

Global Control Platform (GCP) Engine Display Interface Software (EDIS) Training Manual



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A. Overview

All engine control modules (ECMs) produced by EControls Inc. have the ability to be used as calibration development controllers and include an abundance of interface functionality. This manual is intended to introduce technical professionals and service personnel to EControls' Engine Display Interface Software (EDIS), however, this manual is not intended to define control system variables, outline the ECM's embedded software functionality, or provide calibration direction.

The text outlines:

- Installation of the EDIS package onto a personal computer (PC)
- Software login and password functionality
- EDIS Header and top-level menubar functions
- General functions of each user-interface page
- Fault and Diagnostic Trouble Code (DTC) interaction

Examples and snapshots used in this manual are based off of the Heavy-Duty ECM Display Interface ('HD Display') Software package but extend to all EControls' EDIS packages including 'ECM56 Display,' 'FPP Display,' and 'GCP Display.'

In addition to providing a calibration interface, software capabilities include extracting a calibration from an ECM, loading a calibration to an ECM, reflashing an ECM with a MOT file, graphically plotting variables and metrics, data logging variables and metrics to PC memory, and display/retrieve fault code information. Before elaborating on the software's functionality, it is crucial to understand the ECM's configuration. There are two types of files that can be used to configure an ECM, a *MOT file* and a *CAL file*. The functions of these files are described in Table 1.

Table 1: Calibration Configuration Files

<i>Calibration File (.cal)</i>	Calibration disk file (partial calibration) that contains static variables to define part of an engine's calibration. A CAL file is a calibration overlay but DOES NOT contain the engine's <u>entire</u> calibration. CAL files are used for saving a calibration from an ECM or loading specific variables.
<i>MOT File (.mot)</i>	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 an ECM. MOT files CAN NOT be viewed or executed on a PC.

B. Software Installation

The installation software is contained in six (6) files; these are shown in Figure 1. In order to install the software, all files must be contained in the same directory.

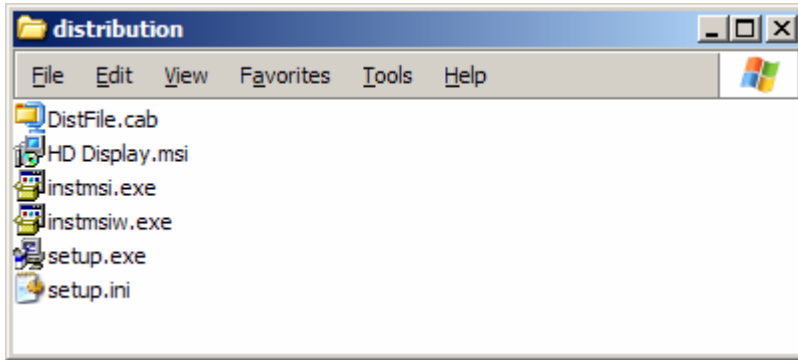
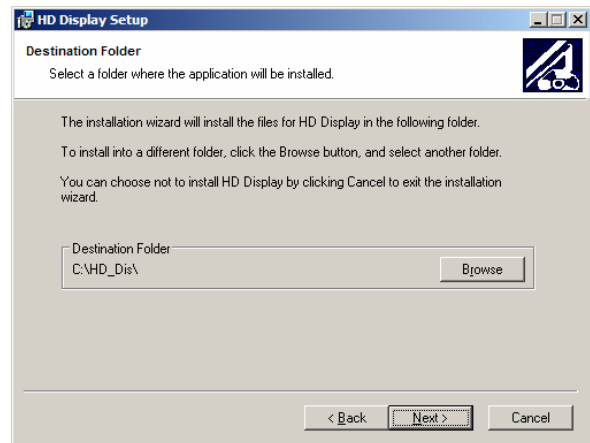
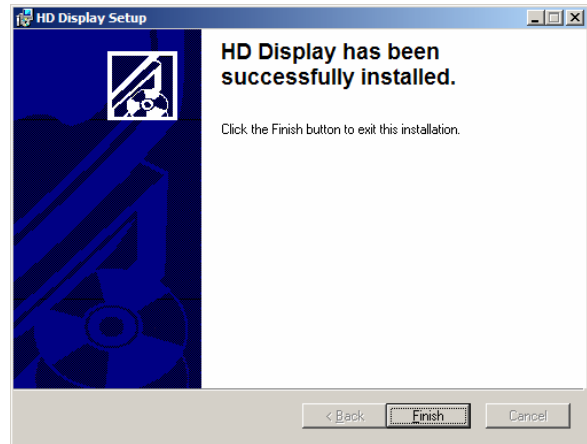
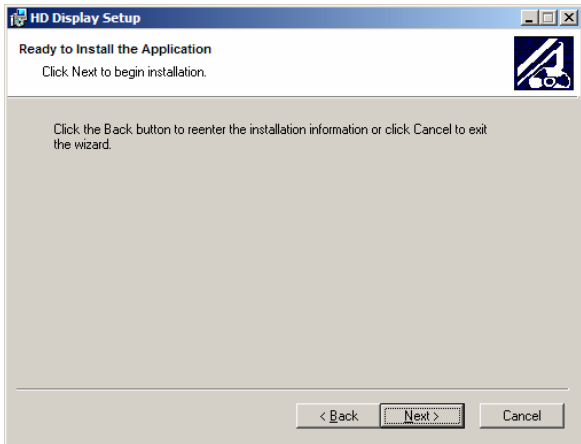


Figure 1: EDIS Installation Files

Installation Instructions

1. Start the Windows Installer by double-clicking one of the following installation files.
 - **setup.exe**
 - **HD Display.msi**
2. Follow the instructions for installation. (*NOTE: If a previous version of the software is installed, the uninstaller will remove the previous version and exit. You will be required to start the installer again to install the new version*).





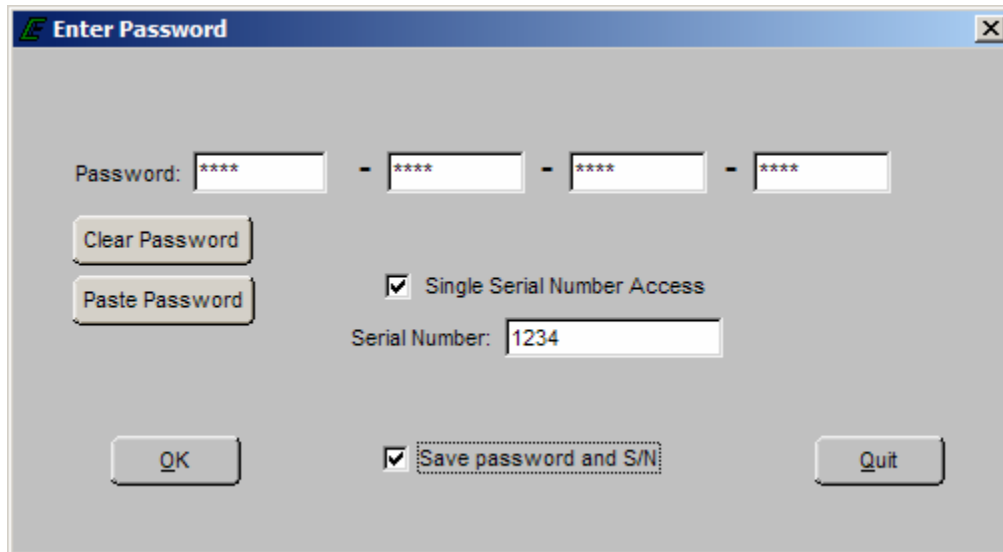
3. Once installed, the software can be accessed from *Start Menu* → *Programs* → *HD Display* → *HD Display*

NOTE: Upon completion of the install, installation files may be deleted from your PC.

C. Software Log-In

Figure 2 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 applicable to all ECMs of a given original equipment manufacture (OEM) or 2) enter a 'Single S/N Password' and corresponding serial number for a single ECM. A Single Serial Number password is only applicable for the specific ECM serial number it applies to and is useful for authorizing service personnel to make changes or view information for a single ECM for which they would otherwise not have access to.

Each password is a 16-character alpha-numeric string specific to each EControls customer and determines which pages and variables are visible through the software as well as which ECM calibration variables can be written. Passwords are assigned to an OEM by EControls Inc. Passwords also determine the functionality granted a user, including loading calibration files and reprogramming the ECM. Passwords can be used to provide full or limited access to as many or as few pages and variables as desired. This allows the software to be all encompassing for the calibration engineer, provide limited access for distributors and service technicians, or provide any access level for a single ECM.



The image shows a software dialog box titled "Enter Password". It features four password input fields, each containing four asterisks. Below the password fields are two buttons: "Clear Password" and "Paste Password". A checkbox labeled "Single Serial Number Access" is checked. Below this checkbox is a "Serial Number" input field containing the text "1234". At the bottom of the dialog, there are three buttons: "OK", "Save password and S/N" (which is checked), and "Quit".

Figure 2: Populated Password Dialog Box for Single Serial Number Access

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. 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 3 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

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 4 will be displayed.

Figure 5 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).

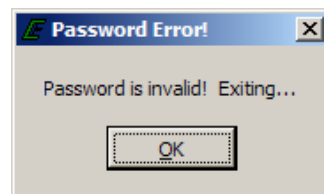


Figure 3: Password Error Prompt

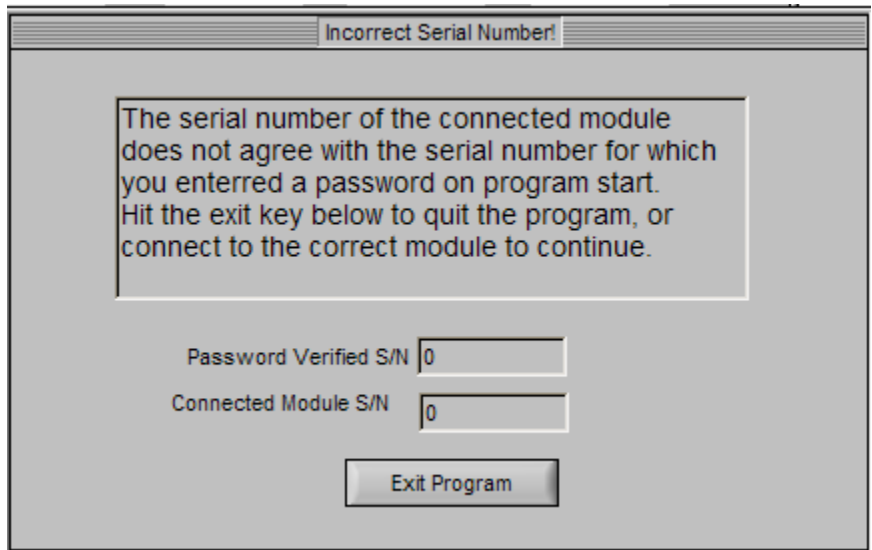


Figure 4: Incorrect Serial Number Message



Figure 5: Not Authorized to Connect Message

D. EDIS Header and Menu Bar Functionality

All high-level functions are accessible from the EDIS Header. The header shown in Figure 6 is displayed above the active page and is accessible from any page. Included in the header is the menu bar, page toggle buttons, communication status window, and active page header. Functions, such as file transfer, plotting, and flash committal are selectable from the menus located in the menu bar. The communication status window, located at the far right of the screen, displays real-time information regarding serial communication. If the PC is connected to a valid target, battery voltage is supplied to the V_bat pins of the ECM, and the proper password has been entered the communication status window will show that the computer is connected and communication is established. Figure 7 is an example of the header once communication has been established. Toggle buttons may be used to advance to the next page or go back to the previous page based on the active page list order. This function may also be accomplished by using the Page Up/Page Down buttons. The F9 key is a shortcut to toggle between the last page visited and the current page.



Figure 6: EDIS Header (Not Connected)



Figure 7: EDIS Header (Connected)

Menu Bar Menus

- **File Menu:** Used primarily to perform disk and file management functions.
- **Page Menu:** Used to select the active page and configure which pages will be visible for use during a software session.
- **Flash Menu:** Commits updated calibration variables from the ECM's random access memory (RAM) to Flash memory or releases/clears updated calibration variables from the ECM's RAM. Flashing an ECM permanently saves a variable or set of variables to the ECM.

- **Comm Port Menu:** Selects the PC's active serial communication port and displays communication statistics.
- **Plot/Log Menu:** Graphically plots or numerically logs static and dynamic variables and metrics that have been tagged for plotting or logging.
- **Help:** Provides general information about EDIS and defines shortcuts for use in the software.

I. **File Menu Functions**

All disk and file management functions are accessible from the File menu. Functions contained in the File menu include:

- **Save Calibration to Disk:** Saves calibration variables, accessible from the display software, from the ECM's flash memory to the PC. Table 2 outlines the Save Calibration to Disk functions.
- **Load Calibration from Disk:** Loads a partial calibration from a *Trusted Source* (see Trusted Source definition below) calibration file on the PC to the ECM's flash memory. Only variables for which your password has write access will be updated.
- **Clear Cal Tags:** Removes all calibration tags from EDIS memory during software use.
- **Reprogram Target:** Reprograms the ECM processor with a binary MOT file (S-record) that contains both a full calibration and embedded software control algorithms.
- **Bulk Reprogram:** Used to program multiple ECMs for an OEM's end-of-line production process.
- **Print Panel:** Sends a snapshot of the active EDIS page to a printer.

Figure 8 is an example of a calibration table that has been tagged for a calibration save. A variable is tagged for a calibration save by combining the shift key with a right-click of the mouse, thereby highlighting the calibration variable or table in blue. This allows for specific calibration variables to be saved to disk without having to know the variable's name. It should be noted that tables are not automatically saved with their corresponding independent axes, therefore, axes should also be tagged.

If the password used at login has a high level of access, the prompt shown in Figure 9 is displayed. This prompt asks if the calibration is a *Trusted Source Calibration*. A *Trusted Source Calibration* allows a high-level user to generate a calibration file that can be loaded and committed into an ECM using any level of password that permits calibration file loads even though the password may not allow write access to all variables contained in the calibration file. A successful calibration save generates the prompt displayed in Figure 10.

Table 2: Save Calibration to Disk Functions

<i>Save All Calibration Variables</i>	Saves all password accessible calibration variables from ECM Flash to the PC that are accessible in the EDIS software package (NOTE: Not all ECM variables are accessible through the interface software, thus this does not constitute saving a 'full' calibration).
<i>Save Tagged Cal Variables*</i>	Saves any password accessible variable from ECM Flash memory to the PC that is cal. tagged in the display software.
<i>Save Cal Variables for Which You Have Write Access</i>	Saves all calibration variables from ECM Flash memory to PC for which your password allows write access.
<i>Save Cal Variables from List</i>	Saves any password accessible variable from ECM Flash memory to the PC that is selected from the list of accessible variables. Multiple variables may be selected by single left-click of each variable.
<i>Update Existing Cal File</i>	Update an existing calibration file on the PC with the same variables from the connected ECM. Used to update a partial calibration with updated variables from an ECM.
*Calibration Tag (shift & right-click): Selection of static calibration variables to save to PC disk.	

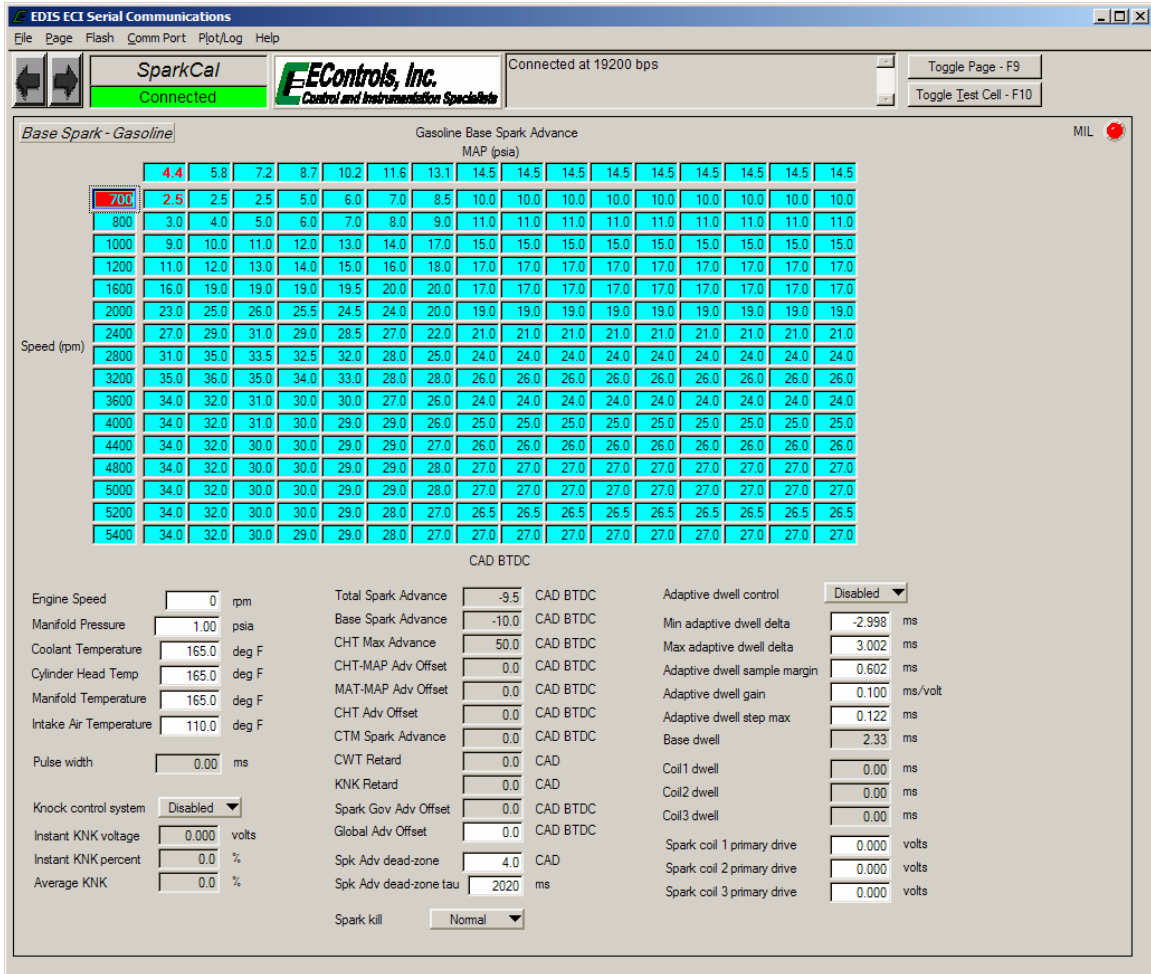


Figure 8: Variables Tagged for Calibration Save

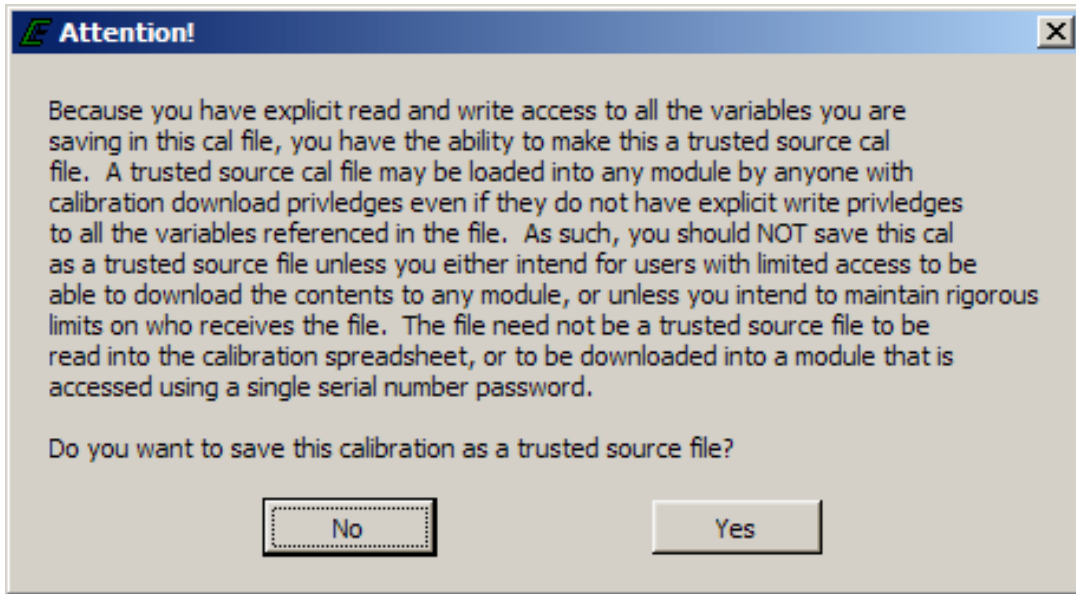


Figure 9: Trusted Source Calibration Save Prompt

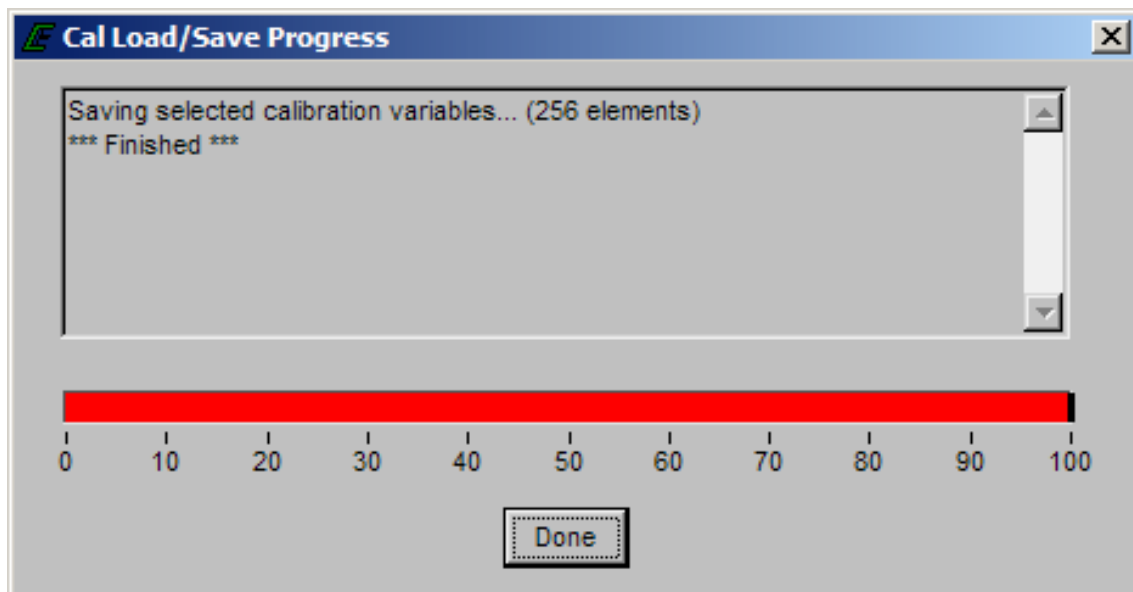


Figure 10: Successful Calibration Save Prompt

Additional functions available from the File menu include:

- **Load Calibration from Disk:** Uploads a calibration from a partial calibration file stored on disk to ECM flash memory for the variables your password has write access provided that the password has calibration load privileges. Figure 11 shows the prompt for a successful calibration file load.

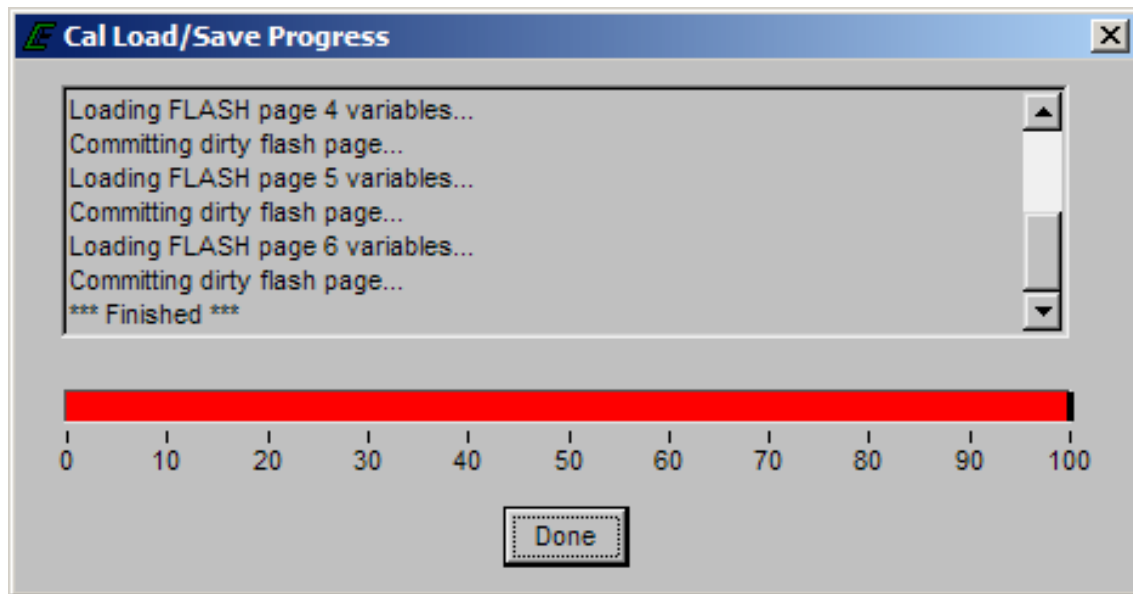


Figure 11: Successful Calibration Load Prompt

- **Reprogram Target:** Reprograms the ECM's microprocessor with a binary MOT file (S-record) that contains the full calibration and embedded software control algorithms. This task is performed when software modifications have been released or you desire to load a full calibration.

When reprogramming an ECM, the prompts shown in Figures 12-14 will be displayed in sequence. Figure 12 is the first prompt, asking if you desire to perform a standard application download. A "standard application" download reprograms the target with the embedded software and the full calibration. Prior to beginning the reprogram sequence, the prompt in Figure 13 will be displayed. Selecting "Yes" will proceed with the reprogramming sequence; selecting "No" will exit the reprogram sequence. During the reprogramming sequence, the serial communication baud rate will change from the preset communication baud rate (default=19200 bps) to 57600 bps, permitting faster downloads. A status indicator will be displayed during reprogramming to display the

download status. Successful completion of a reprogrammed target will generate the prompt in Figure 14 and the software will automatically revert back to the preset communication baud rate.

Answering “No” to the prompt in Figure 12 indicates a “non-standard application” download that will constitute an application and bootblock download, Figure 15 shows the ensuing dialog box. Bootblock essentially erases everything in the ECM’s flash memory and reprograms the ECM. This function is used primarily when updating an ECM’s encryption. In order to reprogram in Bootblock, a valid password must be entered in the password field of the Non-standard Target Reprogram prompt. If the password is accepted, the prompts shown in Figure 16 and Figure 17 will be displayed.

NOTE: If serial communication is lost, the reprogramming sequence is cancelled, or ignition and battery power are removed from the ECM during reprogramming, the ECM will inform you that it is in bootstrap mode and is inoperable requiring the ECM to be reprogrammed as shown in Figure 18. This prompt will be presented each time the PC reconnects with the ECM if the ECM is not properly configured.

! NOTE: Interruption of bootblock reprogramming may cause the ECM to be unusable. An ECM that becomes unusable as a result of a failed reprogram requires the unit to be returned to EControls Inc.

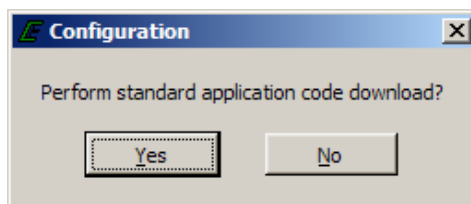


Figure 12: Reprogram Target Download Prompt

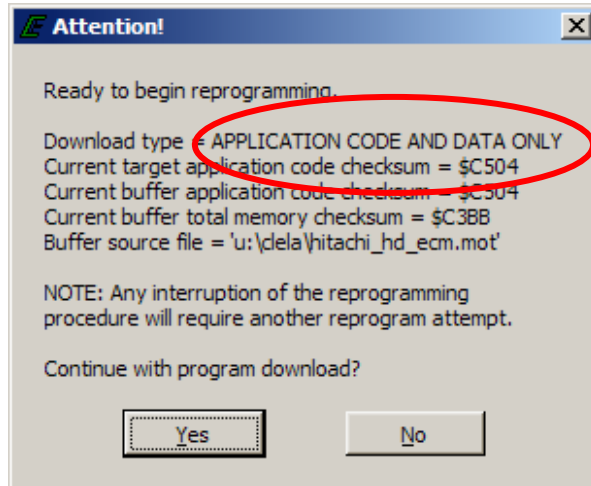


Figure 13: Standard Application Download Prompt

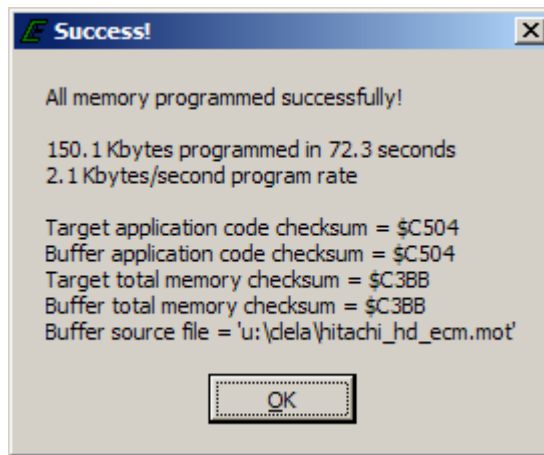


Figure 14: Successful Target Reprogram Prompt

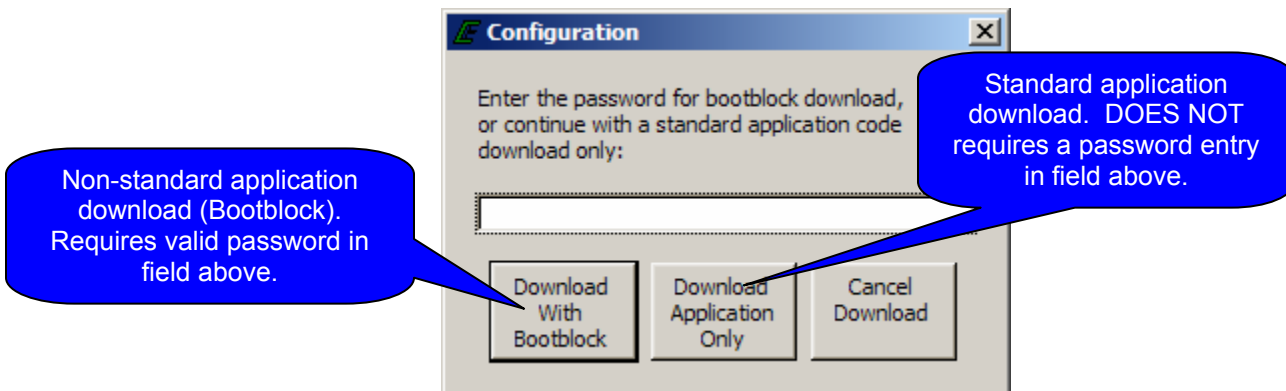


Figure 15: Non-standard Target Reprogram Prompt

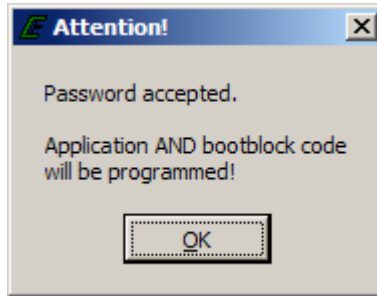


Figure 16: Successful Bootblock Password Entry Prompt

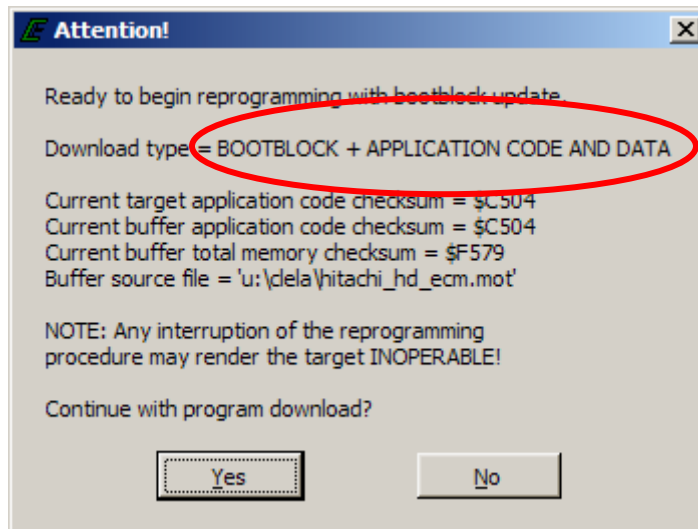


Figure 17: Non-Standard Application Download Prompt

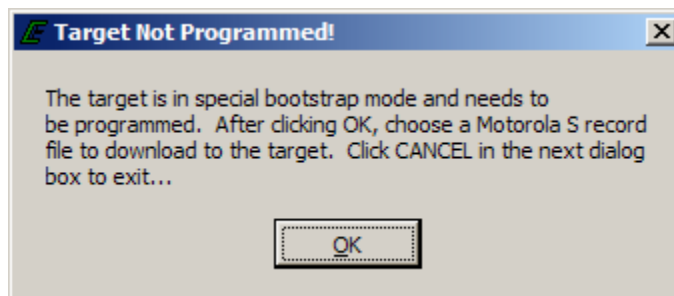


Figure 18: Inoperable Target Prompt

II. Page Menu Functions

The Page menu is used to configure which pages will be visible for use during a software session and contains the list of selectable pages. Functions accessible from the Page menu are listed below.

- **Pages:** Configures which pages will be selectable from the Page menu. Figure 19 shows an example of the Page Configuration Interface. Selecting a page for use is accomplished by a single left-click next to the page name. Pages available for display are password dependent. Pages may be retained for software re-entry by checking the 'Save pages setup for startup' checkbox.
- **'Page_Name':** Selects the active page for display.

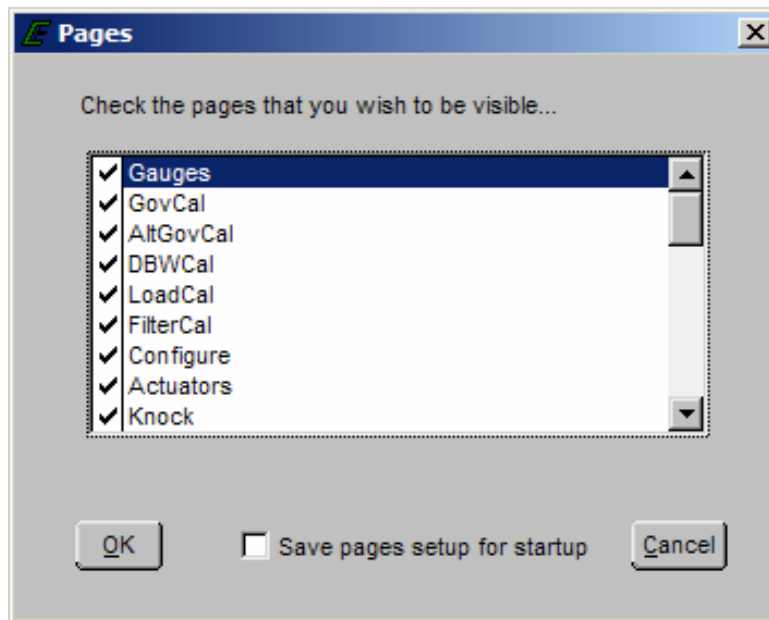


Figure 19: Page Configuration Interface

III. *Flash Menu Functions*

The Flash menu contains the two functions that transfer or release updated variables from ECM RAM to ECM flash. These functions are described below.

- ***Commit Dirty Page:*** Transfers updated calibration variables from ECM RAM to flash memory. Committing variables to flash permanently stores the variables from a flash page allowing variables on different flash pages to be updated. A 'Dirty' page refers to a flash page that has update calibration variables in RAM that have not been updated in Flash. If a page is 'Dirty' and battery power is removed from the ECM updated variables revert back to values stored in Flash. Once a page has been flashed, the page is no longer 'Dirty.' Upon selecting Commit Dirty Page, the prompt in Figure 20 will be displayed.

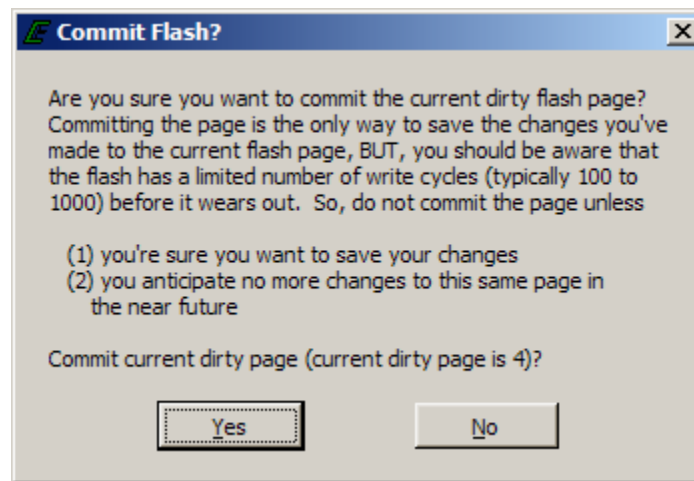


Figure 20: Commit Dirty Page Prompt

⚠ **NOTE:** Caution should be taken to not commit flash pages at high engine speeds as the engine may briefly stall during the flash committal process.

- ***Release Dirty Page:*** Deletes updated calibration variables from ECM RAM and reverts back to the calibration stored in flash memory. Prior to releasing the updated variables from RAM, the prompt in Figure 21 will be displayed.

NOTE: Updated variables that have not been committed to flash memory are retained during ignition key-off cycles, however they are erased if battery power (V_bat) is removed from the ECM.

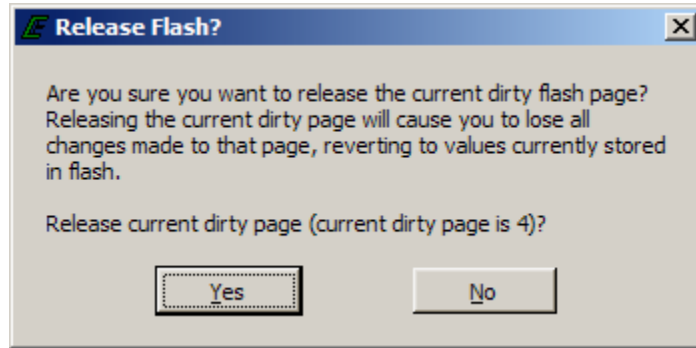


Figure 21: Release Dirty Page Prompt

IV. Comm Port Menu Functions

The Comm Port menu allows the user to select the PC's active serial communication port and provides information about communication statistics. Functions available from this menu are detailed below.

- **Automatic (Default):** Permits the software to cycle through available RS-232 serial communication ports until a connection is established with a target.
- **COM1, COM2, etc.:** Specifies which communication port to connect through for a given software session. This setting is not retained once the software has been exited, however it may be retained by right-clicking the main software icon, selecting properties, and adding `-com#` to the end of the target field. An example is shown in Figure 22.

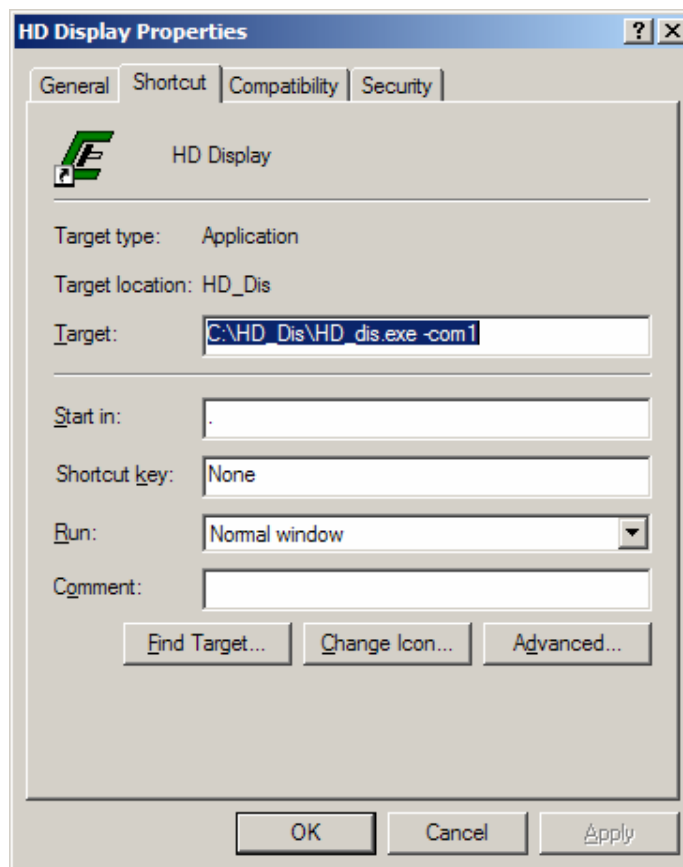


Figure 22: Software Properties

- **Show Stats (Ctrl+S):** Displays communication statistics between the PC and ECM once a connection has been established.

Statistics include serial baud rate, transmit and receive loads, and time information. An example of available data is presented in Figure 23.

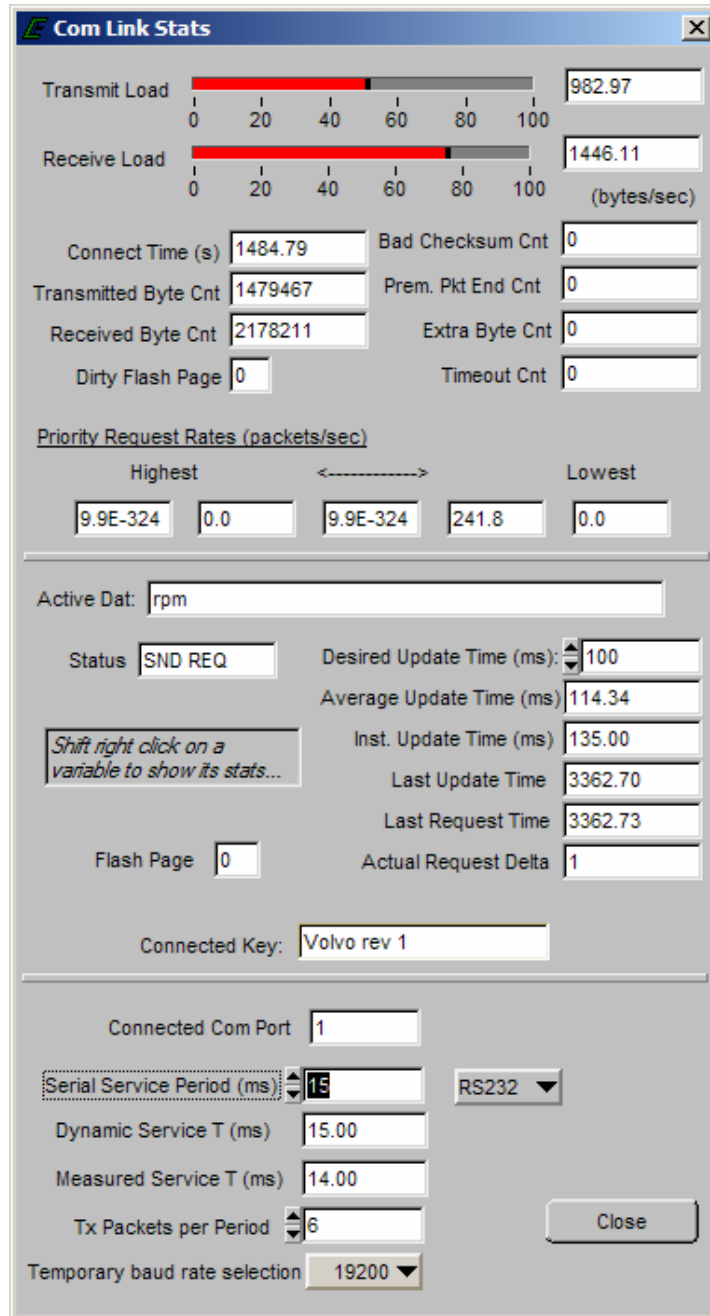


Figure 23: Communication Statistics Interface

V. 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 24 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. The equation below can be used to calculate the minimum sample period for a given selection of variables.

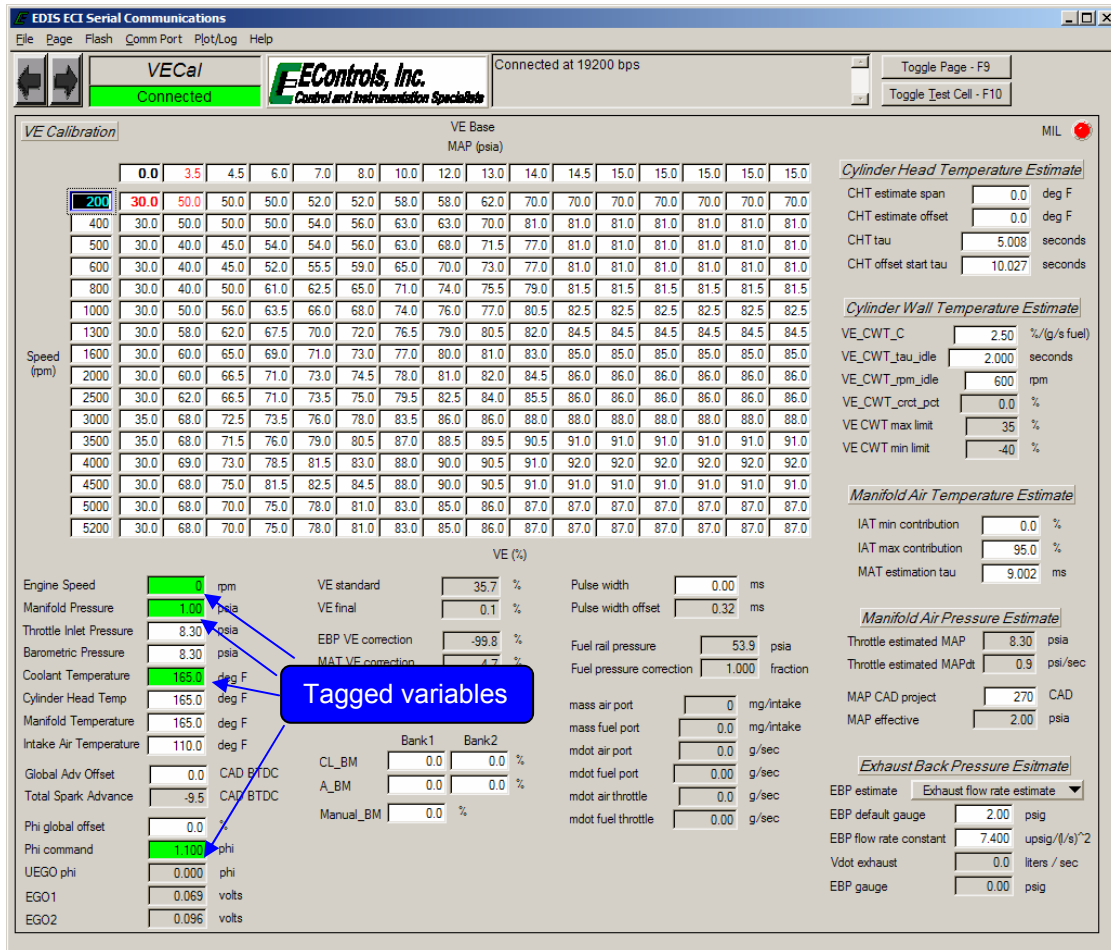


Figure 24: Tagged Variables for Plot/Log

$$P = \text{sample period (ms)} = \left(\frac{N}{6}\right) \times 15 \text{ ms. } N = \# \text{ of variables rounded up to the nearest multiple of 6}$$

Minimum = 15 ms.

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 25. Capabilities of the plotter are outlined in Table 3.

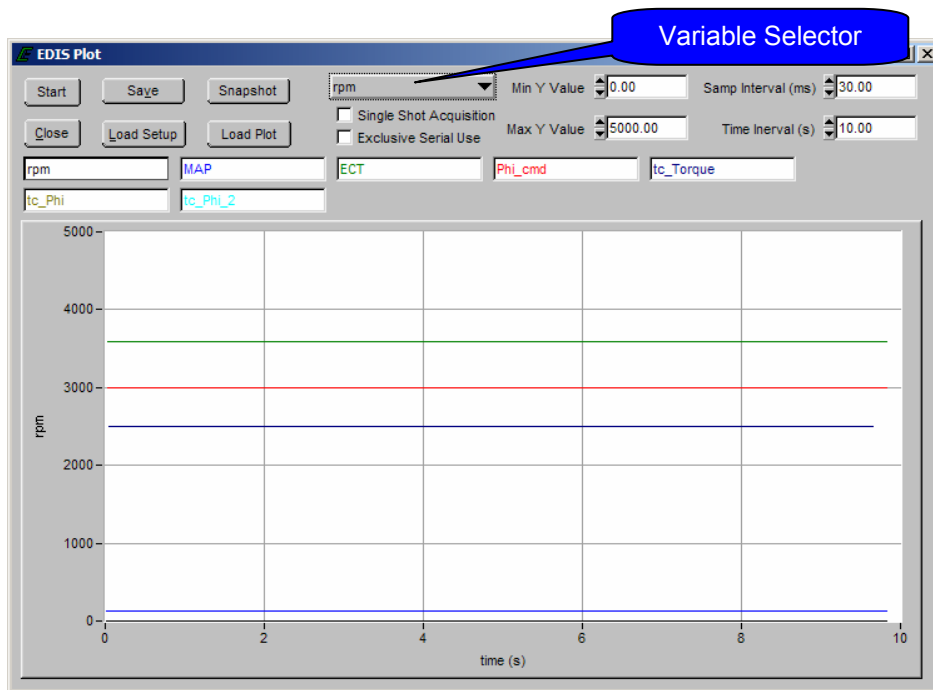


Figure 25: EDIS Plot

Table 3: EDIS Plot Interface Functions

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

A useful 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 26. Any CSV file in plot format (.plt) may be loaded into the snapshot. Table 4 outlines the available hot key functions of the snapshot screen.

Table 4: Snapshot Hot Key Functions

Command	Function
<Single, left-click on trace>	Snap closest cursor to data
<Ctrl + Up/Down Arrows>	Move/pan plot along y axis
<Ctrl + Left/Right Arrows>	Move/pan plot along t axis
<Ctrl+Shift + Up/Down Arrows>	Zoom plot in and out in y axis
<Ctrl+Shift + Left/Right Arrows>	Zoom plot in and out in t axis
<Ctrl + Home>	Resize plot to default settings
<Ctrl + Page Up>	Zoom out by 10%
<Ctrl + Page Down>	Zoom in by 10%
<Page Up>	Toggle to previous cursor
<Page Down>	Toggle to next cursor
<Left/Right Arrow>	Follow selected data along trace
<Up/Down Arrow>	Follow selected data along trace
<Shift + Left/Right Arrow>	Move 10 points along trace
<Shift + Up/Down Arrow>	Move 10 points along trace
<Home>	Go to first visible point on current plot
<End>	Advance to last visible point on current plot
<Shift + Up/Down Arrow>	Toggle between traces/variables

Another data capture function incorporated in the software is the EDIS logger. This tool serves as a PC data logger for any variable available in the ECM through the interface software. Figure 27 shows the interface display for configuring EDIS Log. The interface allows the user to create the file's 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 logging. The amount of data stored is only limited by available PC RAM.

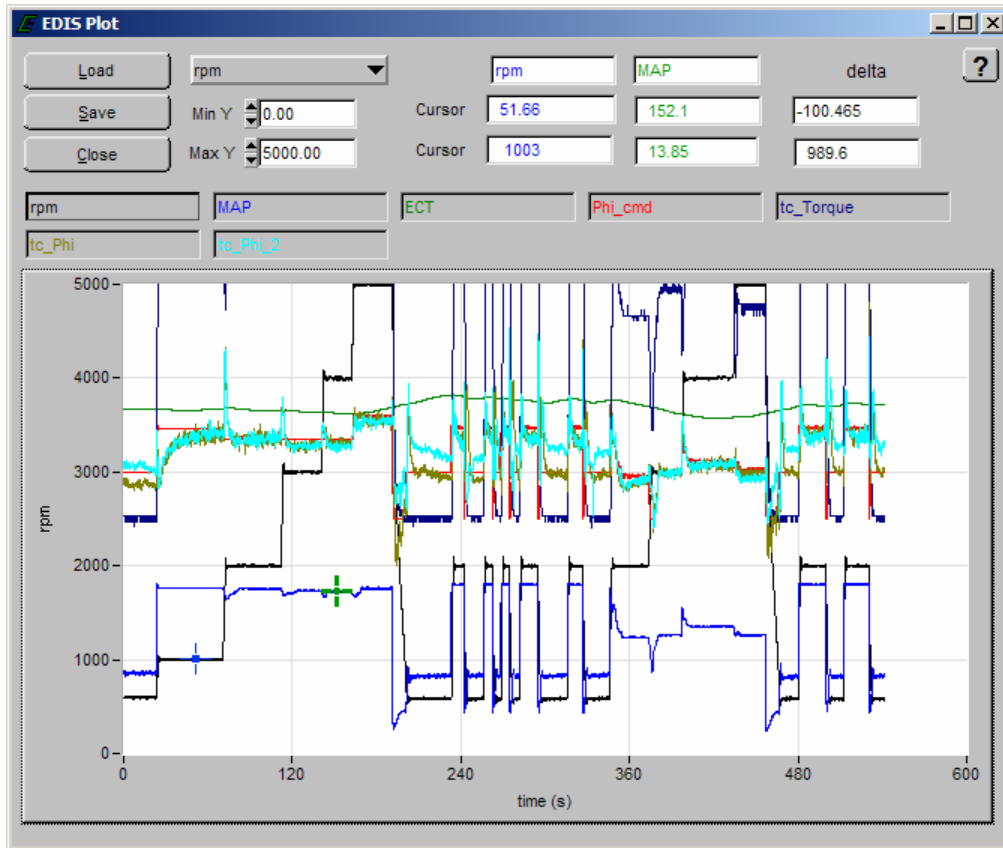


Figure 26: EDIS Plot Snapshot

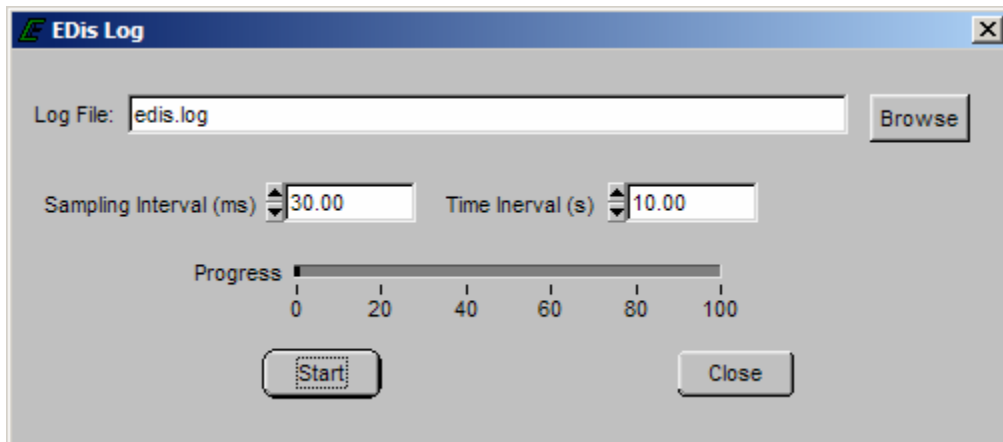
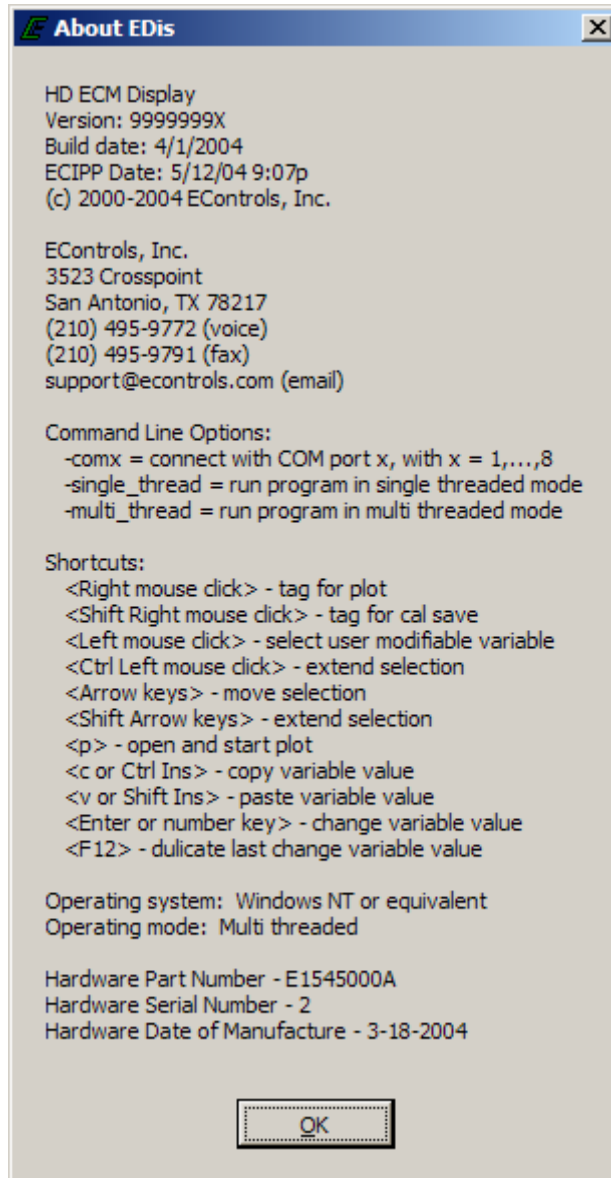


Figure 27: EDIS Log Interface

VI. Help Menu Functions

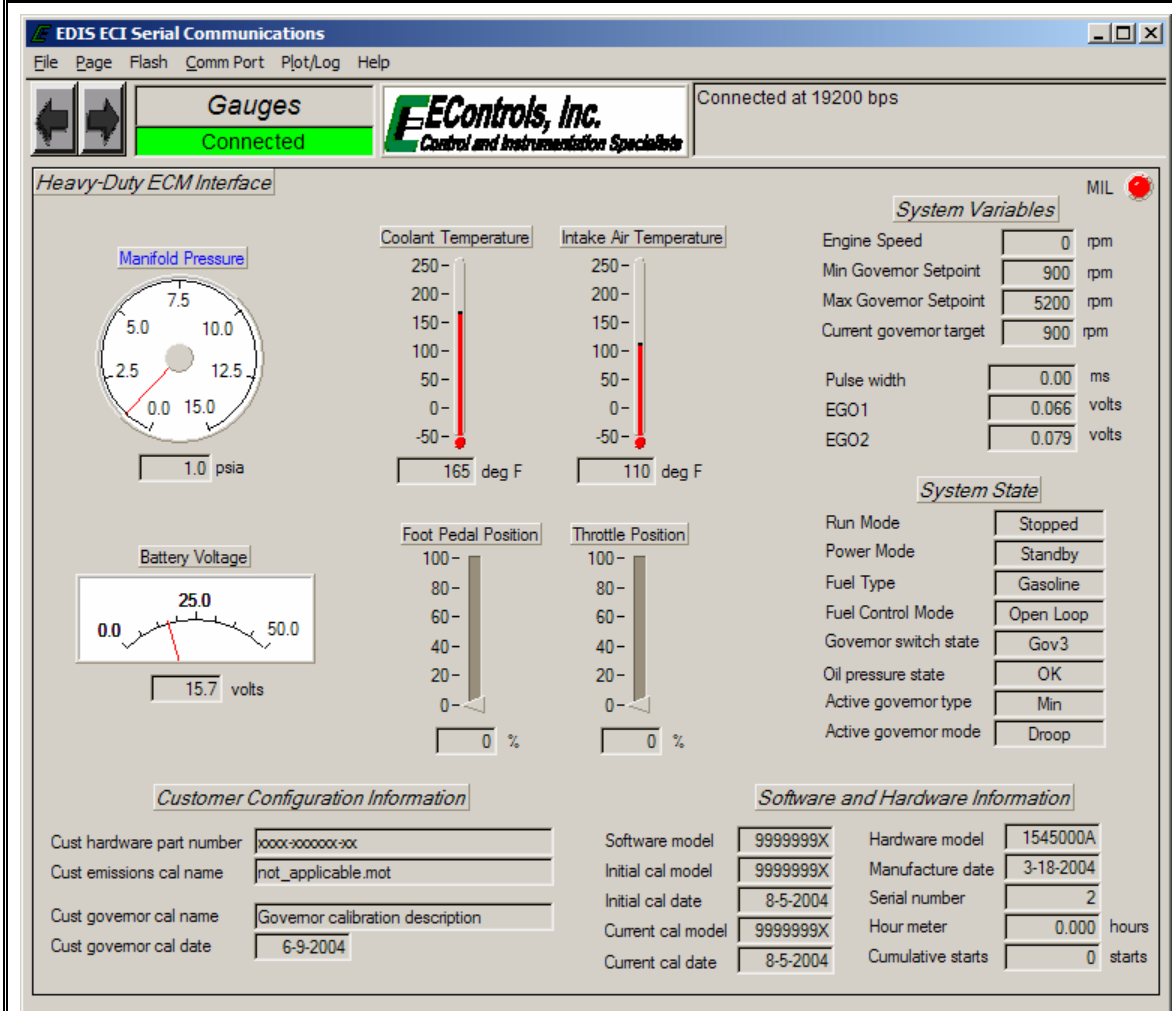
- **About:** Documents the EDIS version information, displays information about the connected target, and displays keyboard shortcuts for software navigation.



E. Pages

1. Gauges Page

Main Function: Initial screen shown at start-up. Presents visual indication of most viewed information.



Secondary Functions:

- Displays ECI and customer configuration information including the ECM's part numbers, displays the customer's emissions calibration MOT filename, and displays governor calibration information
- Displays system states based on current operating conditions

2. GovCal Page

Main Function: Contains calibration variables that define the engine's electronic governors (for use with electronic throttle only).

The screenshot displays the 'GovCal' software interface for EControls, Inc. The window title is 'EDIS ECI Serial Communications'. The interface includes a status bar at the top showing 'GovCal' as 'Connected'. The main area is divided into several sections for configuring governor parameters:

- Standard Isochronous Governor Gains and Parameters:** A table with columns for Speed (rpm), Kp rpm (%/krpm), Ki rpm (%/krpm/s), Kd rpm (%/krpm/s), KdMAPdt (1/sec), KdMAPdt FB (fraction), Kp dz (rpm), Ki dz (rpm/sec), and I freeze (rpm/sec). Values are shown for speeds of 1000, 1400, 2540, and 4000 rpm.
- Standard Droop Governor Gains and Parameters:** A similar table for droop governors, with values for speeds of 700, 1000, 1500, and 3000 rpm.
- Currently Active Governor Gains and Parameters:** A table showing the currently active governor's parameters, with a 'Gain selection' dropdown set to 'Lookup'.
- Governor Gain Temperature Attenuation Schedule:** A table with columns for ECT (deg F), Kp Multiplier, Ki Multiplier, Kd Multiplier, KMAPdt Multiplier, KMAPdt FB Multiplier, Nominal Load (% adder), Speed (rpm), Window (5ms), and Low-Pass (ms). Values are shown for ECT values of 32, 100, 120, and 140 deg F.
- rpm/dt Filter Parameters:** A table with columns for Speed (rpm), Window (5ms), and Low-Pass (ms). Values are shown for speeds of 800, 1000, 3000, and 4000 rpm.

On the left side, there are input fields for various engine parameters such as Engine Speed, Manifold Pressure, Throttle Inlet Pressure, Coolant Temperature, Manifold Temperature, Spark Advance, Spark governor adv offset, VE final, MAP noload, MAP fullload, Engine Load, Desired Load, Desired MAP, Desired MAPdt, RPM gain selector, RPM trajectory target, RPMdt, RPMdt trajectory target, TPS position, TPS command, TPS GovN command, TPS min gov command, TPS max gov command, Governor switch state, Active Governor type, and Active governor mode.

At the bottom, there are sections for 'Gain Schedule Source' (Fuel Type: Gasoline, Active governor gain schedule: Standard, Gasoline mode governor gains: Standard, LPG mode governor gains: Standard, NG mode governor gains: Standard) and 'Absolute Speed Range Limits' (Minimum speed setpoint limit: 500 rpm, Maximum speed setpoint limit: 5500 rpm).

Secondary Functions:

- Contains the gain schedules for the governors
- Contains the idle speed schedule, individual governor setpoints, and governor filters
- Displays feedback referenced during governor tuning

3. AltGovCal Page

Main Function: Contains an alternate set of calibration variables that define the engine's electronic governor. Allows a single calibration to have up to ten (10) governors and two (2) sets of governor gains for each governor type based on fuel selection.

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

- Alternate Governor Calibration:** A list of engine parameters such as Engine Speed, Manifold Pressure, Throttle Inlet Pressure, Coolant Temperature, Spark Advance, etc., with their current values and units.
- Alternate Isochronous Governor Gains and Parameters:** A table with columns for Speed (rpm), Kp rpm, Ki rpm, Kd rpm, K dMAPdt, K dMAPdt FB, Kp dz, Ki dz, Kd dz, and I freeze. It shows values for speeds of 1500, 1800, 3600, and 4000 rpm.
- Alternate Droop Governor Gains and Parameters:** A similar table for droop governors, with values for speeds of 1500, 2000, 2500, and 3000 rpm.
- Currently Active Governor Gains and Parameters:** A table showing active parameters for a gain selection of 89.9, with values for Kp, Ki, Kd, KMAPdt, KMAPdt FB, Kp dz, Ki dz, and Kd dz.
- Governor Gain Temperature Attenuation Schedule:** A table with columns for ECT (deg F), Kp Multiplier, Ki Multiplier, Kd Multiplier, KMAPdt Multiplier, KMAPdt FB Multiplier, Nominal Load (% adder), rpm, Speed (rpm), Window (5ms), and Low-Pass (ms). It shows values for ECT values of 32, 100, 120, and 140.
- Gain Schedule Source:** A section for selecting fuel type (Gasoline) and governor gain schedules (Standard) for Gasoline, LPG, and NG modes.
- Absolute Speed Range Limits:** A section for setting minimum (500 rpm) and maximum (5600 rpm) speed setpoint limits.
- Min governor, Max governor, Gov1, Gov2, Gov3:** A section for configuring individual governor parameters like Droop, Isochronous, and Disabled settings, along with target speeds and integrator limits.

Secondary Functions:

- Contains gain schedules for alternate governor
- Contains the idle speed schedule, individual governor setpoints, and governor filters for alternate governors
- Displays feedback referenced during governor tuning

4. DBWCal Page

Main Function: Contains the configuration for an electronic throttle and electronic throttle actuation devices.

The screenshot displays the DBWCal configuration page within the EDIS ECI Serial Communications software. The interface is organized into several functional sections:

- Drive-By-Wire Parameters:** Shows real-time engine data including Engine Speed (0 rpm), Manifold Pressure (1.00 psia), Barometric Pressure (8.30 psia), Coolant Temperature (165.0 deg F), and Manifold Temperature (165.0 deg F).
- Throttle Position State:** Displays TPS command (20.0%), TPS position (0.0%), and TPS1/2 percent, voltage, and full values.
- Fuel Pedal State:** Shows FPP command (5.0%), FPP position (0.0%), and FPP1/2 percent, voltage, and full values.
- Fuel Shutoff Parameters:** Configures FSO control (Disabled), FSO engage/disengage speeds (1300/1100 rpm), FSO throttle open speed/position (1500 rpm/50.0%), and MAP FSO engage/hysteresis (0.00 psia).
- DBW Closed-Loop Position Control:** Defines control gains (Kp, Ki, Kd) and integrator values for throttle feedback.
- Load-Limiting Control:** Allows setting load-limiting max load and max TPS, with a table for speed-based limits for Gasoline, LPG, and NG.
- FPP Dashpot Idle Return:** Configures FPP dashpot max (5.0%) and decay (1.0%/sec).
- FPP Slew Rate Control:** Sets low and high FPP maximum slew rates (997.9%/sec).
- FPP->TPS Non-linear Mapping:** Configures non-linear FPP point (25.0%) and non-linear TPS point (10.0%).
- FPP Diagnostic Mode:** Includes a DBW test mode (Off).
- Closed-Stop Braking Function:** Configures throttle closed-stop brake (Disabled) and TPS delta (0.800 volts).
- Open-Stop Braking Function:** Configures throttle open-stop brake (Disabled) and TPS delta (0.800 volts).
- Min-MAP Control Parameters:** Defines minimum MAP control (Enabled), target (3.50 psia), pseudo (3.50 psia), Ki (1.00 psi/psi/sec), and authority (10.0% TPS).
- Foot pedal configuration:** Sets primary/secondary foot pedal modes (Throttle Contr/Disabled) and active foot pedal mode (Throttle Control).

Secondary Functions:

- Contains the Load-Limiting calibration to limit engine power output as a function of speed or coolant temperature
- Contains the Fuel Shutoff calibration to define fuel shutoff operating conditions
- Contains the MIN-MAP calibration to define the minimum MAP target during decelerations (permits electronic throttles to open reducing manifold vacuum and lean misfire)
- Displays calibration and feedback pertaining to electronic throttle and throttle actuation calibrations

5. LoadCal Page

Main Function: Defines the engine's no-load and full-load manifold air pressure curves based on engine speed for engine load scaling and torque shaping.

Load/Torque Parameters

Engine Speed	600	rpm
Manifold Pressure	1.00	psia
Barometric Pressure	14.70	psia
Throttle Inlet Pressure	30.00	psia
Coolant Temperature	190.0	deg F
Cylinder Head Temp	190.0	deg F
Manifold Temperature	198.0	deg F
Intake Air Temperature	200.0	deg F
TPS command	20.0	%
TPS position	0.0	%
FPP command	0.0	%
TPS1 voltage	0.005	volts
TPS2 voltage	0.000	volts

Governor Load Range Calibration

Speed (rpm)	No-Load MAP (psia)	Full-Load MAP (psia)
400	2.50	45.00
650	2.50	20.00
800	2.50	20.00
1000	2.00	27.50
1100	2.00	30.00
1200	2.00	32.50
1300	2.00	34.30
1400	2.00	35.00
1600	2.00	35.00
1800	2.00	35.00
2000	2.00	35.00
2300	2.00	35.00
2500	2.00	28.00
2700	2.00	27.00
3000	2.00	27.00
3300	2.00	27.00

Engine Torque Estimation

Speed (rpm)	Zero Torque MAP (psia)	Max Torque MAP (psia)	Torque (N-m)
400	5.50	18.00	450.0
650	4.70	20.00	550.0
800	4.30	20.00	650.0
1000	3.90	27.00	820.0
1100	3.73	28.50	895.0
1200	3.61	32.50	940.0
1300	3.65	34.00	960.0
1400	3.72	35.00	980.0
1600	4.05	35.00	950.0
1800	4.34	35.00	915.0
2000	4.73	35.00	875.0
2300	5.70	35.00	795.0
2500	7.14	28.00	260.0
2600	7.60	20.00	0.0
3000	8.90	20.00	0.0
3300	9.20	20.00	0.0

TIP based full-load rescaling: (dropdown)

Load estimation type: (dropdown)

Current estimated zero torque MAP: 4.86 psia

Current estimated max torque MAP: 19.60 psia

Current estimated max torque: 530.0 N-m

Current estimated torque: 0.0 N-m

Current estimated torque: 0.0 %

J1939 engine config reference torque: 1080.0 N-m

Secondary Functions:

- Defines torque estimation for data broadcast through EDIS and on CAN

6. FilterCal Page

Main Function: Defines software filters for throttle position, fuel pressure, throttle inlet pressure, waste-gate pressure, manifold air pressure, and crankshaft position sensor feedback.

The screenshot displays the FilterCal software interface with the following sections and parameters:

Filter Calibrations

- Engine Speed: 0 rpm
- Manifold Pressure: 1.00 psia
- Coolant Temperature: 165.0 deg F
- Cylinder Head Temp: 165.0 deg F
- Manifold Temperature: 165.0 deg F
- Intake Air Temperature: 110.0 deg F

MAP / MAPdt Filtering

- MAP raw tau: 3.000 ms
- MAP average window: 5 ms
- MAP slow avg window: 20 ms
- MAPdt window: 15 ms
- MAPdt tau: 10.000 ms
- MAPdt: 0.0 psi/sec
- MAPdt_dz: 0.0 psi/sec
- MAPdt crank dz: 998.9 psi/sec
- MAPdt normal dz: 19.9 psi/sec
- MAP CAD project: 270 CAD
- MAP effective: 2.00 psia

RPM / RPMdt Filtering

- rpm slow average: 30 ms
- rpmdt: 0 rpm/sec

rpmdt Filter Parameters

Speed (rpm)	Window (5ms)	Low-Pass (ms)
800	30	5.000
1000	30	5.000
3000	15	1.000
4000	15	1.000
	30	5.000

TPS / TPSdt Filtering

- TPS1 percent: 0.0 %
- TPS1 voltage: 0.005 volts
- TPS raw tau: 1.500 ms
- TFBdt: 0.4 %/sec
- TFBdt window: 3 ms
- TFBdt tau: 2.000 ms

Misc Pressure Filtering

- FP raw filter: 19.999 ms
- TIP raw filter: 19.999 ms
- EGO derivative interp window: 4 T_delay
- TIP_slow: 8.32 psia
- WGPrav_LP: 5.0 ms

MAP Noise Cancellation

Speed (rpm)	Phase (CAD)	P-P Mag (psi)
1000	-30	0.00
1800	-25	0.00
3000	-20	0.00
3600	-10	0.00

7. Configure Page

Main Function: Defines the engine hardware configuration.

The screenshot displays the 'Configure' page of the EDIS ECI Serial Communications software. The interface is organized into several functional sections:

- System Variables:** Displays real-time engine data such as Engine Speed (0 rpm), Manifold Pressure (14.64 psia), Coolant Temperature (182.8 deg F), and Intake Air Temperature (162.6 deg F).
- System State:** Shows engine status including Run Mode (Stopped), Power Mode (Standby), Fuel Type (Propane), and Governor switch state (None).
- Engine Volumes:** Configures intake and exhaust volume limits (e.g., Intake volume lower: 2.97 liters).
- EGO Configuration:** Sets up EGO sensor configurations for EGO1, EGO2, EGO3, and EGO4.
- Oil Pressure Configuration:** Defines oil pressure switch state, sender pressure (100.0 psig), and sensor type (Switch).
- Governor 1/2 Switch Input Configuration:** Configures governor input and state configurations.
- Fuel Run-Out Configuration:** Sets fuel run-out feature (Disabled) and time limit (5000 ms).
- Tachometer Configuration:** Configures tachometer output mode (1 pulse/cylinder) and custom frequency (4.00 pulses/rev).
- Fuel Switching/Control Configuration:** Defines fuel type select input pin (Aux DIG1) and fuel configuration (Gnd/Open=Gsln, +V=LP).
- Gaseous Fuel Configuration:** Configures fuel trim mode (Megajector) and gaseous fuel coil kill diagnostic (Disallow).
- Sensor Calibrations:**
 - MAP Sensor:** Configures volts (1.412, 3.840) and psia (5.14, 13.96) values, along with MAP sensor constant (18.16 psi / 5V) and offset (0.02 psia).
 - TIP Sensor Calibration:** Configures TIP sensor volts (0.300, 4.800) and psia (2.91, 29.09) values, along with TIP constant (29.09 psi / 5V) and offset (1.16 psia).
 - Oil Sender Sensor Calibration:** Configures volts (0.500, 4.500) and psig (0.00, 100.00) values, along with OIP sender constant (125.00 psi / 5V) and offset (-12.50 psig).
- Multi-Engine Configuration:** Sets multi-engine selection (Master / Single) and status (Master / Single).
- Engine Derate:** Configures force idle min-governor speed (1000 rpm).

Secondary Functions:

- Defines feedback pressure sensor calibrations
- Defines the engine's fuel, sensor, and manifold configuration
- Defines the engine's derate and multi-engine synchronization configurations
- Displays the system state based on current operating conditions

8. Outputs Page

Main Function: Configures starter relay control and user configurable low-side outputs used to control LEDs, audible warning devices, and relays.

The screenshot displays the 'Outputs' configuration page within the 'EDIS ECT Target Communications' application. The interface includes a menu bar (File, Page, Flash, Comm Port, Plot/Log, Help) and a toolbar with navigation icons. The main area is titled 'Outputs' and shows a 'Connected' status. The configuration is organized into several panels:

- Actuator Calibration:** Shows real-time sensor data such as Engine Speed (3011 rpm), Manifold Pressure (1.00 psia), Coolant Temperature (190.0 deg F), and Intake Air Temperature (200.0 deg F).
- User Configurable Output #1-3 Configuration:** Three panels for configuring outputs. Each panel includes:
 - Configurable output channel status (e.g., Disabled).
 - Engine states (stopped, cranking, running) and current output state (Off/On/Open).
 - 'Turn ON if' conditions: RPM, MAP, ECT, Oil Press, Battery, Aux PD1, Aux PU1, and Aux DIG1 with associated thresholds and logic (e.g., 'and', 'or', 'longer than').
 - 'Turn OFF if' conditions: Similar logic for turning the output off.
- Electronic Thermostat Control (ETHC):** Controls for ETHC enable (Disabled), output state (Off), and thresholds (240.0 deg F, -50.0 deg F).
- Max User Setpoint Activity Indication:** Controls for speed control activity output (Disabled) and approach indication windows for RPM and KPH.
- Warning Outputs:** Configuration for soft warning output channels, including blink/pulse on-time and off-time (500 ms).
- Crank-Limiter/Auto-Crank Configuration:** Settings for starter control mode (Disabled), output channel (Standard), auto-crank trigger input (AUX PU1 = Gnd), and crank limiter window (8.0 sec).

9. Knock Page

Main Function: Configures the engine's knock calibration.

The screenshot displays the 'Knock' page in the EDIS ECI Serial Communications software. The interface is divided into several sections:

- Knock Control System Calibration:** A large table of parameters including Engine Speed, Manifold Pressure, Coolant Temperature, Cylinder Head Temp, Manifold Temperature, Intake Air Temperature, and various gain/offset settings for the knock sensor system.
- Knock Window Start/Duration:** Tables showing MAP (psia) values for different engine speeds (10.0, 11.5, 13.0, 14.0 rpm).
- Cylinder/Knock Sensor Associations:** A table mapping F.O. Cyl (1-8) to Sensor (Sensor 1 or Sensor 2).
- Individual Cylinder Spark Modifiers:** A table for setting CAD Advance for each cylinder (1-8).
- Knock 0% and 100% Calibration:** Tables for setting MAP (psia) and RMS volts for different engine speeds.
- Knock Max Retard:** A table for setting MAP (psia) and Knock mode for different engine speeds.
- Knock band-pass filter selection:** A dropdown menu set to 'Disabled'.
- Knock software gain and hardware scaling:** Input fields for multiplier and volts/full-scale.
- Knock register refresh:** An input field set to 5000 ms.
- Knock Window-Sampled Data Plot:** A graph showing Knock RMS Volts (0.000 to 5.000) vs CAD BTDC #1 (-360.0 to 360.0).
- Knock Raw Cycle-Sample Data Plot:** A graph showing Knock RMS Volts (0.000 to 5.000) vs CAD BTDC #1 (-360.0 to 360.0).

Secondary Functions:

- Contains a table for spark advance of individual cylinders
- Displays plots of real-time knock sensor feedback for knock window definition and knock sensor assignment
- Displays feedback pertinent to knock calibration

10. SparkCal Page

Main Function: Contains the base spark advance map for the engine when operating on Gasoline.

EDIS ECI Serial Communications
Link error - attempting reconnect...
Connected at 19200 bps

SparkCal
Connected

Control and Instrumentation Specialists

Toggle Page - F9
Toggle Test Cell - F10

Base Spark - Gasoline
Gasoline Base Spark Advance
MIL ●

MAP (psia)

	4.4	5.8	7.2	8.7	10.2	11.6	13.1	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
700	2.5	2.5	2.5	5.0	6.0	7.0	8.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
800	3.0	4.0	5.0	6.0	7.0	8.0	9.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
1000	9.0	10.0	11.0	12.0	13.0	14.0	17.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
1200	11.0	12.0	13.0	14.0	15.0	16.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
1600	16.0	19.0	19.0	19.0	19.5	20.0	20.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
2000	23.0	25.0	26.0	25.5	24.5	24.0	20.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
2400	27.0	29.0	31.0	29.0	28.5	27.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
2800	31.0	35.0	33.5	32.5	32.0	28.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
3200	35.0	36.0	35.0	34.0	33.0	28.0	28.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
3600	34.0	32.0	31.0	30.0	30.0	27.0	26.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
4000	34.0	32.0	31.0	30.0	29.0	29.0	26.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
4400	34.0	32.0	30.0	30.0	29.0	29.0	27.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
4800	34.0	32.0	30.0	30.0	29.0	29.0	28.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
5000	34.0	32.0	30.0	30.0	29.0	29.0	28.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
5200	34.0	32.0	30.0	30.0	29.0	28.0	27.0	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
5400	34.0	32.0	30.0	29.0	29.0	28.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0

CAD BTDC

Engine Speed rpm

Manifold Pressure psia

Coolant Temperature deg F

Cylinder Head Temp deg F

Manifold Temperature deg F

Intake Air Temperature deg F

Pulse width ms

Knock control system

Instant KNK voltage volts

Instant KNK percent %

Average KNK %

Total Spark Advance CAD BTDC

Base Spark Advance CAD BTDC

CHT Max Advance CAD BTDC

CHT-MAP Adv Offset CAD BTDC

MAT-MAP Adv Offset CAD BTDC

CHT Adv Offset CAD BTDC

CTM Spark Advance CAD BTDC

CWT Retard CAD

KNK Retard CAD

Spark Gov Adv Offset CAD BTDC

Global Adv Offset CAD BTDC

Spk Adv dead-zone CAD

Spk Adv dead-zone tau ms

Spark kill

Adaptive dwell control

Min adaptive dwell delta ms

Max adaptive dwell delta ms

Adaptive dwell sample margin ms

Adaptive dwell gain ms/volt

Adaptive dwell step max ms

Base dwell ms

Coil 1 dwell ms

Coil 2 dwell ms

Coil 3 dwell ms

Spark coil 1 primary drive volts

Spark coil 2 primary drive volts

Spark coil 3 primary drive volts

Secondary Functions:

- Displays feedback and command information pertinent to defining the spark calibration

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11. SparkOfst Page

Main Function: Contains the spark advance offset calibrations based on cylinder head temperature and manifold air temperature for the engine when operating on Gasoline.

EDIS ECI Serial Communications

File Page Flash Comm Port Plot/Log Help

SparkOfst **Connected**  Link error - attempting reconnect... Connected at 19200 bps

Toggle Page - F9
Toggle Test Cell - F10

Spark Offset - Gasoline & General

Fuel Type: Gasoline

Engine Speed: 0 rpm

Manifold Pressure: 1.00 psia

Coolant Temperature: 165.0 deg F

Cylinder Head Temp: 165.0 deg F

Manifold Temperature: 165.0 deg F

Intake Air Temperature: 110.0 deg F

Total Spark Advance: -9.5 CAD BTDC

Base Spark Advance: -10.0 CAD BTDC

CHT Max Advance: 50.0 CAD BTDC

CHT-MAP Adv Offset: 0.0 CAD BTDC

MAT-MAP Adv Offset: 0.0 CAD BTDC

CHT Adv Offset: 0.0 CAD BTDC

CTM Spark Advance: 0.0 CAD BTDC

CWT Retard: 0.0 CAD

KNK Retard: 0.0 CAD

Spark Gov Adv Offset: 0.0 CAD BTDC

Global Adv Offset: 0.0 CAD BTDC

CWT Spark Modifiers

CWT+retard - gasoline: 0.2 CAD / %

CWT+retard - LPG: 0.1 CAD / %

CWT+retard - NG: 0.0 CAD / %

CWT-retard - gasoline: 0.0 CAD / %

CWT-retard - LPG: 0.0 CAD / %

CWT-retard - NG: 0.0 CAD / %

CWT+retard limit: 5.0 CAD

CWT-retard limit: 3.0 CAD

CWT VE correction: 0.0 %

Spark CHT Offset

CHT (deg F)	CAD
-40	5.0
-20	5.0
0	5.0
20	4.0
32	3.0
50	3.0
70	3.0
90	2.0
110	2.0
130	1.0
155	0.0
160	0.0
190	0.0
200	0.0
230	0.0
240	0.0
260	0.0

Gasoline Temperature Based Spark Offsets

Gasoline Temperature (deg F)	MAP (psia)							
	4.4	5.8	7.2	8.7	10.2	11.6	13.1	14.5
-40	8.0	8.0	6.0	5.5	4.5	3.5	2.5	0.0
-20	7.5	7.5	6.0	5.0	4.0	3.0	2.0	0.0
0	7.0	7.0	6.0	5.0	4.0	3.0	2.0	0.0
20	7.0	7.0	6.0	5.0	4.0	3.0	2.0	0.0
32	6.5	6.5	5.5	4.5	3.5	2.5	1.5	0.0
50	5.5	5.5	4.5	4.5	3.0	2.0	1.0	0.0
75	5.0	5.0	4.0	4.0	2.5	1.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	2.0	2.0	2.0	1.5	1.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
175	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-1.5
200	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-3.0
220	0.0	0.0	0.0	0.0	-1.0	-2.0	-3.0	-4.5
240	0.0	0.0	0.0	-0.5	-1.5	-2.5	-3.0	-4.5
260	0.0	0.0	0.0	-0.5	-1.5	-3.0	-3.5	-4.5
280	0.0	0.0	0.0	-1.0	-2.0	-3.0	-4.0	-5.0

MAP (psia) Based Spark Offsets

MAP (psia)	MAT (deg F)							
	3.0	4.5	10.0	12.0	14.0	16.0	18.0	21.0
-40	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
-20	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
20	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
32	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
150	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
175	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
200	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
225	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
240	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
250	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
280	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0

CAD BTDC

12. SparkCaING Page

Main Function: Contains the base spark advance and spark advance offset calibrations for the engine when operating on Natural Gas.

EDIS ECI Serial Communications
Eje Page Flash Comm Port Plot/Log Help

SparkCaING
Connected

Control and Instrumentation Specialists

Link error - attempting reconnect...
 Connected at 19200 bps

Toggle Page - F9
 Toggle Test Cell - F10

Spark Calibration - NG

Fuel Type: Gasoline

Engine Speed: rpm

Manifold Pressure: psia

Coolant Temperature: deg F

Cylinder Head Temp: deg F

Manifold Temperature: deg F

Intake Air Temperature: deg F

CWT Spark Modifiers

CWT+ retard - NG: CAD/%

CWT- retard - NG: CAD/%

CWT+ retard limit: CAD

CWT- retard limit: CAD

CWT VE correction: %

NG Base Spark Advance		MAP (psia)													
	4.4	5.8	7.2	8.7	10.2	11.6	13.1	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
700	2.5	2.5	2.5	5.0	6.0	7.0	8.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
800	3.0	4.0	5.0	6.0	7.0	8.0	9.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
1000	9.0	10.0	11.0	12.0	13.0	14.0	17.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
1200	11.0	12.0	13.0	14.0	15.0	16.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
1600	16.0	19.0	19.0	19.0	19.5	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
2000	23.0	25.0	26.0	25.5	24.5	24.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
2400	27.0	29.0	31.0	29.0	28.5	28.0	26.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
2800	31.0	35.0	33.5	32.5	32.0	29.0	28.5	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
3200	35.0	36.0	35.0	34.0	33.0	32.5	30.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
3600	36.0	36.0	35.0	35.0	35.0	33.0	31.5	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
4000	36.0	36.0	35.0	35.0	35.0	33.0	31.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
4400	36.0	36.0	35.0	35.0	35.0	33.5	31.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
4800	36.0	36.0	36.0	35.0	35.0	33.5	34.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
5000	36.0	36.0	36.0	35.0	35.0	33.5	33.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
5200	36.0	36.0	36.0	35.0	35.0	33.0	32.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0
5400	36.0	36.0	36.0	35.0	35.0	32.0	32.0	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5

NG CHT Spark Offset		MAP (psia)							NG MAT Spark Offset		MAP (psia)						
CHT (deg F)	3.0	4.5	6.0	8.0	10.0	12.0	13.5	14.0	MAT (deg F)	3.0	4.5	10.0	12.0	14.0	16.0	18.0	21.0
-40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	145	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180	0.0	0.0	0.0	-1.0	-2.0	-2.0	-2.0	-2.0
240	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	220	0.0	0.0	0.0	-1.0	-3.0	-3.0	-3.0	-4.0
260	0.0	0.0	0.0	-1.0	-2.0	-2.0	-2.0	-2.0	230	0.0	0.0	0.0	-2.0	-4.0	-4.0	-5.0	-5.0
280	-1.0	-1.0	-1.0	-3.0	-3.0	-3.0	-3.0	-3.0	240	0.0	0.0	-2.0	-3.0	-5.0	-5.0	-6.0	-6.0

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13. SparkCallP Page

Main Function: Contains the base spark advance and spark advance offset calibrations for the engine when operating on Liquefied Propane.

EDIS ECI Serial Communications
EControls, Inc.
Control and Instrumentation Specialists

SparkCallP
Connected

Link error - attempting reconnect...
Connected at 19200 bps

Toggle Page - F9
Toggle Test Cell - F10

Spark Calibration - LPG

Fuel Type: Gasoline

Engine Speed: rpm

Manifold Pressure: psia

Coolant Temperature: deg F

Cylinder Head Temp: deg F

Manifold Temperature: deg F

Intake Air Temperature: deg F

CWT Spark Modifiers

CWT+retard - LPG: CAD/%

CWT-retard - LPG: CAD/%

CWT+retard limit: CAD

CWT-retard limit: CAD

VE_CWT_crct_pct: %

LPG Base Spark Advance										MAP (psia)							
	4.4	5.8	7.2	8.7	10.2	11.6	13.1	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
700	2.5	2.5	2.5	5.0	6.0	7.0	8.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
800	3.0	4.0	5.0	6.0	7.0	8.0	9.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
1000	9.0	10.0	11.0	12.0	13.0	14.0	17.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
1200	11.0	12.0	13.0	14.0	15.0	16.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
1600	16.0	19.0	19.0	19.0	19.5	20.0	20.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
2000	23.0	25.0	26.0	25.5	24.5	24.0	20.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
2400	27.0	29.0	31.0	29.0	28.5	27.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
2800	31.0	35.0	33.5	32.5	32.0	28.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
3200	35.0	36.0	35.0	34.0	33.0	28.0	28.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
3600	34.0	32.0	31.0	30.0	30.0	27.0	26.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
4000	34.0	32.0	31.0	30.0	29.0	29.0	26.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
4400	34.0	32.0	30.0	30.0	29.0	29.0	27.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
4800	34.0	32.0	30.0	30.0	29.0	29.0	28.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
5000	34.0	32.0	30.0	30.0	29.0	29.0	28.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
5200	34.0	32.0	30.0	30.0	29.0	28.0	27.0	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
5400	34.0	32.0	30.0	29.0	29.0	28.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0

LPG CHT Spark Offset

	MAP (psia)							
CHT (deg F)	3.0	4.5	6.0	8.0	10.0	12.0	13.5	14.0
-40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
240	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
260	0.0	0.0	0.0	-1.0	-2.0	-2.0	-2.0	-2.0
280	-1.0	-1.0	-1.0	-3.0	-3.0	-3.0	-3.0	-3.0

LPG MAT Spark Offset

	MAP (psia)							
MAT (deg F)	3.0	4.5	10.0	12.0	14.0	16.0	18.0	21.0
-40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180	0.0	0.0	0.0	-1.0	-2.0	-2.0	-2.0	-2.0
220	0.0	0.0	0.0	-1.0	-3.0	-3.0	-3.0	-4.0
230	0.0	0.0	0.0	-2.0	-4.0	-4.0	-5.0	-5.0
240	0.0	0.0	-2.0	-3.0	-5.0	-5.0	-6.0	-6.0

Total Spark Advance	<input type="text" value="-9.5"/>	CAD BTDC
Base Spark Advance	<input type="text" value="-10.0"/>	CAD BTDC
CHT Max Advance	<input type="text" value="50.0"/>	CAD BTDC
CHT-MAP Adv Offset	<input type="text" value="0.0"/>	CAD BTDC
MAT-MAP Adv Offset	<input type="text" value="0.0"/>	CAD BTDC
CHT Adv Offset	<input type="text" value="0.0"/>	CAD BTDC
CTM Spark Advance	<input type="text" value="0.0"/>	CAD BTDC
CWT Retard	<input type="text" value="0.0"/>	CAD
KNK Retard	<input type="text" value="0.0"/>	CAD
Spark Gov Adv Offset	<input type="text" value="0.0"/>	CAD BTDC
Global Adv Offset	<input type="text" value="0.0"/>	CAD BTDC

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14. VECal Page

Main Function: Defines the engine's volumetric efficiency calibration.

The screenshot displays the VECal software interface. At the top, it shows 'EDIS ECI Serial Communications' with a status of 'Connected'. The main area is titled 'VE Calibration' and features a large table of Volumetric Efficiency (VE) values. The table is organized by MAP (psia) on the x-axis (0.0 to 15.0) and Speed (rpm) on the y-axis (200 to 5200). The current operating point is highlighted at 2000 rpm and 30.0 psia, showing a VE of 66.5%. Below the table, there are several parameter settings for VE, including 'VE standard' (35.7%), 'VE final' (0.1%), and various correction factors (EBP, MAT, ECT). To the right of the table, there are sections for temperature estimates: 'Cylinder Head Temperature Estimate', 'Cylinder Wall Temperature Estimate', and 'Manifold Air Temperature Estimate', each with adjustable parameters like span, offset, and tau. At the bottom right, there are sections for 'Manifold Air Pressure Estimate' and 'Exhaust Back Pressure Estimate' with their respective parameters.

Secondary Functions:

- Defines the model-based calibrations for cylinder head temperature, cylinder wall temperature, manifold air pressure, effective manifold air pressure, and exhaust back-pressure.

15. Boost Page

Main Function: Defines a turbocharged or supercharged engine's boost control calibration

EDIS ECI Target Communications
 Efile Page Flash Comm Port Plot/Log Help
 Boost Connected
 EControls, Inc. Control and Instrumentation Specialists
 Connected at 19200 bps
 Toggle Page - F9
 Toggle Test Cell - F10

Boost Calibration MIL

Engine Speed: 600 rpm
 Manifold Pressure: 1.00 psia
 Throttle Inlet Pressure: 30.00 psia
 Barometric Pressure: 14.70 psia
 Coolant Temperature: 190.0 deg F
 Cylinder Head Temp: 190.0 deg F
 Manifold Temperature: 198.0 deg F
 Intake Air Temperature: 200.0 deg F

Boost Pressure Command (abs-TIP or delta-P)

Speed (rpm)	Load Cmd (%)								No-Load MAP (psia)	Full-Load MAP (psia)	
	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0			
750	4.00	4.00	4.00	3.50	2.00	1.50	0.80	0.00	400	2.50	45.00
1000	4.00	4.00	4.00	3.50	2.00	1.50	0.80	0.00	650	2.50	20.00
1200	4.00	4.00	4.00	3.50	2.00	1.50	0.80	0.00	800	2.50	20.00
1400	4.00	4.00	4.00	3.50	2.00	1.50	0.80	0.00	1000	2.00	27.50
1600	4.00	4.00	4.00	3.50	2.00	1.50	0.80	0.00	1100	2.00	30.00
2000	4.00	4.00	3.00	2.00	2.00	1.50	0.80	0.00	1200	2.00	32.50
2200	3.00	3.00	2.00	2.00	2.00	1.50	0.80	0.00	1300	2.00	34.30
2500	3.00	3.00	2.00	2.00	2.00	1.50	0.80	0.00	1400	2.00	35.00
									1600	2.00	35.00
									1800	2.00	35.00
									2000	2.00	35.00
									2300	2.00	35.00
									2500	2.00	28.00
									2700	2.00	27.00
									3000	2.00	27.00
									3300	2.00	27.00

TIP Control Loop

TIP feedback Kp: 1.0 WGP/TIP
 TIP feedback Ki: 0.2 WGP/TIP/s
 TIP feedback Kd: 0.10 WGP/(TIP/sec)
 TIP feedback Kiv: 0.10 WGP/TIP/sec
 TIP derivative (dTIP/dt): 0.00 psi/sec
 TIP derivative dz limited: 0.00 psi/sec
 TIP derivative window: 20 ms
 TIP derivative low-pass tau: 5.0 ms
 TIP derivative cubic dz limit: 2.00 psi/sec
 WGP neutral actuator pressure: 14.00 psig
 TIP control loop integrator: -11.00 WGP
 WGP target output low-pass: 5.0 ms
 TIP control WGP target (initial): 25.00 WGP (psig)
 TIP control WGP target (final): 25.00 WGP (psig)

TIP/Delta-P Control Parameters

Boost control mode: delta-P
 Boost WGP pressure source: Constant Supply
 Boost WGP constant supply: 25.00 psig
 FPP command: 0.0 %
 Boost target load command: 0.0 %
 Boost target IAT correction: 1.000 multiplier
 Boost target MAT derate: 0.810 multiplier
 Total boost target correction/derate: 0.810 multiplier
 Boost target BP limit: 100.00 psia
 Boost temp comp nominal IAT: 120.0 deg F
 Delta-P boost control TPS command: 0.0 %
 Delta-P boost control TIP-MAP target: 4.00 psi
 Delta-P boost control MAP target: 2.02 psia
 Boost control TIP target: 6.02 psia

WGP Control Loop

WGP control test mode: Disabled
 WGP gage pressure: 0.00 psig
 WGP derivative (dWGP/dt): 0.0 psi/sec
 WGP derivative target: 0.0 psi/sec

Non-linear WGP Target Mapping

WGP in (psig)	WGP out (psig)	MAT (deg F)	Limit (mult)
0.00	0.00	-40	1.200
1.50	3.00	120	1.050
3.00	5.00	140	1.050
4.50	6.00	160	1.050
7.00	7.00	180	0.900
9.50	8.00	200	0.800
12.00	9.00	210	0.700

Boost MAT Temp Correction Limit/Derate

TIP based full-load rescaling: Disabled

Secondary Functions:

- Defines boost bypass waste-gate control
- Configures TIP sensor control parameters
- Defines Turbine Energy Injection calibration

16. TranCal Page

Main Function: Defines the engine's transient fueling calibration for the engine when operating on Gasoline.

The screenshot shows the TranCal software interface. At the top, it displays 'EDIS ECI Serial Communications' and 'TranCal Connected'. The main area is titled 'Transient and Cold Calibration - Gasoline'. It features a list of engine parameters on the left and two calibration tables on the right.

Engine Parameters:

- Engine Speed: 0 rpm
- Manifold Pressure: 1.00 psia
- Coolant Temperature: 165.0 deg F
- Cylinder Head Temp: 165.0 deg F
- Manifold Temperature: 165.0 deg F
- Intake Air Temperature: 110.0 deg F
- Total Spark Advance: -9.5 CAD BTDC
- Pulse width: 0.00 ms
- mass fuel port: 0.0 mg/intake
- mdot fuel port: 0.00 g/sec
- Cww enrich: 140.0 %
- Cww enlean: 125.0 %
- wall-wet dead-zone: 4.00 %
- mass fuel wall-wet: 0.0 mg/intake
- Start adder: 40.0 %
- Start multiplier: 100.0 %
- mass fuel start: 0.0 mg/intake
- mass fuel choke: 0.0 mg/intake
- mass fuel port: 0.0 mg/intake
- Run timer: 0 sec
- Crank cycles: 0.0 cycles
- EGO1: 0.091 volts
- EGO2: 0.117 volts

Wall-Wetting Calibration Table:

CHT (deg F)	Enrichment		Enleanment	
	Cww (%)	Tau (cyl events)	Cww (%)	Tau (cyl events)
-40	500.0	7.0	500.0	1.0
-20	500.0	7.0	500.0	1.0
0	500.0	7.0	500.0	1.0
25	400.0	7.0	400.0	1.0
50	350.0	5.0	350.0	1.0
70	300.0	5.0	300.0	1.0
90	200.0	5.0	200.0	1.0
110	200.0	5.0	200.0	1.0
130	175.0	4.0	154.0	1.0
155	150.0	2.5	140.0	1.0
175	130.0	2.5	110.0	1.0
200	100.0	2.5	100.0	1.0
205	75.0	2.5	75.0	1.0
210	75.0	2.5	75.0	1.0
220	75.0	2.5	75.0	1.0
240	50.0	2.5	50.0	1.0

Cww Speed-CHT Attenuation Table:

Speed (rpm)	CHT (deg F)			
	0	90	100	160
1200	1.000	1.000	1.000	1.000
1500	1.000	1.000	1.000	0.600
1800	1.000	1.000	0.800	0.400
3300	1.000	1.000	0.500	0.300

Cww Multiplier:

Secondary Functions:

- Contains the cylinder wall-wetting gain schedule based on engine speed and cylinder head temperature.

17. Starting Page

Main Function: Contains the fuel and spark advance calibration for starting.

Starting / Cranking Calibration - Gasoline

Gasoline Cranking Fuel Modifiers

Crank Fuel Adder	Crank Fuel Multiplier	
	CHTcrank (F)	Crank Fuel (%)
-40	1200.0	0.00
-18	1100.0	0.90
3	1000.0	1.00
25	680.0	2.00
46	460.0	3.00
68	290.0	4.00
90	170.0	5.00
111	120.0	6.00
133	80.0	7.00
154	50.0	8.00
176	30.0	9.00
198	25.0	10.00
219	20.0	20.00
241	15.0	30.00
250	10.0	40.00
251	10.0	50.00

Gasoline Afterstart Fuel Modifiers

Choked Fuel Adder Calibration			
CHTcrank (F)	Add (%)	Hold (sec)	Decay (sec)
-40	110.0	8.0	65.0
-18	98.0	7.0	60.0
0	88.0	6.0	55.0
25	75.0	5.0	50.0
46	65.0	4.0	45.0
68	55.0	3.0	40.0
90	45.0	2.0	35.0
110	35.0	2.0	30.0
130	25.0	1.5	25.0
155	15.0	1.0	20.0
175	13.0	0.5	18.0
200	11.0	0.5	15.0
205	10.0	0.5	10.0
210	10.0	0.5	10.0
220	10.0	0.5	10.0
240	10.0	0.5	10.0

Cranking Ignition Advance

CHTcrank (deg F)	MAP (psia)			
	4.0	7.0	10.0	14.0
-20	25.0	25.0	20.0	12.0
20	20.0	15.0	10.0	5.0
50	-10.0	-10.0	-10.0	-10.0
100	-10.0	-10.0	-10.0	-10.0

CHTcrank Equivalent Cranking CHT Estimate

CHTcrank	165.0	deg F
CHTcrank delta from CHT	0.0	deg F
CHTcrank increasing rate	2.50	deg F / sec / 100% load
CHTcrank decreasing rate	0.60	deg F / sec
CHTcrank delta max	80.0	deg F
CHTcrank ceiling	150.0	deg F

Starting Statistics

Pre-sync teeth	2	teeth
Post-sync teeth to run	0	teeth
Post-sync theoretical first fire	0	teeth
Start time	0.3	sec
Average start speed	30	rpm
Sync-loss events	0	count
Invalid large-gap events	0	count

Standard Start Datalogging Parameters:

- RPM
- MAP
- ECT
- TPS
- Vbat
- PW (extended)
- Pre-sync teeth
- Post-sync teeth to run
- Sync-loss events
- Invalid large-gap events

Secondary Functions:

- Contains fuel modifiers for an engine fueled on gasoline
- Displays starting synchronization statistics

18. Fuel Page

Main Function: Contains the injector timing calibration controlling injectors fire during the engine cycle, configures closed-loop fuel pump control, and defines the fuel impurity calibration for inferring gaseous fuel composition.

Injection Timing

Speed (rpm)	3.0	5.0	7.5	10.0	15.0	20.0	25.0	30.0
400	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
650	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
1200	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
1800	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
2400	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
3600	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
4500	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
6000	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0

Closed-Loop Liquid Fuel Pressure Control

- Liquid fuel pressure control: Disabled
- Fuel rail pressure: 0.0 psia
- Fuel rail pressure target: 115.0 psia
- Fuel rail pressure derivative: 0.0 psi/sec
- FP derivative window: 10 ms
- FP derivative low-pass tau: 2.0 ms
- FP feedback Kp: 5.0 %/psi
- FP feedback Ki: 10.0 %/psi/sec
- FP feedback Kd: 1.00 %/psi/sec
- FP feedback Kiv: 1.00 %/psi/sec
- FP feedback integrator: 0.0 %
- FPump command low-pass: 5.0 ms
- FPump command voltage authority: 6.00 +/- volts
- FPump min voltage: 4.00 volts
- FPump max voltage: 10.00 volts
- FPump shutdown max pressure delta: 10.00 psi delta
- FP closed-loop percent command: 0.0 %
- FP control voltage command: 0.00 volts
- FP control PWM duty-cycle command: 0.0 %

Fuel Impurity (Composition) Comp

- Fuel impurity compensation: Disabled
- Fuel impurity determination mode: Constant / Default
- Key-on fuel impurity reset mode: Use last value
- Cold power-up default fuel impurity level: 0.0 %
- Steady-state fuel impurity: 0.0 %
- Current fuel impurity: 0.0 %
- LPG adapt MAP min: 3.00 psia
- LPG adapt MAP max: 13.00 psia
- LPG adapt RPM min: 500 rpm
- LPG adapt RPM max: 2500 rpm
- Fuel impurity adapt engine start wait: 30.0 sec
- Fuel impurity adapt window wait: 2.0 sec
- Fuel impurity adaptation tau: 30.0 sec
- Load-limit fuel impurity start: 0.0 %
- Load-limit fuel impurity finish: 100.0 %
- Current load-limit fuel impurity factor: 0.0 %

CAD BBDC Intake

- Engine Speed: 600 rpm
- Manifold Pressure: 1.00 psia
- Coolant Temperature: 190.0 deg F
- Cylinder Head Temp: 190.0 deg F
- Manifold Temperature: 198.0 deg F
- Intake Air Temperature: 200.0 deg F
- Vbat: 12.4 volts
- Vsw: 12.4 volts
- Injection timing: 500 CAD BBDCI
- Pulse width: 0.00 ms
- Pulse width (extended): 0.0 ms
- Pulse width offset: 0.50 ms
- mass fuel port: 0.0 mg/intake
- mdot fuel port: 0.00 g/sec
- mdot fuel throttle: 0.00 g/sec
- MAP CAD project: 180 CAD
- MAP effective: 2.00 psia
- Asynchronous Injection: ON

Fuel Pump Feedforward Voltage

fuel (g/sec)	pump volts
0.00	5.00
0.02	6.70
0.20	6.95
1.00	7.56
3.00	9.71
10.00	12.78
20.00	15.85

LPG FTP/FTT Fuel Impurity Calibration


FTT (deg F)	0.0	30.0	70.0	100.0
-30	20.0	17.0	16.0	15.0
-10	31.0	23.4	16.0	15.0
10	46.0	35.0	20.2	15.0
30	66.0	50.5	29.9	15.0
55	99.0	76.4	46.2	23.8
80	143.0	111.2	69.0	37.2
110	214.0	167.9	106.4	60.0

19. PhiGsln Page

Main Function: Defines the gasoline fueling calibration based on engine coolant temperature.

EDIS ECI Serial Communications
 File Page Flash Comm Port Plot/Log Help

PhiGsln
Connected



Link error - attempting reconnect...
 Connected at 19200 bps

Toggle Page - F9
 Toggle Test Cell - F10

Phi Calibration - Gasoline MIL

Gasoline Phi Base
MAP (psia)

Speed (rpm)	0.0	3.0	6.0	7.5	9.0	10.0	11.0	12.0	13.0	14.0	14.5	16.0	18.0	24.0
700	1.100	1.100	1.100	1.100	1.100	1.100	1.130	1.160	1.190	1.190	1.200	1.190	1.190	1.190
1000	1.030	1.040	1.040	1.040	1.040	1.100	1.130	1.160	1.190	1.190	1.200	1.190	1.190	1.190
1500	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.170	1.170	1.200	1.170	1.170	1.170
2000	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.170	1.170	1.200	1.170	1.170	1.170
2500	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.170	1.170	1.180	1.170	1.170	1.170
3000	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.170	1.170	1.170	1.170	1.170	1.170
3500	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.170	1.170	1.170	1.170	1.170	1.170
4000	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.170	1.170	1.170	1.170	1.170	1.170
4500	1.050	1.050	1.050	1.050	1.050	1.100	1.135	1.170	1.170	1.170	1.170	1.170	1.170	1.170
5000	1.100	1.100	1.100	1.100	1.100	1.100	1.160	1.220	1.220	1.220	1.220	1.220	1.220	1.220

Gasoline Phi Cold
MAP (psia)

Speed (rpm)	0.0	3.0	6.0	7.5	9.0	10.0	11.0	12.0	13.0	14.0	14.5	16.0	18.0	24.0
700	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
1000	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
1500	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
2000	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
2500	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
3000	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
3500	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
4000	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
4500	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
5000	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200

Gasoline Phi Transition
MAP (psia)

Speed (rpm)	0.0	3.0	6.0	7.5	9.0	10.0	11.0	12.0	13.0	14.0	14.5	16.0	18.0	24.0
700	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.150	1.200	1.200	1.200	1.200
1000	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.100	1.100	1.150	1.200	1.200	1.200	1.200
1500	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.140	1.150	1.150	1.200	1.200	1.200	1.200
2000	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.150	1.150	1.150	1.200	1.200	1.200	1.200
2500	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.150	1.150	1.150	1.200	1.200	1.200	1.200
3000	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.150	1.150	1.150	1.200	1.200	1.200	1.200
3500	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.150	1.150	1.150	1.200	1.200	1.200	1.200
4000	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.150	1.150	1.150	1.200	1.200	1.200	1.200
4500	1.050	1.050	1.050	1.100	1.100	1.100	1.100	1.150	1.150	1.150	1.200	1.200	1.200	1.200
5000	1.050	1.050	1.050	1.100	1.100	1.100	1.150	1.150	1.150	1.150	1.200	1.200	1.200	1.200

Engine Speed rpm

Manifold Pressure psia

Coolant Temperature deg F

Cylinder Head Temp deg F

Manifold Temperature deg F

Intake Air Temperature deg F

Total Spark Advance CAD BTDC

Global Adv Offset CAD BTDC

Pulse width ms

Pulse width offset ms

Fuel rail pressure psia

Fuel pressure correction fraction

CTM enrichment %

A/F ratio -

Phi global offset %

Open-loop phi limit phi

Phi command phi

UEGO phi phi

Bank1 Bank2

CL_BM % %

A_BM % %

Manual_BM %

Phi Base-Cold Ratio
(-100=Cold, 0=Transition, 100=Base)

ECT (deg F)	Phi Cold (%)
<input type="text" value="-40"/>	<input type="text" value="-100"/>
<input type="text" value="-20"/>	<input type="text" value="-100"/>
<input type="text" value="44"/>	<input type="text" value="75"/>
<input type="text" value="60"/>	<input type="text" value="0"/>
<input type="text" value="75"/>	<input type="text" value="10"/>
<input type="text" value="100"/>	<input type="text" value="30"/>
<input type="text" value="120"/>	<input type="text" value="80"/>
<input style="color: red;" type="text" value="135"/>	<input style="color: red;" type="text" value="100"/>

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20. PhiLP Page

Main Function: Defines fuel and fuel trim calibrations for the engine when operating on Liquefied Propane.

EDIS ECI Serial Communications
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File Page Flash Comm Port Plot/Log Help

Link error - attempting reconnect...
Connected at 19200 bps
Toggle Page - F9
Toggle Test Cell - F10

PhiLP
Connected

EControls, Inc.
Control and Instrumentation Specialists

Phi Calibration - LPG ● MIL

Engine Speed rpm

Manifold Pressure psia

Coolant Temperature deg F

Manifold Temperature deg F

Intake Air Temperature deg F

LPG CL Control

Force CL inactive

Fuel Control Mode

Fuel Type

CL Inactive Indication

CL enable value logical

EGO1 volts

EGO2 volts

EGO3 volts

UEGO phi phi

CL_BM1 %

A_BM1 %

Manual_BM %

CL perturbation %

Total fuel correction multiplier

Phi command phi

Post-cat phi target offset phi

CL perturb excursion %

CL perturb Emin %

CL perturb Emax %

CL perturb ramp + %

CL perturb ramp - %

CL perturb hold + %

CL perturb hold - %

CL perturb rich DC %

CL perturb lean DC %

EGO1 DC actual %

EGO2 DC actual %

LPG Phi Base
MAP (psia)

Speed (rpm)	0.0	3.0	6.0	8.9	11.9	13.2	13.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0
0	1.100	1.100	1.100	1.100	1.100	1.100	1.130	1.160	1.100	1.190	1.190	1.190	1.190	1.190
200	1.030	1.030	1.030	1.030	1.030	1.100	1.130	1.160	1.100	1.190	1.190	1.190	1.190	1.190
400	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.150	1.150	1.150	1.150	1.150	1.150
600	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.150	1.150	1.150	1.150	1.150	1.150
1000	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.150	1.150	1.150	1.150	1.150	1.150
2000	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.150	1.150	1.150	1.150	1.150	1.150
3000	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.150	1.150	1.150	1.150	1.150	1.150
4000	1.000	1.000	1.000	1.000	1.000	1.100	1.130	1.160	1.150	1.150	1.150	1.150	1.150	1.150
4000	1.050	1.050	1.050	1.050	1.050	1.100	1.135	1.170	1.170	1.170	1.170	1.170	1.170	1.170
4000	1.100	1.100	1.100	1.100	1.100	1.100	1.160	1.220	1.220	1.220	1.220	1.220	1.220	1.220

LPG Post-Cat Phi Target Table
MAP (psia)

Speed (rpm)	0.0	3.0	6.0	8.9	11.9	13.2	13.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
400	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
600	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
3000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

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21. PhiNG Page

Main Function: Defines fuel and fuel trim calibrations based on engine coolant temperature for the engine when operating on Natural Gas.

The screenshot shows the EDIS ECI Serial Communications software interface for the PhiNG calibration page. The interface includes a menu bar (File, Page, Flash, Comm Port, Plot/Log, Help) and a status bar (Connected at 19200 bps). The main area displays the 'Phi Calibration - NG' settings, including engine parameters (Engine Speed, Manifold Pressure, Coolant Temperature, Manifold Temperature, Intake Air Temperature) and control settings (LPG CL Control, Force CL inactive, Fuel Control Mode, Fuel Type, CL Inactive Indication, CL enable value, EGO1-3, UEGO phi, CL_BM1, A_BM1, Manual_BM, CL perturbation, Total fuel correction, Phi base, Phi command, Post-cat phi-target offset, CL perturb excursion, CL perturb Emin, CL perturb Emax, CL perturb ramp +, CL perturb ramp -, CL perturb hold +, CL perturb hold -, CL perturb rich DC, CL perturb lean DC, EGO1 DC actual, EGO2 DC actual, EGO DC desired). The main data area shows the 'NG Phi Base MAP (psia)' and 'NG Post-Cat Phi Target Table' with columns for Speed (rpm) and MAP (psia). The right-hand panel shows the 'Phi-target Humidity Comp' settings, including 'Phi humidity correction' and 'Phi Offset' values.

Secondary Functions:

- Defines the fuel correction calibration relative to humidity for NG operation (only applicable for use with Envirotech™ fitted systems)

22. CLCaGsln Page

Main Function: Defines the closed-loop calibration for the engine when operating on Gasoline.

The screenshot displays the CLCaGsln configuration page in the EDIS ECI Serial Communications software. The interface is organized into several functional areas:

- Top Bar:** Shows 'EDIS ECI Serial Communications' and 'CLCaGsln' with a 'Connected' status. The EControls, Inc. logo is present.
- Left Panel:** 'Closed Loop - Gasoline' section with various engine parameters:
 - Engine Speed: 0 rpm
 - Manifold Pressure: 1.00 psia
 - Coolant Temperature: 165.0 deg F
 - Manifold Temperature: 165.0 deg F
 - Intake Air Temperature: 110.0 deg F
 - Pulse width: 0.00 ms
 - MAPdt: 0.0 psi/sec
 - Gasoline CL Control: Disabled
 - Force CL inactive: Normal
 - Injector kill: Normal
 - Fuel Control Mode: Open Loop
 - Fuel Type: Gasoline
 - CL Inactive Indication: CL_Ena_Map = 0
 - CL enable value: 0.00 logical
 - CL disable MAPdt: 29.9 psi/sec
 - EGO: Bank 1 (0.086), Bank 2 (0.112) volts
 - CL_BM: 0.0 %
 - A_BM: 0.0 %
 - CL perturbation: 0.0 %
 - Total fuel correction: 1.000 multiplier
 - Adapt valid count: 0 count
 - Manual_BM: 0.0 %
 - Transport delay: 49 ms
 - CL temp wait timer: 196 ms
 - AL temp wait timer: 784 ms
 - Adapt valid count: 0 count
 - CL temp disable wait multiplier: 4.0 multiplier
 - AL temp disable wait multiplier: 16.0 multiplier
 - EGO response delay: 50 ms
 - EGO light-load MAP: 4.5 psia
 - EGO light-load RPM: 1200 rpm
- Right Panel:** 'Gasoline Adaptive Tables (Bank1/Bank2)' and 'Gasoline CL Enable Table' with data tables.
 - Gasoline Adaptive Tables (Bank1/Bank2):**

MAP (psia)	4.0	6.1	9.0	12.0	12.0	12.0	12.0
Speed (rpm) 4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1200	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
 - Gasoline CL Enable Table:**

MAP (psia)	0.0	3.0	6.0	7.5	9.0	10.0	11.0	12.0	13.0
Speed (rpm) 700	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0
2500	0	0	0	0	0	0	0	0	0
3000	0	0	0	0	0	0	0	0	0
3500	0	0	0	0	0	0	0	0	0
4000	0	0	0	0	0	0	0	0	0
4500	0	0	0	0	0	0	0	0	0
5000	0	0	0	0	0	0	0	0	0
 - Gasoline Post-Cat Phi Target Table:**

MAP (psia)	0.0	3.0	6.0	7.5	9.0	10.0	11.0	12.0	13.0
Speed (rpm) 700	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Secondary Functions:

- Displays feedback information for closed-loop (CL) control
- Displays adaptive fuel correction for each pre-catalyst exhaust gas oxygen sensor (EGO)
- Defines the closed-loop switching frequency of pre-catalyst EGO sensors
- Defines the calibration for CL fueling excursions
- Defines CL operating conditions
- Defines fuel trim based on post-catalyst EGO feedback

23. CLCaLP Page

Main Function: Defines the closed-loop calibration for the engine when operating on Liquefied Propane.

The screenshot displays the CLCaLP page in the EDIS ECI Serial Communications software. The interface is divided into several sections:

- Top Bar:** Shows 'EDIS ECI Serial Communications' and 'CLCaLP' status as 'Connected'. It also includes the EControls, Inc. logo and a link error message: 'Link error - attempting reconnect... Connected at 19200 bps'.
- Left Panel:** Contains various engine and control parameters such as Engine Speed (0 rpm), Manifold Pressure (1.00 psia), Coolant Temperature (165.0 deg F), Intake Air Temperature (110.0 deg F), and Fuel Type (Gasoline).
- Center Panel:** Lists numerous calibration parameters like 'CL perturbation tau' (500 ms), 'Phi command' (1.100), and 'CL perturb excursion' (3.0 %).
- Right Panel:** Features two tables:
 - LPG Adaptive Table:** A table with Speed (rpm) on the y-axis (3.0, 6.1, 10.0, 13.0, 13.0, 13.0, 13.0, 13.0) and MAP (psia) on the x-axis (3.0, 6.1, 10.0, 13.0, 13.0, 13.0, 13.0). Values are mostly 0.0.
 - LPG Nominal PWM Trim Duty-Cycle Table:** A table with Speed (rpm) on the y-axis (3.0, 6.0, 12.0, 13.0, 13.0, 13.0, 13.0, 13.0) and MAP (psia) on the x-axis (3.0, 6.0, 12.0, 13.0, 13.0, 13.0, 13.0). Values are mostly 50.0.
- Bottom Panel:** Includes 'PWM Trim Valve Parameters' and 'Nominal Duty-Cycle (%)' table.

Secondary Functions:

- Displays feedback information for closed-loop (CL) control
- Displays adaptive fueling for Propane operation
- Defines the closed-loop switching frequency of the pre-catalyst EGO sensors for Propane operation
- Defines the calibration for CL Propane fueling excursions
- Defines CL operation conditions for Propane operation
- Defines nominal commands for Propane fuel control
- Defines a carburetor's flow characteristics

24. CLCaING Page

Main Function: Defines the closed-loop calibration for the engine when operating on Natural Gas.

The screenshot displays the CLCaING software interface, which is used for defining closed-loop calibration for an engine operating on Natural Gas. The interface includes a menu bar (File, Page, Flash, Comm Port, Plot/Log, Help), a status bar (Connected), and a main control area with various parameters and tables.

Parameters and Settings:

- Engine Speed: 0 rpm
- Manifold Pressure: 1.00 psia
- Coolant Temperature: 165.0 deg F
- Manifold Temperature: 165.0 deg F
- Intake Air Temperature: 110.0 deg F
- Pulse width: 0.00 ms
- MAPdt: 0.0 psi/sec
- NG CL Control: Disabled
- Force CL inactive: Normal
- Fuel Control Mode: Open Loop
- Fuel Type: Gasoline
- CL Inactive Indication: CL Ena Map = 0
- CL enable value: 0.00 logical
- CL disable MAPdt: 29.9 psi/sec
- EGO1: 0.086 volts
- EGO2: 0.112 volts
- EGO3: 0.000 volts
- CL_BM1: 0.0 %
- A_BM1: 0.0 %
- Manual_BM: 0.0 %
- CL perturbation: 0.0 %
- Total fuel correction: 1.000 multiplier
- Transport delay: 49 ms
- CL temp wait timer: 196 ms
- AL temp wait timer: 784 ms
- Adapt valid count: 0 count
- PWM Trim Valve Parameters:
 - PWM trim mode: Auto
 - PWM trim duty-cycle: 0.0 %
 - PWM trim period: 50.0 ms
 - PWM transient compensation: Enabled
 - PWM cranking duty-cycle: 0.0 %
- UEGO mode: Off
- UEGO phi: 0.000 phi
- Post-cat phi update status: Inactive

Calibration Tables:

NG Adaptive Table

Speed (rpm)	3.0	6.1	10.0	13.0	13.0	13.0	13.0	13.0	13.0
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

NG Nominal PWM Trim Duty-Cycle

Speed (rpm)	3.0	6.0	12.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
600	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
1500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
2500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0

Nominal Duty-Cycle (%)

Speed (rpm)	3.0	6.0	12.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
600	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
1500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

NG Nominal MegaJector Outlet Pressure

Speed (rpm)	3.0	6.0	12.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
600	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
1500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Nominal Phi Pressure (in H2O)

NG Nominal Trim Phi

Secondary Functions:

- Displays adaptive fueling for Natural Gas operation
- Defines the closed-loop switching frequency of the pre-catalyst EGO sensors for Natural Gas operation
- Defines the calibration for CL Natural Gas fueling excursions
- Defines CL operating conditions for Natural Gas operation
- Defines nominal commands for Natural Gas fuel control
- Defines a carburetor's flow characteristics.

25. Megajector Page

Main Function: Configures the Megajector/EPR, gaseous fuel temperature estimate, and carburetor pressure correction model.

EDIS ECI Target Communications
 File Page Flash Comm Port Plot/Log Help
Megajector Connected at 19200 bps
 Toggle Page - F9
 Toggle Test Cell - F10

MegaJector / EPR Configuration MIL

Engine Speed	600	rpm
Manifold Pressure	1.00	psia
Coolant Temperature	190.0	deg F
Manifold Temperature	198.0	deg F
Intake Air Temperature	200.0	deg F
Fuel regulator temperature	150.0	deg F
Fuel rail/mixer temperature	173.5	deg F
Fuel temperature default	150.0	deg F
Megajector manual mode	Auto	
Megajector press command	0.00	in H2O
Megajector feedback press	0.00	in H2O
Megajector area command	0.000	in ²
Megajector area feedback	0.000	in ²
Megajector control type command	Offline	
Megajector control type feedback	Offline	
Megajector status	Comm Lost	
Megajector fault bits	0	bits
Internal flash write request	Idle	
Internal flash writes remaining	0	count
Internal current MJ cal model	0000000	
Engine calibration MJ cal model	1539301A	
Internal current EPR SW model	0000000	
Internal current EPR HW model	0000000	
Megajector control strategy	Internal PID Only	
Megajector control type support	Standard DP Mode Only	
Megajector parameter comms	Disabled	
Megajector param comm support	Unknown	
Megajector cal upload from MJ	Idle	

MegaJector / EPR DPstd Control Mode Parameters

MJ/EPR internal default start press	-2.00	in H2O
MJ/EPR DPstd I min	-98.4	%
MJ/EPR DPstd I max	98.4	%
MJ/EPR DPstd sensor input LP tau	70.1	ms
MJ/EPR DPstd area output LP tau	25.0	ms

MegaJector-Only DPstd Control Mode Parameters

MJ DPstd Kp	5.99	% / in H2O
MJ DPstd Ki	0.0400	% / (in H2O * ms)
MJ DPstd Kd	19.9	% / (in H2O / ms)

MegaJector-Only DParea Control Mode Parameters

MJ DParea Kp	2.00	fracation
MJ DParea Ki	0.0100	1 / ms
MJ DParea Kd	50.0	ms
MJ DParea Kvi	0.50	fracation
MJ DParea I min	-10.00	in H2O
MJ DParea I max	10.00	in H2O
MJ DParea sensor input LP tau	70.1	ms
MJ DParea area output LP tau	10.0	ms
MJ DParea sensitivity min	0.0005	in ² / in H2O
MJ DParea sensitivity max	0.0200	in ² / in H2O
MJ DParea inlet pressure	0.00	in H2O
MJ DParea abs rel pressure	14.70	psia

Fuel Rail Temperature (at Mixer) Estimate

FRT Estimate	IAT-FT based estimate	
FT min contribution	53.0	%
FT max contribution	100.0	%
FRT estimation tau	2.0	sec

Variable Venturi Mixer Pressure Corrections

WC transient model	Disabled	
WC number of iterations	8	
WC sample time	0.000	ms
WC mounting	Side mount	
WC tip-in multiplier	0.10	
WC tip-out multiplier	0.10	
WC number of carburetors	1	count
WC inlet flow Cd	0.80	
WC inner diameter	2.380	inch
WC outer diameter	4.750	inch
WC outer area multiplier	0.65	
WC diaphragm mass	75.00	g
WC spring constant	2.71	lbf/in
WC initial spring deflection	0.750	inch
WC max. diaphragm displacement	0.500	inch
WC diaphragm CdA	0.0123	in ²
WC throat volume	1.00	L
WC minimum diaphragm volume	0.050	L
WC damping	0.020	psia/(in/sec)
WC stiction	0.020	psia
WC stiction delta	0.100	in/sec
WC throat pressure tau	2.0	ms
WC inlet pressure tau	100	ms
WC throttle flow tau	20.0	ms
WC inlet air flow	0.00	g/sec
WC diaphragm flow	0.00	g/sec
WC throttle flow	0.00	g/sec
WC port flow	0.00	g/sec
WC inlet air pressure	14.70	psia
WC execution time		
WC diaphragm acceleration		
WC diaphragm velocity		
WC CdPDi * Kcomp mult. * Ktemp		
WC CdA * Kcomp mult. * Ktemp		
WC diaphragm total area		
WC diaphragm outer area		
WC diaphragm total area		
WC area per unit mass		
WC normalized outer area		
WC normalized inner area		
WC spring constant / unit area		
WC spring constant / outer area		
WC initial force / unit area		
WC initial force / outer area		
WC initial force		
WC initial force / spring constant		
WC Ao / [CdPDi * Ktemp] * 2 * ks		
WC stiction slope		
WC initial diaphragm volume		
WC Rgas * IAT		
WC Rgas * IAT / Vth		
WC diaphragm pressure derivative		
WC throat pressure derivative		

26. EGOConfig Page

Main Function: Defines the heated exhaust gas oxygen sensor configuration

The screenshot displays the EGOConfig software interface. At the top, it shows 'EDIS ECI Target Communications' with a menu bar (File, Page, Flash, Comm Port, Plot/Log, Help) and a status bar indicating 'Connected' and 'Connected at 19200 bps'. The main window is titled 'EGO Configuration' and features a 'MIL' indicator.

EGO Configuration Parameters:

- Engine Speed: 600 rpm
- Manifold Pressure: 1.00 psia
- Coolant Temperature: 190.0 deg F
- Run timer: 1922 sec
- EGO1: Pre-Catalyst, 0.000 volts
- EGO2: Not Present, 0.000 volts
- EGO3: Not Present, 0.000 volts
- EGO4: Not Present, 0.000 volts

EGO Impedance (Z) Monitoring:

- EGOZ monitor/control: Disabled
- EGOZ sampling state: 0
- EGOZ sampled sensor: 0
- EGOZ sampling interval: 600 ms
- EGOZ sampling pre-sample: 0.019 ms
- EGOZ pulse drive settling time: 0.029 ms
- EGOZ pulse time: 0.362 ms
- EGOZ post-sample recovery time: 3.002 ms
- EGOZ pre-sample hi/lo threshold: 1.000 volts
- EGOZ pre-sample SS tolerance: 0.030 volts
- EGOZ default cold R value: 10000 ohms
- Pre-cat EGO active threshold Z: 4000 ohms
- Post-cat EGO active threshold Z: 4000 ohms
- EGO1 impedance: 4000 ohms
- EGO2 impedance: 4000 ohms
- EGO3 impedance: 4000 ohms
- EGO4 impedance: 4000 ohms
- EGO failed impedance sample limit: 20 count
- EGO1 failed impedance samples: 0 count
- EGO2 failed impedance samples: 0 count
- EGO3 failed impedance samples: 0 count

EGOZ Heater Control Target Impedance / Voltage Limit:

Run Time (sec)	Pre-Cat EGOZ (ohms)	Post-Cat EGOZ (ohms)	Pre-Cat Htr Vlimit (volts)	Post-Cat Htr Vlimit (volts)
0.0	300	300	14.0	14.0
5.0	300	300	14.0	14.0
10.0	300	300	14.0	14.0
15.0	300	300	14.0	14.0

UEGO Heater Start Delay Schedule:

ECT at start (deg F)	UEGOH start delay (sec)
-40	1
0	1
32	1
77	1
100	1
150	1

UEGO Heater Delay from start: 1 sec

EGO Sample Buffer:

Sample #	Volts
1	0.000
2	0.000
3	0.000
4	0.000
5	0.000
6	0.000
7	0.000
8	0.000
9	0.000
10	0.000
11	0.000
12	0.000
13	0.000
14	0.000
15	0.000
16	0.000
17	0.000
18	0.000
19	0.000
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000

Other Parameters:

- EGOZ heater control target Z: 300 ohms
- EGOZ heater control Kp: 0.500 volts/%
- EGOZ heater control Ki: 0.020 volts/%/s
- EGOZ heater control Vmin: 0.5 volts
- EGOZ heater control Vmax: 14.0 volts
- Pre-cat EGO heater default voltage: 13.8 volts
- Post-cat EGO heater default voltage: 13.8 volts
- Post-cat heater mode: On when engine is running
- EGOZ heater control initial integrator: 12.0 volts
- EGO1Z heater integrator accum: 12.0 volts
- EGO2Z heater integrator accum: 12.0 volts
- EGO3Z heater integrator accum: 12.0 volts
- EGO4Z heater integrator accum: 0.0 volts
- EGO1 heater V target: 13.8 volts
- EGO2 heater V target: 13.8 volts
- EGO3 heater V target: 13.8 volts
- EGO4 heater V target: 0.0 volts
- EGO1 heater duty-cycle: 0.0 %
- EGO2 heater duty-cycle: 0.0 %
- EGO3 heater duty-cycle: 77.0 %

Secondary Functions:

- Defines which HEGO sensor is used for bank-to-bank pre-catalyst and post-catalyst control.
- Defines the HEGO/UEGO sensor heater control calibration
- Displays data pertinent to HEGO/UEGO sensor operation

27. Catalyst Page

Main Function: Defines the calibration for catalyst protection fuel enrichment based on estimated catalyst temperature relative to air flow.

The screenshot displays the 'Catalyst Temperature Monitor (CTM) System' interface. It is divided into several sections for parameter configuration:

- System Status:** Shows 'Catalyst Connected' and 'EControls, Inc. Control and Instrumentation Specialists' logo. A status bar at the top indicates 'Link error - attempting reconnect... Connected at 19200 bps'.
- General Settings:** Fuel Type is set to 'Gasoline'. The CTM control is currently 'Disabled'.
- Engine Parameters:** Includes fields for Engine Speed (0 rpm), Manifold Pressure (1.00 psia), Coolant Temperature (165.0 deg F), Cylinder Head Temp (165.0 deg F), Manifold Temperature (165.0 deg F), and Intake Air Temperature (110.0 deg F).
- Gasoline Calibration:**
 - CTM max enrichment: 20.0 %
 - CTM max spark advance: 5.0 CAD BTDC
 - CTM phi upper limit: 1.600 phi
 - CTM time constant: 4 seconds
 - CTM initiation temperature: 1550 deg F
 - CTM finish temperature: 1650 deg F
 - CBT Steady-State Calibration table:
- Gaseous Fuel Calibration:**
 - CTM max enrichment: 20.0 %
 - CTM max spark advance: 5.0 CAD BTDC
 - CTM phi upper limit: 1.150 phi
 - CTM time constant: 4 seconds
 - CTM initiation temperature: 1550 deg F
 - CTM finish temperature: 1650 deg F
 - CBT Steady-State Calibration table:
- Advanced Settings:** Includes EGO sensor readings (Bank1: 0.086, Bank2: 0.112 volts), CL and A_BM values, Total spark advance (-9.5 CAD BTDC), and various CTM control parameters like pulse spacing, ramp rate, and trigger levels.
- RMS Attenuation:** A section at the bottom for setting RMS limits for various signals like CL perturbation wave, EGO1, EGO2, EGO3, and CM current.

28. RawTable Page

Main Function: Displays raw voltage feedback from ECM inputs and outputs.

RawVolts Table

Engine Speed	rpm	TPS1_raw	0.005 volts	EGO1_raw	0.085 volts	GOV1_raw	2.509 volts
Manifold Pressure	1.00 psia	TPS2_raw	0.000 volts	EGO2_raw	0.112 volts	GOV2_raw	2.543 volts
Coolant Temperature	165.0 deg F	FPP1_raw	0.005 volts	EGO3_raw	0.000 volts	Neutral_SW_raw	2.543 volts
Cylinder Head Temp	165.0 deg F	FPP2_raw	5.000 volts	UEGOR_raw	5.000 volts	Pedal_INH_raw	2.509 volts
Manifold Temperature	165.0 deg F	MAP_raw	0.000 volts	Vsw_raw	15.913 volts	Eng_Brake_raw	2.509 volts
Intake Air Temperature	110.0 deg F	TIP_raw	0.000 volts	Vbat_raw	15.673 volts	AUX_DIG1_raw	2.543 volts
		BP_raw	0.005 volts	VE5_FB_raw	5.005 volts	AUX_DIG2_raw	2.509 volts
		WGP_raw	0.000 volts	OILP_raw	35.160 volts	AUX_PWM1_LS_raw	0.000 volts
		FRP_raw	0.010 volts	AUX_PU1_raw	5.000 volts	AUX_PWM2_LS_raw	0.000 volts
		FTP_raw	0.000 volts	AUX_PU2_raw	5.000 volts	WG_PWM_LS_raw	0.000 volts
		ECT_raw	5.000 volts	AUX_PU3_raw	5.000 volts	EGO1H_LS_raw	0.000 volts
		IAT_raw	5.000 volts	AUX_PD1_raw	0.015 volts	EGO2H_LS_raw	0.000 volts
		FRT_raw	5.000 volts	AUX_PD2_raw	0.010 volts	EGO3H_LS_raw	0.000 volts
		FTT_raw	5.000 volts	AUX_PD3_raw	0.005 volts	FGAUGE_LS_raw	0.000 volts
						LOCKOFF_LS_raw	0.000 volts
						DBW_status_raw	0.518 volts

29. RawVolts Page

Main Function: Displays most commonly referenced raw voltage feedback from ECM inputs.

Raw Voltage Inputs ● MIL

Parameter	Value	Unit
Engine Speed	600	rpm
Manifold Pressure	1.00	psia
Coolant Temperature	190.0	deg F
Cylinder Head Temp	190.0	deg F
Manifold Temperature	198.0	deg F
Intake Air Temperature	200.0	deg F
Vbat	12.4	volts
Vsw	12.4	volts
Gov1 voltage	0.4	volts
Gov2 voltage	0.4	volts
Oil pressure voltage	5.0	volts
TPS1_raw	0.005	volts
TPS2_raw	0.000	volts
FPP1_raw	0.010	volts
FPP2_raw	5.000	volts
MAP_raw	0.000	volts
TIP_raw	0.005	volts
BP_raw	2.500	volts
WGP_raw	0.000	volts
FRP_raw	0.005	volts
FTP_raw	0.010	volts
ECT_raw	5.000	volts
IAT_raw	5.000	volts
FT_raw	5.000	volts
FTT_raw	5.000	volts
EGT_raw	2.500	volts
OILP_raw	5.000	volts
UEGOR_raw	5.000	volts
SHIFT_FB_raw	2.500	volts
EGO1_raw	0.000	volts
EGO2_raw	0.000	volts
EGO3_raw	0.000	volts
EGO4_raw	0.000	volts
Vsw_raw	1.769	volts
Vbat_raw	1.760	volts
VE5a_FB_raw	4.550	volts
VE5b_FB_raw	4.526	volts
AUX_PU1_raw	5.000	volts
AUX_PU2_raw	5.000	volts
AUX_PU3_raw	5.000	volts
AUX_PD1_raw	0.000	volts
AUX_PD2_raw	0.005	volts
AUX_PD3_raw	0.010	volts
AUX_PUD1_raw	0.005	volts
AUX_PUD2_raw	5.000	volts
AUX_PUD3_raw	0.010	volts
AUX_PUD4_raw	2.500	volts
AUX_PUD5_raw	2.500	volts
AUX_PUD6_raw	2.500	volts
GOV1_raw	0.357	volts
GOV2/DIG4_raw	0.357	volts
AUX_DIG1_raw	0.362	volts
AUX_DIG2_raw	0.357	volts
AUX_DIG3_raw	0.357	volts
AUX_PWM1_LS_raw	0.000	volts
AUX_PWM2_LS_raw	0.000	volts
AUX_PWM3_LS_raw	0.000	volts
AUX_PWM4_LS_raw	0.000	volts
AUX_PWM5_LS_raw	0.000	volts
EGO1H_LS_raw	0.000	volts
EGO2H_LS_raw	0.000	volts
EGO3H_LS_raw	0.000	volts
EGO4H_LS_raw	0.000	volts
WG_PWM_LS_raw	2.500	volts
LOCKOFF_LS_raw	0.000	volts
FGAUGE_LS_raw	2.500	volts
DBW_status_raw	0.000	volts
Neutral_Sw_raw	0.362	volts
Peda_INH_raw	0.357	volts
Eng_Brake_raw	0.357	volts
AUX_DIG1 volts	2.54	volts
AUX_DIG2 volts	2.51	volts
AUX_DIG3 volts	2.51	volts

30. Power Page

Main Function: Displays generator power monitoring data and ambient conditions.

The screenshot shows the EDIS ECI Target Communications software interface. The window title is "EDIS ECI Target Communications". The menu bar includes "File", "Page", "Flash", "Comm Port", "Plot/Log", and "Help". The status bar shows "Power Connected" and "EControls, Inc. Control and Instrumentation Specialists". The connection status is "Connected at 19200 bps". There are two buttons: "Toggle Page - F9" and "Toggle Test Cell - F10".

The main content area is divided into two sections:

- Power Monitoring and Estimation:**
 - Engine Speed: 600 rpm
 - Manifold Pressure: 1.00 psia
 - Coolant Temperature: 190.0 deg F
 - Cylinder Head Temp: 190.0 deg F
 - Manifold Temperature: 198.0 deg F
 - Intake Air Temperature: 200.0 deg F
 - Total Spark Advance: 13.0 CAD BTDC
 - Phi command: 0.928
 - VE final: 0.0 %
 - Barometric Pressure: 14.70 psia
 - Specific humidity: 9.8 g/kg
 - Ambient air temperature: 80.0 deg F
 - Ambient air temp source: EnviroTech
- Generator Monitoring:**
 - Generator power calculations: Disabled
 - Generator frequency source: Engine Speed
 - Power monitor per-leg voltage: 0.0 volts
 - Power monitor per-leg current: 0.0 amps
 - Power monitor measured frequency: 0.00 Hz
 - Power monitor measured phase: 0.0 deg
 - Power correction type: SAE
 - Generator parasitic power: 0.00 kW
 - Generator manual power derate: 1.000 multiplier
 - Power correction factor: 1.014 multiplier
 - Generator per-phase voltage: 0.0 volts
 - Generator per-phase current: 0.0 amps
 - Generator total power: 0.00 kW
 - Generator real power: 0.00 kW
 - Generator power factor: 0.50
 - Generator real corrected power: 0.00 kW
 - Generator frequency: 0.00 Hz

31. Cam Page

Main Function: Defines cam position calibration for variable cam engines.

EDIS ECI Target Communications
 File Page Flash Comm Port Plot/Log Help
 Connected at 19200 bps
 Toggle Page - F9
 Toggle Test Cell - F10

Cam
 Connected

ECControls, Inc.
 Control and Instrumentation Specialists

Cam Timing Calibration

Intake Cam

ICam timing control: Disabled
 ICam open target: 0.0 CAD BTDC
 ICam open actual: 0.0 CAD BTDC
 ICam edge sample: 0.0 CAD BTDC
 ICam control cmd: 0.0 %
 ICam PWM mode: Automatic
 ICam control PWM DC: 0.0 %
 ICam control PWM tau: 4.0 ms

ICam Kp: 10.0 %/CAD
 ICam Ki: 10.0 %/CAD/sec
 ICam integrator value: 0.0 %
 ICam integrator min: -30.0 %
 ICam integrator max: 30.0 %
 ICam coil nominal current: 0.40 amps
 ICam coil desired current: 0.00 amps
 ICam coil resistance: 8.00 ohms

Intake Valve Timing
 MAP (psia)

Speed (rpm)	3.0	4.5	6.0	8.0	10.0	12.0	13.5	14.0
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Open CAD BTDC

Exhaust Cam

ECam timing control: Disabled
 ECam close target: 0.0 CAD BTDC
 ECam close actual: 0.0 CAD BTDC
 ECam edge sample: 0.0 CAD BTDC
 ECam control cmd: 0.0 %
 ECam PWM mode: Automatic
 ECam control PWM DC: 0.0 %
 ECam control PWM tau: 4.0 ms

ECam Kp: 10.0 %/CAD
 ECam Ki: 10.0 %/CAD/sec
 ECam integrator value: 0.0 %
 ECam integrator min: -30.0 %
 ECam integrator max: 30.0 %
 ECam coil nominal current: 0.40 amps
 ECam coil desired current: 0.00 amps
 ECam coil resistance: 8.00 ohms

Exhaust Valve Timing
 MAP (psia)

Speed (rpm)	3.0	4.5	6.0	8.0	10.0	12.0	13.5	14.0
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Close CAD BTDC

System Variables

Engine Speed: 600 rpm
 Manifold Pressure: 1.00 psia
 Throttle Inlet Pressure: 30.00 psia
 Barometric Pressure: 14.70 psia
 Coolant Temperature: 190.0 deg F
 Cylinder Head Temp: 190.0 deg F
 Manifold Temperature: 198.0 deg F
 Intake Air Temperature: 200.0 deg F

General Intake/Exhaust Parameters

Cam engine starting current: 0.00 amps
 Cam engine starting-timeout: 0.000 sec

32. Roadspeed Page

Main Function: Configures roadspeed/vehicle speed sensor calibration, displays vehicle speed feedback, configures roadspeed speed control limiting system, and configures roadspeed diagnostic calibration.

The screenshot displays the 'Roadspeed' configuration page within the 'EDIS ECI Target Communications' software. The interface includes a menu bar (File, Page, Flash, Comm Port, Plot/Log, Help) and a status bar showing 'Connected at 19200 bps'. The main area is divided into several sections:

- Roadspeed Calibration:** Shows real-time data for Engine Speed (600 rpm), Manifold Pressure (1.00 psia), Coolant Temperature (190.0 deg F), and TPS position (0.0 %).
- Roadspeed Limit Setpoint Configuration:** Includes fields for Roadspeed limit setpoint source (Fixed Value), Setpoint source status (Fixed Setpoint), TPS-based fixed roadspeed limit (12.0 km/hr), and RPM-based Max/SetPt roadspeed limit (199.0 km/hr).
- Roadspeed Control Parameters:** A large section for configuring control logic, including Roadspeed function (Disabled), Road speed (0.0 km/hr), Roadspeed limit final target (12.0 km/hr), Road speed derivative (0.00 km/hr/sec), Road speed derivative w/ deadzone (0.00 km/hr/sec), Roadspeed engine load limit (100.0 %), Roadspeed TPS limit (100.0 %), Roadspeed control integrator (100.0 % load), Roadspeed limit nominal rpm (2000 rpm), Roadspeed speed input low-pass (20.0 ms), Roadspeed acceleration window (100 ms), Roadspeed acceleration low-pass (200.0 ms), Roadspeed acceleration deadzone (0.0 km/hr/sec), Roadspeed control Kp (40.0 % load / (km/hr)), Roadspeed control Ki (40.0 % load / (km/hr) / sec), Roadspeed control Kd / Kd_decel (0.0 % load / (km/hr) * sec), Roadspeed control Kd_accel (-999.0 % load / (km/hr) * sec), Roadspeed control Kiv (10.0 % load / (km/hr)), Roadspeed TPS limit output low-pass (20.0 ms), and Roadspeed RPM control err int freeze (9999 rpm).
- Roadspeed Pulse Input Parameters:** Configures signal source (Pulse Input), hardware input enable (Not Required), pulse calibration (137000.5 pulses/km), pulse spacing filter (0.301 ms), pulse time (0.00 ms), pulse accumulator (0 pulses), speed averaging window (100 ms), and speed zeroing time (150 ms).
- Roadspeed Aquastar/GPS Input Parameters:** Configures Aquastar setpoint mode (Not Available), gain selection (A - Normal), ground speed setpoint (0.0 km/hr), engine rpm setpoint (0 rpm), and GPS speed state (Disconnected).
- Roadspeed Input Diagnostic Configuration:** Includes Long-term roadspeed input loss detection (Roadspeed input < 1.0 km/hr and engine speed > 2000 rpm and MAP > 10.00 psia) and Instantaneous roadspeed input dropout detection (engine speed > 1200 rpm with initial roadspeed > 10.0 km/hr for at least 1000 ms followed by roadspeed <= 2.0 km/hr for at least 200 ms after dropping roadspeed faster than 200 ms).
- Roadspeed Transient Control:** Configures Aquastar Kiv adder (0.0 % / (km/hr)).

33. Comms Page

Main Function: Defines parameters broadcast via CAN communication, permits serial communication with digital signal processors, and permits remote starting.

The screenshot displays the 'EDIS ECI Target Communications' software interface. The window title is 'EDIS ECI Target Communications' and it includes a menu bar with 'File', 'Page', 'Flash', 'Comm Port', 'Plot/Log', and 'Help'. The interface is divided into several sections:

- Comms:** Shows 'Connected' status and 'Connected at 19200 bps'. Includes 'Toggle Page - F9' and 'Toggle Test Cell - F10' buttons.
- Communications Systems:** Includes 'MIL' indicator and engine parameters: Engine Speed (600 rpm), Manifold Pressure (1.00 psia), Coolant Temperature (190.0 deg F), Intake Air Temperature (200.0 deg F), Vbat (12.4 volts), and Vsw (12.4 volts). Run Mode is 'Running', Fuel Type is 'Natural Gas', Fuel Control Mode is 'Open Loop', Governor switch state is 'None', Active governor type is 'Min', Active governor mode is 'Isynchronous', Brake input level is 'Ground', and Oil pressure state is 'OK'.
- J1939 Lamp Status:** Shows four indicators: J1939 MIL (red), J1939 Red Stop (red), J1939 Amber Warn (yellow), and J1939 Protect (red).
- CCP CAN System:** CCP comm processing is 'Disabled', CCP session state is 'Inactive', CCP CR (Rx) packets is 0 count, and CCP DT (Tx) packets is 0 count.
- DSP Communications:** DSP comm passthrough is 'Disabled', DSP software revision is 3.
- Remote Control Parameters:** Includes settings for Remote start function (Disabled), Remote starter control (Disengaged), Remote start limit timer (0.0 sec), Remote start limit timeout (15.0 sec), Remote start speed release (800 rpm), Remote gov mode selection (None), J1939 TSC1 command (Disabled), Remote speed setpoint/limit (0 rpm), Remote torque setpoint/limit (-200.0 %), Remote speed/torque requests (Full Authority), Remote speed limit throttle governor (Normal Max Gov), Remote speed limit spark governor (Normal Max Gov), Remote speed request idle-limit (>= Idle Schedule), Remote speed req feedfwd torque (Disabled), J1939 EC reference torque (1080.0 N-m), Remote fuel selection (Gasoline), Remote shutdown request (None), Remote shutdown clear (None), Remote engine stop request (Inactive), Remote engine stop log (Inactive), Remote throttle request (0.0 %), Transmission actual gear (Uninitialized), Transmission desired gear (Uninitialized), Remote governor gain attenuators (Rejected), and Remote Kd attenuator (1.000).
- CAN/J1939 System:** Includes CAN1 and CAN2 system settings. CAN1 J1939 system is Enabled, link speed is 250 Kbaud (J1939), termination is Termination ON, address selection is Engine Number Based, address forced value is 0, current J1939 address is 0, receive (Rx) packets is 5725 count, and transmit (Tx) packets is 487408 count. CAN2 channel is Disabled, link speed is 250 Kbaud (J1939), termination is Termination ON, address selection is Engine Number Based, address forced value is 0, current J1939 address is 0, receive (Rx) packets is 0 count, and transmit (Tx) packets is 0 count. PGN request activity is 30 count, NACK activity is 179 count, DENIED activity is 141 count, Address claim activity is 1 count, Address conflict counter is 0 count, Address conflict fail limit is 5 failures, and Incoming PGN Rx activity is 0 count.
- Miscellaneous CAN/J1939 Parameters:** A table showing Broadcast Tx PGN List (65262), Supported Tx PGN List (65262), Required Rx PGN List (61202), and Rx SPN Update Access (65477).

34. GaugeDrive Page

Main Function: Configures analog gauge driver circuits

Gauge Drive Calibration

Engine Speed: 600 rpm
 Manifold Pressure: 0.00 psia
 Coolant Temperature: 40.0 deg F
 Cylinder Head Temp: 190.0 deg F
 Manifold Temperature: 198.0 deg F
 Intake Air Temperature: 40.0 deg F
 Oil pressure (effective): 56.2 psig
 AUX_PU1_raw: 5.000 volts
 AUX_PU2_raw: 5.000 volts
 AUX_PU3_raw: 5.000 volts
 AUX_PD1_raw: 0.000 volts
 AUX_PD2_raw: 0.005 volts
 AUX_PD3_raw: 0.010 volts
 AUX_PUD1_raw: 0.005 volts
 AUX_PUD2_raw: 5.000 volts
 AUX_PUD3_raw: 0.010 volts

Gauge driver mode: Automatic
 Gauge excitation voltage estimate: 12.43 volts
 Gauge excitation voltage lowpass: 20 ms

ECT Gauge Driver Calibration

ECT gauge driver channel: Disabled
 ECT gauge driver control type: Duty-cycle PWM
 ECT gauge driver PWM period: 5.00 ms
 ECT gauge driver duty-cycle: 0.0 %
 ECT gauge sender cal-table R: 0.0 ohms
 ECT gauge sender target R: 0.0 ohms
 ECT gauge sender actual R: 0.0 ohms
 ECT gauge driver initial pullup R: 4000.0 ohms
 ECT gauge pullup R estimate: 0.0 ohms
 ECT gauge excitation regulation: 36.00 volts
 ECT gauge excitation ratio: 1.000 ratio
 ECT gauge resistance ctf1 tau: 100 ms
 ECT gauge sender voltage: 0.00 volts
 ECT gauge driver current: 0.0 mA
 ECT gauge dual-helm sender: Disabled
 ECT gauge single/dual-helm status: Single-Helm
 ECT multi-engine gauge sync: Disabled
 ECT gauge sync deadband: 20 deg F
 ECT gauge display value: -460 deg F

Oil Pressure Gauge Driver Calibration

OIP gauge driver channel: Disabled
 OIP gauge driver control type: Duty-cycle PWM
 OIP gauge driver PWM period: 5.00 ms
 OIP gauge driver duty-cycle: 0.0 %
 OIP gauge sender cal-table R: 0.0 ohms
 OIP gauge sender target R: 0.0 ohms
 OIP gauge sender actual R: 0.0 ohms
 OIP gauge driver initial pullup R: 4000.0 ohms
 OIP gauge pullup R estimate: 0.0 ohms
 OIP gauge excitation regulation: 36.00 volts
 OIP gauge excitation ratio: 1.000 ratio
 OIP gauge resistance ctf1 tau: 100 ms
 OIP gauge sender voltage: 0.00 volts
 OIP gauge driver current: 0.0 mA
 OIP dual-helm gauge sender: Disabled
 OIP gauge single/dual-helm status: Single-Helm
 OIP multi-engine gauge sync: Disabled
 OIP gauge sync deadband: 20.0 psig
 OIP gauge display value: 0 psig

Aux Voltage 1 Gauge Driver Calibration

Volt1 gauge driver channel: Disabled
 Volt1 gauge driver control type: Duty-cycle PWM
 Volt1 gauge driver PWM period: 5.00 ms
 Volt1 gauge driver duty-cycle: 0.0 %
 Volt1 gauge sender cal-table R: 0.0 ohms
 Volt1 gauge sender target R: 0.0 ohms
 Volt1 gauge sender actual R: 0.0 ohms
 Volt1 gauge driver initial pullup R: 4000.0 ohms
 Volt1 gauge pullup R estimate: 0.0 ohms
 Volt1 gauge excitation regulation: 36.00 volts
 Volt1 gauge excitation ratio: 1.000 ratio
 Volt1 gauge resistance ctf1 tau: 100 ms
 Volt1 gauge sender voltage: 0.00 volts
 Volt1 gauge driver current: 0.0 mA
 Volt1 dual-helm gauge sender: Disabled
 Volt1 gauge single/dual-helm status: Single-Helm
 Volt1 gauge driver input source: Aux PU1 input
 Volt1 gauge driver source signal: 5.00 volts
 Volt1 gauge driver reference: 0.0 %

ECT Gauge Driver Cal

ECT (deg F)	Duty-Cycle (%)	Resistance (ohms)
77.0	4.0	2000.0
100.0	10.0	448.0
135.0	28.0	300.0
170.0	34.0	128.0
182.5	39.0	100.0
195.0	44.0	83.0
207.5	49.0	65.0
220.0	55.0	53.0

Oil Pressure Gauge Driver Cal

OIP (psig)	Duty-Cycle (%)	Resistance (ohms)
5.0	4.0	2000.0
10.0	10.0	448.0
15.0	28.0	300.0
20.0	34.0	128.0
25.0	39.0	100.0
30.0	39.0	83.0
35.0	44.0	65.0
40.0	49.0	53.0

Volt1 Gauge Driver Cal

Volt1 (volts)	Duty-Cycle (%)	Resistance (ohms)
0.00	4.0	2000.0
0.50	10.0	448.0
1.00	28.0	300.0
1.25	34.0	128.0
1.50	39.0	100.0
1.75	39.0	83.0
2.00	44.0	65.0
2.25	49.0	53.0

35. Marine Page

Main Function: Defines multi-engine synchronization configuration, multi-engine derate, exhaust manifold/riser water temperature estimate and diagnostic, and shift interrupt systems.

The screenshot displays the EDIS ECI Target Communications software interface for Marine engine control. The interface is divided into several sections:

- Marine Engine Operation:** Shows real-time data for MIL, Engine Speed (800 rpm), Manifold Pressure (1.00 psia), Barometric Pressure (14.70 psia), Coolant Temperature (190.0 °F), Intake Air Temperature (200.0 °F), Spark Advance (13.0 °BTDC), Pulse width (0.0 ms), Vbat (12.4 volts), Vsw (12.4 volts), FPP command (0.0 %), and TPS command (20.0 %).
- Multi-Engine CAN Communication Status:** Shows connection status for Master, Slave 1, Slave 2, and Slave 3. Sync mode is set to None for all. Engine status shows 62 for Master and 0 for Slaves. Speed target/actual is 600/0 rpm, FPP target/actual is 0/0 %, MAP target/actual is 0.0/0.0 psia, ECT is -40 °F, and Oil pressure is 56 psig.
- Multi-Engine Derate Coordination:** Shows Multi-engine derate coordination (Disabled), Multi-engine derate reset time (10.0 sec), and Multi-engine derate logic state (Offline). Derate 1 and 2 are shown with status indicators.
- Multi-Engine Gauge Driver Synchronization:** Shows ECT multi-engine gauge sync (Disabled) and ECT gauge sync deadband (20 deg F). It includes two gauge displays: ECT gauge sync'd display value (100 to 250 deg F) and DIP gauge sync'd display value (0 to 200 psig).
- EGT Switch Input Configuration:** Shows EGT temperature state (DK), EGT input voltage (2.50 volts), EGT sensor configuration (Open = DK), EGT sensor threshold (2.00 volts), and EGT diagnostic start wait (15.0 sec).
- Multi-Engine Configuration:** Shows Multi-engine selection (Master / Single) and Multi-engine status (Master / Single).
- Multi-Engine Speed Synchronization:** Shows Multi-engine speed sync (Disabled), Sync command (None), Sync state (Offline), MES idle delta initiate (300 rpm), MES speed phase-in delta (300 rpm), MES lever control mode (Master Lever), MES +/- lever match full engagement (2.0 %), MES +/- lever match disengaged (5.0 %), MES WOT de-sync feature (Disabled), MES WOT de-sync FPP initiate (95.0 %), MES WOT de-sync FPP complete (98.0 %), MES phase-in value (0.0 %), and MES gain selection (Isochronous Standard).
- Shift Interrupt System:** Shows Shift interrupt input (Disabled), Shift interrupt state (DIP), Shift interrupt ignore timeout (10.000 sec), Shift interrupt active timer (0.000 sec), Shift interrupt FPP max (4.0 %), Shift interrupt spark retard rpm deadzone (10 rpm), Shift interrupt spark retard maximum (30.0 CAD retard), Current shift interrupt spark adv modifier (0.0 CAD BTDC), Shift interrupt in-gear feedforward load (0.0 % load), Shift interrupt governor target (600 rpm), Shift interrupt fuel rev limit (640 rpm), Shift interrupt rev limit delta-rpm (0 rpm), Shift interrupt spark retard gain (0.00 CAD/rpm), Shift interrupt switch governor target (600 rpm), Shift interrupt switch fuel rev limit (640 rpm), and Shift interrupt switch rev limit delta-rpm (0 rpm).
- Exhaust Manifold Water Temperature:** Shows EMWT sensor time constant, EMWT standard inlet temperature, EMWT CWT correction coefficient, EMWT inlet temperature, EMWT steady-state temp rise, and EMWT model estimation. It includes a table for Steady-State EMWT Rise Above In MAP (psia):

Speed (rpm)	6.0	8.0	10.0	12.0
600	30.0	30.0	30.0	30.0
1200	30.0	30.0	30.0	30.0
2000	30.0	30.0	30.0	30.0
3000	30.0	30.0	30.0	30.0
4000	30.0	30.0	30.0	30.0
5000	30.0	30.0	30.0	30.0
- Throttle Override Mode (TORM) System:** Shows TORM system (Disabled).

36. Service1 Page

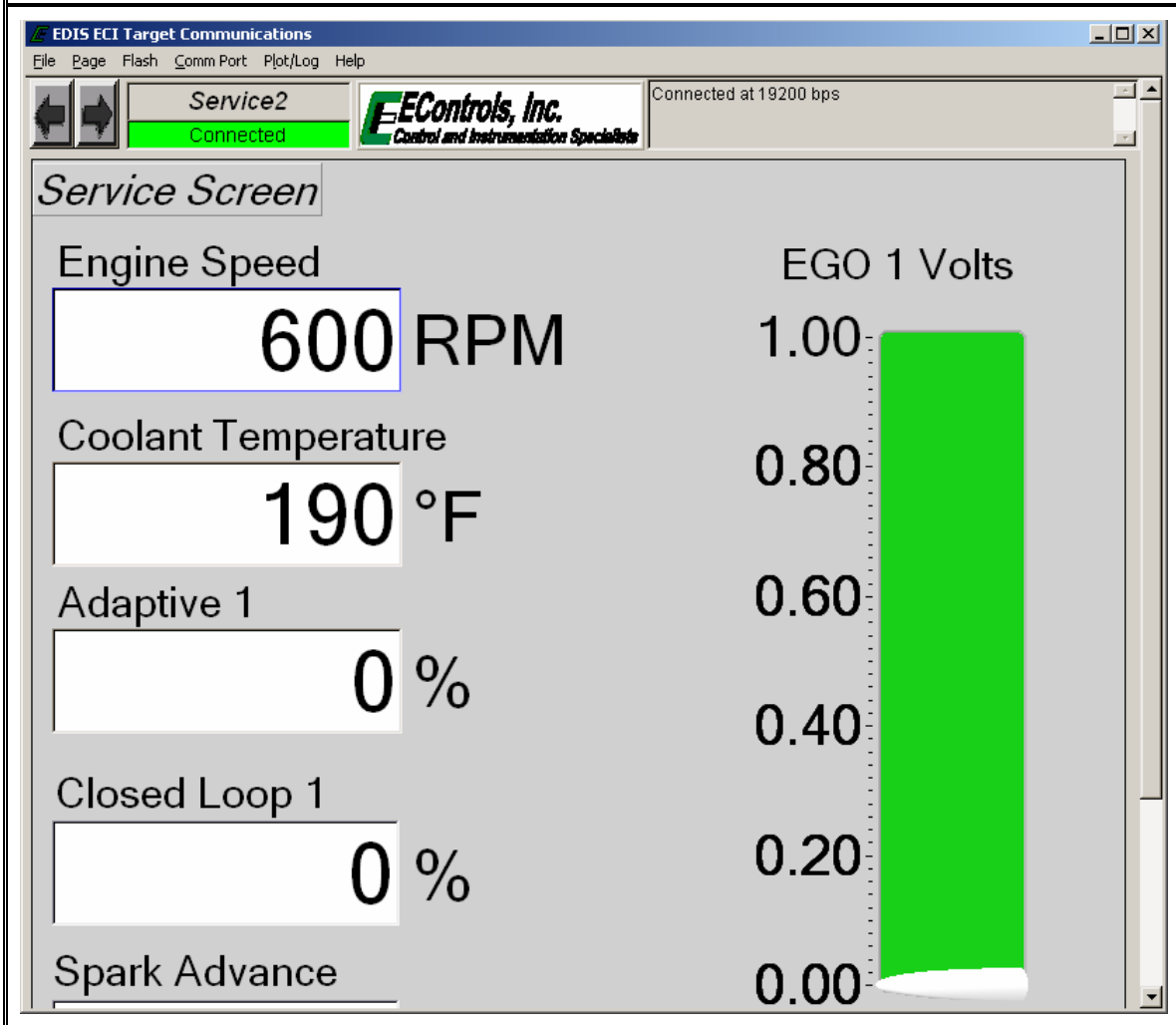
Main Function: Displays primary service variables in an easy-to-read display and clears adaptive learn table(s).

The screenshot displays the 'Service1' page of the 'EDIS ECI Target Communications' software. The interface includes a menu bar (File, Page, Flash, Comm Port, Plot/Log, Help) and a status bar showing 'Service1 Connected' and 'EControls, Inc. Control and Instrumentation Specialists'. The main display area is titled 'Service Screen' and features several key indicators and controls:

- Engine Speed:** 600 RPM
- Coolant Temperature:** 190 °F
- Spark Advance:** 13.0 CAD BTDC
- Mixture Control:** A vertical slider with 'Rich' at the top and 'Lean' at the bottom, currently set to 'Mixture'.
- MIL Indicator:** A red circular light labeled 'MIL'.
- Clear Faults:** A button to clear diagnostic trouble codes.
- Fuel Control Mode:** A dropdown menu currently set to 'Open Loop'.
- Adaptive Learn State:** A green bar indicating the state is 'Cleared'.
- Fuel Type:** A dropdown menu currently set to 'Butane'.
- Closed-Loop Switch:** A control with 'Normal' and 'Adjustment' positions, currently in 'Normal'.
- Clear Adaptive:** A button to clear adaptive learn data.

37. Service2 Page

Main Function: Displays primary service variables in an easy-to-read display and clears adaptive learn table(s).



38. Tests Page

Main Function: Displays many of the primary engine parameters and contains all diagnostic engine tests.

The screenshot displays the 'Tests' page of the EDIS ECI Target Communications software. The interface is organized into several sections:

- System States:** Shows engine parameters such as Engine Speed (600 rpm), Manifold Pressure (0.00 psia), Barometric Pressure (14.70 psia), Coolant Temperature (-40.0 °F), Cylinder Head Temp (190.0 °F), Manifold Temperature (198.0 °F), Intake Air Temperature (-40.0 °F), Spark Advance (13.0 °BTDC), Pulse width (0.0 ms), Vbat (12.4 volts), and Vsw (12.4 volts).
- System States:** Includes Run Mode (Running), Power Mode (Standby), Fuel Type (Natural Gas), Fuel Control Mode (Open Loop), Active governor type (Min), Active governor mode (Isochronous), Oil pressure state (OK), Oil pressure config (Ground = OK), IVS state (At Idle), and Cylinder numbering (Block Order).
- Monitored Driver Status:** Lists electrical statuses for IAC, Power relay, Start relay, FFump relay, Buzzer, MIL, and Tach output, all showing 'OK' or 'Open load'.
- Throttle / IAC Variables:** Displays FPP command (0.0 %), FPP position (0.0 %), FPP1 voltage (0.010 volts), FPP2 voltage (5.000 volts), IVS voltage (5.000 volts), TPS command (20.0 %), TPS position (0.0 %), TPS1 percent (0.0 %), TPS2 percent (100.0 %), TPS1 voltage (0.005 volts), TPS2 voltage (0.000 volts), IAC driver power (Off), IAC command position (20.0 %), and IAC actual position (0.0 %).
- Crank-Cam Datalog:** Shows Crank/Cam data log system (Off) with buttons for Reset and Force Trigger, and Crank/Cam data log status (Offline).
- Distributor Alignment:** Displays Cam position (0 CAD BTDC) and Cam position desired value (0 CAD BTDC).
- Diagnostic Tests:**
 - Spark Kill Test:** Spark kill command (Normal), Spark kill test status (Test Not Started), Spark kill timeout (61.0 sec).
 - Injector Kill Test:** Injector kill command (Normal), Injector kill test status (Test Not Started), Injector kill timeout (61.0 sec).
 - DBW Test:** DBW test command (Off), DBW test status (Test Not Started).
 - Spark Advance Test:** Spark advance test command (Disabled), Spark advance test status (Test Not Started), Diagnostic spark advance input (Software Switch).
 - Injector Fire Test:** Injector firing test command (Disabled), Injector firing test status (Test Not Started), Injector firing test duration (0.00 ms).
 - IAC Test:** IAC test command (Disabled), IAC test status (Test Not Started).
 - Idle Speed Test:** (Section header visible).

39. WirelesDAQ Page

Main Function: Interfaces with EControls Inc. wireless data acquisition devices for real-time display through EDIS.

EDIS ECI Target Communications

File Page Flash Comm Port Plot/Log Help

WirelesDAQ Connected

EControls, Inc.
Control and Instrumentation Specialists

Connected at 19200 bps

EControls Wireless_DAQ

Available Devices

Rescan Network

Name

Serial

TC1 0.00 sps TC2 0.00 sps

TC3 0.00 sps TC4 0.00 sps

AI1 0.00 sps AI2 0.00 sps

Apply Config

WDAQ Device #1

TC1 TC2 TC3 TC4

1500.0- 1500.0- 1500.0- 1500.0-

1000.0- 1000.0- 1000.0- 1000.0-

500.0- 500.0- 500.0- 500.0-

-200.0- -200.0- -200.0- -200.0-

vDAQ AI1 0.00 V

vDAQ AI2 0.00 V

CJC 0.00 F

0.0 F 0.0 F 0.0 F 0.0 F

WDAQ Device #2

TC5 TC6 TC7 TC8

1500.0- 1500.0- 1500.0- 1500.0-

1000.0- 1000.0- 1000.0- 1000.0-

500.0- 500.0- 500.0- 500.0-

-200.0- -200.0- -200.0- -200.0-

vDAQ AI3 0.00 V

vDAQ AI4 0.00 V

CJC 0.00 F

40. Faults Page

Main Function: Displays information generally used during fault detection and provides fault code interaction.

The screenshot displays the 'Faults' page of the EDIS ECI Serial Communications software. The interface is organized into several functional areas:

- Header:** Shows 'Faults' status as 'Connected' and the EControls, Inc. logo.
- System Status:** Includes 'Fault Access' (MIL), 'Closed-Loop Control' (EGO1, EGO2, EGO3, Adaptive 1/2, Post-cat CL offset, Alternate-Fuel trim duty-cycle), 'System States' (Run Mode: Stopped, Fuel Type: Gasoline, Fuel Control Mode: Open Loop, Governor switch state: Gov3, Active governor type: Min, Active governor mode: Droop, Brake input level: Ground, Oil pressure state: OK, Oil pressure config: Open = OK, IVS state: Off Idle), 'Monitored Drivers' (Injector Driver firing order 1-6, Injector-on low-side voltage, Injector-off low-side voltage, Coil Driver firing order 1-10, Spark Coil dwell ms), and 'Diagnostic Modes' (Spark kill, Injector kill, DBW test, External power).
- DBW Variables:** Lists parameters like TPS command, TPS position, TPS1/2 percent, TPS1/2 voltage, FPP command, FPP position, FPP1/2 voltage, and IVS voltage.
- Input Voltages:** Lists Gov1 voltage, Gov2 voltage, Oil pressure voltage, MAP voltage, ECT/CHT voltage, and IAT voltage.
- Engine Parameters:** Engine Speed (0 rpm), Manifold Pressure (0.02 psia), Barometric Pressure (8.30 psia), Coolant Temperature (-40.0 °F), Cylinder Head Temp (165.0 °F), Manifold Temperature (165.0 °F), Intake Air Temperature (-40.0 °F), Spark Advance (-9.5 °BTDC), Pulse width (0.3 ms), Gaseous pressure target (0.00 H2O), Gaseous pressure actual (0.00 H2O), Engine Load (0.0 %), Current governor target (900 rpm), Vbat (15.8 volts), Vsw (15.5 volts), Hour meter (0.000 hours), and Cumulative starts (0 starts).
- Snapshot Tables:**
 - Snapshot Base Definitions:**

run_tmr_sec	CL_BM1	Vbat	EGO2_volts
rpm	CL_BM2	FPP_pct	FW_avg
rMAP	A_BM1	TPS_pct	TRIM_DC
rECT	A_BM2	EGO1_volts	HM_hours
		fuel_state	rIAT
 - Snapshot Custom Definitions:**

EMPTY	EMPTY	EMPTY	EMPTY
EMPTY	EMPTY	EMPTY	EMPTY
EMPTY	EMPTY	EMPTY	EMPTY
 - Flight Data Base Definitions:**

rMAP	CL_BM1	Vbat	A_BM1
FPP_pct	CL_BM2	FW_avg	A_BM2
		rpm	TPS_pct
 - Flight Data Custom Definitions:**

EMPTY	EMPTY	EMPTY	EMPTY
-------	-------	-------	-------
- Faults:** Two empty boxes labeled 'Historic Faults' and 'Active Faults'.

F. Fault/Diagnostic Trouble Code Interaction

All fault and diagnostic information is managed through the Faults page. Interaction includes viewing fault messages, downloading fault data (fault snapshot and flight data recorder), erasing faults from memory, and defining variables for fault data logging.

Faults are separated into two categories, Active and Historic. Active faults are active in real-time and historic faults have been generated at some instance in time that may or may not be active in real-time. Once a fault has become active, it is immediately logged as historic and a snapshot and flight data log is saved. Figure 28 shows an example of the fault page when an active fault has been generated. Notice that the fault is present in both the active and historic lists and the malfunction indicator lamp (MIL) has been illuminated. Figure 29 shows an example of the fault page with a historic fault stored in memory.

The screenshot displays the 'Faults' page in the EDIS ECI Serial Communications software. The interface is divided into several sections:

- Fault Access:** Shows a red MIL indicator and a list of engine parameters such as Engine Speed (725 rpm), Manifold Pressure (6.27 psia), and Barometric Pressure (14.50 psia).
- Closed-Loop Control:** Displays parameters like EGO1 (0.031 volts), Closed-loop 1 (0.0 %), and Adaptive 1 (0.0 %).
- System States:** Shows Run Mode (Running), Fuel Type (Gasoline), and Fuel Control Mode (Open Loop).
- Monitored Drivers:** Lists injector and coil driver data for 10 cylinders.
- Diagnostic Modes:** Includes Spark kill (Normal), Injector kill (Normal), and DBW test (Off).
- DBW Variables:** Shows TPS command (6.2 %), TPS position (7.0 %), and TPS1 percent (6.3 %).
- Input Voltages:** Lists Gov1 voltage (0.4 volts), Gov2 voltage (0.4 volts), and Oil pressure voltage (5.0 volts).
- Historic Faults:** Lists 'DTC 512: FPP1 voltage low'.
- Active Faults:** Lists 'DTC 512: FPP1 voltage low'.
- Variable Definition Tables:**
 - SnapShot Base Definitions:** Maps variables like Vbat to EGO2_volts.
 - SnapShot Custom Definitions:** Shows mostly empty fields.
 - Flight Data Base Definitions:** Maps Vbat to A_BM1 and FPP_pct to A_BM2.
 - Flight Data Custom Definitions:** Shows mostly empty fields.

Four blue callout boxes provide additional context:

- Base Fault snapshot variable definitions (CAN NOT be altered):** Points to the SnapShot Base Definitions table.
- Custom Fault Snapshot variable definitions (User Defined):** Points to the SnapShot Custom Definitions table.
- Base Flight Data Recorder variable definitions (CAN NOT be altered):** Points to the Flight Data Base Definitions table.
- Custom Flight Data Recorder variable definitions (User Defined):** Points to the Flight Data Custom Definitions table.

Figure 28: Faults Page with Active Fault Message

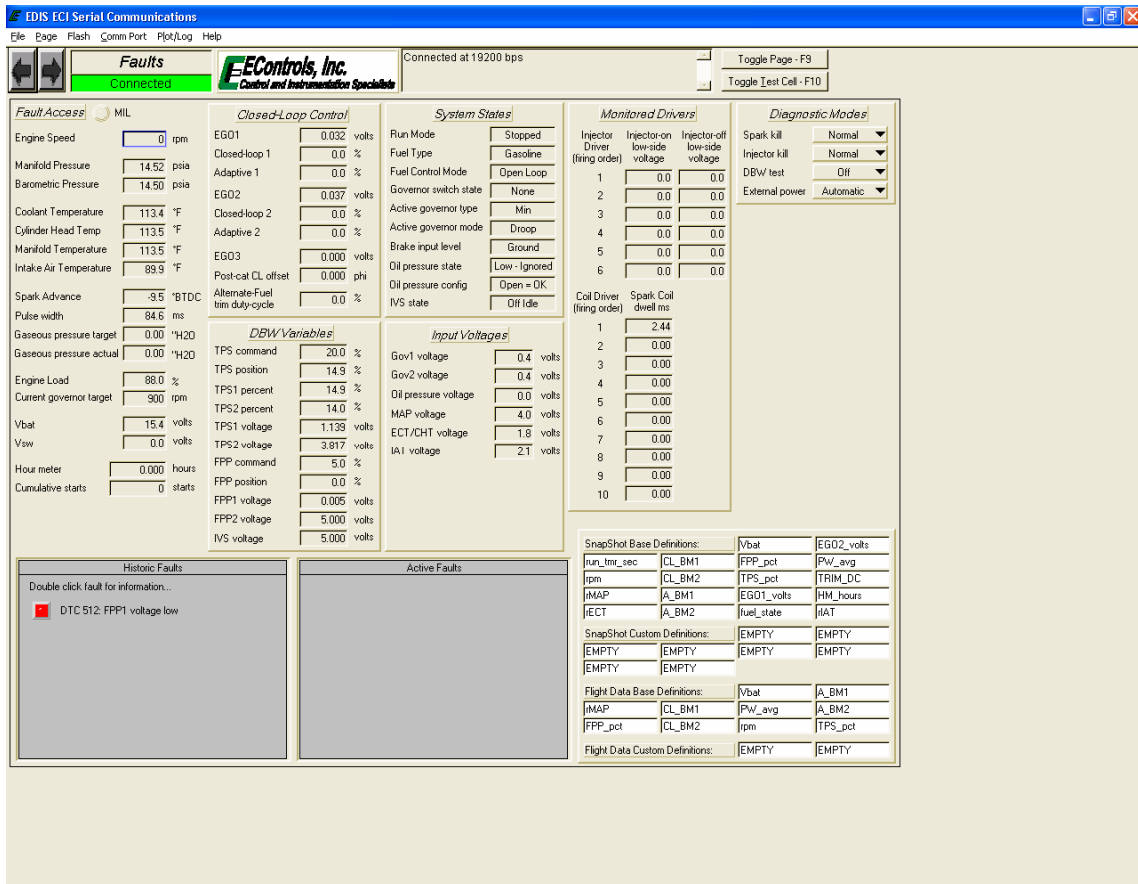


Figure 29: Faults Page with Historic Fault Message

Once an active fault has occurred two sets of data are recorded, fault snapshot and flight data recorder. The fault snapshot (FSS) is a sample of data taken at the instance the fault triggered. Variables included in the FSS are defined in the Snapshot Base and Snapshot Custom Definition fields found on the Faults Page. A FSS is saved with each of the first eight (8) faults for the first time the fault becomes active. Conversely, the flight data recorder (FDR) is a ten-second stream of data that includes eight-seconds prior and two-seconds after triggering the fault. An FDR is saved for each of the first two (2) faults for the first time the fault becomes active. Variables included in the FDR are defined in the Flight Data Base and Flight Data Custom Definition fields found on the Faults Page.

The memory location of the FDR is RAM, therefore this data is only available if the ECM has not lost battery power. In addition, if there is a “Dirty Flash Page” in the ECM, the FDR data will not be available. The memory location of the FSS data is EEPROM and is retained when the ECM loses battery power.

Both sets of data are accessed from the Historic Fault Information interface and can be saved to the PC upon retrieval. Base variables for FSS and FDR are generally defined by the OEM to include variables most often referenced during fault diagnosis. The base definitions are not fault dependent. Additional variables may be selected for capture during a fault occurrence through a single, left-click of the custom table and selecting the desired variables from a list. An example of custom fault variable definitions is shown in Figure 30.

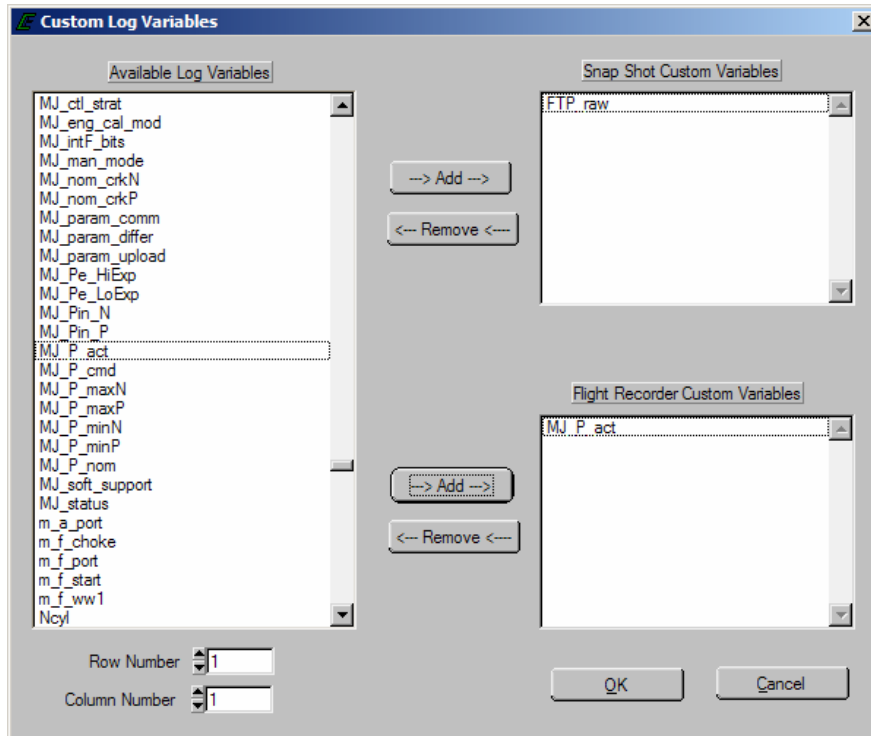


Figure 30: Custom Fault Variable Interface

Accessing fault information is accomplished through a double left-click of the fault LED in the historic fault list. This produces the Historic Fault Information interface shown in Figure 31. From this interface the user can interpret a diagnostic trouble code (DTC) message, identify whether or not the fault occurred during the current key cycle, identify if the fault caused the engine to shutdown, determine how many key cycles have occurred since the fault was last active, clear selected or all historic faults, and view snapshot and flight data. Table 5 outlines the options displayed in the Historic Fault Information screen. Historic faults are not overwritten if the same fault becomes active, storing data from the original active fault.

Figure 32 is an example of a fault snapshot after View Fault Snapshot is selected. Data is presented in two columns, base and custom variables. Once retrieved, the FSS data may be saved to the PC in text format with an .fss

extension. A FSS saved to a PC may be reviewed in any ASCII based software program.

Figure 33 shows the Flight Data Recorder interface after View Flight Data Recorder is selected. The FDR captures a ten second (eight seconds prior and two seconds after generating the fault) strip of data for base and custom variables. FDR data is presented in an interface similar to the Plot interface for a quick graphical presentation. From this interface, the FDR data may be saved to the PC in text, tab-delimited format with an *.fdr* file extension. Once saved to PC, FDR data may be reviewed using any graphical post-processing software capable of handling tab-delimited formatting.

Fault information may be manually erased using the “Clear” button functions. Once a “Clear” function has been selected, the dialog prompt shown in Figure 34 will be displayed. Choosing YES deletes all fault information from the ECM.

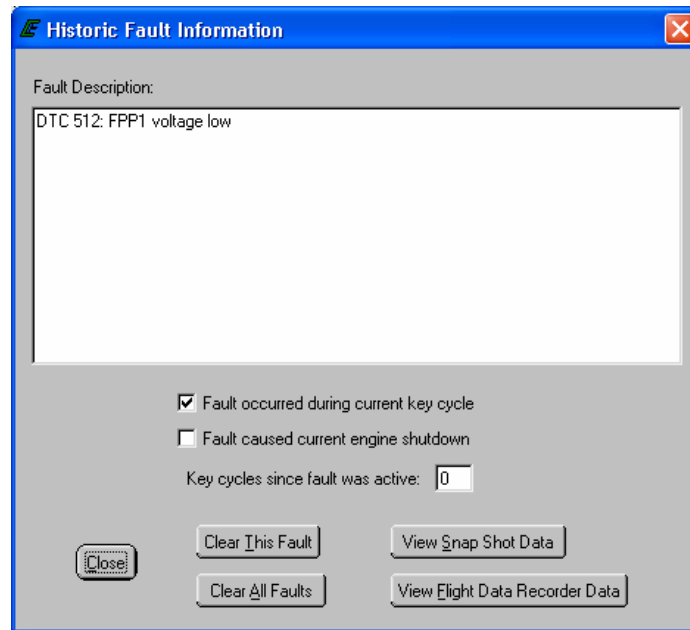


Figure 31: Historic Fault Information Interface

Table 5: Historic Fault Information Interface Functions

Fault Description Message Box	Customized text that references the DTC flash code and describes the fault.
<i>Fault During Key Cycle</i> Checkbox	Informs that the fault occurred during the current key-on event.
<i>Fault Caused Engine Shutdown</i> Checkbox	Informs that the fault caused the engine to shutdown.
<i>Key Cycles Since</i>	Displays the amount of key-on events since the fault was

<i>Fault Active Indicator</i>	last active.
<i>Clear This Fault Button*</i>	Erases the selected historic fault from the ECM.
<i>Clear All Faults Button*</i>	Erases all historic faults from the ECM.
<i>View Snap Shot Data Button</i>	Retrieves a data “snap shot” from the ECM for variables defined in the base and custom snapshot variable definition lists. An example of a fault snap shot is shown in Figure 32.
<i>View Flight Data Recorder Data Button</i>	Retrieves a 10-second data strip chart (8 seconds prior, 2 seconds after fault trigger) from the ECM for variables defined in the base and custom flight data recorder definition lists. An example of a fault snap shot is shown in Figure 33.
<i>Close Button</i>	Exits the Historic Fault Information interface. DOES NOT cancel or clear any faults.
* Snapshot and flight data recorder data for historic faults is erased after the prompt shown in Figure 34 is satisfied	

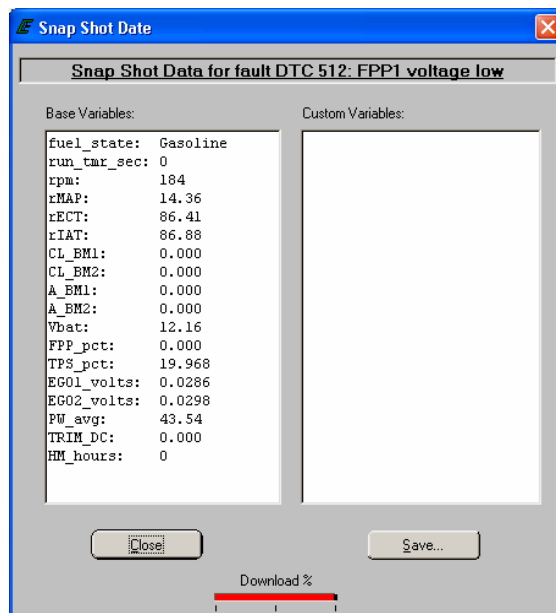


Figure 32: Snapshot Data Interface

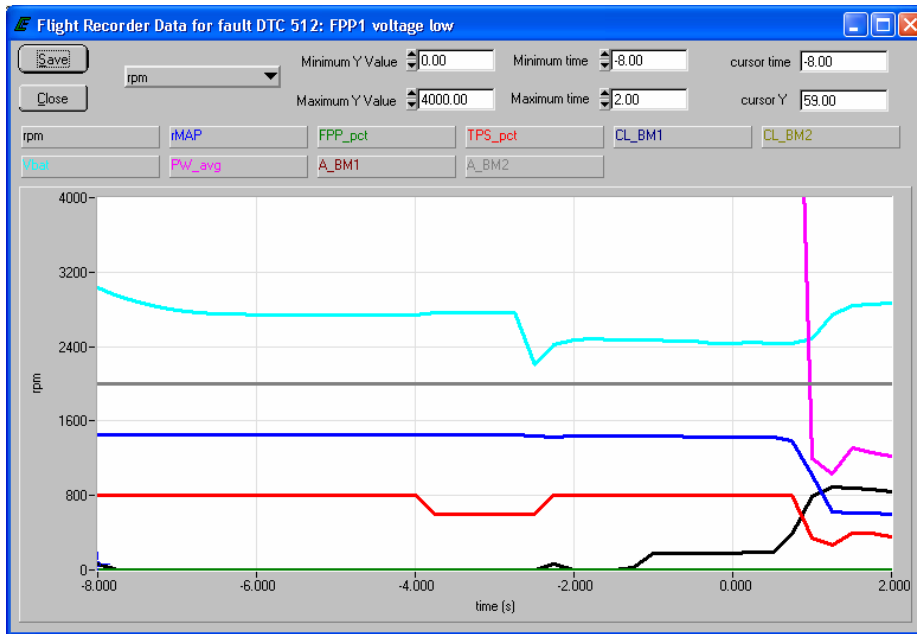


Figure 33: Flight Data Recorder Interface

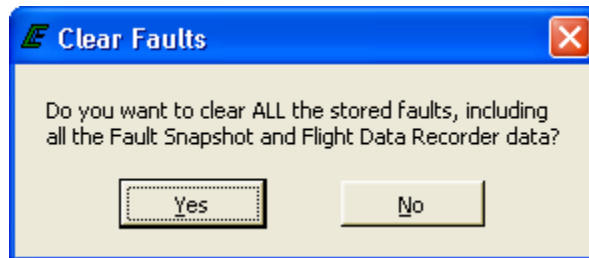


Figure 34: Clear Faults Prompt