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# Stored Data Viewer



# 4 Stored Data Viewer

## 4.1 Introduction

The WinDyn™ Stored Data Viewer allows both Current and Saved test data to be viewed, printed, and plotted. Current data is stored in the data acquisition system's memory (the Dyno's memory). Saved data is stored on the computer's hard drive.



*It is sometimes helpful to view data while it is still recorded in the test system in order to determine if the data is worth saving to disk. However, in most cases, data is saved with every test.*

Up to ten (10) Channel Groups (pages) may be configured, and each channel group can display up to nine (9) different data channels. The Channel Groups and the Data Channels displayed are configured using the WinDyn **Channel Order** which is part of the WinDyn **Test Group**.

## 4.2 Features

The Stored Data Viewer allows the user to:

- View and graphically plot Current and Saved data on the computer monitor.
- Print Current and Saved data, in numeric format or as a graphical plot.
- Save the data with a user selected file name or with the default data file name as defined in the **Auto Increment Filenames** dialog. The default file name automatically increments numerically each time a data file is saved.
- Easily change which channels are displayed and/or plotted by changing the **Channel Order**. The Save button permanently saves any Channel Order changes to the data file only. The Channel Order defined in the Test Group will be used for the next test.
- Average multiple tests together into a single data file. The averaged data may then be displayed, plotted, and printed as any other test data.
- Column Average a single test over a specific range (for example, 4500 - 5500 rpm). Minimum or Maximum data values for that range can also be viewed. All three can be printed with the test data.
- Perform a limited number of Post Process operations on Data Files (such as filtering measured channels to reduce noise). The Post Process feature creates a new Data File identical to the original Data File with the selected options added.
- Convert a SuperFlow data file (\*.SFD) to a Comma Separated Variable (\*.CSV) data file, which may be easily imported into most "spread sheet" programs (e.g., Excel) for analysis.
- Export a plot to a Metafile, Bitmap, or JPG image; or a Text / Data file.





*Metafile is an advanced feature and rarely used. Metafiles are used to maintain an identical image display regardless of the device the image is displayed on (screen, printer, etc.)*

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- View data as it is being recorded in the dyno (i.e. line by line) using the **Auto data refresh** option.
- Enter custom test notes (i.e., comments) in the **Test Description** that will be saved along with test data in a SFD file.
- Create a customer diskette with the viewer program and selected data files to give to a customer for home viewing.
- Playback a stored data test and review a previously run test on a WinDyn data display.

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## 4.3 Speed Tips

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- Click the right mouse button in either the data window or the plot window to display a “pop up” menu for the most common commands.
- Double-click the left mouse button in the test data window to display the Channel Order dialog (if a data file has not yet been opened, this displays a File Open dialog instead).

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## 4.4 Using the Stored Data Viewer

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### 4.4.1 Main Menu

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The second line of the Stored Data display is the main menu with operational categories. These begin with **File** and end with **Help**. Click on each of these menu choices in turn to see the drop-down menu features. The “dimmed” choices are only available in the proper program context.

The Stored Data menu items and a brief description are as follows:

#### **File**

This menu item contains typical file viewing, saving, closing, and printing functions. It also contains commands to some of the special features and a **Preferences** command to define certain software settings.

#### **View**

This menu item allows you to turn display elements on and off and to switch between the various areas of WinDyn.

#### **Tools**

This menu item provides direct access to other programs which are frequently used with WinDyn. It also allows editing the list of programs which are displayed on this menu.



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**Help**

This menu item provides context-sensitive Help information for all WinDyn programs. It includes several links to interesting topics on SuperFlow's website.



*The **Help>About WinDyn** function includes the option to view and print a detailed Version Report. This report lists all components of WinDyn with their version number and date stamp. When contacting SuperFlow Customer Service, you may be asked for this information, in order to better assist you with your question.*

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**4.4.2 Tool Bar**

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Below the menu items is a Tool Bar. It is highly recommended that the tool bar is used for the most common computer commands, as the Tool Bar provides a number of commands that provide direct access to functions without going through the menus. Position the mouse arrow over an item on the Tool Bar, and a "bubble" appears with a description of the function of this button. The "dimmed" choices are only available in the proper program context.

The Tool Bar items and a brief description are as follows:

**View Current Test**

Displays the test data which is currently stored in the Dyno system's memory.

**View Saved Test**

Displays the test data which is saved on the computer's hard drive or other memory media.

**Save & View Current Test**

Saves the test data which is currently stored in the Dyno system's memory to the computer's hard drive or other memory and then displays it.

**Playback**

Starts a playback of the currently displayed data. This feature is available only when a full version of WinDyn is installed on the computer.

**Print**

Prints the currently displayed data.

**Plot**

Plots the currently displayed data.

**Column Averages**

Displays the Column Average, Minimum, or Maximum data.

**Channel Order**

Displays the **Channel Order** dialog.



**Test Description**

Displays the **Test Description** editor.

**Number Buttons**

Click on the numbers 1 through 10, and the Data Screens will change from the current screen to the number of the screen selected. The keyboard keys 1 through 10 (note: for screen 10, select the 0 key) can also be used to change display screens.

**Current Data**

Displays the WinDyn Real-Time data screen.

**Database**

Displays the Database library if enabled.

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### 4.4.3 Status Bar

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The status bar at the bottom of the display shows critical information about the test data.

1. The number of lines recorded in the data file. In Pro-Filtered data this is the number of lines after the post processing. In non Pro-Filtered test this would be the number of lines recorded in the test.
2. The test execution date (example: Tested on: 4/14/2005 at 13:29). This date information is a permanent record of when the test was started (i.e., when the first data line was recorded) and cannot be changed. The "Tested on" date also appears on the first page of all data printouts.
3. The Configuration file (CFA) that was active in the system at the time of the test.

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### 4.4.4 Preferred Settings

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There are several options that can be set to provide the user with individual preferences.

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#### 4.4.4.1 Display

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By clicking on the menu item titled **View**, a drop-down menu will provide a choice to turn the **Status Bar** and the **Tool Bar** off and on. Click on each item. A check-mark to the left means that item will be displayed automatically. When the check-mark disappears, that item will no longer be shown on the display window.



### 4.4.4.2 Viewing Plot and Data Side-By-Side

To quickly view both the tabular data and the plot side by side, select **View|Tile Vertical** which will arrange the 2 windows on the screen? **“Ctrl+i”** may also be used to display and tile both the tabular and the plot window.

### 4.4.4.3 Stored Viewer Preferences

There are selections available for setting prompts for automatic action. Select **File | Preferences** to see these choices (Figure 4-1). These preferences and a brief description are as follows:

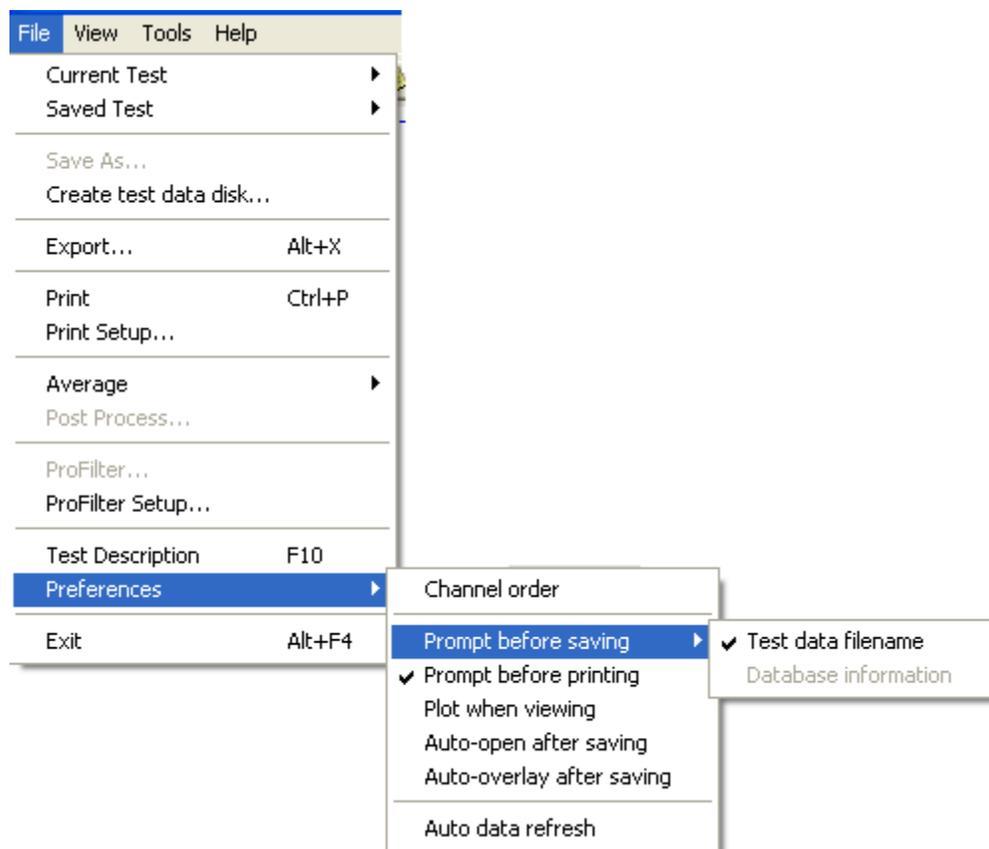


Figure 4-1 Stored Data Viewer Preferences Menu

#### Channel Order

Displays the Channel Order dialog to allow changes (see section 4.5.3).



**Prompt Before Saving*****Test Data Filename***

Prompts for a filename when saving current data using WinDyn functions other than an **Autotest**. When the check mark is not present the system will use the default filename as defined in the **Auto Increment Filename** dialog.

***Database Information***

Prompts for the Database library new record entry dialog. The **Database Manager** must be enabled for this feature to be available.

**Prompt before printing**

Prompts the print setup dialog box allowing for modifying what data will be printed. Otherwise, printing will begin immediately based on the settings last used.

**Plot when viewing**

Allows a plot to be displayed when the data viewer is opened. Otherwise the data screen will be displayed. (A plot can be opened from the data screen)

**Auto-open after saving**

Opens the data viewer with the data that was just saved in an AutoTest, from the operators console, or from the remote handheld controller. This feature has no effect when saving test data from WinDyn.

**Auto-overlay after saving**

Automatically overlays new saved test data on a displayed plot. This feature has no effect when overlaying test data from WinDyn.

**Auto Data Refresh**

Allows viewing of Current Test data on the **Stored Data Viewer** display as it is being recorded in the Test System.

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## 4.5 Viewing Test Data

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### 4.5.1 Viewing Data After Testing

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Once a test is completed, the test data resides in the memory of the test system (Current Test) or is saved to disk (Saved Test). In both cases, the data can be viewed using the **Stored Data Viewer**. The **Analyze** drop-down menu on the main WinDyn menu contains several options to automatically perform sequences of viewing, saving, plotting, or printing operations. Keyboard Function-keys have also been assigned to those sequences.

To view the Current Test, select **Analyze | Current Test | View**. The test results are now displayed in tabular format.





*If no data is stored in the Test System, or if no Test System is connected to the PC running WinDyn, the **Current Test|...** selections are grayed out.*

To view the Saved Test, select **Analyze|Saved Test|View**. A file selection dialog box opens. Select the desired test data file and click OK. The test results are now displayed in tabular format.

## 4.5.2 Viewing Data During Testing

The Auto-Refresh option allows you to view Current Test data on the computer as it is being recorded in the Test System. To turn Auto-refresh on, simply select **File | Preferences | Auto data refresh** from the Stored main menu. To turn it off, re-select the same menu option.



*The Auto Data Refresh works most efficiently when there is NO WinDyn current data display screens active.*

## 4.5.3 Channel Order

The **Channel Order** determines the display order of the data channels for Analysis, Printing and plotting. For example, you might wish to have Speed in Column 1, Torque in Column 2, Power in Column 3, and so on. There can be up to ten pages of column designs with up to nine channels selected on each page.

The Channel Order is specifically assigned to a Test Group. Each Test Group has a Channel Order that becomes the default for data files that are saved while that Test Group is active and becomes imbedded in the data file when it is saved. The Channel Order for a saved data file can be changed while viewing the data.

The Channel Order dialog box (Figure 4-2) is accessed by selecting **File | Preferences | Channel Order** from the Stored Viewer main menu, or by clicking the Channel Order icon  on the toolbar, or by double-clicking anywhere in the data screen. This dialog allows you to select which channels will be displayed *and* plotted when viewing WinDyn data. The **Channel Order** can be changed in a viewed test as desired for a particular application.

The following is a description of the options available in the **Channel Order** editor:

### Page Select

To modify a stored data page, select the desired page using the drop-down list box. There are ten (10) pages available.

### Page Name

Each page can have a unique name. This name will appear on the headings of the WinDyn **STORED DATA** and **PLOT** view screens, and on the data and plot prints.



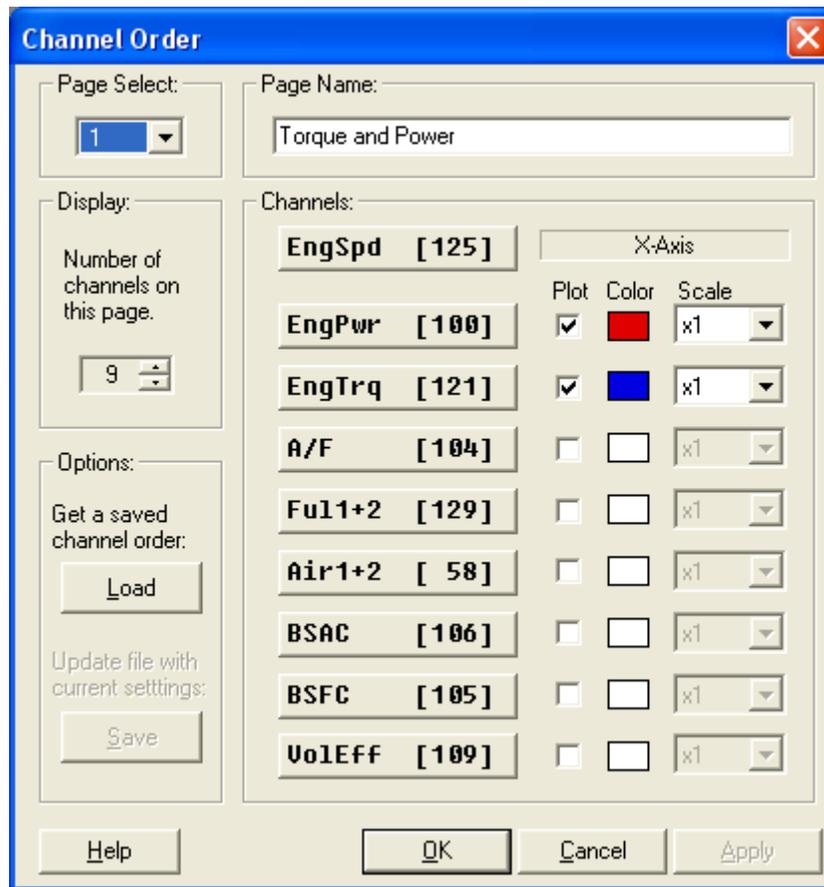


Figure 4-2 Channel Order edit screen

### Display

Selects the number of data channels that will be displayed on the page. Use either the up-down arrows or simply enter in the number.

### Channels

For each channel on the page, select the channel to display by clicking on the desired channel button (Figure 4-3). Use the slide bar to scroll through the various choices, and select the desired channel. The first channel at the top of the list will always be the X-axis (the axis across the bottom) on the graphs.



*A shortcut method to find the desired channel is to enter the first letter of the channel name in the box. The channel list will then scroll directly to that part of the list.*



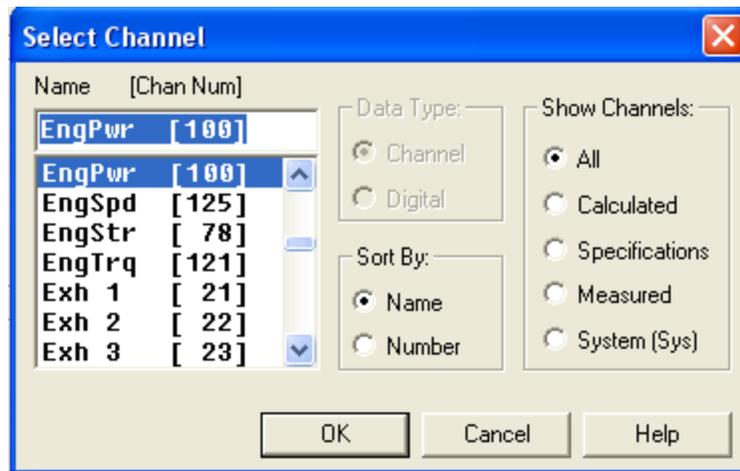


Figure 4-3 Select Channel edit screen

#### Plot

To plot a particular channel, place a check-mark in the associated check-box. The first channel at the top of the list will always be the X-axis. The channels checked will be on either the left or right Y-axis depending upon the settings in the Plot preferences.

#### Color

A wide range of colors can be selected for the plot lines. Click on the color box to display the selection chart.

#### Scale

To plot a channel multiplied by a scale factor, select the desired scale factor from the drop down scale box for that channel. The indicated Y-axis scale equals the actual value times the scale factor Example: if the scale factor for engine speed is 0.01, and the real speed range is 0-10000 rpm, engine speed will be plotted with a Y-axis scale of 0-100.

#### Save

The Save button will permanently save any Channel Order change to the data file currently viewed or to the active Test Group if viewing **current data** (data currently recorded in the remote).

#### Load

The **Load** button allows you to get a saved channel order from a Data File (\*.SFD) or a Test Group (\*.TGP) so that the channel order can be matched. This is so you don't have to enter all the Channel Order information manually. The loaded Channel Order can then be saved in the data file.



#### 4.5.4 Closing the Viewer

To return to the WinDyn Current Data window (if running):

- Leave the Stored Data Viewer open:  
Select **View | Current Data** from the main menu.
- Terminate the Stored Data Viewer:  
Select **File | Exit** from the main menu or click the X in the corner.

### 4.6 Test Description

Use the **Test Description** feature to attach notes to each test you run. These notes can include such things as details on the test device, contact information on the owner, reasons for testing the device, results of the test, etc. The entered information will be saved with the stored "test data" files (\*.SFD). Test comments can be a maximum of 5,280 characters. The Test Description can be printed as part of the report header on the data printout.

To edit the Test Description, select **Analyze | Test Description** from the WinDyn main menu or use the hotkey **F10**. The dialog that appears allows for entering "Test Description" information (Comments) that will be saved with the data in the stored "test data" files (\*.SFD).

In addition to the Edit Menu (accessed by clicking the Right-Mouse-Button over the text edit area), the following keyboard commands are available when editing the Test Description comments:

**Table 4-1: Test Description Hotkeys**

|                        |                                      |
|------------------------|--------------------------------------|
| CTRL+Tab               | Tab over one tab width               |
| CTRL+Arrows            | Move to next word                    |
| SHIFT+Arrows           | Select/Un select text                |
| CTRL+X (SHIFT+Delete)  | Cut selected text to clipboard       |
| CTRL+C (CTRL+Insert)   | Copy selected text to clipboard      |
| CTRL+V (SHIFT+Insert)  | Paste text from clipboard            |
| Delete                 | Delete selected text                 |
| CTRL+Z (ALT+Backspace) | Undo last edit                       |
| Home                   | Move cursor to beginning of line     |
| End                    | Move cursor to end of line           |
| CTRL+Home              | Move cursor to beginning of comments |
| CTRL+End               | Move cursor to end of comments       |



## 4.7 Printing Test Data

WinDyn prints test data in a modern, professional style with headers at the top and bottom of each page. The customer's company name, address, and logo can be printed on *each* page. The first page always has the specific test information (File name, Configuration used, date file was saved). All pages are integrated with as many data lines as will fit on the page. Bold text and various font styles are used to produce a professional style of output.

To print tabular data, select **File | Print** from the Stored Data main menu, or click on the **Print** icon, or press **Ctrl+P** on the keyboard. If the Preferences setting **Prompt before print** is checked, the **Print Setup** dialog will be displayed allowing specific data information to be selected for printing (Figure 4-4). Click the large **Print** button to send the data to the printer. If the **Prompt before print** preference is not checked, printing will begin immediately based on the settings last used.

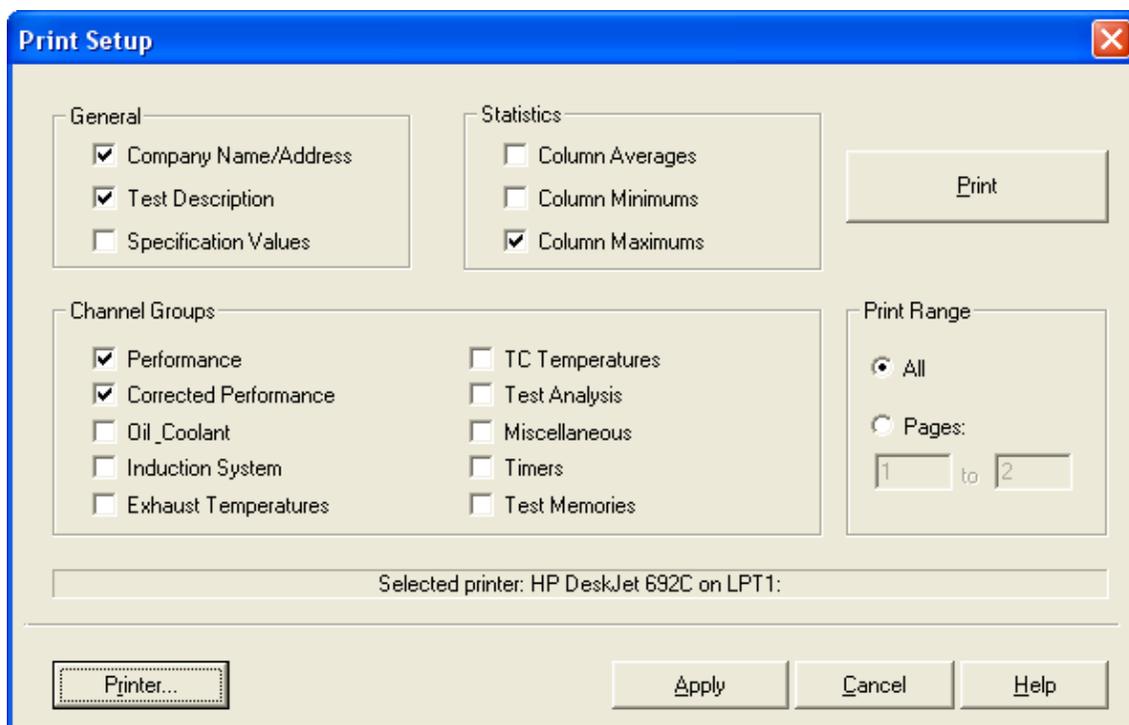


Figure 4-4 Print Setup display dialog

The page setup dialog is displayed by selecting **File | Print Setup** on the main menu. Clicking **Apply** will enable new settings without printing.



### 4.7.1 General

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#### Company Name/Address

If checked the printout will include, at the top of each page, the information entered in **System | Preferences | Test Report Headings** on the WinDyn main menu.

#### Test Description

If checked the printout will include, on the first page, the information entered into the **Test Description** dialog. This information can include such things as details on the test device, contact information about the owner, reasons for testing the device, results of the test, etc. The entered information is saved with the stored "test data" files (\*.SFD). Test comments can be a maximum of 5,280 characters.

#### Specification Values

If checked the printout will include, on the first page, the information entered into the **Specification** channels that are defined in the **Configuration**.

### 4.7.2 Statistics

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If checked the printout will include, on the last page, the values calculated for Average, Minimum, and/or Maximum of each column of data. A range for the values can be set with the **Column Averaging** feature.

### 4.7.3 Channel Groups

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The printout will include any or all of the channel groups selected.

### 4.7.4 Print Range

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Selecting **All** will print all pages for each **Channel Group** selected or a specific page(s) within the Channel Group can be printed.

## 4.8 Plotting Test Data

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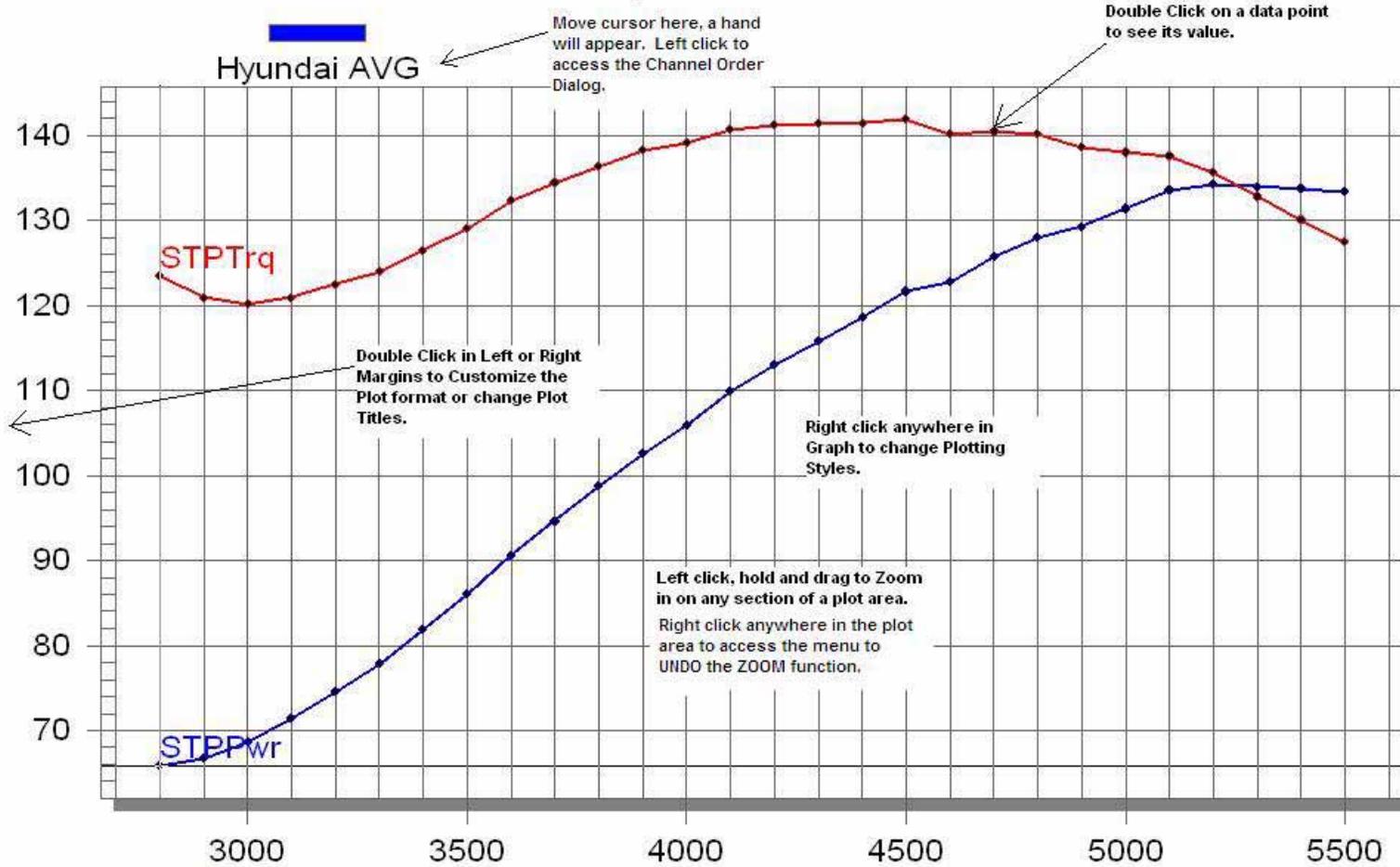
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WinDyn Graphical Plots allow you to easily and quickly view both Current and Saved test data in a graphical format. Up to ten (10) different tests can be overlaid on one plot, and up to ten (10) pages of test data can be configured, each with its own plot setup. A sample plot is shown on the next page.



# STP Corrected Wheel Power vs. RPM

Hyundai AVG,



### 4.8.1 Main Menu

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The second line of the Plot display is the main menu with operational categories. These begin with **Plot** and end with **Help**. Click on each of these menu choices in turn to see the drop-down menu features. The “dimmed” choices are only available in the proper program context.

The Plot menu items and a brief description are as follows:

**Plot**

This menu item contains typical file viewing, saving, closing, and printing functions. It also contains commands to some of the special features and a **Preferences** command to define certain software settings.

**Overlay**

Allows for overlaying up to 10 data files in one window.

**Settings**

Used as a shortcut to many of the more commonly used items located on the Plot Settings dialog.

**View**

This menu item allows you to turn display elements on and off and to switch between the various areas of WinDyn.

**Tools**

This menu item provides direct access to other programs which are frequently used with WinDyn. It also allows editing the list of programs which are displayed on this menu.

**Help**

This menu item provides context-sensitive Help information for all WinDyn programs. It includes several links to interesting topics on SuperFlow's website.

### 4.8.2 Plotting a Test

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To plot the displayed data, simply select **View | Plot** from the **Stored** main menu, or click on the Plot icon or right-click anywhere on the data screen and select Plot from the menu. A plot window appears and the data channel(s) selected in the active Channel Order are automatically plotted. A different page group is selected by pressing the number key 0-9 (0 is group 10). The channels displayed are set by the **Channel Order** in the active **Test Group**.

### 4.8.3 Printing a Plot

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To print the current plot, simply select **Plot | Print**. If the resulting printout is not satisfactory, use the **Plot | Preferences | Settings** and **Plot | Preferences | Customization** dialogs to adjust the plot.



### 4.8.3.1 Monochrome printing options

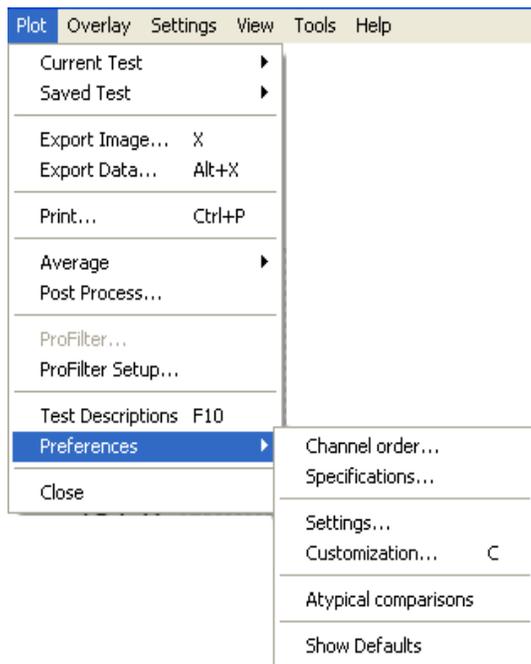
In situations where a color print is not available or desired, a monochrome (black and white) print can be obtained with settings to differentiate the plot lines.

The various options are:

- Select **Settings | Line Style | Default** to put the plot in the dot/dash mode to define the channels or tests.
- Select **Settings | Color Mode | Color is Test**. Then right-click on the plot grid and select **Viewing Style | Monochrome + Symbol**. Each test will then be identified by a unique symbol. Each channel will be identified by the channel name written directly on the plot (the “annotations”). Select **Settings | Line Style | Thin** if the symbols are difficult to see when in medium thickness.

### 4.8.4 Preferences

To access a menu of plotting preferences, select **Plot | Preferences** from the Plot window main menu (Figure 4-5).



Clicking on **Apply** or **OK** will change the display settings but they will revert back to the saved channel order if the plot is closed then reopened. To make the changes permanent, click the **Save** button and the changes will be saved with the data file. This does not apply when viewing current data.

#### Specifications

Allows a display (on the plot) of selected Specification channel values which were in effect during the test.

#### Settings

Allows to configure the general plot display settings to the users specific desires.

#### Customization

Allows for adjusting the appearance of the displayed plot.

Figure 4-5 Plot Preferences Menu



**Channel Order**

To easily change which channels are plotted, select **Plot | Preferences | Channel Order** from the Plot main menu, select the new channels to plot using the channel select and plot check boxes, and then press the **Apply**, **OK**, or **Save** button (see section 4.5.3).



A shortcut to the Channel Order dialog is available by clicking the left mouse button on any of the test names at the top of the plot window (where the mouse cursor turns into a “hand”).

**Atypical Comparisons**

Facilitates comparing test data that was recorded using different configurations and/or channel orders. See section 4.9.2 for details.

**Show Defaults**

A check mark here will reset the plot display to the factory default settings.

## 4.8.5 Plot Settings

From the Plot main menu, select **Plot | Preferences | Settings** to display the Plot Settings dialog (Figure 4-6). Each tabbed page on the Plot Settings dialog allows for configuring a different aspect of the WinDyn plots. The **Settings** menu heading on the Plot main menu is used as a shortcut to many of the more commonly used items located on the Plot Settings dialog.

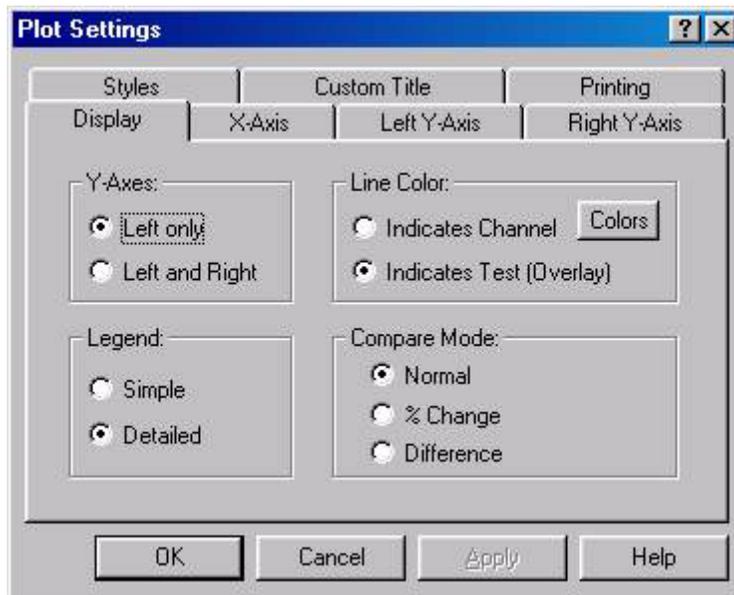


Figure 4-6 Plot Settings

Once these settings are set, they will remain in that mode until they are changed again.





*Double click the left mouse button on the X-Axes or Y-Axes channel name to display the Plot Settings dialog.*

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### 4.8.5.1 Plot Settings - Display

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#### Y-Axes

Displaying the Y-Axes on the Left only is the default setting. To use a second Y Axis, select the Left and Right radio button and press OK. When plotting data using both a Left and Right Y-Axis, channels are assigned to either the Left or Right Y-Axis in the following manner: Think of the channel order dialog plot check boxes as being ordered from the top to the bottom. The first half of the channels checked for this page will be plotted with respect to the Left Y-Axis, and the remaining half checked will be plotted with respect to the Right Y-Axis. If an odd number of channels are checked, the greater number will always appear on the Left Y-Axis.

Using a Left and Right Axis has two primary purposes:

- Allows you to graphically compare channels which have very different values (differ by some order of magnitude).
- Using the “Comparison plot style” option, you may plot data against the Left Y-Axis using one particular plot style (such as Best Curve Fit), and then plot the same data against the Right Y-Axis using a different plot style (such as Cubic Spline).

To modify the comparison plot styles, first ensure the compared channel(s) is selected in the Channel Order. If only one channel is to be compared against itself, select it twice. Enable Dual Y-Axes on the Plot Settings menu. Then select Plot|Preferences|Customization and select the Plot tab. The Plot Style box is for the Left Y-Axis, and the Comparison Plot Style box is for the Right Y-Axis.

#### Legend

Configures the appearance of the channel description legends, which display at the top of the plot window. Detailed (the default): Implies that every channel displayed on the plot will have a complete legend entry to include the test name, channel name, and channel units (example: DEMO0001: EngPwr - hp). Also displayed is the line color (or style) indicator applicable to each channel plotted.



*When plotting several channels, the legend can get crowded and hard to read. Use the “Simple” option to display only the test name and line color (or style) indicator.*



**Line Color**

Configures how the plot uses line color (and line style) to distinguish between different channels (default) and different tests (overlays). Indicates Channel: Line *color* is the same for each channel (e.g., all EngTrq's are red), and line *style* (e.g., solid, dashed, dot) indicates the test (overlay). Indicates Test (Overlay): Line *style* is the same for each channel (e.g. all EngTrq's are dashed), and line *color* (e.g., red, blue) indicates the test (overlay). Function key F12 is a hotkey to switch modes.

**Compare Mode**

Allows for graphically comparing test runs normally, by “%-Change” or by “Difference”. Normal is the default setting. See section 4.9.3 and 4.9.4 for details on this feature.

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**4.8.5.2 Plot Settings - X-Axis**

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**Scaling and Range**

Together, these determine how the plot is scaled for the X-axis.

***Automatic (default)***

Plot is automatically scaled, fitting the plot window to the channel with the greatest range for this axis. The manual range values (Minimum and Maximum) are disabled.

***Manual***

Allows you to enter a specific Minimum and Maximum range for this axis.

**Display*****Bottom only (default)***

A single X-Axis is displayed at the bottom of the plot.

***Top and Bottom***

In addition to the bottom X-Axis, a duplicate X-Axis is displayed at the top of the plot.

**Draw Order**

This option controls in what order the plot lines will be drawn from data-point to data-point (i.e., “connect the dots”).

***Unsorted or as recorded (default)***

Line is drawn from point to point in the order the data was recorded.

***Sorted***

Line is drawn from point to point in order from the minimum X-Axis data value to the maximum X-Axis data value.



*For large data sets (>= 200 data lines), the plotting time increases significantly when the data is sorted.*

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### 4.8.5.3 Plot Settings - Y-Axes (left and right)

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#### Scaling and Range

Together, these determine how the plot is scaled for this axis.

##### **Automatic (default)**

Plot is automatically scaled, fitting the plot window to the channel with the greatest range for this axis. The manual range values (Minimum and Maximum) are disabled.

##### **Manual**

Allows you to enter a specific Minimum and Maximum range for this axis.

#### Mode

Controls the scaling mode used for the Y-Axis. Default is Linear. Logarithmic may be useful for data sets with a very large Y-Axis range.

#### Major/Minor Grid

Controls the grid markings for the Y-Axis. Tick marks (default setting) displays small ticks along the edge of the Y-Axis. Grid lines displays lines across the entire plot.




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*Grid Lines must be enabled for this option to take effect. To enable Grid Lines, click the right-mouse-button over the plot area to access the pop up menu and select **Grid Lines|Both X and Y Axes**.*

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### 4.8.5.4 Plot Settings – Styles

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The following settings affect printing more than it does the screen images.

#### Line Style

Allows you to select the line thickness for the test plots. Once the desired line thickness is set, WinDyn will remember it until it is changed.

##### **Default**

A very thin line, the style of which – solid, dot, dash, etc. – indicating either test or channel.

##### **Thin, Medium, or Thick**

Forces a solid line (regardless of test or channel) of the indicated thickness. The default line-style (new installs) is **Medium**.

#### Grid Style

Determines how the plot grid appears on all plots. This is useful if the grid does not appear properly on the plot printouts. Both Line Styles and Shading can be adjusted.



### 4.8.5.5 Plot Settings - Custom Title

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The information entered here will be displayed at the bottom of each WinDyn plot. Enter a Title or any other information that you desire (for example, your company name). Text entered here will remain in effect for all plots until changed.

### 4.8.5.6 Plot Settings - Printing

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Select the desired plot print orientation. Click the Print button to send the currently displayed plot to the printer. The selected orientation will be saved until it is changed. Landscape is default.

## 4.8.6 Plot Settings Menu

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All the commands located under the **Plot | Settings** menu heading can also be accessed through the Plot Settings dialog, it's just faster to access them from the menu (Figure 4-7). Also note on the menu that there are two shortcut key options (F2, F12). These can be used to quickly cycle through the options available for the related feature (i.e., Compare Mode, Color Mode).

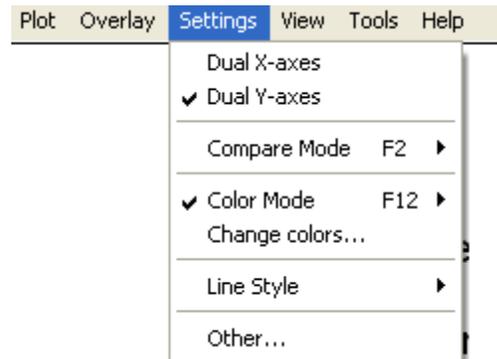


Figure 4-7 Plot Settings Menu

## 4.8.7 Plot Customization

---

The Customization dialog (Figure 4-8) allows the user to adjust the appearance of the plot. The Customization dialog can be accessed in several ways:

- Select **Plot | Preferences | Customization**
- Press the “**C**” key
- Press the Space bar
- Double click the left mouse button outside of the actual plot area



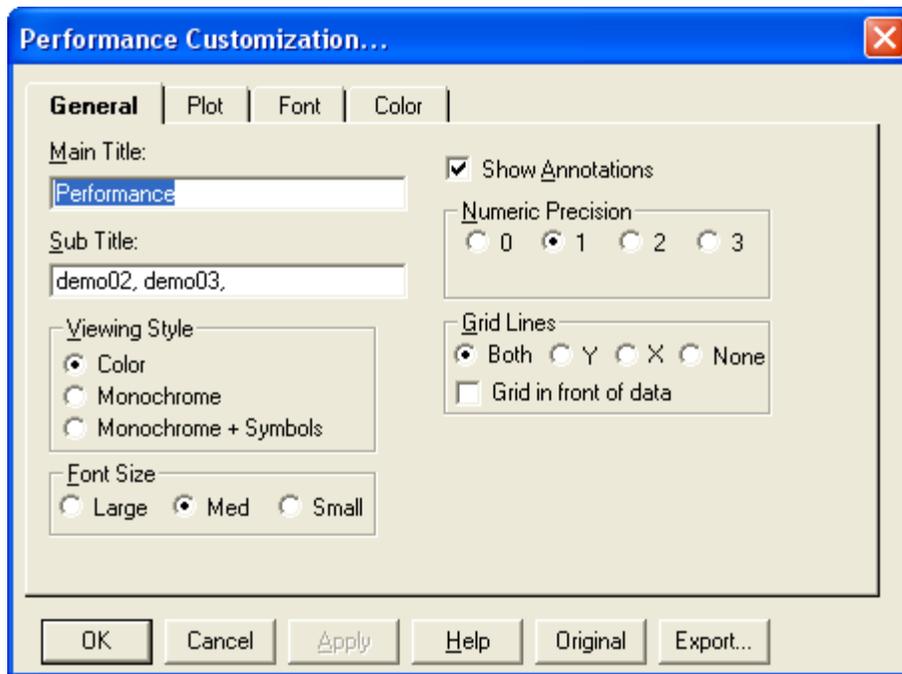


Figure 4-8 Plot Customization Dialog

When the customization dialog is displayed, the parameters it shows reflect the current state of the plot (Figure 4-8). By making adjustments to the customization dialog and then pressing OK, the user updates the Custom set of parameters controlling the object. The Apply button is similar to the OK button but does not close the customization dialog. It allows for continuous changes to be made and viewer without closing and reopening the dialog box.

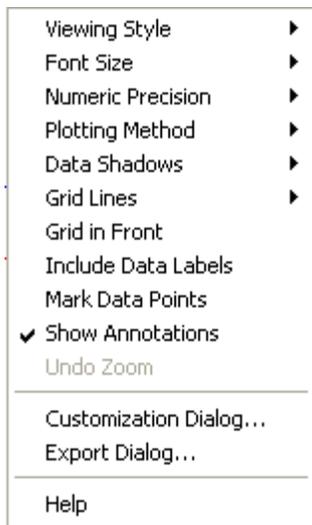


Figure 4-9 Customization Pop-Up menu

A pop-up Customization menu (Figure 4-9) can be accessed by right-clicking anywhere on the plot area. Some of the same functions that are on the primary menu can be selected from the pop-up menu. A few special features are available such as:

- **Include Data Labels** - tags each data point on the plot with the value
- **Undo Zoom** - restores a zoom plot back to the default setting.

Shortcuts to the primary Customization dialog and the Export Image dialog are also provided.



### 4.8.7.1 Original and Custom Parameters

---

The Plot window stores two sets of parameters. The Original set is programmed by SuperFlow and cannot be modified by the user. The Custom set can be adjusted through the Customization dialog. Clicking the Original button will reset the plot to the default factory settings. To toggle between Original and Custom sets of parameters, close the Customization dialog box and press the "T" key.



*The Customization dialog can not be used to toggle between the Original and Custom set of parameters. This is because pressing the OK button creates a new Custom set of parameters.*

---

### 4.8.7.2 Plot Customization - General

---

#### **Main/Sub Title**

These two edit-boxes allow adding, editing, and deletion of main and sub titles that are displayed at the top of the plot window. By default, the main title will be generated by the Test Group Channel Order page name while the subtitle will be generated by the test filename.

#### **Viewing Style (default is color)**

The graph supports three viewing styles: Color, Monochrome, and Monochrome with Symbols. This allows you to quickly adjust the image to best suit printing on a monochrome printer. If fewer than four subsets are to be included in a graph, then the Monochrome setting will probably be the best choice. If four or more subsets are to be included in the graph, then Monochrome with Symbols will help distinguish the different subsets.

#### **Font Size (default is medium)**

The graph supports three font sizes: Large, Medium, and Small. Depending on the size of the graph, the user can select the font size that is most readable. When printing the graph, a font size of Medium or Small is suggested. In some cases, the graph may automatically reduce the size of the font in order to produce a higher quality image.

#### **Show Annotations (default is checked)**

If the graph contains annotations, this check box allows you to remove/add the annotations from/to the image.

#### **Numeric Precision (default is 1)**

When placing data labels onto the graph, or when exporting the graph using the Export Dialog, the number of decimal positions can be between 0 and 3.

#### **Grid Lines (default is both)**

The graph can contain vertical grid lines, horizontal grid lines, both vertical and horizontal grid lines, or no grid lines.



**Grid in front of data (default is unchecked)**

By checking this option, the graph's grid is placed in front of the data graphics. Otherwise, the data graphics are drawn on top of the graph's grid.

---

**4.8.7.3 Plot Customization - Plot**

---

The following Plot Styles are available: Area, Bar, Lines, Points, Points plus Best Fit Curve, Points plus Best-Fit-Line, Points plus Line, Points plus Spline, Ribbon, Spline, and Step. Many, but not all, of these plotting styles can be set for a secondary comparison plotting style. The default setting is Line.

**3D**

Depending on the Plot Style, this option draws shadows behind bars, points, and the area of an area graph. The shadow is always black. The default setting is off.

**Mark Data Points**

When this command is checked, the graph defaults to include markers for each individual data point. The default setting is checked.

---

**4.8.7.4 Plot Customization - Font**

---

The graph only supports True Type fonts (because they're scalable). The user can select fonts for the Main Title, Sub Title, and Subsets (including X- and Y-axis labels and points). The user can also select bold, italic, and underlined fonts. The default setting is Ariel. The main title is bold and the subtitle is italic.

---

**4.8.7.5 Plot Customization - Color**

---

The graph supports two sets of color parameters, a Monochrome set and a Color set. Depending on the Viewing Style, the Colors Dialog customizes the appropriate set.

To adjust colors:

- Select the desired graph attribute in the Graph Attributes section. The corresponding color for that attribute will be highlighted in the color selection grid.
- To change the color, either use the mouse to click an alternate color, or use the keyboard arrow keys to move to adjacent colors.
- Finally, press the OK button to update the colors of the graph.

**Desk Foreground (default is black)**

This is the color that is used when placing text onto the Desk Foreground. This includes the main title, sub title, subset labels, grid numbers, and axis labels.



**Desk Background (default is white)**

This is the color that surrounds the bounding rectangle of the graph's grid.

**Shadow Color (default is dark gray)**

The rectangle that makes up the graph's grid is bounded at the bottom/right edges with shadows. To remove the shadows, choose the same color as the Desk Background.

**Graph Foreground (default is dark gray)**

This is the color used for the bounding rectangle of the grid, and for the grid-lines.

**Graph Background (default is white)**

This is the color used as the background color of the graph's grid.

---

## 4.8.8 Zooming in on Plots

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To zoom in on a specific area of the plot, hold down the Left Mouse button and drag the mouse. Position the rubber-band box (which appears when dragging) over the area of interest and let up on the mouse. The plot will zoom in to the area you selected with the box. Once you have zoomed in, you may toggle the zoom in and out using the **View | Zoom** command (or press ALT+Z). If a plot is currently in a zoom view, the word "(Zoomed)" will appear in the title bar at the very top of the plot window.



*Each of the available plot pages maintains its own zoom view as they are switched and until the Stored Data Viewer is closed. If the Plot is closed and reopened (without closing Stored) the zoom view will remain. If viewing a current data plot in zoom and a modified channel order is saved to the Test Group, subsequent plots when opened with that Test Group active will have that zoom.*

---

---

## 4.8.9 Using the Plot Data Cursor

---

The plot window has a single data cursor which you can use to identify the test data file, channel, and value of any data point displayed on the plot. Select **View | Cursor** from the Plot main menu to display the cursor. To mark the actual data points, display the plot pop-up menu by clicking the right-mouse button over the plot area, and then selecting "**mark data points**". Notice that the mouse pointer changes to a hand when hovering over a data point.

Now activate the data cursor by clicking the left-mouse-button once on a data point; this positions the data cursor cross hairs on that point. There are two cursor position indicators. The upper left hand corner shows the data point's (x, y) value (that is, both horizontal & vertical plot values); the upper right hand corner identifies the test data file and channel. The keyboard left-right arrow keys move the cursor from point to point; the up-down arrow keys move the cursor from channel to channel. Also, you may double-click the left-mouse-button on any point in the plot area to see the value for that point displayed next to the point.



## 4.8.10 Displaying Specification Values

This feature allows to display (on the plot) the Specification channel values which were in effect during the test, such as the Engine Bore and Stroke. The dialog box (Figure 4-10), accessed from the Plot main menu via **Plot | Preferences | Specifications**, allows you to select which specification channels are displayed on each of the available plot pages. You may select different Specification channels to display on each page.

**Page Select:**

Drop-down list box used to switch pages.

**Page Name:**

Title of the data page (example: "Torque and Power"). Note that you cannot edit the Page Name using this dialog box.

**Display:**

Selects the number of Specification channels to be displayed on the currently selected page. Select the channels to display by clicking on the desired channel button to the left of the Display box.

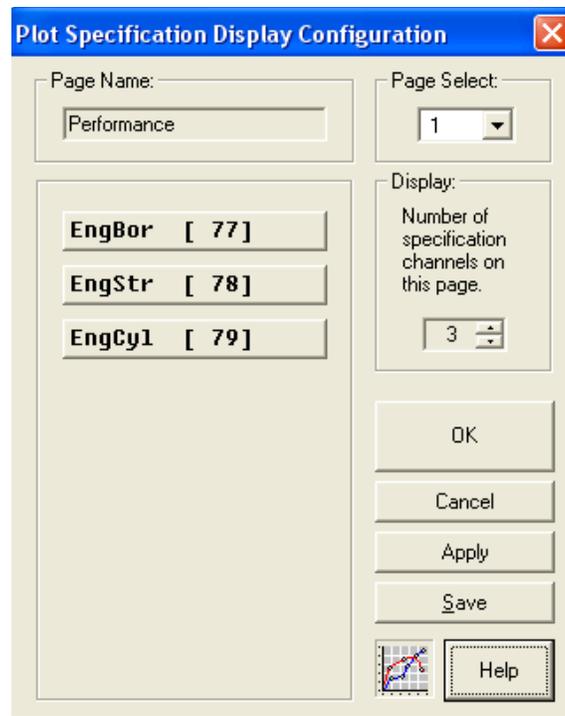


Figure 4-10 Plot Specification Display



**Button Options:**

The Save button permanently saves any changes to the data file you are currently viewing (or to the currently active Test Group if you are viewing the data currently recorded in the test system). Changes made using either the OK or Apply buttons are temporary, and will be lost the next time the test is viewed.

---

**4.8.11 View Test Notes**

---

This viewer (Figure 4-11) allows viewing and changing the test description for each test overlaid in the plot window. To display the viewer, select **Plot | Test Descriptions** from the plot window main menu or press **F10**. An example is shown in the following image.

In the upper-pane, select the desired test to view its associated test description notes. The lower-pane displays the notes; which can be edited if desired. When a change is made to the notes, the **Save** button will become enabled; click **Save** to keep any changes.

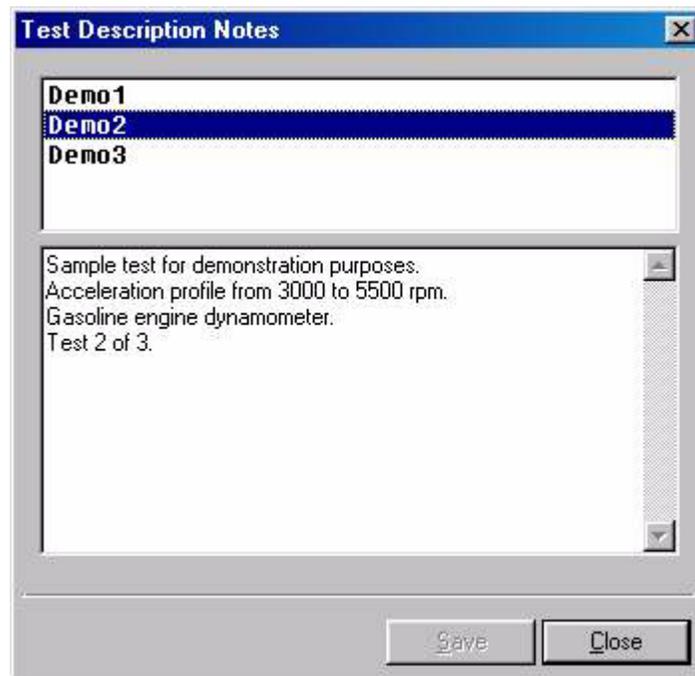


Figure 4-11 Plot Test Description Notes

---

**4.8.12 View Channel Maximums**

---

Test data plots support the option to display the maximum value of each channel graphed. The max value is written directly on the plot, next to the channel's annotation name (example: STPPwr [Max = 687.3]). To enable this new feature, click **View | Maximums** on the plot window main menu. In addition, the plot feature "**Show Annotations**" (available on the popup menu) must also



be enabled. Note that only one maximum per channel graphed is displayed; in the case of multiple overlays, the maximum value displayed is from the test with the highest value of all tests plotted. Therefore, you can quickly determine the highest channel value from a group of tests by simply overlaying the group. Also note that the magnitude of each channel is the determining factor with regard to calculating the maximum. For example, -11.1 in.hg. will always be considered larger than -9.1 in.hg. The shortcut key "M" can be used to quickly toggle this feature on/off.

---

### 4.8.13 Mouse and Keyboard Controls

---

Depending on the program context, some of the following user interface features may or may not be accessible.

#### Mouse commands

- Right-Button Single-Clicking invokes a pop up menu.
- Double-Clicking a data point shows the value of the data point. If the cursor view is on a single click will work.
- Click the left mouse button on any of the test names at the top of the plot window (when the mouse cursor turns into a "hand") to display the Channel Order dialog.
- Click the left mouse button on any of the X-Axes or Y-Axes channel name to display the Plot Settings dialog.
- Double click the left mouse button in the plot window outside of the actual plot area to display the Plot Customization dialog.
- Double click the left mouse button in the plot window inside the actual plot area to display the x,y values for that point in the plot.
- Click the left mouse button on the plot file name list (below the main plot title) to display the Overlay test dialog.

#### Keyboard commands (not all are shown)

- SPACEBAR Shows the customization dialog
- F-10 shows the Test Description notes
- F-12 toggles the color mode between "color is test" and "color is channel"
- D shows the Text/Data export dialog
- M toggles the channel maximum displayed values
- P shows the print dialog
- Q shows the pop up menu
- S toggles between monochrome and color styles
- T toggles between custom and original parameters
- X shows the export dialog
- Y toggles between "Left Only" and "Left and Right" Y axes
- Z undo Zoom
- Alt+Z Toggles between Zoom and Un Zoom states
- ARROWS Moves cursor on the graph

---

## 4.9 Comparing Test Data

---

WinDyn provides several methods for comparing test data on a plot. Data can be compared directly on a overlay or by difference (either direct or by percentage). Data can also be exported and compared numerically.



### 4.9.1 Overlaying Tests

---

To overlay tests for graphical comparisons, select **Overlay | Open** on the Plot main menu. In the displayed list, highlight the desired data file(s) and press OK. Up to nine (9) overlays are allowed (for a total of ten (10) tests plotted at one time). Note that more than one data file can be selected at a time by holding the CTRL key and selecting the tests with the left mouse button.

To temporarily remove a test from the plot, select **Overlay | <test name>** so that its check mark is removed. Click the same command again to re-plot the test. To toggle ALL the overlay tests on or off, select **Overlay | Toggle All**.

A list of recently opened overlaid files is maintained. To clear the overlay menu list, select **Overlay | Clear All**.

### 4.9.2 Atypical Comparisons

---

This advanced feature facilitates comparing test data that was recorded using different configurations and/or channel orders. Click **Plot | Preferences | Atypical comparisons** on the plot window main menu to enable it. A checkmark next to the menu item indicates that it is enabled. When **Atypical comparisons** is enabled, the channel order from each test determines which channels are actually plotted. In contrast, when not enabled, the channel order from the reference (main) test determines the channels plotted for all tests. This feature could be used, for example, to effectively compare engine dyno data with that from a chassis dyno.

This is useful if comparing SF901 data files to new SF902 or SuperFlow chassis dyno files.

### 4.9.3 Plot Percent Change

---



*One restriction when using “% change” or “Difference” comparison modes is WinDyn compares tests on a direct data-line by data-line basis using the channel on the X-Axis as the reference. WinDyn does not compensate for tests that start at different reference values, or tests that have different data record rates. Therefore, to effectively use these comparison modes, the test profiles must be structured so that each run starts at the same point and must use the same data record rate. Tests data acquired using ProFilter will always compare correctly.*

---

The standard method of comparing tests (normal overlay) is by displaying the actual values recorded during the test. In this mode the plot window title bar reads “**WinDyn Data Plot – Normal**”. This indicates that the display is in the “Normal” comparison mode.

Select **Settings | Compare Mode | % Change** or press **F2** to switch modes. The first run is now plotted as a straight line at 0.0; this is the reference test. The second run is plotted in percent-change from the reference. Now the left y-axis units are in percent (+/-) and the plot window title bar now reads “**WinDyn Data Plot –%Change**”.



This mode can easily gauge the magnitude and direction of deviation between successive runs. If the two runs had given identical data, there would be two flat lines on top of each other at 0.0%.

#### 4.9.4 Plot Difference

The “Difference” comparison mode is very similar to the “%-Change” mode. The only difference is that the results are given as a straight mathematical subtraction instead of as percent-change. By selecting **Settings | Compare mode | Difference** or by pressing the **F2** key again, the plot will toggle into “Difference” comparison mode.

Now the y-axis units are in the measured units for the displayed channel and the plot window title bar now reads “**WinDyn Data Plot – Difference**”. The first run is plotted as a straight line at 0.0; this is the reference test. The second run is plotted as a difference in value from the reference.



*A helpful feature related to these comparison modes should be noted. The plot cursor can be used to view the exact difference value for any data point, regardless of the active comparison mode.*

#### 4.9.5 Numerically Comparing Tests

WinDyn has the ability to numerically compare data from different tests in side-by-side columns. This feature is based on the plot’s ability to export numbers for each of the test data points plotted. So, for instance, to numerically compare Torque between three runs, each of the torque curves must be plotted as an overlay.

Once the desired curves are plotted, select “**Plot | Export Data...**” from the plot main menu command. A “Save As” dialog will appear prompting for a file name (the export results will be saved to a text file in the current test data directory). A default name is provided or enter a desired filename and click **Save**.

If the display is in “%-Change” or “Difference” mode when the data is exported, the numbers in the text file will be the “%-Change” or “Difference” numbers. The reference test channel will be zero, as expected. Had the previous comparison data been exported when the plot was in “Normal” comparison mode, the data columns would simply be the actual values.

Next, the “Export” dialog as shown in Figure 4-12 will appear. This dialog allows for configuring how the exported data will be formatted. Note that all the defaults in this dialog are as shown. The “Export Style” selections allow you to export the data in a wide variety of ways. For best results: get a table of data, then set each row to be a data point and each column to be a curve (subset). Click “Table” and “Points/Subsets.” Finally, click **Export**.



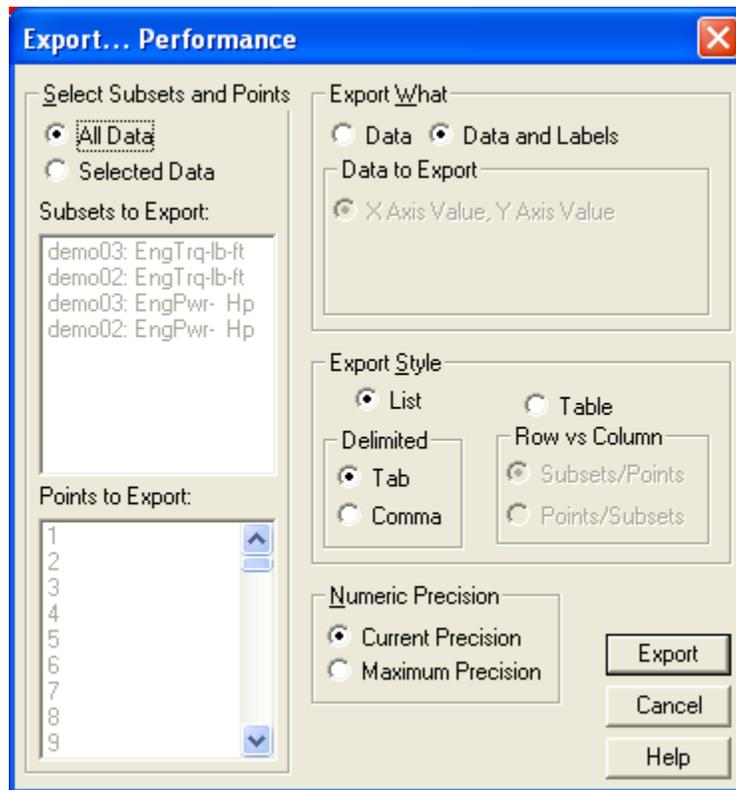


Figure 4-12 Export Data dialog

The data now appears for comparison (Figure 4-13 exported in % Difference mode). Note that the test description notes for each run are included with the export data. If desired, the data columns can easily be imported into Microsoft Excel for further processing (use 'Delimited' import mode).

In addition to a table of columns, there are many other ways to format the exported data for comparison. Experiment with the settings in the "Export" dialog to see the results.

#### Data to Export

All information from the plot can be exported or only that data which is selected in the two list boxes (Subsets to Export, & Points to Export.) If you choose to select the information to export, a list box left empty of selections will cause all the information to be exported.

#### What to Export

The data can be exported with or without subset and point labels. Depending on the object, several possible selections of data to export are offered.

#### Export Format

The information can be exported in two formats:

- Table Format - which exports the information in a grid fashion in either a Subset by Point or Point by Subset style.



- List Format - which exports the information one record per line. The data fields can either be separated by tabs or commas.

#### Export Precision

The numeric precision of the data can either be the current precision state of the object, or 7 decimal positions (the maximum precision stored by the object).

```

Demo1.txt - Notepad
File Edit Format View Help
|      XConsole Demo 3: STPPwr- Chp      XConsole Demo 1: STPPwr- Chp
1      4100.0, 0.0      4100.0, 0.7
2      4200.0, 0.0      4200.0, 0.3
3      4300.0, 0.0      4300.0, -0.8
4      4400.0, 0.0      4400.0, -0.8
5      4500.0, 0.0      4500.0, -1.2
6      4600.0, 0.0      4600.0, -0.9
7      4700.0, 0.0      4700.0, -1.5
8      4800.0, 0.0      4800.0, -1.4
9      4900.0, 0.0      4900.0, -1.1
10     5000.0, 0.0      5000.0, -1.0
11     5100.0, 0.0      5100.0, -0.7
12     5200.0, 0.0      5200.0, -0.2
13     5300.0, 0.0      5300.0, -0.7
14     5400.0, 0.0      5400.0, -1.6
15     5500.0, 0.0      5500.0, -0.0
16     5600.0, 0.0      5600.0, 0.4
17     5700.0, 0.0      5700.0, 0.7
18     5800.0, 0.0      5800.0, 0.8
19     5900.0, 0.0      5900.0, 0.6
20     6000.0, 0.0      6000.0, 0.2
21     6100.0, 0.0      6100.0, 0.1
22     6200.0, 0.0      6200.0, 0.1
23     6300.0, 0.0      6300.0, -0.0
24     6400.0, 0.0      6400.0, -0.1
25     6500.0, 0.0      6500.0, -0.5
26     6600.0, 0.0      6600.0, -0.0
27     6700.0, 0.0      6700.0, 0.4
28     6800.0, 0.0      6800.0, 0.5
29     6900.0, 0.0      6900.0, 0.4
30     7000.0, 0.0      7000.0, 0.1

XConsole Demo 3
*** PROFILTER
*** PROCESSED DATA
*** Created on: 12/03/02
*** Created from: XConsole Demo 3

XConsole Demo 3, Data at 100/second, NASCAR V-8

XConsole Demo 1
*** PROFILTER
*** PROCESSED DATA
*** Created on: 12/03/02
*** Created from: XConsole Demo 1

XConsole Demo 1, Data at 100/second, NASCAR V-8

```

Figure 4-13 Export Data display



## 4.10 Averaging Test Data

Data can be averaged either by columns in one test or multiple tests can be averaged together. Averaging tests is the best way to get the most accurate and repeatable data.

### 4.10.1 Averaging Test Data by Columns

Select **File | Average | Columns** from the Store Data Viewer main menu to display the Column Data Average window. This window shows the column Averages, Minimums, or Maximums for a particular data range. The information shown is for the currently displayed page of test data; switch to any of the available test data pages to view the Column Data information for that particular page.

In the Column Data Average window, select **Display | Averages**, **Display | Minimums**, or **Display | Maximums** to display the desired information. Printing the column data on the data report can be enabled from the Print Setup dialog box.

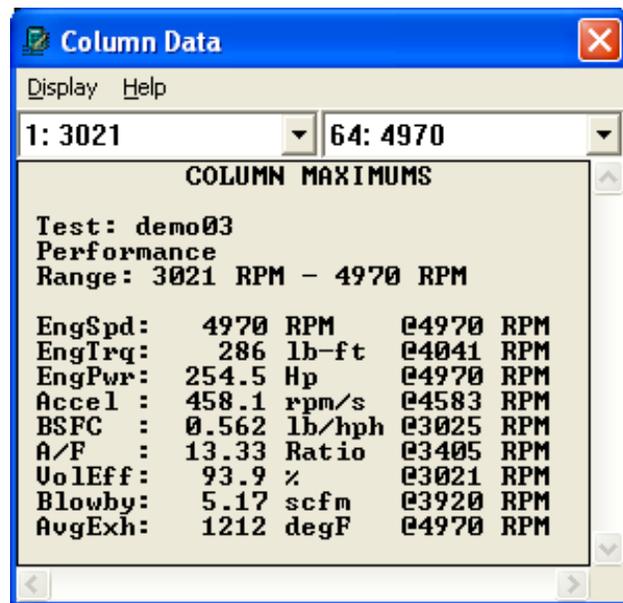


Figure 4-14 Column Data Information



The information on the Column Data screen can be copied and pasted into the Test Description notes or other text document by using the mouse to select, copy, and paste.

#### 4.10.1.1 Data Range

The data range from which the calculations are derived is set in the two boxes at the top of the Column Data window. The left box is the lower start range and the right box is the upper end range. Column 1 (the left-most) of the data sheet is always the reference data and is shown in the boxes. The pull-down arrows allow for selecting the start and end range values. The number to the left of the data reference is the line number.



---

### 4.10.1.2 Statistics Maintain Range mode

---

The Column-Averages (statistics) window has a menu option called “Maintain Range.” This mode can be toggled on/off via the menu command **Display | Maintain range**. A check mark means the option is enabled.

The “Maintain Range” mode controls whether or not this window tries to keep the same averaging range when viewing successive files with Stored. For instance, assume you have two acceleration tests each from 3000 – 5500 rpm. Open the first test in Stored, then average the data columns from 4000-4500 rpm. Then open the second data file. If “Maintain Range” is enabled, when you open the second data file the average range will still be 4000-4500 rpm. If “Maintain Range” is disabled, the average range will revert back to the full-range default (3000-5500 rpm, in this case) when you open the second data file.

Once “Maintain Range” is on or off, WinDyn will remember the setting until changed.

---

### 4.10.2 Averaging Data from Multiple Tests

---

The data from multiple tests can be mathematically averaged into a single data file. The averaged data may then be displayed, plotted, and printed as any other data file.

#### Test Averaging - File selection

To average test data, select **File | Average | Tests** from the main menu. Highlight the desired files and press OK. Up to ten (10) files may be averaged together. More than one file may be highlighted at a time by dragging the mouse with the left button down (or holding down the CTRL Key and selecting the file names with the left mouse button or the space bar).



*It is important to average only those tests with a common X-axis range, (i.e. Number of data points). Averaging files of varying lengths will result in averaged files with erroneous data.*

---

#### Test Averaging - Reference channel

When averaging multiple data files, a reference channel is required. The reference channel allows WinDyn to automatically compensate for tests that start and end at different engine speed points. For example, if two tests are averaged, the first starting at 4000 RPM and the second starting at 4100 RPM, WinDyn will automatically compensate for this difference during averaging.

When the test data being averaged has even-increment engine speed points (such as ProFilter data), then the reference channel should be the Engine Speed (RPM) channel. However, when the test data being averaged does not have even-increment engine speed points, then the reference channel should be the Line Number (LineNo) system channel.

Once you select a reference channel, WinDyn will remember it until it is changed.



**Test Averaging - File Saving**

Select a valid reference channel and click OK, the data will be quickly averaged. A box appears prompting a file name for the averaged data. A default name is provided or enter a different name. Click OK to save the averaged data to disk.

**Deleting the Source Files**

Next, a dialog box appears giving the option to delete the original data files used to create the resulting averaged data file. The files which will be deleted are listed. Click on No if you DO NOT wish to delete any files. Once the original files are deleted they cannot be recovered. This dialog box can be set to NEVER display (and no files will be deleted) by unchecking the box labeled "Always display this dialog box", or by selecting **File | Average | Prompt to delete files** from the main menu so that it is unchecked.

If you know you will never use the original data files, and you wish to permanently remove them from your computer disk, click on Yes (Delete) and the listed data files will be deleted.

The averaging reference channel never gets averaged. However, all other channels do, so this can affect the way the averaged data will appear if an "averaged" channel is used for the X-axis and the two plots that were averaged did not contain an equal number of data points.

WinDyn uses the averaging reference channel to properly "align" the data files before averaging. This is what allows you to properly average tests referenced to, say, RPM or MPH. For example:

| Test1 | Test2 |
|-------|-------|
| 3300  | 3500  |
| 3400  | 3600  |
| 3500  | 3700  |

WinDyn will "shift" the data in Test2 down, then average across all data points. The lines that don't share a common range are thrown out. Note, for a channel to be used as the averaging reference channel, the values MUST evenly increment throughout the entire test (100 rpm increments, for example). That's why the Line Number channel always works, since the even increment value is always 1.

However, when Line Number is the reference channel, the data is already "aligned" from WinDyn's point of view (even though this may not be the case in reality). Here's an example: two back to back tests performed on a chassis dyno where in the first test the operator accelerates and records data from 40 mph to 90 mph. The second test does the same, only from 45 mph to 92 mph. Although each power curve appears very similar and the number of recorded data points may be the same, the reference channel Line Number will not make an accurate "alignment" of the data for averaging.

The offset in the above example will be minute, but it will still be there. Thus, it is very important to note that when averaging multiple tests, the test data aligns accurately. In the above example, WinDyn will skip the "shift" part of the averaging function and just start averaging across the data points (line 1 vs. line 1, line 2 vs. line 2, etc.). Therefore, the data collected at 40 mph will be averaged with the data collected in the second test at 45 mph and so on.

SuperFlow test file averaging has always worked in this fashion, even prior to WinDyn. Thus, it is very important to keep test data aligned well for the file averaging feature to give the most accurate



results. Use of the ProFilter feature will greatly enhance the ability to line up test data on an even increment channel, such as Engine Speed (RPM).

---

### 4.10.3 Adding to the database

---

If the Database Manager is enabled, a dialog box appears asking if this file is to be added to the WinDyn database. Click Yes to add to the database.

---

### 4.10.4 Test Description

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Information on the Averaged Data File (including the files from which the averaged file was created) is automatically added to the **Test Description** Notes of the averaged file. To view the Test Description Notes, select **File|Test Description** from the main menu (or simply press F10). To edit the notes, simply type in the desired text and click OK to save them.

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## 4.11 Post Processing Test Data

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WinDyn allows a limited number of Post Processing operations on Data Files. These are:

- Add filtering to measured data
- Change specification channel values and recompute test data

The Post Processing feature creates a new Data File identical to the original Data File except for the options that were changed. The new Data File is an actual SFD file, which means it can be displayed, printed, plotted, overlaid without another file, averaged, or used in any other operation allowed on SuperFlow Data Files.

The Post Processing dialog box is accessed by selecting **File|Post Process** from the Stored Viewer main menu (Figure 4-15).



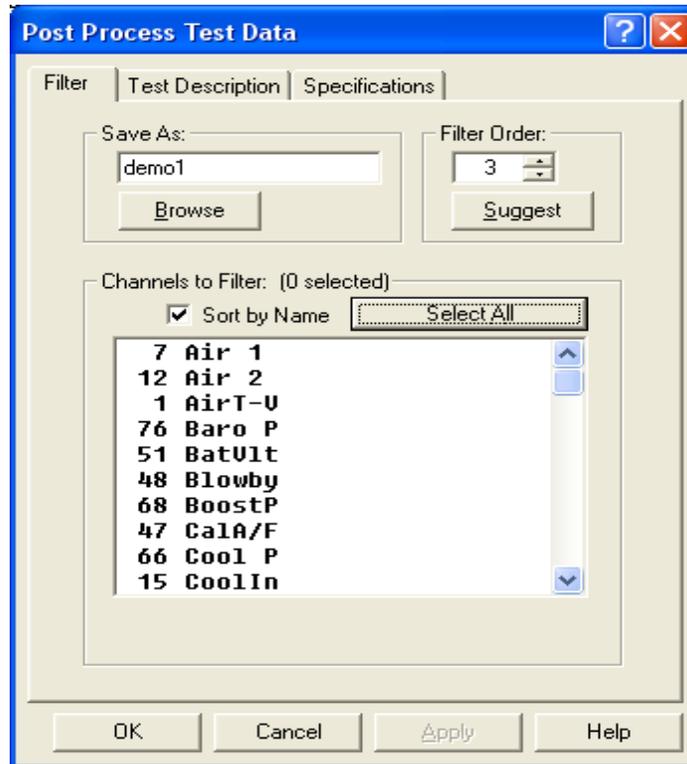


Figure 4-15 Post Processing Test Data

### 4.11.1 Filtering Test Data

The Filter operation will smooth any measured data channel. The actual filter used is a “moving window average”. The filter order (the amount of smoothing) is selectable.

To filter data in an open data file, select **Analyze | Post Process** from the main menu. Select the Filter tab. Following commands are available:

#### Save As

Type in the name for the new data file. A default name is provided. Click the Browse button if a different directory other than the default is desired, or select (and overwrite) an existing SFD file. WinDyn will remember the name and increment a suffix number until the name is changed.

#### Filter Order

Use the Up/Down arrows to select a filter order (a higher number means more smoothing). Click the Suggest button to let the software determine the best filter order for this data. Note that the filter order maximum range is dependent upon the data.



### Channels to Filter

Select (highlight) the measured channels to be filtered. Select more than one channel at a time by dragging the mouse with the left button down (or by holding down the CTRL key and then selecting the file names with the left mouse button or the space bar). Click the **Select All** button to change all measured channels. Click the **Sort by Name** check box to display the available channels in a different order.



*Click on the Test Description tab to enter some notes about the new data file created with changed filter values.*

Once the changes have been made, click the OK button to create the new data file. The new data file is automatically displayed. The original data file still exists and is not modified in any way.



*Only measured channels can be filtered. Since each calculated channel may reference several measured channels, the noise present may be the result of more than one channel. For example, if the system under test calculates Engine Power (EngPwr) using the standard formula  $EngPwr = EngSpd * EngTrq / Constant$ , then the Engine Speed (EngSpd) and Engine Torque (EngTrq) measured channels will each contribute some noise to the resultant Engine Power. Since Engine Power in this example is a calculated channel (it is not directly measured), it cannot be filtered directly. Therefore, to effectively filter Engine Power, both Engine Speed and Engine Torque may need filtering. Also note that if Engine Speed is filtered and is used as the X-axis for your plots (a common scenario), the plot appearance may change dramatically.*

## 4.11.2 Updating Specification Values

The Specifications (Bore, Stroke, etc.) that were in effect during a test are stored as part of the test data file. These Specifications are used to calculate various important values (such as Corrected Power, Displacement, etc.). Once a data file is saved, the **Specification** values stored in the data file cannot be changed. Using this Post Process feature, however, a *new* data file (based on the original) that has new Specification values can be created.

Changing **Specification** values is done for a couple of reasons. For example, if a series of tests are run with incorrect Specification value(s), the error can be fixed and get the true data without re-running the tests. Also, changing specification values allows to see the effect on data using various correction factors.

To update the value for any Specification channel(s), first open the desired data file. Next, select **Analyze|Post Process** from the main menu. In the "Save As" field, type in the name for the new file. A default name is provided. Click the Browse button to select a directory other than the default, or to select (and overwrite) an existing SFD file. WinDyn will remember the name and increment a suffix number until the name is changed.



Then select the Specifications tab. The saved value for each Specification channel is displayed (these are the values that were in effect when the test was ran). Type in a new value for any defined Specification. Click on the Load from File button if desired to update all the displayed Specification values with the Specification values stored in a previously created Specification file (.CST file).



*Click on the Test Description tab to enter some notes about the new data file created with changed Specification values.*

Once the specifications have been updated, click the OK button to create the new data file. If filtering was not changed an error message will appear. Click OK if no filtering is desired. The new data file is automatically displayed. The original data file still exists and is not modified in any way.

## 4.12 Exporting Test Data

### 4.12.1 Exporting Test Data to a CSV file

The Export option allows a SuperFlow data file (\*.SFD) to be converted to a Comma Separated Variable (\*.CSV) data file, which may be easily imported into most "spreadsheet" programs (for example, Microsoft Excel) for analysis.

To Export a SuperFlow data file, first open the desired data file. Select **File | Export...** from the main menu, enter the desired name of the \*.CSV file, and click OK. The \*.CSV file is then created and saved on disk. CSV files cannot be viewed with the WinDyn™ Stored Data Viewer.

Only the data channels selected in the **Test Group Channel Order** are exported to the CSV file. All ten pages in the Channel Order are exported, not just the one displayed. Data channels recorded and saved in the file, but not selected in the channel order, will not be exported.

### 4.12.2 Exporting a Plot

The available Export formats are suitable for the following destinations:

| <u>FORMAT</u> | <u>DESTINATIONS</u>          |
|---------------|------------------------------|
| Metafile      | Clipboard, File, and Printer |
| Bitmap        | Clipboard and File           |
| JPEG          | Clipboard, File, and Printer |
| Text / Data   | Clipboard and File           |

To Export a Plot as an image:



- Select **Plot | Export Image** from the main plot menu or click on Export Dialog from the Customization Pop-Up menu (Figure 4-9).
- Select the type of export desired.
- Select the destination of the export.
- If available, select the size of the image to export.
- Press the Export (Print...) button.

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#### **4.12.2.1 Export a Plot to a File**

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If information is to be exported to a file, a target filename must be entered. Click the mouse over the Browse button to show the File Saving dialog. Enter a filename and select OK to close the dialog.

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#### **4.12.2.2 Export a Plot to a Printer**

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If exporting a metafile to the printer, pressing the Print button shows the Print Dialog. Use the Print Dialog to make changes to the selected printer, orientation, paper bin, and other printer options.

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#### **4.12.2.3 Export a Plot as Text/Data**

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When exporting the plot as Text/Data, pressing the Export button launches the Text / Data Export Dialog. See Section 4.9.5 for details.



