



## Operator Manual

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Original Instructions

[www.superflow.com](http://www.superflow.com)

**PowerPro-SF**  
**Data Acquisition and Control**

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This manual is intended to assist operating personnel in becoming familiar with the product and as guidance in ordering necessary parts inclusive of SuperFlow's warranty requirements. Maximum operating efficiency and life of any SuperFlow product will be attained through complete understanding of the instructions and recommendations contained within this manual.

**⚠ WARNING**

Services performed beyond preventive maintenance by personnel other than SuperFlow Service Technicians on any SuperFlow products during the warranty period may void the warranty.

**IMPORTANT**

When available, please include the model number and serial number of the product in any correspondence.

# Table of Contents

---

<b>1.0 System Overview .....</b>	<b>1</b>
1.1 Data Acquisition and Control System Components .....	1
Commander Computer .....	1
Sensor Interface Device (SID) .....	1
Sensors.....	1
Optional Components .....	1
1.2 Software Overview .....	2
Main Display .....	3
PowerPro-SF Interface .....	3
Pattern Runner Interface Window.....	3
Report Generator Interface Window .....	3
1.3 The PowerNet File System .....	4
Templates (.tds) .....	4
DataSpaces (.pds) .....	4
Patterns (.pcp) .....	4
Tuning Files (.pct) .....	4
ECM Information (.pei).....	4
List of Sensors .....	5
<b>2.0 Basic Operation .....</b>	<b>7</b>
2.1 Before You Begin .....	7
Important Terms and Functions .....	7
Saving a File .....	7
2.2 Starting the Commander Computer.....	8
Logging In .....	9
2.3 Test Procedure.....	10
Prepare for Testing.....	10
After Testing is Completed .....	10
<b>3.0 Main Display .....</b>	<b>11</b>
3.1 The Main Display Window .....	11
3.2 Main Display Window Pull-Down Menus .....	12
The File Menu .....	12
The View Menu .....	14
The Data Menu .....	21
The Window Menu.....	23
The Add-Ins Menu.....	24
The Tools Menu .....	24
The Help Menu .....	25
<b>4.0 PowerPro-SF Interface .....</b>	<b>27</b>
4.1 PowerPro-SF Interface Window.....	27
Controlling the Dynamometer .....	27
Throttle Control Modes .....	28
Dynamometer Control Modes .....	28
4.2 PowerPro-SF Interface Window Pull-Down Menus .....	29
The File Menu.....	29
The Relays Menu.....	29

---

# Table of Contents

---

The View Menu .....	30
The Setup Menu .....	36
<b>5.0 Pattern Runner.....</b>	<b>39</b>
5.1 The Pattern Runner Interface Window.....	39
5.2 Pattern Runner Window Pull-Down Menus.....	40
The File Menu .....	40
The Edit Menu.....	41
5.3 Creating a New Pattern or Editing an Existing Pattern .....	41
Saving a Pattern .....	46
Running a Pattern.....	46
<b>6.0 Report Generator .....</b>	<b>47</b>
6.1 The Report Generator Program .....	47
6.2 Report Generator Window Pull-Down Menus .....	48
The File Menu .....	48
The Edit Menu.....	49
The View Menu .....	64
The Export Menu .....	69
<b>7.0 Add-In Programs.....</b>	<b>71</b>
7.1 Security Editor.....	71
Edit Users .....	71
7.2 Calculated Sensors .....	73
The File Menu .....	75
Importing Reference Data from a DataSpace.....	77
Traces .....	78
<b>8.0 Glossary of Terms .....</b>	<b>79</b>

# 1.0 System Overview

## 1.1 Data Acquisition and Control System Components

The system is divided into three groups: the Commander computer, the PowerPro-SF Controller, and optional components.

### Commander Computer

This terminal communicates with the Sensor Interface Device and the dynamometer. From the Commander Computer, the user can monitor the engine and dynamometer performance through the customizable virtual dashboard. It is also the location where new tests and reports are generated, manipulated, stored, run, and printed.



### Sensor Box

The Sensor Box is used to interface data from the engine and dynamometer into the Commander computer.



### Sensors

Information is gathered from a variety of sensors attached to either the engine or dynamometer.

- Pressures
- Fuel Flow
- Temperatures: EGT, Low Temp.
- Speed

### Optional Components

Super Flow offers a wide range of optional components and accessories for the PowerPro-SF Data Acquisition and Software System, including:

- ECM Communicator
- Fuel Measurements
- Additional Sensors: Temperature, Pressure, Vibration, Speed, Crank Blow By
- Smoke Opacity Meters
- Five Gas Analyzer
- Electronic Throttle Interfaces
- Auxiliary Outputs
- Alarms
- PC Upgrades

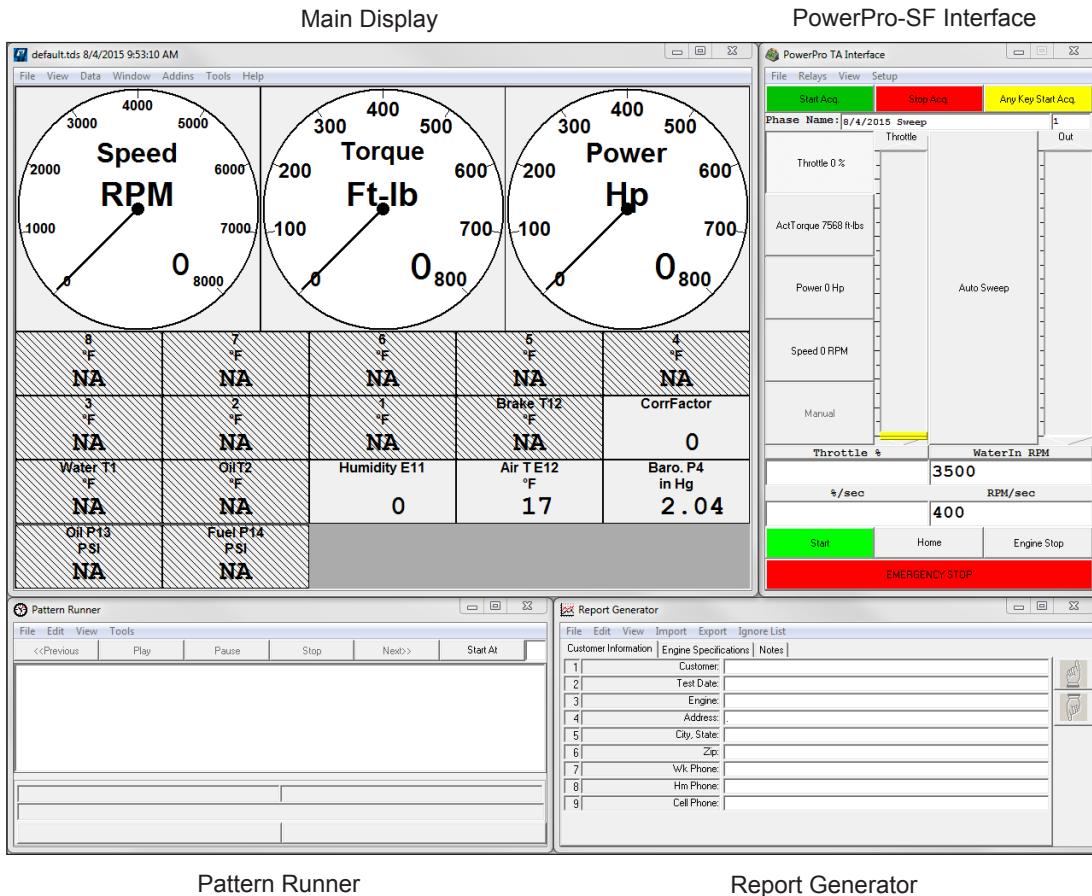
Our in-house manufacturing and electronics department guarantees that we will be able to provide data acquisition and control system accessories for nearly any application. For more information, contact your Super Flow representative, or visit us on the web at [www.superflow.com](http://www.superflow.com).

# 1.0 System Overview

## 1.2 Software Overview

The PowerPro-SF Software Package is a complete data acquisition and control program for dynamometers and engines. PowerPro-SF transforms a standard computer and specially designed electronic components into a highly efficient development and qualification tool.

The software is comprised of several programs running at the same time: the Main Display, PowerPro-SF Interface, Pattern Runner, and Report Generator. There may be other programs running minimized in the background (operational, but hidden) according to what is listed under the Add-Ins menu of the Main Display.



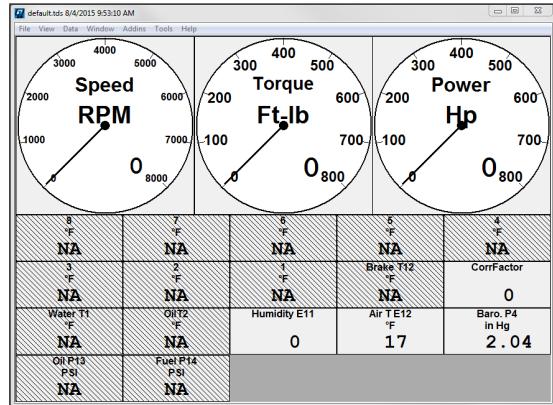
### IMPORTANT

Depending on the operating system used, the software may have a slightly different appearance compared to the examples shown in this manual. This does not affect the performance of the program in any manner.

# 1.0 System Overview

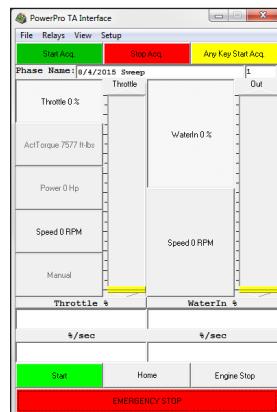
## Main Display

The Main Display contains the readings for all of the available visible sensors. All of the sensor parameters and configurations can be modified from this window by right-clicking on the individual sensor readings. Additionally, this window is used to open and save Templates and DataSpaces, as well as exit the program. The details of the functions and features of the Main Display are discussed in [Chapter 3](#).



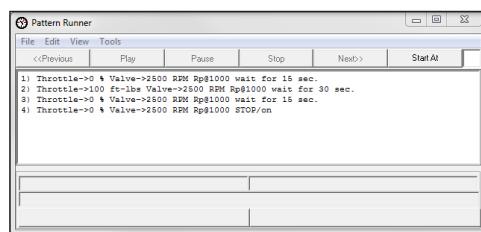
## PowerPro-SF Interface

The PowerPro-SF Interface provides essential control functions for the dynamometer. This window identifies the dynamometer's active load control mode and the current setpoint. It is possible for a user at the Commander computer to control the dynamometer and engine using the mode buttons and the input box directly from the PowerPro-SF Interface. The details of the functions and features of the PowerPro-SF Interface are discussed in [Chapter 4](#).



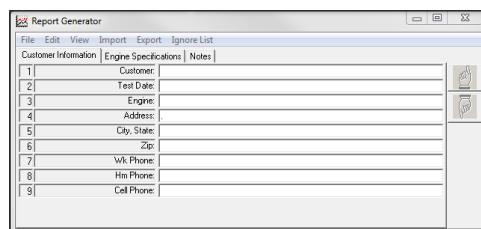
## Pattern Runner Interface Window

The Pattern Runner program allows the user to create, load, save, and execute Patterns. Patterns are pre-configured tests that are designed to run in a specific order. The details of the functions and features of the Pattern Runner are discussed in [Chapter 5](#).



## Report Generator Interface Window

The Report Generator allows the operator to arrange the data into a meaningful visual format. The data can be arranged as spreadsheets and/or graphs, while any customer and vehicle information can be put into paragraphs and/or tables. The details of the functions and features of the Report Generator are discussed in [Chapter 6](#).



# 1.0 System Overview

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## 1.3 The PowerPro File System

The PowerPro File System consists of the following components: Templates, DataSpaces, and Patterns. It is important to understand the function of each of these file types.

### Templates (.tds)

A Template is a file containing pre-configured, basic test information. All Templates can be customized with information applicable to the kind of test you want to perform. This may include sensor configurations and report formats and Patterns. Templates are created by the administrator and do not contain any data. Once a test is performed, data can then be collected and saved in the form of a DataSpace.

### DataSpaces (.pds)

After a Template has been used to acquire data, it is then saved as a DataSpace. A DataSpace contains the same information as the Template with the addition of specific test data. A DataSpace is utilized whenever an operator wants to save new test data or recall data from a previously saved test and is the area where live data is stored.

### Patterns (.pcp)

Patterns are pre-configured tests that are designed to run in a specific order. Patterns are created by the administrator and they can be saved within a Template or as individual files to be loaded into existing Templates.

### Tuning Files (.pct)

Tuning Files are individual files storing dynamometer tuning parameters. The tuning parameters should not be modified unless otherwise instructed to do so by SuperFlow.

### ECM Information (.pei)

Specific vehicle ECM communication configurations can be saved and loaded as individual files.

#### **IMPORTANT**

All file types should be stored in the C:\Power Test\ Commander 2.0 directory.

# 1.0 System Overview

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## List of Sensors

The PowerPro System incorporates numerous sensors. Some of them are shown on the screen and others are invisible. As stated previously, by right clicking on a visible sensor and selecting "Hide", you can hide the sensor. To make an invisible sensor appear, go to View > More Sensors and check the check box indicating that sensor. All sensors in a typical PowerPro system are listed below. Depending on the method to get the sensor's value, those sensors are listed in two groups: Direct Sensors and Calculated Sensors. In addition, Typical System Input Data are listed at the bottom of this page.

**Direct Sensors:** These values are directly determined by the data captured by the physical sensors.

**ActTorque:** The actual torque value from the strain gauge load cell.

**Speed:** Speed data directly from speed pickups. The speed range is 0-14000RPM.

**Temp(1-5):** Temperature data from low temperature sensors ( range 32-300 degrees F).

**EGT(1-12):** Engine exhausted gas temperature data from K type thermocouples. (range 200-1600 degrees F).

**Press(1-4):** Pressure data from pressure gauges. (two 0-200PSI, many other ranges available).

**FREQ(1-3):** Frequency data from frequency sensors. (For PowerPro Plus only).

**AUX(1-3):** Show the data from AUX. (Only AUX1 is available for PowerPro; AUX(1-3) are available for PowerPro Plus)

**Calculated Sensors:** These values are determined by calculation.

**Torque:** The compensated torque value.  $\text{Torque} = \text{ActTorque} + \text{Inertia Torque}$ . ( $\text{Inertia Torque} = \text{Inertia} * \text{Acceleration}$ )

**Power:** Power value, which is calculated by multiplying torque by speed.  $\text{Power} = \text{Speed} * \text{Torque}$ .

**Acceleration:** Acceleration value, which is calculated based on speed and time.

**FuelFlow:** Fuel volume flow data from fuel flow meter(s).

**AirMassFlow:** Air mass flow value from mass air flow sensors.

**FuelMassFlow:** Fuel mass flow.  $\text{FuelMassFlow} = \text{fuel volume flow} * \text{fuel density}$ .

**AirDensity:** Air density, which is calculated based on air temperature, bar pressure and humidity.

**AirFlow:** Air volume flow.  $\text{AirFlow} = \text{AirMassFlow} / \text{AirDensity}$ .

# 1.0 System Overview

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**VolEff:** The ratio of Max. possible air flow through vs. actual air flow measure. VolEff=AirFlow/Vol per Rev.

**AFR:** Air/Fuel ratio. AFR=Mass Air Flow/Mass Fuel Flow.

**CorrFactor:** The correction factors calculated based on correction files and weather conditions.

**CorrHp:** Corrected power. CorrHP=Power\*CorrFactor.

**CorrTorq:** Corrected torque. CorrTorq=ActTorq\*CorrFactor.

**BSFC:** Brake Specific Fuel Consumption. BSFC=Mass Fuel Burn rate/HP. The unit is Lbs/Hp.hr.

**CSFC:** Corrected Specific Fuel Consumption. CSFC=Mass Fuel Burn rate/Corrected HP. The unit is Lbs/Hp.hr.

**BSAC:** Brake Specific Air Consumption. BSAC=Mass Air Burn rate/HP. The unit is Lbs/Hp.hr.

**CSAC:** Corrected Specific Air Consumption. CSAC=Mass Air Burn rate/Corrected HP. The unit is Lbs/Hp.hr.

**Elapsed Time:** Time stamp of recorded data. (accuracy<1ms).

**System Input Data:** To make the system work properly, certain data needs to be inputted by users.

**Inertia Value:** User inputs value required.

**Sweep Test Start RPM:** User inputs value required.

**Sweep Test End RPM:** User inputs value required.

**Sweep Step Size RPM:** User inputs value required.

**Fuel Density (specific gravity):** Requires input from user.

**Inlet Air Temperature:** Requires input from user or an optional sensor.

**Barometric Pressure:** Requires input from user or an optional sensor.

**Relative Humidity:** Requires input from user or an optional sensor.

**Frictional Torque:** Percentage per SAE.

**Volume of Displacement/Revolution:** User inputs desired value.

# 2.0 Basic Operation

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## 2.1 Before You Begin

The PowerPro Data Acquisition software is based on the Microsoft Windows operating system. Successful operation of the PowerPro software requires basic knowledge of the Windows operating system and familiarity with operating a keyboard and mouse.

If you are not familiar with basic computer operations, classes can often be found at your local library or school district. Additionally, there are numerous instructional books that can be found at the local library, book store, or on-line retailer.

### Important Terms and Functions

The PowerPro File System consists of the following components: PowerPro Templates and PowerPro DataSpaces.

#### ***PowerPro Template (.tds)***

A Template is a file containing pre-configured, basic test information. All Templates can be customized with information applicable to the kind of test you wish to perform. This may include sensor configurations, test settings, and report formats. Templates are created by the administrator.

You can create and save as many different Templates as are desired. A Template is often created for each type or style of engine.

Templates do not contain any data. Once a test is performed, data can then be saved in the form of a DataSpace.

#### ***PowerPro DataSpace (.pds)***

After a Template has been used to acquire data, it is then saved as a DataSpace. A DataSpace contains the same information as the Template with the addition of specific test data. A DataSpace is utilized whenever an operator wishes to save new test data, or recall data from a previously saved test and is the area where live data is stored.

A DataSpace can be reopened to run additional sweeps or make modifications to the Report. You can save this new information, overwriting the current file, or save it as a new DataSpace.

### Saving a File

There are two options for saving a file: Save and Save As.

**Save:** Saves the current active DataSpace or Template, overwriting the current file.

It is recommended that you avoid using the Save function until you are very familiar with the way the software operates. You can use the Save As option to save as many new files as needed.

#### **IMPORTANT**

**Use caution when using the Save function. Once changes have been saved and the original file has been overwritten, the original file cannot be retrieved.**

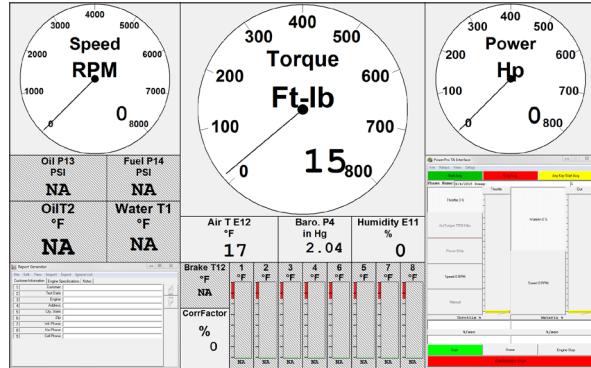
# 2.0 Basic Operation

## 2.2 Starting the Commander Computer

Once the Commander computer and all related components have been installed and set up by your SuperFlow representative, you are ready to turn on the Commander computer. Make sure the monitor and printer are also on at this time.



PowerPro Splash Screen



Default PowerPro-SF Template

The computer should automatically execute the PowerPro-SF program and the splash screen (top left) will become visible during the time the program is loading. If the software ever needs opening, the program can be launched by double-clicking on the “P” icon on your desktop background.

### IMPORTANT

If the program does not automatically start or the icon does not appear, contact your Power Test representative.

Once you have powered up (for operators) or logged in (as an administrator), the default Template should be loaded and visible (top right). To log in to the system, select Log-in from the PowerPro-SF menu bar.

### IMPORTANT

For administrative functions, a log-in name and password are required.

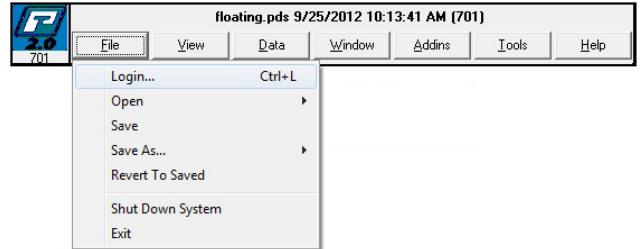
# 2.0 Basic Operation

## Logging In

The Log-In is found in the pull-down menu of the Main Display. The pull-down menus are located in the header of the Main Display when using the Single Main Form format or found in a floating window if the Floating Form format is used.

**File > Log in:** Opens the Log-in screen so an administrator can sign in and perform administrative functions.

As installed from the factory, the default user name and password is the word ADMIN. Changing the password and assigning new users and passwords is performed using the Security Editor function found in the Add-ins section, as discussed in Chapter 7.



### **IMPORTANT**

**Without logging in, many menu items will be grayed out and the corresponding administrative functions cannot be performed. All functions requiring log in will be noted with an \* throughout the rest of this manual.**

Typically, the operator will open one of several Templates created by the administrator based on the type of engine or test being performed.

# 2.0 Basic Operation

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## 2.3 Test Procedure

Once the engine has been prepared for testing, including mounting the engine to the engine cart/stand and installation of all components (flywheel, engine adaptors, drive shafts, engine cooling system, etc.), the next step of the process is to perform the actual engine test. Once the safety and integrity of all of the systems, connections, supplies and the engine are verified, you are ready to begin. The following information outlines a typical test sequence.

### Prepare for Testing

1. **Turn ON the Sensor Box**  
To turn ON the Sensor Box, press the ON/OFF button on the front panel. The green LED will indicate power.
2. **Turn ON the Commander Computer**  
Turn ON the computer, monitor and printer. The PowerPro-SF Data Acquisition Software will load automatically.
3. **Enter in Your User Password**  
Login to the systems from the Main Display menu. Enter your assigned user name and password.
4. **Open a PowerPro-SF Template**  
Open an appropriate template by selecting File > Open > Template from the Main Display. This Template is typically named by engine model. If an appropriate Template does not exist, one must be created. More information on creating Templates can be found in Chapter 3, Main Display.
5. **Calibrate Throttle**  
Verify engine throttle connection and adjustment depending on individual setup.
6. **Turn ON the Support Systems**  
Turn ON the water recirculation system (if applicable), including cooling columns, pumps, etc. Additionally, ensure that all ventilation equipment is operable. Turn ON the Fuel System. Once the throttle has been calibrated and the support systems have been turned ON, start the engine.
7. **Begin Testing**  
Test the engine as specified by your supervisor.

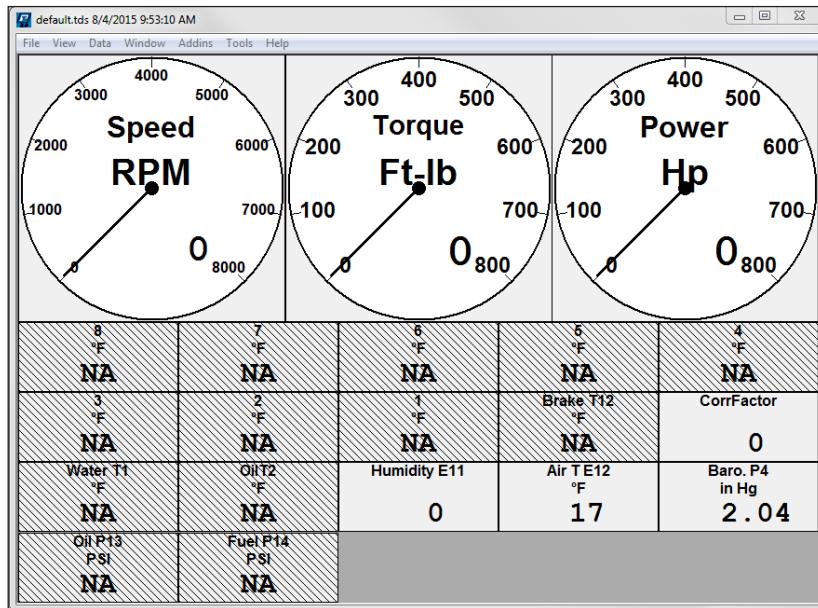
### After Testing is Completed

1. **Turn OFF the Engine**  
Once the testing session has been completed, shut down the engine
2. **Turn OFF the Support Systems**
3. **Edit Data**  
Enter any test specific data using the Report Generator program. Use the Print Preview function to view the edited report.
4. **Save Test Data**  
From the Main Display, click File > Save As > Data Space. Assign a file name, typically determined by work order #, etc. If desired, print a hard copy of the report by selecting File > Print from the Main Display menu.
5. **Shut down the Commander Computer**  
Shut down the computer by clicking File > Shut Down System in the Main Display window.
6. **Turn OFF the Sensor Box**

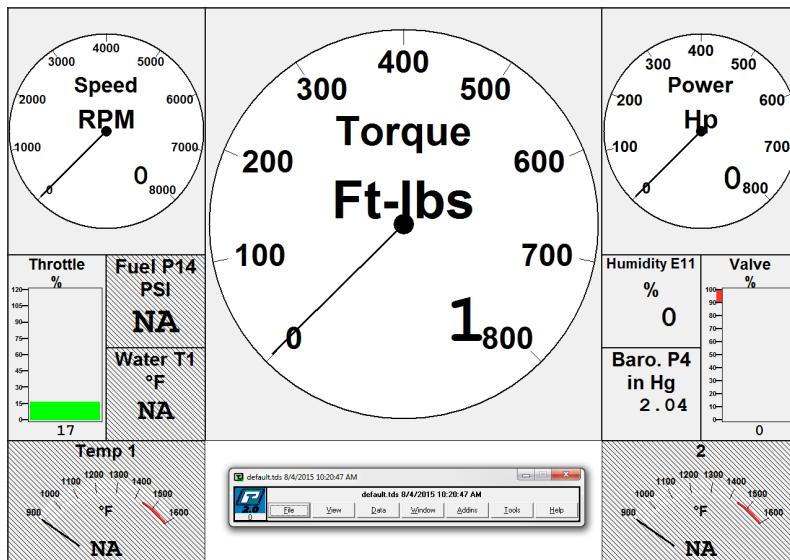
# 3.0 Main Display

## 3.1 The Main Display Window

The Main Display window contains all of the sensors that are connected to the system. These sensors can be displayed in two formats. The Single Main Form format displays all of the individual gauges in a fixed format. The Floating Form format allows the user to customize the size and location of the individual gauges on the screen.



Example of the Single Main Form Format



Example of the Floating Form Format

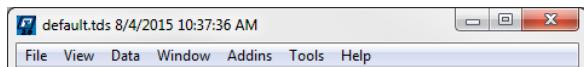
# 3.0 Main Display

## IMPORTANT

The illustrations throughout the rest of this manual will display sensors in the Floating Form format. This may or may not represent how your system is configured.

## 3.2 Main Display Window Pull-Down Menus

The pull-down menus are located in the header of the Main Display when using the Single Main Form format or found in a floating window if the Floating Form format is used. (If the Floating Form format is selected, the full pull-down menus will appear by putting your cursor on the "P" icon.) The pull-down menus consist of: File, View, Data, Window, Add-Ins, and Help.



Single Main Form Pull-Down Menu



"P" Icon and Floating Form Pull-Down Menu

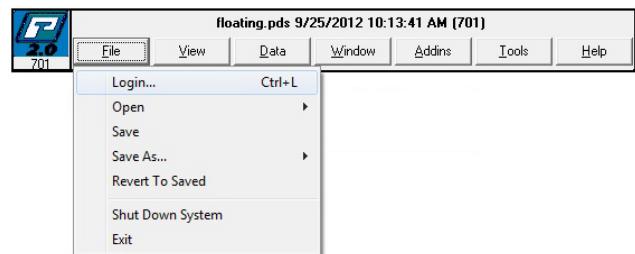
## The File Menu

From the File menu, many of the file management tools needed to operate the software can be accessed. The File menu consists of: Login, Open (Template or DataSpace), Save, Save As (Template or DataSpace), Revert to Saved, Shut Down System, and Exit.

**File > Log in:** Opens the Log-in screen so an administrator can sign in and perform administrative functions.

## IMPORTANT

Without logging in, many menu items will be grayed out and the corresponding administrative functions cannot be performed. All functions requiring log in will be noted with an \* throughout the rest of this manual.



# 3.0 Main Display

**\*File > Open > Template or DataSpace:** Loads existing Template used to run a pre-configured test. If not logged in, the user will only have the option of opening a Template within the program directory. If logged in, the user will have the ability to search the entire computer and all removable drives for a Template. Clicking DataSpace loads an existing DataSpace that contains previously saved test data.

**\*File > Save:** Saves the active Template or DataSpace; overwriting the current file.

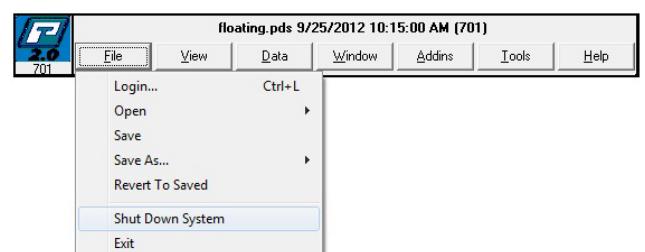
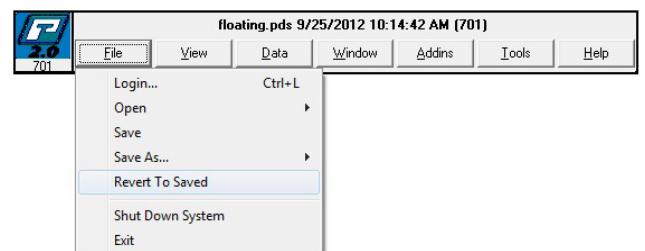
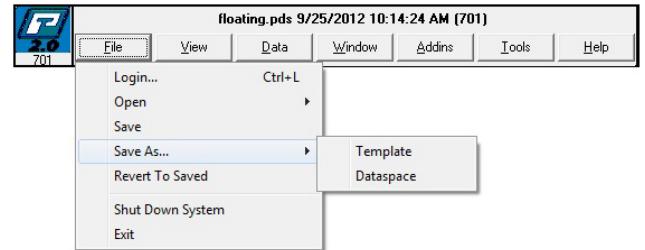
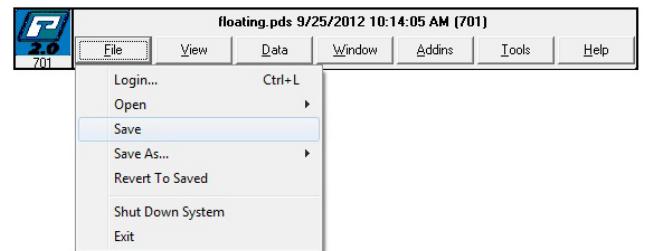
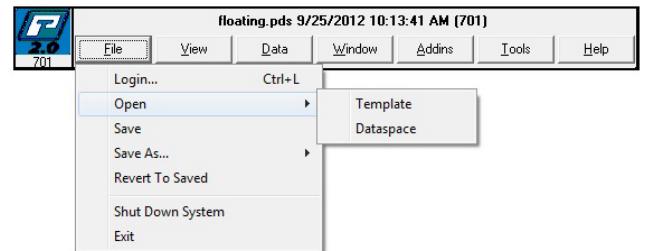
## IMPORTANT

Once changes have been saved and the original file has been overwritten, the original file cannot be retrieved.

**File > Save As >Template or DataSpace:** Saves the active Template or DataSpace as a new Template or DataSpace. The user will be prompted to name the new file before saving. In addition to the new file being saved to the system, the original file will still exist.

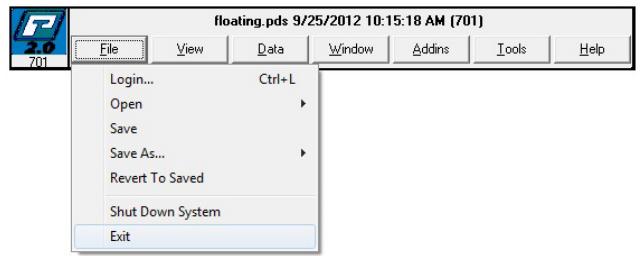
**File > Revert to Saved:** Ignores recent changes in the active Template or DataSpace and reverts back to the previously saved version.

**File > Shut Down System:** Closes the software program and powers down the Commander computer.



# 3.0 Main Display

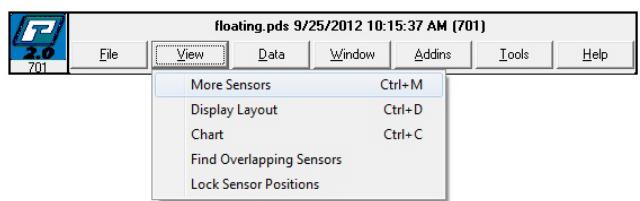
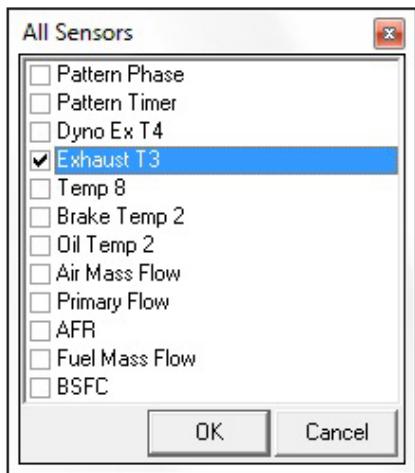
**File > Exit:** Closes the program and returns the user to the Windows Desktop. If changes have been made to the active Template or DataSpace, the user will be given the option of saving the changes before closing the program.



## The View Menu

From the View menu, hidden sensors can be made visible and the sensor layout can be changed. The View menu consists of: More Sensors, Display Layout, Chart, Find Overlapping Sensors, and Lock Sensor Positions.

**View > More Sensors:** Produces a pop-up window (below) that allows the user to make hidden sensors visible. Check the boxes of the sensors you want to show and click OK.



### IMPORTANT

A sensor does not have to be visible for its data to be recorded and/or shown in the report.

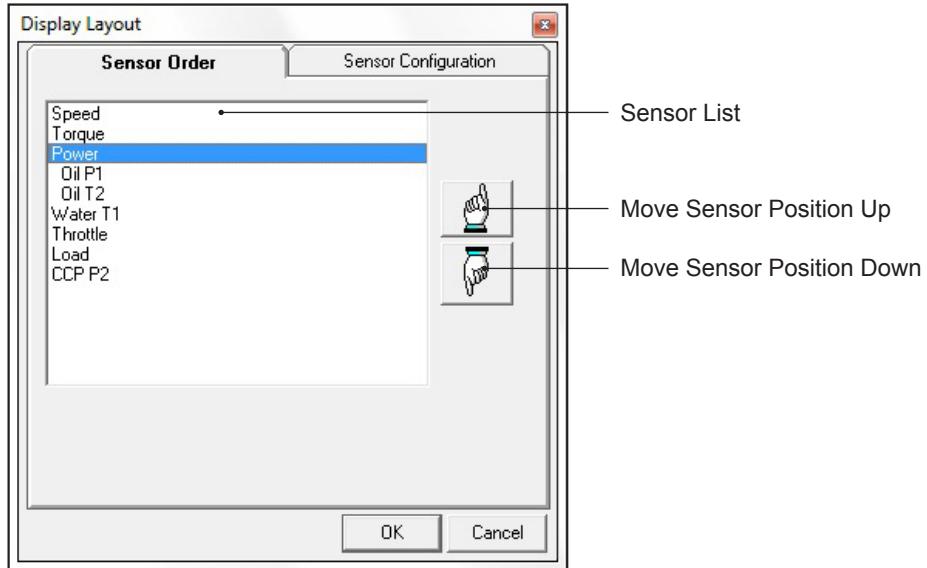
**View > Display Layout:** Clicking Display Layout will automatically open the Sensor Order window, which has two tabs: Sensor Order and Sensor Configuration. Both tabs are described in greater detail on the following pages.



# 3.0 Main Display

## Sensor Order Tab

»» **FastFind** View menu > Display Layout > Sensor Order tab



To change the order in which sensors appear in the Single Main Form format, click on the Sensor Order tab. Highlight a sensor by clicking on it and use the navigational buttons at the right of the window to move the selected sensor. Click OK when finished to save the new sensor order or click Cancel to disregard changes. The Sensor Order tab displays a list of all the sensors in the order they appear in the Single Main format.

### IMPORTANT

The Sensor Order function will not work if all sensors are displayed in the Floating Form format.

## Sensor Configuration Tab

»» **FastFind** View menu > Display Layout > Sensor Configuration tab

There are two formats to display the sensors: Single Main Form and Floating Form. In the Single Main Form format, all of the available sensors are grouped together in the Main Display window. In the Floating Form format, sensors can exist anywhere on screen and can be sized individually. The use of the Floating Form format allows a highly customizable appearance to the Main Display. A Single Main Form and Floating Form can exist together.

# 3.0 Main Display

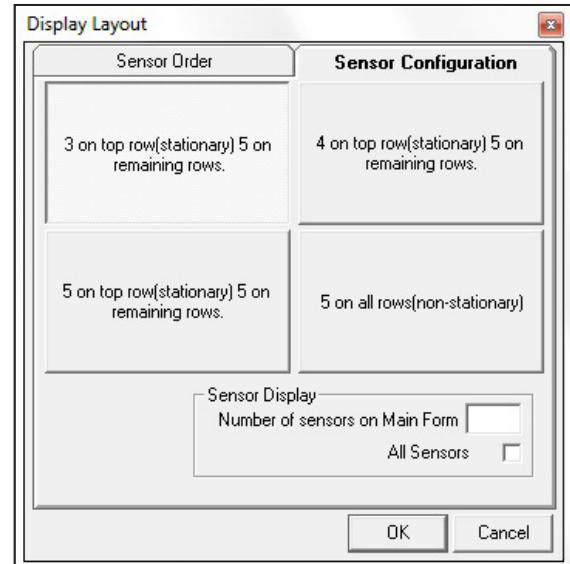
From the Sensor Configuration tab, the user can select how many sensors appear in each row of the Main Display using the Single Main Form format, as well as how many sensors will be displayed in the Single Main Form format and how many in the Floating Form format.

If the **3 on top row (stationary) 5 on remaining rows** option is selected, a Single Main Form will display three sensors in the top row and five sensors in each row thereafter until all sensors are displayed. If selected, the sensors in the first row will all be square in shape.

If the **4 on top row (stationary) 5 on remaining rows** option is selected, a Single Main Form will display four sensors in the top row and five sensors in each row thereafter until all sensors are displayed. If selected, the sensors in the first row will all be square in shape.

If the **5 on top row (stationary) 5 on remaining rows** option is selected, a Single Main Form will display five sensors in the top row and five sensors in each row thereafter until all sensors are displayed. If selected, the sensors in the first row will all be square in size.

If the **5 on all rows (non-stationary)** option is selected, a Single Main Form will display five sensors in each row. If selected, each sensor will be equal in size, regardless of number selected.



The **Sensor Display frame** of the Sensor Configuration tab is used to determine how many sensors will be displayed in the Single Main Form format and how many in the Floating Form format.

## IMPORTANT

To display all sensors in Single Main Form format, click on the All Sensors check box. To have all sensors display in the Floating Form format, uncheck the All Sensors check box and enter the number zero into the Number of Sensors on Main Form input box.

To display sensors in both a Single Main Form and Floating Form format, enter the number of sensors that should remain in the Single Main Form format in the Number of Sensors on Main Form input box. ex. If there are 13 sensors available and six is entered into the Number of Sensors on Main Form input box, then six sensors will be displayed in the Single Main Form and the remaining seven sensors will exist as Floating Forms.

# 3.0 Main Display

To change which sensors appear in the Single Main Form, click on the Sensor Order tab and rearrange the sensors so that the ones you want in the Single Main Form appear at the top of the list. ex: If you want six specific sensors in the Single Main Form, click on the Sensor Order tab and, using the navigational buttons, bring those six sensors up to the top six positions in the list.

To move a sensor's position in the Floating Form format, confirm that the Lock Sensor Positions option in the View drop-down menu is unchecked. If it is checked, click on Lock Sensor Positions to unlock the sensors. (Clicking on Lock Sensor Positions will check or uncheck that option.) Next, click on the sensor and drag it to its new location. To change the size of a sensor, click on an edge or corner of the sensor window and drag it to the desired size. Once all sensors have been placed, click on Lock Sensors Positions from the View menu, which will lock the sensors in their current position and help to avoid the possibility of accidentally moving, re-sizing, or hiding a sensor.

## Sensor Properties

### »» FastFind

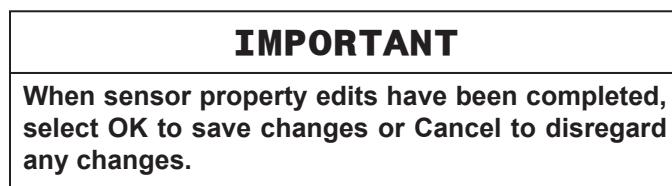
*With the mouse, right-click on any of the sensors on the Main Display and select Properties.*

**Properties:** Selecting Properties will open the Sensor Properties window.

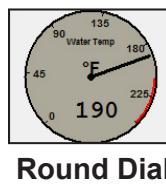
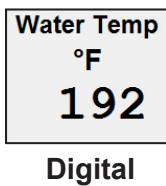
Properties  
Hide

**Hide:** Selecting Hide will remove that sensor from the Main Display window and return it to the list of sensors under View > More Sensors. To add the sensor back, go to View > More Sensors and select the sensor you want to display.

**Sensor Properties Window:** The Sensor Properties window contains five tabs that allow the user to customize the sensor. The tabs are: Gauge, Display, Units, Low Alarm, and High Alarm. In addition, the name of the sensor can be changed by entering the new name into the Sensor Name input box.



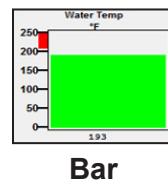
**Properties > Display Tab:** This is where the operator can select which type of gauge should be displayed for a sensor. The operator can select from a Digital, Round Dial, Sweep Dial, or Bar gauge (shown below). However, the Bar gauge is only available in the Floating Form format.



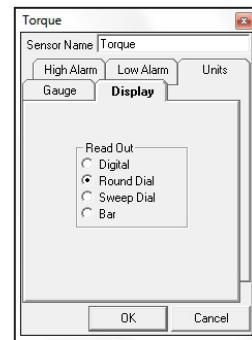
Round Dial



Sweep Dial



Bar

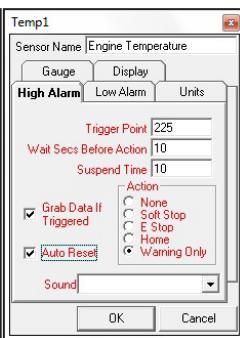
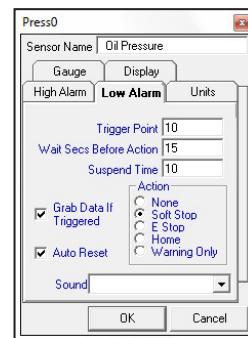
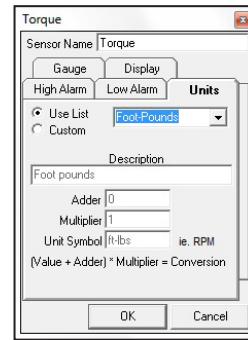
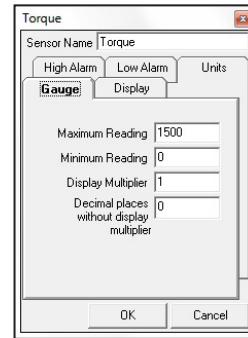


# 3.0 Main Display

**Properties > Gauge Tab:** This tab provides the operator with options to define the displayed range and multiplier for the gauge. The Maximum Reading establishes the top or highest number displayed in a Dial or Bar gauge. The Minimum Reading establishes the bottom or lowest number displayed in a Dial or Bar gauge. The Display Multiplier is the number by which the numbers in a display are divided by. ex. A multiplier of ten will display 1000 RPM as 100 RPM. This will also change the display unit to RPM x 10 (or whichever multiplier is chosen). The Decimal Places without Display Multiplier is the number of decimal places that are displayed as determined by the number entered in the input box. ex. If a value of three is entered in the input box, data will be displayed to .000 or thousandths.

**Properties > Units Tab:** This is where the user defines the unit properties for the gauge. Standard units can be chosen by selecting Use List and picking from the drop-down menu. To define a custom unit, select Custom and enter a unit name, description, and display symbol. Enter the values that the sensor's standard unit must be multiplied by and/or added to, to achieve the custom unit. Once all the information is entered, the custom unit can be added to the list of standard units. To find the base unit, choose from the Use List until you find one with an adder of zero and a multiplier of one (usually the first listing).

**Properties > Low Alarm/High Alarm Tabs:** These tabs are where the user defines what actions (explained on [page 19](#)) will be taken during a Low Alarm/High Alarm state.



# 3.0 Main Display

## Alarms

### »» FastFind

*With the mouse, right-click on any of the sensors and select Properties. Then click on either the Low Alarm tab or High Alarm tab.*

Sensors displaying readings with an optimal range (an administrator defined normal range) will display in grey. Sensors that have fallen below their operational range (low alarm) will display blue. Sensors that have exceeded their operational range (high alarm) will display red.

As soon as the sensor travels outside of its operational range, it will change color and there will be two options available to the operator: Hold (suspend) or Reset the alarm. If the Hold button is clicked during the alarm state, the software will suspend the alarm action for the period of time indicated in the Suspend Time input box. Reset clears the alarm condition. To remove the condition, simply click on either the Hold or Reset function buttons.

The operator has the following options when setting a low alarm or high alarm: Trigger Point, Wait Secs Before Action, Suspend Time, Grab Data if Triggered, Auto Reset, and Action.

**Trigger Point:** The value at which the software will indicate that the sensor is out of the operational range. The units of the value entered are selected from the Units tab. For example, if the sensor is configured in rpm, then the value entered will reflect rpm.

**Wait Secs Before Action:** Indicates how many seconds the software should wait before performing the alarm action.

**Suspend Time:** Indicates how long the alarm action will be delayed (in seconds) if the Hold button is clicked.

**Grab Data if Triggered:** If checked, the software will immediately grab data if the trigger point is reached. Grabbing data once a trigger point has been reached will help identify the problem area and cause of the alarm. If Grab Data if Triggered is not checked, the data will not be gathered at the point of alarm.

**Auto Reset:** If checked, the software will automatically reset the alarm after the sensor limit has returned to normal.

**Action:** The action state of the alarm allows the administrator to set the following actions to be performed by the software after the number of Wait Secs Before Action has completed:

**Action > None:** Indicates no action is to be performed and only a color change is indicated on the screen.

**Action > Soft Stop:** When the alarm is triggered, the software will first apply the Wait Secs Before Action value, then perform a soft stop. Both the speed control and the dynamometer control return to zero and the stop relays fire automatically. These actions stop the engine as if it were shut down normally, as no load is applied during a soft stop. If selected, an alarm will sound.

# 3.0 Main Display

**Action > E Stop:** If an E stop is triggered, the throttle returns to zero and the valve is fully opened, applying a preset load to the engine. The stop relays are fired and the engine is brought to an abrupt stop. If selected, an alarm will sound.

**Action > Warning Only:** In this condition, only an alarm warning is displayed on screen; no actions are performed.

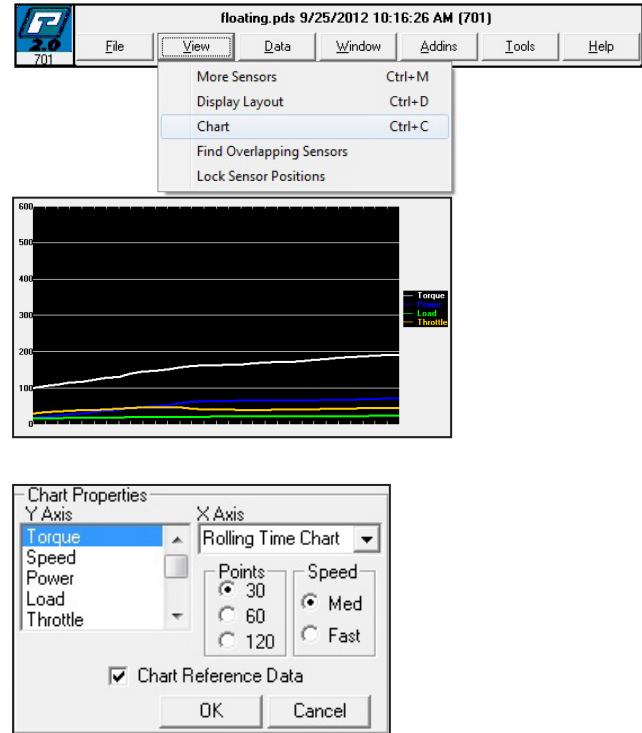
**View > Chart:** By selecting Chart, the Real-Time Chart (middle right) will be displayed. This chart displays the real-time data change. Additionally, reference data can be viewed on the Real-Time Chart.

To customize the Real-Time Chart, right-click on the chart and choose Properties, which opens the Chart Properties window (bottom right). To hide or close the Real-Time Chart, right-click on the chart and choose Hide.

If the user opens the Chart Properties window they will have the option to choose what information will appear on the X-Axis (horizontal) and Y-Axis (vertical) of the chart. Within the Points frame, the user is able to select how many points appear in the Real-Time Chart. The number of points (30, 60, or 120) will determine the actual width of the chart. Within the Speed frame, the user can select the speed (Medium or Fast) at which the system updates and displays data. The actual ranges of the chart are determined by the minimum and maximum values of the sensor as established in the Sensor Properties window.

To display the information from the current, active DataSpace as it is being recorded, select Rolling Time Chart from the X-Axis pull-down menu. If Rolling Time Chart is selected, the chart will scroll from right to left as selected Y-Axis data is being displayed.

Selecting the Chart Reference Data check box will display reference data on the chart in addition to data from the current, active DataSpace. More information on reference data can be found on [page 22](#) and in [Chapter 7.3, Add-In Programs](#).

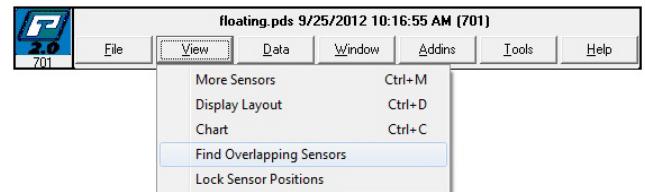


## IMPORTANT

Real-time graphing consumes a greater amount of processing power as the speed rate and number of sensors are increased.

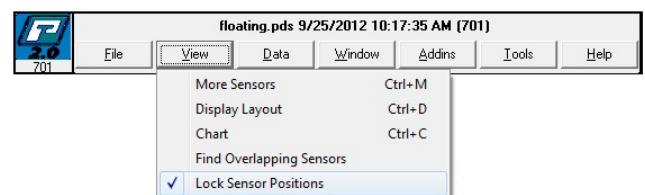
# 3.0 Main Display

**View > Find Overlapping Sensors:** This menu item will be active only if there are sensors displayed as Floating Forms. In this format, some visible sensors may be overlapped by other sensors. This selection will point out the positions of overlapped sensors and mark them with the Overlap symbol. Clicking the Overlap symbol will cause the overlapped sensor to appear.



## View > Lock Sensor Positions:

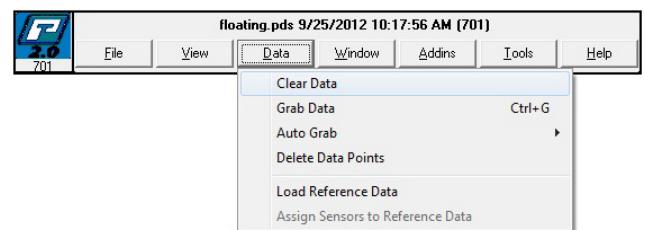
This menu item will be active only if there are sensors displayed as Floating Forms. Normally, sensors in Floating Forms can be any size or positioned anywhere on the screen. Checking this menu item will disable the ability to size or move floating sensors.



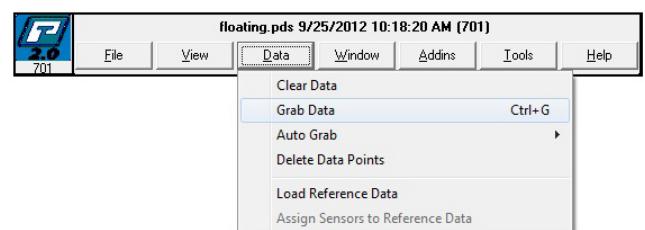
## The Data Menu

Test data from the sensors can be cleared and recorded from the Data menu. The Data menu consists of: Clear Data, Grab Data, AutoGrab, Delete Data Points, Load Reference Data, and Assign Sensors to Reference Data. This data is later used in reports and graphs.

**Data > Clear Data:** Erases any stored data in the active DataSpace. This change will not be saved until the active DataSpace is saved.

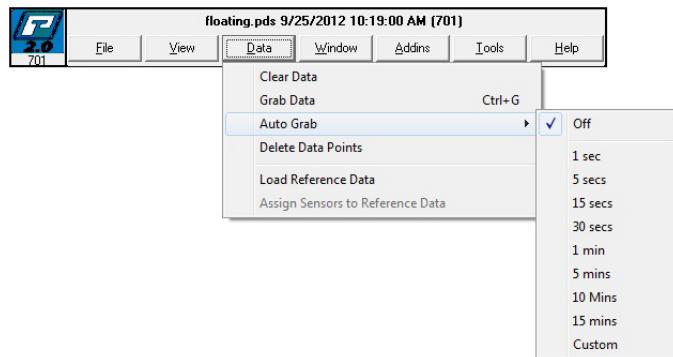


**Data > Grab Data:** Instantly records the current data readings. The Grab Data function can be performed by clicking on this menu item or by using the Windows keyboard shortcut keys Ctrl + G.

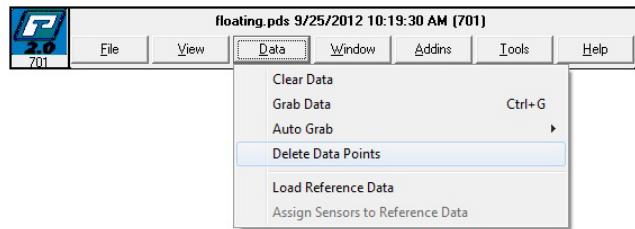


# 3.0 Main Display

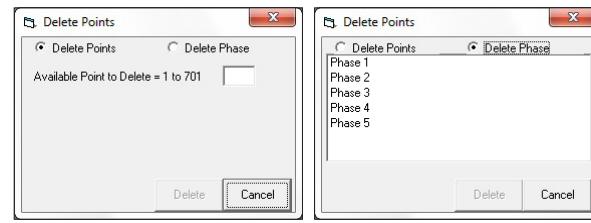
**Data > AutoGrab:** Allows you to turn AutoGrab off or select an interval in which data will be recorded. The user is able to choose one of several preset intervals or custom configure time intervals. AutoGrab only records data when the engine is running. The data you grab is saved into the active DataSpace and can be printed using the Report Generator program, as described in [Chapter 6](#).



**Data > Delete Data Points:** Deletes data points or data phases. If this function is selected, a pop-up window will appear. The user can choose to delete individual data points or delete entire phases.

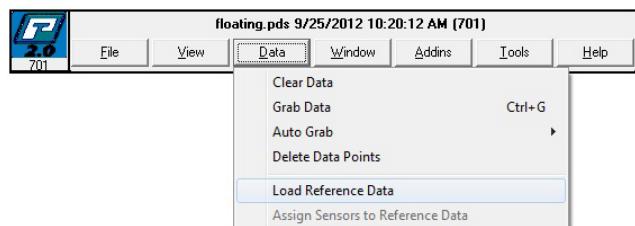


To delete Data Points, enter the Data Point number and click the Delete button. A confirmation window will appear. If the information in the window is correct, click OK. The selected point will be deleted. Data Points are numbered consecutively.



To delete a Data Phase, select the Delete Phase option. A window will list the available phases to delete. Highlight the phase to delete and click the Delete button. Confirm the selection by clicking OK in the confirmation window.

**\*Data > Load Reference Data:** This menu item allows the user to load reference data into the report from an external data source.



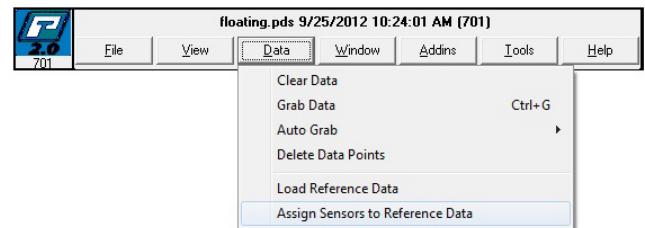
Reference data is data that is typically used for comparing results of a test to accepted standards when viewing a graph. This data can be imported from a DataSpace, a text file created in Excel, or created by the administrator using the Reference Data Builder feature found in the Add-Ins menu (Further details can be found in [Chapter 7.3, Add-In Programs](#)). Once reference data has been loaded to the DataSpace, the Assign Sensors to Reference Data window will automatically open. The user is given the choice of available sensors to assign reference data to.

# 3.0 Main Display

**\*Data > Assign Sensors to Reference Data:** After reference data is loaded, this menu item will become active. It is used to assign the reference data to existing sensors.

## IMPORTANT

Once reference data has been designated to a specific sensor, it will appear in any graph in which that sensor is assigned if the Use Reference Data check box is checked in the Graph Properties window found in the Report Generator.



## The Window Menu

From the Window menu, the arrangement of the Main Display window can be modified. The Window menu consists of: Default Positions, Show Main Form (which toggles to Hide Main Form), and AutoHide.

**Window > Default Positions:** If the active windows have been modified or moved by the user, selecting Default Positions will return them to their default display positions.

**Window > Show Main Form:** To display the Main Form, select Show Main Form. After selecting Show Main Form, the Show Main Form menu item will change to Hide Main Form. To hide the Main Form, select the Hide Main Form function, which causes the Main Form to be hidden. If the sensors are only displayed in the Single Main Form format, the Hide Main Form will remain grayed out.

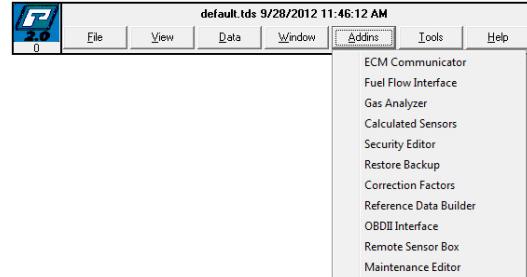
**Window > Autohide:** Clicking Autohide will reduce the floating menu to the "P" icon after a short period of time. To reactivate it, simply place your cursor over the icon.



# 3.0 Main Display

## The Add-Ins Menu

The selections in the Add-Ins menu will vary depending on the programs installed with your system. Any optional component programs that do not come standard will be listed under the Add-Ins menu. Programs found in the Add-Ins menu are explained in [Chapter 7, Add-In Programs](#).



## The Tools Menu

The Tools menu consists of: Convert Sensors to English, Convert Sensors to Metric and Calculator.

**Tools > Convert Sensors to English:** Refer to Table 3.1 below for the sensors that are converted when this menu item is selected. The sensors listed will be converted to the english unit of measure shown in Table 3.1



Sensor	Convert To English	Convert To Metric
Torque(s)	Converts to Ft-Lbs (Foot-Pounds)	Converts to Nm (Newton Meters)
Power(s)	Converts to HP (Horsepower)	Converts to kW (Kilowatt)
Pressure(s)	Converts to PSI (Pound Per Square Inch)	Converts to kPa (Kilopascal)
Temperature(s)	Converts to F (Fahrenheit)	Converts to C (Celsius)

Table 3.1: Sensor Conversations

**Tools > Convert Sensors to Metric:** Refer to Table 3.1 above for the sensors that are converted when this menu item is selected. The sensors listed will be converted to the metric unit of measure shown in Table 3.1.



**Tools > Calculator:** Opens the Calculator program found on the Commander computer.

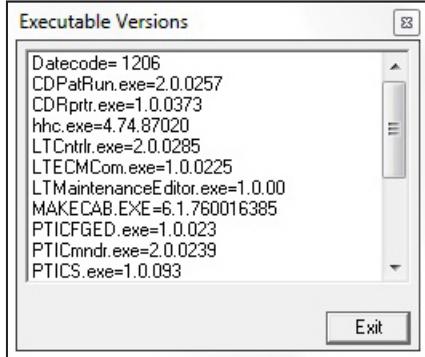


# 3.0 Main Display

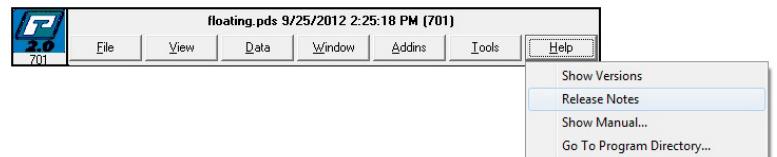
## The Help Menu

The Help menu consists of: Show Versions, Release Notes, Show Manual, and Go To Program Directory.

**Help > Show Versions:** Opens the Executable Versions window (below) displaying the current version specifications of the software.



**Help > Release Notes:** Opens a .txt file that contains the historical changes to the software program. This is used as a reference file by Power Test employees.



**Help > Show Manual:** Opens a PDF file of the software manual supplied with your equipment. Adobe Acrobat Reader was installed with the system software.



**Help > Go To Program Directory:** Opens the program directory or the folder on the Commander computer where all of the files pertaining to the PowerPro software are located. This provides a quick link to this folder in order to locate a specific file type or to make changes.



## 3.0 Main Display

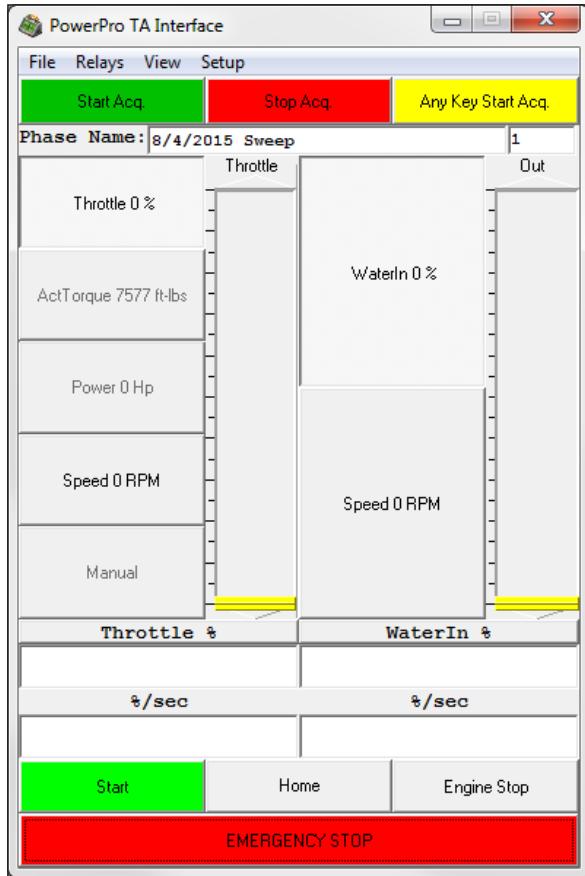
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# 4.0 PowerPro-SF Interface

## 4.1 PowerPro-SF Interface Window

The PowerPro-SF Interface window provides essential control functions for the dynamometer. This window identifies the dynamometer's active load control mode and the current setpoint. It is possible for a user at the Commander computer to control the dynamometer using the mode buttons and the input box directly from the PowerPro-SF Interface window. Additionally, the dynamometer tuning parameters, torque and pressure calibrations, and the relays for ancillary components can all be accessed from this window.



### Controlling the Dynamometer

There are two methods for manually controlling the dynamometer and/or engine directly from the PowerPro-SF Interface. The first method is by entering a number in the Setpoint Entry box directly above the Start, Home, and Engine Stop buttons. Entering a value in this window and pressing enter on the keyboard will move the yellow slide bar to the desired setpoint. A blue bar will display the progress of the change being made. The second method for controlling the dynamometer and/or engine is by clicking on the slide bar and dragging it to the desired setpoint. As the slide bar is moved, its position will be displayed in the Setpoint Entry box. A blue bar will display the progress of the change being made. Additionally, clicking on the arrows at the top and bottom of the slide bar will move the bar 5% for each click.

# 4.0 PowerPro-SF Interface

## Note

*The system can only be controlled using the slide bar in the Throttle Position and Dynamometer Valve Position Modes as described below.*

## Throttle Control Modes

There are two standard and two optional methods by which the engine operating speed may be controlled during testing:

### 1. Position

A method of controlling the engine in which the throttle is set at a percentage of the pre-calibrated throttle range and is maintained at this position during testing.

### 2. Act. Torque

A method of controlling the engine in which an actual torque in lb-ft is entered and the system will move the throttle in an effort to maintain the entered value during testing.

### 3. Horsepower Mode

A method of controlling the engine in which a horsepower setpoint is entered and the throttle tries to maintain that amount of load, regardless of the dynamometer's speed or the engines ability to achieve that load.

### 4. Speed

A method of controlling the engine in which an actual speed in rpm is entered and the system will move the throttle in an effort to maintain the entered value during testing.

### 5. Manual

A method of controlling the engine in which an actual speed in rpm is entered and the system will move the throttle in an effort to maintain the entered value during testing.

## Dynamometer Control Modes

Whether performing automated or manual setpoint operation, the dynamometer will ultimately be controlled by one of the following two modes:

### 1. Water In

A method of controlling the dynamometer in which the dynamometer water valve position is directly controlled by valve percentage (manual load method). Load adjustment may be adjusted by using the slide bar or entering the percentage value in the Setpoint Entry box.

### 2. Engine Speed Mode

A method of controlling the dynamometer in which an engine speed is entered and the dynamometer tries to maintain the engine speed. (Dynamometer must be reading engine speed either through the engine's ECM or the dynamometer's speed pickup.) If the engine speed is higher than the setpoint, the dynamometer will load the engine until the engine speed setpoint is achieved. If the engine speed is lower than the setpoint, the dynamometer will unload the engine until the engine speed is achieved. This mode is typically used for maximum power pulls.

# 4.0 PowerPro-SF Interface

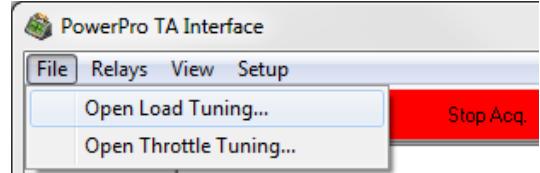
## 4.2 PowerPro-SF Interface Window Pull-Down Menus

The PowerPro-SF Interface window consists of the File, Relays, View, and Setup menus.

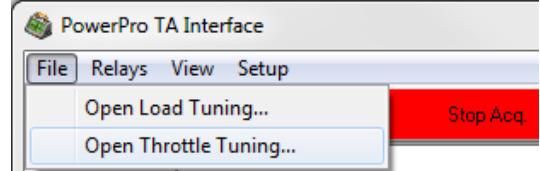
### The File Menu

The File menu allows the operator to load and save sets of tuning parameter values. The File menu consists of Open Load Tuning and Open Throttle Tuning.

**File > Open Load Tuning:** Opens a previously saved set of load tuning parameters.

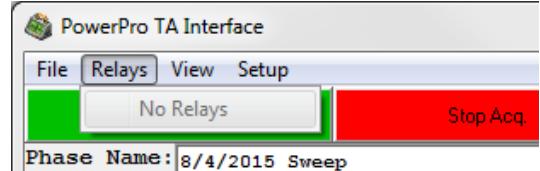


**File > Open Throttle Tuning:** Opens a previously saved set of throttle tuning parameters.



### The Relays Menu

The Relays menu provides control over optional relays. The selected relays can be controlled from the PowerPro-SF Controller.

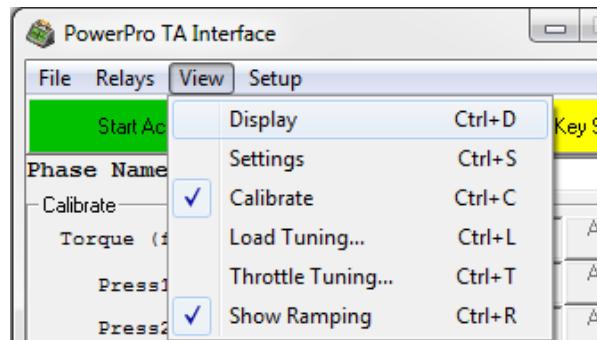


# 4.0 PowerPro-SF Interface

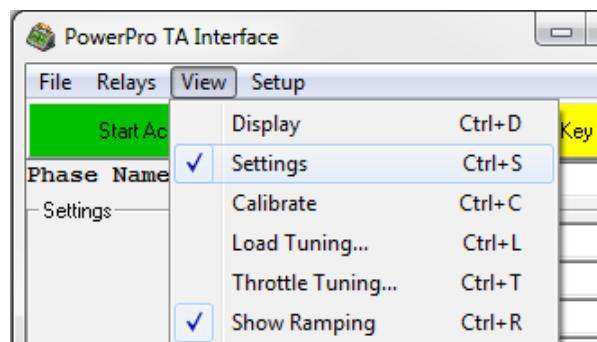
## The View Menu

From the View menu, the user can modify the tuning parameters, adjust the settings, and view the statistics of the PowerPro-SF Interface. The View menu consists of: Display, Settings, Calibrate, Load Tuning, Throttle Tuning, and Show Ramping.

**View > Display:** Displays the main user interface for the PowerPro-SF Controller Interface. From here the user can start and stop data acquisition, select from various throttle and dynamometer control modes, and start and stop the engine. The name off the current phase is displayed below the data acquisition control buttons.



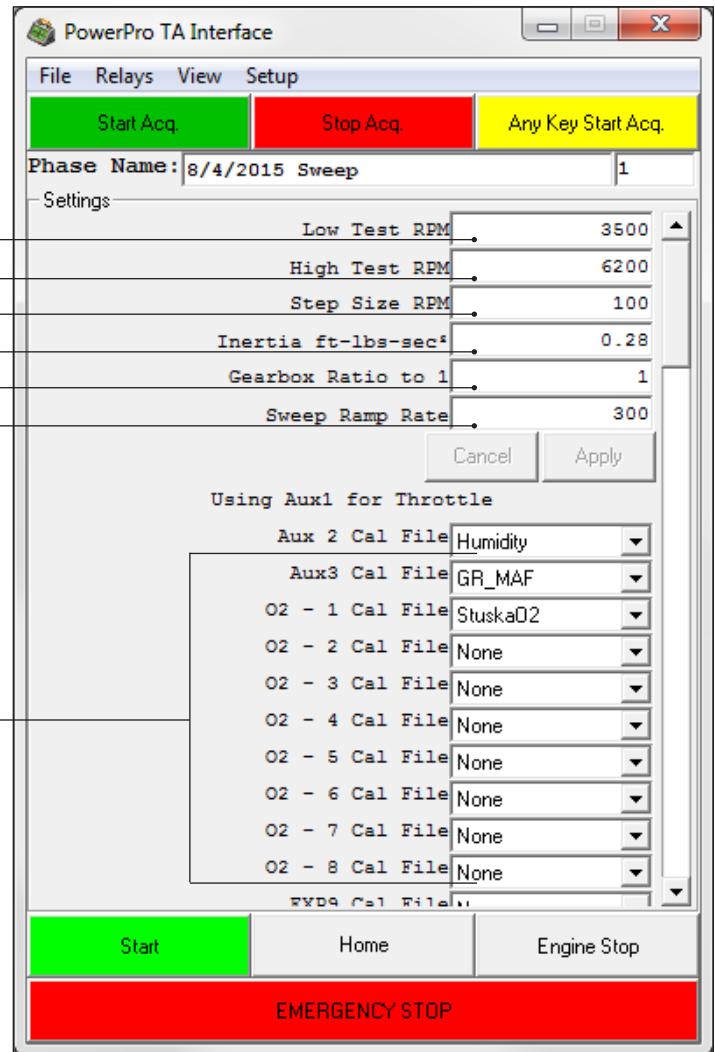
**View > Settings:** Displays the settings for the PowerPro-SF Controller Interface as described on the following pages. From here the user can start and stop data acquisition, select from various throttle and dynamometer control modes, and start and stop the engine. The name off the current phase is displayed below the data acquisition control buttons.



# 4.0 PowerPro-SF Interface

- ① **Low Test RPM:** The low point at which the data acquisition starts or finishes, depending on if it is an up or down sweep.
- ② **High Test RPM:** The high point at which data acquisition starts or finishes, depending on if it is an up or down sweep.
- ③ **Step Size RPM:** The speed interval (in RPM) at which a data point is recorded.
- ④ **Inertia ft-lbs sec:** Inertia of the spinning components of the engine. To calculate inertia, refer to the Appendix section of this manual.
- ⑤ **Gearbox Ratio to 1:** Set gearbox ratio, typically 1
- ⑥ **Sweep Ramp Rate:** The rate of increase (RPM per second) that the system will perform the test.
- ⑦ **Cal Files:** Select calibration files\*

\*The selection of a Calibration file in the PowerPro-SF interface affects the contents of the Use List for AUX sensors, as found in the Sensor Properties in the Main Display.



# 4.0 PowerPro-SF Interface

**⑧ Power Correction:** The formula by which a correction is determined.

**⑨ Friction Torque:** The torque which is produced by frictional forces and opposes rotational motion, such as that. Set to "Assume 85% efficiency".

**⑩⑪⑫⑬** The values needed to compute corrections. These can either be assigned fixed values (by checking "Typed value" check box) or taken from a sensor (by unchecking "Typed value" check box).

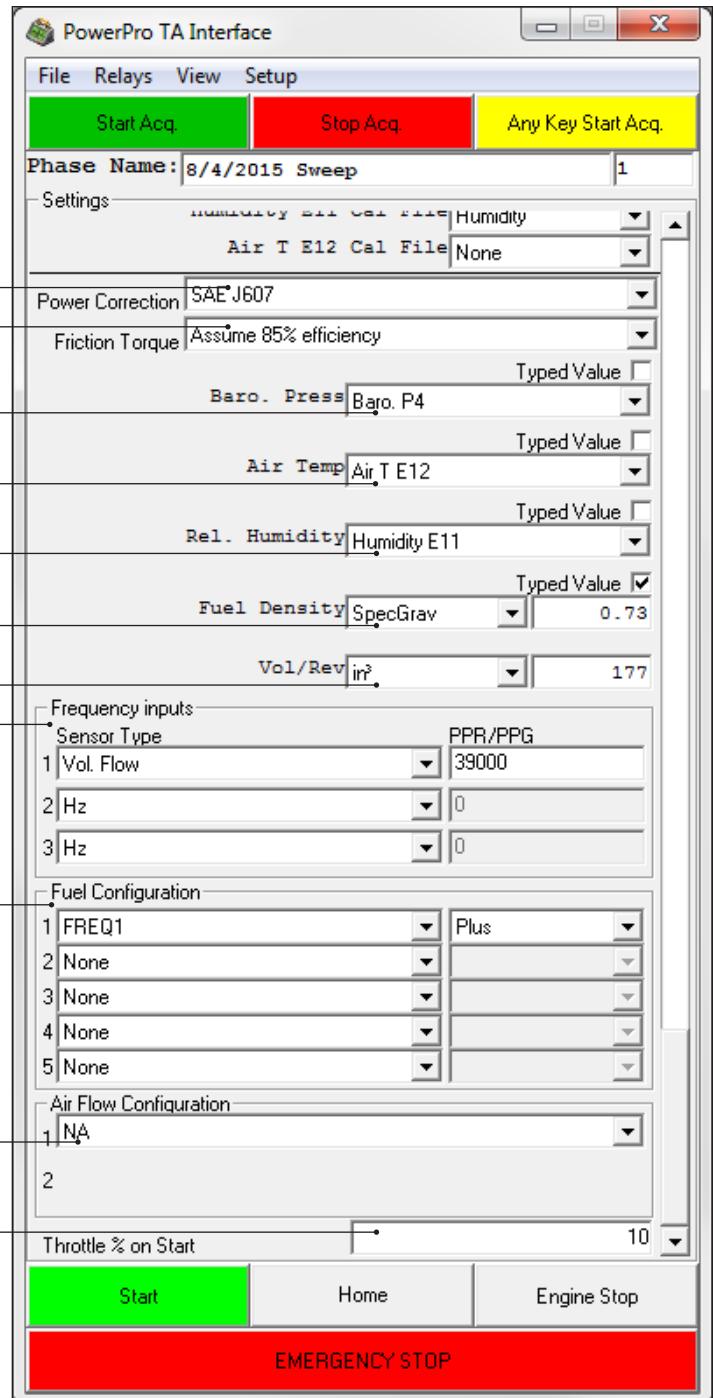
**⑭ Vol/Rev:** The displacement of the engine used in one revolution of the engine. 50% of the volume in a four stroke. 100% of the volume in a two stroke.

**⑮ Frequency Inputs:** Select PPR for Speed and PPG for Volume Flow.

**⑯ Fuel Configuration:** Ignore, Add, or Subtract to determine total fuel volume

**⑰ Air Flow Configuration:** Select to include sensor in airflow

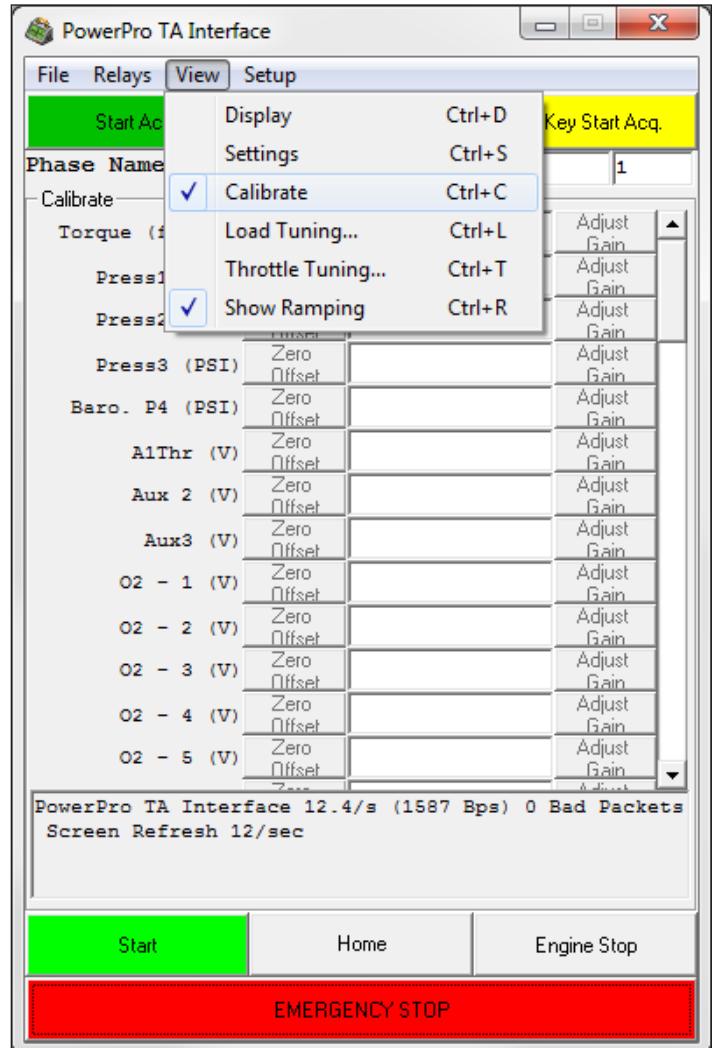
**⑱ Throttle % on Start:** The percentage of throttle position required to start an engine.



# 4.0 PowerPro-SF Interface

**View > Calibrate:** This selection will open the calibration screen allowing the administrator to calibrate attached sensors.

The Calibrate window is used for manually zeroing the torque, pressures, and auxiliary sensors. Clicking the Zero Offset button resets the current value to zero. When zeroing the torque, make certain that there is no torque applied to the dynamometer. Additionally, when zeroing the pressures, make certain there is no pressure applied to the sensor being calibrated at the time of zeroing. Uncoupling the quick disconnects will help to ensure that all pressure has been relieved.



## Calibrating the Sensors

### Torque:

1. Make sure there is no torque being applied to dynamometer.
2. Attach the calibration arm to the torque arm of the dynamometer.
3. Zero the torque by clicking on the Zero Offset button.
4. Stack a known amount of weight on the calibration arm (200 lbs is recommended). The calibration torque is the weight multiplied by the calibration arm length, as measured from the center of the dynamometer shaft.
5. If the calibration is correct, no change is needed. Proceed with other calibration procedures. If the displayed torque is not correct, follow steps 6-8.
6. Enter the calibration torque value and click on the Adjust Gain button. The Adjust Gain button will only become active when a number is entered in the box and torque is applied to the dynamometer.
7. Remove weights and calibration arm.
8. Zero the torque again.

### IMPORTANT

To prevent erroneous calibration, the “Adjust Gain” button will only become active when a torque value is entered into the box and enough force is being applied to the torque sensor you are calibrating.

## 4.0 PowerPro-SF Interface

**Temperature:** There is no adjustment for the calibration of the temperature sensors. If a temperature is reading incorrectly, try using a different probe. If available, the temperature may be verified with a thermocouple simulator. If that does not work, contact your SuperFlow representative.

### Pressures:

1. Make sure there is no pressure source connected to the sensor.
2. Connect a regulated air supply set to 0 psi.
3. Zero the pressure by clicking on the Zero Offset button.
4. Slowly adjust the pressure regulator to a known pressure range near the sensors rating.
5. Enter the known pressure value into the input box for the corresponding sensor and click on the Adjust Gain button.
6. Slowly bleed off the air supply.
7. Disconnect the pressure source.

#### **WARNING**

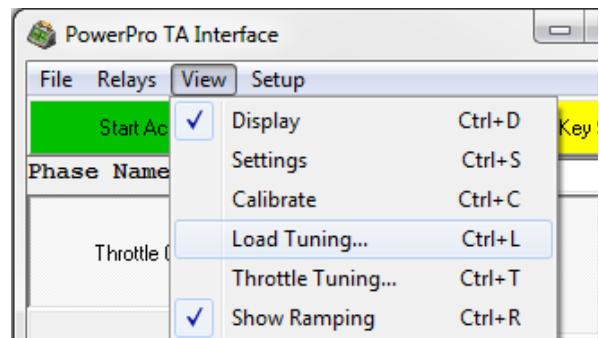
An abrupt change in pressure may result in damage to the sensor being calibrated. Make certain that the regulated air supply is set to zero before introducing pressure at a slow pace. When finished calibrating, slowly bleed off the air supply before removing from the sensor being tested.

**Speed:** There is no adjustment for the calibration of the speed sensor. If the speed is reading incorrectly, check the cables, connectors, and the gap between the magnetic pickup and the gear. If it is still reading incorrectly, repair parts or service may be required. If available, the speed may be verified with a hand tachometer.

Speed pickup gap .015"-.020"

# 4.0 PowerPro-SF Interface

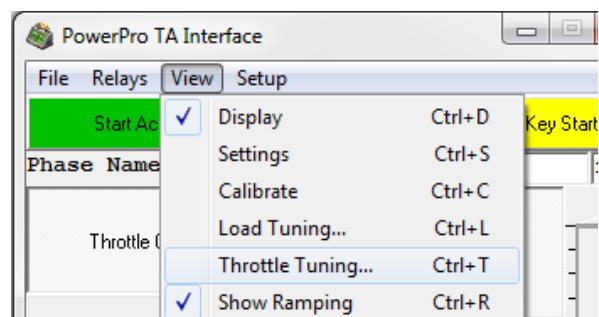
**View > Load Tuning:** Displays the dynamometer tuning parameters, shown below. The PowerPro software utilizes a Proportional Integral Derivative controller. The PID controller compares a measured value from a process with a reference setpoint value. The difference or error signal is then used to calculate a new value for the throttle or valve. The PID loop occurs many times per second.

A screenshot of the "Tuning" dialog box. The title bar says "Tuning". Below it is a "File" menu. The main area is a 10x10 grid of tables labeled 1 through 10. Each table has columns for RPM, P, I, D, and D2. The first row of the grid contains the values: 1000, 2000, 2500, 3000, 3500, 4000, 7000, 8000, 9000, and 12000. The "Apply" and "Close" buttons are at the bottom right of the dialog.

The Proportional (P) or gain positions the throttle or valve at a percentage proportional to the error. The Integral (I) is the rate at which the dynamometer will reach that setpoint. The Derivative (D) controls the rate of change and is seldom used.

Determining the appropriate settings for P and I can be a difficult task. A simple method for tuning is to first set the I and D values to zero. Increase the P until the system begins to oscillate and then divide by 2. Next, increase I until oscillation starts and divide by 2. A fast PID loop tuning usually overshoots slightly to reach the setpoint more quickly; however, some systems cannot accept overshoot. If this is the case, the tuning will need to be slower.

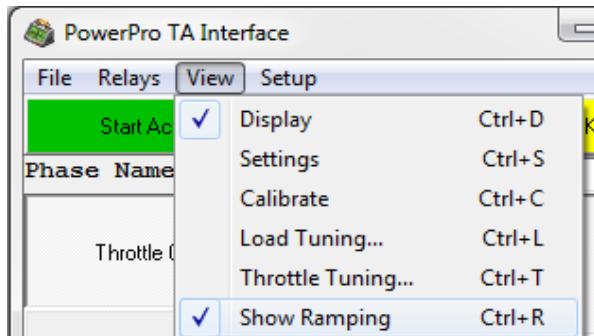
**View > Throttle Tuning:** Displays the throttle tuning parameters, shown below. A detailed description of the tuning process is described above.

A screenshot of the "Throttle Tuning" dialog box. The title bar says "Throttle Tuning". Below it is a "File" menu. The main area has two columns: "Speed" and "Torque". Under "Speed", there are four rows for P, I, D, and D2 with values 0.004, 0.006, 0, and 0 respectively. Under "Torque", there are four rows for P, I, D, and D2 with values 0.002, 0.004, 0, and 0 respectively. The "Apply" and "Close" buttons are at the bottom right.

## 4.0 PowerPro-SF Interface

**View > Show Ramping:** Displays the Ramping, or percentage of change per second of the value being changed.

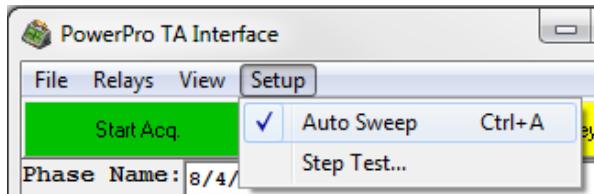
ex. Entering a throttle value of 50 in the Setpoint Entry Box and a value of 10 in the %/sec Entry Box will increase the throttle percentage by 10percent every second, acheiving the set value of 50% throttle in five seconds.



### The Setup Menu

From the Setup menu, the user can turn the Auto Sweep function on or off or switch to the Step Test function screen.

**Setup > Auto Sweep:** Prepares the PowerPro-SF Controller Interface for the Auto Sweep function. Sweep parameters are determined in the Settings window.



# 4.0 PowerPro-SF Interface

**Setup > Step Test:** Prepares the PowerPro-SF Controller Interface for the Step Test function. Step parameters are determined in the Settings window or can be typed directly into the boxes provided.

**NOTE:** Ensure throttle (QuikStik) is in the idle position before clicking on the Step Test menu item.

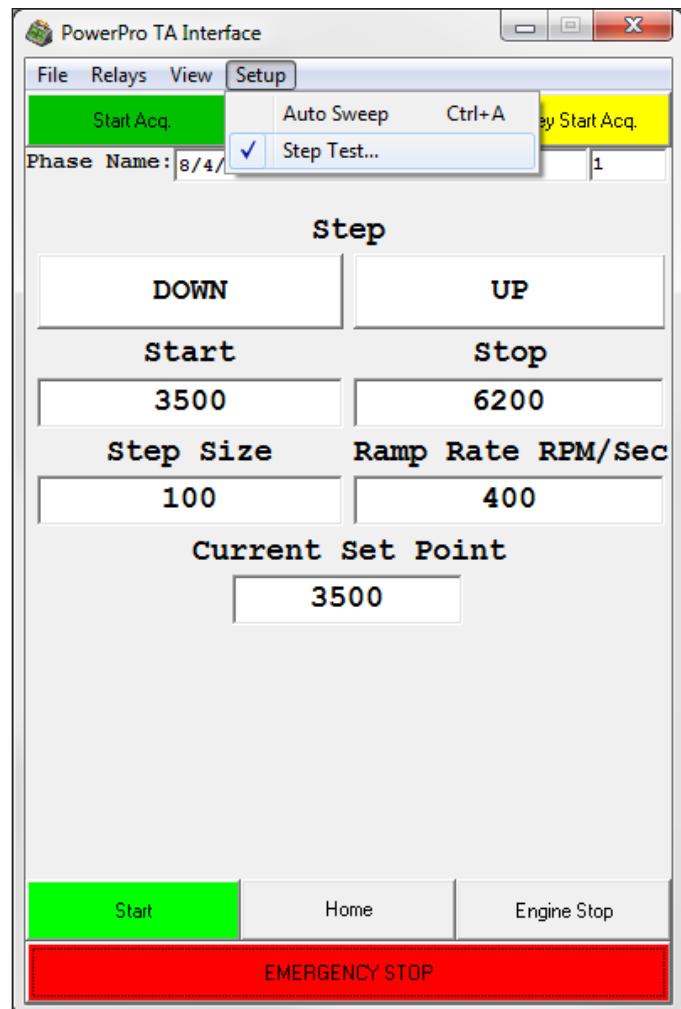
When the Step Test menu item is selected, the throttle mode will be set to MANUAL and the LOAD SPEED set point will be set based on the Start parameter.

After the Step Test parameters have been correctly entered;

1. The operator adjusts throttle to the desired position.
2. Then pressing the UP or DOWN buttons increases or decreases the load to bring the speed to the next desired set point based on the Step Size and Ramp Rate parameters.

At any time the operator can change the Current Set Point, Start, Stop, Set Size and Ramp Rate values by typing a new value into the appropriate box and pressing the Enter key.

**NOTE:** Values that are directly typed in are NOT saved back to the Settings window.



## 4.0 PowerPro-SF Interface

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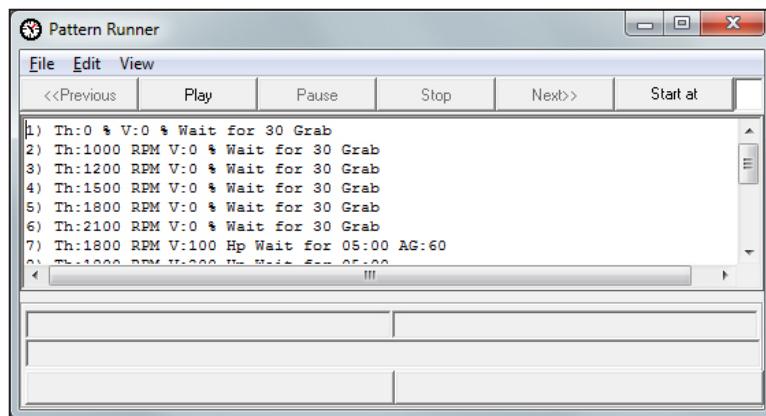
## 5.0 Pattern Runner

## 5.1 The Pattern Runner Interface Window

The Pattern Runner program allows the user to create, load, save, and execute Patterns. Patterns are pre-configured load and speed setpoints that are designed to automatically run in order. Each of these setpoints represents an action executed by the Controller Interface. Once a Pattern has been created, that Pattern is used to run individual commands of the Controller Interface.

## **IMPORTANT**

A thorough understanding of the dynamometer load and throttle controls, modes of operation, and effects on the engine are required before creating new patterns. When creating new patterns, it is recommended to insert many small steps between changes in rpm and load. It is also recommended that the time interval (point duration) is set long enough to allow for each step to stabilize before advancing to the next.



## Example of a PowerPro Test Pattern

Each row represents one point in the Pattern and is divided into as many as five columns.

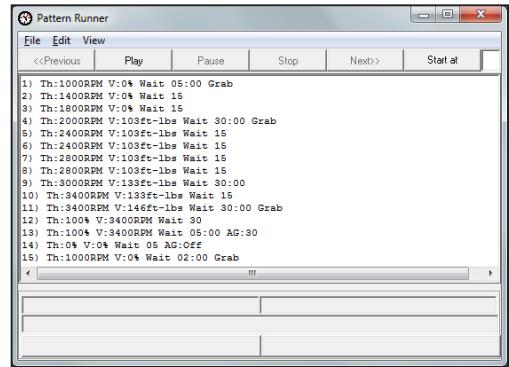
- The first column represents the *Point* or step of the Pattern. ex. 1), 2), etc.
  - The second column represents the *Throttle mode*. ex. Th: represents the Throttle position during the test. The throttle value can be set by either the percentage (%) of the throttle that is desired or by a set speed (rpm).
  - The third column represents the *Unit of Measure* for each Control mode. ex. hp, rpm or %. In the example above, V: represents position of the load control valve. There are four settings for determining the valve position: Valve position, Torque, Power, and Speed.
  - The fourth column represents the *Duration* or the elapsed time during each step of the Pattern. ex. 30, 01:00, etc. In the example above, Wait represents the Duration.
  - Column five indicates whether or not data will be recorded, including activation of the AutoGrab feature.

## **IMPORTANT**

The units for each of these settings are selected from the Sensor Properties window of the Main Display. To access the Sensor Properties window, right-click on the sensor and select Properties. Then choose the appropriate unit from the Units tab.

# 5.0 Pattern Runner

The example (right) uses the Throttle Speed mode for points 1-11 and point 15 and the Throttle Percentage mode for points 12-14. In addition, the Dyno Valve Percentage mode is used for points 1-3 and 14-15, the Valve Torque mode is used for points 4-11, and the Dyno Speed mode is used for points 12-13.



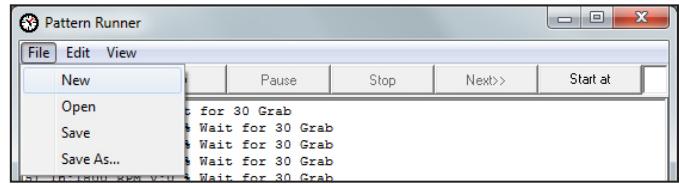
## 5.2 Pattern Runner Window Pull-Down Menus

The Pattern Runner window consists of two pull down menus: the File and Edit menus.

### The File Menu

There are four options within the File menu, New, Open, Save, and Save As.

**File > New:** Clears the active Pattern to allow the user to create a new Pattern, as explained on [page 41](#).



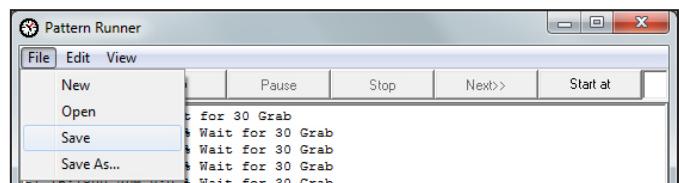
**File > Open:** Allows the operator to open an existing Pattern.



**File > Save:** Overwrites the active Pattern with a file having the same name.

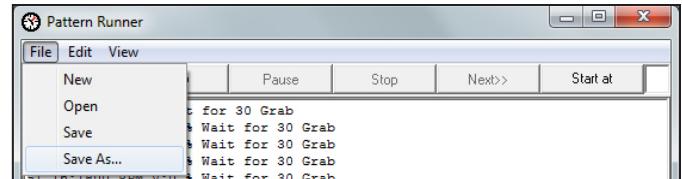
### **CAUTION**

Once changes have been saved and the original file has been overwritten, the original file cannot be retrieved.



# 5.0 Pattern Runner

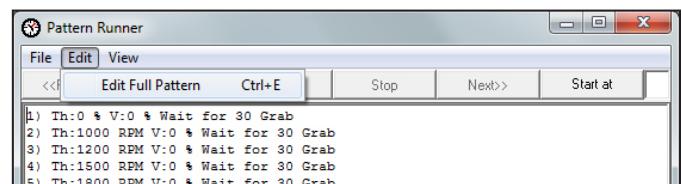
**File > Save As:** Saves a copy of the active Pattern as a new Pattern. The user will be prompted to name the new file before saving.



## The Edit Menu

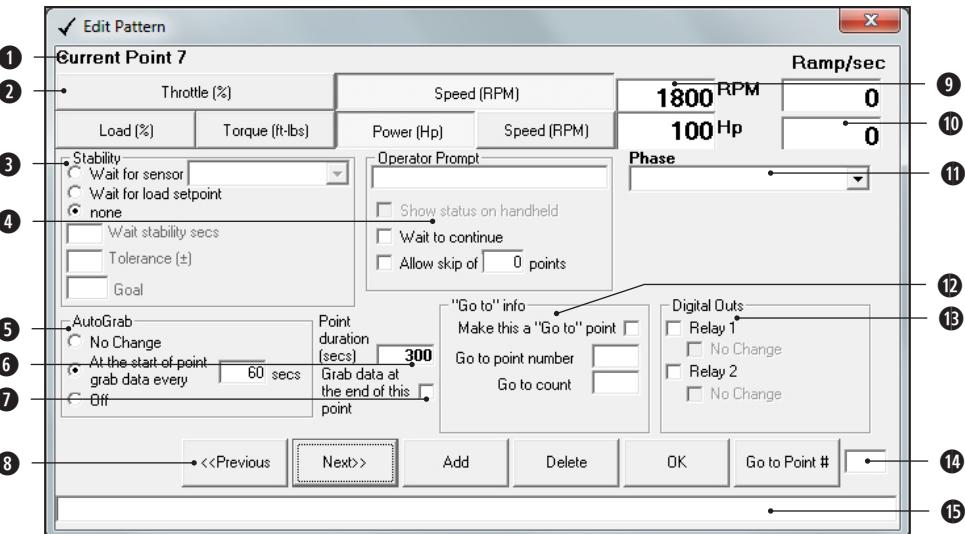
There is one option available for the Edit menu: Edit Full Pattern.

**Edit > Edit Full Pattern:** This allows the operator to edit the active Pattern. Selecting Edit > Edit Full Pattern brings up the Edit Pattern window. The procedure for editing an existing Pattern is similar to creating a new Pattern, see [Chapter 5.3](#) for details.



## 5.3 Creating a New Pattern or Editing an Existing Pattern

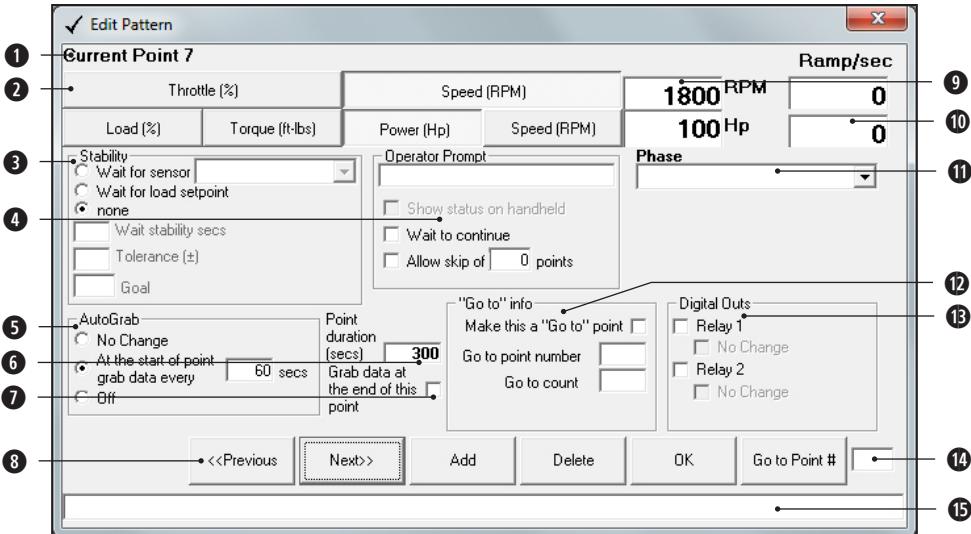
A new Pattern can be created from scratch or by modifying an existing Pattern and then saving as a new file name. To create a new Pattern from scratch, click on File > New in the Pattern Runner window. To modify an existing Pattern, select File > Open and open the Pattern to be modified. In either case, you have the same options available to choose from and edit.



**① Current Point:** Indicates the current point in the Pattern being edited. Points can be added, deleted, or navigated using the function buttons at the bottom of the Edit Pattern window.

**② Control Mode Buttons:** Indicates which method of control is being used for the current point in the Pattern.

# 5.0 Pattern Runner



**③ Stability Frame:** The settings entered in the Stability frame cause the system to wait to perform the functions specified in the current point until the requirements specified by the administrator are met. The Stability frame includes the Wait for Sensor, Wait for Setpoint, and None boxes.

If the **Wait for Sensor** box is clicked, the current point will be held until a selected sensor has reached a predetermined value (Goal input box) within a certain tolerance (Tolerance input box) for a certain duration (Wait Stability Secs input box). When using Wait for Sensor, the Wait Stability Secs won't begin counting down until the sensor value is within the range defined by the Goal and Tolerance. If the sensor value drifts outside the range during the wait time, the wait time will start over once the point is back within the range.

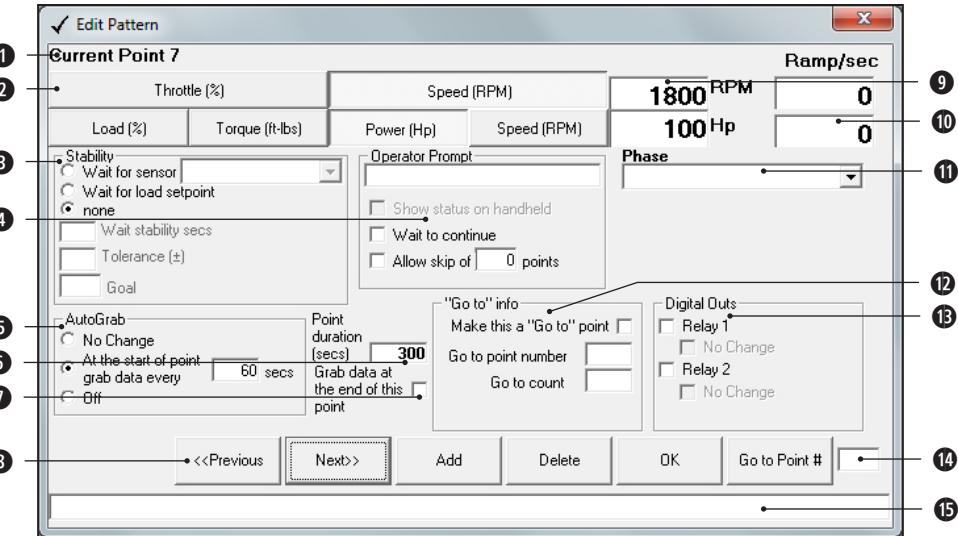
If the **Wait for Setpoint** box is clicked, the current point will be held until its value is reached within a certain Tolerance (Tolerance input box), for a certain duration (Wait Stability Secs input box). When using Wait for Setpoint, the Wait Stability Secs won't begin counting down until the indicated control mode value is within the range determined by the setpoint and the tolerance. If the control mode value drifts outside the tolerance during the wait time, the wait time will start over once the control mode value is back within the range.

**④ Operator Prompt Frame:** The settings entered in the Operator Prompt frame allow the administrator to display instructions for the operator and to pause the current Pattern until the operator responds. The Operator Prompt frame includes the Operator Prompt input box and the Show Status on Handheld, Wait for Continue, and Allow skip of \_\_\_\_\_ points check boxes.

## IMPORTANT

If a Pattern is suspended or restarted after a particular sensor or setpoint has been reached, the system may not be able to resume if the sensor or setpoint value has traveled outside of its specified goal and tolerance. ex. If a point was set to begin when the engine temperature has reached 180° with a setpoint of 180 and a tolerance of five, and the Pattern has been suspended after the engine temperature has reached 205°, the point will not proceed to the next point if the test is restarted without allowing sufficient time for the engine to cool.

# 5.0 Pattern Runner



If the **Wait for Continue** box is checked, the Pattern will not proceed to the next point until the operator touches the Continue button.

If the **Allow Skip of Points** \_\_\_ box is checked, the Skip button will appear. If the operator touches the Skip button, the Pattern will skip the indicated number of Pattern points.

**⑤ AutoGrab Frame:** The AutoGrab function allows the administrator to determine if data is to be grabbed at the end of each point.

If **No Change** is clicked, it keeps the AutoGrab setting the same as in the preceding Pattern point.

If **At the start of point grab data every \_\_\_ secs** is clicked, entering a value defines the time interval that data will be captured during the current Pattern point.

If **Off** is clicked, the AutoGrab feature is disabled.

**⑥ Point Duration Input Box:** In this method, the administrator simply enters how many seconds the current point is to be held before continuing to the next point. The number of seconds is entered in the Point Duration input box.

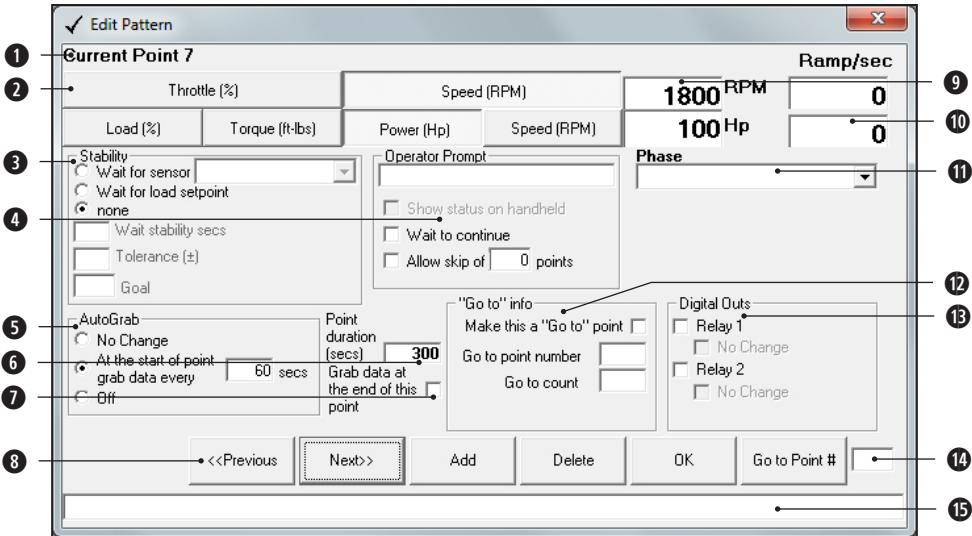
## ⑦ Grab Data at the End of This Point Input Box:

Selecting this will grab a datapoint at the end of the current point in the Pattern.

### IMPORTANT

It is possible to use any of the above methods for determining point duration simultaneously. The dynamometer will first try to satisfy the Stability settings, then the Operator Prompt settings, and finally the Point Duration settings.

# 5.0 Pattern Runner



**⑧ Function Buttons:** Points can be added, deleted, or navigated through using the function buttons as explained below:

**Previous:** Makes the preceding Pattern point active (if one exists) to allow it to be edited. Click once to restart the current point. To activate the previous point, click twice.

**Next:** Advances to the next Pattern point (if one exists) to allow it to be edited.

**Add:** Inserts a copy of the current Pattern point and makes it active for editing.

**Delete:** Deletes the current Pattern point.

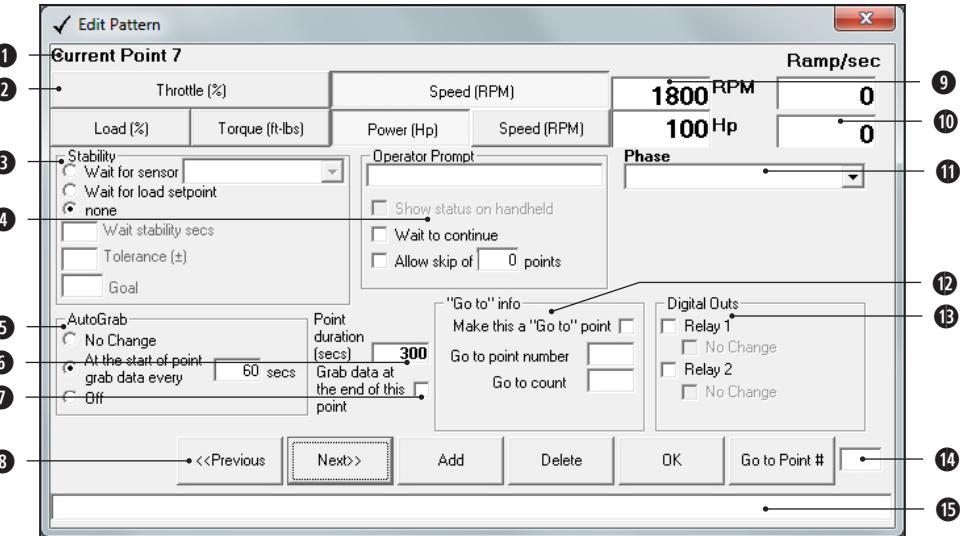
**OK:** Exits the Edit Pattern window.

**⑨ Setpoint Input Box:** Indicates the setpoint for the current point in the Pattern.

**⑩ Ramp/Sec % Input Box:** If ramping is enabled, this input box allows the administrator to change the ramping or percentage of change per second of the value being changed.

**⑪ Phase Drop-Down Menu:** Phases allow acquired data to be grouped for reporting purposes. To assign the data collected during the current point to a particular phase, simply select the desired phase from the drop-down menu. To create a new phase, type the name of the new phase in the drop-down menu. Phases are explained in detail in [Chapter 6, Report Generator](#).

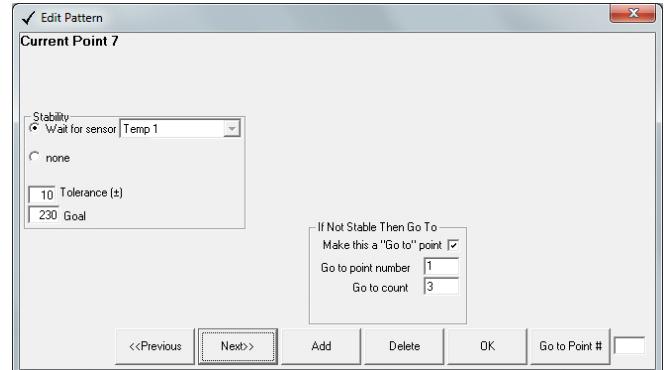
# 5.0 Pattern Runner



## ⑫ "Go to" Info Frame:

When "None" is clicked in Stability, Go To allows the administrator to create a new point that makes the Pattern go to a specific point (Go To point number input box) in the pattern. This allows the administrator to duplicate stages of a Pattern without having to create them again. How many times a stage of the Pattern repeats is determined by the number entered in the Go To Count input box.

When "Wait for sensor" is clicked in Stability, the Go To point will check to see if the predetermined value (Goal input box) within a certain tolerance (Tolerance input box) has been reached for the selected sensor. If the sensor value is within the range defined by the Goal and Tolerance the Pattern steps will continue. If the sensor value is outside the range, the Pattern will go to the point specified (Go To point number input box). If the sensor does not meet the predetermined value after a stage of the Pattern has been duplicated based on the value entered in the Go To Count input box, the Pattern steps will continue.



**⑬ Digital Outs Frame:** This frame allows the administrator to automatically turn relays on/off as part of a point.

**⑭ Go To Point # Input Box:** Allows the administrator to enter a pattern point number into the input box. Once the point number is entered, pressing the "Go to Point #" button will load that point of the pattern.

**⑮ Command Prompt Input Box:** Allows the administrator to enter specialized text that sends a command to an auxiliary programs that may be used in conjunction with the system.

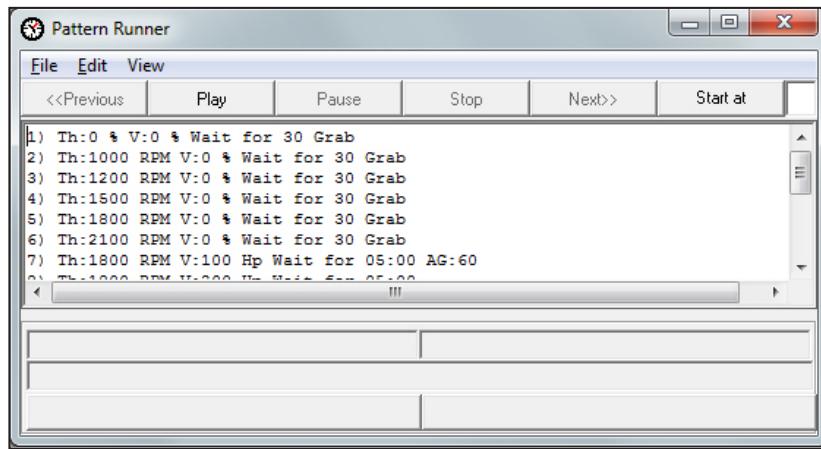
# 5.0 Pattern Runner

## Saving a Pattern

When finished creating or editing the Pattern, it will be saved with the active Template or DataSpace. The Pattern can also be saved as its own file by selecting File > Save As from the Pattern Runner window.

## Running a Pattern

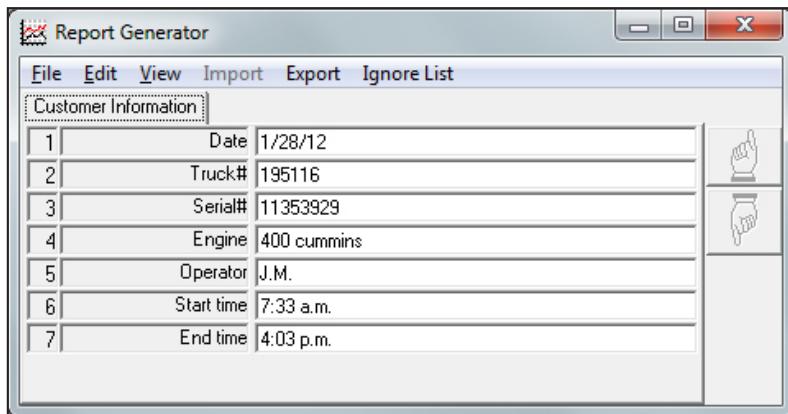
When all of the Pattern points have been edited and saved, the Pattern is now ready to run. To run a Pattern, click on the Play button. This will display the time remaining for the current Pattern point. Clicking the Pause button pauses the current Pattern and changes the function of the Play button to Stop. To resume the Pattern, click the Pause button again. To stop the Pattern, click on the Stop button. The <<Previous and Next>> buttons are used to navigate to different points in the Pattern.



# 6.0 Report Generator

## 6.1 The Report Generator Program

A copy of the data recorded during a dynamometer test should be saved following each test session. The Report Generator allows the operator to arrange the data into a meaningful visual format. Customer, engine, and setup information can be put into user tables and paragraphs. The information gathered during a test can then be arranged in a data table, spreadsheet, and/or graph. Report formats can be created and edited before or after a DataSpace has been created.



Report Generator Window

There are two types of information tables: a user table and a data table. A user table provides blanks for the operator to enter specific information about the test being performed. This can include, but is not limited to: customer information, engine information, and test specific information. A data table contains information gathered from the attached sensors during a test and displays only the information that is specified for that particular data table, such as maximum and minimum values.

The data gathered during a test can also be arranged in a spreadsheet, graph, and/or grid. A spreadsheet is a computer generated arrangement of the test data into rows and columns. A graph is a drawing representing the relationship between two sets of data. One set, such as gathered information, is represented on a vertical scale or axis, the other, such as time, is represented on a horizontal scale or axis. Information can also be entered into operator-designed grids. In most circumstances, an operator will design a grid similar to a manufacturer's test report. The finished grid will display a combination of manually entered and test generated data.

In addition to tables, graphs, spreadsheets and grids, information can also be entered into a paragraph. A paragraph is typically used to enter notes, disclaimers, and descriptions, relating to a specific test or stage of testing.

# 6.0 Report Generator

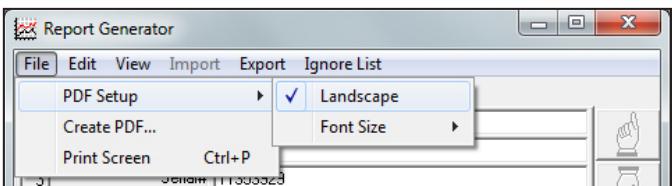
## 6.2 Report Generator Window Pull-Down Menus

The Report Generator window consists of the File, Edit, View, Import, Export, and Ignore List menus.

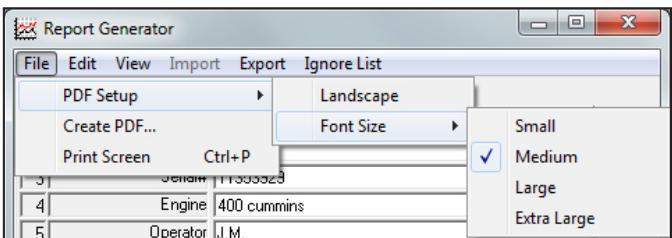
### The File Menu

The File menu allows the user to access the Report Generator print features. The menu consists of: PDF Setup, Create PDF, and Print Screen.

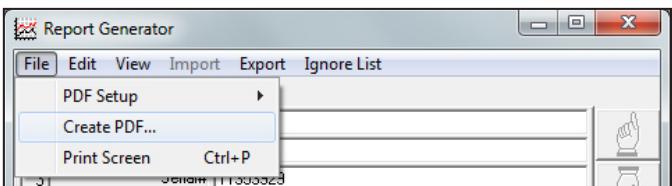
**File > PDF Setup > Landscape:** This selection allows the user to select if the PDF file will be set as Portrait or Landscape. By default PDF files are set to Portrait. If the user check marks Landscape, PDF files will be set to Landscape.



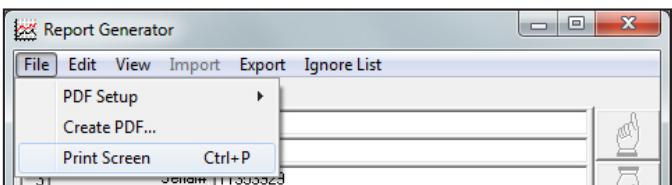
**File > PDF Setup > Font Size:** This selection allows the user to select between predefined font sizes; Small, Medium, Large, and Extra Large.



**File > Create PDF:** Creates and opens a PDF file of the report. From the preview, the user can choose to save or print a hard copy of the report. Reports can be configured to display your company's logo and contact information. Contact your Power Test representative for assistance in creating a custom header.



**File > Print Screen:** Sends a snapshot of the entire Commander computer screen to the printer.

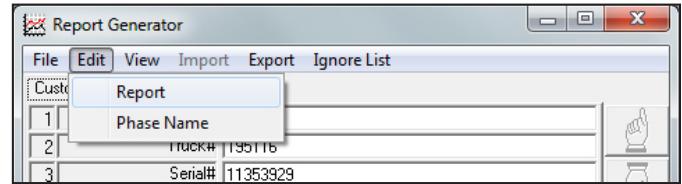


# 6.0 Report Generator

## The Edit Menu

The Edit menu consists of two selection: Report and Phase Name.

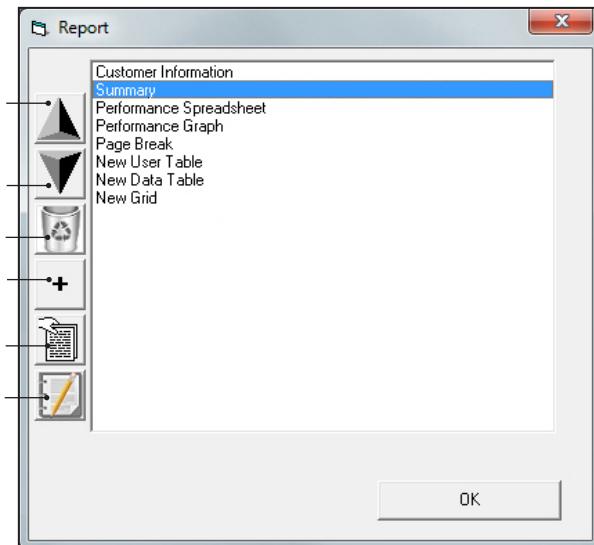
**\*Edit > Report:** This function allows the administrator to modify the active data report. Click on Edit > Report and a new window will appear. The Edit Report window (below) allows the user to configure the printed reports and the entry fields of: user tables, data tables, graphs, spreadsheets, paragraphs and grids.



## Using the Edit Report Window

From the Edit Report window, the user can move, add, delete, copy, and/or edit sections. The information displayed on the report will display as it appears in the list. Clicking on a section highlights that section and enables the function buttons on the left side of the window.

### Edit Report Window Function Buttons



**① Move Section Up Button:** Clicking this button will move the highlighted section up, changing the order in which information appears on the final report.

**② Move Section Down Button:** Clicking this button will move the highlighted section down, changing the order in which information appears on the final report.

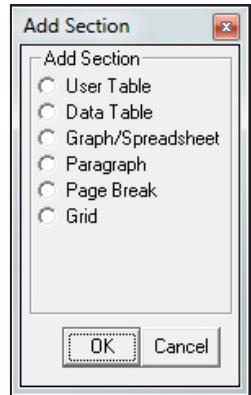
**③ Delete Section Button:** Clicking this button will delete the highlighted section.

# 6.0 Report Generator

**④ Add Section Button:** Clicking this button will open up the Add Section window (right), allowing the user to add one of seven section types: User Table, Data Table, Graph/Spreadsheet, Paragraph, Page Break, Grid, and Event Finder.

**⑤ Copy Section Button:** Clicking this button makes a copy of the highlighted section and all of its properties. This is useful for creating a similar section without having to create it new.

**⑥ Edit Section Button:** Clicking this button or double-clicking on any highlighted section allows the user to edit that particular section of the report.



## Creating or Editing Report Sections

To create a new report section, click the Add Section button on the Edit Report window (shown on [page 49](#)), select the section type you want to create from the Add Section window, and click OK. Next, with the newly created section highlighted, either click on the Edit Section button on the Edit Report window or double-click the selection. This will open a new properties window where you can edit the new section.

To edit an existing **report section**, select the desired section from the Edit Report window (shown on [page 49](#)) and either click on the **Edit Section** button or double-click on the highlighted selection.

## Report Section Properties Windows

When you select a report section from the Edit Report window and either click on the Edit Section button or double-click the selection, a new properties window will open up that gives you options to edit the report section. Each type of report section (User Table, Data Table, Graph, Spreadsheet, etc.) has its own properties window. On the following pages, each report section's properties window is described. It is in these windows that a user customizes how the data gathered will be presented in the generated report.

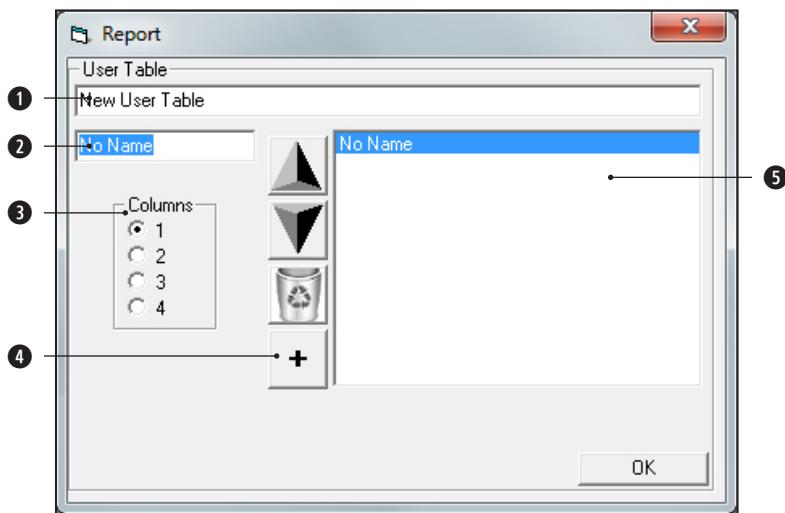
# 6.0 Report Generator

## Creating or Editing a User Table

To create a new user table, click the Add Section button on the Edit Report window (shown on [page 49](#)), select User Table from the list of section types, and click OK. Next, with New User Table selected, either click on the Edit Section button on the Edit Report window or double-click on the highlighted selection. This will open a new properties window where you can edit the new section.

To edit an existing user table, select the desired user table from the Edit Report window (shown on [page 49](#)) and either click on the Edit Section button or double-click on the highlighted selection.

## User Table Properties



### ① Table Name Input Box:

The Table Name input box is where the operator can name a new user table or rename an existing table. To name or to change the name of a user table, highlight the current text in the Table Name input box and type over it with the new name.

### ② Field Name Input Box:

The Field Name input box is where the operator can change the name of a report field. To change the name of a report field, click on the report field name to be changed in the Report Fields list. Then, with the current field name highlighted in the Field Name input box, type over the current name with the new name.

### ③ Columns Frame:

The Columns frame allows the operator to choose how many columns are assigned to the user table.

### IMPORTANT

It is recommended to keep the number of columns in a user table a multiple of the number of fields. i.e. If there are 4 report fields, it is recommended you choose 1, 2, or 4 columns. This will help to ensure that the data is presented in an organized manner.

# 6.0 Report Generator

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## **④ Report Field Buttons:**

Report fields can also be moved up or down using the Navigational buttons or deleted from the user table using the Delete Section button. Clicking the Add Section button adds a report field.

## **⑤ Report Field List:**

The Report Field list displays all the report fields that the operator can enter specific information into regarding the test being performed. To add a report field, click on the Add Section button. A user table is limited to 12 report fields. Report fields can also be moved up or down using the Navigational buttons or deleted from the user table using the Delete Section button.

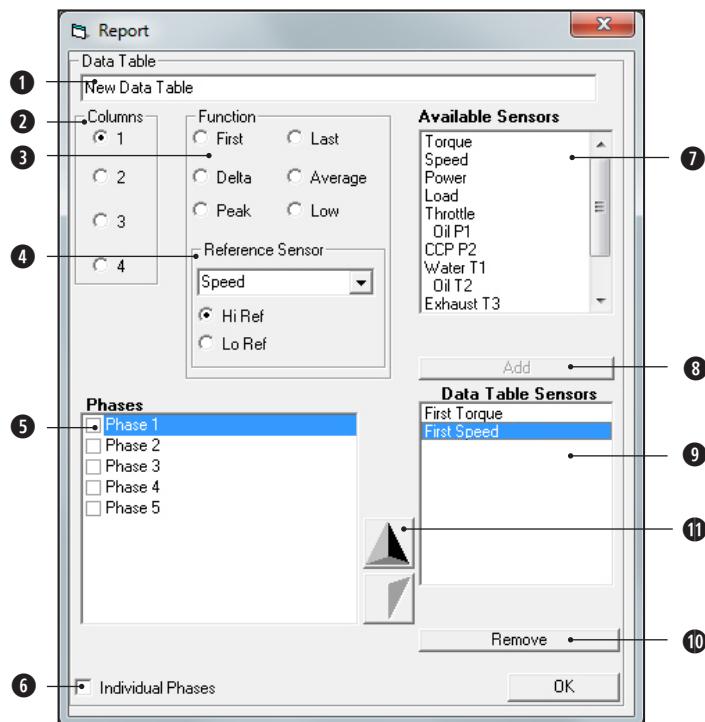
# 6.0 Report Generator

## Creating or Editing a Data Table

To create a new data table, click the Add Section button on the Edit Report window (shown on [page 49](#)), select Data Table from the list of section types, and click OK. Next, with New Data Table selected, either click on the Edit Section button on the Edit Report window or double-click on the highlighted selection. This will open a new properties window where you can edit the new section.

To edit an existing data table, select the desired data table from the Edit Report window (shown on [page 49](#)) and either click on the Edit Section button or double-click on the highlighted selection.

## Data Table Properties



### ① Table Name Input Box:

The Table Name input box is where the operator can name a new data table or rename an existing table. To name or to change the name of a data table, highlight the current text in the Table Name input box and type over it with the new name.

### ② Columns Frame:

The Columns frame allows the operator to choose how many columns are assigned to the data table.

### IMPORTANT

It is recommended to keep the number of columns in a data table a multiple of the number of fields. i.e. If there are 4 report fields, it is recommended you choose 1, 2, or 4 columns. This will help to ensure that the data is presented in an organized manner.

# 6.0 Report Generator

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## ③ Function Frame:

The **Function** frame defines which data points will be displayed in the data table. There are six options an operator can select from, including:

**First:** This will display the first value of the sensor selected. If the Individual Phases check box is selected, it will display the first value of the sensor selected for each selected phase.

**Last:** This will display the last value of the sensor selected. If the Individual Phases check box is selected, it will display the last value of the sensor selected for each selected phase.

**Delta:** This will display the difference between the first and last value of the sensor selected. If the Individual Phases check box is selected, it will display the difference between the first and last value of the sensor selected for each selected phase.

**Average:** This will display the average value of the sensor selected. If the Individual Phases check box is selected, it will display the average value of the sensor selected for each selected phase.

**Peak:** This will display the largest value of the sensor selected. If the Individual Phases check box is selected, it will display the largest value of the sensor selected for each selected phase.

**Low:** This will display the lowest value of the sensor selected. If the Individual Phases check box is selected, it will display the lowest value of the sensor selected for each selected phase.

## ④ Reference Sensor Frame:

The **Reference Sensor** frame will display a particular sensor's values and its correlation to another sensor's greater or lower value. i.e. Speed at Peak Torque. To display reference sensor data in the generated report, choose a reference sensor from the drop-down menu. The list of sensors available as reference sensors is the same as the list of sensors found in the Available Sensors list. When the desired reference sensor has been selected, click on Hi Ref to display the peak value or Lo Ref to display the low value.

## ⑤ Phases:

A **Phase** represents a segment of the data gathered during a test. The Phases section displays the list of stored phases from the current DataSpace. Selecting a phase will include it in the generated report.

## ⑥ Individual Phases Check Box:

If the **Individual Phases** box is unchecked, all function values for the included data table sensors will be calculated by grouping data from the selected phases. If the Individual Phases box is checked, the function values will be calculated on a per phase basis.

## ⑦ Available Sensors List:

Report data is gathered from the sensors displayed in the **Available Sensors** list. This list displays all of the sensors connected to the system at the time of the reports creation. (Available sensors may vary depending on the version of software.)

# 6.0 Report Generator

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## **⑧⑨⑩ Data Table Sensors List:**

The **Data Table Sensors** list (⑨) displays all of the sensors whose data will be displayed on the generated report. To add a sensor to the Data Table Sensors list, first click on a sensor from the Available Sensors list (⑦). Next, select a function to be performed on the sensor from the Function frame (②). Then click the Add button (⑧) to include the selected sensor and function to be performed to the Data Table Sensors list (⑨). To remove a sensor from the Data Table Sensors list (⑨), select the sensor so it becomes highlighted and then click the Remove button (⑩).

## **⑪ Navigational Buttons:**

To change the order in which the data table sensor information appears on the generated report, highlight a sensor in the list and click on the navigational buttons to the left of the Data Table Sensors list to move it up or down.

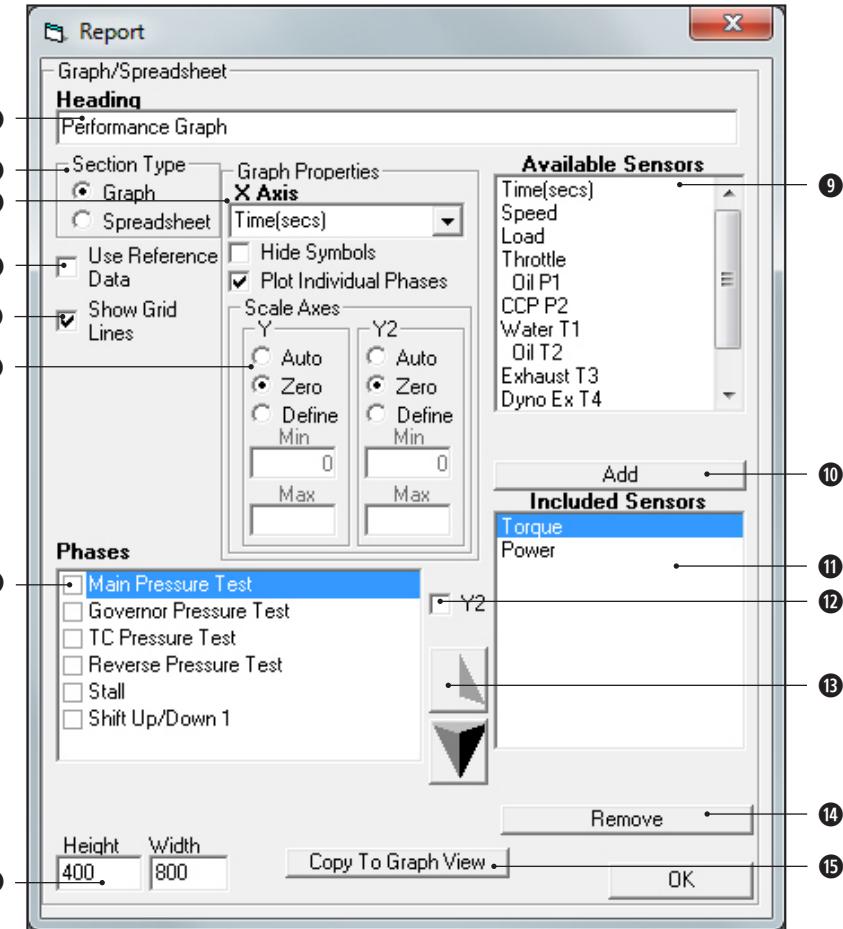
# 6.0 Report Generator

## Creating or Editing a Graph

To create a new graph, click the Add Section button on the Edit Report window (shown on [page 49](#)), select Graph/Spreadsheet from the list of section types, and click OK. Next, with New Graph/Spreadsheet selected, click on the Edit Section button on the Edit Report window or double-click on the highlighted selection. This will open a new properties window where you can edit the new section.

To edit an existing graph, select the desired graph from the Edit Report window (shown on [page 49](#)) and either click on the Edit Section button or double-click on the highlighted selection.

## Graph Properties



### ① Heading Input Box:

The Heading input box is where the operator can name a new graph or rename an existing graph. To name or to change the name of a graph, highlight the current text in the Heading input box and type over it with the new name.

# 6.0 Report Generator

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## **② Section Type Frame:**

The Section Type frame is where the operator defines whether they want the gathered data displayed in a graph or spreadsheet. In the Section Type frame, select Graph.

## **③ Graph Properties Frame:**

The Graph Properties frame is where the operator can choose which sensors to display on the X-Axis of the graph. The X-Axis drop-down menu contains the sensors available for display on the X-Axis (horizontal) of the graph. The graph can only display one sensor on the X-Axis. Clicking on the Hide Symbols check box will create lines on the graph without showing a symbol at the individual points. If the Plot Individual Phases box is checked, each included sensor will be graphed with multiple lines corresponding to each phase selected. If the Plot Individual Phases check box is left unchecked, the graph will show each included sensor as a continuous line throughout all of the phases selected.

## **④ Use Reference Data Check Box:**

Clicking the Use Reference Data check box will plot reference data on the graph in addition to the data being recorded during the test. Reference data is data that is typically used for monitoring and comparing the results of a test. Instructions for creating and loading reference data can be found in [Chapter 7.3, Add-In Programs](#).

## **⑤ Show Grid Lines Check Box:**

The user has the option to show grid lines in the graph or not by clicking the Show Grid Lines check box.

## **⑥ Scale Axes Frame:**

The Scale Axes frame is where the operator specifies the Y and/or Y2 axis options for displaying data on the graph. By default, the Auto function only displays data in the range from which it was obtained. The Zero option displays data from a range of zero to the highest point where data is obtained. The Define option allows the operator to define the minimum and maximum range to display data.

## **⑦ Phases List:**

A phase represents a segment of the data gathered during a test. The Phases frame displays the list of stored phases from the current DataSpace. Selecting a phase will include it in the generated report.

## **⑧ Height/Width Input Boxes:**

The user has the option of setting the height and width of the graph, which determines the size of the graph on the generated report.

## **⑨ Available Sensors List:**

The Available Sensors list displays the sensors available for display on the Y-Axis (vertical). This list displays all of the sensors connected to the system at the time of the reports creation and data is gathered from the sensors displayed in the list. (Available sensors may vary depending on the version of software.)

# 6.0 Report Generator

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## **⑨⑩⑪⑭ Included Sensors List:**

The Included Sensors list (⑪) displays the sensors that will be graphed on the Y-Axis. To add a sensor to the Included Sensors list, click on a sensor from the Available Sensors list (⑨), then click the Add button (⑩). To remove a sensor from the Included Sensors list, click on the sensor to be removed, then click the Remove button (⑭).

## **⑫ Y2 Check Box:**

The Y2 check box allows the operator to display a second sensor's data on the Y2-Axis (vertical, right) of the graph. To assign a sensor to the Y2-Axis, click on the sensor you want to display in the Included Sensors box, then click the Y2 check box.

## **⑬ Navigational Buttons:**

To change the order in which the data table sensor information appears on the generated report, highlight a sensor in the data table sensors list and click on the Navigational Buttons to move it up or down.

## **⑯ Copy To Graph View Button:**

Clicking on the Copy To Graph View button takes the data created from the report and displays it in a new window. The New Graph View will have all of the same functions and properties of the graph it was created from. A New Graph View displays recorded data from a test and is refreshed every time a data point is recorded. This is different from the Real-Time Chart, which displays data regardless if data points are recorded or not.

### **IMPORTANT**

Clicking the Copy To Graph View button opens a graph in a new window. Any changes made to the new graph will not be saved as part of the report. Consequently, any changes made to the graph from the Graph Properties window will not appear on the new graph unless the Copy To Graph View button is clicked again.

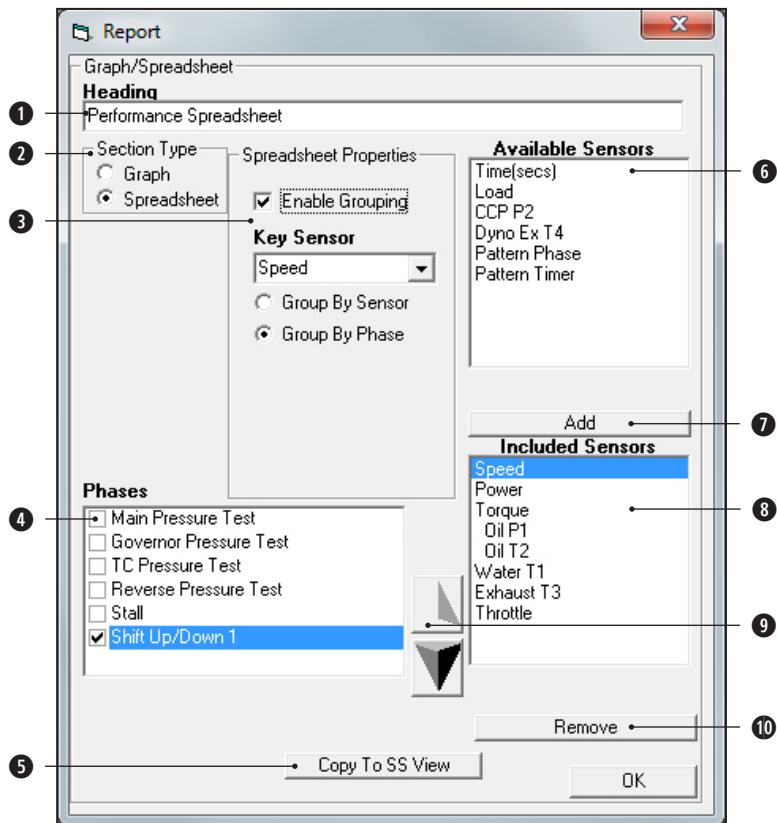
# 6.0 Report Generator

## Creating or Editing a Spreadsheet

To create a new spreadsheet, click the Add Section button on the Edit Report window (shown on [page 49](#)), select Graph/Spreadsheet from the list of section types, and click OK. Next, with New Graph/Spreadsheet selected, either click on the Edit Section button on the Edit Report window or double-click on the highlighted selection. This will open a new properties window where you can edit the new section.

To edit an existing spreadsheet, select the desired spreadsheet from the Edit Report window (shown on [page 49](#)) and either click on the Edit Section button or double-click on the highlighted selection.

## Spreadsheet Properties



### ① Heading Input Box:

The Heading input box is where the operator can name a new spreadsheet or rename an existing spreadsheet. To name or to change the name of a spreadsheet, highlight the current text in the Heading input box and type over it with the new name.

### ② Section Type Frame:

The Section Type frame is where the operator defines whether they want the gathered data displayed in a graph or spreadsheet. In the Section Type frame, select Spreadsheet.

# 6.0 Report Generator

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## ③ Spreadsheet Properties Frame:

In the Spreadsheet Properties frame, the operator has the option of clicking on the Enable Grouping check box. If the Enable Grouping check box is selected, the user has the option to select a sensor from the Key Sensor drop-down menu (the sensor that data is matched to, typically speed) and whether the data is Grouped by Sensor or Grouped by Phase in the generated report. By selecting Group By Sensor, the data is paired by sensors and displayed under each phase. By selecting Group By Phase, the data is grouped by phase under each sensor. If the Enable Grouping check box is not selected, the included sensors will display as a continuous column throughout the whole spreadsheet.

## ④ Phases List:

A phase represents a segment of the data gathered during a test. The Phases frame displays the list of stored phases from the current DataSpace. Selecting a phase will include it in the generated report.

## ⑤ Copy To SS View Button:

Clicking on the Copy To SS View button takes the data created from the report and displays it in a new window. The New Spreadsheet will have all of the same functions and properties of the spreadsheet it was created from. A New Spreadsheet displays recorded data from a test and is refreshed every time a data point is recorded.

## ⑥ Available Sensors List:

The Available Sensors list displays the sensors available for display on the Y-Axis (vertical). This list displays all of the sensors connected to the system at the time of the reports creation and data is gathered from the sensors displayed in the list. (Available sensors may vary depending on the version of software.)

## ⑦⑧⑩ Included Sensors List:

The Included Sensors list (⑧) contains the sensors that will be displayed on the spreadsheet. To add a sensor to the Included Sensors list, click on a sensor from the Available Sensors list (⑥), then click the Add button (⑦). To remove a sensor from the Included Sensors list, click on the sensor to be removed, then click the Remove button (⑩).

## ⑨ Navigational Buttons:

To change the order in which the included sensor information appears on the generated report, highlight a sensor in the included sensors list and click on the Navigational Buttons to move it up or down.

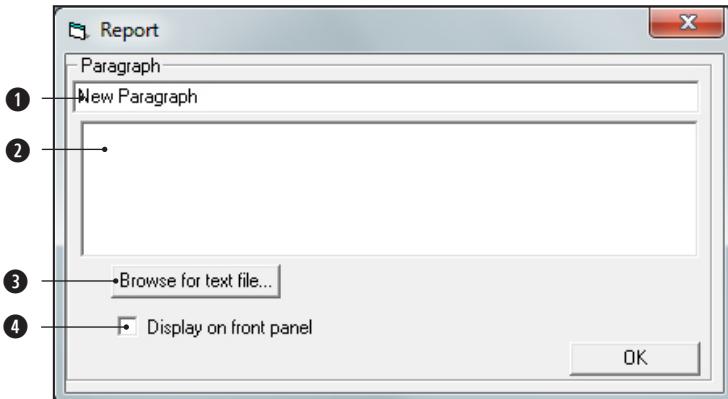
# 6.0 Report Generator

## Creating or Editing a Paragraph

To create a new paragraph, click the Add Section button on the Edit Report window (shown on [page 49](#)), select Paragraph from the list of section types, and click OK. Next, with Paragraph selected, either click on the Edit Section button on the Edit Report window or double-click on the highlighted selection. This will open a new properties window where you can edit the new section.

To edit an existing paragraph, select the desired paragraph from the Edit Report window (shown on [page 49](#)) and either click on the Edit Section button or double-click on the highlighted selection.

## Paragraph Properties



### ① Paragraph Name Input Box:

The Paragraph Name input box is where the operator can name a new paragraph or rename an existing paragraph. To name or to change the name of a paragraph, highlight the current text in the Paragraph Name input box and type over it with the new name.

### ② Text Input Box:

The Text Input box is where the operator is able to enter any information they want to appear on the generated report. To add a paragraph to the generated report, click anywhere in the Text Input box and type the information you want to include on the report.

### ③ Browse for Text File Button:

The Browse for Text File button opens a window that displays available text (.txt) files that can be imported into the Text Input box. Once you have clicked the Browse for Text File button, choose the file you want to import and click Open. This will display all the information from that file in the Text Input box.

### ④ Display on Front Panel:

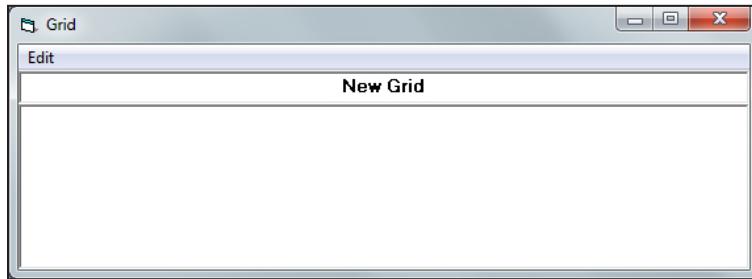
Selecting the Display on Front Panel check box displays the Paragraph Input box as a tab on the Main Form window of the Report Generator. Clicking this tab allows the user to type text into the Text Input box without having to go into the Edit > Report menu.

# 6.0 Report Generator

## Creating or Editing a Grid

To create a grid, click the Add Section button on the Edit Report window (shown on [page 49](#)), select Grid from the list of section types, and click OK. Next, with Grid selected, either click on the Edit Section button on the Edit Report window or double-click on the highlighted selection. This will open a new properties window where you can edit the new section.

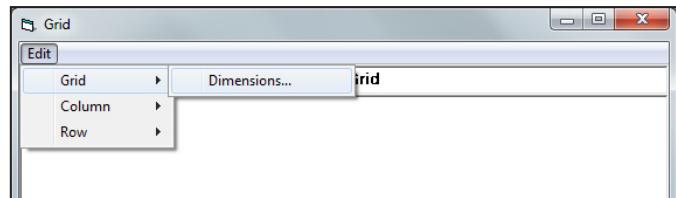
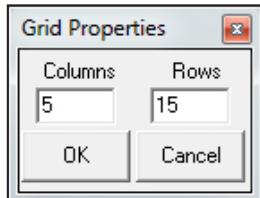
To edit an existing Grid, select the Grid from the Edit Report window (shown on [page 49](#)) and either click on the Edit Section button or double-click on the highlighted selection.



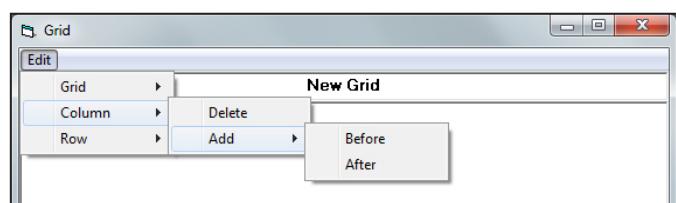
## Grid Edit Menu

The Grid Edit menu consists of three selection: Grid, Column and Row.

**Edit > Grid > Dimensions:** This selection allows the user to modify the grid. Click on Edit > Grid > Dimensions and a new window will appear. The Grid Properties window (below) allows the user to configure the grid by assigning the number of columns and rows.

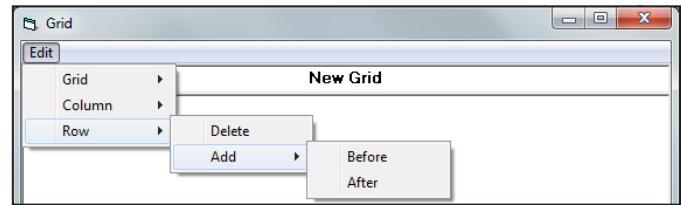


**Edit > Column:** This selection allows the user to modify the grid's columns. To add a column, click on a column in the grid, then click Edit > Column > Add > Before or After menu selection. To delete a column from the grid, click on the column to be removed, then click Edit > Column > Delete menu selection.



# 6.0 Report Generator

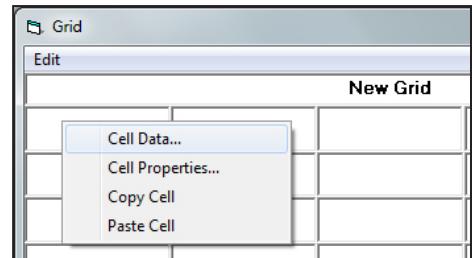
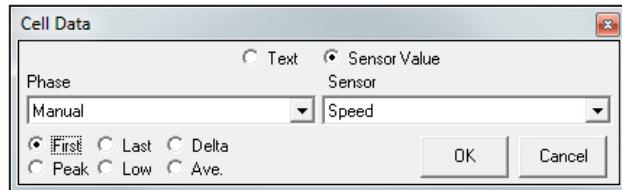
**Edit > Row:** This selection allows the user the grid's rows. To add a row, click on a row in the grid, then click Edit > Row > Add > Before or After menu selection. To delete a row from the grid, click on the row to be removed, then click Edit > Row > Delete menu selection.



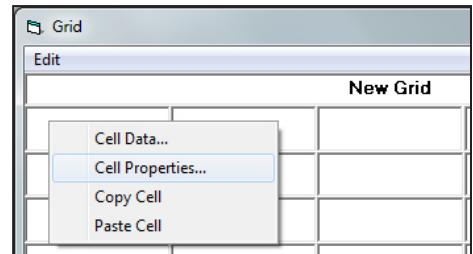
## Cell Options

Right-clicking a cell provides four options for the user to modify the properties of that particular cell. The options are: Cell Data, Cell Properties, and Copy/Paste Cell.

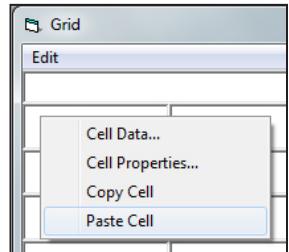
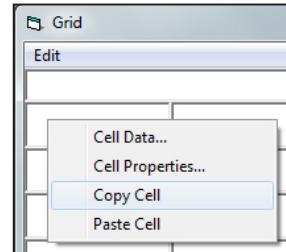
**Cell Data:** This function allows the user to determine whether the cell will display user-entered text or data generated during the test. Selecting Text and typing directly into the cell will display the text. Selecting Sensor Value will allow the user to select which sensor to display and from which phase the information is displayed.



**Cell Properties:** This function allows the user to change the information displayed from regular type to **bold** or, if something is already bold, it can make it regular type again.

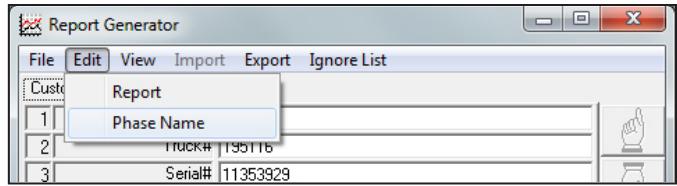


**Copy/Paste Cell:** This function allows the user to copy and paste individual cells into other cells in order to quickly reproduce cells with duplicate properties or to copy and modify a cell with similar properties.



# 6.0 Report Generator

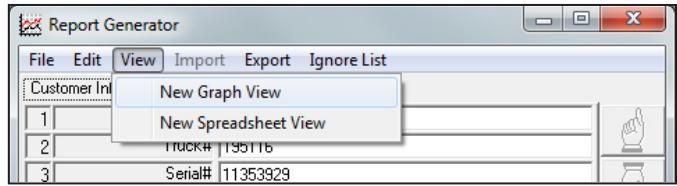
**\*Edit > Phase Name:** This function allows the administrator to modify the phase name's used in the active data report. Click on Edit > Phase Name and a new window will appear. The Edit Phase Name window allows the user to rename the phase names.



## The View Menu

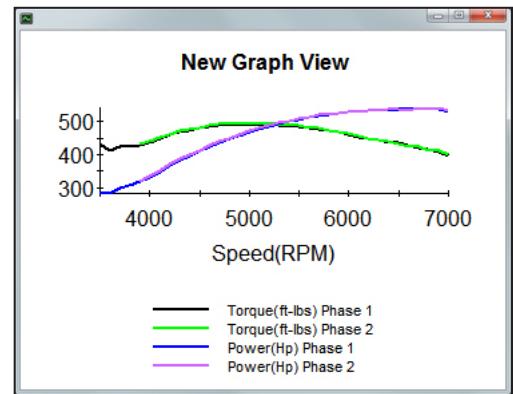
The View menu lists two options: New Graph View and New Spreadsheet View.

**View > New Graph View:** Automatically creates a new graph and opens the Graph View Properties window for that graph. See New Graph View Properties Window for detailed information on this window. The new graph displays recorded data from a test and is refreshed every time a data point is recorded. This is different from the Real-Time Chart, which displays data regardless if data points are recorded or not.

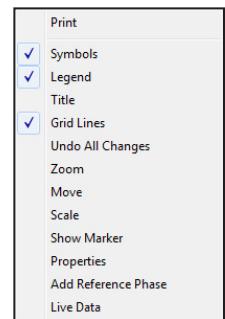


### New Graph View Options

Right-clicking the new graph will display the Options window (next page). The users has the following options for modifying the graph:



**Print:** Prints the active new graph.



**Symbols:** Displays the symbols indicating each point where data has been recorded.

**Legend & Title:** The legend is displayed at the bottom of the graph and the title is displayed at the top of the graph.

**Grid Lines:** Displays the grid lines on the graph.

**Undo All Changes:** Resets any changes made using the Zoom, Move, and Scale functions.

**Zoom:** Allows the user to zoom-in on a specific point on the graph while retaining the X-Axis and Y-Axis.

# 6.0 Report Generator

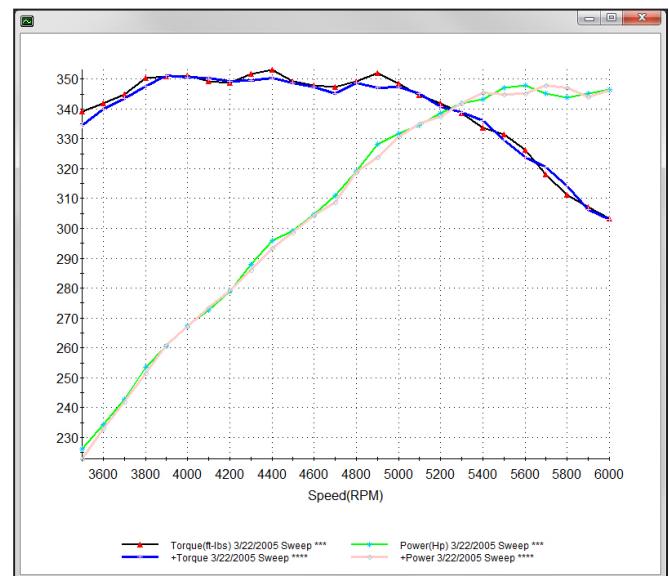
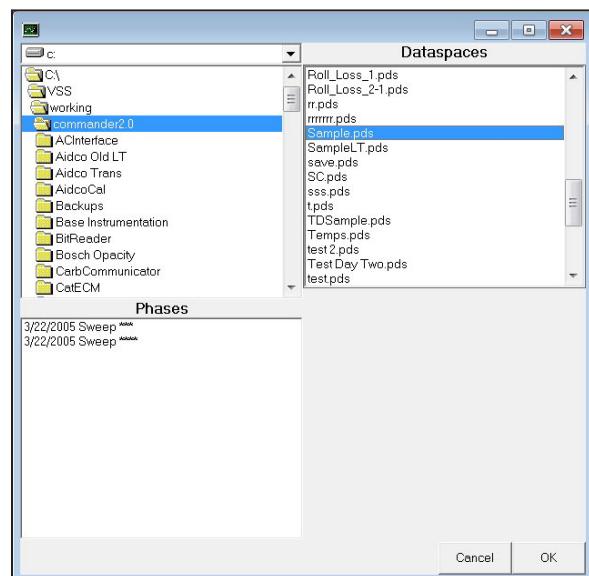
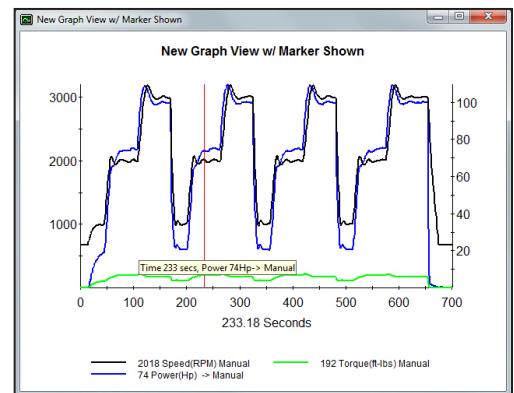
**Move:** Allows the graph to be repositioned within the window.

**Scale:** Allows the graph to be re-sized; enlarging or reducing the actual size of the graph.

**Show Marker:** Allows a red marker line to be placed on the graph. The user can position the marker line anywhere within the graph and that position's information will be displayed as shown right.

**Properties:** Opens the Properties window.

**Add Reference Phase:** Opens the window shown lower left. From this window, the operator selects a "Dataspace" and "Phase" to import into the current graph view for comparison. The newly selected data will be shown with a "+" symbol (shown lower right) in the beginning of it to indicate it's the additional data.



**Live Data:** Will show current live data in the graph view window.

- For Power Pro and Power Pro Total Automation systems only.
- Live data will stream only when in data acquisition mode.
- Live data will disappear at the end of the sweep and replaced by recorded data.

# 6.0 Report Generator

## New Graph View Properties Window

### **① Name Input Box:**

The Name input box is where the operator can name the new graph. To do this, click in the Name input box and type in the name.

### **② X-Axis Drop-Down Menu:**

The X-Axis menu contains the sensors available for display on the X-Axis (horizontal) of the graph. The graph can only display one sensor on the X-Axis.

### **③ Use Reference Data Check Box:**

Clicking the Use Reference Data check box will plot reference data on the graph in addition to the data being recorded during the test. Reference data is data that is typically used for monitoring and comparing the results of a test. Instructions for creating and loading reference data can be found in [Chapter 7.3, Add-In Programs](#).

### **④ Plot Individual Phases Check Box:**

If the Plot Individual Phases box is checked, each included sensor will be graphed with multiple lines corresponding to each phase selected. If the Plot Individual Phases check box is left unchecked, the graph will show each included sensor as a continuous line throughout all of the phases selected.

**⑤ AutoScale Frame:** Clicking the Y and/or Y2 box will display data on the graph from a range of zero to the highest point where data is obtained. By default, the AutoScale function only displays data in the range from which it was obtained.

### **⑥ Y2 Check Box:**

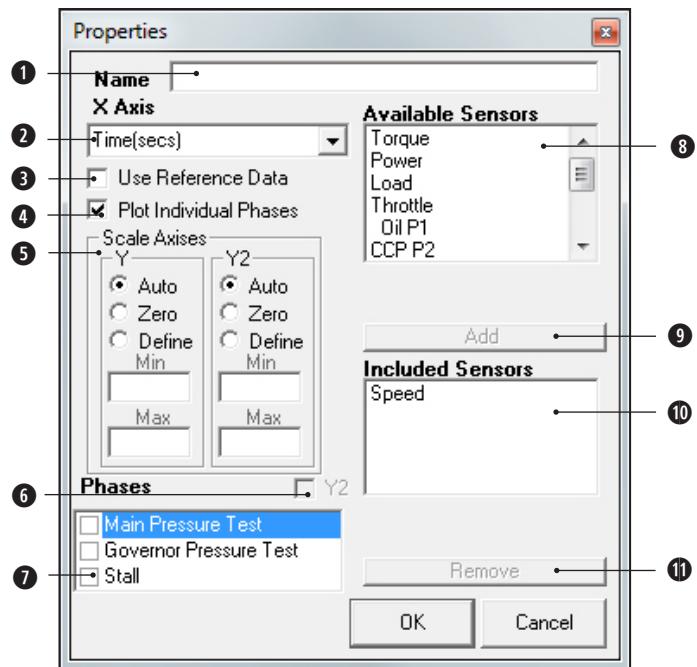
The Y2 check box allows the operator to display a second sensor's data on the Y2-Axis (vertical, right) of the graph. To assign a sensor to the Y2-Axis, click on the sensor you want to display in the Included Sensors box, then click the Y2 check box.

### **⑦ Phases List:**

A phase represents a segment of the data gathered during a test. The Phases frame displays the list of stored phases from the current DataSpace. Selecting a phase will include it in the generated report.

### **⑧ Available Sensors List:**

The Available Sensors list displays the sensors available for display on the Y-Axis (vertical). This list displays all of the sensors connected to the system at the time of the reports creation and data is gathered from the sensors displayed in the list. (Available sensors may vary depending on the version of software.)

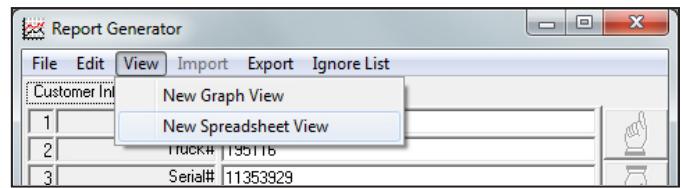


# 6.0 Report Generator

## ⑨⑩⑪ Included Sensors List:

The Included Sensors list displays the sensors that will be graphed on the Y-Axis. To add a sensor to the Included Sensors list, click on a sensor from the Available Sensors list, then click the Add button. To remove a sensor from the Included Sensors list, click on the sensor to be removed, then click the Remove button.

**View > New Spreadsheet View:** Automatically creates a new spreadsheet and opens the Properties window of that spreadsheet. The new spreadsheet displays recorded data from a test and is refreshed every time a data point is recorded. This is different from the Real-Time Chart, which displays data regardless if data points are recorded or not.



## New Spreadsheet View Options Window

Right-clicking the new spreadsheet will display the Options window (right). The user has the following options for modifying the spreadsheet:

**Print:** Prints the active new spreadsheet.

Print  
Show Min & Max Values  
Properties...

**Show Min & Max Values:** Displays the maximum column values in red and minimum values in blue.

**Properties:** Opens the Properties window.

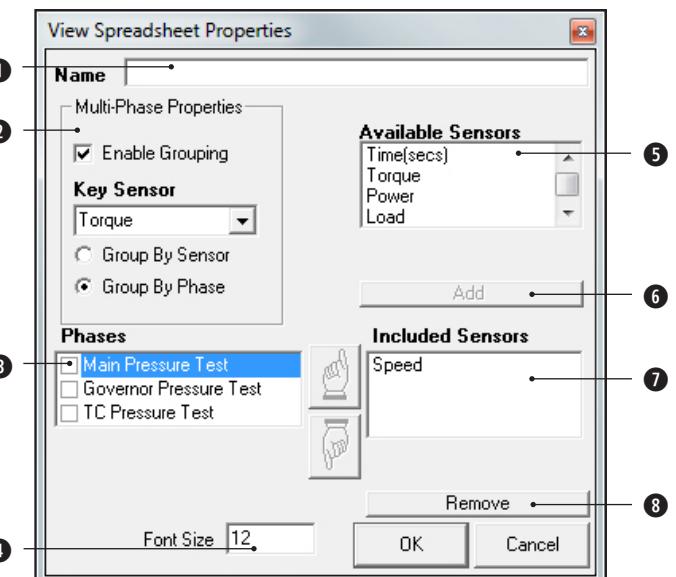
## New Spreadsheet View Properties Window

### ① Name Input Box:

The Name input box is where the operator can name the new spreadsheet. To do this, click in the Name input box and type in the name.

### ② Multi-Phase Properties Frame:

If the Enable Grouping check box is selected, the user has the option to select a sensor from the Key Sensor drop-down menu (the sensor that data is matched to, typically speed) and whether the data is Grouped by Sensor or Grouped by Phase in the generated report. By selecting Group By Sensor, the data is paired by sensors and displayed under each phase. By selecting Group By Phase, the data is grouped by phase under each sensor. If the Enable Grouping check box is not selected, the included sensors will display as a continuous column throughout the whole spreadsheet.



# 6.0 Report Generator

## ③ Phases List:

A phase represents a segment of the data gathered during a test. The Phases frame displays the list of stored phases from the current DataSpace. Selecting a phase will include it in the generated report.

## ④ Font Size Box:

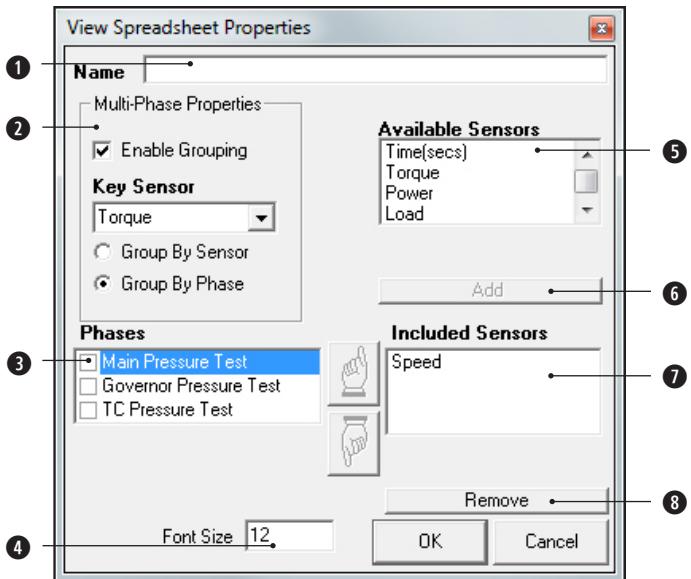
The size of the font displayed in the new spreadsheet can be changed by entering a value in this box.

## ⑤ Available Sensors List:

The Available Sensors list displays the sensors available for display on the Y-Axis (vertical). This list displays all of the sensors connected to the system at the time of the reports creation and data is gathered from the sensors displayed in the list. (Available sensors may vary depending on the version of software.)

## ⑥⑦⑧ Included Sensors List:

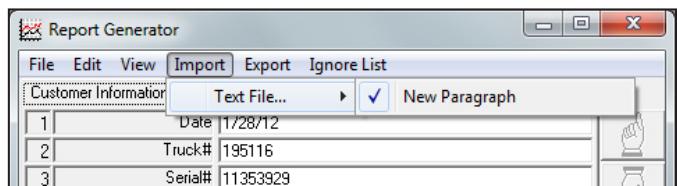
The Included Sensors list contains the sensors that will be displayed on the spreadsheet. To add a sensor to the Included Sensors list, click on a sensor from the Available Sensors list, then click the Add button. To remove a sensor from the Included Sensors list, click on the sensor to be removed, then click the Remove button.



## The Import Menu

The Import menu contains one option: Text File.

**Import > Text File:** If a paragraph has been made importable, this menu item will become active and the name of the paragraph will be listed in this menu. If there is text within the saved paragraph, a check mark will appear next to its name. If no importable paragraphs are available, the tab will display the text "No Importable Paragraphs".



# 6.0 Report Generator

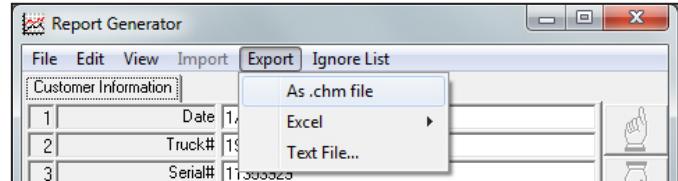
## The Export Menu

There are three options available for choosing in the Export Menu: As .chm file, Excel, and Text File. By selecting these options, the user can export the report to the desired file type.

**Export > As .chm file:** This menu item gives the user the option to export a report as a .chm file. A .chm file is a compressed html page. This type of file, normally used by Microsoft to create help files, is perfect for creating small files that are easily e-mailed. By compressing the html page, not only is the file size made significantly smaller, it also includes all of the support files.

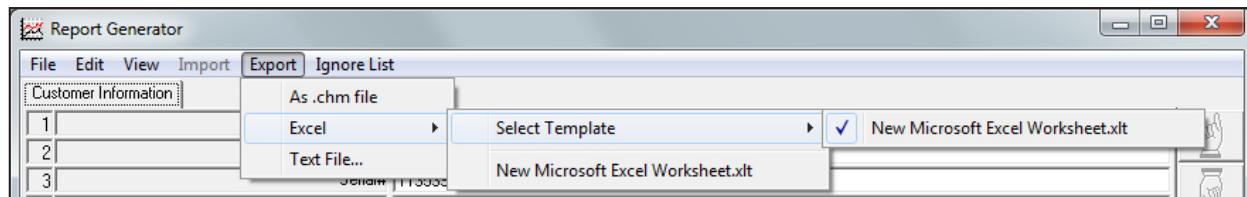
To create a .chm file, simply click on the menu item and choose a file name. The Report Generator will then recreate the html page, compress it, and save it to the Program Directory. A .chm file may be requested by your Power Test representative when providing technical assistance.

**Export > Excel:** This allows the operator to export data directly into Microsoft Excel. The administrator must choose which Excel template will be available to the operator to export the data into. All available Excel templates (.xlt files) will be listed under the arrow of the Select Template menu.

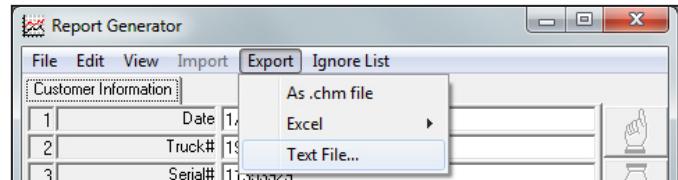


### IMPORTANT

The Excel template must be saved as a .xlt file in the Power Test\Commander 2.0 folder and have a blank sheet named 'Data' before it will show as a selectable template. The 'Data' sheet is where the data will be exported into the template.



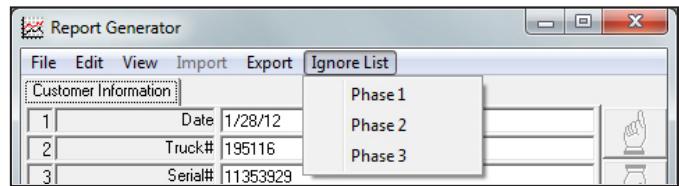
**Export > Text File:** This allows the operator to export all the data from a DataSpace to a tab delimited text file (.txt). By exporting data to this type of file, the data may be imported into virtually any spreadsheet program. Simply click on the Text File menu item, select a file name, and click on Save. The default path is C:\Power Test\ Commander 2.0.



# 6.0 Report Generator

## The Ignore List

The Ignore List shows all of the phases in the DataSpace. If a phase is added to the Ignore List, the data from that particular phase will not be displayed in the entire report and globally ignored by the PowerPro software. To eliminate, but not delete, any particular phase from the entire report, check the phase name under this menu item.



# 7.0 Add-In Programs

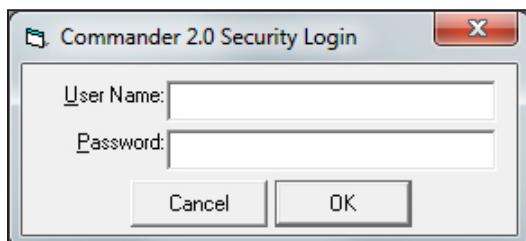
In this chapter, some Add-In programs will be introduced. For some systems, Security Editor and ECM Communicator are standard components. All other Add-In programs are optional, such as the Smoke Check Transfer program, Fuel Controller, and Gas Analyzer. All existing Add-In programs are listed in the Add-Ins menu in the Main Display window.

## IMPORTANT

The following are some examples of Add-In programs available for Power Test Data Acquisition Systems. For instructions and specifications for specified equipment, please consult the information provided with the option.

## 7.1 Security Editor

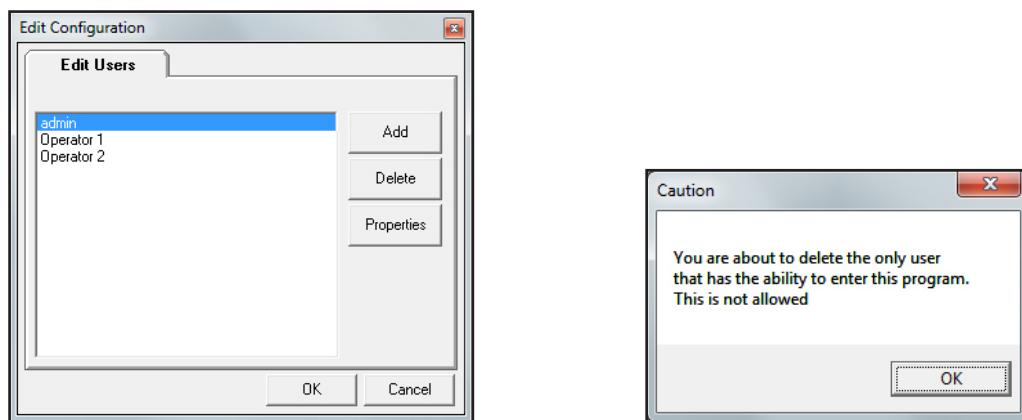
The Security Editor is an administrative tool used to assign rights to operators. To access the Security Editor program, the user must have full administrative rights. The administrator has to log in, even if they have already logged in to the main program.



### Edit Users

The administrator can add, delete, or edit user names, passwords, and security levels.

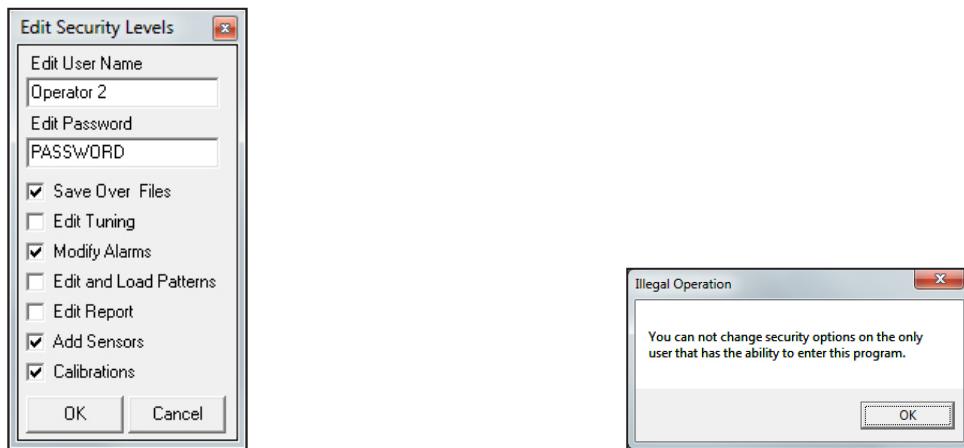
To add a new user, click Add, and a New User will be added to the list of current users. To delete a user, highlight the user name and click Delete. If there is only one user with full administrative rights in the list, the program will not allow you to delete that user. If an attempt is made to do so, the following warning will appear (bottom right).



## 7.0 Add-In Programs

To edit a user's security levels, highlight the user whose levels you want to edit and click Properties. The Edit Security Levels window (below right) will appear, in which the user's name, password, and security can be assigned. Edit the user name and password and check the appropriate boxes to grant those security rights to the user. When finished editing, click OK to accept the changes or Cancel to decline them.

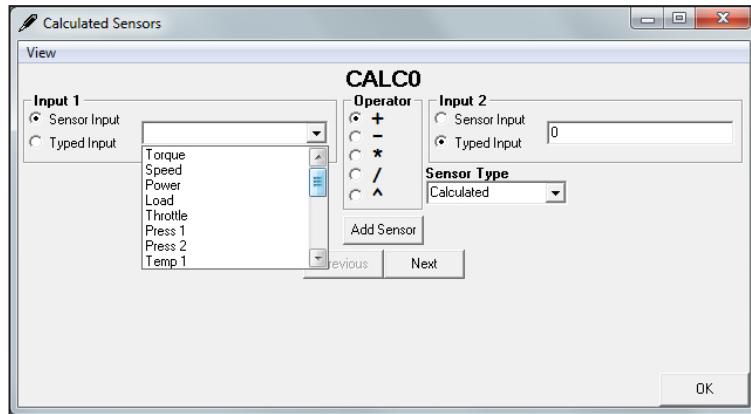
If there is only one user with full administrative rights in the list, the program will not allow you to edit their security level. If an attempt is made to do so, the following warning will appear (below right).



# 7.0 Add-In Programs

## 7.2 Calculated Sensors

This program has the ability to take two sensors or typed values and add, subtract, multiply, divide, or power the two values. The user must choose a sensor type, determining what type of units to use on the new calculated sensor. When a calculated sensor is created, it is permanently added to the list of available sensors.



A user must be logged in to access the Calculated Sensors program. To begin calculating sensors, click View > Edit. Clicking the Add Sensor button will allow the user to configure the sensors. By selecting Sensor Input or Typed Input, either a sensor value or a literal value can be used in the calculation. Select the calculation function by clicking on the various option buttons in the Operator frame. Clicking the Add Sensor button saves the new Calculated Sensor.

To add additional sensors, click on the Add Sensor button. The name of the sensor, as well as its variables and calculations used to determine the value of the calculated sensor, can be edited from the Sensor Properties function in the Main Display. Additionally, a custom unit can be assigned to a calculated sensor from the Sensor Properties function in the Main Display. Any custom unit can be assigned by choosing the Custom option button on the Units tab. If the sensor name has been changed, it will not be renamed until the DataSpace has been reopened.

If more than one sensor is added, the Previous and Next buttons allow navigation from one calculated sensor to the next.

All calculations are performed on the base unit.

When the display unit has an offset relative to the base unit, i.e.  $0^{\circ}\text{C} = 32^{\circ}\text{F}$ , you will have to add a second equation where you add in the offset to correct this issue.

**Example of this issue:**  $20^{\circ}\text{C} - 20^{\circ}\text{C} = ?$

$$20^{\circ}\text{C} = 68^{\circ}\text{F}$$

$$68^{\circ}\text{F} - 68^{\circ}\text{F} = 0^{\circ}\text{F}$$

$$0^{\circ}\text{F} = -18^{\circ}\text{C}$$

$$20^{\circ}\text{C} - 20^{\circ}\text{C} \neq -18^{\circ}\text{C}$$

## 7.0 Add-In Programs

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**How to Fix the Issue:**  $20^{\circ}\text{C} - 20^{\circ}\text{C} = ?$

Eq 1:  $68^{\circ}\text{F} - 68^{\circ}\text{F} = \text{"CalcX"}$  Do not change the unit of Calc0. There is also no need to display it.

Eq 2:  $\text{CalcX} + 32^{\circ} = 32^{\circ}\text{F}$  Select sensor type - "Temperature"  
 $32^{\circ}\text{F} = 0^{\circ}\text{C}$

$$20^{\circ}\text{C} - 20^{\circ}\text{C} = 0^{\circ}\text{C}$$

The result of Eq 2 is only accurate when displayed in  $^{\circ}\text{C}$ . If you want to view the results in  $^{\circ}\text{F}$ , then view the result of Eq 1.

### **IMPORTANT**

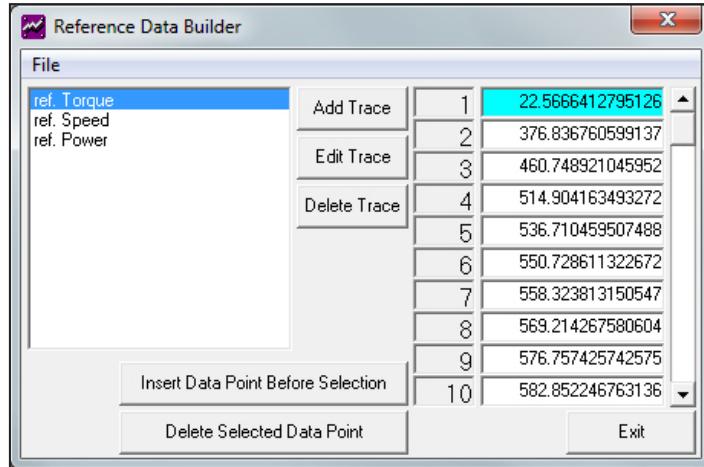
**There is no way to remove a sensor. Sensors can only be added. If a calculated sensor is no longer needed, a new Template must be created from an existing Template not containing the calculated sensor.**

# 7.0 Add-In Programs

## 7.3 Reference Data Builder

Reference data is data that is typically used for comparing the results of a test. The Reference Data Builder creates a file containing reference data that can be displayed in charts, report graphs, and graph views.

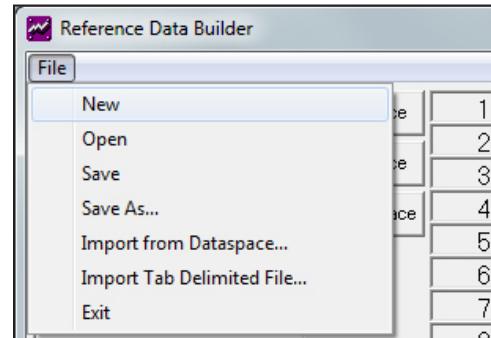
Reference data can be obtained from an existing DataSpace, a tab delimited file created in a spreadsheet program such as Microsoft Excel, or manually entered by the user.



### The File Menu

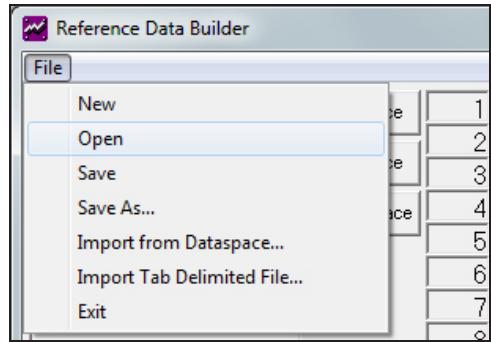
The File menu contains the following options: New, Open, Save, Save As, Import From DataSpace, Import Tab Delimited File, and Exit.

**File > New:** Clears the current reference data file to allow the user to create a new reference data file.

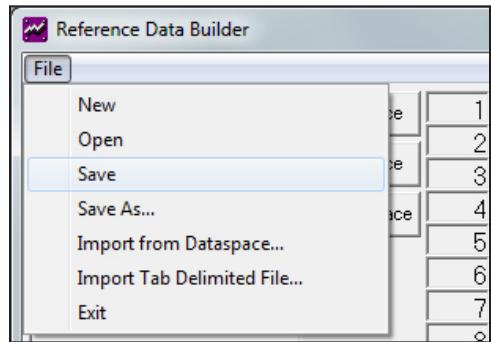


# 7.0 Add-In Programs

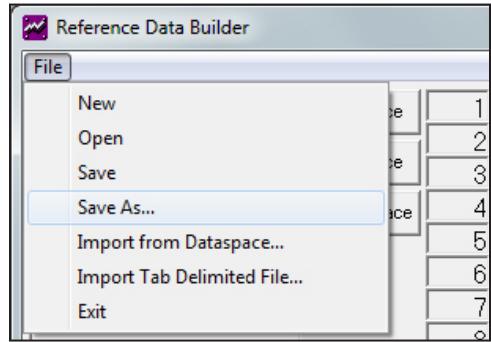
**File > Open:** Prompts the user to open an existing reference data file.



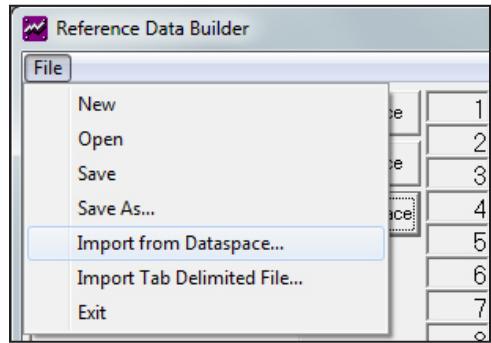
**File > Save:** Overwrites the current reference data file.



**File > Save As:** Saves a copy of the current reference data file as a new file. The user will be prompted to name the new file before saving.

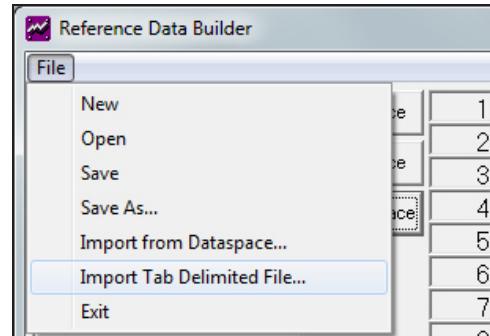


**File > Import from DataSpace:** This menu item allows the user to import reference data into the report from an existing DataSpace by opening the Choose Traces and Phases window, as described on [page 85](#).

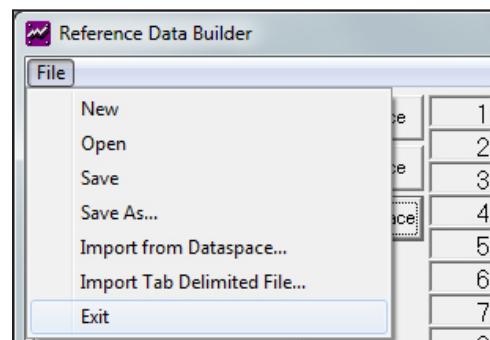


# 7.0 Add-In Programs

**File > Import Tab Delimited File:** This menu item allows the user to import reference data into the report from a program such as Excel.



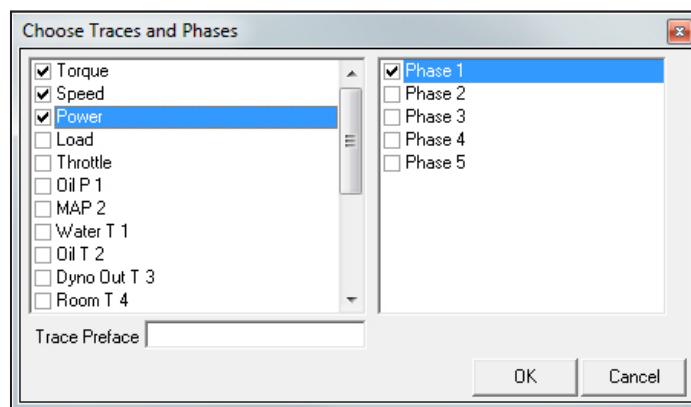
**File > Exit:** Provides the user with the option to save their data and closes the Reference Data Builder program.



## Importing Reference Data from a DataSpace

To import data from an existing DataSpace, click on File > Import from DataSpace. Once you choose the DataSpace file to import data from the Choose Traces and Phases window (below) will appear.

Select the sensors and phases to be included in the reference data file. Assign a preface to the sensor name by entering it into the Trace Preface text box (below). When finished, click OK.



# 7.0 Add-In Programs

## Traces

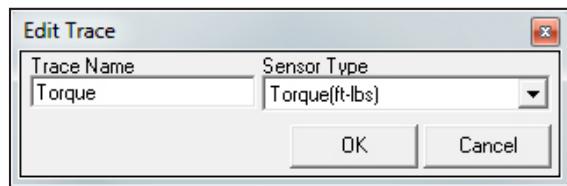
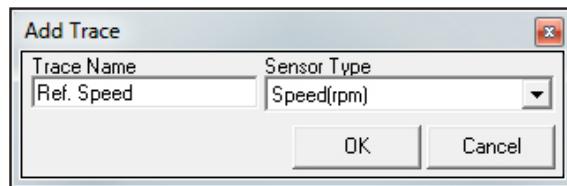
A trace is a line on a graph representing a specific sensor's values. To add a trace to a reference data file, click on the Add Trace button. This will open the Add Trace window (right). From the Add Trace window, the user will be able to assign a name to the new trace and select the sensor type.

To edit an existing trace, highlight the Trace and click the Edit Trace button. This will open the Edit Trace window (right). From the Edit Trace window, the user can edit the trace name and sensor type of the selected trace. To delete a trace, highlight the trace and click the Delete Trace button.

Individual data points can be edited by manually entering values directly into the input box. To add data points, the user can click on the Insert Data Point at End button. Clicking on the numeral to the left of the data point will highlight that particular line and change the button to Insert Data Point Before Selection.

### IMPORTANT

To load reference data into a DataSpace or Template, refer to the *Data menu* section of Chapter 3, The Main Display.

A screenshot of the 'Reference Data Builder' dialog box. On the left is a list of traces: 'ref. Torque' (selected), 'ref. Speed', and 'ref. Power'. To the right is a table with 10 rows of data. Row 1 is highlighted with a blue background. The table has columns for Trace Name, Add Trace, Edit Trace, Delete Trace, and numerical values. The data is as follows:

Trace Name	Add Trace	1	22.5666412795126
ref. Speed		2	376.836760599137
ref. Power		3	460.748921045952
		4	514.904163493272
		5	536.710459507488
		6	550.728611322672
		7	558.323813150547
		8	569.214267580604
		9	576.757425742575
		10	582.852246763136

Buttons at the bottom include 'Insert Data Point Before Selection', 'Delete Selected Data Point', and 'Exit'.

# 8.0 Glossary of Terms

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**Absorber:** The device that absorbs the power from the engine. Converts mechanical horsepower to thermal horsepower.

**Administrator:** The person(s) in charge of creating and editing the PowerPro Data Templates. This person(s) has the highest level of security access to the Commander computer and may or may not be the person that is actually performing the tests (operator).

**BSCF (Brake Specific Fuel Consumption):** Rate of fuel flow per measured horsepower.

**Commander Computer:** The desktop computer that is the “brains” behind the dynamometer. It establishes connections between the chassis dynamometer controller, the vehicle’s ECM, and the optional fuel measurement system.

**DataSpace:** Once a Template contains data, it is referred to and saved as a DataSpace.

**ECM Communicator:** One of the five main windows on the Commander computer main screen (although usually minimized). ECM Communicator establishes a connection to the vehicle’s ECM to allow for bringing in ECM data. From the ECM Communicator window, detailed information about the connection can be viewed.

**Engine Speed Mode:** A method of controlling the dynamometer in which either the operator or an automated Pattern enters an engine speed value (usually in RPM) and the dynamometer loads the engine to that value and maintains it. This mode is generally used for maximum horsepower pulls and can only be used when the dynamometer is reading engine speed (either through the ECM or external speed pickup).

**Fuel Cabinet:** Optional equipment that provides gravimetric fuel measurement data. Allows measurement of burn rate, BSFC, fuel quality, etc.

**Home:** A command button on the user interface window that, when pressed, returns the control mode to valve position and enters a zero as the setpoint.

**Horsepower Mode:** A method of controlling the dynamometer in which a horsepower setpoint is entered and the dynamometer tries to maintain that amount of load, regardless of the engine’s speed or its ability to achieve that load. This is typically used for endurance testing or warm up and may overload the engine if the setpoint is too large.

**Operator:** The person(s) that execute the tests and automated Patterns created by the Administrator. Will be responsible for securing the test engines, loading a DataSpace, and executing the Patterns. Will generally have a lower level of security access to the Commander computer.

**Pattern:** The automated “road” that the vehicle will drive during a test. The Pattern is a sequential program of setpoints that the vehicle will be put through. The Pattern is created using Pattern Runner by the dynamometer system Administrator.

## 8.0 Glossary of Terms

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**Power Mode:** A method of controlling the dynamometer in which either the operator or an automated Pattern enters a power value (usually in horsepower) and the dynamometer loads the engine to that value and maintains it.

**PowerPro-SF Controller:** Receives and processes signals between the Commander computer and the dynamometer.

**PowerPro-SF Interface:** One of the five primary windows on the Commander main screen. The PowerPro-SF Interface provides most of the control functions for the dynamometer. From this window, the dynamometer control mode can be changed and viewed and setpoints can be entered and viewed. This window also provides access to the tuning parameters, some calibrations, and allows the user to activate and deactivate the dynamometer.

**Report Format:** How the data will be displayed in hard copy format.

**Report Generator:** One of the five primary windows on the Commander Main Screen. The Report Generator allows the user to enter work order data and configure the appearance and content of the printed report.

**Setpoint:** User defined data that determines from which point data is collected or retrieved. Could be dependent on speed, etc.

**Soft Stop:** When activated, sends the dynamometer water valve to zero, gradually unloading the dynamometer. Soft Stop does not stop the engine , it only effectively unloads the dynamometer.

**Stator:** The stationary part of a dynamometer within which the rotor turns.

**Template:** Basically a blank test. When a dynamometer test is performed, it is done using one of several Templates.

**Torque:** A measurement of twisting force.

**Torque Mode:** A method of controlling the dynamometer in which either the operator or an automated PowerPro Pattern enters a tractive force value (usually in pounds) and the dynamometer loads the engine to that value and maintains it.

**Tractive Force:** A measure of the horizontal pull force exerted by the vehicle; also referred to as draw bar pull.

**Tuning:** A set of parameters that can be modified to adjust the speed and stability of the dynamometer's load control circuit.

**Valve Mode:** A method of controlling the dynamometer in which either the operator or an automated PowerPro Pattern enters a valve position (usually as % of valve open) and the dynamometer maintains that valve position.