

# Series III

# Diagnostic Scan Tool (DST)

## **Instruction** Manual





June, 2013

#### CONTENTS

- Installation of the DST package to a personal computer (PC).
- Software login and password functionality.
- DST service pages.
- Updating the ECM calibration using a MOT file.
- DTC pages.

Examples and snapshots used in this manual are based off of the initial DST tool release as of July, 2007. This tool is frequently updated and the illustrations may vary depending on the changes included in any updated DST display Interface. Terms, names and descriptions of parts and servicing procedures will be updated based on trade, brand, or common description to more accurately describe the part or service procedure.

#### **DST INSTALLATION INSTRUCTIONS**

Before installing the DST software, please be sure your computer meets the minimum system requirements.

Supported operating systems are:

- Windows Vista
- Windows XP
- Windows 2000
- Windows 7
- Windows 8

Minimum processor speed:

- Pentium II 450 MHz
- Pentium III 1.0 GHz for Windows Vista

Minimum RAM requirement:

- Windows Vista/7/8 512 MB
- Windows XP 256 MB
- Windows 2000 128 MB

\* At least one available USB port.

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• Open the DST\_Series III folder



• Open the Latest\_GCP\_Display folder

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7 items	Ŧ		m			/

• Double click on "setup.exe" (application file) to start the windows installer. If a previous version of the GCP software is installed, the uninstaller may remove the previous version and exit. You will be required to start the installer again to install the new version.



• Click "Next" to continue

📸 Impco GCP Display Setup	
Destination Folder Select a folder where the application will be installed.	
The installation wizard will install the files for Impco GCP Display in the followin	g folder.
To install into a different folder, click the Browse button, and select another fo	lder.
You can choose not to install Impco GCP Display by clicking Cancel to exit the installation wizard.	e
Destination Folder	
C:\ImpcoGCP_Dis\	wse
< Back Next >	Cancel

• Click "Next" to continue

😼 Impco GCP Display Setup	
Ready to Install the Application	
Click Next to begin installation.	600
Click the Back button to reenter the installation information or click Cancel to the wizard.	o exit
< Back Next >	Cancel

• Click "Next" to continue



• Click the "Finish" box to complete the installation.

时 Installe	er Information	23
Ð	You must restart your system to Impco GCP Display to tak No if you plan to manually re	n for the configuration changes made e effect. Click Yes to restart now or istart later.
	Yes	No

• Click "Yes" to restart your computer



• Once installed, the software can be accessed from Start Menu  $\rightarrow$  Programs  $\rightarrow$  IMPCO GCP Display  $\rightarrow$  IMPCO GCP Display

#### **INSTALLING THE USB ADAPTER DRIVER**

If your computer does not have an RS232 serial port you will need to install the USB adapter driver. You do not need to install this driver if you plan to use the ECOM DLC cable.



• Open the DST\_Series III folder



• Open the "USB Driver" folder

USB Driver							
File Edit View Favorites To	ols Help						
🗍 🗘 Back 🔹 🔿 👻 🔛 🔯 Search	Folders	History		v) <b>≣</b> •			
Address 🗀 USB Driver							
Select an item to view its description. See also: My Documents My Network Places My Computer	instmsi	instmsiw	License Agreement	NI-Serial (USB) 1.1.1	ReadMe	Setup Type: Size: 3	Setup 9.0 KB

• Double click on "setup.exe" (application file) and follow the on screen prompts.

#### Installing the ECOM DLC cable driver

The ECOM USB cable is designed to replace both the serial DLC and the USB adapter cables. It also provides communication to the ECM on the CAN line for systems that are CAN enabled. It requires the installation of the ECOM driver and is compatible with the series II and series III DST software programs.

Computer > DVD RW Drive (D:)	070413 0948	•		▼ (▲) Search		
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• Open the DST\_Series III folder

COM_Driver	•			✓ <sup>4</sup> → Search		۶
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DST_Series III	=					
ECOM_Driver						
Latest_GCP_Display						
USB Driver						
Network						
Control Panel						
👿 Recycle Bin	-					
1 item						

• Double click on "setup.exe" (application file).



• Click "Next" to continue

E Setup - ECOM Drivers and Software	
Installation Options Select which files to install	<b>R</b>
It is recommended that you install both drivers and software if you plan to u device for development purposes. Only the hardware drivers are required i use your device exclusively for EControls display software.	ise your f you plan to
Install ECOM Drivers and Supporting Software	
Install ECOM Drivers Only ↓	
< Back Next >	Cancel

• Select install ECOM drivers only. Click "Next" and follow the on screen prompts.

#### **PASSWORD LOGIN**

Figure 1 shows the password dialog box, which is displayed when a software session begins. Login can be accomplished in two ways.

- 1. Enter an "All S/N Password" which is a password applicable to all ECMs of a given original equipment manufacture (OEM).
- 2. Enter a "Single S/N Password" and corresponding ECM serial number for a single ECM. A Single Serial Number password is unique to a specific ECM serial number and permits authorized service personnel to make changes or view information for a specific ECM.
- 3. In most instances the top "all" serial number boxes should be used for password entry. In this case, do not check the single serial number box. Each password is a 16-character alphanumeric string specific to each Spectrum customer and determines which pages and variables are visible through the software. Passwords are assigned by the OEM support group and may change periodically. Check the "save password" box to automatically retain the password for future use.

States Password		×
Password: ****	= <b>***</b>	=
Clear Password Paste Password	Single Serial Number Access	
OK	Save password and S/N	Quit

Figure 1: Populated Password Dialog Box

#### PASSWORD DIALOG BOX FUNCTIONS

- Clear Password Button Erases the current password from the password field.
- **Paste Password Button Allows** the user to copy a 16-character string from any word processor and paste the string in the password field.
- **Single Serial Number Access Checkbox** Tells the software that the password is applicable for single serial number access.
- Serial Number Field Only applicable when Single Serial Number Access Checkbox is checked. The entry field must be populated for the 6-digit serial number for which the Single Serial Number Access password applies (NOTE: Leading zeros included in the serial number are not required).
- Save Password and S/N Checkbox Retains the password, and serial number (if applicable) for the next software session.

### Should an invalid password be entered, the error prompt shown in figure (2) will be displayed and the software will not load. This prompt signifies the following:

- The All S/N password is invalid.
- The Single S/N password is incorrect for the Single Serial Number entered.
- An All S/N password is entered for Single Serial Number use.
- The Single Serial Number password is valid; however, the Single Serial Number Access Checkbox is not checked.

Password Error!
Password is invalid! Exiting
OK

Figure 2: Password Error Prompt

If the Single S/N password entered is correct for the software but does not match the entered S/N of the targeted ECM, the prompt in Figure 3 will be displayed.

Incorrect Serial Number!	
The serial number of the connected module does not agree with the serial number for which you enterred a password on program start. Hit the exit key below to quit the program, or connect to the correct module to continue.	
Password Verified S/N 0 Connected Module S/N 0 Exit Program	

#### Figure 3: Incorrect Serial Number Message

Figure 4 shows the communication status if a valid software password is entered when attempting to connect to an ECM with a different key. In this instance the software will load but will not connect to the target (ECM).

EDIS ECI Serial Communications	
<u>File Page</u> Flash <u>Comm</u> Port Plot/Log Help	
Gauges	Not authorized to connect to this target Not authorized to connect to this target
Not Connected	

#### Figure 4: Not Authorized to Connect Message

In the event you receive this error message call your OEM support group for more information.

#### CONNECTING THE PC TO THE SPECTRUM FUEL SYSTEM



Connecting the DST cable

A laptop computer, with the diagnostic cable and software is the required tool for performing proper diagnostic testing of the Spectrum fuel system. It is also used to monitor sensor and actuator values and to read and clear Diagnostic Trouble codes. The DST software also performs several special tests.

- Connect the system diagnostic cable to the RS232 port on the back of the computer. If you do not have a RS232 port, use the USB to RS232 adapter supplied in the IMPCO ITK test kit. Be sure to install the USB driver to enable the USB adapter for use with your computer.
- Connect the diagnostic cable to the DLC (diagnostic link connector) labeled in the electrical schematic. The DLC is located on the engine harness. The new 8 pin DLC requires the use of the 4 to 8 pin adapter included in the late model ITK test kits.
- Turn the computer ON.
- Start Windows.
- From the start menu select Programs  $\rightarrow$  IMPCO GCP Display  $\rightarrow$  IMPCO GCP Display
- Place the ignition key in the ON position.

🧐 🛛 EDIS ECI Ta	rget Communications		
<u>File</u> <u>P</u> age Fl	ash <u>C</u> ommPort P <u>l</u> ot/Log	Help	~5
	Gauges Connected	Connected at 19200 bps	×

Within several seconds the system Gauge screen should now appear and a green banner in the upper left hand will read "Connected."

#### • Connecting to the PC using the ECOM cable

DIS ECI Target Communications				
<u>File Page</u> Flash <u>Comm</u> Port Plot/Log He	elp			
Automatic COM	SPECTR		r opening ECom module in Han	dleConnect, (error 📥
COM1	50 10011			
Global Control Pl		1.1.N.T	Sustan 1/2	riah/aa Mil
СОМЗ	nt Temperature	Intake Air Temperature	System Val	
Manifold I COM4	р0- ро-	250-	Engine speed	0 npm
20. COM5	po-	200-	Min Governor Setpoint	0 rpm
15.0 COM6	50-	150-	Max Governor Setpoint	0 rpm
COM7	00-	100-	Current governor target	0 rpm
5.0 COM8	50-	50-	Pulse width	0.00 ms
GAN CAN	- 0-	-0	EGO1	0.000 volts
CAN Carfinues CAN	pu- 🍯	-uc-	EGO2	0.000 volts
Configure CAN	0 deg F	0 deg F	Custom	Otata
✓ ECOM			System.	
Configure ECOM 😡	pt Pedal Position	Throttle Position	Run Mode	Stopped
Battery Show Stats Ctrl+S	- 100-	100-		Sleep
10.0 20.0	_ 00-	00-	Fuel Type	Gasoline
10.0 20.0	60-	60-	Fuel Supply	Off
0.0	40-	40-	Fuel/Spark inhibit input	Inactive / Normal
	20-	20-	Fuel Control Mode	Open Loop
J 0.0 Volts	0-~	0-~_	Governor switch state	None
	0 %	0 %	Oil pressure state	ок 🗕
			Active governor type	None
			Active governor mode	Disabled
Customer Configuration Info	rmation	_		
Cust hardware name/number			Software and Hardware Inf	ormation
Cust software name/number		Software model	Hardware model	
Cust courses and anno		Initial cal model	Manufacture date	

• To connect using the ECOM cable you must select ECOM from the COM Port drop down menu.

EDIS ECI Target Communications				
File Page Flash Comm Port Plot/Lo	og Help			
Automatic COM	SPECTE	Error	opening ECom module in Han	dleConnect, (error 🔺
Сом1	SPECIA			
Clabel Costs ( D) COM2				1
COM3	nt Temperature	Intake Air Temperature	System Va	riables MIL
Manifold I COM4	50 -	250 -	Engine Speed	0 rpm
20. COM5	00-	200-	Min Governor Setpoint	0 rpm
15.0 COM6	50-	150-	Max Governor Setpoint	0 rpm
Сом7	00-	100-	Current governor target	0 rpm
-5.0 COM8	60-	50-	Pulse width	0.00 ms
CAN CAN		0-	EGO1	0.000 volts
CAN Configure CAN	bu− <b>š</b>	-50- 🍎	EGO2	0.000 volts
Configure CAN	0 deg F	0 deg F	System	State
✓ ECOM	De del De Weel	Theoretic Decision	Bun Mode	Stanned
Configure ECOM	100-	100-	Power Mode	Sloop
Battery Show Stats	Ctrl+S 80-	80-	Fuel Type	Gasoline
10.0 20.0	60-	60-	Fuel Supply	Off
0.0 ,	40-	40-	Fuel/Spark inhibit input	Inactive / Normal
	20-	20-	Fuel Control Mode	Open Loop
0.0 volts	0-	0- 🗾	Governor switch state	None
	0 %	0 %	Oil pressure state	ок
			Active governor type	None
			Active governor mode	Disabled
Customer Configuration	on Information	_		
Cust hardware name/number			Software and Hardware Inf	ormation
Cust software name/number		Software model	Hardware model	
Cust courses and name		Initial cal model	Manufacture date	

• You will now need to configure the ECOM communication protocol.

Gauges		ening com port 8 in HandleC or - attempting reconnect	Connect
Not Connected			
lobal Control Platform	Coolant Temperature Intake Air Temperature	System Va	riables MIL
Manifold Pressure	250-	Engine Speed	0 rpm
20.0	200- 200-	Min Governor Setpoint	0 rpm
15.0 25.0		Max Governor Setpoint	0 rpm
(-10.0 30.0 ·)	Secon Configuration	Current governor target	0 pm
5.0 7 35.0	Available ECOM Modules	Pulse width	0.00 ms
0,6 40.0		EG01	0.000 volts
×	Thist Available	EGO2	0.000 volts
0.0 psia			0
		System	State
		Run Mode	Stopped
Battery Voltage	CAN -	Fower mode	Sleep
10.0 20.0	Target CAN / Serial	Fuel Type	Gasoline
00	PC CAN Address 🖨 250	Fuel Supply	
		Fuel/Spark inhibit input	inactive / Norma
0.0 volts		Governor ewitch state	Upen Loop
			None
	Cancel	Active governor type	Nena
		Active governor mode	Disabled
Customer Configurat	ion Information		J Disabled
uet hardware name /number			c

• Select the CAN for systems with CAN enabled or serial for all others. Then select OK. You are now ready to connect using the ECOM USB DLC cable.

#### DST SERVICE PAGES

EDIS ECI Target Communic	cations			Ν			
<u>File</u> <u>P</u> age Flash <u>C</u> omm Po	ort P <u>l</u> ot/Log Help			13			
Gaug Connec			nected at 19200 bps		Tog	gle Page - F9	
Global Control Platform	Coolant Temperature	Intake Air Temperature	System Variable	es MIL 🔴			
Manifold Pressure	250 - m	250 - 11	Engine Speed	0 rpm			
	200 -	200 -	Min Governor Setpoint	0 rpm			
15.0 25.0	150 -	150-	Max Governor Setpoint	0 rpm			
(-10.0 30.0 ·	100-	100-	Current governor target	1200 mm			
5.0 35.0	50 -	50 -	Pulse width	0.00 ms			
0/0 40.0	0-	0-	FGO1	0.559 volts			
	-50 – 🏅	-50 - 👗	EGO2 0	0.619 volts			
0.2 psia	-40 deg F	-22 deg F	,	1			
			System State	2			
	Foot Pedal Position	Throttle Position	Run Mode	Stopped			
Battery Voltage	20_	20_	Fower Mode	Standby			
10.0 20.0	60-	60-	Fuel Sumply	Propane			
0.0 menerely 3	30.0 40-	40-	Fuel/Spark inhihit input	tivo / Normal			
	20-	20-	Fuel Control Mode	Dep Loop			
14.7 volts	0-	0-	Governor switch state	None			
	0 %	0 %	Oil pressure state	OK			
	,	,	Active governor type	Min			
			Active governor mode Is	ochronous			
Customer Co	onfiguration Information		,				
Cust hardware name/number 85	539149		Software and Hardware Informa	ation			
Cust software name/number no	ot_applicable.mot	Software model	2105000A Hardware model 16	687002A			
Cust governor cal name 20	007 Governor Calibration	Initial cal model	2042400A Manufacture date	2-9-2007			
Cust governor cal date	1-3-2007	Initial cal date	1-3-2007 Serial number	6936			
Engine part number	999999 <del>9</del> 99	Current cal model	2042400A Hour meter	0.079 hours			
Engine serial number 199	999999999	Current cal date	1-3-2007 Cumulative starts	3 starts			
Displacement	2.0 L Cylinders 4		Emissions Calibration Checksum	5A20978			
Spark system type Co	pil Per Cylinder		Total Calibration Checksum \$EC	CF11F34			
Firing Order 1	- 3 - 4 - 2 - X - X - X - X	- 🗙 - 🔀					
L							

#### Gauge Page

Provides system data in large easy to read displays. Displays ECM configuration information for the ECM software, hardware, serial numbers and calibration dates.

EDIS ECI Target Communications	. Hele	
RawVolts Connected	SPECTRUM SIII	드 Toggle Page - F9 스
Raw Voltage Inputs         ML           Engine Speed         mm           Manifold Pressure         1.00           Coolart Temperature         190.0           Cylinder Head Temp         190.0           Manifold Temperature         190.0           Manifold Temperature         190.0           Ittake Air Temperature         190.0           Vex         14.7           Volts         14.8           Vew         14.8           Gov1 voltage         2.0           Coll pressure voltage         5.0           Oil pressure voltage         5.0           1         0.0           3         0.0           5         0.0           4         0.0           3         0.0           5         0.0           4         0.0           3         0.0           4         0.0           3         0.0           5         0.0           4         0.0           3         0.0           4         0.0           3         0.0           4         0.0           3         0.0 <tr< th=""><th>TPS1_raw         0.005         volts         EGO1_raw         2.356         volts           TPS2_raw         0.000         volts         EGO2_raw         2.590         volts           FPP1_raw         0.015         volts         EGO4_raw         0.000         volts           FPP1_raw         5.000         volts         EGO4_raw         0.000         volts           MAP_raw         5.000         volts         Vsw_raw         2.615         volts           BP_raw         5.000         volts         Vsm_raw         2.615         volts           WGP_raw         5.000         volts         Vsm_raw         2.615         volts           WGP_raw         0.000         volts         Vsm_raw         2.615         volts           WGP_raw         0.000         volts         Vsm_raw         2.610         volts           BP_raw         0.000         volts         Vsm_raw         2.610         volts           FTP_raw         0.000         volts         Vsm_raw         2.610         volts           FTP_raw         0.000         volts         AUX_PU1_raw         5.000         volts           FT_raw         5.000         volts         AUX_PD2_raw</th><th>GOV1_raw         0.474         volts           GOV2_DIG4_raw         0.479         volts           AUX_DIG1_raw         0.479         volts           AUX_DIG2_raw         0.479         volts           AUX_DIG3_raw         0.484         volts           AUX_PWM1_LS_raw         0.000         volts           AUX_PWM2_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           EGO1H_LS_raw         0.000         volts           EGO3H_LS_raw         0.000         volts           EGO3H_LS_raw         0.000         volts           EGO4H_LS_raw         0.000         volts           EGAUS_LS_raw         0.000         volts           DBW_status_raw         0.000         volts           PGAUGE_LS_raw         0.000         volts           Pedal_INH_raw         0.000         volts           Pedal_INH_raw         0.000         volts</th></tr<>	TPS1_raw         0.005         volts         EGO1_raw         2.356         volts           TPS2_raw         0.000         volts         EGO2_raw         2.590         volts           FPP1_raw         0.015         volts         EGO4_raw         0.000         volts           FPP1_raw         5.000         volts         EGO4_raw         0.000         volts           MAP_raw         5.000         volts         Vsw_raw         2.615         volts           BP_raw         5.000         volts         Vsm_raw         2.615         volts           WGP_raw         5.000         volts         Vsm_raw         2.615         volts           WGP_raw         0.000         volts         Vsm_raw         2.615         volts           WGP_raw         0.000         volts         Vsm_raw         2.610         volts           BP_raw         0.000         volts         Vsm_raw         2.610         volts           FTP_raw         0.000         volts         Vsm_raw         2.610         volts           FTP_raw         0.000         volts         AUX_PU1_raw         5.000         volts           FT_raw         5.000         volts         AUX_PD2_raw	GOV1_raw         0.474         volts           GOV2_DIG4_raw         0.479         volts           AUX_DIG1_raw         0.479         volts           AUX_DIG2_raw         0.479         volts           AUX_DIG3_raw         0.484         volts           AUX_PWM1_LS_raw         0.000         volts           AUX_PWM2_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           AUX_PWM4_LS_raw         0.000         volts           EGO1H_LS_raw         0.000         volts           EGO3H_LS_raw         0.000         volts           EGO3H_LS_raw         0.000         volts           EGO4H_LS_raw         0.000         volts           EGAUS_LS_raw         0.000         volts           DBW_status_raw         0.000         volts           PGAUGE_LS_raw         0.000         volts           Pedal_INH_raw         0.000         volts           Pedal_INH_raw         0.000         volts
AUX_DIG1 volts         2.70         volts           AUX_DIG2 volts         2.70         volts           AUX_DIG3 volts         2.73         volts		

#### Raw Volts Page

The raw volts page displays the sensor inputs and outputs in a raw voltage format. This page is most commonly used to check values in the diagnostic trouble shooting charts.

FDIS ECI Target Communications		
Eile Page Flash Comm Port Plot/Log Help		
Service1	ت - Connected at 19200 bps - الم	Toggle Page - F9
Service Screen	Clear Faults	
Engine Speed		
П ВРМ	Rich	
Coolant Temperature		
190 °F		
Spark Advance		
CAD BTDC		
	Lean	
	Mixture	
Fuel Control Open Loop		
Clear Adaptive Adaptive Learn State Cleared	Fuel Type Propane 🔻	

Service 1

The Service 1 screen is used to clear the adaptive learn, shows the MIL status and provides a display for rpm, coolant temperature and spark advance. It also provides a large display to monitor the closed loop mixture control.

EDIS ECI Target Communications			
File Page Flash Comm Port Plot/Log	Help		
Tests Connected		Connected at 19200 bps	Toggle Page - F9
User Tests     ● MIL       Engine Speed     0 pm       Manfold Pressure     0.24 psia       Barometric Pressure     8.30 psia       Coolant Temperature     400 °F       Cylinder Head Temp     190.0 °F       Innfold Temperature     190.0 °F       Intake Air Temperature     22.0 °F       Spark Advance     3.5 °BTDC       Pulse width     0.0 ms       Vbat     14.7 volts       Vaw     14.8 volts	System States           Run Mode         Stopped           Power Mode         Standby           Fuel Type         Progane           Fuel Control Mode         Open Loop           Active governor mode         Isochronous           Oil pressure state         OK           Oil pressure corrlig         Ground = OK           VIS state         Off Idle           Cylinder numbering         Firing Order	Monitored Driver Status       IAC electrical status     OK       Power relay electrical status     OK       Stat relay electrical status     Open load       FPump relay electrical status     Open load       Buzzer electrical status     Open load       Mite electrical status     Open load       Tach output electrical status     Open load       Crank-/Cam Datalog     OK       Crank-/Cam data log system     Off        Reset     Forces Tragger       Crank-/Cam data log status     Offine       Distributor Alignment     Cam position desired value     0 CAD BTDC	Throttle / IAC Variables           FPP command         12         %           FPP position         0.0         %           FPP1 voltage         5.005         volts           IVS voltage         5.000         volts           TPS command         30.0         %           TPS position         0.0         %           TPS position         0.0         %           TPS1 voltage         0.005         volta           IAC driver power         Off         100.0           IAC actual position         30.0         %
Spark Kill Test Spark Kill command Spark Kill test status Spark kill test status Spark kill test status Spark Advance Test Spark advance test command Spark advance test status Dilagneatic spark advance input Dilagneatic spark advance Oto		ector Kill Test     DBW test com       Test Not Stated     DBW test statu       0.0 sec     IAC test common test       ind     Disubled     IAC test datus       n     0.0 ms     IAC test datus       iduration     0.00 ms     Idie speed test	DBW Test mand Off Test Not Stated  IAC Test Inter Not Stated  Idle Speed Test command Disabled

Tests Page

Provides diagnostic information voltages and sensor outputs and includes diagnostic engine tools such as spark and injector kill controls. Please note that not all features are available for all applications. The disabled item menus are grayed out or rendered inoperative.

#### SPARK KILL

The spark kill mode allows the technician to disable the ignition on individual cylinders. If the Spark Kill diagnostic mode is selected with the engine running below 1000 rpm, the minimum throttle command will lock into the position it was in when the test mode was entered. If the Spark System Test mode is selected with the engine running above 1000 rpm, the throttle will continue to operate normally. Disabling Ignition Outputs to disable the ignition system for an individual cylinder, use the mouse to highlight the "Spark Kill" button and select the desired coil. The spark output can be re-enabled by using the mouse to highlight the "Spark Kill" button and selecting "Normal." If the engine is running below 1000 rpm, the spark output will stay disabled for 15 seconds and then re-set. If the engine is running above 1000 rpm, the spark output will stay disabled for 5 seconds and then re-set. This test mode has a timeout of 10 minutes. Record the rpm drop related to each spark output disabled. The spark outputs are arranged in the order which the engine fires, not by cylinder number.

#### **INJECTOR KILL**

The Injector Kill mode is used to disable individual fuel injectors. If the Injector Kill mode is selected with the engine running below 1000 rpm, the minimum throttle command will lock into the position it was in when the test mode was entered. If the Injector Kill mode is selected with the engine running above 1000 rpm, the throttle will continue to operate normally. To disable an injector, use the mouse to select the desired injector. The word "Normal" will change to the Injector you have selected. The injector driver can be re-enabled by selecting again. If the engine is running below 1000 rpm, the injector driver will stay disabled for 15 seconds and then re-set. If the engine is running above 1000 rpm, the injector driver will stay disabled for 5 seconds and then re-set. Record the change in rpm while each driver is disabled.

#### **DBW TEST MODE**

The DBW (Drive by Wire) test mode allows the technician to control the throttle directly with the foot pedal or throttle input and is used during the diagnostic routines specified for FPP and TPS for Spectrum systems that use DBW control. FPP position displays the current position of the foot pedal as a percentage. FPP volts display the voltage which the ECM is reading from the FPP sensor. TPS Command displays the commanded throttle position expressed as a percentage, which is being sent to the throttle. TPS Position is the actual percent of throttle opening being sent to the ECM from the throttle. TPS volts display the actual TPS signal voltage the ECM is receiving from the throttle. To select this test mode the engine must be off and the key must be in the ON position.

#### **EXTERNAL POWER TEST**

The external power test manually activates relays (relay power, fuel pump, and drive-by wire power) controlled by the ECM while the engine is in the "Stopped" or "Running" states. Reverts to normal operation if "Automatic" state is selected or ignition voltage is cycled from high to low.

EDIS ECI Target Communications								
<u>File Page Flash Comm Port Plot/Lo</u>	og Help							
Faults Connected			Connected at 192	200 bps		- - -	Toggle Page - F9	
Fault Access 🔮 MIL	Closed-Loo	o Control	System St	tates	Monitored	Drivers	Diagnos	tic Modes
Engine Speed 0 rpm	EGO1	0.652 volts	Run Mode	Stopped	Injector Injector	on Injector-off	Spark kill	Normal 🔻
Manifold Pressure 0.24 psia	Closed-loop 1	0.0 %	Power Mode	Standby	(firing order) voltag	e low-side e voltage	Injector kill	Normal 🔻
Barometric Pressure 8.30 psia	Adaptive 1	0.0 %	Fuel Type	Propage	1	0.0 37.3	DBW test	Off 🔻
Coolant Temperature -40.0 °F	EGO2	0.702 volts	Fuel Supply	Off	2	0.0 41.6	External power	Automatic 💌
Cylinder Head Temp 190.0 °F	Closed-loop 2	0.0 %	Fuel/Spark inhibit input	Normal	3	0.0 50.7	Cylinder numberin	g Firing Order
Manifold Temperature 190.0 °F	Adaptive 2	0.0 %	Fuel Control Mode	Open Loop	4	0.0 43.6	Doratos	Womings
Intake Air Temperature -22.0 °F	EGO3	0.000 volts	Gauceman awitch atota		5	0.0 32.4	Derates	wallings
Spark Advance 3.5 °BTDC	Post-cat CL offset	0.000 phi	Active governor type	None	6	, 42.2	Derate 1	Q II
Pulse width 0.0 ms	Alternate-Fuel	0.0 %	Active governor type	Min	7	.0 48.2	Derate2	2
Fuel rail pressure 108.9 psia	trim duty-cycle	0.0 **	, bare gerano, node		8	0.0 40.4	Low Rev-Lim	9
Fuel temperature 77.0 deg F	DRIV/Vor	iablaa	Brake input level	Ground	Call Driver Source	- Nel	MIL output pin	0
Gaseous pressure target 0.00 "H2O	TPS command	ables a	Oil pressure state	ОК	(firing order) dwell	ns	Buzzer output pir	ן 🔾 ו
Gaseous pressure actual 0.00 "H2O	TPS position	30.0 %	Oil presaure config	Ground = OK	1 2	50		
Current governor target 1200 rpm	TDC1	0.0 %	IVS state	Off Idle	2 2	50		
Engine Load 0.0 %	TRSTpercent	100.0 %	Input Volta	795	3 2	50		
Current estimated torque 0.0 N-m	TPS2 percent	0.005 vote	Caul unknow		4 2	50		
Current estimated torque 0.0 %	TPS2 voltage	0.000 volts	Gov 7 voltage	2.0 Volts	5 2	50		
V battery 14.7 volts	FPP command	1.2 %	Govz voltage	2.0 Volts	6 2	50		
V switched 14.7 volts	FPP position	1.2 *	Oil pressure voltage	5.0 Volts	7 2	50		
Hour meter 0.079 hours	FPP1 voltage	0.015 volte	MAR Vollage	U.U Volts	8 2	50		
Cumulative starts 3 starts	FPP2 voltage	5.005 volts	LAT veltage	5.0 volts			1	
	IVS voltage	5.000 volts	IAT Voltage	J D.U VOILS				
		0.000 .000			SnapShot Base D	efinitions:	CL_BM1	EGO1_volts
Historic Faults			Active Faults		HM bours	TPS pot	MLR act	PW avo
Double click fault for information					mm	FPP pct	MJ P cmd	BP
DTC 1637: PWM4 open / ground :	short				rMAP	Vbat	fuel_state	rECT
Real Providence of the second se					Snap Shot Custom	Definitions:	EMPTY	EMPTY
					EMPTY	EMPTY	EMPTY	EMPTY
					CHOTY/	CHOTY/		

#### Faults Page

Stores DTC codes that may have occurred in the past (Historic Faults) or current set codes (Active Faults). Includes useful system voltages and sensor readings used while working with the fuel and emission trouble shooting charts. Shows power derate mode status. To erase a historic DTC code, double click on the code with the left mouse button. Then choose to "Clear All Faults."

#### **PLOT/LOG MENU FUNCTIONS**

The Plot/Log menu allows the user to graphically plot or numerically log variables that have been tagged for plotting/logging. To plot or log variables, a tag must be assigned to each variable of interest. A variable is tagged for plotting/logging through a single right-mouse click in the variable's vicinity. Once a variable has been tagged for plotting/logging, it is highlighted in green.

Figure 5 shows an example of variables that have been tagged. A maximum of twenty (20) variables may be tagged for logging and a maximum of ten (10) variables may be tagged for plotting. The maximum achievable sample frequency/minimum period is dependent on the number of variables tagged.

EDIS EC	I Serial	Comm	unicatio	ons														
Eile Page	Flash	Comm P	ort P <u>l</u> o	t/Log	Help													
		Sam p Con	le Pag necteo	e 1						Co	nnecte	d at 192	200 bps					Toggle Page - F9 Toggle Test Cell - F10
VE Calit	bration								VE	Base								MIL 单
									MA	<sup>o</sup> (psia)								
	ſ	0.0	3.5	4.5	6.0	7.0	8.0	10.0	12.0	13.0	14.0	14.5	15.0	15.0	15.0	15.0	15.0	Cylinder Head Temperature Estimate
1	200	30.0	50.0	50.0	50.0	52.0	52.0	58.0	58.0	62.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	CHT estimate span 0.0 deg F
j j	400	30.0	50.0	50.0	50.0	54.0	56.0	63.0	63.0	70.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	CHT estimate offset 0.0 deg F
	500	30.0	40.0	45.0	54.0	54.0	56.0	63.0	68.0	71.5	77.0	81.0	81.0	81.0	81.0	81.0	81.0	CHT tau 5.008 seconds
	600	30.0	40.0	45.0	52.0	55.5	59.0	65.0	70.0	73.0	77.0	81.0	81.0	81.0	81.0	81.0	81.0	CHT offset start tau 10.027 seconds
	800	30.0	40.0	50.0	61.0	62.5	65.0	71.0	74.0	75.5	79.0	81.5	81.5	81.5	81.5	81.5	81.5	
	1000	30.0	50.0	56.0	63.5	66.0	68.0	74.0	76.0	77.0	80.5	82.5	82.5	82.5	82.5	82.5	82.5	Cylinder Wall Temperature Estimate
	1300	30.0	58.0	62.0	67.5	70.0	72.0	76.5	79.0	80.5	82.0	84.5	84.5	84.5	84.5	84.5	84.5	VE_CWT_C 2.50 %/(g/s fuel)
Speed ( (mm)	1600	30.0	60.0	65.0	69.0	/1.0	/3.0	77.0	80.0	81.0	83.0	85.0	85.0	85.0	85.0	85.0	85.0	VE_CWT_tau_idle 2.000 seconds
	2000	30.0	60.0	66.0	71.0	73.0	74.5	79.6	81.0	82.0	84.5	86.0	0.08	0.08	86.0	0.08	0.08	VE_CWT_npm_idle 600 npm
h h	3000	35.0	68.0	72.5	73.5	76.0	78.0	83.5	86.0	0.40	88.0	88.0	88.0	88.0	88.0	88.0	88.0	VE_CWI_crct_pct 0.0 %
i i	3500	35.0	68.0	71.5	76.0	79.0	80.5	87.0	88.5	89.5	90.5	91.0	91.0	91.0	91.0	91.0	91.0	VE CW I max limit 35 %
i l	4000	30.0	69.0	73.0	78.5	81.5	83.0	88.0	90.0	90.5	91.0	92.0	92.0	92.0	92.0	92.0	92.0	VECW1 min limit -40 %
i l	4500	30.0	68.0	75.0	81.5	82.5	84.5	88.0	90.0	90.5	91.0	91.0	91.0	91.0	91.0	91.0	91.0	
1	5000	30.0	68.0	70.0	75.0	78.0	81.0	83.0	85.0	86.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	Manifold Air Temperature Estimate
[	5200	30.0	68.0	70.0	75.0	78.0	81.0	83.0	85.0	86.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	IAT min contribution 0.0 %
										VE	(%)							IAT max contribution 95.0 %
Engine So	haa		0			VEe	tandard		_	25.7	ey.	Pulee	width	Г	0.00	ms		MAT estimation tau 9.002 ms
Manifold P	neeune		1.00	neia		VEG	nal		-	0.1	** */	Pulse	width off		0.00	ms		
Throttle In	let Pressu	re 🗌	8 30	osia						0.1					0.01			Manifold Air Pressure Estimate
Barometric	Pressure		8 30	osia		EBP	VE com	ection		-99.8	%	Fuel	rail pressu	ire		53.9 p	sia	Throttle estimated MAP 8.30 psia
Coolant To	emperatur	re 🗖	165.0	dea F		MAT	VE con	rection		4.7	%	Fuel	pressure	correctio	n 📃 1.	000 fi	raction	Throttle estimated MAPdt 0.9 psi/sec
Cylinder H	ead Tem	p 🗖	165.0	deg F		ECT	VE com	ection		0.0	%		niconst		0	ma /r	taka	MAP CAD project 270 CAD
Manifold 1	Temperatu	ure 🗌	165.0	dea F								mass	fuel port	, r	0.0	mg/i	take	MAP effective 2.00 psia
Intake Air	Temperat	ture	110.0	deg F				Bank	1 E	Bank2		mdot	air port	ł	0.0	n/sec	-	
Global Ad	v Offerst	Ľ,	0.0	CAD	тос	CL_	BM		0.0	0.0	%	mdot	fuel nort	- É	0.0	g/sec	-	Exhaust Back Pressure Esitmate
Total Spa	dc Advani	~ -	0.0	CAD	RTDC	A_B	м		0.0	0.0	%	mdot	air throttle	, 'r	0.00	a/sec		EBP estimate Exhaust flow rate estimate 🔻
Di la constante			-5.5	•,		Man	ual_BM		0.0 %			mdot	fuel thrott	le [	0.00	g/sec	0	EBP default gauge 2.00 psig
Phi global	offset		0.0	/o 										,	2.00			EBP flow rate constant 7.400 upsig/(l/s)^2
Phi comm	and		0.000	phi														Vdot exhaust 0.0 liters / sec
UEGU ph			0.000	phi														EBP gauge 0.00 psig
EG01			0.069	volts														
EG02			0.096	voits														



Once the variables have been tagged as highlighted by the green color fill, select the "Plot/Log" function in the top menu bar as shown below in figure 6.

EDIS ECI Serial Communications							
Eile Page Flash Comm Port Plot/Log H	Help .						
Fault Clear Tag Plot Tags Connec Load Vot	IS Ctrl+P Setup		Link error - attem Connected at 192	pting reconnect. 200 bps			
Fault Access 🔮 MIL	Closed-Loc	op Control	System St	tates	Mon	itored Driv	rers
Engine Speed     528     rpm       Manifold Pressure     0.24     psia       Barometric Pressure     8.30     psia       Coolant Temperature     -40.0     °F       Cylinder Head Temp     190.0     °F       Manifold Temperature     147.5     °F       Intake Air Temperature     -22.0     °F	EG01 Closed-loop 1 Adaptive 1 EG02 Closed-loop 2 Adaptive 2 EG03 Post-cst CL offset Adamste Fuel	0.305         volts           0.0         %           0.0         %           0.332         volts           0.0         %           0.0         %           0.0         %           0.00         %           0.321         volts           0.000         phi	Run Mode Fuel Type Fuel Control Mode Governor switch state Active governor mode Brake input level Oil pressure state Dil pressure state	Running Propane CL Inactive None Min Isochronous Ground OK Greard = OK	Injector Driver (firing order) 1 2 3 4 5 5 6 7	Injector-on low-side voltage 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Injector-off low-side voltage 0.1 0.1 0.1 0.1 0.1 0.1
Spark Advance   22.0 *BTDC	trim duty-cycle	0.0 %	IVS state	OffIdle	8	0.0	0.1
Gaseous pressure target -1.02 "H20	DBW Va	riables	Input Volta	ges	Coil Driver	Spark Coil	
Gaseous pressure actual 0.00 "H20	TPS command TPS position	30.4 %	Gov1 voltage Gov2 voltage	2.0 volts 2.0 volts	(firing order)	dwell ms	
Current governor target 800 rpm	TPS1 percent TPS2 percent	0.0 %	Oil pressure voltage MAP voltage	5.0 volts	3	2.50	
Vbat         14.5         volts           Vsw         14.6         volts	TPS1 voltage TPS2 voltage	0.005 volts 0.000 volts	ECT/CHT voltage	5.0 volts	5	2.50	
Hour meter 0.428 hours Cumulative starts 6 starts	FPP command FPP position FPP1 voltage	0.0 % 0.0 % 0.010 volts		,	6 7 8	2.50	
	FPP2 voltage IVS voltage	5.000 volts 0.000 volts			SnapSho	t Base Defini	itions:

Figure 6

• Select "Plot Tags" to open the snapshot window

Other functions available from the Plot/Log menu include:

- Clear Tags: Releases all plot/log variables.
- Plot Tags (Ctrl + P, or P): Graphically plot all tagged variables.
- Load Plot Setup: Loads and tags variables for plotting/logging that have been stored in a plot file (.plt).
- Log Tags (Ctrl + L): Numerically log all variables that have been tagged for plotting/logging.

Once the Plot Tags menu item has been selected, tagged variables are graphically plotted in a strip chart interface. An example of a plot is shown in Figure 7. Capabilities of the plotter are outlined in Table 1.

Start/Stop Button	Start or stop plotting of selected variables				
Save Button	Save plotted data displayed in the plot to a comma-separated value file (CSV) on the PC hard drive. Format must not be altered if the <i>Load</i> function is to be used.				
Snapshot Button	Convert the plot into a snapshot that may be panned, zoomed, scrolled, <b>and</b> saved				
Close Button	Close the DST Plot interface				
Load Setup Button	Load tags from a previously saved plot (.plt) file to allow for similar plots and logs to be generated				
Load Plot Button	Load a previously saved plot from the PC into the DST Plot interface				
Variable Selector Menu	Selects the active variable for axis scaling				
Single Shot Acquisition Checkbox*	When checked, this does not allow the plot to scroll past the 'Time Interval' thereby preserving plotted data for post-processing.				
Exclusive Serial Use Checkbox*	When checked, this allows exclusive serial communication for the plot variables. Other variables on the active page are not updated.				
Min Y Value Field*	Specify the minimum Y-axis scaling for the active variable				
Max Y Value Field*	Specify the maximum Y-axis scaling for the active variable				
Sample Interval (ms) Field*	Define the sample period for recording and display <i>Frequency</i> ( <i>Hz.</i> ) = 1000/Sample Interval (ms)				
Time Interval (s) Field*	Defines the total sample acquisition time for the plot.				
*Accessible only when plotter is not running.					

	Start plot	Variable selector
EDIS Plot       Start     Saye       Close     Load Setup       Load Plot       rpm     MAP       tc_Phi     tc_Phi_2	rpm     Min Y Value       Single Shot Acquisition     Max Y Value       Exclusive Serial Use     Max Y Value       ECT     Phi_cmd	Source Samp Interval (ms) 30.00 5000.00 Time Inerval (s) 10.00 Tc_Torque
5000 - 4000 -		
3000		
1000 -		
0-	4 6 time (s)	8 10

Figure 7: DST Plot

- Click on the "Start" button to start the DST plot function.
- Click on the variable selector button to view selected sensors



Figure 8: DST Plot Snapshot

• Click on the "Save" button to save the snapshot as a file. To replay the saved file, open the edis\_saplot program from the windows start menu.



• Start Menu  $\rightarrow$  Programs  $\rightarrow$  IMPCO GCP Display  $\rightarrow$  edis\_saplot

#### DST PLOT INTERFACE FUNCTIONS

A graphic tool incorporated in the plotter is the snapshot function. This function allows data collected in a plot to be transferred into a second window for quick graphical post-processing. The snapshot allows the user to zoom in/out, pan left/right, and move cursors along the signal traces to measure the variable values in virtual real-time. An example of a snapshot is shown in Figure 8. Any CSV file in plot format (.plt) may be loaded into the snapshot. Table 2 outlines the available hot key functions of the snapshot screen.

#### **SNAPSHOT HOT KEY FUNCTIONS**

Command	Function
<single, left-click="" on="" trace=""></single,>	Snap closest cursor to data
<ctrl +="" arrows="" down="" up=""></ctrl>	Move/pan plot along y axis
<ctrl +="" arrows="" left="" right=""></ctrl>	Move/pan plot along t axis
<ctrl+shift +="" arrows="" down="" up=""></ctrl+shift>	Zoom plot in and out in y axis
<ctrl+shift +="" arrows="" left="" right=""></ctrl+shift>	Zoom plot in and out in t axis
<ctrl +="" home=""></ctrl>	Resize plot to default settings
<ctrl +="" page="" up=""></ctrl>	Zoom out by 10%
<ctrl +="" down="" page=""></ctrl>	Zoom in by 10%
<page up=""></page>	Toggle to previous cursor
<page down=""></page>	Toggle to next cursor
<left arrow="" right=""></left>	Follow selected data along trace
<up arrow="" down=""></up>	Follow selected data along trace
<shift +="" arrow="" left="" right=""></shift>	Move 10 points along trace
<shift +="" arrow="" down="" up=""></shift>	Move 10 points along trace
<home></home>	Go to first visible point on current plot
<end></end>	Advance to last visible point on current plot
<shift +="" arrow="" down="" up=""></shift>	Toggle between traces/variables

Table 1

#### DST LOGGER

Another data capture function incorporated in the software is the DST logger. This tool serves as a PC data logger for any variable available in the ECM through the interface software. Figure 9 shows the interface display for configuring the DST Log. The interface allows the user to create the filename, set the sample rate for acquisition, set the time interval for sampling, and display the progress of acquisition. A maximum of twenty (20) variables may be tagged for the log. The amount of data stored is only limited by available PC RAM. The resulting text file may then be viewed by any standard Windows text editor/reader program. To create a log file select the "Log Tags" in the drop down menu as shown in figure 6.

🖉 EDis Log							×
Log File: edis.log							Browse
Sampling Interval (ms	) \$30.00	0	Time I	nerval (s)	10.0	0	
Progr	ess I	20	40	60	80	100	
	Star	ţ				Close	J

Figure 9: DST Log Interface

#### **REPROGRAMMING THE ECM**

New software upgrades may become available for in field applications. ECM software upgrades are possible using the DST. Updates are released to service in MOT files (A MOT file has an extension .mot and is a binary S-record file that contains the <u>full</u> calibration and embedded software algorithms). The MOT file is the one file necessary to completely configure or update an existing ECM. The MOT may be supplied on a floppy disk, CD ROM or downloaded from the OEM service network. To update the ECM calibration follow the instructions listed on the next three pages.

EDIS ECI Target Communication					
File Page Flash Common Port	lot/Log_Help				
Save Calibration to Disk Load Calibration from Disk			nected at 19200 bps	Tog	gle Page - F9
Reprogram Target Bulk Reprogram       Print Panel       Exit     Ctrl+:       00     40.0       0.2     psia	Coolart Temperature 250 - 150 - X 100 - 50 - - -50 - - - - - - - - - - - - - -	Intake Ar Temperature 250 - 200 - 150 - 100 - 50 - 0 - -50 - -22 deg F	System Variables         MIII           Engine Speed         0         pm           Min Governor Setpoint         0         pm           Max Governor Setpoint         0         pm           Current governor target         1200         pm           Pulse width         0.00         ms           EG01         0.833         volt           EG02         0.852         volt	L 🔮	
Battery Voltage 10.0 20.0 0.0 14.7 volts	Foot Pedal Position 100 - 80 - 60 - 40 - 20 - 0 - 0 - 0 %	Throttle Position 100 - 80 - 60 - 20 - 0 - 0 %	System State           Run Mode         Stopped           Power Mode         Standby           Fuel Type         Propane           Fuel Supply         Off           Fuel Supply         Off           Fuel Supply         Off           Fuel Control Mode         Open Loop           Governor switch state         None           Oil pressure state         OK           Active governor mode         Imachmous	nal	
Customer Config           Cust hardware name/number         853914           Cust software name/number         fort_app           Cust governor cal name         2007 Gr           Cust governor cal date         1-3-2           Engine part number         1999999           Engine part number         1999999           Displacement         2.0           Spark system type         Coil Per           Rining Order         1	uration Information 9 9licable mot 2007 99x39 99x39 99x39 5L Cylinders 4 Cylinder - 4 - 72 - 7X - 7X - 7X - 7X	Software model Initial cal model Initial cal date Current cal model Current cal date	Software and Hardware Information           2105000A         Hardware model         1687002A           2042400A         Manifacture date         29-2007           13-2007         Serial number         6336           2042400A         Hour meter         0.079           13-2007         Cumulative starts         3           2042400A         Hour meter         0.079           1-3-2007         Cumulative starts         3           Emissions Calibration Checksum         \$F6A20978           Total Calibration Checksum         \$ECF11F34	hours starts	

- Turn the ignition key to the ON position.
- Verify the DST is "connected" to the ECM.
- From the "File" menu select "Reprogram target."

9	elect S-recor	d/Mot File					? ×
	Directory History:	A:\					•
	Look in: 🛃	3½ Floppy (A:)		<b>-</b> ← (	È 💣	<b>*</b>	
	F2_LPG_2	00LPG_7613200B-00	9.mot				
	File name:	F2_LPG_2700LPG_	7613200B-009			Load	7
	Files of type:	*.mot		•	]	Cancel	h4

- Navigate to the media where you have stored the MOT file. In the example above the MOT file was stored on the on the floppy (A) drive.
- Highlight the correct .mot file using the left mouse button.
- Click on "Load."



• Click "Yes" to continue.

E Attention!	×
Ready to begin reprogramming.	
Download type = APPLICATION CODE AND DATA ONLY Current target application code checksum = \$48B1 Current buffer application code checksum = \$48B1 Current buffer total memory checksum = \$19D9 Buffer source file = 'a:\F2_LPG_2700LPG_76132008-009	9.mot'
NOTE: Any interruption of the reprogramming procedure will require another reprogram attempt.	
Continue with program download?	
Yes No	

• Click the "Yes" box to continue with the update. Refrain from using other functions on the computer while the download takes place.

<b>CAUTION</b> Do not disconnect the DLC, remove power or use the PC for any other function during this process. Any interruption during this reprogram process may render the ECM non- programmable in the field.					
📕 Targ	et Reprogr	am Progres	55		X
Repro	ogramming			2	4.3 %
0.0	20.0	40.0	ا 60.0	ا 80.0	100.0
		Can	cel		

The status bar shows the update process.



Message is displayed confirming the update was successful.

#### **MALFUNCTION INDICATOR LAMP (MIL)**

The Spectrum Fuel system has built-in diagnostics for system trouble shooting. The system has a dash mounted malfunction indicator lamp (MIL) that provides indications of an emissions related problem. Most engine control system related problems that affect emissions or driveability of the vehicle will set a (DTC) diagnostic trouble code and illuminate the MIL.

The MIL serves as notification to the operator of a problem related to the emission control system so the driver can arrange for service as soon as possible. It will also display DTCs that have been stored due to a system malfunction.

The MIL should illuminate when the key is in the ON position and the engine is not running. This feature verifies that the lamp is in proper working order. If the MIL does not illuminate with the vehicle key ON/engine OFF, repair it as soon as possible. Once the engine is in start or run mode, the MIL should turn off. If the lamp remains on while the engine is in the start or run mode a diagnostic trouble code may be set.

The MIL will be turned OFF after three (3) consecutive run cycles or by clearing the active code with the Diagnostic Scan Tool (DST).

#### SPECTRUM DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Trouble Codes are set when the Spectrum ECM (Electronic Control Module) runs a diagnostic self test and the test fails. When a DTC is set, the ECM will illuminate the MIL on the instrument panel and also save the DTC in memory. The ECM will continue to run the self test. If the system continues to fail the test, the lamp will stay illuminated and the DTC is stored as an active DTC. If the self test runs and passes, the DTC will be stored as historic DTC. All DTCs are stored as historic faults until they are cleared. Most DTCs will automatically clear from memory if the DTC does not reset within 50 to 100 consecutive engine run cycles.

While a Diagnostic Trouble Code is current for a sensor, the ECM may assign a default "limp home" value and use that value in its control algorithms. All of the system diagnostic self-tests run continuously during normal vehicle operation.

The Diagnostic Trouble Codes can be read by using either the MIL lamp or a laptop computer. Diagnostic Trouble Codes can be cleared from memory with a laptop computer, or by turning the ignition key to the OFF position and removing the ECM power fuse or battery cable for at least 15 seconds.

If more than one DTC is detected, start the diagnostic repair with the lowest DTC number set. Diagnose each problem to correction unless directed to do otherwise by the diagnostic chart. The DTCs are numbered in order of importance. Both DTC 112 and DTC122 pertain to the oxygen sensor, so it is possible that a repair that corrects DTC 112 may also correct the problem causing the DTC 122.

Diagnostic test charts contained in this manual refer to the DST to be connected and in the "System Data Mode." This simply means that the DST is connected and communicating with the PC. In some instances the chart will call out a special test mode. An example of this would be instructions for the DST to be connected and in the DBW (drive by wire) mode. Always be sure to follow the special instructions to avoid a false diagnosis of fuel system components.

#### **DLC COMMUNICATION ERROR**

The ECM 5 volt reference circuit powers the Spectrum diagnostic link cable. In the event that the 5 volt reference signal is open or shorted to ground, you will not be able to connect to the system. If you are unable to connect, follow the quick checks listed below:

Be sure you are using the correct password and latest software for the system you are connecting to.

Check the ECM system power and ground circuits. Refer to DTC 562 for the power schematic. Also check for +12 volts switched power at ECM pin 45 with the ignition key ON.

Check for power at the DLC connector for + 5 volts between pin 1 (BLK /LT GRN) and pin 2 (LT GRN RED) with the ignition key in the ON position.

You may still be able to retrieve a code using the blink code function if none of the above recommendations prove useful. In the event of a 5 volt reference signal malfunction, DTC 642 or DTC 643 should set. If you find one of these codes using the blink code function, follow the DTC diagnostic chart recommendations for that specific DTC.

#### **BLINK CODE FUNCTION**

Although the DST is considered a required tool to access the DTC codes, codes may be retrieved without a laptop computer using the blink code function. To enable this function follow the steps below:

- Jump pins 1 and 4 at the DLC connector.
- Turn the ignition key to the on position
- The system will now enter the self diagnostic blink code mode. Be ready with pen and paper to write down any codes that may be stored.
- The ECM will flash the MIL indicator with a pause between represented numbers that represent DTC codes. The sequence starts with code 1654. Code 1654 confirms the system has entered the blink code mode. The ECM will flash code 1654 (3) times before displaying the actual DTC code that may be set.

#### Example:

### <u>One short blink</u> (pause) <u>six short blinks</u> (pause) <u>five short blinks</u> (pause) <u>four short blinks</u>.

- If no DTC codes are found, the ECM will continue to flash 1654 only. This means no stored DTC codes were found.
- If one of the numbers in the DTC code is zero (0), no flash will occur to represent the zero value—it will be represented as a short pause.

/// EDIS ECI Target Communications							
Faults Connected	Link error - attempting reconnect Connected at 19200 bps	-					
Fault Access       MIL         Engine Speed       0         Manifold Pressure       2.26         Barometric Pressure       8.30         Coolant Temperature       -40.0         Cylinder Head Temp       165.0         Manifold Temperature       165.0         Cylinder Head Temp       165.0         Intake Air Temperature       -40.0         Spark Advance       4.5         Pulse width       2.8         Fuel temperature       47.9         Fuel temperature       77.0         Gaseous pressure target       0.00         "H20       "H20	Clased-Loop Control     System States       EG01     0.401 volts     Run Mode     Stopped       Closed-loop 1     0.10 %     Power Mode     Standby       Adaptive     Historic Fault Information     Information       EG02     Fault Description:     Information       Closed-loop 3     DTC 2128: FPP2 voltage high J1939 SPN = 0, FMI = 0       EG03     Post-cat       Alternate trim duty-	Monitored Drivers Injector Injector-off Iow-side 0.0 40.7 55.0 44.1 36.0 0.0 52.7 40.8 1					
Current governor target     800     rpm       Engine Load     1.4     %       Current estimated targue     0.0     N-m       Current estimated targue     0.0     %       V battery     13.4     volts       V switched     13.4     volts       Hour meter     0.000     hours       Cumulative starts     0     starts	TPS posi       Image: Fault occurred during current key cycle         TPS1 pe       Image: Fault occurred during current key cycle         TPS2 pe       Image: Fault occurrent engine shutdown         TPS1 vo       Key cycles since fault was active:         TPS2 vo       Image: Fault occurrent engine shutdown         FPP com       Clear All Faults         FPP posi       Image: Fault occurrent engine shutdown         FPP1 vol       Image: Fault engine fault engine fault engine fault engine fault engine fault faults         FPP2 vol       Image: Fault engine fault e	SnapShot Base Definitions:					
Historic Faults	Active Faults	run_tmr_sec CL_BM1					

Diagram 1

When using the DST program to clear a DTC, always select the "Clear All Faults" function to immediately turn the MIL OFF after a successful repair (as shown in diagram 1 above).

#### INTERMITTENT PROBLEMS

Intermittent fuel system problems can prove to be the most challenging to repair. It is most important to remember when looking to find the cause of these problems, to operate the system in the condition when and where the problem occurs. An example of this would be, if the DST showed a lean fuel mixture at full load, one of the first things to look at would be the fuel pressure. The fuel pressure would need to be monitored while the machine is operating at full load, not at idle because the leaning effect does not occur at idle. Electrical problems should be treated the same way. One excellent tool for finding intermittent electrical problems is the DST plot/log function. Set up the plot for the code that sets. An example of this would be if an intermittent IAT code set, tag the IAT voltage and watch the plot. While watching the plot, agitate the electrical wire connection at the sensor and ECM connector. The resolution of the plot screen is such that you will be able to see any unstable voltages that you would otherwise not see with a standard DVOM.

Caution should be used when pressure washing the under hood of any electrical system. Avoid direct pressure spray on the system electrical connectors. They are splash proof, but if water is sprayed directly at the connector moisture can become trapped behind the connector seal and cause serious system problems.

Extra care must be taken when probing electrical pins and terminals. Do not bend or spread these terminals as this can also be a source of intermittent problems cause by improper handling of these connectors.