

Engine Control Unit Operation Manual

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1.0 Introduction

Thank you for purchasing your new FAST™ XFI™. Please check your new FAST™ XFI™ contents. You should have received the following items:

Engine Control Unit (ECU)



C-Com™ WP XFI™ Software on CD



Wide-band O2 sensor and jumper harness



5-ft communications cable to connect your ECU to a computer



Depending upon your application you should also have a:

Main wiring harness



Injector harness



Ignition adapter harness



You may also have one of several of our option harnesses depending upon your requirements. These are not required to run your engine

1.1 Overview

Your new FAST™ XFI™ gives you complete control over the fuel and ignition of your engine and many other functions such as power adders, torque converter lockup, fans and fuel pumps. There are numerous possibilities of the things you can control with your new XFI™. This Help section will guide you along step-by-step through the installation and tuning processes. If for any reason you cannot find the information you're looking for we are easily contacted through email at support@fuelairspark.com or by phone at 901-260-FAST. Technicians are available Monday through Friday from 8am to 5pm CST.

As part of our ongoing product improvement efforts, the Help files contained herein will continually be updated to provide as much information as possible to make this guide an easy to follow, user friendly resource. Updates can be found on our website at <http://www.fuelairspark.com>.

Please select **2.0 Hardware and Wiring Installation** in the frame on the left side of the screen. Help for that topic will appear within this frame. Please follow along carefully through the process and we'll have you up and running in no time! Thank you again for your purchase and enjoy your new FAST™ XFI™.

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2.0 Hardware and Wiring Installation

These wiring installation instructions are specific to the wiring harnesses manufactured by FAST™ only. If you are using a wiring harness other than the ones offered by FAST™ please contact your dealer for instructions for that harness.

FAST™ wiring harnesses are labeled on each of the connectors to simplify installation. Your application may not require the use of all the connectors in the harness. You may also require additional accessories such as relays, sensors, and other specialized connectors to complete your installation. All of these are available for purchase from FAST™. Care should be taken to route all wires as far away from the distributor and spark plug wires as possible to minimize interference from ignition noise.

2.1 Main Harness

The underlined headings below are the exact terms used as labels on your FAST™ harness. Below the description is a pinout of the connector. The letter and numeral in parentheses is the corresponding pin location in the main ECU connector. For instance, in the below example “Pin A” is the location of the wire in the POWAD connector (connectors have the letters molded into them) , “pink” is the wire color, and “(B19)” is the pin location for that wire in the main ECU connector (see section [3.0 ECU Pinout](#)).

EXAMPLE: Pin F – Power adder enable, pink (B19)

2.1.1 POINTS

Connect this wire to the points input wire on your aftermarket ignition system, if you are using one. If you are using the FAST™ eDist, the POINTS wire should be connected to the points input of the eDist, located at pin C2 of the eDist connector.

2.1.2 FP-A/FAN-B/ESC-C

This connector contains the fuel pump (FP-A), fan (FAN-B), and knock sensor (ESC-C) wires. The -A, -B, and -C correlate to the pin that each function is housed on. The fuel pump wire is on pin A of the connector. Connect this wire to the **negative** side of a relay used to power your fuel pump (relay not included). *This output switches to ground when active. Use this wire to activate the **negative** side of a relay, and use the relay to provide power to the fuel pump. **Do not connect this wire directly to the fuel pump or to a 12 volt source or ECU damage will occur!*** The fan wire is housed on pin B. Connect this wire to the **negative** side of a relay used to power your fan (relay not included). *This output switches to ground when active. Use this wire to activate the **negative** side of a relay, and use the relay to provide power to the fan. **Do not connect this wire directly to the fan or to a 12 volt source or ECU damage will occur!*** The knock sensor wire is housed on pin C. Connect this wire to a GM-type ESC (knock sensor) module, typically located on the firewall or inner fender. The knock sensor used should be a GM-type knock sensor. Use of the knock sensor is not recommended for applications where high-octane fuel is used. An option harness for fuel pump and fan control with relays included (part # 30-1406) is available from FAST™.

Pin A – Fuel pump, black (B5)

Pin B – Fan, black (B10)

Pin C – ESC, black (A9)

2.1.3 CALPORT

Connect this plug to the supplied RS-232 communications cable for connection to your computer's serial port. If the supplied cable is not long enough for your needs, a 40-foot RS-232 cable (part # 30-8021) is available. If your computer does not have a serial port, a USB to serial port adapter (part # 30-7044) is available.

Pin A – TxD, red (C27)

Pin B – RS232 return, white (C29)

Pin C – RxD, black (C28)

2.1.4 12V+ SWITCH

Connect to a **+12V** source that is active when the key is in the START ***and*** RUN position. This is the wire that actually turns the ECU on, so it is critical that it receives 12 volts when the key is in the ON position ***and*** in the START position.

2.1.5 +12V SWITCH H.E.

If you are using a hall effect cam and/or crank sensor, this will need to be connected to a **+12V** source that is active when the key is in the START ***and*** RUN position. The other end of this wire, which is found in the bundle next to your CAM HALL EFFECT connector, needs to be connected to the +12V wire on your sensor(s). If you are not using a hall effect-type sensor this will not need to be connected.

2.1.6 GND

GND stands for ground, and there are two of these in the main harness. One is bound with the Cam Hall Effect connector and one is bound with the CRANK connector. These ground connections should be connected to a clean engine ground. Be sure to remove all paint and corrosion from the point to which this ground is attached.

2.1.7 BAT+ and BAT-

The battery wires should only be connected to the battery terminals, not to an intermediate power source or ground on the chassis or engine. This will ensure maximum noise rejection from ground loops and conducted noise. ***Connect these only after all other connections are made.***

2.1.8 WIDEBAND O2

Connect this plug to the supplied oxygen sensor using the provided extension harness. The oxygen sensor should be located in an exhaust pipe where the sensor will be able to get a good "average" reading from at least one entire bank of cylinders. If you have a turbocharged motor, put the sensor in the downpipe rather than in a collector.

Pin A – UEGOP-, black (C2)

Pin B – UEGOP+, white (C1)

Pin C – UEGOS+, red (C3)

Pin D - blank

Pin E– UEGOR+, gray (C4)

Pin F – UEGOR-, blue (C5)

Pin G – UEGOH-, yellow (C6)

Pin H – VBAT, orange (goes to 30 amp fuse in main harness)

2.1.9 H2O

Connect this plug to your coolant temperature sensor. Coolant temperature sensors are available separately or as part of complete sensor kits from FAST™.

Pin A – H2O signal, white (C23)

Pin B – H2O return, black (tied to ground)

2.1.10 AIR

Connect this plug to a your air temperature sensor. For speed/density applications, this sensor should be mounted in a position where it samples the charge air in the manifold. For Alpha-N applications, mount this sensor to sample ambient air temperature, as in the hood scoop or in the air cleaner. Air temperature sensors are available separately or as part of complete sensor kits from FAST™.

Pin A – Air signal, white/pink (C22)

Pin B – Air return, black (tied to ground)

2.1.11 MAP

Connect this plug to a GM-type Manifold Absolute Pressure sensor, such as FAST™ part # 30-7007 for normally aspirated applications. For blown or turbocharged applications, use a 2 bar MAP sensor (part # 30-7008) for up to 15 PSI of boost, a 3 bar MAP sensor (part # 30-7009) for up to 30 PSI of boost, a 4 bar MAP sensor for up to 45 PSI of boost, or a 5 bar MAP sensor (part # 30-7047) for up to 60 PSI of boost. For speed/density applications, this sensor must be connected to an intake manifold vacuum port. For Alpha-N applications, mount this sensor to sample ambient air pressure, as in the hood scoop or in the air cleaner. Manifold absolute pressure sensors are available separately or as part of complete sensor kits from FAST™.

Pin A – MAP return, black (tied to ground)

Pin B – MAP signal, white/violet (C20)

Pin C – MAP +5V reference, red (C24)

2.1.12 TPS

Connect this plug to the throttle position sensor located on the throttle body. Throttle position sensors are available separately or as part of complete sensor kits from FAST™.

Pin A – TPS return, black (tied to ground)

Pin B – TPS signal, white/red (C21)

Pin C – TPS +5V reference, red (C24)

2.1.13 IAC

Connect this plug to the Idle Air Control motor. Idle air control motors are available separately or as part of complete sensor kits from FAST. For blown, turbocharged, or other special applications, use Remote Idle Air Control unit, part # 30-7016.

Pin A – A high, red (B12)

Pin B – A low, blue (B13)

Pin C – B high, yellow (B14)

Pin D – B low, black (B15)

2.1.14 CAM HALL EFFECT

This connector doubles not only as the cam sensor input, but also as the overall ignition adapter harness connector. FAST™ ignition adapter harnesses will plug this connector directly into your ignition source without the need for cutting or splicing existing connections. A camshaft sensor input is only *required* for sequential systems with individual cylinder control. It is ***recommended*** for all sequential systems, however. If your engine does not have a camshaft sensor and one is required, contact your FAST™ dealer for assistance. Unless specifically noted elsewhere, bank-to-bank configurations do not require a camshaft sensor.

Pin A – IPU Cam (+), red (A3)

Pin B – IPU Cam return, black (A1)

Pin C – Discrete cam, yellow/black (A7)

Pin D – Discrete return, black/white (A13)

Pin E – Spark output, tan/black (A14)

Pin F – Discrete crank, brown/white (A8)

Pin G – Bypass, green/light green (A15)

Pin H – TFI, blue/white (A10)

2.1.15 CRANK

Connect this plug to an inductive pickup type crankshaft sensor (typically a inductive pickup crank trigger or distributor), and connect the ring terminal to a ground point such as the engine block. The following chart shows the wire colors to connect for some common crank triggers. Virtually any crank trigger system should be compatible, so long as it is properly connected.

IMPORTANT NOTE: The wiring conventions of different manufacturers can vary. FAST users should rely on this chart when connecting the listed crank triggers. That will ensure the ECU receives the required “positive first” sine wave from the crank trigger. If the wiring is reversed, timing may be retarded, erratic and/or change with engine speed. The FAST™ IPU ignition adapter harness will supply you with the MSD style connectors.

	Red (Mag+) Terminal A	Black (Mag-) Terminal B
MSD Distributor	Violet/Black	Orange/Black
MSD Crank Trigger	Green	Violet
Accel 44000 Series	Black	White
Accel Crank Trigger	Black	White

Pin A – IPU crank +, red (A4)

Pin B – IPU crank -, black (A2)

NOTE: If you are ***not*** using a FAST™ ignition adapter harness, the ECU will accept either discrete/ Hall Effect or inductive type signals as its crank and cam inputs. There is a separate ECU pin for each type.

The inductive crank input is ECU pin A4. It can be found in the CRANK connector on the harness as pin A. The discrete/Hall Effect crank input is ECU pin A8. It can be found in the CAM HALL EFFECT connector on the harness as pin F. **Whichever input is not being used should be connected to ground.** This will prevent the unused input from floating and falsely triggering the ECU.

The inductive cam input is ECU pin A3. The discrete/Hall Effect cam input is ECU pin A7. Both can be found in the CAM HALL EFFECT connector on the harness as pin A and pin C respectively. **Whichever input is not being used (or both inputs if no cam sensor is being used)**

should be connected to ground. This will prevent the unused inputs from floating and falsely triggering the ECU.

2.1.16 Injector

This plug will be connected to your FAST™ fuel injector harness. FAST™ has fuel injector harnesses available for all popular engine applications.

If you need to reconfigure your injector harness, refer to the following chart. The 10-pin connector on the end of the injector harness can easily be reconfigured to work with many different engine types. Terminals A through H on the connector are designated for each of the eight injector connectors on the harness and can be reconfigured as per the following chart. Terminals J and K should not be changed under any circumstances. It is important to note that when reconfiguring your harness always start the firing order with Pin E. The XFI starts with Pin E and fires the injectors in order from there. For example, a small block chevy with a firing order of 18436572 would have cylinder 1 connected to Pin E, so a firing order of 18436572 = EFGHABCD. See below for several examples.

Injector Harness Pins	A	B	C	D	E	F	G	H
GM V8 except LS1 (18436572)	Purple	Gray	Green	Yellow	Black	Orange	Brown	Blue
Part# 301200	6	5	7	2	1	8	4	3
GM V8 except LS1 with 4/7 swap camshaft	Purple	Gray	Brown	Yellow	Black	Orange	Green	Blue
Part# 301201	6	5	4	2	1	8	7	3
GM LS-1 V8 (18726543)	Gray	Purple	Blue	Brown	Yellow	Green	Orange	Black
Part# 301202	6	5	4	3	1	8	7	2
Ford 5.0L, all Modular V8 (13726548)	Black	Blue	Purple	Gray	Yellow	Orange	Green	Brown
Part# 301203	6	5	4	8	1	3	7	2
Ford 289/302, FE, 429/460 (15426378)	Black	Orange	Gray	Green	Brown	Blue	Purple	Yellow
Part# 301204	6	3	7	8	1	5	4	2
Buick V6 (165432)	Gray	Purple	Green	Orange	Black	Brown	Blue	Yellow
Part# 301206	4	3	2	1	6	5	n/c	n/c

2.1.17 POWAD

This connector contains the power adder function wires. There are 6 wires in this connector that control 4 completely separate stages as well as the power adder enable wire and a new power adder hold function. A Power Adder option harness (part # 30-1400) is available from FAST™.

The pink wire on pin F is the enable wire. Connecting this wire to **+12V** enables the power adder system. This is typically connected to a toggle switch.

The pink wire on pin E is the power adder hold/force enable wire. Connecting this wire to **ground** enables the power adder hold/force function.

The blue/white wire is the control output for the first stage. *This output switches to ground when active. Use this wire to activate the **negative** side of a relay, and use the relay to provide power to your power adder control source.*

The blue/yellow wire is the control output for the second stage. *This output switches to ground when active. Use this wire to activate the **negative** side of a relay, and use the relay to provide power to your power adder control source.*

The blue/green wire is the control output for the third stage. *This output switches to ground when active. Use this wire to activate the **negative** side of a relay, and use the relay to provide power to your power adder control source.*

The blue/orange wire is the control output for the fourth stage. *This output switches to ground when active. Use this wire to activate the **negative** side of a relay, and use the relay to provide power to your power adder control source.*

Do not connect the blue (/white/yellow/green/orange) wires directly to a 12 volt source or ECU damage will occur!

Pin A – Power adder stage 1, blue/white (B20)

Pin B – Power adder stage 2, blue/yellow (B21)

Pin C – Power adder stage 3, blue/green (B22)

Pin D – Power adder stage 4, blue/orange (B23)

Pin E – Power adder hold, pink (B16)

Pin F – Power adder enable, pink (B19)

2.1.18 DIAG

This connector is for your diagnostic and flash functions. A Flash Kit option harness (part # 30-1401) is available from FAST™.

Pin A – Flash enable, blue (A21)

Pin B – Cal select1, gray (A22)

Pin C – Cal select0, yellow (A23)

Pin D – Service engine soon, light green (B9)

Pin E – Discrete return, black/white (A13)

2.1.19 ANALOG

This connector houses the 8 analog inputs that can be used for things such as fuel pressure sensor, oil pressure sensor, EGT probes, etc. An Analog Auxiliary input harness kit (part # 30-1402) is available from FAST™.

Pin A – AAUX1, blue/gray (C12)

Pin B – AAUX2, gray (C13)

Pin C – AAUX3, purple (C14)

Pin D – AAUX4, light green (C15)

Pin E – AAUX5, yellow/black (C16)

Pin F – AAUX6, blue (C17)

Pin G – AAUX7, brown/white (C18)

Pin H – AAUX8, white (C19)

Pin K – Analog return, black (C11)

2.1.20 AUX SHAFT

This connector is for the auxiliary shaft sensor input circuit. The FAST™ VSS and auxiliary shaft harness kit (part # 30-1403) will supply you with the harness, sensor, and magnets to monitor things such as turbo speed and torque converter/clutch slippage.

Pin A – Inductive return, black (A2)

Pin B – AUX discrete, orange (A6)

Pin C – Discrete return, black/white (A13)

Pin D – Aux inductive, purple (A17)

2.1.21 VSS

This connector is for vehicle speed sensor input. If your vehicle has a vehicle speed sensor an option harness kit (part # 30-1403) is available from FAST™.

Pin A – Inductive return, black (A1)

Pin B – MPH discrete, white (A5)

Pin C – MPH inductive, yellow (A16)

Pin D – Discrete return, black/white (A13)

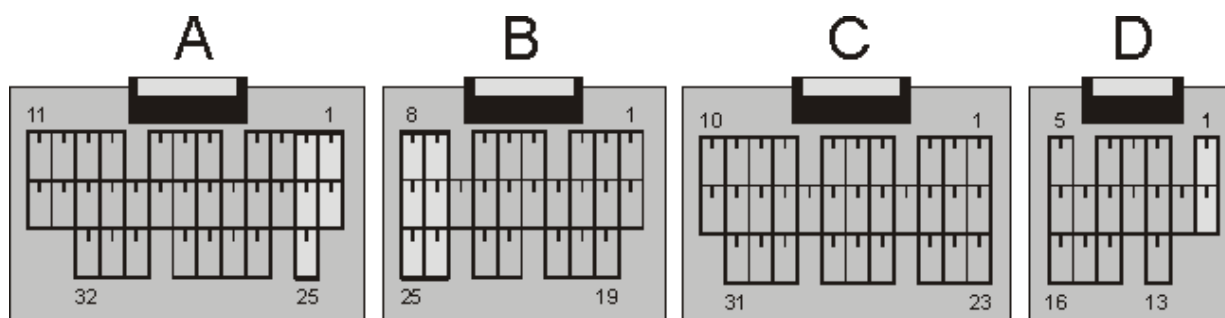
2.1.22 CAN

CAN (or Controller Area Network) is a method for linking electronic devices so that they can communicate with each other. The network is made up of two wires that all of the devices tap into. The devices can all send and receive information as needed to and from the other devices on the network. The need for redundant sensors or complicated wiring between devices is eliminated. For example, since the ECU is already monitoring throttle position, the rest of the devices will also have access to that throttle position data.

- CAN Wiring - Each CAN-enabled FAST unit (XFI ECU, XIM, etc.) has special CAN wiring built into its main harness. There is a CAN plug (male) and a CAN receptacle (female) on each harness. To set up the CAN network between two devices – connecting an XFI ECU to an XIM, for example – the plug from one harness will connect to the receptacle from the other harness. It does not matter which pair of connectors is used as long as one pair is mated. To add more devices to the network, just continue linking devices together in a single chain.
- CAN Interconnect Cable - While each main harness can be directly connected to the next, it will often be useful to use an interconnect cable. This has the same plug and receptacle as the main harnesses and connects in line between the main harnesses. Multiple interconnect cables can be linked together for greater reach between devices.
- Terminating Plug/Receptacle - After all of the devices have been linked together, there will be one loose plug and one loose receptacle at either end of the network. These loose ends need to be capped off with a Terminating Plug at one end and a Terminating Receptacle at the other. This improves network performance. One set of terminating plug/receptacle covers any size network.

Cable Bends - For best network performance, CAN cable bends should have a radius of approximately 1” or larger.

3.0 FAST XFI ECU Pinout Chart



ECU Pin	Name	Wire Color	ECU Pin	Name	Wire Color
A1*	Inductive Cam Pickup Return (Ground)	Black	C1	UEGOP+	White (B)
A2*	Inductive Crank Pickup Return (Ground)	Black	C2	UEGOP-	Black (A)
A3	Inductive Cam Positive Input Signal	Red	C3	UEGOS+	Red (C)
A4	Inductive Crank Positive Input Signal	Red	C4	UEGOR+	Gray (E)
A5	Discrete Vehicle Speed Sensor Input Signal	White (B)	C5	UEGOR-	Blue (F)
A6	Discrete Auxiliary Speed Sensor Input Signal	Orange (B)	C6	UEGOH-	Yellow (G)
A7	Discrete Cam Pickup Input Signal	Ylw / Blk (C)	C7	Pulse Width Modulated (PWM) Output #3 (EGR Control)	
A8	Discrete Crank Pickup Input Signal	Brn / Wht (F)	C8	Pulse Width Modulated (PWM) Output #4 (Boost Control)	Brown
A9	Knock Input Signal (ESC)	Black (C)	C9	Controller Area Network (CAN) #1 High Signal	
A10	TFI / EDIS Ignition Output (TFI/SAW)	Blu / Wht (H)	C10	Controller Area Network (CAN) #1 Low Signal	
A11	Points Ignition Output (POINTS)	White	C11	Analog Auxiliary Input Return (Ground)	Black (K)
A12*	Main Power Return (Ground)	Black (10 ga)	C12	Analog Auxiliary Input Signal #1	Blu / Gra (A)
A13*	Distributor Return (Ground)	Blk / Wht (D)	C13	Analog Auxiliary Input Signal #2	Gray (B)
A14	HEI Ignition Output (EST)	Tan / Blk (E)	C14	Analog Auxiliary Input Signal #3	Violet(C)
A15	Crank / Run Mode Output (BYPASS)	Grn / Lt Grn (G)	C15	Analog Auxiliary Input Signal #4	Lt Green (D)
A16	Inductive Vehicle Speed Sensor Positive Input Signal	Yellow (C)	C16	Analog Auxiliary Input Signal #5	Ylw / Blk (E)
A17	Inductive Auxiliary Speed Sensor Positive Input Signal	Violet (D)	C17	Analog Auxiliary Input Signal #6	Blue (F)
A18	Pulse Width Modulated (PWM) Output #2		C18	Analog Auxiliary Input Signal #7	Brn / Wht (G)
A19	Pulse Width Modulated (PWM) Output #1		C19	Analog Auxiliary Input Signal #8	White (H)

A20	Clutch Input Signal		C20	Manifold Absolute Pressure (MAP) Sensor Input Signal	Wht / Vio (B)
A21	Flash Programming Enable Input Signal	Blue (A)	C21	Throttle Position Sensor (TPS) Input Signal	Wht / Red (B)
A22	Calibration Select Switch Input #1	Gray (B)	C22	Air Temp Sensor (ATS) Input Signal	Wht / Pnk (A)
A23	Calibration Select Switch Input #0	Yellow (C)	C23	Coolant Temperature Sensor (CTS) Input Signal	White (A)
A24	A/C Idle Increase Input Signal		C24	5 Volt Reference Output	Red (5 volt ref)
A25*	Digital Auxiliary Input Signal #0		C25	Controller Area Network (CAN) #0 High Signal	
A26	Digital Auxiliary Input Signal #1		C26	Controller Area Network (CAN) #0 Low Signal	
A27	Digital Auxiliary Input Signal #2		C27	RS-232 PC Communications Transmit #0	Red (A)
A28	Digital Auxiliary Input Signal #3		C28	RS-232 PC Communications Receive #0	Black (C)
A29	Digital Auxiliary Input Signal #4		C29	RS-232 Communications Return (Ground)	White (B)
A30	Digital Auxiliary Input Signal #5		C30	RS-232 PC Communications Transmit #1	
A31	Digital Auxiliary Input Signal #6		C31	RS-232 PC Communications Receive #1	
A32	Digital Auxiliary Input Signal #7				
B1	Auxiliary Switched Output #1		D1*	Main Power Return (Ground)	Black (10ga)
B2	Auxiliary Switched Output #2		D2	Injector Output A	Black (A)
B3	Auxiliary Switched Output #3		D3	Main Power Return (Ground)	
B4	Auxiliary Switched Output #4		D4	Injector Output B	Brown (B)
B5	Fuel Pump Control Output	Black	D5	Main Power Return (Ground)	
B6	Torque Converter Clutch (TCC) Control Output		D6*	Main Power Return (Ground)	
B7*	Main Power Return (Ground)	Black 10gage	D7	Injector Output C	Yellow (C)
B8*	Digital Inputs Return (Ground)	Black	D8	Main Power Return (Ground)	
B9	Service Engine Soon (SES) Lamp Output	Lt Green (D)	D9	Injector Output D	Green (D)
B10	Fan Control Output	Black	D10	Main Power Return (Ground)	
B11	A/C Enable Output		D11	Injector Output E	Orange (E)

B12	Idle Air Control (IAC) Output A Hi	Red (A)	D12	Main Power Return (Ground)	
B13	Idle Air Control (IAC) Output A Lo	Blue (B)	D13	Injector Output F	Blue (F)
B14	Idle Air Control (IAC) Output B Hi	Ylw (C)	D14	Injector Output G	Gray (G)
B15	Idle Air Control (IAC) Output B Lo	Black (D)	D15	Main Power Return (Ground)	
B16	Power Adder Hold Enable Input	Pink (E)	D16	Injector Output H	Violet (H)
B17*	Switched Ignition Voltage Input	Pink (Sw Ign)	* Denotes High Current Pin		
B18*	Battery Voltage Input	Red (Batt 3 Amp)			
B19	Power Adder Enable Input	Pink (F)			
B20	Power Adder Switched Output #1	Blu / Wht (A)			
B21	Power Adder Switched Output #2	Blu / Ylw (B)			
B22	Power Adder Switched Output #3	Blu / Grn (C)			
B23	Power Adder Switched Output #4	Blu / Orn (D)			
B24*	Analog Inputs Return (Ground)	Black			
B25*	Main Power Return (Ground)	Black			

4.0 Communication Setup

4.1 Overview

C-Com WP can be configured to communicate in one of two ways:

- Direct serial port connection from a PC to the ECU
- Internet connection from a remote PC to another PC connected directly to the ECU

4.2 System Requirements

- PC: 80386 or higher CPU
- Operating System: Microsoft® Windows 95/98/NT/ME/2000/XP
- Graphics: VGA * RAM: 2MB minimum
- Hard Disk: 1 MB minimum
- RS-232: A free COM port (#1,2,3 or 4 without conflicting interrupts) is required. If your PC does not have a serial port connection you must use a USB to serial port adapter that is included with your XFI system.

4.3 Menu Mode

In order to keep our commitment of making your EFI experience easier, C-Com XFI Version 1.340 and above now comes with our Menu Mode feature. Menu Mode breaks the software menu system down into three modes: Basic, Intermediate, and Advanced. These software menu system modes are meant to represent the tuning experience required to operate the XFI system. To access the Menu Mode selection window, click FILE/MENU MODE. The Menu Mode selection window will appear and you simply left click with your mouse on which mode you prefer to use. A breakdown of each mode can be found below:

- **BASIC** – only includes the basic tables needed to get a normally aspirated engine operating properly. It only contains the tables needed to accomplish this, thereby making this the easiest mode for a first-time or novice tuner to accomplish their goal.
- **INTERMEDIATE** – gives the tuner more functions to accomplish their goal such as Acceleration Enrichment tables, Closed Loop Correction Limit and Gain tables, Temperature Correction tables, more Idle Control tables, and other more specialized features such as Power Adder, Intelligent Traction Control(if so equipped), EGR, Torque Converter Lockup, and Air Conditioning Clutch Control.
- **ADVANCED** – this mode gives the tuner everything we offer such as Boost Control, Individual Cylinder Control, and Trans-brake Control.

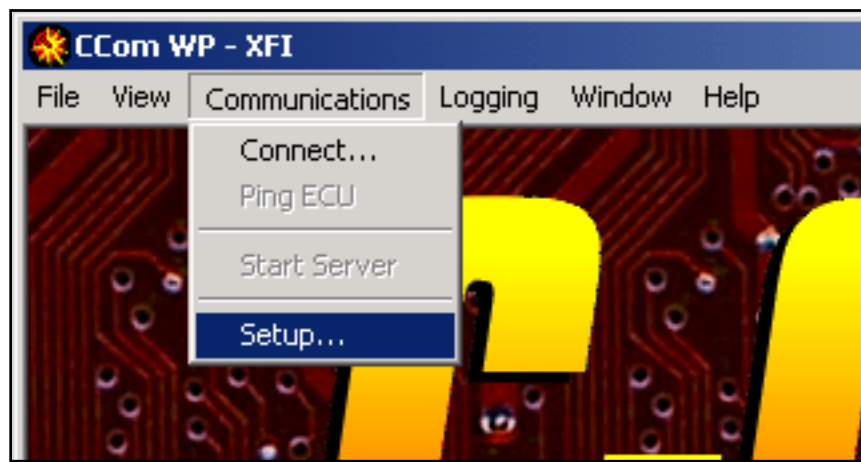
You can switch between modes at anytime without losing tune-up information. If for example you have tuned your engine in Basic Mode and want to try a few more tricks, simply to go FILE/MENU MODE and choose Intermediate. It will not affect your tune-up in any way. You can then go back to Basic if you prefer, with all of your tune-up information and its operation safe and sound. You do not need to be in Intermediate or Advanced Modes to use those features either. Just set-up the features you'd like to use and simply go back to Basic Mode if you'd like. The features you've set-up in Intermediate or Advanced will operate just as you've set them up to.

4.4 Direct Serial Port connection

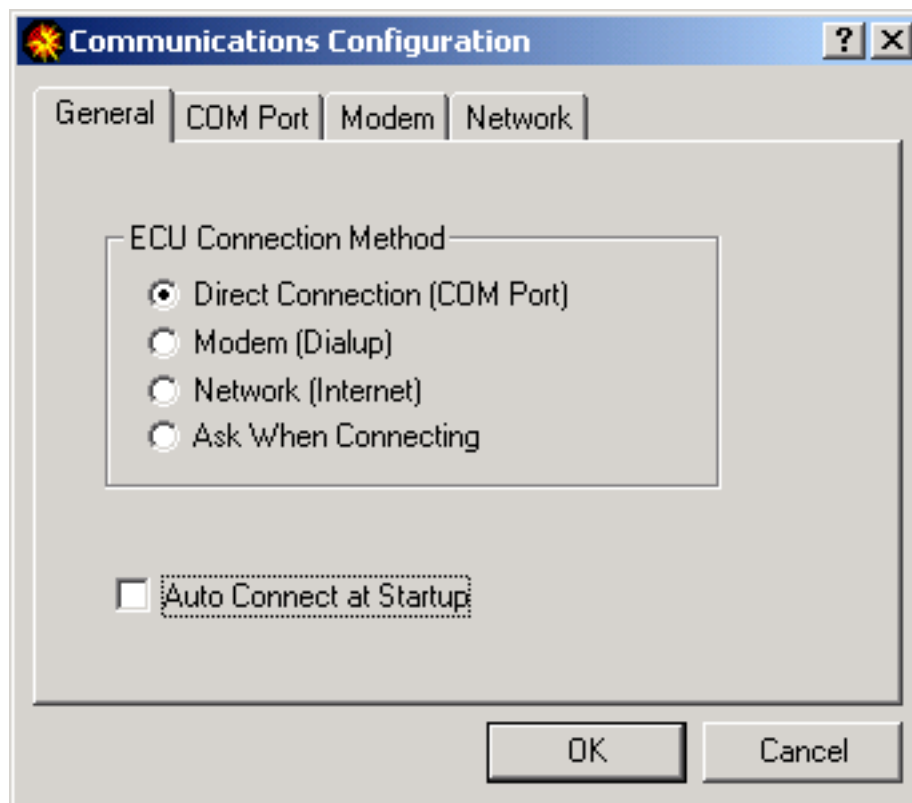
Make sure the ECU is connected to the PC using the provided communication cable and that the ECU is powered up.

4.4.1 Setup

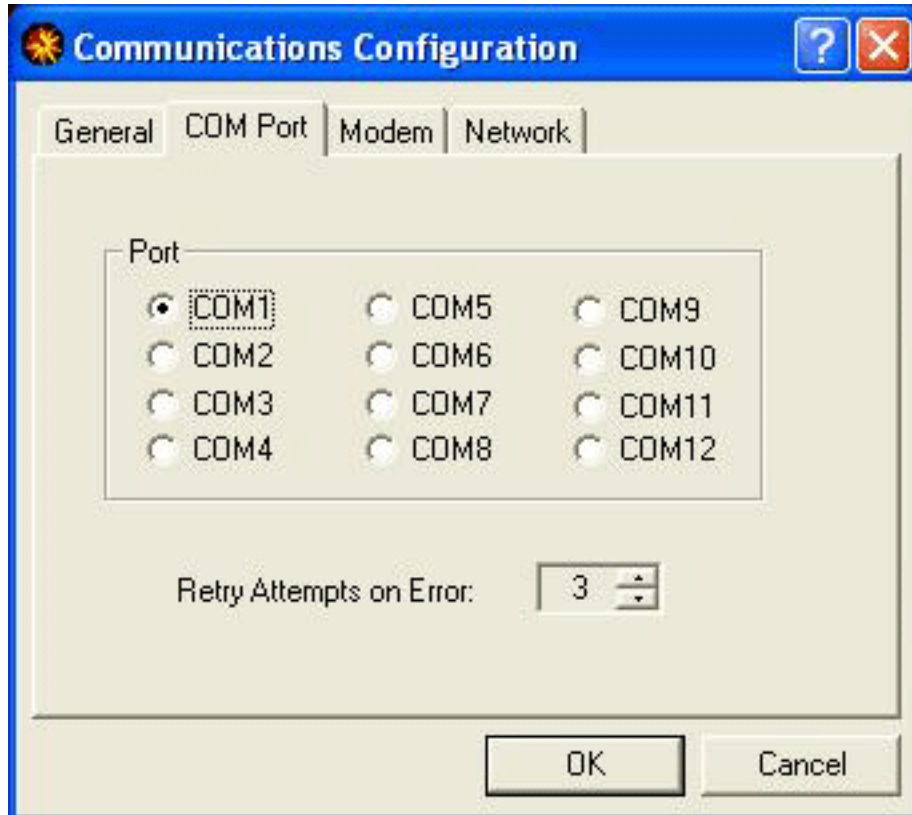
From the pulldown menu, select COMMUNICATIONS/SETUP.



The communications setup window should now appear. Under the "General" tab, select "Direct Connection" for the ECU communication method.

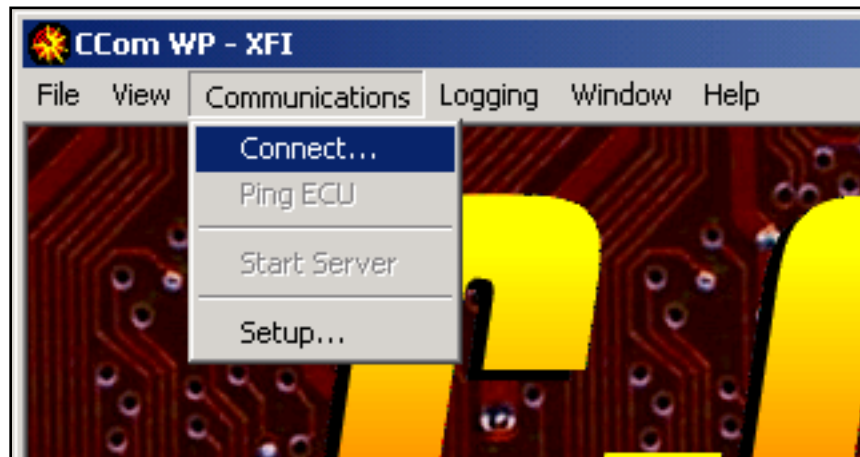


Click on the "COM Port" Tab. From this screen, select the appropriate COM port for your PC. (On most laptop computers this is COM1.) Click "OK" when finished.



4.4.2 Connecting

From the pulldown menu, select COMMUNICATIONS/CONNECT.



The hot key for this operation is “**F2**”. There should be a progress bar at the lower right of the screen, and the word "Online" should appear at the bottom left corner when the progress bar finishes.

Note - If the "Online" message appears, the communication setup directions may be skipped from now on. If the "Online" message does not appear, make sure that the ECU is properly connected to the ECU and verify that the COM port is functional and properly configured. The COM port configuration settings are located in the Windows Device Manager. If a “Incompatible Device” error message appears, either your software or firmware is in need of an update. Updates are available for download from the FAST website 24 hours a day. It can be found at WWW.FUELAIRSPARK.COM.

4.4.3 Ping

ECU Re synchronizes the ECU with C-Com WP XFI™ by testing for a valid device and reading the ECU memory into its buffers.

4.4.4 Start Server

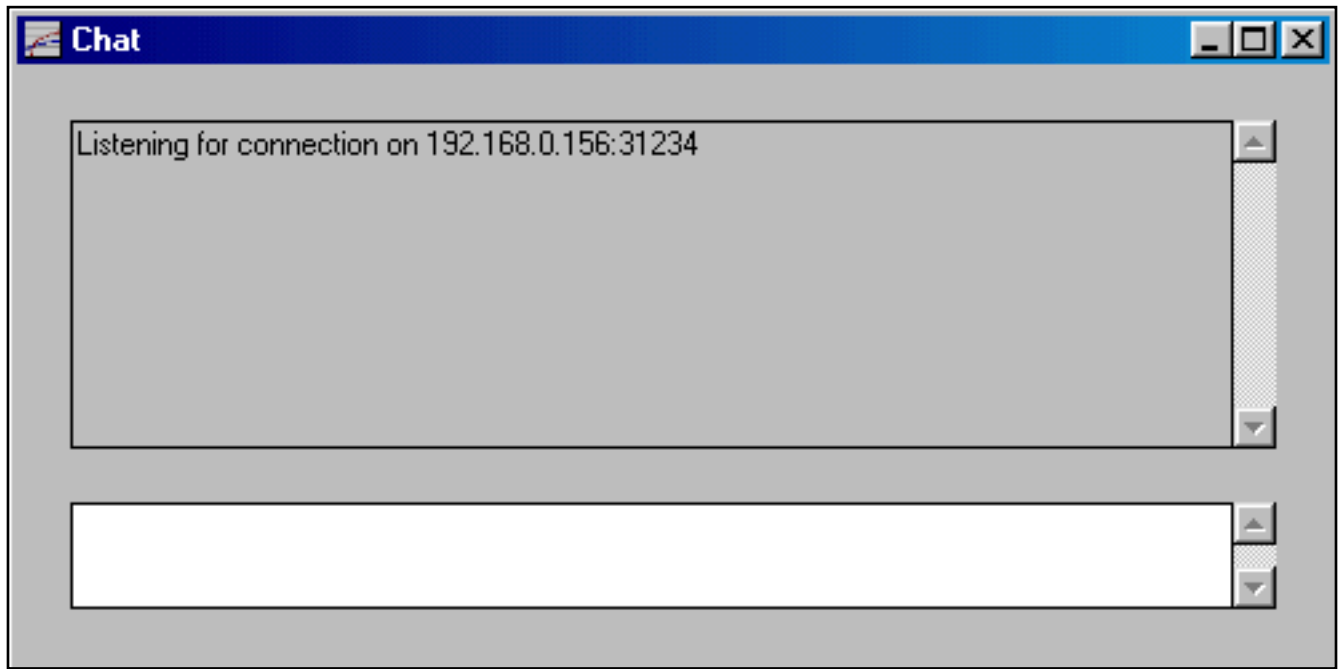
Internet Connection from a remote PC to another PC connected directly to the ECU.

One of the two PCs must be directly connected to the ECU as described above.

From the PC connected to the ECU:

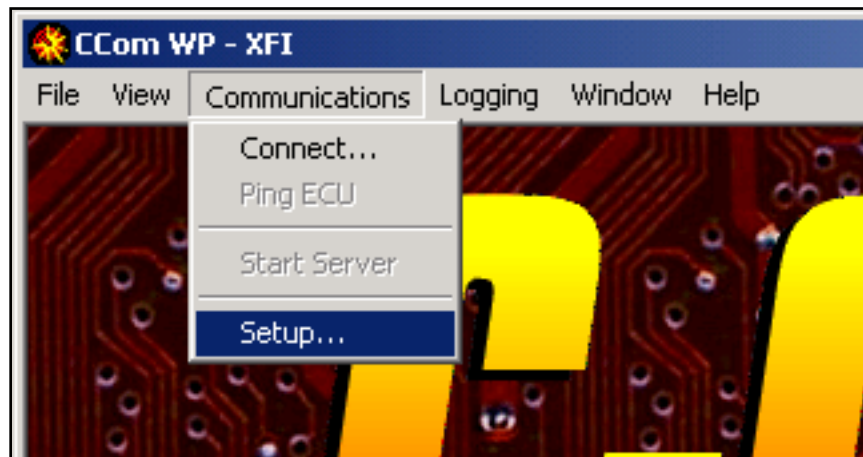
Establish a connection to the Internet. Start C-Com WP XFI™(if not already running) and have the serial cable connected to the ECU, but keep the software in offline mode. Select COMMUNICATION/ START SERVER from the pulldown menu. At this point, you will be prompted to select from the available IP addresses that C-Com WP XFI™ detects as available. Select one of these IP addresses. You should see a chat window like the one below, signifying that C-Com WP XFI is ready to communicate

with another PC over the internet. You may use this chat window to communicate with the other PC.



From the remote PC:

Establish a connection to the Internet. Once this connection has been established, start C-Com WP XFI™. From the pulldown menu, select COMMUNICATIONS/SETUP.



Under the "General" tab, select "Network" for the ECU communication method. Click the "Network" tab. On this screen, enter the IP address of the PC connected directly to the ECU.

If you are able to communicate successfully over the Internet, a chat window will appear as shown above. You may use this chat window to communicate with the other PC.

Once the connection has been established, the remote PC will be able to view and change parameters within the ECU.

5.0 Loading and Saving Calibration Files

5.1 Overview

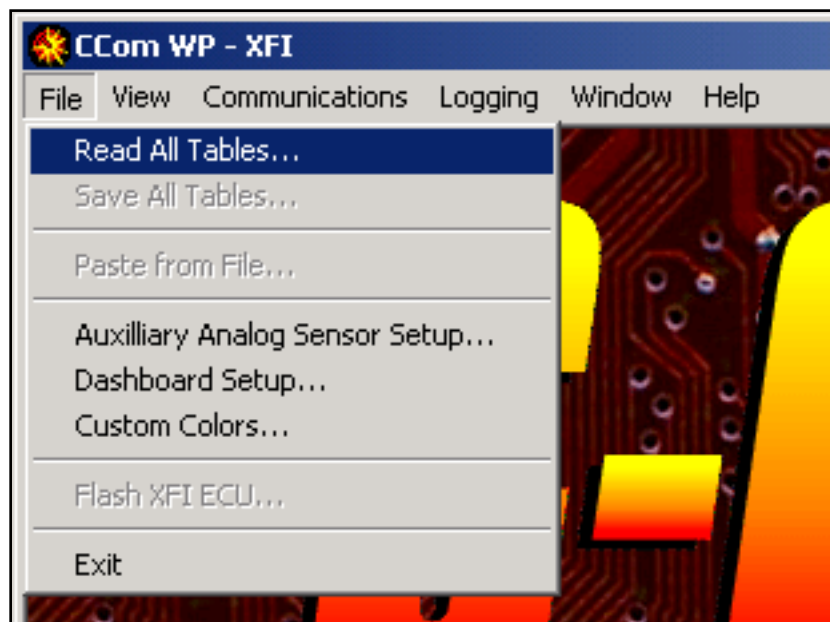
Calibration files can be loaded or saved in one of two ways. In *offline mode*, a calibration file can be loaded into your PC's memory so that you can make changes offline and save them to disk. In *online mode*, you will be sending calibration information directly to the ECU.

Important Note - If the ECU is not connected and powered (key off) when C-Com WP XFI™ is executed for the first time, C-Com WP XFI™ will be in a 'demo' mode. In the 'demo' mode, all file-save functions and some communications features will be disabled. C-Com WP XFI™ will remain in 'demo' mode until such time as an ECU is connected and successful communication is established.

If C-Com WP XFI™ is executed after the ECU is powered up (key on) and connected (by the communication cable), communication will be attempted. You can also press the “F2” key to cause C-Com WP XFI™ to attempt communication with the ECU. Once successful communication has been established, C-Com WP XFI™ will record the serial number to its configuration and become fully functional both *On-line* and *Off-line*. Further uses of C-Com WP XFI™ will be fully functional as well.

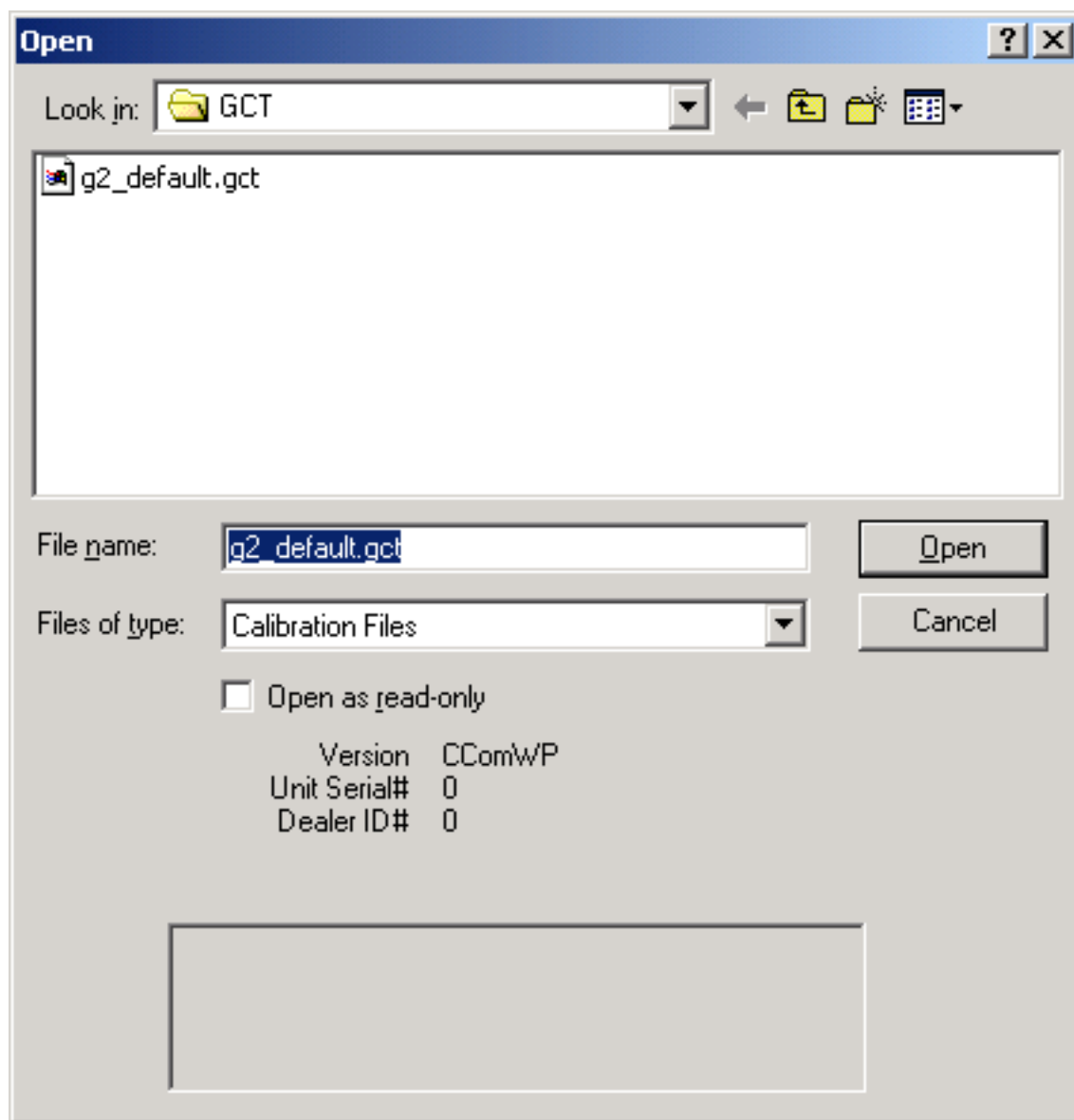
5.2 To Load a File

- From the pulldown menu, select FILE/READ ALL TABLES. Need current screenshot of menu below showing added features



- Select a calibration file to load. You may either double click the file or click the file once to

highlight it and then click OPEN.

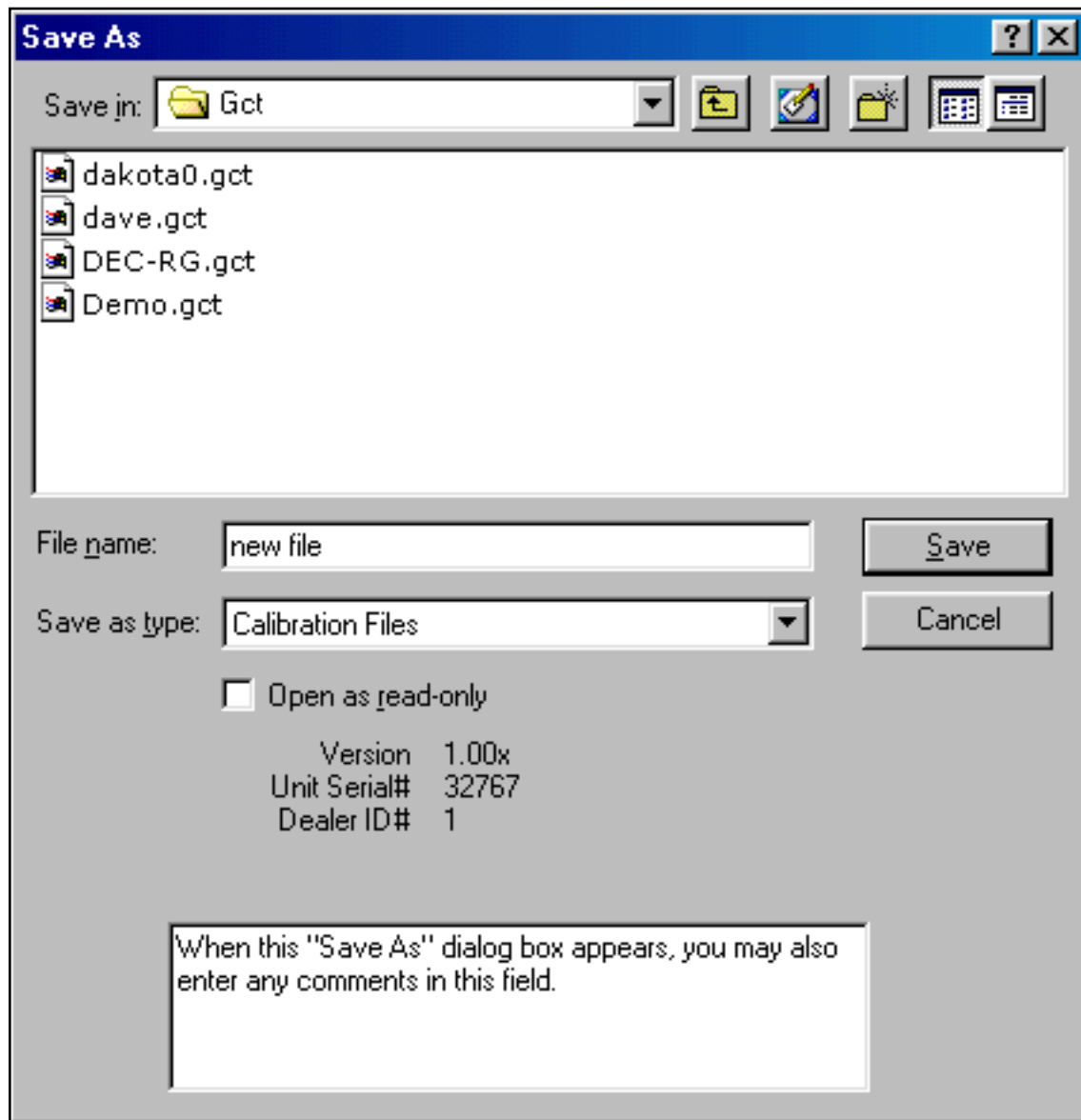


When you are in *offline mode*, once the file is loaded, you may make any changes you wish and save the changes to disk. Once the changes have been made, the file can be programmed into the ECU when you are in *online mode*.

When you select a file to load in *online mode*, you should see a progress bar at the bottom of the screen. When the bar fills up, the new calibration file has been loaded into the ECU. The information you are viewing in the tables in *online mode* is what is actually programmed into the ECU. Any changes you make to any tables or fields are immediately programmed into the ECU.

5.3 To Save a File

- From the pulldown menu, select FILE/SAVE ALL TABLES. (The hot key for this operation is “F12”)



- Enter a name to save the file under and press enter. The calibration file name you select will automatically be given a .GCT file extension. **Important Note** – Give some thought to what you name your files. It is always a good idea to use a name that includes the date and any major change/changes that you've made in the file you're saving.

6.0 Initial Setup

6.1 Overview

From the factory, the ECU comes loaded with several different calibration files that should be sufficient to get most engines started. However, before attempting to start your car, there are a few parameters that need to be set first. These include:

- Operational Parameters
- Fuel Calc Parameters
- Firing Order Synchronization
- Sensor Calibration
- *Start your engine!!!*

IMPORTANT NOTE – If you can not find one of the tables listed below, see the [MENU MODE SECTION](#) for information on how to find them.

While the computer is connected and online, press the F9 key to display the main dashboard. You should be able to read the following dashboard parameters with the engine not running and the ignition on:

- The TPS reading at an idle should be relatively low, and should increase as you open the throttle. If it doesn't go all the way from 0 to 100 yet, that's OK.
- The MAP sensor should read approximately 100 kPa once the proper calibration has been entered. For now, a reading of 20 or higher is OK.
- The air and coolant temperature sensors should read the approximate outside temperature, assuming the engine hasn't been run for some time.
- Battery voltage should be approximately 12 volts.
- Check the LED's on the face of your new FAST™ XFI™ ECU. The Power should be lit as soon as you turn on the keyed power while Crank and Cam will flash once until you start turning over the engine. The Cam will only flash if you're using a cam input of some type. NOTE - keep the fuel injector harness unplugged at this time.

If all the above conditions have been met then its time to move on to the next step. If not, you'll need to go back and check connections in your wiring harness for things such as loose connections, improper grounds, or possible faulty sensors.

6.2 Operational Parameters

These parameters can be accessed through the pulldown menus by selecting VIEW/SYSTEM CONFIGURATION/OPERATIONAL PARAMETERS. Click on any of the parameters in the image

below to jump directly to information on that topic.

Parameter	Value
Fuel Pump Prime (Sec)	6
Injector Opening Time (mS)	1.3
Injector Opening Retard (*)	0.00
Crank to Run Mode RPM	400
Engine Revs to Run Mode	12
Fuel Cut-Off RPM >	5800
Fuel Cut-On RPM <	5750
Speed Density Mode	<input checked="" type="radio"/>
Alpha-N Mode	<input type="radio"/>
SEFI FI Mode Enable	<input checked="" type="radio"/>
Bank-to-Bank FI Mode Enable	<input type="radio"/>
Crank Ref. Angle (*BTDC)	48.00
Inductive Delay (uSec)	96
IPU Ignition	<input checked="" type="radio"/>
Buick DIS Ignition	<input type="radio"/>
GM HEI Ignition	<input type="radio"/>
Ford TFI Ignition	<input type="radio"/>
Ford EDIS Ignition	<input type="radio"/>
GM Optispark Ignition	<input type="radio"/>
Fan On Temperature (*F)	199.40
Fan Off Temperature (*F)	172.10
Cal. Channel Override	

6.2.1 Crank Reference Angle

This is one of the single most important parameters you will set both mechanically, and electronically. The crank reference angle defines the actual engine position at which the crank sensor signal is received. In other words, this value should correlate with where the ignition timing is actually set on the motor so that the ECU and the engine have a common reference point. If this is set incorrectly, all fuel and timing functions will not operate correctly and engine performance will suffer.

On inductive pickup ignition systems, the reference angle (as well as the base ignition timing on the motor) is typically set to 50-60 degrees. The ECU then delays this signal according to the values

specified in the ignition timing table. The total timing advance may be set up to 10 degrees lower than the reference angle; e.g., if your reference angle is set at 50 degrees, you may run up to 40 degrees of timing advance. This 10 degree margin is enforced to provide time for the ECU to perform fuel and spark calculations.

Many factory ignition systems have a pre-determined amount of advance “built in” to them. On systems of this type, timing values entered into the spark table must be at least 0.25 degree higher than the reference angle. The most common reference angles for factory ignition systems are as follows:

- GM HEI - 6 degrees
- GM Optispark - 1 degree
- Buick DIS – 10 degrees
- Ford TFI – 10 degrees
- GM Northstar – 10 degrees
- Ford EDIS – 1 degree

When the crankshaft reference angle is correctly entered, the ignition timing as measured with a timing light should match the value reported by the ECU. This value can be found at the bottom of the spark table screen in a sensor labeled “Spark (BTDC)”. If necessary, small changes to the crankshaft reference angle can be made to align the reported timing value with the value measured with a timing light.

6.2.1.1 Magnetic Pickup Distributor, Crank Trigger Ignition, or FAST XIM/Crank Decoder

If you are using a magnetic pickup distributor or crank trigger ignition, set the Crank Ref. Angle (*BTDC) parameter to 50 degrees. Roll the motor over to 50 degrees BTDC on cylinder #1. With this type of ignition setup, the ECU requires a 10 degree margin between the reference angle and the highest amount of advance you will run; this means that with a 50 degree reference angle, you can run up to 40 degrees of timing. **NOTE** - If you want to run more than 40 degrees of timing, you need to set the reference angle proportionally higher than 50. For example:

Total engine timing of **42° + 10° = 52°** Minimum crank reference angle

If you are using a crank trigger:

Center the pickup on one of the magnets in the trigger wheel. Now, roll the motor to wherever you plan to run your ignition timing at the RPM where your engine produces the most torque (30 degrees, as an example). Rotate the distributor until the rotor tip is directly lined up with the #1 spark plug terminal.

If you are using the pickup in your distributor:

With the motor still at 50 BTDC, remove the cap and rotor and center one of the reluctor tabs with the magnetic pickup in the distributor. If you have a phasable rotor, roll the motor to wherever you plan to

run your ignition timing at the RPM where your engine produces the most torque (30 degrees, as an example). Adjust the rotor position (WITHOUT rotating the distributor housing) until the rotor tip is directly lined up with the #1 spark plug terminal. If you do not have a phasable rotor, you may need to reposition the reluctor wheel on the distributor shaft so that your rotor phase can be optimized without changing the 50 degree crank reference angle.

If you are using the pickup in your distributor as a Cam input (for sequential operation):

The ECU requires a single cam input per engine cycle. So the distributor needs to have a single reluctor tab. On a typical V8 engine, the cam input can occur between 10° and 80° degrees before the crank input. So if the crank is set at 50° BTDC on cylinder #1, the cam can be set between 60° and 130° BTDC on cylinder #1. For example:

$$50^{\circ} + 10^{\circ} = 60^{\circ}$$

$$50^{\circ} + 80^{\circ} = 130^{\circ}$$

Roll the motor to somewhere in that range. Remove the cap and rotor and center the reluctor tab with the magnetic pickup in the distributor, then tighten the distributor hold down so the distributor housing can not move. If you have a phaseable rotor, roll the motor to wherever you plan to run your ignition timing at the RPM where your engine produces the most torque (30 degrees, as an example). Adjust the rotor position (WITHOUT rotating the distributor housing) until the rotor tip is directly lined up with the #1 spark plug terminal. If you do not have a phaseable rotor, you may need to reposition the reluctor wheel on the distributor shaft so that your rotor phase can be optimized while still positioning the cam input in the allowable range. If the cam input cannot be positioned in the allowable range, the firing order settings in the calibration file may need to be changed. See the [Firing Order Synchronization](#) section for more detail.

VIDEO DEMONSTRATION: [Installing a Crank Trigger](#)

VIDEO DEMONSTRATION: [Rotor Phasing](#)

If you are using a FAST XIM or Crank Decoder:

The crank decoder outputs its signal to the ECU at 50 degrees BTDC, so set the Crank Ref. Angle (*BTDC) parameter to 50 degrees.

IMPORTANT NOTE – With the O.E. ignition strategies listed below, you will not be able to run *less* timing advance than the programmed Crank Ref. Angle (*BTDC) parameter. For example, if you are running a GM HEI ignition with a 1 degree Crank Ref. Angle (*BTDC) parameter, you will not be able

to run less than 1 degree of timing advance.

6.2.1.2 GM HEI (High Energy Ignition)

This ignition system typically uses a 6 degree crank reference angle, so set the Crank Ref. Angle (*BTDC) parameter to 6. Disconnect the injector harness. Disconnect the bypass wire (pin G at CAM HALL EFFECT connector) and crank the engine. Adjust the distributor until spark advance is measured at 6 degrees with a timing light during cranking.

6.2.1.3 Buick DIS (Distributorless Ignition System)

This ignition system uses a fixed crank reference angle of 10 degrees, so set the Crank Ref. Angle (*BTDC) parameter to 10. No calibration or modification of any ignition components is necessary. However, small adjustments to the Crank Ref. Angle (*BTDC) parameter (1-2 degrees) may be necessary to get an exact match between programmed timing values and measured timing values.

6.2.1.4 GM Optispark Ignition

This ignition system uses a fixed crank reference angle of 1 degree, so set the Crank Ref. Angle (*BTDC) parameter to 1. No calibration or modification of any ignition components is necessary. However, small adjustments to the Crank Ref. Angle (*BTDC) parameter (1-2 degrees) may be necessary to get an exact match between programmed timing values and measured timing values.

6.2.1.5 Ford TFI (Thick Film Ignition)

This ignition system typically uses a 10 degree crank reference angle, so set the Crank Ref. Angle (*BTDC) parameter to 10. Disconnect the injector harness. Disconnect the TFI/EDIS Ignition Output wire (pin H and CAM HALL EFFECT connector) and crank the engine. Adjust the distributor until spark advance is measured at 10 degrees with a timing light during cranking.

6.2.1.6 Ford EDIS (Electronic Distributorless Ignition System)

This ignition system uses a fixed crank reference angle of 1 degree, so set the Crank Ref. Angle (*BTDC) parameter to 1. No calibration or modification of any ignition components is necessary. However, small adjustments to the Crank Ref. Angle (*BTDC) parameter (1-2 degrees) may be necessary to get an exact match between programmed timing values and measured timing values.

6.2.2 Ignition Type

These radio buttons select the ignition strategy that will be used. The ECU supports many common factory ignition systems. These can be selected by name. The ECU can also be run using an aftermarket crank pickup (and cam pickup if running in sequential mode). The most common examples are an

inductive crank pickup mounted to the front of the engine or an inductive pickup in a distributor. However, the crank and/or cam pickups can also be a discrete/Hall Effect type pickup. Regardless of the pickup type or mounting location, the “IPU Ignition” type should be selected when using aftermarket pickups. The “IPU Ignition” type is also used with the FAST XIM or Crank Decoder.

6.2.3 Speed/Density Mode, Load Indexed speed Density Mode, or Alpha-N Mode Enable

There are three modes of operation that your XFI can use to calculate the fuel requirements of your engine. They are: Speed/Density mode, Load Indexed Speed/Density mode, and Alpha-N mode. In most applications, Speed/Density mode will provide the best overall performance for the least amount of tuning effort from inexperienced tuners. Load Indexed Speed/Density mode is something unique to your FAST XFI. In this mode, a “load” variable is formed from the ratio of manifold pressure to barometric pressure. This “load” variable is used to index into the VE, Target Air Fuel, and Base Spark tables. Barometric pressure is sampled from the MAP sensor prior to start up. Its advantages are for users that may drive in areas of vastly differing altitudes. For example, full engine load at sea level is approximately 101 kPa, but full engine load at 3000 feet above sea level is significantly less in kPa. This means that in regular Speed/Density mode the point of full engine load in the VE table is in a different spot for each of the two altitudes. Load Indexed Speed/Density takes that difference out of the equation and makes the point of full load the same no matter what the altitude, ultimately making the tuning process easier. Neither mode will produce more power than the other, but either Speed/Density mode will allow for much better drivability tuning than Alpha-N.

Any turbocharged or supercharged engine **MUST** use one of the Speed/Density modes. The boost level in a forced induction engine is a critical part of the fuel calculation.

You should use Alpha-N mode if you have an individual runner intake manifold such as a Kinsler, Hilborn, or Crower. However, it is possible to use speed/density mode with some modifications to the manifold. A small manifold with a vacuum connection to each runner can be created and used to provide a manifold pressure signal to the ECU.

Alpha-N mode is often used on naturally aspirated racing engines with very long-duration camshafts that produce little or no engine vacuum at an idle. It is sometimes difficult to achieve decent drivability or idle quality with an engine of this type using Speed/Density mode because the amount of pressure in the intake manifold is almost the same at an idle as it is at wide open throttle. If your engine will not have more than 10in. of vacuum at idle then choose Alpha-N mode.

Simply click on the radio button for the mode you wish to use.

What is Speed/Density mode or Alpha-N mode? Which one should I use?

6.2.4 SEFI FI Mode or Bank-to-Bank FI Mode Enable

There are two decidedly different strategies your FAST™ XFI™ can use to fuel your engine, SEFI or Bank-to-Bank. A detailed description of the differences is given below. **IMPORTANT NOTE** – If you decide to switch between the two modes, you must first turn off your engine, choose the mode you want to switch to, and then restart the engine.

6.2.4.1 SEFI FI Mode

When this radio button is selected, the ECU will operate in Sequential mode. Each injector is opened once per engine cycle. Sequential mode may help idle and low speed operation problems caused by very large injectors that do not work consistently with the very short pulse width required for idle. In Sequential mode, the calculated injector pulse width is not divided among multiple injector openings as it is in Bank-to-Bank mode. ***Proper injector wiring is critical in this mode.*** A cam pickup is required to operate in Sequential mode. The signal from the cam pickup is used by the ECU to find the beginning of the firing order.

6.2.4.2 Bank-to-Bank Mode

When this radio button is selected, the ECU will operate in Bank-to-Bank mode. Half of the injector outputs (INJ A, B, C, D - ECU pins D2, D4, D7, D9 – found in the INJECTOR connector on the harness) will fire together. Then the other half of the injector outputs (INJ E, F, G, H - ECU pins D11, D13, D14, D16 – found in the INJECTOR connector on the harness) will fire together. A firing occurs at every other crank input. So on a V8 (with its 4 crank pulses per revolution), a single injector will fire once per engine revolution – or twice per engine cycle.

IMPORTANT NOTE - In switching from SEFI to Bank-to-Bank mode, if the cam sensor is removed, the individual cylinder corrections should be zeroed out. Although individual fuel enrichment will not be operational, individual cylinder timing corrections may still be in effect. However, the cylinders the corrections are applied to will change each time the engine is started as the ECU will no longer know where the firing order begins.

6.2.5 Fuel Pump Prime (Sec)

The ECU has an output to operate a fuel pump. This output (Pin A – found in the FP/FAN/ESC connector on the harness) switches to ground and is wired to the **negative** terminal of a relay to activate the pump. The pump is turned on whenever the ECU receives an RPM signal. This parameter sets the length of time the pump will run at ECU key-on to prime the fuel system. Three seconds is typically enough time for an electric fuel pump to fill and pressurize the fuel system.

6.2.6 Injector Opening Time (ms)

You should not have to change this parameter with most popular engine applications. Always start at **1.0 ms**.

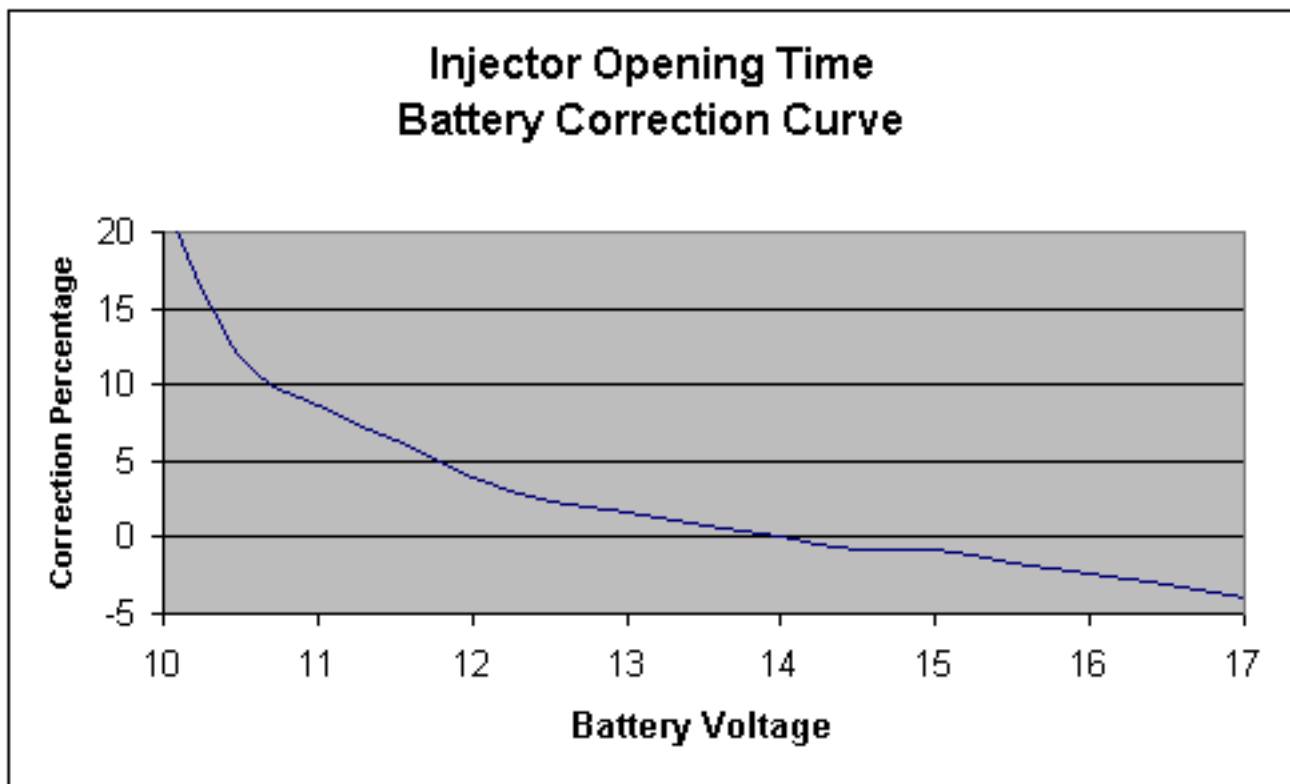
This parameter defines the amount of time that it takes from the instant that an electrical signal is applied to a fuel injector until fuel actually flows from the injector.

This value is added to the base pulsewidth value to compensate for injector opening delays. Because the base pulsewidth value is always changing and this value is constant, the effects of changing this setting will be most pronounced where the base pulsewidths are smallest - typically at idle and light cruise. Here is an example.

Let's assume the engine is idling, and the base pulsewidth value is 3.0 milliseconds. The injector opening time is set to 1.0 millisecond. These two values will be added together, and the reported pulsewidth will be 4.0 milliseconds. If you were to increase the injector opening time by 0.5 milliseconds, the new reported pulsewidth would be 4.5 milliseconds - a 12.5% increase.

Now let's assume that with this same calibration, the base pulsewidth at full throttle and 5000 RPM is 20.0 milliseconds. With an injector opening time of 1.0 millisecond, the reported pulsewidth would be 21.0 milliseconds. Increasing the injector opening time by 0.5 millisecond as in the last example yields a new reported pulsewidth of 21.5 milliseconds - a mere 2.5% increase!

The actual time an injector takes to open will vary slightly as battery voltage fluctuates. Higher battery voltages will open an injector faster, so the injector opening time will be reduced to compensate for this. Alternatively, as battery voltage decreases, an injector will be slower to open. The injector opening time is increased to make up for this. Note that this battery correction only applies to the "Injector Opening Time" – the extra time that is added to the base pulse width value to compensate for injector opening delays. The base injector pulse width calculated by the ECU is not changed. The opening time will be modified as per the following graph:



6.2.7 Injector Opening Retard (*)

You should not have to change this parameter with most popular engine applications. Always set to **0** (*) to start.

This parameter is used to adjust injector phasing – the relationship between injector opening point and the engine's position in its cycle. Injector phasing is similar in concept to ignition timing – except instead of referring to when a spark occurs, it refers to when an injector opens.

When the ECU receives the crank input for a cylinder, it will wait for this user-programmed amount of crank rotation to occur before that cylinder's injector opens. For example, if the crank reference angle is 50° BTDC and the Injector Opening Retard (*) is set to 10, the injector will open at 40° BTDC.

(Note: The crank reference angle is given in ° BTDC on the compression stroke. The injector opening is given in ° BTDC on the exhaust stroke. The 360° offset – to get from compression to exhaust – is hard wired into the injector harness.)

This parameter can be set from 0–700° of crank rotation. Using a large enough number has the effect of opening the injector ahead of the crank input. For example, OEM ignition systems (like the GM HEI) typically have crank reference angles around 6° BTDC. In this case, an Injector Opening Retard (*) setting of 686° would give the same 40° BTDC injector opening position as in the first example. Keep in mind that an engine cycle takes 720° to complete.

The Injector Opening Retard (*) can be calculated with the following equations. One is used for injector opening after the crank input and a second is used for injector opening before the crank input.

- To open injector **AFTER** the crank input
 $\text{Injector Opening Retard (*)} = \text{Crank Ref Angle} - \text{desired inj. phasing}.$
 From the first example $= 50^* - 40^* = 10^*$
- To open injector **BEFORE** the crank input
 $\text{Injector Opening Retard (*)} = \text{Crank Ref Angle} - \text{desired inj. phasing} + 720^*.$
 From the second example $= 6^* - 40^* + 720^* = 686^*$

The Injector Opening Retard (*) parameter only affects when the injector opens. The amount of time it remains open is based on the pulse width calculated by the ECU. In other words, changing this parameter does not affect the amount of fuel that is injected.

The optimal injector phasing is a function of the intake flow characteristics of the engine. This parameter can be adjusted while on a dynamometer to determine its effect on a particular engine. This is a fine-tuning detail that can be explored once a good basic tune has been established. If you are not sure what injector phasing you want to use, set the Injector Opening Retard (*) to 0 to start.

Note - When running in Bank-to-Bank mode, each injector opens more than once per engine cycle. So injector phasing (in the traditional sense) cannot be controlled. In Bank-to-Bank mode, Injector Opening Retard (*) should be left at 0.

6.2.8 Crank to Run Mode RPM

This parameter defines the RPM threshold where the ECU will switch from “Cranking” mode to “Run” mode. In Cranking mode, fuel delivery is based only on the cranking fuel table. In Run mode, fuel delivery is based upon the values in the base fuel table. The ECU will switch from Cranking mode to Run mode when it detects the engine operating above the RPM specified here for the number of counts specified in *Engine Revs to Run Mode*.

6.2.9 Engine Revs to Run Mode

This parameter defines the number of crank pulses that must be received while the engine RPM exceeds the value specified in *Crank to Run Mode RPM* before the ECU switches from “Cranking” mode to “Run” mode.

6.2.10 Fuel Cut-Off RPM >

This parameter defines the RPM that must be exceeded to enable the Fuel Cut-Off rev limiter function. When activated, the Fuel Cut-Off will prevent the fuel injectors from firing (and turn off the power adder, if activated) until the engine RPM drops below the value specified in *Fuel Cut-On*. In order to

work properly, this value must be set higher than the value in *Fuel Cut-On*.

6.2.11 Fuel Cut-On RPM <

If the Fuel Cut-Off rev limiter function has been activated, the engine RPM must fall below the value entered here before the fuel injectors will begin firing again. In order to work properly, this value must be set lower than the value in *Fuel Cut-Off*.

6.2.12 Inductive Delay (uSec)

You should not have to change this parameter with most popular engine applications. Always start at **40** uS.

This parameter is used to compensate for the varying delays that occur with different types of crank sensors. These varying delays often cause ignition-timing error that will increase as engine RPM increases.

For inductive pickup ignition systems, leave this parameter set to 40 uS (microseconds). For other types of ignition systems, this value can be altered to reduce or eliminate ignition-timing error as a function of RPM. This error will show up as either unwanted timing advance as RPM increases or unwanted timing retard as RPM increases.

Increasing the value in this parameter will reduce unwanted timing retard.

Decreasing the value in this parameter will reduce unwanted timing advance.

6.2.13 Fan On Temperature (*F)

The ECU has an output to operate a cooling fan. This output (Pin B – found in the FP/FAN/ESC connector on the harness) switches to ground and is wired to the **negative** terminal of a relay to activate the fan. This parameter defines the coolant temperature that must be exceeded to activate the fan. It needs to be set higher than Fan Off Temperature (*F).

If a CTS fault code is set, the fan output is switched on. See the [Service Engine Soon/Fault Codes](#) section for more detail.

6.2.14 Fan Off Temperature (*F)

This parameter defines the temperature that the coolant must go below to deactivate the fan. It needs to be set lower than Fan On Temperature (*F).

6.3 Fuel Calc Parameters

These parameters must be filled out correctly to ensure proper engine performance. If for any reason you cannot find any part of the information needed below, please contact your FAST™ dealer or a FAST technician on our EFI Help line, 901-260 FAST. You can also receive technical assistance by email at support@fuelairspark.com.

6.3.1 Engine Displacement (CID)

This parameter is a part of the ECU's calculation to determine the amount of fuel to inject when running in Speed Density mode. Enter the engine's displacement in cubic inches. This must be entered correctly or the engine will run richer or leaner than intended.

6.3.2 Map Sensor (1-5 Bar)

This parameter is used to scale the readings from the MAP sensor. MAP sensors are rated by their maximum sensing range. A 1 Bar sensor can read up to one Bar of pressure (atmospheric pressure), a 2 Bar sensor can read up to two Bar of pressure and so on. Enter a number between 1 and 5 that corresponds to your MAP sensor's rating.

6.3.3 Number of Cylinders (2,4,6,8)

This parameter is a part of the ECU's calculation to determine the amount of fuel to inject. Enter the number of cylinders the engine has. This must be entered correctly or the engine will not run correctly, if at all in some cases.

6.3.4 Injector Flow Rate (lb/hr)

This parameter is a part of the ECU's calculation to determine the amount of fuel to inject when running in Speed Density mode. It is also used for fuel flow and mileage calculations. Enter the flow rate of the injectors in lb/hr. This must be entered correctly or the engine will run richer or leaner than intended. Keep in mind that fuel pressure affects flow rate. When manufacturers rate injectors, it is at a certain fuel pressure. Injectors from FAST are rated at 45 psi. If you are using a different fuel pressure, the flow rate of the injectors will be different. A simple equation can be used to estimate flow rate at a different fuel pressure:

$$\text{New Flow Rate} = \text{Old Flow Rate} \times \text{square root of (New Pressure / Old Pressure)}$$

6.3.5 Fuel Energy Constant

This parameter is a constant that defines the energy properties of a given fuel as the difference between

it and gasoline (see table below). This strategy allows us a comprehensive range of fuel types and mixtures. The XFI ECU will compensate the fuel delivery based upon this parameter. While using the Lambda display mode will be more uniform in the display of the air/fuel ratio with different fuels, C-ComXFI will otherwise display all air/fuel ratios adjusted to the Fuel Energy Constant. Please note that the injector flow rate is still entered as lb/hr but as normally rated with gasoline.

Fuel Energy Constants (FEC) for Common Fuels		
Fuel Type	FEC	Stoichiometric A/F
Compressed Natural Gas (CNG)	1.17	17.2:1
Liquid Propane (LP)	1.07	15.7:1
Gasoline	1.00	14.7:1
Methyl Tertiary Butyl Ether (MTBE)	.796	11.7:1
85% Ethanol/Gasoline Mix (E85)	.680	10.0:1
Ethanol (ETOH)	.612	9.0:1
Methanol (MEOH)	.439	6.45:1

6.4 Firing Order Synchronization

6.4.1 Cam Sync Precedes Cylinder

The signal from the cam pickup is used by the ECU to find the beginning of the firing order. The cam pickup outputs one pulse per engine cycle while the crank pickup outputs one pulse for each cylinder during that same one engine cycle. It is standard practice to install the cam pickup so that its output pulse occurs between the two crank pulses representing the last and the first cylinder in the firing order. In other words, the cam signal precedes the crank signal for cylinder #1. However, if the cam is installed in some other position, it is possible to compensate for this by changing the Cam Sync Precedes Cylinder parameter. Enter the cylinder number whose crank signal occurs directly after the cam signal.

If it is unclear where the cam pickup is installed, there is a test that can be performed. Enter “1” for Cam Sync Precedes Cylinder. Use the Individual Cylinder Corrections window to retard the timing for cylinder #1. Use a timing light on each cylinder in turn and find the cylinder with the retarded timing. That cylinder number should be entered for Cam Sync Precedes Cylinder parameter. Repeating the test should now show cylinder #1 as the retarded cylinder.

6.4.2 Firing Order

Enter the firing order of the engine. This information is used to correctly label the Individual Cylinder Corrections setup screen. Changing this setting will NOT change the order in which the injectors

actually fire. That is a function of the wiring from the ECU to the injectors. The injector wiring harness can be swapped out or modified if the system is installed on a different motor with a different firing order.

See [Section 2.1.16](#) for an easy to use chart on how to re-wire your injector harness

6.5 Sensor Calibration

This section will take you through “calibrating” your throttle position sensor and manifold absolute pressure sensor to give you full resolution for better engine control and optimum tuning results.

6.5.1 TPS Calibration

The throttle position sensor sends a varying 0-5 volt signal to the ECU as the throttle is moved. The TPS Calibration table tells the ECU how to relate the voltage level with throttle opening. A TPS calibration is typically linear.

To set up this table with a linear calibration:

1. Open the master dash by hitting the “F9” key and observe the “Raw TPS(V)” channel.
2. Record the value of this channel with the throttle closed and again with the throttle wide open (WOT).
3. Move the cursor over the far left set point on the “TPS Volts” axis (the cursor will change to a pointy finger). Double click and then enter the “Raw TPS(V)” reading you recorded with the throttle closed and click the OK button.
4. Move the cursor over the far right number on the “TPS Volts” axis and use the “Raw TPS(V)” reading you recorded at WOT.
5. The six remaining numbers on the “TPS Volts” axis need to be changed so that they are evenly spaced between your “Raw TPS(V)” readings for closed throttle and WOT. If they are not evenly spaced, your TPS readings will be correct at closed throttle and WOT but may not be correct at part throttle.

Use the following theoretical example to determine this:

Where:

Reading at closed throttle is .5

Reading at WOT is 4.5

Then:

$$(4.5 - .5) / 7 = .57$$

So:

$$\text{1st set point} = .5$$

2nd set point $(.5 + .57) = 1.07$
 3rd set point $(1.07 + .57) = 1.64$
 4th set point $(1.64 + .57) = 2.21$
 5th set point $(2.21 + .57) = 2.78$
 6th set point $(2.78 + .57) = 3.35$
 7th set point $(3.35 + .57) = 3.92$
 8th set point $(3.92 + .57) = 4.49$

Now that the “TPS Volts” axis is setup, you will work on the “% Full Throttle” axis. Set the far left position to “0” and set the far right position to “100” by clicking on the map itself with the cursor and using the arrow keys to move around. Then highlight the entire graph and right click on it. A pop-up menu appears. Select the “Interpolate” command and select “Yes” when prompted. This will perform a linear interpolation between the closed throttle and WOT positions. You should see a straight diagonal line through the graph from the lower left corner to the upper right corner.

To verify the TPS calibration, watch the “TPS (%)” channel. It should read “0” at closed throttle and “100” at WOT. Confirm that the “TPS (%)” and “Raw TPS(V)” channels begin to change as soon as the throttle is opened and that they continue to change all the way up to full throttle. The idea is to avoid any **dead band** – physical movement of the sensor (throttle blade) without a corresponding change in TPS (%) value found in the dashboard. If any **dead band** is detected, the end points in the table will need to be opened up. **NOTE** - If you do rotate the TPS, the steps in the previous two paragraphs should be repeated. If the range or physical mounting of the TPS is limited in such a way that you cannot completely eliminate dead band, you should adjust the TPS so that there is no dead band at closed throttle. It is more important to detect small throttle movements at throttle tip in than it is to detect the last bit of throttle movement at WOT.

The next step is to slowly move the throttle through its full range of motion. The “TPS (%)” channel should increase at a consistent rate. If it changes faster or slower than you are opening the throttle, you should verify that the values on the “TPS Volts” axis are evenly spaced and that the line through the graph is straight.

If the TPS sensor has to be replaced or removed from the engine, the tests described above should be repeated. Throttle position sensors are designed to allow some mounting adjustability. Unless a different style TPS is being used, the calibration you already entered should still be correct. You just need to make sure that the TPS is installed so that it reads “0” at closed throttle and “100” at WOT.

6.5.2 MAP Calibration

The MAP sensor sends a varying 0-5 volt signal to the ECU based on the vacuum/pressure the sensor is exposed to. The MAP Calibration table tells the ECU how to relate the voltage level with vacuum/pressure. MAP sensors typically have linear calibrations.

Information on MAP sensor calibration should be available from the sensor's manufacturer.

The following are the MAP calibration points for available FAST™ sensors.

	MAP Sensor Signal (kPa)		
MAP Sensor Volts	1 Bar #30-7007	2 Bar #30-7008	3 Bar #30-7009
0.00	0	0	0
0.71	15	30	45
1.43	30	60	90
2.14	45	90	135
2.86	60	120	180
3.57	75	150	225
4.29	90	180	270
5.00	105	210	315

	MAP Sensor Signal (kPa)
MAP Sensor Volts	5 Bar #30-7047
0.20	34
1.04	100
2.00	204
2.67	275
3.29	343
3.98	413
4.63	481
4.98	511

Note: To use a 5 bar MAP sensor with older FAST ECU's, it was necessary to edit the 'map.ini' file. This is not necessary with the FAST XFI ECU and software.

The procedure for entering calibration information into the MAP Calibration table is similar to the procedure for the TPS Calibration discussed above.

The calibration information may be presented in the form of a gain number and an offset number. If so, use the following formula to determine the value to enter on the “MAP Sensor Signal (kPa)” axis for each voltage setpoint on the “MAP Sensor Volts” axis:

$$\text{Value} = (\text{Sensor Volts} * \text{Gain}) + \text{Offset}$$

The “MAP Sensor (1-5 Bar)” setting in the Fuel Calc Parameters window determines the scaling for the “MAP Sensor Signal (kPa)” axis. Setting that parameter correctly will ensure there is enough range available without trading off resolution.

6.5.3 CTS / ATS Calibration

The coolant temperature sensor (CTS) and air temperature sensor (ATS) act as resistors that vary with temperature. Circuitry in the ECU converts these resistances into 0-5 volt signals. The CTS and ATS Calibration tables tell the ECU how to relate these voltage levels with coolant and air temperature in *F.

The following table shows the calibration points for common OEM sensors. These can be entered manually, or by using the “Paste from File...” command. This will paste in pre-calibrated tables from files in the ICT sub-directory. For example, to set up the calibration file for a GM CTS sensor, use the “Paste from File...” command and select the “GM CTS Sensor Cal.ict” file.

If entering calibration points manually, remember to enter both the Volts set points and the Temperature values correctly. If either is wrong, the temperature readings will be incorrect. To change the Volts set points, move the cursor over it, (the cursor will change to a pointy finger) double click on it and enter the new value. (**NOTE:** Keep in mind that each set point must be a greater value than the previous set point.)

Ford		GM		Mopar	
ATS/CTS Volts	*F	ATS/CTS Volts	*F	ATS/CTS Volts	*F
0.25	255	0.20	255	0.69	255
1.06	217	0.31	221	1.06	221
1.82	181	0.65	176	1.82	176
2.90	145	1.33	131	2.90	131
3.76	109	2.24	95	3.76	95
4.39	73	3.33	59	4.39	59
4.76	35	4.24	23	4.76	23

4.86	0	4.61	0	4.86	0
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NOTE: The Temp Sensor Bias Resistors settings must be entered correctly in order for the temperature readings to be correct. See [Temp Sensors Bias Resistors](#) section for more detail.

For sensor with calibration given in Ohms:

Calibration information for temperature sensors is sometimes given as a listing of temperatures and corresponding resistances. These resistances can be converted into voltages for use in the CTS / ATS Calibration tables. See below for a discussion on choosing an appropriate sensor bias.

$$\text{CTS / ATS Volts} = (5 \times \text{sensor resistance}) / (\text{sensor resistance} + \text{sensor bias})$$

For example, at 140 *F, a GM temperature sensor has a resistance of 667 Ohm. Using a sensor bias of 2.2 Kohm (2200 Ohm), the corresponding voltage would be 1.16V.

$$\text{CTS / ATS Volts} = (5 \times 667) / (667 + 2200) = 1.16$$

Perform this calculation for eight temperatures (one being below the lowest temperature you expect the sensor to experience in the vehicle and one above the highest temperature) and enter the resulting list of temperatures and voltages in the CTS or ATS Calibration table. From the example, one value on the voltage axis would be set to 1.16V and the corresponding temperature would be set to 140 *F.

For sensor with unknown calibration:

If a sensor's calibration is unknown, it can be determined experimentally. To do this, you need to record temperatures with some known measurement device - a thermometer, a temperature sensor whose calibration is known, etc and also record the sensor voltages for each temperature you record. This can be monitored with the "Raw CTS(V)" or "Raw ATS(V)" channels in the C-Com XFI software by opening the Master Dash with the F9 key (If these channels are not displayed, you may need to edit the Master Dash setup by selecting FILE/DASHBOARD SETUP...) One way to do this is to put the sensor you are calibrating and the reference sensor in a pot of ice water. Then put that on a hot plate. As the temperature rises, take temperature readings from the reference sensor and record the sensor voltages from the test sensor. (Or, instead of recording sensor voltages, you can measure and record the sensor resistance – using an ohmmeter on the sensor terminals with the sensor disconnected from the harness - for each temperature reading. These resistances can be converted to voltages as described above.)

Before you begin this test, you will need to enter a CTS / ATS Sensor Bias setting to start with. 10.0 Kohm is a good starting point. The goal is to make use of a large portion of the available 0-5v scale as you go through the entire operating range of the sensor. Using a Sensor Bias number that is much too large or too small will result in all of the voltage readings being grouped on one end of the scale - either

all low numbers or all high numbers – instead of a nice spread. If the readings are all low, decrease the bias setting. If they are all high, increase the bias setting. If the bias settings need to be changed, the calibration process will have to be repeated from the beginning.

When you are done, you should have a list of temperatures and corresponding voltages. Take eight of these pairs (including the highest and lowest that you recorded) and enter them into the CTS or ATS Calibration table.

6.5.4 Temp Sensors Bias Resistors

The CTS and ATS act as resistors that vary with temperature. Their resistance is used as part of voltage divider circuits within the ECU. The other part of those circuits is determined by the “CTS Sensor Bias (Kohms)” and “ATS Sensor Bias (Kohm)” settings. The ability to adjust these allows the ECU to accommodate temperature sensors with a wide range of operating resistances.

The following table shows the values to use for common OEM sensors. These values, plus the proper CTS / ATS Calibration, must be entered in order for the temperature readings to be correct.

OEM Sensor	CTS/ATS Sensor Bias (Kohm)
Ford	20.0
GM	2.2
Mopar	2.2

To use a different sensor, the bias settings can be determined experimentally. 10.0 Kohm is usually a good starting point. See the [CTS / ATS Calibration](#) section for more detail.

6.6 Rate Sensor Calibration

The ECU has provisions for a drive shaft speed input. This speed can be monitored with the “DS RPM” channel. This input is also used to calculate vehicle speed - which is used in various speed related calculations and controls. For example, vehicle speed is an enable condition for torque converter lockup. It is also used to calculate fuel mileage. Vehicle speed can be monitored with the “MPH” channel. Fuel Mileage can be monitored with the “MPG” channel.

The ECU also has provisions for an additional rate sensor. This rate can be monitored with the “AUX RPM” channel.

The ECU will accept either discrete/Hall Effect or inductive type signals as its speed inputs. There is a separate ECU pin for each type. The following pins are found in the VSS connector on the main harness:

Pin C – MPH Inductive, yellow

Pin B – MPH Discrete, white

The following pins are found in the SHAFT connector on the main harness:

Pin D – Shaft Inductive, purple

Pin B – AUX Discrete, orange

NOTE - Whichever inputs are not being used should be connected to ground. This will prevent the unused inputs from floating and falsely triggering the ECU.

6.6.1 Driveshaft RPM Calib. (600/PPR)

Divide 600 by the number of pulses per revolution of the drive shaft and enter the result here.

6.6.2 MPH Calibration

To calculate this number, multiply your tire diameter (in inches) by 195. Then divide the result by your final drive gear ratio.

$$\text{MPH Calibration} = (195 * \text{tire diameter}) / \text{gear ratio}.$$

For example, if your tire diameter is 26 inches, and your final drive gear ratio is 3.42:1, the MPH Calibration number would be 1482.

$$\text{MPH Calibration} = (195 * 26) / 3.42 = 1482.$$

6.6.3 Aux. RPM Calib. (1200/PPR)

Divide 1200 by the number of pulses per revolution of the part being measured and enter the result here.

6.7 Wideband O2 Type

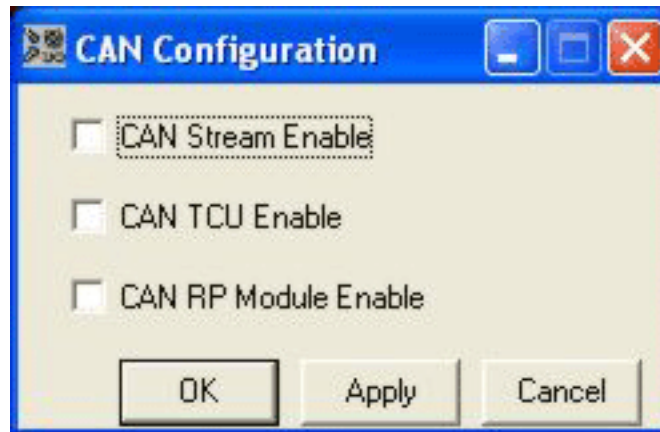
Your FAST XFI can use two different types of NTK O2 sensors. One thing you'll need to do is take a look at the O2 sensor that has come with your system and determine which type it is. The picture below shows you where to locate the numbers that will determine which radio button to choose.



6.8 CAN Configuration

Your FAST XFI can communicate by CAN, or Controller Area Network. CAN is a method for linking

electronic devices so that they can communicate with each other. The network is made up of two wires that all of the devices tap into. The devices can all send and receive information as needed to and from the other devices on the network. The need for redundant sensors or complicated wiring between devices is eliminated. For example, since the ECU is already monitoring throttle position, the rest of the devices, like a transmission controller or digital dash, will also have access to that throttle position data.



6.8.1 CAN Stream Enable

This radio button needs to be checked to communicate with any other compatible electronic device. The exception to this is the FAST Transmission Control Unit, or TCU.

6.8.2 CAN TCU Enable

This radio button needs to be checked to communicate with the FAST Transmission Control Unit. The CAN Stream Enable button will not need to be checked for the TCU to operate properly.

6.9 Start your Engine!!!

The last step in this process is to plug in your fuel injector harness. Your engine is now ready to be started!!!

7.0 Navigating the Software

7.1 Overview

This section details the keystrokes and mouse commands used for accessing and modifying various screens and tables. In addition to the following key commands, all screens and tables can be accessed through the pull-down menus at the top of the main window.

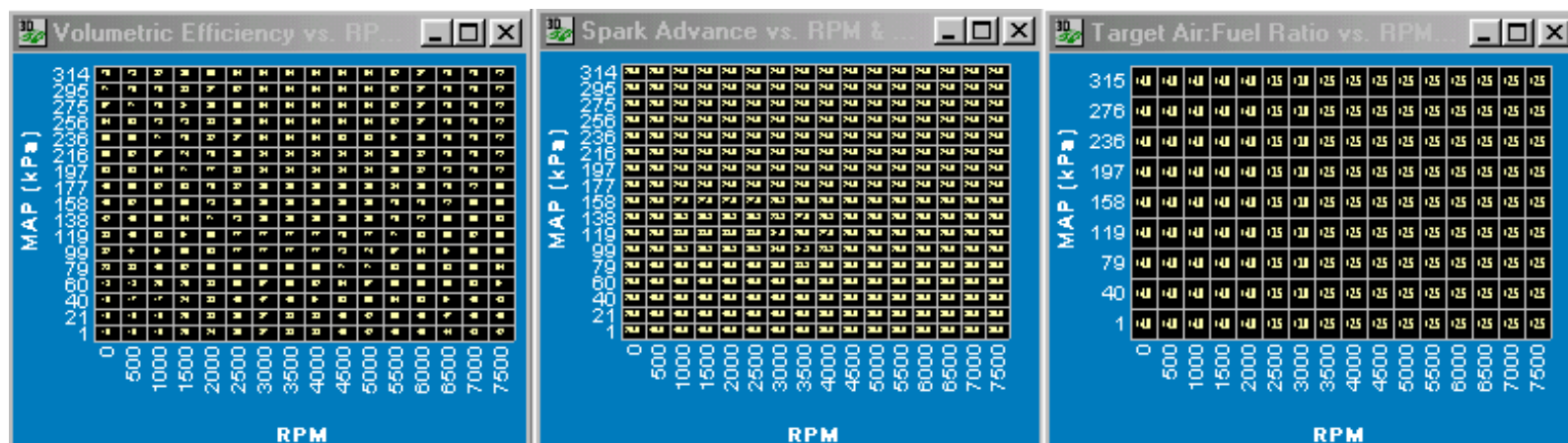
7.2 Hot Key Commands

The following "hot key" commands will immediately open the associated window from anywhere in the program. Any other open windows will remain open.

[F1]	Help
[F2]	Toggles between online and offline mode
[F3]	Edit base fuel table
Ctrl [F3]	Edit target air/fuel ratio table
[F4]	Edit spark advance table
[F5]	Edit global setup parameters
[F6]	Edit nitrous activation parameters
[F7]	Edit nitrous fuel table
[F8]	Opens the data logger
[F9]	View the main dashboard display
[F11]	Load a calibration file from disk
[F12]	Save a calibration file to disk

7.3 3D Table Key Commands

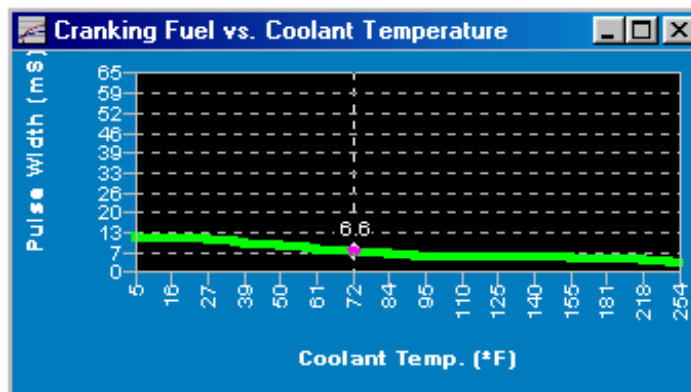
The following key commands are used for performing various functions within the base fuel table, the spark advance table, and the target air/fuel ratio table.



Arrow Keys - ←↑→↓	Moves the edit cursor around the map. Multiple cells can be selected for editing by holding down the [shift] key while moving around with the arrow keys. While multiple cells are selected, holding down the [ctrl] key while moving with the arrow keys will move the entire highlighted block of cells.
[0-9] or [=]	Forces the currently selected cells to the value that you enter. This number will reflect more precision than can be viewed in the table.
[Page Up] and [Page Down]	Increases or decreases the value of the currently selected cells by one step. Holding down the [ctrl] key while pressing the page up or page down keys will change the numbers in larger increments.
[Home] and [End]	Moves the edit cursor to the bottom left corner of the map (home key) or the top right corner of the map (end key.) Pressing the [shift] key while pressing either of these keys will select all the cells between the current edit cursor position and the bottom left or top right of the map.
[D]	While in online mode, this key inserts or hides the default dashboard in the table window.
[G]	Displays a 3D representation of the current table. Refer to the section on viewing a 3D graph for commands available while viewing a 3D graph.
Space bar	Moves the edit cursor to the cell having the most influence.
[+]	Allows the user to add a desired value to the currently selected cells. Entering a "5" here will increase the selected area by 5, and entering a "-5" here will decrease the selected area by 5.
[*]	Allows the user to change the values in the selected area by a desired percentage multiplier. Entering a "120" here will increase the selected area by 20 percent, and entering an "80" here will decrease the selected area by 20 percent.
[%]	Allows the user to change the values in the selected area by a desired percentage. Entering a "20" here will increase the selected area by 20 percent, and entering a "-20" here will decrease the selected area by 20 percent.
ESC	Closes the open window and drops down the View Menu for easy navigation without using a mouse.

7.4 2D Table Commands

The following key commands are used for performing various functions within 2D tables (cranking fuel table, etc.)



Left and Right Arrow Keys - ← →	Moves the edit cursor across the table. A region of the graph can be selected for editing by holding down the [shift] key while moving with the arrow keys. While a region of the graph is selected, holding down the [ctrl] key while moving with the arrow keys will move the entire highlighted region.
[0-9] or [=]	Forces the currently selected area to the value that you enter.
[Page Up] and [Page Down]	Increases or decreases the value of the currently selected area by one step. Holding down the [ctrl] key while pressing the page up or page down keys will change the numbers in larger increments.
[Home] and [End]	Moves the edit cursor to the far left of the graph (home key) or the far right of the graph (end key.) Pressing the [shift] key while pressing either of these keys will select the entire region between the current edit cursor position and the left or right of the graph.
[D]	While in online mode, this key adds or removes the default dashboard in the table window.
Space bar	Moves the edit cursor to the point on the graph having the most influence.
[+]	Allows the user to add a desired value to the currently selected area. Entering a "5" here will increase the selected area by 5, and entering a "-5" here will decrease the selected area by 5.
[*]	Allows the user to change the values in the selected area by a desired percentage multiplier. Entering a "120" here will increase the selected area by 20 percent, and entering an "80" here will decrease the selected area by 20 percent.
[%]	Allows the user to change the values in the selected area by a desired percentage. Entering a "20" here will increase the selected area by 20 percent, and entering a "-20" here will decrease the selected area by 20 percent.
ESC	Closes the open window and drops down the View Menu for easy navigation without using a mouse.

7.5 3D Graph Key Commands

The following key commands are used when viewing one of the 3D tables as a 3D graph. The graph can only be viewed; it cannot be edited.

Arrow Keys - ←↑→↓	Rotates the graph in 3D space
-------------------	-------------------------------

[Insert]	Zoom In
[Delete]	Zoom Out
[B]	Toggles the graph mode from wire mesh display to a bar display

7.6 3D Table Mouse Functions

Within the base fuel table, the spark advance table, and the target air/fuel ratio table, several mouse functions are available to simplify editing these tables.

To move the edit cursor to any cell within the table, simply click once on that cell. To select multiple cells for editing, click on any corner of the area you wish to select and drag the mouse to expand the area to be selected.

Once you have selected an area to edit, right-clicking the mouse will bring up the following list of editing commands:

- **Force Value** - Brings up a field which will force the value of the cells in the selected area to the number you type in here.
- **Interpolate** - This function only works if multiple cells are selected. This command will linearize the values between the beginning and ending points of the selected area. In other words, if you select a row (or column) of the table with the following values:

33 45 47 49 51 53 56 54

By interpolating this selection, the new values will be:

33 36 39 42 45 48 51 54

If you select a region of more than one row or column, a four-corner interpolation process will be applied. As an example, if the following region is selected:

60 61 82
42 65 66
25 29 55

Interpolating this selection will produce the following:

60 71 82
42 56 69
25 40 55

- **Trim** - Brings up a selection of three methods to alter the values in the selected region:
 - **Additive Trim** - Adds the quantity entered in this field to each of the cells in the selected area. Entering a negative number will subtract the value.
 - **Multiplicative Trim** - Allows the user to change the values in the selected area by a desired percentage multiplier. Entering a '120' here will increase the selected area by 20 percent, and entering an '80' here will decrease the selected area by 20 percent.
 - **Percentage Trim** - Allows the user to change the values in the selected area by a desired percentage. Entering a '20' here will increase the selected area by 20 percent, and entering a '-20' here will decrease the selected area by 20 percent.
- **Copy** - This is a Windows function which will copy the values in the selected area to the clipboard so they may be pasted into a selected region at a later time.
- **Paste** - This is a Windows function which will paste the values in the clipboard into the selected area.
- **Copy Table Data to File...** - Saves the contents of the table (including the user definable set points) to a file on the PC. This file can be used to import the table settings into another calibration file or into the same calibration file at a later date. The software will recognize what type of table is stored in each file. But for the user's convenience, the files can be given names to help with organization. For example, a name like "Spark table 04-15-05 qualifying" would tell you what type of table the file contains, the date it was saved and some description of when it was used. **Note** that it is not necessary to highlight the entire table for this feature to work. Right clicking anywhere on the table and selecting this command will copy the entire table.
- **Paste from File...** (found in main File menu) - Imports a previously saved table into the current calibration file. If the table that is being over written is open when the Paste from File... command is used (for example, if you are importing a saved Base Spark Table and the current Base Spark Table is already open in C-Com WP XFI) it must be closed and reopened before the changes will take effect.
- **Show/Hide Dash** - Only works in online mode. This selects whether or not a dashboard will be present in the table window.
- **Select Dash** - Brings up a selection of dashboards available to be viewed from within the table window.

7.7 2D Table Mouse Functions

The mouse can be used to simplify editing within 2D tables as well.

To select any single point on a 2D table, simply click once on the point you wish to edit and the edit cursor will move to the nearest edit point. To select a region of the table, click on either end of the area you wish to select and drag the mouse to expand the area to be selected.

Once an area has been selected, the values within the region can be edited with the mouse. By moving the mouse pointer over a graph point within the selected area, the pointer will appear as a hand. When this hand appears, hold the left mouse button down and the selected area can be dragged up and down to increase or decrease its value.

Once you have selected an area to edit, right-clicking the mouse will bring up the following list of editing commands:

- **Force Value** - Brings up a field that will force the value of the table in the selected area to the number you type in here.
- **Interpolate** - This function only works if multiple edit points on the table are selected. This command will linearize the values between the beginning and ending points of the selected area. In other words, interpolating a selected area will draw a straight line between the beginning and ending points of the selected area. On some tables, it may be necessary to perform this process twice to correct the slope of the curve.
- **Reverse Order** - This function reverses the order of the selected table values.
- **Trim** - Brings up a selection of three methods to alter the values in the selected region:
 - **Additive Trim** - Adds the quantity entered in this field to each of the edit points in the selected area. Entering a negative number will subtract the value.
 - **Multiplicative Trim** - Allows the user to change the values in the selected area by a desired percentage multiplier. Entering a '120' here will increase the selected area by 20 percent, and entering an '80' here will decrease the selected area by 20 percent.
 - **Percentage Trim** - Allows the user to change the values in the selected area by a desired percentage. Entering a '20' here will increase the selected area by 20 percent, and entering a '-20' here will decrease the selected area by 20 percent.
- **Copy** - This is a Windows function that will copy the values in the selected area to the clipboard so they may be pasted into a selected region at a later time.
- **Paste** - This is a Windows function that will paste the values in the clipboard into the selected area.
- **Copy Table Data to File...** - Saves the contents of the table (including the user definable set points) to a file on the PC. This file can be used to import the table settings into another calibration file or into the same calibration file at a later date. The software will recognize what type of table is stored in each file. But for the user's convenience, the files can be given names to help with organization. For example, a name like "Spark table 04-15-05 qualifying" would tell you what type of table the file contains, the date it was saved and some description of when it was used. **Note** that it is not necessary to highlight the entire table for this feature to work. Right clicking anywhere on the table and selecting this command will copy the entire table. See Sections 7.8 and 7.8.1 for more information.
- **Paste from File...** (found in main File menu) – Imports a previously saved table into the current calibration file. If the table that is being over written is open when the Paste from File... command is used (for example, if you are importing a saved Base Spark Table and the current Base Spark Table is already open in C-Com WP XFI) it must be closed and reopened before the changes will take effect. See Section 7.9 for more information.
- **Show/Hide Dash** - Only works in online mode. This selects whether or not a dashboard will be present in the table window.
- **Select Dash** - Brings up a selection of dashboards available to be viewed from within the table window.

7.8 Copy Form/Table Data to a File . . .

This command, accessible by right clicking on a table or form, saves the contents of the form or table (including the user definable set points) to an .ICT file on the PC. This file can be used to import those settings into another calibration file or into the same calibration file at a later date. The software will recognize what type of form or table is stored in each file. But for the user's convenience, the files can be given names to help with organization. For example, a name like "Spark table 06-24-05 qualifying" would tell you what type of table the file contains, the date it was saved and some description of when it was used. It is not necessary to highlight an entire table for this feature to work. Right clicking anywhere on a table and selecting this command will copy the entire table.

7.8.1 Append to Existing ICT File

This is an option in the "Save As" dialog box that appears after selecting the "Copy Form/Table Data to a File..." command. It allows multiple forms and/or tables to be stored in a single .ICT file. Later, when that .ICT file is imported, all of the stored forms/tables will be imported to the current calibration file in one step. To save multiple forms and/or tables into the same .ICT file, start by saving the first form or table as normal. Then select the next form or table you want to save and use the "Copy Form/Table Data to a File..." command again. This time, check the "Append to Existing ICT File" checkbox and select the same file name that was used when the first form or table was saved. Repeat this process for as many forms/tables as needed.

7.9 Paste from File . . .

This command, available under the File menu, is used to import form and/or table data that has been previously saved in an .ICT file into the current calibration file. These files are typically stored in the C:\CComWP XFI\Ict sub-directory. It is a good idea to close whatever

forms or tables are going to be over written before using this command. That will minimize the risk of confusion and accidentally saving new values on top of those that have just been imported.

8.0 Base Calibration Tables

8.1 Overview

The Base Fuel Table, Base Spark Table and Target A/F Ratio Table are 16 x 16 grids. They are the main 3 tables that determine how your particular calibration will operate. A large portion of the tuning process will be spent in these 3 tables.

8.2 Defining Grid Set Points

The set points that define these grids can be changed to suit your particular application. For example, the RPM set points do not need to go all the way to 8000 RPM if the motor will never be operated above 6000 RPM. Or you may want closer spacing in certain RPM or engine load ranges to allow finer adjustments in those areas. Set point changes made to one table will automatically be applied to the others.

To change a set point, move the cursor over it, (the cursor will change to a pointy finger) double click on it and enter the new value. **NOTE** - Keep in mind that each set point must be a greater value than the previous set point.

NOTE - When running in either Speed/Density mode or Load Indexed Speed/Density mode, verify the "MAP Sensor (1-5 Bar)" parameter is set correctly before working with the MAP (kPa) set points. Changing this parameter changes the set points for these tables automatically. This will ensure there is enough range available without trading off resolution.

8.3 Calibrating the Base Fuel Table

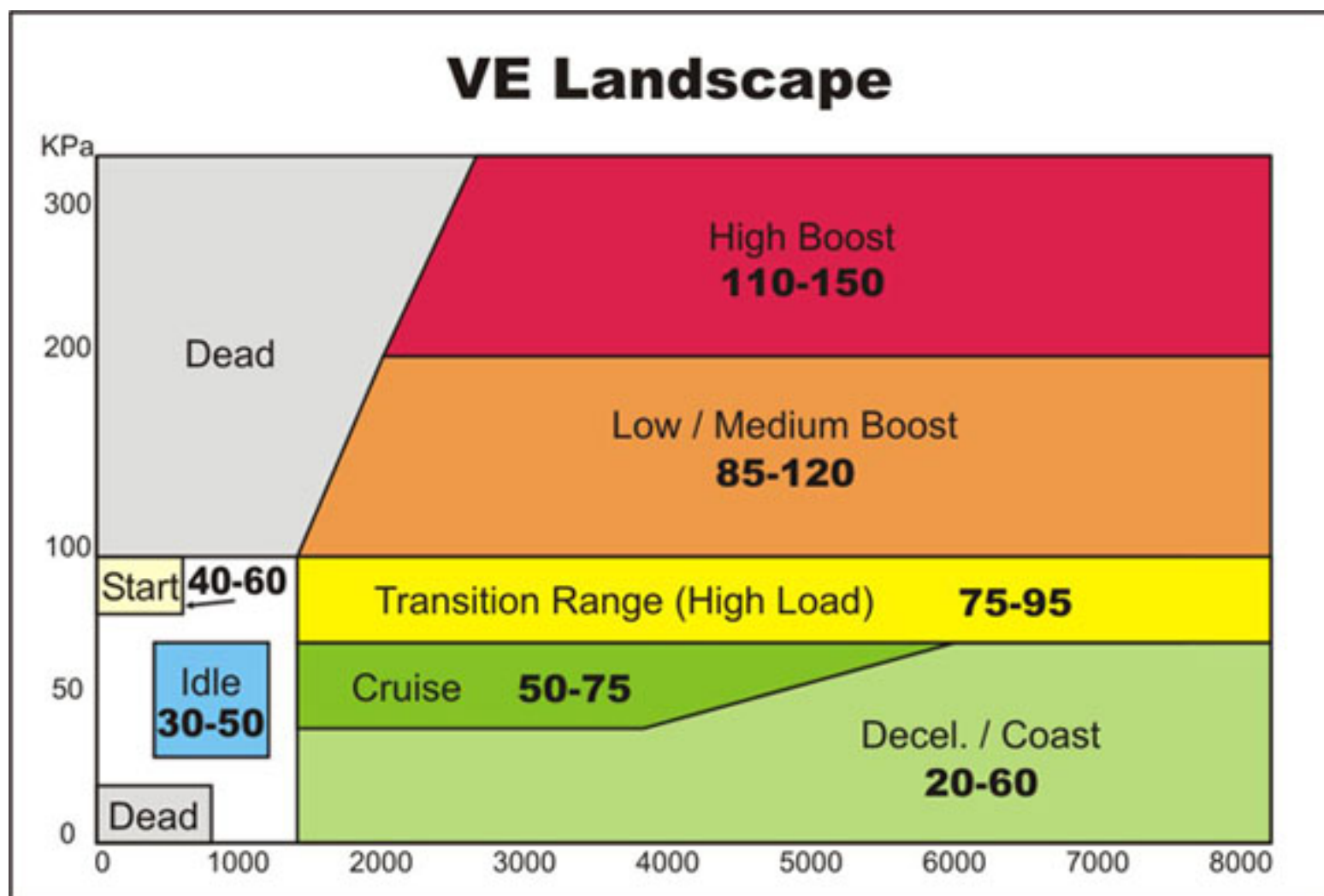
In [Speed/Density mode](#), the base fuel table will appear as a 3D table of % VE values vs. intake manifold pressure in kilopascals (kPa) and engine RPM. The table will be labeled "Volumetric Efficiency vs. RPM and MAP". In [Alpha-N mode](#), the base fuel table will appear as a 3D table of injector pulse width vs. throttle position and engine RPM. The table will be labeled "Injector Pulsewidth (mS) vs. RPM and TPS".

In Load Indexed Speed/Density mode, the base fuel table will appear as a 3D table of % VE values vs. percent of load and engine RPM. The table will be labeled "Volumetric Efficiency vs. RPM and Load". The label running up the left hand side of the table will say "Load %" instead of "MAP (kPa)" as it would in regular Speed/Density mode. In Load Indexed Speed/Density mode, an engine load variable is calculated from the difference between intake manifold pressure and barometric pressure. This variable is used to index into the Table VE numbers just as MAP pressure is used in regular Speed/Density mode. This is helpful in situations where changes in altitude can affect the overall load of the engine. For example, full load on an engine at sea level will be approximately 101 kPa, but at higher altitudes full load on an engine will be at a lesser kPa, directly related to the change in barometric pressure. This means that in regular Speed/Density mode the point of full engine load in the VE table is in a different spot for each of the two altitudes. Load Indexed Speed/Density takes that difference out of the equation

and makes the point of full load the same in the table no matter what the altitude, ultimately making the tuning process easier. The difference in intake manifold pressure vs. barometric pressure at key on of the XFI, before the engine is cranked over, is used to determine this variable.

Important Note - It is always good practice to pause momentarily with the key on before starting your engine when using Load Indexed Speed/Density to allow for the MAP sensor to normalize.

The first step in calibrating the base fuel table is to use the table below to fill in your table VE or pulsewidth values. This table gives you a general idea of where the cursor will be during starting, idle, cruise, transition or high load, and deceleration. These values will get you in a safe area to start the tuning process.



[View Full Size Printable Image](#)

Volumetric Efficiency vs. RPM & MAP																
MAP (kPa)	314	75	78	82	86	90	94	94	94	94	94	94	92	87	79	72
	295	71	75	79	83	87	92	94	94	94	94	94	92	87	79	72
	275	67	71	76	81	85	90	94	94	94	94	94	92	87	79	72
	256	64	68	73	78	83	89	94	94	94	94	94	92	87	79	72
	236	60	65	71	76	82	87	94	94	94	93	93	91	86	79	72
	216	56	62	67	74	79	85	84	84	84	84	84	85	82	79	72
	197	53	58	64	71	77	83	84	84	84	84	84	85	82	78	75
	177	49	56	62	68	75	82	80	80	80	80	80	84	80	76	72
	158	45	52	59	66	73	80	80	80	80	80	80	79	75	72	69
	138	42	49	56	64	71	78	80	80	80	80	80	75	72	69	66
	119	38	45	53	61	69	77	77	77	77	77	77	71	68	65	62
	99	32	41	51	60	68	77	77	77	77	77	77	78	74	67	64
	79	28	38	45	52	59	66	66	66	66	66	66	71	71	63	60
	60	18	18	20	25	33	55	57	60	62	64	67	59	56	55	53
	40	16	17	17	24	33	45	47	49	51	53	56	54	53	51	49
	21	16	16	16	20	33	36	37	38	38	40	42	50	49	47	45
	1	16	16	16	20	24	36	37	38	38	40	42	46	45	44	43
		0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
		RPM														

The base fuel table should be calibrated in one of two ways:

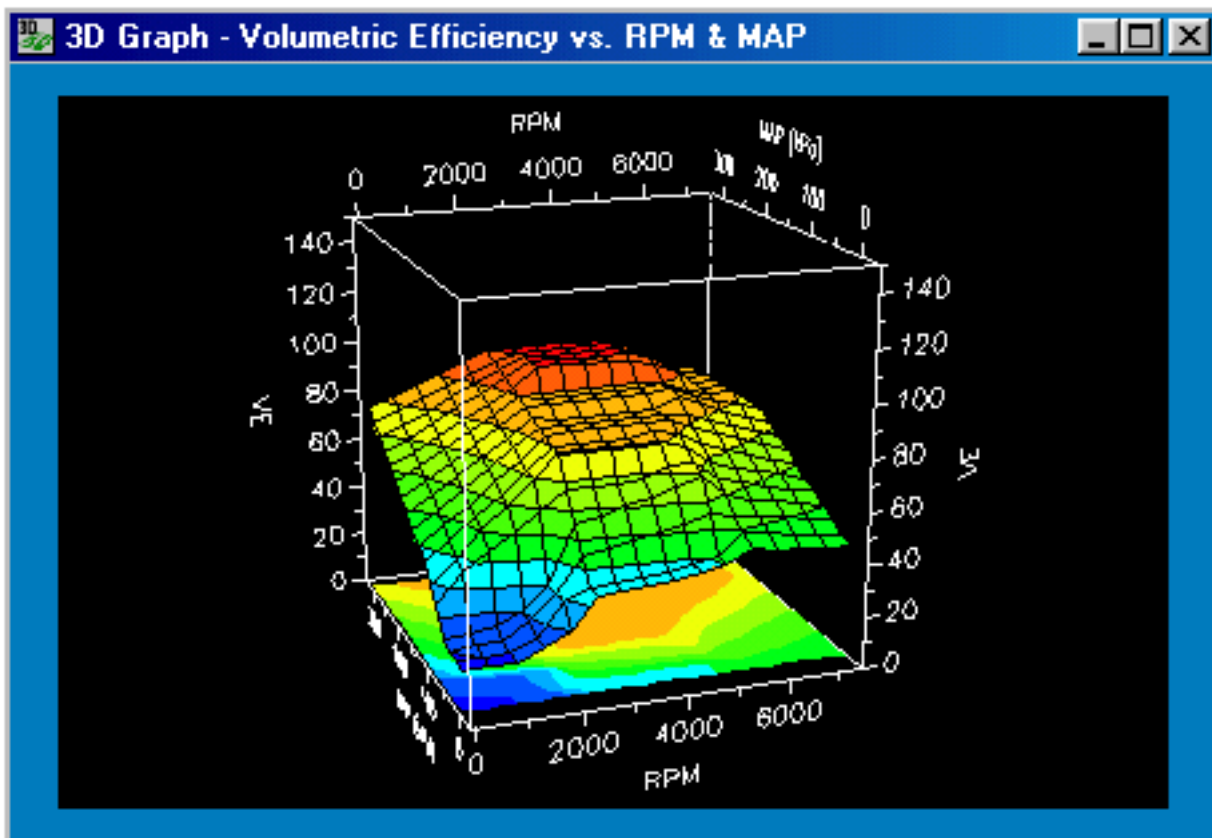
- While operating in closed loop mode, adjust the values in each cell so that the O2 correction (O2 Corr. %, which can be viewed below the table as part of the dashboard function) values are as small as possible while operating within that cell. See the [Dashboards](#) section for more details.

NOTE - C-Com WP XFI™ has a helpful utility for calibrating the VE table when operating in closed loop mode. By pressing the "L" key, the amount of correction currently being applied by the closed loop routine will be applied to the value of the cell in the VE table you are currently using. For example, if you are operating in a cell in the VE table with a value of 60 and you see that there is a 10% O2 correction being applied, pressing the "L" key will apply the 10% correction to the value in the VE table. The end result is that the cell that was reading 60 will now read 66, and the O2 correction will be very close to zero. Please bear in mind that this utility is meant to be used only in a "steady state" mode. You should also only use this utility when the floating cursor is centered within a single cell. If the cursor is being influenced by surrounding cells, if the engine speed or load is changing, or if any acceleration enrichment fuel is being applied, the results of using this will be well off of the intended result.

- While operating in open loop mode, adjust the values in each cell so that the actual measured air/fuel ratio (Actual A/F) matches the target air/fuel ratio (Target A/F) as closely as possible. See the [Dashboards](#) section for more details.

There are a few general guidelines to keep in mind when calibrating the base fuel table:

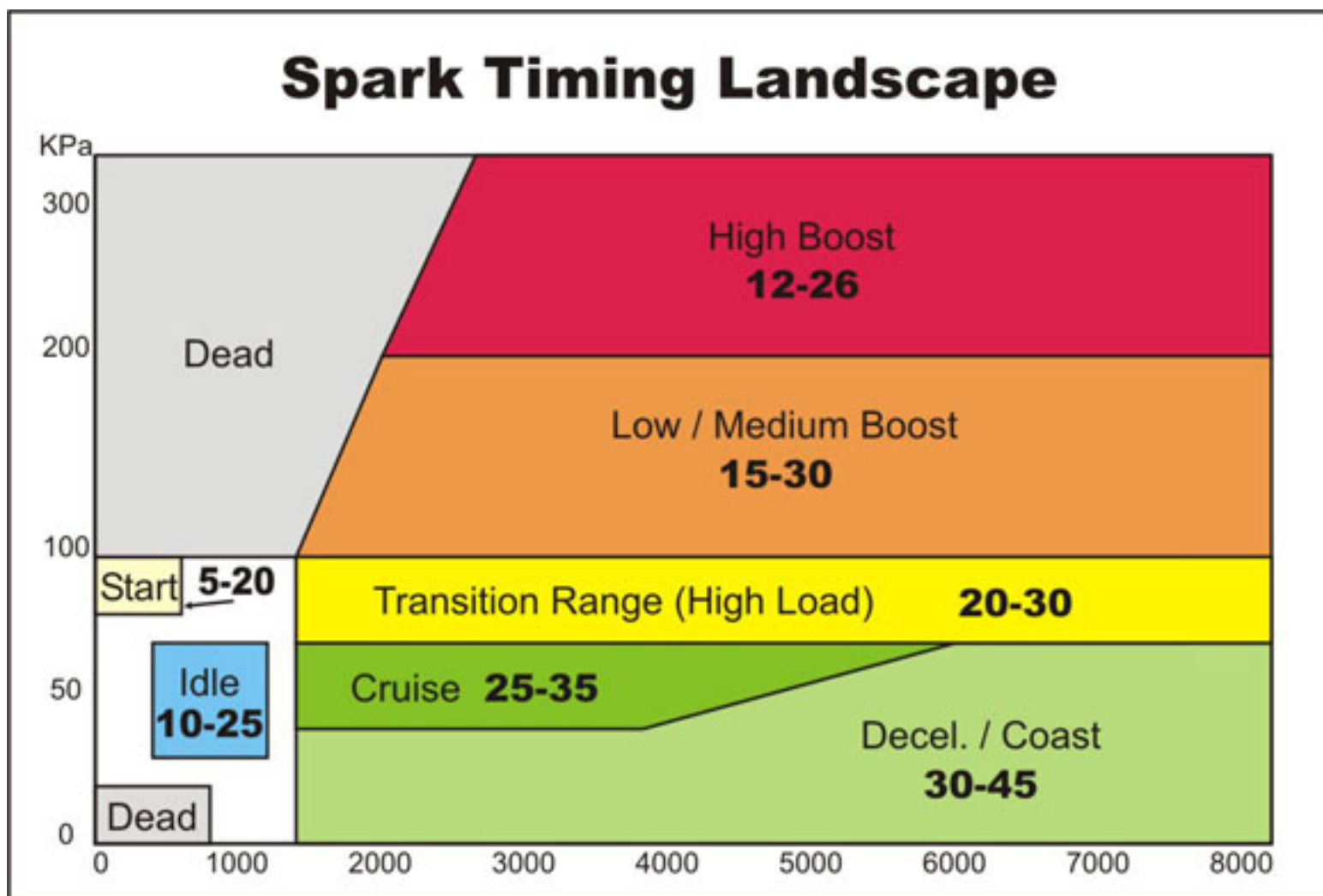
- Higher numbers in the base fuel table mean more fuel, and vice versa (but not necessarily). In closed loop mode, any increase or decrease in this table may be adjusted out by any O2 correction being applied as a result of attempting to maintain the A/F ratio defined in the target A/F table.
- With a properly calibrated base fuel table, the cell values will typically be highest at the engine's peak torque RPM and then decrease beyond peak torque. In Speed/Density mode, the highest numbers are typically in the 90 to 100 range on naturally aspirated engines. On forced induction applications, it is common for VE numbers to be in the 110 to 120 range.
- Calibrate the base fuel table while the engine is at its normal operating temperature. Warm-up enrichment while the engine is cold could cause your calibration to be off once the engine is fully warmed up.
- A good calibration should result in no more than +/- 5% O2 correction (or deviation from the target air/fuel ratio) anywhere within the normal operating range of your engine. In Speed/Density mode your Base VE Table creates the "shape" of your calibration. This shape should not change unless you change something that affects your engine performance such as intake, camshaft, head porting, etc. Tuning for peak power and torque should be done in the Target Air/Fuel Table after the Base VE Table has been calibrated.
- By pressing the "G" key when the base fuel table is open, a 3-dimensional graph of the table will be displayed. There is a very general "shape" to the graph that almost any proper calibration will produce; the following illustration shows this shape. The blue area in the graph is the idle region of the map, and the red area is the wide-open throttle area. The RPM where the highest VE or pulsewidth values are should correspond to the engine's peak torque output; if you are tuning on a dyno and can monitor torque output over the RPM range, this is an excellent indicator of a correct calibration.



8.4 Calibrating the Base Spark Table

The Based Spark Table is a 3D table used for setting ignition timing throughout the operating range of your engine. In Speed/Density mode, this table will appear as "Spark Advance vs. RPM & MAP". In Load Indexed Speed/Density this table will appear as "Spark Advance vs. RPM and Load". In Alpha-N mode it will appear as "Spark Advance vs. RPM & TPS".

The first step in calibrating the base spark table is to use the table below to fill in your timing values. This table gives you a general idea of where the cursor will be during starting, idle, cruise, transition or high load, and deceleration. These values will get you in a safe area to start the tuning process.



[View Full Size Printable Image](#)

MAP (kPa)	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500
314	20.0	21.3	22.8	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
295	20.0	21.5	23.0	24.8	24.3	24.3	24.3	24.3	24.3	24.3	24.0	24.0	24.0	24.0	24.0	24.0
275	20.0	21.8	23.5	25.3	24.5	24.5	24.5	24.5	24.3	24.3	24.0	24.0	24.0	24.0	24.0	24.0
256	20.0	22.0	24.0	26.0	25.0	24.8	24.8	24.5	24.5	24.5	24.0	24.0	24.0	24.0	24.0	24.0
236	20.0	22.3	24.5	26.8	25.3	25.0	25.0	24.8	24.8	24.5	24.0	24.0	24.0	24.0	24.0	24.0
216	20.0	22.5	24.8	27.3	25.5	25.3	25.3	25.0	24.8	24.8	24.0	24.0	24.0	24.0	24.0	24.0
197	20.0	22.8	25.3	28.0	25.8	25.5	25.5	25.3	25.0	24.8	24.0	24.0	24.0	24.0	24.0	24.0
177	20.0	22.8	25.8	28.5	26.3	26.0	25.8	25.5	25.3	25.0	24.0	24.0	24.0	24.0	24.0	24.0
158	20.0	23.0	26.3	29.3	26.5	26.3	25.8	25.5	25.3	25.3	25.3	25.3	25.0	25.0	25.0	25.0
138	20.0	23.3	26.5	30.0	30.3	30.3	28.8	27.5	27.3	27.3	27.3	27.0	27.0	27.0	27.0	27.0
119	20.0	23.5	27.0	30.5	29.8	29.3	28.8	28.0	29.3	29.3	29.0	29.0	29.0	29.0	29.0	29.0
99	20.0	23.8	27.5	31.3	30.8	30.3	29.8	29.3	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0
79	20.0	33.0	32.5	32.3	31.8	31.3	30.8	30.5	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
60	20.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
40	20.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
21	20.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
1	20.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0

While online with the ECU, there should be a sensor in the dashboard on the spark table screen called **Spark (BTDC)**. This value reflects not only the value derived from the cells in the spark table itself, but also from any changes to the ignition timing from an active [knock sensor input](#) or from [timing trim](#). If the value in this sensor doesn't seem to line up with the values being used in the spark table, the difference is most likely caused by one of the following:

- The engine is idling and is off of the target idle speed, causing the ECU to use [Timing Trim](#) to attempt to correct the idle speed.
- If using ESC, the knock sensor is active.
- The crank reference angle is incorrect for the application and the ECU will not allow the timing value specified in the table.

8.4.1 Sequential Rev Limiting

The Sequential Rev Limiting function is an ignition based rev limiter. It works by interrupting the points/ignition signal to the ignition system in a manner that guarantees that no cylinders will be interrupted more than any other. This function can be activated in several ways as described below.

This feature should work with any mechanical distributor ignition systems – both OEM and aftermarket. It may not work properly with external or electronic spark sorting (distributorless) methods such as the FAST eDist Electronic Distributor, Buick Computer Controlled Coil ignition systems, Northstar ignition systems, etc. It will work properly with the FAST XIM for coil on plug applications.

This feature would typically be used as a two step rev limiter for drag racing. However, the Clutch Switch or PA Hold inputs can be used to activate the rev limiter for any purpose. For example, the rev limiter could be used as a rudimentary pit lane speed limiter for road racing applications by allowing the driver to limit engine RPM with a dash-mounted switch. With some wiring creativity, the speed based auxiliary output (Aux. Out 4) could be used to disable the dash-mounted switch to prevent accidental rev/speed limiter engagement while at speed on track.

8.4.1.1 RPM Limit

This parameter sets the maximum RPM the ECU will allow before it begins interrupting ignition signals.

8.4.1.2 PA 1st Stage Activation

When this radio button is selected, the Sequential Rev Limiting function will be activated when the 1st Power Adder stage becomes active (i.e. when TPS, RPM and switch conditions are met). The rev limiter will then remain active as long as the Power Adder mode is active. See the [Power Adder Configuration](#) section for more detail.

8.4.1.3 Clutch Switch Activation

When this radio button is selected, the Sequential Rev Limiting function will be activated when the Clutch Switch input (ECU pin A20) has been activated (switched to ground).

8.4.1.4 PA Hold Activation

When this radio button is selected, the Sequential Rev Limiting function will be activated when the Power Adder Hold input (ECU pin B16) has been activated (switched to ground). See the [Power Adder Hold](#) section for more detail.

8.4.1.5 Disable

When this radio button is selected, the Sequential Rev Limiting function will not activate.

8.4.2 Spark Offset vs. ATS

Spark Offset vs. ATS is a 2D table of spark timing offset vs. air temperature. It allows ignition timing to

be adjusted based on intake air temperature. This adjustment is made to the current timing value from the Base Spark Table. A positive number will advance the timing; a negative number will retard timing.

As an example, this table can be used to prevent detonation on a turbo or supercharged engine by retarding timing if the intake air temperature gets too high.

If an ATS fault code is set, the Spark Offset vs. ATS correction is zeroed out. See the [Service Engine Soon / Fault Codes](#) section for more detail.

8.5 Calibrating the Target Air/Fuel Ratio Table

The Target Air/Fuel Ratio Table is a 3D table used for setting target air/fuel ratios throughout the operating range of the engine. In speed/density mode, this table will appear as "Target Air/Fuel Ratio vs. RPM & MAP". In Load Indexed Speed/Density mode this table will appear as "Target Air/Fuel Ratio vs. RPM and Load". In Alpha-N mode this table will appear as "Target Air/Fuel Ratio vs. RPM & TPS".

MAP (kPa)	0	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000
109	13.6	13.4	13.3	13.1	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
97	13.9	13.8	13.7	13.6	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3
85	14.0	13.9	13.8	13.8	13.7	13.6	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
73	14.1	14.1	13.9	14.1	13.9	13.8	13.8	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
62	14.3	14.2	14.1	14.3	14.2	14.1	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
50	14.6	14.6	14.6	14.6	14.5	14.3	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
38	14.6	14.6	14.6	14.6	14.6	14.4	14.4	14.3	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
26	14.5	14.5	14.4	14.6	14.6	14.4	14.4	14.3	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
14	14.6	14.6	14.6	14.6	14.6	14.4	14.4	14.3	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2

There are two primary factors that will determine what role this table will play in the tuning process. One is whether Speed/Density mode, Load Indexed Speed/Density mode, or Alpha-N mode is selected, and the other is whether the ECU is running in open loop mode or closed loop mode.

In either type of speed/density mode, the ECU first determines, based on several sensor measurements, the volume of air being consumed by the engine. Once it has determined the volume of air, it then looks to this table to determine what air/fuel ratio is

currently being targeted. When a ratio is selected, this information is used to determine the proper amount of fuel to inject in order to produce this ratio. For this reason, the target air/fuel ratio table is always a critical part of the calibration in either speed/density mode. In contrast, Alpha-N mode does not use this table as part of its base fuel calculation. In Alpha-N mode, an injector pulsewidth is simply looked up from the [base fuel table](#).

Regardless of whether a speed/density calibration or an Alpha-N calibration is being used, the system can be run in closed loop mode. When operating in closed loop mode, the ECU will compare the measured air/fuel ratio to the air/fuel ratio targeted within this table. If there is a difference, the fuel delivery will be automatically adjusted in an attempt to make the measured and targeted air/fuel ratio from this table as close as possible. See [Oxygen Sensor and Closed Loop Parameters](#) section for more information.

In open loop mode, the differences in measured and targeted air/fuel ratios won't be made up as they are in closed loop mode. The oxygen sensor will still be actively measuring air/fuel ratios, but no action based on this information will be taken within the ECU.

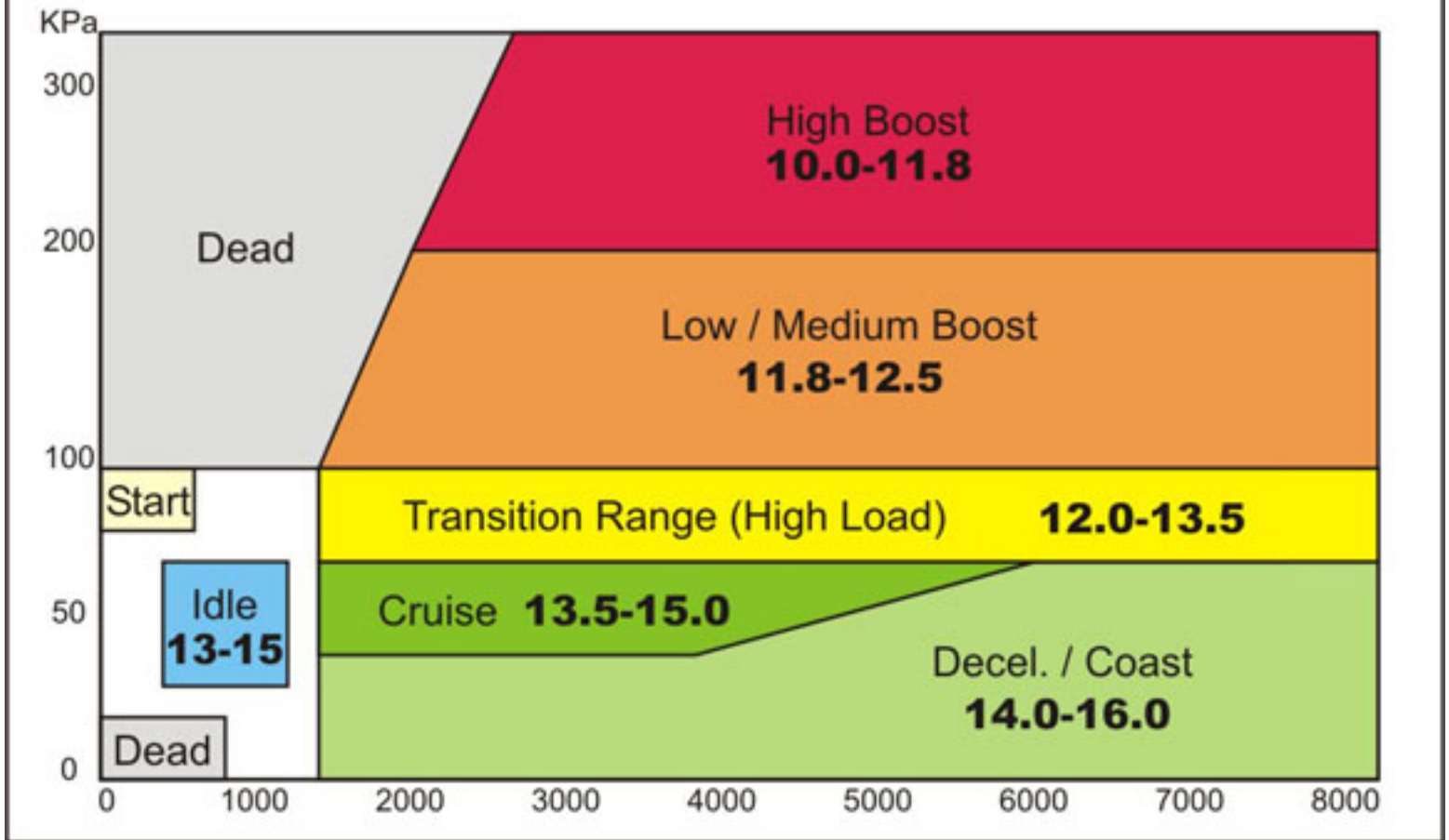
To break it down, there are four different ways this system can be run:

- **Either Speed/density mode, open loop.** The target air/fuel ratio table is used as part of the base fuel calculation only.
- **Either Speed/density mode, closed loop.** The target air/fuel ratio table is used as part of the base fuel calculation, and the ECU will attempt to correct any differences between measured air/fuel ratios and the values in the target air/fuel ratio table.
- **Alpha-N mode, open loop.** The target air/fuel ratio table is not used at all in this configuration.
- **Alpha-N mode, closed loop.** The target air/fuel ratio table will not be used for the base fuel calculation, but the ECU will attempt to correct any differences between measured air/fuel ratios and the values in the target air/fuel ratio table.

Air/fuel ratio selection

There is a particular ratio of air to fuel that results in all of the oxygen molecules combining chemically with all of the fuel molecules. This ratio is 14.7:1, meaning 14.7 parts of air for every 1 part of fuel. Running an engine at this particular air/fuel ratio helps to minimize emissions and maximize fuel economy, but this air/fuel ratio is generally not safe to run at high RPM and/or engine load conditions. Since most oxygen sensors produced are only meant to accurately measure a 14.7:1 air/fuel ratio, they shouldn't be used in applications where much richer or leaner target air/fuel ratios are selected. The wide-band oxygen sensor used with this system is capable of accurately measuring a much wider range of air/fuel ratios. This system can measure any ratio from as rich as 9:1 to as lean as 16:1, thus allowing us to tune for more power and better fuel efficiency. The first step in calibrating the target air/fuel ratio table is to use the table below to fill in your table air/fuel ratio values. This table gives you a general idea of where the cursor will be during starting, idle, cruise, transition or high load, and deceleration. These values will get you in a safe area to start the tuning process.

Air/Fuel Ratio Landscape



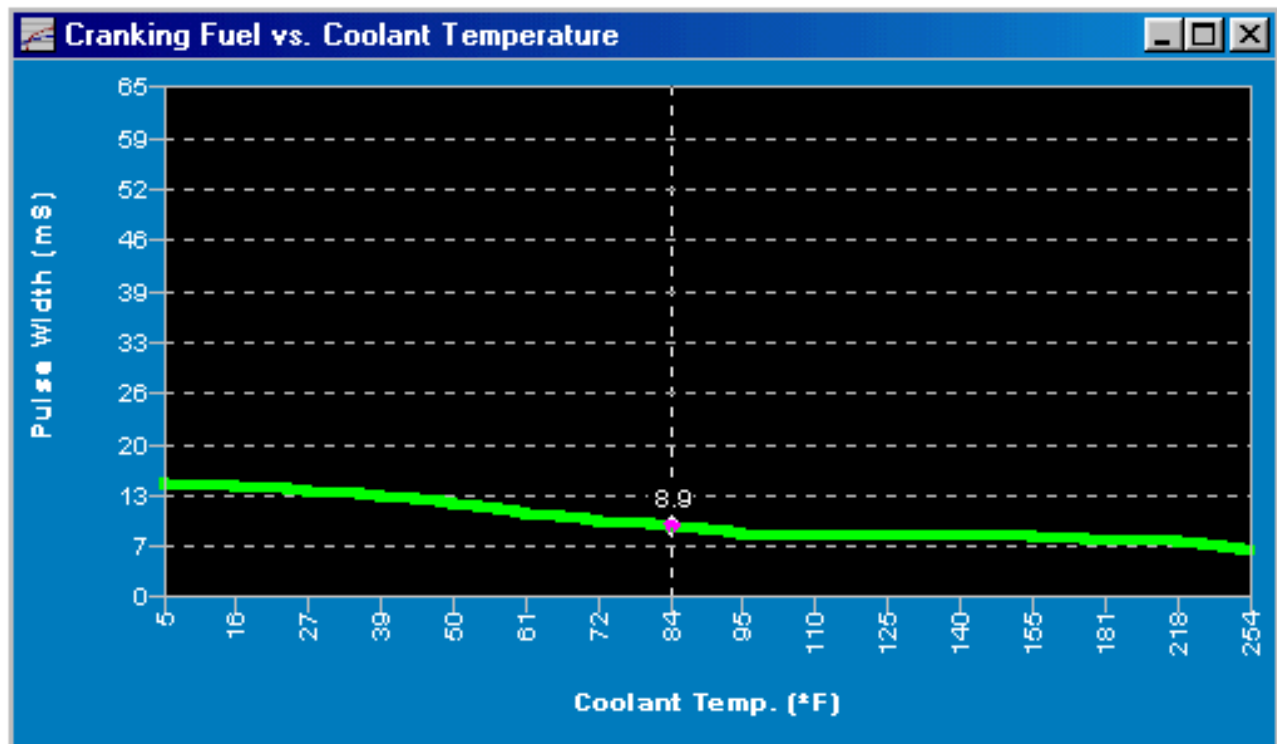
[View Full Size Printable Image](#)

9.0 Calibrating the Afterstart and Cranking Fuel Tables

9.1 Overview

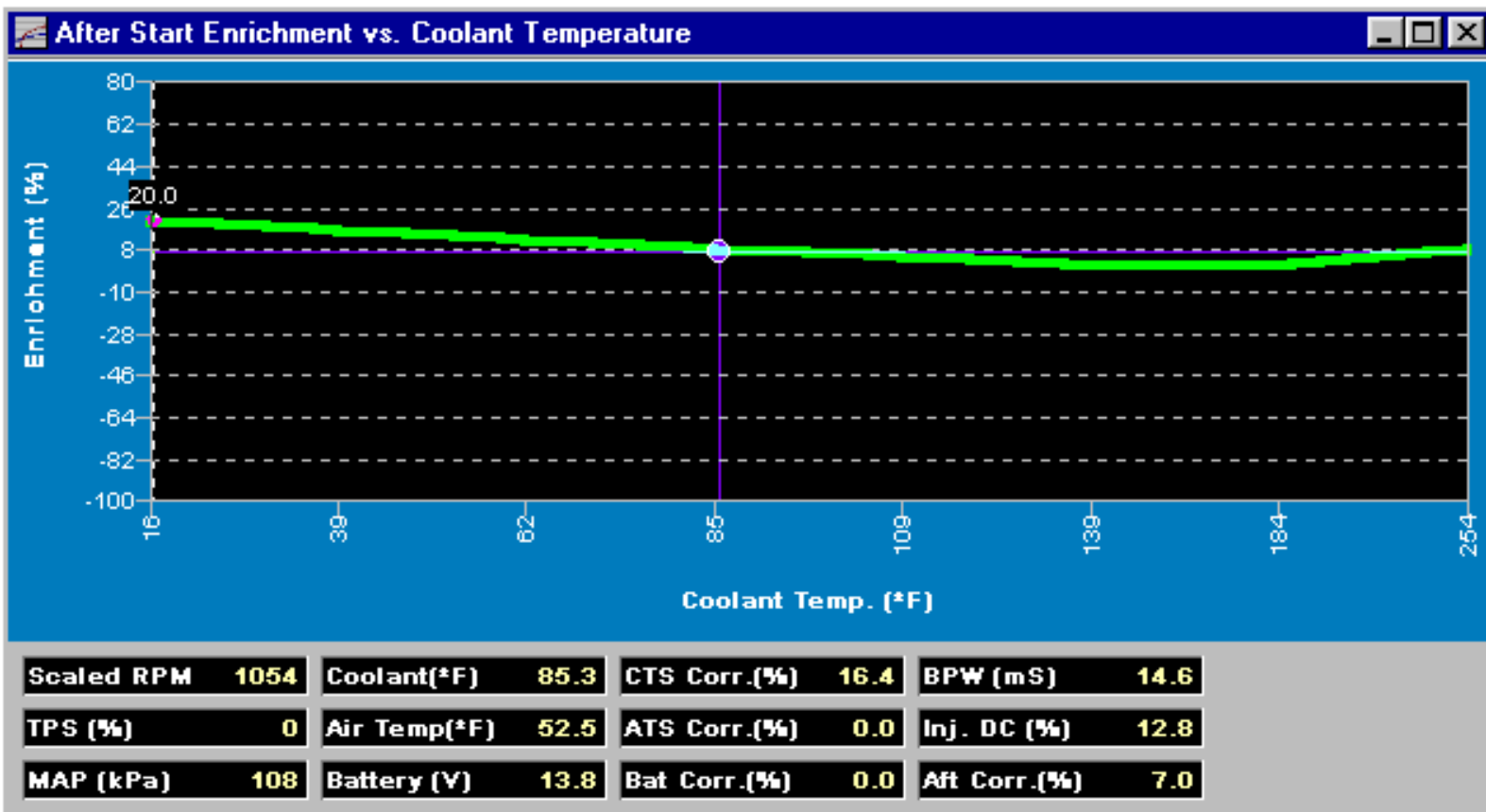
These tables basically act as your “choke” function. The Cranking Fuel Table is your main cold-start table and the After-start Enrichment Tables function as the “when, how much, and how long” functions for the “choke”. Your engine will operate in two modes while these tables are in effect. The first is Crank mode, where the Cranking Fuel Table takes effect. The second is Run mode, where the After-start Enrichment Tables take over the “choke” function. See [Crank to Run Mode RPM](#) and [Engine Revs to Run Mode](#)

9.2 Cranking Fuel Table



This table mainly affects cold start-up. It is displayed as a 2D graph of injector pulsewidth during cranking based on engine coolant temperature. At normal operating temperature, this graph is typically set to deliver 40-50% more fuel than is used at an idle. A simple way to determine a good starting figure is to observe the base pulsewidth sensor (BPW mS) in the main dashboard display while the engine is fully warmed up and idling. (You can see the main dashboard by pressing the F9 key while connected to the ECU.) At the current engine coolant temperature, set the pulsewidth in the cranking fuel table to 50% more than the pulsewidth observed at an idle. The colder the engine is, the more cranking fuel it will require for easy starting. If your engine seems to crank for a long time before it fires, try increasing the pulsewidth; if the engine produces black smoke or seems to “load up” when it fires, try reducing the pulsewidth.

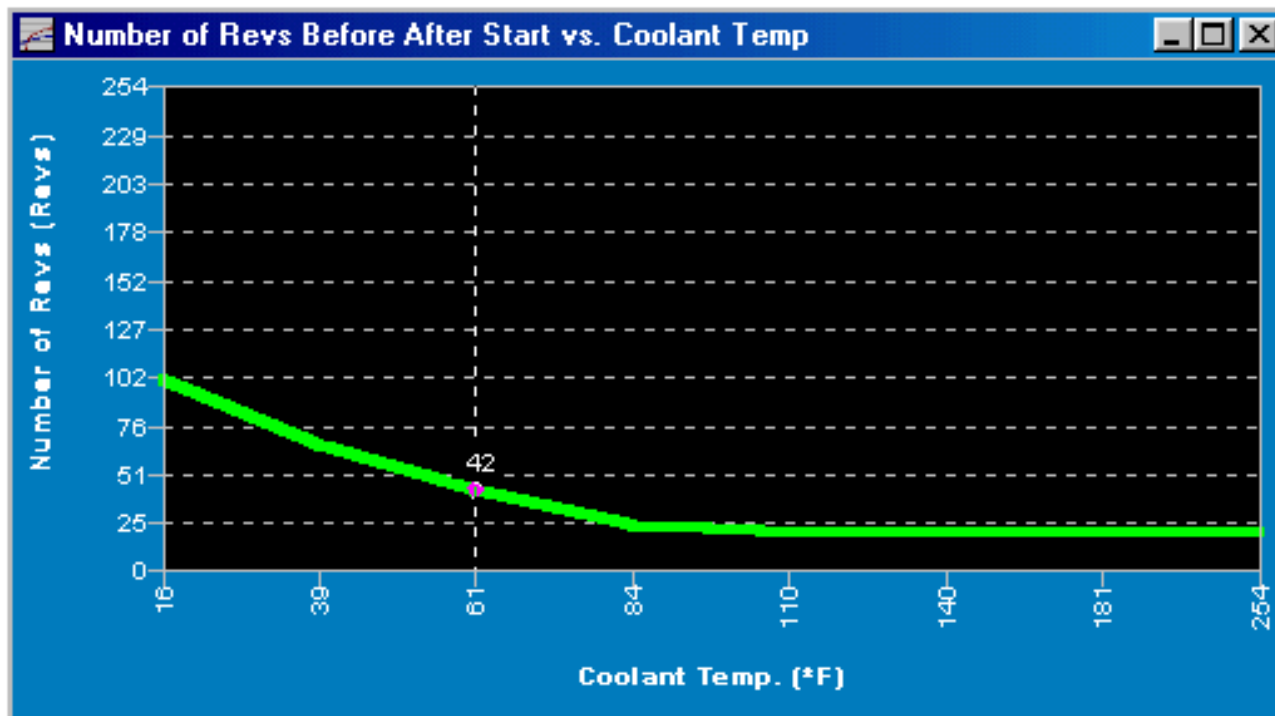
9.3 After Start vs. CTS



After start enrichment is helpful for providing additional fuel right after initial startup to help a cold motor stay running, and it helps prevent a heat-soaked motor from surging on startup as well, acting as somewhat of a “choke” function. This table is displayed as a 2D graph of fuel enrichment applied after the engine is started based on engine coolant temperature. This enrichment will be applied after the ECU enters “run” mode and it receives the number of crank pulses specified in the AFTER START REVS VS. CTS graph. This fuel enrichment will decay out at the rate specified in the AFTER START DECAY VS. CTS graph.

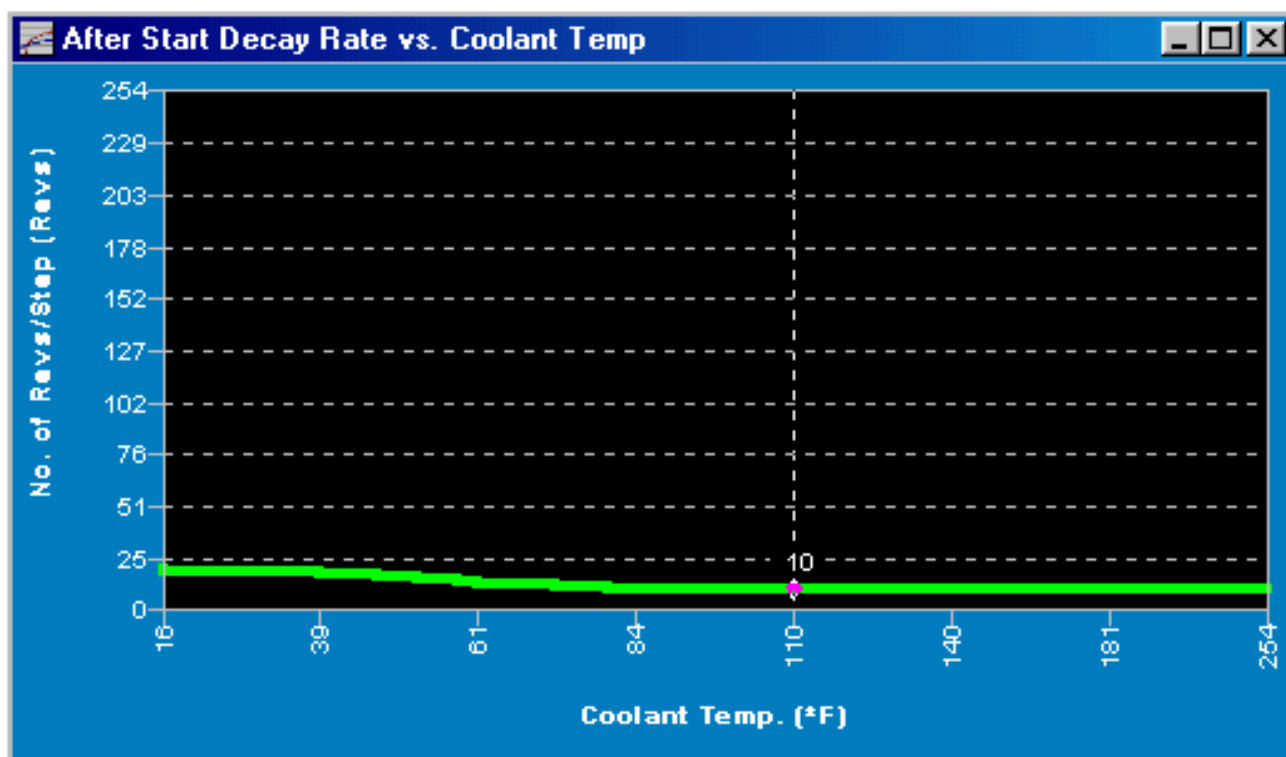
IMPORTANT NOTE - The presence of after start enrichment will also prevent the ECU from entering closed loop mode. If your ECU will not go into closed loop mode even though all of the closed loop parameters have been met, you should check to see if any after start enrichment fuel is still being applied. Refer to the above diagram. If the sensor called Aft Corr. (%) is at any value other than 0%, it will prevent closed loop operation! If you are having trouble getting your ECU to go into closed loop because after start fuel is being applied for too long, reduce the after start decay vs. CTS settings described below.

9.4 After Start Revs vs. CTS



This table is displayed as a 2D graph of the number of crank pulses that must be received by the ECU while in run mode before after start fuel enrichment is applied, based on coolant temperature. This feature allows time for excess cranking fuel to be burned before applying after start enrichment. The higher you set these values, the longer it would take for after start fueling to begin once the engine is started.

9.5 After Start Decay vs. CTS



This table is displayed as a 2D graph of the rate at which the after start enrichment will decay out based on engine temperature. The decay rate is shown as the number of crank pulses that must be received by the ECU to reduce the after start enrichment by 0.8%. The

higher you set these values, the longer it would take for the after start fuel to decay out once it was applied.

IMPORTANT NOTE - The presence of after start enrichment will also prevent the ECU from entering closed loop mode. If your ECU will not go into closed loop mode even though all of the closed loop parameters have been met, you should check to see if any after start enrichment fuel is still being applied. Refer to the above diagram. If the sensor called Aft Corr. (%) is at any value other than 0%, it will prevent closed loop operation! If you are having trouble getting your ECU to go into closed loop because after start fuel is being applied for too long, reduce the after start decay vs. CTS settings described above.

10.0 Oxygen Sensor and Closed Loop Function

10.1 Overview

Your new FAST™ XFI™ comes with a wide-band oxygen sensor that will read air/fuel ratios from as rich as 9:1 to as lean as 16.0:1. Closed loop mode means that the ECU will compare the measured air/fuel ratio to the target air/fuel ratio and automatically increase or decrease fuel delivery accordingly. In open loop mode, the ECU will still use the oxygen sensor to read air/fuel ratios, but will not adjust fuel delivery as in closed loop mode.

10.2 Closed Loop Parameters

Parameter	Value
Closed Loop High RPM	1000
Max. Closed Loop Step (%)	9
Closed Loop Low RPM	950
Closed Loop Min. Temp.(°F)	121.20
Cold Closed Loop Delay (S)	10
Hot Closed Loop Delay (S)	10
Closed Loop Enable	<input checked="" type="checkbox"/>

10.2.1 Closed Loop High RPM

This is the RPM that must be exceeded before the ECU will enter closed loop mode. This number should be set to a higher value than the value in *Closed Loop Low RPM*.

10.2.2 Closed Loop Low RPM

Once the ECU has entered closed loop mode, the engine RPM must drop below this number before closed loop mode is turned off.

10.2.3 Cold Closed Loop Delay

The minimum time from initial startup before entering closed loop mode when the coolant temperature is below 60 degrees F.

10.2.4 Hot Closed Loop Delay

The minimum time from initial startup before entering closed loop mode when the coolant temperature is above 60 degrees F.

10.2.5 Maximum Closed Loop Step

This parameter defines the maximum change in fuel correction (O2 Corr. (%)) allowed by the ECU from one calculation to the next. This value is typically left at 9%.

10.2.6 Closed Loop Minimum Temperature

This is the coolant temperature that must be exceeded for closed loop operation to begin.

10.2.7 Closed Loop Enable

Checking this box turns on closed loop operation if the parameters for closed loop operation are met. If this box is unchecked, the ECU will run in open loop mode.

NOTE - In addition to the parameters set here, there is one other condition which may inhibit closed loop operation. If any [after-start enrichment fuel](#) is being applied, the ECU will not go into closed loop mode, even if all other parameters have been met. This is described in greater detail [here](#).

10.3 Closed Loop Gain Table

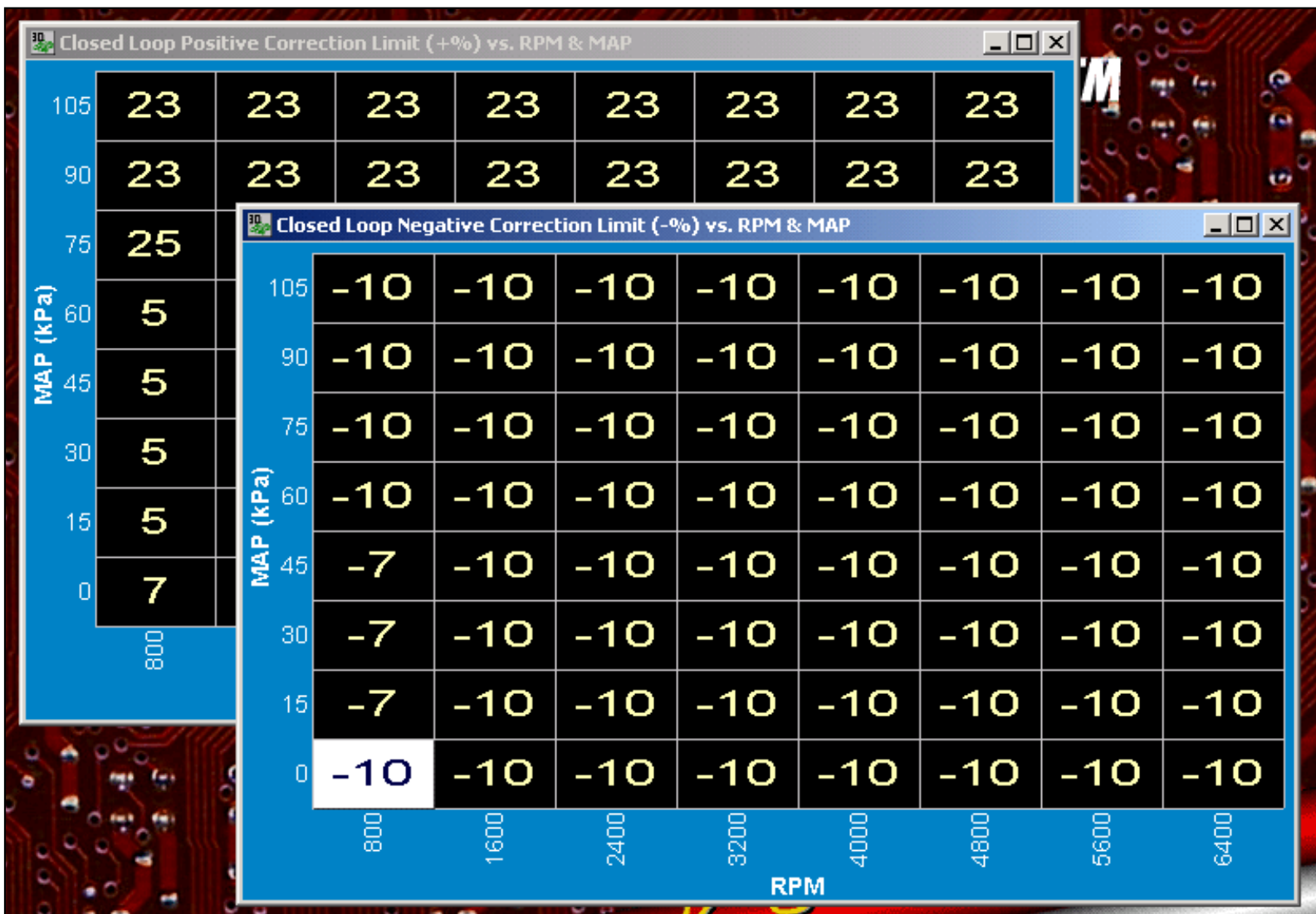
MAP (kPa)	105	25	25	25	25	25	25	25	25
	90	25	25	25	25	25	25	25	25
	75	25	25	25	25	25	25	25	25
	60	5	5	25	25	25	25	25	25
	45	5	5	25	25	25	25	25	25
	30	5	5	25	25	25	25	25	25
	15	5	5	25	25	25	25	25	25
	0	5	5	25	25	25	25	25	25
		800	1600	2400	3200	4000	4800	5600	6400
		RPM							

In Speed/Density mode, the Closed Loop Gain Table will appear as a 3D table of intake manifold pressure in kilopascals (kPa) vs. engine RPM. The table will be labeled "Closed Loop Gain(%) vs. RPM and MAP". In Alpha-N mode, the Closed Loop Gain Table will appear as a 3D table of throttle position vs. engine RPM. The table will be labeled "Closed Loop Gain(%) vs. RPM and TPS".

This parameter affects the amount of fuel correction applied in closed loop mode, based upon the difference of the measured air/fuel ratio from the current target air/fuel ratio. Large injectors generally require small gain numbers, and vice versa. An excellent method of determining the best number for your application is to observe the oxygen sensor correction factor in a data log. If the amount of correction constantly swings from a positive number to a negative number, then your closed loop gain setting should be reduced until this swing is minimized. If the actual air/fuel ratio never seems to get very close to the target air/fuel ratio, you should increase your closed loop gain setting. Closed loop operation is most effective when you have the gain number set as high as possible with a minimum amount of "overshoot" in the oxygen sensor correction.

Different gains can be specified for different RPM and engine loads. This allows closed loop operation to be effective over a broad range of operating conditions. Gains are typically higher at higher RPM and higher engine load. At higher RPM, more combustion events are happening for a given amount of time. The ECU is getting feedback – from the oxygen sensor - on its fueling adjustments more quickly. This allows it to be more aggressive with its corrections with a lower risk of drastic overshoot compared to low RPM operation. Also, at high speed and load, the engine will be more likely to be in a steady state condition – which is where a closed loop system is most effective. At idle and cruise, conditions are changing enough that you only want the ECU to gradually adjust fueling to keep it from wildly chasing a moving target.

10.4 Correction Limit Tables



These are a pair of 3D tables of closed loop correction limits in intake manifold pressure in kilopascals (kPa) vs. engine RPM. These limits determine how much oxygen sensor correction can be applied when running in closed loop mode. Limits for positive correction (adding fuel) are entered in one table and limits for negative correction (subtracting fuel) are entered in another.

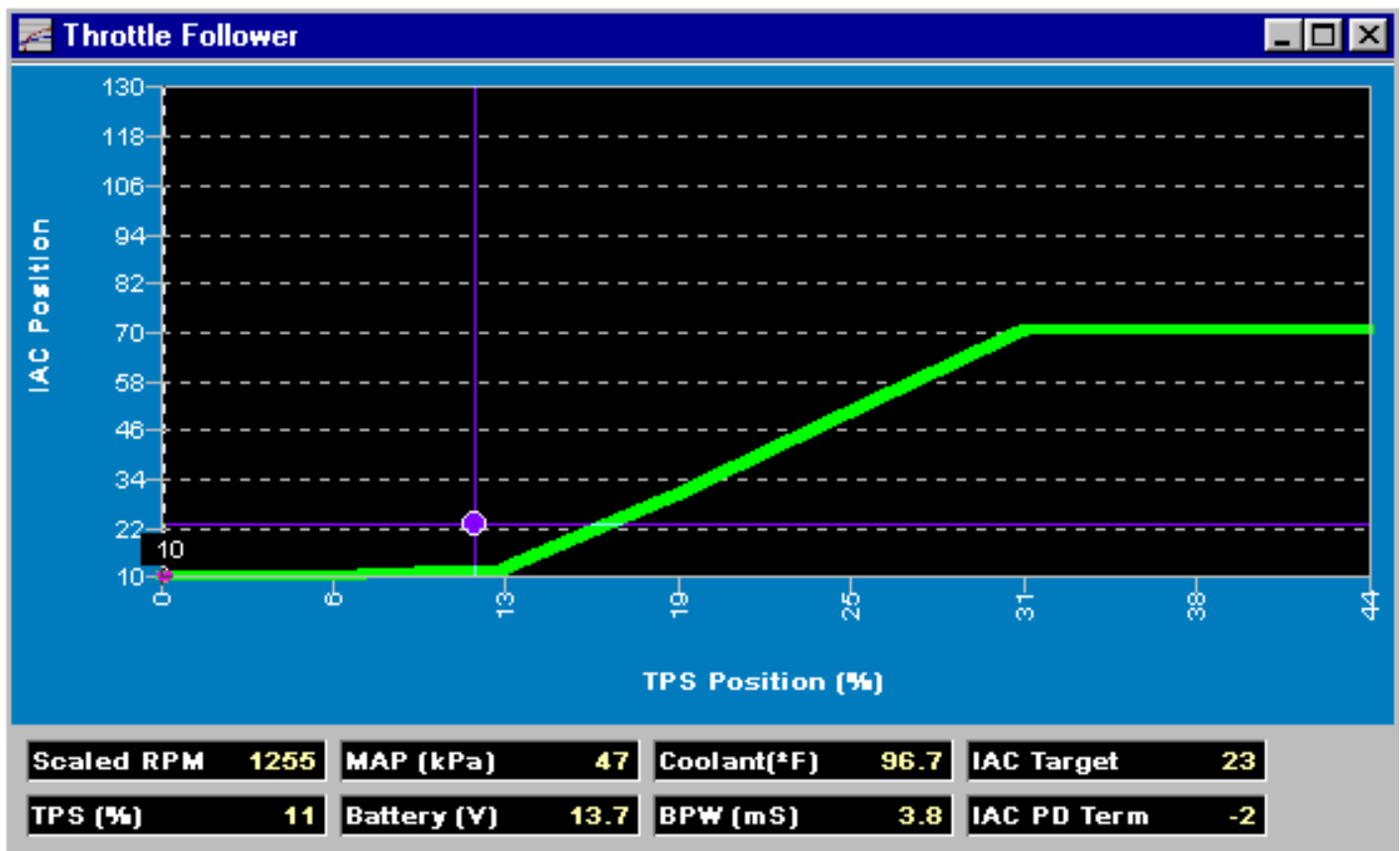
Ideally, a well-tuned engine would only ever require a small percentage of correction - somewhere around 5% in either direction. However, more correction can be allowed to compensate for varying atmospheric conditions, fuel pressure fluctuations, less than perfect base fuel table, etc.

These correction limits act as a fail safe to prevent massively rich or lean conditions in the event of an oxygen sensor failure or other anomaly. For example, imagine there is a problem with one cylinder that prevents it from firing – maybe a plug wire has come loose. The oxygen sensor reading will change but it is not a true reflection of what is happening inside the properly firing cylinders. Without correction limits in place, the ECU would apply drastic fueling changes to try to bring the oxygen sensor reading back to its target. Now instead of one problem cylinder, all of the cylinders may be in trouble.

In general, it is safer to allow more positive correction than negative correction - especially under heavy load (higher MAP or TPS values). A lean condition at high speed and load can quickly damage an engine.

11.0 Idle Speed Control

11.1 Throttle Follower



The throttle follower is a feature used to help prevent an engine from stalling when the throttle goes from open to closed. The line you see in the above graph is used to determine the minimum target position for an idle air control (IAC) motor. The theory of operation is as follows:

The purpose of the IAC motor is essentially to provide a controllable vacuum leak. The ECU can command the IAC motor to open and allow more air to enter the engine, or it can command it to close and allow less air in. More air will mean more engine speed and vice versa, so an IAC motor can be used to control engine speed. As seen in the graph below titled "Idle Speed vs. Coolant Temperature", a desired engine idle speed can be programmed by the user, and the ECU will use the IAC motor to keep the engine idling at this speed. However, as the throttle opens further and engine speed goes well above the targeted idle speed, the ECU will tell the IAC motor to close all the way in an attempt to bring engine speed back to its targeted value.

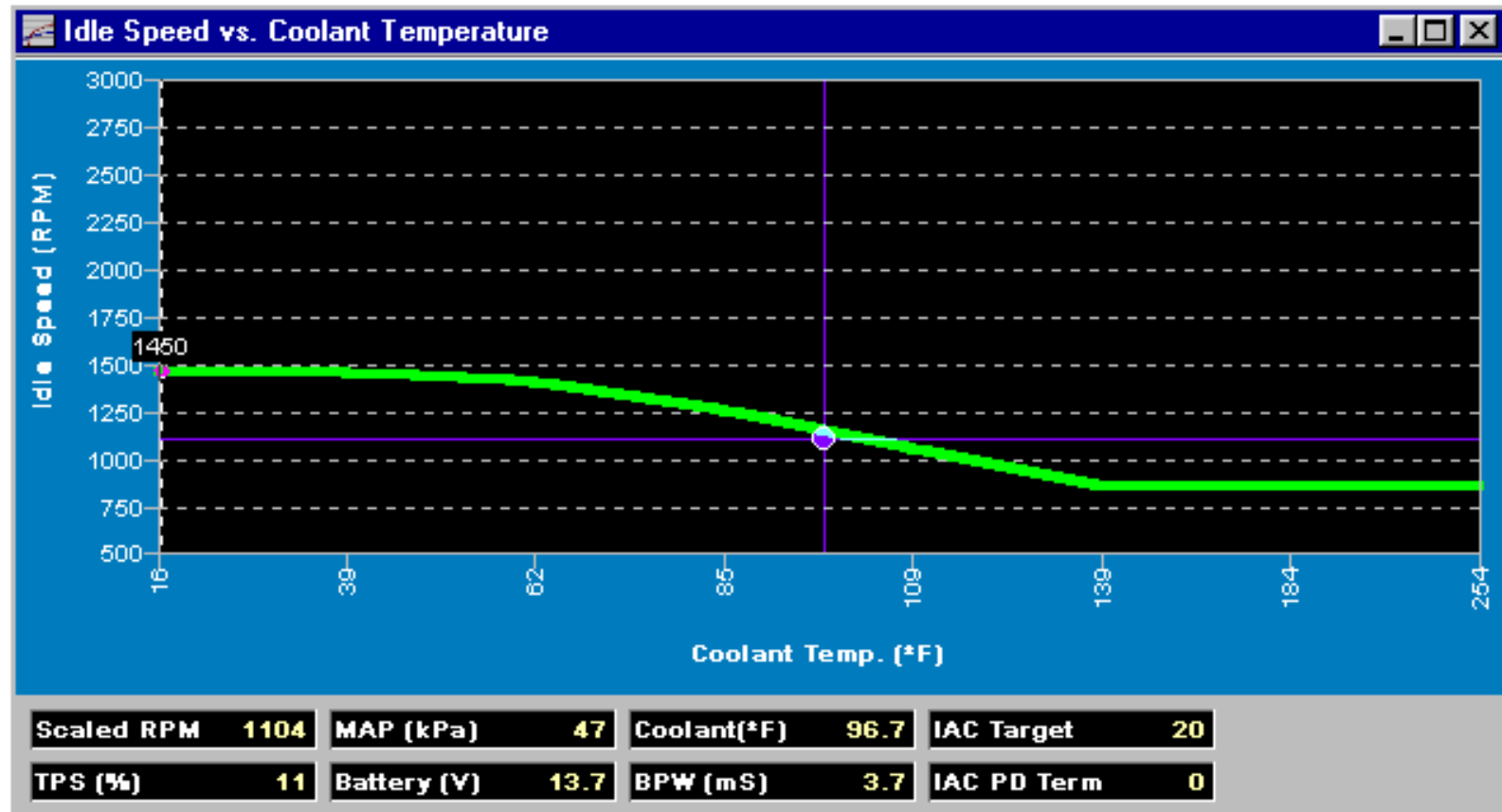
The throttle follower graph is used to set a minimum IAC position through a portion of the throttle position range. Since the ECU will first try and close the IAC to the lowest possible target, defining the minimum target position will essentially "lock" the target IAC position to that minimum as long as the engine is still running above the targeted idle speed. With this method, the targeted IAC motor position can essentially be defined as a function of throttle position.

The above diagram is an excellent example of a typical throttle follower calibration. At the lowest TPS position, where the engine is assumed to be idling, the throttle follower graph is kept to its minimum setting. At idle, the ECU will determine the IAC position necessary to achieve the target idle speed, so defining a minimum IAC position would limit the available range of IAC movement. Once the throttle

position moves above the [maximum TPS reading for idle](#), the throttle follower should open the IAC motor further and further as throttle position increases.

Using the above diagram as an example, assume that the engine is running and the throttle position is at 32%. According to the graph, the IAC will be opened 70 counts at this throttle position. Now, let's assume that the throttle is quickly closed - as if the driver quickly lifted off of the gas pedal. The TPS will return to its idle position, but the IAC motor will still be opened much further than it needs to be to maintain the targeted idle speed. Rather than "slamming shut" like the throttle blades did, the IAC motor will close slowly, easing the transition from cruising RPM to idle RPM and preventing engine stalls that can occur under these conditions.

11.2 Idle Speed vs. Coolant Temp

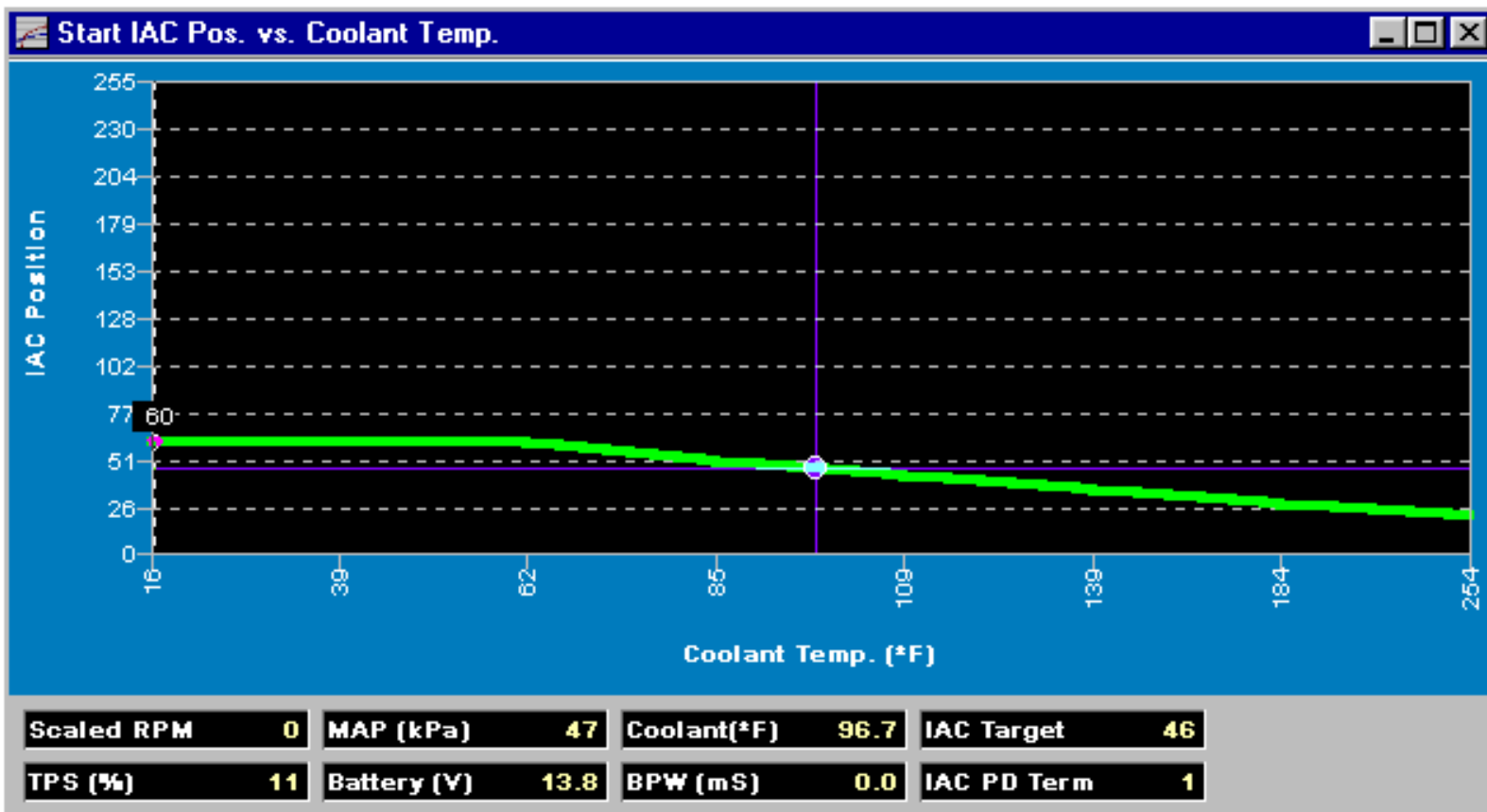


This is a 2D graph used for controlling idle speed as a function of engine coolant temperature. The horizontal axis of the graph represents engine coolant temperature, and the vertical axis of the graph represents the targeted idle speed.

In order to maximize the range over which the ECU can control idle speed, there is a simple idle calibration process that should be followed. Refer to the above diagram. The green trace represents the targeted idle speed, and the blue cross-hairs represent the actual engine speed and temperature. The cross-hairs should be locked on to the green trace any time the engine is idling, and the targeted IAC position should be near its minimum as well. This allows the IAC motor to open as far as possible in the event of heavy engine loading during idle (A/C compressor engaging, electric fans turning on, etc.). At normal operating temperature, simply adjust the throttle blades on the throttle body so that the cross-hairs are locked onto the targeted RPM trace, and the targeted IAC position is 15-25 counts (seen in the "IAC Target" sensor in the dashboard above).

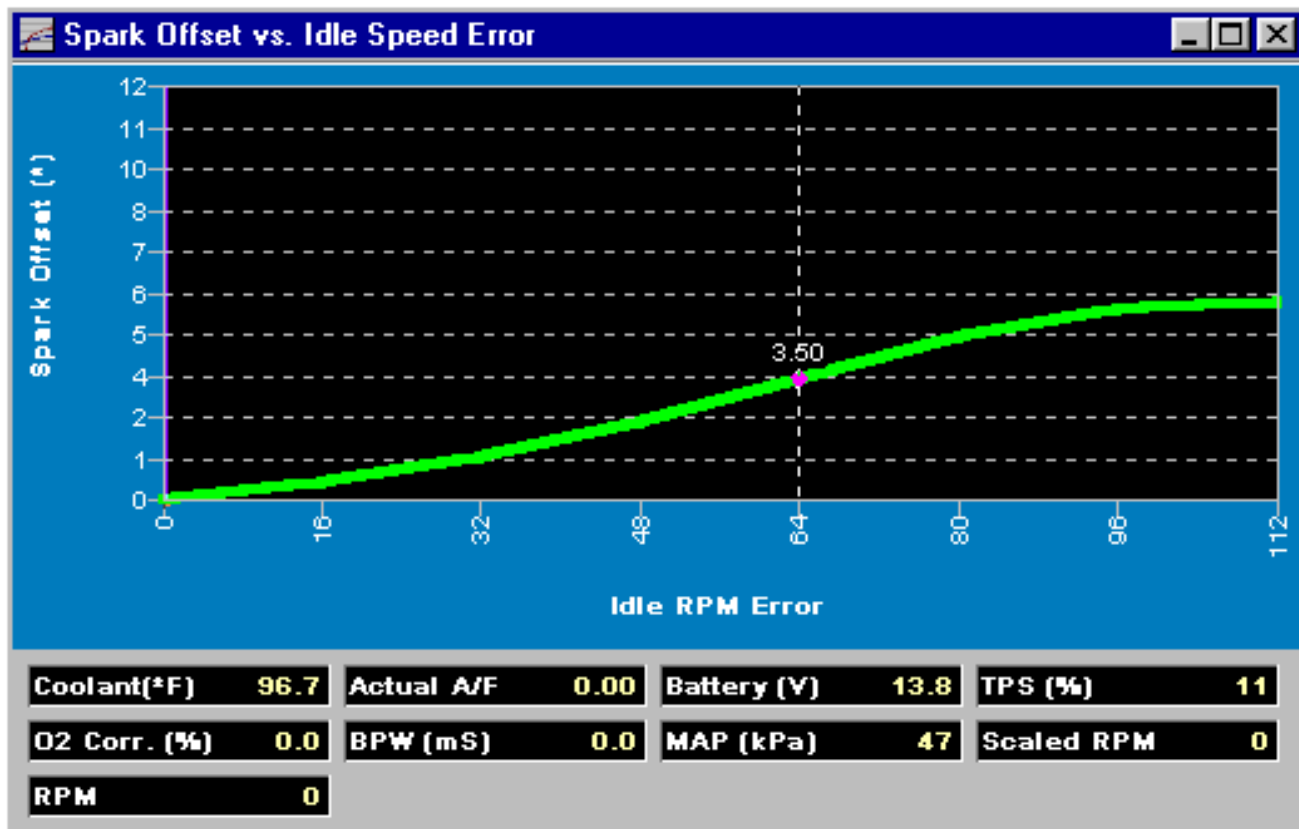
IMPORTANT NOTE - If a CTS fault code is set, the target idle speed is forced to 1000 RPM. See the [Service Engine Soon / Fault Codes](#) section for more detail.

11.3 Starting IAC Position vs. Coolant Temp



This is a 2D graph used for controlling the targeted IAC position when the engine is cranking as a function of engine coolant temperature. The horizontal axis of the graph represents engine coolant temperature, and the vertical axis of the graph represents the targeted IAC position when the engine begins to crank. It will stay in this position until the ECU switches in to run mode. Opening the IAC motor before starting the engine allows bypass air to enter the engine during cranking, eliminating the need to depress the throttle to get the engine started. The opening of the IAC motor during cranking also produces a brief RPM "flare-up" common to IAC-equipped engines. You can raise or lower this flare-up by increasing or decreasing the starting IAC position.

11.4 Timing Trim



This is a 2D graph used to vary ignition timing to help regulate idle speed. The horizontal axis of the graph represents the difference between the actual idle speed and the target idle speed, and the vertical axis of the graph represents the number of degrees to alter the ignition timing. If the idle speed is too high, the ECU will retard the timing by the amount specified in the graph. If the idle speed is too low, the ECU will advance the timing by the amount specified in the graph. It is recommended to set this entire table to zero as a starting point. Add timing trim only if you are otherwise unable to achieve a smooth, stable idle.

11.5 Idle Parameters

The "Idle Speed Parameters" dialog box contains the following settings:

- IAC 'P' Gain: 32
- IAC 'D' Gain: 4
- Max. TPS for Idle (%): 20

Buttons: OK, Apply, Cancel

This is a form used for setting gain controls on the idle air control motor and for setting a threshold on the TPS position where the ECU no longer considers the engine to be idling.

11.5.1 IAC "P" Gain

The IAC "P" gain value can be set from 0 to 255. Raising this value will cause the IAC motor to open or close further in an attempt to correct the idle speed. The default value of 32 for the P gain is generally close to correct for most applications.

11.5.2 IAC "D" Gain

The IAC "D" gain value can also be set from 0 to 255. Raising this value will cause the IAC motor to open or close faster in an attempt to correct the idle speed. The default value of 4 for the D gain is generally close to correct for most applications.

NOTE - An excellent way to better understand these settings is to liken them to a sensitivity control on a cruise control circuit. If the circuit was set for maximum sensitivity (gain values both set to 255) the accelerator pedal would go to the floor as soon as you dropped below the target speed, and the pedal would drop to an idle as soon as you were going too fast. If the circuit was set for minimum sensitivity (gain values set to 0) the accelerator pedal would hardly move if you were going too fast or too slow, and you would almost never be traveling at the desired speed. This same concept applies to how your IAC motor will regulate idle speed.

11.5.3 Max. TPS for Idle (%)

The "Max. TPS for Idle" field is used to set the threshold where the ECU no longer considers the engine to be idling. It is recommended to observe the TPS reading at an idle and setting this field to that number plus one. In other words, if your TPS reads 10% at an idle, set this value to 11. When the TPS percentage exceeds the value specified in this field, the IAC motor will be "locked" into the position specified in the throttle follower graph, and the Timing Trim graph will not be used.

11.5.4 A/C Idle Increase (RPM)

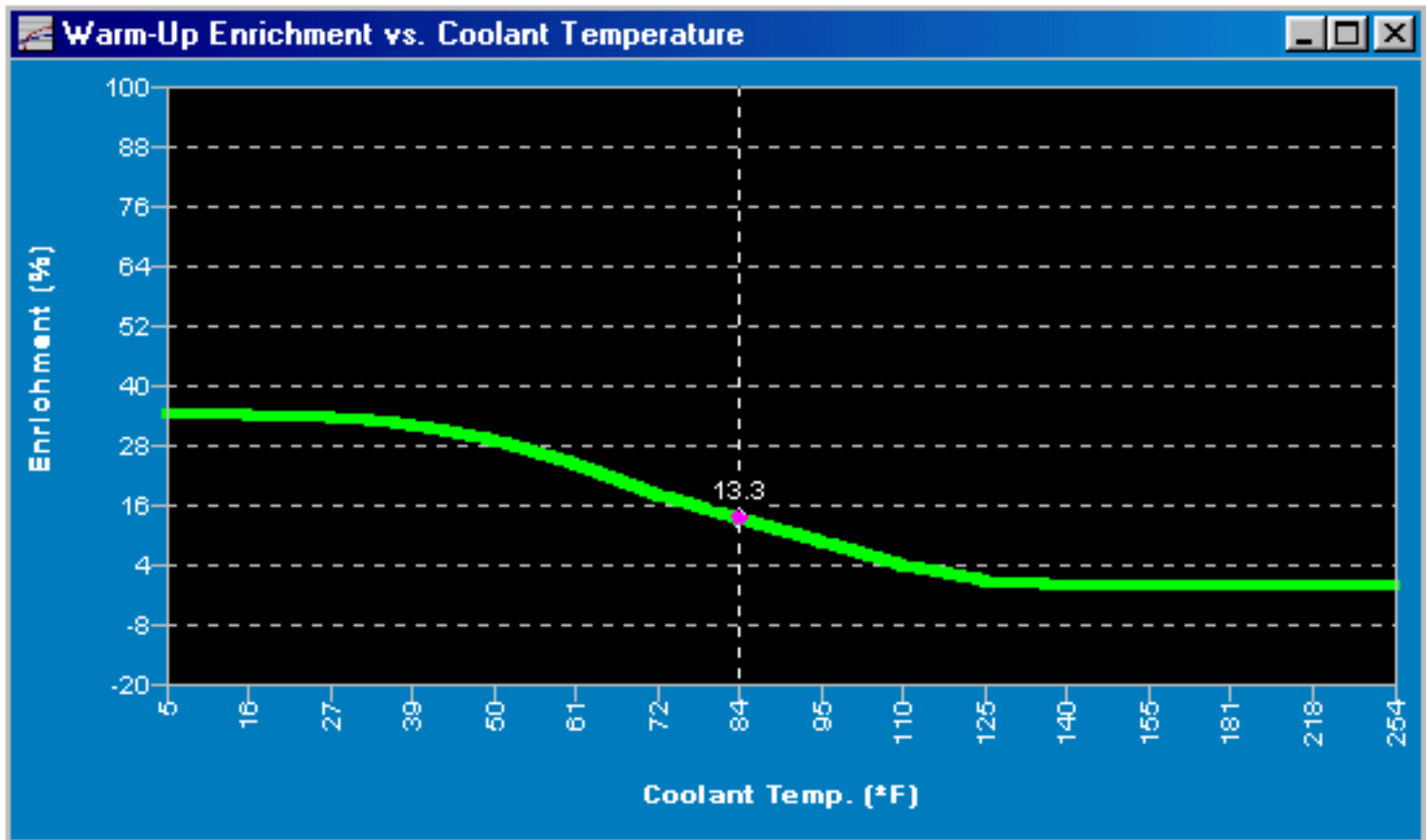
When an additional load is applied to an idling engine – such as an A/C compressor - it may be necessary to increase the engine's idle speed. When the ECU receives a signal that the A/C compressor (or other load) has been turned on, it will add this amount to the target idle speed from the Idle Speed vs. Coolant Temp table. **Grounding** ECU pin A24 activates this feature.

This feature may also be useful for marine applications where shifting into gear can significantly change the load on the engine.

If there was a situation where a reduced idle speed was desired in a certain situation, this feature could be operated in reverse. Apply a negative offset to the entire Idle Speed vs. Coolant Temp table. Enter the amount of that offset in the A/C Idle Increase (RPM) parameter. Wire ECU pin A24 so that it is normally **grounded**. This way, the idle increase function will keep the idle up to the normal speed. When the lower idle is needed, unground ECU pin A24. The idle increase function will be disabled and the engine will drop down to the idle speed specified in the Idle Speed vs. Coolant Temp table.

12.0 Air and Coolant Temperature Correction Tables

12.1 CTS Correction

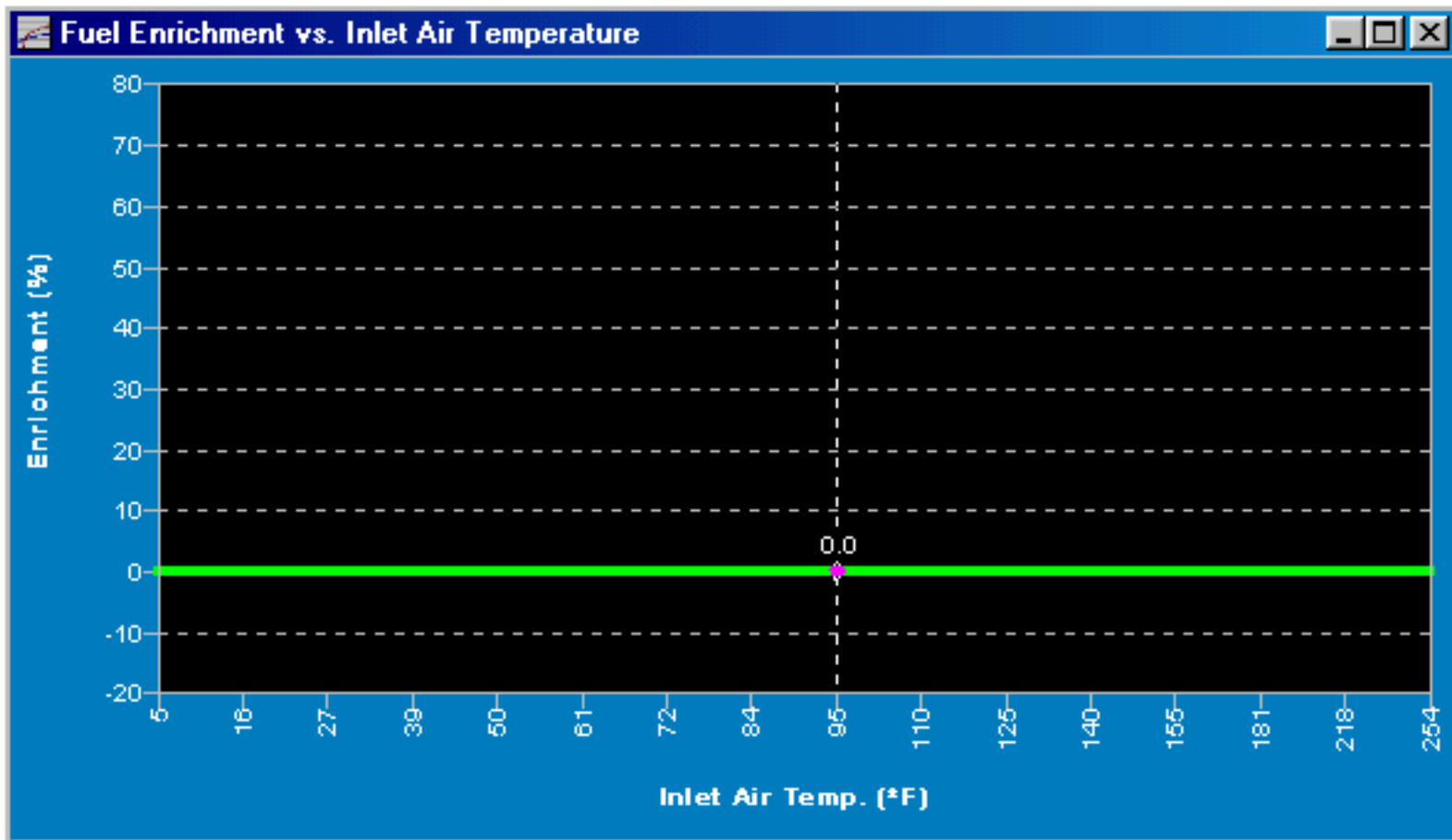


This table is displayed as a 2D graph of the percentage of fuel added or removed based on engine coolant temperature. This allows the user to program the amount of warm-up enrichment.

Prior to making any final adjustments to this graph, the [base fuel table](#) should first be properly calibrated at normal operating temperature. Once the engine idles and drives as desired when fully warm, let the engine cool completely. Restart the engine and make any adjustments to the warm-up enrichment table as the engine begins to warm up. Typically, the lower the coolant temperature is, the more warm-up enrichment will be required to maintain a steady idle and responsive throttle while driving. The percentage of enrichment typically drops until normal operating temperature is reached, at which point the warm-up enrichment should be zero.

IMPORTANT NOTE - If a CTS fault code is set, the CTS correction is zeroed out. See the [Service Engine Soon / Fault Codes](#) section for more detail.

12.2 ATS Correction



This table is also displayed as a 2D graph. It shows the percentage of fuel added or removed based on inlet air temperature.

In speed/density mode, the air temperature measurement is already taken into account in the fuel calculation. The effects of temperature on an air mass are known; therefore, a change in intake air temperature from 105 degrees to 70 degrees has a very predictable effect on the density of the air going into the engine. The laws of physics dictate an inverse relationship between the temperature of air and its density - the lower the air temperature, the greater the density of the air. For this reason, it is common practice to "zero out" this entire graph and let the ECU handle this.

However, some situations require different logic. For example, in a supercharged car, air temperatures climb very quickly, especially if an intercooler is not used. When air temperatures become very hot, a good way to help prevent damage and cool things off a bit is to add fuel. However, the known relationship between air temperature and air density states that hotter air is thinner and requires less fuel to maintain the same air/fuel ratio. The speed/density algorithm will lean out the fuel mixture as the air temperature increases, but in situations such as this, adding fuel at higher air temperatures makes more sense.

In Alpha-N mode, no automatic air temperature compensation happens. The only fueling changes related to air temperature are those specified ***in this table***.

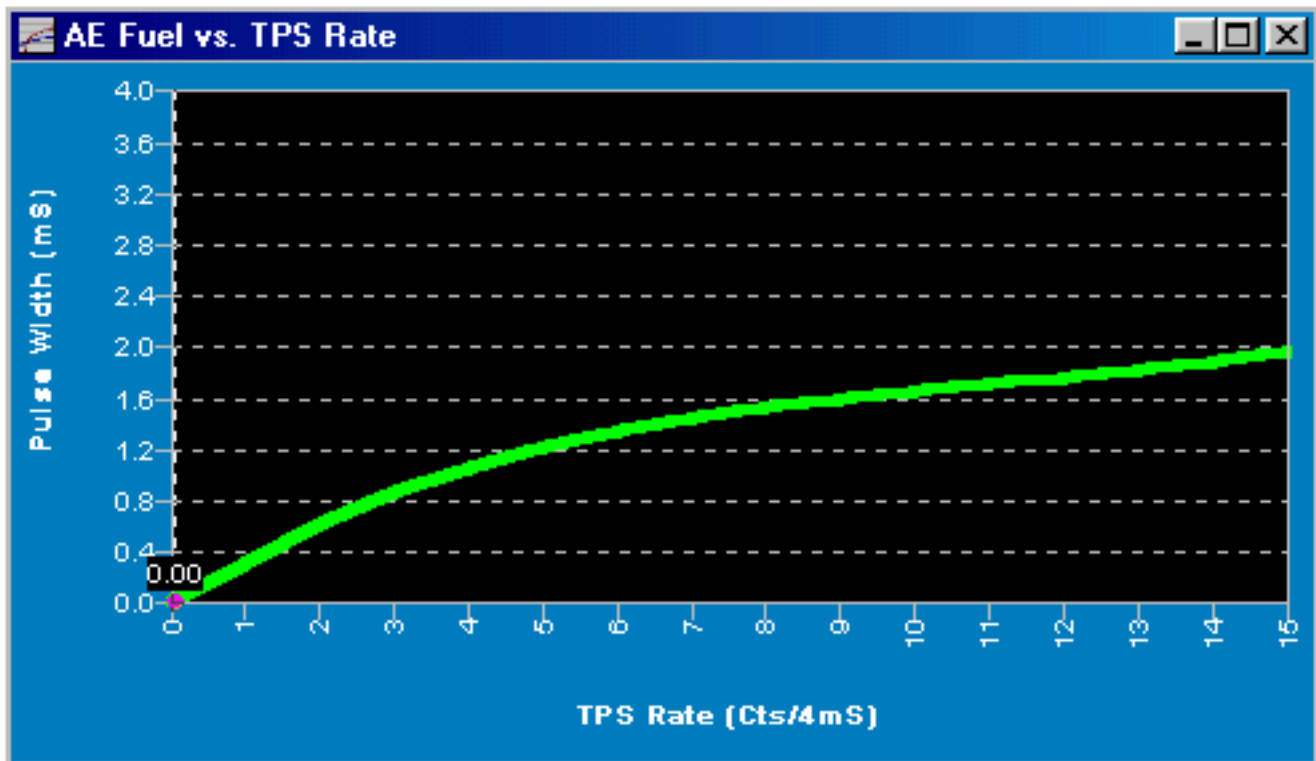
IMPORTANT NOTE - If a CTS fault code is set, the CTS correction is zeroed out. See the [Service Engine Soon / Fault Codes](#) section for more detail.

13.0 Acceleration Enrichment Fuel Tables

13.1 Overview

Acceleration Enrichment is additional fuel used to improve throttle response, much like an accelerator pump on a carburetor. This fuel is applied in response to a positive throttle position rate of change or a positive manifold pressure rate of change. The resulting increase in manifold pressure can cause some of the fuel in the intake runners to undergo a phase change from vapor to liquid. Some of the liquid fuel can coat the walls of the intake runners instead of flowing into the cylinder. If additional fuel is not supplied to offset this effect, the engine will experience a lean condition. These tables can all be found from the pull down menus by selecting VIEW/FUEL TABLES.

13.2 AE FUEL VS. TPS RATE



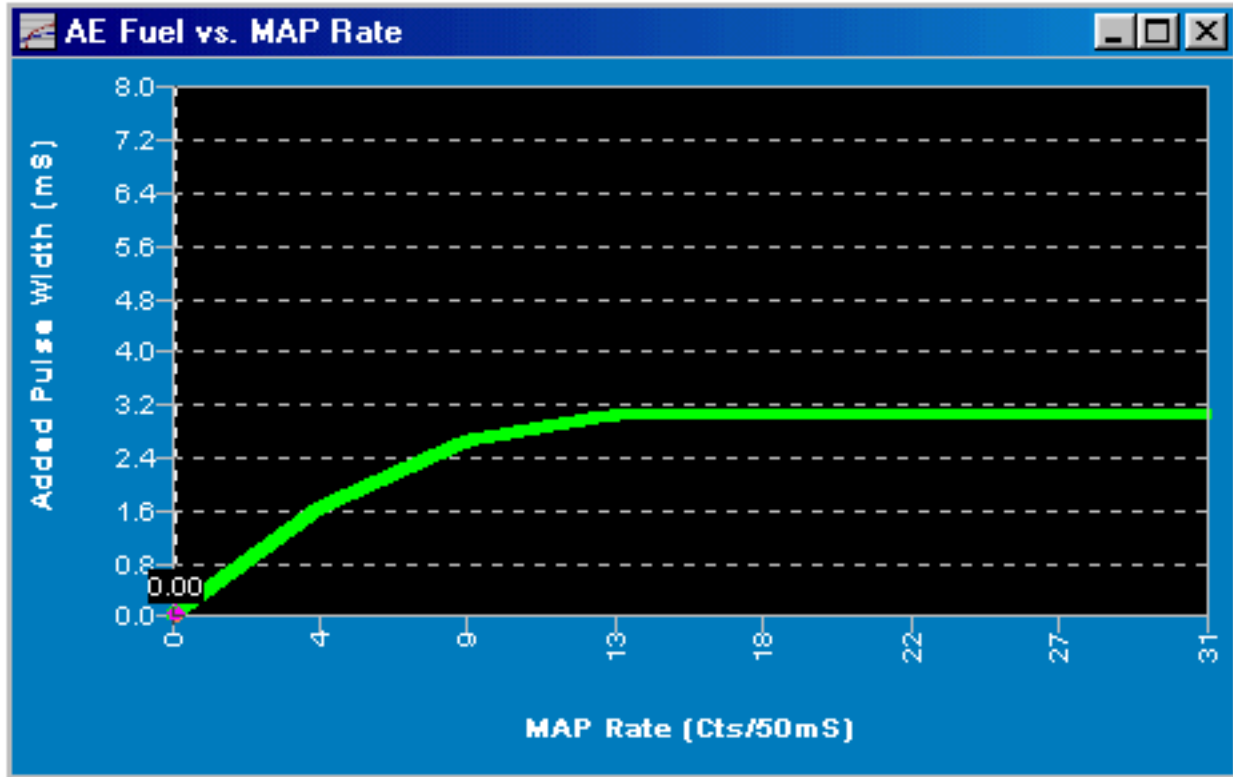
Displays a 2D graph of acceleration enrichment fuel applied in response to a positive throttle position rate of change. The enrichment is delivered in the form of extra, simultaneous firings of all injectors. This is called asynchronous because the extra fuel is not delivered in sync with the normal injector firings. Instead, it happens all at once.

The bottom of the graph indicates the rate at which the throttle position is changing (given in raw A/D count change per 4ms). A higher number on this axis corresponds to a faster opening of the throttle. The left side of the graph indicates the pulse width of the supplemental injector firings. This value is subject to adjustments for TPS position and coolant temperature as described below.

This graph is normally set for higher pulse width with a higher TPS Rate.

Even though this graph has a cursor that will try to follow the TPS Rate, it is likely that most relevant throttle openings will not be seen on the graph. This is because the changes in TPS Rate can happen quicker than data is transferred from the ECU through the communications port to the laptop. It may be more helpful to data log the "Delta TPS" channel at the highest logging rate when tuning this graph. This will give the best chance of catching the TPS Rate values.

13.3 AE FUEL VS. MAP RATE



NOTE - In Alpha-N mode, the ECU will ignore this graph so its settings are irrelevant. In this case, the ECU will ignore this table so its settings are irrelevant.

Displays a 2D graph of acceleration enrichment fuel applied in response to a positive manifold pressure rate of change. This graph works similarly to the AE Fuel vs. TPS Rate graph, but reacts to changes in manifold pressure rather than throttle position. Another difference is the method used to deliver the enrichment. In this case, the enrichment takes the form of addition time added to the base injector pulse width. This method is called synchronous. The extra fuel is delivered during the normal firing of each injector by keeping the injector open longer.

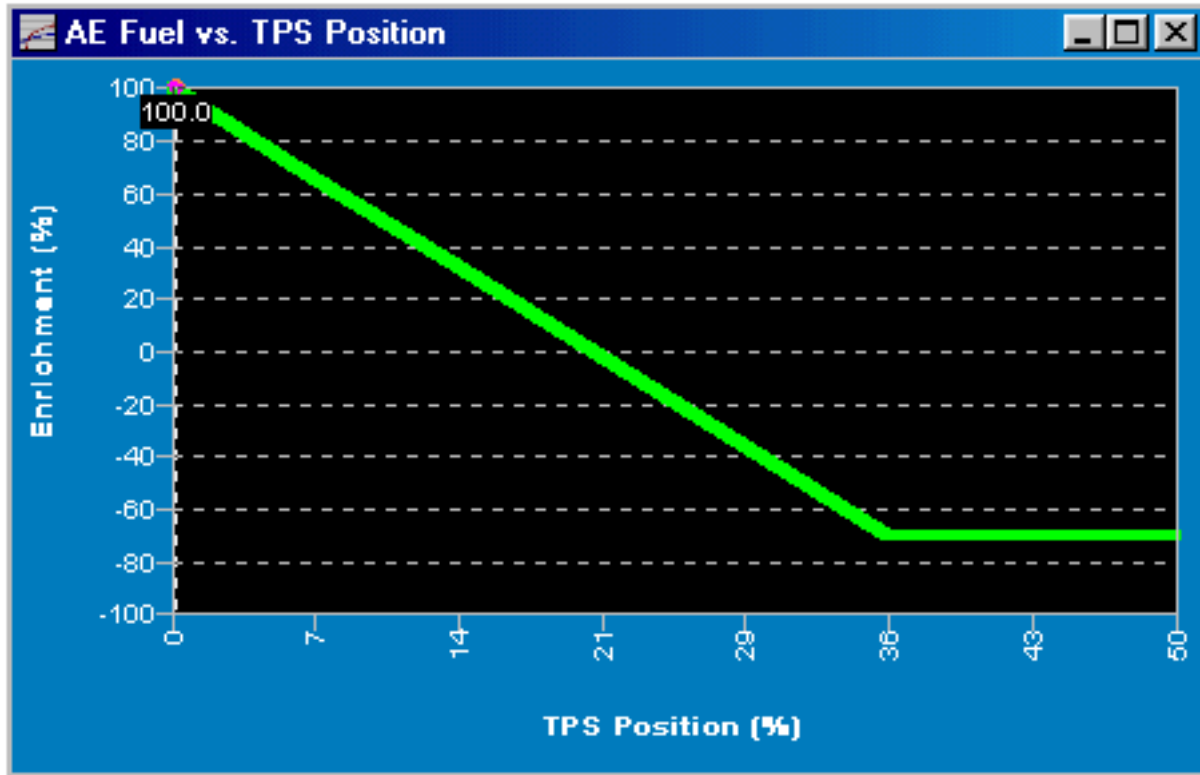
The bottom of the graph indicates the rate at which the manifold pressure is changing (given in raw A/D count change per 50ms). A higher number on this axis corresponds to a faster increase in manifold pressure. The left side of the graph indicates the amount of time that will be added to the base injector pulse width. This amount of time is subject to adjustment for coolant temperature as described below.

Because of variances in throttle body sizes, intake manifolds, etc., some engines will produce large changes in manifold pressure with a slight crack of the throttle, and others may produce very little change. Your engine may or may not respond better by altering this graph rather than the AE Fuel vs. TPS Rate graph.

This graph is normally set for higher added pulse width with a higher MAP Rate.

Even though this graph has a cursor that will try to follow the MAP Rate, it is likely that most relevant increases in manifold pressure will not be seen on the graph. This is because the changes in MAP Rate can happen quicker than data is transferred from the ECU through the communications port to the laptop. It may be more helpful to data log the "Delta MAP" channel at the highest logging rate when tuning this graph. This will give the best chance of catching the MAP Rate values.

13.4 AE FUEL VS. TPS POSITION

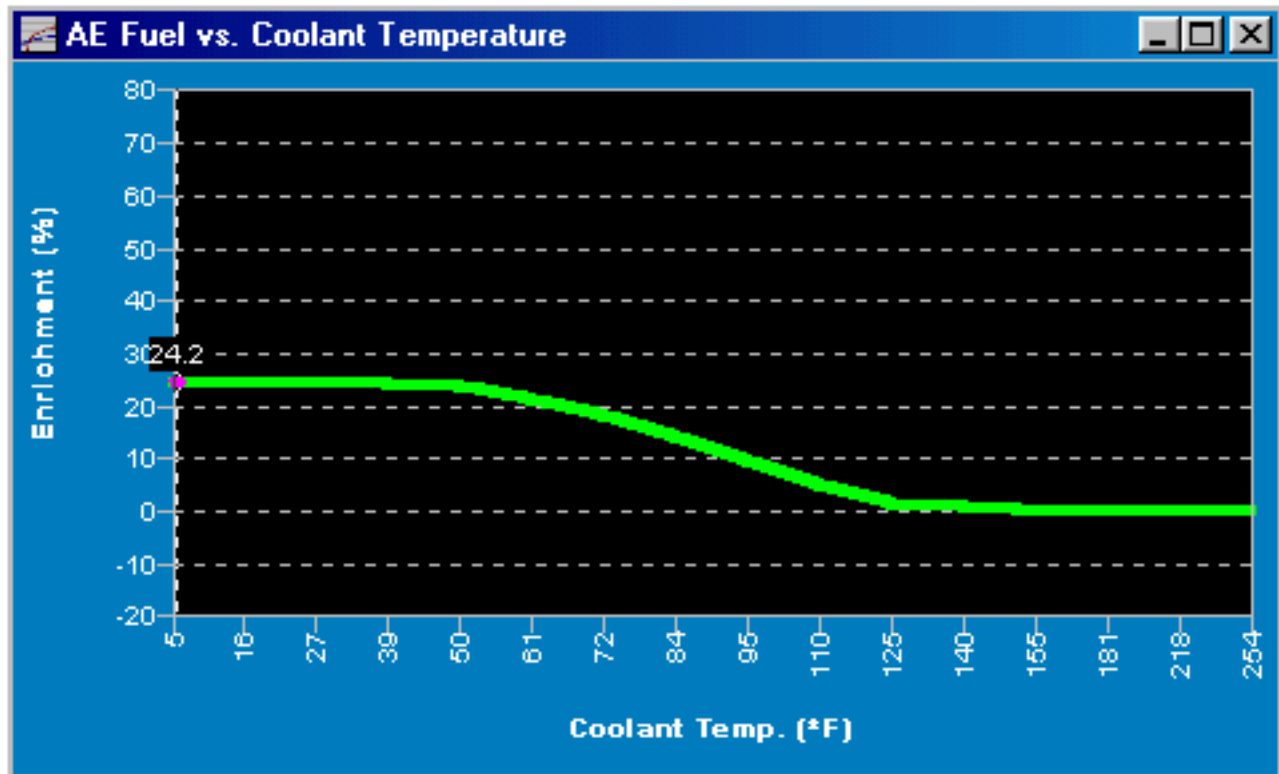


Displays a 2D graph of the adjustment made to the AE fuel applied by the AE Fuel vs. TPS Rate graph. This adjustment is based on the throttle position when the throttle position rate of change was detected. The bottom of the graph indicates the throttle position. The left side of the graph indicates a percentage that is added to (positive percentage) or subtracted from (negative percentage) the AE fuel applied by the AE Fuel vs. TPS Rate graph.

Using the analogy of an accelerator pump on a carburetor, the values in this graph can be compared to the volume of fuel in the pump. At half throttle, the accelerator pump arm would already be halfway through its travel and would have expended half of the total fuel available - leaving half of the total pump volume available.

Generally, larger throttle openings (smaller restriction / pressure change per degree of throttle movement – and normally associated with higher engine speeds with higher intake velocity) require less accelerator enrichment to maintain good throttle response. This graph is normally set to decrease AE Fuel enrichment as TPS position increases.

13.5 AE FUEL VS. Coolant Temperature



Displays a 2D graph of the adjustment made to the AE fuel applied by both the AE Fuel vs. TPS Rate and the AE Fuel vs. MAP Rate graphs. The adjustment is applied to each graph independently. It is based on the current coolant temperature. The bottom of the graph indicates the current coolant temperature. The left side of the graph indicates a percentage that is added (positive percentage) or subtracted (negative percentage).

Generally, a warmer engine (higher intake manifold temperature) requires less accelerator enrichment to maintain good throttle response. This table is normally set to decrease as coolant temperature increases.

13.6 Interaction of AE Fuel Graphs

To illustrate how the various AE fuel graphs interact, consider this example. Assume the current readings from the AE graphs are as follows:

AE Fuel vs. TPS Rate : 2 ms

AE Fuel vs. MAP Rate : 3 ms

AE Fuel vs. TPS Position : -10%

AE Fuel vs. Coolant Temperature : 20%

The AE Fuel applied based on TPS Rate is calculated using this formula:

Asynchronous TPS AE Fuel = (AE Fuel vs. TPS Rate) * (1 + AE Fuel vs. TPS Position) * (1 + AE Fuel vs. Coolant Temperature)

Asynchronous TPS AE Fuel = (2 ms) * (0.90) * (1.20) = 2.16 ms

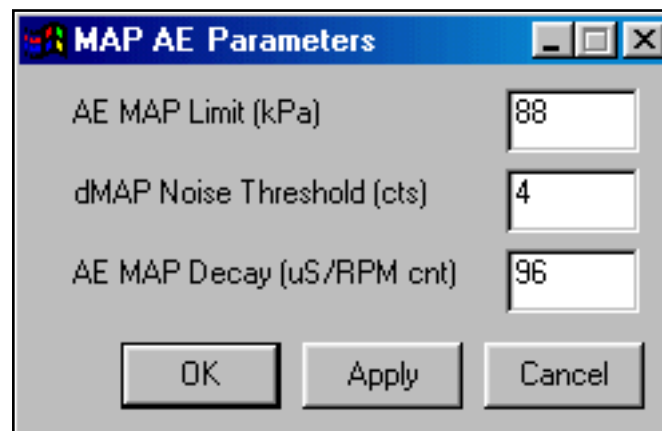
The AE Fuel applied based on MAP Rate is calculated using this formula:

Synchronous MAP AE Fuel = (AE Fuel vs. MAP Rate) * (1 + AE Fuel vs. Coolant Temperature)

Synchronous MAP AE Fuel = (3 ms) * (1.20) = 3.60 ms

13.7 MAP AE PARAMETERS

Displays a selection of parameters affecting how the MAP based acceleration enrichment functions are applied. **NOTE -** In Alpha-N mode, the ECU will ignore these settings so the values entered are irrelevant.



13.7.1 AE Map Limit

This is the point on the Base V/E Table (in kPa-found along the left side of the table) above which no more AE fuel from the AE Fuel vs. MAP Rate graph will be applied. On forced induction applications, it is recommended to set this value within the region where the engine is making the transition from vacuum to boost, typically between 100 and 110 kPa.

Setting this value above this range can cause unnecessary acceleration enrichment fuel to be applied as a result of increasing boost, resulting in a rich condition.

A similar situation exists in naturally aspirated applications running in Speed/Density mode. It is recommended to set this limit to 5-10 kPa under the region of the table where your engine typically runs at wide-open throttle. This will prevent manifold pressure oscillations commonly seen in naturally aspirated applications from causing acceleration enrichment fuel to be applied at wide-open throttle.

13.7.2 dMAP Noise Threshold

This is the amount of change in manifold pressure (in raw A/D counts) that the ECU will ignore before adding fuel from the AE Fuel vs. MAP Rate graph. This is to help prevent a rich condition due to slight variations in manifold pressure at an idle or while cruising. It is recommended to set this value as low as you can without causing a rough or unstable idle. In general, a higher range MAP sensor will use a lower setting for this parameter. A higher range MAP sensor has decreased resolution compared to a lower range MAP sensor. So the same physical fluctuations in manifold pressure result in a smaller change in MAP sensor output with the higher range MAP sensors. For a naturally aspirated engine with a 1 Bar MAP sensor, 5-6 is typical. For a boosted engine with a 2 Bar MAP sensor, 3-4 would be typical. When using a 3 Bar MAP sensor, 2-3 would be typical.

13.7.3 AE MAP Decay

This is the rate at which the ECU will decay out the additional pulse width added by the AE Fuel vs. MAP Rate graph after the MAP reading has stabilized. The larger the value entered here, the faster the added pulse width will be removed. This value will typically be 80-100 for most applications.

14.0 Viewing and Configuring Dashboards

14.1 Overview

All of the calibration tables, as well as the data log viewer, make use of "dashboards". A dashboard is a group of sensors such as RPM, manifold pressure, coolant temperature, etc. that provide feedback on various engine operating parameters. Dashboards can be seen on the bottom of every calibration table window while online with the ECU. There is also a "Main Dashboard" display which can contain up to 48 sensors and is viewed in a separate window. The "Main Dashboard" can be accessed with the F9 key or from the pulldown menus by selecting VIEW/DASHBOARD. There are 15 available dashboard configurations available for use in a calibration table window. These dashboards can each display up to 24 sensors.

14.2 Selecting a Dashboard

To select a dashboard to display from within any of the calibration tables, simply right-click anywhere in that window and choose SELECT DASH and make your selection.

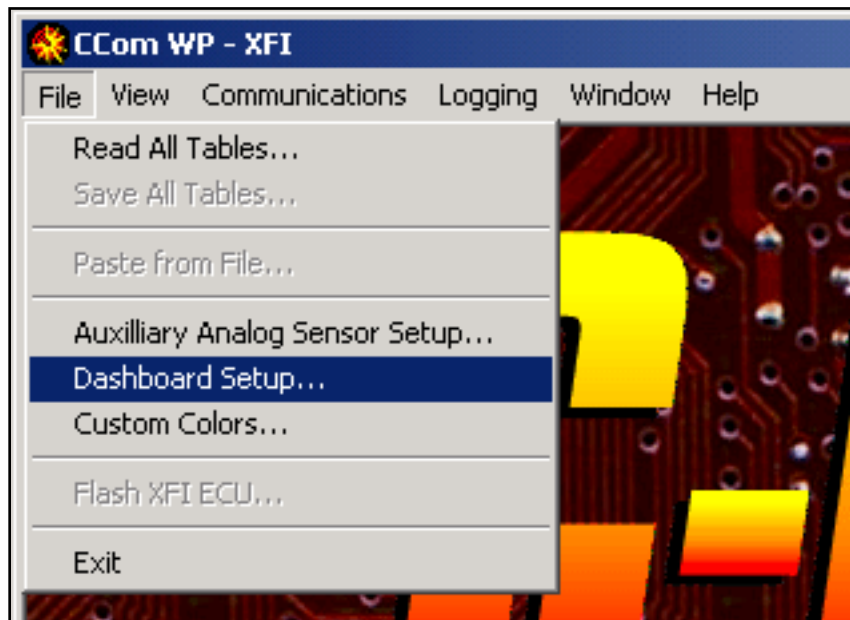


IMPORTANT NOTE – When choosing a different dashboard, make sure it includes both parameters found in the table. For example, the Base VE table uses MAP (kPa) and RPM as its determining factors. Those two sensors need to be included in the dashboard or the cursor will disappear from view.

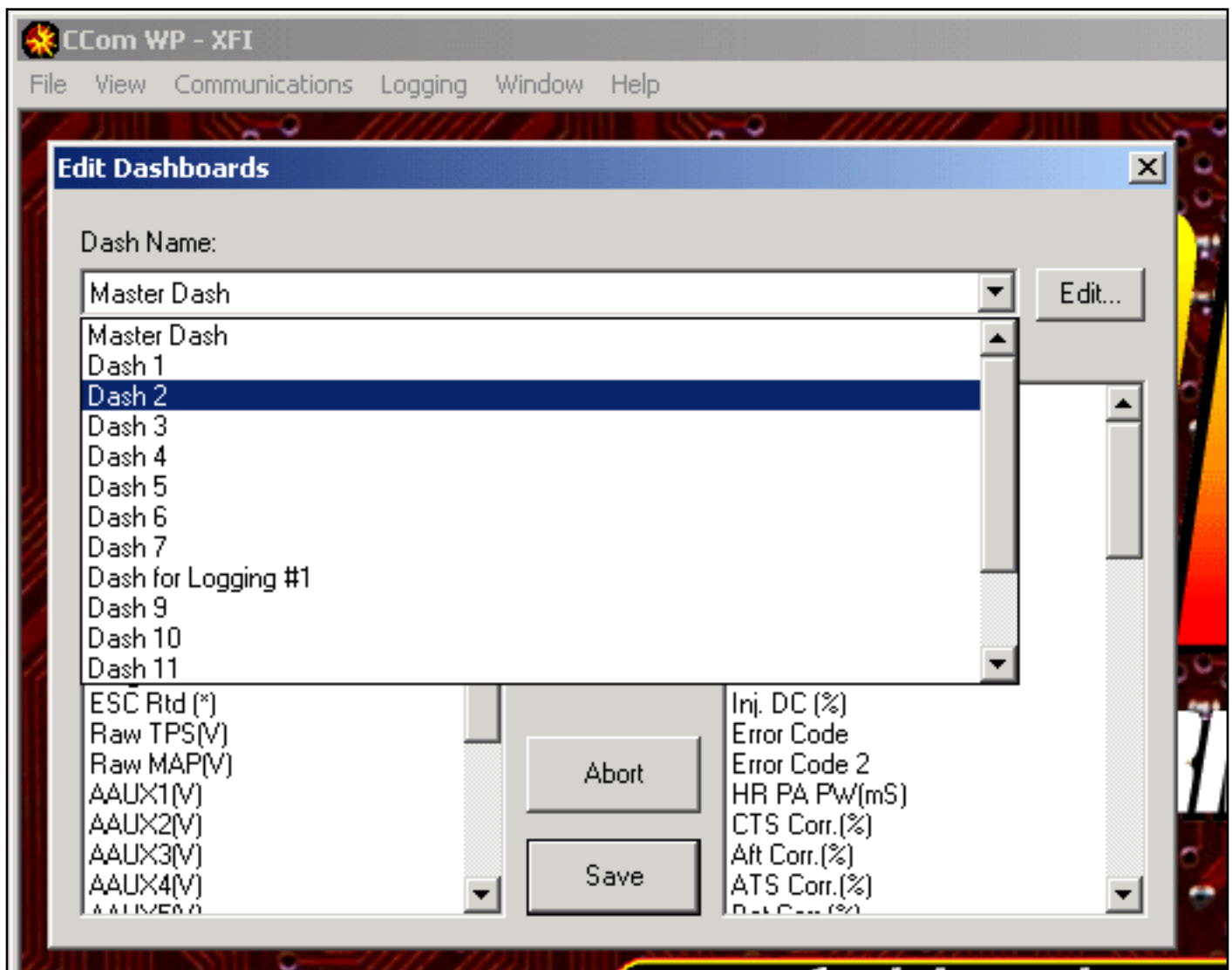
14.3 Setting up Dashboards

To change the content of any of the dashboards:

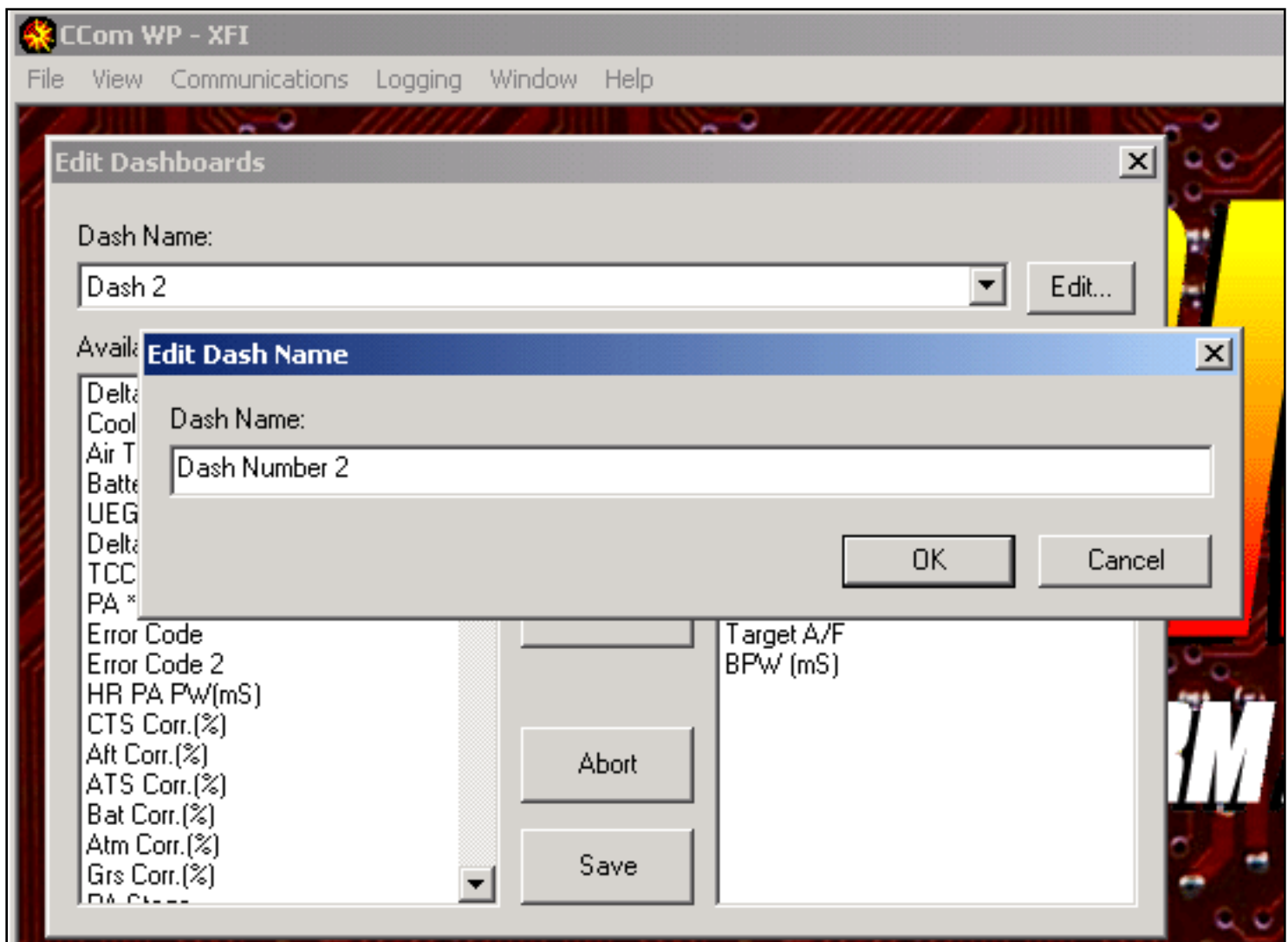
- Select FILE/DASHBOARD SETUP from the pulldown menu.



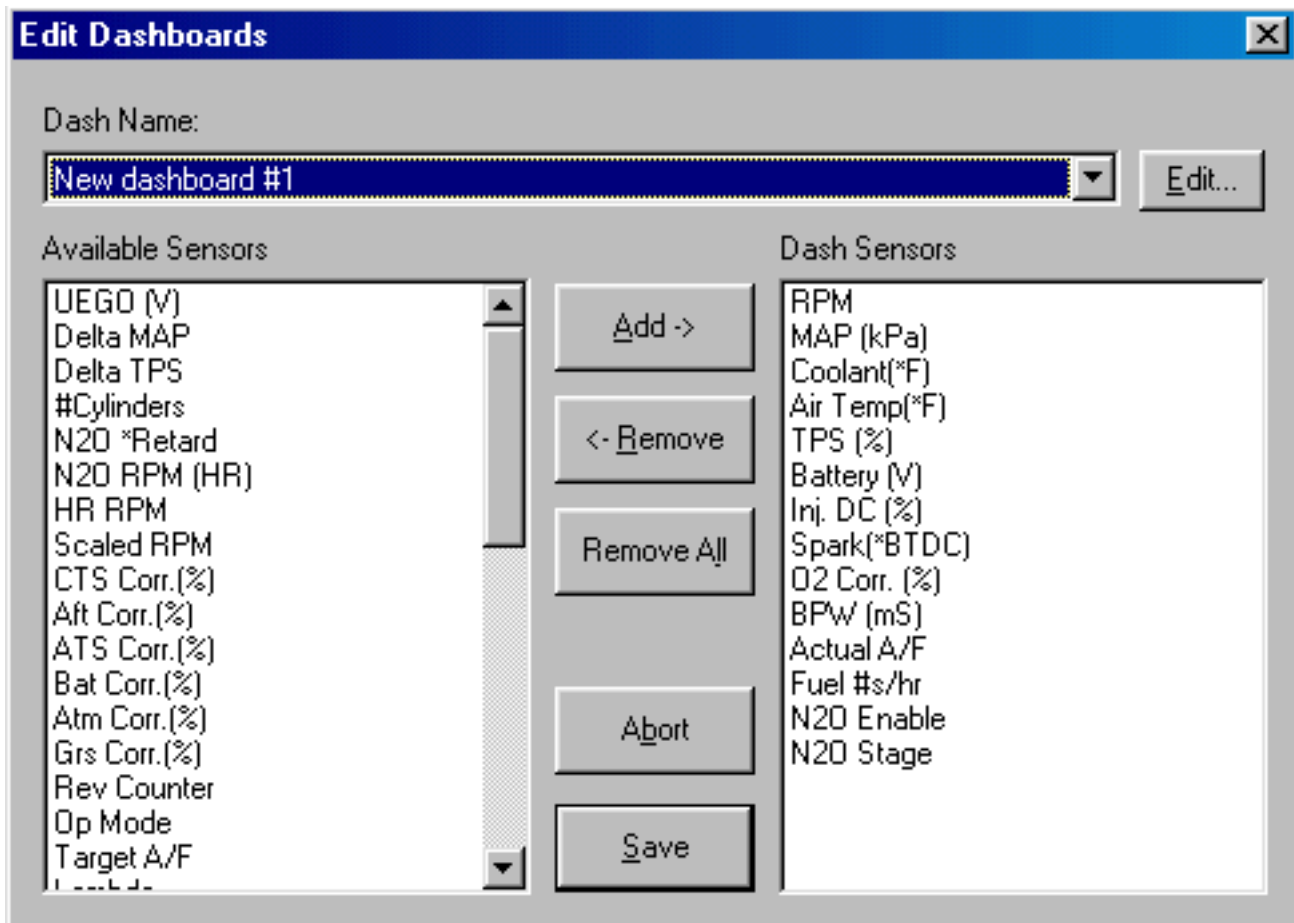
- From the dropdown menu at the top of the dashboard setup window, select which dashboard you want to edit.



- You may change the name of the dashboard by clicking the "Edit" button to the right of the selector.



- A list of sensors currently used in this dashboard will appear at the right, and a list of available sensors will appear at the left.



- To remove a sensor from the dashboard, highlight that sensor on the right and click the REMOVE button. (Clicking REMOVE ALL will remove all sensors from the dashboard.) To add one of the available sensors, select that sensor from the left and click the ADD button. Each dashboard, with the exception of the main dashboard, can contain up to 24 sensors.
- When you are finished making changes, click the SAVE button to finalize your changes. Click the ABORT button if you wish to exit Dashboard setup without saving your changes.

14.4 Channel Descriptions

Channel descriptions can all be found in the [Glossary of Terms](#).

15.0 Knock Retard (ESC) Controls

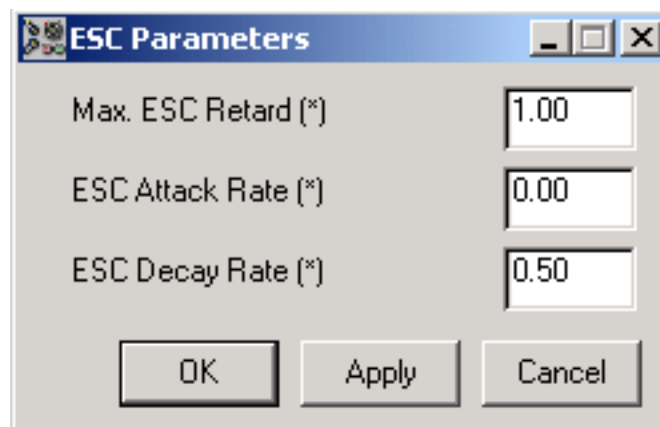
15.1 Overview

These parameters relate to the Electronic Spark Control (knock retard) function. Use of the ESC function requires the installation of a GM ESC module and knock sensor such as that used on a 1987 Buick Grand National.

NOTE - Solid valvetrain components, open exhaust systems and many other high-performance engine components inherently create noise that a knock sensor can perceive to be spark knock, even if the engine is running properly. The end result is that power output can be unnecessarily reduced.

15.2 ESC Parameters

The following parameters can be accessed from the pulldown menus by selecting VIEW/SPARK FUNCTIONS/ESC PARAMETERS:



15.2.1 Max. ESC Retard (*)

This is the maximum amount of timing retard allowed if the knock sensor is activated. Even if knock is still detected once this limit is reached, no more timing will be pulled out.

15.2.2 ESC Attack Rate (*)

This parameter defines the number of degrees to retard the timing every .1 second when the knock sensor is activated. In other words, this parameter is used to set how fast the timing will be pulled out when knock is detected. In the above form, with the attack rate set at 5, the timing would be lowered 5 degrees every .1 second until the knock sensor deactivated, or until the maximum ESC retard limit was reached.

15.2.3 ESC Decay Rate (*)

This parameter defines the number of degrees to remove the timing retard every .1 second after the knock sensor becomes

inactive. In other words, after timing is pulled out due to knock detection, this parameter is used to set how fast the timing will be added back in. If the decay rate is set to 0.50 as above, the timing will come back in at .5 degree per .1 second (or 5 degrees per second) until the ESC retard has reached zero.

16.0 Power Adder Control

16.1 Overview

The ECU has provisions for the use of power adders. There are four separate stages of power adder control. Each stage includes a switched output that can be found in the POWAD connector on the harness. These outputs, which switch to ground, can be wired to the **negative** terminal of relays to control solenoids for the power adder. Each stage also allows for changes to fueling and ignition timing using a variety of control strategies. The stages occur one after the other at specific intervals. These intervals are user programmable. The first stage - and the timer for the second through fourth stages - begins when three conditions have been met. The TPS and RPM values must be above user-programmed thresholds and battery voltage must be applied to the Power Adder Enable input, found in the POWAD connector on the harness. This can be wired to a dash-mounted switch to allow the driver to enable the power adder functions. Or in a drag racing application, it might be wired to a clutch pedal switch or a trans brake switch.

There is also a Sequential Rev Limiting feature available for use as a staging rev limiter. It can be found in the Spark Functions menu. See the Sequential Rev Limiting section for more detail.

16.2 Power Adder Global Parameters

Parameter	Value
Number of Stages (1-4)	2
TPS Enable Threshold (%)	80.0
Activation RPM (>)	3000
De-Activation RPM (<)	2000
PA Fuel Tables	OFF (selected)
Enviro Correction Inhibit	Unchecked
PA Hold Force Max. Stage	Unchecked

16.2.1 Number of Stages (1-4)

This parameter sets the number of power adder stages that will be used.

16.2.2 TPS Enable Threshold (%)

This parameter sets the minimum TPS reading required for the power adder functions to begin (and continue).

16.2.3 Activation RPM (>)

This parameter sets the minimum RPM required for the power adder functions to become active.

16.2.4 De-Activation RPM (<)

This parameter sets the minimum RPM required for the power adder functions to remain active.

NOTE - Once engine RPM exceeds the "Activation RPM (>)" setting, the RPM requirement for Power Adder mode activation is satisfied. If RPM drops below "De-Activation RPM (<)", the power adder mode will be deactivated.

16.2.5 PA Fuel Table options

These radio buttons determine how the Power Adder Fuel Tables are used.

- **PA Fuel Tables OFF** - This means the ECU ignores the Power Adder Fuel Tables so that power adder stages can be used to affect timing only.
- **PA Fuel Tables Exclusive** - This means once the power adder enable conditions are met, the ECU will not use the Base Fuel Table to determine the amount of fuel to inject. Instead, it will rely solely on the Power Adder Fuel Tables. In this mode, the Power Adder Fuel Tables **MUST** be programmed to include enough fuel for regular engine running plus the extra fuel required to satisfy the needs of the power adder.
- **PA Fuel Tables Additive** - This means once the power adder enable conditions are met, the ECU will continue to use the Base Fuel Table to determine the amount of fuel to inject. But it will now add the amount of fuel programmed into the Power Adder Fuel Tables over and above Base Fuel. In this mode, the Power Adder Fuel Tables would be programmed to just include the extra fuel required to satisfy the needs of the power adder.

16.2.6 Enviro Correction Inhibit

The ECU normally makes fueling adjustments to compensate for changing air temperature, coolant temperature and barometric pressure. When this option is selected, and the power adder enable conditions are met, these fuel adjustments are disabled. Caution should be exercised if selecting this option. With the fuel adjustments disabled, the same calibration file may run differently from location to location, from day to day, or even from hour to hour depending on ambient conditions. While using this option, the user will have to manually compensate for changing ambient conditions by making other changes to the calibration file.

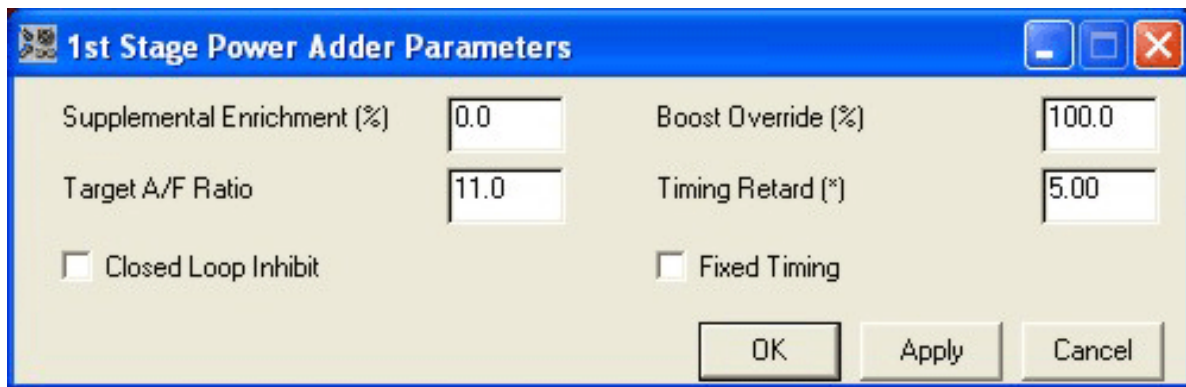
16.2.7 PA Hold/Force Max. Stage

This feature has two very different functions attached to it which are the Power Adder Hold and the Force Max. Stage. Both can be very useful while using the Power Adder functions.

- **Power Adder Hold** – This is the function used when the radio button found in the Power Adder Global Parameters screen is left *unchecked*. This is used to pause the power adder timer. Wiring the pink wire found on pin E of the POWAD connector to a button is usually the best way to apply this function. The other side of the button needs to be wired to ground so that when you apply the button the function is applied as the input is **grounded**. This function is explained in more detail below in the **Power Adder Hold** section.
- **Force Max. Stage** - When the radio button is *checked* in the Power Adder Global Parameters screen, it changes the function of the Power Adder Hold input to the Force Max. Stage mode. Instead of pausing the power adder timer, this will immediately advance the power adder functions to the highest programmed stage. That is, if the "Number of Stages (1-4)" parameter is set to 3, and the Power Adder Hold input is **grounded**, again usually through a button wired to a ground, the fuel enrichment, timing retard and target A/F ratio that have been set for the 3rd stage will be used. This is handy for the bracket racer that likes to use nitrous to race the finish line.

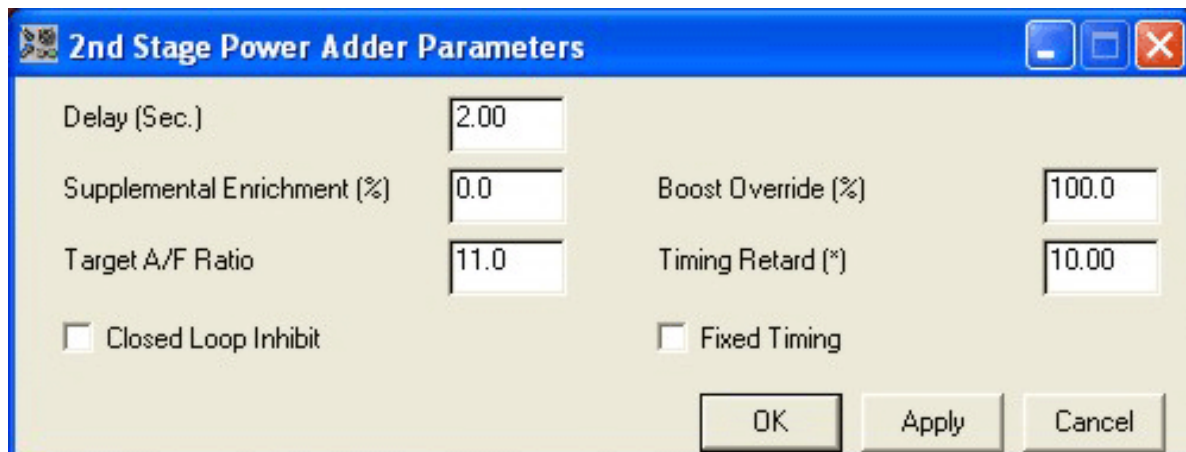
16.3 1st through 4th Stage Parameters

Each of the power adder stages allow for changes to fueling and ignition timing. Each stage has a separate setup window for these functions.



1st Stage Power Adder Parameters

Supplemental Enrichment (%)	<input type="text" value="0.0"/>	Boost Override (%)	<input type="text" value="100.0"/>
Target A/F Ratio	<input type="text" value="11.0"/>	Timing Retard (*)	<input type="text" value="5.00"/>
<input type="checkbox"/> Closed Loop Inhibit		<input type="checkbox"/> Fixed Timing	
<input type="button" value="OK"/> <input type="button" value="Apply"/> <input type="button" value="Cancel"/>			



2nd Stage Power Adder Parameters

Delay (Sec.)	<input type="text" value="2.00"/>		
Supplemental Enrichment (%)	<input type="text" value="0.0"/>	Boost Override (%)	<input type="text" value="100.0"/>
Target A/F Ratio	<input type="text" value="11.0"/>	Timing Retard (*)	<input type="text" value="10.00"/>
<input type="checkbox"/> Closed Loop Inhibit		<input type="checkbox"/> Fixed Timing	
<input type="button" value="OK"/> <input type="button" value="Apply"/> <input type="button" value="Cancel"/>			

16.3.1 Delay (Sec.)

There is no Delay (Sec.) parameter in the 1st Stage Parameters window. When the power adder enable conditions are met, Stage 1 is activated immediately and the power adder timer is started. For Stages 2, 3 and 4, the Delay (Sec.) parameter determines when each succeeding stage will start. These times are cumulative from the time when the power adder timer began. In other words, they represent the elapsed time from when the 1st Stage (or in some cases, the 2nd Stage) has started - not the time after the previous stage started.

For example, assume the 2nd stage delay is set to 2 seconds and the 3rd stage delay is set to 3 seconds. Once the power adder enable conditions are met, Stage 1 will activate. Stage 2 will activate 2 seconds after Stage 1. And Stage 3 will activate 1 second after Stage 2 (or 3 total seconds after Stage 1).

16.3.2 Supplemental Enrichment (%)

With each stage, the user has the option to increase the amount of fuel being injected by a set percentage. This feature can be used in addition to or in place of the Power Adder Fuel Tables. A positive number adds fuel. A negative number reduces fuel. For example, enter 10 to add 10% more fuel.

16.3.3 Target A/F Ratio

With each stage, the user specifies the desired air/fuel ratio. This setting overrides the A/F Ratio Table normally used by the ECU to determine the desired ratio.

16.3.4 Closed Loop Inhibit

With each stage, the user has the option to disable closed loop fuel control. When this option is selected, the ECU will inject the amount of fuel programmed into the various fuel tables without attempting to achieve any certain air/fuel ratio. Closed loop mode is globally enabled in the

Closed Loop Parameters screen. If it is not enabled there, this setting has no effect.

16.3.5 Timing Retard (*)

With each stage, the user has the option to retard ignition timing by a set amount. These values are total degrees of retard from base timing - not an additional amount to retard relative to the previous stage.

For example, assume the 1st stage has Timing Retard set to 10° and that the 2nd stage needs to be retarded an additional 6° - for a total retard of 16°. In this case, the 2nd stage Timing Retard would be set to 16° (the total retard) - **not** 6° (the change from the 1st stage).

16.3.6 Fixed Timing

With each stage, the user has the option to specify the exact amount of ignition timing to be used. When this option is selected, the ignition timing will be fixed at the value entered in the Timing Retard (*) parameter. The only exception is if the PA Ramp Retard feature is being used. In which case, the timing may temporarily be retarded from the user specified fixed timing.

16.4 PA Ramp Retard Table

The PA Ramp Retard feature retards ignition timing when the Power Adder mode is activated (i.e. when TPS, RPM and switch conditions are met). Timing is then added back according to a user programmable curve.

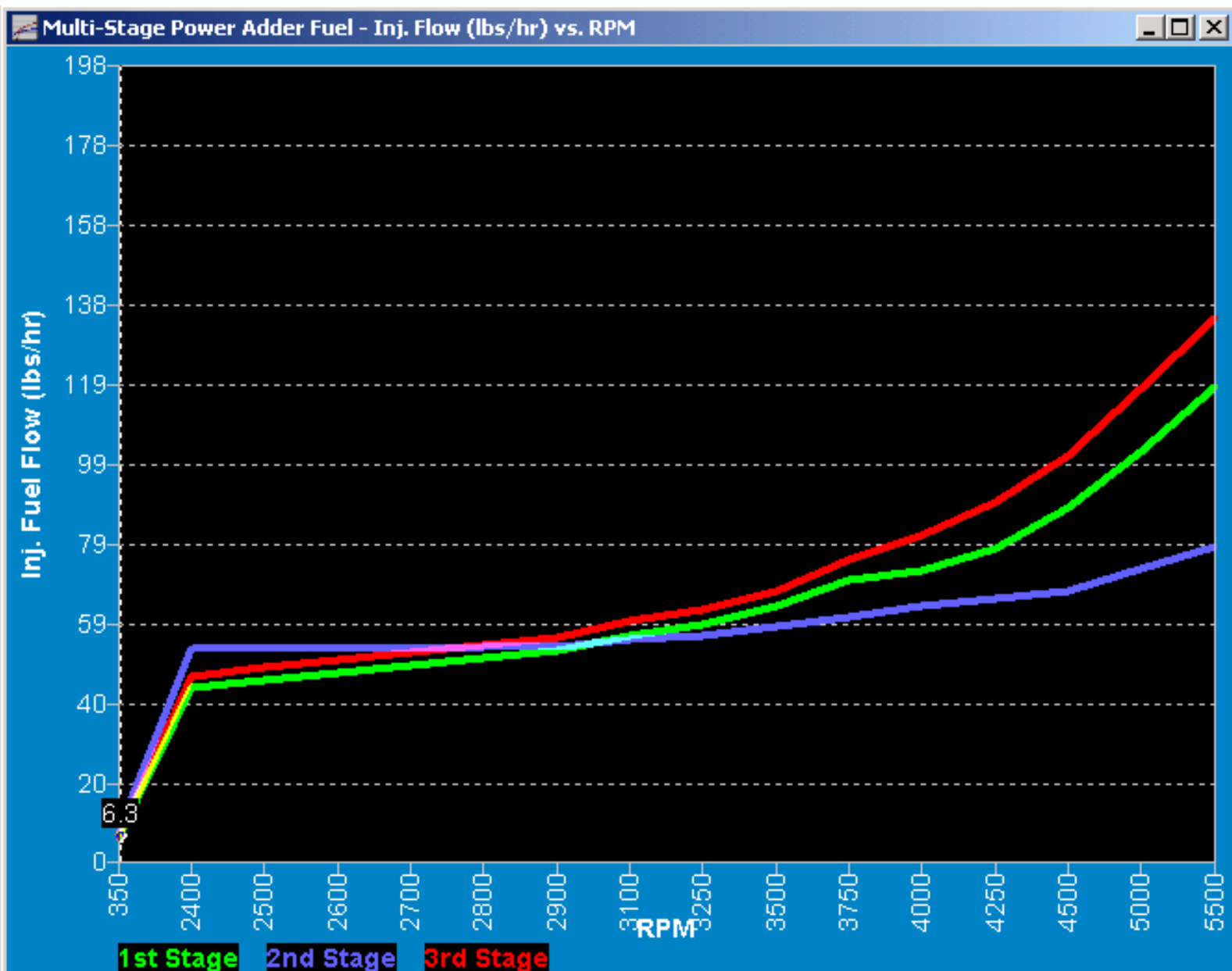
The PA Ramp Retard Table is a 2D table of PA Ramp Retard vs. PA Elapsed Time (time in seconds since the Power Adder mode was activated). The first time set point (furthest to the left) that defines the PA Elapsed Time axis would normally be 0. The rest can be changed to suit the application. To change a set point, move the cursor over it, (the cursor will change to a pointy finger) double click on it and enter the new value. (**NOTE:** Keep in mind that each set point must be a greater value than the previous set point.) Once the time set points have been defined, the amount of timing that the PA Ramp Retard feature takes out can be specified for each one.

Each stage allows the ignition timing to be left alone, retarded by a set amount from the current values in the Base Spark Table, or set to a user specified value. The PA Ramp Retard feature acts independently of those options. The PA Ramp Retard feature can be used by itself or with the ignition timing adjustments made in the individual stages.

For example, assume a single power adder stage is being used. And the first stage is programmed to retard ignition timing by 10°. Further assume the PA Ramp Retard Table is set to 6° at time 0 and decreases with time. Once the three power adder enable conditions are met, ignition timing will immediately be retarded 16° (10° for stage 1 plus 6° for PA Ramp Retard). As time passes, the 6° taken out by the PA Ramp Retard feature will be added back until the ignition timing is running at the 10° retarded value as commanded by the stage 1 settings.

If the PA Ramp Retard feature is not needed, the entire PA Ramp Retard Table should be set to "0".

16.5 Power Adder Fuel Tables



This is a 2D table of injector flow rate (in lbs/hr) vs. RPM. There are three separate curves corresponding to the first three power adder stages. Depending on settings in Power Adder Global Parameters, these curves either do nothing, define the total amount of fuel used, or define an additional amount of fuel to be added during power adder operation.

The [TAB] key toggles between the curves. The set points on the RPM axis can be changed to suit your particular application. To change a set point, move the cursor over it, (the cursor will change to a pointy finger) double click on it and enter the new value. **NOTE** - Keep in mind that each set point must be a greater value than the previous set point.

16.6 Power Adder Hold

As mentioned above, there is a power adder timer that begins when the power adder enable conditions (TPS, RPM, Power Adder Enable switch) are met. This timer controls when the 2nd, 3rd and 4th stages activate. It also controls the removal of timing retard implemented by the PA Ramp Retard feature.

The Power Adder Hold input, found in POWAD connector on the harness, can be used to pause the power adder timer. **Grounding** this input activates the Power Adder Hold function. With the power adder timer paused, no further stages will be activated. Also, if the ignition timing is recovering from the PA Ramp Retard feature, the timing will freeze where it is. When the Power Adder Hold input is deactivated, the power adder

timer resumes and stage activation and PA Ramp Retard recovery will pick up where they left off.

One example of when this may be used is if the driver senses a loss of traction. There would be no sense in continuing with more power adder stages if the chassis is not prepared to deal with them. Once the car has settled, the Power Adder Hold input could be deactivated and the remaining stages would be allowed to continue.

If the Power Adder Hold input is activated before the power adder enable conditions are met, Stage 1 will activate as normal (grounding its switched output and making its programmed fuel and ignition timing changes). But the PA Ramp Retard feature will not retard the timing. Again, when the Power Adder Hold input is deactivated, the power adder timer resumes and stage activation will progress as normal. And now the PA Ramp Retard feature will retard the timing as programmed and continue to feed it back in as normal (as long as the Power Adder Hold input is not reactivated).

This scenario may be useful in a turbocharged drag racing application as an aid to turbo spool up. With the Power Adder Hold activated, Stage 1 could be activated and used to increase fuel delivery and retard timing to get combustion to continue far enough into the exhaust system to help spool the turbo. The Stage 1 switched output could be used to activate an intercooler mister or any other useful function. When the car is ready to leave the line, the Power Adder Hold input is deactivated. At that time, the PA Ramp Retard feature operates. And if the delay for the 2nd Stage were set to "0", the 2nd stage would begin immediately. Stage 2 would have fuel and timing adjustments appropriate for full power running as opposed to the Stage 1 settings for turbo spool up.

These are just a couple of examples. There is enough flexibility built into the Power Adder features that with some creativity, very specialized strategies can be developed.

17.0 Boost Control

TPS (%) \ MPH	0	5	25	40	50	60	80	100
80	49.8	56.9	64.3	71.4	78.4	85.5	92.9	100.0
70	42.7	49.8	56.9	64.3	71.4	78.4	85.5	92.9
60	35.7	42.7	49.8	56.9	64.3	71.4	78.4	85.5
50	28.6	35.7	42.7	49.8	56.9	64.3	71.4	78.4
40	21.2	28.6	35.7	42.7	49.8	56.9	64.3	71.4
30	14.1	21.2	28.6	35.7	42.7	49.8	56.9	64.3
20	7.1	14.1	21.2	28.6	35.7	42.7	49.8	56.9
10	0.0	7.1	14.1	21.2	28.6	35.7	42.7	49.8

The Boost Control Table is a 3D table of % Duty Cycle vs. MPH and TPS %. It is an 8 x 8 grid. The set points that define the grid can be changed to suit your particular application. For example, you may want smaller TPS increments in the lower TPS range for finer control of boost for improved drivability.

To change a set point, move the cursor over it, (the cursor will change to a pointy finger) double click on it and enter the new value. **NOTE** - Keep in mind that each set point must be a greater value than the previous set point.

The ECU can control turbo boost by using a pulse width modulated (PWM) output (ECU pin C8) wired to a solenoid. This solenoid is plumbed between the intake manifold and a wastegate. By altering the % Duty Cycle (the amount of solenoid opening – higher number means more opening), the wastegate is exposed to more or less of the pressure in the intake manifold. This is how the ECU influences the opening and closing of the wastegate and thus controls the amount of boost the turbo makes.

There are two common methods for plumbing the solenoid and the wastegate. One method is to use the solenoid to bleed pressure from the bottom side of the waste gate's diaphragm (the side opposite the spring). Since the waste gate sees less pressure, it remains closed longer – and allows the turbo to produce higher boost.

Another method is to plumb one line straight from the intake manifold to the bottom side of the waste gate's diaphragm and a second line between the intake manifold and the top side of the waste gate's diaphragm (the side

with the spring). A 3 way solenoid is plumbed in series with the second line. The solenoid feeds either atmospheric pressure or some amount of manifold pressure to the top side of the waste gate. When pressure is fed to the top side of the waste gate, it helps the spring keep the waste gate closed.

These examples are meant to show that boost control can be physically implemented in different ways. For this reason, a larger duty cycle may mean more boost or it may mean less boost is produced. Consult your tuner or turbo equipment supplier for information on your application.

XFI™'s boost control is an open loop system. The ECU will strictly use the % Duty Cycle specified in the Boost Control Table regardless of the resulting boost levels. It is important to carefully monitor boost pressure ("MAP (kPa)" channel) as % Duty Cycle ("Boost %DC" channel) is adjusted during initial tuning. Also note that the Boost Control Table will have to be retuned if parts are changed – different turbo, different spring in wastegate, etc.

Keep in mind that the ECU does not directly control the wastegate. It manipulates the operation of a mechanical system. If an improper component is being used – maybe the wastegate spring is grossly over or undersized - the ECU may not have full control over boost. Monitor the "Boost %DC" channel. If you find that it has gone to 0% or 100% duty cycle and you still have not achieved the desired boost level, the problem is not ECU related.

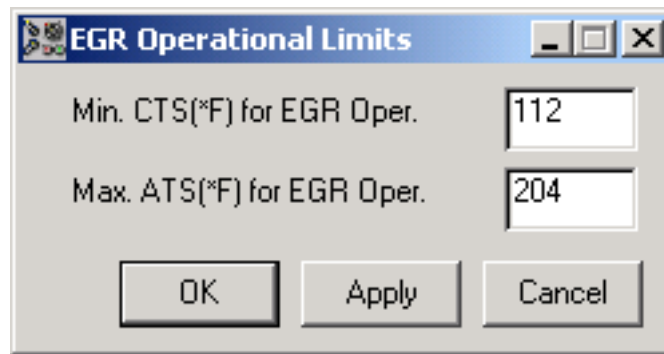
When adding a turbocharger to an engine, make sure the ECU is running in Speed Density mode. This can be verified by selecting VIEW/SYSTEM CONFIGURATION/OPERATIONAL PARAMETERS.

18.0 EGR Control

18.1 Overview

Exhaust Gas Recirculation (EGR) is primarily used for emissions control. It routes some of the exhaust gas back into the intake tract. The ECU can control EGR using a pulse width modulated (PWM) output (ECU pin C7) wired to a solenoid. By altering the % Duty Cycle (the amount of solenoid opening – higher number means more opening), the ECU controls the amount of exhaust gas being re-circulated.

18.2 EGR Parameters



18.2.1 Min. CTS(*F) for EGR Oper.

This parameter sets the minimum coolant temperature required for EGR control to be enabled. EGR is generally not desirable when the engine is cold. This parameter should be set to the engines normal operating temperature.

IMPORTANT NOTE - If a CTS fault code is set, the EGR function is disabled. See the [Service Engine Soon / Fault Codes](#) section for more detail.

18.2.2 Max. ATS(*F) for EGR Oper.

This parameter sets the maximum air temperature for EGR control to be enabled. A major effect of EGR is heating the intake charge. When the intake air temperature is high – from hot weather, forced induction, etc. – the risk of knock increases. In this situation, EGR would be disabled to keep from heating the intake air even further.

IMPORTANT NOTE - If a CTS fault code is set, the EGR function is disabled. See the [Service Engine Soon / Fault Codes](#) section for more detail.

18.3 EGR Table

TPS (%) \ MPH	5	20	30	40	50	60	70	100
100	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8
75	84.7	86.7	88.6	90.6	92.9	94.9	96.9	98.8
60	70.6	74.5	78.8	82.7	86.7	90.6	94.9	98.8
50	56.5	62.4	68.6	74.5	80.8	86.7	92.9	98.8
40	42.4	50.6	58.4	66.7	74.5	82.7	90.6	98.8
30	28.2	38.4	48.2	58.4	68.6	78.8	88.6	98.8
20	14.1	26.3	38.4	50.6	62.4	74.5	86.7	98.8
0	0.0	14.1	28.2	42.4	56.5	70.6	84.7	98.8

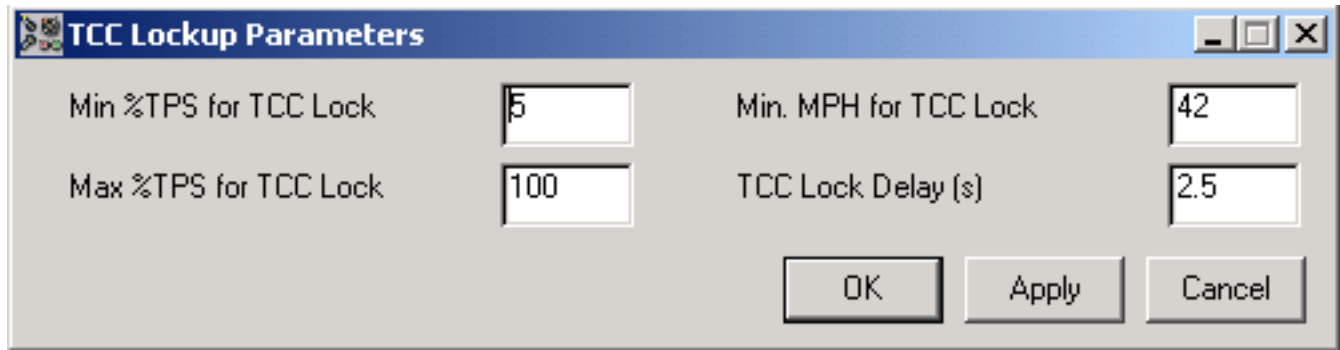
The EGR table is a 3D table of % Duty Cycle vs. MPH and TPS %. It is an 8 x 8 grid. The set points that define the grid can be changed to suit your particular application.

To change a set point, move the cursor over it, (the cursor will change to a pointy finger) double click on it and enter the new value. Keep in mind that each set point must be a greater value than the previous set point.

19.0 TCC Lockup Parameters

19.1 Overview

The ECU can control a torque converter clutch (TCC) in an automatic transmission. The TCC output (ECU pin B6) is switched to **ground** when the ECU determines the TCC should be locked. The ECU will lock the TCC when %TPS and vehicle speed meet user-defined thresholds. To get vehicle mile per hour, your vehicle must be equipped with a vehicle speed sensor (VSS). That VSS will need to be calibrated to your ECU using the Rate Sensor Calibration found below in this section.



Parameter	Value
Min %TPS for TCC Lock	5
Max %TPS for TCC Lock	100
Min. MPH for TCC Lock	42
TCC Lock Delay (s)	2.5

19.2 Min %TPS for TCC Lock

This parameter sets the minimum %TPS required for TCC lockup. It is used to prevent TCC lockup during closed throttle coast down. By unlocking the TCC, the engine is allowed to rev lower to conserve fuel. This would normally be set between the "TPS %" readings at idle and cruise. It needs to be set lower than the "Max %TPS for TCC Lock" setting.

19.3 Max %TPS for TCC Lock

This parameter sets the maximum allowed %TPS for TCC lockup. It is used to prevent TCC lockup during heavy acceleration. An unlocked TCC will prevent wear and allow the benefits of torque multiplication to be realized. This would normally be set between the "TPS %" readings at cruise and at WOT. It needs to be set higher than the "Min %TPS for TCC Lock" setting.

19.4 Min. MPH for TCC Lock

This parameter sets the minimum vehicle speed required for TCC lockup. This setting is used to prevent TCC lockup at low speeds, which could lead to stalling. To use this feature correctly, you must make sure the MPH you're using for vehicle speed is calibrated correctly. See [Section 6.6](#) for further details of how to set this up to operate correctly.

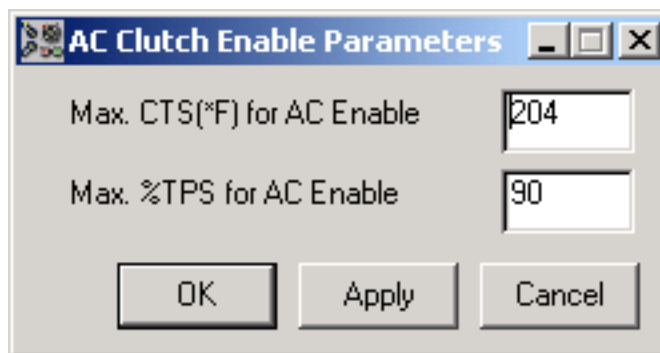
19.5 TCC Lock Delay (s)

This parameter sets the length of time the %TPS and vehicle speed enable conditions must be met before the TCC will lock – or conversely, the length of time the enable conditions must be unmet before the TCC will unlock. This feature prevents repeated locking and unlocking when %TPS or MPH is right at one of the enable thresholds.

20.0 A/C Control

20.1 Overview

To enable an A/C clutch, the ECU switches pin B11 to **ground**. This can be wired to the **negative** terminal of a relay to allow the ECU to override an A/C request from an A/C switch in the car.



20.2 Max CTS(*F) for AC Enable

An A/C compressor puts an additional load on an engine. Removing this extra load can help prevent engine overheating in hot weather, heavy traffic, etc. This parameter tells the ECU to disable the A/C clutch if the engine coolant gets too hot. Enter a coolant temperature in *F.

20.3 Max %TPS for AC Enable

The load from an A/C compressor reduces the total power available for driving the wheels. While idling or cruising, this is not a problem as the engine is using only a small percentage of its maximum power. However, during heavy acceleration, this can affect the vehicle's performance. This parameter tells the ECU to disable the A/C clutch whenever the throttle is opened past a certain point. Enter a %TPS reading above which the A/C clutch should be disabled.

20.4 A/C Idle Increase (RPM)

When an additional load is applied to an idling engine – such as an A/C compressor - it may be necessary to increase the engine's idle speed. When the ECU receives a signal that the A/C compressor (or other load) has been turned on, it will add this amount to the target idle speed from the Idle Speed vs. Coolant Temp table. **Grounding** ECU pin A24 activates this feature.

This feature may also be useful for marine applications where shifting into gear can significantly change the load on the engine.

If there was a situation where a reduced idle speed was desired in a certain situation, this feature could be operated in reverse. Apply a negative offset to the entire Idle Speed vs. Coolant Temp table. Enter the amount of that offset in the A/C Idle Increase (RPM) parameter. Wire ECU pin A24 so that it is normally **grounded**. This way, the idle increase function will keep the idle up to the normal speed. When the lower idle is needed, unground ECU pin A24. The idle increase function will be disabled and the engine will drop down to the idle speed specified in the Idle Speed vs. Coolant Temp table.

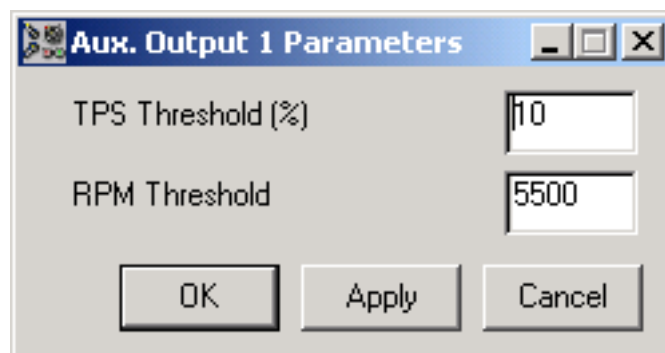
21.0 Aux. Outputs

21.1 Overview

The ECU has four user-programmable auxiliary outputs (ECU pins B1, B2, B3 and B4). These outputs can be used to control a wide variety of functions. They switch to **ground** when triggered. Each output is rated at 2 Amps. Relays can be used to control devices with higher current draw. The current draw of many devices (solenoids, actuators, etc.) can be determined by dividing battery voltage by the resistance (in Ohms) measured across the device. When in doubt, use a relay.

Each auxiliary output has two enable conditions that must be met to activate it. Additionally, the ECU must be receiving an RPM signal for any of the auxiliary outputs to activate. TPS is an enable condition for all of the auxiliary outputs. If a TPS Threshold (%) parameter is set to "0", the output can be triggered strictly off the second enable condition if desired. Alternately, by setting any of the second enable condition thresholds to "0", you can create an auxiliary output triggered strictly by throttle position.

21.2 Aux. Out 1



21.2.1 TPS Threshold (%)

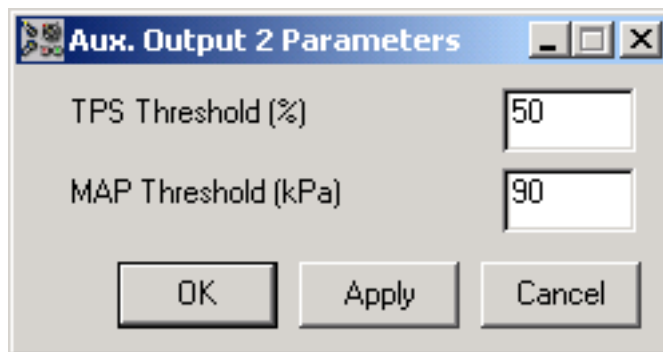
This parameter sets the minimum %TPS required to activate auxiliary output 1.

21.2.2 RPM Threshold

This parameter sets the minimum RPM required to activate auxiliary output 1.

As an example, this output could be wired to a lamp in the car to function as a shift light. Or it could be used to control a two stage, RPM related feature of the engine – such as variable length intake runners or a variable valve lift or timing system.

21.3 Aux. Out 2



21.3.1 TPS Threshold (%)

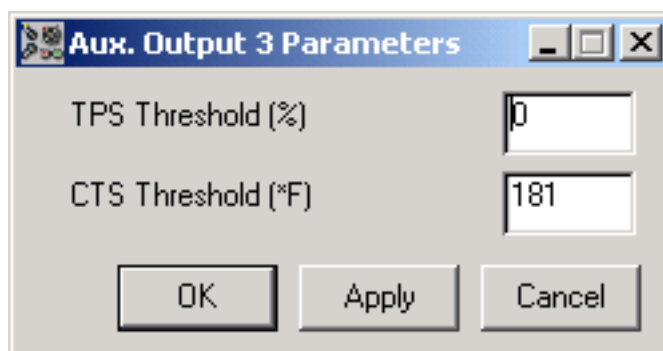
This parameter sets the minimum %TPS required to activate auxiliary output 2.

21.3.2 MAP Threshold (kPa)

This parameter sets the minimum MAP reading required to activate auxiliary output 2.

As an example, this output could be used as an over boost fail-safe feature. With a little wiring creativity, this output could be made to disable injection or ignition if higher than intended boost levels are detected. Or it could be wired to force the boost control solenoid fully open or fully closed – whichever state reduces boost given the engine's solenoid/wastegate plumbing.

21.4 Aux. Out 3



21.4.1 TPS Threshold (%)

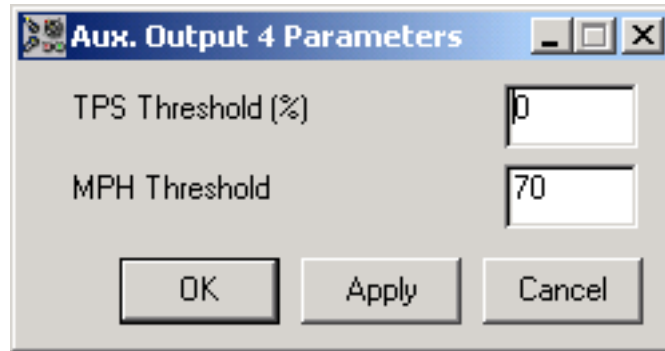
This parameter sets the minimum %TPS required to activate auxiliary output 3.

21.4.2 CTS Threshold (*F)

This parameter sets the minimum coolant temperature required to activate auxiliary output 3.

As an example, this output could be used to control an electric cooling fan.

21.5 Aux. Out 4



21.5.1 TPS Threshold (%)

This parameter sets the minimum %TPS required to activate auxiliary output 4.

21.5.2 MPH Threshold

This parameter sets the minimum vehicle speed required to activate auxiliary output 4.

As an example, this output could be used to deploy an aerodynamic aid – such as the retractable rear spoiler on some modern sports cars. Or it could be used as a makeshift “valet” mode. With the MPH Threshold set a little above parking lot speed and the output wired to a painfully loud audible siren (with a hidden power switch), valets or other distrusted drivers would be discouraged from joy riding.

22.0 Individual Cylinder Control

Individual Cylinder Corrections			
Cyl. #6 Enrichment (%)	0.0	Cyl. #1 Timing Retard (*)	0.00
Cyl. #5 Enrichment (%)	0.0	Cyl. #8 Timing Retard (*)	0.00
Cyl. #7 Enrichment (%)	0.0	Cyl. #4 Timing Retard (*)	0.00
Cyl. #2 Enrichment (%)	0.0	Cyl. #3 Timing Retard (*)	0.00
Cyl. #1 Enrichment (%)	0.0	Cyl. #6 Timing Retard (*)	0.00
Cyl. #8 Enrichment (%)	0.0	Cyl. #5 Timing Retard (*)	0.00
Cyl. #4 Enrichment (%)	0.0	Cyl. #7 Timing Retard (*)	0.00
Cyl. #3 Enrichment (%)	0.0	Cyl. #2 Timing Retard (*)	0.00
<input type="button" value="OK"/> <input type="button" value="Apply"/> <input type="button" value="Cancel"/>			

This menu selection will display a form used to modify ignition timing and fuel delivery for each individual cylinder. In order for your ECU to use these settings, your system must have a cam input signal and be running in Sequential mode. Without a cam input signal, the ECU will be forced to randomly apply the corrections listed in the table to any cylinder that they fall on since there will be no way for the ECU to know which cylinder it is on. These corrections will be applied whenever the TPS(%) channel is above the Max TPS for Idle(%) parameter.

The left hand column on the form is used to specify a percentage of fuel to add (positive percentage) or remove (negative percentage) for the indicated cylinder.

The right hand column on the form is used to specify a number of degrees to retard the ignition timing signal for the indicated cylinder. This field can only be used to specify a timing retard; it cannot be used to advance the timing for that cylinder.

It is necessary that the ECU receives a cam sync signal from the engine between 10 and 80 degrees before the #1 crank signal. In order to verify that this is set up correctly, enter a 10 degree timing retard for cylinder #1 and verify with a timing light that the timing for cylinder #1 is retarded by 10 degrees. If you do not find this to be the case, see [Cam Sync Precedes Cylinder](#) to correct this problem.

23.0 Auxiliary Analog Sensor Setup

23.1 Overview

The ECU has provisions for 8 analog inputs. These can be used to monitor and record a variety of engine or chassis parameters. The ECU is designed to accept linear 0-5 volt inputs. Fuel pressure and oil pressure are two simple and extremely useful sensors to have. Other examples include crankcase pressure, EGT's (requires use of an external thermocouple amplifier), suspension travel, etc. These inputs are found in the ANALOG connector on the main harness. See [Analog](#) in section 2.0 Hardware Installation and Wiring.

Configure User Analog Sensors

Select Sensor: AAUX1(V)

Edit Sensor Name: AAUX1(V)

Sensor Gain: 1.000000

Sensor Offset: 0.000000

Sensor High Limit: 5.000000

Sensor Low Limit: 0.000000

Displayed Decimal Places: 2

Note
 These parameters configure the 0-5 Volt Auxilliary Analog Sensor channels for use by the user.
 Displayed sensor values can be calibrated as:

$$\text{Value} = (\text{Sensor Volts} \times \text{Sensor Gain}) + \text{Sensor Offset}$$

Cancel OK

23.2 Select Sensor

This pull down menu is used to select an analog input to configure. Once all the desired changes are made, click the OK button. This will apply the changes and close the window. If you select a different channel from the pull down menu before clicking the OK button, any changes you have made will be lost.

23.3 Edit Sensor Name

This field is used to change the name of the currently selected analog input – the one selected with the Select Sensor pull down menu. The analog inputs have generic names (AAUX1(V), AAUX2(V), etc.) to start. When an analog input is configured for a particular sensor, it can be given a more descriptive name - "Fuel PSI", "EGT #1", etc. The names can be up to 14 characters long.

23.4 Sensor Gain and Sensor Offset

Sensors output a varying voltage signal that corresponds to some measured physical property – pressure, temperature, position, etc. The Sensor Gain and Sensor Offset numbers are used to calibrate the sensor voltage into useful units (psi for fuel pressure, °F for EGT's, etc.).

The value that will be displayed is given by this equation:

$$\text{Value} = (\text{Sensor Volts} * \text{Sensor Gain}) + \text{Sensor Offset}$$

The sensor manufacturer should supply the gain and offset numbers. If they don't, the gain and offset numbers can be obtained experimentally by observing the raw sensor voltage at two different known references. To view the analog sensor channels, open the Master Dash with the F9 key (If these channels are not displayed, you may need to edit the Master Dash setup by selecting FILE/DASHBOARD SETUP...)

As an example, the following steps will calibrate a fuel pressure sensor:

1. Set Sensor Gain to "1", Sensor Offset to "0" and Displayed Decimal Places to "2". This will allow you to read raw sensor voltage as seen by the ECU.
2. Record the raw sensor voltage at the first known pressure. The pressure can be read from a mechanical gauge or from another calibrated sensor. We will call these two numbers [Raw1, Value1]. For our example, we'll say the sensor reads 1.70V at 45 psi. [1.70 V, 45 psi]
3. Record the raw sensor voltage at the second known pressure. An adjustable fuel pressure regulator can be used to change the pressure. Or the two readings could be taken with the fuel pump off and then with the fuel pump on. Keep in mind that a wider spread between the two measured pressures will result in a more accurate calibration. We will call the second pair of numbers [Raw2, Value2]. For our example, we'll use [2.42 V, 72 psi]
4. Use the following equations to find the Sensor Gain and Sensor Offset:

$$\text{Sensor Gain} = (\text{Value2} - \text{Value1}) / (\text{Raw2} - \text{Raw1})$$

$$= (72 - 45) / (2.42 - 1.70) = 37.5$$

$$\text{Sensor Offset} = \text{Value1} - (\text{Raw1} * \text{Sensor Gain})$$

$$= 45 - (1.7 * 37.5) = -18.75$$

5. Enter these Sensor Gain and Sensor Offset numbers and verify that the analog sensor channel now

reads correctly in psi.

23.5 Sensor High Limit

This parameter defines the upper threshold for normal, safe readings. If the channel's reading exceeds this limit, the color of its numeric value will change on the dashes and in data logs.

23.6 Sensor Low Limit

This parameter defines the lower threshold for normal, safe readings. If the channel's reading drops below this limit, the color of its numeric value will change on the dashes and in data logs.

23.7 Displayed Decimal Places

This parameter sets the number of decimal places displayed for the channel on the dash displays and in data logs.

23.8 FAST Supplied Sensors

The 0-100 psi pressure transducers supplied by FAST (either separately or as part of the Fuel/Oil Pressure option harnesses) use the following settings.

FAST 0-100 psi Pressure Transducer	
Sensor Gain	25
Sensor Offset	-25

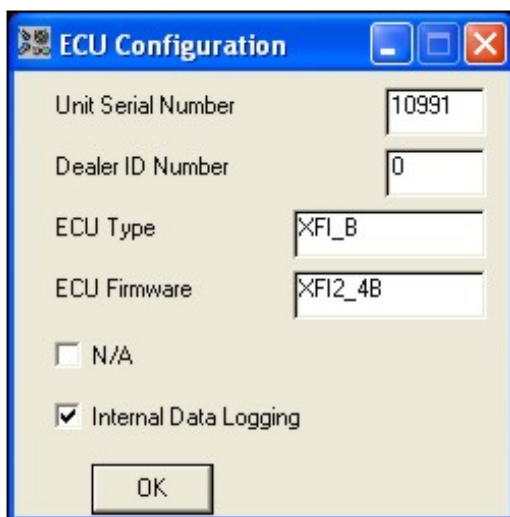
24.0 Datalogging

24.1 Overview

C-ComWP XFI™ has a built-in data logger feature that allows you to record various engine sensor data. Up to 24 sensors can be logged simultaneously, and the log data can be saved for later viewing. This log data can be recorded by utilizing the internal data logging option, connecting a laptop computer inside the vehicle, or by the use of a remote FAST™ data logging device.

If you are using an external FAST™ data logging device, you can skip steps 1 through 4 below and move on to section 24.2 Configuring C-Com XFI for Data Logging. If your XFI™ is equipped with the internal data logging option, you'll need to first verify that your internal data logging option is enabled. To accomplish this, you'll need to follow these four simple steps:

1. Open the C-Com XFI™ software.
2. Establish communications with the ECU. See the Communication Setup section for more detail.
3. Access the pulldown menus by selecting VIEW/DISPLAY ECU CONFIGURATION.

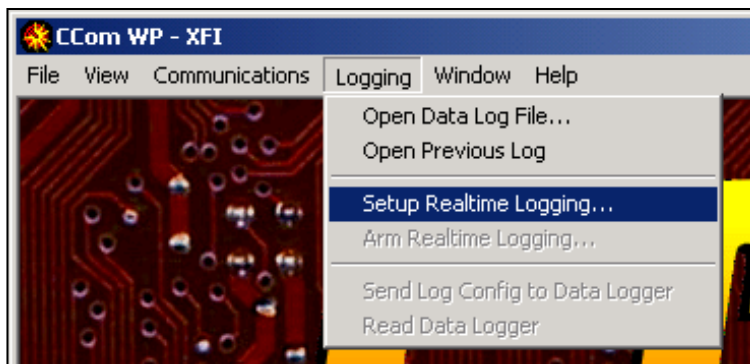


4. Verify there is a check in the box next to Internal Data Logging (If this box is not checked contact a FAST™ representative to purchase the Internal Data Logging option. All FAST XFI™ systems can be upgraded to Internal Data Logging).

Your internal data logging option is now enabled and you are now ready to configure data logging.

24.2 Configuring C-Com WP XFI for Data Logging

Before you begin logging, you should verify that the current dashboard selection and data logging parameters are properly configured. This information can be accessed from the pulldown menus by selecting LOGGING/SETUP REAL-TIME LOGGING.



Realtime Logging Setup

Max Logging Rate: **10 Frames/Sec**

Max Logging Time: **0** MIN **10** SEC

Log Dash Name: **Dash 1**

Trigger Set Point

Sensor: **TPS (%)**

Set Point: **88**

0 100

OK Cancel

24.2.1 Max Logging Rate:

Select the number of frames per second at which to record. You can choose from 1 to 20 frames per second. The value of all logged channels will be recorded this many times per second. A higher logging rate gives more detail in the data. It also produces larger data file sizes. When logging with a laptop, this is not a concern. If using internal data logging or a remote FAST™ data logging device, this will limit the recording time.

24.2.2 Max Logging Time

Set the maximum duration of time for which to log. You can log up to 30 minutes when logging with a laptop. The maximum time that can be logged using internal data logging, or a remote FAST™ data logging device will likely be less depending on number of sensors logged and the logging rate that is used. The following charts can be used as an approximate guide to available logging times. The Max Logging Time can be set beyond the available logging time, but no additional data will be recorded.

Time Available for Logging with FAST Internal Data Logging (in hr:min:sec).					
Based on # of Sensors Logged and Logging Rate					
Sensors Logged	20 Hz	15 Hz	10 Hz	5 Hz	1 Hz
24	0:00:15	0:00:19	0:00:29	0:00:58	0:04:50
22	0:00:16	0:00:21	0:00:31	0:01:03	0:05:15
20	0:00:17	0:00:23	0:00:34	0:01:09	0:05:43
18	0:00:19	0:00:25	0:00:38	0:01:16	0:06:18
16	0:00:21	0:00:28	0:00:42	0:01:24	0:07:00
14	0:00:24	0:00:31	0:00:47	0:01:34	0:07:52
12	0:00:27	0:00:36	0:00:54	0:01:48	0:08:59
10	0:00:31	0:00:42	0:01:03	0:02:06	0:10:29
8	0:00:38	0:00:50	0:01:16	0:02:31	0:12:35
6	0:00:47	0:01:03	0:01:34	0:03:09	0:15:44
4	0:01:03	0:01:24	0:02:06	0:04:12	0:20:59
2	0:01:34	0:02:06	0:03:09	0:06:18	0:31:28

Time Available for Logging with FAST Remote Data Logger (in hr:min:sec).					
Based on # of Sensors Logged and Logging Rate					
Sensors Logged	20 Hz	15 Hz	10 Hz	5 Hz	1 Hz
24	0:01:03	0:01:24	0:02:06	0:04:11	0:20:55

22	0:01:08	0:01:31	0:02:16	0:04:32	0:22:40
20	0:01:14	0:01:39	0:02:28	0:04:57	0:24:44
18	0:01:22	0:01:49	0:02:43	0:05:26	0:27:12
16	0:01:31	0:02:01	0:03:01	0:06:03	0:30:13
14	0:01:42	0:02:16	0:03:24	0:06:48	0:34:00
12	0:01:57	0:02:35	0:03:53	0:07:46	0:38:51
10	0:02:16	0:03:01	0:04:32	0:09:04	0:45:20
8	0:02:43	0:03:38	0:05:26	0:10:53	0:54:24
6	0:03:24	0:04:32	0:06:48	0:13:36	1:08:00
4	0:04:32	0:06:03	0:09:04	0:18:08	1:30:40
2	0:06:48	0:09:04	0:13:36	0:27:12	2:16:00

24.2.3 Log Dash Name

Choose the dashboard you wish to use for logging. The sensors in this dashboard will be the ones that are recorded. To view or edit the sensors included in the different dashboards, use the Dashboard Setup Screen. See the [Setting Up Dashboards](#) section for more detail. Keep in mind the 24 sensor limit. If a dashboard with more than 24 sensors is selected to be logged, only the first 24 sensors will actually be included in the data file. Or if using the remote FAST™ Data Logger, the software will not allow you to configure the data logger if the dashboard selected for logging has more than 24 sensors.

To view or edit the sensors included in the different dashboards, use the Dashboard Setup Screen. See the [Setting Up Dashboards](#) section for more detail.

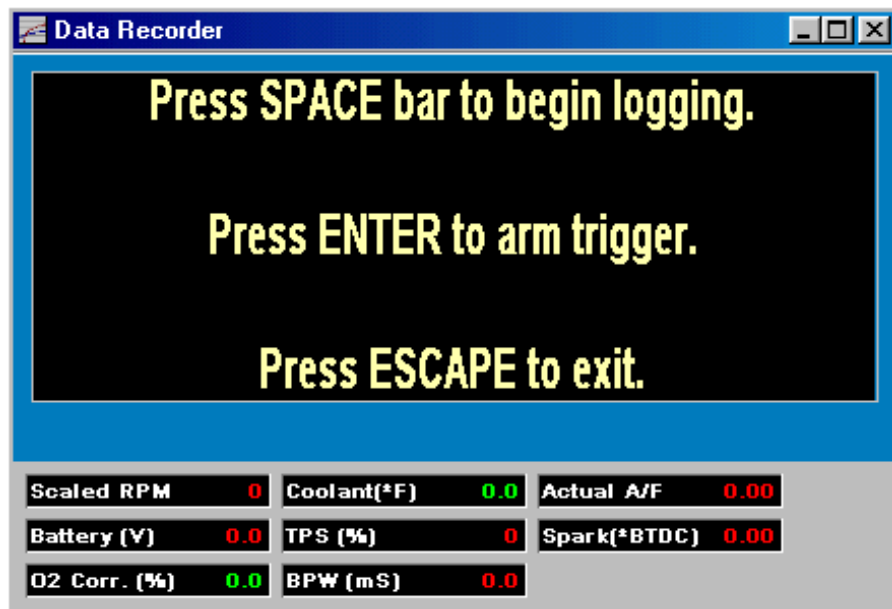
NOTE – If the contents of the selected dashboard are changed, the data logger will need to be reconfigured before data can be properly recorded. For example, assume Dash 8 is selected to be logged. Then assume you have gone into the Dashboard Setup screen and changed some of the sensors included in Dash 8. You will need to resend the log config (see the [Configuring the Remote FAST™ Data Logger](#) section for more detail).

24.2.4 Trigger Set Point

If you wish to use the auto-trigger feature, you may also select a sensor to trigger from and a threshold value at which to trigger. For example, if you select “TPS (%)” with a Set Point of 80, logging would begin when the TPS (%) reading exceeds 80. If you prefer to have manual control of when logging begins with the remote FAST™ Data Logger, select “Manual Trigger”. With that setup, logging will begin as soon as both the arm and trigger wires from the data logger have been grounded.

24.3 Arming and Triggering with a Laptop

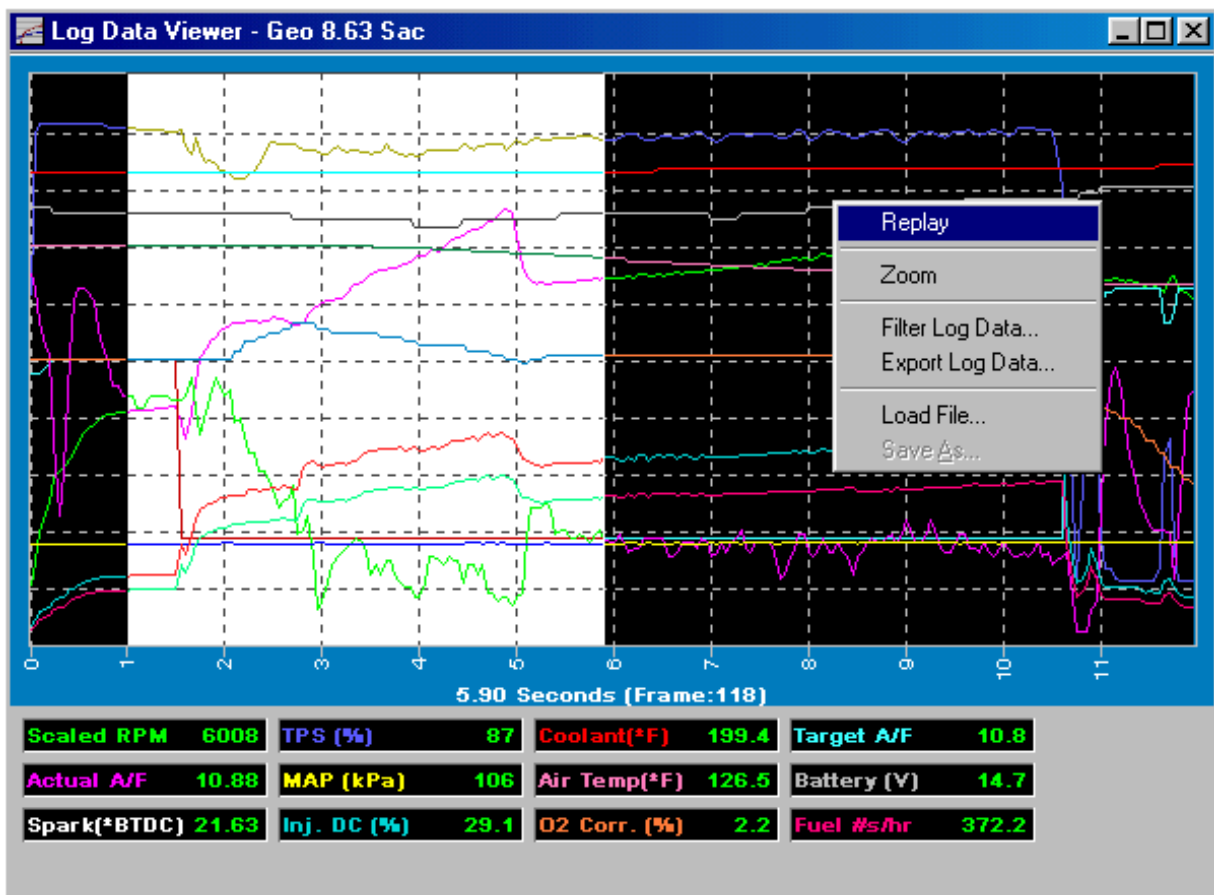
While connected to an ECU and online, the data logging feature can be accessed through the pulldown menus by selecting LOGGING/ARM REAL TIME LOGGING. You may also access the data logger by pressing the F8 key.



When the data logger screen appears, you will be prompted to press the SPACE bar to immediately begin logging or to press the ENTER key to arm the auto-trigger function. Pressing the ENTER key will display a screen showing the current auto-trigger sensor value and the threshold value for that sensor. When the threshold value is exceeded, the data log will begin and continue for the duration specified in the Max Logging Time parameter.

24.4 Reading the information in a data log

Once the data log is complete, a series of colored traces will appear in the data log window. The colors of the traces will correspond to the colors of the text for each of the sensors in the dashboard. There are several features in the data log viewer designed to make reading the data logs easier.



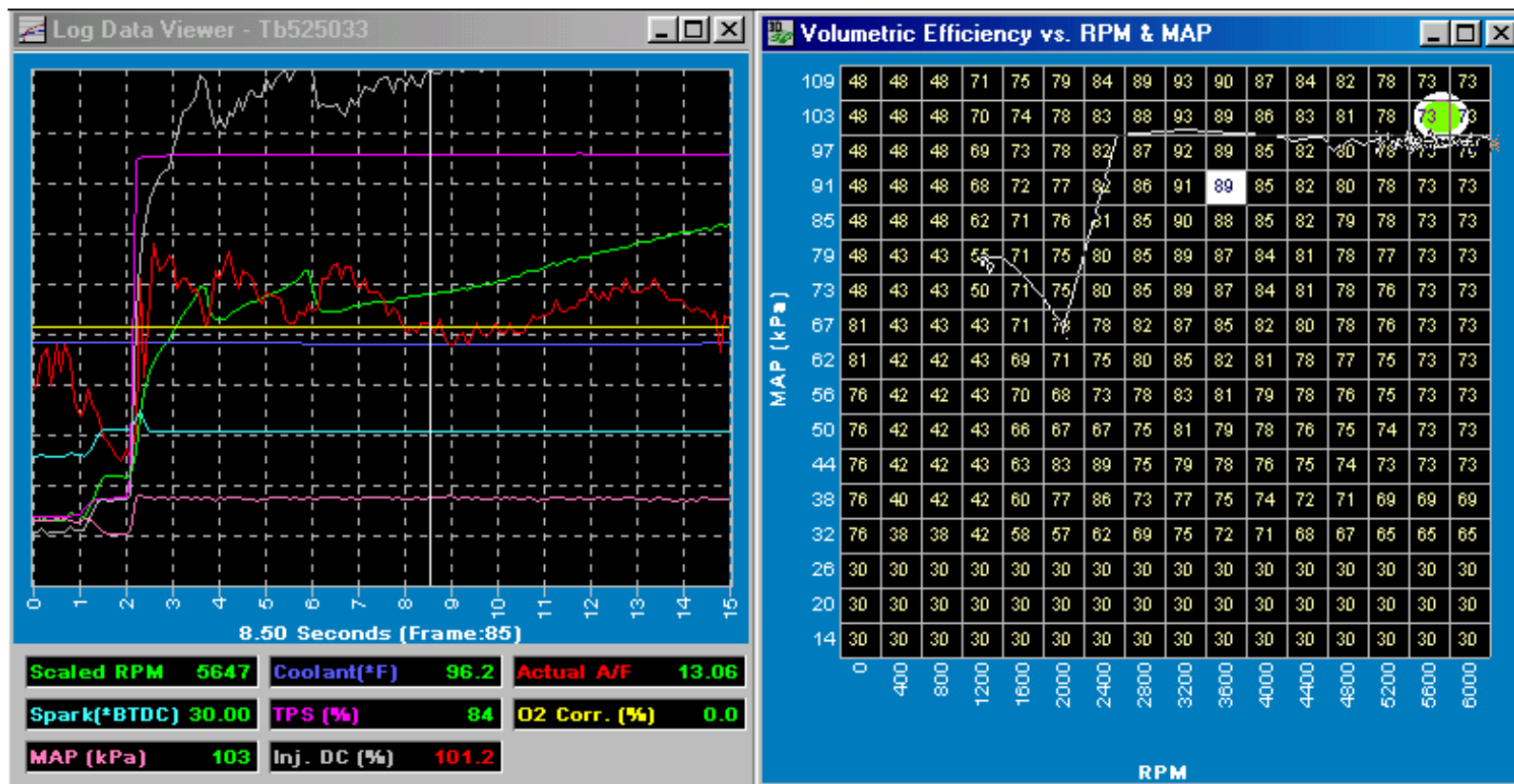
- Double-clicking on any sensor in the dashboard at the bottom of the window will hide the corresponding trace in the data log. On logs with a large number of sensors, this helps reduce "clutter" and makes reading other sensors easier. Double-clicking the sensor again will make the trace re-appear. When the sensor is

hidden, the colored text used to identify the sensor will be displayed in white, as shown above with the "Spark (*BTDC)" sensor.

- By clicking on any location in the data log and dragging the mouse to the left or right, an area of the log will be highlighted in white, as shown above. When you highlight a portion of the data log, the values listed in the dashboard sensors will be that sensor's average value within the highlighted area.
- Right-clicking on the data log will bring up another menu of commands, also shown above:
 - **Replay** will run the cursor in real time through the data log, starting from wherever the cursor is at the time this command is selected.
 - **Zoom** can be used to expand a highlighted portion of the data log to fill the entire window. This is particularly helpful on long data logs where the information appears tightly packed together.
 - **Hide All Data** can be used to hide every data trace in the data log. This is a helpful timesaver for when you'd like to just see a few data traces.
 - **Show All Data** simply returns all data traces to the data log view.
 - **Filter Log Data** allows the user to enter a number between 0 and 0.9 as a gain factor for how much filtering will be applied to the traces in the data log. Filtering is a "smoothing effect" that will greatly reduce the sharp spikes often seen in data logs. 0.9 will apply the maximum amount of filtering, and 0.0 will return the log to its original unfiltered form.
 - **Export Log Data** allows you to save the log file information as either a plain text file (for viewing from Notepad or any word processing application) or a comma-delimited text file (for viewing from Microsoft Excel or similar spreadsheet application).
 - **Load File** allows you to load a previously saved log file into the data log viewer.
 - **Save File** allows you to save the current data log to a file which can be viewed at a later time.

24.5 Overlaying Log Data on a 3D Table

Data log files can be overlaid on the VE Table, the Spark Advance Table, or the Target Air/Fuel Ratio Table. This allows you to step through the data log frame-by-frame to see which cells are being used within these tables at any given point and make any appropriate changes. The tables can be edited while in overlay mode as well.



To overlay a log file:

- The log file must first be saved.
 - For Alpha-N applications, you must have RPM and TPS(%) as two of the sensors being logged.
 - For Speed-Density applications, you must have RPM and MAP (kPa) as two of the sensors being logged.
- Open the 3D table(s) you will be using for the overlay.
 - If you are online, you must hide the dashboard display on the 3D table. This can be done by right clicking on the 3D table window and selecting "Hide Dash".
 - If you are offline, you must first open the calibration file (.gct) used when the data log was created.
- From the pulldown menu, select LOGGING/OPEN DATA LOG FILE and choose the log file to overlay.

- The data logger window will open. As soon as you move the cursor in the data log window, the overlay will appear on the open 3D tables as a trace line with the cursor. Moving the cursor in the data logger window will cause a corresponding movement of the cursor in the 3D tables.

24.6 Using the FAST™ Internal Data Logging Option

The FAST™ Internal Data Logging Option allows data to be recorded within your XFI ECU without requiring a laptop or any other external device to be connected to the system. Once data has been recorded, it is downloaded onto a laptop for viewing.

24.6.1 Configuring Internal Data Logging

In order for the FAST™ Internal Data Logging Option to work correctly, the XFI ECU and the laptop must both be working off the same setup information. This way, the ECU knows which channels it is expected to record and at which logging rate, and the laptop knows what to expect in the data retrieved from the ECU. This ensures that all sensors are displayed in the data viewer in the correct sequence and with the correct calibrated values.

Internal data logging must be configured before its first use, and then reconfigured anytime there is a change made to the logging setup (logging rate, logging time, log dash name or auto triggering settings) or to the dashboard that is being logged.

Follow these steps to configure the internal data logging:

1. Open the C-Com WP XFI software.
2. Establish communications with the ECU. See the Communication Setup section for more detail.
3. Select LOGGING/CONFIGURE XFI INTERNAL DATA LOGGING. This will update the logging setup in the ECU. **NOTE** – This will erase any data currently stored in the ECU. Unsaved data can be downloaded onto the laptop before configuring.
4. The ECU now needs to be power cycled. Switch the power source for the ECU off and back on.

NOTE – If the contents of the dashboard selected to be logged are changed, you must reconfigure the ECU for internal data logging. For example, assume Dash 8 is selected to be logged. Then assume you have gone into the Dashboard Setup screen and changed some of the sensors included in Dash 8. You will need to follow the procedure outlined above.

24.6.2 Arming the FAST™ Internal Data Logging Option

The first step in initiating a data logging session is arming. Applying battery voltage to the pink wire (PA Enable) found in Pin F of the POWAD connector (or Pin B19 of the ECU connector) arms the data logging process. This can be wired to a dash-mounted switch to allow the driver to enable arming. When the data logging process is armed, any data currently stored in the data logger is erased and the data logger will be in stand by mode waiting to be triggered. The PA Enable input serves multiple purposes so care must be taken to ensure that activating this input does not cause any other undesired actions.

NOTE – Utilizing the pink wire found in Pin F of the POWAD connector will arm the Power Adder functions of the XFI. For those that are utilizing the Power Adder function arming of the internal data logger is automatic. For those of you who are not utilizing the Power Adder function and do not want to take the chance that it will activate those functions, simply select from the pulldown menus VIEW/POWER ADDER CONFIGURATION/POWER ADDER GLOBAL PARAMETERS and uncheck the box next to ‘PA Mode Enable’. This will ensure that no Power Adder functions will activate when you arm your internal data logger.

24.6.3 Triggering the FAST™ Internal Data Logging Option

Once internal data logging has been armed, it needs to be triggered before logging will begin. Triggering internal data logging can only be accomplished by using the auto-trigger function. Once a sensor has been selected for use with the auto-trigger feature, the logger will check the current value of that sensor. If the current value is above the auto-trigger Set Point, logging will begin immediately. If not, the logger will wait until the value of the auto-trigger Sensor exceeds the auto-trigger Set Point. Once it does, logging will begin. Any sensor in the currently selected dash, can be used as an auto-trigger sensor.

For example, if you chose ‘TPS%’ as your auto-trigger sensor and set the trigger point to ‘90%’, the ECU will not begin logging until the TPS% is at least 90%.

Once logging has begun, removing battery voltage from the arm input wire will not cause it to stop.

24.6.4 Retrieving Data from the FAST™ Internal Data Logger

Once data has been recorded in the ECU, it must be downloaded onto the laptop for viewing.

Follow these steps to retrieve recorded data from the ECU:

1. Open the C-Com WP XFI software.
2. Establish communications with the ECU. See the Communication Setup section for more detail.
3. Select LOGGING/READ XFI INTERNAL DATA LOGGER.

NOTE – Once data has been recorded with the internal data logging option, you must power cycle the ECU (key it off and back on) before data can be logged again. It is recommended that data always be downloaded and saved for later viewing so that no data is lost or recorded over by accident.

24.7 Using the Remote FAST™ Data Logger

The remote FAST™ Data Logger allows data to be recorded without requiring a laptop to be connected to the system. Once data has been recorded, it is downloaded onto a laptop for viewing.

24.7.1 Installation of the Remote FAST™ Data Logger

The data logger is installed with a simple data logger harness consisting of two connectors and four loose wires. The DB-9 serial port connector attaches to the data logger. The three pin male connector is used to connect the data logger harness to either the ECU communications cable (to allow the logger to communicate with the laptop for configuring the logger or downloading data) or the CALPORT connector on the main FAST™ harness (to allow the logger to communicate with the ECU to log data). There is a separate data logger link cable that is used to connect the data logger harness to the CALPORT connector.

NOTE – The data logger link cable is not wired straight through. Pin A at one end goes to pin C at the other end and vice versa. When installing the data logger link cable, it may appear to have a wiring problem because the wire colors will not match one of the connectors it is being connected to. This is normal.

The four loose wires need to be connected as described below:

RED: +12VDC- this can be wired to either +12V switched or right to the battery

BLACK: GROUND – this can be wired to a clean chassis ground

VIOLET: ARMING – this can be wired to ground through a switch

BLUE: TRIGGER - this can be wired to ground through a switch

NOTE – The remote FAST™ Data Logger can be powered up while out of the vehicle by wiring the red and black wires across a 9V battery.

24.7.2 Configuring the Remote FAST™ Data Logger

In order for the remote FAST™ Data Logger to work correctly, the data logger and the laptop must both be working off the same setup information. This way, the data logger knows which channels it is expected to record and at which logging rate. And the laptop knows what to expect in the data retrieved from the data logger. This ensures that all sensors are displayed in the data viewer in the correct sequence and with the correct calibrated values.

The data logger must be configured before its first use. And then reconfigured anytime there is a change made to the logging setup (logging rate, logging time, log dash name or auto triggering settings) or to the dashboard that is being logged or if the data logger is being used with a different ECU.

Follow these steps to configure the data logger:

1. Open the C-Com WP XFI™ software.
2. Establish communications with the ECU. See the [Communication Setup](#) section for more detail. –OR- Manually load the calibration file that will be used in the ECU. See the [Loading and Saving Calibration Files](#) section for more detail. These steps will load basic ECU setup information into the C-Com WP XFI™ software.
3. If communication was established with the ECU, select COMMUNICATIONS/DISCONNECT. Verify that the word “Idle” is

displayed at the bottom left corner of the C-Com WP XFI™ software window. This step is necessary because the C-Com WP XFI™ software cannot try to communicate with an ECU and with a data logger at the same time. –OR- If a calibration file was manually loaded, verify that you see that file's name at the bottom left corner of the C-Com WP XFI™ software window.

4. Disconnect the ECU communications cable from the CALPORT connector on the main FAST™ harness (if communication was established with the ECU) and connect it to the data logger harness.
5. Select LOGGING/SEND LOG CONFIG TO DATA LOGGER. This will update the logging setup in the data logger. **NOTE** – This will erase any data currently stored in the data logger. Unsaved data can be downloaded onto the laptop before configuring the data logger. See the [Retrieving Data from the Remote FAST™ Data Logger](#) section for more detail.
6. The data logger now needs to be power cycled. Disconnect the data logger from the data logger harness and then reconnect it. Or switch the power source for the data logger off and back on.
7. Disconnect the ECU communications cable from the data logger. Use the data logger link cable to connect the data logger harness to the CALPORT connector on the main FAST™ harness. The data logger is now ready to record data.

NOTE – If the contents of the dashboard selected to be logged are changed, you must power cycle the ECU (key it off and back on) in addition to reconfiguring the data logger. For example, assume Dash 8 is selected to be logged. Then assume you have gone into the Dashboard Setup screen and changed some of the sensors included in Dash 8. You will need to follow the procedure outlined above and power cycle the ECU.

24.7.3 Arming the Remote FAST™ Data Logger

The first step in initiating a data logging session is arming the data logger. Switching the violet wire in the data logger harness to **ground** arms the data logger. When the data logger is armed, any data currently stored in the data logger is erased and the data logger will be in stand by mode waiting to be triggered. The green LED will flash quickly.

24.7.4 Triggering the Remote FAST™ Data Logger

Once the data logger has been armed, it needs to be triggered before logging will begin. Switching the blue wire in the data logger harness to **ground** triggers the data logger. The red LED will flash slowly. When the data logger is triggered, it will do one of two things depending on the setting of Trigger Set Point parameters.

- If "Manual Trigger" is selected, logging will begin immediately and continue for the duration specified in the Max Logging Time parameter.
- If a sensor has been selected for use with the auto-trigger feature, the logger will check the current value of that sensor. If the current value is above the auto-trigger Set Point, logging will begin immediately. If not, the logger will wait until the value of the auto-trigger Sensor exceeds the auto-trigger Set Point. Once it does, logging will begin.

Once logging has begun, un-grounding the arm or trigger wire will not cause it to stop. While logging is in progress, both the green and the red LEDs will flash quickly.

Depending on the application, it may be convenient to connect the arm and trigger wires together so they can be switched to ground simultaneously.

24.7.5 Retrieving Data from the Remote FAST™ Data Logger

Once data has been recorded in the data logger (green LED flashing slowly), it must be downloaded onto the laptop for viewing. This can be done with the data logger still installed in the vehicle. Or the data logger can be removed and downloaded later. The data logger can be powered up while out of the vehicle by wiring the red and black wires across a 9V battery.

Power is not required to maintain the data stored in the data logger. The data is stored in non-volatile memory. This means the data can remain in the logger for a very long time – up to 10 years. If power is lost while data is being logged, the data that has already been recorded will remain intact in the data logger.

Follow these steps to retrieve recorded data from the data logger:

1. Open the C-Com WP XFI™ software.
2. Confirm that the C-Com WP XFI™ software is not trying to communicate with the ECU. If "Online" is displayed at the bottom left corner of the screen, select COMMUNICATIONS/DISCONNECT.
3. Connect the ECU communications cable to the data logger harness. You will have to disconnect the data logger link cable if it is still in place.
4. Select LOGGING/READ DATA LOGGER.

24.7.6 Using the Remote FAST™ Data Logger's External LED's

The data logger has two external LED's (one green and one red) that can be used to determine its status. The LED's can be interpreted using the following chart:

	GREEN LED	RED LED
ON	IDLE / NO DATA	ERROR
OFF	UNPOWERED	
SLOW FLASH	DATA AVAILABLE	TRIGGERED / AUTO-TRIG
FAST FLASH	ARMED	LOGGING

25.0 Cal. Channel Switching

This menu will only be accessible while the C-Com WP XFI™ software is online with the ECU.

25.1 Cal. Channel Override

The ECU has the ability to store four calibration files. They are stored in the ECU's memory in locations referred to as 0, 1, 2 and 3. The calibration file the ECU will run on is user selectable with a switch (wired to pins B and C in the DIAGNOSTIC connector on the harness). The Cal. Channel Override setting can be used to force the ECU to run on the calibration file stored in location 1, 2 or 3 regardless of the switch position. Enter 1, 2 or 3 to select the calibration file stored in the corresponding place in the ECU's memory. Or enter 0 to allow the switch to control calibration file selection. Note that to use the calibration file in memory location 0, the Cal. Channel Override parameter must be set to 0 and the switch must be set to 0, or left disconnected.

When the ECU is keyed on, it will load and run on one of the four calibration files stored in the ECU's memory. The position of the calibration file selector switch - or the Cal. Channel Override setting - determines which calibration file is loaded. Changing the position of the calibration file selector switch - or the Cal. Channel Override setting - while the ECU is powered up will not affect the running of the motor since calibration files are only loaded at key-on. It will, however, cause the ECU to load a calibration file from a different memory location at the next key-on.

25.2 Copy at Key-Off

This checkbox can be used in conjunction with the calibration file selector switch - or the Cal. Channel Override feature - to save calibration files to the four different memory locations in the ECU.

Checking this box will cause the currently loaded calibration file (along with any changes that have been made to it) to be saved to the memory location selected with the calibration file selector switch - or the Cal. Channel Override parameter - at the next key-off. Once the ECU has been powered off, this checkbox will reset itself. This checkbox will need to be manually rechecked each time you want to force the saving of a calibration file to a different memory location than it was loaded from.

This checkbox does not need to be checked to save a calibration file to the same location it was loaded from. So if changes are made to a calibration file while the ECU is powered on, at the next key-off the edited calibration file will automatically be saved into the same location it was loaded from - as long as the calibration file selector switch - or the Cal. Channel Override parameter - has not been changed since the last key-on.

There are two channels that can be used to verify where the current calibration file was loaded from and where it will be saved if the "Copy at Key-Off" option is checked. The "Cal# Loaded" channel displays the calibration file in use. The "Cal# Switch" channel shows the current position of the calibration file selector switch - or the current setting of the Cal. Channel Override parameter. To view these channels, open the Master Dash with the F9 key (If these channels are not displayed, you may need to edit the Master Dash setup by selecting FILE/DASHBOARD SETUP...)

Summary of Calibration File		
Loading and Saving Locations		
Cal. Channel Override	Calibration Select Switch	Load from at Key-on Save to at Key-off*
0	0	0
	1	1
	2	2
	3	3
1	0	1
	1	1
	2	1
	3	1
2	0	2
	1	2
	2	2
	3	2
3	0	3
	1	3
	2	3
	3	3

* **NOTE** – The calibration file will only be saved here if “Cal# Loaded” is different than “Cal# Switch” and “Copy at Key-Off” is checked. Otherwise, it will be saved in the memory location it was loaded from.

26.0 Flashing Updates into your XFI™

26.1 Overview

Your new FAST XFI™ is “in field flash-able”. That means that as we come up with ways to make your XFI™ work smarter, faster or do things we haven’t even thought of yet, you’ll be able to simply download the updates from our website and “flash” them into your XFI™’s ECU from your computer. You never have to remove the ECU from your vehicle. It’s just that simple! Below we’ll walk you through the steps to a successful “flash”.

26.2 Downloading a Flash update

First start by going to our website, <http://www.fuelairspark.com>, and check for the latest update. It will look like “flash_update_1A.xfi”. Save the flash update file to C:\CComWP XFI. **NOTE** - If a message pops up stating that the file already exists and asking if you’d like to replace the existing file, you can click on Cancel since you already have the latest flash update file. You are now done downloading the Flash update.

26.3 Flashing the update into your ECU

To “flash” the update file into your XFI™ ECU, please follow these simple steps:

1. Connect your computer to the ECU with the supplied Communication cable
2. With the ignition switch in the off position, ground the blue wire found in pin A of the DIAG connector in your XFI harness or pin A21 of the ECU main connector.
3. Turn the ignition switch to on but do not start the engine. The CRANK LED on the face of your ECU should start flashing.
4. In the C-Com WP XFI™ software, click on FILE/Flash XFI ECU...
5. In the lower left hand corner you will see a message stating “Flashing ECU” and the progress bar in the right hand corner will show that it’s loading also. This will usually happen very quickly so you may not have time to see them.
6. You will then see a “Verifying Flash” message in the same place in the lower left hand corner along with the progress bar in the right hand corner as in step 5.
7. You will now see a message asking you to “Restart the ECU”.
8. Turn the ignition switch to off.
9. Unground the blue wire from step number 2.
10. The ECU can now be restarted. You are now done updating the ECU.

27.0 Diagnostics

27.1 Overview

Your new FAST™ XFI™ has both visual and built-in diagnostics to help you along with both the tuning process and in case anything were to go wrong. There's nothing worse than having something happen that you can't explain or don't understand, like some EFI systems. That's why FAST™ spent countless hours trying to give you the most complete, hassle-free experience possible.

27.2 External LED's

The XFI ECU features LED's built into the case. They are a valuable tool for confirming basic ECU functions. Because they are built into the ECU, they can be used without connecting a PC to the ECU.

27.2.1 Power

This LED lights up when the ECU is keyed on. If this LED is not lit, the ECU will not start the engine and will not communicate with a PC. If this LED is lit when the key is on but not when you crank the engine, you have not wired the +12V SWITCHED wire in the main harness to the right place in your vehicle.

27.2.2 Crank

This LED lights up when the ECU receives a crank input. It should flash whenever the engine is cranking or running. If it is not flashing, you will need to find out why before the engine will run. Check the source of the crank signal (crank pickup, distributor, stock ignition system, etc). Also check the wiring between the ECU and the crank signal. The flashing may be so rapid that the LED will appear to be continuously lit. This is normal.

If unexpected flashes occur (with engine running or stopped), it may indicate that the unused crank input has not been grounded.

The ECU will accept either discrete/Hall Effect or inductive type signals as its crank input. There is a separate ECU pin for each type. The inductive crank input is ECU pin A4. It can be found as pin A in the CRANK connector on the main harness. The discrete/Hall Effect crank input is ECU pin A8. It can be found as pin F in the CAM HALL EFFECT/HEI connector on the harness. Whichever input is not being used should be connected to ground. This will prevent the unused input from floating and falsely triggering the ECU.

27.2.3 Cam

This LED lights up when the ECU receives a cam input. In sequential mode with a cam input, this LED should flash whenever the engine is cranking or running. It will not flash as quickly as the crank LED does. It should flash once

every two engine revolutions. Just like the crank, the flashing may be so rapid as to appear to be continuously lit. This is normal.

In Bank-to-Bank mode, a cam input is not required. So it is normal for the cam LED to remain off.

If unexpected flashes occur (with engine running or stopped), it may indicate that the unused cam input(s) have not been grounded.

The ECU will accept either discrete/Hall Effect or inductive type signals as its cam input. There is a separate ECU pin for each type. The inductive cam input is ECU pin A3 and can be found as pin A in the CAM/HALL EFFECT connector on the main harness. The discrete/Hall Effect cam input is ECU pin A7 and can be found as pin C in the CAM/HALL EFFECT connector on the main harness. Whichever input is not being used (or both inputs if no cam sensor is being used) should be connected to ground. This will prevent the unused inputs from floating and falsely triggering the ECU.

27.2.4 Points

This LED lights up whenever the ECU commands the ignition system to fire. Again, the flashing may be so rapid as to appear to be continuously lit. This is normal. If your engine will not start and this LED is not lit while cranking, first check to see if the Crank LED is lit up. More often than not if your ECU is not sending a points signal, it is not seeing a crank signal as the root cause.

27.2.5 INJ's

There are 8 LED's labeled INJ A through INJ H. These are wired directly to the outputs from the 8 injector drivers. Each LED should flash when the corresponding injector is fired – which should be whenever the engine is cranking or running. In Sequential mode, the LED's will each flash one at a time. In Bank-to-Bank mode, INJ A, B, C and D will flash together and INJ E, F, G and H will flash together.

If you notice one of the injector LED's is noticeably brighter or dimmer than the rest, it may indicate that one of the injectors is not securely connected to the wiring harness. Or it may indicate that the injectors are not all the same since the brightness of these LED's will depend on the impedance of the injectors. Higher impedance will result in brighter LED's.

27.3 Service Engine Soon / Fault Codes

The ECU stores fault codes related to many of the system's inputs and outputs. Once a fault code is set, it is stored in memory until the ECU is keyed off. At that time, all fault codes will be cleared.

When a fault code(s) have been set, a Service Engine Soon (SES) output (ECU pin B9 – found as pin D in the DIAGNOSTICS connector on the main harness) is activated. It switches to **ground**. Wiring it to a lamp in the cockpit will alert the driver that a fault code has been set.

27.3.1 Display ECU Fault Status

This window displays any fault codes that have been set. A fault code has been set if the SES light is lit or if either the “Error Code” or “Error Code 2” channel displayed in a dashboard is a non-zero number. To determine which code(s) has been set, select VIEW/DISPLAY ECU FAULT STATUS.

The fault code(s) can be also be determined manually as described below. This may be useful if you remember the “Error Code” or “Error Code 2” reading but did not use the Display ECU Fault Status feature before the ECU is keyed off. Or if you record an error code in logged data.

27.3.2 Fault Detection

This form is used to enable detection of the different fault codes. The ECU will ignore (no Error Code readings or SES light) any faults that are not enabled. This feature is convenient if there is a condition that is consistently setting a fault code but that is not really a problem – a wideband fault when no wideband sensor is connected, for example. Disabling that fault code will keep the SES light from always being illuminated.

27.3.3 Fault Codes

To determine what fault code(s) have been set, observe the “Error Code” and “Error Code 2” channels. They will display a numeric code which can be used to look up what fault has occurred. The possible faults are listed here.

Error Code 1:

- 1: CTS Fault
- 2: ATS Fault
- 4: MAP Fault
- 8: TPS Fault
- 16: Wideband Fault
- 32: Ign. Voltage Fault
- 64: n/a
- 128: IAC Fault

Error Code 2:

- 1: CTS Bias Error
- 2: ATS Bias Error
- 4: n/a
- 8: n/a
- 16: n/a

32: n/a

64: Cam Sync Position Error

128: Crank Sync Position Error

If the "Error Code" channel has a value of 4, it means a MAP Fault has occurred. Or if "ErrorCode 2" has a value of 64, a Cam Sync Position Error has occurred. If more than a single fault code has been set, the value of the error code channels will be the sum of the individual fault code numbers. When this happens, there is a simple way to determine which faults have occurred. Determine the largest single fault code that fits into the displayed error code number. That will be one of the fault codes that have been set. Subtract that number and again look for the largest single fault code that fits into the remaining error code number.

For example, assume "Error Code" = 37. 37 does not match up with any single fault code. The largest single fault code that fits into 37 would be 32. So 32 would be the first fault code. 37-32 leaves 5. Again, 5 does not match up with any single fault code. In this case, the largest single fault code that fits into 5 would be 4. So 4 would be the second fault code. 5-4 leaves 1. 1 does match up with a single fault code, so it is the third fault code. So in this example, there has been an Ign. Voltage fault, a MAP fault and a CTS fault.

Error Code Definitions:

CTS Fault

Coolant temperature sensor measurement approaching or at range limit

If a CTS fault code is set, the ECU takes the following actions to protect the engine.

- Fan output is switched on
- Target idle speed is forced to 1000 RPM
- EGR function disabled
- CTS based fuel correction zeroed out

ATS Fault

Air temperature sensor measurement approaching or at range limit

If an ATS fault code is set, the ECU takes the following actions to protect the engine.

- In Speed Density mode, fueling calculations performed based on an air temperature of 59 °F
- EGR function disabled
- ATS based fuel correction zeroed out
- ATS based spark timing correction zeroed out

MAP Fault

Raw MAP measurement approaching or at range limit
-and-
TPS (%) > "Max. TPS for Idle (%)" parameter

TPS Fault

Raw throttle position sensor measurement approaching or at range limit

Wideband Fault

Engine RPM > 2000
-and-
Engine run > 10 seconds
-and-
WBO2 not connected (UEGOR > 4.90V)
-or-
WBO2 Shorted (UEGOR < 0.098V)
-or-
WBO2 not lit off (UEGOS > .07056V)
-or-
WBO2 malfunction (UEGOS < 0.196V)

Ign. Voltage Fault

Measured Ignition Voltage > 19.0V
-or-
Measured Ignition Voltage < 7.0V

IAC Fault

IAC wiring shorted to ground

-or-

IAC wiring shorted to power

-or-

IAC controller overheated

Check the IAC Status channel for more detail.

CTS Bias Error

Programmed sensor bias voltage out of tolerance

ATS Bias Error

Programmed sensor bias voltage out of tolerance

Cam Sync Position Error

Cam Sync occurred at an unexpected angle

-or-

Cam Sync failed to occur when expected

Crank Sync Position Error

Crank Sync occurred at an unexpected angle

-or-

Crank Sync failed to occur when expected

28.0 Glossary of terms

AAUX1(V) – AAUX8(V) – These 8 channels are readings from the auxiliary analog inputs and are numbered 1 through 8. They can be renamed by the user. See the [Auxiliary Analog Sensor Setup](#) section for more detail.

AC Clutch – Indicates when the ECU has enabled the A/C Clutch output. A “0” means the output is disabled. A “1” means the output is enabled.

AC Detect - Indicates when the A/C Idle Increase mode has been activated. A “0” means it is deactivated. A “1” means it is activated.

Actual A/F – The measured air/fuel ratio. An oxygen sensor is required for this channel to work.

Aft Corr.(%) – The percentage correction being applied to injector pulse width by the after start feature. This is controlled by the After Start vs. CTS, After Start Revs vs. CTS and After Start Decay vs. CTS tables. **Note that closed loop fuel control will not operate until this number has decreased to “0”.**

Air Temp(*F) – The calibrated reading from the air temperature sensor.

Alpha-N -A method of determining fuel requirements for an engine based on throttle position and engine RPM. Because naturally aspirated race engines often produce little or no manifold vacuum, manifold pressure readings are nearly the same at an idle as they are at WOT. This makes tuning the engine in speed/density mode nearly impossible. In these cases, Alpha-N mode is used. **Note that supercharged engines should not be run in Alpha-N mode.**

Atm Corr.(%) - The percentage correction being applied to injector pulse width based on atmospheric pressure. This is only active in Alpha-N mode - when the MAP sensor should be plumbed outside the intake manifold.

ATS Corr.(%) – The percentage correction being applied to injector pulse width based on air temperature. A positive number is adding fuel. A negative number is decreasing fuel. This is controlled by the ATS Correction table.

ATS Spark (*) – The timing adjustment being applied based on air temperature. A positive number means timing is being increased. A negative number means timing is being decreased. This is controlled by the Spark Offset vs. ATS table.

AUX RPM – The speed measured by the auxiliary speed sensor in revolutions per minute. For this to be accurate a speed sensor must be installed and the values in the Rate Sensor Calibration window must be entered correctly.

Bank to Bank Firing - Fires half the injectors each 180 degrees of crankshaft rotation of a typical V8. (see sequential firing)

Baro - Barometric pressure as measured by the MAP sensor with the key on, but engine not running

Base Fuel Map - Very similar to a road map that the ECU follows to make changes in the fuel system. It will be called the Base VE Table in Speed/Density mode and Base Fuel PW Table in AlphaN mode.

Batch Firing - Fires all injectors simultaneously every 360 degrees of crank rotation. Not an available option with your FAST XFI.

Bat Corr.(%) – The percentage of the adjustment the ECU is making to the “Injector Opening Time” parameter based on battery voltage.

Battery (V) – The voltage supplied to the ECU by the pink +12V SWITCH wire found in the main harness.

BC TGT % - Boost Control Target (% of full scale sensor range in closed loop)

Boost %DC – The current duty cycle of the boost control output as read from the Boost Control table.

BPW (mS) – The base injector pulse width before any corrections are applied, minus the opening time of the injector. In Speed/Density mode, this is calculated by the ECU based on a number of inputs. In Alpha-N mode, it is read straight from the Base Fuel PW Table, again minus the opening time of the injector.

Cal# Loaded – The ECU has 4 locations in memory to store calibration files. This indicates which location the tuning file currently in use was loaded from. The number displayed will be a 0, 1, 2 or 3. See the [Cal. Channel Override](#) section for more detail.

Cal# Switch – The current position of the calibration file selector switch or the setting currently in the Cal. Channel Override parameter. This is the memory location where the calibration file currently in use will be saved when the ECU is keyed off. The number displayed will be a 0, 1, 2 or 3. It is okay if the “Cal# Loaded” and “Cal# Switch” readings are not the same, but if they are different, make sure you know why and that you intend for them to be that way. Otherwise, calibration files in the ECU may accidentally be overwritten. See the [Cal. Channel Override](#) section for more detail.

Cam Sync Flag – Shows as 1 when ECU has received a cam signal.

CamSync (*BTDC) – The position of the cam pickup. Note that this is expressed in crank (not cam) degrees before top dead center. For this to be accurate, the Crank Ref. Angle (*BTDC) parameter must be set correctly. The cam pickup should be installed to trigger at least 10 crank degrees ahead of when the crank pickup triggers. This is to prevent the two input signals from getting out of sequence – which would cause the firing order to be inconsistent. For example, if the crank pickup is triggered at 50 *BTDC, the CamSync (*BTDC) channel should

read at least 60 °BTDC. If the CamSync (*BTDC) does read less than the crank reference angle, then the cam input is occurring before the next cylinder in the firing order. If this is the case, the cam pickup mounting should be adjusted accordingly. If it is not adjusted, the Cam Sync Precedes Cylinder parameter will need to be changed. See the [Firing Order Synchronization](#) section for more detail.

CL Gain – The current gain being used for closed loop fuel control as read from the Closed Loop Gain Table.

Closed Loop - Defines the engine operation where fuel delivery is continually corrected to a specified target air/fuel ratio based on feedback from an O2 sensor. Closed loop operation can be used in Speed/Density mode or Alpha-N mode.

Clutch Flag - Shows as 1 when the Clutch Switch Input (ECU pin A20) has been activated (grounded).

Coolant Temperature Sensor - Takes temperature readings of your engine coolant and reports them back to the ECU. Popular locations for this sensor are in the cylinder head or coolant crossover in intake manifolds.

Coolant(*F) – The calibrated reading from the coolant temperature sensor.

CrkErr Cnt - Used for factory diagnostics / development. Not applicable for customer use.

CTS Corr.(%) – The percentage correction being applied to injector pulse width based on coolant temperature. A positive number is adding fuel. A negative number is decreasing fuel. This is controlled by the CTS Correction table.

Delta DS RPM – A relative measure of the rate at which the driveshaft RPM is changing in 100 millisecond (ms) intervals. A higher number means the RPM is changing more quickly. A too rapid increase in driveshaft RPM (high Delta DS RPM reading) could indicate a loss of traction.

Delta MAP – A relative measure of the rate at which the manifold pressure is changing. A higher number means the pressure is changing more quickly. This channel is used for tuning the AE Fuel vs. MAP Rate of Change table.

Delta TPS – A relative measure of the rate at which the throttle is opening. A higher number means the throttle is opening more quickly. This channel is used for tuning the AE Fuel vs. TPS Rate of Change table.

DS RPM – The speed of the drive shaft measured in revolutions per minute. For this to be accurate a speed sensor must be installed on the drive shaft and the values in the Rate Sensor Calibration window must be entered correctly. Drive shaft speed and engine speed can be compared to confirm gear ratios or to detect transmission slip.

ECU - Engine Control Unit. This is the brain of the EFI system. It is this box that does the calculations and commands for fuel, spark, and many other features.

EDELIC1 - Used for factory diagnostics / development. Not applicable for customer use.

EERRIC1 - Used for factory diagnostics / development. Not applicable for customer use.

EGR %DC - The current duty cycle of the EGR control output as read from the EGR Table.

EGT 1 through EGT 8– Channels 1 through 8 that display exhaust gas temperatures from the CAN based EGT Module

Error Code – Will display a numeric code corresponding to a fault code. If anything besides a "0" is displayed, a fault code has been set. See the **Service Engine Soon / Fault Codes** section for more detail.

ErrorCode 2 - Will display a numeric code corresponding to a fault code. If anything besides a "0" is displayed, a fault code has been set. See the **Service Engine Soon / Fault Codes** section for more detail.

ESC Rtd (*) – The amount of ignition timing retard being applied by the Knock Retard feature.

Fan - Indicates when the ECU is commanding the fan output to be activated. A "0" means it is off. A "1" means it is on. The fan output is configured in the Operational Parameters window.

Fuel lbs/hr (H) – The current fuel flow rate as calculated by the ECU. For this to be accurate, the values in the Fuel Calc Parameters window must be entered correctly. This channel can display flow rates up to 4046 lbs/hr with a resolution of 16 lbs/hr. For a more accurate reading for flow rates below 510 lbs/hr, use the Fuel lbs/hr (L) channel.

Fuel lbs/hr (L) – The current fuel flow rate as calculated by the ECU. For this to be accurate, the values in the Fuel Calc Parameters window must be entered correctly. This channel can display flow rates up to 510 lbs/hr with a resolution of 2 lbs/hr. For flow rates above 510 lbs/hr, use the Fuel lbs/hr (H) channel.

Fuel Pump - Indicates when the ECU is commanding the fuel pump output to be activated. A "0" means it is off. A "1" means it is on. The fuel pump output is configured in the Operational Parameters window.

Grs Corr.(%) – The gross percentage correction being applied to injector pulse width of both ATS and CTS combined.. A positive number is adding fuel. A negative number is decreasing fuel.

HR PA PW(mS) – High Resolution (16 bit) power adder pulse width of fuel being added by the power adder fuel table measured in milliseconds.

IAC - Idle Air Control. Nothing more than a computer-controlled vacuum leak. It opens and closes to control idle characteristics.

IAC Status – A numeric code that gives information about the operation of the IAC controller.

15 = Normal operation

14 = Short to ground

13 = Short to battery or open load

12 = Thermal shutdown

11 = ECU control error (disabled)

IAC Target – The current target idle position in IAC counts.

Inj. DC (%) – The current duty cycle the injectors are operating at. This is a measure of the amount of time the injectors are open vs. the total amount of time they have available to be open. The available time is dictated by engine speed – less time is available at higher speeds. Injectors are typically specified so that they do not operate above 85-90%. This safety margin is used to avoid injector failure. Also, injectors do not operate consistently when they approach 100% duty cycle. Once an injector reaches 100% duty cycle, it is already fully open. It is incapable of flowing any more fuel than it already is. If injector duty cycle is found to be too high, a larger injector can be used. Or the fuel pressure can be increased. Remember to adjust “Injector Flow Rate (lb/hr)” in the Fuel Calc Parameters window accordingly when/if you change injector size.

Inj. Offs mS – The current value of the “Injector Opening Time” variable as set in the Operational Parameters window. The displayed value also includes any adjustments to the “Injector Opening Time” made by the ECU to compensate for varying battery voltage.

Lambda – The measured air/fuel ratio expressed as the ratio of actual A/F ratio divided by stoichiometric A/F ratio (14.7). A higher lambda value means a leaner fuel mixture. An air/fuel ratio of 14.7 gives lambda = 1.

$$\text{Lambda } \lambda = (\text{actual A/F}) / (\text{stoichiometric A/F})$$

Load % - Engine load (0-500%) based upon the difference in barometric pressure and manifold pressure

MAP Sensor - Manifold Absolute Pressure. It reads intake manifold vacuum (and boost in supercharged applications) and sends a signal back to the ECU, which uses that to determine and adjust the fueling requirements.

MAP (kPa) – The calibrated reading from the manifold absolute pressure sensor expressed in kilopascals. This is the unit used to define various tables in the software when running in Speed/Density mode.

MAP (PSIA) - The calibrated reading (expressed in pounds per square inch) from the manifold absolute pressure sensor minus one standard atmosphere's worth of pressure. The standard atmosphere is subtracted to get an approximate gauge pressure reading – i.e. the difference between ambient and manifold pressure – from an absolute pressure sensor. MAP (PSIA) can be used to monitor boost pressure in a format that is similar to the readings from a mechanical boost gauge.

Because the MAP (PSIA) readings are based on an absolute pressure sensor and an assumed ambient pressure, they will vary with actual ambient pressure (which depends on weather conditions, altitude, etc). For this reason, they may differ slightly from the readings from a traditional boost gauge which are not affected by changing ambient pressure.

In “good” air (above 29.92 inHg), MAP (PSIA) will read higher than a boost gauge.

In “bad” air (below 29.92 inHg), MAP (PSIA) will read lower than a boost gauge.

With the engine stopped, MAP (PSIA) will read approximately 0 in standard pressure air. It will read slightly higher in “good” air and slightly lower in “bad” air. To calculate an exact gauge boost pressure, subtract the MAP (PSIA) reading with the engine off from the MAP (PSIA) readings with the engine running under load.

“Good” air example – ambient pressure above standard:

MAP (PSIA) engine running: 16.0 psi

MAP (PSIA) engine stopped: 1.0 psi

Actual gauge pressure = $16.0 - 1.0 = 15.0$ psi

“Bad” air example – ambient pressure below standard:

MAP (PSIA) engine running: 16.0 psi

MAP (PSIA) engine stopped: -1.0 psi

Actual gauge pressure = $16.0 - (-1.0) = 17.0$ psi

MAP AE – The additional injector pulse width in milliseconds (mS) being added synchronously by the MAP based acceleration enrichment feature. This is controlled by the AE Fuel vs. MAP Rate of Change Table.

Mode Code 1 – Used for factory diagnostics / development. Not applicable for customer use.

Mode Code 2 - Used for factory diagnostics / development. Not applicable for customer use.

Mode Code 3 - Used for factory diagnostics / development. Not applicable for customer use.

MPFI - Multi Point Fuel Injection. This meters the fuel to each cylinder individually via injectors mounted in each

intake manifold runner.

MPG – The current mileage as calculated by the ECU. For this to be accurate a speed sensor must be installed and the values in the Fuel Calc Parameters window and the Rate Sensor Calibration window must be entered correctly.

MPH – Vehicle speed in miles per hour.

O2 Sensor - Oxygen sensor, also known as a Lambda sensor. This sensor reads the oxygen content in the exhaust gases and sends a signal back to the ECU, which in turn can use those readings to adjust the fueling requirements for an engine. (see Open Loop or Closed Loop)

O2 Corr.(%) - The percentage correction being applied to injector pulse width based on closed loop fuel control. This channel is used for tuning the Base VE Table when running in Speed/Density mode – or the Base Fuel PW Table when running in Alpha-N mode.

Open Loop - Describes engine operation and fuel requirements based on typical engine sensors but without using the feedback from the oxygen sensor. A system operating in open loop only uses the oxygen sensor to track what the air/fuel ratio is at any given time and does not use it to adjust fuel requirements.

PA Elapsed T(S) – The time in seconds since the Power Adder mode was activated.

PA Ramp Rtd.(*) – The amount of ignition timing being subtracted by the PA Ramp Retard feature. This is controlled by the PA Ramp Retard Table.

PA *Retard – The amount of ignition timing retard being applied by the Power Adder feature.

PA Enable - Indicates when the Power Adder mode has been enabled. A "0" means it is disabled. A "1" means it is enabled. See the [Power Adder Configuration](#) section for more detail.

PA Hold - PA Hold flag (0=off, 1=activated)

PA Stage – The current stage of the Power Adder features shown as 1, 2, 3, or 4. See the [Power Adder Configuration](#) section for more detail.

Pulse Width - The amount of time an injector is open and flowing fuel.

Raw ATS(V) - The un-calibrated voltage signal from the air temperature sensor input circuitry in the ECU. This channel is used for calibrating and trouble shooting a ATS sensor.

Raw CTS(V) - The un-calibrated voltage signal from the coolant temperature sensor input circuitry in the ECU. This channel is used for calibrating and trouble shooting a CTS sensor.

Raw MAP(V) - The un-calibrated voltage signal from the manifold absolute pressure sensor. This channel is used for calibrating and trouble shooting a MAP sensor.

Raw TPS(V) - The un-calibrated voltage signal from the throttle position sensor. This channel is used for calibrating and trouble shooting a TPS sensor.

Rev Counter - This simply counts the cylinders beginning with 0 and finishing with 3 for a 4 cylinder engine, 5 for a 6 cylinder engine, and 7 for an 8 cylinder engine.

RPM - Engine speed measured in crankshaft revolutions per minute. The ECU reads this in 50 rpm increments and can read from 0 rpm up to 12,750 rpm.

Run Time (S) - The elapsed time, in seconds, since the engine has entered Run mode.

Sequential Firing - Fires each injector individually rather than in groups at set intervals.

Spark (*BTDC) - The final ignition timing value the ECU has calculated based on the Base Spark Table plus any offsets that are being applied (idle trim, knock retard, power adder).

Speed/Density - A method of determining fuel requirements for an engine based on air temperature, manifold pressure, and engine RPM. A true speed/density system constantly calculates the volume of air flowing through the engine based on these readings and then calculates the appropriate amount of fuel to supply to meet a specified target air/fuel ratio.

Target A/F - The air/fuel ratio the ECU will try to achieve. It is normally read from the A/F Ratio Table, or it can be temporarily set to a specific value by the Power Adder feature.

Target Lambda - This is the Target A/F channel expressed as a Lambda value.

Target Lambda λ = (target A/F) / (stoichiometric A/F)

TBI - Throttle Body Injection. The throttle body assembly performs two functions here. One is to regulate airflow and the other is to house the fuel injectors.

TCC Lock - Indicates when the ECU is commanding the Torque Converter Clutch (TCC) to lock. A "0" means the TCC is unlocked. A "1" means the TCC is locked.

TM Rtd. - Used for factory diagnostics / development. Not applicable for customer use.

TPS Sensor - Throttle Position Sensor. Attached to the throttle shaft, it sends voltage signals to the ECU that is proportional to the throttle shaft rotation.

TPS (%) – The calibrated reading from the throttle position sensor.

UEGO (V) – Used to diagnose the oxygen sensor.

UEGOR (V) - Used to diagnose the oxygen sensor.

UEGOS (V) - Used to diagnose the oxygen sensor.

VE (%) – The current volumetric efficiency (VE) value being read from the Base VE Table. This only applies in Speed/Density mode.

WB O2 – Indicates when the ECU successfully recognizes an oxygen sensor connected to the system.

X Acceleration - X-axis acceleration from 3-Axis Accelerometer Module (CAN)

Y Acceleration - Y-axis acceleration from 3-Axis Accelerometer Module (CAN)

Z Acceleration - Z-axis acceleration from 3-Axis Accelerometer Module (CAN)

29.0 Frequently Asked Questions

- Click on one of the topics below to jump to that topic.

[Why can't I get my PC to communicate with my ECU?](#)

[What is Speed/Density mode, Load Indexed Speed/Density mode, or Alpha-N mode? Which one Should I use?](#)

[Where should I set my fuel pressure?](#)

[The car starts and runs, but idles poorly.](#)

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[My oxygen sensor seems to be working, but my system won't run in closed loop mode.](#)

[Can I run methanol with this system?](#)

29.1 Why can't I get my PC to communicate with my ECU? [\(Back to the top\)](#)

- Make sure the ECU is receiving power on the main power leads. This should be connected directly to the battery. It feeds power directly to ECU pin B18. Also verify that you have power on the switched +12V input to the ECU (a pink wire connected to ECU pin B17). Make sure the two negative battery leads are properly connected. They supply ground to ECU pins A12, B7, B8, B24, and D1. If these connections are all made correctly, the green LED on the ECU will be lit.
- Make sure the communication cable is properly connected between the ECU and the PC.
- Make sure that you have selected the appropriate communications port in the communications setup screen of C-Com WP. Also verify that the communications port you have selected is functional.
- Close all other applications that may interfere with the communications port. Also make sure that only one instance of C-Com WP is running.
- Look in your PC's BIOS setup and verify that the communications port is enabled.
- If you are using a USB to serial port adapter, make sure that the adapter has configured itself for COM1, COM2, COM3, or COM4. Sometimes these adapters will assign themselves to a COM port of 5 or higher. C-Com WP cannot be configured to communicate with a communication port configured higher than COM4.

- If an “Incompatible Device” error message appears, either your software or firmware is in need of an update. Updates are available for download from the FAST website 24 hours a day. It can be found at WWW.FUELAIRSPARK.COM

29.2 What is Speed/Density mode, Load Indexed Speed/Density mode, or Alpha-N mode? Which one should I use? [\(Back to the top\)](#)

- A Speed/Density setup uses engine speed and manifold absolute pressure (read with a MAP sensor linked to the intake manifold by a vacuum hose) to determine fuel injector pulse width and ignition timing. Typically, an injector pulse width and a spark advance value are simply looked up from two manifold absolute pressure vs. engine RPM lookup tables. The FAST XFI system uses this technique for ignition timing. But it differs from most engine management systems in the way it handles fuel calculations. It uses the intake manifold absolute pressure and the intake charge air temperature (read with an air temperature sensor located in the air intake tract.) to calculate the density of the air entering the engine. Density is mass/volume. So if the ECU knew the volume of the air entering the engine, it would be able to determine the mass of that air. The ECU calculates this volume of air by using engine RPM (read from a crank pickup or a factory ignition system), the engine's displacement (entered by the user in the Fuel Calc Parameters screen) and a volumetric efficiency number (entered by the user in a manifold absolute pressure vs. engine RPM lookup table). Knowing the density and volume of the air entering the engine, the ECU calculates the mass of the air. From there, the ECU looks up the desired air/fuel ratio (entered by the user in a manifold absolute pressure vs. engine RPM table) and determines the amount of fuel required to achieve that ratio. Finally, the ECU uses the number of injectors and the injector flow rate (both entered by the user in the Fuel Calc Parameters screen) to arrive at the required injector pulse width.

- Load Indexed Speed/Density mode operates almost identically to Speed/Density mode, with the difference being an engine load variable that is calculated from the difference between intake manifold pressure and barometric pressure. This variable is used to index into the Table VE numbers just as MAP pressure is used in regular Speed/Density mode. This is helpful in situations where changes in altitude can affect the overall load of the engine. For example, full load on an engine at sea level will be approximately 101 kPa, but at higher altitudes full load on an engine will be at a lesser kPa, directly related to the change in barometric pressure. This means that in regular Speed/Density mode the point of full engine load in the VE table is in a different spot for each of the two altitudes. Load Indexed Speed/Density takes that difference out of the equation and makes the point of full load the same in the table no matter what the altitude, ultimately making the tuning process easier.

- In Alpha-N mode, the manner of operation is much simpler. An injector pulsewidth is simply looked up from a throttle position vs. engine RPM lookup table. The intake air temperature sensor and the MAP sensor are used to measure ambient air temperature and pressure. There is a user-definable correction curve for adding or removing fuel based on air temperature, and a generic barometric compensation curve is applied internally.

- In most applications, Speed/Density mode will provide the best overall performance. Neither mode will produce more power than the other, but Speed/Density will allow for much better drivability tuning than Alpha-N.

- Any turbocharged or supercharged engine MUST use Speed/Density mode. The boost level in a forced induction engine is a critical part of the fuel calculation.

- You must use Alpha-N mode if you have an individual runner intake manifold. However, it is possible to use speed/density mode with some modifications to the manifold. A small manifold with a vacuum connection to each runner can be created and used to provide a manifold pressure signal to the ECU.

-Alpha-N mode is often used on naturally aspirated racing engines with very long-duration camshafts that produce little or no engine vacuum at an idle. It is sometimes difficult to achieve decent drivability or idle quality with an engine of this type using Speed/Density mode because the amount of pressure in the intake manifold is almost the same at an idle as it is at wide open throttle.

29.3 I can get my car to start, but it stalls almost immediately. [\(Back to the top\)](#)

- Make sure that you have correctly entered the appropriate information in the [Global Setup Parameters](#) screen and the Fuel Calculation Parameters screen.
- Verify that fuel pressure is correct for your application. Fuel pressure on EFI-equipped vehicles is typically set to 45 psi with the engine off.
- If possible, check the timing with a timing light while the car is actually running. The value seen on the timing light should match the value in a sensor called **Spark (BTDC)** seen in the [Spark table](#) window.
- A common cause of this problem is lack of fuel. Try increasing the numbers in the region of the [base fuel table](#) where the engine tries to run after it starts. You may also wish to specify a richer target air/fuel ratio in the [Target Air/Fuel Ratio table](#).
- Look for any values in the main dashboard display (located by pressing the F9 key while online) that would indicate a malfunctioning engine sensor. The TPS value should increase with throttle opening, the MAP sensor should read approximately 100 kPa with the engine off, and the air and coolant temperature sensors should be close to the ambient air temperature, assuming the engine is cold.

29.4 I can't get my car to start at all. [\(Back to the top\)](#)

- Verify that an RPM sensor reading is present (usually 100-150 RPM) while cranking the engine. Also verify that the crank reference angle is set correctly for your application, and that the crank sensor timing is set correctly on the engine. Until an RPM signal is present, you won't get any spark or injector pulse.

Note: *On GM vehicles using factory ignitions with a bypass feature such as HEI, Buick DIS, or Northstar DIS, the ignition module will generate its own spark during cranking even if an RPM signal is not present on the FAST ECU. If this is the case, you will see spark but will not have an injector pulse.*

- If you do see an RPM signal but the engine still won't start, remove a spark plug and verify that you are getting good spark.
- If you are getting good spark, try increasing the pulsewidth values in the [cranking fuel table](#). You may not be injecting enough fuel into the engine during cranking.
- Make sure that you are getting fuel to the rails and that fuel pressure is correctly set. Fuel pressure on EFI-equipped vehicles is typically set to 45 psi with the engine off.
- Verify that each fuel injector is getting a +12V signal on one of the wires, both with the ignition on AND during cranking. The ECU will trigger the other wire on the injector to fire it.

- If the TPS value is at 80 or higher during cranking, the ECU will operate in "clear flood" mode, meaning that it will trigger the ignition but will not fire the injectors.

29.5 The car starts and runs, but idles poorly. [\(Back to the top\)](#)

- If the idle is surging, try richening the fuel mixture in the idle area. Surging at idle is most frequently caused by a lean idle mixture. If you are unable to eliminate the surge by adjusting the fuel mixture, try lowering the [IAC P and D gain settings](#).
- Adjust the ignition timing in the [spark advance table](#) to see if the car responds favorably to more or less timing.
- If the idle speed is steady but the car idles roughly, try leaning the idle mixture. This will frequently cause the idle speed to increase. Continue to lean the idle mixture until the idle speed stops increasing, but don't make it so lean that the idle begins to surge.
- Most cars idle best at an air/fuel ratio between 13:1 and 14:1. Many factors will affect not only how your engine will idle in this range, but how accurately the oxygen sensor can measure an air/fuel ratio at an idle. Engines with long-duration camshafts and large exhaust pipes tend to produce poor airflow across the oxygen sensor at low RPM, especially if the exhaust system is open. This often results in an artificially lean air/fuel ratio reading. If you have a difficult time getting the air/fuel ratio to read anything other than extremely lean at an idle, you probably shouldn't trust the reading.
- If your MAP sensor reads above 70 kPa at an idle, you may need to use [Alpha-N mode instead of Speed/Density mode](#).

29.6 What does an Idle Air Control (IAC) valve do? [\(Back to the top\)](#)

- The purpose of the IAC valve is to allow the ECU to control an additional amount of air to enter the engine without touching the throttle. It's basically an electronically-controlled vacuum leak that allows the ECU to control idle speed. The IAC valve consists of a stepper motor and a pintle. The stepper motor is controlled by the ECU, and the motor moves the pintle towards or away from a seat. The further the pintle is from the seat, the more air is being allowed into the engine. The ECU can raise the idle speed when the engine is cold, or maintain a given idle speed when an AC compressor turns on by allowing more air into the engine.
- To get the IAC motor to work best for you, the blades on the throttle body should be set so that the IAC valve is barely open while idling. This will allow the IAC valve all the room to open up that it will ever need.
- If you are running in Alpha-N mode, use of an IAC motor is not recommended. Because fueling in an Alpha-N calibration is dependent only on throttle position and RPM, the changes in airflow as a result of IAC movement may cause the air/fuel ratio at idle to become erratic, leading to idle instability and low-speed drivability issues.

29.7 I'm not sure if my wide-band oxygen sensor is working correctly. How can I tell? [\(Back to the top\)](#)

- The first thing to check is for the appearance of a Lambda symbol (λ) in the lower right-hand corner of the screen while online. This indicates that the O₂ sensor is connected to the ECU and that the ECU is calibrated for that sensor. The sensor is not

properly connected or the ECU is not calibrated for this sensor if this symbol does not appear.

- If the Lambda symbol appears, start the vehicle and look at a sensor called UEGOS (V) in the main dashboard display. This voltage should stabilize between 0.43 and 0.49 volts within 30 seconds of operation. If it does, it is an excellent indicator that the sensor is in good working order. If your sensor seems to be reading incorrectly but the UEGOS voltage is OK, this is most commonly caused by exhaust leaks, dead or misfiring cylinders, or air reversion in the exhaust pipe causing artificially lean readings. Engines with long-duration camshafts and/or large, open exhaust systems often produce artificially lean readings at low RPM.

- If the UEGOS voltage is out of range, the sensor will become inoperative. This could be the result of wiring harness damage, physical damage to the sensor, contamination of the sensor, or damage to the ECU.

- There is a heating element within the sensor that can break if the sensor is dropped or struck by another object. If this element is damaged, the sensor must be replaced. You can check to see if the heating element is broken much like you would check a light bulb - hold it next to your ear and listen for something rattling around inside the sensor. Be certain to hold the sealing washer on the end of the sensor or it too will rattle.

- If the sensor element does not appear to be broken, apply power to the ECU but do not start the car. You should be able to see the element glowing in the end of the sensor within about 30 seconds, and in 1 to 2 minutes, you should feel the body of the sensor getting very warm. You should also be able to look directly into a small hole in the very tip of the sensor and see the orange glow of the heating element.

- Carefully inspect all of the wires leading to the oxygen sensor and make sure that no wires have been melted or pinched. Also pay special attention to the connectors and be certain that all pins in the connector are securely seated within the connector body.

- The sensor element should become a light gray or tan color after a while. If the sensor is blackened by carbon or oil, this indicates an excessively rich fuel mixture and/or oil burning, which tend to dramatically decrease the life expectancy of the sensor.

- If the sensor has been exposed to any significant amount of antifreeze, it is almost certain to fail if it hasn't already. All oxygen sensors are highly prone to damage when exposed to antifreeze.

- Oxygen sensors are also very prone to failure when exposed to salt water vapor in marine applications. The water vapor will dissolve on the sensor element and leave the salt crystals behind, often leading to premature sensor failure.

- To verify that the oxygen sensor circuitry in the ECU is working properly, disconnect the oxygen sensor and observe the following sensors in the main dashboard display while online: UEGO (V) should read approximately 3.51 volts, UEGOS (V) should read approximately 1.02 volts, and UEGOR (V) should read approximately 4.98 volts.

29.8 Where should I set my fuel pressure? [\(Back to the top\)](#)

- Fuel injector manufacturers generally rate injectors at approximately 45 psi. It is generally recommended to set base fuel pressure at or very near this setting.

- If your fuel injectors do not flow enough fuel at this pressure, you may be able to increase your fuel pressure to increase the fuel flow capability of the injectors. As a "rule of thumb", every 1-pound increase or decrease in fuel pressure will produce a

corresponding 1% increase or decrease in injector flow. If you wish to increase your injector flow capability by raising fuel pressure, be careful! Check with your fuel pump manufacturer to see how changing pressure will effect the volume of fuel the pump can flow. If you are already have the pump flowing at or near what it is capable of flowing, sometimes raising the pressure will actually decrease the flow capability of the pump and worsen the problem!

29.9 Can I run methanol with this system? [\(Back to the top\)](#)

-Yes, you can. Methanol generally requires a little bit more than twice the volume of fuel over gasoline at full engine load, so you will need much larger injectors to provide an adequate supply of fuel. **DO NOT** use any fuel system lubricants or fragrance additives in your fuel when running an EFI-equipped vehicle with methanol. Use of these additives will likely result in clogged or damaged injectors.

-A decent way to approximate injector flow requirements for a methanol-burning engine is to simply divide flywheel horsepower by the number of cylinders:

Flywheel HP / # of Cylinders = Injector Flow Rate (lb/hr)

As an example, if you make 800 horsepower with your 8-cylinder engine, you would need a set of 100 lb/hr injectors to provide enough fuel for this engine.

-If you are using methanol on a vehicle being tuned in speed/density mode, you should change the "Injector Flow Rate" setting in the "Fuel Calculation Parameters" section to half of the actual injector flow rate. This will cause the ECU to calculate twice the injector pulsewidth it normally would, thereby doubling the volume of fuel to the engine. So, if you were using the set of 100 lb/hr injectors described above, you should enter 50 lb/hr as the injector flow rate. If you are monitoring fuel consumption in lbs/hr from C-ComWP, the number shown will be half of what is actually being used by the engine.

If you are tuning in Alpha-N mode, the above information does not apply. You should enter your actual injector flow rate if this is the case.

-The oxygen sensor will display air/fuel ratios when burning methanol. However, they will be displayed as conventional gasoline air/fuel ratios. This means that the ratio displayed is slightly more than twice as high as the actual ratio; in other words, a displayed air/fuel ratio of 12:1 is, in reality, about 6:1. Also, Lambda values are commonly used when tuning methanol-burning engines. There is a dashboard sensor called "Lambda" in C-Com WP that you can monitor if you are familiar with this measurement standard. Lambda measurements do not vary from one type of fuel to the next.

-It is recommended that the fuel system be flushed with gasoline if you plan on not using the vehicle for more than a week. This will help prevent corrosion problems within the injectors and inside the aluminum fuel rails. Periodic inspection and cleaning of the rails and injectors is also a good idea.

29.10 Are there any compatibility problems with certain versions of Windows and C-Com or C-ComWP? [\(Back to the top\)](#)

-We have tested C-ComWP with every version of Windows since Windows 95 and haven't found that any operating system will prevent C-ComWP from working.

-The DOS version of C-Com will not work with Windows 2000 or Windows XP. These operating systems do not support DOS applications.

-It is possible for the DOS version of C-Com to have communication problems when Windows is running on the PC. Because multiple applications can run simultaneously in Windows, other programs running in the background may prevent C-Com from accessing the PC's communications port. If you are unable to communicate with your ECU with C-Com running under Windows, it is advisable to create a DOS boot disk and reboot your PC with this disk in the drive. You can create a boot disk by inserting a floppy disk into your drive, going to a DOS prompt, and typing **SYS A:** at the prompt. The computer should respond with "System Transferred" after a few seconds. Restart the PC with this disk still in the drive. Windows will not load and you will have an MS-DOS prompt when the PC is finished booting. At this prompt, type the following, pressing the enter key after each line:

```
C:
CD\C-COM
CC
```

At this point, if the program runs properly and communicates with your ECU, it is a good indication that a program running in the background within Windows is interfering with C-Com's ability to access the communications port.

29.11 My oxygen sensor seems to be working, but my system won't run in closed loop mode. [\(Back to the top\)](#)

-If the oxygen sensor is working properly as per the above information, the ECU will be able to run in closed loop mode. However, there are a few settings within the calibration file that could inhibit closed loop operation from happening.

-Check the [closed loop correction limits table](#). No more correction can be applied in closed loop mode that the corresponding values in this table will allow. If these values are set to zero no closed loop correction can be applied. The net result is the same as running in open loop mode.

-Double-check your settings in the [closed loop parameters form](#). Make sure that the "Closed Loop Enable" check box is checked, and make sure that you have exceeded the coolant temperature in the "Closed Loop Minimum Temp" setting.

-The most common cause of this problem is incorrectly setting the Closed Loop High and Low RPM settings. **The engine RPM must exceed the value in the "Closed Loop High RPM" setting before closed loop operation will occur**, and it must go below the value in the "Closed Loop Low RPM" setting before turning back off.

-Most current versions of ECU firmware will temporarily suspend negative closed loop correction while the TPS value is increasing. This prevents the closed loop routine from "fighting" the acceleration enrichment fuel that is applied when the throttle is opened. However, this process only happens while the TPS reading is increasing.

-Make sure that no [after start enrichment](#) fuel is still being applied. Closed loop operation will be inhibited as long as any after start enrichment fuel is being applied.

30.0 FAST XFI Trans-Brake Control (patent pending)

30.1 Overview

Normally, after a trans-brake is enabled, a vehicle could only move after the trans-brake is released. A benefit in drag racing is that all available power may be applied to the engine while the vehicle is held stationary with the trans-brake and a vehicle can move on command within a very short reaction time via a button controlling the trans-brake. The XFI adds additional functionality to the trans-brake by allowing the brake to be released in a controlled, variable amount rather than the on/off (all or nothing) method which is the typical method of control. The XFI can "pulse width modulate" the trans-brake solenoid in such a way that the trans-brake will "slip" and the vehicle can "creep" in a controlled fashion and for a controlled time.

Using the trans-brake control feature of the XFI, a driver would be able to engage the trans-brake from the "pre-staged" position, apply the desired power, and then use the trans-brake control function of the XFI ECU to allow the vehicle to roll(creep) into the staged position under the operator's control or under automatic control allowing the driver to concentrate on the "tree" for a better and more consistent reaction time. This should be especially useful for turbocharged applications where the time required to "spool" the turbocharger may be a deciding factor in the outcome of a race.

The trans-brake control function offers complete control of the vehicle's trans-brake. Standard operation of the trans-brake is performed through a switch which grounds the "Clutch" input (ECU pin A20) on the XFI ECU and turns the trans-brake solenoid fully on or fully off as would a normal trans-brake switch. Grounding the PA Hold input (ECU pin B16) while the trans-brake is activated, initiates the creep process which pulse width modulates the trans-brake solenoid and allows the vehicle to "creep". De-activation of this input will cause the trans-brake to revert back to its fully activated or fully unlocked status as defined by the Clutch input. The solenoid is controlled from the PWM #2 (ECU pin A18) output on the ECU. The XFI ECU **does not** have the capacity to drive a trans-brake solenoid directly in most cases and it is **highly recommended** that an external driver be used to interface with the solenoid. FAST's digital relay part number 307043, would work adequately in most applications. A mechanical relay may be used but with a reduced range of control depending on the application.

30.2 Trans-Brake Control Parameters

Parameter	Value
Creep Min. TPS(%)	42
Creep Min. MAP(KPa)	40
Creep Acc. Rate (1-10)	255
Pulse Period (50-200mS)	87.8
Creep Starting DC (0-20%)	100.0
Max. Creep DC (10-60%)	43.1
Max. Creep Time (0.25-25.5S)	25.5

30.2.1 Creep Min. TPS (%)

This parameter limits slippage of the trans-brake to occur only after a minimum TPS position has been exceeded.

30.2.2 Creep Min. MAP (kPa)

This parameter limits slippage of the trans-brake to occur only after a minimum MAP pressure (engine load, boost pressure) has been exceeded. In a turbocharged application, this could be programmed so as to not allow movement until a pre-set boost level has been reached, at which time the vehicle would automatically start to move. If you're tuning in Alpha N and not utilizing a MAP sensor, this parameter can be set to 0.

30.2.3 Pulse Period (50-200mS)

This parameter defines the rate at which the solenoid will be pulsed or modulated. For instance, a period of 100mS would cause the trans-brake solenoid to be pulsed 10 times per second. Since solenoids and the associated transmission valving have a reciprocating mass that varies from application to application, this parameter can be used to adjust the control for the smoothest operation of PWM control and slippage. Settings that are too low will tend to make the trans-brake jerky and settings that are too high will not let the trans-brake move. 100 mS is a good starting point for most applications.

30.2.4 Creep Starting DC (0-20%)

This parameter defines the initial duty cycle of the PWM control when the creep function is first activated, thus allowing the user to define how fast or slow the trans-brake starts to creep. 10 to 15% is a good starting point for most applications.

30.2.5 Max. Creep DC (10-60%)

This parameter defines the maximum duty cycle of the PWM control thereby limiting the

rate of movement to a manageable amount. The user is responsible for keeping this parameter above the *Creep Starting DC*. 20 to 30% is a good starting point for most applications.

30.2.6 Creep Acc. Rate (1-10)

This parameter defines the rate at which the duty cycle is increased from the *Creep Starting DC* to the *Creep Maximum DC*. A higher number will result in a faster acceleration from the starting point to the maximum. 4 is a good starting point for most applications.

30.2.7 Max. Creep Time (0.25-25.5S)

This parameter defines the maximum amount of time that the PWM will be active. Adjusting this parameter will limit the amount of time the vehicle will creep for each time the PA Hold input is activated. Careful adjustment will allow the vehicle to creep a pre-determined distance after the PA Hold input has been activated. Once this has been set, when you activate the PA Hold input the car will only creep for this long no matter how long the input is activated.

31.0 Schematics and Instruction Sheets

31.1 Overview

This section is a collection of wiring harness schematics and instruction sheets that pertain to different products associated with your new XFI. It is simply meant as a help to you in installing your system. You will need [Adobe Acrobat Reader](#) to read these files.

31.2 Main Harness

This file is a basic schematic of our 301100 GM style main harness.

[301100 GM](#)

[301104 MAIN, HEMI](#)

[301106 MAIN, DRAGSTER](#)

31.3 Fuel Injector Harness

This file shows part numbers 301200 through 301206.

[301200-06 INJ, VARIOUS](#)

This file shows how to wire a 4 cylinder engine using 301207.

[301207](#)

[301208-09 INJ, HEMI, & LS2](#)

31.4 Ignition Adapter Harness

This file shows part numbers 301300 and 301301.

[301300 and 301301 IGN, IPU & HALL EFFECT](#)

This file shows part numbers 301302, 301303, and 301304.

[301302, 301303, and 301304](#)

[301305 IGN, LS1 EDIST CRANK TRIGGER](#)

[301305 IGN, LS1 EDIST DECODER](#)

[301307 IGN, BUICK V6 \(EARLY\)](#)

This file shows part numbers 301308 and how to use a Ford EDIS module for the 4.6L and 5.4L Modular motors.

[301308 IGN, TFI & EDIS](#)

This file shows part number 301311.

[301311 IGN, LS1-LS6 XIM](#)

[301311\[MOD\] IGN, LS1-LS6 XIM - CRANK TRIGGER](#)

[301311\[MOD\] IGN, LS1-LS6 XIM - LS1 COILS, IPU_s](#)

[301312 IGN, LS2-LS7 XIM](#)

[301313 IGN, FORD MOD \(COIL ON PLUG\) XIM](#)

[3013xx IGN, FORD MOD \(COIL PACKS\) XIM](#)

This file shows part number 301314.

[301314 IGN, HEMI 6.1 XIM](#)

This file shows part number 301316.

[301316 IGN, HEMI 5.7 XIM](#)

31.5 Option Harness

This file shows part numbers 301400, 301401, and 301402.

[301400, 301401, and 301402 OPTION, POWAD & FLASH & ANALOG](#)

This file shows part numbers 301403 and 301404.

[301403 and 301404](#)

This file shows part number 301405.

[301405](#)

This file shows part numbers 301406, 301407, and 301408.

[301406, 301407, and 301408](#)

[301415-16 - OPTION, LS2 CAM & CRANK ADAPTERS](#)

31.6 CAN

This file shows the FAST CAN network.

[FAST CAN network](#)

This file shows part numbers 30202-03.

[301412-14 - OPTION, CAN RETROFIT, CABLE & TERM RESISTORS](#)

31.7 Power Adder

This file shows how to wire in up to 4 stages of power adders.

[XFI FAST 4 STAGE N2O](#)

[XFI FAST 4 STAGE N2O Wiring with TBC](#)

31.8 Miscellaneous

[FAST CLASSIC TO XFI](#)

[XFI Trans Brake Control](#)

[30103 O2 EXTENSION](#)

[308019 PC TO ECU COMMS CABLE](#)

31.9 Instruction Sheets

[FAST Fuel System Kits](#)

[FAST eDist](#)

[Instructions-XFI - CAN Connectors Assembly](#)

[Instructions-XFI - CAN Retrofit Kit Assembly](#)

[Instructions-XFI - Cal Select Switch 301409 and General](#)

[Instructions-XFI - Fuel & Oil Pressure](#)

[FAST4-101 \(XIM\)](#)

[FAST4-111 \(Pressure sensors\)](#)

[FAST4-110 \(O2 Sensor Type\)](#)

[FAST4-100 \(USB Adapter\)](#)

[170568 \(EGT Module\)](#)

[170569 \(Accelerometer\)](#)

[FAST4-113 \(Distributor\)](#)

[147 \(Intake\)](#)

[164 \(Burst panels\)](#)

[165 \(TB's\)](#)

168 (Fuel Rails)

32.0 Intelligent Traction Control

32.1 Overview

There are two modes of Intelligent Traction Control that can be used in your XFI™. One is called Heuristic Mode, and the other is called PA Mode. Each mode can be used separately or together to reduce or eliminate a loss of traction which can occur due to any number of reasons such as limited tire size, suspension issues, or track conditions. Both modes utilize a speed sensor to monitor driveshaft RPM and are easily set-up using a simple 2D graph.

The fact that both modes rely on driveshaft speed instead of other methods that utilize engine speed (RPM) to base their traction control on makes this much easier. The reason for that is you no longer have to 'chase' plots on a graph that are constantly affected by other factors such as gear changes, torque converter or clutch slippage, or anything else that can affect engine RPM and the rate at which it changes. Those variances don't occur with driveshaft speed. FAST™ has once again come up with a simpler, easier way to get you down track or around town.

32.2 Wiring up your Driveshaft Sensor input

If you do not have a driveshaft sensor you can purchase one from FAST™. There are several different pickup and collar sizes available. If your pickup did not come from FAST™, you will need to know whether your pickup is inductive or discrete to wire it in properly. Consult the manufacturer of the sensor to correctly determine which type you have. Once you have determined which type your sensor is, see [Section 2.1.20](#) for further wiring instructions.

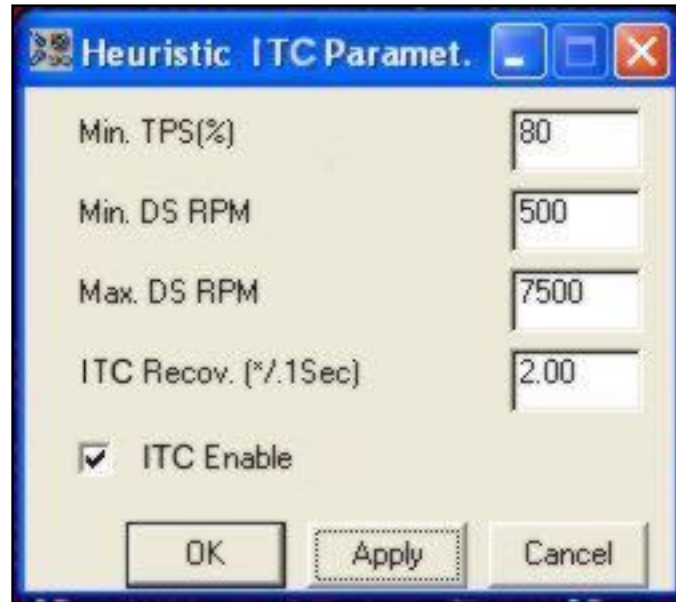
32.3 ITC Heuristic Mode

This is a traction control mode that will not limit the rate at which your car can accelerate. By monitoring the change in driveshaft speed over time, the ECU can determine whether the tires are slipping, and then retard the timing to try and keep that acceleration rate in the acceptable range you program. This acceleration is monitored as the rate in which the driveshaft's rpm is increasing and measured in rpm increase over a 0.10 second period. It's important to understand this as a rate of change in the RPM rather than the rate of speed (RPM) in order to use this feature correctly. It is not the actual speed of the driveshaft that we are referring to. It is the change in RPM of the driveshaft in one tenth of a second of time. For example, it will be typical to see this rate of change in the 250 to 350 RPM range for a well accelerating drag car. To know what the correct range of acceleration rate of your vehicle should be, you'll need to log the 'Delta DS RPM' parameter. For more information on setting up a Dashboard for logging, see [Section 14.3](#). Once you have acquired useful data of your vehicles 'Delta DS RPM' while running well in its typical environment such as drag racing, road racing, or just street driving, you can use that data to setup the curve for acceleration rate in the table 'ITC Retard vs. Delta DS RPM'. It may sound complicated, but follow along and we'll walk you through the process.

Once you've been through it you won't believe how easy it was to improve your E.T., lap times, etc.

32.4 ITC Heuristic Mode Setup Parameters

To get started, click on FILE/ITC SETTINGS/ITC HEURISTIC PARAMETERS. A small window will open. This Window contains some basic setup information you'll need to properly fill in.



32.4.1 Min. TPS(%)

This parameter sets the minimum TPS (throttle position sensor) reading required for the Heuristic Mode function to begin and continue. For example, 50% is half throttle, 100% is full, or wide open throttle.

32.4.2 Min. DS RPM

This parameter sets the minimum driveshaft RPM required for the Heuristic Mode function to begin and continue.

32.4.3 Max. DS RPM

This parameter sets the maximum driveshaft RPM that when met will turn off the Heuristic Mode.

32.4.4 ITC Recov. (*.1Sec)

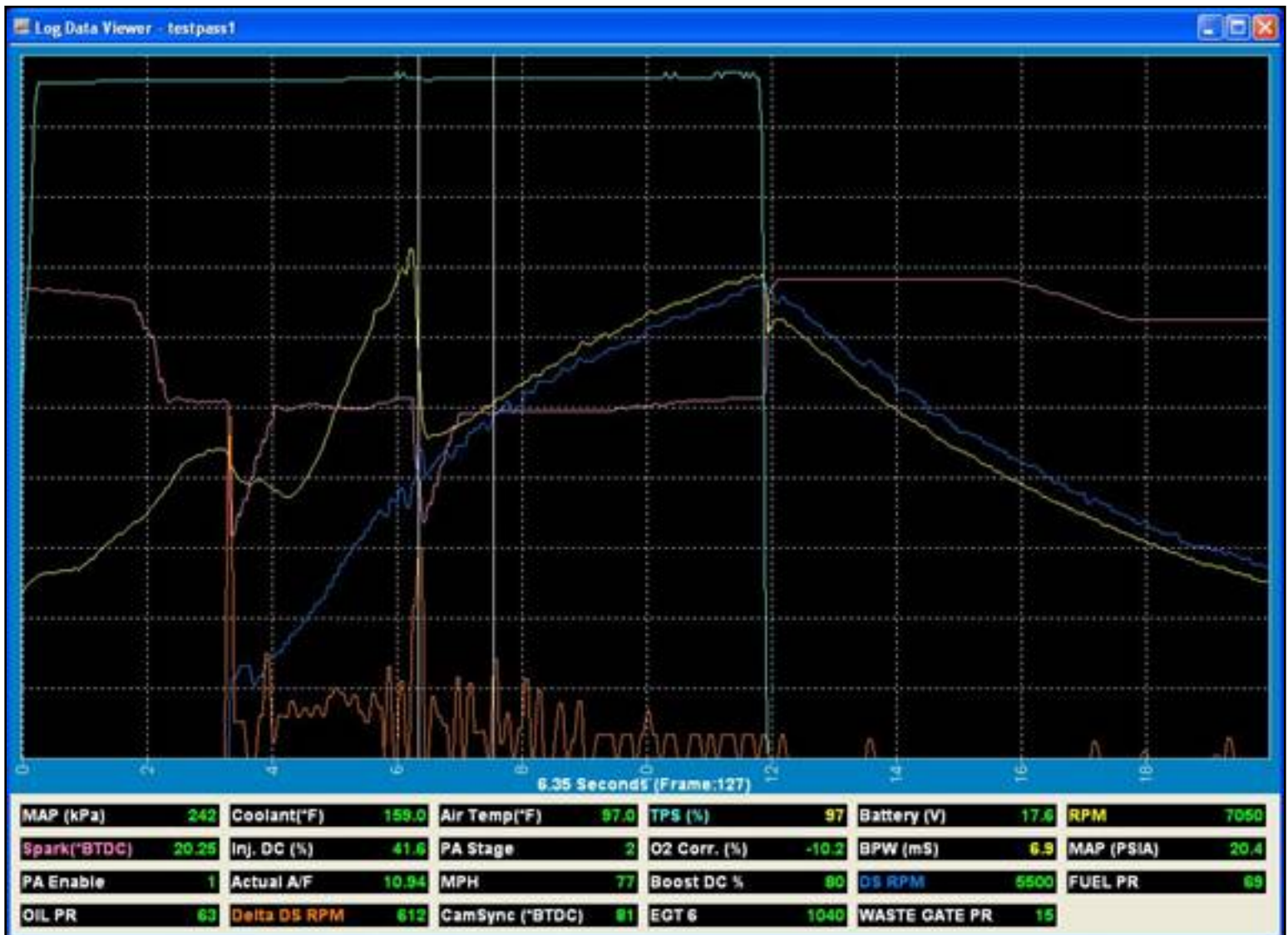
This parameter controls the rate at which the amount of timing you have retarded is brought back in. A larger number will bring the timing back in quicker and a smaller number brings the timing back in slower. '2' (20 degrees per second) is a good place to start if you are not sure. Always refer to your engine builder for questions of this nature.

32.4.5 ITC Enable

This box must be checked for Heuristic Mode to be operational. If, after setting up Heuristic Mode you decide you do not want to utilize it, simply uncheck this box and it will not be operational. To check or uncheck, simply place the mouse over the box and left click once.

32.5 ITC Retard vs. Delta DS RPM

This 2D table uses ITC Retard(*) as the scale running up the left side of the table. The higher up the scale you go the more timing is taken away from the engine. The table uses Delta DS RPM, or change in driveshaft RPM as the scale running across the bottom. The farther to the right you go, the greater the acceleration in driveshaft RPM. The first thing to do is setup the RPM points along the lower scale. You will need to use the datalogs you've accumulated to set this up correctly. The datalog below shows typical DS RPM (blue) and Delta DS RPM (orange) traces for a mid-8 second drag car.

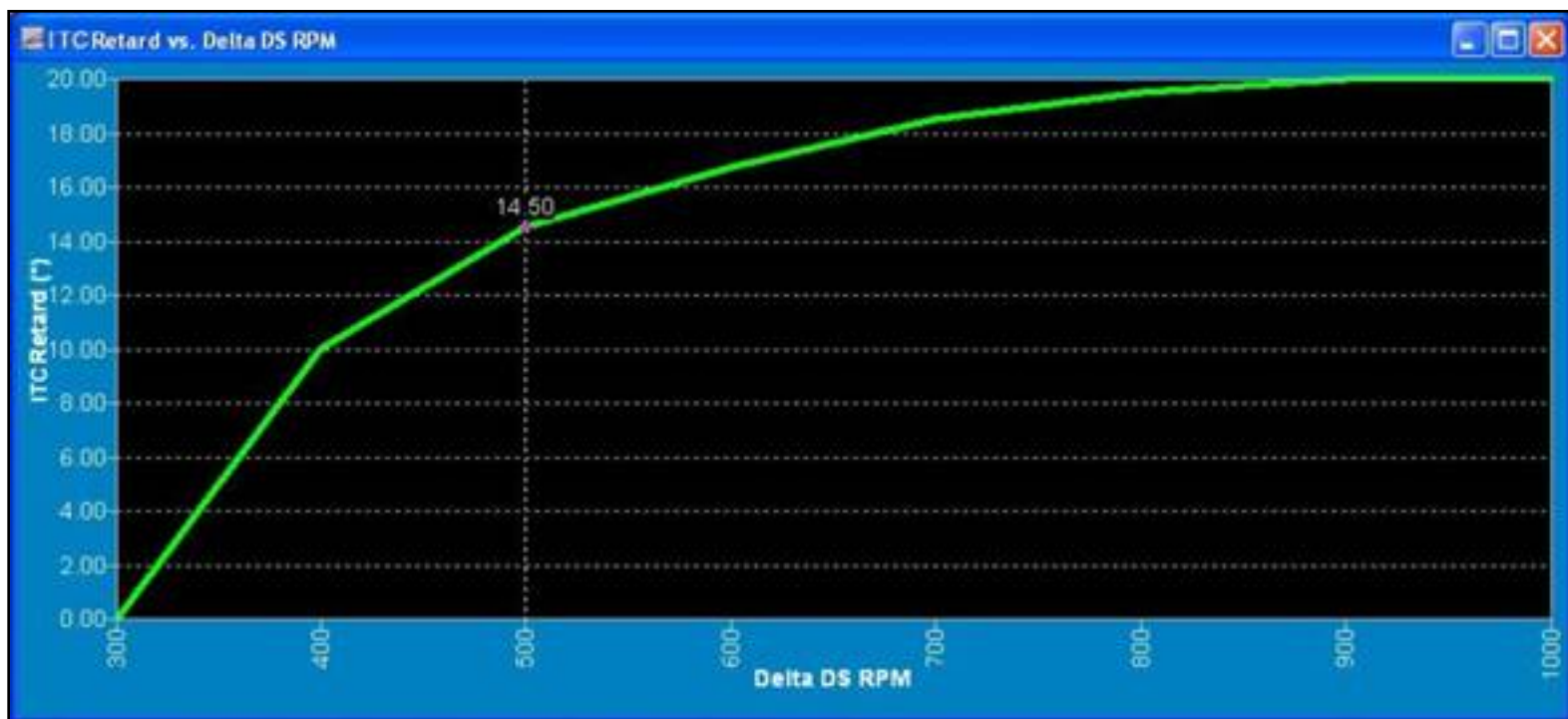


Notice the DS RPM is very smooth between 4 and almost 6 seconds into the run. A smooth trace area

like that is a good place to start looking at Delta DS RPM and figure out what a good acceleration rate for your car would be. Delta DS RPM in this area ranges from 124 to 204. The next thing to look at in the datalog is for the higher spikes in Delta DS RPM. This indicates wheel spin and can be checked by looking at the DS RPM trace to see if the spike occurs there as well. Spikes in DS RPM will not look as dramatic as the corresponding spike in Delta DS RPM. The goal is to determine what Delta DS RPM is acceptable as good acceleration and what isn't. With this information we can move on to the next step.

The next step is to set the Delta DS RPM data points along the bottom of the table. To do this, simply move your mouse cursor over the furthest data point to the left until it turns into a pointy fingered hand. Once you see the pointy fingered hand, double left click and a window will appear. Type the value you want for that data point in the window and hit enter. A good starting spot is about 100 RPM above what you've determined as a good acceleration rate. Using our example above, you would type in 300. Now repeat the previous steps for each data point, gradually increasing as you move to the right.

The next step is to create the curve in the table. **IMPORTANT NOTE – ALWAYS START WITH 'O' AS YOUR FIRST RETARD POINT AS SHOWN BELOW.** You should create a curve that takes out more timing as Delta DS RPM increases. The table below gives you an example of this. Remember, tire size, horsepower level, and transmission type will play a large role in how aggressive this curve needs to be. When in doubt, consult your engine builder for timing retard recommendations.



You're now ready to try ITC Heuristic Mode!

32.6 ITC PA Mode

PA Mode differs from Heuristic Mode in that it uses actual driveshaft RPM as the base curve to

calculate from. The farther/faster your driveshaft goes over the programmed curve, PA Mode will begin cutting out cylinders sequentially (both fuel and spark) until the driveshaft RPM comes back to even or below the programmed curve. As mentioned above in Heuristic Mode, using actual driveshaft RPM instead of engine RPM gives you many advantages. There are no plots to chase, no gear shift spikes, no torque convertor/clutch slippage to deal with. It's simply the speed of the shaft that the rear axle is being driven with.

IMPORTANT NOTE – Use of Nitrous Oxide is not recommended with PA Mode. Consult your engine builder before attempting to use PA Mode with Nitrous Oxide.

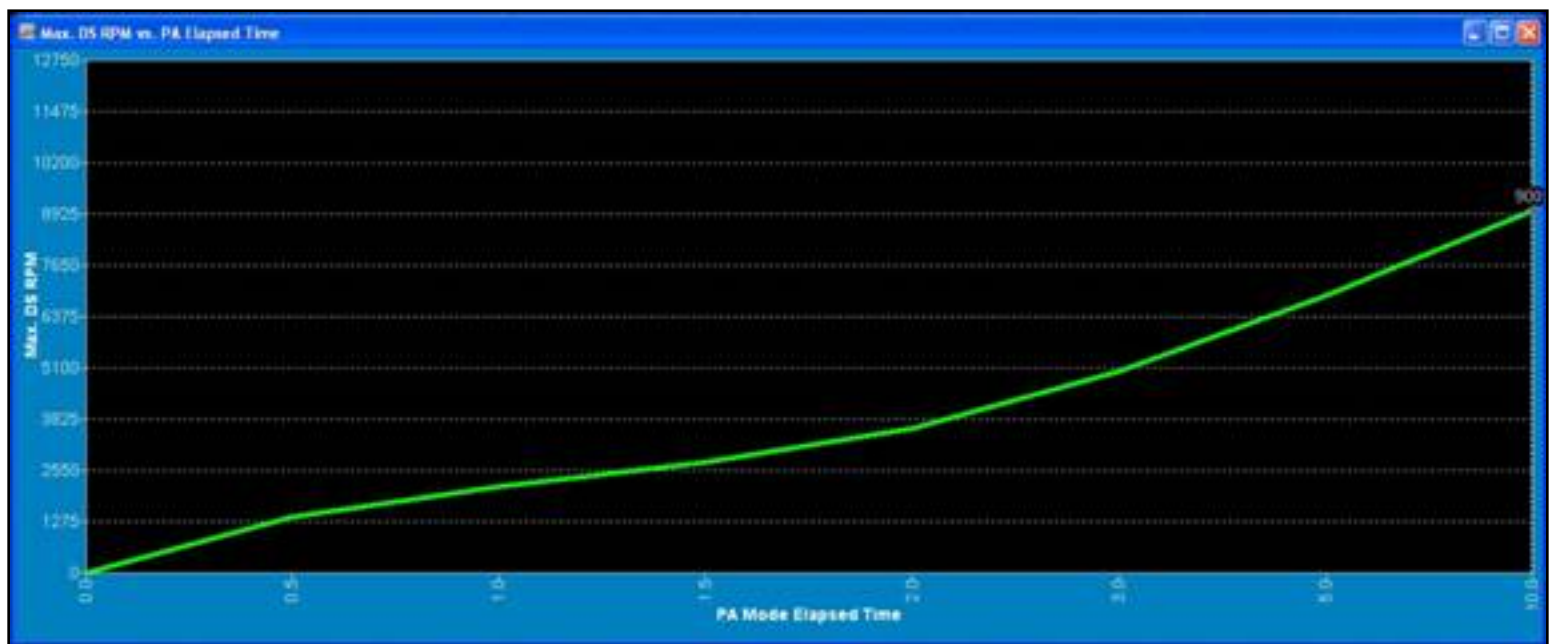
To utilize PA Mode, you'll first need to have a datalog of 'DS RPM' of your vehicle. Once you have acquired useful data of your vehicles 'DS RPM' while running well in its typical environment such as drag racing, you can use that data to setup the curve for the 'Max. DS RPM vs. PA Elapsed Time' table.

32.6.1 ITC PA Mode Parameters

This is very straightforward. Simply check this box to enable PA Mode. To put a check in the box, move your mouse over the box and left click. Do the same to uncheck/disable PA Mode.

32.6.2 Max. DS RPM vs. PA Mode Elapsed Time

This is a 2D table that uses 'Max. DS RPM' as the scale running up the left side of the table with DS RPM increasing as it goes up and 'PA Mode Elapsed Time' as the scale running across the bottom with time increasing as it goes to the right.



The first step is to setup the elapsed time. Each of the time data points along the bottom that are set at 12.8 (seconds) currently can be changed to any number of seconds you prefer. Put your mouse cursor

over the number 12.8 and it will change into a pointy-fingered hand. Once the cursor does this double-click with the left mouse button and a window will appear that will allow you to change the value. Type in the number you want to use and hit 'Enter' to place this number in that data point. For a typical drag race application, you would start with 0 at the left most point, changing each point as you move to the right incrementally ending up at approximately your elapsed time at the last point to the right. This will allow you to place your driveshaft RPM in at each data point to create your programmed curve. We must stress that you need to have good driveshaft RPM data to use to program this curve, otherwise it will not be very accurate, if at all. Also, most will find that it will be more effective to use more data points earlier in the run while the vehicle is accelerating the most, and fewer later in the run when the driveshaft RPM is leveling off.

The next step is to reference your datalogs, and place the DS RPM for each time data point in the table. You can do this many ways; see [Section 7.2](#) or [Section 7.7](#) for ways to change the 2D table.

NOTE - Once you've set up the DS RPM in the table and created your curve, you can add 5% to 10% to the curve to allow for a performance improvement of the vehicle. Otherwise, theoretically the vehicle will only be allowed to go as fast as the curve allows. A 5% improvement for a 10 second drag car is .5 seconds.

32.6.3 Important Information

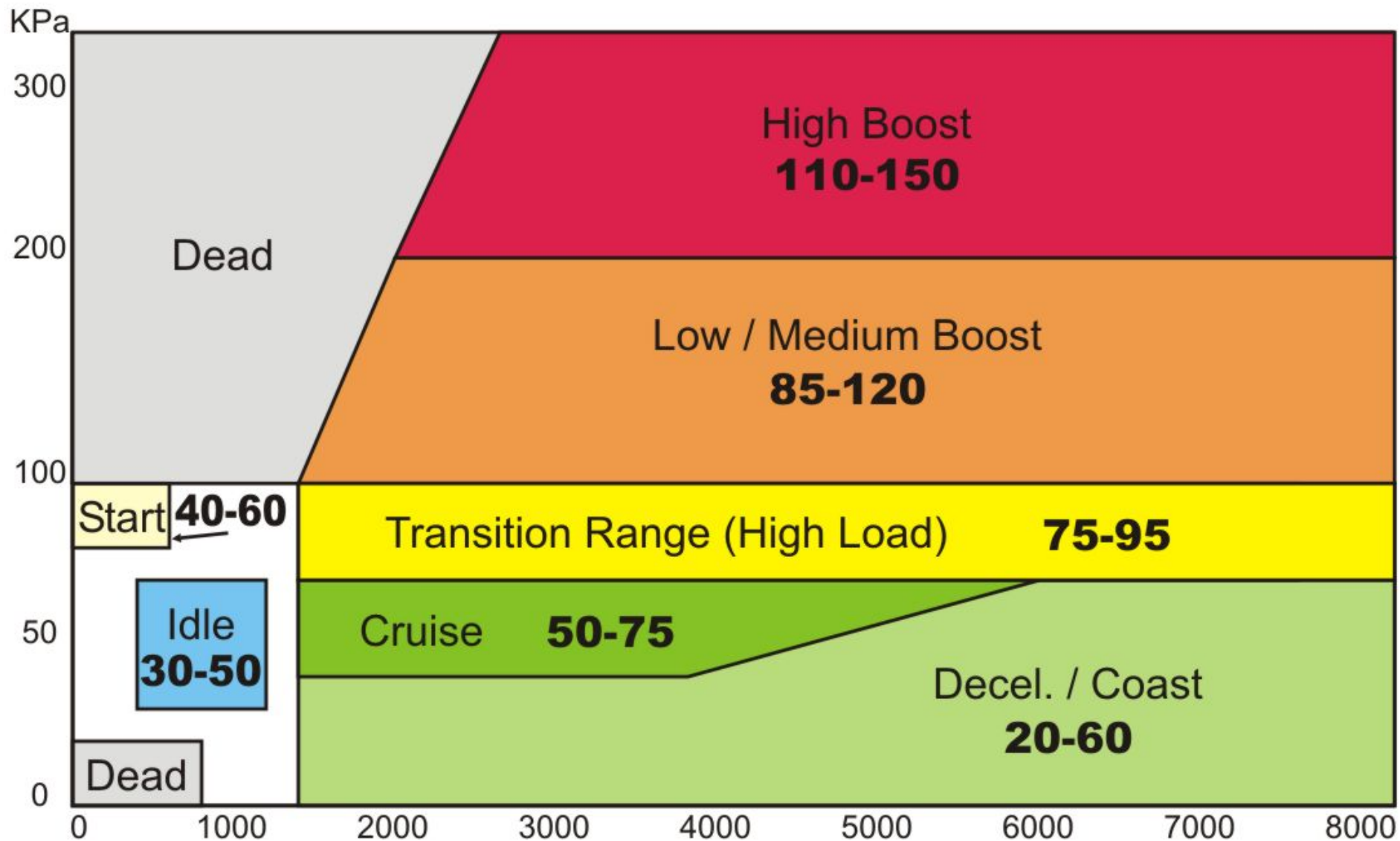
If you are not using the Power Adder feature and want to use PA Mode, there are several things to check to make sure you do not unknowingly trigger fueling or timing changes. They are:

- Click on VIEW/POWER ADDER CONFIGURATION/POWER ADDER GLOBAL PARAMETERS
- Make sure there is a check in the box next to 'PA Mode Enable'
- Make sure 'Number of Stages' is set to 1
- Set 'TPS Enable Threshold (%)' to a number below 100, but above where you do your burnout at
- Set 'Activation RPM (>)' to about 500 RPM below the engine RPM you leave the starting line at
- Set 'Deactivation RPM (<)' to the engine RPM you want the PA Mode to deactivate
- Check the box next to 'PA Fuel Tables OFF'

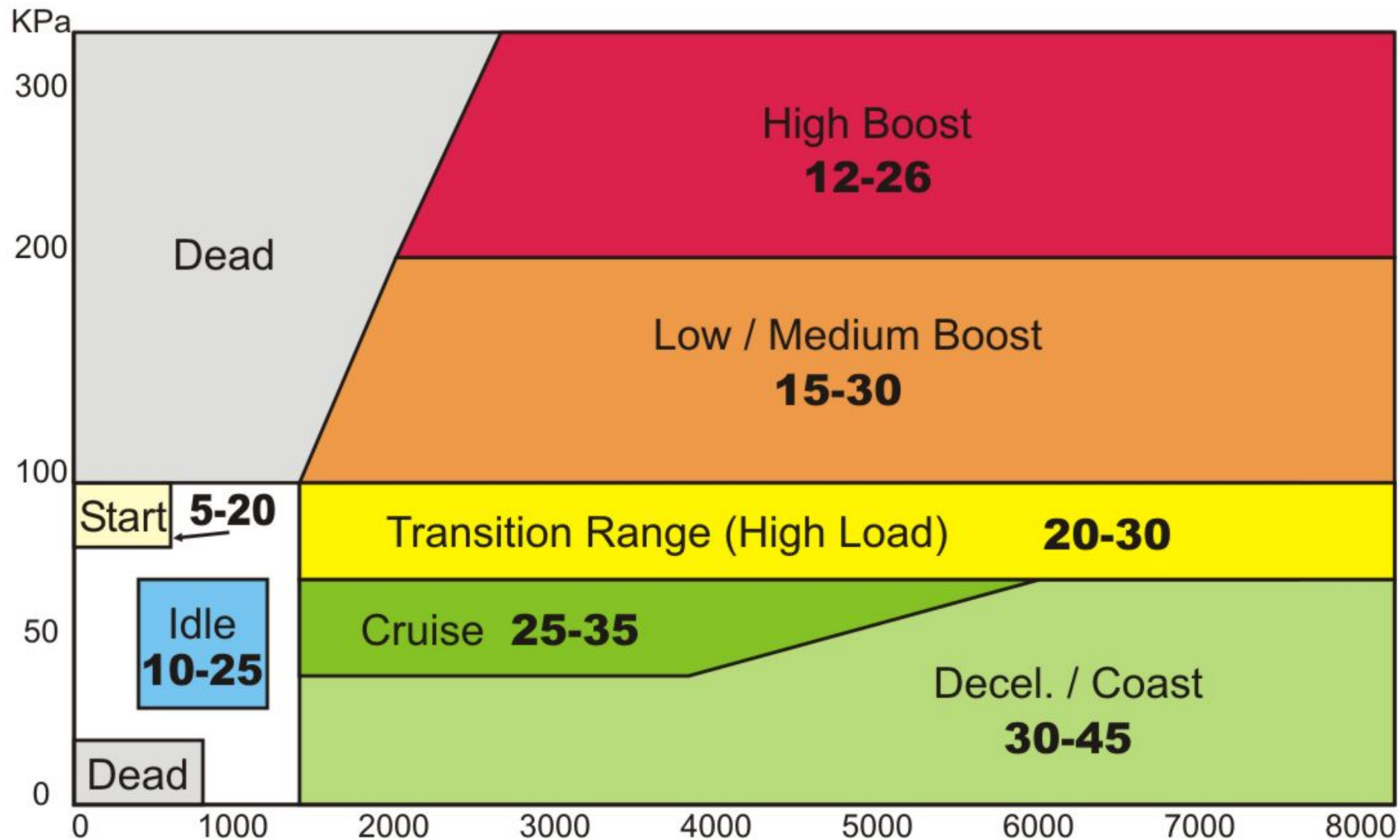
- Make sure the boxes next to 'Disable Enviro Correction' and 'PA Hold Force Max. Stage' are un-checked
- Click on VIEW/POWER ADDER CONFIGURATION/1ST STAGE PARAMETERS
- Make sure 'Supplemental Enrichment (%)' is set to 0
- If you're running in Closed Loop, set 'Target Air/Fuel Ratio' to match what you're using in the wide open throttle area of you Target Air/Fuel map. If you're running in Open Loop this can be disregarded
- Set 'Boost Override (%)' to 0
- Set 'Timing Retard' to 0
- Make sure the box next to 'Fixed Timing' is unchecked

Once all the above is done, you're ready to try ITC PA Mode!

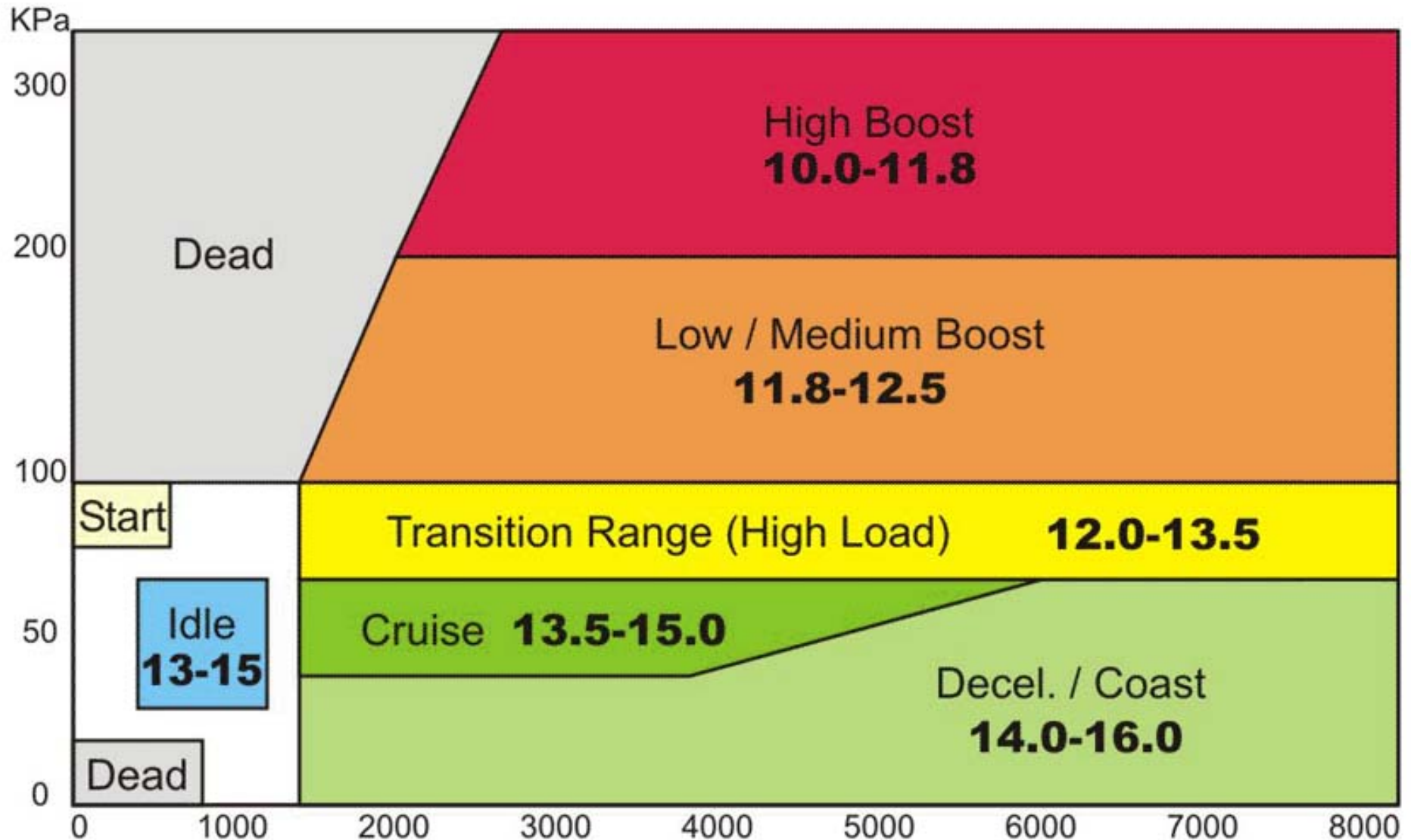
VE Landscape

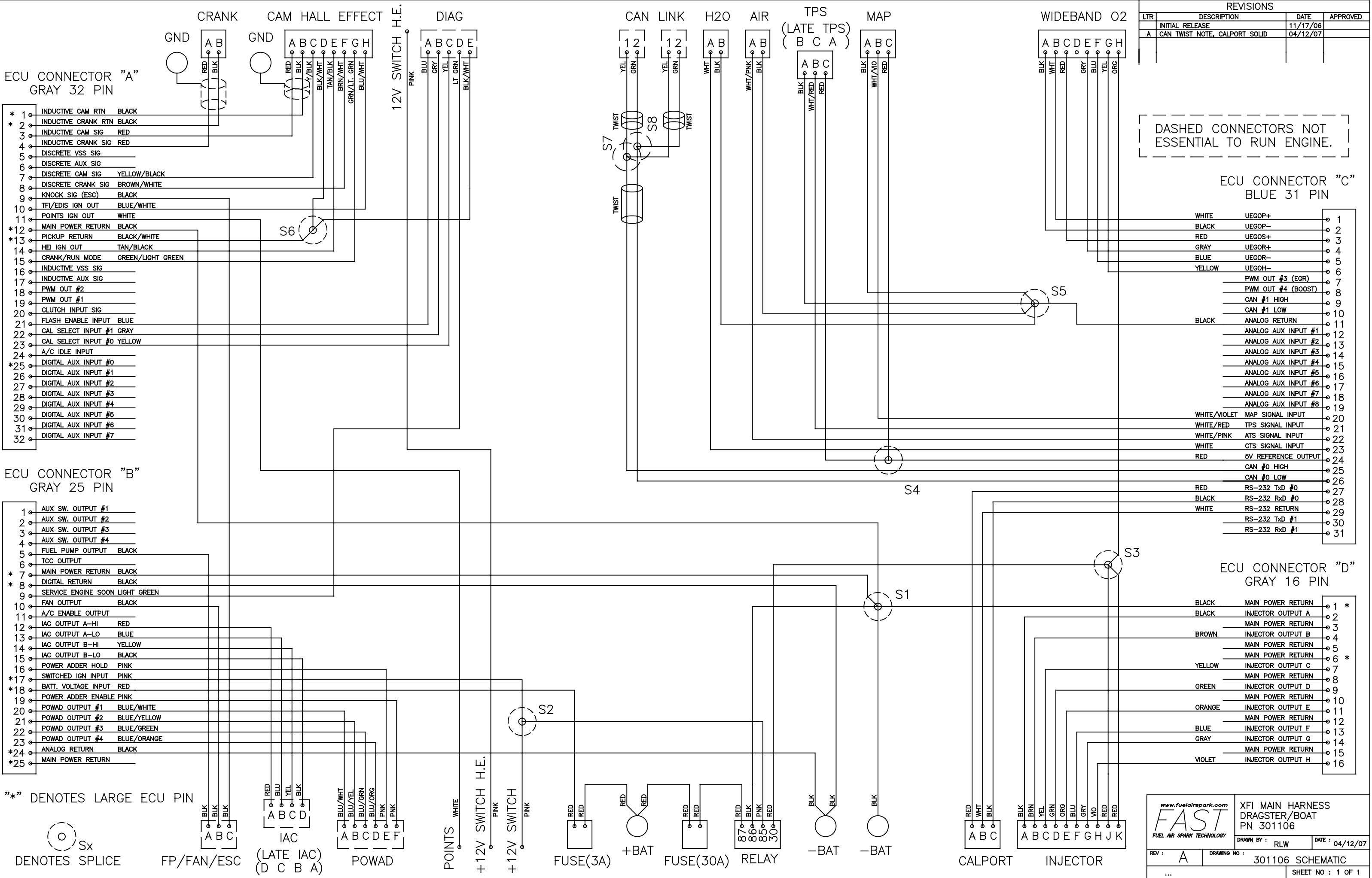


Spark Timing Landscape



Air/Fuel Ratio Landscape





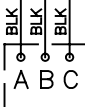
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	11/17/06	
A	CAN TWIST NOTE, CALPORT SOLID	04/12/07	

DASHED CONNECTORS NOT
ESSENTIAL TO RUN ENGINE.

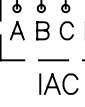
"*" DENOTES LARGE ECU PIN



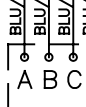
DENOTES SPLICE



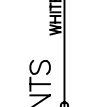
FP/FAN/ESC



(LATE IAC)
(D C B A)



POWAD



POINTS

+12V SWITCH H.E.

+12V SWITCH

FUSE(3A)

+BAT

FUSE(30A)

RELAY

-BAT

-BAT

CALPORT

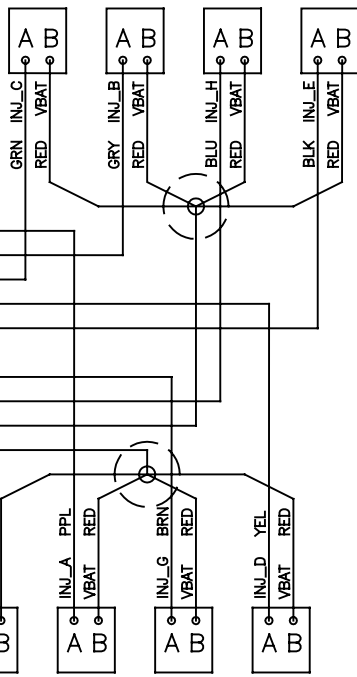
INJECTOR

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/08/06	
A	CHANGE INJECTOR DESCRIPTION		
	REARRANGE FORD LAYOUTS	09/15/06	
B	CHANGE INJ AND MAIN CONN DESC.	04/12/07	

PN 301200

INJECTOR HARNESS
SBC, BBC, LT1, CHRYSLER

#7 #5 #3 #1



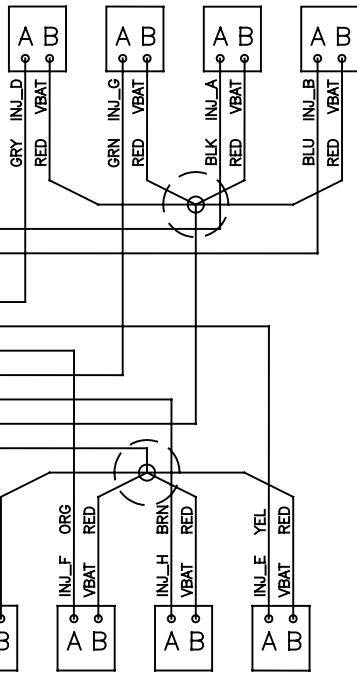
#8 #6 #4 #2

FIRING ORDER : 1-8-4-3-6-5-7-2
INJECTOR OUTPUT : E-F-G-H-A-B-C-D

PN 301203

INJECTOR HARNESS
FORD 4.6L, 5.0L, 5.4L, 5.8L

#8 #7 #6 #5



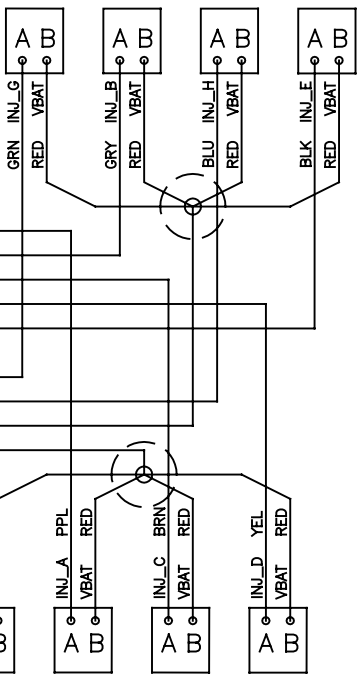
#4 #3 #2 #1

FIRING ORDER : 1-3-7-2-6-5-4-8
INJECTOR OUTPUT : E-F-G-H-A-B-C-D

PN 301201

INJECTOR HARNESS
SBC, BBC WITH 4/7 SWAP

#7 #5 #3 #1



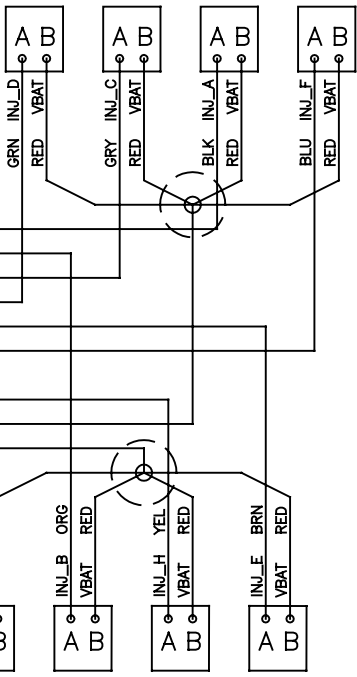
#8 #6 #4 #2

FIRING ORDER : 1-8-7-3-6-5-4-2
INJECTOR OUTPUT : E-F-G-H-A-B-C-D

PN 301204

INJECTOR HARNESS
FORD 289, 302, FE, 429, 460

#8 #7 #6 #5



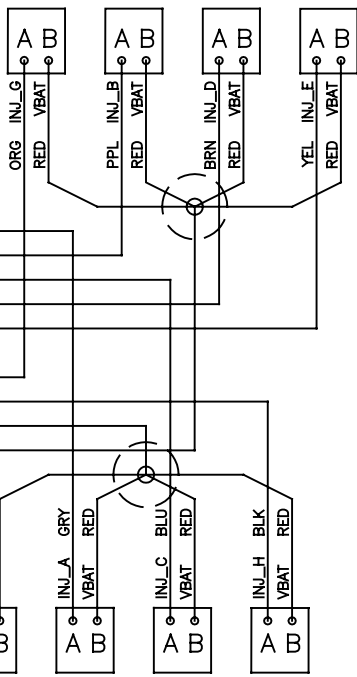
#4 #3 #2 #1

FIRING ORDER : 1-5-4-2-6-3-7-8
INJECTOR OUTPUT : E-F-G-H-A-B-C-D

PN 301202

INJECTOR HARNESS
GM GEN III LS1, LS6

#7 #5 #3 #1



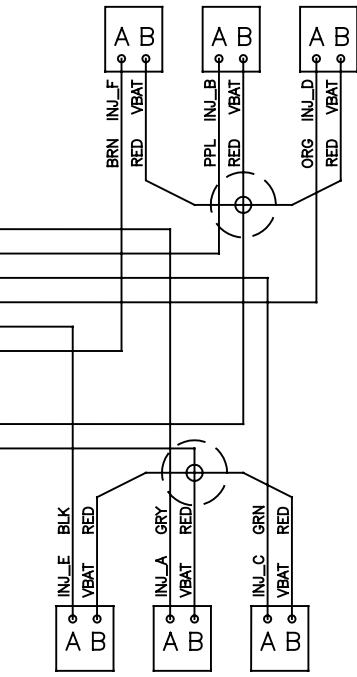
#8 #6 #4 #2

FIRING ORDER : 1-8-7-2-6-5-4-3
INJECTOR OUTPUT : E-F-G-H-A-B-C-D

PN 301206

INJECTOR HARNESS
BUICK V6

#5 #3 #1



#6 #4 #2

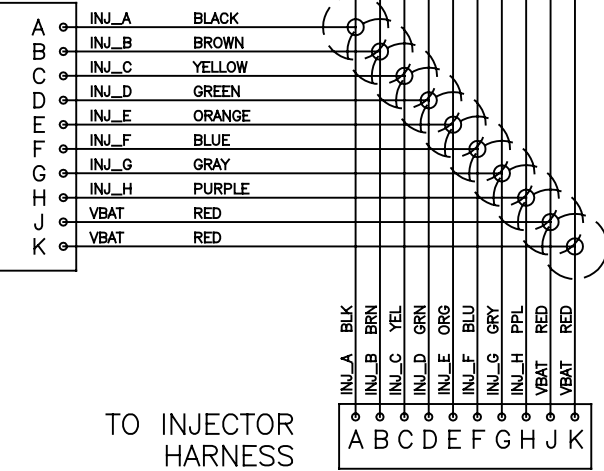
FIRING ORDER : 1-6-5-4-3-2
INJECTOR OUTPUT : D-E-F-A-B-C

PN 301205

INJECTOR HARNESS
Y ADAPTER

TO INJECTOR
HARNESS

TO "INJECTOR"
CONNECTOR ON XFI
MAIN HARNESS



TO INJECTOR
HARNESS

FAST
FUEL AIR SPARK TECHNOLOGY

www.fuelatrapark.com		FAST XFI INJECTOR HARNESS SCHEMATICS PN'S 301200 - 301206	
FUEL AIR SPARK TECHNOLOGY		DRAWN BY : RLW	DATE : 04/12/07
REV : B	DRAWING NO : 301200-06 SCHEMATICS		
...			SHEET NO : 1 OF 1



3406 Democrat Rd.
 Memphis, TN 38118
 901-260-FAST (3278)
 www.fuelairspark.com

FAST™ XFI™ 4 Cylinder Injector Harness (P/N .30-1207)

The proper wiring of the 4 cylinder injector harness will depend on the application. A Bank-to-Bank setup will require different wiring than a Sequential setup. And a Sequential setup will need to be wired according to the engine's firing order.

In Bank-to-Bank mode, half of the injector drivers (INJA, INJB, INJC and INJD) fire together. Then the other half of the injector drivers (INJE, INJF, INJG and INJH) fire together.

In Sequential mode, the first four injector drivers fire one at a time in this order:

INJC → INJD → INJA → INJB

For any application, the red wire will remain in pin K.

Follow these steps to wire the injector harness:

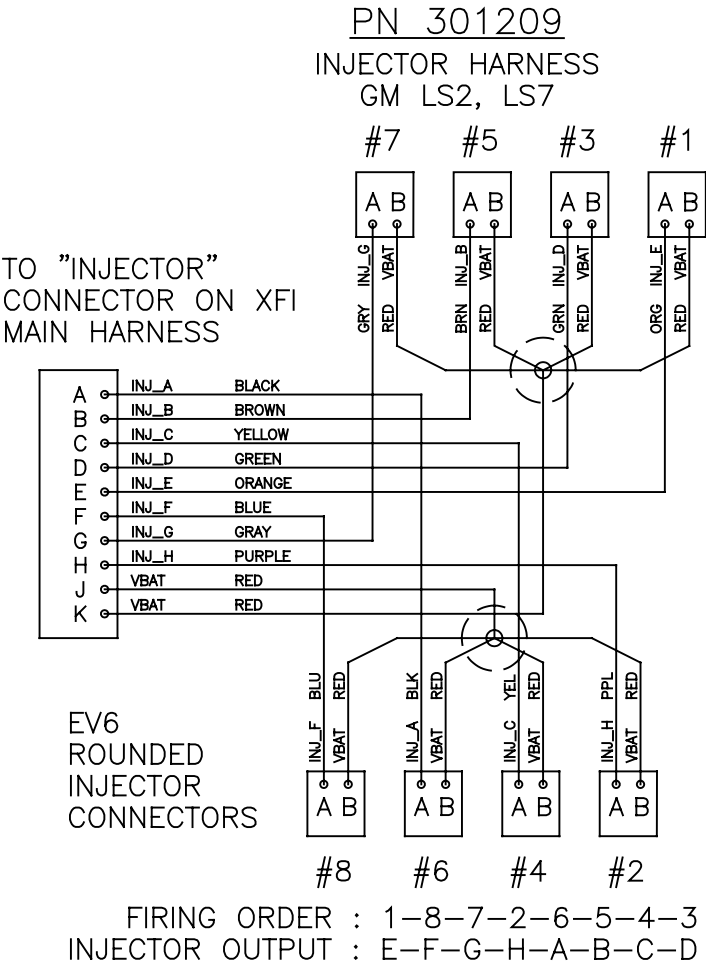
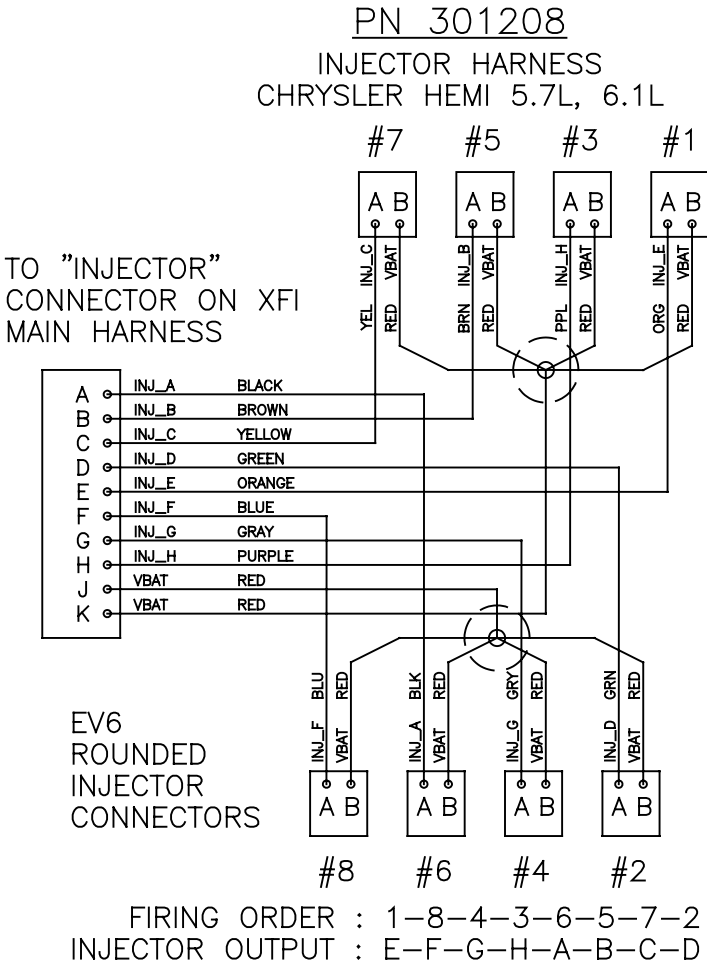
1. Remove the gray lock from the back of the main connector.
2. Insert the 4 loose pins (Black, Brown, Green and Yellow wires) according to the chart. They should click into place.
3. Reinstall the gray lock onto the back of the main connector.

Main Connector	Wires from Injector Connectors		
Pin Desc.	Sequential	Bank-to-Bank	

A	INJA	3rd cylin F.O.*	Cylinder#1
B	INJB	4th cylin F.O.*	Cylinder#2
C	INJC	1st cylin F.O.*	
D	INJD	2nd cylin F.O.*	
E	INJE		
F	INJF		
G	INJG		Cylinder#3
H	INJH		Cylinder#4
J	VBAT		
K	VBAT	Red	Red

*F.O. = Firing Order.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	09/15/06	
A	CHANGE INJ AND MAIN CONN DESC.	04/12/07	



DENOTES SPLICE

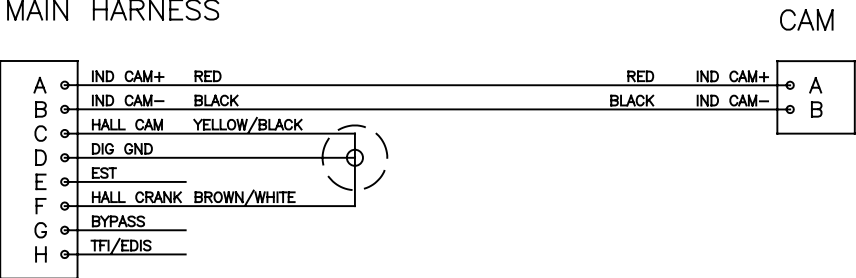
<p>www.fuelairspark.com</p> <p>FAST</p> <p>FUEL AIR SPARK TECHNOLOGY</p>		<p>FAST XFI INJ. HARNESSES</p> <p>HEMI & LS2</p> <p>PN'S 301208/301209</p>	
		<p>DRAWN BY : RLW</p>	<p>DATE : 04/12/07</p>
<p>REV : A</p>	<p>DRAWING NO : 301208-09 SCHEMATICS</p>		
<p>...</p>		<p>SHEET NO : 1 OF 1</p>	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/09/06	
A	ADD NOTES FOR TYPE MISMATCH	10/23/06	

PN 301300

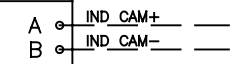
IGNITION ADAPTER — IPU
(INDUCTIVE PICKUP)

TO "CAM/HALL EFFECT"
CONNECTOR ON XFI
MAIN HARNESS



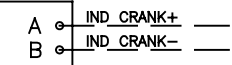
CAM

CAM MATE — GRAY
(INCLUDED)



(CAN BE USED TO MATE
CUSTOMER'S CAM INPUT TO
FAST IGN. ADAPTER HARNESS.)

CRANK MATE — BLACK
(INCLUDED)



(CAN BE USED TO MATE
CUSTOMER'S CRANK INPUT TO
FAST MAIN HARNESS.)

POLARITY OF POPULAR INDUCTIVE PICKUPS

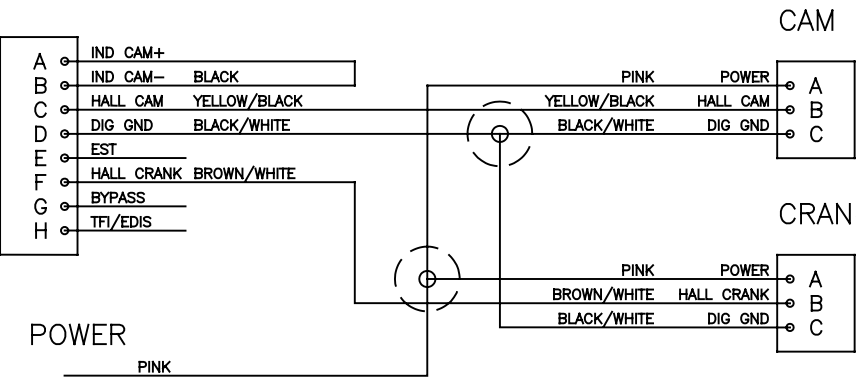
	POSITIVE (+) TO FAST "RED"	NEGATIVE (-) TO FAST "BLACK"
MSD DISTRIBUTOR	BLACK/VIOLET	BLACK/ORANGE
MSD CRANK TRIGGER	GREEN	VIOLET
ACCEL 44000 SERIES	BLACK	WHITE
ACCEL CRANK TRIGGER	BLACK	WHITE

NOTE:
FAST'S SIGN CONVENTION DIFFERS FROM
THAT OF SOME MANUFACTURER'S. IN ALL
CASES, THIS CHART SHOULD BE FOLLOWED.

PN 301301

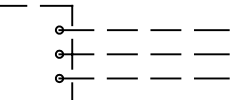
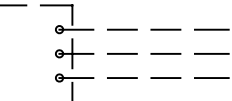
IGNITION ADAPTER — HALL EFFECT

TO "CAM/HALL EFFECT"
CONNECTOR ON XFI
MAIN HARNESS



CAM

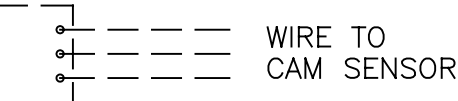
CRANK



NOTE:
VERIFY PINOUT AND POWER
REQUIREMENT WITH SENSOR
MANUFACTURER.

WIRING FOR CAM/CRANK TYPE MISMATCHES

CAM = HALL EFFECT
CRANK = INDUCTIVE



LOOP B TO C
(TO GROUND UNUSED INPUT)
CRANK SENSOR IS WIRED
TO 2-WAY "CRANK"
CONNECTOR ON MAIN XFI
HARNESS.

CAM = INDUCTIVE
CRANK = HALL EFFECT

LOOP B TO C
(TO GROUND UNUSED INPUT)
A-B LOOP AT 8-WAY
CONNECTOR IS REPLACED
WITH WIRING TO CAM SENSOR.

WIRE TO
CRANK SENSOR

⊙
DENOTES SPLICE

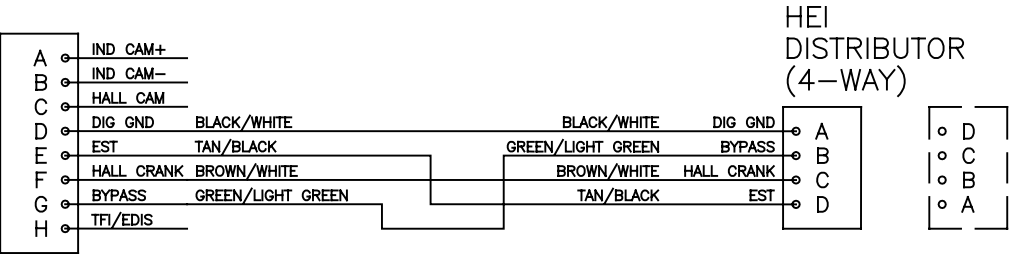
www.fuelairspark.com		FAST XFI IGN. ADAPTERS IPU & HALL EFFECT PN'S 301300/301301	
FAST FUEL AIR SPARK TECHNOLOGY		DRAWN BY : RLW	
		DATE : 10/23/06	
REV : A	DRAWING NO : 301300-01 SCHEMATICS		
...		SHEET NO : 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/09/06	

PN 301302

IGNITION ADAPTER – GM HEI
(SMALL CAP/EXTERNAL COIL)

TO "CAM/HALL EFFECT"
CONNECTOR ON XFI
MAIN HARNESS

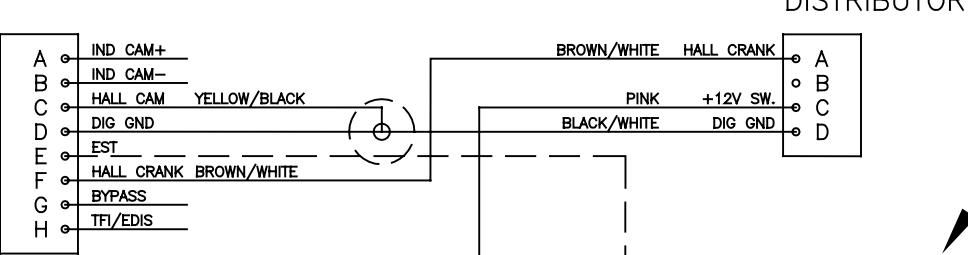


LARGE CAP HEI'S USE PINOUT SHOWN IN DASHED CONN.
REQUIRES A DIFFERENT 4-WAY DISTRIBUTOR CONNECTOR.
MUST ALSO SUPPLY POWER TO "BATT" TERMINAL ON CAP.

PN 301304

IGNITION ADAPTER – GM LT1
(LONG CONN. OPTISPARK)

TO "CAM/HALL EFFECT"
CONNECTOR ON XFI
MAIN HARNESS



ADD WIRE IF USING
FACTORY COIL DRIVER.

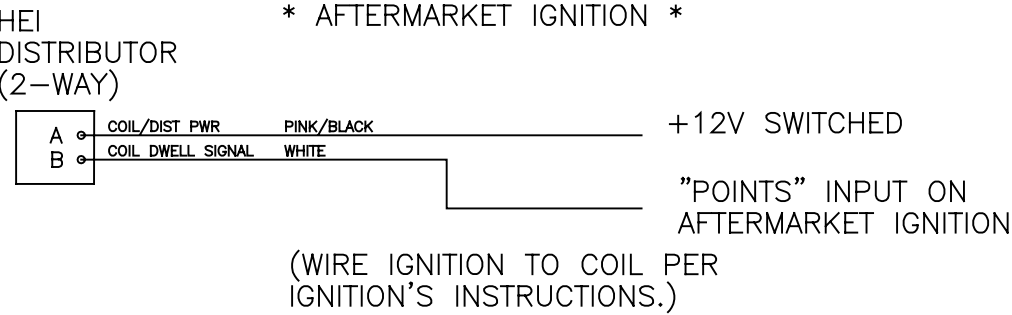
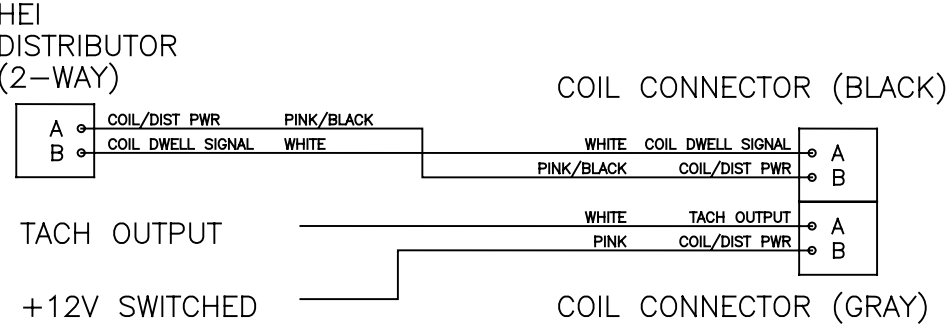
NOTE:
SHORT CONNECTOR OPTISPARK
USES SAME PINOUT.

+12V SWITCHED
PINK

(CONNECT TO POWER SOURCE.
CAN BE CONNECTED TO LOOSE
PINK WIRE PASSING THROUGH XFI
MAIN HARNESS.)

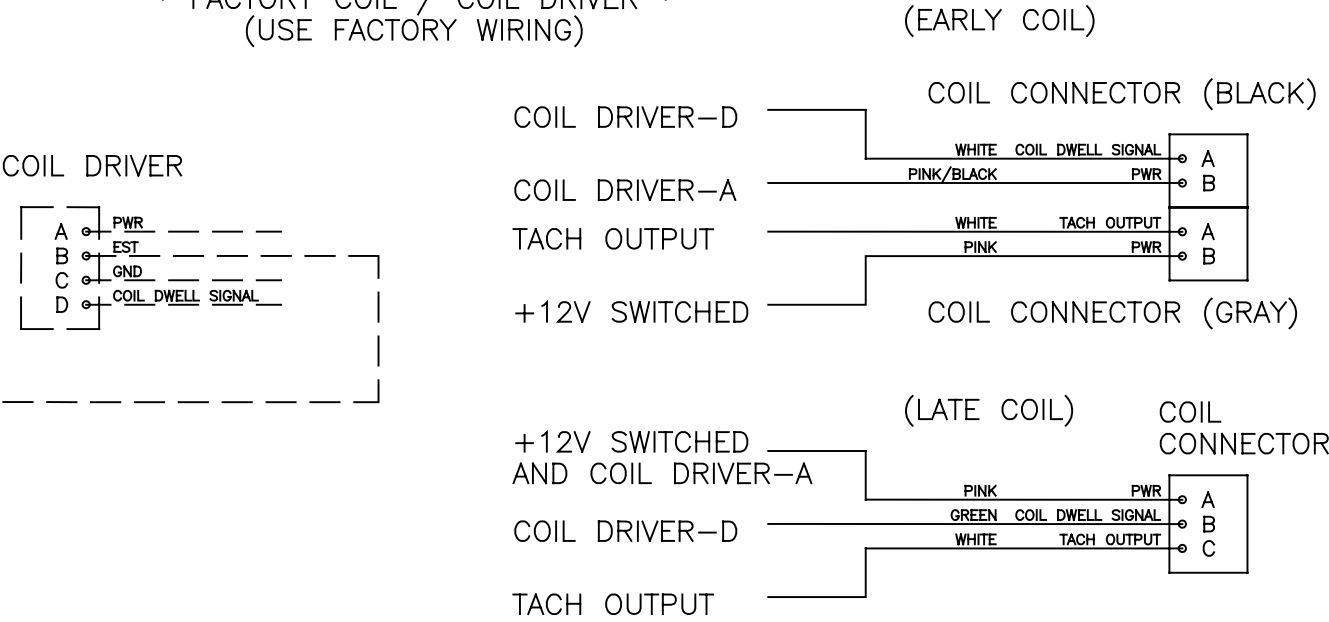
ADDITIONAL HEI WIRING (FOR REFERENCE)

* FACTORY COIL / COIL DRIVER *
(USE FACTORY WIRING OR FAST PN 9900100)



ADDITIONAL OPTISPARK WIRING (FOR REFERENCE)

* FACTORY COIL / COIL DRIVER *
(USE FACTORY WIRING)



* AFTERMARKET IGNITION *

TO USE AFTERMARKET IGNITION, CONNECT WHITE "POINTS" WIRE (ECU
PIN A11) FROM XFI MAIN HARNESS TO "POINTS" INPUT ON IGNITION.

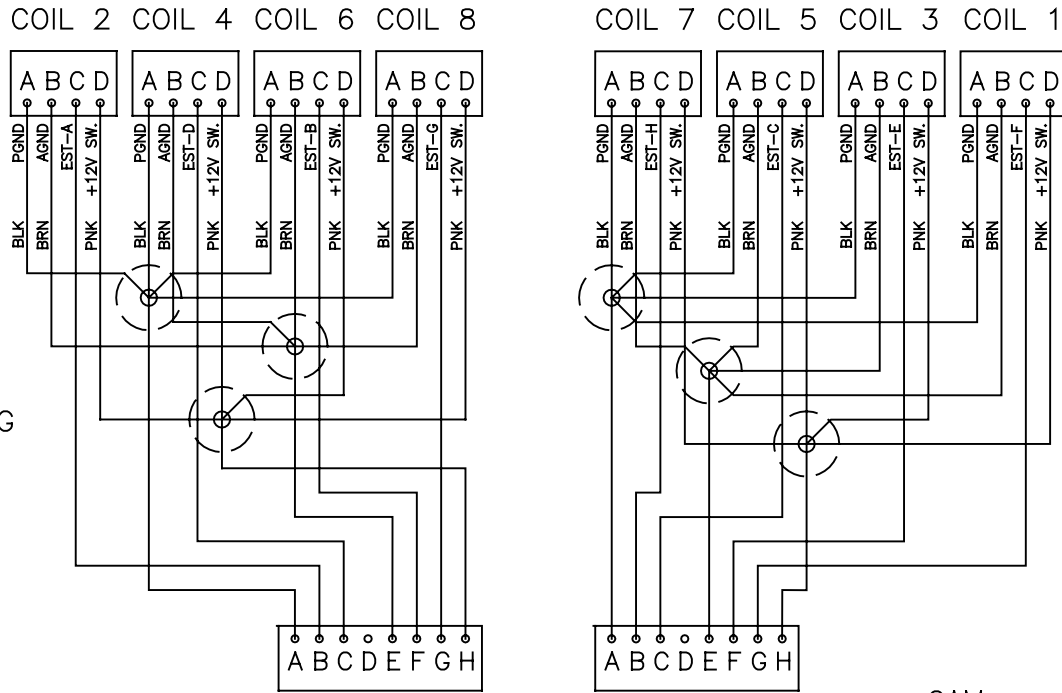
WIRE IGNITION TO COIL PER IGNITION'S INSTRUCTIONS.



DENOTES SPLICE

www.fuelairspark.com FAST FUEL AIR SPARK TECHNOLOGY		FAST XFI IGN. ADAPTERS HEI & LT1 PN'S 301302/301304	
REV : ...	DRAWING NO : 301302-04	DRAWN BY : RLW	DATE : 08/09/06
...		SHEET NO : 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/09/06	



COIL WIRING

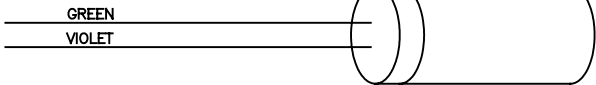
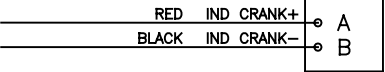
USE FACTORY WIRING

ADDITIONAL WIRING

FOR USING MSD CRANK TRIGGER

"CRANK"
CONNECTOR ON
XFI MAIN HARNESS

MSD CRANK
TRIGGER



PN 301305

IGNITION ADAPTER – GM LS1/LS6
(USING FAST EDIST)

FAST
EDIST

COIL PACK 1 (P)

COIL PACK 2 (D)

CAM

GND

TACH OUTPUT

LT. GRN

+12V SWITCHED

(CONNECT TO POWER SOURCE.
CAN BE CONNECTED TO
LOOSE PINK WIRE PASSING
THROUGH XFI MAIN HARNESS.)

EST/POINTS INPUT

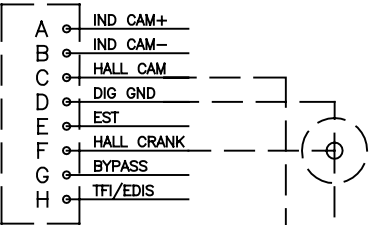
(CONNECT TO WHITE "POINTS"
WIRE (ECU PIN A11) FROM XFI
MAIN HARNESS.)

TAP INTO CAM SIGNAL WIRE
FOR SEQUENTIAL FUELING.

EST/POINTS GND

(CONNECT TO "CAM/HALL
EFFECT" CONNECTOR PIN D.)

TO "CAM/HALL EFFECT"
CONNECTOR ON XFI
MAIN HARNESS



C1	N/c	
C2	EST/POINTS INPUT	WHITE
C3	INDUCTIVE CAM SIG	RED
C4	DISCRETE CAM SIG	BROWN
C5	ANALOG GND	BROWN
C6	EST-B	BLUE/WHITE
C7	EST-D	GREEN/WHITE
C8	EST-F	VIOLET
C9	EST-H	RED
C10	ANALOG GND	BROWN
C11	COIL-B	RED
C12	COIL-D	BLUE
C13	COIL-F	GREEN
C14	COIL-H	PURPLE
C15	TACH OUTPUT	LIGHT GREEN
C16	+12V SWITCHED	PINK
D1	N/c	
D2	EST/POINTS GND	BROWN/WHITE
D3	INDUCTIVE CAM RTN	BLACK
D4	DISCRETE CAM RTN	BLACK/PINK
D5	EST-A	RED/WHITE
D6	EST-C	GREEN
D7	EST-E	BLUE
D8	EST-G	VIOLET/WHITE
D9	ANALOG GND	BROWN
D10	COIL-A	RED/WHITE
D11	COIL-C	BLUE/WHITE
D12	COIL-E	GREEN/WHITE
D13	COIL-G	PURPLE/WHITE
D14	POWER GND	BLACK
D15	POWER GND	BLACK
D16	POWER GND	BLACK

FIRING ORDER: 1-8-7-2-6-5-4-3
EST OUTPUT.: F-G-H-A-B-C-D-E

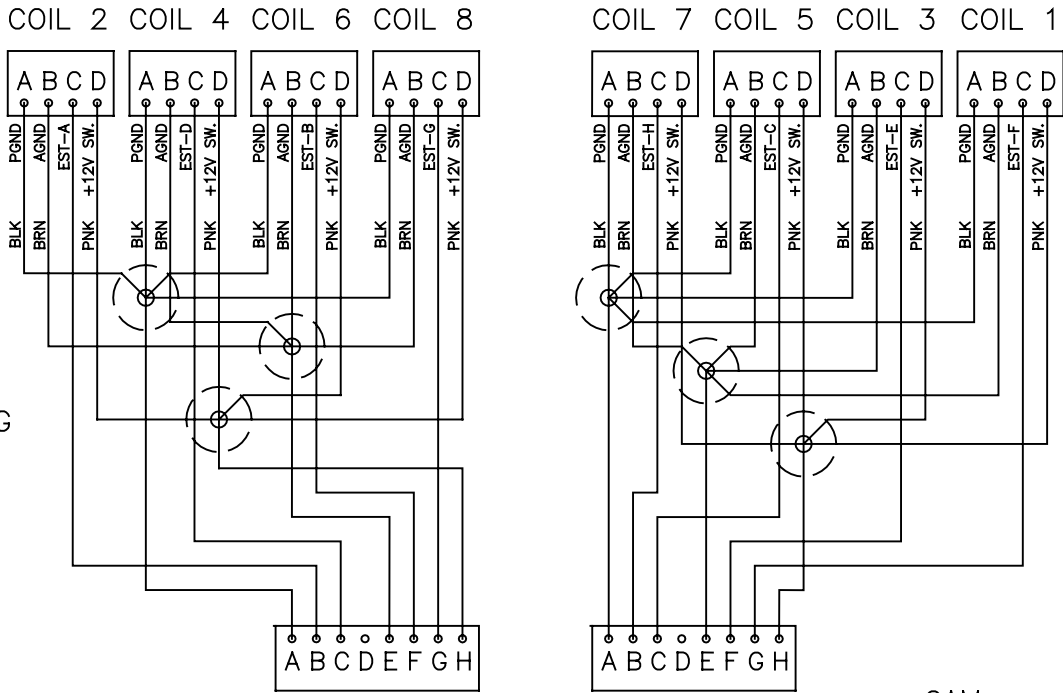
DENOTES SPLICE

www.fuelairspark.com		FAST XFI IGN. ADAPTER GM LS1/LS6 W/ EDIST PN 301305 (CRANK TRIG.)	
FAST		DRAWN BY : RLW DATE : 08/09/06	
FUEL AIR SPARK TECHNOLOGY		REV : ... DRAWING NO : 301305 SCHEMATIC-CRANK TRIG	
...		SHEET NO : 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/09/06	

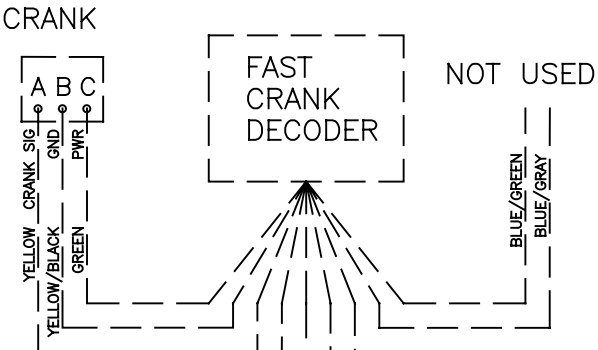
COIL WIRING

USE FACTORY WIRING



ADDITIONAL WIRING

FOR USING FAST CRANK DECODER
WITH FACTORY CRANK TRIGGER
WHEEL AND CRANK SENSOR



+12V SWITCHED RED
GROUND BLACK

PN 301305

IGNITION ADAPTER – GM LS1/LS6
(USING FAST EDIST)

FAST
EDIST

C1	N/c	
C2	EST/POINTS INPUT	WHITE
C3	INDUCTIVE CAM SIG	RED
C4	DISCRETE CAM SIG	BROWN
C5	ANALOG GND	BROWN
C6	EST-B	BLUE/WHITE
C7	EST-D	GREEN/WHITE
C8	EST-F	VIOLET
C9	EST-H	RED
C10	ANALOG GND	BROWN
C11	COIL-B	RED
C12	COIL-D	BLUE
C13	COIL-F	GREEN
C14	COIL-H	PURPLE
C15	TACH OUTPUT	LIGHT GREEN
C16	+12V SWITCHED	PINK
D1	N/c	
D2	EST/POINTS GND	BROWN/WHITE
D3	INDUCTIVE CAM RTN	BLACK
D4	DISCRETE CAM RTN	BLACK/PINK
D5	EST-A	RED/WHITE
D6	EST-C	GREEN
D7	EST-E	BLUE
D8	EST-G	VIOLET/WHITE
D9	ANALOG GND	BROWN
D10	COIL-A	RED/WHITE
D11	COIL-C	BLUE/WHITE
D12	COIL-E	GREEN/WHITE
D13	COIL-G	PURPLE/WHITE
D14	POWER GND	BLACK
D15	POWER GND	BLACK
D16	POWER GND	BLACK

COIL PACK 1 (P)

COIL PACK 2 (D)

CAM

GND

TACH OUTPUT

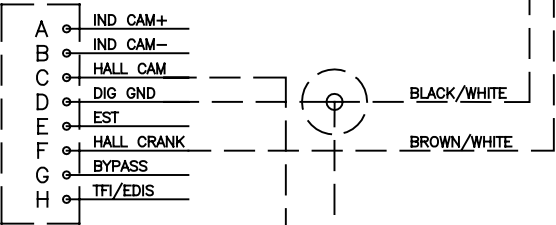
+12V SWITCHED
(CONNECT TO POWER SOURCE.
CAN BE CONNECTED TO
LOOSE PINK WIRE PASSING
THROUGH XFI MAIN HARNESS.)

EST/POINTS INPUT
(CONNECT TO WHITE "POINTS"
WIRE (ECU PIN A11) FROM XFI
MAIN HARNESS.)

TAP INTO CAM SIGNAL WIRE
FOR SEQUENTIAL FUELING.

EST/POINTS GND
(CONNECT TO "CAM/HALL
EFFECT" CONNECTOR PIN D.)

TO "CAM/HALL EFFECT"
CONNECTOR ON XFI
MAIN HARNESS



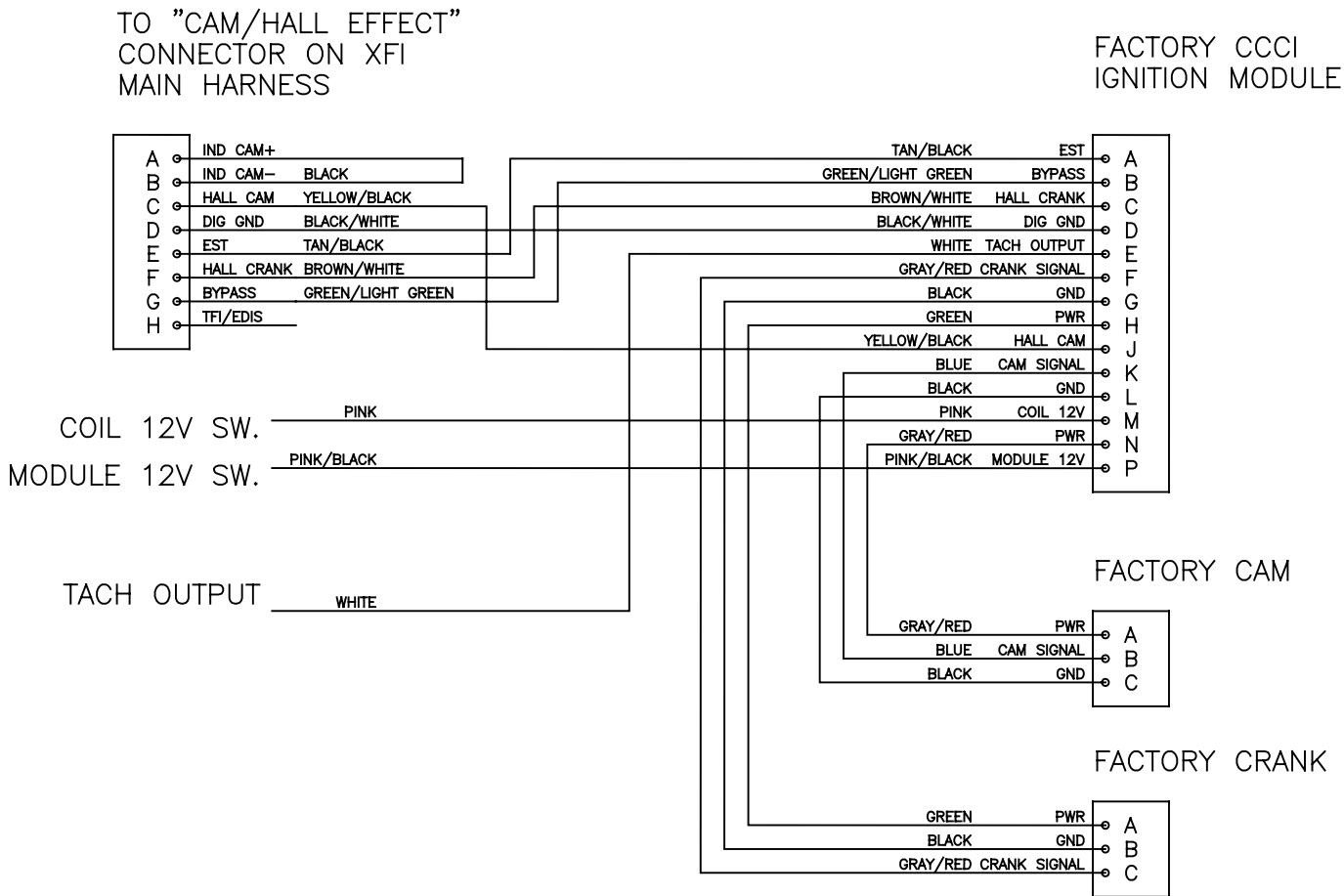
FIRING ORDER: 1-8-7-2-6-5-4-3
EST OUTPUT.: F-G-H-A-B-C-D-E

⊙
DENOTES SPLICE

www.fuelairspark.com		FAST XFI IGN. ADAPTER GM LS1/LS6 W/ EDIST PN 301305 (DECODER)	
FAST		DRAWN BY : RLW DATE : 08/09/06	
FUEL AIR SPARK TECHNOLOGY		REV : ... DRAWING NO : 301305 SCHEMATIC-DECODER	
...		SHEET NO : 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	02/15/07	

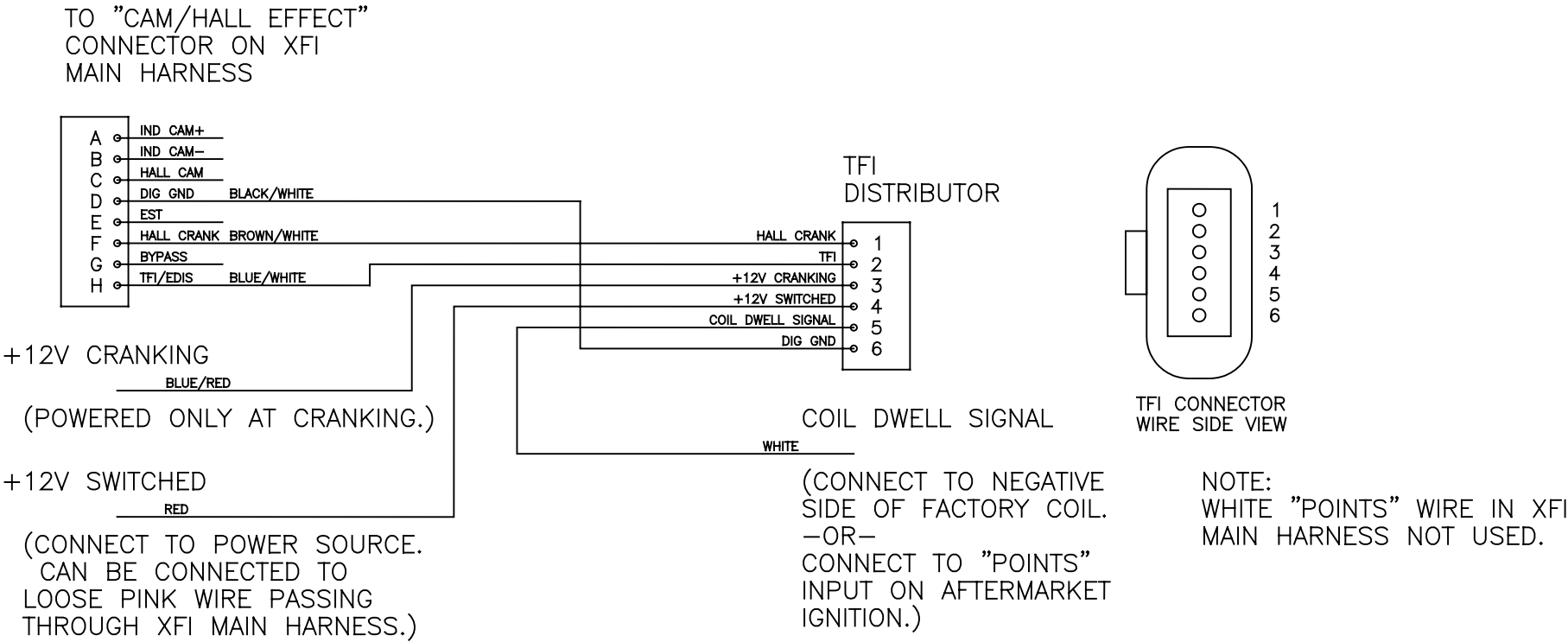
PN 301307
IGNITION ADAPTER – BUICK V6 (EARLY)



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/09/06	
A	ADD TACH TO EDIS	04/12/07	

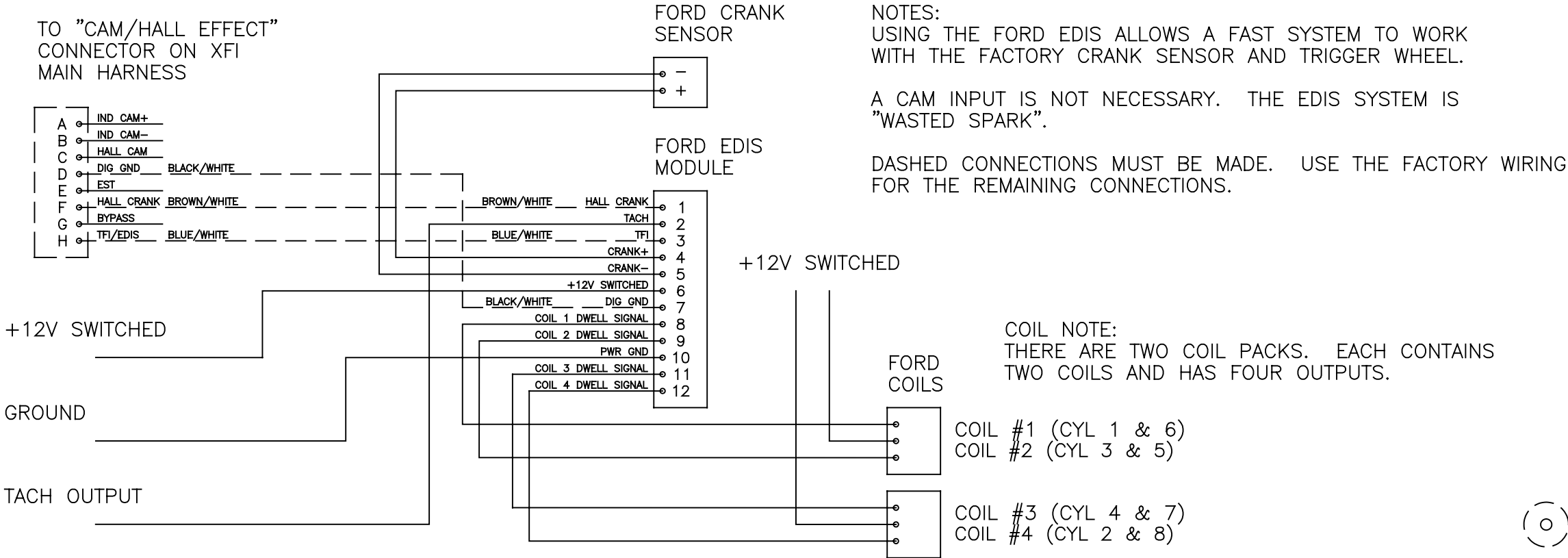
PN 301308

IGNITION ADAPTER – FORD TFI



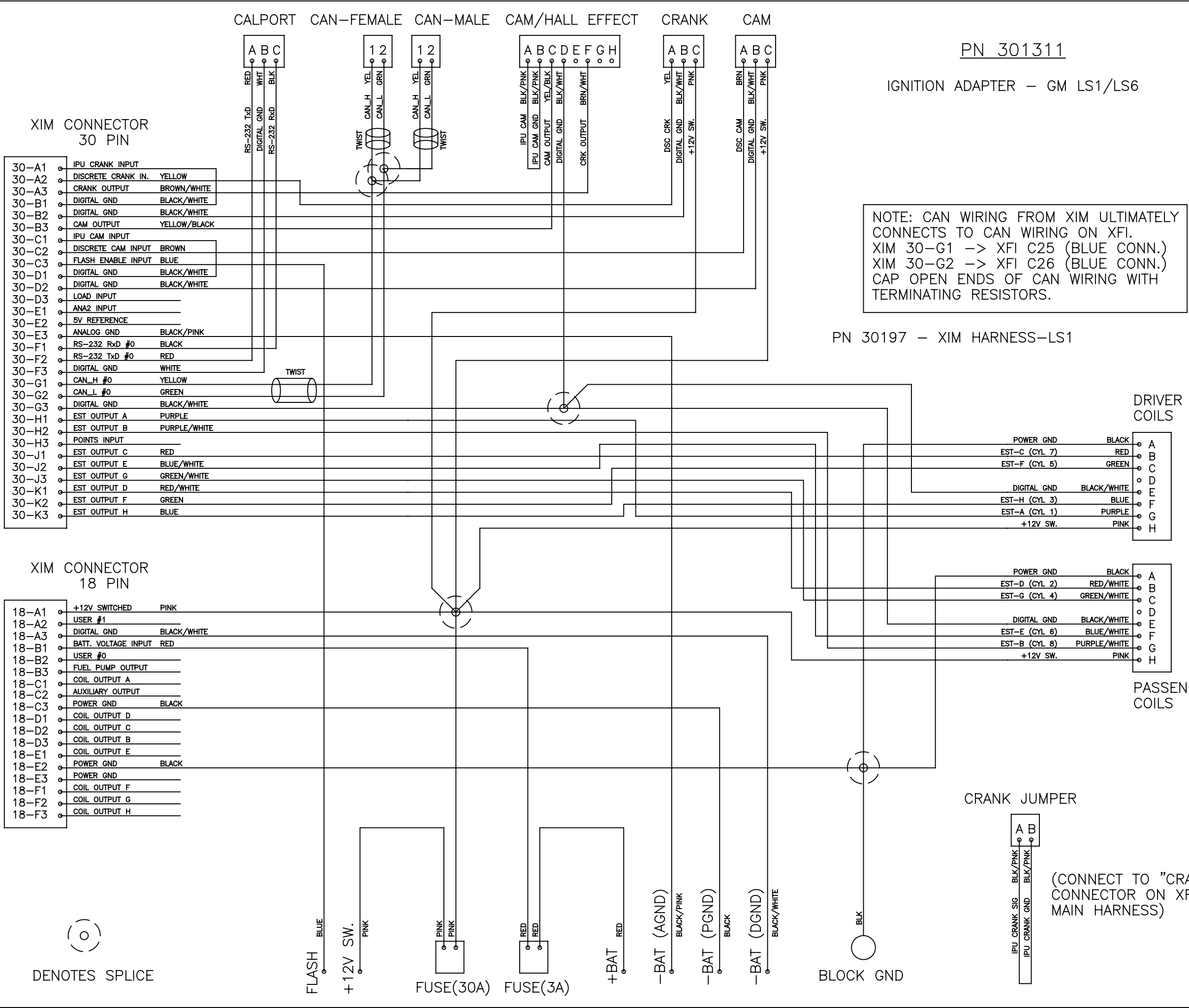
PN 3013xx (NOT OFFERED PRE-ASSEMBLED)

IGNITION ADAPTER – FORD EDIS (8 CYLINDER)



DENOTES SPLICE

www.fuelatrapark.com FAST FUEL AIR SPARK TECHNOLOGY		FAST XFI IGN. ADAPTERS FORD TFI & FORD EDIS PN'S 301308/3013xx	
REV : A	DRAWN BY : RLW	DATE : 04/12/07	
301308-xx SCHEMATICS		SHEET NO : 1 OF 1	



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/25/06	
A	ADD INSTRUCTION PN	09/21/06	
B	ADD XIM TO XFI CAN WIRING NOTE	11/01/06	
C	CAN LAYOUT CHANGE. INTERCONNECT REMOVED.	02/05/07	
D	CAN TWIST NOTE.	04/12/07	

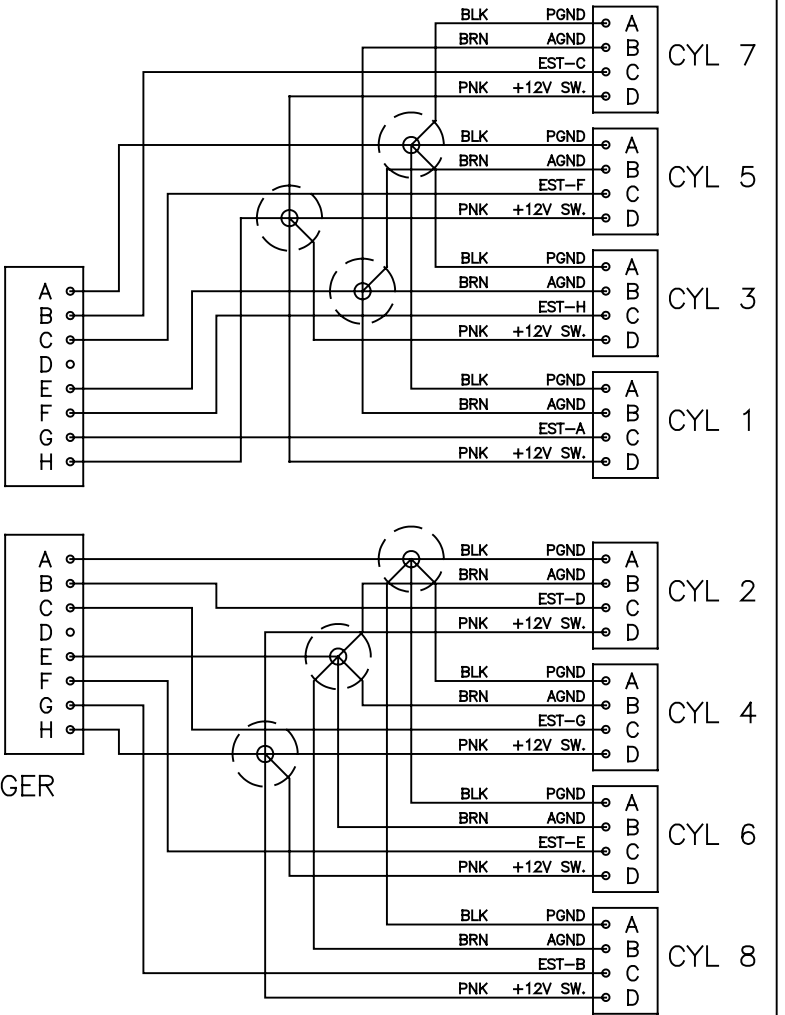
PN 301311

IGNITION ADAPTER – GM LS1/LS6

NOTE: CAN WIRING FROM XIM ULTIMATELY CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -> XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH TERMINATING RESISTORS.

PN 30197 – XIM HARNESS-LS1

FACTORY COIL WIRING
(SHOWN FOR REFERENCE)



FIRING ORDER: 1-8-7-2-6-5-4-3
EST OUTPUT.: A-B-C-D-E-F-G-H

DENOTES SPLICE

(CONNECT TO "CRANK"
CONNECTOR ON XFI
MAIN HARNESS)

NOTE:
WIRES SHOWN AS
DASHED LINES DIFFER
FROM STD LS1 HARNESS.

CALPORT CAN-FEMALE CAN-MALE CAM/HALL EFFECT CRANK CAM

PN 301311 [MODIFIED]

IGNITION ADAPTER – GM LS1/LS6
[USING NON-FACTORY CRANK TRIGGER]

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	02/06/07	
A	CAN TWIST NOTE.	04/12/07	

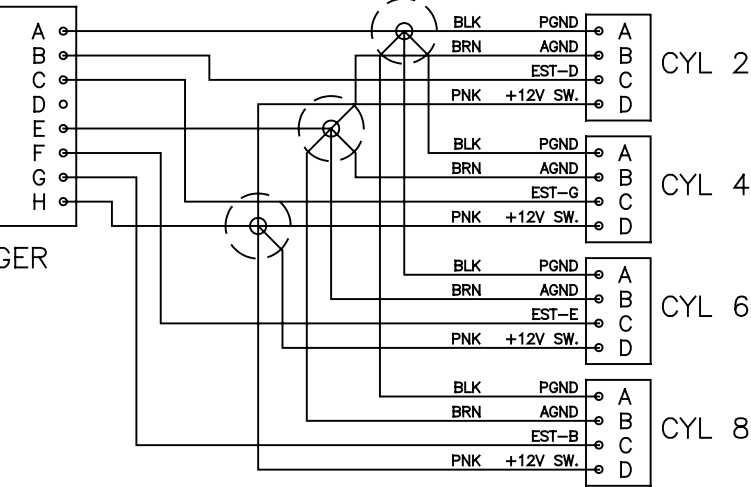
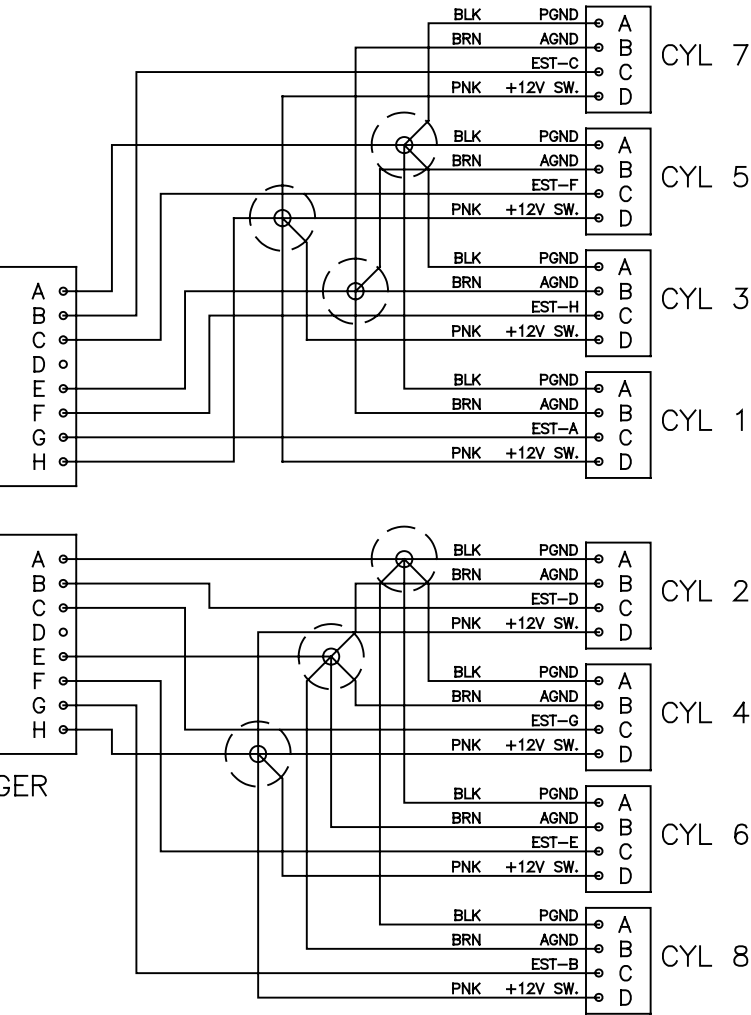
CRANK WIRING:
XIM 30-A1 (RED) TO CRANK TRIGGER GREEN
XIM 30-B1 (BLK) TO CRANK TRIGGER VIOLET

IGNITION STRATEGY:
USE "CRANK TRIGGER" IGNITION STRATEGY.
SEE XIM INSTRUCTIONS.

NOTE: CAN WIRING FROM XIM ULTIMATELY
CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -> XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH
TERMINATING RESISTORS.

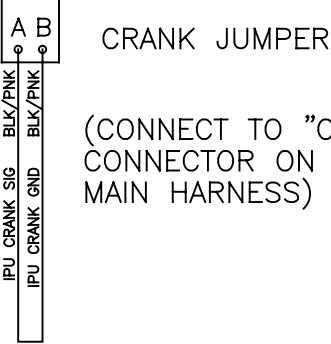
FACTORY COIL WIRING
(SHOWN FOR REFERENCE)

PN 30197 – XIM HARNESS-LS1 [MODIFIED]



FIRING ORDER: 1-8-7-2-6-5-4-3
EST OUTPUT.: D-E-F-G-H-A-B-C

NOTE:
COIL WIRING BASED ON
STOCK CAM SENSOR
LOCATION (TDC #6) AND
CRANK AT 50* BTDC.



XIM CONNECTOR
30 PIN

30-A1	IPU CRANK INPUT	RED
30-A2	DISCRETE CRANK IN.	(YELLOW)
30-A3	CRANK OUTPUT	BROWN/WHITE
30-B1	DIGITAL GND	BLACK
30-B2	DIGITAL GND	BLACK/WHITE
30-B3	CAM OUTPUT	YELLOW/BLACK
30-C1	IPU CAM INPUT	
30-C2	DISCRETE CAM INPUT	BROWN
30-C3	FLASH ENABLE INPUT	BLUE
30-D1	DIGITAL GND	BLACK/WHITE
30-D2	DIGITAL GND	BLACK/WHITE
30-D3	LOAD INPUT	
30-E1	ANA2 INPUT	
30-E2	5V REFERENCE	
30-E3	ANALOG GND	BLACK/PINK
30-F1	RS-232 Rx/D #0	BLACK
30-F2	RS-232 Tx/D #0	RED
30-F3	DIGITAL GND	WHITE
30-G1	CAN_H #0	YELLOW
30-G2	CAN_L #0	GREEN
30-G3	DIGITAL GND	BLACK/WHITE
30-H1	EST OUTPUT A	PURPLE
30-H2	EST OUTPUT B	PURPLE/WHITE
30-H3	POINTS INPUT	
30-J1	EST OUTPUT C	RED
30-J2	EST OUTPUT E	BLUE/WHITE
30-J3	EST OUTPUT G	GREEN/WHITE
30-K1	EST OUTPUT D	RED/WHITE
30-K2	EST OUTPUT F	GREEN
30-K3	EST OUTPUT H	BLUE

XIM CONNECTOR
18 PIN

18-A1	+12V SWITCHED	PINK
18-A2	USER #1	
18-A3	DIGITAL GND	BLACK/WHITE
18-B1	BATT. VOLTAGE INPUT	RED
18-B2	USER #0	
18-B3	FUEL PUMP OUTPUT	
18-C1	COIL OUTPUT A	
18-C2	AUXILIARY OUTPUT	
18-C3	POWER GND	BLACK
18-D1	COIL OUTPUT D	
18-D2	COIL OUTPUT C	
18-D3	COIL OUTPUT B	
18-E1	COIL OUTPUT E	
18-E2	POWER GND	BLACK
18-E3	POWER GND	BLACK
18-F1	COIL OUTPUT F	
18-F2	COIL OUTPUT G	
18-F3	COIL OUTPUT H	

DENOTES SPLICE



www.fuelatrapark.com		FAST XFI IGN. ADAPTER LS1, XIM, CRANK TRIGGER PN 301311 [MODIFIED]	
FUEL AIR SPARK TECHNOLOGY		DRAWN BY : RLW	DATE : 04/12/07
REV : A	DRAWING NO : 301311[MOD]	SCHEMATIC-CRANK	
INSTRUCTION PN: .		SHEET NO : 1 OF 1	

NOTE:
WIRES SHOWN AS
DASHED LINES DIFFER
FROM STD LS1 HARNESS.

XIM CONNECTOR
30 PIN

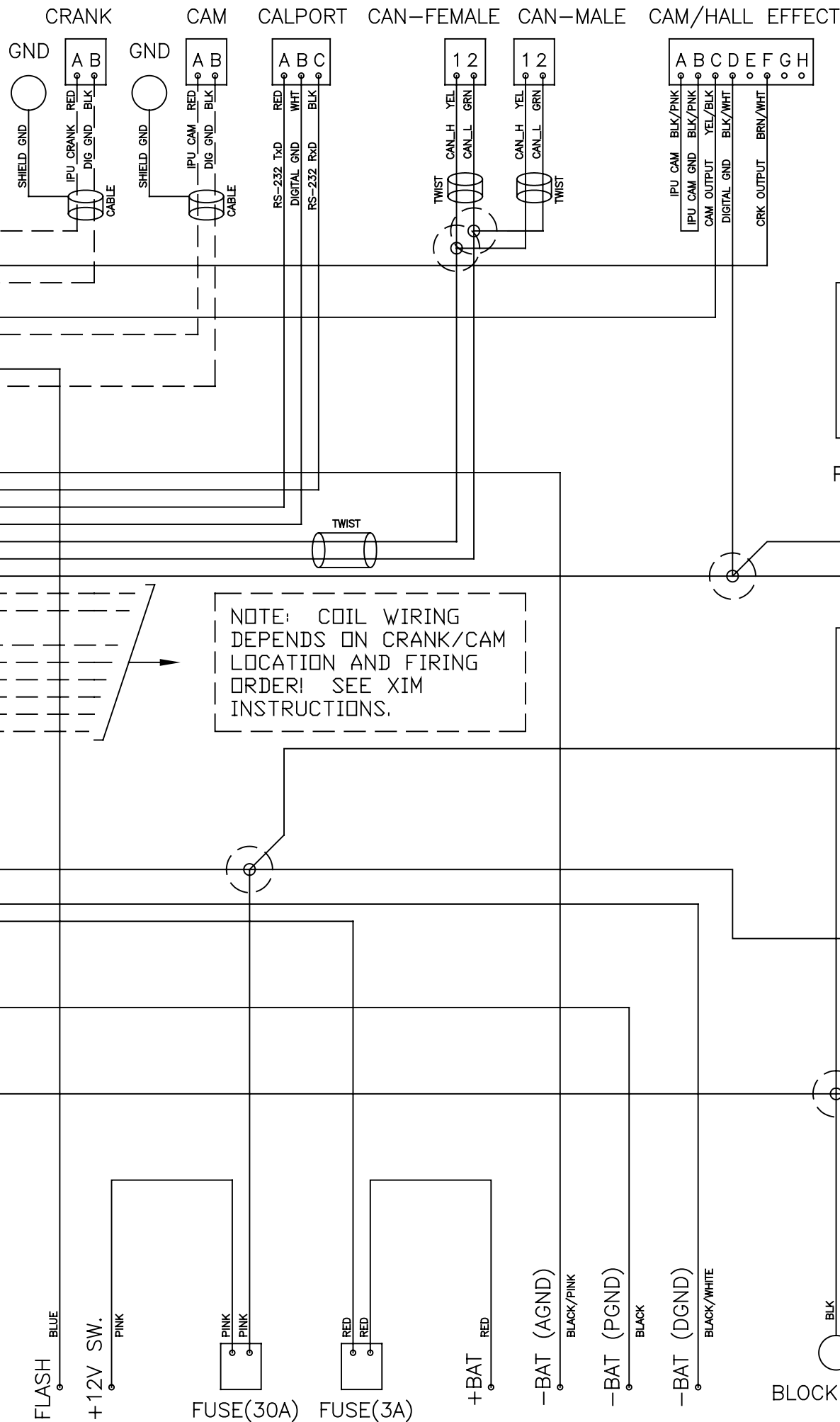
30-A1	IPU CRANK INPUT	RED
30-A2	DISCRETE CRANK IN.	(YELLOW)
30-A3	CRANK OUTPUT	BROWN/WHITE
30-B1	DIGITAL GND	BLACK
30-B2	DIGITAL GND	BLACK/WHITE
30-B3	CAM OUTPUT	YELLOW/BLACK
30-C1	IPU CAM INPUT	RED
30-C2	DISCRETE CAM INPUT	(BROWN)
30-C3	FLASH ENABLE INPUT	BLUE
30-D1	DIGITAL GND	BLACK
30-D2	DIGITAL GND	BLACK/WHITE
30-D3	LOAD INPUT	
30-E1	ANA2 INPUT	
30-E2	5V REFERENCE	
30-E3	ANALOG GND	BLACK/PINK
30-F1	RS-232 Rx/D #0	BLACK
30-F2	RS-232 Tx/D #0	RED
30-F3	DIGITAL GND	WHITE
30-G1	CAN_H #0	YELLOW
30-G2	CAN_L #0	GREEN
30-G3	DIGITAL GND	BLACK/WHITE
30-H1	EST OUTPUT A	PURPLE
30-H2	EST OUTPUT B	PURPLE/WHITE
30-H3	POINTS INPUT	
30-J1	EST OUTPUT C	RED
30-J2	EST OUTPUT E	BLUE/WHITE
30-J3	EST OUTPUT G	GREEN/WHITE
30-K1	EST OUTPUT D	RED/WHITE
30-K2	EST OUTPUT F	GREEN
30-K3	EST OUTPUT H	BLUE

XIM CONNECTOR
18 PIN

18-A1	+12V SWITCHED	PINK
18-A2	USER #1	
18-A3	DIGITAL GND	BLACK/WHITE
18-B1	BATT. VOLTAGE INPUT	RED
18-B2	USER #0	
18-B3	FUEL PUMP OUTPUT	
18-C1	COIL OUTPUT A	
18-C2	AUXILIARY OUTPUT	
18-C3	POWER GND	BLACK
18-D1	COIL OUTPUT D	
18-D2	COIL OUTPUT C	
18-D3	COIL OUTPUT B	
18-E1	COIL OUTPUT E	
18-E2	POWER GND	BLACK
18-E3	POWER GND	
18-F1	COIL OUTPUT F	
18-F2	COIL OUTPUT G	
18-F3	COIL OUTPUT H	



DENOTES SPLICE



PN 301311 [MODIFIED]

IGNITION ADAPTER – GM LS1/LS6
[LS1 COILS FOR ENGINES USING
AFTERMARKET INDUCTIVE CRANK/CAM]

NOTE: CAN WIRING FROM XIM ULTIMATELY
CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -> XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH
TERMINATING RESISTORS.

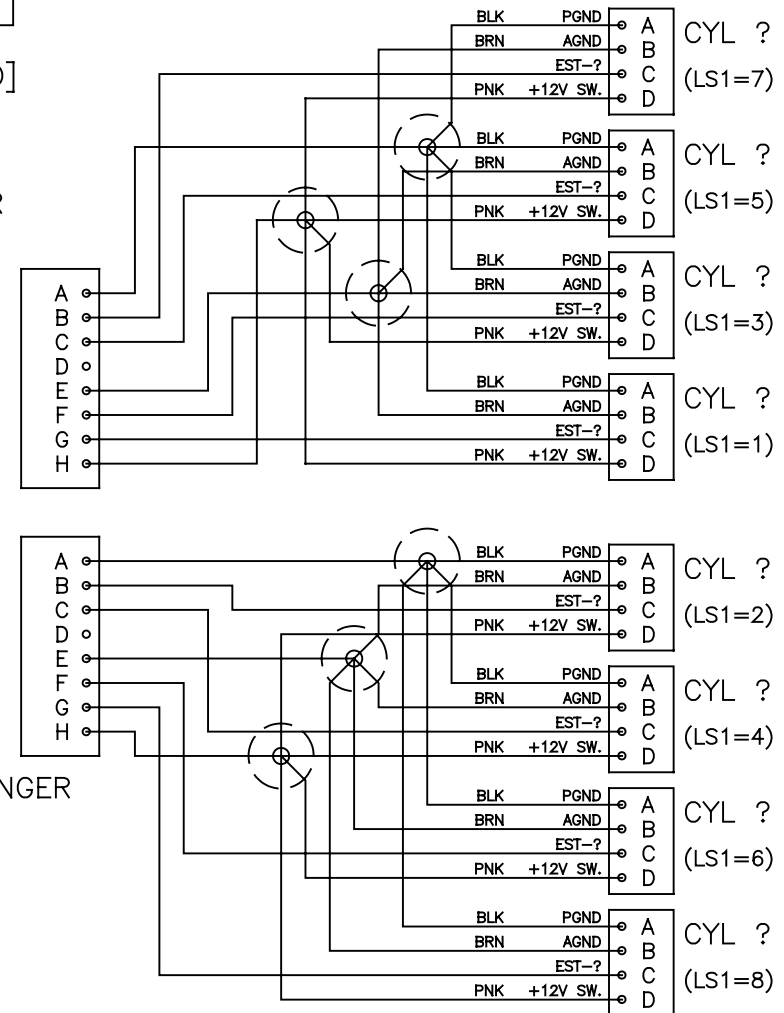
PN 30197 – XIM HARNESS-LS1 [MODIFIED]

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	02/06/07	
A	CAN TWIST NOTE.	04/12/07	

CRANK WIRING:
XIM 30-A1 (RED) TO CRANK TRIGGER GREEN
XIM 30-B1 (BLK) TO CRANK TRIGGER VIOLET

IGNITION STRATEGY:
USE "CRANK TRIGGER" IGNITION STRATEGY.
SEE XIM INSTRUCTIONS.

FACTORY COIL WIRING
(SHOWN FOR REFERENCE)



FIRING ORDER: ?-?-?-?-?-?-?-?
EST OUTPUT.: A-B-C-D-E-F-G-H
* DEPENDS ON CRANK/CAM LOCATION!
SEE XIM INSTRUCTIONS.

www.fuelatrapark.com FAST FUEL AIR SPARK TECHNOLOGY		FAST XFI IGN. ADAPTER XIM, LS1 COILS, IPU'S PN 301311 [MODIFIED]	
REV : A	DRAWING NO : 301311[MOD]	DRAWN BY : RLW	DATE : 04/12/07
INSTRUCTION PN: .		SCHEMATIC-IPU'S SHEET NO : 1 OF 1	

CALPORT CAN-FEMALE CAN-MALE CAM/HALL EFFECT

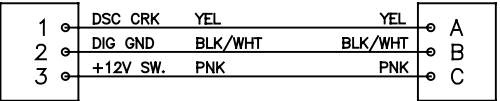
PN 301312

IGNITION ADAPTER – GM LS2/LS7
(INCLUDES SEVERAL HARNESSSES)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	09/19/06	
A	ADD INSTRUCTION PN	09/21/06	
B	ADD XIM TO XFI CAN WIRING NOTE	11/01/06	
C	CAN LAYOUT CHANGE. INTERCONNECT REMOVED.	02/05/07	
D	CAN TWIST NOTE.	04/12/07	

PN 30197 – XIM HARNESS-LS1

PN 30207 – LS2 58x CRANK ADAPTER



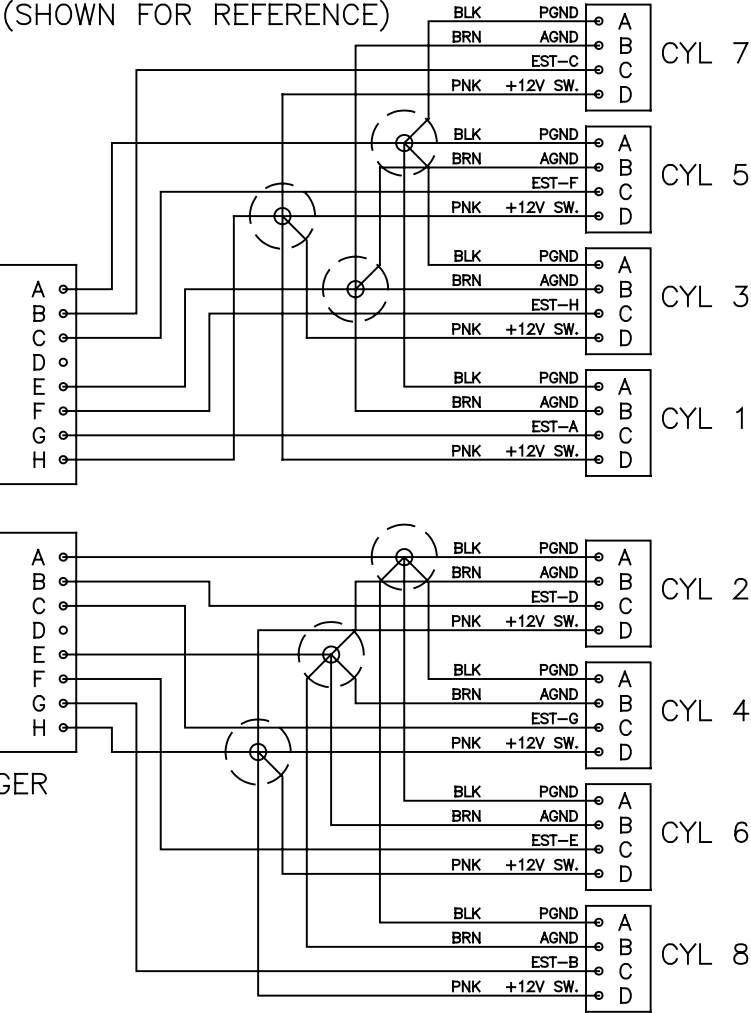
NOTE:
IF ASSEMBLING
FROM 301311K
CONNECTOR
KIT, SEPARATE
CRANK & CAM
ADAPTERS ARE
NOT NEEDED.
INSTEAD, WIRE
DIRECTLY TO
APPROPRIATE
CONNECTOR.

PN 30200 – LS2 CAM ADAPTER

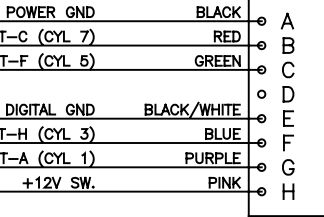


NOTE: CAN WIRING FROM XIM ULTIMATELY
CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -> XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH
TERMINATING RESISTORS.

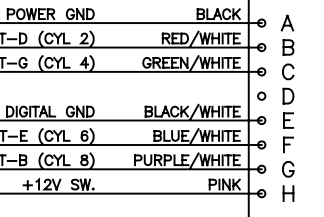
FACTORY COIL WIRING
(SHOWN FOR REFERENCE)



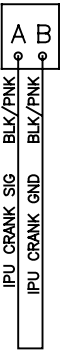
DRIVER
COILS



PASSENGER
COILS



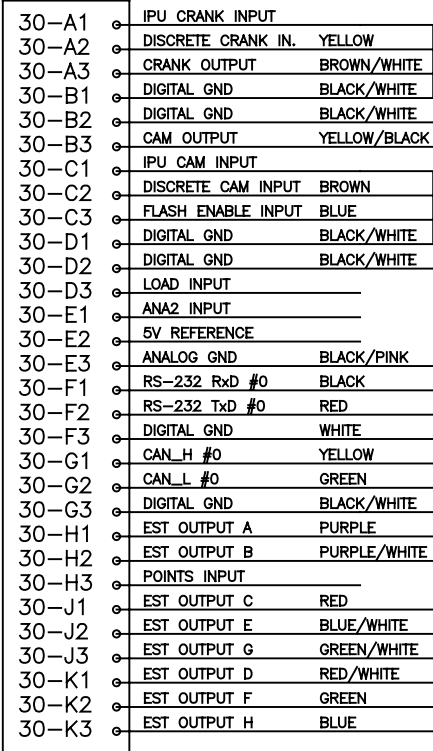
CRANK JUMPER



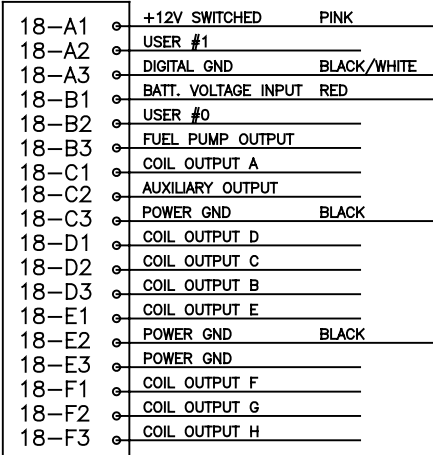
(CONNECT TO "CRANK"
CONNECTOR ON XFI
MAIN HARNESS)

FIRING ORDER: 1-8-7-2-6-5-4-3
EST OUTPUT.: A-B-C-D-E-F-G-H

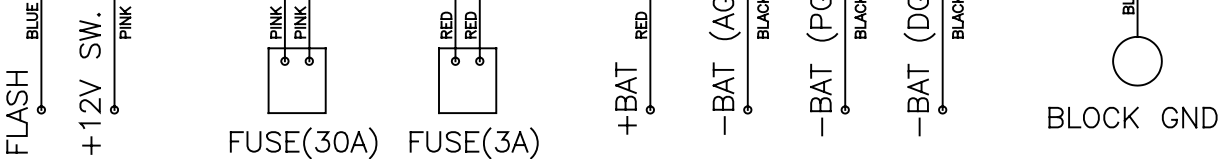
XIM CONNECTOR
30 PIN



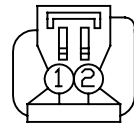
XIM CONNECTOR
18 PIN



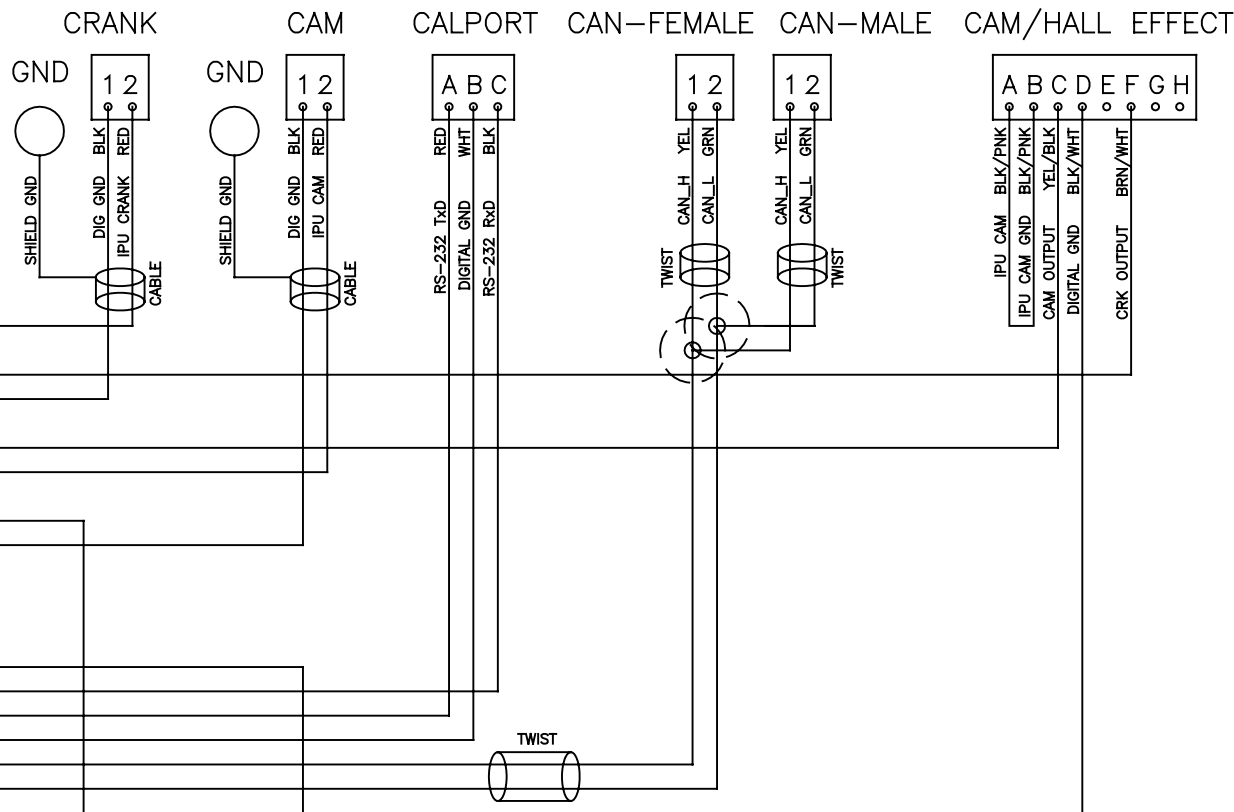
DENOTES SPLICE



www.fuelatrapark.com		FAST XFI IGN. ADAPTER	
FAST		GM LS2/LS7 W/ XIM	
FUEL AIR SPARK TECHNOLOGY		PN 301312	
REV : D	DRAWING NO :	301312	SCHEMATIC
INSTRUCTION PN: FAST4-105		SHEET NO : 1 OF 1	



CRANK/CAM CONN'S
WIRE SIDE VIEW



PN 301313

IGNITION ADAPTER
FORD MODULAR (COIL ON PLUG)
(INCLUDES SEVERAL HARNESSSES)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	09/19/06	
A	ADD INSTRUCTION PN	09/21/06	
B	ADD XIM TO XFI CAN WIRING NOTE	11/01/06	
C	REVERSE CRANK WIRING	11/29/06	
D	CAN LAYOUT CHANGE. INTERCONNECT REMOVED.	02/05/07	

30-A1	IPU CRANK INPUT	RED
30-A2	DISCRETE CRANK IN.	
30-A3	CRANK OUTPUT	BROWN/WHITE
30-B1	DIGITAL GND	BLACK
30-B2	DIGITAL GND	BLACK/WHITE
30-B3	CAM OUTPUT	YELLOW/BLACK
30-C1	IPU CAM INPUT	RED
30-C2	DISCRETE CAM INPUT	
30-C3	FLASH ENABLE INPUT	BLUE
30-D1	DIGITAL GND	BLACK
30-D2	DIGITAL GND	BLACK/WHITE
30-D3	LOAD INPUT	
30-E1	ANA2 INPUT	
30-E2	5V REFERENCE	
30-E3	ANALOG GND	BLACK/PINK
30-F1	RS-232 RxD #0	BLACK
30-F2	RS-232 TxD #0	RED
30-F3	DIGITAL GND	WHITE
30-G1	CAN_H #0	YELLOW
30-G2	CAN_L #0	GREEN
30-G3	DIGITAL GND	BLACK/WHITE
30-H1	EST OUTPUT A	
30-H2	EST OUTPUT B	
30-H3	POINTS INPUT	
30-J1	EST OUTPUT C	
30-J2	EST OUTPUT E	
30-J3	EST OUTPUT G	
30-K1	EST OUTPUT D	
30-K2	EST OUTPUT F	
30-K3	EST OUTPUT H	

NOTE: CAN WIRING FROM XIM ULTIMATELY
CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -> XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH
TERMINATING RESISTORS.

PN 30xxx - XIM HARNESS-FORD MODULAR

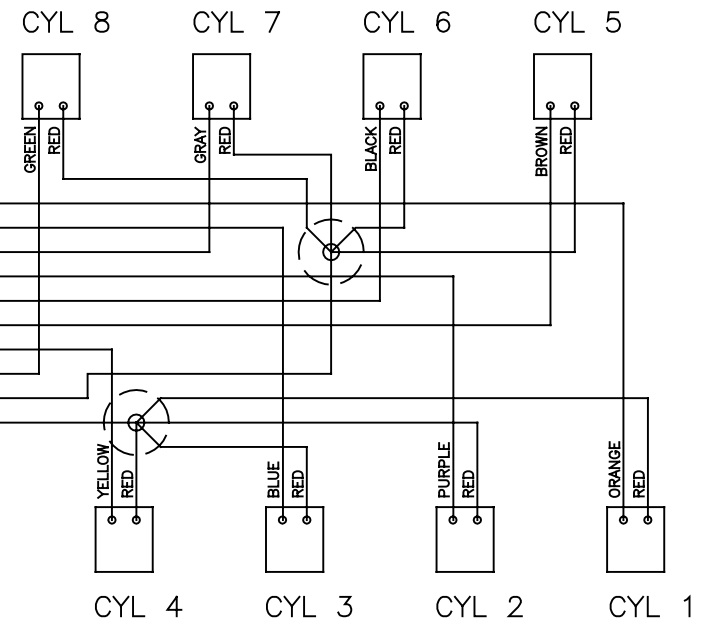
PN 30xxx - COIL HARNESS-FORD MODULAR (COIL ON PLUG)

XIM CONNECTOR
18 PIN

18-A1	+12V SWITCHED	PINK
18-A2	USER #1	
18-A3	DIGITAL GND	BLACK/WHITE
18-B1	BATT. VOLTAGE INPUT	RED
18-B2	USER #0	
18-B3	FUEL PUMP OUTPUT	
18-C1	COIL OUTPUT A	ORANGE
18-C2	AUXILIARY OUTPUT	
18-C3	POWER GND	BLACK
18-D1	COIL OUTPUT D	PURPLE
18-D2	COIL OUTPUT C	GRAY
18-D3	COIL OUTPUT B	BLUE
18-E1	COIL OUTPUT E	BLACK
18-E2	POWER GND	BLACK
18-E3	POWER GND	BLACK
18-F1	COIL OUTPUT F	BROWN
18-F2	COIL OUTPUT G	YELLOW
18-F3	COIL OUTPUT H	GREEN

COIL OUTPUT A	ORANGE	A
COIL OUTPUT B	BLUE	B
COIL OUTPUT C	GRAY	C
COIL OUTPUT D	PURPLE	D
COIL OUTPUT E	BLACK	E
COIL OUTPUT F	BROWN	F
COIL OUTPUT G	YELLOW	G
COIL OUTPUT H	GREEN	H
VBAT	RED	J
VBAT	RED	K

A	COIL OUTPUT A	ORANGE
B	COIL OUTPUT B	BLUE
C	COIL OUTPUT C	GRAY
D	COIL OUTPUT D	PURPLE
E	COIL OUTPUT E	BLACK
F	COIL OUTPUT F	BROWN
G	COIL OUTPUT G	YELLOW
H	COIL OUTPUT H	GREEN
J	VBAT	RED
K	VBAT	RED



DENOTES SPLICE

FLASH BLUE

-BAT

+12V SW.

FUSE3(3A)

FUSE2(3A)

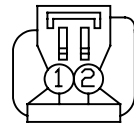
+BAT

RELAY

FUSE1(30A)

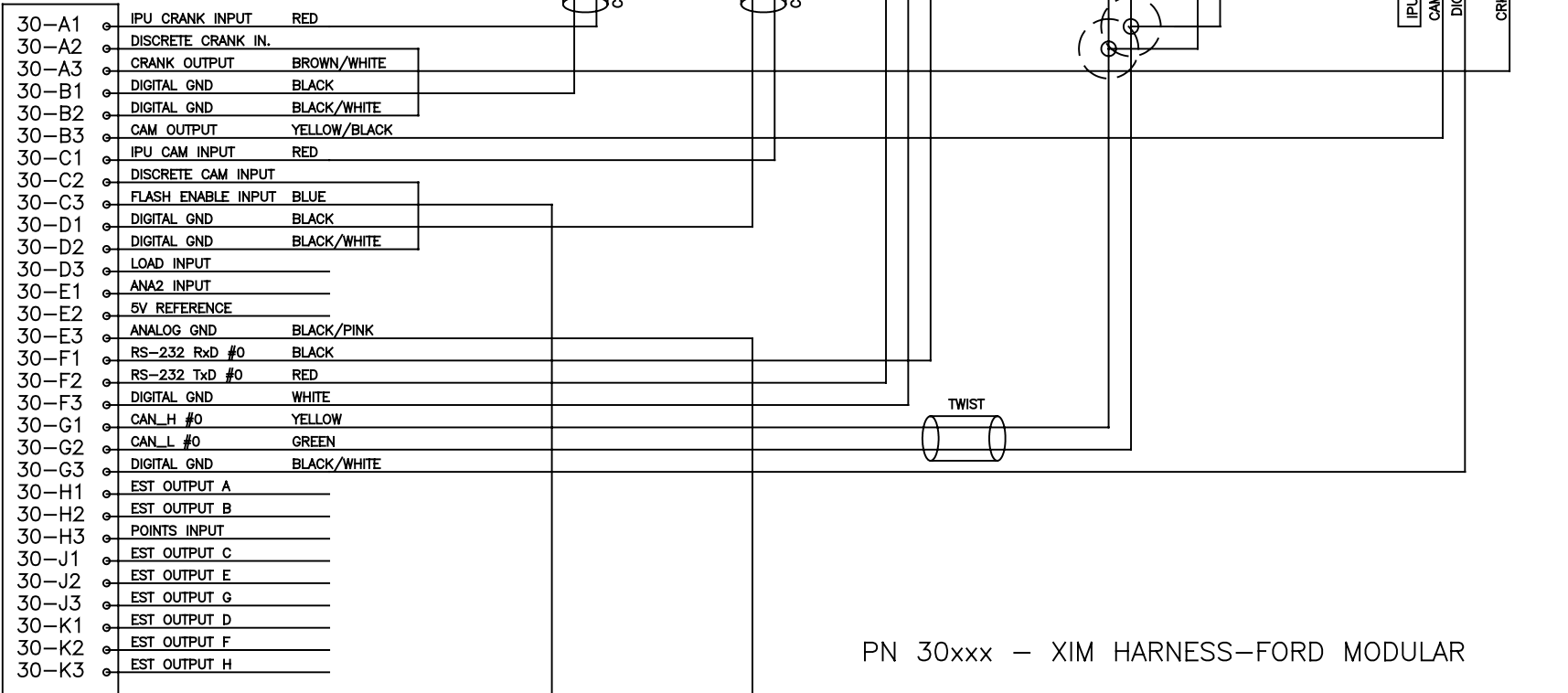
FIRING ORDER: 1-3-7-2-6-5-4-8
COIL OUTPUT: A-B-C-D-E-F-G-H

www.fuelatrapark.com		FAST XFI IGN. ADAPTER	
FAST		FORD MOD(COIL ON PLUG)	
FUEL AIR SPARK TECHNOLOGY		W/ XIM, PN 301313	
REV : D	DRAWN BY : RLW	DATE : 02/05/07	
INSTRUCTION PN: FAST4-108		SHEET NO : 1 OF 1	

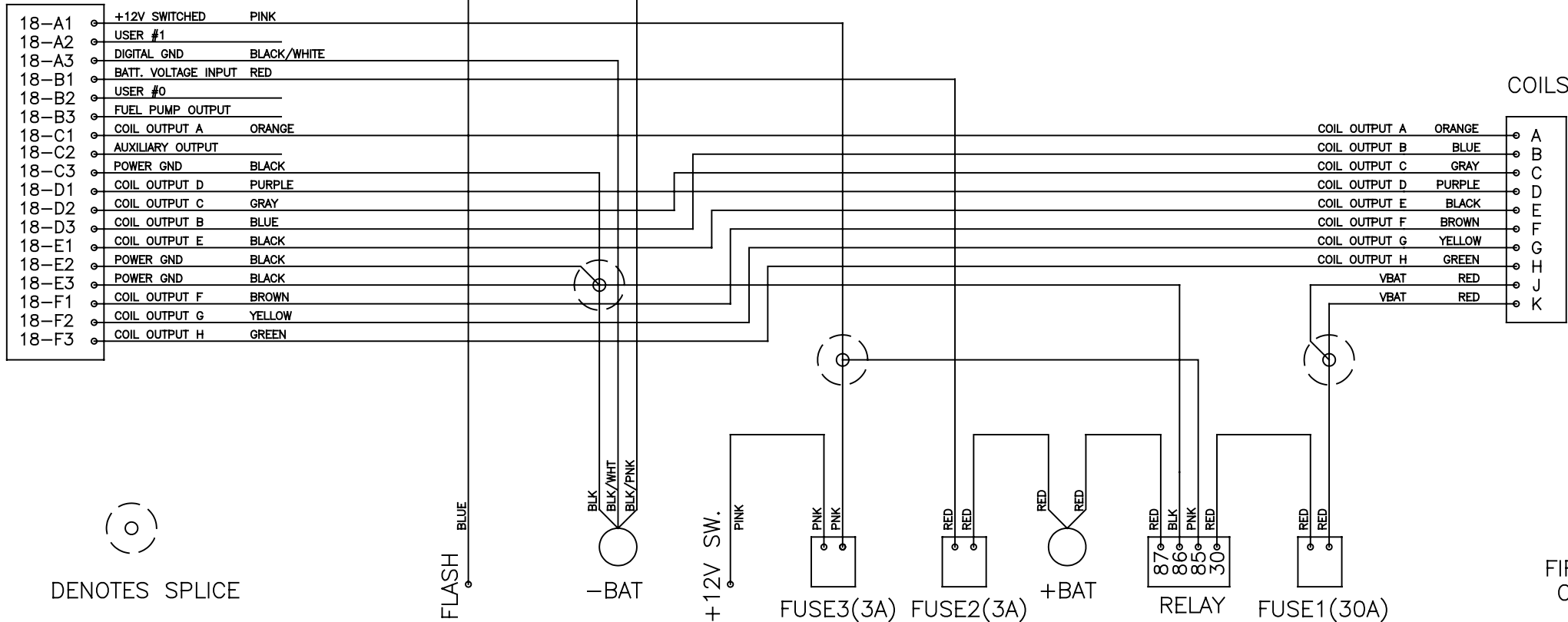


CRANK/CAM CONN'S
WIRE SIDE VIEW

XIM CONNECTOR
30 PIN



XIM CONNECTOR
18 PIN



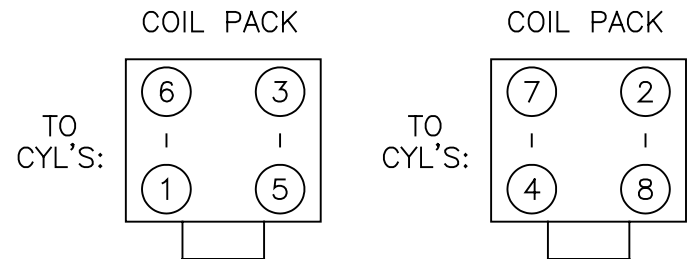
DENOTES SPLICE

PN 3013xx

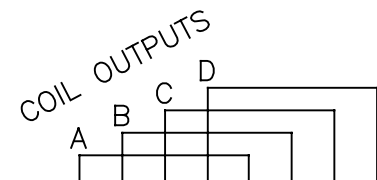
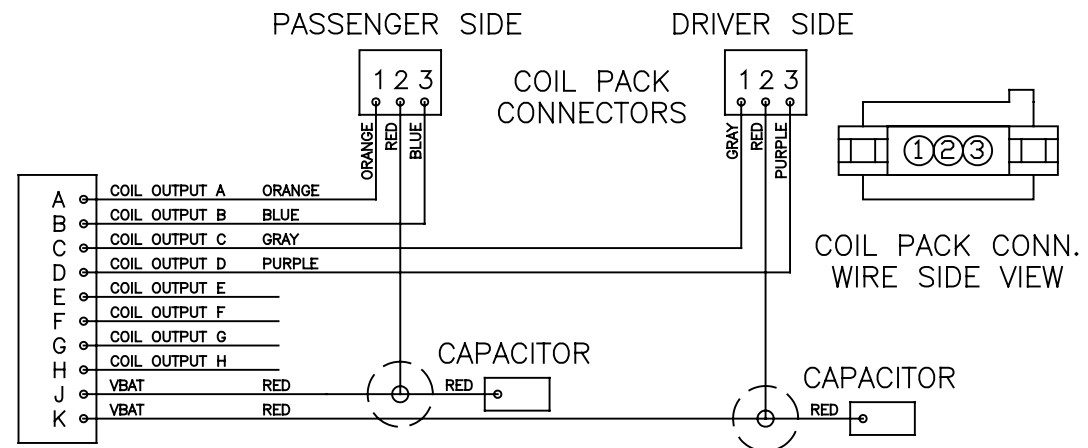
IGNITION ADAPTER
FORD MODULAR (COIL PACKS)
(INCLUDES SEVERAL HARNESSSES)

NOTE: CAN WIRING FROM XIM ULTIMATELY
CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -&; XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH
TERMINATING RESISTORS.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	09/19/06	
A	ADD INSTRUCTION PN	09/21/06	
B	ADD XIM TO XFI CAN WIRING NOTE	11/01/06	
C	REVERSE CRANK WIRING	11/29/06	
D	CAN LAYOUT CHANGE. INTERCONNECT REMOVED.	02/05/07	

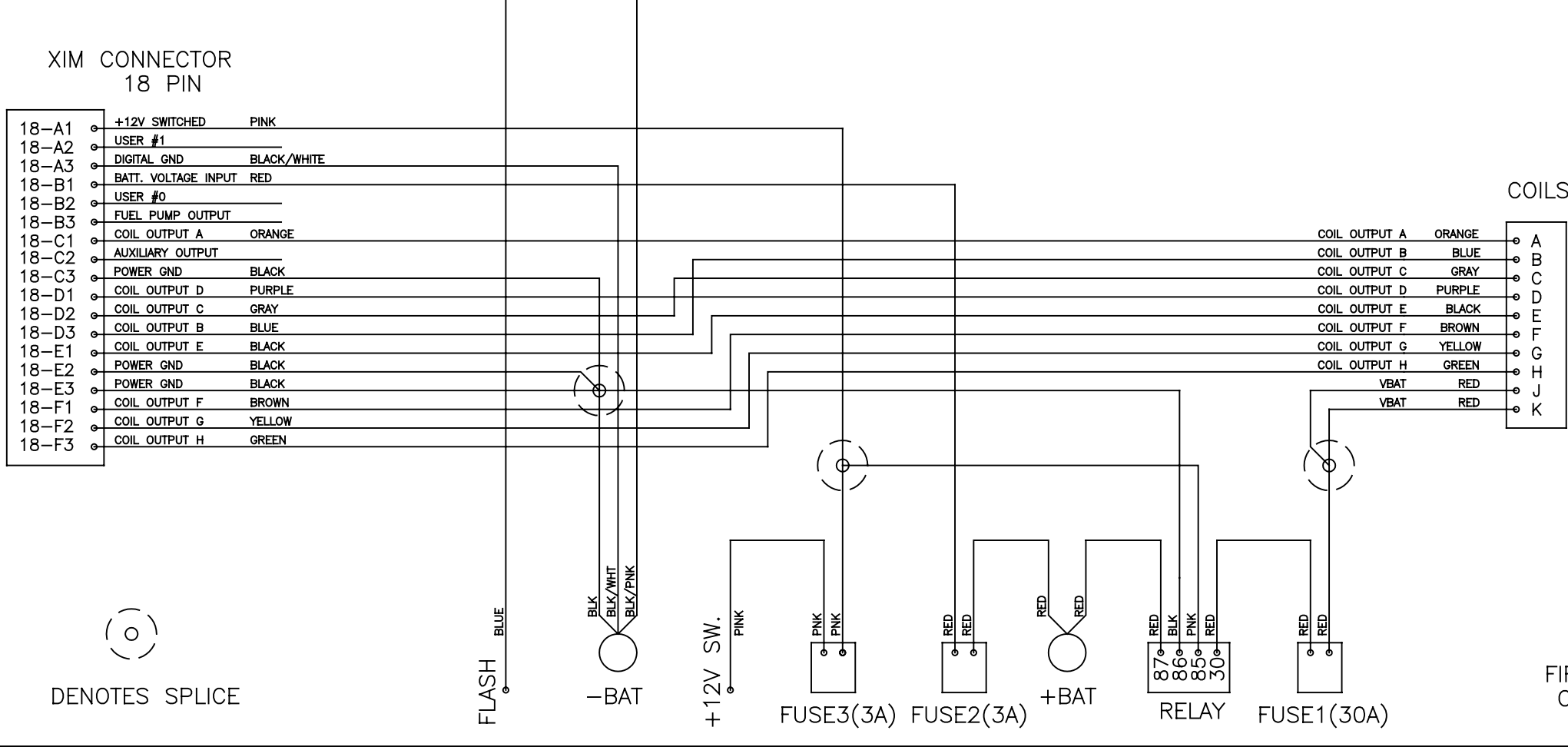
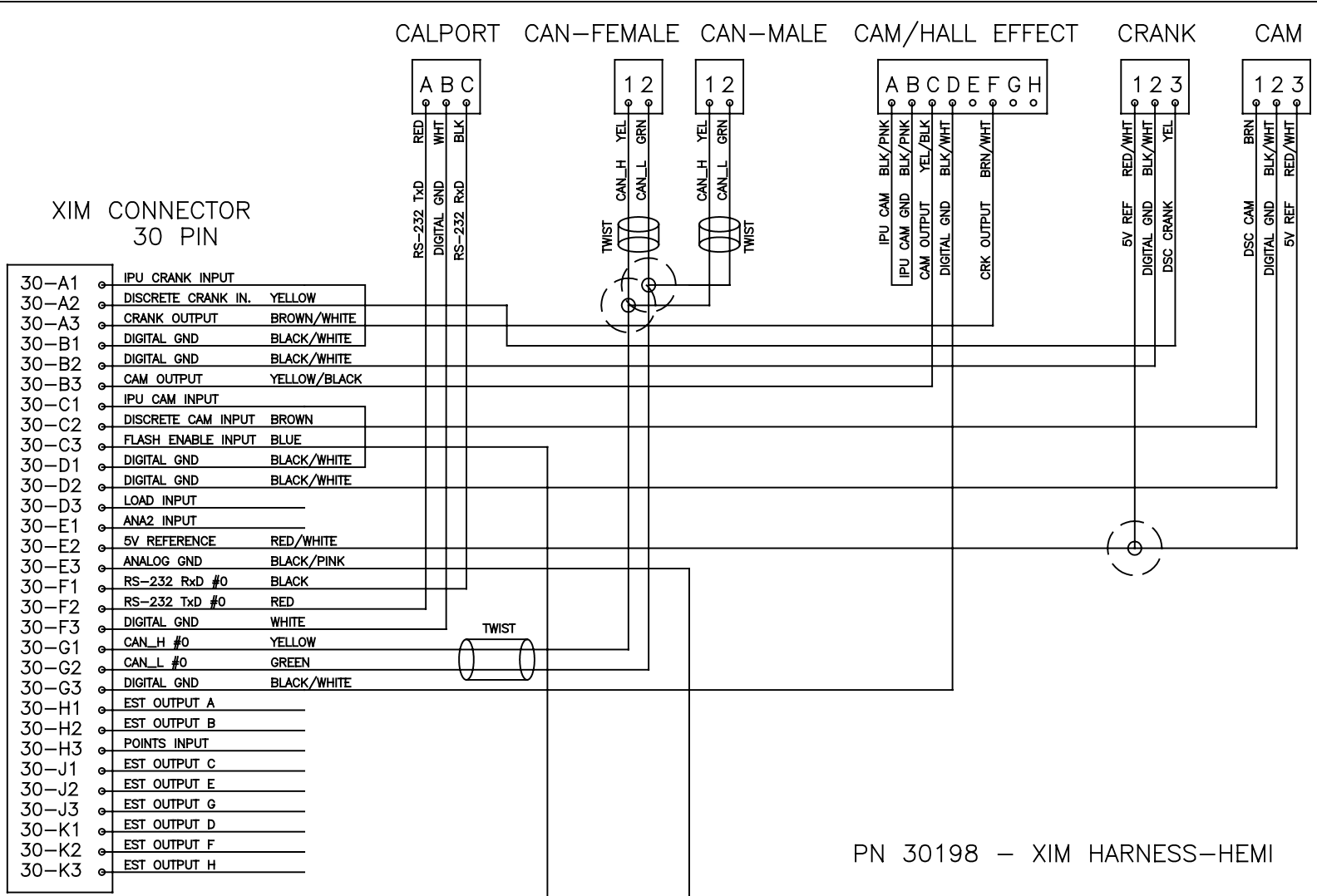


PN 30xxx - COIL HARNESS-FORD MODULAR (COIL PACKS)



FIRING ORDER: 1-3-7-2-6-5-4-8
COIL OUTPUT: A-B-C-D-A-B-C-D

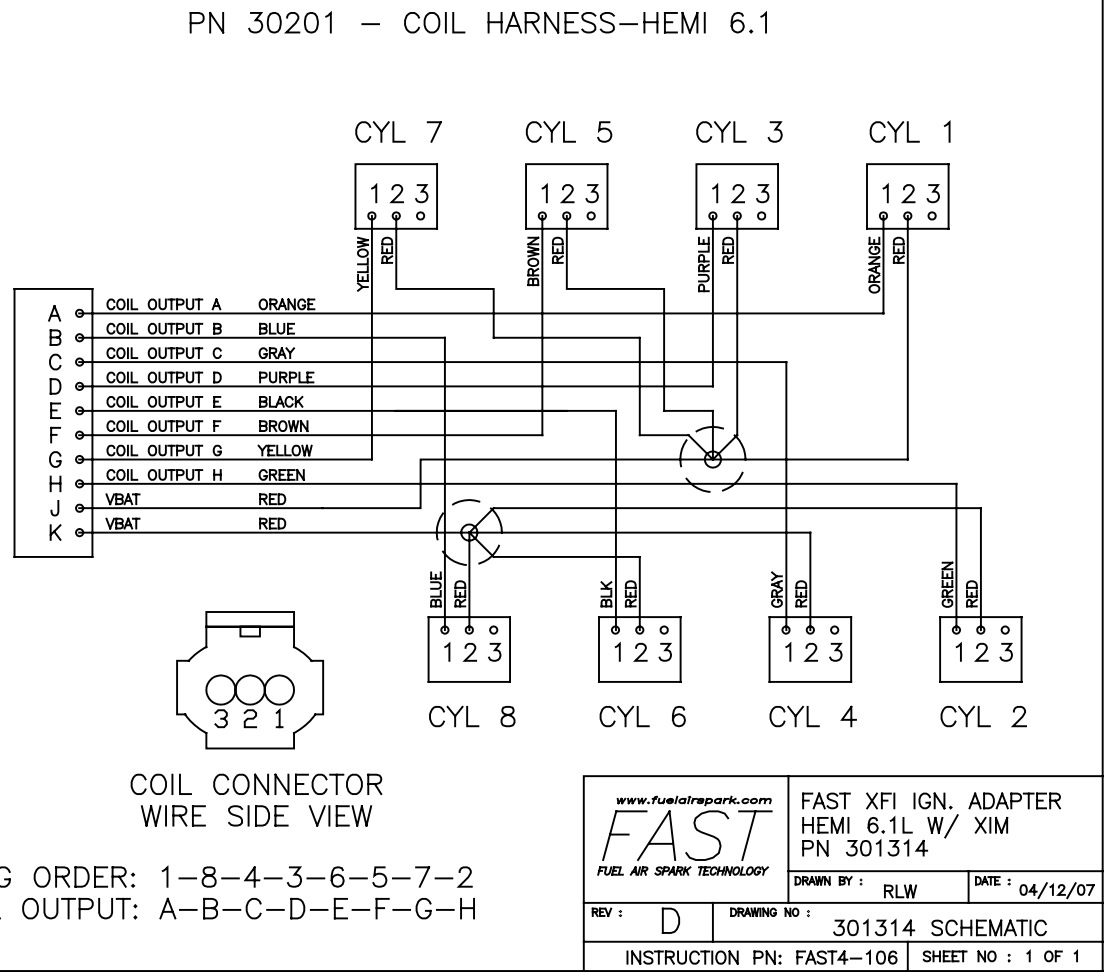
www.fuelatrapark.com FAST FUEL AIR SPARK TECHNOLOGY		FAST XFI IGN. ADAPTER FORD MOD. (COIL PACKS) W/ XIM, PN 3013xx	
REV : D	DRAWN BY : RLW	DATE : 02/05/07	
INSTRUCTION PN: FAST4-109		SHEET NO : 1 OF 1	

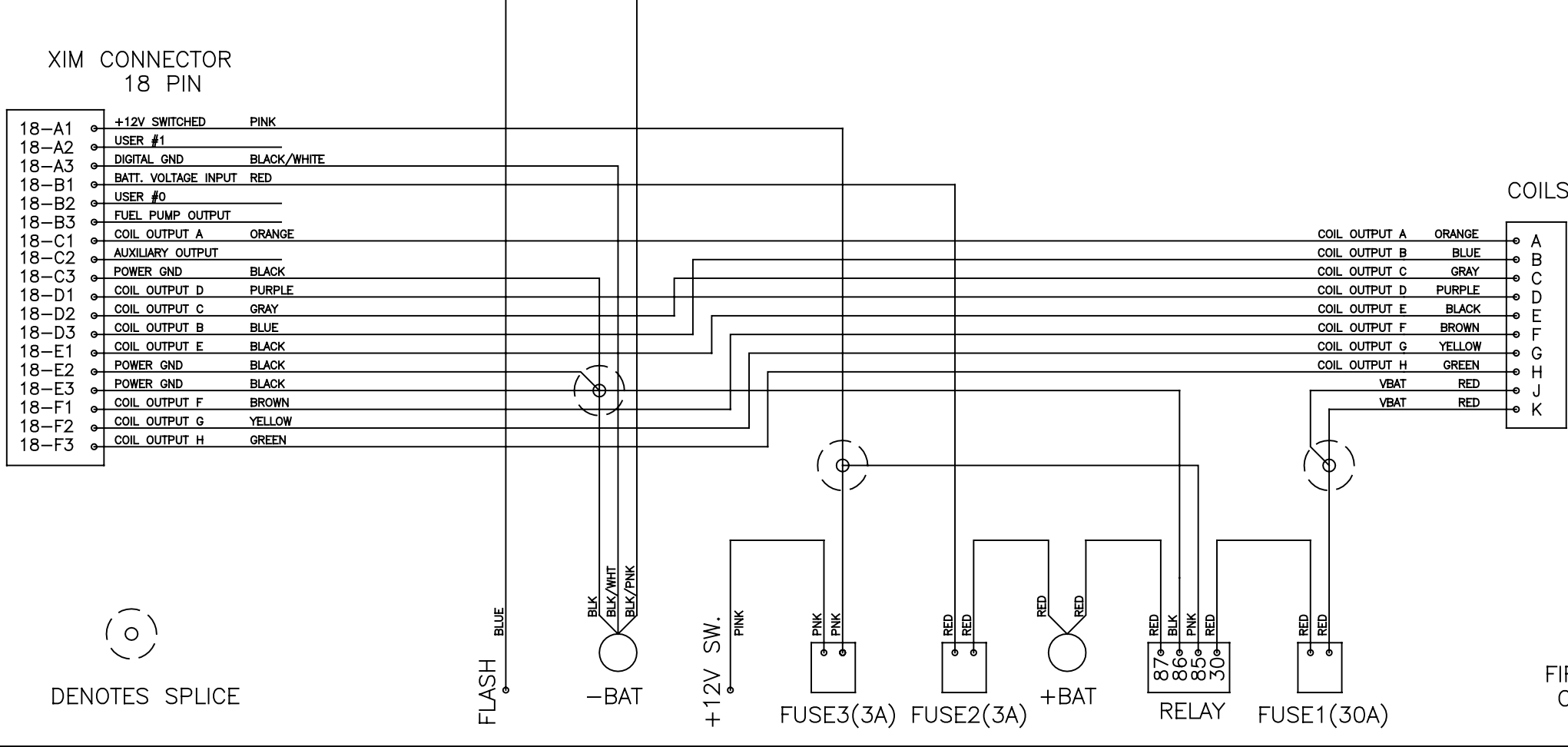
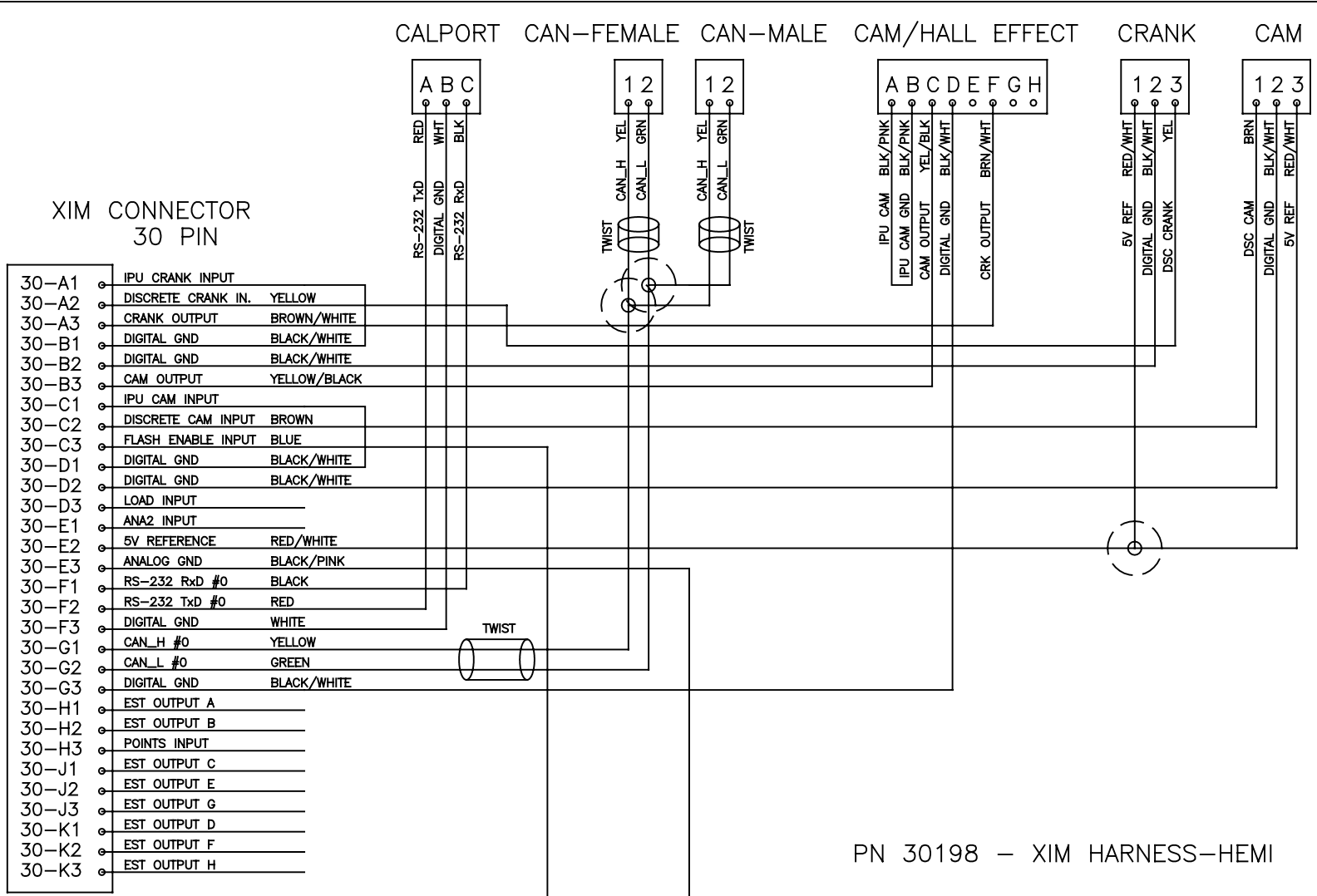


PN 301314

IGNITION ADAPTER - HEMI 6.1
(INCLUDES SEVERAL HARNESSES)

NOTE: CAN WIRING FROM XIM ULTIMATELY CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -> XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH TERMINATING RESISTORS.

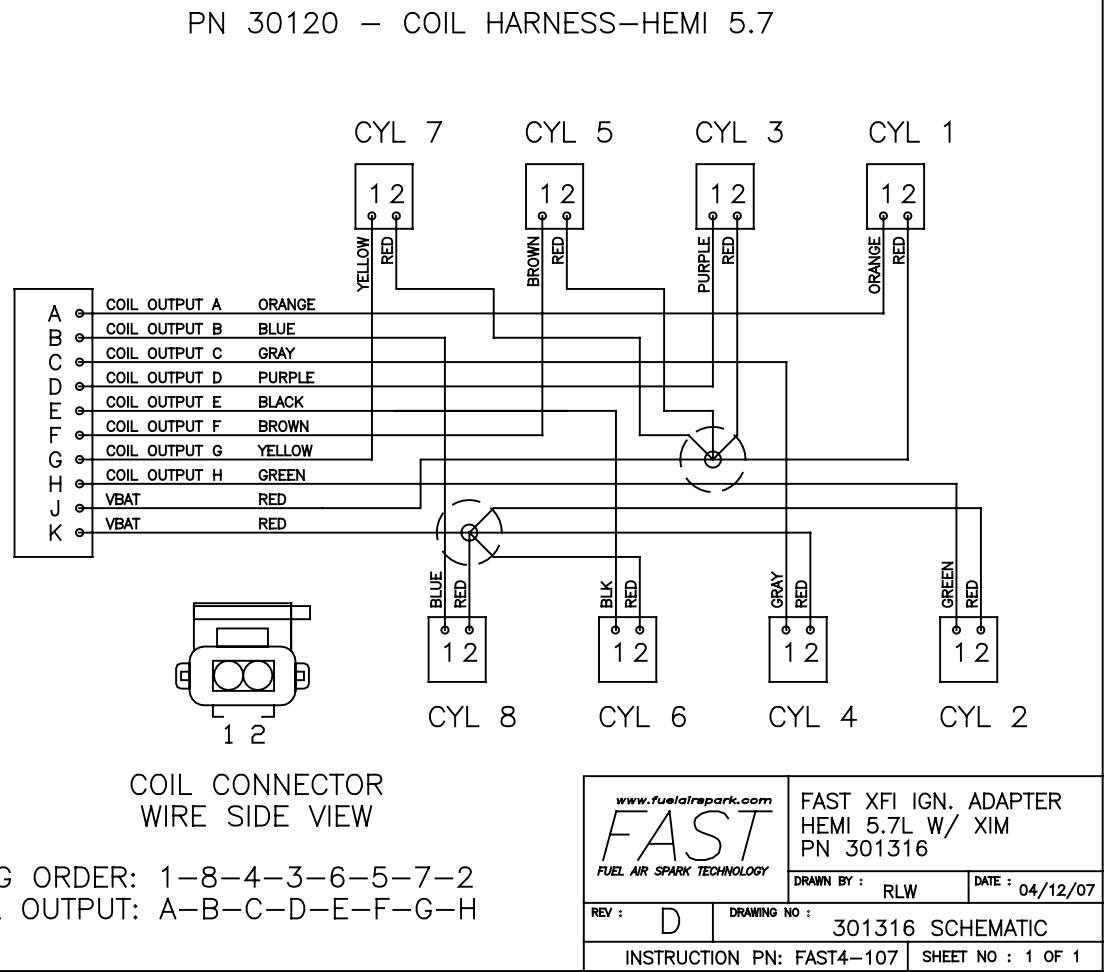




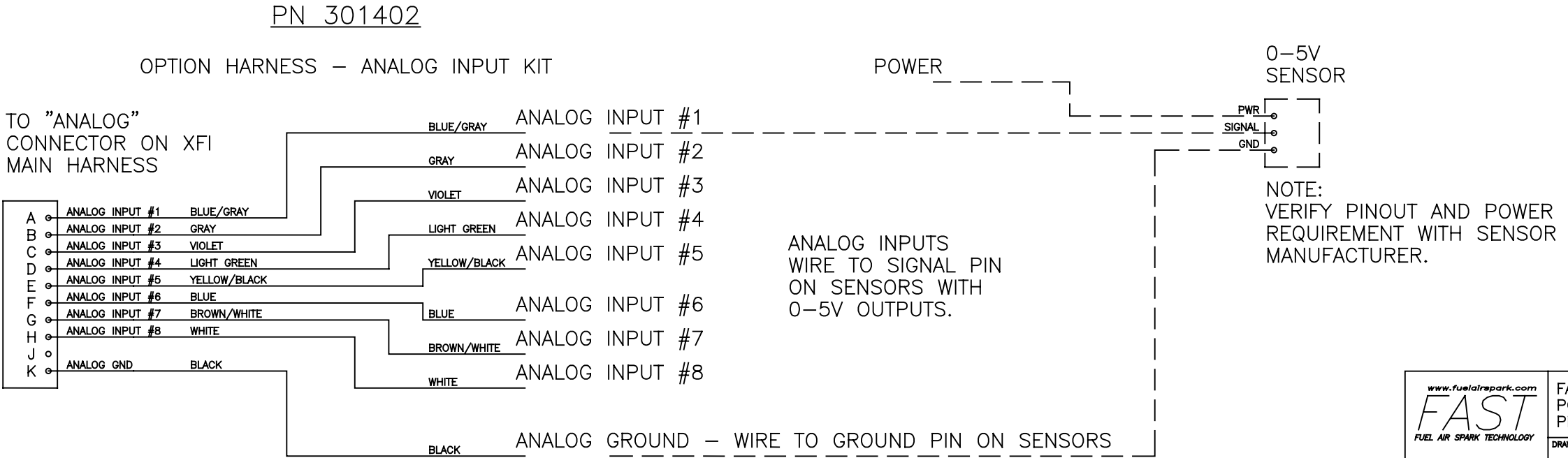
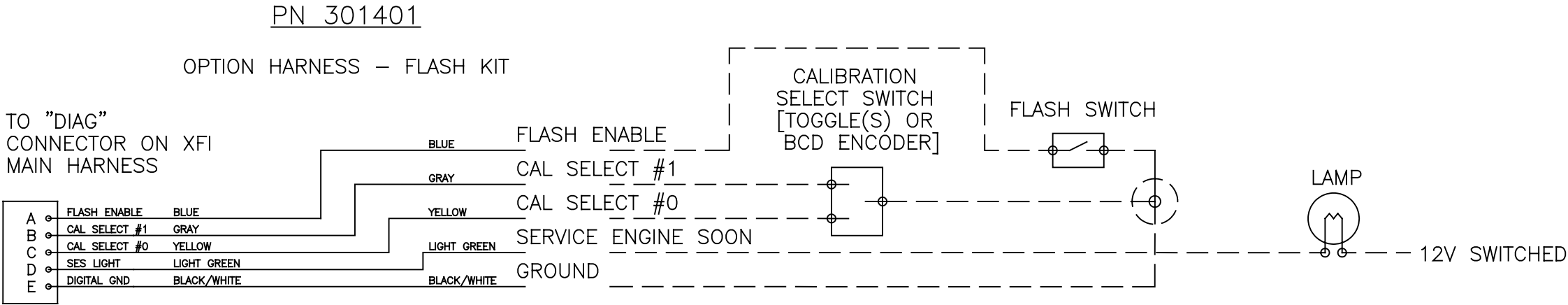
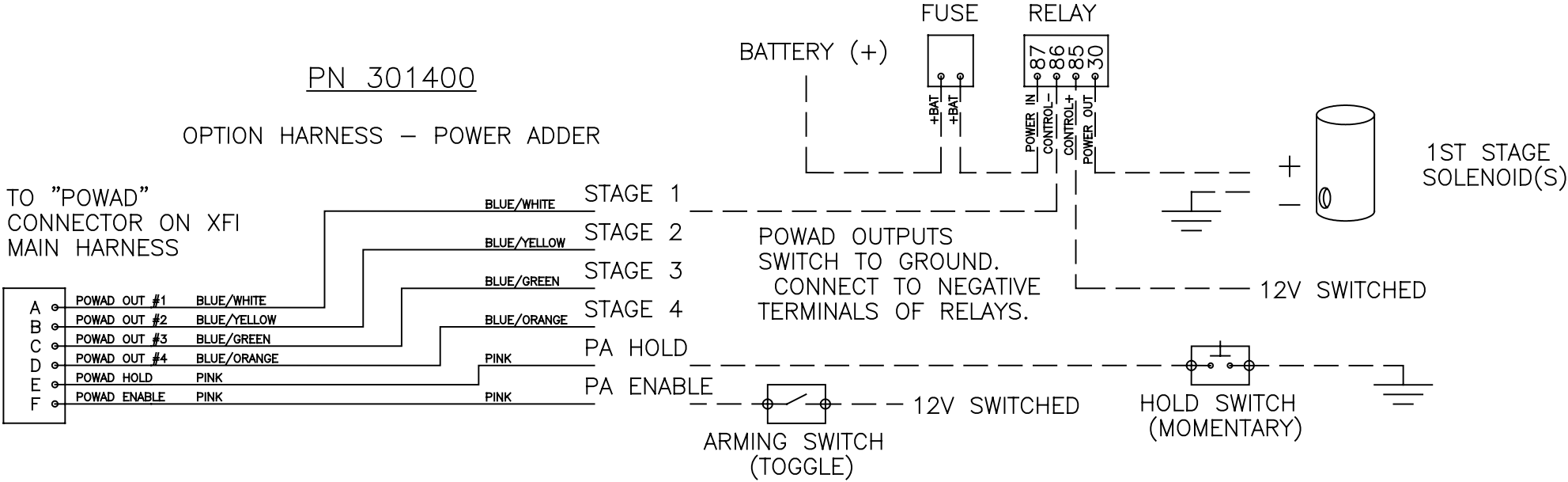
PN 301316

IGNITION ADAPTER - HEMI 5.7
(INCLUDES SEVERAL HARNESSES)

NOTE: CAN WIRING FROM XIM ULTIMATELY CONNECTS TO CAN WIRING ON XFI.
XIM 30-G1 -> XFI C25 (BLUE CONN.)
XIM 30-G2 -> XFI C26 (BLUE CONN.)
CAP OPEN ENDS OF CAN WIRING WITH TERMINATING RESISTORS.



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/09/06	
A	CHANGE PA HOLD BUTTON	04/12/07	



DENOTES SPLICE

www.fuelairspark.com FAST FUEL AIR SPARK TECHNOLOGY		FAST XFI OPTION HARN'S POWAD, FLASH, ANALOG PN'S 301400-02	
REV : A	DRAWING NO : 301400-02	DRAWN BY : RLW	DATE : 04/12/07
SHEET NO : 1 OF 1			

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/09/06	

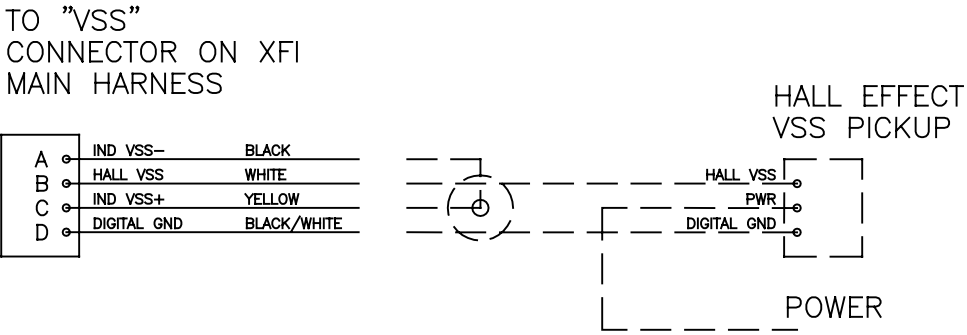
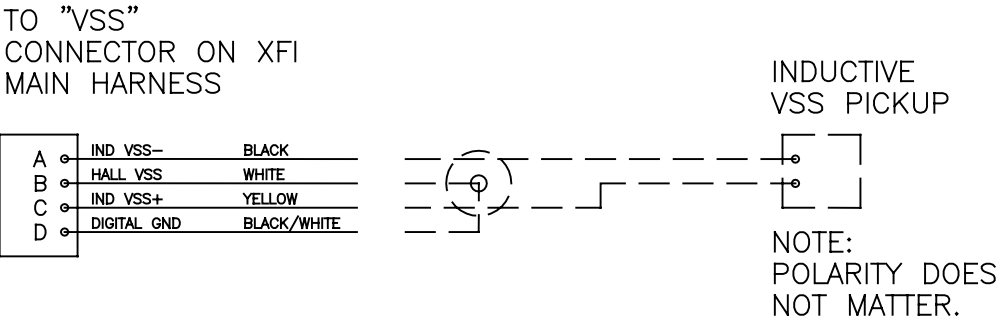
PN 301403

OPTION HARNESS – VSS AND AUX. SHAFT KIT

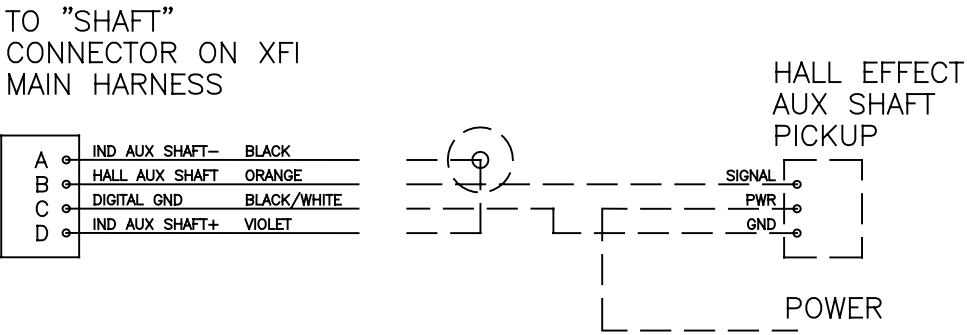
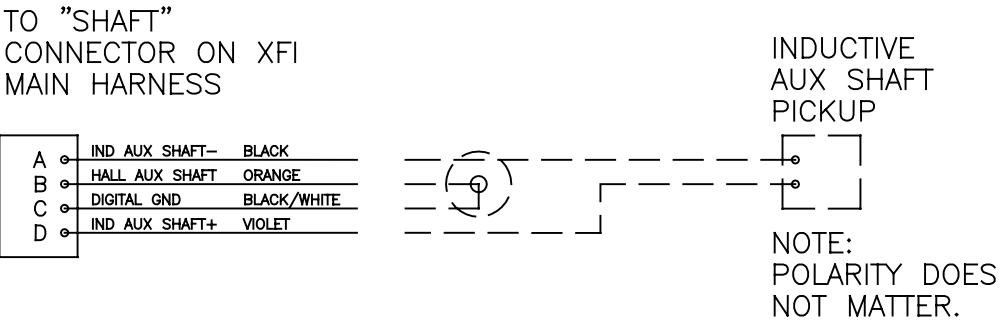
WIRING FOR INDUCTIVE SENSORS

WIRING FOR HALL EFFECT SENSORS

VSS



AUX. SHAFT



PN 301404

OPTION HARNESS – SWITCHING OUTPUTS

EIGHT LOOSE WIRES WITH XFI MAIN CONNECTOR TERMINALS
(7 W/ STANDARD TERMINALS, 1 W/ LARGE TERMINAL).

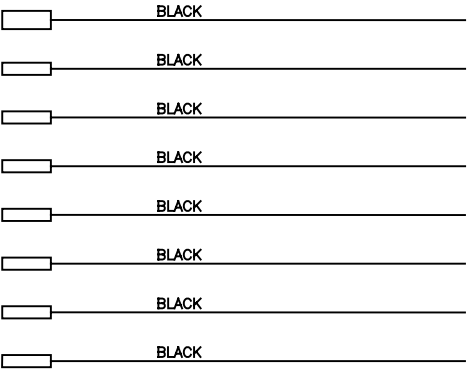
USED TO ACCESS INPUTS AND OUTPUTS NOT ALREADY BUILT
INTO XFI MAIN HARNESSES. WIRING VARIES BY APPLICATION.

INPUTS: CLUTCH INPUT, A/C IDLE INPUT, ETC
OUTPUTS: TCC LOCKUP, PROGRAMMABLE OUTPUTS, ETC.

NOTE: WHITE LOCK MUST BE SLID OUT OF CONNECTOR
APPROXIMATELY 1/16" BEFORE PINS CAN BE INSERTED
INTO CONNECTOR.



DENOTES SPLICE



<small>www.fuelairspark.com</small> FAST <small>FUEL AIR SPARK TECHNOLOGY</small>		FAST XFI OPTION HARN'S VSS/SHAFT, SW. OUTPUTS PN'S 301403-04	
DRAWN BY : RLW		DATE : 08/09/06	
REV : ...	DRAWING NO : 301403-04 SCHEMATICS		
...		SHEET NO : 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/10/06	

PN 301405

OPTION HARNESS – EGT KIT
(INCLUDES PARTS IN DASHED BOX)
(ONE AMPLIFIER AND THERMOCOUPLE)

EGT Amplifier

K-Type Thermocouple

EGT AMPLIFIER WIRING

COLOR	FUNCTION
WHITE	SIGNAL
RED	PWR (12–15V)
BLACK	SIGNAL GND

TO "ANALOG"
CONNECTOR ON XFI
MAIN HARNESS

A	ANALOG INPUT #1	BLUE/GRAY
B	ANALOG INPUT #2	GRAY
C	ANALOG INPUT #3	VIOLET
D	ANALOG INPUT #4	LIGHT GREEN
E	ANALOG INPUT #5	YELLOW/BLACK
F	ANALOG INPUT #6	BLUE
G	ANALOG INPUT #7	BROWN/WHITE
H	ANALOG INPUT #8	WHITE
J		
K	ANALOG GND	BLACK


NOTE:
FAST PN 301402 (ANALOG INPUT KIT)
CAN BE USED TO WIRE EGT AMPS TO
XFI MAIN HARNESS.

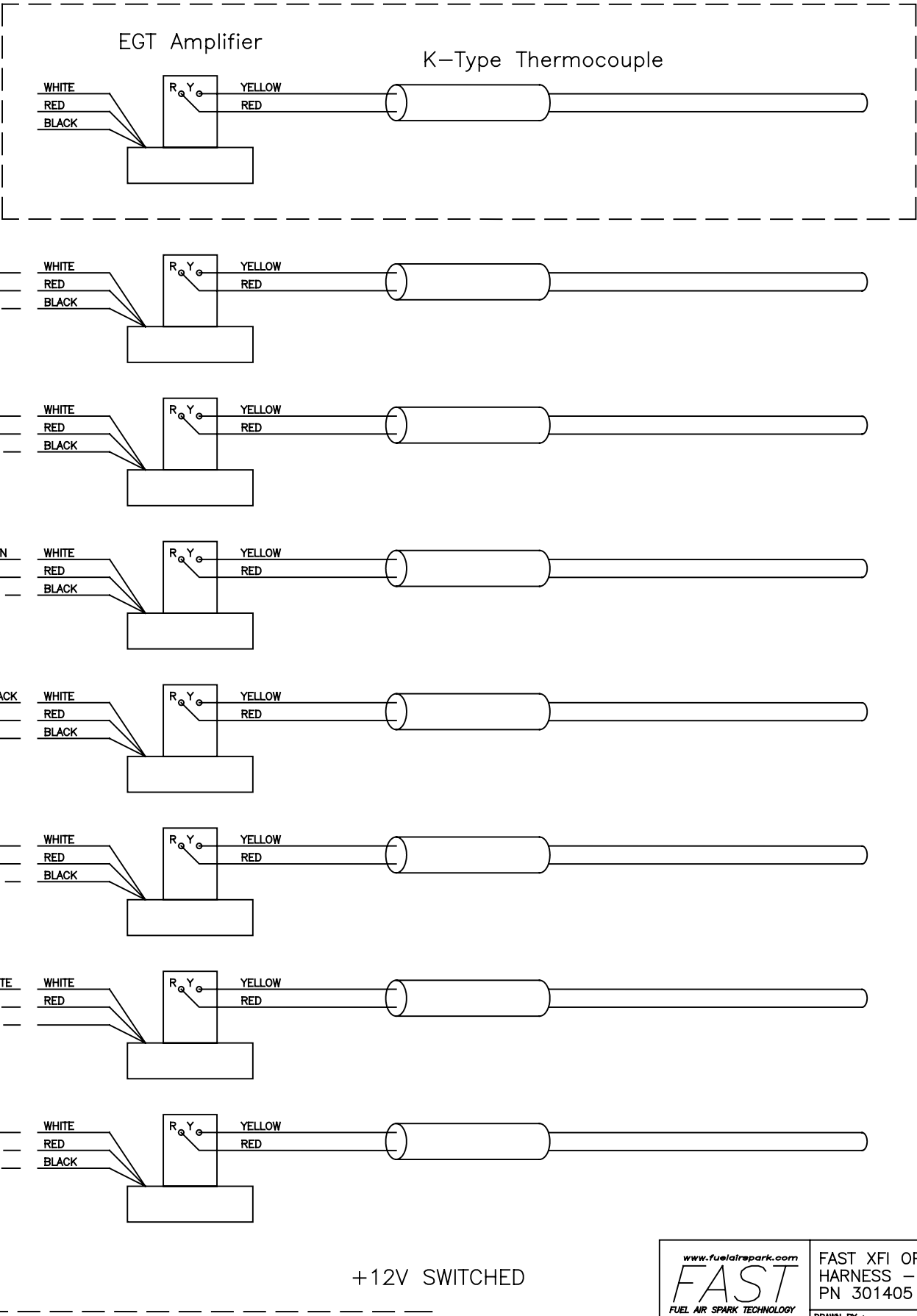
SOFTWARE SETTINGS TO
DISPLAY TEMPERATURE IN...


	FAHRENHEIT	CELSIUS
SENSOR GAIN	356.4	198
SENSOR OFFSET	32	0

MEASUREMENT RANGE

	FAHRENHEIT	CELSIUS
MAXIMUM TEMP	1814	990
MINIMUM TEMP	32	0

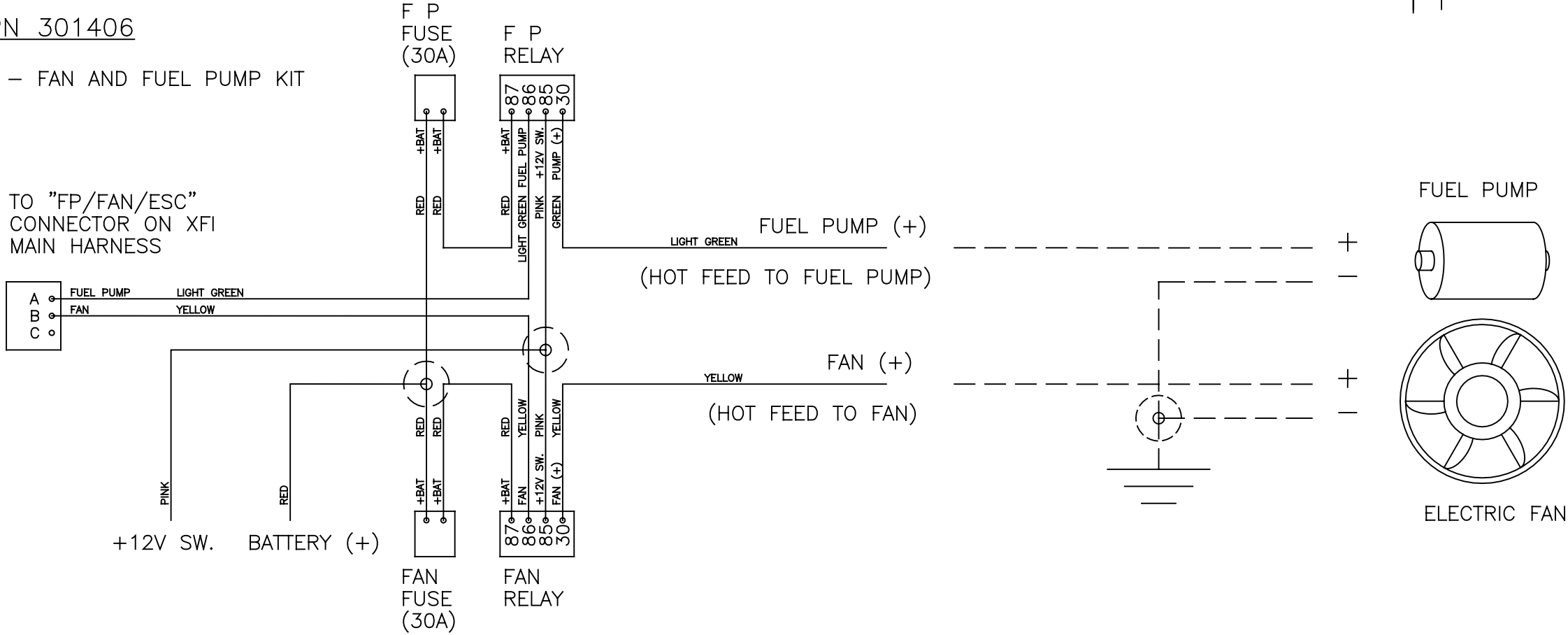

DENOTES SPLICE



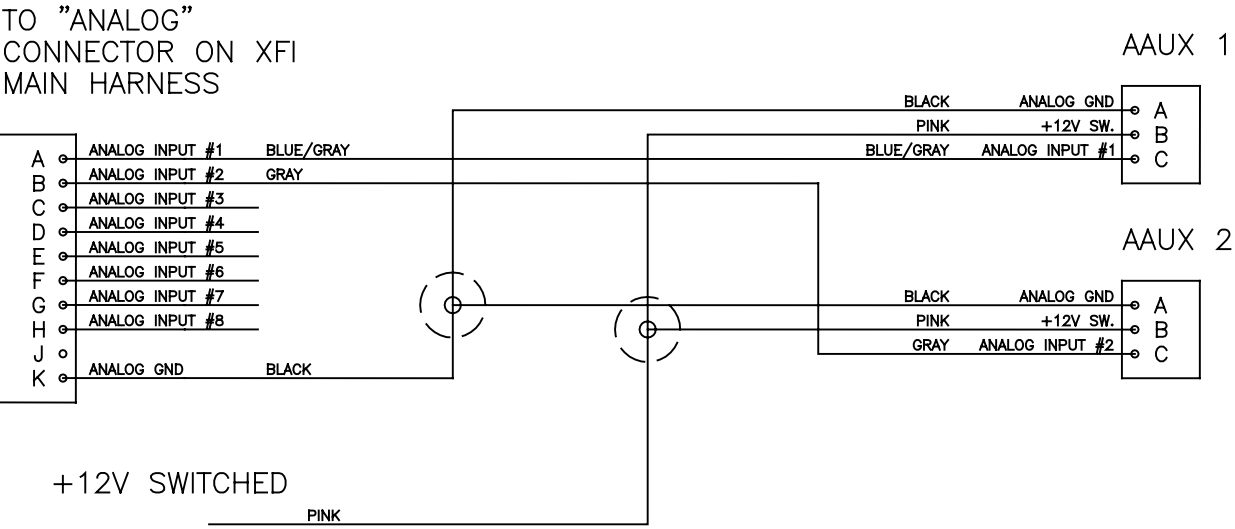
 www.fuelairspark.com FUEL AIR SPARK TECHNOLOGY		FAST XFI OPTION HARNESS – EGT KIT PN 301405	
DRAWN BY : RLW		DATE : 08/10/06	
REV : ...	DRAWING NO : 301405 SCHEMATIC		
...		SHEET NO : 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/10/06	

PN 301406
OPTION HARNESS – FAN AND FUEL PUMP KIT



PN 301407
OPTION HARNESS – FUEL AND OIL PRESSURE KIT



"AAUX" CONNECTORS
GO TO PRESSURE
SENSORS.

FAST SUPPLIED 0–100 PSI
SENSORS USE THE
FOLLOWING SOFTWARE
SETTINGS.

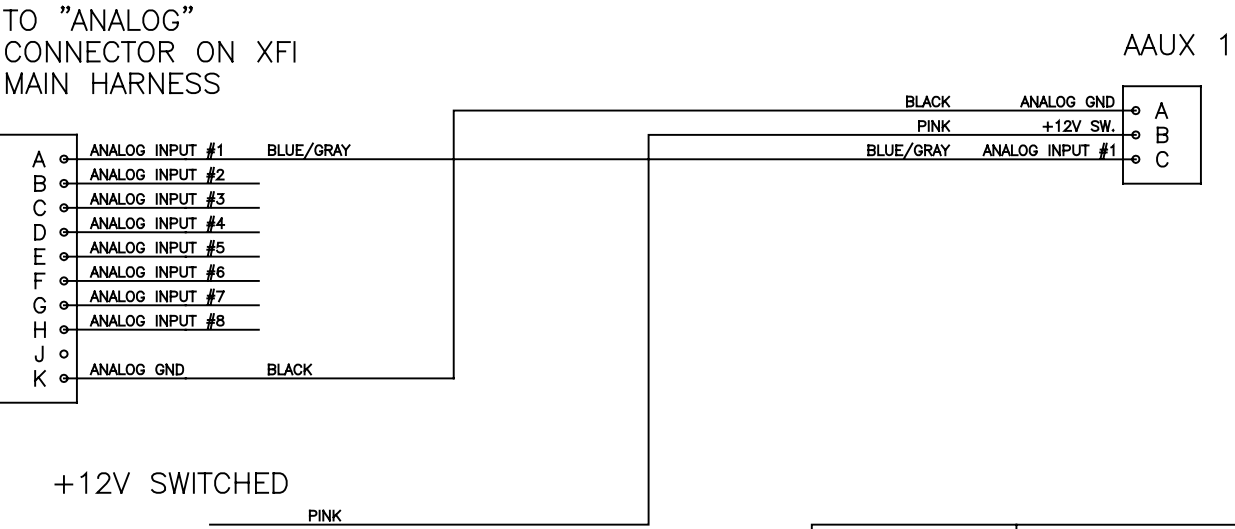
SENSOR GAIN	25
SENSOR OFFSET	–25



DENOTES SPLICE

PN 301408

OPTION HARNESS – SINGLE PRESSURE KIT



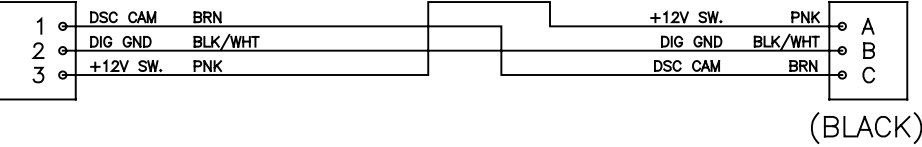
www.fastspark.com FAST FUEL AIR SPARK TECHNOLOGY		FAST XFI OPTION HARN'S FAN/PUMP, FUEL/OIL PR. SINGLE, PN'S 301406–08	
REV : ...	DRAWING NO : 301406–08	DRAWN BY : RLW	DATE : 08/10/06
SHEET NO : 1 OF 1			

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	09/19/06	
..			

PN 301415/30200
LS1 TO LS2 CAM SENSOR ADAPTER

TO "CAM"
CONNECTOR ON
LS1 XIM HARNESS

TO CAM SENSOR
ON LS2/LS7
ENGINE

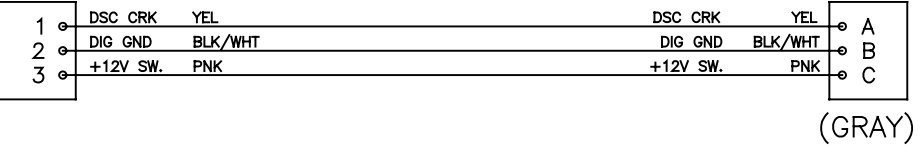


NOTE:
LS2/LS7 CAM SENSOR
LOCATION AND PINOUT
DIFFERENT THAN LS1.

PN 301416/30207
LS1 TO LS2 58x CRANK SENSOR ADAPTER

TO "CRANK"
CONNECTOR ON
LS1 XIM HARNESS

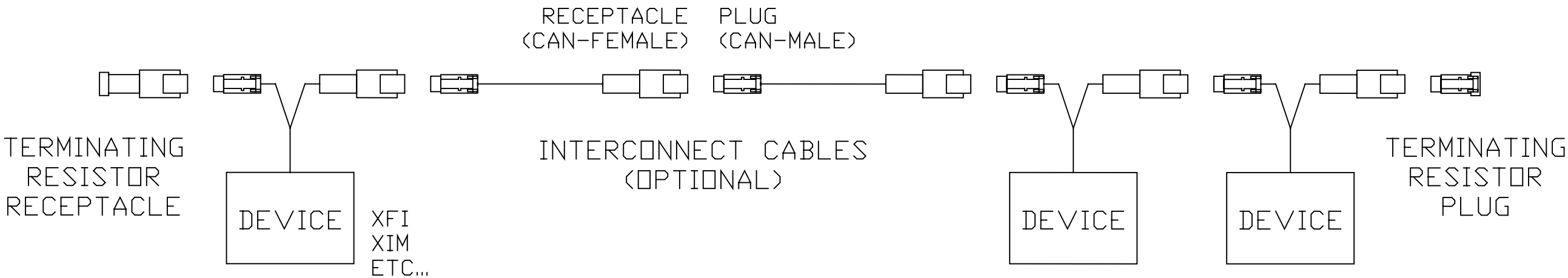
TO CRANK
SENSOR ON 58x
LS2/LS7 ENGINE



NOTE:
LS7 AND LATE LS2 CRANK
SENSOR CONNECTOR
DIFFERENT THAN LS1.

FAST CAN NETWORK

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/18/06	
A	ADD PLUG/RECEPT. LABELS	08/28/06	
B	CONN'S REDRAWN, NOTES AMENDED	11/02/06	
C	CAN LAYOUT CHANGED	02/05/07	



NOTES:

A CAN NETWORK ALLOWS DIFFERENT DEVICES TO COMMUNICATE WITH EACH OTHER.

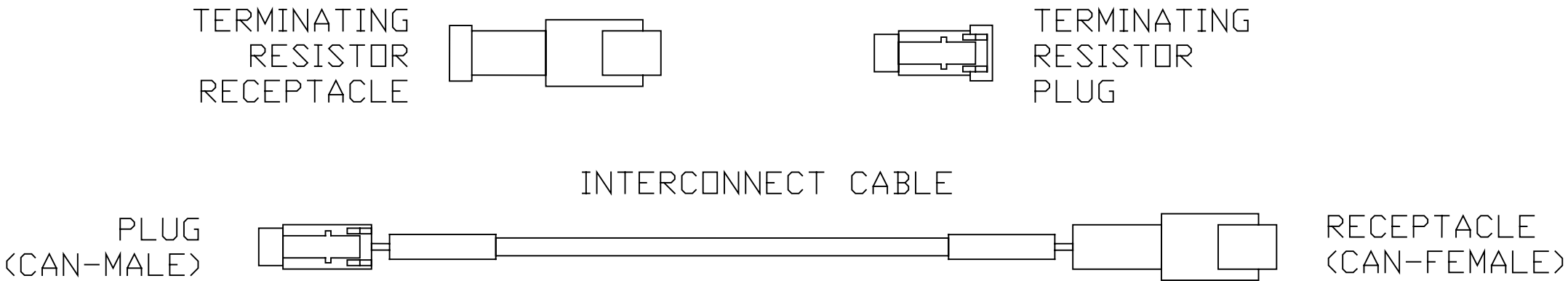
EACH CAN-ENABLED FAST DEVICE HAS A CAN PLUG AND A CAN RECEPTACLE BUILT INTO ITS WIRING HARNESS.

MATE A PLUG FROM ONE DEVICE TO THE RECEPTACLE FROM ANOTHER DEVICE.

DEVICES CAN BE DIRECTLY LINKED OR THEY CAN BE CONNECTED THROUGH AN INTERCONNECT CABLE.

MULTIPLE INTERCONNECT CABLES CAN BE LINKED TOGETHER FOR ADDITIONAL REACH.

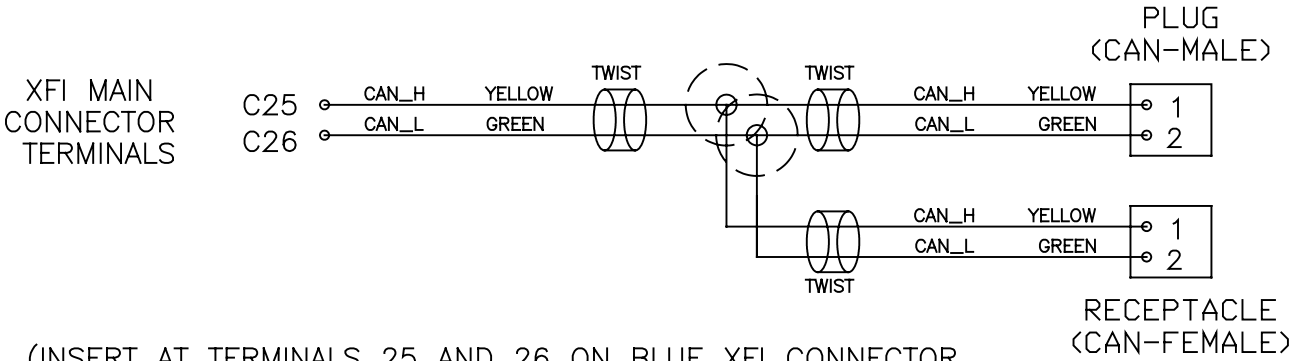
A TERMINATING RESISTOR PLUG & RECEPTACLE ARE USED TO CAP OFF THE OPEN ENDS OF THE CAN NETWORK WIRING. THESE ARE NECESSARY FOR PROPER NETWORK PERFORMANCE.



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	08/28/06	
A	ADD CATALOG PN'S, CHANGE DRAWING NAME	09/15/06	
B	ADD INSTRUCTION PN	09/21/06	
C	ADD TERMINATING RESISTORS TO DRAWING	10/19/06	
D	CONN NAMES TO MATCH NETWORK DRAWING, AMEND NOTES	11/02/06	
E	CAN RETROFIT LAYOUT CHANGE	02/05/07	
F	CAN TWIST NOTE. 301414 ADDED.	04/12/07	

PN 301412/30203

CAN XFI RETROFIT W/ TERMINATING RESISTORS
(USED TO ADD CAN WIRING TO XFI MAIN HARNESS)



(INSERT AT TERMINALS 25 AND 26 ON BLUE XFI CONNECTOR.
NOTE: WHITE LOCK MUST BE SLID OUT OF CONNECTOR
APPROXIMATELY 1/16" BEFORE PINS CAN BE INSERTED.
LOCK IS THEN PUSHED BACK INTO THE CONNECTOR.)

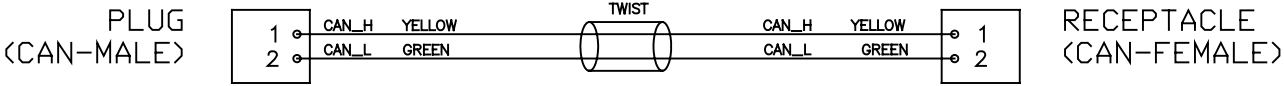
TERMINATING
RESISTOR
RECEPTACLE

TERMINATING
RESISTOR
PLUG

(TERMINATING RESISTORS ARE USED
TO CAP OFF THE OPEN ENDS OF
THE CAN NETWORK. THESE ARE
NECESSARY FOR PROPER NETWORK
PERFORMANCE.)

PN 301413/30202

CAN INTERCONNECT CABLE



PN 301414

CAN TERMINATING RESISTOR SET

TERMINATING
RESISTOR
RECEPTACLE

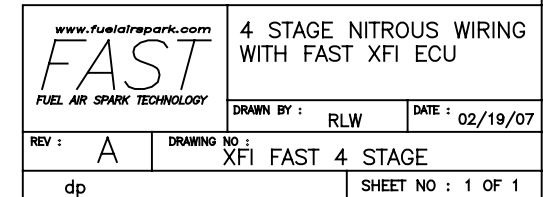
TERMINATING
RESISTOR
PLUG



DENOTES SPLICE

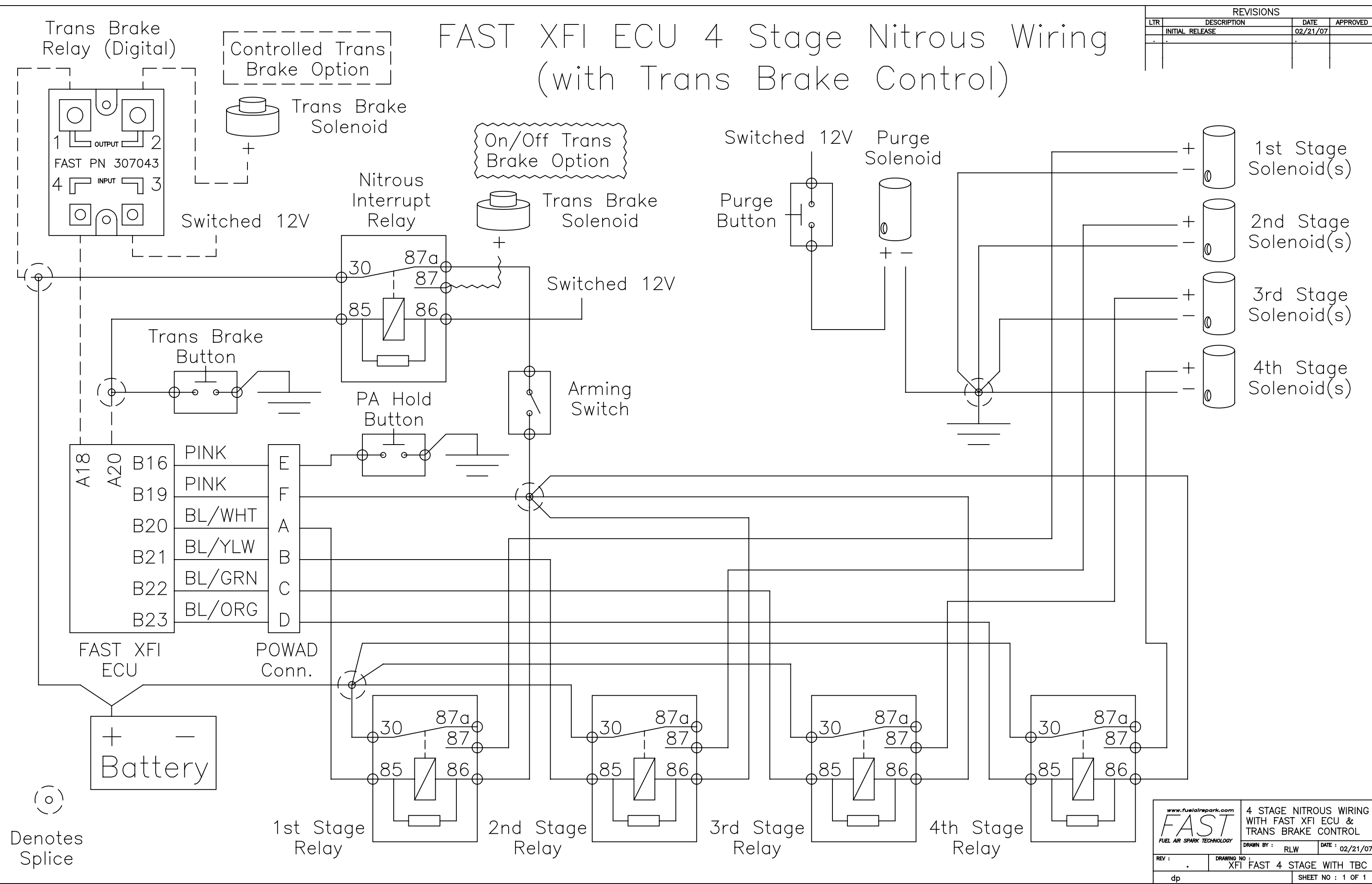
<small>www.fuelairspark.com</small> FAST <small>FUEL AIR SPARK TECHNOLOGY</small>	FAST CAN WIRING XFI RETROFIT AND CABLE PN'S 301412/301413	
	DRAWN BY : RLW	DATE : 04/12/07
REV : F	DRAWING NO : 301412-14 SCHEMATICS	
INSTRUCTION PN: FAST4-103		SHEET NO : 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	05/12/06	
A	BUTTONS REDRAWN	02/19/07	



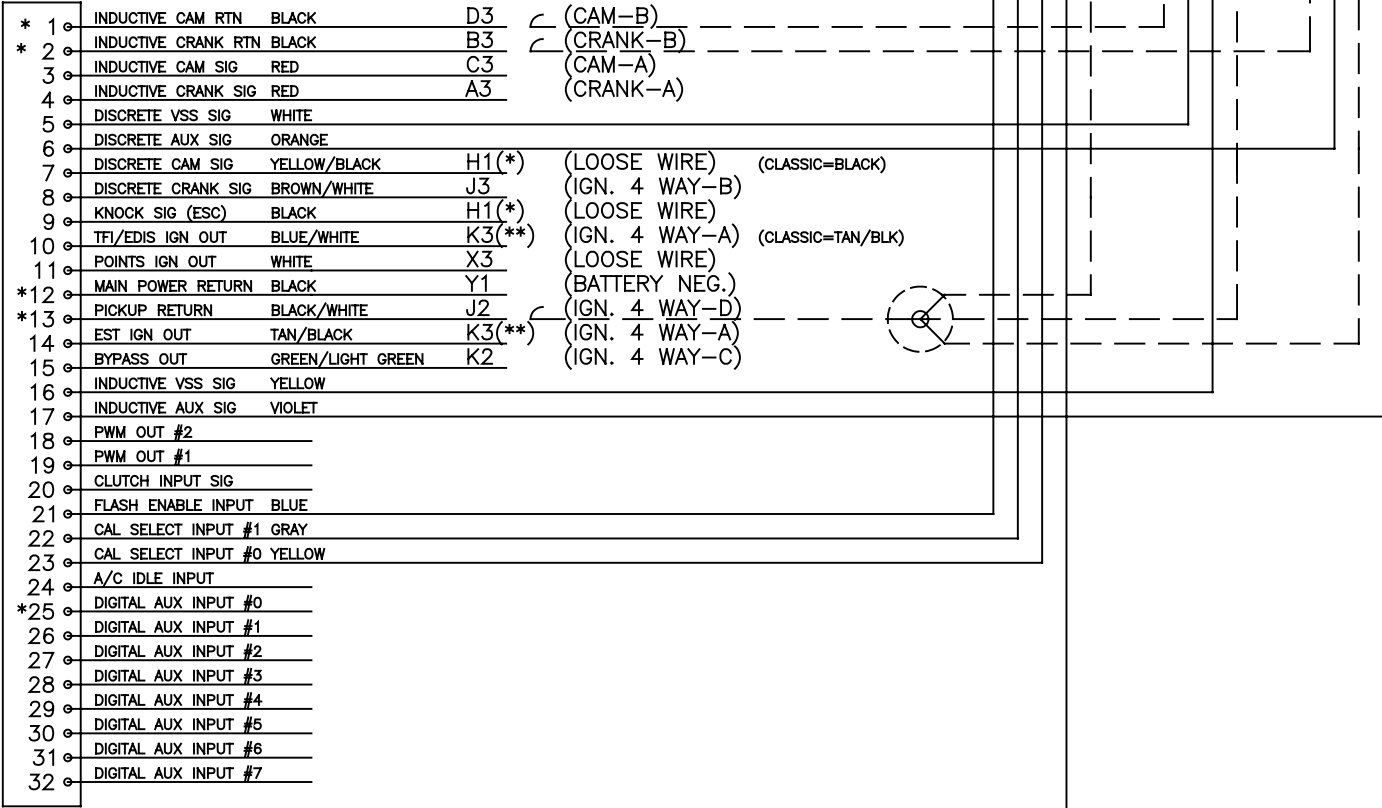
FAST XFI ECU 4 Stage Nitrous Wiring (with Trans Brake Control)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
1	INITIAL RELEASE	02/21/07	

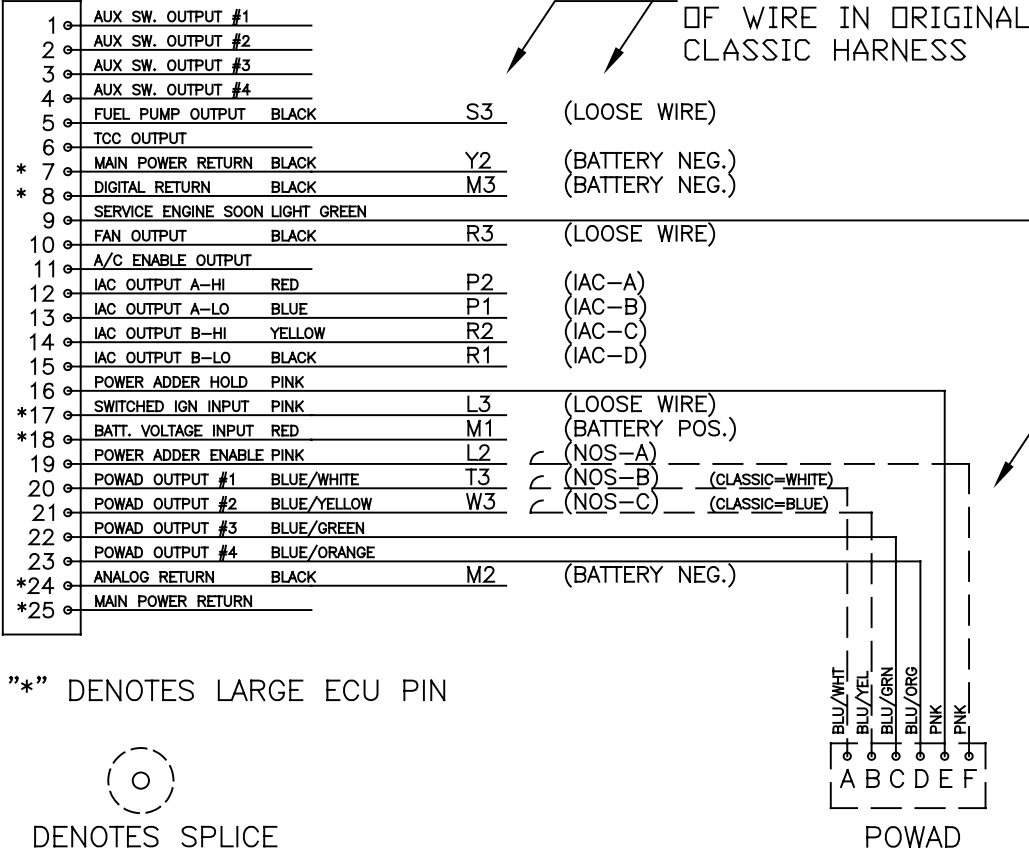


XFI MAIN CONNECTORS

ECU CONNECTOR "A"
GRAY 32 PIN



ECU CONNECTOR "B"
GRAY 25 PIN



"*" DENOTES LARGE ECU PIN

DENOTES SPLICE

DIAG

VSS

SHAFT

CAN LINK

ANALOG

ADAPTING CLASSIC HARNESS FOR USE WITH XFI

1. REMOVE WIRES FROM CLASSIC HARNESS MAIN CONNECTORS ONE AT A TIME.
2. INSTALL XFI TERMINAL AND INSERT INTO XFI MAIN CONNECTORS AS NOTED.

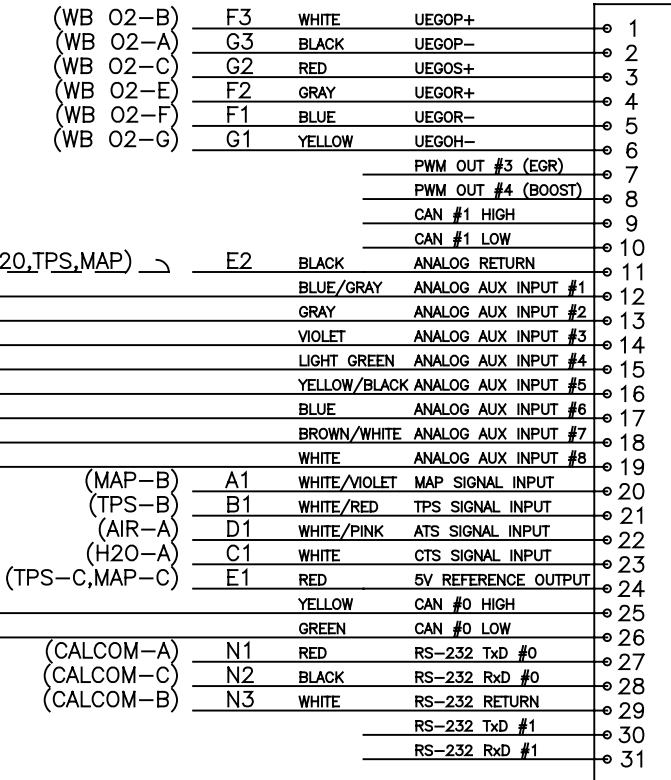
XFI MAIN CONNECTORS AND TERMINALS AVAILABLE AS PN 301000K.

WIRES SHOWN AS SOLID LINES DO NOT EXIST IN CLASSIC HARNESS, BUT CAN BE ADDED TO REPLICATE STANDARD XFI CONNECTIONS.

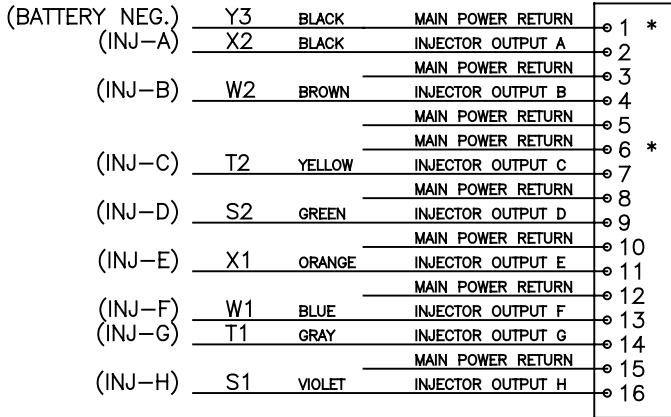
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
.	INITIAL RELEASE	01/12/07	
.	(BASED ON 301100 SCHEM REV. B)		
A	ADD CLASSIC CONN. DETAIL	01/23/07	
B	CAN TWIST NOTE.	04/12/07	

DASHED CONNECTORS NOT ESSENTIAL TO RUN ENGINE.

ECU CONNECTOR "C"
BLUE 31 PIN



ECU CONNECTOR "D"
GRAY 16 PIN



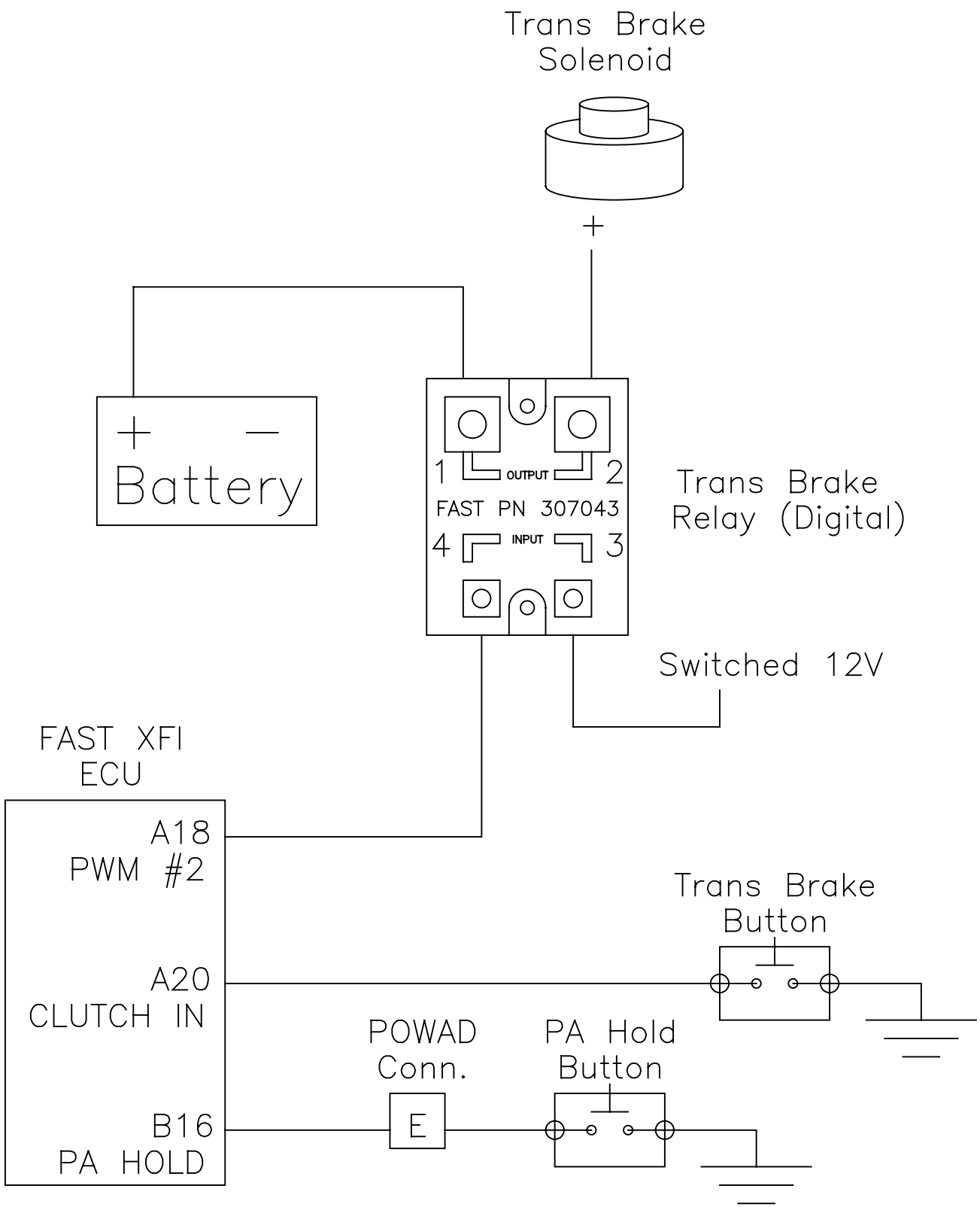
NOTE:
XFI REQUIRES UNUSED CRANK/CAM INPUTS TO BE GROUNDED.
CONNECTING THESE WIRES DOES THAT.

TYPE OF PICKUP BEING USED	LOOP TOGETHER ON XFI HARNESS
INDUCTIVE CRANK	A8 & A13
HALL EFFECT CRANK	A2 & A4
INDUCTIVE CAM	A7 & A13
HALL EFFECT CAM	A1 & A3

<p>www.fuelairspark.com</p> <p>FAST</p> <p>FUEL AIR SPARK TECHNOLOGY</p>		<p>ADAPTING CLASSIC HARNESS FOR USE WITH XFI</p>	
<p>DRAWN BY : RLW</p>		<p>DATE : 04/12/07</p>	
<p>REV : B</p>	<p>DRAWING NO : FAST CLASSIC TO XFI</p>		
<p>...</p>		<p>SHEET NO : 1 OF 1</p>	

FAST XFI ECU — Trans Brake Control

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	02/19/07	



<div>www.fuelairspark.com</div> <div>FAST</div> <div>FUEL AIR SPARK TECHNOLOGY</div>		TRANS BRAKE CONTROL WITH FAST XFI ECU	
DRAWN BY : RLW		DATE : 02/19/07	
REV : .	DRAWING NO : XFI TRANS BRAKE CONTROL		
dp		SHEET NO : 1 OF 1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	04/03/07	
.		.	

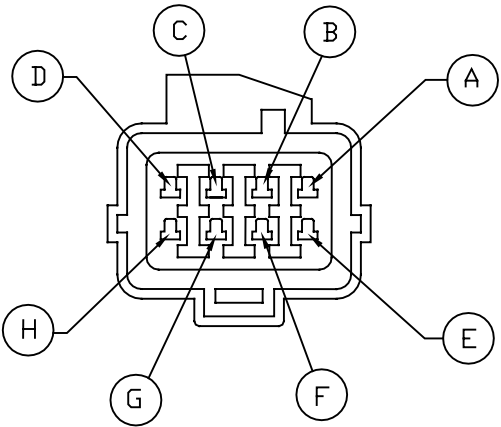
PN 30103

O2 SENSOR EXTENSION

TO "WIDEBAND O2"
CONNECTOR ON MAIN
HARNESS

TO O2
SENSOR

A	UEGOS-P-	BLACK	BLACK	UEGOS-P-	A
B	UEGOP+	WHITE	WHITE	UEGOP+	B
C	UEGOS+	RED	RED	UEGOS+	C
E	UEGOR+	GRAY	GRAY	UEGOR+	D
F	UEGOR-	BLUE	BLUE	UEGOR-	E
G	UEGOH-	YELLOW	YELLOW	UEGOH-	F
H	UEGOH+	ORANGE	ORANGE	UEGOH+	G
					H



TERMINAL SIDE VIEW
OF O2 SENSOR MATE

7-WAY CONN. TO MAIN HARN.	8-WAY CONN. TO SENSOR	FUNCTION	CLASSIC ECU	XFI ECU
A	A	UEGOS-P-	G3	C2
B	B	UEGOP+	F3	C1
C	C	UEGOS+	G2	C3
BLOCKED	D	n/c	n/c	n/c
E	E	UEGOR+	F2	C4
F	F	UEGOR-	F1	C5
G	G	UEGOH-	G1	C6
H	H	UEGOH+	VBAT	VBAT

NOTE:
FAST MAIN HARNESSES ARE BUILT TO USE AN O2 EXTENSION HARNESS TO CONNECT THE MAIN HARNESS TO THE O2 SENSOR. IF BUILDING A CUSTOM HARNESS, THE O2 SENSOR CAN BE WIRED DIRECTLY TO THE ECU AS SHOWN IN THE TABLE. THE MATING PARTS TO THE O2 SENSOR ARE AVAILABLE AS PN 301422K.

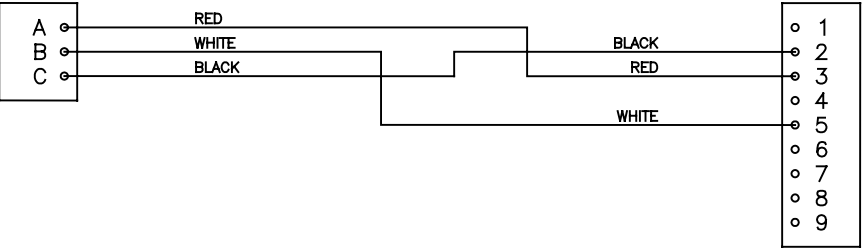
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	04/13/07	
.		.	

PN 308019

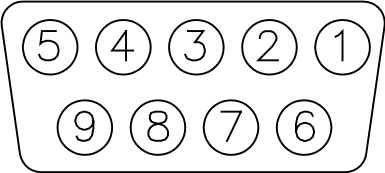
PC TO ECU COMMUNICATIONS CABLE

TO "CALPORT"
CONNECTOR ON MAIN
HARNESS

TO SERIAL CONNECTOR
ON PC OR ON
USB-SERIAL ADAPTER



DB9 CONNECTOR
WITH FEMALE
TERMINALS



FRONT / TERMINAL SIDE VIEW
OF DB9 CONNECTOR

PC TO ECU COMMUNICATIONS CABLES
ARE OFFERED IN SEVERAL LENGTHS

PN	LENGTH
308014	25 FT
308019	5 FT
308021	40 FT



INSTRUCTIONS

FAST™ Fuel System Kit

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning the installation.

Kit Contents:

1 ea	fuel pump wiring kit	1 ea	Pump
1 ea	3ft length of 10 ga. Black wire	1 ea	Filter 100 Micron SS
1 ea	25ft length of 10 ga. Red wire	1 ea	Filter 10 Micron Paper
1 ea	30 amp circuit breaker	1 ea	Fuel Pressure Regulator
1 ea	30 amp automotive relay	1 ea	Y-block Assembly
2 ea	blue female blade connector	2 ea	AN-08 cutoff union
2 ea	yellow female blade connector	2 ea	AN-08 o-ring
5 ea	yellow #10 stud ring connector	1 ea	AN-10 cutoff to AN-08 union
1 ea	yellow 3/8" stud ring connector	1 ea	AN-10 o-ring
6 ea	tie-wraps	12 ea	tie-wraps
1 ea	AN-06 cutoff union	1 ea	AN-06 o-ring
3 ea	AN-10 cutoff union	8 ea	AN-10 o-ring
3 ea	AN-10 cutoff to AN-08 union		

Caution: Installation of this product requires detailed knowledge of automotive systems and repair procedures. We recommend that this installation be carried out by a qualified automotive technician. Installation of this product requires handling of gasoline. Ensure you are working in a well ventilated area with an approved fire extinguisher nearby. Extinguish all open flames, prohibit smoking and eliminate all sources of ignition in the area of the vehicle before proceeding with the installation. When installing this product, wear eye goggles and other safety apparel as needed to protect yourself from debris and sprayed gasoline.

Warning: The fuel system is under pressure. Do not open the fuel system until the pressure has been relieved. Refer to the appropriate vehicle service manual for the procedure and precautions for relieving the fuel system pressure. FAST™ fuel system components are not legal for sale or use on emission controlled motor vehicles. The included FAST™ fuel pump is not compatible with alcohol based fuels or fuel additives!

This kit assumes you have a sumped fuel tank or fuel cell with accommodations for an AN-10 Supply line and an AN-06 return line. Fuel tank pickups will not work properly with FAST™ fuel systems and will be detrimental to your fuel systems life. If your fuel tank is not sumped, we recommend having your fuel tank sumped by a qualified professional. No fuel rails are provided with this kit, your fuel rails must have accommodations to accept AN-08 hose ends in order to install this kit properly.



FAST™
3400 Democrat Rd.
Memphis, TN 38118
Phone: (901) 260-3278 Fax: (901) 375-3408
www.fuelairspark.com

Part #165
Revised 2/5/2007

The following steps are typical of most installations:

Section 1 – Fuel Pump Installation

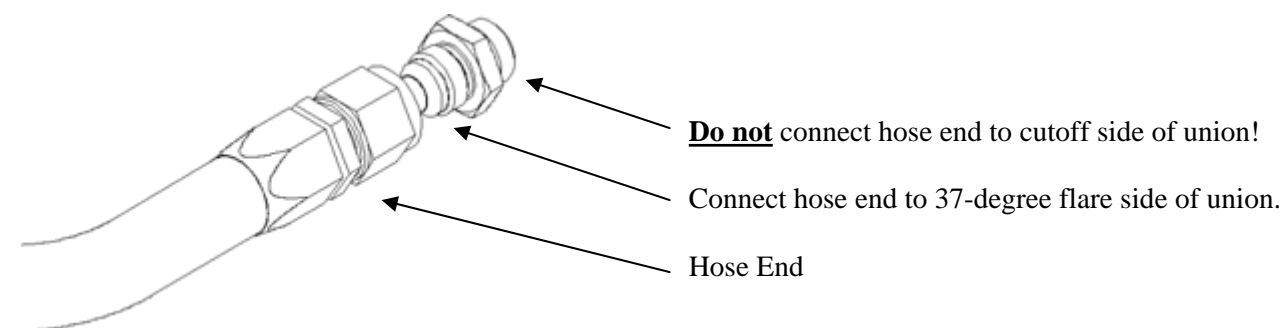
Section 2 – Fuel Regulator Installation and Fuel Line Plumbing

Section 3 – Fuel Line Hose End Installation

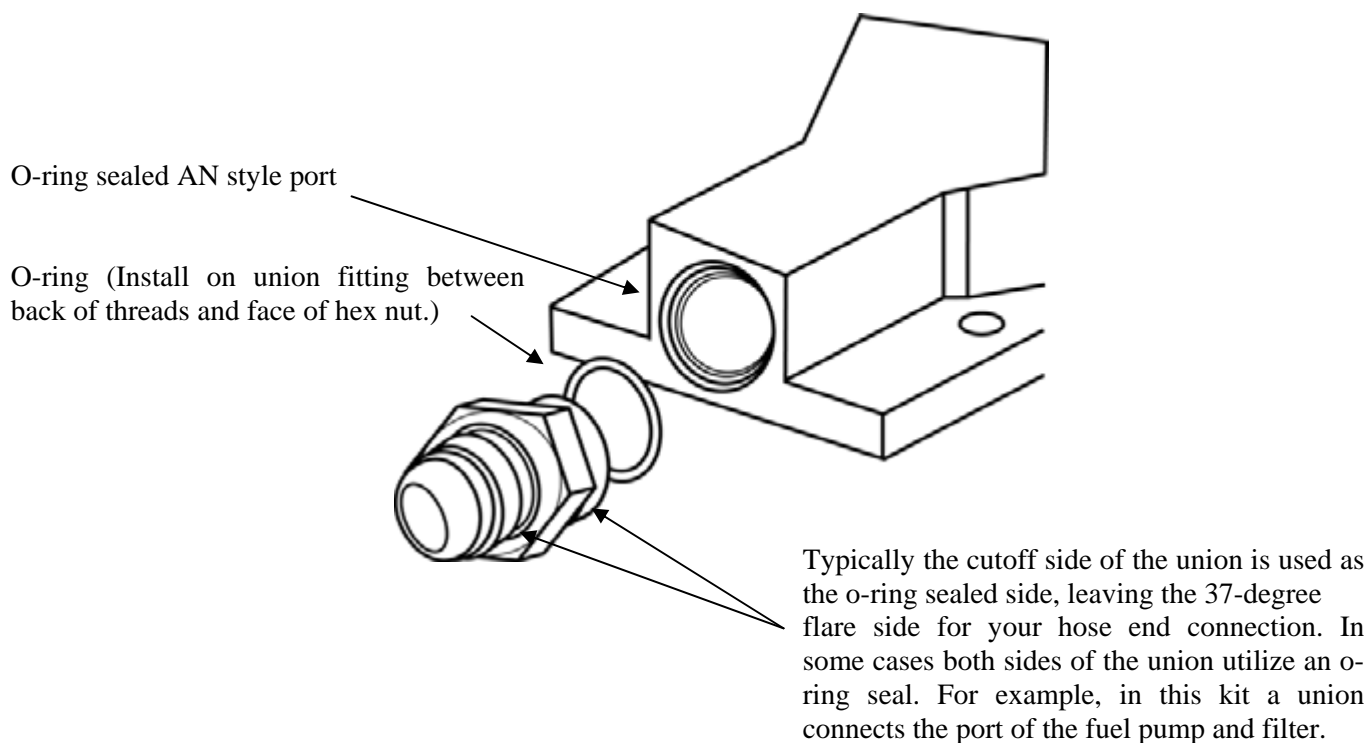
Section 4 – Electrical Installation

Section 5 – Final Checks and System Start-up, Fuel Pump Template

Typical hose end to fitting connection:

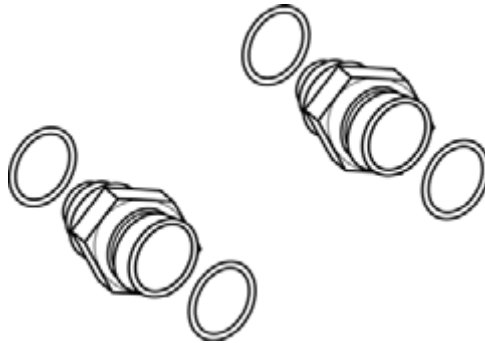


Typical o-ring sealed port connection:

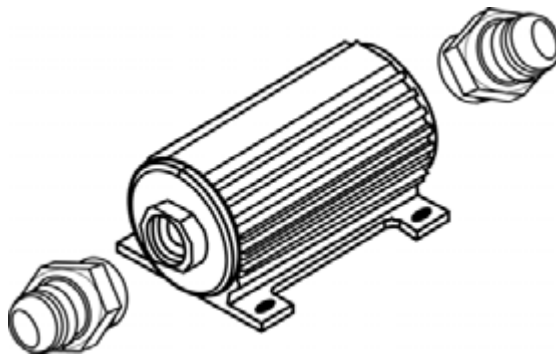


Section 1 - Fuel Pump Installation:

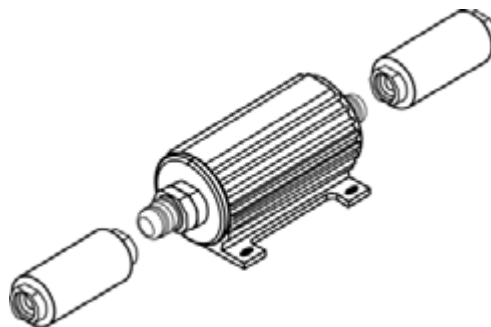
- 1-1. Once the engine has been allowed to cool, disconnect the negative battery cable and relieve the fuel system of all pressure.
- 1-2. Raise the vehicle and support it with jack stands.
- 1-3. Referring to the appropriate vehicle service manual for instructions, drain, disconnect any electrical and fuel component connections.
- 1-4. In the kit find two AN-10 cutoff union fittings and four of the AN-10 o-rings. Install each of the four o-rings on each end of the two AN-10 cutoff union fittings.



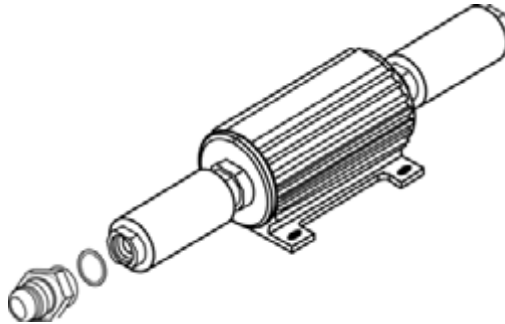
- 1-5. Install each of the two fittings into each end of the provided FAST™ fuel pump.



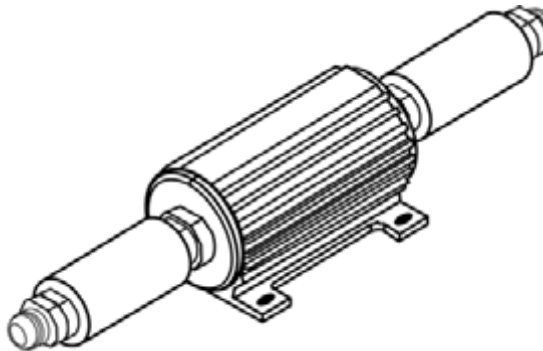
- 1-6. Noting the appropriate flow directions, install the provided fuel filter. If you get the two filters mixed-up, the fuel pump inlet side filter will have a 100 micron stainless steel filter element inside, where as the fuel pump outlet filter will have a 10 micron paper filter element inside.



- 1-7. Install one of the supplied AN-10 o-rings on the cutoff side of the AN-10 cutoff union fitting, if not already installed, and install on the inlet side of the pump / filter assembly.



- 1-8. Install one of the supplied AN-10 o-rings on the AN-10 cutoff side of the AN-10 cutoff to AN-08 reducer union fitting, and install the fitting on the outlet side of the pump/filter assembly.



- 1-9. Find a suitable mounting location for the above pump / filter assembly. **Warning: Do not mount on the gas tank shield; the typical mounting location is the inside of the frame rail.** The fuel pump should be mounted as close to the fuel tank as possible and as low as possible. Using the fuel pump as a guide or using the pump mounting template, mark the four pump mounting holes. Ensure there are no obstructions behind the mounting surface and drill four 1/4" mounting holes.

Note: Be sure to route all fuel lines clear of any moving suspension or drivetrain components and any exhaust components! Protect fuel lines from abrasion and road obstructions or debris.

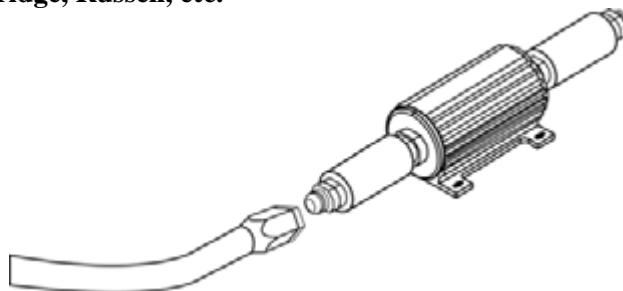
- 1-10. Secure the fuel pump to the mounting surface using four 1/4" bolts, nuts, and lock washers (not provided).

Note: Be sure to route all fuel lines clear of any moving suspension or drivetrain components and any exhaust components! Protect fuel lines from abrasion and road obstructions or debris.

- 1-11. Using the two supplied AN-10 hose ends as a guide, measure the length of AN-10 steel braided line needed to connect your fuel tank sump or fuel cell outlet to the fuel pump / filter assembly inlet.

- 1-12. Connect one end to the outlet of the fuel tank sump and the other end to the fuel pump / filter assembly inlet and tighten.

Note: It is recommended that a fuel shut off valve be installed between the fuel tank outlet and the fuel pump & filter assembly inlet, these valves are available from most popular racing fitting manufactures; Aeroquip, Earl's, Goodridge, Russell, etc.



1-13. In vehicles engine compartment, locate a suitable mounting location for the supplied fuel pressure regulator.

1-14. Starting from the determined regulator mounting location in the engine compartment, plan a route to run an AN-06 return line back to the fuel tank or fuel cell return port and measure the required length.

Note: Be sure to route all fuel lines clear of any moving suspension or drivetrain components and any exhaust components! Protect fuel lines from abrasion and road obstructions or debris.

1-15. Thread one end of the AN-06 return line onto the AN-06 return line accommodations of your fuel tank or fuel cell and tighten.

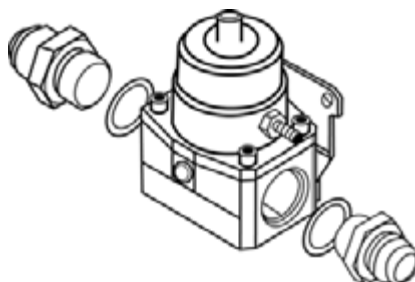
1-16. Make any line or electrical adjustments necessary to clear the vehicles exhaust, suspension, and drivetrain components.

Section 2 – Fuel Regulator Installation and Fuel Line Plumbing

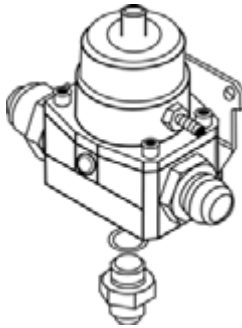
2-1. In the vehicle's engine compartment, mount the supplied fuel pressure regulator in the location established in step 1- 15. Using the supplied mounting bracket as a template, mark the bracket mounting holes and drill to accept a #10 screw.

2-2. With the bracket attached to the regulator, mount the bracket and regulator to the vehicle using two #10 screws, nuts and lock washers (not provided).

2-3. Install two of the supplied AN-10 o-rings on the cutoff side of two AN-10 cutoff to AN-08 reducer union fittings, if not already installed, and install in each of the AN-10 ports located on the sides of the supplied fuel pressure regulator.



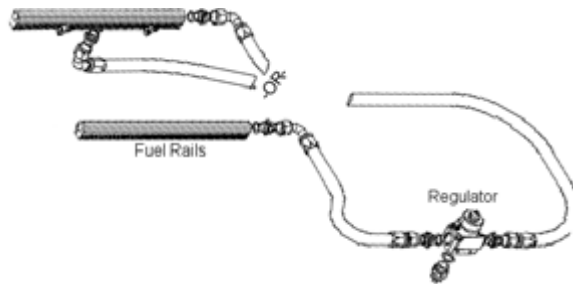
- 2-4. Install one of the supplied AN-06 o-rings on the cutoff side of the AN-06 cutoff union fitting, if not already installed, and install in the AN-06 port located on the bottom of the supplied fuel pressure regulator.



- 2-5. Starting from the fuel rails, plan a route to run an AN-08 supply line from each fuel rail to each side of the regulator. Cut the two supply lines to the determined length and install the AN-08 hose ends, as detailed in Section 3.

Note: Be sure to route all fuel lines clear of any moving suspension or drivetrain components and any exhaust components! Protect fuel lines from abrasion and road obstructions or debris.

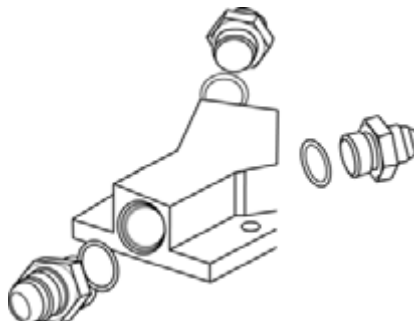
- 2-6. Using the above steel braided hose assemblies, connect one end to the side of the fuel pressure regulator and the other end to the fuel rails and tighten.



- 2-7. In the vehicle's engine compartment, find a suitable mounting location near the fuel rails for the supplied Y-Block, using the Y-block as a template, mark the mounting holes and drill to accept a #10 screw.

- 2-8. Attach the Y-block to the vehicle using two #10 screws, nuts and lock washers.

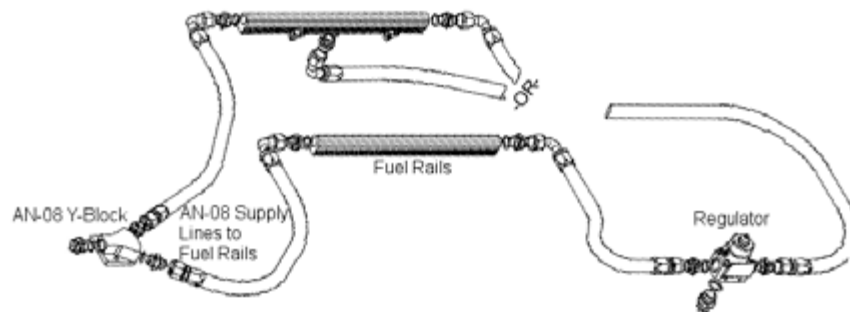
- 2-9. Install two of the supplied AN-08 o-rings on the cutoff side of two AN-08 cutoff union fittings, if not already installed, and install in each of the AN-08 ports located on the supplied Y-Block. Install one of the supplied AN-10 o-rings on the cutoff side of the AN-10 to AN-08 reducer union fitting, if not already installed, and install in the AN-10 port located on the supplied Y-Block.



2-10. Starting from the fuel rails, plan a route to run an AN-08 supply line from each fuel rail to each side of the Y-block.

Note: Be sure to route all fuel lines clear of any moving suspension or drivetrain components and any exhaust components! Protect fuel lines from abrasion and road obstructions or debris.

2-11. Using the above steel braided hose assemblies, connect one end to the Y-block and the other end to the fuel rails and tighten.

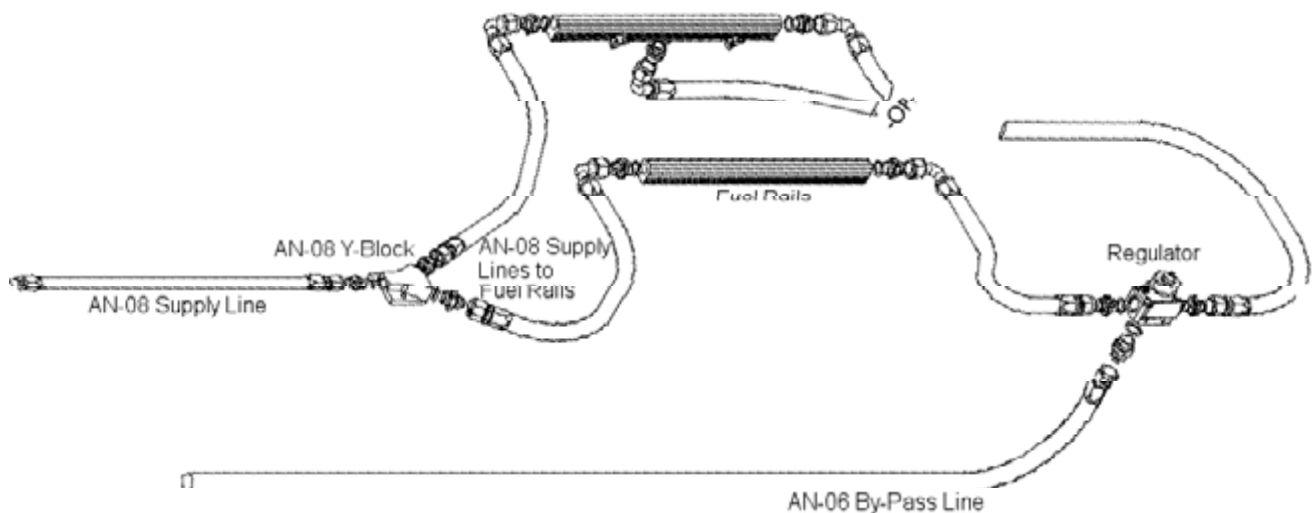


2-12. Starting from the outlet of the fuel pump / filter assembly; plan a route to run an AN-08 supply line from fuel pump / filter assembly to the Y-block, this line should be run along the same route you planned to run the return line in step 1.16.

Note: Be sure to route all fuel lines clear of any moving suspension or drivetrain components and any exhaust components! Protect fuel lines from abrasion and road obstructions or debris.

2-13. Using the above steel braided hose assembly, connect one end to the outlet of the fuel pump / filter assembly. Keeping both the supply line and return line from the fuel tank together, secure both lines to the vehicle along the predetermined route using the supplied tie-wraps. Once both lines are secure, connect the supply line to the Y-block and the return line to the bottom of the regulator and tighten.

Note: Be sure to route all fuel lines clear of any moving suspension or drivetrain components and any exhaust components! Protect fuel lines from abrasion and road obstructions or debris.



2-14. Once the regulator is installed, attach a suitable fuel pressure gauge (not supplied) to the 1/8 NPT port on the fuel pressure regulator.

Section 3 - Fuel Line Hose End Installation:

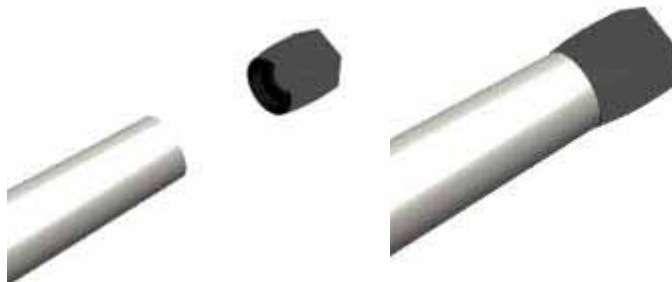
Caution: When assembling this product, wear eye goggles and other safety apparel as needed to protect yourself from debris and sharp edges.

3-1. Wrap hose with masking tape at the desired cutoff length. Cut hose through masking tape squarely to desired length using a cut-off machine or a fine tooth hacksaw and remove the masking tape.

3-2. Unthread the hose socket from the rest of the hose end fitting.



3-3. Insert hose in the socket with a twisting and pushing motion until the hose is fully seated in the socket.



3-4. Using a grease pencil, marker or tape, mark the location of the hose in relation to the hose socket that you just installed.

3-5. Using a light oil, lubricate the inside of the hose and hose end mating parts.

3-6. Carefully thread the hose end onto the hose socket, making sure that the hose does not push out of socket, by observing the mark you placed on the hose in step 3-4.



- 3-7. Using a properly sized wrench, complete threading the two components together (The maximum allowable gap between the two fitting components is .030 inches).



- 3-8. Inspect the hose for push out by comparing the mark you made on the hose in step 3-4 to the hose end socket location.
- 3-9. Clean all debris from exterior and interior of hose.
- 3-10. All lines should be tested to twice their operation pressure prior to use.

Section 4 - Electrical Installation:

- 4-1. Find a suitable place to mount the supplied relay, the relay is typically mounted by the OEM fuel pump wiring connector (**Never mount the relay inside of the fuel tank or next to fuel tank vents!**). Ensure the relay and any associated parts are clear of the exhaust, any moving suspension or drivetrain components and any possible road obstructions or debris.
- 4-2. Attach the OEM fuel pump wires to relay terminals 85 and 86 using two of the supplied blue female blade connectors (See Figure Below).

Note: Be sure to route all electrical wires clear of any moving suspension or drivetrain components, and any exhaust components! Protect wires from abrasion and road obstructions or debris.

- 4-3. Find a suitable location for mounting the supplied circuit breaker. For optimal circuit protection, the circuit breaker needs to be mounted as close to the battery as possible.
- 4-4. Connect terminal number 30 on the relay to the circuit breaker by using the supplied red 10 ga. wire, one of the yellow female blade connectors on the relay end of the wire and one of the yellow #10 ring connectors on the circuit breaker side of the wire.

Note: Be sure to route all electrical wires clear of any moving suspension or drivetrain components and any exhaust components! Protect wires from abrasion and road obstructions or debris.

- 4-5. Connect terminal number 87 on the relay to the positive terminal on the fuel pump. This is accomplished by using the supplied red 10 gauge wire, one of the yellow female blade connectors on the relay side of the wire and one of the yellow #10 ring connectors on the fuel pump side of the wire.
- 4-6. Connect the negative terminal on the fuel pump to a clean chassis ground using the supplied black 10 gauge wire and two yellow #10 ring connectors.

- 4-7. Connect 12VDC to the circuit breaker using the supplied red wire and one of the yellow #10 ring connectors and the supplied yellow 3/8" ring connector.
- 4-8. Ensure that electrical components and wires are connected properly (See Figure 4-1) and are clear of any moving suspension or drivetrain components and any exhaust components! Protect wires from abrasion and road obstructions or debris.

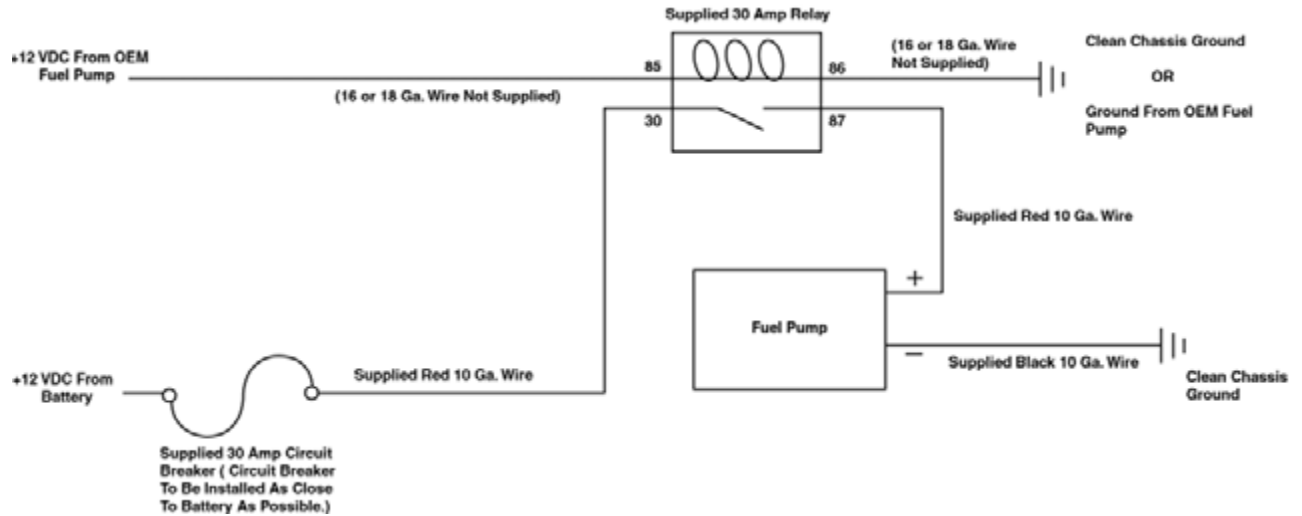


Figure 4-1

Section 5 – Final Checks and System Start-up

- 5-1. Ensure that any spilled gasoline and any gasoline soaked shop towels are cleaned up and removed from the vicinity of the vehicle!
- 5-2. Carefully lower the car to the ground.
- 5-3. Fill the fuel tank with gasoline and check for any leaks in the system, if any leaks are found repair immediately.

Caution: While performing the following steps, if any fuel leaks are detected, immediately turn the ignition OFF, remove any spilled fuel and repair the leak(s) before proceeding!

- 5-4. Reconnect the battery and turn the ignition to the ON position WITHOUT starting the car. After several seconds check the fuel pressure. If there is no fuel pressure, turn the ignition key to the OFF position, wait one minute, return the ignition to the ON position, and recheck the fuel pressure. Repeat this ignition OFF and ON procedure until the fuel pressure gauge registers fuel pressure.
- 5-5. With the fuel pressure gauge registering fuel system pressure, check for leaks throughout the entire fuel system! If any leaks are found, turn the ignition key to the OFF position, remove any spilled fuel and repair the leak before proceeding!
- 5-6. Once the fuel pressure gauge registers fuel system pressure and there are no fuel leaks, start the engine and adjust the regulator to the desired fuel pressure. Turning the adjustment screw clockwise will increase the fuel pressure. OEM regulators are typically set at approximately 43 psi, without the vacuum line attached. The fuel pressure adjustment range for this regulator is 35-80 psi.

- 5-7. Once the desired fuel pressure is achieved, tighten the regulator adjustment jam nut & attach vacuum line.
- 5-8. Test drive the car to ensure proper operation and re-check the fuel system for leaks. **If any leaks are found, immediately discontinue use of the vehicle and repair the leak(s)!**

Limited Warranty

FAST, Inc. warrants that all of its products are free from defects in material and workmanship for a period of 1 year from the date of purchase. This limited warranty shall cover the original purchaser.

FAST, Inc.'s obligation under this warranty is limited to the repair or replacement of its product. To make a warranty claim, the part must be returned within 1 year of purchase to the address listed below, freight prepaid. Items covered under warranty will be returned to you freight collect.

It is the responsibility of the installer to ensure that all of the components are correct before installation. We assume no liability for any errors made in tolerances, component selection, or installation.

There is absolutely no warranty on the following:

- **Any parts used in racing applications.**
- **Any product that has been physically altered, improperly installed or maintained.**
- **Any product used in improper applications, abused, or not used in conjunction with the proper parts.**

There are no implied warranties of merchantability or fitness for a particular purpose. There are no warranties, which extend beyond the description of the face hereof. FAST, Inc. will not be responsible for incidental and consequential damages, property damage or personal injury damages to the extent permitted by law. Where required by law, implied warranties of merchantability and fitness are limited to a term of 1 year from the date of original purchase. This warranty gives you specific legal rights and you may also have other legal rights, which vary from state to state.



FAST™
3400 Democrat Rd.
Memphis, TN 38118
Phone: (901) 260-3278 Fax: (901) 375-3408
www.fuelairspark.com

Part #165
Revised 2/5/2007



Overview

- The eDist allows the use of multiple ignition coils with a spark management system designed to run only one coil.
- The eDist can be configured to operate on engines with one coil per cylinder or on engines with waste-spark ignitions (one coil for two cylinders).
- The eDist distributes pulses within conventional ignition control signals to multiple ignition coils, much as a mechanical distributor's rotor distributes spark from one ignition coil to multiple spark plugs.
- A cam sensor signal to the eDist is necessary for operation. This signal ensures that appropriate cylinders are fired at the proper time. The signal should consist of a single pulse every two rotations of the crankshaft. A hall-effect or inductive pickup cam sensor may be used. If you are already using a FAST ECU and a cam sensor is being used, the cam signal may be shared between the eDist and the ECU.
- eDist part number 30-5000 for use with OEM ignition coils*
- eDist part number 30-5001 for use with GM "Smart Coils" such as those used on the Chevrolet LS1
- In high horsepower applications, eDist part number 30-5000 can be used in conjunction with an aftermarket multi-channel ignition system.

**Compatible with ignition coils with a primary resistance of higher than 1 ohm. See "coil outputs" section for additional information.*

Installation

- Mount the eDist inside the car if possible. The enclosure and connector are not water resistant.
- The supplied wiring harness comes with 48 inches of unterminated wire for attachment to ignition coils, engine sensors, etc. It is advisable to select a mounting location that will allow all connections to be made with the supplied wiring.
- Mount the eDist so that the end panels are easily accessible. There are configuration switches and status LEDs behind the panel on the opposite end of the connector that you will need to access.

Wiring

EST/Points control signal (white)

Connect the ignition control signal wire to pin C2. It is advisable to connect pin D2 of the eDist to the same ground point used by the ignition system. This will help minimize problems due to electrical noise caused by poor grounds.

Cam Signal (1 red, 1 black)

If you are using an inductive pickup cam sensor: connect the positive lead of the sensor to pin C3 with the red wire, and connect the negative lead to D3 with the black wire.

If you are using a discrete-type / hall-effect cam sensor: connect the signal wire from the sensor to pin D4 with the red wire. Connect pin D4 of the eDist to the ground lead of the hall-effect cam sensor with the black wire. You must provide a switched +12 volt source to the power lead of this sensor.

Grounds

Connect pins C5, D9, and C10 directly to the negative battery terminal. You may need to extend the wiring on the supplied harness to make this connection. Connect pins D14, D15, and D16 to the chassis or engine block.

Tachometer output (light green)

Pin C15 can be connected to an aftermarket, electronically driven tachometer. This should work with most factory tachometers as well.

Switched ignition (pink)

Connect pin C16 to a switched +12V power source through a 2 amp fuse.

EST outputs (see pinout chart for wire colors)

The EST outputs are available on both eDist part numbers 30-5000 and 30-5001. The EST outputs are designed to be compatible with coils using built-in coil drivers, such as the GM "smart coils" (used on the Chevrolet LS1 engine, for example.) Compatibility with other types of smart coils is undetermined at this time but any other "smart coil" with a 0-5V logic (active high dwell) control signal should be compatible. The order in which these outputs are wired varies with an engine's firing order and cam sensor timing. This is described in the "wiring the outputs" section of this manual.

Coil outputs (see pinout chart for wire colors)

The coil outputs are only available on eDist part number 30-5000 and are not available with eDist part number 30-5001. These outputs can fire a coil directly by connecting them to the negative side of an ignition coil. The order in which these outputs are wired varies with an engine's firing order and cam sensor timing. This is described in the "wiring the outputs" section of this manual.

The drive capabilities of the coil outputs are not infinite and some ignition coils may present a challenge for heat dissipation and drive capacity. Generally, a coil with a primary resistance of 1 ohm or higher can be safely fired directly from the eDist. If you are using coils with a primary resistance of lower than 1 ohm, it is advisable to connect the eDist outputs to the inputs of a multi-channel ignition system and use that to fire the coils.

PINOUT

Pin #	Description	Connect to	Pin #	Description	Connect to
C1	N/A	Not used	D1	N/A	Not used
C2	EST/Points Input Signal (White)	Points control or EST signal wire from engine management system	D2	EST/Points Ground/Ref. Low	Ignition system ground
C3	Inductive+ Cam Input (Red)	Positive lead of inductive cam sensor (if used)	D3	Inductive- Cam Input (Black)	Negative lead of inductive cam sensor (if used)
C4	Discrete+ Cam Input (Brown)	Signal wire of hall-effect cam sensor (if used)	D4	Discrete- Cam Input	Ground wire of hall-effect cam sensor (if used)
C5	AGND (Analog Ground)	Negative battery terminal	D5	EST-A (LS1 Cyl. #2 – Red/White)	<i>See operation section</i>
C6	EST-B (LS1 Cyl. #6 – Blue/White)	<i>See operation section</i>	D6	EST-C (LS1 Cyl. #5 – Green)	<i>See operation section</i>
C7	EST-D (LS1 Cyl. #4 – Green/White)	<i>See operation section</i>	D7	EST-E (LS1 Cyl. #3 – Blue)	<i>See operation section</i>
C8	EST-F (LS1 Cyl. #1 – Violet)	<i>See operation section</i>	D8	EST-G (LS1 Cyl. #8 – Violet/White)	<i>See operation section</i>
C9	EST-H (LS1 Cyl. #7 – Red)	<i>See operation section</i>	D9	AGND (Analog Ground)	Negative battery terminal
C10	AGND (Analog Ground)	Negative battery terminal	D10	Coil- Output A (Red/White)	<i>See operation section</i>
C11	Coil- Output B (Red)	<i>See operation section</i>	D11	Coil- Output C (Blue/White)	<i>See operation section</i>
C12	Coil- Output D (Blue)	<i>See operation section</i>	D12	Coil- Output E (Green/White)	<i>See operation section</i>
C13	Coil- Output F (Green)	<i>See operation section</i>	D13	Coil- Output G (Purple/White)	<i>See operation section</i>
C14	Coil- Output H (Purple)	<i>See operation section</i>	D14	PGND (Power Ground) (Block)	Engine block or chassis
C15	Tach Output (Light Green)	Signal input on tachometer	D15	PGND (Power Ground) (Block)	Engine block or chassis
C16	Switched Ignition +12VDC (Pink)	Switched +12VDC source	D16	PGND (Power Ground) (Block)	Engine block or chassis

*Shaded areas denote typical connections for LS-1 applications

Cam sensor installation

- The purpose of the cam sensor is to tell the eDist where in the firing order to start counting. This helps to ensure that spark will occur in the appropriate cylinder at the appropriate time.
- The cam sensor used with the eDist may be an inductive pickup or discrete-type / hall-effect sensor. The eDist is compatible with either type.
- The cam signal should consist of a single pulse every 2 revolutions of the crankshaft.
- The normal range of ignition timing values is 10 to 45 degrees BTDC, typically. The cam signal should be timed so that the cam pulse does not occur within 10 degrees of this range. If the cam sensor signal is received within this range, the eDist may not be able to properly discern the correct cylinder in the firing order.

Crank reference signal

The eDist requires a spark signal that has been generated by an engine management system or other ignition control system as a spark dwell signal. The eDist cannot change the ignition timing, so the incoming dwell control signal must already be properly timed. The signal should consist of a single pulse per cylinder. The pulse may be a 0-12 volt pulse or a 0-5 volt pulse, and it may have either an active high or active low dwell state.

Wiring the outputs

Because firing orders and cam sensor trigger positions vary, the order in which the outputs of the eDist are wired to the engine will also vary. The following examples demonstrate how to determine the proper output wiring of the eDist in your application. All you need to know is your firing order and where the cam reference pulse occurs relative to TDC of cylinder #1.

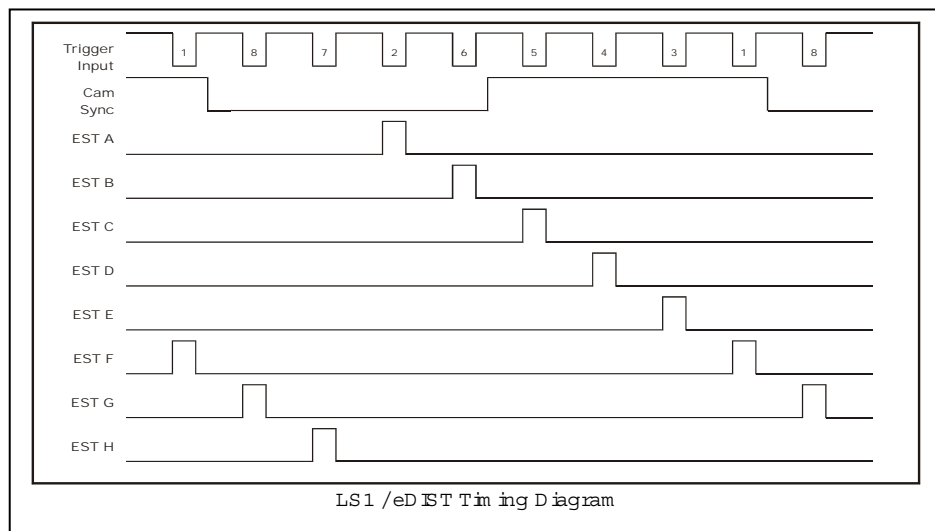
Output A will fire on the 3rd dwell pulse detected after the cam pulse.

LS-1 Example:

-Cam pulse (falling edge) is at TDC.

-Firing order is 18726543.

In this case, we know that the dwell signal for cylinder #1 was received prior to the cam pulse – the dwell signal occurs somewhere within 10-45 degrees before TDC, typically. After this, dwell pulses for cylinder #8, then #7, then #2 are received. Since cylinder #2 is the third dwell pulse after the cam, #2 is wired to output A on the eDist. From there, follow the firing order in your wiring. A=2, B=6, C=5, D=4, E=3, F=1, G=8, H=7.



In this LS-1 application, dip switch positions 1-3 should be **OFF** and position 4 should be **ON** configuring the eDist as an 8 coil application. Dip switch position 6 will be set to **OFF** to configure the eDist for the LS-1's hall-effect cam sensor, position 7 will be set to **ON** to configure the eDist for an points type (dwell state low) spark input signal, and position 8 will be set to **OFF** to configure the eDist for the LS-1's falling edge cam sync signal.

Another example:

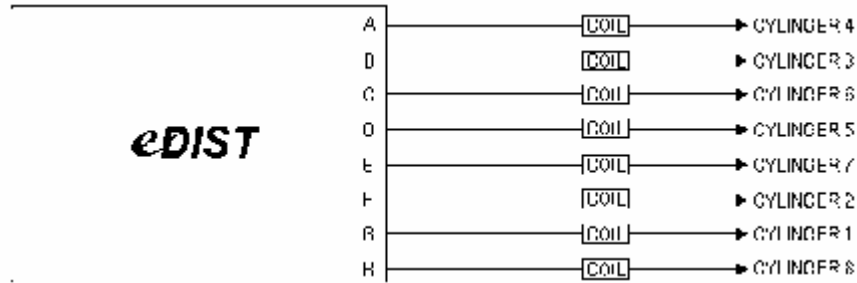
-Cam pulse is at 75 degrees before TDC.

-Firing order is 18436572.

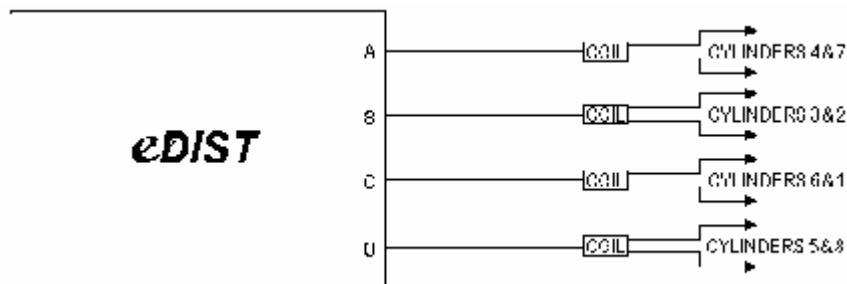
This time, the cam pulse has occurred before the #1 dwell pulse. After the cam pulse has occurred, dwell pulses for cylinder #1, then #8, then #4 are received. Since #4 is the third dwell pulse after the cam pulse is detected, output A goes to #4. A=4, B=3, C=6, D=5, E=7, F=2, G=1, H=8. The dip switches would be configured accordingly.

Coil-On-Plug vs. Waste-Spark Ignition systems

Coil-on-plug ignition (COP) systems use an individual ignition coil for each cylinder of an engine. A COP ignition system eliminates many problems that are frequently found in conventional single-coil ignition systems used with a mechanical distributor. Since each coil only operates a single cylinder, the amount of "work" the coil does is greatly reduced, minimizing the chances for coil failure. In the event a coil does fail, it will only affect a single cylinder rather than the entire engine. COP ignition systems eliminate the problems associated with rotor phasing, allowing for a wider potential range of ignition timing values while removing the possibility of misfires caused by improper rotor phase. The following diagram shows how the eDist outputs would be wired to the coils in a COP configuration, according to the firing order prescribed in the above example:

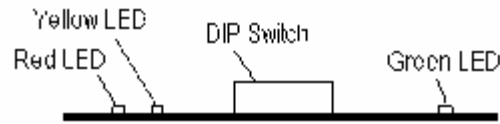


Waste-spark ignition systems work in a manner similar to COP systems. However, with a waste-spark system, ignition coils are used to fire two cylinders rather than one. Special coils that have two spark plug wire terminals on them are used. The two terminals on this coil are connected to a pair of cylinders that fire 360 degrees apart from each other in the firing order. Both cylinders will receive spark simultaneously in this configuration. While one cylinder is nearing TDC of the compression stroke, where the spark needs to happen, the other cylinder will be nearing TDC of the exhaust stroke, where an extra spark will have no impact on how the engine operates. A waste-spark system provides the same benefits as a COP system, but can do so with half as many ignition coils as a COP system and half of the control wiring. The following diagram shows how the eDist outputs would be wired to the coils in a waste-spark configuration, according to the same firing order used in the above diagram:



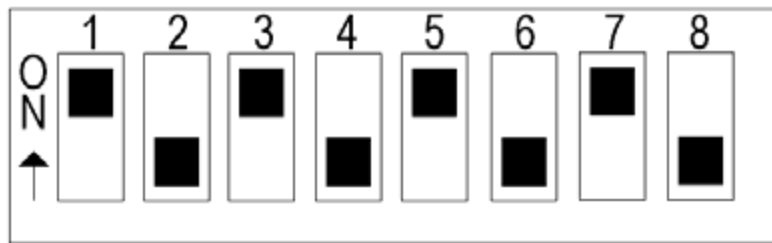
DIP Switch Settings

Remove the blank end panel on the eDist so that the DIP switches and LEDs are visible. When viewing the eDist with the end panel removed, the DIP switches and LEDs are located as per the following diagram:



- Switches 1-4 are used to determine the number of coil outputs to use. For coil-on-plug applications, set the switches as outlined in the following chart. For waste spark applications, set the switches for half the number of cylinders in the engine.
- Switch 5 is not used.
- Use switch 6 to determine what type of cam sensor you are using. If you are using an inductive cam sensor, set switch 6 on. If you are using a hall effect cam sensor, set switch 6 off.
- Switch 7 should be turned on if you are triggering the eDist with a points-type control signal. If you are triggering the eDist with an EST-type signal (such as that from an ignition module on a Buick DIS or GM HEI-equipped engine) switch 7 should be turned off.
- Switch 8 is only used if switch 6 is off. If you are referencing from the rising edge (the point where the signal goes from 0 volts to 12 volts) of a hall effect cam signal, switch 8 should be on. If you are referencing from the falling edge (the point where the signal goes from 12 volts to 0 volts) of a hall effect cam signal, switch 8 should be off.

Dip Switch Diagram And Chart



1-4	Select Number of coils to fire.	5	N/A
8 coils:	1=0 ff, 2=0 ff, 3=0 ff, 4=0 n *	6	On - Use Inductive Cam Sync Input Off - Use Hall Effect (0-12V) Cam Signal*
7 coils:	1=0 n, 2=0 ff, 3=0 ff, 4=0 n	7	On - Use Points-type input signal* Off - Use EST-type input signal
6 coils:	1=0 ff, 2=0 n, 3=0 ff, 4=0 n	8	On - Use Cam Signal Rising Edge for Reference Off - Use Cam Signal Falling Edge for Reference *
5 coils:	1=0 n, 2=0 n, 3=0 ff, 4=0 n		
4 coils:	1=0 ff, 2=0 ff, 3=0 n, 4=0 n		
3 coils:	1=0 n, 2=0 ff, 3=0 n, 4=0 n		
2 coils:	1=0 ff, 2=0 n, 3=0 n, 4=0 n		

*denotes typical LS-1 settings

LED and Output Operation

- When power is applied to the eDist, the green LED behind the blank end panel will illuminate.
- When a compatible dwell signal is received, the red LED behind the blank end panel will illuminate.
- When a compatible cam signal is received, the yellow LED behind the blank end panel will illuminate.
- There will be no output from the eDist until all three LEDs are on. In other words, you must have the eDist powered up and receiving compatible dwell AND cam reference signals before the outputs will fire.
- Once the eDist has met the above conditions, it fires the outputs in order, A through H (depending on how many coils you have selected), and starts over.

CAN Connectors Assembly Instructions

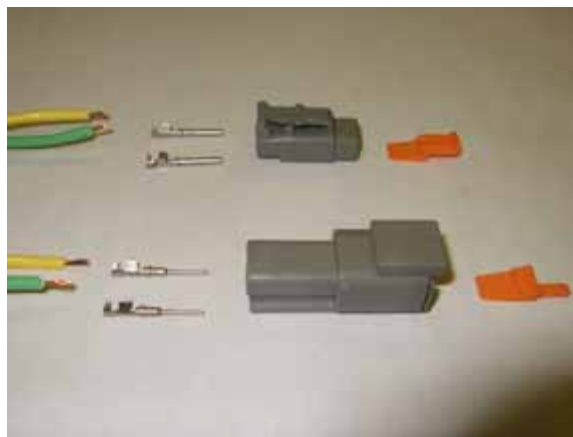
Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

These instructions outline the assembly of the CAN connectors used in FAST wiring.

1. Strip the end of each wire.

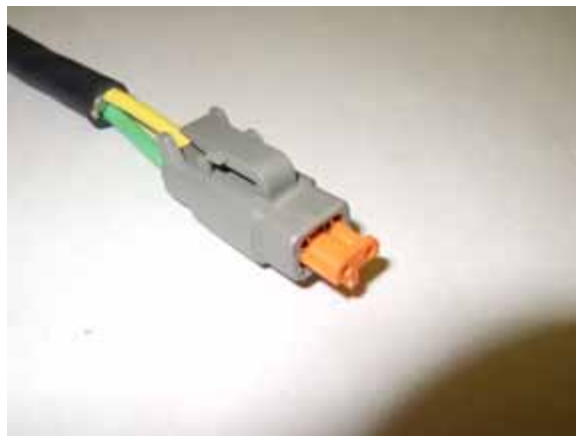


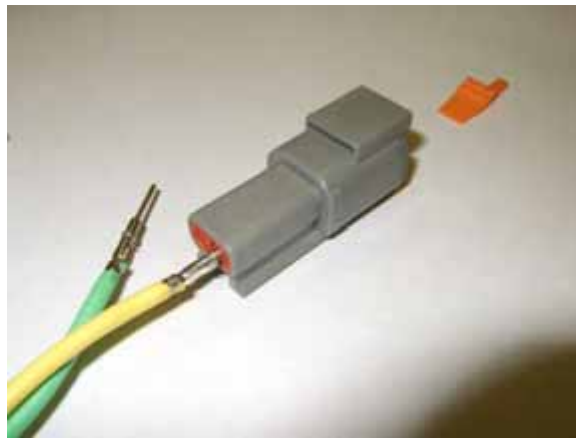
2. Install male and female round terminals for the gray CAN connectors. First, crimp onto the bare wire, then crimp onto the wire insulation. The male terminals are used with the larger connector.



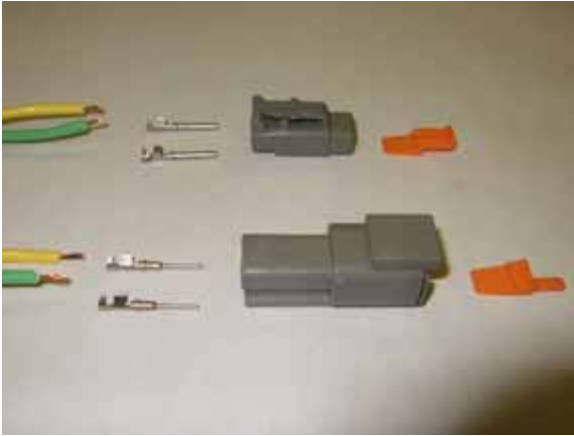


10. Insert the terminals into the connectors through the rubber seals in the back of the connector until they lock into place. For both connectors, the yellow wire goes in cavity 1 and the green wire goes in cavity 2. Cavity numbers are molded into the side of the connectors. Insert the orange wedge locks.





CAN Connector PartNumbers



Plug /CAN-MALE (Pictured at top)	
170507	Connector
170510	W edge lock
170512	Terminal - socket (2 per assembly)
Receptacle /CAN-FEMALE (Pictured at bottom)	
170508	Connector
170509	W edge lock
170511	Terminal - pin (2 per assembly)
Terminating Resistors (not pictured)	
170527	Terminating Plug
170528	Terminating Receptacle
Note: One pair of terminating resistors is used in a CAN network. A pair is available as PN 301414.	

Tools

The wire stripper (PN 307068) and crimping tool (PN 307067) used in these instructions are available for purchase from FAST.



Limited Warranty

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FAST, Inc.'s obligation under this warranty is limited to the repair or replacement of its product. To make a warranty claim, the part must be returned within 1 year of purchase to the address listed below, freight prepaid. Items covered under warranty will be returned to you freight collect. It is the responsibility of the installer to ensure that all of the components are correct before installation. We assume no liability for any errors made in tolerances, component selection, or installation.

There is absolutely no warranty on the following:

- Any parts used in racing applications.
- Any product that has been physically altered, in properly installed or maintained.
- Any product used in improper applications, abused, or not used in conjunction with the proper parts.
- Damage due to excessive manifold pressure, i.e. nitrous backfires, engine misfire, etc.

There are no implied warranties of merchantability or fitness for a particular purpose. There are no warranties, which extend beyond the description of the face hereof. FAST, Inc. will not be responsible for incidental and consequential damages, property damage or personal injury damages to the extent permitted by law. Where required by law, implied warranties of merchantability and fitness are limited to a term of 1 year from the date of original purchase.

This warranty gives you specific legal rights and you may also have other legal rights, which vary from state to state.



FAST™
3400 Democrat Rd.
Memphis, TN 38118
Phone: (901) 260-3278 Fax: (901) 375-3408
www.fuelairspark.com

Part # ...
Revised 4/13/07



INSTRUCTIONS

CAN Retrofit Kit Assembly Instructions

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

These instructions cover the assembly of a CAN Retrofit harness using the parts in connector kit PN 301412k.

1. The CAN Retrofit wiring can be built using cable or regular wire. Cut three pieces of cable or six pieces of wire. Cable containing yellow and green wires is used in these instructions – but other wire colors can be used. Just substitute the wire colors used in place of the yellow and green references in these instructions. If using regular wire, skip to step 4. Note: Regular wire should be twisted approximately 10-12 turns per foot.

2. Remove ~1.5" of outer insulation from both ends of the three pieces of cable.



3. Cutback any foil shield, bare drain wire or filler rods that may be present.



4. Strip the end of each wire.



5. Crimp or solder two of the green wires together.



6. The joint needs to be covered with heat shrink tubing or electrical tape. If using heat shrink tubing, slide a piece over the joint before crimping the third green wire to the first two.



7. Repeat this process for the three yellow wires.



8. Cover both joints with heat shrink tubing or electrical tape.

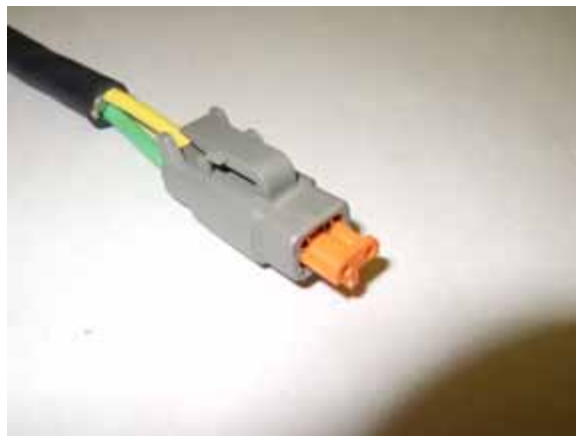


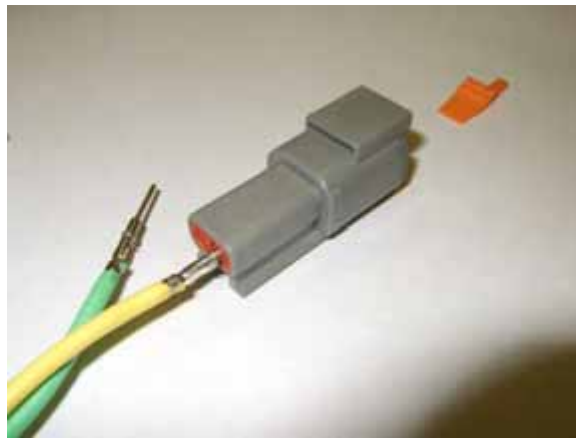
9. Install male and female round terminals for the gray CAN connectors. First, crimp onto the bare wire, then crimp onto the wire insulation. The male terminals are used with the larger connector.





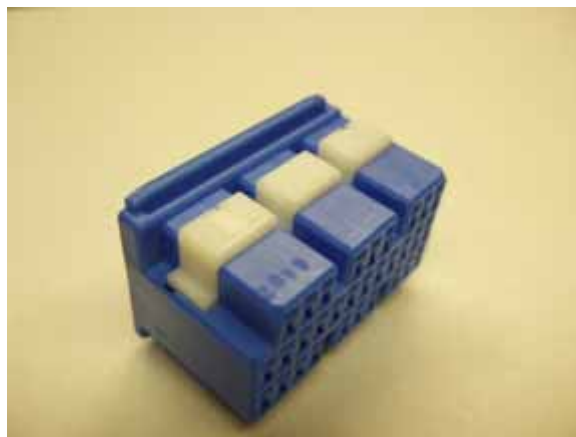
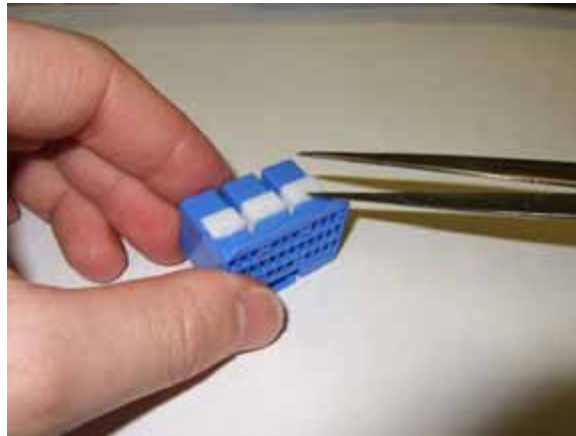
10. Insert the terminals into the connectors through the rubber seals in the back of the connector until they lock into place. For both connectors, the yellow wire goes in cavity 1 and the green wire goes in cavity 2. Cavity numbers are molded into the side of the connectors. Insert the orange wedge locks.



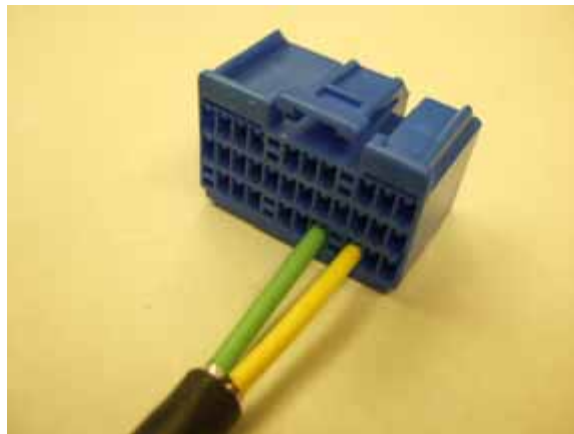
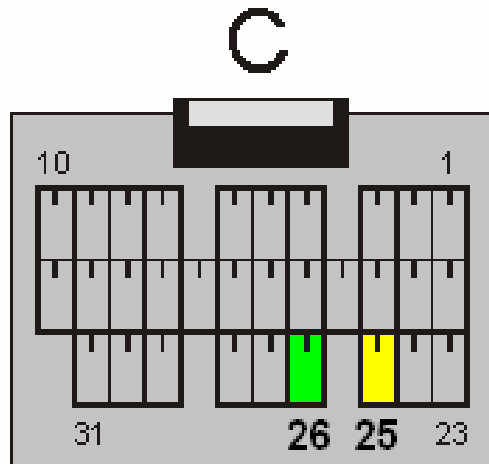




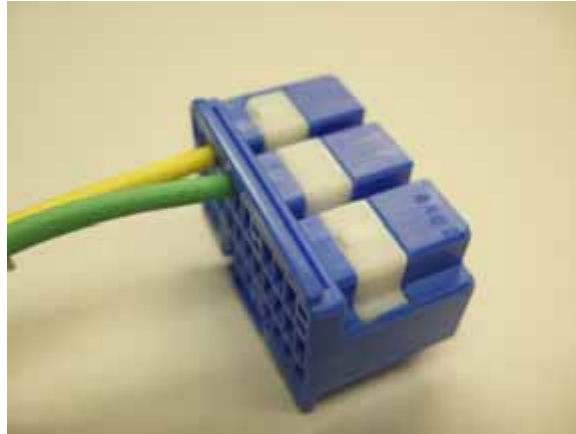
11. Install square XFI terminals on the remaining two wires. Before they can be inserted, the white lock on the blue 31 pin XFI connector needs to be pulled out slightly.



12. Insert the terminals into the connector until they click into place. The yellow wire goes in cavity 25. The green wire goes in cavity 26. Cavity numbers are molded into the back of the connector.



13 . After the terminals are inserted, press the white lock on the connector back into place so that it is flush with the connector body.



Tools

The wire stripper (PN 307068) and crimping tool (PN 307067) used in these instructions are available for purchase from FAST.



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- Damage due to excessive manifold pressure, i.e. nitrous backfires, engine misfire, etc.

There are no implied warranties of merchantability or fitness for a particular purpose. There are no warranties, which extend beyond the description of the face hereof. FAST, Inc. will not be responsible for incidental and consequential damages, property damage or personal injury damages to the extent permitted by law. Where required by law, implied warranties of merchantability and fitness are limited to a term of 1 year from the date of original purchase.

This warranty gives you specific legal rights and you may also have other legal rights, which vary from state to state.



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Memphis, TN 38118
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Calibration File Selector Switch

The FAST™ XFI™ ECU has the ability to store four calibration files. They are stored in the ECU's memory in locations referred to as 0, 1, 2 and 3. The calibration file the ECU will run on is user selectable.

Inputs

The ECU has two wires that are used to select a calibration file.

CalSelect Input #0	ECU pin A 23	"D I A G" connector pin C	Yellow
CalSelect Input #1	ECU pin A 22	"D I A G" connector pin B	Gray

Connecting one, both or neither input to ground (pin E of the "D I A G" connector can be used as the ground source) selects one of the four tuning files stored in the ECU as shown in the table.

CalSelect Input #0	CalSelect Input #1	Calibration file selected
		0
Grounded		1
	Grounded	2
Grounded	Grounded	3

Switches

- A single toggle switch can be used to access calibration files 0 and 1. Simply wire "CalSelect Input #0" to ground through the switch.
- Using two toggle switches will give access to all four calibration files. Wire "Cal Select Input #0" to ground through the first switch and wire "Cal Select Input #1" to ground through the second switch. The switches would then be set as shown above to select the desired calibration file.
- A BCD encoder is a switch that will ground the inputs in the required pattern. "Cal Select Input #0", "Cal Select Input #1" and a ground are connected to the switch according to the manufacturer's instructions. All four calibration files can be selected with this type of switch.

Working with Multiple Tuning Files

See section 25.0 "Cal Channel Switching" of the help file within the C-Com XFI™ software for information on loading multiple tuning files into the ECU.

FAST XFICalibration SelectSwitch
PN 301409

5/15/2006

WIRING

Cal.SelectSwitch ConnectorPin	Contacts on Board Existing Switch	Wire Color	DIAG Conn.Pin	ECU Pin	Function
2	C	Black/White	E	A13	Ground
4	1	Yellow	C	A23	Cal.SelectInput#0
5	2	Gray	B	A22	Cal.SelectInput#1
6*	4*	Blue*	A*	A21*	Flash Enable Input*
NOTE: "UP" on switch indicated by wiring on sides and # display		These wires are part of 301401 "Flash Kit"			

*Note: Wiring Flash Enable Input to switch allows Calibration SelectSwitch to double as Flash Mode Switch.

SWITCH RANGE

Allowed Sw. Positions	1st Pin	2nd Pin	Switch Function
0-3	"9" and "0"	"3" and "4"	Cal.SelectSwitch Only
0-4*	"9" and "0"	"4" and "5"	Cal.SelectSwitch and Flash Switch
	Insert "Stopper Pins" between these numbers to limit switch range.		

SWITCH OPERATION

Switch position	Result
0	1st Calibration will be bated at key-on
1	2nd Calibration will be bated at key-on
2	3rd Calibration will be bated at key-on
3	4th Calibration will be bated at key-on
4*	ECU will enter Flash mode at key-on



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Fuel Pressure and Oil Pressure Monitoring

FAST™ XFI™ ECU has provisions for 8 analog inputs. These can be used to monitor and record a variety of engine or chassis parameters. Fuel pressure and oil pressure are two simple and extremely useful sensors to have. FAST™ offers option harnesses that are supplied with 0-100 psi pressure sensors to allow the user to monitor these two parameters. (PN 301407: Harness w/2 sensors, PN 301408: Harness w/1 sensor)

Wiring

The option harnesses offered by FAST™ are pre-wired to connect directly to the supplied pressure sensors and to the ANALOG connector on the XFI™ main harness. All that is required is that the "Switched +12V" lead on the option harness be connected to battery voltage.

For reference, the pinout of the sensors is as follows:

Pin	Function
A	Ground
B	+12V Switched
C	Output

Software Setup

The 0-100 psi pressure sensors have a linear voltage output that varies with pressure.

Measured Pressure	Output Voltage
0 psi	1 V
100 psi	5 V

This translates to the following Sensor Gain and Sensor Offset values. See the "Auxiliary Analog Sensor Setup" section of the help file within the C-Com XFI™ software form for detail about entering these values.

Sensor Gain	25
Sensor Offset	-25



INSTRUCTIONS

FAST™ XIM™

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

XIM™ Unit Installation

The XIM™ unit itself is designed to withstand under hood temperatures but needs to be mounted in a location that allows for some airflow in and around the heat sink. Also keep in mind that the XIM™ is not 100% waterproof and should not be mounted where it will be exposed to direct spray. It is also good practice to mount the XIM™ with the connectors facing down. Typical installation locations would be on the firewall or inside the vehicle cockpit.

Wiring

These wiring installation instructions are specific to the wiring harnesses manufactured by FAST™ only. If you are using a wiring harness other than the ones offered by FAST™, please contact your dealer for instructions for that harness.

FAST™ wiring harnesses are labeled on each of the connectors to simplify installation. Your application may not require the use of all the connectors in the harness. And not all harnesses will include every connection listed below. You may also require additional accessories such as relays, sensors and other specialized connectors to complete your installation. All of these are available for purchase from FAST™.

Crank:

This connector simply plugs into your crank pickup. Depending upon your application, it may be found near the harmonic balancer or towards the back of the engine near the flywheel. The crank sensor is used by the XIM™ to determine crank speed and position.

Cam:

This connector plugs into the cam pickup. Depending upon your application, it may be found on the end of one of the cylinder heads or the front of the intake manifold area. The cam sensor is used by the XIM™ to find the start of the firing order.

CAM HALL EFFECT:

This connector plugs into the CAM HALL EFFECT connector on your FAST™ XFI™ Main Harness. This connection feeds cam and crank signals from the XIM™ to the XFI™. The XIM™ crank and cam outputs are always wired to the XFI™ discrete crank and discrete cam inputs regardless of what type of pickups (inductive or discrete) are connected to the XIM™.



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CAN LINK:

This connects to the CAN LINK connection on your FAST™ XFI™ Main Harness. Both the XIM™ and the XFI™ Harness will have a pair of CAN connectors. The plug from one harness will connect to the receptacle from the other harness. It does not matter which pair of connectors is used as long as one pair is mated. This connection can be made through an Interconnect Cable(s) for additional reach. There will be one loose plug and one loose receptacle at either end of the CAN wiring. These loose ends need to be capped off with a Terminating Plug at one end and a Terminating Receptacle at the other. This is absolutely necessary for proper network performance. The XFI™ uses the CAN Link to tell the XIM™ what timing values are called for in the tuning file.

CALPORT:

This connector does not connect to anything during normal operation of the XIM™ unit. It is only used when ‘flashing’ your XIM™ unit when there is an update available. See ‘Flashing your XIM™’.

FLASH:

This is a loose wire that does not connect to anything during normal operation of the XIM™ unit. It is only used when ‘flashing’ your XIM™ unit when there is an update available. See ‘Flashing your XIM™’.

+12V SW:

This wire needs to be connected to a ‘switched’ power source, or in other words, a power source that is hot whenever the engine is cranking or running. This is the wire the turns the XIM™ on and off.

+BAT:

This wire needs to go directly to your positive post of your vehicle’s battery.

-BAT/-BAT(AGND)/-BAT(DGND)/-BAT(PGND):

Any of these that are present in the harness go to the negative post of your vehicle’s battery.

BLOCK GND:

This wire is to be connected to a good paint and rust free ground source on the engine block of your vehicle. It is only used for the LS1/LS2/LS6/LS7 engines and will not be found in other harnesses.

DRIVER COILS:

This connector plugs into the GM factory coil harness plug on the driver side valve cover. It is only found in the LS1/LS2/LS6/LS7 engine harness.

PASSENGER COILS:

This connector plugs into the GM factory coil harness plug on the passenger side valve cover. It is only found in the LS1/LS2/LS6/LS7 engine harness.

COILS:

This connector plugs into the FAST™ coil harness that comes with your XIM™ unit for the Mopar Hemi applications. One coil harness is used with a 5.7L engine and another is used with a 6.1L engine. All coil connectors are clearly labeled with cylinder numbers.



CRANK JUMPER:

This jumper connects to the CRANK connector on your FAST™ XFI™ Main Harness. It loops together the unused wires of the ECU's inductive crank input.

DIP Switch Settings

Your XIM™ unit is configurable for different engine applications. This is accomplished by using 8 DIP switches found inside the back cover of your unit. To access the DIP switches, simply take the lid off by removing the 5 screws, being careful not to tear the gasket beneath the lid. Below you'll find a handy list of the current engine applications covered with your XIM™ unit and the switch settings that are required for each. The "on" position is marked on the switches.

XIM™ DIP Switches			
DIP Switch (1-4) [0=OFF, 1=ON]	Ignition Strategy	Crank Input	"Crank Ref. Angle (*BTDC)" setting in C-Com XFI™ software
0 - 0 - 0 - 0	Crank Trigger	1/2/3/4X, 50* BTDC	50
1 - 0 - 0 - 0	OE Crank Trigger	1/2/3/4X, 1-10* BTDC	Actual Crank Position (1-10) + 45
1 - 0 - 1 - 1	Ford Mod, 2 Valve	36-1 (1 tooth cam)	60
1 - 1 - 0 - 1	Ford Mod, 3 Valve	36-1 (5 tooth cam)	60
1 - 1 - 1 - 1	Chrysler Hemi	36-2-2	50
0 - 0 - 1 - 1	GM Gen 3 - LS1/LS6	24X (Special)	50
0 - 1 - 1 - 1	GM Gen 4 - LS2/LS7	60-2	49

DIP Switch (5-6) [0=OFF, 1=ON]	# of Cylinders
0 - 0	2 Cylinder
1 - 0	4 Cylinder
0 - 1	6 Cylinder
1 - 1	8 Cylinder

DIP Switch (7) [0=OFF, 1=ON]	Operation Mode
1	Stand Alone
0	CAN Enabled

"CAN Enabled" allows XIM™ to communicate with XFI™

DIP Switch (8) [0=OFF, 1=ON]	Coil Layout
1	Coil per Cylinder
0	Waste Spark

"Waste Spark" – Each coil fires two companion cylinders simultaneously.

Ignition Strategies

CRANK TRIGGER:

Using a crank trigger with an XIM™ is similar to using a crank trigger with an XFI™. The crank trigger is used to determine engine speed and position. And a separate cam input signal (one pulse every two engine revolutions) is used to locate the start of the firing order. As with an XFI™, the crank trigger should be installed so that the pickup and one of the magnets in the crank trigger wheel are lined up with each other when the engine is approximately 50 degrees BTDC.

The number of crank pulses the XIM™ expects to see per revolution (number of magnets in crank trigger wheel) is equal to half the number of cylinders. An 8-cylinder engine uses a crank trigger wheel with 4 magnets, a 6-cylinder engine uses 3, etc.

The cam signal needs to occur between 10 and 80 degrees before a crank input (which works out to be between 60 and 130 degrees BTDC for a 50 degree crank reference angle). The cam input is typically



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setup to occur before the crank pulse that corresponds to the first cylinder in the firing order. But other locations are permissible with appropriate coil wiring.

The XIM™ has two sets of outputs for controlling coils – EST and COIL. The type of coil being used determines which set of outputs is needed.

The EST outputs are used with “smart” coils such as those found on GM LS1 engines. These coils have built in coil drivers. They are controlled by a 0-5V square wave. They charge while receiving a 5V signal and fire when the signal drops to 0V.

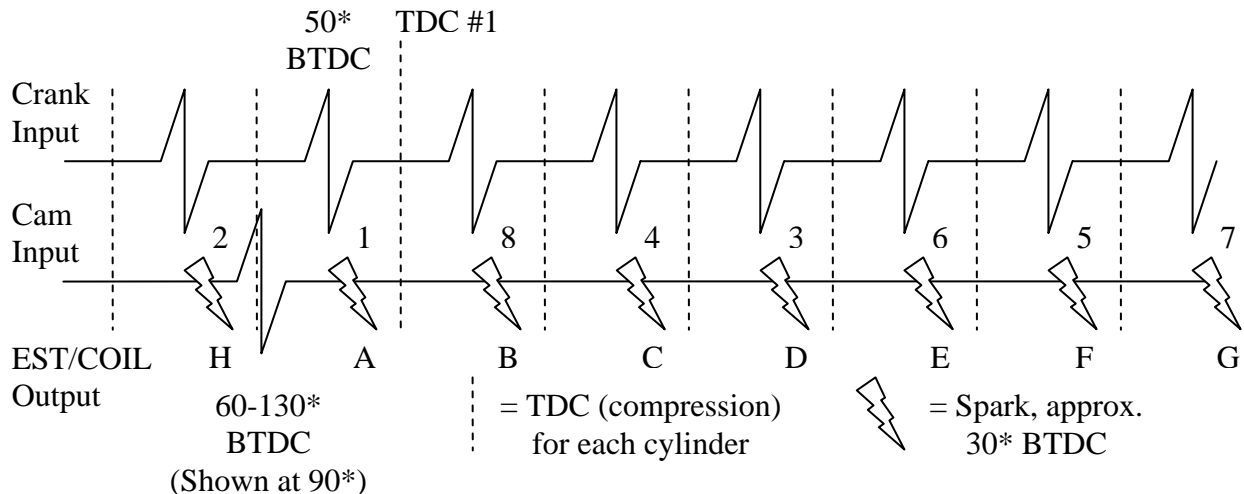
The COIL outputs are used to directly charge traditional (usually 2 pin) coils. Each coil is connected to a COIL output from the XIM™ and to switched ignition power. The COIL outputs are held low to charge the coil and released to fire the coil.

The coil outputs – either EST or COIL – fire one at a time in alphabetical order starting with output A. They need to be wired to each coil according the engine’s firing order. EST/COIL output A goes to the cylinder associated with the first crank signal after the cam input (which is typically the first cylinder in the firing order.) The following table shows examples of coil wiring for a small block Chevy with a 1-8-4-3-6-5-7-2 firing order.

XIM™ EST/COIL Wiring (Coil per Cylinder) for Different Cam Signal Locations								
EST/COIL Output	A	B	C	D	E	F	G	H
Sequence after Cam Input	1 ST	2 ND	3 RD	4 TH	5 TH	6 TH	7 TH	8 TH
Cylinder # (SBC w/ Cam Before #1 Crank Signal)	1	8	4	3	6	5	7	2
Cylinder # (SBC w/ Cam Before #4 Crank Signal)	4	3	6	5	7	2	1	8

XIM™ – Crank Trigger Ignition Strategy

(One complete engine cycle shown for Small Block Chevy with 1-8-4-3-6-5-7-2 firing order)



In the case of a “waste spark” setup (one coil for every pair of companion cylinders), the same principle is used to determine where EST/COIL output A will be wired. It goes to the coil that fires the cylinder associated with the first crank signal after the cam input. Unlike a “coil per cylinder” setup,

the number of EST/COIL outputs used is only equal to half the number of cylinders. On a “waste spark” V8, the XIM™ fires the first four EST/COIL outputs and then starts back over at A. The sequence is: A–B–C–D–A–B–C–D–...

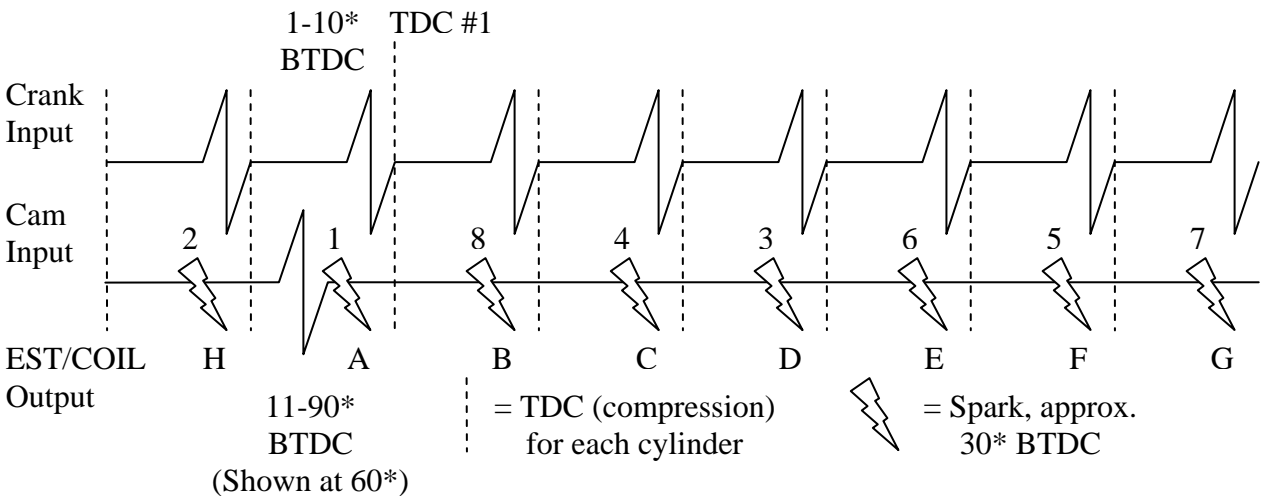
OE CRANK TRIGGER:

The OE Crank Trigger ignition strategy is designed for crank trigger wheels and pickups whose output (1, 2, 3 or 4 evenly spaced pulses per revolution) occurs just ahead of TDC – as is the case with many older factory ignition systems.

This ignition strategy is the same as the Crank Trigger ignition strategy except that it is intended for use with a crank input between 1 and 10 degrees BTDC. The cam input still needs to occur between 10 and 80 degrees before the crank input. The EST/COIL outputs still fire in alphabetical order starting with output A and EST/COIL output A still goes to the cylinder associated with the first crank signal after the cam input.

XIM™ – OE Crank Trigger Ignition Strategy

(One complete engine cycle shown for Small Block Chevy with 1-8-4-3-6-5-7-2 firing order)



FACTORY SPECIFIC: (Ford Mod, Hemi, LS1, etc.)

Newer factory engines have a variety of complicated trigger wheel arrangements. The XIM™ is pre-programmed to decode these different signal frames. Simply connect the factory crank and cam pickups to the XIM™ and wire the EST/COIL outputs in the engine’s firing order. EST/COIL output A always goes to cylinder #1.

XIM™ EST/COIL Wiring for Different Factory Engines								
EST/COIL Output	A	B	C	D	E	F	G	H
Position in Firing Order	1 ST	2 ND	3 RD	4 TH	5 TH	6 TH	7 TH	8 TH
Cylinder # (Ford Mod, Waste Spark) - COIL	1&6	3&5	7&4	2&8				
Cylinder # (Ford Mod, Coil per Cylinder) - COIL	1	3	7	2	6	5	4	8
Cylinder # (Chrysler Hemi) - COIL	1	8	4	3	6	5	7	2
Cylinder # (GM LS1/LS6 & LS2/LS7) - EST	1	8	7	2	6	5	4	3



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External LEDs

The XIM™ features four LEDs built into its case. They are a valuable tool for confirming basic functions.

POWER – This LED lights up when the XIM™ is switched on.

CRANK – This LED lights up while the XIM™ is receiving input from the crank sensor. If it is not lit while the engine is turning over, you will need to find out why before the engine will run. Check that the crank sensor is properly installed and plugged in. Also check for any wiring damage between the crank sensor and the XIM™.

CAM – This LED flashes each time the XIM™ receives an input from the cam sensor. It will flash relatively slowly during cranking. The flashing will become more rapid with increasing engine speed. If it is not flashing while the engine is turning over, you will need to find out why before the engine will run. Check that the cam sensor is properly installed and plugged in. Also check for any wiring damage between the cam sensor and the XIM™.

STATUS – In normal operation, this LED lights up when the XIM™ has established CAN communications with the XFI™ ECU. If it is not lit, check that the CAN LINK on the XIM™ harness is connected (either directly or through an Interconnect Cable) to the CAN LINK on the XFI™ harness. Also verify that a Terminating Plug and Terminating Receptacle are connected to the open ends of the CAN wiring.

A flashing status LED indicates that the XIM™ is in flash mode. This is used to update the software in the XIM™. If flash mode was entered accidentally, make sure the FLASH wire is not touching ground and power cycle the XIM™.

Setting up the C-Com XFI™ Software

Setting up the software in your FAST™ XFI™ to use the XIM™ is very simple. Select “IPU Ignition” as the ignition type. Enter the “Crank Ref. Angle (*BTDC)” setting shown in the DIP switch table. And finally, if using the Crank Trigger or OE Crank Trigger ignition strategies with the Cam input not occurring before cylinder #1, change the “Cam Sync Precedes Cylinder:” setting. That setting remains “1” for any of the Factory Specific ignition strategies. That’s all there is to do. Complete step by step instructions are available under the Help menu in the C-Com XFI™ software under Section 6.0 Initial Setup.

Flashing your XIM™

If it becomes necessary to update the software within the XIM™, the unit will need to be put into flash mode. This is done by grounding the FLASH wire while turning on the XIM™. A flashing Status LED will indicate that the XIM™ is in flash mode. An update utility will be provided that will send the new software to the XIM™ through the communications cable that links the XIM™ (through the CALPORT connector) to the laptop. Once the update has been sent, remove the FLASH wire from ground and power cycle the XIM™ to complete the flashing process.



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XIM™ Pinout Chart

XIM™ Pin	Function	Wire Color	XIM™ Pin	Function	Wire Color
30-A1	Inductive Crank Input	Red	18-A1	+12V Switched Input	Pink
30-A2	Discrete Crank Input	Yellow	18-A2	User #1*	
30-A3	Crank Output	Brown/White	18-A3	Digital GND	Black/White
30-B1	Digital GND	Black (/White)	18-B1	Battery Input	Red
30-B2	Digital GND	Black/White	18-B2	User #0*	
30-B3	Cam Output	Yellow/Black	18-B3	N/A*	
30-C1	Inductive Cam Input	Red	18-C1	Coil Output A	Orange
30-C2	Discrete Cam Input	Brown	18-C2	Auxiliary Output*	
30-C3	Flash Enable Input	Blue	18-C3	Power GND	Black
30-D1	Digital GND	Black (/White)	18-D1	Coil Output D	Purple
30-D2	Digital GND	Black/White	18-D2	Coil Output C	Gray
30-D3	Load Input*		18-D3	Coil Output B	Blue
30-E1	Analog 2 Input*		18-E1	Coil Output E	Black
30-E2	5V Reference	Red/White	18-E2	Power GND	Black
30-E3	Analog GND	Black/Pink	18-E3	Power GND	Black
30-F1	RS-232 Rx/D	Black	18-F1	Coil Output F	Brown
30-F2	RS-232 Tx/D	Red	18-F2	Coil Output G	Yellow
30-F3	Dig GND (RS-232)	White	18-F3	Coil Output H	Green
30-G1	CAN_H	Yellow	<p>* Reserved for future use</p> <p>Notes: See letters and numbers molded into sides of connectors to find pin locations.</p> <p>“30-“ and “18-“ refer to 30 way and 18 way connector.</p>		
30-G2	CAN_L	Green			
30-G3	Digital GND	Black/White			
30-H1	EST Output A	Purple			
30-H2	EST Output B	Purple/White			
30-H3	Points Input*				
30-J1	EST Output C	Red			
30-J2	EST Output E	Blue/White			
30-J3	EST Output G	Green/White			
30-K1	EST Output D	Red/White			
30-K2	EST Output F	Green			
30-K3	EST Output H	Blue			



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There is absolutely no warranty on the following:

- **Any parts used in racing applications.**
- **Any product that has been physically altered, improperly installed or maintained.**
- **Any product used in improper applications, abused, or not used in conjunction with the proper parts.**
- **Damage due to excessive manifold pressure, i.e. nitrous backfires, engine misfire, etc.**

There are no implied warranties of merchantability or fitness for a particular purpose. There are no warranties, which extend beyond the description of the face hereof. FAST, Inc. will not be responsible for incidental and consequential damages, property damage or personal injury damages to the extent permitted by law. Where required by law, implied warranties or merchantability and fitness are limited to a term of 1 year from the date of original purchase.

This warranty gives you specific legal rights and you may also have other legal rights, which vary from state to state.



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Pressure Sensors

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

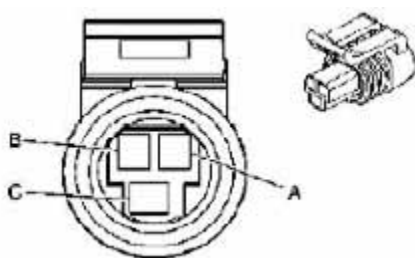
The FAST™ XFI™ ECU has provisions for 8 analog inputs. These can be used to monitor and record various engine or chassis parameters. Fuel pressure and oil pressure are two examples. FAST™ offers a variety of pressure sensors in kit form with pre-built harnesses or by themselves with mating connector included.

Wiring

The harnesses included in the pressure sensor kits are pre-wired to connect directly to the pressure sensors and to the ANALOG connector on the XFI™ Main Harness. All that is required is that the “Switched +12V” lead on the option harness be connected to battery voltage.

Sensors sold by themselves can be wired using the supplied mating connector. They can be wired to the ANALOG connector on the XFI™ Main Harness or directly to the XFI™ itself.

Sensor Pin	Function	To ANALOG Connector Pin	To ECU Blue Connector Pin
A	Ground	K	11
B	+12V Switched		
C	Output	A,B,C,D,E,F,G or H	12,13,14,15,16,17,18 or 19



The mating connector uses “pull to seat” terminals. A wire must be passed through the rubber seal and out the front of the connector before the terminal is installed. The wire is then pulled back into the connector to seat the terminal. There is a T-shaped locking tab extending at an angle from one side of the terminal. That tab should be oriented towards the top for cavities A and B or towards the left for cavity C.

Software Setup

The following Sensor Gain and Sensor Offset values will be used. See the “Auxiliary Analog Sensor Setup” section of the help file within the C-Com XFI™ Software for more detail about entering these values.

Sensor Range	0-100 PSI	0-200 PSI	0-1500 PSI
Sensor Gain	25	50	375
Sensor Offset	-25	-50	-375

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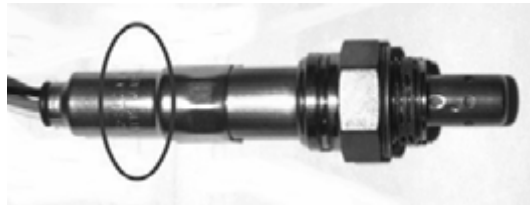
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Part #FAST4-111
Revised 10/31/2006

O₂ Sensor Type

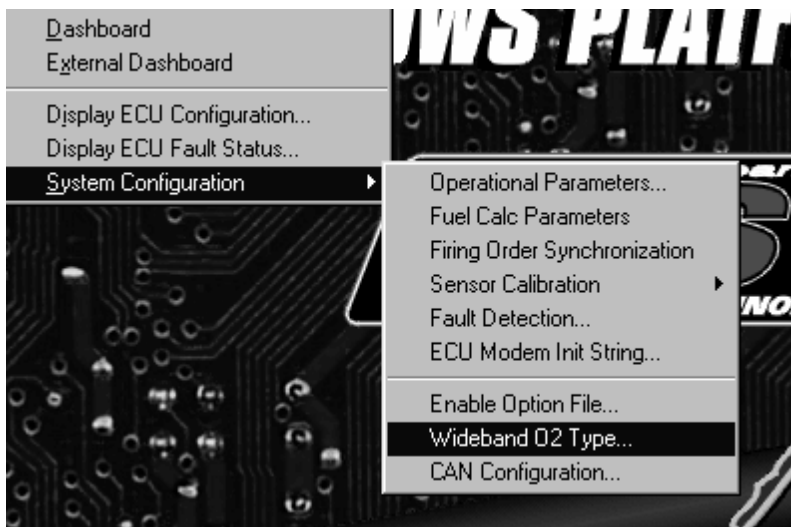
Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

The FAST™ XFI™ ECU is compatible with different models of wide-band oxygen sensors when used with C-Com XFI™ Software V1.310 (and firmware 45) or later. Earlier versions of software were compatible with “L1H1” or “L2H2” sensors. V1.310 adds compatibility with “LHA” sensors. The model number is stamped into the body of the sensor.



Software Setup

There is a setting in the C-Com XFI™ Software that tells the ECU which type of sensor is being used. This setting is stored in the ECU independently of the tuning file so it does not need to be set or verified each time a new tuning file is loaded. However, it does need to be verified before using an ECU for the first time or whenever the O₂ sensor is changed. While online with the ECU, select VIEW/SYSTEM CONFIGURATION/WIDEBAND O₂ TYPE –this will bring up a window where the appropriate sensor type can be selected.



NOTE: An incorrect “O₂ Sensor Type” setting can cause erroneous O₂ readings. If tuning is performed or closed loop fuel corrections are made based on erroneous O₂ readings, the engine may run richer or leaner than intended and engine damage could result.

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INSTRUCTIONS

C-Com XFI™ V1.310 and Firmware 45 Update Instructions

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

C-Com XFI™ V1.310 Software – which uses firmware version 45 – has had many updates and improvements since the previous release. One major change is how the system deals with temperature sensors. Previous versions of C-Com XFI™ Software (V1.110 and earlier) had hard coded temperature sensor calibrations that the software used to calibrate temperature sensor readings. With the new software/firmware, the ECU handles the process of turning the sensor output into temperature readings. And the calibration that is used is defined by the customer. This allows the system to use virtually any temperature sensor.

This new method for handling temperature sensors required a fundamental change in the way the software/firmware functions. This influences all subsequent tables and parameters that rely on the temperature sensors. There are also a few other non-temperature related tables and settings that have been added. Thus, there are some changes that must be made in order to fully update an existing system for use with the new software/firmware. However, these changes are straightforward and should require little time to complete.

Step-by-step instructions for updating your XFI™ ECU:

1. You may backup your entire c:\CComWP XFI™ directory if you feel compelled to do so, but it is not required.
2. Run the software installation program.
3. Connect pins A (blue) and E (black/white) of the DIAG connector in your XFI™ Harness (ECU pins A21 and A13).

Connect the laptop to the ECU with the communications cable. Turn on the ignition. The ECU will begin flashing the red LED to indicate it is in FLASH mode. Do not attempt to start the car.

4. Open C-Com XFI™, and select File/Flash XFI™ ECU.

Browse to c:\CComWP XFI™ directory, select “flash_update_45.xfi” and click on OPEN. The new firmware will be loaded into the ECU and you will be asked to “Restart the ECU”. Once done, it will be time to update the affected tables located in the various menus.



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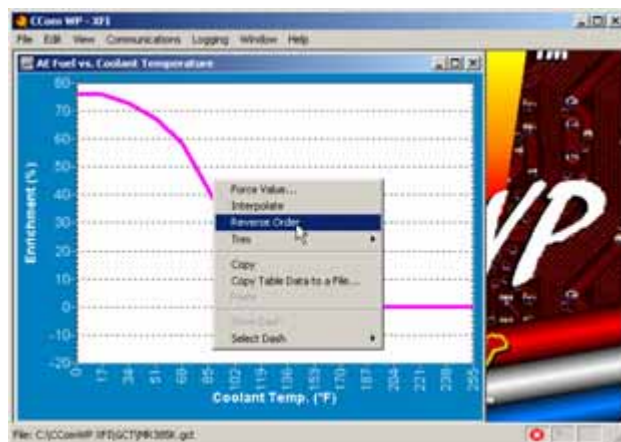
5. Disconnect pins A and D of the DIAG connector, and turn off the ignition. Wait for the green Power LED to go out and restore ignition power. Please note that the ECU will now have many of its tables turned around, plus several other parameters will be incorrect. Do not attempt to start the car yet. If you are using the ECU to control your electric fan there is a good chance it will now turn on. You can temporarily pull the fan relay out to cut down on noise and battery drain.

Note: Software (on the laptop) and firmware (in the ECU) work together and must be compatible with each other - the laptop and the ECU both need to be speaking the same language. The system will not work properly if older software is used with newer firmware or vice versa. The C-Com XFI™ Software now checks for software/firmware compatibility when communication is established between the laptop and the ECU. If there is a mismatch, one of the following messages will be displayed.

Mismatch	Message
New software/old firmware	“Incompatible Device”
Old software/new firmware	“ECU Not Found”

6. There are nine tables that must have their values reversed. The new firmware accesses the tables in reverse order so your tables will now appear backwards. The procedure is the same in all nine cases and will correct the table to the proper order.

- a. Go to the table that needs to be reversed.
- b. Highlight the whole table by clicking on the leftmost data point and dragging your mouse to the rightmost point.
- c. Right-click on the data, and choose “Reverse Order”.
- d. This will flip the table back into the proper sequence.



Perform the reverse sequence on the following tables:

- 1) View/Fuel Tables/AE Fuel vs. CTS
- 2) View/Cranking/Afterstart Fuel Tables/Cranking Fuel Table
- 3) View/Cranking/Afterstart Fuel Tables/After Start vs. CTS
- 4) View/Cranking/Afterstart Fuel Tables/After Start Revs vs. CTS
- 5) View/Cranking/Afterstart Fuel Tables/After Start Decay vs. CTS
- 6) View/Temperature Correction Tables/ CTS Correction
- 7) View/Temperature Correction Tables/ATS Correction
- 8) View/Idle Functions/Idle Speed vs. Coolant Temp
- 9) View/Idle Functions/Start IAC Pos vs. Coolant Temp

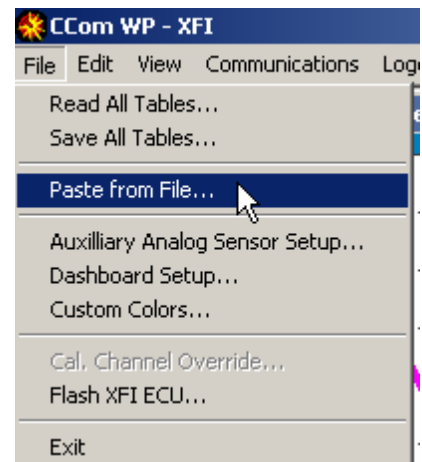
7. Seven parameters must be reset to logical values. Open each of the following menus, and correct the values. You may set them to whatever value you deem correct for your application.

- 1) View/Closed Loop Parameters/Closed Loop Parameters/Closed Loop Min Temp
- 2) View/EGR Control/EGR Parameters/Min. CTS for EGR Oper.
- 3) View/EGR Control/EGR Parameters/Max ATS for EGR Oper.
- 4) View/AC Clutch Control/Max CTS for AC Enable
- 5) View/Aux. Outputs/Aux. Out 3/CTS Threshold
- 6) View/System Configuration/Operational Parameters/Fan ON Temperature
- 7) View/System Configuration/Operational Parameters/Fan OFF Temperature

8. Enter CTS and ATS calibrations/bias resistor values.

These tables and settings are what the ECU uses to convert the temperature sensor voltage into actual units of temperature. The sensor itself has a non-linear resistance change with respect to temperature, and these tables linearize the raw data to reflect actual temperature.

These tables and settings can be quickly entered by using one of the supplied .ICT files. Select File/Paste from File... Browse to the c:\CComWP XFI\ICT directory, and select the appropriate file. For example, select “GM Temp Sensor Cals.ict” if you are using GM sensors. Pre-saved values will be entered into the tuning file at the following locations.

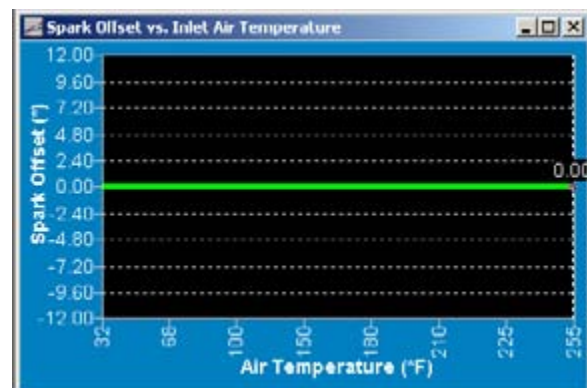


- 1) View/System Configuration/Sensor Calibration/CTS Calibration
- 2) View/System Configuration/Sensor Calibration/ATS Calibration
- 3) View/System Configuration/Sensor Calibration/Temp Sensor Bias Resistors

To confirm the temperature settings have been entered correctly, open the master dashboard (F9 key) and observe “Coolant (*F)” and “Air Temp (*F)”. Both should display reasonable values – ambient temperature if the engine is cool.

9. Setup the Spark Offset vs. ATS table.

This is a new table that needs to be set up. The quickest way to do this is by using an .ICT file. This time, use the “Spark Offset vs. ATS Table.ict” file. The table will be filled in with logical values for the temperature axis and zero degrees of timing offset. This is a baseline setting that can be changed as needed.



View/Spark Functions/Spark Offset vs. ATS

10. Setup the PA Ramp Retard Table.

This is a new table that needs to be set up if the Power Adder features will be used. Again, the quickest way to set this up is with an .ICT file. The “PA Ramp Retard – flat 0.ict” will fill in logical values for the time axis and set the retard values to zero. This is a baseline setting that can be changed as needed. See section “16.0 Power Adder Control” in the software’s help file for more detail.

View/Power Adder Configuration/PA Ramp Retard Table

11. Enter the Fuel Energy Constant.

This new setting allows the ECU to deal with different fuels. Set this value to “1” for gasoline. See section “6.0 Initial Setup” in the software’s help file for more detail and settings for different fuels.

View/System Configuration/Fuel Calc Parameters/Fuel Energy Constant

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Memphis, TN 38118
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INSTRUCTIONS

#301418 EGT Module Kit

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

The EGT module is shipped with the following items.

- EGT Module
- Installation Manual
- Wiring Harness

Overview

The Exhaust Gas Temperature (EGT) module measures and transmits data from k-type thermocouples with a range of 32*-1670* F (0*-910* C). The module transmits the data using the FAST™ XFI™ Controller Area Network (CAN) protocol at 500 kbps. Once transmitted, the data is available for viewing and logging through either the XFI™ or the FAST™ Dash Logger.

Installation

Mounting:

The EGT module is not fully sealed from harsh environments. The module should be mounted close enough to the probe for easy installation but far enough from the exhaust system so that it is not damaged from excessive heat. The module should be secured to the vehicle using the two bolt holes in the case.

Wiring:

The EGT module pin out and wire color descriptions are listed in Table 1 below.

Table 1

Pin	Funtion	Wire Color
1	Power	Red
2	Ground	Black
3	CAN High	Yellow
4	CAN Low	Green
5	Not Used	No Wire
6	Not Used	No Wire
7	Not Used	No Wire
8	Not Used	No Wire



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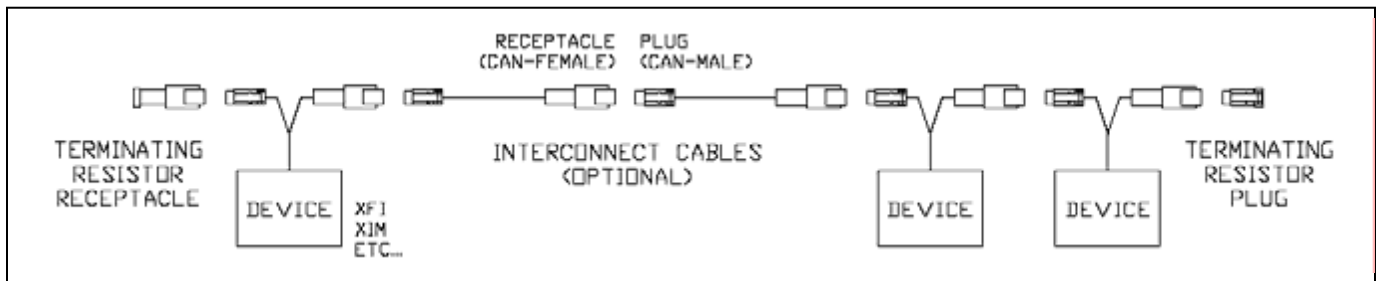
Power and Ground:

The EGT module requires a switched 6 to 24 volts DC connected to pin 1 for operation. The power should turn on and off with the ignition switch. The module draws 0.05 amps of current and should be fused accordingly. A clean ground should be connected to pin 2.

Communication:

The EGT module transmits data to the XFI™ ECU using the Controller Area Network (CAN). CAN is a two wire connection that can be used to connect a series of devices together.

FAST™ CAN devices (XFI™, XIM™, certain sensors, etc) have a pair of CAN connectors built into their harnesses. The plug from one harness will connect to the receptacle from another harness. It does not matter which pair of connectors is used as long as one pair is mated between each neighboring device. This connection can be made through an interconnect cable(s) for additional reach. There will be one loose plug and one loose receptacle at either end of the CAN wiring. These loose ends need to be capped off with a terminating plug at one end and a terminating receptacle at the other. This is absolutely necessary for proper network performance.



XFI™ Monitoring and Logging

Monitoring:

To monitor EGT data using C-Com XFI™, add the EGT sensors to the dashboard of your choice. Throughout C-Com XFI™, the EGT Channels are referred to as “EGT 1” through “EGT 8”.

Troubleshooting:

The C-Com XFI™ will display 0 degrees Celsius (32 deg F) on all EGT channels if it does not detect communication from the EGT module. This will be caused by either no power and ground to the EGT module or incorrect CAN bus wiring. Verify 6 to 24 volts DC at pin 1 of the EGT module and ground at pin 2. Also verify the CAN bus is connected as described in the “Communication” section. One of the common mistakes is to omit the termination resistor plugs from the network. CAN communication will not work without the termination resistor plugs.

The C-Com XFI™ will display greater than 910 degrees Celsius (1670 deg F) on any channel that does not have a probe connected to it. Verify the probe is connected and if possible try a new probe.



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#301419 Accelerometer Kit

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

The accelerometer module is shipped with the following items.

- Accelerometer Module
- Installation Manual
- Wiring Harness

Overview

The accelerometer module measures and transmits G-force data from all three axes with a range of +/- 4g. The module transmits the data using the Controller Area Network (CAN) protocol at 500 kbps. Once transmitted, the data is available for viewing and logging through either the XFI™ or the FAST™ Dash Logger.

Installation

Mounting:

The accelerometer module should be mounted as close to the vehicle's centerline as possible. The module should be secured to the vehicle using the two bolt holes in the case. It can be mounted vertically or horizontally as shown in Figure 1. Be sure the accelerometer is mounted level when the vehicle is on flat and level ground.

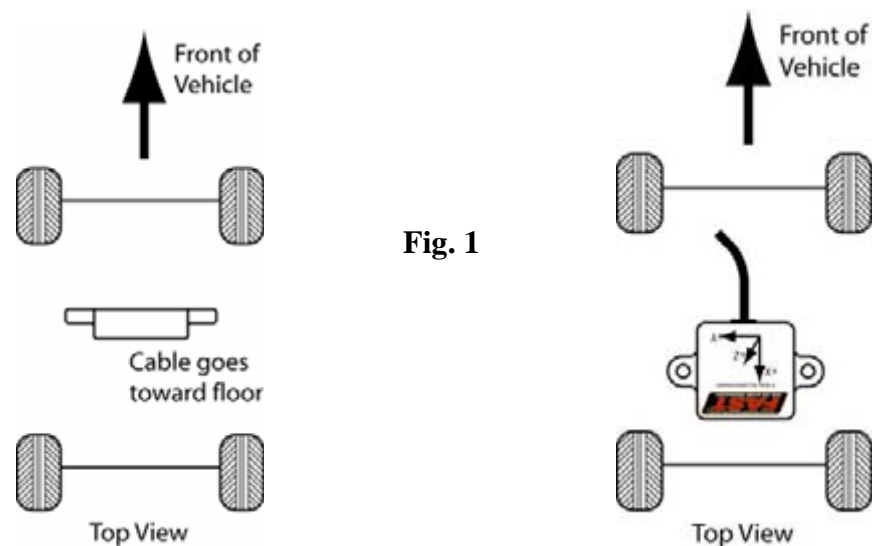


Fig. 1

When mounting the accelerometer, the most important rule to follow is to have one axis perfectly aligned with the vehicle's direction of motion and another axis perpendicular to this. If the accelerometer is not mounted perfectly square in the vehicle, it will transmit inaccurate vehicle measurements. Once the accelerometer is mounted, make note of the label on the accelerometer and identify which axis is measuring forward or reverse forces and which is measuring lateral forces. The axis names, such as X, Y or Z, are fixed. These names are used when monitoring the data or reviewing a data log.

To check for proper installation, monitor the accelerometer when the vehicle is stationary on flat level ground. The forward and lateral axis should measure 0g while the third axis measures 1g. When driving, during a straight line acceleration, the change in g's should only be noticed in the forward axis. If the lateral g's also increase when driving in a straight line, then the module is not mounted square to the vehicle. Check the mounting and perform another test.

Wiring:

The accelerometer module pin out and wire color descriptions are listed in Table 1 below.

Table 1

Pin	Function	Wire Color
1	Power	Red
2	Ground	Black
3	CAN High	Yellow
4	CAN Low	Green
5	Not Used	No Wire
6	Not Used	No Wire
7	Not Used	No Wire
8	Not Used	No Wire

Power and Ground:

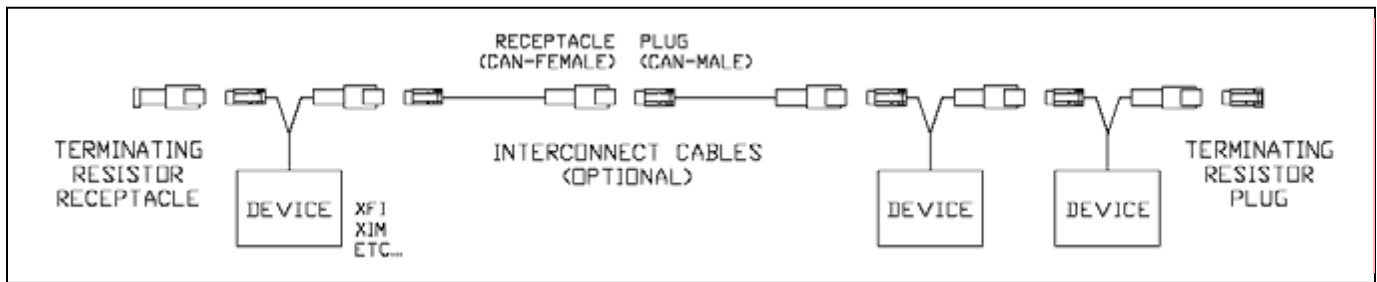
The accelerometer module requires a switched 6 to 24 volts DC connected to pin 1 for operation. The power should turn on and off with the ignition switch. The module draws 0.05 amps of current and should be fused accordingly. A clean ground should be connected to pin 2.

Communication:

The accelerometer module transmits data to the XFI™ ECU using the Controller Area Network (CAN). CAN is a two wire connection that can be used to connect a series of devices together.

FAST™ CAN devices (XFI™, XIM™, certain sensors, etc) have a pair of CAN connectors built into their harnesses. The plug from one harness will connect to the receptacle from another harness. It does not matter which pair of connectors is used as long as one pair is mated between each neighboring device. This connection can be made through an interconnect cable(s) for additional reach. There will be one loose plug and one loose receptacle at either end of the CAN wiring. These loose ends need to be capped off with a terminating plug at one end and a terminating receptacle at the other. This is absolutely necessary for proper network performance.





XFI™ Monitoring and Logging

Monitoring:

To monitor accelerometer data using C-Com XFI™, add the accelerometer sensors to the dashboard of your choice. Throughout C-Com XFI™, the X, Y, and Z axis are referred to as “X Acceleration”, “Y Acceleration”, and “Z Acceleration” respectively.

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Part #170569
Revised 2/16/07



INSTRUCTIONS

#305005 XFI™ SBC/BBC Dual Sync Distributor

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning installation, and also take a moment to review the included limited warranty information.

Installation Instructions:

Two ignition strategies to choose from:

A. **One** degree reference angle

- The simplest method to set up your XFI™ distributor
- Allows you to phase the distributor at TDC (top dead center) so you only need a TDC mark on your balancer
- You can not activate the individual cylinder control feature when using the one degree reference angle.

B. **50** degree reference angle

- Most accurate method for timing control
- Supports individual cylinder control
- Requires a 50 degree mark on balancer

Wiring Instructions:

- A. The 8 pin connector on the distributor harness will plug directly into the “Cam/Hall Effect” connector on the XFI™ Main Harness.



- B. The red wire coming from the distributor needs to be connected to a 12V ignition source. The wire labeled “12V HE” in the XFI™ Main Harness is a convenient source for this. Remember to connect the opposite end of the “12V HE” wire to a 12V source that is hot with the key in the Run position and during cranking.

Wire Functions

- Red Wire: 12v +
- Yellow Wire: Cam Signal
- Brown Wire: Crank Signal
- Black Wire: Signal Ground



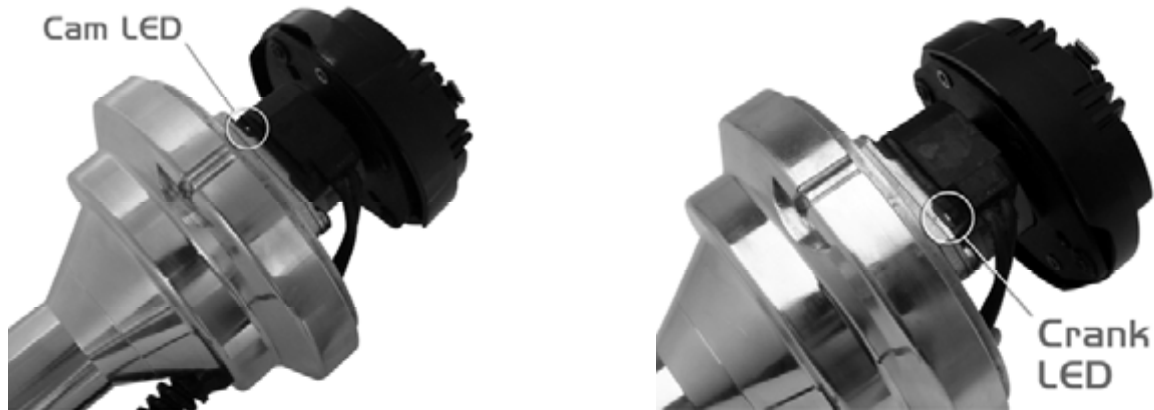
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Part #FAST4-113
Revised 2/8/07

Distributor Cap

The #1 plug wire terminal is marked with a band. Be sure to connect the #1 plug wire to this terminal.

Cam and Crank LEDs: There are two red LED lights at the base of the module in the distributor. They are powered through the red wire. The cam LED illuminates once per revolution and the crank LED illuminates 8 times per revolution.



One degree reference angle installation instructions:

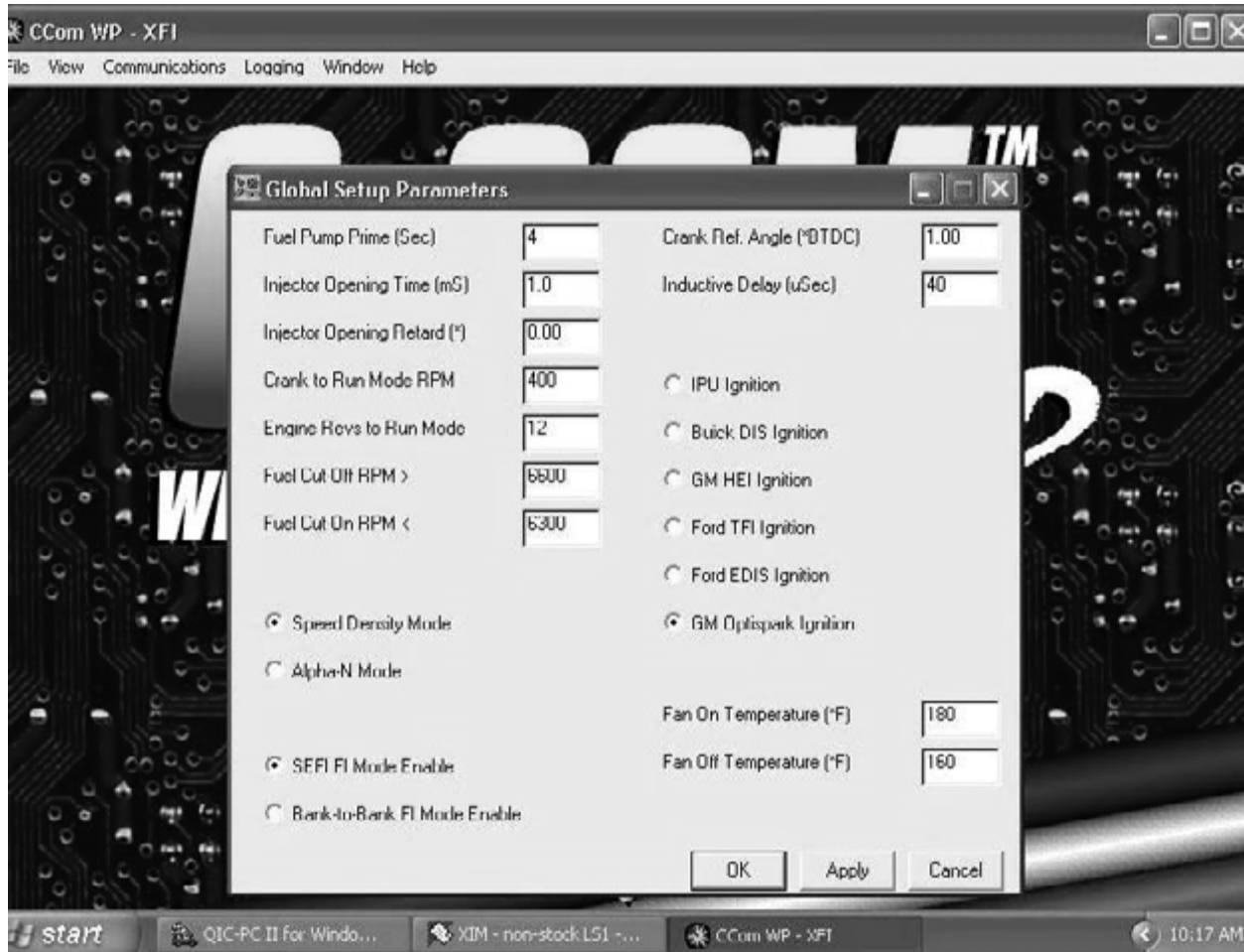
1. Remove rotor to verify that module is mounted in the one degree position. If not, remove two module mounting screws, and shift the module to the one degree position, replace rotor.
2. Rotate engine to TDC on the compression stroke.
3. Install distributor with the rotor pointing in the general direction of the number one cylinder.
4. With the red wire connected to 12V, the ignition key in the run position, and the “Cam/Hall Effect” plug connected, rotate the base of the distributor counterclockwise until the cam LED illuminates, then continue counterclockwise until the next crank signal (crank LED illuminates).
5. Move the base of the distributor back and forth until you find the leading edge of that crank signal, lock down the distributor and you’re finished!

The distributor is now timed and phased properly for a one degree reference angle!



One degree ignition strategy setup parameters:

6. Open C-Com XFI™ software.
7. Establish communications with the XFI™ ECU or select the GCT file you will be using.
8. Click on View, then System Configuration, then Operational Parameters.
9. Click on the button next to “GM Optispark Ignition”.
10. In the box next to “Reference Angle” type “1”
11. You are now ready to run in Sequential mode.



Note: As with any distributor installation, use a high-quality timing light to verify ignition timing matches the timing advance commanded by the XFI™. If necessary, make slight adjustments with the distributor to correct this.

Note: Be sure to verify that the distributor gear you are using is compatible with your cam gear. You can purchase the revolutionary COMP Cams® composite distributor gears and bronze distributor gears from FAST™

Bronze Gear – Part #410

Composite Gear – Part #12140



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Fifty degree reference angle installation instructions:

1. Remove rotor to verify that module is mounted in the 50 degree position, if not, remove two module mounting screws, and shift the module to the 50 degree position, replace rotor.
2. Rotate engine to 50 degrees BTDC on the compression stroke.
3. Install distributor with the rotor pointing in the general direction of the number one cylinder.
4. With the red wire connected to 12V, the ignition key in the run position, and the “Cam/Hall Effect” plug connected, rotate the base of the distributor counterclockwise until the cam LED illuminates, then continue counterclockwise until the next crank signal (crank LED illuminates).
5. Move the base of the distributor back and forth until you find the leading edge of that crank signal, lock down the distributor and you’re finished.

The distributor is now timed and phased properly for a fifty degree reference angle!

Note: Formula for locating crankshaft angle: $(\text{Diameter} \times \pi) / 360 \times (\text{number of degrees you're looking to make the mark at})$. For example, if you're trying to find the 50 degree mark for a 6.820" in diameter balancer:

$$(6.820 \times 3.1416) = 21.425712$$

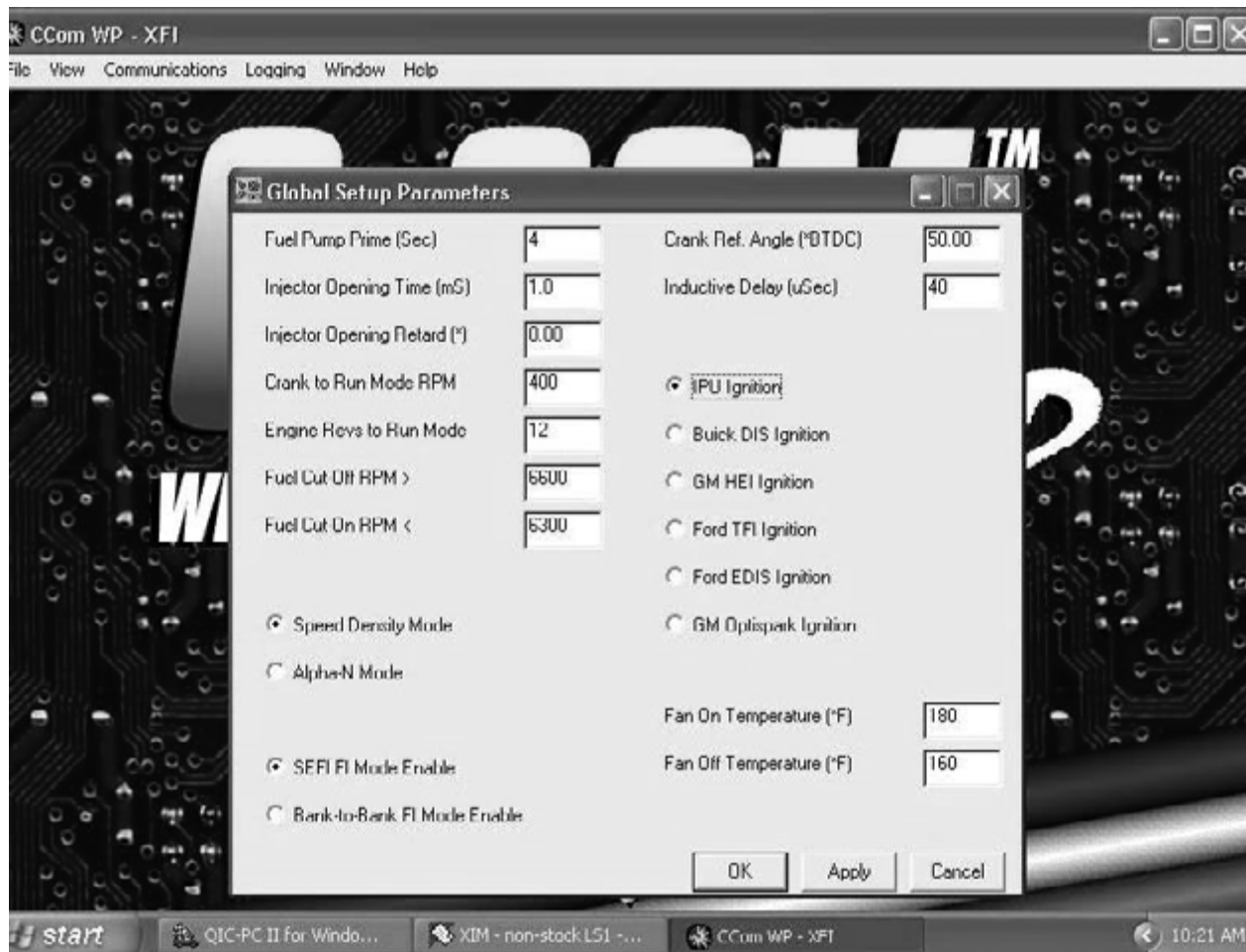
$$21.425712 / 360 = .0595158$$

$$.0595158 \times 50 = 2.97579$$

That means the 50 degree mark is 2.976" BTDC.

**Fifty degree ignition strategy setup parameters:**

6. Open C-Com XFI™ software.
7. Establish communications with the XFI™ ECU, or select the GCT file you will be using.
8. Click on View, then System Configuration, then Operational Parameters.
9. Click on the button next to “IPU Ignition”
10. In the box next to “Reference Angle” type “50”.
11. You are now ready to run in Sequential mode and take advantage of the individual cylinder control feature of the XFI™.



Note: As with any distributor installation, use a high-quality timing light to verify ignition timing matches the timing advance commanded by the XFI™. If necessary, make slight adjustments with the distributor to correct this.

Note: Be sure to verify that the distributor gear you are using is compatible with your cam gear. You can purchase the revolutionary COMP Cams® composite distributor gears and bronze distributor gears from FAST™.

Bronze Gear Part # 410
Composite Gear # 12140

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- Damage due to excessive manifold pressure, i.e. nitrous backfires, engine misfire, etc.

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This warranty gives you specific legal rights and you may also have other legal rights, which vary from state to state.



FAST™
3400 Democrat Rd.
Memphis, TN 38118
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www.fuelairspark.com

Part #FAST4-113
Revised 2/8/07



LSX™ Intake Manifold

#54001 LSX (78mm Throttle Body)

#54003 LSX (90mm Throttle Body)

Thank you for your purchase of the most innovative and powerful Gen III (LS1 and LS6) manifold ever developed. We are confident that you will be pleased with the performance and tuning provided by The LSX™. Please read all instructions carefully before beginning your installation! The LSX™ manifold is designed to directly replace the stock unit including provisions for all sensors, fittings, hoses, EGR and emissions devices.

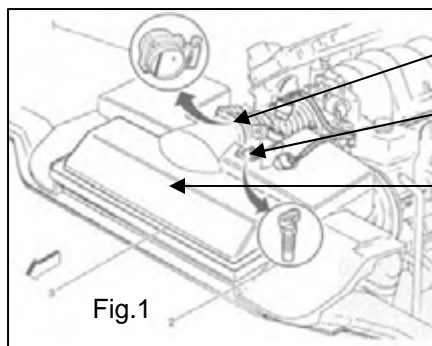
Warning: Please review the packaging contents page (pg 8) to ensure you have all hardware and read the complete instructions (especially the torque specs on pg 5) before installation.

Stock Manifold Disassembly:

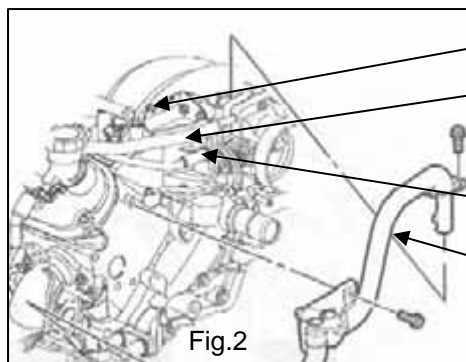
- 1) Allow engine to cool, disconnect the negative battery cable and relieve fuel pressure by depressing the Schrader valve on the end of the rail. Cover with a towel to absorb lost fuel.
- 2) Disconnect fuel line from rail by using quick-connect separator tool (J37088-A). Place shop towels around connection to catch additional gasoline.
- 3) Disconnect MAF & IAT sensors and remove induction system cover (fig.1).
- 4) Disconnect PCV hose on manifold, PCV hose on throttle body, EGR pipe, throttle cables and set aside (fig.2).
- 5) Disconnect coolant vent line hose, purge line, TPS & IAC connector (see fig.3).
- 6) Unplug all 8 fuel injectors by squeezing clips with fingers and pulling up.

Part #147

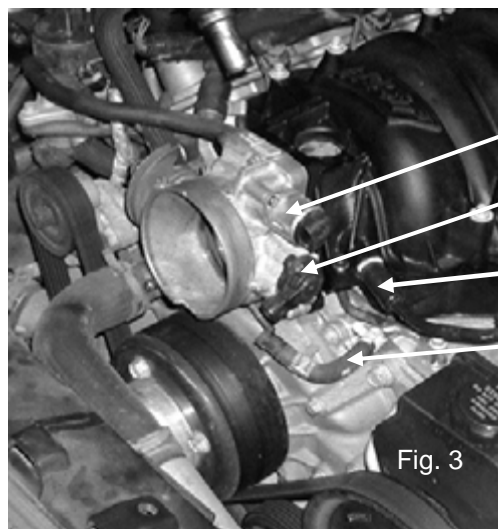
Revised 9/18/06



Mass Air Flow sensor (MAF)
Intake Air Temp sensor (IAT)
Air cleaner cover



Throttle cables
Positive Crankcase Ventilation (PCV) fresh air
PCV foul air (into manifold)
Exhaust Gas Recirculation (EGR)



Idle Air Control (IAC)
Throttle Position Sensor (TPS)
Canister Purge fitting
Coolant vent line (connects to throttle body)

Stock Manifold Disassembly:

- 7) Loosen all 10 intake manifold bolts (8mm hex). The five rear most bolts cannot be removed in vehicle (Camaro, Firebird). To remove manifold these must be partially lifted out of the way. A simple device (Bond sleeve) can be easily made to temporarily hold the bolts up (see fig 4). These are made with a 1" piece of 1/4" rubber hose, slit lengthwise.
- 8) The stock manifold is ready to be removed, however there remain three hidden connections in the rear. The MAP sensor connector, a small vacuum line on the RH side & the brake boost vacuum hose on the LH side (fig.5). On the Camaro and Firebird there is a tall oil pressure sensor that is trapped between the manifold and brake hose (see fig 6). Carefully lift the manifold and move forward until you can reach behind and disconnect the aforementioned items.

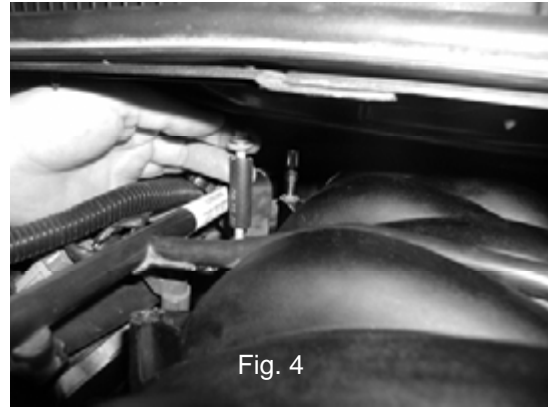


Fig. 4

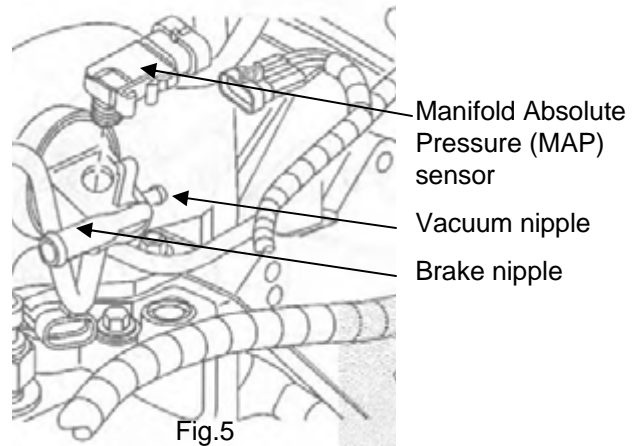


Fig.5



Fig.6

This oil pressure sending unit can be broken if the manifold is pulled straight out without lifting up to clear it first!



Top view of the LS1 in a Gen IV Camaro



Required Modifications:

- 1) **Important Note: Replace 10 valley plate bolts with the button head cap screws provided. Torque to 25N/m (18ft/lbs).**
- 2) The rear coolant vent line on 1997-2000 Corvette and 1998-2000 Camaro/Firebird, located in the valley, must be replaced to clear your new high performance manifold. Replace with GM part number 12568478 front only crossover, and (2) 12563325 plugs. Torque vent pipe bolts to 12 N/m (106 in/lbs).
- 3) Remove plastic clips from knock sensor wire harness by unwrapping tape. Discard (fig.11).
- 4) For EGR use (1998-2002 Camaro/Firebird) you must open the hole in your new manifold. Use a large diameter drill and Dremel type tool to modify polymer (30mm hole). Be careful not to damage the upper diameter where the o-ring seals (fig.12).
- 5) Remove and discard purge solenoid bracket. There is no provision on new manifold for this bracket.(fig.13).



Patent #7,021,263 B1

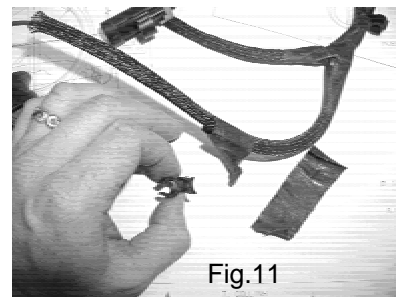


Fig.11

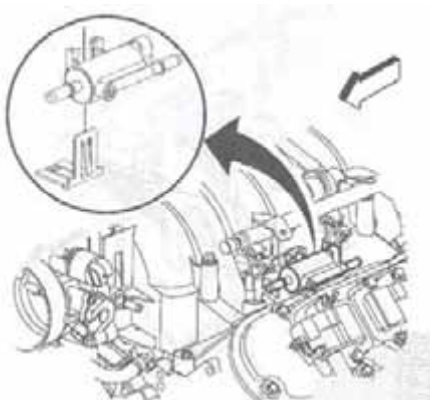


Fig.13

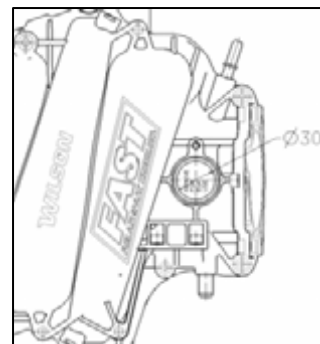


Fig.12

EGR Plug



Manifold Sub Assembly:

Your new FAST™ LSX™ manifold is shipped with the inner piece sealed and pre-assembled to lower. The upper is loosely attached with (14) M6 bolts. Remove bolts and upper shell. Inspect cord seal to insure it is still in place in perimeter groove and runner grooves as shown (fig.14), and re-assemble upper shell using the (6) shorter bolts.

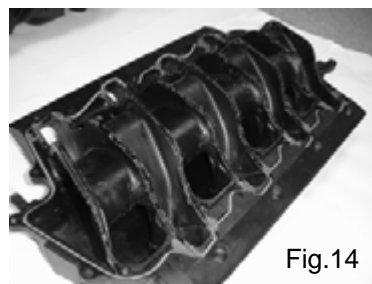


Fig.14

With both manifolds off the engine, transfer the following components from the stock manifold.

- Fuel rail and injectors (fig.15). The injectors should remain in the fuel rail. Undo the four studs (10mm hex) and carefully unseat each injector from manifold.

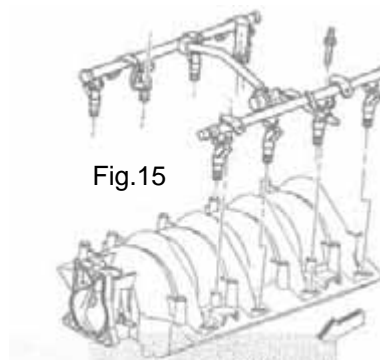


Fig.15

- Lubricate o-rings with clean engine oil. Inspect o-rings for damage. The OEM recommends new injector o-rings after disassembly. Carefully start all injectors in pockets, then firmly seat one side at a time. Add thread lock to M6 studs and tighten to 10N/m (89in/lbs)

- Throttle body – remove (3) M6 (10mm hex) bolts and throttle body. Remove seal by carefully peeling out of the groove. Transfer seal to new manifold (fig.16). A new seal is available as FAST™ part number 54010 (78mm) or 54011 (90mm).

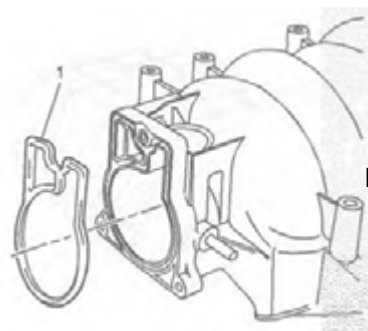


Fig.16

- Port Seals – transfer all (8) ports seals. Make sure the small orientation tabs line up with the manifold. The OEM recommends new seals after disassembly. These are available as FAST™ part number 54009-8, however replacement is not necessary if seals are not worn or damaged.

- MAP sensor – remove the sensor from the stock manifold and inspect seal. Reconnect to the wire harness in vehicle. It is easier to push in the connected sensor after installing the manifold than to reconnect the wire with the new manifold in position.

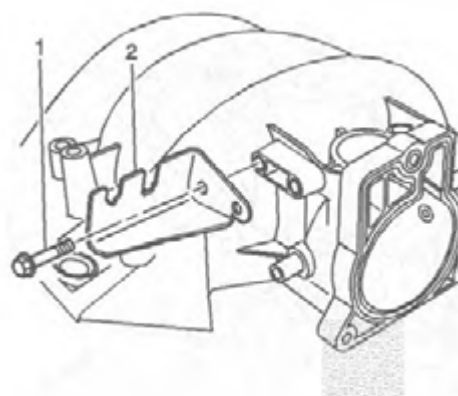


Fig.17

- Transfer the throttle body cable bracket using stock bolts and nuts provided. Torque to 10N.m (89in/lbs).

Manifold to Engine Assembly:

- 1) Place manifold in valley but do not place all the way rearward. Attach brake boost hose, push in MAP sensor and slide in small vacuum nipple.
- 2) Add thread lock to all intake bolt threads and place rear most 5 in manifold with Bond sleeves under head.
- 3) Move manifold into position by lifting slightly while moving rearward until brake nipple clears oil pressure sender (ref. fig.6) . **DO NOT SLIDE MANIFOLD ON CYLINDER HEAD** because seals could be damaged. Once in correct position, the bolt bosses will find counter bores in cylinder heads.
- 4) Remove temporary bolt spacers on five rear most bolts and hand start all 10 fasteners. Don't forget the fuel rail stop bracket on RH rear (fig.18).
- 5) Using two passes in the sequence shown (fig.19). First pass (45in/lbs), final pass (89in/lbs). **Caution: Over-torquing will damage the manifold and cause improper sealing!**
- 6) Throttle Body Installation: Using (3) M6 hex nuts provided, position to manifold pockets. Apply a dab of thread lock to M6 bolts and tighten to (50 in/lbs).
- 7) Reconnect coolant vent line hose, purge line, TPS & IAC connectors.
- 8) Reconnect PCV hose on manifold, PCV hose on throttle body and throttle cables.
- 9) If EGR is used, there is a self tapping screw provided for attaching to manifold.
- 10) Reconnect MAF & MAT sensors and induction system.
- 11) Reconnect all 8 fuel injector wire connectors.
- 12) Reconnect fuel line to rail. Add a few drops of clean engine oil to the male end, then reconnect.

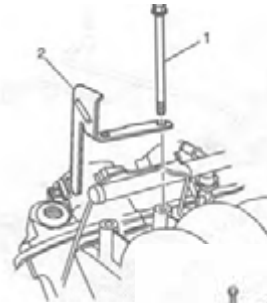


Fig.18

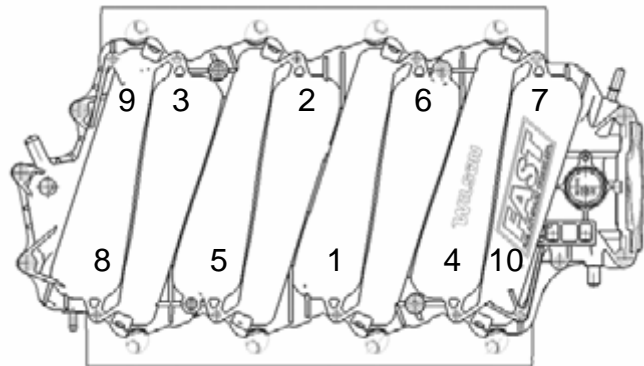
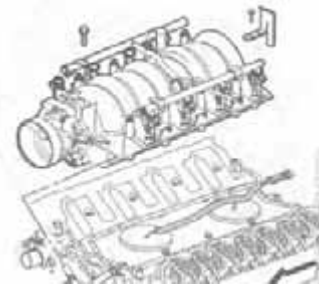


Fig.19

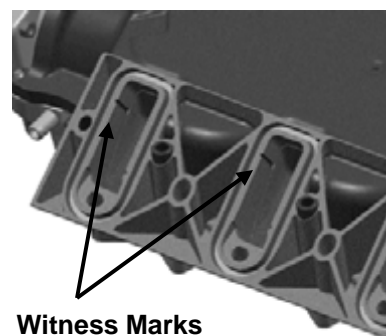
**Torque Sequence
 89 in/lbs Maximum**



Optional Modifications:

Your FAST™ LSX™ manifold can be purchase in individual components:

FAST™ (Part Number)	Description	QTY
54006	Lower Shell	1
54007	Inner Shell	1
54004	Upper Shell – 78mm Bore	1
54005	Upper Shell – 90mm Bore	1
54010	Throttle Body Seal - 78mm	1
54011	Throttle Body Seal – 90mm	1
54009	Cylinder Head Port Seal	1
54009-8	Cylinder Head Port Seals	8
54002	Burst Panel Kit (2 Burst Panels & Hardware)	1
54002RBP-1	Burst Panel Replacement	1
54014	LSX™ Replacement Hardware Kit	1
54016	FAST™ 78mm Billet Throttle Body (Non ETC)	1
54008	FAST™ 90mm Billet Throttle Body (Non ETC)	1



Witness Marks



Installation of optional burst panels

The LSX™ has the capabilities for the following performance modifications:

- The intake manifold runners can be opened up and head matched by removing material near the port. There are witness marks molded in for wall thickness reference. As long as witness mark barely remains the wall is thick enough to retain seal.
- New upper shell with 78mm or 90mm throttle bore can be interchanged.
- Burst Panels can be added for nitrous applications.
- Nitrous Boss can be tapped. 1/8" NPT max.

Note: Call the EFI HELP™ line at 1-877-334-8355, Mon.-Fri. 8-5 CST



90mm T.B.
#54008

78mm T.B.
#54016



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FAST™ Inc.

3400 Democrat Rd. * Memphis, TN 38118

Phone: 901-260-3278 * Fax: 901-375-3408

www.fuelairspark.com



Packaging Contents

LSX™ Manifold, 78mm #54001

Hardware Included In Packet #CPT1035	
3	M6 x 35mm Socket Head Cap Screws (for mounting throttle body)
2	M6 x 20mm Socket Head Cap Screws (for throttle cable bracket)
8	6mm x 12mm O.D. x 6.4mm I.D. x 1.8mm Thick Flat Washer (6 for throttle body mounting screws, 2 for throttle cable bracket screws)
5	M6 x 10mm Wide x 5mm Tall Hex Nuts (3 for throttle body mounting, 2 for throttle cable bracket)
2	M6 x 110mm Socket Head Cap Screws (Bolts manifold to cylinder heads)
2	M6 x 16.5mm O.D. x 6.5mm I.D. x 3.5mm Thick Flat Washer (Manifold to cylinder head bolts)
10	M8 x 30mm Button Head Cap Screws (Replacement OEM valley plate bolts)
1	K60 x 20 PT Type Self Tapping Screw (For EGR)
Hardware Pre-Installed In LSX Manifold #54001	
6	M6 x 16mm Socket Head Cap Screws (Bolts upper shell to lower shell)
8	M6 x 110mm Socket Head Cap Screws
10	K40 x 20mm PT Type Self Tapping Screws (Inner shell)
14	6mm x 12 O.D. x 6.4mm I.D. x 1.8mm Thick Flat Washer for (M6 cap screws)
8	M6 x 16.5mm O.D. x 6.5mm I.D. x 3.5mm Thick Flat Washer
14	M6 x 10mm Wide x 5mm Tall Hex Nuts for (M6 cap screws)

LSX™ Manifold, 90mm #54003

Hardware Included In Packet #CPT1043	
5	M6 x 35mm Socket Head Cap Screws (for mounting throttle body)
2	M6 x 20mm Socket Head Cap Screws (for throttle cable bracket)
12	6mm x 12mm O.D. x 6.4mm I.D. x 1.8mm Thick Flat Washer (10 for throttle body mounting screws, 2 for throttle cable bracket screws)
7	M6 x 10mm Wide x 5mm Tall Hex Nuts (5 for throttle body mounting, 2 for throttle cable bracket)
2	M6 x 110mm Socket Head Cap Screws (Bolts manifold to cylinder heads)
2	M6 x 16.5mm O.D. x 6.5mm I.D. x 3.5mm Thick Flat Washer (Manifold to cylinder head bolts)
10	M8 x 30mm Button Head Cap Screws (Replacement OEM valley plate bolts)
1	K60 x 20 PT Type Self Tapping Screw (For EGR)
1	90mm Throttle Body O-ring Seal
Hardware Pre-Installed In LSX Manifold #54003	
6	M6 x 16mm Socket Head Cap Screws (Bolts upper shell to lower shell)
8	M6 x 110mm Socket Head Cap Screws
10	K40 x 20mm PT Type Self Tapping Screws (Inner shell)
8	M6 x 16.5mm O.D. x 6.5mm I.D. x 3.5mm Thick Flat Washer
14	M6 x 10mm Wide x 5mm Tall Hex Nuts for (M6 cap screws)
14	6mm x 12 O.D. x 6.4mm I.D. x 1.8mm Thick Flat Washer for (M6 cap screws)



INSTRUCTIONS

LSX™ Nitrous Burst Panels

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning the installation.

FAST™ LSX Nitrous Burst Panels #30-54002

Parts List

- (2) Backing Rings, 10/24 Thread - 6061, Black Anodized
- (2) Stainless Steel 36-39psi Burst Panels
- (2) Retention Rings - 6061, Black Anodized
- (8) Stainless Steel 10/24 x 1/2" Button Head



Installation Instructions

Step 1: Remove retaining bolts that hold the upper half of the manifold together. There are four (4) raised bosses located around both of the burst panel guides on the bottom side of the FAST™ LSX manifold. Each of the eight (8) bosses should be drilled through with a size 7 (0.201") drill bit. Drill a hole through the center of both burst panel locations with a 1 3/8" hole saw or open hole up to the embossed circle in the manifold.

Step 2: Begin installation by placing flat side of backing ring (A) with the flat edge facing down toward the floor of lower manifold shell. Place burst panel (B) on outside of manifold with the dome facing to the inside of the manifold. Place flat retention ring (C) on top of the burst panel with the FAST™ logo facing out. Align bolt holes of retention rings, burst panel & manifold. **Note: Offset bolt pattern will only allow the panels to be installed one way.** Put small amount of red Loctite on each of the 10-24 screws and tighten with a 1/8" Allen wrench to 40-48 inch pounds of torque. **Note: Burst panels do not need sealant.**

Step 3: Reassemble manifold taking care to place the o-ring material into the correct position when it was removed.

Special Notes: In case of a backfire, both burst panels should be replaced even if only one burst panel opens. Heat & pressure can effect & change the relief characteristics of the burst panel. Burst panels are high-precision stamped stainless steel and can be damaged by pushing or denting the center panel.



FAST™ LSX Parts

Part Number	Description
30-54001	LSX Manifold (78mm)
30-54002	LSX 36lb Burst Panel Kit
30-54002RBP-1	(1) LSX 36lb Replacement Burst Panel
30-54002RBP-2	(2) LSX 36lb Replacement Burst Panels
30-54003	LSX Manifold (90mm)
30-54004	LSX Upper Shell – 78mm Throttle Body
30-54005	LSX Upper Shell – 90mm Throttle Body
30-54006	LSX Lower Shell - Manifold Base
30-54007	LSX Manifold Inner Shell Only
30-54008	LSX 90mm Billet Throttle Body
30-54009-1	(1) LSX LS1 Replacement Port Seal
30-54009-8	(8) LSX LS1 Replacement Intake Port Seals
30-54010	LSX Throttle Body Seal (78mm Throttle Body)
30-54011	LSX Throttle Body Seal (90mm Throttle Body)
30-54014	LSX Manifold Hardware Kit
30-54016	LSX 78mm Billet Throttle Body
30-54017	LSX 78mm Billet Throttle Body with TPS
30-54019	LSX 90mm Billet Throttle Body with TPS

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FAST Inc.
3406 Democrat Rd
Memphis, TN 38118
Ph: 901.260.3278 * Fx: 901.375.3408
www.fuelairspark.com



INSTRUCTIONS

LSX™ Throttle Body

Thank you for choosing FAST™ products; we are proud to be your manufacturer of choice. Please read this instruction sheet carefully before beginning the installation.

FAST™ Throttle Body - Parts List

- #30-54016 - 78mm Billet Throttle Body
- #30-54017 - 78mm Billet Throttle Body w/ TPS (no IAC)
- #30-54008 - 90mm Billet Throttle Body
- #30-54019 - 90mm Billet Throttle Body w/ TPS (no IAC)
- #30-54020 - TPS
- #30-54010 - Throttle Body Seal (78mm)
- #30-54011 - Throttle Body Seal (90mm)



Step 1: Disconnect the battery. Remove the intake tube, mass air meter, and air box lid. After unplugging the sensors, this can be removed in one piece. Disconnect the coolant hoses from the bottom of the throttle body and join them together or plug both ends.

Step 2: Unplug the sensors and remove the throttle cable. Remove the three bolts holding the throttle body to the intake. Transfer the TPS sensor and IAC motor to the FAST™ throttle body. **Note: The IAC motor must be rotated 180 degrees from the stock mounting position to fit properly.** Make sure you remove the O ring from the old unit and install it in the new throttle body. If you ordered your new FAST™ Throttle Body with TPS it will already be installed.

Step 3: Before installing the throttle body, check the throttle stop adjusting screw. This screw adjusts the position in which the blade will rest with the throttle closed. The blades should be closed but not binding. **Caution: The blades should be adjusted so that the blade is making contact with throttle body bore with minimum light being seen around the blades. When the throttle is closed, it should rest on the adjusting screw. It should not rest on the blade itself.**

Step 4: Install the FAST™ throttle body using the factory bolts on the bottom fastening points. Re-torque all three mounting bolts to 50 inch-pds. **Note: If you are using the FAST™ intake you must use longer bolts with nuts on the backside.**

Step 5: Reconnect the sensors and install the throttle cable. There are two mounting holes for the stock cable. If the stock throttle bell crank is shaped similar to FAST™ unit, use the last hole on the FAST™ units throttle bell crank. If the diameter of the bell crank is smaller use the top hole on the FAST™ throttle bell crank. If the throttle blades do not fully close you may have to adjust the cable. Follow the cable up towards the cruise control unit. You will find a black adjuster inline on the cable. Remove the locking clip and allow the blade too fully close. Adjust the cable with a slight amount of tension and reinstall the locking clip.

Step 6: Reinstall the intake tube assembly and reconnect all the sensors. Start the engine and allow the engine to warm up. If the engine does not idle at the appropriate idle speed, you may have to do an IAC relearn. The ECU will relearn the IAC position when the key is shut off. Shut off the ignition and allow the key to remain off for

thirty seconds. Restart the engine and recheck the idle speed. If the engine still does not idle properly, recheck the cable adjustment or the blade stop adjustment.

FAST™ LSX Parts

Part Number	Description
30-54001	LSX Manifold (78mm)
30-54002	LSX 36lb Burst Panel Kit
30-54002RBP-1	(1) LSX 36lb Replacement Burst Panel
30-54002RBP-2	(2) LSX 36lb Replacement Burst Panels
30-54003	LSX Manifold (90mm)
30-54004	LSX Upper Shell – 78mm Throttle Body
30-54005	LSX Upper Shell – 90mm Throttle Body
30-54006	LSX Lower Shell - Manifold Base
30-54007	LSX Manifold Inner Shell Only
30-54008	LSX 90mm Billet Throttle Body
30-54009-1	(1) LSX LS1 Replacement Port Seal
30-54009-8	(8) LSX LS1 Replacement Intake Port Seals
30-54010	LSX Throttle Body Seal (78mm Throttle Body)
30-54011	LSX Throttle Body Seal (90mm Throttle Body)
30-54014	LSX Manifold Hardware Kit
30-54016	LSX 78mm Billet Throttle Body
30-54017	LSX 78mm Billet Throttle Body with TPS
30-54019	LSX 90mm Billet Throttle Body with TPS

Limited Warranty

FAST, Inc. warrants that all of its products are free from defects in material and workmanship for a period of 1 year from the date of purchase. This limited warranty shall cover the original purchaser.

FAST, Inc.'s obligation under this warranty is limited to the repair or replacement of its product. To make a warranty claim, the part must be returned within 1 year of purchase to the address listed below, freight prepaid. Items covered under warranty will be returned to you freight collect.

It is the responsibility of the installer to ensure that all of the components are correct before installation. We assume no liability for any errors made in tolerances, component selection, or installation.

There is absolutely no warranty on the following:

- **Any parts used in racing applications.**
- **Any product that has been physically altered, improperly installed or maintained.**
- **Any product used in improper applications, abused, or not used in conjunction with the proper parts.**
- **Damage due to excessive manifold pressure, i.e. nitrous backfires, engine misfire, etc.**

There are no implied warranties of merchantability or fitness for a particular purpose. There are no warranties, which extend beyond the description of the face hereof. FAST, Inc. will not be responsible for incidental and consequential damages, property damage or personal injury damages to the extent permitted by law. Where required by law, implied warranties or merchantability and fitness are limited to a term of 1 year from the date of original purchase. This warranty gives you specific legal rights and you may also have other legal rights, which vary from state to state.

FAST Inc.
3400 Democrat Rd.
Memphis, TN 38118
Ph: 901.260.3278 * Fx: 901.375.3408
www.fuelairspark.com



INSTRUCTIONS

FAST™ LS1 Fuel Rail Hardware Kits 30-53023 & 30-53023HDW

#30-53023HDW Parts List

- (2) FAST Fuel Rails
- (4) Billet Mounting Stanchions
- (4) 10-24 x 1" SS Counter-Sink Screws
- (4) 6mm x 35mm SS Allen Head Screws

#30-53023 Parts List

- (2) FAST Fuel Rails
- (4) Billet Mounting Stanchions
- (4) 6mm x 35mm SS Allen Head Screws
- (4) 10-24 x 1" SS Counter Sink Screws
- (2) 54023A #8 SAE O-Ring to #8 AN Fuel Fittings
- (2) 54023B #8 SAE O-Ring to #6AN Fuel Fittings
- (4) 54023OR O-Rings

Note: 10-24 x 1" SS counter sink fasteners attach fuel rails to stanchions and 6mm x 35mm SS allen head fasteners attach stanchions to manifold.



Installation Instructions

Step 1: Once engine is cool, disconnect the battery.

Step 2: Bleed off any fuel pressure, cleaning up and properly disposing of any fuel spillage.

Step 3: Remove the factory fuel line with the appropriate special tool, that is available at most auto parts stores.

Step 4: Disconnect all injector wiring and remove the four (4) retaining bolts.

Step 5: You should now be able to remove the factory fuel rail.

Step 6: After the fuel rail has been removed, remove the factory retaining clips holding the injectors to the factory fuel rail. Insert a screwdriver into the end of the clip and pry outwards. **Note: The clips will not be re-used.**

Step 7: Install all four (4) mounting stanchions on the FAST™ fuel rails before installing the rails with the supplied 10-24 x 1" allen counter sunk head screws. Please see diagram. **Note: Do not fully tighten the brackets to the rail at this point. This will assist you in aligning the bolts.**

Step 8: Apply a thin layer of grease to the o-rings on the injectors.

Step 9: Install the injectors into the FAST™ rails and install them on the engine with the FAST™ logo facing outwards.

Step 10: Using the supplied 6mm x 35mm allen head bolts, tighten the mounting stanchions to the intake manifold.

Step 11: After the stanchions have been secured, tighten the 10-24 x 1" allen counter sunk head screws holding the rails to the stanchions.

Step 12: Install the four (4) o-rings on the supplied AN fittings

Step 13: Install your existing AN fittings & lines according to the type of fuel system you are using.

Step 14: Reinstall all injector wiring correlating the injector connectors to the proper cylinder. The harness connectors should be numbered for the appropriate cylinder. Make sure all fuel fittings are tight.

Step 15: Reconnect the battery and turn on the fuel pump, check for leaks.

Related FAST™ Products

Part Number	Description
30-54001	LSX Manifold (78mm)
30-54002	LSX 36lb Burst Panel Kit
30-54003	LSX Manifold (90mm)
30-54004	LSX Upper Shell – 78mm Throttle Body
30-54005	LSX Upper Shell – 90mm Throttle Body
30-54006	LSX Lower Shell - Manifold Base
30-54007	LSX Manifold Inner Shell Only
30-54008	LSX 90mm Billet Throttle Body
30-54009-1	(1) LSX LS1 Replacement Port Seal
30-54009-8	(8) LSX LS1 Replacement Intake Port Seals
30-54010	LSX Throttle Body Seal (78mm Throttle Body)
30-54011	LSX Throttle Body Seal (90mm Throttle Body)
30-54014	LSX Manifold Hardware Kit
30-54016	LSX 78mm Billet Throttle Body
30-54017	LSX 78mm Billet Throttle Body with TPS
30-54019	LSX 90mm Billet Throttle Body with TPS
30-2408	8 Pack of 24-lb. FAST™ Fuel Injectors
30-3608	8 Pack of 36-lb. FAST™ Fuel Injectors
30-4208	8 Pack of 42-lb. FAST™ Fuel Injectors
30-5508	8 Pack of 55-lb. FAST™ Fuel Injectors
30-6508	8 Pack of 65-lb. FAST™ Fuel Injectors
30-8308	8 Pack of 83-lb. FAST™ Fuel Injectors
30-9508	8 Pack of 95-lb. FAST™ Fuel Injectors
30-16008	8 Pack of 160-lb. FAST™ Fuel Injectors
30-5001	EDIST – LS1
30-7057	140 AMP EFI One Wire Alternator

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