



Extreme Performance Engine Control

M-12650-C80

M-12650-C81

Ford Motor Company

Copyright © 1994-1997 General Systems Research

Table of Contents

Topic	Page
Getting Started	10
Thank You	11
EPEC System Overview	11
Off-Highway or Racing Use Warning	12
No Parts Warranty	12
What You Need to Use the EPEC System	12
Computer Requirements for EPEC Software	12
Vehicle Applications	13
EPEC Kit Contents	13
Installing EPEC for Windows Software	13
Starting and Quitting EPEC for Windows Software	14
Starting EPEC for Windows	14
Quitting EPEC for Windows	14
EPEC for Windows License Agreement	16
EPEC System Registration	17
EPEC System Problem/Suggestion Report	18
Additional EPEC System Items	19
Low Impedance Injector Drivers	19
EPEC User Manual	20
Serial Interface Cables	21
EPEC for Windows	23
EPEC for Windows a Closer Look	24
EPEC for Windows Desktop	24
EPEC for Windows Main Menu	24
EPEC for Windows Status Bar	25
File Menu	26
Open Calibration...	26
Save Calibration...	27
Save Calibration As...	28
Close Calibration	26
Delete Calibration...	29
Export Calibration	30
Import Calibration	31
Exit	32
Edit Menu	32
Data Acquisition Menu	33
Data Logging Menu	34
Tools Menu	34
Options Menu	35
Communications	36

Units	36
Window Menu	36
Help Menu	37
<i>EPEC Control Strategy</i>	40
Fuel Strategy	41
Base Fuel (Idle, Part Throttle, WOT Air/Fuel Ratio)	46
Fuel Modifiers	48
Air Charge Temperature (ACT) Fuel	48
Engine Coolant Temperature (ECT) Fuel	50
Throttle Position (TP) Fuel	52
Manifold Absolute Pressure (MAP) Fuel	54
Cranking Fuel	56
Injector Offset	58
Transitional Fuel Enrichment (TFE)	60
Transitional Fuel Enrichment TP Multiplier	62
Programmable Output 0-3 Fuel Multipliers	64
Analog Channel 0-2 Fuel Multipliers	66
Spark Strategy	69
Idle Spark Advance	74
Part Throttle Spark Advance	76
WOT Spark Advance	78
Air Charge Temperature (ACT) Spark	80
Boost Retard	82
Engine Coolant Temperature (ECT) Spark	84
Manifold Absolute Pressure (MAP) Spark	86
Nitrous Oxide Spark Retard	88
Throttle Position (TP) Spark	90
Programmable Output Channel 0-3 Spark	92
Analog Channel 0-2 Spark	94
Nitrous Oxide Strategy	96
Nitrous Oxide Globals	98
Nitrous Oxide Stage 1 and Stage 2 Controls	100
Engine RPM Limiters	101
Fuel Rev Limit	101
Spark Rev Limit	102
Stage Rev Limit	102
Manual Fuel/Spark Control	104
Engine Configuration	106
Input/Output Configuration	109
ACT Transfer Function	109
ECT Transfer Function	111
MAF Transfer Function	113
MAP Transfer Function	115
TP Transfer Function	117
TP Sensor Configuration	120
PIP Configuration	123
Spark Output (SPOUT) Configuration	126
Module Configuration	128

Programmable Output Channels 0 - 3	130
<i>Data Acquisition</i>	<i>139</i>
Data Acquisition Overview	140
Creating a New Acquisition Set	140
Opening a Stored Acquisition Set	142
Deleting an Acquisition Set	142
Viewing the Data Acquisition Window	143
<i>Data Logging</i>	<i>145</i>
Data Logging Overview	146
New Log Set...	146
Open Log Set...	149
Delete Log Set...	150
New/Upload Log Data	151
Graphing Log Data	152
Opening Log Data Files	153
<i>EPEC Hardware</i>	<i>156</i>
Fuel Injector Output Schematic	157
Spark Output Schematic	157
Programmable Output Schematic	158
Nitrous Controls Schematic	159
Data Logging Schematic	160
TP Sensor Schematic	161
MAP Sensor Schematic	162
ACT Sensor Schematic	162
ECT Sensor Schematic	163
MAF Sensor Schematic	163
Stage Rev Limiter Schematic	164
Analog Input Schematic	165
Computer Interface Schematic	166
Power/Ground Schematic	166
EPEC Module Pin Assignments	167
EEC-IV Module Pin Assignments	169
1988-1993 5.0L EPEC Adapter Harness Schematic	171
1994-1995 5.0L EPEC Adapter Harness Schematic	172
<i>Application Notes</i>	<i>175</i>
Programmable Output Application Notes	176
Adding an Additional Nitrous Oxide Stage	176
Controlling Shift Lamp	178
Controlling a Cooling Fan	180
Controlling a Fuel Pump	183

Acronyms and Terms _____ **186**

Acronyms _____ **187**

EPEC Parameters and Terms _____ **187**

User Notes _____ **197**

Your Notes _____ **197**

Table of Figures

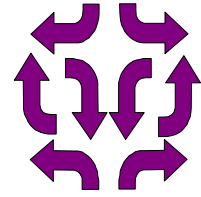
Figure	Page
Figure 1: EPEC System Block Diagram	12
Figure 2: Setup Program Invocation	14
Figure 3: EPEC Desktop	25
Figure 4: File Menu	26
Figure 5: Open Calibration Dialog Box	27
Figure 6: Save Calibration Dialog Box	28
Figure 7: Save Calibration As... Dialog Box	29
Figure 8: Delete Calibration Dialog Box	30
Figure 9: Export Calibration Dialog Box	30
Figure 10: Export Calibration Save Dialog Box	31
Figure 11: Import Calibration Dialog Box	31
Figure 12: Import Calibration Save Dialog Box	32
Figure 13: Edit Menu	33
Figure 14: Data Acquisition Menu	33
Figure 15: Data Logging Menu	34
Figure 16: Tools Menu	35
Figure 17: Options Menu	35
Figure 18: Communication Configuration Dialog Box	36
Figure 19: Window Menu	37
Figure 20: Help Menu	38
Figure 21: Fuel Strategy Block Diagram	44
Figure 22: Idle/Part/WOT Fuel Strategy Diagram	46
Figure 23: Idle/Part/WOT Fuel Menu	46
Figure 24: Idle - RPM Air/Fuel Function	48
Figure 25: ACT Fuel Strategy Diagram	49
Figure 26: ACT Fuel Menu	49
Figure 27: ACT Fuel Function	50
Figure 28: ECT Fuel Strategy Diagram	50
Figure 29: ECT Fuel Menu	51
Figure 30: ECT Fuel Function	52
Figure 31: TP Fuel Strategy Diagram	52
Figure 32: TP Fuel Menu	53
Figure 33: TP Fuel Function	54
Figure 34: MAP Fuel Strategy Diagram	54
Figure 35: MAP Fuel Menu	55
Figure 36: MAP Fuel Function	56
Figure 37: Cranking Fuel Strategy Diagram	56
Figure 38: Cranking Fuel Menu	57
Figure 39: Cranking Fuel Function	58
Figure 40: Injector Offset Fuel Strategy Diagram	59
Figure 41: Injector Offset Fuel Menu	59
Figure 42: Injector Offset Function	60
Figure 43: Base Transitional Fuel Strategy Diagram	61
Figure 44: Transitional Fuel Enrichment Menu	61
Figure 45: Base Transitional Fuel Enrichment Function	62
Figure 46: Transitional Fuel Enrichment TP Multiplier Strategy Diagram	63
Figure 47: Transitional Fuel Enrichment TP Multiplier Menu	63
Figure 48: Transitional Fuel Enrichment TP Multiplier Function	64

Figure 49: Programmable Output Channel 0 -3 Menu	65
Figure 50: Programmable Output 0-4 Fuel Function	66
Figure 51: Analog Channel 0-2 Fuel Strategy Diagram	66
Figure 52: Analog Channel 0 - 2 Fuel Menu	67
Figure 53: Analog Channel 0-3 Fuel Function	68
Figure 54: Spark Strategy Block Diagram	72
Figure 55: Idle/Part Throttle/WOT Spark Strategy Diagram	74
Figure 56: Idle Spark Menu	75
Figure 57: Idle - RPM Spark Advance Function	76
Figure 58: Idle/Part Throttle/WOT Spark Strategy Diagram	76
Figure 59: Part Throttle Spark Menu	77
Figure 60: Part Throttle - RPM Spark Advance Function	78
Figure 61: Idle/Part Throttle/WOT Spark Strategy Diagram	78
Figure 62: WOT Spark Menu	79
Figure 63: Wide Open Throttle - RPM Spark Advance Function	80
Figure 64: ACT Spark Strategy Diagram	80
Figure 65: ACT Spark Menu	81
Figure 66: ACT Spark Advance Function	82
Figure 67: Boost Retard Spark Strategy Diagram	82
Figure 68: Boost Retard Spark Menu	83
Figure 69: Boost Retard Function	84
Figure 70: ECT Spark Strategy Diagram	85
Figure 71: ECT Spark Menu	85
Figure 72: ECT Spark Advance Function	86
Figure 73: MAP Spark Strategy Diagram	87
Figure 74: MAP Spark Menu	87
Figure 75: MAP Spark Advance Function	88
Figure 76: Nitrous Spark Menu	89
Figure 77: Nitrous Spark Retard Values	90
Figure 78: TP Spark Strategy Diagram	90
Figure 79: TP Spark Menu	91
Figure 80: TP Spark Advance Function	92
Figure 81: Programmable Output Spark Menu	93
Figure 82: Programmable Output 0-4 Spark Function	94
Figure 83: Analog Channel 0-2 Spark Strategy Diagram	94
Figure 84: Analog Channel 0 -2 Spark Menu	95
Figure 85: Analog Channel 0-3 Spark Function	96
Figure 86: Nitrous Oxide Menu	99
Figure 87: Nitrous Oxide Globals	100
Figure 88: Nitrous Oxide Stage Parameters	101
Figure 89: Engine RPM Limits Menu	103
Figure 90: Engine RPM Limiter Parameters	104
Figure 91: Manual Fuel/Spark Control Menu	105
Figure 92: Manual Fuel/Spark Control	106
Figure 93: Engine Configuration Menu	107
Figure 94: Engine Configuration	108
Figure 95: ACT Sensor Strategy Block Diagram	109
Figure 96: ACT Transfer Function Menu	110
Figure 97: ACT Sensor Transfer Function	111
Figure 98: ECT Sensor Strategy Block Diagram	111
Figure 99: ECT Transfer Function Menu	112
Figure 100: ECT Sensor Transfer Function	113
Figure 101: MAF Sensor Strategy Block Diagram	114
Figure 102: MAF Transfer Function Menu	114

Figure 103: MAF Sensor Transfer Function	115
Figure 104: MAP Sensor Strategy Block Diagram	116
Figure 105: MAP Transfer Function Menu	116
Figure 106: MAP Sensor Transfer Function	117
Figure 107: TP Sensor Strategy Block Diagram	118
Figure 108: TP Sensor Transfer Function Menu	119
Figure 109: TP Sensor Transfer Function	120
Figure 110: TP Sensor Strategy Block Diagram	121
Figure 111: Throttle Modes	122
Figure 112: TP Sensor Configuration Menu	122
Figure 113: TP Sensor Configuration	123
Figure 114: PIP Strategy Block Diagram	124
Figure 115: PIP Configuration Menu	125
Figure 116: PIP Configuration	126
Figure 117: SPOUT Output Configuration Menu	127
Figure 118: Spark Output Configuration	128
Figure 119: Module Configuration Menu	129
Figure 120: Module Configuration	130
Figure 121: Programmable Output 0-4 Menu	133
Figure 122: Programmable Output Channels 0-4 ON Conditions	134
Figure 123: Programmable Output Channels 0-4 OFF Conditions	135
Figure 124: Data Acquisition Menu	140
Figure 125: New Acquisition Set Dialog Box	142
Figure 126: Save Acquisition Set Dialog Box	142
Figure 127: Open Acquisition Set Dialog Box	142
Figure 128: Delete Acquisition Set Dialog Box	143
Figure 129: Delete Acquisition Confirmation	143
Figure 130: Data Acquisition Window	144
Figure 131: Data Logging Menu	146
Figure 132: New Data Log Set Dialog Box (Log Parameters)	147
Figure 133: New Data Log Set Dialog Box (Log Trigger)	148
Figure 134: Save Log Set Dialog Box	149
Figure 135: Open Log Set Dialog Box	150
Figure 136: Delete Log Set Dialog Box	151
Figure 137: Delete Log Set Confirmation	151
Figure 138: New/Upload Log Data Dialog Box	152
Figure 139: New/Upload Log Data File Name Dialog Box	152
Figure 140: Extreme Graph Desktop	153
Figure 141: Open Log Data Dialog Box	153
Figure 142: Log Data Selection Dialog Box	154
Figure 143: Data Logging Graph	155
Figure 144: Fuel Injector Output Schematic	157
Figure 145: Ignition System Schematic	158
Figure 146: Programmable Output Schematic with a Relay	159
Figure 147: Programmable Output Schematic without relay	159
Figure 148: Nitrous Controls Schematic Diagram	160
Figure 149: Data Logging Schematic	161
Figure 150: TP Sensor Schematic Diagram	161
Figure 151: MAP Sensor Schematic	162
Figure 152: ACT Sensor Schematic	163
Figure 153: ECT Sensor Schematic	163
Figure 154: MAF Sensor Schematic	164
Figure 155: Stage Rev Limit Schematic	165
Figure 156: Analog Input Schematic	166

<i>Figure 157: Computer Interface Schematic</i>	<i>166</i>
<i>Figure 158: Power/Ground Schematic</i>	<i>167</i>
<i>Figure 159: 1988-1993 5.0L Mustang Adapter Harness Schematic</i>	<i>172</i>
<i>Figure 160: 1994-1995 5.0L Mustang Adapter Harness Schematic</i>	<i>173</i>
<i>Figure 161: Programmable Output Nitrous Oxide Schematic</i>	<i>176</i>
<i>Figure 162: Programmable Output "ON" Nitrous Configuration</i>	<i>177</i>
<i>Figure 163: Programmable Output "OFF" Nitrous Configuration</i>	<i>178</i>
<i>Figure 164: Shift Lamp Schematic</i>	<i>179</i>
<i>Figure 165: Shift Lamp "ON" Configuration</i>	<i>179</i>
<i>Figure 166: Shift Lamp "OFF" Configuration</i>	<i>180</i>
<i>Figure 167: Cooling Fan Schematic</i>	<i>181</i>
<i>Figure 168: Cooling Fan "ON" Configuration</i>	<i>182</i>
<i>Figure 169: Cooling Fan "OFF" Configuration</i>	<i>183</i>
<i>Figure 170: Fuel Pump Schematic</i>	<i>184</i>
<i>Figure 171: Fuel Pump "ON" Configuration</i>	<i>184</i>
<i>Figure 172: Fuel Pump "OFF" Configuration</i>	<i>185</i>

Getting Started



In This Chapter

Thank You

EPEC System Overview

Off-Highway or Racing Use Warning

No Parts Warranty

What You Need to Use the EPEC System

 Computer Requirements for EPEC Software

 Vehicle Applications

☞ EPEC Kit Contents

📁 Installing EPEC for Windows Software

Starting and Quitting EPEC for Windows Software

 Starting EPEC for Windows

 Quitting EPEC for Windows

EPEC for Windows License Agreement

 EPEC System Registration

 EPEC System Problem/Suggestion Report

Additional EPEC System Items

 Low Impedance Injector Drivers

 EPEC User Manual

 Serial Interface Cables

Thank You

Ford Motorsport SVO and General Systems Research is very proud of the Extreme Performance Engine Control System (EPEC). We believe that with the flexibility and power, the EPEC System can give you hours of hot rodding enjoyment and gratification. The EPEC System is the most sophisticated aftermarket engine control systems available today, and with its ease of use, will put the power of calibration into your hands – exactly where you want it to be. With only basic knowledge of Microsoft Windows and engine control you should be up and running in no time at all. We have supplied some default calibrations to get you started. These will only get you started and running, the rest is up to you. Calibrate the EPEC any way your engine operates the best, that is why we designed it. So if your ready, lets go make some **HORSEPOWER!!** Happy calibrating – Enjoy.

IMPORTANT: We STRONGLY recommend that you read this manual from front to back and be sure you understand all aspects of the EPEC system before installing the EPEC system in your vehicle. You must understand the operation of the EPEC system or you can get yourself into trouble and the system will not perform as you expect.

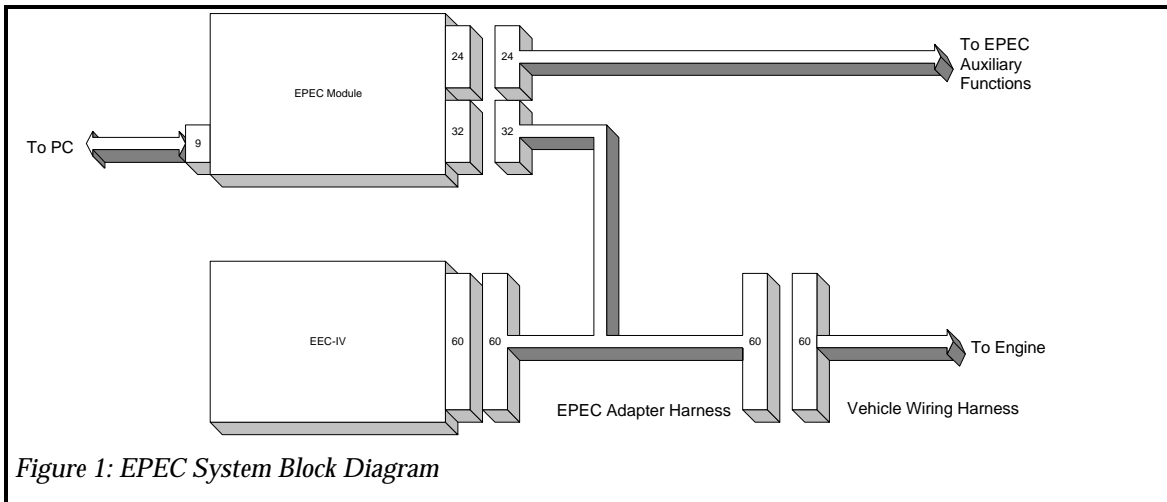
EPEC System Overview

The EPEC system consists of several major components delivered with you kit. The EPEC system has the EPEC Module, an Adapter Harness, an Auxiliary Harness and a PC Serial Interface Cable. The EPEC system is supplied as a piggy back system to the EEC-IV system, however, if your system requires a standalone type of operation, the EPEC system can also fit your needs.

The EPEC module connects to the EEC-IV system through an adapter harness. This adapter harness is a “T” type harness that uses both the EEC-IV module and the EPEC module to control the powertrain the engine. You can calibrate exactly when the EEC-IV module is controlling the engine or the EPEC module is controlling the engine. This piggy back arrangement gives you the greatest flexibility and allow you to only control or modify the fuel or spark delivery where you see fit. The EPEC adapter harness connects the EPEC and EEC-IV modules to the engine sensors and actuators in such a way that the EPEC module can decide which module is to perform the controlling functions, for more information on the wiring harness schematics see the EPEC Hardware chapter. A small pig tail wiring harness is also supplied with the EPEC system. This is for all the auxiliary functions that are supported within the production Ford wiring harness, such as nitrous oxide controls, analog inputs, programmable outputs, etc.

The EPEC module communicates with the EPEC for Windows software through a serial port on your PC. Through this link, the EPEC system provides all the calibration, data acquisition and data logging functionality. The EPEC for Windows software is your “window” or “view” inside of the EPEC module. The EPEC system is a very flexible control system and its specific operation is entirely up to you.

Figure 1: EPEC System Block Diagram shows a block diagram of the EPEC system and its connections to the EEC-IV system. In the next chapters of this book, we will take you through the EPEC for Windows user interface, EPEC Module Strategy, Data Acquisition, Data Logging and all the different calibration parameters that are contained within the EPEC module. So if you are ready, lets take a journey into the EPEC world of engine control.



Off-Highway or Racing Use Warning

Because US, Canadian, state or provincial laws and regulations may prohibit removal or modification of components that were installed on vehicles by Ford Motor Company to meet emission requirements or to comply with motor vehicle safety regulations applicable to vehicles manufactured for use on public roads, Ford Motor Company recommends that vehicles equipped with parts designated “for off-highway use” not be operated on public roads and offers such parts only for track or off-highway competitive or performance use. Such parts have a special “warning” label which reads:

This part has been designated and is intended for off-highway applications only. Installation on a vehicle intended for use on public roads may violate US, Canadian, state or provincial laws and regulations including those relating to emission requirements and motor vehicle safety standards. (NOTE: In California this part may legally be used only on a racing vehicle which will never be operated on public roads.) In addition, installation of this part may adversely affect the warranty coverage on your vehicle.

No Parts Warranty

Competition parts are sold “as is” without any warranty whatsoever. Implied warranties, including warranties of merchantability or fitness for a particular purpose, are excluded. The entire risk as to the quality and performance of such parts is with the buyer. Should such parts prove defective following their purchase, the buyer and not the manufacturer, distributor or retailer, assumes the entire cost of all necessary servicing or repair.



Ford Motor Company vehicle and parts warranties are voided if the vehicle or part is used for competition or if they fail as a result of modification.

What You Need to Use the EPEC System

Computer Requirements for EPEC Software

To use the EPEC Calibration Software for Windows®™, you need:

Any IBM®-compatible machine with a 80486-66 processor or higher.

-
- Microsoft® Windows®™ operating system V3.1, V3.11 or Windows 95®™.
 -  A 3.5-inch floppy disk drive.
 -  A hard disk with at least 25 MB of free disk space.
 - At least 8 megabytes of RAM, 16 megabytes is recommended, but the more you have the better.
A mouse type pointing device is optional, however it is much easier to navigate with a mouse.
 - A printer is optional.

Vehicle Applications

The EPEC Module is compatible with:

- 1986 - 1988 5.0L Mustang with Ford Motorsport SVO Mass Air Conversion Kit.
- 1989 - 1993 5.0L Mustang.
- 1994 - 1995 5.0L Mustang.
- Any vehicle that conforms to the Mustang engine control specifications.

EPEC Kit Contents

Before you install the EPEC Module, unpack all of the contents. The kit should include the following components:

1. EPEC Module.
2. EPEC for Windows Calibration Software.
3. Vehicle adapter wiring harness. Note be sure you have the correct kit for your vehicle. 1988-1993 Mustang: M-12650-A50, 1994-1995 Mustang: M-12650-A51.
4. 9 pin interface cable.
5. 24 pin accessory connector.

Installing EPEC for Windows Software

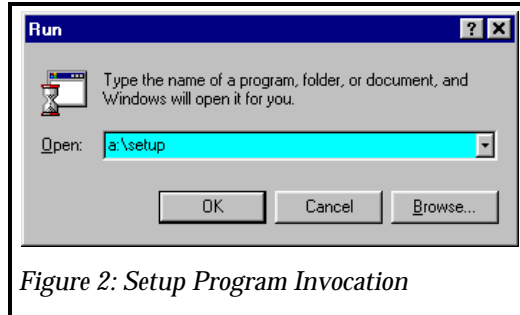
Before you install the EPEC Calibration software, you may want to create a backup copy of the installation disks. The license agreement allows you to make one backup copy. The license agreement also allows you to install EPEC on another computer, such as a laptop computer, provided that you are the computer's primary user and that you use only one copy of the EPEC software at a time. For more information, see your EPEC license agreement.

IMPORTANT: The EPEC software installation program may not require all disks supplied with EPEC for Windows. Which disks are specifically used depends on the version of MS-Windows you are running.

IMPORTANT: If you use a virus protection program on your computer, override it or turn it off before you run the EPEC Setup Program. EPEC Setup may not run properly with virus protection turned on. After running Setup, be sure to restart your virus protection program.

- ▶ To Install EPEC for Windows
 1. Restart your computer.
 2. Start Microsoft Windows (either Windows 95 or Windows 3.1x)
 3. Insert the disk labeled "Disk 1 - Setup" in drive A.
 4. From the File menu in the Program Manager, Choose Run.

5. Type **a:\setup** (See Figure 2: Setup Program Invocation)
6. Press ENTER.
7. Follow the Setup instructions on the screen.



You must install the Acrobat Reader to obtain access to the on line help. This is done the first time you run EPEC for Windows. If you do not currently have the Acrobat Reader installed, EPEC for windows will install it for you. If the Acrobat installation program starts, follow the directions on the screen.

Starting and Quitting EPEC for Windows Software

Starting EPEC for Windows

1. In Windows 3.1 or 3.11, open the program group Ford Motorsport Extreme Performance.
2. Double-click the Ford Motorsport EPEC icon.

- OR -

1. In Windows 95, click the Start button on the Task Bar.
2. Click the Programs menu.
3. Select the Ford Motorsport EPEC menu item
4. Select the Ford Motorsport EPEC program item.

For information about using your computer's operating system or the mouse, see your Windows system documentation.

Once you've started EPEC for Windows, the EPEC desktop will appear after the program loads. This is your interface to the EPEC Control Module. All calibration, configuration, logging etc. will be performed by using the EPEC menu.

Quitting EPEC for Windows

1. Select the File Menu on the EPEC desktop menu.
2. Select the "Exit" menu item.

-OR-

1. Hit the “x” key while holding down the “ctrl” key <ctrl-x>.

EPEC for Windows License Agreement

Authorized Licenses: 1

IMPORTANT-READ CAREFULLY: By opening the sealed packet(s) OR exercising your rights to make and use copies of the SOFTWARE (as may be provided for below), you agree to be bound by the terms of this General Systems Research License Agreement. If you do not agree to the terms of this agreement, promptly return this kit to the place from which you obtained it for a full refund.

General Systems Research License

1. GRANT OF LICENSE. General Systems Research grants you the right to use the enclosed General Systems Research software product, which includes "online" or electronic documents (the "SOFTWARE"), in the manner provided below.

General Systems Research grants to you as an individual, a personal, nonexclusive license to make and use copies of the SOFTWARE for the sole purposes of managing, designing, developing, and testing your system. You may install copies of the SOFTWARE on an unlimited number of computers provided that you are the only individual using the SOFTWARE. If you are an entity, General Systems Research grants you the right to designate one individual within your organization to have the right to use the SOFTWARE in the manner described above. If this is a License Pack, General Systems Research grants you the right to designate as many individuals as the primary user of the SOFTWARE as described in this section, up to the number of individual licenses authorized above.

2. UPGRADES. If the SOFTWARE is an upgrade, whether from General Systems Research or another supplier, you may use or transfer the SOFTWARE only in conjunction with the upgraded product. If the SOFTWARE is an upgrade from a General Systems Research product, you may now use that upgraded product only in accordance with this license agreement.
3. COPYRIGHT. The SOFTWARE (including images, "applets", photographs, animation's, video, audio, music and text incorporated into the SOFTWARE) is owned by General Systems Research and protected by United States copyright laws and international treaty provisions. Therefore, you must treat the SOFTWARE like any other copyrighted material (e.g. a book or musical recording) except that you either (a) make one copy of the SOFTWARE solely for backup or archival purposes, or (b) transfer the SOFTWARE to a single hard disk provided you keep the original solely for backup purposes. You may not copy the printed materials accompanying the SOFTWARE.
4. OTHER RESITRICTIONS. You may rent or lease the SOFTWARE, but you may transfer the SOFTWARE and user documentation on a permanent basis provided you retain no copies and the recipient agrees to the terms of this license agreement. You may NOT reverse engineer, decompile, or disassemble the SOFTWARE except to the extent such foregoing restriction is expressly prohibited by applicable law.

EPEC System Registration

If you would like to be notified of future updates to the EPEC system, such as EPEC for Windows upgrades, Module upgrades etc., fill out the registration form below and we will be happy to send you any future information on the EPEC system.

EPEC System Registration (97EM-6000-AA)			
To: <div style="text-align: center; padding: 20px;"> General Systems Research EPEC System Registration PO Box 604 Dearborn, MI 48128 </div>			
From:			
First Name	MI	Last Name	
Company			
Address		City	State
Phone ()	Store/Reseller Name		
EPEC for Windows Software Version (Found in "Help - About")		EPEC Module Software Version (Found in "Help - About")	
Describe your application			

EPEC System Problem/Suggestion Report

The EPEC System, both hardware and software, has been extensively tested under most conditions. However, if you believe the system is not functioning properly for any reason, or if you have a suggestion for the EPEC system, please fill out the Bug/Suggestion Form below in as much detail as possible. Please include any steps taken to re-create the bug and send it to us. We would love to hear from you.

EPEC Bug Report/Suggestion Form

To:

**General Systems Research
EPEC Bug Report
PO Box 604
Dearborn, MI 48128**

From:

Name:
Address:

Additional EPEC System Items

Low Impedance Injector Drivers

The EPEC Module as delivered will not support low impedance injectors, these require Peak and Hold type injector drivers. These injector drivers can be installed at an additional cost if your application requires them. If you require peak and hold type injector drivers, fill out the order form, enclose a check for the total amount and ship the EPEC module for the upgrade to the address shown below.

EPEC Peak and Hold Driver Order Form		
To:		
General Systems Research Peak and Hold Drivers PO Box 604 Dearborn, MI 48128		
Quantity	Cost Each	Total
8	X \$15.00	\$120.00
Shipping & Handling <small>(Allow 2-4 weeks for delivery)</small>		\$10.00
Total:		\$130.00
From:		
Name:		
Address:		

EPEC User Manual

If you do not have the facility to print a full copy of the EPEC User Manual, a bound copy can be purchased for \$75.00 plus \$10.00 shipping and handling. If you wish to purchase a copy of the EPEC User Manual fill out the order form below and enclose a check or money order for the proper amount:

EPEC User Manual Order Form		
To: <div style="text-align: center;"> General Systems Research EPEC User Manual PO Box 604 Dearborn, MI 48128 </div>		
Quantity	Cost Each	Total
	X 75.00	
Shipping & Handling <small>(Allow 2-4 weeks for delivery)</small>		\$10.00
Total:		
From: <div style="margin-left: 20px;"> Name: Address: </div>		

Serial Interface Cables

A 6 ft. serial interface cable was supplied with your EPEC kit, however, if you require an extra long cable, one can be custom manufactured to your specific requirements. If you wish to purchase a custom serial interface cable, fill out the order form below and enclose a check or money order for the proper amount:

EPEC Serial Cable Order Form

To:

**General Systems Research
EPEC Serial Cable
PO Box 604
Dearborn, MI 48128**

Length <small>(Up to 75 ft.)</small>	Cost per foot	Total
	X 2.00	
Shipping & Handling <small>(Allow 2-4 weeks for delivery)</small>		\$10.00
Total:		

From:

Name:

Address:

EPEC for Windows



In This Chapter

EPEC for Windows a Closer Look

EPEC for Windows Desktop

 EPEC for Windows Main Menu

 EPEC for Windows Status Bar

File Menu

 Open Calibration...

 Save Calibration...

 Save Calibration As...

 Close Calibration

 Delete Calibration...

 Export Calibration

 Import Calibration

 Exit

Edit Menu

Data Acquisition Menu

Data Logging Menu

Tools Menu

Options Menu

 Communications

 Units

Window Menu

Help Menu

EPEC for Windows a Closer Look

The EPEC for Windows software is your interface to the EPEC module. This interface includes the opening of calibrations, calibration editing, data acquisition and data logging. This interface is a very advanced, easy to use interface not found in any other aftermarket engine control system. This chapter will take you through the basics of EPEC for Windows including the menu and navigating your way around the EPEC system.

EPEC for Windows is a fully menu driven software package specifically written for Microsoft Windows. It has a very logical menu layout which is easy to understand and navigate through and contains many advanced features not available on any other engine control or calibration system today.

EPEC for Windows provides the following advanced features not found in any other calibration system available today:

- Easy to use and understand menu system
- On screen status bar of calibration and module connection status.
- Low battery computer crash protection.
- On line Users Manual.
- Most advanced calibration editing functions available.
- Calibration Revision Control
- Calibration Revision Notes.
- On Screen Data Acquisition for watching internal EPEC Parameters.
- High Speed Data Logging.

EPEC for Windows Desktop

The desktop is the main window in the EPEC for Windows calibration software. From the desktop, you can access the EPEC module calibration screens, Data Acquisition screens and Data Logging screens.

IMPORTANT: If you do not have a mouse, all menus and buttons with an underlined letter such as File can be opened by holding the “Alt” key and pressing the underlined letter, i.e. “Alt-F” for “File”.

EPEC for Windows Main Menu

Figure 3: EPEC Desktop shows the EPEC desktop. When EPEC for Windows is started the main menu will appear at the top of the desktop window. There are various menu items contained on the EPEC for Windows desktop; File, Edit, Data Acquisition, Data Logging, Tools, Options, Window and Help. All of the EPEC functions can be accessed from these menus including opening calibrations, viewing a data acquisition window and uploading logged data from the EPEC module.

NOTE: When EPEC for Windows is started, the “EDIT” menu will not appear. The “EDIT” menu will appear when you open a calibration.

EPEC for Windows Status Bar

The EPEC for Windows status bar is located along the bottom of the desktop window. The status bar is an onscreen display of the currently open calibration and the module connection status. The status bar is split into 4 different areas; the open calibration name is shown on the left of the status bar. The “Connected” button indicates when the EPEC module is connect to the PC, a blank button box means the EPEC for Windows software does see the EPEC module attached to the PC. The “Powered” button indicates when the EPEC module is powered up and ready to communicate, a blank button means the EPEC module is not powered. The “Loaded” button indicates if the current open calibration has been written and verified in the EPEC module, a blank button means that the current calibration has not been verified in the EPEC module. The “Metric” button indicates which units are currently selected, this button will either display “English” or “Metric”.

IMPORTANT: Many computers have modems installed. If the EPEC for Windows software is using a comm. port that is connected to a modem, the “Connected” button may appear.

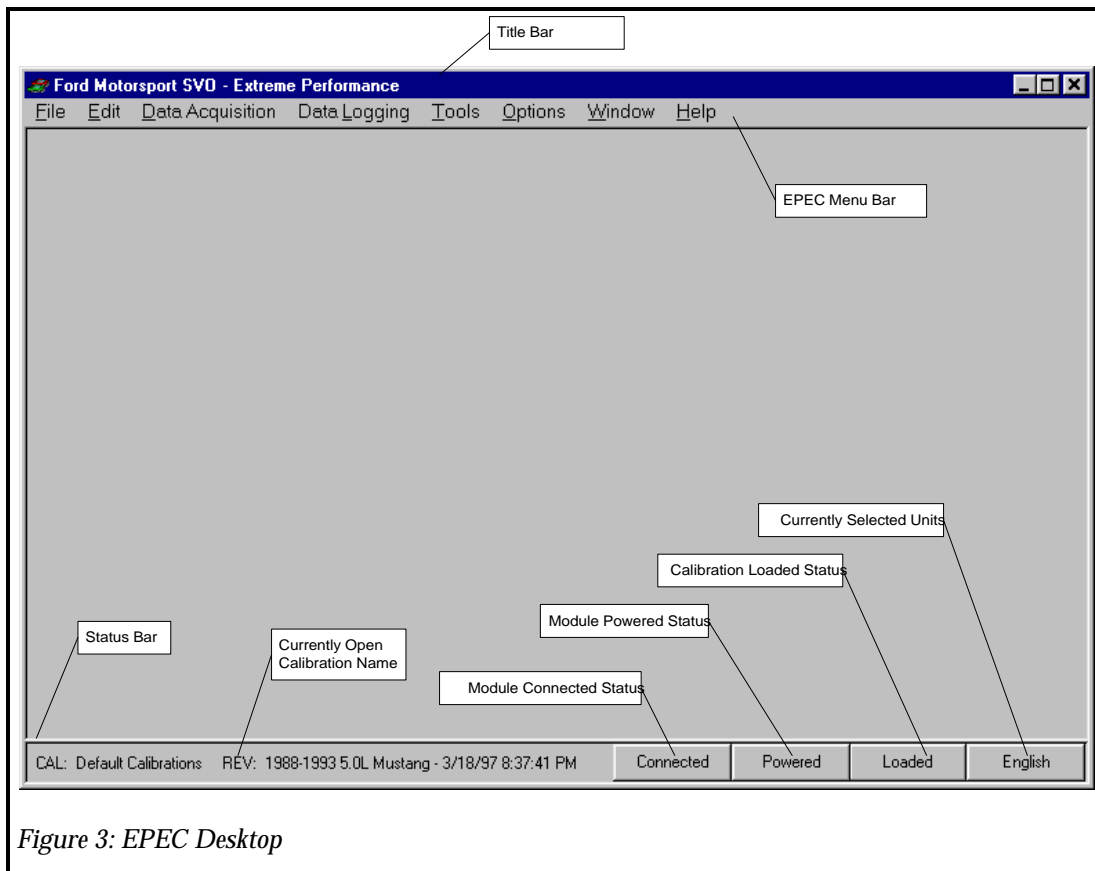


Figure 3: EPEC Desktop

File Menu

The File Menu contains the following menu items: “Open Calibration”, “Save Calibration”, “Save Calibration As...”, “Close Calibration”, “Delete Calibration”, “Export Calibration”, “Import Calibration”, “Upload Calibration from Module” and “Exit”. The file menu is shown in Figure 4: File Menu. This menu can be accessed by either clicking on it with the mouse or pressing “Alt-F”.

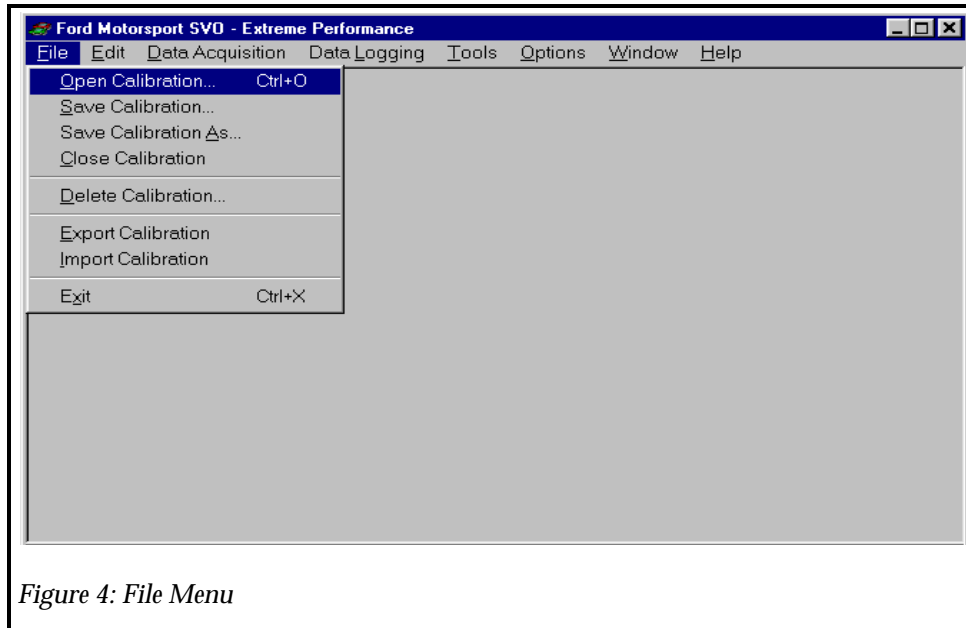


Figure 4: File Menu

Open Calibration...

The “Open Calibration...” menu item is used to open a previously stored EPEC module calibration. When you select this menu item the “Open Calibration” dialog box will appear see Figure 5: Open Calibration Dialog Box. To open a calibration click on the calibration you want to open in the calibration list, then click on the revision of that calibration you want to open. The current selections should be highlighted, then click on the “Open” button. The “Cancel” button will close the Open Calibration dialog box without opening it. The “Help” button will open the on line help for the Open Calibration dialog box.

NOTE: The Open Calibration dialog box can be selected at any time by pressing the control key and pressing “O” (ctrl-O).

IMPORTANT: If the EPEC module is connected to the PC when you open a calibration, it WILL be written to the EPEC module.

NOTE: You can edit the revision comments when you save a calibration or at any time by clicking in the comments box in the Open Calibration dialog box and typing new comments.

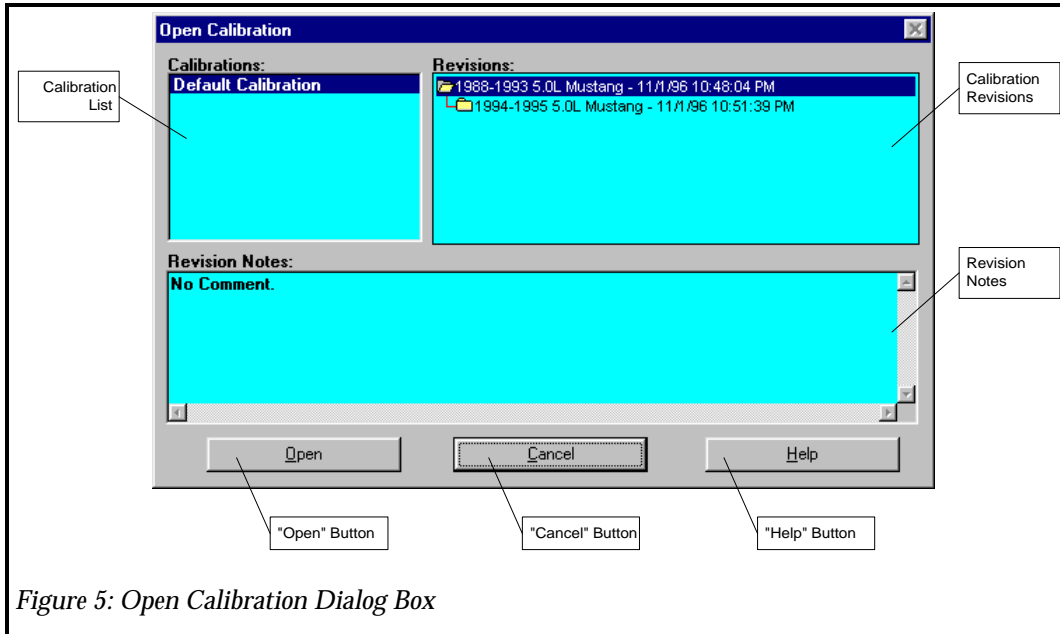


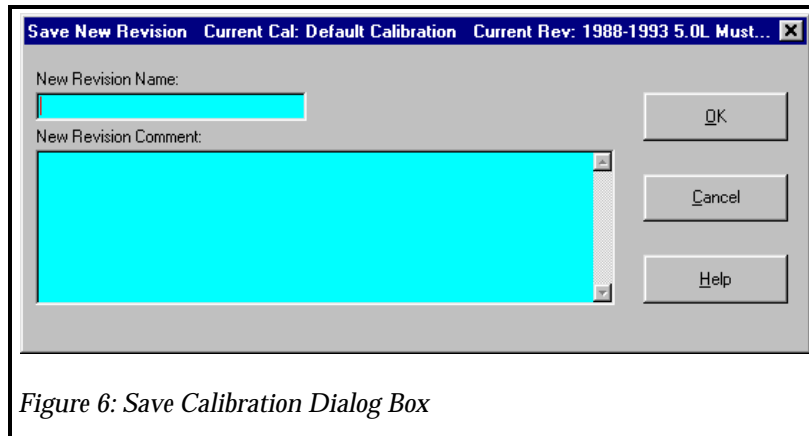
Figure 5: Open Calibration Dialog Box

Save Calibration...

The “Save Calibration...” menu item is used to save a new revision of the currently open calibration. When you select this menu item the “Save Calibration” dialog box will appear see Figure 6: Save Calibration Dialog Box. To save a calibration revision, click on the “File” menu and select “Save Calibration”. The “Save New Revision” dialog box will then appear. Type the new name in the “New Revision Name” box. You can enter any notes for the new revision in the “Revision Notes” box (or you can enter them later from the “Open Calibration” dialog box). When you click on the “OK” button, the currently open calibration will be saved as a new revision.

IMPORTANT: If the EPEC module is connected to the PC when you open a calibration, it WILL be written to the EPEC module.

NOTE: You are not limited to the MS-DOS 8.3 file naming convention, you can enter revision and calibration names up to 32 characters in length. You can include any characters including spaces.



Save Calibration As...

The “Save Calibration As...” menu item is used to save the currently open calibration as a new Calibration and Revision. When you select this menu item the “Save Calibration As...” dialog box will appear see Figure 7: Save Calibration As... Dialog Box. To save a calibration, click on the “File” menu and select “Save Calibration As...”. The “Save Calibration As” dialog box will then appear. Type the new calibration name in the “New Calibration Name” box. Click on the “Initial Revision Name” box and type the new initial revision name. You can enter any notes for the new revision in the “New Calibration Comment” box (or you can enter them later from the “Open Calibration” dialog box). When you click on the “OK” button, the currently open calibration will be saved as a new calibration.

IMPORTANT: If the EPEC module is connected to the PC when you open a calibration, it WILL be written to the EPEC module.

NOTE: You are not limited to the MS-DOS 8.3 file naming convention, you can enter revision and calibration names up to 32 characters in length. You can include any characters including spaces.

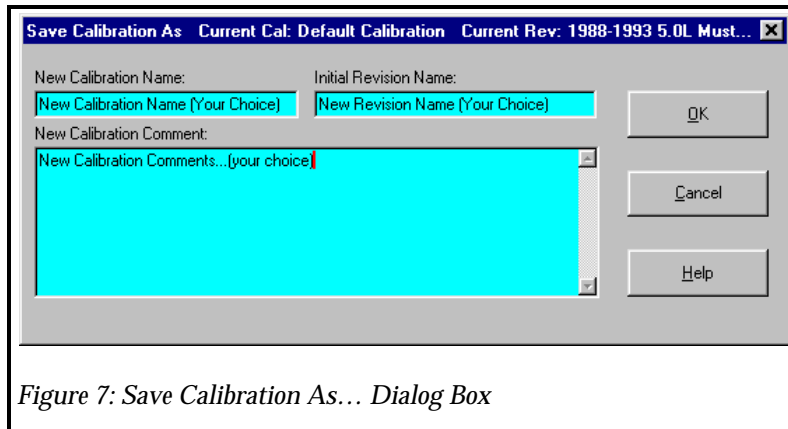


Figure 7: Save Calibration As... Dialog Box

Close Calibration

The “Close Calibration” menu item is used to close the currently opened calibration. If you close the calibration and changes have been made, EPEC for windows will warn you that you have made changes and ask if you would like to save the changes. Select “Yes” or “No”. If you select “Yes”, the “Save Calibration” dialog box will appear.

Delete Calibration...

The “Delete Calibration...” menu item is used to delete stored calibrations. When you select this menu item the “Delete Calibration” dialog box will appear see Figure 8: Delete Calibration Dialog Box. To delete a calibration, click on the calibration you want to delete in the calibration list, then click on the revision of that calibration you want to delete. The current selections should be highlighted, then click on the “Delete” button. The “Cancel” button will close the Delete Calibration dialog box without deleting any calibrations. The “Help” button will open the on line help for the Delete Calibration dialog box.

IMPORTANT: If you select a parent calibration that has calibrations below it, the parent calibration along with the calibrations below it WILL be deleted.

IMPORTANT: You cannot delete a calibration from the MS-DOS command line, you must use the “Delete Calibration...” menu item. None of the calibrations exist as MS-DOS file names, they are all stored in the “cal.mdb” file. DO NOT FOR ANY REASON DELETE THE “CAL.MDB” FILE. IF YOU DO ALL CALIBRATIONS WILL BE LOST AND THE EPEC FOR WINDOWS SOFTWARE WILL HAVE TO BE REINSTALLED.

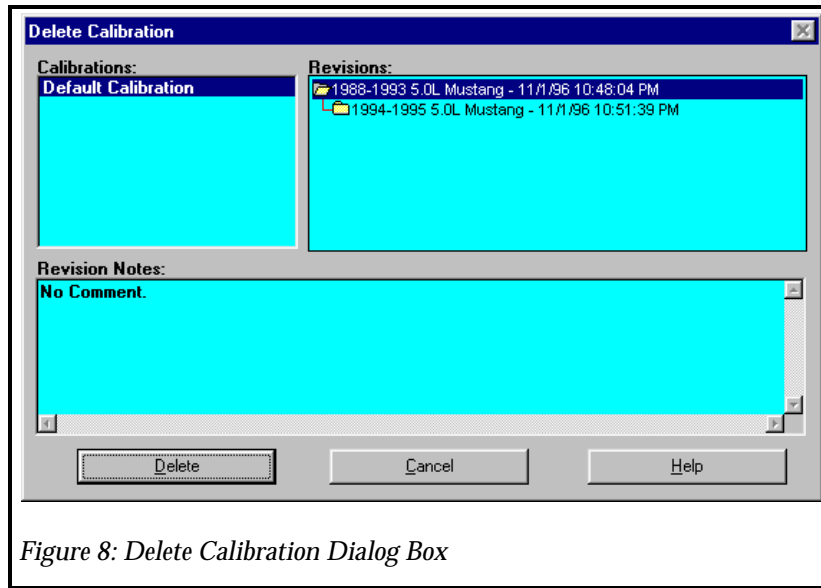


Figure 8: Delete Calibration Dialog Box

Export Calibration

The “Export Calibration” menu item is used to export a stored calibration to a file. This is used to share calibrations with other people. When you select this menu item the “Export Calibration” dialog box will appear see Figure 9: Export Calibration Dialog Box. To export a calibration, click on the calibration you want to export in the calibration list, then click on the revision of that calibration you want to export. The current selections should be highlighted, then click on the “Export” button. The “Cancel” button will close the Export Calibration dialog box. The “Help” button will open the on line help for the Export Calibration dialog box.

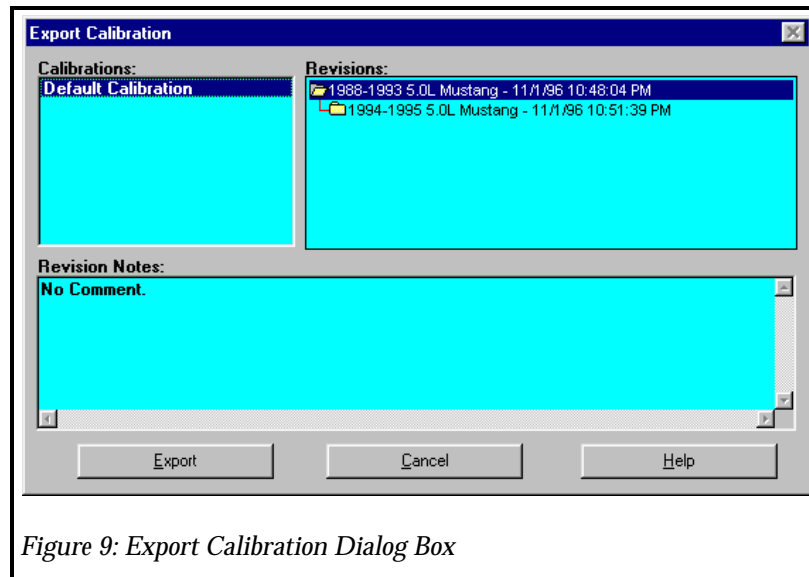


Figure 9: Export Calibration Dialog Box

Once you select the “Export” button, the “Export Calibration Save” dialog box will appear. See Figure 10: Export Calibration Save Dialog Box. Type the MS-DOS path and file name in the “File Name” box and select “OK” to save the selected calibration as a MS-DOS file.

IMPORTANT: Once the calibration is exported to a MS-DOS file, you can “import” the calibration on another computer.

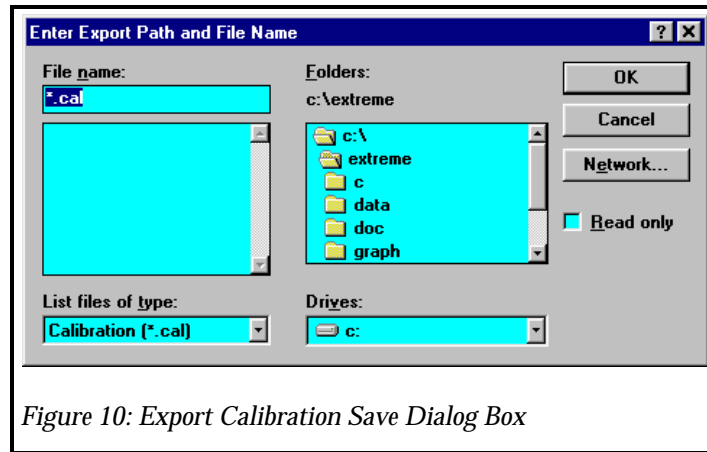


Figure 10: Export Calibration Save Dialog Box

Import Calibration

The “Import Calibration” menu item is used to import an exported MS-DOS file to a calibration. This is used to share calibrations with other people. When you select this menu item the “Import Calibration” dialog box will appear see Figure 11: Import Calibration Dialog Box. To import a calibration, click on or type the MS-DOS file you want to import, then click “OK”. The “Cancel” button will close the “Import Calibration” dialog box. The “Help” button will open the on line help for the “Import Calibration” dialog box.

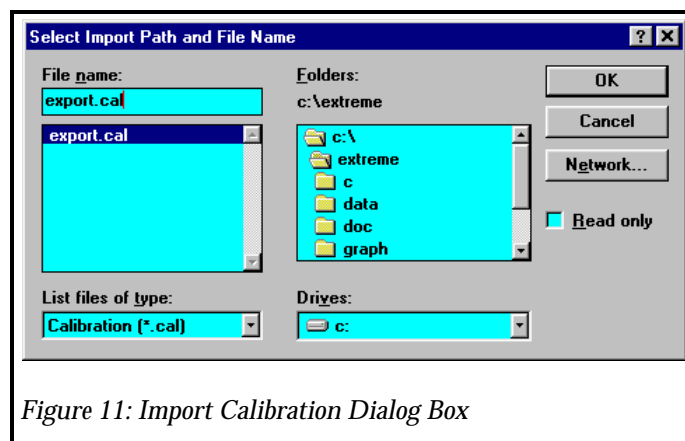


Figure 11: Import Calibration Dialog Box

Once you select the “OK” button, the “Import Calibration Save” dialog box will appear. Type the new calibration name in the “Import Calibration Name” box then type the new revision name in the “Import Revision Name” box and select “OK” to save the MS-DOS file as a new calibration, see Figure 12: Import Calibration Save Dialog Box.

IMPORTANT: The MS-DOS file must be an exported calibration from EPEC for Windows.

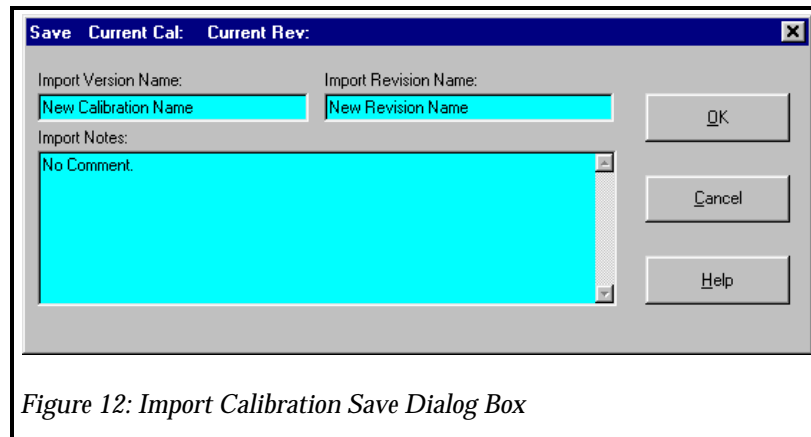


Figure 12: Import Calibration Save Dialog Box

Exit

The “Exit” menu item is used to exit the EPEC for Windows program. This menu item can be accessed holding the control key and pressing “X” (ctrl-X) at any time while in the program.

Edit Menu

The Edit Menu contains the following menu items; “Fuel”, “Spark”, “Nitrous Oxide”, “Engine RPM Limits”, “Manual Fuel/Spark Control”, “Engine Configuration”, “Input/Output Configuration”, “Module Configuration”, “Programmable Outputs” and “Analog Channel Calibration”. The edit menu is shown in Figure 13: Edit Menu. This menu can be accessed by either clicking on it with the mouse or pressing “Alt-E”.

All of the calibration parameters contained within the EPEC Module are accessed from the edit menu. The Edit menu has a very logical layout for ease of use. The “Fuel” sub-menu is for accessing all of the fuel parameters contained within the EPEC Module. The “Spark” sub-menu is for accessing all the spark parameters within the EPEC module and so on. For detailed descriptions of each of the “Edit” sub-menus refer to [EPEC Control Strategy chapter..](#)

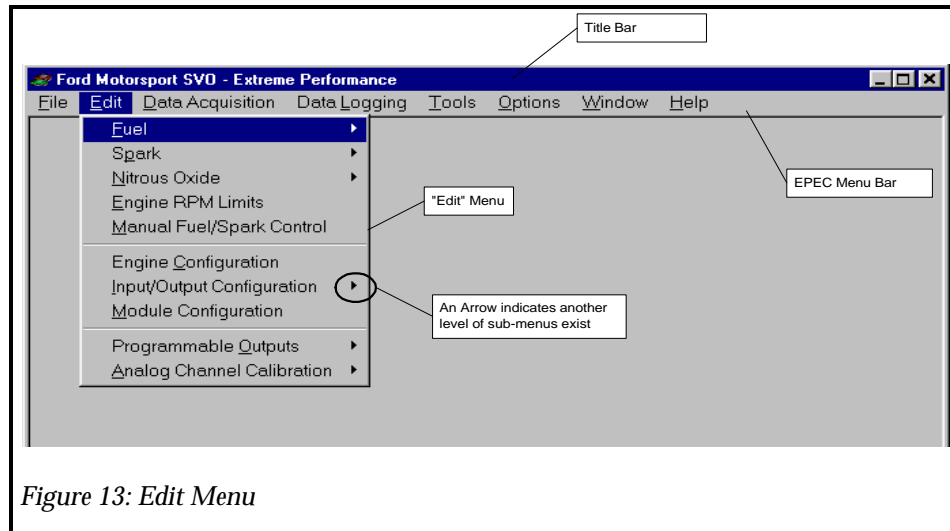


Figure 13: Edit Menu

Data Acquisition Menu

The Data Acquisition Menu contains the following menu items; “New Acquisition Set...”, “Open Acquisition Set...”, and “Delete Acquisition Set...”. The Data Acquisition menu is shown in Figure 14: Data Acquisition Menu. This menu can be accessed by either clicking on it with the mouse or pressing “Alt-D”.

Data Acquisition is an on screen display of internal EPEC parameters. For more information on Data Acquisition, see the EPEC for Windows chapter.

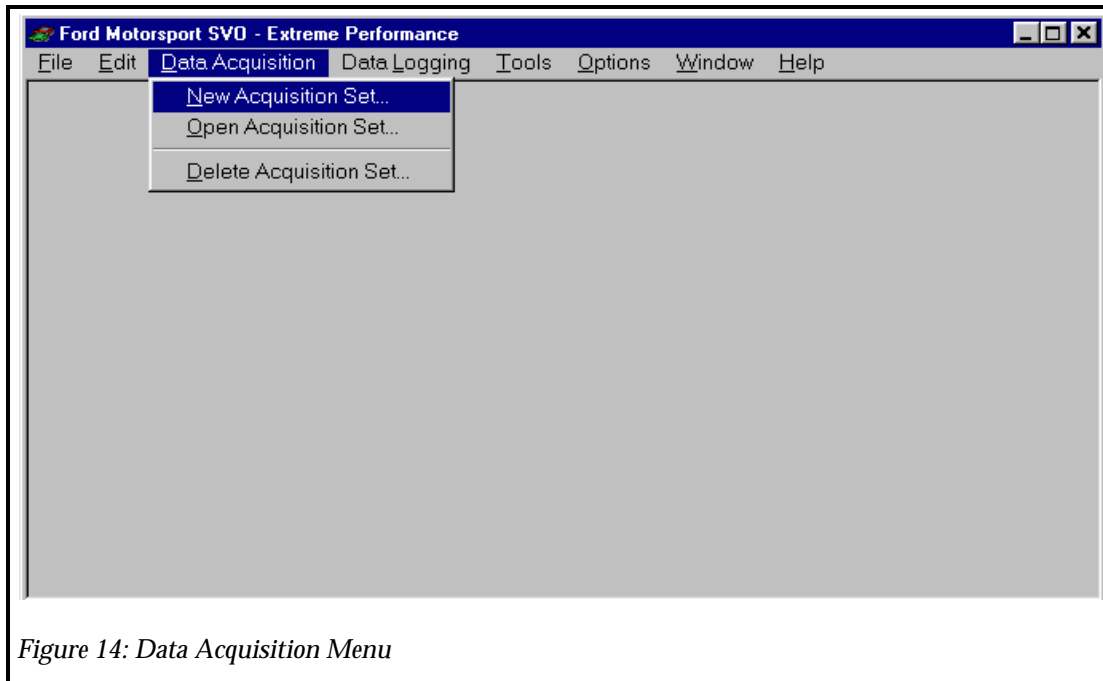


Figure 14: Data Acquisition Menu

Data Logging Menu

The Data Logging Menu contains the following menu items; “New Log Set...”, “Open Log Set...”, “Delete Log Set...”, “New/Upload Log Data” and “Open/Graph Log Data”. The Data Logging menu is shown in Figure 15: Data Logging Menu. This menu can be accessed by either clicking on it with the mouse or pressing “Alt-L”.

The Data Logging menu is used to setup, upload and display the data that is recorded internally within the EPEC module. For more information on Data Logging, see the [Data Logging chapter](#).

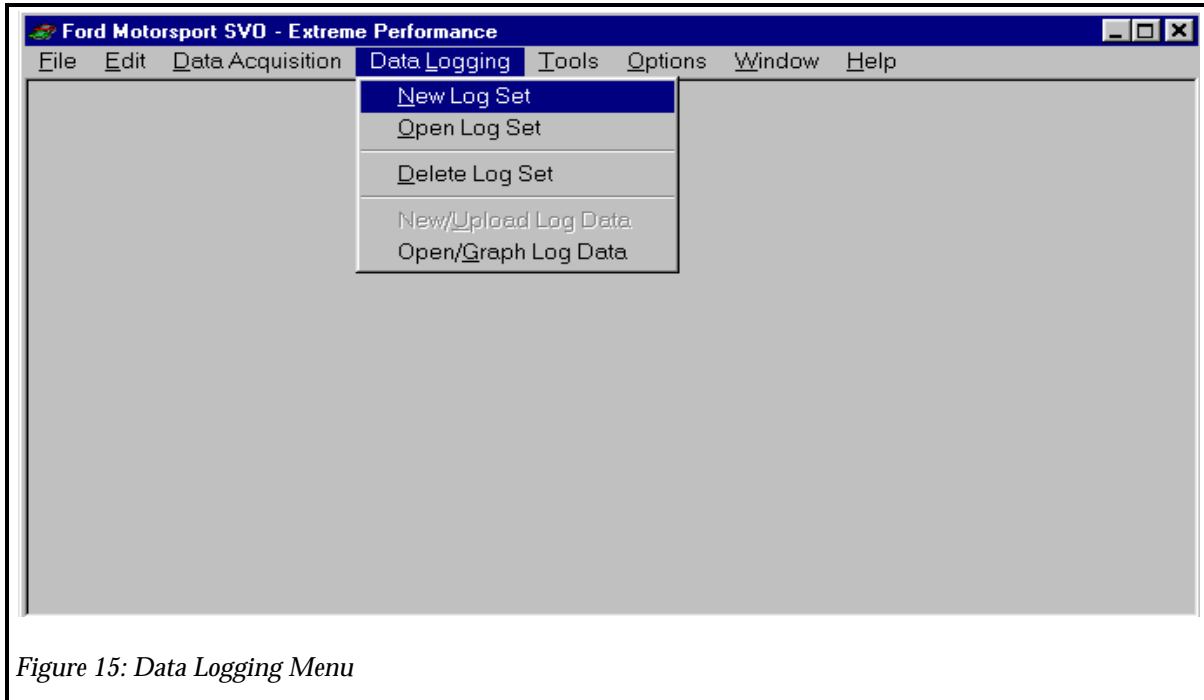


Figure 15: Data Logging Menu

Tools Menu

The Tools menu only contains 1 menu item, the calculator. The calculator is the MS Windows calculator that is shipped with Windows. This is provided as a convenient way to access it, instead of searching through the program manager to find it. Figure 16: Tools Menu shows the Tools Menu.

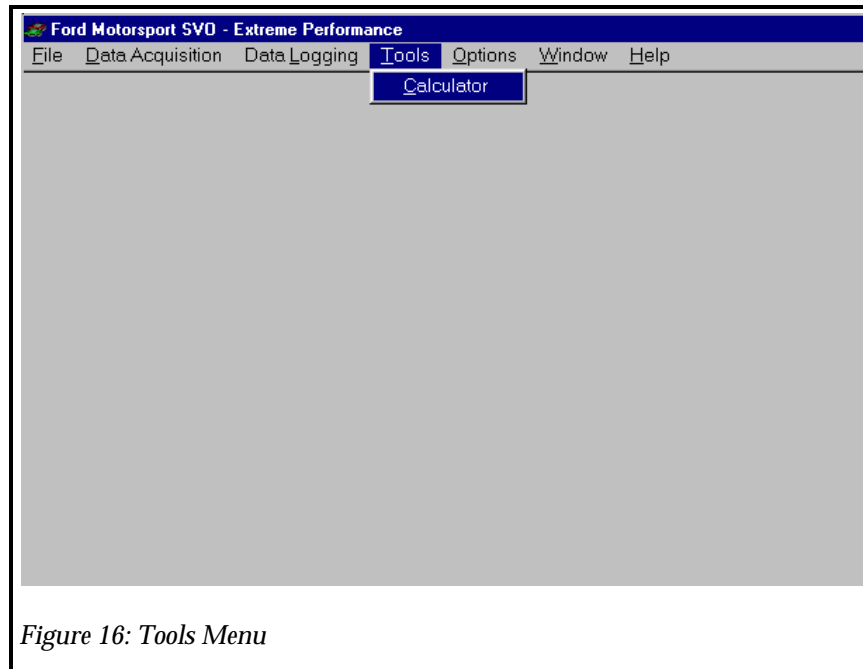


Figure 16: Tools Menu

Options Menu

The Options Menu contains the following menu items; “Communications...” and “Units”. The Options menu is shown in Figure 17: Options Menu. This menu can be accessed by either clicking on it with the mouse or pressing “Alt-O”.

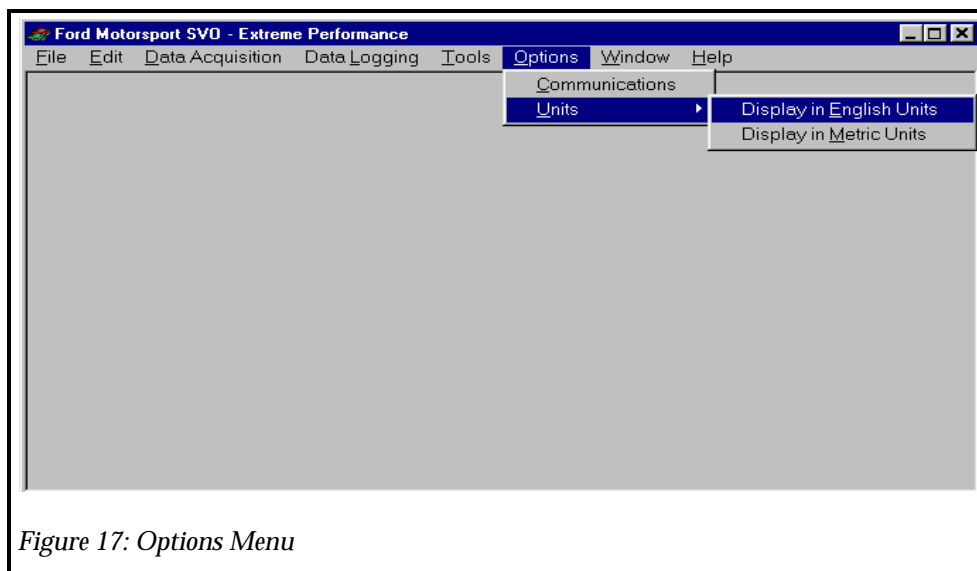


Figure 17: Options Menu

Communications

The Communications menu item is used to select which PC communication port the EPEC module will be connected to. This port can be changed at any time and once set will retain that setting until it is changed. Communications ports 1 - 4 are supported by the EPEC for Windows software (com1 - com4). To access the Communications settings, select the “Options” menu by either clicking on it with the mouse or pressing “Alt-O”. Then select “Communications”. The “Communications” dialog box will then appear as shown in Figure 18: Communication Configuration Dialog Box.

To select a different communications port, either click on it or hold the “Alt” key while pressing the port number 1 - 4, then select “OK”.

NOTE: If a port is “grayed” out, this means that port is not available and you cannot select it.

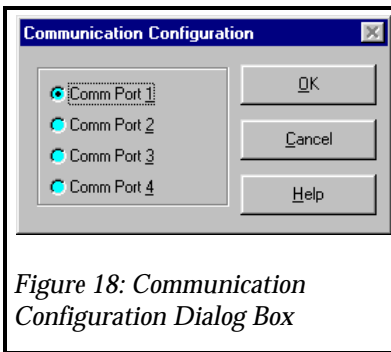


Figure 18: Communication Configuration Dialog Box

Units

The units menu item has 2 sub-menus to select the display units for all of the calibration edit screens. If you select a unit from this menu, it will globally change all of the open edit windows.

Window Menu

The Window Menu contains the following menu items; “Minimize”, “Close”, “Close All”, “Tile” and “Cascade”. The Window menu is shown in Figure 19: Window Menu. This menu can be accessed by either clicking on it with the mouse or pressing “Alt-W”.

The “Minimize” menu item is used to shrink the current window down to an icon view. The “Close” menu item is used to close the window. This close is the same as the “Close” button on each window. The “Close All” menu item is a short cut to close all open windows instead of closing each one manually. The “Tile” menu item is used to tile all open windows within the desktop window. The “Cascade” menu item will arrange all open windows in the desktop on top of each other, but they are still accessible. Below the “Cascade” menu item is a list of all open windows on the desktop. You can use this list to bring the window to the top if it is open but not visible.

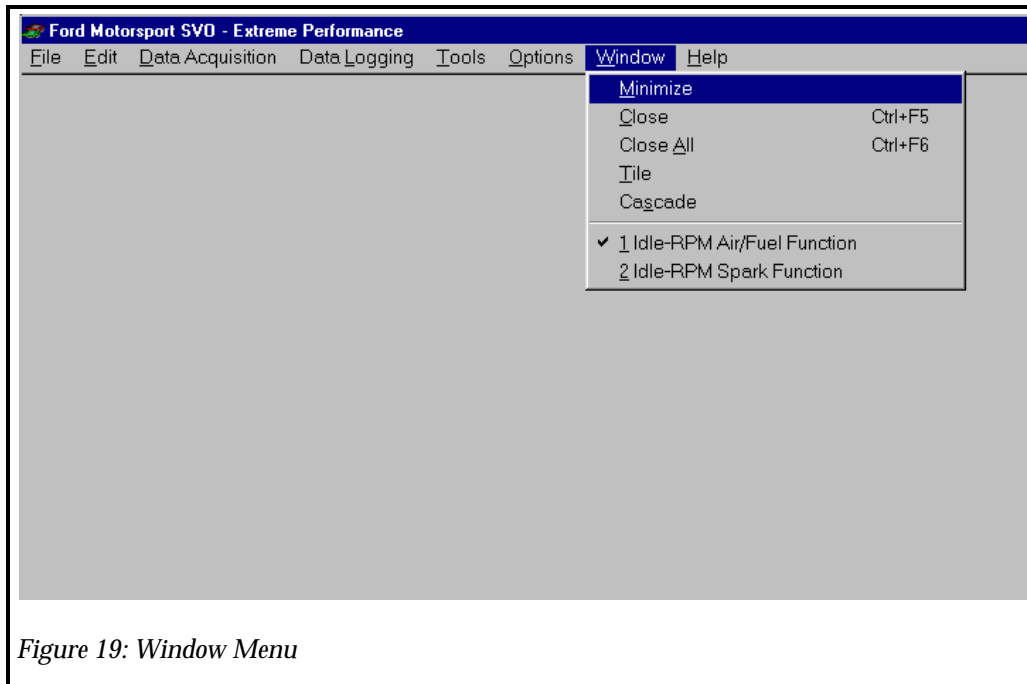


Figure 19: Window Menu

Help Menu

The Help Menu contains menu items associated with the help system. The Help menu is shown in Figure 20: Help Menu. This menu can be accessed by either clicking on it with the mouse or pressing "Alt-H". From the Help menu you can open different parts of the EPEC Users Guide or you can open the entire book on line. You do not have to carry a large printed book with you to the track.

To Access any of the Help topics, simply click on the topic you want or press the hot key while holding down the "Alt" key.

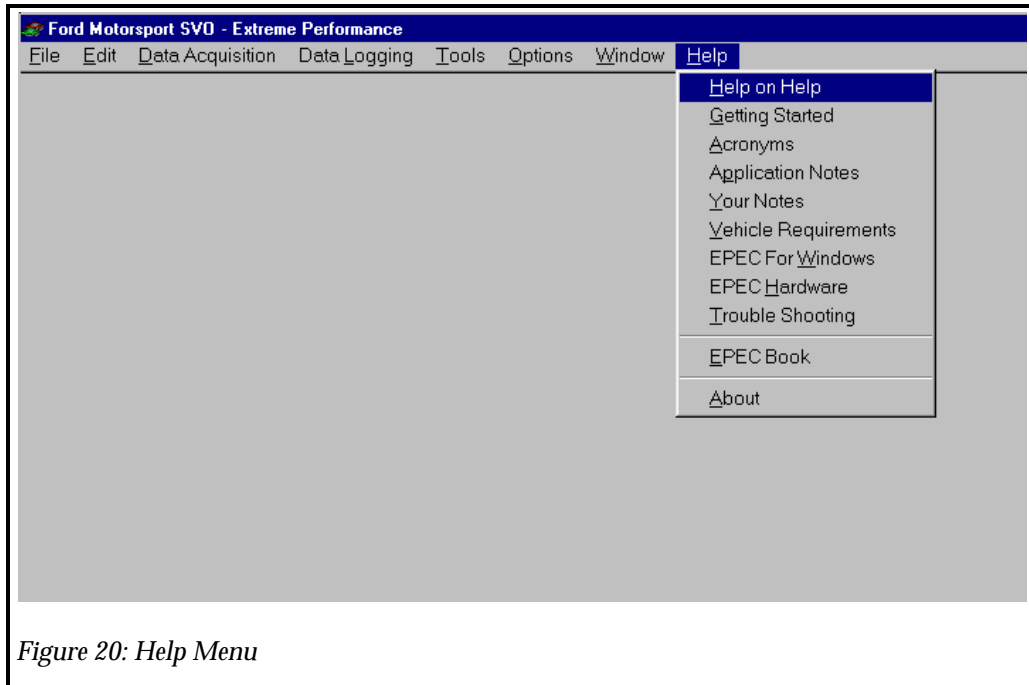
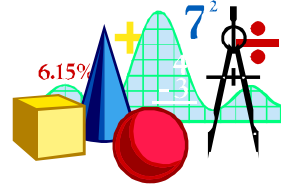


Figure 20: Help Menu

EPEC Control Strategy



In This Chapter

Fuel Strategy

- Base Fuel (Idle, Part Throttle, WOT Air/Fuel Ratio)
- Fuel Modifiers
 - Air Charge Temperature (ACT) Fuel
 - Engine Coolant Temperature (ECT) Fuel
 - Throttle Position (TP) Fuel
 - Manifold Absolute Pressure (MAP) Fuel
- Cranking Fuel
- Injector Offset
- Transitional Fuel Enrichment (TFE)
- Transitional Fuel Enrichment TP Multiplier
- Programmable Output 0-3 Fuel Multipliers
- Analog Channel 0-2 Fuel Multipliers

Spark Strategy

- Idle Spark Advance
- Part Throttle Spark Advance
- WOT Spark Advance
- Air Charge Temperature (ACT) Spark
- Boost Retard
- Engine Coolant Temperature (ECT) Spark
- Manifold Absolute Pressure (MAP) Spark
- Nitrous Oxide Spark Retard
- Throttle Position (TP) Spark
- Programmable Output Channel 0-3 Spark
- Analog Channel 0-2 Spark

Nitrous Oxide Strategy

- Nitrous Oxide Globals
- Nitrous Oxide Stage 1 and Stage 2 Controls

Engine RPM Limiters

- Fuel Rev Limit
- Spark Rev Limit
- Stage Rev Limit

Manual Fuel/Spark Control

Engine Configuration

Input/Output Configuration

ACT Transfer Function
ECT Transfer Function
MAF Transfer Function
MAP Transfer Function
TP Transfer Function
TP Sensor Configuration
PIP Configuration
Spark Output (SPOUT) Configuration
Module Configuration
Programmable Output Channels 0 - 3
Analog Channels 0 - 2 Calibration

Fuel Strategy

The fuel strategy calculates the fuel flow to your engine. If you are familiar with carburetors, this is equivalent to setting main jet sizing, power valve selection, and idle air bleeds. This section will take you through the basic fuel control strategy and typical settings.

If you are not already familiar with Air/Fuel ratios, the following will help. The air/fuel ratio setting is the ratio of the pounds of air the engine is ingesting (measured by the Mass Air Flow meter) divided by the amount of fuel delivered. The limiting factor on performance is the engine hardware and the amount of air the engine is capable of ingesting. The goal is to have the EPEC deliver the amount of fuel to get the maximum engine output (torque and horsepower).

Typical Air/Fuel ratios for optimum output range from 11.5:1 to 13.5:1 depending on the camshaft overlap, engine burn rate, and cylinder to cylinder air and fuel distribution. That's right even with port fuel injection the air and fuel to each cylinder is not the same as all fuel injectors do not flow exactly the same and intake manifold design does not provide the same air flow to each cylinder, based on local restrictions. With that said a typical starting point for Wide Open Throttle Air/Fuel ratio is 12.5:1. Part throttle and idle typically run closer to 14.6:1 or stoichiometry. stoichiometry is the chemically correct amount of fuel that would be completely burned if all the air in the combustion chamber was to mix with all the fuel. The reason why WOT Air/Fuel ratios are richer (more fuel for each unit of air) is to ensure all the oxygen mixes with fuel and thus ensuring all the oxygen is utilized. Another factor is during camshaft overlap, some raw fuel is scavenged or goes directly out the exhaust port and thus is not available for combustion.

Figure 21: Fuel Strategy Block Diagram shows all of the fuel parameters available.. This includes 2 dimensional functions, scalar values, and control options. Table 1: Fuel Strategy Parameters outlines both the calibratable and non-calibratable functions for the entire fuel strategy. The non-calibratable values can be either generated by another function or directly from a sensor.

Name	Type	Notes
Calibratable Functions/Scalars		
Injector Offset	2 dimensional function	Used for injector response time correction
Idle Fuel	2 dimensional function	Used when Throttle Mode is Idle to determine Air/Fuel Ratio.
Part Throttle Fuel	2 dimensional function	Used when Throttle Mode is Part Throttle to determine Air/Fuel Ratio.
WOT Fuel	2 dimensional function	Used when Throttle Mode is WOT to determine Air/Fuel Ratio.
TP Fuel	2 dimensional function	Used to determine the TP Fuel Multiplier.
ACT Fuel	2 dimensional function	Used to determine the ACT Fuel Multiplier
ECT Fuel	2 dimensional function	Used to determine the ECT Fuel Multiplier.

Name	Type	Notes
MAP Fuel	2 dimensional function	Used to determine the MAP Fuel Multiplier.
Analog Channel 0-2 Fuel	2 dimensional function	Used to determine the each of the Analog Channel 0-2 Fuel Multiplier.
Crank Fuel	2 dimensional function	Used to determine the Fuel PW in crank mode.
Base Transitional Fuel	2 dimensional function	Used to determine the Base Transitional Fuel Enrichment.
TP Correction	2 dimensional function	Used to determine the Transitional Fuel TP Correction.
Programmable 0-3 Fuel	Scalar	There is 2 fuel multipliers for each channel, an "ON" and "OFF" fuel multiplier.
Injector Size	Scalar	Used to specify injector size
Manual Air/Fuel Ratio	Scalar	Used to specify desired A/F in manual mode
Control Type	Scalar	Used to specify the Control Type either "Automatic" or "Manual".
Non-Calibratable Values		
Base Transitional Fuel Enrichment	Scalar	This value is the current Base Transitional Fuel amount.
Engine Speed	Scalar	Current Engine Speed.
Air Mass	Scalar	Current Air Mass determined by the MAF Transfer Function.
Battery Voltage	Scalar	Current Battery Voltage.
Throttle Mode	Scalar	Current Throttle Mode (Idle, Part Throttle or WOT) based on the Relative Throttle Position.
Relative Throttle Position	Scalar	Current Throttle Position "relative" to the initial Throttle Position.
ACT	Scalar	Current Air Charge (inlet) Temperature, determined from the ACT Transfer Function.
ECT	Scalar	Current Engine Coolant Temperature, determined from the ECT Transfer Function.
MAP	Scalar	Current Manifold Absolute Pressure, determined from the MAP Transfer Function.

Name	Type	Notes
Analog Channel 0-3 Volts	Scalar	Current input voltage on each of the Analog Channels.
Desired Air/Fuel	Scalar	Current Desired Air/Fuel Ratio based on Throttle Mode and one of the 3 tables; Idle Fuel, Part Throttle Fuel or WOT Fuel.
TP Fuel	Scalar	Current Throttle Position Fuel Multiplier, determined from the TP Fuel Function.
ACT Fuel	Scalar	Current Air Charge (inlet) Temperature Fuel Multiplier, determined from the ACT Fuel Function.
ECT Fuel	Scalar	Current Engine Coolant Temperature Fuel Multiplier, determined from the ECT Fuel Function.
MAP Fuel	Scalar	Current Manifold Absolute Pressure Fuel Multiplier, determined from the MAP Fuel Function.
Analog Channel 0-2 Fuel	Scalar	Current Analog Channel 0-2 Fuel Multipliers, determined from each of the Analog Channel 0-2 Fuel Function.
Throttle Angle Rate	Scalar	Current Throttle Angle Rate determined from the Relative Throttle Position.
Transitional Fuel Enrichment	Scalar	Current Transitional Fuel Enrichment based on Base Transitional Fuel function.
Transition TP Fuel	Scalar	Current Transitional TP Fuel Multiplier based on the TP Correction function.
Transitional Fuel PW	Scalar	Current Transitional Fuel PW based on Transitional Fuel Enrichment and Transitional TP Fuel values.
Fuel Pulse Width	Scalar	Current Fuel Pulse Width that is being delivered to the engine.

Table 1: Fuel Strategy Parameters

IMPORTANT: All of the fuel multipliers are cumulative so be *very cautious*, if you take advantage of the full flexibility of this system you will have several multipliers to the base fuel tables and will more than likely need to look at the Data Acquisition Window or use Data Logging to see the actual requested A/F ratio and/or Fuel Pulse Width.

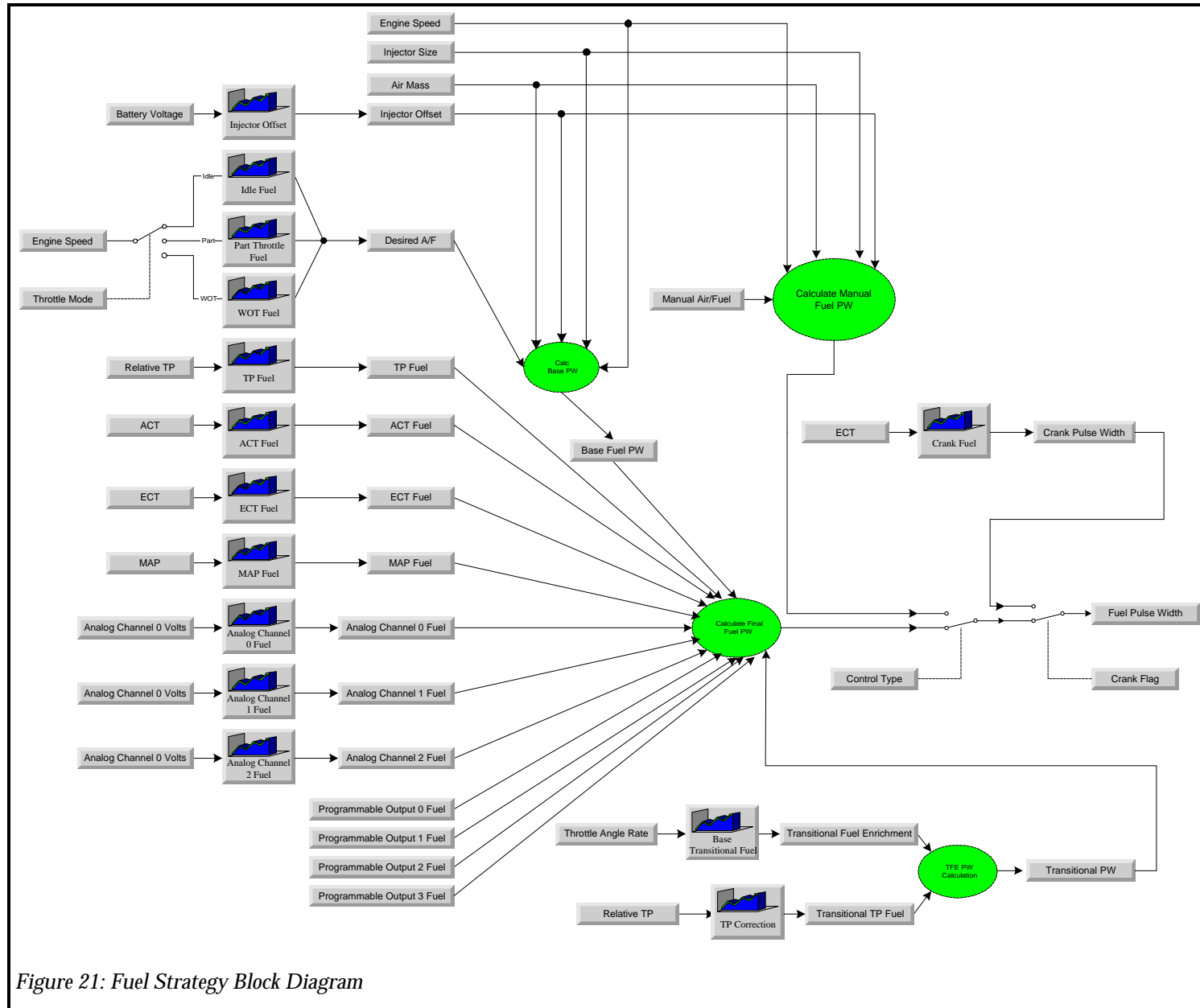


Figure 21: Fuel Strategy Block Diagram

Base Fuel (Idle, Part Throttle, WOT Air/Fuel Ratio)

The Base Fuel control strategy is comprised of either Idle, Part Throttle or WOT Air/Fuel ratio tables. Only one of these tables are used at once and is selected by the current Throttle Mode (Idle/Part/WOT), see Figure 22: Idle/Part/WOT Fuel Strategy Diagram.

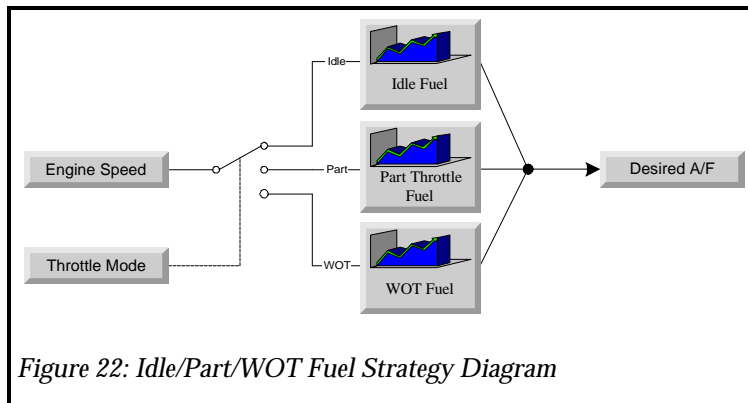


Figure 22: Idle/Part/WOT Fuel Strategy Diagram

To change to base fuel, click on the “Edit” menu. Once the options appear, click on “Fuel”, see Figure 23: Idle/Part/WOT Fuel Menu.

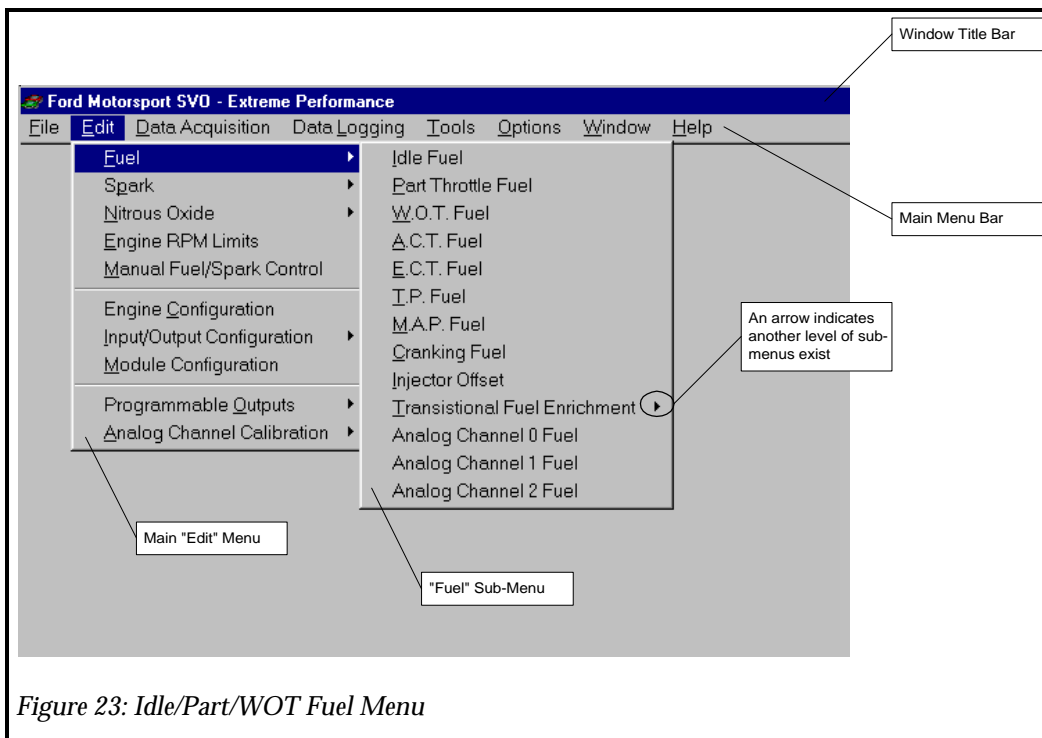


Figure 23: Idle/Part/WOT Fuel Menu

By clicking on one of the options, Idle Fuel , Part Throttle Fuel or WOT Fuel, a two dimensional function (table) will appear for the requested fuel range. This function (table) allows you to specify an Air/Fuel curve based on Engine Speed (RPM). The three functions (Idle, Part, WOT) allow you to specify a different Air/Fuel curve for each operating condition.

Recommended starting points for each function are shown in Table 2: Recommended Air/Fuel Ratios.

<i>Operating Range</i>	<i>Recommended Air/Fuel</i>	<i>Notes</i>
Idle Air/Fuel Ratio	13.0:1 to 14.0:1	Depends on camshaft overlap
Part Throttle Air/Fuel Ratio	12.5:1 to 15.0:1	Depends on camshaft overlap and fuel economy
WOT Air/Fuel Ratio	11.0:1 to 13.5:1	for optimal power

Table 2: Recommended Air/Fuel Ratios

To modify one of the functions (Idle, Part Throttle, or WOT), click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 24: Idle - RPM Air/Fuel Function.

NOTE: You can change either the Air/Fuel Ratio or the RPM value EPEC gives you full tuning control.

Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

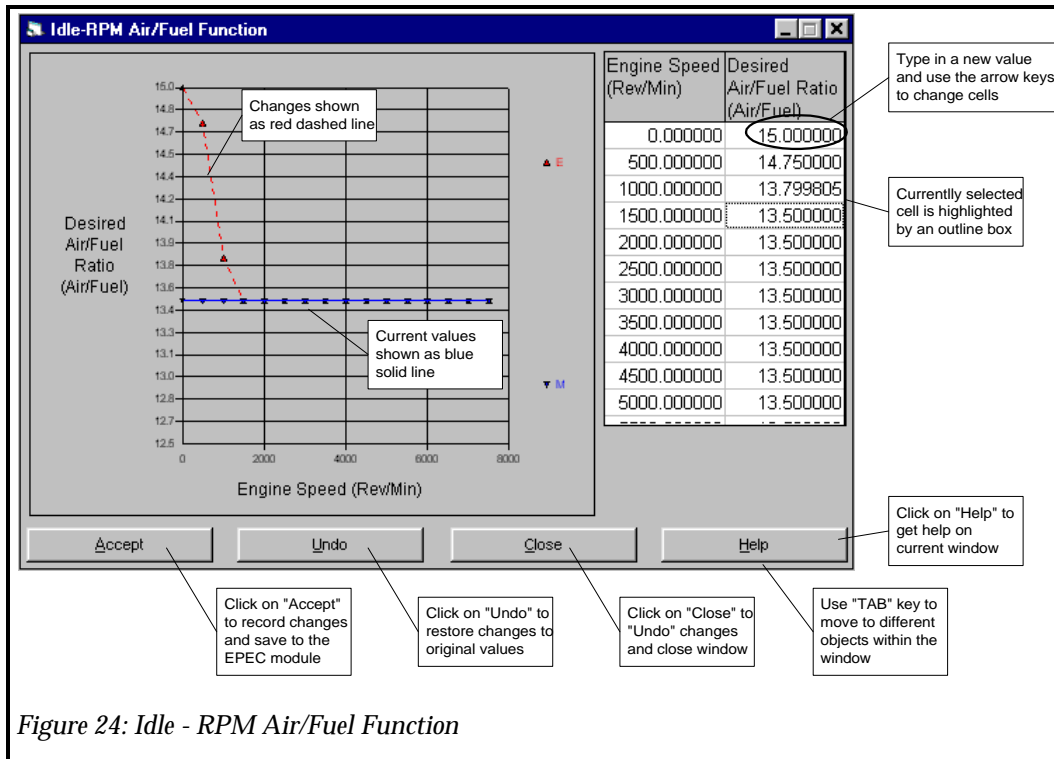


Figure 24: Idle - RPM Air/Fuel Function

Fuel Modifiers

The base fuel functions are used for a fully warmed up engine, however, to obtain good driveability, you may need to modify one or more of the following fuel modifiers.

NOTE: If you are drag racing your vehicle, you will want to make sure you have a very good base calibration such that on a fully warmed up engine does not use the fuel modifiers, especially the temperature modifiers. These fuel modifiers can drastically affect the repeatability of your runs and thus the ability to win bracket races.

Air Charge Temperature (ACT) Fuel

The Air Charge Temperature Fuel (ACT) function is a fuel multiplier that allows you to modify your delivered fuel amount based on Air Inlet Temperature. A value of 1.1 will add 10% fuel and a value of 0.90 will remove 10% fuel. Be careful since this table can make sizable modifications to your fuel flow.

Under most “Warm Engine” conditions, you will not need to use this; however, under very cold operating conditions, you may need to richen (fuel multiplier greater than 1.0) the Air/Fuel ratio for good engine operation. The ACT Fuel Multiplier is calculated from the ACT Fuel Function, see Figure 25: ACT Fuel Strategy Diagram.

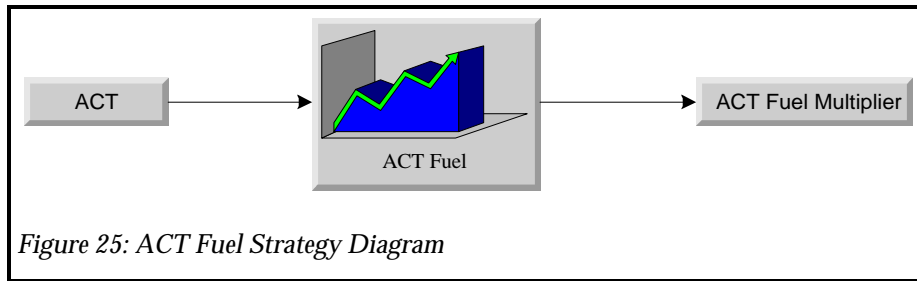


Figure 25: ACT Fuel Strategy Diagram

To change the ACT Fuel Function, click on the “Edit” menu and then the “Fuel” sub-menu and then click on “ACT Fuel”. The ACT Fuel function will then appear. See Figure 26: ACT Fuel Menu..

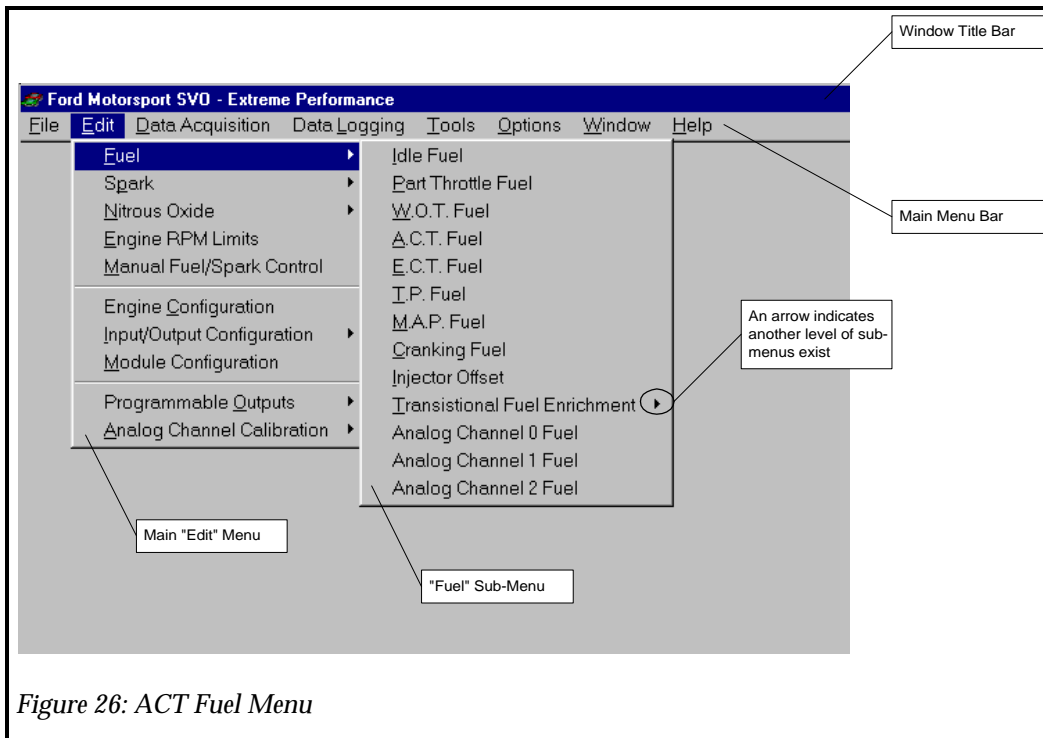
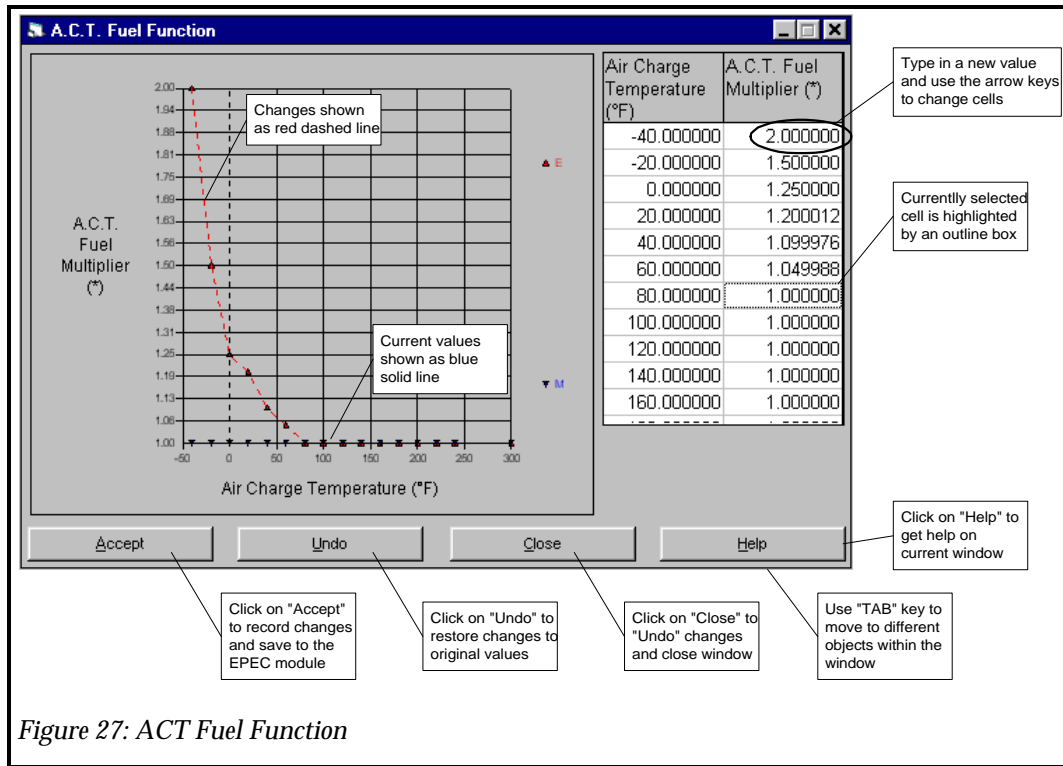


Figure 26: ACT Fuel Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 27: ACT Fuel Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from it original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

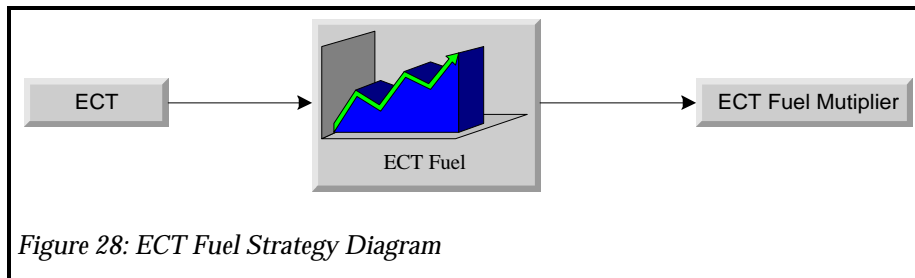
IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



Engine Coolant Temperature (ECT) Fuel

The Engine Coolant Temperature Fuel (ECT) function is a fuel multiplier that allows you to modify your delivered fuel amount based on Engine Coolant Temperature. A value of 1.1 will add 10% fuel and a value of 0.90 will remove 10% fuel. Be careful since this table can make sizable modifications to your fuel flow.

Under most “Warm Engine” conditions, you will not need to use this; however, under very cold operating conditions, you may need to richen (fuel multiplier greater than 1.0) the Air/Fuel ratio for good engine operation. The ECT Fuel Multiplier is calculated from the ECT Fuel Function, see Figure 28: ECT Fuel Strategy Diagram.



To change the ECT Fuel Function, click on the “Edit” menu and then the “Fuel” sub-menu and then click on “ECT Fuel”. The ECT Fuel function will then appear. See Figure 29: ECT Fuel Menu.

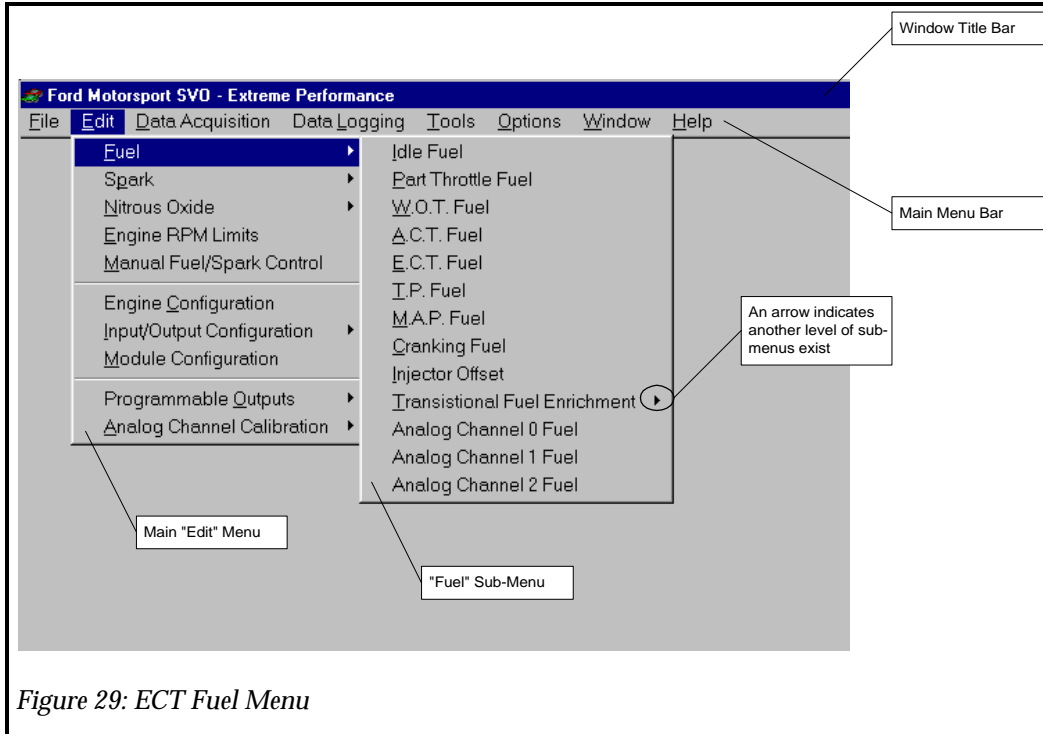


Figure 29: ECT Fuel Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 30: ECT Fuel Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

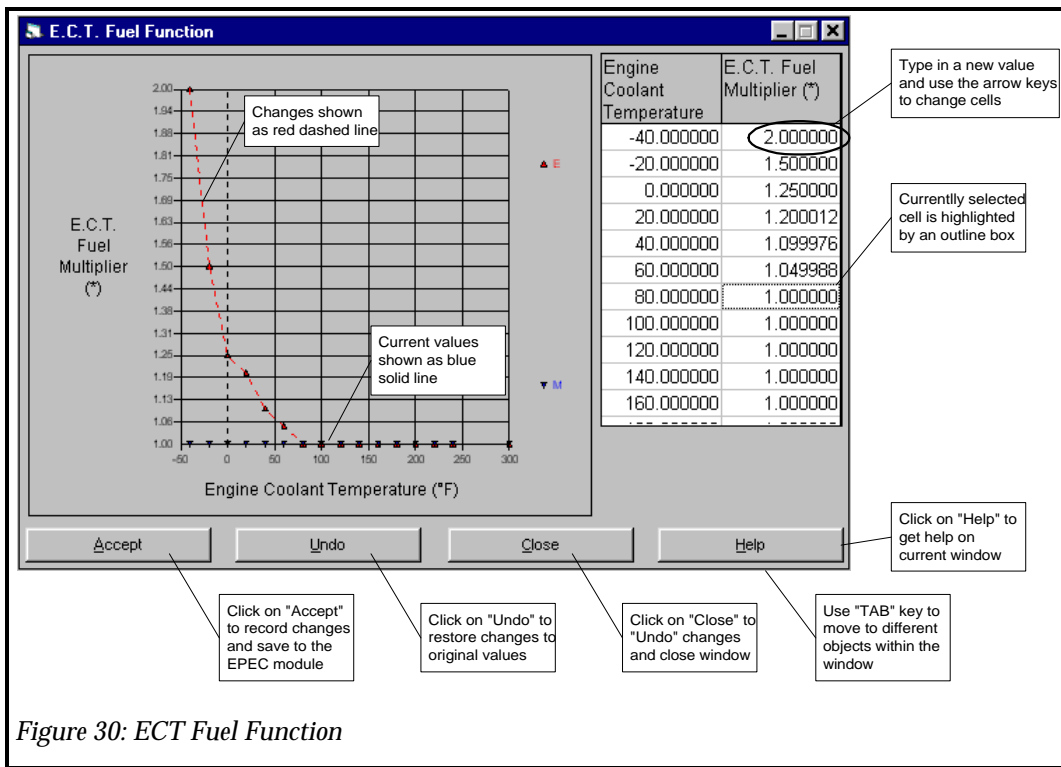


Figure 30: ECT Fuel Function

Throttle Position (TP) Fuel

The Throttle Position Fuel (TP) function is a fuel multiplier that allows you to modify your delivered fuel amount based on Relative Throttle Angle. A value of 1.1 will add 10% fuel and a value of 0.90 will remove 10% fuel. Be careful since this table can make sizable modifications to your fuel flow. The TP Fuel Multiplier is calculated from the TP Fuel Function, see Figure 31: TP Fuel Strategy Diagram.

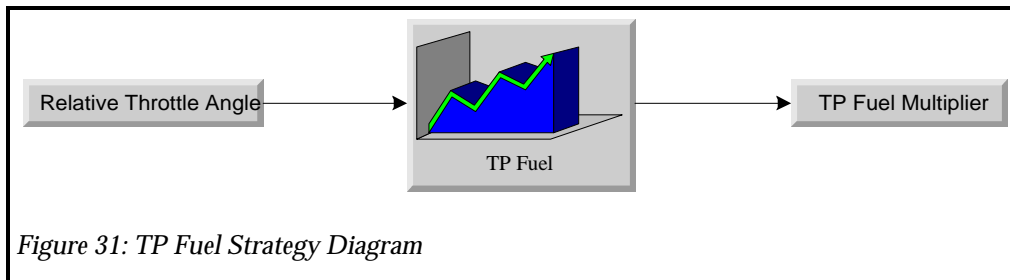


Figure 31: TP Fuel Strategy Diagram

To change the TP Fuel Function, click on the “Edit” menu and then the “Fuel” sub-menu and then click on “TP Fuel”. The TP Fuel function will then appear. See Figure 32: TP Fuel Menu.

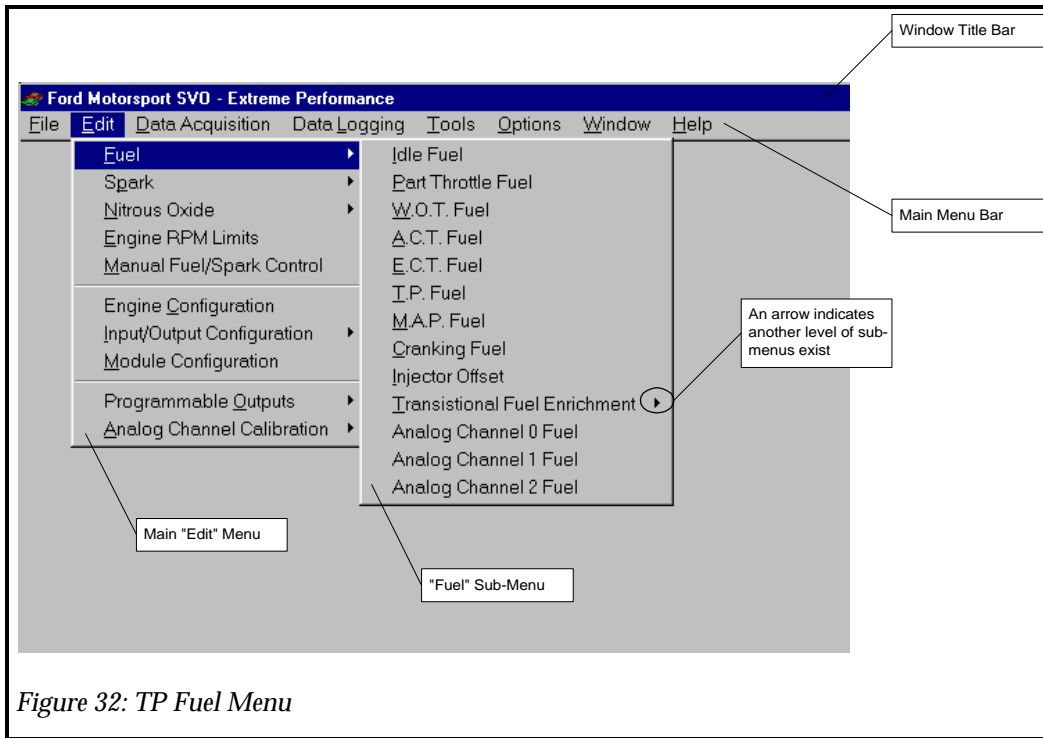


Figure 32: TP Fuel Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 33: TP Fuel Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

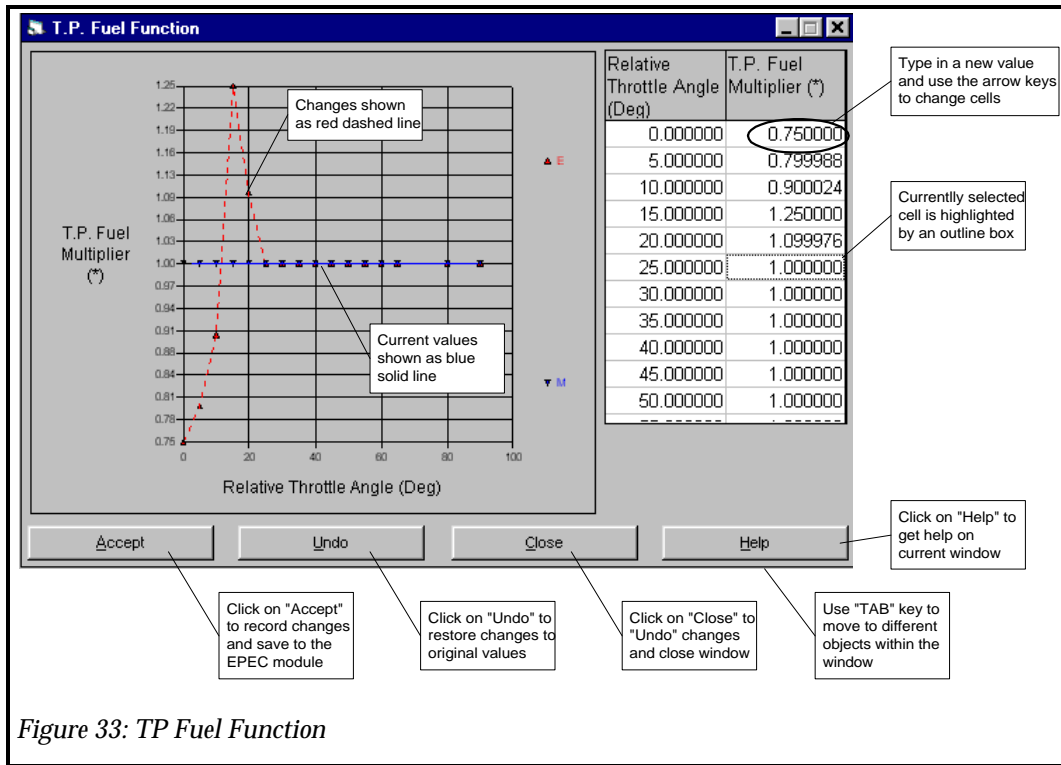


Figure 33: TP Fuel Function

Manifold Absolute Pressure (MAP) Fuel

The Manifold Absolute Pressure Fuel (MAP) function is a fuel multiplier that allows you to modify your delivered fuel amount based on Manifold Absolute Pressure. A value of 1.1 will add 10% fuel and a value of 0.90 will remove 10% fuel. Be careful since this table can make sizable modifications to your fuel flow. The MAP Fuel Multiplier is calculated from the MAP Fuel Function, see Figure 34: MAP Fuel Strategy Diagram.

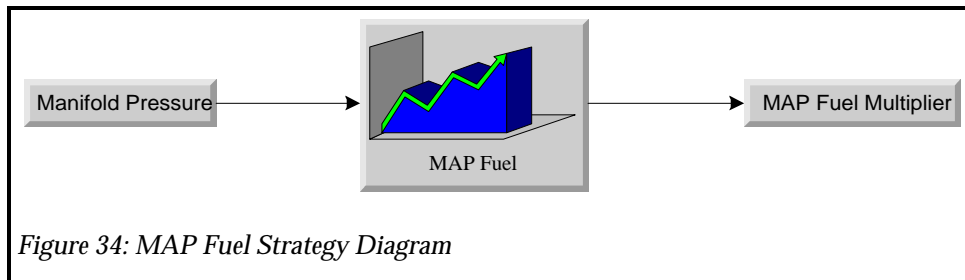


Figure 34: MAP Fuel Strategy Diagram

This is useful on boosted engines where you may want to add fuel as a function of boost pressure.

NOTE: The MAP sensor indicates only ABSOLUTE PRESSURE, not gauge pressure where atmospheric pressure is 29.92 In Hg. At 10 In Hg of vacuum, the MAP sensor will indicate 19.92 In Hg. At 10 psi of boost, the MAP sensor will indicate approximately 49.92 In Hg.

To change the MAP Fuel Function, click on the “Edit” menu and then the “Fuel” sub-menu and then click on “MAP Fuel”. The MAP Fuel function will then appear. See Figure 35: MAP Fuel Menu.

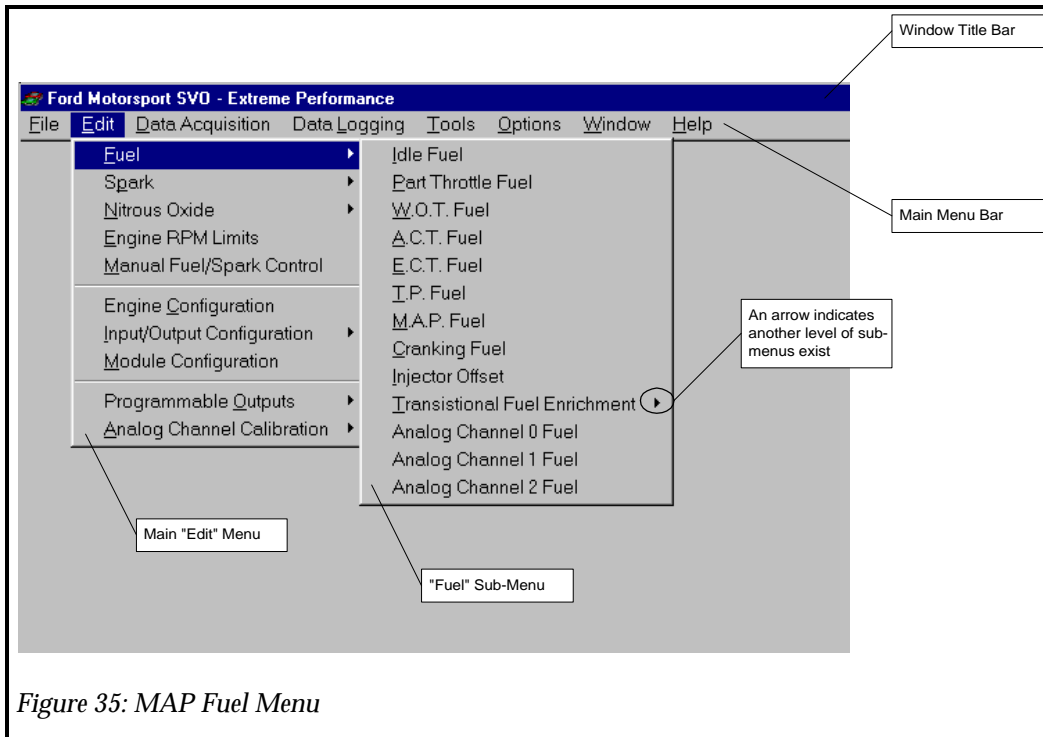


Figure 35: MAP Fuel Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 36: MAP Fuel Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

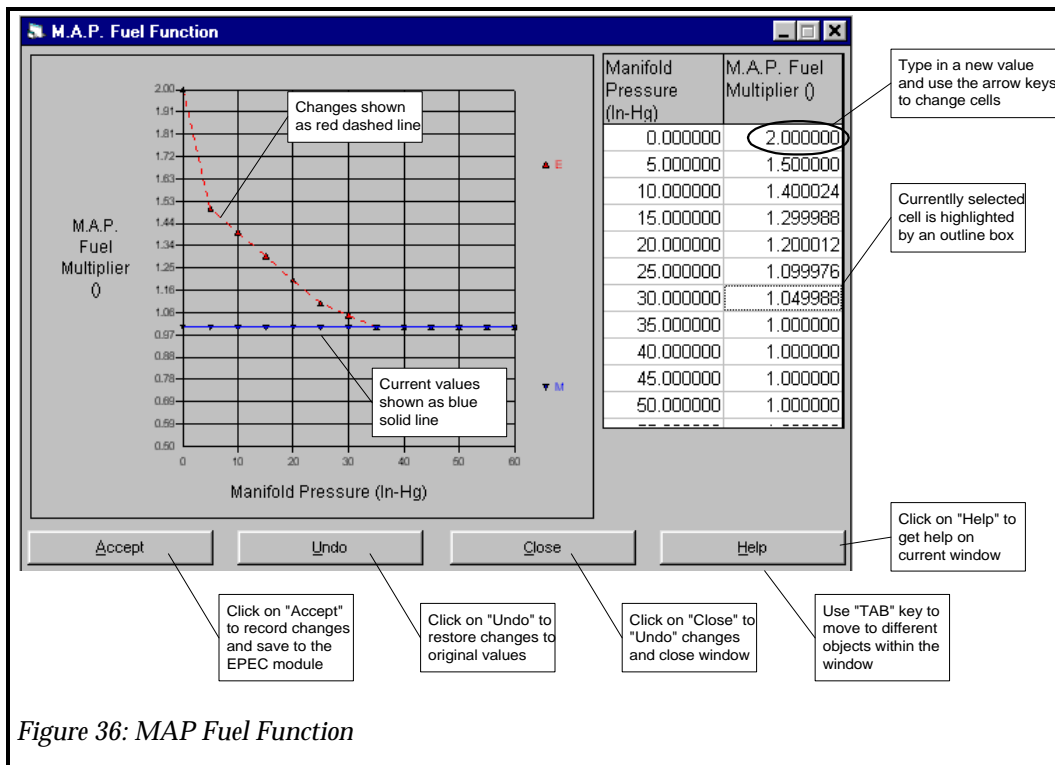


Figure 36: MAP Fuel Function

Cranking Fuel

The Cranking Fuel function is a time based value which allows you to modify your delivered fuel amount at crank. The value entered in the Cranking Fuel function is the pulse width delivered to the injectors every cylinder event. Start with a low value and increase gradually until the engine fires. You must be careful not to make this value too large or engine flooding, or even cylinder bore washing can result. Cranking fuel is a function of Engine Coolant Temperature, and colder starting conditions will most likely require more Cranking Fuel. The Cranking Fuel PW is calculated from the Cranking Fuel Function, see Figure 37: Cranking Fuel Strategy Diagram.

IMPORTANT: When the engine is in “Crank” mode, fuel delivery is shut off at Wide Open Throttle.

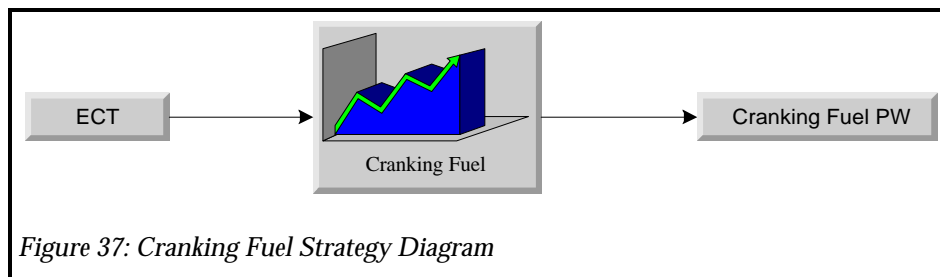


Figure 37: Cranking Fuel Strategy Diagram

To change the Cranking Fuel Function, click on the “Edit” menu and then the “Fuel” sub-menu and then click on “Cranking Fuel”. The Cranking Fuel function will then appear. See Figure 38: Cranking Fuel Menu.

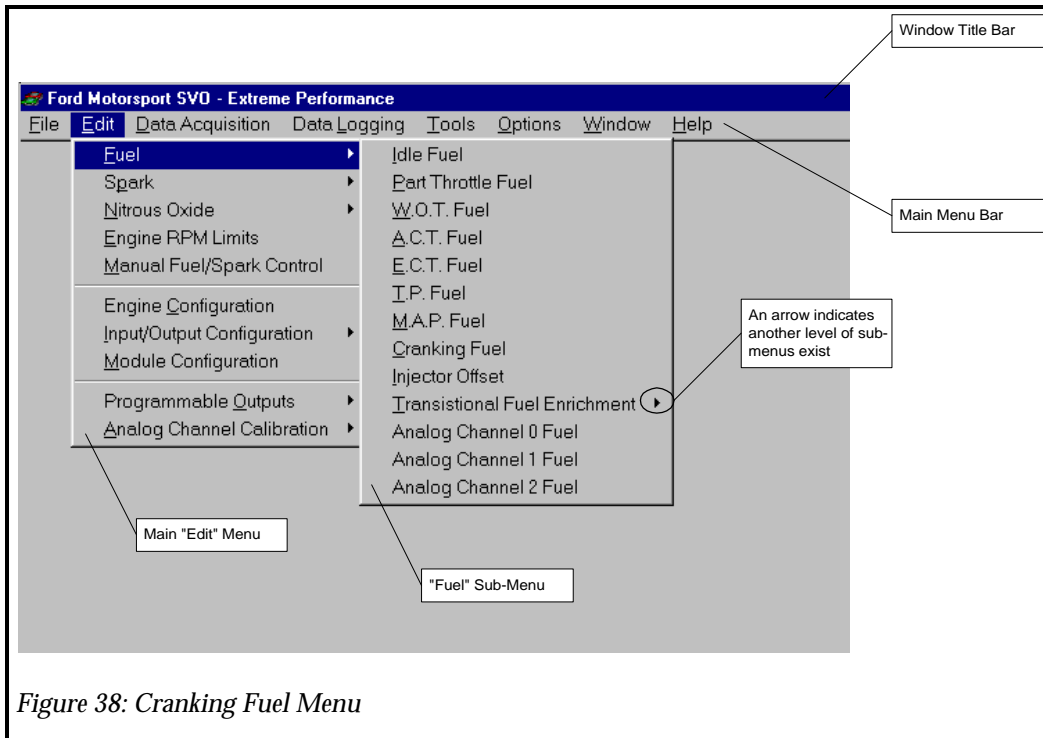


Figure 38: Cranking Fuel Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 39: Cranking Fuel Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

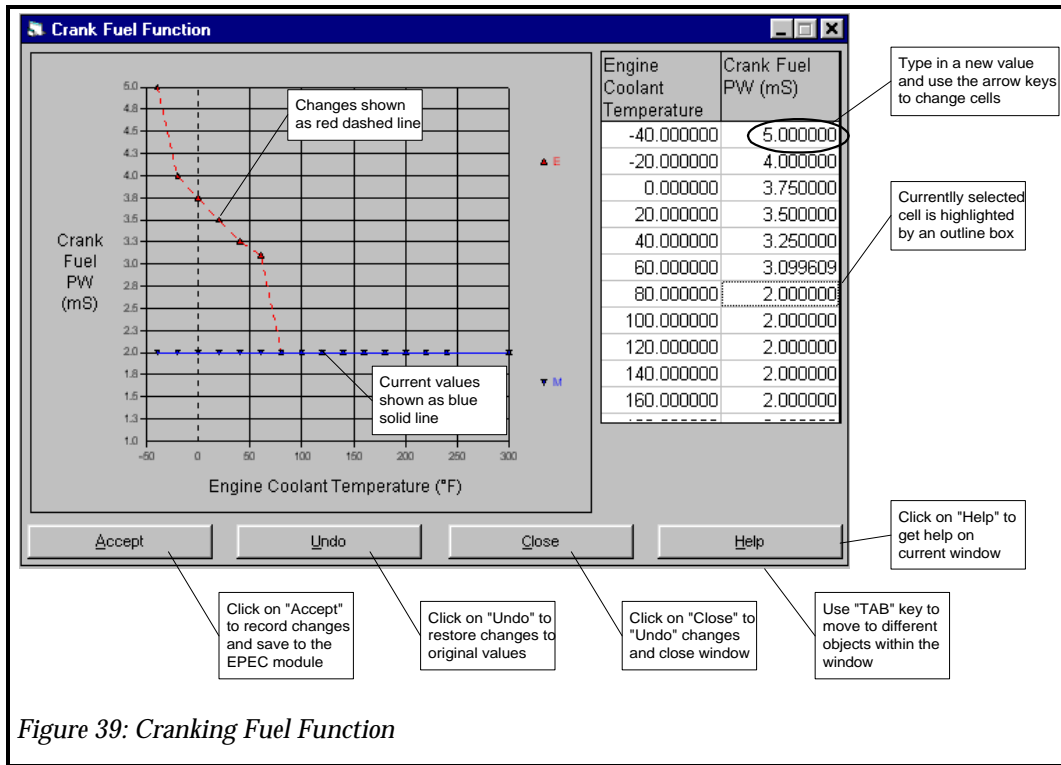


Figure 39: Cranking Fuel Function

Injector Offset

The Injector Offset Fuel function is a time based function which is an adder to the fuel pulse width which allows you to compensate for different injectors. As the battery voltage is reduced, the fuel injectors respond slower, thus taking longer to open. The Injector Offset function is intended to compensate for this “lag time”. Injector Offset is a function of Battery Voltage however, you should never let the battery voltage get low. You should either run an alternator, or make sure your batteries are fully charged.

NOTE: The Injector Offset value is added to the Fuel Pulse Width and is not affected by any of the fuel multipliers such as MAP Fuel, ACT Fuel, ECT Fuel, Transitional Fuel or TP Fuel. The Injector Offset is added to the fuel pulse in the following manner:

$$FuelPulseWidth = (BaseFuelPulseWidth \times FuelMultipliers) + InjectorOffset$$

The Injector Offset is calculated from the Injector Offset Function, see Figure 40: Injector Offset Fuel Strategy Diagram.

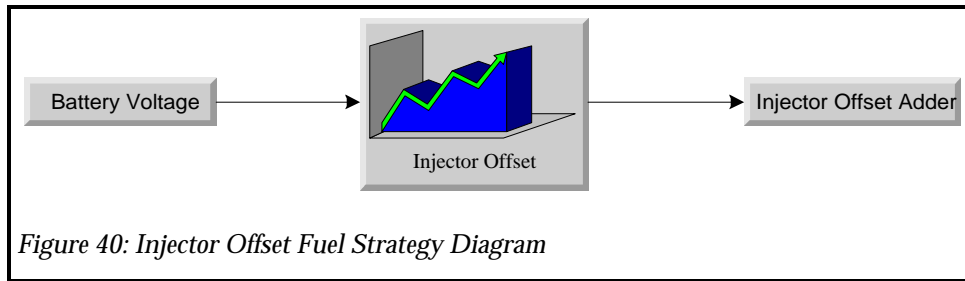


Figure 40: Injector Offset Fuel Strategy Diagram

To change the Injector Offset Fuel Function, click on the “Edit” menu and then the “Fuel” sub-menu and then click on “Injector Offset”. The Injector Offset function will then appear. See Figure 41: Injector Offset Fuel Menu.

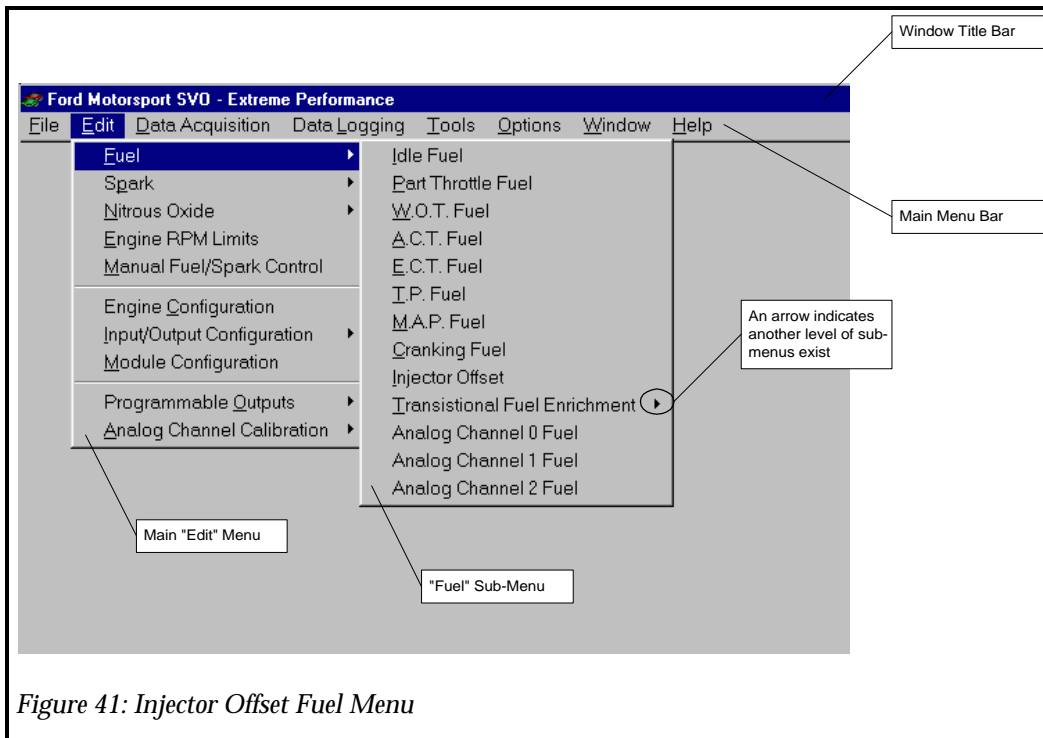
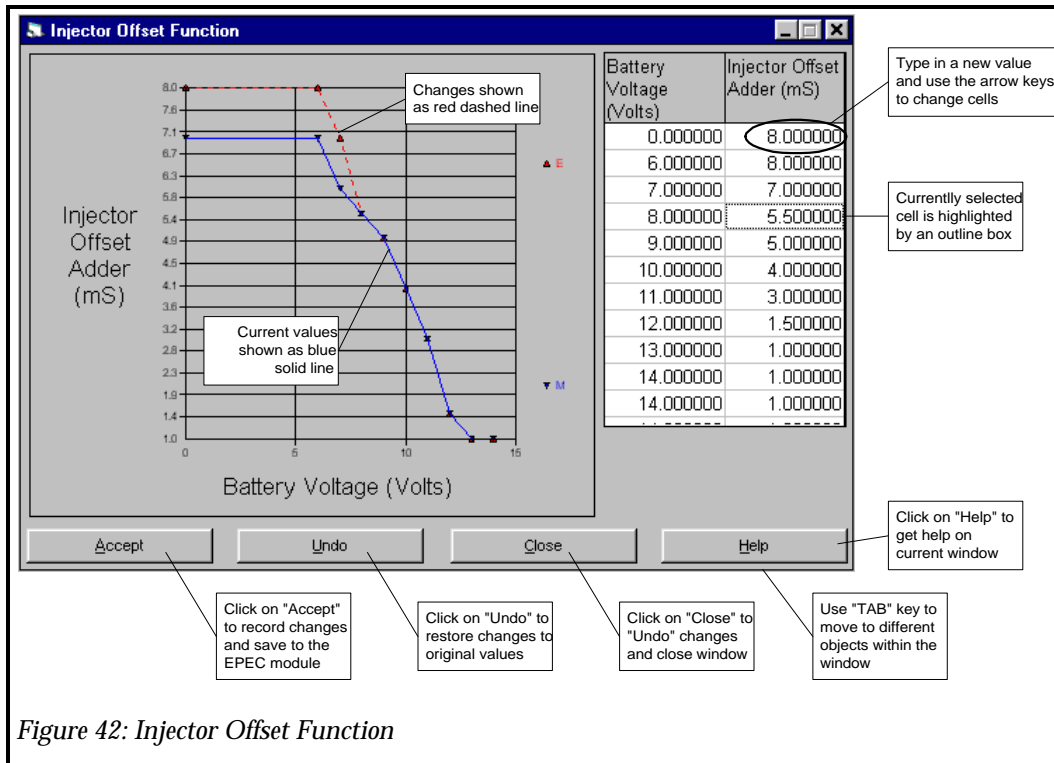


Figure 41: Injector Offset Fuel Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 42: Injector Offset Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



Transitional Fuel Enrichment (TFE)

The Transitional Fuel Enrichment function is the equivalent to “Pump Shot” on a carburetor. This is required because your foot can move the accelerator and the engine can begin to take in air faster than the Mass Air Flow meter can respond. The quicker you move the accelerator the more you will have to compensate.

The EPEC module measures how fast you move the accelerator by calculating the “Throttle Angle Rate” (deg/sec). Fuel enrichment is specified in percent. This percentage enrichment is applied to the current fuel pulse width. You will need to experiment with this on your vehicle. Typically transient engine response is worse at low engine speeds, however, if your vehicle has good transient response with the base fuel calibration, do not play with this parameter too much. The Base Transitional Fuel is calculated from the Base Transitional Fuel Enrichment Function, see Figure 43: Base Transitional Fuel Strategy Diagram.

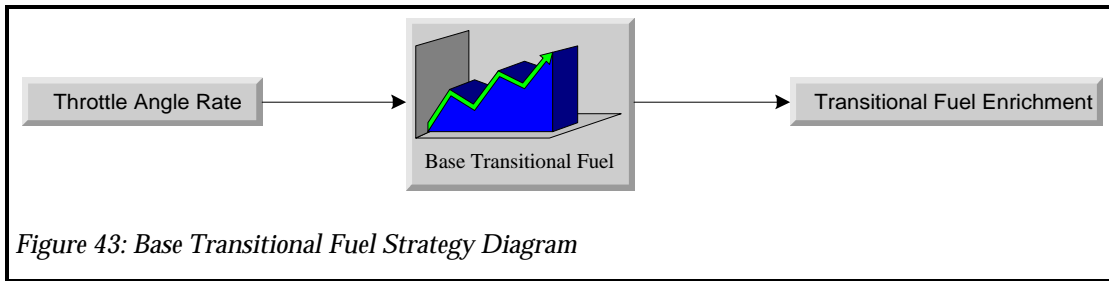


Figure 43: Base Transitional Fuel Strategy Diagram

NOTE: The TFE percent enrichment value uses the current fuel pulse width to calculate the additional fuel delivered. This additional fuel is added and delivered to the engine with the normal fuel injector pulses. The Transitional Fuel Enrichment value is calculated as follows:

$$TransitionalFuelPulseWidth_{(ms)} = FuelPulseWidth_{(ms)} \times TFE_{(\%)} \times TFETPMultiplier$$

To change the Transitional Fuel Enrichment Function, click on the “Edit” menu and then the “Fuel” sub-menu and then the “Transitional Fuel” sub-menu. Click on the “Base Transitional Fuel” menu item. The Base Transitional Fuel function will then appear. See Figure 44: Transitional Fuel Enrichment Menu.

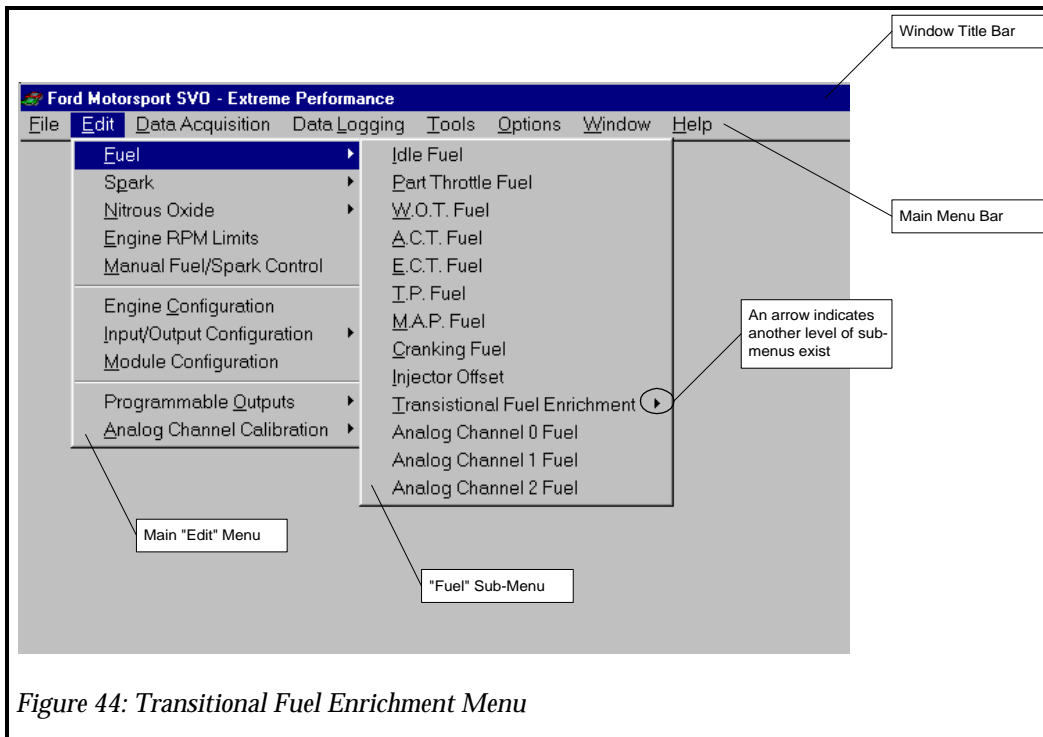


Figure 44: Transitional Fuel Enrichment Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 45: Base Transitional Fuel Enrichment Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This

indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

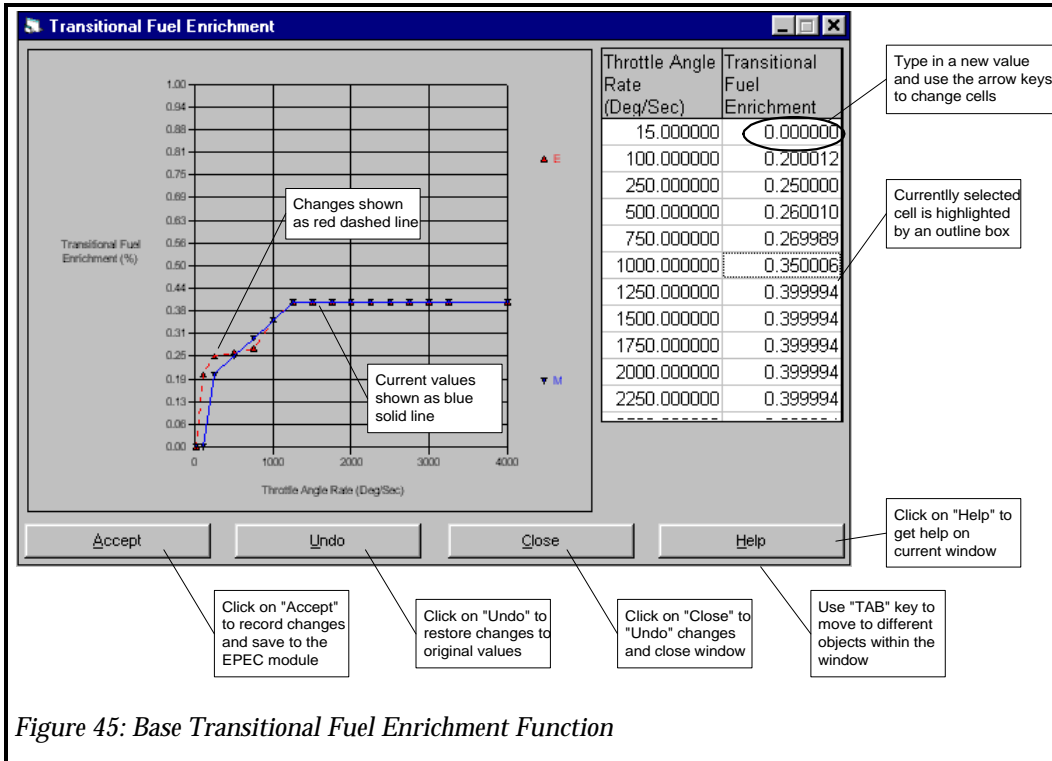
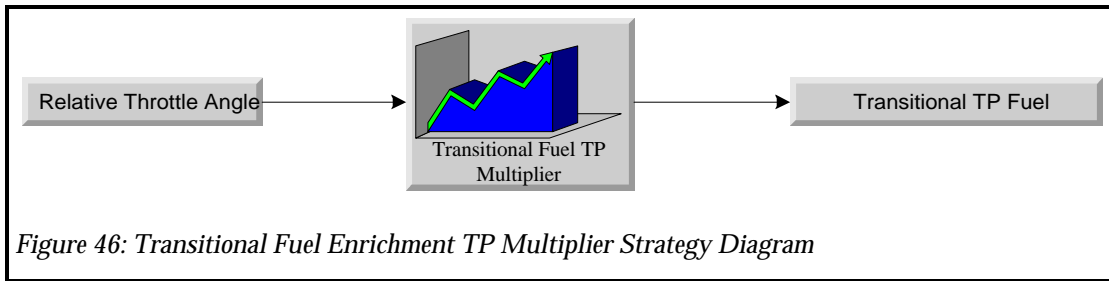


Figure 45: Base Transitional Fuel Enrichment Function

Transitional Fuel Enrichment TP Multiplier

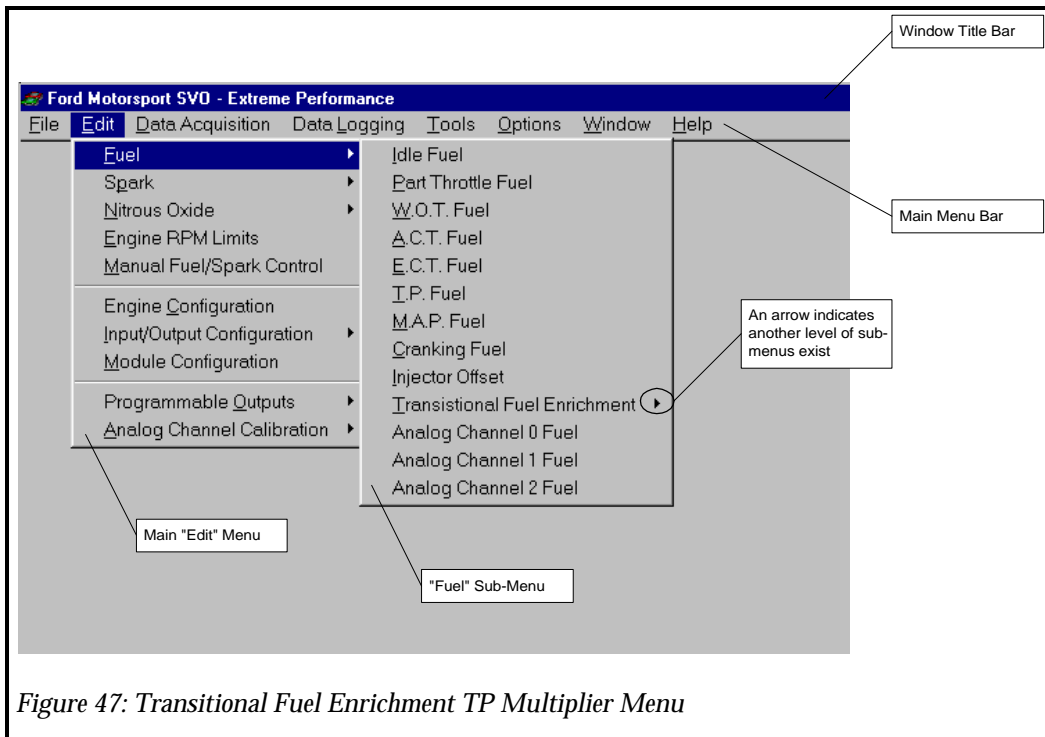
The EPEC module also supplies a Transitional Fuel Enrichment Throttle Position Correction. This allows you to change the transitional fuel enrichment amount based on current throttle position. Frequently, the additional fuel enrichment demands will decrease as current throttle position increases, even though the throttle angle rate remains the same. The Transitional Fuel Enrichment TP Correction is calculated from the Transitional Fuel Enrichment TP Multiplier Function, see Figure 46: Transitional Fuel Enrichment TP Multiplier Strategy Diagram.



NOTE: The TFE percent enrichment value uses the current fuel pulse width to calculate the additional fuel delivered. This additional fuel is added and delivered to the engine with the normal fuel injector pulses. The Transitional Fuel Enrichment value is calculated as follows:

$$TransitionalFuelPulseWidth_{(ms)} = FuelPulseWidth_{(ms)} \times TFE_{(\%)} \times TFETPMultiplier$$

To change the Transitional Fuel TP Multiplier Function, click on the “Edit” menu and then the “Fuel” sub-menu and then the “Transitional Fuel” sub-menu. Click on the “TP Multiplier” menu item. The TFE TP Multiplier function will then appear. See Figure 47: Transitional Fuel Enrichment TP Multiplier Menu.



Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 48: Transitional Fuel Enrichment TP Multiplier Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed

line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

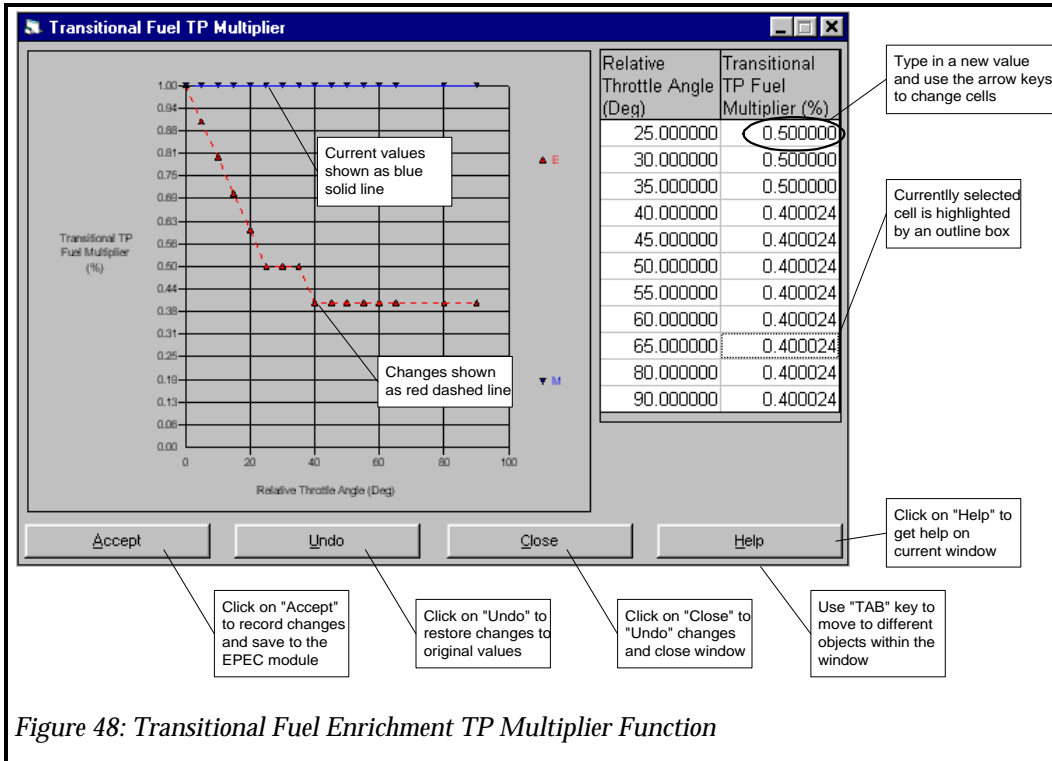


Figure 48: Transitional Fuel Enrichment TP Multiplier Function

Programmable Output 0-3 Fuel Multipliers

The EPEC module has 4 user Programmable Outputs available. Each of these outputs has 2 fuel multipliers associated with it, for a total of 8 fuel multipliers. One fuel multiplier is used when the output is “OFF” and the other is used when the output is “ON”. These fuel multipliers provide the ability to modify the amount of fuel delivered when external devices are switched “ON” and “OFF”.

The Programmable Output Fuel multipliers are accessible from the Programmable Output configurations. To edit these fuel multipliers, click on the “Edit” menu and then the “Programmable Outputs” sub-menu and then the desired Programmable Output channel. The Programmable Output configuration window will appear for the selected output channel. See Figure 49: Programmable Output Channel 0 -3 Menu.

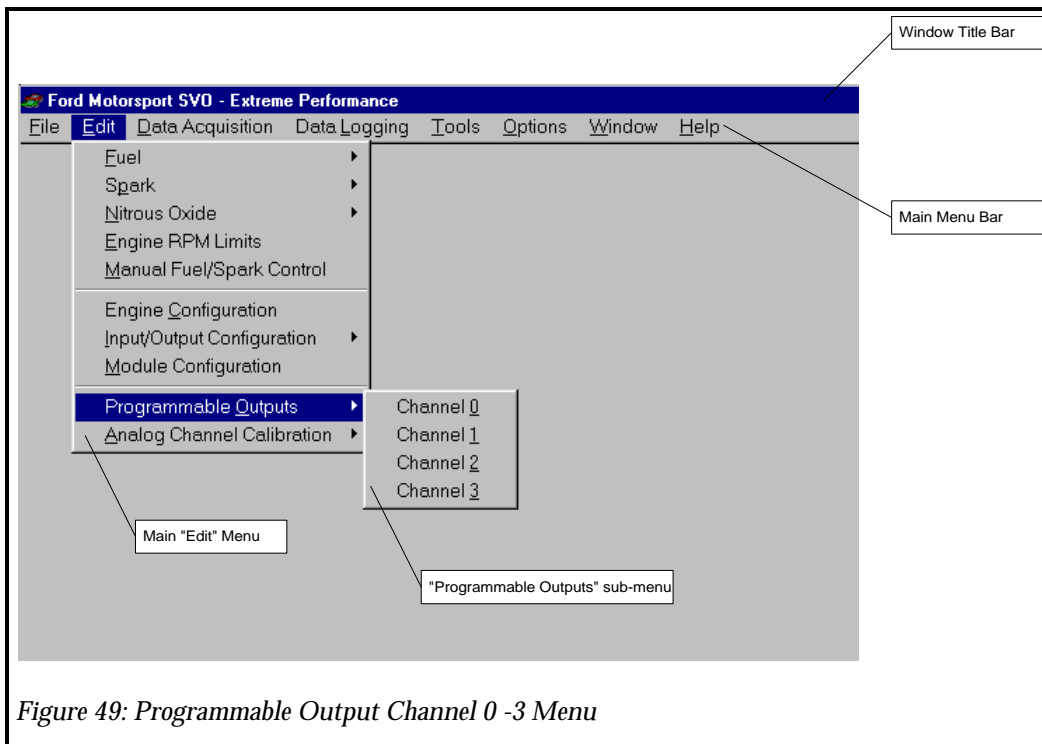


Figure 49: Programmable Output Channel 0 -3 Menu

Click on the “On Fuel Multiplier” or on the “Off Conditions” tab then the “Off Fuel Multiplier” cell and type a new value, then move out of that cell by using the tab key. See Figure 50: Programmable Output 0-4 Fuel Function. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

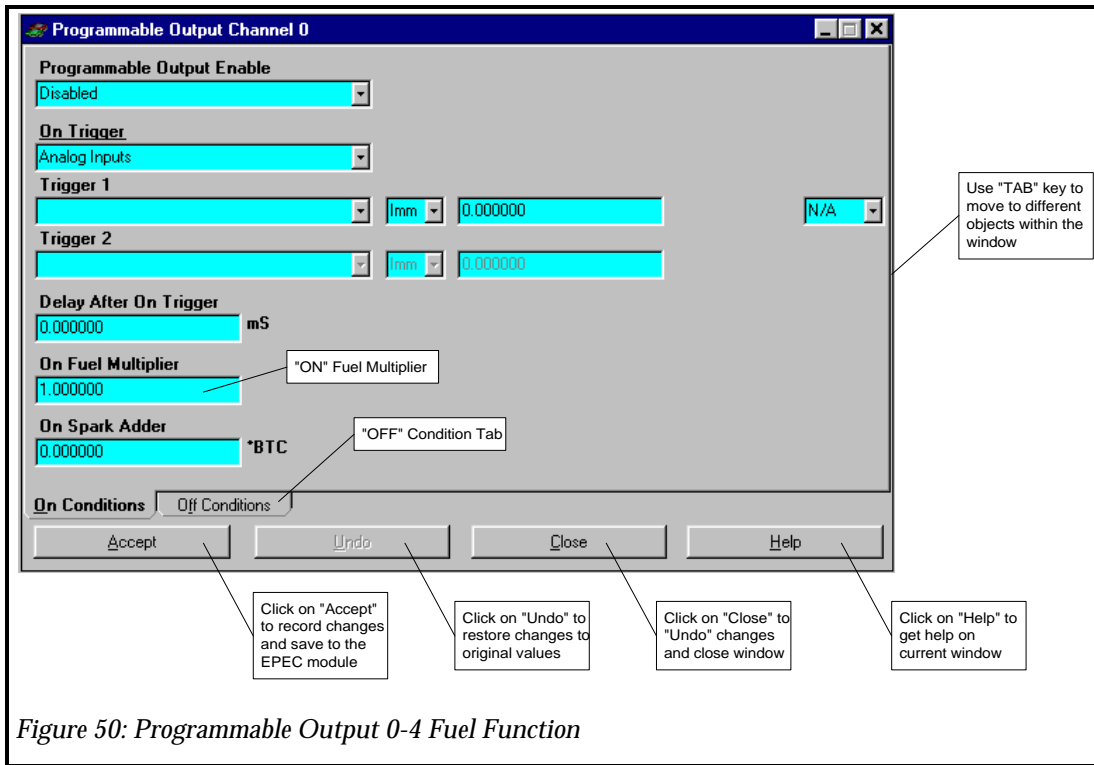


Figure 50: Programmable Output 0-4 Fuel Function

Analog Channel 0-2 Fuel Multipliers

There are 3 Analog Input channels and each of them have a input voltage range of 0v-10v. The Analog Channel fuel multipliers can be used to modify fuel delivered to the engine based on any external analog type sensor or input. The values entered in these tables are straight multipliers to your fuel flow so a value of 1.1 will deliver 10% extra fuel and a value of 0.9 will deliver 10% less fuel. Be careful since this table can make sizable modifications to your fuel flow. The Analog Channel Fuel Multiplier is calculated from the Analog Channel Fuel Function, see Figure 51: Analog Channel 0-2 Fuel Strategy Diagram.

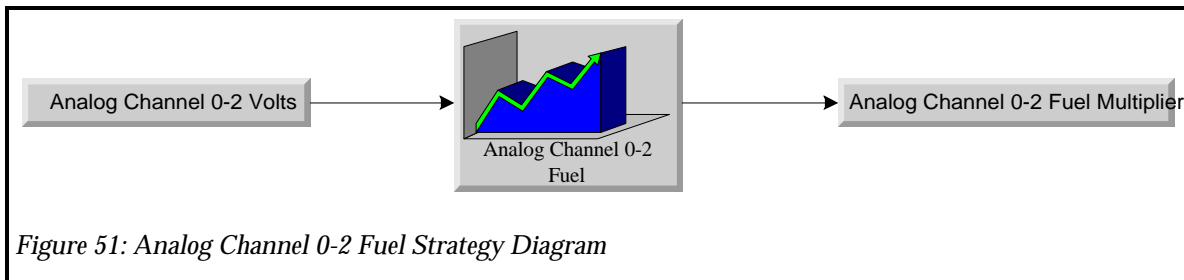


Figure 51: Analog Channel 0-2 Fuel Strategy Diagram

To change one of the Analog Channel’s Fuel Function, click on the “Edit” menu and then the “Fuel” sub-menu and then one of the “Analog Channel x Fuel” menu items. The selected Analog Channel fuel function will then appear. See Figure 52: Analog Channel 0 - 2 Fuel Menu.

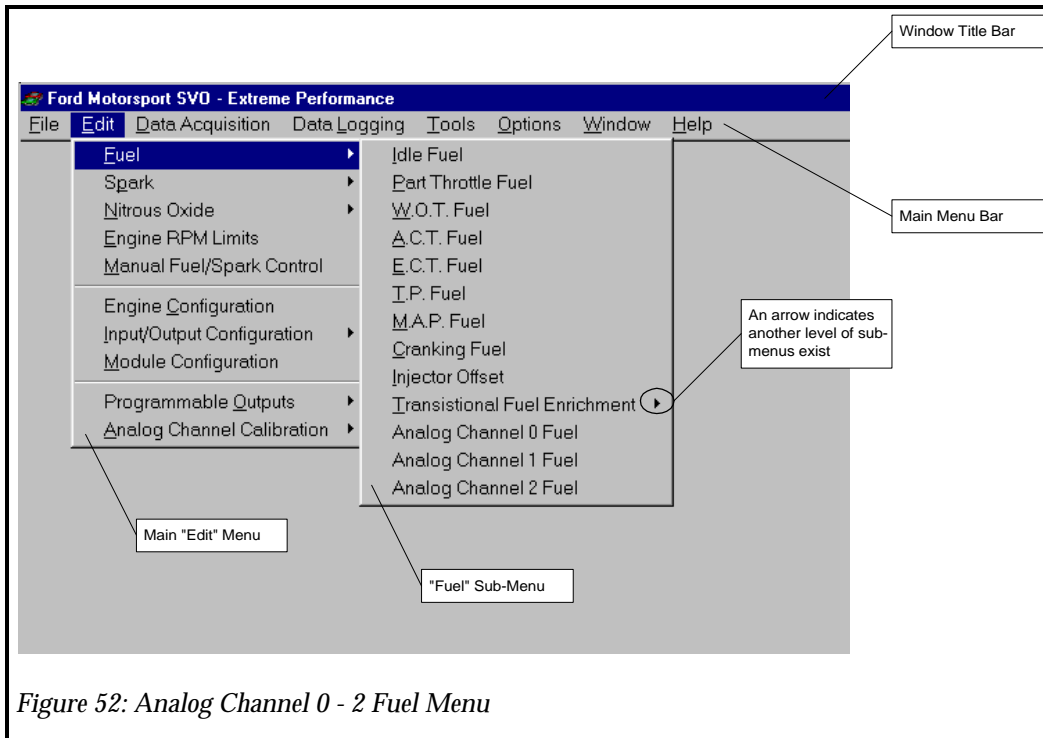


Figure 52: Analog Channel 0 - 2 Fuel Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 53: Analog Channel 0-3 Fuel Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on "Accept", "Undo" or "Close". "Accept" will accept the new values and the red dashed line will disappear. "Undo" will undo the changes and restore the original settings shown on the blue solid line. "Close" will "Undo" and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on "ACCEPT", the new values WILL BE written to the EPEC module.

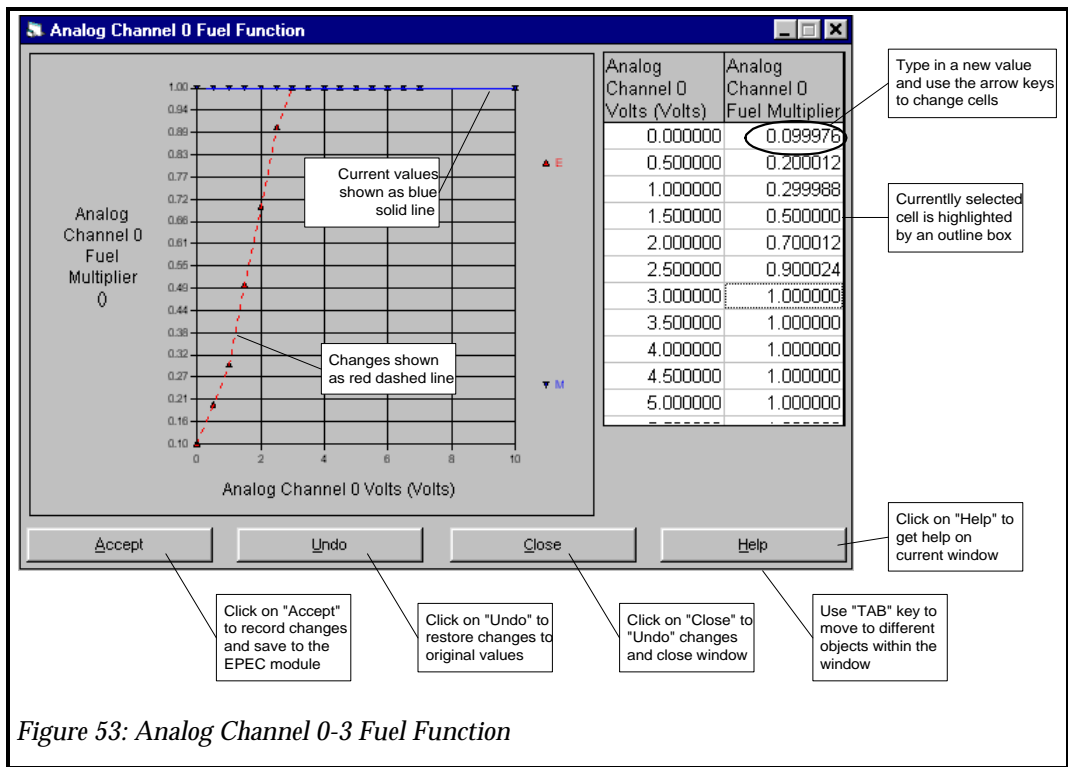


Figure 53: Analog Channel 0-3 Fuel Function

Spark Strategy

The spark strategy calculates the total spark advance delivered to the engine. If you are familiar with distributor curve springs, and weights, the spark strategy replaces these mechanical parts and allows you to program the exact spark advance curve you desire. This section will take you through the basic spark control strategy and typical settings.

Fundamentally the spark advance works off three basic tables, Idle Spark, Part Throttle Spark and Wide Open Throttle (WOT) Spark. These 3 functions deliver spark based on which throttle mode the engine is currently operating under. The Total Spark advance may then be modified based on other inputs or outputs, such as Nitrous Oxide Controls or Boost Retard.

Typically, Total Spark advance values for optimum output range from 26 to 36 BTC depending on the cylinder head, piston dome, combustion chamber, fuel type etc. However, the spark advance values can be greatly influenced by multitude of other things and the proper spark advance is very engine dependent. You will need to experiment to obtain the exact spark advance curve that is required for your particular application.

Figure 54: Spark Strategy Block Diagram shows all of the Spark parameters available. This includes 2 dimensional functions, scalar values, and control options. Table 3: Spark Strategy Parameters outlines the both the calibratable and non-calibratable functions for the entire Spark strategy. The non-calibratable values can be either generated by another function or directly from a sensor.

Name	Type	Notes
Calibratable Functions/Scalars		
Boost Retard	2 dimensional function	Used when the engine is under boost to determine the Boost Retard per psi.
Idle Spark	2 dimensional function	Used when the Throttle Mode is Idle to determine Spark advance.
Part Throttle Spark	2 dimensional function	Used when Throttle Mode is Part Throttle to determine Spark advance.
WOT Spark	2 dimensional function	Used when the Throttle Mode is WOT to determine Spark advance.
TP Spark	2 dimensional function	Used to determine the TP Spark adder.
ACT Spark	2 dimensional function	Used to determine the ACT Spark adder.
ECT Spark	2 dimensional function	Used to determine the ECT Spark adder.
MAP Spark	2 dimensional function	Used to determine the MAP Spark Adder
Analog Channel 0-2 Spark	2 dimensional function	Used when to determine the Analog Channel 0-2 Spark adders.
Programmable Output 0-3 Spark	Scalar	There are 2 spark adders for each channel, "ON" and "OFF" spark adders.

Name	Type	Notes
Nitrous Stage 1 Spark	Scalar	Used when the Nitrous Oxide Stage 1 is active to retard spark.
Nitrous Stage 2 Spark	Scalar	Used when the Nitrous Oxide Stage 2 is active to retard spark.
Manual Spark Angle	Scalar	Used only in Manual Control as the Total Spark Advance.
Control Type	Calibration Switch	Used to specify the Control Type either "Automatic" or "Manual".
Non-Calibratable Values		
Engine Speed	Scalar	Current Engine Speed.
Throttle Mode	Scalar	Current Throttle Mode based on Relative Throttle position.
Relative Throttle Position	Scalar	Current Relative Throttle Position relative to initial Throttle Position.
ACT	Scalar	Current Air Charge (inlet) Temperature.
ECT	Scalar	Current Engine Coolant Temperature.
Boost Pressure	Scalar	Current intake manifold boost pressure.
Boost Retard	Scalar	Current boost retard based on Boost Retard Function.
TP Spark	Scalar	Current Throttle Position Spark adder based on TP Spark Function.
ACT Spark	Scalar	Current ACT Spark adder based on ACT Spark Function.
ECT Spark	Scalar	Current Engine Coolant Temperature Spark adder based on ECT Spark Function.
Analog Channel 0-2 Spark	Scalar	Current Analog Channel 0-2 Spark adder based on Analog Channel 0-2 Spark Functions.
Total Spark Advance	Scalar	The total spark advance delivered to the engine.

Table 3: Spark Strategy Parameters

IMPORTANT: If you are using a distributor type ignition system, the actual spark advance will be the sum of all the spark advance values from all the tables PLUS your initial set “Base Spark Advance”. Typically you should set “Base Spark Advance” to 10 degrees before top dead center. Thus, if your total spark advance from the EPEC module is delivering 20 degrees, you will be delivering 20 degrees (your requested spark advance) PLUS 10 degrees (your base spark advance) for a total spark advance of 30 degrees before top dead center.

If you are using the EDIS ignition system, the spark advance will be the sum of all the spark advance values from all the functions (tables). There is no base timing considerations.

IMPORTANT: All of the spark adders are cumulative so be very cautious, if you take advantage of the full flexibility of this system you will have several adders or subtractors to the base spark tables and will more than likely need to look at the Data Acquisition Window or use Data Logging to see the actual spark advance angle. The total spark advance value is also clipped internally in the EPEC module between -40 and 50 degrees, so if all your tables call for 70 degrees of spark advance the EPEC module will only deliver 50 degrees.

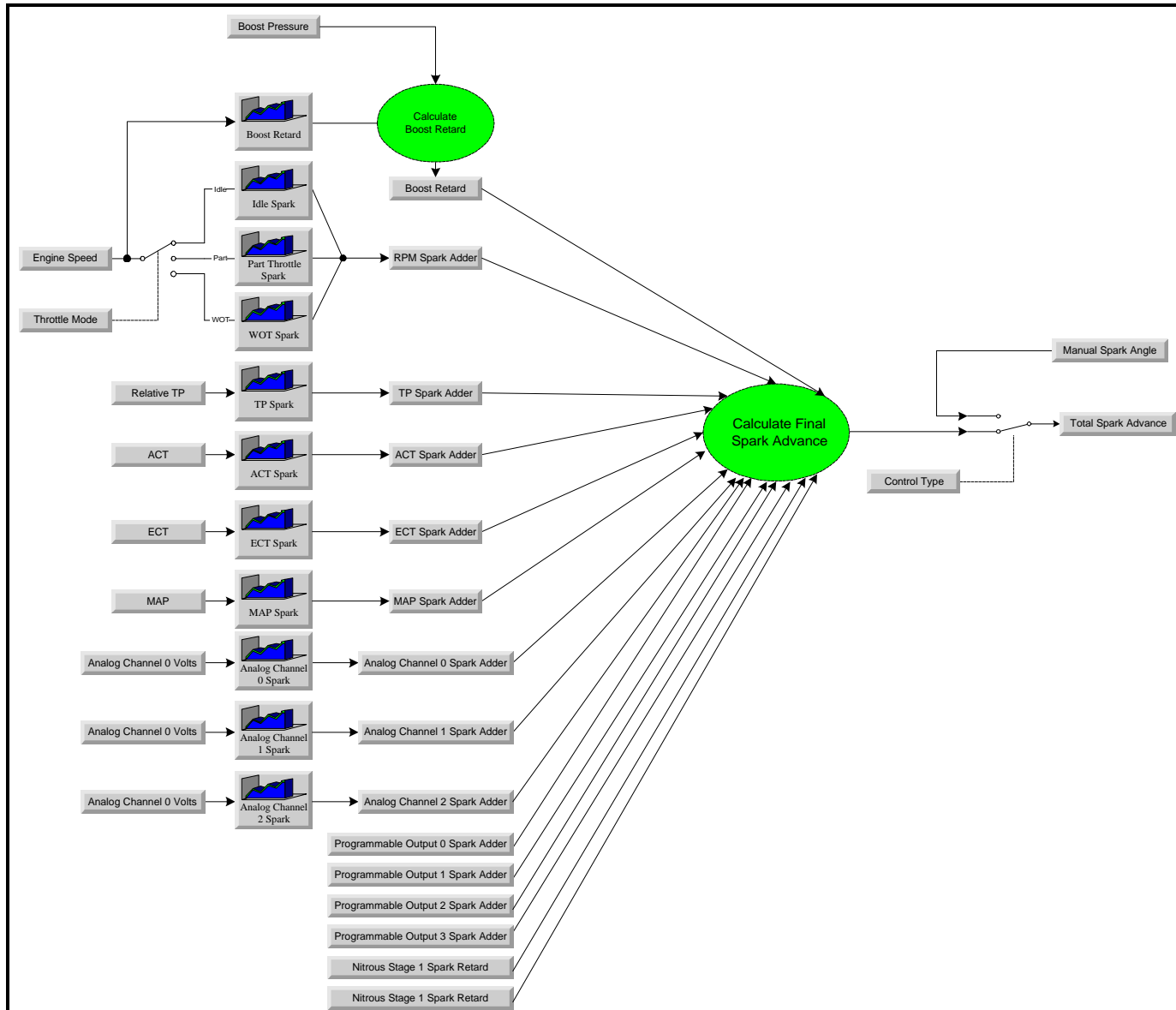
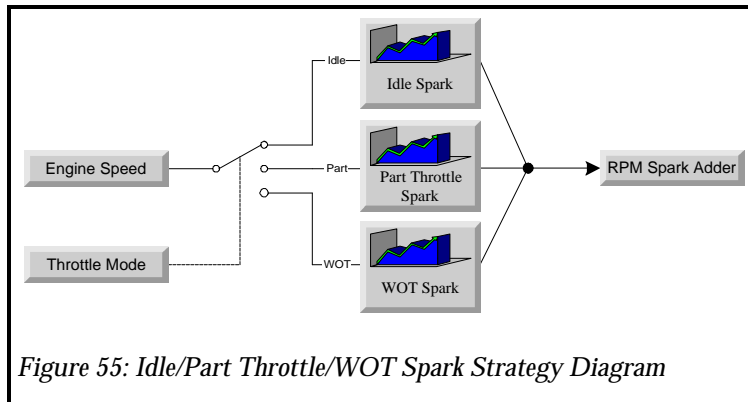


Figure 54: Spark Strategy Block Diagram

Idle Spark Advance

The Spark Control Strategy is comprised of either Idle, Part Throttle or WOT spark Functions (tables). Only one of these tables are used at once and is selected by the current Throttle Mode (Idle/Part/WOT). The Idle, Part Throttle and WOT Spark advance is calculated from one of 3 functions, Idle Spark, Part Throttle Spark or WOT Spark. See Figure 55: Idle/Part Throttle/WOT Spark Strategy Diagram.



To change the Idle Spark Advance, click on the “Edit” menu. Once the options appear, click on “Spark”, see Figure 56: Idle Spark Menu.

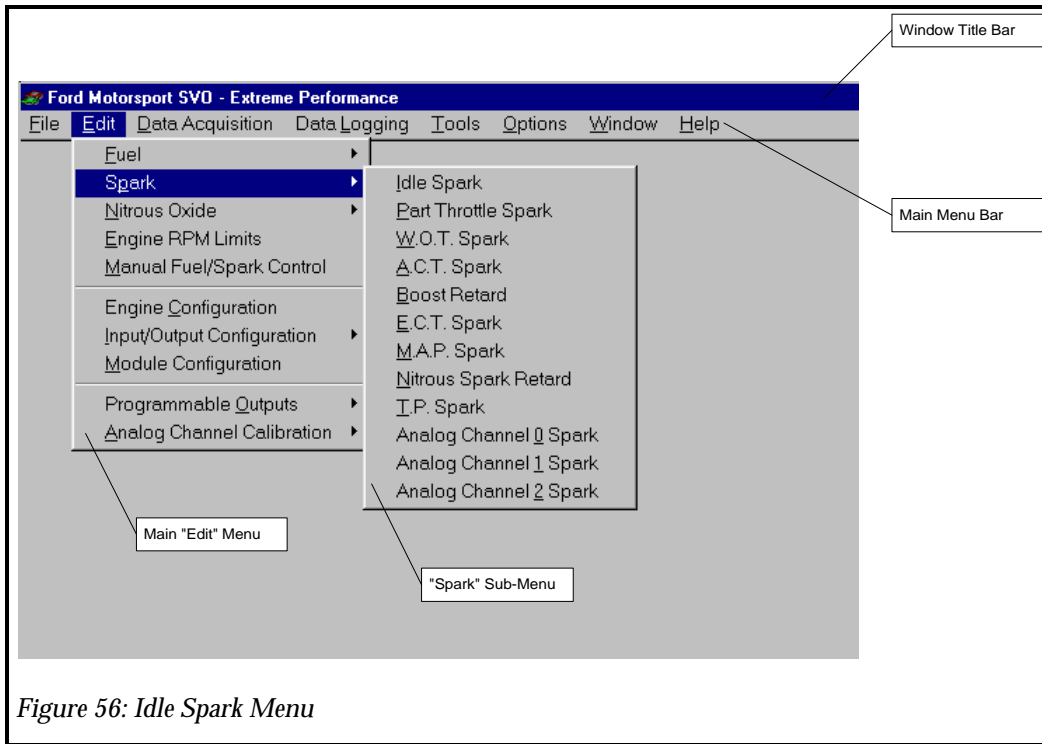


Figure 56: Idle Spark Menu

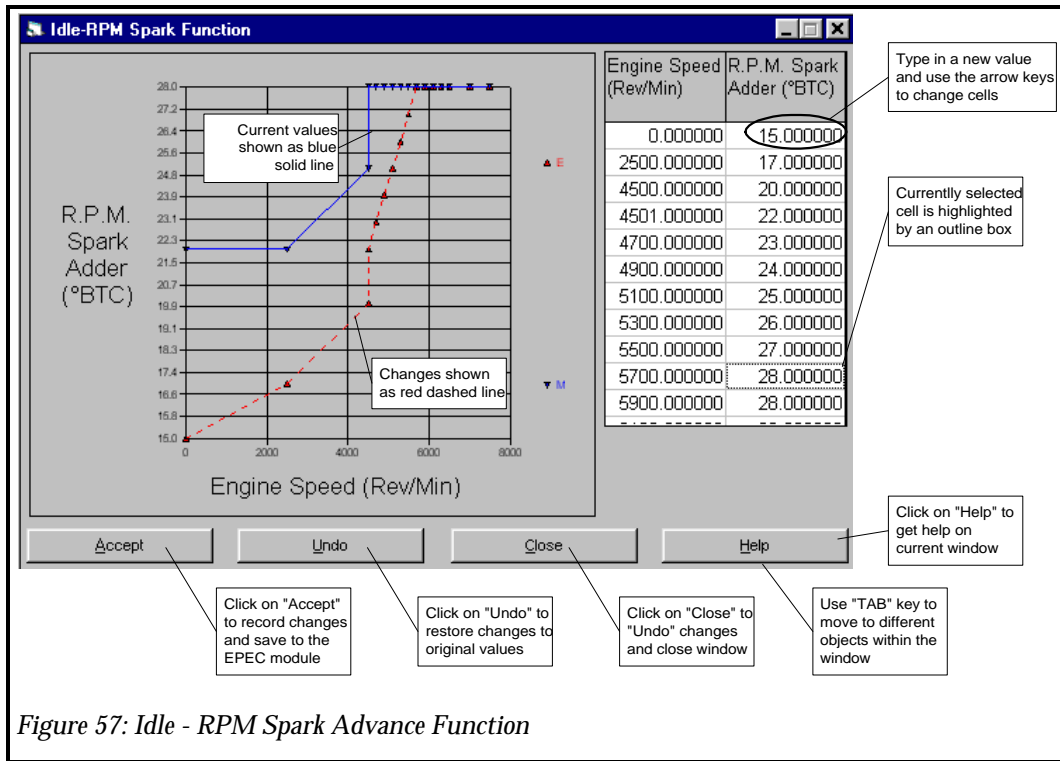
By clicking on the “Idle Spark” menu item, a two dimensional function (table) will appear for the Idle throttle range. Idle is typically from a closed throttle plate to 10 degrees of throttle movement. This function (table) allows you to specify a spark curve based on Engine Speed (RPM).

To modify the Idle Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 57: Idle - RPM Spark Advance Function.

NOTE: You can change either the Spark Advance value or the RPM value EPEC gives you full tuning control.

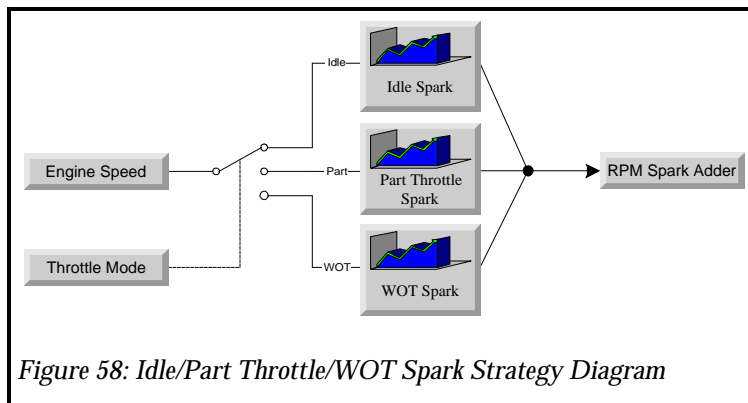
Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



Part Throttle Spark Advance

The Spark Control Strategy is comprised of either Idle, Part Throttle or WOT spark tables. Only one of these tables are used at once and is selected by the current Throttle Mode (Idle/Part/WOT). The Idle, Part Throttle and WOT Spark advance is calculated from one of 3 functions, Idle Spark, Part Throttle Spark or WOT Spark. See Figure 58: Idle/Part Throttle/WOT Spark Strategy Diagram.



To change the Part Throttle Spark Advance, click on the “Edit” menu. Once the options appear, click on “Spark”, see Figure 59: Part Throttle Spark Menu.

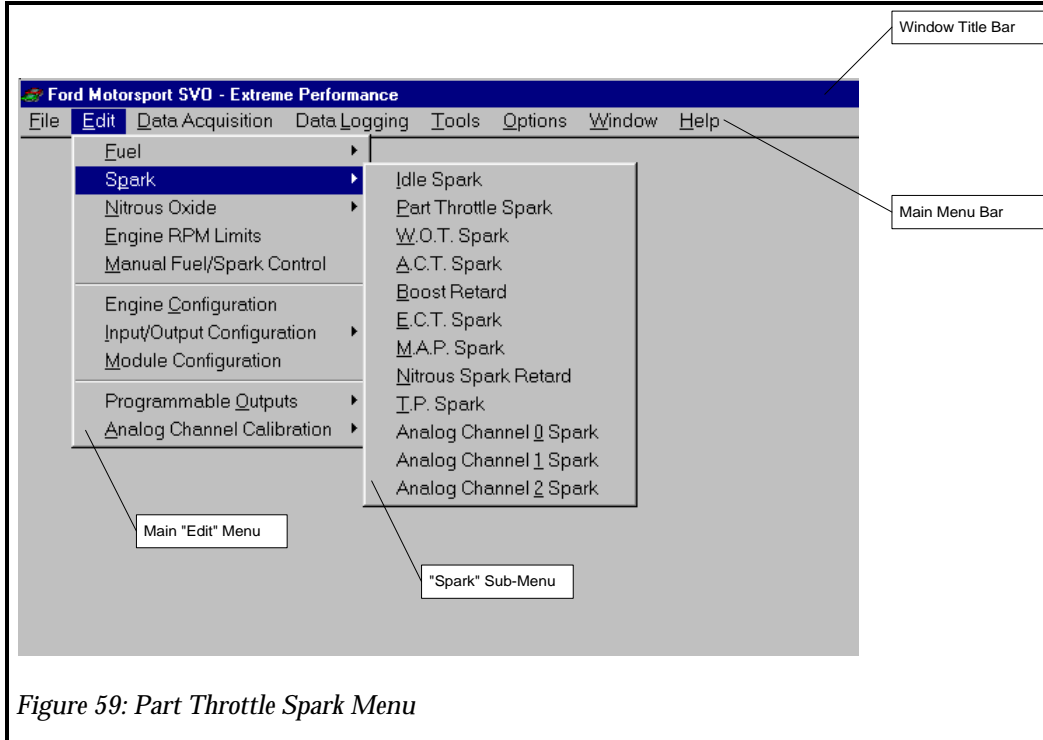


Figure 59: Part Throttle Spark Menu

By clicking on the “Part Throttle Spark” menu item, a two dimensional function (table) will appear for the Part Throttle range. Part Throttle is typically from 10 degrees to 50 degrees of throttle movement. This function (table) allows you to specify a spark curve based on Engine Speed (RPM).

To modify the Part Throttle Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 60: Part Throttle - RPM Spark Advance Function.

Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

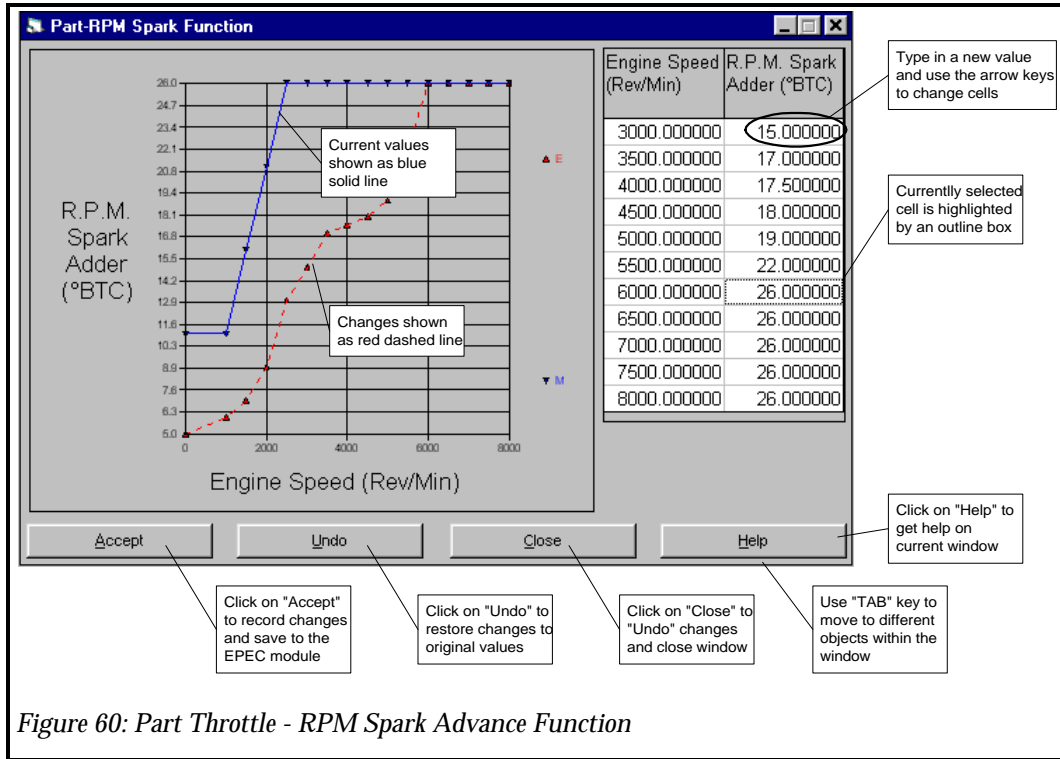


Figure 60: Part Throttle - RPM Spark Advance Function

WOT Spark Advance

The Spark Control Strategy is comprised of either Idle, Part Throttle or WOT spark tables. Only one of these tables are used at once and is selected by the current Throttle Mode (Idle/Part/WOT). The Idle, Part Throttle and WOT Spark advance is calculated from one of 3 functions, Idle Spark, Part Throttle Spark or WOT Spark. See Figure 61: Idle/Part Throttle/WOT Spark Strategy Diagram.

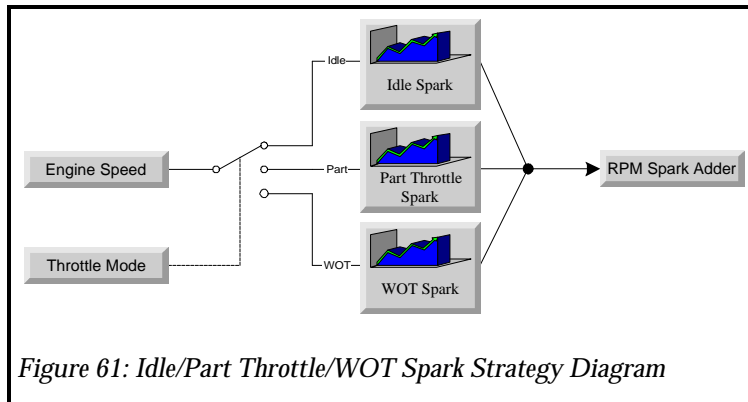


Figure 61: Idle/Part Throttle/WOT Spark Strategy Diagram

To change the Wide Open Throttle Spark Advance, click on the “Edit” menu. Once the options appear, click on “Spark”, see Figure 62: WOT Spark Menu.

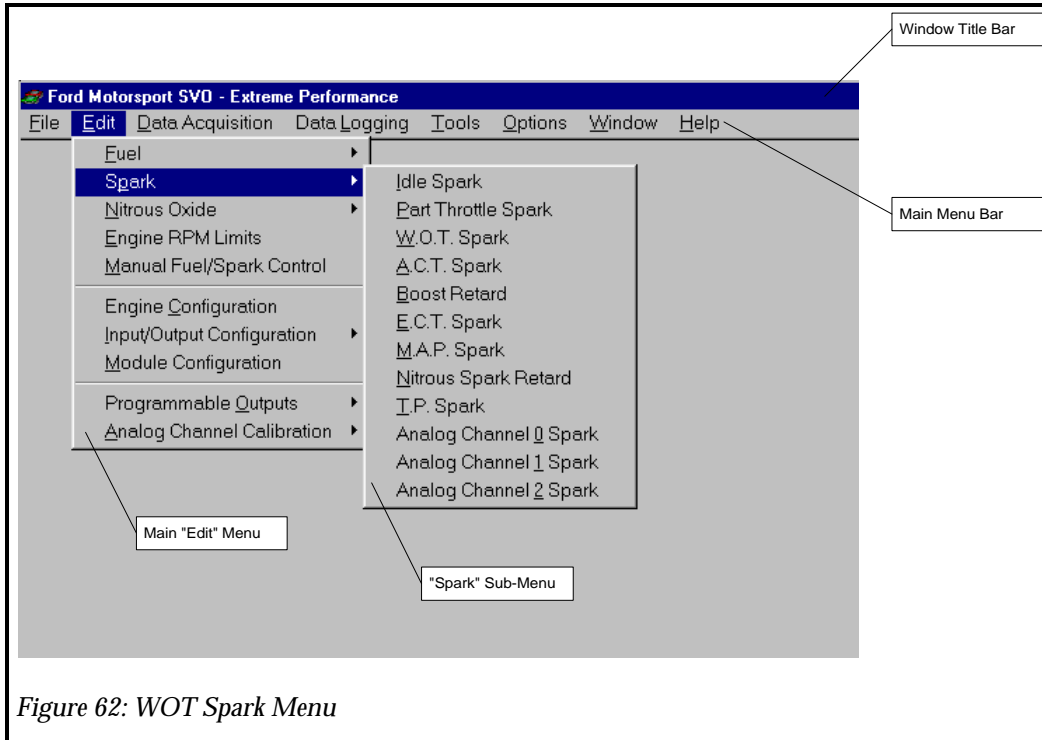


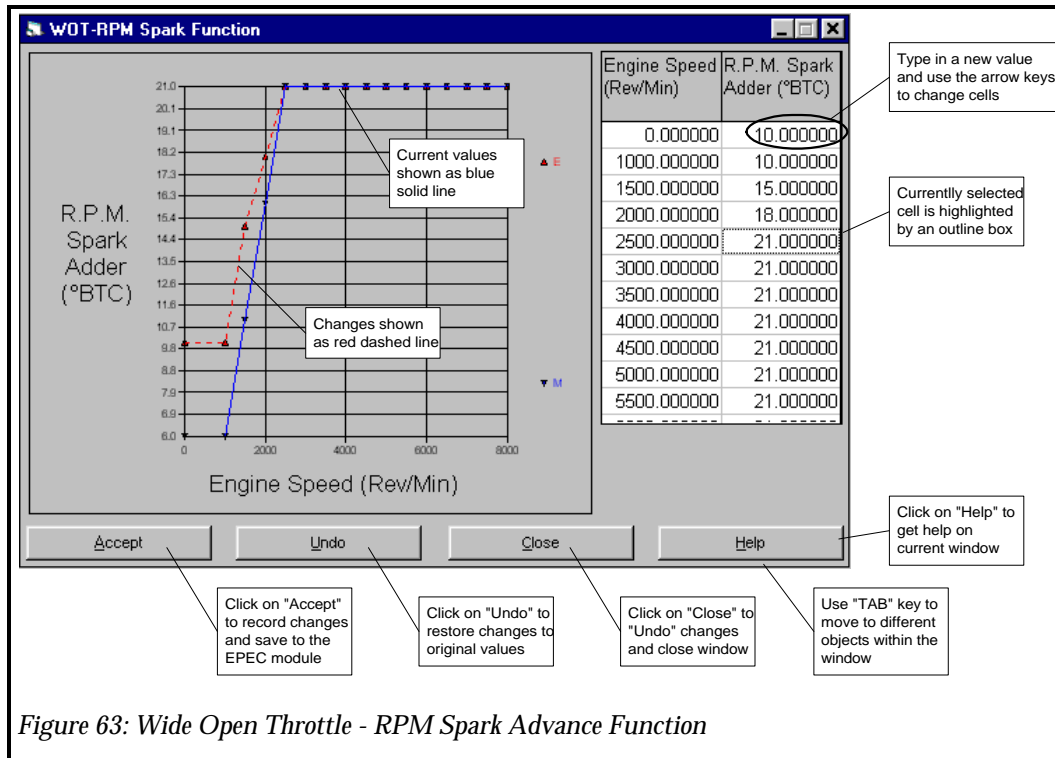
Figure 62: WOT Spark Menu

By clicking on the “WOT Spark” menu item, a two dimensional function (table) will appear for the wide open throttle range. Wide Open Throttle is typically from 50 degrees to 90 degrees of throttle movement. This function (table) allows you to specify a spark curve based on Engine Speed (RPM).

To modify the Wide Open Throttle Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 63: Wide Open Throttle - RPM Spark Advance Function.

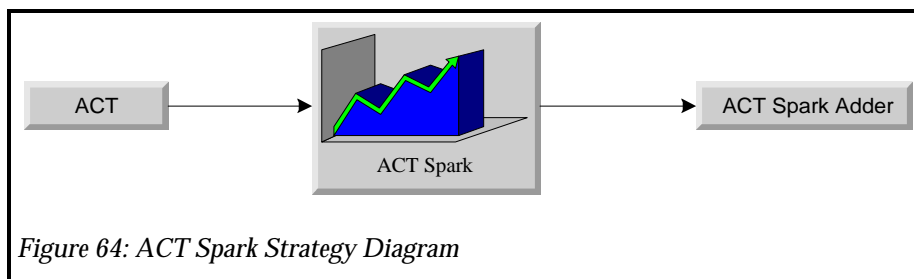
Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



Air Charge Temperature (ACT) Spark

ACT Spark is a spark modifier (a positive value adds spark, a negative value subtracts spark), which allows you to modify spark from the base spark as air inlet temperature changes. The ACT spark function is supplied for driveability, however, it will affect vehicle repeatability. If you are experiencing detonation at elevated temperatures, and a higher octane fuel is not available, then you can use this parameter to subtract spark advance (retard) to a level where the detonation disappears. The ACT Spark adder is calculated from the ACT Spark Function, See Figure 64: ACT Spark Strategy Diagram.



NOTE: In order for the ACT spark function to be functional, you must have an ACT sensor installed, connected and have the correct transfer function programmed into the EPEC module.

To change the ACT Spark Advance, click on the “Edit” menu. Once the options appear, click on “Spark”, see Figure 65: ACT Spark Menu. By clicking on the “ACT Spark” menu item, the ACT Spark function will appear.

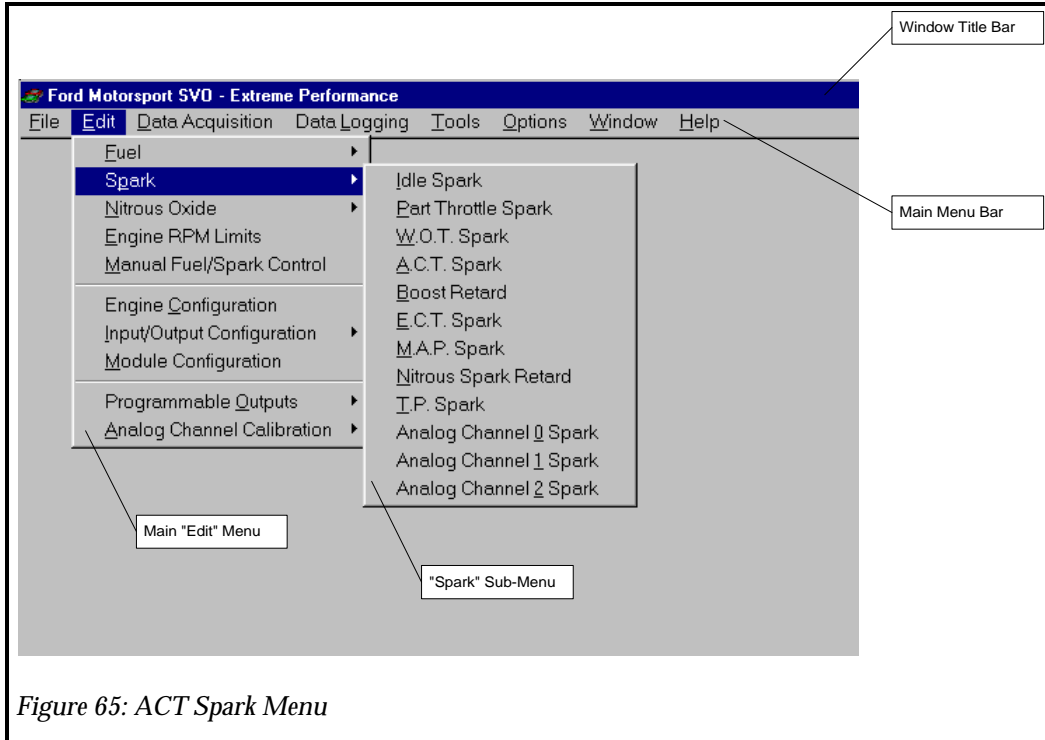
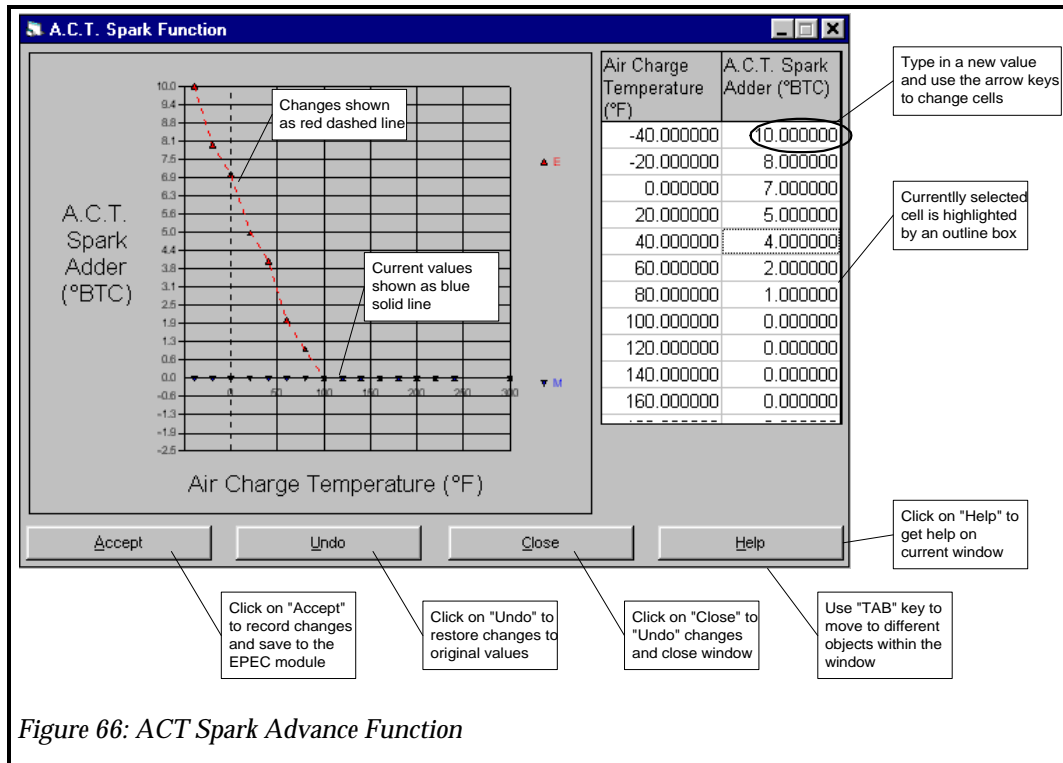


Figure 65: ACT Spark Menu

To modify the ACT Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 66: ACT Spark Advance Function.

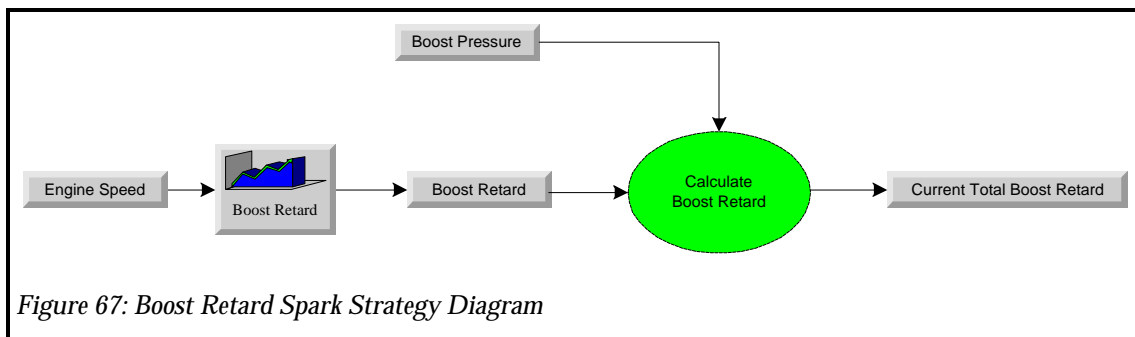
Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



Boost Retard

Boost Retard is only a spark subtractor (a positive value subtracts spark) which allows you to retard spark from the base spark as boost pressure increases. This function of course is intended to be used on engines with either superchargers or turbochargers. The boost retard function is dependent on engine speed (RPM) and is specified in terms of degrees retard per PSI of boost. Typical values range from 0.5 degrees/psi to 2 degrees/psi. The boost retard function is only functional under boost and will not modify spark advance under vacuum. For a value of 0.5 degrees/psi and if boost is at 10 psi, 5 degrees of spark will subtracted. The Boost Retard is calculated from the Boost Retard Function, see Figure 67: Boost Retard Spark Strategy Diagram.



NOTE: In order for the Boost Retard to be functional, you must have an analog MAP sensor capable of measuring vacuum and boost (GM or Chrysler type) installed, connected and have the correct transfer function programmed into the EPEC module.

To change the Boost Retard, click on the “Edit” menu. Once the options appear, click on “Boost Retard”, see Figure 68: Boost Retard Spark Menu.

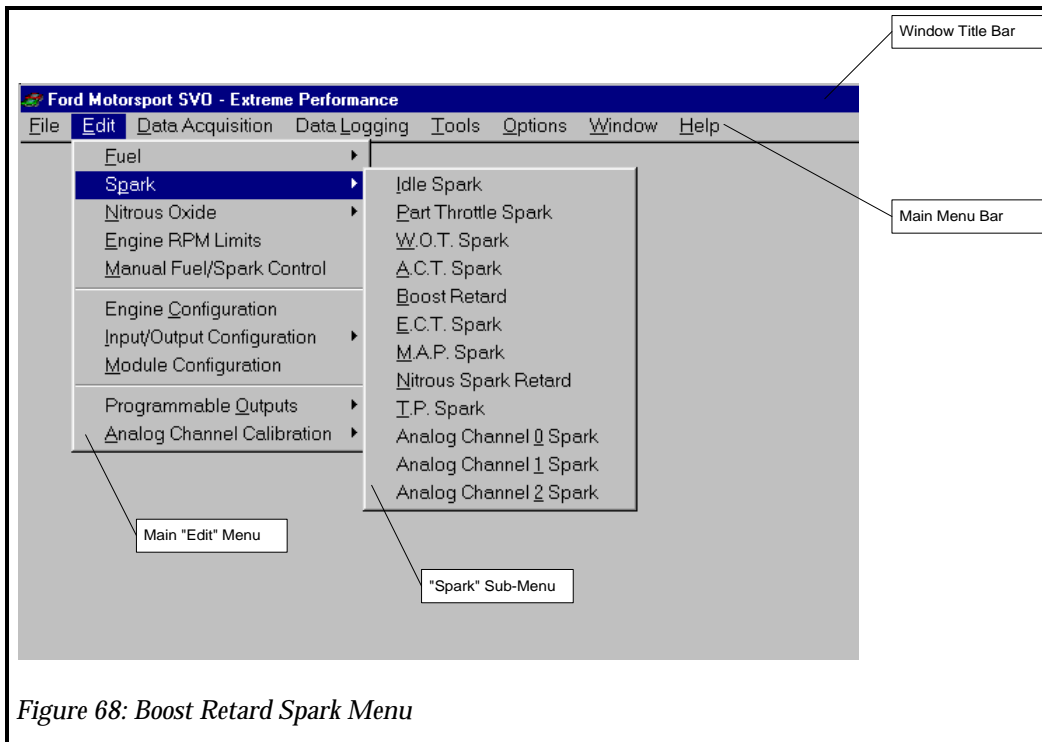


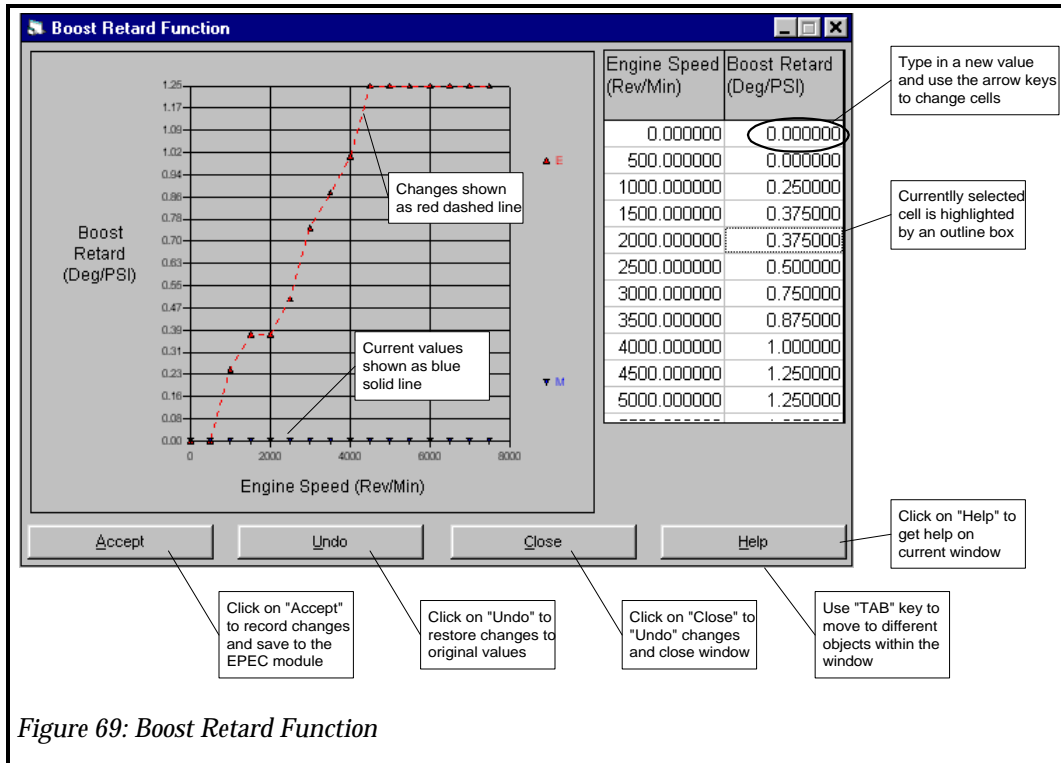
Figure 68: Boost Retard Spark Menu

By clicking on the “Idle Spark” menu item, a two dimensional function (table) will appear for the Idle throttle range. Idle is typically from a closed throttle plate to 10 degrees of throttle movement. This function (table) allows you to specify a spark curve based on Engine Speed (RPM).

To modify the Idle Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 69: Boost Retard Function.

Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on "ACCEPT", the new values WILL BE written to the EPEC module.



Engine Coolant Temperature (ECT) Spark

ECT Spark is a spark modifier (a positive value adds spark, a negative value subtracts spark), which allows you to modify spark from the base spark as engine temperature changes. The ECT spark function is supplied for driveability, however, it will affect vehicle repeatability. If you are experiencing detonation at elevated temperatures, and a higher octane fuel is not available, then you can use this parameter to subtract spark advance (retard) to a level where the detonation disappears. The ECT Spark adder is calculated from the ECT Spark Function, See Figure 70: ECT Spark Strategy Diagram.

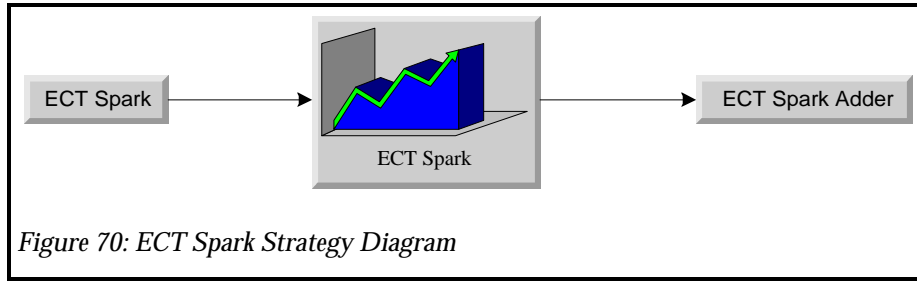


Figure 70: ECT Spark Strategy Diagram

NOTE: In order for the ECT spark function to be functional, you must have an ECT sensor installed, connected and have the correct transfer function programmed into the EPEC module.

To change the ECT Spark Advance, click on the “Edit” menu. Once the options appear, click on “Spark”, see Figure 71: ECT Spark Menu. By clicking on the “ECT Spark” menu item, the ECT Spark function will appear.

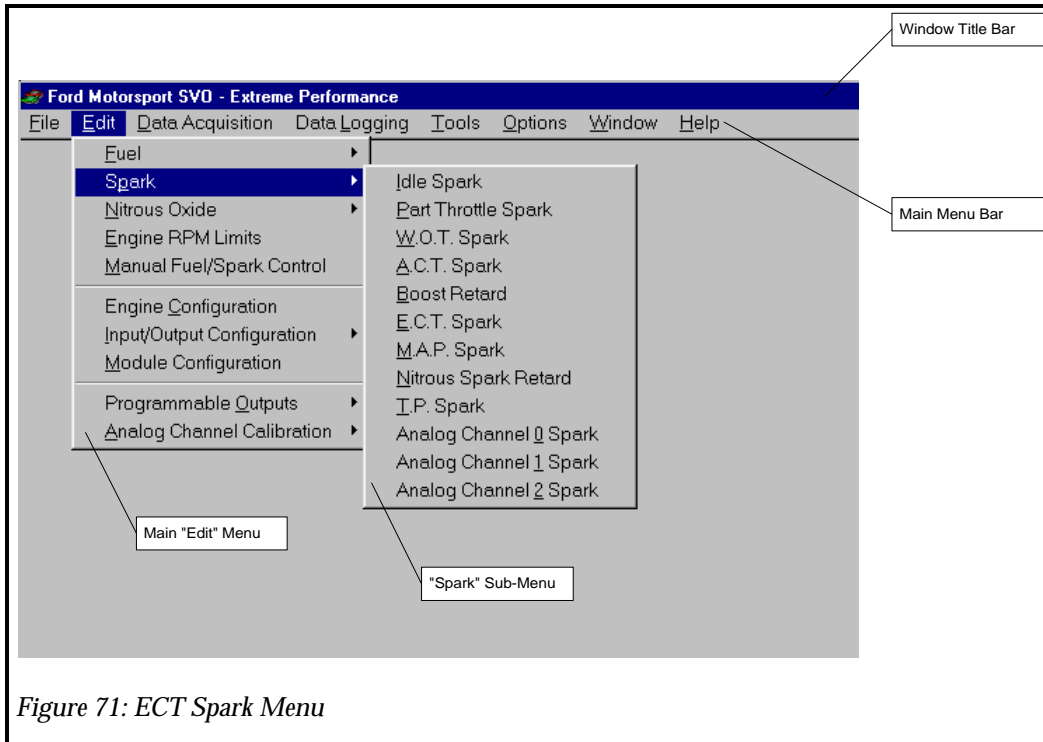


Figure 71: ECT Spark Menu

To modify the ECT Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 72: ECT Spark Advance Function.

Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from it original

value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

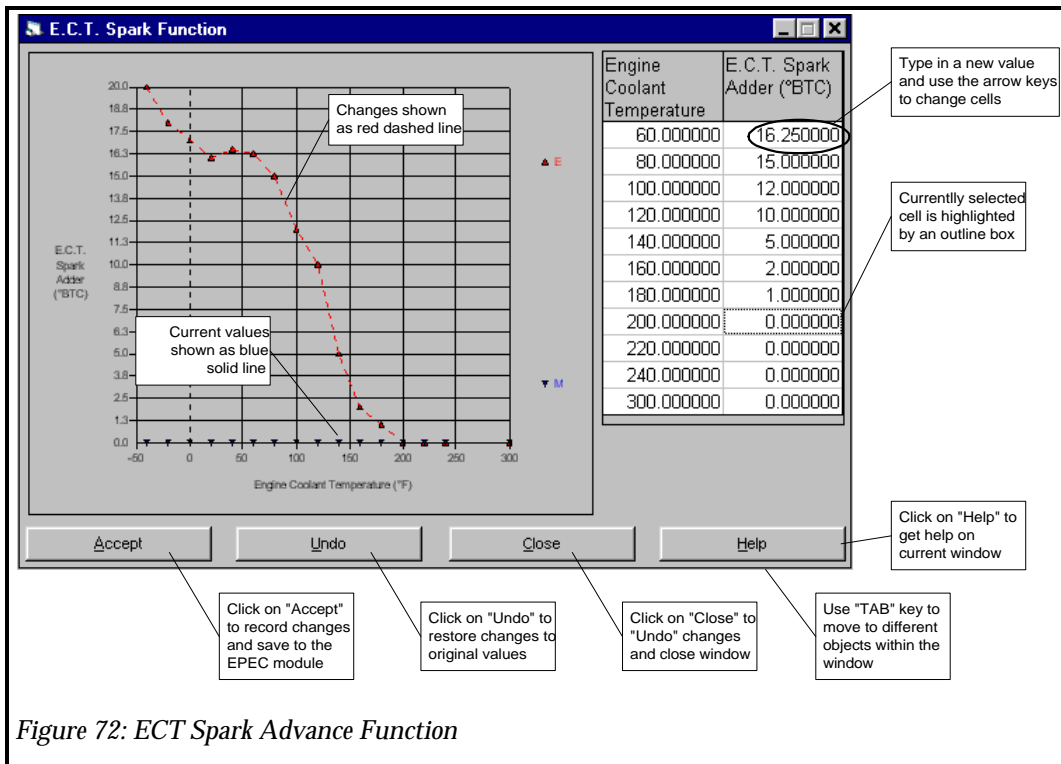


Figure 72: ECT Spark Advance Function

Manifold Absolute Pressure (MAP) Spark

MAP Spark is a spark modifier (a positive value adds spark, a negative value subtracts spark), which allows you to modify spark from the base spark as intake manifold pressure changes. The MAP spark function is supplied for driveability, however, it will affect vehicle repeatability. The MAP Spark adder is calculated from the MAP Spark Function, See Figure 73: MAP Spark Strategy Diagram.

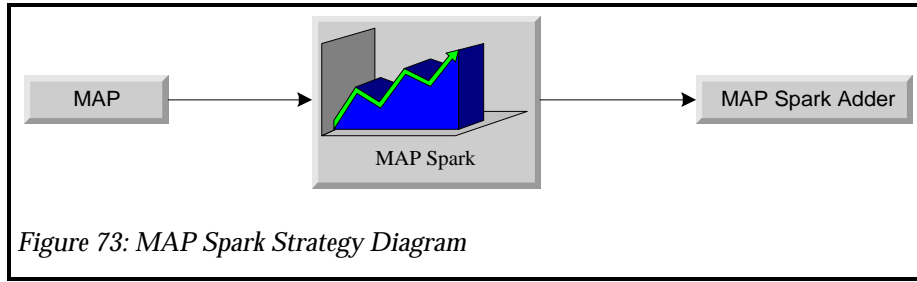


Figure 73: MAP Spark Strategy Diagram

NOTE: In order for the Boost Retard to be functional, you must have an analog MAP sensor capable of measuring vacuum (GM or Chrysler type) installed, connected and have the correct transfer function programmed into the EPEC module.

To change the ECT Spark Advance, click on the “Edit” menu. Once the options appear, click on “Spark”, see Figure 74: MAP Spark Menu. By clicking on the “MAP Spark” menu item, the MAP Spark function will appear.

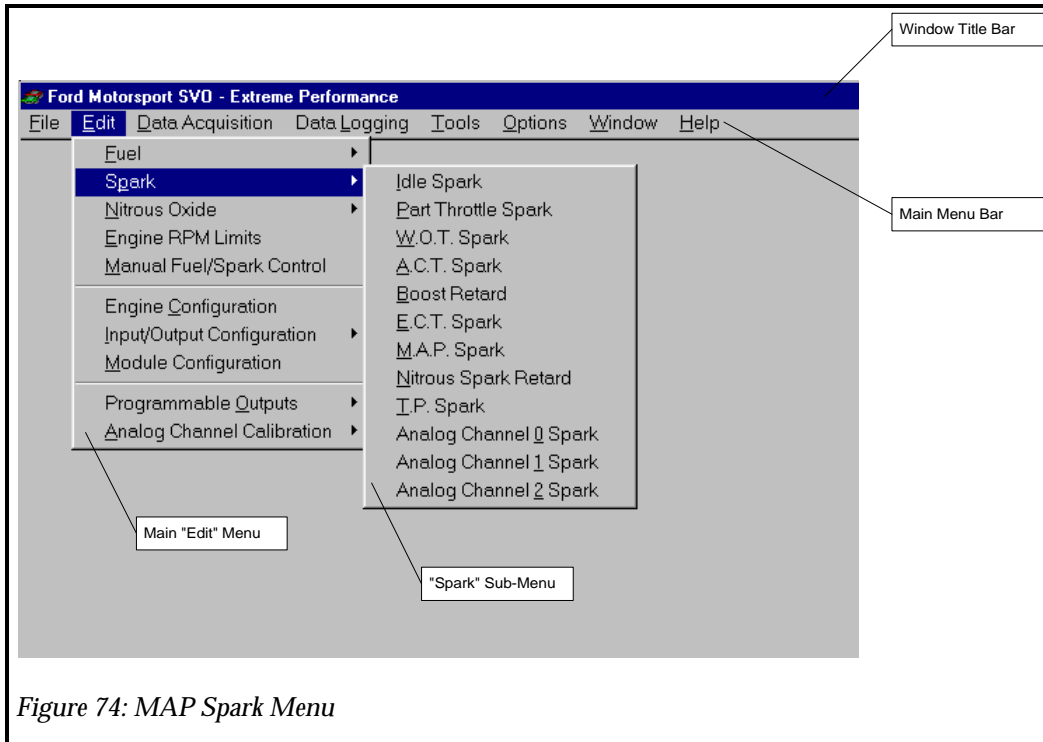


Figure 74: MAP Spark Menu

To modify the MAP Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 75: MAP Spark Advance Function.

Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original

value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

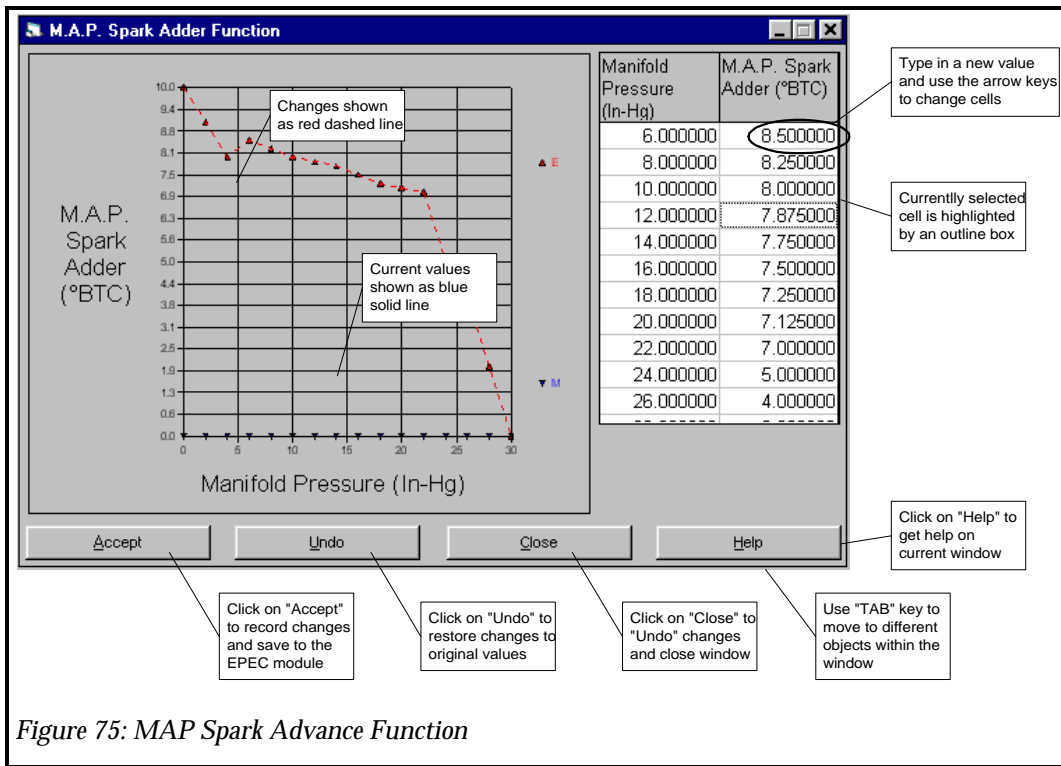


Figure 75: MAP Spark Advance Function

Nitrous Oxide Spark Retard

Nitrous Oxide Spark Retard is only a spark subtractor (a positive value subtracts spark) which allows you to retard spark from the base spark when each stage of Nitrous Oxide is activated. There are two values for Nitrous Oxide Spark Retard, one for each stage of nitrous the E.P.E.C controls. These two values are additive, i.e. if stage one is calibrated for 5 degrees retard and stage 2 is calibrated for 7 degrees retard and both stages of Nitrous Oxide are activated, a total of 12 degrees of spark will be removed from the base spark.

NOTE: In order for the Nitrous Oxide Controls to be functional the Nitrous Enable Switch, Nitrous Arm Switch, Throttle Position Sensor and each stage of Nitrous Oxide must be connected to the EPEC module.

To change the Nitrous Spark Retard, click on the “Edit” menu. Once the options appear, click on “Spark”, see Figure 76: Nitrous Spark Menu.

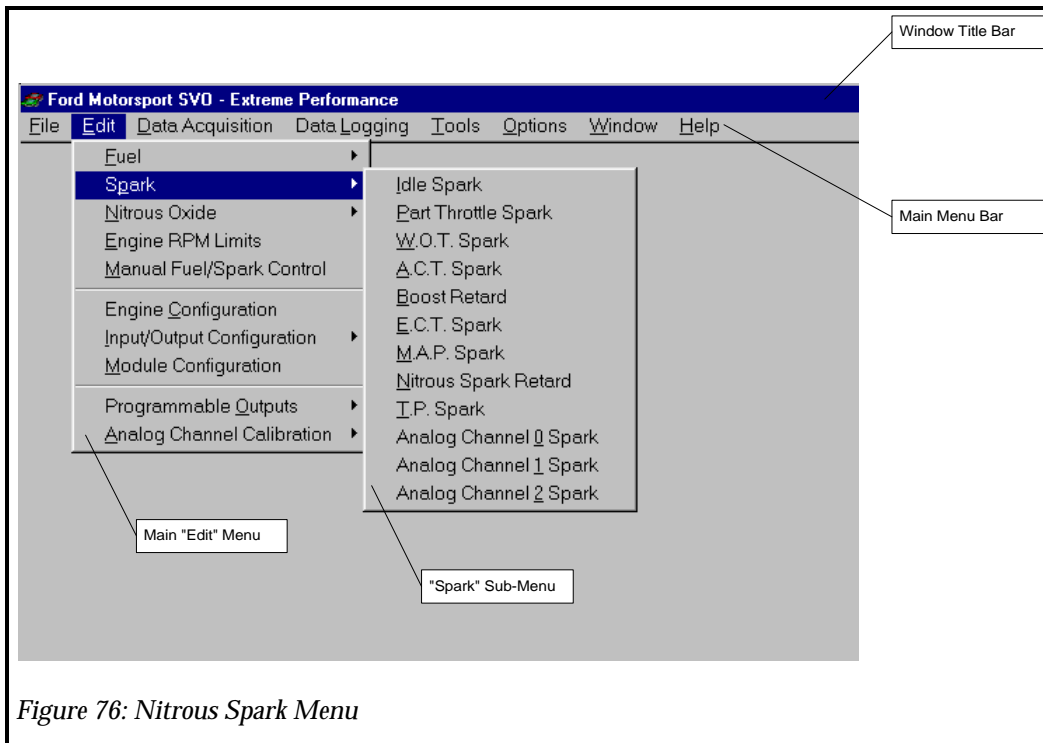


Figure 76: Nitrous Spark Menu

By clicking on the “Nitrous Spark Retard” menu item, window with a spark retard value for each stage will appear.

NOTE: You can also access the spark retard values for each stage in the Nitrous Oxide Control windows under the “Nitrous Oxide Stage 1 or Nitrous Oxide Stage 2” menu items.

To modify the Nitrous Spark Retard for each stage, click on the cell you want to modify and type a new value, then move out of that cell using the “TAB” key. See Figure 77: Nitrous Spark Retard Values.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

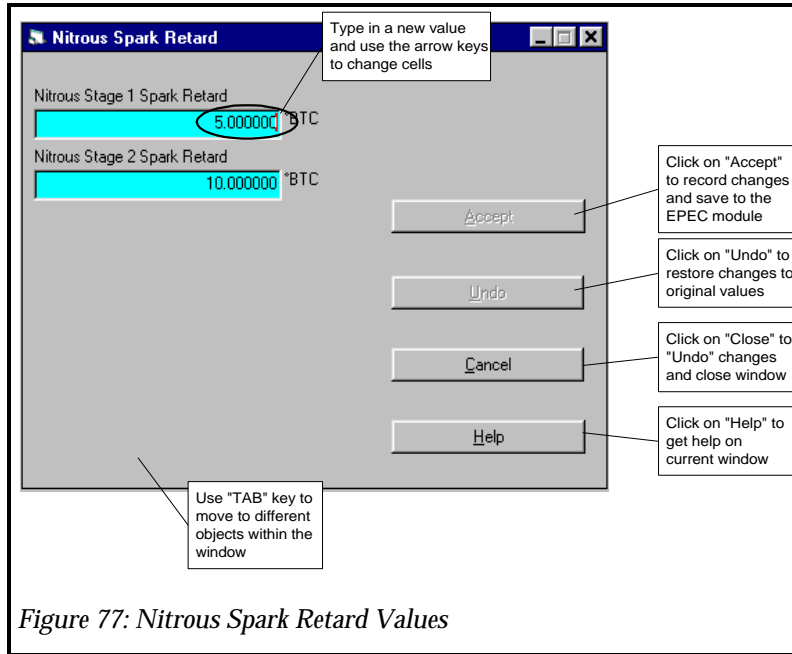


Figure 77: Nitrous Spark Retard Values

Throttle Position (TP) Spark

TP Spark is a spark modifier (a positive value adds spark, a negative value subtracts spark), which allows you to modify spark from the base spark as Throttle Angle changes. The TP Spark adder is calculated from the TP Spark Function, See Figure 78: TP Spark Strategy Diagram.

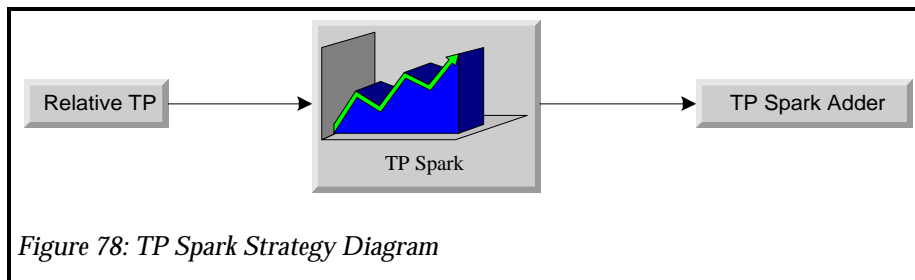


Figure 78: TP Spark Strategy Diagram

NOTE: In order for the TP spark function to be functional, you must have an TP sensor installed, connected and have the correct transfer function programmed into the EPEC module.

To change the TP Spark Advance, click on the "Edit" menu. Once the options appear, click on "Spark", see Figure 79: TP Spark Menu By clicking on the "TP Spark" menu item, the TP Spark function will appear.

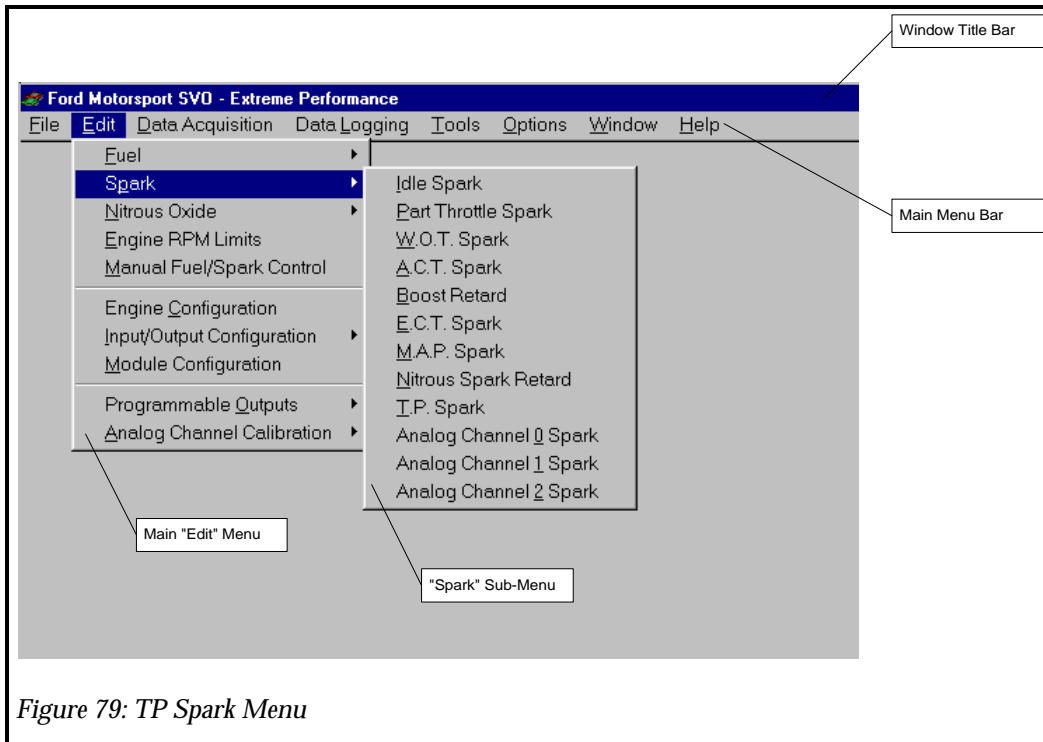


Figure 79: TP Spark Menu

To modify the TP Spark Advance function, click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 80: TP Spark Advance Function.

Also note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

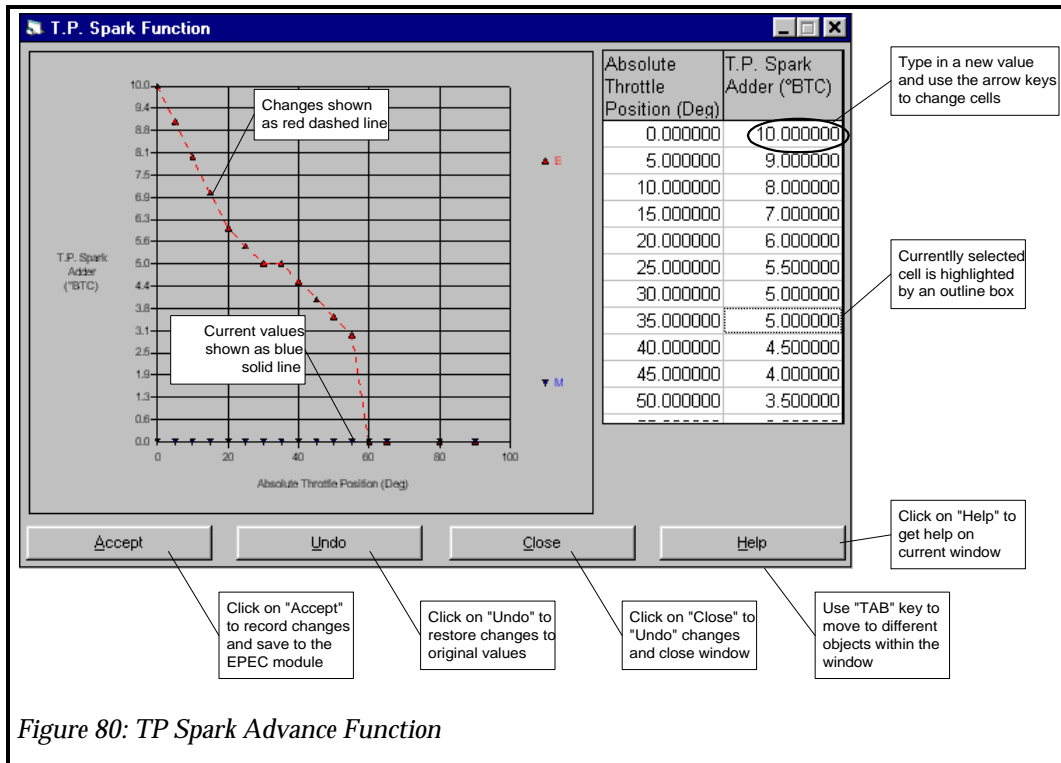


Figure 80: TP Spark Advance Function

Programmable Output Channel 0-3 Spark

The EPEC module has 4 user Programmable Outputs available. Each of these outputs has 2 Spark Adders associated with it, for a total of 8 Spark Adders. One Spark Adder is used when the output is "OFF" and the other is used when the output is "ON". These Spark Adders provide the ability to modify the total spark advance delivered when external devices are switched "ON" and "OFF".

The Programmable Output Spark Adders are accessible from the Programmable Output configurations. To edit these Spark Adders, click on the "Edit" menu and then the "Programmable Outputs" sub-menu and then the desired Programmable Output channel. The Programmable Output configuration window will appear for the selected output channel. See Figure 81: Programmable Output Spark Menu.

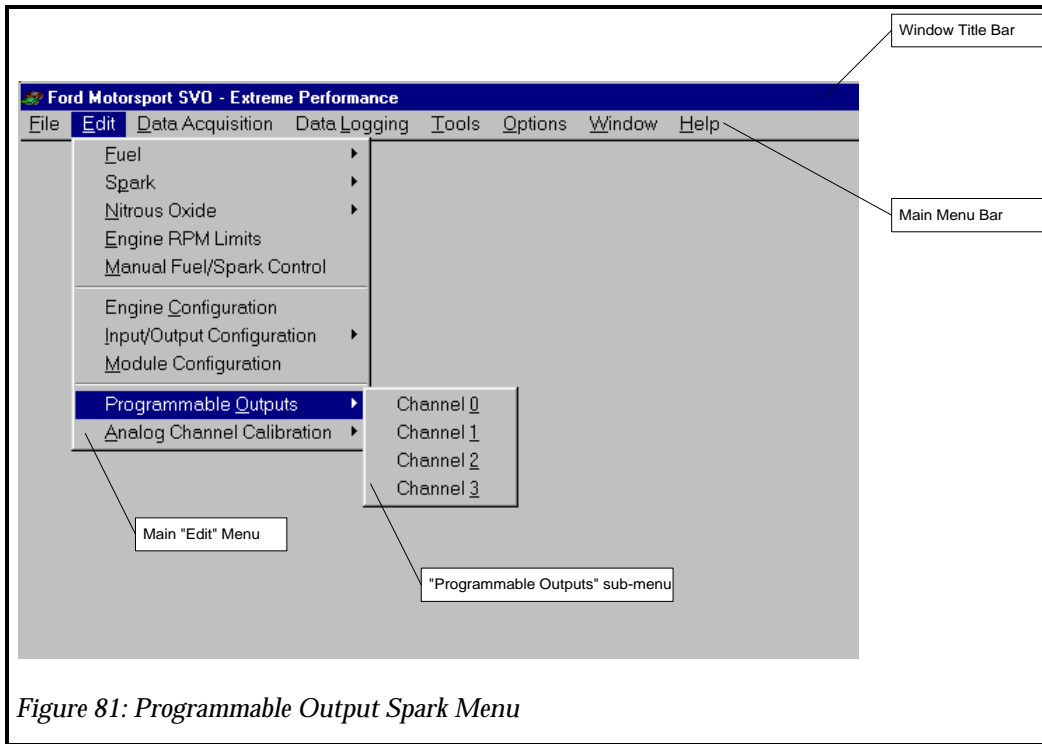


Figure 81: Programmable Output Spark Menu

Click on the “On Spark Adder” or on the “Off Conditions” tab then the “Off Spark Adder” cell and type a new value, then move out of that cell by using the tab key. See Figure 82: Programmable Output 0-4 Spark Function. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

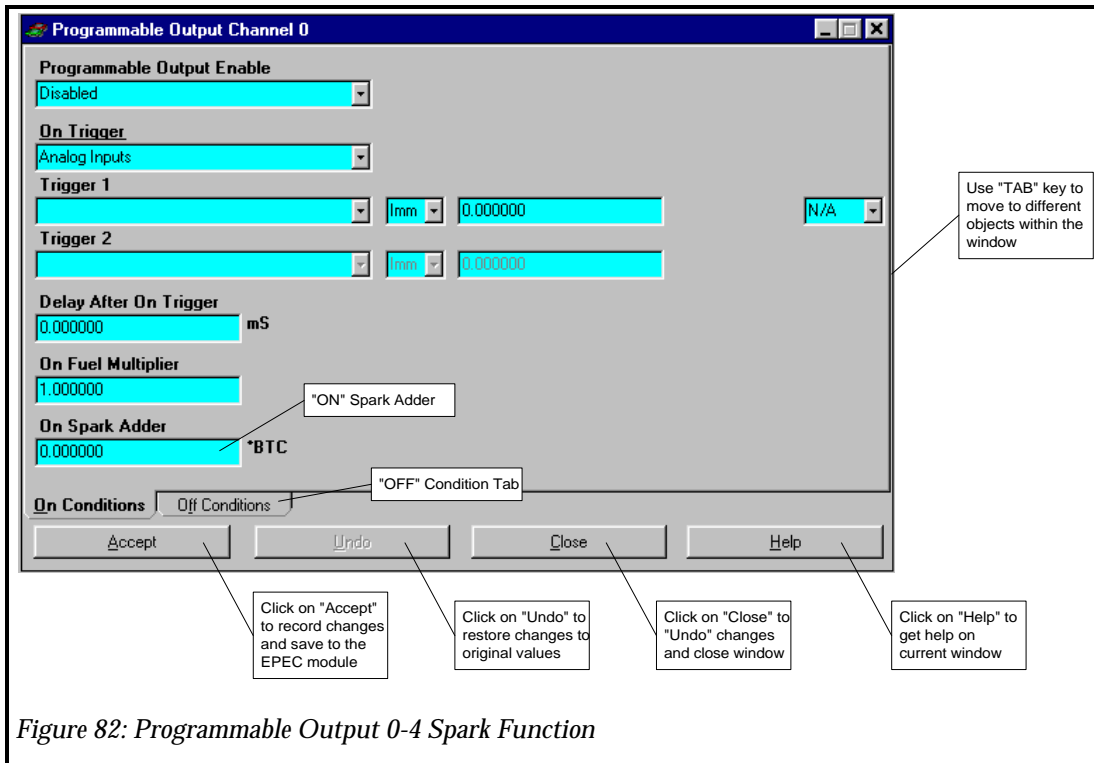


Figure 82: Programmable Output 0-4 Spark Function

Analog Channel 0-2 Spark

There are 3 Analog Input channels and each of them have a input voltage range of 0v-10v. The Analog Channel Spark Adders can be used to modify total spark advance to the engine based on any external analog type sensor or input. The values entered in these tables are straight adders to your spark advance (a positive value adds spark advance, a negative value subtracts spark advance). The Analog Channel Spark adder is calculated from the Analog Channel Spark Function, See Figure 83: Analog Channel 0-2 Spark Strategy Diagram

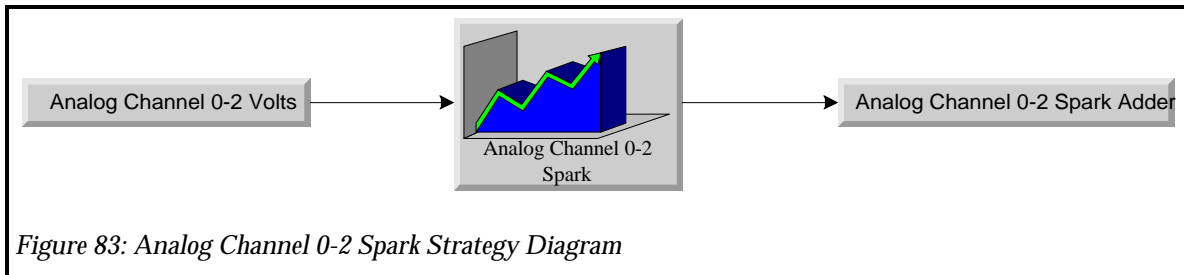


Figure 83: Analog Channel 0-2 Spark Strategy Diagram

To change one of the Analog Channel’s Spark Function, click on the “Edit” menu and then the “Spark” sub-menu and then one of the “Analog Channel X Fuel” menu items. The selected Analog Channel spark function will then appear. See Figure 84: Analog Channel 0 -2 Spark Menu.

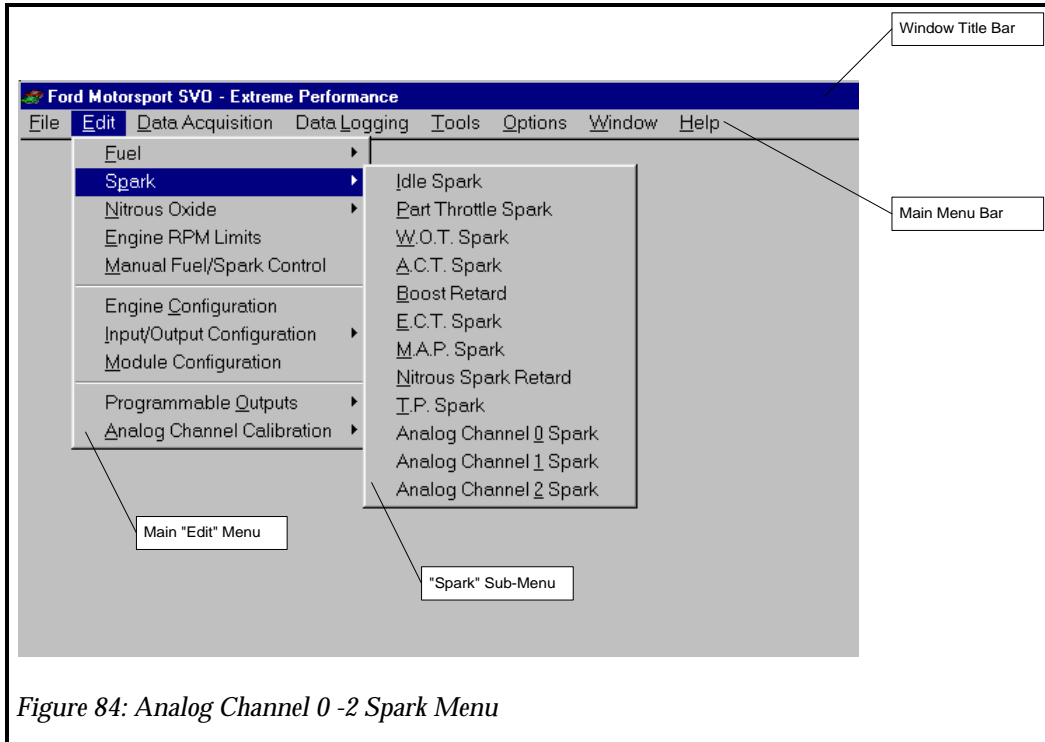
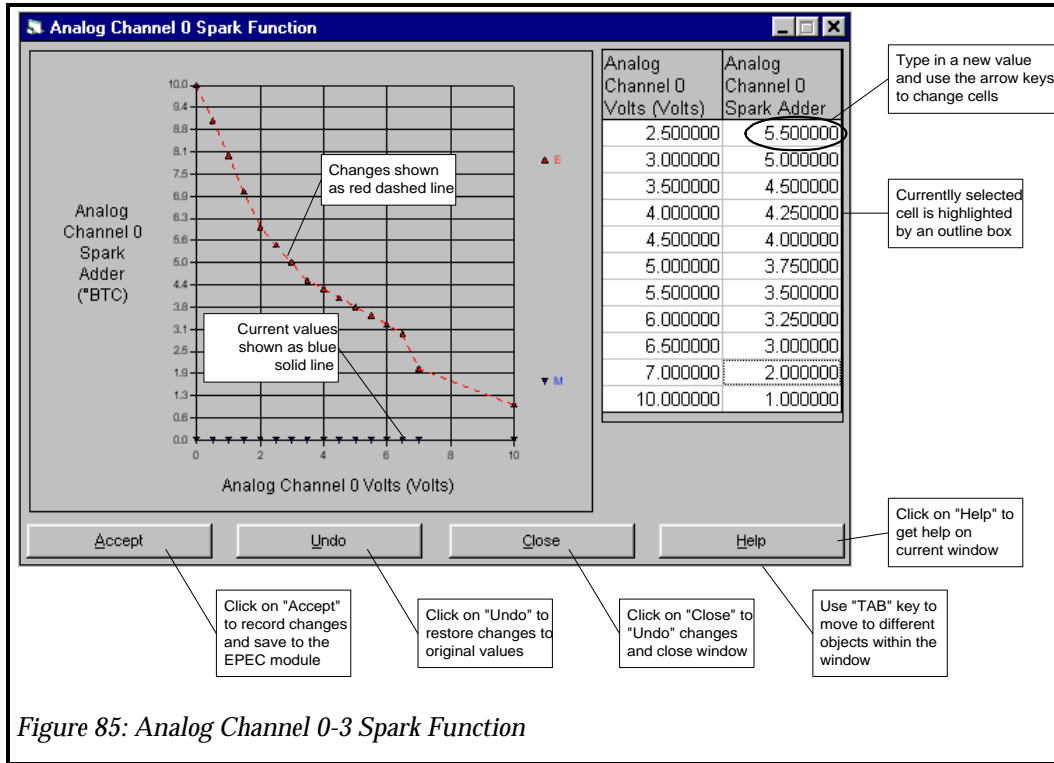


Figure 84: Analog Channel 0 -2 Spark Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 85: Analog Channel 0-3 Spark Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



Nitrous Oxide Strategy

The EPEC module has built in Nitrous Oxide Controls. This will enable you to have the computer turn on the Nitrous Oxide System and retard spark advance for you. You will have to wire the output from the computer to a relay system which turns on your Nitrous System

CAUTION: Do not connect the output from the EPEC module directly to the nitrous oxide solenoids. The current draw of typical nitrous oxide solenoids is too high for the EPEC Module to activate directly and damage may occur.

Once your Nitrous Oxide system hardware is wired, which includes the Nitrous Oxide Arm Switch (the device to trigger or start the Nitrous timers, which typically can be a transmission brake button, clutch switch, or line lock button), nitrous oxide solenoids, Nitrous Oxide Indicator Lamps and Nitrous Oxide Enable switch, the calibration is quite simple as described below.

IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.

The EPEC system allows for two stages of nitrous oxide controls. Each stage is activated (turned on) after a programmable time delay, once the trigger is activated. There are two steps to “Arm” the Nitrous Oxide system. First you must enable the Nitrous System by closing the Nitrous Oxide Enable Switch.

IMPORTANT: The Nitrous Oxide Enable switch cannot be “ON” when the EPEC module is powered up. If it is, the Nitrous System will not “ARM” when the Nitrous Oxide Arm Switch is depressed. If the Nitrous Oxide Enable Switch is “ON” when the EPEC module is powered up, you must turn the switch off then back on again. This is done intentionally to protect against accidental Nitrous Oxide discharge.

Secondly, you must depress the Nitrous Oxide Arm Switch. This switch has two functions, when depressed this switch will arm the Nitrous System and when it is released, the nitrous timers start.

For example if your Nitrous Oxide Arm input is connected to the transmission brake, when you press the transmission brake, the Nitrous Oxide System will arm nitrous indicator lamps will illuminate indicating that the Nitrous System is armed and is ready. Once you release the transmission brake, the Nitrous Oxide System will activate in the programmed number of Milliseconds. So, if you entered 50ms (Note: 1ms = 0.001 seconds) and a spark retard of 4 degrees for stage one activation and 1100ms and a spark retard of 6 degrees for stage two. The first stage will activate 0.050 seconds after you released the transmission brake and the spark will be retarded 4 degrees. The second stage will come on 1.100 seconds after you after you released the transmission brake and the spark will be retarded an additional 6 degrees (total 10 degrees = 4 degrees from stage one + 6 degrees for stage two). This is explained further in the table below:

Time from transmission brake release	Comments
0	Car staged at the line, transmission brake applied, Throttle at WOT, total WOT spark advance calibrated to 32 degrees BTC
0	Christmas tree activated, you release trans. Brake
0.050 sec (50 ms)	First stage of Nitrous is activated, spark retarded 4 degrees Total Spark advance = 28 degrees BTC
1.100 sec (1100 ms)	Second stage of Nitrous is activated, spark retarded 6 additional degrees Total Spark Advance = 22 degrees BTC

NOTE: You could calibrate stage II to come on before stage I as both stages are timed independently from the trigger.

IMPORTANT: The timer starts from the time the trigger is activated AND the Relative Throttle Angle is greater than Minimum Throttle Angle AND RPM is greater than Minimum RPM for operation of the Nitrous Oxide System, in other words if you release the trigger and the Throttle Angle is not at the Minimum Angle for the Nitrous Oxide system to be operational the timer will start after the Throttle Angle gets to the specified Minimum Angle.

Nitrous Oxide Globals

The Nitrous Oxide Globals apply to both Stage 1 and Stage 2. There are four parameters that apply to both Stage 1 and Stage 2.

1. “Nitrous On Throttle Angle”: The minimum throttle angle for the Nitrous Oxide system to activate.
2. “Nitrous Off Throttle Angle”: The throttle angle at which the Nitrous Oxide system will turn off.
3. “Nitrous Maximum RPM”: The engine speed at which the Nitrous Oxide system will turn off, this is to protect from over revving the engine.
4. “Nitrous on Delay After Max. RPM”: The amount of time (in milliseconds) it will take the nitrous system to turn back on after the engine speed drops below the “Nitrous Maximum RPM”.

IMPORTANT: The system will not turn the nitrous solenoids back on once you remove your foot, so if you lift, the system will not come back on.

To modify the Nitrous Oxide Global calibration parameters, go to the “Edit” menu, then the “Nitrous” sub-menu and select “Globals” See Figure 86: Nitrous Oxide Menu.

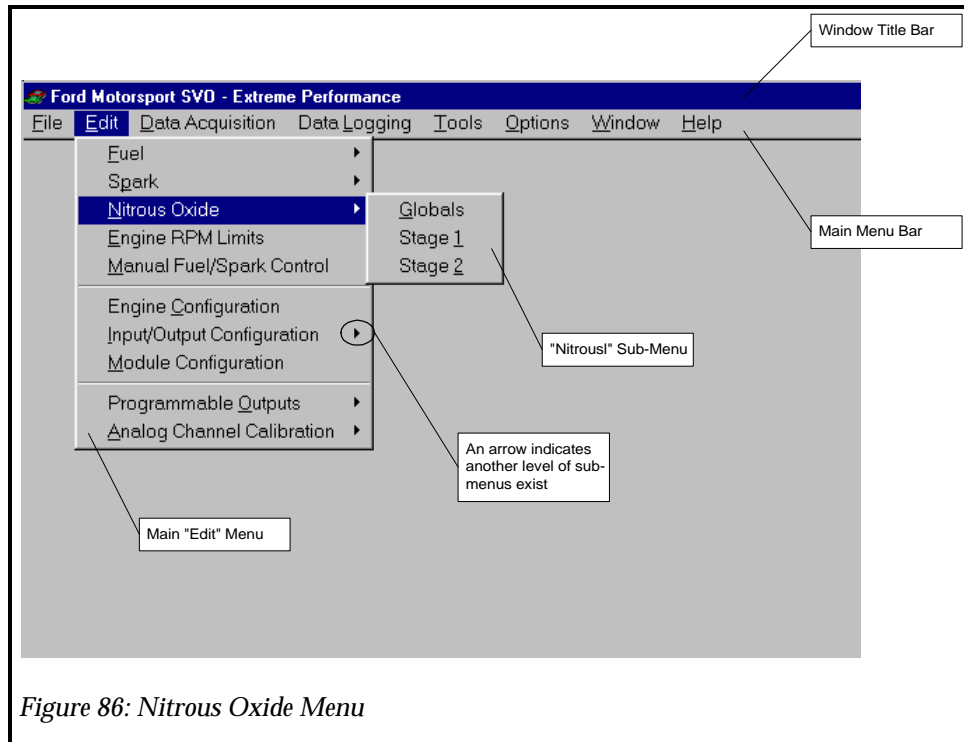


Figure 86: Nitrous Oxide Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the “TAB” key. See Figure 87: Nitrous Oxide Globals. At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

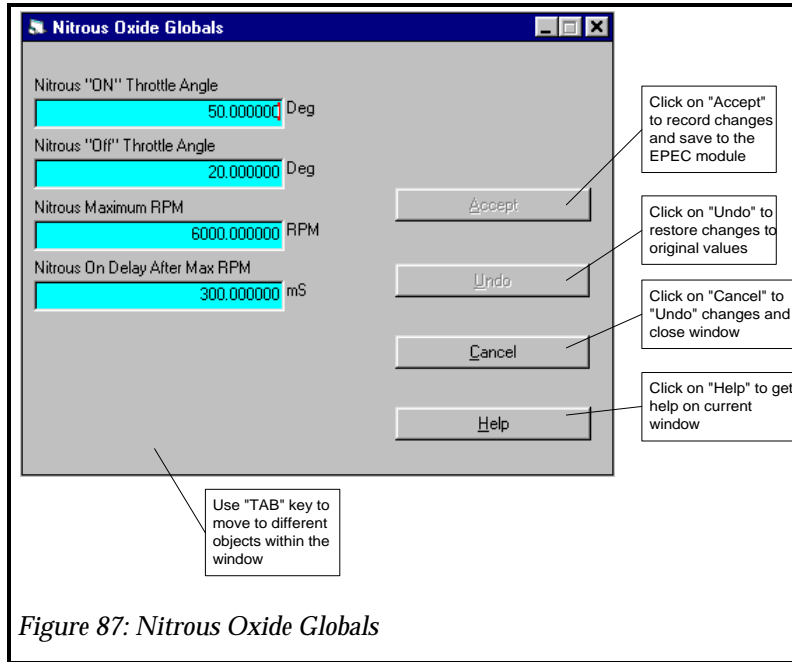


Figure 87: Nitrous Oxide Globals

Nitrous Oxide Stage 1 and Stage 2 Controls

The Nitrous Oxide Stage 1 and Stage 2 controls are identical in function. There are three parameters that apply to only Stage 1 or Stage 2.

1. “Nitrous Stage X Spark Retard”: The amount of spark angle the Nitrous Oxide system will remove when the stage is activated.
2. “Nitrous Stage X Minimum RPM”: The minimum RPM at which the Nitrous stage will come on. This is to protect from excessive low speed cylinder pressures.
3. “Nitrous Stage X Delay”: The amount of time, in milliseconds, which the nitrous stage will come on after the trigger is activated, and the minimum throttle angle and RPM requirements are met. Note that 1ms is equal to 0.001 seconds. The following table is provided for reference:

Milliseconds	Seconds
1	0.001
10	0.010
100	0.100
1000	1.000

To modify the Nitrous Oxide Global calibration parameters, go to the “Edit” menu, then the “Nitrous” sub-menu and select “Stage 1” or “Stage 2” See Figure 86: Nitrous Oxide Menu.

NOTE: Each stage works independently and each are timed from the trigger. So if the time for "Nitrous Stage 2 Delay" is less than for "Nitrous Stage 1 Delay" then Stage 2 will come on before stage one.

Click on the cell you want to modify and type a new value, then move out of that cell using the "TAB" key. See Figure 88: Nitrous Oxide Stage Parameters. At this point you can click on "Accept", "Undo" or "Cancel". "Accept" will accept the new values. "Undo" will undo the changes and restore the original settings. "Close" will "Undo" and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on "ACCEPT", the new values WILL BE written to the EPEC module.

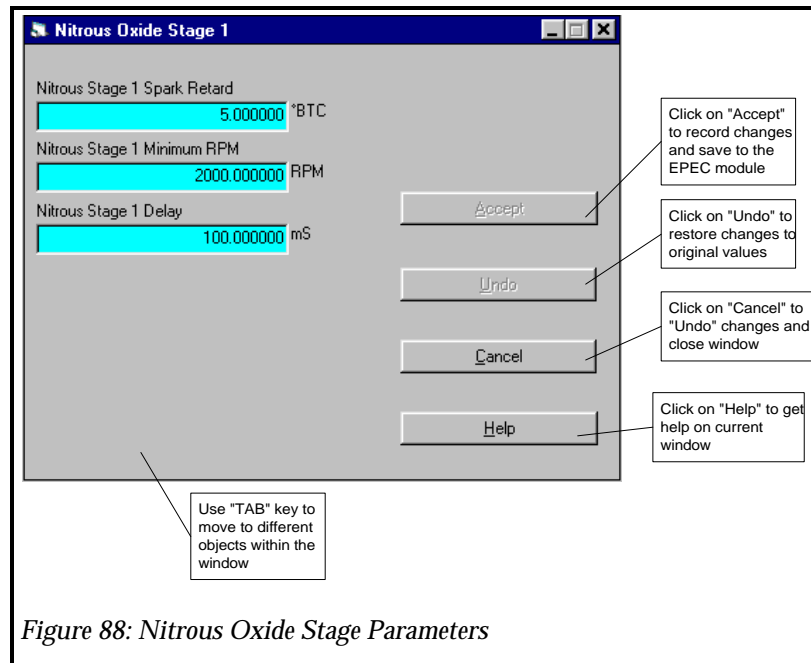


Figure 88: Nitrous Oxide Stage Parameters

Engine RPM Limiters

These are engine limits to protect your engine from over-revving or to provide assistance for staging the car, like an aftermarket two step.

Fuel Rev Limit

The Fuel Rev Limit specifies the RPM at which the EPEC Module will shut off fuel flow to the engine by not activating the injectors. The EPEC module will cut fuel (Fuel Cut Flag = ON) at this engine speed. The fuel will turn back on at this setting minus 200 RPM. So if you have this value set at 6000 RPM, the fuel will be cut as soon as the engine speed is greater than

6000 RPM and the fuel will turn back on at 5800 RPM. This is typically set slightly higher than the spark rev. limiter (described below).

NOTE: The fuel rev limiter does not lean out the engine. If the fuel rev limiter is active, no fuel is delivered.

Spark Rev Limit

The Spark Rev Limit specifies the RPM at which the computer will shut off spark delivery to the engine by not firing the coil. This is updated every cylinder event, and is similar to other aftermarket spark type rev limiters. The EPEC module will cut spark (Spark Cut Flag = ON) at this engine speed. The spark will turn back on at this setting minus 200 RPM. So if you have this value set at 6000 RPM, the spark will be cut as soon as the engine speed is greater than 6000 RPM and the spark will turn back on at 5800 RPM.

IMPORTANT: If you are running the EPEC module with an EDIS type ignition system, Spark cannot be cut. You must rev limit the Fuel Rev Limit.

Stage Rev Limit

This is similar to a two-step device. It cuts the spark, at each cylinder event. This is activated when a trigger is activated, such as a clutch pedal depressed. It will cut the spark to hold the engine at a given speed.

IMPORTANT: If you are running the EPEC module with an EDIS type ignition system, Spark cannot be cut. You cannot use this feature.

To modify the Engine RPM Limits parameters, go to the “Edit” menu, then select “Engine RPM Limits” See Figure 89: Engine RPM Limits Menu.

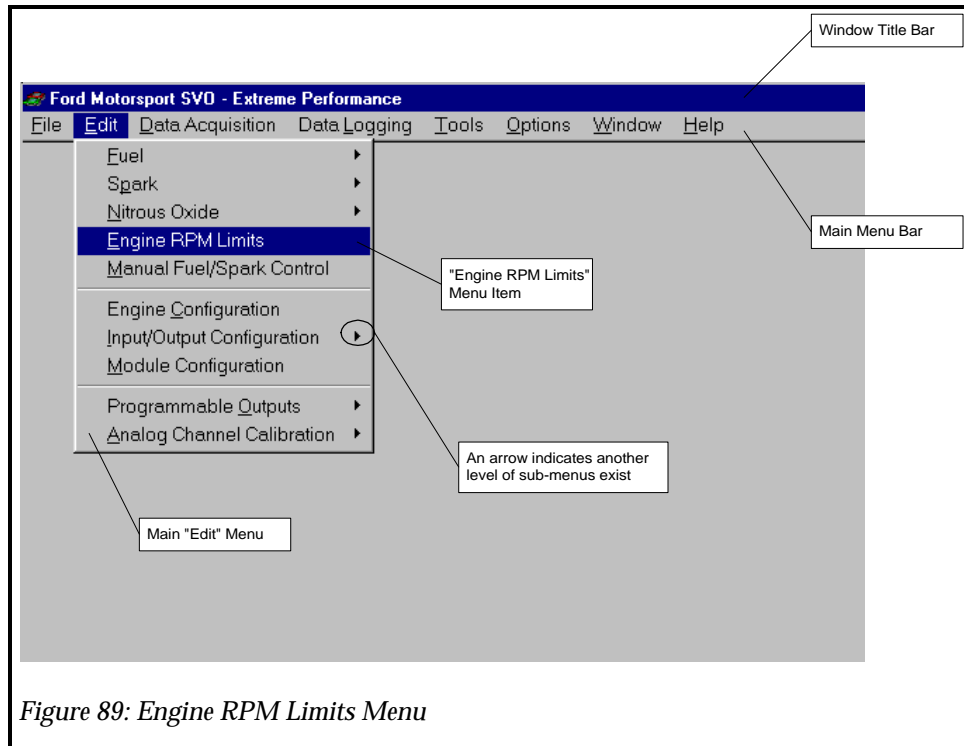


Figure 89: Engine RPM Limits Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the “TAB” key. See Figure 90: Engine RPM Limiter Parameters. At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

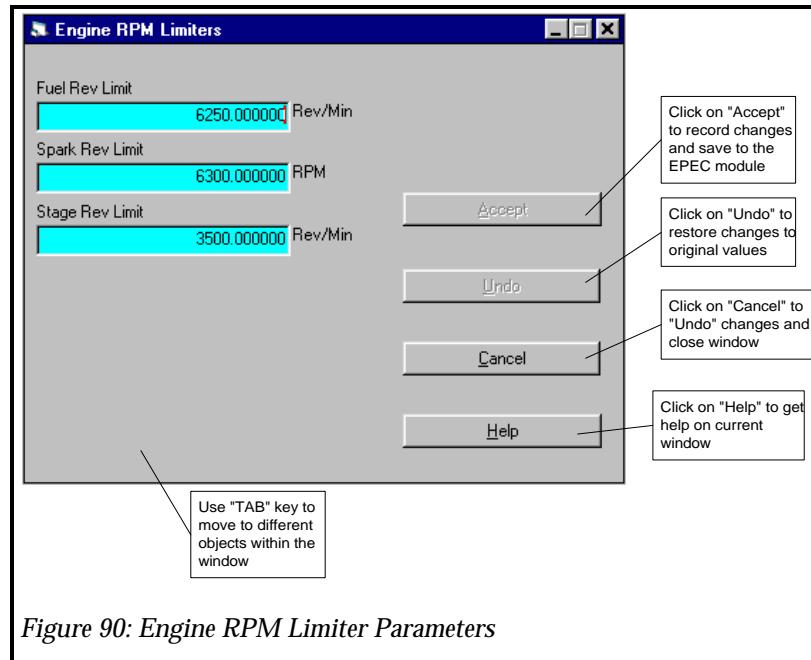


Figure 90: Engine RPM Limiter Parameters

Manual Fuel/Spark Control

This should be used cautiously. It is intended to be used when testing on the dynamometer, it allows you to specify the spark advance and Air/Fuel ratio the engine is operating regardless of any other fuel or spark function. This is a total override of any values calibrated in the base program, so no matter what speed and throttle angle you are at, the computer will deliver the spark advance and Air/Fuel ratio specified in this window, if you have selected "Manual Mode".

NOTE: If you are using the "TFI" or "CCDTFI" ignition types, the spark value here needs to be added to the base spark advance, so if you have 10 degrees base spark and 16 degrees specified in this cell, then you will actually have 26 degrees of spark delivered to the engine. If you are running the "EDIS" ignition system, the value specified here will reflect the actual spark advance.

To modify the Manual Fuel/Spark Control parameters, go to the "Edit" menu, then select "Manual Fuel/Spark Control" See Figure 91: Manual Fuel/Spark Control Menu.

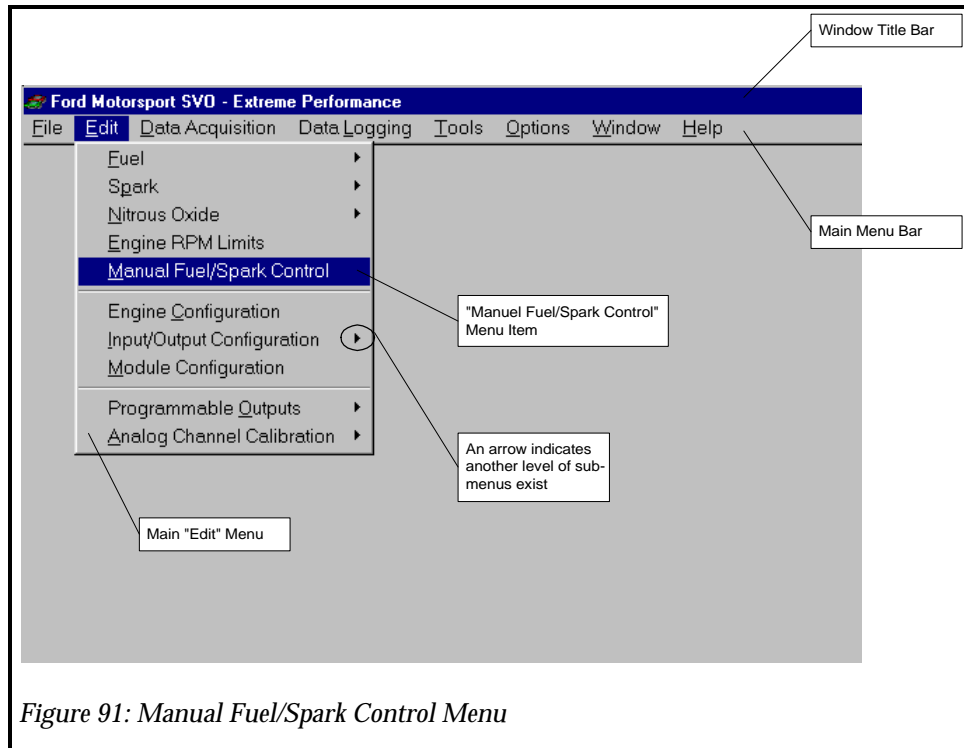


Figure 91: Manual Fuel/Spark Control Menu

To use the Manual Fuel/Spark control, the "Control Type" must be set for "Manual Control". If the "Control Type" is set to "Automatic Control", the "Manual A/F Ratio" and "Manual Spark Angle" values are not used. To change the "Control Type", "click" on the down arrow in the box and click on "Manual Operation". Once you do this the engine will have the spark advance and Air/Fuel you have specified, so be sure you are ready for these values! The engine should be running with the EPEC module connected to the IBM PC.

To change either Air/Fuel or Spark advance "click" on the desired cell and type in your new value, then move out of that cell using the "TAB" key. See Figure 92: Manual Fuel/Spark Control. At this point you can click on "Accept", "Undo" or "Cancel". "Accept" will accept the new values. "Undo" will undo the changes and restore the original settings. "Close" will "Undo" and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on "ACCEPT", the new values WILL BE written to the EPEC module.

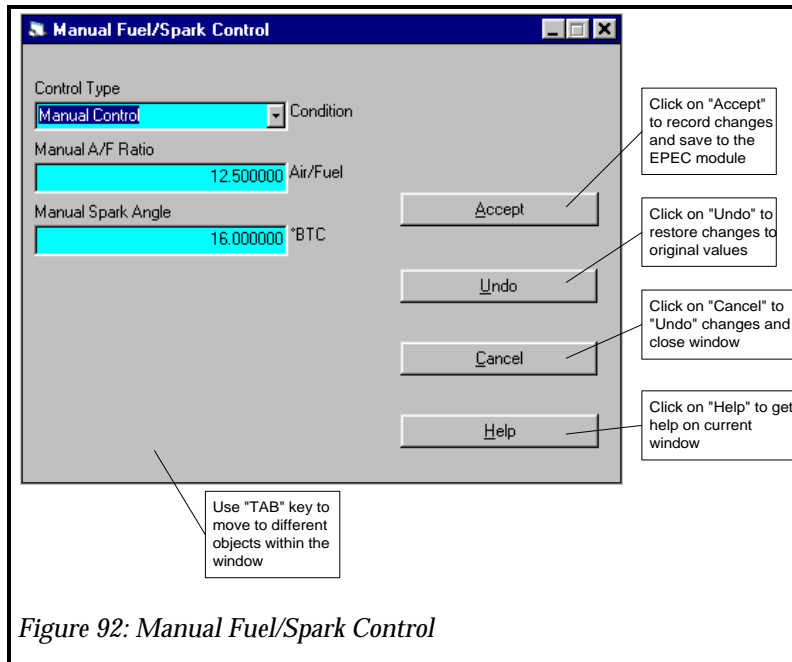


Figure 92: Manual Fuel/Spark Control

Engine Configuration

The Engine Configuration allows you to specify the Number of Cylinders, Engine Displacement and Injector Size. To modify the Engine Configuration parameters, go to the "Edit" menu, then select "Engine Configuration" See Figure 93: Engine Configuration Menu.

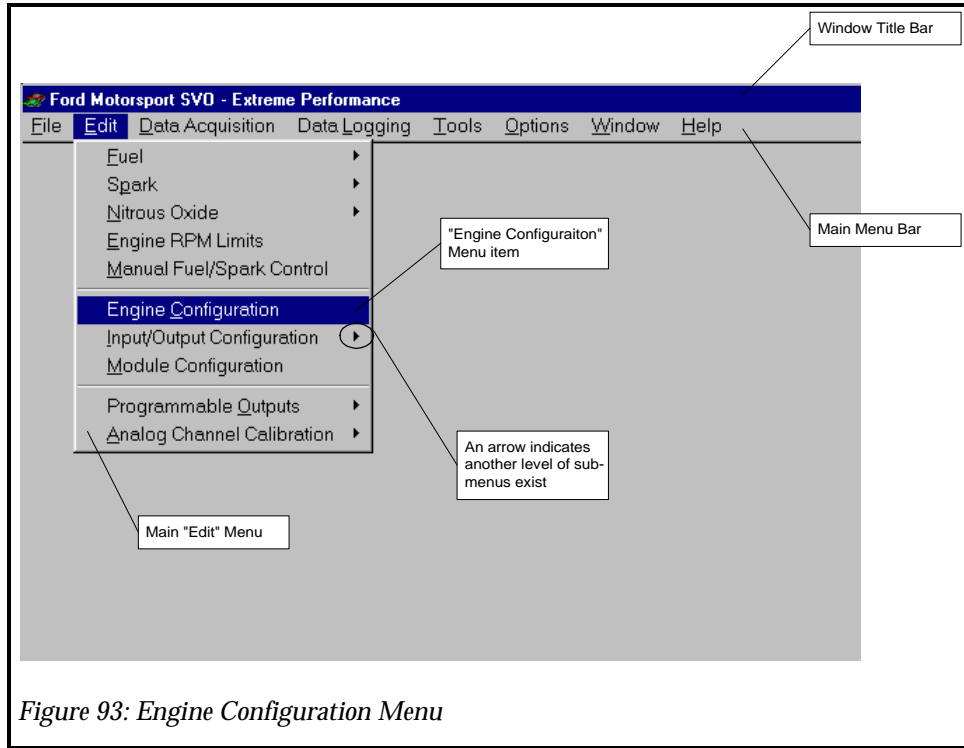


Figure 93: Engine Configuration Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the “TAB” key. See Figure 94: Engine Configuration. At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

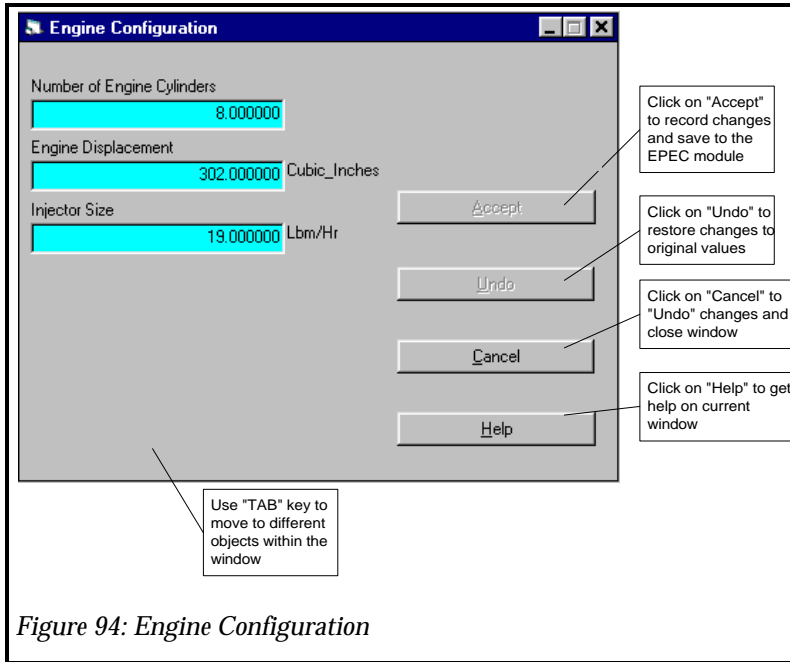


Figure 94: Engine Configuration

Input/Output Configuration

There are 6 basic sensors for the EPEC system. These are Air Charge Temperature Sensor (ACT), Engine Coolant Temperature Sensor (ECT), Mass Air Flow Sensor (MAF), Manifold Absolute Pressure Sensor (MAP), Throttle Position Sensor (TP) and Profile Ignition Pickup (PIP from the distributor). The Input/Output Configuration allows you to enter values for each of these sensors.

These values describe each of the sensors to the EPEC module. These values should only be entered once and should only change if you install new hardware. The default configuration has standard 86-93 5.0L MAF Mustang or 1994 and 1995 5.0L MAF Mustang configurations. The EPEC module is compatible with all Ford Sensors except the MAP sensor which must be a GM or Chrysler analog type MAP sensor. Ford MAP sensors are not capable of measuring positive manifold pressure or boost, however, GM manufactures a 2 bar and a 3 bar MAP sensor.

ACT Transfer Function

The Air Charge Temperature (ACT) sensor measures the temperature of the incoming air into the engine. The EPEC Strategy uses the ACT Transfer Function to correlate the voltage read from the ACT Sensor to the actual Air Temperature that is entering the engine. The ACT sensor is a Thermistor which is an electronic device that changes resistance with temperature. The EPEC module is compatible with the Ford ACT sensors.

The ACT sensor is first converted to a voltage “ACT Volts”. This voltage value is then used as the input or “X” value to the ACT Transfer Function. The output or “Y” of the ACT Transfer Function is the temperature that corresponds to the input voltage. Figure 95: ACT Sensor Strategy Block Diagram shows the block diagram from the ACT Sensor to the actual ACT °F value.

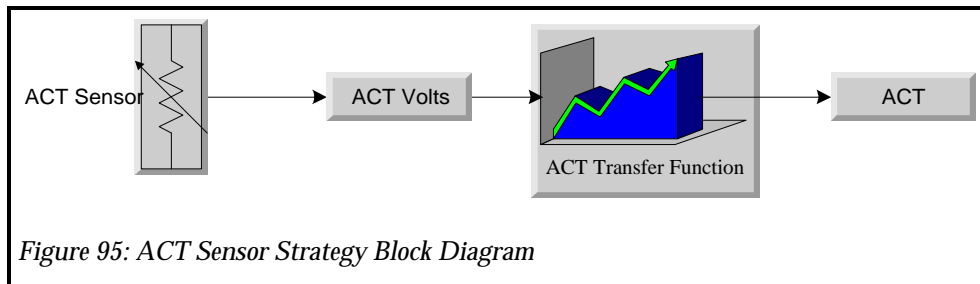


Figure 95: ACT Sensor Strategy Block Diagram

To change the A.C.T. Transfer Function, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “ACT Transfer Function” menu item. The ACT Transfer Function will then appear. See Figure 96: ACT Transfer Function Menu.

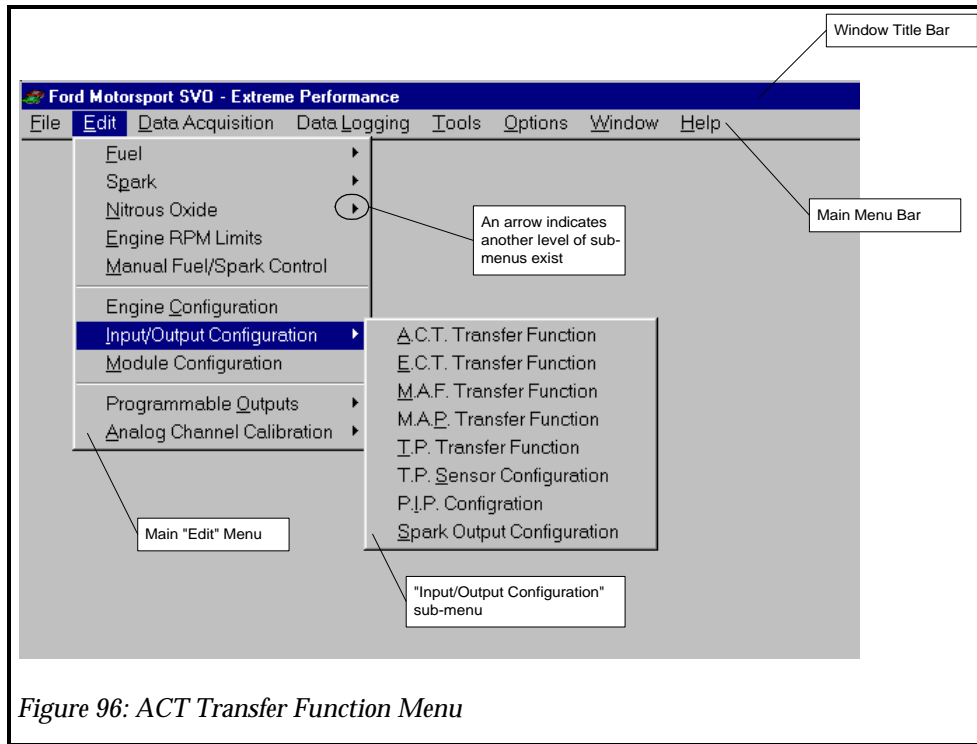
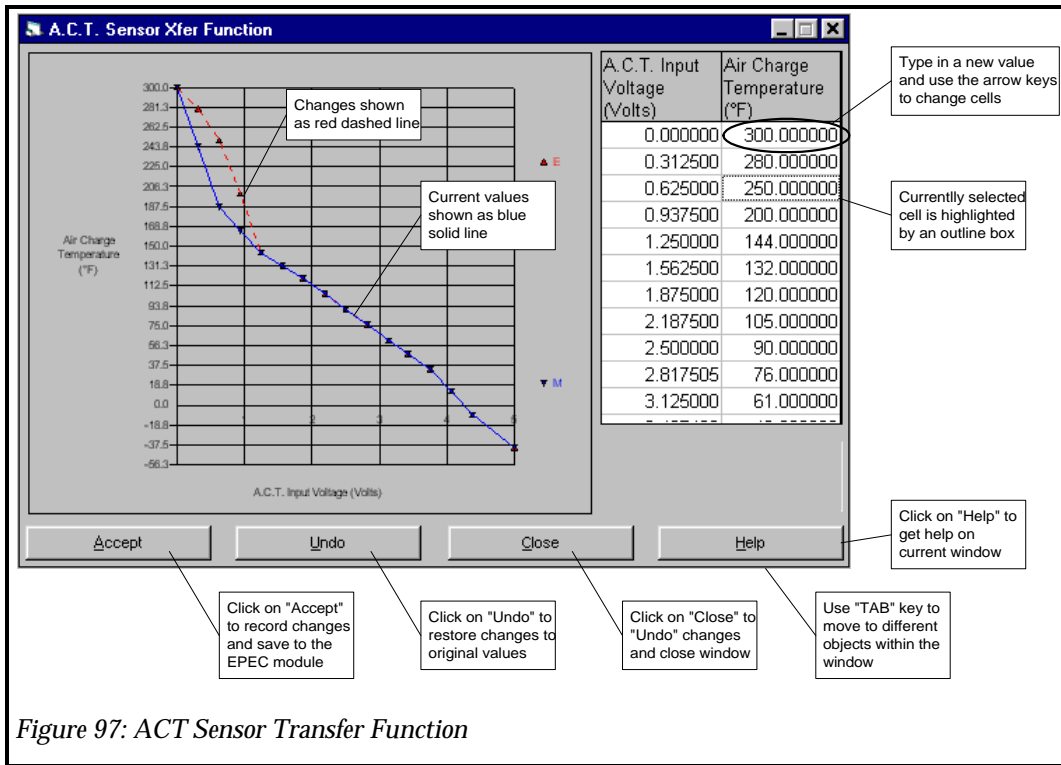


Figure 96: ACT Transfer Function Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 97: ACT Sensor Transfer Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

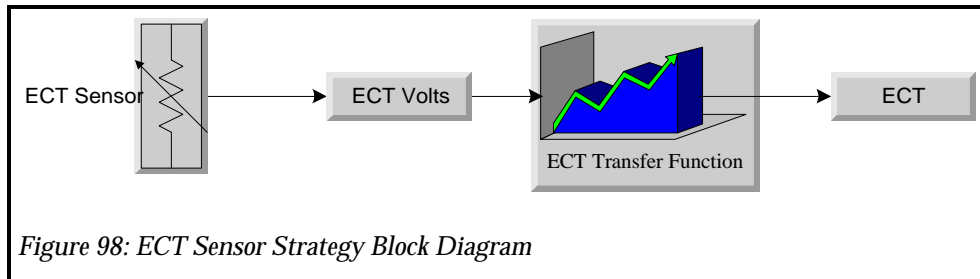
IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



ECT Transfer Function

The Engine Coolant Temperature (ECT) sensor measures the coolant temperature of the engine. The EPEC Strategy uses the ECT Transfer Function to correlate the voltage read from the ECT Sensor to the actual Engine Temperature. The ECT sensor is a Thermistor which is an electronic device that changes resistance with temperature. The EPEC module is compatible with the Ford ECT sensors.

The ECT sensor is first converted to a voltage “ECT Volts”. This voltage value is then used as the input or “X” value to the ECT Transfer Function. The output or “Y” of the ECT Transfer Function is the temperature that corresponds to the input voltage. Figure 98: ECT Sensor Strategy Block Diagram shows the block diagram from the ECT Sensor to the actual ECT °F value.



To change the ECT Transfer Function, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “ECT Transfer Function” menu item. The ECT Transfer Function will then appear. See Figure 99: ECT Transfer Function Menu.

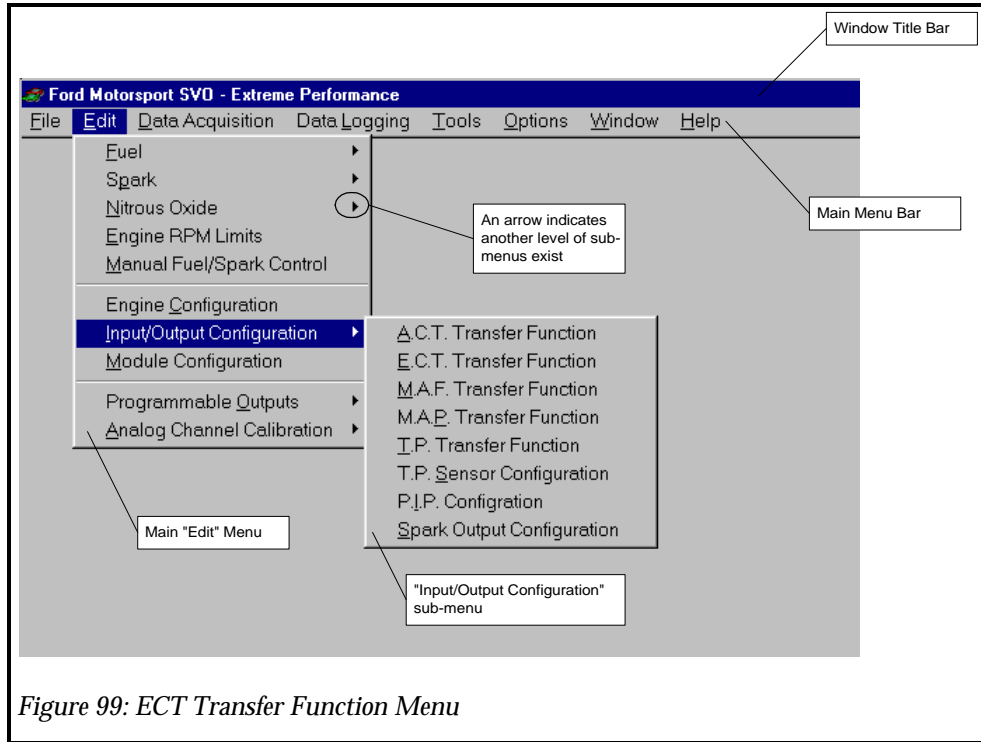


Figure 99: ECT Transfer Function Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 100: ECT Sensor Transfer Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

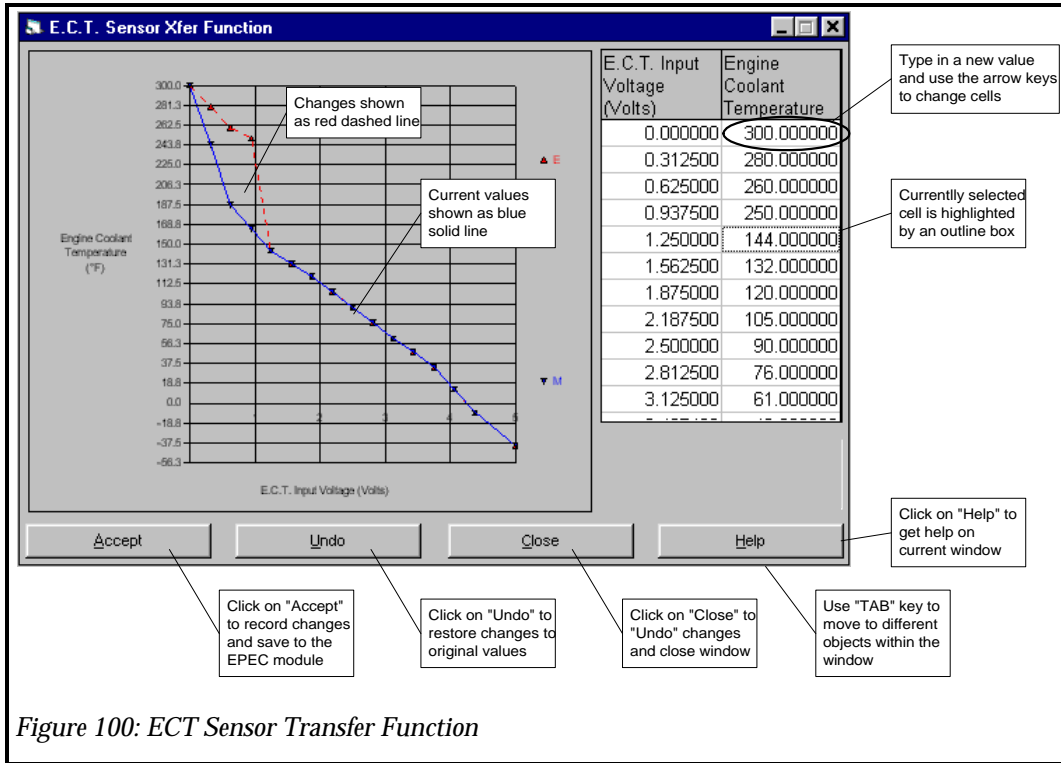


Figure 100: ECT Sensor Transfer Function

MAF Transfer Function

The Mass Air Flow (MAF) sensor measures amount of air entering the engine. The base fuel amount (Idle/Part/WOT Air/Fuel ratio) is based on the readings from the MAF sensor. The EPEC Strategy uses the MAF Transfer Function to correlate the voltage read from the MAF Sensor to the actual engine air flow. The MAF sensor is a hot wire anemometer. The EPEC module is compatible with the Ford type MAF sensors.

The MAF sensor is first converted to a voltage “MAF Volts”. This voltage value is then used as the input or “X” value to the MAF Transfer Function. The output or “Y” of the MAF Transfer Function is the air mass that corresponds to the input voltage. Figure 101: MAF Sensor Strategy Block Diagram shows the block diagram from the MAF Sensor to the actual Air Mass value.

VERY IMPORTANT: The base fuel flow is based on the air flow into the engine. This air flow is determined by the MAF Transfer Function. If this function is not configured correctly, the Air/Fuel values in the Idle/Part/WOT fuel functions will give incorrect results.

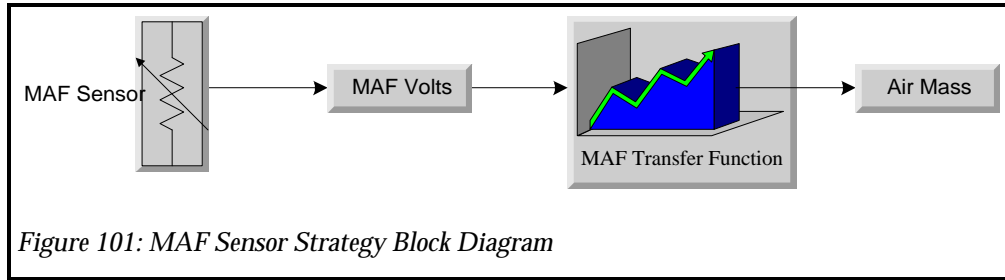


Figure 101: MAF Sensor Strategy Block Diagram

To change the MAF Transfer Function, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “MAF Transfer Function” menu item. The MAF Transfer Function will then appear. See Figure 102: MAF Transfer Function Menu.

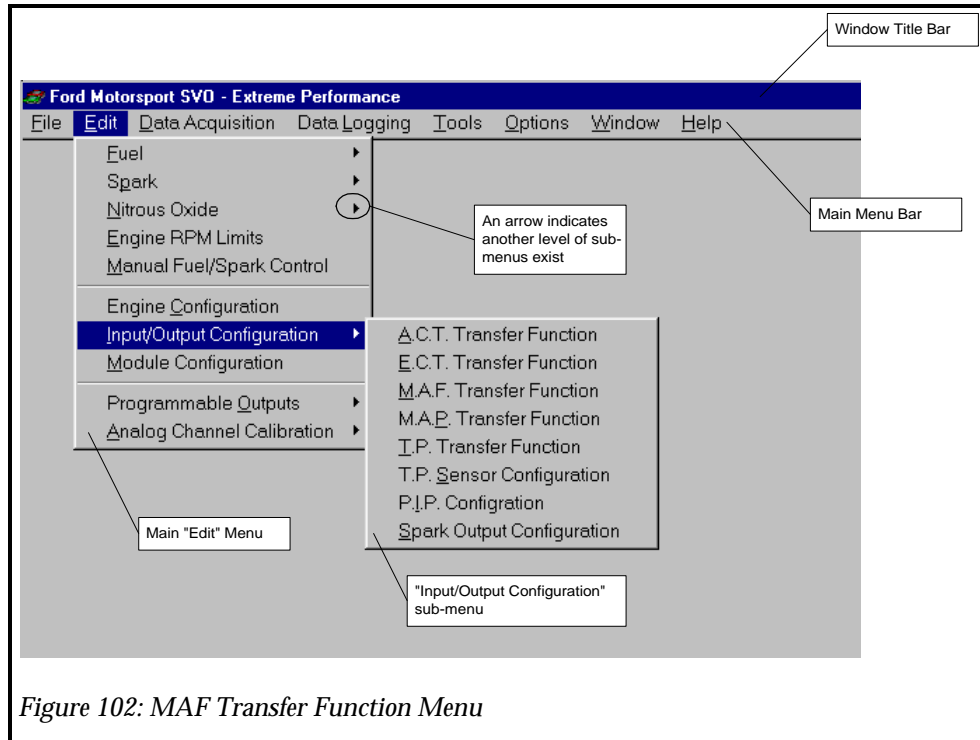


Figure 102: MAF Transfer Function Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 103: MAF Sensor Transfer Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on "ACCEPT", the new values WILL BE written to the EPEC module.

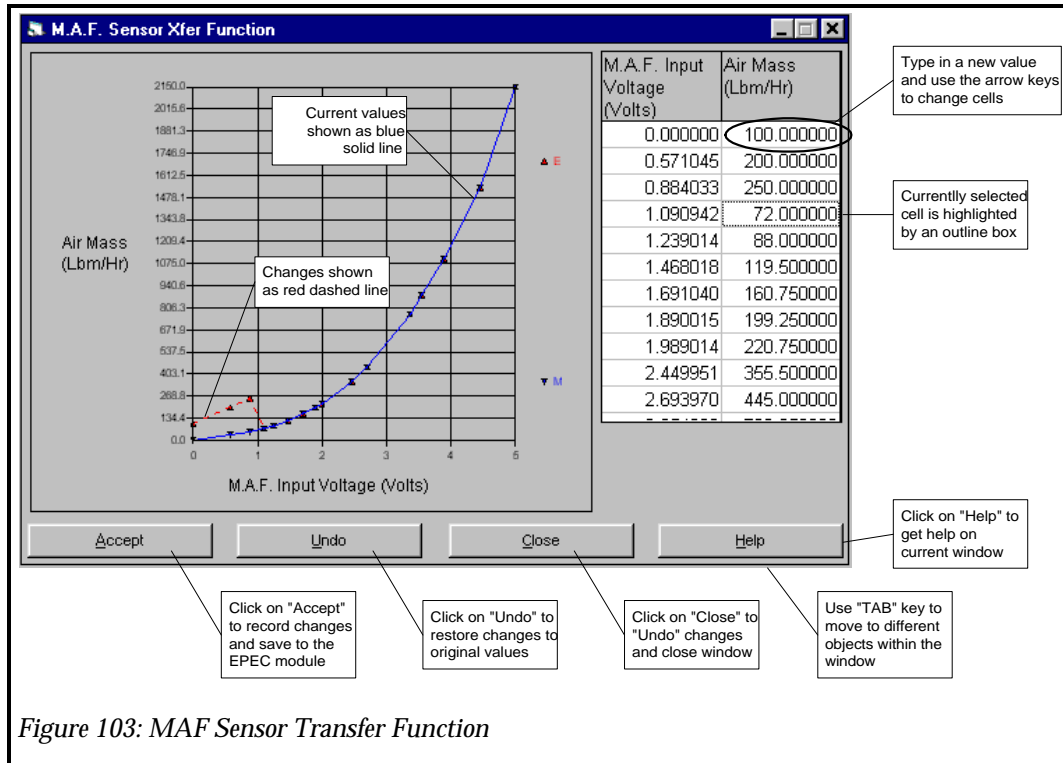


Figure 103: MAF Sensor Transfer Function

MAP Transfer Function

The Manifold Absolute Pressure (MAP) sensor measures the ABSOLUTE manifold pressure in the intake manifold. The Boost Retard and MAP Fuel functions are based on the MAP sensor. The EPEC Strategy uses the MAP Transfer Function to correlate the voltage read from the MAP Sensor to the actual intake manifold pressure.

IMPORTANT: The EPEC module is not compatible with the Ford MAP sensors. Ford MAP sensors cannot measure positive pressure (over 30 In of Hg) they can only measure manifold vacuum (up to 30 In of Hg). You MUST use a GM analog type 2 or 3 bar MAP Sensor OR a Chrysler analog type MAP Sensor.

The MAP sensor is first converted to a voltage "MAP Volts". This voltage value is then used as the input or "X" value to the MAP Transfer Function. The output or "Y" of the MAP Transfer Function is the absolute intake manifold pressure that corresponds to the input voltage. Figure 104: MAP Sensor Strategy Block Diagram shows the block diagram from the MAP Sensor to the actual Manifold Pressure value. There two other values that are calculated

from the MAP Sensor. The Boost Pressure and Barometric Pressure are calculated based on the MAP Sensor.

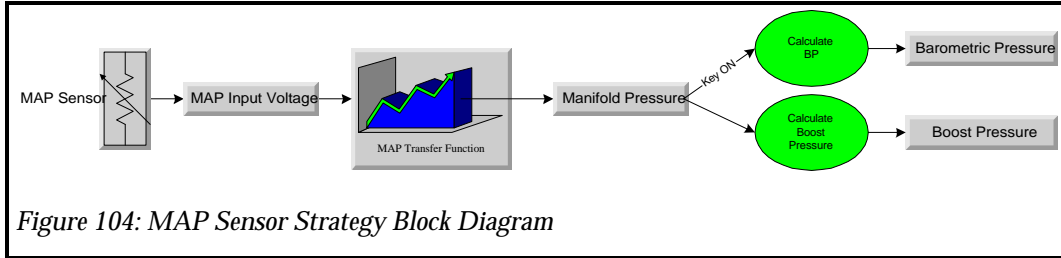


Figure 104: MAP Sensor Strategy Block Diagram

To change the MAP Transfer Function, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “MAP Transfer Function” menu item. The MAP Transfer Function will then appear. See Figure 105: MAP Transfer Function Menu.

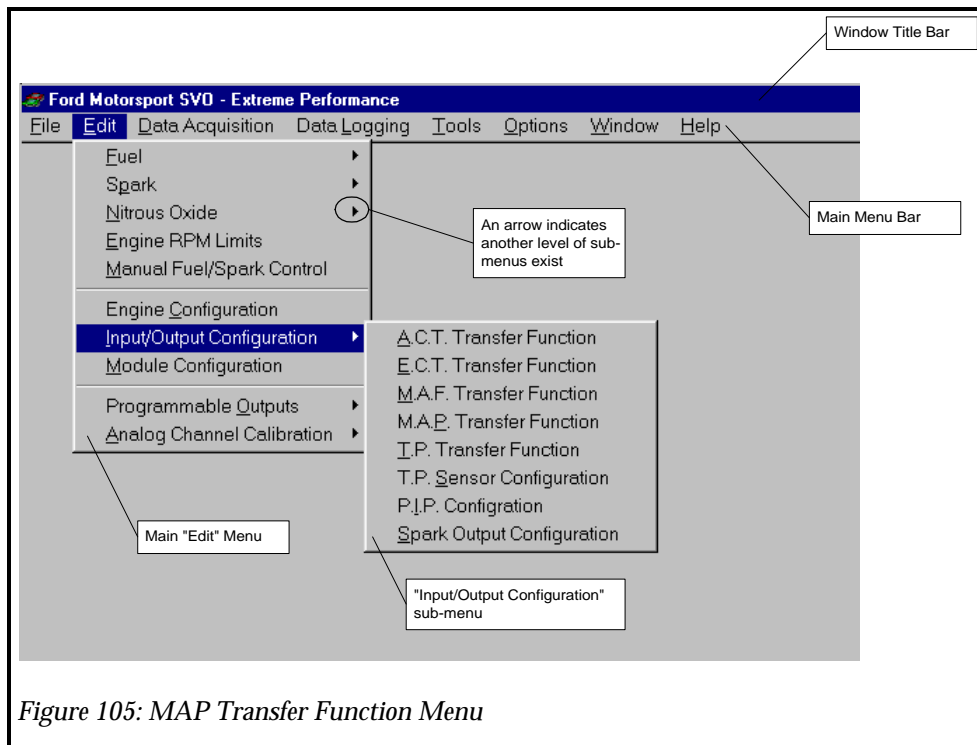


Figure 105: MAP Transfer Function Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 106: MAP Sensor Transfer Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on "ACCEPT", the new values WILL BE written to the EPEC module.

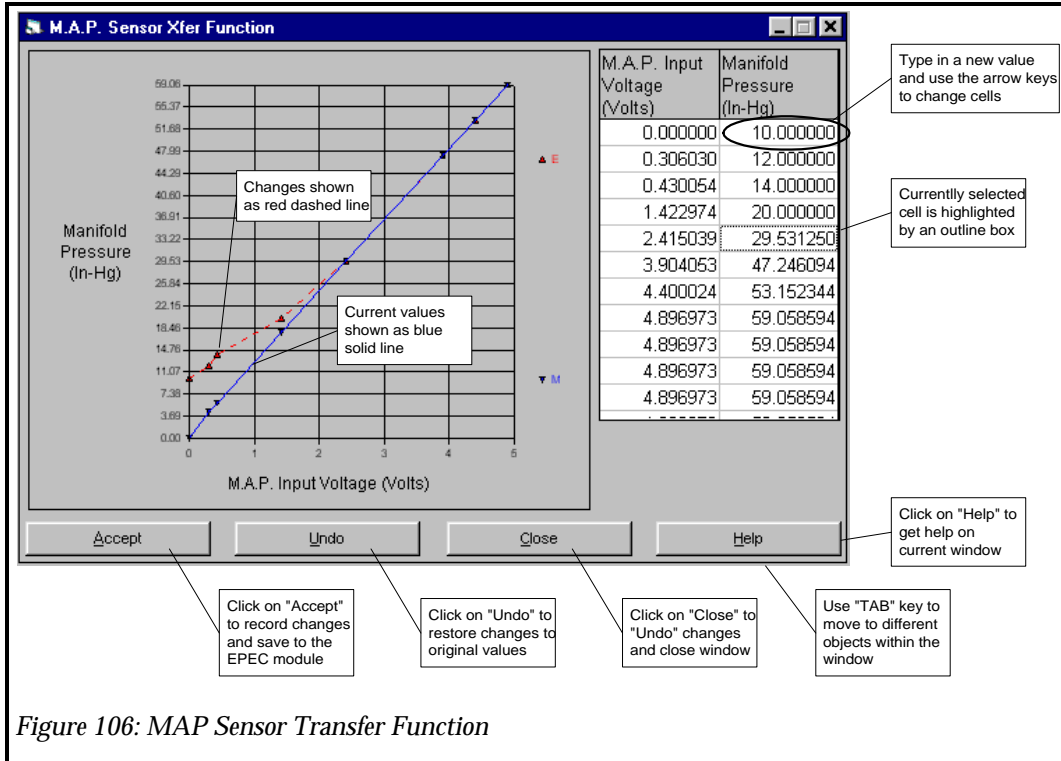


Figure 106: MAP Sensor Transfer Function

TP Transfer Function

The Throttle Position (TP) sensor measures the angular throttle opening. There are several values calculated from the TP sensor including Absolute TP, Relative TP, Throttle Angle Rate and TP Mode. Absolute TP is the absolute throttle opening assuming a starting point of 0 degrees. The Absolute TP however, is only used to calculate the Relative TP and Initial TP. The Relative TP value is the amount of throttle opening using the Initial TP as the starting point, i.e. if the Initial TP is 5 degrees and the Absolute TP is 7 degrees then the Relative TP is 2 degrees.

IMPORTANT: All calibration functions based on Throttle Position are based on the Relative TP value. The EPEC module uses this strategy to alleviate the user of precise TP settings. The idle hard stop setting does not matter to the EPEC module since it uses Relative TP as long as it has enough range to span idle, part throttle and wide open throttle.

The Throttle Angle Rate is also calculated from the Absolute TP value. The Throttle Angle Rate is how fast the throttle is being opened in degrees per second. The TP Mode is determined based on the Relative TP value and the programmable breakpoints.

The EPEC Strategy uses the TP Transfer Function to correlate the voltage read from the TP Sensor to the actual throttle position. The TP sensor is first converted to a voltage “TP Volts”. This voltage value is then used as the input or “X” value to the TP Transfer Function. The output or “Y” of the TP Transfer Function is the absolute throttle position that corresponds to the input voltage. Figure 107: TP Sensor Strategy Block Diagram shows the block diagram from the TP Sensor to the actual throttle position value and the calculation of all other throttle related parameters.

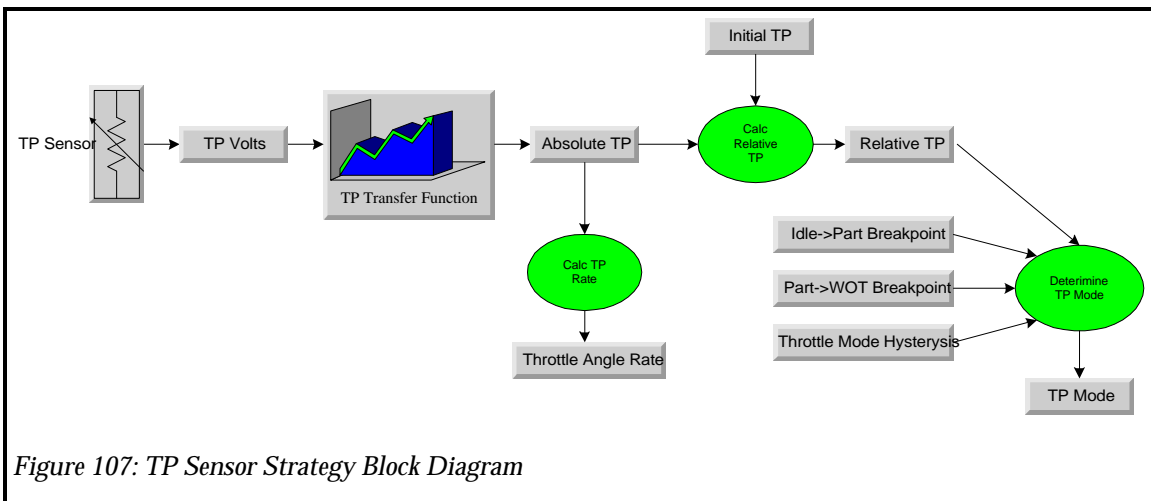


Figure 107: TP Sensor Strategy Block Diagram

To change the TP Transfer Function, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “TP Transfer Function” menu item. The TP Transfer Function will then appear. See Figure 108: TP Sensor Transfer Function Menu.

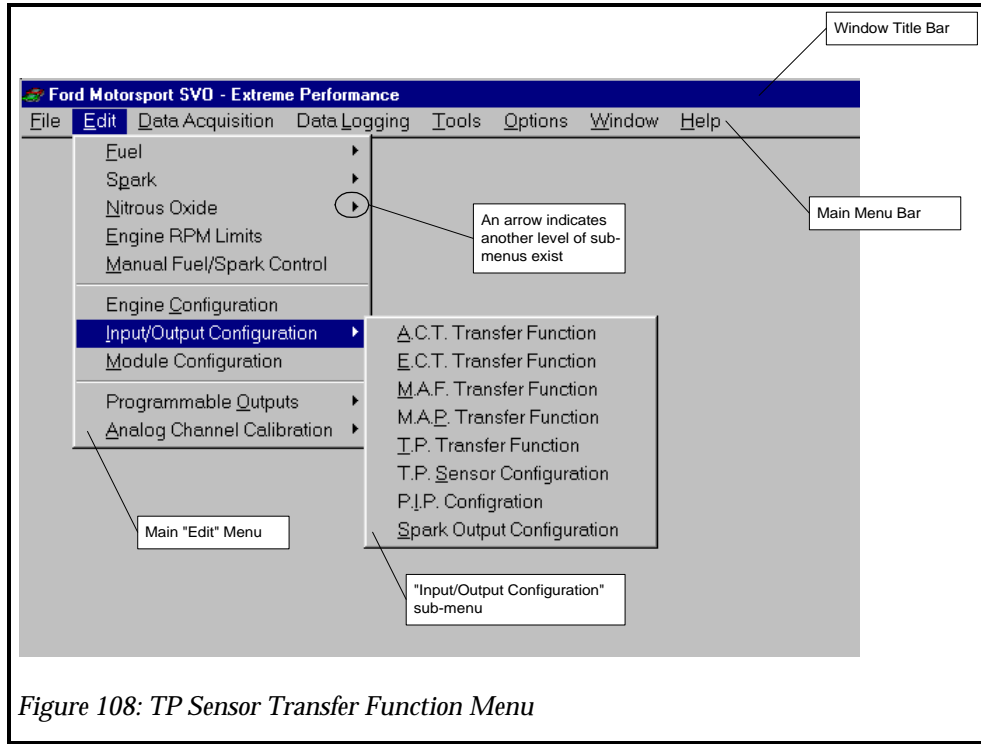


Figure 108: TP Sensor Transfer Function Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the arrow keys. See Figure 109: TP Sensor Transfer Function. Note the original curve is shown in a blue solid line and the new curve is displayed in a red dashed line. This indicates how much you are changing the calibration from its original value. At this point you can click on “Accept”, “Undo” or “Close”. “Accept” will accept the new values and the red dashed line will disappear. “Undo” will undo the changes and restore the original settings shown on the blue solid line. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

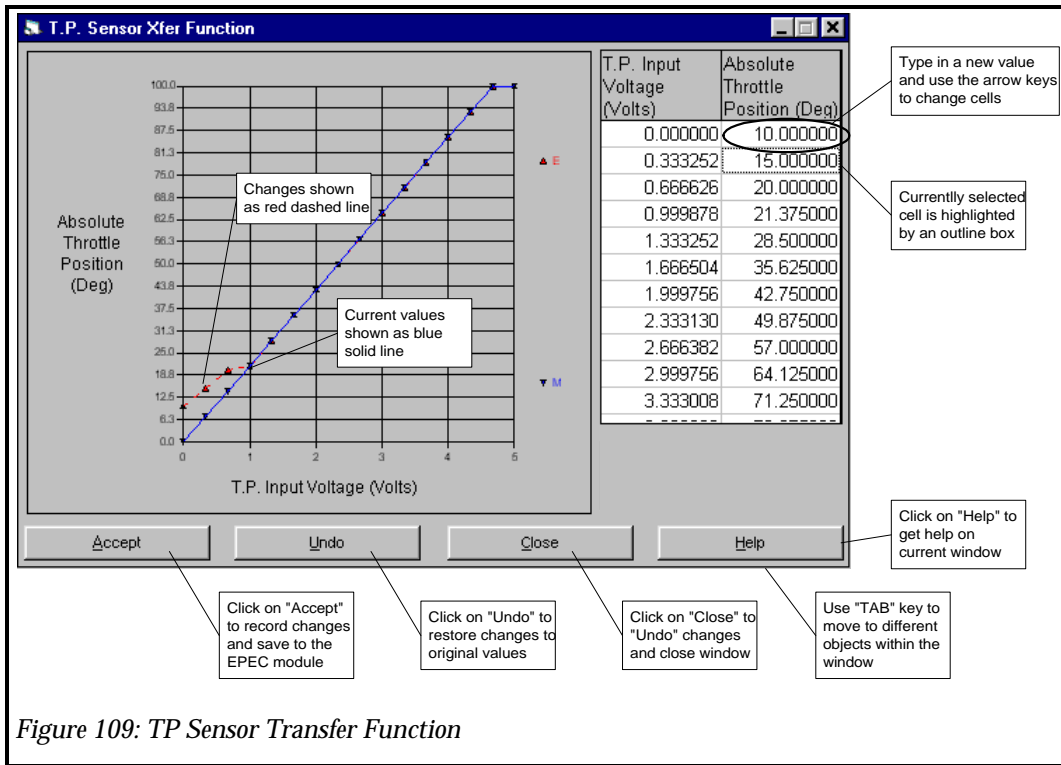


Figure 109: TP Sensor Transfer Function

TP Sensor Configuration

The Throttle Position (TP) Configuration values include three parameters, Idle -> Part Breakpoint, Part -> WOT Breakpoint and the Throttle Mode Hysteresis. These three parameters are used by the EPEC Module to determine the current operating throttle mode. The “Idle -> Part Breakpoint” is the throttle angle at which the EPEC Module changes from Idle to Part Throttle. The “Part -> WOT Breakpoint” is the throttle angle at which the EPEC Module changes from part throttle to WOT. The “Throttle Mode Hysteresis” is the amount of throttle angle that is used as a filter (buffer zone) so the EPEC does not switch from one mode to the other due to the noise on the TP signal line.

Figure 110: TP Sensor Strategy Block Diagram shows how the “Throttle Mode” is determined using the Throttle Mode Configuration values. Figure 111: Throttle Modes shows how the Throttle Mode Configuration values relate to actual throttle movement. The blue section as shown is the Idle area of throttle movement. The red section as shown is the Part Throttle area of throttle movement and the green section as shown is the Wide Open Throttle area of throttle movement. The gray sections are the Hysteresis bands.

Parameter	Value	Meaning
Idle -> Part Breakpoint	5	Change from Idle Mode to Part Throttle Mode as 5 degrees of relative throttle opening.

Parameter	Value	Meaning
		Return to idle Mode at 5 - 2 or 3 degrees
Part -> WOT Breakpoint	60	Change from Part Throttle Mode to Wide Open Throttle Mode at 60 degrees of relative throttle opening. Return to Part Throttle Mode at 60 -2 or 58 degrees
Throttle Mode Hysteresis	2	Throttle Filter range

IMPORTANT: Do not set the Throttle Mode Hysteresis value greater than the Idle -> Part Breakpoint. If this is done, the EPEC module will never return to the Idle Mode of operation.

IMPORTANT: All calibration functions based on Throttle Position are based on the Relative TP value. The EPEC module uses this strategy to alleviate the user of precise TP settings. The idle hard stop setting does not matter to the EPEC module since it uses Relative TP as long as it has enough range to span idle, part throttle and wide open throttle.

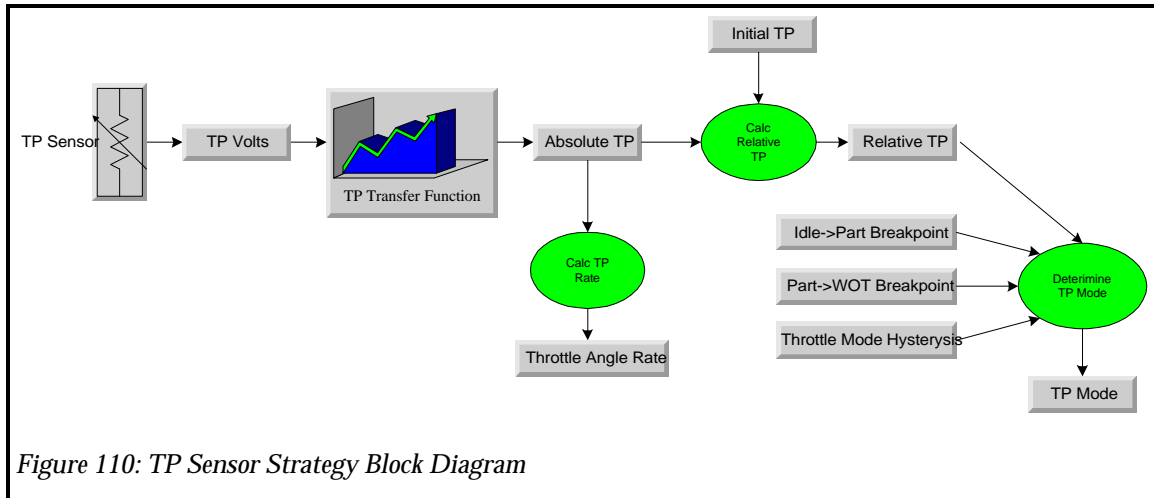


Figure 110: TP Sensor Strategy Block Diagram

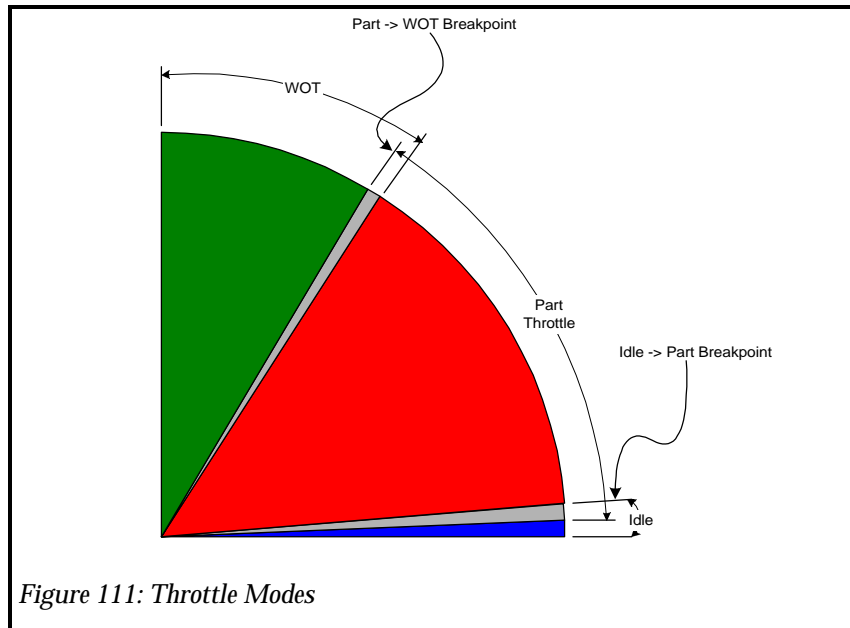


Figure 111: Throttle Modes

To change the TP Configuration Values, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “TP Sensor Configuration” menu item. The TP Configuration Window will then appear. See Figure 112: TP Sensor Configuration Menu.

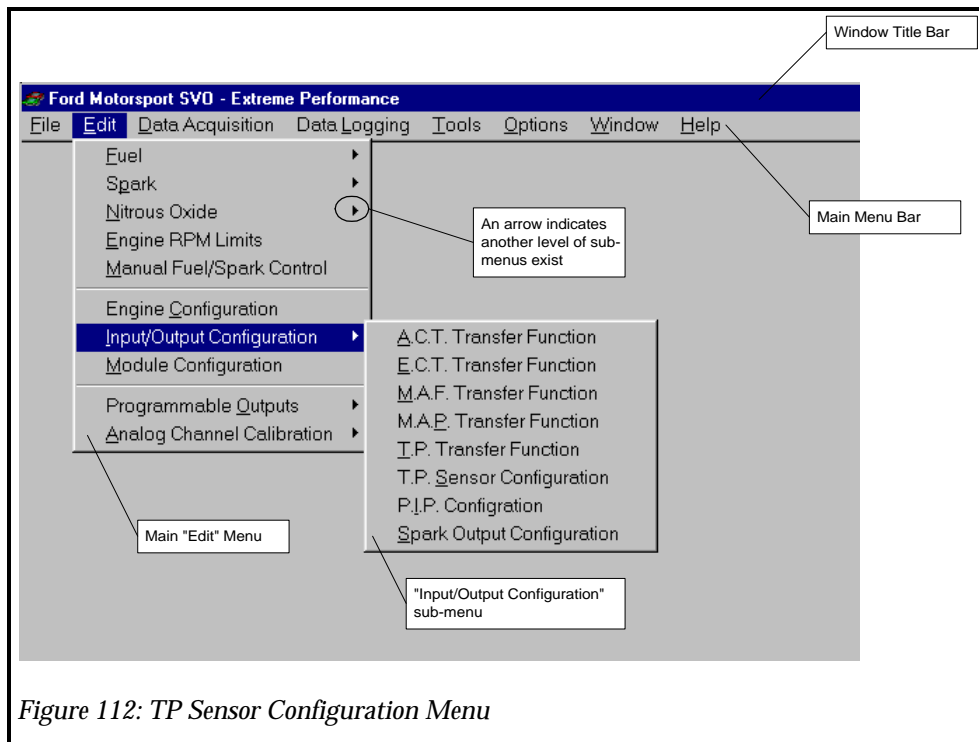


Figure 112: TP Sensor Configuration Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the “TAB” key. See. Figure 113: TP Sensor Configuration. At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

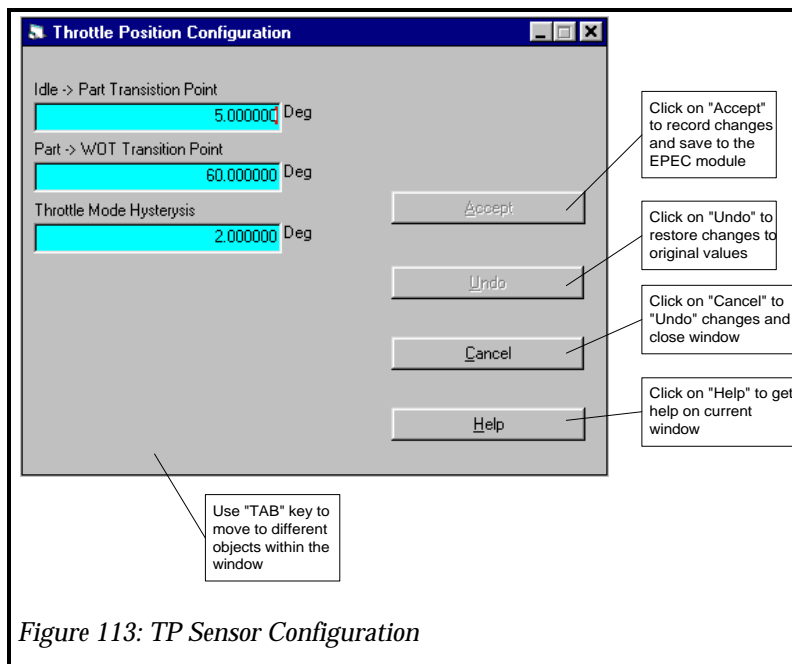


Figure 113: TP Sensor Configuration

PIP Configuration

The Profile Ignition Pickup (PIP) Configuration values include the following parameters; Crank to Run Transition RPM, Crank to Run Hysteresis and the Signature PIP Angle. These five parameters are used by the EPEC Module to determine the current “Crank/RUN” operation mode, and how the EPEC module synchronizes with the distributor signal.

The “Crank to Run Transition RPM” and “Crank To Run Hysteresis” values are used in conjunction to determine when the engine mode changes from “CRANK” to “RUN”. The “Crank to Run Transition RPM” is the engine speed in which the EPEC module will change from “CRANK” to “RUN”. The “Crank to Run Hysteresis” is the filter (buffer zone) so the EPEC module does not switch from one mode to the other due to engine instantaneous acceleration/decelerations.

The “Signature PIP Angle” tells the EPEC module what the angular difference is between a normal PIP and the PIP for the number 1 cylinder. The EPEC module uses this value to determine the location of the number 1 cylinder.

Figure 114: PIP Strategy Block Diagram shows how the different parameters are used and calculated. The “Number of Engine Cylinders”, “PIP Edge Filter”, “PIP Time Filter”, “Signature PIP Angle”, “Crank to Run Transition RPM” and “Crank to Run Hysteresis” are all programmable for your specific application. The following table shows typical values for a 5.0L Mustang.

Parameter	Value	Meaning
Crank to Run Transition RPM	400	Crank to Run at 400 RPM Run to Crank at 350 RPM
Crank to Run Hysteresis	50	Filter (buffer zone) for changing modes
Signature PIP Angle	13.5	The number 1 cylinder PIP is 13.5 degrees shorter than a normal PIP. A normal PIP angle is 360/cylinders

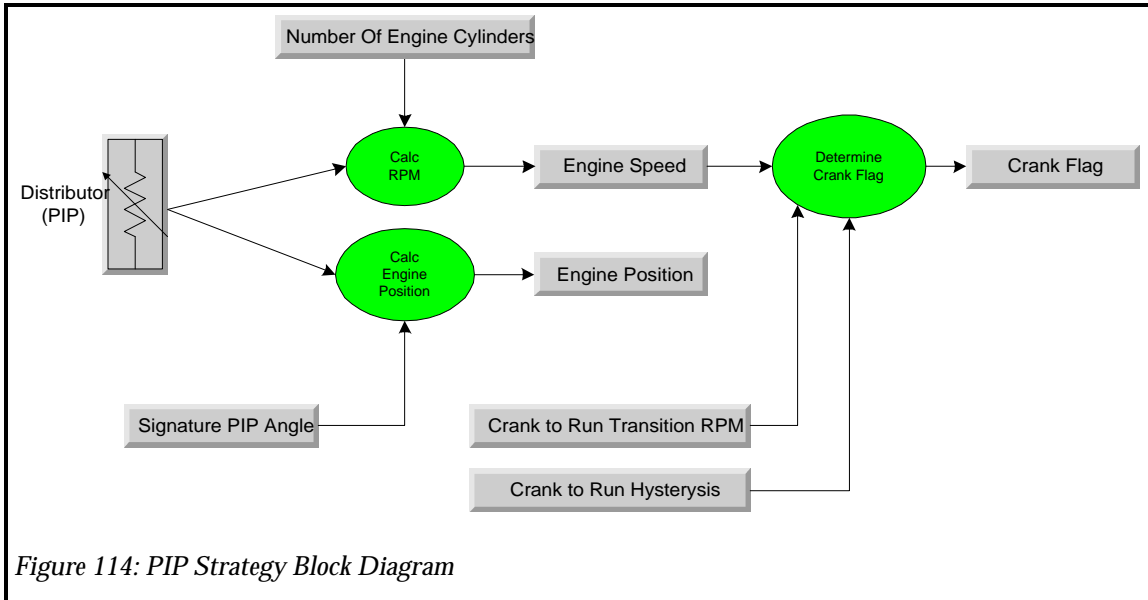


Figure 114: PIP Strategy Block Diagram

To change the PIP Configuration Values, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “PIP Configuration” menu item. The PIP Configuration Window will then appear. See Figure 115: PIP Configuration Menu.

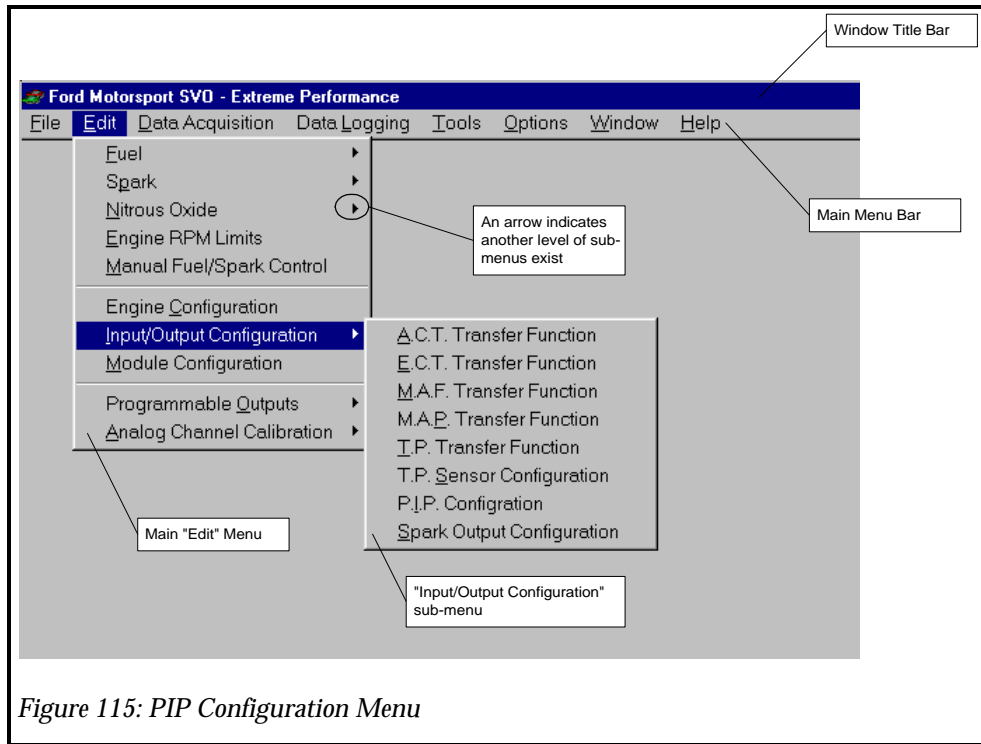


Figure 115: PIP Configuration Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the “TAB” key. See. Figure 116: PIP Configuration. At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

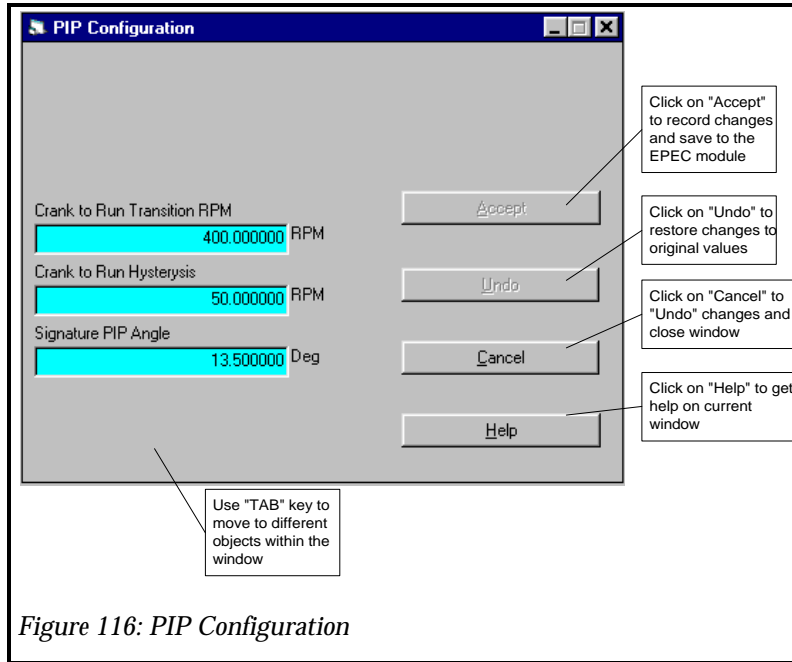


Figure 116: PIP Configuration

Spark Output (SPOUT) Configuration

The Spark Output (SPOUT) Configuration values include the following parameters; Ignition Type, Dwell Angle, Dwell Time and SPOUT Level. These four parameters are used by the EPEC Module to determine the current Spark Output mode of operation.

The “Ignition Type” parameter gives you the ability to select three different types of ignition systems. The EPEC module supports the Standard TFI Ignition system, Computer Controlled Dwell TFI Ignition System and the Ford Distributorless Ignition System (EDIS).

The Dwell Angle and Dwell Time values are not used at the same time by the EPEC module. The Dwell Angle is used ONLY when the Standard TFI Ignition System is selected. The Dwell Time is used ONLY when the Computer Controlled Dwell TFI (CCDTFI) Ignition System is selected. Typical values for the Dwell Angle are 30 - 45 degrees and 6 ms (6000 μs) for CCDTFI.

The last parameter “Spout Level” gives you the ability to invert the Spark Output signal for compatibility with other ignition systems.

The following table shows typical settings for the Spark Output Configuration parameters.

Parameter	Value	Meaning
Ignition Type	Standard TFI	Use with 1988-1993 5.0L Mustang Use CCDTFI for 1994-1995 5.0L Mustang
Dwell Angle	45	Used with Standard TFI ONLY

Parameter	Value	Meaning
Dwell Time	6000	Used with CCDTFI ONLY
Spout Level	Rising Edge	Standard Ford Mode

To change the Spark Output Configuration Values, click on the “Edit” menu and then the “Input/Output Configuration” sub-menu. Click on the “Spark Output Configuration” menu item. The Spark Output Configuration Window will then appear. See Figure 117: SPOUT Output Configuration Menu.

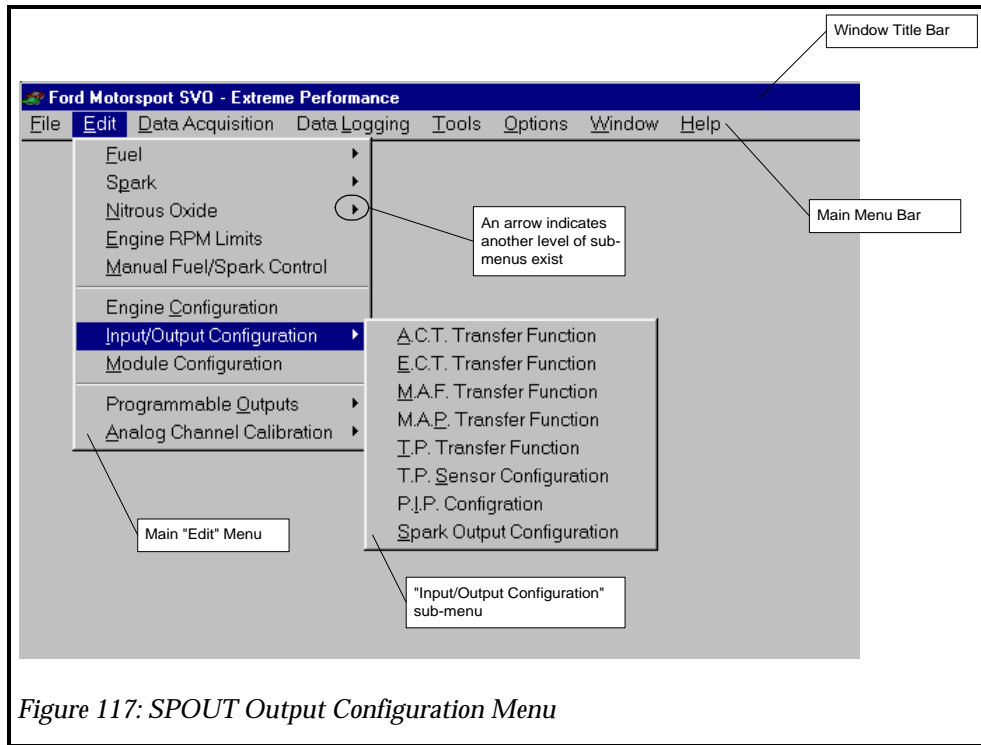


Figure 117: SPOUT Output Configuration Menu

Click on the cell you want to modify and type a new value, then move out of that cell using the “TAB” key. See. Figure 118: Spark Output Configuration. At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

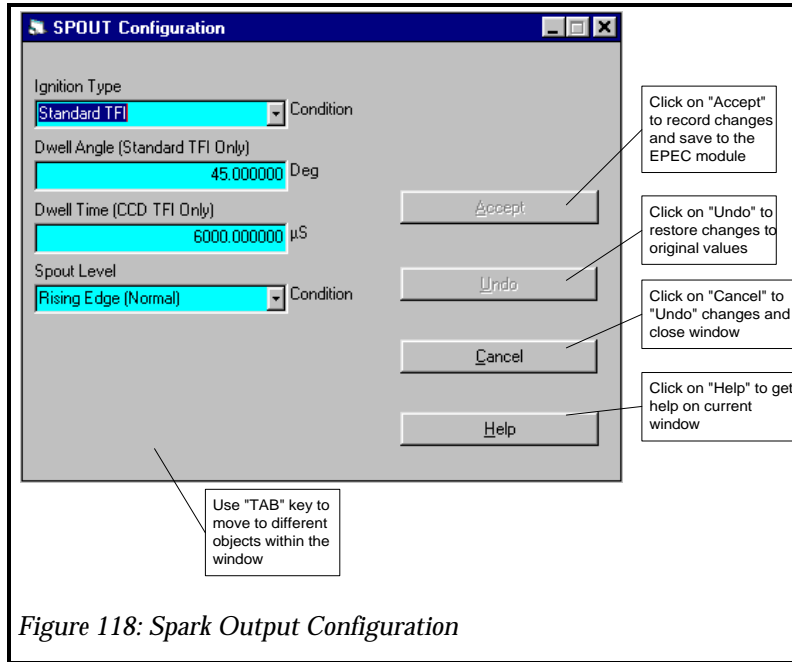


Figure 118: Spark Output Configuration

Module Configuration

The Module Configuration values include the following parameters; “Module Type”, “Override Type”, “Override Engine Speed”, and “Override Throttle Angle”. These three parameters are used by the EPEC Module to determine when to “Override” the EEC-IV Module.

The “Module Type” parameter gives you the ability to select either a piggy back (Extender) or a stand alone type of operation. If you are using the supplied wiring harness, you must select the Extender mode of operation. This parameter gives you the ability to adapt the EPEC module to a variety of different applications.

The “Override Type” parameter gives you the ability to select four different types of EEC-IV override. The EPEC module supports the “Always Override”, “Use RPM as Override”, “Use TP as Override” and “Use RPM AND TP as Override”. Table shows the function of each of the “Override Type” settings.

Override Type	Meaning
Always Override	Always override EEC-IV module in all conditions (operates like a standalone module)
Use RPM as Override	Use RPM <u>ONLY</u> to override EEC-IV module. Note: EPEC Override Throttle Angle setting is ignored.
Use TP as Override	Use TP <u>ONLY</u> to override EEC-IV module. Note: EPEC Override Engine Speed setting is ignored.
Use RPM and RP as Override	Use RPM <u>AND</u> TP to override EEC-IV module. Note: Both the EPEC Override Engine Speed setting and the EPEC Override Throttle Angle settings are used. The RPM must be greater than the set point <u>AND</u> Throttle angle must be greater than the set point before the EPEC

Override Type	Meaning
	module will override the EEC-IV module.

To change the Module Configuration Values, click on the “Edit” menu and then the “Module Configuration” menu item. The Module Configuration Window will then appear. See Figure 119: Module Configuration Menu.

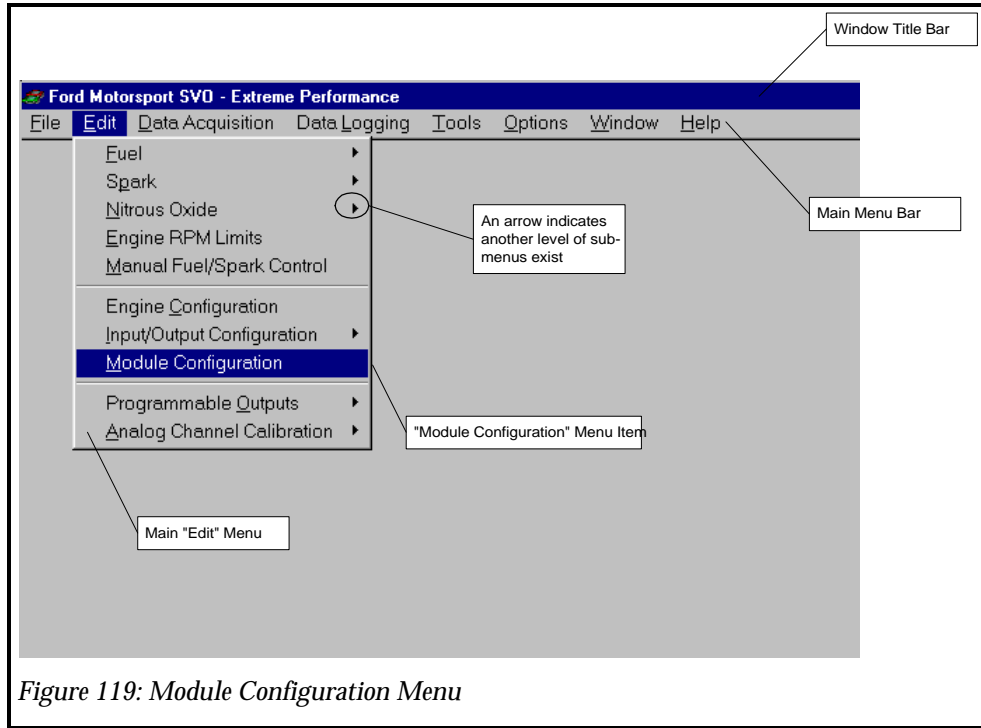


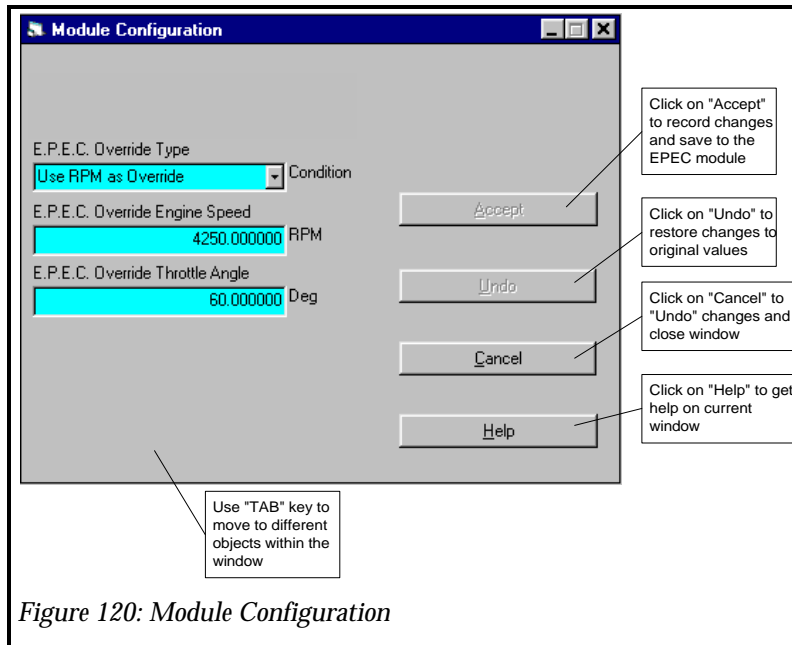
Figure 119: Module Configuration Menu

To change the “Module Type” value select the down arrow on the right side of the Module Type value and select either “Extender Mode” (piggy back) or “Stand Alone”.

To change the “Override Type” value select the down arrow on the right side of the EPEC Override Type value and select the override type you would like to use. Move to the EPEC Override Engine Speed or EPEC Override Throttle Angle values by pressing the “TAB” key.

Type a new value, then move out of that cell using the “TAB” key. See. Figure 120: Module Configuration. At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.



Programmable Output Channels 0 - 3

The EPEC module contains 4 Programmable Output Channels. These channels can be used to drive indicator lamps, external loads, or relays. These output functions can be used to control anything from a simple control such as a fuel pump to more complex functions such as a third stage of Nitrous Oxide output. These outputs are limited to “low” speed type operations and cannot be used to drive “high” speed type outputs such as additional injectors. Below is a list of some possible output functions that the Programmable Output Channels can control:

- Cooling Fan Controls
- Electric Water Pump Control
- Fuel Pump Control
- Additional Nitrous Oxide Stages
- Alternator Cutout
- Air Conditioning Compressor Cutout
- Burn out RPM range indicator
- Shift Lamp
- Transmission Shift Control

These outputs are driven by the EPEC software and have a resolution (update rate) of approximately 2 - 4 milliseconds. The Programmable Output Channels are all identical in function and any of the 4 channels can be used for any function you wish. There are 4 different calibration properties to the Programmable Output channels for both the “ON” condition and the

“OFF” condition. The Programmable Output channels provide a ground path through the EPEC module to the external load that you connect. This means to connect an indicator lamp for example, you would connect one terminal of the lamp to +12v and the other terminal of the lamp to one of the Programmable Output Channels, see EPEC Hardware [chapter](#). The “ON” condition means the ground path is supplied and the “OFF” condition means the ground path is open.

The first property is the “Trigger Enable” property. The channel must be “Enabled” before it will be functional. If the channel is not enabled, all of the other properties will be ignored by the EPEC module and the output will not be functional.

NOTE: You can disable an output channel by setting the “Trigger Enable” property to “Disable”. If the output is disabled it will be driven to the “OFF” state. This gives you the ability to disabling a channel without having to change the triggers.

The second property that must be configured are the “Trigger” conditions. There are 2 trigger conditions for both the “ON” condition and the “OFF” condition. These 2 triggers can be AND’ed or OR’ed together to perform logical trigger operations. Each trigger has three programmable fields, “Parameter”, “Operator” and the “Constant”. The Parameter field can be any internal EPEC value such as Engine Speed, Air Charge Temperature, etc. The Operator is the mathematical operator such as “Greater Than”, “Greater Than or Equal-to”, “Less Than” etc. The Constant field is the programmable value that the parameter field will be compared against. The programming for a typical trigger may look as follows:

Parameter	Operator	Constant	Logical
Engine Speed	>	4000	AND
Throttle Mode	=	WOT	

This trigger configuration states that in order for the trigger to be true, the Engine Speed must be greater than 4000 RPM AND the Throttle Mode must be equal to Wide Open Throttle. If the current Engine Speed is not greater than 4000 RPM or the Throttle mode is not equal to Wide Open Throttle, then the trigger will not be true.

IMPORTANT: If you set the logical value to “N/A”, the second trigger condition will be ignored regardless of its configuration.

IMPORTANT: You must be VERY CAREFUL not to program the triggers in such a way that they will turn “ON” and “OFF” at a very high rate. It is very easy to program an “ON” trigger and an “OFF” trigger to simultaneously be true. An example of this would be an “ON” trigger that was set to:

ON Trigger: Engine Speed > 4000

OFF Trigger: Engine Speed < 4100

This would cause the output to “toggle” at a very high rate when the Engine Speed is between 4000 and 4100 rpm, probably not a condition that is desirable.

The third property that must be set is the “Delay” property. This value is programmed in milliseconds and is the time delay from the trigger occurrence to the output being driven. This value can be programmed to a value anywhere between 0 ms and 32000 ms (32 seconds).

The fourth and fifth property to complete the configuration are the “Fuel Multiplier” and “Spark Adder”. You have the ability to modify the amount of fuel and spark delivered to the engine while the output is “ON” or “OFF”.

IMPORTANT: The fuel multiplier is cumulative with all the other fuel multipliers in the system so BE CAREFUL. A value 1.1 will richen the fuel amount by 10% and a value of 0.90 will lean the fuel amount by 10%. There is a fuel multiplier for both the “ON” condition and the “OFF” condition for each of the Programmable Output channels for a total of 8 fuel multipliers.

IMPORTANT: The spark adder is cumulative with the other spark adders in the system so BE CAREFUL. A positive value will add spark advance and a negative value will remove spark advance (retard). There is a spark adder for both the “ON” condition and the “OFF” condition for each of the Programmable Output channels for a total of 8 spark adders.

To change the Programmable Output Channel configuration, click on the “Edit” menu and then the “Programmable Outputs” sub-menu. Then click on the desired channel number. The Programmable Output Window will then appear. See Figure 121: Programmable Output 0-4 Menu.

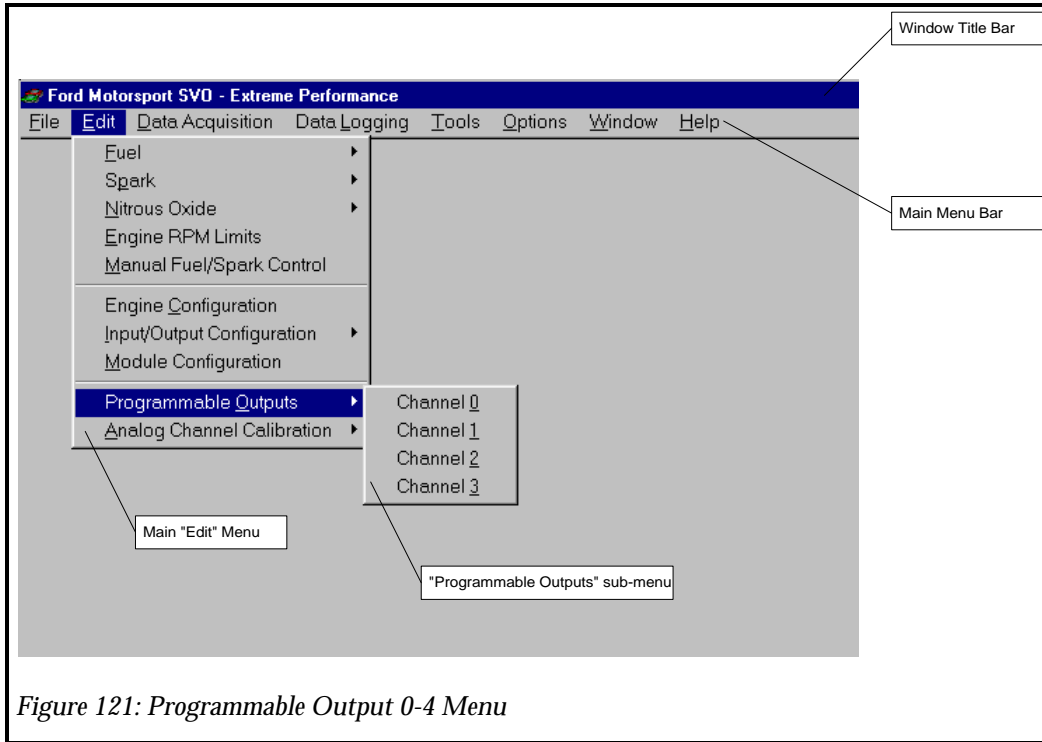


Figure 121: Programmable Output 0-4 Menu

To change the “Trigger Enable” value select the down arrow on the right side of the box and select “Enable” or “Disable”.

To change the trigger, you must first select the parameter category for the parameter list, i.e. fuel, spark, etc. then select the desired parameter in the trigger. Once you select the desired parameter, you must select the operator that will be used as the comparison. These operators depend on the parameter you select. The table below shows all the operator types, however, not all of these operators will be available for all the parameters available.

Operator Symbol	Operator Meaning
=	Equal To
!=	Not Equal To
>	Greater Than
>=	Greater Than or Equal To
<	Less Than
<=	Less Than Or Equal To
Imm	Immediate
Nvr	Never

Once the parameter and the operator are selected, you must enter a value that will be used in the comparison, type a new value, then move out of that cell using the "TAB" key. See. Figure 122: Programmable Output Channels 0-4 ON Conditions and Figure 123: Programmable Output Channels 0-4 OFF Conditions.

IMPORTANT: If you select "Imm" or "Nvr" as the comparison type, the parameter and the constant values are ignored.

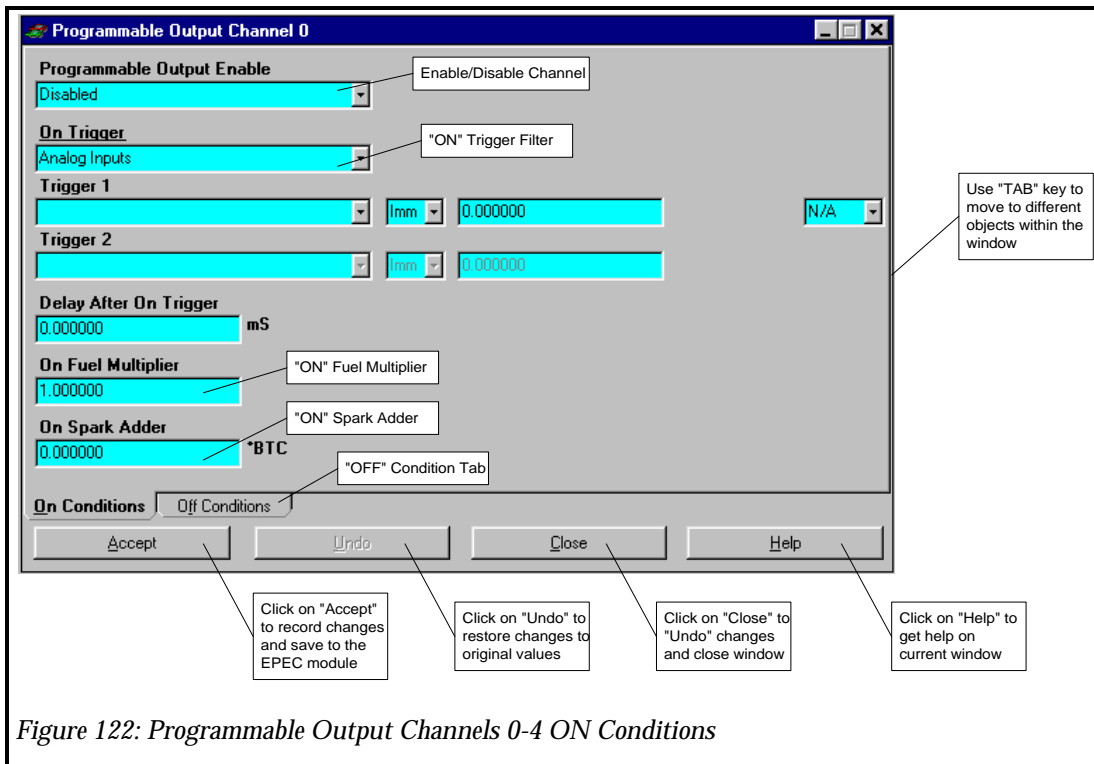


Figure 122: Programmable Output Channels 0-4 ON Conditions

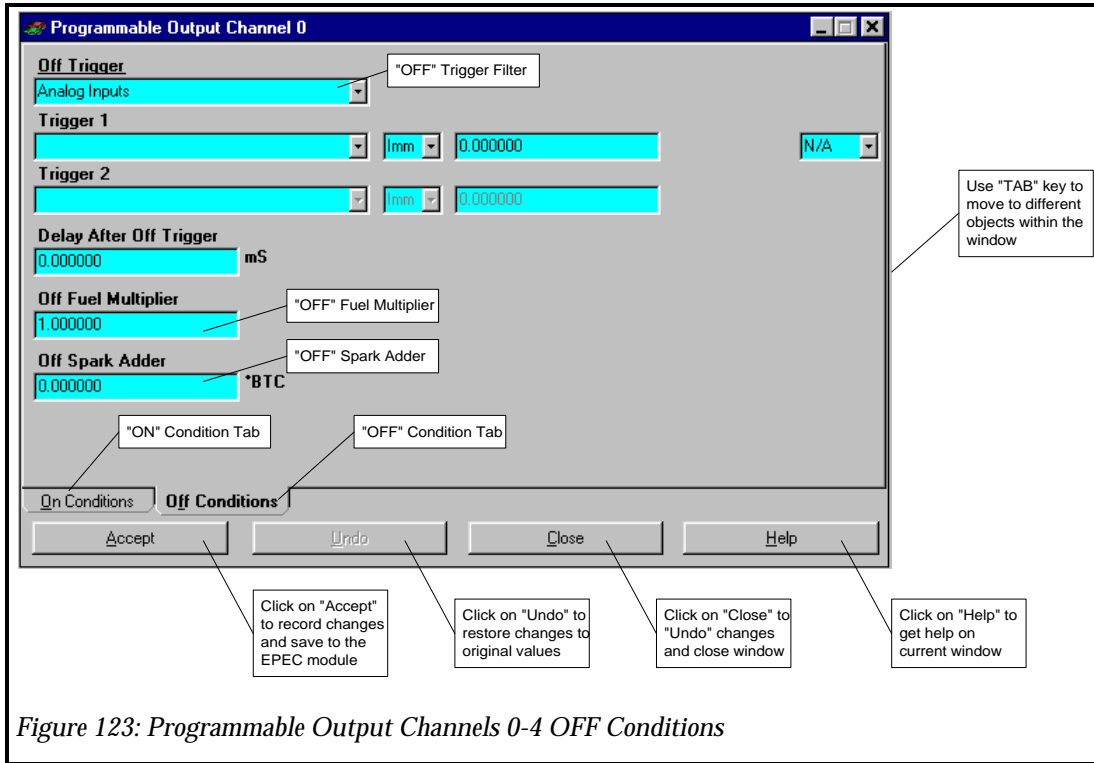


Figure 123: Programmable Output Channels 0-4 OFF Conditions

At this point you can click on “Accept”, “Undo” or “Cancel”. “Accept” will accept the new values. “Undo” will undo the changes and restore the original settings. “Close” will “Undo” and close the window.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the EPEC module.

Analog Channels 0 - 2 Calibration

The EPEC module contains 3 Analog Input Channels. These channels can be used for other type inputs to the EPEC module that are not directly supported by the EPEC module. These input sources can range from thermocouples to Air/Fuel Meters. These input channels can be used to modify fuel and spark, Programmable Output triggers or just to data log for additional information. Below is a list of some possible input sources that the Analog Channels can be used to measure:

- Additional Switch inputs
- Air/Fuel Ratio meters
- Temperature Probes such as thermocouples
- Drivers seat adjustable Fuel/Spark modifiers

-
- Additional Analog type Sensors

IMPORTANT: Many external devices such as thermocouples CANNOT be connected directly to the EPEC module analog input channels. Thermocouples require an external signal conditioning circuit that will accept the thermocouple type input and have an output of 0v - 5v or 0v - 10v. The analog input channels have an input voltage range from 0v - 10v DC. Each analog input channel has a positive (+) and a negative (-) input. If the device you are using does not have a negative terminal, connect the negative (-) input of the analog channel to the ground of the external device.

The Analog Channel calibration parameters allow you to calibrate the analog channel. This calibration accounts for input circuit component tolerances to get more accurate input voltage measurements.

To change the Analog Input Channel calibration, click on the “Edit” menu and then the “Analog Input Calibration” sub-menu. Then click on the desired channel number. The Analog Input Calibration Window will then appear. See Figure 124: Analog Channel 0-3 Calibration Menu.

There are 2 calibration parameters for each of the Analog Input Channels. This is a 2 step process in which you must calibrate the zero and span of the input channel. You will need an accurate digital voltmeter and a good adjustable voltage source to calibrate the analog inputs. You will need to setup a Data Acquisition window to view the analog input channels indicated voltage.

See [EPEC for](#)

Windows

 chapter on setting up a Data Acquisition window.

Step 1: Set the zero value equal to “0”.

Step 2: Set the span value equal to 10.00

Step 3: Using the voltmeter, monitor the actual input voltage. Set the input voltage on the analog input channel as indicated by the Data Acquisition to 10.00 volts. Record the value indicated by the voltmeter.

Step 4: Enter the value that you recorded in Step 3 in the “Span” parameter of the Analog Input Channel Calibration window and click on “Accept”.

Your analog input channel should now be calibrated and indicate a more accurate voltage value in the Data Acquisition window.

IMPORTANT: If the value entered in the “Span” parameter is less than 10.00 volts, the maximum input voltage value that can be measured by the Analog Input Channel is equal to the value of the “Span” parameter.

IMPORTANT: If the E.P.E.C. module is attached to the computer and you click on “ACCEPT”, the new values WILL BE written to the E.P.E.C. module.

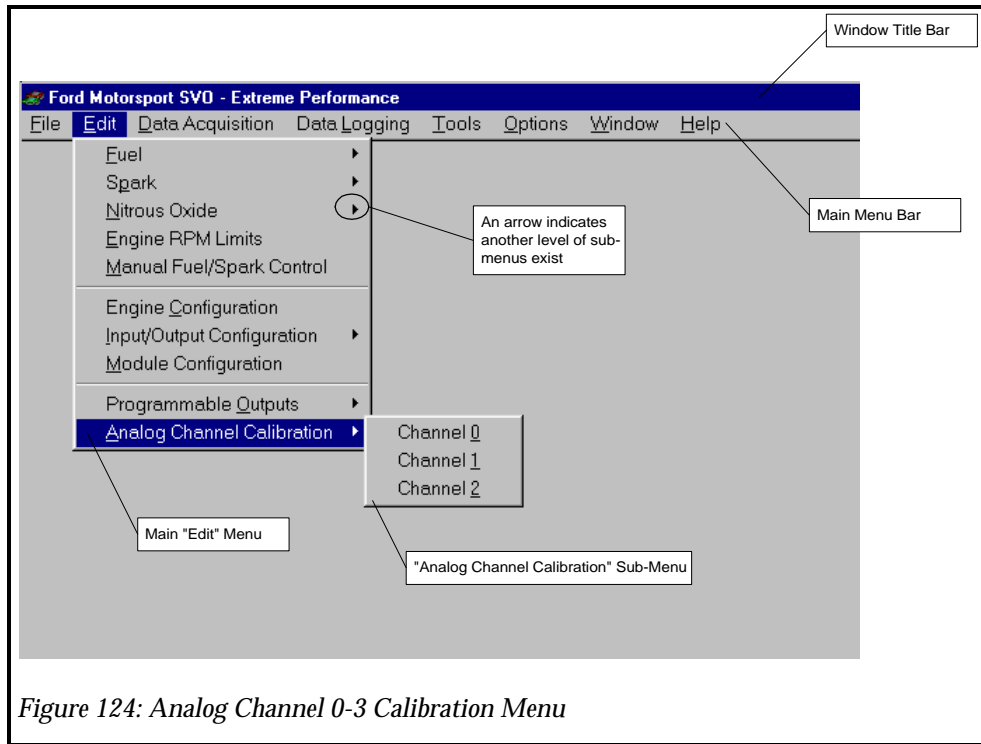


Figure 124: Analog Channel 0-3 Calibration Menu

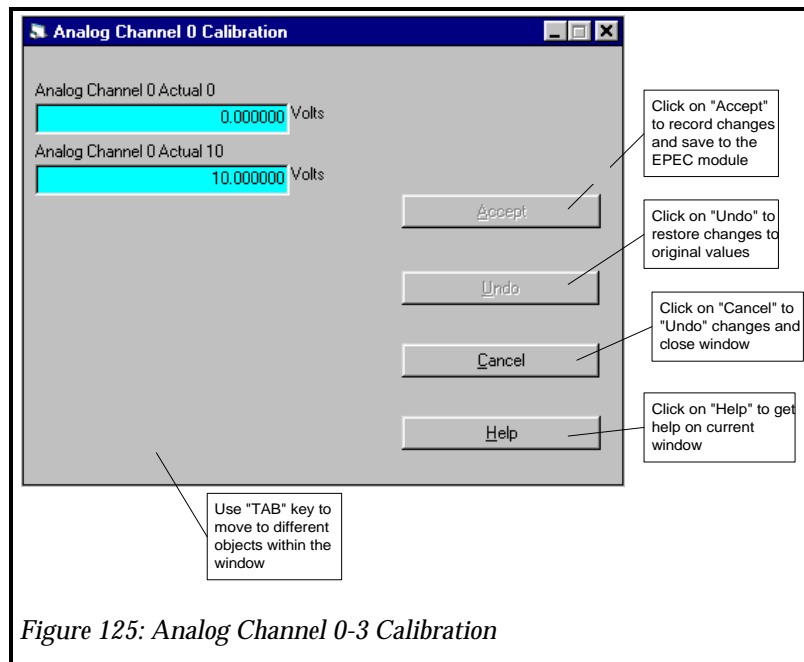
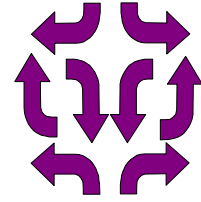


Figure 125: Analog Channel 0-3 Calibration

Data Acquisition



In This Chapter

[Data Acquisition Overview](#)
[Creating a New Acquisition Set](#)
[Opening a Stored Acquisition Set](#)
[Deleting an Acquisition Set](#)
[Viewing the Data Acquisition Window](#)

Data Acquisition Overview

Data Acquisition is the on screen view of internal EPEC module parameters. This can be used to watch parameters within the EPEC module for calibration, system debug, or any other purpose. Data Acquisition is a very easy way to find out how the EPEC module is controlling the system. The data acquisition screen is updated 4 times a second depending on the speed of your computer. If you require more resolution, you have to use the Data Logging feature which takes samples of data at a very high rate, see Data Logging [chapter](#). Data Acquisition is completely controlled from the Data Acquisition Menu on the EPEC for Windows Desktop, See Figure 126: Data Acquisition Menu.

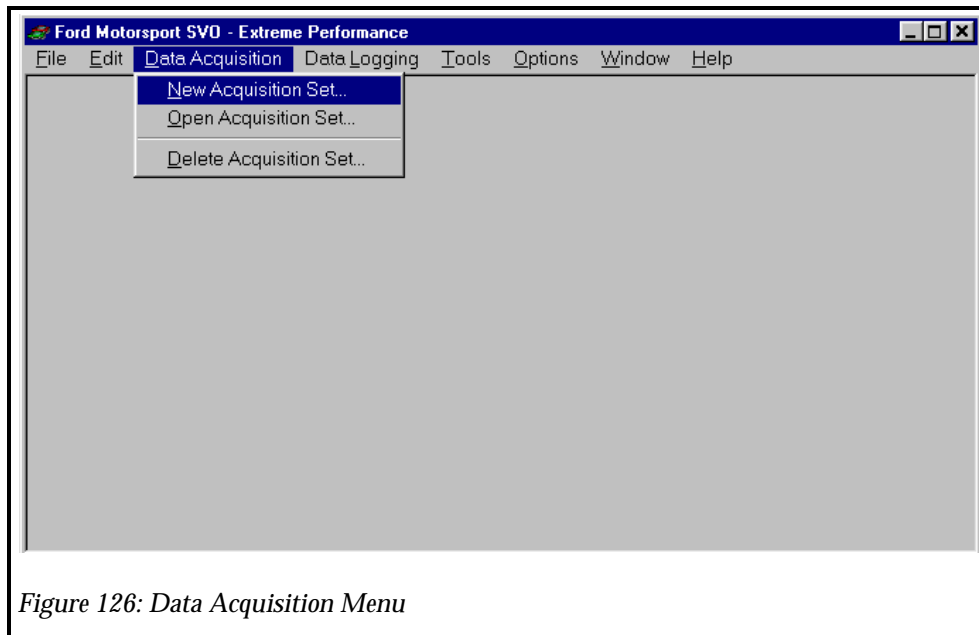


Figure 126: Data Acquisition Menu

Creating a New Acquisition Set

The "New Acquisition Set..." menu item is used to configure a new data acquisition set. When you select this menu item the "New Acquisition Set" dialog box will appear see Figure 127: New Acquisition Set Dialog Box. To create a new acquisition set, you must select the parameters you wish to view. This is a 2 step process, the parameter category is used to sort the available parameters by a logical grouping. As you change the Parameter Category, the Available Parameters list will change. You should become familiar with the Parameter Categories and the Available Parameters in each category.

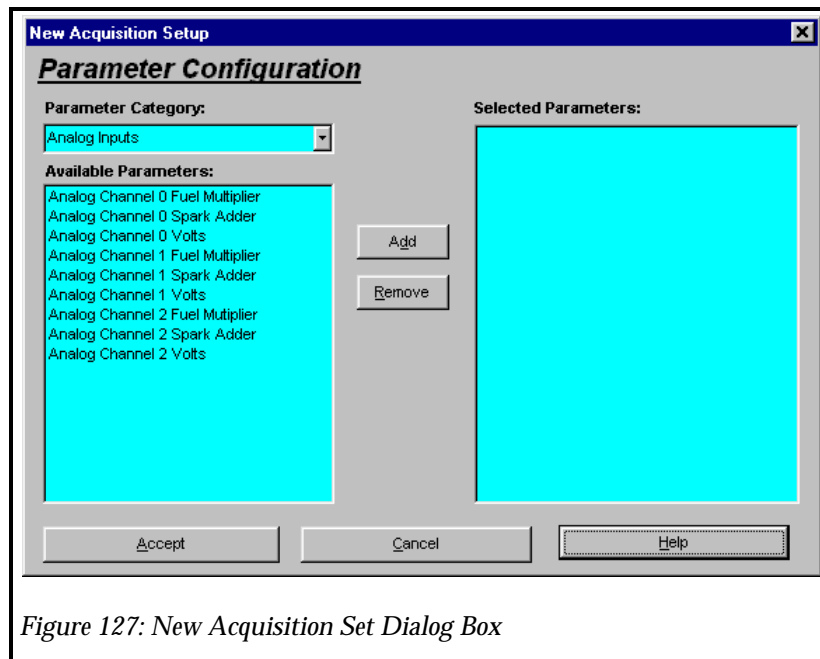


Figure 127: New Acquisition Set Dialog Box

To add parameters to the Data Acquisition Set, simply select the Parameter Category, then from the Available Parameters list, select the desired parameter and click on “Add”. The parameter will disappear from the Available Parameters list and appear on the Selected Parameters list.

Once you have selected all the parameters you would like to view, click on “Accept” to save the Data Acquisition Set. When you click on “Accept”, the Save Acquisition Set Dialog box will appear, see Figure 128: Save Acquisition Set Dialog Box. “Cancel” will cancel close the New Data Acquisition Dialog box and not save your configuration.

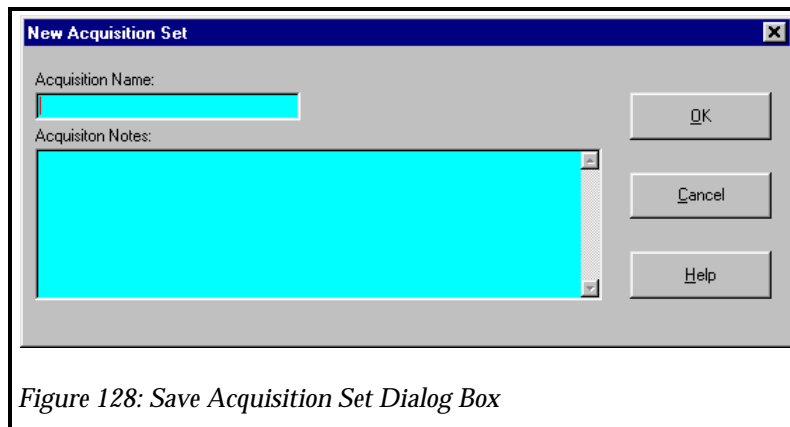


Figure 128: Save Acquisition Set Dialog Box

Opening a Stored Acquisition Set

The “Open Acquisition Set...” menu item is used to open a stored Data Acquisition configuration. When you select this menu item the “Open Acquisition Set” dialog box will appear see Figure

129: Open Acquisition Set Dialog Box. Select the Acquisition Set you would like to open and click on “Open”. This will open the previously stored Data Acquisition Set.

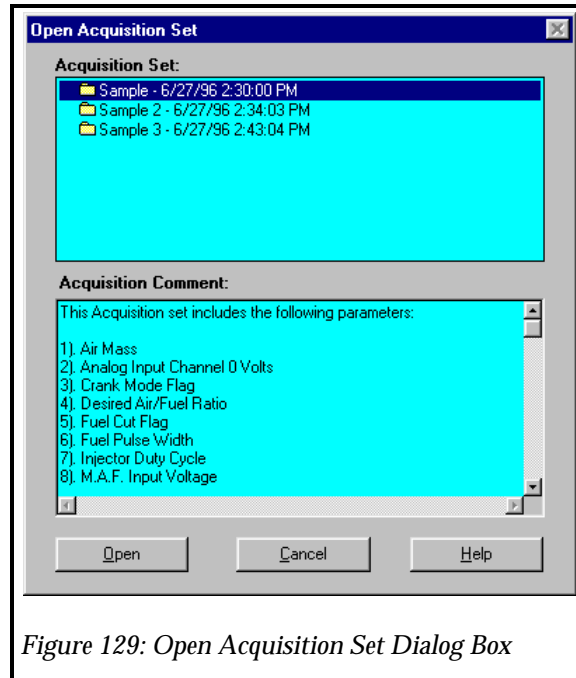


Figure 129: Open Acquisition Set Dialog Box

Deleting an Acquisition Set

The “Delete Acquisition Set...” menu item is used to delete a stored Data Acquisition set. When you select this menu item the “Delete Acquisition Set” dialog box will appear see Figure 130: Delete Acquisition Set Dialog Box. Select the Acquisition Set you would like to delete and click on “Delete”.

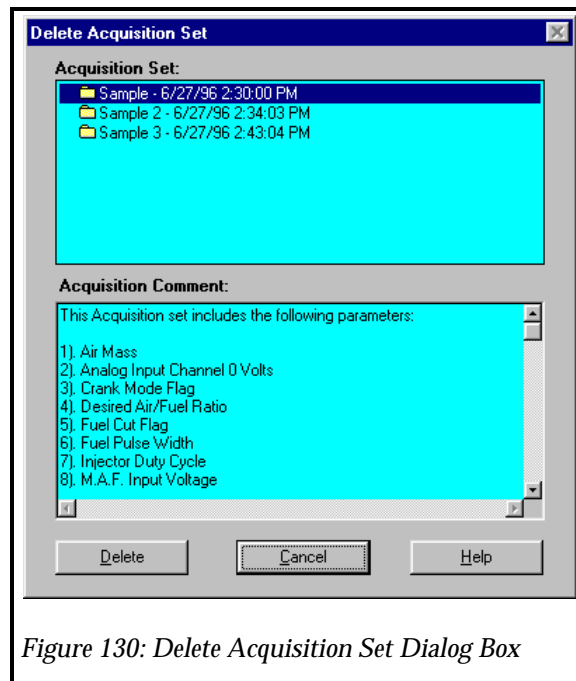


Figure 130: Delete Acquisition Set Dialog Box

When you select “Delete”, the Data Acquisition Delete Confirmation dialog box will appear. This is your last chance not to delete the selected Data Acquisition Set. If you select “Yes”, the Data Acquisition Set will be deleted and cannot be restored. See Figure 131: Delete Acquisition Confirmation

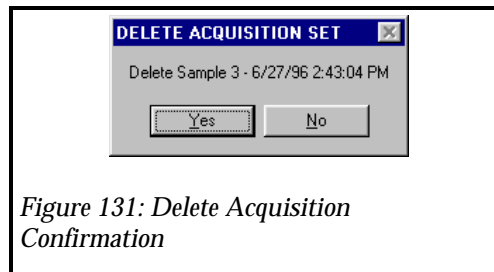


Figure 131: Delete Acquisition Confirmation

Viewing the Data Acquisition Window

To view the data acquisition window you must either create a new data acquisition set (See Creating a New Acquisition Set) or open a previously stored acquisition set (see Opening a Stored Acquisition Set). Once you create or open an acquisition set, the Data Acquisition Set window will appear see Figure 132: Data Acquisition Window.

IMPORTANT: You must have the EPEC Module attached to the computer before you use a Data Acquisition set, otherwise the Data Acquisition will not work correctly. You can create a new Data Acquisition set without being connected to the EPEC Module, however, do not start the Data Acquisition until the EPEC Module has been connected.

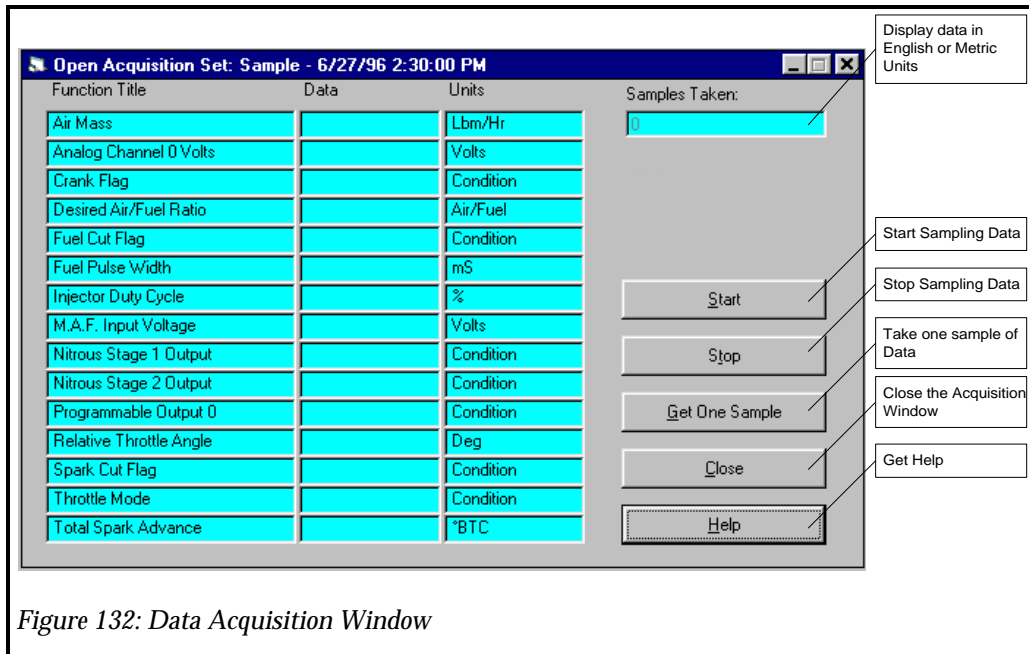
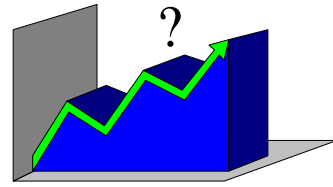


Figure 132: Data Acquisition Window

The Data Acquisition Window has various controls on it. While the Data Acquisition Window is open, you can start or stop taking data, Take one sample of data, close the window, display the data in English or Metric units. The data acquisition window also tells you how many samples have been taken. As EPEC for windows takes data from the EPEC module, you will see the data values changing.

IMPORTANT: You can take data while you are calibrating the EPEC module, however, this may slow down the response of your computer. If you find the computer speed unacceptable while the Data Acquisition Window is taking data, you can Stop the Data Acquisition Window from taking data while you are calibrating. You do not have to close the Data Acquisition Window to calibrate any parameter within the EPEC module.

Data Logging



In This Chapter

[Data Logging Overview](#)

[New Log Set...](#)

[Open Log Set...](#)

[Delete Log Set...](#)

[New/Upload Log Data](#)

[Graphing Log Data](#)

[Opening Log Data Files](#)

Data Logging Overview

Data Logging is the high speed internal recording EPEC module parameters. Data Logging offers many advantages over the Data Acquisition, such as high speed up to 100 samples per second instead of 4 samples per second., data is logged internal to the EPEC module and uploaded instead of logged by a computer inside the car. You also have the ability to set a log trigger which will start the logging of data. Once the data is logged, it can be uploaded by the EPEC for windows software for viewing. All of the data logging features are controlled through the Data Logging menu. See Figure 133: Data Logging Menu.

IMPORTANT: You must have the Logger Arm switch and lamp wired to the EPEC module in order for the Data Logging features to operate. See EPEC Hardware Chapter.

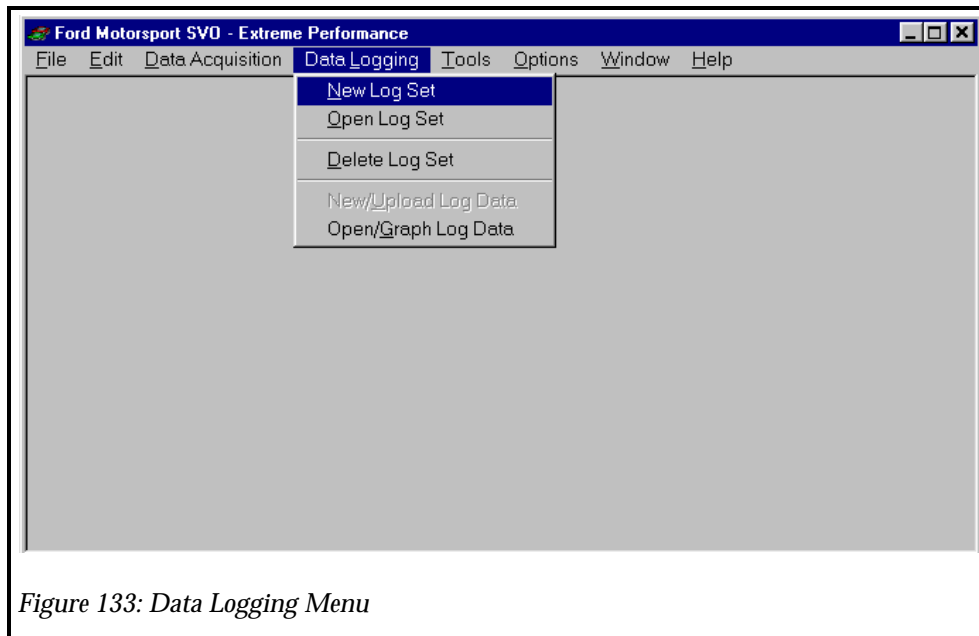


Figure 133: Data Logging Menu

New Log Set...

The "New Log Set..." menu item is used to configure a new Data Log Set. When you select this menu item the "New Log Set" dialog box will appear see Figure 134: New Data Log Set Dialog Box (Log Parameters) and Figure 135: New Data Log Set Dialog Box (Log Trigger). Creating a new Log Set is a 2 step process, you must select the parameters you wish to Data Log and configure the trigger that will start the data logging. To select the parameters to data log, select the Parameter Category. The Parameter Category is used to sort the Available Parameters by a logical grouping. As you change the Parameter Category, the Available Parameters list will change. You should become familiar with the Parameter Categories and the Available Parameters in each category.

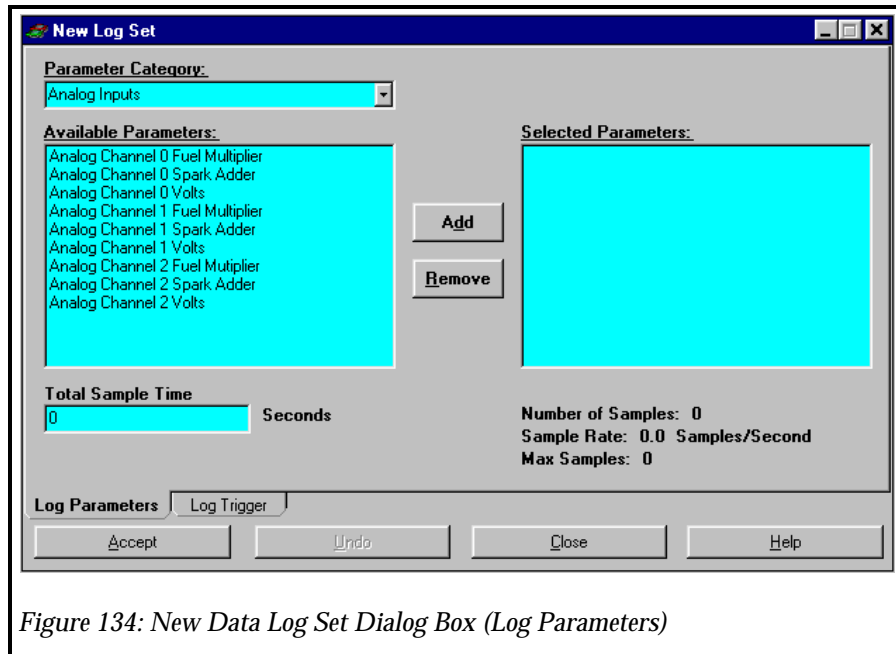


Figure 134: New Data Log Set Dialog Box (Log Parameters)

To add parameters to the Data Log Set, simply select the Parameter Category, then from the Available Parameters list, select the desired parameter and click on "Add". The parameter will disappear from the Available Parameters list and appear on the Selected Parameters list. As you fill the Selected Parameters list, the Max Samples value will change. The value of the Max Samples depends on how many parameters you select.

Once you have selected all the parameters you wish to log, move to the Total Sample Time entry box and type the total time you wish to log data. Typical sample times are 9 - 20 seconds. When you type a new value for the Total Sample Time, the Number of Samples and the Sample Rate values will change. The maximum Sample Rate is 100 samples per second. The Number of Samples is the total number of samples the EPEC module will take. Once this many samples are taken the EPEC module will stop logging data.

IMPORTANT: The Sample Rate and Number of Samples depends on the number of parameters you have selected and the Total Sample Time. You should balance the number of selected parameters and the Total Sample Time to obtain the highest Sample Rate. This is however up to you.

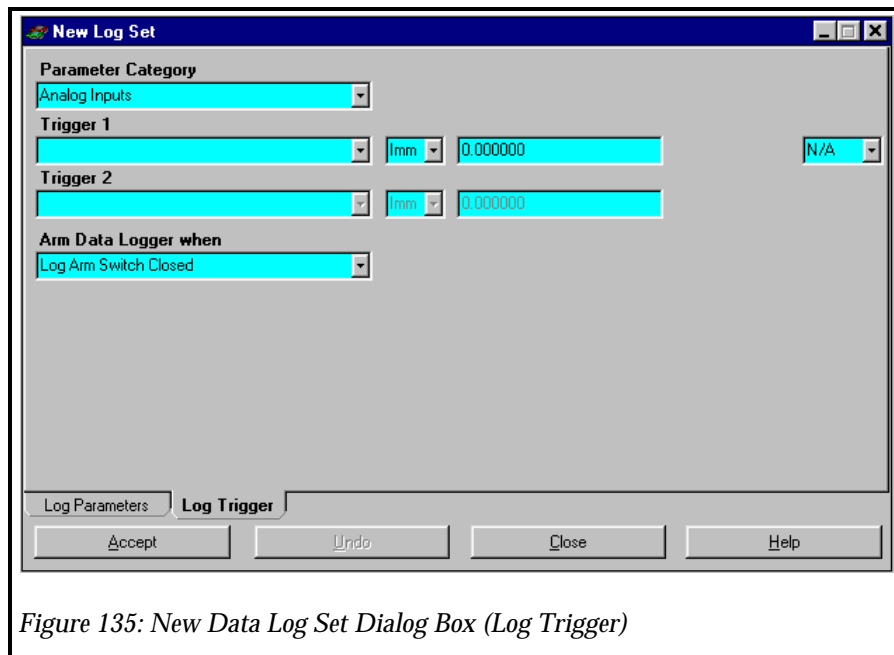


Figure 135: New Data Log Set Dialog Box (Log Trigger)

The second step in creating the Log Set, is to configure the trigger. The trigger is the conditions that will start the data logging. This trigger can range from a simple trigger to a complex trigger. A simplest trigger would be to set the condition to “Imm”. This will trigger as soon as you press and release the Logger Arm switch. A complex trigger can be based on 2 parameters that you select.

IMPORTANT: You must have the Logger Arm switch and lamp wired to the EPEC module in order for the Data Logging features to operate. See EPEC Hardware Chapter.

Once you have selected all the parameters you would like to view and configured the Logger Trigger, click on “Accept” to save the Data Log Set. When you click on “Accept”, the Save Log Set Dialog box will appear, see Figure 136: Save Log Set Dialog Box. “Cancel” will cancel close the New Log Set Dialog box and will not save your configuration.

IMPORTANT: If the EPEC module is attached to the computer and you click on “ACCEPT”, the new Data Logging configuration values WILL BE written to the EPEC module.

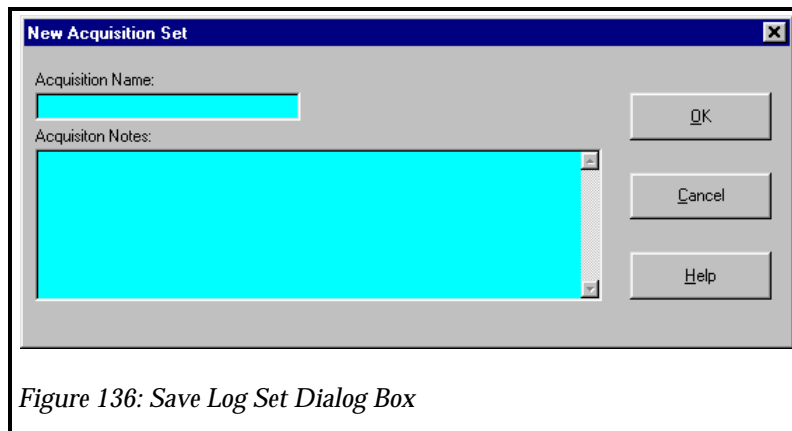


Figure 136: Save Log Set Dialog Box

Open Log Set...

The "Open Log Set..." menu item is used to open a stored Data Logging configuration. When you select this menu item the "Open Log Set" dialog box will appear see Figure 137: Open Log Set Dialog Box. Select the Log Set you would like to open and click on "Open". This will open the previously stored Data Log Set.

IMPORTANT: Once you have the log set open, you must have the EPEC module connected to the computer to save the currently open log set to the EPEC module. When you open a previously stored log set, you will have to re-enter the total sample time. This gives you the ability to change the total sample time each time you open a stored log set.

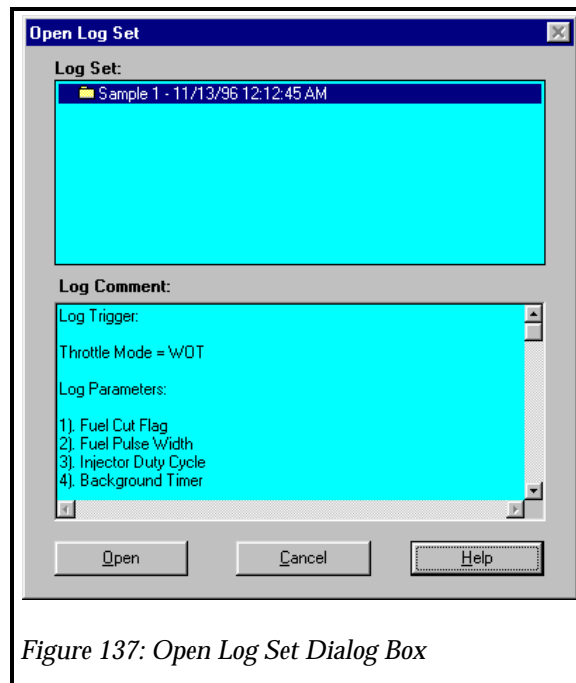
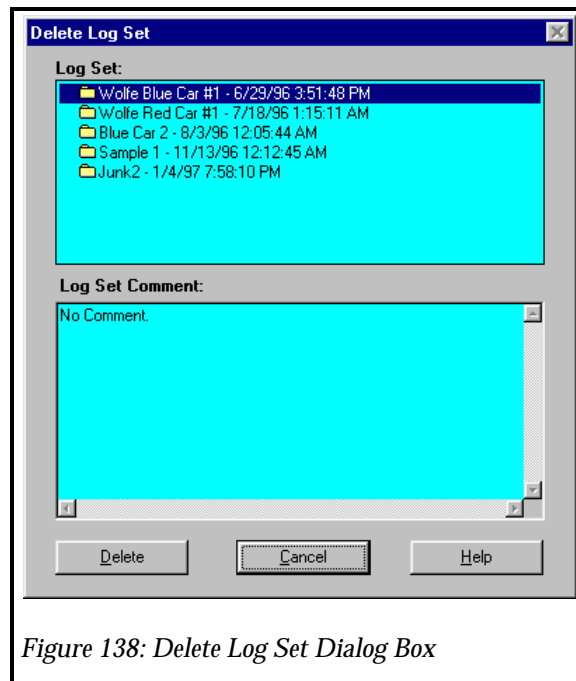


Figure 137: Open Log Set Dialog Box

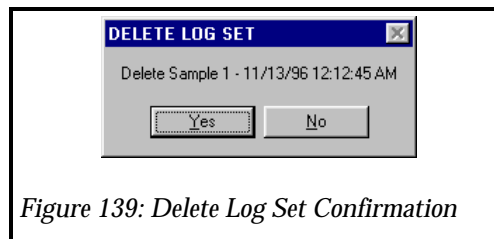
Delete Log Set...

The "Delete Log Set..." menu item is used to delete a stored Data Log set. When you select this menu item the "Delete Log Set" dialog box will appear see Figure 138: Delete Log Set Dialog Box. Select the Log Set you would like to delete and click on "Delete".



When you select “Delete”, the Data Log Delete Confirmation dialog box will appear. This is your last chance not to delete the selected Data Acquisition Set. If you select “Yes”, the Data Acquisition Set will be deleted and cannot be restored. See Figure 139: Delete Log Set Confirmation

IMPORTANT: You cannot delete any of the log sets from the MS-DOS prompt. These log sets are all stored in a single file and cannot be deleted from the MS-DOS prompt.



New/Upload Log Data

The “New/Upload Log Data” menu item is used to upload logged data from the EPEC module. When you select this menu item, the “New/Upload Log Data” dialog box will appear see Figure 140: New/Upload Log Data Dialog Box. Logged data is stored as individual files on your hard disk. These files are used by the graphing utility provided with EPEC for Windows and can be loaded by spreadsheet programs such as Microsoft Excel for more analyzing.

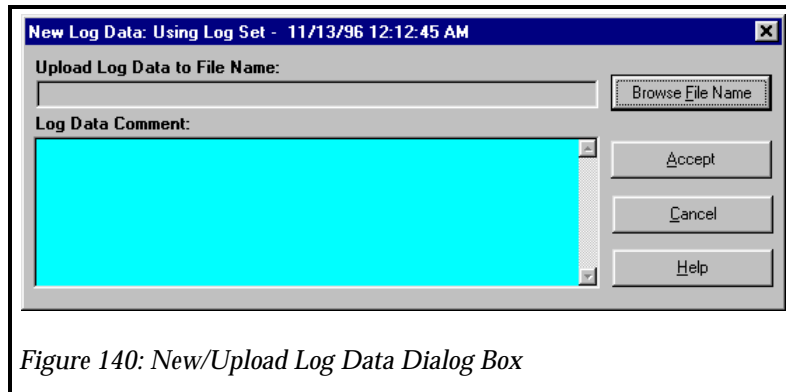


Figure 140: New/Upload Log Data Dialog Box

To save the log data to a file, first enter any comments you desire then click on the “Browse File Name” button. When you click on this button, another dialog box will appear so you can select the file name to store the logged data. Type the desired name in the “File Name” entry box and click “OK”. See Figure 141: New/Upload Log Data File Name Dialog Box. When you select “OK”, the New/Upload Log Data File Name Dialog Box will disappear. Then click on “Accept” in the New/Upload Log Data Dialog Box. EPEC for Windows will then begin to upload the data from the EPEC module. A progress bar will be displayed to indicate the uploading progress.

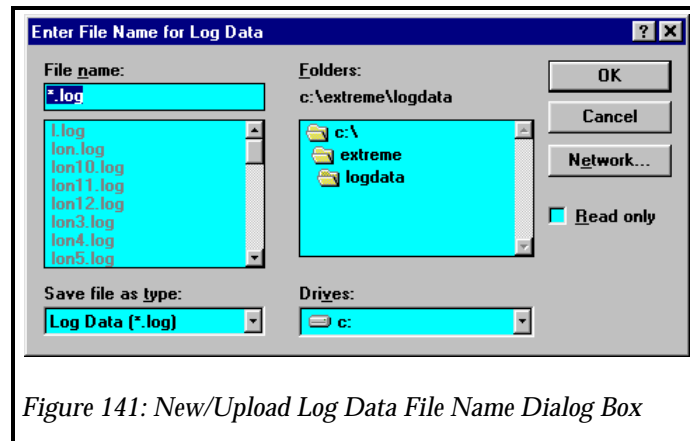


Figure 141: New/Upload Log Data File Name Dialog Box

Graphing Log Data

The “Open/Graph Log Data” menu item is used to graph logged data from the EPEC module. When you select this menu item, the Extreme Graph application will appear see Figure 142: Extreme Graph Desktop. Logged data is stored as individual files on your hard disk. These files are used by the graphing program provided with EPEC for Windows. These files can also be loaded by spreadsheet programs such as Microsoft Excel for more advanced graphing.

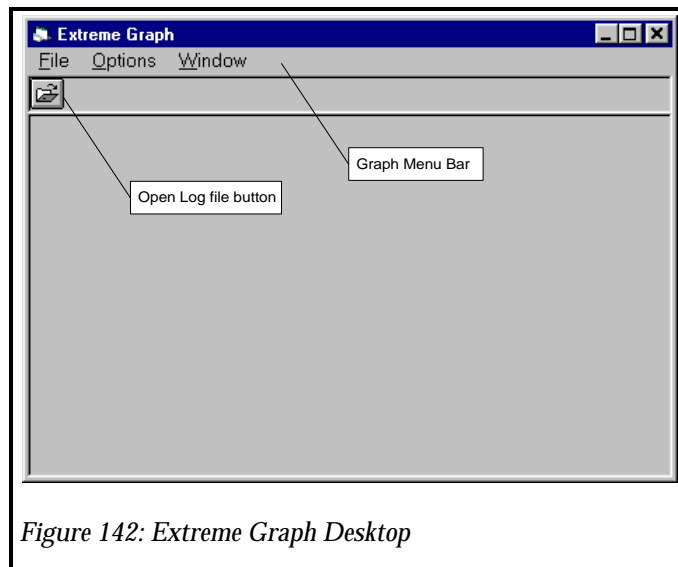


Figure 142: Extreme Graph Desktop

Opening Log Data Files

To open a log data file, click either on the Open Log File button on the Extreme Graph toolbar or select “File” then “Open”. When you select “Open”, the Open Log Data File dialog box will appear, see Figure 143: Open Log Data Dialog Box. To open a stored log data file, select the file name in the file list box, then select “OK”.

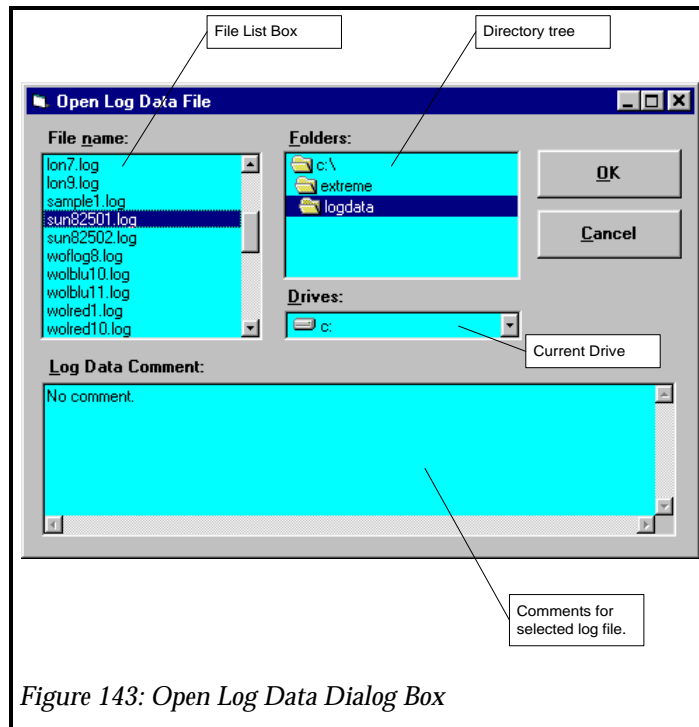
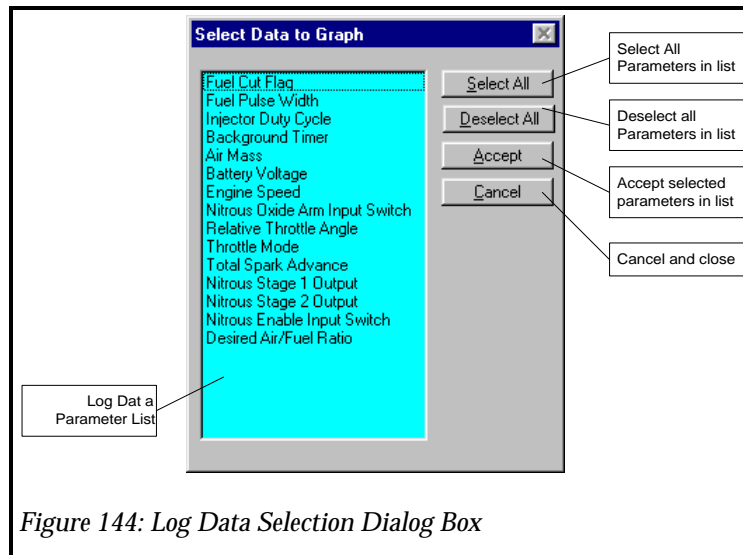


Figure 143: Open Log Data Dialog Box

Once you select the file to load, the Log Data Selection Dialog Box will appear, see Figure 144: Log Data Selection Dialog Box. This dialog box will list all of the parameters that are stored in

the log data file you have opened. There is also 4 buttons to aid in the selection process. The “Select All” button will select all of the parameters in the list. The “Deselect All” button will reset the selection so none of the parameters are selected. The “Accept” button will accept the currently selected parameters and the “Cancel” button will close the dialog box. You can also select each parameter in the list manually by clicking on it. Once you have selected all of the parameters you would like to view, click on the “Accept” button and the graph will then appear, Figure 144: Log Data Selection Dialog Box.

IMPORTANT: Only select the parameters that you wish to view. The more parameters you select to graph the slower the response time of your computer will be. If you select all of the parameters, the response time may be unacceptable.



Once the graph window appears you have many controls to view the data. You can zoom in, print the graph, toggle grids on or off, select how many graphs are displayed simultaneously, and select which graph is displayed at the top of the window, see Figure 145: Data Logging Graph. A sample of log data is supplied with EPEC for Windows so you can play the Extreme Graph and become familiar with it.

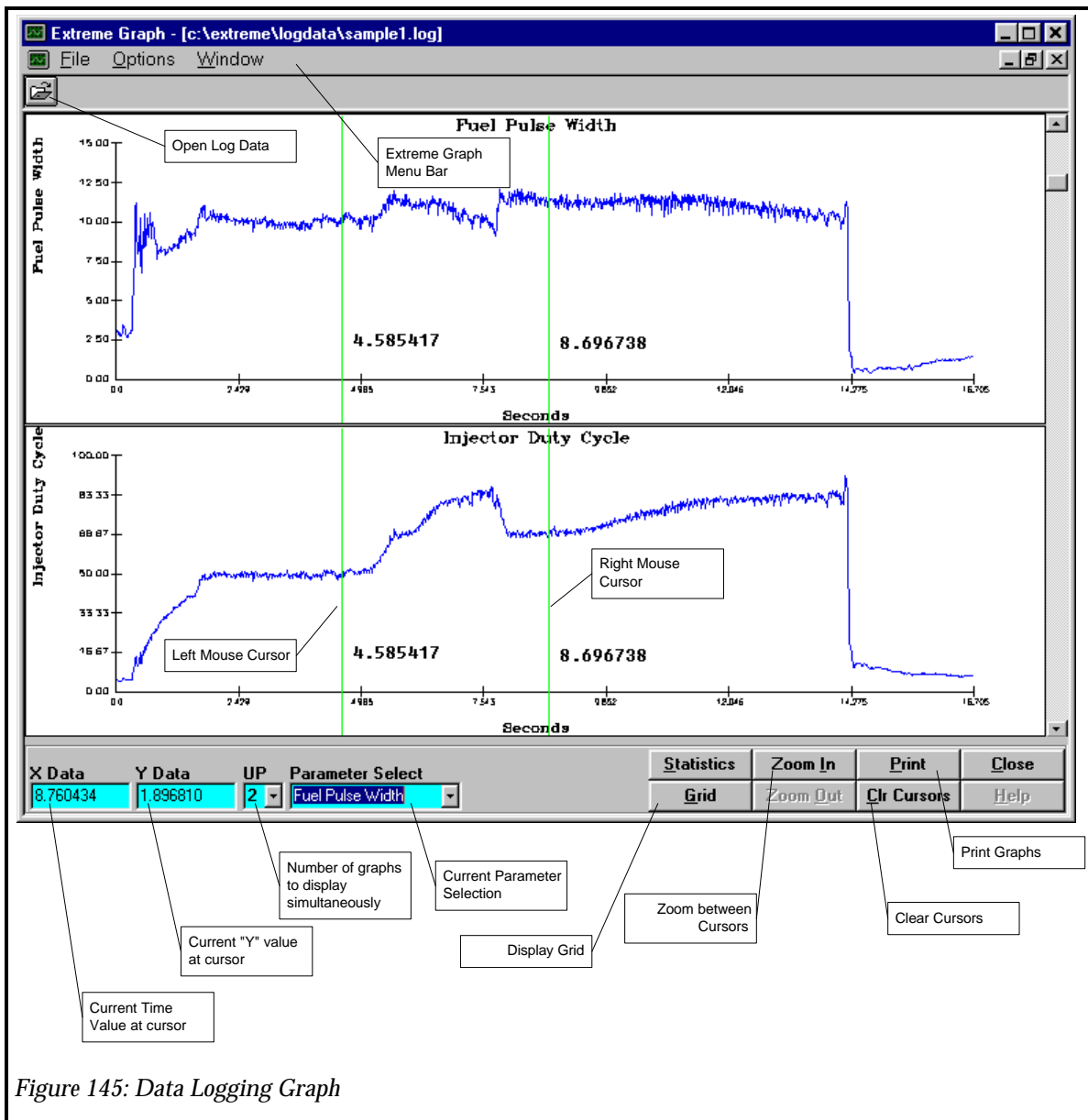


Figure 145: Data Logging Graph

EPEC Hardware



In This Chapter

Fuel Injector Output Schematic
Spark Output Schematic
Programmable Output Schematic
Nitrous Controls Schematic
Data Logging Schematic
TP Sensor Schematic
MAP Sensor Schematic
ACT Sensor Schematic
ECT Sensor Schematic
MAF Sensor Schematic
Stage Rev Limiter Schematic
Analog Input Schematic
Computer Interface Schematic
Power/Ground Schematic
EPEC Module Pin Assignments
EEC-IV Module Pin Assignments
1988-1993 5.0L EPEC Adapter Harness Schematic
1994-1995 5.0L EPEC Adapter Harness Schematic

Fuel Injector Output Schematic

Figure 146 shows the schematic wiring diagram for the fuel injector control. All of this wiring is contained within the wiring harness adapter provided with the EPEC kit, this wiring diagram is provided for reference. There are 2 different wiring harness adapters depending on the EPEC kit required;1988-1993 5.0L Mustang or 1994-1995 5.0L Mustang. Both adapters are shown. There are 16 circuits associated with the fuel injector control. Once the wiring harness adapter is installed into the vehicle, the 8 injector outputs are routed from the EPEC module to the fuel injectors. The other 8 circuits are routed between the EEC-IV module and the EPEC module. These are the injector outputs from the EEC-IV module. This gives the EPEC module the ability to dynamically select which module will be driving the fuel injectors.

IMPORTANT: The fuel injectors are only driven by the EPEC module when the EPEC is “overriding” the EEC-IV module. Otherwise the EEC-IV module is driving the injectors and the EPEC module strategy is (your calibration) is not having any effect on engine operation. This includes all fuel calibration parameters contained within the EPEC Module.

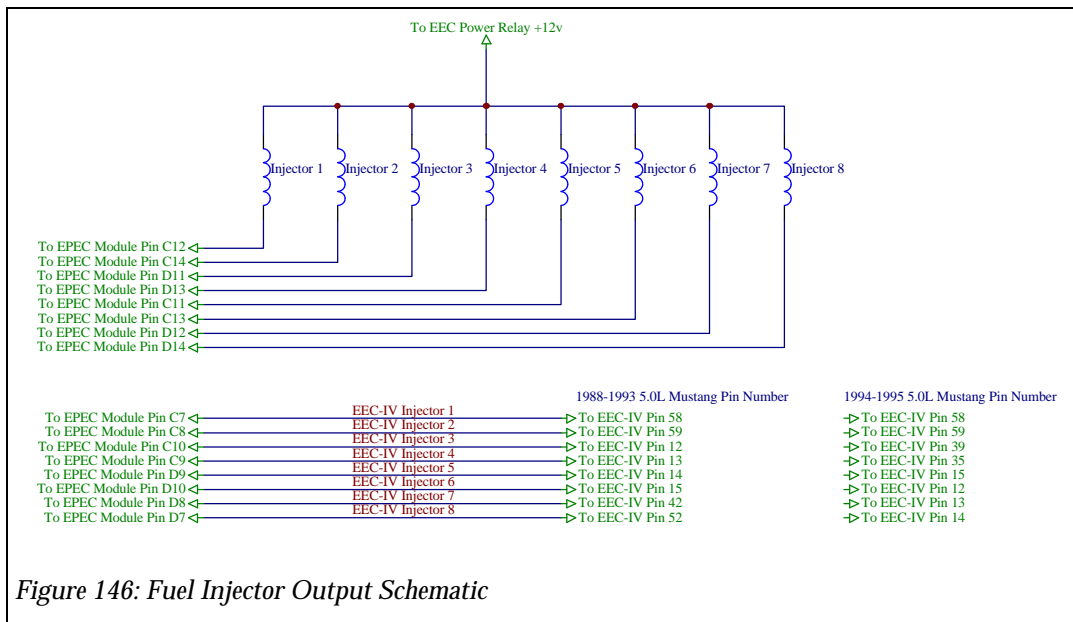


Figure 146: Fuel Injector Output Schematic

Spark Output Schematic

Figure 147 shows the schematic wiring diagram for the ignition system control. All of this wiring is contained within the wiring harness adapter provided with the EPEC kit, this wiring diagram is provided for reference. There are 2 different wiring harness adapters depending on the EPEC kit required;1988-1993 5.0L Mustang or 1994-1995 5.0L Mustang. Both adapters are shown. There are 3 circuits associated with the ignition system control. Once the wiring harness adapter is installed into the vehicle, the SPOUT output is routed from the EPEC module to the TFI Ignition Module. The IGNGND is routed from the TFI Ignition Module to both the EPEC Module and the EEC-IV Module. The last circuit is the EEC-IV SPOUT signal. This signal is routed between the EPEC Module and the EEC-IV Module. This gives the EPEC module the ability to dynamically select which module will be driving the ignition system.

IMPORTANT: The ignition system is only driven by the EPEC module when the EPEC is “overriding” the EEC-IV module. Otherwise the EEC-IV module is driving the ignition system and the EPEC module strategy is (your calibration) is not having any effect on engine operation. This includes any spark calibration parameters contained within the EPEC Module.

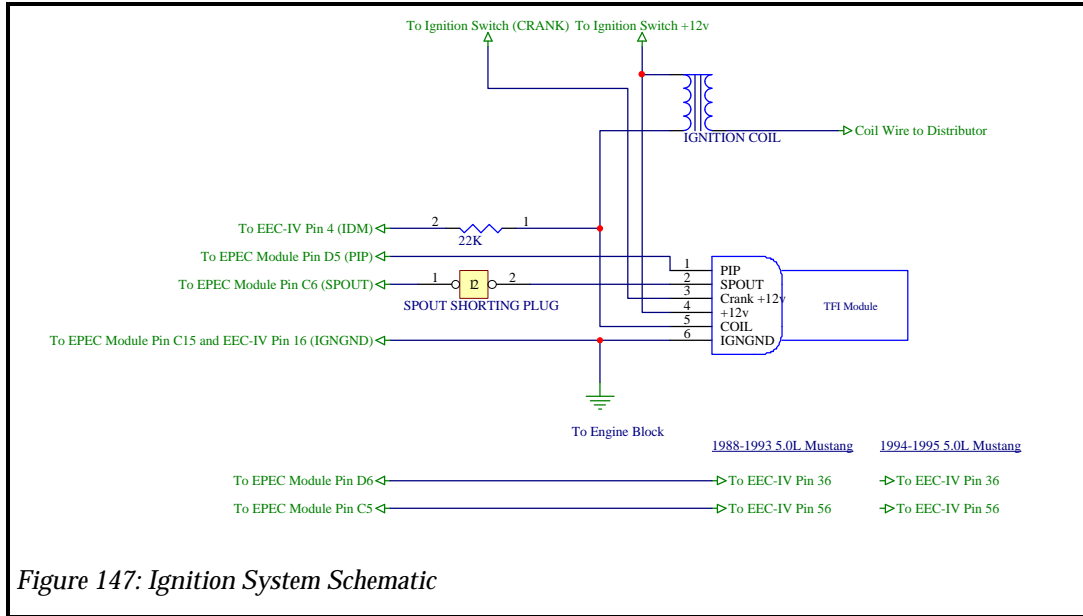
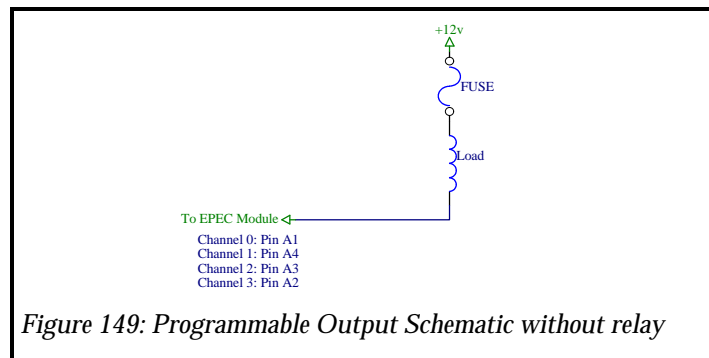
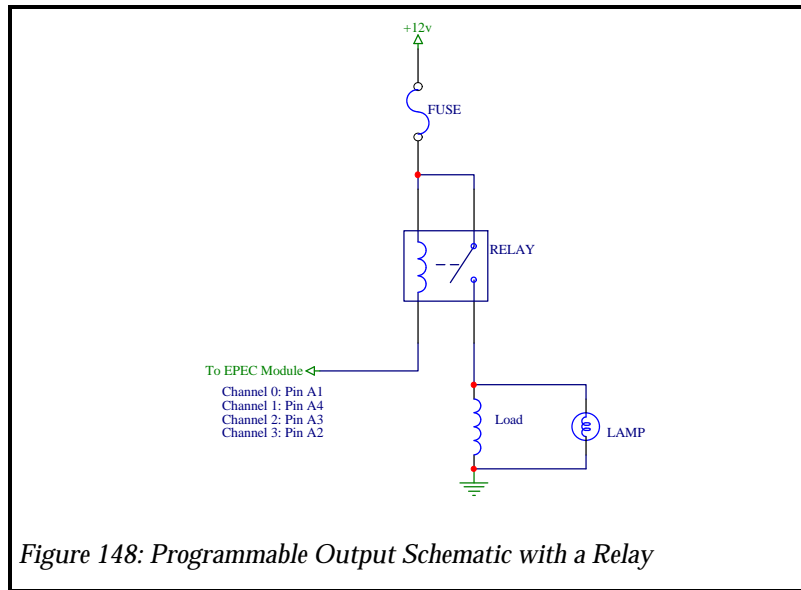


Figure 147: Ignition System Schematic

Programmable Output Schematic

Figure 148 and Figure 149 show a typical schematic of one programmable output channel. There are two ways of wiring a programmable output depending on the current requirements of the load which is to be driven. Each channel of the programmable outputs is capable of driving 0.5 amp of current. If the load is less than 0.5 amps, such as an indicator lamp, the load can be connected directly to the EPEC Module as shown in Figure 149. If the load current is greater than 0.5 amp then a relay must be used because the EPEC Module will not drive the load directly as shown in Figure 148.

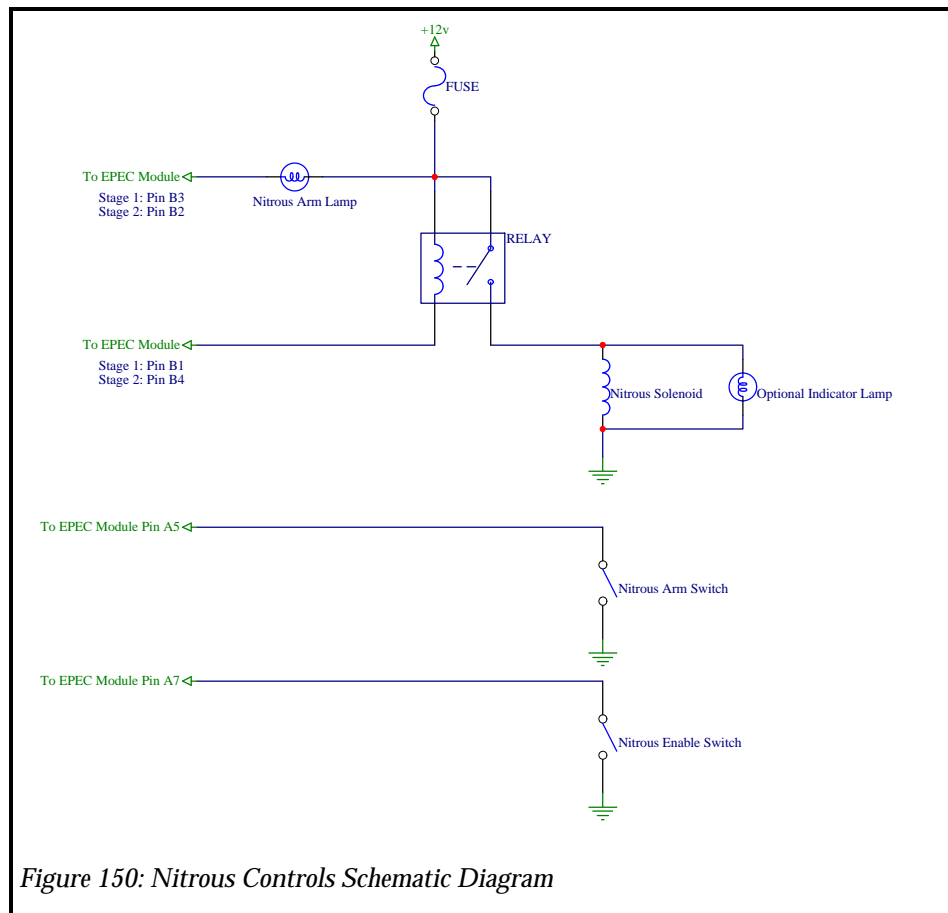
IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.



Nitrous Controls Schematic

Figure 150 shows the inputs to the Nitrous Oxide Control System and one stage of the outputs. The nitrous solenoids must be driven by a relay since most nitrous oxide solenoids have a very low impedance (typically 2-8 ohms). There are two indicator lamp outputs to the nitrous oxide control system. These lamps indicate when the nitrous oxide system is armed and ready to operate. There are two inputs to the nitrous oxide control system, first is the Nitrous Oxide Enable Switch and the Nitrous Arm Switch. The Nitrous Oxide Enable Switch is used to enable and disable the nitrous oxide system. The nitrous oxide enable is a switch connected between EPEC pin A7 and ground. This is a normally open switch. The second input to the nitrous oxide control system is the Nitrous Oxide Arm Switch. This switch is connected between EPEC pin A5 and ground, however this switch must be a normally open momentary type switch. An optional indicator lamp is shown connected in parallel with the nitrous oxide solenoid. This indicator lamp will turn on whenever the nitrous oxide solenoid is activated.

IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.



Data Logging Schematic

Figure 151 shows schematic diagram for the input to the High Speed Data Logger. This input circuit consists of a switch and an indicator lamp. The switch is used to arm the data logger. Once the data logger is armed it will look for the programmed trigger. Once the trigger condition is true, the EPEC module will then begin taking data. The indicator lamp performs 2 functions. First, it shows when the data logger is armed and is looking for the log trigger to occur. Second, the indicator lamp will flash when the EPEC Module is currently taking data. When the data logging is complete the lamp will stay off.

NOTE: If the ignition switch is turned off before the EPEC module is finished taking data, the data set will not be complete, however, the data can still be uploaded by the calibration software.

IMPORTANT: The data that is logged by the EPEC module is stored in battery backed memory. This memory is powered by the Keep Alive +12v power to the EPEC module. In order for the data logging function to work properly, the Keep Alive power must be connected directly to the vehicle battery.

IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.

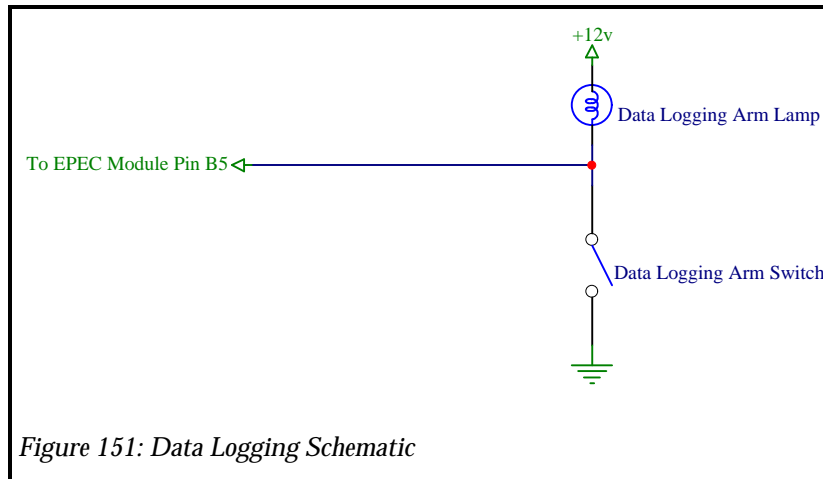


Figure 151: Data Logging Schematic

TP Sensor Schematic

Figure 152 shows the schematic wiring diagram for the Throttle Position Sensor. All of this wiring is contained within the wiring harness adapter provided with the EPEC kit, this wiring diagram is provided for reference. There are 2 different wiring harness adapters depending on the EPEC kit required; 1988-1993 5.0L Mustang or 1994-1995 5.0L Mustang. Both adapters are shown. There are 3 circuits associated with the TP Sensor. Once the wiring harness adapter is installed into the vehicle, the TP signal is routed from the TP sensor to both the EEC-IV module and the EPEC module. The other 2 circuits are routed between the EEC-IV module and the TP Sensor. The TP Sensor input is always visible from the EPEC module even when the EEC-IV is running the engine.

IMPORTANT: The readings seen on the TP Sensor from the EPEC module are always available, however, these do not reflect the reading taken by the EEC-IV module. None of the readings taken by EEC-IV are available to the EPEC module.

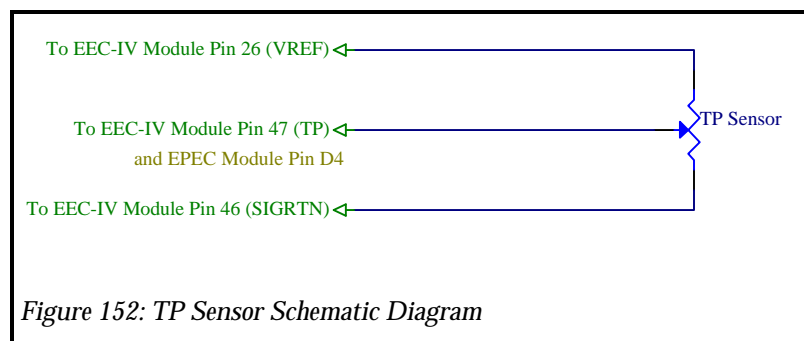
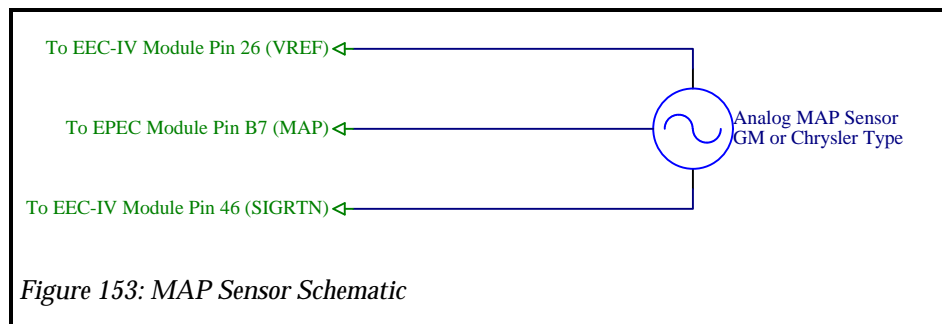


Figure 152: TP Sensor Schematic Diagram

MAP Sensor Schematic

Figure 153 shows the schematic wiring diagram for the Manifold Absolute Pressure (MAP) Sensor. This sensor is **NOT** contained within the production Ford wiring harness and must be installed by you. The production Ford MAP/BP sensor can only measure vacuum so this MAP sensor must be an analog type capable of measuring both vacuum and boost. Sensors such as the GM 2 or 3 bar or the Chrysler 2 bar are capable of measuring both vacuum and boost. The EPEC Module is compatible with both the GM and Chrysler MAP sensors, however the MAP Sensor Transfer Function must be calibrated to the specific sensor you are using. There are 3 circuits associated with the MAP sensor, VREF (+5v), Signal Return and the MAP signal. The VREF and Signal Return can be obtained within the production Ford wiring harness from the TP sensor or the production Ford MAP/BP sensor. The MAP sensor is only connected to the EPEC module and does not connect to the EEC-IV module in any way. This sensor must be added to your system if you will be using the Boost Retard or MAP Fuel functionality of the EPEC module. If you do not plan on using the MAP sensor functions, the MAP sensor does not need to be installed.

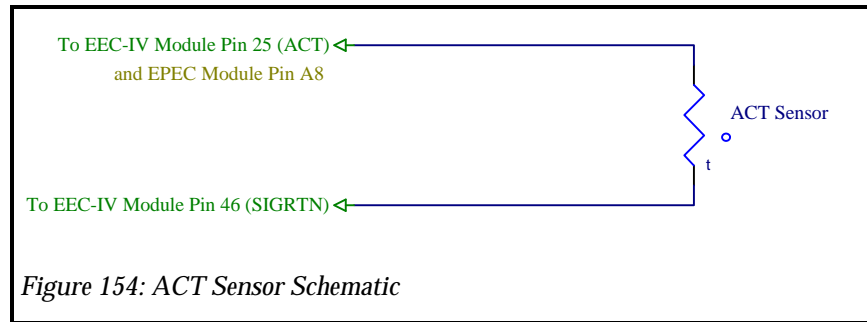
IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.



ACT Sensor Schematic

Figure 154 shows the schematic wiring diagram for the Air Charge Temperature Sensor. The connections between the sensor and the EEC-IV module are contained within the production wiring harness. The EPEC kit contains the same wiring harness adapter as the Ford Motorsport Extender. The Extender wiring harness adapter does **NOT** contain the ACT circuit therefore, connections between the ACT signal and the EPEC Module must be made by you. The ACT readings from the EPEC module are always available, even when EEC-IV is controlling the engine.

IMPORTANT: The readings seen on the ACT Sensor from the EPEC module are always available, however, the EPEC readings do not reflect the readings taken by the EEC-IV module. None of the readings taken by EEC-IV are available to the EPEC module or software.

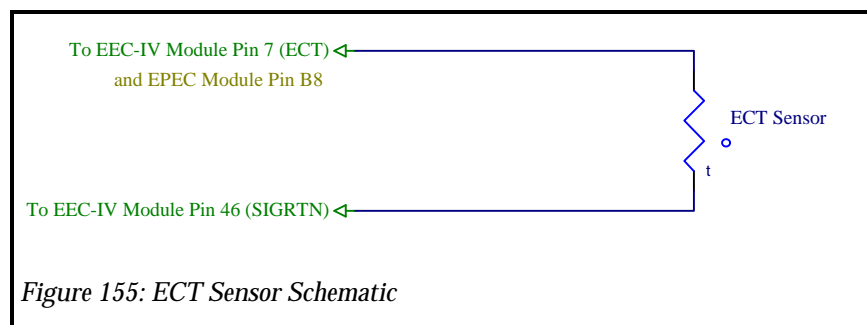


ECT Sensor Schematic

Figure 155 shows the schematic wiring diagram for the Engine Coolant Temperature Sensor. The connections between the sensor and the EEC-IV module is contained within the production wiring harness. The EPEC kit contains the same wiring harness adapter as the Ford Motorsport Extender. The Extender wiring harness adapter does **NOT** contain the ECT circuit therefore, connections between the ECT signal and the EPEC Module must be made by you. The ECT readings from the EPEC module are always available, even when EEC-IV is controlling the engine.

IMPORTANT: The readings seen on the ECT Sensor from the EPEC module are always available, however, the EPEC readings do not reflect the readings taken by the EEC-IV module. None of the readings taken by EEC-IV are available to the EPEC module or software.

IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.



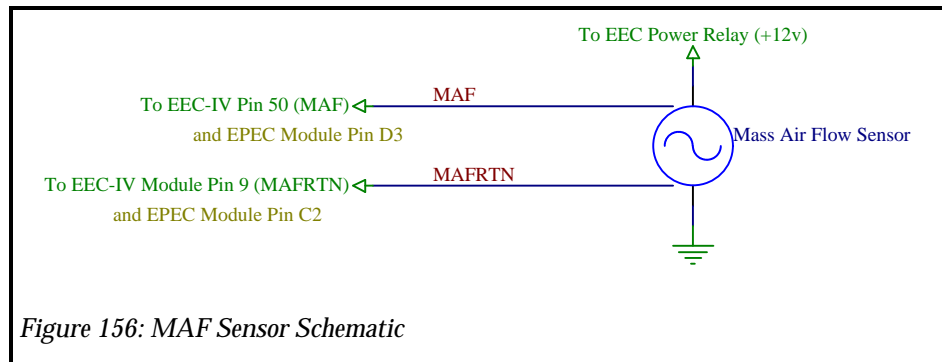
MAF Sensor Schematic

Figure 156 shows the schematic wiring diagram for the Mass Air Flow Sensor. All of this wiring is contained within the wiring harness adapter provided with the EPEC kit, this wiring diagram is provided for reference. There are 2 different wiring harness adapters depending on the EPEC kit required; 1988-1993 5.0L Mustang or 1994-1995 5.0L Mustang. Both adapters are shown. There are 4 circuits associated with the MAF Sensor. Once the wiring harness adapter is installed into the vehicle, the MAF and MAF Return signals are routed from the MAF sensor to both the EEC-IV

module and the EPEC module. The other 2 circuits are the power and ground connections to the MAF Sensor.

IMPORTANT: The readings seen on the MAF Sensor from the EPEC module are always available even if EEC-IV is running the engine, however, the EPEC readings do not reflect the readings taken by the EEC-IV module. None of the readings taken by EEC-IV are available to the EPEC module.

IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.

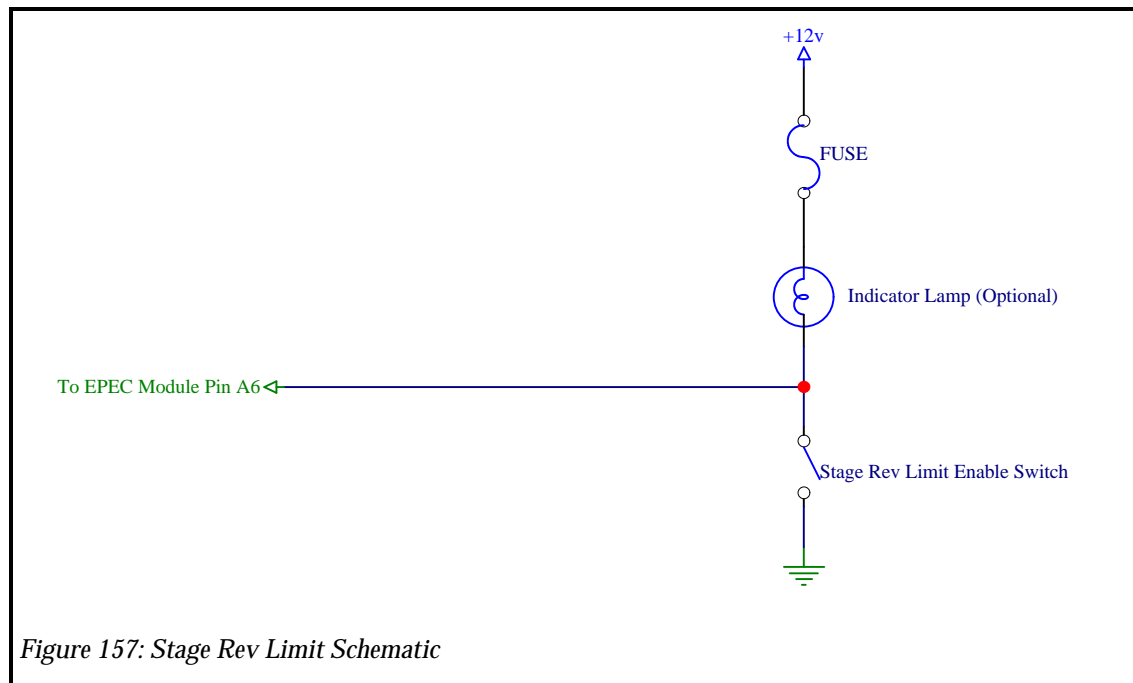


Stage Rev Limiter Schematic

Figure 157 shows schematic diagram for the input to the Stage Rev Limiter. This input circuit consists of a switch connected between the EPEC pin A6 and ground. The switch is used to enable the Stage Rev Limiter (2 step). The Stage Rev Limiter will be enabled whenever the Stage Rev Limit switch is depressed. This switch should be a normally open momentary switch.

IMPORTANT: The Stage Rev Limiter is ONLY functional when the EPEC module is running the engine. If EEC-IV is running the engine, the Stage Rev Limiter is not functional. You must calibrate the Stage Rev Limiter value higher than the EEC-IV Override Engine Speed.

IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.

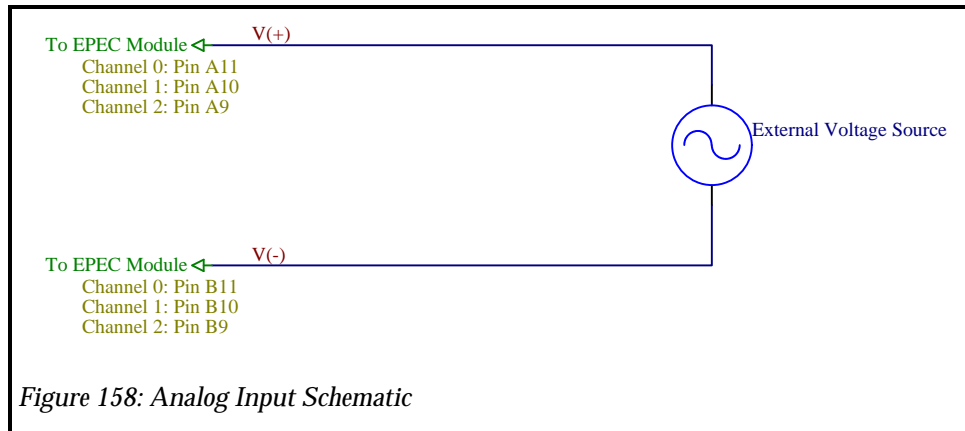


Analog Input Schematic

Figure 158 shows the schematic for 1 channel of the Analog Input. These input channels are used to measure and data log input voltages from external devices such as pressure transducers, thermocouples etc. These inputs can be logged along with other parameters such as Air Mass, Fuel Pulse Width etc. They can also be used as a trigger condition for the data logger, or an “ON” or “OFF” condition for the Programmable Output channels.

IMPORTANT: Many sensors cannot be connected directly to the EPEC Module, they must be conditioned by an external device to produce a 0v-10v. An example of this type would be a thermocouple. You must have an external signal conditioning circuit for the thermocouple used in the application, it cannot be connected directly to the EPEC module. The Analog Inputs have a range of measurement of 0v - 10v DC.

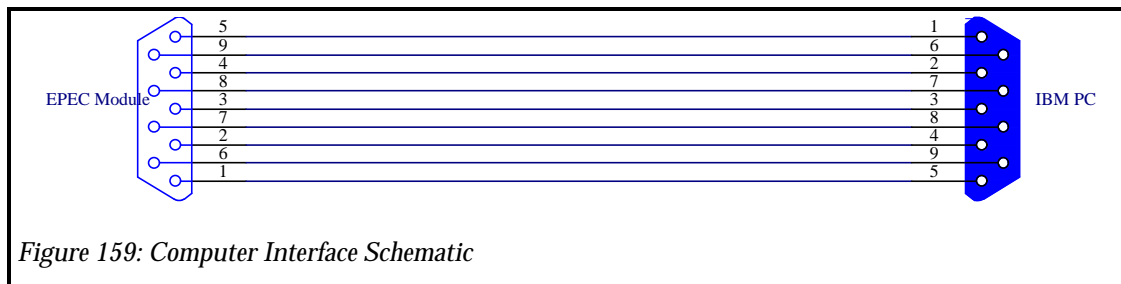
IMPORTANT: Be sure to solder and tape all connections, wiring is the most common cause of system problems.



Computer Interface Schematic

Figure 159 shows the pin out of the serial communication cable between the EPEC Module and the IBM PC. This cable is very simple consisting of a male DB9 connector and a female DB9 connector and is a 1 to 1 connection, i.e. Pin 1 on the EPEC Module is connected to Pin 1 of the IBM PC etc. This cable can be found at any computer retail store or can be made to a custom length that you require.

IMPORTANT: You should keep the serial cable shorter than 100 ft. Depending on the electrical noise conditions around the area that you are working, communication errors could arise making communication between the EPEC Module and the IBM PC. Communication errors will not adversely affect your calibration, it will only slow down the saving process. If the IBM PC cannot communicate with the EPEC module, your calibrations cannot be sent to the EPEC module.



Power/Ground Schematic

Figure 160: Power/Ground Schematic shows the schematic diagram for the Power and Ground circuits required for the EPEC and EEC-IV system. There are 2 ground pins on the EEC-IV module and 4 ground pins on the EPEC module. There are 2 power pins on the EEC-IV module and 2 power pins on the EPEC module. There is also 1 Case Ground pin on each both the EEC-IV module and EPEC module. All of these connections are contained within the EPEC wiring harness adapter cable except the ground connections on EPEC pins A12 and B12. These must be connected directly to the battery by you for proper operation.

IMPORTANT: If you move the battery from the stock location, you must move the computer grounds. DO NOT FOR ANY REASON connect the computer grounds to the chassis of the vehicle, this includes EEC-IV pins 40 and 60 and EPEC pins A12, B12, C16 and D16. These pins must be connected the battery ground using at least a 12 Ga. wire for each pin. Failure to connect the computer grounds directly to the battery will result in unreliable and erratic computer operation.

IMPORTANT: ALWAYS solder your connections, wrapping them by hand and tapping will not provide the proper connection required by the sensitive electronics. Without proper ground connections, the EPEC module will produce unpredictable results.

IMPORTANT: It is good practice to isolate your ignition system grounding from the EEC-IV/EPEC grounds, especially if you are using an aftermarket ignition system. Connect the ground of the ignition system through a dedicated wire (recommended by the ignition system manufacturer) to the negative terminal of the battery. Do not connect all the computer grounds and the ignition system ground at the front of the vehicle and then run a very large wire to the negative terminal of the battery. This may cause interference between the ignition system and the EEC-IV/EPEC modules and unpredictable results can occur.

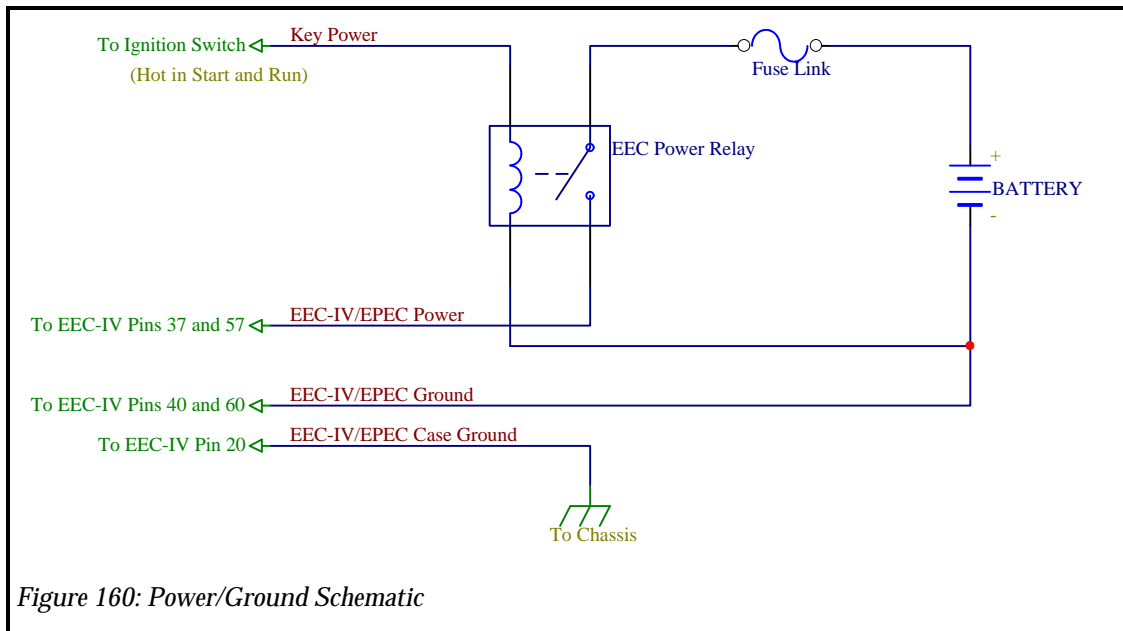


Figure 160: Power/Ground Schematic

EPEC Module Pin Assignments

The following table describes the EPEC module pin numbers and their associated functions.

Pin Number	Pin Name	Notes
A1	Programmable Output Channel 0	0.5 A output. Typically used to drive an indicator lamp directly or a relay for higher current loads.
A2	Programmable Output Channel 3	0.5 A output. Typically used to drive an indicator lamp directly or a relay for higher current loads.
A3	Programmable Output Channel 2	0.5 A output. Typically used to drive an indicator lamp directly or a relay for higher current loads.
A4	Programmable Output Channel 1	0.5 A output. Typically used to drive an indicator lamp directly or a relay for higher current loads.
A5	Nitrous Arm	Connect a momentary switch between this pin and ground.
A6	Stage Rev Limit Enable	Connect a momentary switch between this pin and ground
A7	Nitrous Enable	Connect a normally open switch between this pin and ground
A8	Air Charge Temperature Sensor	"T" this pin into the ACT Sensor
A9	Analog Input Channel 2 (+)	Analog Input Channel 2 positive input
A10	Analog Input Channel 1 (+)	Analog Input Channel 1 Positive Input
A11	Analog Input Channel 0 (+)	Analog Input Channel 0 Positive Input
A12	Power Ground	Connect directly to the negative terminal of the battery
B1	Stage 1 Nitrous Output	Connect to relay to drive the stage 1 nitrous and fuel solenoids (0.5 A Max output load)
B2	Stage 2 Nitrous indicator Lamp	Connect to an indicator lamp directly.(0.5 A Max output load)
B3	Stage 1 Nitrous Indicator Lamp	Connect to an indicator lamp directly.(0.5 A Max output load)
B4	Stage 1 Nitrous Output	Connect to relay to drive the stage 1 nitrous and fuel solenoids (0.5 A Max output load)
B5	Data Logging Arm	Connect to an indicator lamp and a momentary switch for data logging arming
B6	OPEN	Do Not Connect
B7	Manifold Absolute Pressure Sensor	Connect to Analog type MAP sensor
B8	Engine Coolant Temperature	"T" this pin into the ECT Sensor
B9	Analog Input Channel 2 (-)	Analog Input Channel 2 Negative input
B10	Analog Input Channel 1 (-)	Analog Input Channel 1 Negative Input
B11	Analog Input Channel 0 (-)	Analog Input Channel 0 Negative Input
B12	Power Ground	Connect directly to the negative terminal of the battery
C1	Power (+12v)	Connect to positive terminal of battery through the Power relay
C2	Mass Air Flow Sensor(-)	MAF Sensor negative output
C3	OPEN	Do not connect
C4	Reference Voltage	+5v Output for sensors
C5	PIP Output/Signal Return	Connect to EEC-IV PIP if EPEC is being used as a Piggy back system. If the EPEC is being used as a Standalone, this is the ground for the sensors (SIGRTN).
C6	Spark Output (SPOUT)	Connect to Ignition Module

Pin Number	Pin Name	Notes
C7	Injector 1 Input	Connected to Injector 1 Output of EEC-IV
C8	Injector 2 Input	Connected to Injector 2 Output of EEC-IV
C9	Injector 4 Input	Connected to Injector 4 Output of EEC-IV
C10	Injector 3 Input	Connected to Injector 3 Output of EEC-IV
C11	Injector 8 Output	Connected to Fuel Injector 8
C12	Injector 1 Output	Connected to Fuel Injector 1
C13	Injector 7 Output	Connected to Fuel Injector 7
C14	Injector 2 Output	Connected to Fuel Injector 2
C15	Ignition Ground	Connected to TFI module
C16	Power Ground	Connect directly to battery negative terminal
D1	Power (+12v)	Connect to positive terminal of battery through the Power relay
D2	Keep Alive Power (+12v)	Connect to positive terminal of battery
D3	Mass Air Flow Sensor(+)	MAF Sensor Positive Output
D4	Throttle Position Sensor	Connected to TP Sensor
D5	PIP Input	Connector distributor, engine reference signal
D6	Spark Input	Connected to EEC-IV Spark Output
D7	Injector 8 Input	Connected to Injector 8 Output of EEC-IV
D8	Injector 7 Input	Connected to Injector 7 Output of EEC-IV
D9	Injector 5 Input	Connected to Injector 5 Output of EEC-IV
D10	Injector 6 Input	Connected to Injector 6 Output of EEC-IV
D11	Injector 3 Output	Connected to Fuel Injector 3
D12	Injector 6 Output	Connected to Fuel Injector 6
D13	Injector 4 Output	Connected to Fuel Injector 4
D14	Injector 5 Output	Connected to Fuel Injector 5
D15	Case Ground	Connected to Chassis
D16	Power Ground	Connect directly to battery negative terminal

EEC-IV Module Pin Assignments

The following table describes the EEC-IV pin assignments and their associated functions.

Pin Number	1988-1993 Pin Name	1994/1995 Pin Name (Manual Transmission Only)
1	Keep Alive Power (+12v)	Keep Alive Power (+12v)
2	None	Brake On/Off Switch
3	Vehicle Speed Sensor(+)	Vehicle Speed Sensor (+)

Pin Number	1988-1993 Pin Name	1994/1995 Pin Name (Manual Transmission Only)
4	Ignition Diagnostic Monitor	Ignition Diagnostic Monitor
5	None	None
6	Vehicle Speed Sensor(-)	Vehicle Speed Sensor (-)
7	Engine Coolant Temperature Sensor	Engine Coolant Temperature Sensor
8	None	Fuel Pump Monitor
9	Mass Air Flow Sensor (-)	Mass Air Flow Sensor (-)
10	A/C Clutch Signal	A/C Clutch Signal
11	None	Canister Purge
12	Injector 3 Output	Injector 6 Output
13	Injector 4 Output	Injector 7 Output
14	Injector 5 Output	Injector 8 Output
15	Injector 6 Output	Injector 5 Output
16	Ignition Ground	Ignition Ground
17	Self Test Output	Self Test Output
18	None	Data (+)
19	Fuel Pump Monitor	Data (-)
20	Case Ground	Case Ground
21	Idle Speed Control	Idle Speed Control
22	Fuel Pump Control	Fuel Pump Control
23	None	None
24	None	None
25	Air Charge Temperature Sensor	Air Charge Temperature Sensor
26	Reference Voltage Output (+5v)	Reference Voltage Output (+5v)
27	EGR Valve Position	EGR Valve Position
28	None	None
29	Right EGO Sensor	None
30	Neutral Gear Switch	None
31	Canister Purge	Thermactor Air Bypass
32	Thermactor Air Diverter	High Speed Cooling Fan Control
33	EGR Valve Control	EGR Valve Control
34	None	Thermactor Air Diverter
35	None	Injector 4 Output
36	Spark Output (SPOUT)	Spark Output (SPOUT)
37	Power (+12v)	Power (+12v)
38	Thermactor Air Bypass	None

Pin Number	1988-1993 Pin Name	1994/1995 Pin Name (Manual Transmission Only)
39	None	Injector 3 Output
40	Power Ground	Power Ground
41	None	OCS
42	Injector 7 Output	A/C Pressure Switch
43	Left EGO Sensor	Left EGO Sensor
44	None	Right EGO Sensor
45	Barometric Pressure Sensor	None
46	Signal Return	Signal Return
47	Throttle Position Sensor	Throttle Position Sensor
48	Self Test Input	Self Test Input
49	EGO Ground	None
50	Mass Air Flow Sensor (+)	Mass Air Flow Sensor (+)
51	None	None
52	Injector 8 Output	None
53	None	None
54	WOT A/C Cut Control	WOT A/C Cut Control
55	None	Low Speed Cooling Fan Control
56	Profile Ignition Pickup (PIP)	Profile Ignition Pickup (PIP)
57	Power (+12v)	Power (+12v)
58	Injector 1 Output	Injector 1 Output
59	Injector 2 Output	Injector 2 Output
60	Power Ground	Power Ground

1988-1993 5.0L EPEC Adapter Harness Schematic

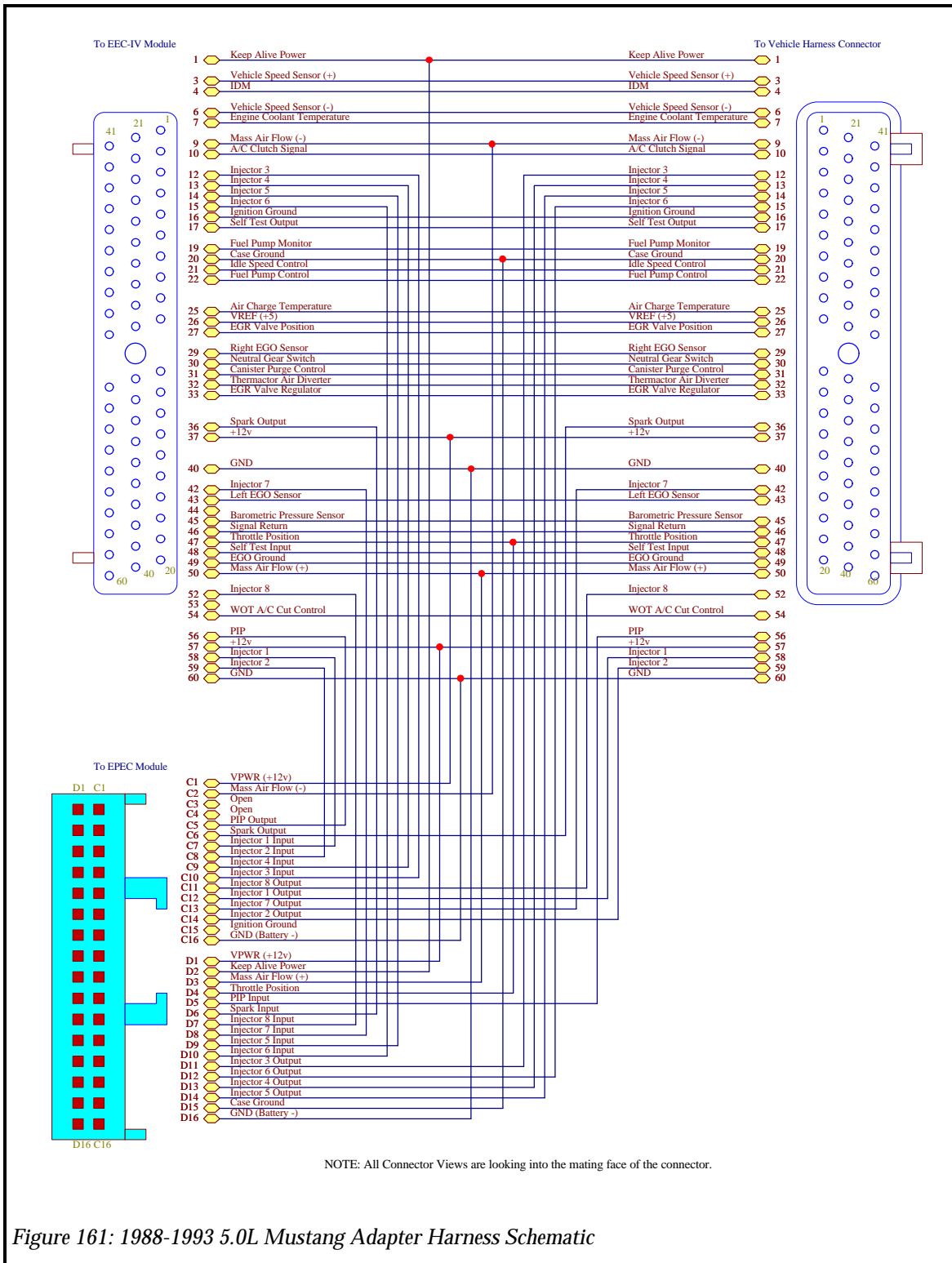
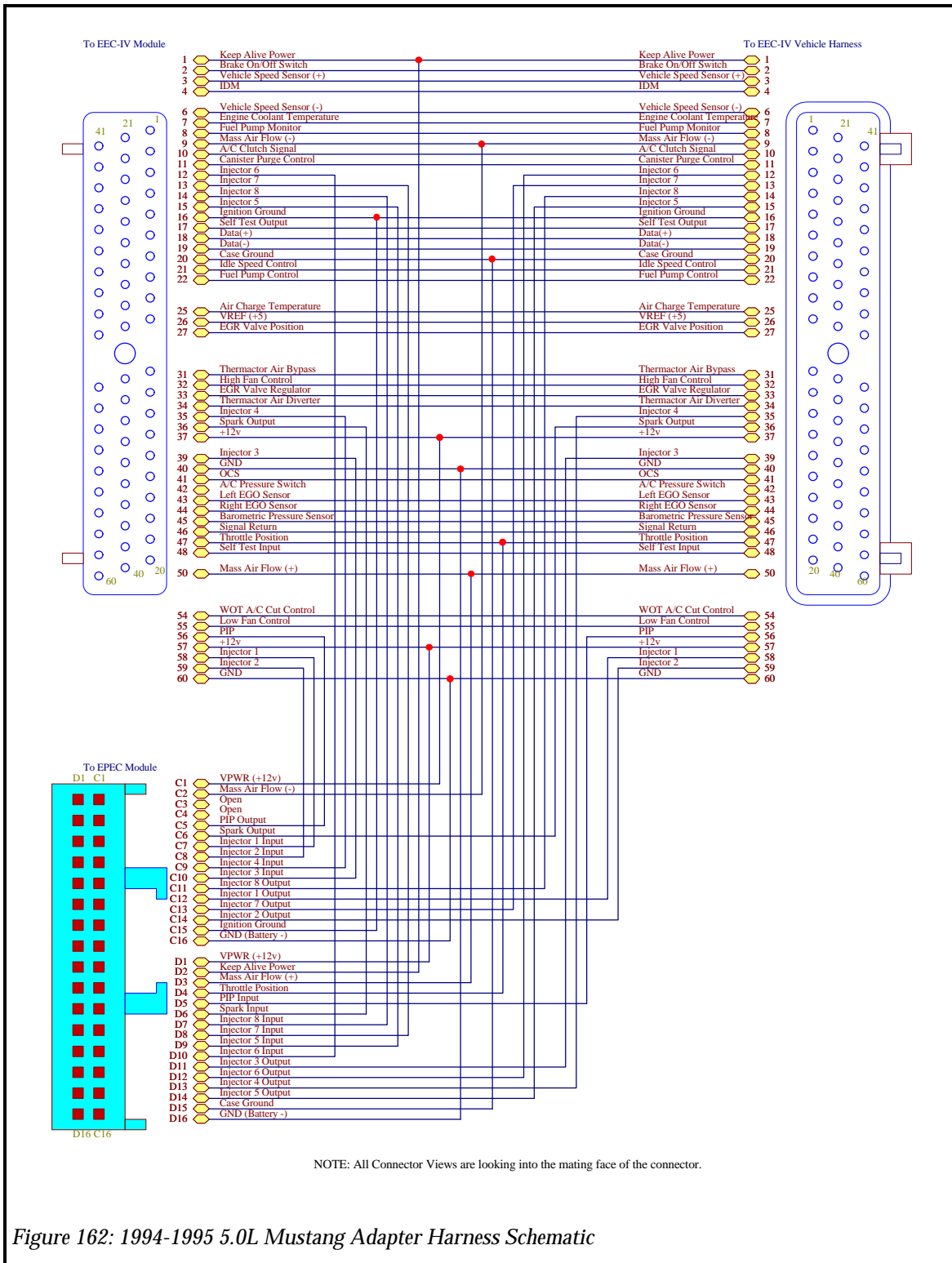
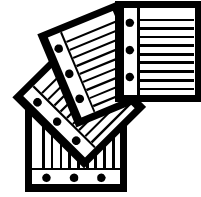


Figure 161: 1988-1993 5.0L Mustang Adapter Harness Schematic

1994-1995 5.0L EPEC Adapter Harness Schematic



Application Notes



In This Chapter

[Programmable Output Application Notes](#)

[Adding an Additional Nitrous Oxide Stage](#)

[Controlling Shift Lamp](#)

[Controlling a Cooling Fan](#)

[Controlling a Fuel Pump](#)

Programmable Output Application Notes

This section details some of the common applications that can be implemented with the Programmable Output Channels. Though not a complete list, these should get you started with your own applications.

Adding an Additional Nitrous Oxide Stage

The EPEC module provides a very good Nitrous Oxide control strategy, however, there are only 2 stages provided. This application note will detail how to add a third or more Nitrous Oxide stages.

The first step in creating another Nitrous Oxide Output stage is to fabricate the wiring required for the additional Nitrous Oxide Output stage. Nitrous Oxide solenoids should be controlled using a relay since the current requirements for the solenoid are much higher than the EPEC module can drive directly. Figure 163: Programmable Output shows the schematic diagram for a Nitrous Oxide solenoid using a Programmable Output Channel.

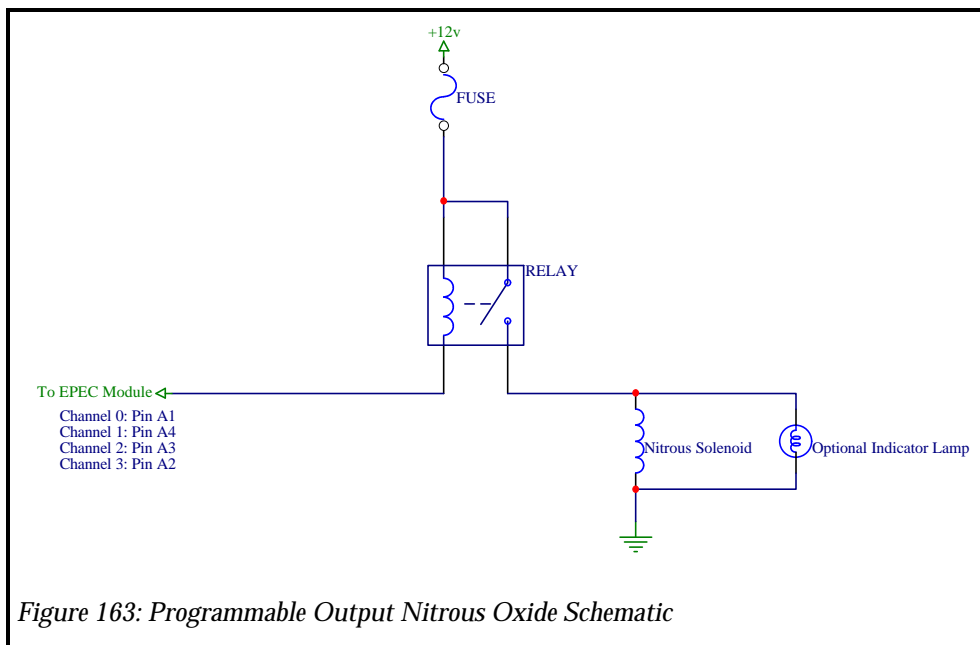


Figure 163: Programmable Output Nitrous Oxide Schematic

The second step is to configure the Programmable Output Channel to control the “ON” and “OFF” conditions of the third stage of nitrous oxide. There are many ways to configure this output to control the nitrous solenoid depending on how you may want the solenoid to function. For this application note, we will assume you are using the first two nitrous oxide output stages supplied by the EPEC Module.

The “ON” condition for the third stage of nitrous oxide will only use the second stage of Nitrous Oxide as the trigger. By setting the Programmable Output to trigger on the second stage of nitrous oxide output, the third stage will “inherit” all the Stage 2 nitrous parameters and the Nitrous Global Parameters such as; Minimum Engine Speed, Maximum Engine Speed, Minimum Throttle Angle, etc. For this example we will also want the third stage of

nitrous to be delayed 1.5 seconds after the second stage of nitrous. Figure 164: Programmable Output “ON” Nitrous Configuration shows the “ON” conditions for the 3rd stage of Nitrous Oxide control. The Programmable Output is triggered when the 2nd stage of nitrous turns on, but will turn on 1500 milliseconds (1.5 seconds) after the 2nd stage turns on. We also will retard the spark 5 degrees when the Programmable Output stage is “ON” so we set the Spark Adder value to -5.0 degrees. We will not modify the amount of fuel delivered so we will set the Fuel Multiplier to 1.0.

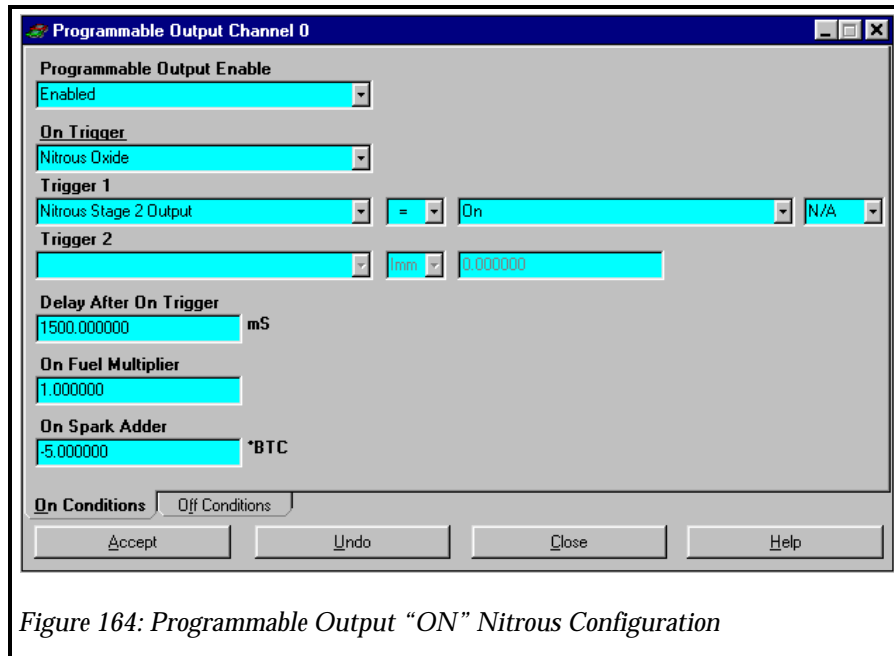


Figure 164: Programmable Output “ON” Nitrous Configuration

The “OFF” condition for the third stage of nitrous oxide will only use the second stage of Nitrous Oxide as the trigger, except the “OFF” trigger will be set to the opposite value of the “ON” trigger. We will also not want any delay after the “OFF” trigger is reached. Figure 165: Programmable Output “OFF” Nitrous Configuration shows the “OFF” condition for the 3rd stage of Nitrous Oxide control. The Programmable Output is triggered when the 2nd stage of nitrous turns off, and will not delay after the 2nd stage turns off. We will not retard spark when the Programmable Output turns off so we set the Spark Adder value to 0.0. We will also not modify fuel so we set the Fuel Multiplier to 1.0.

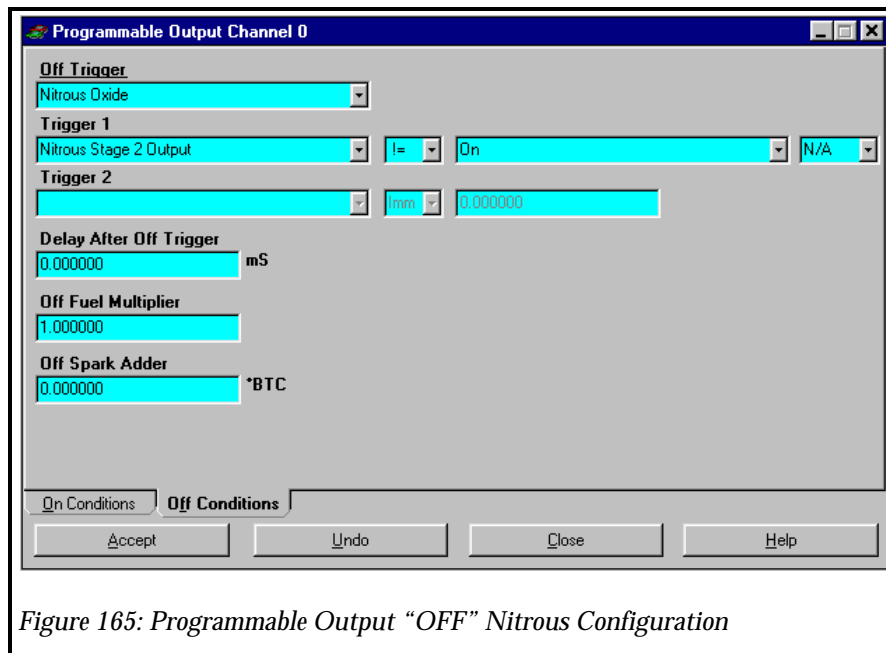


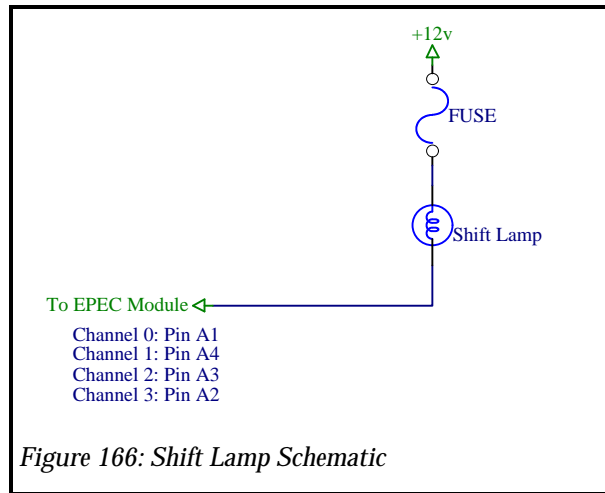
Figure 165: Programmable Output "OFF" Nitrous Configuration

This example is shown only to give an idea of how to add additional nitrous oxide output stages. The actual configuration you use to add nitrous oxide output stage may be slightly different from this example depending on how you may want to control the 3rd stage of nitrous oxide.

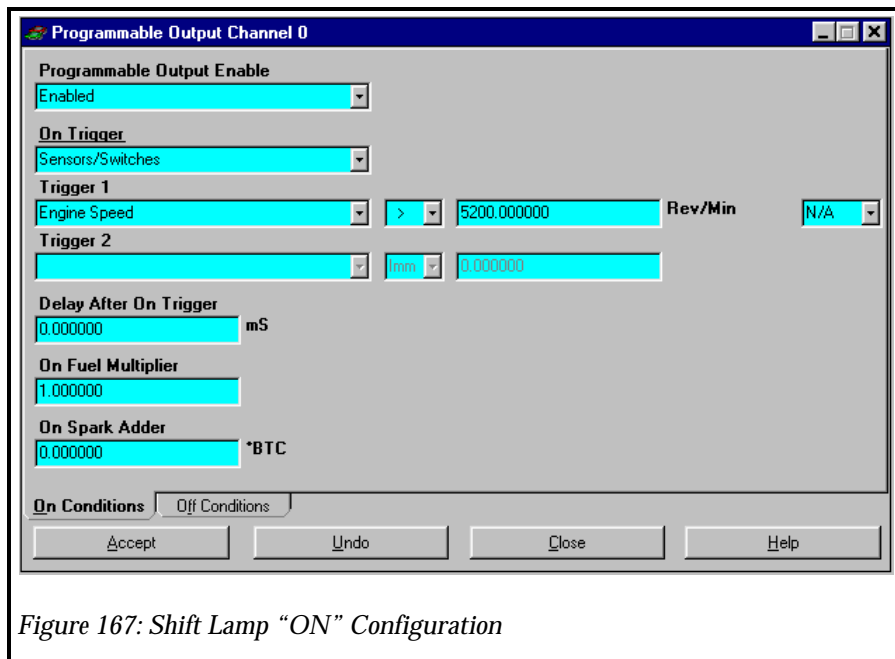
Controlling Shift Lamp

The EPEC module does not provide a shift lamp control strategy, however, you can implement a shift lamp using a Programmable Output Channel. This application note will detail how to implement a shift lamp control directly from the EPEC Module.

The first step in creating shift lamp control is to fabricate the wiring required for the shift lamp. Indicator lamps can be driven directly from the EPEC Module if the indicator lamp does not require more than 0.5 amps of current. Figure 166: Shift Lamp Schematic shows the schematic diagram for a shift indicator lamp using a Programmable Output Channel.



The second step is to configure the Programmable Output Channel to control the “ON” and “OFF” conditions of the shift lamp. The “ON” condition for the shift lamp will only use Engine Speed as the trigger. You could use other conditions such as Throttle Mode depending on the functionality you require. Figure 167: Shift Lamp “ON” Configuration shows the “ON” conditions for the Shift Lamp control. The Programmable Output is triggered when the Engine Speed is greater than 5200 rpm. We do not want to change the spark advance when the Programmable Output stage is “ON” so we set the Spark Adder value to 0 degrees. We will not modify the amount of fuel delivered so we will set the Fuel Multiplier to 1.0.



The “OFF” condition for the shift lamp will only use Engine Speed. Figure 168: Shift Lamp “OFF” Configuration shows the “OFF” condition for the shift lamp control. The

Programmable Output is triggered when the engine speed is less than 5000 rpm, and will delay 100 ms before it will turn off. We will not retard spark when the Programmable Output turns off so we set the Spark Adder value to 0.0. We will also not modify fuel so we set the Fuel Multiplier to 1.0.

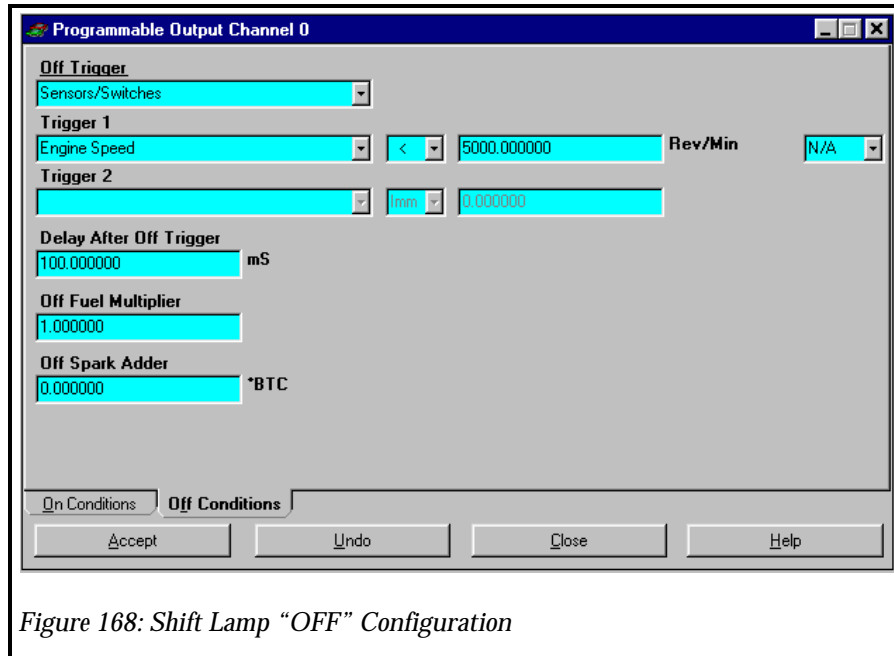


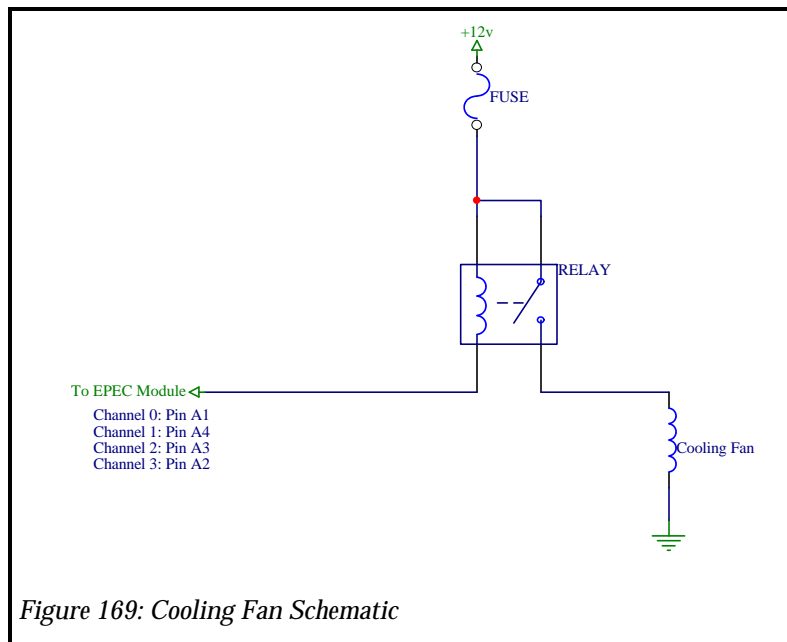
Figure 168: Shift Lamp “OFF” Configuration

This example is shown to give an idea of how to control a shift indicator lamp. The actual configuration you use to control the shift indicator may be slightly different from this example depending on how you may want to control the shift lamp.

Controlling a Cooling Fan

The EPEC module does not provide a cooling fan control strategy, however, you can implement a cooling fan control using a Programmable Output Channel. This application note will detail how to implement cooling fan control directly from the EPEC Module.

The first step in creating the cooling fan control is to fabricate the wiring required for the cooling fan. You must use a relay to drive the cooling fan since the EPEC module cannot drive the cooling fan directly. Figure 169: Cooling Fan Schematic shows the schematic diagram for a cooling fan control using a Programmable Output Channel.



The second step is to configure the Programmable Output Channel to control the “ON” and “OFF” conditions of the cooling fan. The “ON” condition for the cooling fan will use 2 triggers. This will provide the cooling fan control with a Wide Open Throttle Cutoff. Figure 170: Cooling Fan “ON” Configuration shows the “ON” conditions for the cooling fan control. The Programmable Output is triggered when the Engine Coolant Temperature (ECT) is greater than 200 degrees AND the Throttle Mode is not equal to WOT. We do not want to delay before turning on the cooling fan, so we will set the delay to 0. We do not want to change the spark advance when the Programmable Output stage is “ON” so we set the Spark Adder value to 0 degrees. We do not modify the amount of fuel delivered so we will set the Fuel Multiplier to 1.0.

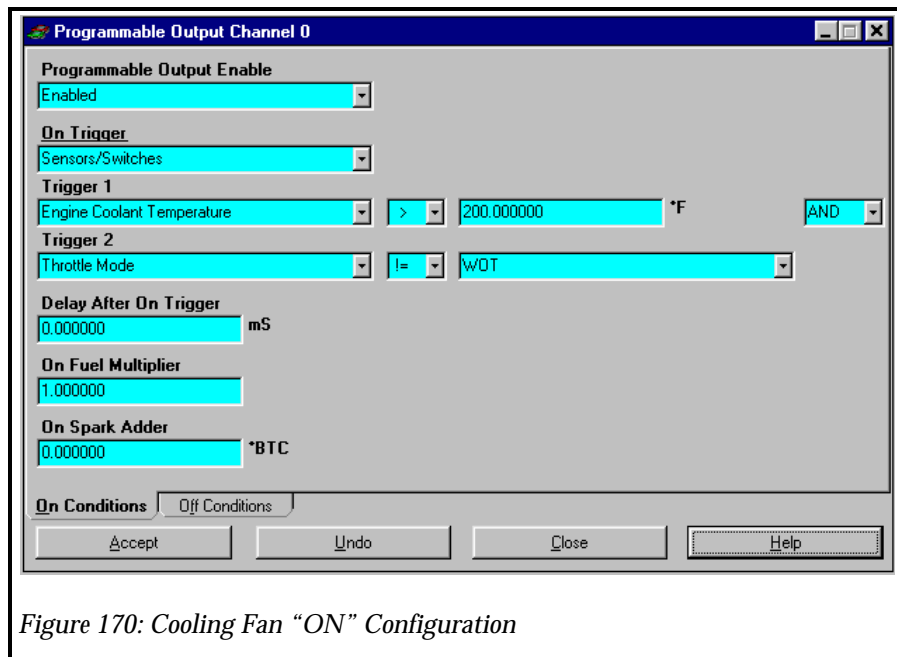


Figure 170: Cooling Fan “ON” Configuration

The “OFF” condition for the cooling fan will also use 2 triggers. Figure 171: Cooling Fan “OFF” Configuration shows the “OFF” conditions for the cooling fan control. The Programmable Output is triggered off when the Engine Coolant Temperature (ECT) is less than 180 degrees OR the Throttle Mode is equal to WOT. We want to delay before turning on the cooling fan, so we will set the delay to 3000 milliseconds (3 seconds). This delay will stop the fan from turning on and off rapidly during shifting. We do not want to change the spark advance when the Programmable Output stage is “OFF” so we set the Spark Adder value to 0 degrees. We do not modify the amount of fuel delivered so we will set the Fuel Multiplier to 1.0.

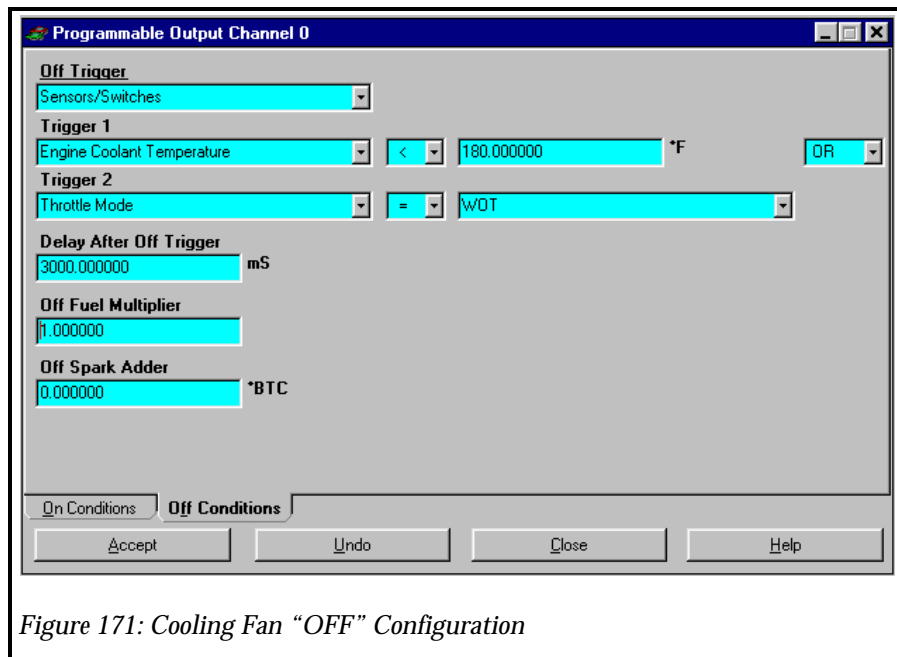


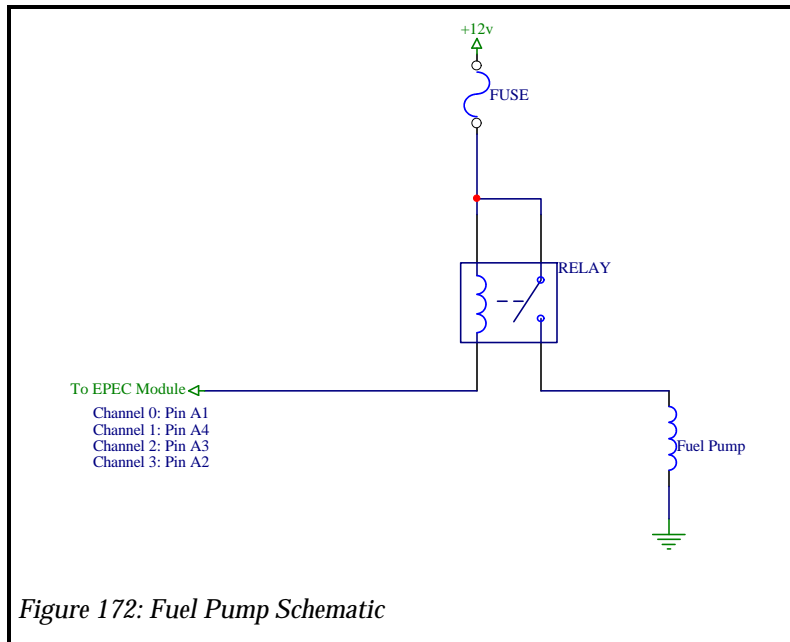
Figure 171: Cooling Fan “OFF” Configuration

This example is shown to give an idea of how to control a cooling fan. The actual configuration you use to control the cooling fan may be slightly different from this example depending on how you may want to control the cooling fan.

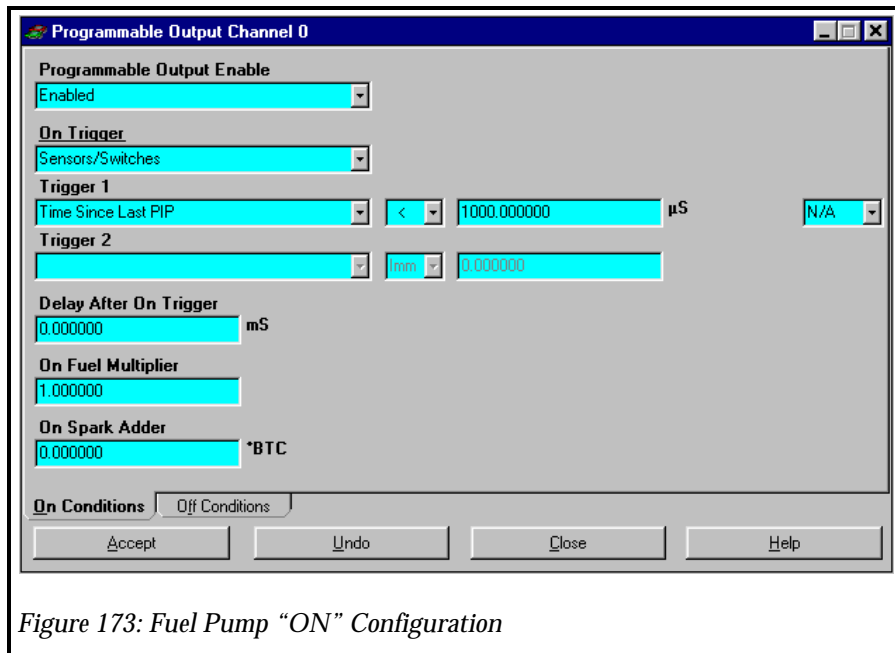
Controlling a Fuel Pump

The EPEC module does not provide a Fuel Pump control strategy, however, you can implement a Fuel Pump using a Programmable Output Channel. This application note will detail how to implement a Fuel Pump control directly from the EPEC Module.

The first step in creating the Fuel Pump control is to fabricate the wiring required for the Fuel Pump or use the production wiring harness. Fuel Pumps cannot be driven directly from the EPEC Module so you must use a relay to control the fuel pump. Figure 172: Fuel Pump Schematic shows the schematic diagram for the fuel pump control using a Programmable Output Channel.



The second step is to configure the Programmable Output Channel to control the “ON” and “OFF” conditions of the fuel pump. The “ON” condition for the fuel pump will only use Time Since Last PIP as the trigger. Figure 173: Fuel Pump “ON” Configuration shows the “ON” conditions for the fuel pump control. The Programmable Output is triggered when the Time Since Last PIP is less than 1,000,000 microseconds (1 second). We do not want to change the spark advance when the Programmable Output stage is “ON” so we set the Spark Adder value to 0 degrees. We will not modify the amount of fuel delivered so we will set the Fuel Multiplier to 1.0.



The “OFF” condition for the fuel pump will also use Time Since Last PIP as the trigger condition. Figure 174: Fuel Pump “OFF” Configuration shows the “OFF” condition for the fuel pump control. The Programmable Output is triggered when the Time Since Last PIP is greater than 1,500,000 microseconds (1.5 seconds). There is no delay before it will turn off, so we will set the delay to 0.0. We will not retard spark when the Programmable Output turns off so we set the Spark Adder value to 0.0. We will also not modify fuel so we set the Fuel Multiplier to 1.0.

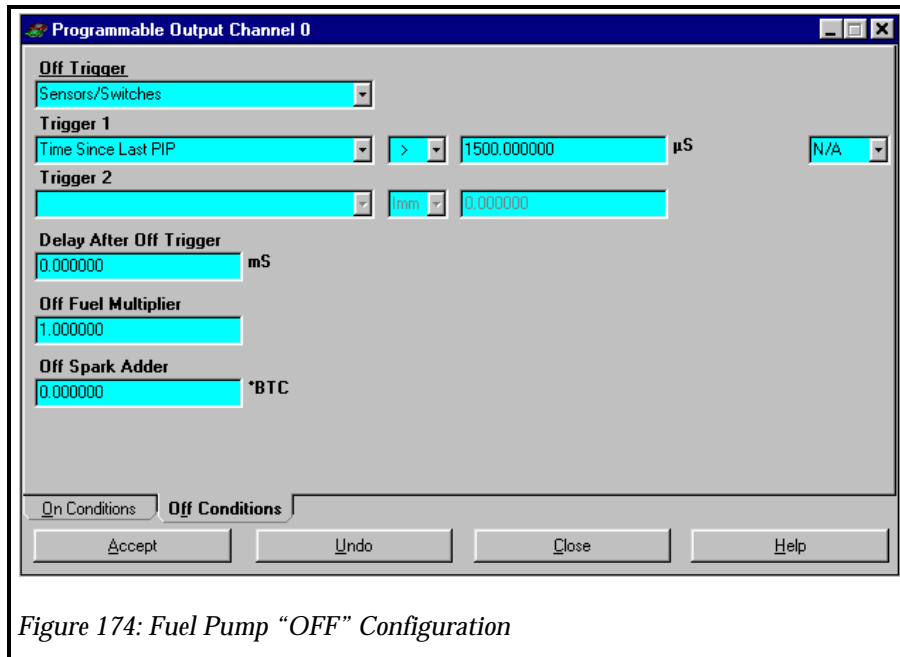
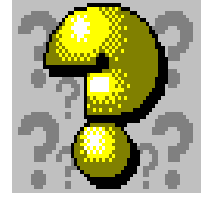


Figure 174: Fuel Pump “OFF” Configuration

This example is shown to give an idea of how to control a fuel pump. The actual configuration you use to control the fuel pump may be slightly different from this example depending on how you may want to control the fuel pump.

Acronyms and Terms



In This Chapter

Acronyms

EPEC Parameters and Terms

Acronyms

The Table 4 shows the acronyms and their associated meanings.

Acronym	Meaning
ACT	A ir C harge T emperature
ECT	E ngine C oolant T emperature
MAP	M anifold A bsolute P ressure
MAF	M ass A ir F low
TP	T hrottle P osition
PIP	P rofile I gnition P ickup
SPOUT	S park O utput
TFE	T ransitional F uel E nrichment
EPEC	E xtr ^e me P erformance E ngine C ontrol
WOT	W ide O pen T hrottle
A/F Ratio	A ir/ F uel Ratio
mS	Milliseconds (1/1000 second)
μS	Microseconds (1/1000000 second)
PW	P ulse W idth
°BTC	Degrees B efore T op C enter
°ATC	Degrees A fter T op C enter
<i>Table 4:Acronym List</i>	

EPEC Parameters and Terms

Parameter/Term	Definition	Notes
ACT Sensor Transfer Function	2 dimensional function used to convert from ACT volts to ACT °F.	The input or X value to this function is ACT Volts and the output or Y value is the ACT value.
ECT Sensor Transfer Function	2 dimensional function used to convert from ECT volts to ECT °F.	The input or X value to this function is ECT Volts and the output or Y value is the ECT value.
MAF Sensor Transfer Function	2 dimensional function used to convert from MAF volts to Air Mass.	The input or X value to this function is MAF Volts and the output or Y value is the Air Mass value.
TP Sensor Transfer Function	2 dimensional function used to convert from TP volts to Throttle Angle	The input or X value to this function is TP Volts and the output or Y value is the TP value.
ACT Fuel Function	2 dimensional function used to determine the ACT Fuel multiplier value.	The input or X value to this function is ACT and the output or Y value is the ACT Fuel.
ACT Spark Function	2 dimensional function used to determine the ACT Spark adder value.	The input or X value to this function is ACT and the output or Y value is the ACT Spark.

Parameter/Term	Definition	Notes
Crank Fuel Function	2 dimensional function used to determine the Cranking Fuel Pulse Width based on ECT.	The input or X value to this function is ECT and the output or Y value is the Crank PW.
ECT Fuel Function	2 dimensional function used to determine the ECT Fuel Multiplier value.	The input or X value to this function is ECT and the output or Y value is the ECT Fuel.
ECT Spark Function	2 dimensional function used to determine the ECT Spark Adder value.	The input or X value to this function is ECT and the output or Y value is the ECT Spark.
Injector Offset Function	2 dimensional function used to determine the Injector offset (adder) based on battery voltage.	The input or X value to this function is Battery Voltage and the output or Y value is the Injector Offset value.
TP Fuel Function	2 dimensional function used to determine the TP Fuel Multiplier value.	The input or X value to this function is TP and the output or Y value is the TP Fuel.
MAP Sensor Transfer Function	2 dimensional function used to convert from MAP volts to MAP In of Hg.	The input or X value to this function is MAP Volts and the output or Y value is the MAP value.
Transitional Fuel Enrichment Function	2 dimensional function used to determine the fuel enrichment percentage based on Throttle Angle Rate.	The input or X value to this function is Throttle Angle Rate and the output or Y value is the Transitional Fuel Enrichment.
TP Spark Function	2 dimensional function used to determine the TP Spark Adder value.	The input or X value to this function is TP and the output or Y value is the TP Spark.
Idle-RPM Spark Function	2 dimensional function used to determine the Idle Spark advance based on Engine Speed.	This function is only used when the Throttle Mode is equal to "Idle". The input or X value to this function is RPM and the output or Y value is the RPM Spark value.
Part-RPM Spark Function	2 dimensional function used to determine the Part Throttle Spark advance based on Engine Speed.	This function is only used when the Throttle Mode is equal to "Part Throttle". The input or X value to this function is RPM and the output or Y value is the RPM Spark value.
WOT-RPM Spark Function	2 dimensional function used to determine the WOT Spark advance based on Engine Speed.	This function is only used when the Throttle Mode is equal to "WOT". The input or X value to this function is RPM and the output or Y value is the RPM Spark value.
Idle-RPM Air/Fuel Function	2 dimensional function used to determine the Idle Air/Fuel value based on Engine Speed.	This function is only used when the Throttle Mode is equal to "Idle". The input or X value to this function is RPM and the output or Y value is the Desired A/F Ratio.
Part-RPM Air/Fuel Function	2 dimensional function used to determine the Part Throttle Air/Fuel value based on Engine Speed.	This function is only used when the Throttle Mode is equal to "Part Throttle". The input or X value to this function is RPM and the output or Y value is the Desired A/F Ratio.

Parameter/Term	Definition	Notes
WOT-RPM Air/Fuel Function	2 dimensional function used to determine the WOT Air/Fuel value based on Engine Speed.	This function is only used when the Throttle Mode is equal to "WOT". The input or X value to this function is RPM and the output or Y value is the Desired A/F Ratio.
Boost Retard Function	2 dimensional function used to determine the Boost Spark Retard value based on Engine Speed.	This function is only used when the engine is under boost. The input or X value to this function is RPM and the output or Y value is the Boost Retard in deg/psi.
MAP Fuel Function	2 dimensional function used to determine the MAP Fuel Multiplier value.	The input or X value to this function is MAP and the output or Y value is the MAP Fuel.
Analog Channel 0 Fuel Function	2 dimensional function used to determine the Analog Channel 0 Fuel Multiplier value.	The input or X value to this function is Analog Channel 0-2 volts and the output or Y value is the Analog Channel 0-2 Spark Adder.
Analog Channel 0 Spark Function	2 dimensional function used to determine the Analog Channel 0 Spark Adder value.	The input or X value to this function is Analog Channel 0-2 volts and the output or Y value is the Analog Channel 0-2 Fuel Multiplier.
PIP Edge Filter	The PIP Edge Filter is a calibration switch to enable the PIP Edge Filter. The PIP edge filter verifies proper edges be received from the distributor signal.	This parameter should be set to "Enabled".
PIP Time Filter	The PIP Time Filter is a calibration switch to enable the PIP Time Filter. The PIP time filter verifies proper edge timing received from the distributor signal.	This parameter should be set to "Enabled".
Crank Flag	The Crank Flag is a status flag that indicates when the EPEC module is in crank mode. If the EPEC module is in crank mode, the fuel pulse width is based on the Cranking Fuel Function and the Spark Timing is fixed at base timing.	This value is not calibratable directly, it is calibrated by the Crank to Run transition RPM and the Crank to Run Hysteresis values.
Fuel Cut Flag	The Fuel Cut Flag is a status flag that indicates when the EPEC module is in fuel cut mode. This flag is set when the Fuel Rev Limiter is active.	This value is not calibratable directly, it is calibrated by the Fuel RPM limiter.
Nitrous Enable Input Switch	The Nitrous Enable Input Switch is the current state of the Nitrous Oxide Enable Switch. When the switch is closed this input is connected to ground and this value will be "Enabled"	This value is not calibratable it is driven by the Nitrous Enable Input Switch.

Parameter/Term	Definition	Notes
Stage Rev Limit Input Switch	The Stage Rev Limit Input Switch is the current state of the Stage Rev Limit Input Switch. When the switch is closed this input is connected to ground and this value will be "Enabled"	This value is not calibratable it is driven by the Stage Rev Limit Input Switch.
Nitrous Stage 1 Output	The Nitrous Stage 1 Output is the current state of the Nitrous Stage 1 Output.	This value is not calibratable it is driven by the output pin.
Nitrous Stage 2 Output	The Nitrous Stage 2 Output is the current state of the Nitrous Stage 2 Output.	This value is not calibratable it is driven by the output pin.
Nitrous Stage 1 Lamp Output	The Nitrous Stage 1 Lamp Output is the current state of the Nitrous Stage 1 Indicator lamp.	This value is not calibratable it is driven by the output pin.
Nitrous Stage 2 Lamp Output	The Nitrous Stage 2 Lamp Output is the current state of the Nitrous Stage 2 Indicator lamp.	This value is not calibratable it is driven by the output pin.
Signature Pickup	The Signature Pickup flag indicates that the EPEC module has detected a signature PIP signal from the distributor.	This value is not calibratable.
Spark Cut Flag	The Spark Cut Flag is a status flag that indicates when the EPEC module is in Spark cut mode. This flag is set when the Spark Rev Limiter is active.	This value is not calibratable directly, it is calibrated by the Spark RPM limiter.
Spout Level	The SPOUT Level is a calibration flag that will invert the SPOUT Output.	This value is calibratable and for Ford applications, it should be set to "Normal". This parameter is supplied to interface to different Ignition modules.
Logger Arm Input Switch	The Logger Arm Input Switch is the current state of the Logger Arm Input Switch. When the switch is closed this input is connected to ground and this value will be "Armed". NOTE: If the logger is armed, this value will always indicate "Armed".	This value is not calibratable it is driven by the Logger Arm Input Switch. If the data logger is armed, it will always reflect "Armed".
Log Lamp Output	The Log Lamp Output is the current state of the Log Indicator lamp.	This value is not calibratable. It will reflect the output state of the Logger lamp.
EPEC Override	The EPEC Override flag is a status flag that indicates which module is controlling the engine. NOTE: if this value is indicates "EEC-IV", none of the calibration parameters you have set in the EPEC module have an effect on the operation of the engine.	This value is calibratable by the Module configuration parameters.
Nitrous Oxide Arm Input Switch	The Nitrous Oxide Arm Input Switch is the current state of the Nitrous Oxide Arm Input Switch. When the switch is closed this input is connected to ground and this value will be "On"	This value is not calibratable. It is driven by the Nitrous Oxide Arm Input switch.

Parameter/Term	Definition	Notes
Programmable Output Enable	This is a calibration value that will enable or disable the Programmable Output Channels.	This values are calibratable by the programmable output channels. They are provided as a simple method of disabling each of the Programmable Output Channels.
Throttle Mode	The Throttle Mode is a status value that indicates which throttle mode the EPEC module is currently in. NOTE: You can change the points at which the EPEC module changes from idle to part throttle to wide open throttle in the TP Sensor Configuration.	This value is not calibratable directly, the throttle mode is calibratable through the TP Sensor Configuration parameters.
Ignition Type	The Ignition Type is a calibration switch that tells the EPEC module what type of ignition system you are using.	This item is calibratable through the SPOUT Configuration parameters.
EPEC Override Type	The EPEC Override Type is a calibration switch that tells the EPEC module how to override the EEC-IV module.	This item is calibratable through the Module Configuration parameters.
Air Mass	The Air Mass is the current indicated amount of air in (Lbm/Hr) that the engine is ingesting.	This value is not calibratable directly. It is calibrated using the MAF Transfer function.
MAF Input Voltage	The MAF Input Voltage is the current input voltage from the MAF Meter.	This value is not calibratable, it is driven by the MAF Sensor.
Air Charge Temperature (ACT)	The Air Charge Temperature (ACT) is the current indicated Air temperature.	This value is not calibratable directly. It is calibrated using the ACT Transfer function.
ACT Input Voltage	The ACT Input Voltage is the current indicated input voltage from the ACT sensor.	This value is not calibratable, it is driven by the ACT Sensor.
Engine Coolant Temperature (ECT)	The Engine Coolant Temperature (ECT) is the current indicated Engine temperature.	This value is not calibratable directly. It is calibrated using the ECT Transfer function.
ECT Input Voltage	The ECT Input Voltage is the current indicated input voltage from the ECT sensor.	This value is not calibratable, it is driven by the ECT Sensor.
Barometric Pressure	The Barometric Pressure is the current indicated barometric pressure. NOTE: this value is obtained from the MAP sensor when the EPEC module is powered up.	This value is not calibratable, it is driven by the MAP Sensor.
Absolute Throttle Position	The Absolute Throttle Position is the current indicated absolute throttle position.	This value is not calibratable directly. It is calibrated using the TP Transfer Function.
TP Input Voltage	The TP Input Voltage is the current indicated input voltage from the TP sensor.	This value is not calibratable, it is driven by the TP sensor.
ACT Fuel Multiplier	The ACT Fuel Multiplier is the current value of the ACT Fuel Multiplier.	This value is not calibratable directly. It is calibrated through the ACT Fuel Function.

Parameter/Term	Definition	Notes
ACT Spark Adder	The ACT Spark Adder is the current value of the ACT Spark Adder.	This value is not calibratable directly. It is calibrated through the ACT Spark Function.
Crank Fuel PW	The Crank Fuel PW is the current value of the Crank Fuel PW.	This value is not calibratable directly. It is calibrated through the Crank Fuel Function.
ECT Fuel Multiplier	The ECT Fuel Multiplier is the current value of the ECT Fuel Multiplier.	This value is not calibratable directly. It is calibrated through the ECT Fuel Function.
ECT Spark Adder	The ECT Spark Adder is the current value of the ECT Spark Adder.	This value is not calibratable directly. It is calibrated through the ECT Spark Function.
Injector Offset Adder	The Fuel Offset Adder is the current value of the Injector Offset Adder.	This value is not calibratable directly. It is calibrated through the Injector Offset Function.
Battery Voltage	The Battery Voltage is the current battery voltage.	This value is not calibratable it is driven by the input voltage to the EPEC module.
Engine Speed	The Engine Speed is the current engine speed in RPM.	This value is not calibratable. It is driven by the distributor (PIP) signal.
RPM Spark Adder	The RPM Spark Adder is the current value of the RPM spark.	This value is not calibratable directly. It is calibrated through one the 3 functions; Idle Spark, Part Throttle Spark or WOT spark depending on the current Throttle Mode.
TP Fuel Multiplier	The TP Fuel Multiplier is the current value of the TP Fuel Multiplier.	This value is not calibratable directly. It is calibrated through the TP Fuel Function.
Manifold Pressure	The Manifold Pressure is the current value of the intake manifold pressure in In of Hg.	This value is not calibratable directly. It is calibrated through the MAP Transfer Function.
MAP Input Voltage	The MAP Input Voltage is the current value of the of the MAP Sensor voltage.	This value is not calibratable. This value is driven by the MAP Sensor.
Throttle Angle Rate	The Throttle Angle Rate is the current value of the Throttle Angle Rate.	This value is not calibratable. This value is driven by how fast the throttle is opened.
TP Spark Adder	The TP Spark Adder is the current value of the TP Spark Adder.	This value is not calibratable directly. It is calibrated through the TP Spark Function.
Number Of Engine Cylinders	The Number of Engine Cylinders tells the EPEC module how many cylinders the engine has.	This value is calibratable through the Engine Configuration parameters.
Engine Displacement	The Engine Displacement value tells the EPEC module the displacement of the engine.	This value is calibratable through the Engine Configuration parameters.
Injector Size	The Injector Size value tells the EPEC module the size of the injectors attached to the EPEC module.	This value is calibratable through the Engine Configuration parameters.

Parameter/Term	Definition	Notes
Fuel Rev Limit	The Fuel Rev Limit value tells the EPEC module where you would like to cut fuel. When the Engine Speed is above this value the "Fuel Cut Flag" will be set.	This value is calibratable through the Engine RPM Limiters parameters.
Stage Rev Limit	The Stage Rev Limit value tells the EPEC module where you would like to set the Stage Rev Limiter. This rev limiter is only active when the Stage Rev Limit input switch input is grounded.	This value is calibratable through the Engine RPM Limiters parameters.
Nitrous Stage 1 Spark Retard	The Nitrous Stage 1 Spark Retard value tells the EPEC module how much to retard spark advance when the Stage 1 Nitrous is activated.	This value is calibratable through one of 2 places, either the Nitrous Spark Retard or the Nitrous Stage 1 configuration.
Nitrous Stage 2 Spark Retard	The Nitrous Stage 2 Spark Retard value tells the EPEC module how much to retard spark advance when the Stage 2 Nitrous is activated.	This value is calibratable through one of 2 places, either the Nitrous Spark Retard or the Nitrous Stage 2 configuration.
Nitrous Stage 1 Minimum RPM	The Nitrous Stage 1 Minimum RPM value tells the EPEC module the minimum engine speed before the Stage 1 Nitrous will be activated.	This value is calibratable through the Nitrous Stage 1 configuration.
Nitrous Stage 1 Delay	The Nitrous Stage 1 Delay value tells the EPEC module how long to delay after the Nitrous Oxide Arm Switch has been released.	This value is calibratable through one Nitrous Stage 1 configuration.
Nitrous Stage 2 Minimum RPM	The Nitrous Stage 2 Minimum RPM value tells the EPEC module the minimum engine speed before the Stage 2 Nitrous will be activated.	This value is calibratable through the Nitrous Stage 2 configuration.
Nitrous Stage 2 Delay	The Nitrous Stage 2 Delay value tells the EPEC module how long to delay after the Nitrous Oxide Arm Switch has been released.	This value is calibratable through one Nitrous Stage 2 configuration.
Nitrous "ON" Throttle Angle	The Nitrous "ON" Throttle Angle tells the EPEC module the minimum throttle angle before either stage of nitrous will be activated.	This value is calibratable through the Nitrous Oxide Global parameters.
Nitrous "OFF" Throttle Angle	The Nitrous "OFF" Throttle Angle tells the EPEC module the throttle angle at which both stages of nitrous will deactivate.	This value is calibratable through the Nitrous Oxide Global parameters.
Spark Rev Limit	The Spark Rev Limit value tells the EPEC module where you would like to cut Spark. When the Engine Speed is above this value the "Spark Cut Flag" will be set.	This value is calibratable through the Engine RPM Limiters parameters.
Desired Air/Fuel Ratio	The Desired Air/Fuel Ratio is the current value of the Desired Air/Fuel Ratio.	This value is not calibratable directly, it is calibratable through one of 3 different functions; Idle Fuel, Part Throttle Fuel or WOT Fuel.

Parameter/Term	Definition	Notes
Idle -> Part Transition Point	The Idle->Part Transition Point tells the EPEC module where you would like to set the Idle transition point between Idle and Part Throttle.	This value is calibratable through the TP Configuration parameters.
Part -> WOT Transition Point	The Part->WOT Transition Point tells the EPEC module where you would like to set the Part Throttle transition point between Part Throttle and WOT.	This value is calibratable through the TP Configuration parameters.
Throttle Mode Hysteresis	The Throttle Mode Hysteresis tells the EPEC module how much of a filter on throttle modes is required.	This value is calibratable through the TP Configuration parameters.
Nitrous Maximum RPM	The Nitrous Maximum RPM tells the EPEC module the maximum engine speed. When the engine is above this RPM, the EPEC module will deactivate the BOTH nitrous oxide stages.	This parameter is provided for manual transmissions, many times the rev limiters are hit during a shift. This will turn off the nitrous oxide so it will not be flowing while the engine is being rev limited. Once the engine RPM is below this value, the nitrous system will re-activate.
Nitrous "ON" Delay After Max RPM	The Nitrous "ON" Delay After Max RPM parameter is the amount of time after the engine speed falls below the Nitrous Maximum RPM before the nitrous stages will re-activate.	This parameter is provided so the nitrous system does not oscillate during a shift.
Background Timer	The Background Timer is the amount of time the EPEC module takes to update fuel and spark calculations.	This parameter is not calibratable, it is only provided for reference.
Total Spark Advance	The Total Spark Advance value is the amount of spark advance delivered to the engine.	This value is not calibratable directly, it is calibrated by all of the spark functions.
Fuel Pulse Width	The Fuel Pulse Width value is the amount of time the injectors are turned on.	This value is not calibratable directly, it is calibrated by all of the fuel functions.
Time Since Last PIP	The Time Since Last PIP value is the length of time since the EPEC module has seen a signal from the distributor.	This value is not calibratable. It is only provided for reference.
Analog Channel 0-2 Volts	The Analog Channel 0-2 Volts value is the input voltage on each of the channels.	This value is not calibratable. It is driven by the external device connected each of the channels.
EPEC Override Engine Speed	The EPEC Override Engine Speed value tells the EPEC module where you would like the EPEC module to override the EEC-IV module. This value is used in conjunction with the EPEC Override Throttle Angle.	This value is calibratable through the Module Configuration parameters.
Crank to Run Transition RPM	The Crank to Run Transition RPM value tells the EPEC module where the split between Crank and Run.	This value is calibratable through the PIP Configuration parameters.
Dwell Angle	The Dwell Angle is the amount of crank angle the spark output signal is left on.	This value is calibratable through the SPOUT Configuration parameters. This value for most systems should be set to 45 deg.

Parameter/Term	Definition	Notes
Dwell Time	The Dwell Time is the length of time the spark output signal is left on.	This value is calibratable through the SPOUT Configuration parameters. This value for Ford ignition systems should be set to 6 ms (6000).
Manual A/F Ratio	The Manual A/F Ratio is the Air/Fuel ratio that will be used while the EPEC module is in Manual Mode.	This value is calibratable through the Manual Fuel/Spark Control. This value is ONLY used when the EPEC module is in Manual Mode.
Signature PIP Angle	The EPEC Module synchronizes with the engine using the #1 PIP. This signal is shorter in duration than all the other signals from the distributor. The Signature PIP Angle is the difference between a normal signal and the #1 signal.	This value is calibratable through the PIP Configuration parameters.
Manual Spark Angle	The Manual Spark Angle is the Spark advance that will be used while the EPEC module is in Manual Mode.	This value is calibratable through the Manual Fuel/Spark Control. This value is ONLY used when the EPEC module is in Manual Mode.
Boost Retard	The Boost Retard value is the amount of Spark Retard the EPEC is delivering to the engine.	This value is not calibratable directly, it is calibratable thorough the Boost Retard Function.
EPEC Override Throttle Angle	The EPEC Override Throttle Angle value tells the EPEC module where you would like the EPEC module to override the EEC-IV module. This value is used in conjunction with the EPEC Override Engine Speed.	This value is calibratable through the Module Configuration parameters.
Crank to Run Hysteresis	The Crank to Run Hysteresis tells the EPEC module how much of a filter on Crank mode is required.	This value is calibratable through the PIP Configuration parameters.
Injector Duty Cycle	The Injector Duty Cycle is the current duty cycle of the injectors.	This value should be kept under 95%, however, it is driven by the current air/fuel setting and all of the fuel multipliers.
Boost Pressure	The Boost Pressure is the current boost the engine is under in psi.	This value is not calibratable. It is driven by the MAP sensor.
MAP Fuel Multiplier	The MAP Fuel Multiplier is the current value of the MAP Fuel Multiplier.	This value is not calibratable directly. It is calibrated through the MAP Fuel Function.
Transitional Fuel PW	The Transitional Fuel PW value is the amount of additional fuel PW the EPEC is delivering to the engine.	This value is not calibratable directly, it is calibratable thorough the Base Transitional Fuel and the TP Correction Functions.
Transitional TP Fuel Multiplier	The Transitional TP Fuel Multiplier is the current value of the Transitional TP Fuel Multiplier.	This value is not calibratable directly. It is calibrated through the TP Correction Function.
Transitional Fuel Enrichment	The Transitional Fuel Enrichment is the current value of the Transitional Fuel Enrichment.	This value is not calibratable directly. It is calibrated through the Base Transitional Fuel Function.

<i>Parameter/Term</i>	<i>Definition</i>	<i>Notes</i>
Analog Channel 0-2 Fuel Multiplier	The Analog Channel 0-2 Fuel Multiplier values are the current fuel multiplier values from the Analog Channel 0-2 Fuel Multiplier Functions.	This value is not calibratable directly. It is calibrated through the Analog Channel 0-2 Fuel Functions.
Analog Channel 0-2 Spark Adder	The Analog Channel 0-2 Spark Adder values are the current Spark adder values from the Analog Channel 0-2 Spark Functions.	This value is not calibratable directly. It is calibrated through the Analog Channel 0-2 Spark Functions.

User Notes



In This Chapter

Your Notes

