



INSTALLATION INSTRUCTIONS

MSD Blaster EFI System Hardware Installation and MSD EFI Software User Instruction Manual PN 2450

Parts Included:		Parts Required, not supplied:
1 - Blaster ECU - Software CD	1 - Communication Cable	1 - Injector Harness
1 - Main Harness	1 - Replay Extension Harness	V8 - PN 24501
1 - Wide Band Oxygen Sensor		V6 - PN 24502
1 - TPS Adapter Harness		4-Cylinder - PN 24503

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1 Blaster EFI System Standard Features

- Configurable Load & RPM axes to enable optimization in desired operating range
- Capable of driving 8 high impedance injectors
- “Wide Band Oxygen Sensor” (WB02) Air/Fuel Ratio (AFR) control to eliminate base engine and transient fuel calibration guesswork.
- Ignition system type is software configurable for GM HEI, Ford TFI, LT1 and Mag Pickup.
- 1, 2, 3, 4, BAR MAP sensor compatible
- Programmable injector opening vs. battery voltage
- Improved transient fueling algorithms
- Seamless decel fuel cut-off
- Improved cold starting and drivability
- The Throttle Position Sensor voltage output is linearized between .5V and 4.5V for GM and .9V to 4.5V for Ford.
- Low side fuel pump and engine cooling fan functionality, as well as ESC control
- Closed Loop PID WB02 heater control to insure accurate and consistent AFR control
- Improved EMI algorithms
- True Speed-Density algorithm allows for easier tuning
- MSDComm Windows 95, 98, 2000, NT and XP compatible calibration software
- Electronics rated from -40° C to 105° C
- Aesthetically pleasing, nylon braided wire harnesses with integrated ECU and Injector/WB02 fuse protection.
- OEM style Packard and TYCO waterproof connectors and terminals.

2 Main Wire Harness Installation

To improve the overall wire harness installation process, the harness was manufactured with identification labels at the end of each wire or connector to ensure that connections are terminated correctly. The main wire harness has two halves; one half is intended to be located inside the vehicle, with the ECU, the other half connects to the sensors in the engine compartment. The two halves of the harness are separated by a firewall grommet designed to fit snugly in a 2-1/8” hole, which needs to be located in the firewall.

The best location for the firewall hole is in an unobstructed location, on either side of the engine closest to where the ECU will be mounted in the passenger compartment. Care should be taken to keep the harness as close to the center of the vehicle as possible. Locating the hole too far away from the vehicle center may affect wire lengths, which need to connect to sensors on the engine. Once the main harness is installed the connections need to be made to sensors, the ECU, etc. The paragraphs below describe how and where each connection should be made.

The instructions on following page are specific to the Blaster engine management system. See page 71 for a main harness wiring diagram.

Note: Additional components such as relays and special connectors may be required to complete your specific installation.

Harness Label	Wire Color/ Connector Type	Label Definition	Connect To	Further Details
ESC	Single lead Packard Connector with single Purple wire.	Electronic knock control connection	A GM style engine knock sensor module.	If a knock sensor input will not be used, do not connect this wire. Only compatible with Bank-to-Bank Systems.
HS GM FP	Single lead with a single red and Green striped wire.	High Side Drive	Connect to the positive side of the fuel pump relay.	Do not connect this wire directly to the fuel pump. A relay must be used.
Fan	Single lead Black/White wire.	Engine cooling fan connection	Connect to the negative side of the cooling fan relay.	Do not connect this wire directly to the fan or positive side of the relay. A relay must be used.
Points	Single White wire.	Output to MSD Ignition	Only to an inductive pickup ignition system.	Points.
12v Switch	Single Pink wire.	Switched 12v supply input	Connect to a 12v source that is "live" when the ignition key is in the "start" position.	Switched Ignition.
Battery (2 connections)	Two (2) 3/8" ring terminals. One (1) Red Wire and one (1) black wire terminas.	Positive and Negative Battery connections	The vehicle battery only!	Battery Connections
HEI	Black, 4-way Amp connector.	High Energy Ignition [Original Equipment (OE) ignition]	Connect to GM factory installed ignition system or appropriate adapter harness.	
H2O	Black, 2-way Packard connector.	Engine Cooling Fluid Temperature Input	Connect to the coolant temperature sensor, typically located on the intake manifold.	Coolant Temperature.
Air	Gray, 2-way Packard connector.	Engine Intake Air Temperature Input	Connect to the air temperature sensor typically located in the air intake duct between the air cleaner and the throttle body.	Air Temperature.
IAC	Black, 4-way Packard connector.	Idle Air Speed Control (IAC) input	Connect to the AIC motor assembly located on or near the throttle body.	Meters and controls intake air around the throttle blades at idle and during cold starts.
TPS	Black, 3-way Packard connector.	Throttle Position Sensor	The TPS located at the end of the throttle shaft on the throttle body.	Senses the position of the throttle blades [0% (throttle closed) to 100 (throttle wide open)]. TPS.
Crank	Black, 2-way connector with a separate ground wire (3/8" ring).	Crankshaft position sensor input	Connect to MSD Distributor or crank trigger.	
MAP	Green, 3-way Packard connector.	Manifold Absolute Pressure Sensor	Connect to the MAP sensor.	MAP.
Main Fuse and Relay	N/A	N/A	N/A	Main Fues and Relay.
Injector Harness	Black, 4-way Packard connector.	Injector harness connector	Connect to main wire harness.	Injector Harness.

The paragraphs below further support the information outlined in the table above.

Stage 1 (External Output) - Single red/orange wire.

Provides 12 volts when external output is activated. The current limit on this circuit is 1 amp. If the device used draws more current, a relay will have to be wired into the circuit.

Injector - Four pin square connector

Plugs into the mating connector of the injector harness.

Wideband O2 - Six pin rectangular connector

Connects to the oxygen sensor.

Toss - Two pin black connector

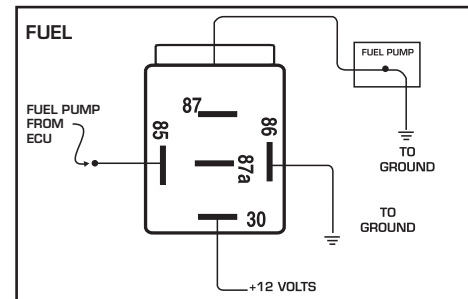
Plugs into the speed sensor on GM 4L80E transmissions.

ESC (Electronic Spark Control) – Single lead Packard connector with Purple wire.

This wire connects to the GM type ESC module. The module is usually located on the fender or firewall. The knock sensor is not required if high-octane fuel is being used.

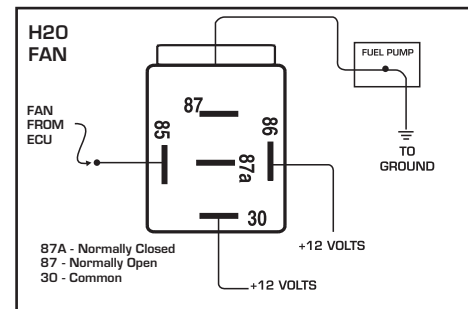
Fuel Pump (HS) - Single Red/Green striped wire.

This connector must go to the positive side of a fuel pump relay, not directly to the fuel pump. **Terminating this connection directly to a fuel pump will damage the Blaster controller and will void the warranty!** The fuel pump relay and wiring provisions are not supplied with the system.



Fan (engine cooling fan) - Single Black/White wire

This termination must go to the negative side of a fan relay, not directly to the fan. **Terminating this connection directly to a fan will damage the Blaster controller and will void the warranty!**



Points - Single White wire

Do not connect this wire if a factory ignition system is being used. This is the Blaster ECM's "points" signal (White wire). It needs to be connected to the "points" input connection on an aftermarket ignition module, e.g. MSD 7A box.

12V Switched - Single Pink wire

A secure connection must be made to a switched 12V supply. The best and, in most cases, the only source of a switched 12V supply is at the vehicle fuse block. The ECU must have a "live" 12V supply during cranking. If the 12V supply does not stay live during cranking the ECU will not function. A simple way to determine if a live 12V supply exists during cranking is to check it with an inexpensive voltmeter. Securely fasten the voltmeter's Red (+ positive) wire to the ignition input on the fuse block. Secure the voltmeter's Black wire (- negative) to a ground location on the fuse block or another adequate location. Once the voltmeter connections are made, crank the engine. The voltage meter should indicate an output voltage of between 8V to 14V. If the output voltage is below 8 volts, check to make sure the battery is fully charged and all the cells of the battery are functioning properly.

Positive and Negative Battery Connections - Two (2) 3/8" ring terminals, One (1) Red wire terminal and One (1) Black wire terminal

The main wire harness battery connections need to be made to the positive and negative posts of the vehicle battery to ensure trouble free operation! The positive and negative battery cable lengths have been designed with sufficient length to accommodate a trunk-mounted battery. Make sure the Black wire battery (-) is securely fastened to the negative battery post (NO EXCEPTIONS). The Red cable battery (+) must be securely fastened to the positive (+) battery post. **Reversing the battery connections will damage the ECU and void the warranty!**

Making battery connections to locations on the vehicle other than the battery itself can cause the ECU to function improperly, due to potential ground loop issues. Connect these wires to the battery only after all other connections are made.

Factory Dist - Black, 4-way AMP connector

The main harness Factory Dist connection plugs directly into an MSD LT1 distributor. If using a factory LT1 distributor, external coil HEI, or Ford TFI distributor an adapter harness will have to be purchased.

Appropriate harnesses are listed below:

TFI Adapter	PN 24505	'92-'95 LT1 Adapter	PN 24508
External Coil HEI Adapter. . .	PN 24507	'96-'97 LT1 Adapter	PN 24509

The jumper cable needs to be installed between the Main wire harness and the distributor being used in the vehicle. This connection also includes a “bypass” connector for setting the timing.

H2O - Black, 2-way Packard connector

This connector mates with a GM style coolant temperature sensor.

Air - Gray, 2-way Packard connector

This connector mates with a GM style air temperature sensor.

IAC (Idle/Air Control) - Black, 4-way Packard connector

The main harness IAC connector was designed to work with a GM style IAC motor and valve assembly with a 4 by 1 connector. This is the IAC used on MSD Throttle Body PN 2250. If a GM style IAC motor and valve assembly with a 2 by 2 in-line connector is used, an adapter harness will need to be purchased (MSD PN 24510). The Adapter harness needs to be installed between the Main wire harness and the in-line IAC valve and motor assembly.

Alternatively, the factory installed 4 by 1 connector can be removed and replaced with a 2 by 2 in-line connector per the pin-out table below.

2 by 2 IAC Connector Pin-out Identifier	4 by 1 In-line IAC Connector Pin-out Identifier
A	D
B	C
C	B
D	A

TPS (Throttle Position Sensor) - Black, 3-way Packard connector

The main harness TPS connector was designed to work with a GM “L98” style TPS with a 3 by 1 connector.

If a late model GM TPS with a 3-pin round connector is used the supplied adapter harness will have to be used. If a Ford TPS will be used the factory connector will have to be replaced.

Alternatively, the factory installed TPS connector can be removed and replaced with a late model GM or Ford TPS connector per the pin-out tables below.

GM Late Model

3 by 1 TPS Connector Pin-out Identifier	GM Late Model Round, “3-point” TPS Connector Pin-Out Identifier
A	B
B	C
C	A

Ford TPS

3 by 1 TPS Connector Pin-out Identifier	Ford TPS Connector Pin-Out Identifier
A	C
B	B
C	A

Mag Pickup - Black, 2-way connector with a separate ground wire (3/8" ring)

The black connector should be connected to an MSD distributor or crank trigger. The Black wire ring terminal should be securely fastened to the engine block.

MAP (Manifold Absolute Pressure) - Green, 3-way Packard connector

Connect to a GM style (1 BAR) Manifold Absolute Pressure (MAP) sensor. For normally aspirated engines, a 1 bar sensor is used. For blown or turbocharged applications a 2 BAR MAP sensor must be used for boost pressures up to 15 PSI. For boost pressures up to 30 PSI a 3 BAR MAP sensor must be used. For boost pressures up to 45 PSI a 4-BAR MAP sensor must be used. If a 2 or 3 BAR MAP sensor is required, it must be obtained from MSD or the connector will have to be changed.

- 1 BARPN 23111
- 2 BARPN 23121
- 3 BARPN 23131
- 4 BARCall for details.

For speed-density applications, the MAP sensor must be connected to an intake manifold port. For Alpha/N systems, use the sensor to sense ambient air pressure in the hood scoop or air cleaner.

ECU 3-Amp Fuse

This fuse protects the ECU electronics.

30-Amp Fuse

This fuse protects the wide band oxygen sensor circuit.

Replay (Internal Dat Logger) - Black, 2-way connector with blue and black wires. This pigtail comes out of the ECU.

When the black and blue wires are connected together the internal data logger is armed. A switch and extension harness is provided in the kit.

3 Injector Harness Installation - Black, 4-way Packard connector

Once the main harness is installed and all the connections to it are made, the injector harness can be installed and connected to the main harness.

The injector harness is constructed with the connector (for the connection to the main wire harness) located half way between the two banks of fuel injector connectors. The main-harness-to-injector harness connection should be made on the end of the engine opposite the ignition distributor. For example, for GM engines, the main harness to injector harness connection should be made at the front of the engine. For a Ford 5.0L engine, the connection should be made at the back of the engine.

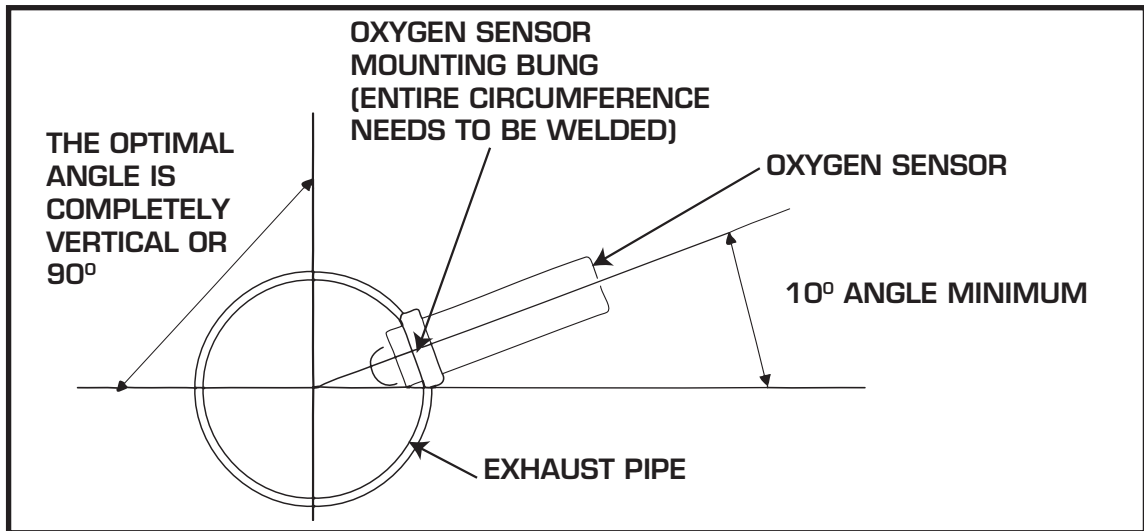
4 Wide Band Oxygen Sensor Installation

Once the main and injector harnesses are installed, the Wide Band Oxygen (WBO2) sensor needs to be installed and connected to the main harness. First, install the wide band sensor.

The WBO2 sensor threads into the sensor mounting bung (MSD PN 2335), which needs to be drilled and welded into the exhaust pipe. Before drilling and welding, read the design guidelines below.

- Install the mounting bung approximately 8" - 12" from where the primary pipes enter the exhaust collector.
- Make sure the mounting location selected does not allow condensation to collect directly in front of the sensor. Make sure there are no depressions, projections, edges, etc. in the exhaust pipe near the sensor tip.

- The mounting angle of the sensor should be tilted a minimum of 10° to the horizontal tip of the sensor. The tip of the sensor must be tilted down. See the diagram below. The optimum sensor angle is 90°.
- Make sure sensor cabling is routed and secured away from the exhaust system.



Drill a 7/8" - 15/16" hole in the exhaust pipe. Weld a WBO2 sensor-mounting bung into the exhaust pipe. The mounting bung was manufactured with a lip to help locate it prior to welding it to the exhaust pipe. **The entire circumference of the mounting bung must be welded and free of exhaust leaks!**

Once the sensor-mounting bung is welded into place, thread the sensor into the bung. Installation torque is about 10 - 15 ft/lbs. Connect the oxygen sensor 6-way connector (with gold plated terminals) to the main wire harness.

5 ECU Installation

Note: The ECU **MUST** be installed in the passenger compartment! The ECU has four vibration mounts that attach to the bottom of the housing. Once installed, connect the main wire harness header connector to the ECU.

The Blaster system hardware installation process is now complete. The next step is to install the MSD EFI software, which allows the sensor interfaces to be checked, and ultimately start and operate the engine.

The remainder of the manual will describe how to install and use the MSD EFI software to monitor and calibrate the Blaster ECU parameters and variables.

6 MSD EFI Software Overview

The Blaster system can be configured to operate on almost any 4-cylinder, V6 or V8 engine, including normally aspirated, supercharged and turbocharged applications! The MSD EFI software was designed to act as the interface between the Blaster ECU and the engine it is installed on. View it as the screwdrivers and wrenches once used to make crude adjustments to a carburetor. The MSD EFI software allows the user extraordinary ability to tune the fuel and ignition system for improved performance and drivability.

The MSD EFI software allows full user access to all of the tables needed to calibrate the Blaster system. Calibrations can be modified both "on-line" and "off-line". The engine control tables in the MSD EFI ECU are stored in non-volatile memory, allowing for the stored information not to be lost when power to the ECU is removed.

The minimum computer requirements to run the MSD EFI software are:

- Microsoft Windows 95/98/Me/2000/NT or XP
- 300 MHz or faster Pentium processor.

- Blaster recommends a minimum of 128K of RAM.
- RS-232 serial port recommended. A USB port can also be used with a port adapter (not included).

7 MSD EFI Software Installation

1. Insert the installation CD Rom into the CD Drive, wait up to 30 seconds, the CD will auto run. IF THIS DOES NOT OCCUR:

Locate and open the CD Drive.

Double click on the autorun.exe file.

2. Select "Click here to install Version X.XX".
3. Once loaded, your monitor will have an MSD EFI logo. Accept the agreement. Drive the installation to your program files folder, press the enter key. The installation will complete, select OK.
4. A window will be opened with two aliases, double click on the MSD EFI alias to launch the software.

8 Communication Cable-to-PC Connection

Using the communication cable supplied with the system connect the RS-232 connector to the back of the personal computer.

Port Problems

If the PC is a newer model it will most likely have a USB port. If the PC being used is an older model it may only have a 25-pin serial port. Make sure the 25-pin port, on the back of the PC, is a serial port and not a parallel port, there is a difference. The parallel port will not work. Parallel ports are typically printer ports that let data travel in only one direction. If your PC is configured with only a USB port, a USB-to-9-pin adapter must be procured. USB-to-9-pin or 25-pin-to-9-pin serial adapters are readily available at Radio Shack or comparable stores. Radio Shack's USB port to 9-pin serial adapter is part number 26-183 and available for approximately \$40.00.

Prior to establishing communication with the Blaster ECU, the PC's COM port needs to be selected. In order to complete the PC COM port selection a quick overview of the Tool Bar is required. The configuration tables within the MSD EFI software area accessed using the MSD EFI Tool Bar explained on following page.

9 Using the Tool Bar

The Tool Bar is located at the very top of the MSD EFI Main Menu screen. All of the MSD EFI software functionality is accessed using the Tool Bar and associated drop down screens.



If the Com Port selected is not available, the following message will appear.



Select another Com Port until an available port is identified. Once the PC identifies an available Com Port, the following screen will appear.

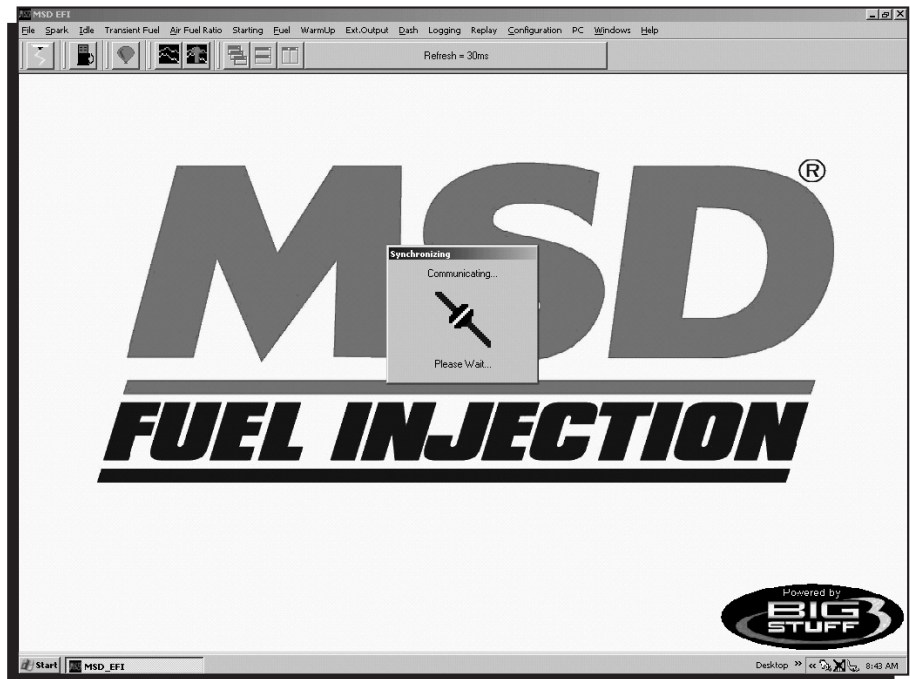


Press the PC's "Enter" key or left mouse click on **Yes** and the Comp Port will resynchronize.

Next, double click the left mouse button on the MSD EFI short cut icon located on the Windows desktop.



The MSD EFI software will attempt to establish a connection between the PC and the Blaster ECU. The following screen will appear.



If the Blaster ECU is not powered up (the ignition key is not in the "Run" position) and the Communications cable is not connected, communication cannot be established. The following screen will appear. This may also occur if the Comm Port is not configured correctly. If this occurs, use the above process of configuring the Comm Port until communication is established.



Left mouse click the **Work Offline** button. The MSD EFI software will ask what calibration should be used “off-line”. The following screen will appear, informing the user that a calibration file must be loaded to work “off-line”.



Left mouse click on Yes and the MSD EFI software should go to the MSD EFI folder. If the PC does not automatically take you to the MSD EFI folder, navigate to **C:/ Program Files/MSD_EFI**. Double left click on the calibration to be used for “off-line” modifications and the calibration will be loaded. After the calibration is loaded, the Main MSD EFI window will open.



10 Establishing a Connection

The sequence for connecting the Blaster ECU to the Main wire harness is as follows:

- Connect battery terminals
- With the ignition switched off, connect the 32-way header connector

This assembly sequence should preserve the firmware and initial calibration that was loaded in at the factory.

Assuming that the system wire harnesses, ECU and software are all installed and connected correctly, the next step is to establish communication between the PC and Blaster ECU. Double check to make sure the communication cable connections, between the PC and Blaster ECU, are securely in place. Turn the PC on and power up the Blaster ECU by turning the vehicle ignition to the “Run” position.

Left mouse double click the MSD EFI icon *on the Windows desktop*.



The following screen will appear.



Once communication has been established, the MSD EFI “Main Menu” screen will open and the *Green Sliding Ball* in the tool bar will become active.

11 MSD EFI Main Menu Screen



The engine is not yet ready to be started. A few additional items need to be completed before attempting to do so!

In most cases, the ECU will be delivered with a calibration that will closely match your engine configuration. This “base calibration” will allow the engine to be started and run. If this is not the case, the following steps need to be taken.

Note: MSD recommends checking all of the settings in the configuration tables to ensure the system as supplied will operate correctly.

12 Inputting Values into a Cell

There are two methods for inputting values into cells as follows:

- **Arrow Keys** - Use the PC keyboard arrow keys to navigate the cursor horizontally and/or vertically to the cell to be changed. Input the desired value and hit “Enter”.
- **Using the Mouse** - Use the Mouse to navigate the cursor to the cell to be changed and left Mouse click on the cell. Input the desired value and hit “Enter” to save the change.

13 Closing Windows

Open windows can be closed using the PC’s mouse. To close an open window, left mouse click on the “X” in the upper right corner of any window and it will close. Another method to close open windows, tables and drop down screens is to hit the PC’s escape key, typically abbreviated as “**Esc**”. If multiple windows are open, continue to hit the **Esc** key until all windows are closed and the main MSD EFI window is displayed. Hitting the **Esc** key too many times may result in a message stating, “**Do you really want to quit?**” Hit “**No**” to continue working with the MSD EFI software. Hit “**Yes**” to close the MSD EFI software.

14 Rotor Phasing

Rotor Phasing is defined as the alignment between the rotor tip and the distributor cap terminal when the spark occurs. This position can be very important to your engine's performance. If the alignment is incorrect, the spark will jump to the next closest terminal or another ground resulting in a misfire and loss of Power.

On engines with extreme cylinder pressures, such as nitrous and supercharged applications, correct rotor phasing increases in importance. More voltage is required to ionize the plug gap and if the phasing is off, the spark is more apt to find an easier path to ground rather than the correct cap terminal. This may result in severe engine damage.

Checking Rotor Phasing

To check rotor phasing, you'll have to modify a distributor cap so you can observe the rotor tip with a timing light when the engine is running. Drill a large hole into a cap near a terminal that will allow you an easy view of the terminal.

To help see the rotor tip you may want to mark it with white correction fluid. With your modified cap installed, connect the timing light's inductive lead to the corresponding plug wire. Start the engine and run at a steady speed. Shine the timing light in the modified cap and note the relation of the rotor tip and the terminal when the spark jumps.

Note: MSD recommends using a non-dial back timing light for best timing results.

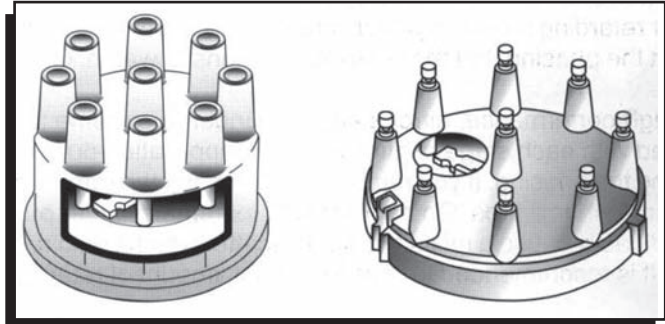
The rotor tip should be centered on the terminal in the cap when the ignition timing is at it's midpoint. For example if max timing is 40 degrees and min is 10 degrees the midpoint will be 25 degrees. In the Static Test Timing field of the Operating Parameter Configuration window set Test Timing (deg) to 25 and select the Enable Test Timing checkbox. This overrides any values in the spark advance table and locks the timing at 25 degrees.

To correct rotor phasing:

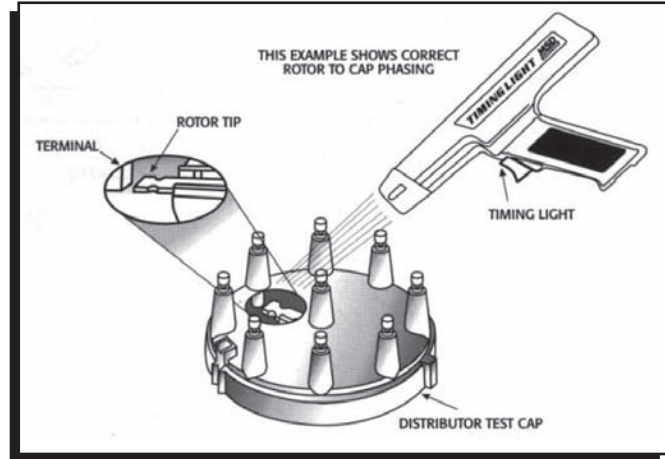
Crank Trigger – Loosen the distributor hold down clamp and rotate the distributor until the phasing is correct. Re-tighten hold down bolt.

Distributor – Included in the parts bag is a stamped metal bracket used to adjust the phasing if using one of MSD's vacuum advance distributors. This piece replaces the vacuum advance canister. The installation is easiest with the distributor out of the engine.

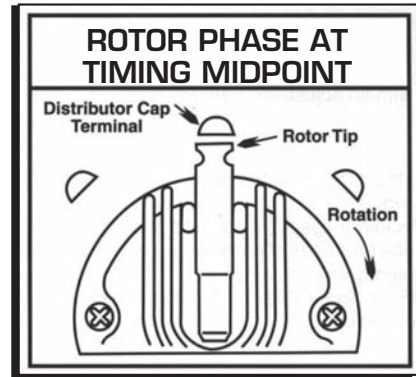
1. Remove the two Allen head screws that hold the advance canister.
2. Remove the snap ring that holds the magnetic pickup assembly in place. This is easy to do with a set of snap ring pliers by straddling one of the reluctor paddles.



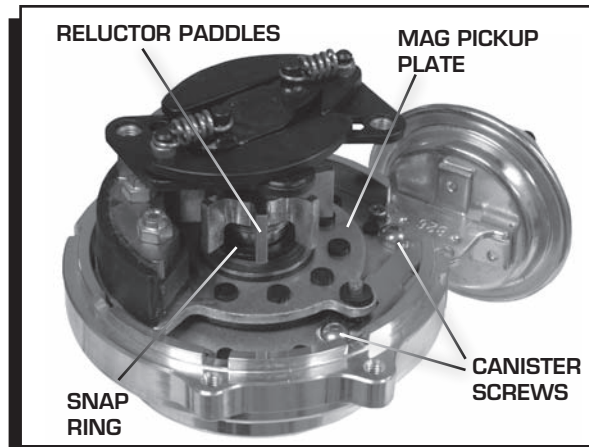
Examples of modified distributor caps.



Drill a hole in a cap to view the location of the rotor tip with one of the cap terminals.

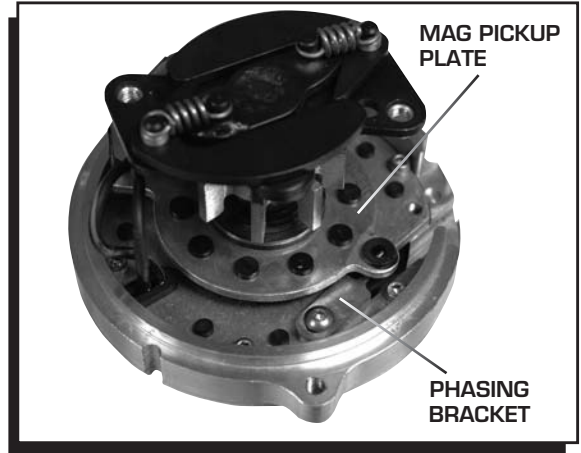


The rotor tip should align with the cap terminal at the timing midpoint.



Removing the Vacuum Canister.

3. Gently lift up on the mag pickup plate and slide the vacuum canister out.
4. Install the lockout plate in place of the canister as shown at right. Position the plate so the screw is centered in the slot. Tighten the screw.
5. Install the distributor, rotor and cap. Check the timing when complete.
6. If rotor phasing is still off, loosen the screw, adjust slot position, and re-check.

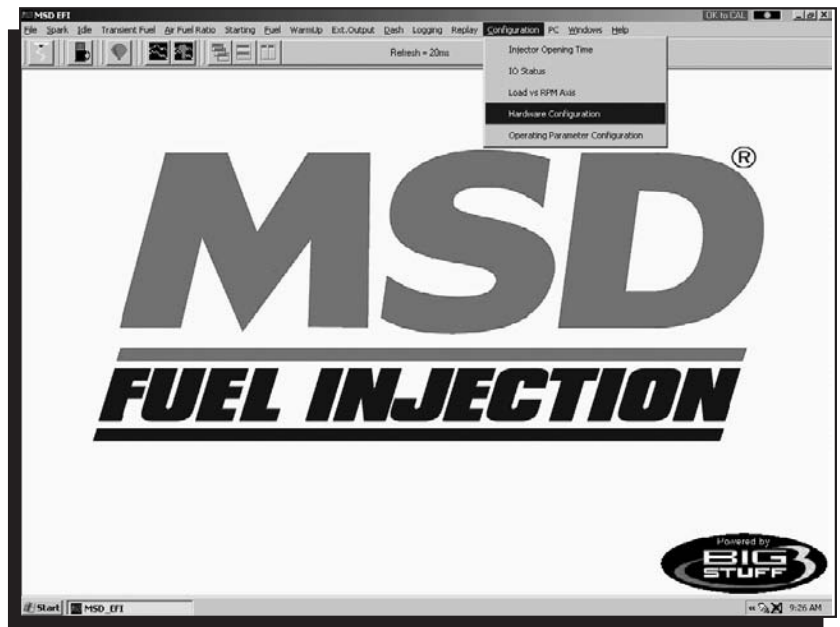


Installation of the Vacuum Lockout Plate.

15 Configuration

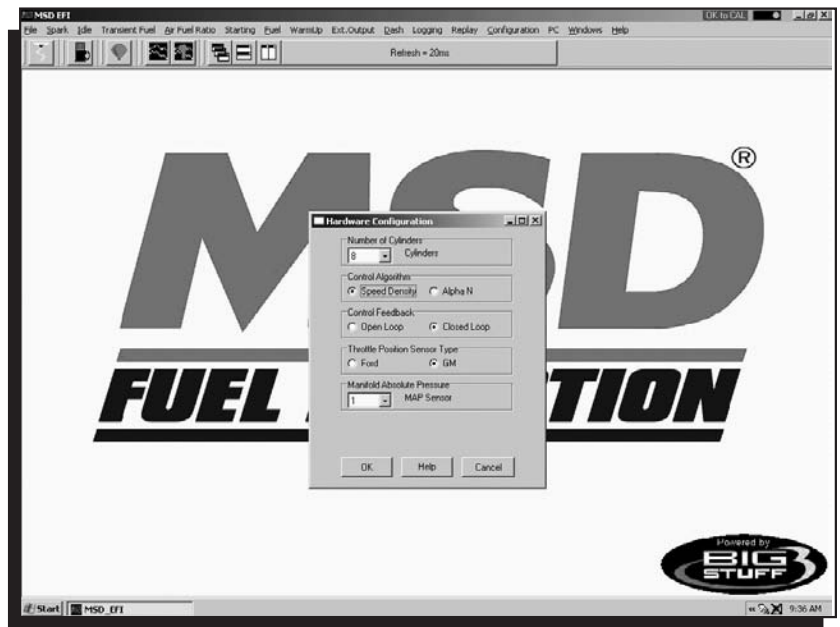
The Blaster ECU needs to be configured for the engine it will control. For example, the ECU needs to know if it is operating a 4, 6 or 8 cylinder engine along with other important engine parameters and variables. The initial configuration steps can be accomplished with the vehicle ignition key in “run” position and the engine off. The ECU must be supplied with 8V-14V for the ECU to be “live”.

From the tool bar on Main Menu screen, left click on the “**Configuration**” and the drop down screen to right will open.



16 Hardware Configuration

Keep the left mouse button depressed and slide the mouse pointer down until “**Hardware Configuration**” is highlighted. Release the left mouse button. The screen to right will open.



The Hardware Configuration table is relatively self-explanatory. Working from the top of the table, select the parameters shown in the screen print above as follows:

- Select the number of cylinders the engine has.
- Select whether system will operate using a speed density (engine speed and engine load) or Alpha N (throttle angle and engine speed) algorithm. The majority of the engine applications use the Speed-Density control algorithm. If the camshaft duration exceeds 260° at .050" lift, the Alpha N control algorithm should be considered.
- Select the fuel feed back control configuration. If the engine will not use oxygen (O₂) sensor feedback control, select "Open Loop". If the engine will use oxygen sensor feedback, select "Closed Loop". Note: Air fuel ratio can still be recorded in "Open Loop" mode.
- Select the type of Throttle Position Sensor (TPS) being used (to output throttle angle to the ECU). The TPS is located on the side of the throttle body, at the end of the throttle shaft. GM style TPS sensors have a .5V to 4.5V output. Ford style TPS sensors have a .9V to 4.5V output.
- Lastly, select the Manifold Absolute Pressure (MAP) sensor setting for the application. For normally aspirated engines, the 1 BAR MAP sensor setting should be selected. For supercharged or turbocharged applications a 2 BAR MAP sensor setting must be selected (for boost pressures up to 15 PSI). For boost pressures up to 30 PSI, the 3 BAR MAP sensor setting should be selected. For boost pressures up to 45 PSI, the 4 BAR MAP sensor setting should be selected.

17 IO Status

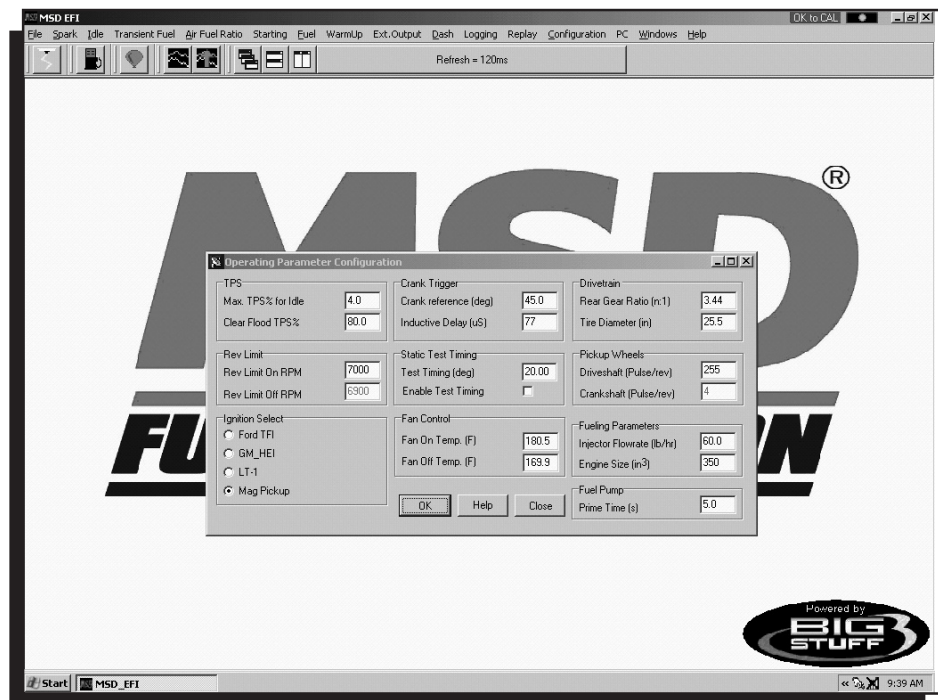
The IO Status Window provides information on some key dash variables as well as the status of various functions. The items below will illuminate when they are active.

- Timer Enable: Replay switch (Internal data logger) is armed.
- Closed Loop: ECU is running in closed loop operation.
- Extern Output On: External output has been activated.
- Fan ON: Fan is turned on.
- Fuel Pump ON: Fuel pump is on.
- O₂ Lit Off: The heater circuit of the oxygen sensor is up to operating temperature.
- Rev Limiting: Rev limiter is active.
- DFCO On: Deceleration Fuel Cut Off is active.

18 Operating Parameter Configuration (F5 - "Quick Key")

Next, the system "Operating Parameter Configuration" needs to be set up. From the Main Menu screen Tool Bar, left click on "Configuration". Keep the left mouse button depressed and slide the mouse pointer down until "Operating Parameter Configuration" is highlighted. Release the left mouse button. The screen at right will open.

The paragraphs on next page outline how each operating parameter should be configured.



TPS Configuration

This input screen allows the user to set:

- The TPS sensor to the correct output voltage when the throttle is completely closed.
- The Clear Flood TPS %, described later in this section.

Note: It is important to have the TPS (%) setup correctly. The TPS sensor (on the throttle body) and software need to be setup properly to ensure that the full resolution (0% to 100%) of the sensor can be utilized and the following related features function properly (described later in the manual):

- Idle Spark Control - See *Idle Spark* for more information.
- Decel Fuel Cutoff (DFCO) - See *dMAP Parameters* for more information.

How to Set Max TPS % for Idle

Note: Make sure that the correct type of TPS (GM or Ford) was selected during the hardware configuration process outlined above. See *TPS Selection*.

In the input table set the “Mas TPS % for Idle” at 2%. Next, go to the TPS sensor located on the throttle body. With the throttle blades completely closed and with the engine running at its normal operating temperature and preferred idle speed, adjust the TPS so that the TPS = % value shown in the Dash reads between .5% and 1%.

The dashboard can be configured to appear at the bottom of most of the MSD EFI software screens. An example of a dashboard is shown below. See *Dashboard* for more details (described later in this manual).

Press <Ctrl> <Enter> keys together to Update Window		TPS SIGNAL IN THE DASH.		
Boost = 0.0psig	Baro = 108.0kPa			
ATM Corr = 7.8%	RPM = 0	Spk Adv = 19.5 deg	Vol Eff = 28.1%	Act AFR = 14.6:1
MAP = 108.0kPa	CLT Corr = 0.0%	O2 Corr = 0.0%	AFT Corr = 0.0%	Air Corr = 0.0%
Scaled Load = 0xF0	Scaled RPM = 0x00	TPS = 2.0%	Coolant = 231.1F	Vbat = 15.2V

How to Set Clear Flood TPS %

Set the Clear Flood TPS% value at 80%. This setting tells the ECU not to add fuel when the following conditions exist.

- The engine is cranking (between 75 and 400 RPM).
- The throttle position is at 80% or greater (user specified).

If these conditions are met, the ECU does not add fuel. This function is especially useful when attempting to start a flooded engine. Once the fuel is cleared from the engine, **release the throttle** to restart the engine.

Rev Limiter Configuration

This input screen allows the user to set the maximum engine RPM before fuel shutoff occurs. This setting is referred to as “Rev Limit On RPM”.

Fueling Parameters Configuration

This screen requires the user to input the fuel injector flow rate and the engine displacement (in cubic inches!). The user needs to know these inputs. If the injector flow rate, in pounds per hour (lbs./hr.) is known, the flow rate in cubic centimeters/minute (cc/min.) can be calculated by multiplying the lbs/hr rate by 10.

Crank Trigger Configuration

See settings below for the input values [Crank Ref Angle (deg) and Inductive Delay (μ s)] to be used, based on the most common configurations.

The crank timing (Crank Ref Angle) should equal the value in the table.

Engine Type	Crank Ref Angle	Inductive Delay (μ seconds)
LT1	6°	6
Ford TFI	10°	0
GM HEI	6°	64
IPU	45°	77

Engine Cooling Fan Control Configuration

This input screen allows the user to set the coolant temperature that the Blaster ECU will turn the engine-cooling fan on (Fan On Temp) and off (Fan Off Temp). The Fan Off temperature should be ~ 5° to 10° less than the Fan On temperature.

Fuel Pump Configuration

This input screen allows the user to set the amount of time the fuel pump will run when the ignition is turned to the “On” position. This allows the user time to prime the fuel pump and check for leaks before the engine is started. A time period of up to 25 seconds can be specified on this screen.

Drivetrain Configuration

The vehicle final drive ratio and tire diameter inputs are required to enable the ECU to make the correct Mile-Per-Hour (MPH) calculations.

Pickup Wheels

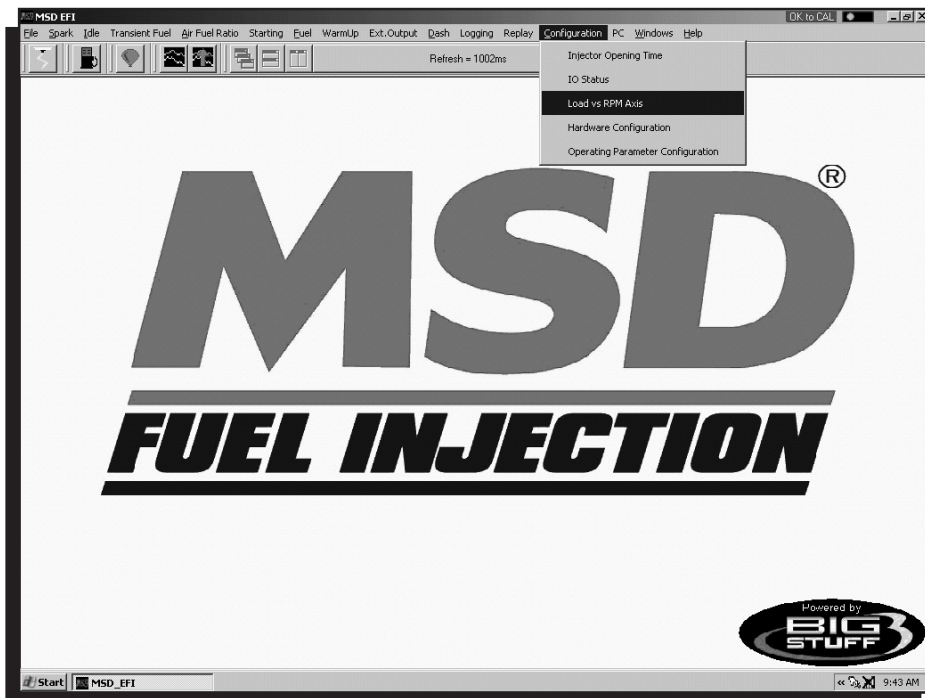
This input screen allows the user to set the quantity of teeth on the transmission output shaft. This input is part of the MPH calculation made by the ECU. For reference, the GM 4L60E and 4L80E transmissions have 40 teeth tone rings on their output shafts.

19 Load vs. RPM

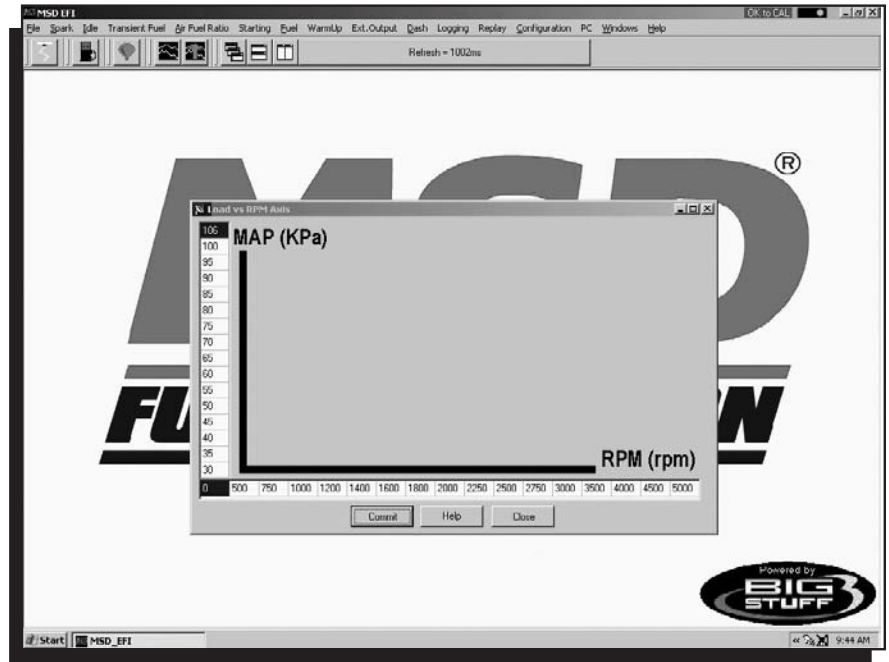
The Blaster MSD EFI system offers configurable Load and RPM axes.

This feature allows the user to configure the X axis (RPM) and Y Axis (Load), so that a majority of the available 16 cell by 16 cell fuel and spark map area is available for calibrating. Systems with fixed X and Y axis allow only a small portion of the available map area to be used to calibrate the fuel and spark needs of the engine.

This capability is extremely important if the engine is fuel or spark sensitive at a given load and/or RPM. For example, if the engine/transmission/rear gear combination makes the engine sensitive to throttle changes at 2,200 RPM, the user can configure the X-axis in 200 or 300 RPM increments at or around 2,200 RPM.



If the “Speed Density” control algorithm was selected during the aforementioned Hardware Configuration step, the screen should show MAP (kPa) in the Y axis and RPM in the X axes. If the screen shows TPS % and the preferred control algorithm is “Speed Density,” go back to Main Configuration and select Seed Density instead of Alpha N.

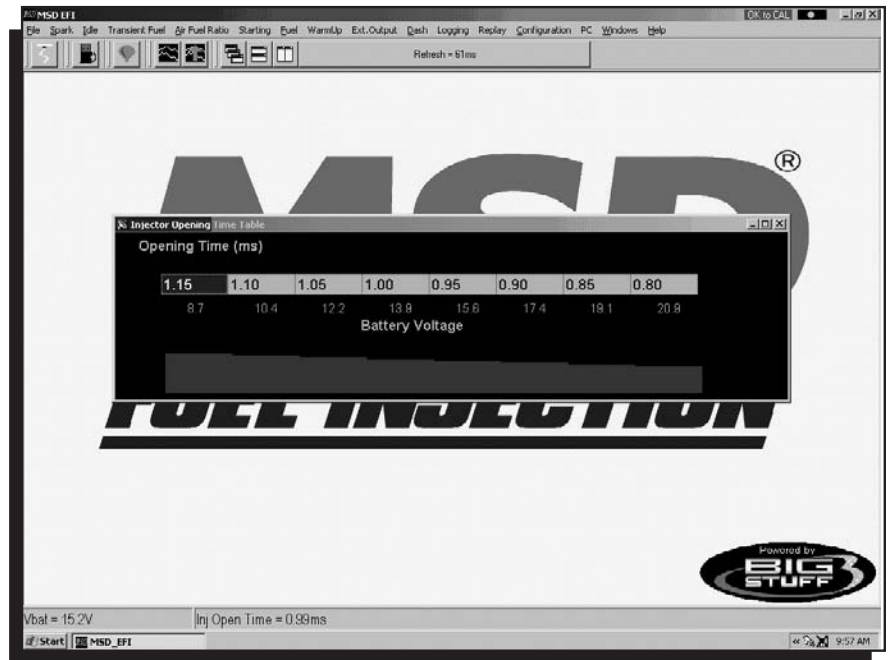


20 Injector Opening Time

Next, go back to Configuration on the Tool Bar. Left click on the “**Configuration**” and the drop down screen will open. Keep the left mouse button depressed and slide the mouse pointer down until “**Injector Opening Time**” is highlighted. Release the left mouse button. The screen below will open.

The purpose of this table is to allow the user to configure the ECU to maintain a constant injector flow rate with varying battery voltages.

Fuel injectors have a minimum pulse width (in milliseconds) required before they will open and let fuel flow. For example, with a constant battery voltage of 13.4V, a 60 lb/hr. Bosch injector is not likely to open until the ECU sends a pulse width command of 1.4 to 1.5 milliseconds (injector opening time is also influenced by fuel pressure).



21 Air Fuel Ratio (F11)

At a given voltage, the minimum pulse width required to open an injector will vary based on injector size, injector type and manufacturer. This input screen allows the user the ability to fine tune flow rates (injector opening time) based on battery voltage.

The following sections of the manual will outline how to use the Air/Fuel Ration table, O2 Correction tables and the Fuel Table. Calibrating the engine for steady state operation is an iterative process using these tables.

The fuel calibration process, in order of importance, is as follows:

- The air/fuel ration table will be configured to desired ratios for the different engine speed and load combinations.
- The positive and negative O2 correction tables will be configured.
- The volumetric efficiency (VE) values in the Fuel Table will be calibrated.

Once these tables are configured, as a baseline, the **Calibrating with the Trace Function** can be used to fine-tune the interrelationships of the aforementioned tables. The “Trace” function allows the engine to be quickly calibrated “On-Line” (ECU powered up) or “Off-Line” (PC only). The Trace Function is explained in Chapter 71 of this manual.



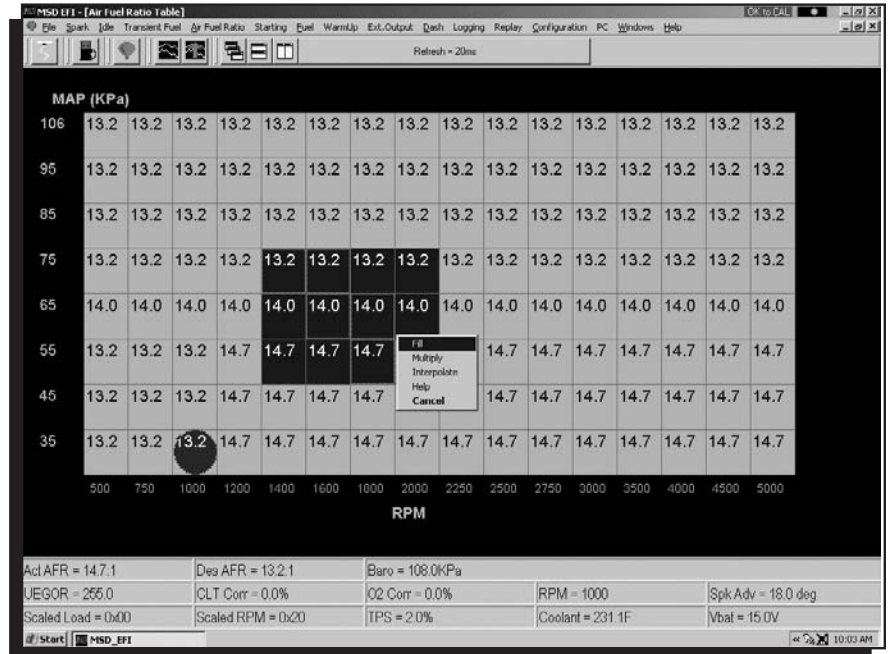
22 Air Fuel Ratio Table

Note: In most cases, the ECU shipped with your system will come pre-configured with a table, which will closely match your engine configuration. The air fuel ratio table below allows the user to input desired air/fuel ratios for sixteen (16) engine **speed** (RPM) and 8 **load** (MAP or TPS) combinations. The X-axis represents engine RPM and allows for 16 inputs and the Y-axis represents engine load and allows for 8 inputs. For each speed and load combination (cell) the engine operates within, the ECU uses the WB92 sensor feedback to achieve the desired air/fuel ratio for that cell.



While the engine is running, a “Real-Time Ellipse” will move throughout the Air Fuel Ratio table relative to the current RPM and Load “operating point”. Use it as a point of reference to help calibrate the Air Fuel Ratio table.

To change a cell value in the Air Fuel Ratio table, move the cursor using the PC’s mouse or the arrow keys to the cell to be changed. Click on the cell and type a desired Air Fuel Ratio value (from 10.5 to 15.0) and hit “**Enter**” to save the change.



To make changes to multiple cells simultaneously, left mouse click and drag the cursor (down and to the right) across the cell range to be changed. Release the left mouse button and a secondary drop down screen will appear outlining three potential “cell fill” options.

- **Fill** - Choosing “Fill” will open a secondary drop down-screen which allows the selected cells to be changed to the value inputted into the window.
- **Multiply** - Choosing “Multiply” will open a secondary drop down-screen which allows the values of the selected cells to be changed by the “Multiply” value inputted into the window. For example, if the values in the cells selected are 13 and the inputted “Multiply” value was 80, the new cell values would be 10.4.
- **Interpolate** - If a series of cells in the same row are selected and the “Interpolate” “cell-fill” option is selected the ECU will use the value in the cell all the way to the left and the cell value all the way to the right and interpolate the numbers in between so that the values are linear.

EXAMPLE:

Cell values Selected in a Row
 14 14 13.5 13.8

Interpolated Results from Cell Values Selected Above
 14 13.9 13.8 13.8

If a series of cells in the same column are selected and the “Interpolate” option is selected the ECU will use the value in the cell all the way at the bottom and the cell value all the way at the top and interpolate the numbers in between so that the values are linear.

EXAMPLE:

Cell Values Selected in a Column
 13
 13
 14
 13.9

Interpolated Results from Cell Values Selected Above
 13
 13.3
 13.6
 13.9

If a range of cells (multiple rows and columns) are selected and the “Interpolate” “cell-fill” option is selected the ECU will use the value in the cells at the bottom left and top left corners, bottom left and bottom right corners and the bottom left and top right corners of the entire range and interpolate the numbers in between so that the values are linear.

EXAMPLE:

Range of Cell Values Selected

13	13	13	13
13.8	13.8	13.8	13.8
14.1	14.1	14	14
14	14.2	14.2	14

Interpolated Results from Range of Cell Values Selected Above

13	13	13	13
13.3	13.3	13.3	13.3
13.6	13.6	13.6	13.6
14	14	14	14

- **Cancel** - Hit cancel to disregard making any changes.

Example Air Fuel Ratio Tables

Example air fuel ratio tables, for a normally aspirated street engine, a supercharged engine and a turbocharged engine, are shown below. The air/fuel ratio values in these cells can be used as base lines for each of the engine configurations. The “Example Maps” below are segmented into engine operating areas (Cruise, Idle, Wide Open Throttle, etc.) to help the user understand what part of the map is “active” under different driving conditions (engine speed and load combinations).

Normally Aspirated Street Engine

	13.1	13.5	13.7	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1
	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
		14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
LOAD	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
	14.5	14.5	14.5	14.6	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	14.5	14.5	14.5	14.6	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	14.5	14.5	14.5	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	600	800	1,000	1,100	1,200	1,500	1,800	2,400	2,800	3,000	3,500	4,000	4,500	5,200	5,500	6,000
	RPM															

Turbocharged Engine (30 PSI)

LOAD	13.1	13.1	13.1	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	13.5	13.5	13.5	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75
	14	14	14	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	14.5	14.5	14.5	12.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
	14.5	14.5	14.5	13	13	13	13	13	13	13	13	13	13	13	13	13	13
	14.5	14.5	14.5	14.6	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	14.5	14.5	14.5	14.6	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	14.5	14.5	14.5	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	600	800	1,000	1,150	1,200	1,500	1,800	2,000	2,400	2,800	3,200	3,600	4,000	5,000	6,000	7,000	

RPM

Super Charged Engine (15 PSI)

LOAD	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75
	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	14.6	14.6	14.6	14.6	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	600	800	1,000	1,150	1,200	1,500	1,800	2,000	2,400	2,800	3,200	3,600	4,000	5,000	6,000	7,000	

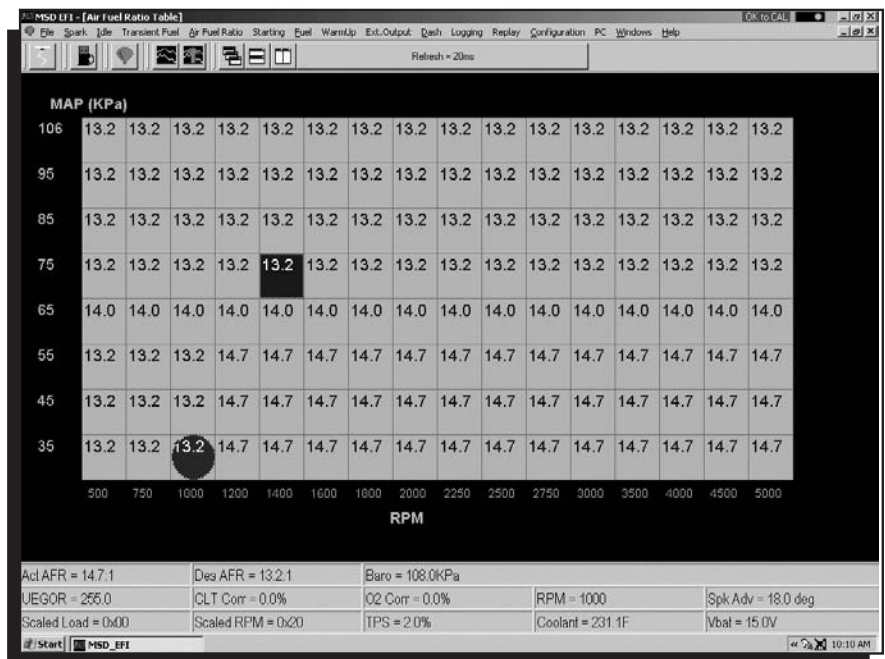
RPM

23 Positive O2 Correction

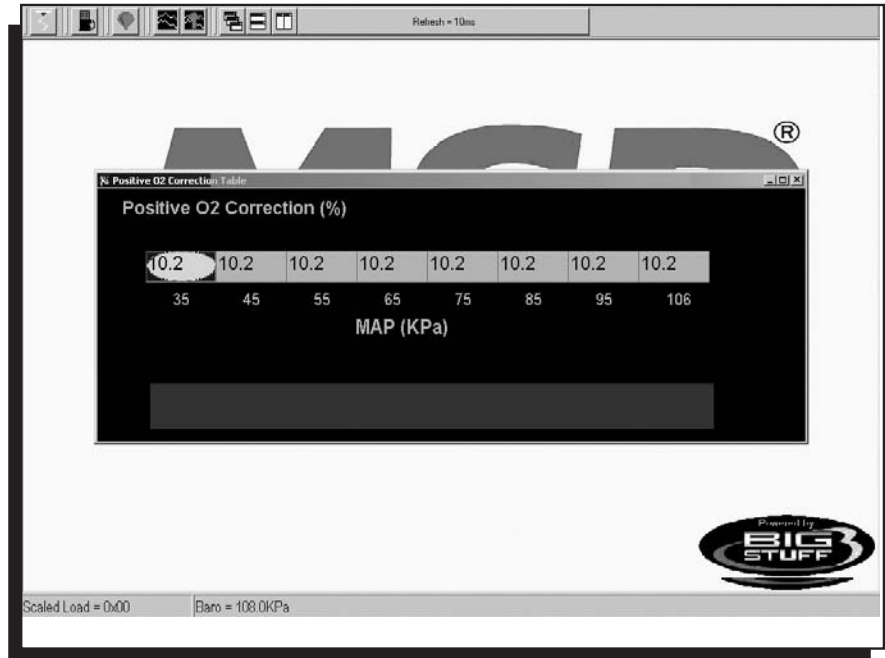
The air fuel ratio table at right allows the user to specify desired air/fuel ratios for 128 speed and load combinations. The positive and negative O2 correction tables on next page allow the user to specify how much fuel the O2 Correction will be allowed to add or subtract to achieve the user defined air/fuel ratio.

The positive and negative O2 Correction tables limit the amount added or subtracted.

The eight (8) **horizontal** input cells in the tables correspond to the eight (8) **vertical** "Load" rows in the Air/Fuel Ratio Table. The input values in the tables add or subtract fuel, as a percentage, for each cell in the entire engine "Load" row. The cell all the way to the left corresponds to the bottom row in the air/fuel ratio table and the cell all the way to the right corresponds to the top row of the air/fuel ratio table.

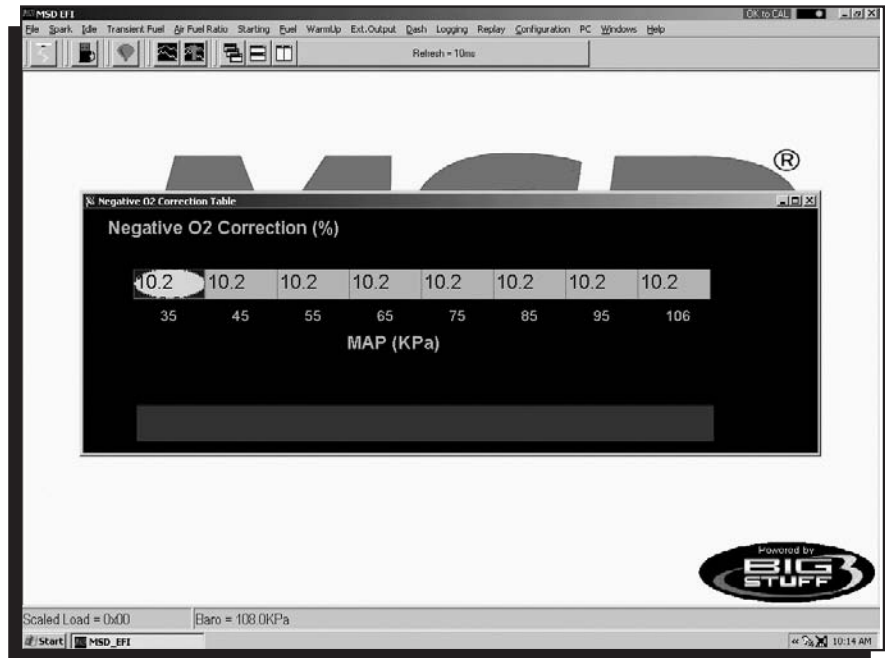


To make changes to the values in these tables, use the left or right arrow keys to move the cursor to the cell to be changed. Input the desired value and hit "Enter".



24 Negative O2 Correction

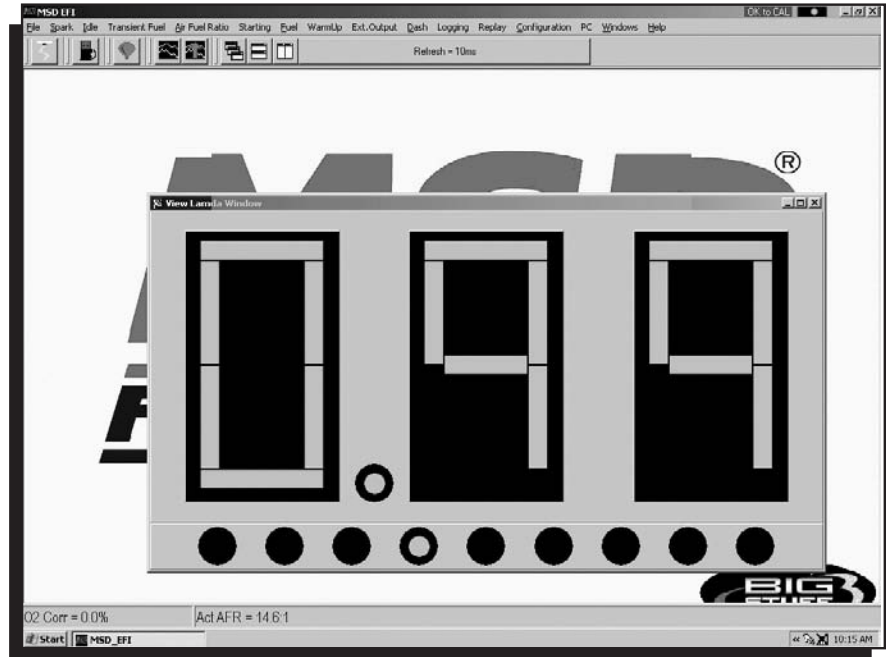
This table is configured and operates in the same way as the table above. The difference is that this table limits the amount of Negative O2 Correction.



25 View Lambda (F2)

The View Lambda allows the user to view the current Lambda status in a large LED-like format.

The window can be expanded or contracted by locating the mouse cursor at the edge of the window. The cursor will change shape from an arrow with one (1) point, to an arrow with points on both ends. When the cursor is in the two-point mode, hold the left mouse button down and pull the edge of the window in or out to expand or contract the window.



26 AFR Parameters (F11)

The Air/Fuel Ratio (AFR) Parameters table allows the user to configure control parameters associated with closed loop fuel control, using the WBO2 sensor.

The following paragraphs will describe the function of each control parameter.

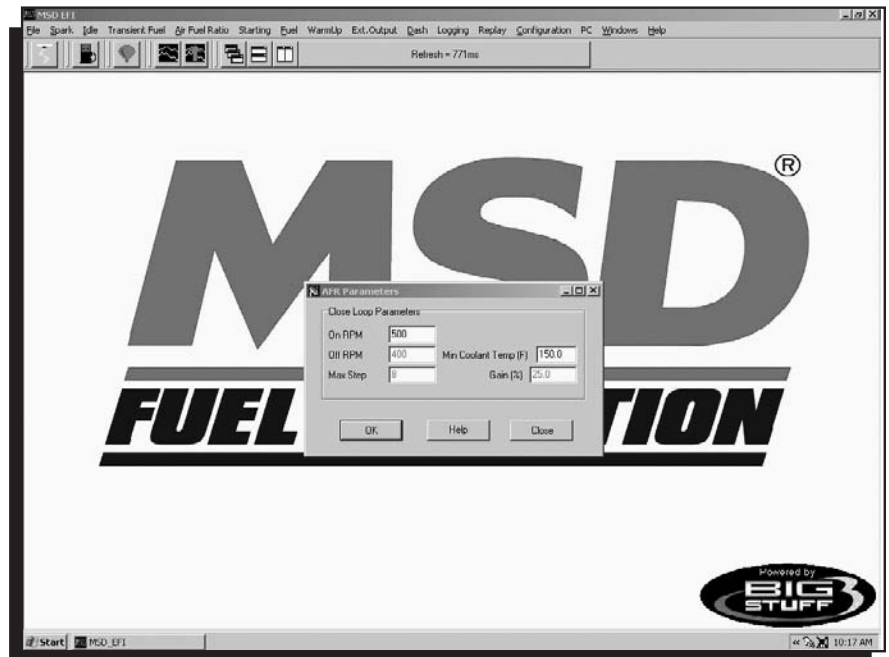
RPM On Inputs

- RPM On - Defines the RPM the engine needs to exceed before the ECU will allow the system to go into closed loop fuel using the O2 sensor.

Minimum Coolant Temperature

The minimum coolant temperature input is the temperature threshold the engine coolant needs to exceed before the ECU will let the system go into closed loop control.

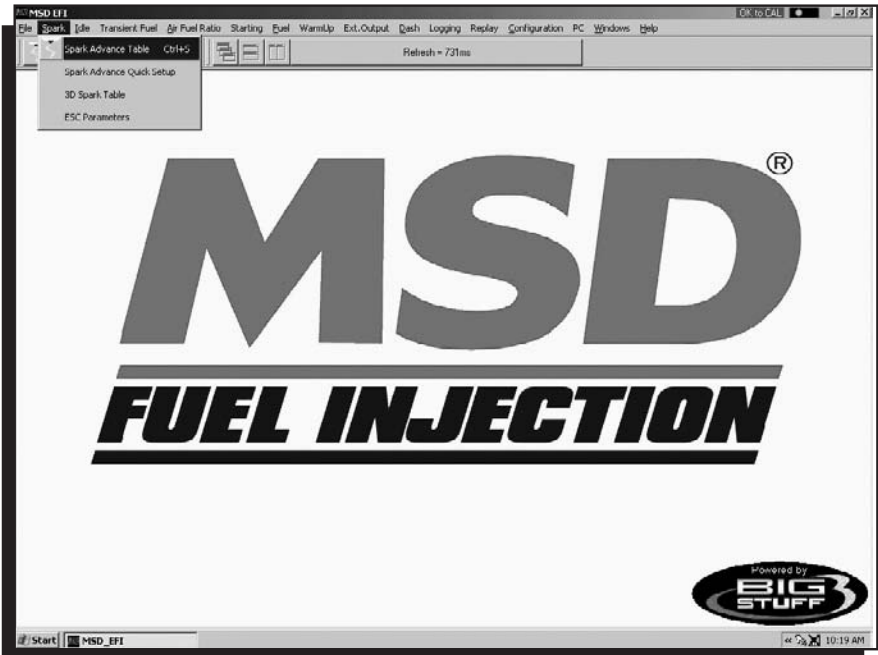
To make changes to the values in these tables, use the left or right arrow keys to move the cursor to the cell to be changed. Input the desired value and click on “OK” at the bottom of the table.



27 Spark (F4)

There are several ways to access the base **Spark** table. The quickest methods are to hit the F4 “Quick Key” or left mouse click on the **Spark** Table icon, accessible from the main MSD EFI Screen. The Main Tool Bar can also be used to access the **Spark** table. From the main MSD EFI software screen tool bar left click on **Spark** and the drop down screen will open.

When the key is turned on the ECU takes a snapshot of the MAP sensor and records the atmospheric pressure (Barometer). The fuel and spark advance maps have a red line that is displayed horizontally across the table. This line represents the Baro pressure. Baro will have different values based on the elevation the vehicle is located at. MAP readings above the line represent positive manifold pressure (Boost) and values below represent negative manifold pressure (Vacuum). The scale on the right side of the table displays boost in psi and vacuum in In-Hg. The variable “Baro” must be displayed in the fuel and spark advance windows dash for the line to be displayed correctly. In order to achieve a correct baro reading the key should be turned on for at least one second before cranking the engine.



28 Spark Table

The **Spark** table uses actual timing values in each of the 256 cells in the table. The Spark table allows the user to input Spark values for sixteen (16) engine speed (RPM) and sixteen (16) load (MAP or TPS) combinations. The X-axis represents engine RPM and allows for 16 inputs and the Y-axis represents engine load and allows for sixteen (16) inputs as well. The X and Y-axes are configurable. For information on how to configure the X and Y-axes see **Load vs RPM**.



While the engine is running, a “Real-Time Ellipse” will move throughout the Spark table relative to the current RPM and Load “operating point”. Use it as a point of reference to help calibrate the Spark table.

To change a cell value in the Spark

	MAP (kPa)																Relative Pressure			
106	19.5	19.5	19.5	19.5	21.0	22.8	24.3	26.0	27.5	29.0	30.8	32.3	34.0	34.0	34.0	34.0	0.5 inHg			
95	19.5	19.5	19.5	19.5	21.0	22.8	24.3	26.0	27.5	29.0	30.8	32.3	34.0	34.0	34.0	34.0	2.4 inHg			
90	20.3	20.3	20.3	20.3	21.8	23.5	25.0	26.8	28.3	29.8	31.5	33.0	34.5	34.5	34.5	34.5	3.9 inHg			
85	21.0	21.0	21.0	21.0	22.5	24.3	25.8	27.5	29.3	30.8	32.5	33.8	35.3	35.3	35.3	35.3	5.3 inHg			
80	21.8	21.8	21.8	21.8	23.5	25.0	26.8	28.5	30.0	31.8	33.5	34.8	36.0	36.0	36.0	36.0	6.8 inHg			
75	22.5	22.5	22.5	22.5	24.3	25.8	27.5	29.3	31.0	32.5	34.5	35.5	36.8	36.8	36.8	36.8	8.0 inHg			
70	23.5	23.5	23.5	23.5	25.0	26.5	28.3	30.0	31.8	33.5	35.3	36.3	37.3	37.3	37.3	37.3	9.0 inHg			
65	24.3	24.3	24.3	24.3	26.0	27.5	29.0	31.0	32.8	34.5	36.3	37.0	38.0	38.0	38.0	38.0	10.0 inHg			
60	18.0	18.0	18.0	25.0	26.8	28.3	30.0	31.8	33.5	35.3	37.3	38.0	38.8	38.8	38.8	38.8	11.0 inHg			
55	18.0	18.0	18.0	25.8	27.8	29.0	30.8	32.8	34.5	36.3	38.3	38.8	39.5	39.5	39.5	39.5	12.0 inHg			
50	18.0	18.0	18.0	26.0	28.0	29.8	31.5	33.5	35.3	37.3	39.3	39.5	40.0	40.0	40.0	40.0	13.0 inHg			
45	18.0	18.0	18.0	27.5	29.3	30.5	32.5	34.3	36.3	38.0	40.0	40.5	40.8	40.8	40.8	40.8	14.0 inHg			
40	18.0	18.0	18.0	28.3	30.3	31.3	33.3	35.3	37.0	39.0	41.0	41.3	41.5	41.5	41.5	41.5	15.0 inHg			
35	18.0	18.0	18.0	29.0	31.0	32.0	34.0	36.0	38.0	40.0	42.0	42.0	42.3	42.3	42.3	42.3	16.0 inHg			
30	30.0	18.0	18.0	30.0	32.0	33.0	35.0	37.0	39.0	41.0	43.0	43.0	43.0	43.0	43.0	43.0	17.0 inHg			
					500	750	1000	1200	1400	1600	1800	2000	2250	2500	2750	3000	3500	4000	4500	5000

Press <Ctrl> <Enter> keys together to Update Window

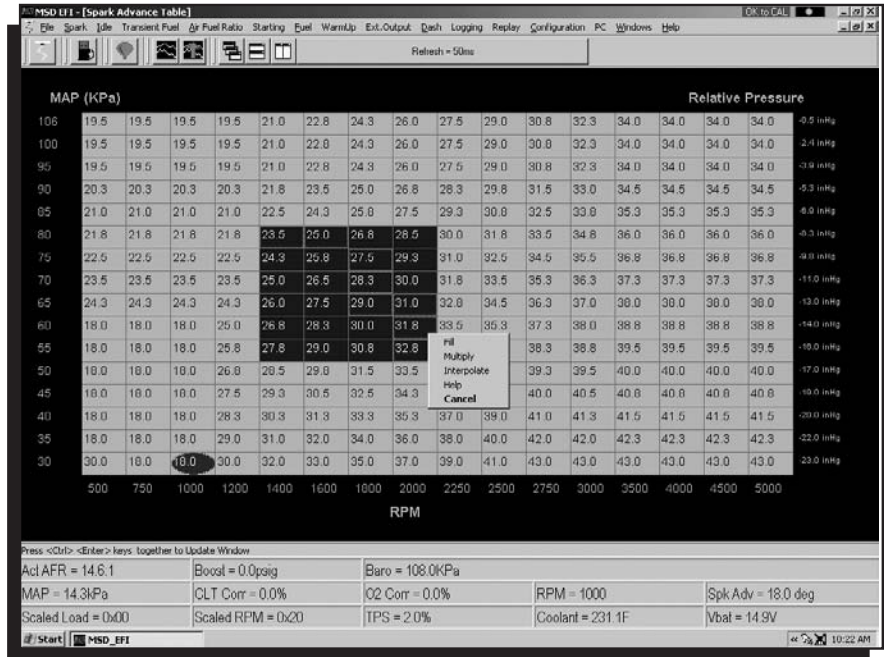
Act AFR = 14.6:1	Boost = 0.0psig	Baro = 108.0kPa	RPM = 1000	Spk Adv = 18.0 deg
MAP = 14.3kPa	CLT Corr = 0.0%	O2 Corr = 0.0%	Scaled Load = 0x00	Scaled RPM = 0x20
TPS = 2.0%	Coolant = 231.1F	Vbat = 15.0V		



table, move the cursor using the PC’s mouse or the arrow keys to the cell to be changed. Click on the cell and type a desired Spark value (from 15.0 to 63.8) and hit “**Enter**” to save the change.

To make changes to multiple cells simultaneously, left mouse click and drag the cursor across the cell range to be changed. Release the left mouse button and a secondary drop down screen will appear outlining three potential “cell fill” options.

- **Fill** - Choosing “Fill” will open a secondary drop down-screen which allows the selected cells to be changed to the value inputted into the window.
- **Multiply** - Choosing “Multiply” will open a secondary drop down-screen which allows the values of the selected cells to be changed by the “Multiply” value inputted into the window. For example, if the values in the cells selected are 13 and the inputted “Multiply” value was 80, the new cell values would be 10.4.
- **Interpolate** - If a series of cells in the same row are selected and the “Interpolate” “cell-fill” option is selected the ECU will use the value in the cell all the way to the left and the cell value all the way to the right and interpolate the numbers in between so that the values are linear.



Cell values Selected in a Row
 30.5 27.8 27.8 27.8

Interpolated Results from Cell Values Selected Above
 30.5 29.5 28.5 27.8

If a series of cells in the same column are selected and the “Interpolate” option is selected the ECU will use the value in the cell all the way at the bottom and the cell value all the way at the top and interpolate the numbers in between so that the values are linear.

EXAMPLE:

Cell Values Selected in a Column
 27.8
 30.5
 32
 33

Interpolated Results from Cell Values Selected Above
 27.8
 29.5
 31.3
 33

If a range of cells (multiple rows and columns) are selected and the “Interpolate” “cell-fill” option is selected the ECU will use the value in the cells at the bottom left and top left corners, bottom left and bottom right corners and the bottom left and top right corners of the entire range and interpolate the numbers in between so that the values are linear.

EXAMPLE:

Range of Cell Values Selected

27	30.5	33.3	33.3
26	33.3	33.3	34
22	28	34	35
18	25	35	36
15	22	33	35

Interpolated Results from Range of Cell Values Selected Above

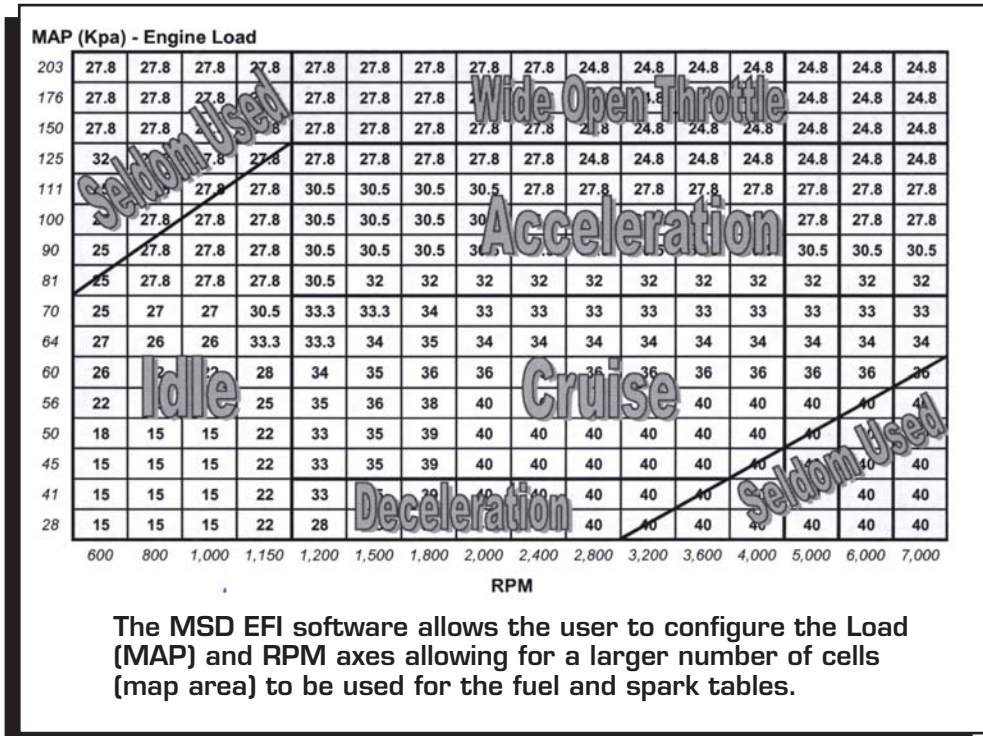
27	29	31	33.3
24	27	30.3	33.5
21	25.3	29.8	34
18	23.5	29	34.5
15	21.5	28.3	35

- **Cancel** - Hit cancel to disregard making any changes.

The illustration below shows the areas of the Spark map that the ECU accesses under different driving conditions.

Cell Changes using the “Page Up” and “Page Down” Keys (Fuel and Spark Tables)

Multiple cell values can also be changed simultaneously using the “Page Up” and “Page Down” keys. This approach offers a quick alternative to using the mouse. Use the keyboard arrow keys (up/down/left/right) to maneuver to area of the map where the desired cell changes will be made. Next, depress and hold the keyboard “Shift” key. Depress the “Page Up” key to increase the cell values and the “Page Down” key to decrease the cell values. The cell values will increase or decrease by a value of one (1) for every keystroke. To exit this mode, depress any one of the arrow keys.



29 Spark Advance Quick Setup

This feature allows a timing curve to be built independent of engine load. A simple curve is entered which is identical to the mechanical advance function of a distributor (minus vacuum advance). For those new to fuel injection who are un-familiar with a load-based spark map, it is suggested to begin using this option. The load-based values can be changed at a later time if desired. Once this mode is selected the Spark Advance Quick Setup and Spark Advance Table windows will be displayed. Timing values are entered into the 2D table. Any value entered into the 2D table will populate the entire column for that RPM in the Spark Advance Table. For example: a value of 10 degrees is entered into the 1000 RPM cell, after the Enter key is pressed the entire 1000 RPM column of the Spark Advance Table gets updated to 10 degrees.

30 ESC Parameters

Note: If “knock” sensors are not being used, no inputs are required in this table. The system is configured to work with GM style “knock” sensors.

ESC Configuration Table

The Electronic Spark Control (ESC) Configuration table allows the user to take timing out of the engine if the GM style knock sensor detects “knock,” or pre-ignition, in the engine. The table below has three input screens.

- **Knock Retard Rate** - The amount of timing, in degrees per second, the ECU will take timing out if the sensor detects “knock”.
- **Knock Rate Restore** - The rate, in degrees per second, in which timing is added back or restored once “knock” or longer present.
- **Max ESC** - The maximum amount of timing the ECU will pull out if “knock” is detected.

The values shown in the table below can be used as a base line starting point.



31 Fuel (F3)

There are several ways to access the base “Fuel” table. The quickest methods are to hit the F3 key or left mouse click on the Fuel Table icon, accessible from the main MSD EFI Screen.

The Main Tool Bar can also be used to access the “Fuel” table. From the Main MSD EFI software screen tool bar left click on Fuel and the drop down screen will open.

Using the PC’s mouse, keep the left mouse button depressed and slide the mouse pointer down until “Fuel Table” is highlighted. Release the left mouse button. The screen below will open.



When the key is turned on the ECU takes a snapshot of the MAP sensor and records the atmospheric pressure (Barometer). The fuel and spark advance maps have a red line that is displayed horizontally across the table. This line represents the Baro pressure. Baro will have different values based on the elevation the vehicle is located at. MAP readings above the line represent positive manifold pressure (Boost) and values below represent negative manifold pressure (Vacuum). The scale on the right side of the table displays boost in Psi and vacuum in In-Hg. The variable “Baro” must be displayed in the fuel and spark advance windows dash for the line to be displayed correctly. In order to achieve a correct baro reading the key should be turned on for at least one second before cranking the engine.

32 Fuel Table



The Fuel table uses Volumetric Efficiency (VE) values in each of the 256 cells in the table. Volumetric Efficiency is the measure for how efficient the engine is operating at a given engine speed and load combination. The efficiency of the engine is nearly perfect at a value of 100. Volumetric Efficiency (VE) is highest at peak torque.

The Fuel table allows the user to input desired (VE) values for 16 engine speed (RPM) and 16 load (MAP or TPS) combinations. The X-axis represents engine RPM and allows for 16 inputs and the Y-axis represents engine load and allows for 16 inputs as well. The X and Y-axes are configurable. For information on how to configure the X and Y-axes see **Load vs RPM**.

MAP (KPa)	Relative Pressure															
	78	78	78	78	79	82	85	84	77	83	85	83	78	78	78	78
106	78	78	78	78	79	82	85	84	77	83	85	83	78	78	78	78
100	78	78	78	78	79	82	85	84	77	83	85	83	78	78	78	78
95	78	78	78	78	79	82	85	84	77	83	85	83	78	78	78	78
90	75	75	75	75	77	79	82	81	75	80	82	80	76	76	76	76
85	72	72	72	72	73	76	79	78	73	77	79	77	73	73	73	73
80	69	69	69	69	70	73	76	75	70	74	76	74	70	70	70	70
75	66	66	66	66	68	70	73	72	67	71	73	71	68	68	68	68
70	61	61	63	63	65	67	70	69	65	69	70	69	66	66	66	66
65	58	58	60	60	62	64	66	66	63	66	66	66	63	63	63	63
60	54	54	57	57	59	61	63	63	60	63	63	63	61	61	61	61
55	45	45	54	54	58	58	60	60	58	59	60	59	59	59	59	59
50	45	45	51	51	54	55	57	57	55	57	57	57	56	56	56	56
45	35	35	48	48	51	52	54	54	53	54	54	54	53	53	53	53
40	35	35	45	45	48	49	51	51	51	51	51	51	51	51	51	51
35	33	33	37	37	38	38	40	40	40	40	40	40	40	40	40	40
30	33	33	28	28	28	28	28	28	28	28	28	28	28	28	28	28
	500	750	1000	1200	1400	1600	1800	2000	2250	2500	2750	3000	3500	4000	4500	5000

Press <Ctrl> <Enter> keys together to Update Window

Boost = 0.0psig	Baro = 108.0KPa	Spk Adv = 18.0 deg	Vol Eff = 28.1%	Act AFR = 14.6:1
ATM Corr = 7.8%	RPM = 1000	O2 Corr = 0.0%	AFT Corr = 0.0%	Air Corr = 0.0%
MAP = 14.3KPa	CLT Corr = 0.0%	TPS = 2.0%	Coolant = 231.1F	Vbat = 14.5V
Scaled Load = 0x00	Scaled RPM = 0x20			

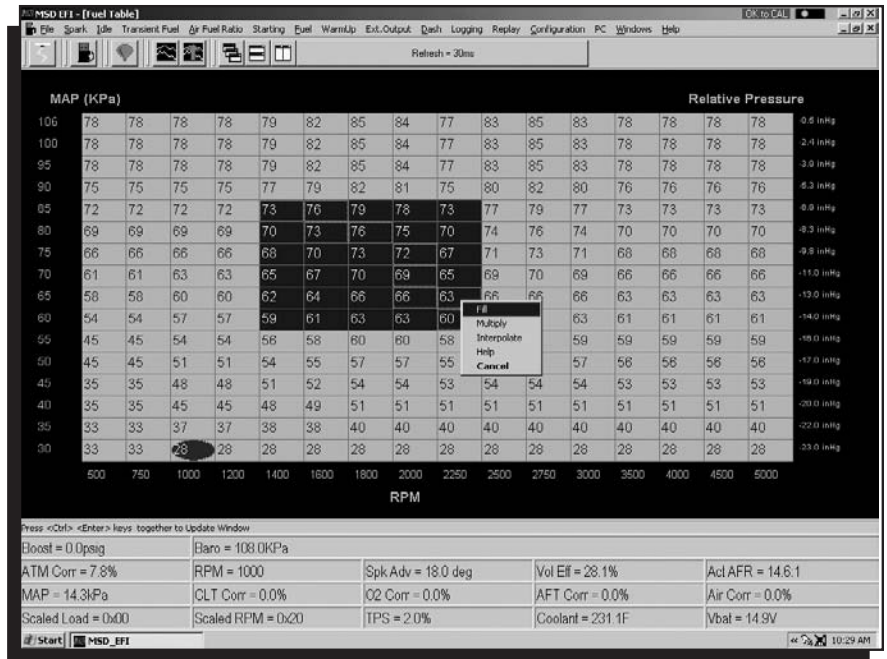


While the engine is running, a “Real-Time Ellipse” will move throughout the Fuel table relative to the current RPM and Load “operating point”. Use it as a point of reference to help calibrate the Fuel table.

To change a VE cell value in the Fuel table, move the cursor using the PC’s mouse or the arrow keys to the cell to be changed. Click on the cell and type a desired VE value (from 15.0 to 200) and hit “**Enter**” to save the change.

To make changes to multiple cells simultaneously, left mouse click and drag the cursor across the cell range to be changed. Release the left mouse button and a secondary drop down screen will appear outlining three potential “cell fill” options.

- **Fill** - Choosing “Fill” will open a secondary drop down-screen which allows the selected cells to be changed to the value inputted into the window.
- **Multiply** - Choosing “Multiply” will open a secondary drop down-screen which allows the values of the selected cells to be changed by the “Multiply” value inputted into the window. For example, if the values in the cells selected are 13 and the inputted “Multiply” value was 80, the new cell values would be 10.4.
- **Interpolate** - If a series of cells in the same row are selected and the “Interpolate” cell-fill” option is selected the ECU will use the value in the cell all the way to the left and the cell value all the way to the right and interpolate the numbers in between so that the values are linear.



EXAMPLE:

Cell values Selected in a Row

70 70 70 80

Interpolated Results from Cell Values Selected Above

70 73 77 80

If a series of cells in the same column are selected and the “Interpolate” option is selected the ECU will use the value in the cell all the way at the bottom and the cell value all the way at the top and interpolate the numbers in between so that the values are linear.

EXAMPLE:

Cell Values Selected in a Column

90
70
70
70

Interpolated Results from Cell Values Selected

85
80
75
70

If a range of cells (multiple rows and columns) are selected and the “Interpolate” “cell-fill” option is selected the ECU will use the value in the cells at the bottom left and top left corners, bottom left and bottom right corners and the bottom left and top right corners of the entire range and interpolate the numbers in between so that the values are linear.

EXAMPLE:

Range of Cell Values Selected

80	80	80	80
80	80	80	80
80	79	77	80
77	77	75	80

Interpolated Results from Range of Cell Values Selected Above

80	80	80	80
79	80	80	80
78	79	80	80
77	78	79	80

- **Cancel** - Hit cancel to disregard making any changes.

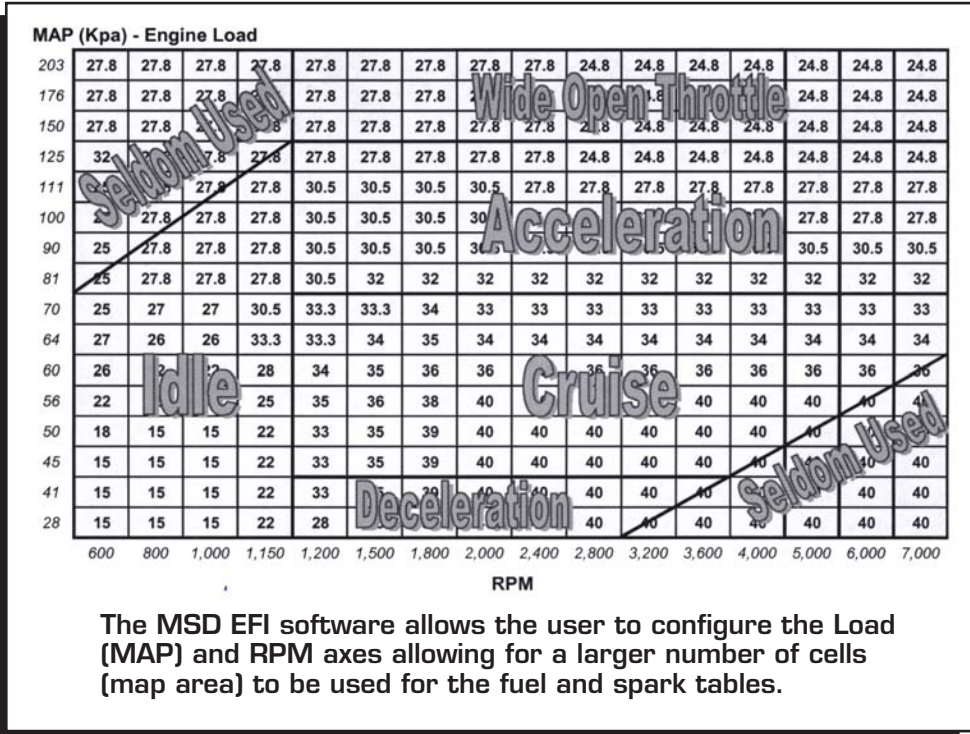
Cell changes using the “Page Up” and “Page Down” Keys (Fuel and Spark Tables)

Multiple cell values can also be changed simultaneously using the “Page Up” and “Page Down” keys. This approach offers a quick alternative to using the mouse. Use the keyboard arrow keys (up/down/left/right) to maneuver to area of the map where the desired cell changes will be made. Next, depress and hold the keyboard “Shift” key. Now, use the arrow keys, to maneuver through the cells to be changed. As the cells are being selected they will become highlighted. Once the desired cell range has been highlighted, release the “Shift” key. Depress the “Page Up” key to increase the cell values and the “Page Down” key to decrease the cell values. The cell values will increase or decrease by a value of one (1) for every keystroke. To exit this mode, depress any one of the arrow keys.

The illustration below shows the areas of the base fuel map that the ECU accesses under different driving conditions.

Hint: Use the 02% Correction feedback in the Dash to help calibrate the Fuel table VE values. Also, do not calibrate the Fuel Table VE values until the engine has reached its steady state operating temperature i.e. 180°F coolant temperature.

Note: Be sure the ECU is properly configured and the Base Fuel and Spark Tables are calibrated before configuring and calibrating any of the following engine operating parameters.



The MSD EFI software allows the user to configure the Load (MAP) and RPM axes allowing for a larger number of cells (map area) to be used for the fuel and spark tables.

Calibration Readiness Indicator

On the top right hand side of the screen to the left of the status box with the green ball is the calibration readiness indicator. There are three modes that can be displayed.

- Offline: Displayed when unit is not connected to the ECU.
- Warming: Displayed when the ECU is connected and the engine is in warm-up mode.
- OK to Cal: Displayed when the ECU is connected and the engine is up to operating temperature (out of cold start enrichment). The base fuel map can now be changed.

33 Starting

The “Starting” drop-down selections allow the user to calibrate parameters associated with starting (cranking) and running the engine for a short period of time (temperature dependent) after the engine is initially started.

To configure engine starting fuel, go to **Starting** on the Tool Bar. Left click on “Starting” and a drop down screen will open. Keep the left mouse button depressed and slide the mouse pointer down until the desired “Starting” fuel drop down is highlighted.

The sequence of events the ECU steps through during an engine “start” are defined, in order, in the next four sections as follows:

- Cranking
- After Start Delay
- After Start Correction (adding fuel)
- After Start Decay

34 Cranking (F1)

The inputs in this table are only used by the ECU when the engine is in the cranking mode (<400 RPM).

The **Cranking** table allows the user to input the actual pulse which the injectors will operate at during engine cranking. The pulse width required is a function of the engine coolant temperature. The colder the engine, the larger the pulse width required.

If the throttle needs to be opened to start the engine during Cranking, the ECU is adding to much fuel. Therefore, a **smaller** injector pulse which needs to be entered into the input cell relative to the engine coolant temperature. Make sure pulse width modifications are inputted into the correct input cells. Entering a smaller pulse width into the cell representing an engine coolant temperature of 144° will not help start the engine when the temperature is 55°.

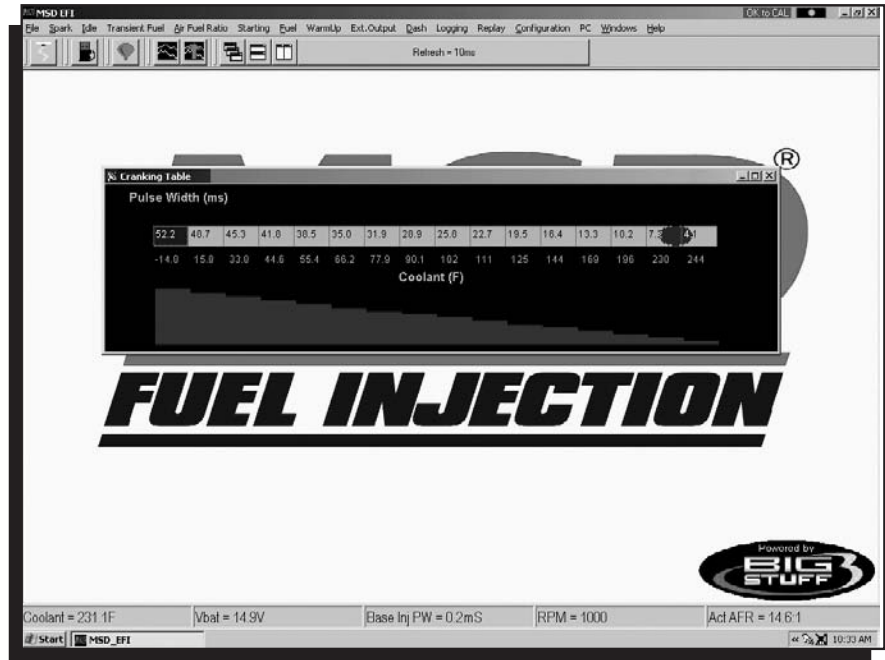
Note: If the throttle is opened to position greater than what was set in the **Clear Flood TPS%** setting, the ECU will not add fuel. See **Clear Flood Setting** for more details.



While the engine is cranking, a “Real-Time Ellipse” will move within the Cranking table relative to the current engine coolant temperature “operating point”. Use it as a point of reference to help calibrate the Cranking table.

To change a value in the **Cranking** table, move the cursor until the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.

Once the engine starts (the ECU will detect the rapid change in engine speed) the ECU will ignore the **Cranking** table and begin using inputs from the **After Start Delay** (see below).



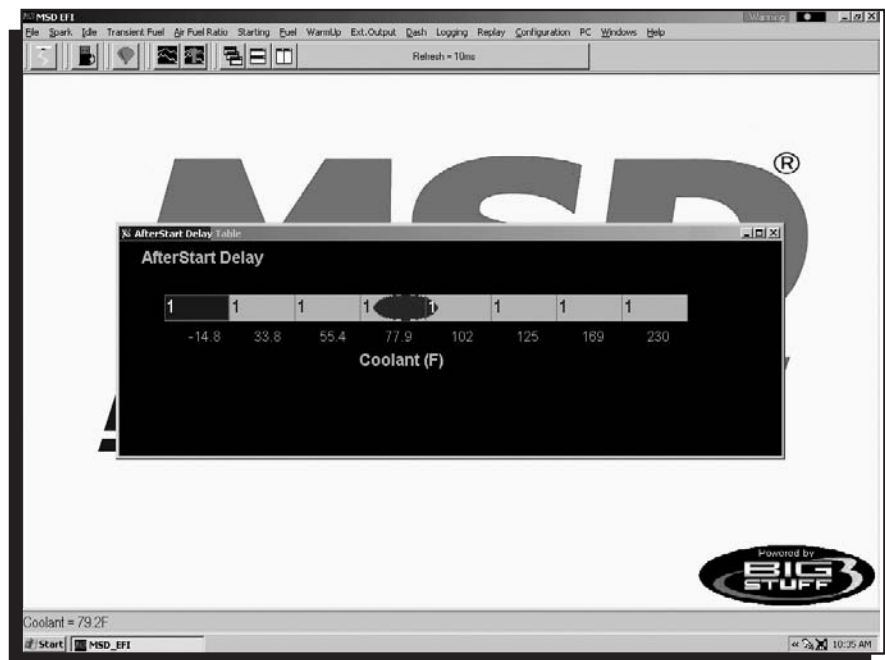
35 After Start Delay

Once the ECU detects the engine has started, it uses the vehicle coolant temperature sensor and inputs from the **After Start Delay** table to decide when to introduce the **After Start Correction Fuel**. The ECU begins counting the crankshaft interrupts. When the ECU counts off the number of interrupts defined in the **After Start Delay** table, for the current engine operating temperature, the ECU adds the **After Start Correction Fuel**. The delay mentioned here is very, very short.

The table below shows 9 interrupts were used at -14° and 16 interrupts at 230°. One can appreciate how quickly nine (9) or sixteen (16) crankshaft interrupts occur at an engine speed of 800 RPM.

While the engine is running, a “Real-Time Ellipse” will move within the After Start Delay table relative to the current engine coolant temperature “operating point”. Use it as a point of reference to help calibrate the After Start Delay table.

To change a value in the After Start Delay table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.



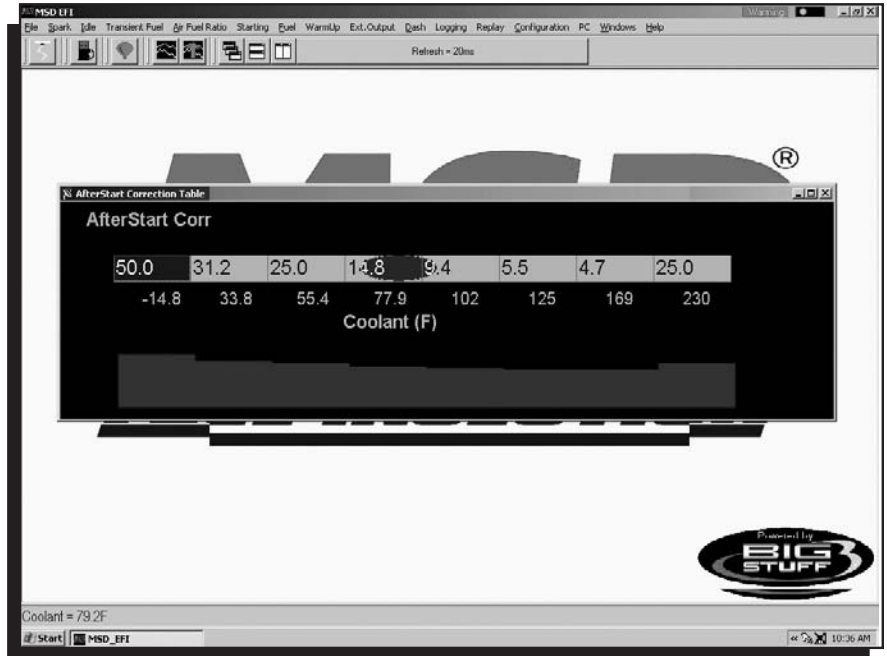
36 After Start Correction

As outlined above, the ECU delays the introduction of **After Start Correction** fuel once the engine starts.

The table below allows the user to define the amount of **After Start Correction** fuel to be added as a function of coolant temperature. The After Start Correction fuel is added synchronously as a percent (%) of the base pulse width (defined in the Fuel table). As you will notice in the table, the percent (%) of fuel added is greater at the two temperature extremes. The largest amount of fuel is needed when the engine is coldest. A larger amount of fuel is also added when the engine is hot versus the mid range temperatures, to release any vaporized fuel that may have “boiled” in the fuel rail(s) during a hot soak.

While the engine is running, a “Real-Time Ellipse” will move within the **After Start Correction** table relative to the current engine coolant temperature “operating point”. Use it as a point of reference to help calibrate the **After Start Correction** table.

To change a value in the **After Start Correction** table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “**Enter**” to save the change.

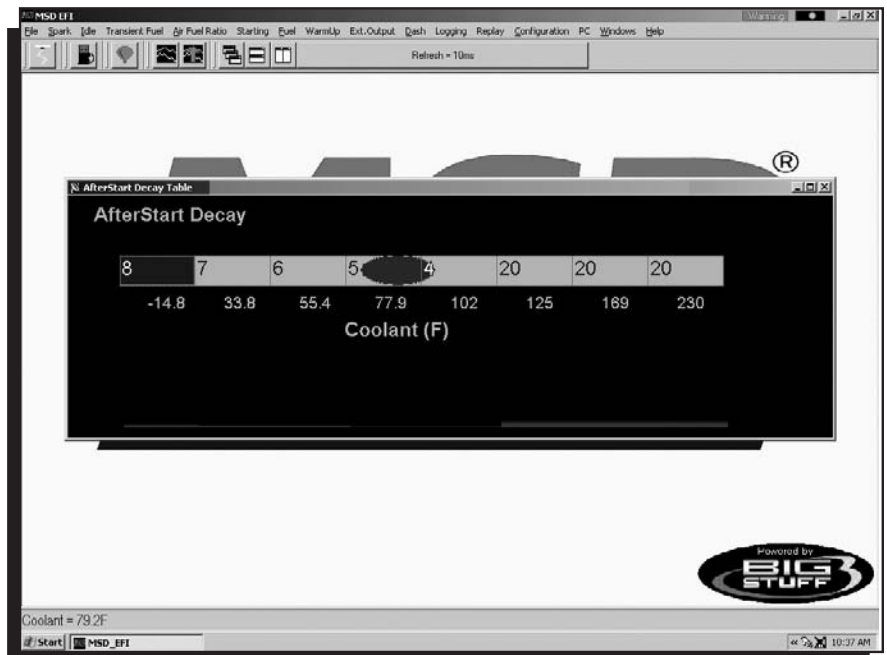


37 After Start Decay

The **After Start Correction** fuel being added by the ECU during an engine starting routine is only required for a very short period of time. The ECU pulls the fuel back out, or decays it, as a function of crankshaft interrupts and coolant temperature. The ECU decays the After Start Correction Fuel over the number of interrupts, depending on the temperature the engine is currently operating at, defined in the After Start Decay table. The decay period mentioned here is very, very short. The table at right shows 8 interrupts were used at -14° and 22 interrupts at 230°.

While the engine is running, a “Real-Time Ellipse” will move within the **After Start Decay** table relative to the current engine coolant temperature “operating point”. Use it as a point of reference to help calibrate the **After Start Decay** table.

To change a value in the **After Start Decay** table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “**Enter**” to save the change.



38 Idle

The “Idle” drop down offers the user four tables to calibrate the engine idle quality. Each input table will be described in the paragraphs below. To get to the Idle drop down screen, go to the main Tool Bar and left click on Idle and the screen below will appear. Hold the left mouse down and drag it to the desired input screen and release the mouse button.



39 Throttle Follower

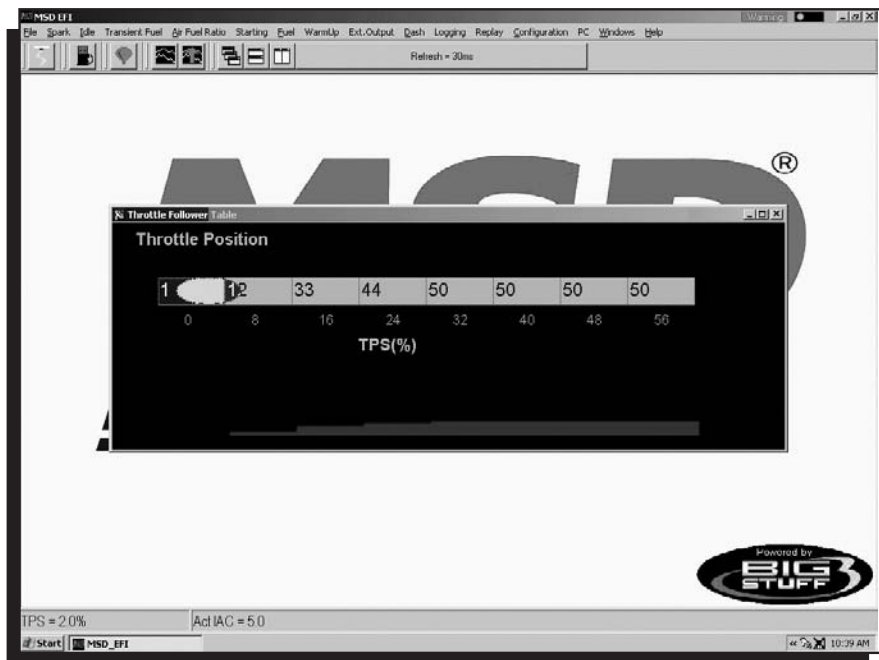
Throttle bodies used with electronic fuel injection systems have an air bypass channel molded or machined into the valve body to allow air to be bypassed around the throttle blades when they are fully closed. The air entering the engine through the bypass channel is used to control the engine idle speed. The amount of air needed to maintain a desired engine speed varies depending on engine coolant temperature, camshaft overlap, etc. The Idle Airspeed Control (IAC) motor (and plunger) control the amount of air allowed to be bypassed around the throttle blades.

The “Throttle Follower” table allows the user to set a relationship between throttle blade **angle** and the **position** of the IAC metering valve (plunger). This is required to keep the engine from stalling when the throttle position changes from some percent (%) open to fully closed very quickly.

The fixed values along the bottom of the table below represent the percent (%) throttle position which increase in increments of 8%. The input values above the fixed numbers are used by the ECU to position the IAC metering valve (plunger), inside the bypass channel. The position of the metering valve (plunger) will vary depending on throttle position. The default values, configured with the system as shipped, will work with a majority of engine applications.

While the engine is running, a “Real-Time Ellipse” will move within the **Throttle Follower** Table relative to the current TPS (%) “operating point”. Use it as a point of reference to help calibrate the **Throttle Follower** table.

To change a value in the **Throttle Follower** table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.

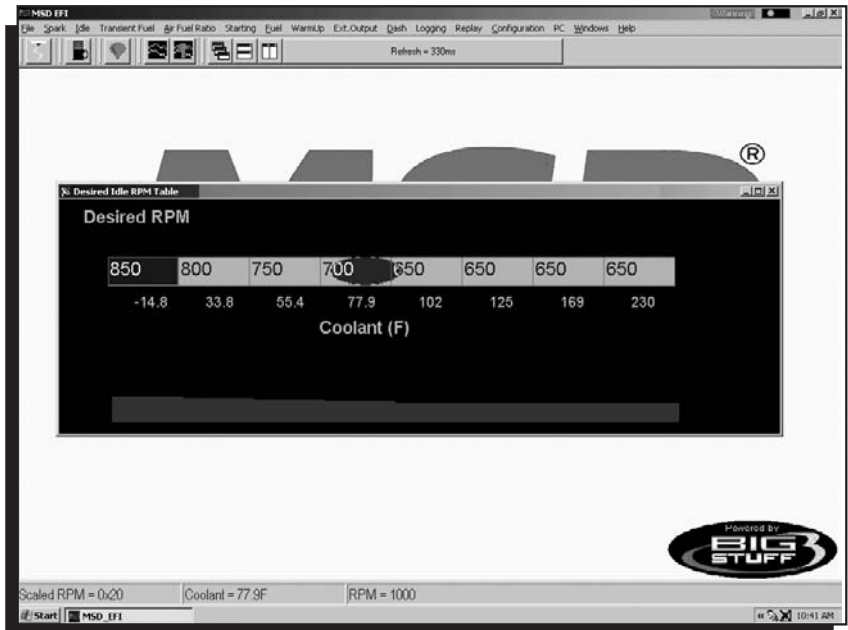


40 Desired Idle RPM

The **Desired Idle RPM** table allows the user to set the desired engine RPM as a function of coolant temperature. To configure the table, input the desired engine RPM for each temperature shown at the bottom of the table. The ECU controls the idle speed so transitions between temperature ranges are not noticeable.

Note: The TPS needs to be set properly for this input to function properly. See **TPS Configuration** for further assistance.

While the engine is running, a “Real-Time Ellipse” will move within the **Desired Idle RPM** Table relative to the current engine coolant temperature “operating point”. Use it as a point of reference to help calibrate the **Desired Idle RPM** table.



To change a value in the **Desired Idle RPM** table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.

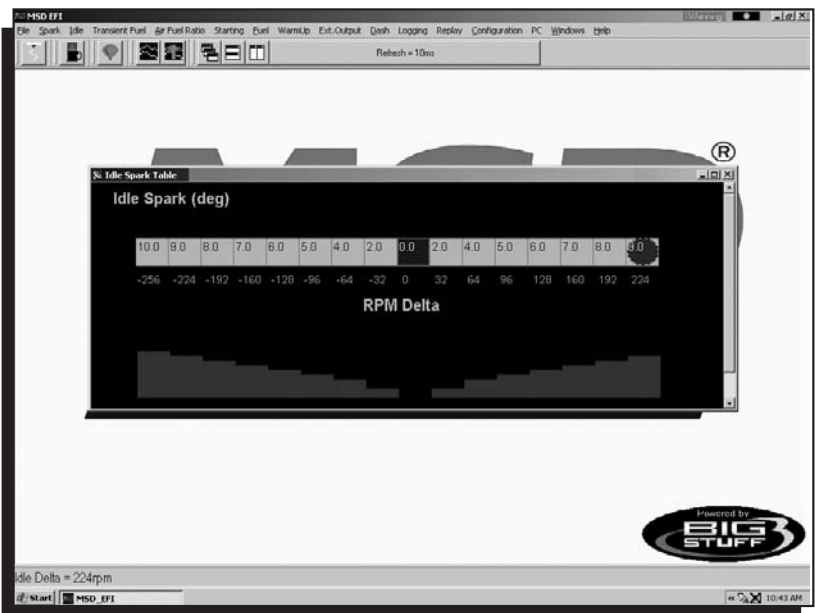
41 Idle Spark

The **Idle Spark** control function helps maintain idle quality by introducing bi-directional spark timing as an additional control variable.

Note: This control strategy is only invoked when the throttle position is below the Max TPS for Idle. See **TPS Configuration**.

The fixed values, below the table, are the ECU’s reference points for how many RPM the engine is operating at above or below the “Desired RPM.” The fixed values define the active control (RPM) range. The active range is from 256 RPM below the “Desired” RPM to 224 RPM above the “Desired” RPM.

The bi-directional input table allows the user to quickly advance the timing (left side of the input table) when the RPM begins falling below the “Desired RPM” setting. Once the timing is advanced it needs to be retarded (right side of the input table) as the engine RPM begins increasing. The zero point in the table is equal to the user defined, “Desired” RPM.



While the engine is running, a “Real-Time Ellipse” will move within the **Idle Spark** table relative to the current RPM Delta “operating point”. Use it as a point of reference to help calibrate the **Idle Spark** table.

To change a value in the **Idle Spark** table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.

The values shown in the table above can be used as a baseline.

42 IAC Start Position

A general description of the IAC motor and valve (plunger) was described on page 36 in the “Throttle Follower” paragraph. The IAC motor can be in one of 180 potential positions, from fully open to fully closed. Fully closed would represent position number one and fully open would represent position number 180. The ECU monitors key engine operating conditions and positions the IAC valve (plunger) accordingly. When the engine is shut off, the IAC goes to position number zero and then counts back to position number 90, or half way open, and stays there. When the engine goes into cranking mode the ECU reads the coolant temperature and instructs the IAC what position to go to. Based on user defined inputs, the **IAC Start Position Table** allows the ECU to position the IAC valve to a predetermined position while the engine is cranking, so that when the engine starts the idle speed can be quickly reached and maintained.

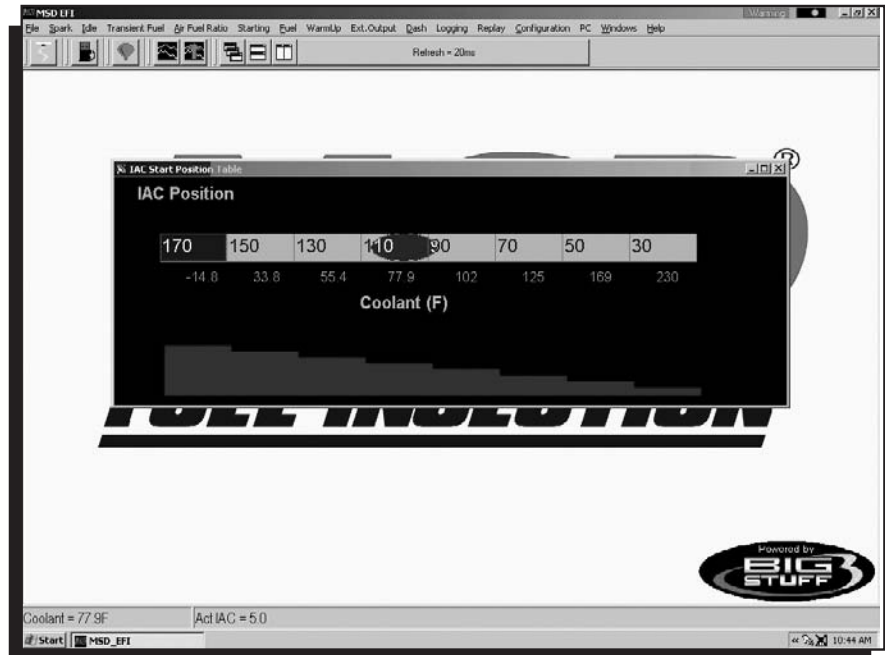
The “position” values shown in the table at right can be used as a baseline for most applications. You can see from the large values in the table that when the coolant temperature is cold, the IAC seeks a position in the direction of the fully open position (position number 180). As the engine reaches normal operating temperature, the IAC finds the position that allows the engine to idle at the user prescribed “Desired” idle speed.

While the engine is running, a “Real-Time Ellipse” will move within the **IAC Start Position** table relative to the current engine Coolant Temperature “operating point”. Use it as a point of reference to help calibrate the **IAC Start Position** table.

To change a value in the IAC Start Position table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.

43 IAC Gain Terms

This input table allows the user to set how quickly the IAC motor moves (in or out) in a given period of time. Use the default settings that come with the ECU unless it becomes necessary to control the IAC motor speed. The Proportional Gain setting should be from 4 to 16. The Derivative Gain should be 1/4 to 1/2 of the Proportional Gain. Enter the desired value in the table and left mouse click OK to save the information



44 Warm Up

Before the engine reaches normal operating temperature, i.e. 180° additional fuel is required as a function of engine coolant temperature and manifold absolute pressure (for speed-density applications). To calibrate “warm up enrichment” fuel go to the Mail Tool bar and highlight **“Warm Up.”** Keep the left mouse button depressed and slide the cursor down to select MAP vs Coolant or Air Temperature Correction, depending on the table to be accessed.

45 Air Temperature Correction

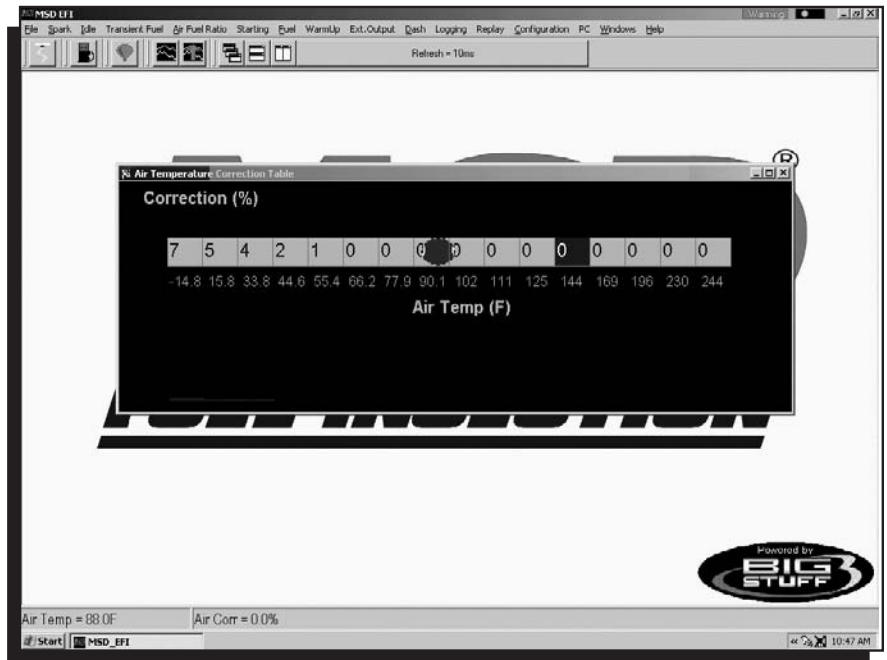
The inputs from this table are used by the ECU if “Alpha N” was the control algorithm selected during the Main Configuration set up. If the “Speed Density” control algorithm was selected, the ECU ignores inputs from this table.

For Alpha N systems, the ECU uses input from this table for air temperature compensation. The fixed numbers in the input table represent air temperature from -14.8° to 244°F. The ECU uses the user-defined inputs for each temperature point to add or subtract fuel relative to the base fuel map values.

While the engine is running, a “Real-Time Ellipse” will move within the **Air Temperature** table relative to the current engine Coolant Temperature “operating point”. Use it as a point of reference to help calibrate the **Air Temperature** table.

To change a value in the **Air Temperature** table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit **“Enter”** to save the change. The input values need to be smaller working from the left to right. As the engine warms up it needs less Air Temperature correction (added fuel).

The inputs shown in the table at right can be used as a baseline.

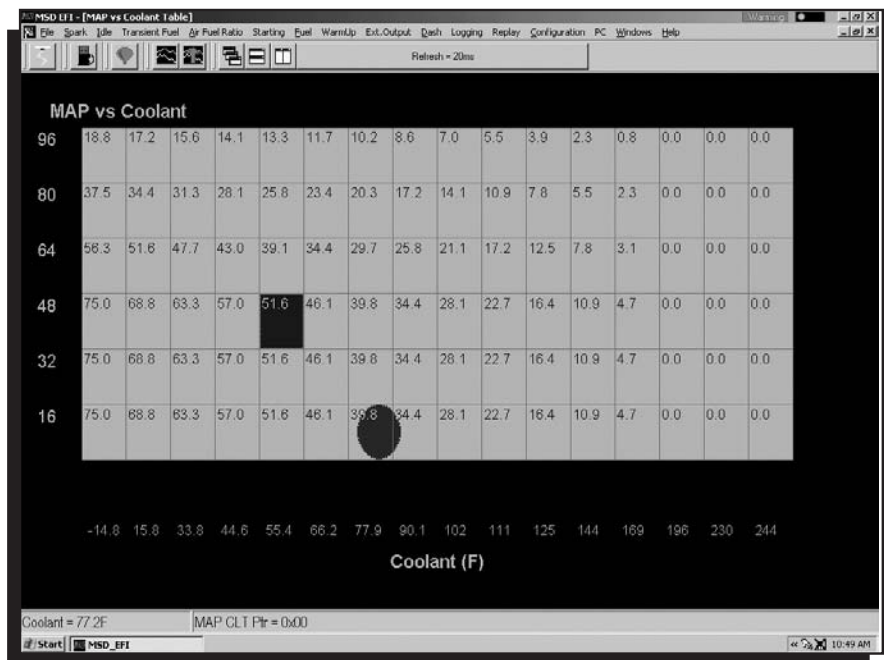


46 MAP vs. Coolant

The Blaster ECU’s MAP vs. Coolant table offers an improved warm up routine. The table applies a fuel correction (a % increase or decrease to the base pulse width) as a function of both Load (MAP) and coolant temperature. The cells in the table represent 96 different MAP and coolant temperature combinations.

The same calibration technique should be used with this table as was employed with the base fuel map. This table should be calibrated after the base fuel map.

To change a value in the **MAP vs. Coolant** table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit **“Enter”** to save the change.



47 Transient Fuel

Transient Fuel is the fuel added to the engine during non-steady state conditions as a function of dTPSdt and dMAPdt. Transient Fuel is applied relative to a rate of throttle change (dTPS) and a rate of MAP change (dMAP). TPS transient fuel is added asynchronously. Asynchronously means fuel added between the regularly schedule injector pulses. MAP transient fuel is added synchronously to increase and decrease the base fuel pulse width.

MAP Transient Fuel: MAP (+) Transient Fuel can be compared to a carburetor’s power valve. It is used to increase the base fuel pulse width when the manifold pressure increases significantly for a slight change in throttle opening. MAP (-) Transient Fuel is used to decrease the base fuel pulse width when the manifold pressure decreases significantly as a result of the throttle blades being closed.

The MAP (+) and (-) Transient Fuel control is comprised of 5 primary tables and 1 secondary table. Each of the tables play an integral role as to how the best fuel pulse width will be increased or decreased for a given change in manifold pressure. Below, is a description of how and when each of the tables is used by the ECU.

From the tool bar on Main Menu screen, left click on “Transient Fuel”. The screen below will open. The following paragraphs will describe how to calibrate each of the Transient Fuel drop down selections.



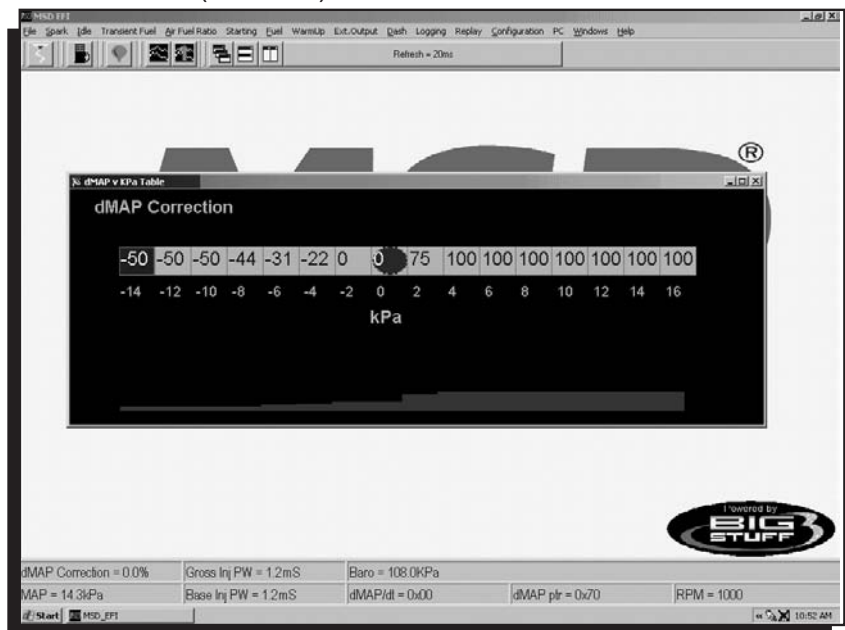
48 dMAP Correction (F10)

The first table is **dMAP Correction**. It is used to determine the percent fuel correction, either positive or negative, for a change in manifold pressure (dMAPdt). The ECU calculates the change in manifold pressure every 52 milliseconds (ms) as long as the throttle is moving. The ECU will increase or decrease the base pulse width relative to the dMAP Correction table’s % correction value (i.e. 100%).

Changes in MAP need to be compensated for by increasing or decreasing fuel synchronously to the base fuel pulse width. Each cell in the input table represents eight (2) kPa increments.

While the engine is running, a “Real-Time Ellipse” will move within the dMAP Correction table relative to the current % Correction “operating point”. Use it as a point of reference to help calibrate the dMAP Correction table.

To change a value in the dMAP Correction table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the changes.

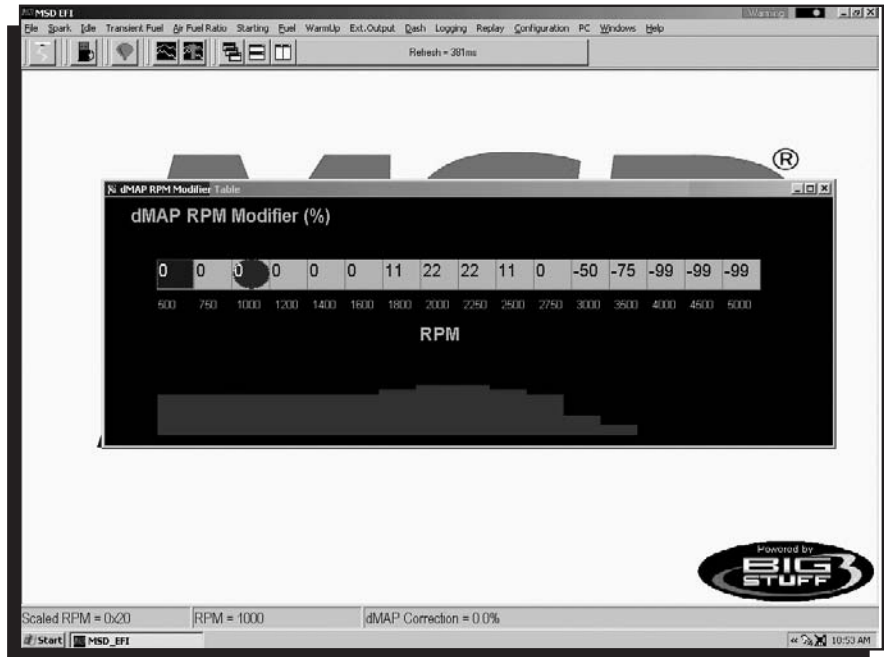


49 dMAP RPM Modifier (F10)

The second table used to calibrate the MAP Transient Fuel is the dMAP RPM Modifier table. Inputs to the table are used to increase or decrease the dMAP correction as a function of engine RPM. The positive or negative value inputted into the table is the percent (%) applied to the dMAP Correction table relative to the RPM.

While the engine is running, a “Real-Time Ellipse” will move within the dMAP RPM Modifier table relative to the current RPM “operating point”. Use it as a point of reference to help calibrate the dMAP RPM Modifier table.

To change a value in the dMAP RPM Modifier table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.



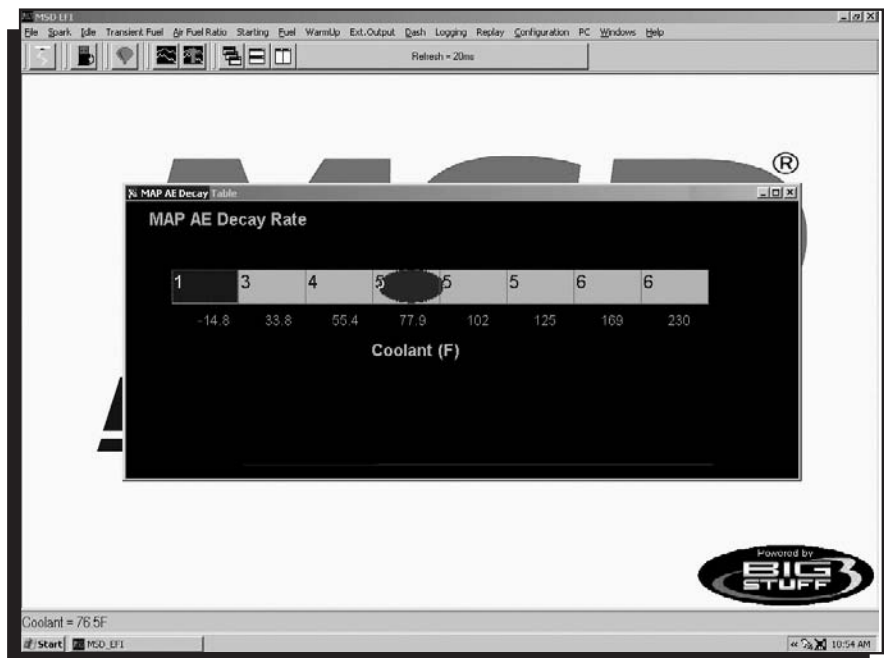
50 MAP AE Decay Rate

The third table is MAP AE Decay rate. It is used to determine how quickly to decrease the Positive dMAP correction value after accelerating (throttle tip-in) the engine at a given coolant temperature. The ECU decrements the dMAP correction by the MAP AE Decay Rate. A MAP AE Decay Rate of 6 represents a decrease of the dMAP Correction by 6% every crank interrupt until it reaches zero. In other words, if you input the number 6 into the table, after 1 crank interrupt the dMAP Correction will decrease 6%. The 6% per interrupt continues until the dMAP correction reaches zero.

The MAP AE Decay rate table’s fixed values (X-axis) represent coolant temperature, which increase from left to right. The MAP AE Decay rate input values need to increase as coolant temperature increases. The larger the value in the table, the quicker the fuel is taken out or decayed.

While the engine is running, a “Real-Time Ellipse” will move within the MAP AE Decay rate table relative to the current engine Coolant Temperature “operating point”. Use it as a point of reference to help calibrate the MAP AE Decay rate table.

To change a value in the MAP AE Decay rate table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change.



The inputs shown in the table can be used as a baseline.

51 MAP AE Inc Rate

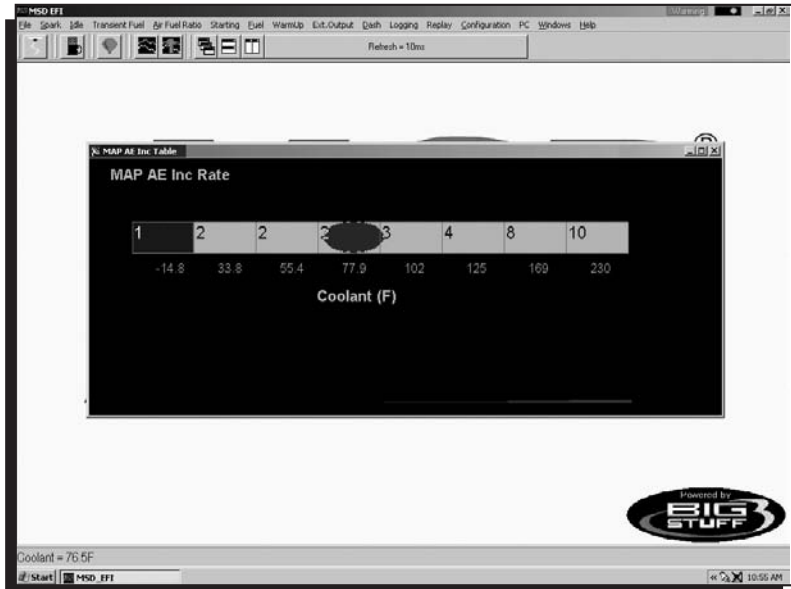
The fourth table is MAP AE Inc Rate. It is used to determine how quickly to increase the Negative dMAP correction value after decelerating (throttle tip-out) the engine at a given coolant temperature.

A MAP AE Inc Rate of 3 represents 3 crank interrupts per 1 step increase of the dMAP Correction until it reaches zero. In other words, if you input the number 3 into the table, after 3 crank interrupts the dMAP Correction will increase 1 step. This 3 interrupt for 1 step process continues until the dMAP correction reaches zero.

The fixed axis values in the MAP AE Inc Rate table represent coolant temperature, which increases from left to right. The MAP AE Inc Rate table's input values need to increase as coolant temperature increases. The larger the value in the table, the slower the fuel is added.

While the engine is running, a "Real-Time Ellipse" will move within the MAP AE Inc Rate table relative to the current engine Coolant Temperature "operating point". Use it as a point of reference to help calibrate the MAP AE Inc Rate table.

To change a value in the MAP AE Inc Rate table, move the cursor using the PC's mouse or arrow keys to the cell to be changed. Input the desired value and hit "Enter" to save the change.



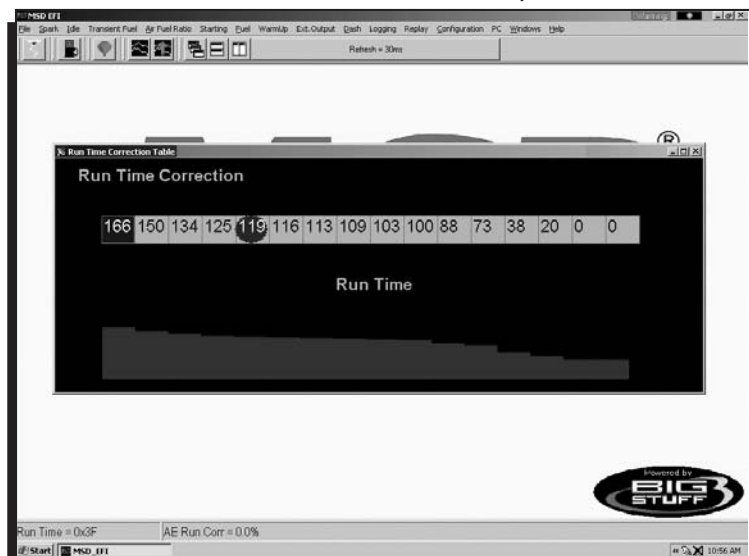
52 Run Time Correction

The fifth table is Run Time Correction. It only influences the Positive dMAP and dTPS Correction Values for a short period of time after the engine is running. (I.e. up to 8 minutes). The Run Time Correction table's value is used to increase the positive dMAP Correction value. Therefore, if the current dMAP correction value is 200% and the Run Time Correction value is 25%, the ECU will increase the dMAP 200% correction value by 25%, relative to the time at which the acceleration event occurred.

The amount of Run Time Correction fuel is decreased as time transpires and the engine warms up. The first cell in the table, all the way to the left, represents the first 1/2 minute of engine run time. The cell all the way to the right represents the end or eighth minute of engine run time. The Run Time Correction table's input values need to decrease as you work from the left to right.

While the engine is running, a "Real-Time Ellipse" will move within the Run Time Correction table relative to the current Run Time Modifier "operating point". Use it as a point of reference to help calibrate the Run Time Correction table.

To change a value in the Run Time Correction table, move the cursor using the PC's mouse or arrow keys to the cell to be changed. Input the desired value and hit "Enter" to save the change.



53 dMAP Parameters

The Secondary Transient Fuel table is dMAP Parameter. This table is used to control auxiliary MAP and TPS transient and base fuel functions.

The first entry of the dMAP Parameter Configuration table is Asynchronous Acceleration Enrichment (AAE). It is used to set the dMAP and dTPS transient fuel thresholds relative to MAP (kPa) and TPS (%) values. Below, is a brief description of each.

- MAP Limit: Establishes the MAP value in kPa at which the dMAP transient fuel is disabled. For example, if the MAP Limit value is set to 80 kPa, the dMAPdt transient fuel will be disabled above MAP values of 80 kPa.
- TPS % Clip: Establishes the TPS value, as a percentage, at which the dMAP and dTPS transient fuel is disabled. For example, if the TPS % Clip value is set to 80%, the dMAP and dTPS transient fuel will be disabled above TPS values of 80%.

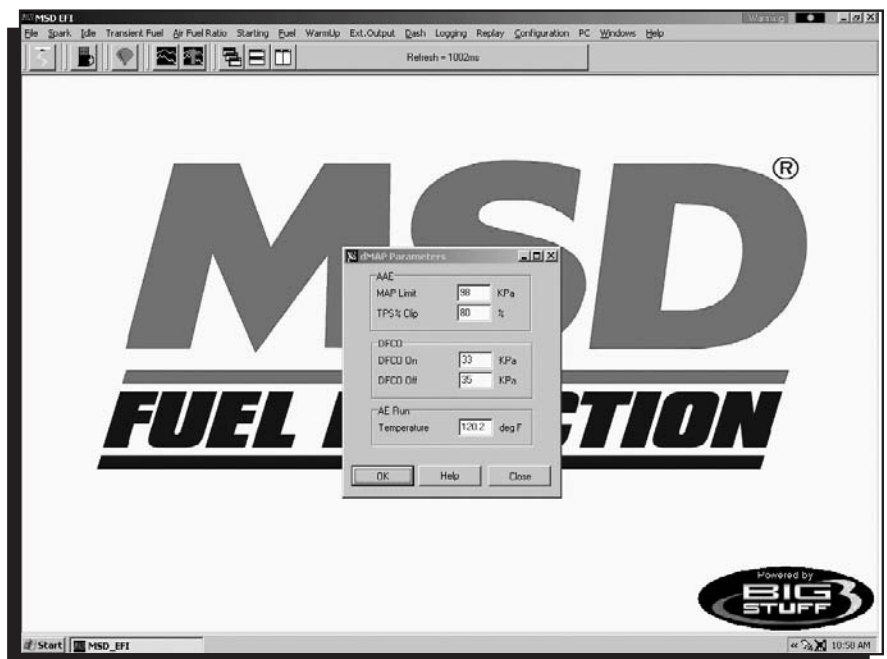
The secondary entry of the dMAP Parameter Configuration table is Deceleration Fuel Cut Off (DCFO). It is used to calibrate when the Base Fuel Map pulse width fuel is turned off and on relative to MAP (kPa) values. Below, is a brief description of each.

- DCFO On: Establishes the MAP value in kPa at which the Base Fuel Map pulse width is momentarily disabled. It is used to calibrate deceleration drivability. For example, if the DCFO On value is set to 30 kPa, the base pulse width will go to zero, 2.5 seconds after falling below a MAP value of 30 kPa, with the throttle closed. The Base Fuel Map pulse width is turned back on based upon the DCFO Off value (see DCFO Off).
- DCFO Off: Establishes the MAP value in kPa at which the Base Fuel Map pulse width is re-enabled. It is used to calibrate deceleration drivability. Typically, the DCFO Off value is set to 5 kPa above the DCFO On value. For example, if the DCFO On value is set to 30 kPa the DCFO Off value should be set to 35 kPa. Once the MAP value exceeds 35 kPa, the Base Fuel Map pulse width is turned back on.

The third and final entry of the dMAP Parameter Configuration table is Acceleration Enrichment (AE) Temperature. It is used to disable the affect of the Run Time Correction multiplicative scalar value has on the Positive dMAP Correction and dTPS Transient fuel values relative to an engine coolant temperature (deg. F). Below, is a brief description of the AE Temperature “Run Temperature” setting.

Run Temperature: Establishes the engine coolant temperature in deg. F at which the Run Time Correction multiplicative scalar term no longer influences the Positive dMAP Correction or TPS transient fuel values. Therefore, if the Run Temperature value is set to 120°F, the Run Time Correction multiplicative scalar term will no longer influence the Positive dMAP Correction or TPS Transient fuel values at engine coolant temperatures above 120°F.

To change a value in these tables, move the cursor using the PC’s mouse or arrow keys to the cell to be changed and input the desired value. Then click on OK to save the changes.



TPS Transient Fuel

The TPS transient fuel control is comprised of 2 primary tables. Each of the tables play an integral role as to how the TPS Transient Fuel requirements are calibrated for abrupt throttle changes that causes the engine to accelerate. TPS transient fuel is asynchronously injected relative to a rate of throttle change (dTPSdt). The asynchronous pulse can be modified relative to the throttle position where the acceleration event occurred (AE Position Correction). Below, is a description of how the TPS Transient Fuel requirements are calibrated using the dTPSdt and AE Position Correction tables.

54 dTPSdt

The first TPS Transient Fuel control table is dTPSdt. It can be compared to a carburetor's accelerator pump shot. The ECU uses the dTPSdt table value to compute the size of the Asynchronous Pulse Width (APW) for a given rate of throttle change. It does so by sensing the rate of the throttle change and then using the corresponding dTPSdt table value to calculate the size of the asynchronous pulse width.

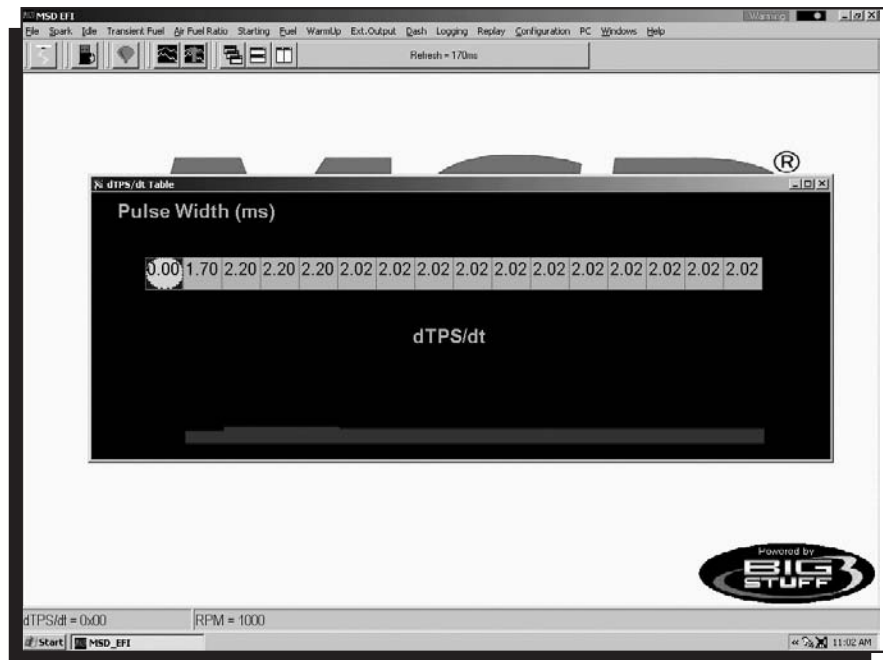
For example, if the ECU detected a throttle change of 10 degrees/second (dTPSdt), it would immediately look up the corresponding dTPSdt table value to 2ms. The ECU then uses AE Position Correction table (see below) to modify the asynchronous pulse size relative to the throttle position at which the dTPSdt event occurred. If the dTPSdt pulse width is less than the injector opening time, the fuel will not be delivered asynchronously. Instead, it will be accumulated and added to the next synchronous pulse width.

Note: The value in the first cell (the cell all the way to the left) must always be zero (0).

Working from left to right, each input cell in the dTPSdt table represents a 1% change in throttle angle for a total percent change of 15%. This is plenty of resolution since the ECU looks for changes every 20 milliseconds. As a reference point, it typically takes approximately 250 milliseconds for a person to slam the throttle open.

While the engine is running, a "Real-Time Ellipse" will move within the dTPSdt table relative to the current dTPSdt "operating point". Use it as a point of reference to help calibrate the dTPSdt table.

To change a value in the dTPSdt table, move the cursor using the PC's mouse or arrow keys to the cell to be changed. Input the desired value and hit "Enter" to save the change. The values need to be larger as you work from the left to right. The greater the throttle angle rate of change, the larger the dTPSdt table value needs to be.

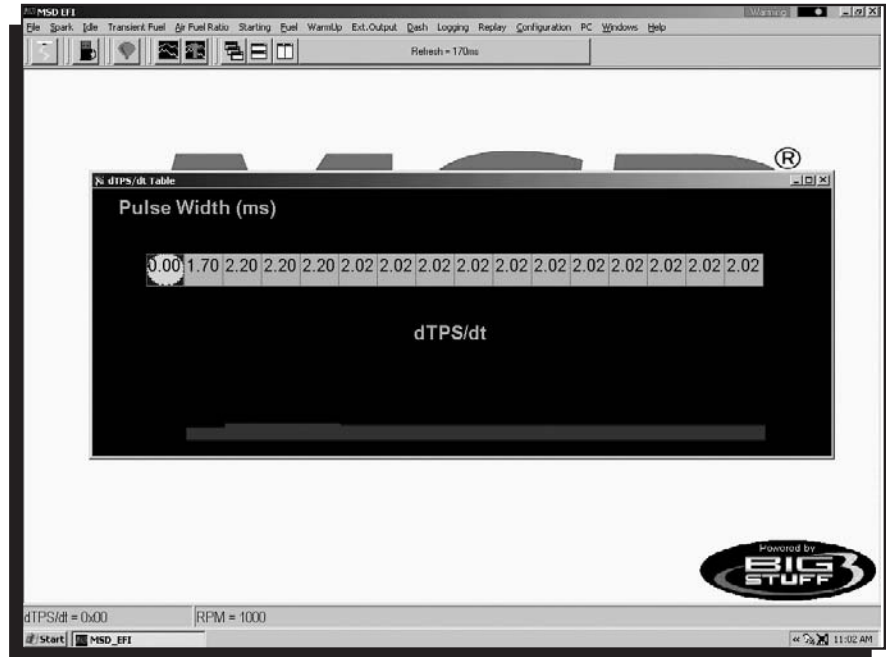


55 AE Position Correction

The second TPS transient fuel control table is AE Position Correction. It can be compared to a carburetor's accelerator pump "cam" profile. The ECU uses the AE Position Correction table value to modify the size of the Asynchronous Pulse Width (APW) relative to the throttle position at which the dTPSdt event occurred. For example, if a 10°/second dTPSdt event occurred (resulting in a look up of 2.0 ms) at a 24% throttle position, the ECU would immediately look up the corresponding AE Position correction value of 13%. The ECU will then decrease the 2.0 ms pulse by 13% and output a 1.74 ms pulse. If the same 10°/second dTPSdt event occurred at a 48% throttle position and the corresponding AE Position Correction value was -31% the APW would then be 2.0 ms -31% or 1.38 ms.

While the engine is running, a “Real-Time Ellipse” will move within the AE Position Correction table relative to the current TPS % “operating point”. Use it as a point of reference to help calibrate the AE Position Correction table.

To change a value in the AE Position Correction table, move the cursor using the PC’s mouse or arrow keys to the cell to be changed. Input the desired value and hit “Enter” to save the change. The greater the TPS%, the larger the AE Position Correction table value needs to be.



56 External Output

The external output feature allows a device to be activated based on RPM, throttle position or both. This feature could be used to turn on a shift light or to provide an RPM based step retard.

- a. Minimum RPM: RPM at which the switch will turn on.
- b. Minimum TPS: Throttle position at which the switch will turn on.
- c. Spark Retard: Amount ignition timing will be retarded when RPM & TPS minimums are met. If no retard is desired then a value of zero should be entered.
- d. External Output Feature Enabled: This box must be checked to turn on the external output function.

57 Dash

A Dash, (short for Dashboard) can be configured and displayed at the bottom of most of the “Operating Screens” within the MSD EFI software. A Dash needs to be selected, configured and saved as a default before it will appear at the bottom of a MSD EFI software “Operating Screen”. Up to thirty-one (31) individual Dashes can be configured to display various engine parameters also referred to as Signals.

When the MSD EFI software is launched, it uses MSD/MSD EFI folder. The “Default Dash” is actually a compilation of the 31 available dashes.

The recommended way to configure the “Default Dash” is to configure each of available dashes, or most frequently used dashes, to your liking and then save them as a “Default Dash”. This way, every time you open the MSD EFI software, the dashes will be opened to the preferred configuration.

58 Configure Dash

To configure a Dash, to go Dash on the Tool Bar. Left click on “Dash” and the drop down screen shown at right will open. Keep the left mouse button depressed and slide the mouse pointer down until “Dash Configuration” is highlighted.



Release the left mouse button. The screen below will open. Left click on the “Pick Dash” drop down screen.

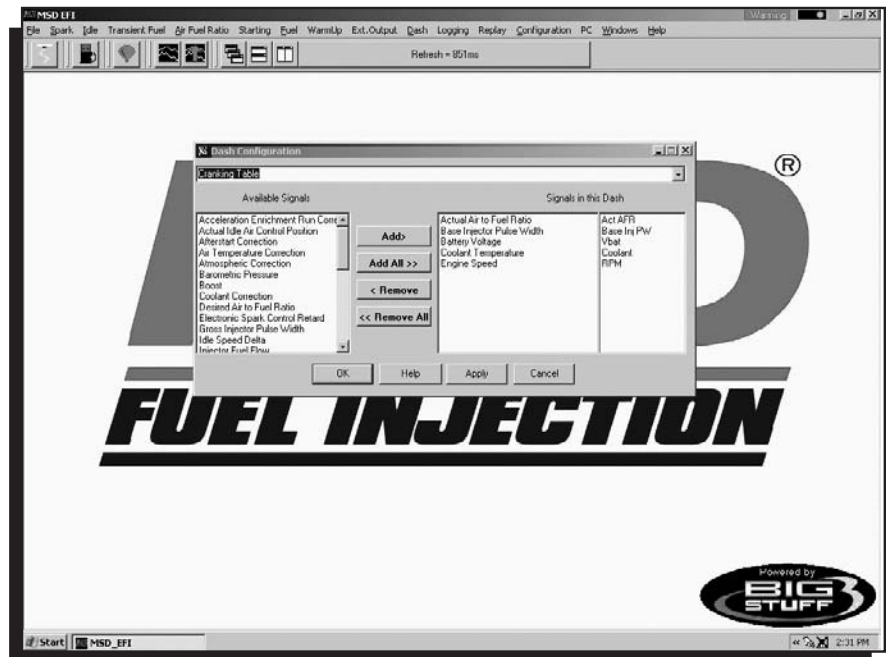


The screen at right will appear,

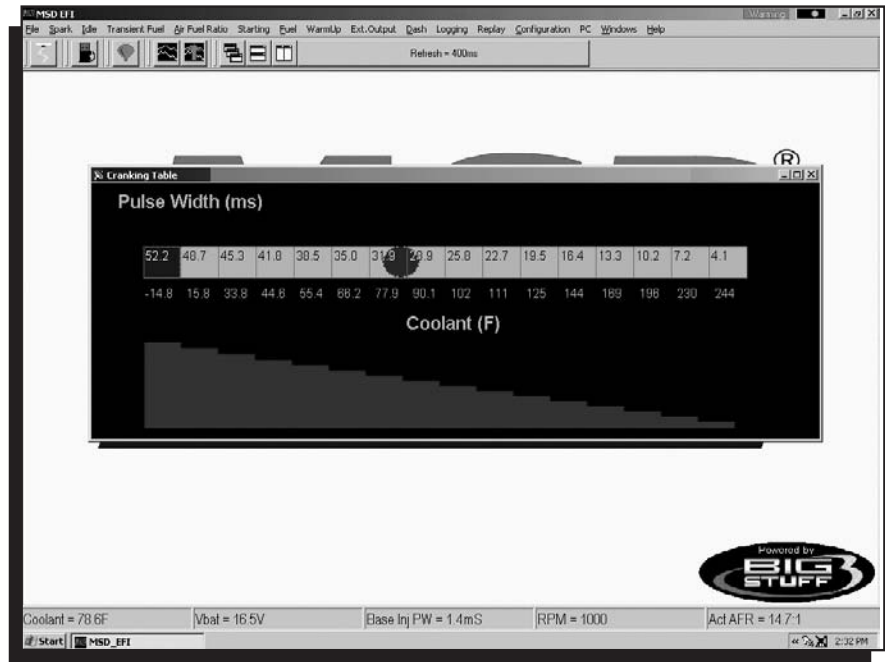


After selecting a Dash to configure, “Signals” need to be selected and added to the Dash. After the Signals are selected, added and saved, they will be displayed in the Dash at the bottom of the relevant MSD EFI software screens. The left side of the drop down screen below shows the “Available Signals”. The right side of the drop down screen below shows the “Signals in the Dash”. To add Signals to the Dash, highlight a desired Signal on the left and click Add. The Signal will move to the right side of the screen (Signals in the Dash). All Signals shown under “Signals in the Dash” will now appear in the Cranking Fuel screen when that screen is used to calibrate the Cranking Fuel.

In the Cranking Fuel example below, Air Temp, Base Injector Pulse Width, Coolant, MAP and TPS were selected and added to “Signals in the Dash”.



In the screen print below notice that the same “Signals” appear in the Dash at the bottom of the Cranking Fuel screen.



59 Save a Dash

Again, the recommended way to configure the “Default Dash” is to configure each of available dashes, or most frequently used dashes, to your liking and then save them as the “Default Dash”.

This way, every time you open the MSD EFI software, the dashes will be open to the preferred configuration.

Once the “Default Dash” has been saved, individual dashes can be changed and saved again as part of the compilation of dashes referred to as the “Default Dash”.

The steps for saving a reconfigured Dash, so that it becomes part of the “Default Dash”, are outlined below:

- After configuring a Dash hit OK at the bottom of the Dash Setup window. The window will close.
- Go back to Dash on the Main Window tool bar and Select Save to File from the Dash drop down list. The screen at right will open.



Note: Before saving the Log Window dash for the first time, you need to navigate to the C:/Program Files/MSD_EFI directory. This step only occurs the very first time any Dash file is saved. Subsequent Dash file saves will automatically be saved to the C:/Program Files/MSD_EFI folder.

- Name the file “Default” and hit Save. By selecting “Default” as the file name, the Log Window dash becomes part of the compilation called “Default Dash”. Again, the file will be saved to C:/Program Files/MSD_EFI directory.
- A unique file name can also be assigned by typing the name in the “File Name” sub window and clicking on Save.

61 Load from File

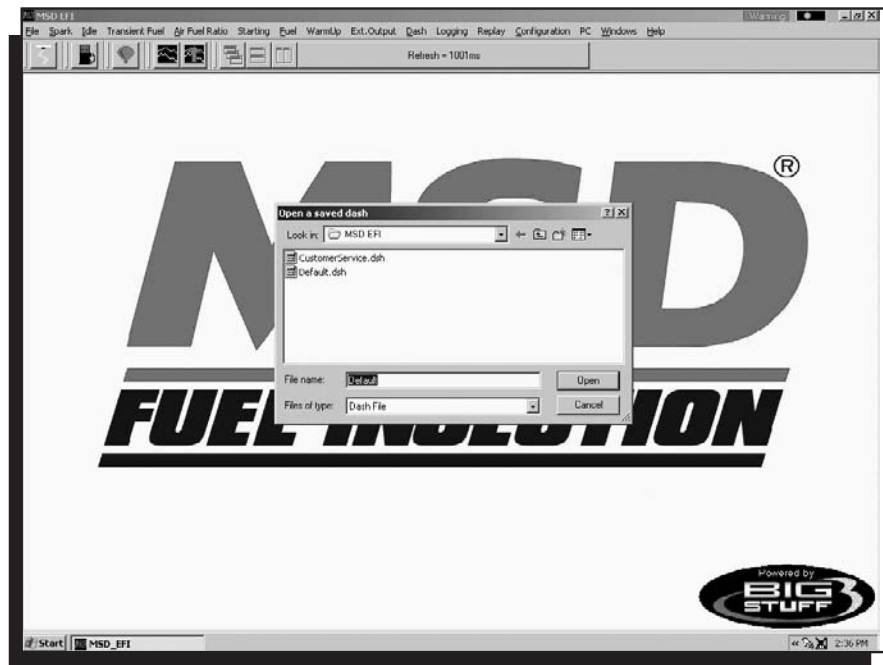
In addition to the “Default Dash” unique dashes can be configured and used, e.g. Turbo Car dash. To view a previously saved unique dash, go to Dash on the Main Menu screen. Left mouse click on Dash and slide the cursor down to “Load from File”.



Release the left mouse button and the following screen will open with a message that reads, “This will destroy your current Dash setting.” “Do you want to continue?”



Select "Yes". The screen below will open. All the previously saved Dash files will be listed. Select the file to be opened by double clicking the left mouse button. The selected Dash file will open.

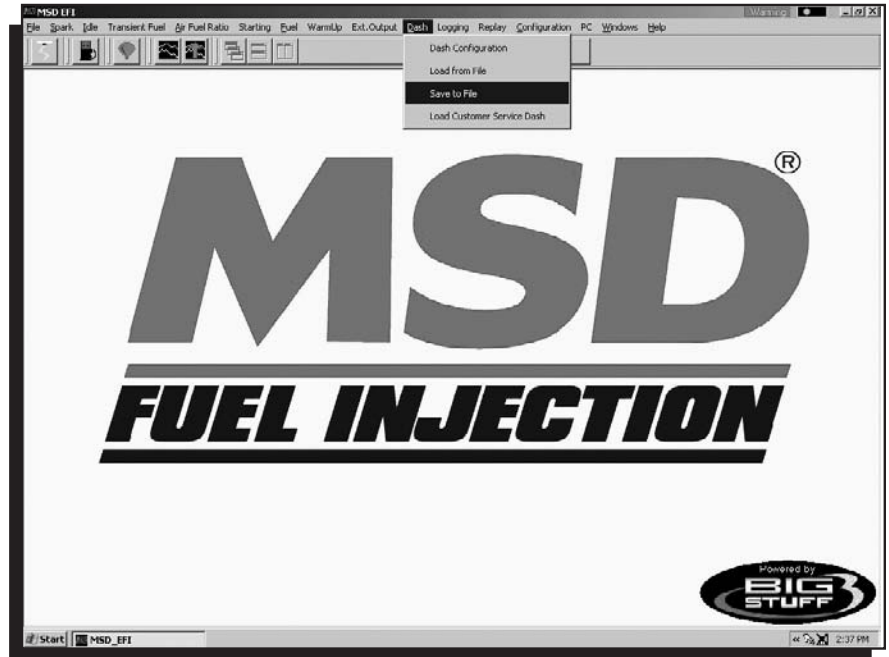


The next time the MSD EFI software is opened it will automatically load and run the "Default Dash" compilation, while retaining your unique dash in the C:/Program Files/MSD_EFI folder.

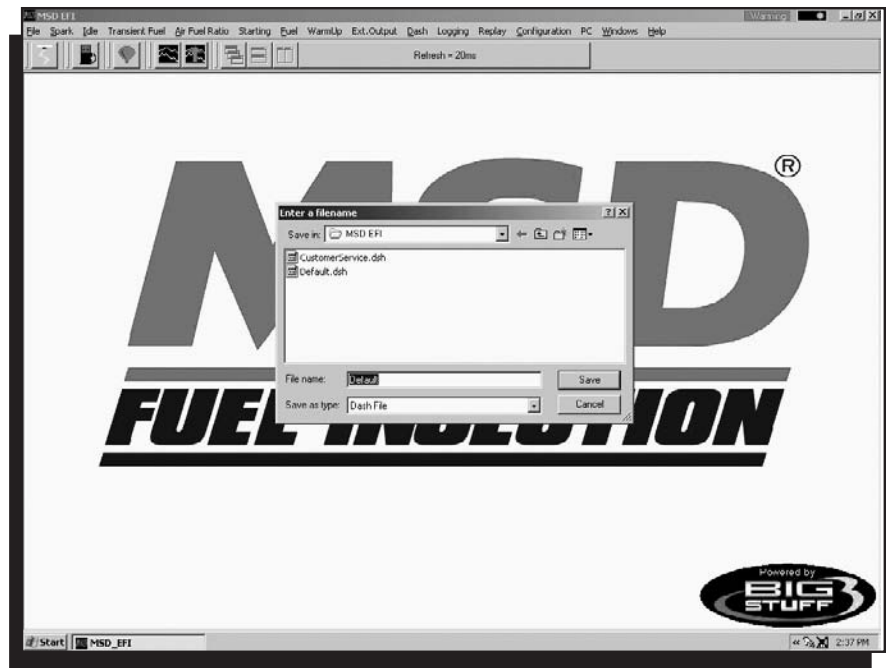
61 Save to file

Load from File above described how to configure the 31 available Dashes. The steps for saving a reconfigured dash in the “Default Dash” or unique dash compilation are outlined below.

To save a Dash, go to Dash on the Main Menu screen. Left mouse click on Dash and slide the cursor down to “Save to File”.



Release the left mouse button and the following screen will open.



Name the Dash to be saved in the “File Name” sub-window and hit Save. The dash will be saved.

62 Logging (External)

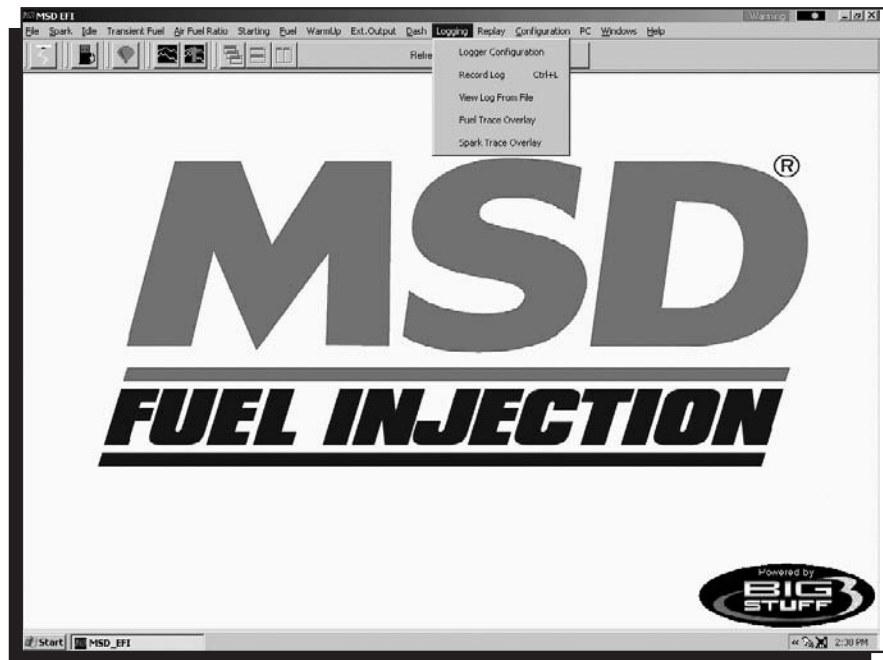
As an option, the Blaster ECU is capable of supporting both internal (internal to the Blaster ECU) and external (to a remote personal computer) data logging. The Blaster's internal data logging eliminates the need for a PC in the car.

This section, titled Logging, describes the external data-logging feature. The internal data-logging feature, titled Replay, is described in the following chapter.

The MSD EFI software allows the user to log data while the engine is running. The data is captured by the PC during the logging event and can be subsequently reviewed "On-Line" (connected to the ECU) or "Off-Line" (PC only).

Note: The Dash for the Log Window needs to be configured so that all of the logged data is captured and displayed in the Dash at the bottom of the Log window. Refer to the Dash/Logging procedure outlined at the end of the Logging section. Also see Dashboard for information on how to configure other Dashes.

From the tool bar on the Main Menu screen, left click on "Logging". The drop down screen below will open.



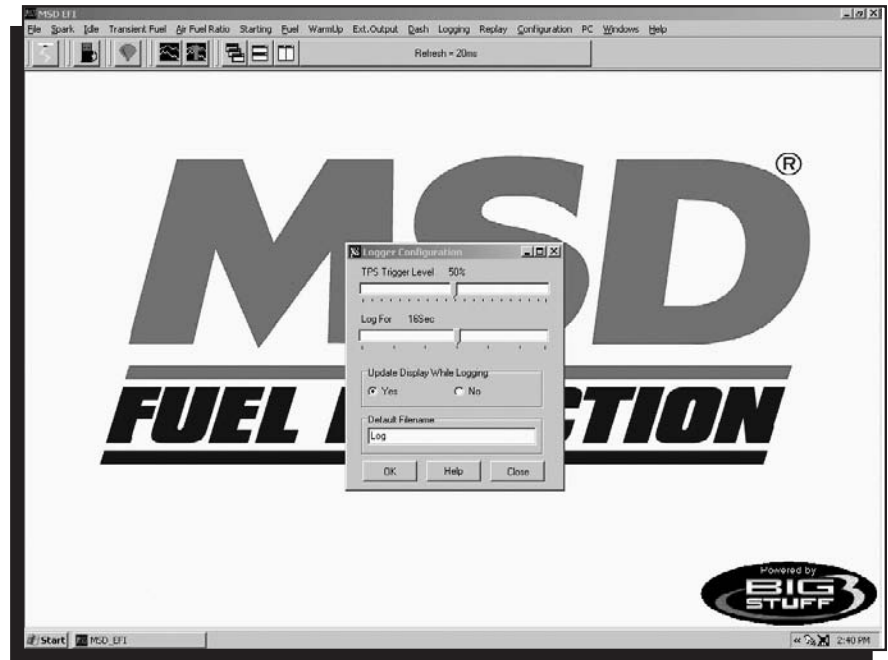
From this drop down screen, the following data Logging events can be configured:

- Configure Log - Instructs the ECU to:
 - Start logging when user defined TPS percent (%) is reached.
 - How long to Log date for.
 - Whether the display will update while data is being logged.
 - Set the default file name for the series of data to be logged.
- Record Log - Starts Logging data.
- View Log from file - View logged data from a user defined file name.

The logging options are further explained on next page.

63 Configure Log

From the tool bar on Main Menu screen, left click on “Logging”. When the drop down screen opens, hold the left mouse button down and slide the mouse until Logger Configuration is highlighted. Release the mouse button. The screen below will open.



Using the Throttle Position Sensor (TPS) as a Load input, the user can automatically trigger the MSD EFI software’s data-logging feature. Place the left mouse cursor on the “TPS Trigger Level” slide bar. Depress the left mouse button and slide it to the desired TPS% value or threshold. The logging feature will automatically start once the selected % TPS value is exceeded.

Before exiting this window the following, additional logging parameters should be set:

- “Log-For” Setting - This setting dictates how long the ECU will log the data (0 to 30 seconds). To set the data Log period, place the mouse cursor on the “Log For” slide bar. Keep the left mouse button depressed, and move the slide bar left or right to achieve the desired data log time frame.
- Update Display While Logging - Determines whether or not the logged data will be displayed in the Log Window screen. Select Yes to display or No, not to display.
- Set Default File Name - The default file name for the data being logged. A default file name needs to be established and saved. Once a default file name is set, the ECU will automatically include number extensions for all subsequently saved files under the same default file name.

Once the desired changes have been made, click OK at the bottom of the window. Your changes will be saved.

64 Record Log (F8)

The “Record Log” function is another way to initiate a data Logging event. To use this method, go to the tool bar on Main Menu screen and left click on “Logging”. When the drop down screen opens, hold the left mouse button down and slide the mouse until “Record Log” is highlighted. Release the mouse button. A black Log screen will open. To start logging data, depress the space bar on the laptop keyboard once.

A data-logging event can be initiated by simultaneously depressing and holding the “Control” (ctrl) and “L” keys on the PC’s keyboard. Left mouse clicking the “Take Log” icon from the MSD EFI Main Menu screen will also start a logging event



The ECU will log data for the time period defined in the Logger Configuration screen outlined above. Once the logging event is complete, the ECU automatically stores the logged event as a file, using the default filename, which was set up. The file should be saved in the Program Files/MSD/MSD EFI folder. If not, navigate to this folder location. The next time the MSD EFI will automatically save the logged file to this location.

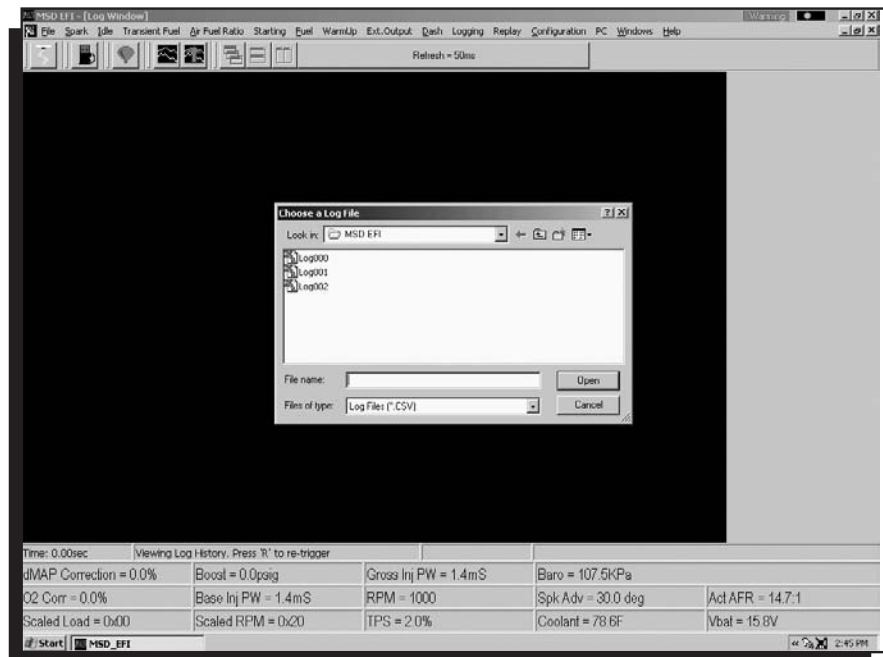
65 View Log from File

“Log” files are logged directly to an external PC. “Replay” files, outlined later in this manual, are log files, logged internally to the Blaster ECU, and subsequently transferred to a PC.

To view a “Logged” file go to the MSD EFI main menu and click on the “View Logged File” icon.



The following window will open. Choose the desired log file by double clicking the left mouse button on the file. The logged file will open.



An example “Log” Data Graph is shown below. The “Signals” shown below the Data Graph were selected when the “Log Window” Dashboard was configured. See Dashboard in Chapter 58 for more Details.

Note: The “Dash” at the bottom of Data Graph will only be visible when the ECU is “On-Line”. The “Dash” allows the user to monitor the engine operating parameters (when the engine is running) while viewing previously logged data.

When the ECU is operating “Off-line”, only the “Signals” to the right of the Data Graph will be visible. A “Log” Data Graph shows only the “Signals” that were in the Log Window Dash when the “Log” was created.

Including or Excluding Data Lines in a Data Graph

Each logged “Signal” in the column to the right of the Data Graph represents a line displayed in the graph. These “Signals” can be included or excluded from the Data Graph by left clicking on the “O” in the cell next to the logged “Signal”.

An “O” signifies the corresponding data line, is being displayed in the Data Graph.

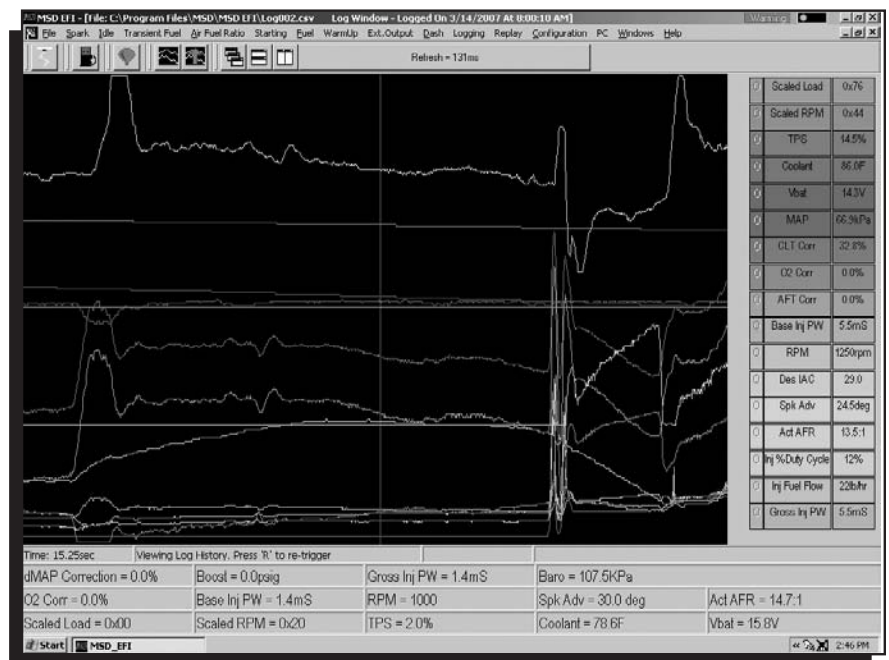
An “X” signifies the corresponding data line, is not being displayed in the Data Graph.

Once the “O” is clicked, it will be replaced by an “X” indicating that the logged “Signal” will be excluded from the log screen. The opposite is true when an “X” is clicked. The “X” will be replaced by an “O” indicating that the logged “Signal” will be included in the Data Graph.

Red Cursor Line

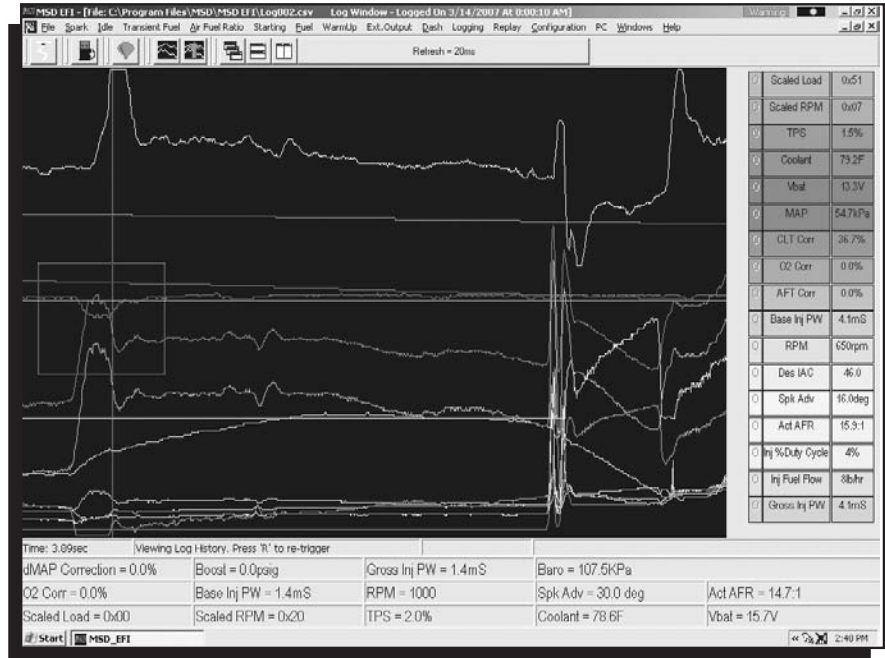
A vertical cursor line can be used to see “Signal” values in the Data Graph. To add the vertical cursor line to the Data Graph left mouse click at the location in the graph that you want to see “Signal” data. Alternatively, press the left or right arrow keys on the keyboard and the vertical cursor line will be displayed in the center of the Data Graph. Press and hold the left and right arrow keys to maneuver to the desired location in the Data Graph.

As the vertical, red “cursor-line” is moved across the Data Graph, the “Signals” to the right of the Data Graph will display the actual engine operating parameters recorded at each point in them. The log timer is displayed in the lower left corner of the Data Graph.

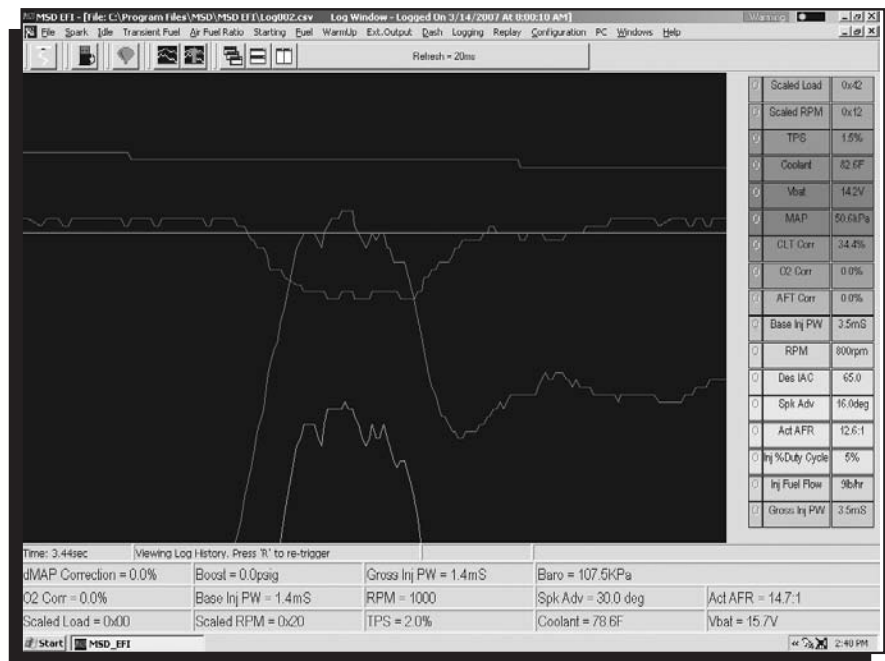


“Zoom-In” Feature

The user can also “Zoom-in” on a particular area of the Data Graph. To “Zoom-in” on a particular area of the Data Graph, depress and hold the left mouse button. Start from the upper left and drag the mouse down and to the right to cover the desired “Zoom-in” area. A red box is created around the selected area, as shown in the screen print below. Release the left mouse button and the selected graph area will fill the screen. Again, the left and right arrow keys on the keyboard can be used to display the actual engine operating parameters recorded at each point in the “Zoom-in” Data Graph.



Once the left mouse button is released the graph area inside the red box above will fill the screen as shown below.



Note: Depressing the right mouse key will return to the original Data Graph after “zooming-in” on a specific area.

66 Dash/Logging procedure to record Data Log session

1. Select **Dash** from the Main Window tool bar.
2. Select **Dash Configuration** from the Dash drop down list.
3. Select Log Window from the **Pick Dash** drop down selection window.
4. Select the **Available Signals** that you want to appear in the **Log Window** dash. The selected signals will also be logged when **Record Log, Record Log Icon** or **F8** quick key are selected. Be sure to select **Scaled Load and Scaled RPM** if you want to use the **Trace** function to assist with the calibration of the Base Fuel and Spark Maps.
5. After selecting the Available Signals hit **OK**.
6. Select **Dash** again from the Main Window tool bar to save the Log Window dash.
7. Select **Save To File** from the Dash drop down list.
8. Before saving the Log Window dash, you need to navigate to the **C:/Program Files/MSD_EFI** directory. **Note:** Step 8 only occurs the very first time any Dash file is saved. Subsequent Dash file saves will automatically default to the C: Program Files/MSD/MSD EFI directory.
9. Once you are in the C: Program Files/MSD/MSD EFI directory, you can save the Log Window dash. You can assign a unique file name by typing the name in and clicking on **Save** or save it as the "Default Dash" by clicking on **Save** with **Default** highlighted as the file name. By selecting Default, the Log Window dash becomes one of the new dashes in the "Default Dash" compilation.
10. Next select **Logging** from the Main Window tool bar to configure the data log parameters.
11. Select **Logger Configuration** from the Logging drop down list.
12. Select the **TPS Threshold** (0 - 100% TPS), **Log for** (0-30 seconds) and **Update Data While Logging** (yes or no) settings. Next **type** in a Log File name and hit **OK**. **Note:** Once the initial Log File name is entered, the MSD EFI software automatically increments, with number extensions, and saves the subsequent Log Files, associated with the initial file name. You will need to create a new Log File name to initiate another log data session that is not related to the initial file name.
13. After entering a Log File name, a Record Log session can be initiated. Again, there are several ways to initiate a log session. Below are the different log initiation options.
 - Option 1: Hit the **F8** key.
 - Option 2: Select the **Record Log Icon** in the Main Window tool bar. When the log window opens, hit the PC's space bar to start the logging event.
 - Option 3: Select **Logging** from the Main Window tool bar. Then select **Record Log** from the Logging drop down list.
- Note:** Steps 1 through 13 can be configured off-line or on-line. However, you need to be on-line to record a data log session.
14. After selecting one of the above Record Log options, the Log Window Dash will be displayed. Hitting the PC's Space Bar or exceeding the TPS threshold setting can initiate the Record Log session.
15. Once the Record Log session is initiated, the MSD EFI software will begin to record the Log Window Dash signals. The logged signals will be displayed in the Dash at the bottom of the screen as well as on the right hand side of the Log Window Dash screen. The signals will be recorded for as long as the Record Log Time setting (0-30 seconds). **Note:** After the Record Log session has timed out, the Log Window Dash signals will continue to be displayed, in real time, at the bottom of the screen (assuming that the engines is still running). Also, if power is turned off before the Record Log session has timed out, the Log File data will be lost.
16. Once the Record Log session has timed out, you can either view the Logged data file (see step 17) or initiate another Record Log session by hitting the **R** key. Once triggered, hitting the PC's Space Bar or exceeding the TPS Threshold setting can initiate another Record Log session.
17. There are a couple of ways to access the Record Log data file. Below are the options.
 - Option 1: Select the **View Log File** Icon from the Main Window tool bar.
 - Option 2: Select **Logging** from the Main Window tool bar. Drag the mouse to **View Log File** from the Logging drop down list.
18. After selecting one of the above View Log File options, select the Log File you want to view and click on Open. Once opened, the Log File data will appear in the Log Window. Refer to the **Logging** section of the MSD EFI instruction manual to learn how to navigate the Log Window screen.
19. The Trace function can also be used in the on-line or off-line mode to help calibrate the Base Fuel and Spark Maps in the "Record Log" files. "Calibrating with the Trace Function" is outlined in the next chapter of the manual.

67 Replay

The Blaster ECU's internal data logging capability is called **"Replay"**. **"Replay"** functions the same way as the external data logging feature outlined in Chapter 63 **Logging** except that it offers the following significant benefits:

- **"Replay"** eliminates the need to keep your PC in the car while going down the track!
- **"Replay"** is capable of sampling and retrieving 52 channels of data, 50 times per second, independent of engine speed! Most competitive PC based or external data loggers are supplied data only when the ECU can provide it. Data retrieval significantly decreases as engine RPM increases with external systems.

In order to record data to the internal RAM, the external arming switch must be turned on and the TPS threshold setting must be met. After a pass (with the ignition off) the data will be maintained in the ECU's internal RAM for 30 minutes. After thirty minutes the data will be lost so it needs to be uploaded to a PC within this time. Once you've verified the data is good, turn off the arming switch for the next logging event. Remember to turn the toggle switch back on prior to staging the car.

Note: Even if the TPS is satisfied again (clear flood to restart on the return road) none of the data will be lost. You can only record another run by turning the toggle switch off and then back on.

Inside the **"Replay"** drop down there are 3 submenus. Each submenu will be described in the paragraphs below. To get to the **Replay** drop down screen go to the main Tool Bar and left click on **Replay** and the screen at right will appear. Hold the left mouse down and drag it to the desired input screen and release the mouse button.

68 Configure Replay

To configure Replay, open the Configure Replay drop down screen as shown above. The following screen will open.



Signals Displayed - Select the signals you would like displayed by checking the box next to the desired signal. Checking the “ALL OFF” or “ALL ON” toggles the bottom of the table to turn all the signals off or on respectively. Any signal checked will be logged and displayed.

Replay Duration - The length of time the Blaster ECU will log data, once initiated by the TPS Trigger Level setting. The data logging duration can be set from 1 to 18 seconds.

TPS Trigger Level - The throttle position (TPS position in degrees) that will trigger the Blaster ECU to begin logging data internally.

During a logging event, the Blaster ECU automatically logs 53 parameters (referred to as Signals). After an event has been logged, hitting the letter “C” on the keyboard will open the “Replay Configuration” screen on page 58. Signals can be selected or de-selected then graphed. This feature allows the user to control the number of parameters (Signals) displayed in a graph.

69 Upload

Upload is the high-speed Blaster ECU-to-PC data transfer process. When the Upload drop down is selected a process bar will open displaying the progress of the data being transferred.

Once 100% of the data has been transferred, a file is automatically written to the folder MSD EFI was originally installed in. Typically, the C:/Program Files/MSD_EFI directory.



70 View Replay from File

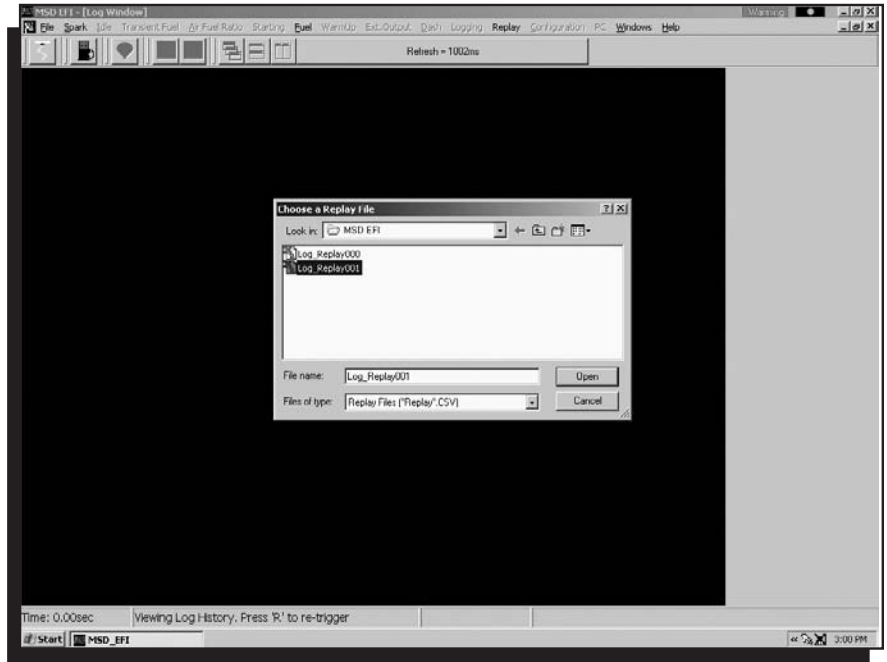
“Replay” files are log files, which were internally logged (vs. to an external PC) to the Blaster ECU. Once data has been internally logged to the Blaster ECU, and transferred to a PC, the logged data can be viewed the same way as externally (logged to a PC) logged data, as explained in Chapter 65 **Review Log from File** above. To review Replay (logged) data, go to “Replay” on the Main Menu bar. Left click on “Replay” and drag the mouse down until “View Replay From File” is highlighted.



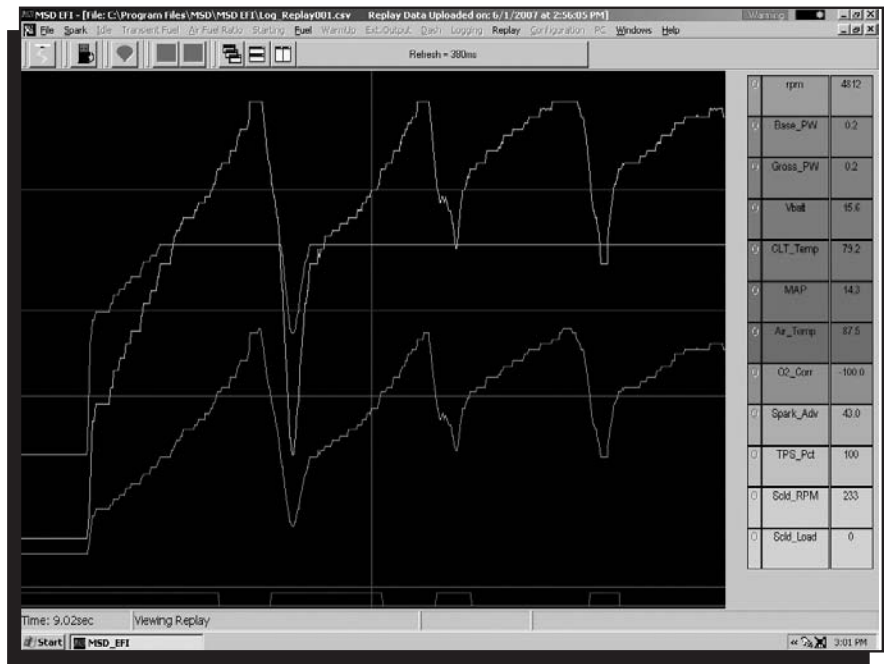
Release the mouse button and the screen below will open with a message stating, “Opening this Window will Freeze your Dash Readings and you cannot take logs while it is open!”



Press enter or left mouse click on OK and the following screen will open showing all the available Replay logged files. Left click on the desired “Replay” file.



A Replay screen similar to the one below will open.



All of the “Signals” selected during the Configure Replay process above are displayed along the right side of the log Data Graph.

Including or Excluding Data Lines in a Data Graph

Each logged “Signal” in the column to the right of the Data Graph represents a line displayed in the Data graph. These “Signals” can be included or excluded from the Data Graph by left clicking on the “O” in the cell next to the logged “Signal”.

An “O” signifies the corresponding data line, is being displayed in the Data Graph.

An “X” signifies the corresponding data line, is not being displayed in the Data Graph.

Once the “O” is clicked, it will be replaced by an “X” indicating that the logged “Signal” will be excluded from the log screen. The opposite is true when an “X” is clicked. The “X” will be replaced by an “O” indicating that the logged “Signal” will be included in the Data Graph.

Red Cursor Line

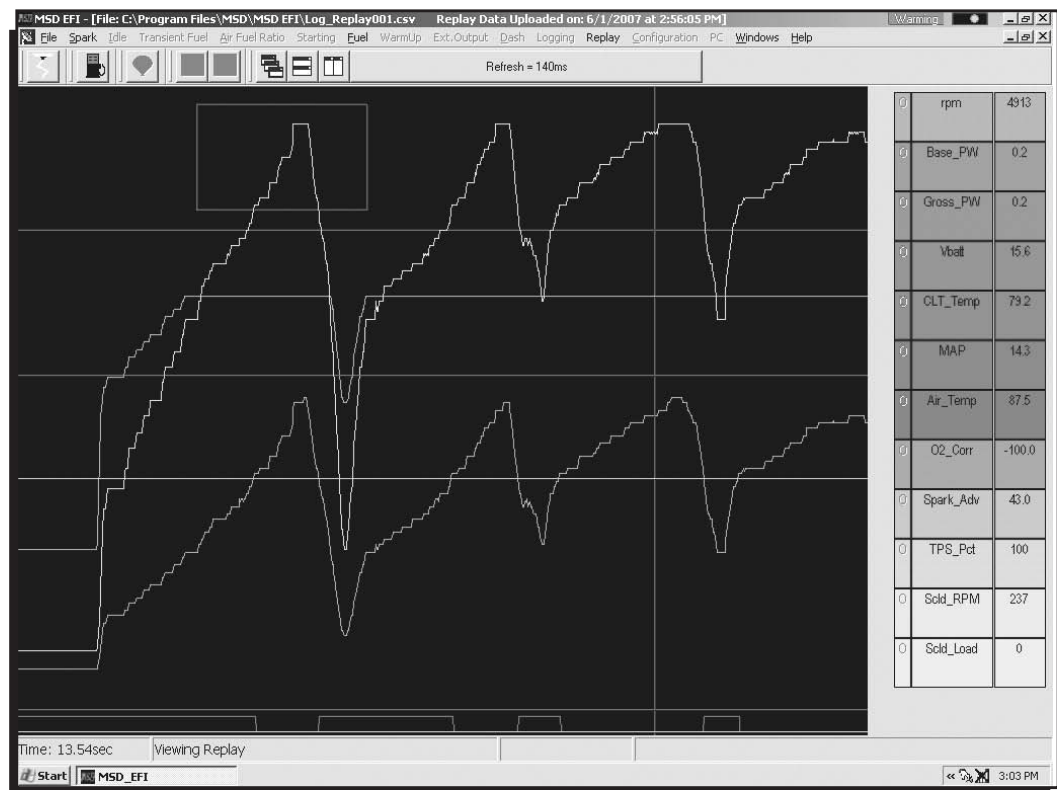
A vertical cursor line can be used to see “Signal” values in the Data Graph. To add the vertical cursor line to the Data Graph left mouse click at the location in the graph that you want to see “Signal” data. Alternatively, press the left or right arrow keys on the keyboard and the vertical cursor line will be displayed in the center of the Data Graph. Press and hold the left and right arrow keys to maneuver to the desired location in the Data Graph.

As the vertical, red “cursor-line” is moved across the Data Graph, the “Signals” to the right of the Data Graph will display the actual engine operating parameters recorded at each point in time. The log timer is displayed in the lower left corner of the Data Graph.

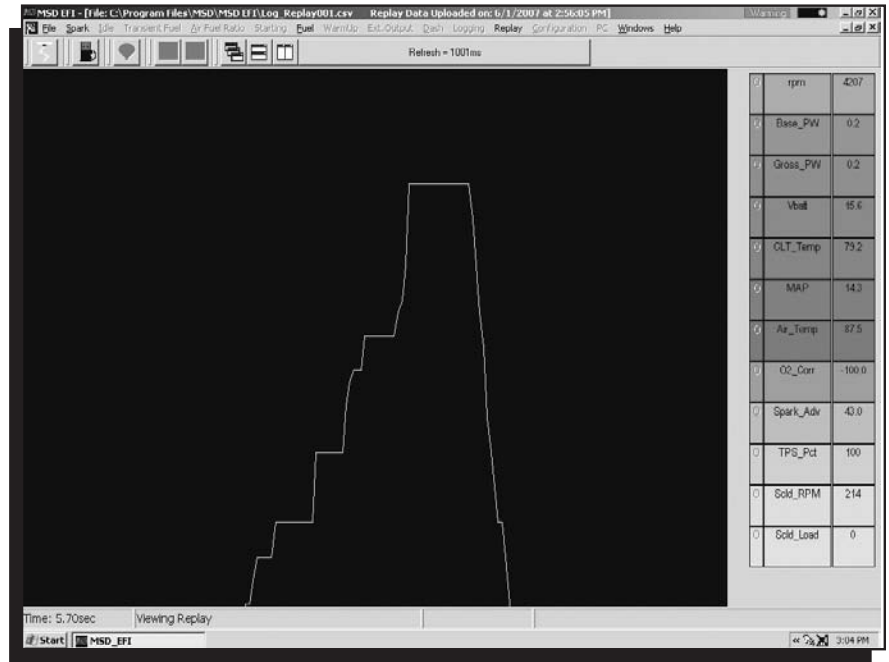
Note: While the Replay log screen is open, press “C” at any time to return to the Configure Replay screen to include or exclude Signals to the Replay screen.

“Zoom-In” Feature

The user can also “Zoom-in” on a particular area of the Data Graph. To “Zoom-in” on a particular area of the Data Graph, depress and hold the left mouse button. Start from the upper left and drag the mouse down and to the right to cover the desired “Zoom-in” area. A red box is created around the selected area, as shown in the screen print below. Release the left mouse button and the selected graph area will fill the screen. Again, the left and right arrow keys on the keyboard can be used to display the actual engine operating parameters recorded at each point in the “Zoom-in” Data Graph.



Once the left mouse button is released the graph area inside the red box above will fill the screen as shown below.



The left and right arrow keys on the keyboard can be used to move the red cursor line to display the actual engine operating parameters recorded at each point in the Data Graph. Click the right mouse key to get back to original Log Window screen.

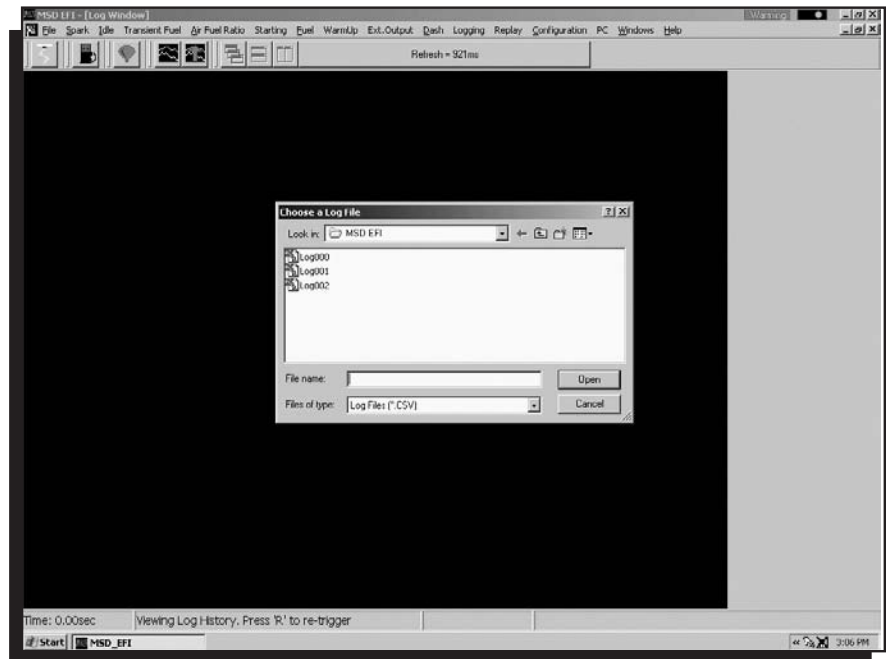
Note: Depressing the right mouse key will return to the original data screen after “zooming-in” on a specific area.

The Trace function can also be used with Replay (internal data logger) logged files. For more information on how to use the Trace function go to the next chapter titled **Calibrating with the Trace Function**.

71 Calibrating with the Trace Function

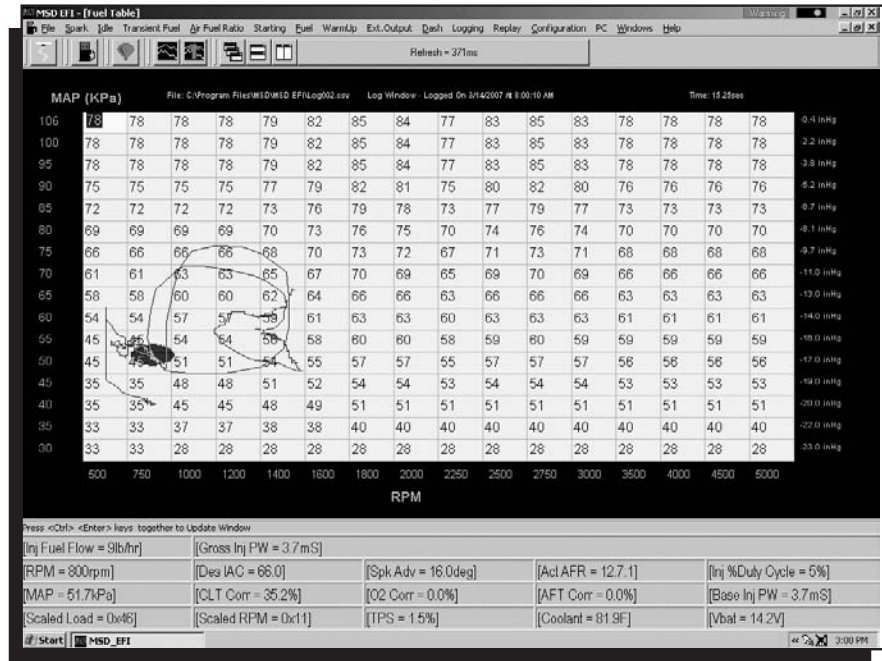
The MSD EFI software includes a very powerful calibration tool called the “Trace Function”. The “Trace Function” allows the user to calibrate Fuel and Spark Tables, using a Logged data file, “On-Line” or “Off-Line”.

To use the Trace function, open the Fuel or Spark Table. Once opened, hit the **T** key on the PC keyboard and the screen at right will open.



The “Choose a Log File Screen” (shown on page 63) will open and display the available, previously logged, files. Select and open the desired log file. Once opened, the Fuel or Spark table will turn yellow indicating that the Trace function is enabled. A trace line, representing the logged data file, will superimpose itself over the fuel or spark table.

Note: Scaled RPM (Sclد RPM) and Scaled Load (Sclد Load) must be logged in order to support the “Trace” function.

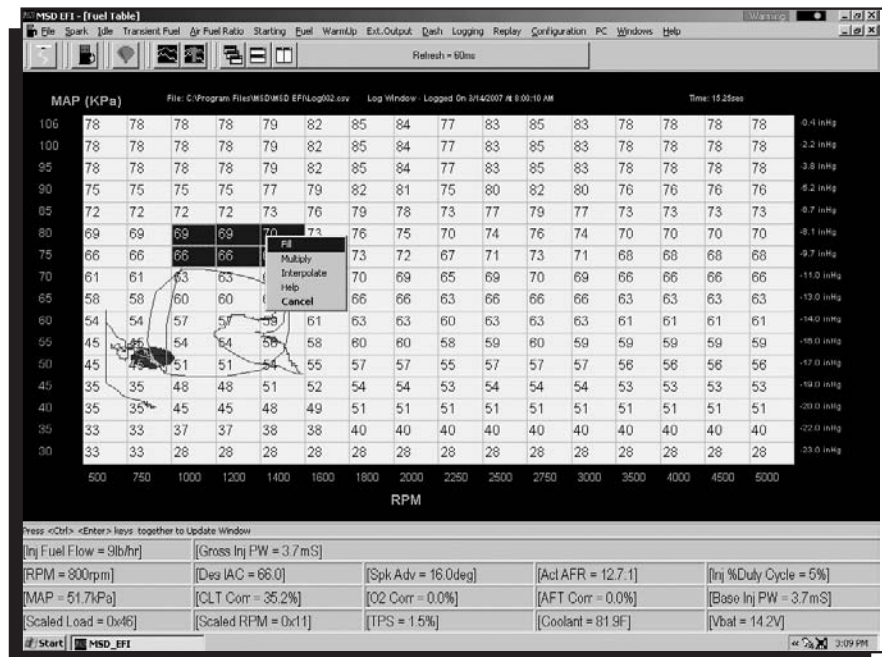


A Blue Ellipse will appear along the trace line highlighting the logged engine operating points. To navigate the ellipse along the trace line, depress and hold the “Alt” key while simultaneously depressing the left or right arrow keys. As the blue Ellipse moves along the trace line, the logged engine operating parameters will be displayed in the Dash.

The values displayed in the Dash can be used to calibrate the Fuel or Spark tables. For example, assuming the O2 Correction Signal was selected as a Dash display item, the user can see how much fuel the ECU had to add or subtract at every point (cell) along the trace line. The values in the cells along the trace line can be increased or decreased, in the Trace screen, by the amount of the O2 correction % shown in the Dash. The values in the cells next to and surrounding the trace line can also be increased or decreased.

To change the Fuel or Spark Table values, while in the Trace screen, simply left click on the desired cell, input the new value and hit the “Enter” key. Continue this process for all of the “traced cells”.

To make changes to multiple cells simultaneously, left mouse click and drag the cursor across the cell range to be changed. Release the left mouse button and a secondary drop down screen will appear outlining three potential “cell fill” options.



- **Fill** - Choosing “Fill” will open a secondary drop down-screen which allows the selected cells to be changed to the value inputted into the window.
- **Multiply** - Choosing “Multiply” will open a secondary drop down-screen which allows the values of the selected cells to be changed by the “Multiply” value inputted into the window. For example, if the values in the cells selected are 13 and the inputted “Multiply” value was 80, the new cell values would be 10.4.
- **Interpolate** - If a series of cells in the same row are selected and the “Interpolate” “cell-fill” option is selected the ECU will use the value in the cell all the way to the left and the cell value all the way to the right and interpolate the numbers in between so that the values are linear.

Cell Changes using the “Page Up” and “Page Down” Keys (Fuel and Spark Tables)

Multiple cell values can also be changed simultaneously using the “Page Up” and “Page Down” keys. This approach offers a quick alternative to using the mouse. Use the keyboard arrow keys (up/down/left/right) to maneuver to area of the map where the desired cell changes will be made. Next, depress and hold the keyboard “Shift” key. Now, use the arrow keys, to maneuver through the cells to be changed. As the cells are being selected they will become highlighted. Once the desired cell range has been highlighted, release the “Shift” key. Depress the “Page Up” key to increase the cell values and the “Page Down” key to decrease the cell values. The cell values will increase or decrease by a value of one (1) for every keystroke. To exit this mode, depress any one of the arrow keys.

Once complete, the new calibration can be saved and then loaded into the ECU.

Note: See **Saving On Line Calibration Changes** in Chapter 74 to ensure calibration changes made “On-Line” are properly saved.

72 Loading and Saving Calibration Files

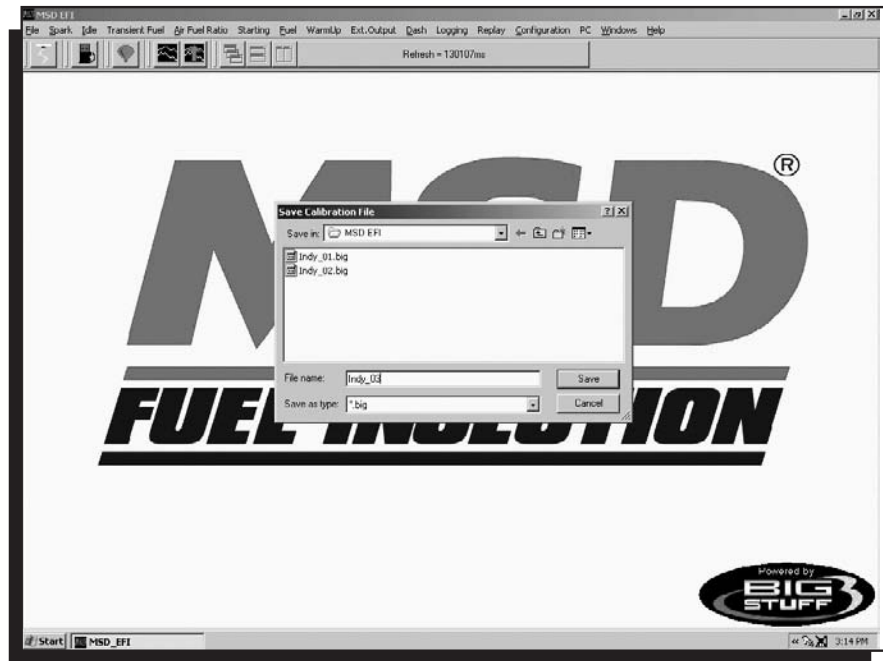
Calibration files can be saved to a file folder or loaded from an existing file in one of two ways. In “off-line” mode, a calibration file can be saved to the PC so changes can be made “off-line” and saved to a disc (the hard drive or memory card). In “on-line” mode, calibration changes are made and sent directly to the Blaster ECU while the ECU is “live”.

73 Save Calibration (F12)

To save a calibration file go to **File** on the Tool Bar. Left click on **File**. The following drop down will appear. While holding the left mouse button down, drag the mouse down until **Save Calibration** is highlighted. Release the mouse button. Alternatively, hit the F12 “Quick-Key”.



The following screen will appear. Name the file, in this example Indy_03, and hit the PC's "Enter" key or left click on the Save button.



74 Saving "On-Line" Calibration Changes

When using the MSD EFI software with Blaster ECU, special care must be taken to properly save "On-Line" calibration changes. **Working On Line** means the Blaster ECU is powered up (the ignition is on) and is connected and communicating with the PC. A green ball will be seen moving back and forth in the upper right hand corner of the screen as long as an operating window is open with a dash selected. Blaster "On-Line" or "real time" calibration changes are temporarily stored in the ECU's Random Access Memory (RAM). Once the desired calibration changes are made, they are not permanently saved to the Blaster ECU's "Flash" memory until the **engine is turned off, and the ignition switch remains in the "off" position for 15 seconds**. If further calibration changes are going to be made, the ignition switch must be turned back to the "On" position. The ECU cannot be programmed and changes will not be saved with the ignition switch in the "Off" position.

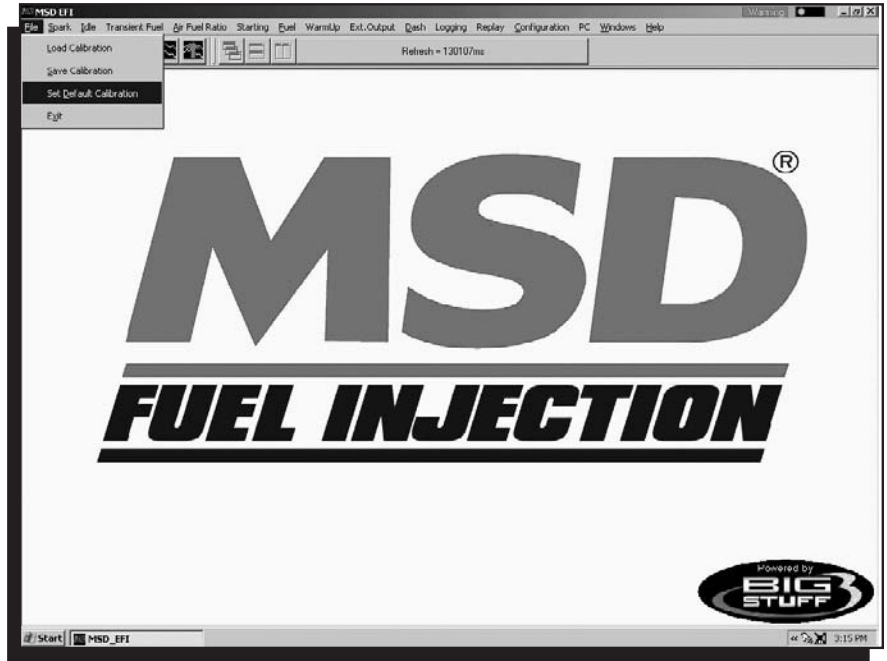
The best way to detect that the calibration changes have been saved from RAM to the Blaster Flash memory is to watch the green communication ball in the upper right corner of the MSD EFI software screen. After the ignition switch is turned off, the green sliding ball will continue to move back and forth for approximately fifteen (15) seconds. After approximately 15 seconds, **the green ball will momentarily stop**, indicating that the ECU's calibration RAM has been permanently saved to the ECU's Flash memory. **DO NOT TURN THE IGNITION SWITCH ON OR CRANK THE ENGINE WHILE THE CALIBRATION IS BEING SAVED!**

NOTES:

- The ECU stays alive for 30 minutes after vehicle ignition is off to allow the DAI uploads from the Blaster's ECU to a PC.
- The ECU cannot be programmed when the vehicle ignition is off.
- The Flash memory is only updated when calibrations changes are made.

Saving a Default Calibration

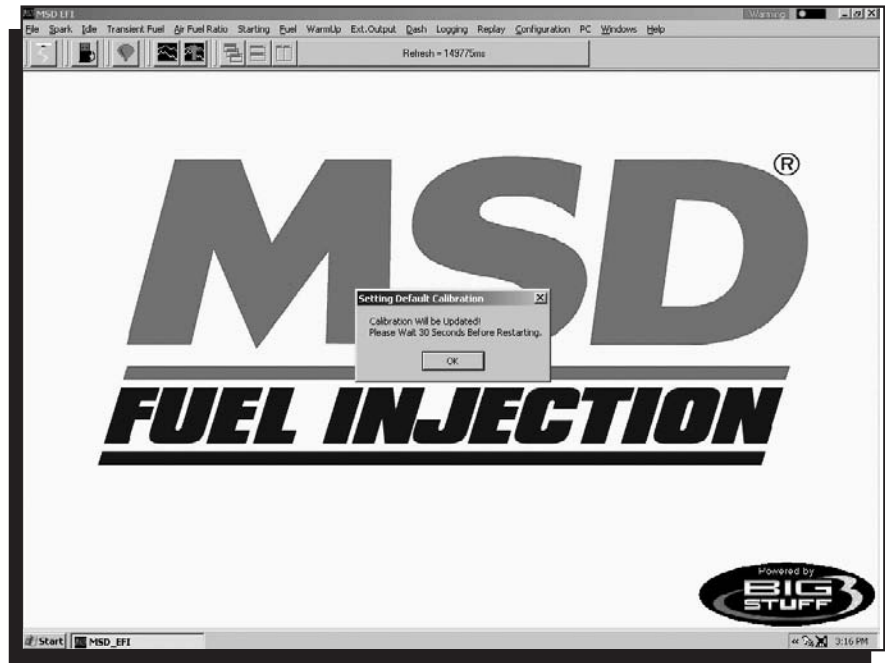
Once the ECU's calibration RAM changes have been saved to the ECU's Flash memory and you are satisfied with the calibration, MSD recommends that a "Default" calibration be saved to the ECU to safeguard against system crashes. With the engine off (no engine RPM) and the vehicle ignition in the "On" position, go to the main tool bar and left click on File as shown below. A drop down screen will open. Left click on "Set Default Calibration"



The following screen will open. Select "Yes" to save the default.



The following screen will open indicating that a delay (worst case 30 seconds, typically less than 2 seconds) is required to set default calibration.



75 Load Calibration

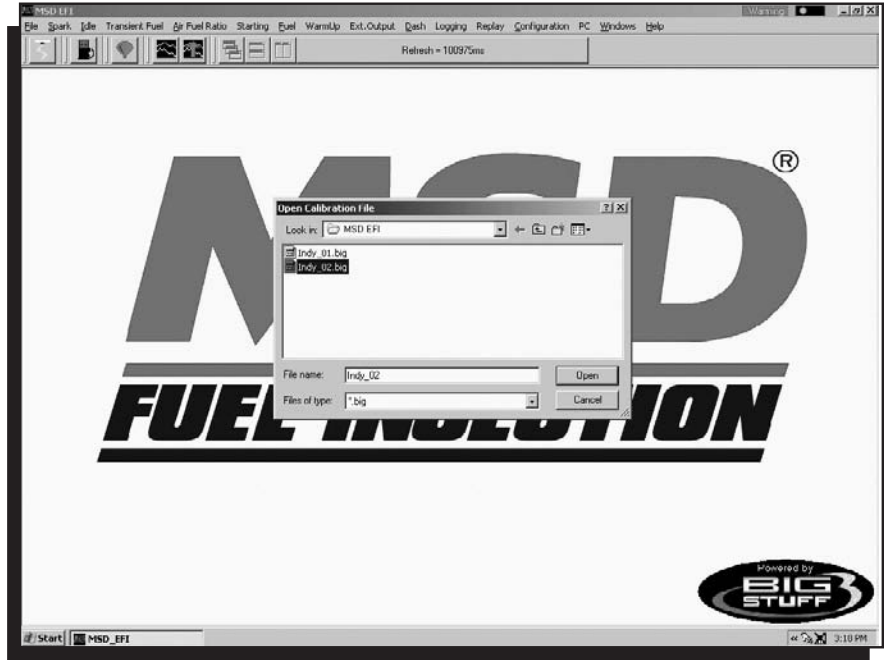
To load a calibration file, previously saved to the PC's hard drive or external disc, go through the steps above except select Load Calibration from the drop down screen.

Note: The ECU must be powered on to load a calibration file.

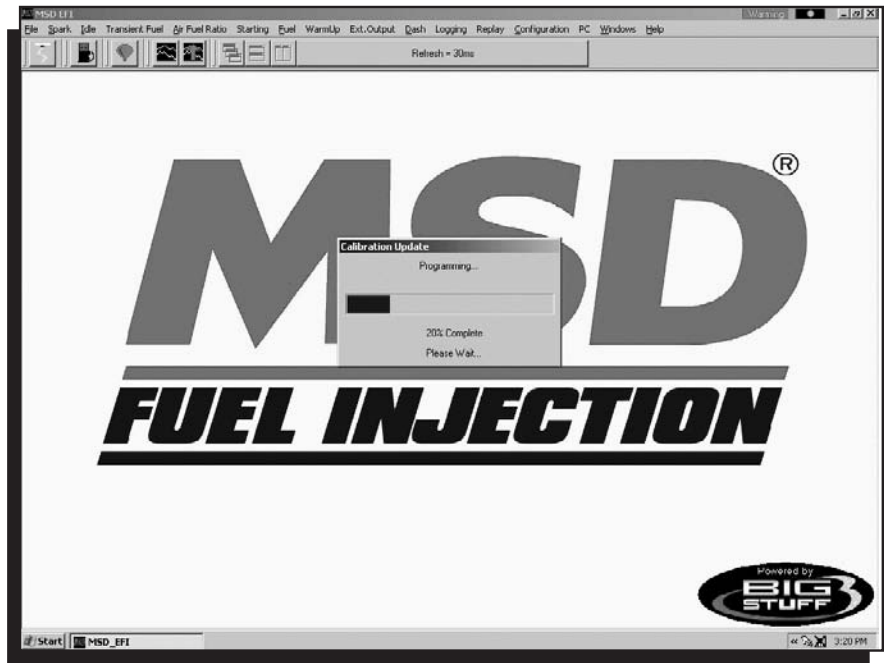
The following screen will appear warning that loading a new calibration will overwrite the ECU's current calibration. Left click on Yes to continue loading the selected calibration file.



The following screen will appear listing all the available calibration files. Left click on the file (It will be highlighted in blue) and click Open.



The following screen will open showing the status of the file loading. Once the file finishes loading, the selected calibration will be loaded into the Blaster ECU.



76 Acronym Definitions

BLM - Block Learn Modifier
SEFI - Sequential Electronic Fuel Injection
AFR - Air Fuel Ratio
MPH - Mile Per Hour
EMI - Electronic-Magnetic Interference
CD - Compact Disc
ROM - Read Only Memory
PC - Personal Computer
WOT - Wide Open Throttle
TCC - Torque Converter Clutch
APW - Asynchronous Pulse Width

77 Control Keys

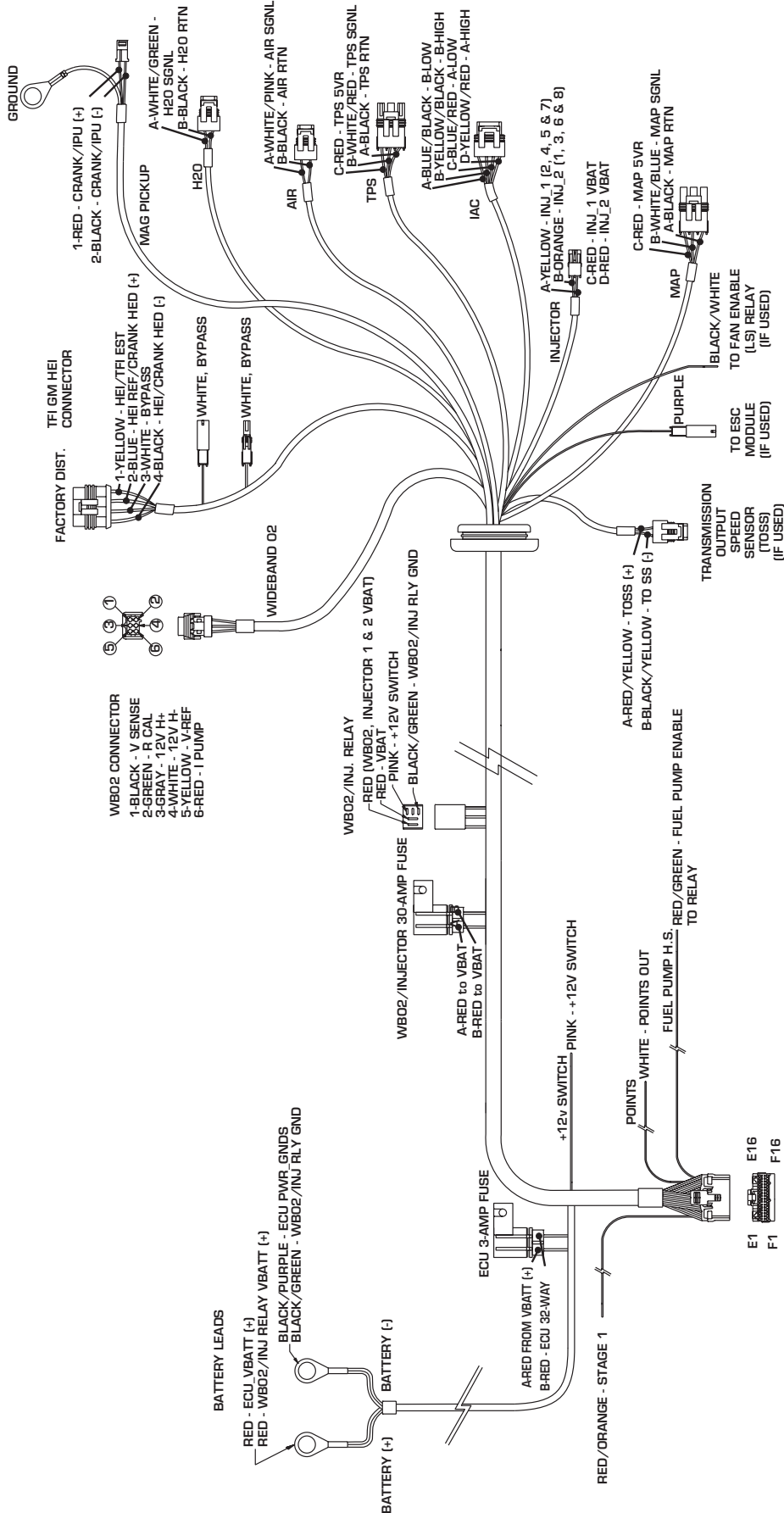
Control S - Spark Table
Control F - Fuel Table
Control A - Air/Fuel Ratio Table
Control V - View Log

78 Function or "Quick Keys"

F1 - Cranking Table
F2 - View Lambda Screen
F3 - Fuel Table
F4 - Spark Table
F5 - Operating Parameters Table (opens all operating parameter tables)
F6 - Coolant Correction Table
F7 - I/O Status Window
F8 - Record Log Window
F9 - Upload Replay
F10 - dMAP Corr vs. kPa table and dMAP RPM Modifier
F11 - Air/Fuel Ratio (AFR) and AFR Parameters Configuration Tables
F12 - Save Calibration Folder

79 Definitions

Working "Off-line" - The Blaster ECU is not powered up (PC Only) - Red Ball
Working "On-line" - The Blaster ECU is powered ON and communicating with the PC - Green Ball.



ECM CIRCUIT GAUGE	WIRE COLOR	GOES TO	NOTES	WIRE GAUGE	ECM CIRCUIT GAUGE	WIRE COLOR	GOES TO	NOTES
E1	RED	ECU VBATT (+)		16	F4	BLUE/BLACK	IAC - D	IAC B - LOW
E2	RED - WB02/INJ RELAY VBATT (+)		INJ 2 (1, 3, 6 and 8)	18	F5	YELLOW/BLACK	IAC - C	IAC B - HIGH
E3	BLACK/PURPLE - ECU PWR_GNDS		INJ 1 (2, 4, 5 and 7)	18	F6	BLUE/RED	IAC - B	IAC A - LOW
E4	BLACK/GREEN - WB02/INJ RLY GND		GOES TO 1-WAY HEI BYPASS CONNECTOR	18	F7	YELLOW/RED	IAC - A	IAC A - HIGH
E5	BATTERY (+)		FAN - A	18	F8	BLUE	HEI - B	HEI REF / CRANK HED (+)
E6	BATTERY (-)		FP ENABLE	18	F9	BLACK/PURPLE	PWR_GND 1	SPLICE #5 (ECU PWR_GND 1 AND 2)
E7	RED/ORANGE - STAGE - A		STAGE 1	18	F10	RED/YELLOW	ESC - A	ESC
E8	RED/ORANGE - STAGE - A		CRANK/IPU (+)	18	F11	PURPLE	ESC - A	H20 SIGNAL
E9	RED	TOSS - B, HEI - D	SPLICE #6 (TOSS, HEI/CRANK HED AND CRANK/IPU GROUND)	18	F12	WHITE/PINK	H20 - A	AIR SIGNAL
E10	BLACK/YELLOW, BLACK AND BLACK	CRANK/IPU - A AND CRANK/IPU - B	SPLICE #5 (ECU PWR_GND 1 AND 2)	18	F13	WHITE/RED	AIR - A	TPS SIGNAL
E11	BLACK	WB02 - 5	V-REF	18	F14	WHITE/BLUE	MAP - B	MAP SIGNAL
E12	RED	WB02 - 1	I-PUMP	18	F15	PINK	ECU +12V SWITCH, WB02/INJ RELAY	SPLICE #4 (ECU, WB02/INJ RELAY AND SOURCE +12V SWITCH)
E13	GREEN	WB02 - 6	V-SENSE	18	F16	PINK	ECU +12V SWITCH, WB02/INJ RELAY	AND SOURCE +12V SWITCH
E14	RED	TPS - C, MAP - C	CAL RESISTOR					
E15	RED	AIR - B, H20 - B, TPS - A AND MAP - A	SPLICE #3 (AIR, H20, TPS AND MAP SENSOR RTN)					
E16	RED	V BATT (+)	ECU V BATT (+)					
F1	RED	FROM VBATT (+)	HEATER (-)					
F2	YELLOW	HEI - A	HEI / TFI EST					
F3	WHITE	POINTS - A	POINTS OUT					



