

# **WAVEWIN**

## **COMTRADE**

**FILE MANAGEMENT & ADVANCED ANALYSIS FOR COMTRADE FILES**

### **USER'S GUIDE**

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# Preface

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This document contains information about the Wavewin Comtrade data management, and analysis system for Windows 98 and above.

The management capabilities (File Manager) provide tools for copying, moving, deleting, renaming, sorting, and searching event files. The analysis feature (Data Display) is used to view and manipulate waveform and load files. Displayed channels can be marked, moved, zoomed, removed, restored, superimposed, scaled, numerically processed, and/or summarized. It also offers extra software channels that provide engineers with a generic tool for monitoring and/or molding tasks.

## Documentation Format

The documentation is structured to the following format:

Chapter 1: describes the main features of the File Manager, and Data Display.

Chapter 2: describes the system requirements and the installation procedure.

Chapter 3: lists the fields and features in the system.

Appendix A: defines the scripting language used to create format files for the Save Sample Values feature.

Appendix B: describes the system errors that might be encountered while working with the software.

Appendix C: lists the available function keys, navigational keys, and menu buttons for the file table, the query fields, the data display, and the DXF display.

Appendix D: lists the abbreviations and symbols used by the system.



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## C H A P T E R 1

## Quick Start

This chapter describes the main features of the File Manager, and the Data Display.

## File Manager

The File Manager is used to manage files on disk, search the contents of a drive or directory, and edit, plot, or draw the contents of a file. This feature is similar to Windows Explorer with application specific functions tailored for the Power Utility Industry. The functions include automatic event file association, specialized copy/move engines, intelligent queries, specialized report files, COMTRADE conversion and compression routines, merge and append waveform and load files, event summaries, and calibration reports.

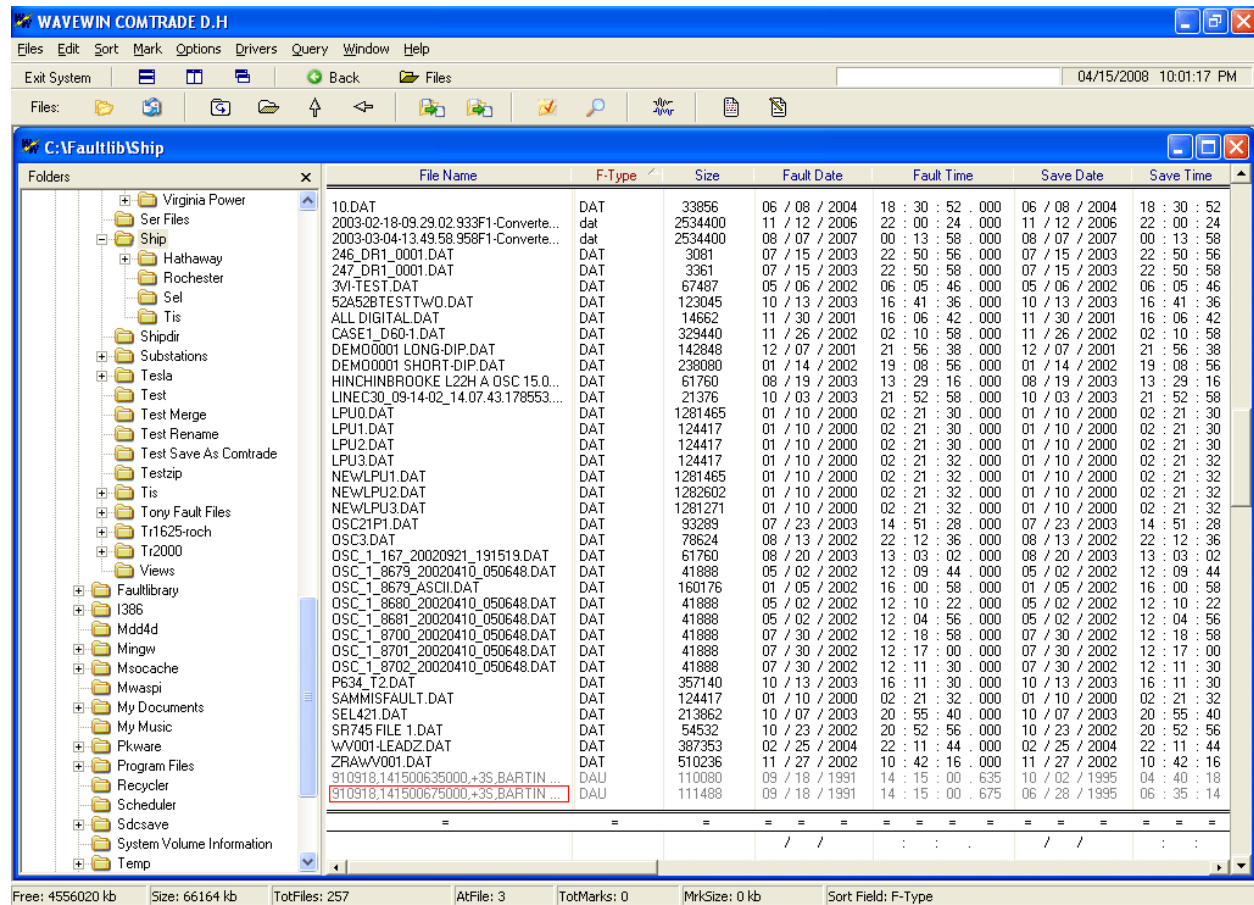


Figure 1.1 Event File Manager

When the software is activated, the File Manager displays the subdirectories and files of the last active drive and directory. This window consists of a folder tree, file table and a query bar. The query bar is located below the table. Refer to Figure 1.1. The main features are described in the following sections.

### LONG FILE NAMING FORMAT

The File Manager supports the IEEE long file naming convention. The IEEE long file naming convention is a PSRC convention used to name time sequenced data files. The file table columns are used to display the contents of the long file name. The file name contains the following first six required fields stored in a comma-delimited fashion. The remaining fields are optional. The file table lists 4 optional columns at the end of the table to support user defined fields. The ComNames properties dialog allows for user input for the first 2 optional fields.

**Example: 000112,123433234,-5S, South Arkey,DLP1,Sun Power,000003000,T,4287N,6587W.OCS**

#### Field Definitions:

Field	Example	Displayed	Definition
Date	000112	01/12/2000	The Date field defines the fault date of the file. The date fields are defined as: the first 2 characters are the year, the next two are the month and the last two is the day. (required)
Time	123433234	12:34:33.234	The time field defines the fault time of the file. The Time fields are defined as: the first 2 characters are the hour, the next two are the minutes, the next two are the seconds and the last two or three is the milliseconds. (required)
Tcode	-5S	-5S	The TCode field defines the difference between the time system used for start time and Universal Time. -5s would be specified for US Eastern Standard Time. If the start time is expressed in UT, this field is coded 0z, Note: UT is the international abbreviation for Universal Time, also called Greenwich Mean Time or GMT. (required)
Substation	South Arkey	South Arkey	The substation name or code where the originating device is located. (required)
Device	DLP1	DLP1	The device name or code that generated the file. (required)
Company	Sun Power	Sun Power	The company of the specifed substation. (required)
Duration	000003000	000003000	The duration of the file. (optional)
Type	T	T	The fault type or contents type of the file. (optional)
Latitude	4287N	4287N	Latitude represents the geographical position of the substation. The letter N indicates latitude in the Northern Hamisphere. (optional)
Longitude	6587W	6587W	Latitude represents the geographical position of the substation. The letter W indicates longitude in the Western Hamisphere. (optional)

### COMNAME(S) RENAME

To rename time sequenced data files using the IEEE long file naming convention select the "ComName(s) Rename" option under the "File" menu. ComName(s) Rename will rename all the marked waveform files to the IEEE PSRC long file naming convention. A message box will be prompted before renaming the file to insure the execution of the rename feature. This feature will permanently rename the files. It is advisable to back up the files before renaming. Some proprietary applications may not be able to read the files once they are renamed. Refer to Figures 1.2 & 1.3. For a full description of the format refer to the Long file Naming Format above.

All files associated with the marked Comtrade files will be renamed (".CFG", ".INF", ".HDR", ".DAT" and "\*.D###" files).

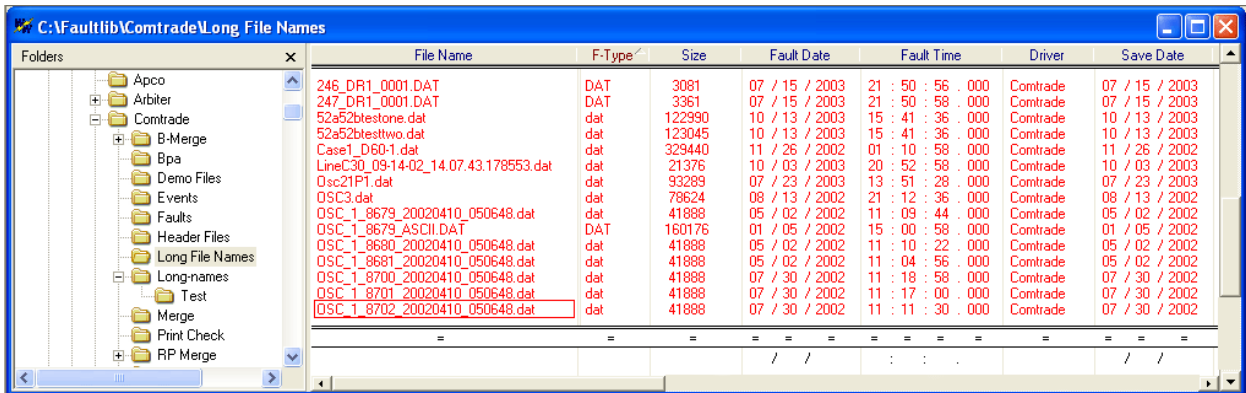


Figure 1.2 ComNames Rename: Select & Mark all the Waveform Files to Rename

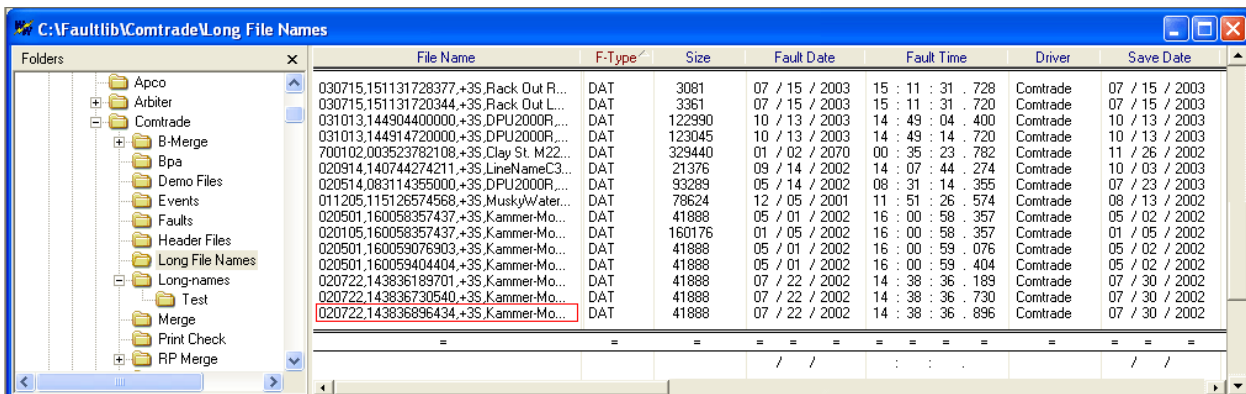


Figure 1.3 ComNames Rename: Result

### COMNAME PROPERTIES

The fields defined in the IEEE long file naming convention are not always available from the time sequenced files. The “ComName Properties” dialog allows for setting the most common fields not available in the time sequenced formats supported. User fields allow for setting specific information into the file name. Refer to Figure 1.4.

- Company Name
- Time Code
- User Field 1
- User Field 2

The fields entered are used for all files renamed.

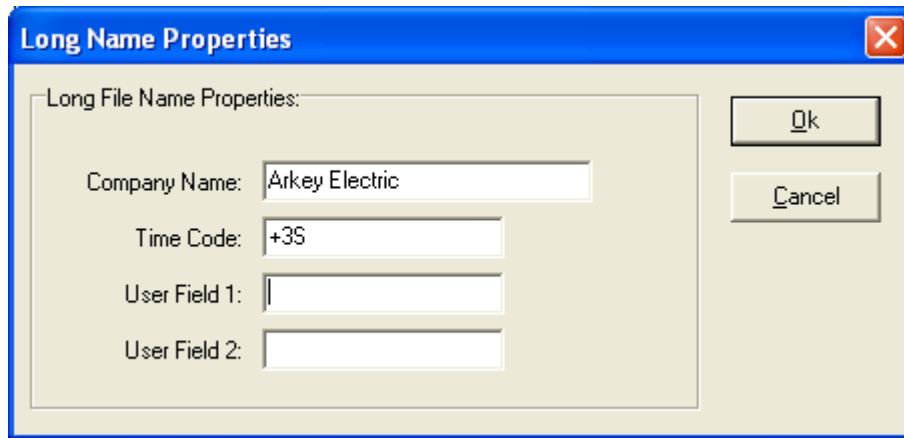


Figure 1.4 ComName Properties Dialog

### COMMAND LINE PARAMETERS

There are a number of command line parameters supported in the Wavewin software. The listed command line parameters are specific for the file manager and data plotting window. Below is a list of all supported command line parameters and their description:

Command Line	Description
Path & Filename	If a path and filename is passed as a command line parameter then the path and filename must be surrounded by quotes, such as "c:\faultlibrary\event1.dat". Wavewin will automatically open and display the file.
/View	The "/View" command line parameter is used along with a path and filename command line. It automatically opens and displays the file when Wavewin is executed.
/Print	The "/Print" command line parameter is used along with a path and filename command line. It automatically opens, displays and prints the file when Wavewin is executed.
/Batch	The "Batch" command line parameter is used along with a path and batch filename command line. It automatically opens the defined batch file and executes each command line parameter defined in the file. This feature is mainly used to print a number of files through one command line parameter.
/Merge	The /Merge command line parameter is used along with a path and filename command line. It will merge the file with all files that have a /merge command line parameter associated with them. The /merge command line parameter is defined in a Merged File.lst ASCII file. The Merged File.lst is passed to Wavewin through the command line parameters. All files listed in the Merged File.lst are automatically merged by time and if the files have different sampling frequencies then the highest frequency is used. The merged file is saved as an ASCII 1999 Comtrade file and placed in the same directory where the Merge File.lst is located. The Comtrade files are name Merged File.cfg and Merged File.dat. If an error occurs then a Merged File.log file is created listing all errors encountered. Example contents of a Merged File.lst: C:\faultlibrary\event10.dat /merge /exit C:\faultlibrary\event12.dat /merge /exit C:\faultlibrary\event14.dat /merge /exit
/X	The "/X" command line parameter tells where to display Wavewin's


	left corner when executed.
/Y	The “/Y” command line parameter tells where to display Wavewin’s upper corner when executed.
/W	The “/W” command line parameter tells the width of the Wavewin application when executed.
/H	The “/H” command line parameter tells the height of the Wavewin application when executed.
/Exit	The “/Exit” command line will automatically exit Wavewin after all other command line parameters are fully complete.


## NAVIGATING


### FILES:

To browse the files in the active directory use the up, down, right, left, page up, page down, home, end, ctrl+home, and ctrl+end keys, or use the scroll bars.

### DRIVES/DIRECTORIES:

To view the contents of a directory, navigate through the folder tree or place the cursor on the directory name in the file table and press <enter> or double click on the desired folder. Refer to Figure 1.5. The “.” and “..” displayed at the top of the file table provide shortcuts to the previous directory and the root directory. To return to the previous directory, place the cursor on the “..” shortcut and press <enter> or click the **Up**  menu button or press the backspace key. To return to the root directory, place the cursor on the “.” shortcut and press <enter>.

To change the active drive letter, click the **ChDir**  menu button or press F7. Enter the drive letter and path and click **OK**. To return to the last active directory, enter only the drive letter. To display the contents of the root directory, enter the drive letter, a colon, and a backslash, for example type “C:\”. An error message is displayed if the software cannot find or open the specified path.

To navigate through the last active directories click the **Back**  menu button or click the right mouse button to display a list of the connected drives and the last 12 navigated directories. Refer to Figure 1.6.

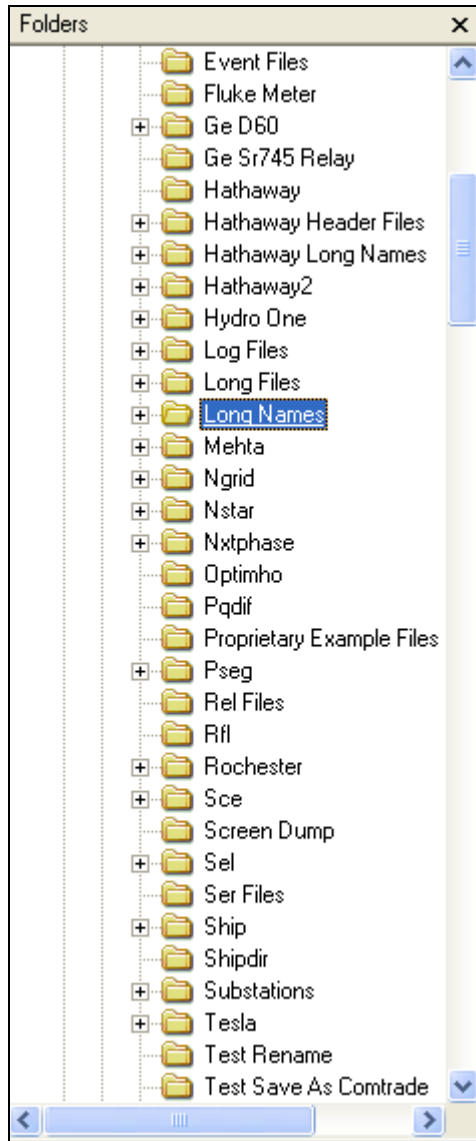


Figure 1.5 Folder Tree

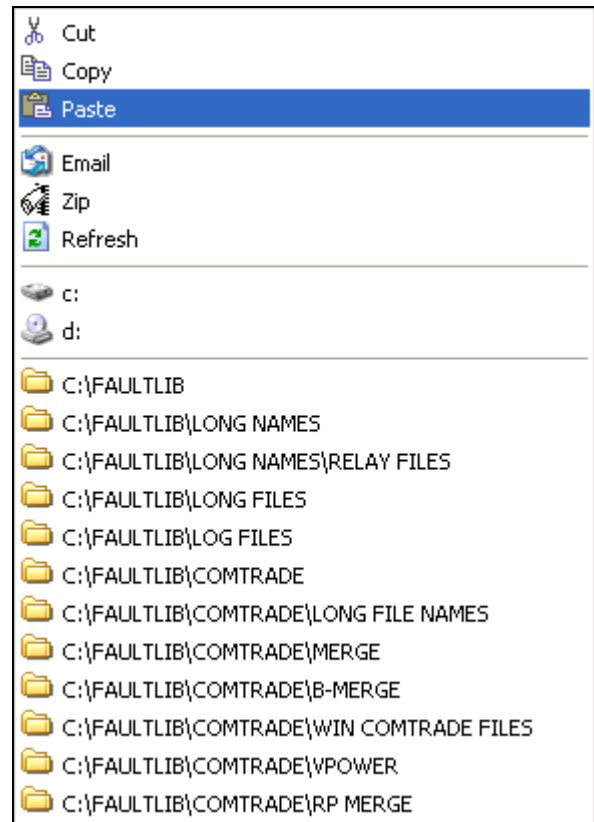




Figure 1.6 Drive/Directory Navigation Menu

### UPDATING THE ACTIVE DIRECTORY

Click the **Refresh**  menu button to update the contents of the folder tree and the file table or press F12. To refresh the folder tree only right click on the folder tree and select the **Refresh** option. Refer to Figure 1.7. To refresh the file table only right click on the file table and select the **Refresh**  Refresh menu option.

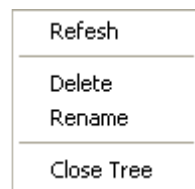


Figure 1.7 Folder Tree Popup Menu

## MARKING FILES

Files are marked and unmarked through the “Mark” menu option, the space bar, or the left mouse button. Use the shift+left mouse button to mark a group of files or the ctrl+left mouse button to randomly mark files. Marked files are displayed in red and can be copied (F8), moved (F9), deleted (Delete), grouped, sorted or used for reports.

## SORTING FILES

The column headers displayed at the top of the table are used to sort all the files in the table. Click the header buttons to toggle between ascending and descending order **F-Type** or use the Sort menu option to sort all or marked files with respect to the selected sort field. To change the sort field, place the cursor in the desired column and select “Set Sort Field” from the “Sort” menu. The active sort field is displayed in the status bar at the bottom of the window. **Sort Field: Fault Date**

## COPYING OR MOVING FILES

Files must be marked in order to copy or move them from the active directory. To copy/move files using the Window’s **Select Folder** dialog click the **Copy** / **Move** menu buttons or press F8 for copy and F9 for move or select the “Copy To” or “Move To” menu options under the “Files” menu. Select an existing folder from the Folder tree or click the **New Folder** button to create a new folder under the selected folder. Modify the **Name** then press <enter>. Click the **OK** button to select the active folder. Refer to Figure 1.8. A message is displayed if an error occurs while copying or moving the files. Refer to the Copy/Move Files sections in Appendix B for more information. The **Cancel** button or the <esc> key terminates the command.

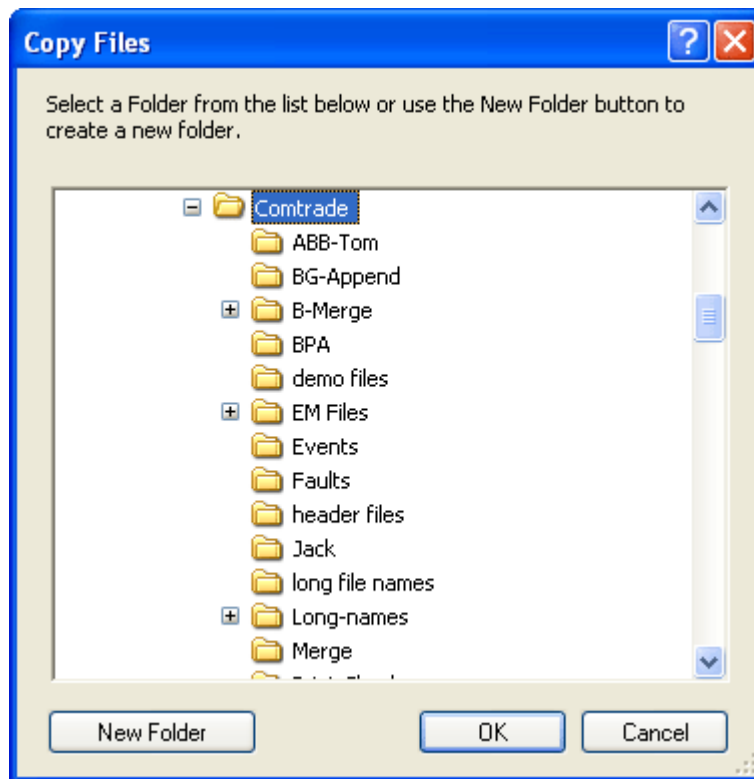



Figure 1.8 Copy Dialog



To copy or move files to the clipboard select the “**Copy/Cut**” menu options under the “Edit” menu or right click in the file table and select the **Copy** / **Cut** option from the popup menu.

Navigate to the destination folder and select the **“Paste”** option under the **“Edit”** menu or the **Paste**  option from the file tables right click popup menu.

Once the copy/move or paste commands are executed, the system’s task bar in the upper right hand corner of the screen is updated after a file is successfully transferred to the destination directory. All files that were unsuccessfully copied/moved using the **Copy/Move** menu buttons are marked and grouped at the top of the table.

The specialized copy/move/paste engine copies the COMTRADE header and configuration information along with the selected data file. For example, when a Comtrade data file is copied or moved the corresponding header information (**“.CFG”, “.HDR” & “.INF”**) is automatically copied from the source directory to the destination directory.

### EMAIL FILES

Files must be marked first (displayed in red) to email. Mark all of the files to email than click the **Email** menu button  or right click in the file table to display the popup menu and select the **Email**  option or select the **“Email Marked Files”** menu option under the **“Files”** menu. The users default email program is displayed with all marked files in the attachment section. Also, any support files needed to display the selected files will be automatically attached. Support files include the Comtrade **.CFG**, **.HDR** and **.INF** files, refer to Figure 1.9.

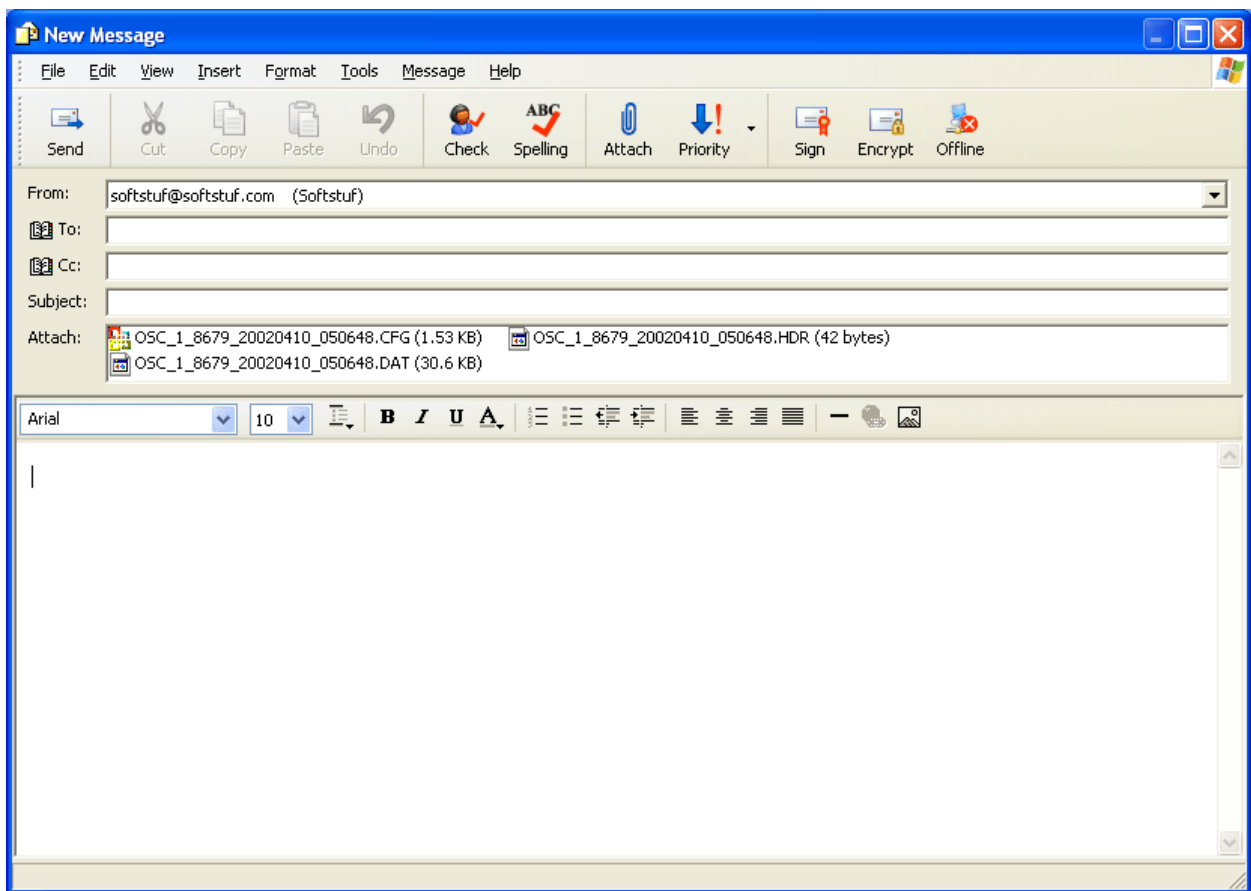




Figure 1.9 Email Dialog

## ZIP FILES

Files must be marked first (displayed in red) to zip them. Mark all of the files to zip then click the “Zip Marked Files” menu option under the “File” menu or right click in the file table to display the popup menu and select the **Zip**  option. The zip dialog is displayed. Enter the filename and folder. Click the **Folder**  button to browse and select a destination folder. If no destination folder is defined then the zip file is saved to the file table’s active directory. Also, any support files needed to display the selected files will be automatically included in the zip file. Support files include the Comtrade .CFG, .HDR and .INF files. The zip files created are compatible with the WinZip, PKZip and Window’s Zip applications. Refer to Figure 1.10.

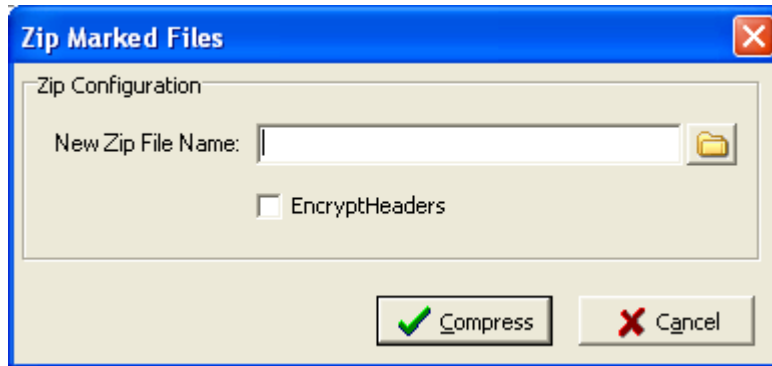


Figure 1.10 Zip Dialog

## CUSTOMIZING THE TABLE DISPLAY

The columns displayed in the table can be repositioned through the “Display” menu option under the “Options” menu. Refer to Figure 1.11. Use the **Move Up** and **Move Down** buttons to change the position of a column. The table columns can also be resized. Position the mouse over the column separator and drag the mouse to the desired location or double click on the table separator to resize the column to the largest display.

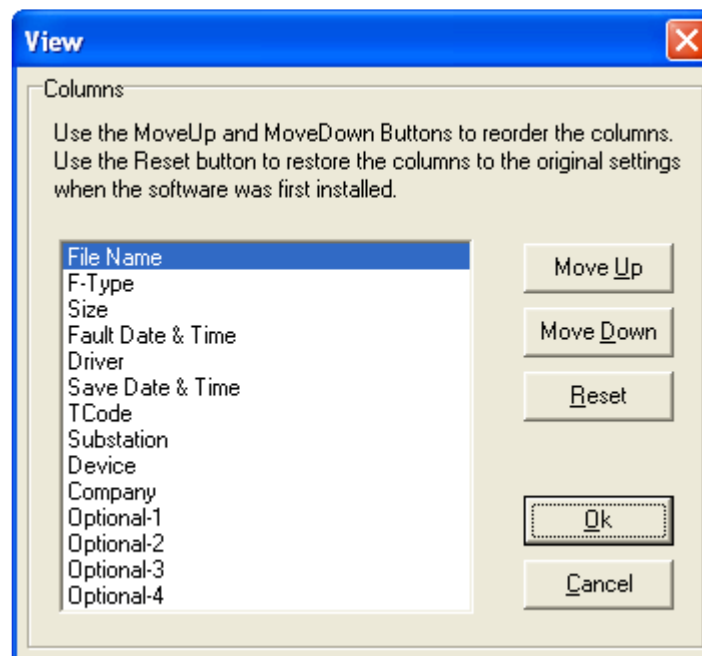


Figure 1.11 Customize Table Columns

### **PRINTING THE FILE TABLE**

The print feature provides two options: print all or marked files in the active directory. To print all the files, select the "Print/Print All Rows" menu option under the "Files" menu (Alt+F,P,A) or select the "Print/Print Marked Rows" menu option under the "Files" menu (Alt+F,P,M) to print only the marked files. An error message is displayed if the software cannot access the printer port.

### **COMPRESSING COMTRADE ASCII FILES**

The File Manager contains a built in compression routine that converts COMTRADE ASCII files to COMTRADE Binary files. To compress COMTRADE ASCII files, mark the files and select "Compress COMTRADE Files" from the "Options" menu. The software prompts for conformation, click **Yes** to continue, or **No** to cancel.

### **SAVING AS COMTRADE**

Existing files can be converted to the COMTRADE ASCII or Binary format. Currently there are two Comtrade versions supported: the older 1991 format and the newer 1999 format. The Comtrade format can be selected from the "Data Plotting Window's Properties" dialog. The default format is the newer 1999 format. Refer to Figure 1.12. To create a COMTRADE file place the cursor on the event file or mark the desired files and select the "Save As COMTRADE" (ASCII/Binary) menu option under the "Options" menu. Enter the destination path and filename (do not enter a filename extension) and click **OK**. The ".DAT" and ".CFG" files are automatically created. If a path is not defined, the COMTRADE files are saved in the active directory.

If the sample values in the selected file(s) are RMS calibrated and the outcome Comtrade file must have instantaneous values then set the "Comtrade Settings" fields to automatically convert the RMS data to instantaneous values. To set the "Comtrade Settings" fields open the "Window Properties" dialog in the data display. Select the "Comtrade" tab then select "Yes" for the "Convert RMS Calibrated Data to Peak Data".

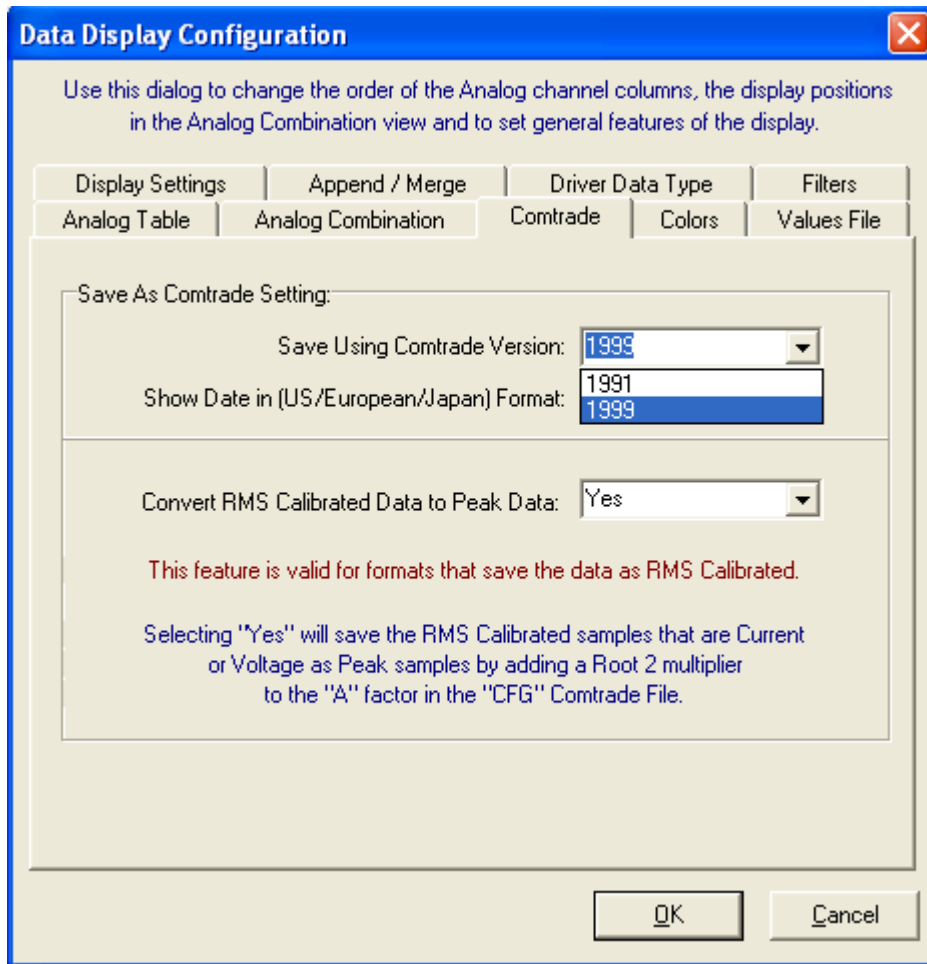


Figure 1.12 Comtrade Version

To automatically convert the selected file(s) to Comtrade using the IEEE long file naming convention check the "Use the ComNames Naming Convention to Name the Comtrade File(s)" field in the "Save As Comtrade" dialog and leave the File Name field empty. Refer to Figure 1.13. All files marked in the table will be converted to the selected Comtrade format and will be named using the IEEE long file naming convention.

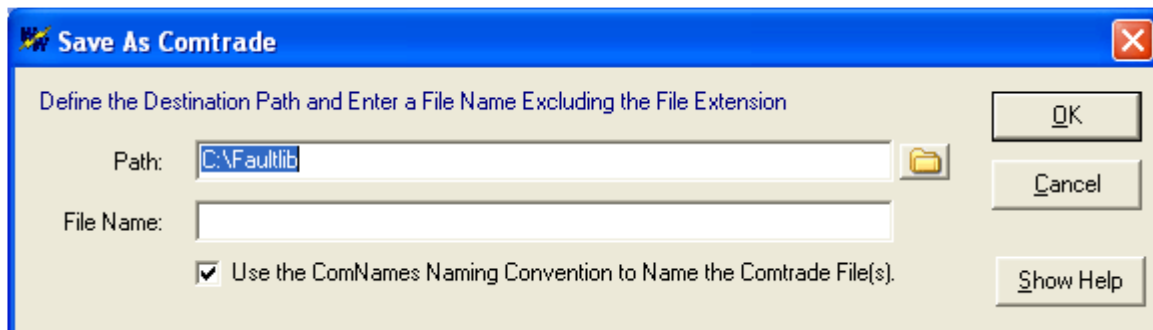


Figure 1.13 Save As Comtrade

## RUNNING APPLICATIONS

Files that contain the extension EXE, BAT, and COM can be activated from the file table. To run an application from the active directory place the cursor on the filename and press <enter> or double click the left mouse button. To run an application from a non-active directory select "Run" from the File menu, enter the path and the filename in the "Open" field, and click **OK**. Refer to Figure 1.14.

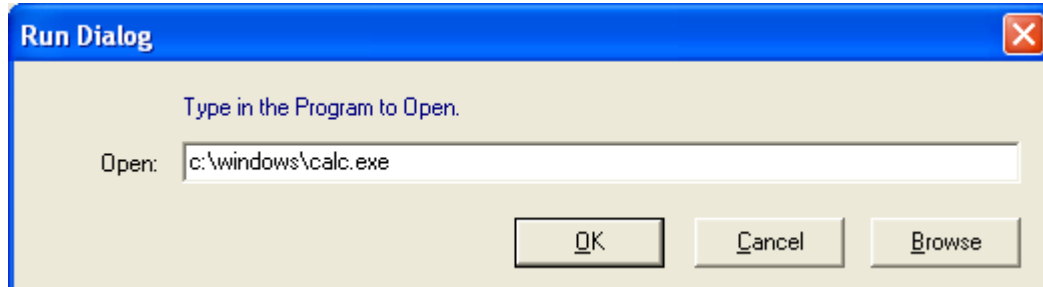


Figure 1.14 Run Dialog

## DISPLAYING COMTRADE OSCILLOGRAPHY RECORDS

The Comtrade format supports waveform and load data. To plot the contents of a Comtrade file double click on the ".DAT" file or move the table cursor to the ".DAT" file and press enter. The system will determine how to display the data (waveform or load) by the time samples in the file.

A maximum of 10 display windows can be opened at one time. Refer to the "Data Display" section for more information.

## ASSOCIATING FILE TYPES

The File Manager automatically associates file types according to the file naming structure. The associated driver is displayed in the driver column. When the <enter> key is pressed or the left mouse button is double clicked the software inspects the filename at the cursor position and executes the assigned driver. Files are associated according to the following parameters:

Driver	Association Parameter
Directories	Directories are tagged according to the parameters read from the file allocation table.
Applications	Files that have the extension ".BAT", ".COM", or ".EXE" are tagged as application files.
COMTRADE	Filenames that have the extension ".DAT" and there exists a corresponding ".CFG" file are tagged as COMTRADE files.
TIS	Files that have the ".TIS" extension are tagged as TIS (Wavewin Sniffer) files.
Audio Wave	Files that have the extension "*.WAV" are tagged as Window's Wave files.
Application Files	Word Documents (".Doc" & ".RTF"), Excel Documents (".XL", ".XLS", ".XLT", ".XLM", ".XLA", ".XLC" & ".XLW"), Web pages (".HTM", ".HTML", ".MSPX" & ".ASP"), Access Files (".MDB" & ".ADP"), Power Point Presentation files (".PPT" & ".PPS"), Image files (".GIF", ".TIF", ".JPG", ".JPE", ".BMP", ".PSD" & ".PDD"), Zip files (".ZIP"), and PDF files (".PDF") are automatically associated with their source application.
ASCII	All other files are tagged as ASCII files.

To change the driver type, place the cursor on the filename and select the driver from the Drivers menu. Once a driver is assigned the file contents appears in the corresponding display window. The following drivers are supported:

ASCII (Text)

Hexadecimal (Binary)  
 Table (Comma Delimited, Double Quotes/Comma Delimited, Tab Delimited)  
 DXF  
 COMTRADE (ASCII and Binary)  
 TIS (Wavewin Sniffer)  
 WAVE (Microsoft's Wave Files)

The “Auto Detect” feature inspects the file at the cursor position and tags it according to the file name.

## VIEWING/MODIFYING ASCII FILES

The ASCII editor allows for viewing and/or modifying the contents of a text file. To open an ASCII file place the cursor on the filename and press F2, or click the **Edit** menu button. Use the up, down, right, left, ctrl+right, ctrl+left, page up, page down, home, end, ctrl+home, and ctrl+end keys, the scroll bars or the search (F4) and search again (F3) features to navigate through the file contents. The line and character number at the cursor position is displayed in the status bar (bottom left corner of the window). Refer to Figure 1.15. The **Cut** (ctrl+x), **Copy** (ctrl+c), and **Paste** (ctrl+v) commands are also provided. New files can be created or existing files can be opened, saved and saved under a new name. A maximum of 10 editing windows can be opened at one time.

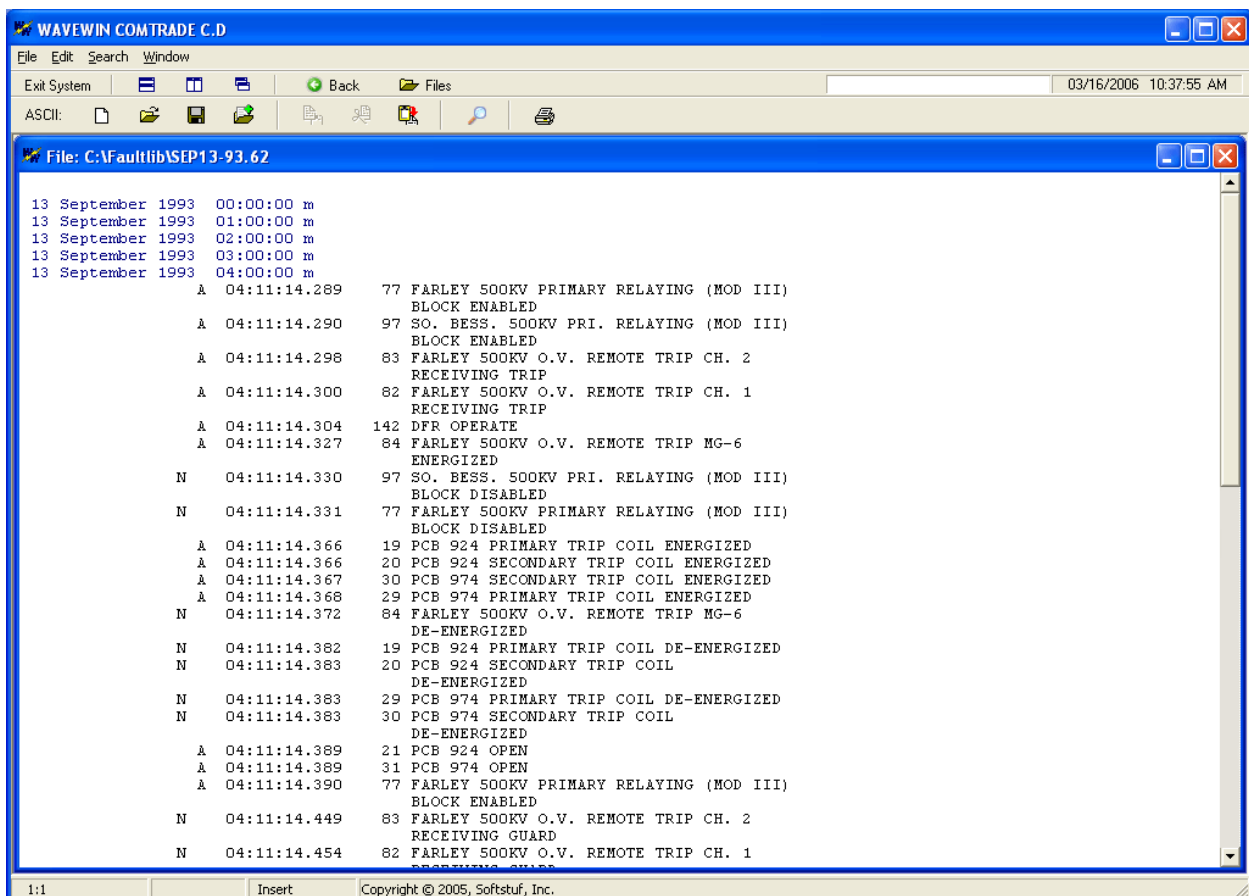


Figure 1.15 ASCII Editor

### VIEWING/MODIFYING BINARY FILES

The Hexadecimal editor allows for viewing and/or modifying the contents of a binary file. To open a binary file, place the cursor on the file and press F3. The Hexadecimal window consists of a hex editor and an ASCII display. Refer to Figure 1.16. When a hex value is entered, the ASCII equivalent appears in the window to the right of the editor. To navigate through the file contents use the up, down, right, left, page up, page down, ctrl+home, and ctrl+end keys or the scroll bar. The byte number at the cursor position is displayed in the lower left corner of the window. To search the contents of a hex file use the search (F4) and search again (F3) functions. To search the ASCII window enter the ASCII information into the "Find Text" Field. To search for a hex value enter "#" then the hex number into the "Find Text" field. Refer to Figure 1.17.

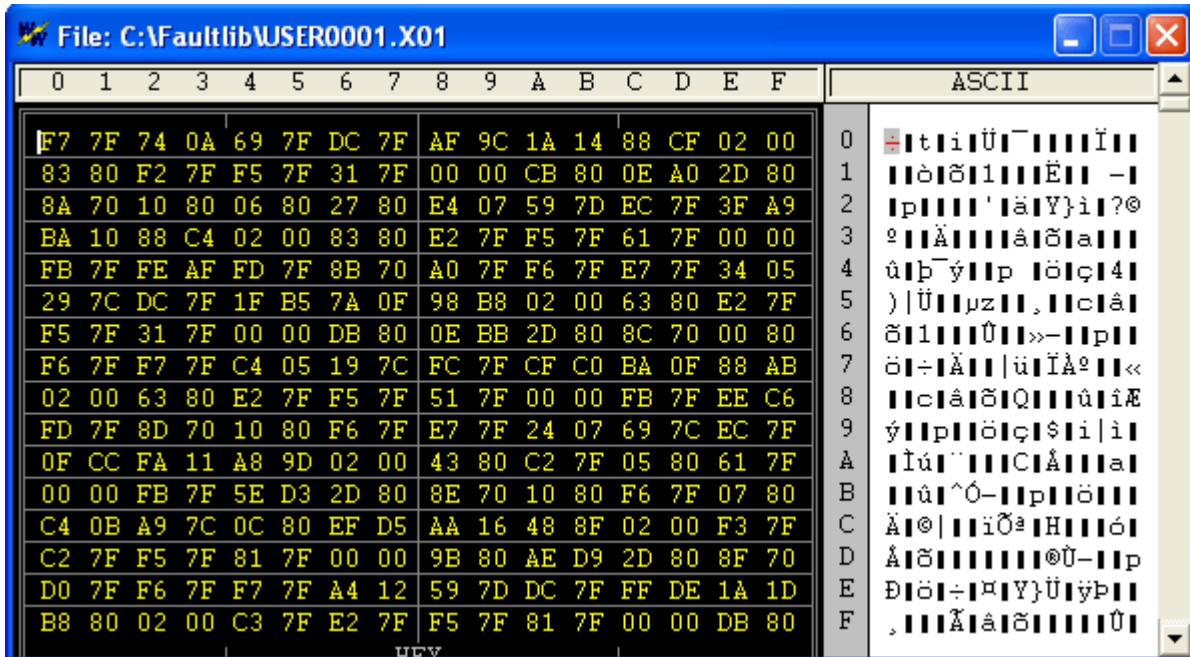


Figure 1.16 Hexadecimal Editor

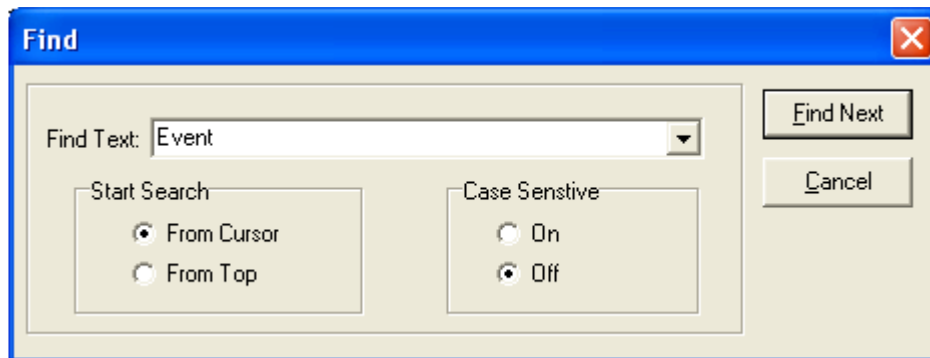


Figure 1.17 Hexadecimal Search

### VIEWING WAVEFORM SUMMARIES

The File Manager and Data Display features generate analog and digital summaries for the supported oscillography formats. The summary engine extracts key information from the file and saves it to a small summary file. The header, analog, and digital information includes:

**Event Information**

Field	Description
Station	Name of the Station associated with the event file.
Filename	Name of the event file.
File Size	File size (displayed in kilobytes).
Prefault-Time	Date and time of the first prefault sample.
Fault-Time	Date and time of the first fault sample.
Save-Time	Date and time the file was saved to disk.
Process-Time	Date and time the file summary was processed.
Start Date & Time	Date and time of the first sample in the file.
End Date & Time	Date and time of the last sample in the file.
File Duration	Duration of the file measured in days, hours, seconds, milliseconds and/or microseconds, depending on the type of file.
Sampling Frequency	Sampling frequency and the time between each sample.
Line Frequency	Line Frequency defined in the file.

**Highest/Lowest Analog Peak Chart**

Field	Description
HPeak-Up	Highest positive peak.
HPeak-Dn	Highest negative peak.
LPeak-Up	Lowest positive peak.
Lpeak-Dn	Lowest negative peak.
OneBit	Channel's full-scale value divide by the channel's resolution.
pU	Channel prefix and unit.
Description	Channel title and number.
HP-Dif	Absolute value of the HPeak-Up minus absolute value of the HPeak-Dn divided by the OneBit value. $((\text{HPeak-UP} - \text{HPeak-Dn})/\text{OneBit})$
LP-Dif	Absolute value of the LPeak-Up minus absolute value of the LPeak-Dn divided by the OneBit value. $((\text{LPeak-UP} - \text{LPeak-Dn})/\text{OneBit})$


**Events/Sensors Activity Summary**

Field	Description
Fst	State the channel started at, A=alarm and N=normal.
Lst	State the channel ended at, A=alarm and N=normal.
Fst-Change	Date and time the channel first changed state.
Lst-Change	Date and time the channel last changed state.
Changes	Number of times the channel changed state.
Description	Channel title and number.

**Events/Sensors Activity Log**

Field	Description
State	State of the channel at the triggered time, A=alarm and N=normal.
Trigger Time	Time the channel-changed state.
Description	Channel title and number.

The xx:xx:xx.xxx displayed in the “Fst-Change” and/or “Lst-Change” fields of the Events/Sensors Activity Summary indicates that the digital channel's state did not change from the initial state (Fst).

To generate a summary file, place the cursor on the filename and click the **Summary**  menu button or select the “Waveform Summary” menu option under the “Options” menu. Refer to Figure 1.18.

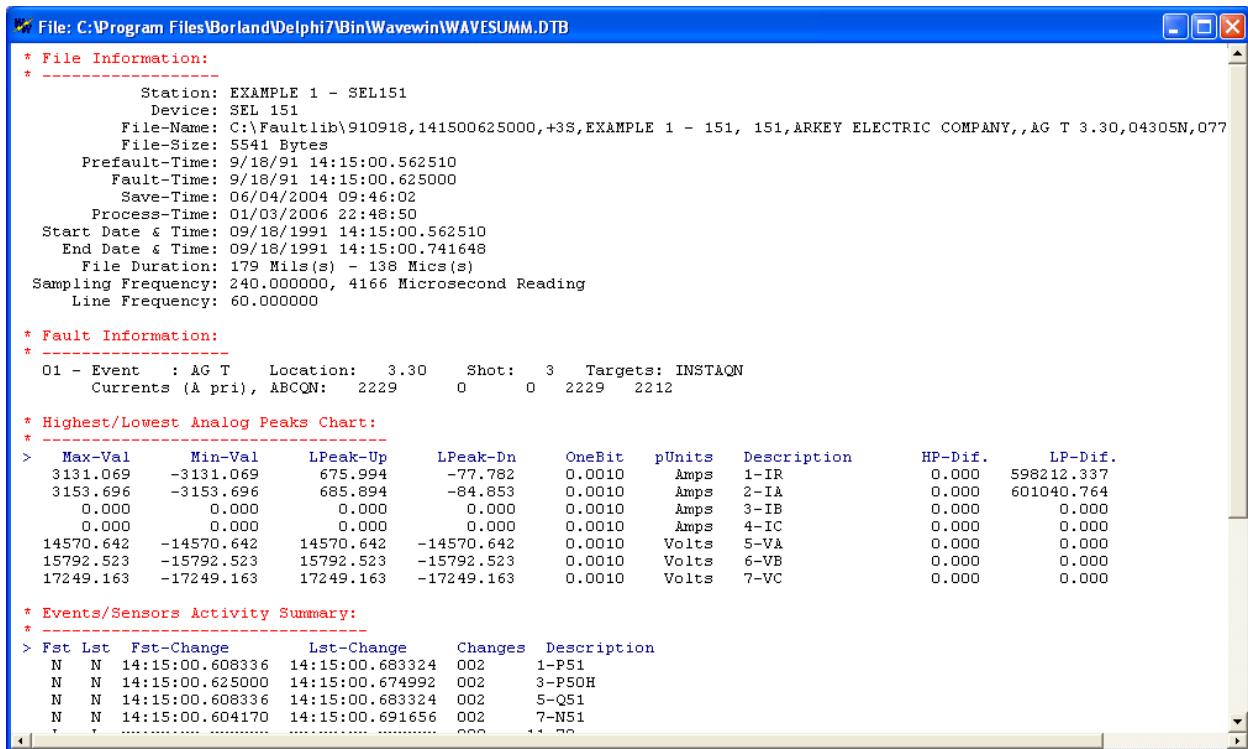


Figure 1.18 Waveform Summary

## WAVEFORM FILE(S) OPTIONS

### OPEN SELECTED FILE


The open selected file option opens the waveform file at the cursor position. Refer to the Displaying Oscillography Records section for a list of the supported waveform files.

### OPEN ALL MARKED FILES

The open all marked files option will open all of the marked waveform files, tile the waveform files horizontally and minimize the file manage. To bring up the file manager click the files menu button.



A maximum of 10 data windows can be opened at one time.

The plot button icon  will plot all the marked files. If there are no marked files then it will plot the selected file.

### APPEND WAVEFORM FILES

The append waveform files option will append the marked files according to time. There are two options available under the Append Menu:

- Discard Common Times: Any common times found in the marked files will be deleted from the older file. Refer to Figure 1.19.
- Back to Back: The files are appended back to back. No samples are deleted. Refer to Figure 1.20.

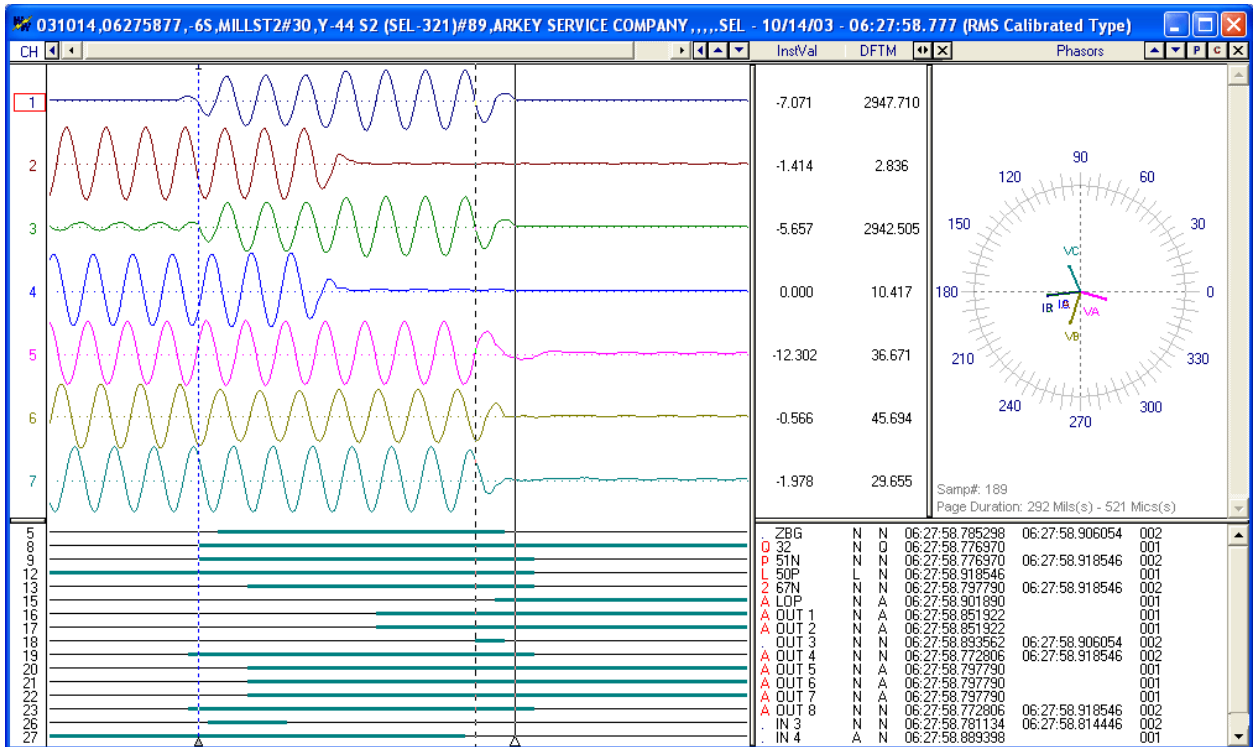


Figure 1.19 Append Waveform Files: Discard Common Times

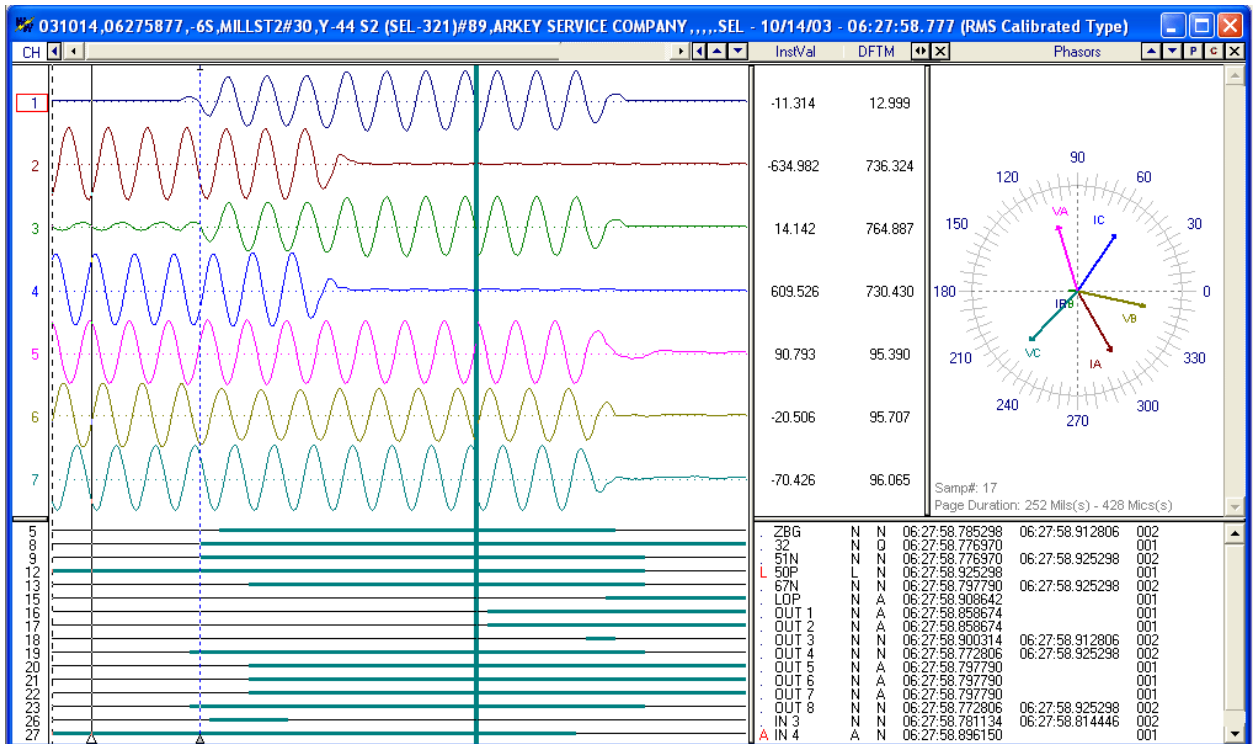


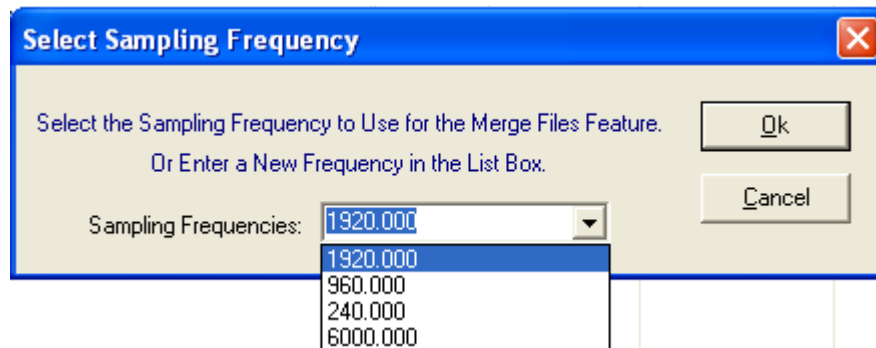
Figure 1.20 Append Waveform Files: Back to Back

## MERGE WAVEFORM FILES

The merge waveform files option will merge the marked waveform files. There are two options available under the Merge Menu:


- By Time: Merge channel samples if they have a common time segment. The reference time is from the file with the latest start date and time. The file with the least amount of samples determines the length of the new merged file. Refer to Figure 1.23.
- By Sample: Merge regardless of time stamps. The reference time is from the first marked file. And the file with the least amount of samples determines the length of the file. Refer to Figure 1.24.

When files with different sampling frequencies are merged a dialog will be displayed. The dialog contains a list of all the sampling frequencies in the marked files. Select the frequency for the merged file or enter a new frequency. Refer to Figure 1.21.



**Figure 1.21 Merge Waveform Files: Select Frequency**

If the merged files have different data types (RMS Calibrated or Peak Values) then the RMS values will be converted to Peak values by multiplying the RMS values by Root 2.

To identify the merged channels the station name for each file is added to the beginning of the analog and digital channel names. To turn off this feature open the “Properties” dialog  in the data-plotting window. Click on the “Append/Merge” tab and uncheck the “Add the File’s Station Name to Beginning of the Analog/Digital Channels” field. Refer to Figure 1.22.

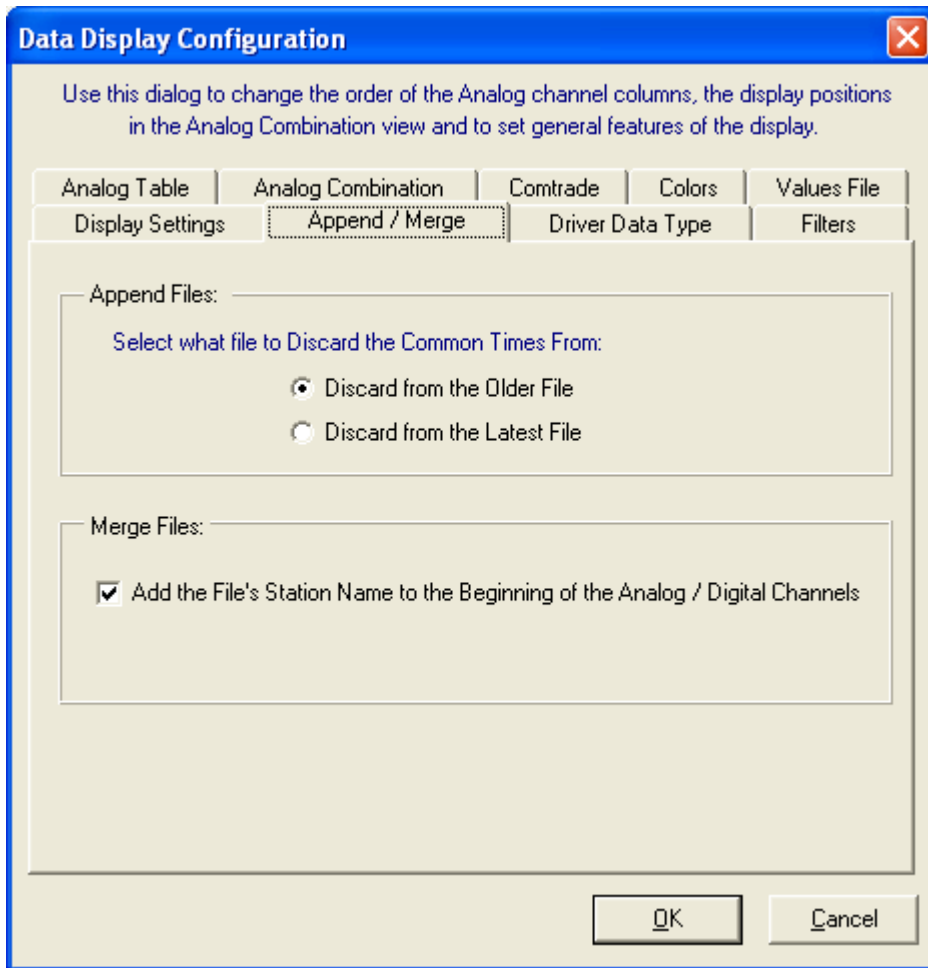


Figure 1.22 Append/Merge Properties

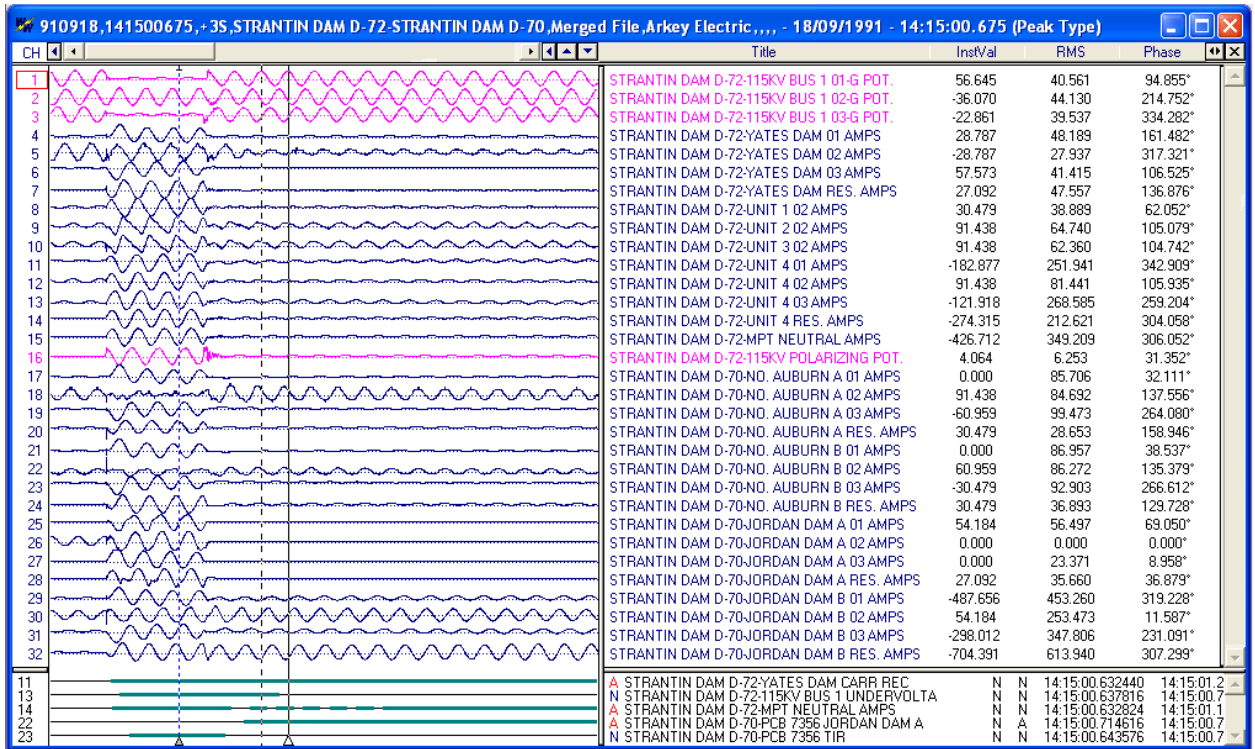


Figure 1.23 Merge Waveform Files By Time

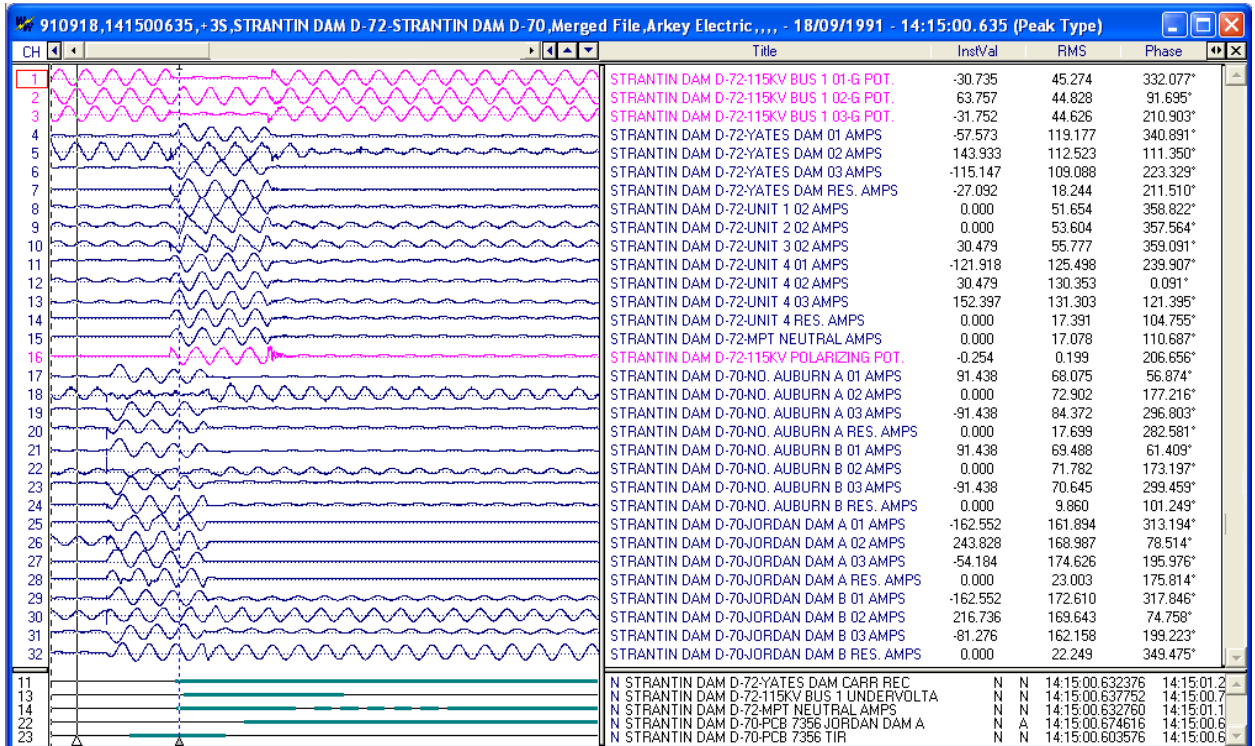


Figure 1.24 Merge Waveform Files By Sample

## FILE REPORTS

### GENERATING CALIBRATION REPORTS

The calibration feature performs the following calculation on the analog channels of the selected DFR file. If one of the calculations is true, the channel is displayed in the report:

- The HP-Dif is greater than 2.5 times the OneBit.
- The LP-Dif is greater than 2.5 times the OneBit.
- The difference between the HPeak-Up and LPeak-Up is greater than 2.5 times the OneBit.
- The difference between the HPeak-Dn and LPeak-Dn is greater than 2.5 times the OneBit.

Calibration reports should only be generated on files that contain no fault data such as snap shot files. To generate a report, mark the desired files and select "Calibration Report" from the "Options" menu. The information contained in the report corresponds to the data displayed in Analog Peak Chart section of the Waveform Summary. Refer to the previous section for field descriptors. The report information is saved in the DVREPORT.DTB file located in the system directory.

### GENERATING SEQUENCE OF EVENTS (SOE) REPORTS

To generate a table of sequence of events for multiple waveform files, first mark all the desired files then press F11 or Select the "SOE List" menu option from the "Reports" submenu under the "Options" menu. A table will be displayed listing all the events triggered in the selected files. Refer to Figure 1.25. The table is sorted according to date and time. The columns listed in the table include:

- State: The state on the event/sensor at the displayed date and time (A=Abnormal, N=Normal).
- Trigger Date: The date the event/sensor triggered or cleared.
- Trigger Time: The time the event/sensor triggered or cleared.
- Chan: The channel number of the event/sensor in the file it was read from.
- Channel Title: The channel title of the event/sensor.
- Device: The device the event/sensor originated from.
- Substation: The substation the event/sensor originated from.
- File: The file name the event/sensor originated from.

The Query section at the bottom of the table allows for searching events from specific substations, devices, and channels... To plot the file containing the specific events press enter or double click on the event.

Substation	Device	State	Trigger Date	Trigger Time	Ch...	Channel Title	File	
MARTIN DAM	DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 632120	9	THURLOW DAM CARR XMIT	C:\Faultib\710BQ1EF.063
MARTIN DAM	DAU 72	DAU 72	A	09/ 18/ 1991	14: 15: 00. 632888	11	YATES DAM CARR REC	C:\Faultib\720BQ1EF.063
MARTIN DAM	DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 633080	33	SYLCAUGA RES. AMPS	C:\Faultib\710BQ1EF.063
MARTIN DAM	DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 633080	10	THURLOW DAM CARR REC	C:\Faultib\710BQ1EF.063
MARTIN DAM	DAU 72	DAU 72	A	09/ 18/ 1991	14: 15: 00. 633272	34	MPT NEUTRAL AMPS	C:\Faultib\720BQ1EF.063
MARTIN DAM	DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 634232	34	HARRIS DAM RES. AMPS	C:\Faultib\710BQ1EF.063
EXAMPLE 69 KV LINE - SEL121	SEL 121C	L	09/ 18/ 1991	14: 15: 00. 637668	1	RELAYS 50P	C:\Faultib\910918,141500646000,+3S,EX...	
MARTIN DAM	DAU 72	DAU 72	A	09/ 18/ 1991	14: 15: 00. 638264	33	115KV BUS 1 UNDERVOLTAGE	C:\Faultib\720BQ1EF.063
MARTIN DAM	DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 641144	35	CROOK CRK/BREMEN RES AMP	C:\Faultib\710BQ1EF.063
EXAMPLE 69 KV LINE - SEL121	SEL 121C	A	09/ 18/ 1991	14: 15: 00. 646000	9	OUTPUTS A1	C:\Faultib\910918,141500646000,+3S,EX...	
EXAMPLE 69 KV LINE - SEL121	SEL 121C	P	09/ 18/ 1991	14: 15: 00. 646000	5	RELAYS 51N	C:\Faultib\910918,141500646000,+3S,EX...	
EXAMPLE 69 KV LINE - SEL121	SEL 121C	2	09/ 18/ 1991	14: 15: 00. 646000	4	RELAYS 67N	C:\Faultib\910918,141500646000,+3S,EX...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	47	PICKUP 150G-2 WDG2 2ND IN...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	45	PICKUP 50G-2 WDG2 1ST GRN...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	43	PICKUP 51G-2 WDG2 GROUND...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	40	PICKUP 150N-1 WDG1 2ND NE...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	38	PICKUP 50N-1 WDG1 1ST NET...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	36	PICKUP 51N WDG1 GROUND...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	20	OUTPUT STATUS BIT, 2ND HA...	C:\Faultib\910918,141618800000,+3S,TPU...	
EXAMPLE 69 KV LINE - SEL121	SEL 121C	P	09/ 18/ 1991	14: 15: 00. 650166	6	RELAYS 51P	C:\Faultib\910918,141500646000,+3S,EX...	
EXAMPLE 69 KV LINE - SEL121	SEL 121C	2	09/ 18/ 1991	14: 15: 00. 650166	3	RELAYS 21P	C:\Faultib\910918,141500646000,+3S,EX...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	61	FAULT 50G-2 WDG2 1ST GRN...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	54	FAULT 50N-1 WDG1 1ST NET...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	42	PICKUP 51P-2 WDG2 PHASE T...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	37	PICKUP 50P-1 WDG1 1ST PH...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	35	PICKUP 51P WDG1 1ST PHAS...	C:\Faultib\910918,141618800000,+3S,TPU...	
EXAMPLE 69 KV LINE - SEL121	SEL 121C	A	09/ 18/ 1991	14: 15: 00. 654332	11	OUTPUTS A3	C:\Faultib\910918,141500646000,+3S,EX...	
EXAMPLE 69 KV LINE - SEL121	SEL 121C	A	09/ 18/ 1991	14: 15: 00. 654332	7	OUTPUTS TP	C:\Faultib\910918,141500646000,+3S,EX...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 658160	53	FAULT 50P-1 WDG1 1ST PH...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 658160	33	PICKUP 87T DIFFERENTIAL O...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 662320	49	FAULT 87T DIFFERENTIAL OV...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	N	09/ 18/ 1991	14: 15: 00. 662320	20	OUTPUT STATUS BIT, 2ND HA...	C:\Faultib\910918,141618800000,+3S,TPU...	
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 662320	17	OUTPUT STATUS BIT, TRIP	C:\Faultib\910918,141618800000,+3S,TPU...	
EXAMPLE 69 KV LINE - SEL121	SEL 121C	N	09/ 18/ 1991	14: 15: 00. 666830	18	INPUTS 52A	C:\Faultib\910918,141500646000,+3S,EX...	
MARTIN DAM	DAU 71	DAU 71	N	09/ 18/ 1991	14: 15: 00. 702776	35	CROOK CRK/BREMEN RES AMP	C:\Faultib\710BQ1EF.063
MARTIN DAM	DAU 71	DAU 71	N	09/ 18/ 1991	14: 15: 00. 703736	34	HARRIS DAM RES. AMPS	C:\Faultib\710BQ1EF.063
MARTIN DAM	DAU 71	DAU 71	N	09/ 18/ 1991	14: 15: 00. 703736	33	SYLCAUGA RES. AMPS	C:\Faultib\710BQ1EF.063
MARTIN DAM	DAU 72	DAU 72	N	09/ 18/ 1991	14: 15: 00. 707768	34	MPT NEUTRAL AMPS	C:\Faultib\720BQ1EF.063

Figure 1.25 SOE List

### GENERATING SEQUENCE OF EVENTS (SOE) SUMMARIES

To generate a summary of the sequence of events for multiple waveform files, first mark all the desired files then Select the "SOE Summary" menu option from the "Reports" submenu under the "Options" menu. A table will be displayed listing a summary of all the events triggered in the selected files. Refer to Figure 1.26. The table is sorted according to date and time. The columns listed in the table include:

- Substation: The substation that triggered the event/sensor.
- Device: The device that triggered the event/sensor.
- Fst-State: State the channel started at, A=alarm and N=normal.
- Lst-State: State the channel ended at, A=alarm and N=normal.
- Fst-Change Date: Date the channel first changed state.
- Fst-Change Time: Time the channel first changed state.
- Lst-Change Date: Date the channel last changed state.
- Lst-Change Time: Time the channel last changed state.
- Changes: Number of times the channel changed state.
- Chan #: Channel number in the file.
- Channel Title: The channel title of the event/sensor.
- File: The file name the event/sensor originated from.

The Query section at the bottom of the table allows for searching events from specific substations, devices, and channels... To plot the file containing the specific events press enter or double click on the event.

Substation	Device	Fst...	Lst...	Fst-Change D...	Fst-Change Time	Lst-Change D...	Lst-Change Time	Ch...	Channel Title	
MARTIN DAM	DAU 71	DAU 71	N	A	09/18/1991	14:15:00.632120	09/18/1991	14:15:00.555512	001 9	THURLOW DAM CARR XMIT
MARTIN DAM	DAU 72	DAU 72	N	N	09/18/1991	14:15:00.632888	09/18/1991	14:15:01.239428	002 11	YATES DAM CARR REC
MARTIN DAM	DAU 71	DAU 71	N	N	09/18/1991	14:15:00.633080	09/18/1991	14:15:00.703736	002 33	SYLACAUGA RES. AMPS
MARTIN DAM	DAU 71	DAU 71	N	A	09/18/1991	14:15:00.633080	09/18/1991	14:15:00.555512	001 10	THURLOW DAM CARR REC
MARTIN DAM	DAU 72	DAU 72	N	N	09/18/1991	14:15:00.633272	09/18/1991	14:15:01.156280	014 34	MPT NEUTRAL AMPS
MARTIN DAM	DAU 71	DAU 71	N	N	09/18/1991	14:15:00.634232	09/18/1991	14:15:00.703736	002 34	HARRIS DAM RES. AMPS
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.637668	09/18/1991	14:15:00.725154	002 1	RELAYS 50P
MARTIN DAM	DAU 72	DAU 72	N	N	09/18/1991	14:15:00.638264	09/18/1991	14:15:00.737720	002 33	115KV BUS 1 UNDERVOLTAGE
MARTIN DAM	DAU 71	DAU 71	N	N	09/18/1991	14:15:00.641144	09/18/1991	14:15:00.702776	002 35	CROOK CRK/BREMEN RES AMP
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.646000	09/18/1991	14:15:00.716822	002 9	OUTPUTS A1
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.646000	09/18/1991	14:15:00.725154	002 5	RELAYS 51N
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.646000	09/18/1991	14:15:00.720988	002 4	RELAYS 67N
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.030000	001 47	PICKUP 150G-2 WDG2 2ND INST. OVE
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.030000	001 45	PICKUP 50G-2 WDG2 1ST GRND. INST
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.030000	001 43	PICKUP 51G-2 WDG2 GROUND TIME C
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.030000	001 40	PICKUP 150N-1 WDG1 2ND NET. INST.
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.030000	001 38	PICKUP 50N-1 WDG1 1ST NET. INST. C
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.030000	001 36	PICKUP 51N WDG1 GROUND OVERCUR
TPU Relay	TPU Relay	TPU Relay	N	N	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.662320	002 20	OUTPUT STATUS BIT, 2ND HARMONIC
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.650166	09/18/1991	14:15:00.716822	002 6	RELAYS 51P
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.650166	09/18/1991	14:15:00.716822	002 3	RELAYS 21P
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.654000	09/18/1991	14:15:00.030000	001 61	FAULT 50G-2 WDG2 1ST GRND. INST.
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.654000	09/18/1991	14:15:00.030000	001 54	FAULT 50N-1 WDG1 1ST NET. INST. O
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.654000	09/18/1991	14:15:00.030000	001 42	PICKUP 51P-2 WDG2 PHASE TIME OVE
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.654000	09/18/1991	14:15:00.030000	001 37	PICKUP 50P-1 WDG1 1ST PH. INST. O
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.654000	09/18/1991	14:15:00.030000	001 35	PICKUP 51P WDG1 1ST PHASE TIME C
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.654332	09/18/1991	14:15:00.716822	002 11	OUTPUTS A3
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	N	N	09/18/1991	14:15:00.654332	09/18/1991	14:15:00.720988	002 7	OUTPUTS TP
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.658160	09/18/1991	14:15:00.030000	001 53	FAULT 50P-1 WDG1 1ST PH. INST. O
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.658160	09/18/1991	14:15:00.030000	001 33	PICKUP 87T DIFFERENTIAL OVERCUR
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.662320	09/18/1991	14:15:00.030000	001 49	FAULT 87T DIFFERENTIAL OVERCUR
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.662320	09/18/1991	14:15:00.030000	001 17	OUTPUT STATUS BIT, TRIP
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.666830	09/18/1991	14:15:00.583510	001 18	INPUTS 52A
EXAMPLE 68 KV LINE - SEL121	SEL 121C	SEL 121C	A	N	09/18/1991	14:15:00.666830	09/18/1991	14:15:00.030000	001 63	FAULT 150G-2 WDG2 2ND INST. OVER
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.733040	09/18/1991	14:15:00.030000	001 56	FAULT 150N-1 WDG1 2ND NET. INST.
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.733040	09/18/1991	14:15:00.030000	001 56	FAULT 150N-1 WDG1 2ND NET. INST.
TPU Relay	TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.966000	09/18/1991	14:15:00.030000	001 18	OUTPUT STATUS BIT, BREAKER FAIL

Figure 1.26 SOE Summary

**APPENDING LOG FILES**

The append log features will combine an unlimited number of log files into one file. The files must be marked and of the same type (generated from the same device). The generated combined file can be displayed in a table or plotted in the data plotting window. This feature allows for analyzing load data over a long period.

**COMBINING LOG FILES**

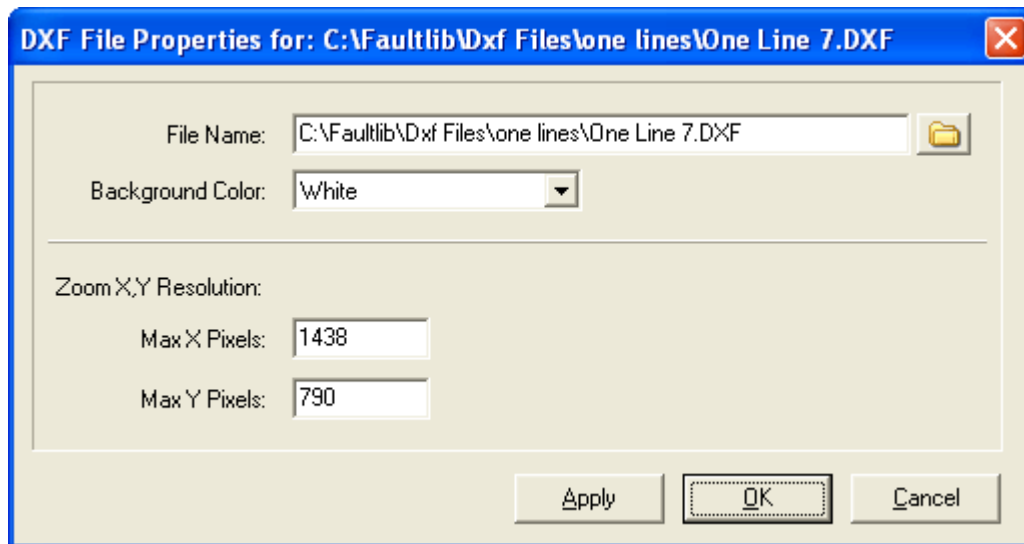
The combine log features will combine an unlimited number of log files into one file. The files must be marked and can be from different file types (generated from different devices). The substation and device of each file is added in the file. The saved file can be displayed in a table. This feature allows for analyzing load data over a long period for different devices.

**VIEWING CAD-DXF FILES**

The CAD-DXF viewer reads and displays the contents of a Drawing Exchange Format (DXF) file. Refer to Figure 1.27. DXF files can be created using an off-the-shelf program such as AutoCAD, Turbo CAD, Technical Visio, Drafix, or MEDUSA. To view a DXF file double click the left mouse button on the DXF filename. The viewer allows for opening and closing of DXF files, changing display resolution, setting zoom ratio, and selecting background color. It also provides zooming and printing capabilities.



Use the tab or shift+tab keys to navigate between fields and the up and down arrow keys to view the selectable options. Click **Apply** to view the changes, **OK** to accept the changes, or **Cancel** to terminate the changes.



**Figure 1.28 DXF Drawing Constants**

### VIEWING ASCII FILES IN DATABASE FORMAT

The database viewer provides an effective way to organize, sort, and search comma delimited, double quoted comma delimited, or tab delimited text files. Refer to Figure 1.29. The data is presented in tabular form and an unlimited number of rows and columns can be displayed. The viewer allows for intelligent queries, column sorting, selecting and grouping data, row deletion, printing, saving and saving in a new file.

Use the column headers to sort the data in ascending or descending order and the query fields to search the data. Refer to the "Querying Files" section for more information. To browse the data use the up, down, right, left, page-up, page-down, home, end, ctrl+home, and ctrl+end keys or use the scroll bars. Rows must be marked in order to delete them from the table.

The database viewer is useful for processing COMTRADE data files, employing undertriggers and overtriggers, locating instantaneous maximum and minimum peak values and analyzing load information.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
00000000	00000000	022017	016732	010391	017555	016822	014744	016381	016377	016374	016375	016385	016376
00000001	00000033	020894	018444	009814	017206	017214	014694	016383	016378	016375	016379	016388	016373
00000002	00000166	019453	020030	009673	016798	017553	014765	016386	016376	016373	016378	016385	016376
00000003	00000250	017815	021351	009998	016362	017817	014937	016382	016377	016377	016379	016385	016374
00000004	00000333	016075	022345	010751	015930	017977	015210	016385	016377	016379	016381	016389	016377
00000005	00000416	014357	022930	011890	015530	018029	015561	016383	016380	016375	016378	016385	016378
00000006	00000500	012771	023070	013334	015184	017966	015969	016383	016379	016377	016380	016386	016374
00000007	00000583	011429	022750	014988	014919	017793	016398	016383	016378	016374	016378	016384	016372
00000008	00000666	010425	021992	016739	014752	017522	016837	016377	016377	016375	016379	016385	016376
00000009	00000750	009829	020859	018452	014703	017177	017235	016381	016378	016376	016379	016385	016373
00000010	00000833	009683	019406	020036	014762	016769	017572	016377	016378	016375	016379	016383	016374
00000011	00000916	009992	017764	021359	014937	016344	017831	016380	016373	016376	016377	016384	016372
00000012	00001000	010736	016024	022356	015209	015914	017993	016378	016376	016372	016377	016386	016371
00000013	00001083	011862	014309	022941	015558	015519	018040	016378	016373	016375	016378	016382	016374
00000014	00001166	013304	012727	023079	015966	015178	017972	016381	016376	016372	016377	016382	016374
00000015	00001250	014941	011400	022756	016402	014922	017796	016376	016372	016373	016376	016378	016372
00000016	00001333	016682	010404	022000	016833	014758	017526	016378	016375	016372	016374	016379	016369
00000017	00001416	018399	009822	020858	017232	014703	017178	016379	016375	016372	016372	016379	016369
00000018	00001500	019899	009683	019415	017582	014768	016772	016378	016375	016372	016376	016381	016372
00000019	00001583	021327	010000	017765	017843	014941	016338	016383	016376	016375	016376	016381	016373
00000020	00001666	022328	010750	016025	018010	015206	015906	016383	016375	016374	016374	016382	016371
00000021	00001750	022925	011886	014307	018062	015551	015506	016383	016375	016373	016375	016383	016369
00000022	00001833	023075	013332	012720	018001	015959	015168	016383	016376	016376	016374	016384	016375
00000023	00001916	022768	014978	011394	017826	016387	014913	016386	016376	016376	016378	016383	016374
00000024	00002000	022019	016726	010395	017555	016818	014746	016383	016375	016375	016378	016384	016374
00000025	00002083	020896	018438	009813	017209	017213	014695	016383	016375	016374	016375	016385	016374
00000026	00002166	019459	020024	009678	016798	017553	014765	016383	016376	016378	016378	016383	016375
00000027	00002250	017818	021348	009996	016365	017816	014938	016383	016377	016381	016381	016387	016378
00000028	00002333	016078	022342	010747	015934	017976	015209	016385	016379	016377	016381	016387	016378
00000029	00002416	014362	022927	011887	015533	018028	015561	016384	016376	016378	016379	016387	016377
00000030	00002500	012774	023068	013332	015186	017966	015969	016383	016379	016375	016379	016385	016376
00000031	00002583	011433	022751	014982	014920	017792	016397	016383	016376	016377	016379	016386	016378
00000032	00002666	010427	021996	016733	014752	017524	016834	016382	016377	016377	016382	016385	016374
00000033	00002750	009831	020858	018444	014702	017175	017232	016379	016376	016377	016378	016383	016375
00000034	00002833	009681	019414	020031	014764	016770	017572	016379	016374	016372	016377	016384	016371
00000035	00002916	009991	017766	021354	014933	016342	017830	016376	016373	016373	016376	016382	016371
00000036	00003000	010735	016028	022355	015208	015914	017992	016378	016374	016374	016378	016384	016371
00000037	00003083	011860	014311	022940	015556	015518	018040	016378	016376	016375	016378	016383	016372
-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 1.29 Database Viewer

**SHOW/HIDE CHANNEL TITLES**

The data plotting window automatically hides channels that contain certain characters in the channel title. Below is a list of the characters defined to be invalid channels when a file is displayed.

- UNUSE
- UNDEF
- NOT D
- NOT U
- NOT I
- NOT A
- {
- N/A
- ANALOG INPUT
- UNTITLED
- ANALOG CHANNEL
- EXTERNAL INPUT
- EVENT CHANNEL
- CHANNEL:
- DIGITAL TRACE #
- SPARE

If a channel title contains the above characters in the beginning of the title then that channel is automatically hidden. These characters can be modified to show a channel when a file is displayed. To show a title that contains the above characters open the Show/Hide Channel titles dialog. Refer to Figure 1.30.

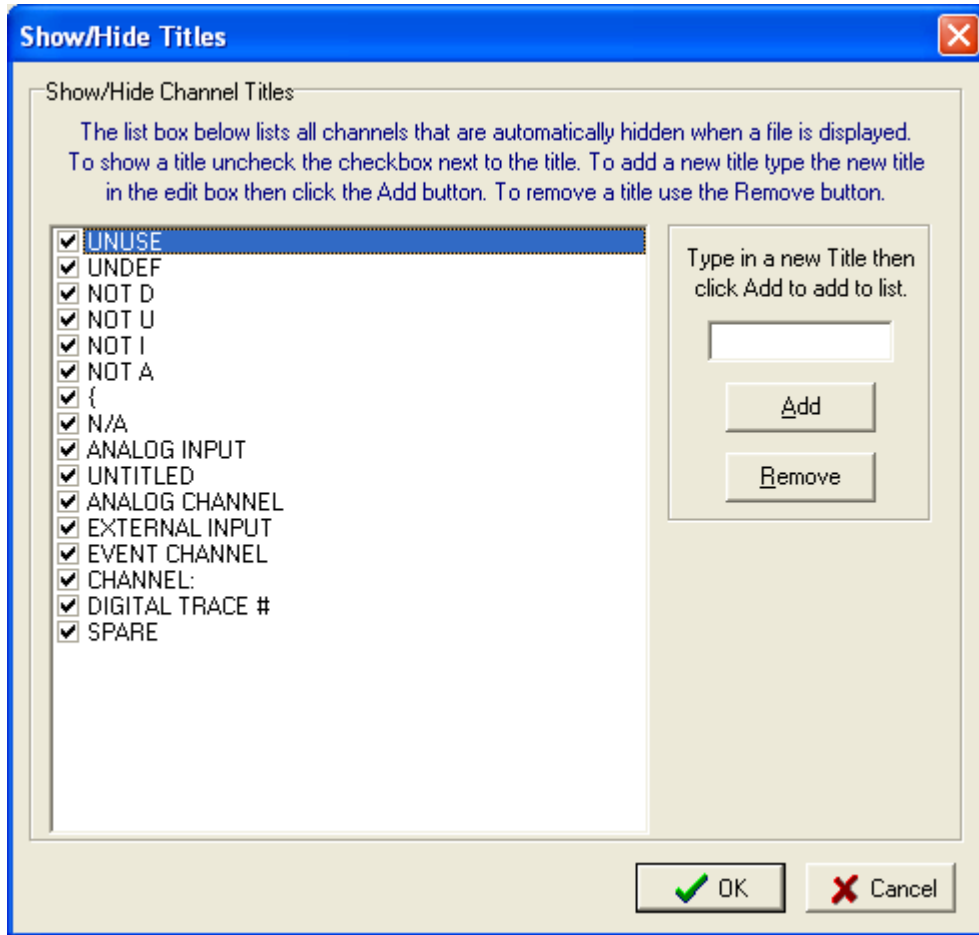


Figure 1.30 Show/Hide Channel Titles Dialog

To show a title, uncheck the checkbox next to the displayed invalid channel title. To remove a title from the list select the title in the list box then click the “Remove” button or press the delete key. To add a new title first, type the new title in the edit box then click the “Add” button. The new title will be added to the end of the list with the checkbox automatically checked.

### QUERYING FILES

The query fields are used to search the information in the tables. Query fields are located below the table. Refer to Figure 1.31. Use the tab key to move the cursor from the table to the query fields and up arrow to return to the table. The Ctrl-left/right keys moves between each query field. Each field contains a criteria and an operator. The criteria is directly entered from the keyboard, and may include the “\*” and “?” wild cards. Operators are located above the criteria fields and can be changed by clicking the left mouse button on the operator symbol or by pressing the F9 key. The selectable options include equal to (=), less than (<), and greater than (>).

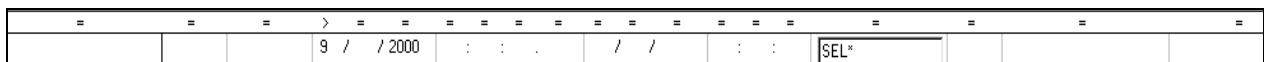


Figure 1.31 Query Fields

When a query is launched, the engine numerically compares the criteria with the information in the table. If numerical comparison is not possible then symbolic comparison is performed. When multiple fields are defined, the engine searches for a match on the first field “AND” on the second field “AND” on the third field and so on.

Three query options are available: Query All Files, Query Marked Files, or Query Unmarked Files. Files that meet the specified query requirements are marked, grouped, and displayed at the top of the table. Use the Ctrl-left/right keys to navigate through the query fields and the <enter> key to process the criteria at the cursor position.

## Data Display

The Data Display offers a high-resolution graphical interface for displaying, analyzing, and manipulating analog and digital channels of an oscillography record or a periodic load file. Refer to Figure 1.32. Displayed channels can be marked, merged, appended, moved, zoomed, removed, restored, superimposed, scaled, numerically processed, and summarized. A maximum of 10 data windows can be opened at one time.

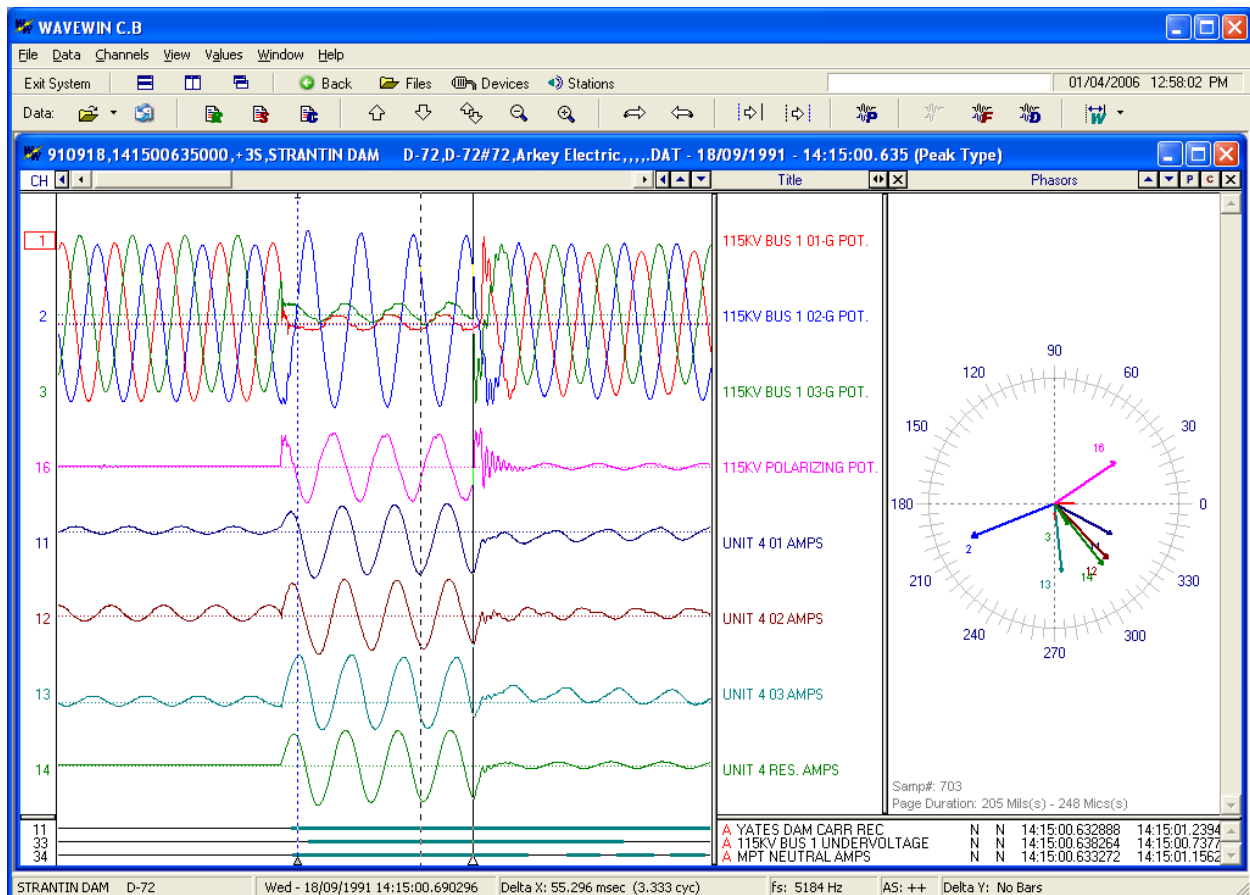








Figure 1.32 Data Display

The Data Display contains two sections: the analog view and the digital view. The analog view plots the oscillography or load data and displays the channel's highest peak, RMS, phase, reference, instantaneous, maximum, and minimum values and so on. The cursor bars are used to view the data values. The digital view plots the events and sensors and displays the channel's original state, final state, time of the first change, time of the last change, and number of times the channel-changed state.

Up to 256 analog and 1024 digital channels can be displayed. The main features are described below.

## PHASORS

The phasor diagram shows a vector for each visible analog channel. The diagram is displayed to the right of the analog information window. Refer to Figure 1.32. To increase or decrease the size of the phasor window place the cursor over the vertical separator between the analog information window and the phasor window and drag the mouse to the left to increase or to the right to decrease. To close the phasor window click the close button located in the header. To navigate the phase angles use the left arrow, right arrow, home, end, page up and page down keys or the data scroll bar. To increase/decrease the length of a channel's vector along with the amplitude of the oscillography channel first mark the channels and use the increase/decrease amplitude menu buttons   or the Ctrl-Up and Ctrl-Down keys. To only increase/decrease the length of the vectors use the up and down phasor buttons.  .

To toggle between the phasor display and the circular chart display click the “P” button above the phasor display for phasors or the “C” button for a circular chart  .

There are 2 types of phasor displays: non-referenced and referenced, refer to Figure 1.33. The non-referenced display shows the phase angle for each sample in the display. The reference display shows the phase angle for each sample with respect to the reference channel. The reference channel is the first marked channel in the window. All angles at a sample are subtracted from the reference angle. If there are no marked channels the non-referenced display is shown.

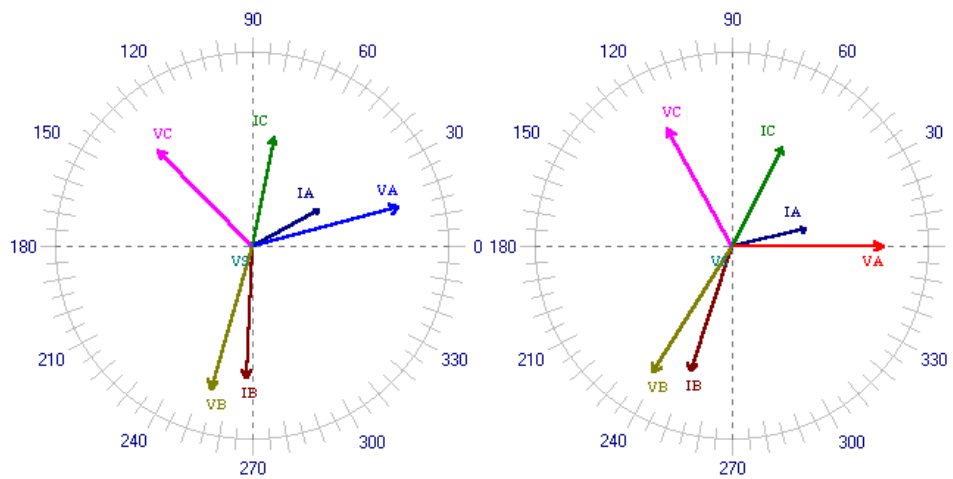


Figure 1.33 (a) Non-Referenced Phasors


(b) Referenced Phasors

## HARMONICS

The harmonics window displays as many harmonics as possible based on the file's sampling frequency. A maximum of 200 harmonics can be displayed in the table. Refer to Figure 1.35. To display the harmonics window right click in the phasor diagram or in the analog information section and select the Harmonics menu option. The harmonics window displays the harmonics for the first marked analog channel or if no channels are marked then the first visible channel. Changing the marked channel in the data plotting window will update the harmonics window with the appropriate channel.

The harmonic calculation is performed on one cycle of data, starting at the RMS bar and going forward to the data bar. There are 3 fields displayed at the bottom of the harmonics table and histogram; TrueRMS, CalculatedRMS and Total Harmonic Distortion (THD). The TrueRMS field displays the RMS value calculated using the samples in the active cycle displayed in the waveform trace window. The CalculatedRMS field displays the square root of the summation of the squares of the DFT Magnitudes from harmonics 2 to the maximum harmonic divided by square root of 2. The THD field displays the square root of the summation of the squares of the DFT Magnitudes from harmonics 2 to the maximum

harmonic divided by the square root of 2 and that quantity divided by the DFT Magnitude of the Fundamental.

The harmonics can be viewed in a table format or in a histogram. Click on the harmonics toggle button  to change the view. Refer to Figure 1.36. The histogram can show only one column from the table. To change the column of data displayed click the histogram drop down menu and select the column. Refer to Figure 1.34. The default view is the % of Fundamental.

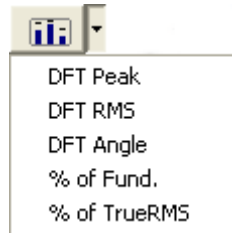


Figure 1.34 Histogram Drop Down Menu

Also, a vector for each harmonic is displayed in the phasor diagram. To hide/show the harmonic vectors toggle the "Vector Harmonics" menu option under the "View" menu from checked=on to unchecked=off.

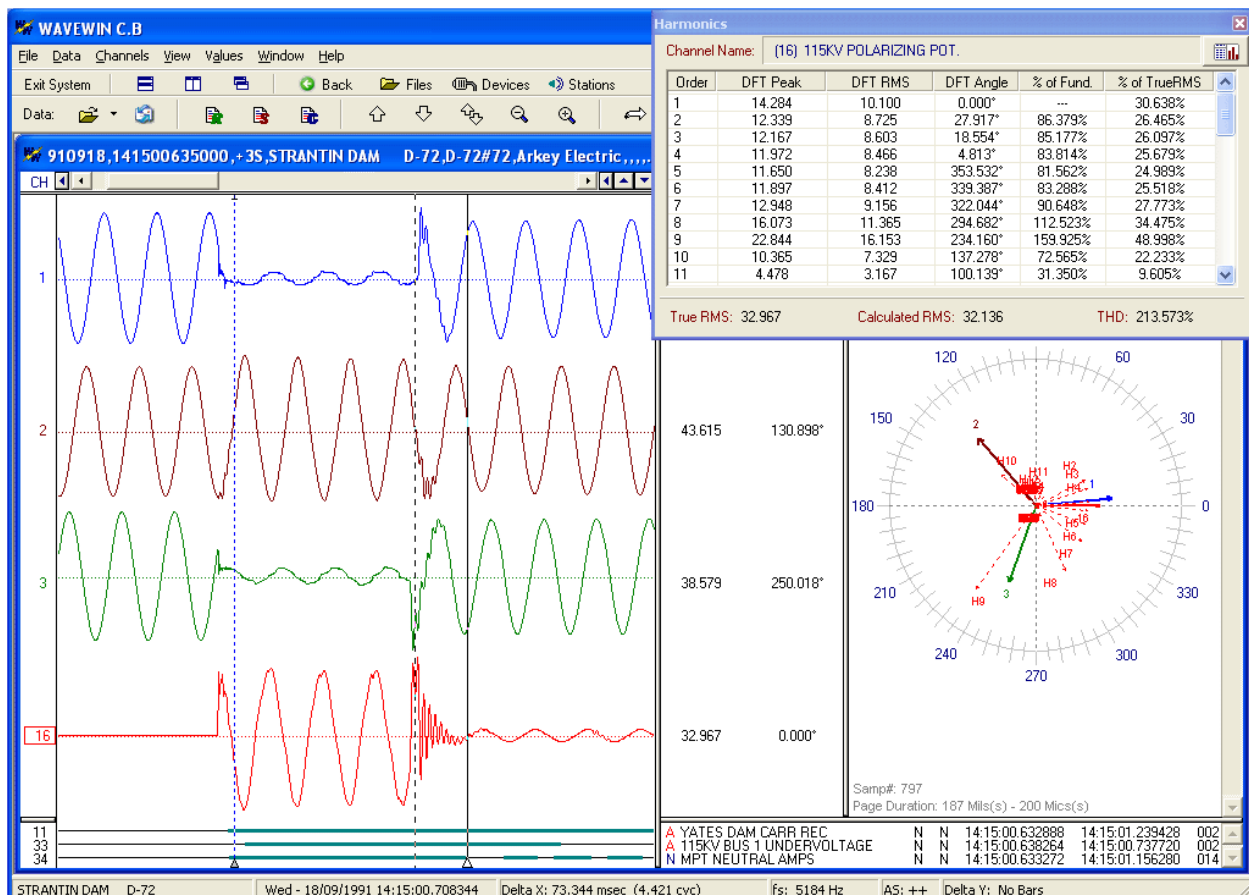


Figure 1.35 Harmonics Table View

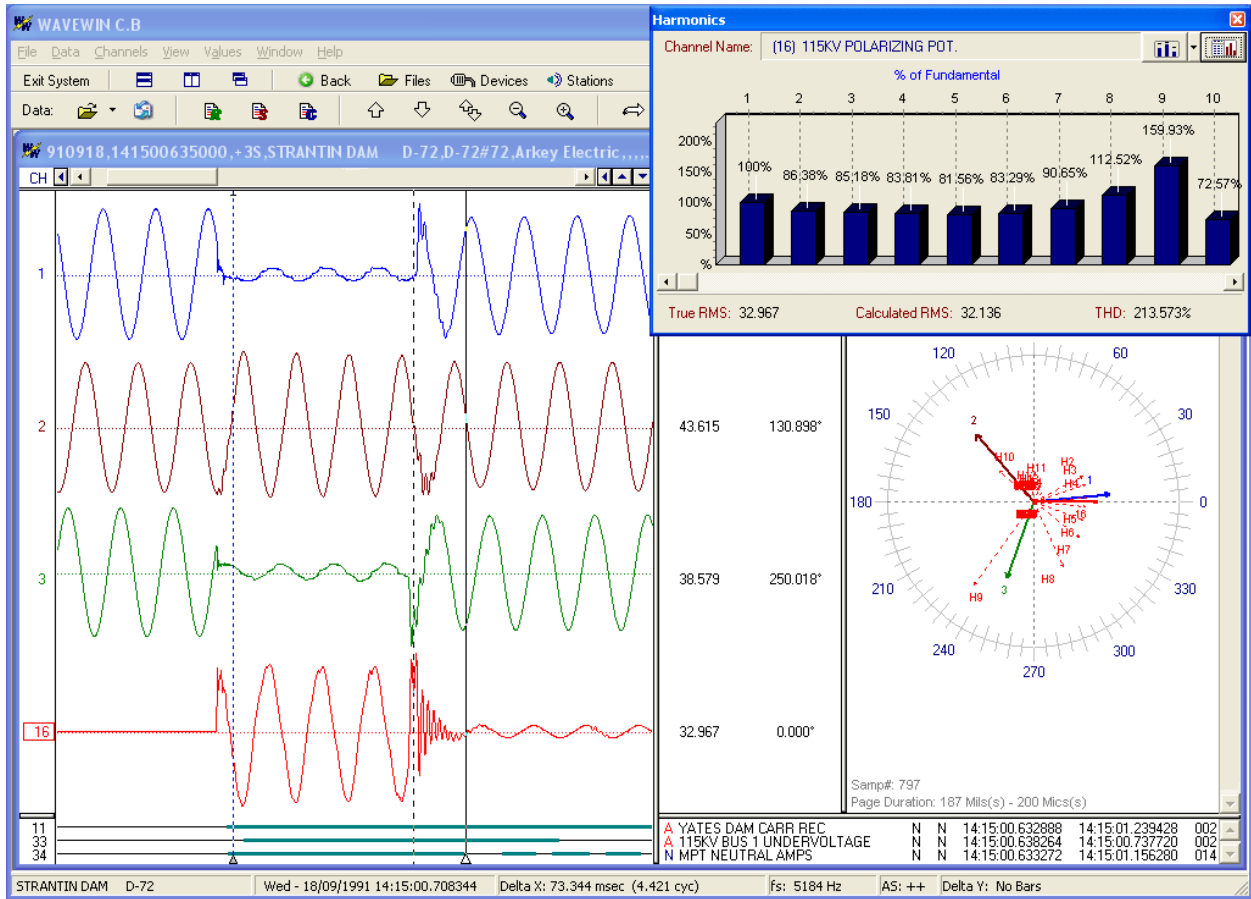


Figure 1.36 Harmonics Histogram View

### PERIODIC LOG FILES

The periodic log viewer allows for viewing and analyzing large amounts of event data in a single display. Refer to Figure 1.37. The data is displayed in envelope form and may contain one day, one week, one month or one year of event data. This feature is useful for load flow analysis.

A circular chart of the data displayed in the trace window is plotted to the right of the channel information window. The circular chart cursor is positioned on the sample at the waveform data bar. The duration of the data displayed is also shown below the circular chart along with the sample number at the cursor bar.

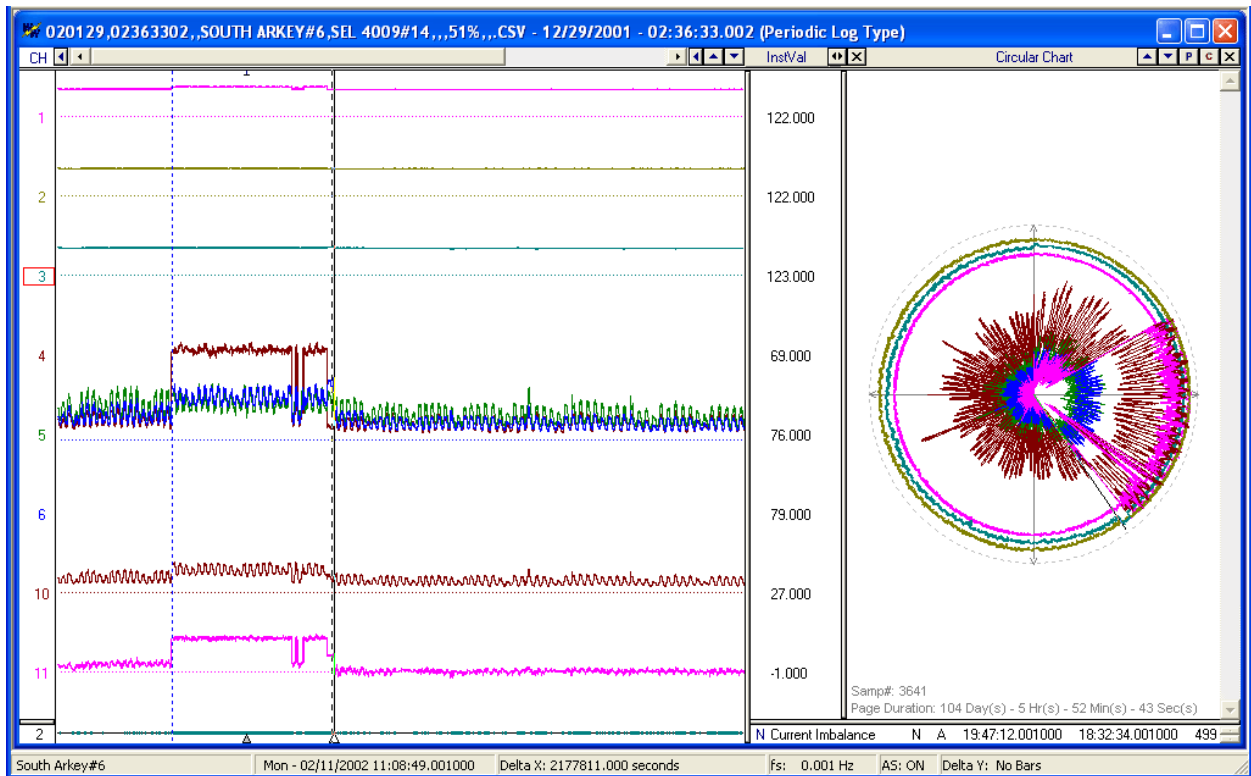


Figure 1.37 Periodic Log File

### CIRCULAR CHART

The circular chart diagram shows a circular display for each visible channel. The diagram is displayed to the right of the analog information window. Refer to Figures 1.37 and 1.38. The amount of data displayed in the circular chart is equal to the amount of data displayed in the waveform trace window. The duration of the data displayed is shown at the bottom of the circular chart. To increase or decrease the size of the circular chart window place the cursor over the vertical separator between the analog information window and the circular chart window and drag the mouse to the left to increase or to the right to decrease. To close the circular chart window click the close button  located in the header.

To navigate the circular chart use the left arrow, right arrow, home, end, page up and page down keys or the data scroll bar. There is a cursor bar on the circular chart that allows you to see where you are in the data. To increase/decrease the display area of a channel on the circular chart, mark the channel and use the increase/decrease amplitude menu buttons or the Ctrl-Up and Ctrl-Down keys or use the up and down arrow button   located in the circular chart header.

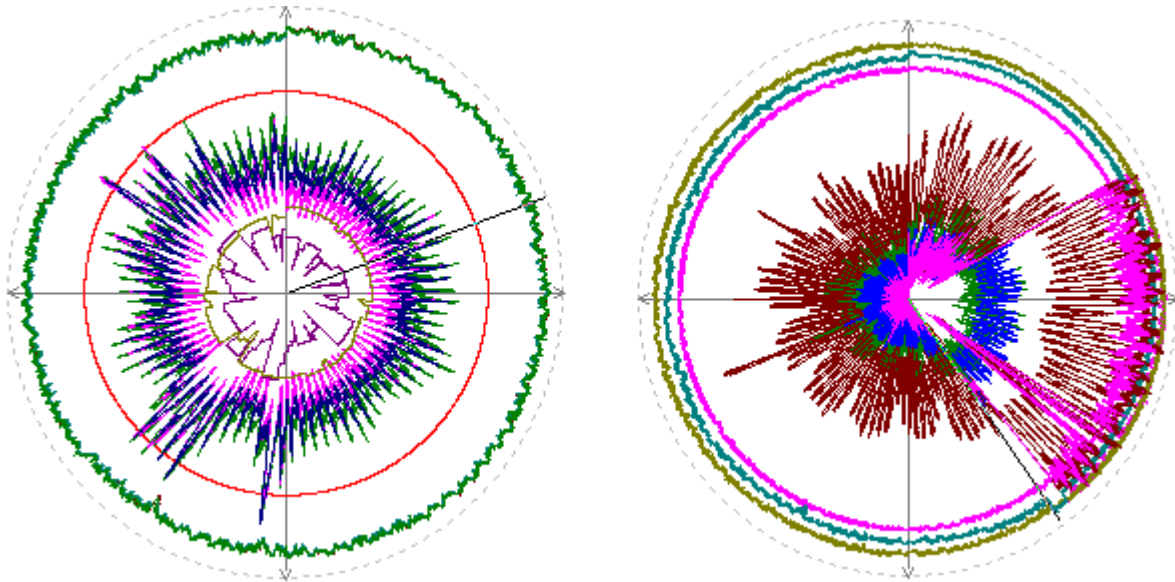



Figure 1.38 Circular Chart

#### DISPLAY DRIVER'S DATA TYPE

The data stored in the displayed file can be instantaneous values or RMS values. The default setting for the supported files is instantaneous values. If the sample values are RMS calibrated then set the data type to "RMS Calibrated". If the data is RMS calibrated and the data type is not set properly then the analog column data will be displayed incorrectly. To set the driver's data type click the "Window

Properties"  menu button from the speed bar or select the "Window Properties" option under the "File" menu. Click the "Driver Data Type" tab and set the "Display Device's Data Type" field to "RMS Calibrated" for RMS calibrated values and "Peak Type" for instantaneous values. Refer to Figure 1.39.

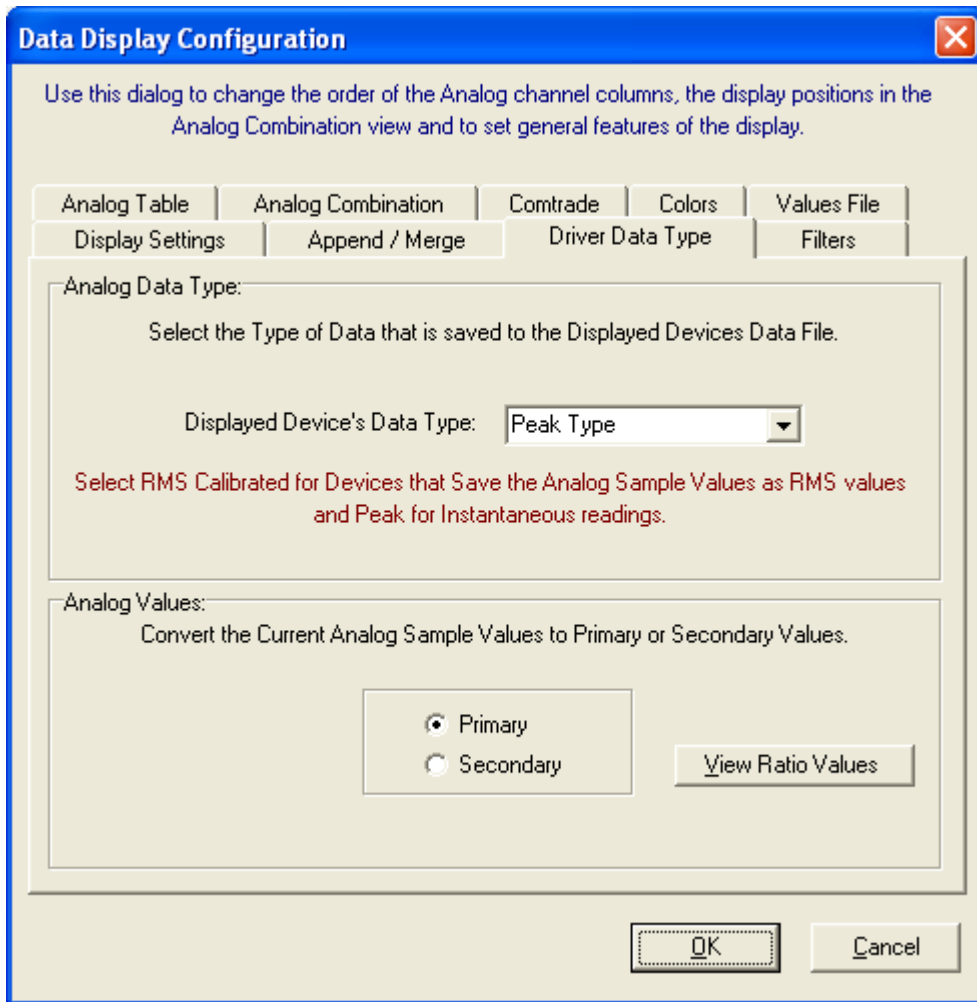

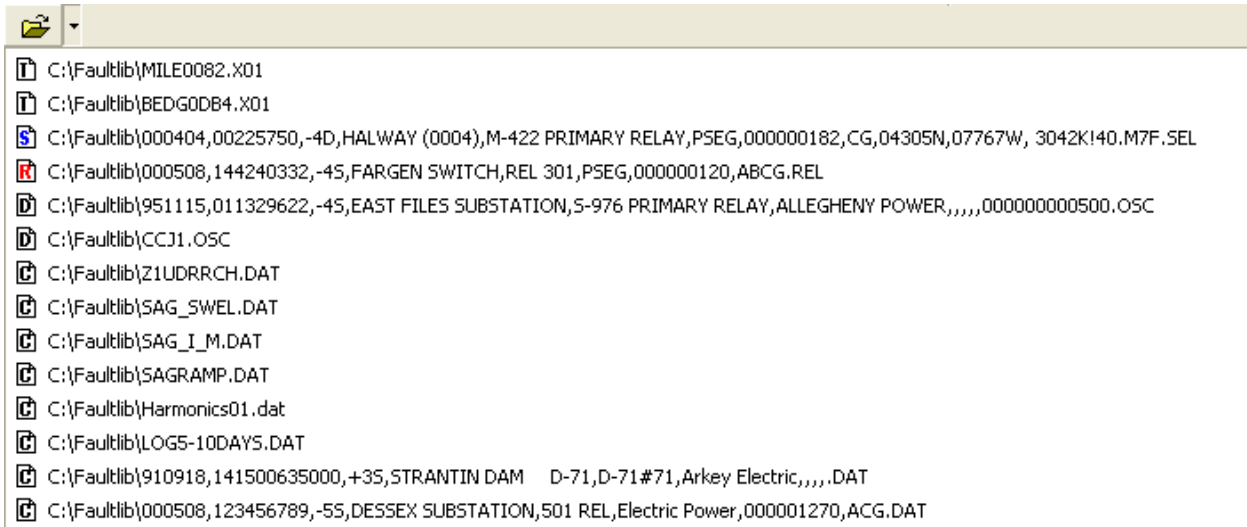


Figure 1.39 Analog Data Type Setting


### REOPEN WAVEFORM FILE

To reopen a waveform file that was previously viewed click the reopen menu button  and select one of the files from the drop down list. Refer to Figure 1.40.



**Figure 1.40 ReOpen Data File**



## EMAIL ACTIVE FILE


The active data file can be emailed by clicking on the email  menu button or by selecting “Email Active File” from the “File” menu. All support files associated with the open file are included as attachments.

## NAVIGATING

Use the up and down arrow keys or the vertical scroll bar to browse the analog channels. The tab key toggles between the analog and digital views.

The analog and digital values are displayed in a table to the right of the channel traces. Hold the left mouse button down and drag the table separator bars to resize the viewing area. To view the analog sample values use the following navigation tools:

- Left and right arrow keys to navigate sample by sample
- Ctrl+left or ctrl+right keys to peak navigate
- Shift+ctrl+left or shift+ctrl+right keys to cycle hop
- Home and end keys to display the channel’s first and last samples
- Triangle  $\Delta$  at the bottom of the data bar to drag the data bar through the samples
- Page up and page down keys to page through the samples
- Left button  displayed to the left of the data scroll bar to move the sample at the data bar to the position of the first sample displayed
- Left button  displayed to the right of the data scroll bar to move the trace and table separator to the position of the data bar

Click the left/right arrow button  (located to the right of the analog table headers) or use the shift-right/left arrows to scroll through the analog table columns. Refer to “Viewing Analog Data” section for field descriptions.

**NOTE:** If no channels are marked the ctrl+left and ctrl+right arrow keys peak navigate and cycle hop the cycles displayed in the first channel.


## SETTING THE CURSOR BARS

Four vertical cursor bars are displayed in the analog view: the blue dotted line represents the reference bar, the black solid line represents the data bar, the black dotted line represents the RMS bar and the red dotted line represents the fault position defined in the configuration file. There are also two horizontal bars displayed when the “Horizontal Bars” menu option under the “View” menu is checked.


### DATA BAR

The data bar is displayed as a black solid line with a white triangle below the line. The data bar starts at the end of the first cycle in the data file. To move the data bar use the left and right arrow keys to move one sample, use the Ctrl-left and Ctrl-right keys to peak hop, use the Shift-Ctrl-left and Shift-Ctrl-right keys to cycle hop, use the page up and page down keys to move one page up or down or left click the mouse to move to any position in the data or drag the triangle to scroll through the data. When the mouse is held over the triangle a hint message displays the sample number at the data bar and the delta time from the first sample displayed. The time of the sample at the data bar is displayed in the D&T status bar field. The channel values at the data bar are displayed to the right of the traces in the analog channel information table.

### REFERENCE BAR

The reference bar is displayed as a blue dotted line. The reference bar is positioned at the fault time specified in the file. To move the reference bar to the position of the data bar use the "Move Reference Bar to Data Bar" option inside the “View” menu or press Ctrl-A or click the **SetRef** menu button . To move the reference bar to any position in the data area, click the right mouse button. The status field Delta time (Dt) in the status bar at the bottom of the screen, shows the time difference, in milliseconds or seconds, between the reference bar and the data cursor bar. It also shows how many cycles are between the two bars. The instantaneous channel values at the reference bar are displayed to the right of the traces in the analog channel information table.

### RMS BAR


The RMS bar is displayed as a black dotted line. The RMS bar is defaulted to always be one cycle away from the data bar, except when the data bar is positioned at the beginning of the data. This bar is used for calculating the RMS value displayed in the analog table view. The RMS value in the analog table is calculated using all of the sample values displayed between the data bar and the RMS bar. To move the RMS bar to the position of the reference bar (blue dotted line) use the "Move RMS Bar to Reference Bar" option inside the “View” menu or press Ctrl-Z or click the **SetRMS**  menu button.

### FAULT BAR

The fault bar is displayed as a red dotted line. The fault bar is fixed and positioned at the fault time defined in the configuration file. The fault bar can be shown or hidden by selecting “Yes” or “No” for the “Show Vertical Fault Bar” field in the properties dialog under the “Display Settings” tab.

### HORIZONTAL BARS

When the “Horizontal Bars” menu option under the “View” menu is checked two horizontal bars will be displayed. The solid black line follows the data bar and the dotted blue line follows the reference bar. The bars will be positioned at the first marked analog channel (displayed in red), if no channels are marked then they are positioned at the first displayed channel. The Delta Y field in the status bar shows the difference between the two bars.

To automatically resize the RMS sliding window click on the **Resize Sliding Window** menu button  or open the “Set Sliding Window Size” menu option under the “View” menu. Refer to Figures 1.41 to

1.43. To manually resize the RMS sliding window click the right mouse button to set the reference position and the left mouse button to set the ending data position then click the **SetRMS** menu button. The RMS bar is moved to the reference position. The Delta time (Delta X) field displayed in the status bar at the bottom of the screen shows the time difference (in milliseconds) and the number of cycles between the reference and data bars. Use the left, right, ctrl+left, and ctrl+right keys or the horizontal scroll bar to move the sliding window.

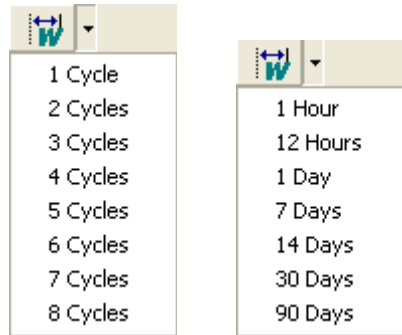


Figure 1.41 Resize Sliding Windows Drop Down Menus

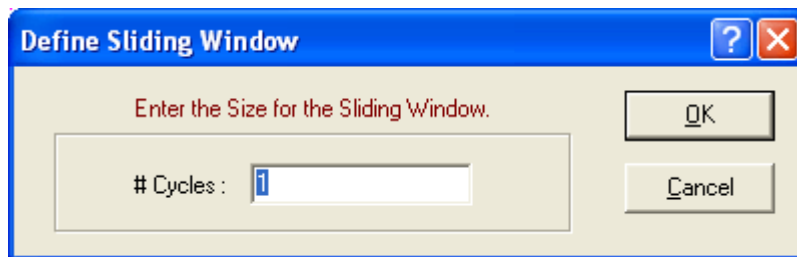


Figure 1.42 Resize Sliding Dialog for Waveforms

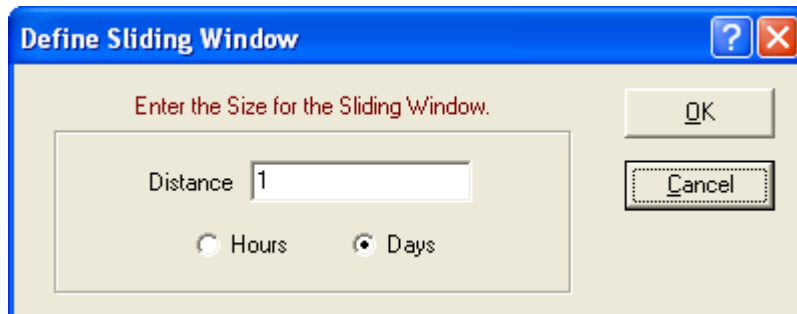


Figure 1.43 Resize Sliding Windows Dialog for Log Files

### SAVE DISPLAYED VALUES

The save displayed values feature saves all displayed values in the analog table to a common delimited file (default format), to a user defined format file or to the Windows clipboard. To setup the waveform display, for saving values follow the following steps:

### SELECT ANALOG COLUMNS

All columns displayed in the table will be saved to the selected values file. Move the data bar along the waveform to change the sample values displayed in the table

To change the way the columns are displayed open the "Properties" dialog located in the "File" menu. Select the "Analog Table" tab. A list of all the available analog columns is displayed. Use the "Move Up" and "Move Down" buttons to change the order of the columns and the check box next to each column header to hide or show the column (checked =show, unchecked=hide).

Resizing the Analog table can also isolate the columns to save. Use the Shift-left and Shift-right keys to navigate through the columns. Navigate to the first column to be saved then resize the window by dragging the table/phasor separator bar to show only the columns needed.

### **SELECT ANALOG CHANNELS**

The template file can define channels to save in two ways: by the visible position of the channel or by specifying the actual channel number. If the template defines channels to save by position then the channels displayed have to be selected and arranged properly to match the template file. In both methods the channel values must be visible in the analog table.

To isolate certain analog channels mark the desired channels. Marked channels are plotted in red. To mark a channel move the channel cursor to the channel and press the spacebar or click on the channels number or table values. After marking all the desired channels press enter <CR>. The selected channels will be displayed only.

### **ARRANGE ANALOG CHANNELS**

To arrange the analog channels in a specific order mark the channels to be moved and press the "+" key to move them up or the "-" key to move them down.

### **SETUP THE VALUES FILE**

Before saving values to the Values file the file must first be defined. To create or change the existing file select the "New" option from the "Values File" submenu under the "Values" menu. Type in a new file name or select an existing file from the list. The new file will automatically be created.

### **MARK & SAVE**

To save values to a file move the data bar to the desired sample and select the "Mark & Save" option under the "Values" menu. The sub menu allows for selecting the default format or a user defined format. The default format is the basic format defined in the "Values File" tab in the "Properties" dialog. Refer to the "User Templates" section below for more information on the user-defined formats. All user defined template files must be saved in the Wavewin directory and have an extension ".TMP" to be listed in the template menu.

Once the format is selected the sample at the data bar is marked and all of the values in the table are saved to the selected values file. Marked samples have a red upside down T displayed at the top of the window. To clear the marked samples select the "Clear Marked Values" menu option under the "Values" menu.

### **OPEN VALUES FILE**

To view the contents of the Values File select the "Open" option under the "Values File" submenu. A notepad window will be displayed. Refer to Figure 1.44. This window allows for editing the file, saving any changes, saving the file under a new name and for opening other Value files.

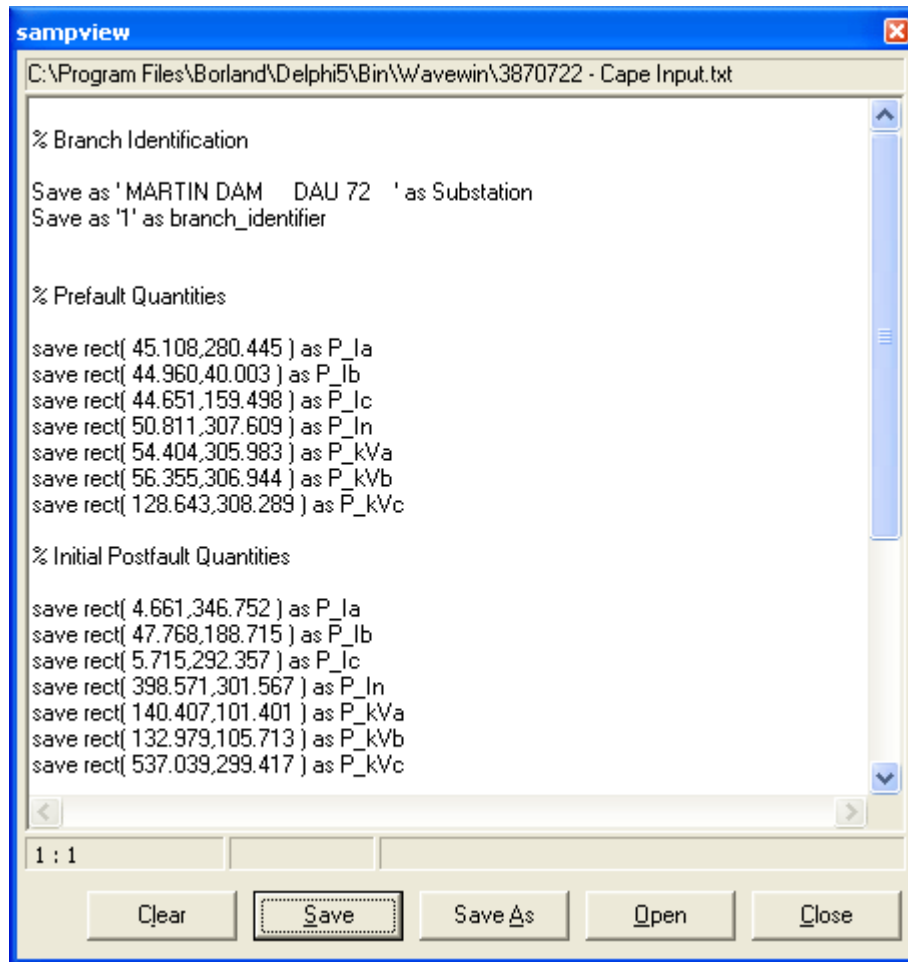


Figure 1.44 Values File

### CLEAR VALUES FILE

The "Clear" option under the "Values File" submenu or the "Clear" button inside the "View Values" window will clear the contents of the file. Use this feature if the Value File always stays the save and new value files are create using the "Save As" button in the "View Values" window or if a mistake was made during saving and the file needs to be cleared to start over.

### DEFAULT FORMAT

The "Values File" tab in the "Properties" dialog defines the default format for saving displayed values to the Values file.

Below is a description of each field:

- Save To - Select file to save the values to an ASCII text file, select clipboard to have the values go directly to the Windows clipboard or select both for both features.
- Select Values File - Select an existing file or create a new file. If the file does not exist a message will be displayed asking to create the file upon exit of the dialog.
- Save Type - Select Rewrite to clear the file before every save or select Append to add the values to the existing file.
- Save Format - Select Fixed ASCII to format the data as a table or select comma delimited to save the values separated by a comma.

- Add Titles - Select "Yes" to add the titles of the column to the file or "No" to define no titles (Used in the Default format only).

## **USER FORMATS**

User formats are used to create custom templates for saving the displayed values. The user formats are selected from the "Mark & Save" menu. User format files must be saved to the active Wavewin directory and have an extension ".TMP" to be listed in the "Mark & Save" menu.

The format files can contain any ASCII text. Tags are used to define where the specified values are to be placed in the values file. When saving channel information the channel values must be visible in the analog table.

### **Available Tags:**

- <Channel position #> - the position of the visible channel in the data plotting window.
- <^Channel #> - the channel number displayed in the data plotting window.
- <station> - the station displayed in the first status field.
- <date> - then date displayed in the D&T status field.
- <time> - then time displayed in the D&T status field.

Refer to Appendix A for examples of format files and their results.

## **OPEN FORMAT FILE**

To view the contents of a format file select the "Open" option under the "Format Files" submenu. A notepad window will be displayed. This window allows for editing the file, saving any changes, saving the file under a new name and for opening other Format files.

## **CREATE NEW FORMAT FILES**

To create a new Format File select the "New" option under the "Format Files" submenu. A notepad window will be displayed. This window allows for adding text to the file, saving any changes, saving the file under a new name and for opening other Format files.

User template files must be saved to the active Wavewin directory and have the extension ".TMP" to show up in the "Mark & Save" menu.


## **MARKING, DELETING, AND RESTORING CHANNELS**

To mark or unmark a channel, click the left-mouse button on the channel ID or channel title, or use the space bar. To mark groups of channels use the left mouse button to mark the first channel and the shift+left mouse button to mark the last channel. Marked channels are displayed in red.

To mark/unmark all analog and digital channels press the F8 key or select the "Mark/UnMark All" menu option under the "Channels" menu option. If no channels are marked then all the analog and digital channels will be marked. If any channels are marked, then all of the channels will be unmarked. To mark/unmark all the analog channels select the "Analog Mark/Unmark All" menu option under the "Channels" menu. To mark/unmark all the digital channels select the "Digital Mark/Unmark All" menu option under the "Channels" menu.





Channels must be marked to delete them from the display. The delete key removes the marked channels and the insert key restores the deleted channels.



## SCALING ANALOG CHANNELS

When the data display is initially opened, all the analog channels are scaled to one value. To scale the channels according to the maximum space allocated for display, press F6 or click the **AutoScale**  menu button. This option toggles between the three views: On, Off and ++. The active auto scale state is display in the AS status field. Each view is defined below:

- **ON** – The On view plots the channel data scaled to the maximum value allocated along the zero reference line.
- **OFF** – The Off view plots the all channels scaled to one value.
- **++** - The ++ view plots the signal using the number of maximum pixels allocated for the channel. The highest value is plotted at the maximum position and the smallest value is plotted at the lowest position. This feature was added to clearly show the profile of frequency, Vdc and load data channels.



The number of pixels allocated for each channel is displayed in the “PixsDisp” column in the analog information table.

To increase or decrease a channel's amplitude, along with the phasors and circular chart mark the channels and click the **AmpUp**  or **AmpDn**  menu buttons or use the ctrl+up and ctrl+down keys. The auto scale multiplier (ASM) is used to amplify or attenuation the channel's data values. For example, when the amplitude increases the ASM value is multiplied by the channel's current “Pixsdisp” and when the amplitude decreases the ASM value is divided by the channel's current “Pixsdisp”. To change the ASM value, select the “Properties” menu option from the “File” menu then click the “Display Settings” tab. Enter a number and click **OK**. This value is initially defaulted to 2.00. To increase/decrease only the analog channels amplitude, click the up and down arrow buttons  located to the right of the data scroll bar. To increase/decrease only the phasor magnitude or circular chart click the up and down arrow buttons  located to the phasor/circular chart header.

To increase or decrease the channel's time scale, click the **Condense**  or **Expand**  menu buttons or press the ctrl+page up and ctrl+page down keys.

NOTE: If no channels are marked all the visible channels are scaled accordingly.

## ZOOMING CHANNELS

To zoom in on analog or digital channels, mark the channels and press <enter> or click the **ViewMrks**  menu button. The unmarked channels are removed from the Data Display. To restore the hidden channels press the <esc> key, the <backspace> key, or click the **ViewAll**  menu button. Refer to Figures 1.45 and 1.46.

When returning to the original view all channels in the previous view remain marked for quick selection of additional channels for a new view.

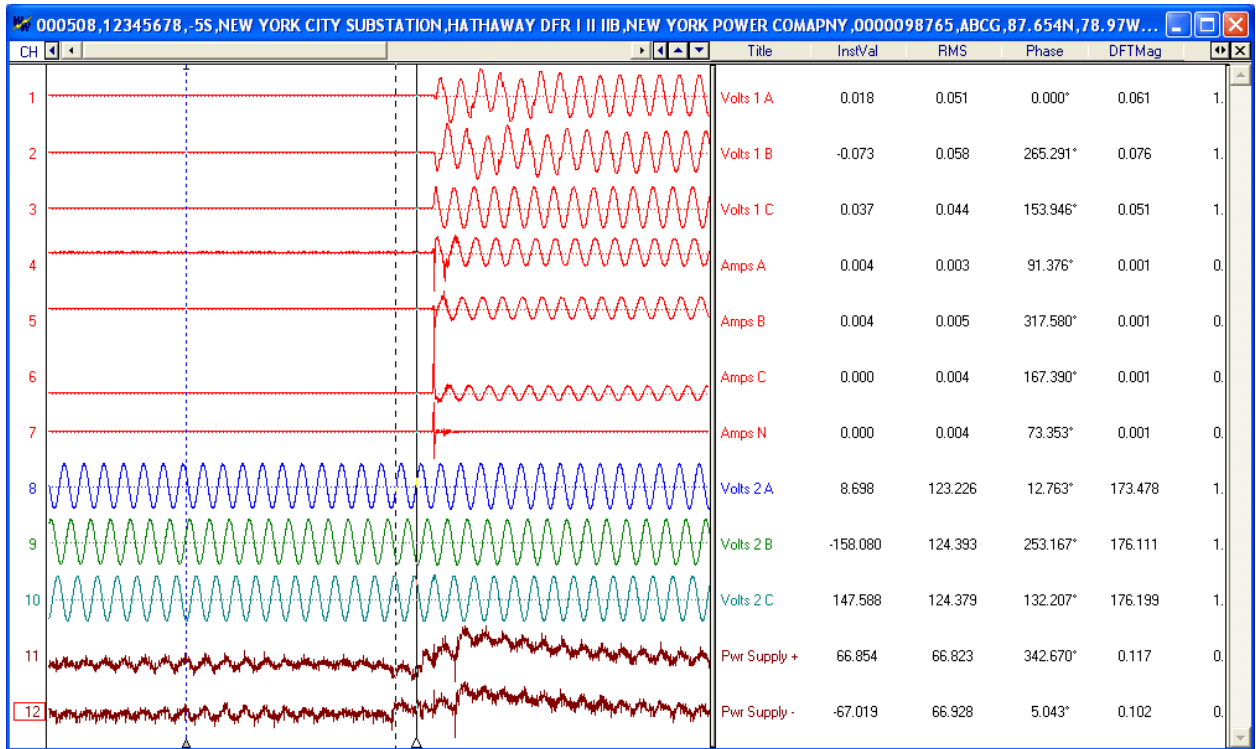


Figure 1.45 Mark Analog Channels

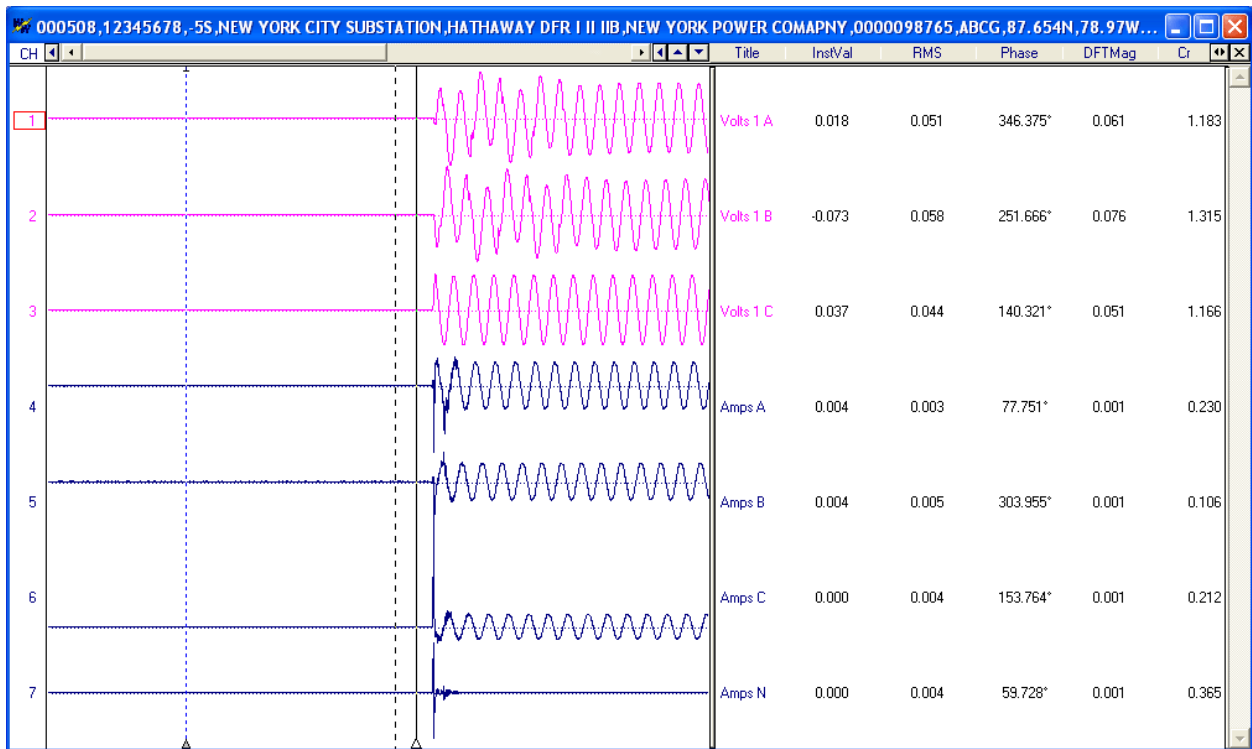


Figure 1.46 Show Marked Analog Channels


## REPOSITIONING CHANNELS

Analog channels can be repositioned in the Data Display. To move a channel up one position mark the channel and press the “+” key or select “Shift Marks Up” from the “Channel” menu. To move a channel down one position mark the channel and press the “-” key or select “Shift Marks Down” from the “Channel” menu.

## PRINTING WAVEFORM FILES

To print all of the data for the visible channels, select “Print/All” from the File menu. The page numbers are located on the top right corner of each printout. The date and time of the first sample on each page is printed at the bottom left corner. To print only the data currently displayed in the data window select “Print”/“Page” from the File menu. Use the zoom feature to print only the selected channels. An error message is displayed if the software cannot access the printer port.

## SAVING AS COMTRADE

The visible analog and digital channels can be saved in COMTRADE ASCII or Binary format. Currently there are two Comtrade versions supported: the older 1991 format and the newer 1999 format. The Comtrade format is selected in the “Properties” dialog under the “Comtrade” tab. The default format is the newer 1999 format. Mark the analog and digital channels to save and press <enter> or click the **ViewMrks** menu button . To create a COMTRADE file select the “Save as COMTRADE” (ASCII or Binary) option from the “File” menu. Enter the destination path and filename (do not define the filename extension) and click **OK**. Refer to Figure 1.46. The “.DAT” and “.CFG” files are automatically created. If a path is not defined, the COMTRADE files are saved in the active directory.

To automatically name the Comtrade file using the IEEE long file naming convention check the “Use the ComNames Naming Convention to Name the Comtrade File(s)” field in the “Save As Comtrade” Dialog and leave the File Name field empty. Refer to Figure 1.47. The selected channels are converted to the selected Comtrade format and are named using the IEEE long file naming convention.

If the sample values in the displayed file are RMS calibrated and the outcome Comtrade file must have instantaneous values then set the “Comtrade Settings” fields to automatically convert the RMS data to instantaneous values. To set the “Comtrade Settings” fields open the “Properties” dialog. Select the “Comtrade” tab then select “Yes” for the “Convert RMS Calibrated Data to Peak Data”.

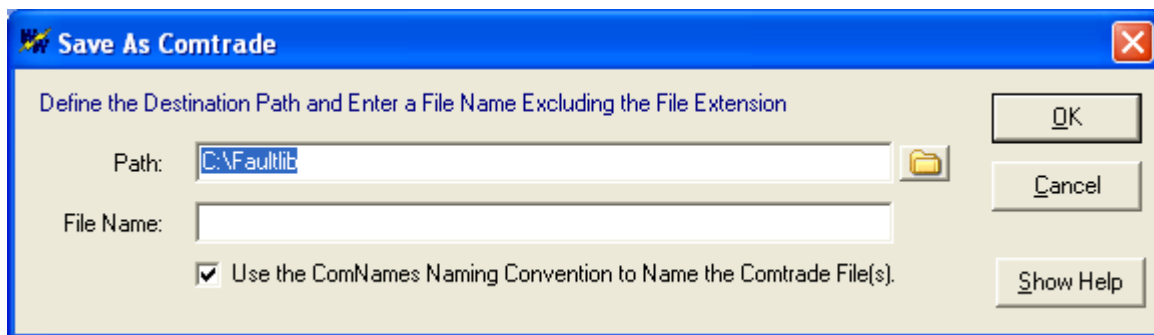



Figure 1.47 Save As COMTRADE

## VIEWING ANALOG DATA


The values displayed in the analog view can be presented in tabular form (analog table) or in a concentrated form (combination view). Press F4 to toggle between the two views or use the View  button (located to the right of the analog table headers) or the shift-right/left arrow keys to toggle through the analog table columns. To close the analog table, click the close button located in the header. Valid analog channels are displayed in the left portion of the window and the analog information

in the right. An analog channel is marked as invalid if the title is empty or it has the following strings in the beginning of the title. To show an invalid channel use the "Show/Hide Channel Title" dialog in the file manager. Refer to the "Show/Hide Channel Title" section for usage.

- UNUSE
- UNDEF
- NOT D
- NOT U
- NOT I
- NAT A
- UNDEF
- {
- N/A
- ANALOG INPUT
- ANALOG CHANNEL
- EXTERNAL INPUT
- EVENT CHANNEL
- CHANNEL
- DIGITAL TRACE #
- SPARE

A maximum of 255 analog channels can be displayed in one window. The values displayed in the analog table and combination view are described below.

**Analog Table View:**

The analog table view is the default view. Use the view button  or the shift-right/left arrow keys to navigate through the columns of the table. The original sample values are plotted according to one of the following data types:

- Peak to Peak data
- RMS Calibrated data
- Log files.

The display drivers in the system are all defaulted to peak to peak except for the predefined log drivers. To change the settings for a driver select the "Window Properties" option under the "File" menu. Click on the "Driver Data Type" tab and select the type from the "Displayed Device's Data Types" drop down list. Periodic Log File's data type cannot be changed.

The following tables describe the analog data for the sinusoidal peak-to-peak, non-sinusoidal, and sinusoidal RMS data types:

**Peak to Peak**

Field	Description
Title	The analog channel titles.
RMS	The TrueRMS value is calculated by taking the summation of the square of all the sample values that lie between the RMS bar (black dotted line) and the data bar. It then divides the result by the total number of samples between the two bars and takes the square root of the result.
InstPeak	The highest absolute value of all the samples between the two zero reference crossings surrounding the data bar (black solid line).
Phase	The phase angle of each channel.
InstVal	The sample value at the data bar (black solid line).
RefVal	The sample value at the reference bar (blue dotted line).

Field	Description
MaxPeak	The maximum peak value of the channel.
MinPeak	The minimum peak value of the channel.
Units	The analog channels prefix and units.
PixsDisp	The number of pixels allocated for displaying the trace.
DFT Peak	The DFT Magnitude calculated between the RMS bar (black dotted line) and the data bar (solid data bar).
Crest	The DFTMag column divided by the RMS column.

#### Sinusoidal RMS Calibrated

Field	Description
Title	The analog channel titles.
RMS	The RMSVal column calculates an RMS value for all the samples between the RMS bar (black dotted line) and the data bar (black solid line). Since the data is RMS calibrated each sample value is multiplied by the square root of 2 before it is squared.
InstPeak	The square root of 2 times the peak value measured between the two reference crossings surrounding the data bar (black solid line).
Phase	The phase angle of each channel.
InstVal	The RMS sample value at the data bar (black solid line) times Root 2.
RefVal	The RMS sample value at the reference bar (blue dotted line) times Root 2.
MaxPeak	The RMS maximum peak value of the channel times Root 2.
MinPeak	The RMS minimum peak value of the channel times Root 2.
Units	The analog channels prefix and units.
PixsDisp	The number of pixels allocated for displaying each trace.
DFT Peak	The DFT Magnitude calculated between the RMS bar (black dotted line) and the data bar (solid data bar).
Crest	The DFTMag column divided by the RMS column.

#### Non-Sinusoidal (Log Files)

Field	Description
Title	The analog channel titles.
MaxWin	The absolute maximum value between the sliding window bar (black dotted line) and the data bar (black solid line).
InstVal	The sample value at the data bar (black solid line).
RefVal	The sample value at the reference bar (blue dotted line).
MaxVal	The maximum value of the channel.
MinVal	The minimum value of the channel.
Units	The analog channels prefix and units.
PixsDisp	The number of pixels allocated for displaying the trace.
AvgWin	The average value of all the samples between the sliding window bar (black dotted line) and the data bar (black solid line)

#### Combination View:

The combination view shows all the channel information in a signal view. This view is only available if there is enough room between analog channels to display three lines of text.

#### Default Display format:

Peak to Peak:

Channel Title			
RMS	MaxPeak	RefVal	
InstVal	MinPeak	Units	ASV

RMS Calibrated:

Channel Title			
RMS	MaxPeak	RefVal	
InstVal	MinPeak	Units	ASV

Load Files:

Channel Title			
MaxWin	MaxVal	RefVal	
InstVal	MinVal	Units	ASV

The peak sample values are displayed in red when the data bar is on the channel's maximum value and displayed in blue when the data bar is on the minimum value. Use the tab key to toggle between the analog and digital channels. To hide the channel information, select "Channel Information" from the "View" menu.

The analog table and combination views can be resized by selecting the vertical separator bar and dragging it to the right or left. The cursor changes to the vertical resize cursor when the mouse is positioned over the separator bar.

To change how the analog data is displayed in the analog table and combination view select "Properties" menu option from the "File" menu. The "Properties" dialog allows for reordering, hiding, and showing the analog table columns; changing the data positions in the combination view; changing the background colors and trace colors; and for changing the drivers data type and trace/phasor scale multipliers plus more.

### VIEWING DIGITAL DATA

The default digital view consists of only the triggered digital channels, which are displayed at the bottom of the screen. To view all the digital channels including the unused channels press F9 or select "All Digital Channels" from the "View" menu.

The digital trace is displayed as a thin black line when the sample value equals the original state defined in the displayed format and displayed as a thick green line when the sample value is different than the original state. The cursor state column in the digital table displays an "A" for Alarm and "N" for Normal. They are set by comparing the sample value at the data bar with original state, "A" = different then original state, "N" = same as original state.

The Digital information is displayed in tabular form. The data columns are described below:

Column Number	Description
1 – Cursor State	The digital state of the sample at the cursor position (A=Alarm, N=Normal).
2 – Title	The channel title, a maximum of 40 characters can be displayed.
3 – Fst	The digital state of the first sample (A=Alarm, N=Normal).
4 – Lst	The digital state of the last sample (A=Alarm, N=Normal).
5 – Fst-Change	The time the channel first changed state.
6 – Lst-Change	The time the channel last changed state.
7 – Changes	The number of times the channel-changed state.

Use the scroll bar or the up and down arrow keys to navigate through the channels and the tab key to toggle between the analog and digital views.

### CUSTOMIZING THE DATA DISPLAY

The "Properties" option in the "File" menu allows for customizing the data display window. Below is a description of each tab defined:

- **Analog Table** – The analog table tab is used to reorder, hide and show the columns in the analog table.
- **Analog Combination** – The analog combination tab is used to change the position of the data values in the combination view.
- **Comtrade** – The Comtrade tab is used to define the Comtrade format for saving, the date and time format for display and to set automatic conversion from RMS data to Peak data when using the “Save As Comtrade” feature.
- **Colors** – The colors tab is used to define the background colors of each display section and to set the default analog channel colors.
- **Values File** – The values file tab is used to define the values file and general information used when saving samples values to a file.
- **Display Settings** – The display settings tab is used to define the ASM scale multiplier for the traces and phasor/circular chart scaling, and to define general display information for the window such as: setting the display trace type (sample based or time based), showing the time reference bar between the analog channels and the digital channels, showing the separator bar between multiple events displayed in one window, showing or hiding the fault bar (red dotted vertical bar) and for defining the option to reference angles across windows when Sync mode is active. When “Yes” is defined all phase angles for the currently opened windows will be referenced off the 1<sup>st</sup> marked channel in the active window.
- **Append / Merge** – The append/merge tab is used to define which file the samples will be discarded from when the append/discard common times option is used. It is also used to define if the station name should be added to the analog/digital titles when an append/merge option is executed.
- **Driver Data Type** – The driver data type tab is used to define the type of date that is saved to the displayed device’s data file: RMS Calibrated Type or Peak Type.
- **Filters** – The filters tab is used to define if spikes detected in the data file should be ignored when the maximum and minimum values are calculated and at what level they should be ignored.

### TIME & SAMPLE BASED DISPLAYS

The “Trace Display Type” field located in the “Display Settings” tab of the “Properties” dialog allows for toggling between the “Time Based” display and the “Sample Based” display. The sample base display plots the channel data with 1 pixel distance between each displayed sample. Sample based displays are useful for showing changes in sampling frequency. The time base display plots the channel data in time. Time base displays are useful for showing changes in line frequency.

To change the trace display type open the “Properties” dialog under the “File” menu. Click the “Display Settings” tab and change the “Trace Display Type” field to time based or sample based.

### FAULT REFERENCE TIME BAR

The fault reference time bar is displayed between the analog and the digital traces. It displays the time difference from the fault time defined in the displayed file. The units are displayed in the Delta X status field.

To show or hide the fault reference time bar open the “Properties” dialog under the “File” menu. Click the “Display Settings” tab and select “Yes” or “No” for the “Show Reference Time Bar” field.

### SUPERIMPOSING ANALOG CHANNELS

To superimpose two or more analog channels, mark the channels and press F7 or select “Super Impose” from the “Data” menu. The marked channels are superimposed and placed at the top of the display. If no channels are marked, all channels are superimposed. Press F7 to turn this feature ON/OFF.

### CHANGING ANALOG CHANNEL COLORS

To change the color of an analog channel, click the right mouse button on the channel ID. Select the channel color from the list or click “More Colors” to select from the color palette. Channels must be unmarked to change their colors.

### SYNCHRONIZING DATA CURSORS

The Sync Data Cursors feature is used to synchronize the data bars for two or more display windows. Refer to Figure 1.48. To synchronize two or more data bars, open the files, select “Tile Horizontal” from the Windows menu, and select “Sync Data Cursors” from the “Data” menu. This feature offers two sync functions: “By Time” and “Manually”. When a function is selected, the data bars in the non-active windows are moved to the synchronization point of the active window. The two functions are described below:

#### By Time

When the time function is activated, the data bars in the non-active windows are moved to the sample time of the data bar in the active window. For example if the data bar in the active window is positioned on a sample at time 01:12:34.5600 then all the non-active data bars are moved to the sample at that time. If the time cannot be found the data bar does not move.

#### Manually

The manual sync function allows for the selection of different cursor positions in the windows before synchronization is activated. For example, open four display windows and tile horizontally. Move the data bar to the beginning of the fault cycle in each window and select the Manual cursor sync function. Press the left arrow, right arrow, ctrl+left, ctrl+right, page up, page down, ctrl+page up, ctrl+page down, home and end keys or use the scrollbar to move the data bars.

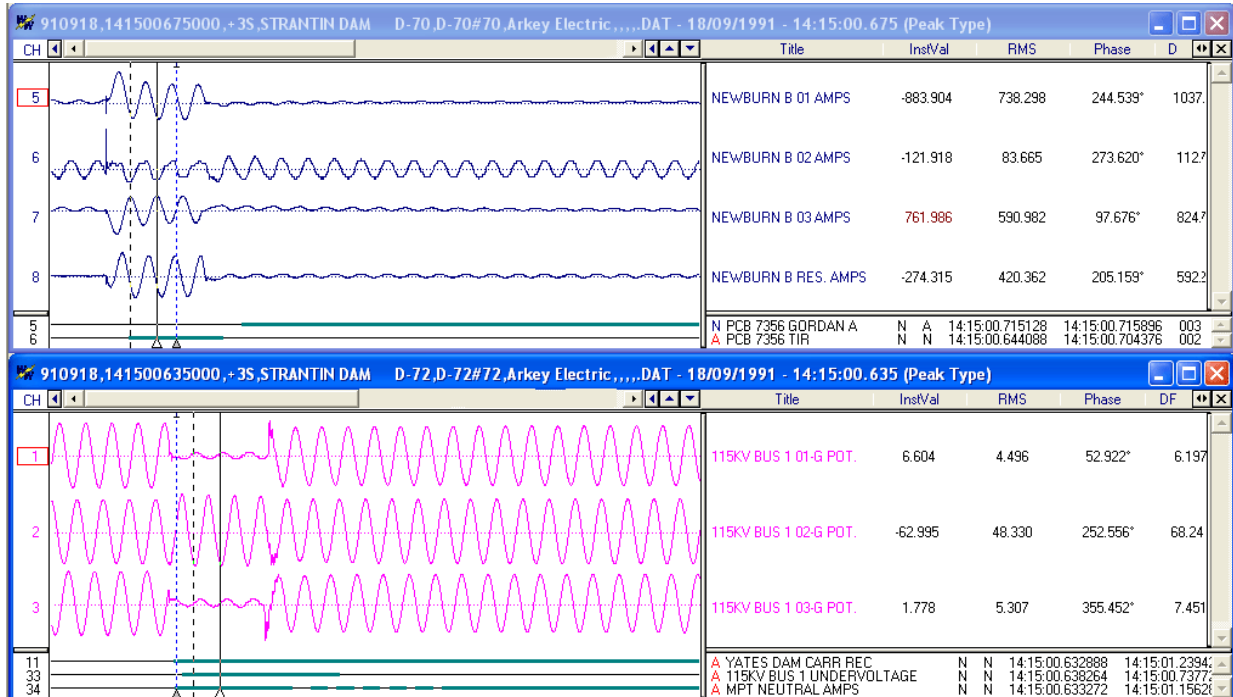


Figure 1.48 Cursor Synchronization

In Sync Mode phase angles can be referenced across data display windows. The phase angles in the opened data windows are referenced by the 1st marked channel in the active data window. This feature

is activated from the “Properties” dialog under the “Display Setting” tab in the Sync Mode section. Sync Mode must be active for the angles to be referenced.

### APPEND OPEN FILES

The “Append Open Files” option under the “File” menu appends all the open windows into a new display window. There are two options available under the Append Open Files Menu:

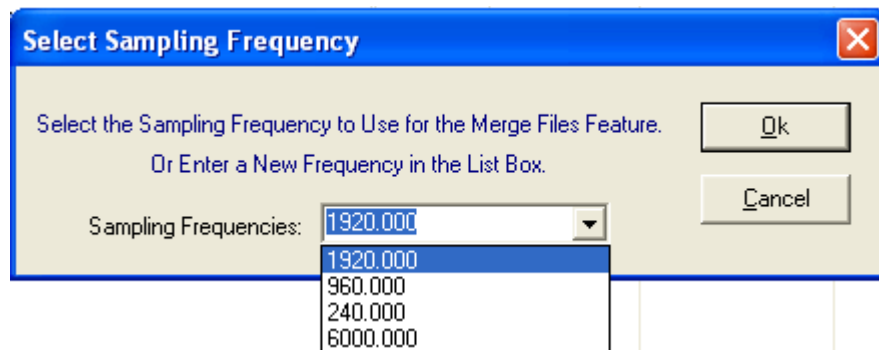
- Discard Common Times: Any common times found in the open files will be deleted from the oldest file.
- Back to Back: The files are appended back to back. No samples are deleted.

### MERGE OPEN FILES

The “Merge Open Files” option under the “File” menu merges all the displayed or marked channels into one display window. There are three options available under the Merge Open Files Menu:

- By Time: Merge channel samples if they have a common time segment. The reference time is from the file with latest start date and time. The file with the least amount of samples determines the length of the new merged file. Refer to Figure 1.51 & 1.52.
- Manually: Use the data bars to highlight where the common sample time is in each window. Merge manually will then line up the data bars and adjust the time stamps accordingly. This option is used when the file times are not synchronized. The active window determines the time stamp of the new merged file and the open window with the smallest number of samples determines the length of the new merged file. Refer to Figure 1.53 & 1.54.
- By Sample: Merge regardless of time stamps and/or data bar positions. The reference time is from the active window. And the file with the least amount of samples determines the length of the file. Refer to Figure 1.55.


When files with different sampling frequencies are merged a dialog will be displayed. The dialog contains a list of all the sampling frequencies in the opened files. Select the frequency for the merged file or enter a new frequency. Refer to Figure 1.49.



**Figure 1.49 Merge Open Files: Select Frequency**

Merging Open Files allows for flexibility of what channels are merged. “Merge Open Files” will merge either the marked channels only or if there are no marked channels then it will merge the visible channels.

If the merged files have different data types (RMS Calibrated or Peak Values) then the RMS values will be converted to Peak values by multiplying the RMS values by Root 2.

To identify the merged channels the station name for each file is added to the beginning of the analog and digital channel names. To turn this feature off open the “Properties” dialog . Click on the

Append/Merge tab and uncheck the “Add the File’s Station Name to Beginning of the Analog/Digital Channels” field. Refer to Figure 1.50.

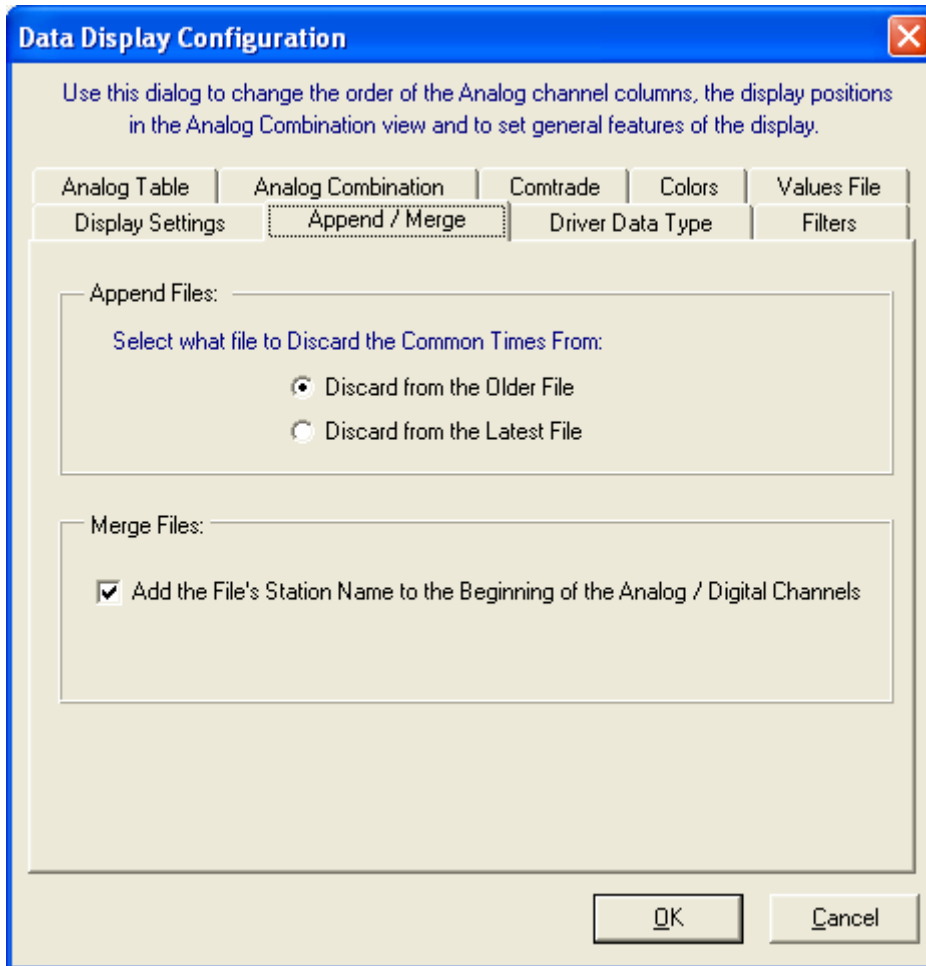


Figure 1.50 Append/Merge Properties

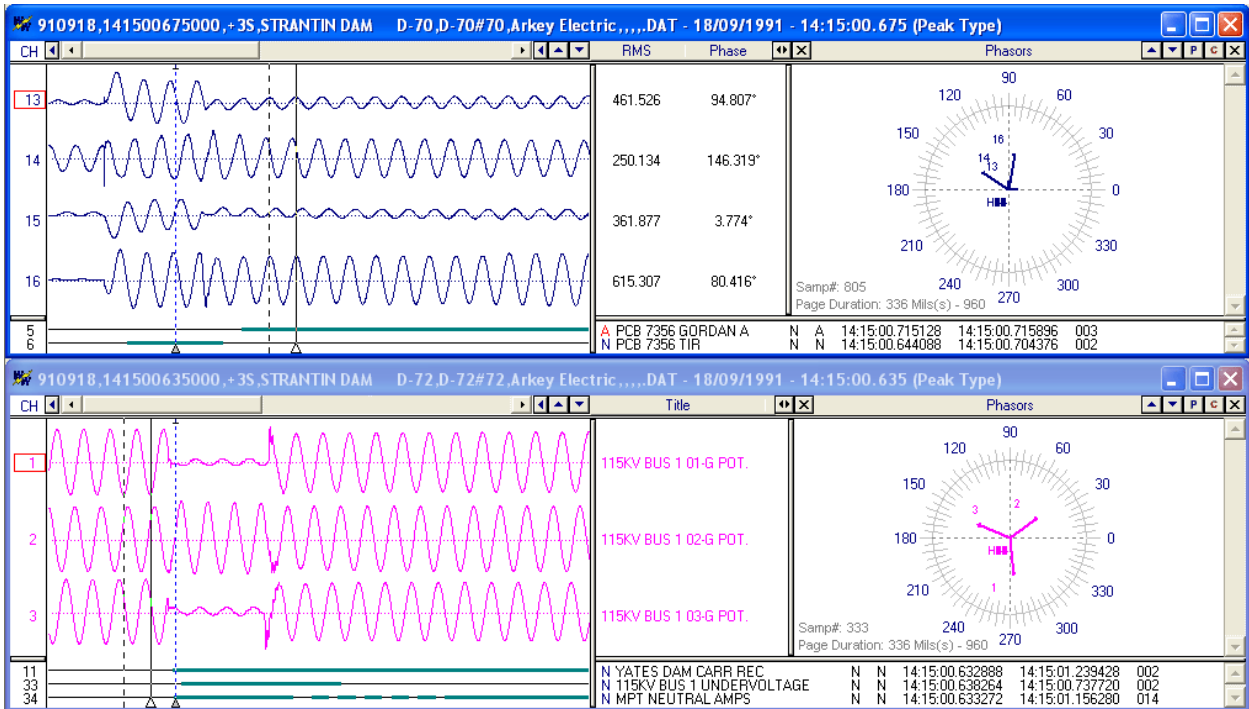


Figure 1.51 Merge Open Files – By Time: Open files and select channels to Merge

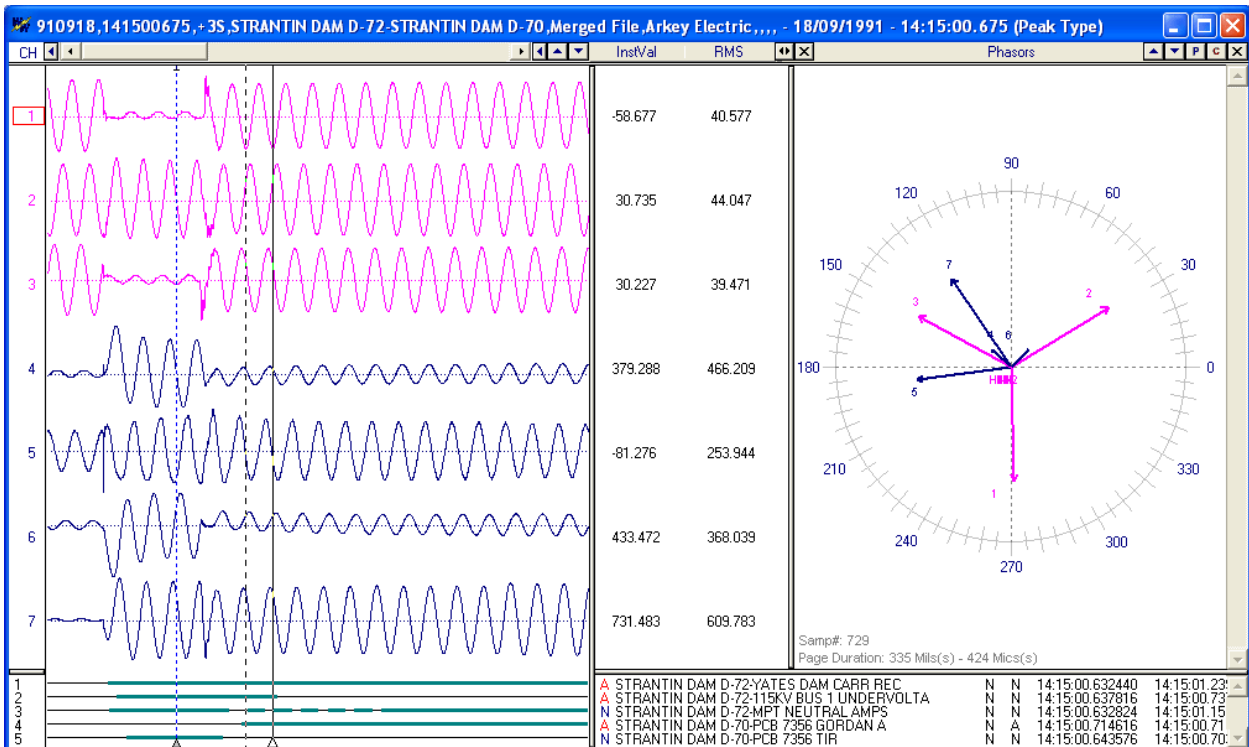


Figure 1.52 Merge Open Files – By Time: Result: By Time

Merge Open Files “By Time” will only merge the samples with common times. The reference time is the file with the latest start date and time.

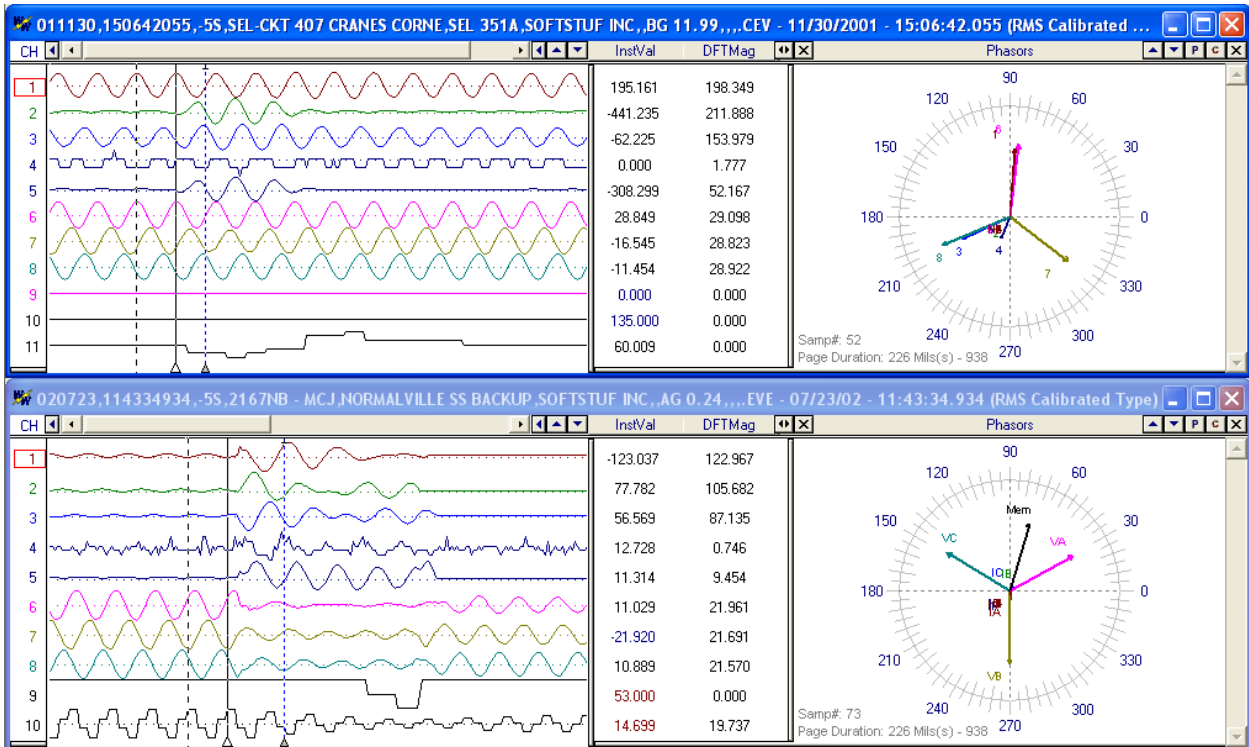


Figure 1.53 Merge Open Files – Manually: Select Channels & Position Data Bars

First select the channels to merge by marking the channels and pressing the <enter> key. Next position the data bars at what should be the Same Point in time.

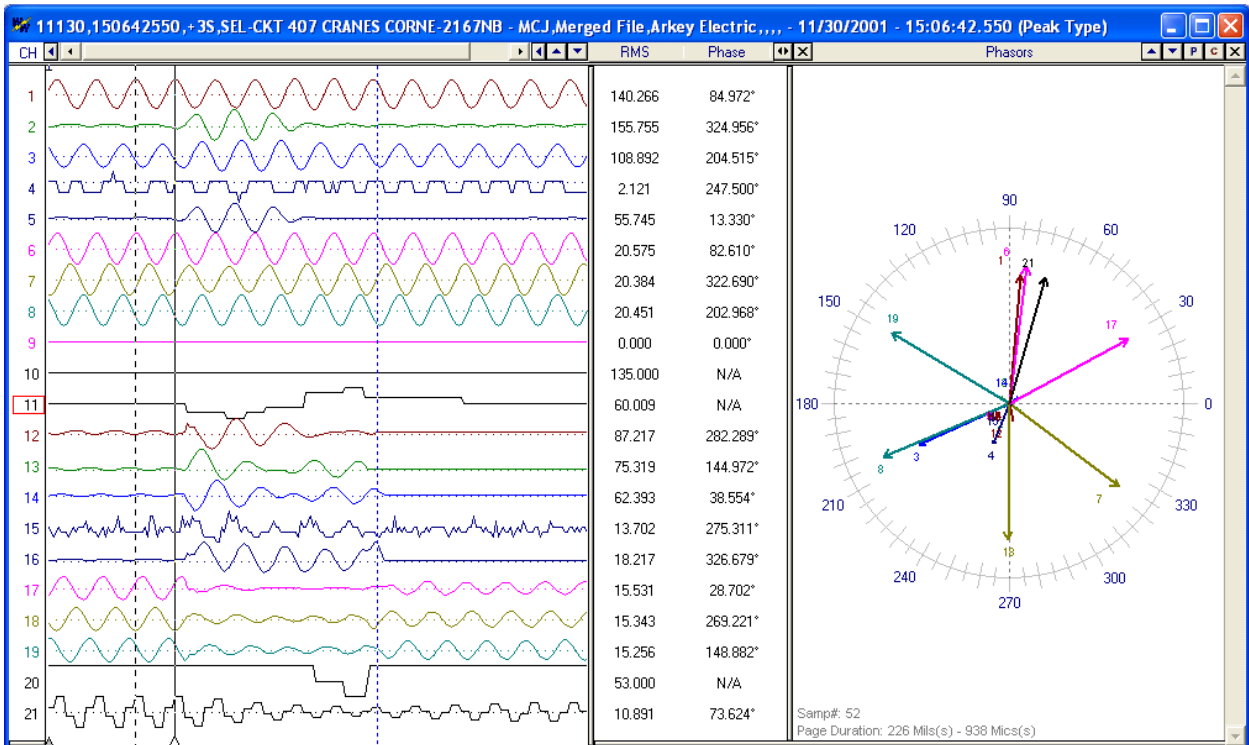
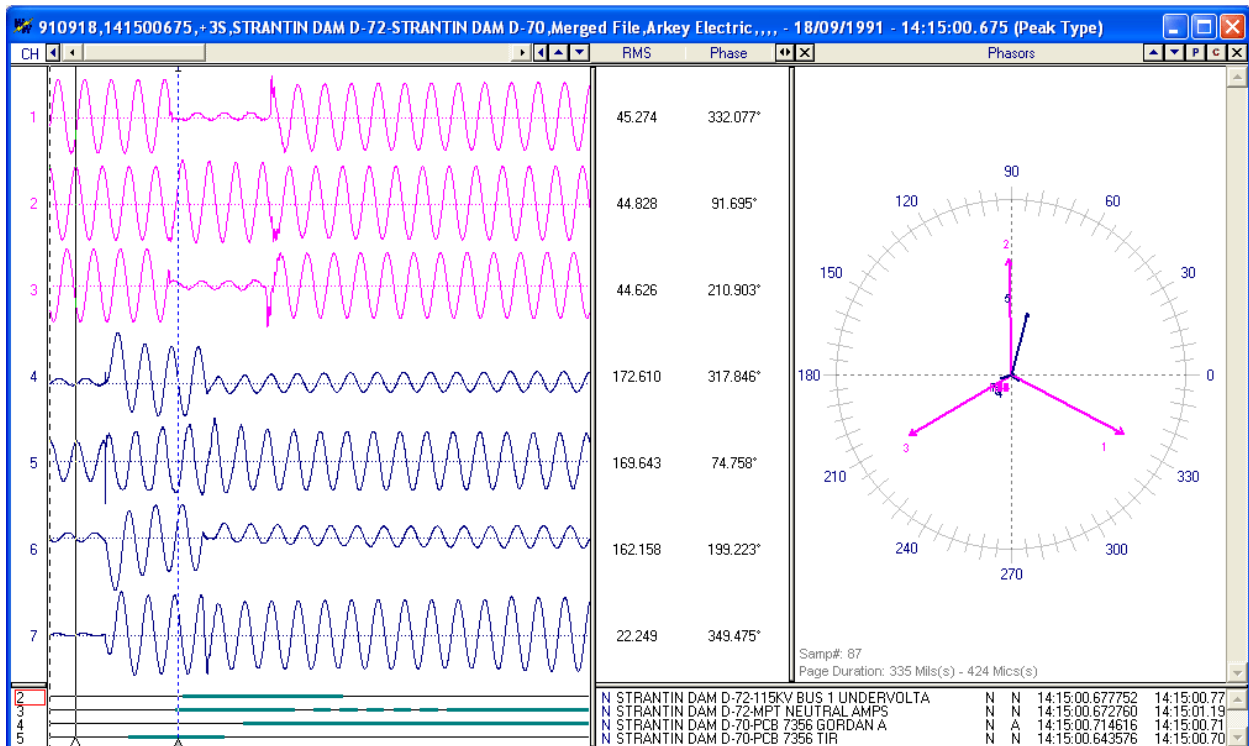


Figure 1.54 Merge Open Files – Result: Manually

Merge Open Files “Manually” is used when the file times are not synchronized. Place the data bars in the position where the times should be synced and merge the files. Merge will line up the samples according to the position of the data bar in each open file. The data bar with the least amount of samples to the beginning determines the number of samples to truncate from the beginning of all other open files. The active window’s time stamp is used for the merged file and the open file with the least amount of samples determines the length of the merged file.



**Figure 1.55 Merge Open Files – Result: By Sample (As Applied to Figure 1.51)**

Merge Open Files “By Sample” merges regardless of time stamps and/or data bar positions. It merges “As Is”. The reference time is from the active window. And the file with the least amount of samples determines the length of the file.

### CHANGE FREQUENCY

Change Frequency changes the current sampling frequency to the entered frequency. Refer to Figure 1.56. If the entered frequency is greater than the current frequency, then samples are added. If the entered frequency is less than then the current frequency, then samples are deleted. Refer to Figure 1.57 & 1.58 for an example that sets a multiple frequency file to a single frequency. The entered frequency must be greater than 2 times the line frequency.

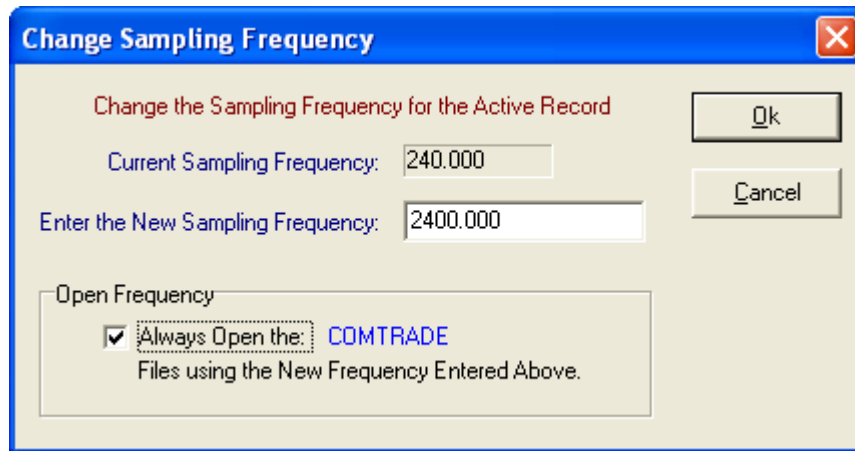


Figure 1.56 Change Frequency Dialog

It also allows for defaulting a driver to always display its' files in the entered frequency.

**NOTE:** If Open Frequency is checked then the Restore Original is not available.

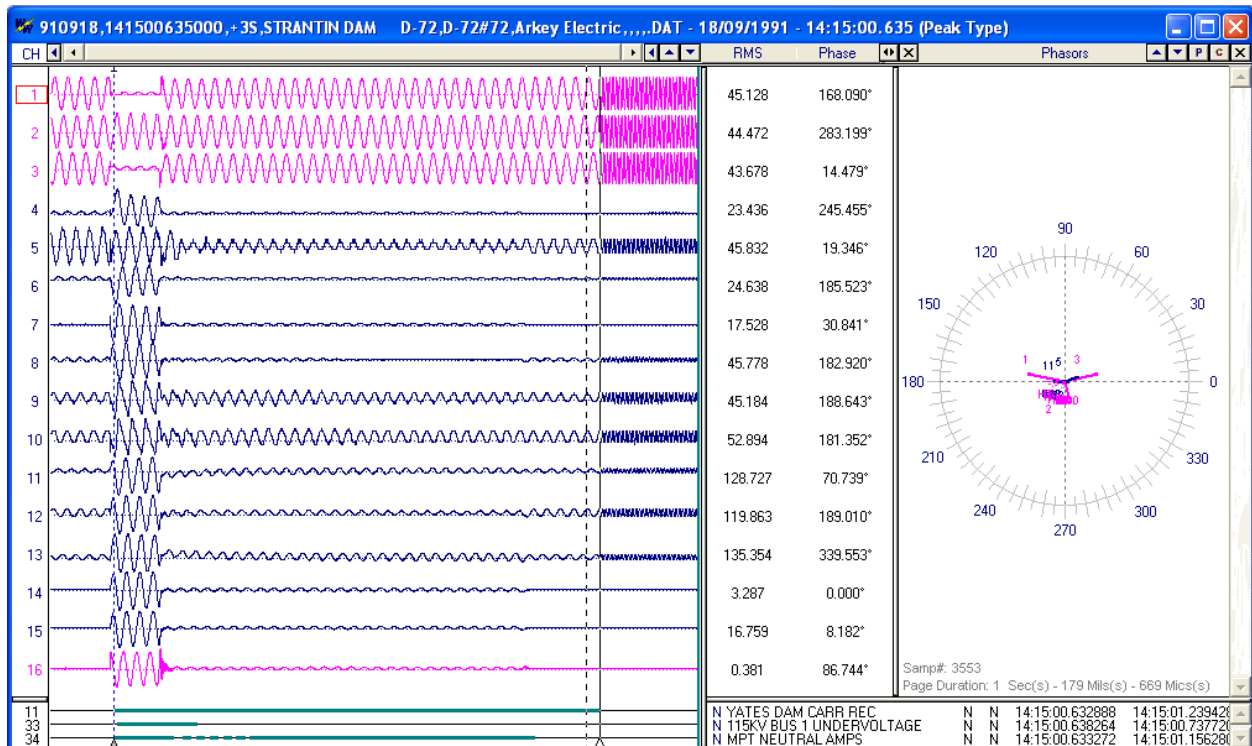


Figure 1.57 Change Frequency: Change a Multiple Frequency File to One Frequency

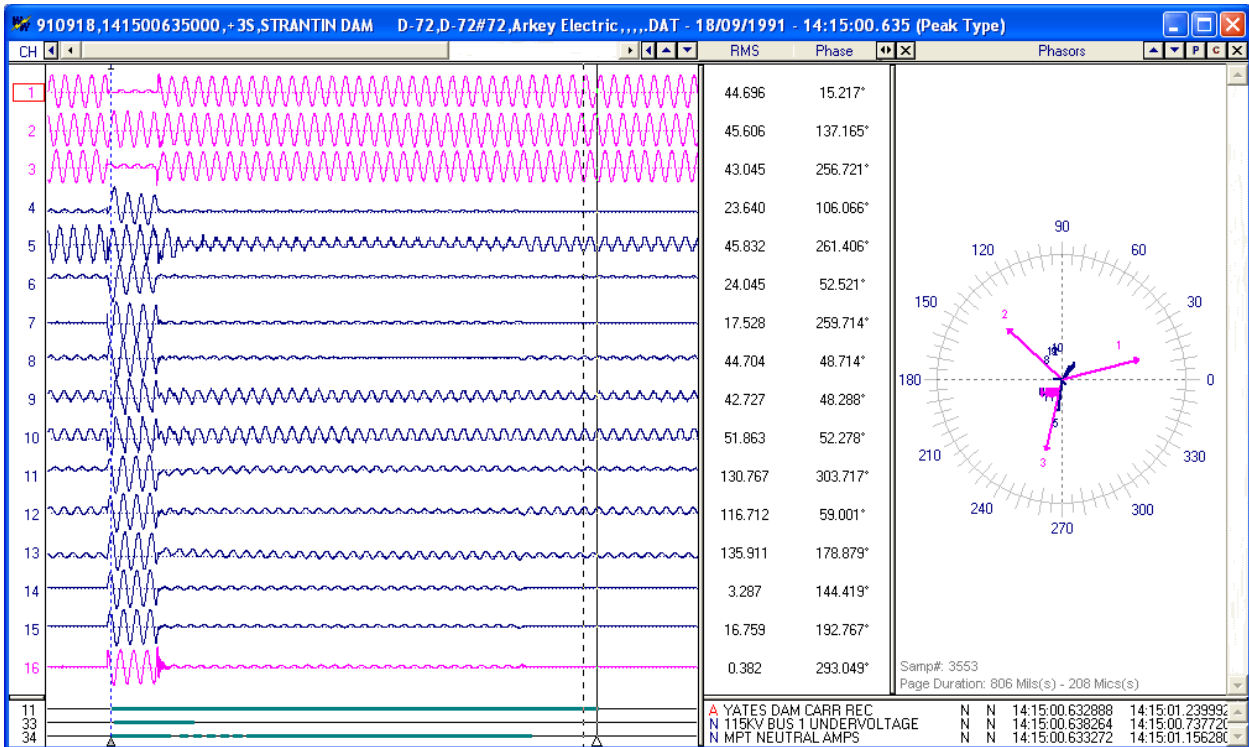


Figure 1.58 Change Frequency: Results

### TRUNCATE CYCLES

Truncate Cycles removes the specified number of cycles from the data display. Refer to Figures 1.59 & 1.60. There are three options available under the Truncate Cycles menu option.

- Left: Remove all cycles from the 1<sup>st</sup> sample to the data bar.
- Right: Remove all cycles from the data bar to the last sample.
- Middle: Remove all cycles from the data bar to the reference bar (blue dotted line).

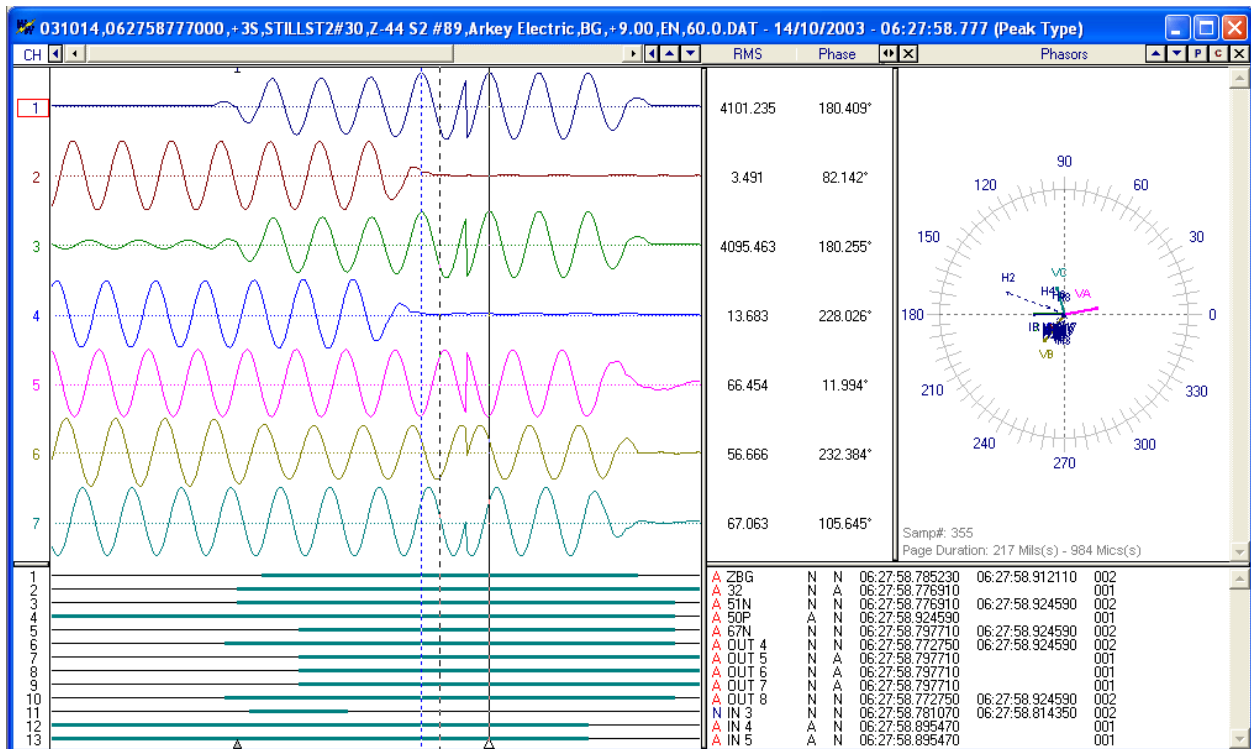


Figure 1.59 Truncate Cycles: Append Non Time Matching Waveforms

After Appending two waveform files it may be necessary to truncate the cycle that did not match up. First line up the reference bar on the peak before the appended position then line up the data bar on the peak after the appended position and select the truncate middle menu option.

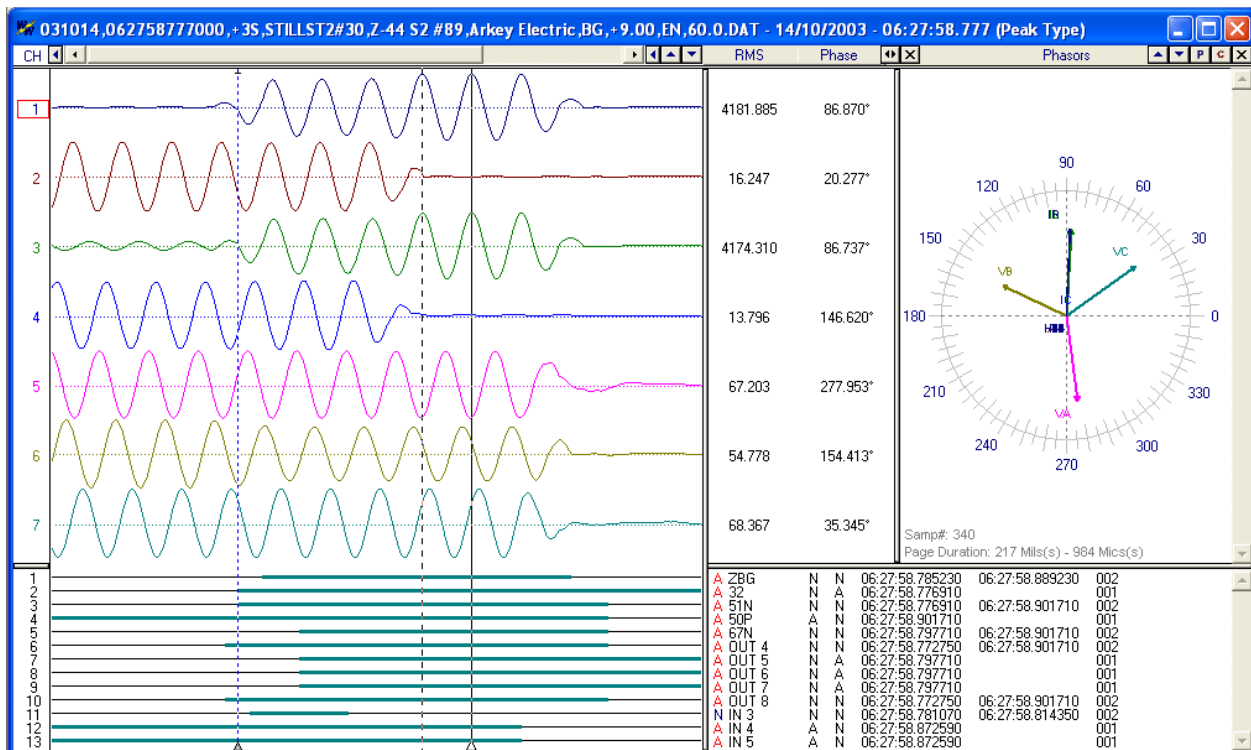


Figure 1.60 Truncate Cycles: Results

### DUPLICATE CYCLES

Duplicate Cycles duplicates the cycle at the data bar by the number of times entered in the Duplicate Cycles Dialog. Refer to Figure 1.61. This feature is useful for creating Comtrade files to play back to test set applications and for modeling and simulation applications. Refer to Figures 1.62 & 1.63 for an example that adds 5 cycles of fault cycles to a file.

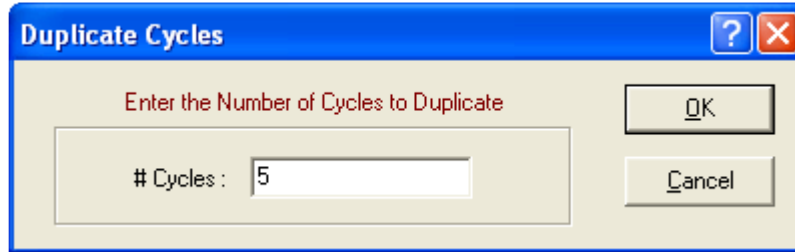


Figure 1.61 Duplicate Cycles Dialog

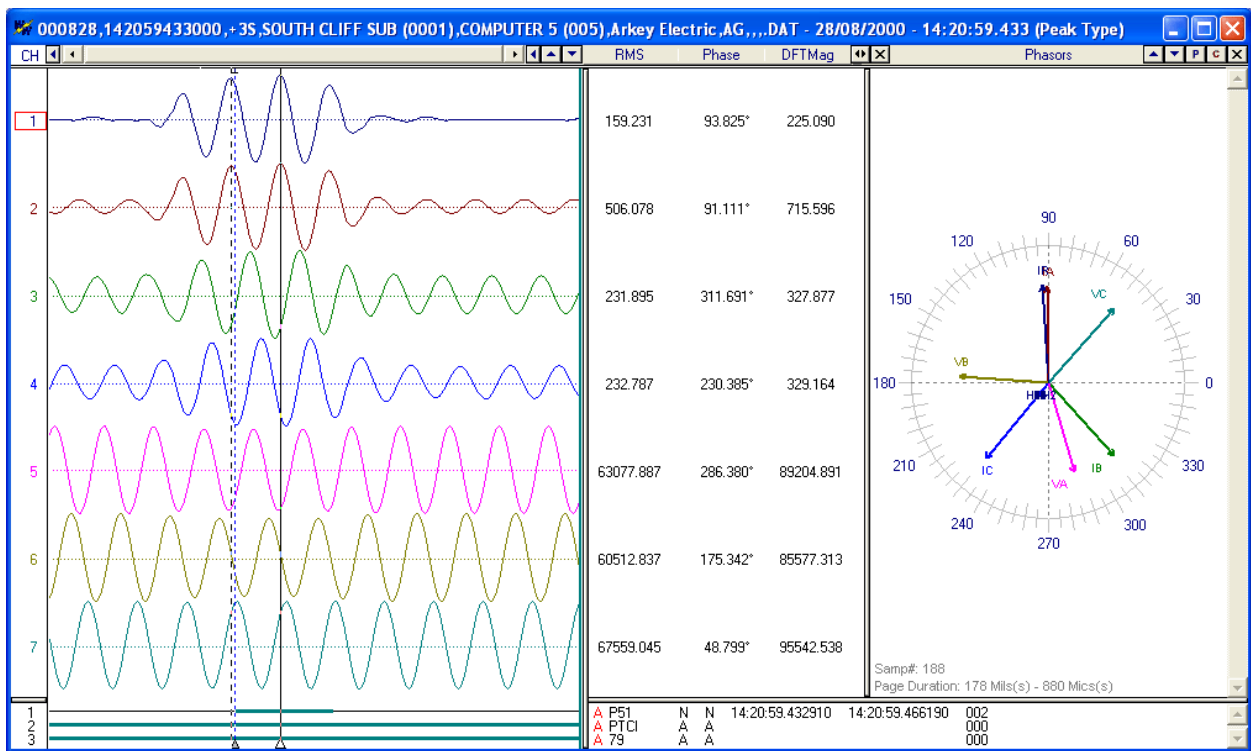


Figure 1.62 Duplicate Cycles: Initial File

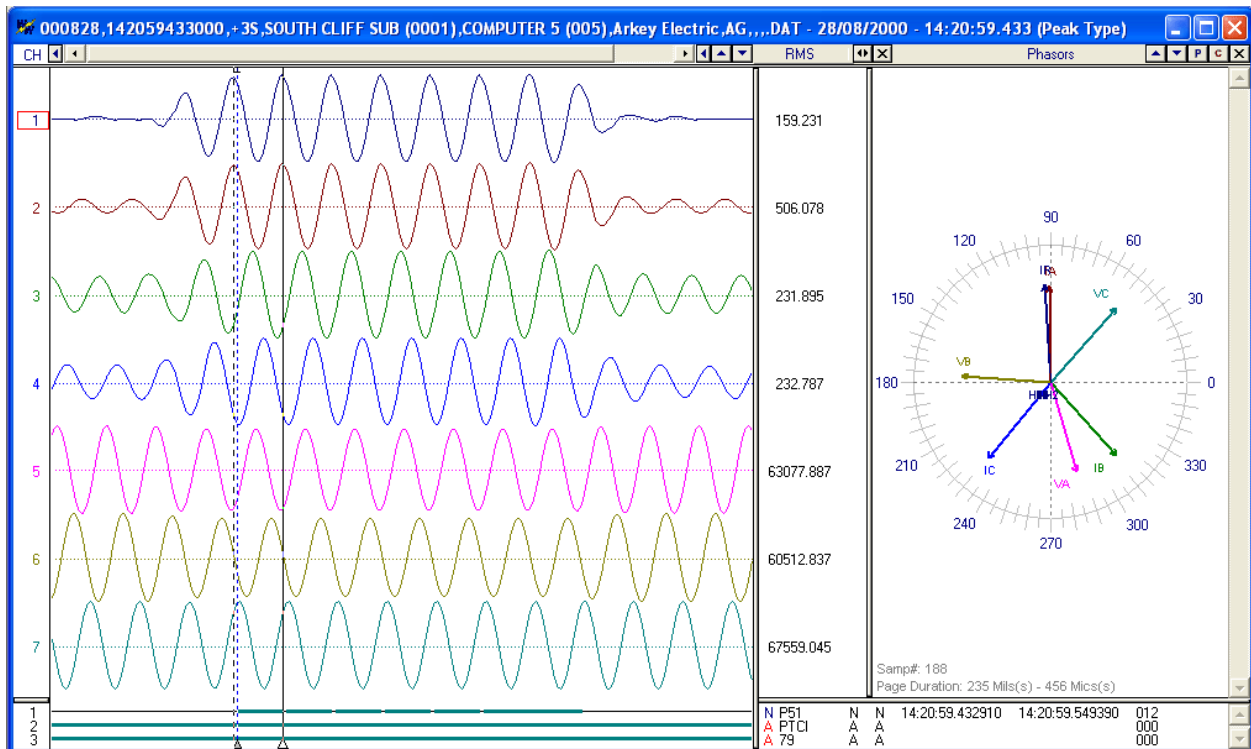


Figure 1.63 Duplicate Cycles: Results

### RESTORE ORIGINAL DATA

Restore original data will reread and display the sample values from the active waveform file on disk. Any changes made to the data display window, such as: duplicate cycles, change frequency and truncate cycles will be lost when this feature is activated. If the "Open Frequency" option is checked in the "Change Frequency" dialog then the Restore Original Data is not available.

### MARK RAW VALUES

Mark Raw Values marks the raw samples saved in the active waveform file on disk. A small hollow blue circle is placed at the raw sample. This feature is helpful in highlighting the raw sample values saved in low sampling rate files. Refer to Figure 1.64.

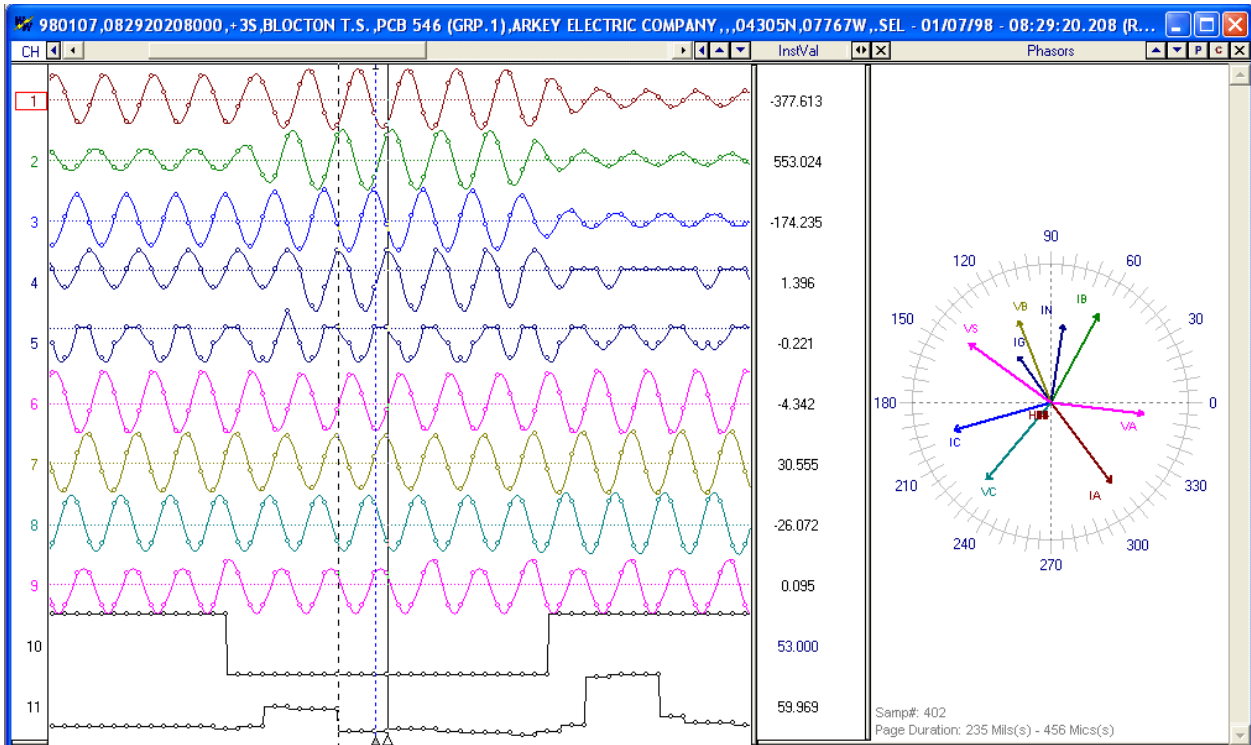


Figure 1.64 Mark Raw Values

### MARK PEAK VALUES

Mark Peak Values marks the peak sample values for all visible analog traces. A small solid gray square is placed at the peak values. Refer to Figure 1.65. This feature is helpful in highlighting the positive and negative peak values.

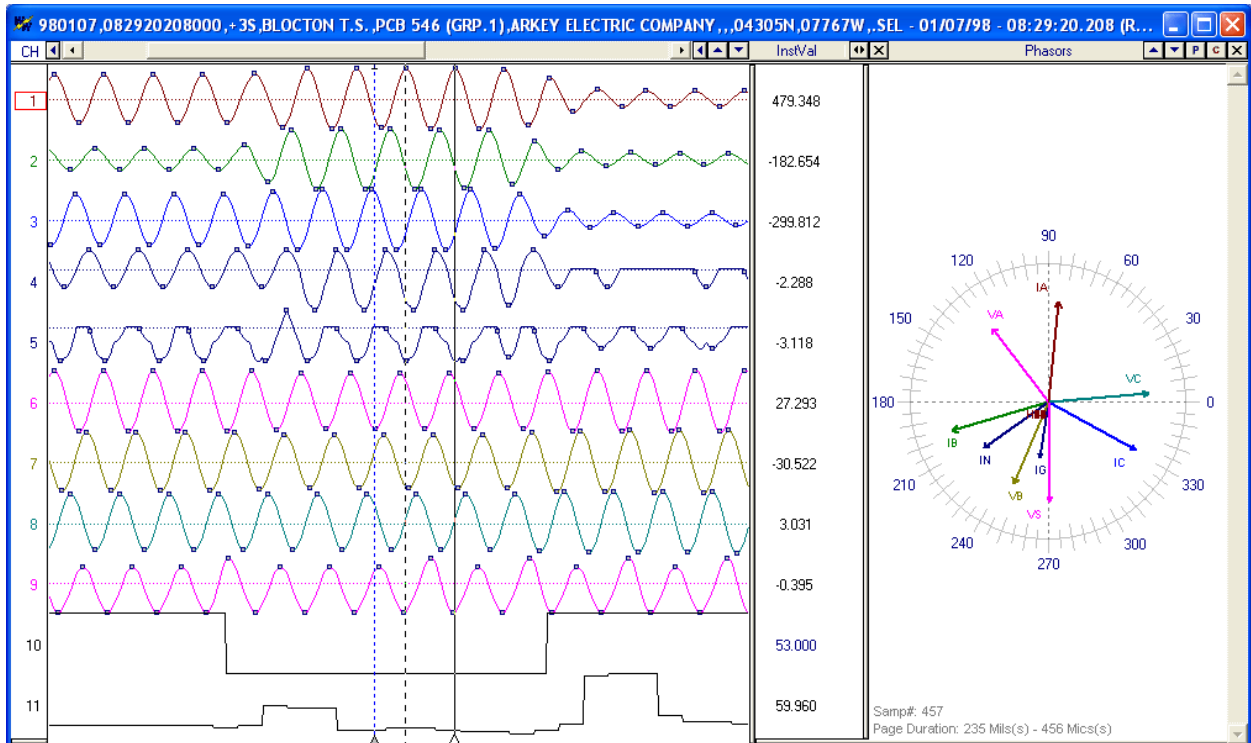


Figure 1.65 Mark Peak Values

### MARK CHANGE IN SIGN VALUES

Mark change in sign marks the all samples where a change in sign occurs. A small solid gray triangle is placed at the change position. Refer to Figure 1.66. This feature is helpful in highlighting the position where a change in sign occurs.

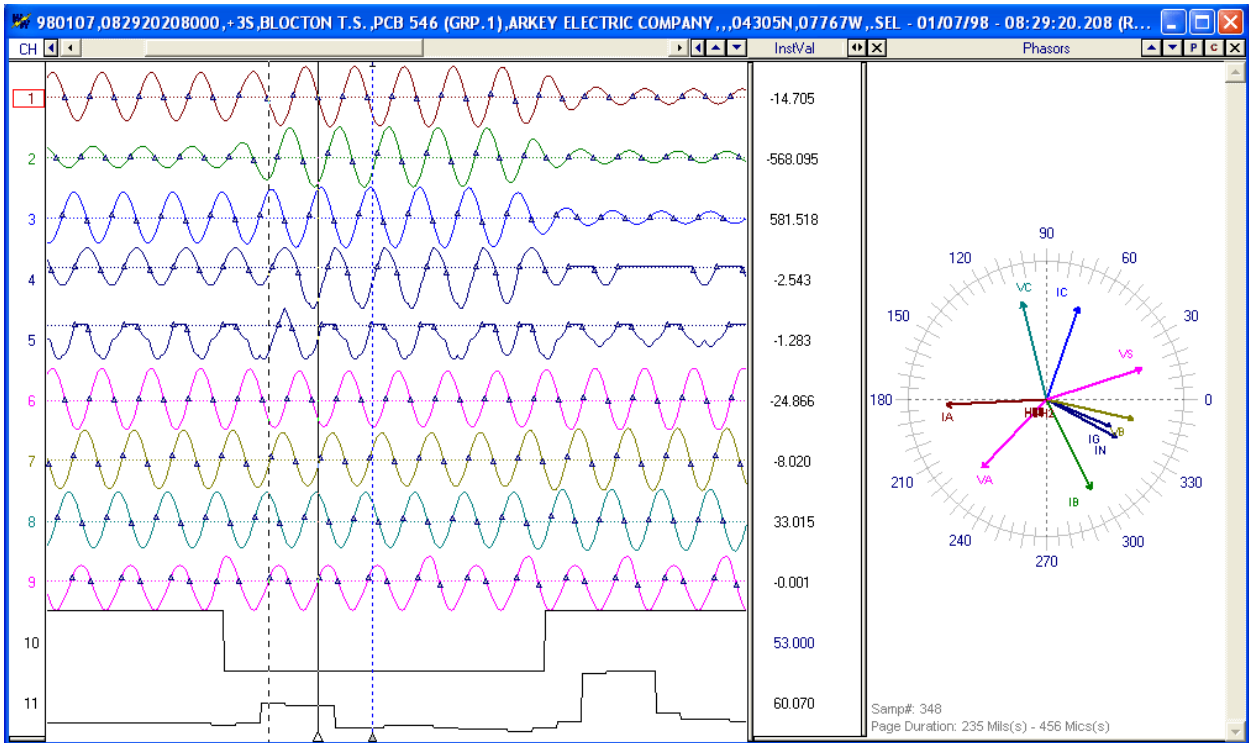


Figure 1.66 Mark Change in Sign

### CHANGE ANALOG VALUES (PRIMARY ↔ SECONDARY)

The values displayed in the analog table are either in primary or secondary quantities. If the file defines the type of values saved then the type is displayed in the window header. Refer to Figure 1.67. Also, if the CT and PT ratios are defined in the configuration file then the values can be changed from primary to secondary and vice versa. To change the values open the properties dialog and click on the “Driver Data Type” tab, select the Primary or Secondary radio button to switch between values. Refer to Figure 1.68.

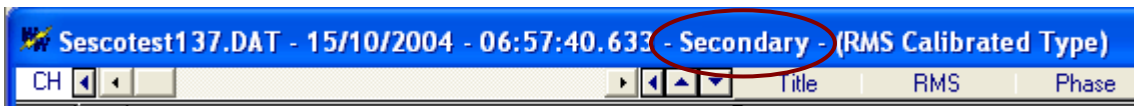
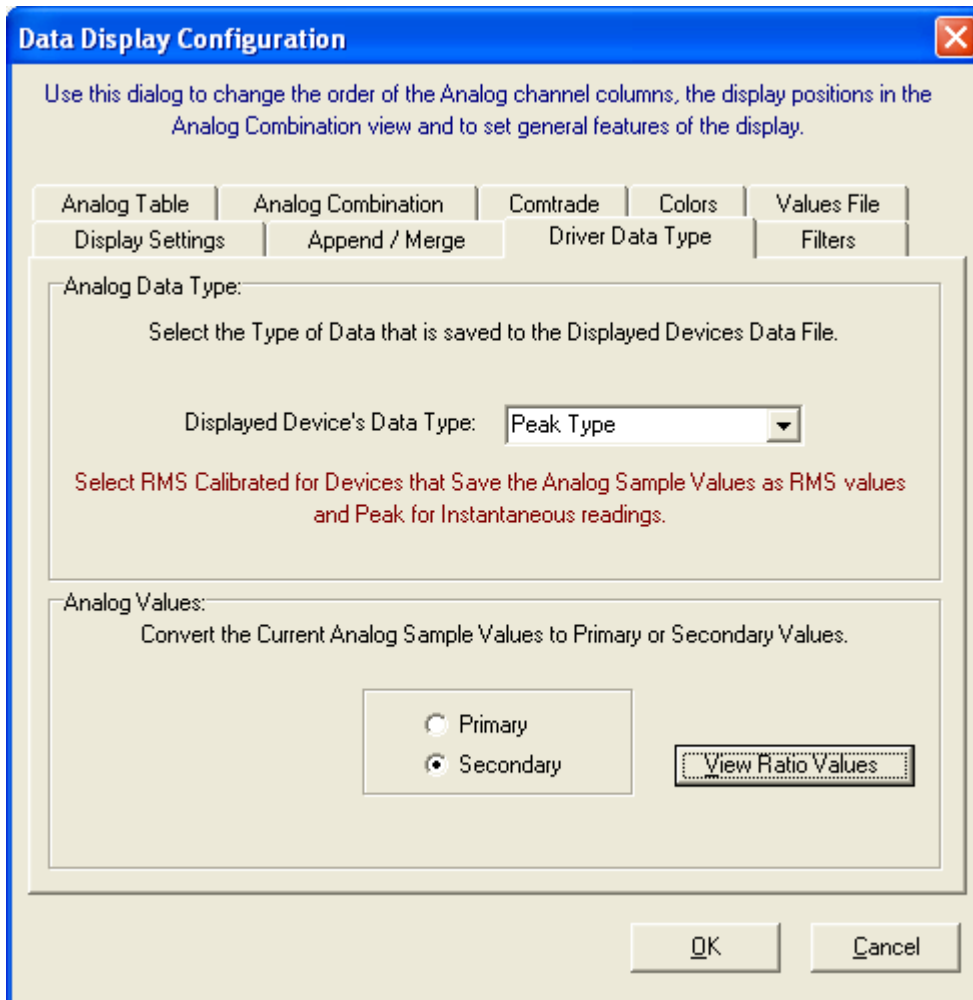


Figure 1.67 Type of Analog Values Displayed



**Figure 1.68 Change Analog Values (Primary ↔ Secondary)**

The CT and PT ratio values can be viewed by clicking on the “View Ratio Values” button in the “Driver Data Type” tab. The values are listed in a table format for each analog channel. Refer to Figure 1.69.

Channel	Primary	Secondary
1 - Volts A 1	70.0	1.0
2 - Volts B 1	70.0	1.0
3 - Volts C 1	70.0	1.0
4 - Amps A 1	400.0	1.0
5 - Amps B 1	400.0	1.0
6 - Amps C 1	400.0	1.0
7 - Amps N 1	400.0	1.0
8 - Volts A 2	1.0	1.0
9 - Volts B 2	1.0	1.0
10 - Volts C 2	1.0	1.0
11 - Aux In 1 X	1.0	1.0
12 - Aux In 2 X	1.0	1.0
13 - {Software Channel}	1.0	1.0
14 - {Software Channel}	1.0	1.0
15 - {Software Channel}	1.0	1.0
16 - {Software Channel}	1.0	1.0
17 - {Software Channel}	1.0	1.0
18 - {Software Channel}	1.0	1.0

Figure 1.69 Ratio Values

### ADJUST FILES TIME

The Adjust Files Time allows for adjusting the time of the open file. To open the "Adjust File Time" dialog select the "Adjust Files Time" menu option under the "Data" menu. You can specify to add or subtract a give time increment from the files current time. Enter the desired time increment for the hour, minutes, seconds and milliseconds. If there is no adjust needed on a specific time field enter 0. Refer to Figure 1.70.

Enter the adjustment time for the active file.

Active File's Start Time: 05:38:53.000000

Add Time     Subtract Time


Hours: 05    Minutes: 00    Seconds: 00    Milliseconds: 000

Adjust Open Time:

Always Adjust the files time using the above time adjustment for COMTRADE Files

Figure 1.70 Adjust Files Time

To always have the file's time automatically adjusted when a specific driver is used to open a file check the "Adjust Open Time" check box.

To show the file's original date and time click on the "Restore Original" button  or select the "Restore Original Data" menu option under the "Data" menu.

## CREATING VIRTUAL CHANNELS

The data display window allows for six software analog channels (SAC) and eight software digital channels (SDC). These additional channels are virtual channels that exist only in RAM. The sample values are created using a function of the existing analog/digital channels. Predefined operators can be used to calculate a missing phase, create positive/negative and zero sequence channels; convert channels to secondary or primary values; calculate the resistance of V/I, multiply, divide, add and subtract multiple channels; multiply, divide, add and subtract channel data by a constant value; create an envelope of an analog channel; define over-trigger or under-trigger values; calculate a missing phase; define the prefix and unit for the channel; or perform bit-wise ANDing/ORing on digital traces.

All calculations are designed to operate "on the fly". For the forward looking SAC operator ("@" some positive angle) care must be taken. Upon opening a file and while the system is reading the data samples, the forward samples are not available. In that case the system will use the current sample instead of the requested forward sample. To execute forward looking SAC instructions, wait until the file is read then use F5 to recalculate.

The SAC and SDC instructions are composed of an operator and an operand. An operand can be a channel defined by the channel number or a constant. Constant values must have a "Λ" operator before each value to distinguish between channel numbers and constant values. To phase shift analog channels, use the "@" sign before each angle defined. All angles must be defined in degrees. Below is a list of all the software operators that are available:

- "+" - Add (Analog)
- "-" - Subtract (Analog)
- "\*" - Multiply (Analog)
- "/" - Divide (Analog)
- "Λ" - Constant value (Analog)
- "@" - Angle in degrees (Analog)
- "e" - Half cycle envelope (Analog)
- "a" - Envelope (Analog)
- "<" - Under-trigger (Analog)
- ">" - Over-trigger (Analog)
- "h" - Harmonic for Channel
- "h=" - Harmonic for all Back Operations
- "I" - Absolute Value
- "p=" - Prefix (Analog)
- "u=" - Unit (Analog)
- "+" - And (Digital)
- "." - Or (Digital)
- "/" - Instruction terminator (Analog & Digital)

**NOTE:** All SAC/SDC operations are performed in reverse polish notation (one operation at a time). The instruction set must always terminate with a "/". An operation error is generated if the instruction formats are not followed.

Press F5 to display the SAC dialog or select “Software Analog Channels” from the Channel menu. Refer to Figure 1.71. To display the SDC dialog select “Software Digital Channels” from the Channel menu. Below are a few examples:

Operations	Example	Description
Addition	+7/+8/+9/	Add channels 7, 8, & 9 and store the result in the SAC.
Subtraction	+7/-8/-9/	Subtract channel 8 from channel 7, and store the result in the SAC then subtract channel 9 from the SAC and restore the values in the SAC.
+ Sequence	+1/+2@120/+3@240:^3/p=k/u=volt/	Calculate the + sequence components and store the result in the SAC then set the SAC's prefix and unit.
- Sequence	+1/+2@240/+3@120:^3/p=k/u=volt/	Calculate the - sequence components and store the result in the SAC then set the SAC's prefix and unit.
0 Sequence	+1/+2/+3:^3/p=k/u=volt/	Calculate the zero sequence components and store the result in the SAC then set the SAC's prefix and unit.
Harmonics	+16/h=1/p=k/u=volt/	Extract the 1 <sup>st</sup> Harmonic component from Channel 16 and store in the SAC then set the SAC's prefix and unit.
Multiplication	+3/*^2.66/	Multiply all sample values in channel 3 with the constant value 2.66 and store the result in the SAC.
Division	+7/:3/	Divide all sample values in channel 7 by the sample values in channel 3 and store the result in the SAC.
Half Cycle Envelope	+2/e/	Calculate the half cycle envelope of channel 2 and store the result in the SAC.
Envelope	+12/a/	Calculate the envelope of channel 12 and store the result in the SAC.
Under-trigger	+4/<135/	Store all the sample values from channel 4 that are < 135 in the SAC.
Over-trigger	+62/>500/	Store all the sample values from channel 62 that are > 500 in the SAC.
Absolute Value	+7/+8/+9/ p=k/u=Volts/	Add channels 7, 8, & 9 and store the absolute value of the result in the SAC then set the SAC's prefix and unit.
AND	+2/.33/	AND channel 2 with channel 33 and store the result in the SAC. The “.” represents the AND operation.
OR	+2/.4/+14/	AND channel 2 with 4, then OR the result with channel 14 and store the result in the SAC. The “+” sign represents the OR operation.

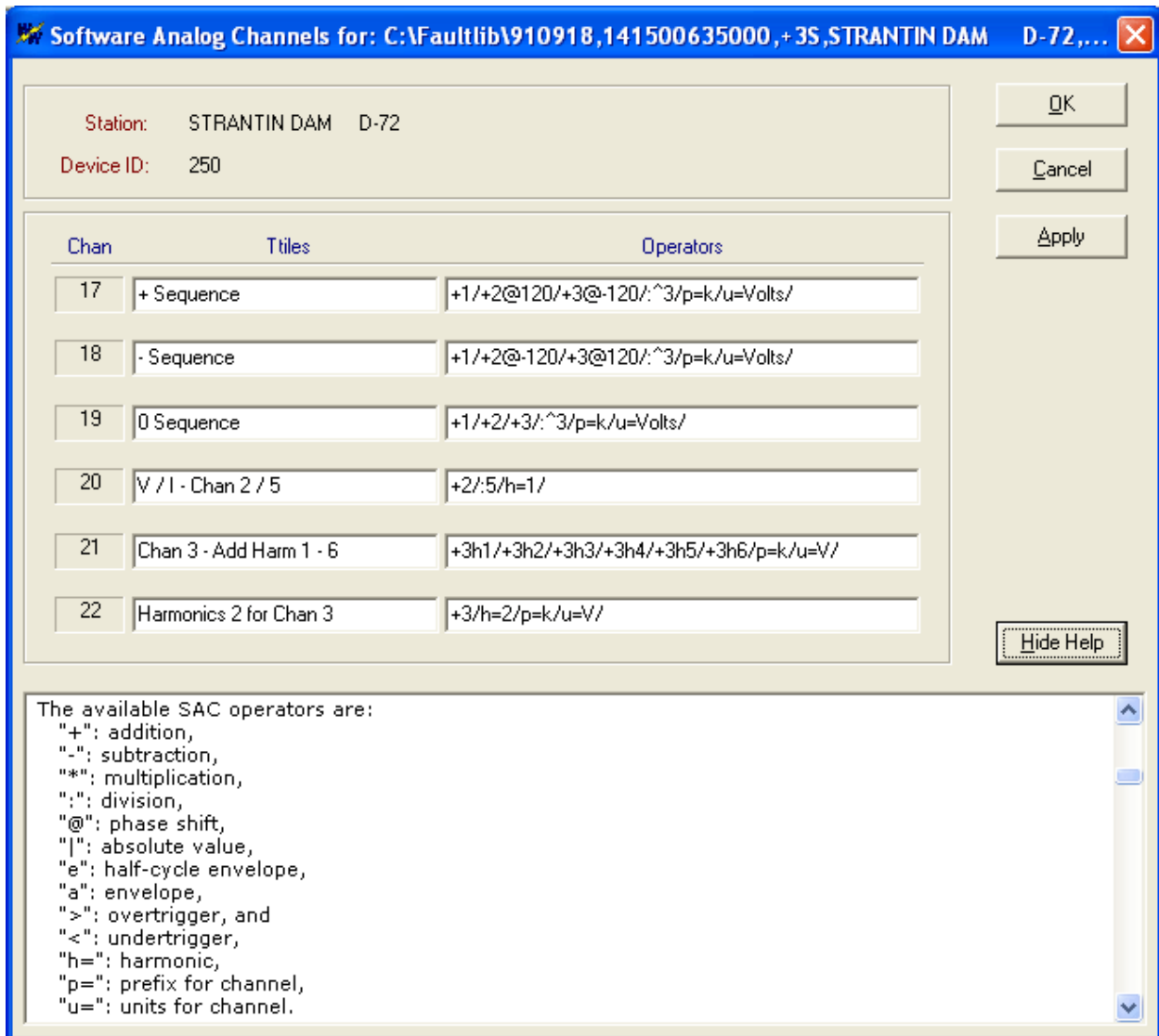
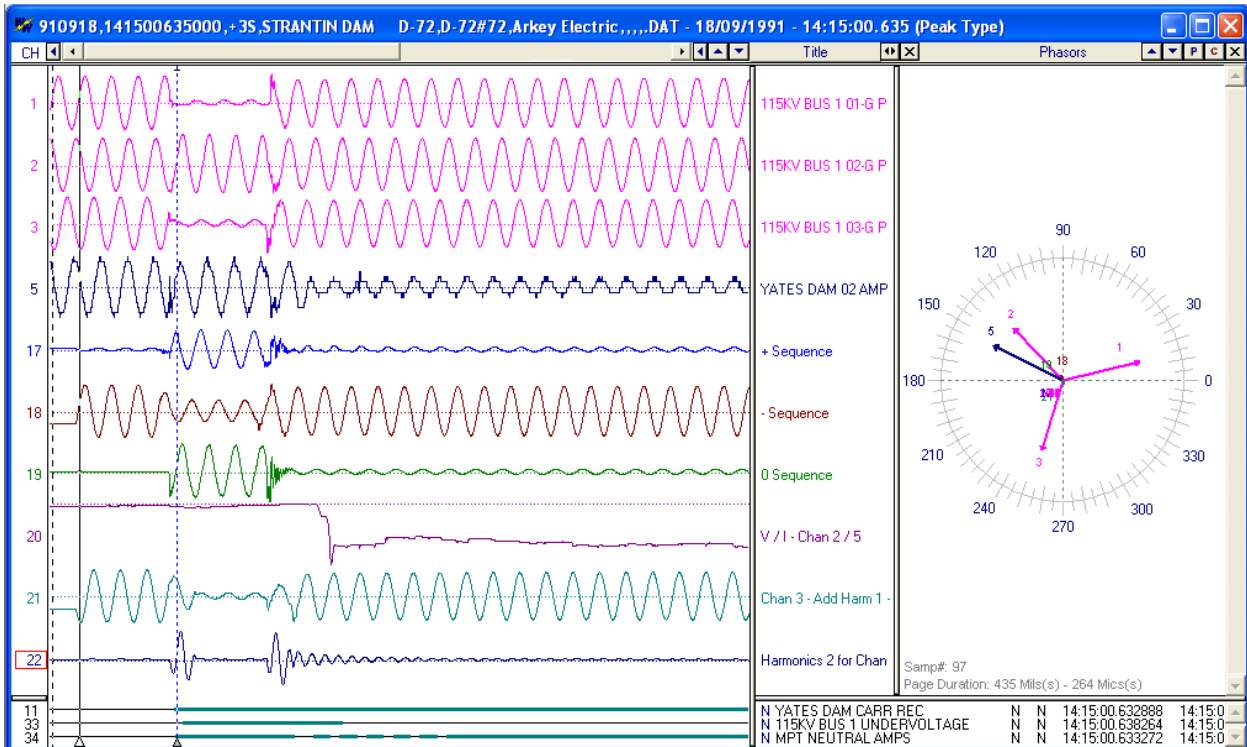


Figure 1.71 SAC Dialog



**Figure 1.72 SAC Results**


Engineers can use the additional channels as a generic tool for monitoring or modeling tasks. A virtual channel can be used to compute one of the phases of a monitored line by adding the remaining phases then subtracting the result from the residual channel. This in turn frees up a hardware channel for other monitoring needs.

### PLAY CHANNELS AUDIO

It is now possible to hear the characteristics of a signal through the data display window. To play the audio of a specific analog channel first mark the channel then open the “Analog Channel Audio” dialog by selecting the “Play Channels Audio” menu option under the “Data” menu. The Analog Channel Audio dialog is displayed in the bottom right hand corner of the data display window. Refer to Figure 1.73.



**Figure 1.73 Play Audio Dialog**

The “Active Channel” section displays the analog channel marked in the data display window. The “Audio Controls” section allows for playing the active analog channel’s data through the computers speakers and for increasing/decreasing the volume of the output. The “Save .WAV File” section allows for saving the analog channel data in the Window’s .WAV format. Click the folder button  to select and destination directory and to enter a new “.WAV” file or for selecting an existing “.WAV” file. The selected file path and name will be updated in the “Audio Filename” field.

To view the saved “.WAV” file exit the data plotting window, navigate to the “.WAV” file path and double click on the wave file. A new display driver has been added to plot Microsoft’s “.WAV” files.


### ALIGN CHANNEL DATA

The “Align Channel Data” option will align the analog channel samples according to the defined phase shift angles. The alignment routines use the Thiran 3<sup>rd</sup> Order All Pass Fractional filter. The all-pass delay guarantees no magnitude deterioration and fractional because delays can be a fraction of the sample interval.

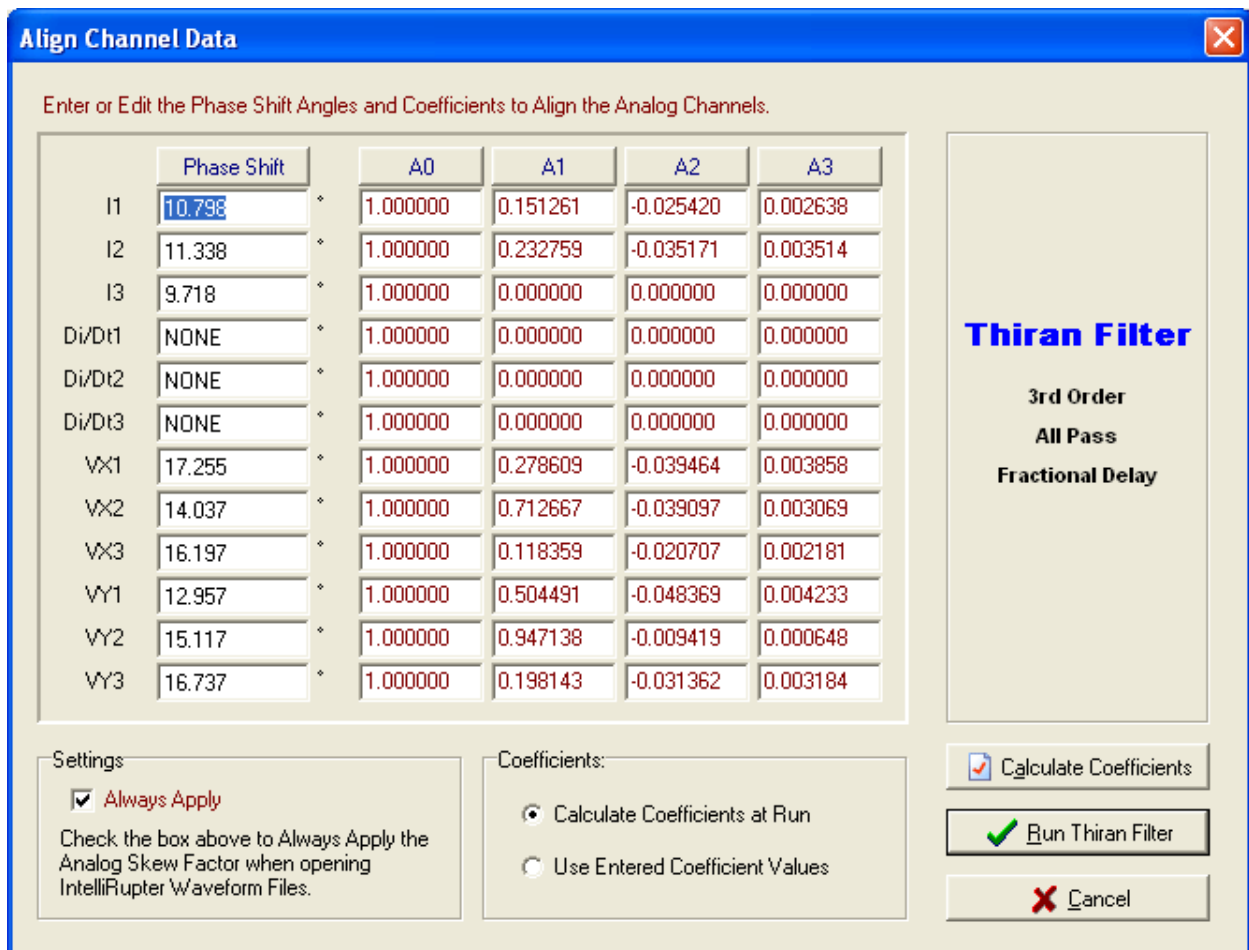
To align the analog channels manually open the “Align Channel Data” by selecting the menu option under the “Channel” menu. If the Thiran filter has already been applied to the displayed analog channels a message is displayed. Refer to Figure 1.74.



**Figure 1.74 Align Channel Message**

To continue to the “Align Channel Data” dialog click “Yes”. To apply the filter to the file’s original unfiltered data click “No” or “Cancel” then select the “Restore Original Data” menu option under the “Data” menu or click on the “Restore Original” menu button. 

The “Align Channel Data” dialog will apply the Thiran filter according to the entered Phase Shift angles. Enter the phase shift angle for each analog channel. Refer to Figure 1.75. If the filter does not apply to a specific analog channel enter 0 or leave the field blank or enter NONE. To display the coefficient values used for each analog channel click the “Calculate Coefficients” button. The “A0, A1, A2 and A3” fields will be updated with the coefficients for the entered phase shift angles.



**Align Channel Data**

Enter or Edit the Phase Shift Angles and Coefficients to Align the Analog Channels.

	Phase Shift	A0	A1	A2	A3
I1	10.798	1.000000	0.151261	-0.025420	0.002638
I2	11.338	1.000000	0.232759	-0.035171	0.003514
I3	9.718	1.000000	0.000000	0.000000	0.000000
Di/Dt1	NONE	1.000000	0.000000	0.000000	0.000000
Di/Dt2	NONE	1.000000	0.000000	0.000000	0.000000
Di/Dt3	NONE	1.000000	0.000000	0.000000	0.000000
VX1	17.255	1.000000	0.278609	-0.039464	0.003858
VX2	14.037	1.000000	0.712667	-0.039097	0.003069
VX3	16.197	1.000000	0.118359	-0.020707	0.002181
VY1	12.957	1.000000	0.504491	-0.048369	0.004233
VY2	15.117	1.000000	0.947138	-0.009419	0.000648
VY3	16.737	1.000000	0.198143	-0.031362	0.003184

**Thiran Filter**

3rd Order  
All Pass  
Fractional Delay

Settings:  Always Apply  
Check the box above to Always Apply the Analog Skew Factor when opening IntelliRupter Waveform Files.

Coefficients:  Calculate Coefficients at Run  
 Use Entered Coefficient Values

Calculate Coefficients  
 Run Thiran Filter  
 Cancel

**Figure 1.75 Align Channel Data Dialog**

To always apply the Thiran filter on files for the active driver click the “Always Apply” check box. Always apply will automatically run the Thiran filter with the defined phase shift angles before displaying the file.

To display the files original samples click the “Restore Original” menu button  or select the “Restore Original Data” menu option under the “Data” menu.

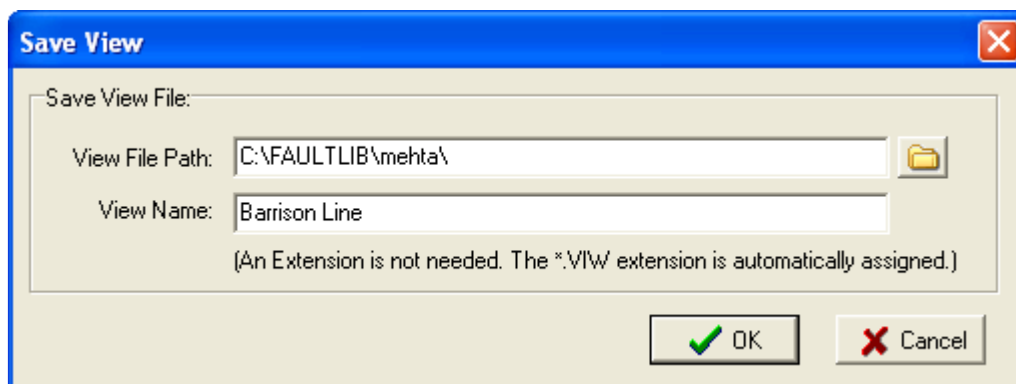
The coefficients used for the filter can be edited. If the coefficients are modified click the “Use Entered Coefficients Values” radio button. To have the coefficients automatically calculated when the filter is applied click the “Calculate Coefficients at Run” radio button.

## USER VIEWS

User Views allow for saving and displaying specific information about a selected view. When a view is saved the following information is saved to an ASCII text file in the user defined folder.

- Displayed analog channels,
- Analog channel order,
- Superimposed channels,
- Analog channel colors,
- Digital channels displayed,
- Sampling frequency,
- Time scale,
- Sliding window size (RMS bar to Data bar),
- Phasor window size,
- Table window size,
- Red fault bar,
- Auto scale and
- Phasor or circular chart displayed

To save a view first setup the desired view then select the “Save View” menu option under the “View” menu. The “Save View” dialog is displayed. Refer to Figure 1.76.



**Figure 1.76 Save View Dialog**

Enter the view’s name in the “View Name” field and select or enter the destination path into the “View File Path” field. By selecting the destination folder a hierarchy of views can be saved that allows for easy access to specific views according to the users preference.

To select a view open the view drop down menu. Refer to Figure 1.77. The drop down menu list the last 7 saved/selected views. If the view is not listed click on the “More View” option to open Microsoft’s select file dialog. Refer to Figure 1.78. Navigate to the view’s folder and double click on the view file.

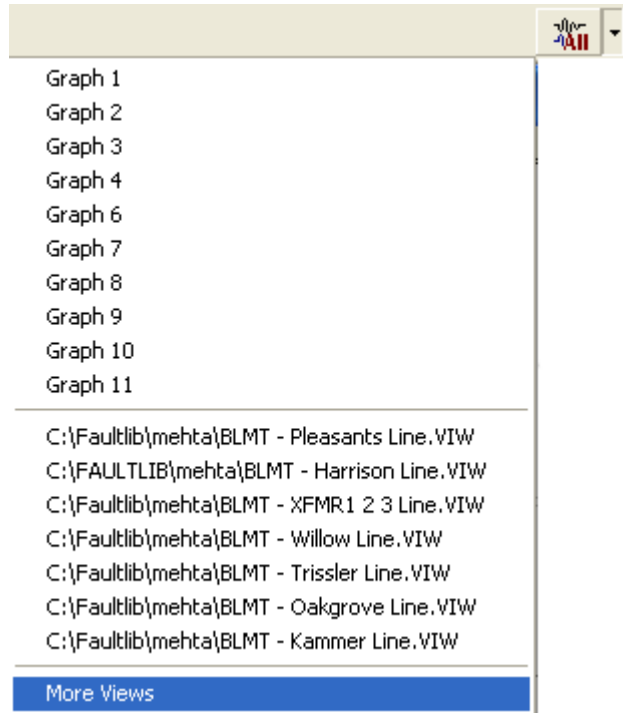


Figure 1.77 Select View Drop Down Menu

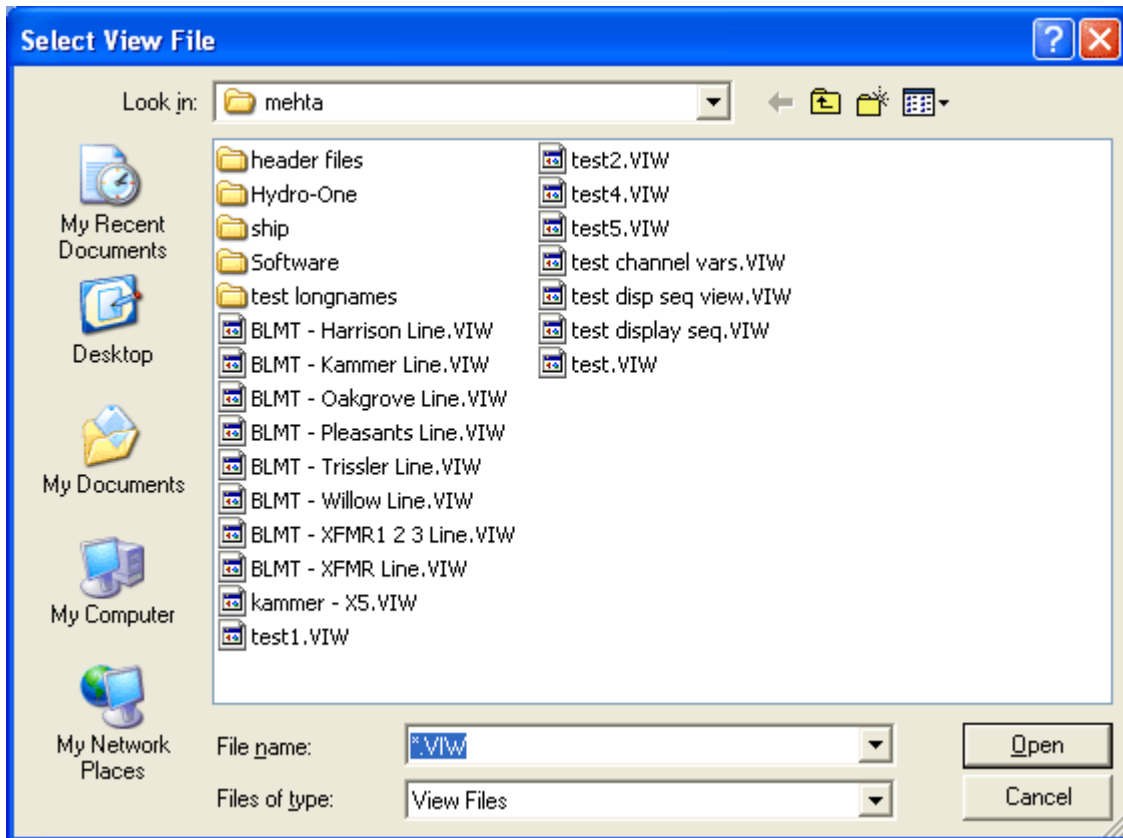


Figure 1.78 Select View File Dialog

To view the details of a saved view before selecting it, open the “Select View” dialog from the “View” menu. Refer to Figure 1.79. The select view dialog has 3 sections. On the left side of the dialog is the list of all the available views located in the displayed view path. To change the view path either use the browse button or select a previous navigated directory from the “View Path” drop down list. On the right side is the view information for each analog channel and digital channel in the view.

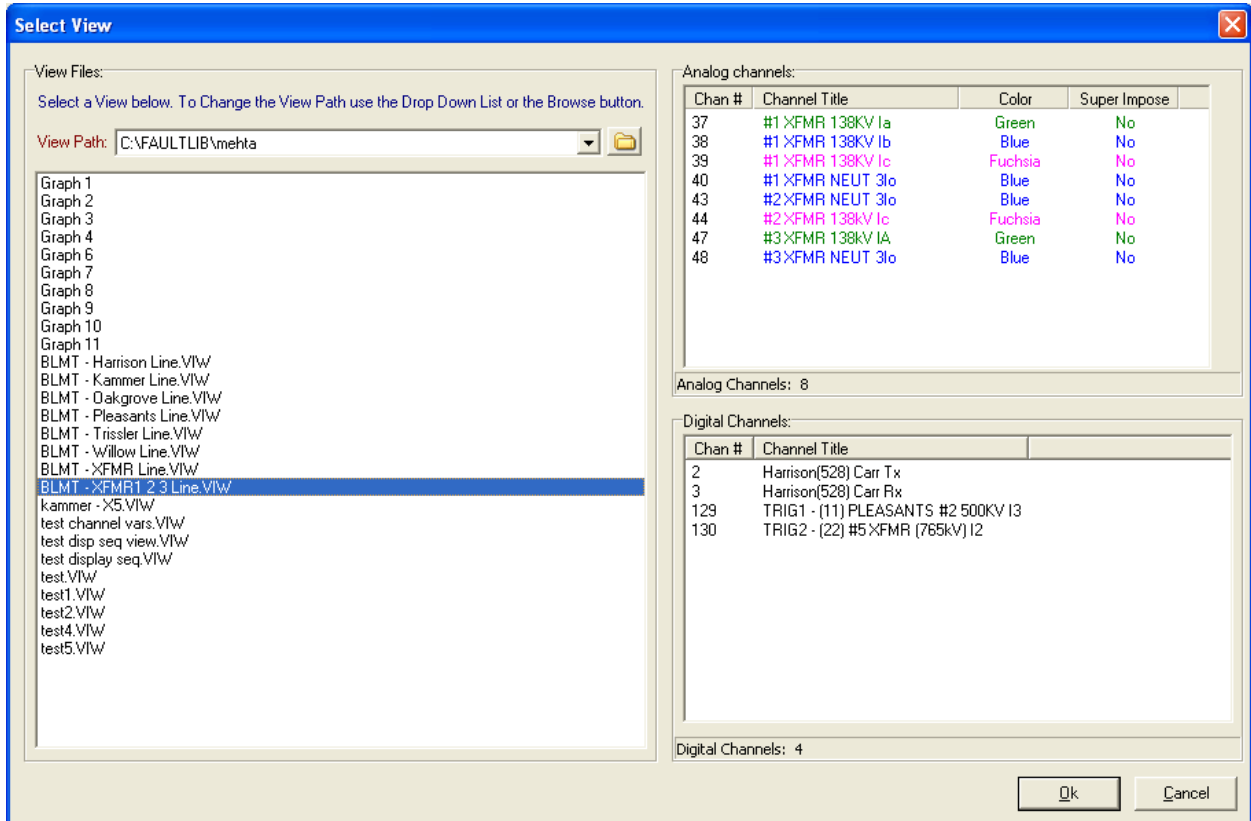


Figure 1.79 Select View Details Dialog

Double click on the view file or select the file and click “OK”. If the analog channel and digital channel names defined in the view file are not in the displayed file than an error message is displayed. To exit the dialog without selecting a view, click on the “Cancel” button.

## C H A P T E R 2

# System Requirements & Installation

---

This chapter lists the system requirements needed for installing and running the Wavewin software. It also describes the installation procedures and provides technical support information.

## System Requirements

The system requirements are listed below.

An IBM or compatible PC with an 80486 microprocessor or higher.  
128 Megabytes of memory.  
2 gigabytes of available hard disk space.  
A VGA, 8514/A, or compatible graphics adapter.  
Microsoft Windows version 98 or higher.

## Installation

The system files are distributed in a compressed format. To install the software follow the instruction for the type of storage media distributed with this manual.

**Web:** To install the software from the web open the [www.wavewin.net](http://www.wavewin.net) web site. Under the “Wavewin Upgrades” link click on the Wavewin application to download. Enter your username and password. The username & password are case sensitive. Click on the application link to download the system’s executable files. Open the zip file and run the install.

**CD:** To install the software using a CD place the CD into the CD drive. The installation program will run automatically. If the installation program is not displayed then navigate to the CD’s root drive and double click on the install.exe application.

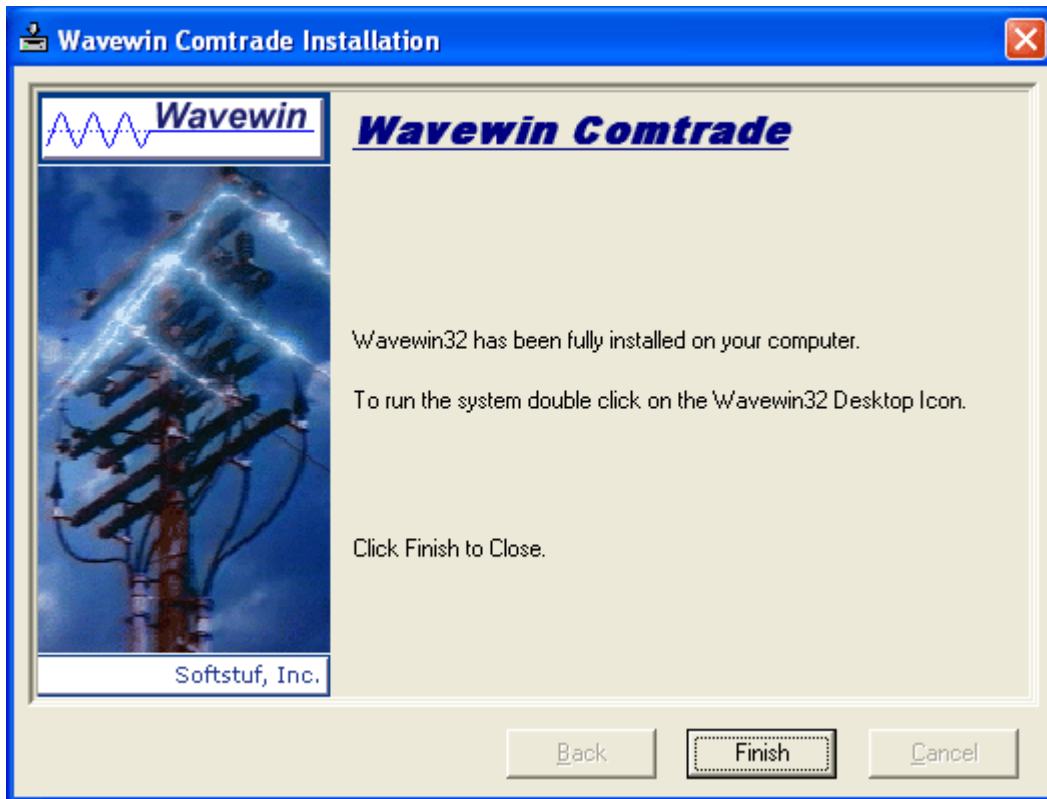
Follow the following instructions to fully install the software.



**Figure 2.1 Destination Folder**

Define the destination folder for the system files then click Next to start the installation.

The destination folder is the folder where all files are to be copied. Use the browse button to select and existing directory.



**Figure 2.2 Finish Install**

The install is now complete click Finish to end the installation.

## Starting the Software

After you have installed the software on your computer, you are ready to get started. The way you begin depends on your own style. If you like to dive right in and learn by doing the system provides on-line help to assist you. If you prefer a structured learning approach, read the previous chapter to get familiar with the software features.

To run the software, click on the installed desktop icon or open the Start menu, navigate to the installed Program folder and click on the Wavewin32 shortcut.



## Technical Support

Although this system is easy to use and understand, at some point you may encounter a technical question, feel that the system has improperly operated, or have suggestions for future improvements. In either case, contact Softstuf using one of the following methods:

Phone: 215-922-6880, hours are from 9:00 a.m. to 8:00 p.m. Mon- Fri, (EST).  
 Fax: 215-625-2497, response time is 24 hours.  
 E-mail: support@softstuf.com, response time 24 hours.



## C H A P T E R 3

# Fields & Features

---

This chapter describes all the fields and features available in the software. They are listed alphabetically for your convenience.

**ACTIVE TOPIC - HELP**

---

**Location:** All child windows

**Description:** Display the active windows Help file.

**Activation:** *Menu:* Alt-H, T


**ADJUST FILES TIME**

---

**Location:** Data Display

**Description:** The Adjust Files Time allows for adjusting the time of the open file. To open the “Adjust File Time” dialog select the "Adjust Files Time" menu option under the "Data" menu. You can specify to add or subtract a give time increment from the files current time. Enter the desired time increment for the hour, minutes, seconds and milliseconds. If there is no adjust needed on a specific time field enter 0.

**Activation:** *Menu:* Alt-D, J

**Comments:** To always have the file's time automatically adjusted when a specific driver is used to open a file check the "Adjust Open Time" check box. To show the file's original date and time click on the “Restore Original” button  or select the “Restore Original Data” menu option under the “Data” menu

**See Also:** Adjust Files Time in Chapter 1

**ALIGN CHANNEL DATA**

---

**Location:** Data Display

**Description:** The Align Channel Data option allows for aligning the channel data using the Thiran 3<sup>rd</sup> Order All-Pass Fractional filter. To open the “Align Channel Data” dialog select the "Align Channel Data" menu option under the "Channel" menu. Enter the phase shift for each analog channel. Enter 0 or leave the field blank if the filter does not apply to a specific analog channel. Click the “Run Thiran Filter” to apply the filter.


**Activation:** *Menu:* Alt-C, T

**Fields:**

<i>Phase Shift:</i>	The phase shift angle for each analog channel.
<i>A0:</i>	The Thiran A0 coefficient for each analog channel.
<i>A1:</i>	The Thiran A1 coefficient for each analog channel.
<i>A2:</i>	The Thiran A2 coefficient for each analog channel.
<i>A3:</i>	The Thiran A3 coefficient for each analog channel.
<i>Always Apply:</i>	Always apply the filter when opening files for the active driver.

**Coefficients:** Calculate coefficients at run or use the entered coefficients.

**Options:** *Calculate Coefficients:* Calculate the Thiran coefficients for each analog channel.  
*Run Thiran Filter:* Run the Thiran filter.  
*Esc/Cancel:* Exit the dialog without executing the command.

**Comments:** To always have the filter automatically applied when a specific driver is used to open a file check the "Always Apply" check box. To show the file's original date and time click on the "Restore Original" button  or select the "Restore Original Data" menu option under the "Data" menu.

**See Also:** Align Channel Data in Chapter 1

---

### ANALOG MARK/UNMARK ALL

**Location:** Data Display

**Description:** Marked all analog channels if there are no analog channels marked else unmark all the marked channels.

**Activation:** *Menu:* Alt-C, N


**Comments:** The channels ID and titles are displayed in light red when marked. Press F8 to mark or unmark all the analog and digital channels.

---

### ANALOG TABLE VIEW

**Location:** Data Display

**Description:** Displays the channel titles, ASV, units, and associated data values.

**Comments:** Use the  button or the shift-right/left arrow keys to scroll the columns in the table. This button is located to the right of the analog table headers.

**See Also:** Viewing Analog Data in Chapter 1.

---

### APPEND LOGS

**Location:** File Manager

**Description:** Combine a number of log files (ABB Load Profile, Comtrade Logs and SDC Logs), of the same types (the columns match), into one comma delimited file with the extension .CSV.

**Activation:** *Menu:* Alt-O, R, A

**Comments:** The files must be of the same type (columns must be equal and data extracted from the same device). The save file can be displayed in a table or plotted in the log data viewer.

**See Also:** Combine Logs

---

### APPEND OPEN FILES

**Location:** Data Display

**Description:** Combine a number of open files of the same types (the analog/digital channel titles must match) in time. All of the currently open waveform files will be appended into a new data display window.

**Activation:** *Menu:* Alt-F, F, D (Append the open files by Discarding the common times)  
*Menu:* Alt-F, F, B (Append the open files Back-to-Back)

**Comments:** The files must be of the same type (the analog/digital channel titles must match). The results in the new data display window can be saved in a Comtrade file for archiving.

**See Also:** Append Waveform Files  
 Append Open Files in Chapter 1

---

### APPEND WAVEFORM FILES

**Location:** File Manager

**Description:** Combine a number of waveform files of the same types (the analog/digital channel titles must match) in time into a data display window.

**Activation:** *Menu:* Alt-O, W, A, D (Append waveform files by Discarding the common times)  
*Menu:* Alt-O, W, A, B (Append waveform files Back-to-Back)

**Comments:** The files must be of the same type (the analog/digital channel titles must match). The results in the data display window can be saved in a Comtrade file for archiving.

**See Also:** Append Open Files  
 Append Waveform Files in Chapter 1

---

### ASCENDING SORT

**Location:** All Tables

**Description:** Sort the table columns in ascending order with respect to the selected sort field.

**Activation:** *Direct:* Column Header   
*Menu:* Alt-S, A

**Comments:** To change the sort field, place the cursor in the desired column and select “Set Sort Field” in the Sort menu. The sort field is displayed in the status bar at the bottom of the window. To sort column data directly press the column header button. The sort field in the status bar is automatically updated. The header buttons toggle between ascending and descending order. The current sort order is displayed in the active sort column header as an up triangle for ascending and as a down triangle for descending.

**See Also:** Descending Sort  
 Sorting Files in Chapter 1

---

### ASCII DRIVER

**Location:** File Manager

**Description:** Display the file at the cursor position in the ASCII text editor.

**Activation:** *Menu:* Alt-D, 1

**See Also:** ASCII Editor

---

### ASCII EDITOR

**Location:** File Manager

**Description:** Edit the ASCII file at the cursor position.

**Activation:** *Direct:* F2  
*Menu:* Alt-O, A

**Comments:** The file content is displayed in text format. Use the up arrow, down arrow, left arrow, right arrow, page up, page down, home, end, Ctrl-home and Ctrl-end keys or the scroll bar to navigate through the data and the Edit menu options to cut, copy, or paste text. A maximum of 10 ASCII Editors can be opened simultaneously.

---

### AS STATUS FIELD

**Location:** Data Display (Status Bar)

**Description:** Displays the current state of the Auto Scaling feature (ON, OFF or ++).

**Comments:** To toggle through the Auto Scaling options (ON, OFF or ++), press F6 or select “Auto Scale” from the Options menu. When auto scaling is turned “ON”, the channel data is scaled to the maximum value allocated for display from the zero reference line. When auto scaling is in the “++” state the signals are plotted using the maximum value allocated for display, ignoring the zero reference line. The highest value is plotted at the maximum position and the smallest value is plotted at the lowest position. This feature was added to clearly show the profile of frequency, Vdc and load channels. In the “OFF” state all channels are scaled to one value.

**See Also:** ASV Column  
Auto Scaling

---

### ATFILE

**Location:** File Manager (Status Field)

**Description:** Displays the file number of the selected file in the table.

---

### AUDIO WAVE DRIVER

**Location:** File Manager

**Description:** Change the driver at the cursor position to the Window’s Audio Wave driver (\*.WAV) and plot the input channels.

**Activation:** *Menu:* Alt-D, W


**Comments:** All files that have a “.WAV” extension are tagged as Microsoft Audio Wave files.

**AUTO DETECT DRIVER**

---

**Location:** File Manager**Description:** Infers the filename at the cursor position and activates the associated driver.**See Also:** Associating File Types in Chapter 1.**AUTO SCALING**

---

**Location:** Data Display**Description:** Turn the state of amplitude auto scaling On, Off or to ++ for all the visible analog channels.**Activation:** *Direct:* F6 - ASV menu button   
*Menu:* Alt-D, A, F-Off, O-On and P-Plus**Comments:** The AS field displayed in the status bar indicates the auto scale's current state, ON, OFF or ++. When auto scaling is turned "ON", the channel data is scaled to the maximum value allocated for display from the zero reference line. When auto scaling is in the "++" state the signals are plotted using the maximum value allocated for display, ignoring the zero reference line. The highest value is plotted at the maximum position and the smallest value is plotted at the lowest position. This feature was added to clearly show the profile of frequency, Vdc and load channels. In the "OFF" state all channels are scaled to one value.**See Also:** Increase Amplitude  
Decrease Amplitude  
Auto Scale Multiplier  
AS Status Field**BACKGROUND COLOR**

---

**Location:** DXF Display (Drawing Constants Dialog)**Description:** Select the background color of the DXF drawing.**Activation:** *Direct:* F2  
*Menu:* Alt-F, D**Default:** Black**CALIBRATION REPORT**

---

**Location:** File Manager**Description:** Generate a calibration report for all marked event files.**Activation:** *Menu:* Alt-O, R, C**Comments:** The calibration report runs a series of equations on the input analog data to determine if a channel needs to be calibrated. An analog channel is displayed in the report if one or more of the following equations are true:

The HP-Dif is greater than 2.5 times the OneBit value.  
 The LP-Dif is greater than 2.5 times the OneBit value.  
 The difference between the HPeak-Up and LPeak-Up is > 2.5 x's the OneBit.  
 The difference between the HPeak-Dn and LPeak-Dn is > 2.5 x's the OneBit.

For this feature to work properly reports should be generated on non-fault data. The DVREPORT.DTB file, saved in the software directory contains the last generated report. To archive the contents of this file use the SaveAs option to save the file under a new name.




**See Also:** Waveform Summary

### CHANGE DRIVE/DIRECTORY

---

**Location:** File Manager

**Description:** Change the file table's active path.

**Activation:** *Direct:* F7, ChDir button , Back button , Up button , Right Mouse Click or Folder Tree  
*Menu:* Alt-F, H, Alt-F, T

**Comments:** There is a number of ways to change the file table's active path. Use the folder tree to navigate the connected drives. To enter a path use the Change Drive/Directory dialog located in the File menu. To select from a list of the last 12 active directories click the right mouse button. To navigate back through the last 12 active directories use the Back menu button and to change to the previous directory use the Up menu button. An error message is displayed if the destination path is not found.


**See Also:** Navigating Files in Chapter 1

### CHANGE FREQUENCY

---

**Location:** Data Display

**Description:** Change the current sampling frequency.

**Activation:** *Direct:* Change Frequency menu button   
*Menu:* Alt-D, F

**Fields:** *Current Sampling Frequency:* The current sampling frequency.  
*Enter the New Sampling Frequency:* The new sampling frequency.  
*Open Frequency:* Sets the driver to open with the new frequency.

**Options:** *Enter/Ok:* Change frequency.  
*Esc/Cancel:* Exit the dialog without executing the command.

**Comments:** The Open Frequency field will set the current display driver to always convert the files to the new frequency before displaying.

**CHANGE QUERY OPERATORS**


---

**Location:** Query Fields**Description:** Change the operator for the active query field.**Activation:** *Direct:* F9  
*Menu:* Alt-Q, O**Comments:** To change the operator press F9 or click the left mouse button on the operator symbol.**See Also:** Equal To (=),  
Greater Than (>),  
Less Than (<)**CHANNEL BACKGROUND COLOR**

---

**Location:** Data Display**Description:** Change the background colors for the data display. The background colors fields are in the “Window Properties” dialog under the “Colors” tab.**Activation:** *Menu:* Alt-F, T, Colors Tab**CHANNEL INFORMATION (ON/OFF)**

---

**Location:** Data Display**Description:** Show or hide the channel information displayed in the frame to the right of the analog and digital traces.**Activation:** *Direct:* Analog table close button   
*Menu:* Alt-V, C**Comments:** The channel information frame can be resized by selecting the vertical separator bar and dragging it to the right or left. The cursor changes to the vertical resize cursor when the mouse is positioned over the separator bar.**CLEAR ANALOG COLORS**

---

**Location:** Data Display**Description:** Set the analog channel colors to the default color, black.**Activation:** *Menu:* Alt-C, C**Comments:** To change the color of an analog channel click the right mouse button on the channel ID or channel title.**CLEAR QUERY AREA**

---

**Location:** Query Fields**Description:** Set all the query fields to blanks and default the query operators to equal (=).

**Activation:** *Direct:* F8  
*Menu:* Alt-Q, C

### COMBINE LOGS

---

**Location:** File Manager

**Description:** Combine a number of log files (ABB Load Profile, Comtrade Logs and SDC Logs), of different types (different columns), into one comma delimited file with the extension .CSV.

**Activation:** *Menu:* Alt-O, R, L

**Comments:** The files can be of different types (columns do not have to be equal). The substation and device names for the data will be added as the first two columns in the file. The result file can be displayed in a table.

**See Also:** Append Logs

### COMBINED VIEW

---

**Location:** Data Display

**Description:** Display all the selected information contained in the analog table in a condensed form.

**Activation:** *Direct:* F4  
*Menu:* Alt-V, A

**Comments:** Use the F4 key to toggle between the tabular view and the combination view. The combination view is only available if there is enough space between the analog channels to display three lines of text. To change the positions of the data values select the "Window Properties" option from the "Option" menu, then click on the "Analog Combination" tab.

**See Also:** Viewing Analog Information in Chapter 1.

### COMMA DELIMITED TABLE DRIVER

---

**Location:** File Manager

**Description:** Display the selected comma delimited file in a table format. Comma delimited files have textual fields separated by commas, such as 0001,7834,872.

**Activation:** *Menu:* Alt-D, T, C

**Comments:** The file data is presented in tabular form. An unlimited number of rows and columns can be displayed.

**See Also:** Viewing ASCII Files in Database Format in Chapter 1.  
Double Quotes/Comma Delimited Table Driver  
Tab Delimited Table Driver

**COMNAME PROPERTIES**

---

**Location:** File Manager**Description:** Setup the fields not available in the supported waveform files for the IEEE long file naming format.**Activation:** *Menu:* Alt-F, O

**Fields:**

<i>Company Name:</i>	Enter the Company name that will be used in the long naming format.
<i>Time Code:</i>	Enter the time code for the device files to rename.
<i>User Field 1:</i>	Enter the 1st User Field.
<i>User Field 2:</i>	Enter the 2nd User Field.

**Options:**

<i>Enter/Ok:</i>	Save the entered data.
<i>Esc/Cancel:</i>	Exit the dialog without saving.

**Comments:** These fields are used for all the files renamed to the IEEE long file naming format. Update this dialog for files with different time code and user fields .**See Also:** ComName(s) Rename in Chapter 1  
ComName Properties in Chapter 1  
ComName(s) Rename**COMNAME(S) RENAME**

---

**Location:** File Manager**Description:** Rename all the marked time sequenced data file to the IEEE long file naming format.**Activation:** *Menu:* Alt-F, A**Comments:** A message box will be prompted before renaming the file to insure the execution of the rename feature. This feature will permanently rename the files. It is advisable to back up the files before renaming. Some proprietary applications may not be able to read the files once they are renamed.**See Also:** ComName(s) Rename in Chapter 1.  
ComName Properties**COMPANY COLUMN**

---

**Location:** File Manager**Description:** Displays the company name associated with the long file name. The sixth field in the file name defines the company field for the IEEE long file-naming format.**See Also:** Long File Naming Format in Chapter 1.**COMPRESS COMTRADE FILES**

---

**Location:** File Manager**Description:** Convert all the marked COMTRADE ASCII files to COMTRADE Binary files.

**Activation:** *Menu:* Alt-O, C

**Comments:** This feature compresses the COMTRADE ASCII file size. It is useful for porting files to floppy or transferring files through a medium.

**See Also:** Compressing COMTRADE Files in Chapter 1.

## COMTRADE DRIVER

---

**Location:** File Manager

**Description:** Change the driver at the cursor position to the COMTRADE driver and plot the input channels.

**Activation:** *Menu:* Alt-D, 5


**Comments:** All files that have a “.DAT” or “D##” file extension, and a corresponding “.CFG” file are tagged as COMTRADE files. If the selected file does not have a corresponding “.CFG” file an error message is generated. Both the COMTRADE ASCII and Binary formats are supported.

## CONDENSE TIME

---

**Location:** Data Display

**Description:** Condense the time scale for all visible channels.

**Activation:** *Direct:* Ctrl-Page Down or the Condense menu button   
*Menu:* Alt-D, C




**See Also:** Expand Time

## COPY/CUT/PASTE FILES

---

**Location:** File Manager

**Description:** Copy or Cut the marked files to the clipboard. Navigate to the destination folder and Paste the files.


**Activation:** *Direct:* Ctrl-X (Cut)  Cut , Ctrl-C (Copy)  Copy , Ctrl-V (Paste)  Paste  
*Menu:* Alt-E, T (Cut), Alt-E, C (Copy), Alt-E, P (Paste)

**Comments:** Marked files are displayed in red. The TotMarks and MrkSize fields displayed in the status bar are updated accordingly. To copy/cut/paste files use the Edit menu options, the shortcut keys or right click in the file table and select the desired option.


**See Also:** Copy File  
Move Files  
Mark/Unmark File

**COPY FILES**

---

**Location:** File Manager**Description:** Copy the marked files to the specified destination path. If the path does not exist, type the directory name in the edit box. The system prompts prior to creating the directory.**Activation:** *Direct:* F8 or the Copy menu button   
*Menu:* Alt-F, C**Fields:**  
*Directory Name:* The destination path where the marked files are to be copied. To specify a new path type the path directly into this edit box.  
*Directories:* Displays a tree of the system's directories, double click to open a node in the tree and click on the desired directory to highlight it.  
*Files:* Displays a list of the files in the highlighted directory.  
*Drives:* A list of all the connected drives. Select the desired drive.**Options:** *Enter/Ok:* Copy the marked files to the destination path.  
*Esc/Cancel:* Exit the dialog without executing the command.**Comments:** Marked files are displayed in red. The TotMarks and MrkSize fields displayed in the status bar are updated accordingly. Files that were unsuccessfully copied are marked and grouped at the top of the table.**See Also:** Move Files  
Mark/Unmark File**COPY TEXT**

---

**Location:** ASCII Editor**Description:** Copy the blocked text to the clipboard.**Activation:** *Direct:* Ctrl-C, Ctrl-Ins - Copy menu button   
*Menu:* Alt-E, C**Comments:** To block text use the shift key plus the up arrow, down arrow, page up and page down keys or the drag the mouse.**See Also:** Cut Text  
Paste Text**CREATE DIRECTORY**

---

**Location:** File Manager**Description:** Create a new directory.**Activation:** *Menu:* Alt-F, E**Fields:** *Directory:* The new directory's name.**Options:** *Enter/Ok:* Create the new directory.  
*Esc/Cancel:* Exit the dialog without executing the command.


**Comments:** If there is no path defined the new directory is placed in the active directory.

### CUT TEXT

---

**Location:** ASCII Editor

**Description:** Copy the blocked text to the Windows clipboard then delete the blocked text.

**Activation:** *Direct:* Ctrl-X, Shift-Del - Cut menu button   
*Menu:* Alt-E, T

**Comments:** Use the shift keys and the up arrow, down arrow, page up and page down keys to block text.

**See Also:** Copy Text  
Paste Text

### CYCLE HOP

---

**Location:** Data Display

**Description:** Move the data bar (vertical black solid line) one cycle forward or backward in time.

**Activation:** *Direct:* Shift-Ctrl-Left arrow and Shift-Ctrl-Right arrow

**Comments:** Use the shift+ctrl left/right keys to move one cycle in time. The number of cycles is displayed in the status bar with the Reference bar (vertical blue dotted line) as the reference position.

**See Also:** Peak Hop  
Data Bar

### D&T

---

**Location:** Data Display (Status Field)

**Description:** Displays the data and time of the sample at the data bar.

**See Also:** Delta X Field

### DATA BAR

---

**Location:** Data Display

**Description:** Displays the channel's instantaneous sample value. The data bar is the solid black line that runs vertically across the analog and digital channels.

**Comments:** The data bar is used to view channel information (such as analog sample values, RMS values, digital information, data and time...). The information is displayed in the channel frame positioned to the right of the traces and in the status bar. The Ctrl-Left/Right keys moves the data peak to peak and the Shift-Ctrl-Left/Right keys moves the data one cycle in time.

**See Also:** RMS bar  
Reference bar  
Horizontal Bars  
Cycle Hop  
Peak Hop

### DECREASE AMPLITUDE

---

**Location:** Data Display

**Description:** Decrease the amplitude of all or marked analog channels.

**Activation:** *Direct:* Ctrl-Down Arrow or the AmpDn menu button   
*Menu:* Alt-D, D

**Comments:** When the channels' amplitude is decreased the Trace Scale Multiplier is divided into the Pixsdisp value. To change the Trace Scale Multiplier, select "Window Properties" from the "File" menu then select the "Display Settings" tab.

**See Also:** Increase Amplitude  
Trace Scale Multiplier

### DELETE FILES

---

**Location:** File Manager

**Description:** Remove all the marked files and empty directories from the active directory.

**Activation:** *Direct:* Delete  
*Menu:* Alt-F, D

**Comments:** Marked files and directories are displayed in red. The TotMarks and MrkSize fields displayed in the status bar are updated accordingly. Files and directories that were unsuccessfully deleted are marked and grouped at the top of the table.

**Restrictions:** A marked directory must be empty in order to remove it from the file table.

**See Also:** Mark/Unmark File

### DELETE TEXT

---

**Location:** ASCII Editor

**Description:** Delete the blocked text from the document.

**Activation:** *Direct:* Del  
*Menu:* Alt-E, D

**Comments:** Use the shift keys and the up arrow, down arrow, page up and page down keys to block text.

**See Also:** Cut Text

### **DELTA X**

---

**Location:** Data Display (Status Field)

**Description:** Displays the time in microseconds, milliseconds, or seconds between the RMS bar and the data bar. The number of cycles is also displayed if the samples in the file are microseconds or milliseconds apart.

**See Also:** D&T Field  
RMS bar

### **DELTA Y**

---

**Location:** Data Display (Status Field)

**Description:** Displays the difference between the data horizontal bar and the reference horizontal bar.

**See Also:** Delta X Field

### **DESCENDING SORT**

---

**Location:** All Tables

**Description:** Sort the file columns in descending order with respect to the selected sort field.

**Activation:** *Menu:* Alt-S, D

**Comments:** To change the sort field, place the cursor in the desired column and select “Set Sort Field” in the Sort menu. The sort field is displayed in the status bar at the bottom of the window. To sort the table columns directly press the column header button. The header buttons toggle between ascending and descending order.

**See Also:** Ascending Sort  
Sorting Files in Chapter 1

### **DEVICE COLUMN**

---

**Location:** File Manager

**Description:** Displays the device name associated with the long file name. The fifth field in the file name defines the device field for the IEEE long file-naming format. It represents the name or code of the device that originated the file.

**See Also:** Long File Naming Format in Chapter 1.

### **DIGITAL MARK/UNMARK ALL**

---

**Location:** Data Display

**Description:** Marked all digital channels if there are no digital channels marked else unmark all the marked digital channels.

**Activation:** *Menu:* Alt-C, I

**Comments:** The channels ID and titles are displayed in light red when marked. Press F8 to mark or unmark all the analog and digital channels.

### DISPLAY DIALOG

---

**Location:** File Manager

**Description:** Reposition the columns in the file table.

**Activation:** *Menu:* Alt-O, D

**Fields:** *File Column List:* A list of all the columns in the file table.

**Options:**

<i>Move Up:</i>	Move the highlighted column before the previous column.
<i>Move Down:</i>	Move the highlighted column after the next column.
<i>Reset:</i>	Default the order of the columns to how they were when the software was first installed.
<i>OK:</i>	Change the order of the columns and redraw the file table.
<i>Cancel:</i>	Exit the dialog without executing the command.

**Comments:** To resize the table columns place the mouse over the column separator and drag the mouse to the left or the right or double click on the column separator to expand to the maximum area for that column.

**See Also:** Customizing the Table Display in Chapter 1  
Resize Columns

### DOUBLE QUOTES/COMMA DELIMITED TABLE DRIVER

---

**Location:** File Manager

**Description:** Display the double quote delimited file in a table format. Double quote-delimited files have textual fields separated by double quotes and commas, such as "CHANNEL", "DATE", "TIME".

**Activation:** *Menu:* Alt-D, T, Q

**Comments:** The file data is presented in tabular form. An unlimited number of rows and columns can be displayed.

**See Also:** Viewing ASCII Files in Database Format in Chapter 1.  
Comma Delimited Table Driver  
Tab Delimited Table Driver

### DRIVER COLUMN

---

**Location:** File Manager

**Description:** Displays the display driver associated with the file.


**See Also:** Associating File Types in Chapter 1.

## DRIVER DATA TYPE

---

**Location:** Data Display

**Description:** Set the active display driver's data type.

**Activation:** *Direct:* Window Properties menu button   
*Menu:* Alt-F, T


**Comments:** The data stored in the displayed file can be instantaneous values or RMS values. The default setting for all drivers is instantaneous values. If the display device saves the sample values as RMS calibrated then select RMS Calibrated Type from the drop down list. If the data type is RMS Calibrated and the data type is not set to RMS calibrated type then the analog column data will be displayed incorrectly.

## DUPLICATE CYCLES

---

**Location:** Data Display

**Description:** Duplicate the cycle between the Data bar and the RMS bar.

**Activation:** *Direct:* Duplicate Cycles menu button   
*Menu:* Alt-D, L

**Fields:** # Cycles: Enter the number of time to duplicate the highlighted cycle(s).

**Options:** *Enter/Ok:* Duplicate the highlighted cycle(s) .  
*Esc/Cancel:* Exit the dialog without executing the command.

**Comments:** This feature is useful for creating test set files or for creating file to play back into simulation or modeling applications.

**See Also:** Duplicating cycles in Chapter 1  
Truncate Cycles

## DXF DRIVER

---

**Location:** File Manager

**Description:** Displays the file(s) drawing information in graphical form.

**Activation:** *Menu:* Alt-D, D, S or M

**Comments:** An error message is displayed if the file is not a valid DXF file. All files that have the ".DXF" extension are tagged as DXF files. A single file can be opened or multiple files can be opened at the same time. For multiple files first mark the files then select Marked files from the DXF submenu option.

## EMAIL FILES

---


**Location:** File Manager & Data Display

**Description:** Email a group of files or a single file using the users default email application. All support files needed to display the selected files will be automatically attached. Support files include the Comtrade configuration (\*.CFG), header (\*.HDR) & information (\*.INF) files.

**Activation:** *Menu:* File Manager: Alt-F, L Data Display: Alt-F, E

**Fields:**

<i>To:</i>	Recipient of the email, initially empty.
<i>From:</i>	Sender, automatically defaulted.
<i>Subject:</i>	Empty.
<i>Attachment:</i>	All selected files and their support files automatically attached.

**Comments:** Files can be email either in the file table or in the data display. To email a set of files, mark the desired files in the file table and select the “Email Marked Files” option from the “File” menu or right click on the file table and select the “Email”  Email option from the pop-up menu. To email a file from the data display window select the “Email Active File” option under the “File” menu. All support files needed to display the file(s) are automatically attached.

**See Also:** Email Files and Email Active File in Chapter 1.

## EQUAL TO (=)

---

**Location:** Query Fields

**Description:** Search the active directory for files that match the entered criteria.

**Comments:** To change the query operator press F9 or click the left mouse button on the operator symbol.


**See Also:** Greater Than (>)  
Less Than (<)

## EXPAND TIME

---

**Location:** Data Display

**Description:** Expand the time scale of all visible analog channels.

**Activation:** *Direct:* Ctrl-Page Up or the Expand menu button   
*Menu:* Alt-D, E

**See Also:** Condense Time

## F-TYPE COLUMN

---

**Location:** File Manager

**Description:** Displays the file type. The “/dr” indicates that the file is a sub-directory. The DAU ID number is displayed for DFR I, II, IIB and 2000 files and the extension of the file is displayed for all other files.

**Comments:** If the active directory is a sub-directory then the first 2 rows of the table are reserved for the “.” and “..” navigation shortcuts. The “.” is a shortcut to the root directory and the “..” is a shortcut to the previous directory.

---

### **FAULT DATE COLUMN**

**Location:** File Manager

**Description:** Displays the fault date of the oscillography files. This column is left blank if the file is not a valid oscillography file or the fault date and time is not available in the file name.

**See Also:** Fault Time Column

---

### **FAULT REFERENCE TIME BAR**

**Location:** Data Display

**Description:** Displays the time difference from the fault time defined in the displayed file. The units are displayed in the Delta X status field.

**Comments:** The fault reference time bar is displayed between the analog channels and the digital channels. To show or hide the fault reference time bar open the “Window Properties” dialog under the “File” menu. Click the “Display Settings” tab and toggle the “Show Reference Time Bar” field.

**See Also:** Fault Reference Time Bar in Chapter 1

---

### **FAULT TIME COLUMN**

**Location:** File Manager

**Description:** Displays the fault time of the oscillography files. This column is left blank if the file is not a valid oscillography file or the fault date and time is not available in the file name.

**See Also:** Fault Date Column

---

### **FILE NAME COLUMN**

**Location:** File Manager

**Description:** Displays the name of the files/directories in the active directory.

**Comments:** If the active directory is a sub-directory then the first 2 rows of the table are reserved for the “.” and “..” navigation shortcuts. The “.” is a shortcut to the root directory and the “..” is a shortcut to the previous directory.

**See Also:** F-Type Column

---

### **FLIP MARKS**

**Location:** All Tables

**Description:** Mark all the unmarked rows and unmark all the marked rows.

**Activation:** *Menu:* Alt-M, F

**Comments:** Marked rows are displayed in red. The TotMarks field displayed in the status bar is updated accordingly.

**See Also:** Unmark Marked Rows  
Mark/Unmark Row

---

## FOLDER TREE

**Location:** File Manager

**Description:** Displays all connected drives and folders in a tree structure.

**Activation:** *Menu:* Alt-F, T – Toggle Show/Hide Tree

**Comments:** To show/hide the folder tree select the “Show/Hide Folder Tree” option under the “File” menu. Folders can be renamed by left mouse clicking on the folder name until the editor is displayed. Also, folders that reside on the computer can be sent to the recycle bin by selecting the “Delete” option under the folder tree’s right click pop-up menu. If the folders reside on external drives then they are permanently deleted.

**See Also:** Navigating in Chapter 1  
Change Drive/Directory

---

## FREE

**Location:** File Manager (Status Field)

**Description:** Displays the amount of free hard disk space on the active drive, displayed in Kbytes.

**See Also:** Size  
MrkSize

---

## Fs

**Location:** Data Display (Status Field)

**Description:** Displays the sampling frequency of the sample at the data bar.

---

## FST

**Location:** Waveform Summary (Events/Sensors Activity Summary)

**Description:** Displays the status of the first digital samples in the file. Fst is the first column in the Events/Sensors Activity Summary. A=Alarm, N=Normal.

**Comments:** This data is also displayed in the second column of the digital information table view.

---

## FST-CHANGE

**Location:** Waveform Summary (Events/Sensors Activity Summary)

**Description:** Displays the date and time the channel first changed state. Fst-Change is the third column in the Events/Sensors Activity Summary.

**Comments:** This data is also displayed in the fourth column of the digital information table view.

### **GROUP MARKED ANALOG CHANNELS**

---

**Location:** Data Display

**Description:** Group all the marked analog channels and move them to the top of the display area.

**Activation:** *Menu:* Alt-C, G

**See Also:** Mark/Unmark Channels

### **GROUP MARKED ROWS**

---

**Location:** All Tables

**Description:** Group all the marked rows and move them to the top of the table.

**Activation:** *Menu:* Alt-M, G

**See Also:** Unmarked Marked Rows  
Toggle Marked Rows  
Mark/Unmark Row


### **HARMONICS TABLE**

---

**Location:** Data Display

**Description:** View the harmonics table.

**Activation:** *Direct:* F11, Right click on phasor diagram or information header  
*Menu:* Alt-V, T

**Comments:** The harmonics table displays the number of harmonics according to the file's sampling frequency with a maximum of 200 harmonics supported. The table displays one channel at a time. It will display the 1<sup>st</sup> marked analog channel, or if no channels are marked then the first visible channel. The harmonic calculation is performed on one cycle of data, starting at the RMS bar to the data bar. The display values include DFT Peak, DFT RMS, DFT Angles, % of fundamental and % of TrueRMS. When the data bar is moved in the data plotting window the harmonics values will be automatically updated. To view the harmonics in a histogram click on the harmonics toggle  button located next to the channel name.

**See Also:** Harmonics in Chapter 1  
Histogram  
Harmonics Vectors

**HARMONIC VECTORS**

---

**Location:** Data Display**Description:** View the harmonics vectors in the phasor diagram.**Activation:** *Menu:* Alt-V, H**Comments:** The harmonics of the first marked analog channel, or if no channels are marked then the first visible analog channel, is displayed in a vector format in the phasor diagram. The harmonic calculation is performed on one cycle of data. It starts at the RMS bar and goes forward one cycle. To hide/show the harmonic vectors toggle the "Vector Harmonics" menu option under the "View" menu from checked=ON to unchecked=OFF.**See Also:** Harmonics in Chapter 1  
Histogram  
Harmonics Table**HELP**

---

**Location:** All Child Windows.**Description:** Displays the help file for the active child window.**Activation:** *Direct:* F1  
*Menu:* Alt-H, T**Comments:** The information contained in the help window is organized in the following fashion:  
Specific Features for the active window,  
Function Keys,  
Menu Options,  
Button Menu Bar,  
Cursor Keys,  
Mouse Actions and  
Status Bar**HEXADECIMAL EDITOR**

---

**Location:** File Manager**Description:** Edit the file at the cursor position in a binary editor.**Activation:** *Direct:* F3  
*Menu:* Alt-O, X**Comments:** The file contents are displayed in a Hex editor. Use the up arrow, down arrow, page up, page down, Ctrl-home and Ctrl-end keys to navigate through the file's data, or use the scroll bar. When a hex value is over written the ASCII equivalent is displayed in the window to the right of the editor. A maximum of 10 viewing windows can be simultaneously. The F4 and F3 function keys allow for searching ASCII data or Hex values. To search for hex values insert the "#" character before the hex value in the "Find Text" field.

## HEXADECIMAL DRIVER

---

**Location:** File Manager

**Description:** Change the driver at the cursor position to the Hexadecimal driver and display the file in binary format.

**Activation:** *Menu:* Alt-D, X

**See Also:** Hexadecimal Editor

## HIDE MARK(S)

---

**Location:** Data Display

**Description:** Hide all the marked analog channels and re-space the unmarked channels.

**Activation:** *Direct:* Delete  
*Menu:* Alt-C, H

**Comments:** To mark/unmark an analog channel, click the channel ID or the channel data.

**See Also:** View Mark(s)  
Show All Hidden  
Restore Mark(s)

## HISTOGRAM

---


**Location:** Data Display

**Description:** View the harmonics histogram.

**Activation:** *Direct:* F11, Right click on phasor diagram or information header  
*Menu:* Alt-V, T

**Comments:** The histogram displays the number of harmonics according to the file's sampling frequency with a maximum of 200 harmonics supported. The histogram displays one channel at a time. It will display the 1<sup>st</sup> marked analog channel, or if no channels are marked then the first visible channel. The harmonic calculation is performed on one cycle of data, starting at the RMS bar to the data bar. The display values can be DFT Peak, DFT RMS, DFT Angles, % of fundamental and % of TrueRMS. The default view is % of fundamental. To change the data displayed click on the drop down menu button



and select from the list. When the data bar is moved in the data plotting window the harmonics values will be automatically updated. To view the harmonics in a table click on the harmonics toggle  button located next to the channel name.

**See Also:** Harmonics in Chapter 1  
Harmonics Table  
Harmonics Vectors

## HORIZONTAL BARS

---

**Location:** Data Display

**Description:** Displays a solid black line that follows the data bar and displays a dotted blue line that follows the reference bar.

**Activation:** *Menu:* Alt-V, B

**Comments:** The bars will be positioned at the first marked analog channel (displayed in red). If no channels are marked then they are positioned at the first displayed channel. The Delta Y field in the status bar shows the difference between the two bars.

**See Also:** RMS bar  
Data Bar  
Reference Bar

---

### HP-DIF

**Location:** Waveform Summary

**Description:** Displays the absolute value of the HPeak-Up minus the absolute value of the HPeak-Dn divided by the OneBit value.

**Comments:** The Hpeak-Up value is the highest positive peak in the channel. The Hpeak-Dn is the highest negative peak in the channel. The OneBit value is the channel's full-scale value divided by the channel's resolution.

**See Also:** Viewing Waveform Summaries in Chapter 1

---

### HPEAK-DN

**Location:** Waveform Summary

**Description:** The highest negative peak value in the channel.

**See Also:** Viewing Waveform Summaries in Chapter 1

---

### HPEAK-UP

**Location:** Waveform Summary

**Description:** The highest positive peak value in the channel.


**See Also:** Viewing Waveform Summaries in Chapter 1

---

### INCREASE AMPLITUDE

**Location:** Data Display

**Description:** Increase the amplitude of all or marked analog channels.

**Activation:** *Direct:* Ctrl-Up arrow or the AmpUp menu button   
*Menu:* Alt-D, I

**Comments:** When the channels' amplitude is increased the Trace Scale multiplier is multiplied into the Pixsdisp value. To change the Trace Scale Multiplier select "Window Properties" from the "File" menu then select the "Display Settings" tab.

**See Also:** Decrease Amplitude  
Auto Scale Multiplier

---

### INSTPEAK COLUMN

**Location:** Data Display (Analog Table)

**Description:** Displays the peak value measured between the two reference crossings surrounding the data bar (black solid line). The value is displayed as Peak type. If the data type for the loaded driver is set to RMS calibrated then the value is multiplied by the square root of 2.

**Comments:** The value is displayed as Peak type. If the data type for the loaded driver is set to RMS calibrated then the value is multiplied by the square root of 2.

**See Also:** Viewing Analog Data in Chapter 1

---

### INSTVAL COLUMN

**Location:** Data Display (Analog Table)

**Description:** Displays the instantaneous sample value at the data bar.

**Comments:** This value is multiplied by the square root of 2 if the driver's data type is set to RMS calibrated.

**See Also:** Viewing Analog Data in Chapter 1  
Data Bar

---

### LESS THAN (<)

**Location:** Query Fields

**Description:** Search the active directory for files that are less than the entered criteria.

**Comments:** To change the operator press F9 or click the left mouse button on the operator symbol.

**See Also:** Equal To (=)  
Greater Than (>)

---

### LP-DIF

**Location:** Waveform Summary

**Description:** Displays the absolute value of the LPeak-Up minus the absolute value of the LPeak-Dn divided by the OneBit value.

**Comments:** The Lpeak-Up value is the lowest positive peak in the channel. The Lpeak-Dn is the lowest negative peak in the channel. The OneBit value is the channel's full-scale value divide by the channel's resolution.

**See Also:** Viewing Waveform Summaries in Chapter 1

---

### LPEAK-DN

**Location:** Waveform Summary

**Description:** The lowest negative peak value in the channel.

**See Also:** Viewing Waveform Summaries in Chapter 1

---

### LPEAK-UP

**Location:** Waveform Summary

**Description:** The lowest positive peak value in the channel.

**See Also:** Viewing Waveform Summaries in Chapter 1

---

### LST

**Location:** Waveform Summary (Events/Sensors Activity Summary)

**Description:** Displays the status of the last digital samples in the file. Lst is the second column in the Events/Sensors Activity Summary. A=Alarm, N=Normal.

**Comments:** This data is also displayed in the third column of the digital information table view.

---

### LST-CHANGE

**Location:** Waveform Summary (Events/Sensors Activity Summary)

**Description:** Displays the date and time the digital channel last changed state. Lst-Change is the fourth column in the Events/Sensors Activity Summary.


**Comments:** This data is also displayed in the fifth column of the digital information table view.

---

### MARK ALL ROWS

**Location:** All Tables

**Description:** Mark all the rows in the table.

**Activation:** *Direct:* Mark menu button (if no files are marked).   
*Menu:* Alt-M, A

**Comments:** Marked rows are displayed in red. The TotMarks field displayed in the status bar is updated accordingly. The Mark menu button toggles between marking and unmarking all rows in the table.

**See Also:** Unmarked Marked Rows  
Flip Marks  
Group Marked Rows

### MARK/UNMARK ALL CHANNELS

---

**Location:** Data Display

**Description:** Unmark all analog & digital channels if the total number of marked channels is less than the total number of displayed channels otherwise mark all the channels.

**Activation:** *Direct:* F8  
*Menu:* Alt-C, M

**Comments:** When an analog channel is marked the ID, title, ASV, and units are displayed in light red. When a digital channel is marked the ID and titles are displayed in light red. To mark or unmark a channel click the channel's corresponding ID number or title, or use the space bar.

### MARK/UNMARK ROW

---

**Location:** All Tables

**Description:** Toggle the row at the cursor position between the marked and unmarked state.

**Activation:** *Direct:* Spacebar, Ctrl-Left Mouse Click  
*Menu:* Alt-M, M

**Comments:** Marked rows are displayed in red. The TotMarks field displayed in the status bar is updated accordingly. The Mark menu button toggles all the rows in the table between the marked and unmarked state.

### MARK CHANGE IN SIGN

---

**Location:** Data Display

**Description:** Mark all positions in the analog channels where the waveform changes in sign.

**Activation:** *Menu:* Alt-A, H

**Comments:** A small gray triangle marks the change in sign position.

**See Also:** Mark Raw Values  
Mark Peak Values

### MARK PEAK VALUES

---

**Location:** Data Display

**Description:** Mark all positive and negative peaks on the analog channels.

**Activation:** *Menu:* Alt-A, H

**Comments:** A small gray square marks the positive and negative peaks.

**See Also:** Mark Change in Sign  
Mark Raw Values

**MARK RAW VALUES**

---

**Location:** Data Display

**Description:** Mark all the raw samples read from the active waveform file.

**Activation:** *Menu:* Alt-A, M

**Comments:** A small clear circle marks the raw samples read from the file.

**See Also:** Mark Change in Sign  
Mark Peak Values

**MAX X PIXELS**

---

**Location:** DXF Display (Drawing Constants Dialog)

**Description:** Displays the total number of X pixels allocation for the current DXF drawing.

**Activation:** *Direct:* F2  
*Menu:* Alt-F, D

**Comments:** This value changes when the Zoom In and Zoom Out features are used and is updated accordingly in the DXF status bar.

**See Also:** Zoom In  
Zoom Out  
Zoom X, Y Resolution Constants

**MAX Y PIXELS**

---

**Location:** DXF Display (Drawing Constants Dialog)

**Description:** Displays the total number of Y pixels allocation for the current DXF drawing.

**Activation:** *Direct:* F2  
*Menu:* Alt-F, D

**Comments:** This value changes when the Zoom In and Zoom Out features are used and is updated accordingly in the status bar.

**See Also:** Zoom In  
Zoom Out  
Zoom X, Y Resolution Constants

**MAXPEAK COLUMN**

---

**Location:** Data Display (Analog Table)

**Description:** Displays the maximum peak value of the channel.

**Comments:** If the active driver's data type is set to RMS calibrated then the files maxpeak value is multiplied by Root 2.

**See Also:** Viewing Analog Data in Chapter 1

### MAXVAL COLUMN

---

**Location:** Data Display (Analog Table)

**Description:** Displays the maximum value of the channel.

**Comments:** This column is displayed if the active driver's data type is set to Non-Sinusoidal-Log Files.

**See Also:** Viewing Analog Data in Chapter 1

### MAXWIN COLUMN

---

**Location:** Data Display (Analog Table)

**Description:** Displays the absolute maximum value between the RMS bar (black dotted line) and the data bar (black solid line).

**Comments:** This column is displayed if the active driver's data type is set to Non-Sinusoidal-Log Files.


**See Also:** Viewing Analog Data in Chapter 1  
Data Bar  
RMS Bar

### MEDIUM DISPLAY

---

**Location:** Data Display

**Description:** Display the analog channel using the maximum pixels allowed with no zero reference point. The medium display is activated through the Auto Scale feature.

**Activation:** *Direct:* F6, - Auto Scale button   
*Menu:* Alt-D, A, P

**Comments:** The Auto Scale toggles between (Off, On and ++). ++ plots the signal using the number of maximum pixels allowed for the channel. The highest value is plotted at the maximum position allowed and the smallest value is plotted at the lowest position allowed. This feature was added to clearly show the profile of frequency, Vdc and load data channels.

**See Also:** Scaling Analog Channels in Chapter 1  
AS Status Field  
Auto Scaling

### MERGE OPEN FILES

---

**Location:** Data Display

**Description:** Merge the visible or marked channels from all the open data display windows into a new data display window. There are three Merge options available. Merge files "By Time" will merge only the common times in the open files. Merge files "Manually" will merge the data according to the positions of the data bars in each open window. Merge files "By Sample" will merge the files by lining up the samples in each open window.

**Activation:** *Menu:* Alt-F, G, B-"By Time", M-"Manually", S-"By Sample"

**Comments:** To distinguish between the merged channels the station name is placed before each channel merged. To deactivate this feature open the “Window Properties” dialog, select the “Append/Merge” tab and click the “Merge Files” option. If the files have different sampling frequencies a dialog will be display to select the frequency for the new window.

**See Also:** Merge Open Files in Chapter 1  
Merge Waveform Files

---

### MERGE WAVEFORM FILES

**Location:** File Manager

**Description:** Merge all the channels from the marked waveform file into a data display window. There are two Merge options available. Merge files “By Time” will merge only the common times in the open files. Merge files “By Sample” will merge the files by lining up the samples in each open window.

**Activation:** *Menu:* Alt-O, W, M, B-“By Time”, S-“By Sample”

**Comments:** To distinguish between the merged channels the station name is placed before each channel merged. To deactivate this feature open the data display “Window Properties” dialog, select the “Append/Merge” tab and click the “Merge Files” option. If the files have different sampling frequencies a dialog will be display to select the frequency for the new window.

**See Also:** Merge Waveform Files in Chapter 1  
Merge Open Files

---

### MINPEAK COLUMN

**Location:** Data Display (Analog Table)

**Description:** MinPeak is the column that displays the minimum peak value of the channel.

**Comments:** If the active driver’s data type is set to RMS calibrated then the files minpeak value is multiplied by Root 2.

**See Also:** Viewing Analog Data in Chapter 1

---

### MINVAL COLUMN

**Location:** Data Display (Analog Table)

**Description:** Displays the minimum value of the channel.

**Comments:** This column is displayed if the active driver’s data type is set to Non-Sinusoidal-Log Files.


**See Also:** Viewing Analog Data in Chapter 1

---

### MOVE FILES

**Location:** File Manager

**Description:** Copy the marked files to the specified destination path then delete the files from the source directory. If a file is not copied successfully it is marked and grouped at the top of source directory. To create a new destination directory enter the name into the Directories edit box. The system prompts prior to creating the new directory.

**Activation:** *Direct:* F9, - Move menu button   
*Menu:* Alt-F, M

**Fields:** *Directory Name:* The destination path where the marked files are to be moved. To specify a new path, type the path directly into this edit box.  
*Directories:* Displays a tree of the system's directories, double click to open a node in the tree and click on the desired directory to highlight it.  
*Files:* Displays a list of the files in the highlighted directory.  
*Drives:* A list of all the connected drives. Select the desired drive.

**Options:** *Enter/Ok:* Move the marked files to the selected destination path.  
*Esc/Cancel:* Exit the dialog without executing the command.

**Comments:** Marked files are displayed in red. The TotMarks and MrkSize fields displayed in the status bar are updated accordingly.


**See Also:** Copy Files  
Mark/Unmark File

### MOVE RMS BAR TO REFERENCE BAR

---

**Location:** Data Display

**Description:** Move the RMS bar (black dotted line) to the sample at the Reference bar position (blue dotted line).

**Activation:** *Direct:* Ctrl-Z – Set RMS bar menu button   
*Menu:* Alt-V, R

**Comments:** The RMS and Data bars define the RMS sliding window.


**See Also:** Setting the Cursor Bars in Chapter 1  
RMS Bar

### MOVE REFERENCE BAR TO DATA BAR

---

**Location:** Data Display

**Description:** Move the Reference bar (blue dotted line) to the sample at the Data bar position (black solid line).

**Activation:** *Direct:* Ctrl-A – Set Reference Bar menu button   
*Menu:* Alt-V, M

**Comments:** The Delta time field (Delta X) in the status bar at the bottom of the screen displays the time difference between the reference bar and the data bar. If the time difference between the samples is in milliseconds or microseconds then the number of cycles between the two bars is also displayed.

**See Also:** Setting the Cursor Bars in Chapter 1  
Data Bar  
Reference Bar

### **MRKSIZE**

---

**Location:** File Manager (Status Field)

**Description:** Displays the combined size (in Kbytes) for all marked files.

**See Also:** Size  
Free

### **NEW FILE**

---

**Location:** ASCII Editor

**Description:** Open a new empty ASCII edit window with the title defaulted to Untitled.

**See Also:** Open File

### **ONEBIT**

---

**Location:** Waveform Summary

**Description:** Displays the analog channel's full-scale value divide by the channel's resolution.

**Comments:** The OneBit value is used to calculate the HP-Dif and the LP-Dif.

**See Also:** Viewing Waveform Summaries in Chapter 1  
HP-Dif  
LP-Dif

### **OPEN ALL MARKED WAVEFORM FILES**

---

**Location:** File Manager

**Description:** Open all the marked waveform files in the file table and minimize the file table.

**Activation:** *Menu:* Alt-O, W, F

**Comments:** All the marked waveform files are opened, tiled and the file table is minimized. A maximum of 10 data windows can be open at one time.

**See Also:** Open All Marked Files in Chapter 1

### **OPEN FILE**

---

**Location:** ASCII Editor

**Description:** Open the window open file dialog box to select an existing file. The open file will be put in a new ASCII edit window.

**See Also:** New File

### OPTIONAL COLUMNS

---

**Location:** File Manager

**Description:** The IEEE PSRC long file naming convention allows for user defined fields appended at the end of the filename. The table reserves 4 columns for the first 4 user defined fields. The columns are named Optional-1 to Optional-4.

**See Also:** Long File Naming Format in Chapter 1.

### PATH/FILENAME (NO EXT.)

---

**Location:** Save as COMTRADE Dialog (ASCII/Binary)

**Description:** Displays the destination path and filename of the new COMTRADE file.

**Comments:** The oscillography file at the cursor position is saved in COMTRADE format to the specified filename. When specifying a filename do not enter an extension, the “.CFG” and “.DAT” files are automatically created. If a path is not specified the files are saved to the active directory.


**Restrictions:** The filename cannot contain an extension.

### PASTE TEXT

---

**Location:** ASCII Editor

**Description:** Paste the contents of the clipboard into the document at the cursor position. Existing blocked text is overwritten with the contents of the clipboard.

**Activation:** *Direct:* Ctrl-V, Shift-Ins - Paste menu button   
*Menu:* Alt-E, P

**Comments:** Use the shift keys and the up, down, page up and page down keys to block file text.

**See Also:** Copy Text  
Cut Text

### PHASOR/CIRCULAR CHART SCALE MULTIPLIER (ASM)

---

**Location:** Data Display (Window Properties Dialog)

**Description:** Used as a multiplier to increase/decrease the length of a vector in the phasor diagram or to increase/decrease the circular chart data.

**Activation:** *Menu:* Alt-F, T, “Display Settings” Tab

**Range:** Greater Than 1.00

**Default:** 2.00

**Comments:** When a channel's amplitude is increased, the phasor/circular chart scale value is multiplied with the Pixsdisp value, and when the channel's amplitude is decreased the phasor/circular chart scale value is divided by the Pixsdisp value .

### PIXSDISP COLUMN

---

**Location:** Data Display

**Description:** Displays the number of pixels allocated for the channels.

**Comments:** When a channels' amplitude is increased or decreased the trace scale multiplier, set in the "Window Properties" dialog, is multiplied or divided with the PixsDisp values in the analog information table. To increase or decrease the channels' amplitude, select "Increase Amplitude" or "Decrease Amplitude" from the Data menu. If no channels are marked, all channels are scaled accordingly.

**See Also:** Trace Scale Multiplier  
Auto Scaling

### PLAY CHANNELS AUDIO

---

**Location:** Data Display

**Description:** Plays the audio of the first marked analog channel. If no channels are marked then it plays the audio of the first displayed channel.


**Activation:** *Menu:* Alt-D, P

**Fields:**

<i>Analog Channel:</i>	Title of the active analog channel.
<i>Save Audio:</i>	Active saving the analog channel data to the window's .WAV format.
<i>Audio Filename:</i>	The path and name of the saved .WAV file.
<i>Drives:</i>	A list of all the connected drives. Select the desired drive.

**Options:**

<i>Play:</i>	Play the active analog channels data.
<i>Volume:</i>	Decrease/Increase the volume of the output.

**Comments:** Marked channels are displayed in red. The "Active Channel" section displays the active analog channel in the data display window. The "Audio Controls" section allows for playing the active analog channel's data through the computers speakers and for increasing/decreasing the volume of the output. The "Save .WAV File" section allows for saving the analog channel data in the Window's .WAV format. Click the folder button  to select and destination directory and to enter a new ".WAV" file or for selecting an existing ".WAV" file. The selected file path and name will be updated in the "Audio Filename" field.

**See Also:** Play Channels Audio in Chapter 1.

### PRIMARY VALUES

---

**Location:** Data Display (Analog Table)

**Description:** The values displayed in the analog table are either in primary or secondary quantities. If the file defines the type of values saved then the type is displayed in the window header.

Also, if the CT and PT ratios are defined in the configuration file then the values can be changed from primary to secondary and vice versa. To change the values open the properties dialog and click on the “Driver Data Type” tab, select the Primary or Secondary radio button to switch between values.

**See Also:** Changing Analog Values in Chapter 1  
Secondary Values

### **PRINT ALL DATA**

---

**Location:** Data Display

**Description:** Print all the data for the visible analog and digital channels.

**Activation:** *Menu:* Alt-F, P, A

**Comments:** The printer must be registered in the system's WIN.INI file. The printed pages include the page number and the date/time of the first sample in the page. The channel information is printed at the end of the data. Use the print page option to print only the contents of the data window.

**See Also:** Printer Setup

### **PRINT ALL ROWS**

---

**Location:** File Manager

**Description:** Print all the files in active directory.

**Activation:** *Menu:* Alt-F, P, A

**Comments:** The printer must be registered in the system's WIN.INI file. Use the Print Marked Rows option to print only the marked files.

**See Also:** Printer Setup

### **PRINT DXF FILE**

---

**Location:** DXF Display

**Description:** Print all the contents of the DXF file.

**Activation:** *Menu:* Alt-F, P, F

**Comments:** The printer must be registered in the system's WIN.INI file. Use the Print “Page” option to print only the contents displayed in the window.

**See Also:** Printer Setup

### **PRINTER SETUP**

---

**Location:** All child windows.

**Description:** Change the printer type and setup the current printer.

**Activation:** *Menu:* Alt-F, S – File Manager/ASCII/Hex Editor  
*Menu:* Alt-F, S – Data Display  
*Menu:* Alt-F, S – DXF Display

### PRINT FILE

---

**Location:** ASCII/HEX Editor

**Description:** Print all the contents of the open file.

**Activation:** *Menu:* Alt-F, P, F

**Comments:** The printer must be registered in the system's WIN.INI file. In the ASCII editor, use the Print File Page option to print the current page.


**See Also:** Printer Setup

### QUERY ALL FILES

---

**Location:** Query Fields

**Description:** Compare the entered criteria to all the files in the active directory.

**Activation:** *Direct:* F6, <enter> or the Query menu button   
*Menu:* Alt-Q, A

**Comments:** All the files in the active directory are compared to the entered query criteria. A marked file that does not meet the query requirements is unmarked. The files that meet the query requirements are marked and grouped at the top of the table. Marked files are displayed in red.

The <enter> key and the query menu button searches all the files in the table.

**See Also:** Query Marked Files  
 Query Unmarked Files  
 Clear Query Criteria

### QUERY MARKED FILES

---

**Location:** Query Fields

**Description:** Compare the entered criteria to the marked rows in the active table.

**Activation:** *Direct:* F5  
*Menu:* Alt-Q, M

**Comments:** The marked rows that meet the query requirements are marked and grouped at the top of the table. All other marked rows are unmarked. Marked rows are displayed in red.

**See Also:** Query Unmarked Files  
 Query All Files

### QUERY UNMARKED FILES

---

**Location:** Query Fields

**Description:** Compare the entered criteria to the unmarked rows in the active table.

**Activation:** *Direct:* F7  
*Menu:* Alt-Q, U

**Comments:** The unmarked rows that meet the query requirements are marked and grouped below previous marked rows. Marked rows are displayed in red.

**See Also:** Query Marked Files  
Query All Files


### RECORDED CHANNELS

---

**Location:** Data Display

**Description:** Display the following information for the active oscillography file:

Channel #	Analog Channel Titles	Full Scale Values
SAC #	SAC Titles	Full Scale Values
Channel #	Digital Channel Titles	Original State Values
SDC #	SDC Titles	Original State Values

**Activation:** *Direct:* F2 - Channel menu button   
*Menu:* Alt-F, R


**Comments:** Triggered digital channel titles are displayed in red. All valid and invalid channels are displayed.

### REFERENCE BAR

---

**Location:** Data Display

**Description:** Displays the instantaneous sample value at the reference bar position (dotted blue line that runs vertically across the analog and digital channels). This value is displayed in the RefVal column of the analog table view.

**Comments:** The reference bar is used to resize the RMS sliding window and display the instantaneous value at the sample position. To resize the sliding window, click the right mouse button to set the reference bar position and the left mouse button to set the data bar position then select the **Set RMS Bar**  menu button.


The Delta time (Delta X) field, displayed in the status bar shows the time difference between the reference bar and the data bar. If the time difference between the samples is in milliseconds or microseconds then the number of cycles between the two bars is also displayed.

The default position of the reference bar is at the fault time.

**See Also:** Data bar  
RefVal

**REFRESH**

---

**Location:** File Manager**Description:** Update the contents of the active directory from the operating system's allocation table.**Activation:** *Direct:* Refresh menu button   
*Menu:* Alt-F, F**REFVAL COLUMN**

---

**Location:** Data Display (Analog Table)**Description:** Displays the sample value at the Reference bar (blue dotted line).**Comments:** If the active driver's data type is set to RMS calibrated, the sample value at the data bar position is multiplied by the square root of 2.**See Also:** Viewing Analog Data in Chapter 1  
Reference Bar**RENAME FILE/DIRECTORY**

---

**Location:** File Manager**Description:** Rename the file or directory at the cursor position.**Activation:** *Menu:* Alt-F, N**Fields:** *From:* The current name of the file.  
*To:* The new name of the file.**Options:** *Enter/Ok:* Change the name.  
*Esc/Cancel:* Exit the dialog without executing the command.**REOPEN WAVEFORM FILE**

---

**Location:** Data Display**Description:** Reopen a file that was previously viewed.**Activation:** *Menu Bar:* Open File drop down menu button **Comments:** A list of the last 14 open files is displayed in a drop down menu button. Click the on the file to reopen.**See Also:** Reopen Waveform File in Chapter 1**RESIZE FILE COLUMNS**

---

**Location:** File Manager**Description:** Resize the columns in the file table.

**Activation:** *Direct:* Left Mouse Drag


**Comments:** To resize the table columns, place the mouse over the column separator and drag to the right or the left. The cursor changes to the vertical resize cursor when the mouse is positioned over the column separator. Double click the left mouse over the separators to make the column size the maximum area to display all the text in the column. The fault date and time and save date and time columns are fixed and cannot be resized.



---

### RESIZE SLIDING WINDOW

**Location:** Data Display

**Description:** Resize the RMS sliding window.

**Activation:** *Direct:* Resize Sliding Window menu button   
*Menu:* Alt-V, W

**Comments:** To automatically resize the RMS sliding window click on the **Resize Sliding Window** menu button  or open the “Resize Sliding Window” menu option under the “View” menu. To manually resize the RMS sliding window click the right mouse button to set the reference position and the left mouse button to set the ending data position then click the **SetRMS**  menu button. The RMS bar is moved to the reference position. The Delta time (Delta X) field displayed in the status bar at the bottom of the screen shows the time difference (in milliseconds or seconds) and the number of cycles between the reference and data bars. Use the left, right, ctrl+left, and ctrl+right keys or the horizontal scroll bar to move the sliding window.


**See Also:** Setting the Cursor Bars in Chapter 1  
Data Bar  
RMS Bar  
Reference Bar

---

### RESTORE MARK(S)

**Location:** Data Display

**Description:** Restore all the hidden analog channels. The delete key removes the marked analog channels and the insert key restores the channels.

**Activation:** *Direct:* Insert or the ViewAll menu button   
*Menu:* Alt-C, R


**See Also:** View Mark(s)  
Hide Mark(s)  
Show All Hidden

---

### RESTORE ORIGINAL DATA

**Location:** Data Display

**Description:** Restore the displayed file to the original samples stored in the file. This feature will undo all changes made using the change frequency, duplicate cycles and truncate cycles features.

**Activation:** *Direct:* Restore Original Data menu button   
*Menu:* Alt-D, R

**See Also:** Duplicate Cycles  
Truncate Cycles  
Change Frequency

---

## RMS COLUMN

**Location:** Data Display (Analog Table)

**Description:** Displays the RMS value for all samples positioned between the RMS bar (black dotted line) and the data bar (black solid line). If the data is RMS calibrated, each sample value is multiplied by the square root of 2 before it is squared.

**See Also:** Viewing Analog Data in Chapter 1  
RMS Bar  
Data Bar

---

## RMS BAR

**Location:** Data Display

**Description:** The RMS bar is the black dotted line that runs vertically across the analog and digital channels. The RMS bar and data bar define the RMS sliding window.

**Comments:** When the data display is initially opened the sliding window is defaulted to one cycle. The sliding window is used to calculate the RMS value for all samples positioned between the data bar and the RMS bar. This value is displayed in the Analog View.

To resize the sliding window, click the right mouse button to set the reference bar position and the left mouse button to set the data bar position then select the **Set RMS Bar** menu button. This button will move the RMS bar to the reference bar.

**See Also:** Data bar  
RMSVal Column  
TrueRMS Column

---

## RUN

**Location:** File Manager

**Description:** Execute the specified command.

**Activation:** *Direct:* F5  
*Menu:* Alt-F, R

**Fields:** *Open:* The path and filename of the application to run.

**Options:** *Enter/Ok:* Run the specified application.

*Esc/Cancel:* Exit the dialog without executing the command.  
*Browse:* Display the Windows open dialog to browse for a file.

### **SAMPLE BASED DISPLAY**

---

**Location:** Data Display

**Description:** The sample base display plots the channel data with 1 pixel distance between each displayed sample. Sample based displays are useful for showing changes in sampling frequency.

**Comments:** To change the trace display settings open the “Window Properties” dialog under the “File” menu. Click the “Display Settings” tab and change the “Trace Display Type” field to time based or sample based.

**See Also:** Time & Sample Based Displays in Chapter 1

### **SAVE AS**

---

**Location:** ASCII/Hex Editor

**Description:** Save the active file to a new name.

**Activation:** *Menu:* Alt-F, A

**See Also:** Save As Text

### **SAVE AS COMTRADE (ASCII/BINARY)**

---

**Location:** File Manager & Data Display

**Description:** Save the waveform file at the cursor position or the displayed analog/digital channels to COMTRADE ASCII or Binary format.

**Activation:** *Menu:* Alt-O, V, A – Save in COMTRADE ASCII format  
*Menu:* Alt-O, V, B – Save in COMTRADE Binary format

**Fields:** *Path:* The destination path.  
*Filename:* The filename with no extension.

**Options:** *Enter/Ok:* Read the file contents and save it in COMTRADE format.  
*Esc/Cancel:* Exit the dialog without executing the command.

**Comments:** Do not enter a filename extension. The COMTRADE configuration (.CFG) and data (.DAT) files are automatically created. If a path is not defined, the files are saved in the active directory.

Currently there are two Comtrade versions supported: the older 1991 format and the newer 1999 format. The Comtrade format can be selected from the “Window Properties” dialog in the data display window. The default format is the newer 1999 format.

If the sample values in the selected file are RMS calibrated and the outcome Comtrade file must have instantaneous values then set the “Comtrade Settings” fields to automatically convert the RMS data to instantaneous values. To set the “Comtrade

Settings” fields open the “Window Properties” dialog in the data display window. Select the “Comtrade” tab then select “Yes” for the “Convert RMS Calibrated Data to Peak Data” field.

To automatically convert the selected channels to Comtrade using the IEEE long file naming convention check the “Use the ComNames Naming Convention to Name the Comtrade File(s)” field in the “Save As Comtrade” Dialog and leave the File Name field empty. The selected channels are converted to the selected Comtrade format and are named using the IEEE long file naming convention.

**Restrictions:** The selected file must be a supported oscillography file.

**See Also:** Save As Comtrade in Chapter 1

### SAVE AS TEXT

---

**Location:** Hex Editor

**Description:** Save the binary values in the hex editor to an ASCII text file.

**Activation:** *Menu:* Alt-F, T

**See Also:** Save As

### SAVE DATE COLUMN

---

**Location:** File Manager

**Description:** Displays the date the file was last saved on disk.

**Comments:** Click the table’s Save Date header to sort the files in ascending or descending order with respect to the Save Date.

**See Also:** Fault Date/Time Column  
Save Time

### SAVE DISPLAYED VALUES (DEFAULT FORMAT)

---

**Location:** Data Display

**Description:** Save the displayed values in the analog table to a file or to the Windows clipboard.

**Activation:** *Menu:* Alt-F, T “Values File” Tab

**Fields:**

<i>Save To:</i>	Where to save the values: file, clipboard or both
<i>Select Values File:</i>	Select the file for the displayed values.
<i>Save Type:</i>	How to maintain the file: append or rewrite
<i>Save Format:</i>	How to save the data: fixed ASCII or comma delimited
<i>Add Titles:</i>	Add the titles to the file or no titles.

**Options:**

<i>Enter/Ok:</i>	Set the format.
<i>Esc/Cancel:</i>	Exit the dialog without executing the command.

**Comments:** To save the samples values to a file select the “Mark & Save” menu option under the “Values” menu. Select the format for the selected sample. To view the values file, select the “Values File/Open” menu option under the “Values” menu.

**See Also:** Save Displayed Values in Chapter 1

---

### SAVE TIME COLUMN

**Location:** File Manager

**Description:** Displays the time the file was last saved on disk.

**Comments:** Click the table’s Save Time header to sort the files in ascending or descending order with respect to the Save Time.

**See Also:** Fault Date/Time Column

---

### SAVE USER VIEWS

**Location:** Data Display

**Description:** Save the displayed view information in an ASCII text file.

**Activation:** *Menu:* Alt-V, S

**Fields:** *View File Path:* Destination path for the file.  
*View Name:* The name of the view. A file extension is not needed. The “.VIW” extension is automatically assigned.

**Options:** *Enter/Ok:* Save the view.  
*Esc/Cancel:* Exit the dialog without executing the command.

**Comments:** The following information is saved:

- Displayed analog channels,
- Analog channel order,
- Superimposed channels,
- Analog channel colors,
- Digital channels displayed,
- Sampling frequency,
- Time scale,
- Sliding window size (RMS bar to Data bar),
- Phasor window size,
- Table window size,
- Red fault bar,
- Auto scale and
- Phasor or circular chart displayed

**See Also:** Select User Views  
User Views in Chapter 1

---

### SECONDARY VALUES

**Location:** Data Display (Analog Table)

**Description:** The values displayed in the analog table are either in primary or secondary quantities. If the file defines the type of values saved then the type is displayed in the window header. Also, if the CT and PT ratios are defined in the configuration file then the values can be changed from primary to secondary and vice versa. To change the values open the properties dialog and click on the "Driver Data Type" tab, select the Primary or Secondary radio button to switch between values.

**See Also:** Changing Analog Values in Chapter 1  
Primary Values

## SELECT USER VIEWS

---

**Location:** Data Display

**Description:** Select a view file from the list of files located in the displayed view path.

**Activation:** *Menu:* Alt-V, V

**Fields:**

<i>View Files:</i>	A list of all the view files in the displayed view path.
<i>Analog Channels:</i>	All analog channel information defined in the view file.
<i>Digital Channels:</i>	All digital channel information defined in the view file.

**Options:**

<i>Enter/Ok:</i>	Select the highlighted view.
<i>Esc/Cancel:</i>	Exit the dialog without executing the command.

**Comments:** The following information is read from the selected view file and applied to the displayed file:

- Displayed analog channels,
- Analog channel order,
- Superimposed channels,
- Analog channel colors,
- Digital channels displayed,
- Sampling frequency,
- Time scale,
- Sliding window size (RMS bar to Data bar),
- Phasor window size,
- Table window size,
- Red fault bar,
- Auto scale and
- Phasor or circular chart displayed

If the analog channel and digital channel names defined in the view file are not in the displayed file than an error message is displayed.

**See Also:** Save User Views  
User Views in Chapter 1

## SEQUENCE OF EVENTS LIST

---

**Location:** File Manager

**Description:** View a table of sequence of events for a number of waveform files. Mark all the desired files then press F11 or select the "SOE List" menu option from the "Reports" submenu

under the "Options" menu. A table will be displayed listing all the events triggered in the selected files.

**Activation:** *Direct:* F11  
*Menu:* Alt-O, R, S

**Fields:**

<i>Substation:</i>	The substation where the device is installed.
<i>Device:</i>	The device the channel came from.
<i>State:</i>	The state of the channel at that time (A=Abnormal, N=Normal).
<i>Trigger Date:</i>	The trigger date.
<i>Trigger Time:</i>	The trigger time.
<i>Channel:</i>	The channel number of the event in the file.
<i>Channel Title:</i>	The title of the channel.
<i>File:</i>	The file containing the event/sensor channel.

**Comments:** The table is sorted according to the date and time. The Query section at the bottom of the table allows for searching events from specific substations, devices, channels and more... To view the file containing the specific events press enter or double click on the event.

### SEQUENCE OF EVENTS SUMMARY

---

**Location:** File Manager

**Description:** View a table of summarizing the sequence of events for a number of waveform files. Mark all the desired files then select the "SOE Summary" menu option from the "Reports" submenu under the "Options" menu. A table will be displayed listing a summary of the events triggered in the selected files.

**Activation:** *Menu:* Alt-O, R, O

**Fields:**

<i>Substation:</i>	The substation that triggered the event/sensor
<i>Device:</i>	The device the channel originated from.
<i>Fst-State:</i>	The state the channel started at, A=alarm and N=normal.
<i>Lst-State:</i>	The state the channel ended at, A=alarm and N=normal.
<i>First Change Date</i>	The date the channel first changed state.
<i>First Change Time:</i>	The time the channel first changed state.
<i>Last Change Date</i>	The date the channel last changed state.
<i>Last Change Time:</i>	The time the channel last changed state.
<i>Changes:</i>	The number of times the channel changed state.
<i>Chan#:</i>	The channel number in the file.
<i>Channel Title:</i>	The title of the channel.
<i>File:</i>	The file containing the event/sensor channel.


**Comments:** The table is sorted according to the first change date and time. The Query section at the bottom of the table allows for searching events from specific substations, devices, channels and more... To view the file containing the specific events press enter or double click on the event.

### SET DRAWING CONSTANTS

---

**Location:** CAD-DXF Display

**Description:** Set the DXF drawing's constants.

**Activation:** *Direct:* F2 - Const menu button   
*Menu:* Alt-F, D

**Fields:** *File Name:* The file name for the currently select file.  
*Background Color:* The color for the background .  
*Max X Pixel:* The maximum X resolution value.  
*Max Y Pixel:* The maximum Y resolution value.

**Options:** *Enter/Ok:* Exit the dialog, then save and execute the entered information.  
*Esc/Cancel:* Exit the dialog without saving the information.  
*Apply:* Apply and save the entered parameters without closing the dialog.


**Comments:** The Max X Pixel and Max Y Pixel values cannot exceed 32000. The “...” button allows for changing the active file.

### SET OPENING FREQUENCY

---

**Location:** Data Display

**Description:** Set a driver’s open frequency. This feature is available in the “Change Frequency” dialog.

**Activation:** *Direct:* Change Frequency menu button   
*Menu:* Alt-D, F

**Fields:** *Open Frequency:* Specify to always open the files associated with the active driver using the entered frequency.

**Options:** *Enter/Ok:* Exit the dialog, then save and execute the entered information.  
*Esc/Cancel:* Exit the dialog without saving the information.

**Comments:** Setting the Always Open field will open all files associated with the active driver using the entered frequency. This feature is useful for files with low sampling frequency.

**See Also:** Change Frequency

### SET SORT FIELD

---

**Location:** All Tables

**Description:** Set the active sort field to the column at the cursor position.

**Activation:** *Direct:* Left Mouse Click on the Column’s header  
*Menu:* Alt-S, S

**Comments:** The “Ascending” and “Descending” options in the “Sort” menu sorts the table data with respect to the select sort field. To sort the columns directly, click the column header button to toggle between ascending and descending.

**See Also:** Sort All Rows

### SHIFT MARKS DOWN

---

**Location:** Data Display

**Description:** Shift all the marked analog channels down one position.

**Activation:** *Direct:* "-" key  
*Menu:* Alt-C, D

**Comments:** Individual channels can be marked or unmarked by clicking on the channels corresponding display ID or channel information or by pressing the spacebar. Marked analog channels are displayed in red.

**See Also:** Shift Marks Up

### SHIFT MARKS UP

---

**Location:** Data Display

**Description:** Shift all the marked analog channels up one position.

**Activation:** *Direct:* "+" key  
*Menu:* Alt-C, U

**Comments:** Individual channels can be marked or unmarked by clicking the channels corresponding display ID or channel data, or by pressing the spacebar. Marked analog channels are displayed in red.

**See Also:** Shift Marks Down

### SHOW/HIDE CHANNEL TITLES

---

**Location:** File Manager

**Description:** The Show/Hide Channel Titles allows for showing invalid channel titles, remove titles from the invalid title list and adding new titles to the invalid channel title list.

**Activation:** *Menu:* Alt-O, T

**Fields:** *Title List Box:* Lists all invalid channel titles.  
*Add Title:* Add a new title to the list.  
*Remove Title:* Remove a title from the list.

**Options:** *Enter/Ok:* Execute changes.  
*Esc/Cancel:* Exit the dialog without executing the command.

**Comments:** To show a title, uncheck the checkbox next to the title. All new titles are added to the end of the list with the checkbox automatically checked.

**See Also:** Show/Hide Channel Titles in Chapter 1

### SHOW ALL DIGITAL CHANNELS

---

**Location:** Data Display

**Description:** Show all digital channels or just the triggered digital channels. This menu option toggles between the two views.

**Activation:** *Direct:* F9  
*Menu:* Alt-V, D


**Comments:** Placing the mouse on the horizontal separator bar and dragging it up or down can resize the digital channel display area. The cursor changes to the horizontal resize cursor when the mouse is positioned over the bar.

### SHOW ALL HIDDEN

---

**Location:** Data Display

**Description:** Show all hidden analog and digital channels.

**Activation:** *Direct:* ViewAll menu button , the <esc> key or the <backspace> key  
*Menu:* Alt-C, S

**See Also:** View Mark(s)  
Hide Mark(s)  
Restore Mark(s)

### SHOW CHANNEL INFORMATION

---

**Location:** Data Display

**Description:** Show or hide the channel information window. This menu option toggles between the two views.

**Activation:** *Menu:* Alt-V, C

**Comments:** The channel information window can be resized by placing the mouse on the vertical separator bar and dragging it to the right or the left. The cursor changes to the vertical resize cursor when the mouse is positioned over the bar.

### SIZE

---

**Location:** File Manager (Status Field)

**Description:** Displays the total size (in Kbytes) of all files in the active directory.

**See Also:** Free  
MrkSize

### SIZE COLUMN

---

**Location:** File Manager


**Description:** Displays the size (in bytes) of the file.

### SIZE TO ORIGINAL COORDINATES

---

**Location:** DXF Display

**Description:** Size the DXF drawing to the original display coordinates (coordinates of the drawing when the file was first opened).

**Activation:** *Direct:* Original Display menu button   
*Menu:* Alt-V, Z


**Comments:** The Max X and Max Y Pixel values in the Set Drawing Constants Dialog are updated according to the new coordinates.

### SIZE TO WINDOW

---

**Location:** DXF Display

**Description:** Size the DXF drawing to fit in the window.

**Activation:** *Direct:* Fit in Window menu button   
*Menu:* Alt-V, W

**Comments:** The Max X and Max Y Pixel values in the Set Drawing Constants Dialog are updated according to the new coordinates.

### SOFTWARE ANALOG CHANNELS

---

**Location:** Data Display

**Description:** Display the software analog channel dialog.

**Activation:** *Direct:* F5  
*Menu:* Alt-C, A

**Fields:** *Titles:* The titles for the software analog channels.  
*Operators:* Each analog operation followed by an operator terminator “/”.

**Options:** *Enter/Ok:* Exit the dialog then save and execute the operators.  
*Esc/Cancel:* Exit the dialog without saving or executing the operators.  
*F1/Help:* Display the help window.

**Comments:** Software analog channels (SAC's) are extra channels provided by the system. These channels can be used to calculate a missing phase, create +, - and 0 sequence channels, create an envelope of a selected trace, or define an under/over-trigger values to monitor a given channel. The SAC window is split into two sections: the titles and the operators. To navigate between fields use the tab, up arrow and down arrow keys.

**See Also:** Creating Virtual Channels in Chapter 1.

### SOFTWARE DIGITAL CHANNELS

---

**Location:** Data Display

**Description:** Display the software digital channel dialog.

**Activation:** *Menu:* Alt-C, D

**Fields:** *Titles:* The titles for the software digital channels.  
*Operators:* Each digital operation followed by an operator terminator “/”.

**Options:** *Enter/Ok:* Exit the dialog then save and execute the operators.  
*Esc/Cancel:* Exit the dialog without saving or executing the operators.  
*F1/Help:* Display the help window.

**Comments:** Software digital channels (SDC's) are extra channels provided by the system. The SDC window is split into two sections: the SDC titles, and the SDC operators. To navigate between fields use the tab, up arrow and down arrow keys.

**See Also:** Creating Virtual Channels in Chapter 1.

### **SORT ALL ROWS**

---

**Location:** File Manager

**Description:** Sort all the rows in the table in ascending or descending order.

**Activation:** *Direct:* Column headers  
*Menu:* Alt-S, A – Ascending  
*Menu:* Alt-S, D – Descending

**Comments:** All the rows in the directory are sorted with respect to the sort field displayed in the table's status field.

**See Also:** Set Sort Field

### **SORT MARKED ROWS**

---

**Location:** File Manager

**Activation:** *Menu:* Alt-S, M

**Description:** Sort the marked files according to the previously selected sort order.

**Comments:** All marked files are sorted and grouped at the top of the table.

### **SUBSTATION COLUMN**

---

**Location:** File Manager

**Description:** Displays the substation name associated with the long file name. The fourth field in the file name defines the substation field for the IEEE long file-naming format.

**See Also:** Long File Naming Format in Chapter 1.

### **SUPER IMPOSE**

---

**Location:** Data Display

**Description:** Superimpose all or marked analog channels.

**Activation:** *Direct:* F7  
*Menu:* Alt-D, S

**Comments:** Marked channels are superimposed and grouped at the top of the display window. The superimpose menu option and the F7 function key toggles superimposing on and off.

### SYNC DATA CURSORS

---

**Location:** Data Display

**Description:** Synchronize the data cursors for two or more open display windows by time or manually.

**Activation:** *Menu:* Alt-D, Y, T – “By Time”  
*Menu:* Alt-D, Y, M – “Manually”

**Options:** *By Time:* When the "By Time" sync cursor feature is turned ON the data cursors in the non-active windows are moved to the sample value time in the active window. For example if the active data cursor is positioned on sample time 01:12:34.560, all non active data cursors are moved to the sample value at that time. If the time is not found in the non-active window, the cursor position is unchanged. The active window defines the master data cursor and all other cursors follow this position.

*Manually:* This feature allows for selection of different cursor positions in the open data windows before synchronization is turned ON. For example, open two data windows and tile horizontally, move the data cursors to the beginning of the fault cycles, and select the sync manual cursor option. When the left, right, ctrl-left, ctrl-right, page up, page down, ctrl-page up, ctrl-page down, home and end keys are pressed the data cursors move simultaneously.

**Comments:** A check mark indicates that the sync feature is ON. To turn synchronizing OFF click on the active sync menu option to remove the check mark. When synchronizing is ON the channel information displayed to the right of the traces is updated for all open data windows.

**See Also:** Synchronizing Data Cursors in Chapter 1.

### TAB DELIMITED TABLE DRIVER

---

**Location:** File Manager

**Description:** Display the tab delimited file at the cursor position in a table format. Tab delimited files have textual fields separated by blank spaces, such as: CHANNEL DATE TIME.

**Activation:** *Menu:* Alt-D, 3, T

**Comments:** The data in the file is presented in tabular form. An unlimited number of rows and columns can be displayed.

**See Also:** Viewing ASCII Files in Database Format in Chapter 1.  
Double Quotes/Comma Delimited Table Driver  
Comma Delimited Table Driver

**TCODE COLUMN**

---

**Location:** File Manager

**Description:** Displays the TCode associated with the long file name. The third field in the file name defines the TCode field for the IEEE long file-naming format. This field represents the time code of the substation with respect to Greenwich Time.

**See Also:** Long File Naming Format in Chapter 1.

**TIME BASED DISPLAY**

---

**Location:** Data Display

**Description:** The time base display plots the channel data in time. Time base displays are useful for showing changes in line frequency.

**Comments:** To change the trace display properties open the “Window Properties” dialog under the “File” menu. Click the “Display Settings” tab and change the “Trace Display Type” field to time based or sample based.

**See Also:** Time & Sample Based Displays in Chapter 1

**TIS DRIVER**

---

**Location:** File Manager

**Description:** Change the driver at the cursor position to the TIS driver and plot the input channels.

**Activation:** *Menu:* Alt-D, S

**Comments:** The TIS file format is an ASCII comma delimited format with the channel information defined in the first line of the file. If the selected is not an ASCII comma delimited file then an error message is generated. All files that have a “.TIS” extension are tagged as TIS files.

**See Also:** Associating File Types in Chapter 1.

**TOTAL HARMONICS DISTORTION**

---

**Location:** Data Display (Harmonics Dialog)

**Description:** The "Total Harmonic Distortion" field displays the square root of the summation of the squares of DFT Magnitudes for harmonics 2 to n divided by square root of 2 and that quantity divided by the DFT Magnitude of the Fundamental.

**See Also:** Harmonics Histogram

**TOTFILES**

---

**Location:** File Manager (Status Field)

**Description:** Displays the total number of hidden and unhidden files/directories in the active directory. The "." and ".." navigation shortcuts are included in the unhidden total.

**See Also:** TotMarks

---

### TOTMARKS

**Location:** All Tables (Status Field)

**Description:** Displays the total number of marked rows in the active table. Marked rows are displayed in light red.

---

### TRACE SCALE MULTIPLIER (ASM)

**Location:** Data Display (Window Properties Dialog)

**Description:** Used as a multiplier to increase/decrease the amplitude of the visible analog channels

**Activation:** *Menu:* Alt-F, T

**Range:** Greater Than 1.00

**Default:** 2.00

**Comments:** When a channel's amplitude is increased, the trace scale value is multiplied with the Pixsdisp value, and when the channel's amplitude is decreased the trace scale value is divided by the Pixsdisp value .

---

### TRIGGER-TIME

**Location:** Waveform Summary (Events/Sensors Activity Log)

**Description:** Displays the time the digital channel changed state. This value is displayed in the third column of the Events/Sensors Activity Log.

**Comments:** The Events/Sensors Activity Log displays a time-sequenced list of all the events and sensors activity.

---

### TRUE RMS

**Location:** Harmonics Table (Data Display)

**Description:** Displays the RMS value for all the samples between the RMS bar (black dotted line) and the data bar (black solid line).

**Comments:** This value is taken directly from the RMS column inside the analog information table.

**See Also:** Harmonics Table

---

### TRUNCATE CYCLES

**Location:** Data Display

**Description:** Remove beginning, middle or end cycles from the active data display window.

**Activation:** *Menu:* Alt-D, T, L: Left-Start to Data Bar  
*Menu:* Alt-D, T, R: Data Bar to End  
*Menu:* Alt-D, T, M: Data Bar to Reference Bar

**Comments:** There are 3 options available under the Truncate Cycle's menu option. Left removes the cycles from the first sample to the data bar (solid black vertical line). Right removes the cycles from the data bar to the last sample. Middle removes the cycles from the data bar to the reference bar (dotted blue vertical line)

**See Also:** Truncate Cycles in Chapter 1

## TYPE COLUMN

---

**Location:** File Manager

**Description:** Displays the fault type associated with the long file name. The eighth field in the file name defines the type field for the IEEE long file-naming format. This field represents the fault type or contents type of the file.

**See Also:** Long File Naming Format in Chapter 1.

## UN/MARK FILE

---

**Location:** All Tables

**Description:** Mark or unmark the row at the cursor position.

**Activation:** *Direct:* Spacebar - Ctrl-Left Mouse Button  
*Menu:* Alt-M, M

**Comments:** Marked rows are displayed in red. The TotMarks field displayed in the status bar is updated accordingly.


**See Also:** Unmarked Marks  
 Group Marked Rows

## UNMARK MARKS

---

**Location:** All Tables

**Description:** Unmark all the marked rows in the table.

**Activation:** *Direct:* Mark menu button (if marked files>0) .  
*Menu:* Alt-M, U

**Comments:** Marked rows are displayed in red. The TotMarks field, displayed in the status bar, is updated accordingly.

**See Also:** Mark/Unmark File  
 Group Marked Files

## VIEW MARK(S)

---

**Location:** Data Display

**Description:** Hide all the unmarked channels and resize the marked channels.

**Activation:** *Direct:* Enter  
*Menu:* Alt-C, V

**Comments:** Individual channels are marked and unmarked by clicking the left mouse button on the channel's corresponding display ID or channel information or by pressing the spacebar. Marked channels are displayed in red.

**See Also:** Hide Mark(s)  
Show All Hidden  
Restore Mark(s)

## VIEW RAW DATA FILE

---

**Location:** Data Display

**Description:** View the contents of the active displayed file in an ASCII editor or a hexadecimal editor.

**Activation:** *Direct:* Menu button   
*Menu:* Alt-F, V

**Comments:** The waveform file is displayed in an ASCII editor if the contents of the file are in text format and displayed in a hex editor if the file is in binary format.


**See Also:** Viewing/Modifying ASCII Files  
Viewing/Modifying Binary Files

## WAVEFORM DATA

---

**Location:** File Manager

**Description:** Plot the contents of the event file at the cursor position or if there are marked waveform files, plot all marked.

**Activation:** *Direct:* <enter>, Plot menu button   
*Menu:* Alt-O, W, O



**Comments:** A maximum of 10 oscillography/log files can be opened simultaneously.

## WAVEFORM SUMMARY

---

**Location:** File Manager & Data Display

**Description:** Generates and displays analog and digital summaries for the active file in the file table or the data display.

**Activation:** *Direct:* Sum menu buttons  - File Table,  - Data Display  
*Menu:* Alt-O, S – File Table, Alt-F, S – Data Display

**Comments:** The summary file displays the following information:

#### Waveform Information

Station: Name of the Station associated with the waveform.  
 Filename: The name of the waveform file.  
 File Size: The size of the file in kilobytes.  
 Prefault-Time: The date and time of the first prefault sample.  
 Fault-Time: The date and time of the first fault sample.  
 Save-Time: The date and time the file was saved to hard disk.  
 Process-Time: The date and time the file was processed into this summary.  
 Start Date & Time: Date and time of the first sample in the file.  
 End Date & Time: Date and time of the last sample in the file.  
 File Duration: Duration of the file measured in days, hours, seconds, milliseconds and/or microseconds, depending on the type of file.  
 Sampling Frequency: Sampling frequency and the time between each sample.  
 Line Frequency: Line Frequency defined in the file.

#### Fault Information

Fault Information is displayed if there is fault information contained in the \*.HDR file. The fault information must begin with "Events:".

#### Highest/Lowest Analog Peak Chart

HPeak-Up: The highest positive peak.  
 HPeak-Dn: The highest negative peak.  
 LPeak-Up: The lowest positive peak.  
 LPeak-Dn: The lowest negative peak.  
 OneBit: The channel's full-scale value divided by the channel's resolution.  
 pU: The channel's prefix and units.  
 Description: The number and title of the channel.  
 HP-Dif: The (absolute value of the HPeak-Up minus the absolute value of the HPeak-Dn) divided by the OneBit value.  
 LP-Dif: The (absolute value of the LPeak-Up minus the absolute value of the LPeak-Dn) divided by the OneBit value.

#### Events/Sensors Activity Summary

Fst: The state the channel started at, A=alarm, N=normal.  
 Lst: The state the channel ended at, A=alarm, N=normal.  
 Fst-Change: The date and time the channel first changed state.  
 Lst-Change: The date and time the channel last changed state.  
 Changes: The number of times the channel changed state.  
 Description: The number and title of the channel.

#### Events/Sensors Activity Log

State: The state of the channel at the triggered time, A=alarm, N=normal.  
 Trigger Time: The time the channel changed state.  
 Description: The number and title of the channel.


**Note:** An xx:xx:xx.xxx in the events/sensors activity summary indicates that the digital channel's state did not change from the initial state (Fst).

## WINDOW PROPERTIES

---

**Location:** Data Display

**Description:** Reposition the columns in the analog table, change the fields displayed in the combination view, change the background colors and trace colors; change the driver's data type, change the trace/phasor scale multipliers and more. Refer to the fields below.

**Activation:** *Direct:* Menu Button   
*Menu:* Alt-F, T

**Fields:** *Analog Table Tab:* Reorder/Show/Hide the columns in the analog table.  
*Analog Combination Tab:* Change the display positions in the analog combination view.  
*Comtrade:* Define the Comtrade format for saving, the date and time format for display and set automatic conversion from RMS data to Peak data when using the "Save As Comtrade" feature.  
*Colors:* Change the background colors and trace colors.  
*Values File:* Format the save displayed values feature.  
*Display Settings:* Change the trace/phasor scale multipliers and set general display properties.  
*Append/Merge:* Set the append/merge properties.  
*Driver Data Type:* Set the current display driver's data type to Peak type or RMS calibrated.  
*Filters:* Define to delete spikes and set up spike properties

**Options:** *OK:* Apply the selected changes and redraw the data display.  
*Cancel:* Exit the dialog without executing the changes.

**Comments:** All data windows are defaulted to the display settings. The analog data columns depend on the data type specified.


**See Also:** Customizing the data display in Chapter 1  
 Viewing Analog Data in Chapter 1

## ZIP FILES


---

**Location:** File Manager

**Description:** Zip a group of files or a single file using the "Zip Marked Files" option under the "File" menu. All support files needed to display the selected files will be automatically included in the zip file. Support files include Comtrade configuration (\*.CFG), header (\*.HDR) & information (\*.INF) files, DFR's analog and digital information files such as: Hathaway DAU files, Rochester preamble and header files, Faxtrax/Director CTL files, Transcan SCF and TCF files.

**Activation:** *Direct:* Right Click Pop-up menu Button  Zip  
*Menu:* Alt-F, Z

**Fields:** *New Zip File Name:* Enter a path and name for the new zip file.  
*EncryptHeaders:* Click to encryptheaders.

**Comments:** To zip files, mark the desired files in the file table and select the "Zip Marked Files" option from the "File" menu or right click on the file table and select the "Zip"  ZIP option from the pop-up menu. All support files needed to display the file(s) are automatically included.



**See Also:** Zip Files in Chapter 1.

## ZOOMING

---

**Location:** DXF Display

**Description:** Change the DXF display viewing area.

**Activation:** *Direct:* “+” & “-“ keys, Menu buttons  &   
*Menu:* Alt-V, I, O


**Comments:** To zoom in press the “+” key, to zoom out press the “-“ key or use the Zoom In and Out menu buttons to change the viewing area. If the Max X and Max Y variables, inside the status bar, are at 32000 then this feature is not be available

## ZOOM IN

---

**Location:** DXF Display

**Description:** Increase the drawing's resolution by multiplying the Zoom IN/OUT Ratio constant with the current X, Y resolution.

**Activation:** *Direct:* “+” key, Menu buttons   
*Menu:* Alt-V, I

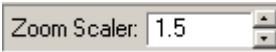
**Comments:** The Max X and Max Y variables inside the status bar are updated accordingly. The zoom in/out ration constant can be directly changed via the Zoom Scalar menu button.

**Restrictions:** The Max X and Max Y resolution values cannot exceed 32000.

## ZOOM SCALAR

---

**Location:** DXF Display

**Activation:** *Menu:* Menu button 

**Description:** The Zoom Scalar Ratio constant is used to increase or decrease the drawing's display resolution. The Zoom features multiples/divides the drawing's X and Y resolution values by the Zoom Scalar to increase/decrease the resolution.

**Range:** Greater than 1.00


**Default:** 2.50

## ZOOM OUT

---

**Location:** DXF Display

**Description:** Decrease the drawing's resolution by dividing the Zoom Scalar constant by the current X, Y resolution.


**Activation:** *Direct:* “-” key, Menu buttons   
*Menu:* Alt-V, O

**Comments:** The Max X and Max Y variables inside the status bar are updated accordingly. The zoom in/out ration constant can be directly changed via the Zoom Scalar menu button.

### **ZOOM X, Y RESOLUTION CONSTANTS**

---

**Location:** DXF Display (Drawing Constants Dialog)

**Activation:** *Direct:* F2 - Const menu button   
*Menu:* Alt-F, D

**Description:** Set the drawings max X and max Y resolution values.  
Max X Pixel: The maximum X resolution value.  
Max Y Pixel: The maximum Y resolution value.

**Range:** Less than 32000

## A P P E N D I X A

# Save Displayed Values: Format Files

---

The format files listed in the “Mark & Save” menu option in the data display window allows for customizing ASCII sample files for playback into simulation and modeling applications. The format files are tag based. The available tags are listed in the “Save Displayed Values” section in chapter 1. All format files must have a “.FMT” extension and must be saved to the active Wavewin directory to show up in the “Mark & Save” menu option. Below are some examples of format files and their results when used.

## Script Commands & Results

**Example 1:**

```
% Branch Identification

Save as '<station>' as Substation
Save as '387' as branch_identifier

% Prefault Quantities

save rect( <1> ) as I_kVa
save rect( <2> ) as I_kVb
save rect( <3> ) as I_kVc
save rect( <4> ) as I_la
save rect( <5> ) as I_lb
save rect( <6> ) as I_lc
```

The channel position <1> tag places all the displayed column data for the first visible channel in that position, separated by commas. The <2> tag places the column data for the second visible channel and so on...

**Result 1:**

```
% Branch Identification

Save as ' Arkey ' as Substation
Save as '387' as branch_identifier

% Prefault Quantities

save rect( 65.859,0.000 ) as P_kVa
save rect( 65.487,239.404 ) as P_kVb
save rect( 65.779,119.194 ) as P_kVc
save rect( 1.163,182.891 ) as P_la
save rect( 0.984,56.515 ) as P_lb
save rect( 0.922,308.324 ) as P_lc
```

**Example 2 (CVS format):**

```
<Date>, <Time>, <1>, <2>, <3>, <4>, <5>, <6>
```

**Result 2:**

```
01/05/2002 , 16:00:58.297001
,65.859,0.000,65.487,239.404,65.779,119.194,1.163,182.891,0.984,56.515,0.922,308.324
```

```
01/05/2002 , 16:00:58.363168
,66.163,0.000,58.410,230.927,43.068,90.845,0.841,172.201,1.823,43.631,6.714,36.394
01/05/2002 , 16:00:58.467320
,49.464,0.000,55.965,196.688,7.190,313.356,0.013,239.559,0.065,315.538,0.028,77.032
```

**Example 3 (Fault Report):**

Fault Report

Station = <station>  
Date = <Date> <Time>

Karry 230kV

-----

<^4>  
<^35>  
<^5>  
<^6>

Box Cr 230kV

-----

<^7>  
<^36>  
<^8>  
<^9>

Dgl 1 230kV

-----

<^10>  
<^33>  
<^11>  
<^12>

Dgl 2 230kV

-----

<^13>  
<^34>  
<^14>  
<^15>

The channel position <^4> tag places all the displayed column data for the fourth channel in the window, separated by commas. The <^35> tag places the column data for the thirty fifth channel and so on...

**Result 3:**

Fault Report

Station = South Power Company  
Date = 07/23/1999 16:41:29.510832

Karry 230kV

-----

Karry 230kV Ph 1 Cur, 1.012, 71.969  
Karry 230kV Ph 2 Cur, 1.010, 12.023  
Karry 230kV Ph 3 Cur, 1.007, 312.760  
Karry 230kV Res Cur, 0.025, 53.267

Box Cr 230kV

-----

Box Cr 230kV Ph 1 Cur, 0.232, 83.134  
Box Cr 230kV Ph 2 Cur, 0.218, 22.161  
Box Cr 230kV Ph 3 Cur, 0.217, 320.950  
Box Cr 230kV Res Cur, 0.018, 110.258

Dgl 1 230kV

-----

Dgl 1 230kV Ph 1 Cur, 0.434, 256.083  
Dgl 1 230kV Ph 2 Cur, 0.443, 196.842  
Dgl 1 230kV Ph 3 Cur, 0.424, 137.258  
Dgl 1 230kV Res Cur, 0.017, 324.199

Dgl 2 230kV

-----

Dgl 2 230kV Ph 1 Cur, 0.418, 257.373  
Dgl 2 230kV Ph 2 Cur, 0.408, 197.122  
Dgl 2 230kV Ph 3 Cur, 0.411, 137.104  
Dgl 2 230kV Res Cur, 0.017, 244.132



## A P P E N D I X B

## System Errors

---

This section lists the system errors that may occur during the operation of the software. For your convenience, they are arranged alphabetical.

### ASCII Driver

The following errors are displayed if the system encounters an error while reading the contents of a file:

- 1 Read Error: File Not Found - This error occurs if the system cannot access the file attributes, or the file does not exist on disk. From the file table, click the **Dir** menu button to see if the file still exists on disk.
- 2 Not Enough Memory to Read File, File Truncated - This error occurs if there is not enough memory to read the contents of the selected file. Close other applications to free up memory.
- 3 Read Error: File is Empty - This error occurs when the selected file is empty.

### Change Drive/Directory

The following error message is displayed if the system encounters a problem while changing to a specified drive/directory:

- 1 Destination Path Not Valid - This error occurs when the path entered inside the Change Drive/Directory dialog is not a valid path. Press F7 or click the **ChDir** menu button to re-enter a valid path.

### COMTRADE Driver

The following errors messages are displayed if the system encounters a problem while reading the contents of a COMTRADE File:

- 1 Unable to Open the COMTRADE CFG file - This error occurs when the CFG file is not found in the active directory, or there was a problem opening the file. The DAT and CFG files must reside in the same directory. From the file table, click the **Dir** menu button to see if the CFG file still exists on disk.
- 2 Not Enough Memory Available to Read the COMTRADE CFG file - This error occurs if there is not enough memory to read the contents of the CFG file. Close other applications to free up memory.
- 3 Not Enough Memory Available for the Device Information - This error occurs if there is not enough memory for the analog and digital channel information. Close other applications to free up memory.
- 4 Not Enough Memory Available to Read Device File - This error occurs if there is not enough memory to store the first data samples in the DAT file. Close other applications to free up memory.
- 5 Unable to Open the Selected Device File - This error occurs if the COMTRADE DAT file was not found in the active directory, or there was a problem opening the file. The COMTRADE DAT and CFG files must reside in the same directory. From the file table, click the **Dir** menu button to see if the DAT file still exists on disk.
- 6 Not Enough Memory Available to Read the File, File Truncated - This error occurs if there is not enough memory available to store all the samples in the DAT file. Close other applications to free up memory.

- 7 Not Enough Memory Available to Display Selected File - This error occurs if there is not enough memory to store the drawing variables. Close other applications to free up memory.
- 8 Too Many Acquisition Frequencies, File Truncated - This error occurs if the number of acquisition frequencies stored in the file exceeds 80.
- 9 Invalid Acquisition Frequency - This error occurs if the system encounters an invalid acquisition frequency in the CFG file.

## Copy/Move Files

The following error messages are displayed if the system encounters a problem while copying or moving a file:

- 1 Getting the File Attribute's - This error occurs if the system cannot access the file's attributes from the allocation table.
- 2 Opening the Source File - This error occurs if the source file does not exist on disk.
- 3 Creating the Destination File - This error occurs if the destination directory is full or the file attribute is set to read only.
- 4 Reading from the Source File - This error occurs if there was a problem accessing the source file on disk, the disk sector, or the data maybe corrupt.
- 5 Writing to the Destination File - This error occurs if there was a problem accessing the destination file, the disk sector, or the data maybe corrupt.
- 6 Setting the Date & Time for the Destination File - When a file is copied the date and time of the destination file is changed to the data and time of the source file. This error occurs if the software could not access the destination file.
- 7 Cannot Find the Destination File - After a file is copied the software checks the destination path to see if the file was copied successfully. This error occurs if the file was not found in the destination directory.
- 8 Destination and Source do not Match - After a file is copied, the software compares the size of the source file to the size of the destination file. This error occurs if the file sizes do not match.
- 9 Insufficient Disk Space - This error occurs if there is not enough disk space on the destination drive to store the file.

When an error occurs, the system prompts the user to continue or abort the copy process. Press "Y" to continue or "N" to cancel the command.

## DXF Driver

The following errors messages are displayed if the system encounters a problem while reading the contents of a DXF file:

- 1 Not Enough Memory for DXF Variables - This error occurs if there is not enough memory to store the DXF variables. Close other applications to free up memory.
- 2 Could Not Open the Selected DXF File - This error occurs if the selected DXF file was not found, or there was a problem opening the file. From the file table, click the **Dir** menu button to see if the file still exists on disk.
- 3 Not Enough Memory for DXF Entities - This error occurs if there is not enough memory to store the first drawing items. Close other applications to free up memory.
- 4 Not Enough Memory to Read File, File Truncated - This error occurs if there is not enough memory to store all the drawing items. Close other applications to free up memory.
- 5 No Scale Factors Defined in the DXF File, Process Aborted - This error occurs if the DXF scale factors are not found in the file. The scale factors are needed to correctly display the DXF drawing.

## Hexadecimal Driver

The following errors messages are displayed if the system encounters a problem while reading the contents of a Binary file:

- 1 Read Error: File Not Found - This error occurs if the system cannot access the file attributes in the file allocation table, or the file does not exist on disk. From the file table, click the **Dir** menu button to see if the file still exists on disk.
- 2 Not Enough Memory to Read File, File Truncated - This error occurs if the system runs out of memory while reading the contents of the selected file. Close other applications to free up memory.
- 3 Read Error: File is Empty - This error occurs if the selected file is empty.

## Software Analog Channels

The following errors messages are displayed if the SAC instruction formats are not adhered to. The error message includes the corresponding channel number that caused the error. Two types of errors can occur:

- 1 Type Mismatch - This error occurs if the channel units do not match.
- 2 Operation Error - This error occurs if the instruction format is incorrect. For example the instruction terminator "/" is missing or the operator is invalid.

## Software Digital Channels

The following errors messages are displayed if the SDC instruction formats are not adhered to. The error message includes the corresponding channel number that caused the error.

- 1 Operation Error - This error occurs if the instruction format is incorrect. For example the instruction terminator "/" is missing or the operator is invalid.



## A P P E N D I X C






# System Keys










This section lists the function keys, cursor keys, and menu buttons available in the file table, query fields, data display, port table, and DXF display.

## File Table

Function Keys	Description
F1	Display the file table's help file.
F2	Display the file, at the cursor position in text format: ASCII Editor.
F3	Display the file, at the cursor position in hexadecimal format: Hex Editor.
F4	Display the list of station titles found in the active database directory.
F5	Display the command line dialog to run an application.
F7	Change the active path to the specified destination path.
F8	Copy the marked files to the destination path.
F9	Move the marked files to the destination path.
F11	Display a table of sequence of events for all the marked waveform files.
F12	Refresh the current directory

Cursor Keys	Description
Left Arrow	Move the cursor bar to the left one position.
Right Arrow	Move the cursor bar to the right one position.
Up Arrow	Move the cursor bar up one position.
Down Arrow	Move the cursor bar down one position.
Page Up	Display the files on the previous page.
Page Down	Display the files on the next page.
Home	Move the cursor to the first column in the file table.
End	Move the cursor to the last column in the file table.
Ctrl+Home	Move the cursor to the first file in the file table.
Ctrl+End	Move the cursor to the last file in the file table.
Tab	Move the cursor from the file table to the query fields.
Delete	Delete all the marked files and empty directories.
Enter	Run the driver at the cursor position.
Backspace	Change the active path to the previous directory.
Character keys	Move to the next row in the active column that starts with the entered character.


Menu Buttons	Description
 Folder Tree	Show / Hide the Folder Tree
 Email	Email all marked files and their support files.
 Refresh	Refresh the current directory from disk.
 ChDir	Change the active path to the specified destination path.
 Previous Dir	Change to the previous directory.

 Last Dir	Change to the last navigated directory.
 Copy	Copy the marked files to the destination path.
 Move	Move the marked files to the destination path.
 Mark	Mark/Unmark all visible files.
 Query	Query all files in the active directory.
 Plot	Plot the data contents for the highlighted file.
 Summary	Display the waveform summary for the file at the cursor position.
 Edit	Edit the contents of the file at the cursor position: ASCII Editor
 Load Analysis	Perform load analysis on the marked files.

## Query Fields

Function Keys	Description
F1	Display the query help file.
F5	Query all the marked files in the active directory.
F6	Query all the files/directories in the active directory.
F7	Query all the unmarked files in the active directory.
F8	Clear the query criteria and set all the query operators to “=”.
F9	Toggle through the available query operators for the active query field.

Cursor Keys	Description
Up Arrow	Return the cursor to the file table.
Right Arrow	Move the cursor one position to the right.
Left Arrow	Move the cursor one position to the left.
Ctrl+Left Arrow	Move the editor to the next query field.
Ctrl+Right Arrow	Move the editor to the previous query field.
Tab	Activate the Folder Tree.
Enter	Process the query criteria for all or marked files. If a rename operator is used the marked files fault date and time is changed accordingly.

Menu Button	Description
 Query	Query all files in the active directory.




















## Data Display

Function Keys	Description
F1	Display the data help file.
F2	Display the analog and digital channel information.
F3	Generate a max/min peak chart and an EN/SR summary log.
F4	Toggle between the available analog views.
F5	Display the software analog channel dialog.
F6	Turn channel amplitude auto scaling ON or OFF.
F7	Turn super imposing ON/OFF for all or marked channels.

F8	Mark or unmark all the visible analog/digital channels.
F9	Toggle between the available digital views (All or Triggered).
F11	Display the harmonics table

<b>Cursor Keys</b>	<b>Description</b>
Left Arrow	Move the data bar to the left one sample.
Right Arrow	Move the data bar to the right on sample.
Ctrl+Right Arrow	Move the data bar to the next peak for the first display channel or the first marked channel.
Ctrl+Left Arrow	Move the data bar to the previous peak for the first display channel or the first marked channel.
Shift+Ctrl+Right Arrow	Move the data bar ahead one cycle for the first displayed channel or the first marked channel.
Shift+Ctrl+Left Arrow	Move the data bar back one cycle for the first displayed channel or the first marked channel.
Shift+Left Arrow	Shift the analog information table to the left by one column.
Shift+Right Arrow	Shift the analog information table to the right by one column.
Page Up	Page up through the channel data.
Page Down	Page down through the channel data.
Home	Move the data bar to the first data sample.
End	Move the data bar to the last data sample.
Ctrl+Up Arrow	Increase the amplitude for all or marked channels.
Ctrl+Down Arrow	Decrease the amplitude for all or marked channels.
Ctrl+Page Up	Expand the time scale for all visible channels.
Ctrl+Page Down	Condense the time scale for all visible channels.
Tab	Toggle between the analog and digital channels.
Up Arrow	Move the cursor up one channel.
Down Arrow	Move the cursor down one channel.
Shift+Page Up	Display the analog/digital channels on the previous page.
Shift+Page Down	Display the analog/digital channels on the next page.
Ctrl+Home	Display the first page of the analog/digital channels.
Ctrl+End	Display the last page of the analog/digital channels.
Spacebar	Mark or Unmark the channel at the cursor position.
Shift+Up Arrow	Mark or Unmark a group of channels while moving the cursor up.
Shift+Down Arrow	Mark or Unmark a group of channels while moving the cursor down.
Insert	Display the hidden channels that were removed by the delete keys.
Delete	Hide the marked channels and respace the unmarked channels.
Enter	Hide the unmarked channels and respace the marked channels.
Esc	Display all the hidden channels or exit the data window.
Backspace	Display all the hidden channels.
+	Shift all the marked channels up one position.
-	Shift all the marked channels down one position.
Ctrl-A	Move the reference bar to the sample at the cursor bar.
Ctrl-Z	Move the RMS bar to the sample at the reference bar.

<b>Menu Buttons</b>	<b>Description</b>
---------------------	--------------------









 Reopen File	Reopen a previous viewed waveform file.
 Email Active File	Email the active file and any support files needed.
 View Raw Data	View the waveform's raw data file in an ASCII or binary editor.
 Summary	View the Analog/Digital Summary of the active displayed file.
 Recorder Chans	Display the waveform's analog/digital channel headers and scale factors.
 Inc	Magnify the amplitude of the marked channels.
 Dec	Attenuate the amplitude of the marked channels.
 ASV	Turn auto scaling ON/OFF for all visible channels.
 In	Condense the time scale of the visible channels.
 Out	Expand the time scale of the visible channels.
 View Marked	Hide the unmarked channels and respace the marked channels.
 View All	Replot all the hidden channels.
 Set Ref Bar	Move the reference bar to the sample at the cursor bar.
 SetRMS Bar	Move the RMS bar to the sample at the reference bar.
 Properties	Display the Window Properties dialog.
 Restore Original	Restores the samples to the original raw samples stored in the file.
 Change Freq.	Change the frequency of the active display file.
 Duplicate Cyc.	Duplicate the cycle and number of times at the data bar.
 Resize Sliding Window	Resize the RMS sliding window.

## DXF Display

Function Keys	Description
F1	Display DXF mode's help window.
F2	Display the Set Constants dialog.

Cursor Keys	Description
Up Arrow	Move the viewing area of the drawing up 40 pixels.
Down Arrow	Move the viewing area of the drawing down 40 pixels.
Right Arrow	Move the viewing area of the drawing to the right 40 pixels.
Left Arrow	Move the viewing area of the drawing to the left 40 pixels.
Ctrl+Right	Move the viewing area of the drawing to the right by one screen.
Ctrl+Left	Move the viewing area of the drawing to the left by one screen.
Page Up	Move the viewing area of the drawing up by one screen.
Page Down	Move the viewing area of the drawing down by one screen.
Home	Display the far left portion of the drawing.
End	Display the far right portion of the drawing.
Ctrl+Home	Display the top portion of the drawing.
Ctrl+End	Display the bottom portion of the drawing.

Tab	Move to the next DXF drawing tab
Shift+Tab	Move to the previous DXF drawing tab
+ key	Increase the drawing's resolution using the zoom scaler constant.
- key	Decrease the drawing's resolution using the zoom scaler constant.

<b>Menu Buttons</b>	<b>Description</b>
 Original	Display the drawing in the original coordinates.
 Fit in Win	Fit the full drawing to fit in the screen area.
 Zoom-In	Increase the drawing's resolution using the zoom scaler constant.
 Zoom-Out	Decrease the drawing's resolution using the zoom scaler constant.
 Print Drawing	Print the drawing displayed in the active tab.
 Const	Set the property Constants for the drawing.
 Open File	Open a DXF file and add it to the window. (Table DXF display)
 Close File	Close the selected DXF file. (Table DXF display)



## A P P E N D I X D

## Abbreviations & Symbols

The abbreviations and symbols used by the system are listed below in alphabetical order.

Symbol	Description
*	Query criteria wild character.
+	Query = Add to operator. SAC = Add analog channels operator. SDC = "OR" digital channels operator.
-	Query = Subtract from operator.
->	Query = Replace with operator.
.	SDC = "AND" digital channels operator.
/	SAC/SDC instruction termination indicator.
<	Query = Less than operator. SAC = Undertrigger operator.
=	Query = Equal to query operator.
<CR>	Enter key.
>	Query = Greater than operator. SAC = Overtrigger operator
?	Query criteria wild character.
a	SAC = Absolute envelope operator.
A	Analog channel unit, Amp. Digital channel state, Alarm.
ASV	Auto Scale Value.
CH	Channel's display ID.
DAU	Data Acquisition Unit.
DC	Digital Channels.
DXF	Drawing Exchange Format.
e	SAC = Half cycle envelope operator.
EN	Events.
Fst	Summary = The first state of a digital channel.
HP-Dif.	Summary = ((absolute value of the HPeak-Up – absolute value of the HPeak-Dn)/OneBit)
HPeak-Dn	Summary = The highest negative peak value.
HPeak-Up	Summary = The highest positive peak value.
ID	The event file's device ID number.
k	Kilo.
Kbyte	The size in kilobytes.
LP-Dif.	Summary = ((absolute value of the LPeak-Up – absolute value of the LPeak-Dn)/OneBit)
LPeak-Dn	Summary = The lowest negative peak value.
LPeak-Up	Summary = The lowest positive peak value.
Lst	Summary = The last state of a digital channel.
N	Digital channel state, Normal.
OneBit	Summary = An analog channel's full scale value divided by the channel's resolution.
pU	Summary = The prefix and unit of the analog channel.
RMS	Root Mean Square.
SAC	Software Analog Channels.
SDC	Software Digital Channels.
SR	Sensors.

*Appendix D - Abbreviations and Symbols*

<b>Symbol</b>	<b>Description</b>
V	Voltage.

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