in satisfactory operation of the engine, consult the SmartLink Manual (enclosed on your software disc), Section 3 (Tuning the ThunderMax ECM) for further adjustment procedures.

CLOSED LOOP PROCESSING

When equipped with AutoTune, your SmartLink software will allow you to set Air/Fuel tuning parameters for your ThunderMax and its installed base map. To set Target AFR and AutoTune Limits, go to the toolbar and click **[Configure] [Close Loop MODULE Settings]**.

The Closed Loop Configuration dialog page opens; the right side shows the default MAP settings stored in the MAP file (settings are applied to the installed base map during the 'Closed Loop Format' conversion performed by SmartLink), while the left side shows what the module is currently set to (unadjusted, these settings will mirror MAP's settings).

The un-highlighted left 'MODULE' side of the page allows editing of those settings within the module for tuning purposes. To edit module settings, click the **[Link/Read (Module)]** button (left side highlights/active). You can now edit these settings within the module should you want to change any of the settings from the MAP default settings.

Closed Loop Processing (Module) – Check **[ON]** to enable closed loop AutoTune processing. During closed loop processing, the ThunderMax module processes feedback from the oxygen sensors to adjust the fuel volume at all points by creating learned "offset" points from the installed 'base map' fuel points. The 'static' base map is dynamically used by the ThunderMax module and the AutoTune's active (closed loop) feedback system. This system optimizes the fuel points to fit the target air/fuel ratio through 'learned offset points'. These 'learned offset points' are stored within the ThunderMax and are used in conjunction with the base map. The 'base map' fuel points are not being adjusted by either the AutoTune or ThunderMax modules.

If AutoTune Closed Loop Processing is un-checked, fuel points will be adjusted to the last learned offset points, or if no learning has occurred, to the original base map points. Stored offset points remain within the module; in

the event that power is interrupted for any reason, the learned offset points remain until re-learned or cleared under the **[Map Editing]** toolbar menu.

Air Fuel Ratio Override (Module) – A single Target AFR setting can be applied using this command. Clicking this box and changing this number overrides ALL 'Air/Fuel Ratio vs. TPS' pages at all RPM's. 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.

Idle Air Control Override (Module) - Check **[OFF]**. This setting should not be checked on except for diagnosing a particular type of supported problem or during tuning on a load cell dyno. Changing this setting will lead to starting and idling problems.

Maximum CLP Offset (Module) – **[Session (Module)]** button sets the AFR *maximum learning correction* from the base map's fuel setting *per session* by percentage (range is 0-50%). A 'session' is defined as the period of time from engine on to engine off (per cycle).



[Maximum (Module)] button sets the *total* AFR maximum learning correction from the base map's fuel setting by percentage (regardless of number of sessions; range is 0-50%). Unless your application is a considerable mismatch to the installed base map, the default settings of 5 and 20 percent are sufficient for most AFR corrections.

You should always pick the best possible map match during the selection of your base map. The theory behind this is to reduce the range and time the closed loop system needs to learn offsets (corrections) for the target AFR. If your map selection is a poor match to the application, the amount of learning needed will be significant. Review the parameters of your base map vs. available base maps under 'Base Maps Listing' to ensure you have the best map match and the latest version of the map.

TIPS AND GENERAL INFORMATION

- **A comprehensive instruction booklet** in PDF format is included on the CD for viewing and printing from your desktop.
- **When the SmartLink program is opened**, it will automatically retrieve and open the last map that was open.
- **Any time you link to your motorcycle**: Read the map that is installed in the ThunderMax ECM by selecting [File] then [Read Module Maps and Settings] on the SmartLink toolbar. This will synchronize the map file loaded into the ThunderMax ECM with the SmartLink software.
- **2003 FLT/FLHT models**: H-D® used 2 different speedometer calibrations during the extended 2003 model production. Which calibration you may need is easily identified by checking the part number on the back of your factory ECM. Calibration **20480** is used if the part number ends in -03, while **4352** is used if the ECM p/n ends in -02. If your turn signals don't cancel on a 2003 model, try the alternate setting.
- **2007 Big Twin models**: There are two settings in the [Module Configuration] [Basic Settings] page that should be set to the following to enable the 6th gear indicator light to function:
Final drive ratio [87] Gear 6 Min TPS [40].
- **2007 Sportster® models**: The [Main Relay Loc] must be set to "1" (the default position is "2") under the [Basic Settings] [Module Configuration] page, or the engine will not start.
- **AFR vs. TPS** page is inoperable when operating in closed loop format.
- **AFR Correction vs. Engine Temperature** page is active yet should be used with extreme caution. Any changes made to this page affects all maps, at every throttle position, every 256 RPM's!
- **AFR vs. Engine Temperature** is active yet at this time you should be discouraged from making any changes to this page.
- **Air/Fuel-TPS @ RPM** These pages reflect desired targets of AFR to throttle position at every 256 RPM. Example: if you desire a leaner mixture for added fuel economy then you can easily make multi-tiered AFR targets at specific throttle positions and RPM's that will be learned during closed loop processing.
- **During warm-up**, the AFR on both cylinders will be richer than the target AFR; this is a normal part of the warm-up map. AutoTune and its targets are inactive below 200 degrees.
- **Target air/fuel ratios** can be viewed on the Air/Fuel-TPS @ RPM pages. When these pages are open, you can view the target AFR by clicking on a dot and tapping the space bar to view the target at a specific throttle position for that RPM. Use arrow keys to raise/lower targets.
- **Writing new or modified maps** to the module requires the system to be re-initialized (Step 7), and any existing learned fuel and IAC adjustments to be cleared (Map Editing, clear). Linking and editing an existing map within the module does not require above steps.
- **Maps can not be created** using the Base Map Name Encoding window. The 10 parameters shown are what the M/C used to create the base map was equipped with. You can not mix and match components to make a new base map.
- **System Updates are available** through SmartLink with an internet connection. Software, Firmware and Map updates can be downloaded; check frequently for updates.
- **In-Tank Fuel Filters** should be inspected as a part of routine maintenance. The filter is small and one bad load of fuel can clog it. The factory recommended service interval is 25K miles.
- **Accel Fuel** is be used to tune throttle response (go to [Module Configuration] [Basic Settings]).
- **Save your edited maps** to your hard drive using the [Save As] command. Document the changes in [Map Notes] located under [EFI Maps] on the toolbar. These notes are stored with the saved map; remember to edit them when making changes for future reference.
- **Oxygen Sensor Care**: Items that can damage or shorten the life of your sensors:
 - Leaded fuel – Race fuel
 - Oil deposits from oil consumption problems
 - Excessive moisture exposure
 - Excessive heatThere is no warranty on sensors. Replacement P/N is 309-355.