INSTRUCTION MANUAL

ID-2000 Windows

4/96

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ID-2000 WINDOWS INTRODUCTION

I.1 WELCOME

Welcome to ID-2000 for Windows! ID-2000 has always represented Interface Design's commitment to providing powerful yet easy to use software for the data acquisition and analysis industry. ID-2000 is designed to be a very useful yet powerful tool for your data analysis needs.

Until now, ID-2000 was only available as a DOS application and as such it was bound by memory limitations and other restrictions created by DOS itself. ID-2000 Windows breaks free of these restrictions allowing more effective and creative features to be implemented in order to make data analysis even easier and more powerful than before.

Many data analysis packages today are designed to be an "everything to everybody" product. Unfortunately most of these are either so generic that they do not do anything particularly well or so complex that you get frustrated and do not use them. ID-2000 breaks this mold by being very simple and easy to use while providing powerful tools to help you analyze data like never before.

The primary goals of ID-2000 Windows are simple:

- Provide an easy to use, simplistic user interface for analyzing time-based data (continuous sampled data).

- Provide fast and flexible data graphing with multiple plot types for both small and huge data files (up to 512 parameters and gigabyte files).

- Allow you to view all the details in your data by multi-level zooming.

- Provide data manipulation through calculated parameters, data smoothing, derivatives, integrals, and FFTs.

- Provide basic frequency analysis features such as Amplitude Spectrum and Power Spectrum plots with various FFT sizes and data windowing types.

- Provide report quality annotated plots and capabilities for inserting plots into other Windows applications.

ID-2000 is a Windows 3.1 application and utilizes many of the latest programming techniques (such as a toolbar with "tool tips") to make operation fast and easy. ID-2000 may also be run using Windows 95 although it is not a 32 bit Windows 95 application.

ID-2000 will run using the standard Windows 3.1 VGA resolution. However, it is recommended that you use SuperVGA (800 x 600 or higher) and 256 colors if possible in order to see the plotted data more clearly.

I.2 GETTING STARTED

You're probably anxious to get started using ID-2000 to analyze your data. We recommend that you follow these steps :

1. Install Microsoft Windows Version 3.1 or Microsoft Windows 95 (both purchased separately) and learn how to use it. Do not attempt to install or use ID-2000 Windows until you are comfortable using Microsoft Windows.

2. Install ID-2000 Windows on your hard disk using the SETUP.EXE program found on the original diskette.

3. Review Chapter 1 which contains a brief tour of some basic functions in ID-2000.

NOTE: The figures shown in this Help file are actual ID-2000 screens that were captured while running under Windows 95. If you are using ID-2000 under Windows 3.1 there may be slight discrepancies between what you see on your display and the figures in this manual. However, the differences should be only in the appearance of the window's border (controlled by Windows itself) and various dialog controls such as check boxes that use an "X" instead of a "√".

SECTION 1. THE BASICS

ID-2000 Windows uses a single window to display one of three different views - Plot Template, Plot, and FFT. Figure 1-1 shows a sample Plot Template view that will produce a single Strip-Chart style plot of the parameter "Signal_0" versus "Time".

The Plot Template view is used to define what parameters you wish to plot and how they should be plotted. When you start ID-2000 the Plot Template view is what initially appears in the ID-2000 application window. You use this view to select data files, select parameters, enable/disable plotting features, import/export data files, and access ID-2000 configuration settings.

The Plot Template view is essentially a large dialog box that fills the entire application window. It contains many different controls such as buttons, check boxes, radio buttons, etc. A complete description of the Plot Template view features and functions can be found in the following chapters.

The second view is the Plot view which contains the actual graphs that you defined in the Plot Template. Figure 1-2 is a sample Plot view based upon the settings in the Plot Template in Figure 1-1.
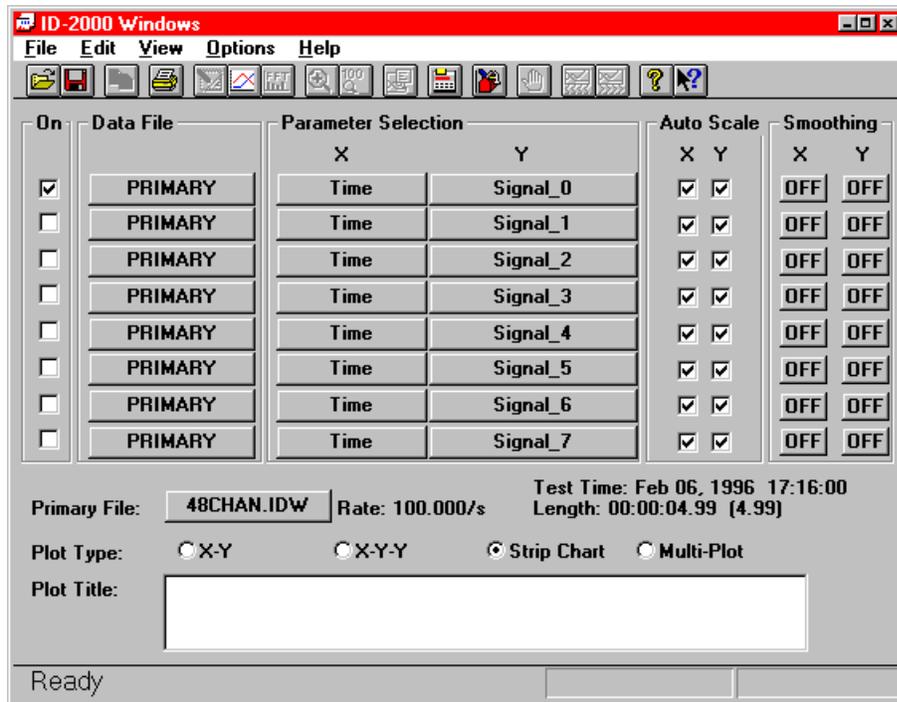
FIGURE 1-1. Plot Template View
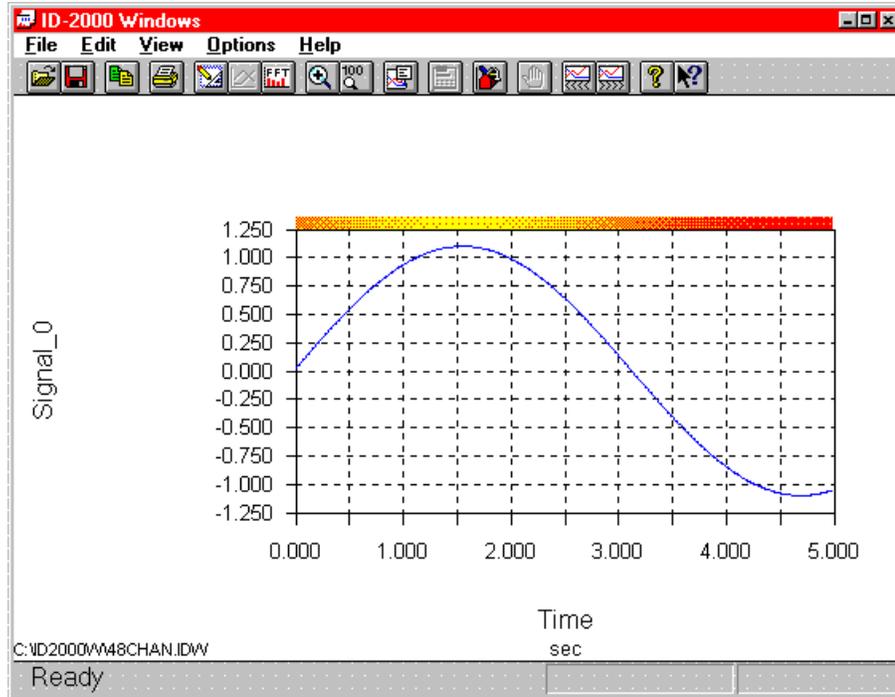
FIGURE 1-2. Plot View

The third and last view is the FFT view which is displayed in Figure 1-3. This view is used to display an Amplitude Spectrum or Power Spectrum plot of selected data. These plots identify either the amplitude or power associated with discrete frequencies within the data. You can control the number of data points used in calculating the FFT as well as the type of data windowing you wish to use through the Options - Preferences menu. Complete descriptions of FFT features and procedures are covered in the following chapters.

All three views share the same application window and therefore only one may be visible at any give time. The menus and toolbar buttons will enable and disable automatically based upon which view is currently active.
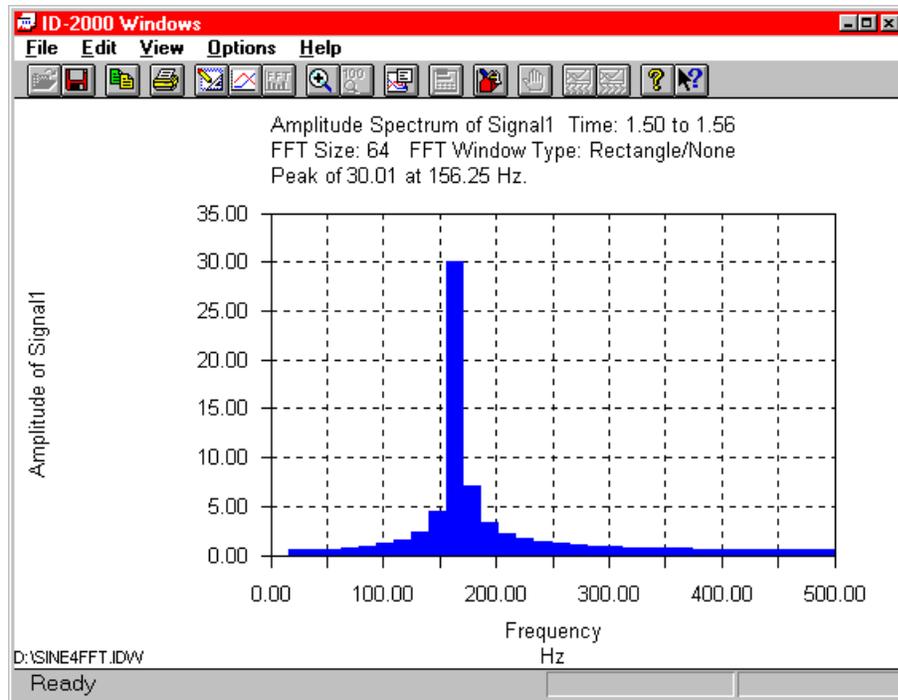
FIGURE 1-3. FFT View

1.1 TOOLBAR BUTTONS

The ID-2000 toolbar is immediately below the menu at the top of the window and consists of buttons with graphical icons on them. Clicking these buttons is a shortcut for various menu selections. The toolbar uses "tool tips" which are little reminders that automatically pop up next to the mouse cursor if you move the mouse over a toolbar button and leave it there for approximately one second. In addition to tool tips the status bar at the bottom of the window also displays information about the function of each toolbar button.

There are two sizes of toolbars from which you may select. The default is the large toolbar which is used throughout this Help file. It looks like this:
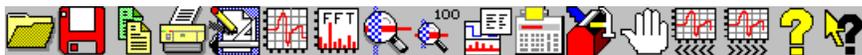
The small toolbar is similar and looks like this:

You may select which toolbar you wish to use in the Preferences dialog box under the General tab. The small toolbar button is primarily for VGA users that do not have enough screen resolution to display the entire large toolbar. Some of the buttons on the small toolbar may be slightly different from the large toolbar button simply because there is no way to successfully reduce the button's graphic on the large toolbar. However, the buttons on both toolbars are in the same order and the "tool tips" are the same.

SECTION 1. THE BASICS

Functions of the toolbar buttons are listed below:

Opens a previously saved plot template (Plot Template view) or recalls a saved plot (Plot view)

Saves the current plot template under a new name (Plot Template view) or saves the current plot (Plot view)

Copy the current plot to the Windows clipboard (Plot or FFT view)

Prints the current plot (All views)

Switches to the Plot Template view (Plot or FFT view)

Switches to the Plot view (Plot Template or FFT view)

Allows you to select the data for calculating an FFT and automatically switches to the FFT view (Plot view only)

Allows you to zoom in on a graph (Plot or FFT view)

Zooms a graph out to full scale (Plot or FFT view)

Displays statistics for the plotted data (Plot or FFT view)

Allows you to add, delete, or edit a calculated parameter (Plot Template view only)

Access all ID-2000 configuration options and preferences (All views)

Stops plotting data (Plot view only)

Pan Left - shifts the plot to the left by ½ of the screen and then redraws the plot. (Plot view only)

Pan Right - shifts the plot to the right by ½ of the screen and then redraws the plot. (Plot view only)

Accesses on-line Help file. (All views)

Context sensitive help (All views)

| Ready | | X= 2.35608 | Y= 0.653659 | 02:04 PM |

1.2 STATUS BAR

The status bar at the bottom of the screen contains four panes.

The first pane is used to display information regarding the status of ID-2000 or instructions for you to follow.

The second and third panes will display the coordinates of the mouse cursor when you move the mouse inside one of the graphs that are plotted. The coordinates displayed in these panes are in the units of the graph in which the mouse cursor is currently located. It is not the actual data value but simply the cursor location.

The fourth and last pane displays the current time of day. Clicking on this pane toggles to display either the current date or current time.

1.3 QUICK TOUR

Let's take a quick tour of how to define a plot in the Plot Template view and then look at the actual plot in the Plot view. We will be using one of the sample data files that is included with ID-2000 so you do not have to worry about converting any data files.

To begin, let's start ID-2000 by clicking on the ID-2000 icon which looks like this:

(If you already have ID-2000 running then just continue with the next step.)

You should see the "splash" screen with copyright information followed by the Plot Template view (Figure 1-1). If you do not see the Plot Template view and see a file selection dialog box instead, that's OK. Just skip down a step to where we select the primary file.

Once the Plot Template view becomes visible we want to select a new template which will default all of the settings for us. Select the File - New menu item which will display the Select Data File or Template dialog box shown in Figure 1-4.

Select the file named "realdata.idw" by either double clicking it or by clicking on it followed by clicking the OK button.
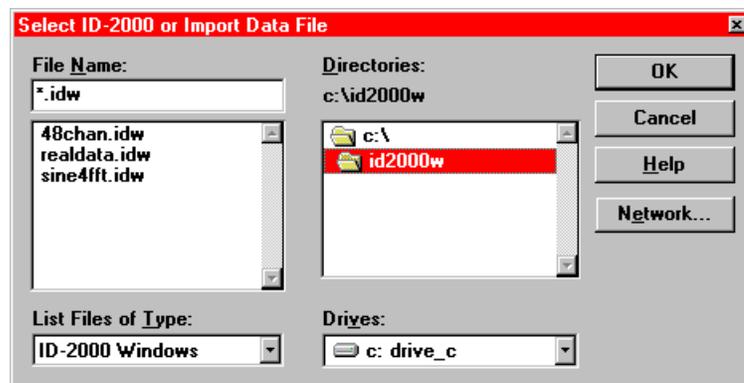
FIGURE 1-4. Select Data File or Template
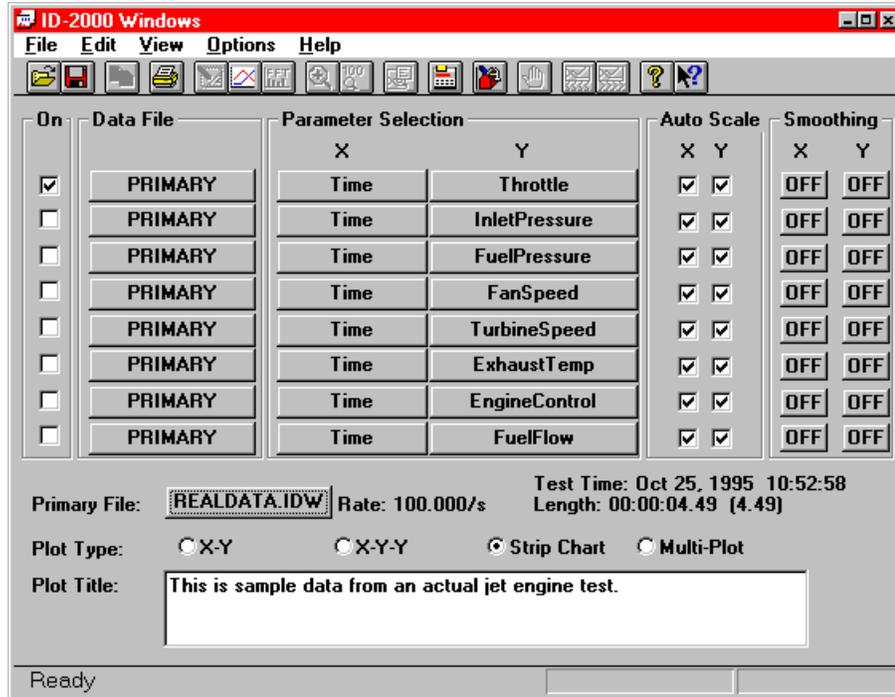
FIGURE 1-5. Plot Template of REALDATA.IDW

The Plot Template view should change to look similar to that in Figure 1-5.

Now let's make a Strip Chart plot. We will have two strips (or graphs) on our plot. The first graph will be "ExhaustTemp" parameter versus "Time". The second one will be "FanSpeed" versus "Time".

If you look at Figure 1-5 you will see groups or columns labeled "On", "Data File", "Parameter Selection", "Auto Scale", and "Smoothing". There are eight rows of items in each group. Each row represents one graph or strip. We want to plot two strips so we will be working with the first two rows only.

Look at the first row in Figure 1-5. The boxes in the "On" group are called "check boxes" and allow you to turn a feature on or off by

"checking" or "unchecking" the box. The box is checked when it contains either an "X" or "√" inside. To check or uncheck it just click the mouse in it which will toggle it back and forth. We want to turn the first graph on so check the box on the first row now.

Continue across on the first row to the group labeled "Data File". The button label should say Primary. This button is used to specify what data file (other than the primary file) you wish to use. We won't change this now but will discuss it later in the manual.

The next group is labeled "Parameter Selection" and contains a column of buttons under the "X" label and another column under the "Y" label. The names on these buttons are the parameters that are selected for the X-axis and Y-axis of your plot.

The button on the first row under the X label in the Parameter Selection group should already be defaulted to "Time". We want to use the "Time" parameter but let's pick a different parameter just to show you how easy it is to change parameters. Click on this button now. You should see the Parameter Selection dialog box appear shown in Figure 1-6.

In this dialog box are all of the parameters available for plotting. The list on the left is labeled "Parameters" and is a list of the actual parameters in the data file that is going to be plotted. In our example it is the parameters in the data file "realdata.idw". At the bottom of the list is a check box labeled "Alphabetical Sort". If you check this box the parameter list will be sorted alphabetically. If this check box is not checked the parameters will be listed in the same order as they are in the data file.

On the right side of the dialog box is a group labeled "Std. Parameters". These are parameters that are available for every data file. The four buttons in the group are labeled: "Time", "Ref. Time", "Scan_Number", and "Scanrate". The "Time" parameter (which we are going to select) is just as it sounds - the time in seconds since the first data point was recorded. "Ref. Time" represents reference time which we will discuss later in the manual but simply put it is the number of seconds from

a user-defined reference point in the data file. The "Scan_Number" parameter is just the number of data points since the first data point. The last button is "Scanrate" which is the speed at which the current data point was recorded in Hz (scans per second). There are also two check boxes labeled "Derivative" and "Integral" which plots the derivative or integral of a parameter. We will discuss integrals and derivatives in a later chapter.

To select a parameter simply click on one of the Std. Parameter buttons or double click one of the parameters in the parameter list. Let's select "Scan_Number" so simply have to click the button labeled "Scan_Number". That's all there is to it. This takes you back to the Plot Template view and the button in the X - Parameter Selection group should now be labeled "Scan_Number".

Now that you know how easy it is to select a parameter let's go back and select "Time" again which is the actual parameter we want to use for our plot. Click on the button that now says "Scan_Number" on the first row of the X-Parameter Selection group to display the Parameter Selection dialog box again (Figure 1-6). Now click on the button labeled "Time". This returns you back to the Plot Template view and the button in the X - Parameter Selection group should now be labeled "Time" .
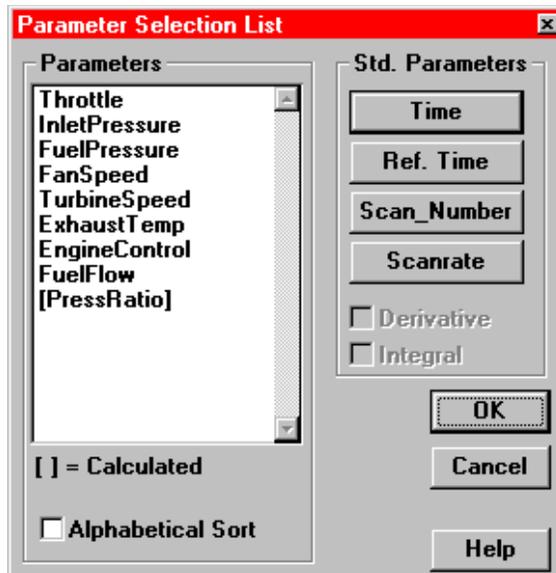

FIGURE 1-6. Parameter Selection
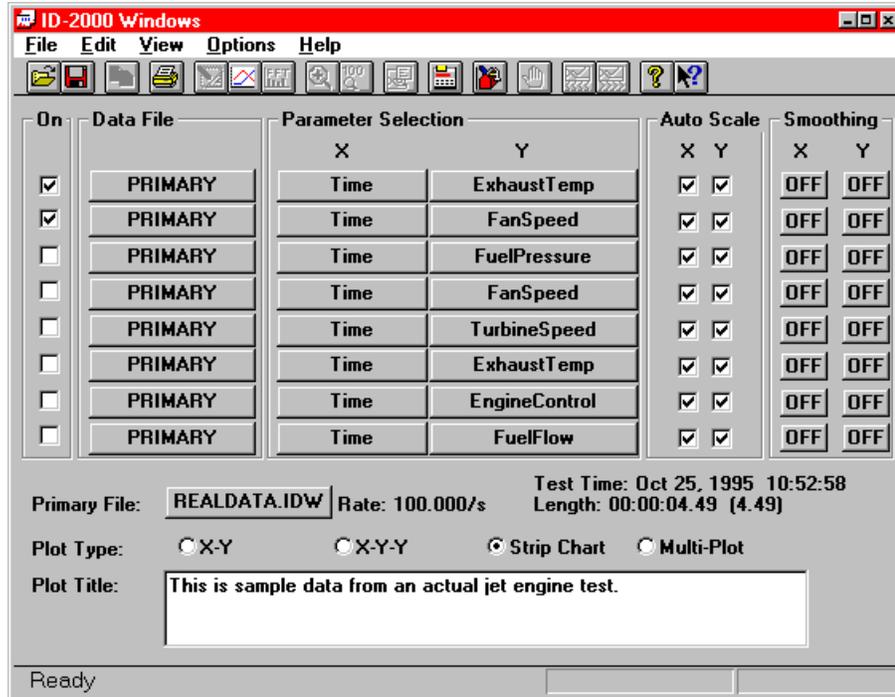
FIGURE 1-7. Plot Template view of ExhaustTemp and FanSpeed vs. Time

OK, now let's pick our Y-axis parameter - "ExhaustTemp". Picking the Y-axis parameter works just like the X-axis parameter. Click on the button in the first row under the Y label in the Parameter Selection group. This causes the Parameter Selection List dialog box in Figure 1-6 to re-appear. Now look in the Parameters list and select the parameter named "ExhaustTemp".

That's all there is to selecting parameters for plotting! Now let's do the second strip. Go down to the second row and "turn on" the second graph by checking the check box in the "On" column just like the first row. The X-axis parameter button on the second row should already be labeled "Time" so go on over to the Y-axis parameter button. Click this button to display the Parameter Selection dialog and select the parameter named "FanSpeed" in the Parameter List. Verify that the button label in the Plot Template view has now changed to FanSpeed.

Look in the group labeled "Auto Scale" and make sure both boxes are checked for the first two rows. Now look at the "Smoothing" group and make sure both buttons are labeled OFF for the first two rows.

Just one more thing to check. Look down toward the lower portion of the window to find the row labeled "Plot Type". Make sure the radio button labeled "Strip-Chart" has a dot in it which means that it is selected. If another plot type is selected then just click on Strip-Chart to select it.

The Plot Template should now look like Figure 1-7.

Now we are ready to see what this plot looks like. Find the toolbar button and click it to switch to the Plot view. You can also do the same thing by selecting the View - Switch to Plot menu item or by pressing the F3 key.

You should see a plot similar to Figure 1-8. The top strip is a graph of our first parameter, ExhaustTemp versus Time. The second strip is FanSpeed versus Time. On Strip-Chart plots there is only one X-axis which is located at the very bottom of the plot. All graphs are plotted against the same X-axis parameter.

If you have a printer attached to your computer and it is installed in Windows you may try printing by simply clicking on the printer toolbar button or via the File - Print menu item.

Now that you know how to make a plot let's make a more interesting one. Go back to the

Plot Template by clicking the Plot-Template toolbar button or the View-Switch to Template menu item.
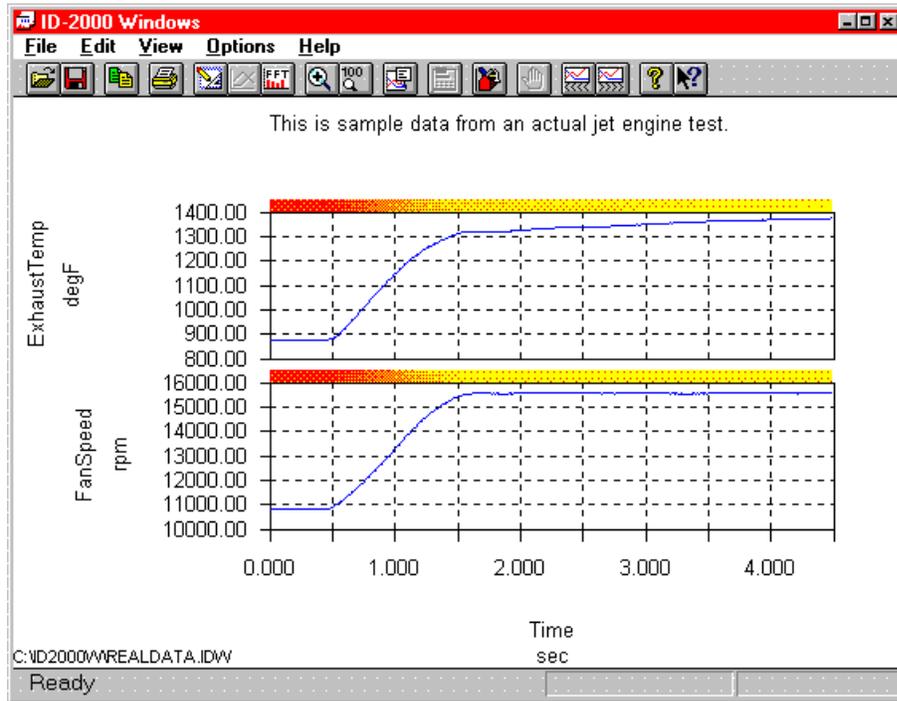
FIGURE 1-8. Plot view of ExhaustTemp and FanSpeed vs. Time

SECTION 1. THE BASICS

We are now going to make an X-Y plot of "FanSpeed" versus "TurbineSpeed". We will only be plotting one graph this time so turn off the second graph (remove the check on the second row in the "On" group). Change the X-axis parameter on the first graph to "FanSpeed". (Click on the first button under the X column and then select the "FanSpeed" parameter in the Parameter Selection dialog.)

Now change the Y-axis parameter to "TurbineSpeed". The last thing we need to do is to change the plot type from Strip-Chart to X-Y. (Just click on the "X-Y" radio button on the Plot Type row.)

Your Plot Template window should look like Figure 1-9.
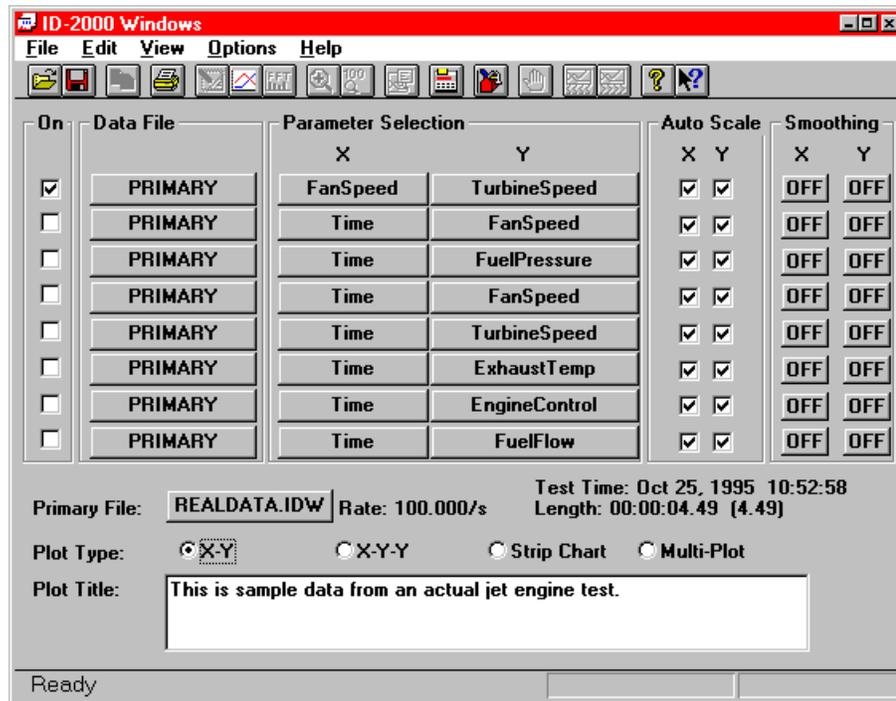
FIGURE 1-9. Plot Template for FanSpeed versus TurbineSpeed

Now you are ready to make your first X-Y plot. Click on the Plot toolbar button and you should see the plot displayed in Figure 1-10.

Let's have a little fun and use the Zoom feature. We are going to zoom in on the small blob of data at the top right of the plot.

Click on the Zoom toolbar button to turn on the zoom feature.

NOTE: When in "zoom" mode the mouse cursor will change from the standard arrow to a small magnifying glass.

To zoom in on a plot you draw a rectangle around the part of the data that you want to expand. Once you have the magnifying glass cursor click the mouse where you want one of the rectangle corners to be and HOLD down the mouse button. While holding the mouse button down you are going to be dragging a rubber-band rectangle along with the mouse cursor. Move the mouse until the data you want to zoom in on is inside the rectangle. When the rectangle is the size you desire then release the mouse button. The plot will redraw to display only the data inside the rectangle. See Figure 1-11.
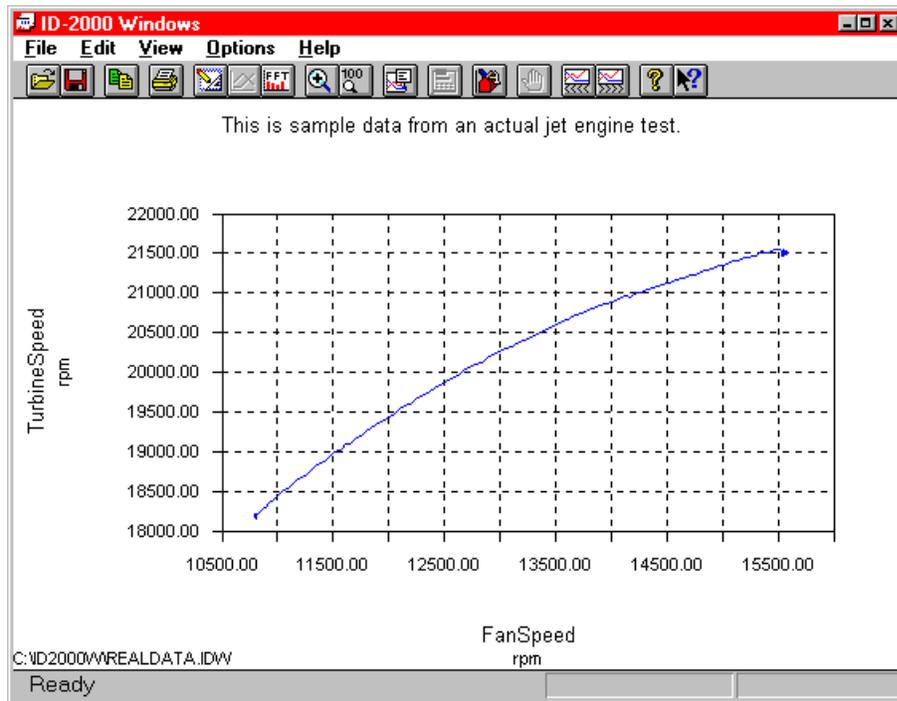
FIGURE 1-10. Plot for FanSpeed versus TurbineSpeed

Of course the actual scales of your plot may be different depending upon exactly what rectangle you drew. That's all there is to zooming. You can try zooming in even closer on the blob if you want to by repeating the same procedure. In fact, ID-2000 will let you keep zooming until you only have a few data points to plot!

Now let's zoom back out to full scale. This is very simple since all you have to do is click the Zoom Full Scale toolbar button:

That concludes our quick tour through a few basic features of ID-2000. Pretty easy wasn't it? You can always use the sample data files (REALDATA, 48CHAN, and SINE4FFT) when you want to explore the many features of ID-2000. In fact, these three data files are used throughout this manual in illustrations so that you can follow along if you like.

You can return to the Plot Template view by clicking the Plot Template toolbar button or the View - Switch to Template menu item. To exit ID-2000 click on the File - Exit menu item or access the Windows system menu to close the ID-2000 window.
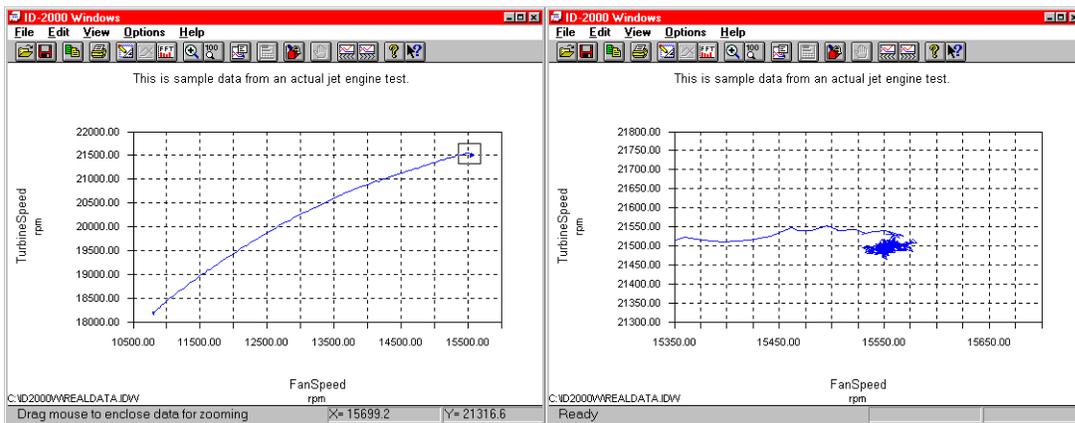
FIGURE 1-11. Zooming an X-Y Plot

SECTION 2. PLOT TEMPLATE VIEW

In the previous chapter we briefly looked at the three different "views" that are available in the ID-2000 Windows application window. To review, only one window is used by ID-2000. In that window you can "view" three different types of things but only one of them can be viewed at a time. These three "views" are:

Plot Template View

In this view you tell ID-2000 what you want to plot and how to plot it.
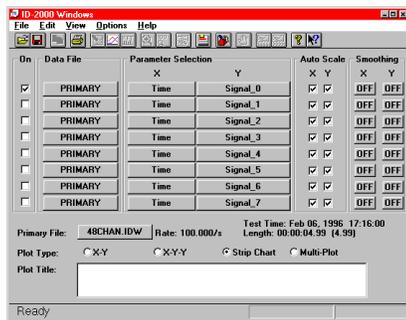
FIGURE 2-1. Plot Template View

Plot View

As its name implies it displays the actual graphs that you defined in the Plot Template view.
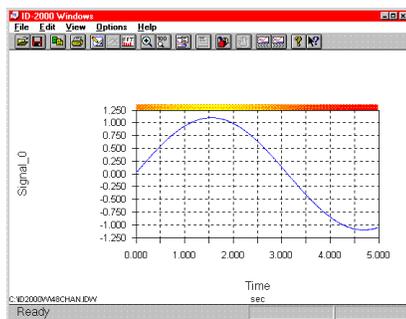
FIGURE 2-2. Plot View

FFT View

This view is similar to the Plot view except that it displays an FFT plot (amplitude or power spectrum) for frequency analysis.

This chapter discusses the features found in the Plot Template view.
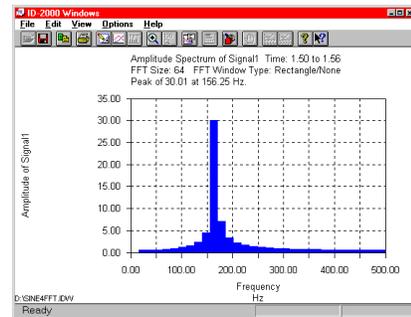
FIGURE 2-3. FFT View

Before getting into the details of the Plot Template view let's discuss the plot template file. The information contained in the Plot Template view is stored in an ID-2000 plot template file. Template files use an extension of ".IDT". These template files are used to:

- Start ID-2000 with the same plot settings that you used when you last exited ID-2000.

- Provide a method for saving multiple plot settings that can be reused.

The template file IDWIN.IDT is the default template and always contains the settings from your last ID-2000 session. When ID-2000 exits it saves the current plot settings in IDWIN.IDT. When you start ID-2000 the settings stored in IDWIN.IDT are automatically loaded so that everything is just like it was when you last used ID-2000.

You may save the plot template settings to another template file at any time by selecting the File - Save Template As menu item and entering the desired file name. You can then load these saved settings by selecting the File - Open Template menu item.

SECTION 2. PLOT TEMPLATE VIEW

The template file feature in ID-2000 is useful for maintaining multiple types of plot settings. Instead of changing all of the graph and parameter settings back and forth you can simply save templates for the standard plot settings you desire and just load the desired template.

You may also start ID-2000 by specifying the desired template file on the command line such as:

    IDWIN.EXE C:\ID2000W\MYTEMP.IDT

When you start ID-2000 Windows by clicking on its icon in Program Manager, ID-2000 attempts to load the template settings you used during your last work session. After checking to make sure all the settings are still valid ID-2000 automatically displays the Plot Template view.

You can switch back to the Plot Template view from any of the other views by clicking on the toolbar button or the View-Plot Template menu item or by pressing the F3 key.

The Plot Template view is essentially a very large dialog box with buttons, check boxes, radio buttons, and edit boxes. All of these items work like any other Windows application. Normally you will use the left mouse button when clicking on these items. However, some items offer special functions when clicking on them with the right mouse button. Items utilizing both left and right buttons will be identified throughout this manual.

Let's take a close up look at the Plot Template view in Figure 2-4.
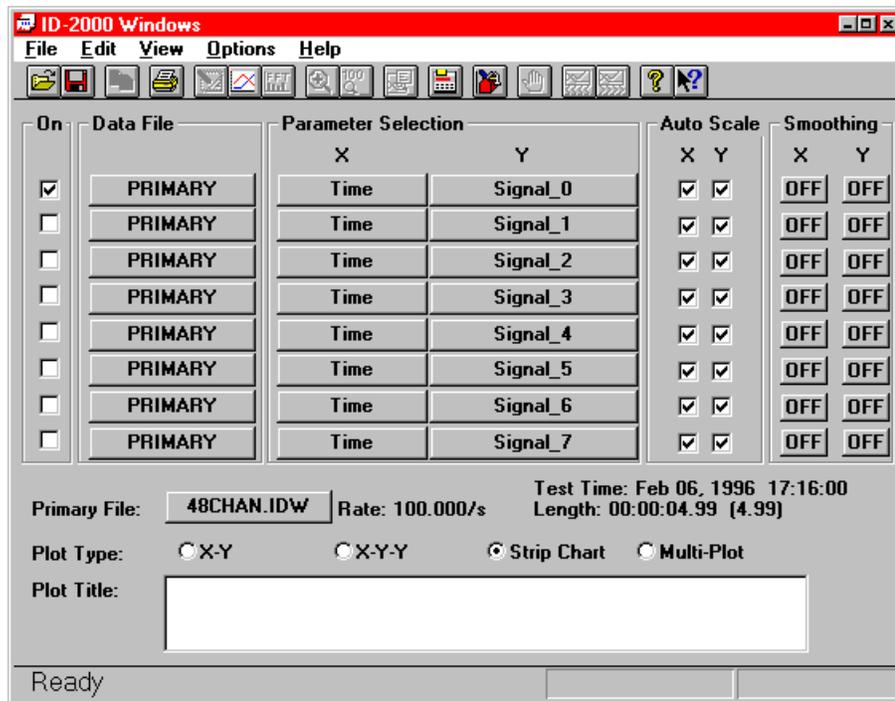
FIGURE 2-4. Plot Template View

Many of the Plot Template items are grouped together. There are five of these groups which are labeled "On", "Data File", "Parameter Selection", "Auto Scale", and "Smoothing". These groups all have eight rows of check boxes or buttons in them which correspond to the eight graphs you can define. Each row represents the settings for a single graph.

The lower portion of the Plot Template view contains various items that are not specifically grouped together. These items do not pertain to a single graph but instead affect the entire plot. These items are "Primary File", "Plot Type", and "Plot Title".

2.1 "ON" GROUP

This group contains eight check boxes for turning each of the eight graphs on and off (Figure 2-5). Clicking the left mouse buttons toggles the graph on and off. If the box has a "X" or "√" inside it, the graph is turned on and will be plotted.
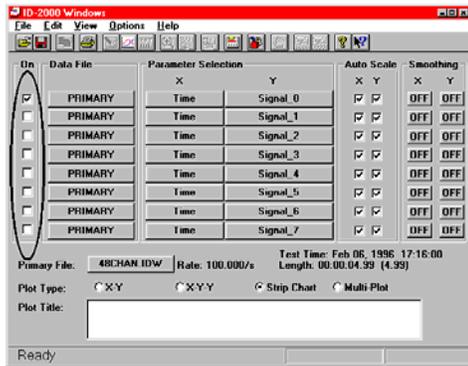
FIGURE 2-5. "On" Group

2.2 "DATA FILE" GROUP

This group contains eight buttons for selecting the data file to be used for each of the eight graphs (Figure 2-6). Most of the time you will

probably be plotting parameters on the graphs that all come from the same data file. ID-2000 simplifies this procedure by having you load a "primary" data file for the entire plot. If the Data File button is labeled "PRIMARY" it indicates that the graph will use whatever primary data file you have loaded. If you change the primary data file for the plot (we'll tell you how to do that later in this chapter) then all graphs that were using the primary file automatically are changed too!
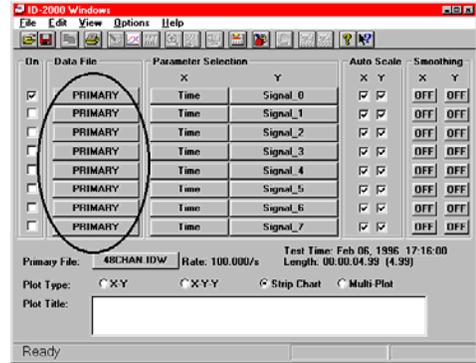
FIGURE 2-6. "Data File" Group

Sometimes you may want to use different data files for each graph allowing you to analyze data between multiple files. This type of analysis is called multi-file plotting.

Let's say you were looking at temperatures from a remote weather station. Perhaps you have separate data files for several 24 hour periods and you would like to compare them against one another. By selecting a different file for each of the graphs you can compare or even overlay the data making it easy to see how the temperature changed from day to day.

If you click (using the left mouse button) on the "Data File" button for a graph you will see the file selection dialog that looks like this (Figure 2-7):
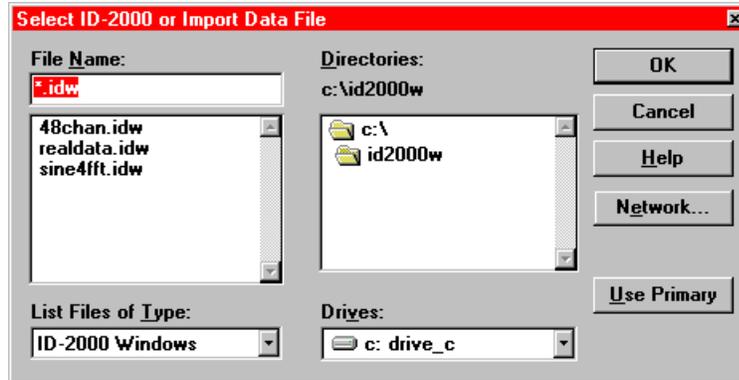
FIGURE 2-7. Data File Selection Dialog

This is a standard Windows file selection dialog box except that a button has been added in the lower right corner labeled "Use Primary".

There are three types of files you may select from Figure 2-7:

1. Primary - If you want to use the plot's primary file simply click the "Use Primary" button.

2. Secondary - If you wish to use an ID-2000 file for this graph other than the primary file select the desired file.

3. Import - If you want to select a data file that is not an ID-2000 data file you first need to select the type of file desired you wish to import in the "List Files of Type" drop down box and then select the desired file. (Refer to the Import/Export section of this manual for additional information on importing files.)

Using the right mouse button to click on a graph "Data File" button is a short cut method of viewing information on that data file. You can alternately use the File - Data File Info menu item to view information on any data file. (Figure 2-8).
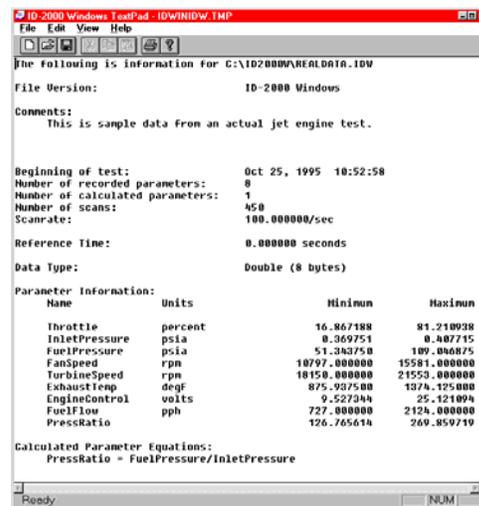
FIGURE 2-8. Data File Info

The information on the data file is displayed in ID-2000's TextPad utility. This utility is similar to the Windows Notepad program that allows you to view and save text files. The CUT, COPY, and PASTE functions in TextPad allow you to manipulate the information as desired including copying/pasting it into other applications.

> **NOTE**: The data file information is in a temporary file which will automatically be deleted upon closing the TextPad utility. If you want to keep this file you must save it under a new name.

2.3 "PARAMETER SELECTION" GROUP

There are two columns of buttons in this group (Figure 2-9). The first column is labeled "X" and the second is labeled "Y". These buttons represent each graph's X-axis parameter and

Y-axis parameter respectively. These buttons are used to either select a different parameter (left mouse button) or to edit the plot scales for the parameter (right button).
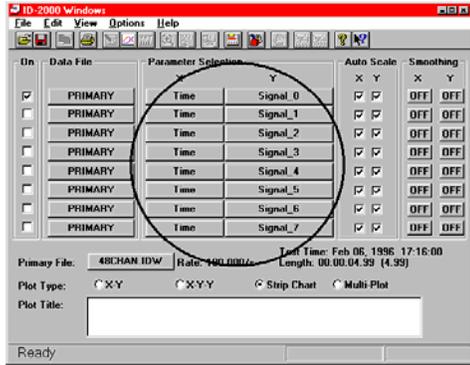
FIGURE 2-9. "Parameter Selection" Group

2.3.1 SELECTING PARAMETERS

To change either the X or Y axis parameter use the left mouse button to click on the appropriate parameter button. This will display the Parameter Selection List dialog box shown below in Figure 2-10.
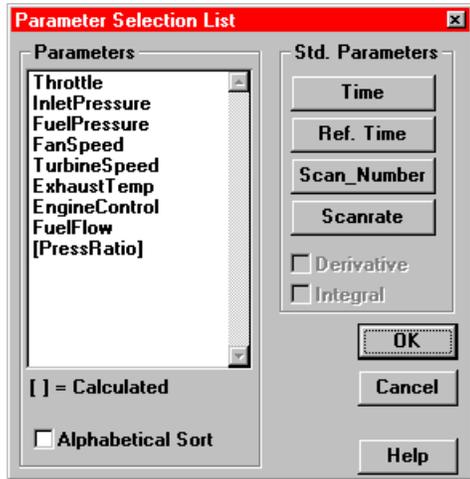
FIGURE 2-10. Parameter Selection List Dialog

The Parameter Selection List contains a list of all parameters contained in the data file as well as some "standard" parameters which are available for every data file.

The Parameter Selection List dialog box is basically the same for selecting either X or Y

parameters. However, there are a few differences. When selecting an X parameter the derivative and integral check boxes are disabled. You may not plot a derivative or integral on the X axis. When selecting a Y parameter the "Time" and "Ref. Time" buttons are disabled. You may not plot time or reference time on the Y axis.

The list inside the group labeled "Parameters" is the actual list of parameters for the data file. If the check box "Alphabetical Sort" is enabled then the list is sorted alphabetically. Otherwise, the parameters are listed in the same order as they are found in the data file.

Any parameters enclosed in brackets "[ ]" are calculated parameters and are not part of the original data file. These are parameters that you can create in ID-2000 which are appended to the original data. You may add, edit, or delete calculated parameters which will be discussed later in this manual. You may never modify any of the original parameters.

On the right side of the Parameter Selection List dialog is a group labeled "Std. Parameters". In this group are buttons labeled "Time", "Ref. Time", Scan_Number", and "Scanrate". These parameters are available for plotting on any data file regardless of what parameters it may contain.

2.3.2 DERIVATIVES AND INTEGRALS

At the bottom of the "Std. Parameters" list are two check boxes labeled "Derivative" and "Integral". Checking one of these boxes allows you to plot either the derivative or integral of one of the data file parameters. You cannot plot a derivative or integral of one of the standard parameters (Time, Ref. Time, etc.). A derivative is the rate of change for a parameter relative to time or how fast the parameter value is changing. A integral is sort of the opposite of a derivative in that it is the total amount of change over time.

Let's say you had a data file of a race car and one of the parameters in the file was "SPEED" which represents car speed in miles per hour. You could plot the derivative of SPEED which would show you the acceleration of the car (how the speed is changing over time). You could also plot the integral of SPEED which would show you how many miles the car was driven.

To select a parameter from the Parameter List either double click on the parameter or highlight the parameter (by clicking once on it) and then click the OK button. Make sure that the derivative and integral boxes are checked (or unchecked) appropriately before selecting the parameter. To select one of the Std. Parameters simply click its button.

When you select X-axis parameters for multiple graphs it is important to remember that all graphs plotted must have the same X parameter. Let's say you wanted to plot four parameters versus "Time" on a strip chart plot. You would need to make sure that all four graphs that are going to be plotted have "Time" as their X-axis parameter. If one of them has a different X-axis parameter you will receive an error message when you attempt to switch to the Plot view.

This does not mean that all eight graphs have to have the same parameter selection in the Plot Template. Only the graphs that are "turned on" have to have the same parameter. You may want to set up many different graphs initially but only turn on the one you want to look at first. When you are finished analyzing that graph then you simply turn it off and turn on the next graph you want to plot.

2.3.3 EDITING SCALES

Most of the time you will probably want ID-2000 to handle the parameter scaling for you. However, you can manually scale a graph using the Edit Scales dialog shown in Figure 2-11. In this dialog you can also specify the section of data to be plotted if you do not want the entire file plotted.

If you click on one of the parameter buttons in the Parameter Selection group (Figure 2-9) using the right mouse button you are able to edit scaling information for that parameter.

The Edit Scales dialog box shown in Figure 2-11 allows you to edit two items that affect how the parameter is plotted:

- The minimum and maximum graph scales.

- The section of data you wish to plot.

On the left of the dialog is a group labeled "Parameter Scaling". Inside this group are fields in which you can enter the MIN and MAX scaling values. You can click on the Full Scale button to default the MIN and MAX to full scale values based upon data file header information. You can also update all eight graphs in the Plot Template to use these scales by checking the "Set scales for all graphs".
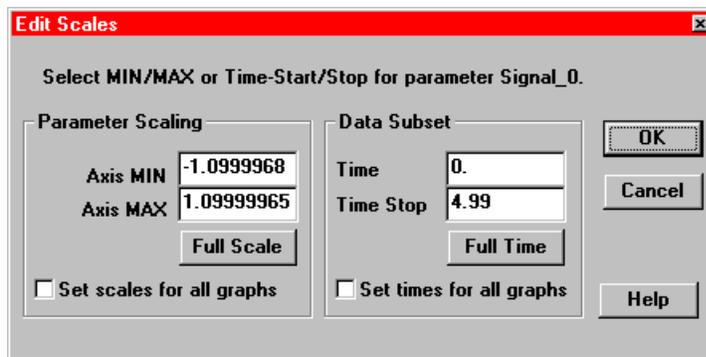


FIGURE 2-11. Edit Scales Dialog

If you change the MIN or MAX scale ID-2000 will automatically switch the graph over to manual scaling so that it will use your scale values instead of automatically calculating scales based upon the plotted data values.

On the right of the dialog box is a group labeled "Data Subset". This group allows you to control how much of the data file is actually plotted. Let's take an example of a very large data file that was recorded at a scanrate of 1000 (1000 scans per second) for 1000 seconds (about 16 minutes). This data file would have 1,000,000 readings of every parameter in it. Obviously this would be a big data file and would take a while to plot the entire file. Perhaps you have already looked at the data or know from the comments in the data file that the part you are primarily interested in looking at is only the data between the time of 450 and 475 seconds. You could of course plot all 1000 seconds of data and then zoom in on the section between 450 and 475 but that would mean you would have to wait for all 1,000,000 data points to be plotted first. Instead you could enter a value in the "Time Start" field of 450 and "Time Stop" field of 475 which would only plot the data for those 25 seconds. This would be much faster than waiting for the entire file to be plotted.

If you press the "Full Time" button the start and stop times will be defaulted to the entire length of the data file so that every point is plotted. You may also check the "Set times for all graphs" box if you want all eight graphs to use the same start and stop times.

2.4 "AUTO SCALE" GROUP

Farther to the right in the Plot Template view is a group labeled "Auto Scale" with two columns of check boxes labeled X and Y (Figure 2-12).
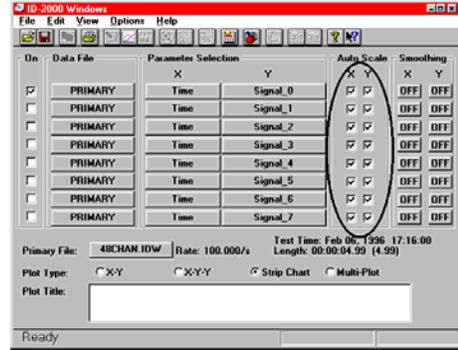
FIGURE 2-12. "Auto Scale" Group

By default, ID-2000 automatically scales the plots you create based upon the value of the data that is being plotted. With autoscaling you never have to worry about having a plot with scales of 0 and 10 when the parameter being plotted only varies between 0.5 and 0.75. ID-2000 will calculate the best scales to use so that the parameter takes up the largest part of the plot.

Sometimes it is advantageous to turn autoscaling off. This may be the case if you are printing many plots from various data files and you want the scales on all the plots to be the same. To turn autoscaling off remove the X in the check box under the appropriate X or Y column and then right click on the appropriate Parameter Selection button to type in your scales. (See the previous paragraph on how to edit scales for a parameter.)

2.5 "SMOOTHING" GROUP

To the far right side of the Plot Template is a group labeled "Smoothing" (Figure 2-13). Like the Parameter Selection group it contains two columns of buttons labeled X and Y that allow you to specify what amount (if any) of data smoothing is to be used when plotting a graph.
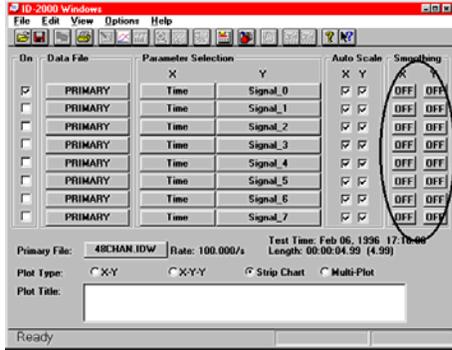
FIGURE 2-13. "Smoothing" Group

Data smoothing uses a "running" average technique to smooth out the small bumps and variations in data that was recorded. There are four levels of data smoothing: off, small, medium, and large. These levels correspond to averaging the current data point with 0, 3, 7, or 11 data points before AND after it. Figure 2-14 shows an example of a Strip-Chart plot of the same parameter with and without smoothing.

The top is the original unsmoothed data corresponding to the derivative of FanSpeed in REALDATA.IDW. The lower trace is the same derivative with a small level of smoothing applied. Any time you plot a smoothed parameter an "(S)" will appear beside the parameter label and a legend is included at the bottom of the plot identifying that "(S)" means the parameter is smoothed.
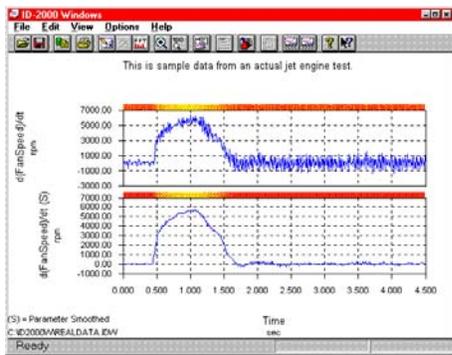
FIGURE 2-14. Smoothed and Unsmoothed

You can see from Figure 2-14 that in some cases data smoothing can substantially improve the readability of a graph. However, caution should be used when smoothing data because you are not plotting the original recorded data - you are plotting a running average of the data.

Because all graphs use a common X parameter when plotted all graphs must also use the same level of X parameter smoothing. If you change the smoothing level for one X parameter it automatically changes them for all graphs.

2.6 "PRIMARY FILE" GROUP

Although not visibly grouped together as the previous groups, the Primary File group is nonetheless a group consisting of one button and informational text (Figure 2-15). This group displays the name of the current primary file on the button. To the right of the button is information about the file such as what rate its data was recorded at, the starting date/time of the recording, and the length of the recording.
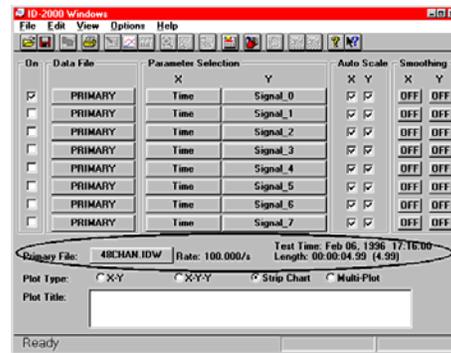
FIGURE 2-15. "Primary File" Group

As described previously, the primary data file is the default data file used for all graphs. You may manually select a "secondary" data file for a single graph if desired but all graphs default to using the primary file. If you change the primary file all graphs that are using the primary file are automatically updated with the new file.

Like the buttons in the Data File group previously discussed, the primary data file button allows you to either select a new primary data file (left mouse button) or displays information about the current primary data file (right mouse button).

2.7 "PLOT TYPE" GROUP

This group is also not visibly marked as a group but contains four radio buttons labeled: "X-Y", "X-Y-Y", "Strip Chart", and "Multi-Plot" (Figure 2-16). To change plot types simply click the plot type desired.
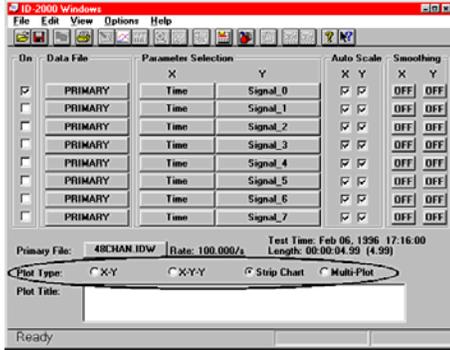
FIGURE 2-16. "Plot Type" Group

The X-Y, X-Y-Y, and Multi-Plot are somewhat similar in that they produce a single graph with either a single or multiple data traces on the graph. The Strip Chart plot contains multiple graphs - each with a single data trace. The X-Y plot uses only one X-axis and Y-axis parameter. The X-Y-Y plot uses one X-axis and two Y-axis parameters. The Strip Chart and Multi-Plot uses one X-axis parameter and from one to eight Y-axis parameters. Figure 2-17 illustrates samples of all four plot types.
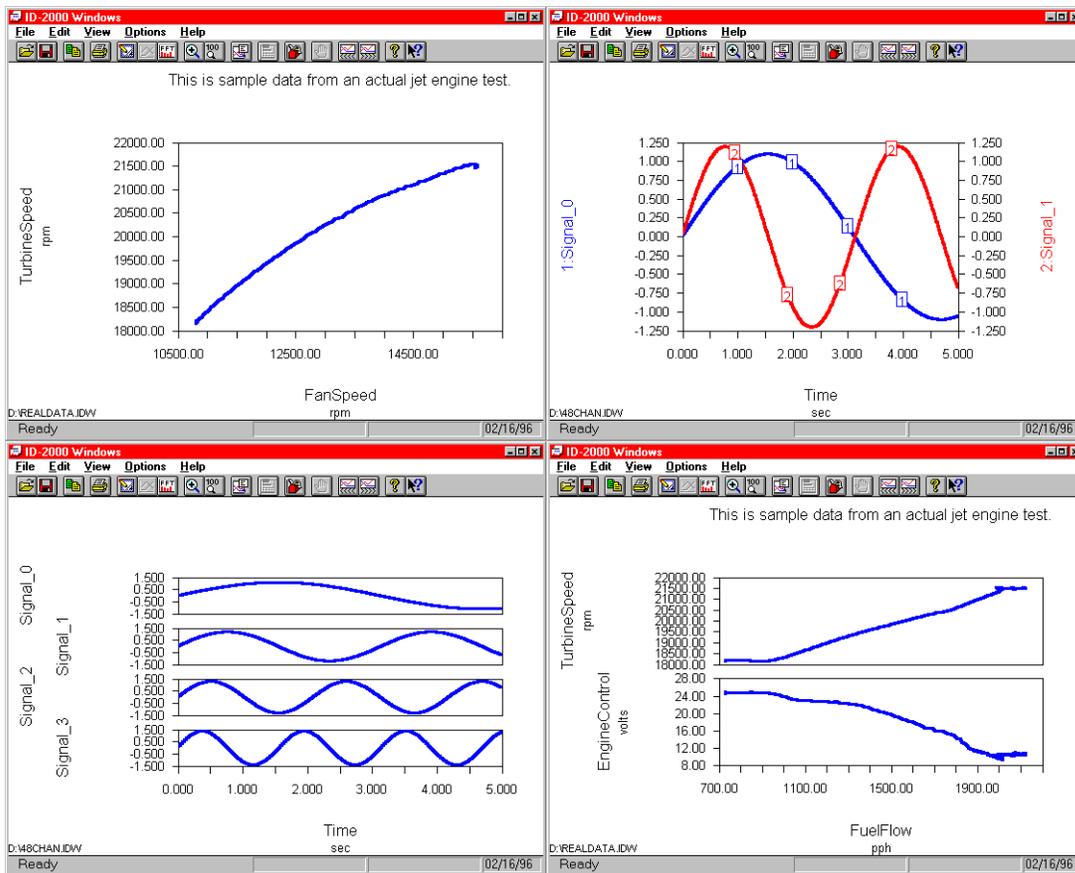
FIGURE 2-17. X-Y, X-Y-Y, Strip Chart, and Multi-Plot

Any parameter (except derivatives and integrals) may be used for the X-axis on all four plot types. However, you must use the same X-axis parameter for each graph or data trace on the plot types that allow multiple Y-axis parameters. Typically Time or Reference Time is used for the X-axis parameter on a Strip Chart or Multi-Plot. X-Y plots typically plot two recorded or calculated parameters against each other. However, there is no restriction as to parameter selection except as previously noted with regard to derivatives and integrals. Any parameter may be plotted as the Y-axis parameter(s) except Time or Reference Time which are only available as an X-axis parameter.

2.8 "PLOT TITLE" GROUP

At the bottom of the Plot Template view is the final group labeled "Plot Title". This is actually a single edit field containing the plot title that is to be displayed at the top of the plot. This title defaults to the comments (if any) in the primary data file. To change the title just click the mouse inside the edit box and type the new title. You may use up to three lines for the plot title. Once you change the title, changes will be saved with the plot template and used instead of the data file comments. However, changing the primary file will erase the plot title and default to the comments for the new primary data file.
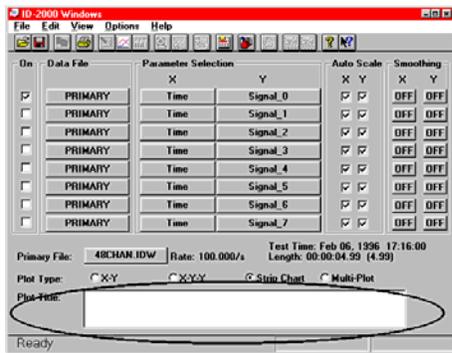
FIGURE 2-18. "Plot Title" Group

SECTION 3. PLOT VIEW

The Plot view contains the graphs that you defined in the Plot Template view. In this view you can zoom in and out on data sections, annotate the plot with notes and leaders, view data statistics, save and recall plots, send the plot to your printer, and much more. The Plot view is where you will do the majority of your data analysis. There are many tools that ID-2000 provides for the Plot view which we will discuss in this chapter.

Figure 3-1 illustrates samples of Plot views corresponding to various Plot Template settings.

You access the Plot view from the other views by clicking the toolbar button, selecting the View-Switch To Plot menu item, or by pressing F3.

There are many ID-2000 settings that can be adjusted which affect how the Plot view looks and acts. Some of these settings will be discussed in this chapter. Please refer to the Preferences chapter for a complete description of these settings.

The Plot view is divided into several areas. The center section contains the graph(s) of the parameters you selected in the Plot Template. In the case of a Strip Chart style plot the first graph is at the top and the last graph at the bottom. The X-axis is always horizontal and is labeled at the bottom of the plot. All graphs use a common X-axis. Y-axes are vertical and labeled on either the left or right side of the graphs. You may have one common Y-axis or individual Y-axes depending upon what plot type you selected.

As you move the mouse through one of the graphs you will see the coordinates of the cursor on the status bar at the bottom of the window. These coordinates are only visible while the mouse cursor is actually inside a graph.
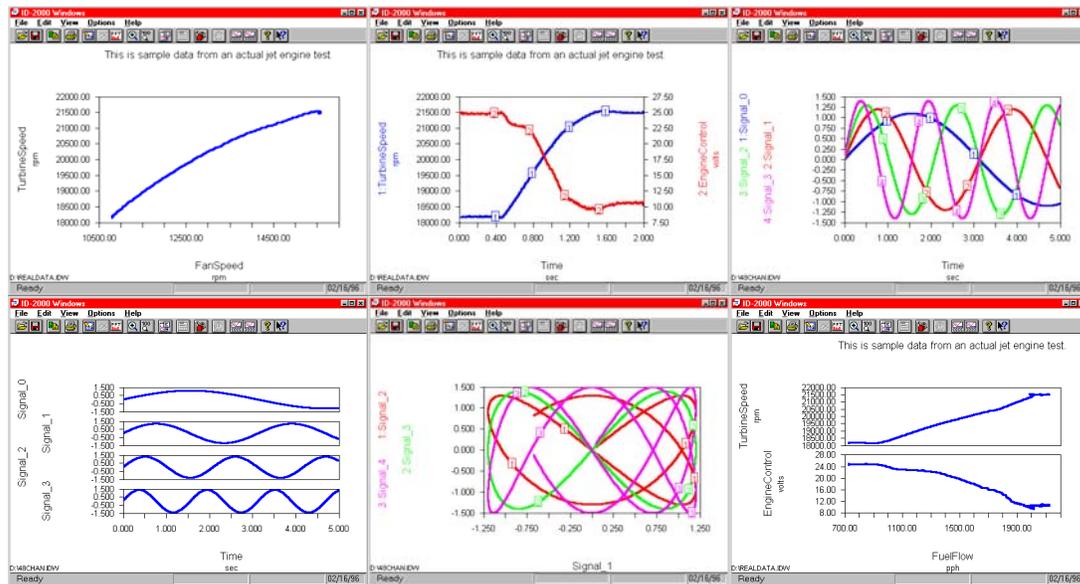
FIGURE 3-1. Plot Views for Various Plot Template Settings

If you have enabled the Data Track feature from the Plotting Preferences dialog box or via the View - Track Rollup menu item you will also see a small "rollup" dialog that displays the actual data values as you move the mouse through a graph.

The mouse cursor coordinates and Data Track coordinates (if enabled) are always available any time the mouse enters a graph.

Delta coordinates are substituted for the mouse cursor coordinates on the status bar any time you click and drag the mouse while inside a graph. These coordinates give you the delta X and delta Y distances from the anchor point which you set when you initially clicked the mouse. As long as you keep the mouse button down delta coordinates will be displayed on the status bar. Releasing the mouse button reverts back to normal mouse coordinates.

ID-2000 offers a unique feature called the "color map". This is a small stripe across the top of each graph if you are plotting Time, Reference Time, or Scan-Number as the X-axis parameter. The color map may look sort of like a rainbow or a "color wash" that goes from one color to another. The purpose of the color map is to provide you a quick visual cue as to where the minimums and maximums of the Y-axis parameter occur.

The colors in the color map correspond to the value of the Y-axis parameter data. If the color map is defined to go from red to yellow then red would correspond to the lowest data value and yellow to the highest data value for the Y-axis parameter. A palette of 100 colors is created for the color map. You may change the colors, disable, or enable the color map in the Preferences dialog box.

3.1 ZOOMING

Zooming allows you to magnify a section of data ("zoom in") or to view more of the entire data file ("zoom out"). To "zoom in" you control the amount of magnification by drawing a rectangle around the data that you want to magnify. To "zoom out" you select one of the preset levels of 200% (scales are doubled), 500% (scales increased by factor of 5), 1000% (scales increased by factor of 10), or FULL (resets scales to full scales from data file). There is also "zoom previous" which either zooms in or out to the settings you previously used.

3.1.1 ZOOM IN

You may want to magnify a particular section of data so that you can see it better. Zooming in with ID-2000 is very easy. To enter the "zoom in" mode you may either select the View - Zoom In menu item or click on the "Zoom In" toolbar button.

> **NOTE**: "Zoom In" mode is denoted by the mouse cursor changing to a small magnifying glass.

Like many Windows applications, you zoom in with ID-2000 by drawing a rectangle around the part of the graph(s) you wish to magnify. This is done by clicking the mouse at a corner of the rectangle and dragging the mouse (which drags a rectangle anchored at the point where you clicked) to the opposite corner. When you release the mouse button at the opposite corner the plot will automatically redraw using scales associated with the area you just defined.

Let's review the example from Chapter 1 where we plotted FanSpeed versus TurbineSpeed and then zoomed in on a portion of the data. Figure 3-2 is our original plot.

To zoom in on the section of data at the top right of the graph you first enter the "Zoom" mode by any of the methods described. When the mouse cursor changes to a magnifying glass we are ready to begin zooming.

Imagine a rectangle around the data that you want to magnify. Move the mouse to a corner of that rectangle and click the left mouse button. While holding the mouse button down drag the mouse toward the opposite corner of the rectangle. A rubber band style rectangle will follow the mouse. When the mouse is where you want the opposite corner to be then release the mouse button. Figure 3-3 shows what you should see just before you release the mouse button and the resulting plot.
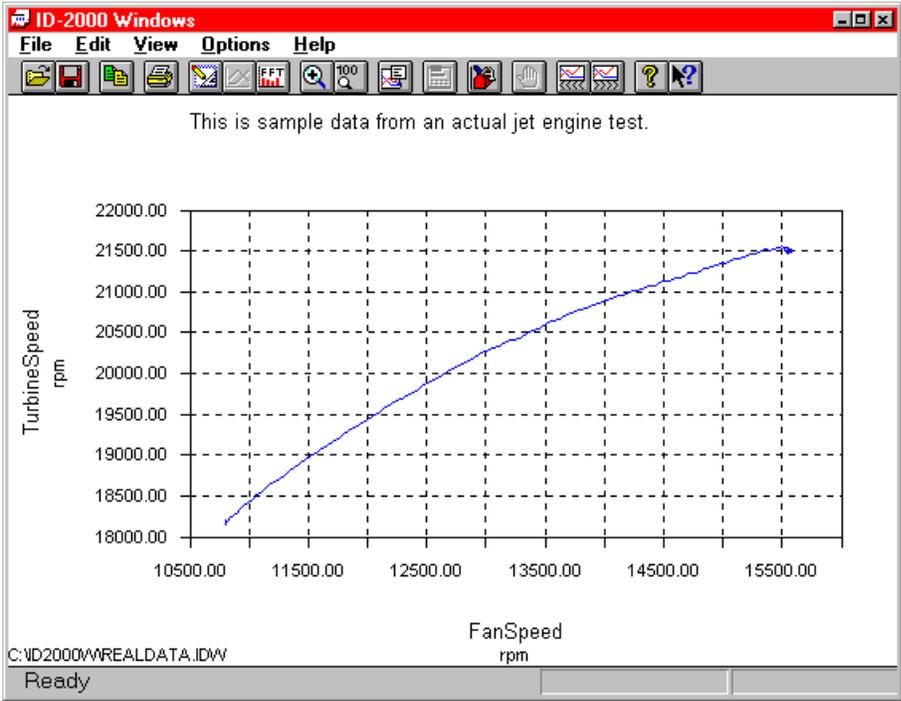
FIGURE 3-2. X-Y Plot
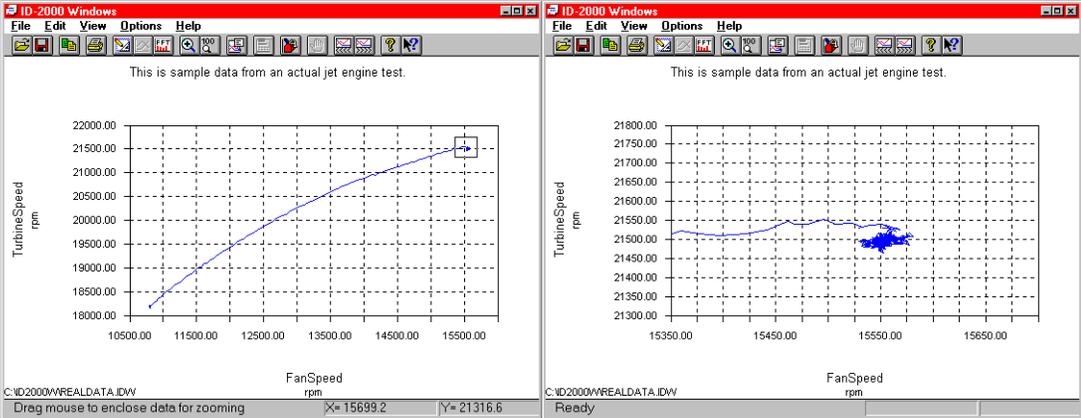
FIGURE 3-3. Zooming an X-Y Plot

Zooming reacts differently depending upon what parameters are plotted and what plot type you are using. In our example we used an X-Y plot of one parameter versus another parameter. In this case the resulting zoomed plot used the rectangle which we drew while zooming. Autoscaling has no affect on this plot since we are not plotting "Time", "Reference Time", or "Scan_Number" on the X-axis.

If our example were changed to a Strip Chart plot of a parameter versus Time the zooming would work a little differently. If we have autoscaling enabled for the Y-axis parameter the resulting zoomed plot will disregard the height of the rectangle you draw and only use the width to scale the X-axis. The Y-axis will be autoscaled according to the data that is plotted using the new X-axis scales.

Both zoom rectangles in Figure 3-4 produce the same plot shown in Figure 3-5. ID-2000 used our zoom rectangles in both cases to only define the time period that we wished to plot. Our zoom rectangles were both approximately the same width starting at 1.7 seconds and stopping at 2.9 seconds. ID-2000 then looked at the data and calculated the optimum Y-axis scale for Signal_5 based upon its data values from 1.7 to 2.9 seconds. The height of the zoom rectangles are disregarded when plotting Time, Reference Time, or Scan_Number on the X-axis with autoscaling enabled for the Y-axis.

If we were to zoom in again on Figure 3-5 between say 2.2 and 2.5 seconds it really would not matter how tall our rectangle is because the Y-axis is going to be autoscaled based upon the data values of Signal_5 between 2.2 and 2.5 seconds. Figure 3-6 shows what it would look like.
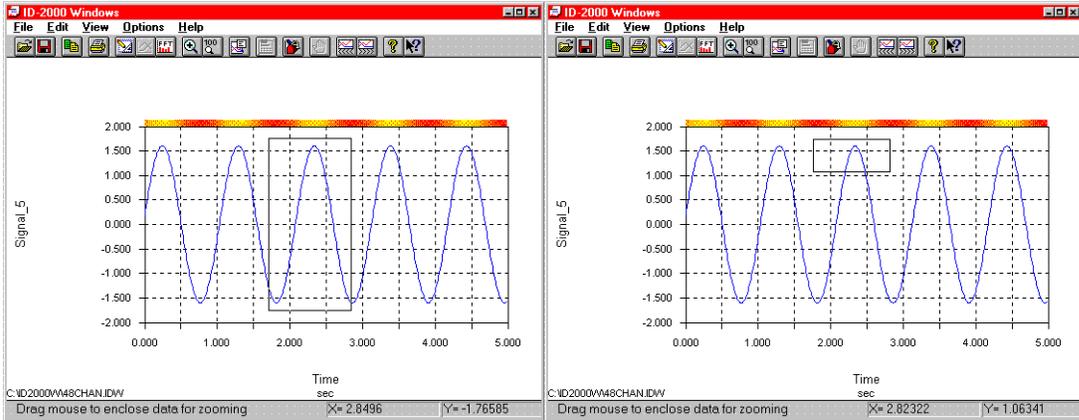
FIGURE 3-4. Zooming Strip Charts using Time and Autoscaling
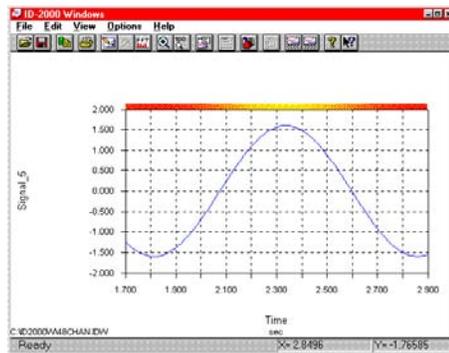
FIGURE 3-5. Zooming Result

Take a look at the left view in Figure 3-6 and you'll see that our zoom rectangle goes from about 2.2 to 2.5 seconds horizontally and about 0.5 to 1.75 vertically. Now look at the right view and you will see that the new plot is scaled from 2.2 to 2.5 for the X-axis. Although our zoom rectangle went from 0.5 to 1.75 the new plot was scaled from 0.8 to 1.6 which is the data value range of Signal_5 between 2.2 and 2.5 seconds.

Autoscaling only affects zooming when it is enabled and the X-axis parameter is Time, Reference Time, or Scan_Number. Any other conditions results in both the height and width of the zoom rectangle being used to determine the new scales.

If your Strip Chart plot has multiple graphs on it as in Figure 3-7 you still zoom the same way. The height of the zoom rectangle doesn't matter - in fact the rectangle doesn't even have to extend through all graphs. It is only the width of the rectangle that matters as long as autoscaling is enabled and the X-axis parameter is Time, Reference Time, or Scan_Number.
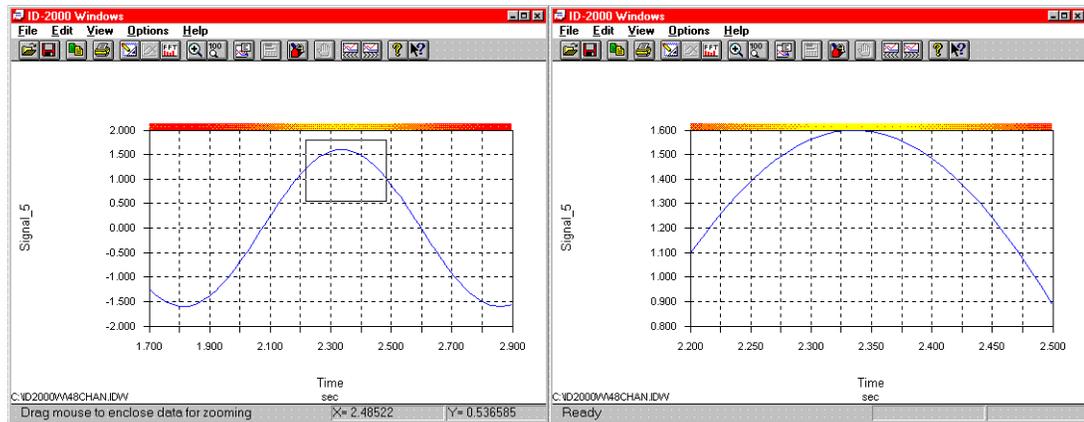
FIGURE 3-6. Zooming Closer
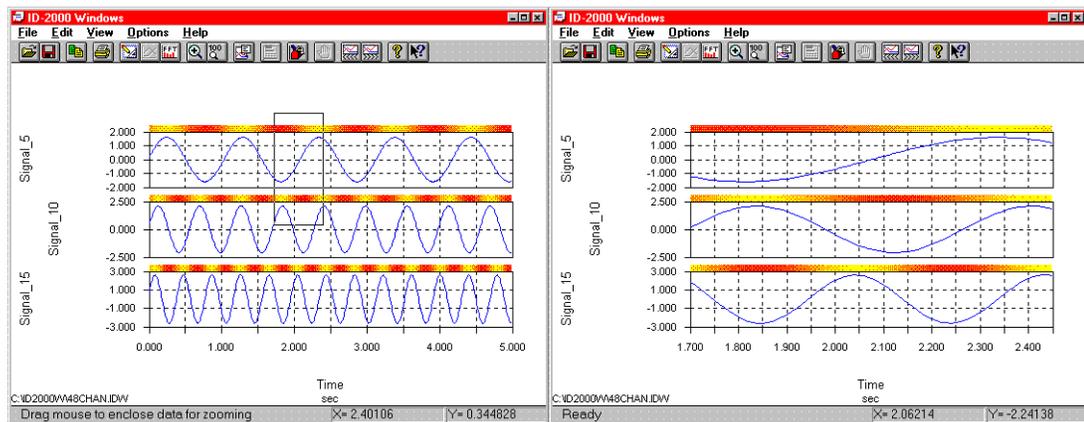
FIGURE 3-7. Zooming Multiple Strip Chart Graphs

Even though our zoom rectangle did not extend into the Signal_15 graph it was zoomed anyway.

If you are confused as to when the height of the zoom rectangle is used then remember these two rules.

- Zoom rectangle height is NOT used when:

    The Y-axis autoscaling is enabled AND the X-axis parameter is "Time", "Reference Time", or "Scan_Number".

- Zoom rectangle height IS used when:

    The Y-axis autoscaling is disabled OR the X-axis parameter is NOT "Time", "Reference Time", or "Scan_Number".

3.1.2 ZOOM OUT

After you have zoomed in on a section of data you may decide that you need to look at a different section of data. Depending upon how closely you zoomed in the current data section, the desired data section may not be visible. Somehow you need to get back to the main plot displaying all the data so that you can then zoom in on the desired data.

There are several ways to zoom out. You could go back to the Plot Template view and then recreate the plot but that would be time consuming and awkward. ID-2000 can zoom out directly from the Plot view. If you click on the View - Zoom Out menu item you will see a sub-menu of items labeled:

    Previous - Zooms in or out to the previous zoom settings you used.

    Full - Zooms out to full scale. All scales are reset to the absolute minimum and maximum contained in the data file. All Time-Start and Time-Stop values are reset to the full length of the data file.

    1000% - Increases both X and Y scales by a factor of 10. If the X-axis parameter is Time, Reference Time, or Scan_Number then Time-Start and Time-Stop are also increased by a factor of 10.

    500% - Same as 1000% except a factor of 5 is used.

    200% - Same as 1000% except a factor of 2 is used.

The only "zoom out" toolbar button is   which zooms out to full scale.

Immediately after selecting the menu item or clicking the toolbar button the plot will be redrawn with the new scales.

> **NOTE**: You may also want to consider using the Save Plot and Recall Plot feature when zooming. These features allow you to save and recall multiple plot settings without having to actually redraw the data. Consider an example of a large data file that takes more than a few seconds to plot. Every time you zoom out to full scale the entire plot has to be redrawn. If you do this many times during a session you could waste a lot of time just redrawing in order to zoom in on a section of data. If you use the Save Plot feature as soon as the plot is first drawn then you are saving a picture of the plot along with all the necessary information ID-2000 needs. When you are ready to zoom out to full scale you can simply recall it with the Recall Plot feature which paints the picture back on the screen and resets all the information to the settings associated with the full plot. This can be much faster than redrawing the plot. Refer to the Save Plot and Recall Plot sections later in this manual for more information on these features.

3.2 PANNING

Panning allows you to shift a zoomed plot either left or right so that you can view data on either side. Panning is only active in the Plot view and only if you have zoomed in on a graph.

Clicking on one of the Pan buttons shifts the current plot left or right by 50%.
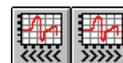
3.3 PLOT NOTES

Any plot in the Plot view can be annotated using the Plot Notes feature in ID-2000. A plot note is a text box that you place on the plot. Each plot note also contains 4 leaders that are attached to each corner of the text box. The leaders may be pulled out from the plot note in order to point to a particular point of interest. Figure 3-8

shows an example of how plot notes and leaders can be used so that someone unfamiliar with the data can still understand the plot.

Adding a plot note is easy. Select the Edit - Add Plot Note menu item to access the Plot Note Text dialog box (Figure 3-9). In this dialog box enter the text that you want to put in the plot note.
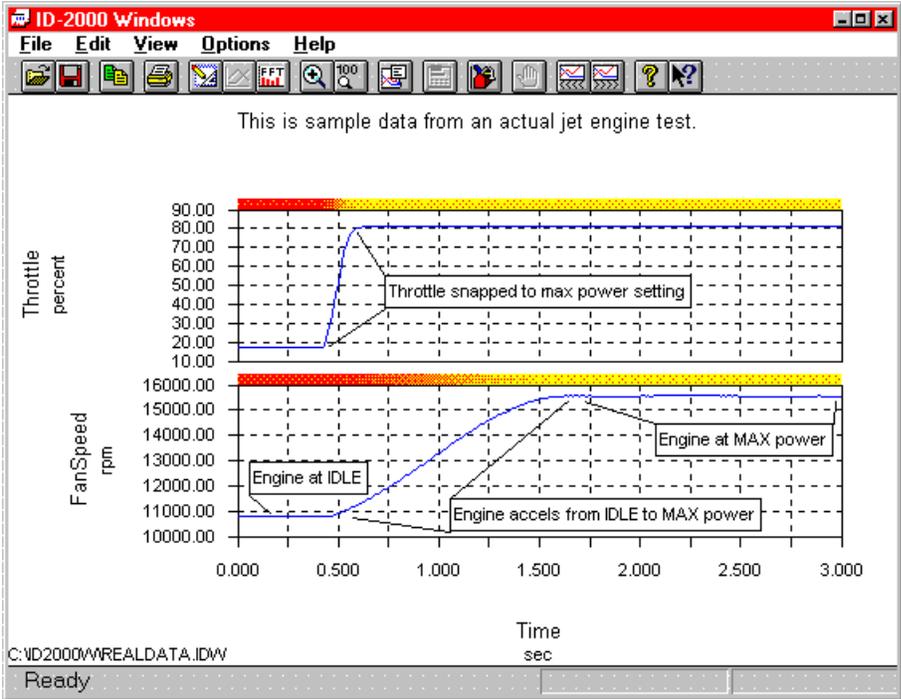
FIGURE 3-8. Plot Notes
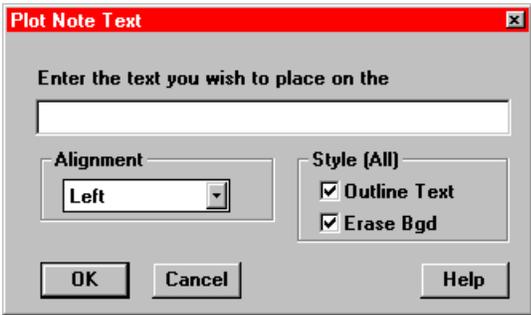
FIGURE 3-9. Enter/Edit Plot Note Text

The text in a plot note is displayed as a single line of text. You cannot split a plot note into multiple lines. While there is no limit to the number of characters you can use in a plot note the most effective notes are very brief and limited only a few words.

You may select whether to use left, center, or right alignment for locating the plot note by selecting the appropriate type in the "Alignment" box. Each plot note may use its own alignment.

In the Plot Note Text dialog you may also change the style used for ALL plot notes. You may select whether or not to have a box drawn around each plot note. (The color of the box can be set in the Preferences dialog). You may also select whether or not to erase the graph behind the plot note. Keep in mind that any Style changes affect all plot notes. These style settings may also be changed via the Preferences dialog.

The mouse cursor will change to one of these cursors (depending upon the alignment you chose) when you have completed entering the plot note text and clicked the OK button indicating that you may now specify the location for the plot note.

A plot note is located by its anchor point. The anchor point depends upon the selected alignment. "Left" uses the upper left corner of the text box as an anchor. "Center" uses the top center point of the text box. "Right" uses the top right corner of the text box. This anchor point MUST fall inside a graph - it cannot be located above the top graph or below the bottom graph. However, the plot note itself may extend outside the graph.

To select the location of the plot note simply move the mouse to the desired location and click the left mouse button.

If you are locating the plot note and move outside the graphs, the cursor will change indicating that it may not be placed at the current location. If you click in an invalid location the plot note placing operation will be aborted.

> **NOTE**: As the cursor indicates, the plot note's anchor point is at the intersection of the small cross-hair in the cursor. This point will be the upper left, center or right depending upon the alignment selected for the plot note.

Once a plot note is located on the plot you may move, edit, or delete it. To select the plot note, click the mouse button inside its text box. You will see four handles at either the corners of the text box or the ends of the leaders (if any).

To move a plot note you must select it, then drag the plot note to the new location. The end of any plot note leaders will remain stationary and stretch to connect to the new plot note location.

You can move a plot note leader by clicking in the leader's handle and dragging it to the new location. If you want to delete the leader simply drag it back inside the text box.

To delete an individual plot note you must select it and then press the delete key or select the Edit - Delete Plot Note menu item. You may delete all plot notes by selecting the Edit - Delete ALL Plot Notes menu item.

To edit the plot note you must select it and then select the Edit - Edit Plot Note menu item.

It is important to understand the life span of a plot note.

- All plot notes are deleted when you return to the Plot Template view.

- If you zoom in so that the plot note's upper left corner is not visible the plot note will be automatically deleted.

- If you zoom in so that the end of a leader is invalid the leader will be deleted (if the plot note is at a valid location it will remain without the leader).

3.4 COPY PLOT

It is simple to insert an ID-2000 plot into another Windows application. Once you have the plot created click the "Copy" toolbar button or select the Edit - Copy menu item. This places a copy of the current plot on the Windows clipboard. Then just "paste" it into whatever application you desire.

"Copy" toolbar button

> **NOTE**: If you have the color map feature enabled you may find that the colors are fewer or different when you paste the plot into other applications. This is common if your display is capable of 256 colors but the application only uses 16 colors. Should you find this condition to exist you can disable the color map feature in the Preferences dialog box, recreate the plot, and then copy it to the clipboard.

3.5 EXPORT PLOT

In addition to copying the current plot to the clipboard you can export the current plot to a device independent bitmap file (.BMP). Once your plot has been created select the File - Export menu item which allows you to enter the file name you wish to save the plot under.

3.6 STATISTICS

ID-2000 can provide quick access to plotted data statistics. There are three methods of accessing these statistics:

- Click the statistics toolbar button:

- Select the View - Statistics menu item

- Click inside one of the graphs using the right mouse button

The statistical information will be displayed in ID-2000's TextPad utility as shown in Figure 3-10.

The statistics displayed are only for the data that is actually plotted. If you have zoomed in on a section of data or specified a Time-Start and Time-Stop that resulted in only part of the data being plotted then the statistics will not be for the entire length of the file.

There are four basic statistics calculated for each plotted parameter including the X-axis parameter. These are:

- MIN - The minimum data point that was plotted

- MAX - The maximum data point that was plotted

- AVG - The average of all data points plotted

- SUM - The "area under the curve" for all data points plotted

If you access the Data Statistics by clicking the right mouse button inside a graph AND the graph has "Time", "Scan_Number", or "Reference Time" as the X-axis parameter you will find additional statistical information. This information consists of the data values for ALL parameters (regardless of whether or not they are plotted) that correspond to the point where you clicked the mouse. This is makes it very easy to check values of multiple parameters at any given time or point in the file without having to plot each one.

The statistical information is stored in a temporary file named IDSTATS.TXT which is automatically loaded into the TextPad utility. This file will automatically be deleted when you have completed viewing the statistics unless you have disabled this feature. The enabling or disabling of the automatic deletion of the statistics file is done via the General Preferences dialog box. (See the section on Preferences for more information.)
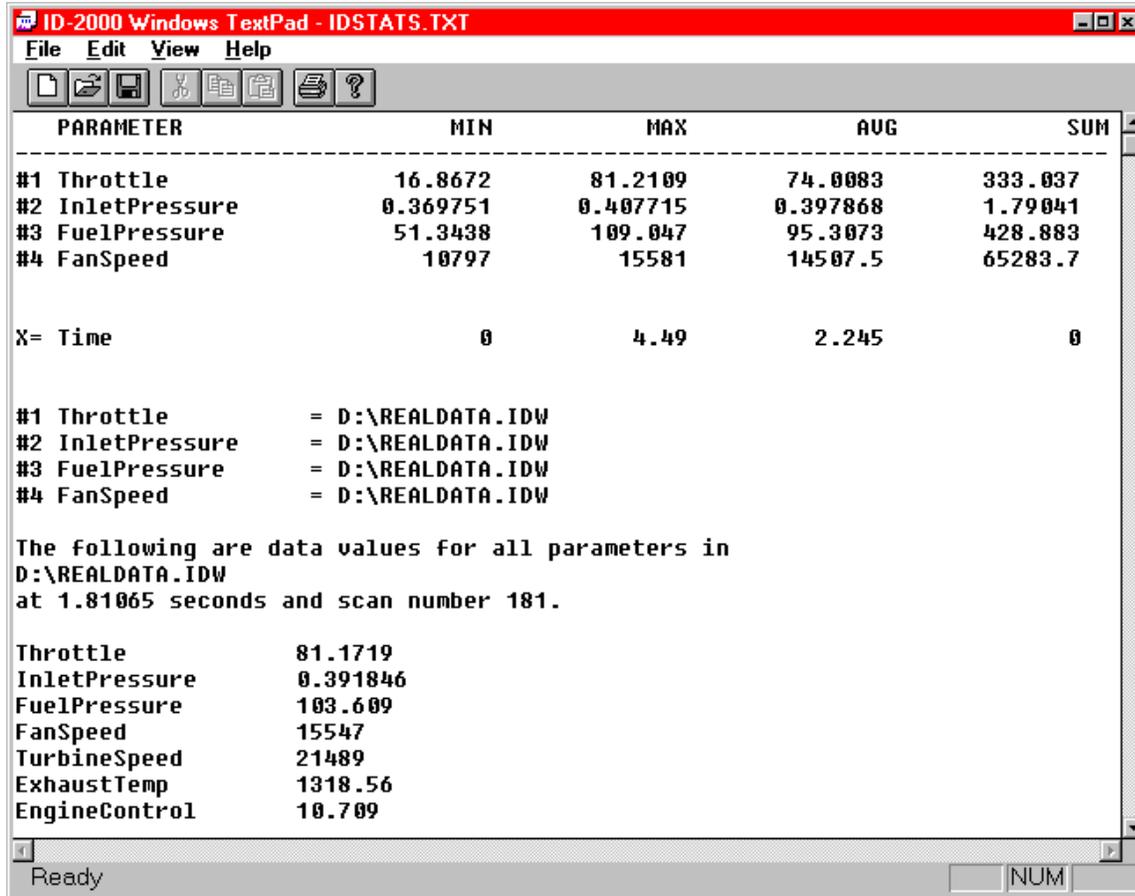
FIGURE 3-10. Data Statistics

NOTE: When you request to view statistics ID-2000 asks Windows to load and run the TextPad utility program which automatically loads the IDSTATS.TXT file. If you have multiple applications active or minimal system resources Windows may not be able to run the TextPad utility (or any other application). Should this occur you will be notified via an error message. You may be able to close other applications in order to free up Windows resources that will allow the TextPad utility to be loaded.

It is also important that you exit TextPad instead of just switching back to ID-2000 which leaves TextPad still running and active.

3.7 SAVE AND RECALL PLOT

We briefly described the save and recall plot feature during our discussion on zooming. The primary reason for using these features is to save you time by eliminating the need to:

- Redraw a plot of a large data file

- Create a plot template to match a specific plot's characteristics.

As we discussed in the zooming section you can use the save and recall feature to make zooming more efficient. Without this feature ID-2000 would have to redraw the plot every time you zoomed out to full scale which could be time consuming on large data files.

There is another benefit of this feature. Consider the case where you are analyzing a plot and think that you are finished with it. You switch back to the Plot Template view, load a different file, and make some other plots. Suddenly you realize that you need to look at that first plot again. If you did not save that plot then you would have to go back to the Plot

Template view and try to remember all of the settings in order to recreate that initial plot. However, if you saved it you only have to recall it. All the plot template settings will be changed back automatically to what they were when you saved the plot initially.

When you save a plot ID-2000 creates two files - one for the image of the plot and one for the Plot Template information necessary to create the plot. These two files are named IDWSAVED.T?? and IDWSAVED.B?? where ?? is the number of the saved plot ranging from 00 to 99. When you decide to recall the plot you simply select it from the recall dialog box and the image of the saved plot is painted in the window.

ID-2000 does not delete any saved plots when you exit ID-2000 or return to the Plot Template view. A saved plot can always be recalled as long its data file(s) still exist and parameters are available. If the saved plot is based upon a calculated parameter you must make sure that the parameter is not deleted or the equation modified.

> **NOTE**: The IDWSAVED files are placed in the "Temporary Path". This path is defaulted to the location specified in the General Preferences dialog

As we discussed one of the major benefits of saving and recalling a plot is not having to redraw the plot. In some circumstances the plot MUST be redrawn. The image of the plot that is saved is strictly dependent upon the size of the ID-2000 application window. If you save a plot and later in your session (or subsequent

sessions) change the size of the application window then the saved plot image does not match your new window size and becomes invalid. You can still recall the plot but since the image is invalid ID-2000 is forced to redraw it using the plot template settings that were saved with it.

To save or recall a plot you may do one of the following:

- Click the Recall or Save toolbar buttons.

- Select the View - Save Plot or View - Recall Plot menu item.

- Use the accelerator keys of F5 or F6.

The Save Plot or Recall Plot dialog will then be displayed as shown in Figure 3-11.

The Save Plot and Recall Plot dialogs are essentially the same. In the Save Plot dialog there is an additional button labeled "New" for saving a new plot image. The second button is labeled "Overwrite" and is used to replace a saved image with the current plot image.

The "Saved" list box contains a list of all the plots already saved. They are numbered 0 through 99. To preview a saved plot image you only need to highlight it in the "Saved" list box. To recall a plot select it and click the "Load" button.
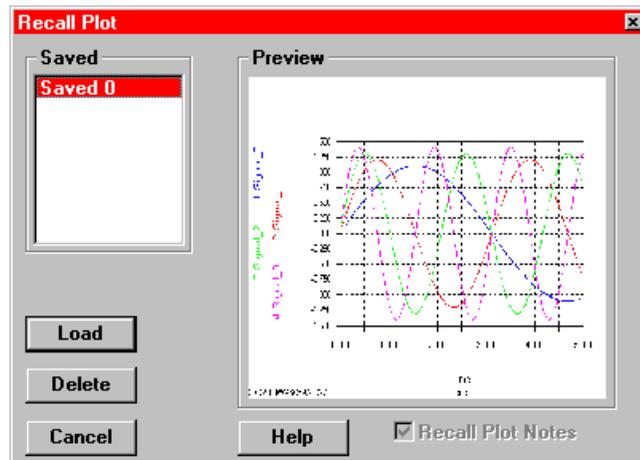

FIGURE 3-11. Save/Recall Dialog Box

3.8 DATA TRACK ROLLUP

At the beginning of this chapter we discussed the various coordinates that can be displayed. The mouse cursor coordinates (either actual or delta) are displayed on the status bar at the bottom of the application window. If you have enabled data tracking you will also see a "rollup" dialog as shown in Figure 3-12.

The track rollup can be moved to any location on the Windows screen (it is not restricted to the ID-2000 application window). In its upper right corner is a button with an arrow on it. This is used to "roll up" or "roll down" the dialog box. The upper left corner contains a Windows system menu button that allows you to close, roll up and down, or arrange the rollup. "Arranging" the rollup automatically rolls it up and locates it at the top left of the Plot view.

> **NOTE**: If you are using Windows 95 you may want to turn off the "Center Dialog Boxes" feature in the Desktop - Preferences. If enabled this feature will force the rollup dialog to be initially displayed in the center of your display.

FIGURE 3-12. Data Track Rollup Dialog

You can display or remove the data track rollup by three methods:

- Check or uncheck the View - Track Rollup menu item

- If the rollup is visible you may close it using its system menu button at the top left corner

- Check or uncheck the Data Track box in the Plotting Preferences dialog.

The data track rollup may only be active if the X-axis parameter is Time, Reference Time, or Scan_Number. When active and rolled down, it displays the data point value of each graph's Y-axis parameter for the point in time or scan number pointed to by the mouse cursor. In addition to these values, small markers are placed on each graph identifying the data point that is being displayed. An example of these markers can be seen in Figure 3-13.
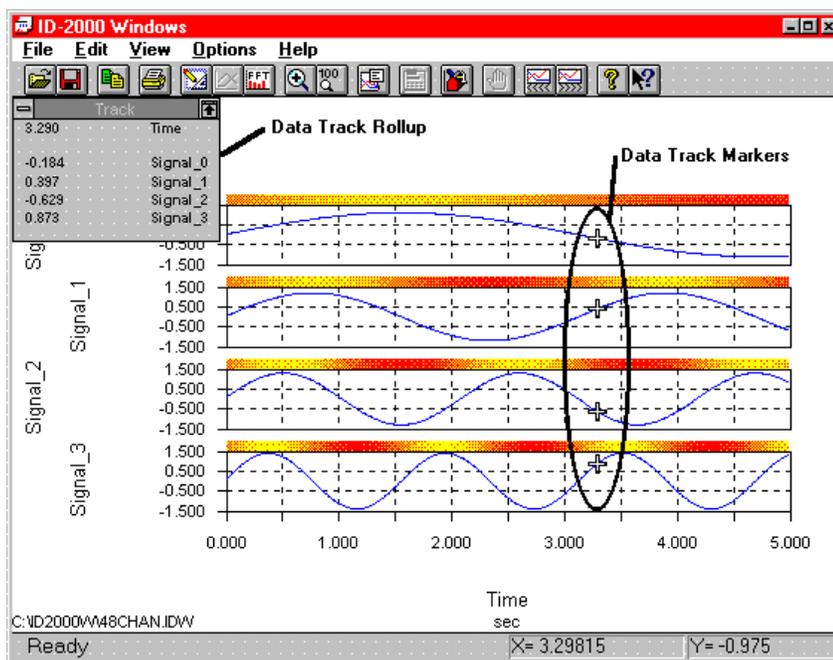
FIGURE 3-13. Data Track Rollup and Data Track Markers

3.9 DATA MARKERS

ID-2000 provides the capability of marking data traces to assist you in distinguishing them on monochrome displays or printers. These markers consist of a small square with a number in it that is displayed periodically along a data trace. Each data trace uses a different number which is also included in the Y-axis parameter title for reference.

Data markers are only available for Multi-Plot and X-Y-Y plots where multiple data traces are plotted on a common graph.

Data markers may be enabled or disabled via the View - Data Marker menu item or the Plotting Preferences dialog.

Figure 3-14 is an example of a Multi-Plot with and without data markers enabled.

3.10 REFERENCE TIME

One of the powerful features in ID-2000 is the capability to overlay data from different files. In order to plot parameters in multiple files versus time you must be able to synchronize the files in time. Selecting the "Reference Time" parameter instead of "Time" for the X-axis parameter allows you to plot data versus time by using a reference time instead of actual time.

In order to use the reference time feature, you must select a point in each data file that will be assigned a reference time of "0.0" seconds. Data prior to that point will be considered to have negative time and points following will have positive time. This technique allows you to synchronize multiple data files at their 0.0 reference time points so that you can perform data trending.
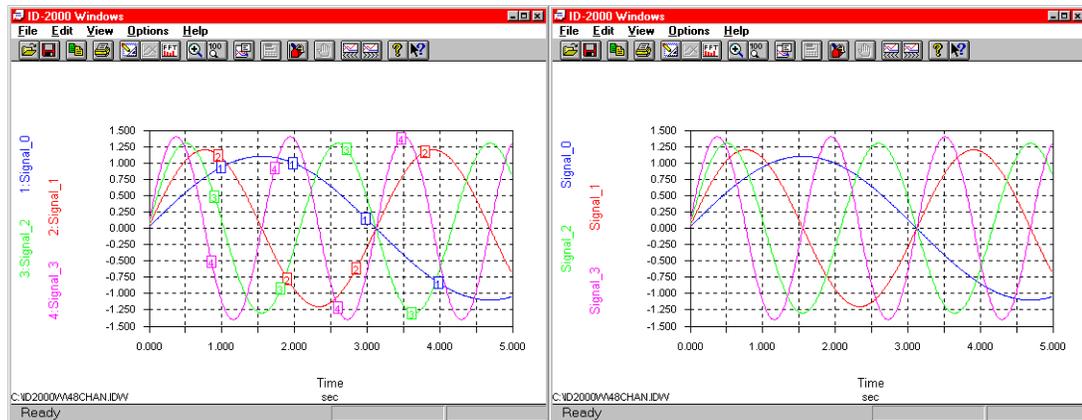

FIGURE 3-14. Multi-Plot with and without Data Markers
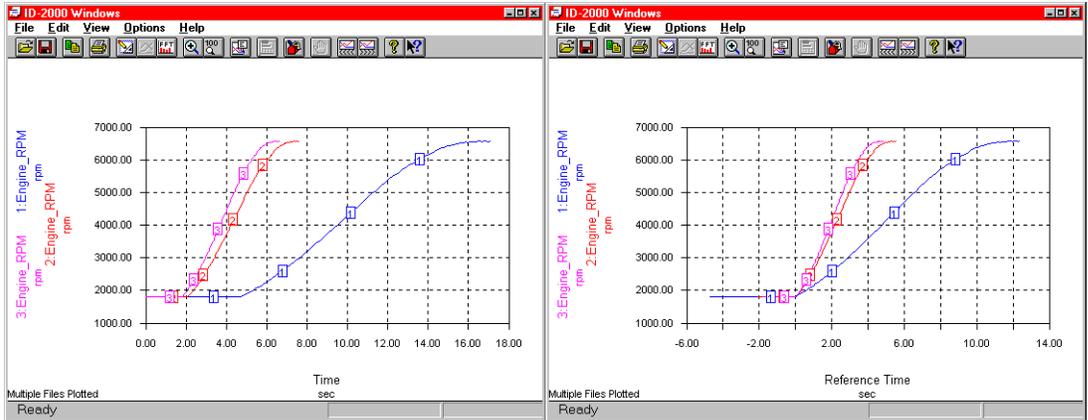
FIGURE 3-15. Reference Time Synchronizes Files

Figure 3-15 shows plots of the same parameter from three different files. The plot on the left simply plots the data versus actual time. The result is that it is difficult to compare the traces because they are not synchronized. The plot on the right uses Reference Time for the X-axis parameter. The 0.0 reference time point was set for each of the data files so that synchronization occurred at a specific location where the engine's RPM began to accelerate.

You only need to set the reference time for a data file once. The location of the 0.0 reference point is stored in the file's header section and is available for every parameter (including calculated parameters). You may change the 0.0 reference time location as often as desired although typically you only need to set it once.

To set the 0.0 reference time location you need to plot one or more parameters versus either Time or Reference Time. You may use any plot type desired when plotting a single file. If you wish to plot multiple files you may only use the X-Y and Strip Chart plot types so that only one data file is on each graph. The point where you want to establish the 0.0 reference time location must be visible on one or more of the graphs plotted. You may wish to zoom in closer on the data in order to more accurately locate where you want the reference time location to be.

Once you are ready to tell ID-2000 where to place the 0.0 reference time point select the Edit - Reference Time menu item. You will then be asked to "point" to a graph (containing a parameter from the data file in which you wish to set a new reference time location). Click the mouse (left button) on the desired graph at the

point you wish to establish as the new 0.0 reference time location. The dialog box shown in Figure 3-16 will then be displayed to let you edit and verify the location of the 0.0 point.

FIGURE 3-16. Edit Reference Time

Repeat this process for every data file that you will be using in you multiple file plot. Remember, you only need to do this once as the 0.0 reference time location remains in the data file header section for future use.

SECTION 4. FFT VIEW

ID-2000 makes no claims to be a full featured frequency analysis product. However, it does offer basic frequency analysis capabilities in the form of Amplitude Spectrum and Power Spectrum plots for those users that need to periodically look at the frequency response of their time-based data. These plots are displayed in the FFT view.

The FFT view is very similar to the Plot view. It can only be accessed from the Plot view by:

- FFT toolbar button:

- Selecting the View - Switch to FFT menu item

The FFT view shares many common features with the Plot View including cursor coordinates, data tracking, zooming, statistics, copying a plot to the Windows clipboard, and printing. For information on these common features refer to the chapter on Plot View.

For those of you not familiar with FFTs or frequency analysis, an FFT is a complex mathematical calculation performed on a set of data points. The result of the calculation is a set of values corresponding to the amplitude or power of the signal at discrete frequency ranges.

Figure 4-1 shows a Power Spectrum plot which displays the amplitude the signal produced for various frequency ranges. The tall bar in the middle indicates that the largest amplitude was concentrated at a single frequency range corresponding to approximately 156Hz.
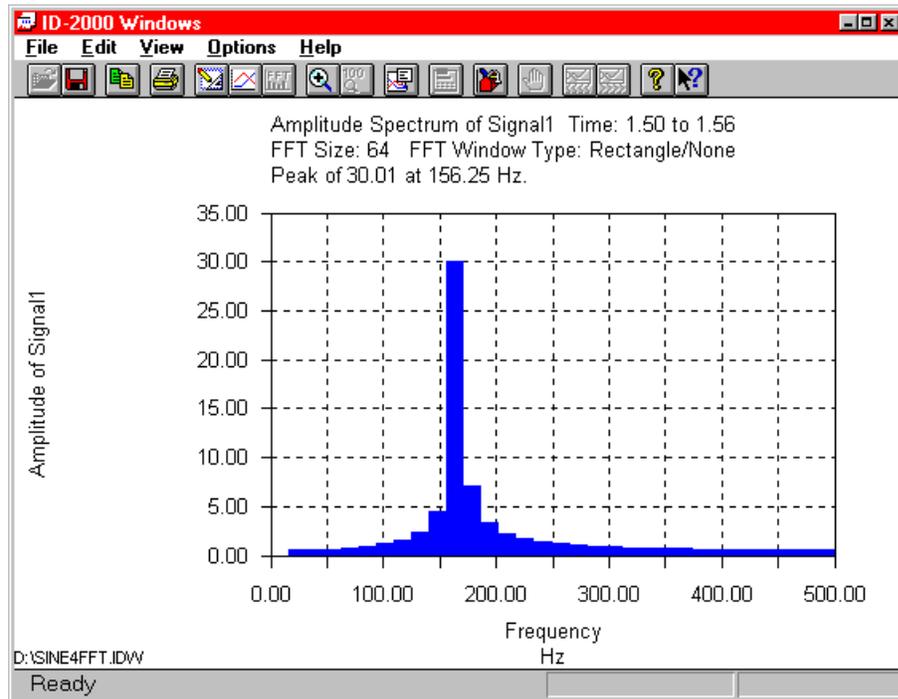

FIGURE 4-1. Power Spectrum Plot

ID-2000 calculates FFTs based upon 64, 128, 256, 512, 1024, or 4096 data points. You select the number of points to use in the FFT Preferences dialog box. The number of data points is important because it directly affects how many frequency ranges can be determined for the signal.

Let's take an example where we specify a 1024 point section of data for a parameter where all the points were recorded at a constant scanrate of 1000/second. An FFT calculation on these points would result in the amplitude (Amplitude Spectrum plot) or power (Power Spectrum plot) for each of 512 frequencies (half the number of data points) ranging from 0Hz to 500Hz (half the scanrate). The number of frequencies determined by an FFT is always half the number of data points in the FFT. The minimum frequency is always 0Hz and the maximum is always half the scanrate. Therefore, an FFT using a small number of data points results in a coarse frequency resolution where an FFT using a large number of data points produces a fine frequency resolution.

Figure 4-2 contains Amplitude Spectrum plots of the exact same data using both the minimum (64) and maximum (4096) number of data points for the FFT calculation.

Both plots have an X-axis scale of 0Hz to 500Hz (half our scanrate) because this scale is only based upon the rate at which the data was recorded - not the number of data points used for the FFT. However, this scale is divided up into frequency ranges equal to exactly one half of the number of points used in the FFT calculation.

For our 64 point FFT plot on the left we have only 32 frequencies ranges to represent the full range from 0Hz to 500Hz. This means that each one corresponds to a frequency range of approximately 500 / 32 = 15.6 Hz (half the recording rate / half the number of points in the FFT).

The plot on the right used 4096 points for the FFT calculation so we can break our 0Hz to 500Hz up into many more frequency ranges with each corresponding to 500 / 2048 = 0.24Hz. You can visibly tell the difference by the width of the bars in the plots. The left plot has fairly wide bars while the plot on the left has very thin bars that look like single lines.
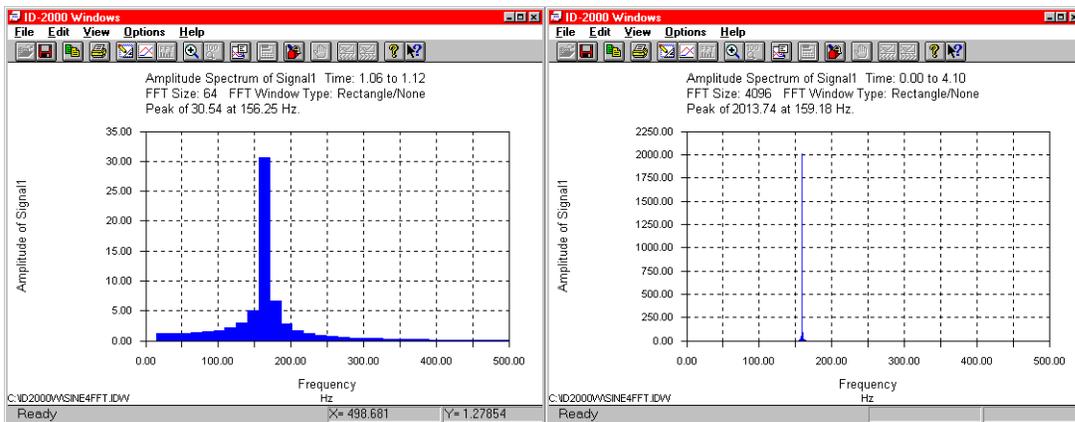

FIGURE 4-2. Effects of FFT sizes

There is another option available for the FFT calculation called "Data Windowing". This is a technique of modifying the FFT data prior to calculating the FFT in order to accent the results. There are different types of data windowing that may be selected from the FFT Preferences dialog. The types of data windowing available are:

- Rectangle or None

- Exact Blackman

- Hamming

- Hanning

- Parzen

- Welch

Now you know the very basics about frequency analysis and how the FFT settings can be used to affect the FFT plot. There are several steps that you have to take in order to produce an Amplitude or Power Spectrum plot of your data.

STEP 1

Make a normal plot (X-Y or Strip Chart) of the parameter for which you wish to create an Amplitude or Power Spectrum plot. There are a couple of restrictions to consider.

- The data must have been recorded at a constant rate. If multiple rates or random

sampling was used in your data file there is no way to calculate the frequency ranges.

- The data file must contain at least as many data points as the FFT size you are going to use. If your data file only contains 500 data points then you obviously cannot use an FFT size of 512, 1024, 2048, or 4096 since there are not enough data points.

- The current plot must have at least as many data points plotted as the FFT size you are going to use.

STEP 2

Select the View - Switch to FFT menu item or click the FFT toolbar button to enter the FFT data selection mode.

The cursor will change to the FFT selection cursor:

Now you must tell ID-2000 what data to use for calculating the FFT. This is done by moving the mouse into the graph and placing the mouse so that the highlighted area covers the data you wish to use as illustrated in Figure 4-3. When the desired data is highlighted click the mouse button to create the FFT plot.
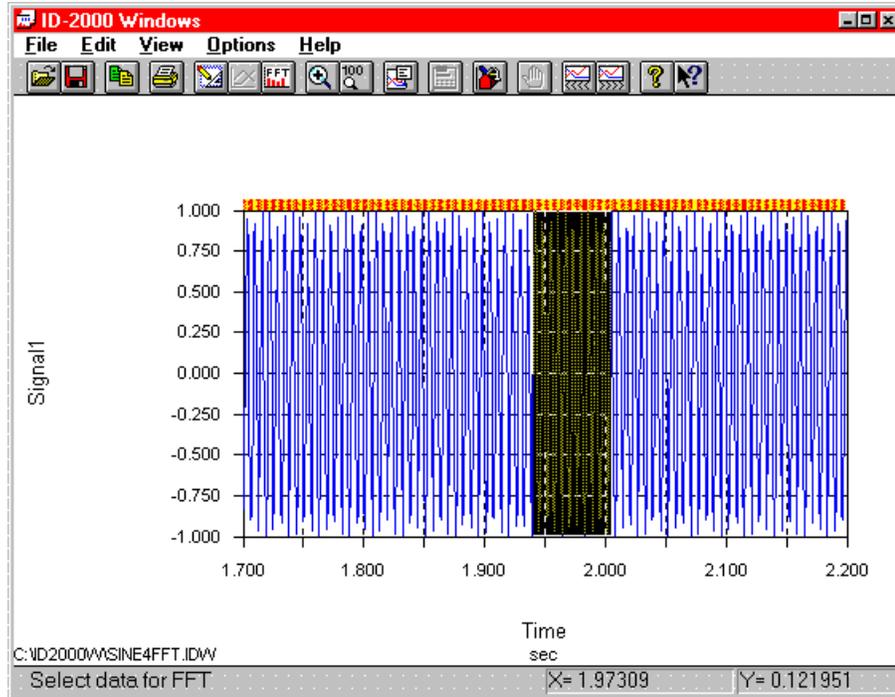
FIGURE 4-3. Selecting FFT Data

There are several options that may be set via the FFT Preferences dialog including plot type, FFT size, data windowing type, use of decibels, and plot style. For more information refer to the section on ID-2000 Preferences. You may modify the FFT plot without going back to the Plot view and reselecting the FFT data by simply changing these options in the FFT Preferences. For example, if you currently have a 1024 point Amplitude Spectrum plot you can easily switch to a 512 point Power Spectrum plot using decibels and any type of data windowing by selecting the appropriate options in the FFT Preferences dialog. The FFT view will automatically redraw to accommodate the new options.

If you change the FFT size in the FFT view ID-2000 attempts to keep the data section used for FFT calculation "centered" about the same point as the current FFT. This is no problem if you select a smaller FFT size. However, selecting a larger FFT size could result in the center point of the FFT data having to be shifted.

If the current center data point is less than one half the FFT size from the beginning of the file it will be shifted forward to the point corresponding with half the FFT size. The entire data section used for calculating the FFT will be set as the first FFT size data points. Consider as an example a 1024 point FFT centered about the 1500th data point in the file. Now assume the FFT size were changed to 4096. The 1500th point could no longer be the center of a 4096 point FFT since it is too close to the beginning of the file. Therefore it would automatically be moved to the 2048th point which would correspond to the FFT data ranging from the first to the 4096th data point.

A similar condition exists if the current center data point is less than one half the FFT size from the end of the file. In this case it will be shifted backward to the point corresponding to file's total number of data points minus half the FFT size.

SECTION 5. CALCULATED PARAMETERS

In addition to plotting any of the original data file parameters, ID-2000 standard parameters, or derivatives/integrals you can also create and plot "calculated" parameters. A calculated parameter is just as it sounds - a parameter that is calculated based upon an equation and other parameter values.

Calculated parameters are powerful analysis tools. You can easily plot parameters such as ratios, multiple parameter averages, normalized parameters, etc. even though they were not originally in the data file. You can even have calculated parameters based upon other calculated parameters.

Calculated parameters are created by an equation which you enter. The resulting data from the equation is appended to the data file. Therefore, you can plot calculated parameters over and over without having to recalculate all of its values each time because the values actually become part of the data file. You can add, delete, or edit calculated parameters in any ID-2000 Windows data file. There is a maximum parameter (original plus calculated) limit of 512 for any data file.

Calculated parameter equations may contain other parameters, other calculated parameters, or standard mathematical functions. Besides the standard mathematical operators you may use functions such as ABS(), SIN(), COS(), etc. in your equations. All equations are saved with the data file which allows you to review or edit the equations at a later time.

Once a calculated parameter is added to a data file it is treated like an original parameter. The only difference is that calculated parameters may be deleted from the data file while the original data can never be changed. All calculated parameters are displayed in the Parameter Selection List in square brackets "[ ]" to distinguish them from the original parameters.

To access the Calculated Parameters dialog either select the Edit - Calc. Parameters menu item or click the calculated parameter toolbar button.

The Calculated Parameters dialog (Figure 5-1) allows you to create new parameters and edit or delete existing parameters.
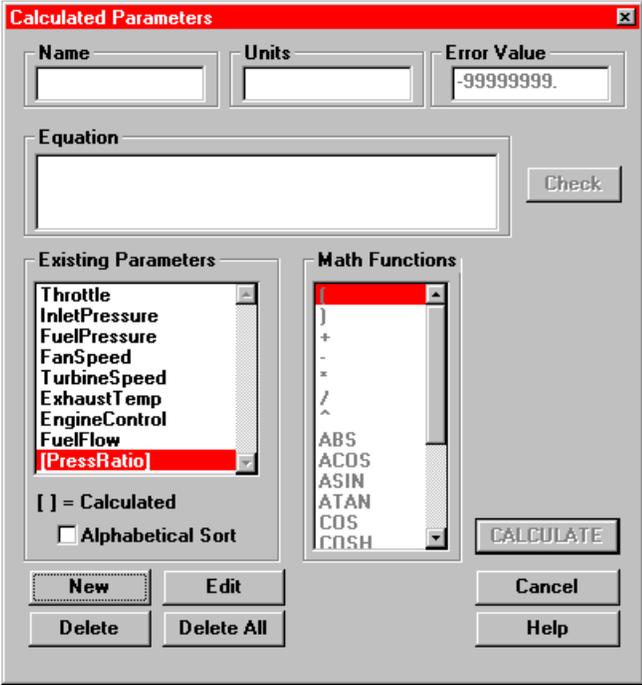

FIGURE 5-1. Calculated Parameters Dialog Box

SECTION 5. CALCULATED PARAMETERS

5.1 EDITING/CREATING

To create a new calculated parameter click the "New" button which activates the "Name" edit box. Use this box to enter the name for the new calculated parameter.

There are restrictions on what you may name a parameter. For detailed information on these restrictions please refer to the chapter on Importing. The following is a brief summary of these restrictions:

- It may be up to 15 characters in length.

- It must start with a letter.

- It must contain ONLY letters, numbers, and the underscore character _.

- It must NOT contain spaces.

- It may consist of both upper and lower case letters.

- It may not be the same as one of ID-2000s standard parameters (regardless of case):

- It may not be the same as one of ID-2000 mathematical functions (regardless of case):

- It may also be useful to use upper and lower case character combinations for parameter names as in EngineSpeed, OilPressure, ExhaustTemp, etc.

To edit an existing calculated parameter in the Existing Parameters list, highlight it and click the "Edit" button. You may also double click the parameter to edit it.

5.1.1 DELETING

To delete an existing calculated parameter in the Existing Parameters list highlight it and click the "Delete" button.

5.1.2 ENTERING AN EQUATION

Calculated parameter equations may contain any parameter in the Existing Parameters list including other calculated parameters, mathematical operators, and/or mathematical functions. The following is a sample equation that uses parameters, operators, and mathematical functions.

$$((TurbineSpeed^{0.5})+Throttle/ABS(PressRatio))$$
$$*(ExhaustTemp/1080.98)^2$$

Equations must not exceed 180 characters in length.

> **NOTE**: If your equation is longer than 180 characters you may be able to break it up into multiple sub equations and then combine them together for a final calculated parameter.

Equations are case sensitive. In the sample equation above notice that some parameters use both upper and lower case characters. You must enter a parameter or math function precisely or ID-2000 will report it as a missing parameter.

Equations may use any of the standard math operators:

- +   Addition

- -   Subtraction

- *   Multiplication

- /   Division

- ^   Raise to power

- ( )   Parenthesis

ID-2000 provides many mathematical functions that may also be used in an equation. These functions are listed on the following pages.

You can manually enter or modify the equation using the Equation edit box. You may also double click on any parameter in the Existing Parameters list or Math Functions list which will cause it to be pasted into the equation at the current location.

When the equation is complete you may check it for errors by clicking the "Check" button. If any errors are found ID-2000 will display the error so that you may correct the equation.

If errors such as 'division by zero' or 'argument too large' occur during the calculation of a calculated parameter, a message will be displayed at the end of the process identifying

the error. Should such an error occur, a value equal to that entered in the Error Value edit box will be substituted for the values that could not be calculated. The default Error Value is -99,999,999.0 but may be changed to any value desired.

> **NOTE**: You may specify any value you wish for the Error Value. However, you should use a value that would NEVER be possible to avoid future confusion as to whether a data point represents a true value or a calculation error.

5.2 MATHEMATICAL FUNCTIONS

Mathematical functions can be used in the equation of a calculated parameter. Mathematical functions have the form of:

FUNCTION(argument)

where 'FUNCTION' is the name of the mathematical function (i.e. - ABS, COS, SIN, etc.) immediately followed by a left parenthesis and no spaces. The function argument may consist of any combination of parameters, operands and/or other functions. The argument must always be followed by a matching right parenthesis. The following is a list of mathematical functions you may use when entering a calculated parameter:

ABS(n**)**

Finds the absolute value for n.

ACOS(n**)**

Calculates the arccossine of n where n must be a value less than 1.0 and greater than -1.0.

ASIN(n**)**

Calculates the arcsine of n where n must be a value less than 1.0 and greater than -1.0.

ATAN(n**)**

Calculates the arctangent of n.

COS(n**)**

Calculates the cosine of n where n must be a value less than 134219000.0 and greater than -134219000.0

COSH(n**)**

Calculates the hyperbolic cosine of n where n must be a value less than 712 and greater than -712.

LOG(n**)**

Calculates the log base 10 of n where n must be a value greater than 0.0.

LN(n**)**

Calculates the natural log of n where n must be a value greater than 0.0.

SIN(n**)**

Calculates the sine of n where n must be a value less than 134219000.0 and greater than -134219000.0.

SINH(n**)**

Calculates the hyperbolic sine of n where n must be a value less than 712 and greater than -712.

TAN(n**)**

Calculates the tangent of n where n must be a value less than 134219000.0 and greater than -134219000.0

TANH(n**)**

Calculates the hyperbolic tangent of n.

All mathematical functions use only upper case characters. When using them in an equation be sure to enter them just as they appear in the Math Functions list box.

SECTION 5. CALCULATED PARAMETERS

SECTION 6. IMPORT/EXPORT

6.1 IMPORTING DATA

ID-2000 includes data import utilities for ASCII data files as well as files produced by specialized data acquisition equipment. To import a data file you may either select the File - Import menu item or click the "Import" button when selecting a Primary or Secondary data file.

There are virtually an unlimited number of file formats in which data may be stored. As a result you may find that ID-2000 is unable to directly import your data. Most data producing programs include the ability to export data to other data formats such as ASCII, DADiSP, etc. Even if your original data file is not directly supported by ID-2000 you may be able to export the data using the software that originally created it to a format that is supported by ID-2000. You should also contact Interface Design to find out if an import program has already been written for your specific file format.

There are two methods for importing a data file into ID-2000. You may select the File - Import menu item or simply click on either the primary file button or a graph's data file button in the Plot Template View window. The file selection dialog box will appear as shown in Figure 6-1.

In the bottom left corner of the dialog is a drop down list labeled "List Files of Type:". If you click on the drop down arrow you will see a list of all "built-in" file imports. They include imports

for data files from previous ID-2000 DOS versions, ASCII text, and various specialized formats produced by different data acquisition equipment.

If you are unable to produce a data file in a format supported by ID-2000 you have two options.

- You can write your own file conversion utility. This chapter contains a complete description of the ID-2000 file format. However, writing a file conversion utility is not a trivial matter and requires significant programming experience.

- Contact Interface Design about having a custom import utility written for you on a contractual basis. This is often faster and more cost effective than trying to write a conversion program yourself. Contact the Interface Design sales department for more information.

Any custom import utility can be added to the "List Files of Type" drop down list in the file selection dialog. This allows you to automatically execute your import utility from within ID-2000. Your import utility will be executed with two command line arguments. The first argument is the name of your data file you wish to import. The second argument is the name of the new ID-2000 Windows file you wish to create.
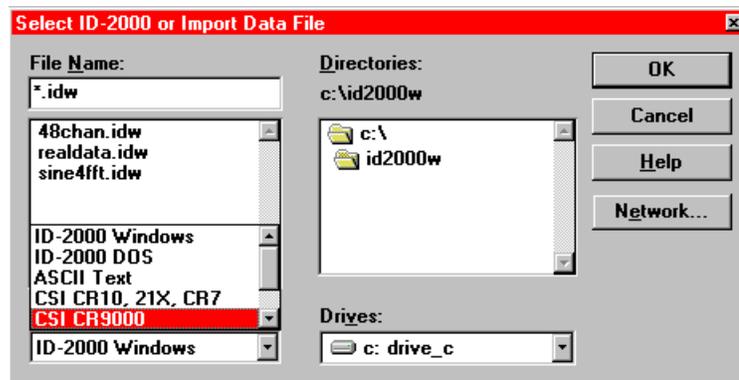

FIGURE 6-1. Select Data File For Import

SECTION 6. IMPORT/EXPORT

To add your custom import utility to ID-2000 follow the steps outlined below:

1. Use the Windows Notepad or other text editing utility to load the IDWIN.INI file located in you Windows directory.

2. Locate the [User Import] section of the file. If you do not have this section in your IDWIN.INI file then add it as a new line at the bottom of the file.

3. On the line(s) below the [User Import] section is where you will add your custom import utilities. The line should begin with "User1=" (without the quotation marks) for the first custom import, "User2=" for the second, "User3=" for the third and so on. Following the equal sign should be the description you wish to see in the drop down list. Place a comma after the description and then the data file extension of your data files (i.e. - *.dat). If you wish to search for multiple file extensions simply separate them by a semi-colon (i.e. - *.dat;*.txt;*.prn;*.csv). Place another comma after the file extension and then the full path name of your custom import utility. Here is an example of two custom imports that have been added:

> [User Import]
>
> User1=My Import,*.dat,C:\ID2OOOW\CUSTOM1.EXE
>
> User2=Your Import,*.dat,C:\ID2000W\YOUR.EXE

Keep in mind that ID-2000 merely sends a request to Windows asking it to execute your custom import program when you select your data file. If your system does not have enough resources to simultaneously run your custom import program then the request is denied by Windows.   Should this happen you may be able to close other applications you might have running to free additional Windows resources.

When your custom import program activates, remember that it is running simultaneously with ID-2000. This means that you should exit your program (or have it automatically terminate) when you are finished with it instead of leaving it active and merely switching back to the ID-2000 window. This will allow any memory and resources used by your application to be returned to Windows.

6.1.1 USING THE ASCII TEXT IMPORT

There is no standard ASCII file format. ASCII only implies that text characters are used instead of binary formatted data. As a result, there are an infinite number of ASCII formats that may be encountered. Fortunately, most data acquisition programs that produce ASCII files follow some general guidelines. These guidelines are used by the ID-2000 ASCII import feature.

Below is a portion of a sample ASCII file that may be imported using the ASCII Text file type in ID-2000.

```
Pressure1,Pressure2,Pressure3,..
psia,psia,psia,...
0.021999,0.047987,0.077953,...
0.032995,0.071957,0.116842,...
0.043988,0.095898,0.155626,...
0.054977,0.1198,0.19427,...
0.06596,0.143655,0.232738,...
```

Here is another sample of the same file but using another ASCII format.

```
Pressure1    Pressure2    Pressure3    ...
psia         psia         psia         ...
0.021999     0.047987     0.077953     ...
0.032995     0.071957     0.116842     ...
0.043988     0.095898     0.155626     ...
0.054977     0.1198       0.19427      ...
0.06596      0.143655     0.232738     ...
```

And still another format of the same file

```
"Pressure1"  "Pressure2"  "Pressure3"  ...
"psia"       "psia"       "psia"       ...
0.021999     0.047987     0.077953     ...
0.032995     0.071957     0.116842     ...
0.043988     0.095898     0.155626     ...
0.054977     0.1198       0.19427      ...
0.06596      0.143655     0.232738     ...
```

As you can see from the above examples there truly are many different formats that can be used to store data. Therefore ID-2000 makes some basic restrictions on the formats that can be imported.

- The data must be in column format. That means that each line of data must contain one value for each parameter. The result is that data for the first channel is the first number one each line. The second channel is the second number, and so on.

- White space (spaces and tabs) are ignored. This means you can have any number of spaces or tabs separating the data.

- Each line must end with a carriage return character followed by a linefeed character.

- Each line must contain the same number of values.

- Each line of data must begin with a numerical value. It can of course have white space characters since they are ignored.

- Each value on a line must be separated by a space, tab, and/or comma. Multiple spaces and tabs may be used between values although only one comma may be placed between values.

- There are no blank lines.

- The parameter names and units for the data are optional. If they are included they must be on the line(s) immediately before the first line of data.

- Parameter names and units may be enclosed in quotation marks.

- Parameter names must conform to the ID-2000 parameter naming restrictions. (Refer to the Parameter Names section later in this chapter).

- There can be any number of header lines at the beginning of the file provided that none begin with a numerical value.

- All data in the file must be recorded at a single constant rate.

Some import types may require you to enter additional information in order to complete the import procedure. The "Enter File Information" dialog box allows you to specify the starting date/time and recording rate as well as edit the names and units used for the imported parameters.

Depending upon what information could be determined from the import file, some of the items in the "Enter File Information" dialog box may disabled.

Most of the time you only need to enter additional information when importing an ASCII file or other imports that are missing necessary information such as the recording date/time, recording rate, or parameter name information.

Figure 6-2 displays the "Enter File Information"   dialog box.
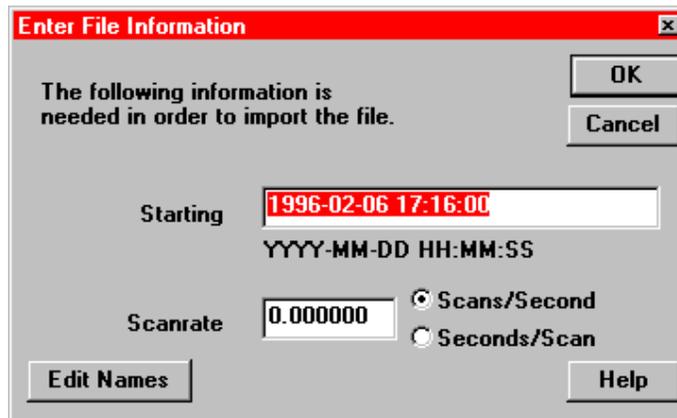

**FIGURE 6-2. Import File Information**
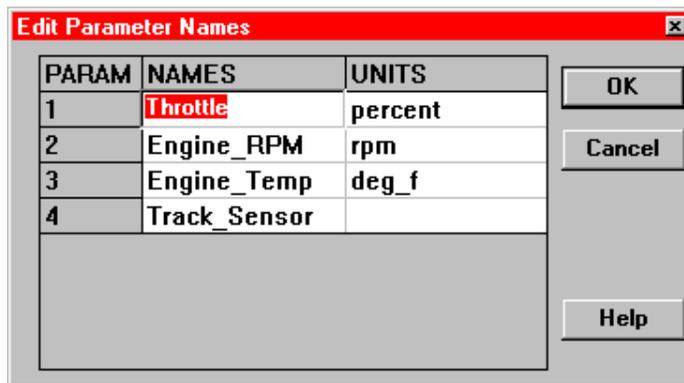
FIGURE 6-3. Edit Parameter Names

The date and time are defaulted to the file creation date of the import data file. You should change this to reflect the precise time/date of the first data point in the file. You must enter the date/time in the following format:

YYYY-MM-DD HH:MM:SS

as in 1993-09-14 19:43:22 which represents September 14, 1993 at 7:43:22 p.m.

The scanrate may be entered as either the number of scans/second or seconds/scan. Check the box that corresponds to the value entered for the scanrate.

You may edit the parameter names by clicking on the "Edit Names" button which displays the "Edit Parameter Names" dialog box displayed in Figure 6-3.

6.2 PARAMETER NAMES

When importing certain types of data files or creating calculated parameters you will need to create a parameter name. So that your new parameter name does not conflict with any ID-2000 processes you must follow several guidelines when determining a parameter name.

- It may be up to 15 characters in length.

- It must start with a letter.

- It must contain ONLY letters, numbers, and the underscore character "_".

- It must NOT contain spaces.

- It may consist of both upper and lower case letters.

- It may not be the same as one of ID-2000s standard parameters (regardless of case):

    Time
    Scan_Number
    Scanrate.

- It may not be the same as one of ID-2000 mathematical functions (regardless of case):

    ABS
    ACOS
    ASIN
    ATAN
    COS
    COSH
    LOG
    LN
    SIN
    SINH
    TAN
    TANH

- It may also be useful to use upper and lower case character combinations for parameter names as in EngineSpeed, OilPressure, ExhaustTemp, etc.

If you have entered an invalid name (or one is included in a data file being imported) the Invalid Name dialog box will be displayed.

ID-2000 keeps track of parameter name substitutions that you have previously used and will attempt to default the same substitution. As in the figure above a parameter using the restricted name of "Time" must be changed. In the "Enter new name" field the new name of "MegadacTime" is defaulted because that was

previously used for a parameter originally named "Time". ID-2000 stores all the name substitutions you use from the Invalid Name dialog in the IDWIN.INI file under Name Substitutions. You may of course enter any name desired for a parameter with an invalid name. Doing so will simply update the IDWIN.INI file with the new name you select.

You may optionally include units for any, all, or none of the parameters.

6.3 EXPORTING DATA

Any ID-2000 data file may be exported as another ID-2000 file, an ASCII text file, or DADiSP file.   ID-2000 also allows you to perform a partial export by specifying which parameters and what section of data you wish to export.

To export a data file select the File - Export menu item from the Plot Template view. The standard file selection dialog box will be displayed so that you can select which ID-2000 Windows data file you wish to export. The default is the current primary data file.

After selecting which file to export the file export dialog box is displayed for selecting what type of file format you wish to export and the name of the exported file. Figure 6-4 shows the file export dialog box.

In the bottom left corner of the dialog is a drop down list labeled "List Files of Type:". If you click on the drop down arrow you will see a list of all export file formats. They include ID2000 - Windows (used for partial exports to another ID-2000 file), ASCII Column, and DADiSP.

After selecting the export file format the Export Data Selection dialog box is displayed to allow you to select various export options.
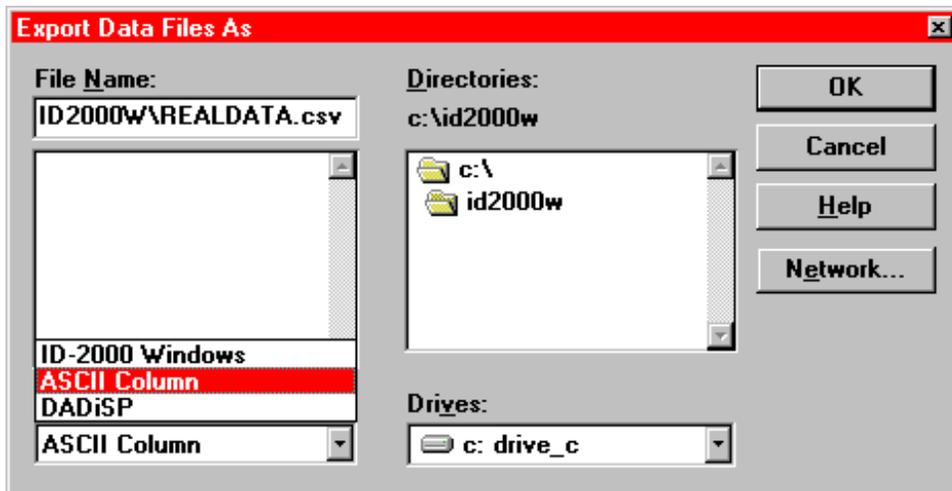
**FIGURE 6-4. Select Export Type and File Name**
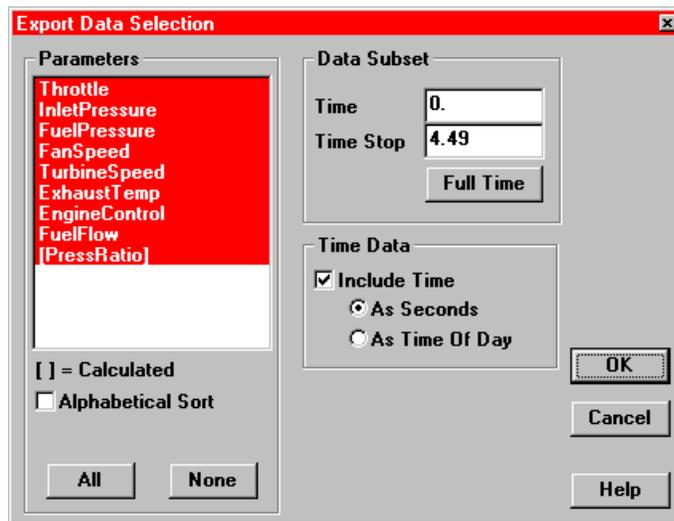
FIGURE 6-5. Export Data Selection

You may export all or only a portion of an ID-2000 Windows data file. After selecting the data file to export, the export file format, and the export file name the Export Data Selection dialog box is displayed as shown in Figure 6-5.

The parameter list on the left is used to select the parameters you wish to include in the export. The default is all of the parameters are exported. You may use the "All" and "None" to quickly select or de-select all of the parameters or you may individually click on a parameter to turn it on/off. You may also check the "Alphabetical Sort" box if you prefer to list the parameters in alphabetical order.

The Data Subset group in the upper right is used to specify a subset of the entire file. The Time Start and Time Stop default to the beginning and ending of the file which will export all the data for each selected parameter. Figure 6-3 shows these fields with values of 0. and 4.49 which represent the entire length of the data file being exported. If you only wanted to export data between 1.0 and 2.0 seconds you would simply edit the Time Start field and Time Stop field to show 1.0 and 2.0 respectively.

The Time Data group is only available for ASCII Column exports and is not applicable to ID-2000 Windows or DADiSP exports. For ASCII Column exports you may optionally include time

as an exported parameters by checking the "Include Time" box. If time is exported it will be the first parameter and labeled "TIME" with a units label of "sec". You may also select what type of format should be used for the time data. "As Seconds" produces a floating point number corresponding to the elapsed time in seconds since the first data point. "As Time Of Day" produces a string value formatted as YYYY-MM-DD HH:MM:SS.SSS. An example of this format would be:

> 1995-12-01 18:05:45.289

which represents December 1, 1995 at 6:05:45pm with 0.289 fractional seconds.

6.4 DATA FILE FORMATS

Most data that is recorded by some type of instrument such as a data logger, analog to digital converter, etc. is stored in what we will refer to as a "by scan" format. This means that the data is stored in the following pattern:

Param0 - Param1 - Param2 - ... - ParamN - Param0 - Param1 - Param2 - ... - ParamN

where Param0 represents the value of the first parameter and ParamN is the value of the last parameter. One reading of each parameter is called a "scan" of data. Therefore a "by scan" format consists of the first scan of data followed by the second scan followed by the third scan and so on.

This format is very inefficient for plotting large data files. The reason is simple. Consider as an example a large data file with 10 parameters in it and 100,000 scans (readings of each parameter). If you want to plot the first parameter you would need to open the data file, read one number, skip nine numbers, read one number, skip nine numbers, etc. until all 100,000 values for the first parameter were read. You could alternately read every number in the file (all 1,000,000 numbers) and throw away 90% of them only keeping the first parameter values (10%). Either way is very inefficient and slow.

ID-2000 uses what we will refer to as a "by parameter" file format. This simply means that all the data for the first parameter is sequential in the file and can be read as one continuous data block. In our example the first 100,000 numbers would all be Param0 data. The next 100,000 numbers would be all Param1 data. And so on. This is much more efficient for plotting since a parameter can be plotted by reading just that parameter's data without having to skip numbers or throw away unneeded numbers.

Unfortunately, the "by parameter" format is not efficient for real-time recording so most data loggers and data acquisition equipment use the "by scan" format instead. Therefore most data files must be imported or converted to the ID-2000 format in order to plot them.

6.4.1 DATA FILE FORMAT

The ID-2000 data file format is listed here for informational purposes only in order to assist you should you decide to write your own file conversion. Many of the terms used to describe the file format is technical and associated with the C programming language constructs.

> **NOTE**: Unless you are experienced in C programming it is not advisable to attempt to create a file conversion utility yourself. Interface Design personnel will only explain the format and will make no attempt to help you actually write a conversion program unless you wish to do so on a contractual basis. For more information on C language data types refer to your C compiler manual.

The ID-2000 Windows file format consists of a file header followed by all the data for the first parameter, then the second parameter, etc. This header is placed at the beginning of the data file and contains necessary information such as the number of channels, number of scans, parameter names, recording rate, etc.

TYPE	SIZE	DESCRIPTION
string	12 + NULL	ID-2000 data file signature. Must be "IDWIN 1.0" space padded to 12 characters followed by a NULL byte
unsigned integer	2	Must be equal to 0
string	60 + NULL	First line of data file comments
string	60 + NULL	Second line of data file comments
string	60 + NULL	Third line of data file comments
long integer	4	Recording start time in seconds since midnight (00:00:00), January 1, 1970, Universal Coordinated Time
unsigned integer	2	Number of parameters including calculated parameters but not including TIME if it is a recorded parameter
unsigned integer	2	Number of calculated parameters
unsigned long integer	4	Number data scans (one reading of each parameter is a scan)
byte	1	0 if time is calculated by following rate information 1 if time data is included in the file. See NOTE 1
unsigned integer	2	Number of scanrates (0 if time data included in file or >0 if time is to be calculated)
struct RATES	see NOTE 2	Data structure containing recording rate information
struct CHAN	see NOTE 3	Data structure containing parameter information
unsigned integer	2	Number of event markers
unsigned long integer	4 * number of event markers	Scan numbers of event markers
double	8	Reference time in delta seconds from beginning of test. See NOTE 4
byte	1	0 = single precision data (4 bytes) 1 = double precision data (8 bytes)

NOTE 1:
The time corresponding to each data point can either be calculated based upon the recording rate and the time of day for the first data point or actual time data can be stored in the data file. The most efficient method of handling time is for ID-2000 to calculate it. In order to do this the data must have been recorded using one of the following methods:

- All data was recorded using a single constant rate throughout the data file.

- All parameters were recorded at the same rate for any give scan but the rate changed one or more times during the data file.

If the data was not recorded using one of these methods then time data must be contained in the data file. The time data must start at 0.0 seconds and continually increase through the file.

NOTE 2:
If time data is included in the data file this structure array will not be present. If time is to be calculated then the rate information must be contained in an array of the following C language structures:

struct RATES

{

unsigned long	4 bytes	Scan number where rate changed. First rate must be set with a scan number of 0.
double	8 bytes	Rate in seconds/scan. (Remember that a scan is one reading of every parameter)

}[number of scanrates]

The RATES structure array, as well as all ID-2000 structures, are packed on 2 byte boundaries for performance.

If your data file was recorded at a single constant rate you would use a value of 1 for the number of rates and the RATES structure would contain just one entry for the two elements.

Now assume that your data file was recorded with the rate being changed three times during the recording. It started out at 100 scans per second (0.01). At scan number 1150 the rate was changed to 1000 scans per second (0.001). And finally at scan number 6750 the rate was changed to 10 scans per second (0.1). The RATES structure array would be filled out as follows:

ARRAY ENTRY	SCAN NUMBER	RATE
0	0	0.01
1	1150	0.001
2	6750	0.1

NOTE 3:
The parameter information is contained in the following array of C language structures:

struct CHAN

{

string	15 + NULL	Name of parameter
string	15 + NULL	Parameter units
double	8	Minimum data value for this parameter
double	8	Maximum data value for this parameter

}[number of parameters]

> **NOTE 4:**
> ID-2000 allows you to plot parameters versus "reference" time instead of standard time in order
> to synchronize multiple data files about a common data event. The reference time value in the
> file header is the time (in seconds from the beginning of the data) for the point that you wish to
> use as a reference data point. Initially this point should be set as 0.0 which refers to the
> beginning of the data file. However, the user may modify the reference time point which updates
> this variable in the file header.

This ends the header section of the file. What comes next in the file is actual parameter data values. If
time data is included in the file it is placed immediately after the header. If time is being calculated by
using the scanrate information then the data values for the first parameter is placed immediately after
the header. Following the last data point of the first parameter is the first data point of the second
parameter. All values of a parameter are included sequentially followed by all the values of the next
parameter and so on.

ID-2000 has the capability of adding calculated parameters to a data file. All calculated parameter values
are appended to the end of the original data in the file. The parameter information is included in the
CHAN structure array located in the header. Calculated parameters are placed in the data file like the
data for other parameters except that it begins with a 181 character null terminated string that contains
the equation used to create the calculated parameter. Immediately following this string starts the
calculated parameter data values.

SECTION 7. PREFERENCES

ID-2000 has many features that can be adjusted. All of these adjustments are made using the Preferences tabbed dialog box which may be accessed by either the Options - Preferences menu item or by clicking the Preferences toolbar button:

As it's name implies it is a "tabbed" type dialog box that combines multiple dialog boxes into one. Clicking the desired tab activates the dialog for that tab. Figure 7-1 depicts the "Plotting" tab dialog that allows you to control various settings associated with how data is plotted and displayed.

The Preferences dialog contains six different tabs which are described throughout this chapter.

Each dialog uses the same three buttons at the bottom.

7.1 PLOTTING PREFERENCES

This dialog contains four basic control groups named "Time Format", "Performance", "Display Items", and "Miscellaneous". Inside each of these groups are multiple check boxes, radio buttons, or edit boxes that allow you to control various aspects of how ID-2000 plots and displays data.

7.1.1 TIME FORMAT

When you plot the Time or Reference Time parameter you can control how the time is displayed. The default format is "Seconds (0.0)", which displays time in seconds from the beginning of the data file. In this format time would always begin at 0.0 and increase to the total number of seconds data was recorded.

If you have a particularly long file you may prefer using the "24hr Clock (0.0)" format which displays time in hours, minutes, and seconds relative to the beginning of the data file. The first data point's time would be displayed as 00:00:00.0. If the total time displayed exceeds 24 hours then the format is modified to displays the number of days also. This is not "time of day" time and always starts at 00:00:00.0.
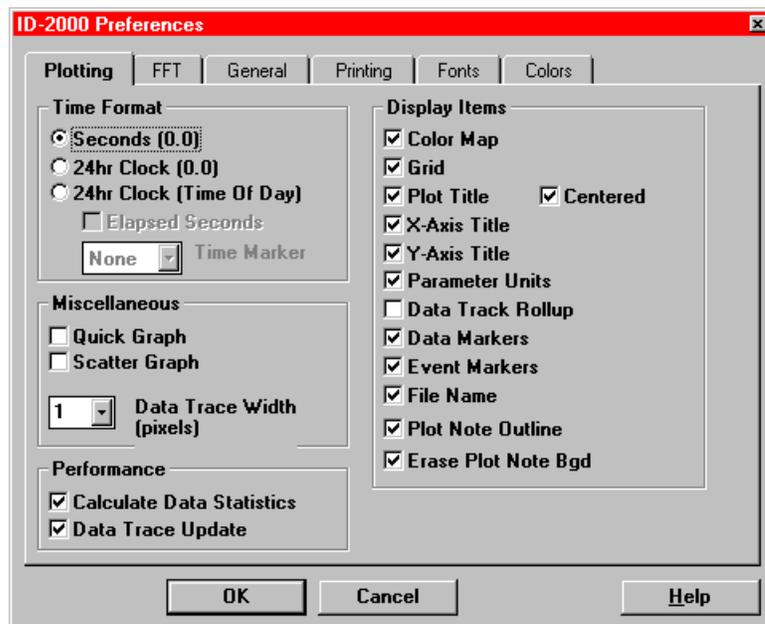

FIGURE 7-1. Preferences Tabbed Dialog

SECTION 7. PREFERENCES

In some instances you may desire to use "24hr Clock (Time Of Day)" format which displays time in a multi-line label. The first line contains the time of day in hours, minutes, seconds format. This does not begin at 00:00:00.0 as the previous format but the actual time of day when the data file began to be recorded. The next line of the label contains the date in either month/day/year or day/month/year format (see the General - Preferences description later in this chapter).

Figure 7-2 displays the same plot with the three different time formats.

The time formats used in Figure 7-2 starting with the far left plot are "Seconds (0.0)", "24hr Clock (0.0)", and 24hr Clock (Time Of Day).

NOTE: You cannot use the 24hr Clock (Time Of Day) format when plotting multiple files.

There are two additional items in the Time Format group. The first of these is labeled "Elapsed Seconds" and is only available in either of the 24hr Clock formats. Enabling the "Elapsed Seconds" will insert the same label as produced by the Seconds (0.0) format above the normal labels. If this feature were enabled on the example above using the 24hr Clock (Time Of Day) format the first tick label would be changed from:

	Elapsed Seconds disabled	Elapsed Seconds enabled
Line 1	17:16:00	0.0
Line 2	02/06/1996	17:16:00
Line 3		02/06/1996

FIGURE 7-2. Time Formats
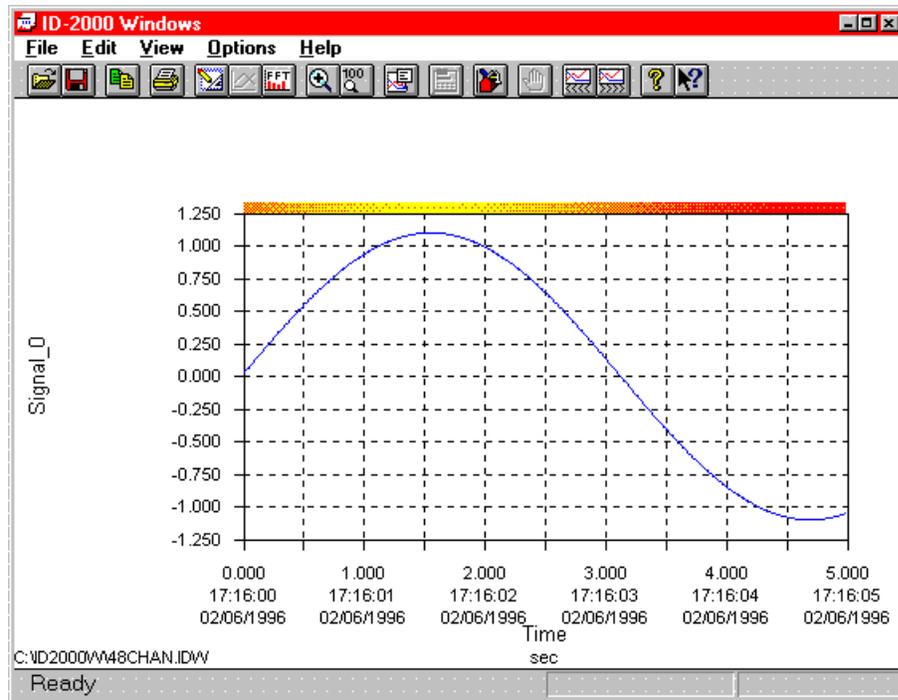
FIGURE 7-3. Elapsed Seconds

The purpose of the Elapsed Seconds feature is to also provide elapsed time which is used for other features in ID-2000 such as specifying the Time-Start/Stop, reference time, etc.

The second additional feature is labeled "Time Marker". This feature places a small triangular mark at periodic intervals on the X-axis that correspond to the interval selected (Day, Week, Month, or Year). Figure 4 shows an example of this feature. This can be very useful when plotting long data files that span a great deal of time. The "Time Marker" feature allows you to easily locate daily, weekly, monthly, and annual sections of the data.

If you are plotting with the 24hr Clock (0.0) format the markers are placed at the selected interval relative to the first data point. Let's say you have selected "Day" for the interval then there would be a mark at 24 hours, 48 hours, 72 hours, etc.
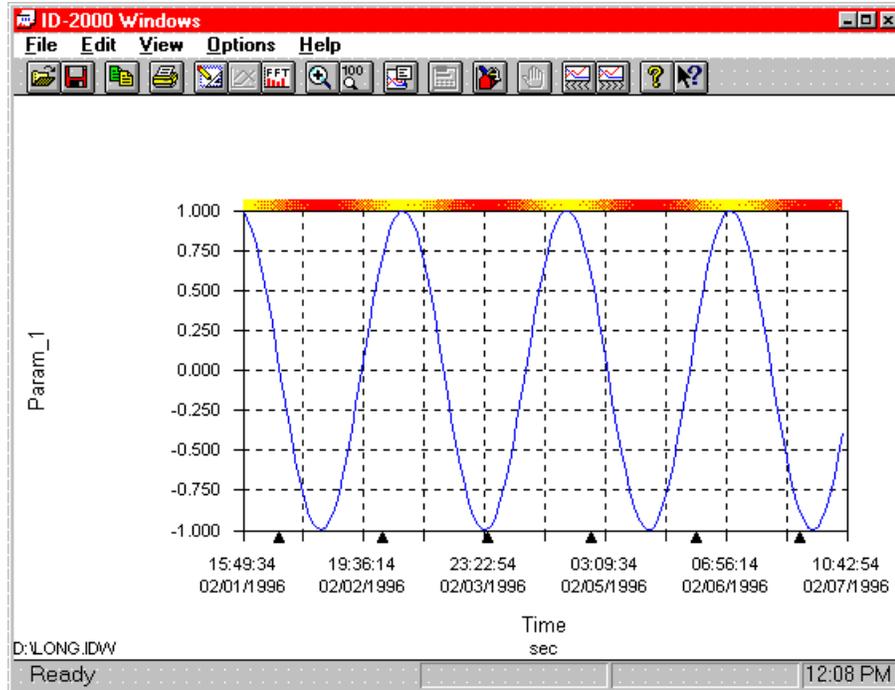
FIGURE 7-4. Time Marker

If you are plotting with the 24hr Clock (Time Of Day) format then the marks would be 24 hours apart but the first mark would occur at midnight following the first data point. In Figure 7-4 the first point starts at 15:49:34 on February 1. The first time mark would be located at midnight February 2 and time marks at each following midnight.

7.1.2 MISCELLANEOUS

This group contains three items. The first is the Quick Graph check box. The Quick Graph feature is useful for plotting very large data files. With Quick Graph checked, ID-2000 does not plot every data point. Instead it plots approximately four data points per pixel of horizontal screen resolution. If your graph is 400 pixels across then ID-2000 would only plot 1600 data points evenly dispersed throughout the data file regardless of how many points were actually in the file. This allows you to display a representation of a graph quickly. You may then turn off the Quick Graph feature and zoom in closer on areas of interest.

Instead of drawing lines between data points you can tell ID-2000 to just draw the data point. This type of graph is commonly referred to as a

Scatter graph and is useful when plotting historical trending data.

The last item in this group is the Data Trace Width which specifies the line width to use when plotting data (not used for Scatter graphs). The default is for the line to be one pixel in width. You may select or specify any width desired to make the data traces thicker or thinner.

> **NOTE**: Selecting a width greater than 1 pixel can result in decreased plotting performance.

7.1.3 DISPLAY ITEMS

This group contains numerous check boxes that affect how the plot is displayed.

Color Map:

The color map is the multi-colored stripe at the top of graphs. This feature is only available for X-Y and Strip Chart plots with Time, Reference Time, or Scan_Number selected for the X-axis parameter. Check this box if you wish to display the color map. Disabling the color map can increase plotting performance in some instances.

Grid:

Check this box if you wish to display the background grid on each graph.

Plot Title:

At the top of the plot is space reserved for three lines of text that may be entered in the Plot Title group in the Plot Template view. If you do not have a plot title or prefer to not display it you can disable this feature which will also make more room on the plot for each graph.

Centered:

To the right of the Plot Title check box is another check box labeled "Centered" which is only available if the Plot Title box is checked. The default alignment for the plot title is left aligned along the far left side of the graph. If the Centered box is checked then each line of the plot title will be center aligned at the middle of the graph.

X-Axis Title:

Check this box if you wish to display the X-axis parameter title. Normally you would always want this feature enabled.

Y-Axis Title:

Check this box if you wish to display the Y-axis parameter title. Normally you

would always want this feature enabled. However, there may be circumstances where disabling the Y-Axis title might be advantageous. An example would be a Multi-Plot where the same parameter from eight different data files is being plotted . With this feature enabled the plotted parameter would be displayed eight times for the Y-Axis title. This is not only redundant but could unnecessarily clutter the plot. A better solution would be to turn off the Y-Axis title and use a plot note or modified Plot Title to identify the plotted parameter's name.

Parameter Units:

To display parameter units in the graph axes check this box.

Data Track Rollup:

If this box is checked, the data track rollup dialog will be displayed immediately in the Plot or FFT view. This feature may also be enabled/disabled via the View - Track Rollup menu item.

Data Markers:

Data markers are small squares with numbers inside that are placed directly over the data on a graph at several locations to assist you in distinguishing the data traces. This feature is only available for the plot types of X-Y-Y and Multi-Plot. Figure 7-5 illustrates a plot with and without data markers.
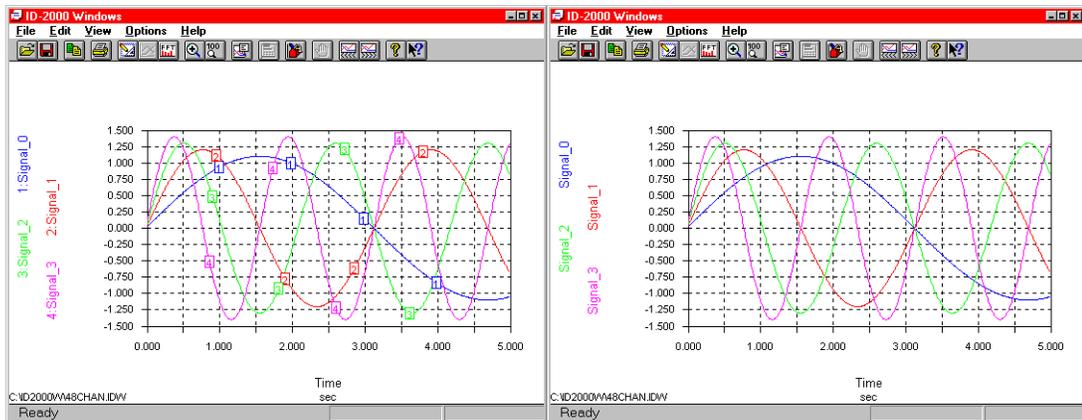

FIGURE 7-5. Data Markers

Event Markers:

Specialized ID-2000 data files contain "events" which can be displayed as small rectangles on the data traces at the location where the event occurred. Figure 7-6 is an example of a file with event markers.

File Name:

If this box is checked ID-2000 will display the name of the file that is being plotted at the lower left corner of the plot. If multiple files are plotted ID-2000 will display "Multiple Files Plotted". Uncheck this box if you prefer not to have the file name displayed.

Plot Note Outline:

If this box is checked ID-2000 draws a box around each plot note. The color of the box may be changed using the Preferences - Colors tab. Changing the setting of this feature affects all plot notes. You may also change this feature when editing or adding a plot note in the Plot Note Text dialog.

Erase Plot Note Bgd:

If this box is checked ID-2000 erases the graph underneath the plot note text.

You may turn this feature off if you do not want the graph erased. Changing the setting of this feature affects all plot notes. You may also change this feature when editing or adding a plot note in the Plot Note Text dialog.

7.1.4 PERFORMANCE

This group contains two check boxes. The "Calculate Data Statistics" box enables the calculating of data statistics that can be accessed via the View - Statistics menu item or toolbar button. You can increase plotting performance by unchecking this box so that ID-2000 does not spend time keeping track of and calculating statistics on the data that is plotted.

The second box is "Data Trace Update". Any time another window is displayed on top of the ID-2000 application window, Windows sends a command requesting that ID-2000 redraw its window. If you are in the Plot view when this occurs this would normally mean that ID-2000 would have to redraw the entire plot. Obviously this would be inefficient especially if you are plotting large data files that take significant time to plot. Instead of redrawing the plot ID-2000 maintains an image of the plot in memory and simply copies that image back to the display screen.
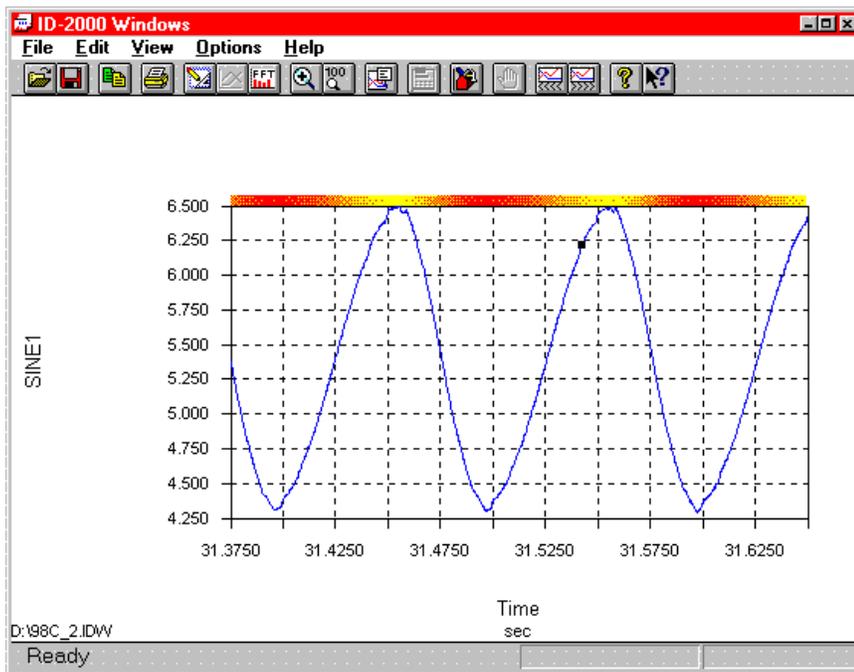

FIGURE 7-6. Event Marker at 31.54 Seconds

ID-2000 always plots data on this memory image. If you check the "Trace Update" box ID-2000 will simultaneously plot data on both the memory image and the display screen. This allows you to see the plot as it is being created but reduces performance due to ID-2000 having to draw twice as many lines. If you uncheck the box then ID-2000 will only plot on the memory image and at its completion copy the image to the display. This is the fastest plotting method although you will not see anything until the plot is completed on the memory image.

Both of these controls default to a checked condition.

7.2 FFT PREFERENCES

The FFT tab dialog is shown in Figure 7-7.

The FFT dialog is fairly simple with only a few controls. The FFT Type group contains two radio buttons for selecting the type of FFT plot. The two types are Amplitude Spectrum and Power Spectrum.

An amplitude spectrum plots the amplitude of the signal at each frequency. A power spectrum plots the amount of signal power generated at each frequency.

The Drawing Style group allows you to specify whether the FFT plot should be made using lines between the points (like a non-FFT plot) or bars (like a bar graph). You may also specify to display the Y-axis values in decibels. A decibel is defined as 20 times the log base 10 of the amplitude or power.

Data windowing is a technique used for modifying the data prior to FFT calculation in order to accent the results. The types of data windowing available are:

- Rectangle or None

- Exact Blackman

- Hamming

- Hanning

- Parzen

- Welch

To select a data windowing type click the down arrow which will drop down the list of available choices from which to choose.
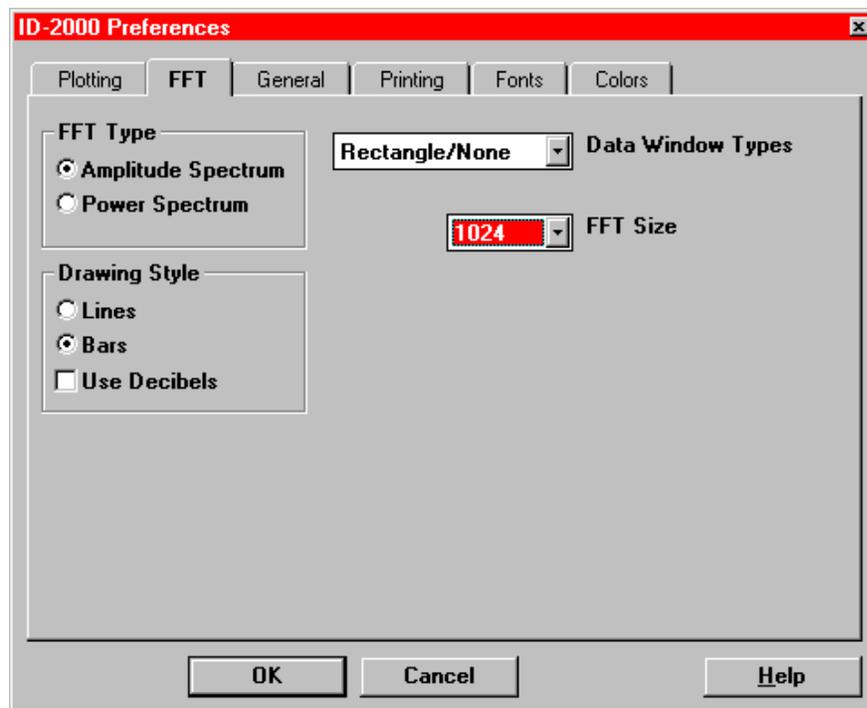

FIGURE 7-7. FFT Preferences

The last item in the FFT dialog is the FFT size which is the number of data points used for the FFT calculation. You may choose from 64 to 4096 data points. To select a different size click the down arrow to drop down the list of available sizes. Keep in mind when selecting the FFT size that your data file must have at least that number of points recorded at a constant scanrate. While large FFT sizes can produce more precise frequency resolution a smaller size may be sufficient and allow you to view FFT plots on smaller data files.

7.3 GENERAL PREFERENCES

The General tab dialog is shown in Figure 7-8 and is used to adjust miscellaneous ID-2000 features.

There are three groups of controls labeled "Date Format", "ToolBar and StatusBar", and "File Locations".

The first group is used to tell ID-2000 how it should display dates. You may select from Month/Day/Year (default) or Day/Month/Year.

The second group allows you to turn on/off the toolbar and status bar. If the toolbar is enabled you can also select from either a small or large toolbar. The large toolbar is the default although in lower resolution displays (i.e. VGA) not all the toolbar buttons will fit in the application window. For lower resolution displays you may wish to use the small toolbar.

The last group specifies two path locations to be used by ID-2000. These two paths are labeled "Templates" and "Temp Files".   Both of these default to the ID-2000 application directory. However, if you have installed ID-2000 on a server that does not give you write permission for the application directory you must specify another location for these files. You may specify any location where you have write privileges. The locations may be the same or different directories.

The "Template" location is where the default plot template, IDWIN.IDT, will be stored. This is also used as the default location when you save plot template files.

The "Temp Files" location is used for any of the temporary files that ID-2000 needs to create while running. Examples of temporary files are those produced for displaying data statistics, data file information, saved plots, etc.

ID-2000 normally deletes all the temporary files it creates except saved plot files. The data statistics file is normally deleted after viewing. However, you may wish to retain this information file. You can control whether or not ID-2000 automatically deletes the statistics file by checking or unchecking the "Delete stats file after viewing" box at the bottom of the dialog.
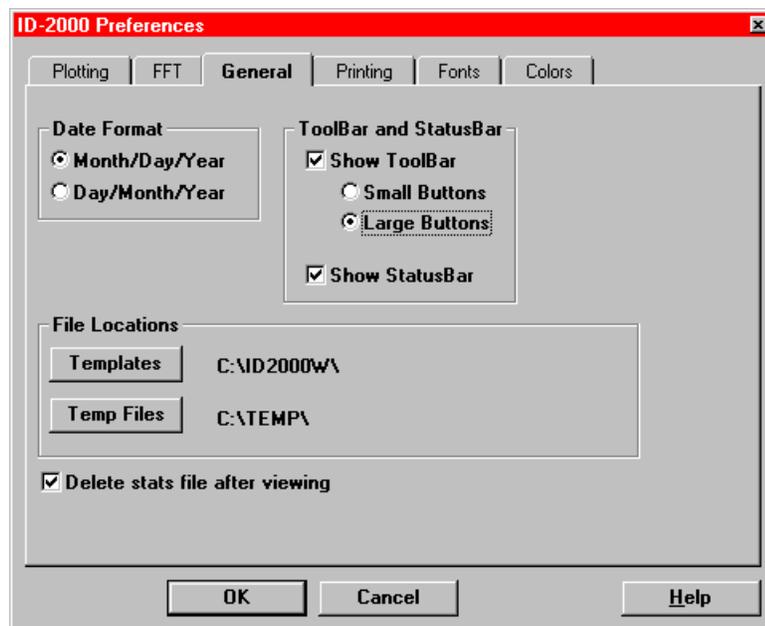

FIGURE 7-8. General Preferences

7.4 PRINTING PREFERENCES

The printing tab displays the dialog in Figure 7-9 and controls how colors should be printed and the margins used when printing.

If your printer is not a color printer you may wish to have ID-2000 always use monochrome colors when printing. This has no effect on what is displayed on your screen. Most printers that are not capable of printing in color will use a "dithering" process to simulate colors by print various shades of gray. To eliminate these shades of gray select "Always print using mono color scheme".

If your printer is capable of color and you wish to have ID-2000 print plots in the colors exactly as you have them displayed then select "Always print using current colors".

You can control the margin when printing plots by entering values for the four margin fields. Enter the margin in inches. If you are using 8-1/2 X 11 paper and want a 1/2 inch margin all around then you would enter 0.5 in each of the fields.

> **NOTE**: Do not enter 7.5 for the right margin as this would mean you want 7.5 inches of space on the right side.

7.5 FONTS PREFERENCES

There are many parts of a plot for which you can specify what font is to be used. You can also specify what font should be used for the status bar at the bottom of the application window. All of these fonts may be any font available to Windows including all True Type fonts. Figure 7-8 displays the Fonts Preferences dialog.
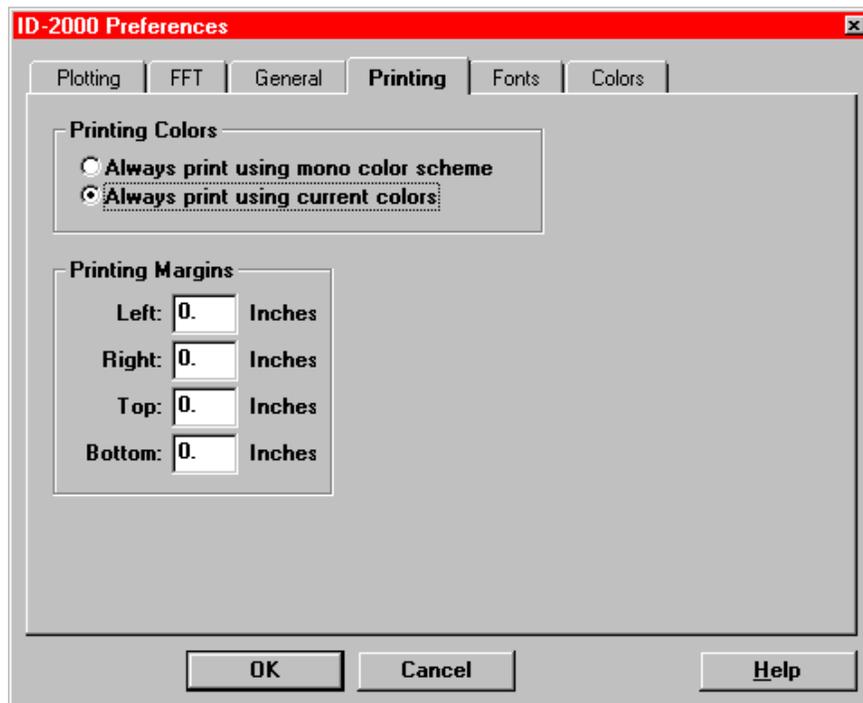
FIGURE 7-9. Printing Preferences

SECTION 7. PREFERENCES

A sample of the current font style, size, and color selected for each text item on the plot (or status bar) can be found just to the right of its button. The background color of the sample corresponds to the color of the plot section where the text will be located.

To change the font size, style, or color of any item simply click on its button. The standard

Windows font selection dialog box will be displayed (Figure 7-11).

Keep in mind when selecting fonts that the font is used for both the screen and printer. You should select a font that is easily read both on the screen and when printed. Also remember that large fonts take up a lot of space which leave less room for the actual graphs.
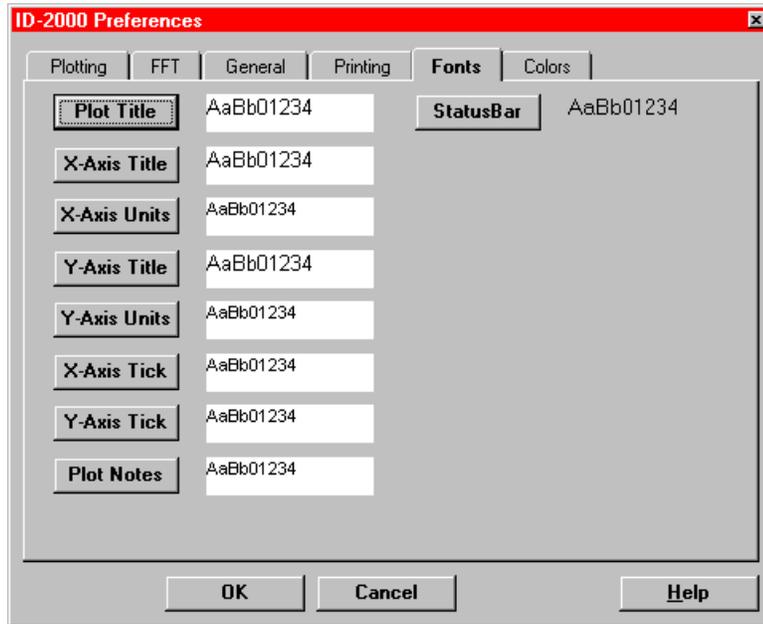
FIGURE 7-10. Fonts Preferences
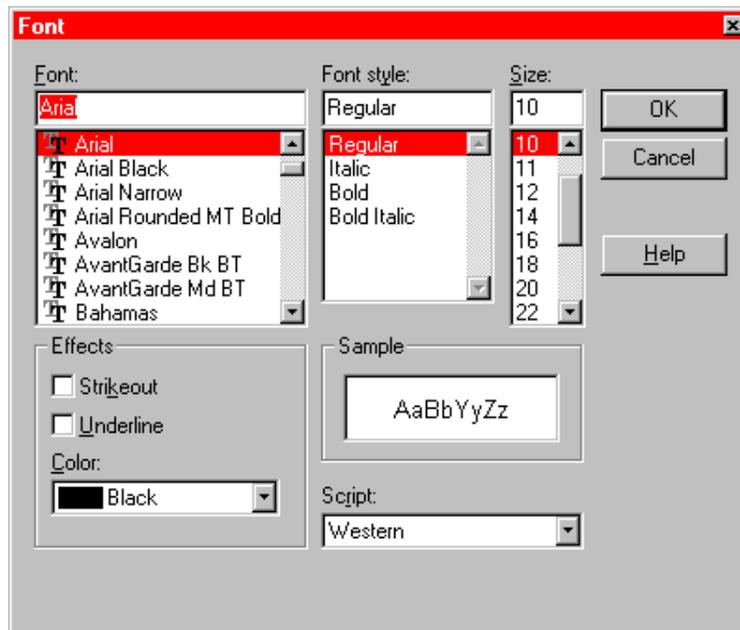
FIGURE 7-11. Font Selection

7.6 COLORS PREFERENCES

Like the fonts, there are numerous items for which you may change the color. There are also pre-defined color schemes that you can select. The Colors Preferences dialog (Figure 7-12) allows you to specify colors for virtually every item on the plot as well as the colors of the data traces and color map.

The first two groups are labeled Graph Colors and Data Colors. These two groups contain many items and their current color selection. To change the color of an item simply click its button which displays the standard Windows color selection dialog (Figure 7-13).
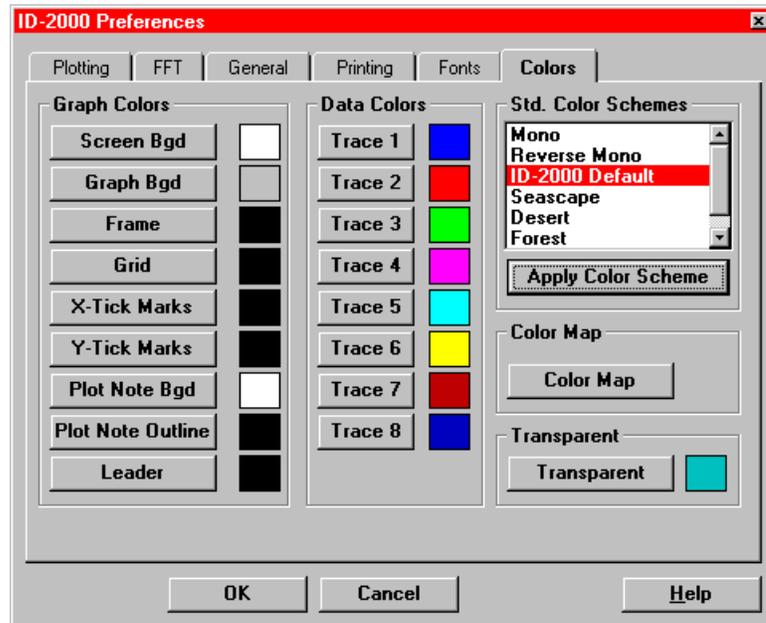
FIGURE 7-12. Colors Preferences
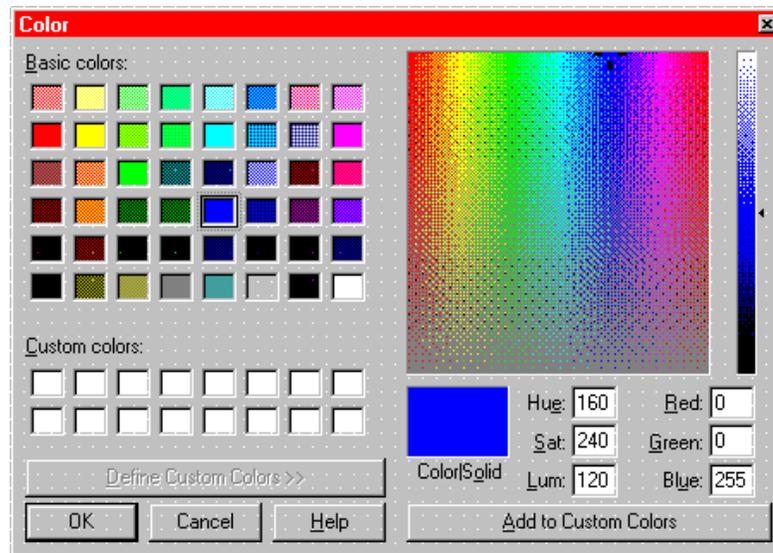
FIGURE 7-13. Color Selection

You do not have to use any color scheme and may manually specify each item's color as described above. Alternately you may select one of the standard color schemes listed in the "Std. Color Schemes" group which will default all the colors for you. To choose a color scheme simply highlight the desired one and click the "Apply Color Scheme" button. This will change the colors for every item to what is specified by the selected color scheme.

The Color Map button activates the dialog for selecting what color(s) to use when creating the color map (Figure 7-14).

The color map dialog contains two buttons labeled From and To which represent the color for the minimum Y-axis value and maximum Y-axis value respectively. In the center is a representation of what the color map would look like. To change one or both of these colors click on the From or To button and select a new color.

The color map uses 100 different colors. These colors will appear differently on a 256 color or higher display (SVGA) versus a 16 color (VGA). The colors displayed also are dependent upon what other applications you are currently running in Windows. Windows provides access to one single color palette between all active applications. If you have another application that has locked its colors into the palette ID-2000 may not be able to display the full range of 100 colors. However, when the other application is closed ID-2000 should have full access to the palette and all 100 colors will be displayed.

The last group is labeled "Transparent" and represents the color that will be considered "transparent". ID-2000 needs to have a unique solid color specified which it can use when overlaying multiple images so that the images on the bottom will "show through" the images on top. The color specified as transparent must not be used for anything else.
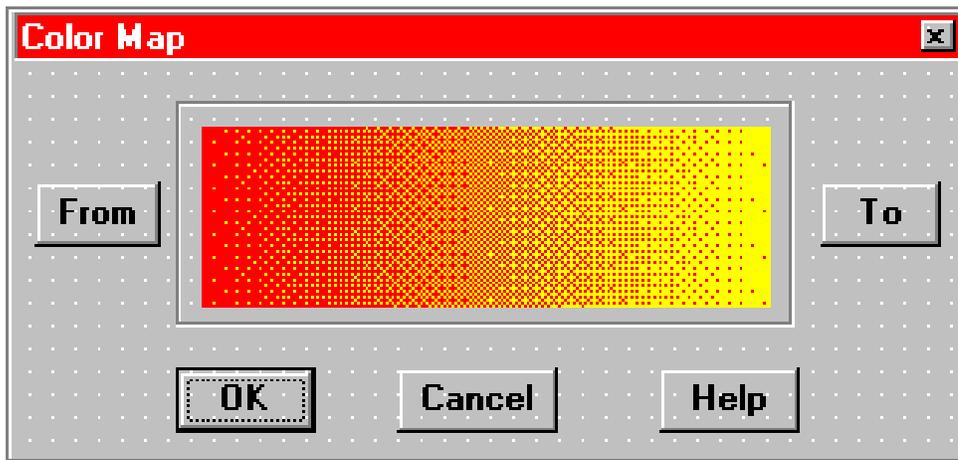

FIGURE 7-14. Color Map Selection

SECTION 8. TROUBLESHOOTING

The following is a list of some of the more commonly asked questions regarding ID-2000 features and procedures. Solutions and hints for each are provided. It is recommended that you look through these questions prior to calling Technical Support to see if your particular question has already been answered.

"I have a very large data file but I only want to look at a small piece of it and do not want to wait for the entire graph to be displayed. How can I do this?"

There are two common ways to only display a small portion of a data file. The first method is to access the Edit Scales dialog and enter values for Time Start and Time Stop if you know the starting and stopping points you wish to plot. ID-2000 will only plot data starting at the data point corresponding to Time Start and stop plotting at the data point corresponding to Time Stop.

A second method is to use the Quick Graph feature which draws a quick representation of the graph by only plotting selected data points. Turn the quick graph feature on in the Plotting Preferences dialog then go ahead and plot the entire graph. When the graph has finished plotting then turn off the Quick Graph feature and zoom in on the section of data desired.

"I am manually scaling my graphs but the scales are not the same as what I entered in the Edit Scales dialog. What is wrong?"

There are conditions when ID-2000 will not use the exact scaling numbers that you specify for manual scaling. This is because ID-2000 will not use non-standard scales. These types of scales have grid intervals of an abnormal number such as 3, 6, 7, 9, etc. or scales that would result in partial grids being used at either the top or bottom of the graph. ID-2000 uses only intervals that are easy to read such as 1, 2, 5, etc. and always uses whole grids.

For example, let's say you request scales of 3 for the min and 97 for the max. ID-2000 will not produce a plot where the minimum scale is 3 and the maximum scale is 97. Instead, it will calculate the closest min and max that could be used and still produce standardized grid

intervals. In this example it would substitute values of 0 and 100 in order to eliminate the non-standard scales you requested.

"What is an integral and how does it work?"

If you plot an integral of a parameter you are actually plotting the running total of the amount of change in the parameter over time.

Let's say that you have a data file of a race car and one of the parameters in the file is Speed which is speed of the car in miles per hour. Now assume that you want to make a plot of the distance the car travels over time but you don't have any Distance parameter in the file. By using the integral feature in ID-2000 you can still make the desired plot.

Without getting too complicated, think of plotting the Speed parameter against Time. Now draw small rectangles that are one second wide with the bottom of the rectangle at 0 and the top at the velocity value for that particular second. If you do this for every second in the data file you would have something similar to a bar chart where the bars are touching each other. If you added up the areas of each rectangle you would have the distance traveled.

This is how the integral values of a parameter are calculated. What you see on the screen is the cumulative total of these areas at any given point which in our example would represent distance.

"How do derivatives work in ID-2000 and why do they look so "noisy"?"

The derivative of a parameter represents how fast a parameter is changing over time. This is the opposite of an integral which represents the total amount of change over time. In our previous example involving integration we integrated the Speed parameter in order to obtain distance that a car travels. If you plot the derivative of the Speed parameter you obtain the car's acceleration. Or in other words, the derivative of the Speed parameter is how fast the car's speed is changing which is acceleration.

SECTION 8. TROUBLESHOOTING

The reason that the derivative of a parameter may look "noisy" is because of the method used in producing the original data. If the data was recorded using an Analog to Digital Converter, what may look like a smooth curve is actually a series of very small stair steps. If you zoom in very close on any parameter you may be able to see these steps in some of the parameters. When you calculate a derivative of a parameter with all these tiny stair steps the result may not be a smooth line but a shading effect that oscillates between zero and some value.

To reduce this effect and provide a smoother derivative calculation you can enable the Smoothing feature for the parameter. With Smoothing enabled the stair steps in the data are smoothed out using a running average technique prior to calculating the derivative. This results in less oscillation in the derivative values.

You should start with the lowest amount of smoothing and see if that is enough to "clean up" the derivative. If necessary then increase the amount of smoothing.

> **WARNING**:   You must be aware that smoothing alters the data values which are plotted (or used for derivative calculations). Although the original data in the file is never changed the resulting plot of a smoothed parameter may no longer be an accurate representation of the original data and therefore smoothing should be done with caution. To see if smoothing is acceptable, plot the smoothed and unsmoothed parameter on a Multi-Plot so that you can see exactly how the data is changed.

"I already have data files but there is no import for my file format in ID-2000. How can I convert them?"

ID-2000 provides importing capabilities for numerous file formats and allows you to add custom import utilities. For a complete description of these refer to the Importing Data.

If the program that generated the data files offers a DADiSP or ASCII file format you may be able to export the data from that program into one of those formats which can then be imported into ID-2000.

Otherwise, you will need to create a custom import utility. Interface Design can create it for you for a nominal charge. Contact Interface Design for more information on creating custom imports.

"I can't tell which parameter is which on a Multi-Plot or X-Y-Y when I print it on my black and white printer?"

ID-2000 has a Data Markers feature that can be enabled which will "mark" each of the data traces. Refer to the Plotting Preferences section of this manual for more information.

"ID-2000 always starts with the same plot settings that I used last time. Can I save multiple settings and just load those settings when I need to change? Can I have ID-2000 start with different settings?"

ID-2000 uses plot template files which contain all the plot settings, data files, parameter information, etc. These settings are stored in a plot template file which uses an IDT extension. The default plot template file is IDWIN.IDT which contains the settings when you last used ID-2000.

You can create a plot template at any time by accessing the File - Save Template As menu item. To load the settings from a template simply select the File - Open Template menu item. You may also specify a template file on the ID-2000 command line as in "IDWIN.EXE C:\ID2000W\MYOTHER.IDT" which will automatically load the specified template.

Plot template files are only used to change the current plot settings when they are loaded. The plot templates are immediately closed after the plot settings have been updated. The plot template will not be changed by any subsequent plot changes you make. In order to update a plot template with the current settings you must re-save it.

"I am color blind (or partially color blind) and can't see some of the colors in ID-2000?"

Actually, this question is not as uncommon as you might think. A great many people are either partially or totally color blind and just can't distinguish the difference between some colors.

You can change any of the plotting colors in ID-2000 through the Color Preferences dialog box. There are preset color schemes available from which you can choose or you can change the color of individual items.

"The data in my file was not recorded at a constant rate. Can ID-2000 still import it?

ID-2000 is capable of using data files with multiple recording rates and files that include actual time data. However, the current import functions do not support this. In order to import data with multiple or variable rates you must create a custom import utility.

"I am adding plot notes and leaders to my plot but I keep losing them. What is happening?"

Plot notes and leaders should be the very last thing you do before printing, saving, or exporting. If you zoom or pan a plot so that the anchor point of a plot note or leader is not visible it will be automatically deleted.

"I made an Amplitude Spectrum (or Power Spectrum) plot but wish to use a different data windowing or FFT size. Do I have to start all over?"

No, ID-2000 allows you to simply click on a different data window type or FFT size and the plot will automatically be redrawn.

"The Y-axis labels look different (or they are not rotated) when I print to my HP LaserJet II printer."

Some printers such as the HP LaserJet II have some unique quirks that can cause unexpected results when printing a plot. The HP LaserJet II ALWAYS prints non-rotated text at 300DPI regardless of the resolution you actually select in the Windows Print Setup dialog. This results in crisp looking text for everything except the Y-axis labels which are rotated 90 degrees and printed as graphics instead of text. To make matters worse the LaserJet II does not support rotated text AT ALL at low resolutions.

The only solution when printing to these printers is to always print at their maximum resolution or turn off the Y-axis labels and use plot notes to annotate the graphs accordingly.

"I am running ID-2000 under Windows 95 and every time I try to stretch the size of the application window the plot redraws."

If you have installed Microsoft Plus! for Windows 95 there is a setting that affects how windows are resized. Access the Properties feature for the display (right click on the desktop and select Properties). Click on the Plus! tab and check the setting for "Show windows contents while dragging". If this feature is checked it will cause ID-2000 to constantly redraw the plot while you are resizing the window. To eliminate this behavior simply uncheck this feature.

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