



WAVE TUNE

**Part # 309-385 for
2010-2012 XL Models
2004-2011 Dyna® Models
2008-2010 Softail® Rocker Models
2009 CVO Springer FXSTSSE²**

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 (Help Menu) with this package. The cable included with your ThunderMax requires a serial port on your computer for communication with the ThunderMax. If you do not have a serial port on your computer, you will need to use a USB to Serial converter. **Record serial number NOW on your warranty card, and here for your records!**

ECM Serial # TMFM

AutoTune Serial # TMAT

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.



Step 2 All Models –

A packet of dielectric grease is included with your ThunderMax. When installing the ECM, apply the provided dielectric grease to the inside lip of the ThunderMax ECM (Photo 1) and



Photo 1

“DISCLAIMER: NOT LEGAL FOR SALE OR USE IN CALIFORNIA ON ANY POLLUTION CONTROLLED MOTOR VEHICLES” 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. Review your application and check your local laws before installing.
* CA Proposition 65 “known to the state of CA to cause [cancer] [birth defects or other reproductive harm]” see www.p65warnings.ca.gov for details

across the clear case on the 36 pin ECM connector (Photo 2). Spread the grease across all of the female terminal openings, making sure the grease penetrates openings. This grease will greatly improve vital conductivity between the ThunderMax and the 36 pin connector.

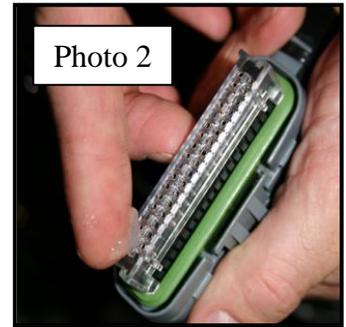
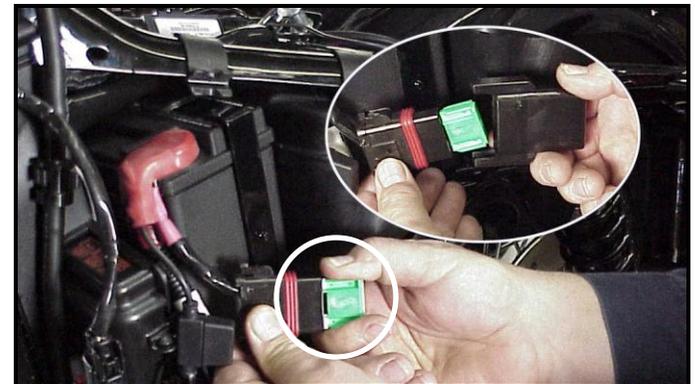


Photo 2

Remove any previously installed ancillary tuning device including oxygen sensor eliminators that may be plugged into the factory oxygen sensor harness. Check battery cable terminals (clean and tighten).

**XL Sportster® Models
(Skip ahead for Dyna® or Rocker® Models)**

XL-A: Remove the left side cover to expose the battery and main fuse compartment. Remove the main fuse cover, then the main fuse (Note: if equipped with optional security system, turn on ignition switch before you remove the fuse to avoid tripping alarm).



XL-B: Remove the socket head screw and slide the ECM cover towards the left side of the bike to remove it (remove wires from ECM caddy cover channels).



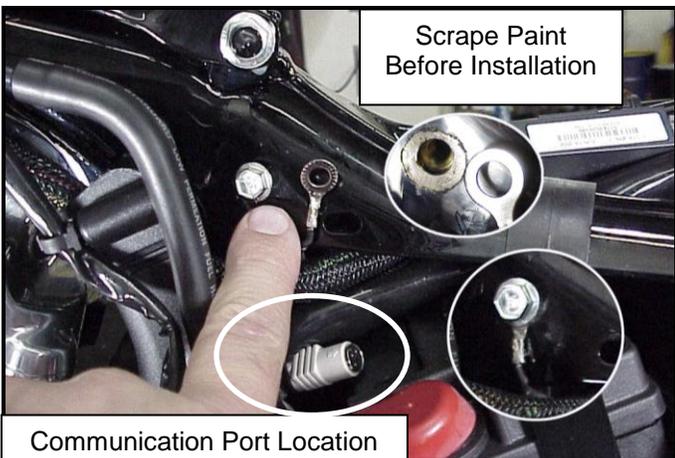
XL-C: Remove the stock ECM out of the caddy, towards the primary side of the motorcycle. Lift tang on the top of the caddy to help release the unit.



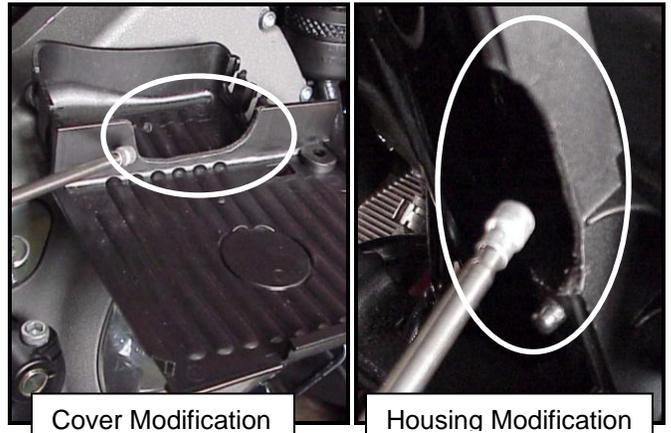
XL-D: Fully depress connector tab and disconnect the stock ECM from the 36 pin connector



XL-E: Install ThunderMax Pigtail connector # 309-324 to 36 pin harness connector per connector instructions. Install ground wire to oil tank mounting bolt on left side of the frame backbone above the battery as shown. Carefully scrape paint from frame for a good ground contact. Run the communication cable straight up inside the caddy towards the left side of the motorcycle, between the module area and the frame backbone, coming out above the battery. Use a wire tie on the connector to the main harness above the battery for easy access under left side cover.



XL-F: With a Dremel® or suitable tool, remove material from the outer caddy cover to accommodate the AutoTune wiring as shown; make sure a generous amount has been removed from this area to avoid chaffing of the wiring. Grind a relief in the plastic caddy to match the relief added to the caddy cover, providing needed clearance for the oxygen sensor wires. The outer caddy cover will shield the view of this area



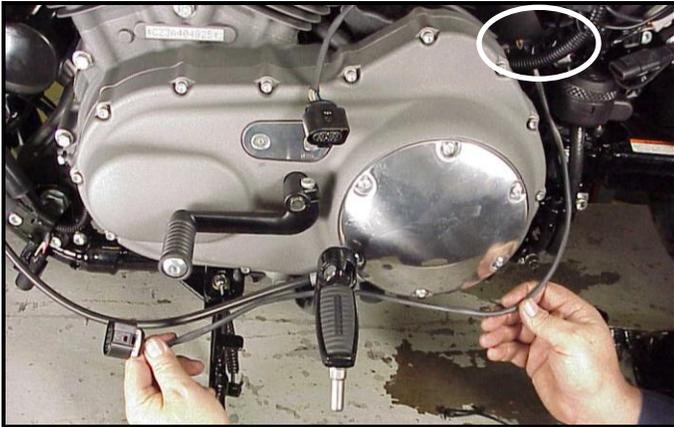
XL-G: Connect the pre-dielectric greased ThunderMax ECM to the greased 36 pin harness plug, ensuring that the harness plug weather seal does not get pinched during assembly; firmly press the plug and ECM together until latched completely. Place the ECM in position with both sensor wires and AutoTune power cable exiting through the relief in the ECM caddy as shown.



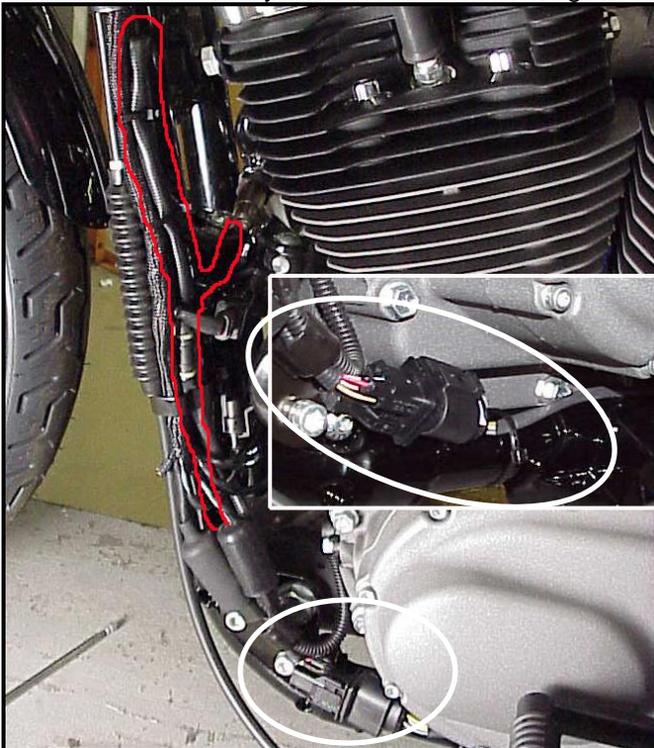
XL-H: Insert O₂ wires into cover channels along with fuel pump wiring connector and reinstall the ECM caddy cover.



XL-I: Unplug and remove both factory O₂ sensors. Route the front sensor lead behind the battery positive cable, then between the primary cover and footpeg mount to just in front of the kickstand mount.

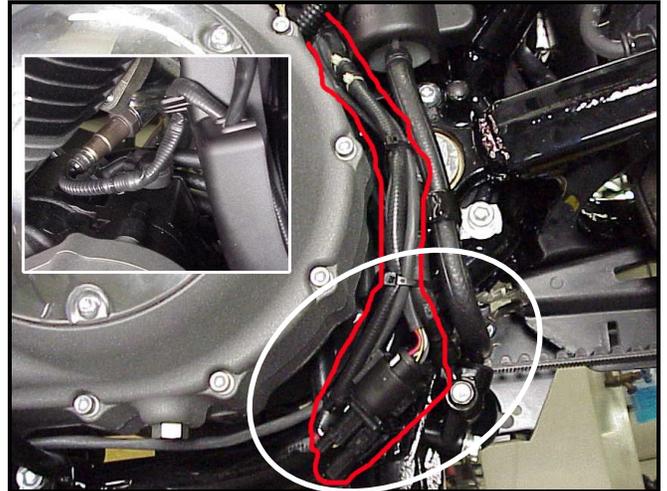


XL-J: Install the front O₂ sensor into the exhaust pipe. Plug sensor connector into the ECM sensor lead. Tie the sensor wires to the frame with wire ties, positioning the connector along the frame tube as shown. Extra wire from the sensor must be routed up and back down the frame tube and secured with the factory wire clamps and wire ties. Carefully tie wires to avoid chaffing.



XL-K: Install the rear sensor into the exhaust pipe and connect the sensor to the ECM harness. Route the rear sensor harness loop behind battery positive cable and along the brake line the rear of the primary housing.

Position the connector as shown; sensor harness will double-back along frame tube to exhaust location. Secure wires to brake line with wire ties.



XL-L: Re-install main fuse. Route and plug AutoTune power harness into 4-pin (gray) data port plug as shown. Advance to **Step 3.**

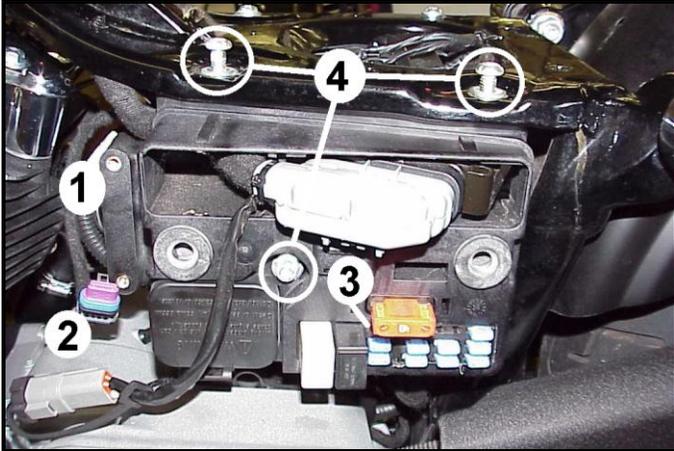


Dyna® Models

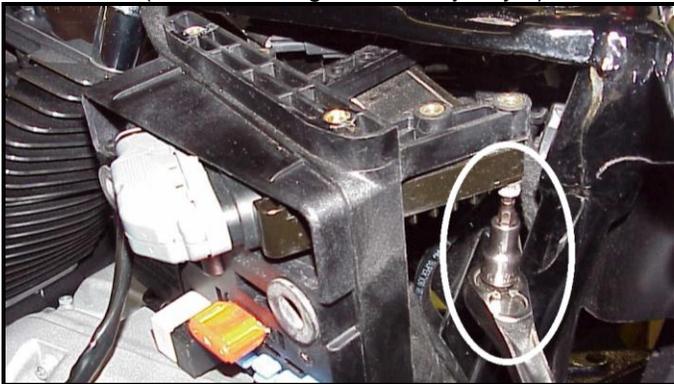
FXD-A: Remove seat. Disconnect fuel line from fuel tank by carefully pushing up the ribbed quick disconnect ring on the tank fitting while gently pulling the fuel line down. Loosen front fuel tank mounting bolt; remove rear mounting bolt, prop up tank rear 4-5" with a wood block.



FXD-B: Remove left side cover to expose electrical caddy. (1) Unplug and remove coil assembly from caddy. (2) Slide diagnostic plug forward to remove from caddy. (3) Remove ECM fuse (top left blue fuse; Note: if equipped with optional security system, turn on ignition switch before you remove the fuse to avoid tripping alarm). (4) Remove 3 caddy mounting bolts.



FXD-C: Gently pull caddy from chassis far enough to access the two stock ECM mounting bolts. Once ECM is unbolted from caddy, depress tang on main 36-pin ECM connector plug and remove ECM from plug. Install pigtail harness to 36 pin connector as per included instructions (do not install ground wire just yet).



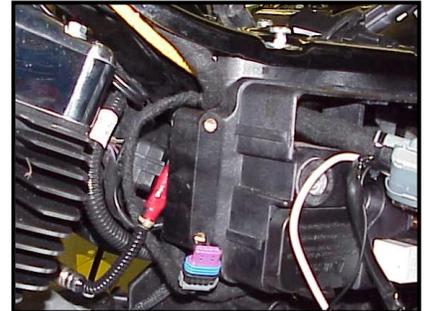
FXD-D: '06-'11 Models - unplug and remove factory oxygen sensors from exhaust pipes. If you wish to cap off the factory harnesses, inexpensive connector caps can be purchased from any H-D® dealer (PN 72533-06). Feed front & rear ThunderMax oxygen sensor harnesses through ECM opening in caddy.



FXD-E: Route front sensor along left frame backbone under gas tank; position sensor plug just forward of engine mount top link. Install supplied oxygen sensor in front pipe and route harness up left frame tube to connector as shown. Check that connector position does not interfere with gas tank when in position before securing harnesses with plastic wire ties.



FXD-F: For the rear cylinder, install and connect the oxygen sensor; coil and tie the excess harness and locate it in the pocket behind the ECM caddy in front of the frame backbone.



FXD-G: Install ThunderMax ECM to the caddy and attach the caddy to the chassis with the two top frame bolts, taking care not to pinch any harnesses in the process. After applying dielectric grease (step 2), connect the 36 pin connector to the ECM. Cut pigtail ground wire to length, crimp on ring terminal and install ground wire on center caddy mounting bolt between bolt head and washer (1). **Plug the closed loop module into the 4-pin gray data link on the bike (2), reconnect to caddy, then re-install the ECM fuse.**



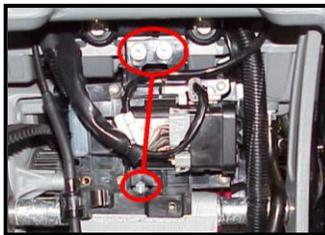
FXD-H: After checking that all harnesses are securely tied down (away from any sharp edges that could chaff or cut harnesses), re-install the ignition coil assembly, gas tank, fuel line and seat. Advance to step 3.

Rocker® and FXSTSSE² Models

ST-A: Unplug and remove the factory oxygen sensors. Thread the supplied front sensor up from the bottom through the gap between the engine and kickstand mount in front of inner primary cover; install into front pipe. Install sensor in rear exhaust pipe; route sensor lead under oil tank to right rear of transmission. Leave leads loose for connection after ECM installation.



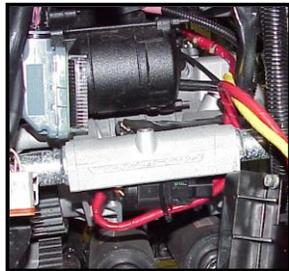
ST-B: Locate and remove the ECM fuse. Remove rear fender assembly and rear wheel to access ECM mounting caddy. Remove the plastic shield, then the ECM caddy mounting bolts.



ST-C: Remove the caddy from the chassis, then remove the factory ECM from the caddy. Mount the T-Max ECM using two mounting bolts.



ST-D: Install pigtail communication harness to 36-pin ECM plug as per included instructions. After applying dielectric grease (step 2), connect the 36 pin connector to the ECM. Re-install the ECM caddy with the oxygen sensor harnesses routed over the top of the swingarm pivot bolt; connect the rear sensors and coil the excess harness for the rear sensor (shown red) and tie it up under the transmission housing, clear of the suspension and any other moving parts.



ST-E: Route the front sensor lead along the right frame rail, position connector as shown behind brake pedal; tie harness to top of frame rail (avoid hot or moving parts).



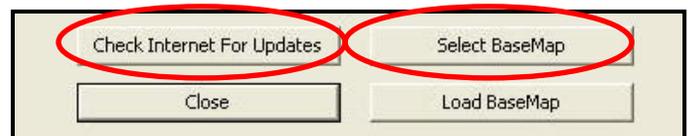
ST-F: Connect and tie front oxygen sensor. Route 4-pin AutoTune communication harness and pigtail to the factory grey data-port connector located at the battery and plug in the AutoTune harness. Replace the ECM fuse, position the pigtail for convenient access and re-install the rear wheel and fender assembly; proceed to step 3.



Oxygen Sensor Installation Notes

The wide band sensors are longer than the factory sensors. Installation of the wide band sensors into factory headpipes presents no clearance problems, however, some aftermarket pipes 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 from many sources in straight or angled versions if current bungs present clearance issues.

Step 3 Load a Base Map to your SmartLink software. Selecting a base map for 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. Close the **[Base Map Definitions]** window, then click the **[Check Internet For Updates]** button (requires internet connection; follow prompts). After updating, select **[Select BaseMap]**..



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).

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.

Base Map Definitions			
Ite...	Manufacturer	EngineType	Family
416	HarleyDavidson	883cc	EVO XL
415	HarleyDavidson	1200cc	EVO XL
543	Zipper	1200cc	EVO XL

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

Throttle
Stock HD XL 45mm
Stock HD XL 45mm
Stock HD XL 45mm

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

Exhaust
Stock HD XL Head Pipe
Stock HD XL Head Pipe
2:1 D+D Fat Cat

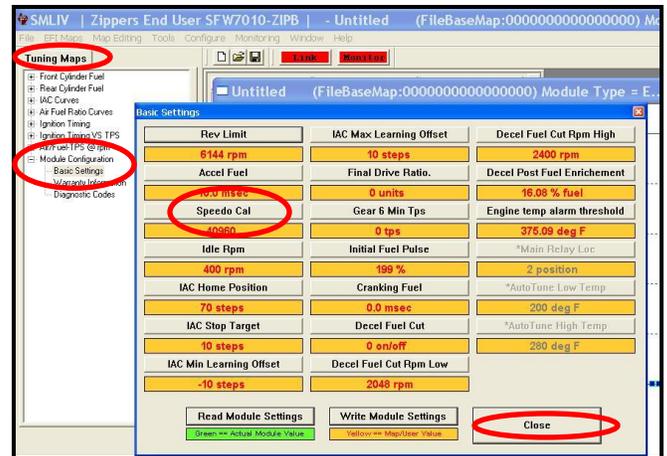
Fourth, right click the 'Muffler' column if further definition of the exhaust system is required (depends on exhaust application). Keep right-clicking the application columns until you have located the best map match (in the case of identical maps, choose the latest date). Highlight the map you've chosen (left-click; blue bar indicates selected map) and click **[Close]** button. This brings you to the 'Base Map Name Encoding' page, from which you can review the map parameters. Click the **[Load BaseMap]** button to load the map into the software. Click **[Close]** this page to view the open map page.

Select BaseMap
Load BaseMap

Step 4 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

XL 883	2007-up	48400
XL 1200	2007-up	46000
DYNA®	2004-2005	40960
DYNA®	2006-2007	45900
DYNA®	2008-2009	42450
DYNA®	2010-2011	44750
ROCKER®	2008-2009	42450
ROCKER®	2010	44750
FXSTSSE ²	2009	42450



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 pigtail harness, making certain that the cable is routed away from any part of the motorcycle that generates heat.



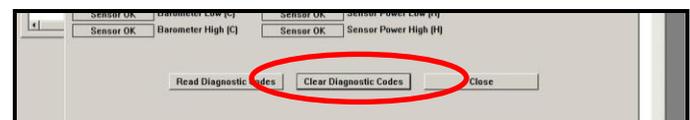
Special Note for International Model Bikes with Active Exhaust Enabled: If your bike is equipped with a working Active Exhaust Valve, you must unplug the active exhaust harness before linking to the module, as the AEV circuitry conflicts with the communication stream. You can re-connect the harness after unlinking. If the stock exhaust has been changed, disregard this step. ThunderMax does not support active exhaust

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. Answer **[No]** to the "Do you wish to READ the module map now" question at this time.



From the toolbar, click **[File] [Write Module Maps and Settings]**, answer OK to the overwrite message; the transfer bar appears during the map load.

Step 7 Clear any active Diagnostic Code readings. While linked, from the Tuning Tree select **[Module Configuration] [Diagnostic Codes]**, click **[Clear]**.



IMPORTANT STEP BEFORE STARTING

Next, 'Initialize' the ThunderMax ECM. Initializing synchronizes 'home' positions for the TPS and IAC, and is a required step any time battery power has been interrupted or established to the ThunderMax ECM.

With the handlebar switch in the 'ON' position, cycle the key switch on and off 3 times, leaving the ignition on for 30 seconds, then off for 30 seconds, each cycle. DO NOT start the engine or move the throttle during this process.



After 3 on/off cycles, make certain that the motorcycle is in neutral and 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. This initialization process must be performed any time battery power is interrupted to the module (after battery servicing/winterization, etc). After initialization, shut off the engine, but stay linked for step 8.

Step 8 Before restarting the engine (while linked) from toolbar click [Monitoring] [Show Gauges]. The "Engine Speed", "Engine Head Temp", "IAC Position", "AFR Front", AFR Rear" and "AFR Target" gauges are automatically formatted and are shown on the screen.

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



Step 10 Now select the IAC Stops vs. Engine Temperature page from "IAC Curves" menu within the



tuning tree. Strike the spacebar to show the actual values of the tuning block (use left/right arrow keys to move the block marker). Make certain that the motorcycle is in neutral and the engine is cold, and then start the engine. Once the engine idle is stable after 15-20 seconds, select the "IAC-Auto" button (Idle Air Control Auto Adjustment). Allow the "IAC-Auto" function to run at idle until the engine head temperature reaches 275 degrees. After reaching temperature of 275 degrees, the "IAC-Auto" function automatically shuts off. You can terminate this function at any time, and re-run it at a later time if you wish.

Step 11 Unlink the SmartLink software from the ECM, turn off the ignition switch and remove the communication cable from the pigtail connector. 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 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 is determined that these automatic adjustments have not resulted in satisfactory operation of the engine, consult the SmartLink Manual (available under the Help section of the toolbar), Section 3 (Tuning the ThunderMax ECM) for further adjustment procedures.

TIPS AND GENERAL INFORMATION

- **Several support features** are located under the [Help] menu:
 - A comprehensive tuning manual
 - Links to allow transmission of module and map data via E-mail directly to ThunderMax support
 - Links to allow transmission of monitor logs (recorded riding sessions) via E-mail directly to ThunderMax support (see video link page 8)
 - Links to Thunder-Max.com web site for support documents and videos
- **'08-'10 Softail® and '09-'11 Dyna® models** with Distance To Empty readout in the speedometer may lose this function upon battery or main fuse disconnection during installation and future services involving electrical power interruption. To restore this feature follow the instructions located under [Help] in the SmartLink Software toolbar.

- **System Updates are available** through SmartLink with an internet connection. Software, Firmware and Map updates can be downloaded; dealers, tuners and end users should check frequently for updates.
- **TMax Control Center** provides a snapshot of AutoTuned fuel flow adjustments, RPM time logs in increments of 100 RPM's, engine temperature logs and diagnostic codes. Valuable information about the condition of your tune and how you ride. **AutoMap**, located within the TMax Control Center, feature creates a custom base map based on AutoTuned fuel flow adjustments. Create a custom base map with just a few clicks!
- **International (non-US) model notes –** ThunderMax does not support active intake/exhaust functions or Jiffy stand safety switch.
- **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.
- **2007-up 6-Speed 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: 06-07 Dyna® **[84]**, '07 FL, '07-'10 Softail®, '08-'11Dyna® **[87]** Gear 6 Min TPS (all) **[40]**
- **AFR Correction vs. Engine Temperature** page is used to adjust warm-up AFR's. If the engine requires more fuel during warm-up (start to 200°), use this function to adjust. See SmartLink Tuning Manual for procedures.
- **AFR vs. Engine Temperature** - During warm-up, the AFR on both cylinders will show richer than the target AFR at operating temperatures; this is a normal part of the warm-up map. No permanent changes to AFR targets and adjustments are made below 200 degrees. See SmartLink Tuning Manual for applications and procedures.
- **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 enhance multi-tiered AFR targets at specific throttle positions and RPM's that will be learned during riding sessions. 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.
- **Interrupting 12v power** to the module (battery service/replacement) requires system to be re-initialized (Step 7). Check battery terminal tightness as part of routine service (like during oil changes); avoid stacking accessory power leads onto main battery cables. If equipped with dual battery post ports, connect accessories separately.
- **When a new map is installed** any existing learned fuel and IAC adjustments need to be cleared (Map Editing, clear x2). Linking and editing an existing map within the module does not require above steps.
- **System Updates are available** through your software with an internet connection [Configure] [SmartLink Update]. 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 compromise it. The factory recommended service interval is 25K miles.
- **Fuel Pressure Should Be Checked** during periodic service; this is also the first thing to check should you experience sudden or gradual decreasing performance. For any EFI system to operate properly, your fuel system should build and maintain 55-62 PSI of fuel pressure; your dealer can perform this simple test quickly.
- **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 (extreme) heat
 There is no warranty on sensors. Replacement P/N is 309-355.

For additional video instructions go to:

<http://www.youtube.com/user/ThunderMaxV>