WAVEWIN

FILE MANAGER

QUICK START

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Preface

This document contains information about the Wavewin file management capabilities. The document also describes the numerous display drivers provided including Hathaway, Mehta, Schweitzer, ABB, GE, etc.

This document is intended for use by individuals working in protection, engineering, and system operations.

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C H A P T E R 1

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.
- 500 Megabytes of memory.
- 2 gigabytes of available hard disk space.
- A VGA, 8514/A, or compatible graphics adapter.
- Microsoft Windows version XP 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 access 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 and password are case sensitive. Click on the software link to download the latest 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, navigate to the CD's root drive and double click on the install.exe application.

Follow the instructions to fully install the software.

Figure 1.1 Destination Folder

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

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

Figure 1.2 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 begin. How 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 quick start chapters to get familiar with the software.

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 6:00 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 2

File Manager Quick Start

This chapter describes the main features of the File Manager.

File Manager Features

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.

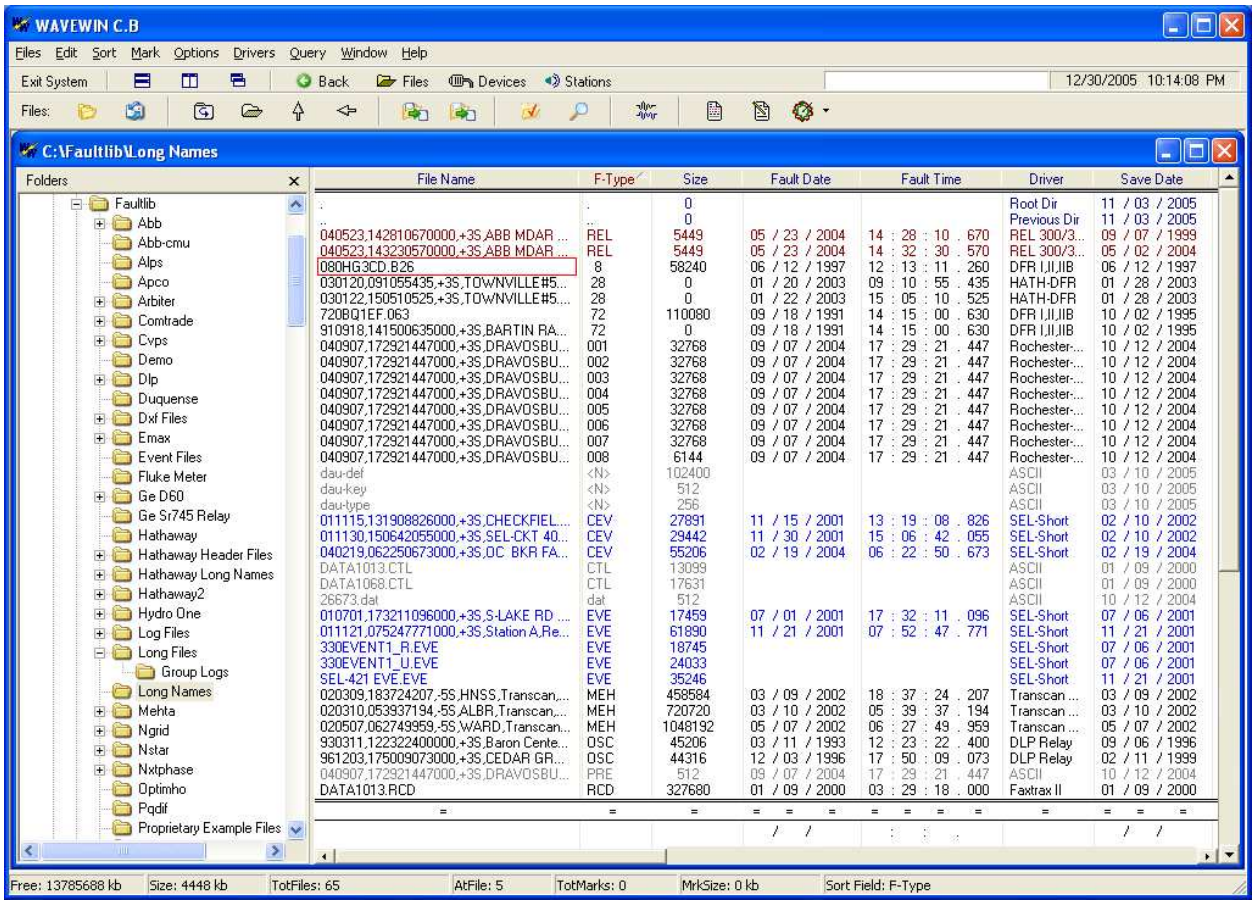


Figure 2.1 File Manager

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. The main features are described in the following sections.

LONG FILE NAMING FORMAT

The File Manager supports the IEEE long file naming format. The IEEE long file naming format is a PSRC format 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 first ten fields stored in a comma-delimited fashion. The remaining fields are optional. The file table lists four optional columns at the end of the table to support user defined fields. The ComNames properties dialog allows for user input for the first two optional fields.

Example: 000112,123433234,-5S,South Arkey,DLP1,Sun Power,T,123.22,+34.6,AG T.OCS

Field Definitions:

Field	Example	Displayed	Definition
Date	000112	01/12/2000	The Date field defines the start date of the file. The date fields are defined as: the first two characters are the year, the next two are the month and the last two are the day. (required)
Time	123433234	12:34:33.234	The time field defines the start time of the file. The Time fields are defined as: the first two characters are the hour, the next two are the minutes, the next two are the seconds and the last two or three are the milliseconds. (required)
Tcode	-5S	-5S	The TCode field is the time offset from GMT time. If the start time is expressed in UT, this field is coded 0z, Note: GMT is the international abbreviation Greenwich Mean Time. (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)
File Tag	T	T	The fault type or contents type of the file. (optional)
Line Length	123.22	123.22	The line length extracted from the event file. This field applies to certain relays. (optional)
Fault Location	+34.60	+34.60	The fault location extracted from the event file. This field applies to certain relays. (optional)
Fault Type	AG T	AG T	The fault type extracted from the event file. This field applies to certain relays. (optional)

COMNAME(S) RENAME

To rename time sequenced data files using the IEEE long file naming format select the “ComName(s) Rename” menu option under the “File” menu. ComName(s) Rename will rename all the marked waveform files to the IEEE PSRC long file naming format. 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. 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 files will also 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.

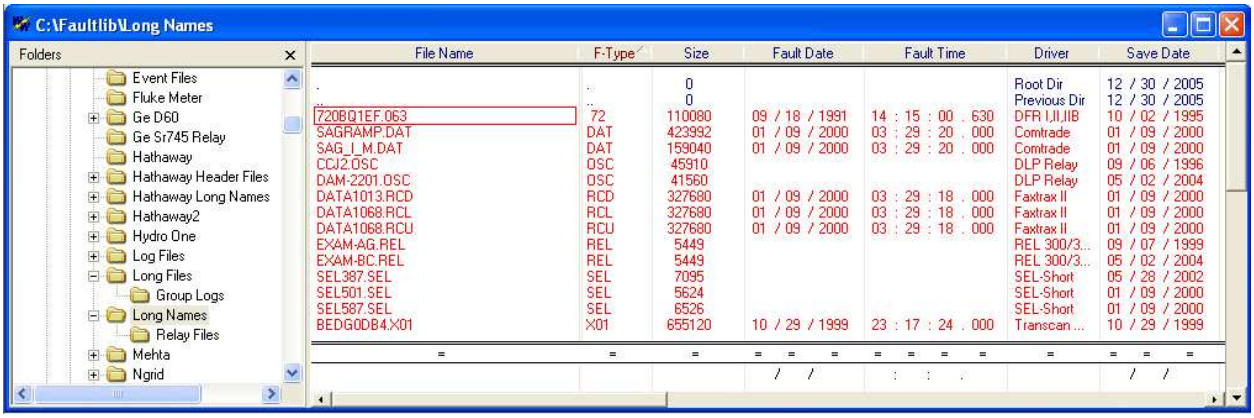


Figure 2.2 ComNames Rename: Select and Mark all the Waveform Files to Rename

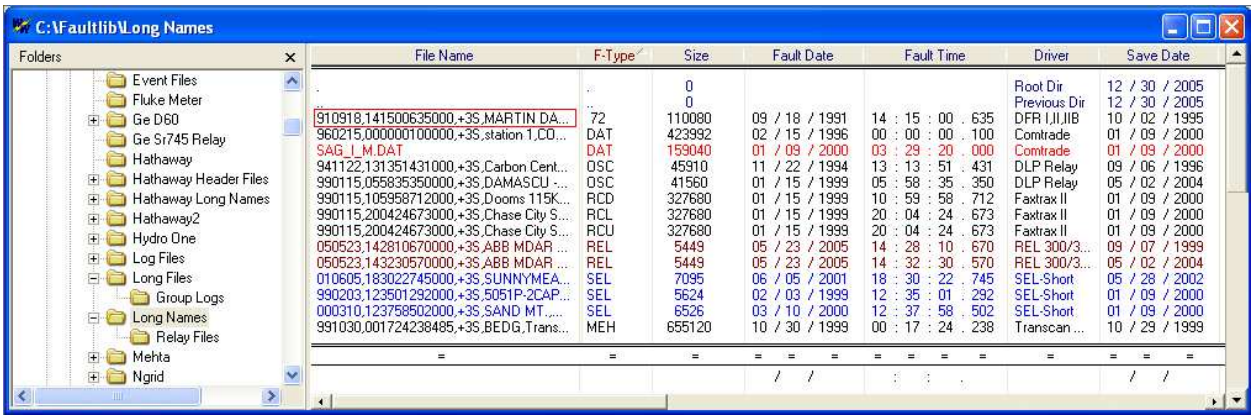


Figure 2.3 ComNames Rename: Result

COMNAME PROPERTIES

The fields defined in the IEEE long file naming format 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 files. User fields allow for setting specific information into the file name.

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

The fields entered are used for all files renamed.

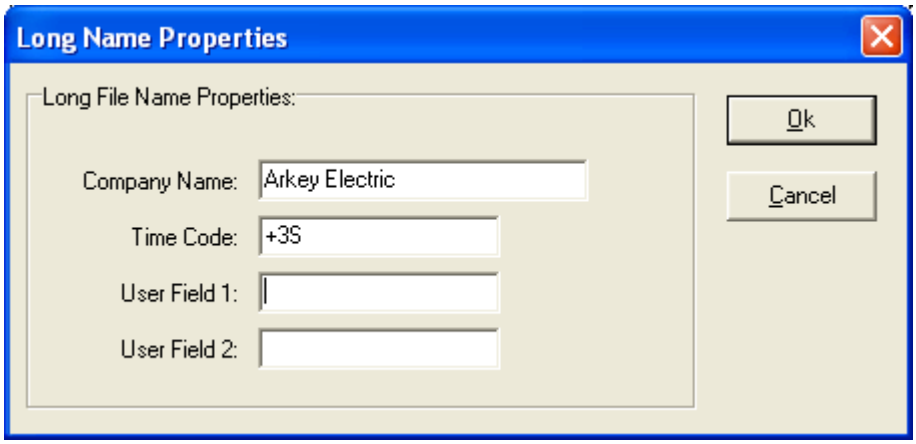


Figure 2.4 ComName Properties Dialog

COMMAND LINE PARAMETERS

Command line parameters are 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 descriptions:

Command Line	Description
Path and Filename	If a path and filename is passed as a command line parameter 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.
/Comtrade	The "/Comtrade" command line parameter is used along with a path and filename command line. It automatically converts a file to the IEEE C37.111 Comtrade ASCII 1999 format. The new passed parameter is /Comtrade. To retain the original file name of the source file use the /Comtrade passed parameter. To have the file automatically named using the IEEE C37.232 file naming format use the /Comtrade=1 passed parameter. The /Comtrade command line parameter can also be used in batch files. The converted Comtrade files are saved in the same directory as the source file. The new passed parameter will convert the source file to Comtrade then display the converted Comtrade file in the data plotting window. Below are some examples: Examples: ---------- 1.) Passed Parameter: "c:\faultlib\shipdir\SEL-421.CEV" /Comtrade=1 Comtrade Filename: 011207,145119291000,-5,Station A,Relay 1,SOFTSTUF,TRIP,,SOTF B_PHASE C_PHASE GROUND 50,60.00.DAT

	2.) Passed Parameter: "c:\faultlib\shipdir\DATA1068.RCD" /Comtrade Comtrade Filename: c:\faultlib\shipdir\DATA1068.DAT
/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 used mainly to print or convert to Comtrade 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. If the files have different sampling frequencies 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 named Merged File.cfg and Merged File.dat. If an error occurs 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.
Dispatcher	The dispatcher command line will automatically open the Dispatch table at runtime.

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 folder, navigate through the folder tree or place the cursor on the folder name in the file table and press <enter> or double click on the desired folder. The "**.**" and "**..**" displayed at the top of the file table provide shortcuts to the previous folder and the root directory. To return to the previous folder, 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 folder, 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 folder, enter only the drive letter. To display the

contents of the root folder, 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 folder.

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

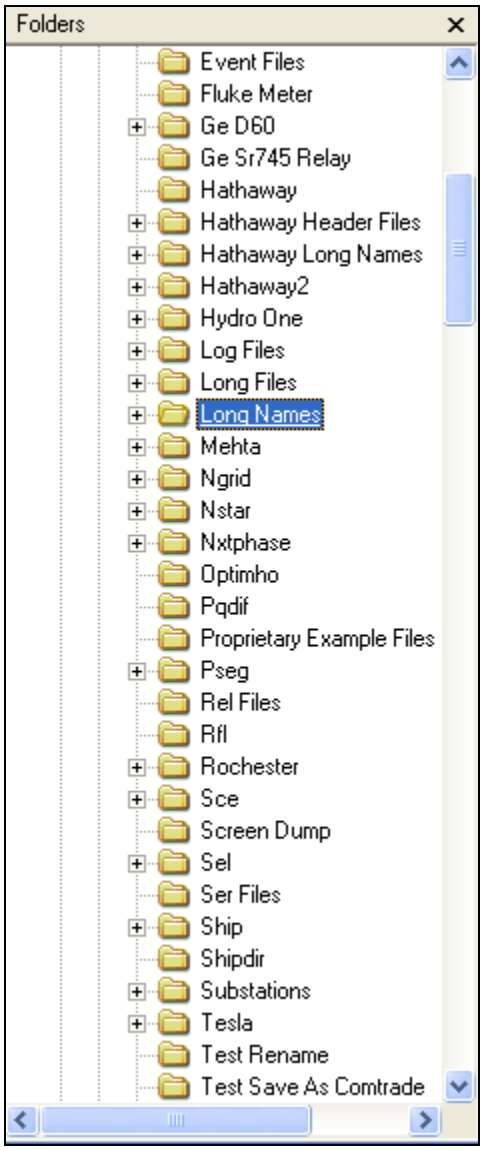


Figure 2.5 Folder Tree

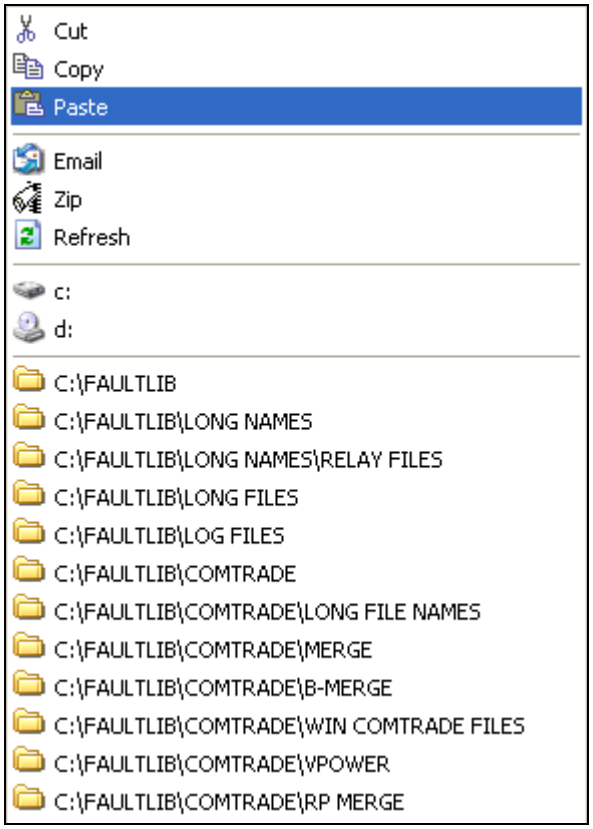


Figure 2.6 Drive/Directory Navigation Menu

UPDATING THE ACTIVE DIRECTORY

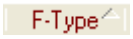
Click the **Refresh** menu button to update the contents of the folder tree and the file table or press F12. To refresh only the folder tree right click on the folder tree and select the **Refresh** option. To refresh only the file table right click on the file table and select the **Refresh** Refresh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

Figure 2.7 Folder Tree Popup Menu

MARKING FILES

Files are marked and unmarked through the mark menu option, the space bar, or the 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 plotted.

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 

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

.

COPYING OR MOVING FILES

Files must be marked in order to copy or move them from the active folder. To copy/move files using the Window's **Folder Tree** dialog click the **Copy** **/ Move** menu buttons or press F8 for copy and F9 for move. Select the folder from the Directories tree or click on the **New Folder** button and enter the new directories name then press <enter>. A message is displayed if an error occurs while copying or moving the files. The **Cancel** button or the <esc> key terminates the command.

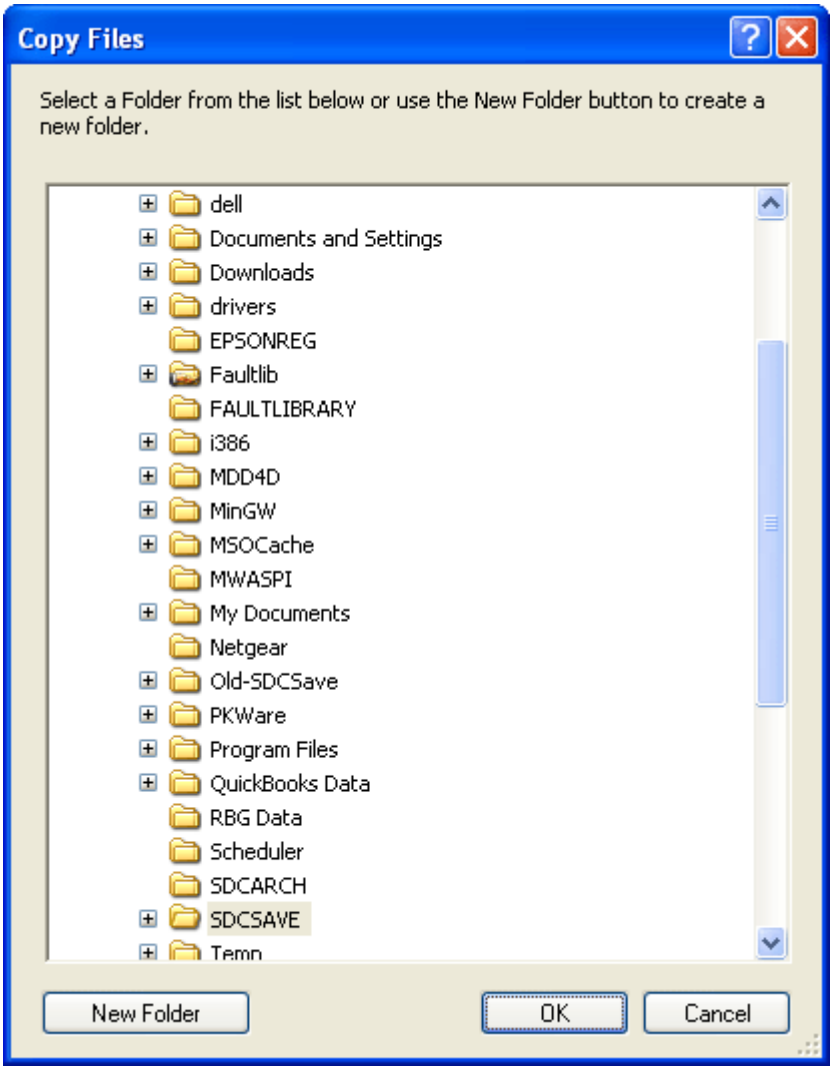


Figure 2.8 Copy Dialog

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.

To move files using the drag and drop feature, first mark the files in the file table then drag them to the desired folder in the Folder tree. Once the move is complete, a message box will be displayed listing the number of files moved to the selected folder.

After a copy/move or paste command is executed and a file is successfully transferred to the destination directory, the system's task bar in the upper right hand corner of the screen is updated. 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, HDR, INF, DAU-DEF, SCF File, CTL File and *.PRE files…) are automatically copied from the source folder to the destination folder.

EMAIL FILES

Files must be marked first (displayed in red) to email. Mark all of the files to email then 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.

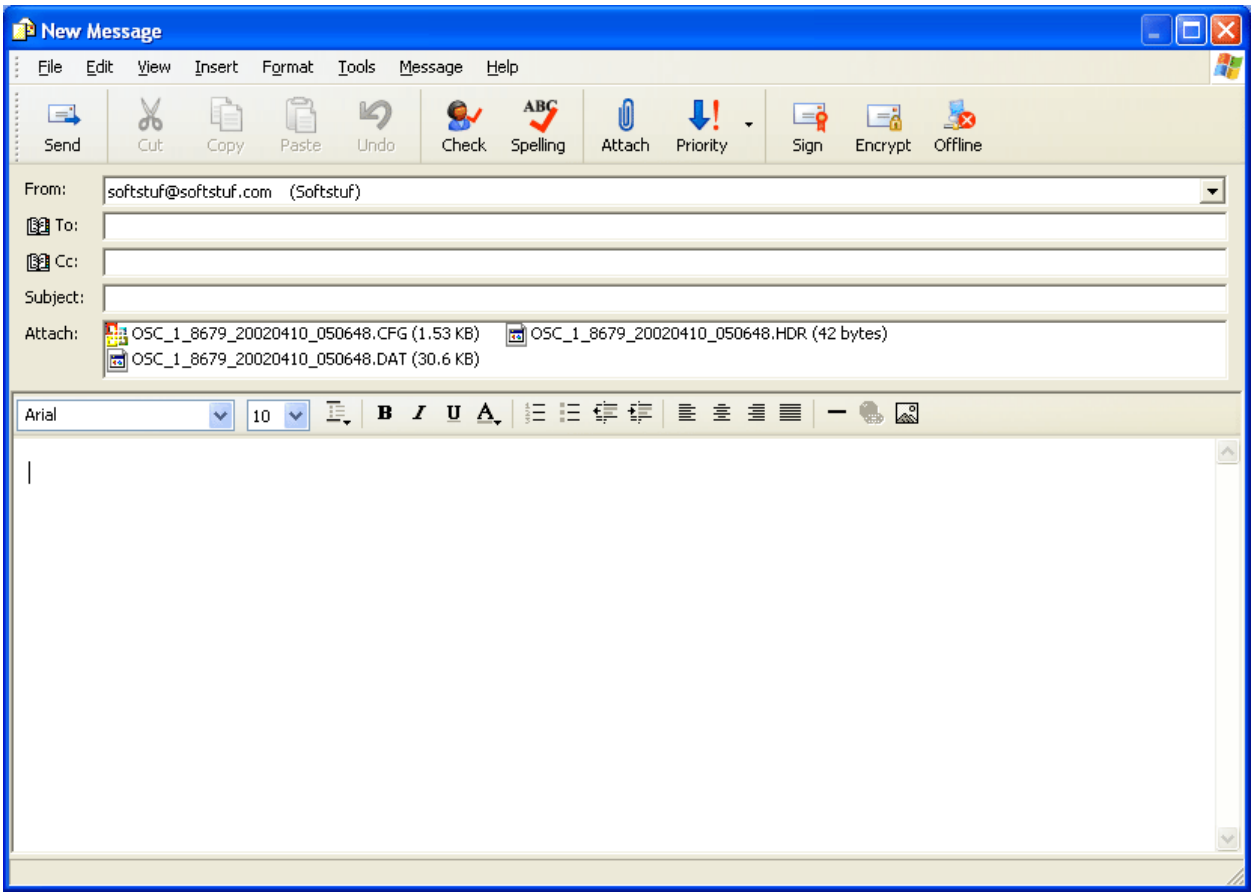


Figure 2.9 Email Dialog

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, the zip file is saved to the file table's active folder. 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.

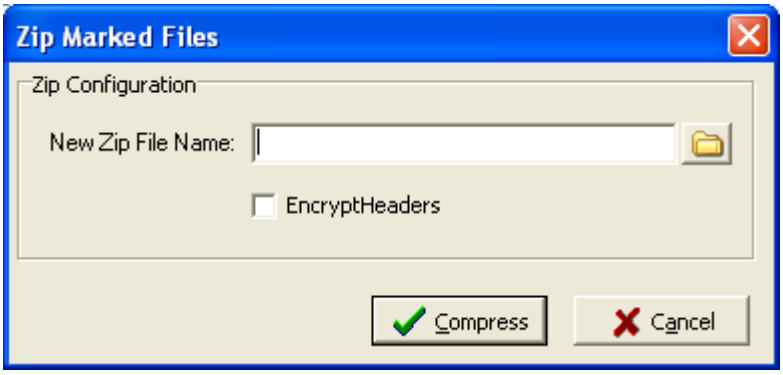


Figure 2.10 Zip Dialog

CUSTOMIZING THE TABLE DISPLAY

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

The size of the font displayed in the table can also be changed. Use the "Table Font Size" drop down list to select the desired font. Also, to use the Window's default file marking, select the "Windows" option from the "File Marking" drop down list. To mark files with a single mouse click select the "Single Mouse Click" option.

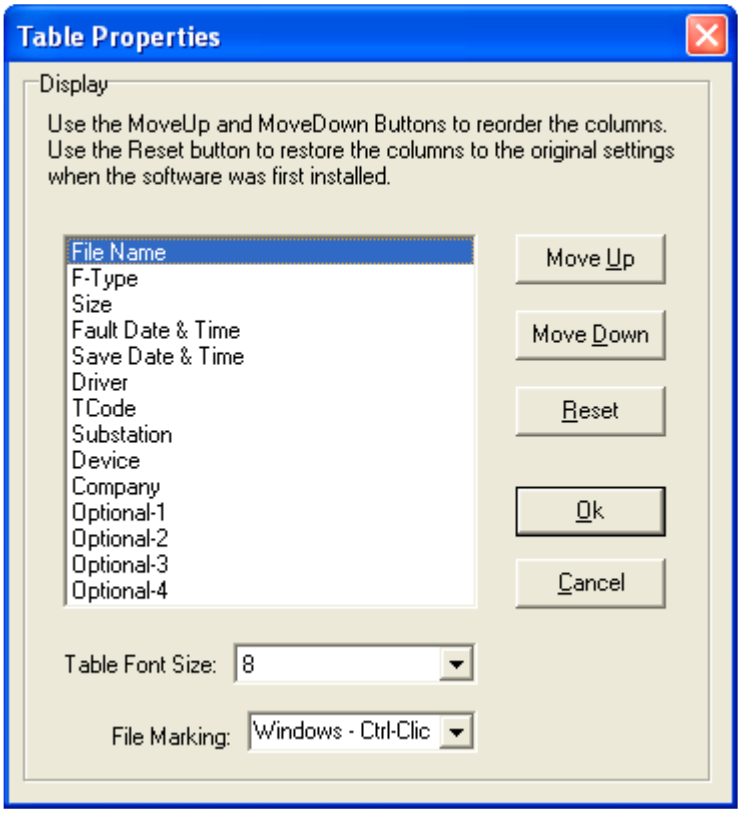


Figure 2.11 Customize Table Columns

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 confirmation, 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. Two Comtrade versions are 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. 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 desired Comtrade file must have instantaneous values 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 analysis display. Select the "Comtrade" tab then select "Yes" for the "Convert RMS Calibrated Data to Peak Data".

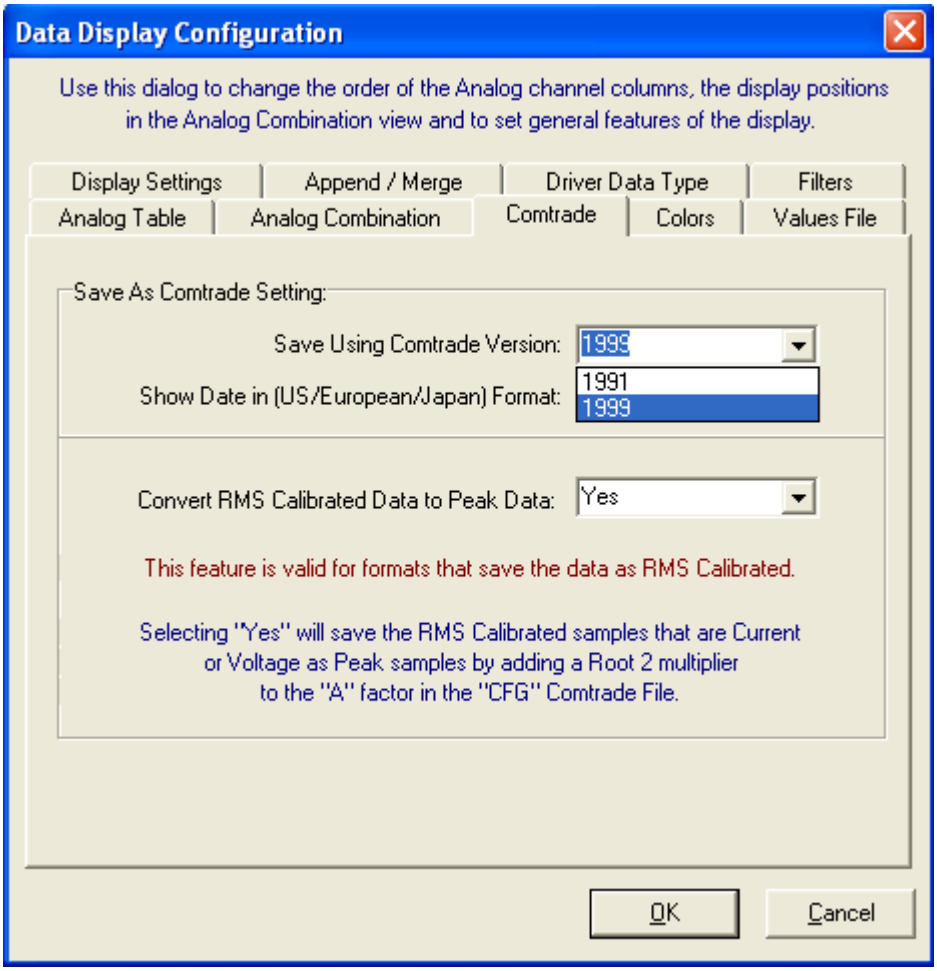


Figure 2.12 Comtrade Version

To automatically convert the selected file(s) to Comtrade using the IEEE long file naming format 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. 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.

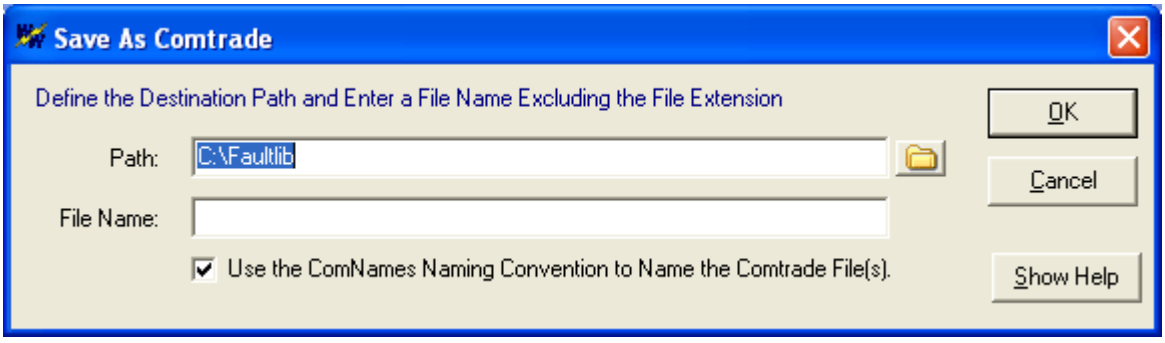


Figure 2.13 Save As Comtrade

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 folder place the cursor on the filename and press <enter> or double click the

mouse button. To run an application from a non-active folder select “Run” from the File menu, enter the path and the filename in the “Open” field, and click **OK**.

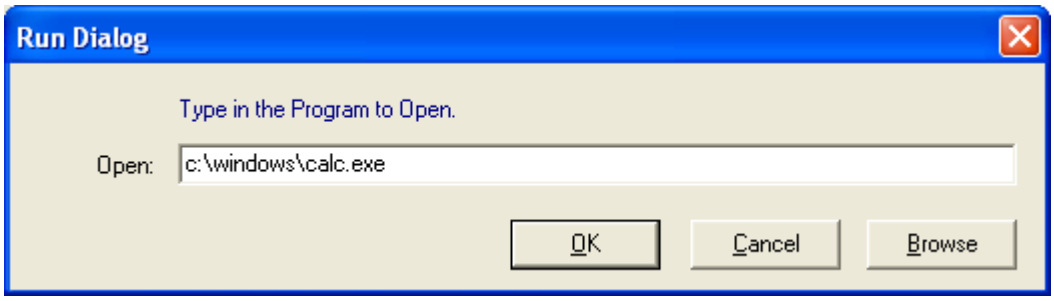


Figure 2.14 Run Dialog

DISPLAYING OSCILLOGRAPHY RECORDS

A library of device drivers is used to display various types of oscillography formats (Universal Viewer). The formats 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
SEL Sag/Swell/Interruption Files (SSI)
Ametek TR-100+, DL-8000, TR-2000 & P&QR128
ERLPhase Tesla
ERLPhase 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
S&C Daily High Low File
Nicolet PNRF
Nicolet Power Pro WFT
Comma Delimited (Time, Channel) format
SDC Comma Delimited Files
Audio Wave Files

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 ten display windows can be opened at one time. Refer to the "Analysis" 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 default mouse button is double clicked the software inspects the filename at the cursor 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 with 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 with 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 with the extension ".TLR" are tagged as NxtPhase Tesla files.
COMTRADE	Files with the extension ".DAT" that have a cooresponding ".CFG" file are tagged as COMTRADE files.
SEL	Files with the extensions ".SEL", ".CEV" or ".EVE" are tagged as SEL files.
SEL LPD	Files with the extension ".BSV" are marked as SEL Load Profile Data files
DLP	Files with the extension ".OSC" are tagged as DLP relays. GE DLP1 and DLP3 formats are supported.
REL300/301/302	Files with the extension ".REL" are tagged as ABB-MDAR files.
TPU/DPU/GPU	Files with the extension ".CAP" are tagged as ABB-TPU/DPU/GPU files.
ABB Load Profile	Files with the ".DLA" extension are tagged as ABB Load Profile-Wye files.
GE SR745/489 File	Files with the ".CSV" extension are tagged as GE SR745 Files.
SDC Log File	Files with the ".CSV" extension are tagged as SDC Log Files.
TIS File	Files with the ".TIS" extension are tagged as TIS (Trip Information System) Files.
Ametek Files	Files with the ".AMT" extension are tagged as Ametek TR-100+, DL-8000, TR-2000 & P&QR128 Files.
NxtPhase Tesla	Files with the ".TLR" extension are tagged as NxtPhase Tesla Files.
NxtPhase Relays (BPRO, TPRO, LPRO & FPRO)	Files with the ".BPR, .TPR, .LPR, FPR" extensions are tagged as NxtPhase Relay Files.
Emax Long Term	Files with the ".DAT" extension with an associated ".SET" file are tagged as Emax Long Term Files.
Hathaway Replay Plus	Files with the ".DAT" extension with no ".CFG" associated with it are tagged as Hathaway Replay Plus Files.
S&C IntelliRupter	Files with the extension ".WFC" are tagged as S&C IntelliRupter Waveform Files.
Nicolet Power Pro WFT	Files with the extension ".WFT" are tagged as Nicolet Power Pro WFT Files.

Driver	Association Parameter
Nicolet PNRF	Files with the extension ".PNRF" are tagged as Nicolet PNRF Files.
S&C PXI	Files with the extension ".TSV" are tagged as S&C PXI Waveform Files.
S&C Extended Waveform Capture	Files with the extension ".EWC" are tagged as S&C IntelliRupter Extended Waveform Files.
Audio Wave	Files with the extension ".WAV" are tagged as Microsoft's Wave Files.
S&C Meter	Files with the extension ".PRO" are tagged as S&C IntelliRupter Meter Files.
DXF	Files with 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 appear 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 "Auto Detect" feature inspects the file at the cursor position and tags it according to the filename.

DEVICE CONFIGURATION

The device configuration dialog allows for setting certain parameters for each type of device driver supported. To open, select the "**Device Configuration"** menu 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. 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 information. This field is available for Hathaway, Transcan, Rochester and Comtrade Files.
- **Change Sampling 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 the file with 40 samples per cycles enter 2400. To maintain the original frequency leave this field blank or set to 0.00.
- **Change Line Frequency:** If the line frequency is not defined in a specific driver's files then the line frequency can be defined in this dialog. The entered line frequency will be used when displaying files for the selected driver. To maintain the original line frequency leave this field blank or enter 0.00.

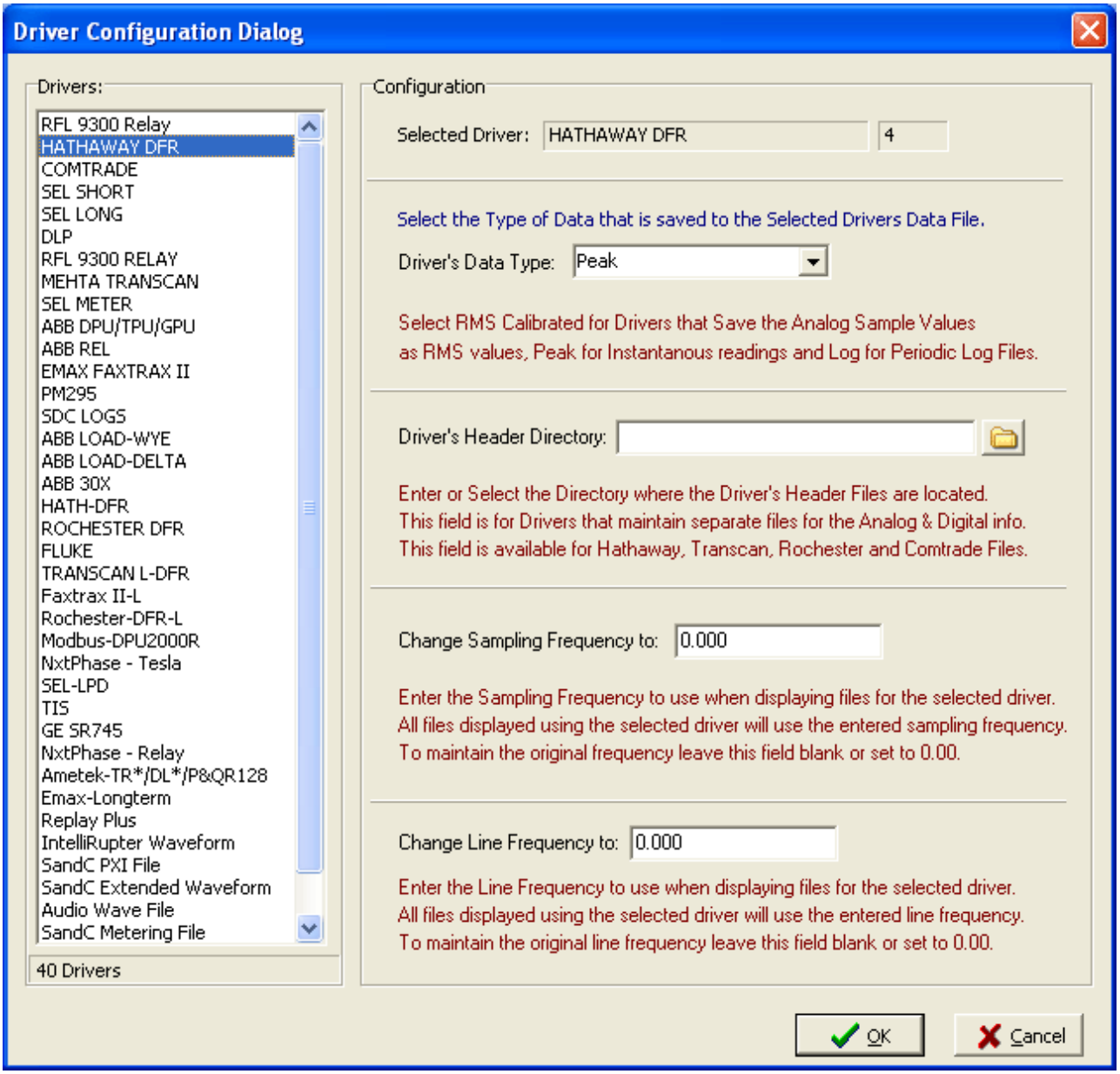


Figure 2.15 Device Configuration Dialog

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"** menu 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. The left panel displays the available settings for each device. Below is a list of the available settings:

- **Station Name:** Enter or change the station name.
- **Telephone #:** Enter the telephone number 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.

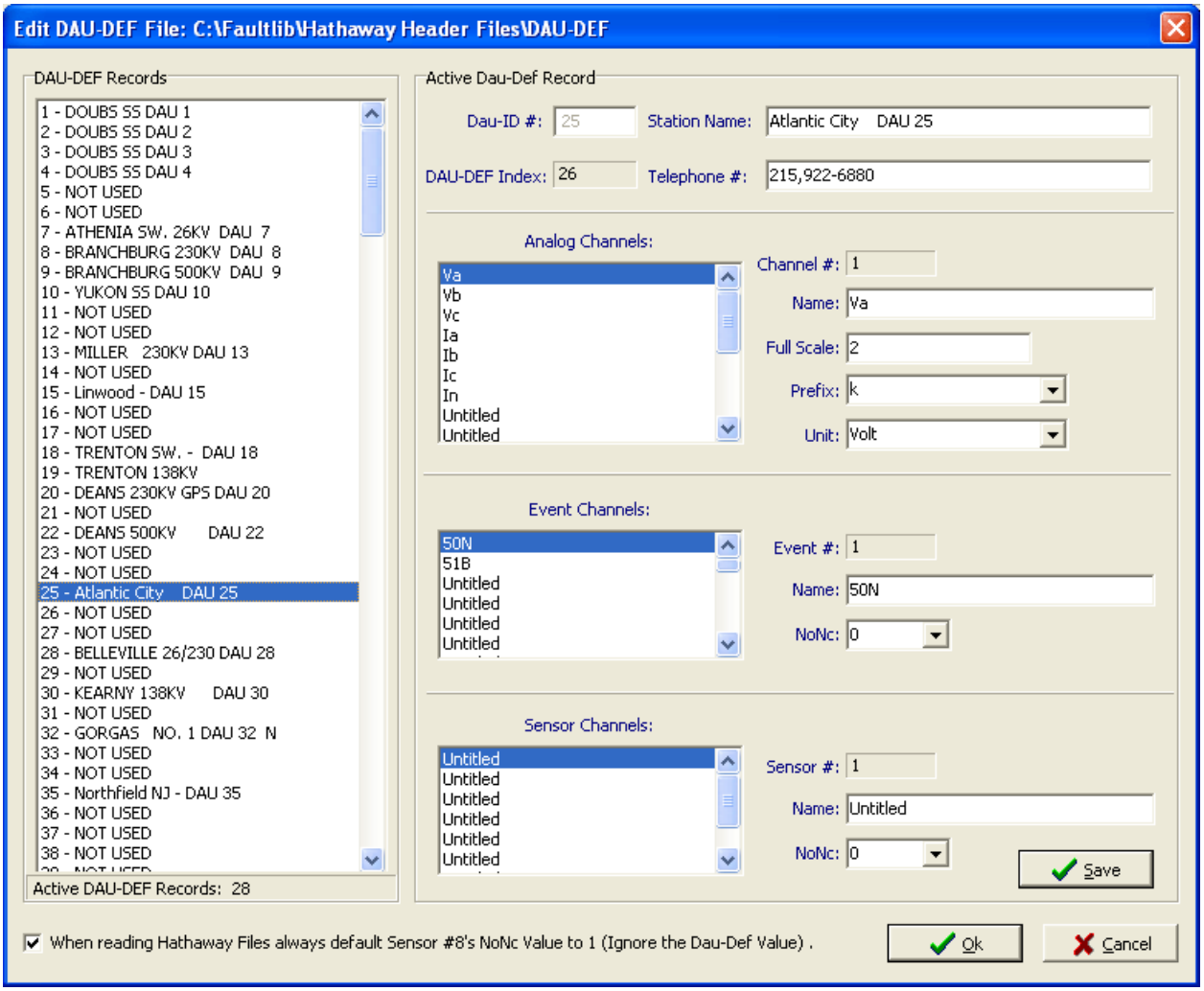


Figure 2.16 Hathaway DAU-DEF Editor

TESLA FILES

Tesla Files are displayed in the IEEE Comtrade Binary format. NxtPhase has developed an automatic conversion application called "AutoComtrade.exe" to convert the Tesla proprietary files to the Comtrade 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 NxtPhase.

To edit the Tesla AutoComtade configuration open the “Device Configuration” dialog from the “Options” menu. Select the NxtPhase-Tesla device under the device list box. 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 file name 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”.

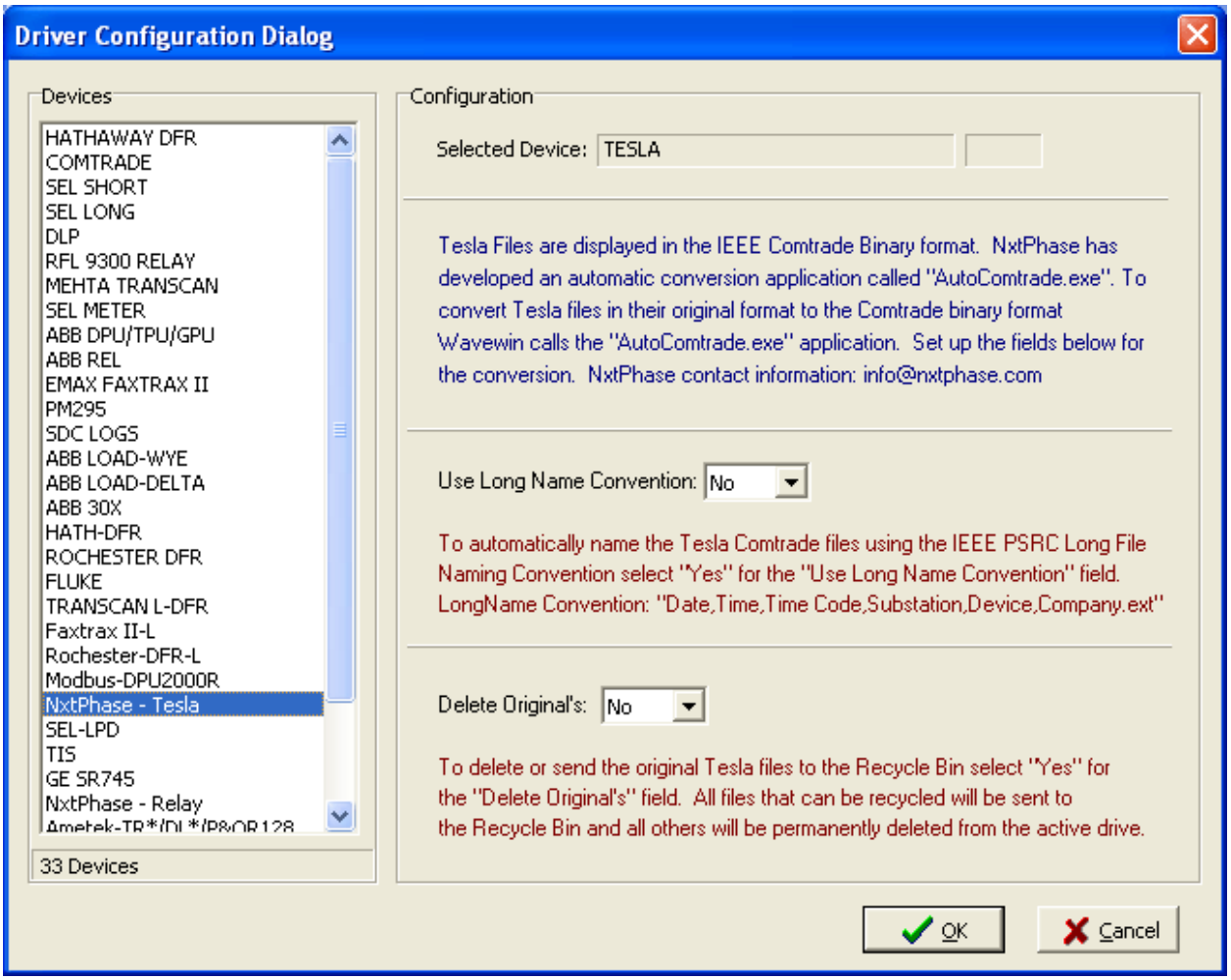


Figure 2.17 Tesla Configuration

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 is 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 routines can be performed on a file the ratings for the device must be defined. To define the ratings select a file in the file manager then select the "Load Rating" menu option from the "Reports" submenu option under the "Options" menu. Enter the "Summer Normal Rating" and the "Summer Emergency Rating".

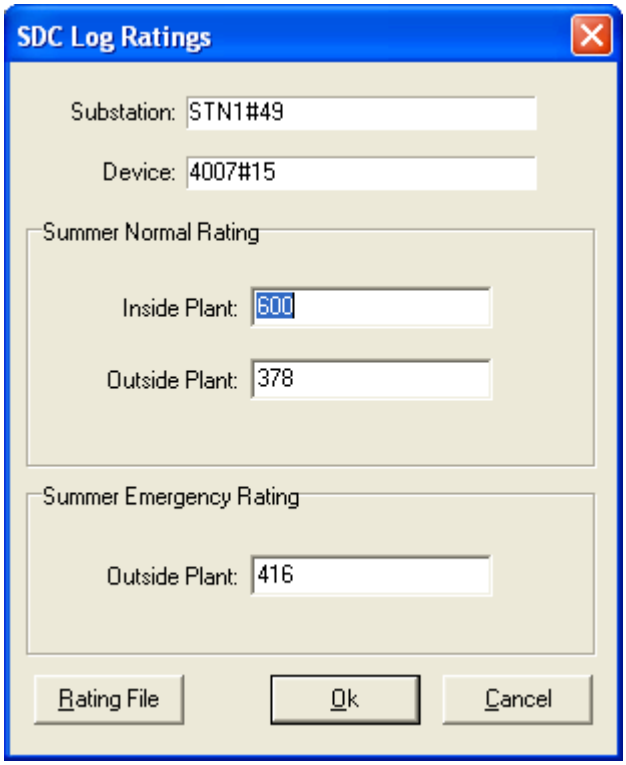


Figure 2.18 Load Rating Dialog

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 4.19 and 4.20 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)

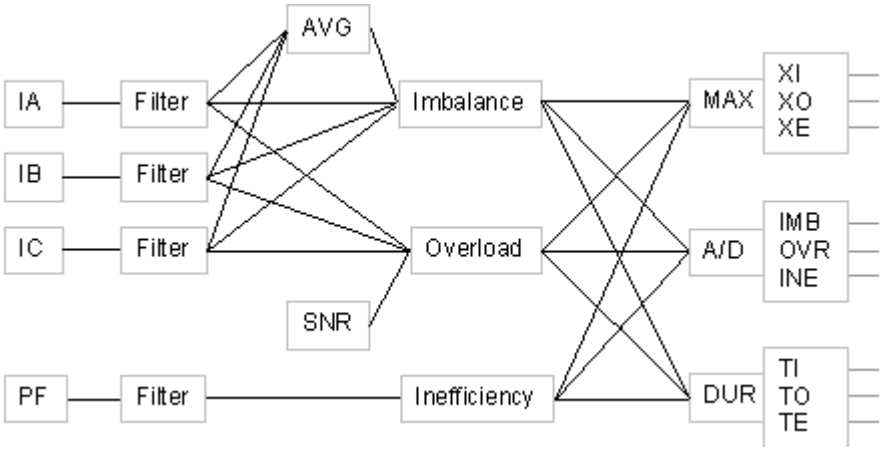


Figure 2.19 Expert System Model

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

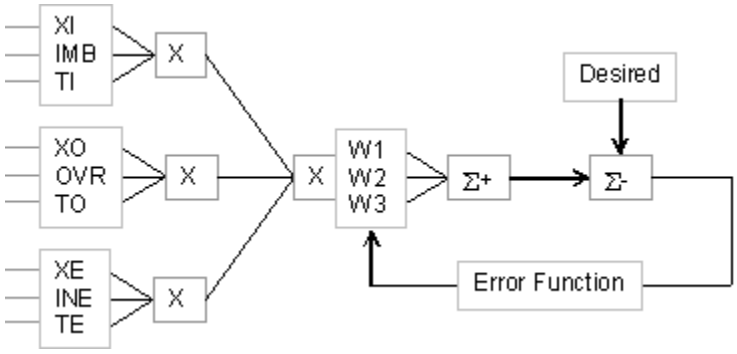


Figure 2.20 Adaptive Learning Model

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

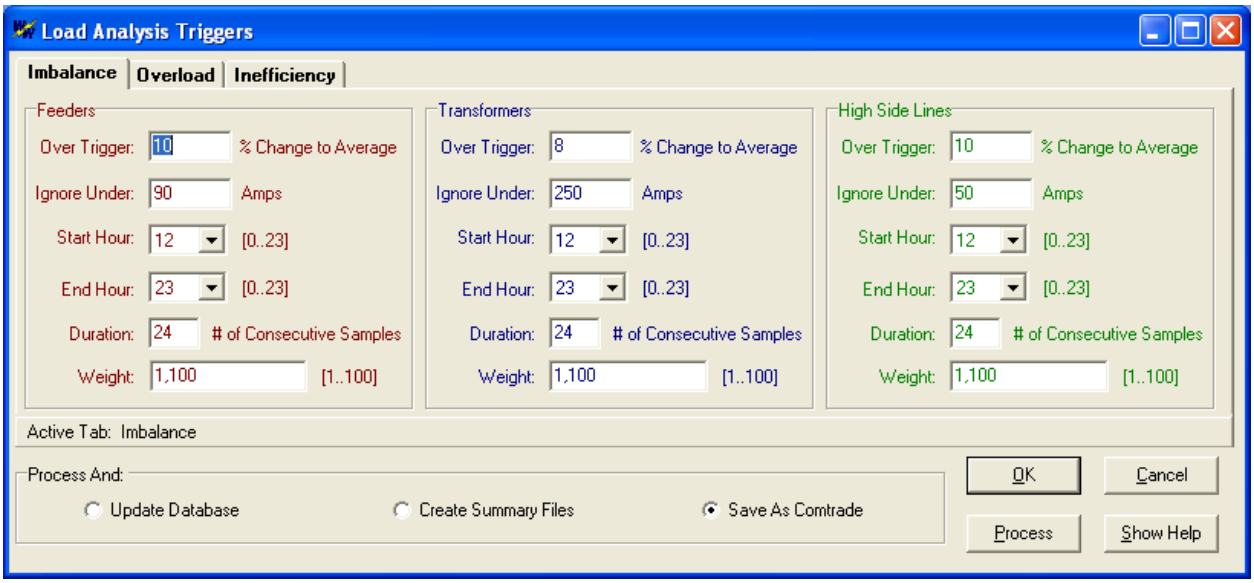


Figure 2.21 Load Analysis Triggers Dialog

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.

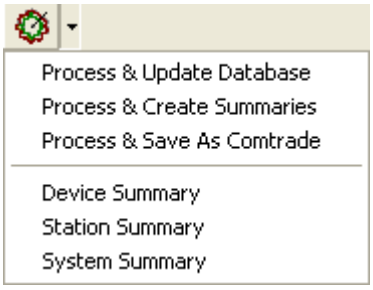


Figure 2.22 Load Menu Button

The first three menu options are also available from the Load Analysis Trigger dialog. 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 2.23. 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.

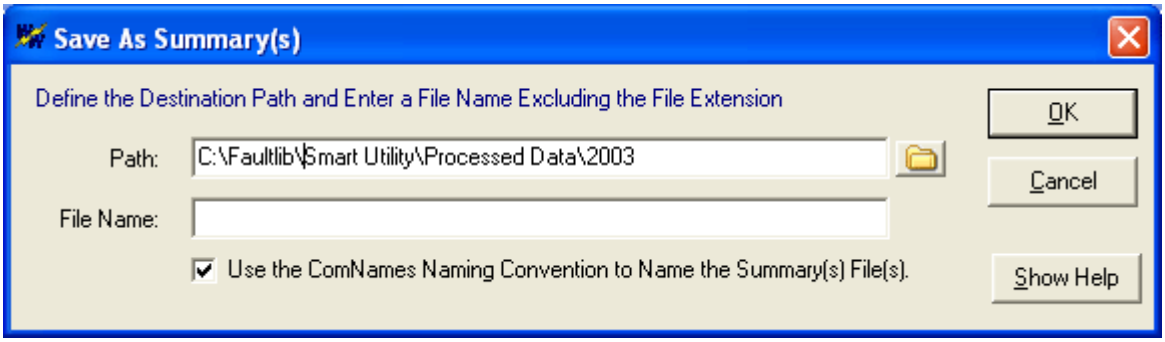


Figure 2.23 Summary Destination Dialog

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.
- **Station Summary** – The station summary lists the imbalance, overload, inefficiency and priority for each device in the station.
- **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.

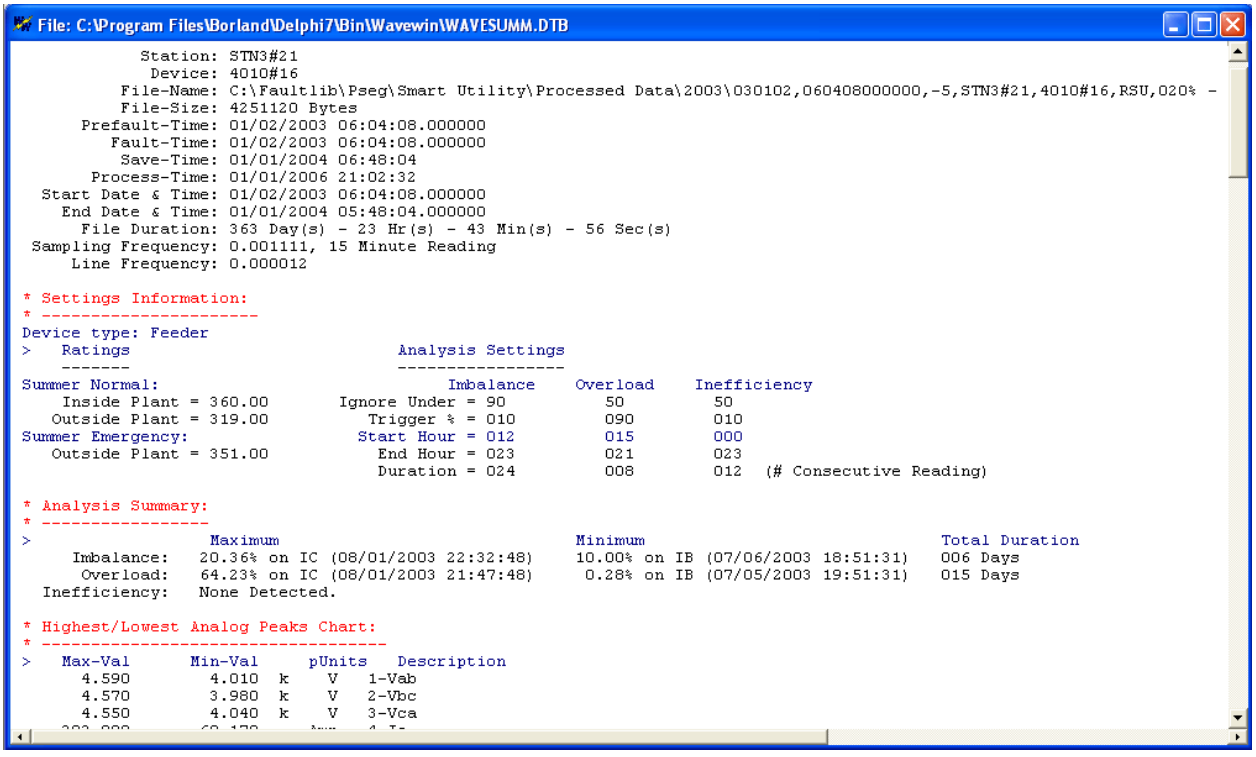


Figure 2.24 Load Device Summary

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 2.25 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 2.26 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 are displayed in the status bar (bottom left corner of the window). 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 ten editing windows can be opened at one time.

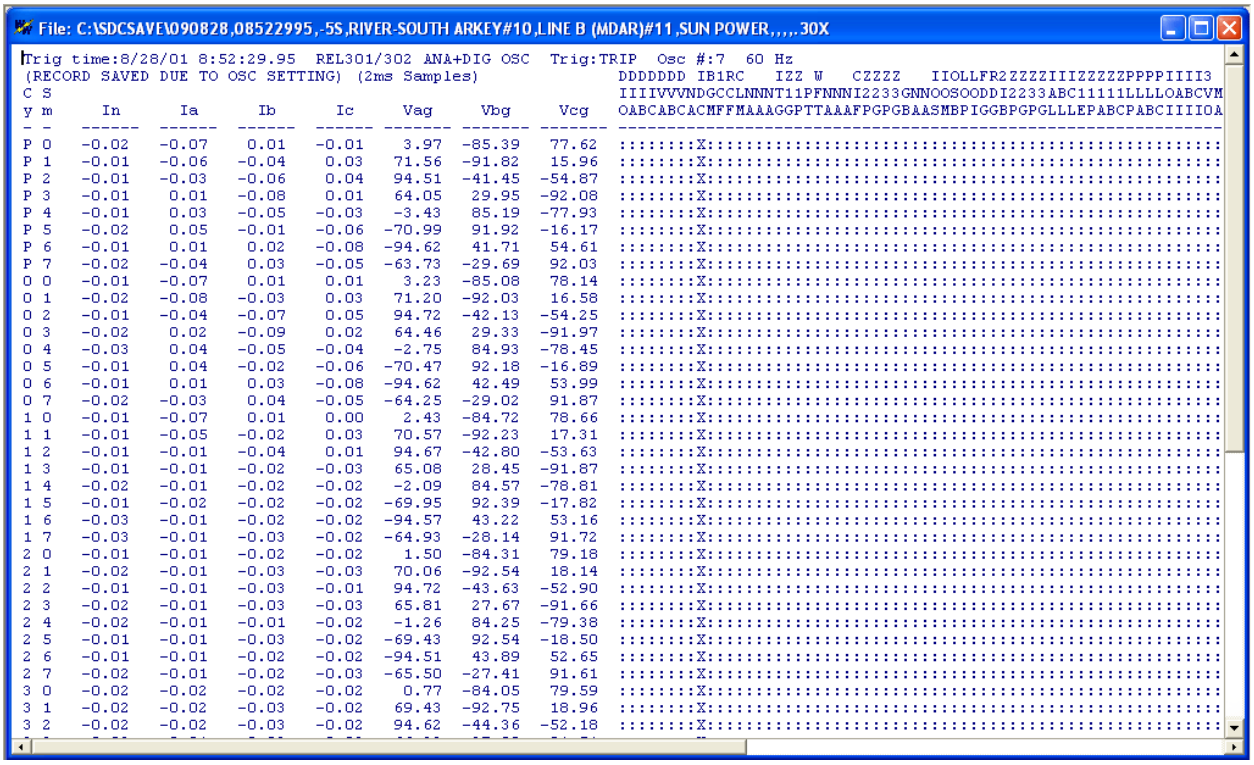


Figure 2.27 ASCII Editor

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. 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.

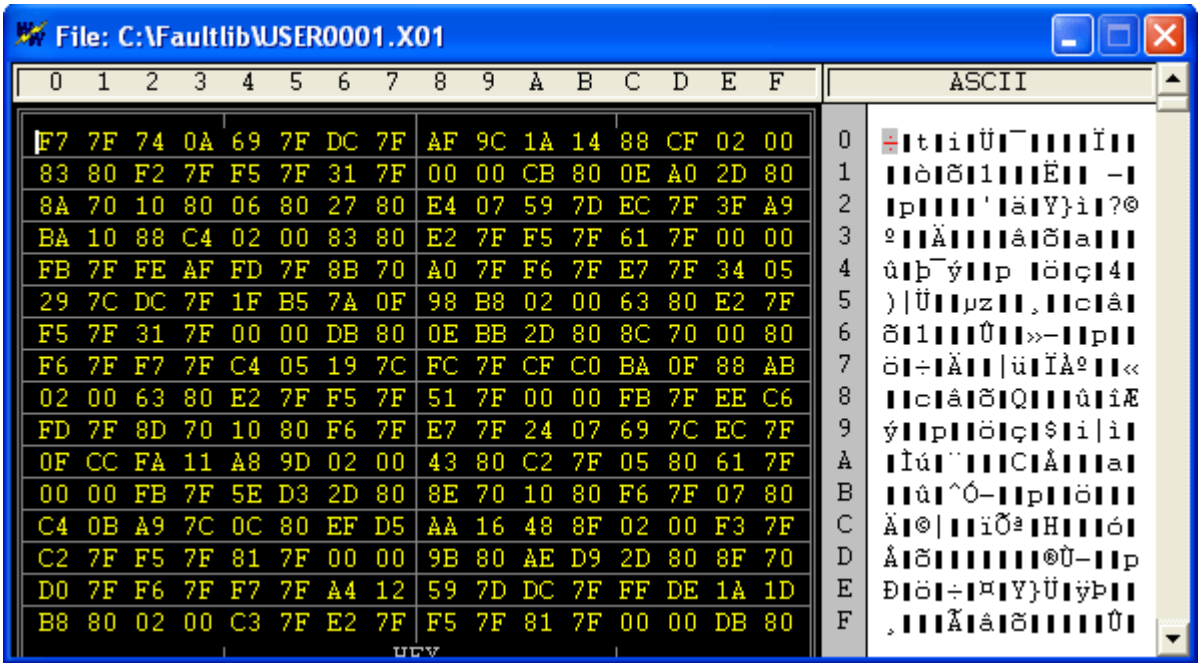


Figure 2.28 Hexadecimal Editor

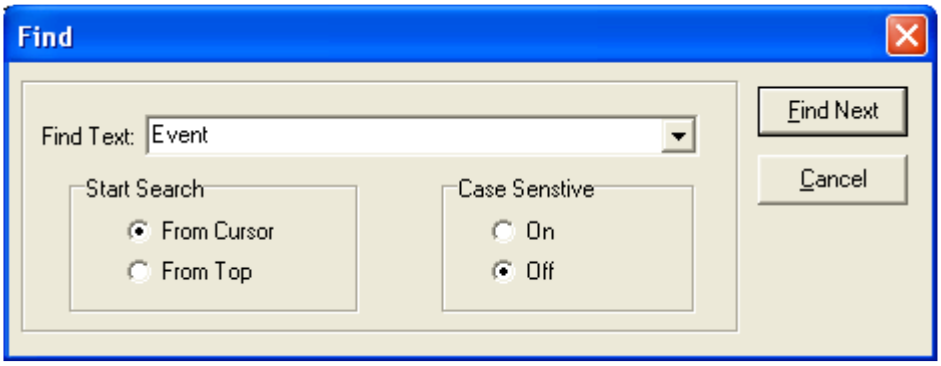


Figure 2.29 Hexadecimal Search

VIEWING WAVEFORM SUMMARIES

The File Manager and Analysis 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 and Time	Date and time of the first sample in the file.
End Date and	Date and time of the last sample in the file.

Field	Description
Time	
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.

Maximum/Minimum Analog Summary

Field	Description
Max-Inst	Instantaneous maximum values.
Min-Inst	Instantaneous minimum values.
Max-RMS	RMS maximum values.
Min-RMS	RMS minimum values.
OneBit	Channel's full-scale value divide by the channel's resolution.
Inst-Diff	The difference between the Max-Inst and Min-Inst values.
RMS-Diff	The difference between the Max-RMS and Min-RMs values.
pU	Channel prefix and unit.
Description	Channel title and number.

Events/Sensors Activity Summary

Field	Description
Fst	State at which the channel started, A=alarm and N=normal.
Lst	State at which the channel ended, 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.

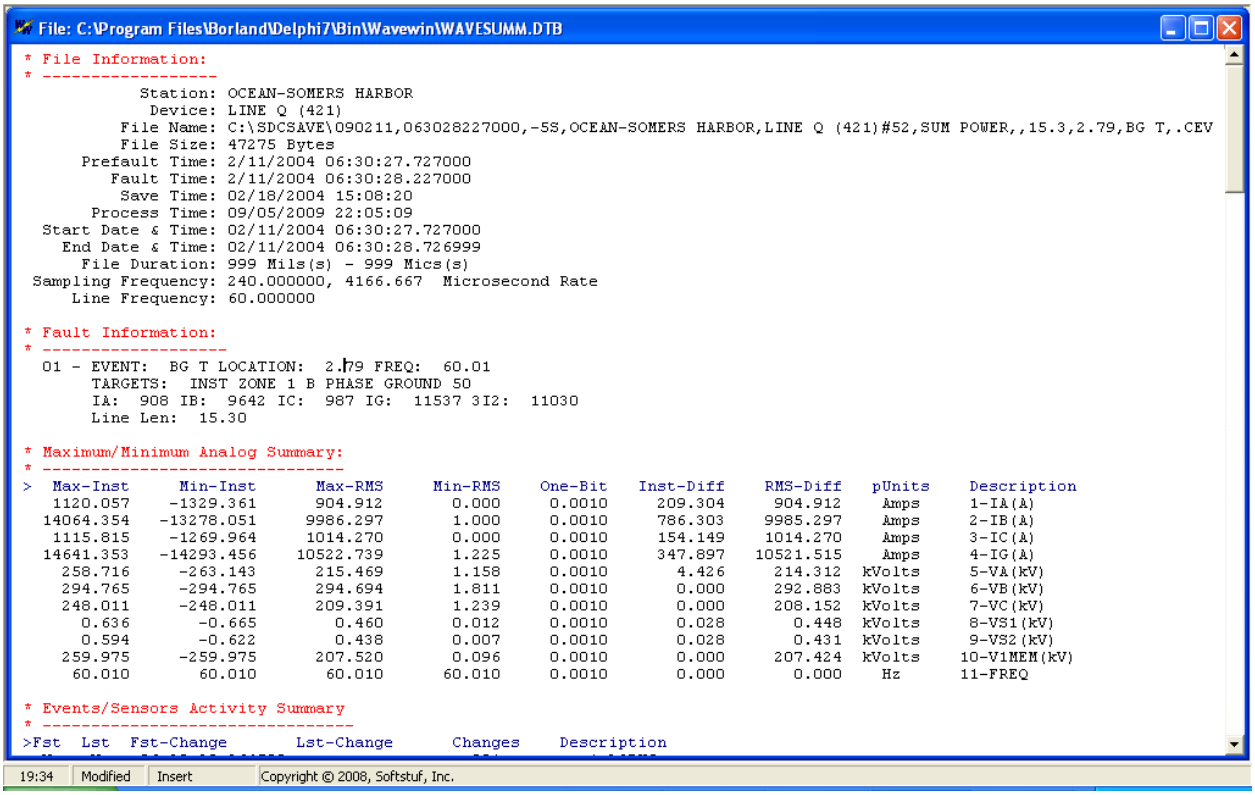


Figure 2.30 Waveform Summary

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 opens all the marked waveform files, tiles the waveform files horizontally and minimize the file manage. To access the file manager click the “Files” menu button

.

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

The plot button icon will plot all the marked files. If there are no marked files, the selected file is plotted.

APPEND WAVEFORM FILES

The Append Waveform Files option appends 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.
- Back to Back: The files are appended back to back. No samples are deleted.

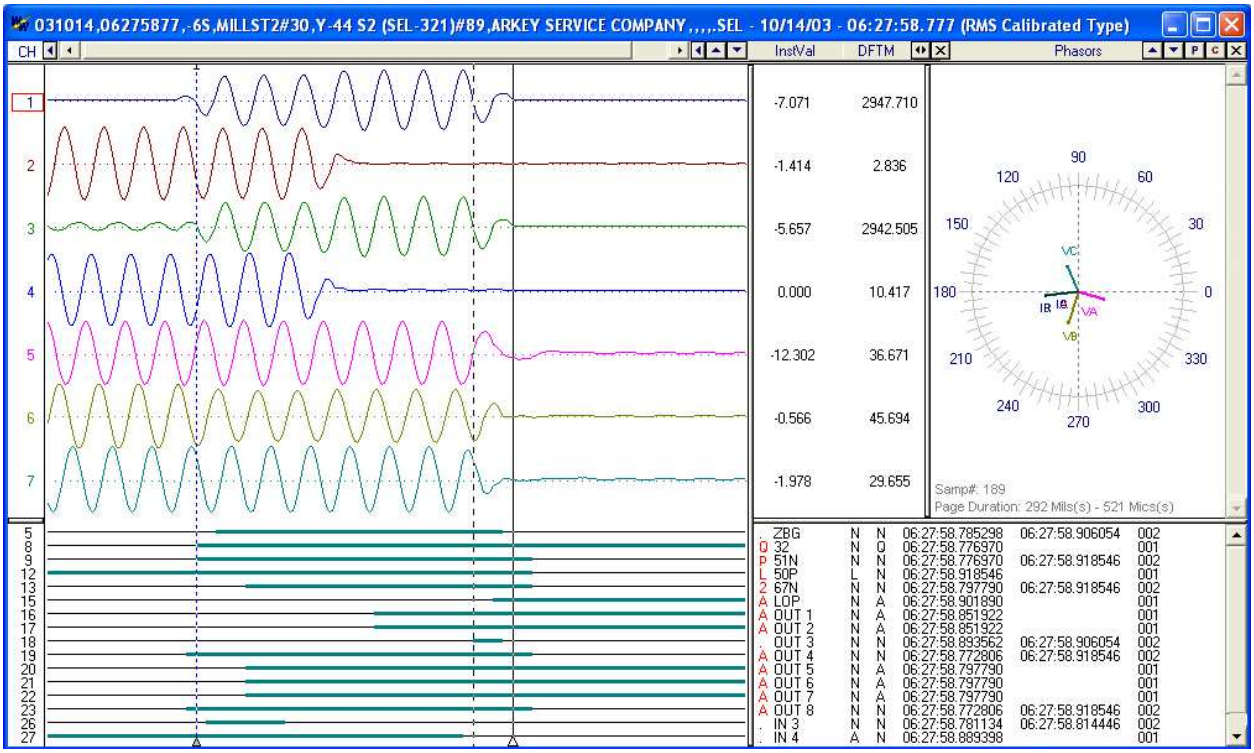


Figure 2.31 Append Waveform Files: Discard Common Times

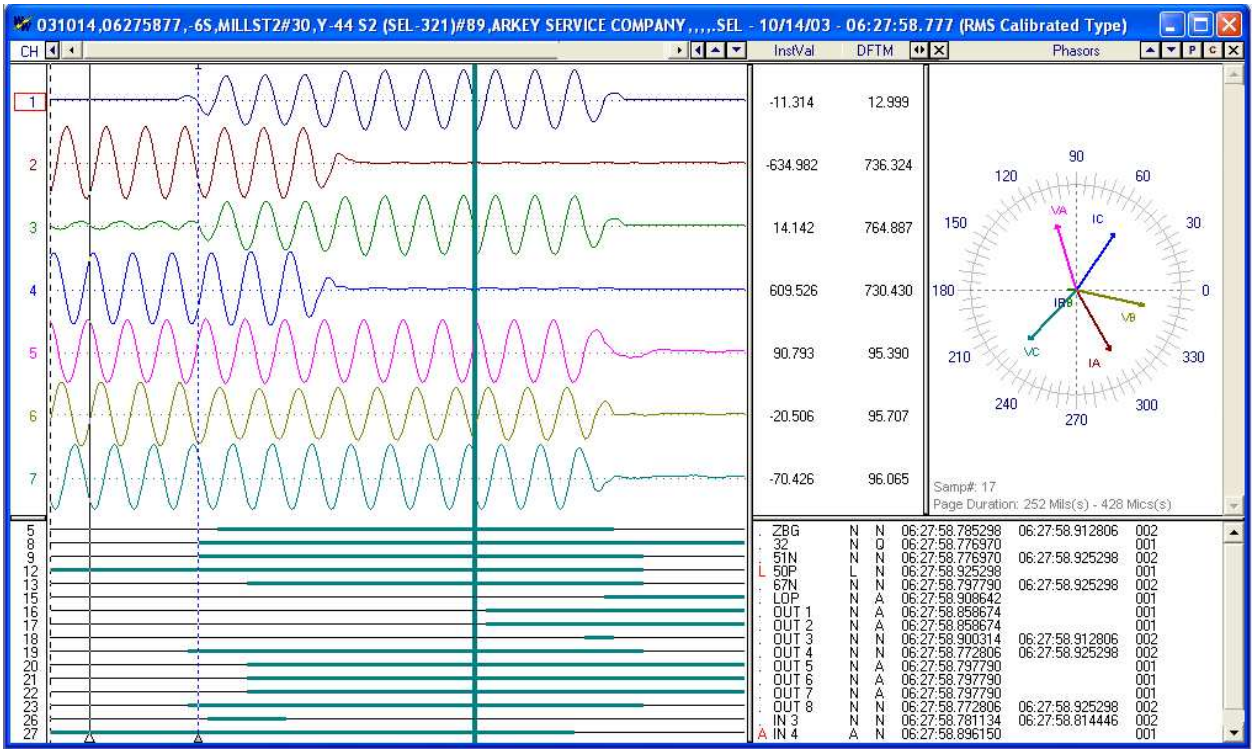


Figure 2.32 Append Waveform Files: Back to Back

MERGE WAVEFORM FILES

The Merge Waveform Files option merges 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 derived 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.
- By Sample: Merge regardless of time stamps. The reference time is derived from the first marked file. The file with the least number of samples determines the length of the file.

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.

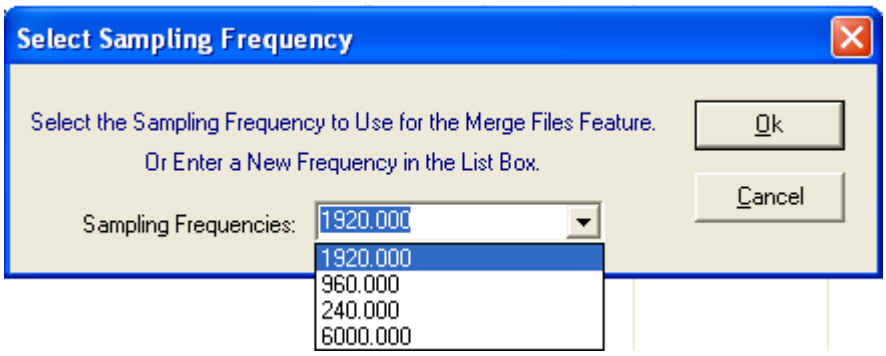


Figure 2.33 Merge Waveform Files: Select Frequency

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 analysis window. Click on the Append/Merge tab and uncheck the “Add the File’s Station Name to Beginning of the Analog/Digital Channels” field.

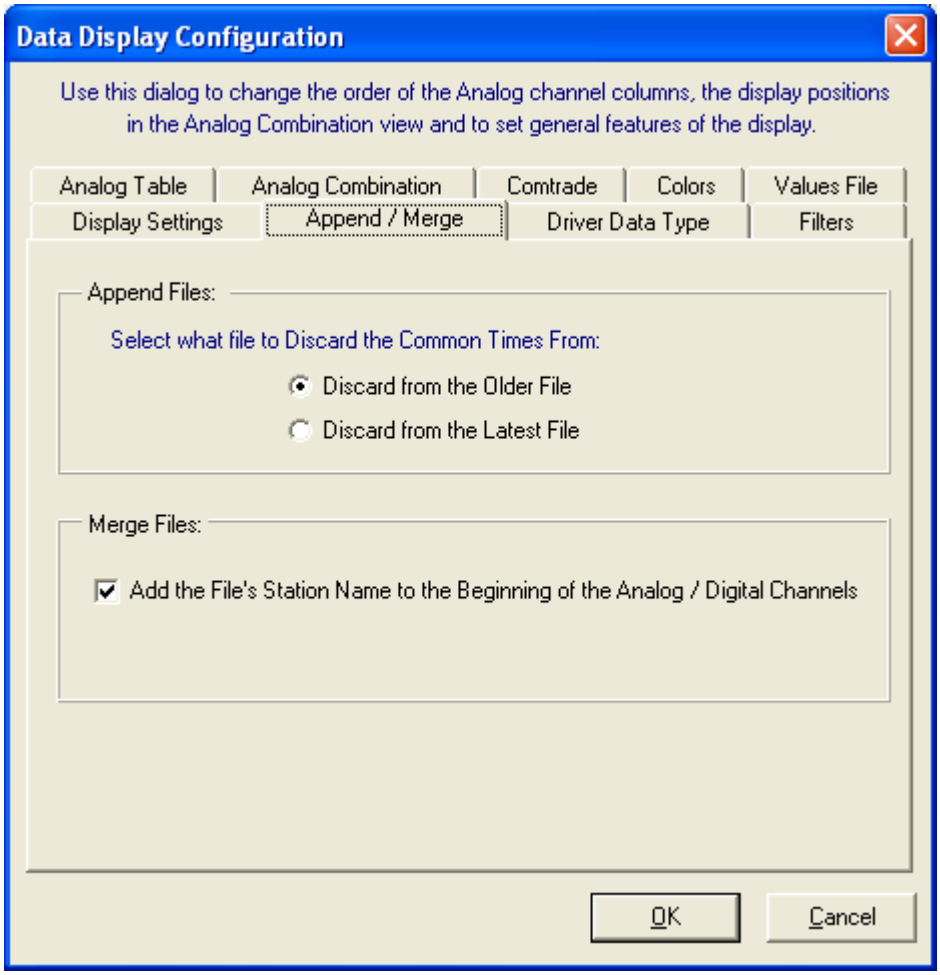


Figure 2.34 Append/Merge Properties

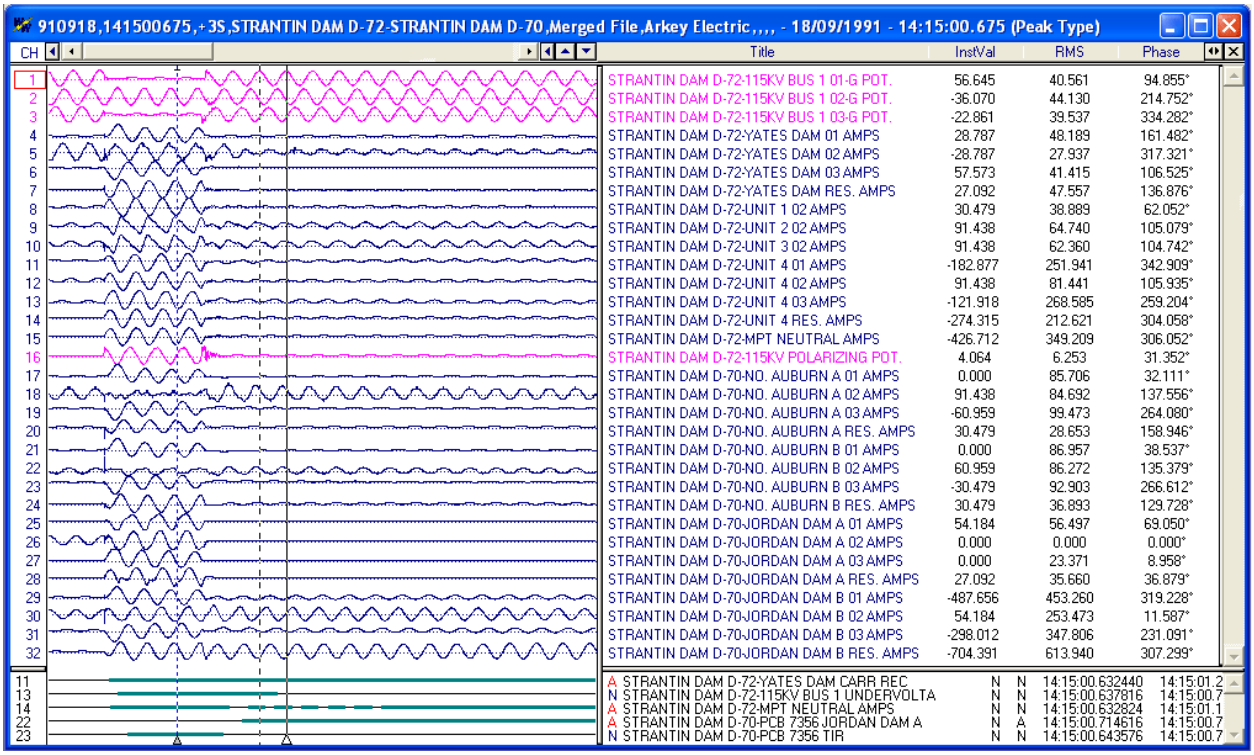


Figure 2.35 Merge Waveform Files By Time

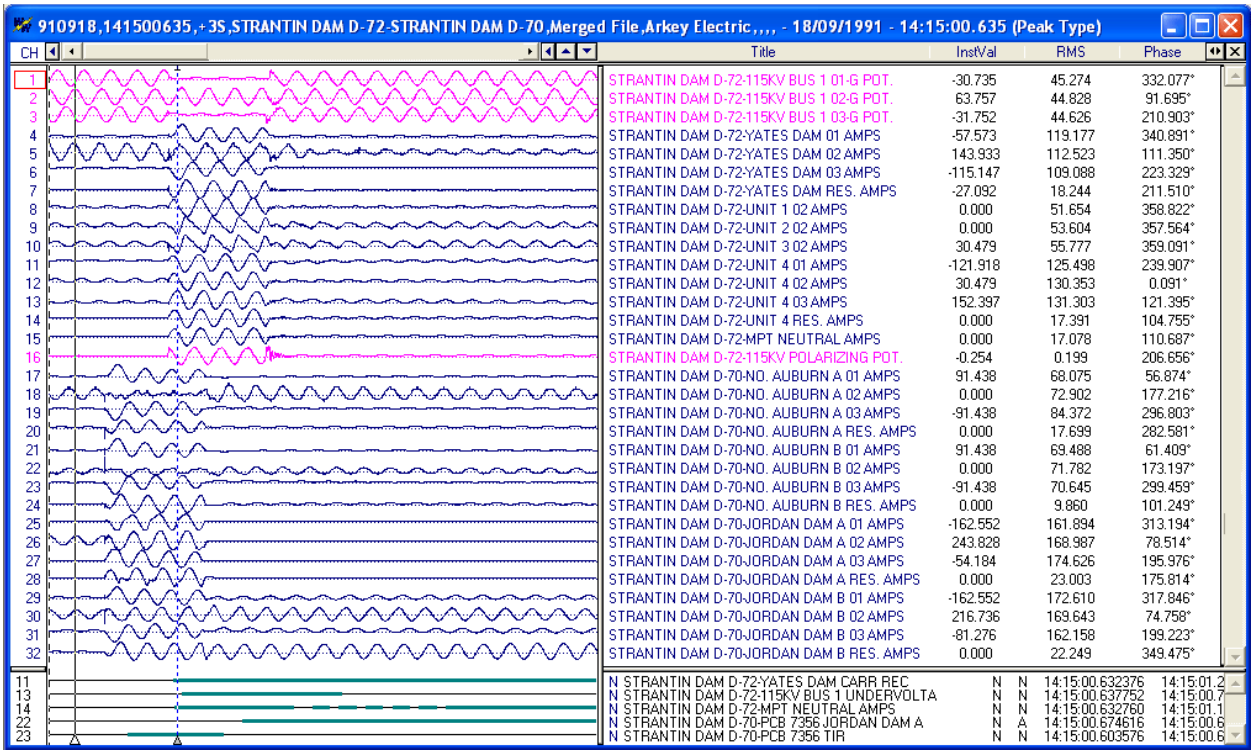


Figure 2.36 Merge Waveform Files By Sample

FILE REPORTS

GENERATING CALIBRATION REPORTS

The Calibration report list the Maximum and Minimum analog summary information for the marked files. 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 the “Calibration…” menu option from the “Report” submenu option under the “Options” menu. Refer to the “Summary” section for field descriptors. The report information is saved in the DVREPORT.DTB file located in the Wavewin directory.

GENERATING SEQUENCE OF EVENTS (SOE) REPORTS

To generate a table of sequence of events from multiple waveform files, mark all of the desired files then press F11 or Select the "SOE List" menu option from the "Reports" submenu under the "Options" menu. A table listing all of the events triggered in the selected files is displayed. 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/sensors in the file from which it was read.
Channel Title: The channel title of the event/sensors.
Device: The device from which the event/sensors originated.
Substation: The substation from which the event/sensors originated.
File: The filename from which the event/sensors originated.

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

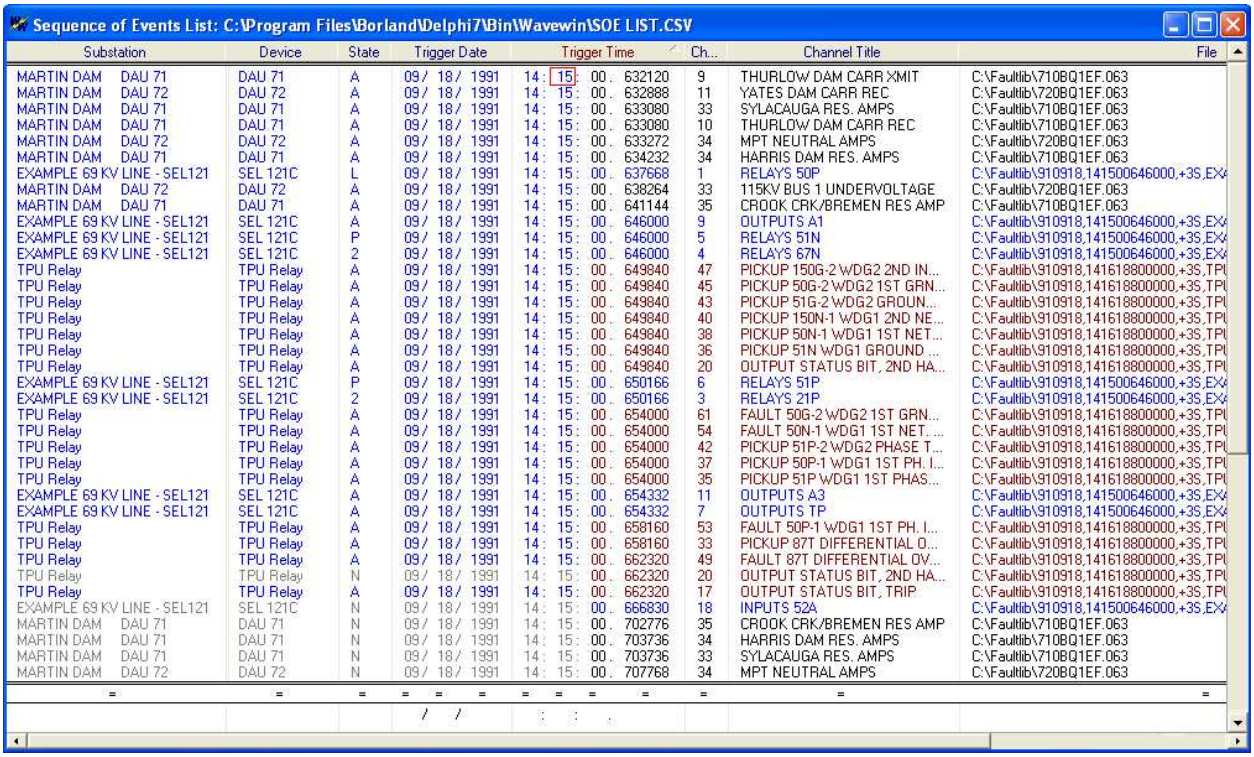


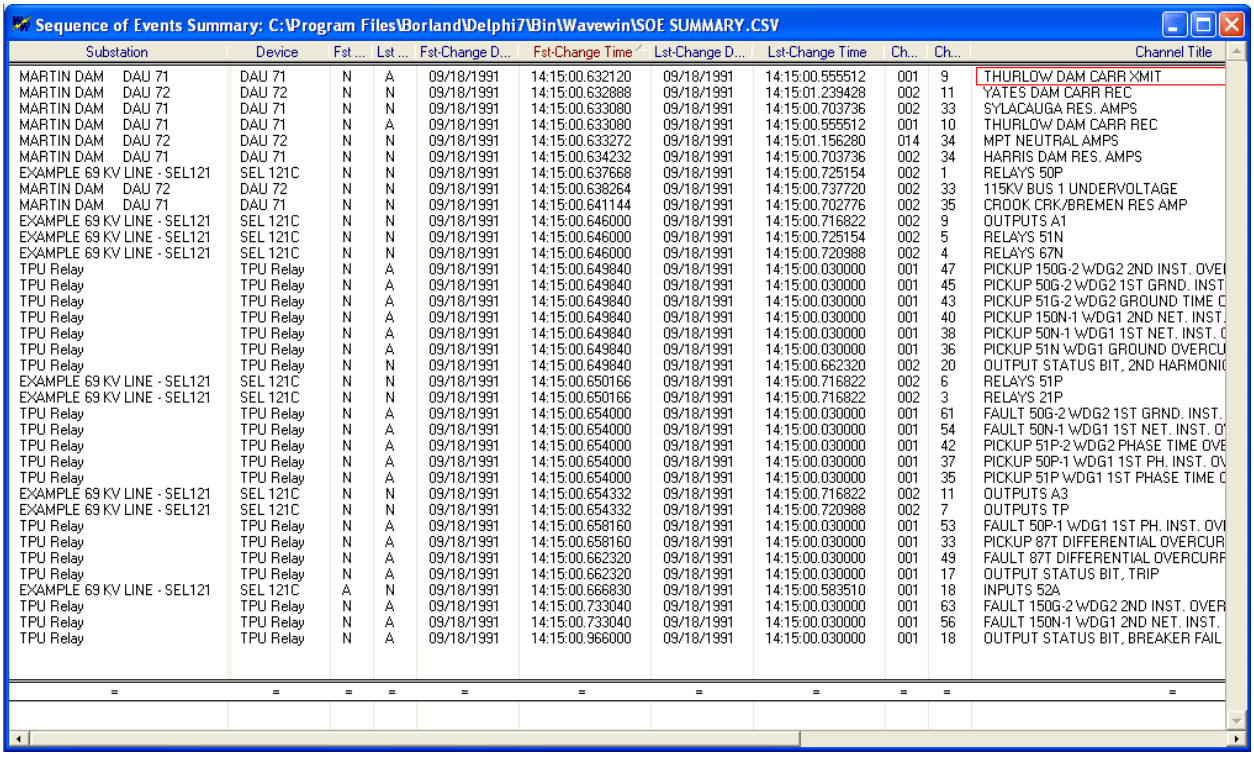
Figure 2.37 SOE List

GENERATING SEQUENCE OF EVENTS (SOE) SUMMARIES

To generate a summary of the sequence of events for multiple waveform files, mark all the desired files then Select the "SOE Summary" menu option from the "Reports" submenu under the "Options" menu. A table listing a summary of all the events triggered in the selected files is displayed. 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 filename from which the event/sensors originated.

The Query section at the bottom of the table allows for searching events from specific substations, devices, and channels. To plot 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. OVEI
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 C
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. C
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 C
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 OVERCURF
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 2.38 SOE Summary

APPENDING LOG FILES

The Appending Log features combine an unlimited number of CSV 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 feature combines an unlimited number of CSV 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 is 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. 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 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.

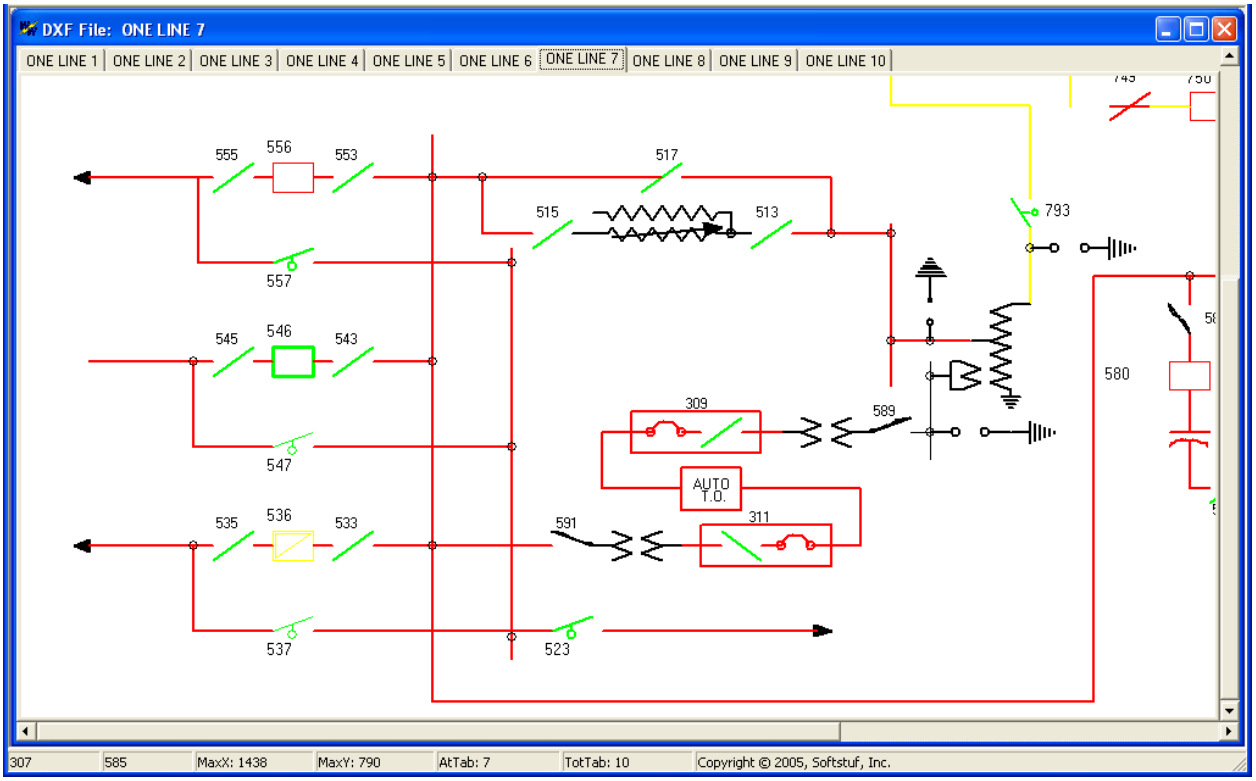


Figure 2.39 DXF Viewer

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. To zoom in or out 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. 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. The dialog fields are described below:

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

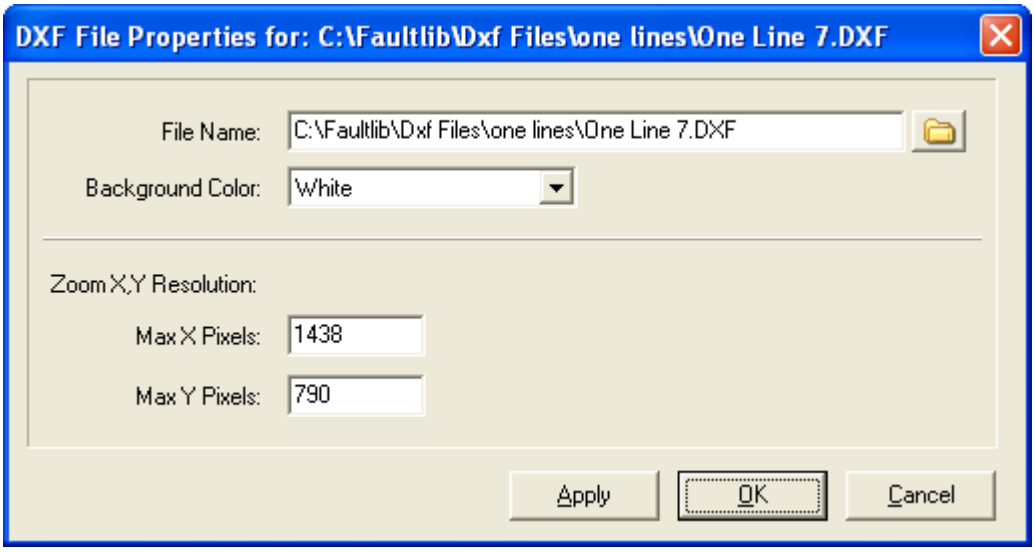


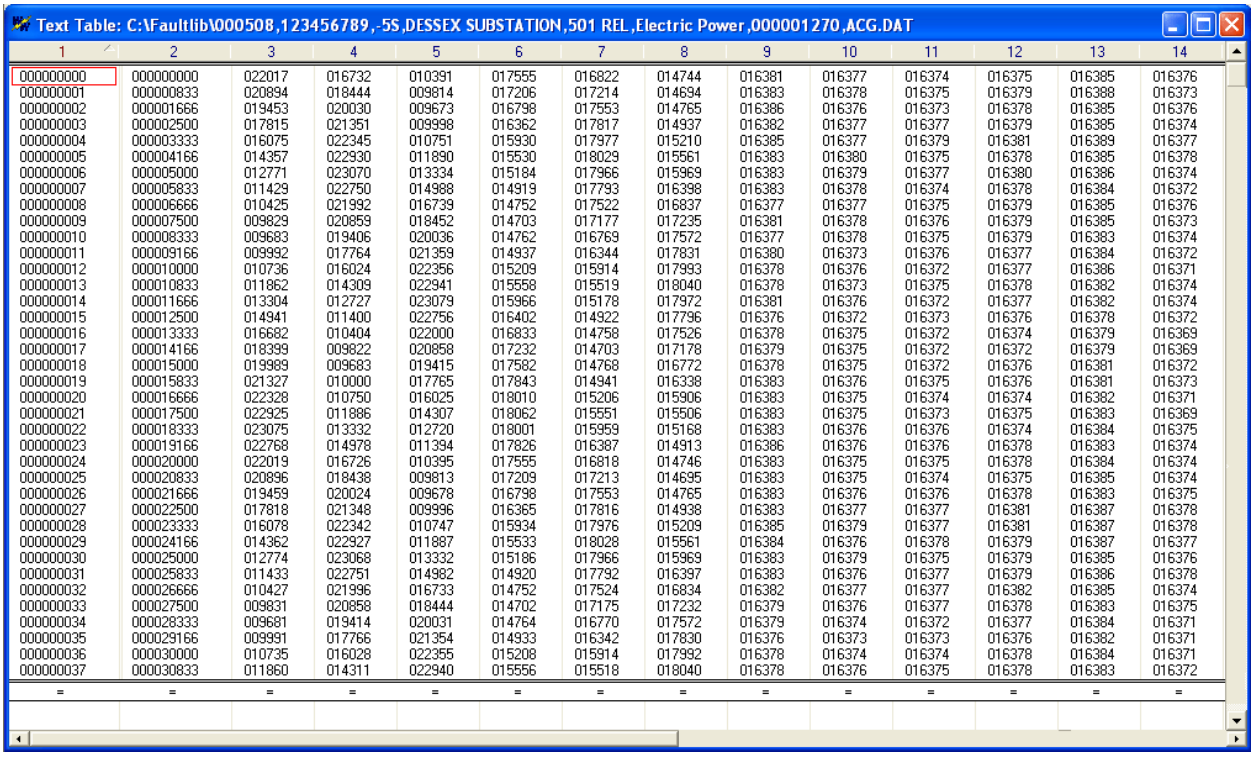
Figure 2.40 DXF Drawing Constants

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. 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 2.41 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 as 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 an analog or digital channel title the 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 select the “Show/Hide Channel Titles…” menu option under the “Options” menu.

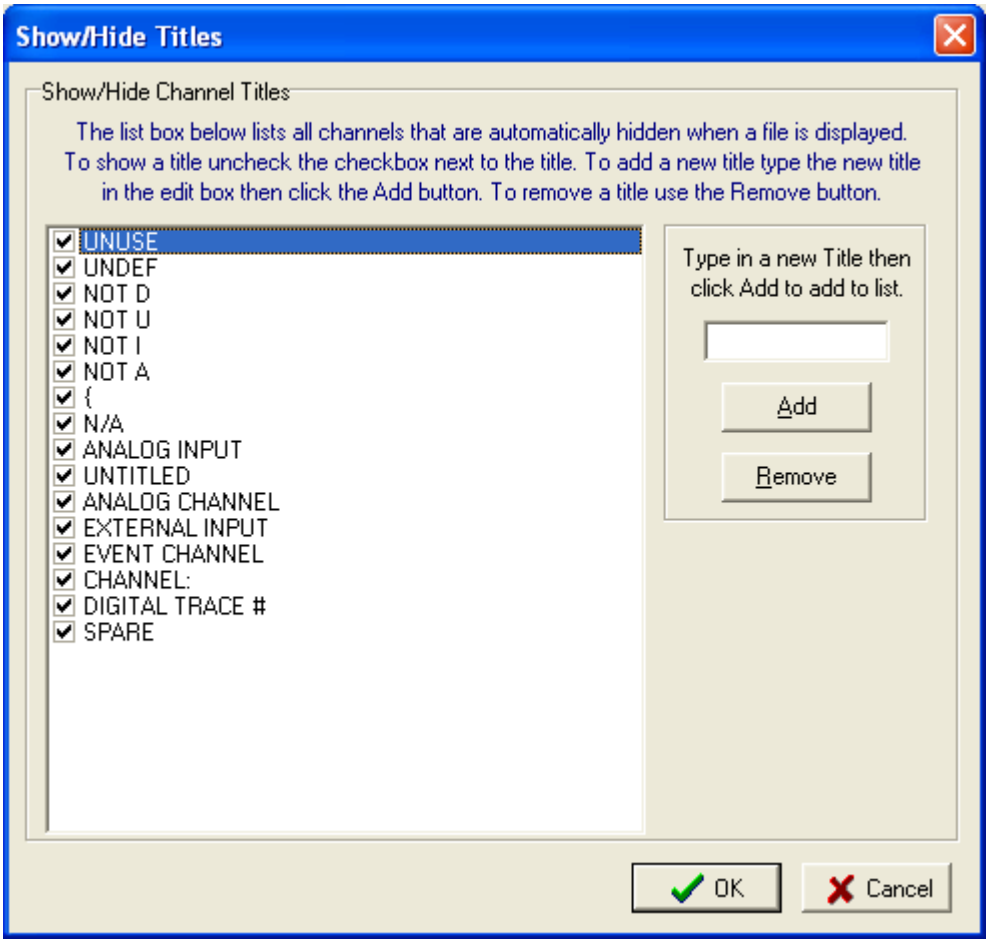


Figure 2.42 Show/Hide Channel Titles Dialog

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 is added to the end of the list with the checkbox automatically checked.

QUERYING FILES

The query fields are used to search for specific information in the table. Query fields are located below the table. Use the tab key to move the cursor from the table to the query fields and up arrow to return to the table. The Ctrl-left/right keys moves between the query fields. 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 mouse button on the operator symbol or by pressing the F9 key. The selectable options include equal to (=), less than (<), and greater than (<).

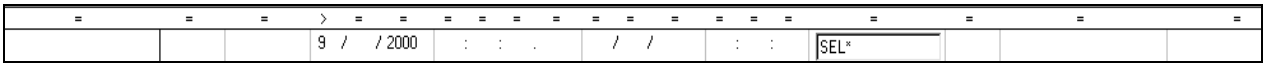


Figure 2.43 Query Fields

When a query is launched, the engine numerically compares the criteria with the information in the table. If numerical comparison is not possible, 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” submenu then click on the “Disturbance Report” menu option.

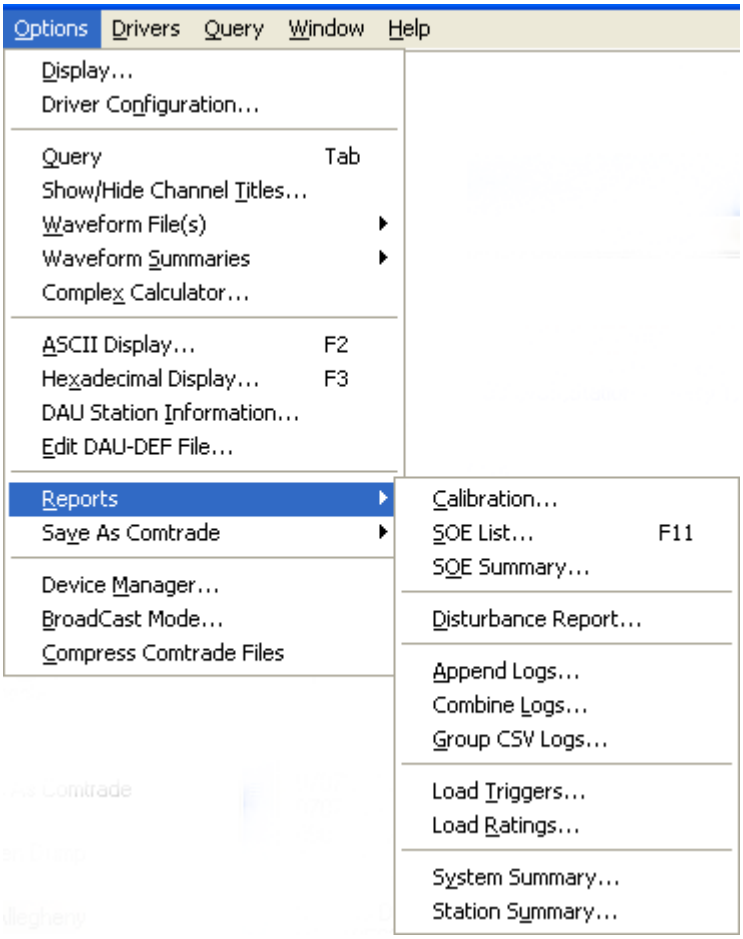


Figure 2.44 Disturbance Report Menu

The disturbance report dialog is displayed when the “Disturbance Report” option is selected.

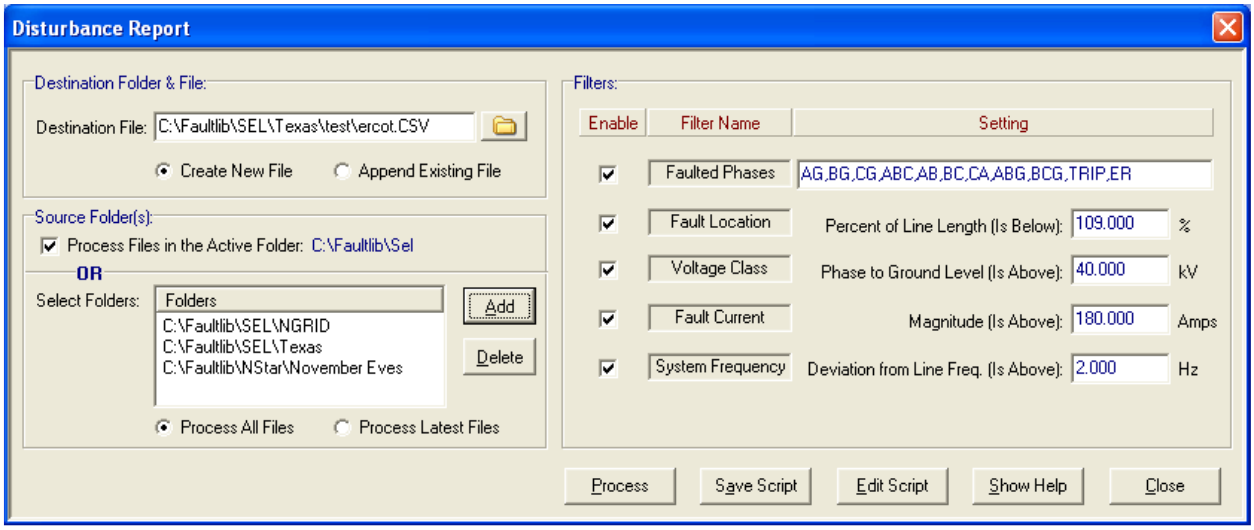


Figure 2.45 Disturbance Report Dialog

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.

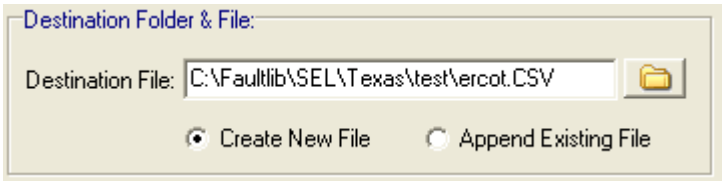


Figure 2.46 Disturbance Report: Destination Folder & File

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. If files are marked in the active folder, then this feature will process only the marked event files. If there are no marked files then all the event files are processed.

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.

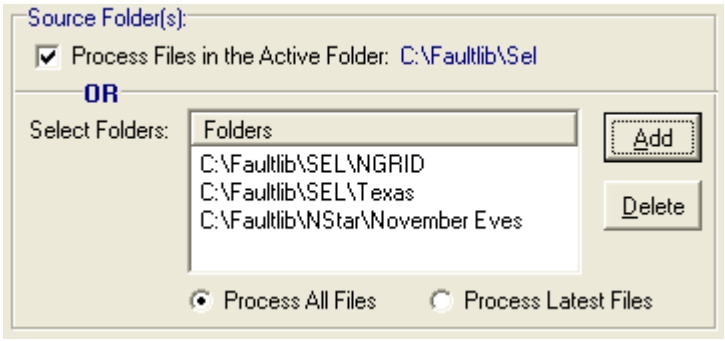


Figure 2.47 Disturbance Report: Source Folder(s)

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.

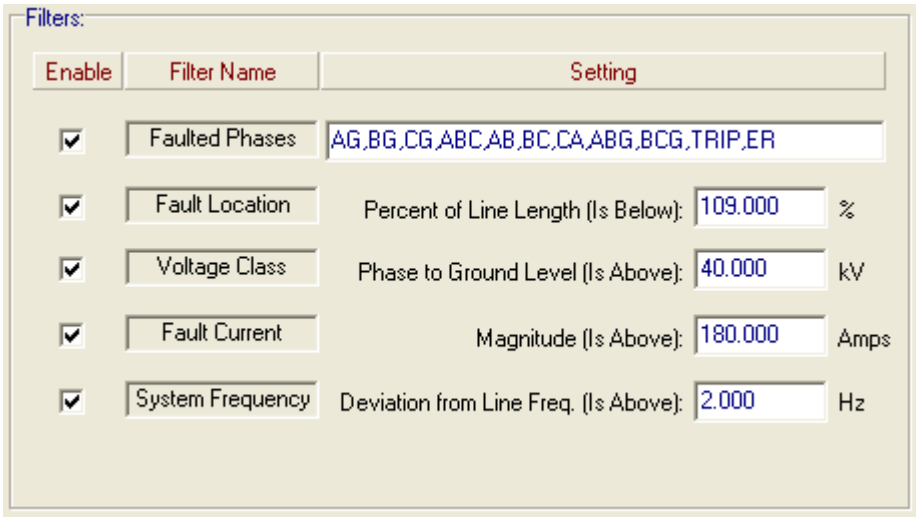


Figure 2.48 Disturbance Report: Filters

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 otherwise it is left blank.

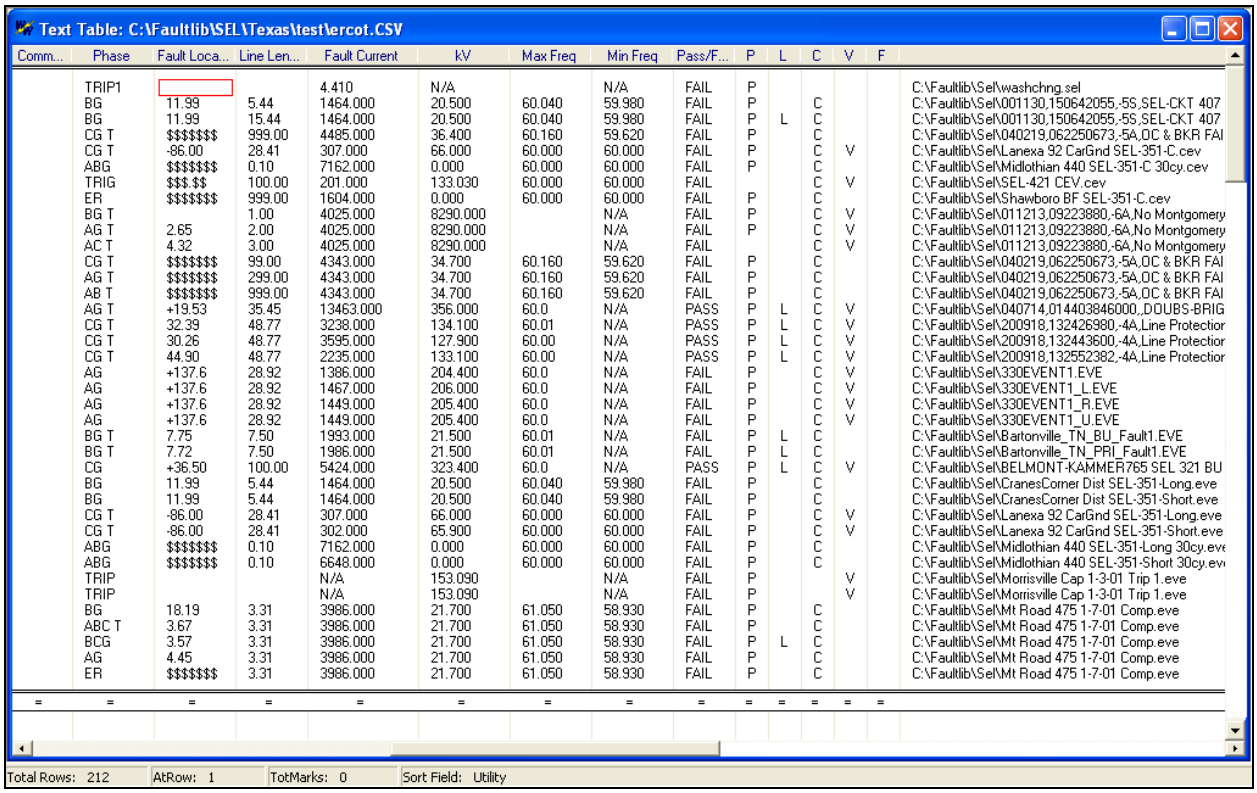


Figure 2.49 Disturbance Report

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 speed bar is updated according to the number of files to process and the current file being processed.

When the processing is complete a comma delimited table is displayed. 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 analysis window.

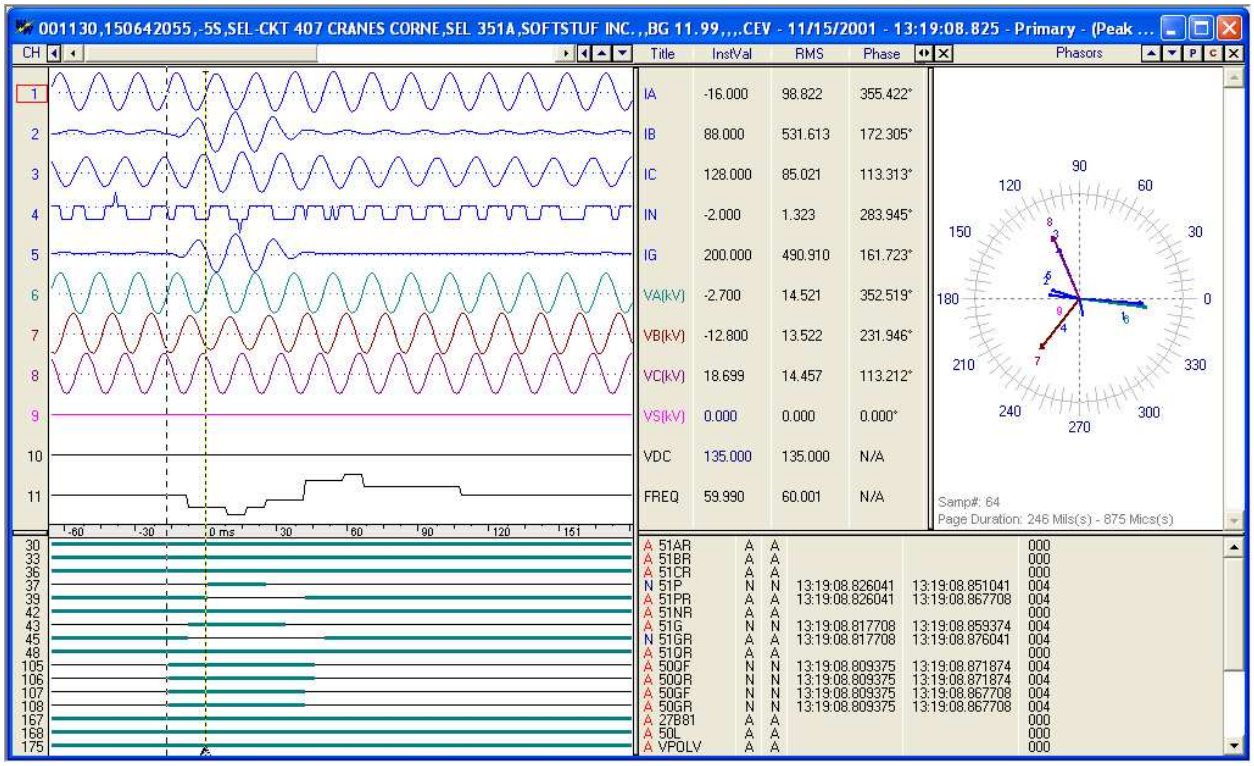


Figure 2.50 Disturbance Display File

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 speed bar 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 message box 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 closes the dialog and 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.

COMPLEX CALCULATOR

The complex calculator is used to perform complex mathematical operations. Operations can be performed in Polar or Rectangular form. Also, there are 4 memory locations used to store the results of an operation. To store a result first click on the memory location radio button then click on the down arrow next to the "Magnitude" edit box. To recall a memory location click on the memory locations radio button then click on the "Recall" button. The "Clear All" button clears all four memory locations.

The calculator operates as an HP calculator. After each entry click the “Enter” button to record the values in the Accumulator.

The complex calculator menu option is listed under the "Options" menu.

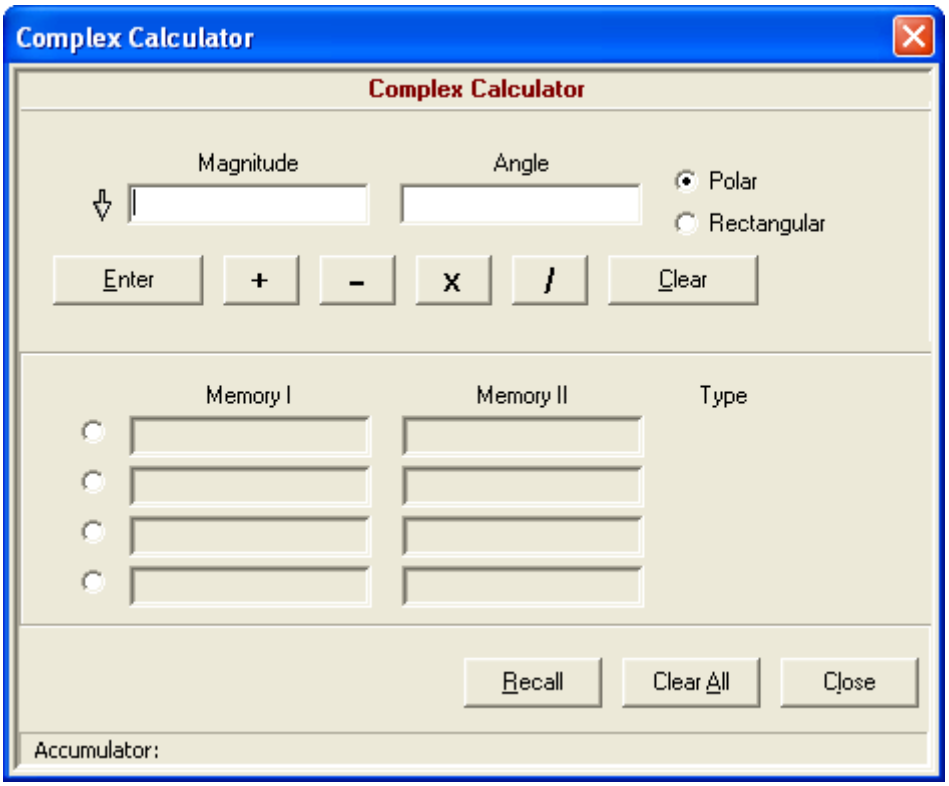


Figure 2.51 Complex Calculator

AUTO CONVERT TO COMTRADE

The auto convert to Comtrade dialog is used to automatically convert specific file types to the IEEE C37.111 Comtrade 1999 format. This dialog will monitor the entered “Source Path” for the defined file extensions. When a file is detected for conversion it will first save the output Comtrade file to the defined “Destination Path” then archive the source file to the defined “Archive Path”.

The SEL Sag/Swell/Interruption (SSI) files contain multiple event information stored with big gaps of time between each event. These files will be scanned for events and each event will be saved in a separate Comtrade file. To define the boundaries for the SSI files enter then minimum number of cycles required before saving to Comtrade, the default is 2 cycles. Also, enter the maximum number of milliseconds between samples before the SSI data is separated into multiple Comtrade files, the default is 50 milliseconds.

To start the auto convert to Comtrade process open the "Auto Convert to Comtrade" dialog by selecting the "Auto Convert to Comtrade..." menu option under the "Options" menu in the File Manager. Enter the source path, destination path, archive path, file extension and the scan period in minutes. Auto Convert to Comtrade will monitor the Source path for the defined file extensions every scan period.

To start the process, click on the "Start Convert" button. Once the conversion starts the button caption will change to "End Convert". To end the conversion process, click on the "End Convert" button. If a file already exists in the destination path then the file is overwritten. The status of each scan is displayed in the Status section of the dialog.

Inputs:

Field	Definition
Properties:	
Source Path	Path where the original files are located.
Destination Path	Path where the converted Comtrade files are saved.
Archive Path	Path where the original files are archived after they are converted to Comtrade.
File Extensions	The extension of the files to convert to comtrade separated by commas, *.SSI,*.EVE
Scan Period	The scan period in minutes.
SEL SSI Files	
Minimum # of Cycles	The minimum number of cycles required before saving to Comtrade.
Milliseconds Difference	The maximum number of milliseconds between samples before the SSI data is separated into multiple Comtrade files.

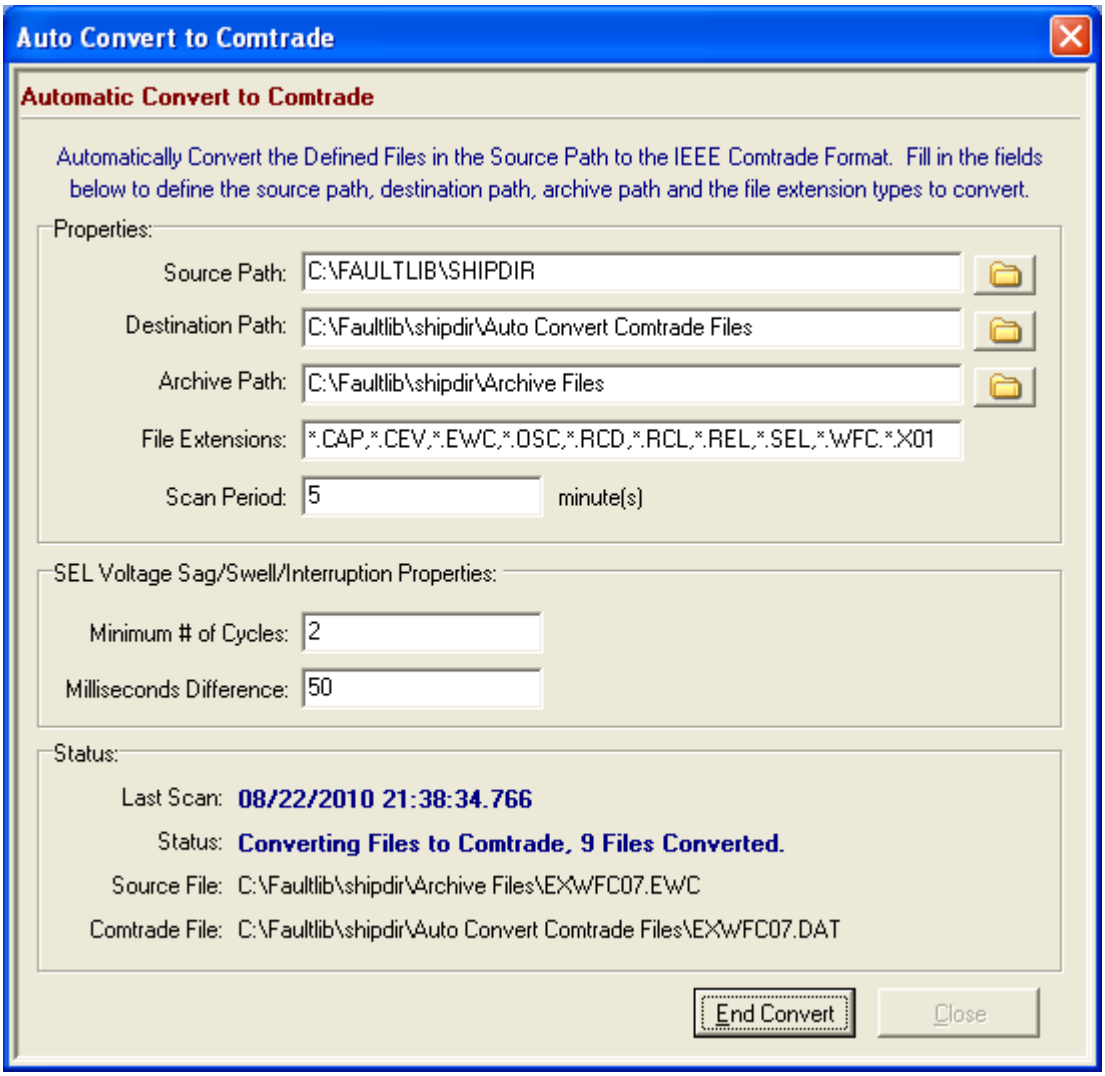


Figure 2.52 Auto Convert To Comtrade

A P P E N D I X A

System Keys

This section lists the function keys, cursor keys, and menu buttons available in the device manager, query fields and DXF display.

File Manager

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 devices in the active configuration.
F6	Query all the devices in the active configuration.
F7	Query all the unmarked devices in the active configuration.
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 device table.
Right Arrow	Move the cursor one position to the right, wraps to next field at the end.
Left Arrow	Move the cursor one position to the left, wraps to next field at the beginning.
Tab	Move the editor to the next query field.
Shift+Tab	Move the editor to the previous query field.
Enter	Process the query criteria for all devices in the active configuration.

Menu Button	Description
Query	Query all devices in the active configuration.

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