– MAE TestCell –

– AMAD –

– Transmission Test Stand –

Last Change: May 13, 2025

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The Login Screen

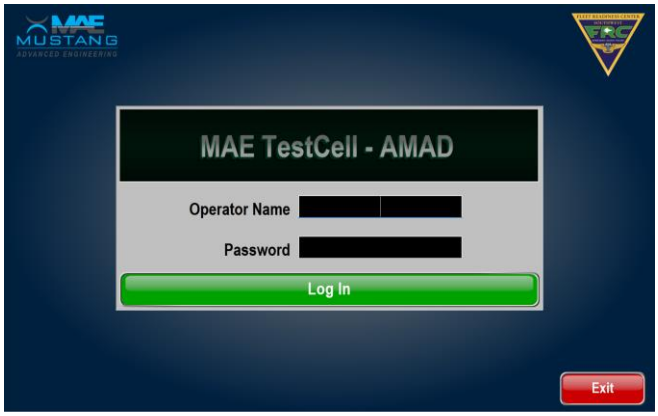

Figure 1 - The Login Screen

The login screen is displayed upon starting the application, and immediately after an operator logs out. It is from this screen that all operators must enter their operator name and password in order to log in to the TestCell application. Click the “Log In” button to verify the operator credentials and proceed to the main testing screen. For information on creating and editing operator accounts, see the *Operator Database* section of this document.

The Main Testing Screen

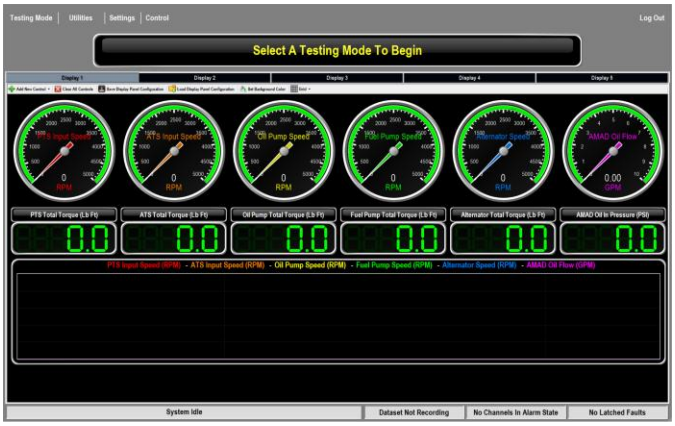

Figure 2 - The Main Testing Screen

The main testing screen is the full-screen form that is displayed immediately upon login. From the main testing screen, all software functions can be accessed using the main menu. To log out of the software and return to the login screen, select the ‘Log Out’ menu option on the right side of the menu.

The ‘Test Modes’ menu allows the operator to select the testing mode. The testing modes are ‘Manual (Constant Target)’ and ‘Scripted’. Please see the section ‘Test Modes’ for more information on the testing modes.

The ‘Utilities’ menu contains items which can be used to access the various utilities discussed in the ‘Utilities’ section of this document.

The ‘Settings’ menu allows access to the various configuration parameters of TestCell. See ‘Settings’ for more information.

The main testing screen contains a row of tabs, labelled “Display 1” through “Display 5”, which can be used to auto-switch between 5 different user-defined display panel configurations. Each fully-configurable display panel is used to represent the values relevant system channels using an assortment of different display controls. The display panel is discussed further in the *Display Panel* section of this document.

Test Modes

Constant Target Testing – Allows on-the-fly testing, where the operator is presented with a test panel containing target sliders to control each individual motor of the test stand.

Upon being placed in constant target testing mode, the constant target test panel will be displayed. In order to make the target slider active and enable the input motor, the operator must click the 'System Enable' button.

The dropdown box is used to set the control mode of the input motor / PAU. Control modes may include speed, where target points are specified in terms of RPM, torque (Ft. Lbs.), power (HP), and manual (open-loop, 0-100%). Output PAUs will also have available Vehicle Simulation (Polynomial Loading) mode, where target output torque load is calculated as a function of input speed (Torque = A + Bx + Cx^2, where x is input speed). Ramp rates for each control mode (RPM/Sec, Ft. Lbs./Sec, HP/Sec, %/Sec), vehicle simulation A, B, and C constants, simulated inertia, and slider minimum and maximum reference values can be set on the 'Constant Target Test Parameters' screen, available from the 'Settings' menu.

While actively testing, the slider can be used to specify the target point, or a specific target value can be typed in the value box and the 'Enter' key pressed. Once the desired input mode has been selected and appropriate target points have been defined, the operator clicks the blue 'Apply' button to send these values to the test stand controller.

At any time before, during, or after a constant target test, the operator can start a data acquisition session by clicking on the dataset status on the status bar at the bottom of the main screen and selecting 'Begin Manually Recording' from the context menu (the operator will be prompted for a filename for the new dataset). The same menu can also be used to stop and save the recording session.

When constant target testing has been completed, the operator clicks the red 'Stop Test' button, which disables the mode dropdowns and target sliders ends the test. The input motor and power absorbers will also be disabled.

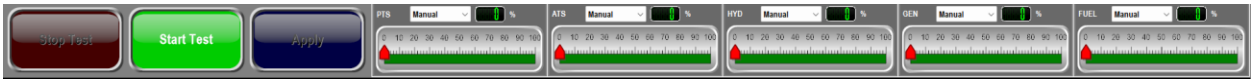

Figure 3 - A Constant Target Test Panel

Scripted Testing – Allows the operator to execute scripted tests created using the Script Editor (discussed in the 'Utilities' section of the document).

Upon entering scripted mode, the operator will be asked to enter some information on the scripted test parameters screen, such as test article identification, number of script iterations to run, and whether to automatically acquire data and generate a report and add it to the database. Note that selecting a part number from the dropdown causes the script and shift profile to be set to the defaults defined for that part number in the "Scripted Testing" tab of the system settings, but that the script can be changed by clicking the "Load" button, and a different shift profile can be used by selecting it from the dropdown.

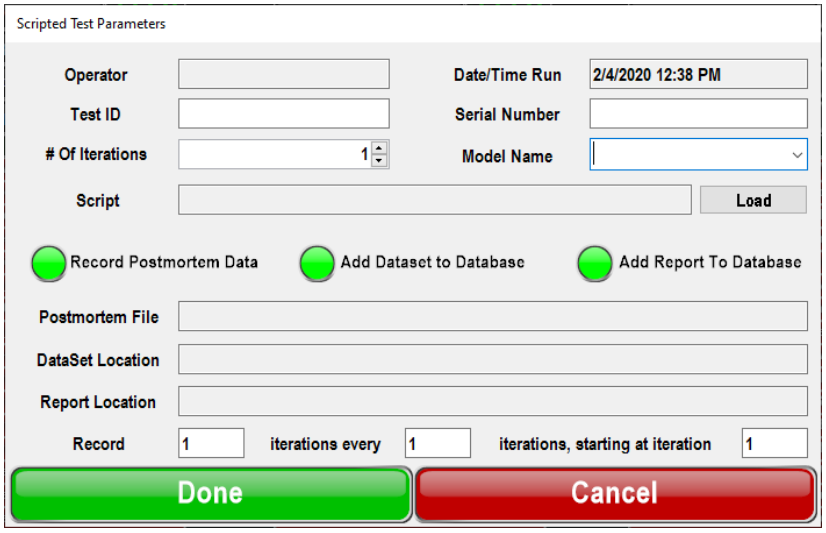

Figure 4 – The Scripted Test Parameters Screen

After verifying the information on the scripted test parameters screen and clicking 'Done', the application enters scripted testing mode, where the scripted test panel is visible at the top of the main screen. Click 'Start Test' to begin execution of the selected script at the first step.

During the execution of a scripted test, the scripted test panel will display the current iteration, current step name, current step description, and time remaining in the current step. To get a detailed display of the control modes and target values for the current script step, hover the mouse over the step description display. An operator may access the transmission control utility or the analog output control utility during the execution of the scripted test in order to view status and/or make adjustments. While a scripted test is in process, the yellow 'Pause' button can be used to temporarily halt a running script, maintaining current control modes and target values, and the blue 'Advance' button can be used to manually increment a script to the next step before the completion of the current step. A scripted test can be aborted at any time before completion by clicking the red 'Abort Test' button.

Figure 5 - The Scripted Test Panel

After a scripted test has been completed, the operator will be presented with the test report, which contains all of the recorded values and pass/fail results for each step defined in the script. After reviewing the report, click 'Exit' on the report viewer screen to dismiss the report, which will be automatically saved to the database, and return to the main screen. At this point with the application still in scripted testing mode, the operator can click 'Start Test' to re-run the currently selected script test again. To select a new script to run or change any of the scripted test parameters, the operator must exit and re-enter scripted testing mode from the 'Test Modes' menu.

Automatic Testing – Allows the operator to execute pre-defined tests.

Utilities

System Channel Editor – For operators of high access level, this menu item displays the *Diagnostic Display of System Data*, which is discussed later in this document.

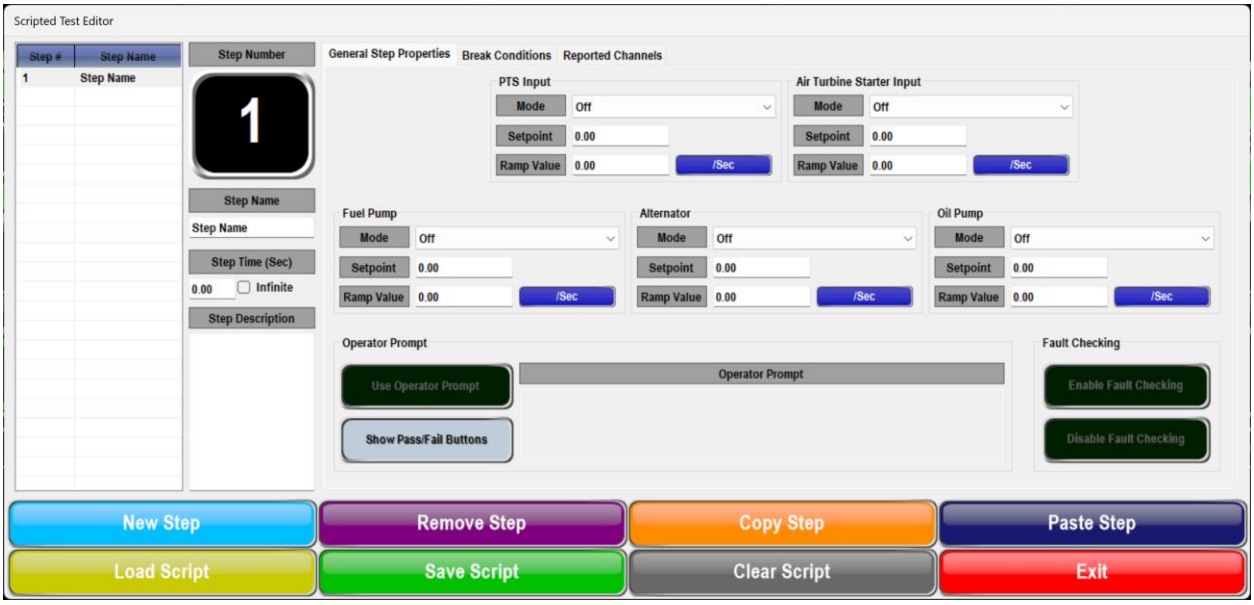

Figure 6 - The Script Builder

Script Builder (Scripted Test Editor) – A utility for designing automated test routines or scripts, available to operators with medium access or higher. Each script consists of a number of sequential steps, and each step is defined by name, time, description, gear position, control modes, target values, ramp rates, conditional stepping (break) parameters, operator prompt, and a set of recorded channels with associated pass/fail criteria.

Step Name – The name of the step, which appears on the screen during execution, and on the report for any channels recorded during the step, which is shown upon test completion.

Step Time – The time, in seconds, of the step. If “Infinite” is selected, then time will not be used, and the step must continue either by meeting the break criteria or, in the case of an operator prompt step, the prompt is dismissed. A non-operator prompt step without break criteria or time defined will run indefinitely.

Step Description – The text that will appear in the scripting status during the execution of this step.

Break Conditions – To use conditional stepping, create entries in the table on this tab page. Select the channel, the operation (greater-than, less-than, or in-range), the value, the break time, and the break action. When selected, if the value of the break channel meets the break criteria during execution of the step for the duration of the break time defined, the script will perform the selected break action. For the break action “Jump To Step”, the “Value” field should contain the step number of the target step of the jump. The break action “Set Digital Output” requires the “Value” field to contain the number of the digital output to set. To clear the digital output, make this value negative. To use the “Reset Timer” break action, the “Value” field must contain the channel index (from the system channel editor) of the timer channel to be reset. For the “Next Step”, “Next Iteration”, and “End Script” break actions, the “Value” field has no meaning. Note that when conditional stepping is selected, the step time is still in effect, acting as a timeout for the break action. If the time expires before the break criteria have been met, then the script simply proceeds to the next step, and the break action is not preformed.

Operator Prompt – If “Use Operator Prompt” selected, then an operator prompt dialog displaying the text typed into the “Operator Prompt” field will appear on screen at the beginning of the step, and the script will

advance to the next step only when the operator clicks a button on the prompt to dismiss the dialog. Additionally, by selecting “Show Pass/Fail Buttons”, the operator will be presented with buttons that allow them to enter a passing or failing result. Note that when the operator prompt option is selected, step time is set to infinite and conditional stepping is disabled.

Reported Channels – Specify the channels to be recorded on the report for this step. For each channel selected, select the value type to record (snapshot, mean, maximum, minimum). The snapshot value type records the value of the channel at the conclusion of the step, the mean value type records the average value of the channel throughout the step, and minimum, and maximum record the minimum and maximum values of the channel throughout the step. The value version (raw, filtered, min, max) to record may also be specified. High and low pass/fail criteria can be entered for each channel. Marking a recorded channel as “Critical” will, during execution of the script after completion of the step, if the channel is outside of the pass/fail range by more than the amount specified in “Threshold”, prompt the operator if they wish to stop the test due to critical channel failure. After execution of the script, when the recorded channels are displayed as a report, if the recorded value does not fall within the bounds of the high and low limit, then the channel will appear with a red background on the test report, signaling a failure.

A button bar across the bottom of the script editor contains several functions.

Load/Save Script – Recall from and save the current script to disk.

Clear Script – Clear the contents of the currently loaded script and reinitialize the script builder with a blank script.

New Step – Adds a new step to the end of the currently loaded script.

Remove Step – Removes the currently selected step from the script.

Copy/Paste Step – Copy and paste a step from one part of the script to another. Note that a pasted step will be inserted *after* the selected step when the “Paste Step” button is clicked.

Exit – Dismiss the script editor and return to the main testing screen.

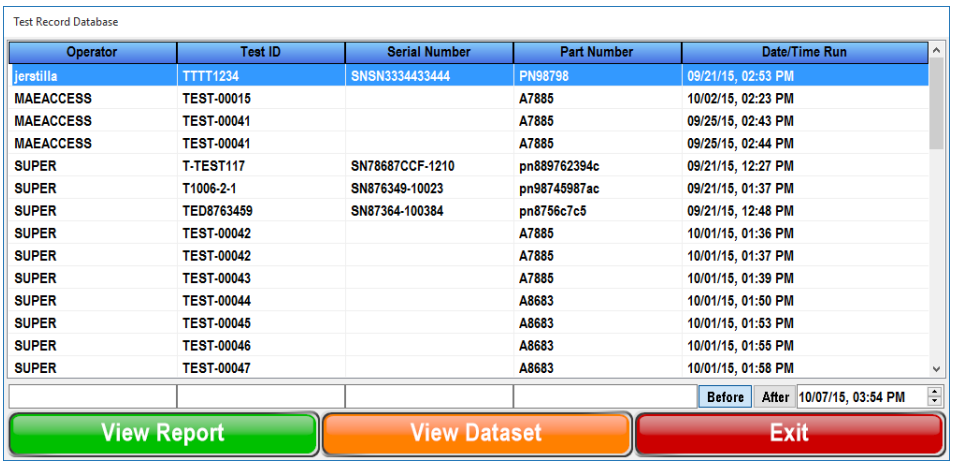

Figure 7 - The Test Record Database

Test Record Database – Displays a utility which allows previous test records to be recalled and to view the datasets and/or reports associated with those test records. The list of saved records can be sorted in ascending or descending order by clicking on the column headers. To search for one or more test records with specific properties, enter the search criteria in the boxes below each column. The list will automatically filter as the search criteria is entered. To

view the dataset (using the Dataset Viewer utility, discussed in length in the section of this document labelled “Dataset Viewer”) or report (using Adobe Reader) associated with a test record, select the record by clicking on it, then click either the ‘View Report’ or ‘View Dataset’ button. If a selected test record does not have an associated dataset or test record available in the database, then the button for that function will be disabled. This utility is available only to operators with a medium access level or higher. Once finished, click ‘Exit’ to dismiss this utility and return to the main testing screen.

Dataset Viewer – Generally used for datasets recorded manually, this menu option opens a file dialog that allows the operator to select a dataset from disk to load into the Dataset Viewer utility, discussed in another section of this document. Note that the Dataset Viewer can be launched for automatically-recorded datasets from the Test Record Database as well.

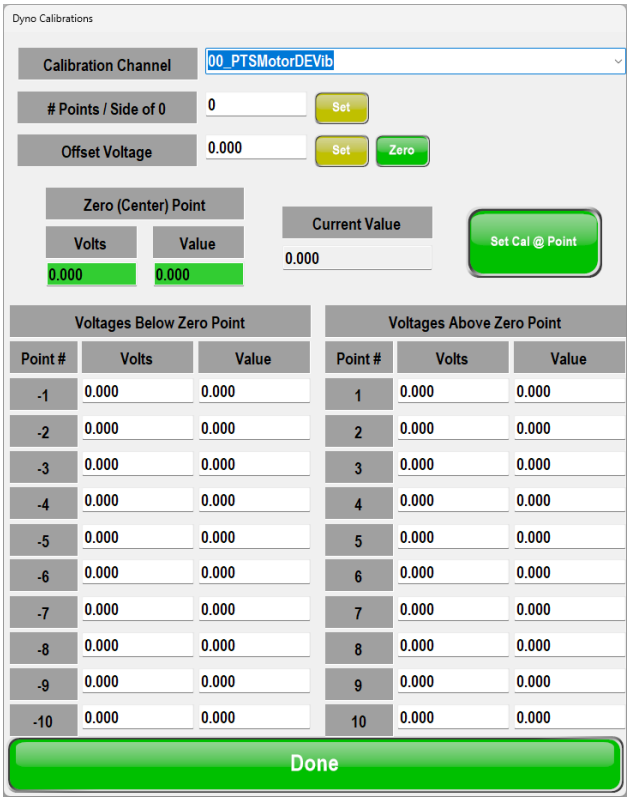

Figure 8 - The Dyno Calibration Utility

Dyno Calibration – To calibrate the torque measurement devices such as load cells and inline torque sensors, the dyno calibration utility is used. This utility is capable of doing both bipolar calibrations (when both positive and negative torque are measured, used with inline torque sensors and electric motors) and unipolar calibrations (for load cells, where torque is only measured in one direction). To begin a calibration, select the calibration channel from the dropdown menu. Then, install the calibration arm on the test stand (on the positive torque side if doing a bipolar calibration) and click ‘Zero’ to record the zero voltage (with calibration arm installed, so that any torque added by the weight of the calibration arm itself can be accounted for). Then, put the calibration weight on the calibration arm. If doing a bipolar calibration, click ‘Positive Span’, move the calibration arm and weight to the negative torque side of the test stand, and click ‘Negative Span’, otherwise, for unipolar calibrations, just click ‘+/- Span’. Finally, remove both the calibration weight and arm from the test stand, and click ‘Zero’ to re-record the zero voltage. To save the recorded calibration values to the dyno controller, click ‘Save To DAC’.

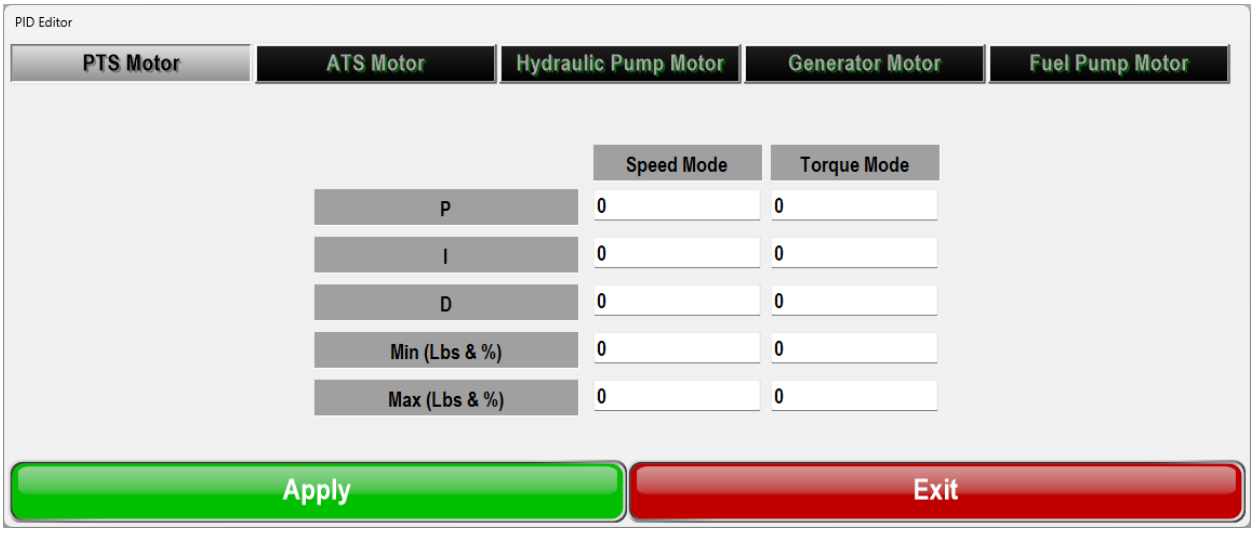

Figure 9 - The PID Editor

PID Editor – The PID editor can be used to change the response characteristics of the test stand's input and output devices by changing the proportional, integral, and derivative constants of the device's control loop, as well as the minimum and maximum reference voltages. Typically, the devices are tuned for proper response prior to installation, and therefore this utility should only be used by trained individuals, as damage to equipment and personnel can result from an improperly tuned device.

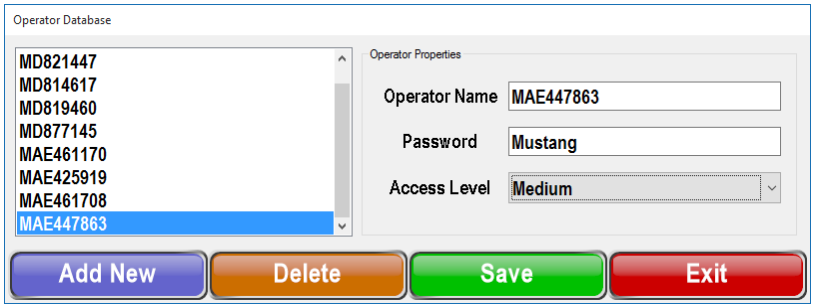

Figure 10 - The Operator Database

Operator Database – This utility is only accessible to one account, the super user, which has the operator name "SUPER" and the password "SUPER". This utility allows the super user to edit the operator database – add and delete operator accounts, change operator access levels, and change operator passwords. To add a new operator to the database, click 'Add New' and enter the operator's name, password, and access level under 'Operator Properties'. To edit the name and password or change the access level of any operator, select the operator by clicking on the name of the operator in the list on the left, and change the value of the fields in the box on the right. To delete the selected operator, click the 'Delete' button. To save the operator database to disk, click the button labeled 'Save', and click 'Exit' to close this utility.

Settings

Figure 11 - System Settings

System Settings – Various system configuration settings, including those pertaining to hardware communications, disk locations of saved records, script files, and display panel configurations, can be set here. The display panel tabs on the main screen can be associated with display panel configurations on disk in the 'Display Panel' tab. In the scripted testing tab, part numbers can be associated with script files and shift tables. Different items will appear here depending upon the configuration of the test stand.

Dyno Communications – Set the COM port of the dyno controller. Set to inactive to run in demo mode.

File Locations – Set the path to the folder containing saved test data, scripts, and display panels. These are the default locations where these file types will be stored and retrieved.

Misc. – Change setpoint values between metric and imperial units. Also, you can turn language translations on/off. When language translations are turned on, all label text will be replaced with the equivalent value found in the LanguageTranslations.Ser file in the executable folder.

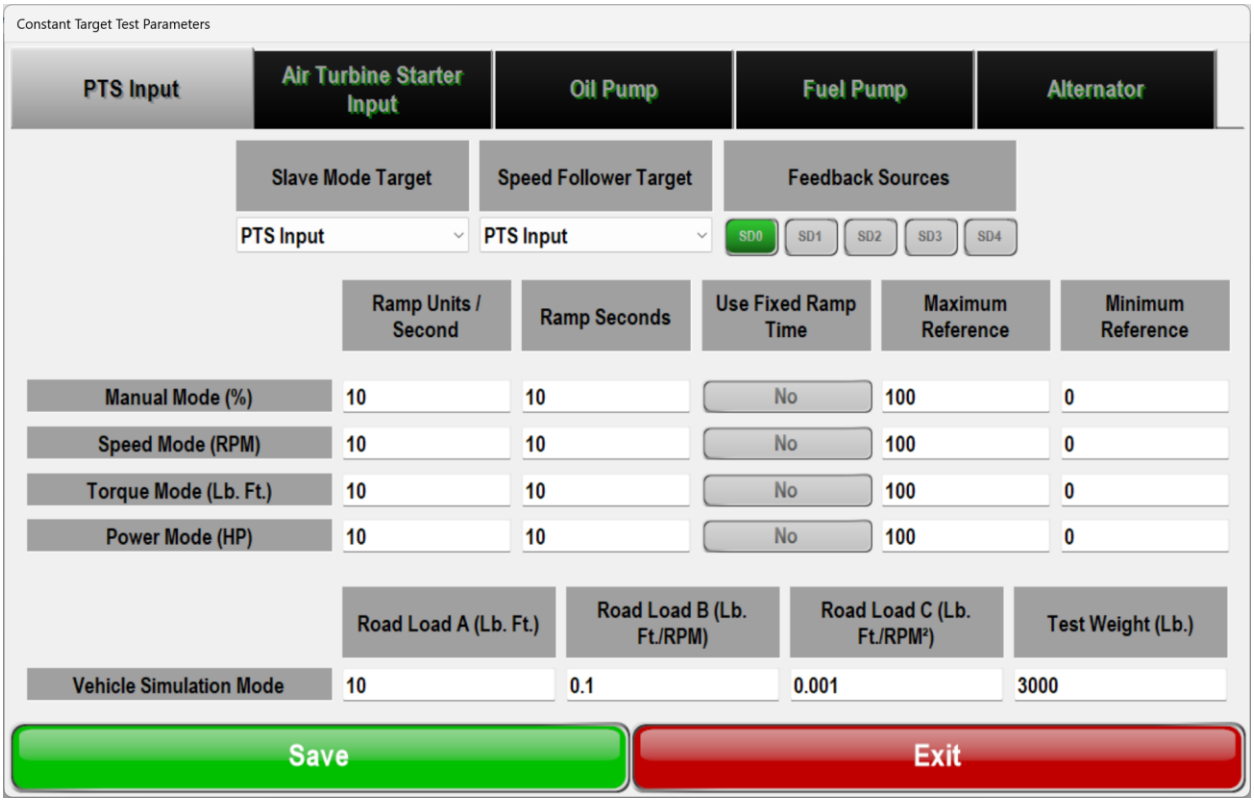

Figure 12 – Constant Target Test Parameters

Constant Target Test Parameters – Allows the operator to specify ramp rates for each control mode, slave/speed follower mode parameters, vehicle simulation constants, and maximum and minimum references pertaining to the manual (constant target) testing mode, for each subdyno. To change the displayed subdyno, click the appropriate tab at the top of the utility. The save any changes, click 'Save And Exit', otherwise, click 'Cancel' to dismiss this dialog without saving.

Diagnostic Display of System Data

The channel editor, accessible from the 'Utilities' menu as well as a display control's context menu, is used to view and edit the properties of the system data channels. Depending upon the application and configuration of the test stand, a standard set of pre-defined system data channels is will be available from the dropdown list after installation. When the utility is accessed from the context menu of a display control, it will be pre-loaded with the channel information for the channel that was associated with that display control, but the dropdown box can be used to change the current channel. An operator can further add and define new calibrated, calculated, or timed system data channels using the "Add New Channel" dropdown menu.

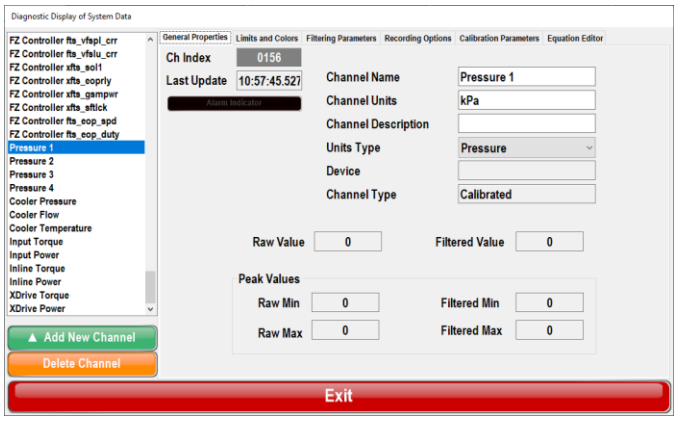

Figure 13 - General Properties

General Properties – This tab allows the operator to change a system data channel's name (operator-defined channels only), description, and units. In addition, channel alarm status, current raw and filtered values, and peak raw and filtered values are shown. For timer channels, the reset function can be accessed by clicking 'Reset Timer'.

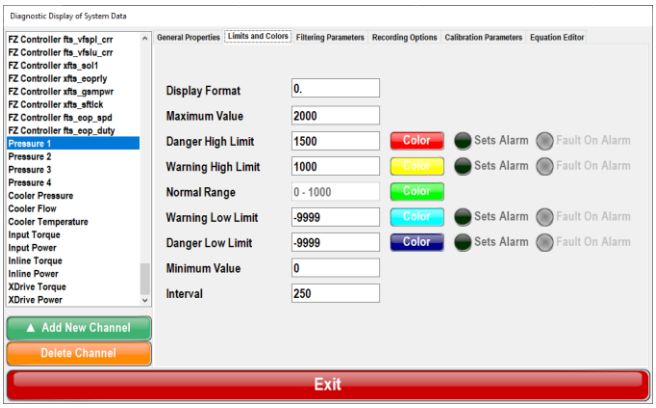

Figure 14 - Limits and Colors

Limits and Colors – Use this tab to define the way a system data channel looks when associated with a display control, including limits, colors, alarms, and increment. Exclude a danger or warning limit by setting the value outside the bounds of the minimum and maximum values. For each danger and warning limit, select the color for that region on a gauge, and select whether an alarm will be triggered if the channel's value is greater than a high limit or less than a low limit.

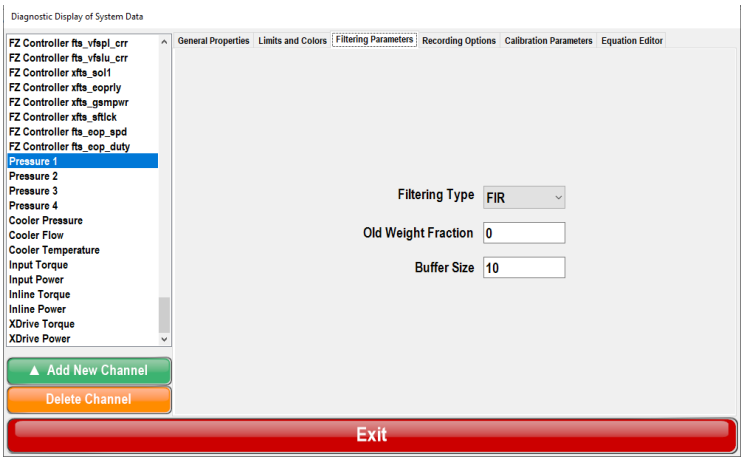

Figure 15 – Filtering Parameters

Filtering Parameters – Specify filtering parameters including old weight fraction (OWF) for a channel using infinite filtering (IIR), or a buffer size for a channel using finite (FIR) filtering. Channel filtering can smooth noisy data.

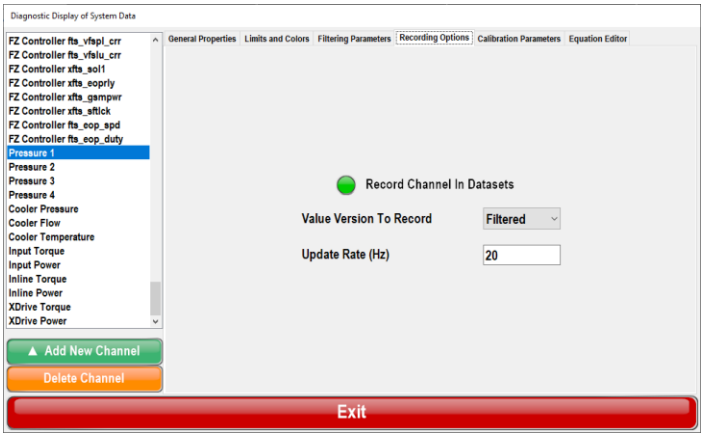

Figure 16 - Recording Options

Recording Options – Select to include this channel in datasets by selecting the “Record” option, then, select the value version to record and the data recording rate (specifying “Synchronous” will record the channel every time the value is updated, at the cost of system performance).

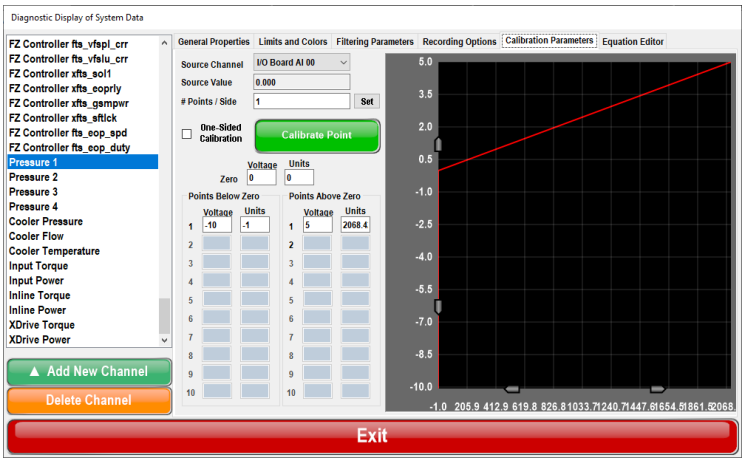

Figure 17 - Calibration Parameters

Calibration Parameters – For calibrated channels only, allows the operator to view/edit various calibration parameters including source channel and number of calibration points. Calibration values can be manually entered by selecting the calibration point (turning it green), entering in the new value on the keypad, and pressing "Enter". Calibration points can also be recorded using the "Calibrate Point" button while the desired calibration point is selected. To the right, the channel's calibration is represented visually on a graph to allow the operator to check for linearity errors.

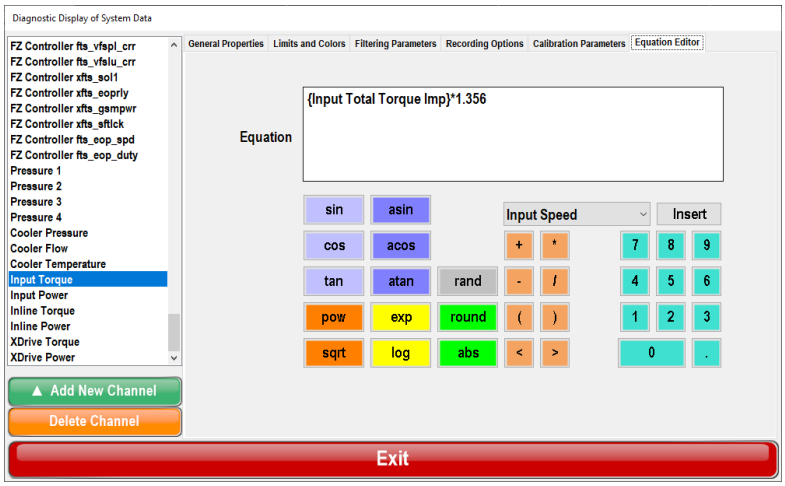

Figure 18 - Equation Editor

Equation Editor – The equation editor is a utility for defining the equation that is used to calculate the value of a calculated system data channel. The value of other channels can be inserted into the equation using the dropdown box and "Insert" button. Standard mathematical, trigonometric, and exponential functions are available, as well as Boolean greater-than (>) and less-than (<).

The Display Panel

The display panel is operator-defined dashboard area for displaying the values of the system data channels using an assortment of graphical controls, including angular and linear gauges, strip charts, digital displays and indicators, etc. A new display panel control is added to the display panel by choosing a control type from the “Add New Control” submenu. Once added to the display panel, the control can then be manipulated using the mouse. Left-clicking and dragging the mouse on the control causes the control’s position to change, while right-clicking and dragging the mouse on the control allows the operator to change the control’s size. Once defined and customized to an operator’s liking, the display panel layout can be saved to disk (serialized) and recalled (deserialized) at any time. The buttons across the top of the display panel allow multiple display panel configurations to be switched between quickly during a test. Display panel configurations may be associated with each of the five buttons in the ‘System Settings’ dialog, in the ‘File Locations’ tab.

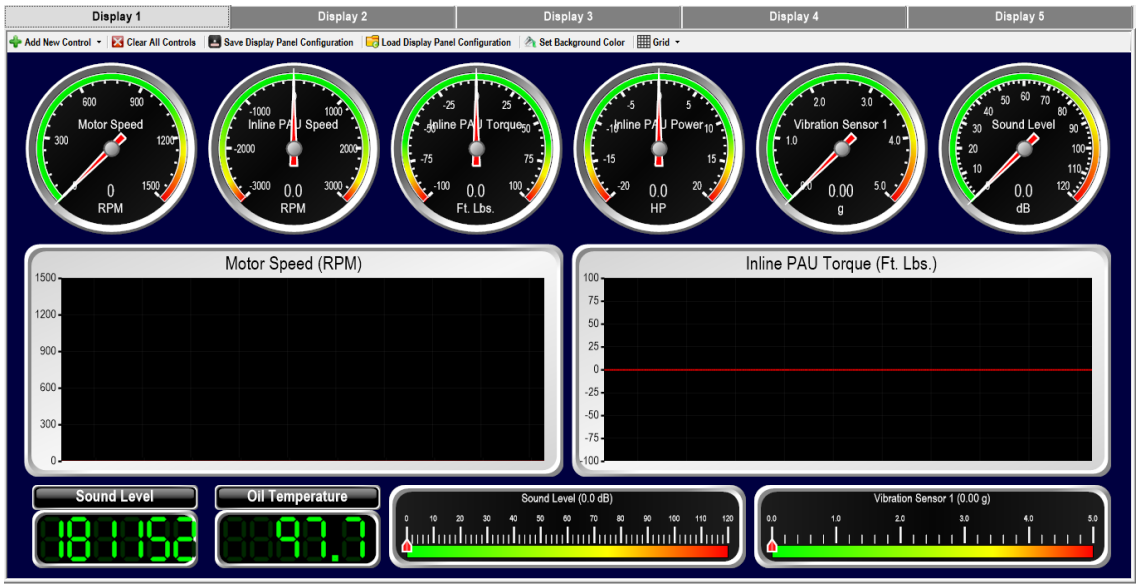

Figure 19 - The Display Panel

Add New Control – Displays a menu that allows a new graphical control to be added to the display panel.

Clear All Controls – Clears the display panel of all controls.

Save Display Panel Configuration – Allows the operator to save the current display panel to disk, for recall at a later time.

Load Display Panel Configuration – Allows a saved display panel configuration to be recalled from disk.

Set Background Color – Allows the selection of the dashboard color behind the controls.

Grid – Displays the grid submenu, which allows the operator to enable/disable and configure the grid, which can be underlain on the panel to help place and size the controls.

Right-clicking on any display panel control will bring up the context menu for that control. The display panel control context menu allows for the further personalization of the display panel control, including setting its association with a system data channel. The options available in the context menu will differ depending upon the control type and the type of channel associated with that control, but all contain a number of functions common to all display panel control types, including Duplicate, Delete, and Reset Min/Max. Other control types, such as the constant label, will not be associated with a system data channel, as they act only as stand-alone labels or as auxiliary labels for other display panel controls.

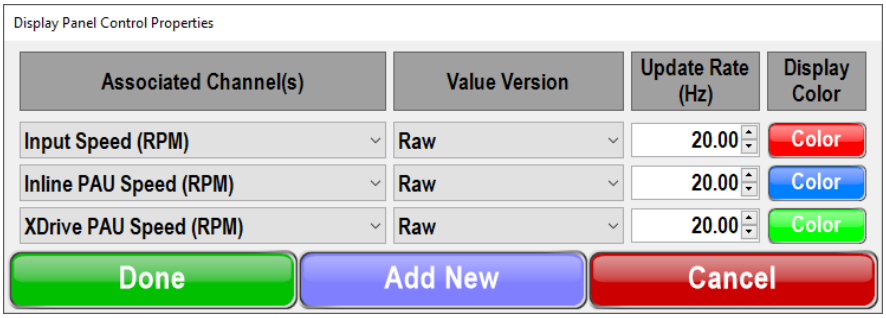

Figure 20 - Display Control Properties

Display Control Properties – Clicking on this menu item will bring up a dialog box that allows the display panel control to be associated with one or more system data channel(s). In addition the value version of the associated channel can be chosen, as well as the control's update rate, and, for strip chart display controls, the color associated with the channel's plot. Note that the strip chart control type can be associated with and display multiple system channels.

Channel Properties – Brings up the Diagnostic Display of System Data (System Channel Properties dialog), with the control's associated channel loaded. For more information, see the section titled 'Diagnostic Display of System Data'. Changes made to a system channel's properties will immediately be reflected in any display panel control associated with that channel.

Delete – Remove the display control from the display panel.

Bring To Front/Send To Back – Allows display controls that overlay each other to move forward/back.

Reset Min/Max – Resets the stored minimum and maximum values of the system channel that is currently associated with the display panel control.

Duplicate – Creates an exact copy of the display control, including the associated channel, size, and all display control-specific settings, and adds it to the display panel at the default position (0, 0).

Reset Timer – If the display control's associated system channel is a timer channel, the timer can be reset directly from the display panel context menu.

Set Font/Text – For a display panel control that displays text, the font style and size can be defined from this menu item. For a constant label, the text to display can also be specified.

The following context menu options are available only for the strip chart display control type:

Pause/Unpause Graph – Stops/starts the accumulation of new data points on a strip chart.

Set Plot Thickness – Set the thickness, in pixels, of the lines drawn to create the plot of each channel displayed on a strip chart control.

Set Buffer Length – Set the amount of time, in seconds, to show in the history of the strip chart.

Set X-Axis Interval – Set the amount of time, in seconds, between the vertical grid lines of the strip chart.

Show X-Axis – Show or hide the x-axis, in seconds elapsed since application execution.

The following context menu options are available only for the numeric LED display control type:

Set Number Of Digits – Set the number of digits displayed on the numeric LED.

Set Segment Width/Separation/On Color/Off Color – Further customize the look and feel of the numeric LED display control.

The following context menu options are available only for the light strip display control type:

Set Orientation – Change the orientation of the light strip to vertical or horizontal.

Set Segment Number Of Divisions/Separation/Segment Color – Further customize the look and feel of the light strip display control.

Set Display Value Relativity – Set whether the light strip has its origin in the middle or the left side of the control.

Other display control types allow for further graphical customization using control-specific context menu items. The text-based display controls value label and constant label allow the setting of the font size, background color, text, etc. Any display control that is associated with a timer channel also has a 'Reset Timer' menu item available in its context menu (timer channels can also be reset in the general channel properties).

The Dataset Viewer

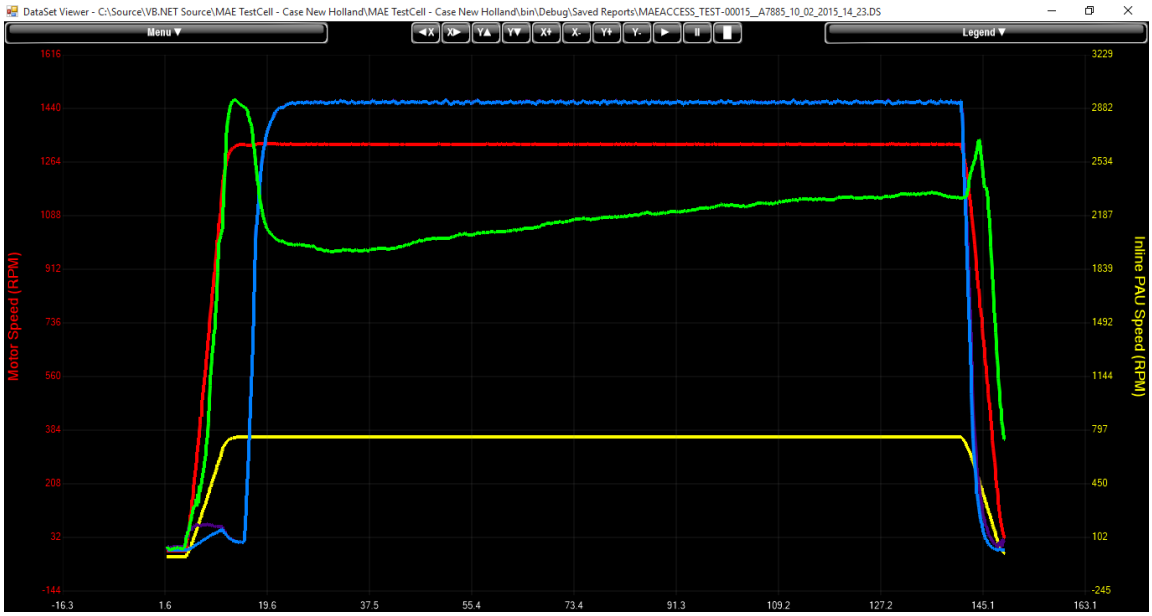

Figure 21 - The Dataset Viewer

The Dataset viewer is a utility used for viewing and analyzing recorded test data. The datasets loaded to the viewer are created during a manual (constant target) test or a scripted test, and contain the data for all of the channels recorded during the duration of the data recording session. While the viewer is capable of showing any number of channels in the graph area at once, it can show only two y-axes at a time, one on either side of the graph.

The following mouse gestures are in the graph area:

Left mouse button drag – Draws a box around an area to be zoomed.

Right mouse button drag – Pans the entire graph.

Mouse wheel up/down – Zoom in/out on the entire graph.

Mouse wheel click – Draw a cursor on the screen.

Clicking 'Legend' will display a table of all recorded channels. Check the box in the 'Visible' column to make the channel visible in the graph area. Scroll the mouse wheel up/down with a channel selected in the legend to zoom in/out on just that selected channel. Right-click on an individual channel's name in the legend to show a context menu for that channel.

Select Color – Change the display color of the channel on the graph.

Set Y-Axis Left/Right – Show the channel's Y-axis on the left/right side of the graph.

Set Minimum/Maximum Value – Type in the minimum or maximum value of the channel's y-axis.

Set To Full Scale – Set the channel's y-axis values to encompass the full scale of the channel over the duration of the dataset recording session.

The following options are available in the dataset viewer's menu, accessible by clicking on the button labelled 'Menu':

Force All Channels Full Scales – Forces the y-axes of all channels in the dataset to encompass the full scale of the channel over the duration of the dataset recording session.

Force All Channels Same Scales – Enter the minimum and maximum values, to be applied to the y-axes of all of the channels in the dataset.

Force X-Axis Full Scale – Set the x-axis to display the entire duration of the dataset.

Set X-Axis Minimum/Maximum – Set the beginning and end time to show on the graph.

Line/Scatter Graph – Select to connect the points of the dataset with a line or show the points only.

Thin/Thick Lines – Decrease/increase the width of the plot lines on the graph.

Change Background Color – Set the background color of the graph and scale areas.

Change Grid Color – Set the color of the grid underlay in the graph area.

Change X-Axis Color – Set the color of the x-axis (time) scale font.

Print Screen – Print the screen as displayed.

View Table – View the graphed data as a table.

Export – Export the table data to a comma-delimited CSV file.