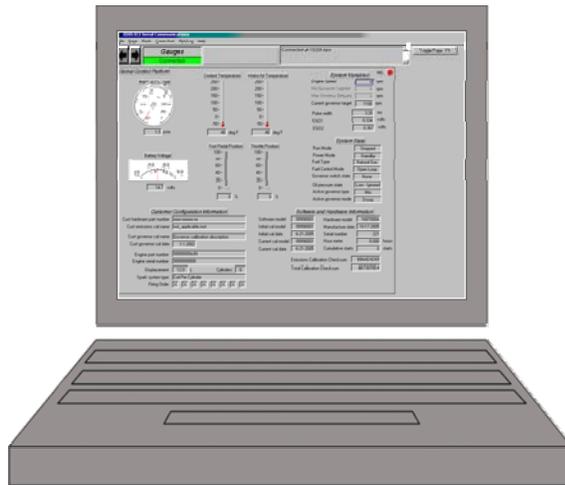




Series II

Diagnostic Scan Tool (DST)

Instruction Manual



September, 2013

A laptop computer, with the system diagnostic cable and diagnostic software, is used to read and clear Diagnostic Trouble codes. It is also used to monitor sensor, actuator values and performs several special tests.

The following procedures will assist you in using a laptop computer to diagnose the Spectrum system:

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.

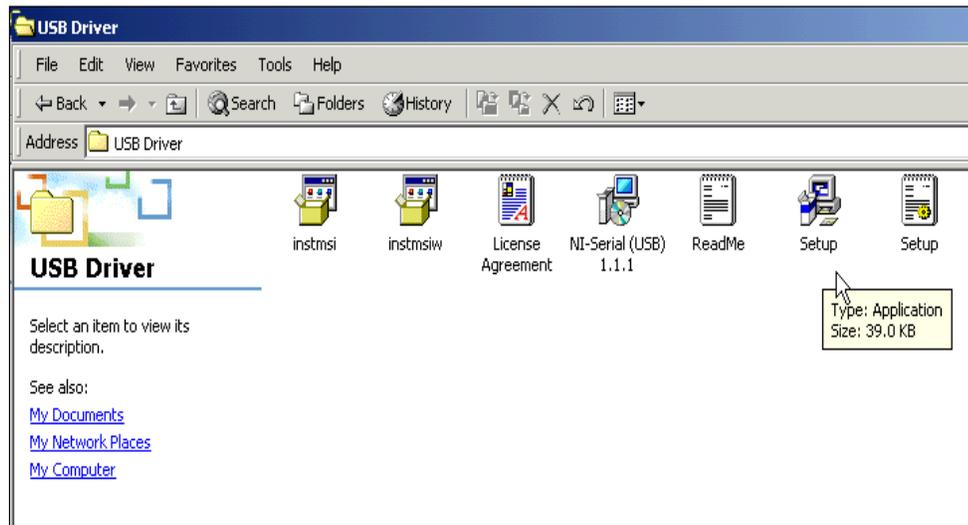
This tool is frequently updated and the illustrations may vary depending on the changes included in any updated DST display Interface. Terms, names and descriptions of parts and servicing procedures will be updated based on trade, brand, or common description to more accurately describe the part or service procedure.

DST INSTALLATION INSTRUCTIONS

- Locate the folder or installation software (also available at <http://www.impcotechnologies.com/spectrum-test-tools.asp>)
- 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 through the screens as directed, until you are prompted to restart your computer. Click on "Yes" to restart the computer.

INSTALLING THE USB ADAPTER DRIVER

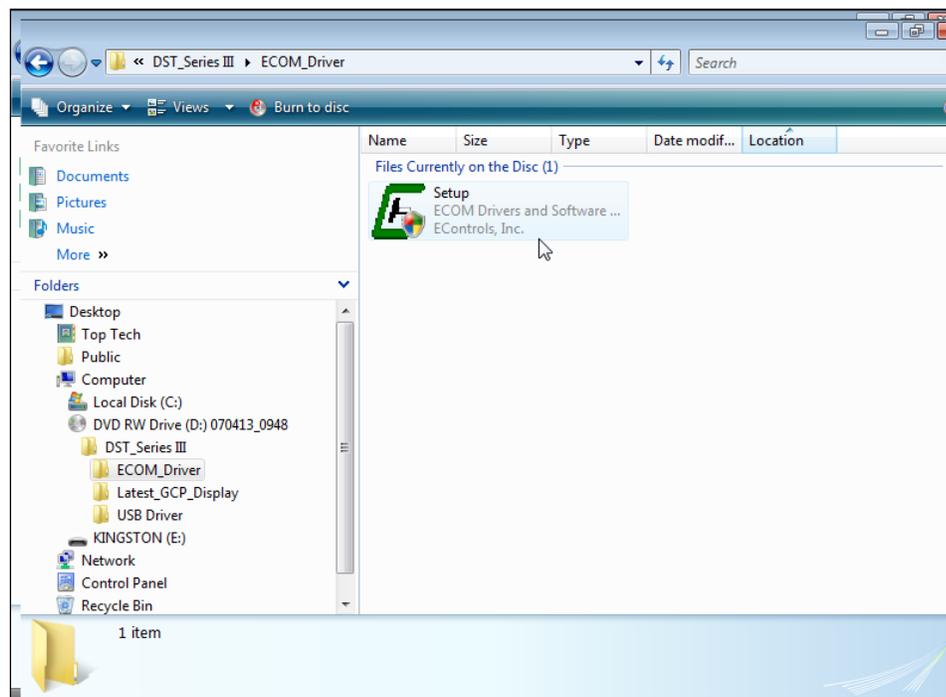
- Locate the USB adapter file (also available at <http://www.impcotechnologies.com/spectrum-test-tools.asp>).



- Double click on “setup.exe” (application file) and follow the on screen prompts.

INSTALLING THE ECOM DLC CABLE DRIVER

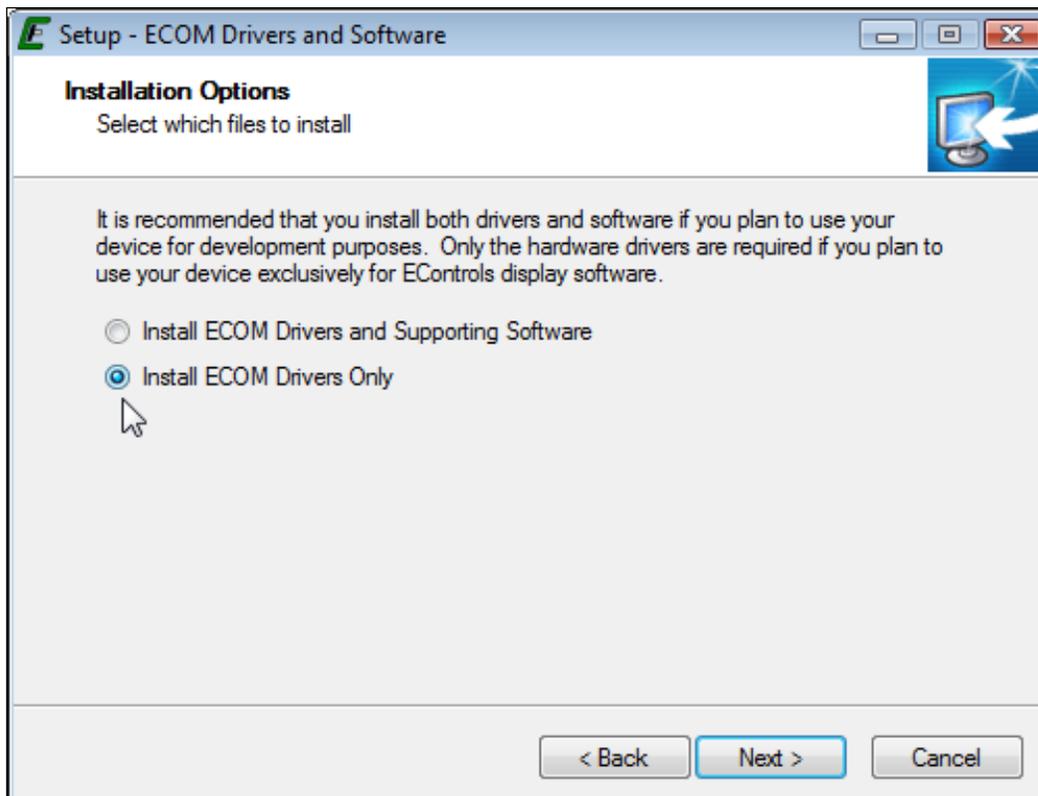
The ECOM USB cable is designed to replace both the serial DLC and the USB adapter cables. It also provides communication to the ECM on the CAN line for systems that are CAN enabled. It requires the installation of the ECOM driver and is compatible with the series II and series III DST software programs.



- Double click on “setup.exe” (application file).



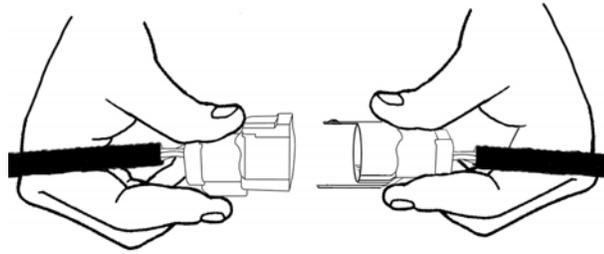
- Click "Next" to continue



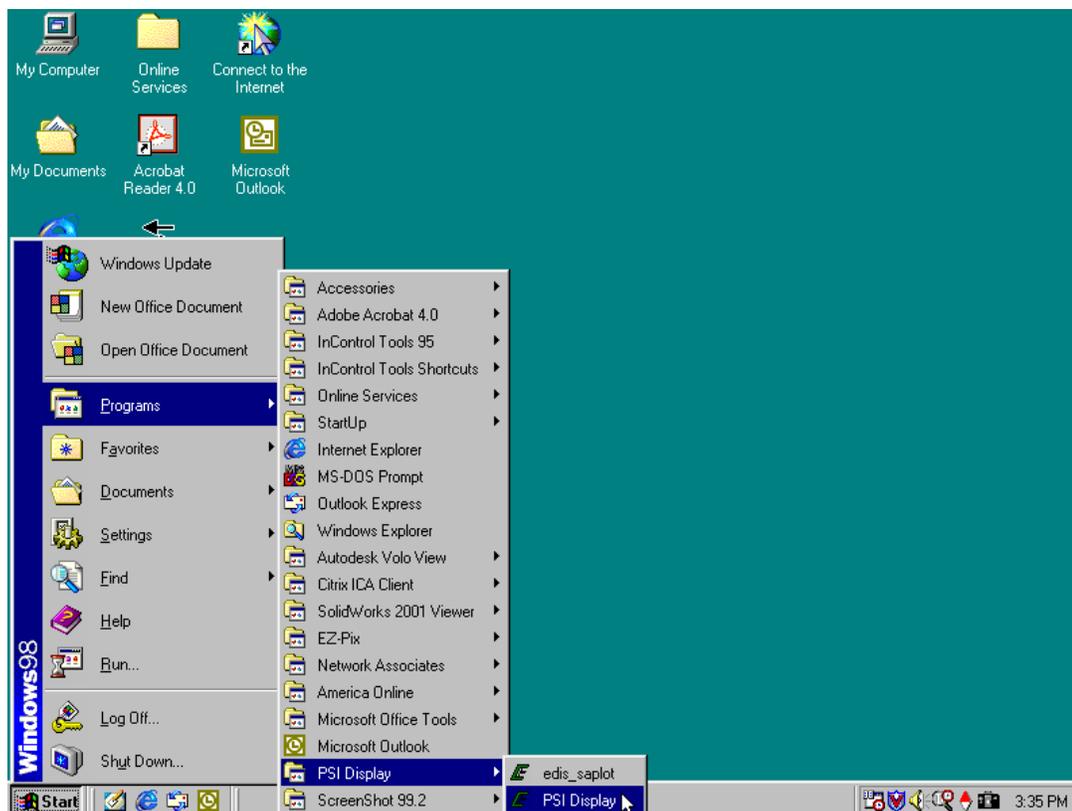
- Select install ECOM drivers only. Click "Next" and follow the on screen prompts.

CONNECTING TO THE PC USING THE ECOM CABLE

- 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 → PSI Display → PSI Display
- Place the ignition key in the ON position.

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 alpha-numeric 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.

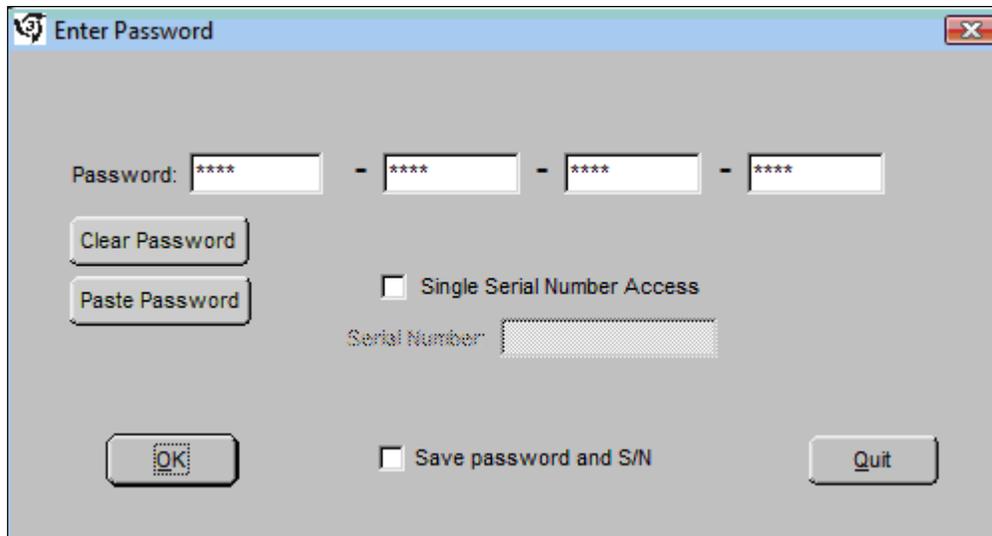


Figure 1: Populated Password Dialog Box

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.



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.

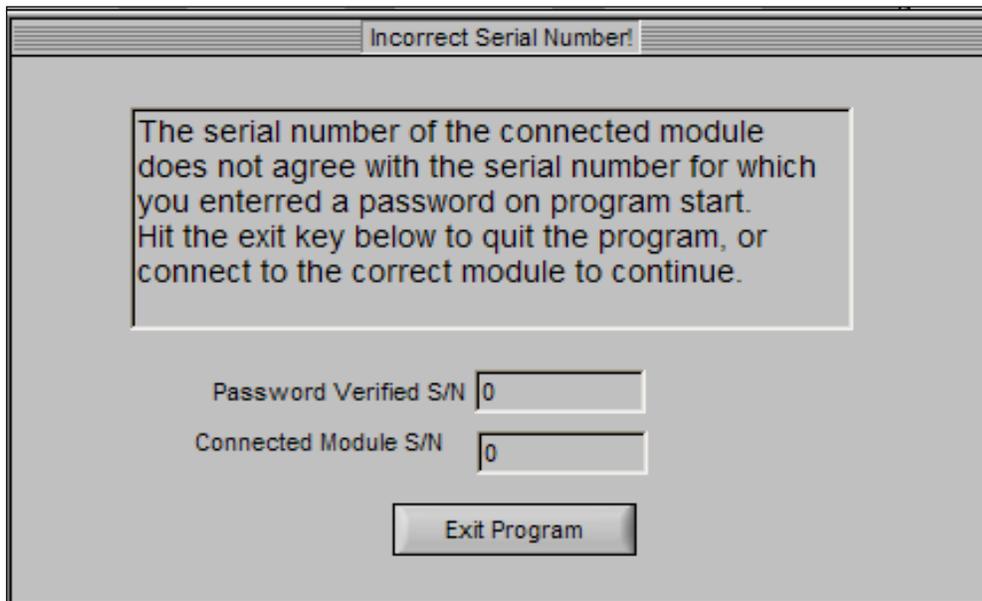


Figure 3: Incorrect Serial Number Message

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).

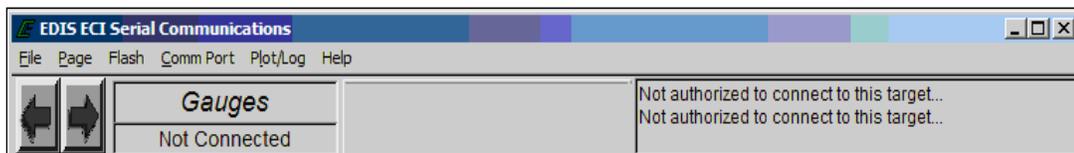


Figure 4: Not Authorized to Connect Message

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

- You will now need to configure the ECOM communication protocol.
- To connect using the ECOM cable you must select ECOM from the COM Port drop down menu.
- 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.
- Within several seconds the system Gauge screen should now appear and a green banner in the upper left hand will read “Connected.”

DIAGNOSTIC TROUBLE CODES

The screenshot displays the EDIS ECI Serial Communications software interface. At the top, it shows 'Faults' as 'Connected' and a status message: 'Link error - attempting reconnect... Connected at 19200 bps'. The main area is divided into several sections:

- Fault Access:** Shows MIL (Malfunction Indicator Lamp) status.
- System States:** Includes Engine Speed (1401 rpm), Run Mode (Running), Fuel Type (Gasoline), Fuel Control Mode (CL Active), Governor switch state (Gov3), Active governor type (Min), Active governor mode (Droop), Brake input level (Open), and Oil pressure state (OK).
- DBW Variables:** Lists TPS command (0.0%), TPS position (0.1%), FPP command (0.0%), FPP position (0.0%), TPS1 voltage (0.484 volts), TPS2 voltage (4.477 volts), FPP1 voltage (0.442 volts), FPP2 voltage (0.000 volts), and IVS voltage (5.000 volts).
- Coil Number:** Shows dwell times for coils 1, 2, and 3.
- Injector:** Shows injector-on and injector-off low-side voltages for injectors 1 through 6.
- Closed-Loop Control:** Displays voltages and percentages for EGO1, Closed-loop 1, Adaptive 1, EGO2, Closed-loop 2, and Adaptive 2.
- Digital Input Voltages:** Shows voltages for Fuel select, Fuel pump, Gov1, Gov2, Overspeed, and Oil pressure.
- Diagnostic Modes:** Includes Spark kill (Normal), Injector kill (Normal), and DBW test mode (Off).
- Historic Faults:** Lists MAP voltage low, IAT voltage high, and ECT voltage high.
- Active Faults:** Lists ECT voltage high.
- Flight Data:** A table with columns for Base Definitions, SnapShot Base Definitions, and SnapShot Custom Definitions, listing various parameters like rpm, MAP, FPP_pct, TPS_pct, CL_BM1, CL_BM2, IAT, Vbat, Pw_avg, A_BM1, A_BM2, FFP_pct, FPS_pct, EGO1_volts, EGO2_volts, Pw_avg, TRIM_DC, and HM_hours.

The System Fault screen is used to view and clear DTC's, which have been set.

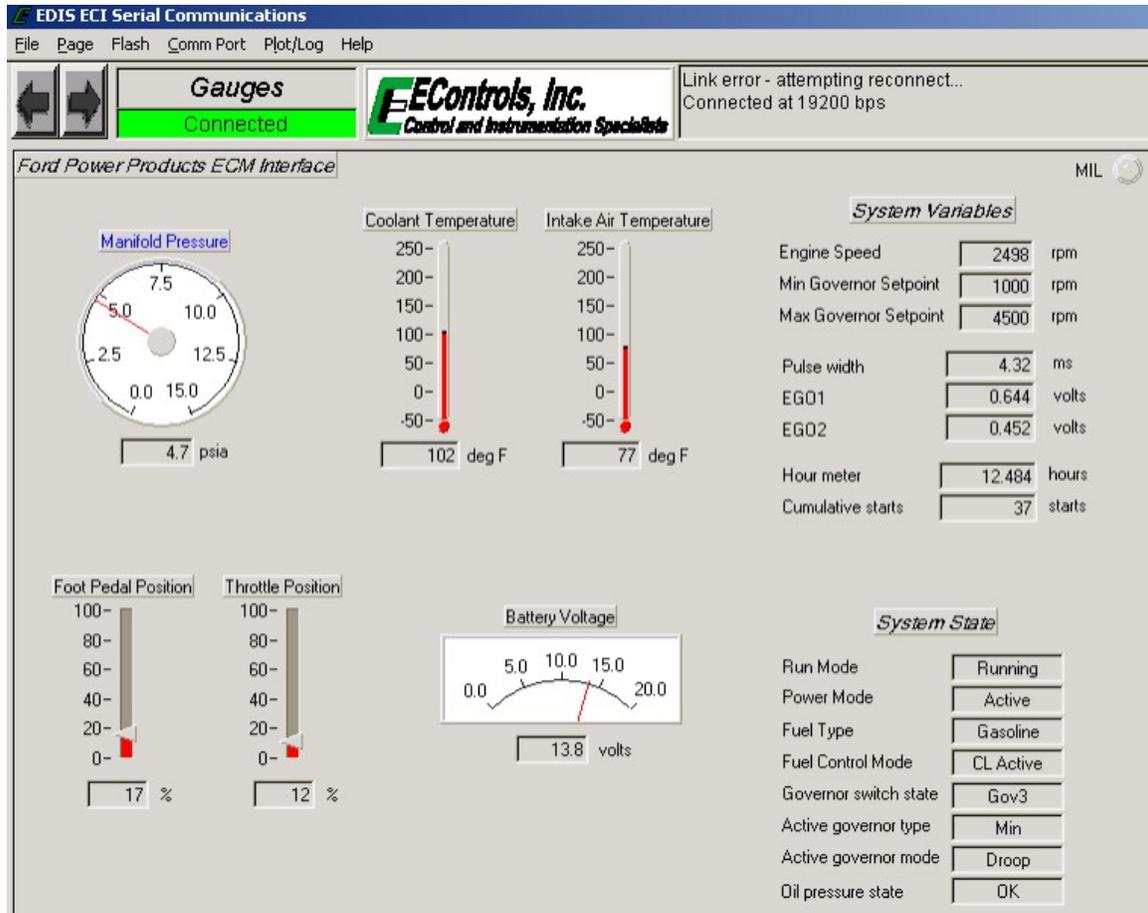
Checking Diagnostic Trouble Codes

The System Fault screen contains a listing of all of the Historic and Active DTC's set within the system. If a DTC is stored in memory, the screen will display that fault in the History column. If the fault is active it will also show up in that column.

Clearing Diagnostic Trouble Codes

To clear a DTC from memory use the arrow keys or mouse to move the Press the Enter key to clear the fault from memory. NOTE: Record faults before erasing them for reference during diagnostics.

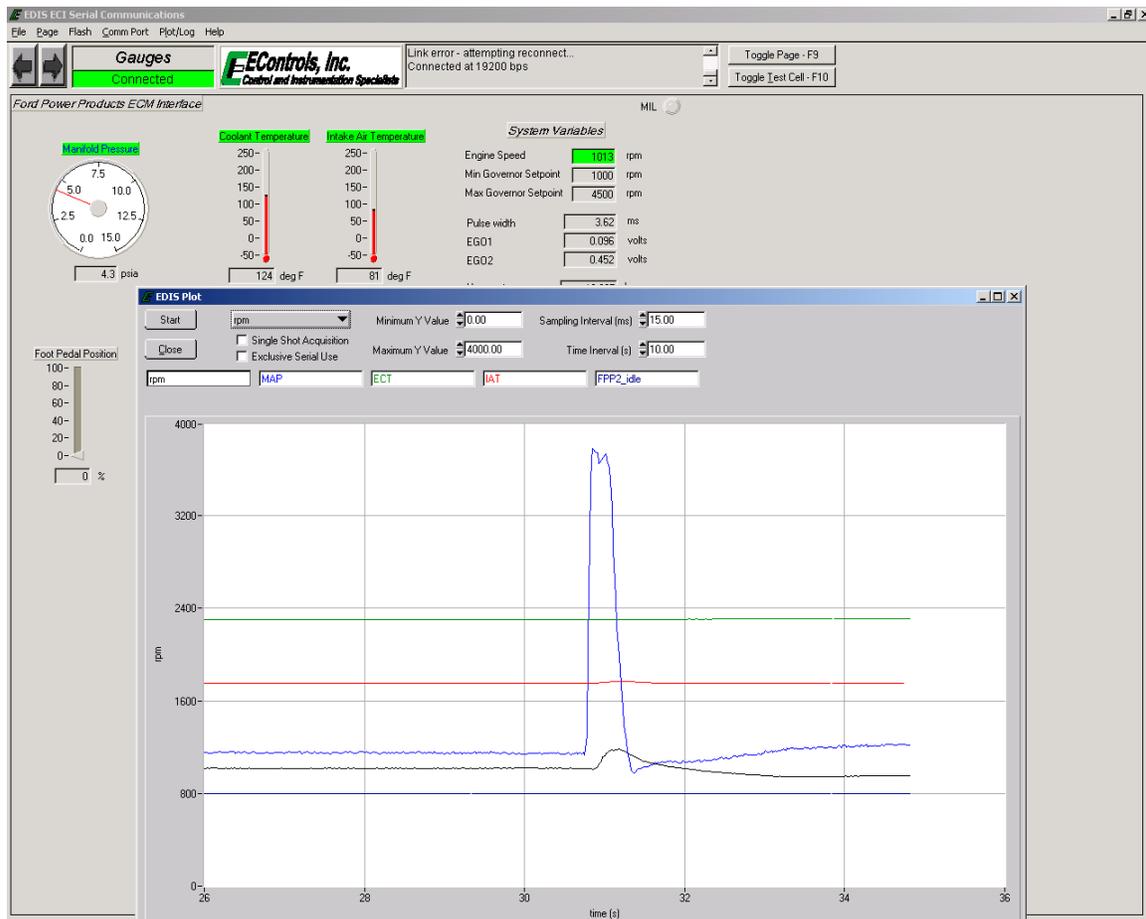
Reading Sensor and Actuator Values



Most applicable sensor and actuator values are displayed on the Gauges screen. The display shows the value for sensors, voltages and the sensor values in engineering units.

NOTE: If a DTC for a sensor is current, the engineering value for that sensor may be a default, limp home value and the voltage value will be the actual sensor voltage. Use the voltage value when performing diagnostics unless directed to do otherwise by the diagnostic trouble tree.

Graphing and Data Logging



Graphing the values and voltages can be a very useful tool in doing intermittent diagnosis. The system diagnostic monitoring software includes graphing and data logging capability. These features enhance the ability to diagnose and repair possible problems with the system. The graphing feature allows sensor inputs and select control output variables to be plotted in real-time while the engine is running.

To plot a variable you must first "TAG" the variable you wish to plot. To do this, use the mouse to highlight the variable, and then right click.

Next press the "P" key or double click the Plot/Log button to invoke the plotting feature. You may change the desired time interval for each display screen. The default is 10 seconds. This can be increased or decreased as necessary to display the desired results. You can also change the sample rate.

You are now ready to plot. Simply click the "START" button to observe the plotted variables. The plot sweeps across the screen from left to right. To pause the display screen press the "SPACE BAR" at any time during plotting. To continue plotting simply press the "SPACE BAR" again. To stop the plotting feature simply click the "STOP" button. To exit the plotting screen click the "CLOSE" button. The range of each variable is listed along the left side of the display and the time is listed along the bottom of the screen.

The screenshot shows the EDIS ECI Serial Communications software interface. At the top, it displays 'Faults' and 'Connected' status. The main area is divided into several sections:

- Fault Access:** MIL indicator.
- Engine Speed:** 1027 rpm.
- System States:** Run Mode: Running; Fuel Type: Gasoline; Fuel Control Mode: CL Active; Governor switch state: Gov3; Active governor type: Min; Active governor mode: Droop; Brake input level: Open; Oil pressure state: OK.
- DBW Variables:** TPS command: 3.8%; TPS position: 3.7%; FPP command: 0.0%; FPP position: 0.0%; TPS1 voltage: 0.636 volts; TPS2 voltage: 4.267 volts; FPP1 voltage: 0.434 volts; FPP2 voltage: 0.000 volts; IVS voltage: 5.000 volts.
- Closed-Loop Control:** EGO1: 0.882 volts; Closed-loop 1: 0.0%; Adaptive 1: 0.0%; EGO2: 0.452 volts; Closed-loop 2: 0.0%; Adaptive 2: 0.0%.
- Digital Input Voltages:** Fuel select voltage: 10.4 volts; Fuel pump voltage: 13.6 volts; Gov1 voltage: 20.6 volts; Gov2 voltage: 20.6 volts; Overspeed voltage: 5.0 volts; Oil pressure voltage: 5.0 volts.
- Diagnostic Modes:** A dropdown menu is open, showing 'Normal' selected and 'Spark kill' as an option. Below it, 'DBW test mode' is also visible.
- Data Definitions Table:**

Data Definitions	SnapShot Base Definitions	SnapShot Custom Definitions
MAP	fuel_status	EMPTY
FPP_pct	run_tm_sec	EMPTY
TPS_pct	rpm	EMPTY
CL_BM1	MAP	EMPTY
CL_BM2	ECT	EMPTY
Vbat	IAI	EMPTY
PW_avg	CL_BM1	EMPTY
A_BM1	CL_BM2	EMPTY
A_BM2	A_BM1	
	A_BM2	
	Vbat	
	FFF_pct	
	TPS_pct	
	EGO1_volts	
	EGO2_volts	
	PW_avg	
	TRIM_DC	
	HM_hours	

The Spark Kill diagnostic 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 firing order, not by cylinder number.

INJECTOR TEST (Gasoline or Bifuel Only)

The screenshot displays the EDIS ECI Serial Communications software interface. At the top, it shows the status 'Connected' and 'Link error - attempting reconnect... Connected at 19200 bps'. The main area is divided into several sections:

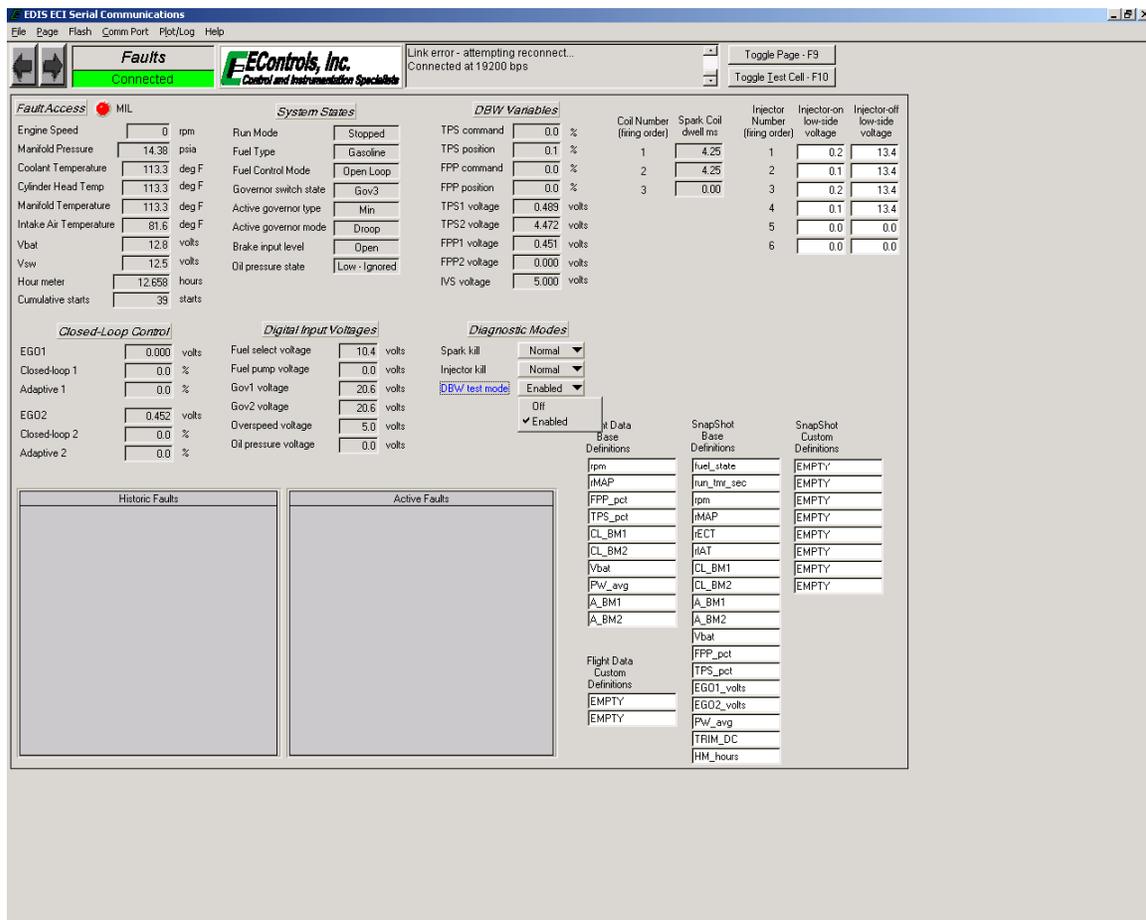
- Faults:** Shows 'Connected' status.
- System States:** Includes Engine Speed (1000 rpm), Run Mode (Running), Fuel Type (Gasoline), Fuel Control Mode (CL Active), Governor switch state (Gov3), Active governor type (Min), Active governor mode (Droop), Brake input level (Open), and Oil pressure state (OK).
- DBW Variables:** Lists TPS command (3.3%), TPS position (3.5%), FPP command (0.0%), FPP position (0.0%), TPS1 voltage (0.685 volts), TPS2 voltage (4.275 volts), FPP1 voltage (0.448 volts), FPP2 voltage (0.000 volts), and IVS voltage (5.000 volts).
- Injector Information:** A table showing injector numbers, firing order, dwell times, and low-side voltages.

Injector Number	Firing order	Spark Coil dwell ms	Injector on low-side voltage	Injector-off low-side voltage
1	1	4.25	0.3	14.2
2	2	4.25	0.1	14.1
3	3	0.00	0.4	14.0
4	4		0.2	14.4
5	5		0.0	0.0
6	6		0.0	0.0
- Digital Input Voltages:** Shows Fuel select voltage (10.2 volts), Fuel pump voltage (13.7 volts), Gov1 voltage (20.6 volts), Gov2 voltage (20.6 volts), Overspeed voltage (5.0 volts), and Oil pressure voltage (5.0 volts).
- Diagnostic Modes:** A dropdown menu is open, showing 'Normal' selected. Other options include 'Injector Kill', 'Normal', and 'Normal'. Below the dropdown, there are sections for 'Data use definitions', 'SnapShot Base Definitions', and 'SnapShot Custom Definitions'.
- Historic Faults:** An empty box for recording past faults.
- Active Faults:** An empty box for recording current faults.

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.

Disabling Injectors

To disable an injector, use the mouse to select the desired. 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 or closed loop multiplier while each driver is disabled.



To select this test mode the engine must be off but the key must be in the ON position.

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.

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.

Using a Diagnostic Jumper to Diagnose the ECI System

NOTE: Counting the blink codes is tedious and difficult to accurately count. It is strongly recommended a laptop computer is used.

If you do not have access to a laptop computer, it is still possible to access the Diagnostic Trouble Codes stored in the memory of the Spectrum system ECM using a diagnostic jumper and the Malfunction Indicator Lamp. With the key off connect the diagnostic jumper to the ECI system diagnostic connector located near the ECM. The jumper will connect diagnostic pins A and D. Turn the ignition on but do not start the vehicle. The Malfunction Indicator Lamp (MIL) will begin to flash.

The MIL displays three digit codes by flashing the first digit, pausing, then flashing the second digit, pausing, and then flashing the third digit. There will be a long pause between codes. For example, a code 143 would be one flash followed by four flashes followed by three flashes.

The MIL will first display a "123" three times. Code 123 indicates that the ECM based diagnostic routines are functioning. Then, any Diagnostic Trouble Codes stored in memory will display three times each. The MIL will then start over with the code 123. If the vehicle is started while the diagnostic jumper is in place, the MIL will flash rapidly.

Diagnostic Trouble Codes may be cleared from the system ECM memory by moving the ignition key to the OFF position and removing the (F1) system battery fuse for at least 15 seconds. Note: This will erase all of the memory in the computer including the adaptive learn.

DIAGNOSTIC PROCEDURES FOR BI-FUEL APPLICATIONS

Diagnostic Trouble Codes (DTC) will set in both propane and gasoline fuel modes. Some DTC's are specific to either gasoline or propane, but are described in the DTC in the OEM Service Manuals. When dealing with a fuel specific DTC, it is advised to run the diagnostic test in the fuel mode that the code was originally set. In the case of a fuel specific DTC, the diagnostic test procedures must be performed running in the fuel mode that is described for that particular DTC. An example of this would be DTC 243 Adaptive Learn High (LPG). The diagnostic test must be run in the LPG mode for a successful repair. In the presence of multiple DTC codes always begin with the lowest number DTC and diagnose each problem to correction, unless directed to do otherwise by the DTC chart. The DTC's are numbered in order of importance. Having DTC 112 and DTC 122, both concerning the oxygen sensor, is possible. By repairing DTC 112 first, the problem causing the DTC 122 may also be corrected.

When a DTC is set, the ECM will illuminate the Malfunction Indicator Lamp on the instrument panel and save the code in memory. The ECM will continue to run the self-test unless the DTC is an oxygen sensor lean, oxygen sensor rich, or an internal ECM related DTC. If the system continues to fail the test, the lamp will stay illuminated and the DTC is current (ACTIVE). All DTC's are stored as historical faults until they are cleared. All DTC's except the ECM related DTC's will automatically clear from memory if the DTC does not reset within 50 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.