WAVEWIN

UNIVERSAL VIEWER

FILE MANAGEMENT & ADVANCED ANALYSIS

USER'S GUIDE

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Acknowledgments

Preface

This document contains information about the universal 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 routines (Data Display) use a library of device drivers to display multiple vendor formats such as COMTRADE, Hathaway, EMAX, Mehta, Rochester, Schweitzer, ABB, and GE. 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 file 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.

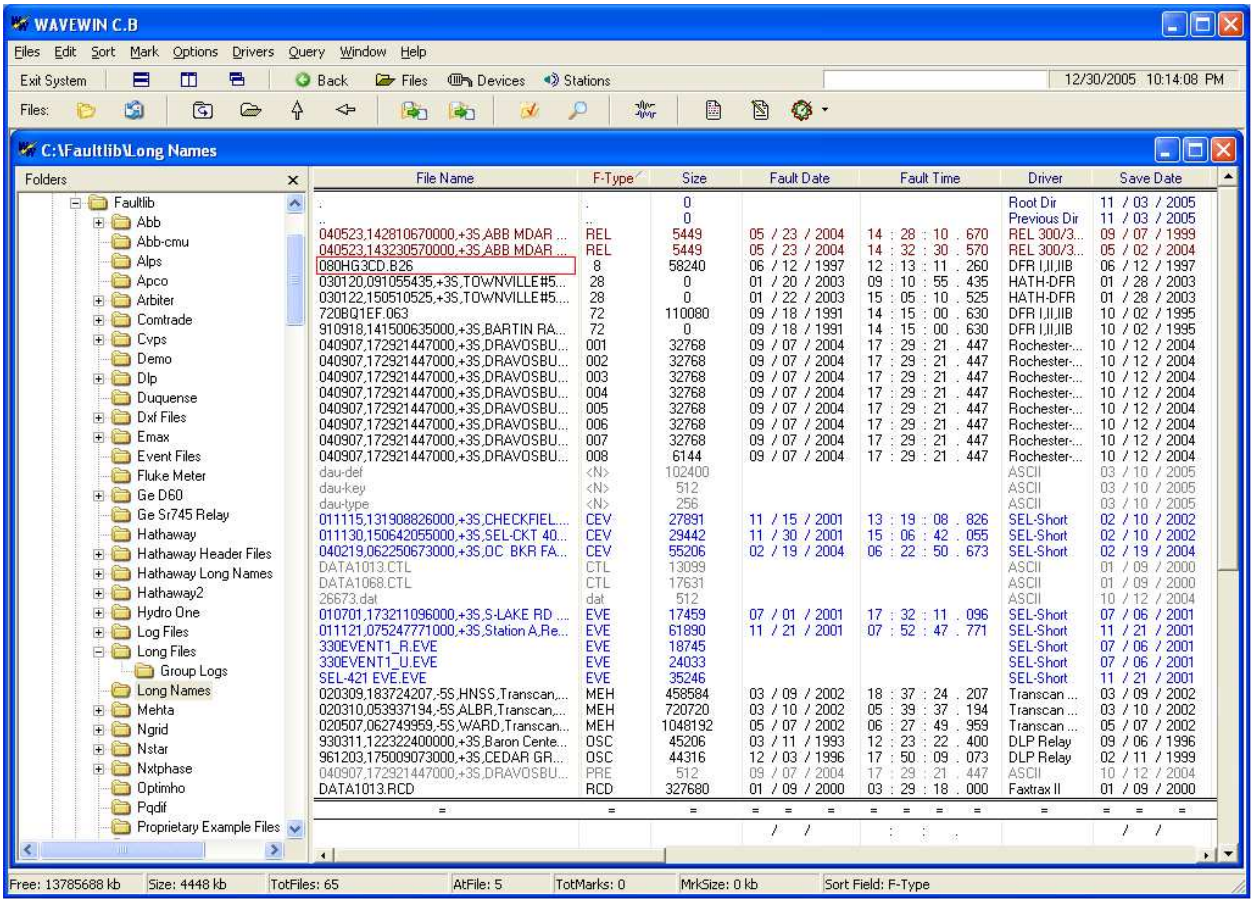


Figure 1.1 File Manager

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.

For specific display driver's information from the file is placed in the long file names.

- SEL Files: The Type field has the Event Type and Fault Location (example type field: ",CG T -86.0,").
- DLP Files: The Type field has the Fault Type, Distance and Trip Type in the type field (example type field: ",AG 001.8 PLT,").
- Transcan Files: The 1st User Field has the 4 character station ID (example user field: ",BEDG,").
- Rochester Files: The 1st User Field has the 5 character header name (example user field: ",20626,").
- Hathaway Files: The #DAU ID data is added next to the device name (example device field: ",DAU 8#8,")

All files associated with the marked waveform files will be renamed.

- Comtrade files: the ".CFG", ".INF", ".HDR", ".DAT" and "*.D##" files will be renamed.
- Faxtrax files: the ".CTL", ".RCD", ".RCL", ".RCU" and ".RCS" files will be renamed.
- Rochester files: the ".PRE" file and all files with the same name and a ".###" extension will be renamed.

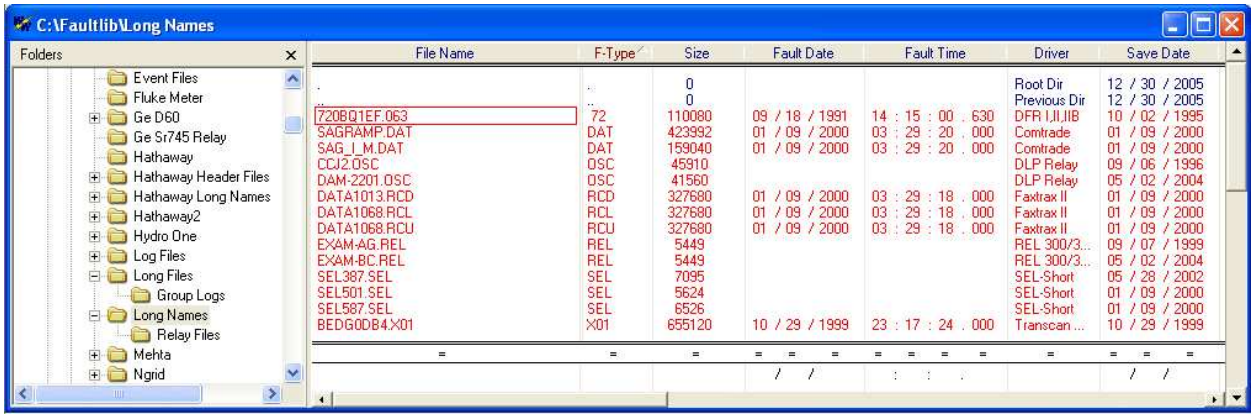


Figure 1.2 ComNames Rename: Select & Mark all the Waveform Files to Rename

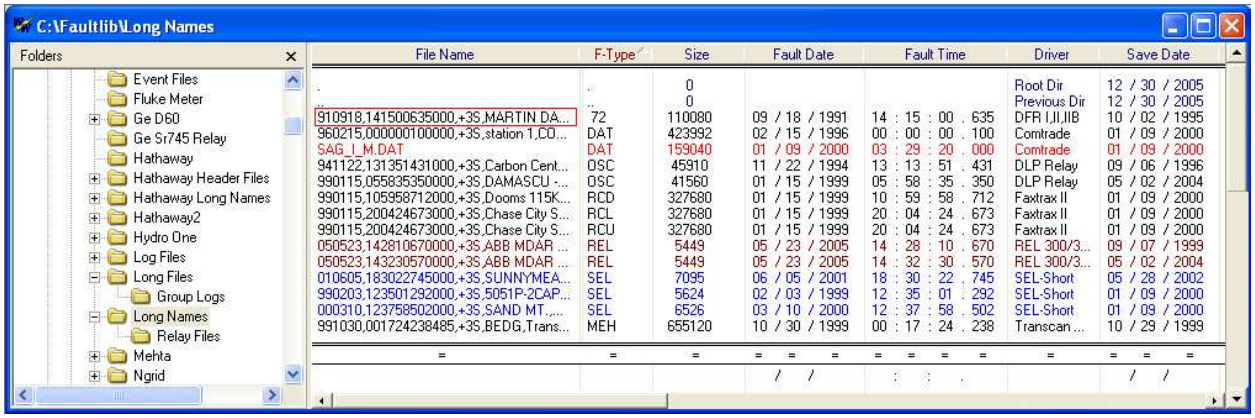


Figure 1.3 ComNames Rename: Result

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.

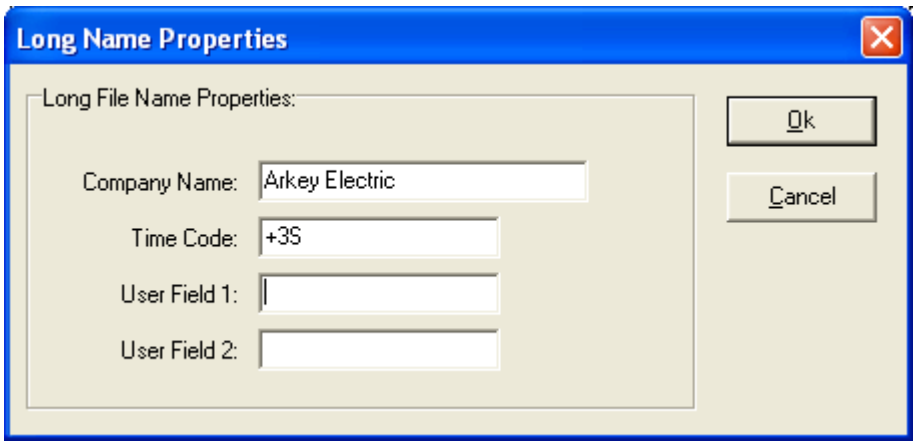


Figure 1.4 ComName Properties Dialog

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. 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/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.

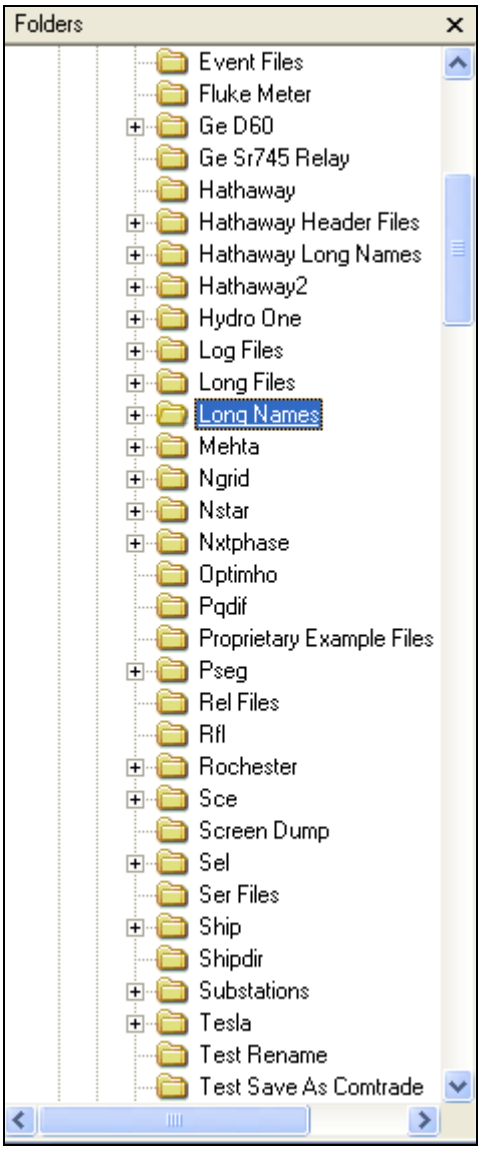


Figure 1.5 Folder Tree

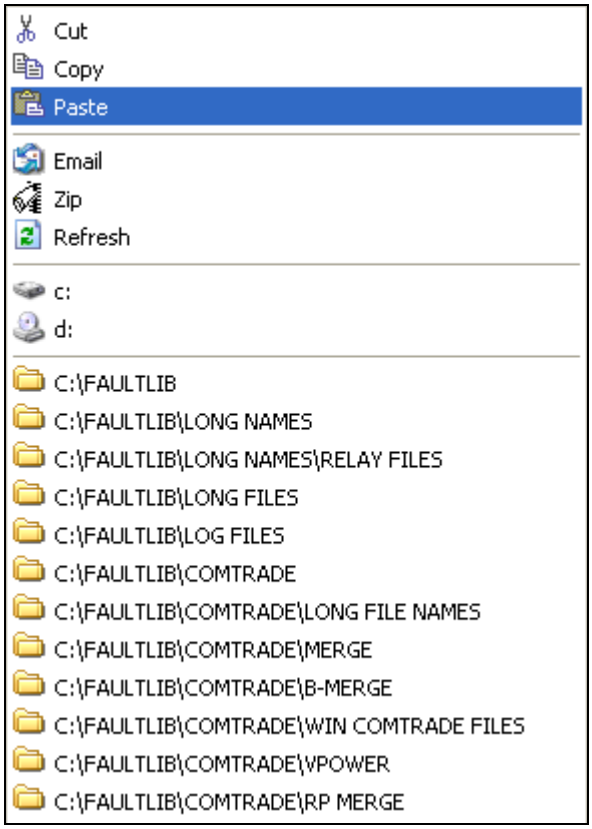


Figure 1.6 Drive/Directory Navigation Menu

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 Directory** dialog click the **Copy** / **Move** menu buttons or press F8 for copy and F9 for move. Select the directory from the Directories tree or enter a new directory in the **Directory Name** field then press <enter> or click the **OK** button. The system prompts the user prior to automatic creation of the directory. Refer to Figure 1.8. A message is displayed if an error occurs while coping 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.

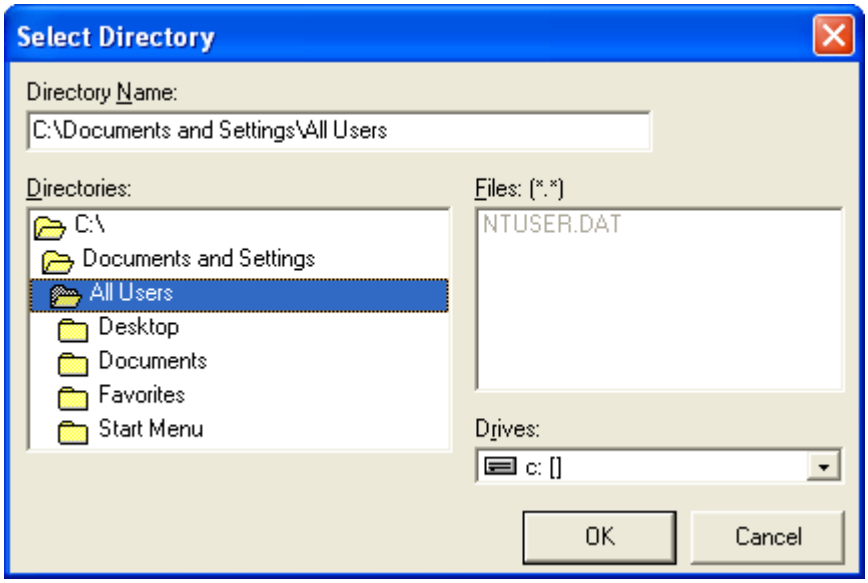


Figure 1.8 Copy Dialog

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** Copy or **Cut** Cut option from the popup menu. Navigate to the destination folder and select the **Paste** option under the edit menu or the **Paste** Paste option from the file table's popup menu.

Once the copy/move or paste command is 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 and DFR header and configuration information along with the selected DFR data file. For example, when a DFR data file is copied or moved the corresponding DFR header information (CFG, DAU-DEF, SCF File, CTL File and *.PRE files…) are 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** Email option. 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 Comtrade .CFG, .HDR and .INF files, Hathaway DAU files, Transcan .SCF and .TCF Files, Faxtrax or Director .CTL files and Rochester .PRE, Machine.DAT and Data files. Refer to Figure 1.9.

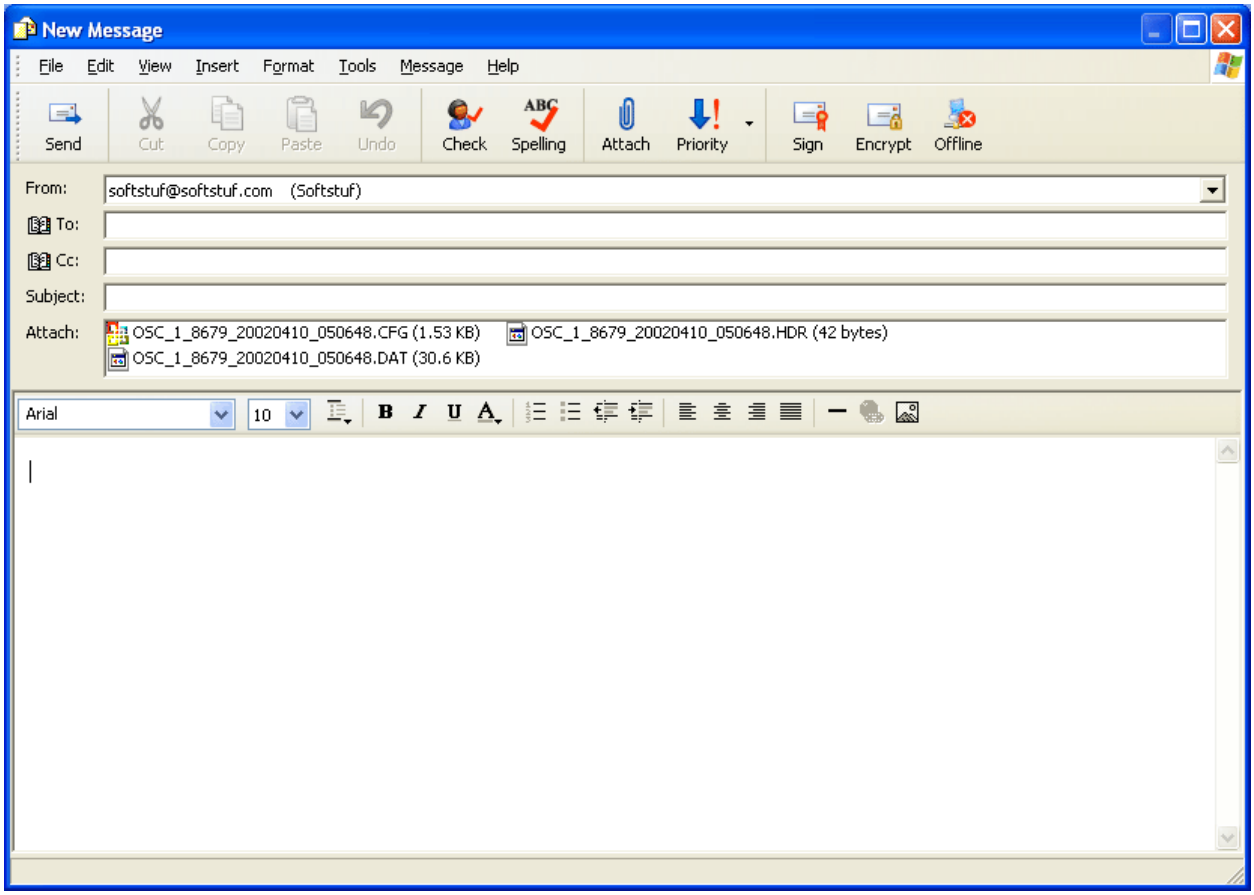


Figure 1.9 Email Dialog

ZIP FILES

Files must be marked first (displayed in red) to zip them. Mark all of the files to zip than 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** 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 Comtrade .CFG, .HDR and .INF files. The zip files created are compatible with the WinZip and PKZip applications. Refer to Figure 1.10.

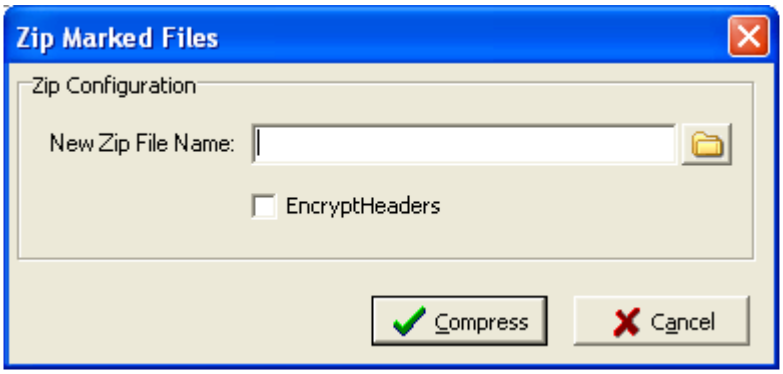


Figure 1.10 Zip Dialog

CUSTOMIZING THE TABLE DISPLAY

The columns displayed in the table can be repositioned through the "Display" feature in 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.

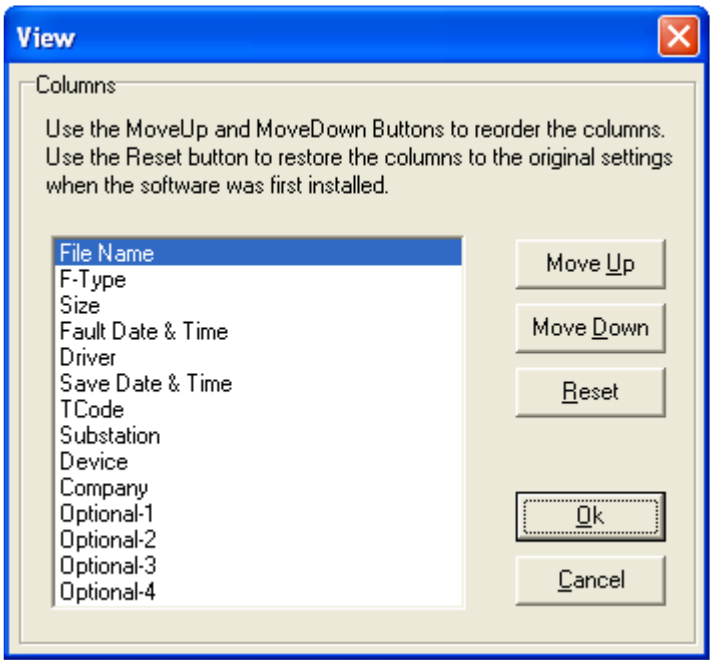


Figure 1.11 Customize Table Columns

PRINTING THE FILE TABLE

The print feature provides two options: print all or marked files in the active directory. To print all the files press Alt+F,P,A or Alt+F,P,M to print 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

Oscillography formats supported by the software 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 "**Save As COMTRADE**" (ASCII or Binary) from 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".

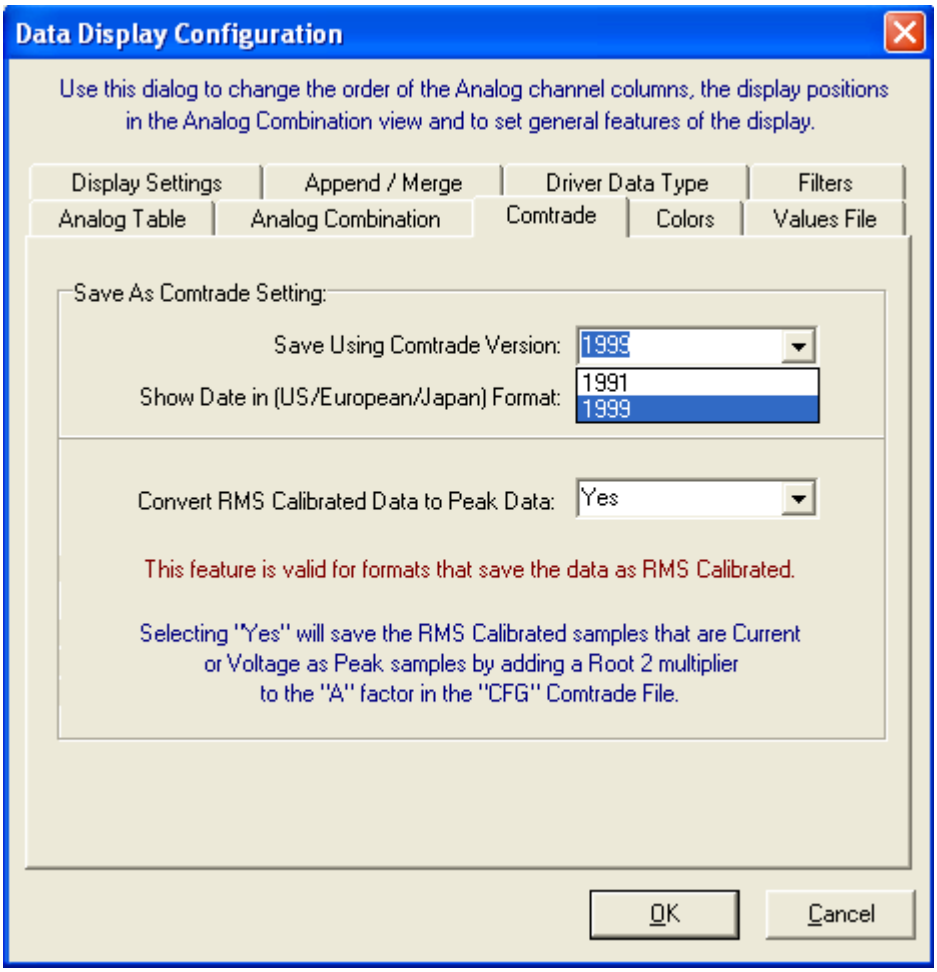


Figure 1.12 Comtrade Version

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.

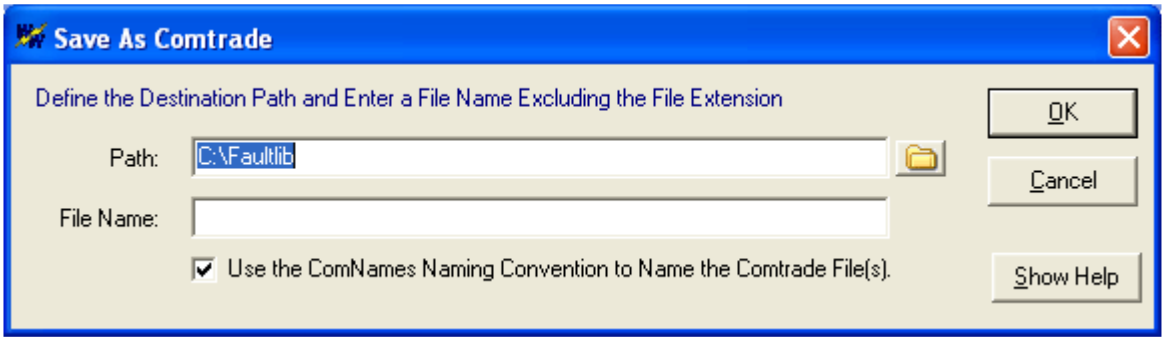


Figure 1.13 Save As Comtrade

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.

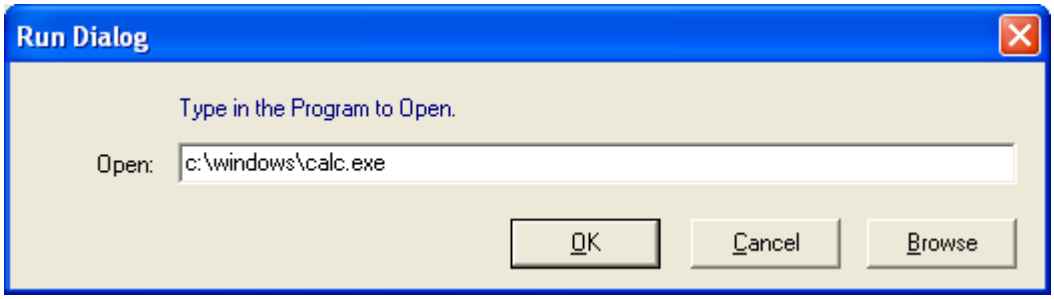


Figure 1.14 Run Dialog

DISPLAYING OSCILLOGRAPHY RECORDS

A library of device drivers is used to display various types of oscillography formats. The formats currently supported by the system are:

- COMTRADE ASCII and Binary
- Hathaway DFR I, II, IIB, and 2000
- Emax Faxtrax & Director DFR
- Mehta Transcan DFR
- Rochester TR16** DFR
- SEL Relays (all series including the compressed format)
- ABB Relays (REL 301/302, MDAR 300, GPU, TPU & DPU 2000R and below)
- ABB Load Profile (Wye-Connected VTs and Delta-Connected VTs)
- GE Relays (DLP1 & DLP3)
- Dranetz SER
- Satec PM295

- RFL 9300
- SDC Log Files
- Fluke Scope Meter
- SEL Load Profile Data
- Ametek TR-100+, DL-8000, TR-2000 & P&QR128
- NxtPhase Tesla
- NxtPhase BPRO, TPRO, LPRO & FPRO
- Emax Long Term Records
- GE-SR745 & GE-SR489
- Hathaway Replay Plus (DFR, TSS & CSS files)
- TIS
- S&C IntelliRupter Waveform
- S&C PXI
- S&C Extended Waveform Capture
- Audio Wave File
- S&C Meter

To plot the contents of a file, place the cursor on the filename and select the appropriate driver from the Driver menu. 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.
Hathaway DFR I,II, IIB & 2000	Files that match the Hathaway Base32 file naming scheme or are long files with the .DFR extension are tagged as DFR I,II, IIB, & 2000 files.
EMAX Faxtrax II / Director	Filenames that have the extensions ".RCD", ".RCL", ".RCU", and there is a cooresponding ".CTL" file, are tagged as Faxtrax II / Director files. The Emax Faxtrax II / Director (12-bit/16bit) format is supported.
Mehta Transcan	Files that have an extension starting with "X" and a corresponding ".SCF" file exists are tagged as Mehta Transcan files.
Rochester TR16**	Files that have the same name and an extension with a number and there is a corresponding .PRE file in the same directory are tagged as Rochester files.
NxtPhase Tesla	Files that have the extension ".TLR" are tagged as NxtPhase Tesla files.
COMTRADE	Files that have the extension ".DAT" and there exists a cooresponding ".CFG" file are tagged as COMTRADE files.
SEL	Files that have the extension ".SEL", ".CEV" or ".EVE" are tagged as SEL files.
SEL LPD	Files that have the extension ".BSV" are marked as SEL Load Profile Data files
DLP	Files that have the extension ".OSC" are tagged as DLP relays. GE DLP1 and DLP3 formats are supported.
REL300/301/302	Files that have the extension ".REL" are tagged as ABB-MDAR files.
TPU/DPU/GPU	Files that have the extension ".CAP" are tagged as ABB-TPU/DPU/GPU files.

Driver	Association Parameter
ABB Load Profile	Files that have the ".DLA" extension are tagged as ABB Load Profile-Wye files.
GE SR745/489 File	Files that have the ".CSV" extension are tagged as GE SR745 Files.
SDC Log File	Files that have the ".CSV" extension are tagged as SDC Log Files.
TIS File	Files that have the ".TIS" extension are tagged as TIS (Trip Information System) Files.
Ametek Files	Files that have the ".AMT" extension are tagged as Ametek TR-100+, DL-8000, TR-2000 & P&QR128 Files.
NxtPhase Tesla	Files that have the ".TLR" extension are tagged as NxtPhase Tesla Files.
NxtPhase Relays (BPRO, TPRO, LPRO & FPRO)	Files that have the ".BPR, .TPR, .LPR, FPR" extensions are tagged as NxtPhase Relay Files.
Emax Long Term	Files that have the ".DAT" extension with an associated .SET file are tagged as Emax Long Term Files.
Hathaway Replay Plus	Files that have the ".DAT" extension with no .CFG associated with it are tagged as Hathaway Replay Plus Files.
S&C IntelliRupter	Files that have the extension ".WFC" are tagged as S&C IntelliRupter Waveform Files.
S&C PXI	Files that have the extension ".TSV" are tagged as S&C PXI Waveform Files.
S&C Extended Waveform Capture	Files that have the extension ".EWC" are tagged as S&C IntelliRupter Extended Waveform Files.
Audio Wave	Files that have the extension ".WAV" are tagged as Microsoft's Wave Files.
S&C Meter	Files that have the extension ".PRO" are tagged as S&C IntelliRupter Meter Files.
DXF	Files that have the extension ".DXF" are tagged as Drawing Exchange Format files.
Application Files	Word Documents (".Doc" & ".RTF") , Execl Documents (".XL", ".XLS", ".XLT", ".XLM", ".XLA", ".XLC" & ".XLW") , Web pages (".HTM", ".HTML", "MSPX" & "ASP") , Access Files ('"MDB" & ".ADP") , Power Point Presenation 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. If the driver encounters an error while reading a file an "Invalid Driver Message" is displayed indicating the line number in which the error was encountered. Use the ASCII or Hexadecimal editors to locate and correct the error. The ASCII and hexadecimal editors display the cursor's line and character number in the lower left corner of the window. The following drivers are supported:

- ASCII (Text)
- Hexadecimal (Binary)
- Table (Comma Delimited, Double Quotes/Comma Delimited, Tab Delimited)
- DXF
- COMTRADE (ASCII and Binary)
- DRF I, II, IIB, and 2000
- Transcan
- Faxtrax II & Director (12/16 bit)
- Rochester TR16**
- Tesla
- SEL
- SEL-Meter

- SEL-Load Profile Data (LPD)
- DLPI and DLP3
- REL 300/301/302
- TPU/DPU/GPU
- GE SR745/489
- PM295
- RFL 9300
- SDC Log files
- ABB Wye/Delta Connected VTs Load Profile
- TIS (Trip Information System)
- Fluke Scope Meter
- SEL Load Profile Data
- Ametek TR-100+, DL-8000, TR-2000 & P&QR128
- NxtPhase Tesla
- NxtPhase BPRO, TPRO, LPRO & FPRO
- Emax Long Term Records
- Hathaway Replay Plus (DFR, TSS & CSS files)
- S&C IntelliRupter Waveform (WFC files)
- S&C PXI
- S&C Extended Wavefore Capture
- Audio Wave
- S&C Meter

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

DEVICE CONFIGURATION

The device configuration dialog allows for setting certain parameters for each type of device driver supported. To open, select the **Device Configuration** option under the **Options** menu. The right panel displays all the supported device drivers. Use the mouse or up and down arrow keys to select the device. Refer to Figure 1.15. The left panel displays the available settings for each device. Below is a list of the available settings:

- **Device’s Data Type:** Options (Peak, RMS Calibrated or Log File). Select the type of data that is contained in the files for the selected device.
- **Device Header Directory:** If the device requires support files to display the data then the support files can be placed in a centrialize directory so they do not have to be in the directories where the data files are located. Enter the directory or use the folder button  to browse for an existing directory. This field is for devices that maintain separate files for the Analog & Digital info. This field is available for Hathaway, Transcan, Rochester and Comtrade Files.
- **Default Display Frequency:** If the files are prefered to be displayed in a fixed sampling frequency when the files are open then set the default frequency in this field. Example, if the files have 4 samples per cycle and it is prefered to view then with 40 samples per cycles enter 2400. To maintain the original frequency leave this field blank or set to 0.00.

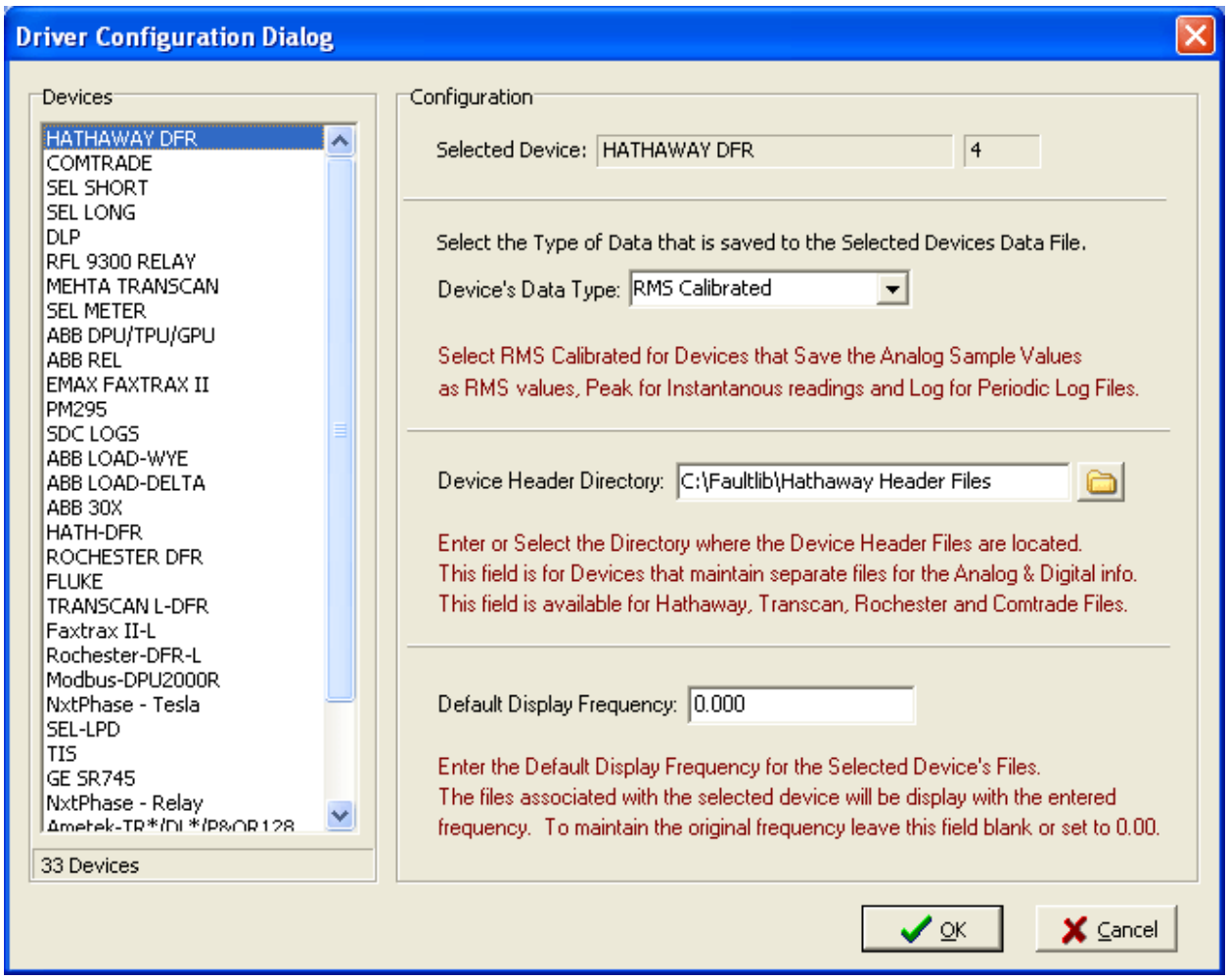


Figure 1.15 Device Configuration Dialog

DAU-DEF EDITOR

The DAU-DEF editor allows for changing the setting for all the available devices defined in the selected Hathaway DAU-DEF file and for adding new dau def configurations. To open, select the **Edit DAU-DEF file** option under the **Options** menu. Navigate to the desired directory and double click on the dau-def file. The right panel displays all the devices defined in the file. Use the mouse or up and down arrow keys to select the device. Refer to Figure 1.16. The left panel displays the available settings for each device. Below is a list of the available settings:

- **Telephone #:** Enter the telephone numbe to connect to the device.
- **Analog Channels:** The analog channels defined for the selected DAU-DEF record are displayed in a list box. Use the up and down arrow keys or the mouse to select the analog channel to modified. The following fields can be modifed for each analog channel.
  - **Name:** Modifiy the analog channel name.
  - **Full Scale:** Modify the analog channel's full scale value.
  - **Prefix:** Modify the analog channel's prefix.
  - **Unit:** Modify the analog channel's unit.
- **Event Channels:** The event channels defined for the selected DAU-DEF record are displayed in a list box. Use the up and down arrow keys or the mouse to select the event channel to modified. The following fields can be modifed for each event channel.
  - **Event #:** Modifiy the event channel's number.

- **Name:** Modify the event channel's name.
- **NoNc:** Modify the event channel's normally open or normally closed value, option (1,0).

- **Sensor Channels:** The sensor channels defined for the selected DAU-DEF record are displayed in a list box. Use the up and down arrow keys or the mouse to select the sensor channel to modified. The following fields can be modifed for each sensor channel.
  - **Sensor #:** Modifiy the sensor channel's number.
  - **Name:** Modify the sensor channel's name.
  - **NoNc:** Modify the sensor channel's normally open or normally closed value, option (1,0).

To add a new DAU-DEF configuration click on anyone of the "NOT USED" records and fill in the analog and digital information and click "Save". The DAU-KEY and DAU-TYPE files are updated automatically.

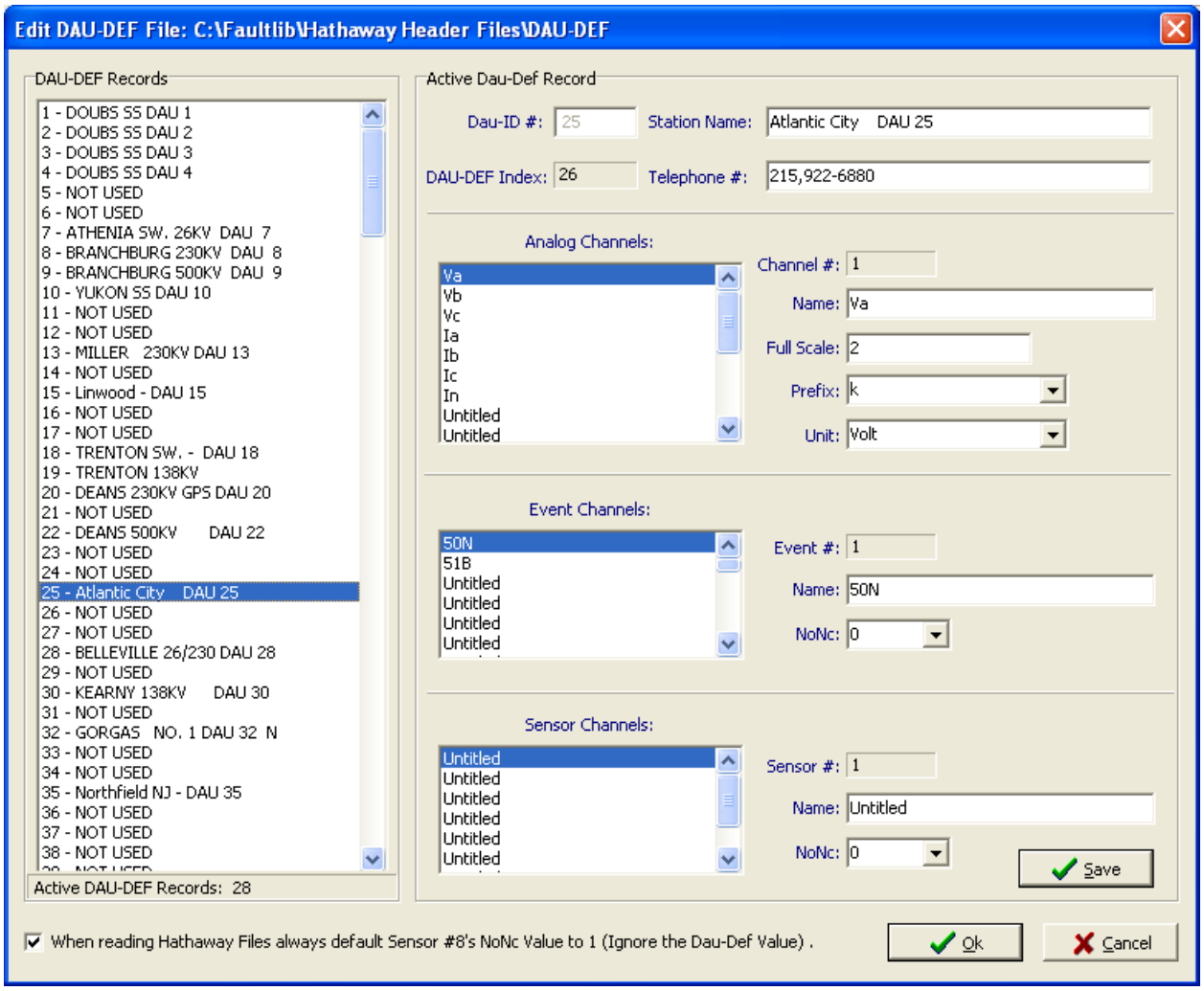


Figure 1.16 Hathaway DAU-DEF Editor

TESLA FILES

Tesla Files are displayed in the IEEE Comtrade Binary format. NxtPhase has developed an automatic conversion application called "AutoComtrade.exe". Wavewin calls "AutoComtrade.exe" to convert Tesla files to the Comtrade binary format for display. To view Tesla Files double click or press enter on the orginal Tesla files. To obtain a copy of the "AutoComtrade.exe" file please contact Tesla.

To edit the Tesla configuration press ALT-O, for the “Options” menu, then N for the Device Configuration dialog. Next select the NxtPhase-Tesla device under the device list box. Refer to Figure 1.17. Below is a list of the available settings:

- **Use Long Name Convention:** The converted tesla files can automatically be named using the IEEE PSRC Long File Naming Convention. Select “Yes” to have them automatically renamed. If “No” is selected then the files are named using the original with the sampling frequency truncated to the name. Example: the “2002-07-23-15.49.01.000F1.tlr” Tesla file’s Comtrade files will be named: 2002-07-23-15.49.01.000F1-Converted_S96.dat.
- **Delete Original’s:** To delete or send the original Tesla file to the recycle bin select “Yes”. All files that can be recycled will be sent to the Window’s recycle bin all other are permentally deleted from the active drive. To maintain the original files select “No”.

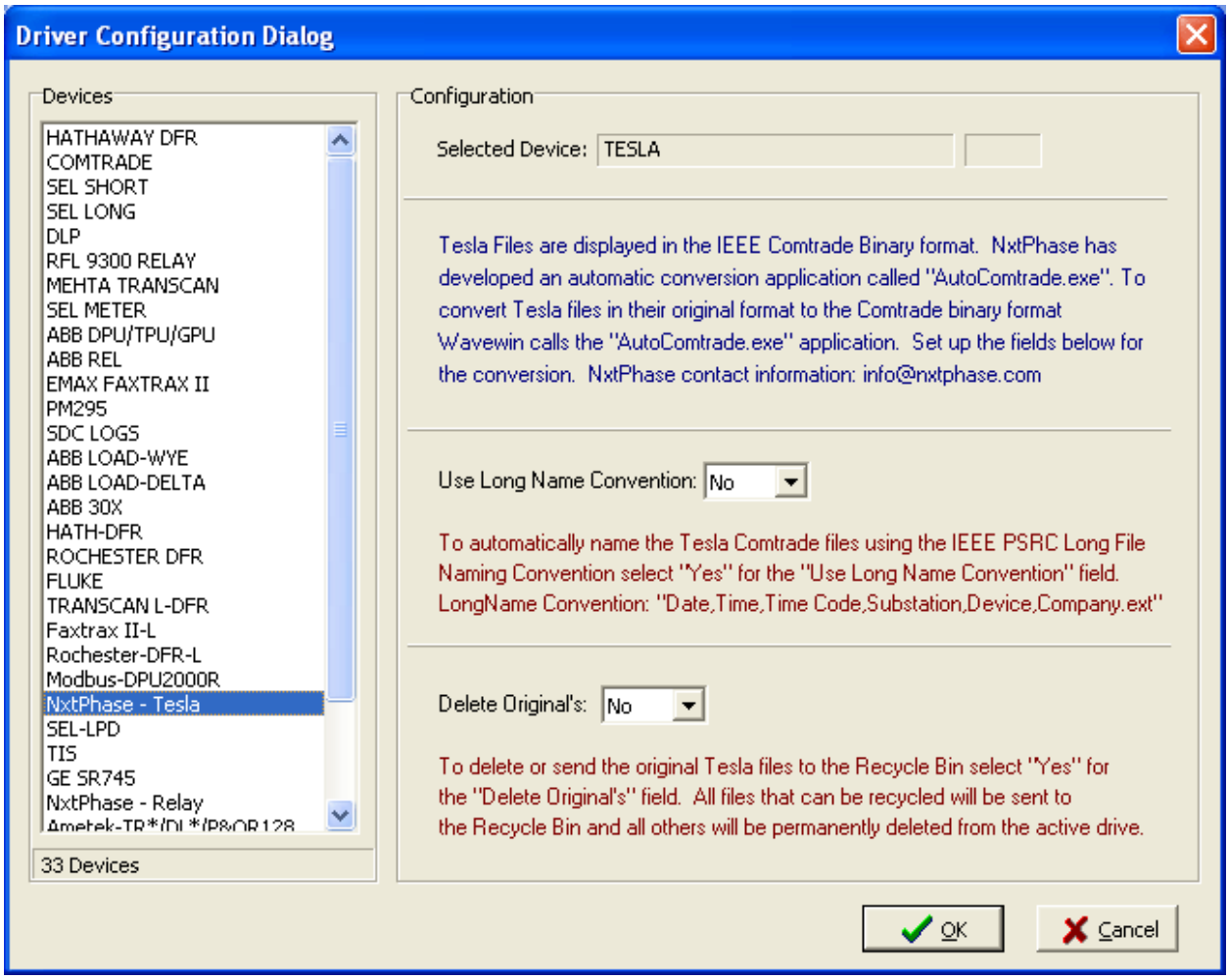


Figure 1.17 Tesla Configuration

LOAD ANALYSIS

The Load Analysis routines are a set of rules and methods used to measure 3 types of abnormal circuit conditions: imbalance, overload and inefficiency in a load “*.CSV“ file. When the load file is processed 4 analog channels and 5 digital channels are created in the file:

Analog Channels:

- Max Rating – The max rating channels displays the defined maximum rating.

- I Average – The I Average channel displays the average value from the IA, IB and IC channels.
- I Max – The I max channel displays the maximum value from the IA, IB and IC channels.
- Derivative – The derivative of the power factor channel.

Digital Channels:

- Breaker Status – The breaker status channel is marked as triggered when a sample indicates an OPEN in the breaker status field (BRK).
- Data Integrity – The data integrity channel is marked as triggered when the date and time for a sample are invalid and the difference between the current samples and the previous samples are greater than 5 times the defined rating.
- Imbalance – The imbalance channel is marked as triggered when an imbalance condition is detected. Refer to the Imbalance section below for more detail.
- Overload – The overload channel is marked as triggered when an overload condition is detected. Refer to the Overload section below for more detail.
- Inefficiency – The inefficiency channel is marked as triggered when an imbalance condition is detected. Refer to the Inefficiency section below for more detail.

Before the load analysis can be performed on a file the ratings for the device must be defined. To define the ratings select a file generated from the device in the table manager then select the Load Rating menu option from the “Reports” submenu option under the “Options” menu. Refer to Figure 1.18. Enter the “Summer Normal Rating” and the “Summer Emergency Rating”.

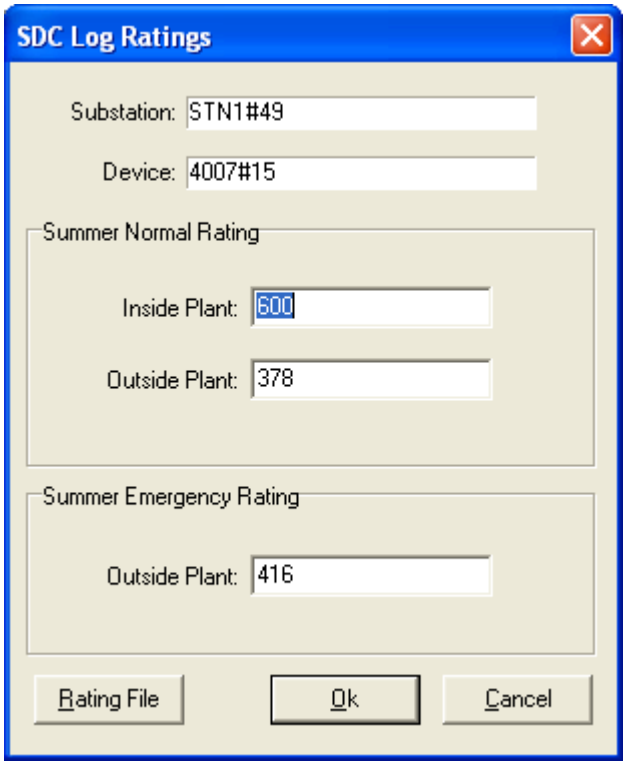


Figure 1.18 Load Rating Dialog

An adaptive learning scheme is used to tune the time varying coefficients (W1, W2 & W3) of an imbalance, overload and inefficiency summation equation. The equation is used to classify circuit conditions (i.e., assign priority values).

Figures 1.19 and 1.20 reveal the basic schematic of the expert and adaptive learning models used. Terms used in Expert System Model are defined as follows:

- IA Phase-A current (Amps RMS)
- IB Phase-B current (Amps RMS)
- IC Phase-C current (Amps RMS)
- AVG Average of Phases A, B, and C
- SNR Summer Normal Rating for the circuit (Amps RMS)
- PF Power factor
- X-I Maximum imbalance value (max % change from average)
- X-O Maximum overload value (max % change from rating)
- X-E Maximum inefficiency value (max % change from unity)
- IMB Discrete imbalance signal (1=On, 0=Off)
- OVR Discrete overload signal (1=On, 0=Off)
- INE Discrete inefficiency signal (1=On, 0=Off)
- T-I Total imbalance duration (Days, Hours)
- T-O Total overload duration (Days, Hours)
- T-E Total inefficiency duration (Days, Hours)

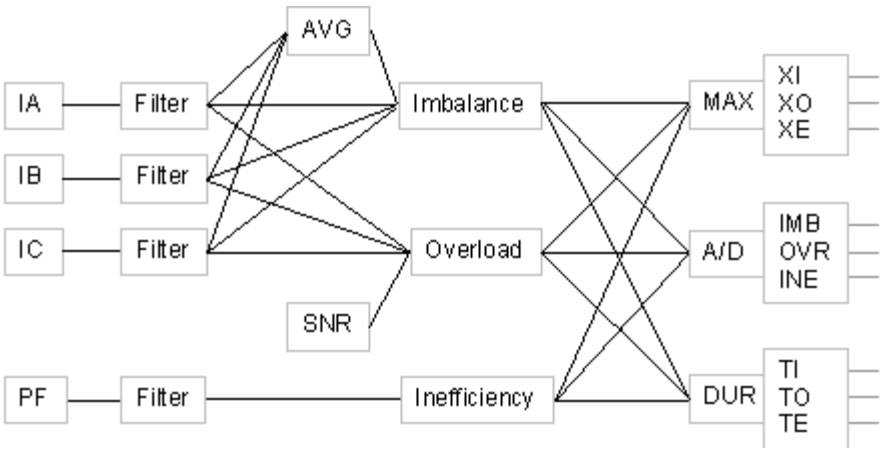


Figure 1.19 Expert System Model

Terms used in Adaptive Learning Model are defined as follows:

- X Multiplication node
- W-1 Time varying coefficient for imbalance condition
- W-2 Time varying coefficient for overload condition
- W-3 Time varying coefficient for inefficiency condition
- ∑+ Summation node (good/bad circuit classification branch)
- ∑- Subtraction node (error signal generation branch)
- Desired Input signal used to train the network
- Err Function Cost function that governs the assignment of coefficient values

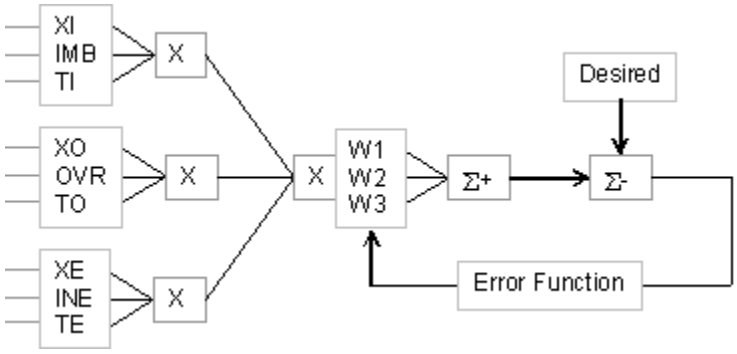


Figure 1.20 Adaptive Learning Model

The Load Trigger Dialog allows for programming the level, weight, and duration triggers for the analysis procedures. Refer to Figure 1.21. The triggers are listed by circuit type.

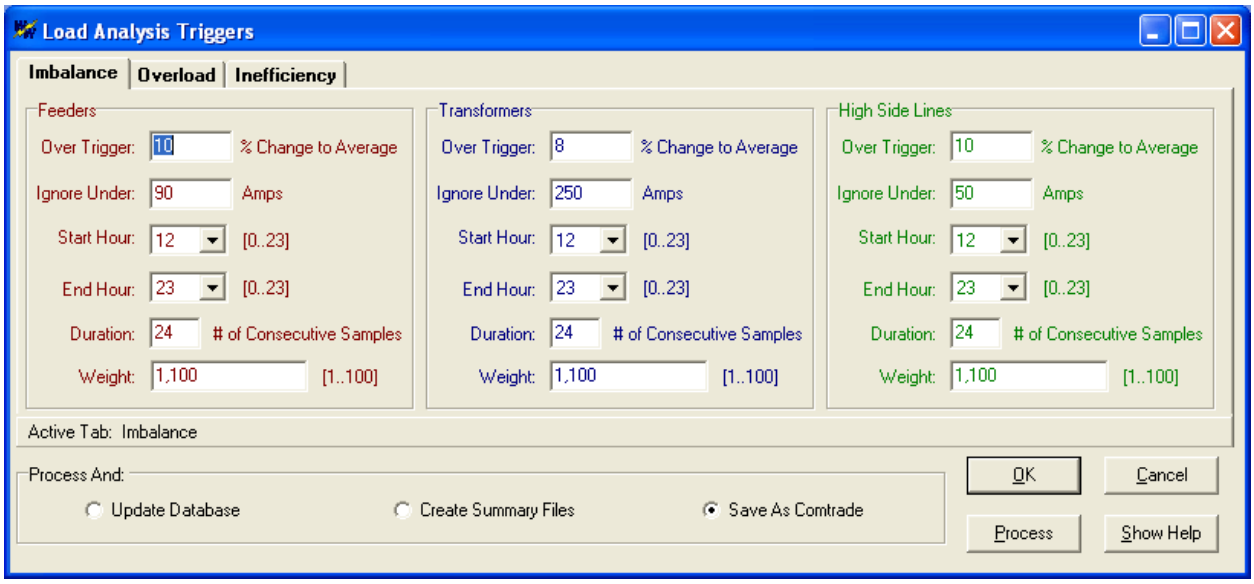


Figure 1.21 Load Analysis Triggers Dialog

A description of the analysis procedures follows:

Imbalance: The system calculates the average value of the 3 phase currents and then measures the difference between each phase and the average. If the maximum percentage change from average is greater than the "Over Trigger" value (say 10% of average) then an imbalanced condition is noted and the maximum percentage imbalance and total duration are tracked. If the condition persists for a consecutive number of readings that is greater than the "Duration" value (say 6 hours) then an actual imbalance alarm is issued.

Overload: The system measures the maximum value of the 3 phase currents and then compares to the summer normal rating that is provided for that circuit. If the maximum value is greater than the "Over Trigger" value (say 90% of rating) then an overload condition is noted and the maximum percentage overload and total duration are tracked. If the condition persists for a consecutive number of readings that is greater than the "Duration" value (say 4 hours) then an actual overload alarm is issued.

Inefficiency: The system looks at the power factor measurements and directly compares to the "Under Trigger" value (say 90% of unity). If the value is less than "Under Trigger" then an inefficiency condition

is noted and the maximum percentage inefficiency and total duration are tracked. If the condition persists for a consecutive number of readings that is greater than the "Duration" value (say 5 hours) then an actual inefficiency alarm is issued.

Cumulative Values: The system calculates a weighted sum of the tracked maximum percentages for imbalance, overload and inefficiency and uses that sum as a priority measure to rate the condition of each circuit. The weights are specified in the "Weight" field as "multiplier, extreme duration". The actual weight is equal to the multiplier value but it doubles when the total duration exceeds the specified extreme duration.

Data Filters: Data measurements that are taken outside the interval "Start Time" to "End Time", or that have values below "Ignore Under", are not processed and the previous state of the system is retained. The system also detects "bad data" (due to spikes, network crashes, incorrect unit designations, modem communication failures and so on) and blocks it from propagating through the system.

To perform the analysis on a directory containing *.CSV load files first mark the desired files then click on the **Load Analysis** menu button to display the **Load Analysis Triggers** dialog or select the desired load option from the load analysis drop down menu. Refer to Figure 1.22.

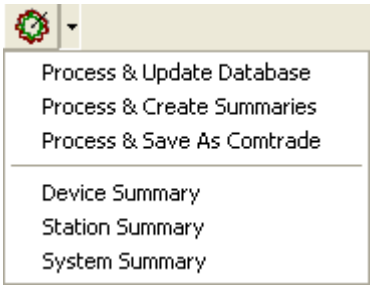


Figure 1.22 Load Menu Button

The first three menu options are also available from the Load Analysis Trigger dialog. Refer to Figure 1.21. Below is a description for each option available.

- **Process & Update Database** – The process & update database will process all the marked *.CSV files in the active directory and update the Max-Imbalance, Max-Overload, Max-Inefficiency and the Priority columns with the new data.
- **Process & Create Summaries** – The process & create summaries will process all the marked *.CSV files in the active directory and create device summary ASCII files for each file processed. A folder destination dialog is displayed. Refer to Figure 1.23. Select the destination folder and define the names for the files. The files are named using the IEEE PSRC Long file naming convention when the "Use ComName" option is checked.
- **Process & Save As Comtrade** – The process & create summaries will process all the marked *.CSV files in the active directory and create Comtrade files for each file processed. A folder destination dialog is displayed. Select the destination folder and define the names for the files. The files are named using the IEEE PSRC Long file naming convention when the "Use ComName" option is checked.

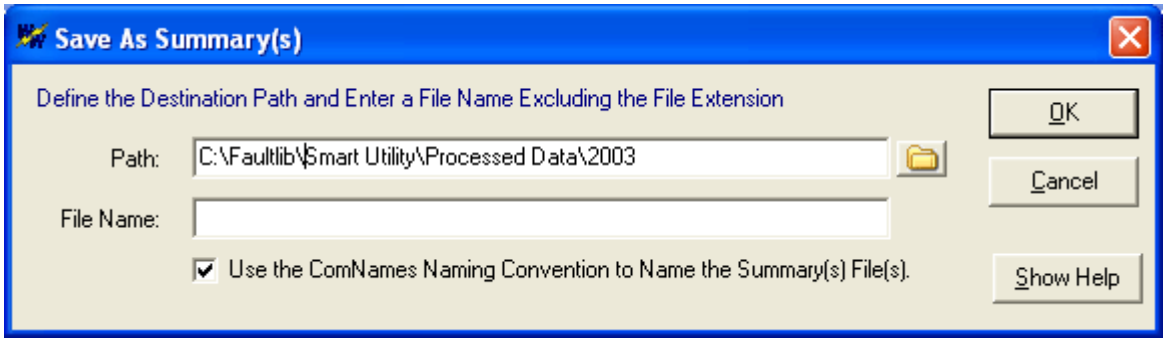
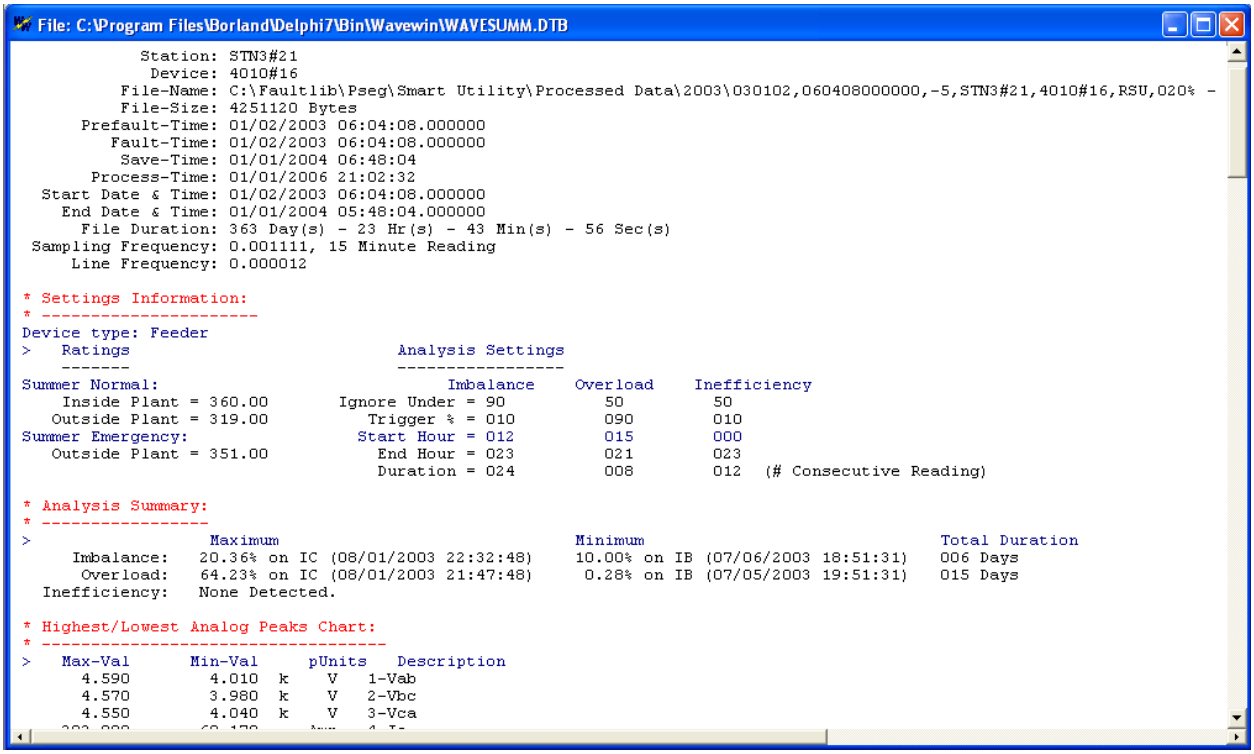


Figure 1.23 Summary Destination Dialog

Summary Files:

- **Device Summary** – The device summary files list all the general information for the file, the maximum and minimum values for imbalance, overload & inefficiency, the maximum and minimum values for each analog channel and SOE for the digital channels. Refer to Figure 1.24.
- **Station Summary** – The station summary lists the imbalance, overload, inefficiency and priority for each device in the station. Refer to Figure 1.25.
- **System Summary** – The system summary lists the imbalance, overload, inefficiency and priority for each device defined in the system along with the average for each station. Refer to Figure 1.26.



File: C:\Program Files\Borland\Delphi7\Bin\Wavewin\WAVESUMM.DTB

```
            Station: STN3#21
             Device: 4010#16
          File-Name: C:\Faultlib\Pseg\Smart Utility\Processed Data\2003\030102,060408000000,-5,STN3#21,4010#16,RSU,020% -
          File-Size: 4251120 Bytes
      Prefault-Time: 01/02/2003 06:04:08.000000
         Fault-Time: 01/02/2003 06:04:08.000000
          Save-Time: 01/01/2004 06:48:04
       Process-Time: 01/01/2006 21:02:32
  Start Date & Time: 01/02/2003 06:04:08.000000
    End Date & Time: 01/01/2004 05:48:04.000000
      File Duration: 363 Day(s) - 23 Hr(s) - 43 Min(s) - 56 Sec(s)
 Sampling Frequency: 0.001111, 15 Minute Reading
     Line Frequency: 0.000012

* Settings Information:
* ----------------------
Device type: Feeder
>    Ratings                          Analysis Settings
     -------                          -----------------
Summer Normal:                              Imbalance     Overload     Inefficiency
    Inside Plant = 360.00        Ignore Under = 90            50           50
   Outside Plant = 319.00           Trigger % = 010           090          010
Summer Emergency:                  Start Hour = 012           015          000
   Outside Plant = 351.00            End Hour = 023           021          023
                                     Duration = 024           008          012   (# Consecutive Reading)

* Analysis Summary:
* ------------------
>                 Maximum                                  Minimum                                  Total Duration
     Imbalance:   20.36% on IC (08/01/2003 22:32:48)     10.00% on IB (07/06/2003 18:51:31)    006 Days
      Overload:   64.23% on IC (08/01/2003 21:47:48)      0.28% on IB (07/05/2003 19:51:31)    015 Days
  Inefficiency:   None Detected.

* Highest/Lowest Analog Peaks Chart:
* -----------------------------------
>    Max-Val      Min-Val     pUnits    Description
       4.590        4.010   k    V    1-Vab
       4.570        3.980   k    V    2-Vbc
       4.550        4.040   k    V    3-Vca
```

Figure 1.24 Load Device Summary

File: C:\Program Files\Borland\Delphi7\Bin\Wavewin\WAVESSUM.DTB

```
- Station Summary:
-  Processed Date: 1/1/2006 9:00:19 PM
-   Total Devices: 0025
-                        Imbalance                   Overload                    Inefficiency          Priority
-                  (Trigger MaxAmps  Dur)      (Trigger Rating  Dur)      (Trigger AvgAmps Dur)       (Rank)
------------------------------------------------------------------------------------------------------------

*  STN1 #49
      4023 #21     :   118%   0991A   324D       022%   0485A   007D       000%   0503A   000M       0412
      4025 #22     :   000%   0995A   000M       009%   0413A   008D       021%   0716A   217D       0158
      4003 #27     :   041%   0362A   329D       007%   0352A   004D       000%   0299A   000M       0113
      4008 #29     :   032%   0457A   328D       011%   0442A   002D       000%   0375A   000M       0108
      4019 #34     :   038%   0229A   310D       000%   0600A   000M       012%   0193A   018H       0100
      4012 #30     :   029%   0328A   251D       000%   0428A   000M       012%   0285A   018H       0082
      4020 #18     :   000%   0988A   000M       000%   0424A   000M       020%   0459A   155D       0080
      4010 #16     :   000%   0970A   000M       000%   0449A   000M       020%   0434A   237D       0080
      4001 #11     :   000%   0991A   000M       000%   0442A   000M       020%   0533A   107D       0080
      4013 #31     :   021%   0446A   276D       009%   0440A   019H       000%   0425A   000M       0078
      4015 #32     :   000%   0166A   000M       000%   0378A   000M       018%   0158A   058D       0072
      4004 #13     :   000%   0987A   000M       000%   0428A   000M       018%   0929A   162D       0072
      XFMR-4 #7    :   000%   9206A   000M       000%   4625A   000M       034%   4656A   042D       0068
      4006 #28     :   018%   0382A   110D       000%   0442A   000M       014%   0360A   001D       0063
      XFMR-1 #23   :   016%   1577A   001D       000%   4625A   000M       021%   1557A   001D       0058
      XFMR-6 #24   :   013%   1645A   001D       000%   4625A   000M       021%   1601A   002D       0055
      4005 #14     :   000%   0903A   000M       000%   0402A   000M       024%   0371A   023D       0048
      XFMR-3 #6    :   000%   9080A   000M       000%   4625A   000M       018%   4883A   011D       0036
      4022 #20     :   000%   0527A   000M       000%   0364A   000M       018%   0381A   016D       0036
      4016 #33     :   000%   0153A   000M       000%   0360A   000M       016%   0144A   013D       0032
      4021 #19     :   000%   0800A   000M       000%   0364A   000M       014%   0267A   019D       0028
      4002 #12     :   000%   0903A   000M       000%   0442A   000M       014%   0373A   023D       0028
      4007 #15     :   000%   0916A   000M       000%   0378A   000M       012%   0399A   001D       0024
      4024 #35     :   017%   0396A   056D       000%   0485A   000M       000%   0359A   000M       0017
      4011 #17     :   000%   0305A   000M       000%   0411A   000M       000%   0374A   000M       0000
------------------------------------------------------------------------------------------------------------
STN1 Averages      :   013%   1388A   079D       002%   1097A   000D       013%   0841A   043D       0077
```

Figure 1.25 Load Station Summary

File: C:\Program Files\Borland\Delphi7\Bin\Wavewin\WAVESSUM.DTB

```
- Processed Date: 1/1/2006 8:58:07 PM
- Total Stations: 05
-  Total Devices: 0095
-                        Imbalance                   Overload                    Inefficiency          Priority
-                  (Trigger MaxAmps  Dur)      (Trigger Rating  Dur)      (Trigger AvgAmps Dur)       (Rank)
------------------------------------------------------------------------------------------------------------

*  CUMULATIVES
      STN5 #54     :   029%   0591A   148D       007%   1098A   001D       038%   0538A   070D       0222
      STN3 #21     :   020%   0603A   073D       012%   1060A   003D       014%   0555A   046D       0171
      STN2 #52     :   017%   1192A   098D       001%   0893A   000D       023%   0542A   062D       0129
      STN4 #39     :   009%   0572A   097D       005%   1145A   002D       013%   0533A   058D       0110
      STN1 #49     :   013%   1388A   079D       002%   1097A   000D       013%   0841A   043D       0077
------------------------------------------------------------------------------------------------------------
    System Averages:   017%   0869A   099D       005%   1058A   001D       020%   0601A   055D       0141

*  STN5 #54
      4009 #13     :   063%   0295A   255D       000%   0442A   000M       083%   0232A   249D       0459
      4008 #12     :   068%   0304A   077D       000%   0378A   000M       089%   0209A   244D       0424
      4001 #5      :   030%   0297A   247D       000%   0351A   000M       089%   0275A   151D       0417
      4006 #10     :   053%   0290A   075D       000%   0294A   000M       086%   0238A   196D       0397
      4005 #9      :   015%   0226A   022H       000%   0294A   000M       089%   0217A   197D       0371
      4013 #17     :   026%   0521A   284D       022%   0464A   001D       089%   0443A   003D       0319
      4010 #14     :   041%   0399A   167D       000%   0464A   000M       058%   0348A   165D       0314
      4011 #15     :   030%   0552A   275D       029%   0464A   011D       000%   0473A   000M       0292
      4012 #16     :   017%   0578A   005D       016%   0545A   001D       068%   0543A   001D       0217
      4002 #6      :   039%   0464A   315D       015%   0442A   001D       000%   0406A   000M       0137
      4003 #7      :   034%   0498A   316D       017%   0464A   004D       000%   0427A   000M       0136
      4004 #8      :   032%   0519A   262D       017%   0485A   021H       000%   0458A   000M       0131
      4014 #18     :   016%   0502A   102D       013%   0485A   002D       000%   0472A   000M       0086
      4007 #11     :   041%   0249A   149D       000%   0290A   000M       000%   0190A   000M       0081
      XFMR-3 #3    :   000%   1449A   000M       000%   4272A   000M       000%   1409A   000M       0000
      XFMR-2 #2    :   000%   1462A   000M       000%   4272A   000M       000%   1406A   000M       0000
      XFMR-1 #1    :   000%   1448A   000M       000%   4272A   000M       000%   1406A   000M       0000
------------------------------------------------------------------------------------------------------------
STN5 Averages      :   029%   0591A   148D       007%   1098A   001D       038%   0538A   070D       0222

*  STN3 #21
      4010 #16     :   020%   0492A   006D       064%   0319A   011D       028%   0416A   170D       0646
      4006 #13     :   030%   0600A   271D       034%   0480A   013D       017%   0514A   005D       0370
```

Figure 1.26 Load System Summary

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 1.27. 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.

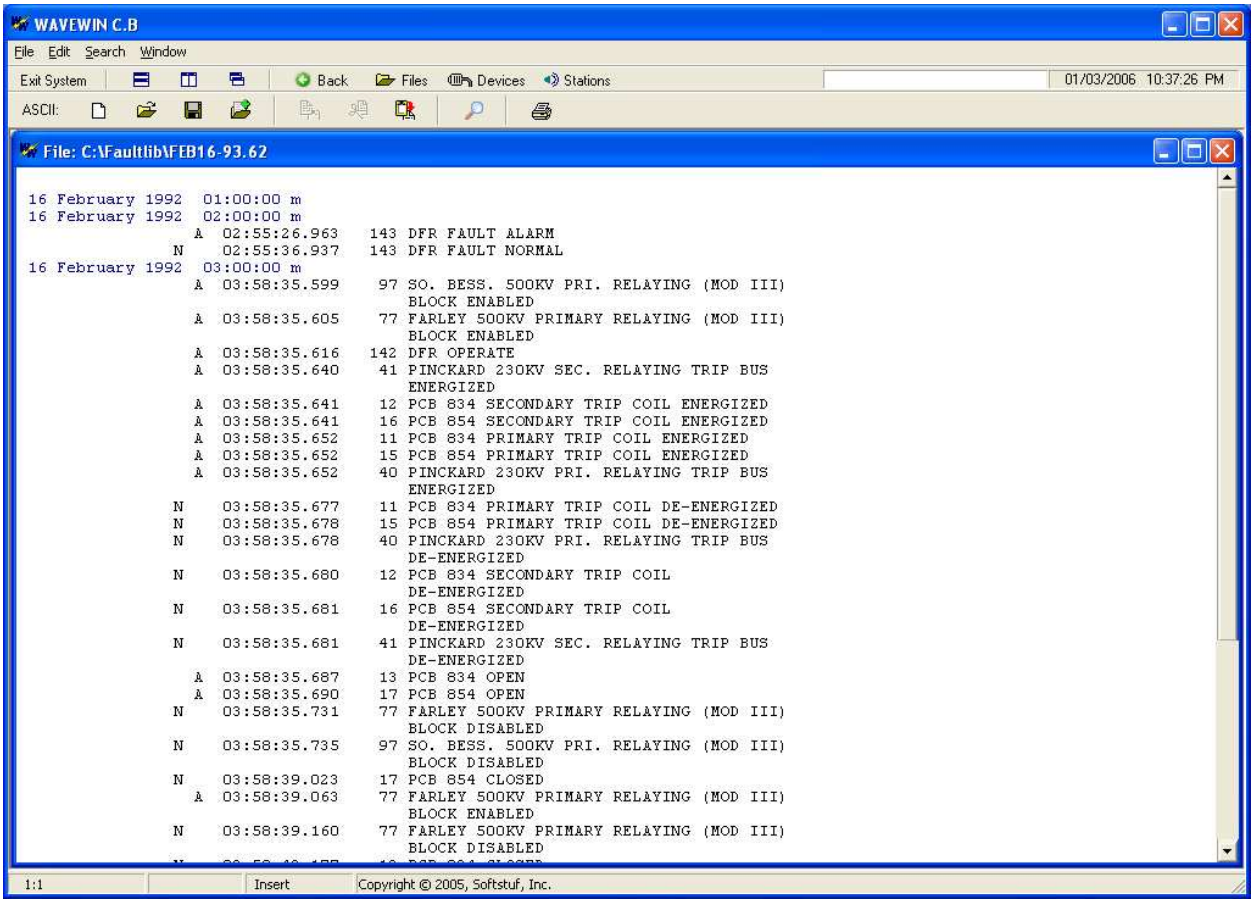


Figure 1.27 ASCII Editor

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 1.28. 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 1.29.

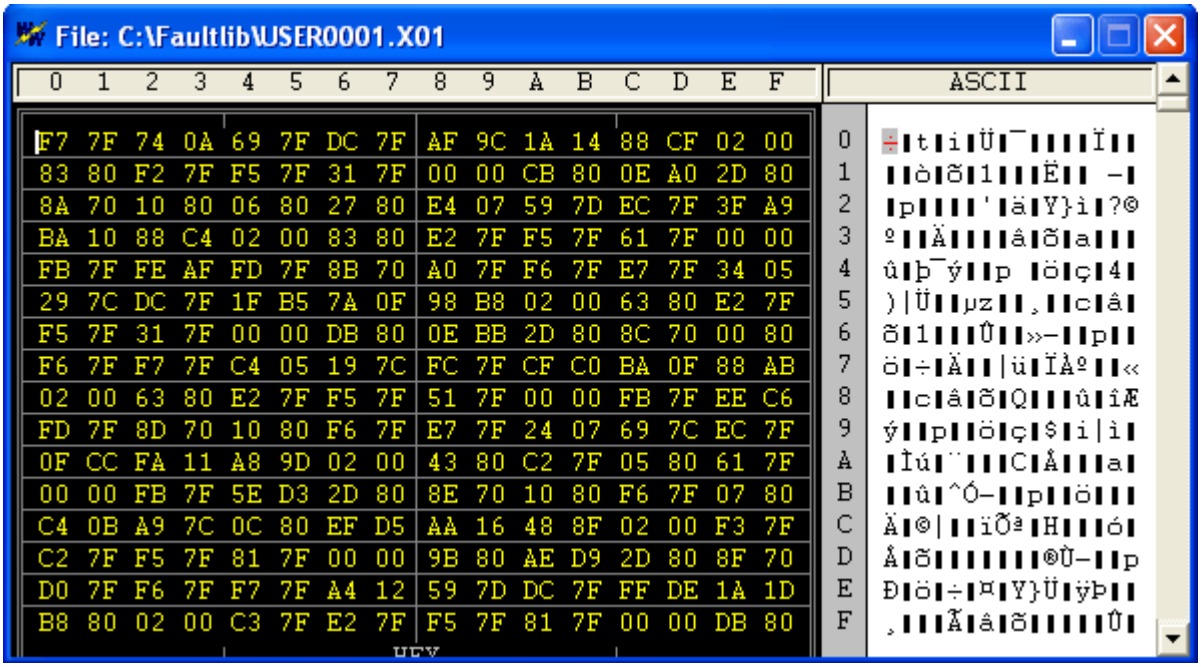


Figure 1.28 Hexadecimal Editor

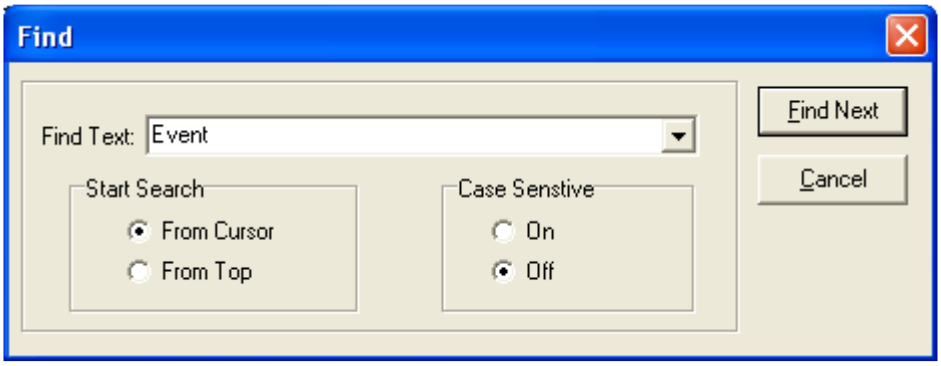


Figure 1.29 Hexadecimal Search

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.

Field	Description
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 for files that include fault information in their format.

Driver	Fault Information
SEL	Event, Location, Frequency, Duration, Shot, Fault Currents, Targets and more.
DLP	Trip Date and Time, Trip Type, Fault Type, Distance and Operating Time.
Transcan	Triggered event information: Name, Time and Type.

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. ((HPeak-UP – HPeak-Dn)/OneBit)
LP-Dif	Absolute value of the LPeak-Up minus absolute value of the LPeak-Dn divided by the OneBit value. ((LPeak-UP – LPeak-Dn)/OneBit)

Events/Sensors Activity Summary

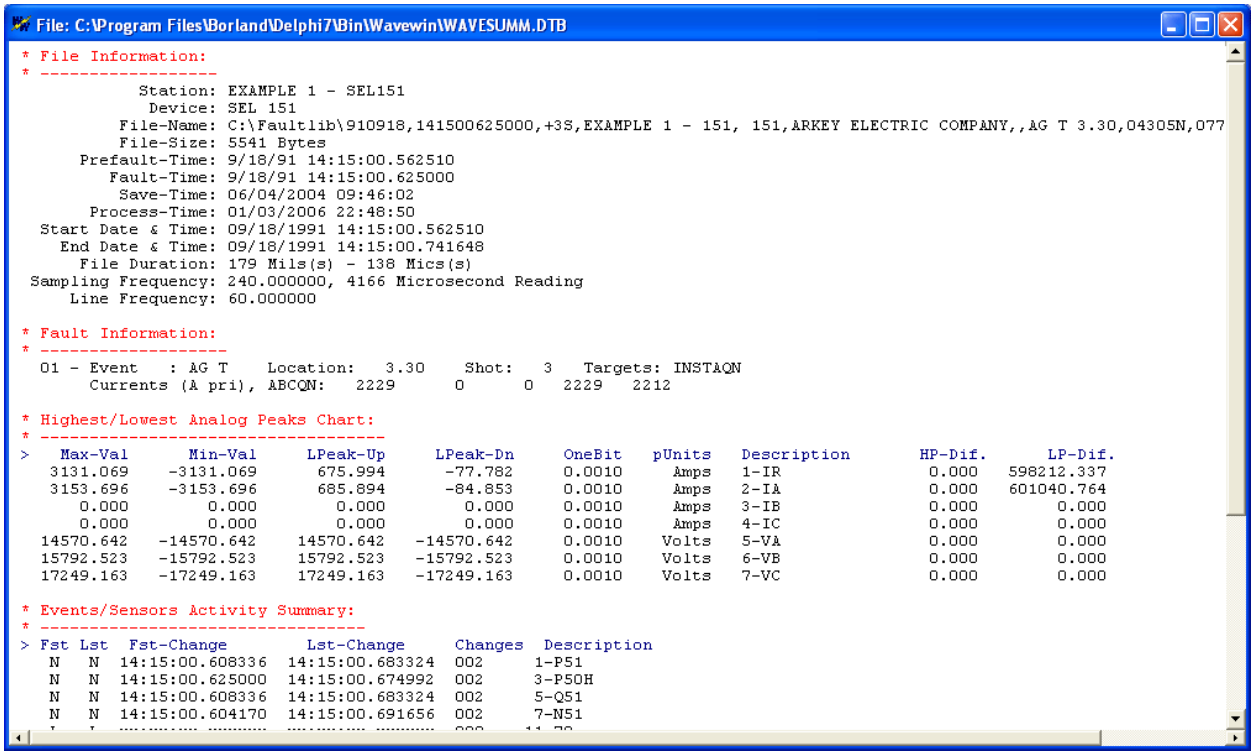
Field	Description
Fst	State the channel started at, A=alarm and N=normal.
Lst	State the channel ended at, A=alarm and N=normal.
Fst-Change	Date and time the channel first changed state.
Lst-Change	Date and time the channel last changed state.
Changes	Number of times the channel changed state.
Description	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 “Waveform Summary” from the Options menu. Refer to Figure 1.30.



File: C:\Program Files\Borland\Delphi7\Bin\Wavewin\WAVESUMM.DTB

```
* File Information:
* ------------------
            Station: EXAMPLE 1 - SEL151
             Device: SEL 151
          File-Name: C:\Faultlib\910918,141500625000,+3S,EXAMPLE 1 - 151, 151,ARKEY ELECTRIC COMPANY,,AG T 3.30,04305N,077
          File-Size: 5541 Bytes
     Prefault-Time: 9/18/91 14:15:00.562510
        Fault-Time: 9/18/91 14:15:00.625000
         Save-Time: 06/04/2004 09:46:02
      Process-Time: 01/03/2006 22:48:50
  Start Date & Time: 09/18/1991 14:15:00.562510
    End Date & Time: 09/18/1991 14:15:00.741648
      File Duration: 179 Mils(s) - 138 Mics(s)
 Sampling Frequency: 240.000000, 4166 Microsecond Reading
     Line Frequency: 60.000000

* Fault Information:
* ------------------
  01 - Event   : AG T    Location:   3.30    Shot:   3   Targets: INSTAQN
       Currents (A pri), ABCQN:   2229      0      0   2229   2212

* Highest/Lowest Analog Peaks Chart:
* ----------------------------------
>   Max-Val      Min-Val     LPeak-Up     LPeak-Dn     OneBit   pUnits   Description      HP-Dif.      LP-Dif.
   3131.069    -3131.069      675.994      -77.782     0.0010     Amps   1-IR               0.000   598212.337
   3153.696    -3153.696      685.894      -84.853     0.0010     Amps   2-IA               0.000   601040.764
      0.000        0.000        0.000        0.000     0.0010     Amps   3-IB               0.000        0.000
      0.000        0.000        0.000        0.000     0.0010     Amps   4-IC               0.000        0.000
  14570.642   -14570.642    14570.642   -14570.642     0.0010    Volts   5-VA               0.000        0.000
  15792.523   -15792.523    15792.523   -15792.523     0.0010    Volts   6-VB               0.000        0.000
  17249.163   -17249.163    17249.163   -17249.163     0.0010    Volts   7-VC               0.000        0.000

* Events/Sensors Activity Summary:
* ---------------------------------
> Fst Lst  Fst-Change         Lst-Change      Changes  Description
   N   N  14:15:00.608336  14:15:00.683324  002      1-P51
   N   N  14:15:00.625000  14:15:00.674992  002      3-P50H
   N   N  14:15:00.608336  14:15:00.683324  002      5-Q51
   N   N  14:15:00.604170  14:15:00.691656  002      7-N51
```

Figure 1.30 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 1.31.
- Back to Back: The files are appended back to back. No samples are deleted. Refer to Figure 1.32.

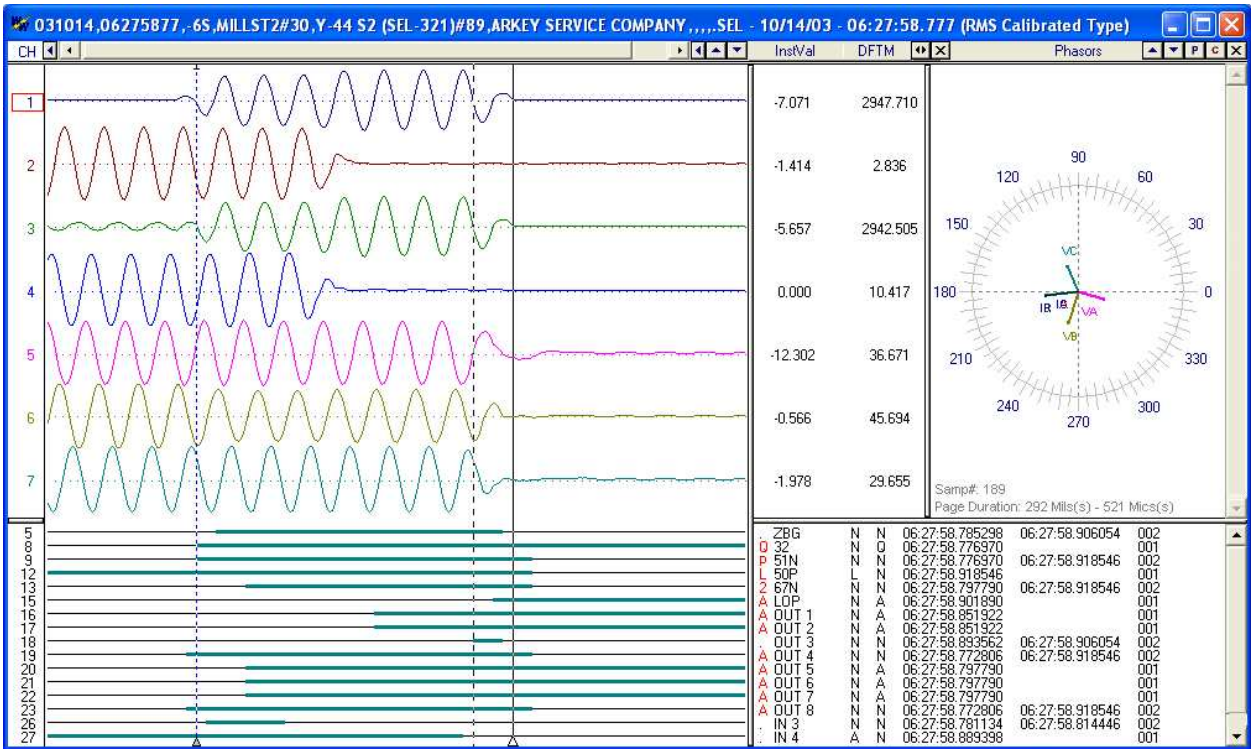


Figure 1.31 Append Waveform Files: Discard Common Times

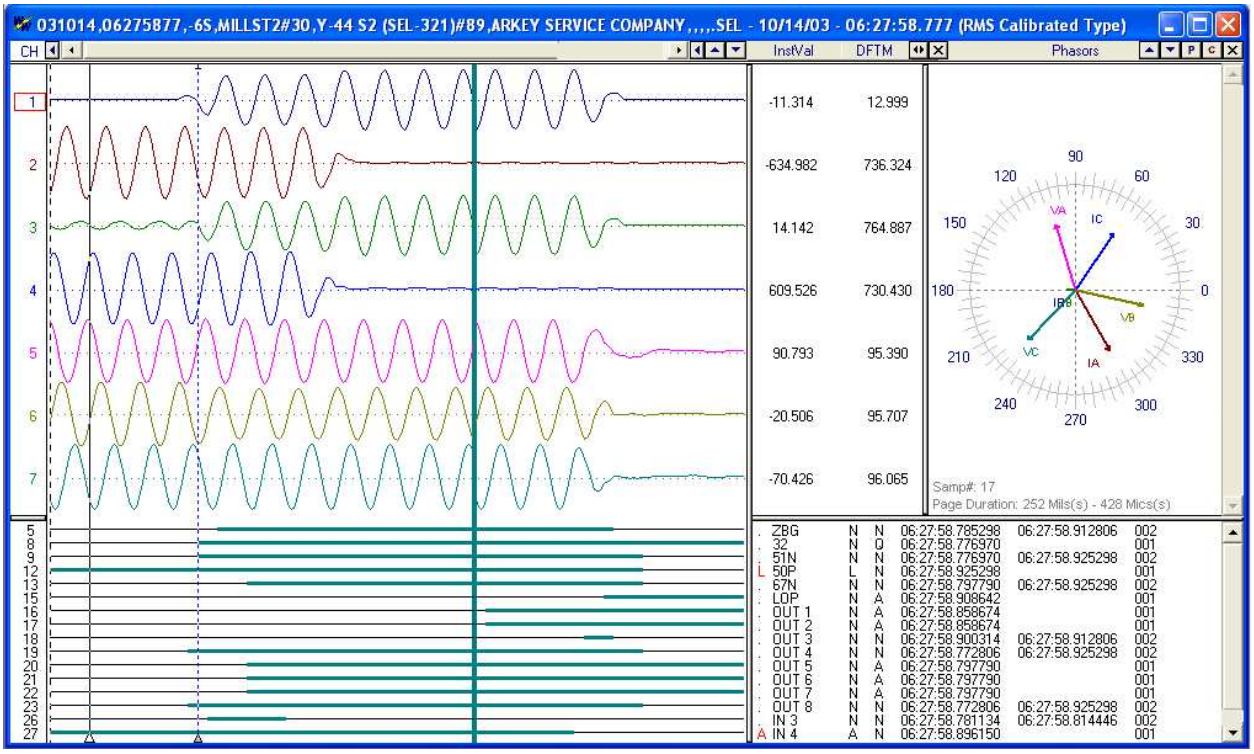


Figure 1.32 Append Waveform Files: Back to Back

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 1.35.
- 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 1.36.

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 1.33.

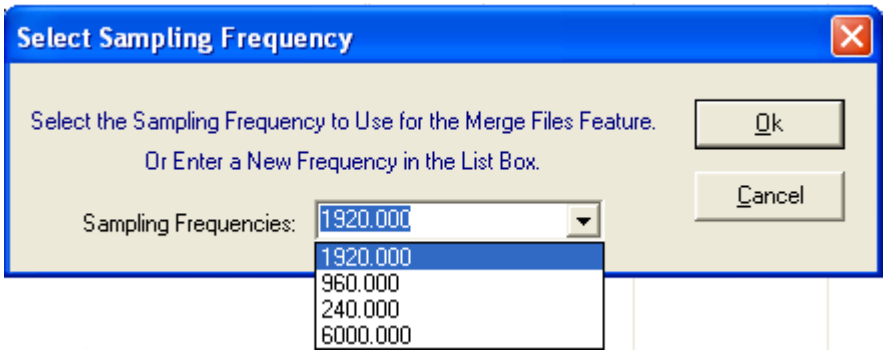


Figure 1.33 Merge Waveform Files: Select Frequency

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 1.34.

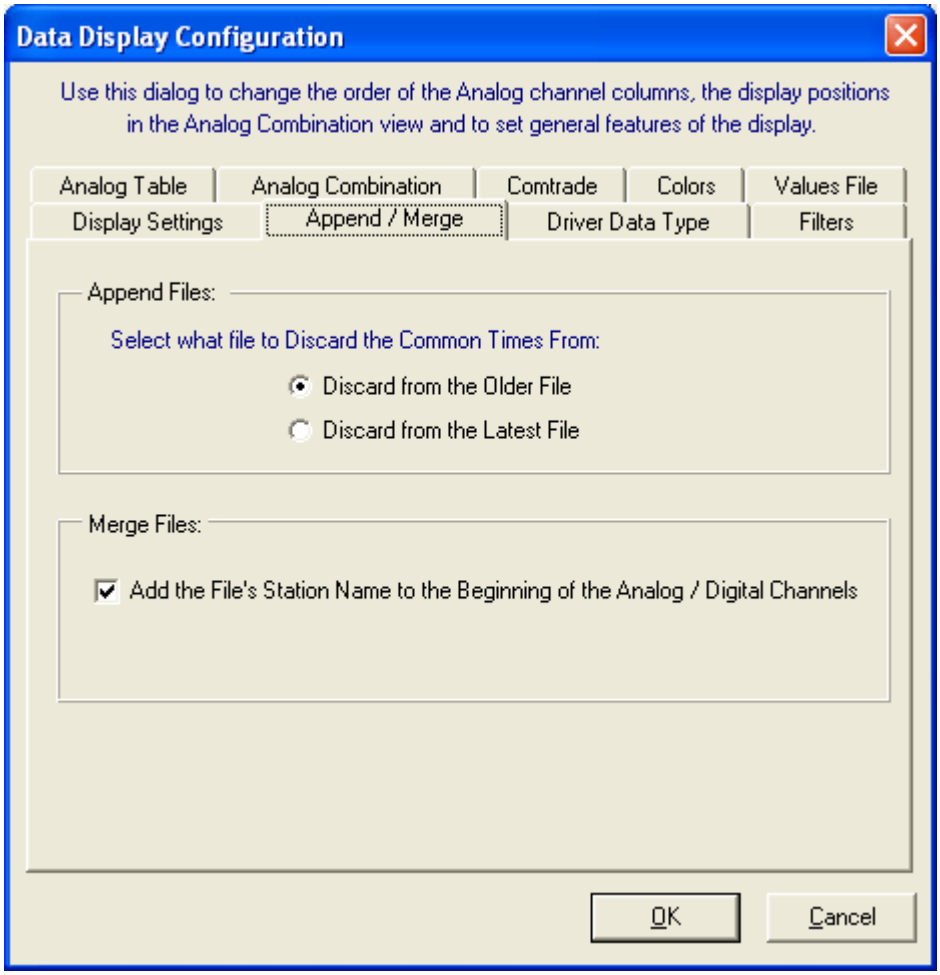


Figure 1.34 Append/Merge Properties

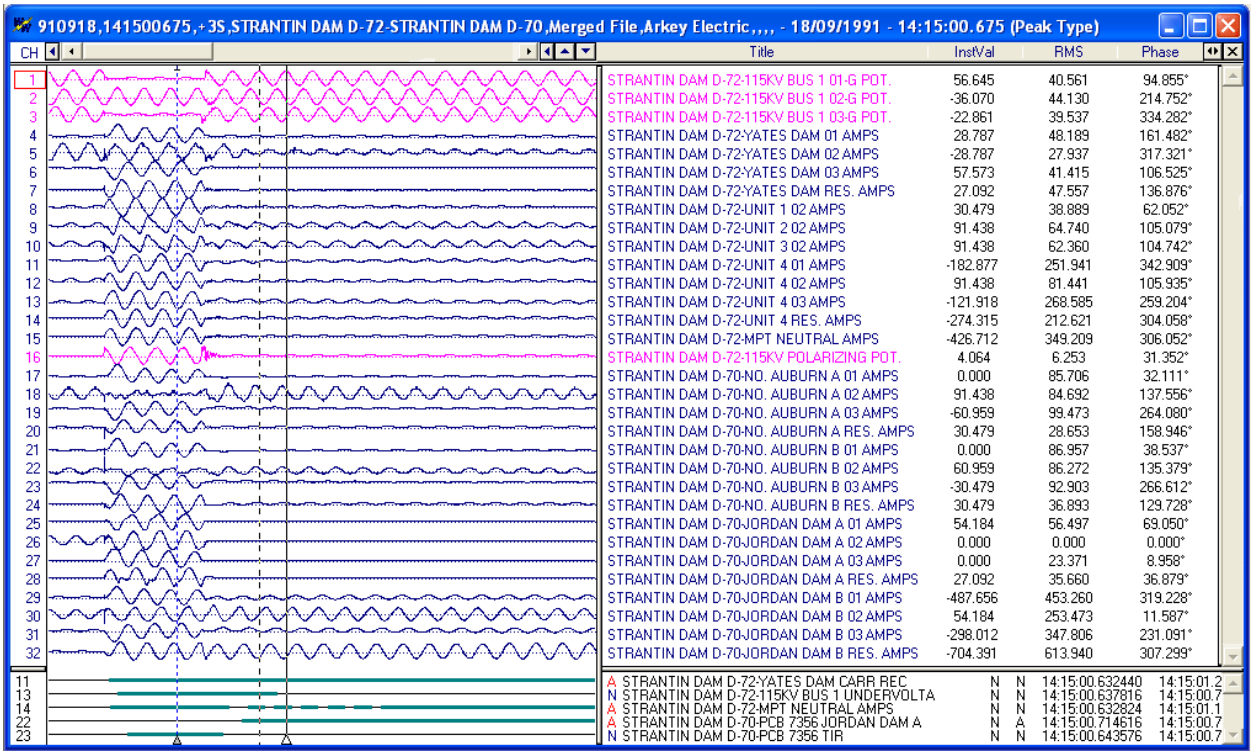


Figure 1.35 Merge Waveform Files By Time

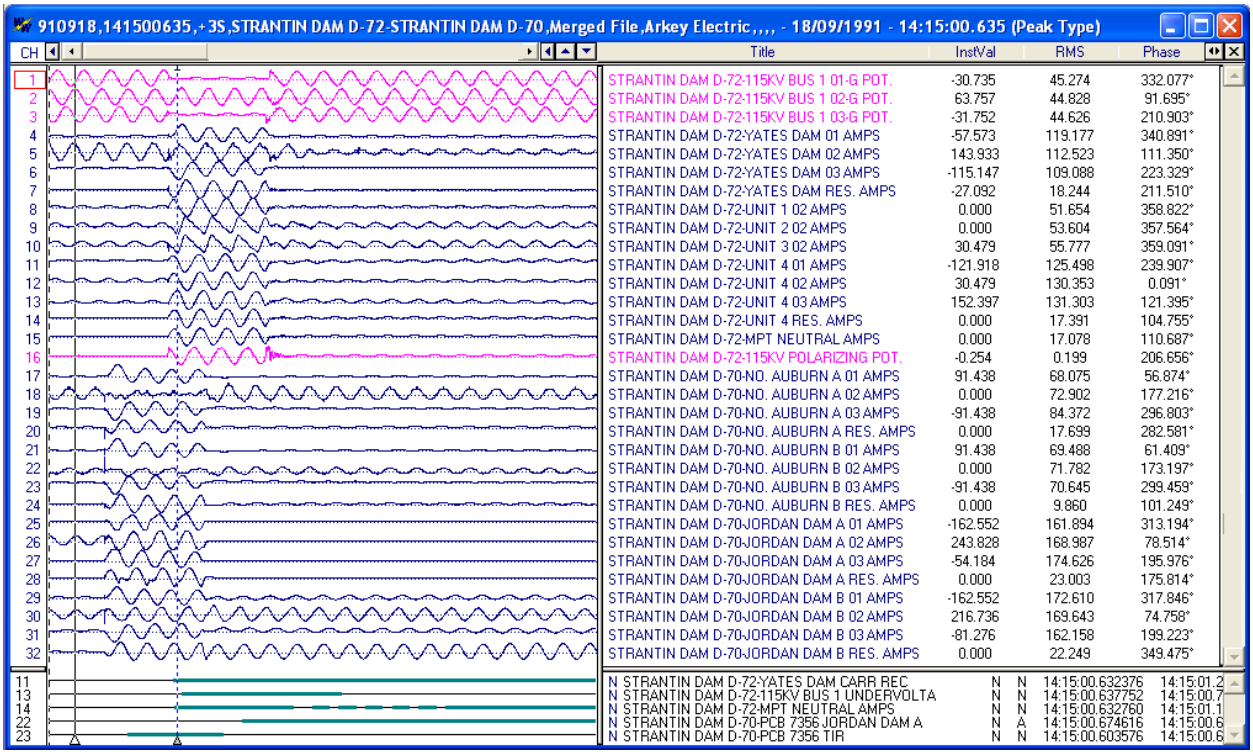


Figure 1.36 Merge Waveform Files By Sample

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.

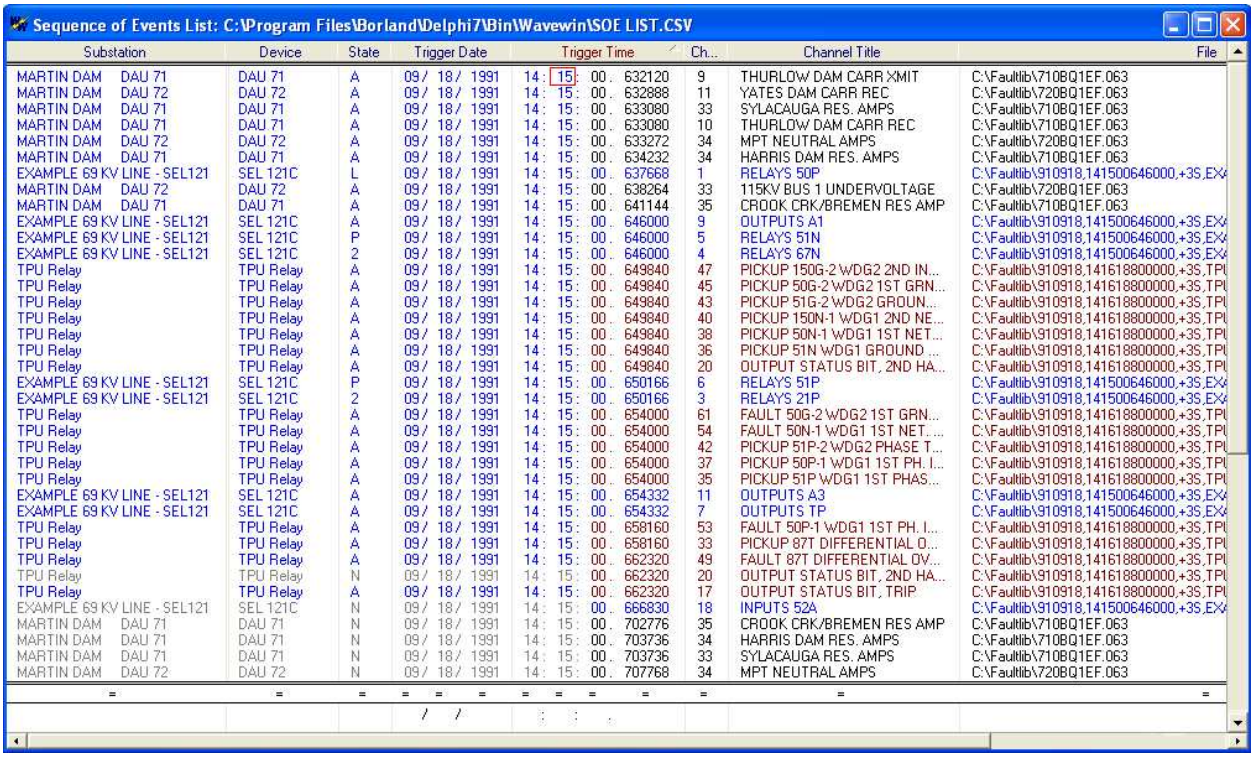
Calibration reports should only be generated on files that contain no fault data such as snap shot files. To generate a report, mark the desired files and select “Calibration Report” from the Options menu. The information contained in the report corresponds to the data displayed in Analog Peak Chart 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 1.37. 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:\Faultlib\710BQ1EF.063
MARTIN DAM DAU 72	DAU 72	A	09/ 18/ 1991	14: 15: 00. 632888	11	YATES DAM CARR REC	C:\Faultlib\720BQ1EF.063
MARTIN DAM DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 633080	33	SYLACAUGA RES. AMPS	C:\Faultlib\710BQ1EF.063
MARTIN DAM DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 633080	10	THURLOW DAM CARR REC	C:\Faultlib\710BQ1EF.063
MARTIN DAM DAU 72	DAU 72	A	09/ 18/ 1991	14: 15: 00. 633272	34	MPT NEUTRAL AMPS	C:\Faultlib\720BQ1EF.063
MARTIN DAM DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 634232	34	HARRIS DAM RES. AMPS	C:\Faultlib\710BQ1EF.063
EXAMPLE 69 KV LINE - SEL121	SEL 121C	L	09/ 18/ 1991	14: 15: 00. 637668	1	RELAYS 50P	C:\Faultlib\910918,141500646000,+3S,EX
MARTIN DAM DAU 72	DAU 72	A	09/ 18/ 1991	14: 15: 00. 638264	33	115KV BUS 1 UNDERVOLTAGE	C:\Faultlib\720BQ1EF.063
MARTIN DAM DAU 71	DAU 71	A	09/ 18/ 1991	14: 15: 00. 641144	35	CROOK CRK/BREMEN RES AMP	C:\Faultlib\710BQ1EF.063
EXAMPLE 69 KV LINE - SEL121	SEL 121C	A	09/ 18/ 1991	14: 15: 00. 646000	9	OUTPUTS A1	C:\Faultlib\910918,141500646000,+3S,EX
EXAMPLE 69 KV LINE - SEL121	SEL 121C	P	09/ 18/ 1991	14: 15: 00. 646000	5	RELAYS 51N	C:\Faultlib\910918,141500646000,+3S,EX
EXAMPLE 69 KV LINE - SEL121	SEL 121C	2	09/ 18/ 1991	14: 15: 00. 646000	4	RELAYS 67N	C:\Faultlib\910918,141500646000,+3S,EX
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	47	PICKUP 150G-2 WDG2 2ND IN...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	45	PICKUP 50G-2 WDG2 1ST GRN...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	43	PICKUP 51G-2 WDG2 GROUN...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	40	PICKUP 150N-1 WDG1 2ND NE...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	38	PICKUP 50N-1 WDG1 1ST NET...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	36	PICKUP 51N WDG1 GROUND ...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 649840	20	OUTPUT STATUS BIT, 2ND HA...	C:\Faultlib\910918,141618800000,+3S,TPU
EXAMPLE 69 KV LINE - SEL121	SEL 121C	P	09/ 18/ 1991	14: 15: 00. 650166	6	RELAYS 51P	C:\Faultlib\910918,141500646000,+3S,EX
EXAMPLE 69 KV LINE - SEL121	SEL 121C	2	09/ 18/ 1991	14: 15: 00. 650166	3	RELAYS 21P	C:\Faultlib\910918,141500646000,+3S,EX
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	61	FAULT 50G-2 WDG2 1ST GRN...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	54	FAULT 50N-1 WDG1 1ST NET. ...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	42	PICKUP 51P-2 WDG2 PHASE T...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	37	PICKUP 50P-1 WDG1 1ST PH. I...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 654000	35	PICKUP 51P WDG1 1ST PHAS...	C:\Faultlib\910918,141618800000,+3S,TPU
EXAMPLE 69 KV LINE - SEL121	SEL 121C	A	09/ 18/ 1991	14: 15: 00. 654332	11	OUTPUTS A3	C:\Faultlib\910918,141500646000,+3S,EX
EXAMPLE 69 KV LINE - SEL121	SEL 121C	A	09/ 18/ 1991	14: 15: 00. 654332	7	OUTPUTS TP	C:\Faultlib\910918,141500646000,+3S,EX
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 658160	53	FAULT 50P-1 WDG1 1ST PH. I...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 658160	33	PICKUP 87T DIFFERENTIAL O...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 662320	49	FAULT 87T DIFFERENTIAL OV...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	N	09/ 18/ 1991	14: 15: 00. 662320	20	OUTPUT STATUS BIT, 2ND HA...	C:\Faultlib\910918,141618800000,+3S,TPU
TPU Relay	TPU Relay	A	09/ 18/ 1991	14: 15: 00. 662320	17	OUTPUT STATUS BIT, TRIP	C:\Faultlib\910918,141618800000,+3S,TPU
EXAMPLE 69 KV LINE - SEL121	SEL 121C	N	09/ 18/ 1991	14: 15: 00. 666830	18	INPUTS 52A	C:\Faultlib\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:\Faultlib\710BQ1EF.063
MARTIN DAM DAU 71	DAU 71	N	09/ 18/ 1991	14: 15: 00. 703736	34	HARRIS DAM RES. AMPS	C:\Faultlib\710BQ1EF.063
MARTIN DAM DAU 71	DAU 71	N	09/ 18/ 1991	14: 15: 00. 703736	33	SYLACAUGA RES. AMPS	C:\Faultlib\710BQ1EF.063
MARTIN DAM DAU 72	DAU 72	N	09/ 18/ 1991	14: 15: 00. 707768	34	MPT NEUTRAL AMPS	C:\Faultlib\720BQ1EF.063

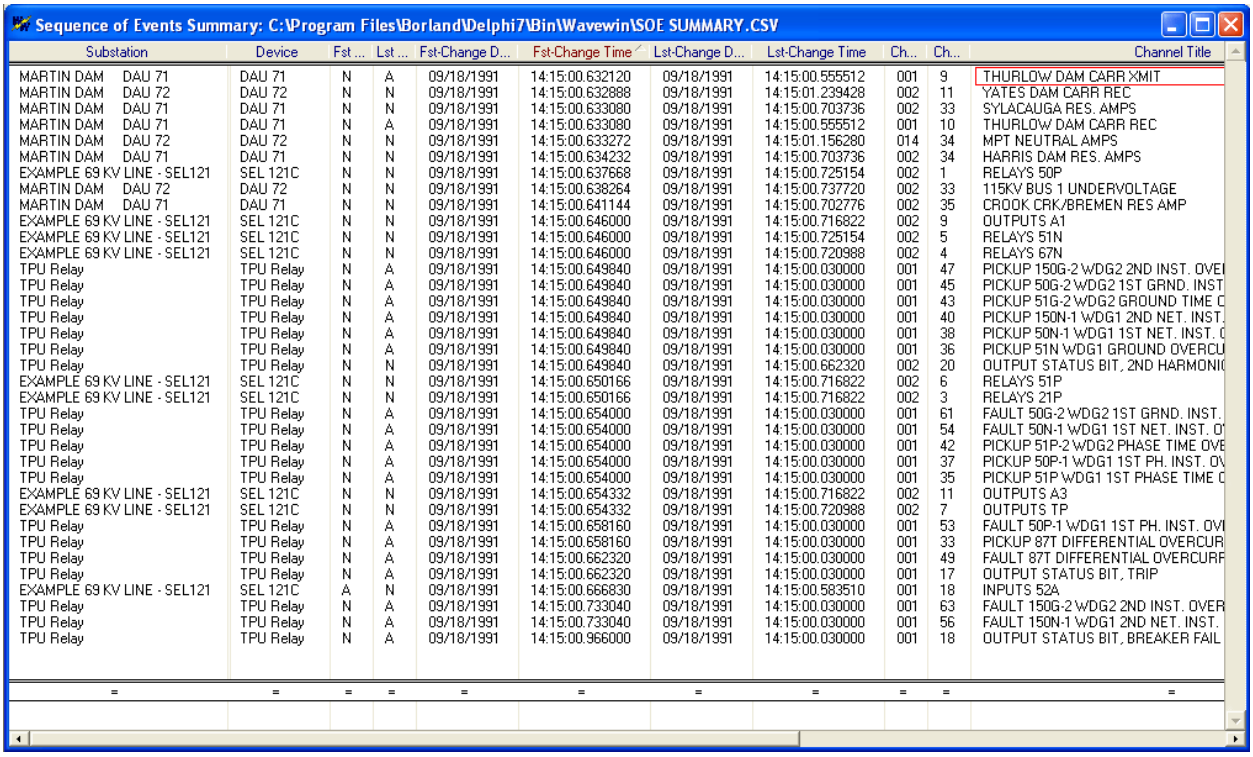
Figure 1.37 SOE List

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 1.38. 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...	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 69 KV LINE - SEL121	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 69 KV LINE - SEL121	SEL 121C	N	N	09/18/1991	14:15:00.646000	09/18/1991	14:15:00.716822	002	9	OUTPUTS A1
EXAMPLE 69 KV LINE - SEL121	SEL 121C	N	N	09/18/1991	14:15:00.646000	09/18/1991	14:15:00.725154	002	5	RELAYS 51N
EXAMPLE 69 KV LINE - SEL121	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	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	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	N	A	09/18/1991	14:15:00.649840	09/18/1991	14:15:00.030000	001	43	PICKUP 51G-2 WDG2 GROUND TIME D
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	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. D
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 OVERCU
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 HARMONI
EXAMPLE 69 KV LINE - SEL121	SEL 121C	N	N	09/18/1991	14:15:00.650166	09/18/1991	14:15:00.716822	002	6	RELAYS 51P
EXAMPLE 69 KV LINE - SEL121	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	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	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	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	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. OV
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 D
EXAMPLE 69 KV LINE - SEL121	SEL 121C	N	N	09/18/1991	14:15:00.654332	09/18/1991	14:15:00.716822	002	11	OUTPUTS A3
EXAMPLE 69 KV LINE - SEL121	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	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. OVI
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	N	A	09/18/1991	14:15:00.662320	09/18/1991	14:15:00.030000	001	49	FAULT 87T DIFFERENTIAL OVERCURR
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
EXAMPLE 69 KV LINE - SEL121	SEL 121C	A	N	09/18/1991	14:15:00.666830	09/18/1991	14:15:00.583510	001	18	INPUTS 52A
TPU Relay	TPU Relay	N	A	09/18/1991	14:15:00.733040	09/18/1991	14:15:00.030000	001	63	FAULT 150G-2 WDG2 2ND INST. OVER
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	N	A	09/18/1991	14:15:00.966000	09/18/1991	14:15:00.030000	001	18	OUTPUT STATUS BIT, BREAKER FAIL

Figure 1.38 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 log data viewer. This feature allows for analyzing load data over a long period.

COMBINDING 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 1.39. 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.

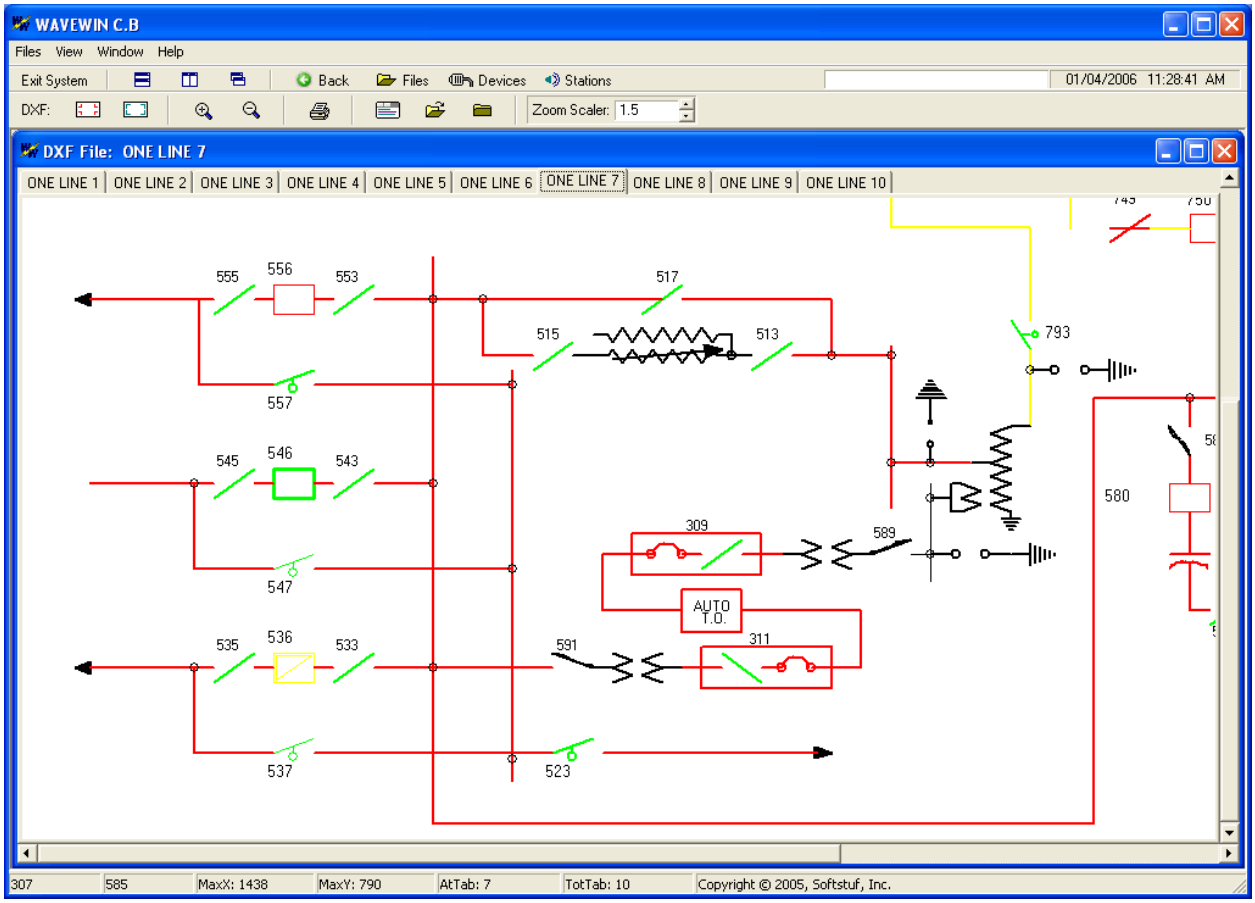


Figure 1.39 DXF Viewer

The status bar at the bottom of the screen displays the X and Y coordinates of the mouse position, the maximum X and Y coordinates of the drawing, the active tab number and the total number of tabs in the window. Refer to Figure 1.23. To zoom in on a given area hold down the left mouse button, surround the area you want to zoom, and release the mouse button or use the **Zoom In** and **Zoom Out** menu buttons. To view the drawing in its original size click the **Original Display** menu button, or click the **Fit to Window** menu button to resize the drawing to fit in the window. Use the **Open File** menu button to add DXF files to the window. Click on the Close File menu button to close an open DXF file.

The Zoom Scalar selectable box Zoom Scaler: 1.5 is used to increase or decrease the drawing's display resolution. For example, when the Zoom In feature is activated the drawing's X and Y resolution values are multiplied by the Zoom IN/OUT Ratio to increase the resolution and when the Zoom Out feature is activated the drawing's X and Y resolution values are divided by the Zoom IN/OUT Ratio to decrease the resolution.

The **Const** menu button allows for changing the file, the drawing's display resolution, and the background color. Refer to Figure 1.40. The dialog fields are described below:

Field	Description
File Name	The path and the DXF filename. Default: Empty. Use the "…" button to browse for a file.
Background Color	The background color for the displayed DXF file. Defult: White.

Field	Description
Max X Pixels	The maximum number of X pixels used to display the DXF file. Enter an integer value.
Max Y Pixels	The maximum number of Y pixels used to display the DXF file. Enter an integer value.

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.

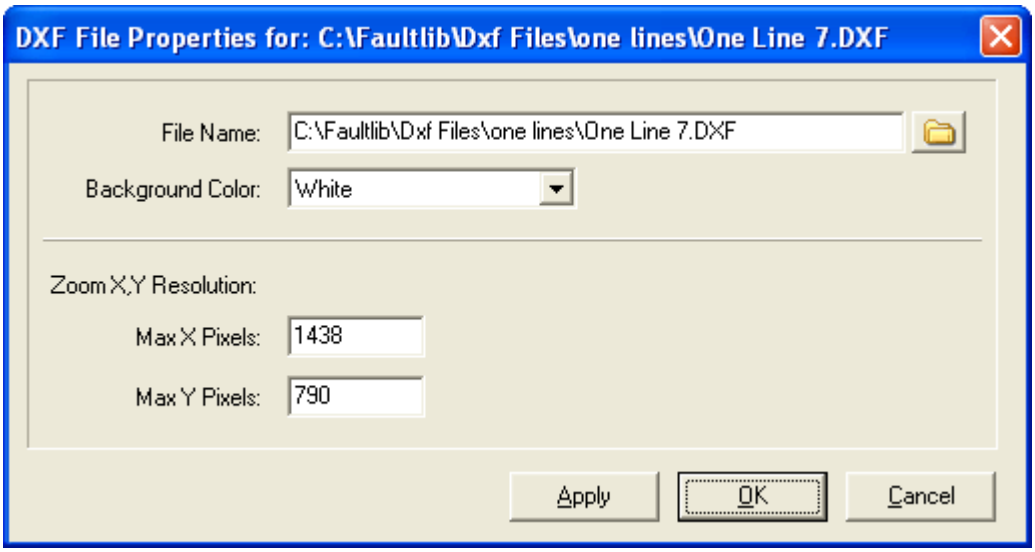


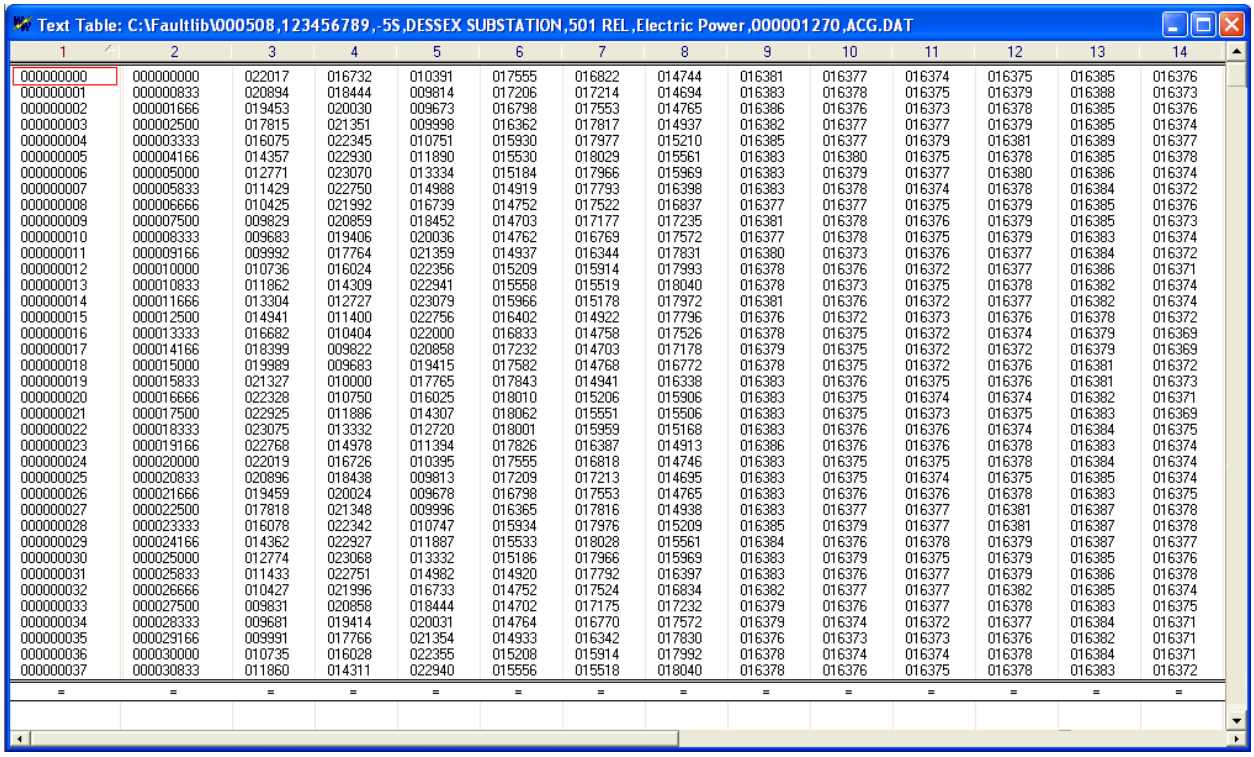
Figure 1.40 DXF Drawing Constants

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 1.41. 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 under triggers and over triggers, 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
000000000	000000000	022017	016732	010391	017555	016822	014744	016381	016377	016374	016375	016385	016376
000000001	000000833	020894	018444	009814	017206	017214	014694	016383	016378	016375	016379	016388	016373
000000002	000001666	019453	020030	009673	016798	017553	014765	016386	016376	016373	016378	016385	016376
000000003	000002500	017815	021351	009998	016362	017817	014937	016382	016377	016377	016379	016385	016374
000000004	000003333	016075	022345	010751	015930	017977	015210	016385	016377	016379	016381	016389	016377
000000005	000004166	014357	022930	011890	015530	018029	015561	016383	016380	016375	016378	016385	016378
000000006	000005000	012771	023070	013334	015184	017966	015969	016383	016379	016377	016380	016386	016374
000000007	000005833	011429	022750	014988	014919	017793	016398	016383	016378	016374	016378	016384	016372
000000008	000006666	010425	021992	016739	014752	017522	016837	016377	016377	016375	016379	016385	016376
000000009	000007500	009829	020859	018452	014703	017177	017235	016381	016378	016376	016379	016385	016373
000000010	000008333	009683	019406	020036	014762	016769	017572	016377	016378	016375	016379	016383	016374
000000011	000009166	009992	017764	021359	014937	016344	017831	016380	016373	016376	016377	016384	016372
000000012	000010000	010736	016024	022356	015209	015914	017993	016378	016376	016372	016377	016386	016371
000000013	000010833	011862	014309	022941	015558	015519	018040	016378	016373	016375	016378	016382	016374
000000014	000011666	013304	012727	023079	015966	015178	017972	016381	016376	016372	016377	016382	016374
000000015	000012500	014941	011400	022756	016402	014922	017796	016376	016372	016373	016376	016378	016372
000000016	000013333	016682	010404	022000	016833	014758	017526	016378	016375	016372	016374	016379	016369
000000017	000014166	018399	009822	020858	017232	014703	017178	016379	016375	016372	016372	016379	016369
000000018	000015000	019989	009683	019415	017582	014768	016772	016378	016375	016372	016376	016381	016372
000000019	000015833	021327	010000	017765	017843	014941	016338	016383	016376	016375	016376	016381	016373
000000020	000016666	022328	010750	016025	018010	015206	015906	016383	016375	016374	016374	016382	016371
000000021	000017500	022925	011886	014307	018062	015551	015506	016383	016375	016373	016375	016383	016369
000000022	000018333	023075	013332	012720	018001	015959	015168	016383	016376	016376	016374	016384	016375
000000023	000019166	022768	014978	011394	017826	016387	014913	016386	016376	016376	016378	016383	016374
000000024	000020000	022019	016726	010395	017555	016818	014746	016383	016375	016375	016378	016384	016374
000000025	000020833	020896	018438	009813	017209	017213	014695	016383	016375	016374	016375	016385	016374
000000026	000021666	019459	020024	009678	016798	017553	014765	016383	016376	016376	016378	016383	016375
000000027	000022500	017818	021348	009996	016365	017816	014938	016383	016377	016377	016381	016387	016378
000000028	000023333	016078	022342	010747	015934	017976	015209	016385	016379	016377	016381	016387	016378
000000029	000024166	014362	022927	011887	015533	018028	015561	016384	016376	016378	016379	016387	016377
000000030	000025000	012774	023068	013332	015186	017966	015969	016383	016379	016375	016379	016385	016376
000000031	000025833	011433	022751	014982	014920	017792	016397	016383	016376	016377	016379	016386	016378
000000032	000026666	010427	021996	016733	014752	017524	016834	016382	016377	016377	016382	016385	016374
000000033	000027500	009831	020858	018444	014702	017175	017232	016379	016376	016377	016378	016383	016375
000000034	000028333	009681	019414	020031	014764	016770	017572	016379	016374	016372	016377	016384	016371
000000035	000029166	009991	017766	021354	014933	016342	017830	016376	016373	016373	016376	016382	016371
000000036	000030000	010735	016028	022355	015208	015914	017992	016378	016374	016374	016378	016384	016371
000000037	000030833	011860	014311	022940	015556	015518	018040	016378	016376	016375	016378	016383	016372

Figure 1.41 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 1.42.

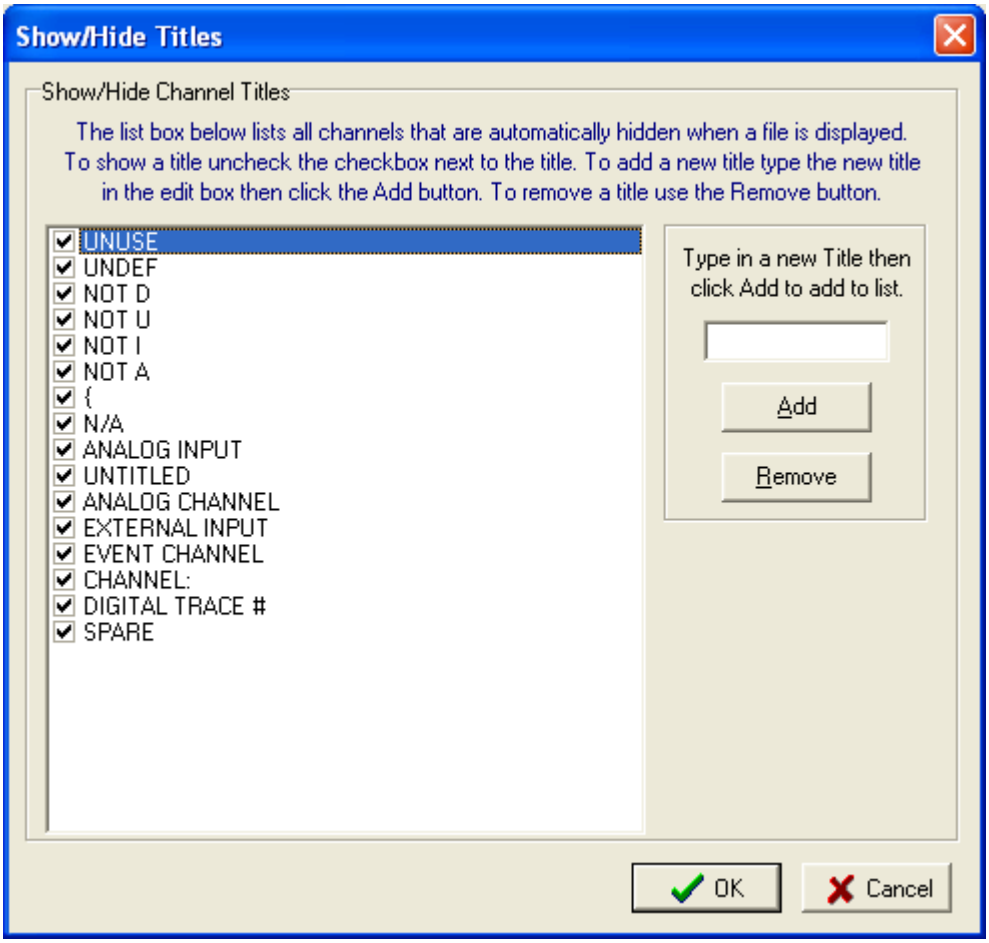


Figure 1.42 Show/Hide Channel Titles Dialog

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 1.43. Use the tab key to move the cursor from the table to the query fields and up arrow to return to the table. 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 (<).

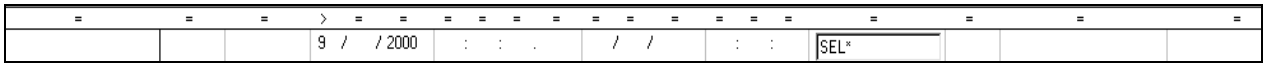


Figure 1.43 Query Fields

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 tab and shift-tab keys to navigate through the query fields and the <enter> key to process the criteria at the cursor position.

DSITURBANCE REPORT

The disturbance report feature creates a comma delimited file that contains the following information for each file processed (if available in the file):

- Utility Name,
- Device Name (Fault),
- File Start Date & Time,
- Substation Name,
- Report Date,
- Faulted Phase,
- Fault Location,
- Line Length,
- Fault Current,
- Maximum Voltage,
- Maximum Frequency,
- Minimum Frequency,
- Pass/Fail,
- Passed Filters and the
- Source file's folder and filename.

The disturbance report dialog allows for setting the report's destination folder and filename. It also allows for setting the folder(s) where the event files are located. The filter section is for setting filter levels for the Faulted Phase, Fault Location, Current and Voltage thresholds and the deviation for the frequency.

To open the disturbance report dialog, open the “Options” menu in the file manager’s table, select the “Report” menu then click on the “Disturbance Report” menu option. Refer to Figure 1.44.

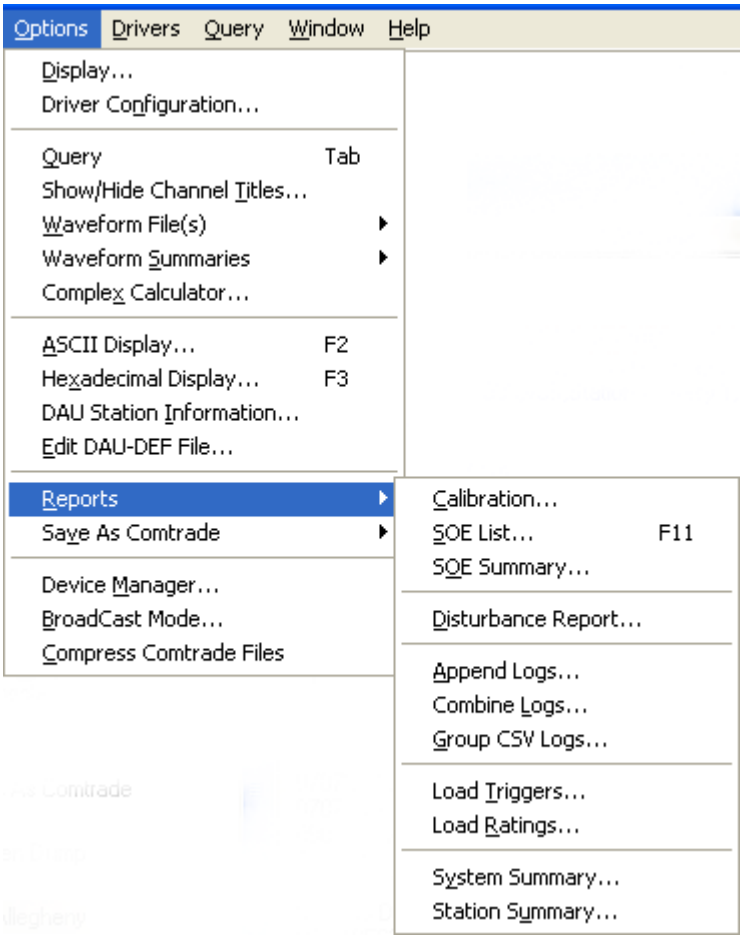


Figure 1.44 Disturbance Report Menu

The disturbance report dialog is displayed when the “Disturbance Report” option is selected. Refer to Figure 1.45.

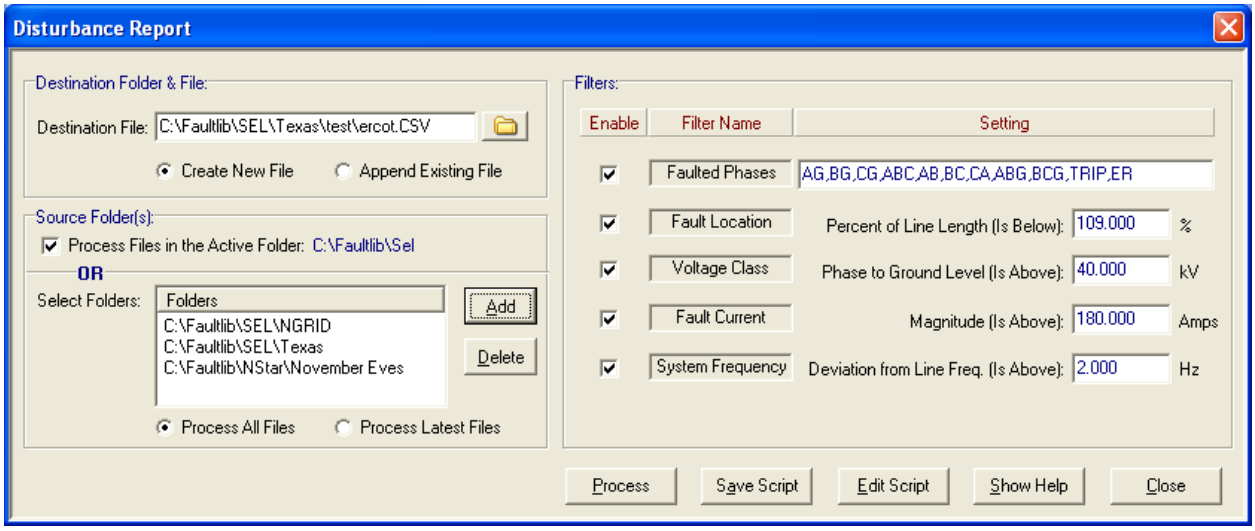


Figure 1.45 Disturbance Report Dialog

The disturbance dialog has 3 sections: Destination Folder & File, Source Folder(s) and Filters. Each section is explained below along with the functions for each button.

DESTINATION FOLDER & FILE:
The Destination Folder & File section is used to set the disturbance report folder & filename. Type the drive, folder and filename into the "Destination File:" field or use the Browse button to locate an existing file or for creating a new file and/or folder. Refer to Figure 1.46.

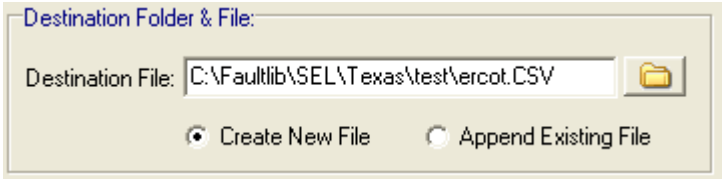


Figure 1.46 Disturbance Report: Destination Folder & File

To save the disturbance information to a new file, click the "Create New File" radio button. This option will clear the file before processing the event files. To append the disturbance information to the end of an existing file, click the "Append Existing File" radio button.

FOLDERS:
The Folders section is used for defining where the event files are located. To process files located in the File Manager's active folder check the "Process Files in the Active Folder" check box. This feature will process only the marked event files, if there are no marked files then it will process all the event files.

If the event files are located in different folders then use the "Add" button to add a folder to the Source Folder list. To remove a folder from the list, use the "Delete" button. Refer to Figure 1.47.

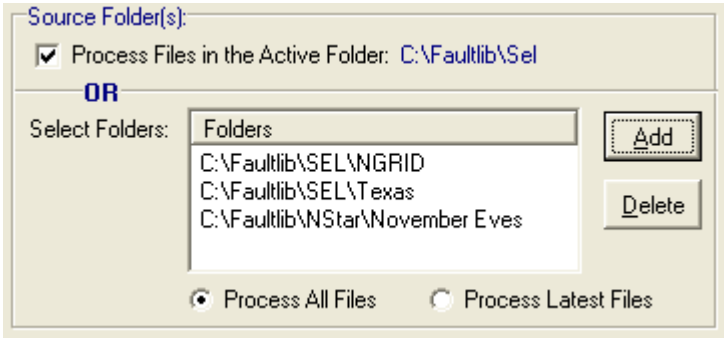


Figure 1.47 Disturbance Report: Source Folder(s)

FILTERS:
The Filters section is used to define the faulted phases, the filter levels for the fault location, voltage class and fault current levels. It also defines the deviation of the maximum and minimum frequency values from the Line Frequency. Refer to Figure 1.48.

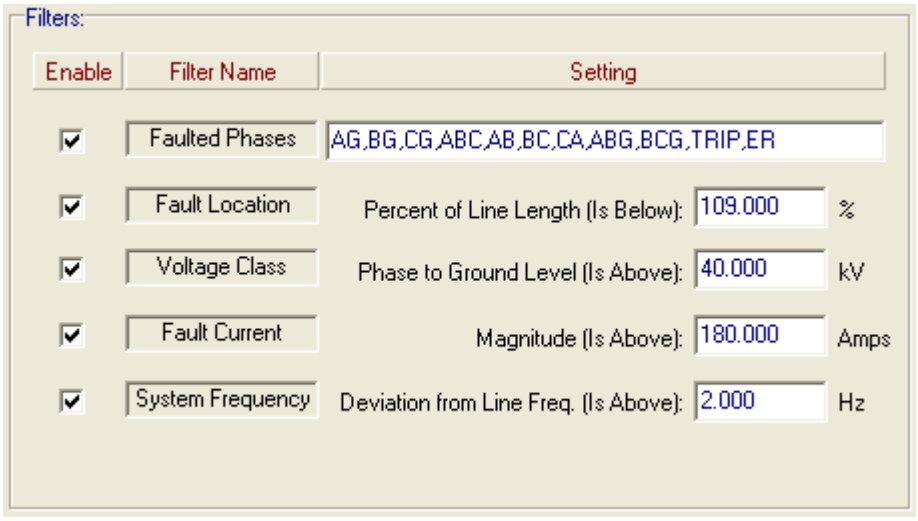


Figure 1.48 Disturbance Report: Filters

After the filters are applied to the data file the file will be tagged with a PASS or FAIL. A PASS means that the file's fault type exists in the list AND the fault location is within the entered percentage of the line length AND the fault current is above the entered fault current value AND the voltage class is above the entered voltage class value OR the maximum or minimum frequency is above the entered deviation from the line frequency. The calculations used are listed below:

For files with no Voltage Channels a PASS Equals:
Faulted Phase is in the List of Filter Phase Settings
AND
Maximum Fault Current is > Entered Fault Current Filter
OR
|Maximum/Minimum Frequency Value - Line Frequency| is > Entered Filter Deviation Value

For files with Voltage Channels a PASS Equals:
Faulted Phase is in the List of Filter Phase Settings
AND
Fault Location is < Entered % of the Line Length
AND
Maximum Voltage Value is > Entered Voltage Class Filter
AND
Maximum Fault Current is > Entered Fault Current Filter
OR
|Maximum/Minimum Frequency Value - Line Frequency| is > Enter Filter Deviation Value

Each file in the report also lists the filters that triggered. The 5 columns to the right of the PASS/FAIL column list the filters that triggered. Each column is labeled according to the filter:
P = Faulted Phase Filter
L = Fault Location Filter
C = Current Filter
V = Voltage Filter
F = Frequency Filter

If a filter triggers then the filter letter is displayed in the columns else it is blank. Refer to Figure 1.49.

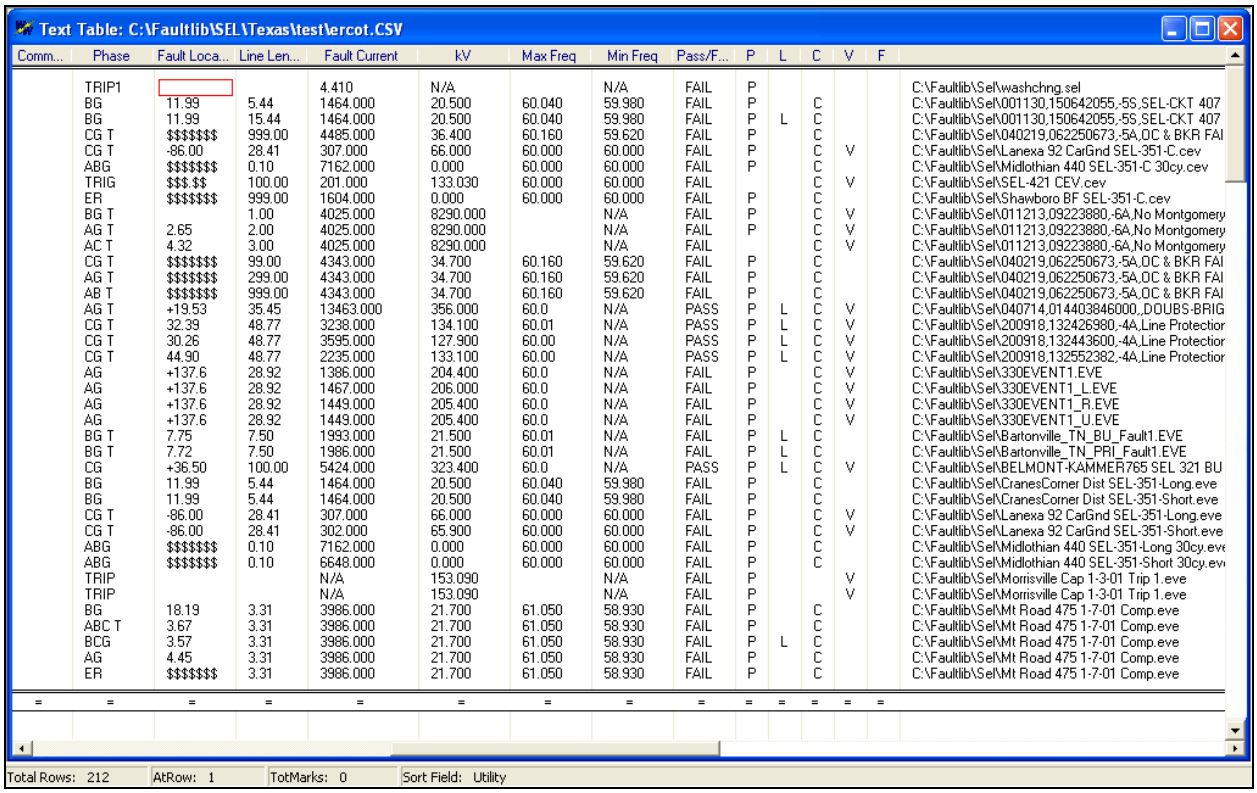


Figure 1.49 Disturbance Report

The “Process” button starts the disturbance report. Once started the Disturbance dialog is closed and each file is processed. The progress bar displayed in the button speedbar is updated according to the number of files to process and the cuurent file being processed.

When the processing is complete a comma delimited table is displayed. Refer to Figure 1.49. The comma delimited table allows for sorting each column by clicking on the column’s header. The query section located below the table allows for quickly searching for specific files. Also, the processed files can be displayed by double clicking on a row or moving the table cursor to the row and pressing enter. The file will be displayed in the data plotting analysis window. Refer to Figure 1.50.

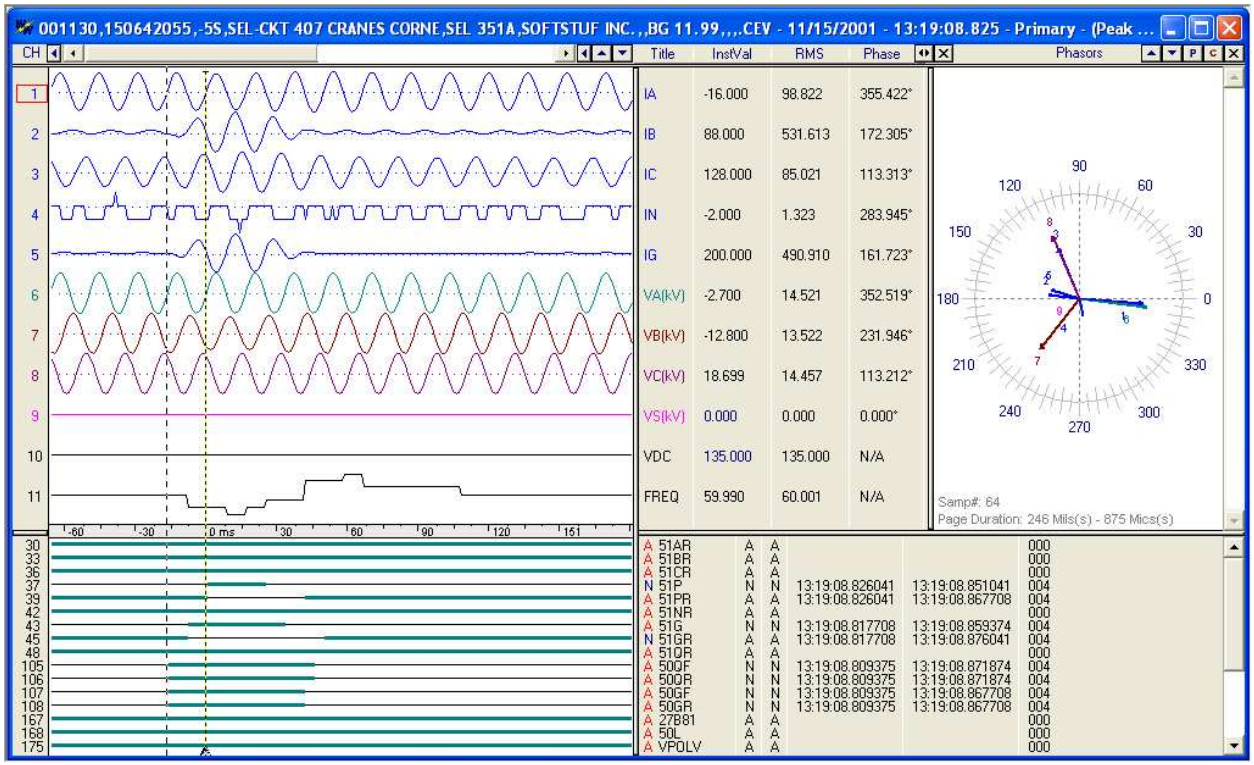


Figure 1.50 Disturbance Display File

BUTTONS:
There are 5 buttons displayed at the bottom of the disturbance dialog. Each button is explained below:

1. **Process Button:** The process button starts the disturbance report. The dialog is closed and each file is processed. The progress bar displayed in the button speedbar is updated according to the number of files to process and what file is currently being processed.

2. **Save Script:** All the information displayed in the dialog is saved in a script file located in the folder where Wavewin is located. The file is called: Disturbance.ini. A messagebox is displayed confirming that the information has been saved. The dialog information is also saved to the Disturbance.ini file when the “Process” button is clicked.

3. **Edit Script:** The edit script button displays the Disturbance.ini file in the ASCII editor.

4. **Show Help:** The show help button displays the help information in a note pad below the buttons. The window size is increased to show the note pad. When the help window is displayed the “Show Help” button’s text changes to “Hide Help”. To hide the help window click on “Hide Help”.

5. **Close:** Close the dialog without saving the entered information.

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 1.51. 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.

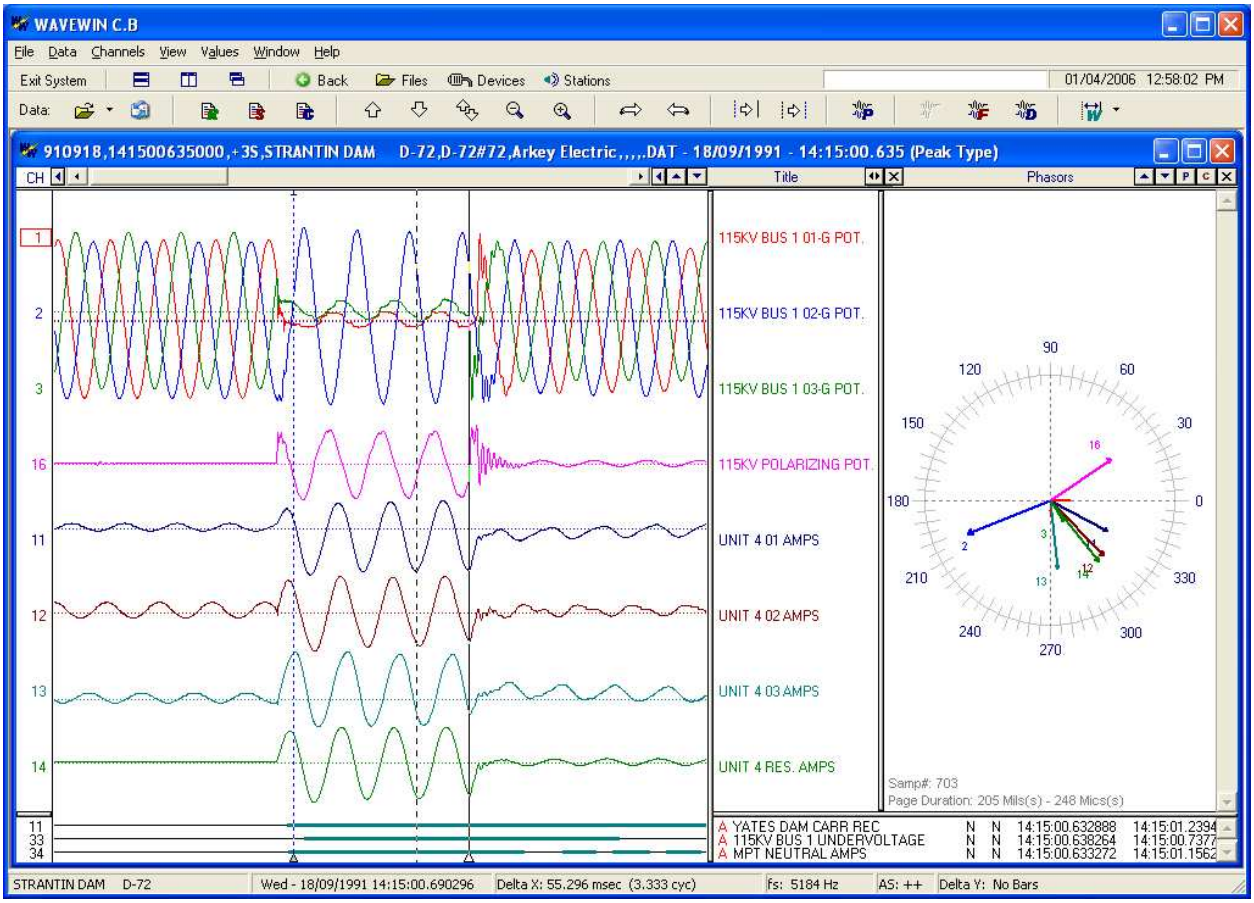


Figure 1.51 Data Display

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 1.51. 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 mark the channel and use the increase/decrease amplitude menu buttons or the Ctrl-Up and Ctrl-Down keys

To toggles 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 1.52. 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.

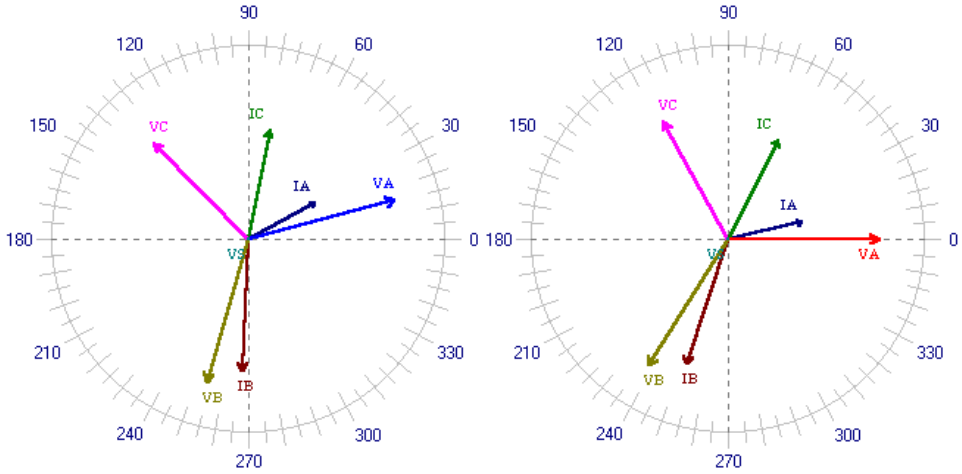


Figure 1.52 (a) Non-Referenced Phasors (b) Referenced Phasors

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 1.54. 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 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 1.55. 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 1.53. The default view is the % of Fundamental.

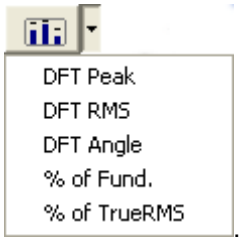


Figure 1.53 Histogram Drop Down Menu

The harmonic histogram bars can be resized using the resize up and down arrows 

to display more or less harmonics in the window. The text displayed above the histogram bars can be shown or hidden be clicking on the Show/Hide text bar button  . The harmonics window can be resized by dragging the edge of the window to show more or less harmonics per window.

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.

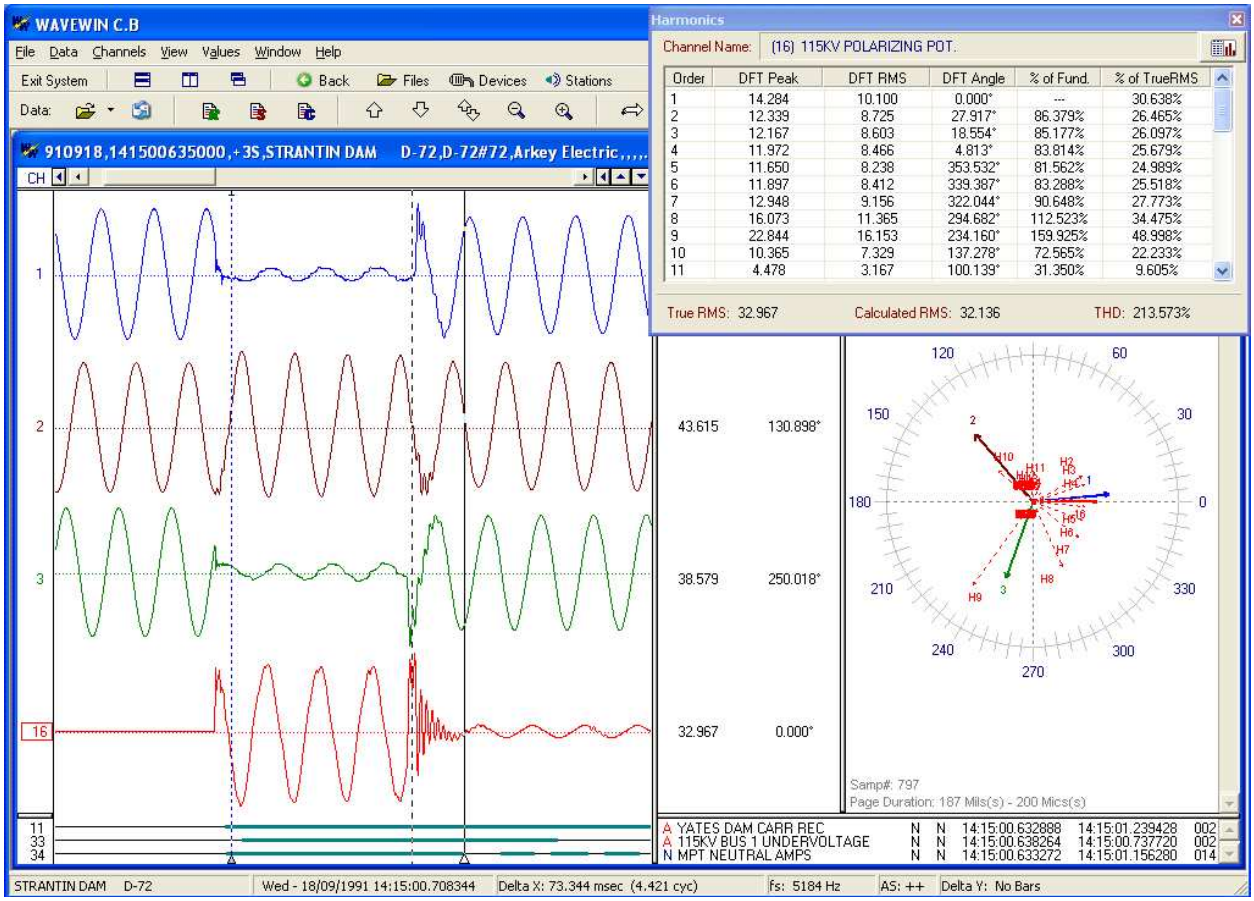


Figure 1.54 Harmonics Table View

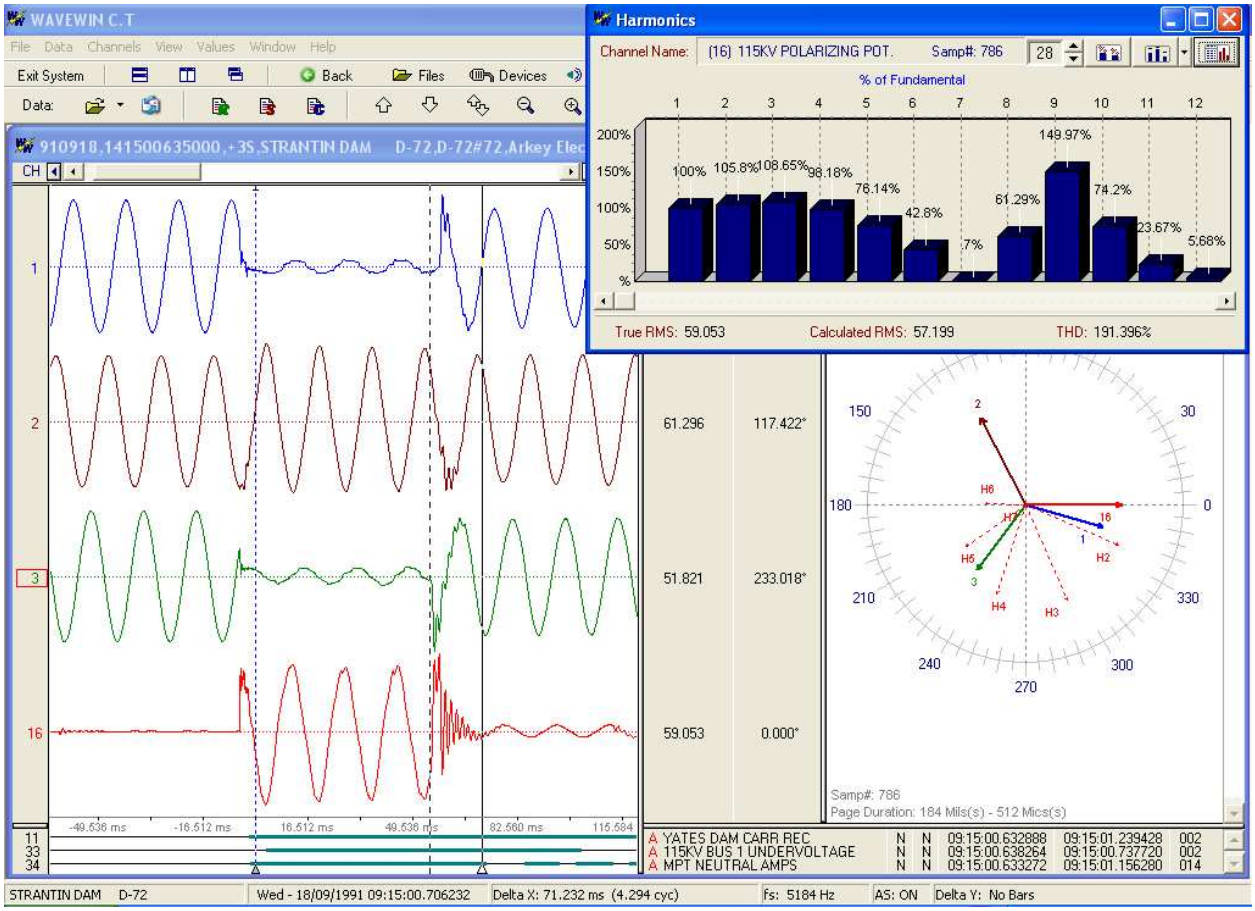


Figure 1.55 Harmonics Histogram View

PERIODIC LOG FILES

The periodic log viewer allows for viewing and analyzing large amounts of event data in a single display. Refer to Figure 1.56. 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.

The ABB Load Profile and SDC log drivers are specific drivers used to view periodic log data. The COMTRADE format also displays log data. The ABB Load Profile format is an ASCII text file that contains time sequenced load information. The SDC Log format is an ASCII comma delimited CSV text file. The first line of the file is the header information. These files are generated from the Station Data Concentrator (SDC).

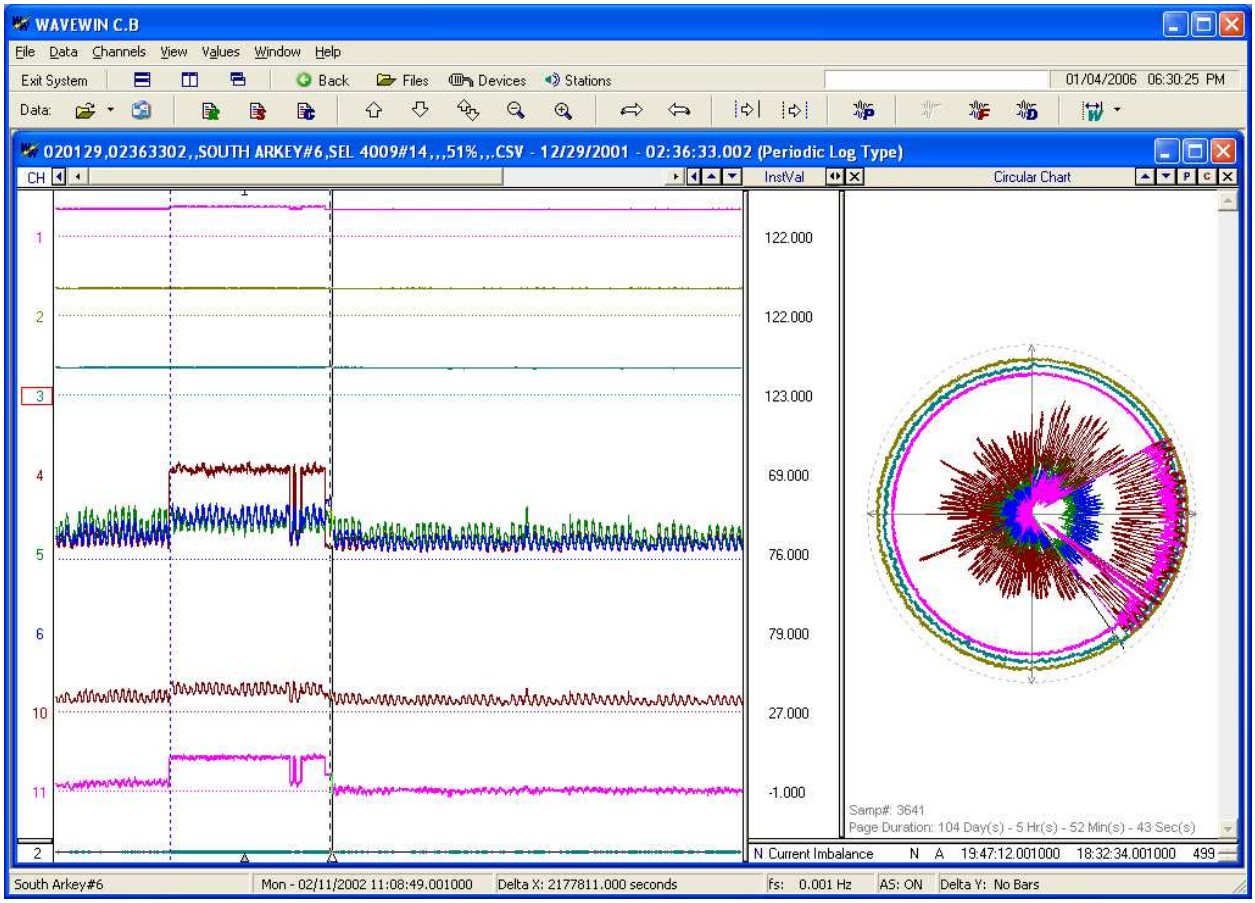


Figure 1.56 Periodic Log File

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 1.56 and 1.57. 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.

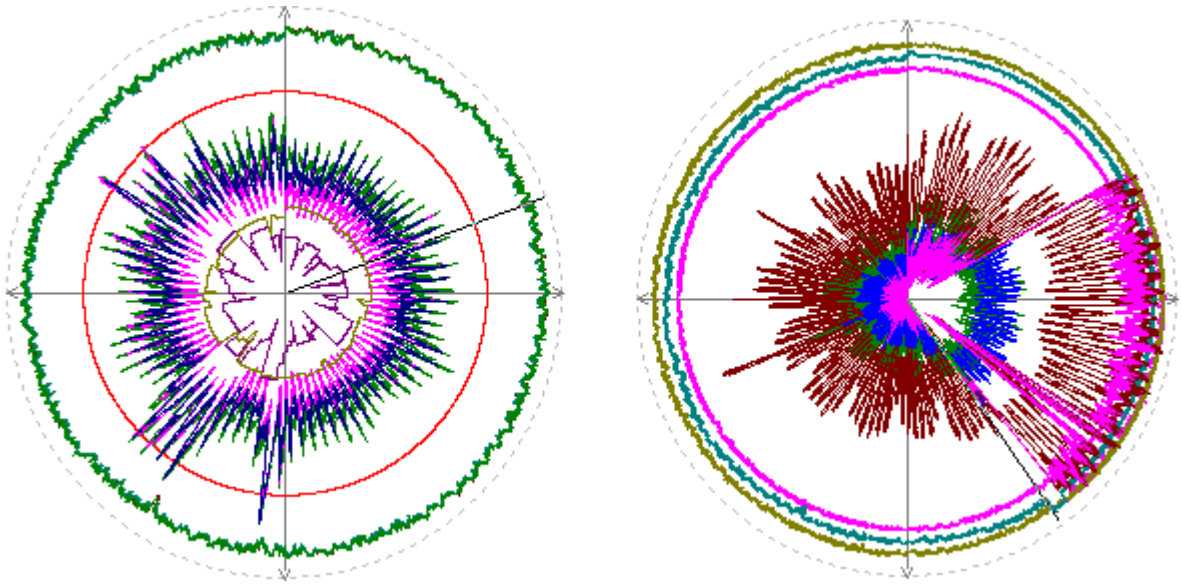


Figure 1.57 Circular Charts

DISPLAY DRIVER'S DATA TYPE

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 driver saves the sample values as RMS calibrated then set the display driver's data type. If the display driver is not set for RMS calibrated data 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 1.58.

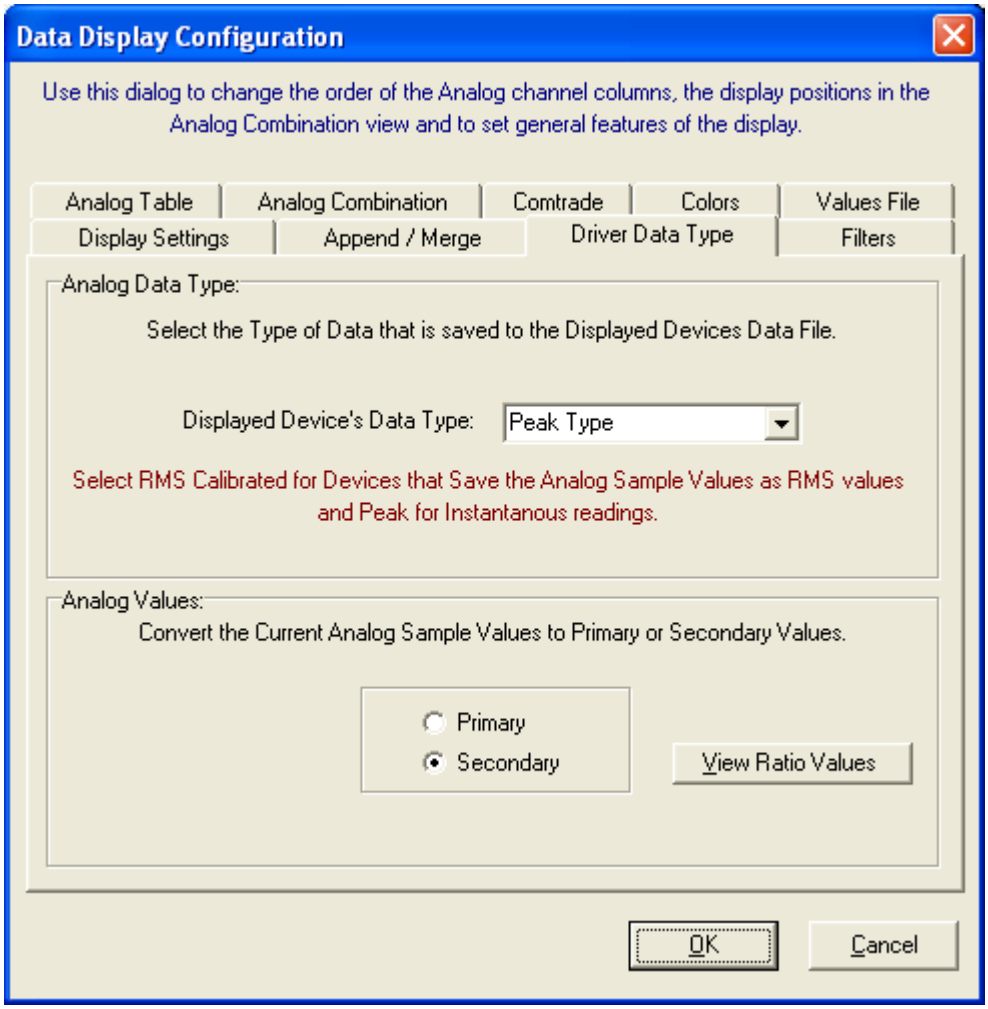


Figure 1.58 Analog Data Type Setting

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 1.59.

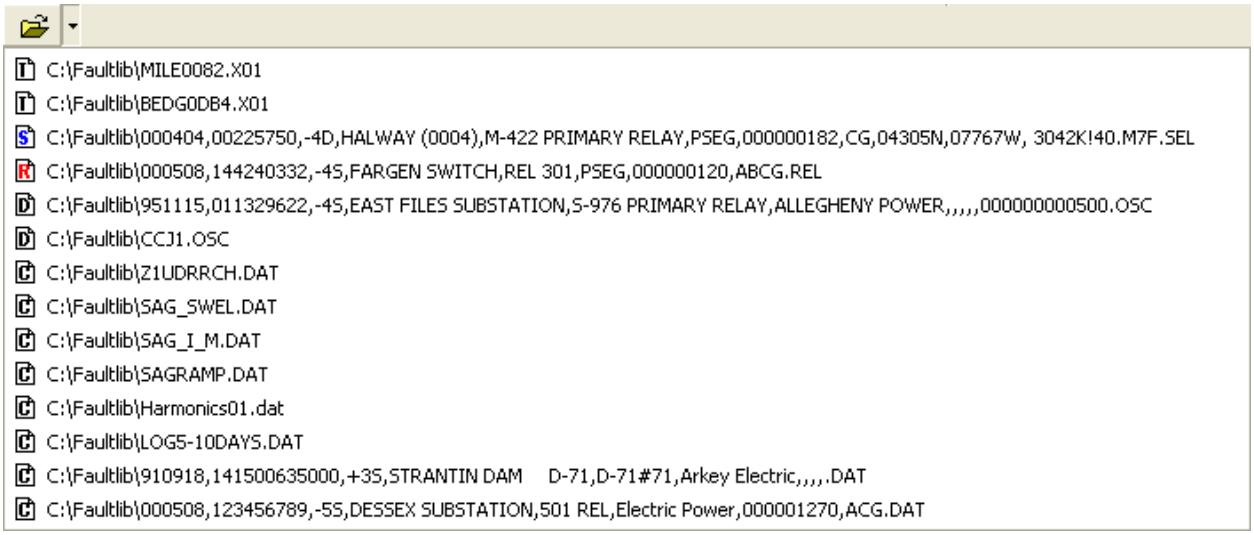


Figure 1.59 ReOpen Data File

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 △ 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. 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.

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 “Resize Sliding Window” menu option under the “View” menu. Refer to Figures 1.60 to 1.62. 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.

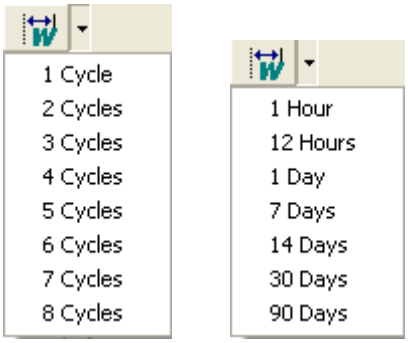


Figure 1.60 Resize Sliding Windows Drop Down Menus

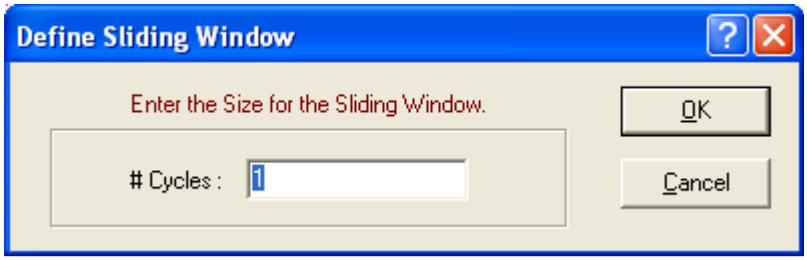


Figure 1.61 Resize Sliding Dialog for Waveforms

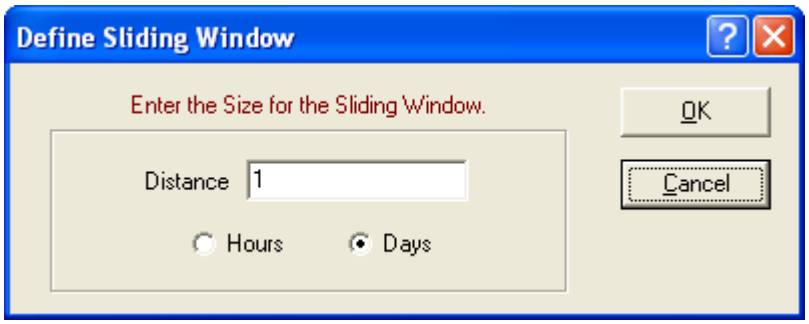


Figure 1.62 Resize Sliding Windows Dialog for Log Files

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 analog 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 1.63. This window allows for editing the file, saving any changes, saving the file under a new name and for opening other Value files.

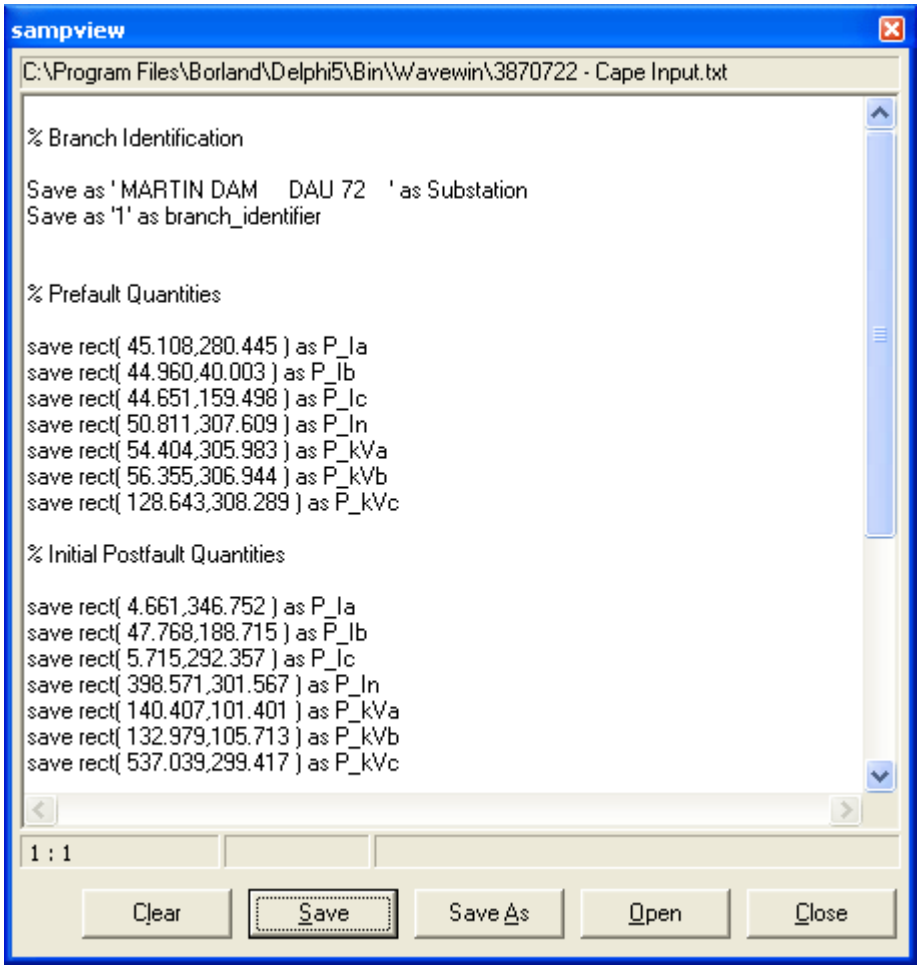


Figure 1.63 Values File

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 last column of the analog 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** menus 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 "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.

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

SELECTING PREDEFINED VIEWS

The DFR Transcan and Faxtrax records have predefined views encoded into their format. To select the predefined views click on the "Show All/ Select View" drop down menu button or select the "Select Views" menu option under the "View" menu option. A list of the available lines/graphs will be displayed. Refer to Figures 1.64 & 1.65. Click on the desired view. The analog channels defined in the select view will be displayed. To view all the analog channels in the file press the <esc> key, the <backspace>, or click the "Show All" menu button or click the **ViewAll** menu button. To view user defined views refer to the "User Views" section.

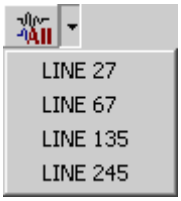


Figure 1.64 Predefined Lines

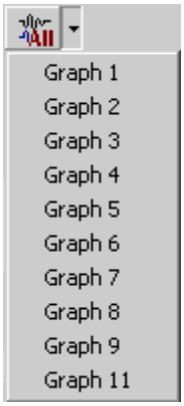


Figure 1.65 Predefined Graphs

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 1.66. 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 1.66. 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".

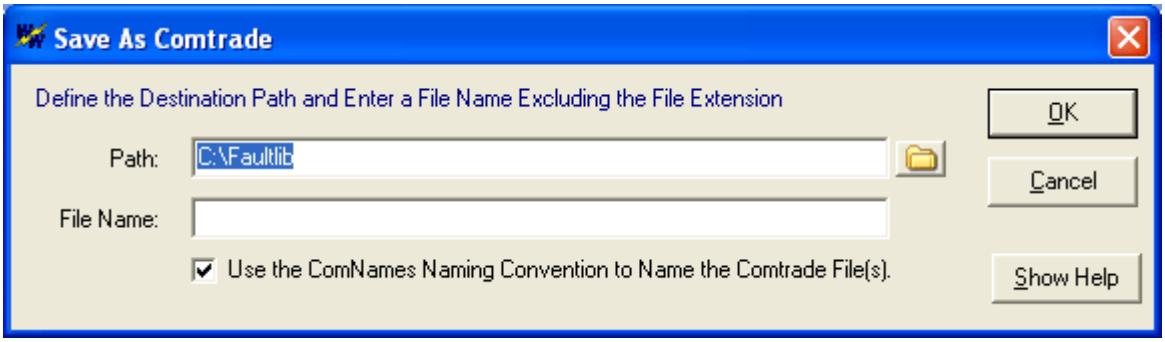


Figure 1.66 Save As COMTRADE

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).
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 (Load 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).

Field	Description
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

or the SEL defined state. 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 1st 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 date type tab is used to define the type of date that is saved to the displayed device's data file: RMS Calibrated 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 1.67. 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.

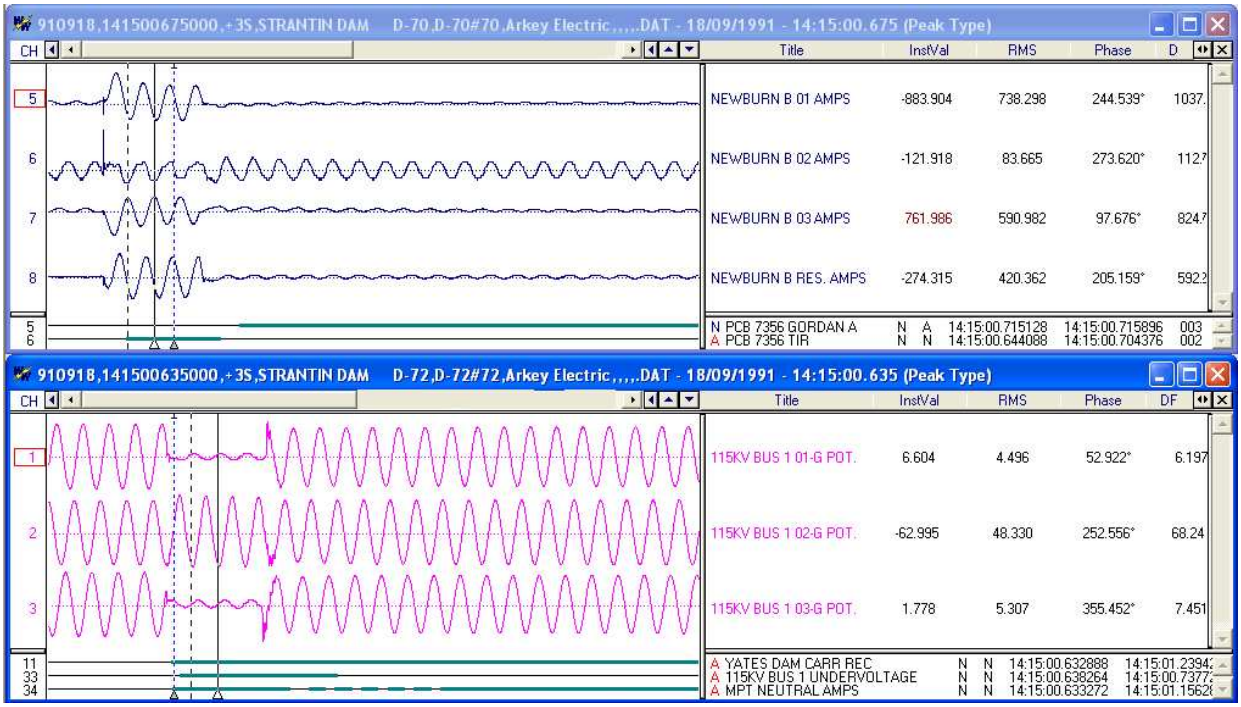


Figure 1.67 Cursor Synchronization

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 1.70 & 1.71.
- 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 1.72 & 1.73.
- 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 1.74.

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 1.68.

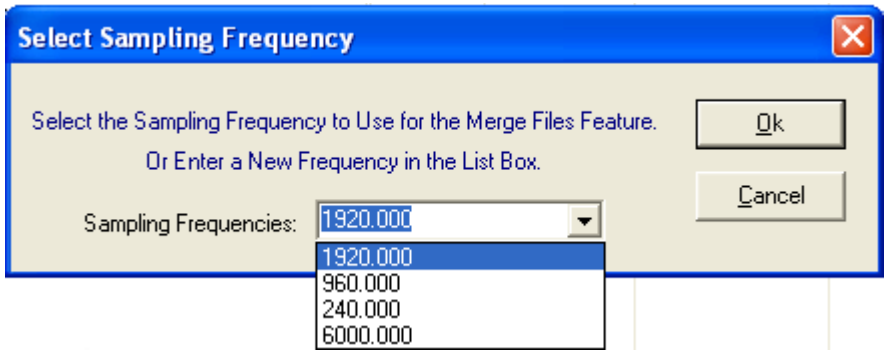


Figure 1.68 Merge Open Files: Select Frequency

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 1.69.

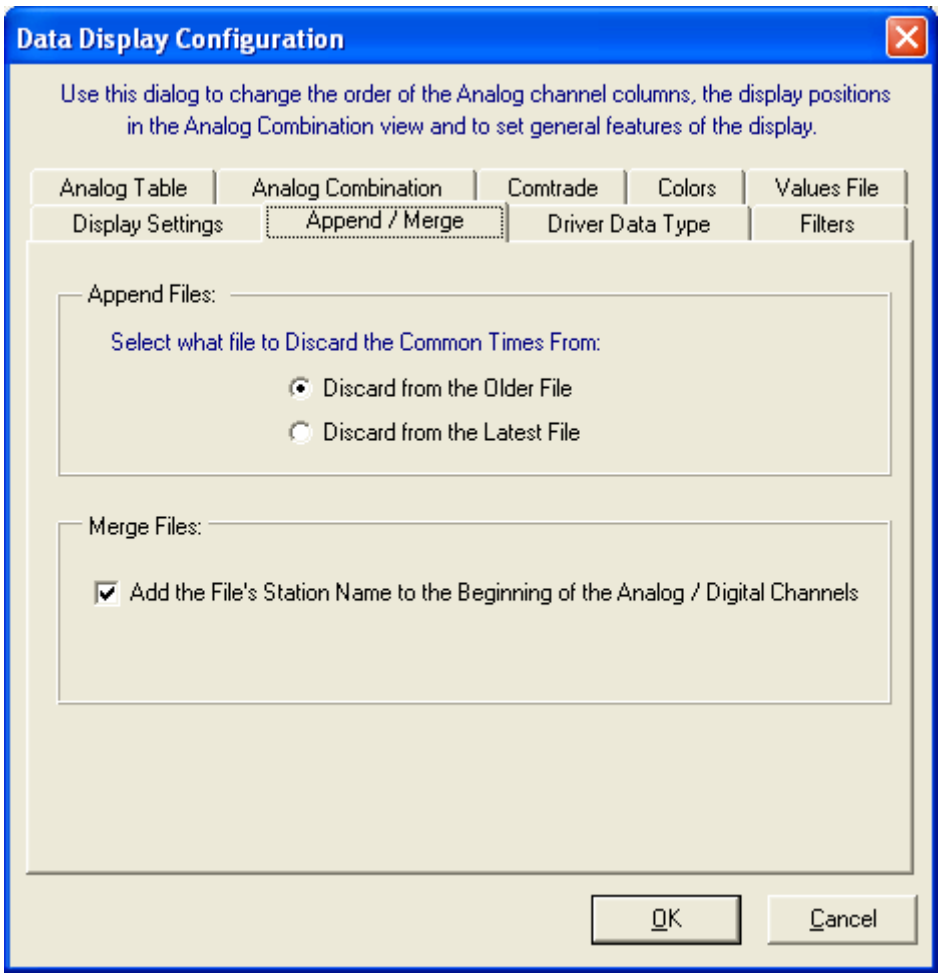


Figure 1.69 Append/Merge Properties

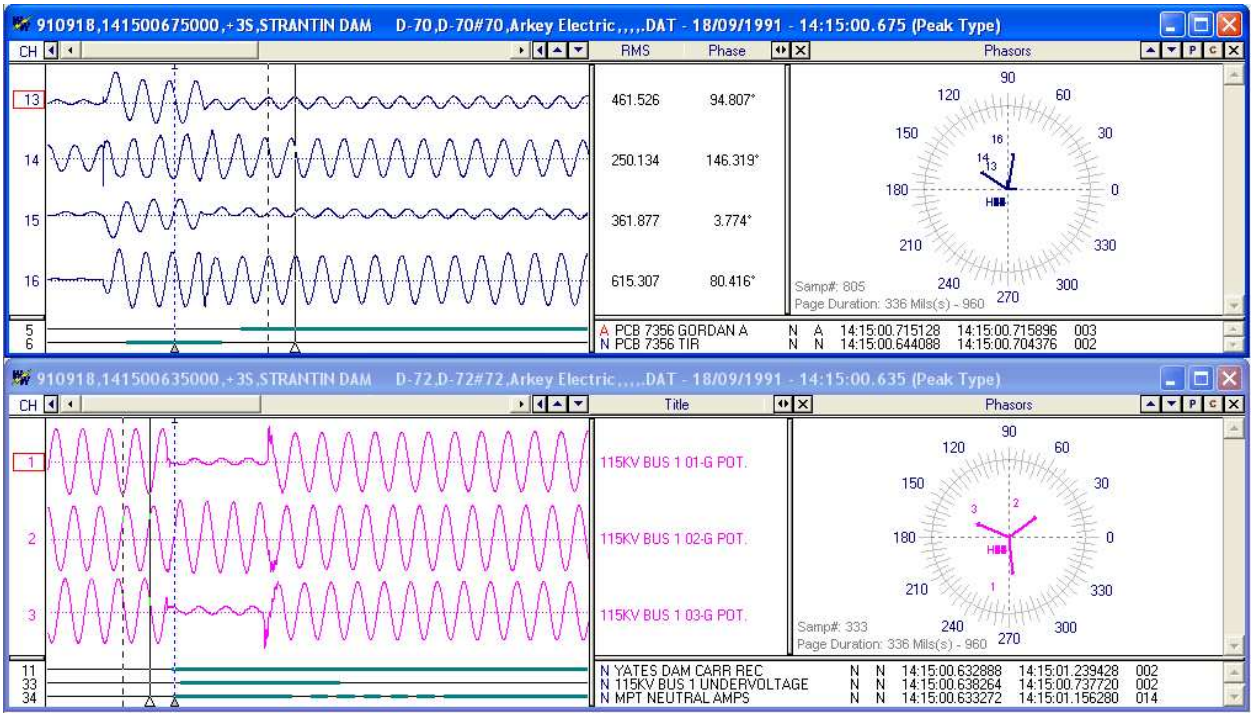


Figure 1.70 Merge Open Files – By Time: Open files and select channels to Merge

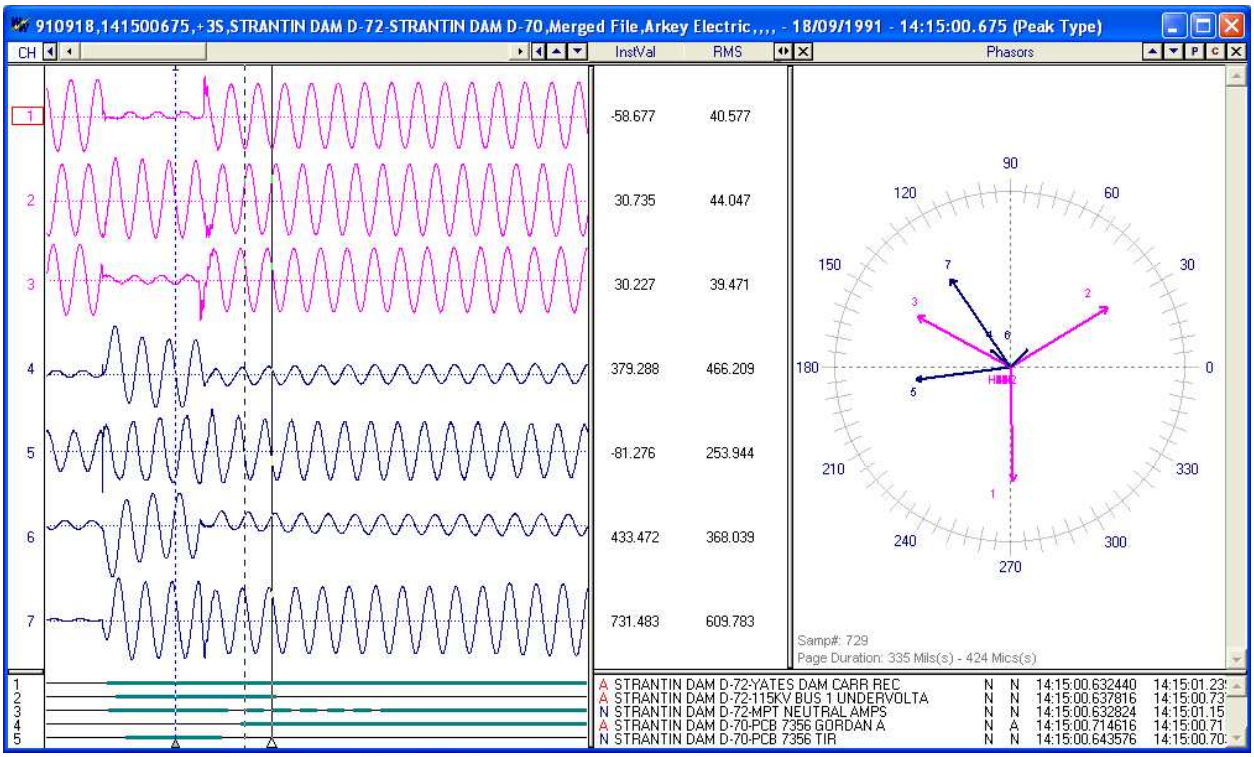


Figure 1.71 Merge Open Files – By Time: Result: By Time

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.

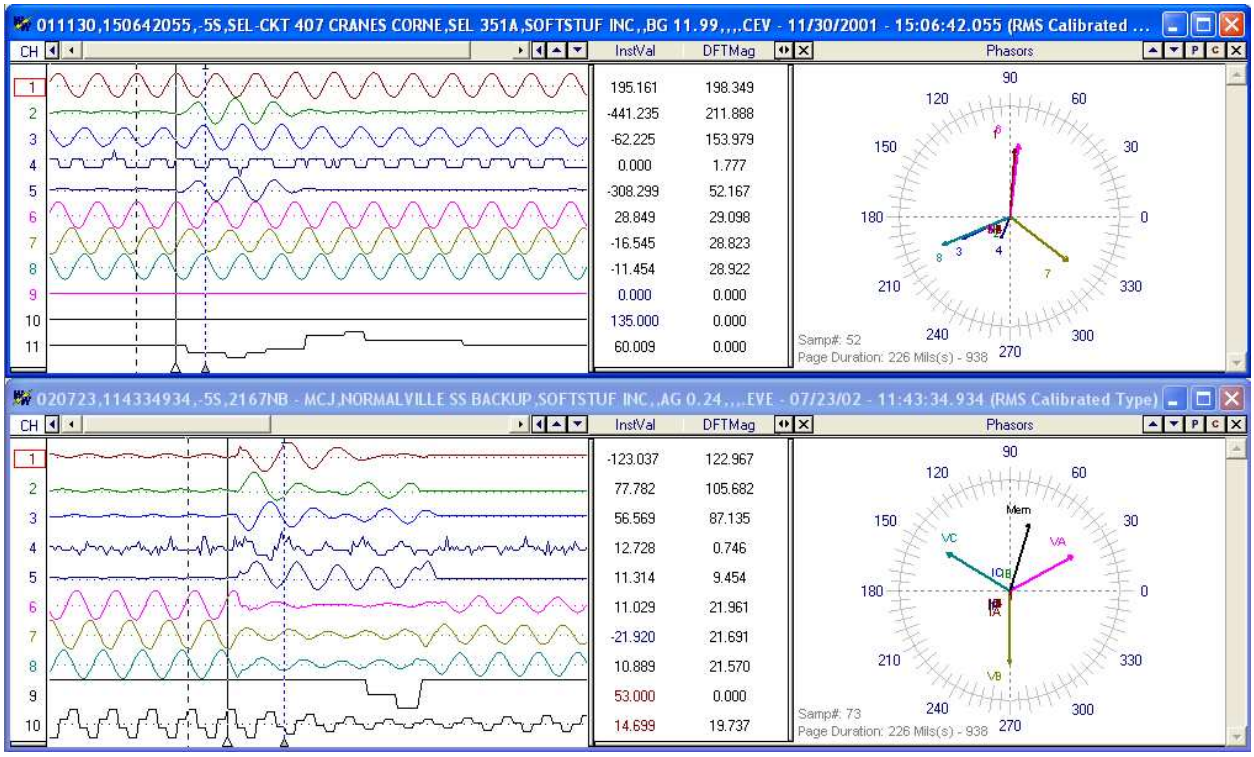


Figure 1.72 Merge Open Files – Manually: Select Channels & Position Data Bars

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.

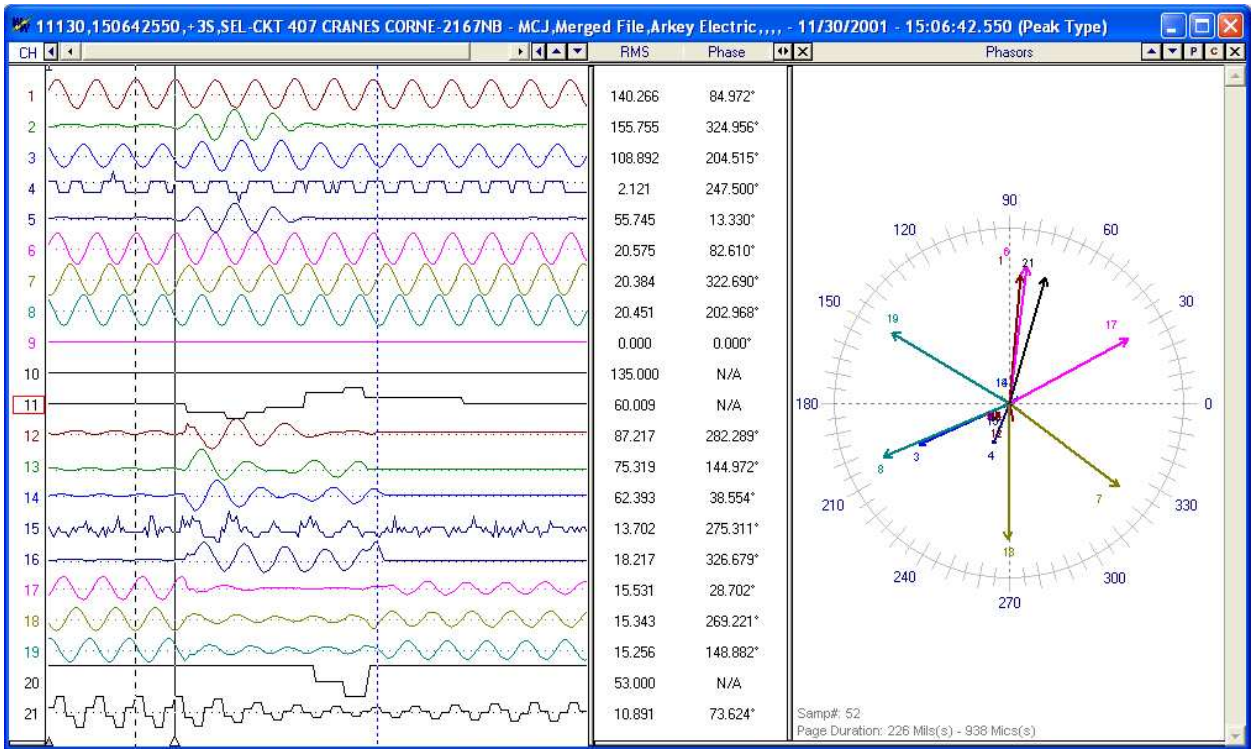


Figure 1.73 Merge Open Files – Result: Manually

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.

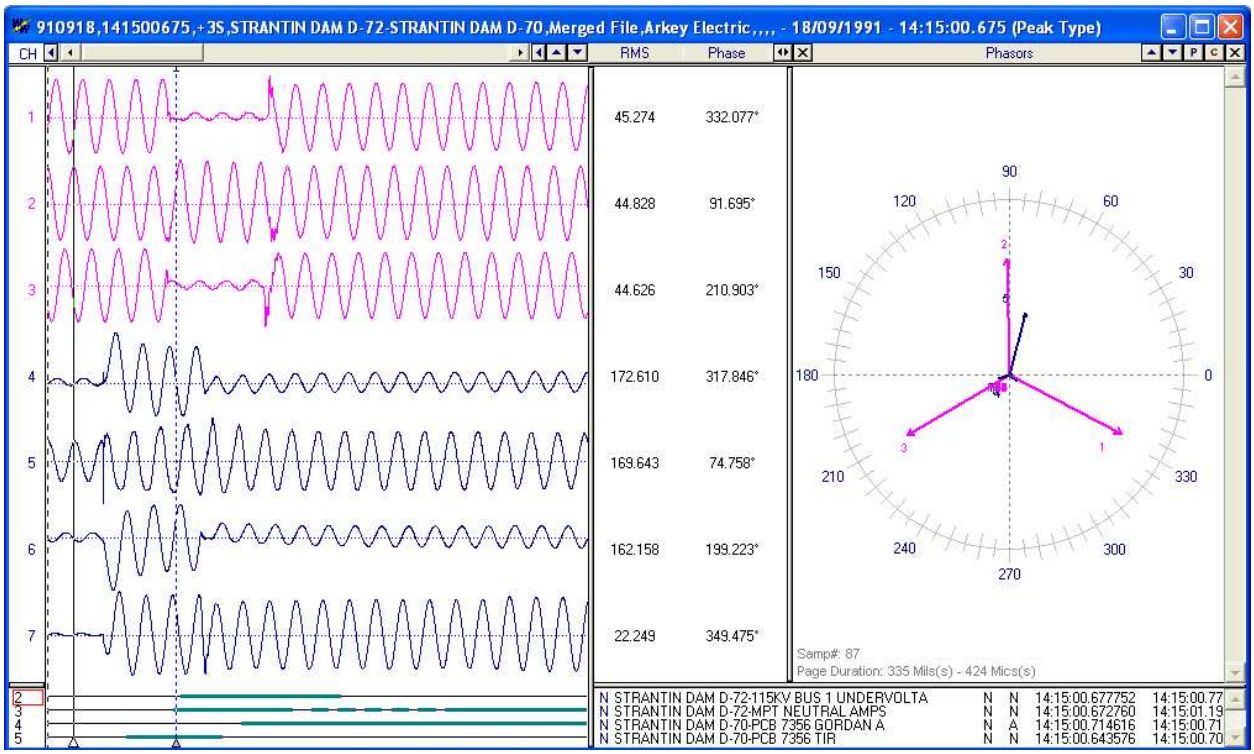


Figure 1.74 Merge Open Files – Result: By Sample (As Applied to Figure 1.70)

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 1.75. 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 1.76 & 1.77 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.

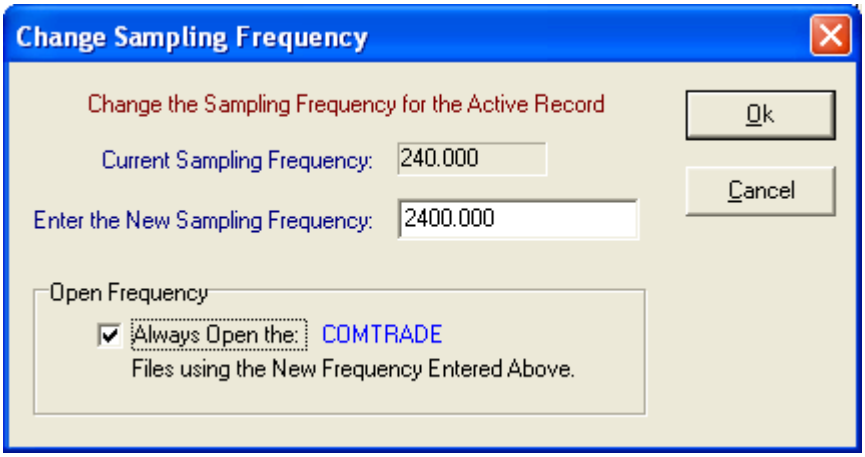


Figure 1.75 Change Frequency Dialog

It also allows for defaulting a driver to always display its' files in the entered frequency. For example, all SEL 4 samples/cycle (240fs) files can be set to automatically display 40 samples/cycle (2400fs).
NOTE: If Open Frequency is checked then the Restore Original is not available.

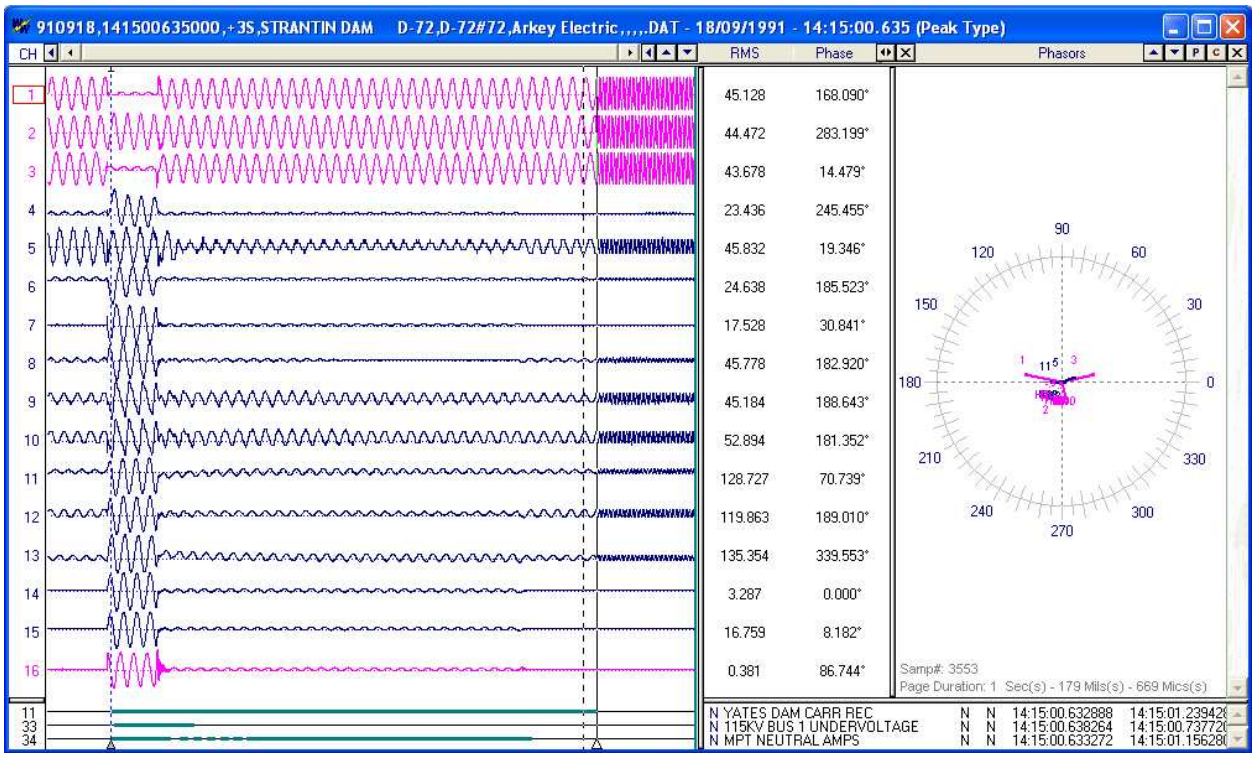


Figure 1.76 Change Frequency: Change a Mutiple Frequency File

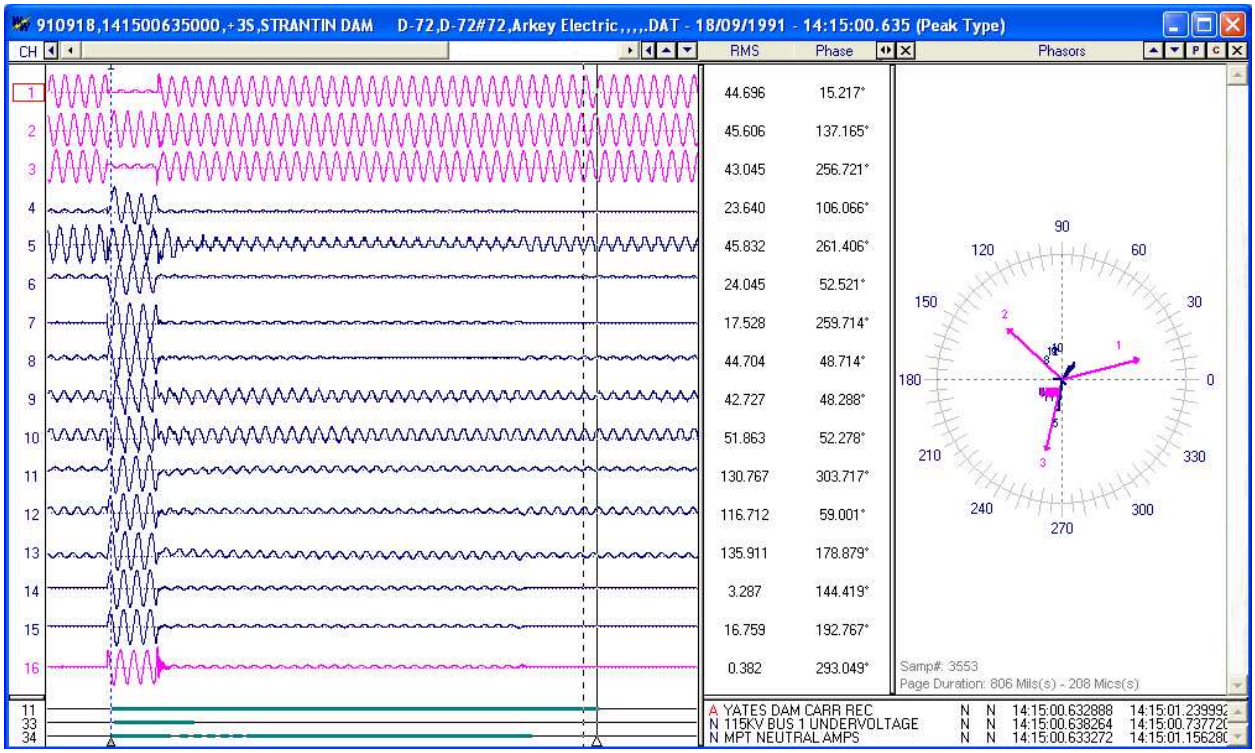


Figure 1.77 Change Frequency: Results

TRUNCATE CYCLES

Truncate Cycles removes the specified number of cycles from the data display. Refer to Figures 1.78 & 1.79. There are three options available under the Truncate Cycles menu option.

- Left: Remove all cycles from the 1st 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).

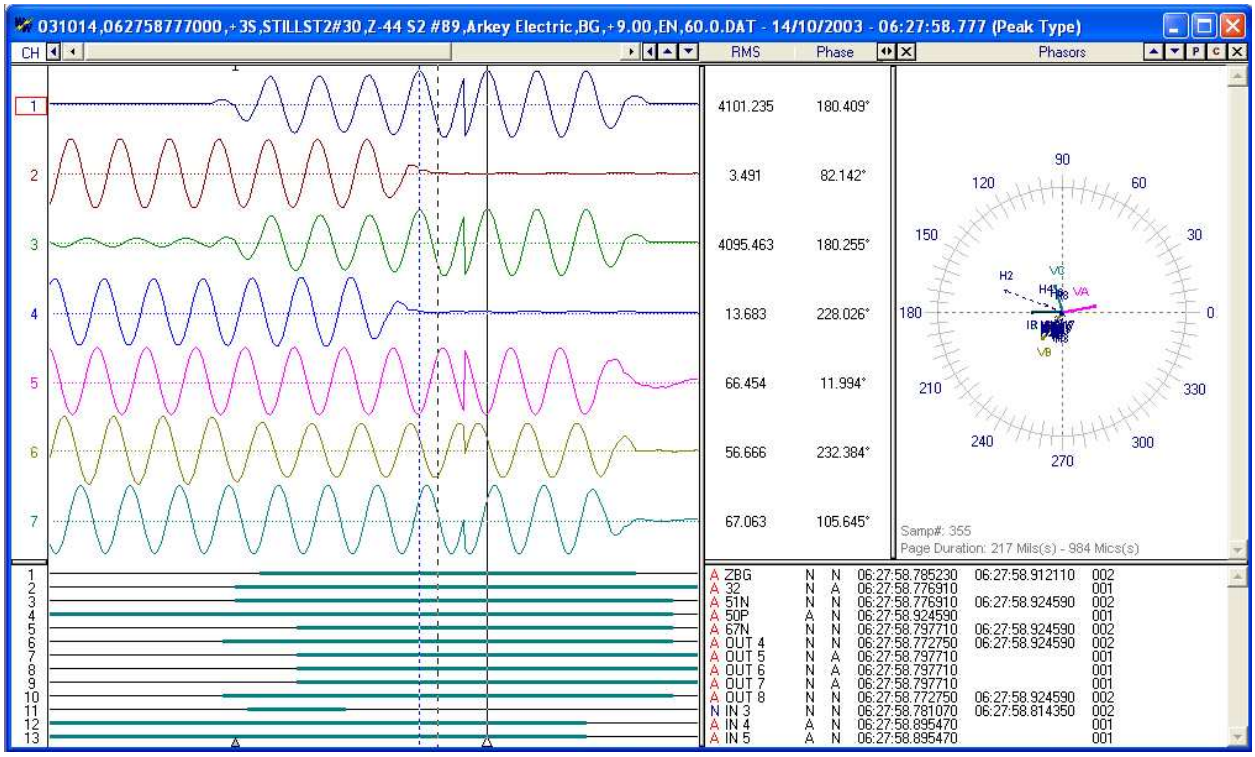


Figure 1.78 Truncate Cycles: Append Non Time Matching Waveforms

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.

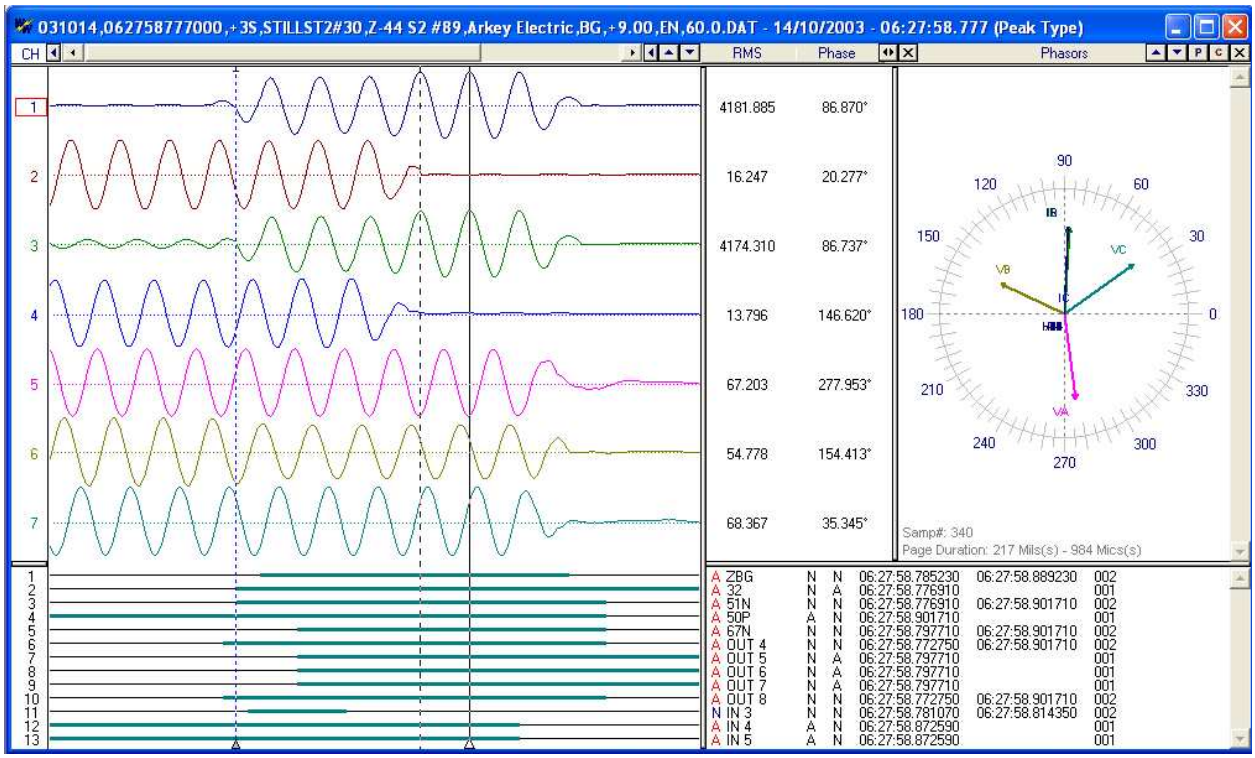


Figure 1.79 Truncate Cycles: Results

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 1.80. This feature is useful for creating Comtrade files to play back to test set applications and for modeling and simulation applications. Refer to Figures 1.81 & 1.82 for an example that adds 5 cycles of fault cycles to a file.

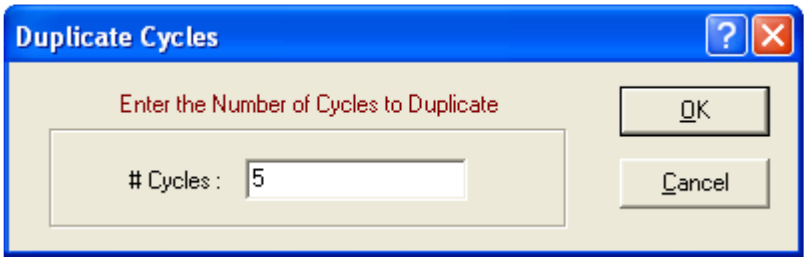


Figure 1.80 Duplicate Cycles Dialog

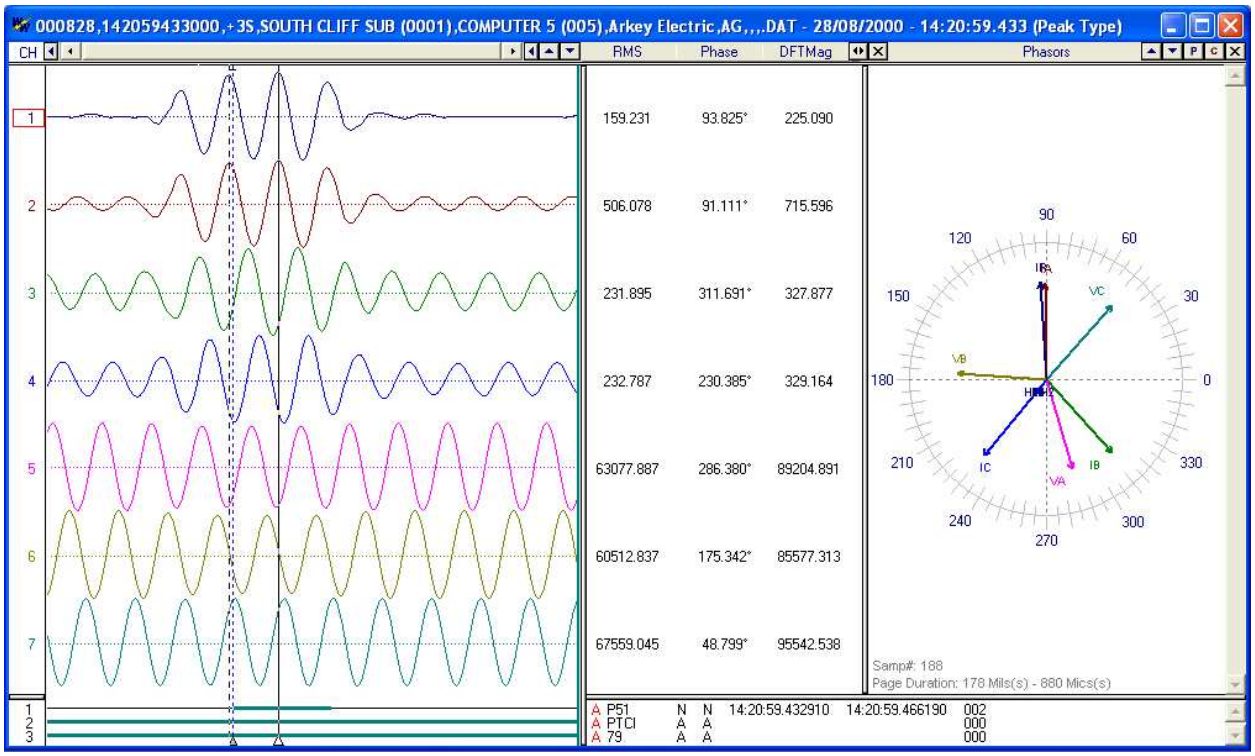


Figure 1.81 Duplicate Cycles: Initial File

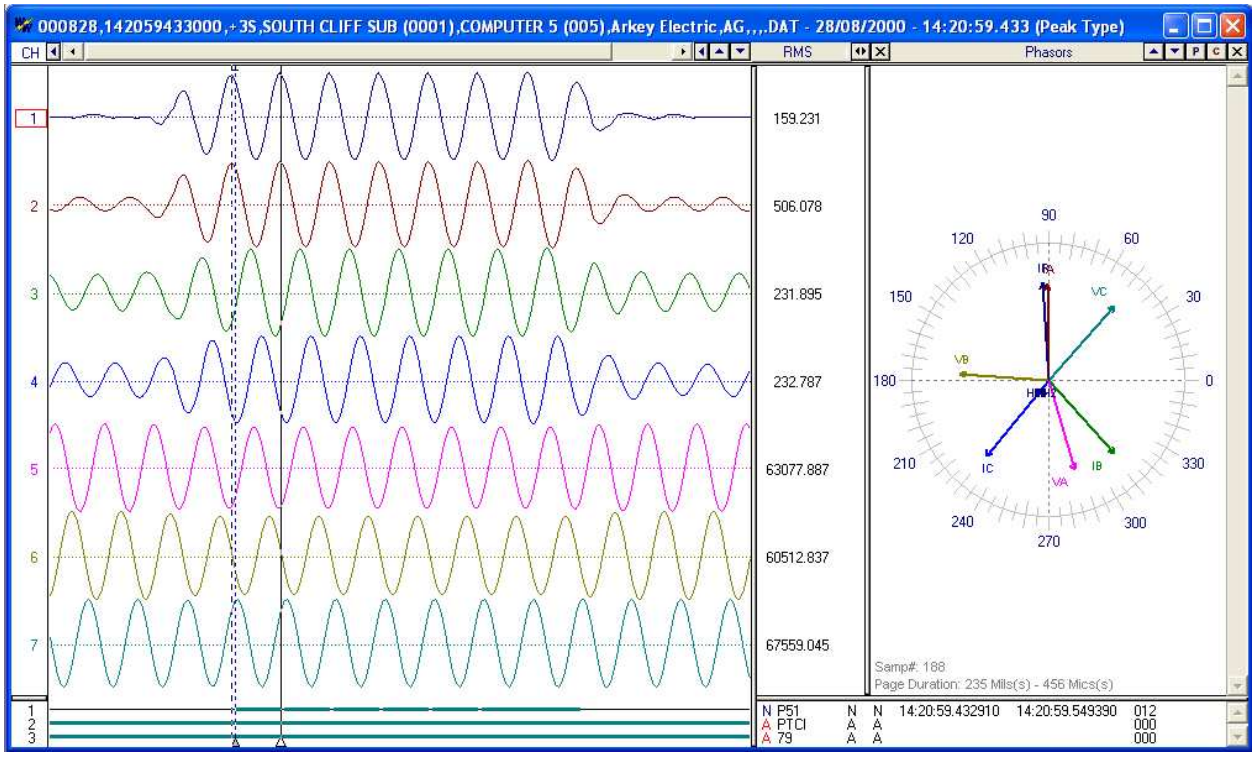


Figure 1.82 Duplicate Cycles: Results

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 is not available.

MARK RAW VALUES

Mark Raw Values marks the raw values saved in the active waveform file on disk. A small hollow blue circle is placed at the raw value. This feature is helpful in highlighting the raw sample values saved in low sampling rate files. Refer to Figure 1.83.

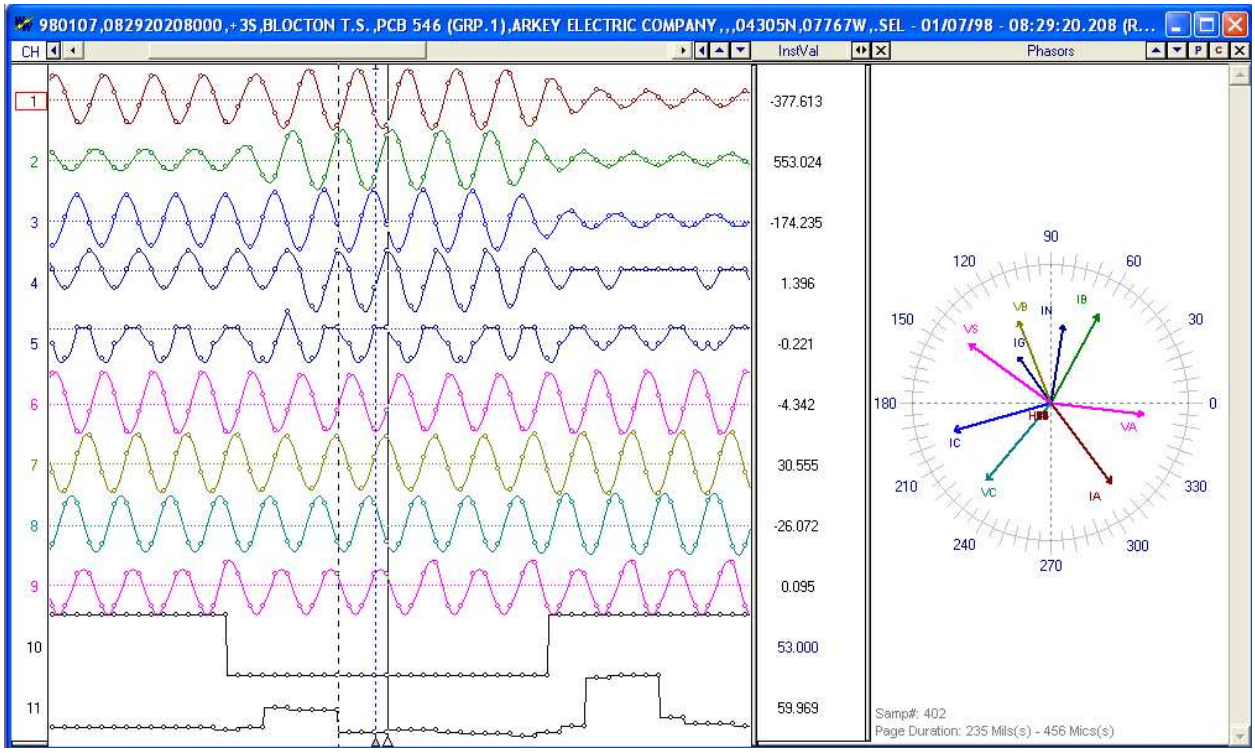


Figure 1.83 Mark Raw Values

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 1.84. This feature is helpful in highlighting the positive and negative peak values.

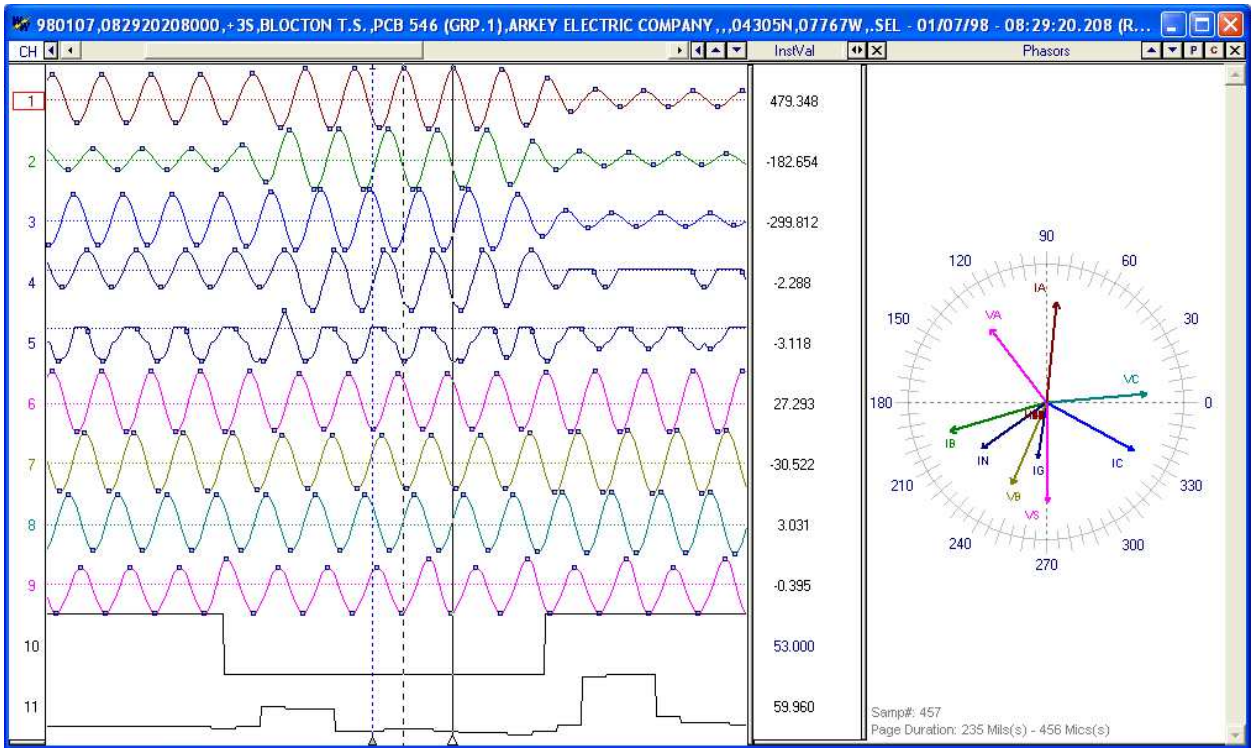


Figure 1.84 Mark Peak Values

MARK CHANGE IN SIGN VALUES

Mark Change in Sign marks all the samples where a change in sign occurs. A small solid gray triangle is placed at the change position. Refer to Figure 1.85. This feature is helpful in highlighting the position where a change in sign occurs in the signal.

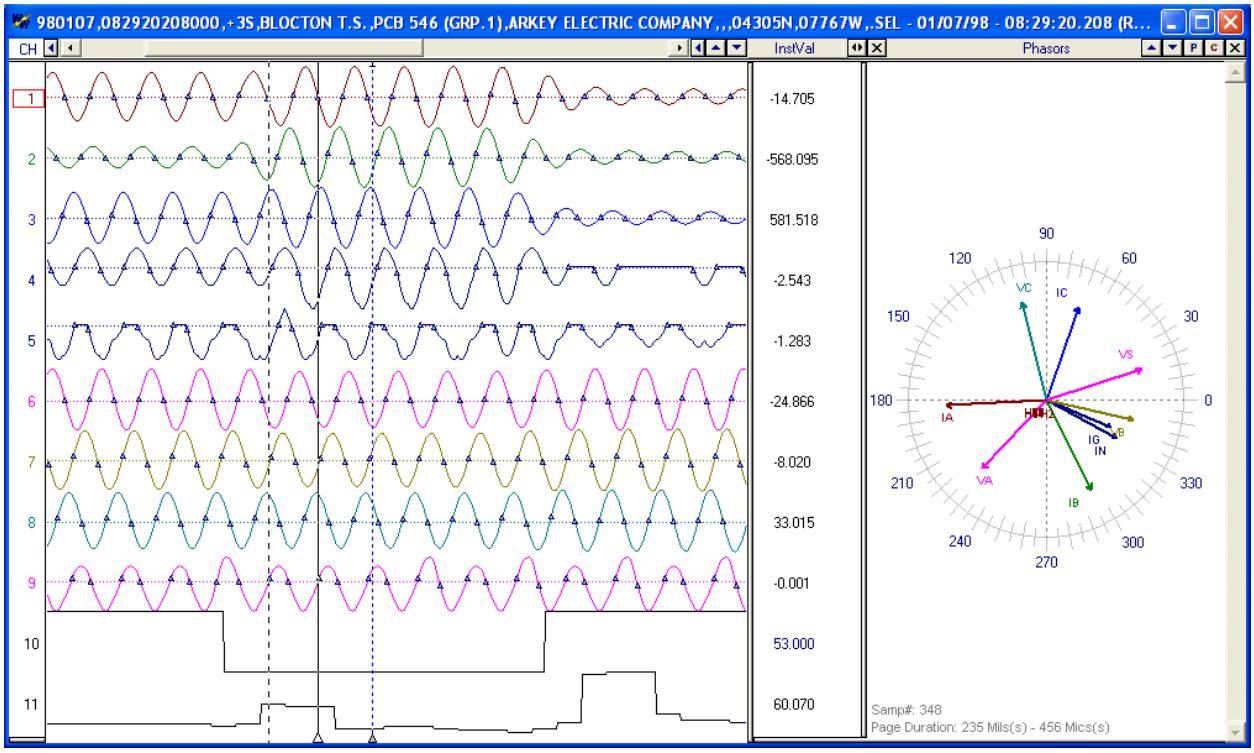


Figure 1.85 Mark Change in Sign

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 1.86. 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 1.87.

Figure 1.86 Type of Analog Values Displayed

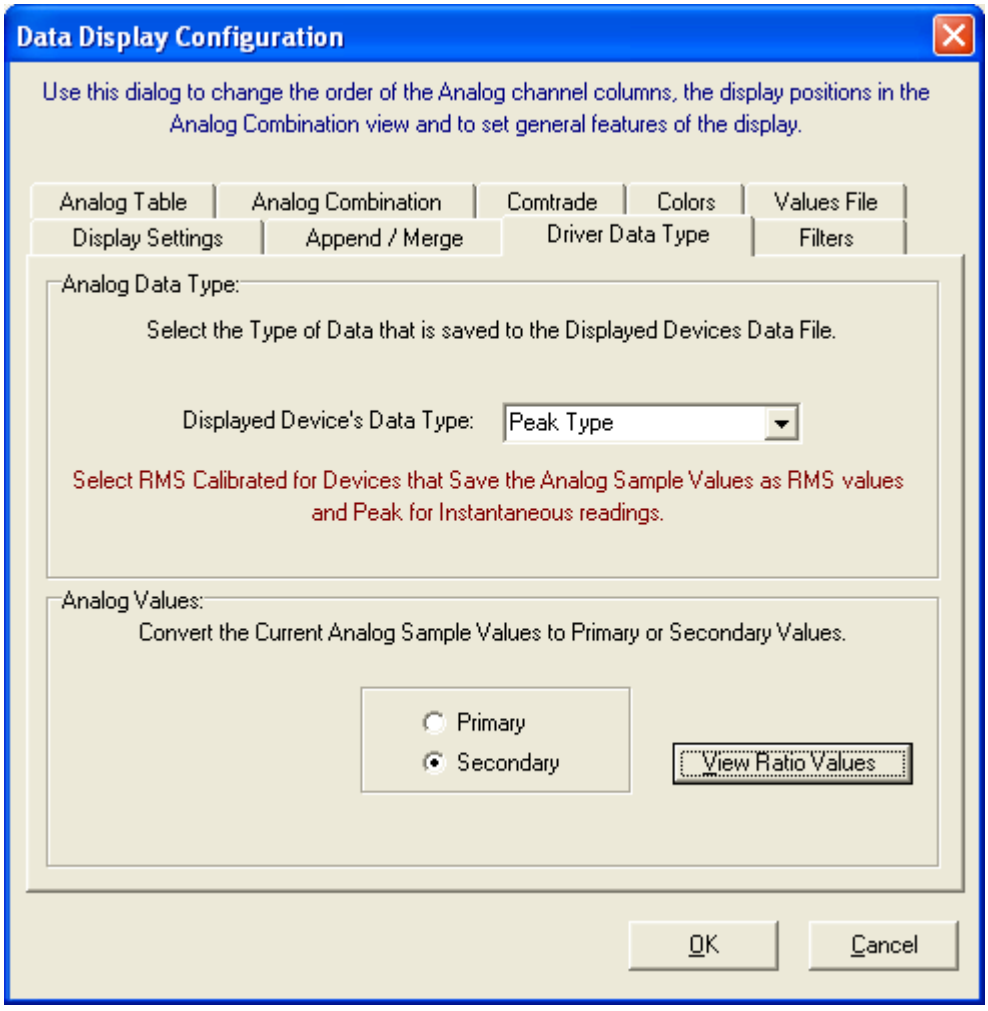


Figure 1.87 Change Analog Values (Primary ←→ Secondary)

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 1.88.

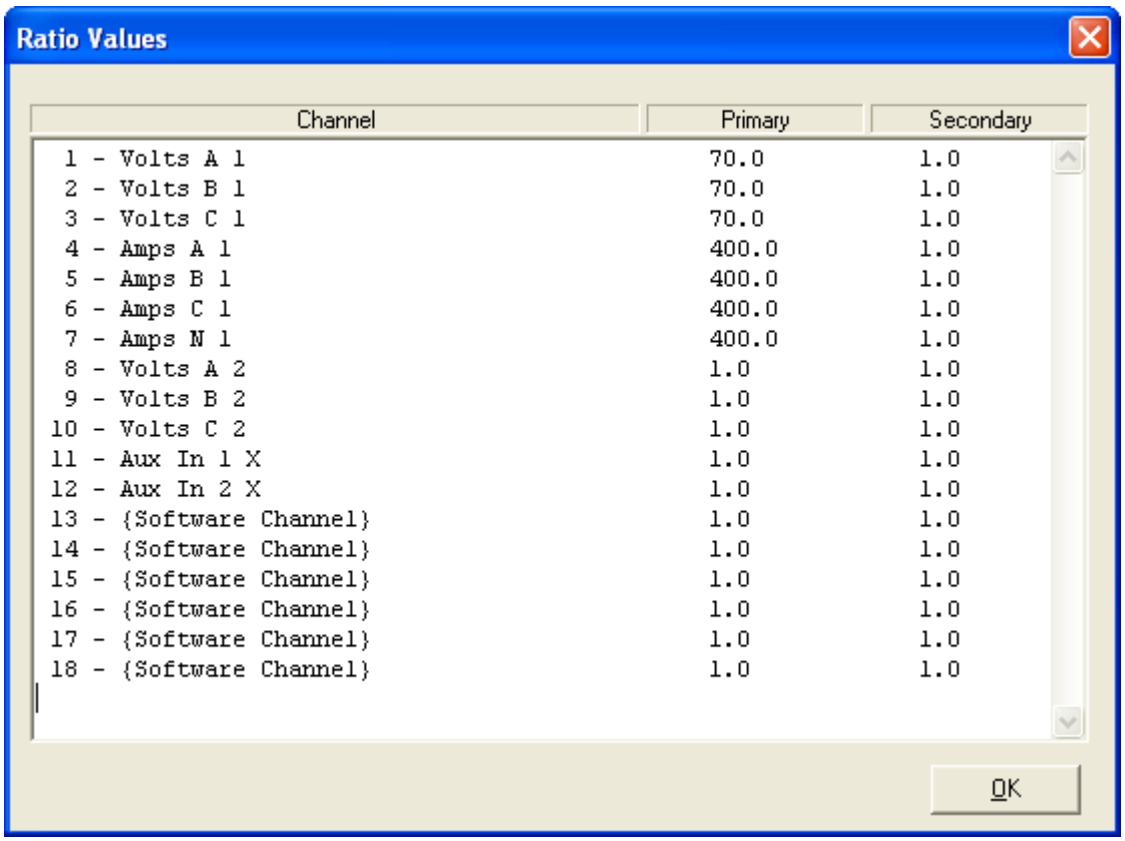


Figure 1.88 Ratio Values

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 1.89.

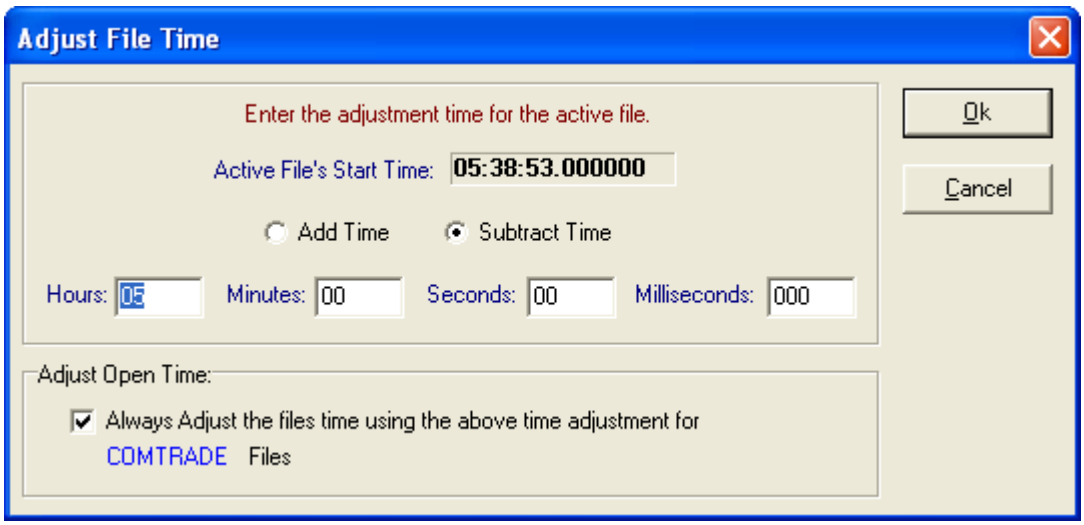


Figure 1.89 Adjust Files Time

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.

SAC title and operators can be saved to an ASCII text file on disk by using the "Save" and "Save As" buttons located to the right of the SAC operators. The "Open" button allows for opening existing SAC file without having to manually enter the SAC titles and operators. These features are useful for reusing existing SAC operations on like files. The "New" button clears the existing SAC title and operators.

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 "^" 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)
- "**^**" - 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
- "**|**" - 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 Channels menu. Refer to Figure 1.90. To display the SDC dialog select "Software Digital Channels" from the Channels 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 1st 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 samples 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.

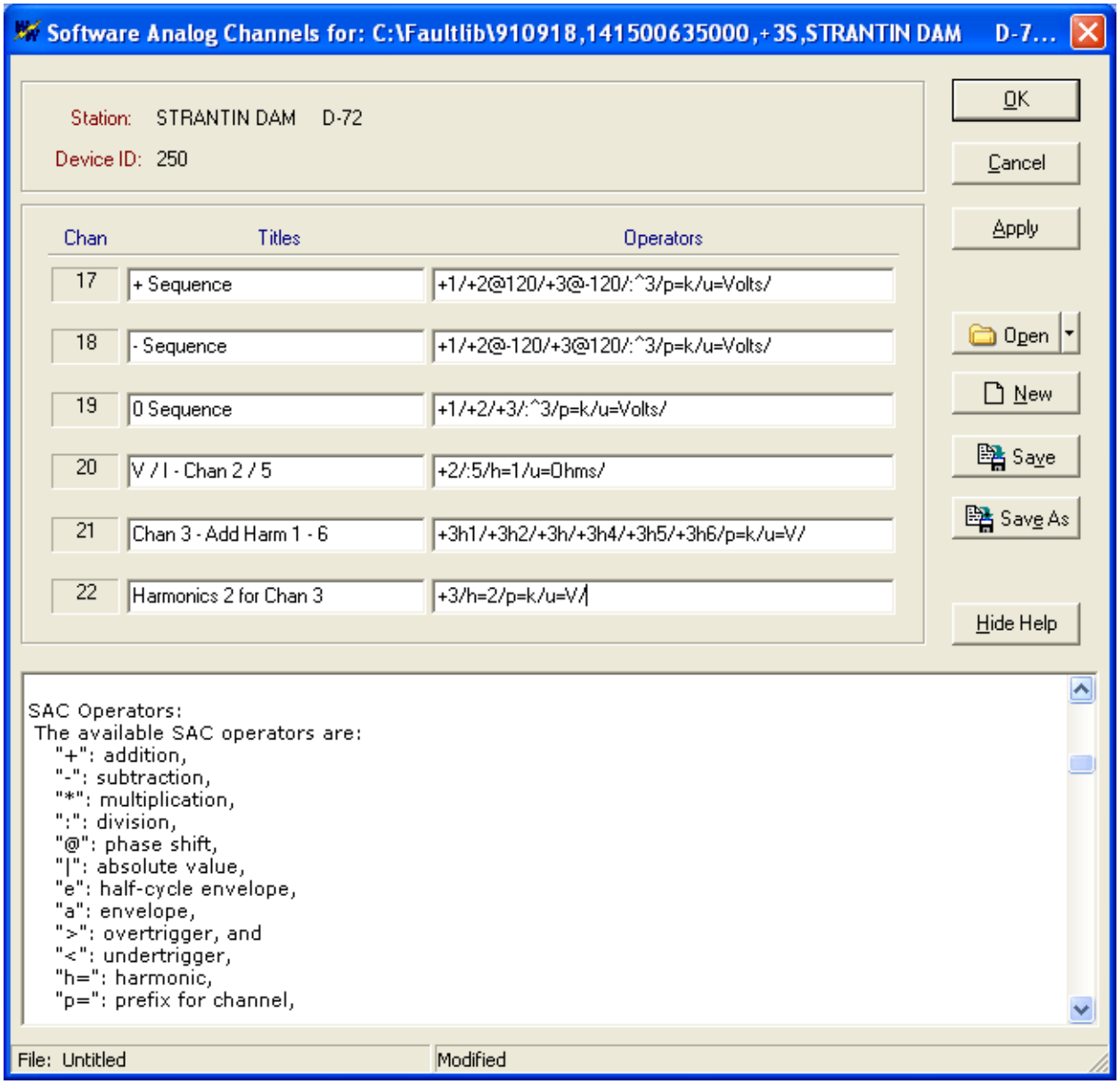


Figure 1.90 SAC Dialog

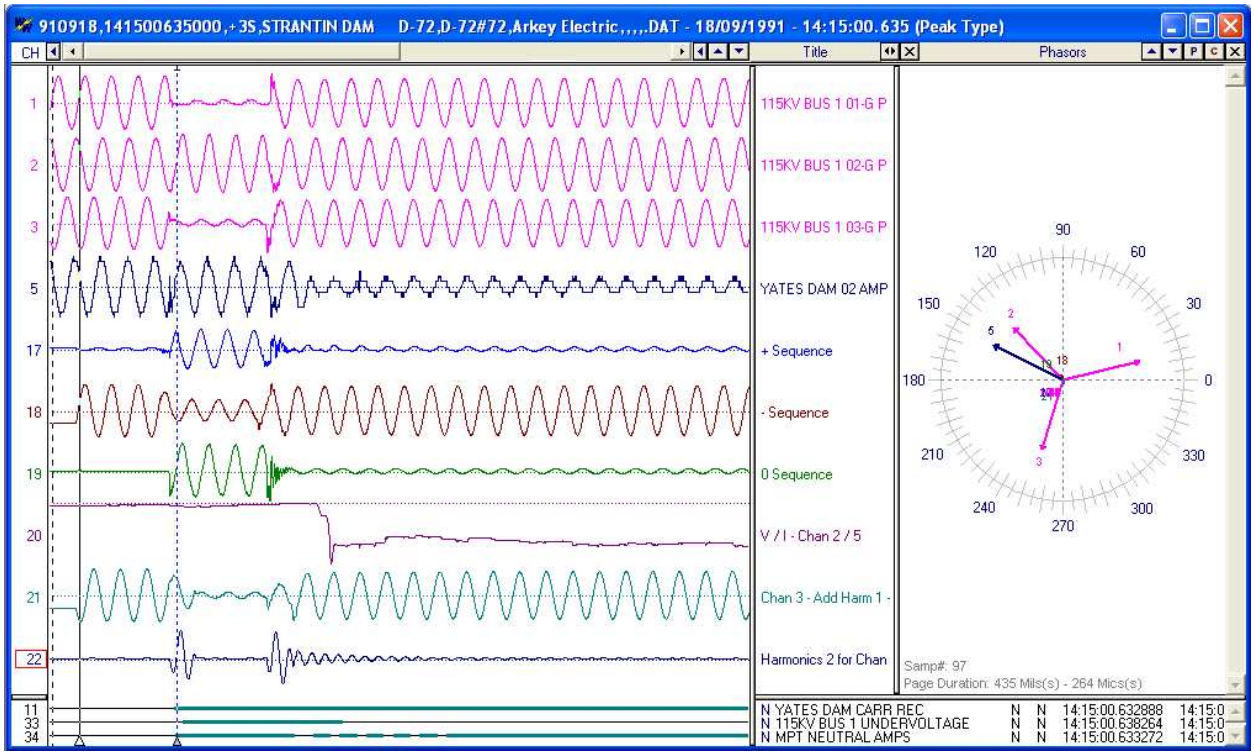


Figure 1.91 SAC Results

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.

The SAC operators and titles can be saved to an ASCII text file on disk to save time when re-entering SAC operator and titles. The SAC files can have any filename but the extension must be .SAC. If an extension is entered when saving a SAC file then the extension is deleted and .SAC is added to the filename. The active SAC path and filename is displayed in the first status field. The second status field indicates if the SAC title or operator fields where modified.

There are 4 options for the SAC files, Open, New, Save and Save As. Each option is explained below:

SAC File Operator	Description
Open	Open an existing SAC file. The Window's open file dialog is displayed. Refer to Figure 1.84. Navigate to the desired directory and double click on the SAC file. The SAC title and operator fields are populated with the contents of the selected file. If the file is not a valid SAC file then an error message is displayed.
New	Clear the current SAC title and operators and change the SAC filename in the first status field to Untitled. If the previous SAC title and operators where modified then a message will be prompted asking to save the existing SACs before clearing the fields.
Save	Save the active SAC title and operators to the SAC file listed in the first status field. If the SAC filename is listed as Untitled then a Save As dialog is displayed.
Save As	Save the existing SAC title and operators to a new SAC file. The Window's Save As dialog is displayed. Navigate to the desired directory and enter the new name in the "File name" field and click the "Save" button or press enter.

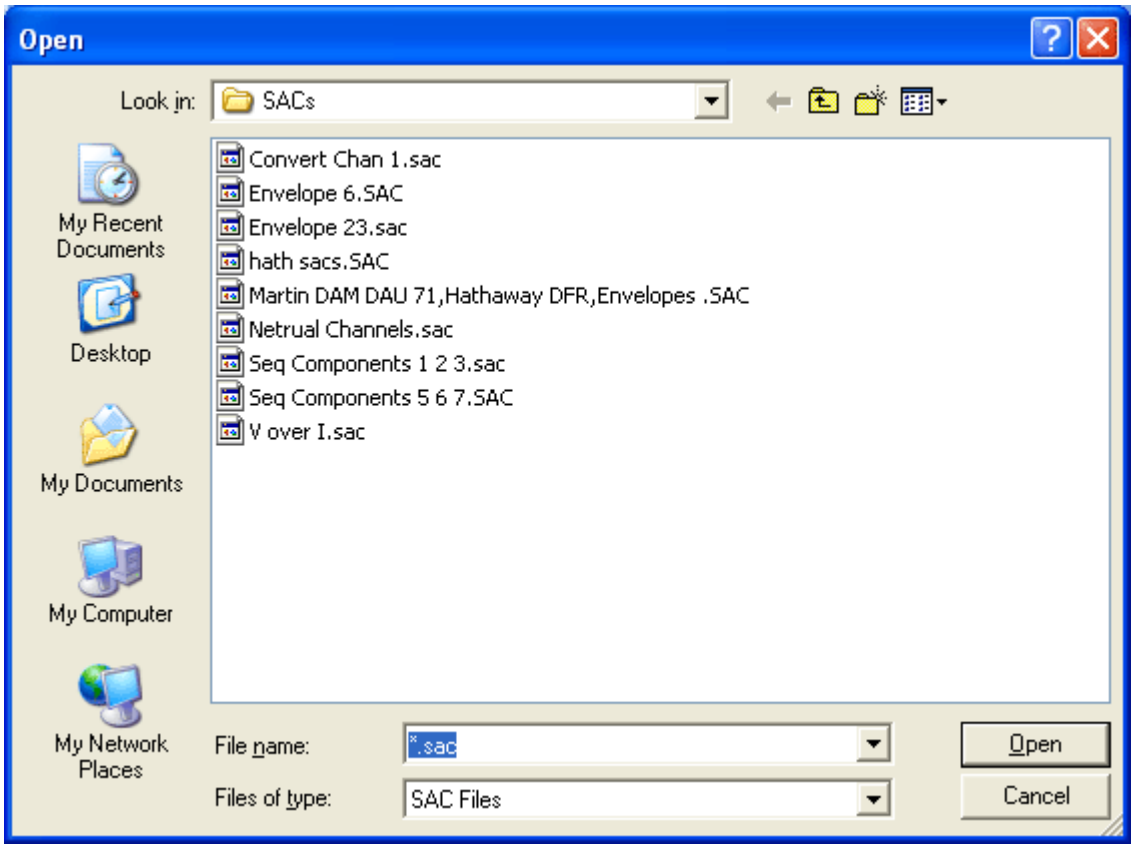


Figure 1.92 Open SAC File

SINGLE ENDED FAULT LOCATION

The Single Ended Fault Location Dialog is used to interface to the SingleEndFaultLocation.dll. The SingleEndFaultLocation.dll will calculate the fault location, fault type and fault time.

The sampling frequency must be set to ensure 24 samples per cycle. The sampling frequency must be set prior to opening the fault location dialog. If the sampling frequency is not set to 1440 Hz for 60 Hz or 1200 Hz for 50 Hz then the change sampling frequency dialog will automatically be displayed. Refer to Figures 1.93 & 1.94. Click OK or press enter to change the sampling frequency then reopen the Fault Location dialog.

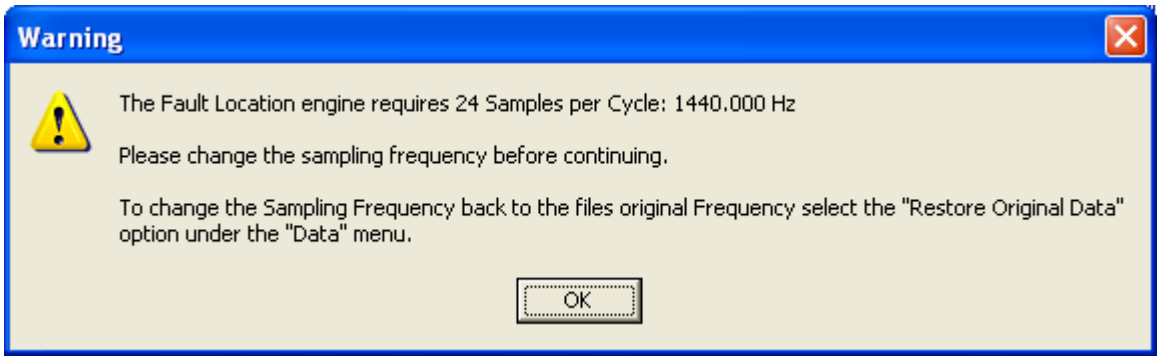


Figure 1.93 Fault Location Change Sampling Frequency Message

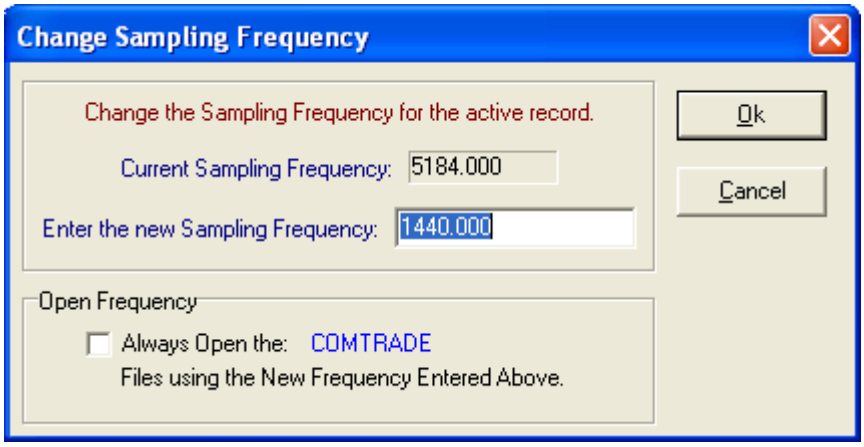


Figure 1.94 Fault Location Change Sampling Frequency Dialog

Also, all sample values sent to the DLL must be in secondary quantities. If the sample values are in primary values then the CT and PT ratio values must be available in the data configuration file. If the CT and PT ratio values are not available a message will be displayed asking to ignore the request or abort displaying the fault location dialog. Refer to Figure 1.95.

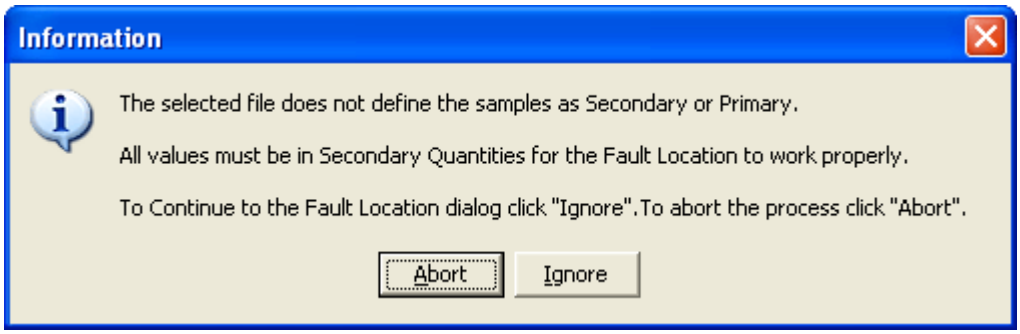


Figure 1.95 Fault Location Secondary Quantities Message

If the analog values are in primary quantities and the CT and PT ratio values are available then the fault location dialog will automatically convert the sample values to secondary quantities before sending them to the DLL.

The fault location window is divided into 6 sections; Inputs, Advanced, Analog Channels, Outputs, Configuration Buttons and Action Buttons. Refer to Figure 1.96. Each section is defined below.

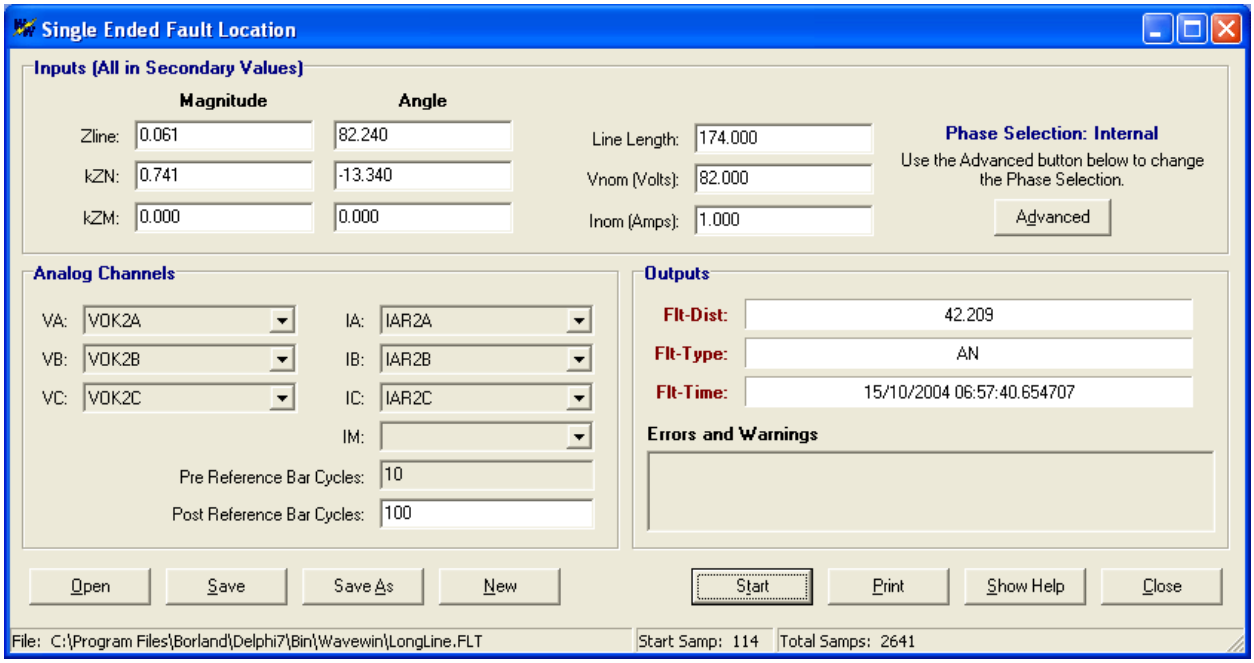


Figure 1.96 Fault Location Dialog

Input Fields

All input fields must be entered in secondary quantities.

Field	Type	Units	Description
Zline	Real	Per Unit Length	Positive sequence impedance
Zline Angle	Real	Degrees	Positive sequence angle
kZN	Real	Factor	Compensated zero sequence impedance (Z0-Z1)/(3*Z1)
kZN Angle	Real	Degrees	Compensated zero sequence factor angle (Z0-Z1)/(3*Z1)
kZM	Real	Factor	Mutual compensation factor (Z0m)/(3*Z1)
Line Length	Real	Not Required	Line Length
Vnom	Real	Voltage	Nominal phase to phase voltage
Inom	Real	Amps	Nominal current

Advanced Dialog

The advanced dialog is used to enter specific information to help tune the fault location algorithms. Refer to Figure 1.97. Modify the advanced dialog to specify the phase selection, Z1 & Z2 % of line, thresholds and reach settings. Each field is explained below.

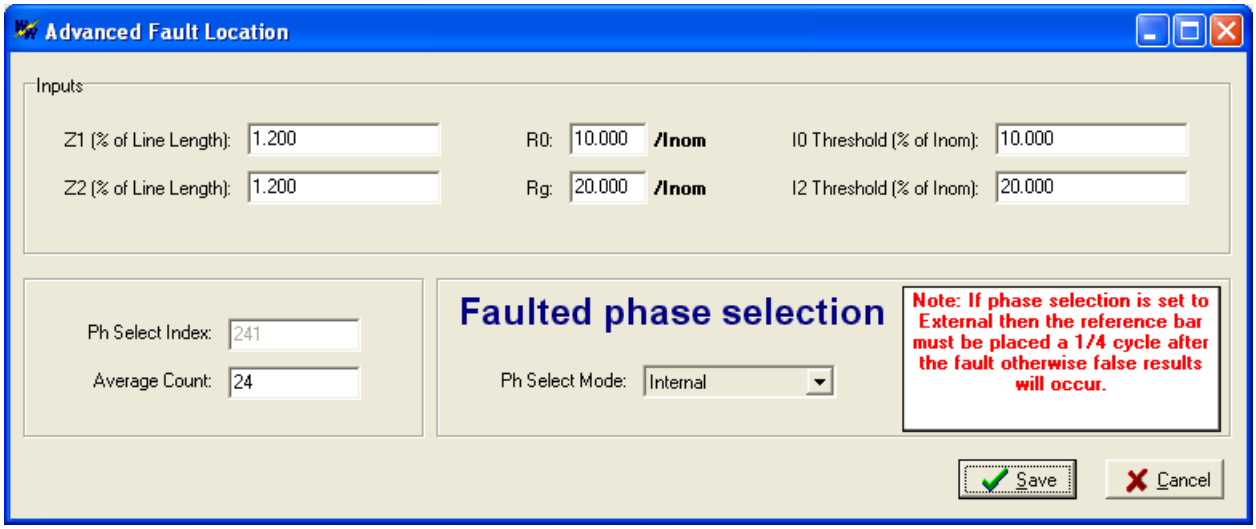


Figure 1.97 Fault Location Advanced Dialog

Field	Type	Units	Description
Z1 (% of Line)	Real	Percent	Zone 1 forward impedance (default value is 120% of line positive sequence impedance (=1.2 * Zline * Length))
Z2 (% of Line)	Real	Percent	Zone 2 reverse impedance(default value is 120% of line positive sequence impedance (=1.2 * Zline * Length))
R0	Real	Ohms	Phase loop resistance reach (default value set to 10/Inom)
Rg	Real	Ohms	Ground loop resistance reach (default value set to 20/Inom)
I0 Threshold	Real	% of Inom	Zero sequence current threshold for VTS (default value set to 10)
I2 Threshold	Real	% of Inom	Neg. sequence current threshold for VTS (default value set to 10)
Ph. Select Index	Integer	Samples	Index of the sample corresponding to the fault inception instance (this field is automatically calculated according to the position of the reference bar and the Pre and Post reference bar cycles defined in the Analog Channel section).
Average Count	Integer	Samples	Total post fault samples for averaging fault distance (default value set to 24)
Ph. Select Mode	N/A	N/A	Phase selection mode (Internal, AG, BG, CG, AB, BC, CA)

If the Phase Section is set to internal then the fault location algorithms will automatically determine the fault position in the file. If it is set to external then the user must specify where the fault position is in the file. To do this move the Reference bar in the data plotting window to a ¼ cycle after the fault. The reference bar must be set prior to opening the fault location dialog.

Analog Channels:
Select the Current and Voltage channels from the drop down lists. Also, define how many cycles to send before the Reference bar (blue dotted line) and after the reference bar. The reference bar can be moved by right clicking on the desired sample.

Outputs:
The results of the fault location calculations are displayed in the output section. The Fault Distance, Fault Type and Fault Time are displayed. Any errors or warnings sent from the SingleEndFaultLocation.dll are displayed in the Error and Warnings edit box.

Configuration Buttons:
The configuration buttons allow for saving the fault location fields, creating a new fault location configuration and for opening previously saved configurations. The configuration files must have a *.FLT extension. Click on the "Open" button to open an existing configuration. Window's file navigation dialog is displayed, navigate to the desired directory and double click on the fault location file.

To save an existing configuration, under a new name click on the "Save As" button. Navigate to the desired directory enter the new name then click "Save". The extension must be .FLT.

Click the "Save" button to save any changes made to an existing configuration. To create a new fault location configuration, click the "New" button.

Action Buttons:
The action buttons are used to perform specific actions. Each button is described below:

- **Start:** The Start button initiates all communications with the SingleEndFaultLocation.dll. It first sends all of the input fields, next all samples are sent to the DLL. The starting sample and the total number of samples sent is defined by the reference bar position and the Pre and Post reference bar cycles. The starting sample number and the total number of samples sent are displayed in the status bar. Once all samples are sent it then calls calculate. If no errors occurred then the fault location results are displayed in the Output section. All errors or warnings are displayed in the Error & Warning edit box.

- **Print:** The print button sends a screen dump of the fault location dialog to the system's default printer.

- **Help:** Show or hide the drop down help window.

- **Close:** The close button closes the fault location dialog. If any changes were made to the fault location fields a message will be display asking to save the changes.

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 1.98.

Figure 1.98 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 3rd 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 1.99.

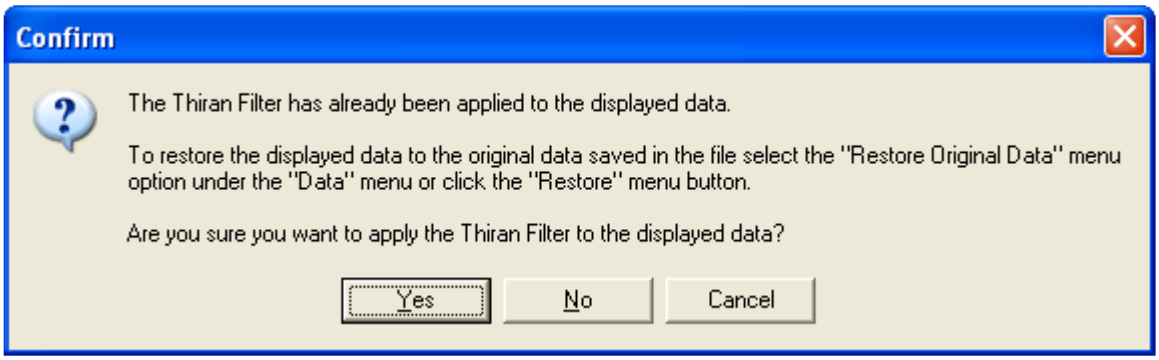


Figure 1.99 Align Channel Message

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 1.100. 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.

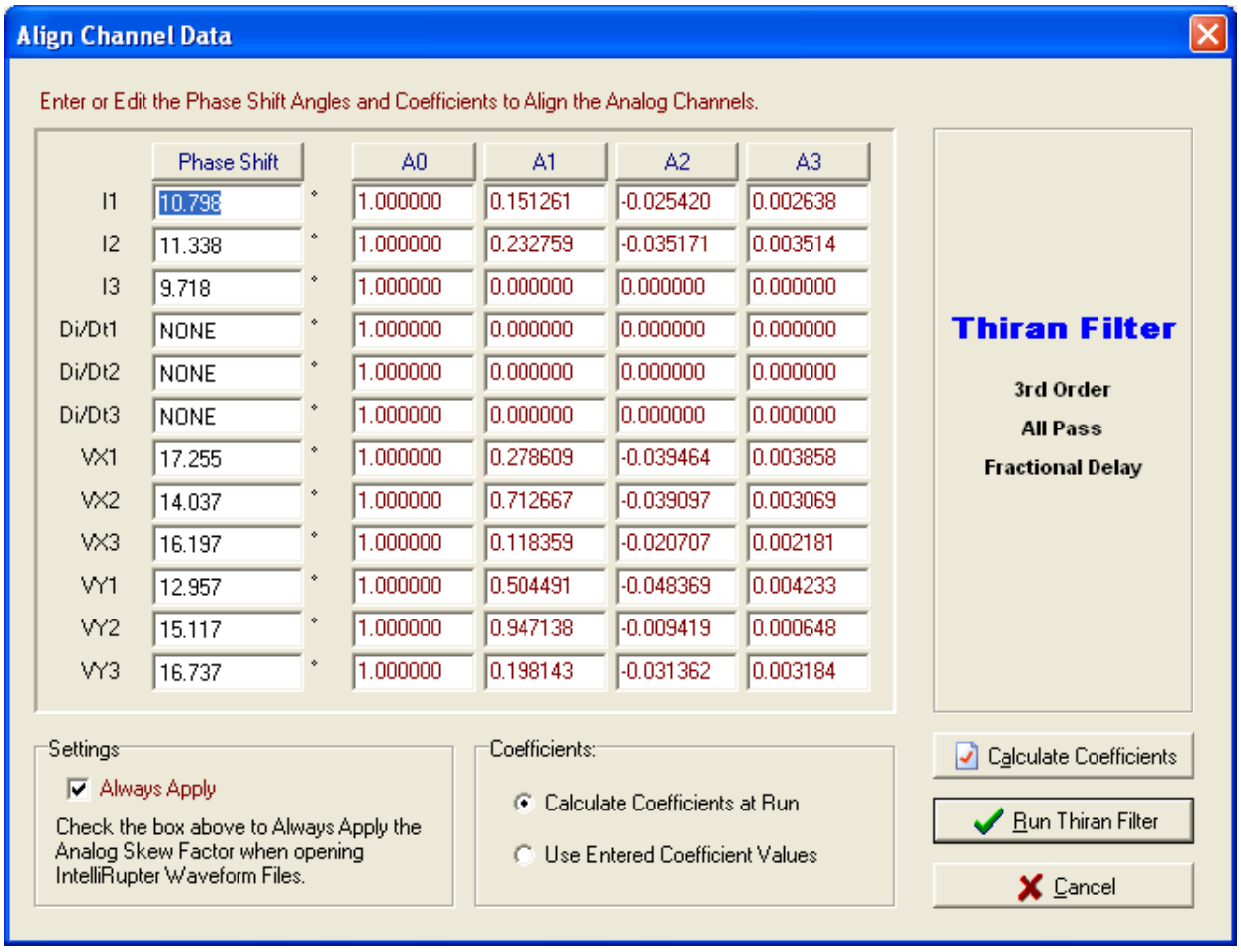


Figure 1.100 Align Channel Data Dialog

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 1.101.

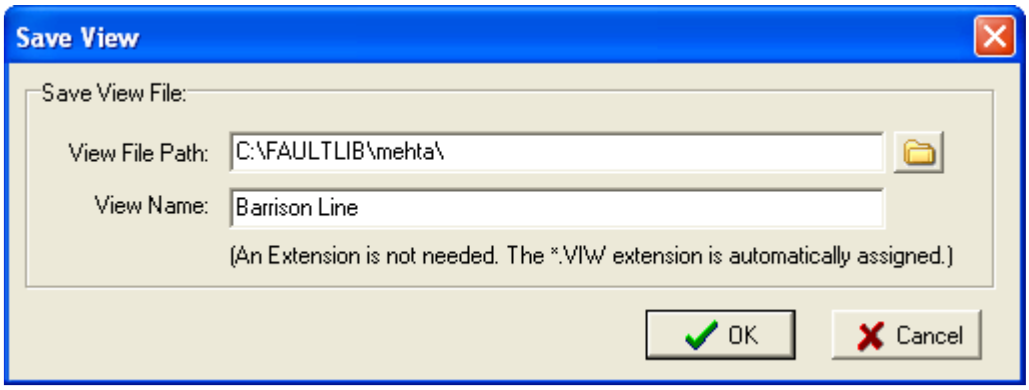


Figure 1.101 Save View Dialog

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 1.102. 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 1.103. Navigate to the view’s folder and double click on the view file.

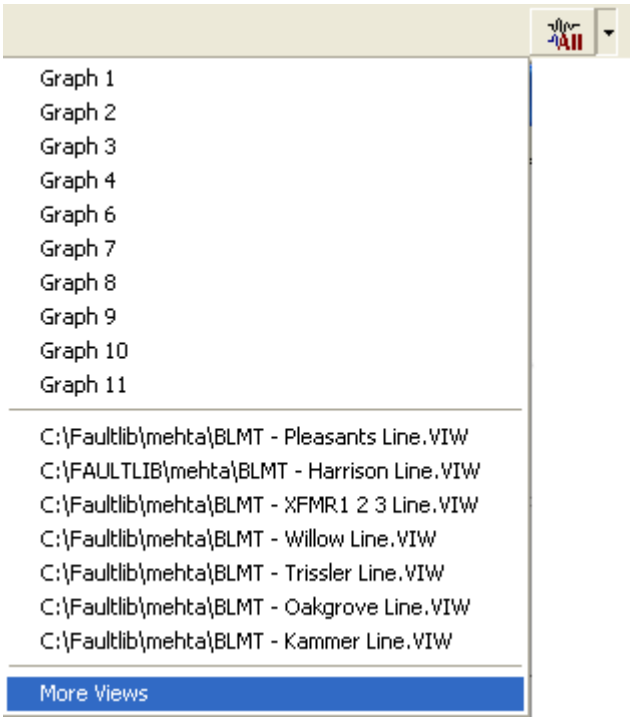


Figure 1.102 Select View Drop Down Menu

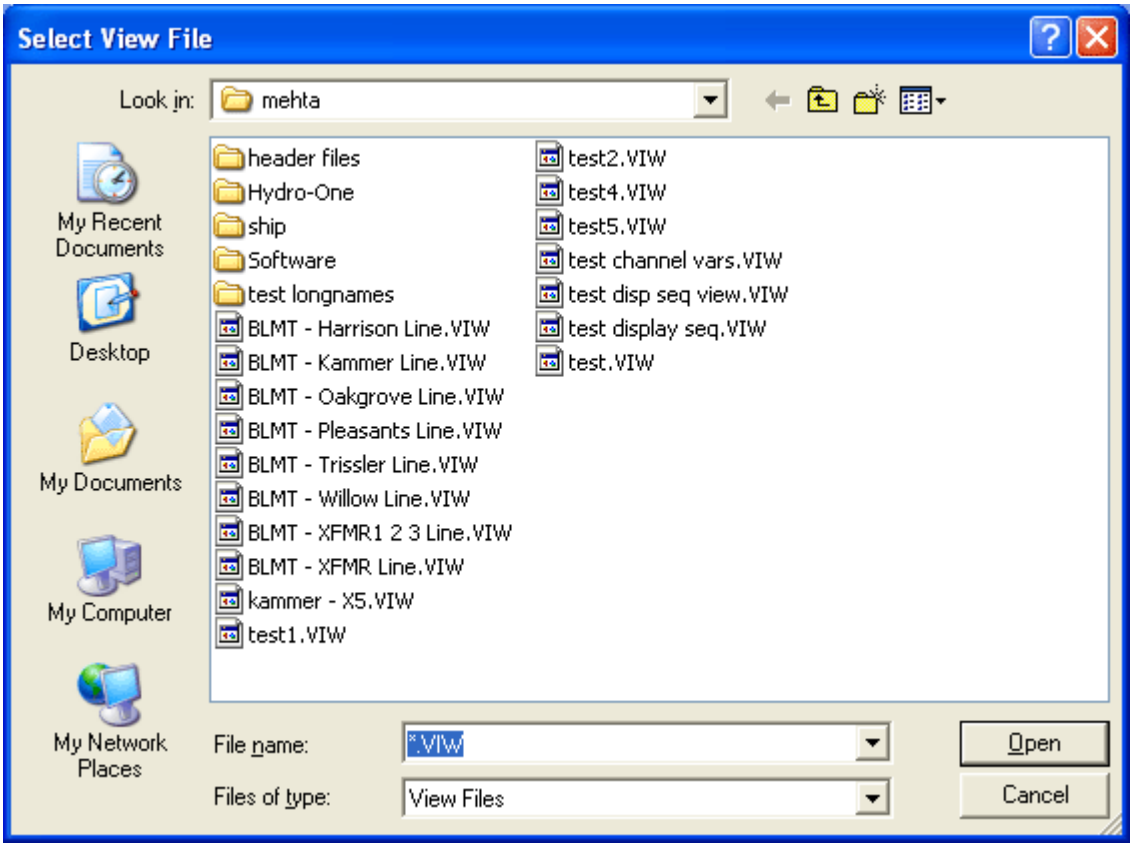


Figure 1.103 Select View File Dialog

To view the details of a saved view before selecting it, open the “Select View” dialog from the “View” menu. Refer to Figure 1.104. 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.

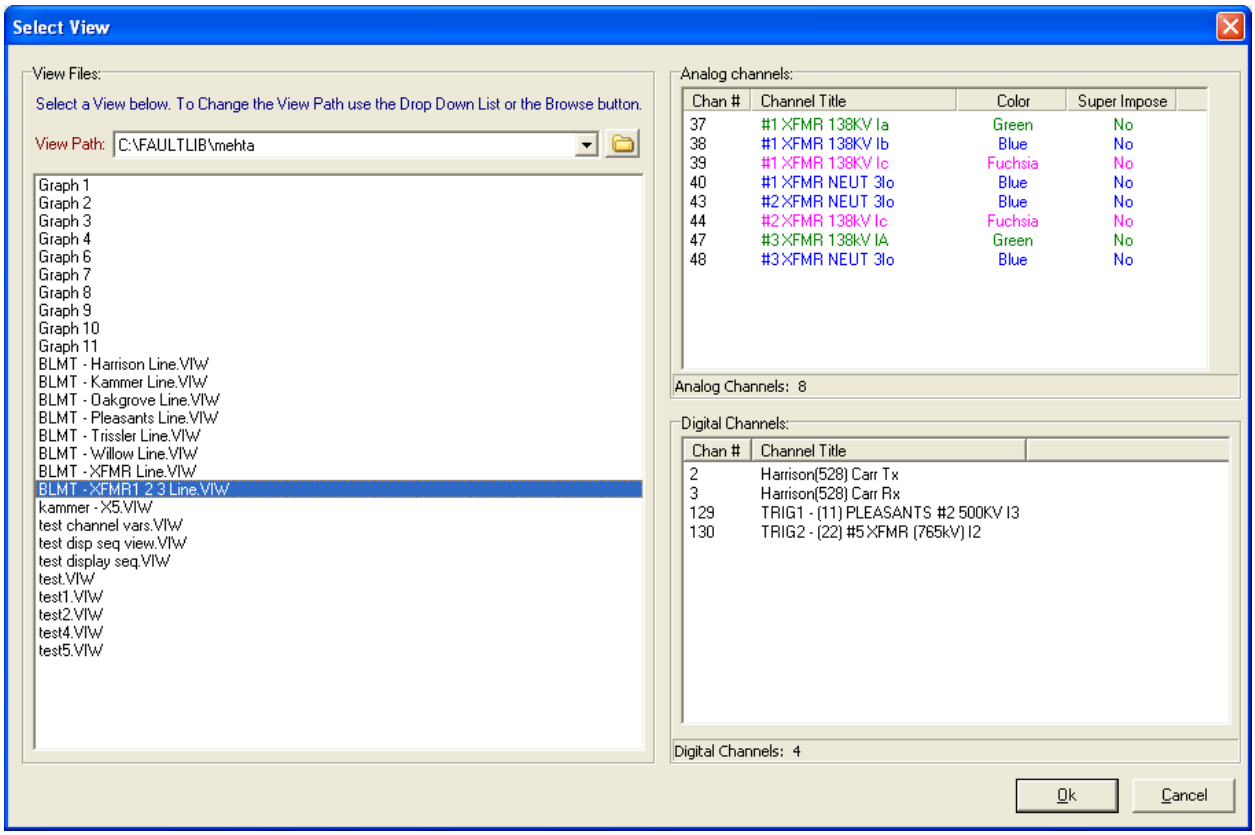


Figure 1.104 Select View Details Dialog

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 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 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 3rd 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:

Phase Shift:	The phase shift angle for each analog channel.
A0:	The Thiran A0 coefficient for each analog channel.
A1:	The Thiran A1 coefficient for each analog channel.
A2:	The Thiran A2 coefficient for each analog channel.
A3:	The Thiran A3 coefficient for each analog channel.
Always Apply:	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

AMETEK TR*/DL*/PQR128 DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the Ametek TR*/DL*/PQR128 driver.

Activation: *Menu:* Alt-D, P

Comments: An error message is displayed if the selected file is not a valid Ametek file. Files that have a ".AMT" extension or files that have the first 2 characters in the name as "ZQ" and the file has no extension are automatically tagged as Ametek files.

See Also: Display Oscillography in Chapter 1
Associating File Types 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)

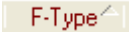
Comments: The files must be of the same type (the analog/digital channel titles must match). The results in the data display window can be saved in a Comtrade file for archiving.

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 (Options menu) or Alt-D, 1 (Driver menu)

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, V

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.

Activation: *Menu:* Alt-D, Z

See Also: Associating File Types in Chapter 1.

AUTO SCALING

Location: Data Display

Description: Turn the state of amplitude auto scaling On, Off or ++ 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

BPRO DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the NxtPhase BPRO driver and plot the input channels.

Activation: *Menu:* Alt-D, O

Comments: NxtPhase files are displayed in the IEEE Comtrade Binary format. NxtPhase has developed an automatic conversion application called "AutoComtrade.exe". Wavewin calls "AutoComtrade.exe" to convert NxtPhase files to the Comtrade binary format for display. To view NxtPhase relay files double click or press enter on the original BPRO files. To obtain a copy of the “AutoComtrade.exe” file please contact NxtPhase.

Files that have a .BPR extension are automatically tagged as NxtPhase BPRO files.

See Also: Tesla Files in Chapter 1.
Display Oscillography in Chapter 1
Associating File Types in Chapter 1

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 Save As 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 Click, 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 in the file table. 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, Color's 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 position of the data values select the "Window Properties" option from the "File" 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, 3, 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:

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

Options: *Enter/Ok:* Save the entered data.
Esc/Cancel: 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 file with different time code, latitude and longitude coordinates.

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) 

, Ctrl-C (Copy) 

, Ctrl-V (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 where 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: 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
Fault Bar

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.

DFR I II IIB & 2000 DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the Hathaway DFR I II IIB and 2000 driver.

Activation: *Menu:* Alt-D, 6

Comments: An error message is displayed if the system cannot find the files DAU header file or there was a problem reading the file.

See Also: Display Oscillography in Chapter 1
Associating File Types 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:

Move Up:	Move the highlighted column before the previous column.
Move Down:	Move the highlighted column after the next column.
Reset:	Default the order of the columns to how they were when the software was first installed.
OK:	Change the order of the columns and redraw the file table.
Cancel:	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

DISTURBANCE REPORT

Location: File Manager

Description: Create a disturbance report from the defined fault files.

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

Fields:

Destination File:	The folder and filename where the report is saved.
Source Folder(s):	The source folder(s) where the event files are located.
Filter: Faulted Phases:	Enter the valid faulted phases (separated by commas).
Filter: Fault Location:	Enter the maximum % of the line length to detect.
Filter: Voltage Class:	Enter the voltage kv value that is above the phase to ground level.
Filter: Fault Current:	Enter the minimum magnitude value.
Filter: System Frequency:	Enter the deviation from the line frequency to detect.

Options:

Process:	Process the report and display the results.
Save Script:	Save the entered values to the Disturbance.ini script file.
Edit Script:	Edit the Disturbance.ini script file.
Show Help:	Show the help file below the buttons.
Close:	Close the disturbance dialog without saving.

Comments: The result disturbance report is saved to the defined destination file and displayed in a comma delimited table. The table allows for sorting, querying, deleting of rows and saving.

See Also: Disturbance Report in Chapter 1

DLP1/DLP3 DRIVER

Location: File Manager

Description: Plot the contents of the oscillography file using the DLP1/DLP3 driver. If the driver encounters an error while reading the file an "Invalid Driver Message" is displayed indicating the line number in which the error was encountered. Use the ASCII or Hexadecimal editors to locate and correct the error. The ASCII and hexadecimal editors display the cursor's line and character number in the lower left corner of the window.

Activation: *Menu:* Alt-D, C

Comments: An error message is displayed if the file is not a valid DLP file. All files that have an ".OSC" extension are tagged as DLP files.

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, 3, 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 CONFIGURATION DIALOG

Location: File Manager

Description: Display the driver configuration dialog. The driver configuration dialog allows for setting certain features pertaining to a specific driver.

Activation: *Menu:* Alt-O, N

Fields:

Driver List:	A list the supported drivers in the system.
Devices Data Type:	Select the type of data that the device saves (RMS or Peak).
Device Header Dir:	Enter a localized directory for all support files needed to display the files.
Default Frequency:	Enter the default frequency to display the device's file when the files are first displayed.

Options: *Ok:* Save the changes made and close the dialog.
Cancel: Ignore any changes made and close the dialog.

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

See Also: Driver Configuration 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, Driver Data Type Tab

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: Duplicate 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, 4, 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.

EDIT DAU-DEF

Location: File Manager

Description: Display the DAU-DEF editor for Hathaway DAU-DEF files. The DAU-DEF editor allows for changing certain fields defined in the DAU-DEF records. A Windows file selection dialog is display to select the DAU-DEF to edit. Navigate to the desired directory and double click on the DAU-DEF file to edit.

Activation: *Menu:* Alt-O, E

Fields:

DAU-DEF Records:	A list the all DAU-DEF records defined in the selected file.
Analog Channels:	A list of all the analog channels defined for the selected record.
Analog Name:	Edit the analog name for the selected analog channel.
Analog Full Scale:	Edit the analog full scale value for the selected analog channel.
Analog Prefix:	Edit the analog prefix for the selected analog channel.
Analog Unit:	Edit the analog unit for the selected analog channel.
Event Channels:	A list of all the event channels defined for the selected record.
Event #:	Edit the event's number for the selected event channel.
Event Name:	Edit the event name for the selected event channel.
Event NoNc:	Edit the event's normally open normally close value for the selected event channel.
Sensor Channels:	A list of all the sensors channels defined for the selected record.
Sensor #:	Edit the sensor number for the selected sensor channel.
Sensor Name:	Edit the sensor name for the selected sensor channel.
Sensor NoNc:	Edit the sensor's normally open normally close value for the selected sensor channel.

Options:

Save:	Save the selected DAU-DEF record.
Ok:	Save all changes made and close the dialog.
Cancel:	Ignore any changes made and close the dialog.
Default Sensor #8:	Checking this option will always default Sensor channel #8;s NoNc value to be 1.

Comments: When this feature is activated a Windows file selection dialog is display, navigate to the desired directory and double click on the DAU-DEF file to edit.

See Also: Edit DAU-DEF in Chapter 1.

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

Fields:

To:	Recipient of the email, initially empty.
From:	Sender, automatically defaulted.
Subject:	Empty.
Attachment:	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"  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.

EMAX LONG TERM DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the Emax Long Term driver and plot the input channels.

Activation: *Menu:* Alt-D, Q

Comments: If the selected file is not a valid EMAX Long Term file an error message is generated. All files that have the ".DAT" extension along with a corresponding .SET file are tagged as EMAX Long Term files.

See Also: Display Oscillography in Chapter 1
Associating File Types 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 BAR

Location: Data Display

Description: The Fault bar is the red dotted line that runs vertically across the analog and digital channels.

Comments: 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.

See Also: Data bar
RMS Bar
Reference Bar

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

FAXTRAX II (12-BIT) & DIRECTOR DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the Faxtrax II (12-bit) driver or the Director format depending on the format of the file.

Activation: *Menu:* Alt-D, 8

Comments: If the selected file does not have a corresponding ".CTL" file an error message is generated. All files that have the ".RCD", ".RCL" and ".RCU" extensions, and there is a corresponding ".CTL" file in the same directory, are tagged as Faxtrax/Director files.

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 "Files" 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

FPRO DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the NxtPhase FPRO driver and plot the input channels.

Activation: *Menu:* Alt-D, O

Comments: NxtPhase files are displayed in the IEEE Comtrade Binary format. NxtPhase has developed an automatic conversion application called "AutoComtrade.exe". Wavewin calls "AutoComtrade.exe" to convert NxtPhase files to the Comtrade binary format for display. To view NxtPhase relay files double click or press enter on the original FPRO files. To obtain a copy of the “AutoComtrade.exe” file please contact NxtPhase.

Files that have an “.FPR” extension are automatically tagged as NxtPhase FPRO files.

See Also: Tesla Files in Chapter 1.
Display Oscillography in Chapter 1
Associating File Types in Chapter 1

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 forth 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 1st 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, 2

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 1st 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

INTELLIRUPTER DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the S&C IntelliRupter driver.

Activation: *Menu:* Alt-D, S

Comments: An error message is displayed if the selected file is not a valid IntelliRupter file. Files that have a ".WFC" extension are automatically tagged as IntelliRupter files.

See Also: Display Oscillography in Chapter 1
Associating File Types in Chapter 1

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

LPRO DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the NxtPhase LPRO driver and plot the input channels.

Activation: *Menu:* Alt-D, O

Comments: NxtPhase files are displayed in the IEEE Comtrade Binary format. NxtPhase has developed an automatic conversion application called "AutoComtrade.exe". Wavewin calls "AutoComtrade.exe" to convert NxtPhase files to the Comtrade binary format for display. To view NxtPhase relay files double click or press enter on the original LPRO files. To obtain a copy of the “AutoComtrade.exe” file please contact NxtPhase.

Files that have an “.LPR” extension are automatically tagged as NxtPhase LPRO files.

See Also: Tesla Files in Chapter 1.
Display Oscillography in Chapter 1
Associating File Types 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 forth 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 hollow blue circle is placed at 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

MDAR REL 301/302 DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the MDAR REL 301/302 driver and plot the input channels.

Activation: *Menu:* Alt-D, D

Comments: If the selected file is not a valid REL file an error message is generated. All files that have the ".REL" extension are tagged as MDAR REL files. The MDAR REL driver uses circular interpolation techniques to convert the input sampling frequency to a higher frequency suitable for display. The input sampling frequency is 8 samples per cycle (45 degrees apart).

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 file 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:

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

Options:

Play:	Play the active analog channels data.
Volume:	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.

PM295 DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the PM295 driver and plot the input channels.

Activation: *Menu:* Alt-D, G

Comments: If the selected file is not a valid Satec PM295 file an error message is generated.

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 Files 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 option “Page” 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
Fault Bar

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

REPLAY PLUS DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the Hathaway Replay Plus driver and plot the input channels.

Activation: *Menu:* Alt-D, R

Comments: The Replay Plus driver reads and displays waveform (dfr), disturbance (css) and trend (tss) files. If the selected file is not a valid Replay Plus file an error message is generated. All files that have the ".DAT" extension, with no corresponding ".CFG" file are tagged as Replay Plus files.

See Also: Display Oscillography in Chapter 1
Associating File Types 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

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 menu button 
Menu: Alt-D, R

See Also: Duplicate Cycles
Truncate Cycles
Change Frequency

RFL 9300 DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the RFL 9300 driver and plot the input channels.

Activation: *Menu:* Alt-D, F

Comments: If the selected file is not a valid RFL 9300 file an error message is generated.

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
Fault Bar

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:

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

Options:

Enter/Ok:	Set the format.
Esc/Cancel:	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

SDC LOG DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the SDC Log driver and plot the input channels.

Activation: *Menu:* Alt-D, H

Comments: If the selected file is not a valid SDC Log file an error message is generated. All files that have the ".CSV" extension are tagged as SDC Log files.

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

SEL LOAD PROFILE DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the SEL load profile driver and plot the input channels.

Activation: *Menu:* Alt-D, O

Comments: If the selected file is not a valid SEL load profile file an error message is generated. All files that have the ".BSV" extension are tagged as SEL load profile files.

SEL METER DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the SEL Meter driver and plot the input channels.

Activation: *Menu:* Alt-D, B

Comments: The SEL Meter files are ASCII files that have time sequenced meter commands in them. These files are automatically displayed as Non-Sinusoidal Log files.

SEL RELAY DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the SEL event driver and plot the input channels.

Activation: *Menu:* Alt-D, A

Comments: If the selected file is not a valid SEL file an error message is generated. All files that have the ".SEL", "CEV" and ".EVE" extensions are tagged as SEL files. Use the Drivers menu to change the file's SEL driver type. All SEL relay display formats are supported.

SELECT LINES/VIEWS

Location: Data Display

Description: Select a specific line or view for display.

Activation: *Direct:* Line/View drop down menu button 
Menu: Alt-C, L

Comments: The DFR Transcan and Faxtrax records have predefined views encoded into their format. To select the predefined views click on the "Show All/ Select View" drop down menu button or select the "Select Views" menu option under the "Channels" menu option. A list of the available lines/graphs will be displayed. To view all the analog channels in the file press the <esc> key, the <backspace>, or click the "Show All" menu button or click the **ViewAll** ⇦ menu button.

See Also: Selecting Predefined Views in Chapter 1

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:

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

Options:

Enter/Ok:	Select the highlighted view.
Esc/Cancel:	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:

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

Channel Title:	The title of the channel.
File:	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:

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

SINGLE ENDED FAULT LOCATION

Location: Data Display

Description: Display the single ended fault location dialog. The Single Ended Fault Location Dialog is used to interface to the SingleEndFaultLocation.dll. The SingleEndFaultLocation.dll will calculate the fault location, fault type and fault time.

Activation: *Menu:* Alt-D, O

Fields:

ZLine:	Positive sequence impedance.
ZLine Angle:	Positive sequence angle.
kZN:	Compensated zero sequence impedance (Z0-Z1)/(3*Z1).
kZN Angle:	Compensated zero sequence factor angle (Z0-Z1)/(3*Z1).
kZM:	Mutual compensation factor (Z0m)/(3*Z1).
Line Length:	Line Length.
Vnom:	Nominal phase to phase voltage.
Inom:	Nominal current.
Analog Chans:	Select the analog channels from the drop down lists.
Pre Cycles:	Number of cycles to send before the reference bar.
Post Cycles:	Number of cycles to send after the reference bar.

Advanced Dialog Fields:

Z1 (% of Line):	Zone 1 forward impedance.
Z2 (% of Line):	Zone 2 reverse impedance.
R0:	Phase loop resistance reach.
Rg:	Ground loop resistance reach.
IO Threshold:	Zero sequence current threshold for VTS.
I2 Threshold:	Neg. sequence current threshold for VTS.

Ph Select Ind: Index of the sample corresponding to the fault inception.
Average Count: Total post fault samples for averaging fault distance.
Ph Select Mode: Phase selection mode (Internal, AG, BG, CG, AB, BC, CA).

Options:

Advanced:	Display the Advanced dialog for fine turning the algorithms.
Start:	Start the fault location algorithms.
Print:	Send a screen dump of the outputs to the system's default printer.
Show Help:	Show/Hide the fault location drop down help window.
Open:	Open a fault location (*.flt) file.
New:	Create a new fault location file.
Save:	Save the active fault location file.
Save As:	Save the active fault location file under a new name.

Comments: The sampling frequency must be set to ensure 24 samples per cycle. The sampling frequency must be set prior to opening the fault location dialog. If the sampling frequency is not set to 1440 Hz for 60 Hz or 1200 Hz for 50 Hz then the change sampling frequency dialog will automatically be displayed. Click OK or press enter to change the sampling frequency then reopen the Fault Location dialog.

All sample values sent to the DLL must be in secondary quantities. If the sample values are in primary values then the CT and PT ratio values must be available in the data configuration file. If the CT and PT ratio values are not available a message will be displayed asking to ignore the request or abort displaying the fault location dialog.

See Also: Single Ended Fault Location in Chapter 1.

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.
Open:	Open a *.SAC file.
New:	Create a new *.SAC file.
Save:	Save the active SAC file.
Save As:	Save the active SAC file under a new name.

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.

SR745/489 DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the GE SR745/489 driver and plot the input channels.

Activation: *Menu:* Alt-D, K

Comments: If the selected file is not a valid SR745/489 file an error message is generated. All files that have the ".CSV" extension, and have "CSV format" in the first line of the file are tagged as GE SR745/489 files.

See Also: Display Oscillography in Chapter 1
Associating File Types in Chapter 1

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.

TESLA DRIVER

Location: File Manager

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

Activation: *Menu:* Alt-D, N

Comments: Tesla Files are displayed in the IEEE Comtrade Binary format. NxtPhase has developed an automatic conversion application called "AutoComtrade.exe". Wavewin calls "AutoComtrade.exe" to convert Tesla files to the Comtrade binary format for display. To view Tesla Files double click or press enter on the original Tesla files. To obtain a copy of the “AutoComtrade.exe” file please contact Tesla.

Files that have a .TLR extension are automatically tagged as NxtPhase Tesla files.

See Also: Tesla Files 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, M

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 file 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.

TPRO DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the NxtPhase TPRO driver and plot the input channels.

Activation: *Menu:* Alt-D, O

Comments: NxtPhase files are displayed in the IEEE Comtrade Binary format. NxtPhase has developed an automatic conversion application called "AutoComtrade.exe". Wavewin calls "AutoComtrade.exe" to convert NxtPhase files to the Comtrade binary format for display. To view NxtPhase relay files double click or press enter on the original TPRO files. To obtain a copy of the "AutoComtrade.exe" file please contact NxtPhase.

Files that have a ".TPR" extension are automatically tagged as NxtPhase TPRO files.

See Also: Tesla Files in Chapter 1.

Display Oscillography in Chapter 1
Associating File Types in Chapter 1

TPU/DPU/GPU DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the ABB TPU/DPU/GPU driver and plot the input channels.

Activation: *Menu:* Alt-D, E

Comments: If the selected file is not a valid TPU or DPU or GPU file an error message is generated. All files that have the ".CAP" extension are tagged as TPU/DPU/GPU files.

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.

TRANSCAN DRIVER

Location: File Manager

Description: Change the driver at the cursor position to the Mehta Transcan driver and plot the input channels.

Activation: *Menu:* Alt-D, 7

Comments: If the selected file does not have a corresponding SCF file an error message is generated. All files that have an extension that starts with ".X", and there is a corresponding ".SCF" file in the same directory, are tagged as Transcan files.

See Also: Associating File Types in Chapter 1.

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.

TRUERMS

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 Cycles 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 if there are no marked waveform files else plot all the marked waveform files.

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 for SEL, DLP and Transcan files. The fault information includes: Fault Type, Fault Time, Location, Targets, Triggers, Frequency, Event and Targets.

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:* Properties 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.

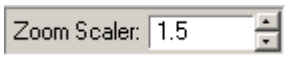
Activation: *Direct:* "+" key, Menu buttons
Menu: Alt-V, I

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_Ia
save rect( <5> ) as I_Ib
save rect( <6> ) as I_Ic
```

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_Ia
save rect( 0.984,56.515 ) as P_Ib
save rect( 0.922,308.324 ) as P_Ic
```

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.

DFR Drivers

The following errors messages are displayed if the system encounters a problem while reading the contents of a DFR file:

1 Unable to Open the Selected Device's Header Files - This error occurs if the header files were not found in the active directory or there was a problem opening the file. From the file table, click the **Dir** menu button to see if the header files still exist on disk. The header files must be in the same directory as the event files.
2 Selected Device Information not Available in the DAU-DEF file - This error occurs if the address stored in the DAU definition record is not found in the DAU-DEF file. The record address is read from the DAU-KEY file.
3 Unable to Open the Selected Device's DAU-KEY file - This error occurs if the DAU-KEY file was not found in the active directory, 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. The DAU-KEY file must be in the same directory as the event files, or in an adjacent directory named "DATABASE".
4 Unable to Open the Selected Device's DAU-TYPE file - This error occurs if the DAU-TYPE file was not found in the active directory, 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. The DAU-TYPE file must be in the same directory as the event files, or in an adjacent directory named “DATABASE”.

5 Unable to Open the Selected Device's SAC/SDC database file - The event files corresponding SAC/SDC channels are saved in the WAVESC40.DTB file. This error occurs if the file was not found in the system directory or could not be opened. From the file table, navigate to the system directory and verify that the WAVESC40.DTB file exists. To re-create the file, exit the system and rerun the software.

6 Not Enough Memory Available for the Device Information - This error occurs if there is not enough memory to store the analog and digital channel information. Close other applications to free up memory.

7 Not Enough Memory Available for the SAC/SDC Information - This error occurs if there is not enough memory to store the SAC/SDC channel information. Close other applications to free up memory.

8 Not Enough Memory Available to Read Device File - This error occurs if there is not enough memory to store the first sample in event file. Close other applications to free up memory.

9 Unable to Open the Selected Device File - This error occurs if the event file was not found in the active directory, 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.

10 Not Enough Memory Available to Read the File, File Truncated - This error occurs if there is not enough memory to store all the samples in the event file. To see the full contents of the file close other applications to free up memory.

11 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.

12 Device File is to Small to Read - A DFR file less than 1000 bytes cannot be read by the system.

13 Too Many Acquisition Frequencies, File Truncated - This error occurs if the DFR file contains more than 80 acquisition frequencies.

14 Invalid Acquisition Frequency - This error occurs if an invalid acquisition frequency is read from the file.

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.

Relay Drivers

The following errors messages are displayed if the system encounters a problem while reading the contents of a relay file:

1 Not Enough Memory Available for the Device Information - This error occurs if there is not enough memory to store the analog and digital channel information. Close other applications to free up memory.
2 Not Enough Memory Available for the SAC/SDC Information - This error occurs if there is not enough memory to store the SAC/SDC channel information. Close other applications to free up memory.
3 Not Enough Memory Available to Read Device File - This error occurs if there is not enough memory to store the first sample in the relay file. Close other applications to free up memory.
4 Not Enough Memory Available to Read the File, File Truncated - This error occurs if there is not enough memory to store all the samples in the relay file. To see the full contents of the file close other applications to free up memory.
5 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.
6 Could Not Open File - This error occurs if the relay file was not found in the active directory, 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.
7 Invalid Relay File, Error at Line N - This error occurs when the relay driver is unable to read the contents of the selected file. The line number in which the error occurred is displayed in the error message.

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 a list of the DAU-DEF station titles found in the active 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 sequence of events table for all the marked waveform files.
F12	Refresh the folder tree and 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 edit cursor one position to the right.
Left Arrow	Move the edit cursor one position to the left.
Tab	Activate the Folder Tree
Ctrl+Left Arrow	Move the editor to the next query field.
Ctrl+Right Arrow	Move the editor to the previous query field.
Enter	Process the query criteria for all or marked files.

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.

Cursor Keys	**Description**
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 data.
Page Down	Page down through the 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.

Menu Buttons	Description
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.
Select Views	Select a specific line or view from the drop down list.

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.

Menu Buttons	**Description**
 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.

Symbol	Descripition
V	Voltage.

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