THUNDER MAX
EFI made simple.

Part # 309-360 for Cable Big Twins

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

AutoTime Serial # TMAT_____

Step 1 Insert the SmartLink CD (red disk) 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 Install the ThunderMax module. **Special Note:** Module location on some model motorcycles (notably all Dyna® and Softail® Rocker® models) makes it difficult to insert the communication cable once the module is installed. An 8" 'pigtail' harness is available that can be permanently connected to the bike's ECM harness plug, allowing a remote port for the communication cable if desired (video page 8).

All Models-Locate the fuse box that contains the ECM fuse, remove fuse labeled "ECM POWER".

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 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 help maintain vital conductivity between the ThunderMax and the 36 pin connector.

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).

Touring Models (Video Link on Page 8)

FL-A. Depress tab on main ECM harness plug and unplug the ECM wiring harness from the factory ECM. Apply dielectric grease to plug as described above.

FL-B: 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 <u>slowly</u> to break them loose. If the screw and brass threaded insert turn together in the plastic, use a socket on an electric or air impact driver to spin them as a unit; the heat generated will release the thread glue.

FL-C: After applying dielectric grease, install the ECM wiring harness plug 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.*

FL-D: Route the AutoTune harnesses through the frame opening before positioning the ECM for installation. <mark>Re-install the ECM fuse</mark> and secure the fuse box back into position on the electrical caddy.

FL-E: Mount the ThunderMax ECM onto the electrical caddy using the two factory socket head cap screws. <mark>**Apply dielectric grease and plug the AutoTune harness into the 4-pin gray data port (shown)**</mark>. Advance to **Oxygen Sensor Installation** next.

Softail® Models (Video Link on Page 8)

ST-A: Remove the seat, locate and remove the ECM PWR fuse. Remove the stock ECM from the motorcycle and the wiring harness plug from the ECM. Lift the battery up from the oil tank and remove the battery cables (negative first). Remove the battery.

Cut Wire Ties Holding Harness

ST-B: Cut the wire ties holding the right side harness trough (between battery pocket and right side of frame); remove the bolts holding the fuse block bracket to the frame and lift the bracket away from the frame to allow access to the gap between the frame and oil tank on the right side of the motorcycle.

ST-C: Connect the ThunderMax ECM to the harness and position it loosely in the ECM tray. Feed the front oxygen sensor harnesses through the gap between the frame and oil tank on the right side of the motorcycle.
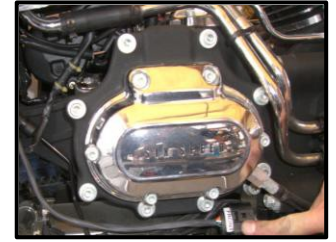

ST-D: Ensure that the front O_2 harness is positioned so that no sharp edges can chaff the harness sheathing or that the harness will not be contacted by the swingarm moving parts at full stroke (suspension bottomed) before tying down. Position the harness plug for the front pipe under the transmission, along the frame rail. Install O_2 sensor into front pipe, route harness along frame rail and plug into AutoTune harness; tie securely.

ST-E: Snake the rear oxygen sensor towards the rear exhaust pipe by starting it from the right side of the bike, under the oil tank, and around the seat post to the rear exhaust pipe; install and tighten (do not connect it to the harness until after it has been installed and tightened into the exhaust pipe). Route O_2 harness through opening in base of oil tank in front of battery compartment and along top of oil tank to left side of ECM; connect the harness plug but do not tie it down just yet.

ST-F: Re-install the fuse block bracket bolts, being careful not to pinch front O$_2$ sensor harness. Attach the ThunderMax ECM to the ECM tray (secure with supplied hose if equipped with stud-type tray). Re-install the battery (positive cable first) and ==install the ECM fuse. Plug the AutoTune module into the 4-pin gray data port plug on the motorcycle.== Position the rear cylinder O2 connector to the left of the ECM as shown and tie down. Tie all harnesses and harness troughs securely; check for seat interference.

FXD (Dyna®) Models

FXD-A: Remove the left side cover to reveal the electrical caddy. 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). Remove the coil assembly from the caddy and remove the caddy from the chassis.
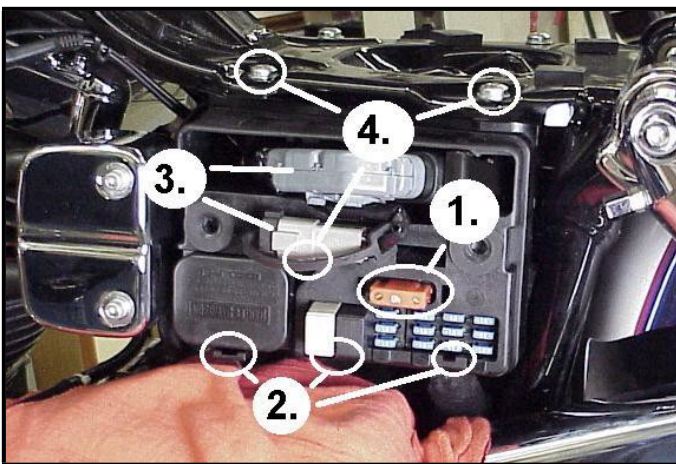

FXD-B: Remove the stock ECM from the electrical caddy. The caddy must be slightly modified for additional main harness connector clearance.

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.

FXD-C: 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, or the optional 'pigtail' harness mentioned in step 2 used. If using the communication cable, and if equipped with AutoTune, feed it and 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.
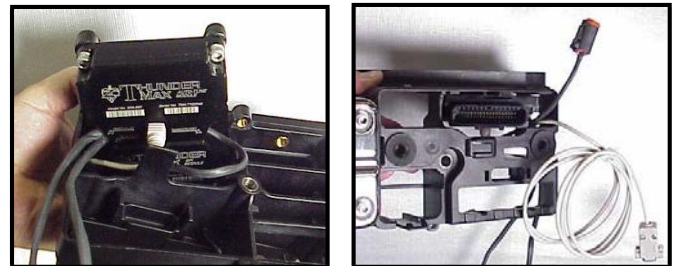

Before reinstalling the caddy, feed the front cylinder oxygen sensor harness along the left side backbone and position the connector just forward of the engine top link. Install the front sensor into the pipe and route the harness up the left front frame downtube, under the backbone to the connector; plug in. Lower gas tank and check for connector clearance before tying harnesses as shown. Re-install gas tank bolts and fuel line, secure harness to left frame downtube using plastic wire ties.

For the rear cylinder harness, 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. Reinstall the caddy with fuse and relay blocks in place. Reconnect the TSSM, coil and ECM harnesses and ==main fuse==. ==Plug the closed loop module into the 4-pin gray 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 if not using the 'pigtail' harness.

Dyna®: ECM installed with communication cable attached.
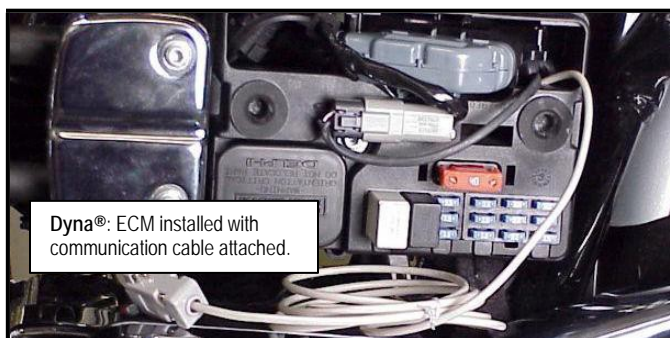
Oxygen Sensor Installation Tips (AutoTune)

2006-11 FXD, '07-'10 Softails® and 2007 Touring models are equipped with narrow band sensors, which must be disconnected, removed and replaced with the supplied longer wide band units. The factory O2 sensor harnesses will not be used with ThunderMax; If you wish to cap off the factory harnesses, inexpensive connector caps can be purchased from any H-D® dealer (PN 72533-06) **Remove any previously installed ancillary tuning device including oxygen sensor eliminators that may be plugged into the factory oxygen sensor harness.** 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 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 factory location on 2007-up models). Weld-in bungs are available from many sources in straight or angled versions; video installation link on page 8).   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 harnesses or connector plugs***.

Connect the sensors to the closed loop module. The AutoTune harness for the rear cylinder sensor is shorter and can be easily identified by black tracers on all of its wires; both plugs are clearly marked for front and rear use. It is very important to install these correctly or the engine will perform poorly! Tie the harnesses to the frame or existing component harnesses, taking care to avoid contact with any vibrating component that may chaff the sheathing or wires. Some disassembly of bike components may be required for best harness routing.

If you purchased a pre-mapped system, you may skip steps 3-6 and proceed to Initializing (page 6).

Map Loading & Set-Up (Video Link on Page 8)

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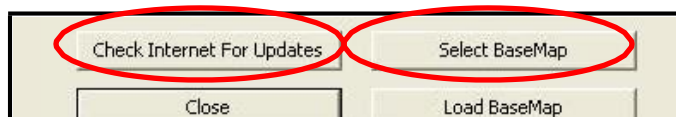
Available base maps will be shown (if the **[Clear Filters]** button at the lower left of the screen is highlighted, click it to clear filtered maps so all maps will be shown).

Filter the maps to locate a base map that best matches your application by placing your curser **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.

Second, place your curser 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
ck HD TC 06-07 25° Inj	Rinehart FL True Duals	N/A
ck 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 (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.

Step 4 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.

Base Map Name Encoding

Engine Manufacturer	HarleyDavidson	H
Engine Type | Family	96ci | TwinCam A&B	D
Cylinder Head Type	HD TC 2006-08 Stock	T
Piston Type	Stock Flat Top	S
Cam	Stock	S
Exhaust	Stock HD FXD Head Pipe	Q
Throttle	Stock HD TC 06-07 all, 08 FX (25° Inj)	V
Air Cleaner	Hi-Flow/2.75" Deep	C
Muffler	KW HP+ Mufflers	U
Modification	None	G

Base Map File Name HDTSSQVCUG082807.slk

Check Internet For Updates   Select BaseMap
Close   Load BaseMap

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.

Step 5 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

	04-05 FXD	40960
	06-07 FXD	45900
Dyna®	07-09 CVO	42450
	2008-09 FXD	42450
	2010-11 FXD	44750
	2001-2003	4352
Softail©	2004-2006	40960
	2007-09	42450
	2010	44750
	2002	4352
	2003	20480
Touring	2004-2006	40960
	2007 (16" r/tire)	42450
	2007 (17" r/tire)	42000

Step 6 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.

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*

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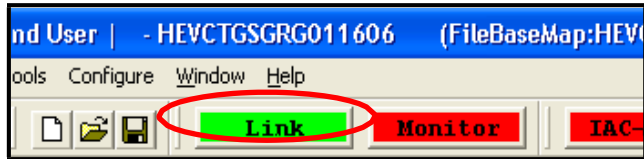
From the toolbar, click **[File] [Write Module Maps and Settings]**, answer OK to the message that informs you that you are about to overwrite the current map in the module; the transfer bar appears during the map load.

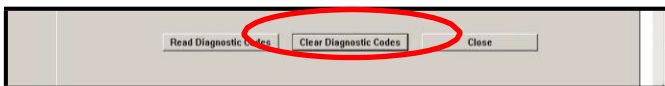Verify Module Settings. Before performing this step, clear any active Diagnostic Code readings. While linked, from the Tuning Tree select **[Module Configuration] [Diagnostic Codes].**

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 factory 6 speed model the 6th gear indicator settings are correctly set to **Final drive ratio [84]** for '06-'07 Dyna® models; **[87]** for '08-'11 Dyna®, '07 Touring, '07-'10 Softail® models, and **Gear 6 Min TPS [40]**). After verifying these settings, click **[Write Basic Settings]**.

<mark>**Step 7** **Initializing System –** This process is required during this initial installation after powering the ECM (installing ECM fuse). It is also required any time 12 volt power has been interrupted (battery change).</mark>

IMPORTANT STEP BEFORE STARTING

<mark>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**</mark>

<mark>**battery servicing/winterization, etc)**. After initialization, shut off the engine, but stay linked for step 8.</mark>

Step 8 Before restarting the engine, link to the ECM and click the red [Monitor] button to activate live gauges (turns green when active). 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 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. Unlink the SmartLink software from the ECM, turn off the ignition switch and remove the communication cable from the ThunderMax ECM.

*If during this process you encounter wandering or unstable idle, the map selected may not be the best match for your application, or a mechanical problem may be present on your motorcycle. Please contact Product Support (from your toolbar, select **[TMax AutoSupport] [Collect TMax Support***
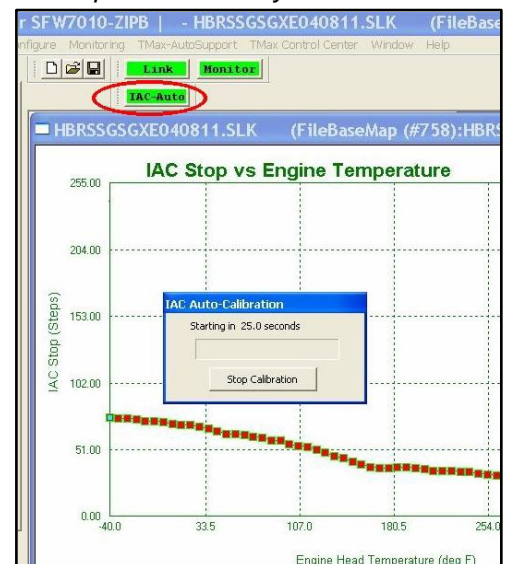
Data] *and follow the prompts (Internet connection required). This process copies your map and adjustments and automatically transmits the data to Product Support for evaluation.*

Step 10 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 with as much variation in terrain and RPM as possible. During this process, the IAC virtual stops are further refined and your air/fuel ratio is automatically adjusted to the map's targets. Your ThunderMax customizes your map based on your engine, ambient conditions and your riding habits. Once several sessions have been logged, link to your ThunderMax and select **[TMax Control Center]** for an automatic analysis of the adjustments that have been made, and follow prompts for further action if more optimization is suggested.

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.

- **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-up Big Twin models:** There are two settings in the [Module Configuration] [Basic Settings] page that should to 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 closed loop processing. 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 information, scan the QR-codes below with
your smart phone for links to video instructions or go to:
http://www.youtube.com/user/ThunderMaxAV

Installing Exhaust Bungs	Basic Map Set-Up	PigTail Installation	Softail® Installation
Touring Install 1/2	Touring Install 2/2	Auto Support	How T-Max Works