

WAVEWIN

NEW FEATURES

Updated: December 2nd, 2021

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1. Device Manager – Added a new SSHClient Component:

Updated December 1st, 2021

Replaced the existing SSClient component with a more reliable component. The previous SSHClient was designed to work with ASCII communications only. The new component supports both ASCII and Binary communications. The new component also has a better support team.

2. Data Plotting – Sort Digital Channels:

Updated December 1st, 2021

Added a new feature that will sort the Digital Channels according to the change of state. This new feature will sort the first change in state in Ascending order or sort the first change in state in Descending order. There is also an option to restore the order of the Digital Channels when the file was first opened. In the menu system there is a new submenu under the Channels menu called Sort Digital Channels and in the ribbon system a new drop down menu was added to the Channel tab under the Arrange section.

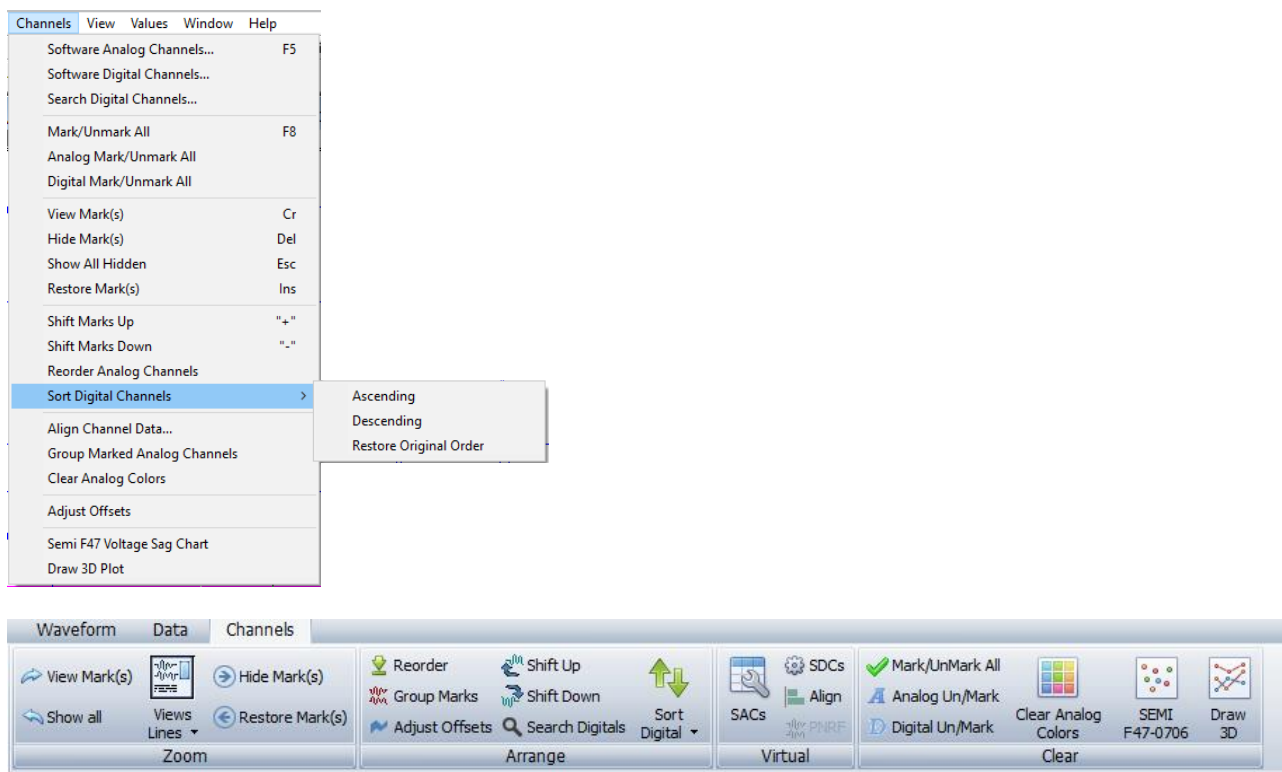


Figure-1: Sort Digital Channels Menu Options

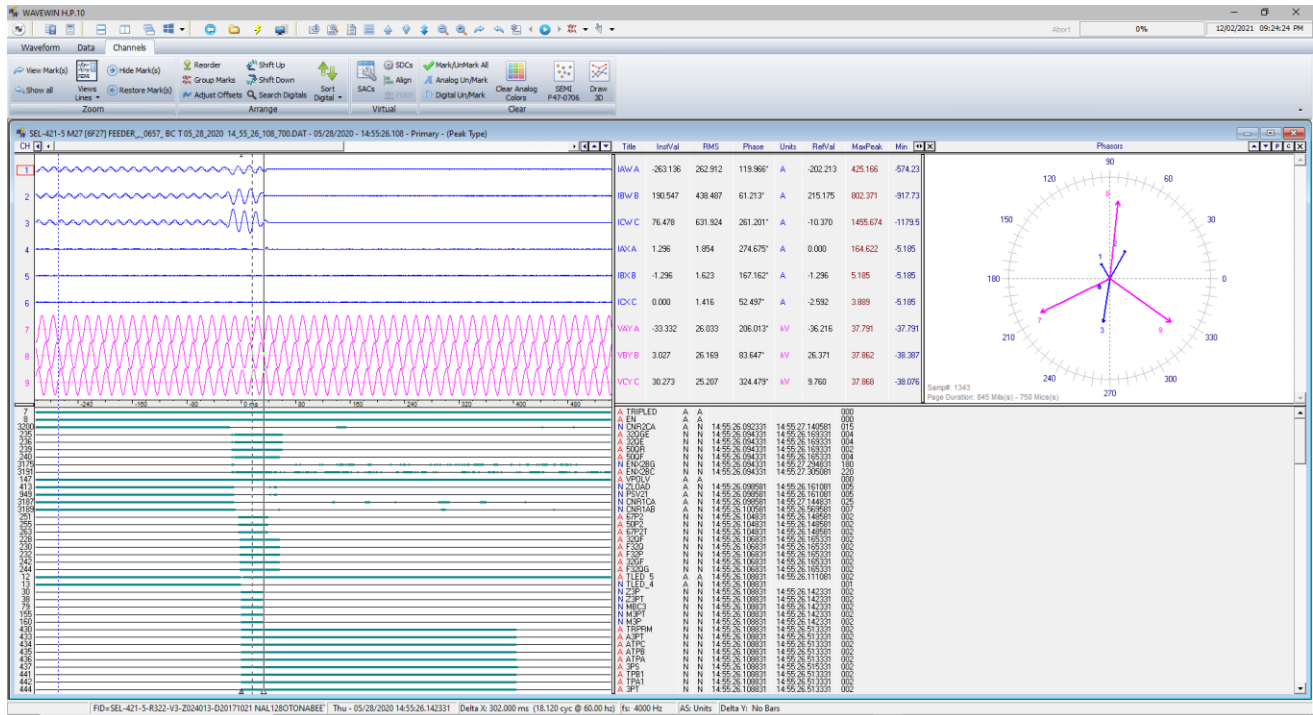


Figure-2: Sort Digital Channels in Ascending Order

3. Data Plotting – Append Files:

Updated December 1st, 2021

When Appending files only the files that have matching analog and digital channel titles are appended. The scale factor has been added as an additional check to make sure all analog channels appended have matching scale factors.

4. Data Plotting – Sequence Components Calculator:

Updated December 1st, 2021

Added an option inside the Sequence Components calculator to always use the displayed channels that are selected in the voltage and current drop down lists. A new checkbox has been added under the phasor diagram to specify that the channels selected in the drop down boxes be preselected when opening the sequence components calculator.

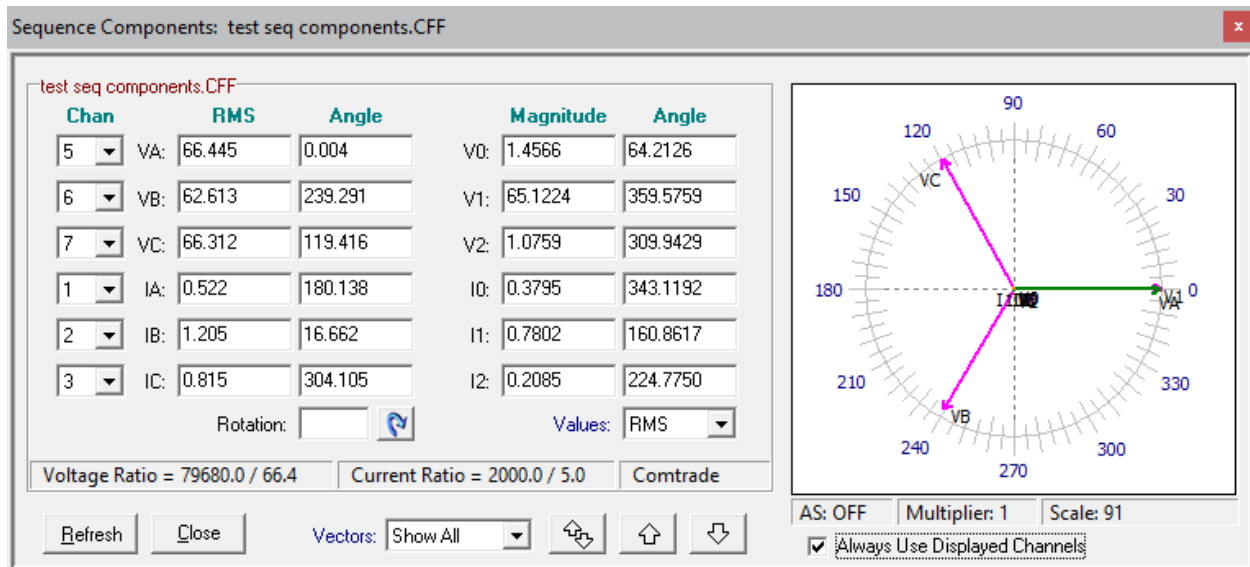


Figure-3: Always Use Displayed Channels in the Sequence Components Calculator

5. Device Manager – Relay Tech Polling Configuration:

Updated January 20th, 2021

Created a generic polling configuration for relay techs to poll relays in the station without having to edit the configuration to add the station and device names. The station name and device name for each record in the device manager lists the type of data to retrieve from the relay. For example, one record will have Compressed Raw in the Device Name field and Event in the Station name. When the device is activated to poll the relay will download all the new Compressed Raw event files from the relay and name the event files using the IEEE Comnames format. The device name and station name will be automatically populated with the Relay ID and Station ID fields listed in the event file. Below are examples of the Relay and Station Fields defined in a compressed format and an ASCII format located in the event file. When an event is extracted from the relay the SEL driver will automatically look for the Relay and Station ID fields and put the fields inside 2 variables: RID and TRMID. The RID variable will replace the Device field in the IEEE long filename and the TRMID variable will be used for the Station field in the filename. The Device and Stn-Group fields will be added to the IEEE long filename in the 7th field, right after the Company Name field, see the example filename below.

Wavewin will only perform the automatic naming of the files using the Relay and Station ID fields from inside the event files if a file named Relay_Techs.INI exists in the path where Wavewin is running from. The Relay_Techs.INI file lists all the possible titles a relay would use to label the Relay and Station ID. If a relay uses another title to represent the Station and Relay IDs add them under the proper section. The Relay_Techs.INI file lists all the possibilities for the Relay IDs under the [RELAYIDS] section and all the

possibilities for the Station IDs under the [STATIONIDS] section. The two sections must be separated by a blank line. See the Relay_Techs.INI File Contents section to see the format of the file.

Compressed Format

"FID","RID","SID","03E2"

"FID=SEL-421-R113-V0-Z004005-D20050119","Relay 1","Station A","0f13"

ASCII Formats

SID := "Station A"

RID := "Relay 1"

RID =FEEDER 1

TID =STATION A

Example Filename

181003,21272145,-5,Station A,Relay 1,Softstuf,Event-Compressed Raw,100.000,\$\$\$.\$\$,TRIG.SEL

Relay_Techs.INI File Contents

[RELAYIDS]

MID

RELID

RID

[STATIONIDS]

TID

TRMID

SID

6. Device Manager – Event File Type Field:

Updated January 20th, 2021

Added an option to add event commands to the Event File Type Field's drop down list using a file called SEL Event File Type.INI. When the Device Manager is open, it will check if the SEL Event File Type.INI exists in the path where Wavewin is running from. If it does not exist then it will create the file with the default event commands that currently exist in the Event File Type drop down list. The Event File Type Field is stored in the Command field. Currently the field stored in the Command field is a letter or number that corresponds to each title listed in the Event File Type drop down box. The current letters are listed below with its corresponding title and outgoing command.

| <u>Storied Letter/Number</u> | <u>Title</u> | <u>Outgoing Command</u> |
|------------------------------|----------------------|-------------------------|
| 0 | Default | EVE # |
| S | Short | EVE # |
| L | Long | EVE # L |
| R | Raw (Unfiltered) | EVE # R |
| C | Compressed Raw | CEV # R |
| X | Compressed Raw L60 | CEV # R L60 |
| D | Compressed Default | CEV # |
| B | Compressed B Command | CEV # B |
| A | ASCII EVE B Command | EVE # B |

The # in the outgoing command represents the Event number. The system now stores the number that represents the position in the drop down list box. For example, the new stored values are listed below:

| <u>New Storied Number</u> | <u>Title</u> | <u>Outgoing Command</u> |
|---------------------------|----------------------|-------------------------|
| 0 | Default | EVE # |
| 1 | Short | EVE # |
| 2 | Long | EVE # L |
| 3 | Raw (Unfiltered) | EVE # R |
| 4 | Compressed Raw | CEV # R |
| 5 | Compressed Raw L60 | CEV # R L60 |
| 6 | Compressed Default | CEV # |
| 7 | Compressed B Command | CEV # B |
| 8 | ASCII EVE B Command | EVE # B |

Following is what the Command field for an SEL-421 Relay used to be stored in the configuration:

```
0~OTTER~TAIL~0~0~C~IP=196.72.197.177:4097
```

The C in the 6th position indicates to use the Compressed Raw event command. The new command now looks like the below:

```
0~OTTER~TAIL~0~0~4~IP=196.72.197.177:4097
```

The 4 replaced the C and indicates to use the 5th field in the drop down list. The index into the drop down list starts with 0 so the 4 is equal to the 5th field.

Backward compatibility is also preserved. When the MID window is opened it will check if the Event File Type field stored in the Command field is a letter and convert it to its new number.

The new SEL Event File Type.ini allows for adding up to a maximum of 50 commands. When the file is read all lines that start with a ; is ignored. The ; allows for adding comments to the file. The format of the file is the title That will be placed in the drop down list box then the command separated by a comma. Add a # in the outgoing command field where the event number goes. When the command is sent to the relay the system will search for the # in the outgoing command string and replace it with the proper event number.

It is recommended to compose the list of commands before configuring the devices, so the order is preserved. If new commands are needed, add them to the end of the file. If new commands are added in the middle or beginning of the file then existing configurations will not have the proper commands.

SEL Event File Type.IN File Contents

;The list of all the SEL event commands that will be available under the Event File Type drop down list.

;in the Device Configuration Dialog. There are two fields below separated by a comma.

;The first field is the name that will appear in the File Type drop down list box.

;The second field is the command sent to the relay. Put a # where the event number appears in the ;command.

;A maximum of 50 commands are supported.

Default,EVE #

Short,EVE #

Long,EVE # L

Raw (Unfiltered),EVE # R

Compressed Raw,CEV # R

Compressed Raw L60,CEV # R L60

Compressed Default,CEV #

Compressed B Command,CEV # B

ASCII EVE B Command,EVE # B

7. Data Plotting – Digital Channel Titles:

Updated December 17th, 2020

Increased the Digital Channel title characters from 80 to 90.

8. Data Plotting – Auto Process Templates:

Updated December 17th, 2020

Added 2 new fields in Display dialog under the Data Plotting tab. These 2 new fields are called PDF Width and PDF Height. When running Wavewin as a service the monitor coordinates for the PDF are not exact. These fields allow for changing the width and height to fit the PDF report properly.

9. Device Manager – SEL/FTP Events:

Updated December 17th, 2020

Added the ability to connect to a SEL Relay using the TCPIP connection to check if there are new files for download. If there are new files then the FTP connection is used to download the new files. This was required because the level 2 password is used to logon to the FTP server and that causes alarms sent to SCADA. This will eliminate a majority of the alarms by only logging on to FTP server if there are new events to download.

10. File Manager – Automatically Rename Files:

Updated September 17th, 2020

Added a new feature to Automatically rename waveform/load files to the IEEE ComNames format. This new feature monitors a folder for waveform/load files with user defined extensions. When a file is detected in the source path or in its included folders it will first move the original file to the Archive path then read the file's configuration information and rename the file to the destination path. To activate this feature select the Auto Rename Files option under the Options menu/tab. A dialog will be displayed. Enter the Source Path, click the Include Sub Folders check box if needed. Enter the Destination and Archive Paths. Enter all file extensions (*.DAT, *.CEV, *.CFF) and the scan period. If this feature needs to start when Wavewin runs click the Automatically Start Auto Rename Files at Run Time checkbox. The bottom section of the dialog gives a status update on the activity of the process. It displays the last scan time, the original and Renamed filenames and when the next scan will start in minutes. To start the process click the Start Rename button.

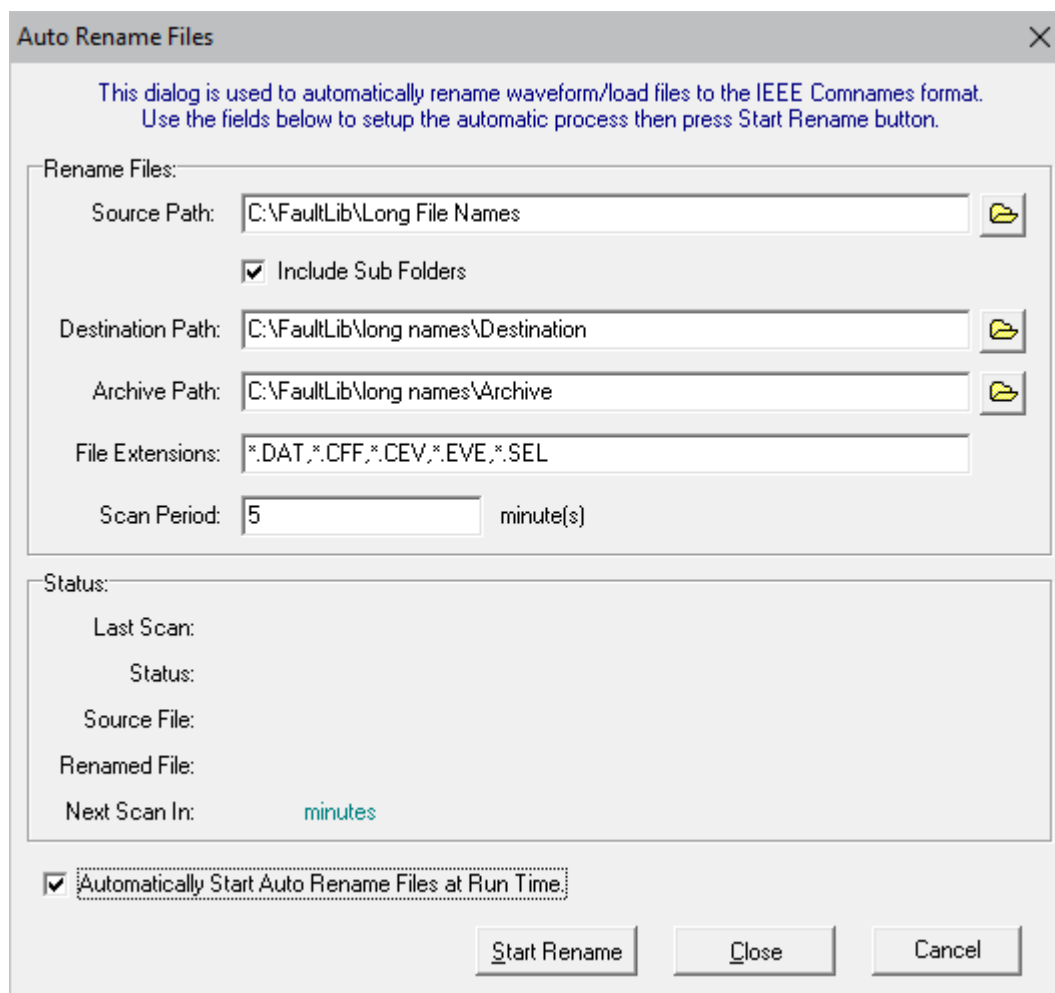


Figure-4: Automatically Rename Files Dialog

11. File Manager/Process Templates – SER Reports:

Updated August 29th, 2020

Added a new feature to create SER files for each waveform file. This new feature monitors a folder for waveform files with user defined extensions. When a file is detected it will read the file and create a comma delimited SER file from the digital channel activity. The SER file will have the same name as the original waveform file.

Create SER Files [X]

This dialog is used for creating a SER file for each Event file located in the source path defined below. Please define the fields below then click on the Start Create button.

SER Fields:

Source Path: [Folder Icon]

☒ Include Sub Folders

File Extensions:

Scan Period: minute(s)

☒ Create a combined SER File with the Filename and Path below.

Combined Path: [Folder Icon]

Combined Filename:

Status:

Last Scan:

Status:

Source File:

Create SER File:

Next Scan In: minutes

☐ Automatically Start Create SER Files at Run Time.

[Start Create] [Close] [Cancel]

Figure-5: Create SER File Dialog

To activate this feature select the Create SER Files option under the Options menu/tab. A dialog will be displayed. Enter the Source Path, click the Include Sub Folders check box if needed, enter the file extensions (*.DAT,*.CEV,*.CFF) and the scan period. If this feature needs to start when Wavewin runs click the Automatically Start Create SER File at Run Time checkbox. The bottom section of the dialog gives a status update on the activity of the process. It displays the last scan time; the original and SER filename being processed and when the next scan will start in minutes. To start the process click the Start Create button.

To create an SER file with all the digital activity from all processed Waveform files click on the Create a Combined SER File check box. Select or enter the path of the Combined file and enter its filename. This allows for adding the SER information into a database from one single file.

To create the SER files for each file being processed by the Auto Process Templates add a /SER to each line in the Format files being processed.

12. Data Plotting – Auto Process Templates:

Updated: June 15th, 2020

Added a few new checks and features to the auto process template engine.

1. When Comtrade files are automatically collected using the device manager the Comtrade .DAT file maybe collected first before the .CFG file is collected. If this happens then Wavewin will see the .DAT file as a Replay Plus file which causes an error in the system. To remedy this Wavewin will not process a Comtrade .DAT file until the .CFG file is collected.
2. Again, when files are automatically collected using the device manager it may be possible that Wavewin will try to process the file before the full file is collected. To fix this, files are only processed if they have a save time greater than one minute from the current time. This was added to avoid conflict with reading files when they are being written to.
3. In previous versions Wavewin would process 256 files at a time. Before the process begins Wavewin would bin into memory all the information needed to process each file including renaming the file with a WWD added to the last field in the filename. Renaming the file with the WWD tag indicates the file has been processed. This was done to ensure the filename added to the DIG processed file's information matched the filename on disk. This was causing a problem if Wavewin was shut down during a process session. All of the files that were not processed but were renamed never got reprocessed. To avoid this, renaming of the file occurs after the file is processed.
4. Corrected a problem when opening waveform files from the processed DIG file. Since the filename is now marked as processed (adds a WWD in the last field in the filename) after the file is processed then it's not writing the correct filename into the table at process time. To correct this when a double click occurs in the DIG file, the system checks if the file exists, if it does not exist it adds the WWD to the filename in the DIG file and tries to open that file.
5. Added a new way to process files. In the past Wavewin would add a WWD to the last field in the filename to indicate a file has been processed. When using third party backup software to move files from one folder to another the third party's software was constantly copying back files that were previously processed. It was doing this because it could not find the files since they were renamed by Wavewin. A second option was added to process files according to the file's save date. In the System Settings dialog under the Data Plotting tab a new field was added to specify the process type, see Figure 1. If Rename with ,WWD is selected in the Process Type drop down field then the field to the right of the Process Type field changes to Batch Files. The batch Files

drop down allows for selecting New Files (Files that do not have a WWD as the last field) or All Files. If the By Save Date drop down option is selected then the field to the right of the Process Type field changes to Start DT. The Start DT allows for setting what Date and Time to start at when processing the files. For example, to process just the last 30 days of files set the date and time to 30 days prior to the current date and time.

6. Another field was added to give control over how many files get processed during a single session. The Process # field allows for selecting 1 to 256 files per session.
7. Softstuf supplies a Fault Report template to process waveform files for fault information. In the Fault Report template there is a field for producing PDF files that gives a fault summary and a screen dump of the faulted area, refer to Appendix A. These PDF files were being produced for all fault files collected and processed. A large number of PDF files were being created that were not necessary. An option was added to select what files would produce a PDF. The new field is in the System Settings dialog under Data Plotting tab in the Process File section. The available options are All Files, No Files or Breaker Opt Files. In the fault report template there are 4 columns used to monitor up to 4 breaker digital channels. If one of the 4 breakers operated then a PDF will be saved.

System Settings

Use the Tabs below to define each Setting.

File Columns | General Table Settings | Data Plotting | Device Manager | Help Files

General Settings:

Open View: Digital Toggled Channels:

Analog Table Font Size Open Files w/ Primary Values:

Process Files:

Process Type: Start DT:

Versioning:
 Process #:

PDF Files:

Duration Calculation:

Current: If 1st Prefault RMS Value < Then Trigger Value =
 else Trigger Value = Prefault RMS *

Voltage: If 1st Prefault RMS Value > Then Trigger at %.

Append Files:

Append ComName Files: within minute

ShortCuts

Figure-6: Auto Process Template Fields

13. Data Plotting – Digital Channel Groups:

Updated: June 15th, 2020

In the Save View dialog a new section was added to create digital channel groups. When a record is open, Wavewin will only display the digital channels that changed state. When creating digital groups all of the digital channels may have to be displayed prior to opening the Save View dialog. Before opening the Save View dialog select the All Digital ribbon item in the Waveform tab. This will include all of the digital channels in the Save View dialog.

The new Digital Groups section is disabled until the New Group button is clicked. To create a digital group use the Mouse to select the digital channels in the Digital Channel's list box. Next, click on the New Group button. Once the New Group button is clicked the Digital Group section will be enabled and the Digital Group Name field will have the focus. Type in the name of the new group and hit enter or click the Save button. The table below the Digital Group Name field will be populated with the name of the digital groups in the first column and the number of channels in that group in the second column.

The screenshot shows the 'Save View' dialog box with several sections. The 'Digital Groups' section is highlighted with a red circle. It contains a 'Digital Group Name' text field and a table with two columns: 'Group Name' and 'No# Chan...'. A 'Save' button is located to the right of the table. The 'Channels' section on the right contains two tables: 'Analog Channels' and 'Digital Channels'. The 'Analog Channels' table has columns for 'Chan #', 'Channel Title', 'Color', and 'Super Impose'. The 'Digital Channels' table has columns for 'Chan #' and 'Channel Title'. Buttons for 'Move Up', 'Move Down', 'Delete', and 'Reset' are located to the right of the 'Analog Channels' table. Buttons for 'New Group', 'Delete', and 'Reset' are located to the right of the 'Digital Channels' table. At the bottom right of the dialog are 'OK' and 'Cancel' buttons.

Save View File:

☒ Save a View Profile

View File Path: C:\FaultLib\Views

View Name: DAT

(An extension is not needed. The extension is automatically assigned.)

Print Profile

☐ Save a Print Profile

Orientation: ☒ Portrait ☐ Landscape

Header: ☐ Short ☒ Advanced

Digital Groups

Digital Group Name

| Group Name | No# Chan... |
|------------|-------------|
| | |

Save

Channels

Analog Channels:

| Chan # | Channel Title | Color | Super Impose |
|--------|---------------|---------|--------------|
| 1 | IAW A | Blue | No |
| 2 | IBW B | Blue | No |
| 3 | ICW C | Blue | No |
| 4 | IAA A | Blue | No |
| 5 | IBB B | Blue | No |
| 6 | ICC C | Blue | No |
| 7 | VAY A | Fuchsia | No |
| 8 | VBY B | Fuchsia | No |
| 9 | VCY C | Fuchsia | No |
| 10 | VAZ A | Fuchsia | No |
| 11 | VBZ B | Fuchsia | No |
| 12 | VCZ C | Fuchsia | No |

Move Up, Move Down, Delete, Reset

Digital Channels:

| Chan # | Channel Title |
|--------|---------------|
| 7 | TRIPLED |
| 8 | EN |
| 12 | TLED_5 |
| 13 | TLED_4 |
| 17 | TLED_16 |
| 30 | Z3P |
| 38 | Z3PT |
| 78 | MCA3 |
| 79 | MBC3 |
| 147 | VPOLV |
| 155 | M3PT |
| 160 | M3P |
| 209 | LD_DPF3 |
| 210 | LD_DPF3 |

New Group, Delete, Reset

OK, Cancel

Figure-7: Save View: Digital Groups

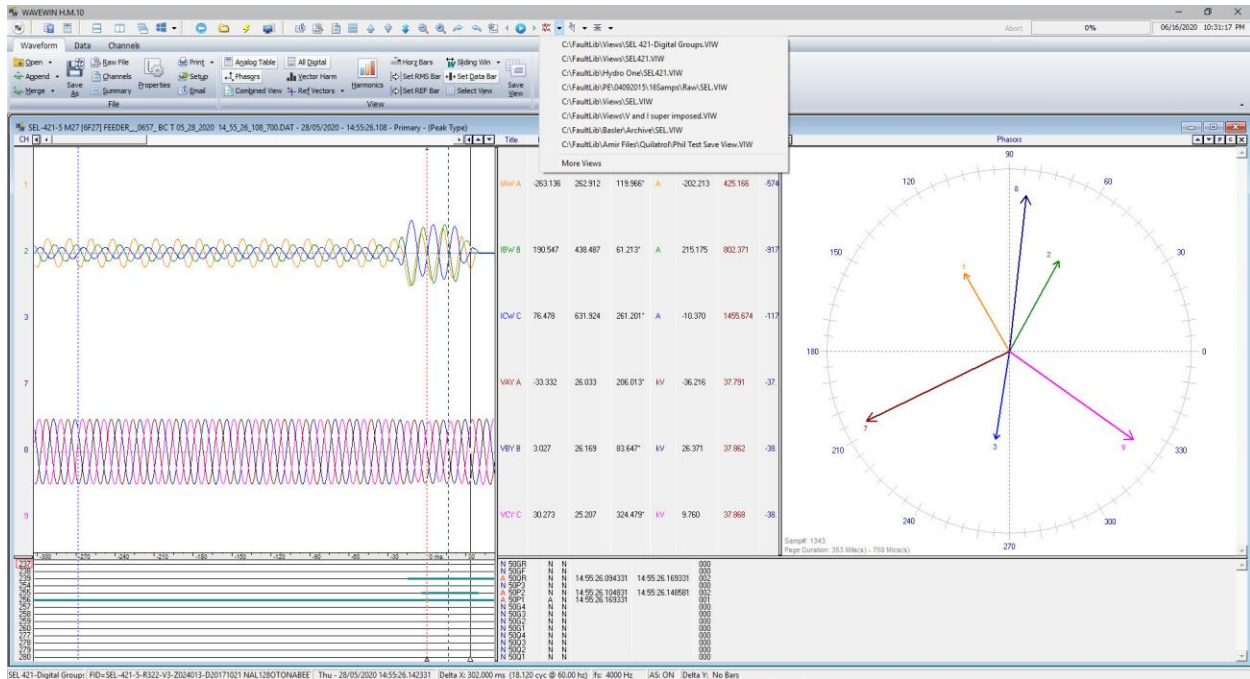


Figure-8: Select View



Figure-9: Digital Group Drop Down Menu

In the Data Plotting window select the View that was saved with the Digital Groups. A new drop down button is added to the Data Plotting main toolbar. The new drop down lists all the Digital Groups in the View. To display a digital group select the group from the drop down menu. By default Wavewin only displays the triggered digital channels for each group. To view all the digital channels in the group click on the All Digital ribbon item in the Waveform tab.

A View can also be selected from the Select View Dialog. Click on the Select View ribbon item under the Waveform tab. When the view is selected under the View Files section a new list is displayed next to the Digital Channel list box. It lists all the Digital Group Names and if the digital group is compatible with the displayed file. The group is compatible if it's digital number and name in the group match the digital channels name and number in the file.

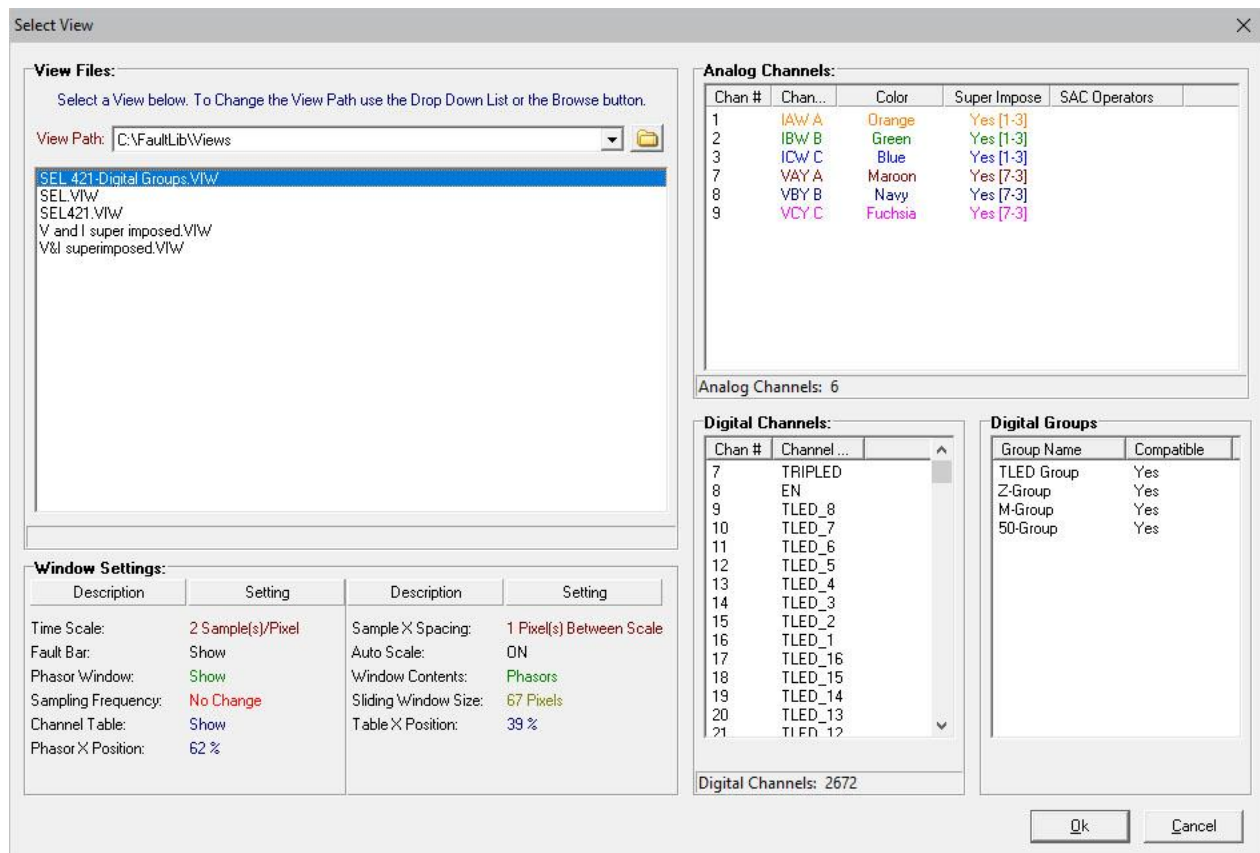


Figure-10: Select View Dialog

14. Data Plotting – Auto Play Waveform:

Updated: June 15th, 2020

A feature to auto play the analog and digital channels has been added to Wavewin. In the ribbon system three new buttons were added to the data plotting's main toolbar along with a new Replay section in the Ribbon under the data tab. In the menu system there are 3 new menu options under the data tab. The new options will auto play the displayed analog and digital channels. This new feature will move the channels to the left keeping the data cursor fixed at one cycle from the beginning of the display. In the Ribbon system the button to the left of the auto play button is used to slow the speed of the waveform movement and to the right is a button to increase the speed of the waveform. In the Menu System use the menu items increase/decrease to control the speed of the waveforms.

All values in the tables are the values at the data bar.

The auto play Waveform does extensive drawing to the screen. To minimize flicker and slow drawing select a maximum of 7 channels and expand the time scale to see a smooth transition when the analog channels are played. The drawing is done in the background. This allows for marking, deleting, expanding, contrasting, scaling channels and more while the Waveform is being played.

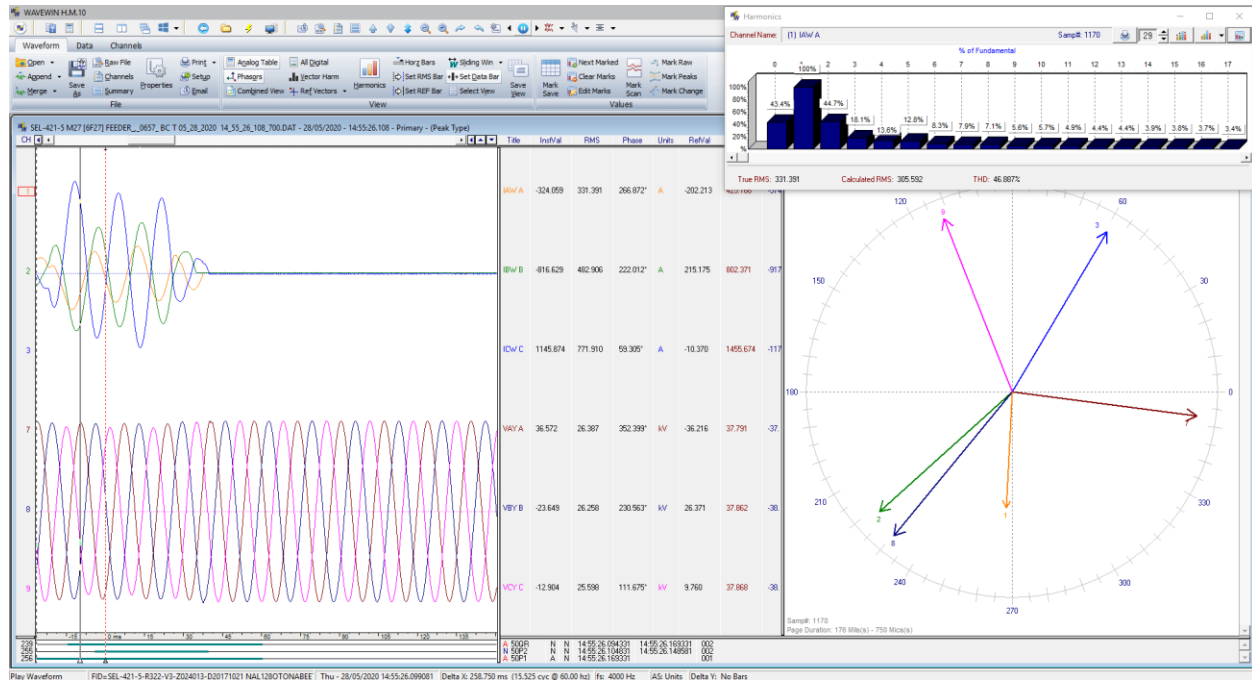


Figure-11: Auto Play Waveform

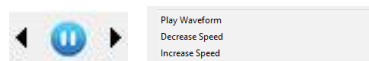


Figure-12: Auto Play Waveform Menu Buttons

15. Data Plotting – Digital Channels:

Updated: June 15th, 2020

Increased the number of digital channels from 2048 to 4096.

16. File Manager – Change Filename:

Updated: June 15th, 2020

A new feature was added that allows for changing the contents of a long filename. It can add or remove information from the marked files in the active folder or all the files in the active folder. The add feature adds the entered information as a new field to the right of the existing last field. This feature is helpful for adding the Company name to long filenames if it did not exist.

It also allows for removing information from long filenames. This feature is helpful for processing waveform files that have already been processed by the Wavewin process template feature. If the process template use the Rename with, WWD then to reprocess the files the ,WWD added to the end of each filename can easily be removed using the Remove check box.

To add or remove information from long filename in a folder, first checked the desired checkbox, Remove or Add. Next enter the information to remove or add in the File String field. Next select what file to act on, Marked Files or All Files. If there are no marked files in the active folder then the Marked Files radio button is disabled. Click the OK button to activate.

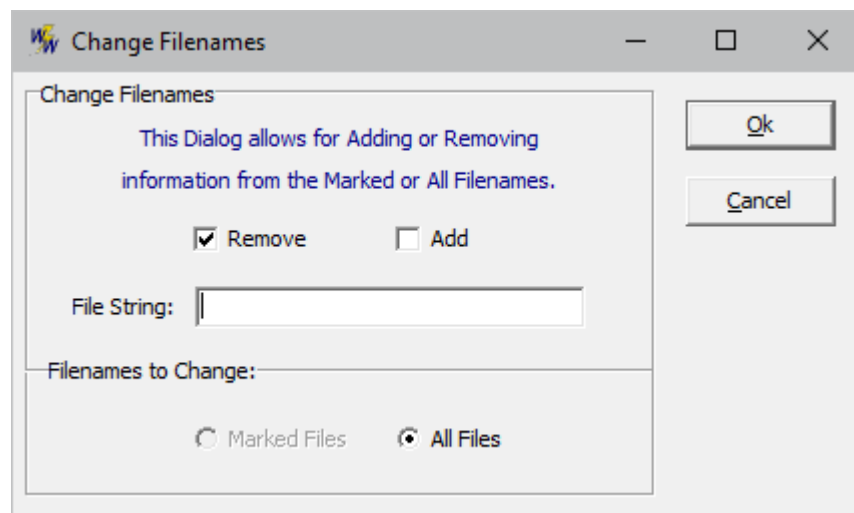


Figure-13: Change Filenames Dialog

17. File Manager – Rename Files to ComName Format:

Updated: June 15th, 2020

Removed a 14 character limitation for the station and device names in the ComName format when renaming files to the long format either directly from the File Manager or through the Auto Convert to Comtrade.

18. File Manager – Auto Convert to Comtrade:

Updated: June 15th, 2020

When the auto convert to Comtrade copies waveform files to the destination path it was not copying the support files with the data file. This applied to Comtrade files, Emax files, Transcan file and Rochester files. It now copies all support files to the destination path.

19. Device Manager – SEL Fault Report:

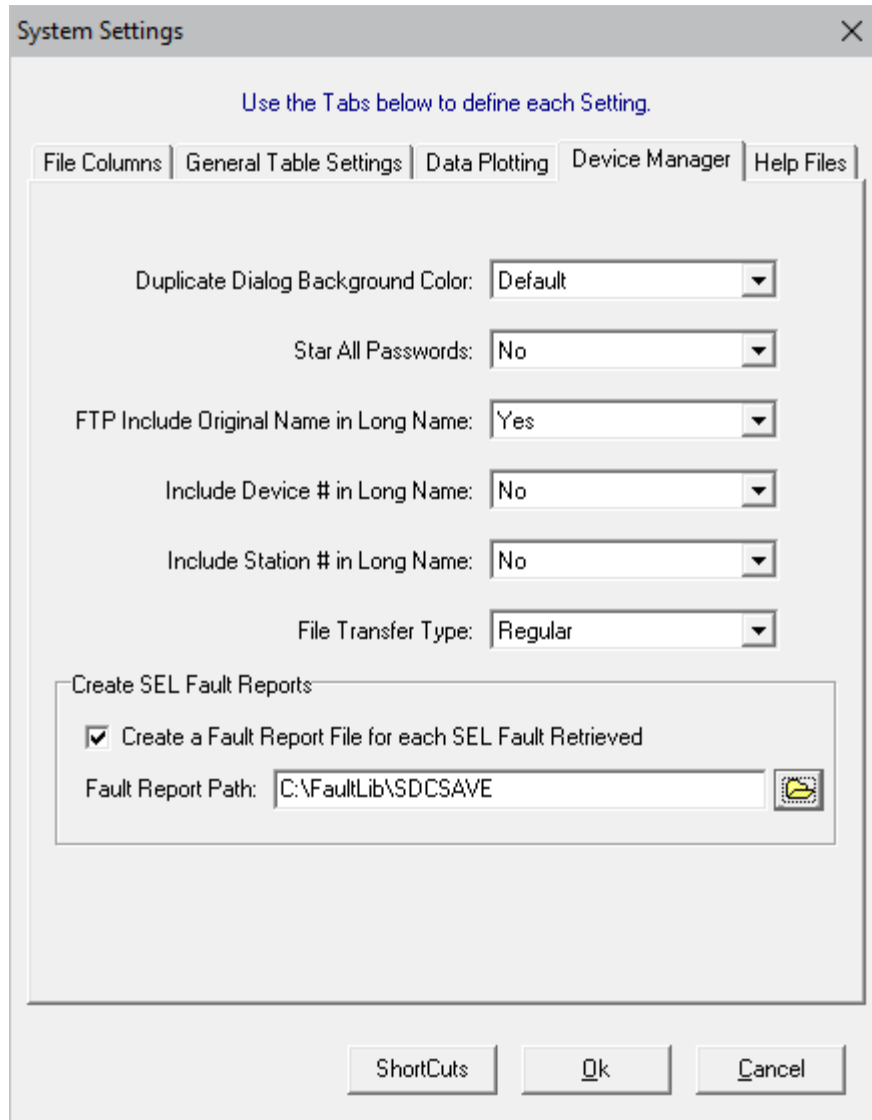
Updated: March 20th, 2020

Added an option to create an SEL Fault Report text file for each fault file retrieve from the SEL Relays. To activate this new feature open the Display Dialog under the Options menu/tab in the File Manager. Click on the Device Manager tab. Click on the Create a Fault Report for each SEL Fault Retrieved check box. Next, select or enter the path where the fault report files will be saved. The contents of the report are listed below:

```

Date: 07/14/20
Time: 12:38:32.18
Station: BAIN SOUTH
Device: SOUTH STREET SET #2
Event: CG T
Location: +21.62
LineLen: 72.71
Targets: INST SOTF Level1 EN C G

```

**Figure-14: SEL Fault Report Dialog**

20. File Manager – Auto Convert to Comtrade:

Updated: October 28th, 2019

The Auto Convert to Comtrade feature converts all files with extensions matching the ones specified in the File Extensions field.

The converted files are saved following the Comtrade Revision specified in the Properties Dialog under the Comtrade tab. All revisions of the Standard are supported including the latest single file format (CFF) which has helped solve many of the problems associated with managing very large volumes of Comtrade records.

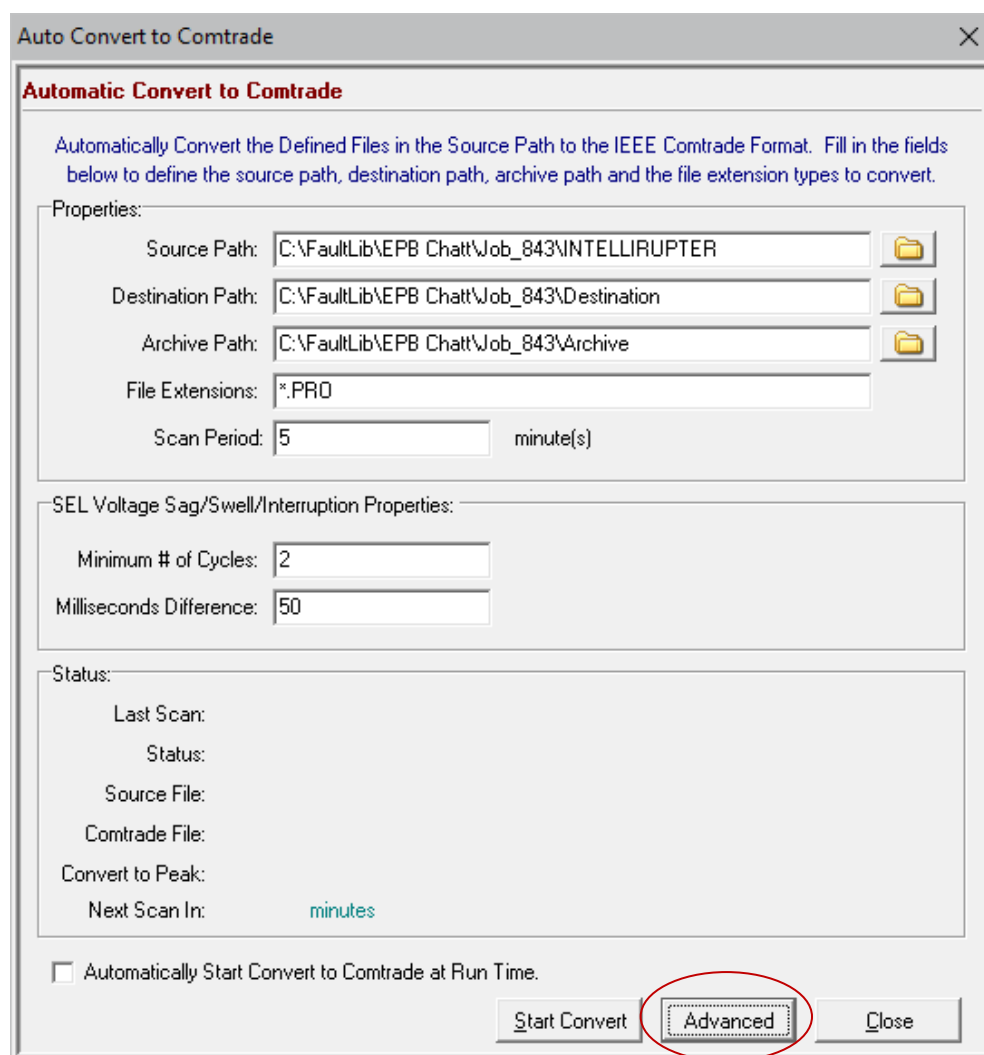


Figure-15: Auto Convert to Comtrade Dialog with New Advanced Setting Button

In addition, a new Advanced Settings feature allows for including subfolders and for automatically appending files from the same device which enables long term displays of both transient and periodic data.

The new Advanced Settings feature also allows for automatically renaming the converted files to the standard IEEE Comname format. Setting details are provided in the following sub sections.

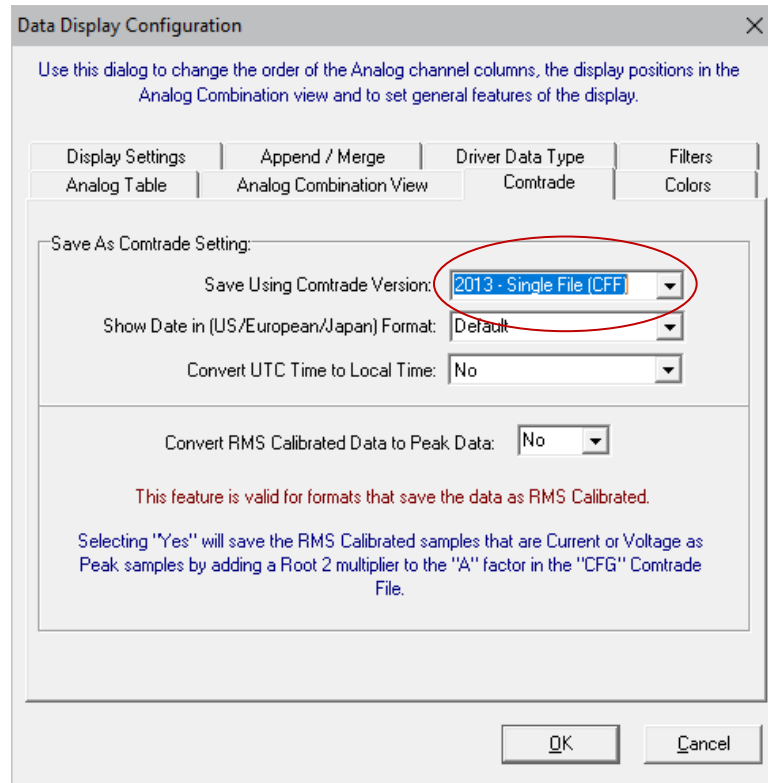


Figure-16: Data Display Properties Dialog with CFF 2013 Revision Selected

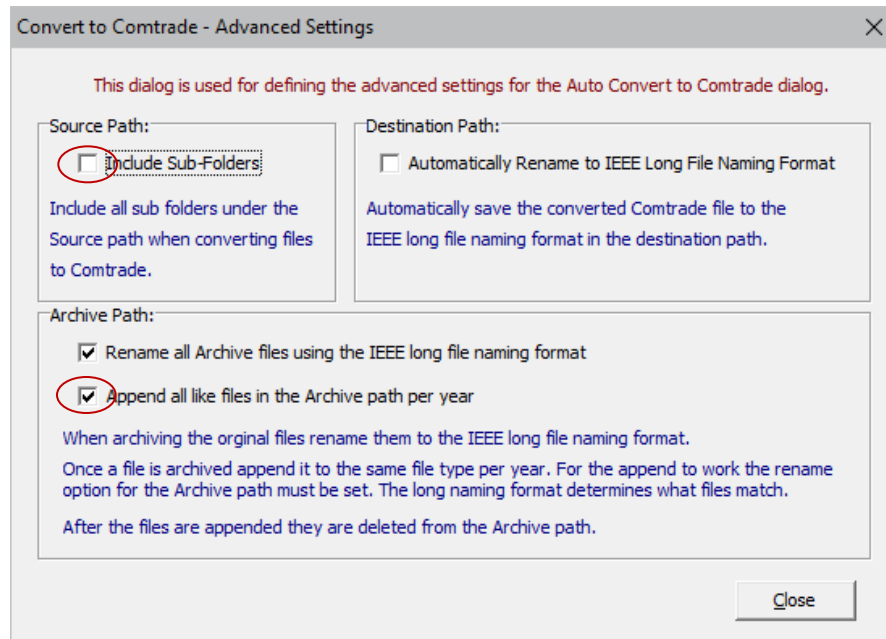


Figure-17: New Advanced Setting Dialog

Advance Settings:

The Advanced Settings dialog has 3 sections, one for the Source path, one for the Destination Path and one for the Archive path. The Source path section allows for including Sub-folders when scanning for files to convert to Comtrade. The Destination and Archive sections allow for renaming to the Comname format. The Archive section also allows for appending all like files into one Comtrade file per year. If the append is checked then after each append the original archive files are deleted.

Source Path:

If Include Subfolders is selected, then the system reads all of the subfolders and their subfolders under the source path and puts them into a string list (the source path is included on top of the list). When scanning for new files, it starts at the first path in the list and then repeats for each subsequent path (multiple nests deep) (the number of nests is limited by the length of the path name, maximum allowable length is 128 characters).

Destination Path:

When a new file is found, it is first copied to the archive path and then it is converted to Comtrade and saved to the destination path. If the original file name is not based on a unique and readable naming scheme then the file name can be renamed to Comname in the destination path.

Archive Path:

The file names in the archive path can also be renamed to Comname. If Rename is selected, then the renamed files can be automatically appended (1 file/device/year) by selecting the Append option.

The appending process starts after the Conversion process is complete (for all of the paths in the list). This ensures that the conversion process is not delayed. The appending process scans the archive path and appends all of the files that have the same year, station, and device fields in the file name.

The appended files are saved in the selected Comtrade version and are also named following the Comname format. After all of the files have been appended, the originating files are deleted from the archive path.

21. Appending files from the File Manager and Data Display:

Updated: October 28th, 2019

The append engine is invoked from the file manager, from the data display, and now from the auto Convert to Comtrade feature. In support of the new features, the append engine was upgraded to allow for appending up to 400 files at a time (previous limit was 100). For periodic data, the 400 limit is just right because typically up to 366 files may be collected per year per device. For oscillography files, the 400 limit provides large margins. Care must be taken when appending large numbers of files because of memory limitations. Typically each byte on disk corresponds to 10 bytes in memory.

In addition, the file name in the data display window header was revised to show the number of appended files along with the name of the first appended file. For example, if 28 files were appended then the appended file name in the window header would look like:

28 Appended Files – The first file's original name – Date and time – Values – (File type)

22. File Manager – Options Menu Item, Display Option, System Settings Dialog:

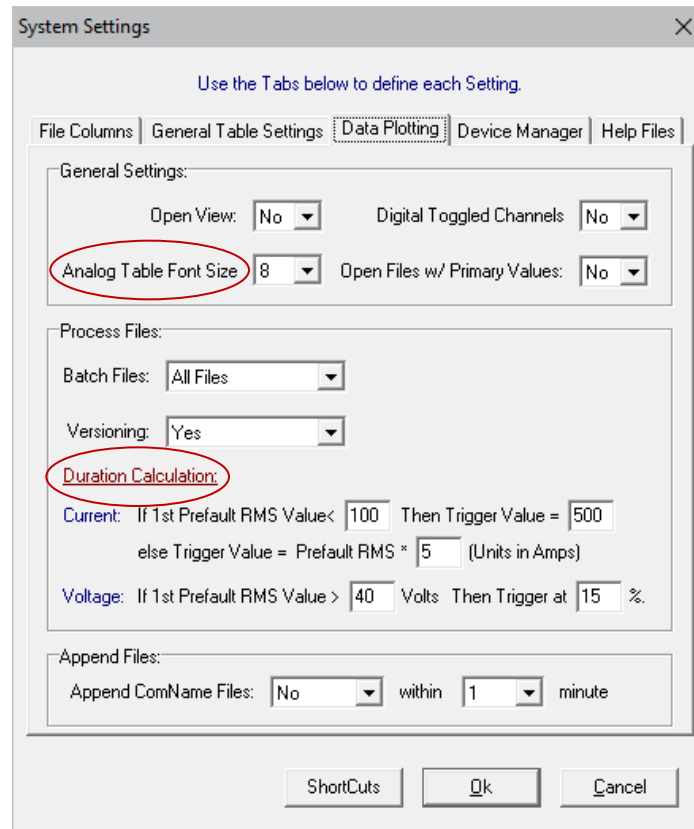


Figure-18: System Settings Dialog with New Data Plotting Settings

Updated: October 28th, 2019

A number of new fields have been added to the System Settings dialog under the Data Plotting tab. The first feature is the ability to change the size of the font of the measurements shown in the data display. A drop down list is provided for selecting up to 16 font size (the default is 8).

The second feature is a new, change detection algorithm to automatically measure duration and magnitude of evolving fault conditions within the same record (maximum/minimum over/under voltage and current magnitude and duration are calculated). The ability to set triggers for seeding the algorithm is provided under the Duration Calculation section. When a file is open a true RMS value is calculated at each sample using a running, recursive RMS calculation. After the first full cycle is processed, the algorithm kicks in and compares the calculated RMS values to the specified trigger values.

23. Data Plotting – New Semi F47-0706 Voltage Sag Chart:

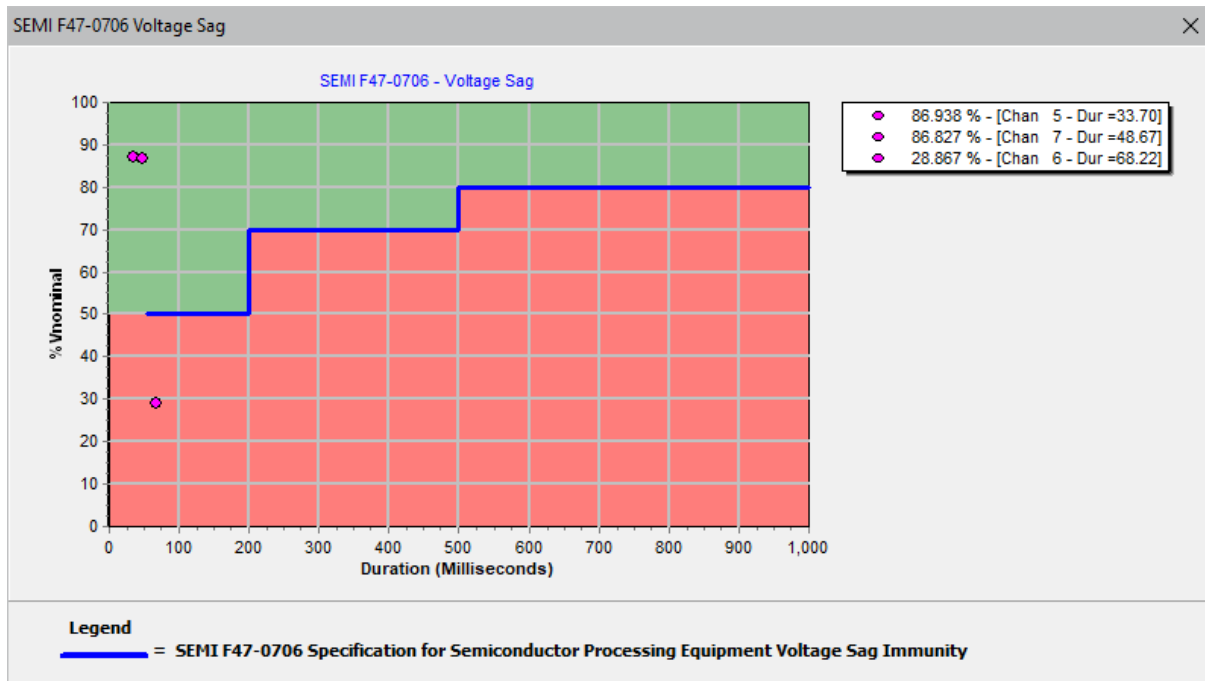


Figure-19: SEMI F47 0706 Voltage Sag Chart

Updated: October 28th, 2019

The SEMI F47-0706 Voltage Sag display shows the sag immunity chart. The chart depicts the required voltage sag ride-through capability curve. The unaffected region is the green area, and the miss operation region is the red area.

To view the chart, first mark the voltage channels then click on the SEMI F47 option from the Channels menu.

To the right of the chart is the sag percentage which is calculated for each voltage channel using the following equation: $(\text{Nominal RMS} * 100) / (\text{Lowest Sag RMS})$. Each displayed percentage is followed by the channel number and the duration in milliseconds.

The trigger value for the duration calculation is set in the System Settings dialog (refer to Figure-4). The default setting is 15% of nominal.

24. Data Plotting - 3-D Plots:

Updated: October 28th, 2019

The Plot 3-D feature plots a maximum of 3 channels. To plot in 3-D, first mark the channels then click on the Draw 3-D icon under the Channels menu.

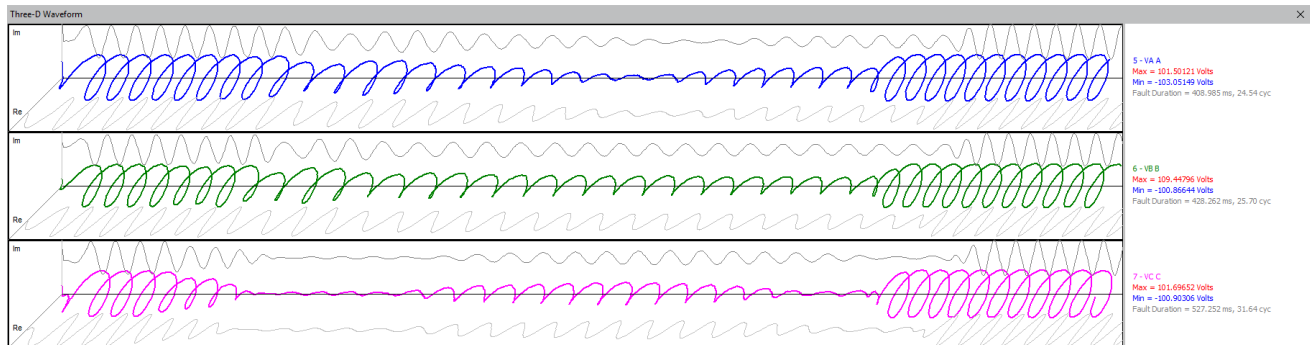


Figure-20: Plot 3-D Window

To the right of each channel is the channel number, the channel title, the instantaneous maximum and minimum values of the entire channel and the duration of the fault in cycles and milliseconds.

The trigger values for the duration calculation are set in the System Settings dialog. The default setting is 15% of nominal for the voltage channels, and times 5 of nominal per unit for the current channels.

25. Data Plotting – Rose Charts:

Updated: October 28th, 2019

The Rose charts feature plots the waveform signal using the circular charts. To plot a rose chart, first mark the channels to plot then hit enter to isolate the channels. Next, click on the C button above the phasor diagram. The rose charts displays a small circle the same color as the signal color if the value is a negative value. To return to the phasor display click on the P button above the rose chart.

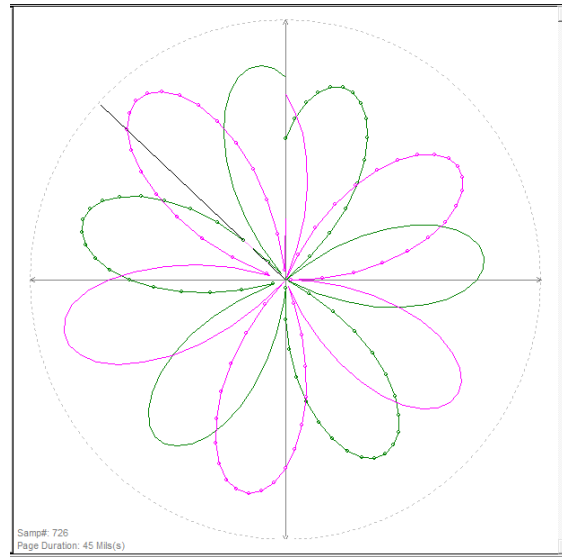


Figure-21: Rose Charts

26. Data Plotting – Power Calculator:

Updated: October 28th, 2019

The Power Calculator measures the harmonics for a voltage and current channel. To open the power calculator first mark a voltage and current channel in the data plotting window. Next select the Power Calculator menu option under the Data tab in the menu system. In the ribbon system select the Power Calculator under the Data tab. A table is displayed listing the Voltage harmonics, Current harmonics, the angle difference between the current and voltage, the calculated MWatts and MVars. The MWatts and MVars calculations are below:

$$\text{MWatts} = (V * I) * \cos(\phi_V - \phi_I)$$

$$\text{MVars} = (V * I) * \sin(\phi_V - \phi_I)$$

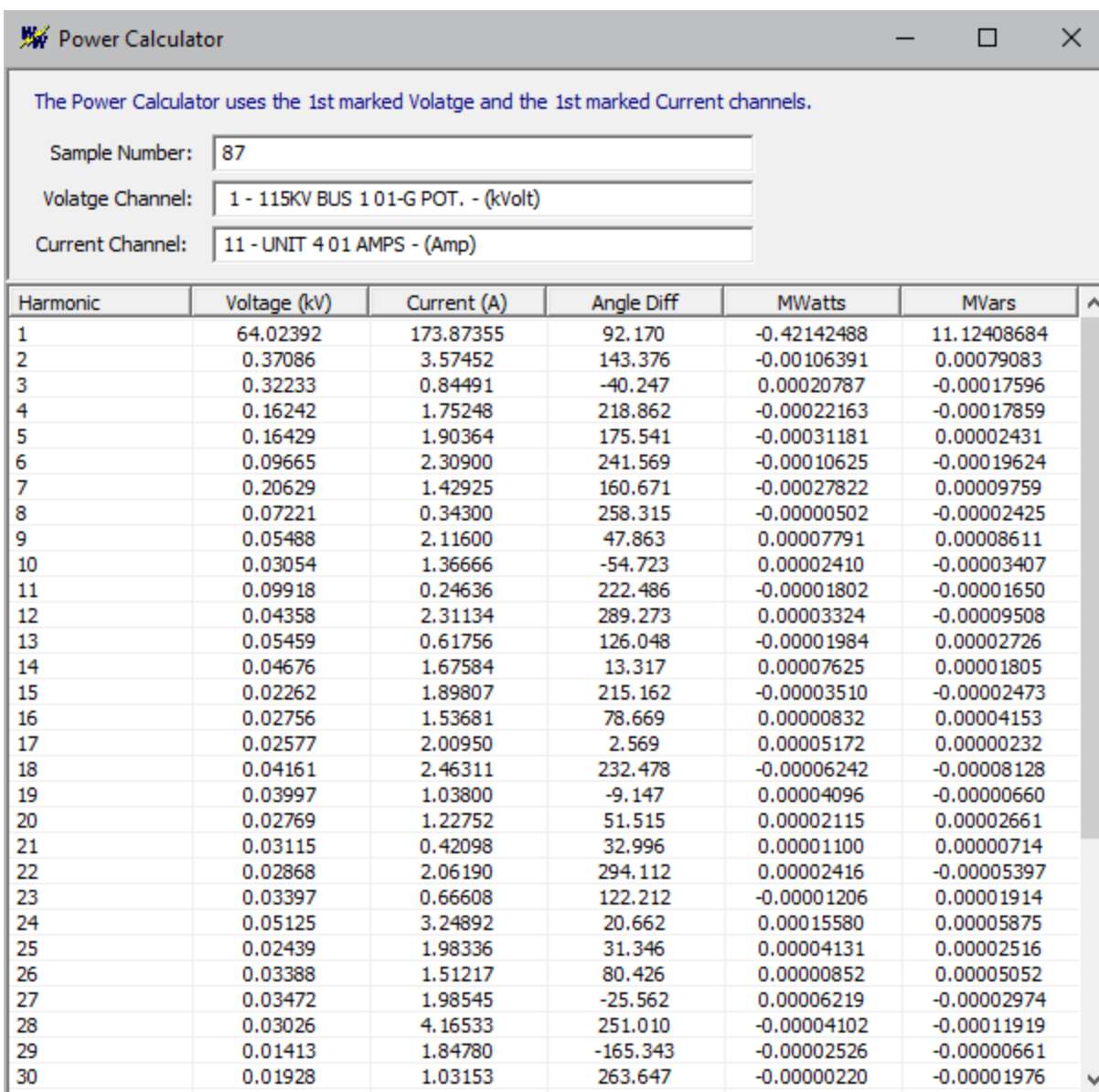


Figure-22: Power Calculator

27. Data Plotting – RMS Calibrated Channels:

Updated: October 28th, 2019

In RMS Calibrated Files added an option in the analog table popup menu to remove the root 2 multiplier from all of the marked analog channels. In the Channel display window added a * in front of each analog channel's number to show the channel is multiplied by root 2.

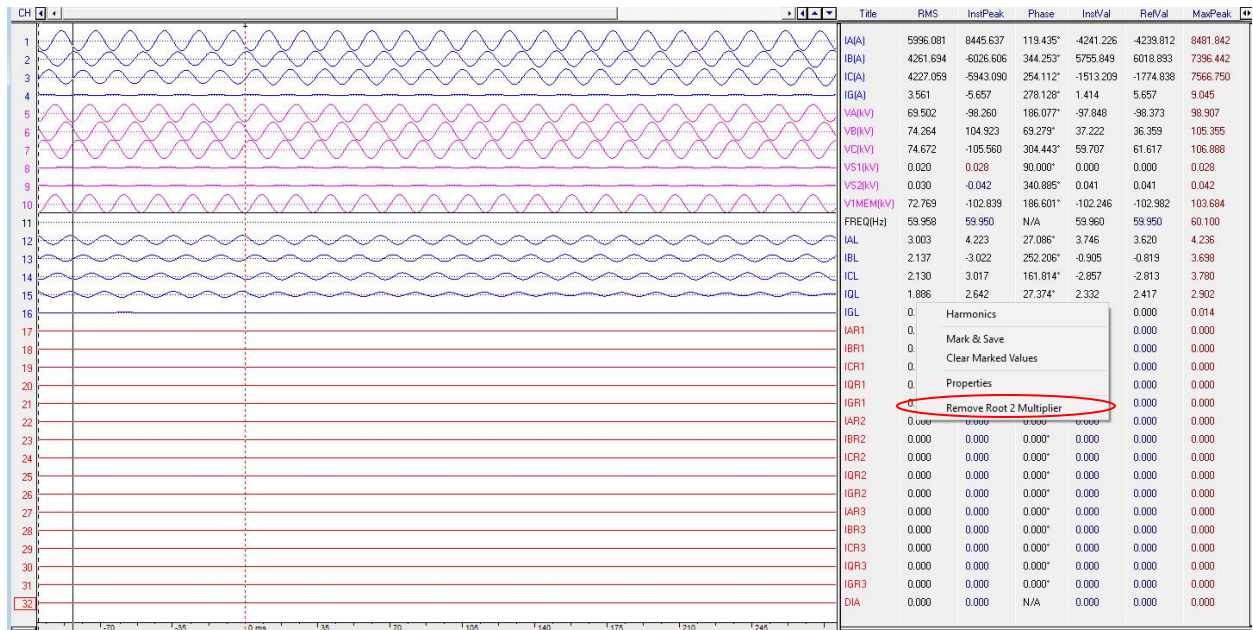


Figure-23: Remove Root 2 Multiplier

In RMS Calibrated files a new menu option was added to the analog table popup menu to Remove Root 2 Multiplier from the marked analog channels.

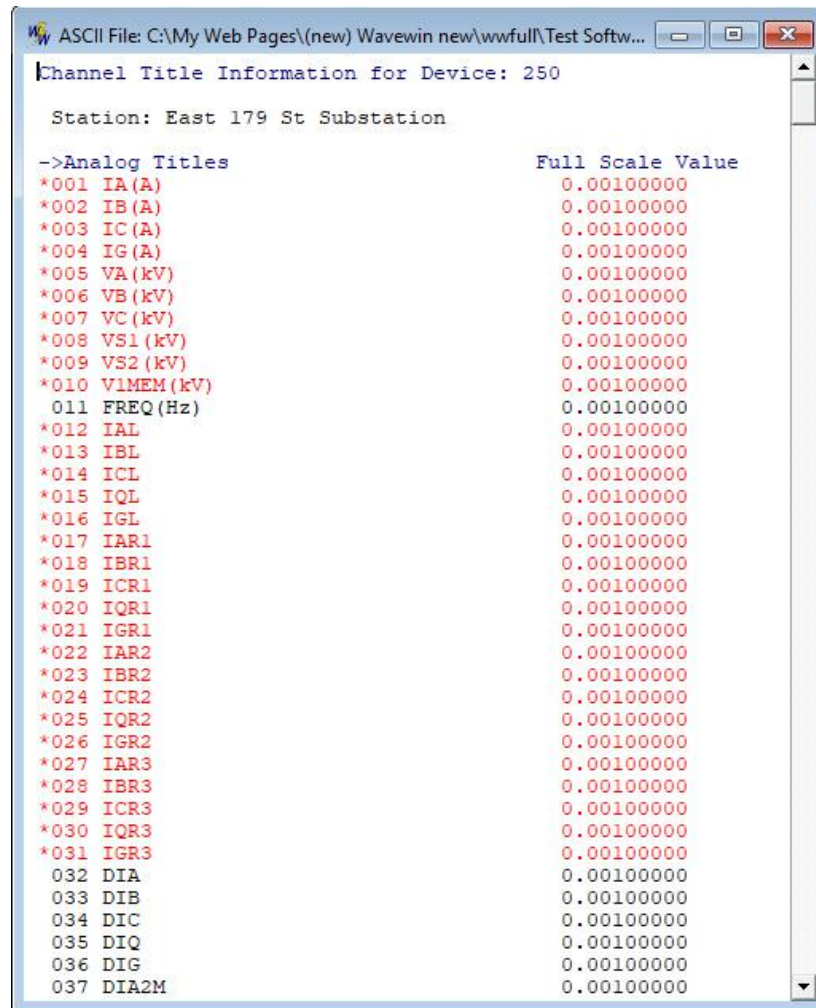


Figure-24: Mark Channel's when root 2 Multiplier applied

In the Channel Window a star is placed in front of the analog channel number if has a root 2 multiplier applied.

28. Data Plotting – Search Digital Channels:

Updated: October 28th, 2019

Modified the search digital channels option to mark and move the digital channels found to the top of the digital channels list.

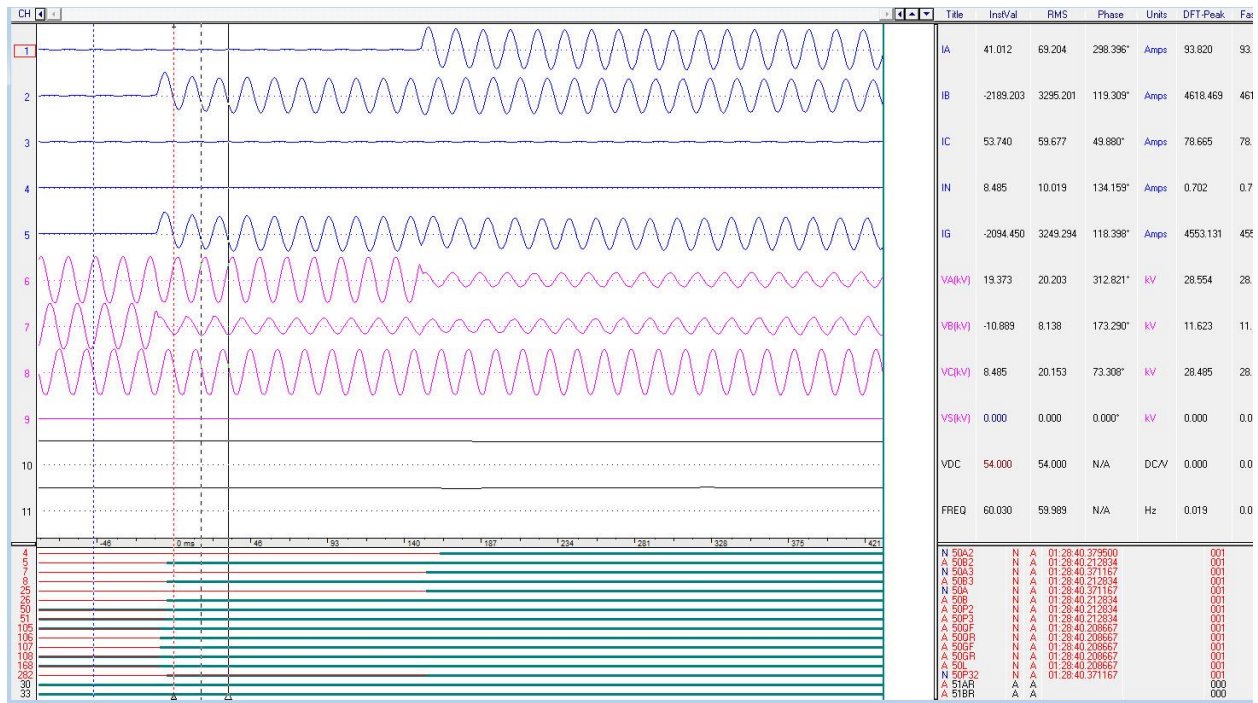


Figure-25: Mark and Move Search Digital Channels

29. Data Plotting – Save View Path:

Updated: October 28th, 2019

Defaulted the save view path to be the path where the file is located. In the past versions it would be the last path a view was saved in.

30. Device Manager – Device Idle Report (Last Waveform Extracted):

Updated: October 28th, 2019

Added a new report in the Device Manager that displays a table listing the number of days idle since a waveform was extracted. The table columns are, Device #, Group #, Days Idle, Last Date, Station, Title and Driver Name.

Text Table: C:\My Web Pages\new\Wavewin new\wwwfull\Test Software\Menu\Waveform Extraction.RPT

| De. | Group # | Days Idle | Last Date | Station | Title | Driver |
|-----|---------|-----------|------------|--------------|-------------------------|------------------------|
| 1 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 2 | 1 | 4227 | 04/01/2008 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 3 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 4 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 5 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 8 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 9 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 10 | 10 | 1761 | 01/01/2015 | PHILADELPHIA | SCHEDULER | POLL DEVICES (START) |
| 11 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 12 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 13 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 14 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 15 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 16 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 17 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 18 | 80 | 1761 | 01/01/2015 | SOFTSTUF NJ | BITRONICS-FTP-2 (FTP) | LAN-DIRECT FTP-EVENTS |
| 19 | 80 | 1761 | 01/01/2015 | SOFTSTUF NJ | BITRONICS-FTP-1 (FTP) | LAN-DIRECT FTP-EVENTS |
| 20 | 80 | 1761 | 01/01/2015 | SOFTSTUF NJ | FTP-2 (FTP) | LAN-DIRECT FTP-EVENTS |
| 21 | 21 | 1761 | 01/01/2015 | PHILADELPHIA | LAB SEL-351-1 (351)(D) | LAN-DIRECT SEL-EVENTS |
| 22 | 22 | 758 | 9/30/2017 | PHILADELPHIA | LAB SEL-321-2 (321)(D) | LAN-DIRECT SEL-EVENTS |
| 23 | 23 | 1761 | 01/01/2015 | PHILADELPHIA | LAB SEL-321-3 (321)(D) | LAN-DIRECT SEL-EVENTS |
| 24 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 25 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 26 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 27 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 28 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 29 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 30 | 30 | 1761 | 01/01/2015 | PHILADELPHIA | LAB SEL-2020 | LAN-SWITCH SEL-EVENTS |
| 31 | 30 | 1761 | 01/01/2015 | PHILADELPHIA | LAB SEL-351-1 (351)(S) | LAN-SWITCH SEL-EVENTS |
| 32 | 30 | 1761 | 01/01/2015 | PHILADELPHIA | LAB SEL-321-2 (321)(S) | LAN-SWITCH SEL-EVENTS |
| 33 | 30 | 1761 | 01/01/2015 | PHILADELPHIA | LAB SEL-321-3 (321)(S) | LAN-SWITCH SEL-EVENTS |
| 34 | 30 | 1761 | 01/01/2015 | PHILADELPHIA | GE-8-SERIES RELAY (8-S) | DYNAMIC UPDATE |
| 37 | 30 | 1761 | 01/01/2015 | PHILADELPHIA | GE-EPM7000 RELAY (7000) | SEL CHECK SER |
| 38 | 38 | 1761 | 01/01/2015 | PHILADELPHIA | GE-F35 RELAY (F35) | LAN-DIRECT GE-D60 EVES |
| 39 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 40 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 41 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 42 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 43 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 44 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 45 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 46 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 47 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 48 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 49 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 50 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 51 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 52 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 53 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 54 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 55 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 56 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 57 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 58 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 59 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 60 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 61 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | SOFTSTUF WEB SITE | LAN-DIRECT FTP-EVENTS |
| 62 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | FAULTNET WEB SITE | FTP EVENTS |
| 63 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 64 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| 65 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEGRID WEB SITE | LAN-DIRECT FTP-EVENTS |
| 66 | 1 | 1761 | 01/01/2015 | MAIN OFFICE | WAVEWIN WEB SITE | FTP EVENTS |
| = | | | | | | |
| = | | | | | | |

Figure-26: Device Manager – Days Idle Report

Prepared By:

Maria Rothweiler

December 2nd, 2021

Revision: 12

Appendix A - Fault Report

> Fault Report:

```

      Station: South Arkey
      Fault Time: 03/08/2017 03:57:42.006317
      Equipment: Feeder 1202
      Breakers Operated: Breaker 2 Closed
      Fault Type: A, N
      Fault Duration(CyCs): 3.893
      Fault Mag(Amps): 14851.230
      Voltage Dip(%): NA
      V2(Volts): 18883.702
      I2(Amps): 5226.823
      VA(Volts): 26949.568 @0.000°
      VB(Volts): 76249.703 @-106.062°
      VC(Volts): 84881.925 @133.488°
      IA(Amps): 14851.230 @-55.586°
      IB(Amps): 1374.458 @99.968°
      IC(Amps): 375.488 @41.528°
      IN(Amps): 13622.515 @-51.698°

```

> Event Report:

| Start Time | Duration(ms) | Description |
|--------------|--------------|------------------|
| 03:57:42.009 | NA | Breaker 2 Closed |
| 03:57:41.972 | 99 | R3-Any Trip |
| 03:57:41.971 | 66 | Diff Trip A |
| 03:57:41.996 | 29 | Zone 1 A Trip |
| 03:57:41.996 | 29 | Zone 1 N Trip |
| 03:57:41.984 | 70 | Diff InterTrip |
| 03:57:41.993 | 767 | 86-1 Operated |

> Location Report:

```

      Line Length: 11.12 Miles
      Z1(Ohms): 2.600 @75.499°
      Z0(Ohms): 10.001 @52.500°
      SE Radial: 3.851 Miles
      SE Reactance: 4.022 Miles
      DE Sequence: NA

```

