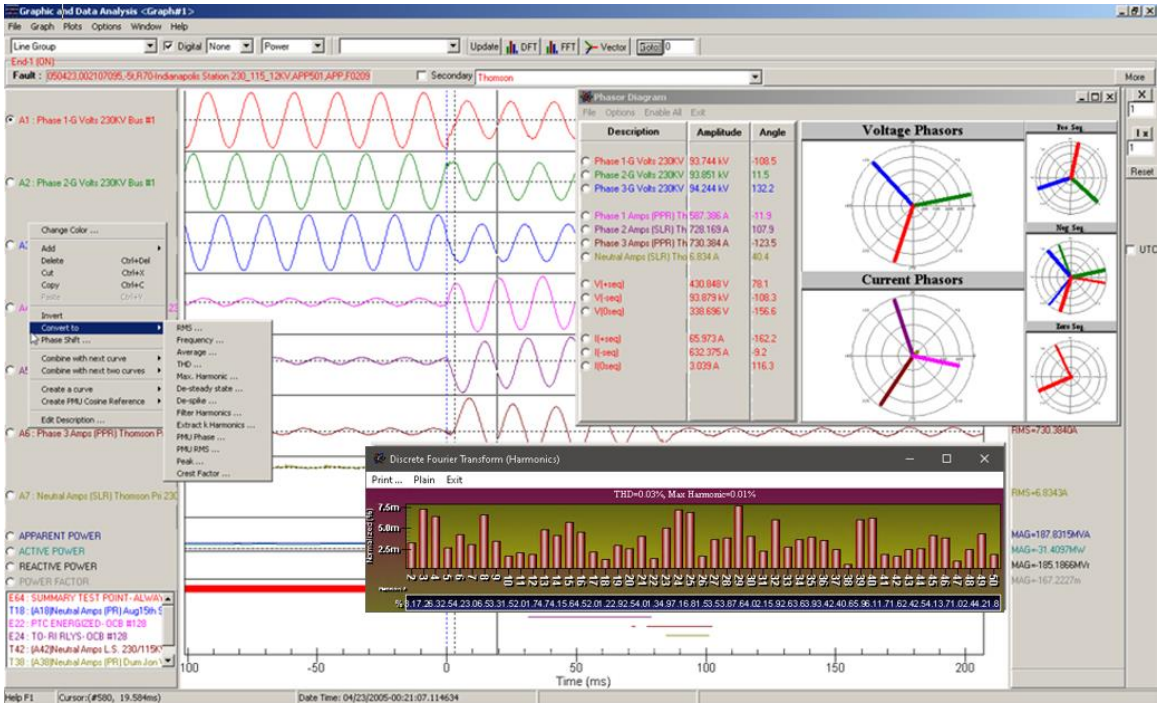
APP Engineering, Inc.

APP ClearView

(Data Analysis & COMTRADE Viewer)

Instruction Manual



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NOTES:

Starting serial number is 090113-1
Ending serial number is TBD

Throughout this manual the APP ClearView Software™ may be referred to as the “software”, “master station software”, “analysis software”, or “COMTRADE Viewer”.

Throughout this manual an event channel or event input may be referred to as a digital channel or digital input.

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WARNING **A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, that if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until you fully understand and are prepared to address the indicated conditions.**

CAUTION **A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until you fully understand and are prepared to address the indicated conditions.**

WARNING **(Personnel)**
Only qualified, service-trained personnel who are aware of the hazards involved should install, open any doors, remove any covers, or disconnect the instrument (APP Recorder). Disconnect power before attempting any service or maintenance.

WARNING **(Fuse)**
For continued protection against fire, replace the line fuse only with a fuse of the specified type and rating.

WARNING **(Live Circuits)**
Replacement of chassis, components, fuses and internal adjustments must be performed by qualified personnel. The system main power must always be disconnected before servicing. If the system utilizes voltage and/or current test switches make sure they are open and understand that the back of these switches are still live! If the system utilizes sliding link terminal blocks for the digital channels and alarm outputs, ensure that the sliding links are open and understand that one side of the sliding link terminal block is still live!

WARNING **(Operating Environment)**
This instrument should not be used in an explosive environment. It should not be used in the presence of flammable gases or liquids. This instrument should not be used in a damp or wet environment or an environment that is subject to condensation.

WARNING **(Grounding)**
All chassis, cabinets, panels, and rack mount equipment must be connected to an electrical earth ground. Grounding must be done to prevent shock hazard to people. Instruments provided with a power terminal block are provided with an appropriate means for connecting an electrical safety earth ground. Only qualified and trained personnel should connect power to this instrument. If the instrument includes a three prong AC power cord, ensure that your power receptacle is properly earth grounded.

WARNING **(Two Person Rule)**
Do not service or adjust equipment alone. Ensure that another person is present that knows emergency procedures and is capable of giving first aid.

Additional Document Notes

Throughout this manual an event channel or event input may be referred to as a digital channel or digital input.

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Table of Tables

1. Introduction

This manual describes the use of the APP ClearView software and its basic principles. The order of the chapters follows the typical process for retrieving fault records and viewing record oscillograms.

One of APP Engineering's premier strengths is our ability to provide time saving, valuable, user-friendly software. Years of experience in software development, logical algorithm formulation, engineering, mathematics, and customer service has given us the tools to provide world class software solutions. Our commitment to provide software that is truly valuable is enhanced by our ability to respond quickly to customer requested changes and upgrades.

APP ClearView™ is the ideal data analysis software for engineers and managers that need system information and answers quickly. It has a wide variety of graphics, math functions, reports, and file manipulation features that allow the user to easily navigate through their data. It supports the importing of industry standard formats such as COMTRADE (Common Data Transient Data Exchange) version 1991, and 1999, and 2013. It also allows users to export general data formats such as PQDIF, comma delimited files (*.csv) and text files (*.txt).

The software is capable of communicating and retrieving COMTRADE records from any APP Recorder or viewing COMTRADE records already retrieved from other recording devices. Communication with the APP Recorder can be via modem or network connection. The software can be used to manually or automatically retrieve transient records and disturbance information from the recorder. It can also be configured to automatically accept incoming calls from any APP Recorder.

When data is retrieved or automatically called in, a summary of the record is seen on the main page of the analysis software. Summary information includes fault ID number, fault date, fault time, fault length, synchronization status, list of triggers that started the record, and if applicable distance to fault information. Record oscillograms are easily viewed by double clicking a record in the summary table.

Oscillograms can be viewed in channel sequential order, user defined order, by line group or a multitude of other ways. The channel drag and drop feature aids in the quick setup and analysis process. A simple right click in the values column displays readings such as RMS, instantaneous magnitude, DC offset, frequency, phase+RMS, and a host of statistical choices. Mathematical manipulation of the data can be easily performed with features such as add, subtract, invert, log, sine, cosine, tangent, and more. Available calculations include positive sequence, negative sequence, zero sequence, apparent power, active power, relative power, power factor, and impedance.

Prefault, fault, and post fault event data are also included in the record. This information is displayed at the bottom of the oscillogram screen and can be set up in a variety of ways for convenient viewing and analysis.

2. Installation

2.1 System Requirements

Before you install APP ClearView, make sure your computer meets the minimum requirements.

- Windows (95 or above including NT, XP, Vista, Windows 7, 8, and 10 and Server 2003 or later)
- Pentium III 800MHz or better
- 500MB RAM
- Hard Drive Free Space 500MB (Program size is approximately 15MB)
- Pointing Device
- CD-ROM or USB

2.2 Installing APP ClearView

Initial installation is done using the CD provided. Subsequent installations or upgrades can be done via download from the APP Engineering website once you have obtained a Password. Request a password by email to sales@appengineering.com or call Greg Bradley at 317-536-5300 ext. 101 or 317-442-4075.

➢ To Install APP ClearView From CD

- Place the APP ClearView CD in the CD-ROM drive.
- On the CD-ROM, browse to and double-click the setup.exe file.
- An installation wizard will walk you through the installation process. During the installation process, you must agree to the license terms, which are specified in this manual and on the CD-ROM. If you do not agree to the terms do not install the software.
- APP recommends that you install the program to the default path of **C:\APP ClearView**.

➢ To Re-install or Upgrade APP ClearView from Download

Before upgrading see "*Upgrading APP ClearView*" section below

- Open browser and go to www.appengineering.com
- Click Downloads
- Type the password provided from APP Engineering next to the option for Clearview Software Full Version

2.3 Upgrading APP ClearView

Before you can upgrade to a new version of APP ClearView, you must first **uninstall** the current version of APP ClearView. Do this with the **Add/Remove Programs** feature in the Windows Control Panel.

CAUTION **Do not delete any files from the APP ClearView folder.**

Install the new version by following the instructions in *Installing APP ClearView*.

2.4 Running APP Clearview as a Service

A reliable way to run APP Clearview continuously is to set it up to run as a Windows Service. This will ensure Clearview continues to run and restart after the application or computer is interrupted. You can run Clearview as a service on a Server or Windows computer. The following instructions describe our preferred method of setting up Clearview as a Windows Service using NSSM as the service manager.

Once Clearview is running as a service. The user will not run the visible Clearview application until you want to make changes to settings or use the analysis tools. At that time, you should Open Task Manager and **stop** the service while having Clearview open. Once you are done, close Clearview, go to **Task Manager** and **start** the Clearview Service again.

2.4.1 NSSM Installation

To install NSSM as the Service Manager, open your browser and go to https://nssm.cc

1. Download NSSM.by clicking one of the links in the Home screen or click Download from the menu on the left.

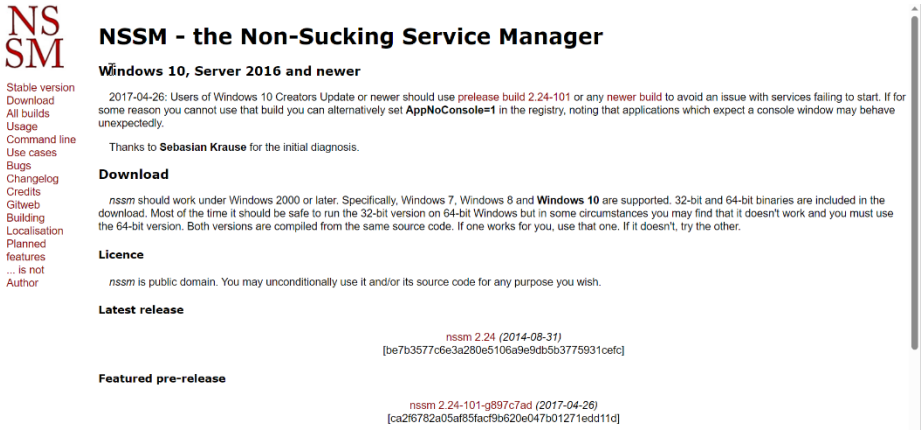


Figure 1 Downloading NSSM

2. Extract the downloaded ZIP file.

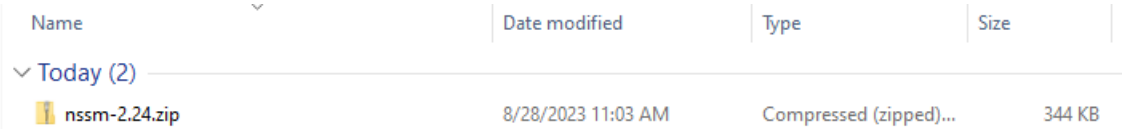


Figure 2 NSSM Downloaded ZIP file

3. Rename the extracted folder (e.g. "nssm-2.24"), to **NSSM**.
4. Copy the NSSM folder to the root folder of drive **C:**

5. Open Command Prompt as **Administrator** by clicking Windows Start and typing command prompt. Right click on Command Prompt and select Run as Administrator.

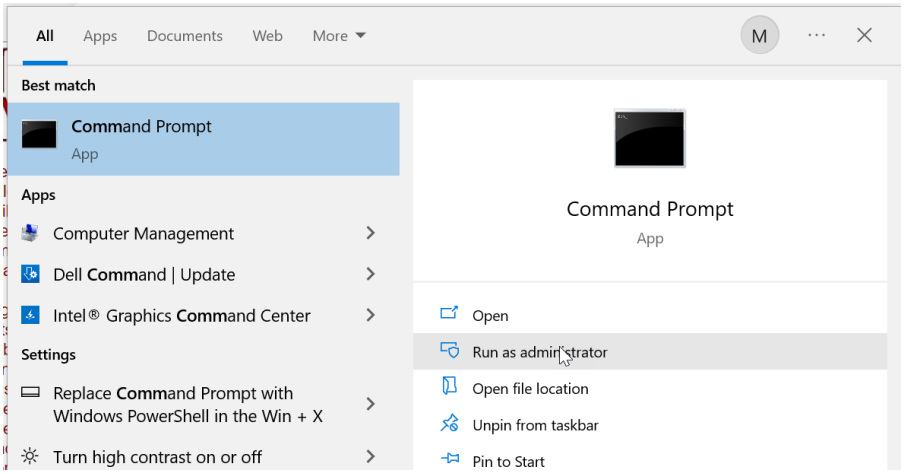


Figure 3 Run Command Prompt as Administrator

6. Navigate to the NSSM folder, by typing the following commands in order (Press Enter after typing each command):
   cd
   cd nssm

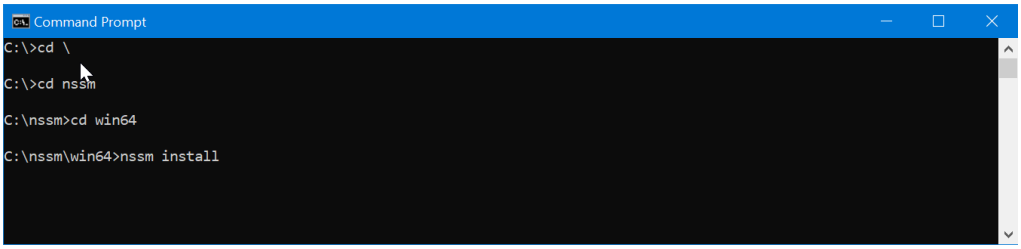


Figure 4 Install NSSM command

7. Now according to your Windows system type (32 or 64bit), navigate to the appropriate subfolder:
   If you own 64Bit Windows, type: **cd win64**
   If you own 32Bit Windows, type: **cd win32**
8. Now type the following command:
   nssm install
9. Press the three (3) dots navigation button next to **PATH** and select the application's executable you want to run as a service.

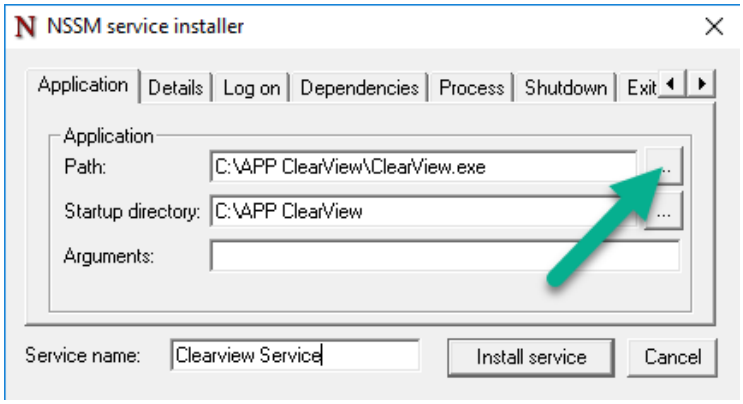


Figure 5 Selecting APP Clearview program to run as a service

10. When done, type a Name for the new service and click Install service

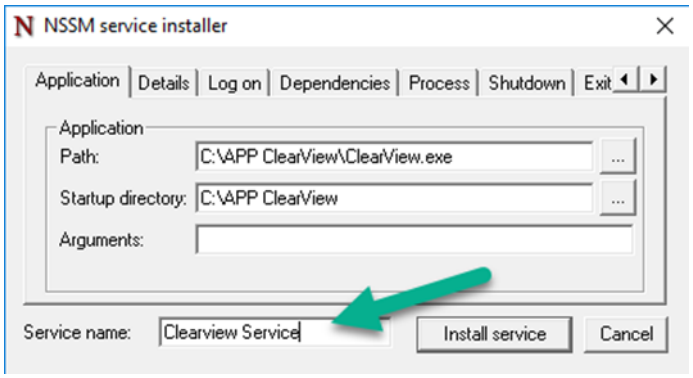


Figure 6 Name the Clearview service

Note: If you use a name with spaces, you will need to use double quotes anytime the name is used in a command line.

11. Click **OK** to the message "Service installed successfully".

After installing the Clearview service with the NSSM service installer, a new Windows Service will appear in the services list in Task Manager, with the name you specified in the Service name, then it can be managed as any other Windows service.

2.4.2 Setting the Clearview Service Account Logon

Clearview as a service should be run using an account-other than **SYSTEM.**

To check or change the user account running the Clearview Service, follow these instructions.

Open Windows Task Manager and select **Details TAB**

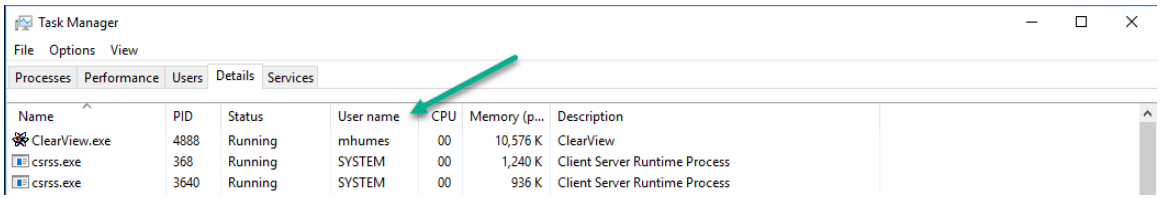


Figure 7 Check logon account of the Clearview service

If you need to change the logon account, click on the **Services TAB**, select the service and right-click, then select **Open Services**

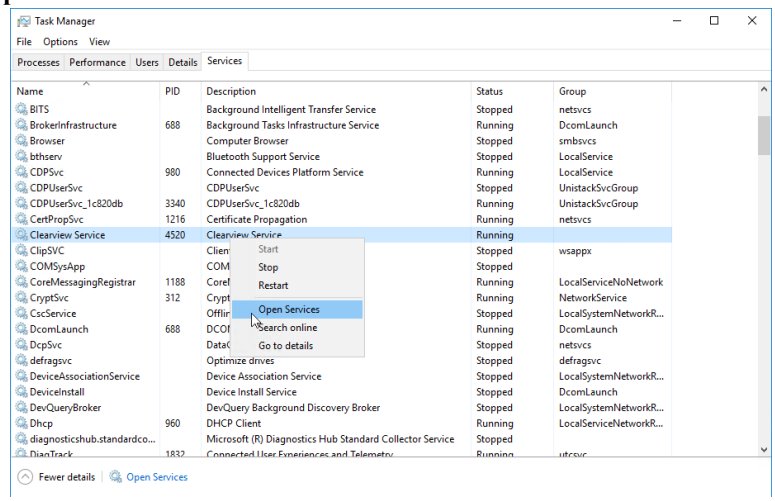


Figure 8 opening the service properties

Then select **Logon TAB**

Select “This Account” option instead of Local System Account option.

Fill in the login and password for the account and click **OK**.

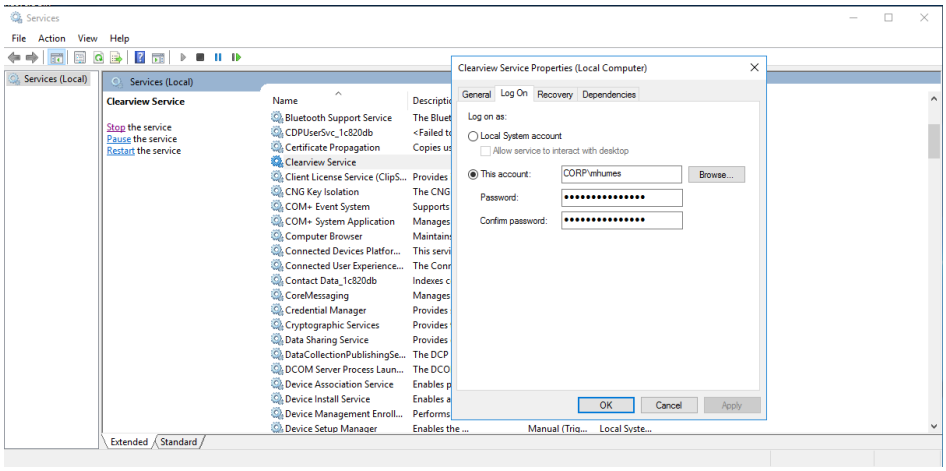


Figure 9 change the logon account of the Clearview service

If the service was running, you will need to **Stop** and then **Start** for the logon to take effect.

2.4.3 Using Remote Access with Clearview as a Service

Using your remote access tool, connect and login to the computer or server running Clearview service.

Go to Task Manage, **Services TAB**, right click the service and select **stop**.

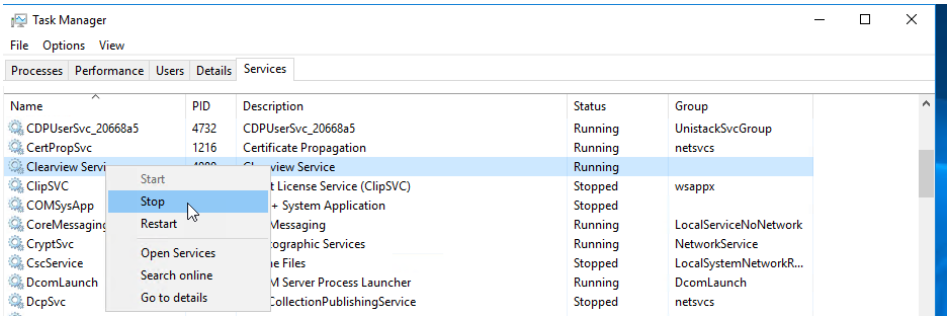


Figure 10 Stop or Start the Clearview service

Then you can start APP Clearview from the Start menu and interact with the configurations and use the analysis tools as usual.

When the user is done, close Clearview.

Go to Task Manager and under **Services TAB**, right-click on the service and select **start.**

If you are using a Server, **logout** of the computer which will close the Remote access session.

Otherwise, Close your remote access session.

2.4.4 Uninstalling the Service

To uninstall the service, follow the steps 5, 6 and 7 from the installation process, and then type the following command:

nssm remove "Service Name"

Where Service Name = the name of the service you created, using the NSSM utility (e.g. nssm remove "Clearview Service").

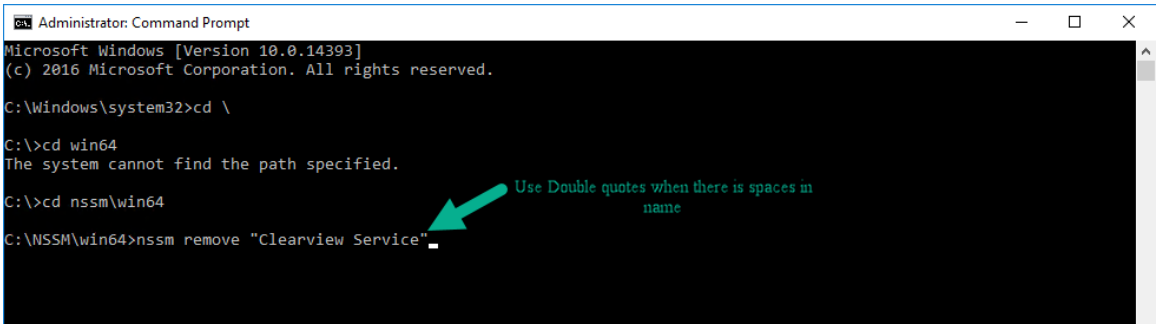


Figure 11 Removing the Clearview service

Note: Service names having spaces need to be put in double quotes (i.e. "clearview service")

Finally, click **Yes** to Remove the service.

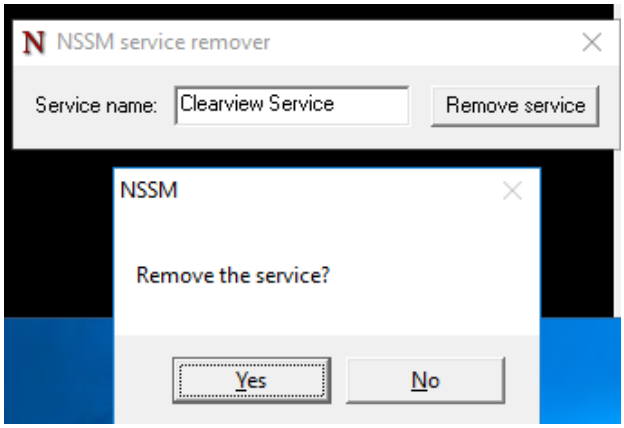


Figure 12 confirm remove Clearview service

3. Quick Start Guide

3.1 Introduction

This chapter guides you through the process for establishing communications between APP ClearView and an APP Recorder, retrieving records from the APP Recorder, and viewing fault data.

This chapter is designed to help you get started as quickly as possible. Therefore, it provides only the basic information to complete the basic tasks. Subsequent chapters provide more details about the functionality used to complete the steps presented in this chapter.

In summary, the steps are:

1. Create the Data and Setup Folders.
2. Start ClearView and Specify the Minimum Configuration Settings.
3. Add a New Point Assignment Record.
4. Set up the Phone and Network List.
5. Choose the Modem.
6. View the Communication Screen.
7. Connect to the APP Recorder.
8. Retrieve a Point Assignment Record.
9. Retrieve the APP Recorder Configuration File.
10. Retrieve the Line Group Record.
11. Retrieve the Calibration File
12. Retrieve the Fault Summary File
13. Retrieve Specific Fault Records from the APP Recorder.
14. View the Fault Record Oscillogram for a Fault Record.

Note: This procedure assumes the APP ClearView software was installed to path **C:\APP ClearView**. If the software was installed to a different drive or directory, please make the appropriate adjustments during this procedure.

3.1.1 Step 1: Create the Data and Setup Folders

➢ **To Create the Data and Setup Folders**

1. Use Windows Explorer to access the APP ClearView folder.
2. Create two new folders. Name them **Data** and **Setup**. After creating the folders the directory should look similar to the figure below.

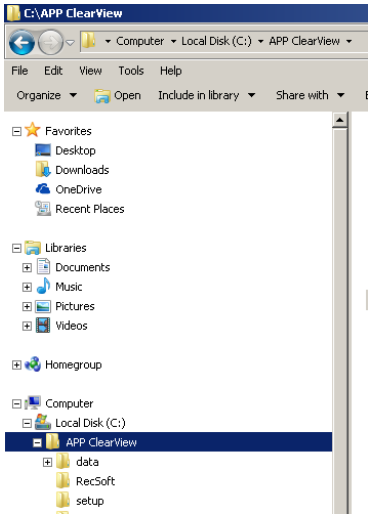


Figure 13: APP ClearView Folder with Data and Setup Folders

3.1.2 Step 2: Start ClearView and Specify the Minimum Configuration Settings

➢ **To Start ClearView and Specify the Minimum Configuration Settings**

1. Start APP ClearView. You can do this by clicking its name from the Windows **Start** menu or by double-clicking the **ClearView.exe** file, which is found in the APP ClearView folder.
   The following message box appears.
2. Click the **OK** button.

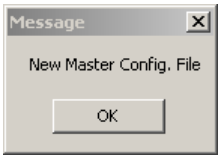


Figure 14: Message Box, New Master Configuration File

The **ClearView Configuration** window appears.

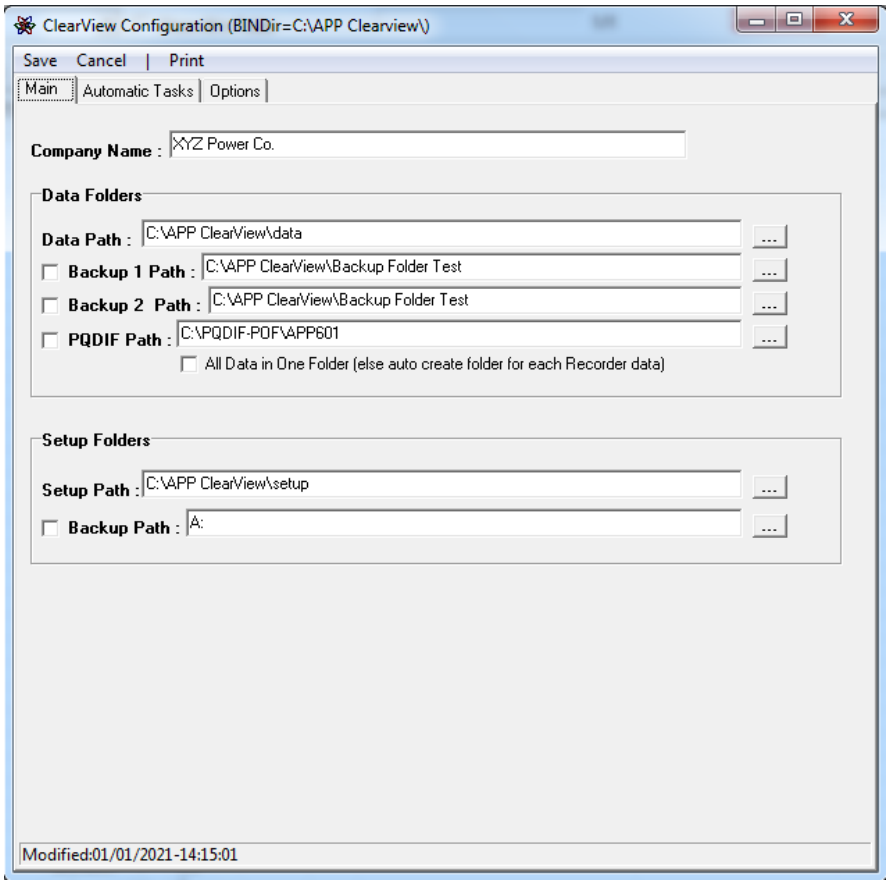


Figure 15: ClearView Configuration Window

3. Enter your company name, data path, and setup path as shown in the figure and then click **Save**. The following message box appears.

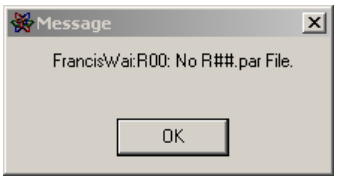


Figure 16: Message Box, No R##.par File

This message indicates that ClearView is looking for a Point Assignment Record in the APP ClearView folder. You will create one later in this chapter.

4. Click the **OK** button.

The **APP ClearView** window opens. The **Fault Summary** tab appears. It displays no fault data.

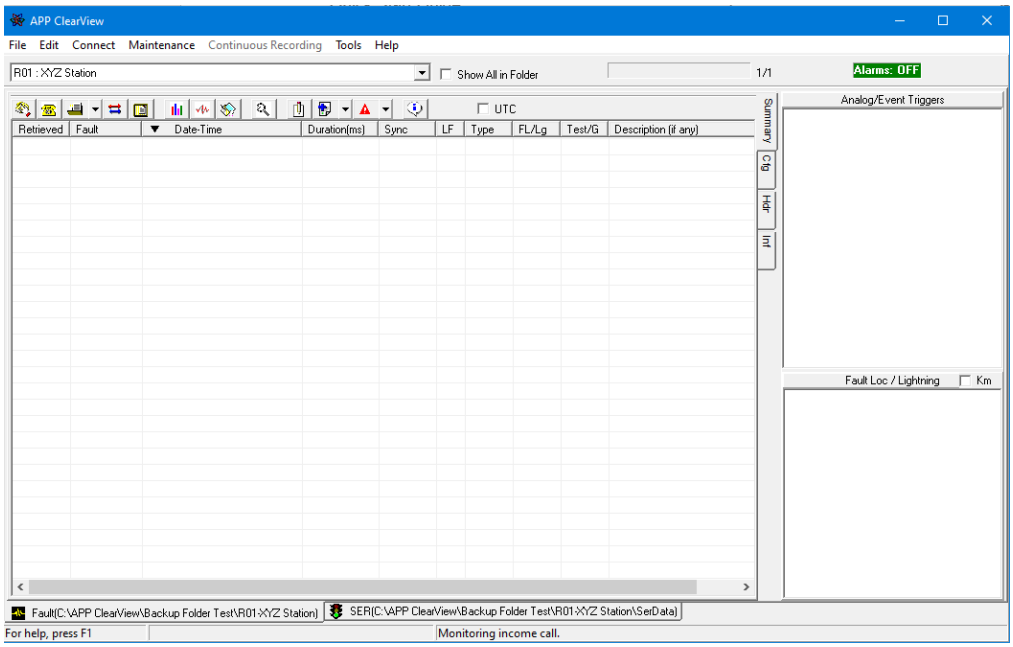


Figure 17: APP ClearView Window

3.1.3 Step 3: Add a New Point Assignment (PA) Record

➢ To Add a New Point Assignment (PA) Record

1. In the **APP ClearView** window, from the **Edit** menu, point to **Point Assignment Record** and then click **Add PA Record**.

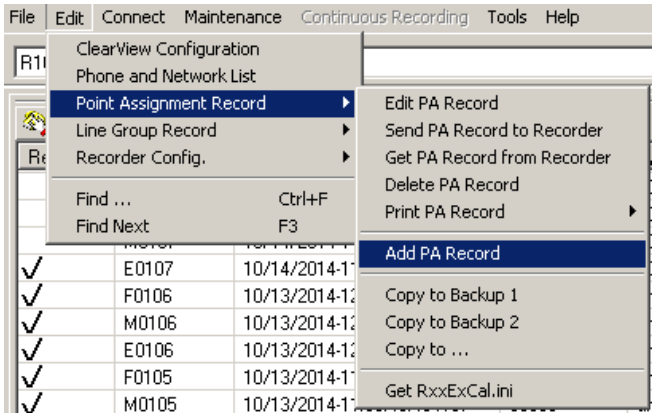


Figure 18: Point Assignment Menu

The Add Point Assignment Record message box appears.

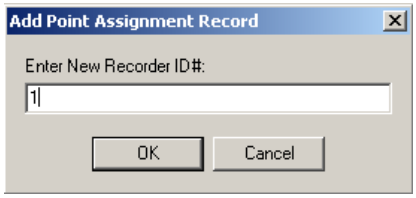


Figure 19: Add Point Assignment Record Window

2. Type the recorder ID of the APP-Recorder with which you want to communicate. For example, **1**.

3. Click the **OK** button. A confirmation message box appears.

4. Click the **OK** button.
   The **Edit Point Assignment Record** window appears.

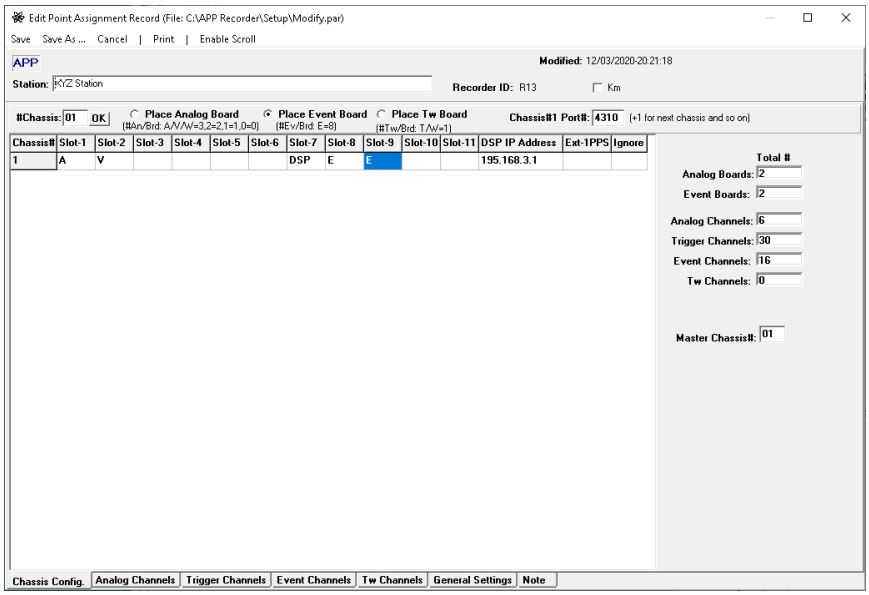


Figure 20: Edit Point Assignment Record Window

5. In the **Station** box, type the station name in which the APP Recorder is located. In this example, the location of APP Recorder number 1 is named "XYX Substation."

Note: These special characters are not allowed: **\ / : * ? " < > |**. If you use those, they will automatically be converted to a dash (**-**).

6. From the menu bar, click **Save.** A message box appears confirming that a new Point Assignment Record has been created and saved.

7. Click the **OK** button.
   The **APP ClearView** window appears.

3.1.4 Step 4: Set up the Phone and Network List

➢ **To Set up the Phone and Network List**

1. In the **APP ClearView** window, from the **Edit** menu, click **Phone and Network List**.

Note: If running **Window 10** The dial capability will not exist. No phone option will be able to function.

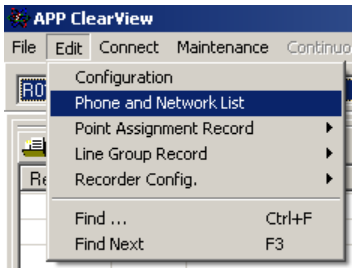


Figure 21: Edit Menu—Phone and Network List Option

If a Phone and Network List has not been created, an error message will appear. Click OK and the **Phone and Network List** window appears.

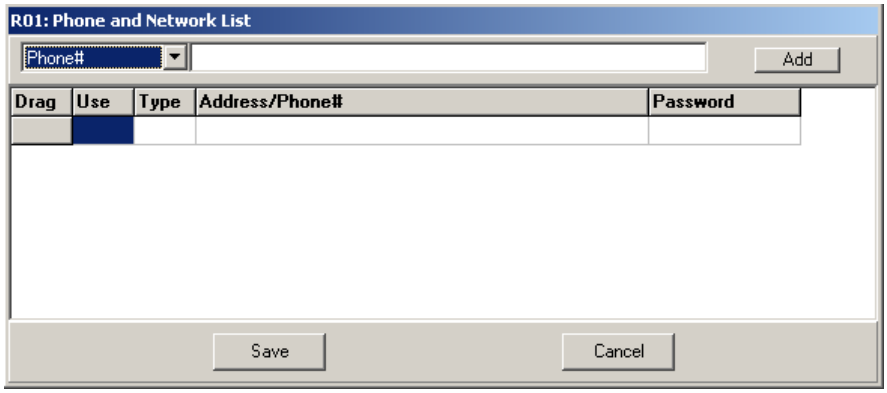


Figure 22: Phone and Network List Window

2. Do one of the following:

   If the APP Recorder is connected to a phone line, then from the list, select **Phone#**. Then in the corresponding box, type the phone number. You can use any standard Windows format. Click the **Add** button.

   If the APP Recorder is connected to an IP address, then from the list select IP Addr. Then in the corresponding box, type the IP address. You can use any standard Windows format. Click the **Add** button. For information on configuring DialNet, see *Setting Up Dial-up Networking*.

Note If the APP Recorder is connected to both a phone line and a network, then add both the phone number and the IP address.

The entries appear in the window. In the following figure, the APP Recorder is connected to both a phone line and network.

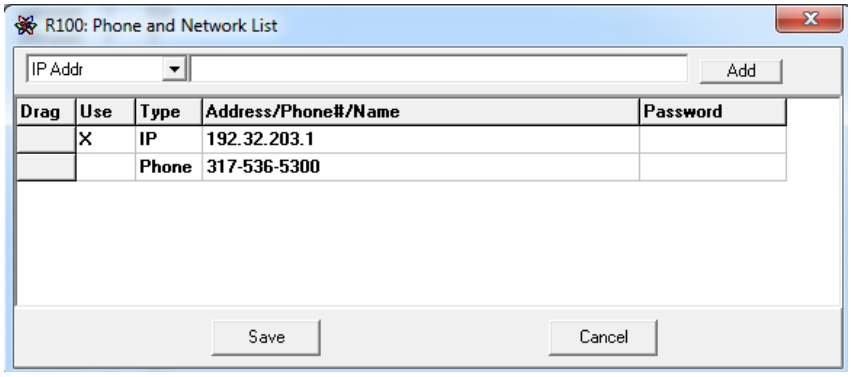


Figure 23: Phone and Network List with Entries

3. By default, the first entry that you make is selected, as indicated by the X in the **Use** column. The entry with the "X" is the number that APP ClearView will call when it connects to or calls the APP Recorder. You can activate multiple phone numbers and/or IP addresses.

   Do you want to activate or de-activate a phone number or IP address?

   If **yes**, then in the **Use** column, click the box next to the entry. An X appears when the entry is activated; it disappears when the entry is deactivated.

   If **no**, skip to the next step.

4. Do you want to delete a number?

   If **yes**, then right-click the number and then click **Delete**.

   If **no**, skip to the next step.

5. Do you want to reorder entries?

   If **yes**, then under the Drag column, click the gray box that corresponds to the entry you want to move and then move it to its new position.

   If **no**, skip to the next step.

6. Click the **Save** button.
   Your entries are saved and the **Phone and Network List** window closes.

Note: If the APP Recorder has been password-protected, then you must also enter the appropriate password. When the APP Recorder leaves the factory, no passwords have been setup.

3.1.5 Step 5: Choose the Modem

➢ **To Choose the Modem**

Note: If running **Windows 10**, the Modem is not available and is disabled.

1. In the **APP ClearView** window, from the **Connect** menu, point to **Modem**, and then click **Choose Modem**.

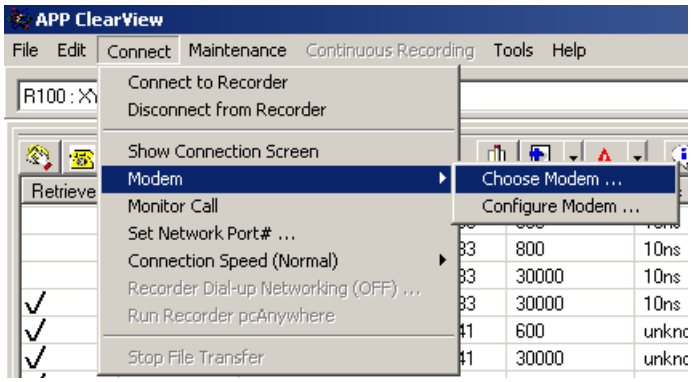


Figure 24: Modem Menu

The **Choose Modem** window appears.

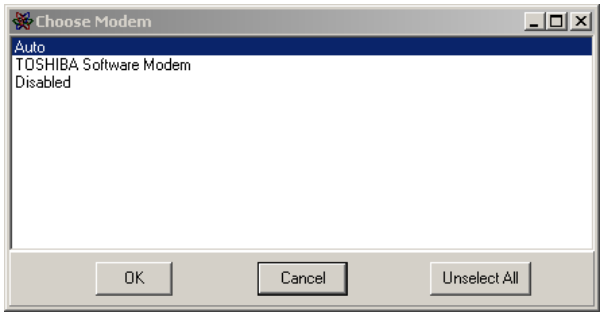


Figure 25: Choose Modem Window

2. Click the modem that you want and then click the **OK** button.

Note: If the only entry in the window is **Auto**, then ClearView did not detect a modem connected to your master station computer and you cannot communicate with the APP Recorder via a modem.

3.1.6 Step 6: View the Communication Screen

➢ **To View the Communication Screen**

1. In the **APP ClearView** window, from the **Connect** menu, click **Show Connection Screen**.

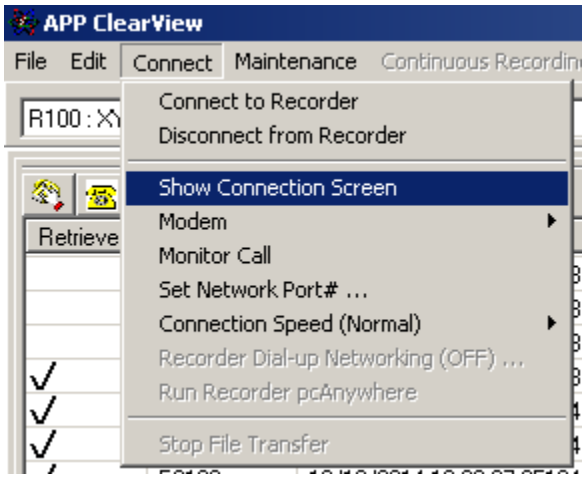


Figure 26: Connect Menu

The **Connection Status** window appears.

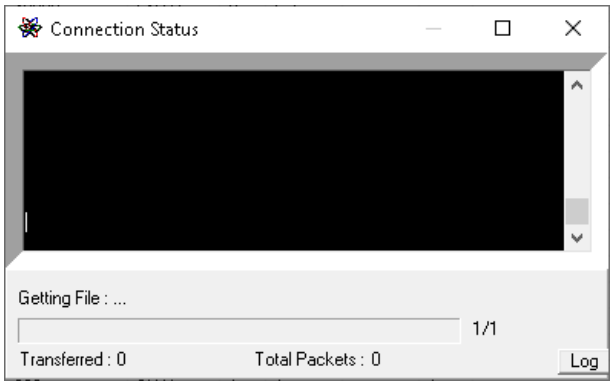


Figure 27: Connection Status Window (Empty)

This window shows messages related to master station and recorder communications and data transfer progress. This window is very useful in determining if a successful connection has been established between the master station and the APP Recorder. Right-clicking in the communication window will display cut, copy, paste, and delete functions.

2. Leave the **Connection Status** window open as you proceed with the next step in the procedure.

3.1.7 Step 7: Connect to the APP Recorder

➢ **To Connect to the APP Recorder**

1. In the **APP ClearView** window, from the **Connect** menu, click **Connect to Recorder**.

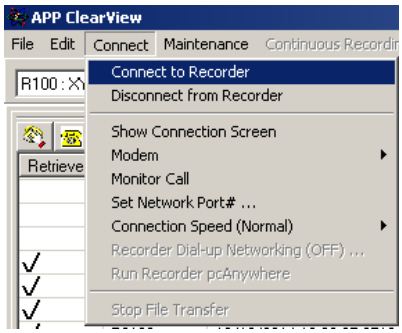


Figure 28: Connect to Recorder Menu Option

The APP ClearView software attempts to connect to the APP Recorder using the phone number or IP Address you entered.

2. Observe the **Connection Status** window as it shows the details of a successful connection. In addition, observe the tray at the bottom of the **APP ClearView** window, which shows that APP ClearView is logged into the APP Recorder.

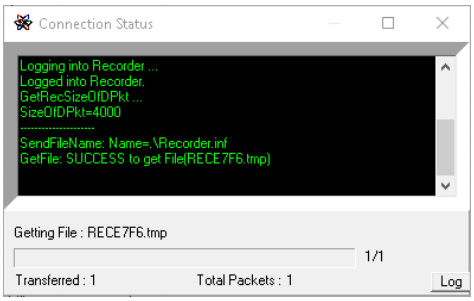


Figure 29: Connection Status Window and Login Tray

Note: If you are unable to connect to the APP Recorder, recheck the phone number or IP address, check your physical wiring connections, and ensure that the APP Recorder is powered up and the APP Recorder Software is running.

If you are attempting to communicate through a modem, verify that you selected the correct modem.

If you cannot establish communications, call the APP factory for assistance at (317) 536-5300.

3.1.8 Step 8: Retrieve a Point Assignment Record

➢ **To Retrieve a Point Assignment Record**

If the most up-to-date Point Assignment Record is loaded on the APP Recorder, you should retrieve it.

1. In the **APP ClearView** window, from the **Edit** menu, point to **Point Assignment Record**, and then click **Get PA Record from Recorder**.
2. Does the following message appear?

Figure 30: Message Box—Point Assignment Records Are Different

   If **yes**, then the Point Assignment Record at the APP Recorder does not match the PA Record at the master station. Click the **OK** button. The Point Assignment Record is uploaded immediately to the master station and is displayed.

   If **no**, then the Point Assignment Record at the APP Recorder match the PA Record at the master station. You do not need to take any further action to complete this step.

3. You can view the Point Assignment Record and then decide whether to save it on the master station or cancel the upload.

For more information see section on Managing Point Assignment (PA) Records. on Page 6-1

CAUTION **If you save the Point Assignment Record from the APP Recorder, it will overwrite the Point Assignment Record at the master station. However, a backup copy will be created prior to overwriting.**

3.1.9 Step 9: Retrieve the APP Recorder Configuration File

➢ **To Retrieving the APP Recorder Configuration File**

1. In the **APP ClearView** window, from the **Edit** menu, point to **Recorder Config.** and then click **Get Recorder Config**.
2. Does the following message appear?

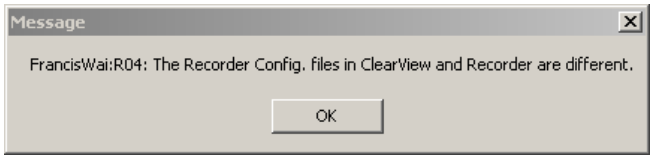


Figure 31: Message Box—Recorder Configurations Are Different

   If **yes**, then the APP Recorder Configuration file at the APP Recorder does not match the file at the master station. Click the **OK** button. The APP Recorder Configuration file is uploaded immediately to the master station and is displayed.

   If **no**, then the APP Recorder Configuration file matches the file at the master station. You do not need to take any further action to complete this step.

3. You can view the APP Recorder Configuration file and then decide whether to save it on the master station or cancel the upload.

For more information Section 9 Configuring a Recorder

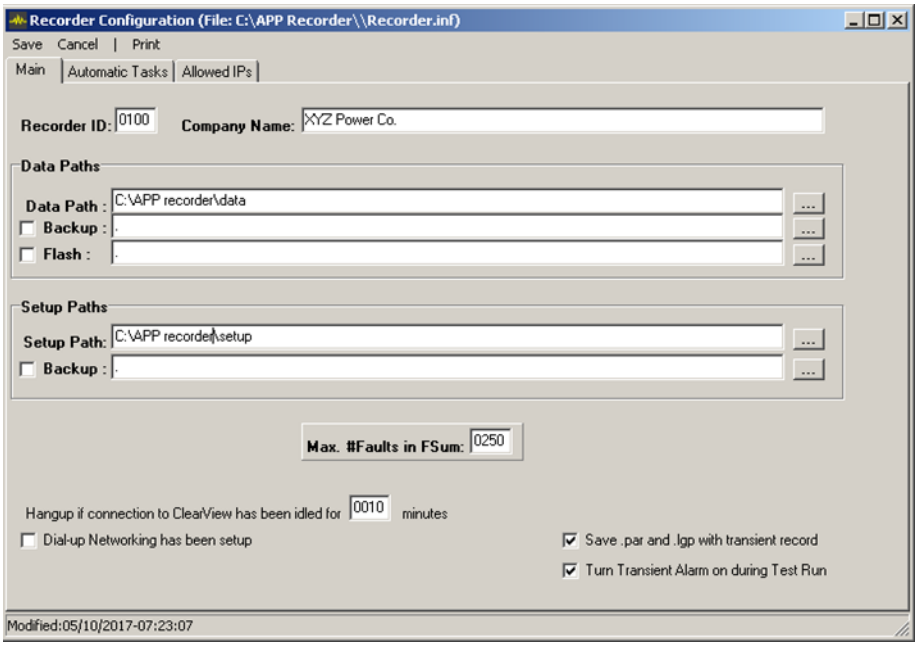


Figure 32: APP Recorder Configuration in APP Clearview

CAUTION **If you save the APP Recorder Configuration file from the APP Recorder, it will overwrite the APP Recorder Configuration file at the master station. However, a backup copy will be created prior to overwriting.**

3.1.10 Step 10: Retrieve the Line Group Record

➢ **To Retrieve the Line Group Record**

If the most up-to-date Line Group Record is loaded on the APP Recorder, you should retrieve it.

1. In the **APP ClearView** window, from the **Edit** menu, point to **Line Group Record** and then click **Get Line-Group Record from Recorder**.
2. Does the following message appear?

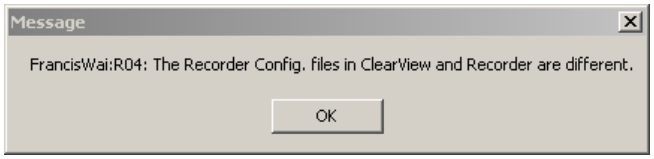


Figure 33: Message Box—Recorder Configurations Are Different

If **yes**, then the Line Group Record at the APP Recorder does not match the file at the master station. Click the **OK** button. The Line Group Record is uploaded immediately to the master station and is displayed.

If **no**, then the Line Group Record matches the file at the master station. You do not need to take any further action to complete this step.

3. You can view the Line Group Record and then decide whether to save it on the master station or cancel the upload.

For more information see *Power Quality Recording for* Inverter Based Resources

3.2 Introduction

The increase in penetration levels of inverter-based resources (IBRs) will significantly change the dynamic performance of the bulk electric system. As the penetration levels of inverter-based resources increase and the technology of inverter-based resources evolves, recording equipment with PQ-DDR capabilities are needed to address the performance requirements of inverter-based resources. APP Recorders can provide a one solution system to meet the recording requirements of PRC-002-05, PRC-028, IEEE 2800 Table 19, and allow for model validation per MOD 25, 26, and 27. Points of measure can include the HS of the MPT, low side of the MPT, solar feeder circuits, BESS feeder circuits, cap banks, and other supplemental locations within an IBR plant.

Regarding IEEE-2800, APP recorders can comply with the requirements of IEEE-2800 Table 19 if the proper elements are connected and setup for the APP Data Chassis recording at the point of interconnect with the transmission or sub-transmission system (the plant level). The recorder can perform PQ-DDR on elements with harmonics being recorded or derived out to the 50th harmonic. PQ-DDR and triggering can include Pst, Plt, RVC, very short-term harmonics, short-term harmonics, long-term harmonics, apparent power, active power, reactive power, power factor, frequency, and change of frequency. These quantities can be continuously recorder and trended with the files being in COMTRADE format and can be automatically converted to PQDIFF format.

3.3 IEEE-2800 Table 19 Measurement Data

The following table is based on IEEE 2800 Table 19 and describes the data type, points, sampling rate, retention and duration for Power Quality continuous recording APP Recorder includes. Retention values listed are typical and can be set in the Point Assignment Record. **See Section 6.19 Configuring General Settings**

3.4 PQ Hardware

There are some PQ hardware component required in order for the APP Recorder to receive signals from IBRs for PQ. There are three Analog boards involved when recording for PQ. Analog channels are wired to both Standard Analog boards and to Voltage or Current specific PQ Analog boards. The IBR needs to send voltage signals through a PQ sensor to a PQ Analog Voltage Board. Voltage channels are also wired to a standard analog board for recording and triggering on other conditions. PQ Analog Current boards are wired in series to a standard analog board wired for current channels.

PQ Sensor connected to a PQ Voltage analog channel with 1Meg Input Impedance

PQ Board connected to a PQ Current analog channel with a fixed full scale of about 5A

The following diagrams illustrate the wiring from a PQ sensor to a PQ Voltage board and an Analog Current board. You will notice these boards have only Current connections or Voltage connections, not both like the standard Analog board.

The Voltage board is connected directly to a PQ Sensor.

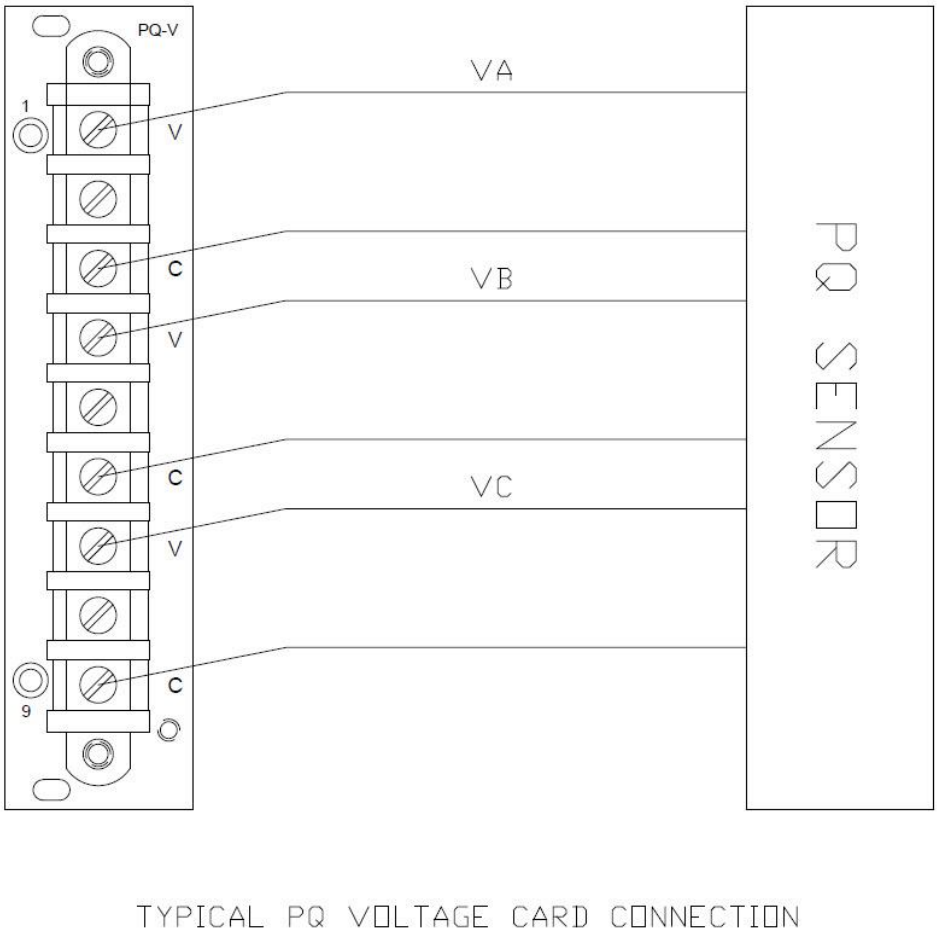


Figure 105 PQ Voltage board wiring

PQ Current boards are wired in series to a standard Analog board wired for the same Current channels being recorded.

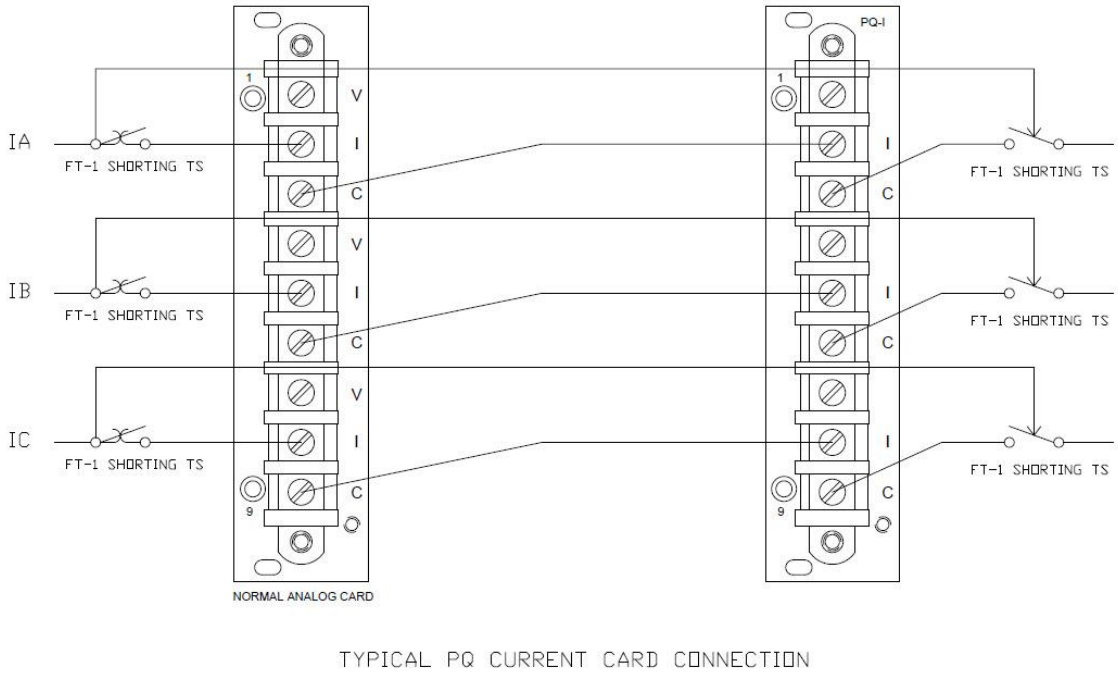


Figure 106 PQ Current Board wiring

3.5 Point Assignment Analog TAB settings

There are PAR settings required or recommended when setting up PQ analog channels. Please see Section 6-1 Managing Point Assignment (PA) Records for more information on the full PAR set up.

To measure out to the 50th Harmonic you must use a Transient Sampling rate of **9600 or higher**.

The Transient Sampling rate is recommended to be no higher than **15360**.

When setting up **PQ current channels**, use Full Scale Setting of **5 and ABS to 20**. This will change slightly when calibration is done.

When setting up **PQ voltage channels,** Full Scale must be set to **115**.

3.6 Power Quality Data Recorder sample Trigger settings

The plant level Data Chassis PQ settings enable you to trigger for Transient Recording as well as Triggers for PQ Continuous Recording. Ideally these triggers will be set up for channels in **Data Chassis 1**. The Figure below shows the typical Trigger settings for recording PQ based on IEEE 2800 Table 19.

Note: When using DSP 7 or higher there is no restriction on how many RVC triggers, or which triggers they are assigned to. With DSP 6 or lower, RVC triggers are limited to six per data chassis and must be assigned to 1 or more of the first 6 triggers only.

3.6.1 Power Quality Data Recorder (PQ DDR)

When utilizing DSP7 or higher in the Data Chassis and running APP Recorder software 3.3.6 or higher the following data shown in the table below is recorded when you have checked the **Include PQ Data** option in the Point assignment Record General Settings TAB and have enabled HD, THD, or TRD Triggers in the Triggers TAB.

Note If you have DSP6 or below and have Include PQ Data checked, you will receive the five files in Table 8 but not the Harmonics files discussed in this section.

Note: If you have both HD and THD triggers set on a channel, only one continuous recording file will be created for the channel (i.e. it won't be duplicated). If you have either HD or THD and TRD Triggers on the same channel, 2 PQ continuous recording files will be recorded for the channel.

Table 8 PQ Data Recorded

Description	File Name	Interval	Typical for IEEE-2800 Triggering & Continuous Recording for Each Mapped Analog Channel	Typical Circular Buffer
3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily	3p-Vrms, 3p-Irms, 3p-W, 3p-Vr, V-Hz, V-Hz Sign, 3p-RVC, 3p-V HD, 3p-I HD, 3p-V THD, 3p-I THD, TRD	10 Days
10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily	Same as above	90 Days
2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly	Same as above	365 Days
Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily	Selected Volt Channels	90 Days
Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly	Selected Volt Channels	90 Days

3.6.2 Individual Harmonics files

If you check the **Include Individual Harmonic Data** check box in the PAR General Settings TAB/Power Quality box, Individual Harmonic files are created to enable easier identification of which Harmonic Order is the largest and above the Standard. The files will be created for any HD, THD, or TRD triggers set. See table below with more details. The following is a summary of the files created and more detail about each file name and sampling intervals.

Table 9 Harmonics File names and descriptions

Description	File Name	Interval	Typical Circular Buffer
3-sec Very Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_VShort_3sec_Daily	3 seconds, daily (1 file a day per Analog Channel with HD as trigger) Each file contains 50 X-axes analyzed to extract the harmonic order values for each analog channel.	30 Days
10-min Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_Short_10min_Weekly	10 min., weekly (5am daily) (1 file a week per Analog Channel with HD as trigger) 50 X-Axes in the file, to find what is the largest harmonic for each analog channel	90 Days
10-min weekly 95th percentile	yyyyIHR##T##A#_Short_10min_Weekly_95	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
10-min weekly 99th percentile	yyyyIHR##T##A#_Short_10min_Weekly_99	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days
3-sec weekly 95th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_95	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
3-sec weekly 99th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_99	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days

Note: The HD and THD measurements are based on IEC 61000-4-7, -30 and IEEE Std 519 up to the harmonic, see table below. Any harmonics beyond the 50th harmonic is not measured or recorded by the DFR.

Transient Sampling	Up to Harmonic
2400 Hz	19th
4800 Hz	39th
9600 Hz and above	50th

3 Second Daily Harmonics - one file per Analog Channel with HD, THD or TRD trigger 3 second samplings daily starting at 5:00 AM for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily. Each file contains 50 X-axes to extract the harmonic order values for each analog channel. Typical Retention is 30 days.

10 Minute Weekly Harmonics - one file per analog channel with HD, THD or TRD Trigger sampled every 10 minutes starting 5am Sunday for a week. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly. Each file contains 50 X-axes to find the 95th percentile. Typical Retention is 90 days.

Yearly Harmonic Percentile - The following Harmonics recording files are contained in APPRecorder\Data\PqData\PQHar folder. You set the retention for all three types of files described below in this field (see **Section 6.19 Configuring General Settings)**. Typical Retention is 365 days.

3 Second 95th Percentile Harmonic files - one file per Analog Channel with HD, THD or TRD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

3 Second 99th Percentile Harmonic files - one file per Analog Channel with an HD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

10 Minute weekly 95th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

10 Minute weekly 99th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

3.6.3 Convert COMTRADE to PQDIF

If you have checked the **Convert COMTRADE to PQDIF Every Day** in the Power Quality area of the PAR General settings TAB, Recorder will create PQDIF files in the **APP Recorder\Data\PQDATA\PQDIFData** folder. The following table lists the PQDif files created automatically every day.

Table 10 Convert to PQDIF files

Location:	Description	File Name	Interval
APPRecorder\Data\PQData\ PQDIFData	3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily
	10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily
	2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly
	Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily
	Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly

3.6.4 Viewing PQ Continuous recording files

View the PQ continuous recording files in Clearview by opening a new Graph then navigating to the APP Recorder/Data/PQData folder and opening the desired file. The following figures show examples of viewing PQ files. **See Section 14.2 Opening the Graphic and Data Analysis Window.** Look at the Figure captions below each image and the filenames at the top to identify which file examples each figure shows.

3.6.5 Harmonics Reports

In addition to viewing Harmonics files in Clearview, five reports to enhance analysis of Harmonics to pinpoint more easily if and where the Standard is not being met based on IEEE-2800 Table 19. These reports are saved in APP Recorder\Data\PQData\PQReport folder and written in HTML format. When you open a report file it will open in your browser application. You can use your browser functions to save to a PDF and Print etc..

Following are the report descriptions.

YYYYMMDD[RecID]VshortHarDailyReport.html
Daily report of individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies the Largest Order and Largest Range. Includes Min (%), Avg(%), Max(%), and 99th(%).

You can Filter on a **Harmonic Order** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

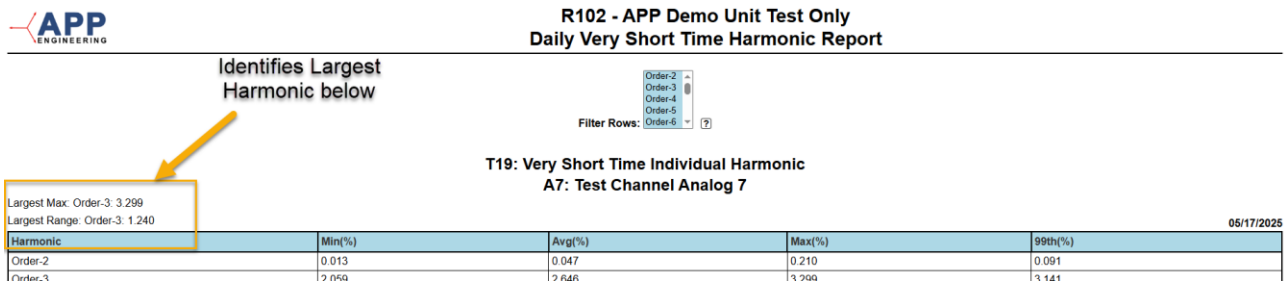


Figure 115 Sample Daily Harmonics Report

YYYYMMDD[RecID]VshortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%).

YYYYMMDD[RecID]shortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on **Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

APP ENGINEERING

R102 - APP Demo Unit Test Only
Weekly Very Short Time Harmonic Report

Filter Rows: 05/13/2025 05/14/2025 05/15/2025 05/16/2025 05/17/2025

T19: Very Short Time Individual Harmonic
A7: Test Channel Analog 7

Date	Largest Max Order	Largest Max (%)	Largest Range Order	Largest Range (%)	Max THD (%)	THD 99th (%)
05/13/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/14/2025	Order-3	0.150	Order-5	0.063	0.374	0.366
05/15/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/16/2025	Order-7	0.220	Order-7	0.177	0.579	0.568
05/17/2025	Order-3	3.299	Order-3	1.240	3.906	3.784

T20: Very Short Time Individual Harmonic
A8: Test Channel Analog 8

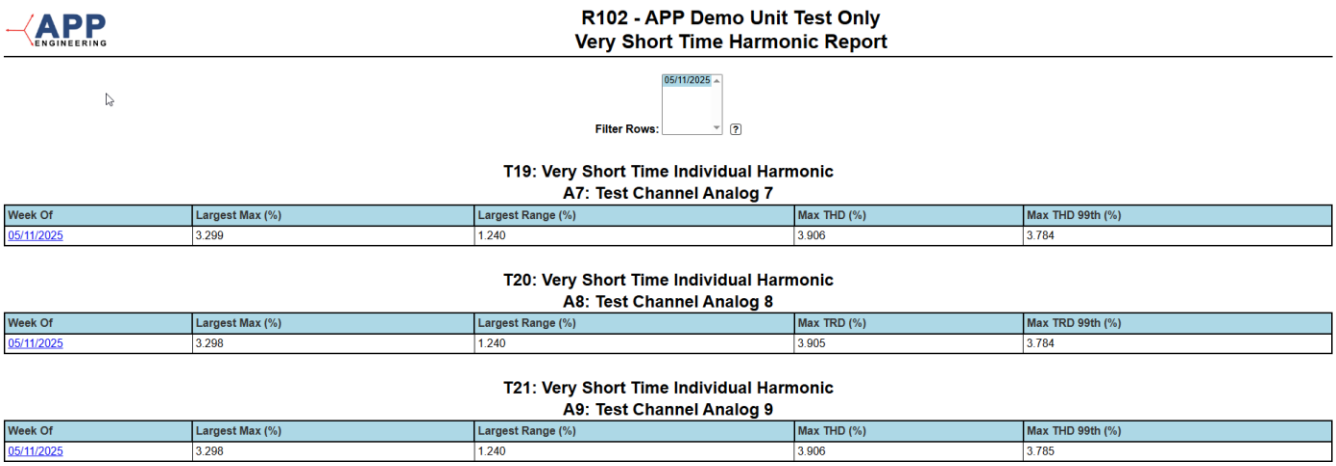
Date	Largest Max Order	Largest Max (%)	Largest Range Order	Largest Range (%)	Max TRD (%)	TRD 99th (%)
05/13/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/14/2025	Order-2	0.184	Order-2	0.087	0.331	0.326
05/15/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/16/2025	Order-5	0.136	Order-5	0.067	0.446	0.436
05/17/2025	Order-3	3.298	Order-3	1.240	3.905	3.784

Figure 116 Sample Weekly Harmonics Report

YYYY[RecID]VshortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%).

YYYY[RecID]shortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on "**Week of" Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.



APP ENGINEERING

R102 - APP Demo Unit Test Only
Very Short Time Harmonic Report

05/11/2025

Filter Rows:

T19: Very Short Time Individual Harmonic
A7: Test Channel Analog 7

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.299	1.240	3.906	3.784

T20: Very Short Time Individual Harmonic
A8: Test Channel Analog 8

Week Of	Largest Max (%)	Largest Range (%)	Max TRD (%)	Max TRD 99th (%)
05/11/2025	3.298	1.240	3.905	3.784

T21: Very Short Time Individual Harmonic
A9: Test Channel Analog 9

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.298	1.240	3.906	3.785

Figure 117 Sample Yearly Report

Managing Line Group Records *Page 7-1*.

CAUTION **If you save the Line Group Record from the APP Recorder, it will overwrite the Line Group Record at the master station. However, a backup copy will be created prior to overwriting.**

3.6.6 Step 11: Retrieve the Calibration File

➢ **To retrieve the Calibration File**

If the most up-to-date Calibration File is on the Recorder, you should retrieve it.

In the APP Clearview Window, from the **Edit Menu,** point to **Point Assignment Record,** then click **Get RxxExCal.ini.**

CAUTION **Once you click "Get RxxExCal.ini" the calibration file will be immediately uploaded and saved to the APP Clearview setup folder. It will overwrite the existing RxxExCal.ini file at the Master Station**

3.6.7 Step 12: Retrieve the Fault Summary File

➢ **To Retrieve the Fault Summary File**

The Fault Summary file shows a summary of faults and associated triggers for the APP Recorder that is selected in the **APP ClearView** window. The number of faults contained inside the Fault Summary file is controlled by a setting in the APP Recorder's configuration. Typically, the APP factory sets the number to 250, but it can be changed at your discretion. The larger the number, the longer it takes to retrieve the Fault Summary file.

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to retrieve the Fault Summary file.
2. Right-click anywhere in the table portion of the **APP ClearView** window. The menu shown in the following figure appears.

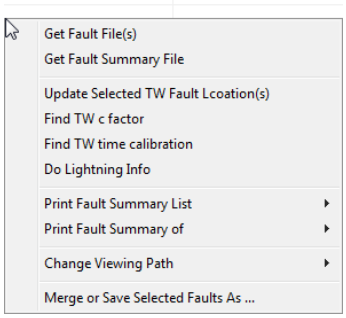


Figure 34: Summary and Fault Menu

3. Click **Get Fault Summary File**.

Tip: You can also retrieve the Fault Summary file by clicking the icon shown in the following figure.

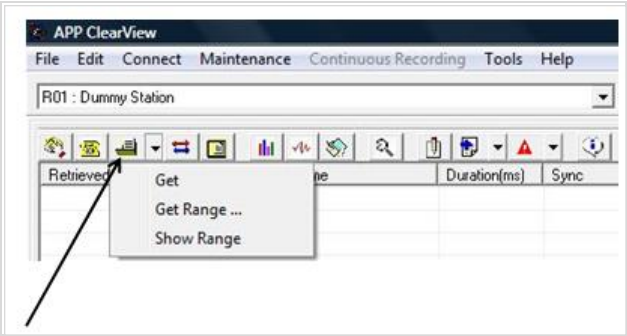


Figure 35: Get Fault Summary File Icon

4. The Fault Summary file is immediately uploaded. In the **APP ClearView** window, **the Fault Summary** tab is populated with transient and extended fault records.

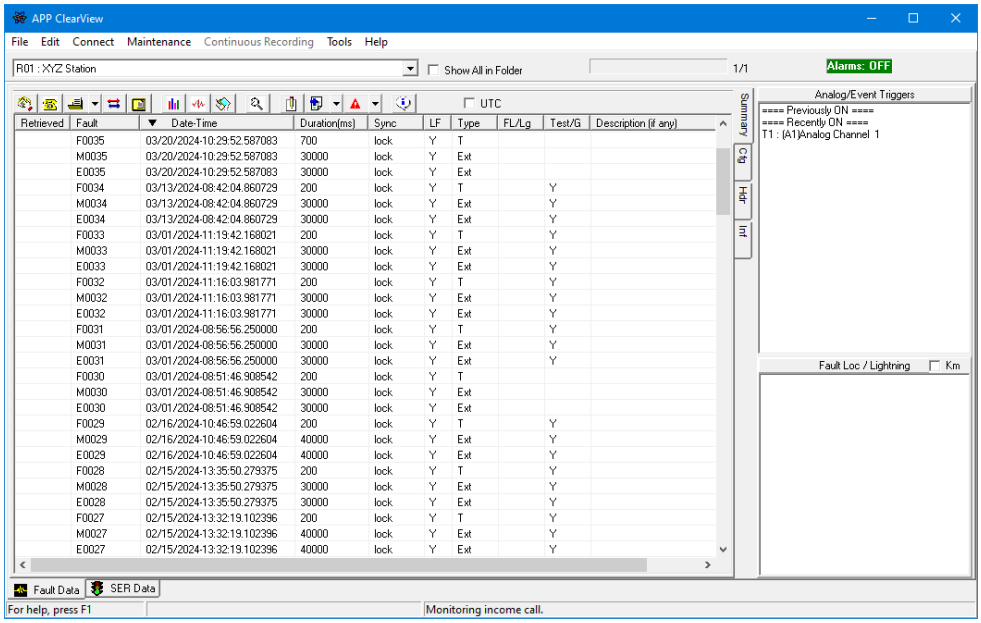


Figure 36: APP ClearView Window with Retrieved Fault Summary Information

Note: Only the Fault Summary file is retrieved. Oscillograms cannot be viewed because the data has not been retrieved. Also notice that there are no check marks in the **Retrieved** column.

File Type Definitions:

- F – Transient Fault Record
- E – Extended Oscillography Record
- M – RMS Plot Data (Derived from Extended Oscillography Record, E file)

Show All in folder check box will cause Clearview to display fault records from all the recorders in the data folder and adds the recorder number next to the fault number.

UTC check box if checked time will display the Universal Time in the fault list without any offset that may have been defined in the configuration.

3.6.8 Step 13: Retrieve Specific Fault Records from the APP Recorder

The **Fault Summary** tab of the **APP ClearView** window now displays all of the fault records from the APP Recorder. However, none of them have been saved to the master station computer. You need to complete the retrieval process by selecting specific fault records.

Retrieved records are in COMTRADE format. You can view them with the APP ClearView software or with any COMTRADE viewer.

The time it takes to retrieve data is dependent on the record length(s), the number of records being retrieved, and the type of connection between the master station and the APP Recorder (i.e. Modem or Network).

➢ To Retrieve Specific Fault Records from the APP Recorder

1. In the **Fault Summary** tab, click the row(s) of the fault record(s) that you want to retrieve. To retrieve multiple records at the same time, highlight multiple rows by using the standard Windows Control and Shift key functions.

2. Do one of the following:

   Right-click any of the selected rows. From the menu that appears, click **Get Fault Files**.

   Click the  icon.

   Note: If you are not already connected to the APP Recorder, the master station will first attempt to connect to it automatically.

   Once a fault record has been retrieved, a check mark will appear in its row under the **Retrieved** column, as shown in the following figure.

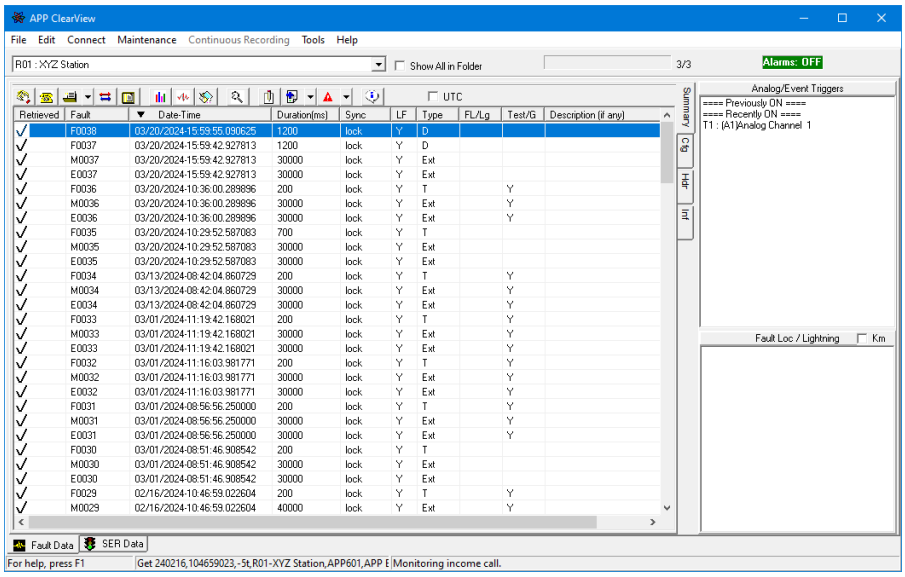


Figure 37 APP ClearView Window with Retrieved Fault Records

By default, APP ClearView places retrieved records in the **C:\APP Recorder\Data** folder. However, if you specified a different path during the installation process, ClearView places the retrieved records there instead.

3.6.9 Step 14: View the Fault Record Oscillogram for a Fault Record

➢ To View the Fault Record Oscillogram for a Fault Record

1. In the **Fault Summary** tab, do any of the following:

   Double-click a retrieved fault record.

   Right-click a retrieved fault record and then click **Graphic and Data Analysis of XXXX** (XXXX represents the fault ID number).

   Click the fault record and then click the  icon.

   From the **Tools** menu, click **New Graph**.
   An empty oscillogram window appears. From the **File** menu, point to **Open Data** and then click **Open Data 1**. Browse to the location of your desired COMTRADE record and then open it.

   Note: This method also allows you to open two COMTRADE records simultaneously.

The following figure illustrates a sample oscillogram window.

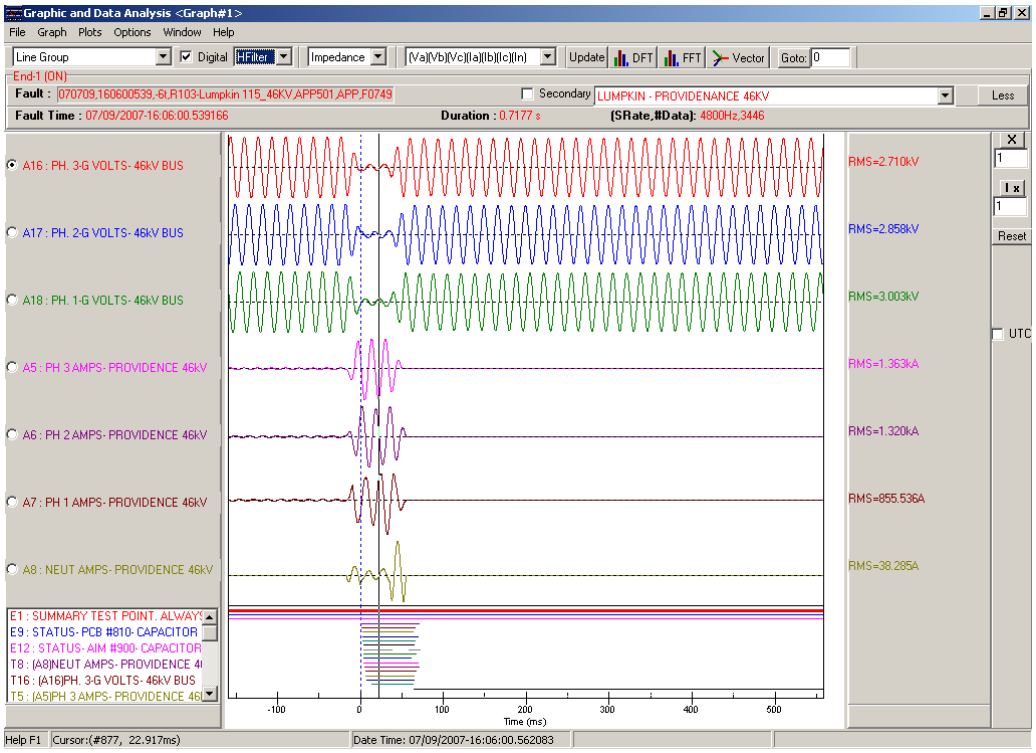


Figure 38: Sample Oscillogram Graph Window

4. Using the APP ClearView Window

The **APP ClearView** window is the first window that appears when the APP ClearView Program starts. This window has multiple tabs, which appear along the right-hand side of the window.

4.1 Setting the Administrator Password

In the **APP ClearView** window, you can optionally set an administrator password to restrict access to administrative features. If you set an administrator password, then only the people that know the password will be able to perform the following functions:

- Changing passwords
- Configuring the ClearView software
- Configuring the APP Recorder software
- Modifying the Point Assignment Record
- Modifying the Line Group Record

Note: By default, there is no administrator password.

➢ To Set an Administrator Password

1. From the **File** menu, select **Administrator**.
2. From the **File** menu, click **Change Administrator Password**.
   A **Change Administrator Password** box appears.
3. Enter the desired password and click the **OK** button.
   The **Change Administrator Password** box reappears.
4. Re-type your new password and click the **OK** button.
   The password is now set.

Note: If the **Password** box does not appear when you select an administrative feature, then you have not set an administrative password.

Also, if a check mark does not appear next to the **Administrator** menu item, and there *is* an administrative password, then the **Change Administrator Password** option will not appear on the **File** menu.

4.2 Setting the Exit Password

If you set an exit password, then that password must be entered before ClearView can be closed.

Note: By default, there is no exit password.

➢ To Set an Exit Password

1. From the **File** menu, select **Change Exit Password**.
   A **Change Exit Password** box appears.
2. Enter the desired password and click the **OK** button.
   The **Change Exit Password** box reappears.
3. Re-type your new password and click the **OK** button.
   The password is now set.

4.3 Changing the Master Directory

Use Change Master Directory if you are working with multiple DFRs and need to change the directory where Clearview is pointing to get Configuration and Point Assignment for a different DFR.

1. From the **File** menu, select **Change Master Directory**
2. The Windows file explorer appears, navigate to the folder you want to make the master directory and select it.
3. If files do not appear in the folder selected, the Clearview Configuration screen appears for you to define Data and Setup folders.

4.4 Selecting and Configuring the Printer

Before you print, select and configure the printer that you want to use.

➢ To Select and Configure the Printer

1. From the **File** menu, select **Printer Setup**.
   The standard **Windows Print Setup** dialog box appears.
2. From the **Name** list, select the printer that you want to use.
3. Complete the other fields in this dialog box and then click the **OK** button.

4.5 Reinitializing the ClearView Program

You may need to reinitialize the ClearView to perform troubleshooting or maintenance. When you reinitialize the ClearView program, the **Fault Summary** tab is updated.

CAUTION During this process, the communications between ClearView and the APP Recorder will be disconnected.

➢ To Reinitialize the ClearView Program

In the **APP ClearView** window, from the menu bar click **Reinitialize**.
The ClearView program is reset and restarted.

4.6 Run APP Clearview Monitor

APP Clearview can be set up to automatically restart if Clearview is shutdown. When APPCWMonitor is running, APP Clearview will restart within 60 seconds of being closed. This ensures no manual intervention is required to maintain APP Clearview operation.

From the **File** menu, select **Run APPCWMonitor**

4.7 Exiting ClearView

➢ To Exit ClearView

In the **APP ClearView** window, from the **File** menu, click **Exit**.

4.8 Using the Fault Summary (Summary Tab)

By default, the **Fault Summary** tab appears when the APP ClearView window is opened. The following figure identifies key controls in the tab.

Show All in folder check box will cause Clearview to display fault records from all the recorders in the data folder and adds the recorder number next to the fault number.

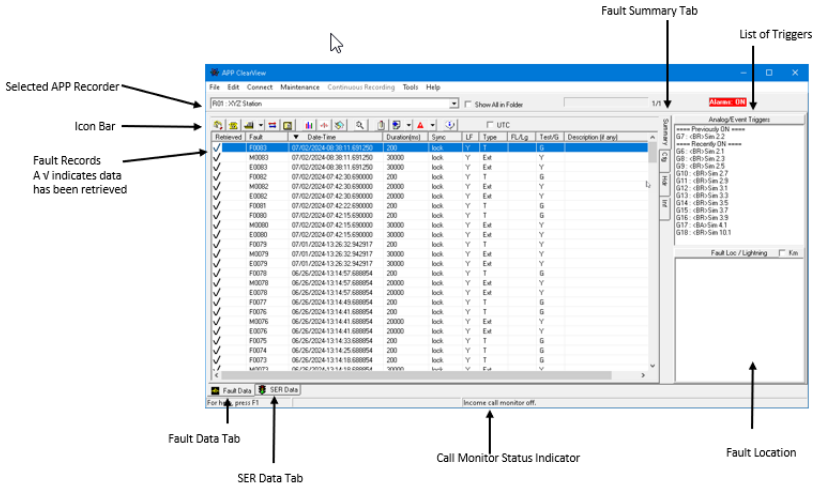


Figure 39 Fault Summary Tab

UTC check box if checked will display the Universal Time in the fault list without any offset that may have been defined in the configuration.

For each fault shown in the **Fault Summary** tab, the following information is listed:

- Fault ID Number
- Date & Time
- Duration in Milliseconds
- Synchronization status (Sync)
    - lock
    - no Signal
    - bad Signal
    - initializing
    - unstable
    - <2.5h
    - wrong year
    - unknown
    - SNTP
- If a user defined Logic Filter (LF) was passed
- Type: Indicates Fault Record Type. It can be one of four types:
    - T – Transient
    - Ext – Extended
    - D – Disturbance (Only possible if defined Disturbance in Point Assignment Record)
    - T/D both Transient and Disturbance
- FL/LG: If a distance to fault or lightning location was calculated
    - F – indicates fault location was calculated
    - L – indicates lightning location was calculated (requires Vaisala Lightning account see 13.4 Vaisala Lightning Configuration)

- Test/G: If the listed fault is a manually initiated test run or a Goose Message TAG triggered fault
    - Y – Test Run
    - G – Goose Message/TAG fault
- If extended recording is enabled, the **Fault Summary** tab also contains this information:
    - A summary of extended RMS records
    - A summary of extended oscillography records
        - Description associated with a Traveling Wave (TW) Channel involved in the Fault

For information on working with the fault records that appear in this tab, see *Working with Fault Records*. on page 5-1

4.9 Finding Records in the Fault Summary Table

You can search the Fault Summary Table for a specific fault ID number, time, date, duration, etc.

➢ To Find Records in the Fault Summary Table

1. In the **APP ClearView** window, on the **Fault Summary** tab, from the **Edit** menu, click **Find**. The **Find** window appears, as shown in the following figure.

Figure 40 The Find Window

2. Type any value that you want to search for and then click the **Find Next** button. ClearView highlights the row(s) where the value appears.

Note: You can search again for the same value at any time until you either close ClearView or change the search value. To search again, press the F3 button or choose **Find Next** from the **Edit** menu.

4.10 Using the Configuration (Cfg) Tab

The **Configuration** tab displays information related to the exact configuration of the APP Recorder when a particular fault record was generated. This configuration file follows the requirements of the COMTRADE standard ANSI/IEEE C37.111.

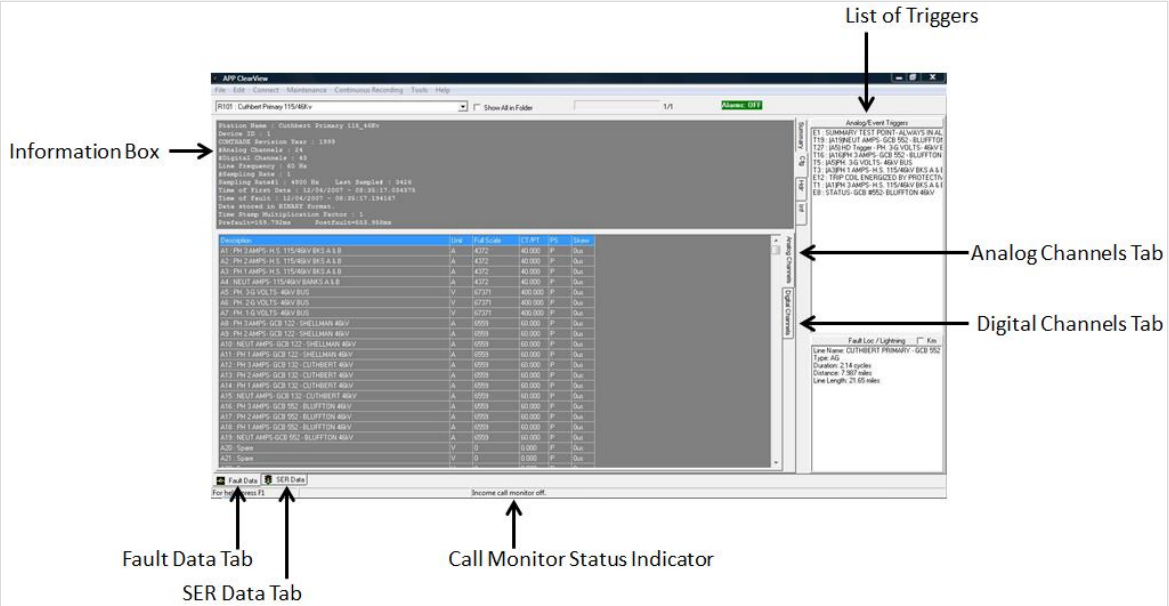


Figure 41: The Configuration Tab

➢ To View the Configuration for an APP Recorder

On the **Cfg** tab, from the **APP Recorder** list, select the APP Recorder that you want to view. The following configuration information appears in the Information box:

- Station Name
- Device ID
- COMTRADE Revision Year
- Number of Analog Channels
- Number of Digital Channels (Including 30 triggers)
- The Frequency of the Line(s) Being Recorded
- Transient Sampling Rate #1
- Last Sample #
- How Many Data Samples Per Channel?
- Time of the First Data Sample
- Time of the Fault
- Data Format (Binary, ASCII)
- Time Stamp Multiplication Factor
- Prefault Length
- Postfault Length

4.11 Using the Analog Channels Tab

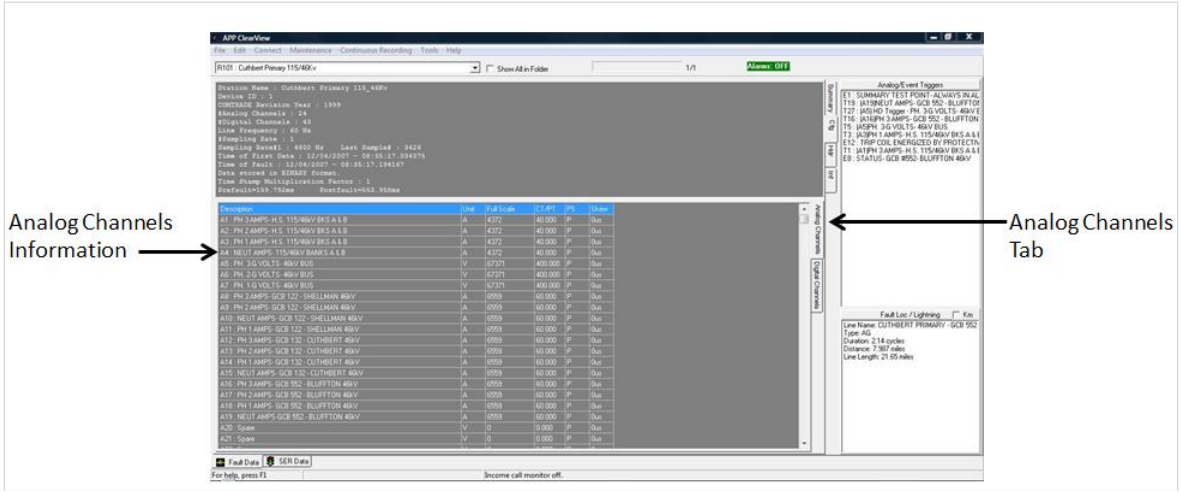


Figure 42: The Configuration Tab—Analog Channels Tab

The analog channel configuration saved with each record contains the following information:

- The user-defined channel description
- Channel number
- Unit - Type of channel (voltage or current)
- Full scale value
- Current transformer or potential transformer ration (CT/PT)
- Full scale value is primary or secondary (P=Primary) (S=Secondary)
- The amount of time skew in the data (for systems that use sample and hold technology)

4.12 Using the Digital Channels Tab

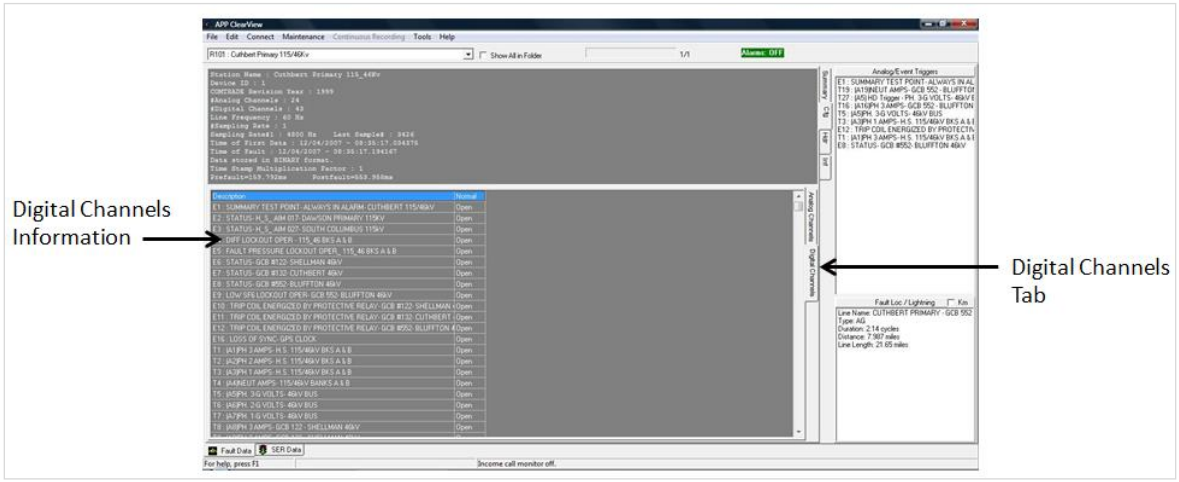


Figure 43: The Configuration Tab—Digital Channels Tab

The digital configuration saved with each record contains the following information:

- The user-defined channel description
- Channel number
- The normal state of the input (Normally Open or Normally Closed)

4.13 Using the Header (Hdr) Tab

You can use the Header (Hdr) tab to save a header file for an APP Recorder.

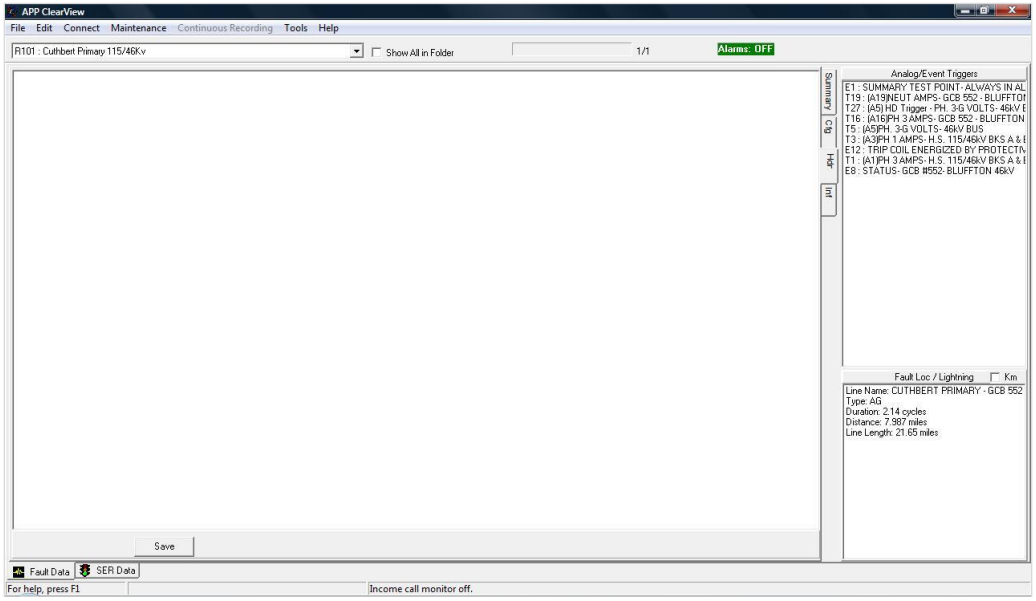


Figure 44: The Header Tab

➢ To Save a Header for a Fault Record

1. On the **Hdr** tab, from the **APP Recorder** list, select the APP Recorder that you want.
2. Click anywhere in the blank area and type a report or comment concerning the fault.
3. At the bottom of the area, click the **Save** button.
   The header file is now part of the COMTRADE file structure that includes the data file, vendor information (inf) file, configuration file, and optional header file.

4.14 Using the Vendor Specific Information (Inf) Tab

The **Inf** Tab displays the COMTRADE inf. file, which holds vendor-specific information related to the data. For APP Recorders, it displays the username, recorder ID, events/triggers, time information, and fault location information.

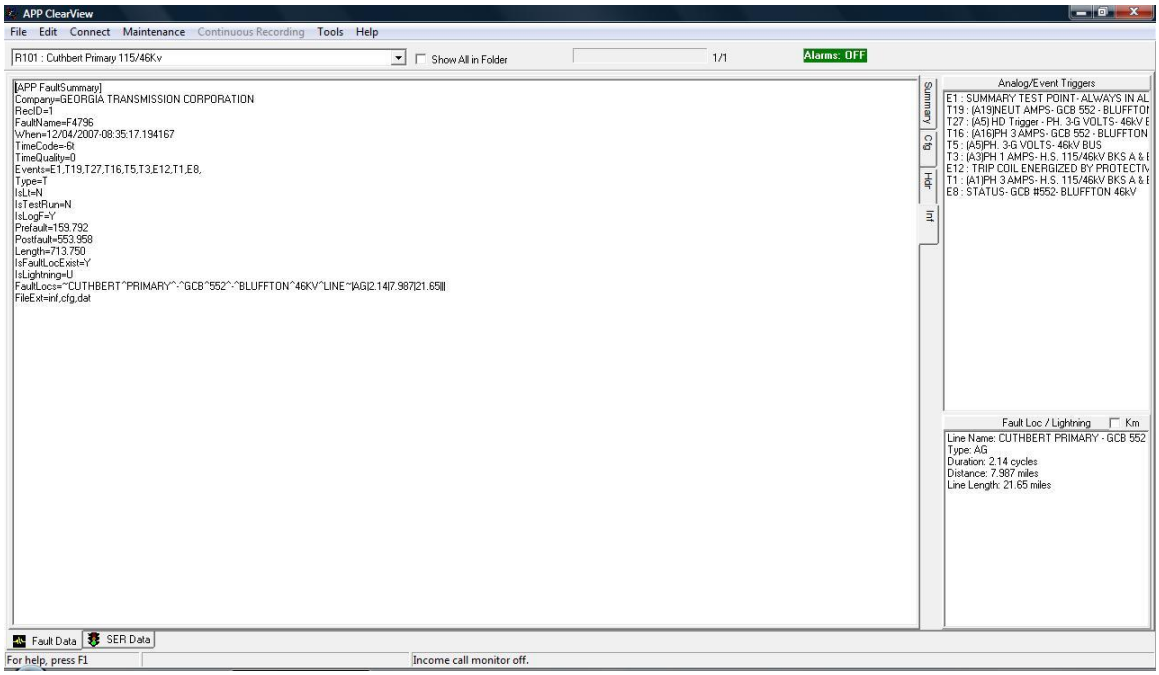


Figure 45: The INF Tab

➢ To View the Vendor-specific Information

On the **Inf** tab, from the **APP Recorder** list, select the APP Recorder that you want. The information appears in the tab.

4.15 Using the SER Tab

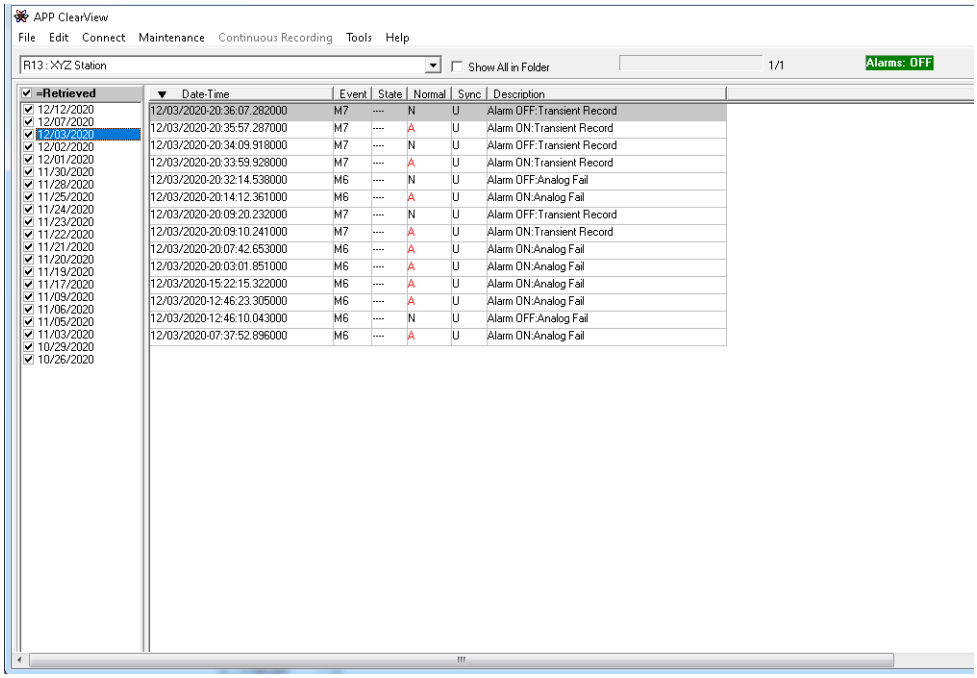


Figure 46 The SER Tab

You use the SER tab to retrieve specific Sequence of Event Reports.

You can configure Event Channels as DFR, SER, or both. If an event channel is configured as SER or Both, any changes in its state will be logged in the **Sequence of Event Report**. The APP Recorder creates **Sequence of Event Reports** by date. A report is created under two conditions:

- An SER channel changes state.
- At the end of the day, there are one or more channels in an abnormal state.

If IEC 61850 GOOSE Capture is set up, GOOSE messages will also appear in the SER report. Reflecting a change of State if any have occurred in the time range being viewed.

> **Note:** It is common practice to set or wire a channel in an abnormal state. In this way, a report will be generated every day. If a SER Report is supposed to be generated every day, it is easy to determine if any SER recording problems have arisen.

Show All in folder check box will cause Clearview to display fault records from all the recorders in the data folder and adds the recorder number next to the fault number.

4.15.1 Retrieving the Sequence of Event Report

To retrieve Sequence of Event Reports, you should first retrieve the Dates file and then retrieve reports for the specific dates of interest. If one channel is set or wired in a constant abnormal state, the list of dates should be continuous.

➢ **To Retrieve Sequence of Events Reports**

1. On the **Fault Summary** tab, at the bottom of the window, click the **SER Data** tab.

2. In the **Retrieved** column (below the **Retrieved** heading), right-click.
   The following menu appears.

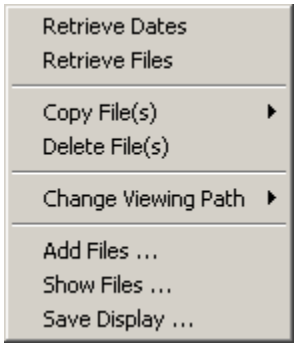


Figure 47: The SER Menu

3. Click **Retrieve Dates**.
   The communication process and file transfer begins.

4. The **Retrieved** column displays new dates.
   The retrieved file name is "RxxDates.ser," where xx is the unique recorder ID number. The file is saved in **C:\APPClearView\Data\R01-APP Demo 1\SerData**. The format of the date file is ASCII.

5. Retrieve a report for one day or for multiple days.

   - To retrieve a report for one day, double-click that date or right click it and click **Retrieve File**.
   - To retrieve multiple reports for multiple dates, use the standard Windows control and shift functions. Right click on one of the highlighted dates, and then select **Retrieve Files**.

   The report file name for a specific date would look something like 20170507Rxx.ser. The file name consists of the year, month, day, and unique recorder ID number. The file is saved in **C:\APP ClearView\Data\R01-APP Demo 1\SerData**. The format of this file is ASCII.

Note: A Sequence of Event Report can be quite long. You can select the **Show Only These Events** check box, which appears below the **Retrieved** column. Specify the SER channels that interest you. Separate multiple channels with commas.

6. After a report is retrieved, a checkmark appears next to its date in the **Retrieved** column.
   A **Sequence of Event Report** is shown in the following figure.

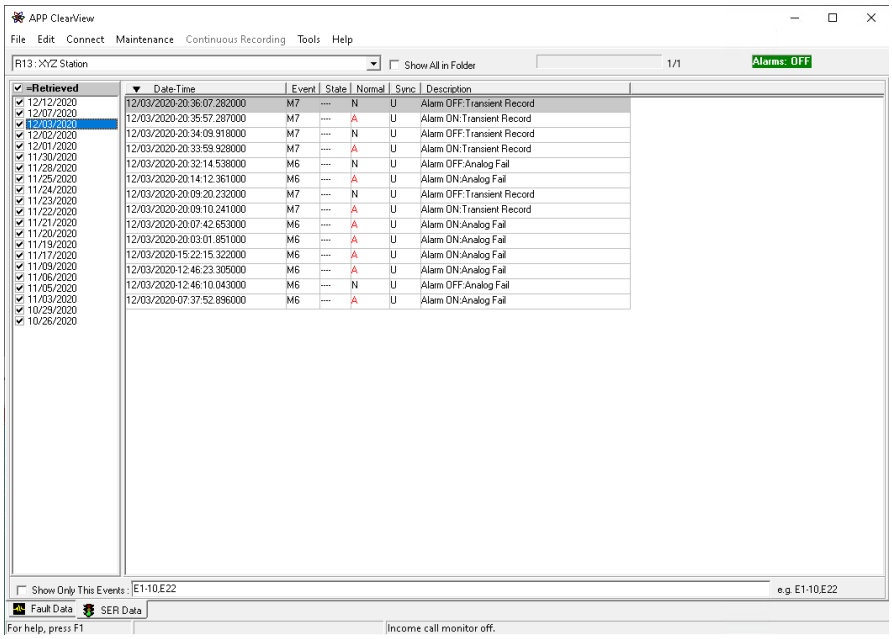


Figure 48: SER Report

The Sequence of Event Report includes the following information:

- Date and time of the event
- Event channel number
- Current state of the event (O = Open, C=Closed)
- Whether the event is in its normal state (A = Abnormal, N = Normal)
- Whether the APP Recorder received a synchronized satellite signal (U = Unsynchronized, S = Synchronized)
- User-defined channel description. The channel description could contain the following information.

  (**M. Stop**) this indicates that the channel was manually placed in a stop condition via the Point Assignment Record.

  (**Stop**) this indicates that the channel was automatically placed in a stopped condition. Settings that will auto stop an SER channel are located in the Point Assignment Record.

  (**End**) this indicates that the channel was in an abnormal condition at the end of the day.

For **Goose messages**, the Sequence of Event Report includes the following information:

Date and time of the event

GOOSE ID = Gx where x is the id

State - is not used

Normal - is defined as (A = Abnormal= Closed, N = Normal= Open)

Sync - is not used

User-defined GOOSE Entry Description as entered in the GOOSE Points Record.

4.15.2 Copying an SER Report

You can copy SER reports to user-defined backup paths or to the specific copy destination that you browse to. You specify the backup paths in the **ClearView Configuration** window. For information on setting these values, see Section 4.17.2 Configuring the Main Configuration Settings

➢ To Copy an SER Report

1. On the **SER** tab, in the **Retrieved** column, right-click the date for which you want to copy the SER report.
   The following menu appears.

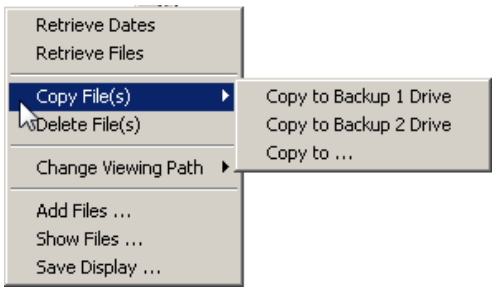


Figure 49: SER Menu

2. Point to **Copy File(s)** and then do one of the following:

   To copy the file to the primary backup drive, click **Copy to Backup 1 Drive**.

   To copy the file to the secondary backup drive, click **Copy to Backup 2 Drive**.

   To browse to a different backup folder, click **Copy to…** and then browse to the folder where you want to save the copied file**.**

   A message box appears to confirm the copy.

3. Click **Yes**.

4.15.3 Deleting a SER Report

➢ To Delete an SER Report

1. On the **SER** tab, in the **Retrieved** column, right-click the date for which you want to delete the SER report.

2. Click **Delete File(s)**.
   The report associated with the selected date(s) is deleted. The date(s) will remain in the retrieved column, but the check mark(s) will be removed.

4.15.4 Changing the Viewing Path

You can change the viewing path in order to view other folders where saved SER reports are stored.

CAUTION **Changing the viewing path changes it for the "Fault Summary Table and "SER Summary Table."**

1. On the **SER** tab, in the **Retrieved** column, right-click the date for which you want to change the viewing path.

2. Click **Change Viewing Path.**
   A menu of possible paths appears.

3. Select the path.

4.15.5 Adding SER Files

➢ **To Add Files**

1. On the **SER** tab, in the **Retrieved** column, right-click the date for which you want to add files.
2. Click **Add Files**.
3. Browse to the .SER file that you wish to insert into the Sequence of Events Report for the selected date. The Sequence of Events Report for the selected date appears with the new or added entries.

4.15.6 Showing SER Files

1. On the **SER** tab, in the **Retrieved** column, right-click the date for which you want to show files.
2. Click **Show Files**.
3. Browse to the .SER file that you wish to view into the Sequence of Events Report for the selected date. The Sequence of Events Report for the selected date appears with the selected entry.

4.15.7 Saving the Display

You can create an ASCII file containing the sequence of events (SER) for the date(s) that you select.

➢ **To Save Display**

1. On the **SER** tab, in the **Retrieved** column, right-click the date for which you want to add files.
2. Click **Save Display**.
3. Browse to the desired path, name the file, and click **Save**.

Note: Saving Display also saves to **PRC** format.

4.16 Selecting the APP Recorder

You can select the APP Recorder for which you want to view fault records. You can select any APP Recorder that is connected to the master station. When you select a new APP Recorder, the **Summary** tab is immediately updated with fault records from that APP Recorder.

➢ **To Select the APP Recorder to Display**

On the **Summary** tab, from the **APP Recorder** list, click the down arrow to view the list and select the APP Recorder that you want.

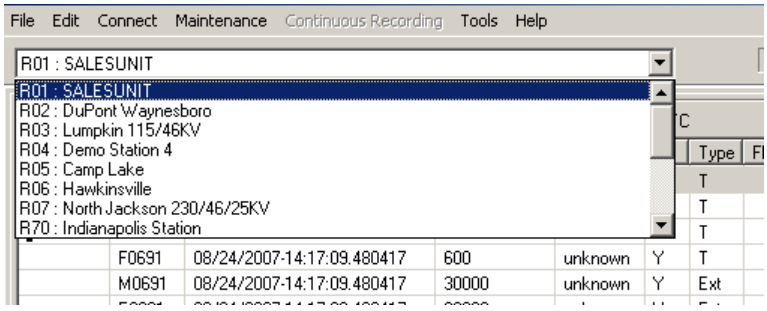


Figure 50: Recorder Pull Down Menu

➢ To Sort the APP Recorder List

You can sort the APP Recorder list by station name or recorder ID number.

1. Right-click the **APP Recorder** list.

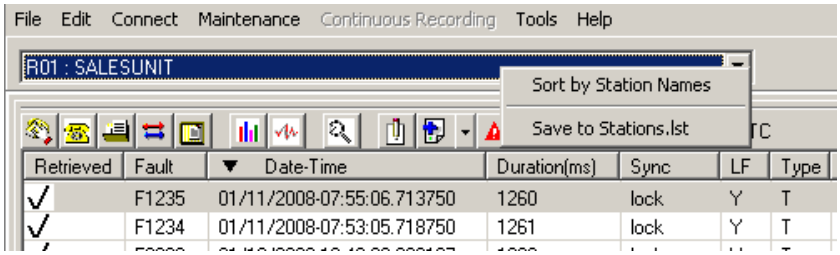


Figure 51: Recorder Sorting Menu

2. The option that appears by default depends on the current sort order of the list. Click **Sort by Station Names** or **Sort by Recorder IDs**, depending on whichever appears.
   The list is sorted immediately.

4.16.1 Saving a Station List

You can create a comma-delimited text file containing the list of the APP Recorders and key details about them. Information inside the Station.lst includes recorder ID number, station name, recorder model number, number of analog channels, number of trigger channels, number of event channels, the transient sampling rate, and the extended sampling rate.

➢ To Save a Station List

Right-click the **APP Recorder** list and then click **Save to Stations.lst**.
The list is saved in the location specified in the **Data Path** box in **Main** tab of the **ClearView Configuration** window. See Configuring the Main Configuration Settings

4.17 Configuring Clearview

Some minimum configuration parameters must be setup for the ClearView program and the master station to operate. For example, it must know where to place the retrieved data and where to find point assignment information

Note: The required configuration fields are Data Path and Setup Path.

4.17.1 Types of Configuration Settings

You can configure the following types of settings for the ClearView program:

- Main configuration settings
- Automatic Tasks
- Options

4.17.2 Configuring the Main Configuration Settings

Main configuration settings are integral to the basic functioning of the ClearView program.

➢ To Configure the Main Configuration Settings

1. In the **APP ClearView** window, from the **Edit** menu, click **ClearView Configuration**. The ClearView Configuration window appears. By default, the **Main** tab is selected.

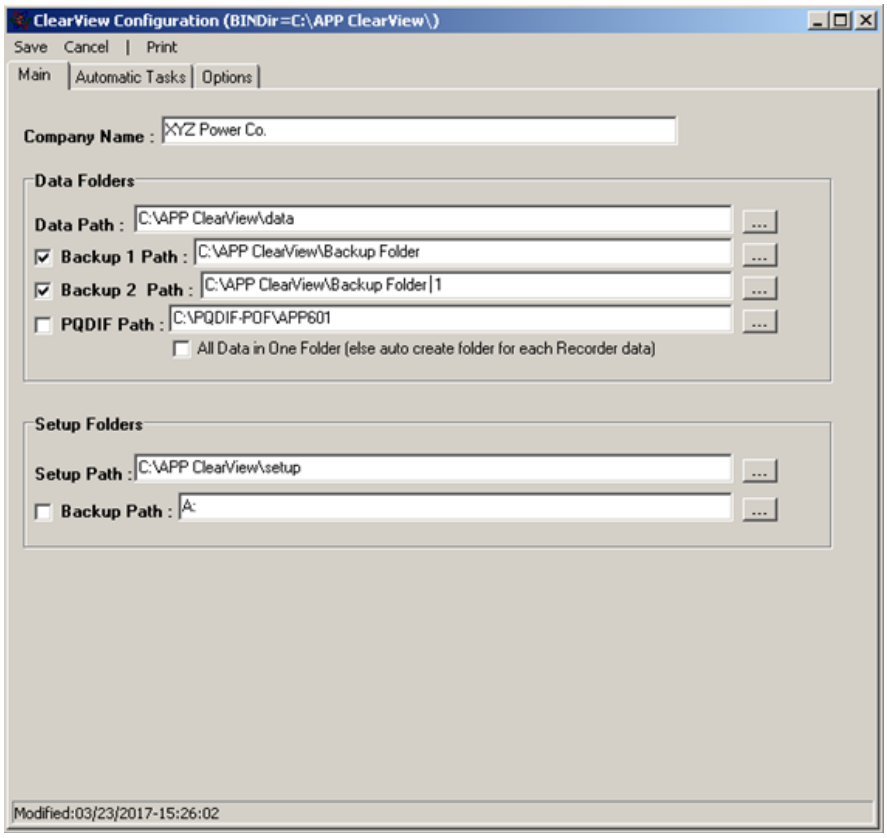


Figure 52: ClearView Configuration Window

2. In the **Company Name** field, enter any name you would like. This name will appear at the top of the ClearView main page. At the factory, the name of the company or person that purchased the system is entered.

3. *(Required)* In the **Data Path** field, click ... and enter the location of the physical file where transient and extended recording information will be written. Typically, the path is **C:\APP ClearView\Data.** You can change this value to any other path you want.

4. Transient and extended recording information can be written to more than one path. To create a second location, select the check box next to **Backup 1 Path**, click ..., and then enter the path to the desired location. You can specify any path you want.

5. To create a second backup location, select the check box next to **Backup 2 Path**, click ..., and then enter the path to the desired location. You can specify any path you want.

6. Do you want to convert all retrieved COMTRADE data to PQDIF data daily and store it as PQDIF data?

   If **yes**, then select the check box next to the **PQDIF Path** box. Then click ... and enter the path to the folder where the PQDIF data should be stored. You can specify any path you want. The PQDIF folder will have the same structure as the folder specified in the **Data Path** box.

   If **no**, then skip to the next step.

7. Do you want to keep all COMTRADE files from all APP Recorders in the **C:\APP Recorder\Data** folder? This allows you to segregate COMTRADE records from different APP recorders.

   If **yes**, then select the **All Data in One Folder** (else auto create folder for each Recorder data).

   If **no**, then do not select this check box. A folder for each APP Recorder will be automatically created inside the folder specified in the **Data Path** box.

   Note: This check box also affects the PQDIF Path since it has the identical directory structure as the Data Path.

8. (*Required*) Next to the **Setup Path** box, click the ... and then specify the path the location for saving Point Assignment Records.

9. Do you want to specify a **Backup path** for Point Assignment Records?

   If yes, then select the check box next to the **Backup Path** box. Then click the ... and then enter the path to the desired location. You can specify any path you want.

10. From the menu bar, click **Save**.

4.17.3 Configuring the Automatic Tasks

The master station can perform a variety of automatic tasks, which appear on the window that is shown in Figure 53. By configuring the automatic tasks, you can take full advantage of the master station's ability to become an integral part of your substation or plant automation.

There are several types of automatic tasks that you can configure.

- Whether ClearView should auto-poll the APP Recorders, and if so, how it should happen
- Whether or not to automatically print fault-related information when an APP Recorder calls in or when auto-polling
- Whether or not to automatically send an email when an APP Recorder calls in or when auto-polling

4.17.4 Accessing the Automatic Tasks Tab

You configure all of the automatic tasks on the **Automatic Tasks** tab of the ClearView Configuration window.

➢ **To Access the Automatic Tasks Tab of the ClearView Configuration Window**

1. In the **APP ClearView** window, from the **Edit** menu, click **ClearView Configuration**.
   The **ClearView Configuration** window appears. By default, the **Main** tab is selected.

2. Click the **Automatic Tasks** tab.
   The **Automatic Tasks** tab appears, as shown in the following figure.

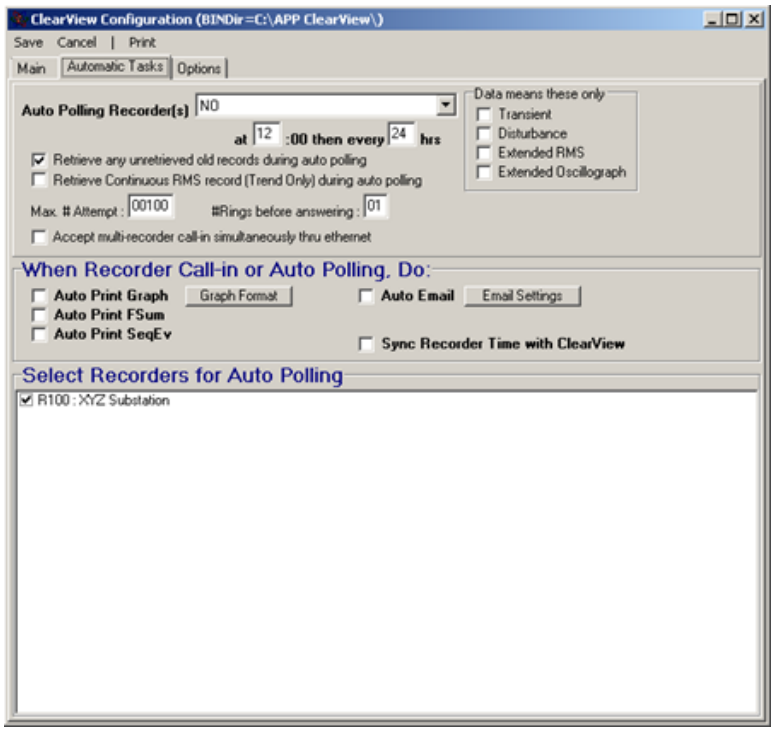


Figure 53: Configuration Automatic Tasks Tab

4.17.5 Configuring Auto-Polling

You can configure whether or not ClearView performs auto-polling. If auto-polling occurs, you can also configure how it occurs:

- Whether or not master station automatically polls the APP Recorders for new fault data
- The meaning of the data that is transmitted from the APP Recorders
- Whether un-retrieved, old records are retrieved
- The number of attempts the master should make to contact an APP Recorder
- Whether or not to accept multiple simultaneous calls from different APP Recorders
- Whether the time on the APP Recorders should be synced with the master station
- Which APP Recorders should be automatically polled

➢ To Configure Auto-Polling

1. In the **ClearView Configuration** window, click the **Automatic Tasks** tab.
2. From the **Auto Polling Recorders** list, select the appropriate option:

   NO: No auto-polling.

   Yes – always (Get FSum Only)
   At the specified time, the master station will call the selected APP Recorders and upload a fault summary file. The number of faults in the file depends on a user-defined setting in each APP Recorder's configuration file.

   Yes – always (Get FSum and Data)
   At the specified time, the master station will call the selected APP Recorders and upload the Fault Summary file and any new fault records. If any of the check boxes in the **Data means these only** group are selected, then only the new record(s) with the corresponding check

mark(s) will be uploaded to the master station. If none of the options are selected, then all new records will be uploaded to the master station.

Yes – if logic true (Get FSum Only)
At the specified time, the master station will call the selected APP Recorders and upload a Fault Summary file. Contrary to the title, the master station will always retrieve a Fault Summary file.

Yes – if logic true (Get FSum and Data): At the specified time, the master station will call the selected APP Recorders and upload a Fault Summary file. If a user-defined Boolean Logic Equation (filter) has been entered at the APP Recorder and a recorded fault passes the filter, the master station will upload its fault data. If any of the check boxes in the **Data means these only** group are selected, then only the new record(s) with the corresponding check mark(s) will be uploaded to the master station. If none of the options are selected, then all new records will be uploaded to the master station. Contrary to the title, the master station will always retrieve a Fault Summary file.

Yes – always (FSum), if logic true (Data)
At the specified time, the master station will call the selected recorders and upload a fault summary file. If a user-defined Boolean Logic Equation (filter) has been entered at the APP Recorder and a recorded fault passes the filter, the master station will upload its fault data. If any of the check boxes in the **Data means these only** group are selected, then only the new record(s) with the corresponding check mark(s) will be uploaded to the master station. If none of the options are selected, then all new records will be uploaded to the master station.

3. In the **at** box, specify the hour at which the auto-polling should occur. This is a 24-hour clock.
4. In the **then every XX hours** box, specify the time interval between the auto-poll cycles.

Note: The time of day takes priority over the number of every hours.

For example, if you specify 

, ClearView will automatically change it to 

to ensure that the auto-polling will occur at 02:00 every day.

Also note that ClearView will not wait until 02:00 to start the first polling. For example, if the configuration has been saved at 03:00, the first auto-polling will be at 08:00 (2:00 + 6 Hours).

5. **Retrieve any un-retrieved old records during auto Polling,** this function is to ensure all COMTRADE Records on the Recorder is retrieved into APP Clearview. Check the box if you want Clearview to pull any fault records during polling/auto polling existing in the Recorder and has not yet been retrieved.

Note: If the fault summary list (.lst file) is retrieved manually then the Recorder is auto polled, Clearview may not retrieve any un-retrieved fault records until the next polling cycle.

6. Do you want to retrieve continuous RMS records (Trend Only) during auto polling?

   If **yes**, select the Retrieve continuous RMS records (Trend Only) during auto polling check box.

   If **no**, skip to the next step

7. In the **Data means these only** group, select the types of records that you want the auto-polling process to retrieve.

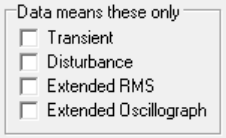


Figure 54: Data Means These Only Options

Note: If you select any one of these check boxes, then ClearView will retrieve only records of that type. However, if you select **none** of these check boxes, then ClearView will retrieve **all** of these types of records.

8. In the **Max # of Attempt** box, type the maximum number of times the master station should attempt to contact a particular APP Recorder before giving up.

9. In the **#Rings before answering** box, type the number of times the master station should allow an incoming phone call to ring before it picks up the call and makes the connection.

Note: The **Monitor Call** menu option on the **Connect** menu must be enabled before this entry has an effect

10. Do you want to allow multiple APP Recorders (up to 5) to call in simultaneously through an Ethernet connection?

Note: Five instances of the ClearView program will be opened simultaneously, but only one will be visible on the master station screen.

If **yes**, then select the **Accept multi-recorder to call-in simultaneously through Ethernet** option. In addition, you must select the **Monitor Call** option on the **Connect** menu. Also, for each APP Recorder, you must select the **ClearView allows multi-recorders call-in simultaneously thru Ethernet** check box. This is found on the **Automatic Tasks** tab in the Recorder Configuration window.

If **no**, skip to the next step.

4.17.6 Configuring ClearView Actions

You can configure which of the following actions ClearView takes when an APP Recorder calls in, or when auto-polling occurs.

Print a graph

Print a Fault Summary report

Print a Sequence of Events report

Send an Email

Sync the Recorder time with ClearView

➢ To Configure the Automatic Printing of a Graph

1. In the **ClearView Configuration** window, click the **Automatic Tasks** tab.

2. Under **When Recorder Call-in or Auto Polling, Do,** select the **Auto Print Graph** check box.

3. Click the **Graph Format** button.
The **Format All Wave Printing** window appears, as shown in the following figure.

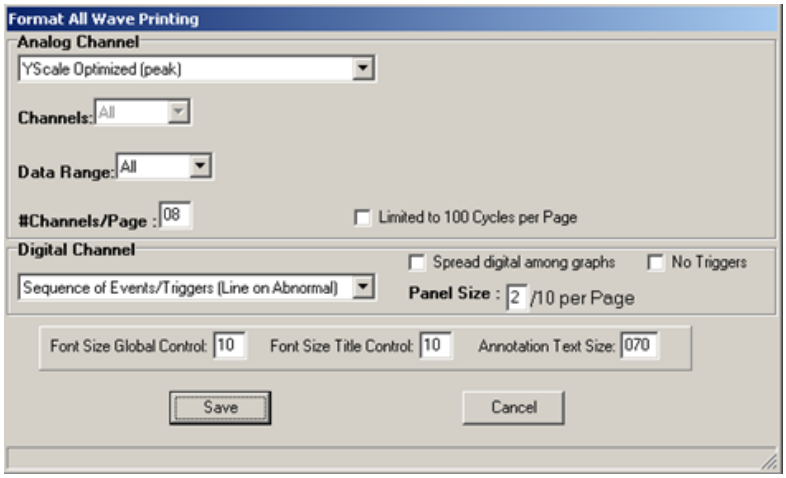


Figure 55: All Wave Printing Window

4. On the **Format All Wave Printing** window, from the **Analog Channel** list, select one of the following:

   YScale Optimized (peak)
   This option prints the highest peak value measured to the right-hand side of each oscillogram printed.

   YScale Optimized (unit/cm)
   This option prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed.

   Note: Print fewer oscillograms on a page to increase the resolution on the Yscale.

   YScale = Channel Full Scale Optimized (unit/cm)
   This option prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed. The value is based on the **Full Scale** setting in the Point Assignment Record and the number of oscillograms printed on the page.

   Note: Print fewer oscillograms on a page to increase the resolution on the Yscale.

   Yscale = User Select Scale (unit/cm)
   If you select this option, a **Yscale** box appears. Enter your preferred volts/cm or amps/cm scale. This option prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed, which is based on the Yscale you entered.

   Yscale Optimized (RMS)
   This selection prints the RMS value to the right side of each oscillogram printed.

   Note: Print fewer oscillograms on a page to increase the resolution on the Yscale. If the scale you specify is too small, waveform clipping will occur.

5. From the **Channels** list, select one of the following:

    - **All**
      This option prints an oscillogram for each analog channel listed in the Point Assignment Record.
    - **Selected**
      If you select this option, a **Select Channels** button appears. Click this button and then select the specific channels to print.
    - **Group**
      When selected, specific preset line groups can be printed.

6. From the **Data Range** list, select one of the following options:

    - **All**
      This option prints the entire length (X-axis) of all the oscillograms selected for printing.
    - **Selected**
      Each data point in an oscillogram has a number. The starting number is "0" which is usually the prefault portion of the waveform. The ending number depends on how long the fault or recording lasted. To print a partial record, X-axis length, enter the data range.

7. In the **#Channels/Page** box, enter the number of oscillograms you want on each printed page.

    Note: Print fewer oscillograms on a page to increase the resolution on the Yscale.

8. **Limited to 100 Cycles per Page** check box causes the report to limit to 100 Cycles per page for each channel displayed on a page.

9. There are two types of triggers, analog triggers and event triggers. You can print these triggers in conjunction with oscillograms. Triggers are represented by horizontal lines at the bottom of a printed or displayed page. In the **Digital Channel Format** list, select how the trigger line should appear, whether it is normal or abnormal:

    - **Sequence Of Events /Triggers (Line on Abnormal)**
      This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown it represents the period of time the event was abnormal.
    - **Sequence Of Events /Triggers (Line on Normal)**
      This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown it represents the period of time the event was normal.
    - **All Events/Triggers (Line on Abnormal)**
      This selection prints the analog triggers and event channels that were in an abnormal state when the record was created. If a line is shown it represents the period of time the analog trigger or event channel was abnormal.
    - **All Events/Triggers (Line on Normal)**
      This selection prints the analog triggers and event channels that were in an abnormal state when the record was created. If a line is shown it represents the period of time the analog trigger or event channel was normal.

10. **Spread digital among graphs,** if **Spread Digital** check box is **not** checked, the Analog channels are printed, then the Event Channels, on each page (See Figure 56). With **Spread Digital** check box checked the report shows the digital channels along with the Analog lines together (See Figure 57).

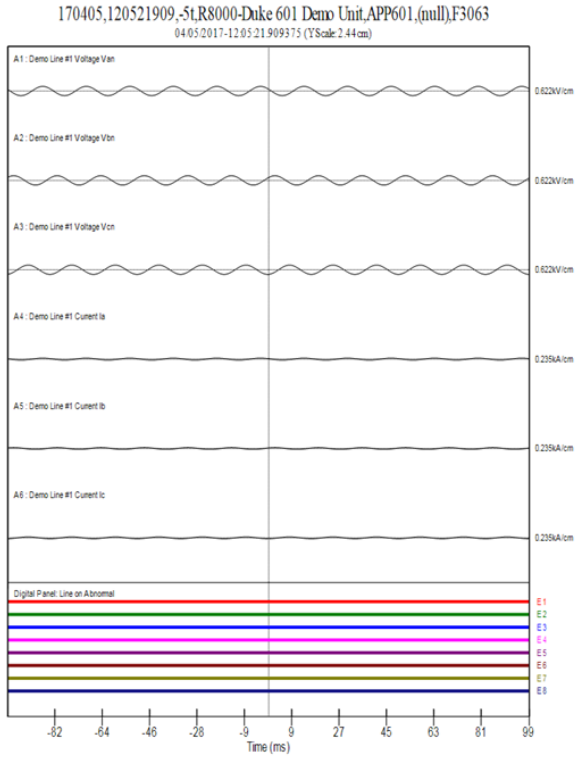


Figure 56: Default Report Format

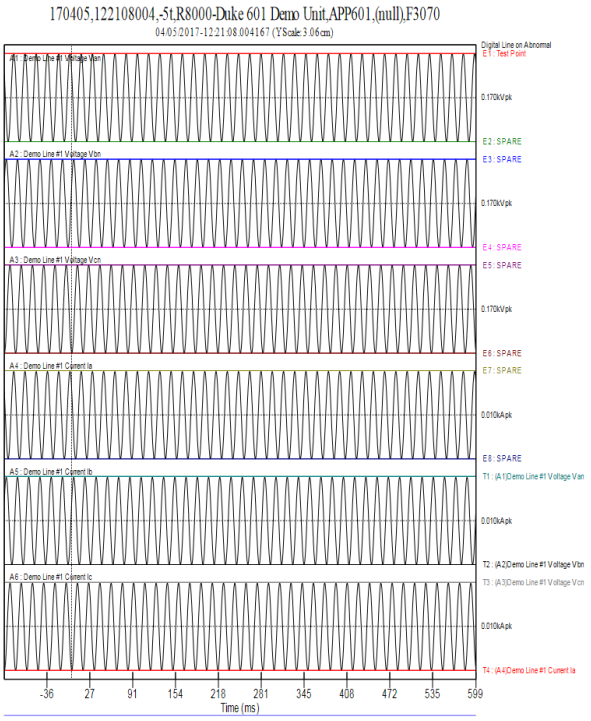


Figure 57: Report with Spread Digital Among Graphs Checked

11. **No Trigger** check box causes the report to exclude Analog Trigger faults from the report. An Event Trigger will still display if an Event Channel is set up, and an Event Channel caused the Trigger or an Event Channel changed state while the record was being created.
12. In the **Panel Size** box, enter the percentage of space the event and analog trigger lines will use at the bottom of a printed page.
13. In the **Font Size Global Control** box, enter the font size to be used for the title of the waveform pages and any annotations that may have been added. You cannot change the font on the **Fault Summary Report**.
14. In the **Font Size Title Control** box, enter the font size for the title that appears at the top of each waveform or oscillogram page.
15. In the **Annotation Text Size** box, enter the font size for any annotations that are added to a waveform or oscillogram page.
16. Click the **OK** button.
    The **ClearView Configuration** window appears.

➢ To Configure the Email Settings

1. In the **ClearView Configuration** window, click the **Automatic Tasks** tab.
2. Under **When Recorder Call-in or Auto Polling, Do,** select the **Auto Email** check box.
3. Click the **Email Settings** button.
   The **Email Settings** window appears, as shown in the following figure.

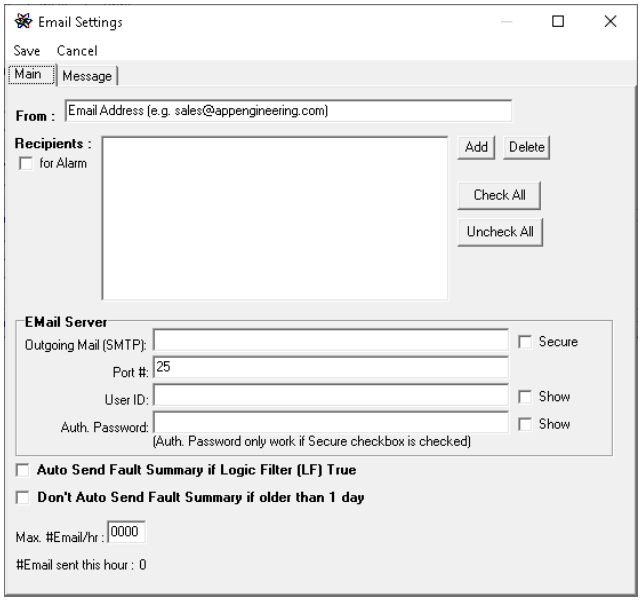


Figure 58: Email Settings Window

4. In the **From** box, type a valid email address.

5. The **Recipients** list, add or delete recipients' email addresses. The e-mail message will be sent to all of the recipients in this list. If no recipients are listed, click **Add** and specify a valid email address.

    - Use the "Check All" button to select all recipients at once.
    - Use the "Uncheck All" button to unselect all recipients at once.

6. **For Alarm**, checking the box will cause Clearview to send an email once a day if an Alarm has occurred changing the Alarm List.

7. Contact your network administrator to obtain values for the **Outgoing Mail (SMTP)**, **Port#**, **User ID** fields, and **Auth Password**.

    Note: The master station must have a SMTP/POP3 email account and connectivity in order to use the email feature.

8. Do you want ClearView to automatically email a summary of every fault each time the master station automatically retrieves a fault record or whenever an APP Recorder calls in a fault record?

    - If **yes**, then select the **Auto Send Fault Summary if Logic Filter (LF) True** check box. In addition, on the **Automatic Tasks** tab of the **Recorder Configuration** window for each APP Recorder, verify that the **Logic** box contains the appropriate value. For more information on completing the **Logic** box, see **Defining a Boolean Logic Equation** in the *APP Recorder Operating Manual***.**
    - If **no**, skip to the next step.

9. **Auto Send Fault Summary**, do you want the Auto Send Fault Summary function to limit what is sent to the Master Station to any faults less than 1 day old?
    - If **yes**, then click the **Don't Auto Send Fault Summary if older than 1 day** check box.
    - If **no**, skip to the next step

    This function works only if Auto Send Fault Summary is also checked.

10. In the **Max #Email/hr:** box, type the maximum number of emails that ClearView should send every hour.

11. From the menu bar, click **Save**. At this point, you have completed configuring e-mail settings. It is a good idea to send a test e-mail to ensure that messages will be sent properly. To do this, complete the procedure, *To Test the Email Function.*

➢ To Test the Email Function

In the **Send Email** window, click the **Message** tab.
The **Message** tab appears, as shown in the following figure. From here, you can type an email and manually send it to everyone in the **Recipient** list.

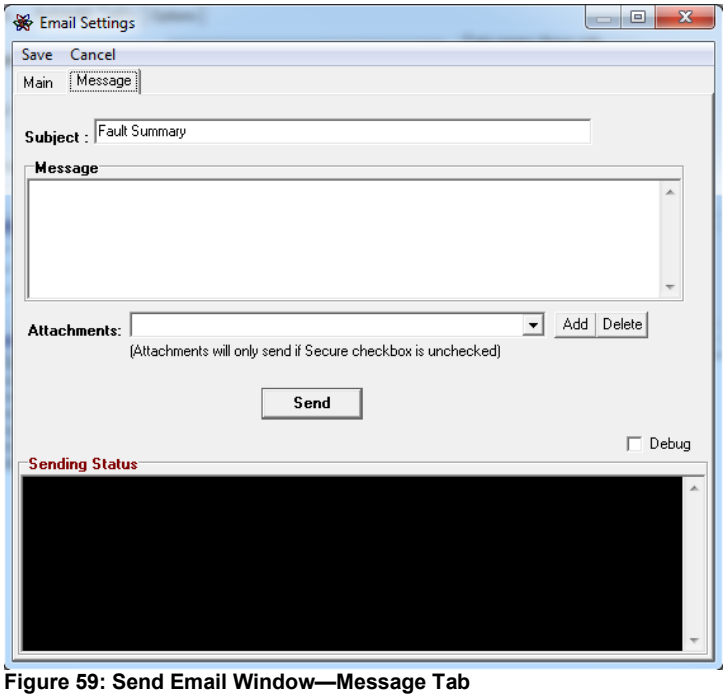


Figure 59: Send Email Window—Message Tab

1. In the **Subject** box, type the subject line for the email.
2. In the **Message** box, type the message.
3. In the **Attachments** list, select an attachment to include. Use the **Add** and **Delete** buttons to select or remove additional files.
4. The **Debug** checkbox is for APP Engineering use only.
5. Click **Send**.

➢ To Configure the Automatic Printing of a Fault Summary Report

1. In the **ClearView Configuration** window, click the **Automatic Tasks** tab.
2. Under **When Recorder Call-in or Auto Polling, Do,** select the **Auto Print FSum** check box.
3. From the menu bar, click **Save**.

➢ To Configure the Automatic Printing of a Sequence of Events Report (SER)

1. In the **ClearView Configuration** window, click the **Automatic Tasks** tab.
2. Under **When Recorder Call-in or Auto Polling, Do,** select the **Auto Print SeqEv** check box.
3. From the menu bar, click **Save**.

➢ To Configure the Automatic Syncing of the Times in ClearView and on the APP Recorder

1. In the **ClearView Configuration** window, click the **Automatic Tasks** tab.
2. Under **When Recorder Call-in or Auto Polling, Do,** select the **Sync Recorder Time with ClearView** check box.

   The date and time from the master station is downloaded to the APP Recorder. This feature is mainly used by companies that prefer to sync the master station instead of the individual APP Recorders.
3. From the menu bar, click **Save**.

4.17.7 Selecting Recorders for Auto Polling

You can specify which APP Recorders you want ClearView to automatically poll for fault summary files and fault data.

➢ To Select Recorders for Auto Polling

1. In the **ClearView Configuration** window, click the **Automatic Tasks** tab.
2. Under **Select Recorders for Auto Polling,** select the check box for each APP Recorder that you want to auto-poll.
3. From the menu bar, click **Save**.

4.17.8 Configuring Options

➢ To Configure Options

1. In the **ClearView Configuration** window, click the **Options** tab.
   The tab appears, as shown in the following figure.

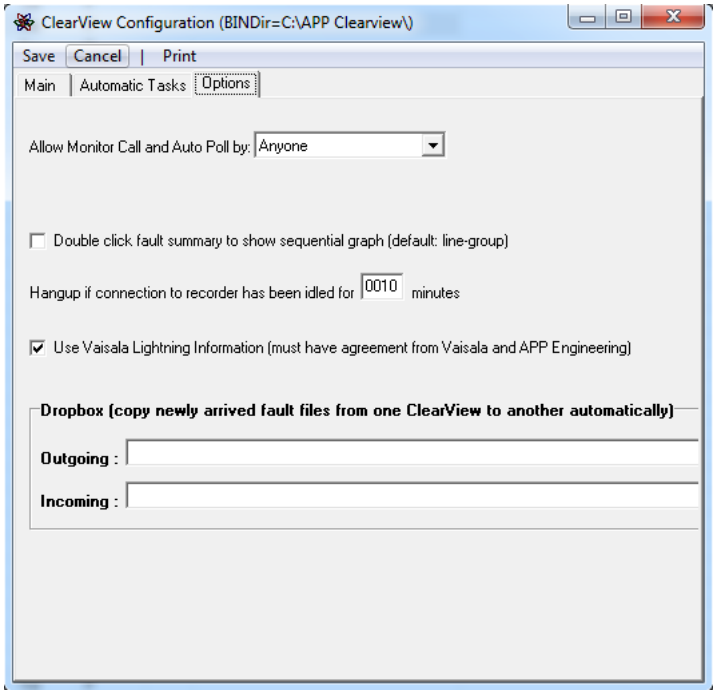


Figure 60: ClearView Configuration Window—Options Tab

2. Do you want to restrict who should be allowed to enable the Monitor Incoming Calls option?
   - If **yes**, then from the Allow Monitor Call and Auto Poll list, select the name of your administrator.
   - If **no**, leave the default setting of **Anyone**.
3. How do you want the fault summary data to appear?
   - If you want to view the faulted line group or first line group, select **Double click fault summary to show sequential graph (default: line-group).**
   - If you want to display analog channels in sequential order when a fault record is viewed, skip to the next step.

4. After normal communication has been established between the APP ClearView and the APP Recorder programs, the ideal disconnect situation is for someone at the master station or someone at the APP Recorder to initiate a disconnect or hang up command. When this is done, both programs are aware of the disconnect request and can properly close down communications.

   However, it is possible for a communication path to be cut without notice. This results in neither program receiving notice of the disconnect. Therefore, a hang up timer is needed to ensure that both programs receive an automatic command to release the communications link.

   The default hang up timer for both the APP Recorder and APP ClearView programs is 10 minutes. However, the APP Recorder hang up timer has a delay making its effective default time 10 minutes and 30 seconds. Therefore, in the case of no communications activity, the APP ClearView program will be the first to initiate a hang up action.

   Do you want to make the ClearView the first program to initiate a hang up action in the event of an unexpected disconnect?

   - If **yes**, then in the **Hang up if connection to recorder has been idle for X minutes** box, type a value less than 10 minutes.
   - If **no**, skip to the next step.

5. **Vaisala Lightning information,** if you have an account with Vaisala to receive lightning strike information, you can use ClearView to correlate lightning strike locations with recorded faults.

   To enable **lightning information**, check the box and then follow instructions to set up Clearview for Correlation of lightning information in Section 13.4 Vaisala Lightning Configuration on the Tools menu.

6. **Dropbox**, using the Dropbox feature allows you to copy fault records to another Clearview on another network automatically upon arrival.
   1. **Outgoing:** Enter or browse to the path where outgoing Fault files are
   2. **Incoming:** Enter or browse to the path where incoming Fault files will go.

7. Click **Save**

4.17.9 Printing Clearview Configuration

You can print the configuration information by clicking **Print** at the top of the screen then selecting **Print Preview** or **Print**. Print Preview allows you to review the report, save, change the printer preferences, and print.

4.18 Managing the Phone and Network List

The master phone list contains the phone numbers, IP Address, or Master ID's of the APP Recorders which the master station will automatically call. It also contains the passwords that are necessary to access the APP Recorders.

➢ To Configure the Master Phone List

1. In the **APP ClearView** window, from the **Edit** menu, click **Phone and Network List**.
   The Phone and Network List window appears, as shown in the following figure.

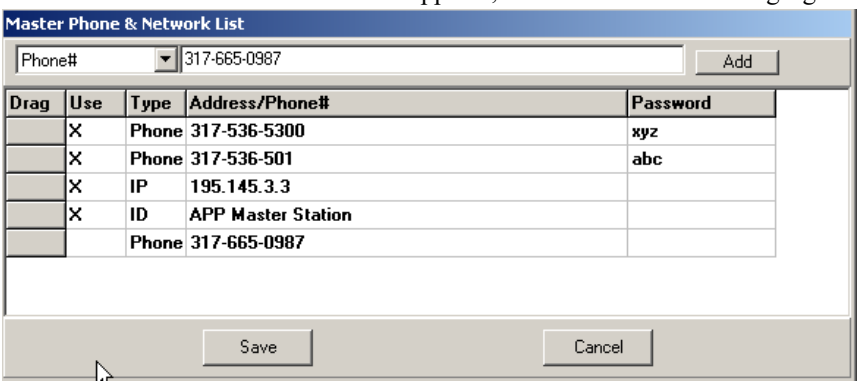


Figure 61: Master Phone & Network List Window

2. Do you want to add a new IP address or phone number for an APP Recorder?

   If **yes**, then do one of the following:

   If the APP Recorder is connected to a phone line, then from the list, select **Phone#**. Then in the corresponding box, type the phone number. You can use any standard Windows format. Click the **Add** button.

   If the APP Recorder is connected to an IP address, then from the list select **IP Addr**. Then in the corresponding box, type the IP address. You can use any standard Windows format. Click the **Add** button. For information on configuring DialNet, see *Setting Up Dial-up Networking*.

   If **no**, skip to the next step.

3. By default, the first entry that you make is selected, as indicated by the X in the **Use** column. The entry with the "X" is the number that APP ClearView will call when it connects to or calls the APP Recorder. You can activate multiple phone numbers and/or IP addresses.

   Do you want to activate or de-activate a phone number or IP address?

   If **yes**, then in the **Use** column, click the box next to the entry. An X appears when the entry is activated; it disappears when the entry is deactivated.

   If **no**, skip to the next step.

4. Do you want to delete a number?

   If **yes**, then right-click the number and then click **Delete**.

   If **no**, skip to the next step.

5. Do you want to reorder entries?

   If **yes**, then under the Drag column, click the gray box that corresponds to the entry you want to move and then move it to its new position.

   If **no**, skip to the next step.

6. Click **Save**.

4.19 Setting Up DialNet

Setting Up Dial-up Networking

DialNet is for users who want to use Remote Desktop or a similar program to access the APP Recorder using the same phone line as the APP Recorder. The following is the procedure to set up DialNet. This procedure is also in Readme.txt located inside of the ClearView directory.

Note: If Windows 10 is running Dial-Up Networking will be set to Off and unable to be turned ON.

To establish dial-up networking, you must complete the setup procedures on both the APP Recorder (server) computer and on the ClearView (client) computer.

For Windows 7 and 10

Dial-up Networking using Windows 7 and 10, is supported on a case-by-case basis. To setup Dial-up networking with Windows 7 or above, please contact APP Engineering support at **(317) 536-5300.**

Things to Remember

- The Dial-up network IP Address of the Recorder is (200.200.200.200)
- The Dial-up network IP Address of the ClearView computer is (200.200.200.201)
- Use IP:200.200.200.200 to call the Recorder when using Remote Desktop or UltraVNC or whatever
- The dial-up network can only be disconnected by the application that started it.
- The dial-up network will stop the Internet connection and also could stop some local LAN.
- The Internet will resume automatically after the dial-up network connection is disconnected.

5. Working with Fault Records

5.1 Retrieving the Fault Summary File

The Fault Summary file shows a summary of faults and associated triggers for the currently selected APP Recorder. The number of faults contained inside the Fault Summary file is controlled by a setting in the APP Recorder's configuration. Typically, the APP factory sets the number to 250, but it can be changed at your discretion. The larger the number, the longer it takes to retrieve the Fault Summary file.

➢ To Get the Fault Summary File

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to retrieve a fault summary file.
2. Right-click anywhere in the table portion of the **APP ClearView** window. The menu shown in the following figure appears.

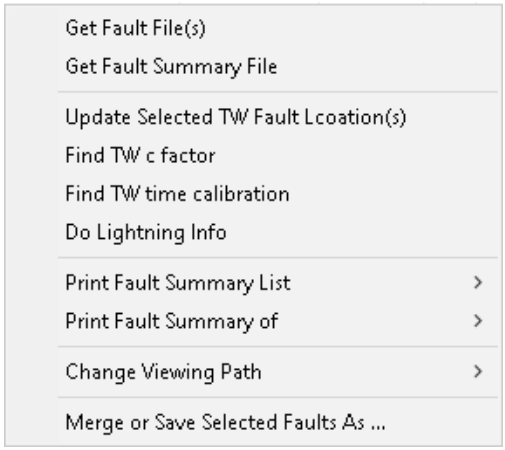


Figure 62: Summary and Fault Menu

3. Click **Get Fault Summary File**.

Tip: You can also retrieve the Fault Summary file by clicking the icon shown in the following figure.

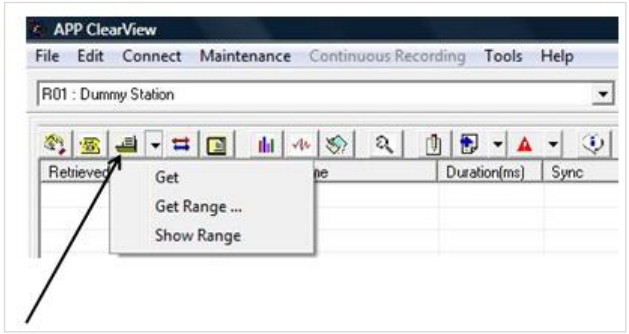


Figure 63: Get Fault Summary File Icon

4. The Fault Summary file is immediately uploaded. In the **APP ClearView** window, **the Fault Summary** tab is populated with transient and extended fault records.

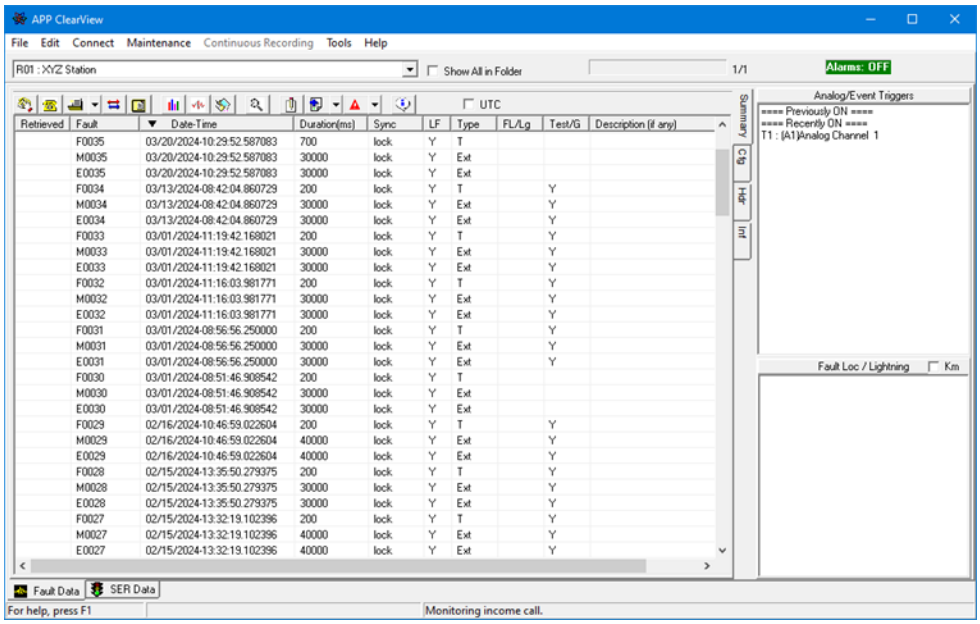


Figure 64: APP ClearView Window with Retrieved Fault Summary Information

Note: Only the Fault Summary file is retrieved. Oscillograms cannot be viewed because the data has not been retrieved. Also notice that there are no check marks in the **Retrieved** column.

File Type Definitions:

- F – Transient Fault Record
- E – Extended Oscillography Record
- M – RMS Plot Data (Derived from Extended Oscillography Record, E file)
- W – Traveling Wave Fault

5.2 Retrieving the Fault File(s)

The **Fault Summary** tab of the **APP ClearView** window now displays all of the fault records from the APP Recorder. However, none of them have been saved to the master station computer. You need to complete the retrieval process by selecting specific fault records.

Retrieved records are in COMTRADE format. You can view them with the APP ClearView software or with any COMTRADE viewer.

The time it takes to retrieve data is dependent on the record length(s), the number of records being retrieved, and the type of connection between the master station and the APP Recorder (i.e. Modem or Network).

➢ To Get the Fault File(s)

1. In the **Fault Summary** tab, click the row(s) of the fault record(s) that you want to retrieve. To retrieve multiple records at the same time, highlight multiple rows by using the standard Windows **Control and Shift key** functions.

2. Do one of the following to get one or more files:

   - Right-click any of the selected rows. From the menu that appears, click **Get Fault Files**.
   - Click the  down arrow then click **Get**.

Note: If you are not already connected to the APP Recorder, the master station will first attempt to connect to it automatically.

Once a fault record has been retrieved, a check mark will appear in its row under the **Retrieved** column, as shown in the following figure.

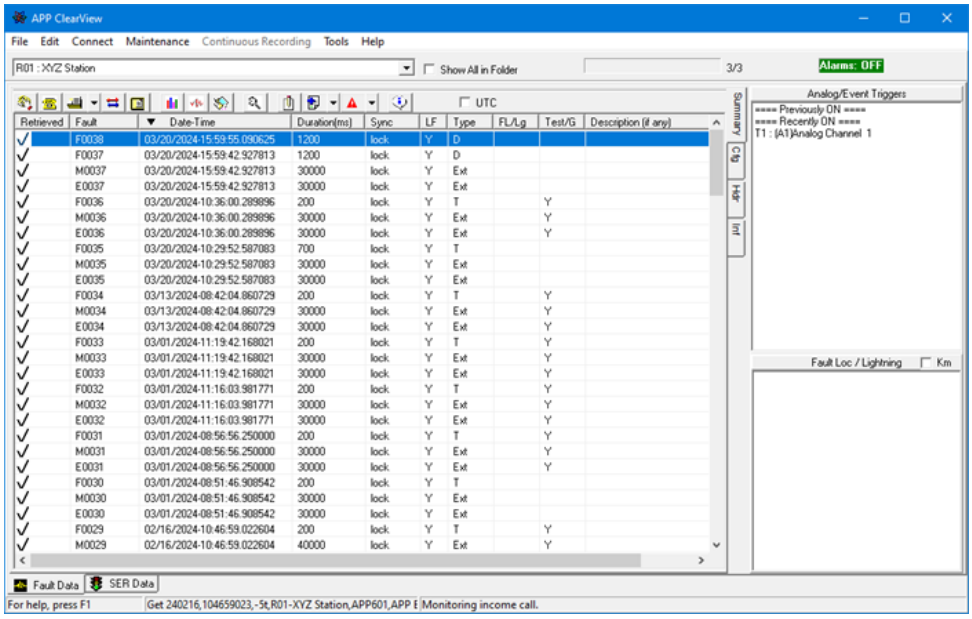


Figure 65: APP ClearView Window with Retrieved Fault Records

APP ClearView places retrieved records in the **C:\APP Recorder\Data** folder. However, if you specified a different path during the installation process, ClearView places the retrieved records there instead.

5.3 Viewing the Pop-Up Menu for Fault Records

When you right-click on a specific fault record in the **Fault Summary** tab, the following menu appears.

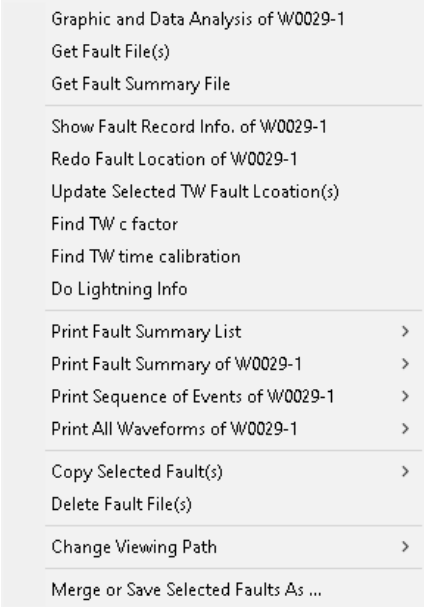


Figure 66: Summary Window and Fault Record Pop-Up Menu

Here, you can select various features related to the highlighted fault record. If you have selected multiple records, the record with the larger fault ID is referenced in the pop-up menu.

The following sections describe these menu items in more detail.

5.4 Viewing a Graphic and Data Analysis of a Fault Record

➢ To View the Graphic and Data Analysis of a Fault Record

In the **Fault Summary** tab, right-click the fault record that you want to view.
If no other graphs are already open, then the **Graphic and Data Analysis** window appears. This window displays the oscillogram for the fault record.

If one or more **Graphic and Data Analysis** windows are already open, then the **Graphic Choices** menu appears.

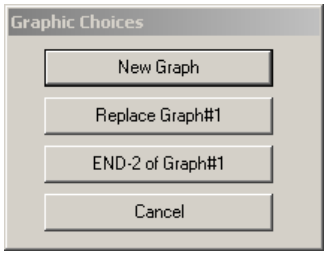


Figure 67: Graphic Choices Menu

Do one of the following:

- To open another Graphic and Data Analysis window, click New Graph.
- To replace the data in the first Graphic and Data Analysis window with the data for the selected fault data record, click on Replace Graph#1.

- To put the data for the selected fault data record as END-2 into Graph#1. If END-2 in Graph#1 already has data, it will be replaced.

Tip: Open one graph as END-1 then use the APP Recorder list to switch to a different APP Recorder and select another fault as END-2.

5.5 Viewing the Fault Record Information

You can view detailed Fault Record Information for a fault, which includes the maximum and minimum RMS values for each analog channel as well as trigger involvement.

➢ To View the Fault Record Information

1. In the **Fault Summary** tab, single-click the fault record that you want to view.
2. Do one of the following:
   - Right-click the fault record that you want to view and select Show Fault Record Info.
   - Click the  icon.

   The **Fault Record Information** window appears.

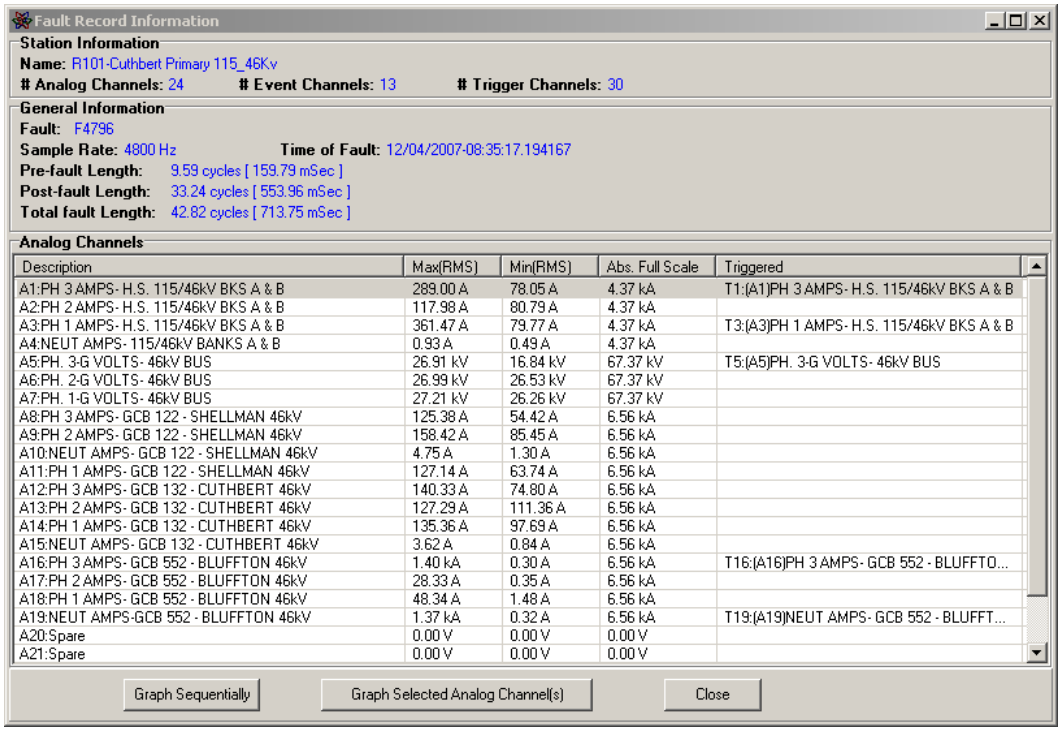


Figure 68: Fault Record Information Window

3. After examining the data, you can select analog data to plot graphically by holding down the Control key and then clicking the desired channels. You can do one of the following:
   - To display the selected analog channels in a graph, click the **Graph Selected Analog Channel(s)** button.
   - To display the selected analog channels sequentially, click the **Graph Sequentially** button.
4. When you are finished viewing the information, click the **Close** button.

Note: You can leave the Fault Record Information window open while you work with other fault records. This window will stay on top of other windows until you close it. You can choose a different fault record by clicking the **Fault Summary** tab or by switching to a different substation. Click this menu again to update this information displayed in this window.

5.6 Redoing the Fault Location Calculation for a Fault Record

There are two types of Fault Location methods available with the APP Engineering DFR. The 1st is an impedance-based method the 2nd is Traveling Wave method. This function applies to both methods. Below describes redoing the Fault location calculation for each fault location method.

➢ Impedance Based Method

If ClearView contains a properly configured Line Group Record, and there is sufficient transient data, the fault location calculation is performed automatically by the APP Recorder. However, you may want to perform a manually activated calculation in the following situations:

1. The line-group record may not have been loaded on the APP Recorder at the time of the fault.
2. A COMTRADE record for another DFR might need a manually activated fault location performed.
3. Within the **Graph and Data Analysis** window, the user zooms in on a transient oscillogram and wishes to perform another calculation.

The APP Recorders use an impedance-based method for calculating the distance to fault. The APP Recorder itself uses a single-ended calculation. A double-ended calculation can be performed by pulling data from each end of a faulted line back to the APP ClearView master station software and manually initiating a double-ended calculation command.

For the system to automatically perform a single-ended fault location calculation the line length, positive resistance (R1), positive reactance (X1), zero resistance (R0), and zero reactance (X0) must be entered into the Line Group Record. Also, the analog channel physical connection must be a phase-to-ground connection.

➢ Traveling Wave Method

If Traveling Wave (TW) boards and connections as described in the APP Recorder Manual has been established and A Line Group and TW channels are configured Traveling Wave records can be created. (See Section 6.18 Configuring Traveling Wave Channels). Also, for more information see below Section 5.7 Traveling Wave Fault Location).

Redoing the Traveling Wave calculation may be needed if a user calibrated the C Factor or a Time Calibration has been done after the fault record was created then you will want to redo the fault location calculation.

➢ To Redo the Fault Location Calculation for a Fault Record

1. In the **Fault Summary** tab, right-click the fault record.
2. Click **Redo Fault Location** of FXXXX or WXXXX(where XXXX represents the fault number).

5.7 Traveling Wave Fault Location

Introduction

Travelling Wave Fault Location (TWFL) is a method to determine the location of a fault on an electrical line. The level of accuracy compared to other methods is such that the time needed to visually search for the fault in the field is greatly reduced.

By using the information about the length of the line, the time of when the fault was recorded, and the velocity at which the fault moves along the line (information which is known at the time of setup), the Recorder's TWFL feature can determine the location of the fault along the line.

Concept

The concept of travelling wave fault location is based on the relation between distance travelled (displacement) and time. From classical kinematics, we know that displacement is proportional to the time taken for that displacement,

$$x \propto t$$

where x is displacement and t is the time taken for the that displacement. Then the constant of proportionality between the two quantities is the velocity c,

$$x = ct$$

5.7.1 Single End and Double End

Single end and double end TWFL refers to the configuration of the TWFL apparatus. Single end TWFL, only one end of the line is setup to record TWFL data. Double end TWFL, both ends of he line are setup to record TWFL data. Because double end TWFL returns twice the amount of data compared to single end TWFL, double end TWFL is generally more likely to be more precise in locating faults along the line than single end TWFL.

5.7.2 Double End TWFL

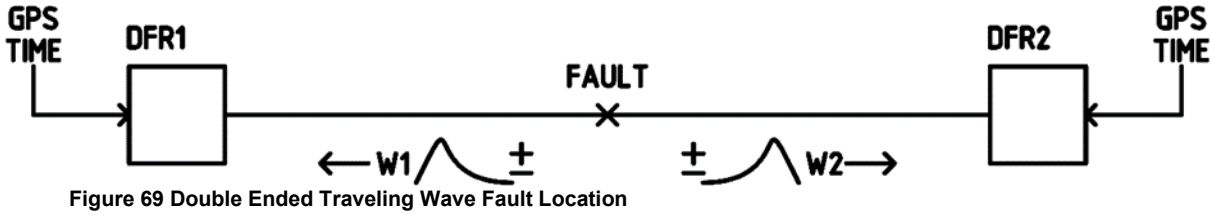


Figure 69 Double Ended Traveling Wave Fault Location

The diagram above represents a double end TWFL setup. DFR1 represents the DFR on left end of the line, and DFR2 represent the DFR on the right end of the line. The FAULT happens at some undetermined point along the line and the signals of the fault, W1 and W2, travel along the line away from the fault towards DFR1 and DFR2 respectively. The peak amplitude of W1 and W2 can be either positive or negative. Both DFR1 and DFR2 are receiving signals of GPS TIME (through IRIG-B) and therefore are synchronized in time.

Let t_0 be the time that the fault happens at FAULT, and W1 and W2 are generated simultaneously. W1 and W2 travel along the line with speed c. Let t_1 be the time that the signal W1 reaches DFR1 and let t_2 be the time that the signal W2 reaches DFR2. Let L be the total length of the line, and L_1 be the length of the line from DFR1 to FAULT, and L_2 be the length of the line from DFR2 to FAULT.

L_1 and L_2 are unknown and are the final quantities we are trying to determine. To do this, we must first determine t_0, which is also unknown. We can do this by using the time data collected by DFR1 and DFR2, t_1 and t_2.

The time taken for W1 to travel from FAULT to DFR1 is $t_1 - t_0$. Similarly, the time taken for W2 to travel from FAULT to DFR2 is $t_2 - t_0$. Using the relationship between displacement and time described earlier, this gives us the equations,

$$L_1 = c(t_1 - t_0)$$
$$L_2 = c(t_2 - t_0)$$

Then the sum of L_1 and L_2 should give us the total line length L,

$$L = c\big((t_1 - t_0) + (t_2 - t_0)\big)$$

The Recorder then uses this equation to solve for t_0, and subsequently for L_1 and L_2.

5.7.3 Single End TWFL

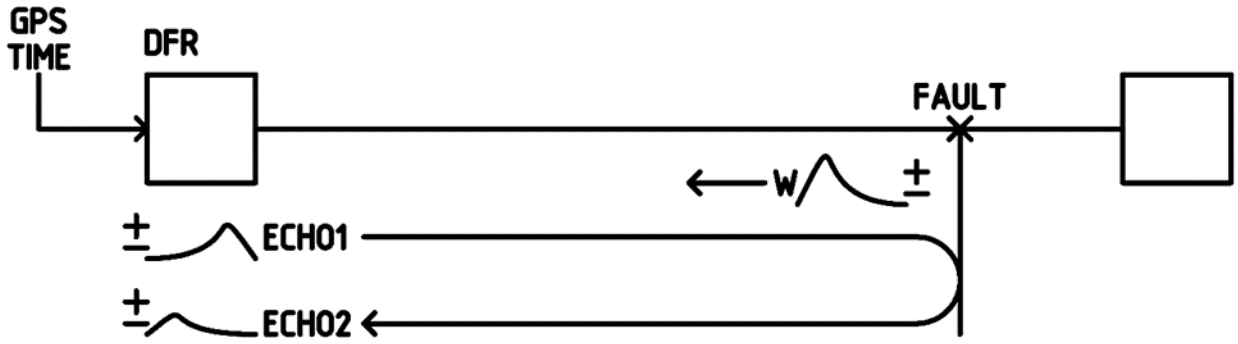


Figure 70 Single Ended Traveling Wave Fault Location

The diagram above represents a single end TWFL setup. DFR represents the DFR on the recorded end of the line. The FAULT happens at some undetermined point along the line and the signal of the fault, W, travels along the line away from the fault towards DFR. The peak amplitude of W can be either positive or negative. DFR is receiving signals of GPS TIME (through IRIG-B). When W reaches the DFR, it will reflect as ECHO1, which is similar to W, but diminished in amplitude, and travels away from DFR towards FAULT. When ECHO1 reaches FAULT, it will reflect as ECHO2, which is similar to ECHO1, but diminished in amplitude, and travels away from FAULT towards DFR.

Let t_0 be the time that the fault happens at FAULT, and W is generated. W travels along the line with speed c. Let t_1 be the time that the signal W reaches DFR and ECHO1 is generated. Then let t_2 be the time that the signal ECHO2 reaches DFR. Let L be the length of the line from DFR to FAULT.

L is unknown and is the final quantity we are trying to determine. Because the speed at which a signal travels along the line remains invariant, we know that the time between ECHO1 leaving DFR and ECHO2 reaching DFR is twice the time taken for W to travel from FAULT to DFR. Meaning, if we let Δt be the time taken for a signal to travel the distance L, then the distance a signal has to travel from DFR to FAULT and to be reflected back to DFR from FAULT is $2L$, and the time it will take to travel that distance is $2\Delta t$. So, the time taken for a signal to travel from FAULT to DFR, Δt is,

$$\Delta t = \frac{t_2 - t_1}{2}$$

Then from the relationship between displacement and time described earlier, the distance from DFR to FAULT is,

$$L = c\left(\frac{t_2 - t_1}{2}\right)$$

NOTE: The Recorder does not calculate single end TWFL automatically. The time-mark data and this equation must be used in conjunction by the user to determine the distance to the fault.

5.7.4 SOFTWARE

To use the TWFL feature, APP software version 2.9.8 greater must be installed.

All TW fault records have a fault number prefixed with **W** and will have a fault type of **Tw**. The TW faults will be listed in the fault summary list with other faults. The format of the fault numbers is Wxxxx-xx and will increment before and after the dash accordingly for each fault or set of faults. The date and time of the beginning of the fault is shown in the Date-Time column to the right of the Fault column.

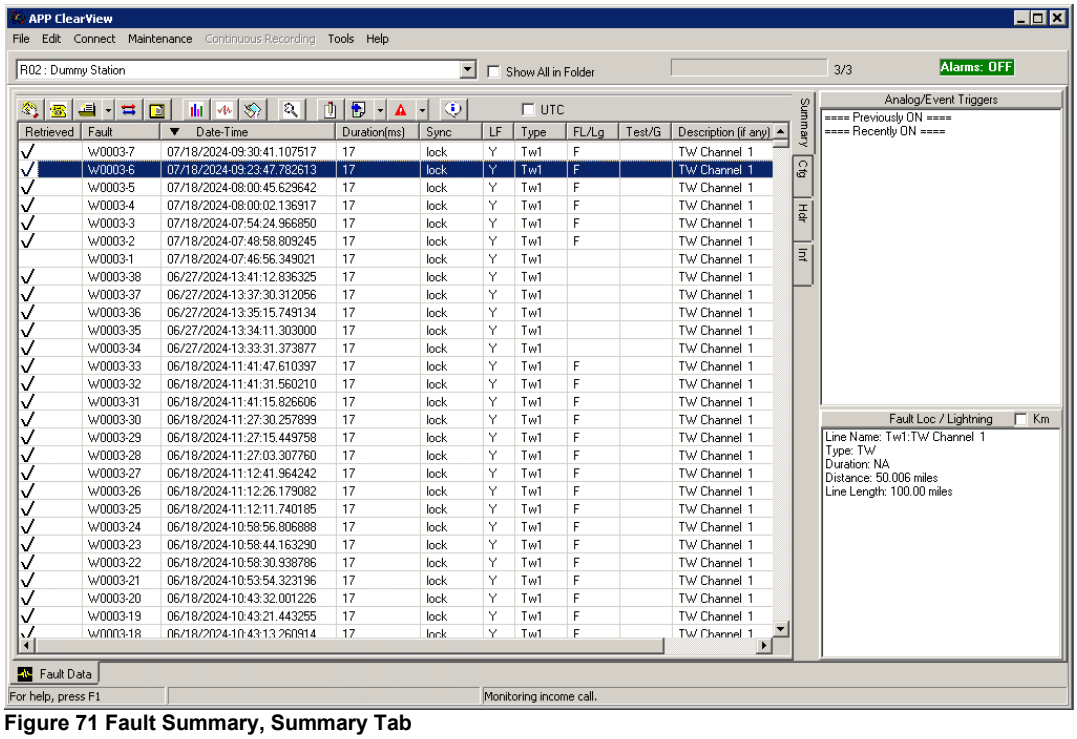


Figure 71 Fault Summary, Summary Tab

To see the information about a fault, click once on a fault to highlight the fault, then click the **Inf** tab to the right of the fault summary list, the following screen appears.

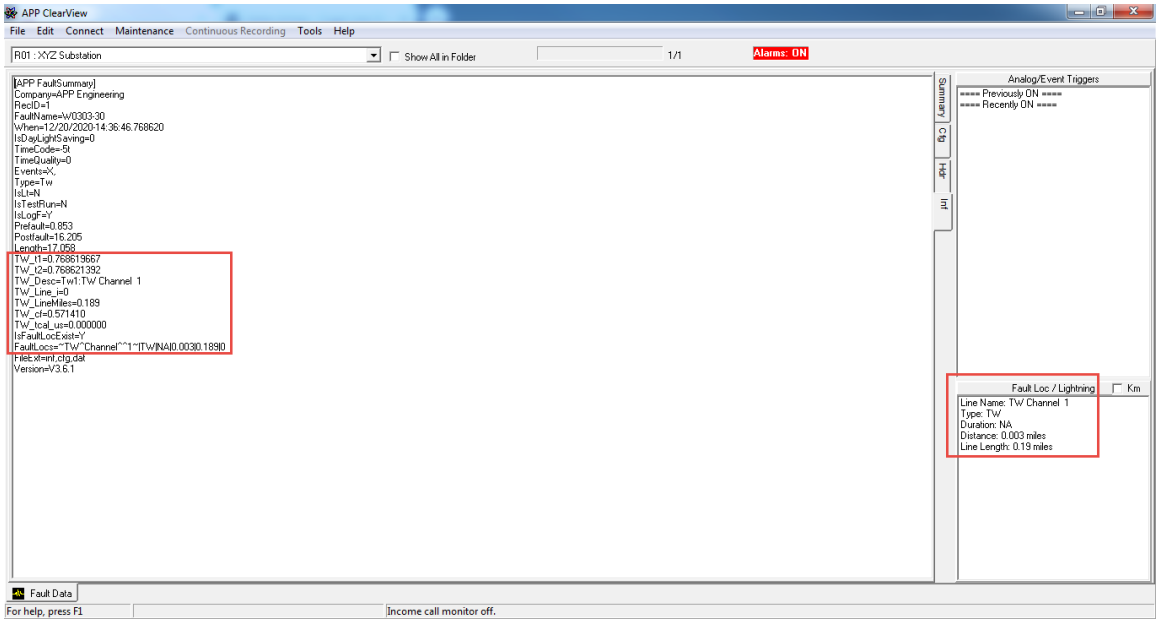


Figure 72 Traveling Wave Fault, Inf Tab

➢ **The fault summary values relevant to TWFL are:**

TW_t1

For double end fault location, this value indicates the time when the fault arrived at the local DFR on the end of the line the fault was recorded. Therefore, **TW_t1** and **TW_t2** should have their respective values swapped for the fault recorded at the remote DFR on the other end of the line. The value is a fraction of a second at a nanosecond precision.

For single end fault location, this value indicates the time when the fault arrived at the DFR on the end of the line the fault was recorded.

TW_t2

For **double end fault location**, this value indicates the time when the fault arrived at the remote DFR on the other end of the line the fault was recorded. Therefore, **TW_t1** and **TW_t2** should have their respective values swapped for the fault recorded at the remote DFR on the other end of the line. The value is a fraction of a second at a nanosecond precision.

For **single end fault location**, this value may or may not be displayed and can be disregarded.

TW_Desc

This value represents the name given to the channel that recorded the fault. It is set in the PAR and the default format is **Tw#:TWChannel #.** The channels are incrementally numbered automatically in the PAR at time of setup.

TW_Line_i

This value represents the line the channel recorded the fault from. It is set in the PAR and the format is and integer. The default line number is automatically to 0 in the PAR at time of setup.

TW_LineMiles

This value represents the length of the line the channel recorded the fault from. It is set in the PAR and the format is a number in miles with a 3-decimal place precision.

For **double end fault location**, the length of the line from the local DFR to the remote DFR should be known and input into the PAR at time of setup.

For **single end fault location**, the length of the line is from the local DFR to where the line terminates. However, this information is not used for single ended calculation.

TW_cf

This value represents the speed of light factor used to calculate the distance of the fault from the DFR. It is set in the PAR (**c factor**) and the format is a number that is a fraction of the speed of light with a 6-decimal place precision. The default line number is automatically to 0 in the PAR at time of setup.

TW_tcal

Time from a Fault to each end of the line should be symmetrical relative to where the fault occurred on the line. If differences in infrastructure of the stations at each end or some other factor causing the time not to be symmetrical, you can use tcal to calibrate the time to obtain a better result. Time Calibration does not have to be done until the first TW fault record has been created. The field is 3 decimal place precision and the value is 0.000 unless it is adjusted by a user using the Time Calibration process. To determine the calibration factor and entering it into the Point Assignment record see *(5.10* Find TW Time Calibration (tcal).

FaultLocs

This value includes information about the location of the fault including the channel that recorded the fault, the fault type, the region the fault was recorded in, distance to the fault, and the length of the line. The format is **~TW^Channel^^#~|TW|NA|x.xxx|x.xxx|0** where # is the channel number and first x.xxx is the distance to the fault and the second x.xxx is the length of the line.

5.8 Update Selected TW Fault Location(s)

If a user manually copies a TW fault into the Clearview data folder then use **Update Selected TW Fault Location** to calculate the fault distance.

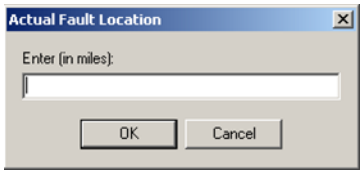
1. Right click on the **fault record** that you would like to update the location for.
2. Click **Update Selected TW Fault Location(s)** in the pop-up dialogue.

5.9 Find TW C Factor

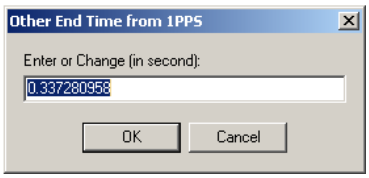
Calibration does not have to be done until the first TW fault record has been created. If the distance to fault result is not correct, the c factor can be recalibrated to obtain a better result.

➢ **To calibrate the c factor**

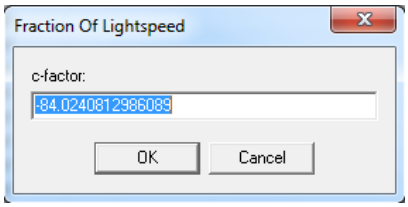
1. Right click on the **fault record** that you would like to recalibrate for
2. Click **Find TW c factor** in the pop-up dialogue
3. Enter the **Actual Fault Location** in miles



4. Click **OK**
5. Then enter the **Other End Time** from IRIG-B value. This value is obtained from the corresponding TW fault record of the remote end of the line



6. Click **OK**
7. The c factor calculated from the two quantities entered is then shown in the text field. The user may choose to accept this calculated c factor value by clicking OK, or enter their own.



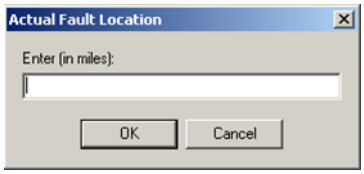
8. To update the **c factor** in the **Point Assignment Record**, you may copy this value and paste into the Point Assignment Record.
9. Click **OK**.

5.10 Find TW Time Calibration (tcal)

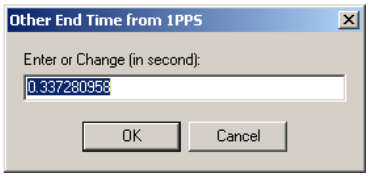
Time Calibration does not have to be done until the first TW fault record has been created. If the time of the traveling wave is not symmetrical at each end of the line, you can use tcal to calibrate for differences in infrastructure of the stations or other factors causing the time inconsistency. The time can be recalibrated to obtain a better result.

➢ **To set the Time Calibration (tcal)**

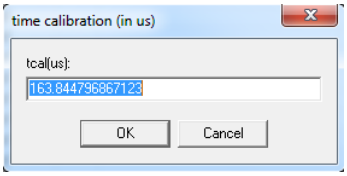
1. Right click on the **fault record** that you would like to recalibrate.
2. Click **Find TW Time Calibration** in the pop-up dialogue.
3. Enter the **Actual Fault Location** in miles.



4. Click **OK**
5. Then enter the **Other End Time** from IRIG-B value. This value is obtained from the corresponding TW fault record of the remote end of the line.



6. Click **OK**
7. The **tcal** calculated from the two quantities entered is then shown in the text field. The user may choose to accept this calculated Tcal value by clicking OK or enter their own.



8. To update the **tcal** in the **Point Assignment Record**, you may copy this value and paste into the Point Assignment Record.
9. Click **OK**.

5.11 Correlating Lightning Information

If you have an account with Vaisala to receive lightning strike information, you can use ClearView to correlate lightning strike locations with recorded faults. Be sure you have the "Use Vaisala Information" box checked in the Clearview Configuration Options Tab see **Section 4.17.8 Configuring Options,** and see Section 13.4 Vaisala Lightning Configuration for setup instructions.

➢ **To Correlate Lightning Information**

1. In the **Fault Summary** tab, right-click the fault record.
2. Click **Do Lightning Info**.

5.12 Printing the Fault Summary List

You can preview or print the list of faults displayed in the **Fault Summary** tab.

➢ To Print the Fault Summary List

1. In the **Fault Summary** tab, right-click anywhere.
2. Point to **Print Fault Summary List** and then do one of the following:
   - To preview what will be printed, click **Preview**.
   - To send the contents to the printer, click **Print**. Then complete the fields in the **Print** window and click the **OK** button.

5.13 Printing the Summary of a Fault Record

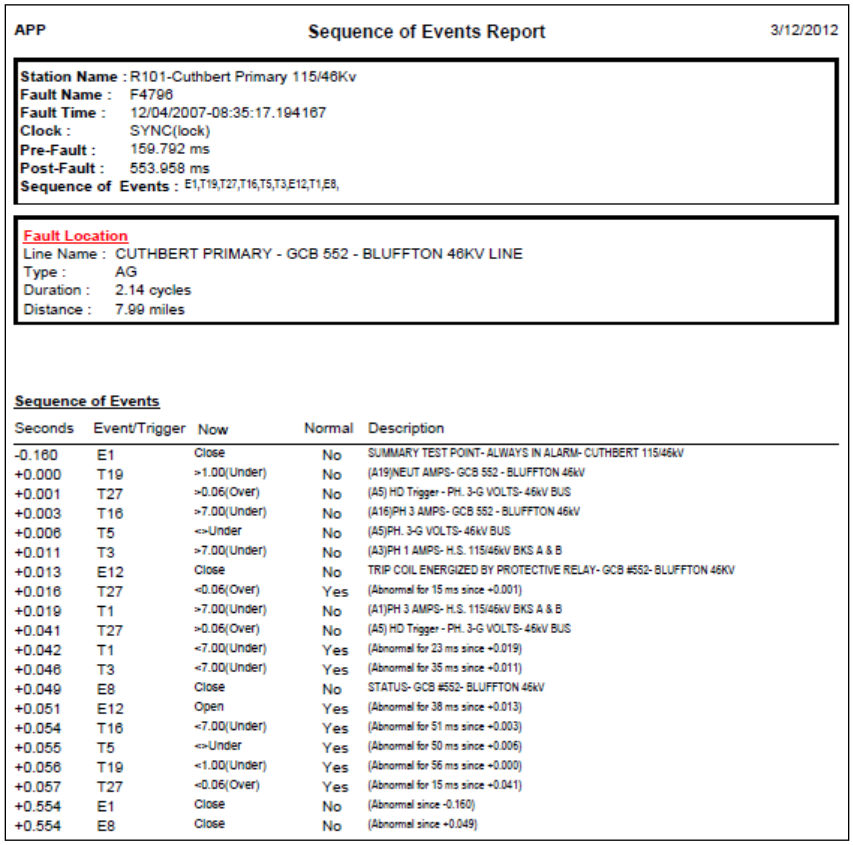
You can preview or print the information displayed in the **Fault Summary** tab for a specific record.

➢ To Print the Summary of a Fault Record

1. In the **Fault Summary** tab, right-click the fault record that you want.
   The pop-up menu appears.
2. Point to **Print Fault Summary of FXXX** and then do one of the following:
   - To preview what will be printed, click **Preview**.
   - To send the contents to the printer, click **Print**. Then complete the fields in the Print window and click the **OK** button.

5.14 Printing the Sequence of Events Report for a Fault Record

You can preview or print the sequence of analog and digital triggers for a specific fault record. The following figure shows a sample report.



APP — Sequence of Events Report — 3/12/2012

Station Name : R101-Cuthbert Primary 115/46Kv
Fault Name : F4796
Fault Time : 12/04/2007-08:35:17.194167
Clock : SYNC(lock)
Pre-Fault : 159.792 ms
Post-Fault : 553.958 ms
Sequence of Events : E1,T19,T27,T16,T5,T3,E12,T1,E8,

Fault Location
Line Name : CUTHBERT PRIMARY - GCB 552 - BLUFFTON 46KV LINE
Type : AG
Duration : 2.14 cycles
Distance : 7.99 miles

Sequence of Events

Seconds	Event/Trigger	Now	Normal	Description
-0.160	E1	Close	No	SUMMARY TEST POINT- ALWAYS IN ALARM- CUTHBERT 115/46kV
+0.000	T19	>1.00(Under)	No	(A19)NEUT AMPS- GCB 552 - BLUFFTON 46kV
+0.001	T27	>0.06(Over)	No	(A5) HD Trigger - PH. 3-G VOLTS- 46kV BUS
+0.003	T16	>7.00(Under)	No	(A16)PH 3 AMPS- GCB 552 - BLUFFTON 46kV
+0.006	T5	<>Under	No	(A5)PH. 3-G VOLTS- 46kV BUS
+0.011	T3	>7.00(Under)	No	(A3)PH 1 AMPS- H.S. 115/46kV BKS A & B
+0.013	E12	Close	No	TRIP COIL ENERGIZED BY PROTECTIVE RELAY- GCB #552- BLUFFTON 46KV
+0.016	T27	<0.06(Over)	Yes	(Abnormal for 15 ms since +0.001)
+0.019	T1	>7.00(Under)	No	(A1)PH 3 AMPS- H.S. 115/46kV BKS A & B
+0.041	T27	>0.06(Over)	No	(A5) HD Trigger - PH. 3-G VOLTS- 46kV BUS
+0.042	T1	<7.00(Under)	Yes	(Abnormal for 23 ms since +0.019)
+0.046	T3	<7.00(Under)	Yes	(Abnormal for 35 ms since +0.011)
+0.049	E8	Close	No	STATUS- GCB #552- BLUFFTON 46kV
+0.051	E12	Open	Yes	(Abnormal for 38 ms since +0.013)
+0.054	T16	<7.00(Under)	Yes	(Abnormal for 51 ms since +0.003)
+0.055	T5	<>Under	Yes	(Abnormal for 50 ms since +0.006)
+0.056	T19	<1.00(Under)	Yes	(Abnormal for 56 ms since +0.000)
+0.057	T27	<0.06(Over)	Yes	(Abnormal for 15 ms since +0.041)
+0.554	E1	Close	No	(Abnormal since -0.160)
+0.554	E8	Close	No	(Abnormal since +0.049)

Figure 73: Sequence of Events Report for a Fault Record

➢ To Print the Sequence of Events Report for a Fault Record

1. In the **Fault Summary** tab, right-click the fault record that you want.
   The pop-up menu appears.
2. Point to **Print Sequence of Events of FXXX** and then do one of the following:
   - To preview what will be printed, click **Preview**.
   - To send the contents to the printer, click **Print**. Then complete the fields in the **Print** window and click the **OK** button.

5.15 Printing All Waveforms for a Fault Record

You can preview or print oscillograms for a specific fault. You can optionally include a fault summary.

➢ To Print All Waveforms for a Fault Record

1. In the **Fault Summary** tab, right-click the fault record that you want.
   The pop-up menu appears.
2. Point to **Print all Waveforms of FXXX** and then do one of the following:
   - To print just the oscillogram graphs, point to **Graphs**.
   - To print the oscillogram graphs and the fault summary, point to **Fsum + Graphs**.

3. Do one of the following:
   - To preview what will be printed, click **Preview**.
   - To send the contents to the printer, click **Print**. Then complete the fields in the Print window and click the **OK** button.
4. Did you choose to print the oscillogram graphs in step 3?
   - If **yes**, then complete the rest of this procedure.
   - If **no**, (you chose only to preview the graphs), then you have completed this procedure.
5. After you click the **OK** button in the **Print** window, the **Format All Wave Printing** window appears, as shown in the following figure.

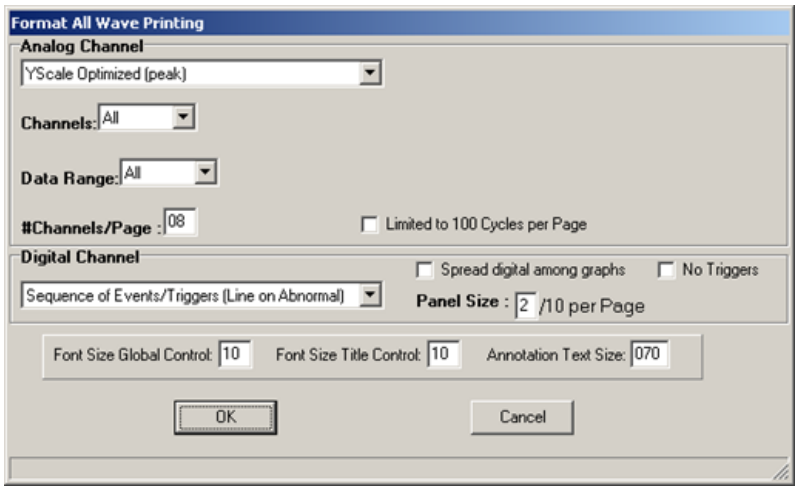


Figure 74: Format All Wave Printing Window

6. From the **Analog Channel** list, select one of the following options:

   YScale Optimized (peak)
   This selection prints the highest peak value measured to the right-hand side of each oscillogram.

   YScale Optimized (unit/cm)
   This selection prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram. Fewer channels printed on a page yields more resolution on the Yscale.

   YScale = Channel Full Scale Optimized (unit/cm)
   This selection prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram. The value is based on the full scale setting in the Point Assignment Record and the number of oscillograms printed on the page. Fewer channels printed on a page yields more resolution on the Yscale.

   Yscale = User Select Scale (unit/cm)
   If you select this, then a **Yscale** field appears. In this field, type your preferred volts/cm or amps/cm scale, which will be printed to the right-hand side of each oscillogram. If the scale you specify is too small, waveform clipping will occur. Fewer channels printed on a page yields more resolution on the Yscale.

   Yscale Optimized (RMS)
   This selection prints the RMS value to the right side of each oscillogram printed.

7. From the **Channels** list, select one of the following options:

   - **ALL**
     This selection prints an oscillogram for each analog channel listed in the Point Assignment Record.
   - **Selected**
     If you select this, then a **Select Channels** button appears. Click the button and then click the specific channels to be printed.
   - **Group**
     If you select this, a list of all preset line groups appears. Click the line group that you want.

8. From the **Data Range** list, select one of the following options:

   - **ALL**
     This selection prints the entire length (X-axis) of all the oscillograms.
   - **Selected**
     If you select this, two entry boxes appear. Each data point in an oscillogram has a number. The starting number is usually the prefault portion of the waveform. The ending number depends on how long the fault or recording lasted. To print a partial record, or X-axis length, enter the data range in these entry boxes.

9. In the **#Channels/Page** box, type the number of oscillograms you want to appear on each page of the printout. Fewer oscillograms per page could increase the resolution of the Yscale.

10. There are two types of triggers, analog triggers and event triggers. You can print these triggers with the oscillograms. Triggers are represented by horizontal lines at the bottom of a printed or displayed page. In the **Digital Channel** list, select how you want the representation of a trigger line as normal or abnormal to appear:

    Sequence Of Events /Triggers (Line on Abnormal)
    This selection only prints the event channels or analog triggers that caused the system to trigger and record a fault. The state of other event channels is not printed. If a line is shown, it represents the period of time the event was abnormal.

    Sequence Of Events /Triggers (Line on Normal)
    This selection only prints the event channels or analog triggers that caused the system to trigger and record a fault. The state of other event channels is not printed. If a line is shown, it represents the period of time the event was normal.

    All Events/Triggers (Line on Abnormal)
    This selection prints the analog triggers and event channels that were in an abnormal state when the fault record was created. If a line is shown, it represents the period of time the analog trigger or event channel was abnormal.

    All Events/Triggers (Line on Normal)
    This selection prints the analog triggers and event channels that were in an abnormal state when the fault record was created. If a line is shown, it represents the period of time the analog trigger or event channel was normal.

11. **Limited to 100 Cycles per Page** check box causes the report to limit to 100 cycles per page for each channel displayed on a page.

12. **Spread digital among graphs,** if this check box is **not** checked, the Analog channels are printed, then the Event Channels, on each page (See Figure 75). With **Spread Digital** check box checked, the report shows the digital channels along with the Analog lines together (See Figure 76).

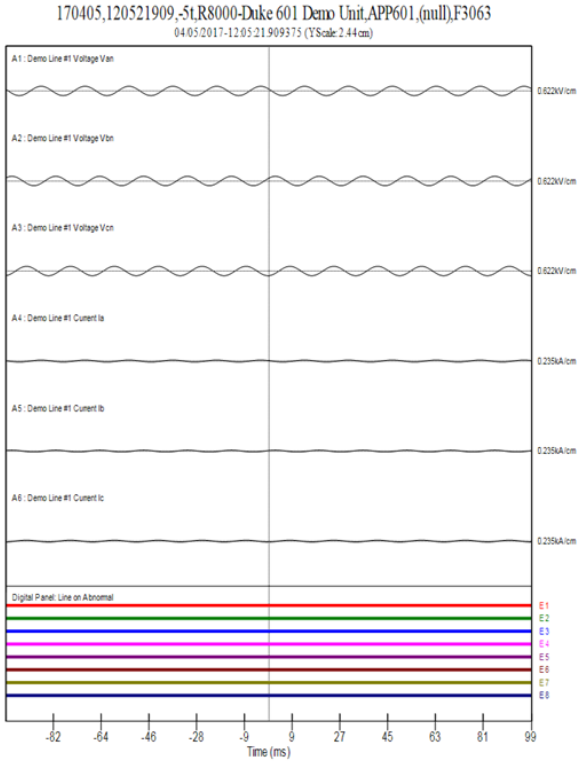


Figure 75: Default Report Format

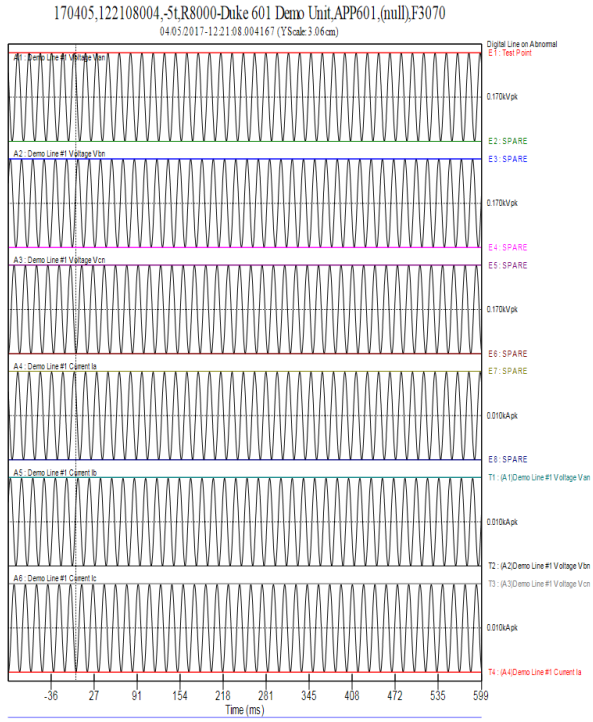


Figure 76: Report with Spread Digital Among Graphs checked

13. **No Trigger** check box causes the report to exclude Analog Trigger faults from the report. An Event Trigger will still display if an Event Channel is set up, and an Event Channel caused the Trigger or an Event Channel changed state while the record was being created.

14. In the **Panel Size** box, specify a number to define the amount of space the event and analog trigger lines will use at the bottom of a printed page.

15. In the **Font Size Global Control** box, type the size of the font for everything except the Fault Summary Report, the title of the waveform pages, and any annotations that may have been added.

16. In the **Font Size Title Control** box, type the size of the font for the title that appears at the top of each waveform or oscillogram page.

17. In the **Annotate Text Size** box, type the size of the font for any annotations that may have been added to a waveform or oscillogram page.

18. Click the **OK** button.
    The waveforms are sent to the printer.

5.16 Copying/Backing up a Fault Record

When fault records are retrieved from the APP Recorder, they are saved to the data path that you specified when you configured ClearView. On the **Fault Summary** tab, you can select the retrieved faults and copy them to another directory.

When you configured ClearView, you also specified two backup paths. You can copy a fault record and save it in one or both of these backup drives, or in another location that you specify. For more information on specifying the backup paths, see Configuring the Main Configuration Settings on Page 9-2.

➢ To Copy a Fault Record

1. In the **Fault Summary** tab, right-click the fault record that you want to copy.
   The pop-up menu appears.

2. Point to **Copy Selected Fault** and then select one of the following options:

   To copy the fault record to the first backup drive, click **Copy to Backup 1 Drive**.

   To copy the fault record to the second backup drive, click **Copy to Backup 2 Drive**.

   To copy the fault record to a different drive, click **Copy to…** and then browse to the folder where you want to save the copied fault record. Then click the **OK** button.

5.17 Deleting a Fault File

➢ To Delete a Fault Record

1. In the **Fault Summary** tab, right-click the fault record that you want to delete.
   The pop-up menu appears.

2. Click **Delete Fault File(s)**.
   A confirmation message box appears.

3. Click **Yes**.

5.18 Changing the Folder You View

You can save incoming fault records to the different folders that you specified when you configured ClearView, and to any other path that you specify from within the **Fault Summary** tab. To view the contents of these folders, you can change the folder you view in the **Fault Summary** tab.

➢ To Change the Folder, You View in the Fault Summary Tab

1. Right-click in the **Fault Summary** tab.
2. Point to **Change Viewing Path** and then click one of the following:

   To view the contents of the data path, click **Data Path**.

   To view the contents of the first backup drive, click **Backup 1 Drive**.

   To view the contents of the second backup drive, click **Backup 2 Drive**.

   To view the contents of a different drive, click **Path…** and then browse to the folder that you want to view. Then click the **OK** button.

5.19 Merging or Saving Selected Faults

➢ To Merge or Save Selected Faults

1. In the **Fault Summary** tab, click on the fault record that you want to merge or save.
   Hold the <Ctrl> key and click one or more fault records to be merged (**see Warning below**). Right Click on a selected file and click **Merge or Save Selected Faults As…**
   A **Merge or Save Data File As** window appears.
2. Browse to the folder where you want to save the merged or saved file.
3. Do one of the following:

   To merge the selected fault(s) with an existing fault file, click the file and then click **Save**.

   To create a new file for the selected files, in the **File name** box, type the new file name and then click **Save**.

CAUTION **ClearView does not restrict the size of the merged file. Merged files can get very large if the records being merged are far apart in time. ClearView automatically populates empty rows (time between merged faults) with "0"**

6. Managing Point Assignment (PA) Records

6.1 Overview of the Point Assignment Record

The point assignment (PA) record is a user-defined record. Information in this record is used by the recorder to control system operation, perform calculations, and perform analysis. If Point Assignment information is provided by the customer, factory personnel will enter that information into the recorder before shipping it.

A Point Assignment Record contains information concerning the recorder hardware, analog channels, analog triggers, events, sampling rates, and different types of recording. A Point Assignment Record can be created or edited via the APP Recorder software or the APP ClearView software. The Point Assignment file can be downloaded from the master station (via APP ClearView) to the APP Recorder or vice versa.

6.2 Accessing the Edit Point Assignment Record Window

➢ To Access the Edit Point Assignment Record Window

1. In the **APP ClearView** window, from the **Edit** menu, point to **Point Assignment Record** and then click **Edit PA Record**.
   The **Edit Point Assignment Record** window appears, as shown in the following figure.

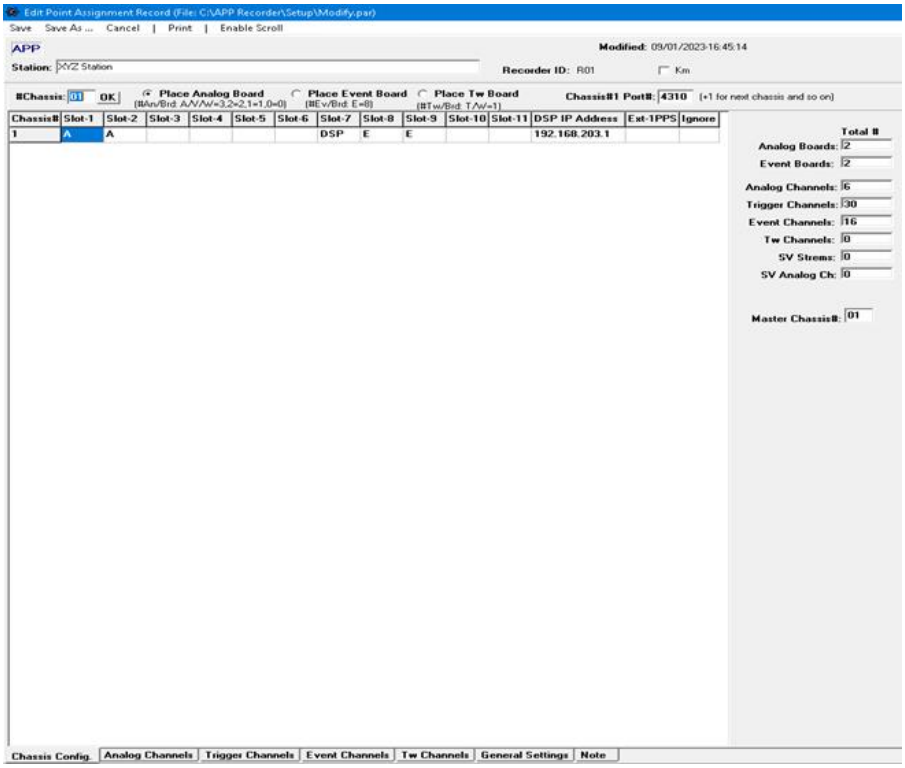


Figure 77: Edit Point Assignment Record Window—Chassis Configuration Tab

6.3 Editing a Point Assignment Record

You can edit a Point Assignment Record at any time. If you edit a Point Assignment Record on the master station, be sure to send the Point Assignment Record to the appropriate APP Recorder.

➢ To Edit a PA Record

1. In the **APP ClearView** window, from the **Recorder** list, select the APP Recorder for which you want to edit the Point Assignment Record.
2. From the **Edit** menu, point to **Point Assignment Record**, and then click **Edit PA Record**. The **Edit Point Assignment Record** window appears.

Note: If the Setup folder for the APP Recorder that you select does not contain a Point Assignment Record, then clicking Edit will create an empty Point Assignment Record which you can edit.

3. Complete any of the following procedures, as necessary:
   - Saving a Point Assignment Record
   - Save As to save a copy or alternative Point Assignment Record
   - Cancelling Your Changes to the Point Assignment Record
   - Printing a Point Assignment Record
   - Enabling Scrolling in the PA Record Window
   - Editing the Station Name
   - Configuring the Chassis
   - Configuring Analog Channels
   - Configuring Trigger Channels
   - Configuring Event Channels
   - Configuring Traveling Wave Channels
   - Configuring General Settings
   - Notes, (Include free form notes about the Point Assignment Record)

6.4 Sending a Point Assignment Record to the Recorder

You can use this menu option to send a Point Assignment Record to an APP Recorder.

6.5 Deleting a Point Assignment Record

To Delete a PA Record

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to delete the Point Assignment Record.
2. From the **Edit** menu, point to **Point Assignment Record**, and then click **Delete PA Record**. A confirmation message appears.
3. Click **Yes**.

6.6 Printing a Point Assignment Record

➢ To Print the Point Assignment Record

1. In the **APP ClearView** window, from the **APP Recorder** list, select the recorder for which you want to print the Point Assignment Record.

2. From the **APP ClearView** window, from the **Edit** menu, point to **Point Assignment Record**, point to **Print PA Record**, and then do one of the following:

   Click **Preview** to view an onscreen picture of how the printout will appear.

   Click **Print** to print a hardcopy of the Point Assignment Record. The **Print** window will appear. Complete the fields in this window and then click the **OK** button.
   The entire Point Assignment Record is printed.

6.7 Adding a Point Assignment Record

Each APP Recorder must have its own Point Assignment Record. When you add a Point Assignment Record, you designate the APP Recorder ID. Each APP Recorder must have a unique ID number. The master station program distinguishes one APP Recorder from another by the recorder ID.

➢ To Add a PA Record

1. In the **APP ClearView** window, from the **Edit** menu, point to **Point Assignment Record**, and then click **Add PA Record**.
   The **Add Point Assignment Record** window appears.

2. Type a unique, numeric recorder ID number and then click the **OK** button.
   The **New Point Assignment Record** window appears.

3. Click the **OK** button.
   The **Edit Point Assignment Record** window appears.

4. Complete the tabs and fields in this window. See the following procedures for details:

   - Saving a Point Assignment Record
   - Cancelling Your Changes to a Point Assignment Record
   - Printing a Point Assignment Record
   - Enabling Scrolling in the PA Record Windows
   - Editing the Station Name
   - Configuring the Chassis
   - Configuring Analog Channels
   - Configuring Trigger Channels
   - Configuring Event Channels
   - Configuring Traveling Wave Channels
   - Configuring General Settings
   - Notes, (Include free form notes about the Point Assignment Record)

6.8 Saving a Point Assignment Record

You can save your Point Assignment Record to the Setup path that you specified in the **ClearView Configuration** window. By default, this path is **C:\APP Recorder\Setup**.

Note: If the administrator feature is used, only the administrator has privileges to save a newly created Point Assignment Record or to save changes to an edited Point Assignment Record.

6.9 "Save As" a Point Assignment Record

You can "Save As" your Point Assignment Record to create a copy, or to create a separate alternative Point Assignment Record. You can specify the path however, the Setup path that you specified in the **ClearView Configuration** window is the default, this path is **C:\APP Clearview\Setup**.

Note: The Point Assignment Record file in use for a recorder is the one named with the Recorder ID.par (e.g. R100.par) only.

6.10 Cancelling Your Changes to the Point Assignment Record

➢ **To Cancel Your Changes to the Point Assignment Record**

In the **Edit Point Assignment Record** window, from the menu bar, click **Cancel**.
The Point Assignment Record is closed without being saved.

6.11 Enabling Scrolling in the PA Record Windows

The Point Assignment Record can be lengthy. If you are using the APP Monitor & Keyboard chassis, then your LCD screen is smaller than a standard computer screen. You can enable scrolling in the **Point Assignment Record** window in order to see portions of the screen that might otherwise be cut off.

➢ **To Enable Scrolling in the Point Assignment Record Window**

In the **Edit Point Assignment Record** window, from the menu bar, click **Enable Scrolling**.

6.12 Editing the Station Name

When you add a new Point Assignment Record, you specify the APP Recorder for which it is associated. By default, the ClearView assigns the station name, "Dummy Station." You can change this name to be more meaningful.

➢ **To Edit the Station Name**

1. In the **Edit Point Assignment Record** window, in the **Station** box, type the station or location name.

Note: These special characters are not allowed: **\ / : * ? " < > |**. If you use those, they will automatically be converted to a dash (**-**).

2. From the menu bar, click **Save**.

6.13 Configuring the Chassis

1. In the **Edit Point Assignment Record** window, click the **Chassis Config** tab.
The tab appears, as shown in the following window.

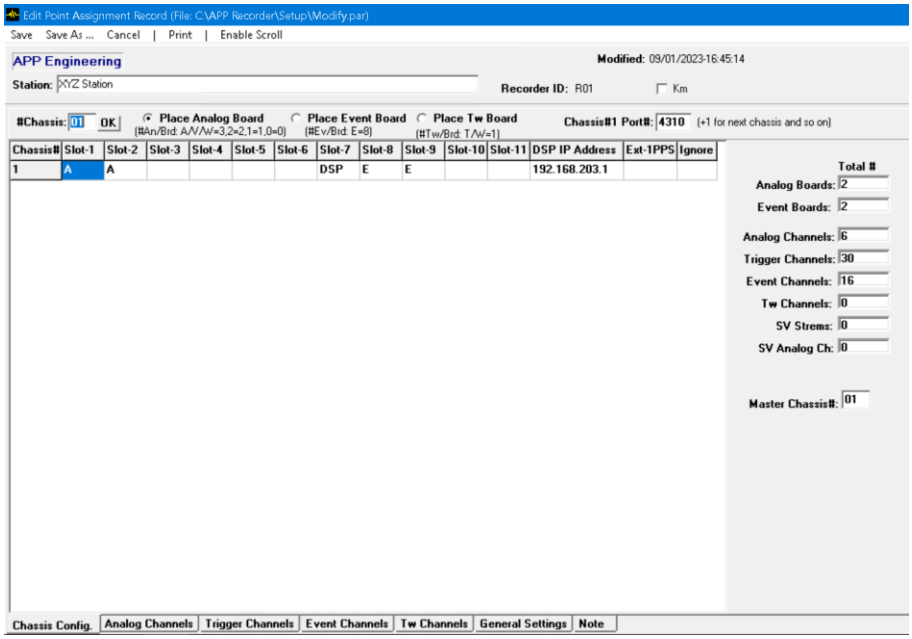


Figure 78: Chassis Config. Tab

2. **Km** check box, checking this box on this Tab or any Tab in the Point Assignment record configuration will enable the display of distance in kilometers wherever distance is displayed.

Note: Records that include distance are always stored in **Miles**. Using the **Km** check box only provides a conversion to display distance in Kilometers and does not change the data.

3. In the **#Chassis** box, type the total number of data chassis in your system.

4. Click the **OK** button.
   The tab displays a table with a separate row for each chassis. ClearView automatically increments the DSP IP addresses for each chassis.

5. You can designate the **Analog, Event, and Tw boards** for each slot in each Data Chassis. Each data chassis contains 13 card slots. Slot 7 is reserved for the DSP/IRIG board, slot 12 is reserved for the alarm output board, and slot 13 is reserved for the power supply board.

   To define an analog board, complete steps 5 and 6.

6. To enter an analog board in the table, select the **Place Analog Board** option and then click in a cell that represents a slot for a particular chassis. By default, ClearView inserts an **A** in the cell where you click.

   There are 3 analog channels per analog circuit board. When an **A** appears in a cell, it means that all 3 analog channels for that chassis and slot combination are active.

   As you click, the **Analog Boards** box is automatically updated with the total number of analog boards you have defined.

   (V) Virtual Channels designation. You can designate an Analog Board as Virtual to document virtual channels on the Chassis Config tab by placing a **V** in the Slot. The channels are not virtual however, until you go into the Analog Tab and use the If Virtual feature for the desired channels.

Note: An Analog Fail alarm will occur if the channels are not made virtual on the Analog tab.

Note: To indicate a slot is empty, do not click on a cell. If you click accidentally, you can select the value and then press backspace or delete key.

Note: You can enter any mix of analog and event boards as long as your entries identically match the hardware configuration.

7. You can change the number of active channels in order to conserve memory and/or increase the speed of the data transfer process. To change the number of active channels, click in the appropriate cell and then use the keyboard to type any of the following values:

    - Enter a **2** to enable 2 channels.
    - Enter a **1** to enable 1 channel.
    - Enter a **0** to disable all the analog channels on the circuit board.
    - Enter an **A** to activate all 3 analog channels on the circuit board.

8. Do you want to define an **Event Board**?

    If **yes**, complete step 9.
    If **no**, skip to step 10.

9. Click the **Place Event Board** option button and then click in a cell that represents a slot for a particular chassis. ClearView inserts an **E** in the cell where you click. There are 8 event channels on each event board which can be used for event triggering, sequence of event recording or both.

    As you click, the **Event Boards** box is automatically updated with the total number of event boards you have defined.

    Note: To indicate that a slot is empty, do not click in a cell. If you click accidentally, you can select the value and then press backspace or delete key.

10. Do you want to define a **Traveling Wave Board**?

    If **yes**, complete step 11.
    If **no**, skip to step 12.

11. Click the **Place TW Board** option button and then click in a cell that represents a slot for a particular chassis. ClearView inserts a **T** in the cell where you click. There is 1 TW channel on each TW board which can be used for Traveling Wave.

    As you click, the **TW Channels** box is automatically updated with the total number of TW Channels you have defined.

    (W) TW + Virtual Channels designation. You can designate a TW Board and three virtual analog channels in the Chassis Config tab by placing a **W** in the Slot. The channels are not virtual however, until you go into the Analog Tab and use the **If Virtual** feature for the desired channels.

    Note: An Analog Fail alarm will occur if the channels are not made virtual on the Analog tab

    Note: To indicate a slot is empty, do not click on a cell. If you click accidentally, you can select the value and then press backspace or delete key.

12. Each DSP circuit board, one per chassis, and 618 Controller was assigned an IP address at the factory. That IP address must be entered in the **DSP IP Address** column for each chassis/DSP board or 618 Controller. The IP address will be entered before the APP Recorder leaves the factory unless the factory is shipping an add-on Data chassis and has not been informed of its installation location.

13. **Ext 1PPS**, this indicates the use of an external 1PPS source. Click on the field to place an X. Click the box again to remove the X. Ext 1PPS does **not** need to be checked for 618 controller chassis.

14. **Ignore**, you can virtually remove a chassis, primarily used for trouble shooting, by clicking the Ignore field. Click the box again to remove the X. If there is a **Traveling Wave** board in the chassis being ignored, it will not be ignored. To ignore the TW board, go to the TW Tab and click ignore for that TW channel.

15. ClearView knows which DSP or 618 controller it is communicating with by the port number. Each chassis/DSP must talk to the computer through a different port number. A default number of 4310 is entered for the first chassis/DSP. ClearView automatically assigns port numbers for the additional chassis (+1 for the next chassis and so on….). You can change the port number, if necessary. Do you want to change the port number for a DSP?

    If **yes**, complete step 16.

    If **no**, skip to step 17.

16. To change the port number for a DSP, type the new number in the **Chassis#1 Port#** box.

17. In the **Master Chassis #** box, enter the chassis number of the master chassis. When a reboot command is sent to the APP Recorder, this chassis will be rebooted last to ensure that the other chassis reboot.

18. From the menu bar, click **Save**.

6.14 Configuring IEEE-61850 Sampled Values

This process is to configure the Point Assignment Record for an APP-618 Controller to receive Sampled Values (SV) streams. You will define one or more 618 Controllers for Sampled Values and set up the configuration for each chassis.

Note: SV is only supported in APP Recorder v3.2.1 and higher.

In the Chassis Config tab, change Slot-7 of each 618 chassis from DSP to “GPU” as shown below. Add the number of analog boards to the chassis based on how many analog channels are required (3 channels per Analog Board). The example below shows a chassis configured for 18 analog channels. Only place the number of boards for the required number of channels. See Section 6.13 Configuring the Chassis above for instructions and rules.

Ext-1PPS – Do not place an X for the APP-618 Controller chassis. It does **not** use Ext-1PPS field as the 618 will receive its clock from a PTP source on the Process Bus or DSP network.

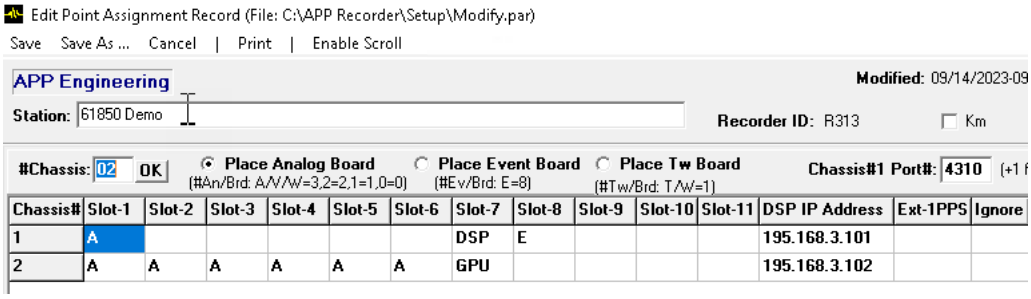


Figure 79 APP-618 Sampled Values Chassis Config

Next, double click on “GPU” in the Slot-7 field of the APP-618 chassis to open the GPU Cfg window shown below.

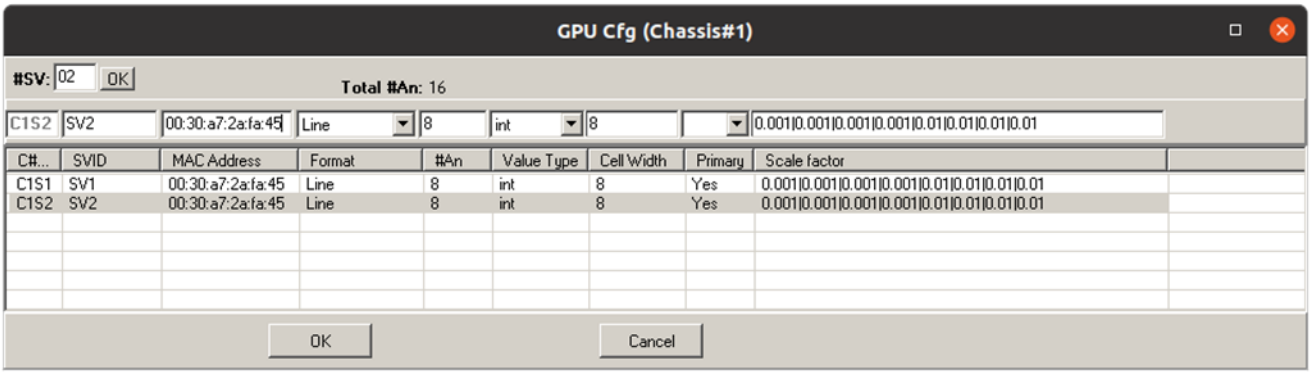


Figure 80 Sampled Values PAR Settings

Fill in **#SV** field, top left, with the number of different SV streams (maximum of 2) the chassis is to subscribe to and click OK.

The streams will be populated based on the #SV entry. The C# field is preset to Chassis#Stream# (C#S#). The number of SV Streams and SV Analog channels will be populated on the Chassis Configuration TAB

SVID field, enter the SVID string for each of the SV streams the chassis is subscribed to. This is the value used to distinguish between different SV streams.

MAC Address, this field is used to further label unique SV devices and is not used by the Recorder currently for processing. It is recommended to populate the MAC address of the SV source publishing each stream.

Format, Select the source format of the stream by selecting **Line** for Streams from an MU. PTP Voltage Module (PVM) format is **NOT** supported currently.

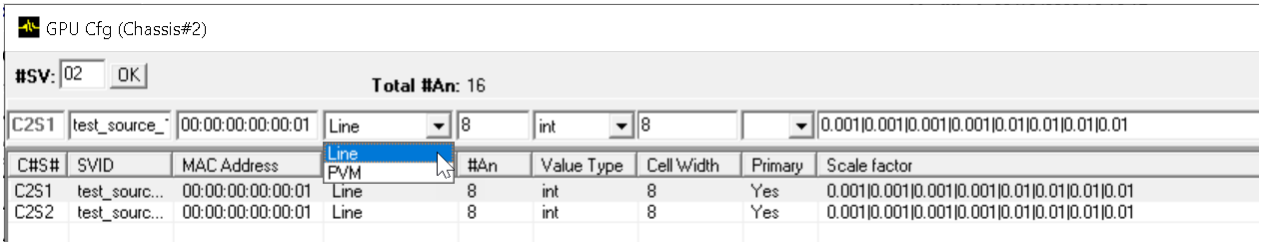


Figure 81 SV PAR Format Setting

#An field sets how many of the 8 channels within an SV stream the chassis will use. Note that when using fewer than 8 channels, the chassis will discard channels from the end. For example, setting #An to 6 will cause the chassis to discard channels 7 & 8 of the stream.

Value Type, Select from the dropdown **int** or **short**. The default will be set based on the selection in the **Format field (Line or PVM)**.

Value Type determines what format the analog values in the SV packet are recorded in. This enables the 618 to know how to interpret the incoming data. The default will be set based on the selection in the **Format field (Line or PVM)**.

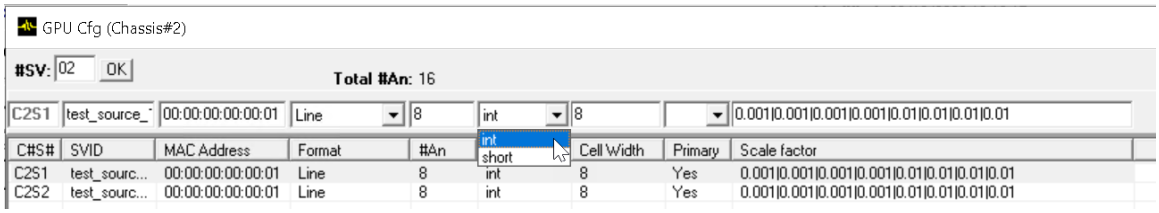


Figure 82 SV PAR Value Type Setting

Cell Width, like Value Type, defines the format of the incoming data. This value should not be changed from the default. The default will be set based on the selection in the **Format field (Line or PVM)**.

Primary field sets whether the SV stream contains primary or secondary values. Yes = Primary, No = Secondary This should not need to be changed from the default. . The default will be set based on the selection in the **Format field (Line or PVM)**.

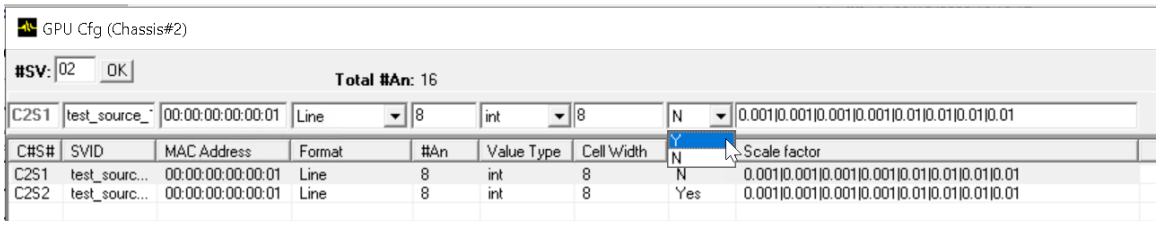


Figure 83 SV PAR Primary Setting

Scale Factor field contains the SV scale factors for each of the channels within an SV stream with the values separated by '|' symbols. These values must match the scale factors used in the SV publisher. The default will be set based on the selection in the **Format field (Line or PVM)**.

The order in which the streams are entered into the configuration determines the order in which the data from the streams is placed in the record. The configuration shown above shows for Chassis#2, the values of analog channels 1-8 will be sourced from the stream SV1 while analog channels 9-16 are sourced from the stream SV2.

The GPU configuration is saved in a separate file in the Setup Folder. The name format is RnnnCnn.gpu where Rnnn is the recorder ID and Cnn is the chassis number of the APP-618.

Analog Config tab, once the Chassis config and SV config have been set up, go to the Analog TAB. Set up the Analog channels. When you set a Full Scale value for a channel, the AbsFS for that channel must also be set to the same value in order for the 618 chassis to scale the data correctly.
Double click or right click on the Virtual\AbsFS field for the channel to open the Virtual\AbsFS setting window. **See 6.15 Configuring Analog Channels section** for more information.

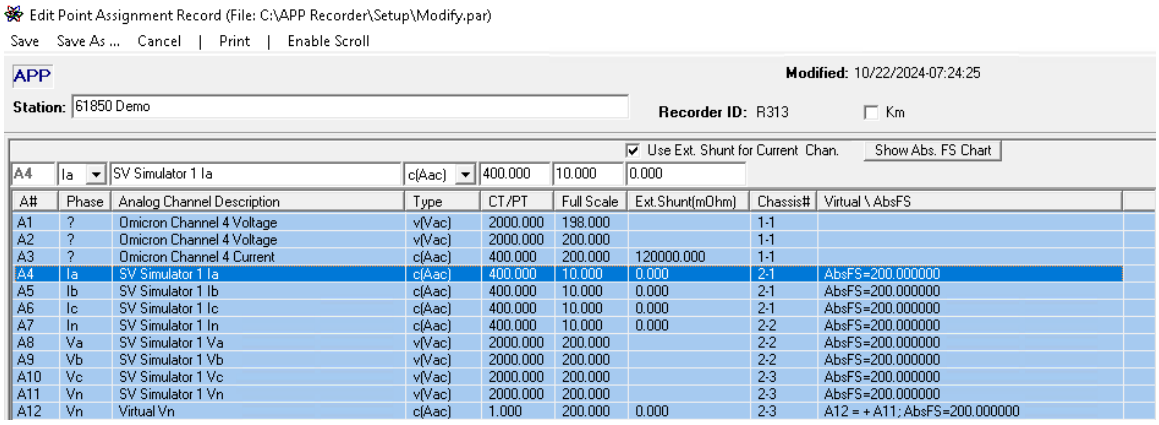


Figure 84 SV PAR Analog Channel AbsFS settings

Sampling Rate for APP-618 Controller

In the General Settings tab, make sure that the transient frequency is set to **4800 Hz**. As of this writing, the 618 Controller does not yet support other sampling frequencies.

6.15 Configuring Analog Channels

The **Analog Channels** tab contains setup information for each analog input channel. The number of analog channels displayed is determined by the setup in the **Chassis Config** tab.

You can edit the values by first clicking the row that you want to update. You can use the Windows Shift and Control keys to select multiple rows simultaneously. If you select multiple rows, then your edits will be applied to all the selected rows. Update the values by typing in the entry fields above the column headings. Your entries are displayed in the selected row(s) immediately.

CAUTION **All entries in the Point Assignment Record should be secondary values.**

➢ To Configure Analog Channels

1. In the **Edit Point Assignment Record** window, click the **Analog Channels** tab. The tab appears, as shown in the following window.

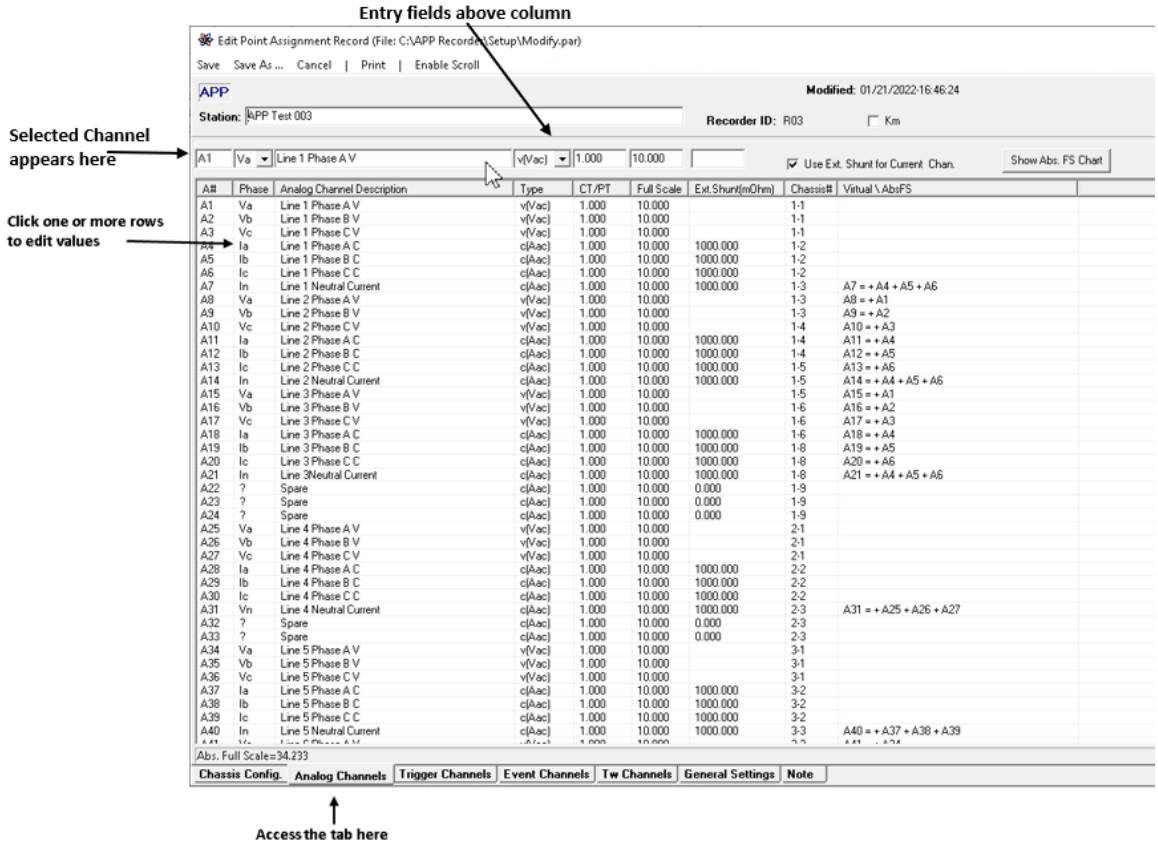


Figure 85: Point Assignment Record Window—Analog Channels Tab

You can specify a phase for one or more channels. This will allow you to apply a color standard for that phase. Select the channel(s) for which you want to specify a phase. Then, in the Phase box, select the phase to apply.

Note: You can select the specific color standard on the Graphic and Data Analysis window under (Options menu: Graph Options).

2. **Km** check box, checking this box on this Tab or any Tab in the Point Assignment record configuration will enable the display of distance in kilometers wherever distance is displayed.

Note: Records that include distance are always stored in **Miles**. Using the **Km** check box only provides a conversion to display distance in Kilometers and does not change the data.

3. Select the channel(s) for which you want to specify a description. Then, in the **Analog Channel Description** box, update the description. ClearView puts no limit to the number of characters you can enter, but the COMTRADE standard limits descriptions to 64 characters. To ensure other COMTRADE viewers can read the fault file, be sure to keep the description to under 64 characters.

4. Select the channel(s) for which you want to specify a type. Then, in the **Type** list, select the analog input type. Available types include AC voltage, DC voltage, AC current, DC current, frequency, watt, var, radians per second, rpm, Temp in˚F and Temp in˚C, P(%), b(bar), d(deg), g(gain).

CAUTION **The selected type must match the hardware setup. Hardware jumpers must be set on the analog circuit boards to allow them to correctly measure voltage or current (two jumpers per channel).**

See the APP Recorder Operating Manual for additional information on hardware setup.

5. You can specify the current transformer/potential transformer ratio. This value is used to calculate the primary values. The ratio is X to 1. Select the channel(s) for which you want to specify the current transformer/potential transformer ratio. Then, in the **CT/PT** box, enter the ratio of the current transformer or potential transformer being used.

6. You can specify the secondary full scale value. Select the channel(s) for which you want to specify the full scale. Then, in the **Full Scale box**, type the maximum anticipated secondary full scale value.

Note: Click any value in the **Full Scale** column to see its **Absolute Full Scale** in the tray at the bottom of the window.

7. Are you using an external shunt or CT for a channel?

   If **yes**, click the channel and then select the **Use Ext. Shunt for Current Chan.** check box.

Note: You should select this only if one or more external current sensing devices will be used.

The **Ext Shunt (mOhm)** column appears. By default, if you leave the field empty, ClearView will use the 2-milliohm internal shunt for the channel current calculation. If you are using an external shunt or CT, then type the shunt value or equivalent shunt value in this field.

CAUTION **The external shunt entry should be in milliohms.**

CAUTION **External shunts should be wired to voltage inputs but the Point Assignment Record should be setup as a current channel.**

If **no**, skip to the next step.

8. **If Virtual\Abs FS,** Virtual channels are an aggregate of 2 or 3 analog channels. To define a virtual channel, **double click the cell** under **If Virtual** for the designated channel. Clearview will ask; **Make A*x* Virtual?** Click yes, then Clearview will ask for the analog channels to be combined for the virtual channel. You can make the channel negative by clicking on the plus (+) and change to minus (-) or back to +. Enter the channel IDs up to 3.

   If you want to specify the Absolute Full Scale Value for a channel enter the value in the AbsFS field and click OK. This setting will override the Absolute full scale described below in the next section.

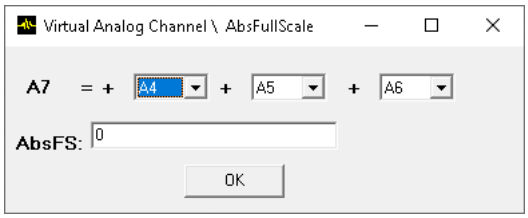


Figure 86: Make a Channel Virtual

When setting up Analog channels associated with an **APP-618 Controller** for Sampled Values stream, you must set AbsFS the same value as the Full Scale value.

9. If you are done editing PA record, click **Save**.

Note: Triggers can be configured for Virtual Channels.

➢ New Absolute Full Scale

You can also set Abs Full Scale by selecting the channel and right clicking. A pop-up window will appear and allow you to enter an absolute full scale value.

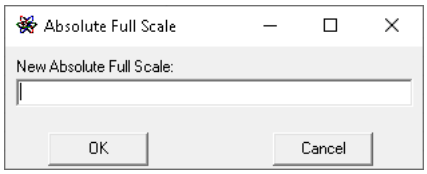


Figure 87 New Absolute Full Scale

➢ Viewing a Chart of Max Full Scale versus Absolute Full Scale Values

Click the **Show Abs. FS Chart**.

The **Absolute full scale** (or Abs. Full Scale for short) is dependent on the channel full scale setting, but it reflects the absolute full scale defined by the hardware divider and gain circuitry. There are 31 absolute full scale values for voltage or current ranging from 0.309V to 954V and 3.093A to 954.140A. When you select a full scale value, ClearView automatically calculates an absolute full scale value based on the finite hardware choices.

The chart will change according to each individual channel configuration. You can enter any full scale value between one Max Full Scale to the next, and the Absolute Full Scale will stay the same until it passes the next Max Full Scale.

Note: If you specified an Absolute Full Scale value as described above in Step 8, the value entered will override the calculated absolute full scale.

Note: The absolute full scale is the amplitude at which the input signal will clip.

6.16 Configuring Trigger Channels

The **Trigger Channels** tab contains settings that will cause the APP Recorder to trip and create transient and extended records. You can define up to a maximum of 30 triggers per chassis; you can also define rate of change for each type of trigger. At your discretion, some analog channels may have no triggers assigned to them and some analog channels may have multiple triggers assigned to them.

You can edit the values by first clicking the row that you want to update. You can use the Windows Shift and Control keys to select multiple rows simultaneously. If you select multiple rows, then your edits will be applied to all the selected rows. Update the values by typing in the entry fields above the column headings. Your entries are displayed in the selected row(s) immediately.

➢ To Configure Trigger Channels

1. In the **Edit Point Assignment Record** window, click the **Trigger Channels** tab. The tab appears, as shown in the following figure.

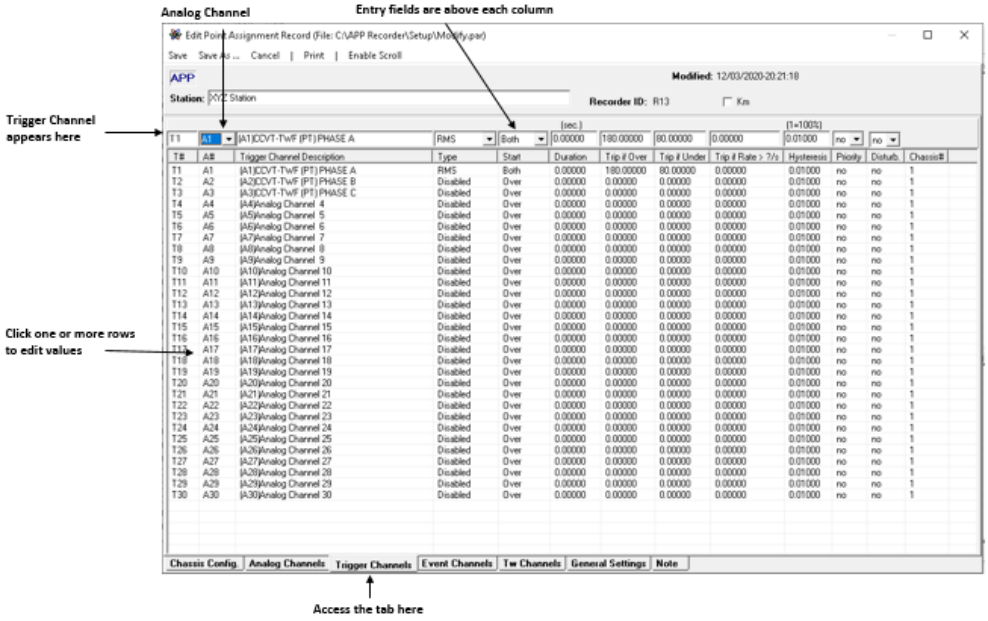


Figure 88: Point Assignment Record Trigger Channel Tab

The number of trigger channels displayed on this tab is determined by the number of chassis defined in the **Chassis Config** tab.

Note: Each chassis has a total of 30 triggers reserved for it. For example, if the first Data chassis has 1 analog card, (3 analog channels), the first 30 triggers are reserved for those channels. The triggers for a second Data chassis start at trigger 31.

2. **Km** check box, checking this box on this Tab or any Tab in the Point Assignment record configuration will enable the display of distance in kilometers wherever distance is displayed.

Note: Records that include distance are always stored in **Miles**. Using the **Km** check box only provides a conversion to display distance in Kilometers and does not change the data.

3. **A#**, Click the trigger(s) for which you want to specify an analog channel. Then, in the **A#** list, select the analog channel(s) for the trigger.

   Note: In the **A#** column, an analog channel can appear more than one time.

4. **Description**, click the triggers for which you want to specify a description. Then, in the **Trigger Channel Description** box, type a meaningful description.

   Tip: If the trigger descriptions should be the same as the analog channel descriptions, right-click anywhere in the **Channel Description** row to display the pop-up menu shown in the following. Then click **Use Analog Channel Description(s)**.

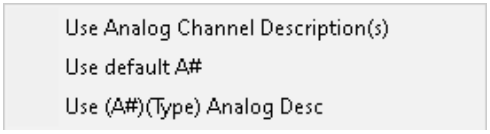


Figure 89: Use Analog Channel Description Menu

If you are setting up the triggers for the first time, right-click anywhere in the channel description row and then select **Use default A#**.

Tagging or highlighting multiple rows then using the **Use default A#** menu option can save time.

5. **Type**, Click the trigger(s) for which you want to specify a trigger type. Then from the **Type** list, select the type. The available trigger types are:

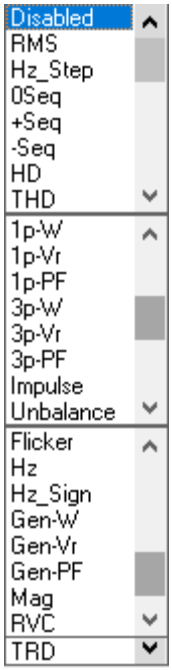


Figure 90: Trigger Type Menu

Disabled: Disables a trigger. A trigger cannot be initiated from a channel with this setting.

RMS: Transient recording will begin if the RMS limits are exceeded. This could be an over limit, under limit, or both over/under limit. Remember, this is an RMS value not a single point value.

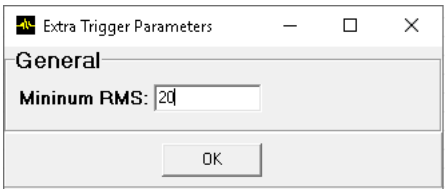
Hz_Step: This is a frequency trigger. Transient recording will begin if the frequency limits are exceeded. This could be an over limit, under limit, or both over/under limit, and/or Frequency Step.

APP Recorder version 2.7.0 and later uses a different algorithm than prior versions to detect frequency disturbances. The new method measures slope by two points that are four seconds apart in time, and then measures another slope 1 second later by the same method. If the absolute value of both slopes exceeds the trigger threshold and they have the same sign, then the trigger activates.

Sample Parameter Settings:

Parameter	Setting
Type	Hz_Step
Start	Over
Duration	1.00
Trip if Over	61
Trip if Under	59
Trip if Rate > /?s	0.004
Disturb	Yes

Then double click on the trigger to enter the extra parameter Minimum RMS.



This trigger operates using the Virginia Tech FNET rate of change trigger method described below. The "duration" setting sets the displacement time, and the slope time is four times the displacement time. For the Eastern Interconnection a slope time of four seconds and a displacement time of one second is a good setting to capture events.

The "Trip if Rate > ?/s" setting is the minimum slope required to activate the trigger. A setting of 0.0038 Hz/sec will trigger for approximately 800 MW load changes.

The delta frequency trigger described in below explains the operation of the old trigger (prior to Apprecorder 2.6.8) in addition to the VT trigger.

If over or under frequency triggers are desired, it is recommended to implement a separate trigger for that function using the "Hz" trigger type.

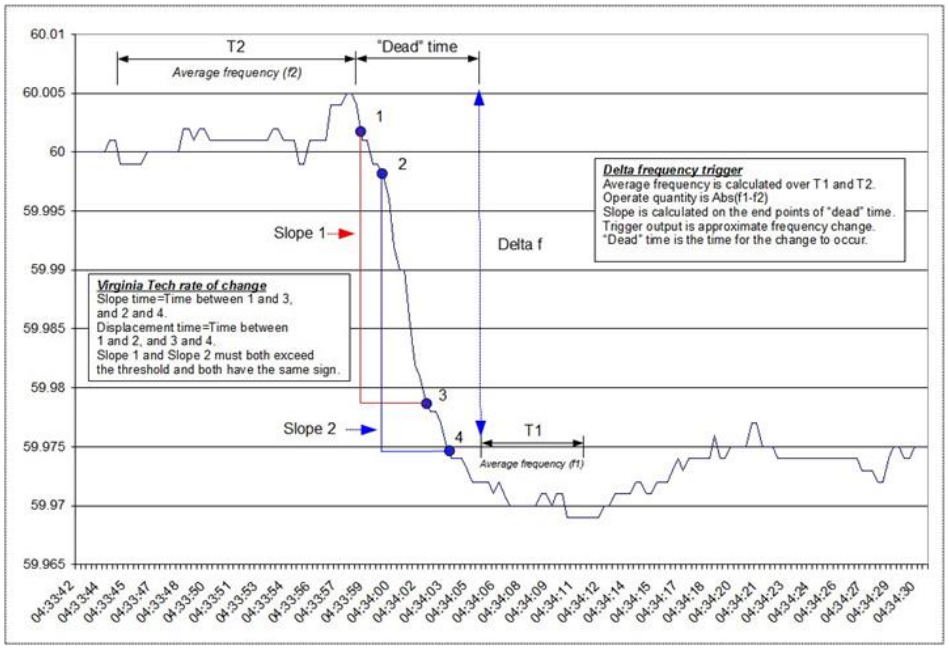


Figure 91 HZ Step Method Illustration

For further details about Frequency Step Trigger, download the paper "Frequency Triggers" published in 2006 in Fault Recorder Conference. (http://www.truc.org/papers/2006)

Note: For all triggers that require multiple channels for calculation purposes, all of the analog channels must be in the same Data chassis.

Note: To define which channels are used for the multi-channel calculation, first enter the trigger type. Then double-click the trigger type. A multi-channel entry window will appear where you can specify the values.

0Seq: This is a zero-sequence trigger. Transient recording will begin if the zero sequence limits are exceeded.

+Seq: This is a positive sequence trigger. Transient recording will begin if the positive sequence limits are exceeded.

-Seq: This is a negative sequence trigger. Transient recording will begin if the negative sequence limits are exceeded.

"HD": This is a harmonic distortion trigger. Transient recording will begin if any calculated harmonic, (See Table below for limits), exceeds the set limits. A trigger level entry of 1 equal 100% harmonic distortion.

"THD": This is a total harmonic distortion trigger. Transient recording will begin if the calculated sum total distortion, (See Table below for limits), exceeds the set limits. A trigger level entry of 1 equal 100% harmonic distortion.

Note: The HD and THD Triggers will follow the following Harmonic limits based on Transient Sampling Rate.

Table 1 Harmonic Trigger Calculation Limits

Transient Sampling	Up to Harmonic
2400 Hz	19th
4800 Hz	39th
9600 Hz and above	50th

Note: As of Version 3.1.8 APP Recorder will show the sign (+, -) for Power related triggers. However, it will continue to trigger on absolute value.

"1p-W": This is a single-phase power trigger. Transient recording will begin if the calculated single phase power limits are exceeded.

"1p-Vr": This is a single-phase reactive power (VAR) trigger. Transient recording will begin if the calculated VAR limits are exceeded.

"1p-PF": This is a single-phase power factor trigger. Transient recording will begin if the calculated PF limits are exceeded.

"3p-W": This is a three-phase power trigger for a connection from a Phase to Ground (transmission line) connection. If you have a connection from a Generator, use the GEN-W trigger type listed below. Transient recording will begin if the calculated three phase power limits are exceeded.

"3p-Vr": This is a three-phase reactive power (VAR) trigger for a connection from a Phase to Ground (transmission line) connection. If you have a connection from a Generator, use the GEN-Vr trigger type listed below. Transient recording will begin if the calculated three phase VAR limits are exceeded.

"3p-PF": This is a three-phase power factor trigger for a connection from a Phase to Ground (transmission line) connection. If you have a connection from a Generator, use the GEN-PF trigger type listed below. Transient recording will begin if the calculated three phase PF limits are exceeded.

Impulse: This is an impulse trigger. Transient recording will begin if a sudden change in instantaneous value (disregarding the direction of the change) comparing to last cycle at the same phase is larger than the value specified in the over limit box. Note: only the over limit is used for this trigger, and it has to be a positive value.

Unbalance: This is a Voltage unbalance trigger. Transient recording will begin if the voltage becomes unbalanced between the 3 channels selected by the amount **over** in the Trip If over Parameter. **"Over"** is the typical start trigger setting however under or both will also work. After selecting the Unbalance trigger type, **double click** on the channel and a dialogue box will pop-up requesting 2 other analog channels for phases 2 and 3.

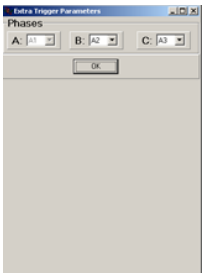


Figure 92: Extra Trigger Parameters

Flicker: Transient recording will begin if the **percentage** difference between RMS and Peak (Peak – RMS) is more/less than X% of V where V = mid-point between RMS and Peak (Peak

- RMS/2). (i.e. Δv/v <> X%) The Flicker trigger will be captured based on a percentage. Enter the Trip if Over and/or Trip if Under in terms of percentage.

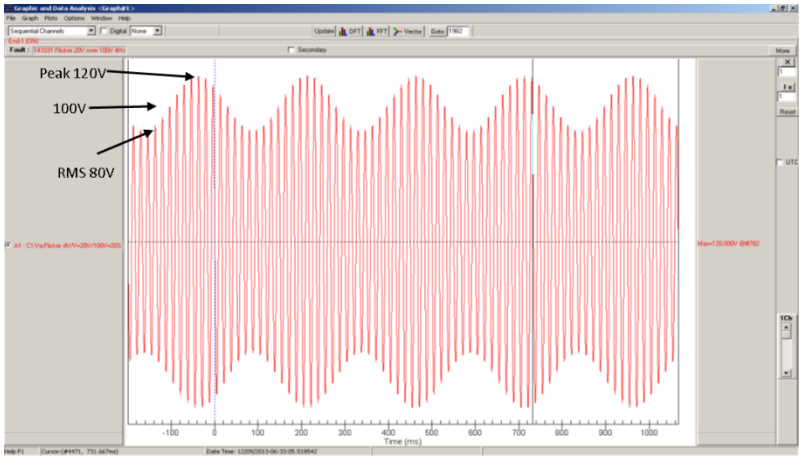


Figure 93: Recording on Percentage of Flicker Variance

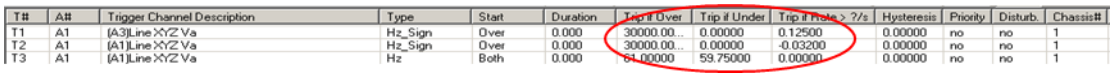
Hz: This is a frequency trigger. Transient recording will begin if the frequency limits are exceeded. This could be an over limit, under limit, or both over/under limit.
When setting the frequency trigger for PRC-002-5 compliance, you can set the Start Parameter for **Both** and set the Trip if under and Trip if Over to the desired setting. However, using one trigger for both conditions can make it complicated to determine which condition caused the fault. To more easily know which condition triggered, set up two separate Hz triggers, 1 for **Over** and the second for **Under**.

Note: Do not use **Duration or Priority** setting with Hz trigger.

Hz_Sign: Hz_Sign is a Frequency trigger intended to be used to record when Rate of Change (i.e. Trip if Rate >?/s) parameter is exceeded. To comply with PRC-002-5 Requirement 8.2 Rate of Change Frequency Trigger, you can set two Hz_sign triggers for the same Channel. One Trigger for Off Normal Frequency Trigger and one for Rate of Change Frequency Trigger. Set the Start parameter to "OVER" for both and set the Over parameter to a value that will not cause a Fault to be recorded. This approach makes it easier to determine what condition caused the Trigger. Transient recording will begin when the rate of change limits are exceeded. The parameter values are Hz per Second.

Table 2 PRC-002-5 Rate of Change Settings

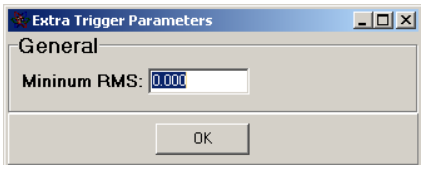
o Eastern Interconnection	< -0.03125 Hz/sec	>0.125 Hz/sec
o Western Interconnection	< -0.05625 Hz/sec	>0.125 Hz/sec
o ERCOT Interconnection	< -0.08125 Hz/sec	>0.125 Hz/sec
o Hydro-Quebec Interconnection	< -0.18125 Hz/sec	>0.1875 Hz/sec



T#	A#	Trigger Channel Description	Type	Start	Duration	Trip if Over	Trip if Under	Trip if Rate > ?/s	Hysteresis	Priority	Disturb.	Chassis#
T1	A1	[A3]Line XYZ Va	Hz_Sign	Over	0.000	30000.00...	0.00000	0.12500	0.00000	no	no	1
T2	A1	[A1]Line XYZ Va	Hz_Sign	Over	0.000	30000.00...	0.00000	-0.03200	0.00000	no	no	1
T3	A1	[A1]Line XYZ Va	Hz	Both	0.000	61.00000	59.75000	0.00000	0.00000	no	no	1

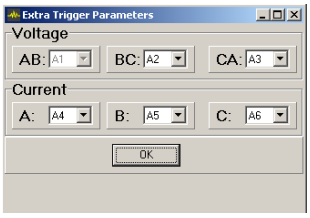
Figure 94: Setting Hz_Sign Triggers

CAUTION **If you create a THD, HD, Flicker, Freq Step Trigger, Freq Trigger, or Freq Sign Trigger, double click on the Trigger Row to reveal the Min RMS window (below). Enter the minimum RMS to automatically deactivate the Trigger. This will eliminate nuisance triggers when the input signal(s) go below the specified minimum RMS value.**

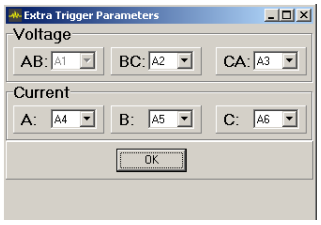


Note: Trigger formulas are proprietary and are not shown in this manual. However, on a case-by-case basis and with a written confidentiality agreement, a separate technical document can be provided with trigger formula information.

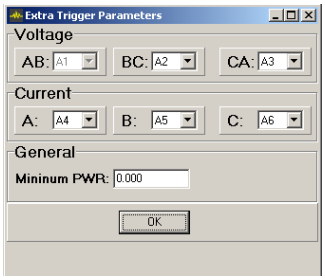
Gen-W: This is a three phase power trigger for a Phase to Phase connection from a Generator. Transient recording will begin if the calculated three phase power limits are exceeded. After selecting the **Generator-Watts** trigger type, **double click** on the channel and a dialogue box will pop-up requesting the Voltage channel for each phase and the Current channels for A,B, and C.



Gen-Vr: This is a three phase reactive power (**VAR**) trigger for a Phase to Phase power connection from a Generator. Transient recording will begin if the calculated three phase VAR limits are exceeded. After selecting the **Generator-VARs** trigger type, **double click** on the channel and a dialogue box will pop-up requesting the Voltage channel for each phase and the Current channels for A,B, and C.



Gen-PF: This is a three phase **Power Factor** trigger. Transient recording will begin if the calculated three phase PF limits are exceeded. After selecting the **Generator-Power Factor** trigger type, **double click** on the channel and a dialogue box will pop-up requesting the



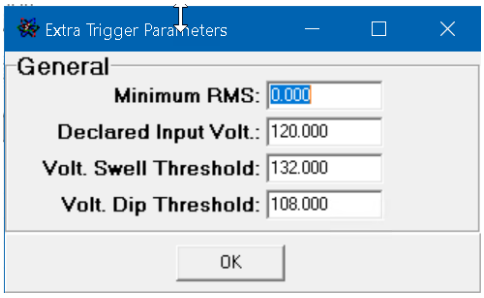
Voltage channel for each phase and the Current channels for A,B, and C and the Minimum Power.

MAG: This is a Magnitude trigger. Transient recording will begin if the magnitude limits are exceeded.

RVC: This is a Rapid Voltage Change trigger. Transient recording will begin if the RMS change is over or under the thresholds. RVC uses 60 cycles as a reference for detecting RVC events referenced every ½ cycle. The over and/or under value is an RMS value based on a percentage of your nominal line voltage. The range, based on the IEC 61000-4-30 standard, is 6%.

The Start field is populated automatically with **Both**. Calculate the Trip If Over and Trip If Under by finding the percentage of the Nominal RMS you would like to trigger on and enter the RMS value into the **Trip If Over** field. The **Trip If Under** fields will automatically be populated with the negative of the value in the Trip if Over field. For example, If you want to use 6%, per the standard, of the nominal RMS value of 120, Enter 7.2 in the Trip If Over and -7.2 will populate in the Trip If Under field automatically and cannot be entered manually.

Next, Double click on the RVC trigger line to bring up the Extra Parameter window to enter the Minimum RMS, Declared Input Voltage, Voltage Swell Threshold, and Voltage DIP Threshold. If the voltage goes below the Minimum RMS, the trigger is deactivated to eliminate nuisance triggers. Enter the expected Voltage in the Declared Voltage field cannot be 0. The Volt. Swell and Volt Dip parameters are recommended to be 10% of the Declared **RMS**. If voltage is outside either threshold, the Trigger is removed from the recording.

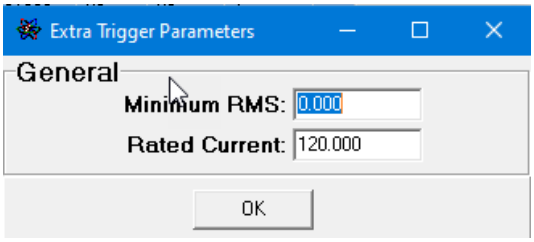


Hysteresis setting is based on **Trip if over** and best practice is to set to 50% (.5) per the standard.

Note: When using DSP 7 or higher there is no restriction on how many RVC triggers, or which triggers they are assigned to. With DSP 6 or lower, RVC triggers are limited to six per data chassis and must be assigned to 1 or more of the first 6 triggers only.

TRD: This is a Total Rated-Current Distortion Trigger. **Only set on Current channels, Trip if Under is not used.** Set **Trip if Over** limit using a percentage value of the Rated Current, which you will enter in the next step below. Transient recording will begin if TRD exceeds the set limit. A trigger level entry of 1 equal 100%.

Next, Double click on the TRD trigger line to bring up the Extra Parameter window to enter the Minimum RMS and Rated Current. If the RMS goes below the Minimum RMS, the trigger is deactivated to eliminate nuisance triggers.



Start, Click the trigger(s) for which you want to specify what will cause APP Recorder to begin observing a trigger situation. Then from the **Start** list, make the appropriate selection. The available starts are:

Over: Recorder will observe only the settings in the **Trip if Over** column.

Under: Recorder will observe only the settings in the **Trip if Under** column.

Both: Recorder will observe the settings in the **Trip if Over** and **Trip if Under Limit** columns.

6. **Duration,** click the trigger(s) for which you want to specify a duration. Then in the **Duration** box enter a time value, in seconds. This setting will desensitize a trigger. For example, if an RMS trigger is set to trip over 100 volts and a duration setting of 1 second is entered, the APP Recorder will not trigger unless the RMS value exceeds 100 volts for at least 1 second.

7. **Trip-if-Over**, Click the trigger(s) that you want to specify as "over limit" triggers. Then in the **Trip if Over** box, enter the value which, when exceeded, will indicate a trigger situation.

Note: Recorder ignores this Over limit if you select **Under** in the **Start** list.

8. **Trip if Under,** Click the trigger(s) that you want to specify as "under limit" triggers. Then in the **Trip if Under** box, enter the value, which not reached, will indicate a trigger situation.

   Note: Recorder ignores this Under limit if you select **Over** in the **Start** list.

9. **Trip if Rate >**, You can specify a rate of change trigger which runs independently from the over limit trigger and/or under limit triggers. Click the trigger(s) for which you want to specify a rate of change trigger. Then in the **Trip if Rate >?/s** box, type the value.

   Note: If the trigger type is Hz Step, then specifying a value in this box makes the trigger a Frequency Step difference trigger. Enter 0 (zero) to disable this trigger.

10. **Hysteresis**, it is possible to overwhelm the APP Recorder with triggers. Hundreds of back-to-back triggers can cause the system to reboot; meaningless records will consume hard drive space. To prevent this, you can specify a hysteresis limit. The hysteresis limit will prevent the APP Recorder from recording uncontrolled triggers if a trigger limit is on the threshold for an extended period of time.

    Click the trigger(s) for which you want to specify a hysteresis limit. In the **Hysteresis** box, type a percentage (1=100%).

CAUTION **If you create a Hz Step trigger or Hz trigger, we recommend reducing the default Hysteresis to 0.001. However, the value is dependent on your trigger limits.**

11. **Priority**, if you designate a trigger as being a priority trigger, then the APP Recorder will ignore the fault record limit and continue to record for 10 seconds even if the trigger level is no longer exceeded. This may be useful in over-current situations. Select the trigger(s) that you want to designate as priority triggers. Then, from the **Trigger** list, select **Yes**.

12. **Disturb**, if you designate a trigger as being a disturbance trigger, then the APP Recorder will mark the triggered fault records as disturbance records. In the **Fault Summary** tab, those records will be designated with a D in the **Type** column. Select the trigger(s) that you want to designate as disturbance triggers. Then, from the **Disturb** list, select **Yes** or **None**.
    None will designate the fault as disturbance but will not cause an Alarm.

13. **Chassis #,** Chassis number is displayed with the triggers and is designated on the Chassis Config Tab.

    Note: A fault record can be both transient "T" and disturbance "D". If both occurred, the type will be "T/D".

6.17 Configuring Event Channels

The **Event Channels** tab contains setup information and trigger conditions for each event input channel. Event channels are sampled at the user defined analog channel sampling rate. The number of event channels displayed is determined by the setup in the **Chassis Config** tab.

You can edit the values by first clicking the row that you want to update. You can use the Windows Shift and Control keys to select multiple rows simultaneously. If you select multiple rows, then your edits will be applied to all the selected rows. Update the values by typing in the entry fields above the column headings. Your entries are displayed in the selected row(s) immediately.

➢ To Configure Event Channels

1. In the **Edit Point Assignment Record** window, click the **Event Channels** tab.
   The tab appears, as shown in the following figure.

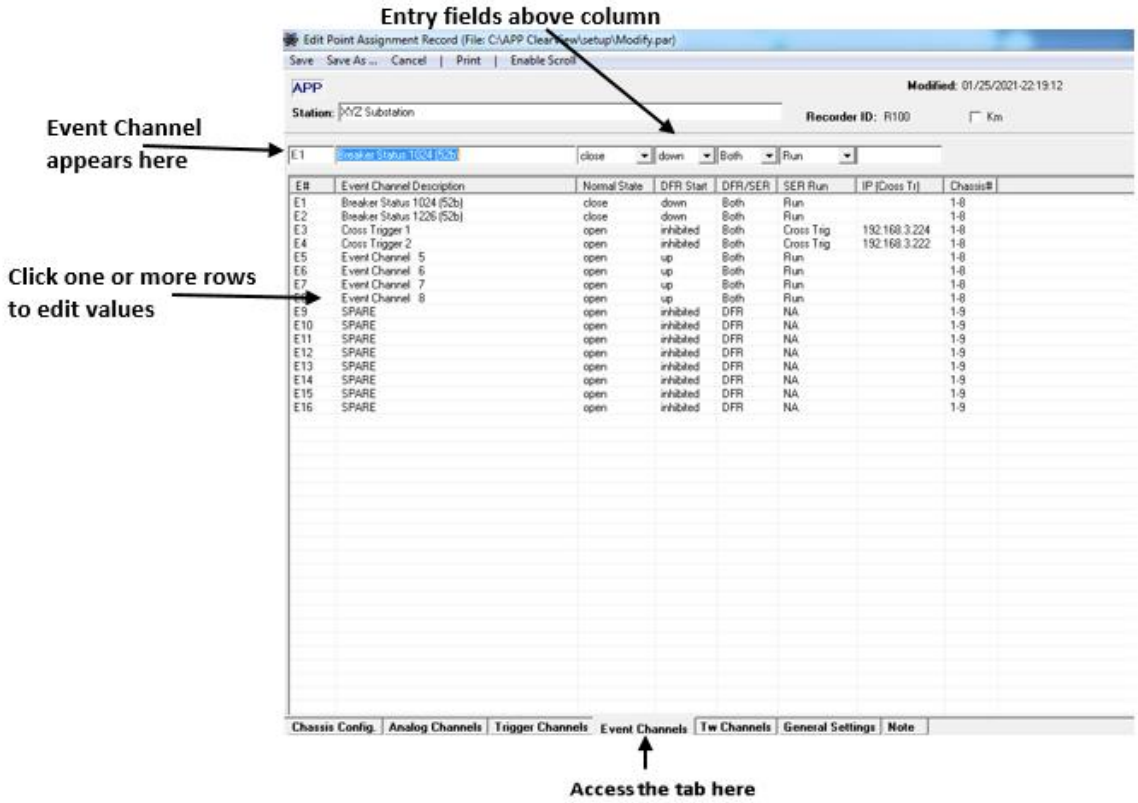


Figure 95: Edit Point Assignment Record Window—Event Channels Tab

2. **Km** check box, checking this box on this Tab or any Tab in the Point Assignment record configuration will enable the display of distance in kilometers wherever distance is displayed.

Note: Records that include distance are always stored in **Miles**. Using the **Km** check box only provides a conversion to display distance in Kilometers and does not change the data.

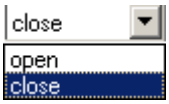
3. Click the event channel(s) for which you want to specify a description. Then in the **Description** box, type a description. You can type up to 81 characters. You can view the **Abnormal Event Channel Description** by clicking once on the Description field and it will alternate which description is visible.

   Abnormal Event Channel Description can be entered in two ways:

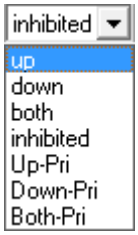
   1. Right click on the Event Channel and a pop-up will appear allowing you to copy Normal Desc to Abnormal Desc field

   2. Go to the Abnormal Description view and edit the field.

4. Click the event channel(s) for which you want to designate the normal state of the external contact connected to the event channel input. Then from the **Normal State** list, select either **open** or **closed**.



5. You can configure events to trip the APP Recorder and create transient and extended records. Select the event channel(s) for which you want to define the DFR Start condition. Then from the **DFR Start** list, select the appropriate value. Table 3 shows the conditions in which the recording process begins.



Priority Trigger, **Up-Pri, Down-Pri, and Both-Pri** are Priority Start Triggers. If you designate a trigger as being a priority trigger, then the APP Recorder will ignore the fault record limit and continue to record for 10 seconds. This may be useful in over-current situations. When using Priority Trigger, it is recommended to set the **DFR/SER** setting to **Both** in order to capture all Fault occurrences (see **caution** below). **See 6.19 Configuring General Settings** to further understand the impact on the Fault record size.

CAUTION **When using the Priority Start settings, be aware there may be a delay after recording a Priority record before the DFR can start recording another Fault on the channel and could result in a missed Fault record. However, every trigger will be logged to the SER.**

Table 3: Event DFR Start Settings and Actions

When the Setting of the DFR Start box is this…	And this action occurs…	Then the APP Recorder recognizes a trigger situation and begins recording (Yes or No)
UP and Up-Pri	N.O. contact goes closed	Yes
UP and Up-Pri	N.O. contact returns to open	No
UP and Up-Pri	N.C. contact goes open	No
UP and Up-Pri	N.C. contact returns to closed	Yes
DOWN and Down-Pri	N.O. contact goes closed	No
DOWN and Down-Pri	N.O. contact returns to open	Yes
DOWN and Down-Pri	N.C. contact goes open	Yes
DOWN and Down-Pri	N.C. contact returns to closed	No
BOTH and Both-Pri	N.O. contact goes closed	Yes
BOTH and Both-Pri	N.O. contact returns to open	Yes
BOTH and Both-Pri	N.C. contact goes open	Yes
BOTH and Both-Pri	N.C. contact returns to closed	Yes
INHIBITED	N.O. contact goes closed	No
INHIBITED	N.O. contact returns to open	No
INHIBITED	N.C. contact goes open	No
INHIBITED	N.C. contact returns to closed	No

6. **DFR/SER**, you can assign each event channel either a DFR or an SER setting to indicate what information should be recorded in the event of a state change. Select the channel(s) for which you want to designate the DFR or SER setting. Then, in the **DFR/SER** list, select one of the following:

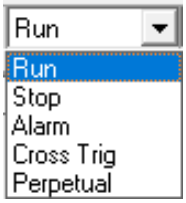
Select the **DFR** setting and choose (Up/Down/Both) if you want all analog and digital channels to be recorded when the event channel is asserted (see the table above).

Select the **SER** setting if you want to record only the event channel that changes state. If you assign a channel the **SER** setting, an entry of **NA** will appear in the **DFR Start** column. In SER mode an Event Channel that changes state will be logged to the daily Sequence of Event Report.

Select both settings if you want an Event Channel change of state to trigger the DFR and log to the Sequence of Event Report. If an Event Channel is set to **Both and Inhibit**, the DFR will not trigger but the Event Channel will appear in the Fault Record if it changes state during the time of the Fault Record.

Note: When using a **Priority DFR Start Trigger**, it is recommended to use **Both** for DFR/SER setting.

7. **SER Run**, you can designate how the APP Recorder should record an SER channel in the event of a state change. Select the SER channel(s) for which you want to designate the SER Run setting. Then, in the **SER Run** list, select one of the following:



Select **Run** if you want the SER feature to log to the Sequence of Events Report.

Select **Stop** if you want to inhibit or disable the SER channel.

Select **Alarm** if you want the SER feature to run and turn on the SER alarm when the SER channel changes state. Additionally, the SER Alarm, in General Settings/Recorder Setup, TAB must be mapped to the alarm output.

Select **Cross Trigger** to configure the Event Channel for a Cross Trigger to be received from another DFR. This will start recording in the receiving DFR at nearly the same time as the first/sending DFR to create a parallel fault record for the components monitored in this DFR. The DFRs need to be connected to an IP network (typically to the DSP network Ethernet Switch) if you are using a network to communicate Cross Triggers (See Recorder Instruction Manual Section 4.5 for instructions on configuring Cross Triggers). The Cross Trigger Alarm output and the Cross Trigger Event Channel must be configured in the DFR to send Cross Triggers over the network.

Alternatively, the DFRs can be hard wired from the Alarm output associated with the Cross Trigger in the first DFR to an event input in the second DFR to receive the Cross Trigger. The Cross Trigger Alarm output in the sending DFR and the Cross Trigger Event Channel in the receiving DFR must be configured in the respective DFR Point Assignment Record to send and receive Cross Triggers.

The Event Channel parameters used with Cross Triggers are:

Normal State	DFR Start	DFR/SER	SER Run	IP (Cross Tr)
Open	Inhibited	Both	Cross Trigger	Unique Computer IP Address

If you are hard wiring the Cross Trigger Alarm to the Event Channel, you can leave the IP address blank. See section 4.6.4 in the Recorder Manual for more on configuring the DFRs for Cross Triggering.

Note: The Transient Sampling rates for both DFRs must be set to the same rate.

Select **Perpetual** to configure the SER alarm to remain energized when the channel goes into abnormal state until the channel returns to Normal State. This is similar to the Alarm setting above except Alarm will only stay energized for 10 seconds. The SER Alarm, in General Settings/Recorder Setup TAB must be mapped to the alarm output.

8. **IP (Cross Tr)**, this field is used when assigning the Event Channel to send and receive **cross triggers** between DFRs across an IP network. Enter the IP address of the DFR computer sending a Cross Trigger to this DFR's event input. If you are hard wiring between the DFRs, you can leave the IP address blank.

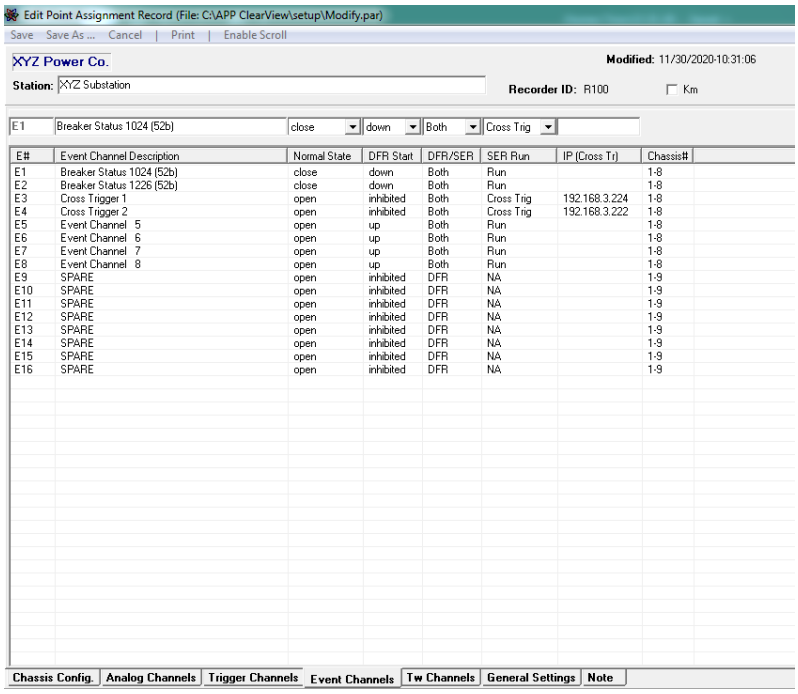


Figure 96: Cross Trigger Event Channel in PAR

9. **Chassis#**, displays the range of chassis the Event Channel is associated with.
10. From the menu bar, click **Save**.

Note: The Transient Sampling rates for both DFRs must be set to the same rate.

6.18 Configuring Traveling Wave Channels

The Traveling Wave, **TW Channels** tab contains setup information for each TW input channel. The number of TW channels displayed is determined by the setup in the **Chassis Config** tab.

You can edit the values by first clicking the row that you want to update. You can use the Shift or Control key to select multiple rows simultaneously. If you select multiple rows, then your edits will be applied to all of the selected rows. Update the values by typing in the entry fields above the column headings. Your entries are displayed in the selected row(s) immediately.

➢ To configure Traveling Wave Channels

In the **Edit Point Assignment Record** window, click the **TW Channels** tab.
The tab appears, as shown in the following figure.

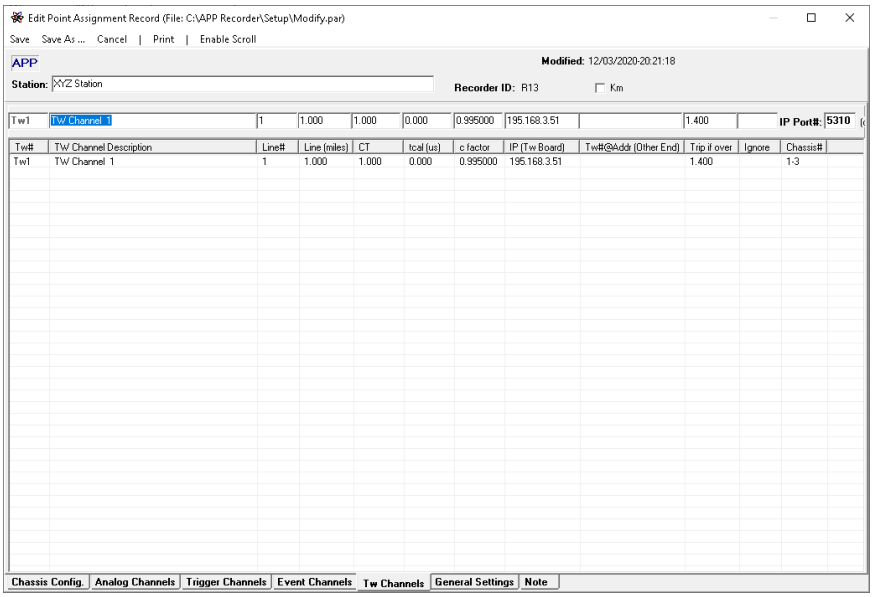


Figure 97 Edit Point Assignment Record Window—Traveling Wave Channels Tab

1. **Km** check box, checking this box on this Tab or any Tab in the Point Assignment record configuration will enable the display of distance in kilometers wherever distance is displayed.

Note: Records that include distance are always stored in **Miles**. Using the **Km** check box only provides a conversion to display distance in Kilometers and does not change the data.

2. **Tw#,** this field is automatically filled with incrementing numbers for each TW channel. It represents the number of the TW channel.

3. **TW Channel Description,** this field is the descriptive name of the channel and should be appropriately named to properly identify the TW channel. It is user modifiable. The default name is TW Channel #, where # is the TW channel number, found in the column immediately to the left.

4. **Line#,** this field is the number that identifies the line that the channel is recording. It is used to separate and identify the lines if one system is monitoring for TW faults on multiple channels and multiple lines. It is user modifiable and the default line number is 1.

5. **Line (miles),** this field represents the length of the line in miles that the TW channel is recording. It should be entered to a 3-decimal place precision. The length of the line should be known at the time of setup. The default value is 1.000.

6. **CT,** this field represents the CT ratio. It should be entered to a 3-decimal place precision. It is user modifiable but should not be changed unless the user is clear on how changing this value will affect the results. The default value is 1.000, which has been predetermined to be correct when using the current transformers supplied with the TW board.

7. **tcal,** Time from a Fault to each end of the line should be symmetrical relative to where the fault occurred on the line. If differences in infrastructure of the stations at each end or some other factor causing the time not to be symmetrical, you can use tcal to calibrate the time to obtain a better result. Time Calibration does not have to be done until the first TW fault record has been created. The field is 3 decimal place precision and the value is 0.000 unless it is adjusted by a user using the Time Calibration process. To determine the calibration factor and entering it into the Point Assignment record see *(5.10* Find TW Time Calibration (tcal).

8. **c factor,** this field represents the speed a fault will travel along the line. The value should be a 6-decimal place precision number between 0 and 1. The value is a decimal fraction of speed of light,

where 1 is the speed of light. It is user modifiable and can be calibrated using fault data and other information provided by the user and can be refined to give better results. The default value is 1.000000.
Calibration of c factor, Calibration does not have to be done until the first TW fault record has been created. If the distance to fault result is not correct, the c factor can be recalibrated to obtain a better result. To calibrate the c factor, see (5.9 Find TW C Factor).

9. **IP (Tw Board),** this field represents the IP address of the local TW board. The value should be an IPv4 address, in the format of xxx.xxx.xxx.xxx where xxx are integers between 0 and 255. It is user modifiable. The default value is 192.168.203.xxx, where xxx depends on the slot position of the channel in the system.

10. **Tw#@IP (Other End),** this field represents the TW channel number and the IP address of the remote TW channel at the other end of the line used for double end fault location. It is user modifiable. The format is Tw#@xxx.xxx.xxx.xxx, where # is the TW channel number of the remote TW board and xxx.xxx.xxx.xxx is the IP address of the remote TW board. It is blank by default.

11. **Trip if over** sets the trigger noise value if over will trigger a TW fault. The default is 1.4A. The over-under voltage of the V-th TRIG is the trigger ratio R_T multiplied by the peak noise I_{NPk}, which can be positive or negative. The peak noise is generally around 1A at the secondary.

12. **Ignore,** this field allows you to virtually remove this channel from the configuration by placing an X in the field typically during trouble shooting. Note that ignoring a Chassis in the Chassis TAB will not ignore the TW board. You need to use ignore on the TW TAB to affect TW channels.

13. **Chassis#,** this field represents the chassis and the slot number the TW board of the corresponding TW channel is in the system. The format is x-x, where the first x is the chassis number and the second x is the slot number the TW board of the corresponding TW channel is in. It is not user modifiable and is filled in automatically.

14. **IP Port#,** this field represents the incoming port on the computer that will receive communications from the TW board. The value should be an integer from 0 to 65535. It is user modifiable but should not be changed unless the user is clear on how changing this value will affect the communication of data. The default value is 5310.

15. **IP TW Board**, each TW board requires its own IPv4 address. To set this address, connect a programming cable from the computer to the TW board or using a UDP connection with an Ethernet cable to the DSP board and change the address using the **Tools->DSP/TW Board's Ethernet Settings** dialogue in the menu bar in either ClearView or the Recorder. The way to change a TW board's IP address is the same as changing the IP address of a DSP board.

    For more detail on configuring a TW Board, see **Configuring a DSP/TW Board's Ethernet and IP Address Settings** in the **APP Recorder Manual**.

6.19 Configuring General Settings

The **General Settings** tab contains two tabs: **Sampling** and **Recorder Setup**.

On the **Sampling** tab you can configure sampling rates and continuous recording settings. You can disable or enable Extended Oscillography Recording, Extended RMS Recording, Continuous RMS Recording, Continuous Oscillography Recording, Continuous Frequency Recording, and Continuous Phase Recording.

CAUTION **Disabling the Extended Recording feature, by entering a sampling rate of 0, also disables <u>all</u> of the Continuous Recording features.**

On the **Recorder Setup** tab, you can configure time synchronization, DNP-3, alarms, and other miscellaneous parameters.

➢ To Configure Sampling Rates and Continuous Recording Settings

1. In the **Edit Point Assignment Record** window, click the **General Settings** tab.
   In the **General Settings** tab, the **Sampling** tab appears by default, as shown in the following figure.

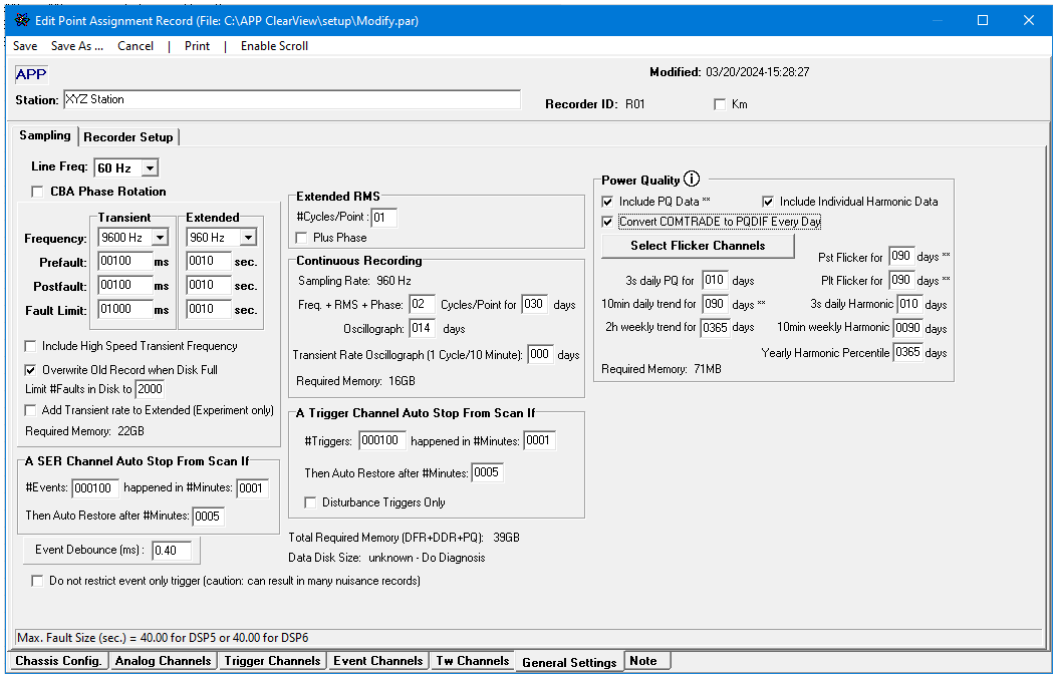


Figure 98: Edit Point Assignment Record Window—General Settings Tab, Sampling Tab

2. **Km** check box, checking this box on this Tab or any Tab in the Point Assignment record configuration will enable the display of distance in kilometers wherever distance is displayed.

Note: Records that include distance are always stored in **Miles**. Using the **Km** check box only provides a conversion to display distance in Kilometers and does not change the data.

3. In the **Line Freq** list, select the line frequency (50Hz or 60Hz) for the analog channels that will be connected to the APP Recorder.

4. **CBA Phase Rotation** check box: if you want to reverse the default order of the three phase channel rotation from ABC to CBA, click the CBA check box.

5. Next to **Frequency**, from the **Transient** and **Extended** lists, select the appropriate sampling rates. Table 4 lists the available selections.

6. **Add Transient Rate to Extended** check box, Version 3.2.4 added this as an experimental option This adds the Transient Rate frequency selected to the list of Extended options. The same restrictions for numbers of Analog Boards in a chassis still apply.

   Note: A higher frequency rate will create larger transient and extended record sizes. Larger records will take longer to retrieve via modem or network connection.

   Note: The continuous Oscillography samples at the same frequency as the Extended.

   Note: If you are using an APP-618 Controller for Sampled Values streaming, use 4800Hz Transient sampling Rate only.

Table 4: Transient vs. Extended Sampling Rates for Line Frequency=60Hz

Transient (Hz)	Extended choices (Hz)	Comment
1200	0, 240, 600, 1200	
2400	0, 240, 480, 600, 1200	
4800	0, 240, 480, 600, 960, 1200	The defaults are 4800 and 960
9600	0, 240, 480, 600, 960, 1200, 1920	
11520	0, 240, 360, 480, 720, 960, 1440, 1920	
15360	0, 240, 480, 960, 1920	
16800	0, 240, 480, 600, 840, 1200, 1680	See Figure 99 High Speed Sampling Rate Limitations for limitations
19200	0, 240, 480, 600, 960, 1200, 1920	See Figure 99 High Speed Sampling Rate Limitations for limitations
24000	0, 240, 480, 600, 960, 1200	See Figure 99: High Speed Sampling Rate Limitations for limitations
30720	0, 240, 480, 960, 1920	See Figure 99: High Speed Sampling Rate Limitations for limitations

Note: "Include High Speed Transient Frequency" must be checked and frequency of 0 means that recording is disabled.

Table 5: Transient vs. Extended Sampling Rates for Line Frequency=50Hz

Transient (Hz)	Extended choices (Hz)	Comment
1200	0, 200, 300, 400, 600, 1200	
2400	0, 200, 300, 400, 600, 1200	
4800	0, 200, 300, 400, 600, 800,1200, 1600	The defaults are 4800 and 800
9600	0, 200, 300, 400, 600, 800,1200, 1600	
16800	0, 200, 300, 400, 600, 700, 800,1200, 1400	See Figure 99: High Speed Sampling Rate Limitations for limitations
19200	0, 200, 300, 400, 600, 800,1200, 1600	See Figure 99: High Speed Sampling Rate Limitations for limitations
24000	0, 200, 300, 400, 500, 600, 800, 1000,1200, 1500, 1600	See Figure 99: High Speed Sampling Rate Limitations for limitations

Note: "Include High Speed Transient Frequency" must be checked.
Note: An Extended frequency of 0 means that Extended and Continuous recording is disabled.

The next step is to indicate the sampling rates. Transient sampling rates of 16800Hz, 19200Hz 24000Hz are classified as High Speed sampling rates. You can select these rates only if you first select the **Include High Speed Transient Frequency** check box. **See Figure 99: High Speed Sampling Rate Limitations** for details about the limitations to these sampling rates.

Do you want to select High Speed transient frequency rates?

- If **yes**, then select the Include High Speed Transient Frequency check box.
- If **no**, skip to the next step.

Figure 99: High Speed Sampling Rate Limitations

7. Next to **Prefault**, in the **Transient** and **Extended** boxes, specify the amount of time/data the APP Recorder saves prior to a trigger. The range for transient recording is 50msec to 99.999sec and the range for extended recording is 10sec to 990sec.

8. Next to **Postfault**, in the **Transient** and **Extended** boxes, specify the amount of time/data the APP Recorder saves after a trigger returns to a normal state or after the fault limit has been reached. The range for transient recording is 50msec to 99.999sec and the range for extended recording is 10sec to 990sec.

9. Next to **Fault Limit**, in the **Transient** and **Extended** boxes, specify the maximum amount of time/data the APP Recorder saves after a trigger occurs. If the trigger returns to normal before fault limit time expires, the post fault time will begin right at the "return to normal" time. If the trigger stays abnormal up to the fault limit time, the fault limit time ends, and the post fault time begins. The fault limit range for transient recording is 50msec to 99.999sec and the range for extended recording is 10sec to 990sec.

Note: If the **priority trigger** has been enabled, the program ignores the fault limit time and will record until the record grows to a length of 40 seconds.

Note: The total length of a fault record is **Prefault + Fault Limit + Post Fault**. The recorder has the capability to perform post fault retriggering. If a trigger occurs during the post fault time, the fault limit and post fault timers reset to zero and begin recounting. Post fault retriggering allows the record to automatically extend for easier viewing with the master station software. The post fault retriggering process can potentially create a transient record with a 40 second length (max) if post fault retriggering keeps going non-stop. If post fault retriggering continues to occur after 40 seconds, a new record will be created.

10. To overwrite old records, select the **Overwrite Old Record when Disk Full** check box, and set the "Disk Alarm on if Below NNNN NN MBytes" parameter in the Recorder Setup tab. If the hard drive memory falls below value, the oldest transient and extended records will be overwritten by new incoming records in a "First In, First Out" sequence.

11. In the **Limit #Faults in Disk to** box, enter a value between 1 and 9999, representing the number fault records to keep at any one time on the disk. By specifying a limit, you will prevent the hard drive from filling up if there is a runaway trigger. The default setting is 2000.

12. Under **Extended RMS**, in the **# Cycles Point** box, enter a number to define how often an RMS value is stored for extended recording. For example, if you enter 2, then one RMS value will be stored every 2 cycles.

13. **Plus Phase**, Check this option to calculate power using Extended RMS record to include Phase Angle along with RMS

14. Under **Continuous Recording**, specify how often RMS, Frequency, and Phase values are stored for continuous recording.

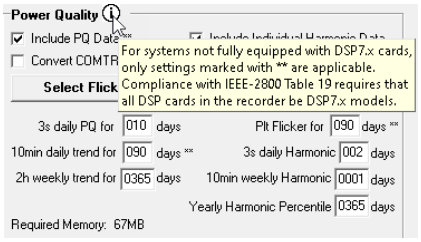
15. The Continuous Oscillography recording follows the sampling rate set for the Extended Oscillography Recording. The number of recording days is also entered here (FIFO.)

CAUTION **Ensure the Recorder Hard Drive can accommodate the data generated by your continuous recording settings. As settings are entered, the required memory is displayed. We recommend 50% free space on the Recorder hard drive to ensure responsive operation. It is important to reserve enough memory to accommodate the continually recorded data, otherwise the hard drive will become fragmented over time. APP Engineering strives to obtain required customer settings before shipping a Recorder. This helps ensure enough memory has been reserved. The continuous recording settings are critical. We recommend calling APP Engineering if you are entering or changing these settings.**

16. **Transient Rate Oscillography** – Enter the number of days you want the unit to record 1 cycle every 10 minutes. The cycle is stored at the transient sample rate. Zero (00) days is the default and turns off the feature. When more than 00 days is entered, the **TOscData** folder is created in the **C:\Recorder\Data** folder and will hold files for each day for the number of days entered. This feature is primarily used by Power Engineers along with 3rd party PQ software tools to analyze Steady State Power quality.

17. It is possible for a **Trigger Channel** to toggle states uncontrollably. To automatically shut down and restart a nuisance trigger channel, complete the fields under **A Trigger Channel Auto Stop From Scan If**. Enabling this feature can save hard drive memory. If you enter 0, the feature is disabled.

18. **Include PQ Data check box –** If you want to capture **Power Quality Data,** check the **Include PQ Data** check box in conjunction with setting the associated **Triggers** in the Trigger Channel tab. Then set the retention periods for each PQData file types in days. If you are using **DSP board Version 7 and software version 3.3.6 higher** you will receive all file types listed below. If you have **DSP Board 6 or below** you will receive a subset of the file types listed below. Hover your cursor over the ⓘ Information icon to see the DSP board restriction note on the screen.



The minimum retention is 2 Days and cannot be set lower or turned off. The following are the file types to set:

With DSP Board 6:

- 10 Minute Daily Trend
- Pst Flicker
- Plt Flicker

With DSP Board 7 or higher you receive all the available files:

- 10 Minute Daily Trend
- Pst Flicker
- Plt Flicker
- 3 Second PQ
- 2 Hour Weekly Trend
- 3 Second Daily Harmonic
- 10 Minute Weekly Harmonic
- Yearly Harmonic Percentile

See **Section 7 Power Quality Recording for Inverter Based Resources** for information on these PQ files and retention settings.

Note: Based on PRC-028-1 and IEEE-2800 Table 19 PQ monitoring requirements. (See Figure 100 Include PQData Check Box below).

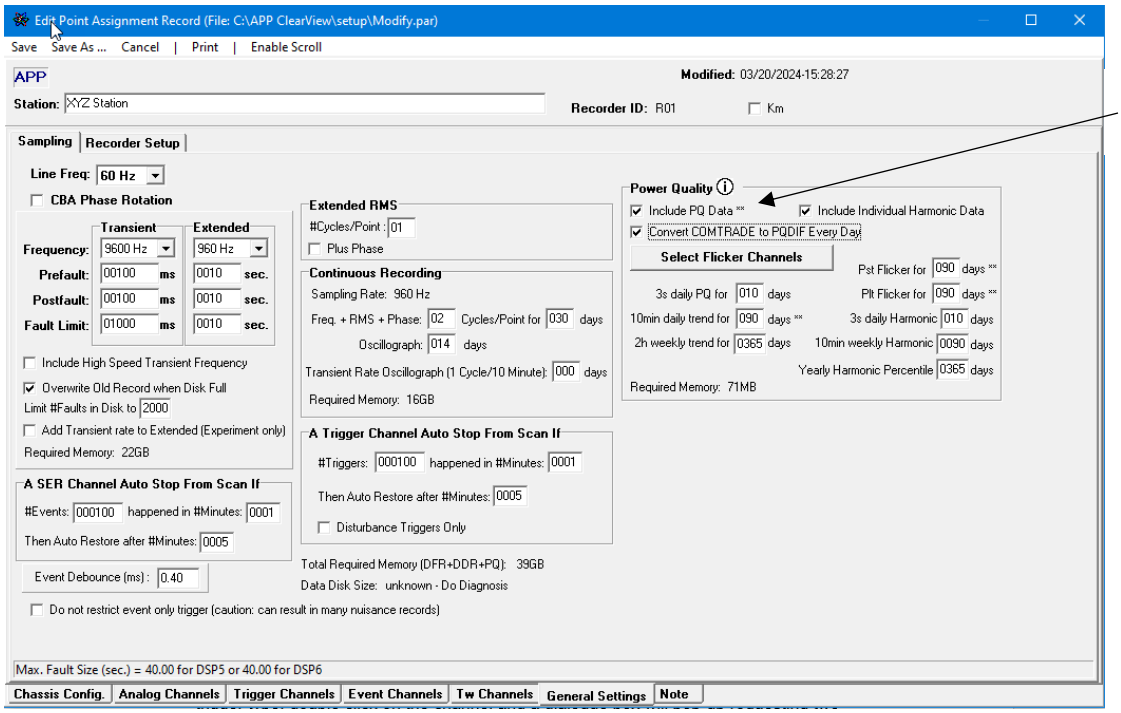


Figure 100 Include PQData Check Box

Convert PQData files to PQDIF - If you would like the PQ trend files and Flicker files to be converted to PQDIF format automatically every day, click the check box for Convert COMTRADE to PQDIF Every Day. This will cause PQDIF format files to be saved to **APPRecorder\Data\PQData\PQDIFData** folder. The filenames will be the same as the original COMTRADE file it was derived from.

Include Individual Harmonic Data – Only available when using DSP 7 and Software version 3.3.6 or higher. This feature enables recording of Individual Harmonic and Total Harmonic Distortion (THD). The primary purpose for providing this data is to make it easier to identify the Harmonic Order which is above the standard. See **Section 7.5.2 Individual Harmonics files** for more information.

Voltage Unbalance: Turn on Continuous Recording for Voltage Unbalance by setting **Unbalance Triggers** for the desired analog channels. Once you have set the Unbalance trigger type, double click on the channel and a dialogue box will pop-up requesting two other analog channels for phases B and C.

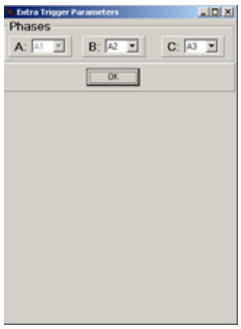


Figure 101: Extra Trigger Parameters

The data will be written to the \APPRecorder\Data\PQData folder. Unbalance PQ data is written in COMTRADE format. This data will be contained in any of the Trend files that are created. Depending on if you have DSP6 or DSP 7 as described above. The file(s) contain recorded Unbalance data and data for other PQ triggers in COMTRADE format.

Note: The voltage unbalance measurements are in accordance with the IEC 61000-4-30:2015.

Flicker: To turn on continuous recording of Flicker, first enable Pst/Plt in the General Settings Tab of the Point Assignment Record by clicking on **Select Flicker Channels** button in the Power Quality box shown in the figure below.

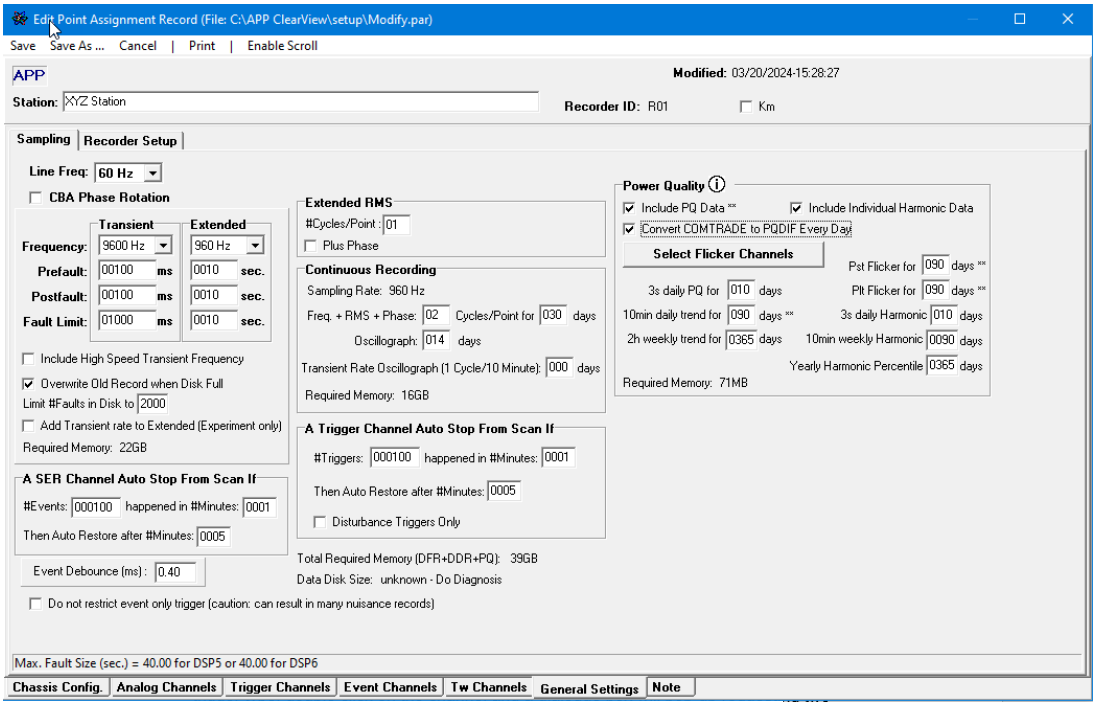


Figure 102 Enable Pst/Plt Continuous Recording

The list of the Analog Channels will appear. Then changing the desired Voltage channels to **Yes** in the **Flicker** column. Only Voltage Channels will work on Flicker.

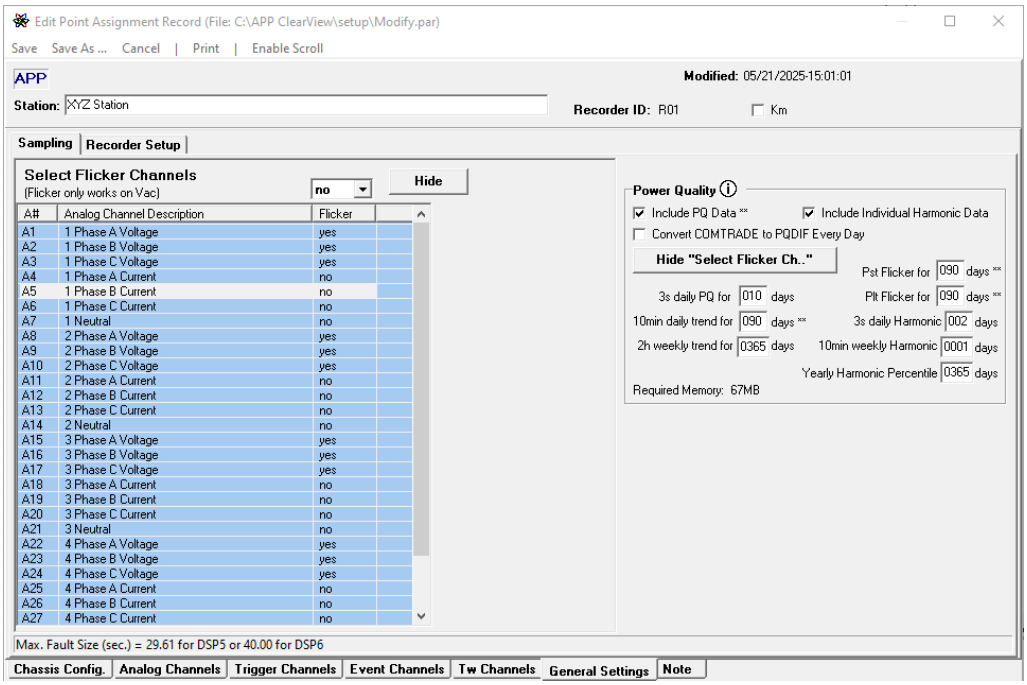


Figure 103 Select Flicker Channels for Continuous Recording

As described above, be sure “Include PQ Data” Check Box is checked in the General Settings TAB. You will **NOT** need Flicker Triggers set up in the Trigger Tab for Flicker to be included in PQ Data recording. The data will be written to the \APPRecorder\Data\PQData folder.

- **Set the retention period in days for each file type described below, minimum retention is 2 Days and cannot be set lower or turned off.**

The retention period begins after the period (daily, weekly, yearly...) of the file is passed. For example, for a yearly file, a retention of 365 will keep that file for another year after it has received its last sample in the interval period.

NOTE: The first three files described below are the only files created if you are using DSP 6 or below. On the screen they are indicated by the double asterisks (**) next to them.

10 min daily trend -The file name will be [YYYYMMDD]TrR[RecID].dat. This file contains recorded trigger values for all triggers set. If there are HD, THD, or TRD Triggers, it will contain the HD/THD data at their highest value. They are recorded at 10 minute intervals in COMTRADE format. Typical Retention is 90 days.

Pst Flicker - Short term flicker data is written in COMTRADE format. The file name will be [YYYYMMDD]FkrR[RecID].dat. This file contains recorded flicker data at 10 minute intervals for 24 hours. Typical Retention is 90 days.

Plt Flicker - Long term flicker is written to \APPRecorder\Data\PQData\[YYYYMMDD]FkrR[RecID]_Weekly.dat as a 2-hour aggregation of Pst data in COMTRADE and stored in the PQ folder. If needed, you can open the COMTRADE file anytime and Save as PQDIF. Typical Retention is 90 days.

Note: The recorded Flicker data is based on IEC 61000-4-15 and -30 up to 1620 cpm which is equivalent to a flicker frequency of 13.5 Hz. The accuracy of the measurements will suffer if the flicker frequency exceeds such.

Power Quality recording based on IEEE2800 Table 19

If you have DSP7 or higher and are running APP Recorder Version 3.3.6 or higher, Recorder will also create continuous recording files based on **IEEE 2800 Table 19.** Please S**ee Section 7 Power Quality Recording for Inverter Based Resources** for more information on the PQ files created and retention period settings.

19. It is possible for an **SER channel** to toggle states uncontrollably. To automatically shut down and restart a nuisance SER channel, complete the fields under **A SER Channel Auto Stop From Scan If**. Enabling this feature can save hard drive memory. If you enter 0, the feature is disabled.

20. Do you want to prevent multiple triggers due to input contact bounce?

    If **yes**, in the **Event Debounce (ms)** box, enter a time period in ms. The contact must be in a steady state condition for this time period before it triggers the system.

    If **no**, skip to the next step.

    Note: A fault record's time will reflect the first detection of a change in state.

    Note: At the bottom of the Sampling Tab screen, the Max Fault Size is displayed based on the sampling settings selected

21. From the menu bar, click **Save**.

➢ To Configure Time Synchronization, DNP-3, Alarms, and Other Miscellaneous Parameters

1. In the **Edit Point Assignment Record** window, click the **General Settings** tab.

2. Click the **Recorder Setup** tab.
   The tab appears, as shown in the following figure.

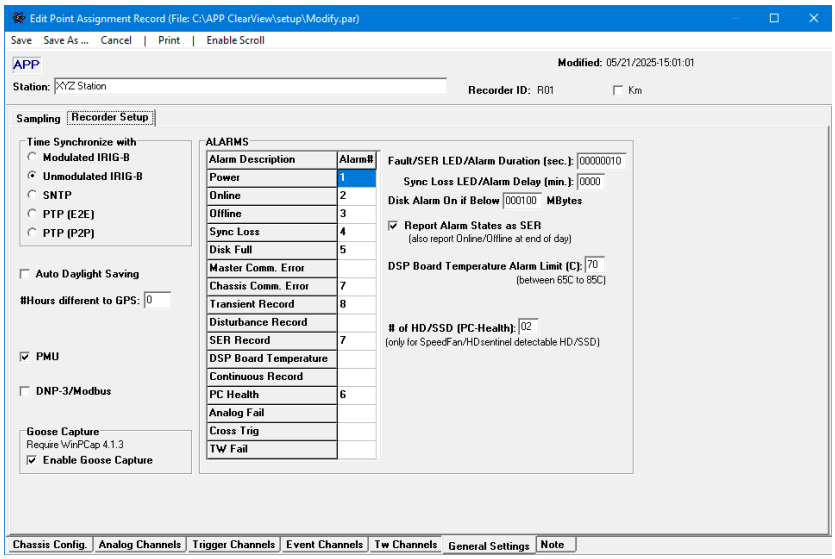


Figure 104: Edit Point Assignment Record Window—General Settings Tab, Recorder Setup Tab

3. **Time Synchronize with:** The APP Recorders can synchronize with any external satellite-controlled clock that can provide a modulated or un-modulated IRIG-B, SNTP, or PTP input. Under **Time Synchronization with**, select the synchronization approach you prefer. See Table 4 for a description of the available options.

Precision Time Protocol (PTP) input Option, PTP input has been developed as an option and requires **DSP Card version 6.4 or higher**. Prior to APP Recorder 3.2.1 checking the PTP will not function as PTP. As of 3.2.1 there are two PTP options, End to End (E2E) and PTP (P2P).

PTP (E2E) Provides Synch delay from the Master Clock using End -to-End methodology
PTP (P2P) Provides Synch delay from the Master Clock using Peer-to-Peer methodology.

Clock Settings for APP-618 Controller

There are two clock connectivity options when there is one or more APP-618 Controllers included in the DFR.

If the DFR has both APP-601 Data Chassis and APP-618 Controllers, and if the Clock source is PTP to the APP-601 Data Chassis (DSP 6.4 or higher) then you will have made an APP-601 as the Master Chassis and other APP-601 Data Chassis will need Ext-1PPS checked. However, do not check Ext-1PPS for the APP-618 Controller (GPU). If your location observes Daylight Saving Time, you will want to check the **Auto Daylight Saving check box** in General Settings and be sure the Windows time settings have **Adjust for daylight saving time automatically** checked

If you have the APP-601 Data Chassis using IRIG-B and APP-618 Controllers in the DFR, the 618 Controllers will need a PTP clock source via the Process Bus network. The APP-601 Data chassis will receive IRIG-B to the Master Chassis and Ext-1PPS to the other APP-601 Data Chassis.

CAUTION **A hardware jumper on the DSP/IRIG circuit board must follow the time synchronization software setting shown in the Table below.**

Note: See the section, “Time Quality,” in the *APP Recorder Operating Manual* for more information.

Table 6: Sync Method and Corresponding Hardware 3-PIN Jumper Position

Sync Method	JP2 3-PIN Jumper (DSP/IRIG Circuit Board)
Un-modulated IRIG-B	Jumper the middle pin & pin closest to the panel
Modulated IRIG-B	Jumper the middle pin & pin furthest from the panel
SNTP (External Clock)	N/A (LAN ENET interface)
PTP (E2E) Option	N/A (LAN ENET interface)
PTP (P2P) Option	N/A (LAN ENET interface)

Note: There are “unmod” and “mod” labels on back of the DSP board under the JP2.

4. **Auto Daylight Saving**, checking this box works with the PTP option sync method and enables the time stamp on Fault Records to take Daylight Saving Time into account. Auto Daylight Saving uses the Computer Time Zone and time setting as the reference and will adjust for Daylight Saving Time if checked.

Note: PC Region setting accuracy is required for accurate Daylight Saving Time. The PC setting for Daylight Saving Time will not conflict with the setting in the Point Assignment Record.

5. **# Hours Different to GPS**, this creates an offset to adjust the time stamp on Fault Records from UTC. An example is to use this setting to cause the time stamp to be local time.

   If you want to have the Fault Time stamp to be an alternative time from UTC, put in the desired UTC offset number of hours (e.g., -5 for Eastern Time)

   If not, skip to the next step

   Note: # Hours Different to GPS only applies to IRIG-B time source. This will not adjust time from PC time.

6. Do you want the APP Recorder to send **PMU** data?

   If **yes**, then select the **PMU** check box.

   If **no**, skip to the next step.

   Note: The settings for PMU are accessible only through the Recorder Driver window due to its real-time requirement. See the *APP Recorder Operating Manual* for further details.

7. Do you want to enable the **DNP-3/Modbus** option?

   If **yes**, then select the **DNP-3/Modbus** check box. See the *APP Recorder Operating Manual* for further details.

   If **no**, skip to the next step

8. Do you want to enable **Goose Capture**?

   The Goose Capture check box will enable Generic Object Oriented Substation Event (GOOSE) Protocol as defined in IEC 61850. This enables APP Recorder to aggregate status data from devices not connected to an APP Recorder with data from devices connected to an APP Recorder. APP 601 Recorder captures relevant messages from configured Intelligent Electrical Devices (IEDs) and writes them to the Sequence of Event Report (SER) file.

   You will need to follow the setup instructions and install additional software. More information can be found in the **APP-601 Recorder Operating Manual**. For more information, please contact APP Engineering at (317) 536-5300.

   If **Yes**, select the GOOSE Capture check box

   If **No**, skip to the next step

9. The alarm circuit board contains 8 relay outputs. Each relay uses an onboard hardware jumper that will allow the contact to be either normally open or normally closed. The board is labeled for easy jumper placement.

   For each of the alarms described in the following table, enter a number 1-8 to establish the mapping between the alarm and the relay output. You can use a number more than once; in other words, you can map more than one alarm to each relay. Additionally, an alarm can be mapped to multiple outputs.

Table 7: Alarm Descriptions

Alarm	Description
Power	The relay is energized when system power is applied. Most users will put contact in the normally closed position. We recommend **Power** be mapped to its own output, no other alarm should be mapped to this output.
Online	The relay is energized when the system program starts and the system is recording. Most users will put this contact in the normally closed position. We recommend **Online** be mapped to its own output, no other alarm should be mapped to this output.
Offline	The relay is energized when the system program, APP Recorder, is stopped. Most users will set this contact to the normally open position.
Clock Sync Loss	The relay is energized when the DSP/IRIG board has completely lost its IRIG-B input, such as disconnecting the cable, or the satellite clock sends a signal (4 bits per the IEEE standard) that an error greater than 1ms has occurred. The relay will stay energized until a synchronized condition is reestablished. Most users will set this contact as normally open.
Chassis to Chassis Communication Error	The relay will energize if any data acquisition chassis stops communicating with the computer control chassis for a period of two minutes or more. The relay will stay energized until the problem chassis begins proper communication. Most users will set this contact in the normally open position.
Chassis to Master Station Communication Error	The relay will energize if the recorder modem or network card stops communicating with the APP recorder software. The relay will remain energized until the problem is fixed. Most users will set this contact in a normally open position.
Disk Full	The relay will energize when the computer hard drive memory falls below the "Disk Alarm on if Below NNNNNN MBytes" parameter in the Recorder Setup tab. The relay will remain energized until the hard drive free space goes above the limit. However, if the "Overwrite Old Record when Disk Full" is enabled in the Sample tab, the alarm relay will not energize. Most users set this contact in the normally open position.
Transient Record	The relay will energize when the recorder triggers, the relay will remain energized for the time set in "Fault/SER LED/Alarm Duration" in the Sampling tab. The default is 10 seconds. Most users will set this contact in the normally open position.
Disturbance Record	If a trigger has been defined as a disturbance trigger with **YES** in the Point Assignment Record, the relay will energize when the recorder trips. The relay will remain energized for the time set in "Fault/SER

Alarm	Description
	LED/Alarm Duration" in the Sampling tab. The default is 10 seconds. Most users will set this contact in a normally open position. If **NONE** is used the Alarm will not energize.
SER Record	If a digital point has been setup as an **Alarm** point in the Point Assignment Record, the relay will energize when any SOE/SER point goes abnormal. The relay will remain energized for the time set in "Fault/SER LED/Alarm Duration" in the Recorder Setup tab. The default is 10 seconds. If a digital point has been setup as a **Perpetual** point in the Point Assignment Record, the relay will energize when any SOE/SER point goes abnormal. The relay will remain energized until the channel returns to Normal status.
DSP Temperature	If the DSP temperature sensor measures a temperature that exceeds the setting in the Point Assignment Record, the relay will energize and remain energized until the temperature drops below the user setting. The user selectable range is 65 to 85° C. The default setting is 70°C.
Continuous Record	If the continuous recording feature has been enabled in the Point Assignment Record, the relay will energize if the continuous recording begins. This alarm will not clear until the Alarm condition is cleared. Continuous Recording should not be mapped with any other alarm output.
PC Health	This alarm monitors the hard drive(s) and Hard Drives and CPU temperature. This relay will energize if the temperature of the hard drive exceeds 70° C. A program called HDSentinel and Speedfan must be installed on the recorder computer for this alarm to be functional. APP Recorder monitors HDSentinel for active drives, if there are fewer active drives in HDSentinel than the number entered in the "# of HD/SSD field, in the PAR General Settings Tab, this relay will energize. PC Health should not be mapped with any other alarm output. PC Health and Sync Loss alarms cannot be mapped together.
Analog Fail	This alarm is activated if the system detects any analog channel signal has hit the amplifier limits for an extended period. This may indicate the analog channel within the recorder has a component failure. The alarm relay will energize.
Cross Trigger	This alarm output is to trigger another DFR when a fault is encountered. This starts the recording in the second DFR at nearly the same time as the first DFR to create a parallel fault record for the components monitored in the second DFR. The DFRs needs to be connected to a network and IP addresses provided in the Point Assignment Record/Cross Trigger Event Channel **OR** wired from the alarm output associated with the Cross Trigger in the first DFR to a digital event input and configured in the second DFR to receive the Cross Trigger. See Section 4.6 in the Recorder Manual for more information.
TW Fail	The TW Fail alarm monitors communications with Traveling Wave boards. If you have Traveling Wave boards installed and configured in the Point Assignment Record, TW Fail Alarm will energize if the TW board(s) are not communicating with the Recorder Driver.

10. In the **Fault/SER LED/Alarm Duration (sec)** box, enter the number of seconds the transient record LED and transient record output alarm will remain illuminated and energized after a system trigger occurs. This cannot be zero.

11. **Sync Loss Delay**, enter the number of minutes to delay alarm LED and Sync Loss Relay Output. This will reduce or eliminate Sync Loss Nuisance alarms.

12. **Disk Alarm On if Below XXX Mbytes** box, enter the number of megabytes **Not** to go below, that determine when the Disk Full LED and Disk Full output alarm will illuminate and energize.

    Note: If the **Overwrite Old Record when Disk Full** check box is selected on the **Sampling** tab (**Edit Point Assignment Record** window, **General Settings** tab), the disk full LED and disk full alarm will not illuminate/energize.

13. Do you want the alarm's **change-of-state** to be recorded in the Sequence of Event Report (**SER**)?

    If **yes**, then select the **Report Alarm States as SER** check box.

    If **no**, skip to the next step.

    Note: The APP Recorder will also record the timestamp and status of the recorder (either online or offline) at the end of every day.

14. There is a temperature sensor on every DSP board. You can set an alarm to activate in the event the temperature exceeds a user defined limit in Celsius. The default setting is 70 degree Celsius. Do you want to set the temperature alarm?

    If **yes**, then in the **DSP Board Temperature Alarm Limit** box, enter a temperature between 65 and 85 degrees Celsius.
    If **no**, skip to the next step.

15. **# of HD/SSD (PC-Health),** This setting is used to indicate how many **Drives** are to be monitored for the **PC-Health alarm**. HDSentinel needs to be active, and the drives included are only those that can be detected by HDSentinel, (i.e. hard drives and solid state drives) within the recorder computer. Drives **NOT** included: Flash, USB drives, or network drives. APP Recorder will generate a **PC Health alarm** to let you know a drive is not active/failed. No LED is lit for PC Health.

    Enter the number of drives to be monitored, usually 3.

    If you enter **0**, PC Health will not alarm on hard drive failure but will still alarm on hard drive temperature.

16. Click **Save**.

6.20 Copying a Point Assignment Record

In the **ClearView Configuration** window, you can specify the Backup 1 Path and a Backup 2 Path. When you copy a Point Assignment Record, you can save the copied record to either of these folders, or to a different folder altogether. For information on specifying the Backup 1 and Backup 2 Paths, see Section 4.17 Configuring Clearview

➢ To Copy a PA Record

1. In the **APP ClearView** window, from the **APP Recorder** list, select the recorder for which you want to copy the Point Assignment Record.
2. From the **Edit** menu, point to **Point Assignment Record**, and then click one of the following:
   - To copy the Point Assignment Record to backup location 1 select **Copy to Backup 1**.
   - To copy the Point Assignment Record to backup location 2, select **Copy to Backup 2**.
   - To select a different location to save the copied record, select **Copy to…** A **Browse for Folder** window appears. Navigate to and select the folder you want and then click the **OK** button.

7. Power Quality Recording for Inverter Based Resources

7.1 Introduction

The increase in penetration levels of inverter-based resources (IBRs) will significantly change the dynamic performance of the bulk electric system. As the penetration levels of inverter-based resources increase and the technology of inverter-based resources evolves, recording equipment with PQ-DDR capabilities are needed to address the performance requirements of inverter-based resources. APP Recorders can provide a one solution system to meet the recording requirements of PRC-002-05, PRC-028, IEEE 2800 Table 19, and allow for model validation per MOD 25, 26, and 27. Points of measure can include the HS of the MPT, low side of the MPT, solar feeder circuits, BESS feeder circuits, cap banks, and other supplemental locations within an IBR plant.

Regarding IEEE-2800, APP recorders can comply with the requirements of IEEE-2800 Table 19 if the proper elements are connected and setup for the APP Data Chassis recording at the point of interconnect with the transmission or sub-transmission system (the plant level). The recorder can perform PQ-DDR on elements with harmonics being recorded or derived out to the 50th harmonic. PQ-DDR and triggering can include Pst, Plt, RVC, very short-term harmonics, short-term harmonics, long-term harmonics, apparent power, active power, reactive power, power factor, frequency, and change of frequency. These quantities can be continuously recorder and trended with the files being in COMTRADE format and can be automatically converted to PQDIFF format.

7.2 IEEE-2800 Table 19 Measurement Data

The following table is based on IEEE 2800 Table 19 and describes the data type, points, sampling rate, retention and duration for Power Quality continuous recording APP Recorder includes. Retention values listed are typical and can be set in the Point Assignment Record. **See Section 6.19 Configuring General Settings**

Provision data type	Measurement/data points (as applicable)	Recording rate	Retention	Duration	Measurement (as applicable)
Power quality—flicker (PQDIF format)	Plant-level P_{st} and P_{lt} using a flicker meter that is compliant with IEC 61000-4-15 and IEC 61000-4-30	10 min	90 days	NA	IEC 61000-4-30
Power quality—RVC (PQDIF format)	Plant-level RVC (DeltaV/V) using a PQ meter that is compliant with IEC 61000-4-30 (IEC RMS value measured by one cycle, updated every half cycle)	NA	90 days	NA	IEC 61000-4-30[150]
Power quality—Very short-term harmonics (COMTRADE or PQDIF format)	Plant level, both voltage and current harmonics as applicable (total distortion and individual harmonics up to order 50). Unless required by the *TS owner*, very short-term harmonics measurements are optional.	3 s	10 days	NA	IEC 61000-4-7 and IEC 61000-4-30
Power quality—short-term harmonics (COMTRADE or PQDIF format)	Plant level, both voltage and current harmonics as applicable (total distortion and individual harmonics up to order 50).	10 min	90 days	NA	IEC 61000-4-7 and IEC 61000-4-30
Power quality—long-term harmonics (COMTRADE or PQDIF format)	Plant level, both voltage and current harmonics as applicable (total distortion and individual harmonics up to order 50).	95 weekly percentile (per IEEE Std 519)	1 year	NA	IEC 61000-4-7 and IEC 61000-4-30

7.3 PQ Hardware

There are some PQ hardware component required in order for the APP Recorder to receive signals from IBRs for PQ. There are three Analog boards involved when recording for PQ. Analog channels are wired to both Standard Analog boards and to Voltage or Current specific PQ Analog boards. The IBR needs to send voltage signals through a PQ sensor to a PQ Analog Voltage Board. Voltage channels are also wired to a standard analog board for recording and triggering on other conditions. PQ Analog Current boards are wired in series to a standard analog board wired for current channels.

PQ Sensor connected to a PQ Voltage analog channel with 1Meg Input Impedance

PQ Board connected to a PQ Current analog channel with a fixed full scale of about 5A

The following diagrams illustrate the wiring from a PQ sensor to a PQ Voltage board and an Analog Current board. You will notice these boards have only Current connections or Voltage connections, not both like the standard Analog board.

The Voltage board is connected directly to a PQ Sensor.

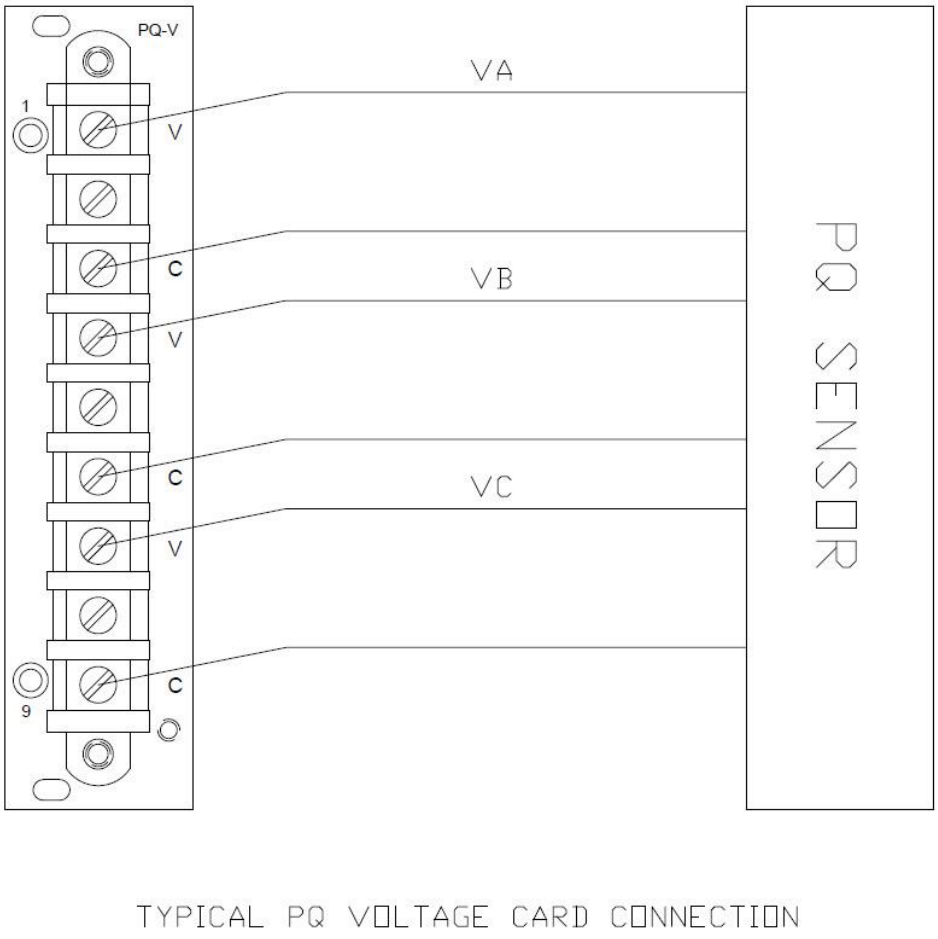


Figure 105 PQ Voltage board wiring

PQ Current boards are wired in series to a standard Analog board wired for the same Current channels being recorded.

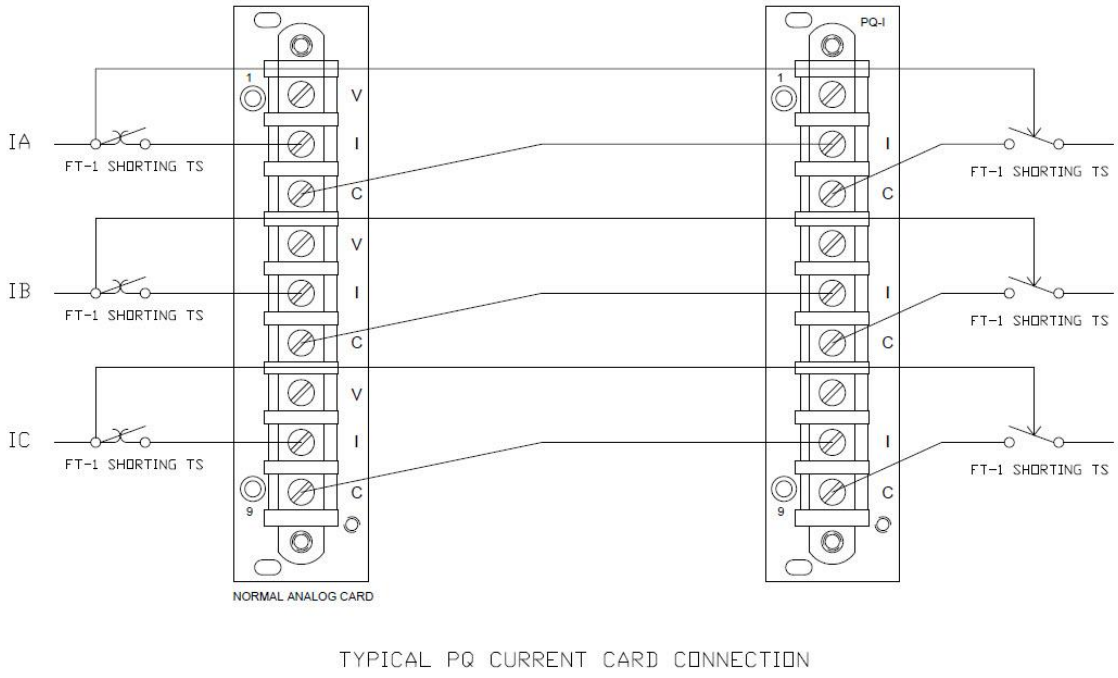


Figure 106 PQ Current Board wiring

7.4 Point Assignment Analog TAB settings

There are PAR settings required or recommended when setting up PQ analog channels. Please see Section 6-1 Managing Point Assignment (PA) Records for more information on the full PAR set up.

To measure out to the 50th Harmonic you must use a Transient Sampling rate of **9600 or higher**.

The Transient Sampling rate is recommended to be no higher than **15360**.

When setting up **PQ current channels**, use Full Scale Setting of **5 and ABS to 20**. This will change slightly when calibration is done.

When setting up **PQ voltage channels,** Full Scale must be set to **115**.

7.5 Power Quality Data Recorder sample Trigger settings

The plant level Data Chassis PQ settings enable you to trigger for Transient Recording as well as Triggers for PQ Continuous Recording. Ideally these triggers will be set up for channels in **Data Chassis 1**. The Figure below shows the typical Trigger settings for recording PQ based on IEEE 2800 Table 19.

Note: When using DSP 7 or higher there is no restriction on how many RVC triggers, or which triggers they are assigned to. With DSP 6 or lower, RVC triggers are limited to six per data chassis and must be assigned to 1 or more of the first 6 triggers only.

T#	A#	Trigger Channel Description	Type	Start	Duration	Trip if Over	Trip if Under	Trip if Rate > ?/s	Hysteresis	Priority	Disturb.	Chassis#
T1	A4	(A4)Line 1 Voltage A (CVT1)	RMS	Both	0.00000	132.00000	108.00000	0.00000	0.01000	no	no	1
T2	A5	(A5)Line 1 Voltage B (CVT1)	RMS	Both	0.00000	132.00000	108.00000	0.00000	0.01000	no	no	1
T3	A6	(A6)Line 1 Voltage C (CVT1)	RMS	Both	0.00000	132.00000	108.00000	0.00000	0.01000	no	no	1
T4	A10	(A10)MPT 1 Current A (CT)	RMS	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T5	A11	(A11)MPT 1 Current B (CT)	RMS	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T6	A12	(A12)MPT 1 Current C (CT)	RMS	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T7	A16	(A16)MPT 1 Current In (CT Virt)	RMS	Over	0.00000	1.00000	0.00000	0.00000	0.01000	no	no	1
T8	A13	(A13)MPT 1 X0 Current	RMS	Over	0.00000	1.00000	0.00000	0.00000	0.01000	no	no	1
T9	A14	(A14)MPT 1 H0 Current	RMS	Over	0.00000	1.00000	0.00000	0.00000	0.01000	no	no	1
T10	A1	Spare Trigger	Disabled	Over	0.00000	1.00000	0.00000	0.00000	0.01000	no	no	1
T11	A4	Line 1 Power (MW)	3p-W	Over	0.00000	1000000...	0.00000	0.00000	0.01000	no	no	1
T12	A4	Line 1 Power (Mvar)	3p-Vr	Over	0.00000	1000000...	0.00000	0.00000	0.01000	no	no	1
T13	A4	(A4)Line 1 Voltage A (CVT1)	RVC	Both	0.00000	0.04000	-0.04000	0.00000	0.01000	no	no	1
T14	A5	(A5)Line 1 Voltage B (CVT1)	RVC	Both	0.00000	0.04000	-0.04000	0.00000	0.01000	no	no	1
T15	A6	(A6)Line 1 Voltage C (CVT1)	RVC	Both	0.00000	0.04000	-0.04000	0.00000	0.01000	no	no	1
T16	A4	(A4)Line 1 Voltage A (CVT1)	Hz	Both	0.00000	60.10000	59.90000	0.00000	0.00000	no	no	1
T17	A4	(A4)Line 1 Voltage A (CVT1)	Hz_Sign	Over	0.00000	1000000...	0.00000	0.12500	0.00000	no	no	1
T18	A4	(A4)Line 1 Voltage A (CVT1)	Hz_Sign	Under	0.00000	1000000...	0.00000	-0.08125	0.00000	no	no	1
T19	A1	(A1)Line 1 Voltage A (PQ Sensor)	HD	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T20	A2	(A2)Line 1 Voltage B (PQ Sensor)	HD	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T21	A3	(A3)Line 1 Voltage C (PQ Sensor)	HD	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T22	A1	(A1)Line 1 Voltage A (PQ Sensor)	THD	Over	0.00000	10.00000	0.00000	0.00000	0.01000	no	no	1
T23	A2	(A2)Line 1 Voltage B (PQ Sensor)	THD	Over	0.00000	10.00000	0.00000	0.00000	0.01000	no	no	1
T24	A3	(A3)Line 1 Voltage C (PQ Sensor)	THD	Over	0.00000	10.00000	0.00000	0.00000	0.01000	no	no	1
T25	A7	(A7)MPT 1 Current A (PQ Board)	HD	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T26	A8	(A8)MPT 1 Current B (PQ Board)	HD	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T27	A9	(A9)MPT 1 Current C (PQ Board)	HD	Over	0.00000	5.00000	0.00000	0.00000	0.01000	no	no	1
T28	A7	(A7)MPT 1 Current A (PQ Board)	THD	Over	0.00000	10.00000	0.00000	0.00000	0.01000	no	no	1
T29	A8	(A8)MPT 1 Current B (PQ Board)	THD	Over	0.00000	10.00000	0.00000	0.00000	0.01000	no	no	1
T30	A9	(A9)MPT 1 Current C (PQ Board)	THD	Over	0.00000	10.00000	0.00000	0.00000	0.01000	no	no	1

Figure 107 Plant Level Data Chassis PQ Settings example

7.5.1 Power Quality Data Recorder (PQ DDR)

When utilizing DSP7 or higher in the Data Chassis and running APP Recorder software 3.3.6 or higher the following data shown in the table below is recorded when you have checked the **Include PQ Data** option in the Point assignment Record General Settings TAB and have enabled HD, THD, or TRD Triggers in the Triggers TAB.

Note If you have DSP6 or below and have Include PQ Data checked, you will receive the five files in Table 8 but not the Harmonics files discussed in this section.

Note: If you have both HD and THD triggers set on a channel, only one continuous recording file will be created for the channel (i.e. it won't be duplicated). If you have either HD or THD and TRD Triggers on the same channel, 2 PQ continuous recording files will be recorded for the channel.

Table 8 PQ Data Recorded

Description	File Name	Interval	Typical for IEEE-2800 Triggering & Continuous Recording for Each Mapped Analog Channel	Typical Circular Buffer
3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily	3p-Vrms, 3p-Irms, 3p-W, 3p-Vr, V-Hz, V-Hz Sign, 3p-RVC, 3p-V HD, 3p-I HD, 3p-V THD, 3p-I THD, TRD	10 Days
10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily	Same as above	90 Days
2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly	Same as above	365 Days
Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily	Selected Volt Channels	90 Days
Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly	Selected Volt Channels	90 Days

7.5.2 Individual Harmonics files

If you check the **Include Individual Harmonic Data** check box in the PAR General Settings TAB/Power Quality box, Individual Harmonic files are created to enable easier identification of which Harmonic Order is the largest and above the Standard. The files will be created for any HD, THD, or TRD triggers set. See table below with more details. The following is a summary of the files created and more detail about each file name and sampling intervals.

Table 9 Harmonics File names and descriptions

Description	File Name	Interval	Typical Circular Buffer
3-sec Very Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_VShort_3sec_Daily	3 seconds, daily (1 file a day per Analog Channel with HD as trigger) Each file contains 50 X-axes analyzed to extract the harmonic order values for each analog channel.	30 Days
10-min Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_Short_10min_Weekly	10 min., weekly (5am daily) (1 file a week per Analog Channel with HD as trigger) 50 X-Axes in the file, to find what is the largest harmonic for each analog channel	90 Days
10-min weekly 95th percentile	yyyyIHR##T##A#_Short_10min_Weekly_95	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
10-min weekly 99th percentile	yyyyIHR##T##A#_Short_10min_Weekly_99	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days
3-sec weekly 95th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_95	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
3-sec weekly 99th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_99	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days

Note: The HD and THD measurements are based on IEC 61000-4-7, -30 and IEEE Std 519 up to the harmonic, see table below. Any harmonics beyond the 50th harmonic is not measured or recorded by the DFR.

Transient Sampling	Up to Harmonic
2400 Hz	19th
4800 Hz	39th
9600 Hz and above	50th

3 Second Daily Harmonics - one file per Analog Channel with HD, THD or TRD trigger 3 second samplings daily starting at 5:00 AM for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily. Each file contains 50 X-axes to extract the harmonic order values for each analog channel. Typical Retention is 30 days.

10 Minute Weekly Harmonics - one file per analog channel with HD, THD or TRD Trigger sampled every 10 minutes starting 5am Sunday for a week. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly. Each file contains 50 X-axes to find the 95th percentile. Typical Retention is 90 days.

Yearly Harmonic Percentile - The following Harmonics recording files are contained in APPRecorder\Data\PqData\PQHar folder. You set the retention for all three types of files described below in this field (see **Section 6.19 Configuring General Settings)**. Typical Retention is 365 days.

3 Second 95th Percentile Harmonic files - one file per Analog Channel with HD, THD or TRD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

3 Second 99th Percentile Harmonic files - one file per Analog Channel with an HD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

10 Minute weekly 95th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

10 Minute weekly 99th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

7.5.3 Convert COMTRADE to PQDIF

If you have checked the **Convert COMTRADE to PQDIF Every Day** in the Power Quality area of the PAR General settings TAB, Recorder will create PQDIF files in the **APP Recorder\Data\PQDATA\PQDIFData** folder. The following table lists the PQDif files created automatically every day.

Table 10 Convert to PQDIF files

Location:	Description	File Name	Interval
APPRecorder\Data\PQData\ PQDIFData	3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily
	10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily
	2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly
	Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily
	Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly

7.5.4 Viewing PQ Continuous recording files

View the PQ continuous recording files in Clearview by opening a new Graph then navigating to the APP Recorder/Data/PQData folder and opening the desired file. The following figures show examples of viewing PQ files. **See Section 14.2 Opening the Graphic and Data Analysis Window.** Look at the Figure captions below each image and the filenames at the top to identify which file examples each figure shows.

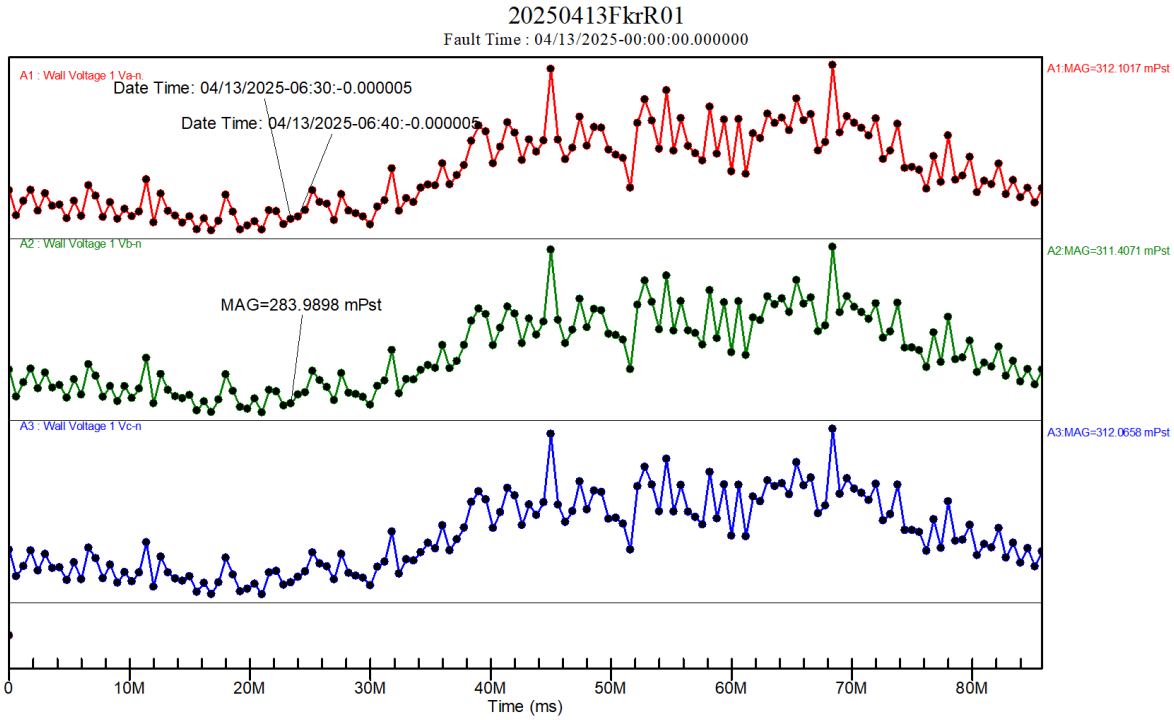


Figure 109 Short-Term Flicker (Pst)

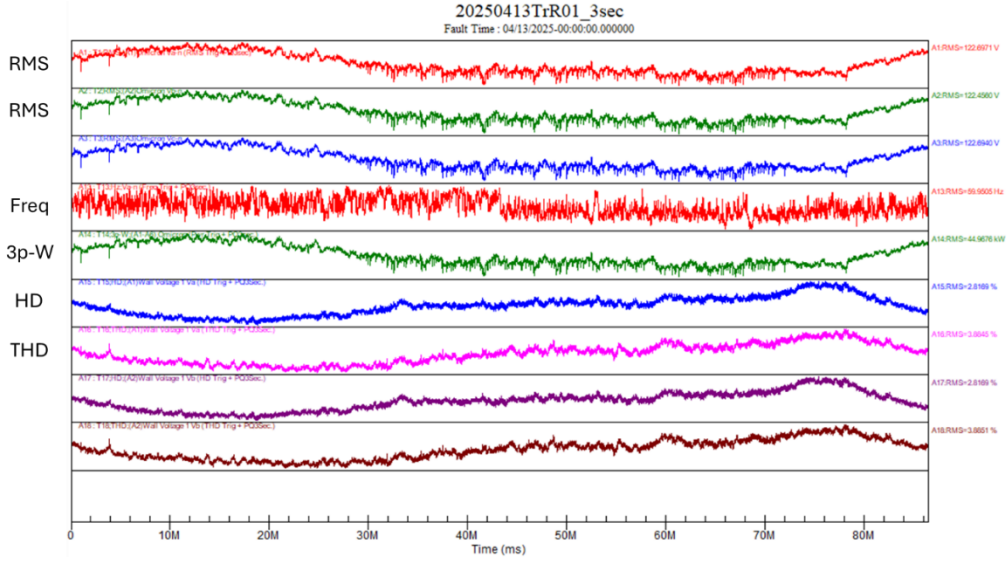


Figure 108 Long-Term Flicker (Plt)

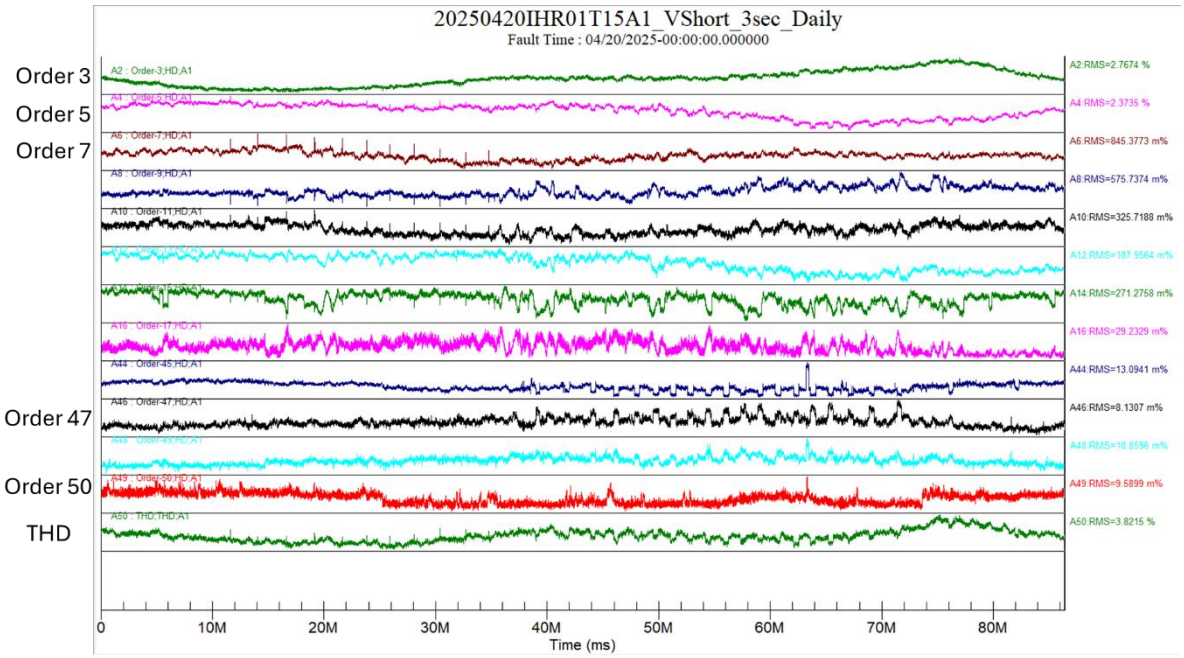


Figure 110 3 Sec. PQ DDR + Triggering

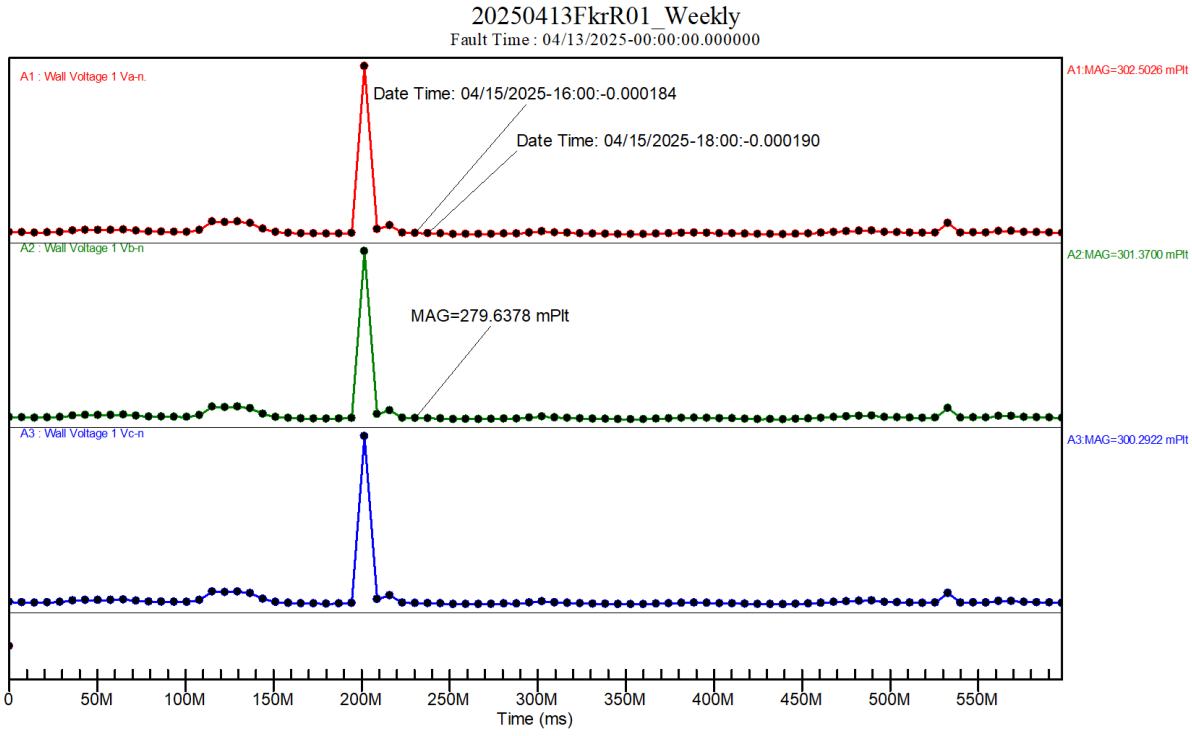


Figure 111 Very Short-Term Harmonics to the 50th

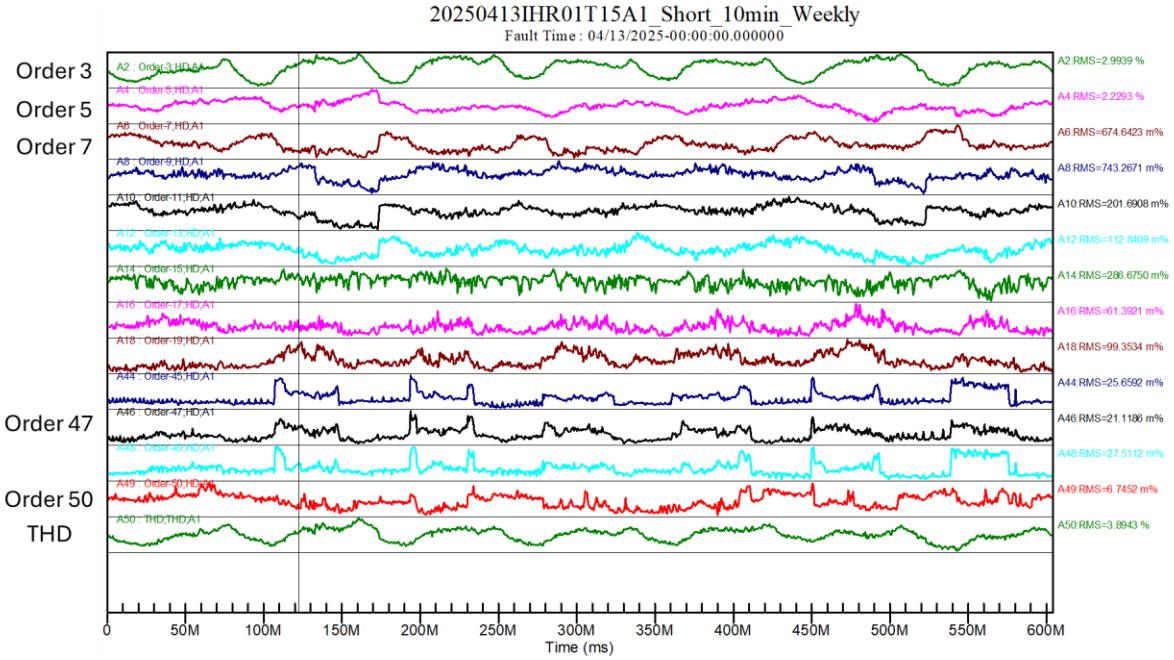


Figure 112 Short-Term Harmonics to the 50th

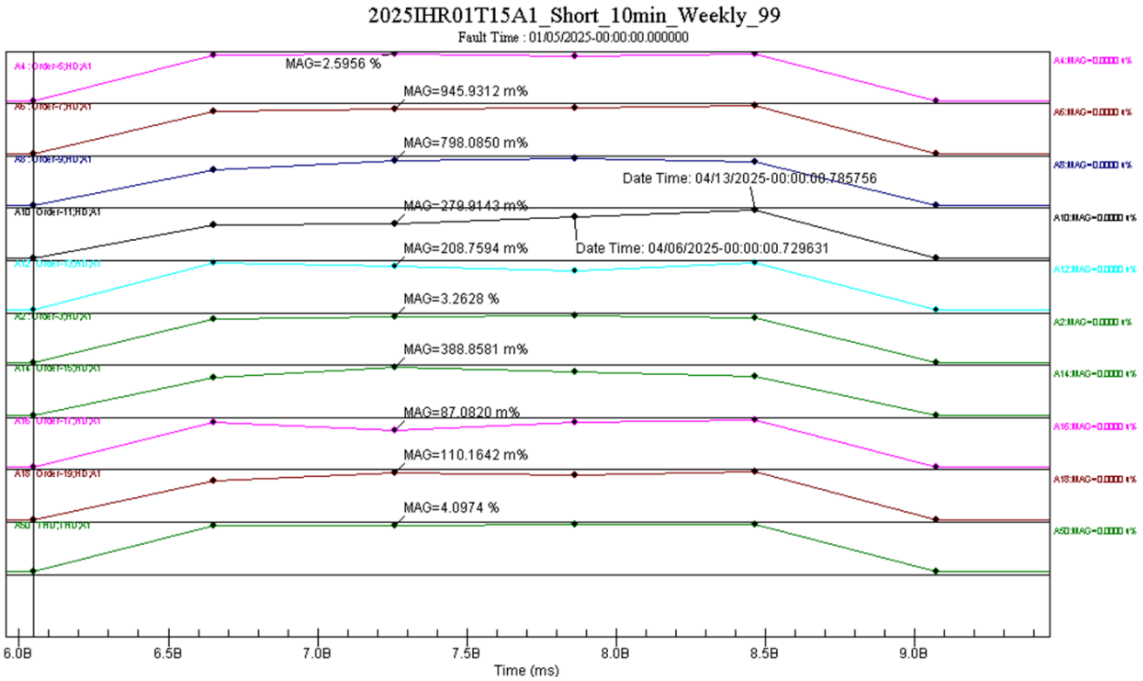


Figure 113 Long-Term Harmonics to the 50th

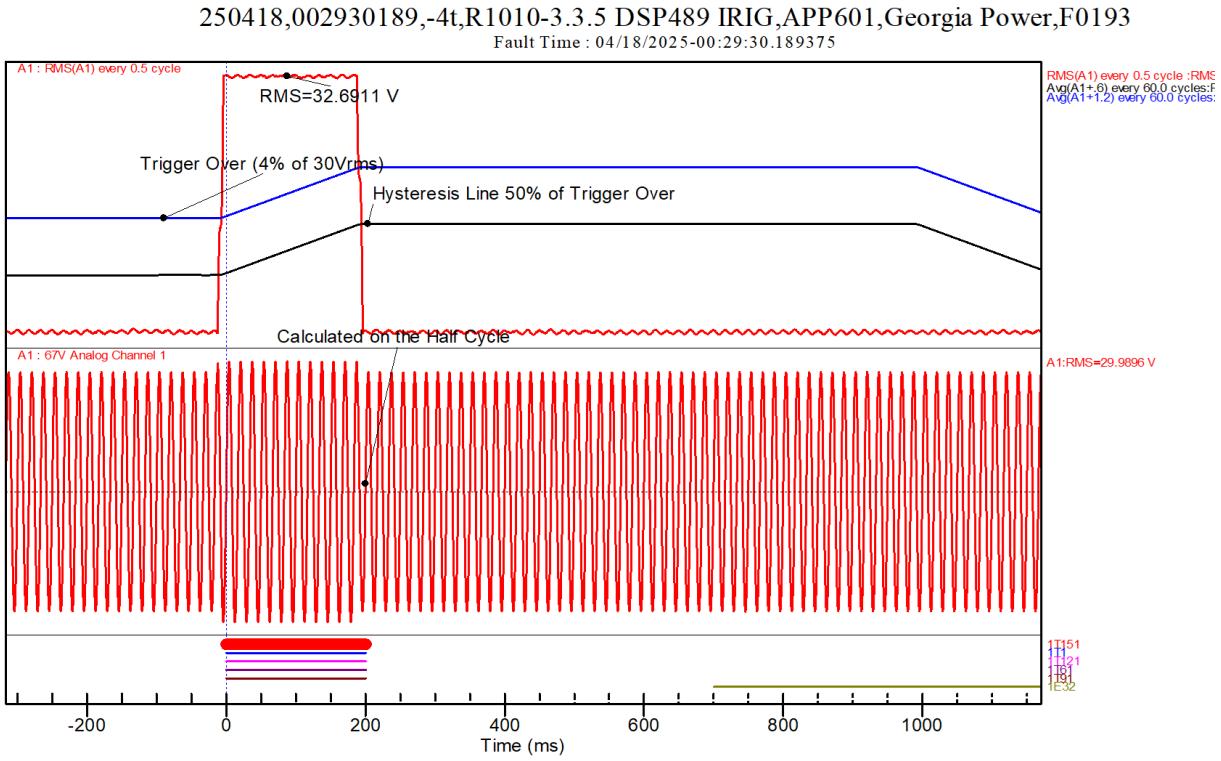


Figure 114 Rapid Voltage Change (RVC)

7.5.5 Harmonics Reports

In addition to viewing Harmonics files in Clearview, five reports to enhance analysis of Harmonics to pinpoint more easily if and where the Standard is not being met based on IEEE-2800 Table 19. These reports are saved in APP Recorder\Data\PQData\PQReport folder and written in HTML format. When you open a report file it will open in your browser application. You can use your browser functions to save to a PDF and Print etc..

Following are the report descriptions.

YYYYMMDD[RecID]VshortHarDailyReport.html
Daily report of individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies the Largest Order and Largest Range. Includes Min (%), Avg(%), Max(%), and 99th(%).

You can Filter on a **Harmonic Order** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

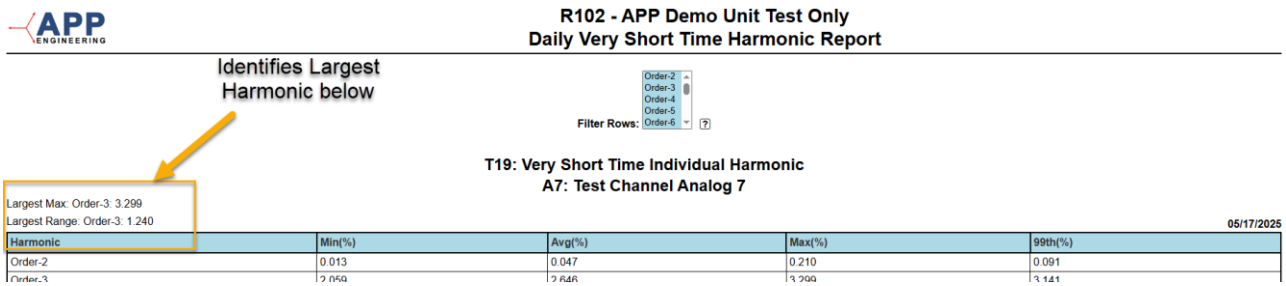


Figure 115 Sample Daily Harmonics Report

YYYYMMDD[RecID]VshortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%).

YYYYMMDD[RecID]shortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on **Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

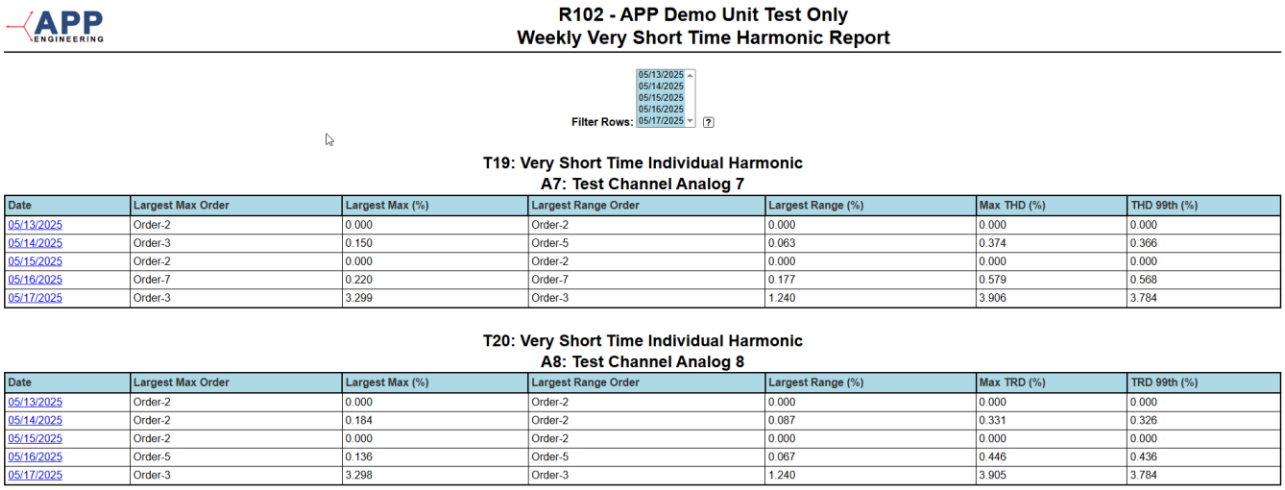
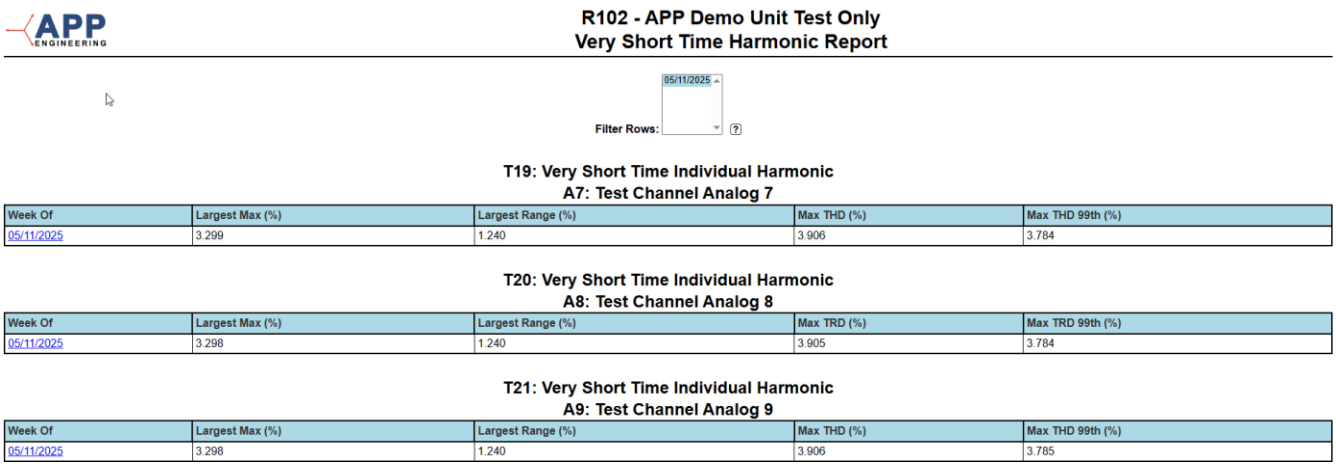


Figure 116 Sample Weekly Harmonics Report

YYYY[RecID]VshortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%).

YYYY[RecID]shortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on "**Week of" Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.



APP ENGINEERING

R102 - APP Demo Unit Test Only
Very Short Time Harmonic Report

05/11/2025

Filter Rows:

T19: Very Short Time Individual Harmonic
A7: Test Channel Analog 7

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.299	1.240	3.906	3.784

T20: Very Short Time Individual Harmonic
A8: Test Channel Analog 8

Week Of	Largest Max (%)	Largest Range (%)	Max TRD (%)	Max TRD 99th (%)
05/11/2025	3.298	1.240	3.905	3.784

T21: Very Short Time Individual Harmonic
A9: Test Channel Analog 9

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.298	1.240	3.906	3.785

Figure 117 Sample Yearly Report

8. Managing Line Group Records

8.1 Overview of Line Group Records

The Line Group Record is a user-defined record. Here channels that form a line group are linked together. This permits ClearView to perform distance to fault calculations, various power calculations, and provides a quick convenient means for viewing oscillograms for different line groups.

If your line group information is provided before the equipment ships, factory personnel will enter that information into the APP Recorder. In addition, you can create or edit a Line Group Record via the APP Recorder software or the APP ClearView software. The line group file can be downloaded from the master station (APP ClearView) to the APP Recorder, or vice versa.

Note: If the administrator feature is used, only the administrator has privileges to save a newly created record or save changes to an edited record.

8.2 Editing a Line Group Record

➢ To Edit a Line Group Record

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to edit a Line Group Record.

2. From the **Edit** menu, point to **Line Group Record** and then click **Edit Line-Group Record**. The **Edit Line-Group Record** window appears.

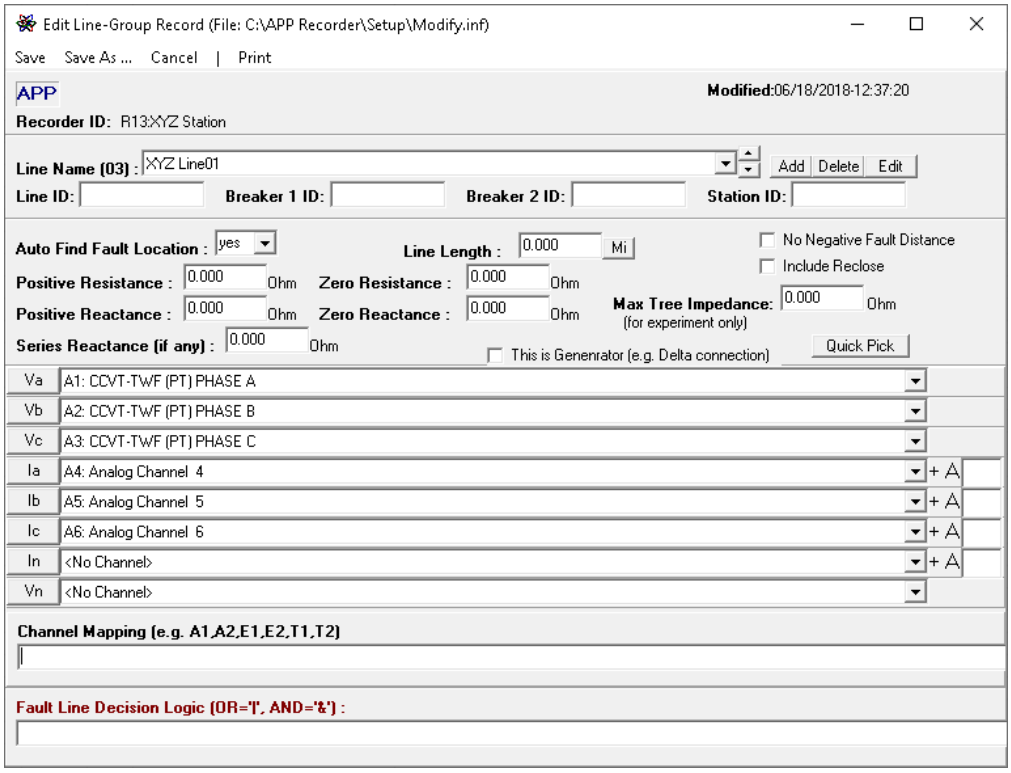


Figure 118: Edit Line-Group Record Window

Note: If the Setup folder for the APP Recorder that you select does not contain a Line Group Record, then clicking Edit will create an empty Line Group Record which you can edit.

3. In the **Line Name** list, select the line group's name.

4. In the **Line ID** box, type the line ID.

5. **Breaker 1 and Breaker 2 ID**, allows you to identify the breaker(s) 1 and/or 2 associated with a Line Group. This will show Breaker ID(s) in the configuration file. This can be used with 3rd party analysis tools to capture associated breaker IDs to the Line Group.

6. **Station ID,** allow you to identify your Station ID associated with this Line Group

7. In the **Auto Find Fault Location**, do one of the following:

   Select **No** if you do not want the APP Recorder Program to perform a distance fault calculation after a system trigger occurs.

   Select **Yes** if you want the APP Recorder program to attempt to perform a distance to fault calculation after a system trigger occurs, provided that the fault line decision logic is true. You can specify the fault line decision logic at the bottom of the window.

8. **No Negative Fault Distance**, click this box if you want to limit the fault distance reported to only positive distance values. A negative value can otherwise result from finding a fault behind the station.

9. **Include Reclose check Box,** if a fault occurs on a line group and this box is checked, ClearView will do a subsequent calculation including the breaker reclose and display it in the Fault Loc/Lightning area when viewing the fault record.

10. The APP Recorders use an impedance-based method for calculating the distance to fault. The APP Recorder uses a single-ended calculation. However, a double-ended calculation can be performed by pulling data from each end of a faulted line back to the APP ClearView master station software and manually initiating a double-ended calculation command.

    For the system to automatically perform a single-ended fault location calculation you must enter the **line length** in Miles or Kilometers (click the box to the right of the **Line Length** field to toggle between MI and KM), **positive resistance (R1)**, **positive reactance (X1)**, **zero resistance (R0)**, and z**ero reactance (X0)**. **These need to be entered as Primary Values**. Also, the analog channel physical connection must provide phase-to-ground voltages and currents. Enter the **Series Reactance** if any.

    A Line Group consists of Va, Vb, Vc, Ia, Ib, Ic, In, and Vn. You must complete the line group table, shown in the following figure, in order to view line group oscillograms and perform distance-to-fault calculations.

11. **This is Generator** check box, click this box to indicate the Line Group is connected to a **Generator**. This pre-sets the recorder to calculate Megawatts and Megavars based on a **Delta** Connection automatically rather than a default Phase to Ground **Y** connection as with a transmission line.

12. The 

button opens the list of channels and allows you to select any or all and inserts them into the line group. **Select the channels in the correct sequence they should appear**.

CAUTION **When Using Quick Pick to select channels You need to click the check Boxes in the correct order. Not doing so could result in lost data.**

Note: Before you select the channels for the line group, be sure that the Point Assignment Record is complete.

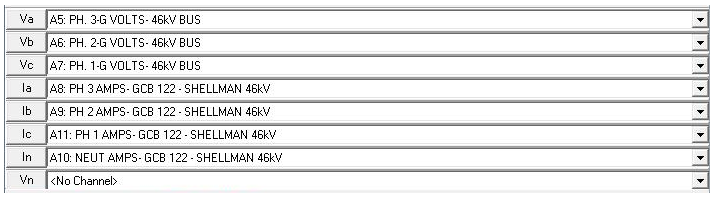


Figure 119: Line Group Table

Note: If you need to make the channels negative, click the channel button once to change to negative or back to positive (e.g., Va to –Va etc.).

13. The **Max Tree Impedance** field should be set at **0** for normal operations. It is used to manually gain better accuracy of distance calculations for high impedances. However, if you change it to a different value, be sure to reset it to **0** in order for manual calculations to be accurate.

    To select channels click on a row, such as Va, and then select your desired channel from the list of channels that pull down. Continue selections for the other phase voltages, currents, and neutral.

    Note: The first channel in the channel pull down box is a virtual channel. If the APP Recorder is missing a physical connection of Ia, Ib, Ic, or In, you can select 950: Virtual Channel and the missing phase or neutral current will be automatically calculated by the software. A virtual channel should only be used for a missing current, not for a missing voltage.

14. **Channel Mapping** allows you to document what Analog and/or Triggers are associated with the line. The information is included in the .inf file and does not cause any action.

15. If you want to filter automatic fault calculations, you can enter a **Boolean logic equation** in the **Fault Line Decision Logic (OR="|", AND="&") field.** The following table contains available equation variables and field entries.

Table 11: Fault Line Decision Logic Filter, Variables, and Entries

Entry	Description
0	False, nothing will pass filter
1	True, everything passes filter
Blank (Nothing Entered)	True, everything passes filter
T1, T2, T3…..	Represents Analog Channels
t1, t2, t3…..	Also Represents Analog Channels
E1, E2, E3….	Represents Event Channels
e1, e2, e3….	Also Represents Event Channels

16. Click **Save**

8.3 Adding a Line Group Record

1. In the **APP ClearView** window from the **APP Recorder** list, select the APP Recorder for which you want to add a Line Group Record.

2. From the **Edit** menu, point to **Line Group Record** and then click **Edit Line-Group Record**. The Edit Line-Group Record window appears.

3. Next to the **Line Name** list, click the **Add** button.
   An Add New Line window appears.

4. In the box, type the name of the new line and then click the **OK** button.
   The Edit Line-Group Record window refreshes. All fields are reset to their default values. For information on completing these fields, see *Editing a Line Group Record*.

8.4 Sending a Line Group Record to the APP Recorder

If you make changes to a Line Group Record on the master station, you can send the updated Line Group Record to the APP Recorder.

➢ To Send a Line Group Record to the APP Recorder

1. In the **APP ClearView** window, from the **APP Recorder** list, select the recorder to which you want to send a Line Group Record.

2. From the **Edit** menu, point to **Line Group Record** and then click **Send Line-Group Record to Recorder**.

8.5 Getting a Line Group Record from an APP Recorder

If changes are made to a Line Group Record on the APP Recorder, you can get an updated Line Group Record from the master station.

➢ To Get a Line Group Record from an APP Recorder

1. In the **APP ClearView** window from the **APP Recorder** list, select the recorder from which you want to get a Line Group Record.

2. From the **Edit** menu, point to **Line Group Record** and then click **Get Line-Group Record.**

8.6 Deleting a Line Group Record

You can delete a Line Group Record.

1. In the **APP ClearView** window, form the **APP Recorder** list, select the recorder from which you want to delete a Line Group Record.

2. From the **Edit** menu, point to **Line Group Record** and then click **Delete Line-Group Record**.
   A confirmation window appears.

3. Click the **Yes** button.

8.7 Printing a Line Group Record

➢ To Print the Line Group Record

1. In the **APP ClearView** window, from the **APP Recorder** list, select the recorder for which you want to print the Line Group Record.

2. From the **APP ClearView** window, from the **Edit** menu, point **Line Group Record**, point to **Print Line-Group**, and then do one of the following:

   Click **Preview** to view an onscreen picture of how the printout will appear.

   Click **Print** to print a hardcopy of the Line Group Record. The Print window will appear. Complete the fields in this window and then click the **OK** button.
   The entire Line Group Record is printed.

8.8 Copying a Line Group Record

In the **ClearView Configuration** window, you can specify the Backup 1 Path and a Backup 2 Path. When you copy a Line Group Record, you can save the copied record to either of these folders, or to a different folder altogether. For information on specifying the Backup 1 and Backup 2 Paths, see 4.17 Configuring the Main Configuration Settings.

➢ To Copy a Line Group Record

1. In the **APP ClearView** window from the **APP Recorder** list, select the recorder for which you want to copy the Point Assignment Record.
2. From the **Edit** menu, point to **Line Group Record**, and then click one of the following:

   To copy the Point Assignment Record to the backup location 1 select **Copy to Backup 1**.

   To copy the Point Assignment Record to backup location 2, select **Copy to Backup 2**.

   To select a different location to save the copied record, select **Copy to**… **Browse for Folder** window appears. Navigate to and select the folder you want and then click the **OK** button.

8.9 Save As a Line Group Record

You can "Save As" your Line Group Record to create a copy, or to create a separate alternative Line Group Record. You can specify the path, however, the Setup path that you specified in the **ClearView Configuration** window, the default is **(C:\APP Clearview\Setup)**.

9. Configuring a Recorder

9.1 Factory Settings

Note: You should not alter the Recorder ID, Data Path, or the Setup Path without thoroughly understanding how the APP Recorder runs. Incorrectly changing these values can prevent the APP Recorder from running.

- The Recorder ID is needed for the recorder to read and save configuration and data files such as the Point Assignment Record, Line Group Record, COMTRADE data files, and so on.
- The Data Path has reserved memory in it.
- The Setup Path has all the configuration information.

9.2 Types of Configuration Settings

You can configure the following types of settings for the APP Recorder:

- Main configuration settings
- Automatic Tasks
- Allowed IPs

9.3 Getting the Recorder Config from the Recorder

You can retrieve the Recorder Configuration from the Recorder to view and update it in APP Clearview

Click Edit/Recorder Config/Get Recorder Config.

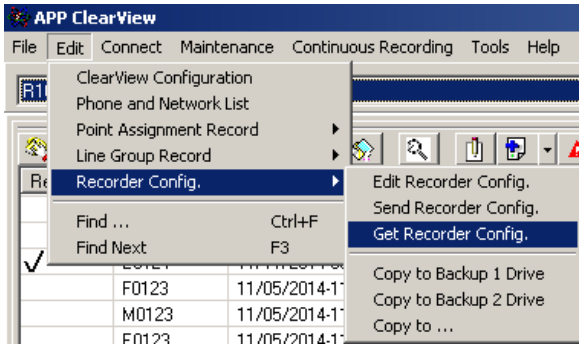


Figure 120: Get Recorder Configuration

9.4 Configuring the Main Configuration Settings

Main configuration settings are integral to the basic functioning of the APP Recorder.

APP Computer Chassis Data Storage Architecture:

The **APP 601** standard configuration, the computer chassis storage setup is C:\ drive with RAID 1 + hot spare. Two 1TB hard drives are in RAID 1 configuration with the 3rd 1TB hard drive acting as a hot spare. The RAID hard drives will contain both the operating system and the Setup and Data folders for the Recorder program.

Typically, the Setup folder contains the Point Assignment Record, Line Group Record, Calibration File, and Trace Files. The Data folder contains the triggered transient records, triggered extended records, and various continuous recording folders such as continuous RMS, continuous frequency, continuous phase, and continuous oscillography.

Remember, you received a complete backup hard drive with the original factory settings along with your computer chassis.

Note: If you want to use the C: drive/Flash for storing fault records, please consult APP Engineering Inc. before configuring APP 601 Computer.

The APP 501 Computer Chassis includes a single conventional hard drive for storing the OS and configuration files as well as the fault records. Remember, you received a complete backup hard drive with the original factory settings along with your computer chassis.

To Change Main Configuration Settings

1. In the **APP Recorder** window, from the **Edit** menu, click **Recorder Config.**
   The **Recorder Configuration** window appears. By default, the **Main** tab is selected.

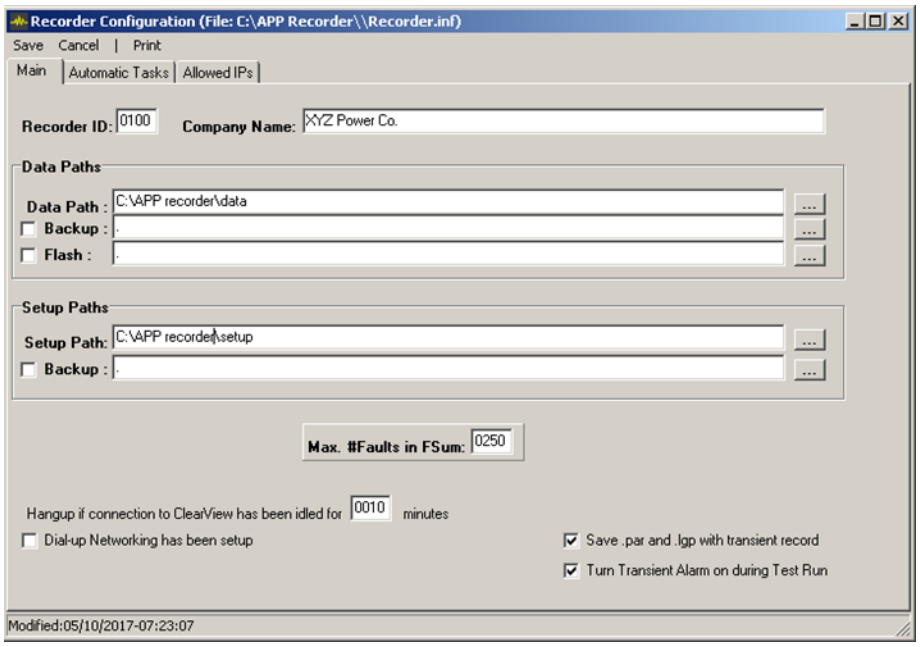


Figure 121: Example of APP 601 Recorder Configuration Window—Main Tab

2. *(Required)* **Recorder ID** field, specify a unique recorder ID. This allows the master station program (APP ClearView) to identify the recorder with which it is communicating.

CAUTION **Do not use duplicate Recorder IDs.**
Before shipping the Recorders, APP Engineering Inc. will assign Recorder IDs and configure each of your Recorders accordingly. Recorders will be numbered sequentially.

3. **Company Name** field, enter any name you would like. This name will appear at the top of the APP Recorder Program main page. At the factory, the name of the company who purchased the system is entered.

4. *(Required)* **Data Path** field, click  and enter the location of the physical file where transient and extended recording information will be written. By default, the factory creates the path: **C:\APP Recorder\Data**

You can change this value to any other path you want. However, you should not change the path without understanding how the APP Recorder runs. Incorrectly changing the path can prevent the APP Recorder from running.

5. Transient and extended recording information can be written to more than one path. To create a second location, next to **Backup,** click  and enter the desired path.

6. **Flash:** Using Flash has a very limited application. If you would like to use Flash for Data, please consult APP Engineering Inc. before setting up the use of Flash.

7. *(Required)* Next to the **Setup Path** box, click the  to specify the location of files such as the Point Assignment Record, calibration factors, Line Group Record, trace files, and diagnostic record. By default, the factory creates the path **C:\APP Recorder\Setup.** You can change this value to any other path you want. However, you should not change the path without understanding how the APP Recorder runs. Incorrectly changing the path can prevent the APP Recorder from running.

8. In the **Max #Faults in FSum:** box, specify the number of Fault record IDs included in the Fault Summary upload to the master station (i.e. remote APP ClearView), when a Fault Summary file is created. The larger the number, the longer it takes to get the summary file. Typically, a reasonable number for this "fast" retrievable file is between 50 and 500.

Note: The APP Recorder AND APP Clearview program should be configured to share the same Data folder (i.e. C:\APP Recorder\Data). All Fault records are available to APP Clearview with this configuration.

9. After normal communication has been established between the APP ClearView and the APP Recorder programs, the ideal disconnect situation is for someone at the master station or someone at the APP Recorder to initiate a disconnect or hang up command. When this is done, both programs are aware of the disconnect request and can properly close down communications.

   However, it is possible for a communication path to be cut without notice. This results in neither program receiving notice of disconnect. Therefore, a hang up timer is needed to ensure that both programs receive an automatic command to release the communications link.

   The default hang up timer for both the APP Recorder and APP ClearView programs is 10 minutes. However, the APP Recorder hang up timer has a delay that makes it effective default time 10 minutes and 30 seconds. Therefore, in the case of no communications activity, the APP ClearView program will be the first to initiate a hang up action.

   Do you want to make the APP Recorder the first program to initiate a hang up action in the event of an unexpected disconnect?

   If **yes**, then in the **Hang up if connection to ClearView has been idle for X minutes** box, type a value less than 10 minutes.

   If **no**, skip to the next step.

10. Have you already set up dial-up networking for the APP Recorder?

    If **yes**, then select the **Dial-up Networking** has been setup check box. See *Setting Up Dial-up Networking* for instructions on setting up dial-up networking.

    If **no**, skip to the next step.

11. If you want the Point Assignment Record and Line Group Record saved with Transient Record, click the check box: **Save .par and .lgp with Transient Record**.
12. If you want the Transient Alarm triggered during a Test Run, click the check box: **Turn Transient Alarm on during Test Run**.
13. From the menu bar, click **Save**.

9.5 Setting Up Dial-up Networking

➢ For computers with Windows 7 or 10

Dial-up Networking using Windows 7 or 10 is supported on a case-by-case basis. To setup Dial-up networking with Windows 7 or above, please contact APP Engineering support at **(317) 536-5300.**

Note: If running Windows 10, the Modem is not available and is disabled.

DialNet is for users who want to use Remote Desktop or a similar program to access the recorder using the same phone line as the recorder.

To establish dial-up networking, you must complete the setup procedures on both the APP Recorder (server) computer and on the ClearView (client) computer.

➢ Things to Remember

- The Dial-up network IP Address of the Recorder is (200.200.200.200)
- The Dial-up network IP Address of the ClearView computer is (200.200.200.201)
- Use IP:200.200.200.200 to call the Recorder when using Remote Desktop or UltraVNC or other remote access services
- The dial-up network can only be disconnected by the application that started it.
- The dial-up network will stop the Internet connection and also could stop some local LAN.
- The Internet will resume automatically after the dial-up network connection is disconnected.

9.6 Defining a Boolean Logic Equation

You can define a Boolean Logic equation to automatically filter, or limit, when the APP Recorder does any or all of the following:

- Calls the master system
- Prints the Fault Summary File and fault-related data
- Sends an email notification
- Sends transient fault record via FTP

Note: You can define only one logic entry.

The following table lists the available equation variables and field entries.

Table 12: Defining a Boolean Logic Filter—Variables and Entries

Entry	Description
0	False, nothing will pass filter
1	True, everything passes filter
Blank (Nothing Entered)	True, everything passes filter
T1, T2, T3…..	Represents Analog Channels
t1, t2, t3…..	Also Represents Analog Channels
E1, E2, E3….	Represents Event Channels
e1, e2, e3….	Also Represents Event Channels

9.7 Configuring Automatic Tasks

The APP Recorder can perform a variety of automatic tasks, which appear on the window shown in Figure 122. By configuring the automatic tasks, you can take full advantage of the APP Recorder's ability to become an integral part of your substation or plant automation.

There are several types of automatic tasks that you can configure.

- **Automatic tasks that occur when a fault arrives**, (See Section 9.9), including:

  Whether or not the APP Recorder calls the master station, and what type of data it sends about the fault

  The format of printed reports

  The email settings for automated notifications

  The FTP settings for automated notifications

- **Automatic tasks that occur when an SER Event occurs,** see Section 9.14
- **Automatic tasks that occur when alarms occur**, see Section 9.15
- **Setting up the Master Phone List and the Passwords for login to the Master Station see Section 9.16** Configuring the Master Phone List**.**

Note: The factory configures all the settings for automatic tasks before shipping the APP Recorder to you. You can optionally change these settings as needed.

9.8 Accessing the Automatic Tasks Tab

You configure all of the automatic tasks on the Automatic Tasks tab of the Recorder Configuration window.

➢ To Access the Automatic Tasks Tab of the Recorder Configuration Window

1. In the **AP Clearview** window, click **EDIT**, click Recorder **Config**.
   The **Recorder Configuration** window appears. By default the **Main** tab is selected.

2. Click the **Automatic Tasks** tab.
   The **Automatic Tasks** tab appears, as shown in the following figure.

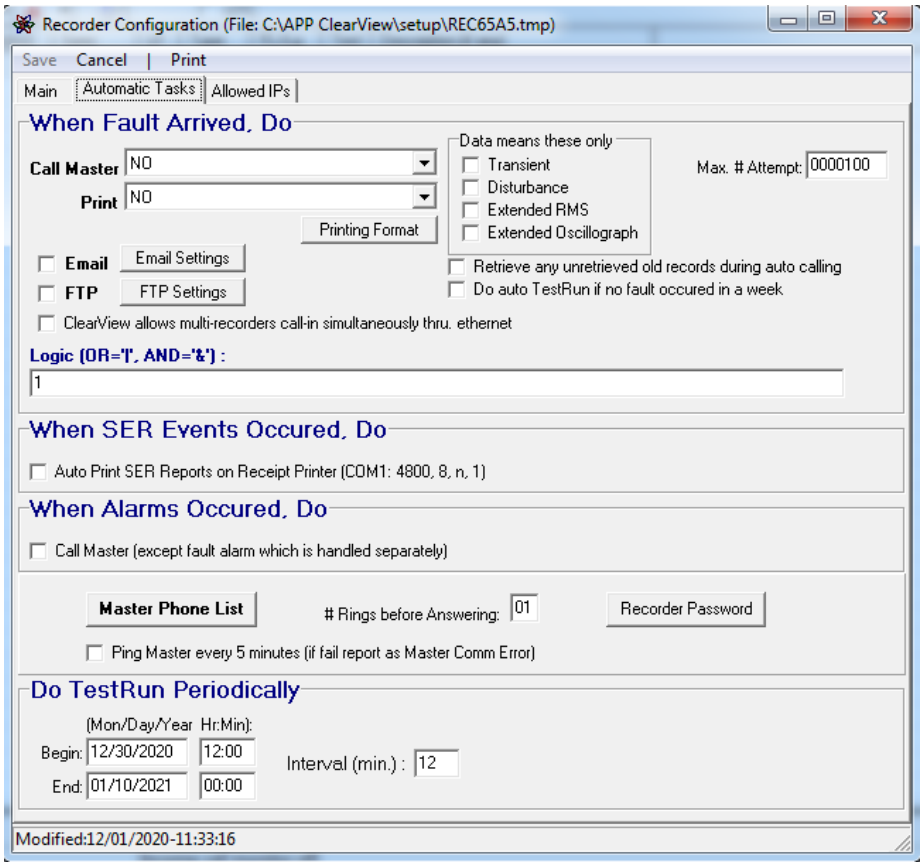


Figure 122: Recorder Configuration Window—Automatic Tasks Tab

9.9 Configuring Automatic Tasks that Occur when a Fault Arrives

You can configure whether or not the APP Recorder calls the master station, and what type of data it sends about the fault.

Note: In order for the APP Recorder Program to call the master station and transfer data, the master station must be running the APP ClearView Program. The APP ClearView Program must be set to monitor incoming calls

➢ To Configure Whether or Not the APP Recorder Calls the Master Station

1. Open the **Automatic Tasks** tab of the Recorder Configuration window.
2. In the **Call Master** list, what you want the APP Recorder to do if a fault occurs. The following table describes the available options.

Table 13: Configuring Automatic Tasks—Options in the Call Master List

If a fault triggers the Recorder		Select this option	Also set the values of these fields
What should it upload?	**When?**		
A Fault Summary File	Always	**Yes– always (Send FSum Only)**	**Max #Faults in FSum** box on the Main tab This determines the number of fault files in the Fault Summary record.
A Fault Summary File, and associated data	Always	**Yes – always (Send FSum and Data)**	**Data means these only** check boxes These determine the type of data sent. If all of the boxes are unchecked, then all of the types of data will be sent.
A Fault Summary File	Only when certain conditions occur	**Yes – if logic true (Send FSum Only)**	**Max #Faults in FSum** box on the Main tab **Logic (OR=1, AND =&)** box **Data means these only** check boxes
A Fault Summary File, and associated data	Only when certain conditions occur	**Yes – if logic true (Send FSum and Data)**	**Logic (OR=1, AND =&)** box **Data means these only** check boxes
A Fault Summary File (always) and associated data (sometimes)	Always print a Fault Summary Report *but* Print all analog waveforms and all event graphs only when certain conditions occur	**Yes – always (FSum), if logic true (Data)**	**Max #Faults in FSum** box on the Main tab **Logic (OR=1, AND =&)** box **Data means these only** check boxes

3. In the **Max # Attempt** box, type the number of times the APP Recorder Program will attempt to call the master station, via modem or network, before stopping.

4. **Data Means These Only**, do you want to limit the type of data sent when a fault occurs?

   If **yes**, then under Data means these only, select the appropriate check boxes. If you select none of the check boxes, then Transient, Disturbance, Extended RMS, and Extended Oscillography data are all sent.

   If **no**, all data will be sent, skip to the next step.

5. **Retrieve any un-retrieved old records during auto Polling,** this function is to ensure all COMTRADE Records on the Recorder is retrieved into APP Clearview. Check the box if you want Clearview to pull any fault records during polling/auto polling existing in the Recorder and has not yet been retrieved.

Note: If the fault summary list (.lst file) is retrieved manually then the Recorder is auto polled, Clearview may not retrieve any un-retrieved fault records until the next polling cycle.

6. **Do an Auto Test Run if no fault occurs in a week,** this will automatically initiate a **test run** if there have been no faults recorded in the past week. This is to provide a way to ensure the recorder is functioning and can provide proof for audit purposes. Click the check box to have Auto Test Run turned on.

7. **Clearview allows multi-recorders call-in simultaneously thru. Ethernet**, has the Master Station (Clearview) been configured to receive calls simultaneously from multiple recorders (up to five) over Ethernet?

   If **yes**, then select the **Clearview Allows Multi-recorders call-in simultaneously thru. Ethernet**.
   If **no**, skip to the next step.

   Note: Five instances of the ClearView program will be opened simultaneously, but only one will be visible on the master station screen.

8. Logic Box, this box indicates the condition(s) that must be met in order for the Recorder to send the data to the master station. Do you want to set conditions for sending data to the Master?

   If **yes**, then complete the **Logic** box. For more information, see 9.6 *Defining a Boolean Logic Equation*.

   If **no**, then skip to the next step.

9. From the menu, click **Save**.

9.10 Configuring Printing

Note: In order for the APP Recorder to print, there must be a local or network printer connected to the recorder.

➢ To Configure Printing

1. Open the **Automatic Tasks** tab of the **Recorder Configuration** window.

2. In the **Print** list, select the specific printing function that you want APP Recorder to perform. The following table describes the available options.

Table 14: Configuring Automatic Tasks—Options in the Print List

If a fault triggers the Recorder		Select this option	Also set the values of these fields
What should it upload?	**When?**		
Nothing **Note:** You can still manually activate printing.	n/a	**No**	n/a
A Fault Summary File	Always	**Yes– always (Print FSum Only)**	n/a
A Fault Summary File, and associated data	Always	**Yes – always (Print FSum and Data)**	**Data means these only** check boxes
A Fault Summary File	Only when certain conditions occur	**Yes – if logic true (Print FSum Only)**	**Logic (OR=1, AND =&)** box
A Fault Summary File, and associated data	Only when certain conditions occur	**Yes – if logic true (Print FSum and Data)**	**Logic (OR=1, AND =&)** box **Data means these only** check boxes
A Fault Summary File (always) and associated data (sometimes)	Always print a Fault Summary Report *but* Print all analog waveforms and all event graphs only when certain conditions occur	**Yes – always (FSum), if logic true (Data)**	**Logic (OR=1, AND =&)** box **Data means these only** check boxes

3. **Logic Box**, this box indicates the condition(s) that must be met in order for the Recorder to send the data to the master station. Do you want to set conditions for sending data to the Master?
   If **yes**, then complete the **Logic** box. For more information, see 9.6 *Defining a Boolean Logic Equation***.**
   If **no**, then skip to the next step.

4. Do you want to configure the **format of printed reports**?
   If **yes**, continue with the procedure, *Configuring the Format of Printed Reports* below.

   If **no**, from the menu bar, click **Save**.

9.11 Configuring the Format of Printed Reports

➢ To Configure the Format of Printed Reports

1. Open the **Recorder Configuration** window and open the **Automatic Tasks** tab.
2. Click the **Printing Format** button.
   The **Format All Wave Printing** window appears.

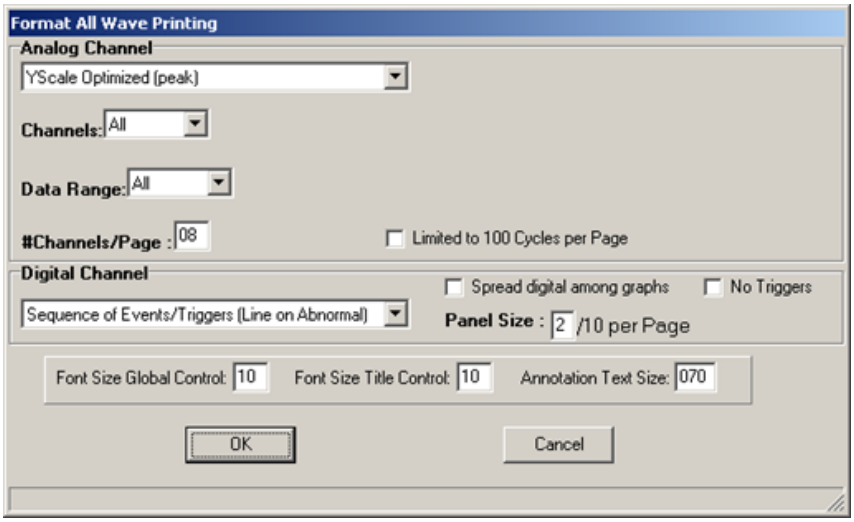


Figure 123: Format All Wave Printing Window

3. From the **Analog Channel Format** list, select the appropriate format:

   YScale Optimized (peak)
   Prints the highest peak value measured to the right-hand side of each oscillogram printed.

   YScale Optimized (unit/cm)
   Prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed.

   YScale = Channel Full Scale Optimized (unit/cm)
   Prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed. The value is based on the full scale setting in the Point Assignment Record and the number of oscillograms printed on the page.

   Yscale = User Select Scale (unit/cm)
   If selected, a user programmable Yscale field appears. The user can enter their desired volts/cm or amps/cm scale. Prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed. The value is based on a user entered Yscale (unit/cm). If the scale is too small waveform clipping will occur.

   Yscale Optimized (RMS)
   This selection prints the RMS value to the right side of each oscillogram printed.

Note: Print fewer channels on a page to increase the resolution on the Yscale.

4. From the **Print Channels** list, select one of the following choices:

   All
   Prints an oscillogram for each analog channel listed in the Point Assignment Record.

   Selected
   After you select this, click the **Select Channels** button to select the specific channels to print.

   Lines
   Specific preset line groups can be printed.

5. From the **Print Data Range** list, select the range of records to print:

   All
   Prints the entire length (X-axis) of all the oscillograms selected for printing.

   Selected
   Each data point in an oscillogram has a number. The starting number is "0" which is usually the prefault portion of the waveform. The ending number depends on how long the fault or recording lasted. To print a partial record, X-axis length, enter the data range.

6. In the **#Channels/Page box,** enter the number of oscillograms you want to appear on each page of the printout.

Note: Print fewer oscillograms on a page to increase the resolution on the Yscale.

7. **Limited to 100 Cycles per Page** check box causes the report to limit to 100 Cycles per page for each channel displayed on a page.

8. There are two types of triggers, analog triggers and event triggers. You can print these triggers in conjunction with oscillograms. Triggers are represented by horizontal lines at the bottom of a printed or displayed page. In the **Digital Channel Format** list, select how the trigger line should appear, whether it is normal or abnormal:

   Sequence Of Events /Triggers (Line on Abnormal)
   This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown it represents the period of time the event was abnormal.

   Sequence Of Events /Triggers (Line on Normal)
   This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown it represents the period of time the event was normal.

   All Events/Triggers (Line on Abnormal)
   This selection prints the analog triggers and event channels that were in an abnormal state when the record was created. If a line is shown it represents the period of time the analog trigger or event channel was abnormal.

   All Events/Triggers (Line on Normal)
   This selection prints the analog triggers and event channels that were in an abnormal state when the record was created. If a line is shown it represents the period of time the analog trigger or event channel was normal.

9. **Spread digital among graphs,** if Spread Digital check box is **not** checked, the Analog channels are printed, then the Event Channels, on each page (See Figure 124). With **Spread Digital** check box checked the report shows the digital channels along with the Analog lines together (See Figure 125).

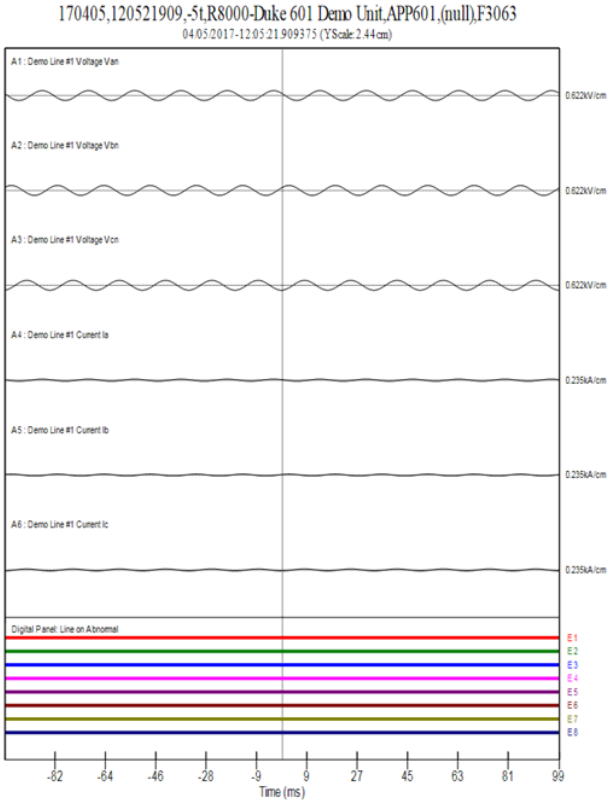


Figure 124: Default Report Format

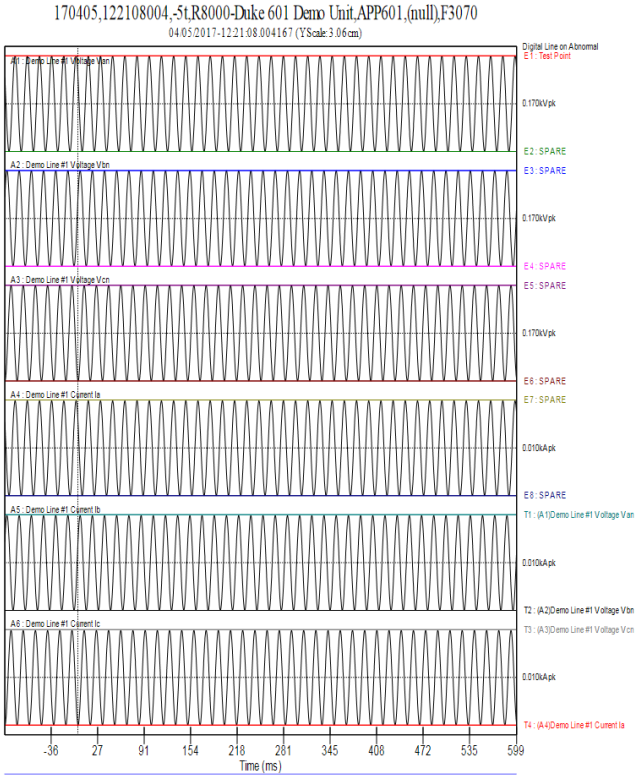


Figure 125: Report with Spread Digital Among Graphs Checked

10. **No Trigger** check box causes the report to exclude Analog Trigger faults from the report. An Event Trigger will still display if an Event Channel is set up, and an Event Channel caused the Trigger or an Event Channel changed state while the record was being created.
11. In the **Panel Size** box, enter the percentage of space the event and analog trigger lines will use at the bottom of a printed page.
12. In the **Font Size Global Control** box, enter the font size to be used for the title of the waveform pages and any annotations that may have been added. You cannot change the font on the **Fault Summary Report**.
13. In the **Font Size Title Control** box, enter the font size for the title that appears at the top of each waveform or oscillogram page.
14. In the **Annotation Text Size** box, enter the font size for any annotations that are added to a waveform or oscillogram page.
15. Click the **OK** button.

9.12 Configuring Email Settings

You can configure the APP Recorder to automatically email fault summary information to the master station. When the APP Recorder sends an email, it sends a plain text e-mail message containing a summary of a fault. The following information is included in the report:

- Recorder ID
- Fault ID number
- Fault date and time
- Fault duration
- Fault location report (if calculable)

Note: The Recorder must have an SMTP/POP3 email account and connectivity for the Email feature to work properly.

➢ To Configure Email Settings

1. Open the **Recorder Configuration** window and open the **Automatic Tasks** tab.
2. Select the **Email** check box.

Note: If the **Email** check box is not selected, the APP Recorder will not automatically send emails with fault summary information.

3. Click the **Email Settings** button.
   The **Main** tab of the **Send Email** window appears.

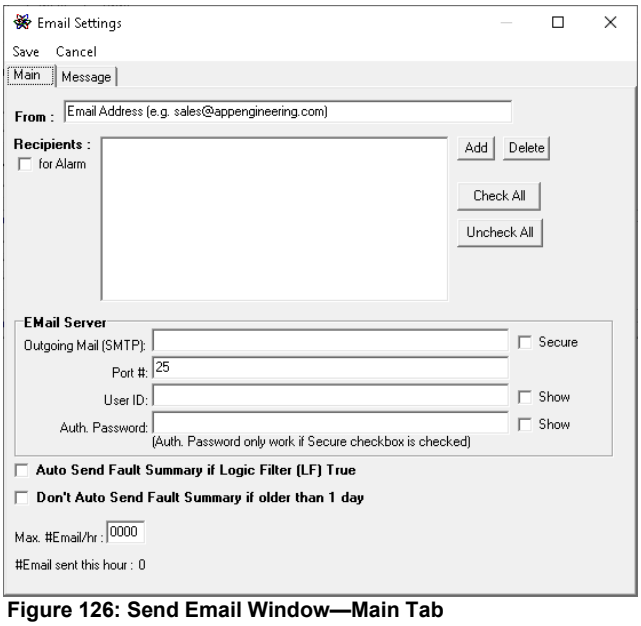


Figure 126: Send Email Window—Main Tab

4. In the **From** field, enter a valid email address.

5. In the **Recipients** list, add or delete recipients' email addresses. The e-mail message will be sent to all of the recipients in this list. If no recipients are listed, click **Add** and specify a valid email address.

   - Use the "Check All" button to select all recipients at once.
   - Use the "Uncheck All" button to unselect all recipients at once.

6. For Alarm, checking the box will cause Clearview to send an email once a day if an Alarm has occurred changing the Alarm List.

7. **Secure** check box, check Secure if you are using an email service that requires a password. Most common email platforms are secure (gmail, Microsoft etc..) and would not use the Secure check box.

8. Contact your network administrator to obtain values for the **Outgoing Mail (SMTP)**, **Port#**, **User ID**, and **Auth Password fields**.

9. Do you want the APP Recorder to automatically email a summary of every fault each time the master station automatically retrieves a fault record or whenever a fault record is automatically called in?

   If **yes**, then select the **Auto Send Fault Summary if Logic Filter (LF) True** check box. On the **Automatic Tasks** tab of the **Recorder Configuration** window, verify that the **Logic** box contains the appropriate value. For more information on completing the **Logic** box, see 9.6 *Defining a Boolean Logic Equation***.**

   If **no**, skip to the next step.

10. Do you want the Auto Send Fault Summary function (above) to limit what is sent to the Master Station to any faults less than 1 day old?

    If **yes**, then click the **Don't Auto Send Fault Summary if older than 1 day** check box.

    If **no**, skip to the next step

    This function works only if Auto Send Fault Summary is also checked.

11. From the menu bar, click **Save**. At this point, you have completed configuring e-mail settings. It is a good idea to send a test e-mail to ensure that messages will be sent properly. To do this, complete the procedure, *To Test the Email Function*.

➢ To Test the Email Function

1. In the Send Email window, click the Message tab.
   The Message tab appears, as shown in the following figure. From here, you can type an email and manually send it to everyone in the recipient list.

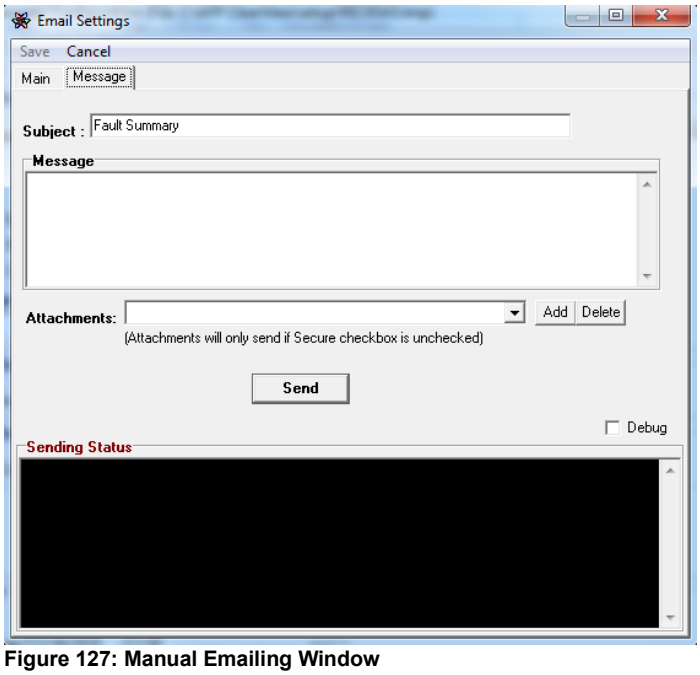


Figure 127: Manual Emailing Window

2. In the **Subject** box, type the subject line for the email.
3. In the **Message** box, type the message.
4. In the **Attachments** list, select an attachment to include. Use the **Add** and **Delete** buttons to select or remove additional files.

Note: Attachments will only be sent if the **Secure** check box is unchecked on the Main Tab

5. The **Debug** checkbox is for APP Engineering use only.
6. Click **Send**.

9.13 Configuring FTP Settings

You can configure the APP Recorder to automatically send the most recently generated transient fault record to a host directory.

9.13.1 Account Tab

➢ **To Configure FTP Settings**

1. Open the **Recorder Configuration** window and open the **Automatic Tasks** tab.
2. Select the **FTP** check box.

Note: You must set this up if you want the APP Recorder to send transient records through FTP.

3. Click the **FTP Settings** button.
   The **FTP Settings** dialog box appears in the **Account tab**, as shown in the following figure.

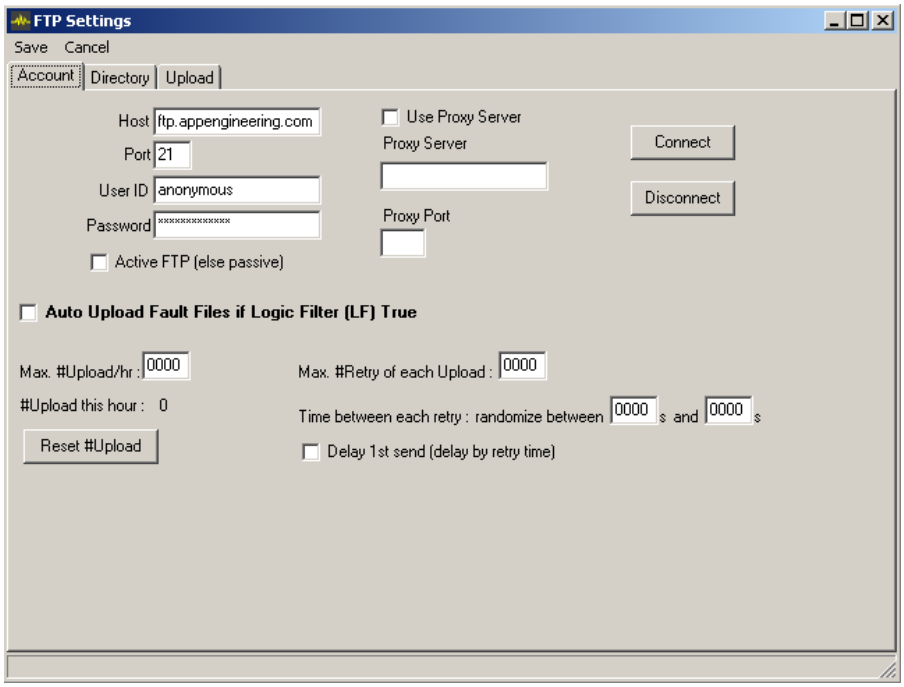


Figure 128: FTP Account Settings Window

4. *(Required)* In the **Host** field, type the URL for the host computer.
5. *(Required)* In the **Port** field, type the port for the host.

   Note: A common port setting is 21.

6. *(Required)* In the **User ID** field, type the user ID to log in to the host.
7. *(Required) In the* **Password** field, type the password to log in to the host.
8. Do you want to use a proxy server?

   If **yes**, then select the **Proxy Server** check box. In the Proxy Server box, type the name of the proxy server. In the **Proxy Port** box, type the port number for the proxy server.

   If **no**, skip to the next step.
9. Do you want to create a logic filter to identify when the transient record should be sent to the host directory?

   If **yes**, then select the **Auto Upload Fault Files if Logic Filter (LF) True** check box. On the **Automatic Tasks** tab of the **Recorder Configuration** window, verify that the **Logic** box contains the appropriate value. For more information on completing the **Logic** box, see 9.6 *Defining a Boolean Logic Equation***.**

   If **no**, skip to the next step.
10. In the **Max #Upload/hr** box, enter the maximum number of fault records that will sent to the host directory per hour. Specify a limiter here to stop the host directory from being inundated with data in the event that the APP Recorder has an unexpected runaway tripping event.

    Note: You can reset the counter manually via the Reset Upload button. The Reset Upload button is for emergency purposes if the maximum upload number has been exceeded, but you still want additional fault records to be sent.

11. In the **Max #Retry of each Upload** box, enter a limiter that determines how many times the software will try to send a new record to the host directory. If the limit is reached due to some connection or setting problem, a message will appear in the APP Recorder trace file.
12. **Time Between each Retry** : **Randomized Between**, enter the two times in seconds, between which FTP retries should occur. APP Recorder will attempt at random intervals between the range specified, to resend data.
13. **Delay 1st Send (by retry time)** check box. Check this to delay 1st send by the Retry time specified above.
14. From the menu bar, click **Save.**

9.13.2 Directory Tab

Click the **Directory** tab. The **Directory** tab appears, as shown in the following figure.

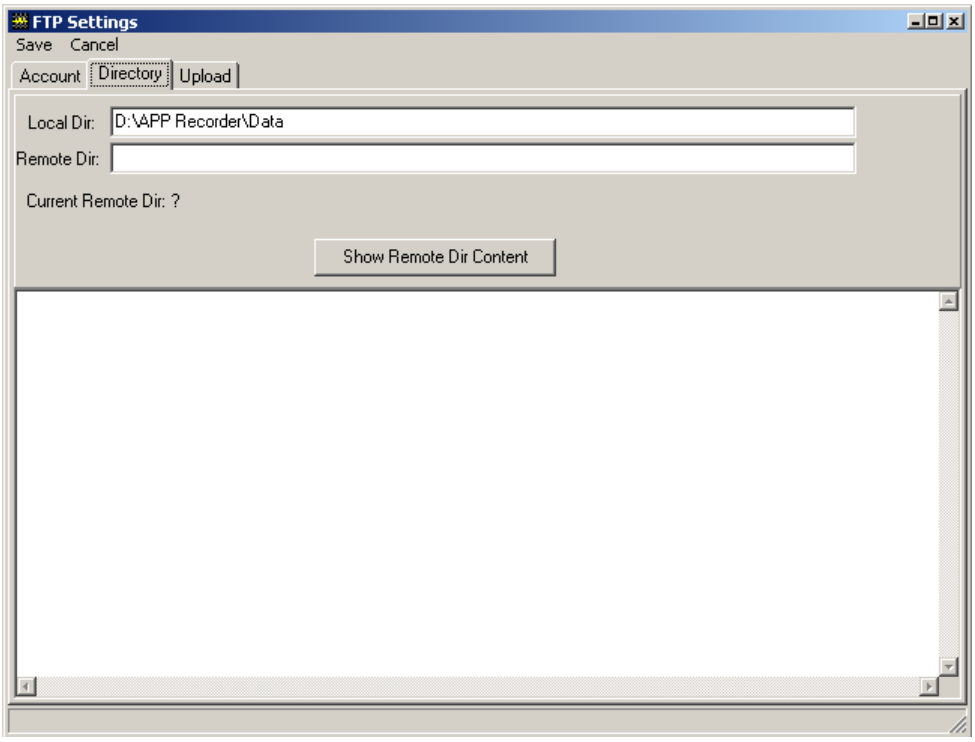


Figure 129: FTP Settings Window—Directory Tab

1. The Local Dir. field automatically displays the value that was entered in the Data Path field on the Main tab of the Recorder Configuration window. This setting tells the FTP program from where to retrieve the new fault records that it will place in the host directory.

   Note: You can change the path while testing the FTP function

2. *(Required)* In the **Remote Dir.** field, type the path to the remote directory that is located on the host site to which the transient records will be sent (for example, **/storage**).

   Note: The backward slash (\) may need to be included in the path.

3. Do you want to test the connection to the remote directory?

   If **yes**, click **Show Remote Dir Content**.

   If communication is established, you will see the remote directory in the message window. If the FTP settings are incorrect, you will see nothing in the message window. In the tray below the message window you might see error messages.

   If **no**, skip to the next step.

   From the menu bar, click **Save**.

9.13.3 Performing a Test Upload

You can use the **Upload** tab to test the upload process. This tab allows the transfer of any file from the local directory to the remote directory. If the file is successfully transferred, an "Upload Succeed" message will appear in the FTP Status pane. If the file is not transferred, an "Upload Fail" message will appear instead.

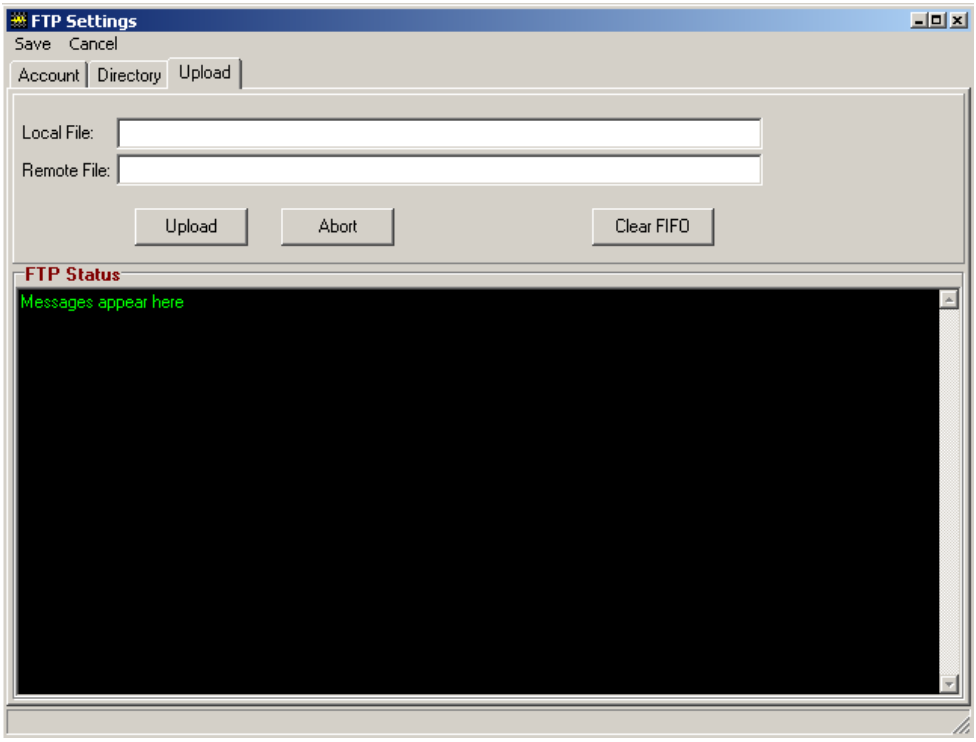


Figure 130: FTP Settings Window—Upload Tab

➢ **To Perform a Test Upload**

1. In the **Local File** box, type the name of the file you wish to send to the remote file. This file must be located in the local directory that is defined on the **Directory** tab.
2. Do you want the file name to remain the same when it is placed in the remote directory?

   If **yes**, then in the **Remote File** field enter the same file name that you entered in the **Local File** box.

   If **no**, type a different file name.
3. Click **Upload**.
   The test file transfer process begins.
4. After the transfer is successful, click the **Show Remote Dir Content** button. The file appears in the remote directory that you specified on the **Directory** tab.

➢ **To Stop the Automatic Retry Attempts**

If the transfer fails and you wish to stop the automatic retries, click **Abort**.

➢ **To Clear the Buffer of Any Fault Record**

Note: You can clear the buffer for troubleshooting or testing purposes.

Click **Clear FIFO** to clear the buffer of any fault record or test file that the APP Recorder is trying to send to the remote directory.

9.14 Configuring Automatic SER Reports

If a receipt printer is connected to the parallel port of the computer running the APP Recorder, the APP Recorder can automatically print an SER report when a SER (SOE) channel experiences a change of state. The printed report includes the date, time, channel description, channel number, and if the channel has switched to a normal or abnormal state.

➢ **To Configure Automatic SER Reports**

1. Open the **Recorder Configuration** window and open the **Automatic Tasks** tab.
2. Select the **Auto Print SER Reports On Receipt Printer** check box.
3. From the menu bar, click **Save**.

9.15 Calling the Master Phone List when Alarms Occur

You can configure the APP Recorder to automatically call the numbers in the master phone list when alarms occur. For information on configuring the master phone list see Section 9.16 Configuring the Master Phone List.

➢ **To Configure whether the APP Recorder Calls the Master Phone List when Alarms Occur**

1. Open the **Recorder Configuration** window and open the **Automatic Tasks** tab.
2. Under the **When Alarms Occurred, Do** section, do one of the following:

   If you want the APP Recorder to call the numbers in the Master Phone list, select the **Call Master…** check box.

   If you want the APP Recorder to ***not*** call the numbers, de-select the **Call Master…** check box.
3. From the menu bar, click **Save**

Note: The Fault alarm is not affected by the setting of the **Call Master…** check box.

9.16 Configuring the Master Phone List

To configure the master phone list, you can specify:

The phone numbers, IP Address, or Master ID's of the master stations that the APP Recorder Program will automatically call.

The password that APP Recorder should use to log in to the master station

➢ To Configure the Master Phone List

1. Open the **Recorder Configuration** window and open the **Automatic Tasks** tab.
2. Click the **Master Phone List** button.
   The **Master Phone & Network List** window appears, as shown in the following figure.

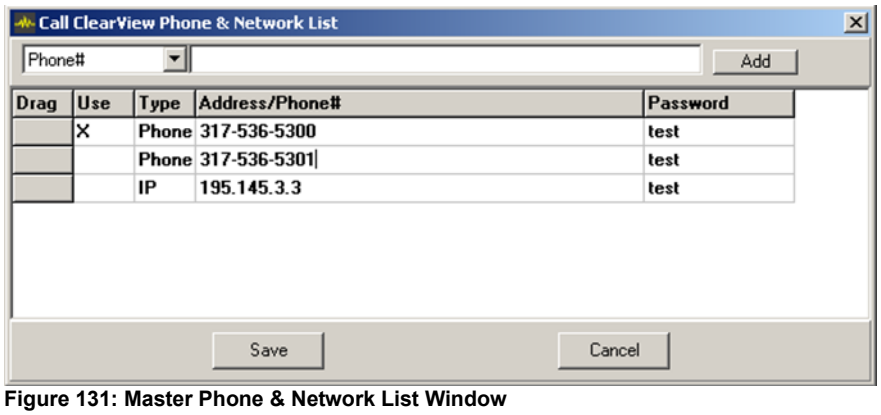


Figure 131: Master Phone & Network List Window

3. Do you want to add a new IP address or phone number?

   If **yes**, then do one of the following:

   If the APP Recorder is connected to a phone, then from the list, select **Phone#**. Then in the corresponding box, type the phone number. You can use any standard Windows format. Click the **Add** button.

   If the APP Recorder is connected to an IP address, then from the list select IP Addr. Then in the corresponding box, type the IP address. You can use any standard Windows format. Click the **Add** button. For information on configuring DialNet, see 9.5 *Setting Up Dial-up Networking*.

   If **no**, skip to the next step.

4. By default, the first entry that you make is selected, as indicated by the X in the **Use** column. The entry with the "X" is the number that APP ClearView will call when it connects to or calls the APP Recorder. You can activate multiple phone numbers and/or IP addresses.

   Do you want to activate or de-activate a phone number or IP address?

   If **yes**, then in the **Use** column, click the box next to the entry. An X appears when the entry is activated; it disappears when the entry is deactivated.

   If **no**, skip to the next step.

5. Do you want to delete a number?

   If **yes**, then right-click the number and then click **Delete**.

   If **no**, skip to the next step.

6. Do you want to reorder entries?

   If **yes**, then under the Drag column, click the gray box that corresponds to the entry you want to move and then move it to its new position.

   If **no**, skip to the next step.

7. Click **Save**.

➢ To Configure the Recorder Password

1. Open the **Recorder Configuration** window and open the **Automatic Tasks** tab.
2. Click the **Recorder Password** button.
   The Recorder Password dialog box appears.
3. Type the new APP Recorder password.

   Note: The password is case-sensitive.
4. Click the **OK** button.

➢ Ping Master every 5 minutes

Click this check box to continually test the connection between the DFR and the Master Computer. The Master has to be set up in the Master Phone list, **Call Master** has to be set to **"Yes"**. If a failure occurs, it will cause a **Master Comm Error**. You must Map that alarm in the Point Assignment Record, General Settings, Recorder Setup Tab to have a hard alarm displayed.

➢ Do Test Run Periodically

Do TestRun Periodically allows you to set up test runs on a schedule defined by a date range and interval in minutes. The test run will occur precisely at the top of the minute and is accurate to the sample point.

To cause a periodic test run, enter the Start Date and Time, the End Date and Time and the number of minutes between Test Runs. Once the end date and time has passed no more scheduled Test Runs will occur.

9.17 Configuring Allowed IPs

The APP Recorder includes a security feature that will limit remote connections to the APP Recorder. Only specified IP addresses will be permitted remote access to the APP Recorder.

Note: If you specify no IP addresses, then all IP address will be allowed access to the APP Recorder.

➢ To Configure Allowed IPs

1. Open the **Recorder Configuration** window and open the **Allowed IPs** tab.
   The **Allowed IPs** tab appears, as shown in the following figure.

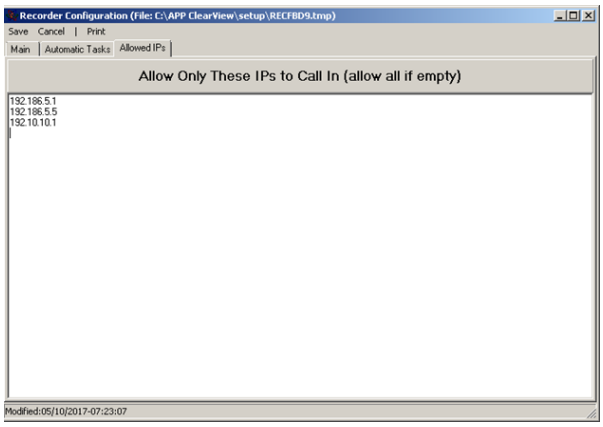


Figure 132: Allowable IPs Entry Window (Security Feature)

2. In the box, type the IP addresses. Press the **Enter** key between each IP address.
3. To delete an IP address, right-click the IP address and click **Delete**.

   Note: You can also use the **Undo**, **Cut**, **Copy**, and **Paste** options from the pop-up menu.

4. From the menu bar, click **Save.**

9.18 Printing Recorder Configuration

You can print the configuration information by clicking **Print** at the top of the screen then selecting **Print Preview** or **Print**. **Print Preview** allows you to review the report, save, change the printer preferences, and print.

9.19 Sending Recorder Configuration to the Recorder

Once you have updated the configuration you can send it to the recorder for its use.

Click Edit/Recorder Config/Send Recorder Config.

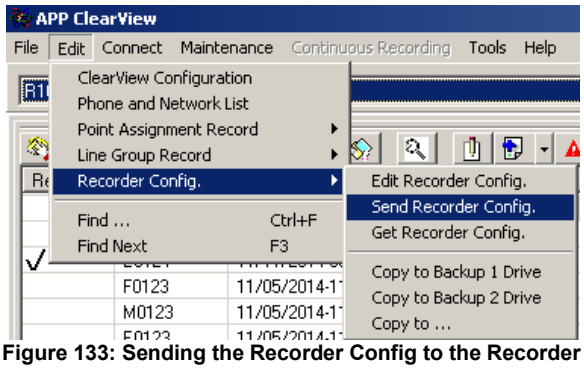


Figure 133: Sending the Recorder Config to the Recorder

9.20 Copying Recorder Configuration

In the **Recorder Configuration** window, you can specify the Backup 1 Path and a Backup 2 Path. When you copy a Configuration record, you can save the copied record to either of these folders, or to a different folder altogether. For information on specifying the Backup 1 and Backup 2 Paths, see 9.4 Configuring the Main Configuration Settings.

➢ To Copy a Recorder Configuration

From the **Edit** menu, point to **Recorder Config**, and then click one of the following:

To copy the Point Assignment Record to the backup location 1 select **Copy to Backup 1**.

To copy the Point Assignment Record to backup location 2, select **Copy to Backup 2**.

To select a different location to save the copied record, select **Copy to…**, A **Browse for Folder** window appears. Navigate to and select the folder you want and then click the **OK** button.

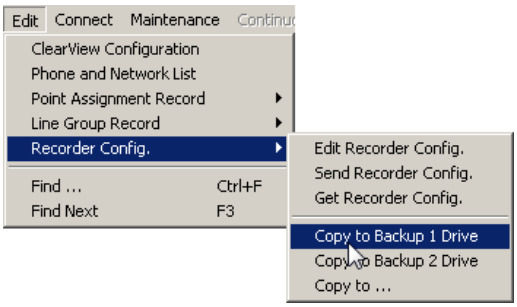


Figure 134: Copy Recorder Configuration

10. Connecting to a Recorder

10.1 Connecting to an APP Recorder

The software uses the phone number or IP address entered in the Phone and Network List. For information on setting up this information, see 4.18 *Managing the Phone and Network List*.

➢ To Connect to an APP Recorder

1. In the **APP ClearView** window, from the **APP Recorder** list, select the recorder to which you want to connect.
2. From the **Connect** menu, click **Connect to Recorder**. The software immediately attempts to establish a connection.
3. To view the connection attempt, click **Show Connection Screen** from the **Connect** menu.

10.2 Disconnecting from Recorder

You can manually tell ClearView to break the communication connection with an APP Recorder at any time.

If ClearView automatically connected to an APP Recorder, then it will automatically disconnect when it completes its data transfer.

➢ To Disconnect to an APP Recorder

In the **APP ClearView** window, from the **Connect** menu**,** click **Disconnect from Recorder.**

10.3 Viewing the Connection Status Window

While the master station is connected to an APP Recorder, you can view real-time messages related to the communications and data transfer progress between the computers in the Connection Status window. This window is useful in determining if a successful connection has been established between the master station and APP Recorder.

➢ To View the Connection Status Window

In the **APP ClearView** window, from the **Connect** menu**,** click **Show Connection Screen.**
The Connection Status window appears, as shown in the following figure.

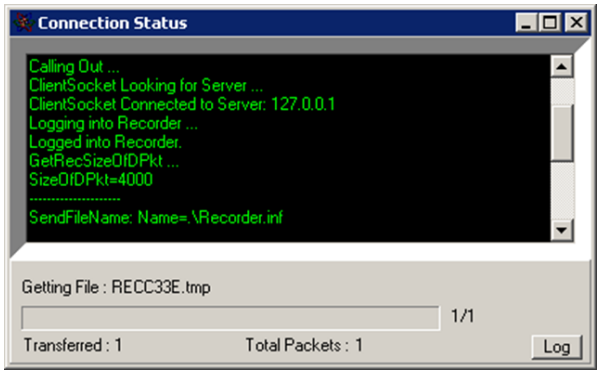


Figure 135: Communication Screen

Note: You can leave this window open while you access other functionality in ClearView.

Select text in the **Connection Status** window and then right-click to access cut, copy, paste, and delete functions.

➢ To view the Trace File

From the **Connection Status Window**, you can view the **Ctrace file** by clicking on the Log button. The CTrace file will open.

10.4 Choosing and Configuring a Modem

You can view the currently installed modems and choose which modem the APP Recorder should use. Clearview must be disconnected from the Recorder to view modems.

Note: If running Windows 10, the Modem is not available and is disabled.

Note: After choosing your modem, you should not need to configure it; the process is automated for you. The instructions for accessing the **Modem Connection Preferences** window are included in this section in case you need to verify or adjust settings during troubleshooting.

➢ To Choose the Modem

In the APP ClearView window, from the Connect menu, point to Modem and then click Choose Modem. The Choose Modem window appears.

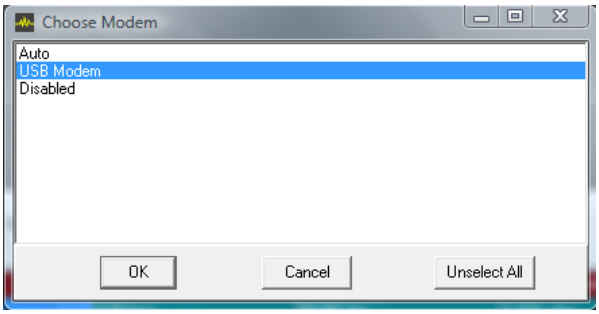


Figure 136: Choose Modem Window

1. Click the modem to use.
2. Click the **OK** button.

➢ To View the Modem Connection Preferences Window

In the **APP Recorder** window, from the **Connect** menu, point to **Modem** and then click **Configure Modem**.
The **Modem Connection Preferences** window appears.

10.5 Monitoring Incoming Calls

You can monitor incoming calls from APP Recorders. This is used when Recorders are configured to auto connect to a Mater Station computer running APP Clearview.

Note: ClearView must be running in Administrator mode, and you must correctly enter the administrator password in order to enable this feature.

➢ To Monitor Incoming Calls

In the **APP ClearView** window, from the **Connect** menu, click **Monitor Call**.
The feature is enabled immediately.

To verify that the feature is working, look at the menu **Monitor Call** menu item. If it has a check mark next to it, then the feature is working. Also, the tray at the bottom of the window displays "Monitoring income call."

10.6 Setting the Network Port

The default network port number of 1024 is automatically configured for the master station. You can change the port number, if necessary.

CAUTION **The Comm Port at the Recorder must match the Comm Port in Clearview.**

➢ To Set the Network Port Number

1. In the **APP ClearView** window, from the **Connect** menu, click **Set Network Port#**.
   The Network Port# dialog box appears.

2. Enter the network port number and click the **OK** button.

10.7 Setting the Transfer Rate to the Highest Speed

You can change the packet sizes that are used when transferring files between ClearView and the APP Recorders. The default packet size for **Ethernet is 45kb and 4kb for modem**. The largest packet size for the modem is 16 kb. The largest packet size for the Ethernet is 65 kb.

➢ To Set the Transfer Rate to the Highest Speed

In the **APP ClearView** window, from the **Connect** menu, click **Set to Highest Speed**.
ClearView makes the change immediately.

10.8 Turning On or Off Dial-up Networking

If you have configured dial-up networking, you can manually turn it on or off as necessary. See 4.19 *Setting Up Dial-up Networking* for instructions on setting up dial-up networking.

➢ To Turn On or Off Dial-up Networking

In the **APP ClearView** window, from the **Connect** menu, click **Recorder Dial-up Networking**.

If the menu option says, **Off**, then clicking this option immediately turns on dial-up networking.

If the menu option says, **On**, then clicking this option immediately turns off dial-up networking.

10.9 Stopping a File Transfer

Note: You can view partially transferred data files with the APP ClearView Software.

➢ To Stop a File Transfer

In the **APP ClearView** window, from the **Connect** menu, click **Stop File Transfer**.

11. Maintaining ClearView and the APP Recorders

11.1 Overview

Use the **Maintenance** menu options to perform a variety of regular ClearView maintenance tasks.

11.2 Viewing the Auto Poll/Call-In Report

The Auto Poll/Call-In Report is automatically displayed or updated after each automatic poll by the master station or automatic call-in by any APP Recorder. The report lets you know that an automatic operation has been carried out.

You can manually view this report at any time.

➢ To View the Auto Poll/Call-In Report

In the **APP ClearView** window, from the **Maintenance** menu, click **Show Auto Poll/Call-In Report**.

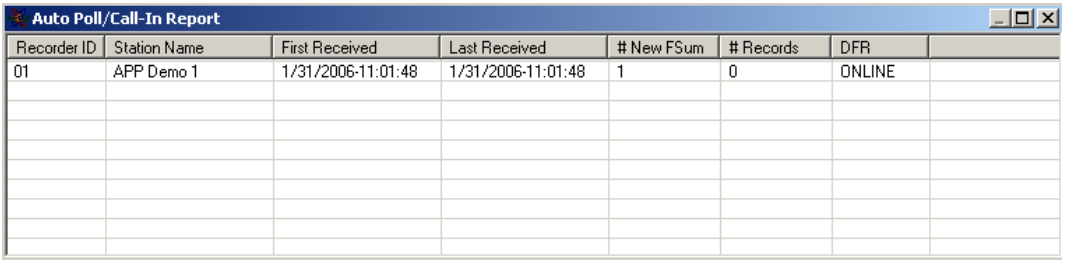


Figure 137: Auto Poll/Call-In Report

If the same APP Recorder calls-in multiple times, use the **First Received** and **Last Received** columns to see when files were automatically transferred.

The Fault Summery File (FSum) is transferred each time an automatic transfer is carried out. Each time that information is transferred, the **# New FSum** column is automatically incremented by one.

The information in the Auto Poll/Call-In Report window is kept until you specifically delete it. To delete a row of information, right-click that row and then click **Delete**. To delete all items in the table, right-click anywhere in the table and then click **Delete All**.

11.3 Viewing and Getting Trace Files

You can use trace files to help during troubleshooting. There is a separate trace file for ClearView and for each APP Recorder and APP Driver.

Each trace file lists the major processes carried out by its respective program, either the APP Recorder or the APP Driver. When a trace file grows to approximately 500 Kbytes, it will automatically be closed and given an incremented extension (for example, .001, .002, and so on.) A new trace file will be created.

There is also an All Trace (**ATrace**) file available. The ATrace is intended for use with software to parse the ATrace log for specific trace information. The ATrace is not simply a consolidation of the Recorder and Driver trace files. The Atrace includes additional trace information from: Recorder, Driver, PMU, DNP3, Modbus, IRIG-B and is intended for diagnostics and correlation of log entries.

On the APP Recorder, the trace files are stored in the **C:\APP Recorder\Setup** on the APP 501 computer or **D:\APP Recorder\Setup** for the 601 computer directory. After the trace files are transferred to the master station computer, they are stored the **C:\APP ClearView\Setup** directory.

➢ To View the Trace File for ClearView

In the **APP ClearView** window, from the **Maintenance** menu, point to **Trace Files** and click **Show ClearView Trace File**.
The trace file for ClearView appears.

➢ To Get the Trace File for an APP Recorder

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to view the respective Recorder trace file.
2. From the **Maintenance** menu, point to **Trace Files** and then click **Get Recorder Trace File**. ClearView contacts the selected APP Recorder, uploads its trace file, and saves it to the master station's hard drive.

➢ To View the Trace File for an APP Recorder

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder that you want.
2. From the **Maintenance** menu, point to **Trace Files** and click **Show Recorder Trace File**. The trace file for the APP Recorder appears.

➢ To Get the Trace File for a Driver

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to get the respective Driver trace file.
2. From the **Maintenance** menu, point to **Trace Files** and then click **Get Driver Trace File**. ClearView contacts the selected APP Recorder, uploads the trace file for its driver, and saves it to the master station's hard drive.

➢ To View the Trace File for the APP Driver

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to view the respective Driver trace file.
2. From the **Maintenance** menu, point to **Trace Files** and click **Show Driver Trace File**. The trace file for the APP Driver appears.

➢ To Get the All Trace File for a Recorder

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to get the respective Driver trace file.
2. From the **Maintenance** menu, point to **Trace Files** and then click **Get All Trace File**. ClearView contacts the selected APP Recorder, uploads the ATrace file for its driver, and saves it to the master station's hard drive.

➢ To View the All Trace (ATrace) File

In the **APP Clearview** window, from the **Maintenance** menu, point to **Trace Files** and click **Show All Trace File**.
The all trace file for the recorder you are on appears.

11.4 Managing APP Recorder Diagnostic Tests

Using ClearView, you can initiate a diagnostic test against a APP Recorder and view the results.

Note: You can also run a diagnostic test from within the APP Recorder main window and the APP Driver window.

11.4.1 Running a Diagnostic Test and Viewing Results

➢ **To Run a Diagnostic Test and View Results**

In the **APP Clearview** window, from the **Maintenance** menu, point to **Diagnosis** and click one of the following:

Click **Show Result** to view the results of the last diagnostic test that was completed.

Click **Redo Diagnostic** to perform a new diagnostic test and view its results. The Recorder Diagnostic Results window appears.

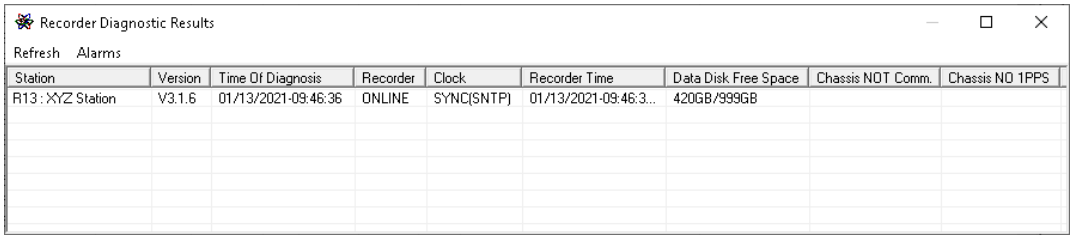


Figure 138: Recorder Diagnostic Results Window

Note: Be cautious because this information may not be current. Double-click on an entry to reveal additional diagnostic details.

1. To see the details of an entry, double-click its name in the list.

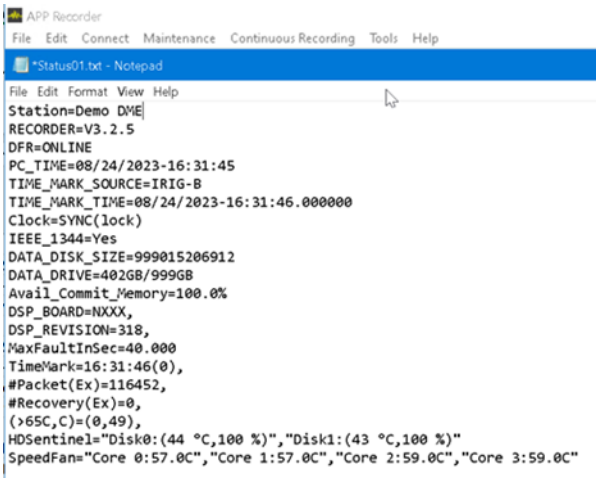


Figure 139 Diagnostics Detail

2. To see the latest diagnostic results, from the menu bar, click **Refresh**.
3. To see which alarms are currently ON, from the menu bar, click **Alarms**.
   The Alarms dialog box displays the alarms.
4. To close the **Recorder Diagnostic Results** window, click the X in the upper right-hand corner.

11.4.2 Getting Results from a Diagnostic Test for an APP Recorder

You can use ClearView to contact an APP Recorder and upload the most recent diagnostic file stored at the recorder.

Note: Be cautious because this information may not be current. Each APP Recorder does an automatic diagnostic test every 5 minutes.

➢ **To Get the Results of a Diagnostic Test for an APP Recorder**

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder.
2. From the **Maintenance** menu, point to **Recorder Diagnosis** and click **Get Result**.

11.4.3 Redoing an APP Recorder Diagnostics Test

You can use ClearView to contact an APP Recorder, command it to perform a fresh diagnostic test, and retrieve the results.

➢ **To Redo a Diagnostics Test for an APP Recorder**

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder.
2. From the **Maintenance** menu, point to **Recorder Diagnosis** and click **Redo Diagnosis**.

11.4.4 Show All Recorder Diagnostic Results

You can review the diagnostic results for all your APP Recorders.

➢ **To Review All Diagnostic Results for your APP Recorders**

From the **Maintenance** menu, point to **Recorder Diagnosis** and click **Get Result**.

11.5 Managing SER Abnormal or Stopped Channels

Note: The Point Assignment Record contains a setting, under the **General Settings** tab that allows you to automatically shut down an SER channel if it changes state too many times in a fixed period. The SER channel will automatically restart after a user-defined shutdown period. Additionally, SER Channels can be manually removed from scan or stopped.

You can view previously received SER abnormal or stopped channels file, or you can retrieve a new file.

➢ To View All SER Abnormal or Stopped Channels

In the **APP ClearView** window, from the **Maintenance** menu, point to **All SER Abnormal Or Stopped Channels** and then do one of the following:

To view the channels, click **Show the Channels**.

To retrieve the channels and save them onto the master station hard drive, click **Get the Channels**.
The following window appears.

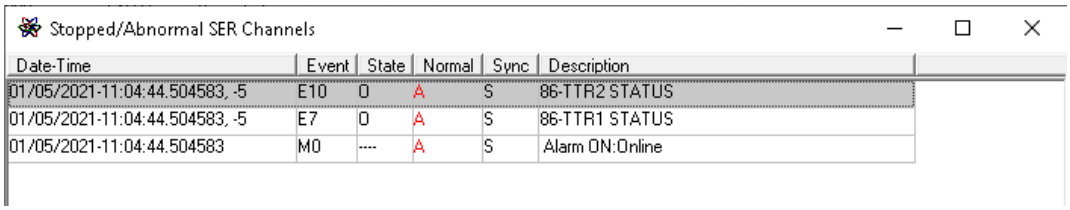


Figure 140: Stopped/Abnormal SER Channels Window

In the **State** column, an **O** represents an open contact and a **C** represents a closed contact.

In the **Normal** column, an A indicates the channel is currently in an abnormal state and an **N** indicates the channel is currently in a normal state.

In the **Sync** column, a **U** indicates an unsynchronized time and an **S** represents a synchronized time.

If an SER channel is stopped, the word **Stop** will appear at the beginning of the channel description, along with either an **M** or an **A:**

M indicates that the channel has been stopped manually via the Point Assignment Record. **A** indicates that the channel stopped automatically.

11.5.1 Polling an APP Recorder

You can poll an APP recorder to retrieve the information set up in the ClearView configuration file. For more information, see 4.17.5 *Configuring Auto-Polling*.

You can also manually override the auto-polling process by stopping auto-polling.

➢ To Poll an APP Recorder

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder that you want to poll.

2. From the **Maintenance** menu, point to **Poll Recorder** and then select one of the following:

   Poll This Recorder
   This selection causes the software to immediately call the APP Recorder and retrieve information (fault summary or fault summary plus data) as set up in the ClearView configuration file.

   Start Auto-Polling
   This selection ignores the auto start-polling time setting and begins immediate polling of all the fault records specified in the ClearView configuration file.

➢ **To Stop Auto-Polling**

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to stop auto-polling.

2. From the **Maintenance** menu, point to **Poll Recorder** and then select **Stop Auto-Polling**.

11.5.2 Performing a Test Run

You can perform a test run to test if the APP Recorder is really recording and to check all the channel data.

When you perform a test run, the APP Recorder trips, creating a transient COMTRADE record. The COMTRADE records contain a snapshot of all the analog channel signals, and the state of all DFR channels, plus the present status of the event inputs.

In addition, if the extended recording feature is enabled in the Point Assignment Record (**General Settings** tab: **Sampling** tab), an extended RMS COMTRADE record and an extended oscillography COMTRADE record will also be created. You can view the transient, extended-RMS, and extended oscillograph records with the APP ClearView program.

The record length will be prefault + post fault. The trigger alarm will not energize during a test run. However, the trigger front panel LED will illuminate.

If the Auto-Call feature is enabled (**Recorder Configuration** window: **Automatic Tasks** tab), the APP Recorder will call the master station(s) and upload the records. If not, you will need to request a new File Summary (FSum) and retrieve the new Fault Record(s) created as a result of the Test Run.

➢ **To Perform a Test Run**

In the **APP ClearView** window, from the **Maintenance** menu, click **Test Run**.
The system immediately responds.

Tip: If the Recorder had auto-call in enabled, disconnect from the recorder quickly so it can call in.

11.5.3 Viewing the ON Alarms

You can view a list of the alarms that are currently on for all the Recorders in the pull down list.

➢ **To View the ON Alarms**

In the **APP ClearView** window, from the **Maintenance** menu, click **Show Alarm ON List**. The **Alarms Currently On** window appears.

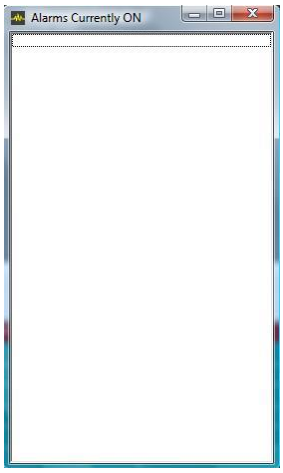


Figure 141: Alarms Currently ON Window

11.6 Syncing an APP Recorder's Time With ClearView

You can use ClearView to synchronize an APP Recorder's time with the master station.

If this menu item is selected, the date and time from the master station is downloaded to the recorder. This feature is mainly used by companies that time-sync the master instead of the recorders.

➢ **To Sync an APP Recorder's Time with ClearView**

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder that you want to synchronize.
2. From the **Maintenance** menu, click **Sync Recorder Time with ClearView**.

11.7 Getting the Time on an APP Recorder

If you need to verify the time set on an APP Recorder, you can do that from within ClearView.

➢ **To Get the Time Set on an APP Recorder**

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder that you want to check.
2. From the **Maintenance** menu, click **Get Recorder Time**. A window displays the current time set for the selected APP Recorder.

11.8 Reinitializing an APP Recorder

You can use ClearView to re-initialize an APP Recorder program to help with troubleshooting.

Note: Re-initializing only restarts the APP Recorder software. Rebooting turns off the entire APP Recorder machine. You will not lose communication during a reinitialization.

CAUTION **The re-initialize command will take the APP Recorder offline for a few moments.**

➢ To Re-Initialize the APP Recorder Program

- In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder that you want to reinitialize.
- From the **Maintenance** menu, click **Reboot Recorder**, then select **Re-initialize Recorder**.

11.9 Restart APP Recorder (program only)

Restart Recorder will immediately **EXIT** APP Recorder program and then re-start it.

- In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder that you want to reinitialize.
- From the **Maintenance** menu, click **Reboot Recorder** then select **Restart APPRecorder**.
- Click **OK** to clear the acknowledgement window.

Note: Communication with the Recorder will be lost and you will need to reconnect. The restart process will take about one minute

11.10 Rebooting the APP Recorder Program

You can use ClearView to reboot the APP Recorder program to help with troubleshooting.

When you reboot, power is momentarily cut to the APP Recorder. The computer and all circuit boards will see a hard power shutdown. Power is cut via a normally closed relay on the data chassis power supply circuit board. After 9-10 seconds power will return, and the system will restart. It takes approximately 1 minute and 30 seconds for the system to return to an online state.

Note: Rebooting turns off the entire APP Recorder machine.

CAUTION **The APP Recorder will be offline during the reboot period.**

➢ To Re-Boot the APP Recorder Program

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder that you want to reboot.
2. From the **Maintenance** menu, click **Reboot Recorder** then select **Reboot Recorder**.

11.10.1 Reserving Memory and Defragging the Data Drive

Occasionally, you may need to reserve memory and/or defragment the data hard drive of an APP Recorder. Using ClearView, you can complete both of these tasks remotely. Reserving memory or defragmenting the hard drive will take up considerable CPU time (hours) and once started, you will be unable to stop these processes remotely.

CAUTION **Perform these functions only if there is little or no likelihood of a fault for 2 to 24 hours. We recommend you consult with APP Engineering before reserving memory.**

➢ **To Reserve Memory**

1. Make sure **Sampling tab** is set as desired.
2. Go to **Chassis tab**. Create a temporary Chassis Configuration that contains the number of analog channels you want to reserve memory for plus add 10% more channels than actual channels present.

CAUTION **We recommend keeping 30% or more hard drive space available for other computer operations**

3. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to reserve memory.
4. From the **Maintenance** menu, point to **Defrag Recorder** and then click **Reserve Memory**. A **Warning** message appears.
5. Click **Yes**.
6. To check if the reserve memory process is finished, look at the APP Recorder trace file. In this file, the message, "Begin Reserve Memory" appears when the reserve memory process starts. The message, "End Reserve Memory" appears when the process finishes. For more information see 11.3*Viewing and Getting Trace Files*.

➢ **To Perform a Defrag Analysis, Defrag the Data Drive, and View the Results**

Note: If the Recorder is using a solid-state drive, defragmentation does not need to be done.

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP recorder for which you want to perform a defrag analysis.
2. From the **Maintenance** menu, point to **Defrag Recorder** and then click **Run Defrag Analysis on Recorder Data Drive**.
3. After viewing the results, do you want to defrag the data drive?

   If **yes**, continue with step 3.

   If **no**, you are finished with this procedure.
4. From the **Maintenance** menu, point to **Defrag Recorder** and then click **Defragment Recorder Data Drive**. A confirmation window appears.
5. Click **Yes**.
6. Wait a minute or two.
7. From the **Maintenance** menu, click **Show Defragment Status**.

11.10.2 Updating the APP Recorder Software

Using ClearView, you can download the latest release of the APP Recorder Software and install it on an APP Recorder. The APP Recorder Software is embedded in the APP ClearView software.

To ensure that you download the most recent version of the APP Recorder Software, verify that you have the most recent version of APP ClearView software. The most recent version of the APP ClearView software is available on the APP website at www.appengineering.com.

CAUTION **The APP Recorder will be offline for approximately 3 minutes while the software is being updated. Communication with the APP Recorder will be lost during this period of time.**

➢ To Update the APP Recorder Software

1. Verify that you have the most recent version of APP ClearView software installed on the master station. Check www.appengineering.com for current version information.
2. In the **APP ClearView** window, from the **Maintenance** menu, point to **Update Recorder Software** and then click **Start Update**. The Update Recorder Software window appears.
3. Select the APP Recorder(s) to update and then click the **OK** button. A Status window appears.

Note: When you update the Recorder software, Clearview, Helper, Translator, and GOOSECap software will also be updated on the DFR.

Note: If you need to stop the update process, click the Stop button in this window.

➢ To Stop the Process of Updating the APP Recorder Software

From the **Maintenance** menu, point to **Update Recorder Software** and then click **Stop Update**. The process is stopped immediately.

12. Continuous Recording

12.1 Configuring Continuous Recording

You can enable or disable continuous recording in the Point Assignment Record for an APP Recorder. Two types of continuous recording can be enabled:

1. A combination of continuous RMS, Frequency, and Phase. You enable or disable these three choices together. They have a 999-day maximum circular buffer (14 days typically). You can view these types of continuous recording in near real-time in the **APP Recorder** window.

Note:Phase angle is shown relative to a selected channel.

2. Continuous oscillography recording. This has a 999-day maximum circular buffer.

12.2 Getting Continuous Recording Data

From ClearView, you can get time slices of continuous recording data in a COMTRADE format. The following figure shows the **Continuous Recording** menu in ClearView. First, in the Recorder list, Select the Recorder you want to get Continuous Recording data from. Then under the **Connect** menu, select **Connect to Recorder**. Once connected, the Continuous Recording menu will become available.

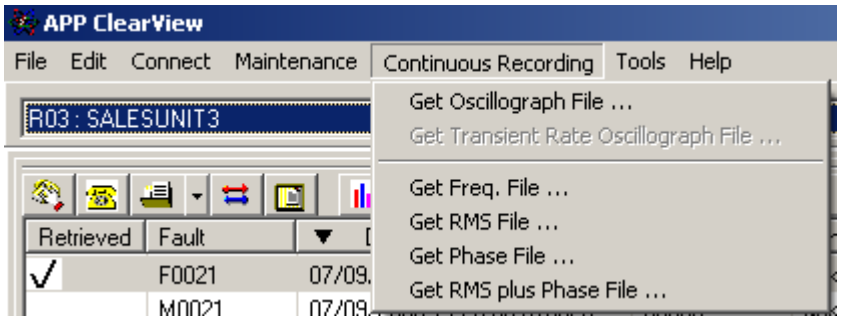


Figure 142: Continuous Recording Menu

12.3 Getting a Time Slice of Oscillograph Data

➢ To Get a Time Slice of Oscillograph Data

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to get data.

2. In the **APP ClearView window**, from the **Continuous Recording** menu, click **Get Oscillograph File**.
   The following window appears.

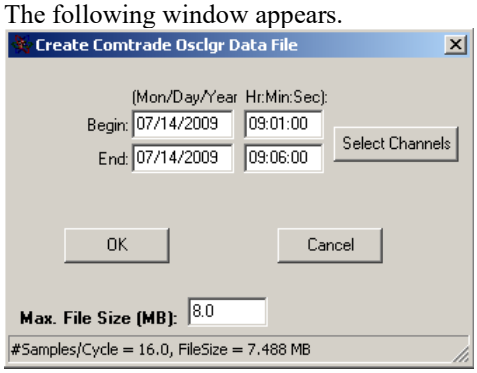


Figure 143: Create Comtrade Osclgr Data File Window

3. In the **Begin** and **End** boxes, enter time slice values.
4. Click the **Select Channels** button to select the channels you want. If you do not select specific channels, then all analog channels will be retrieved.
5. In the **Max File Size** box, set the maximum file size of any continuous record/time slice. For example, if a master station user requests an RMS plus Phase time slice of 4 days, the file could be very large. If the requested file size is larger than the user-defined maximum limit, ClearView reduces the resolution of the file by evenly dropping data points throughout the record. Data points will be dropped until the file size is under the user-defined maximum limit.
6. Click the **OK** button.
   The APP Recorder packs the data from the specified time slice and uploads it to the OsclgrData directory with a file name equal to the range of the time slice (e.g. 20080213T102300_20080213T102400.dat).

   Note: If this directory is not there, it will be automatically created.

   Once the data is retrieved, the **Graphic and Data Analysis** window automatically opens, and the data is displayed.

12.4 Getting a Time Slice of Transient Rate Oscillography Data

➢ **To Get a Time Slice of Transient Rate Oscillograph Data**

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to get data.
2. In the **APP ClearView window**, from the **Continuous Recording** menu, click **Get Transient Rate Oscillograph File**.
   The following window appears.

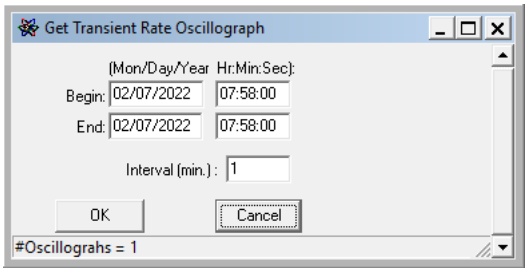


Figure 144 Create Comtrade Transient Rate Oscillograph File Window

3. In the **Begin:** and **End:** fields, enter time slice values.
4. Enter the **interval** desired in minutes
5. Click **OK**

Note: Transient Rate Oscillography must be enabled in the Point Assignment Record for data to be collected.

12.5 Getting a Time Slice of Frequency Data

➢ **To Get a Time Slice of Frequency Data**

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to get data.

2. In the **APP ClearView window**, from the **Continuous Recording** menu, click **Get Freq. File**.. The following window appears.

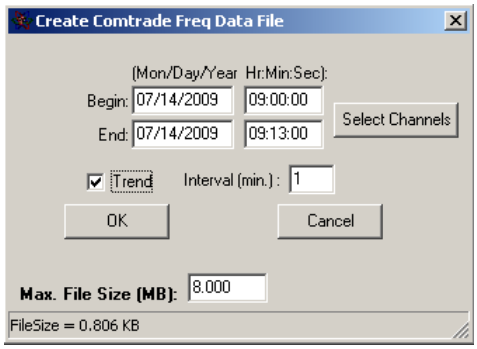


Figure 145: Create Comtrade Freq Data File Window

3. In the **Begin:** and **End:** fields, enter time slice values.

4. Click the **Select Channels** button to select the channels you want. If you do not select specific channels, then all analog channels will be retrieved.

5. **Trend Check Box**, checking the Trend Box will create a Frequency Comtrade file for all channels or specified channels, including a Maximum, Minimum, and Average Voltage value for each interval over the period indicated.
   Do you want to capture Frequency data over a period of time, contingent on the number of days set in the PAR General Settings Tab, Continuous Recording Freq + RMS + Phase, # of Days, and maintain a manageable file size?
   - **If yes**, click the **Trend check box** and enter an interval in minutes typically 1 minute is used. At the bottom of the window, you can see the expected file size and the effect of interval minutes selected.
   - **If no**, then skip to the next step

6. In the **Max File Size** box, set the maximum file size of any continuous record/time slice. For example, if a master station user requests an RMS plus Phase time slice of 4 days, the file could be very large. If the requested file size is larger than the user-defined maximum limit, ClearView reduces the resolution of the file by evenly dropping data points throughout the record. Data points will be dropped until the file size is under the user-defined maximum limit.

7. Click the **OK** button.
   The APP Recorder packs the data from the specified time slice and uploads it to the FreqData directory with a file name equal to the range of the time slice (e.g. 20080213T102300_20080213T102400.dat).

   Note: If this directory is not there, it will be automatically created. Also, a trend data file is much smaller. Therefore, it has no file size limit.

   Once the data is retrieved, the **Graphic and Data Analysis** window automatically opens, and the data is displayed.

12.6 Getting a Time Slice of RMS Data

➢ To Get a Time Slice of RMS Data

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to get data.

2. In the **APP ClearView window**, from the **Continuous Recording** menu, click **Get RMS File**. The following window appears.

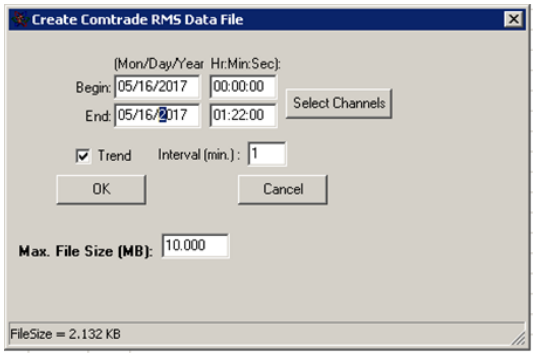


Figure 146: Create Comtrade RMS Data File Window

3. In the **Begin** and **End** fields, enter time slice values.

4. Click the **Select Channels** button to select the channels you want. If you do not select specific channels, then all analog channels will be retrieved.

5. **Trend Check Box**, checking the Trend Box will create an RMS Comtrade file for all channels or specified channels, including a Maximum, Minimum, and Average Voltage value for each interval over the period indicated.

   Do you want to capture RMS data over a period of time, contingent on the number of days set in the PAR General Settings Tab, Continuous Recording Freq + RMS + Phase, # of Days, , and maintain a manageable file size?

   - **If yes,** click the **Trend check box** and enter an interval in minutes typically 1 minute is used. At the bottom of the window, you can see the expected file size and the effect of interval minutes selected.
   - **If no**, then skip to the next step

6. In the **Max File Size** box, set the maximum file size of any continuous record/time slice. For example, if a master station user requests an RMS plus Phase time slice of 4 days, the file could be very large. If the requested file size is larger than the user-defined maximum limit, ClearView reduces the resolution of the file by evenly dropping data points throughout the record. Data points will be dropped until the file size is under the user-defined maximum limit.

7. Click the **OK** button.
   The APP Recorder packs the data from the specified time slice and uploads it to the RMSData directory with a file name equal to the range of the time slice (e.g. 20080213T102300_20080213T102400.dat).

   Note: If this directory is not there, it will be automatically created. Also, a trend data file is much smaller. Therefore, it has no file size limit.

   Once the data is retrieved, the **Graphic and Data Analysis** window automatically opens and the data is displayed.

12.7 Getting a Time Slice of Phase Data

➢ To Get a Time Slice of Phase Data

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to get data.

2. In the **APP ClearView window**, from the **Continuous Recording** menu, click **Get Phase File**. The following window appears.

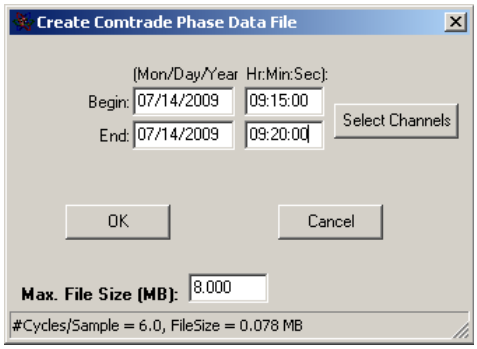


Figure 147: Create Comtrade Phase Data File Window

3. In the **Begin** and **End** fields, enter time slice values.
4. Click the **Select Channels** button to select the channels you want. If you do not select specific channels, then all analog channels will be retrieved.
5. In the **Max File Size** box, set the maximum file size of any continuous record/time slice. For example, if a master station user requests an RMS plus Phase time slice of 4 days, the file could be very large. If the requested file size is larger than the user-defined maximum limit, ClearView reduces the resolution of the file by evenly dropping data points throughout the record. Data points will be dropped until the file size is under the user-defined maximum limit.
6. Click the **OK** button.
   The APP Recorder packs the data from the specified time slice and uploads it to the PhaseData directory with a file name equal to the range of the time slice (e.g. 20080213T102300_20080213T102400.dat).

   Note: If this directory is not there, it will be automatically created.

   The absolute phase for each channel is retrieved. Each data point is a phase angle reading at a certain moment in time. The software looks at an entire cycle to decide what position or angle it is at. A cosine wave is used as a reference where zero degrees is the start of the cosine.

   Once the data is retrieved, the **Graphic and Data Analysis** window automatically opens and the data is displayed.

12.8 Getting a Time Slice of RMS plus Phase Data

RMS plus Phase data allows you to calculate power or impedance in a longer time range with less data compared to using oscillography data.

➢ To Get a Time Slice of RMS Plus Phase Data

1. In the **APP ClearView** window, from the **APP Recorder** list, select the APP Recorder for which you want to get data.
2. In the **APP ClearView window**, from the **Continuous Recording** menu, click **Get RMS Plus Phase File**.
   The following window appears.

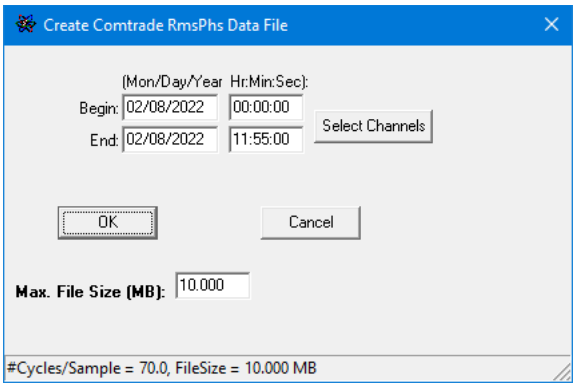


Figure 148: Create Comtrade RmsPhs Data File

3. In the **Begin** and **End** fields, enter time slice values.

4. Click the **Select Channels** button to select the channels you want. If you do not select specific channels, then all analog channels will be retrieved.

5. In the **Max File Size** box, set the maximum file size of any continuous record/time slice. For example, if a master station user requests an RMS plus Phase time slice of 4 days, the file could be very large. If the requested file size is larger than the user-defined maximum limit, ClearView reduces the resolution of the file by evenly dropping data points throughout the record. Data points will be dropped until the file size is under the user-defined maximum limit.

6. Click the **OK** button.
   The APP Recorder packs the data from the specified time slice and uploads it to the RmsPhsData directory with a file name equal to the range of the time slice (e.g. 20080213T102300_20080213T102400.dat).

   Note: If this directory is not there, it will be automatically created.

   Once the data is retrieved, the **Graphic and Data Analysis** window automatically opens and the data is displayed.

   Note: Use preconfigured Line Groups to look at power graphs.

13. Tools Menu

13.1 New Graph

New Graph can be used to open up an empty graphics screen and then open **ANY COMTRADE Record**. This capability is covered in the next Section. See Section 14.2 Opening the Graphic and Data Analysis Window

13.2 Emailing a Fault Summary File

You can email a Fault Summary File to the addresses listed in the **Email Settings** window. For more information on setting up email addresses, see 4.17.6 *To Configure the Email Settings*.

➢ To Email a Fault Summary File

In the **APP ClearView** window, from the **Tools** menu, click **Email FSum**.

13.3 Show Email Window

Email configuration settings, including the list of recipients who receive Fault Summary Reports, are centrally managed in the Email Settings window. You can access this window when you configure the ClearView (**Edit** menu, **Configuration** menu option). A more direct route is to access the Email Settings window directly from the **Tools** menu.

➢ To Show the Email Settings Window

In the **APP ClearView** window, from the **Tools** menu, click **Show Email Window**.
The Email Settings window appears. For information, see 4.17.6 *To Configure the Email Settings*.

13.4 Vaisala Lightning Configuration

On the **Tools** menu, the **Vaisala Lightning Config** option is used to setup the APP recorder to automatically correlate lightning location information provided by Vaisala, Inc. with fault records.

You must have checked the Viasala Lightning Information option in Clearview Configuration Options Tab. **See Section 4.17.8 Configuring Options**

Note: The URL, username, and password are all provided by Vaisala. Inc.

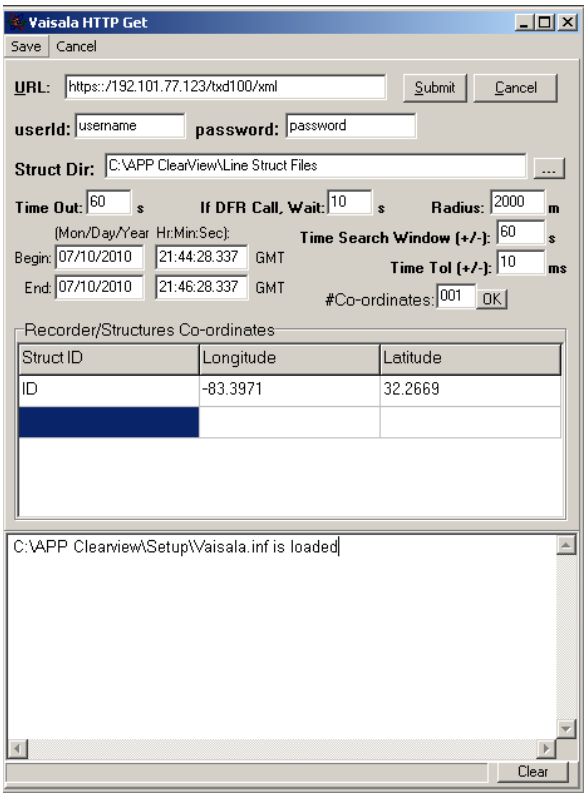


Figure 149: Viasala Configuration Screen

13.4.1 Quick Start

1. Fill in all the necessary information for the fields in BOLD then click **Save.**
2. Make a quick test by clicking the **"Submit"** button. A message will appear on the bottom of the window.
3. If successful, A messages similar to **"OnConnectionStatus: OK"** will appear.
4. Enter LineID on each line group, they should be the same as in the folder **"Line Struct Files."** For example, if the Line id is 100, the file is 100.txt.
5. Click on one of the fault records in ClearView and right mouse click to show the **Fault Record menu**. Click "Do Lightning Info". It will run and a message will appear on the message window described in *step #2*.

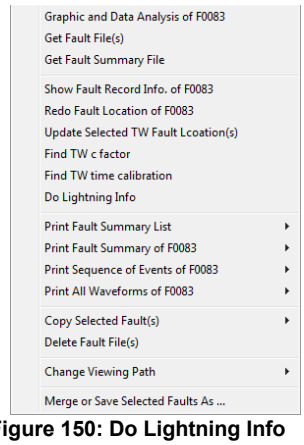


Figure 150: Do Lightning Info

6. Lightning correlation is now ready. Whenever **auto-poll/manual poll or the recorder calls in**, Clearview will do the lightning info, and if auto email was set, the lightning info will be sent with it.

13.4.2 Line Structure Files

Each file is a line and the file name is the line ID. For example, 100.txt and 101.txt for line 100 and line 101

Inside each file, the line is formatted as below:

Longitude	Latitude	Structure ID	Line ID	Description

For example

-84.72569	31.45738	847	100	Arlington Height line

Contact APP Engineering for complete information on how to configure this feature.

13.5 Completing a File Transfer

You can use FTP to transfer a file from the master station to an APP Recorder, or vice versa.

➢ To Complete a File Transfer

In the **APP ClearView** window, from the **Tools** menu, click **File Transfer**.
The File Transfer window appears, as shown in the following figure.

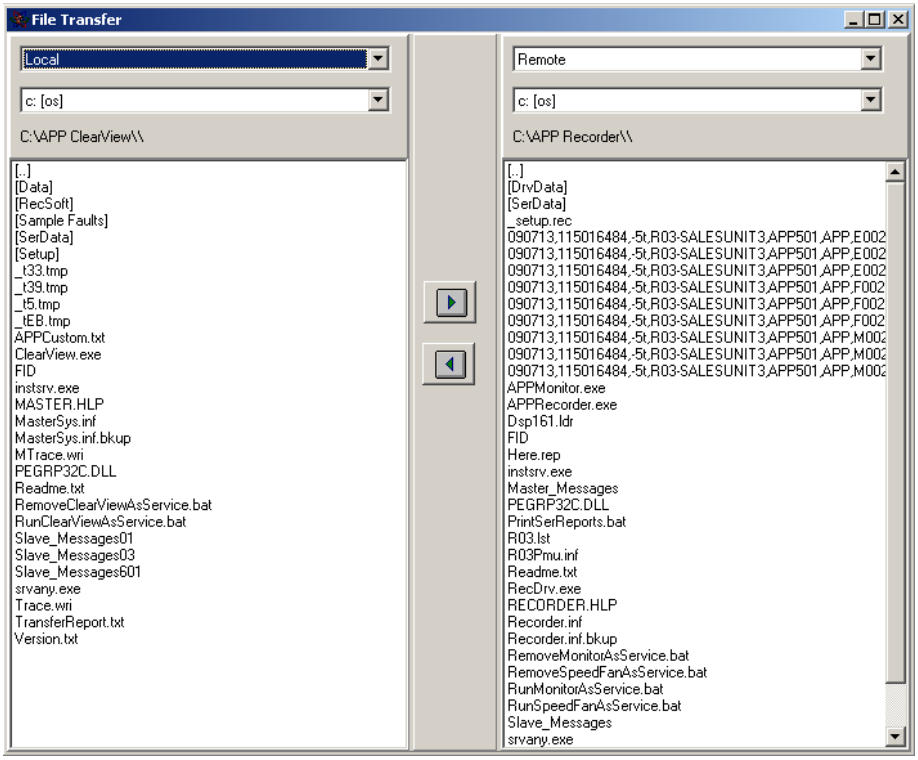


Figure 151: File Transfer Window

Note: Within this window, you can create folders and rename or delete files as needed.

13.6 Merging Fault Records or Saving Fault Records to a New File

WARNING **ClearView does not restrict the size of the merged file. Merged files can get very large if the records being merged are far apart in time. ClearView automatically populates empty rows with "0."**

➢ To Merge Fault Records or Save Fault Records to a New File

1. In the **APP ClearView** window, from the **Tools** menu, click **Merge or Save Data Files As**. The Merge or Save Data Files As window appears.
2. Select the destination folder and specify a new name for the merged/saved file and then click the **Save** button.
3. An explorer window appears, browse to the folder where the faults records to be merged reside. Select the fault records to be merged by clicking the first file and then holding **<Ctrl>** , clicking one or more fault records. Then click **Open**. The merge file (.dat) is saved.

13.7 Extracting Continuous Record Data

Continuous record data consumes a huge amount of space, usually many Giga bytes. For this reason, it is stored in a cyclic buffer in a compact data format. It requires special software to convert a portion of the data to the COMTRADE format so you can view it. In general, you can use ClearView to retrieve a portion of the continuous record data from an APP Recorder when you need it. However, in some situations, you might want to preserve the continuous record data permanently (e.g. in case of a blackout) in a separate hard drive. You can then examine the data whenever necessary.

➢ To Extract Continuous Record Data

1. In the **APP ClearView** window, from the APP Recorder list, select the APP Recorder for which you want to extract continuous record data.
2. From the **Tools** menu, click **Extract Continuous Record Data**.
   The Extract Continuous Record Data window appears, as shown in the following figure.

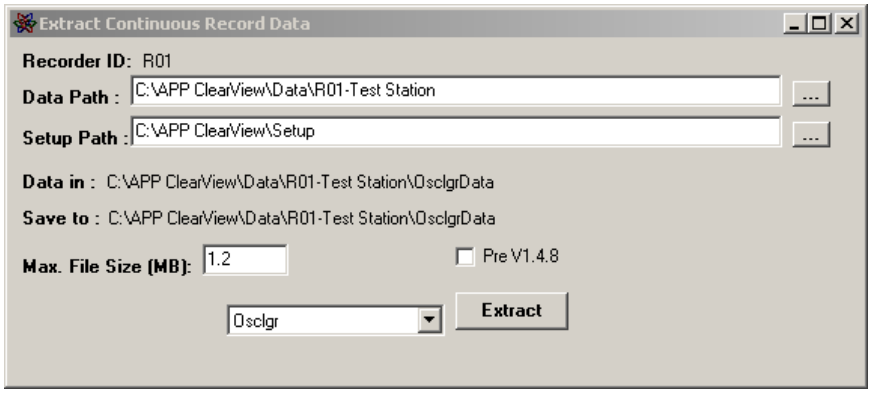


Figure 152: Extract Continuous Record Data Window

3. In the **Data Path** box, specify the path where the data is stored

CAUTION **When storing continuous record data files, be sure to store them in the appropriate folder. For example, frequency data files should be stored in the FreqData folder and RMS data files should be stored in the RmsData folder; these are the folders where the data was originally stored. This will ensure that the software can understand the files.**

4. In the **Setup Path** box, specify the path where the associated Point Assignment Record is stored.
5. In the list at the bottom of the window, select the appropriate type of data (Osclgr, Freq, Rms, Phs or RmsPhs). Above this list, the window displays the **Data in** folder where the specified type of data (e.g. OsclgrData) is stored. The **Save to** folder is where the retrieved data will be saved.
6. Is the software running on the APP Recorder version 1.4.8 or older?

   If **yes**, then select the **Pre V1.4.8** check box. The continuous frequency data has been changed from 0-65Hz to 0-130Hz after Version 1.4.8.

   If **no**, skip to the next step.
7. Click the **Extract** button. ClearView extracts the data and saves it to the location you specified.

13.8 Showing (or Hiding) the ClearView Icons

You can show or hide the icon bar in the **APP ClearView** window.

➢ **To Show (or Hide) the ClearView Icons**

In the **APP ClearView** window, from the **Tools** menu, click **Show Icons**.
If the icons were showing, then clicking this option hides them. If the icons were hidden, then clicking this option shows them.

13.9 Configuring a DSP Board's Ethernet and IP Address Settings

Note: You can configure the DSP board's Ethernet settings using the APP Recorder software. This feature has been implemented in ClearView in order to give you the option to make changes via your laptop instead of using the APP Recorder computer.

Before an APP Recorder leaves the factory, each of its DSP/IRIG boards is programmed with an Ethernet Address, IP Address, Subnet Mask, and Default Gateway. In a centralized or turn-key system, it is highly unlikely that the Ethernet or IP Addresses will ever need to be changed. However, if the factory ships an add on data chassis for a distributed architecture system and does not know the location of the installation, you will need to program the appropriate DSP Ethernet Address and IP Address upon receipt.

For more information on Configuring the DSP settings see the **APP Recorder Operating Manual Section 7.14.9**

13.10 Configuring a DNP3/Modbus Outstation

If you enable **DNP3/Modbus** in the Point Assignment Record on the **General Settings** tab: **Recorder Setup** tab. This will cause the **DNP3/Modbus** configuration option to appear in the Clearview Tools menu.

For more information on configuring **DNP3/Modbus**, please see the **APP Recorder Operating Manual Section 6.13.**

13.11 Configuring a Phasor Measurement Unit (PMU)

If you enable **PMU** in the Point Assignment Record on the **General Settings** tab: **Recorder Setup** tab. This will cause the **PMU** configuration option to appear in the Clearview Tools menu.

For more information on configuring **PMU**, please see the **APP Recorder Operating Manual Section 6.13.**

13.12 File Compare

File Compare enables viewing two text files to find differences. A primary use could be to find the differences in versions of a Point Assignment Record (PAR)

Click file Compare in the Tools Menu

Figure 153 File Compare Window

Select two files by clicking the explorer button to the right of each file field and navigate to the files you would like to compare.

Once both files are listed, **click the Compare button**. Once the compare is complete, the differences will appear in Red.

If you click the Animate box, the compare process will show the changes as comparison progresses down the files.

The Status line at the bottom displays compare status and difference in character count.

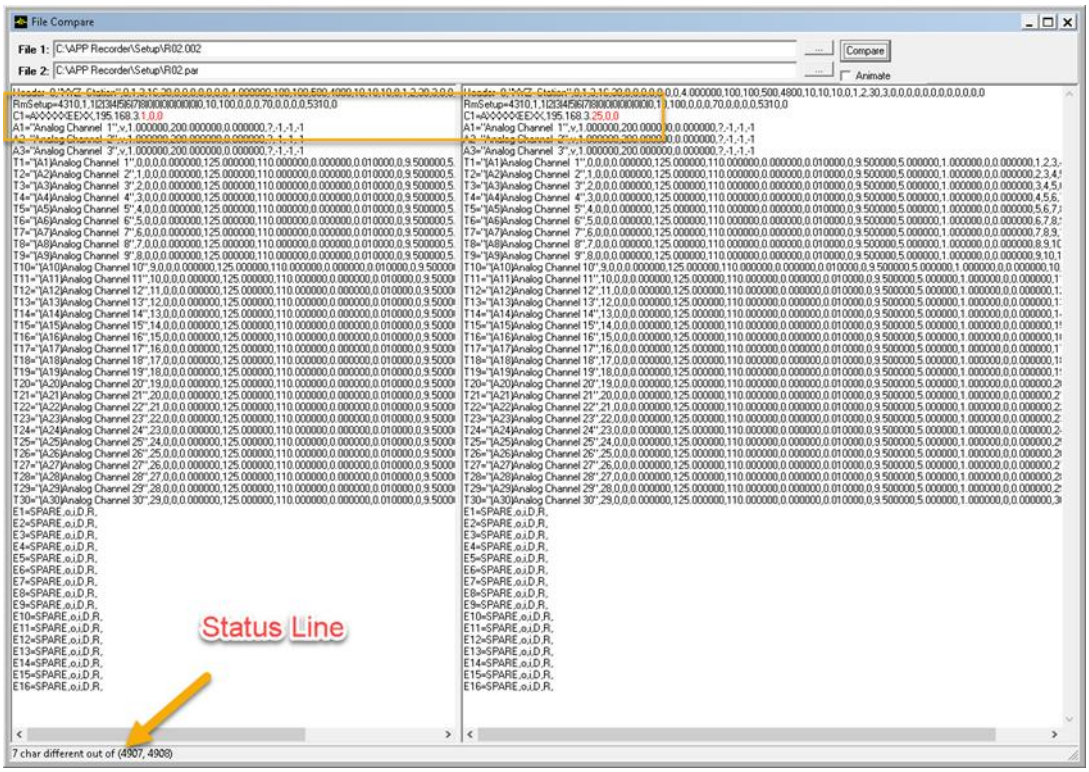


Figure 154 File Compare Results

13.13 Viewing Help and About Information

You can view the help for APP ClearView. The About information includes the software version and factory contact information.

Note: If the help files do not answer your question(s), please do not hesitate to contact APP Engineering, Inc. at **(317) 536-5300**.

➢ To View the Help

In the **APP ClearView** window, from the **Help** menu, click **Help**.

➢ To View the About Information

In the **APP ClearView** window, from the **Help** menu, click **About**.

14. Graphic and Data Analysis Window

14.1 Introduction

The **Graphic and Data Analysis** window, shown below, provides tools for viewing COMTRADE records. You can use this COMTRADE viewer to display and analyze transient, extended, and continuous records from the APP Recorder as well as COMTRADE records from other recording devices.

The software has a wide variety of graphics, math functions, reports, and file manipulation features that allow you to easily navigate your data. It supports importing of industry-standard formats such as COMTRADE (Common Data Transient Data Exchange) version 1991, 1999, and 2013. It also allows you to save data to PQDIF data formats or export the data in comma delimited (*.csv) format.

Note: Any functions that you carry out in the **Graphic and Data Analysis** window will not modify the actual COMTRADE record.

Tip: You can drag and drop oscillograms, tag a channel, grab the channel descriptor, drag it to the desired location, and drop it.

14.2 Opening the Graphic and Data Analysis Window

You can use ClearView to view COMTRADE records. The window in which you view these records is the **Graphic and Data Analysis** window.

➢ **To Open the Graphic and Data Analysis Window**

Go to Fault Summary Table and double click or right click on any record listed with a check mark in the "Retrieved" column.

➢ **To open a COMTRADE Record not shown in the Fault Summary Table.**

Go to the **APP ClearView** window, from the **Tools** menu, click **New Graph**.
The **Graphics and Data Analysis** window appears.

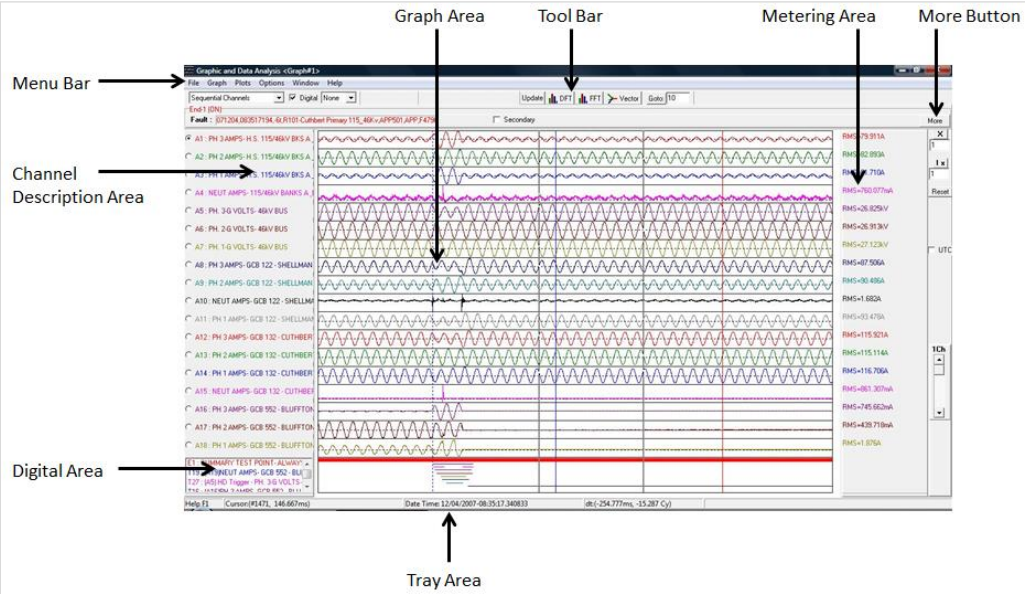


Figure 155: Graphic and Data Analysis Window

14.3 Opening COMTRADE Data Files, Not in the Fault Summary Tab

In the **Graphics and Data Analysis** window, you can view up to two COMTRADE data files simultaneously.

Typically, you use this tool to view records that are not listed in the **Fault Summary** tab of **the APP ClearView** window.

If two records are opened at the same time and their timestamps do not overlap, the two records are placed in the graph area with the T_0 times aligned.

The time (X-Axis) of each oscillogram can be shifted by clicking the **MORE** button and specifying a time offset. The **MORE** button is located in the upper right hand corner of the Graphics and Data Analysis window. Selecting **MORE** also displays a toolbar which lists the Fault Time, Duration, Sampling Rate, and Total Data Points.

Note: Records that have different sampling rates *can* be merged together.

➢ To Open a COMTRADE Data File

1. Open the **Graphics and Data Analysis** window.
2. From the **File** menu, point to **Open Data** and then click one of the following:

   Open Data 1 to select the first COMTRADE record to open.

   Open Data 2 to select the second COMTRADE record to open.

Note: To open a record from a Directory, it must have the (.dat) file and (.cfg) file unless it is a combined (.cff) file type which combines both data and configuration information.

Note: A message will appear saying “End-1 and End-2 time periods do not overlap.” This is normal, click OK to continue.

14.4 Saving a COMTRADE Data File with a Different Name and/or Format

You can save a COMTRADE file with a different name. You can save the data in any of the following formats:

- Comtrade in Binary (.dat)
- Comtrade in ASCII (.dat)
- Comtrade in Binary (.cff)
- Comtrade in ASCII (.cff))
- IEEE-1159 <PQDIF> (.pqd)

➢ To Save a COMTRADE Data File with a Different Name and/or Format

1. In the **Graphics and Data Analysis** window, open the COMTRADE file that you want.
2. From the **File** menu, point to **Save Data As** and then click one of the following:

   Save Data 1 As to select the new file name and format information for the first COMTRADE data file.

   Save Data 2 As to select the new file name and format information for the second COMTRADE data file.

14.5 Opening a Line Group

You can view oscillograms that are organized in line groups to improve your data analysis. See *Power Quality Recording for* Inverter Based Resources

14.6 Introduction

The increase in penetration levels of inverter-based resources (IBRs) will significantly change the dynamic performance of the bulk electric system. As the penetration levels of inverter-based resources increase and the technology of inverter-based resources evolves, recording equipment with PQ-DDR capabilities are needed to address the performance requirements of inverter-based resources. APP Recorders can provide a one solution system to meet the recording requirements of PRC-002-05, PRC-028, IEEE 2800 Table 19, and allow for model validation per MOD 25, 26, and 27. Points of measure can include the HS of the MPT, low side of the MPT, solar feeder circuits, BESS feeder circuits, cap banks, and other supplemental locations within an IBR plant.

Regarding IEEE-2800, APP recorders can comply with the requirements of IEEE-2800 Table 19 if the proper elements are connected and setup for the APP Data Chassis recording at the point of interconnect with the transmission or sub-transmission system (the plant level). The recorder can perform PQ-DDR on elements with harmonics being recorded or derived out to the 50th harmonic. PQ-DDR and triggering can include Pst, Plt, RVC, very short-term harmonics, short-term harmonics, long-term harmonics, apparent power, active power, reactive power, power factor, frequency, and change of frequency. These quantities can be continuously recorder and trended with the files being in COMTRADE format and can be automatically converted to PQDIFF format.

14.7 IEEE-2800 Table 19 Measurement Data

The following table is based on IEEE 2800 Table 19 and describes the data type, points, sampling rate, retention and duration for Power Quality continuous recording APP Recorder includes. Retention values listed are typical and can be set in the Point Assignment Record. **See Section 6.19 Configuring General Settings**

14.8 PQ Hardware

There are some PQ hardware component required in order for the APP Recorder to receive signals from IBRs for PQ. There are three Analog boards involved when recording for PQ. Analog channels are wired to both Standard Analog boards and to Voltage or Current specific PQ Analog boards. The IBR needs to send voltage signals through a PQ sensor to a PQ Analog Voltage Board. Voltage channels are also wired to a standard analog board for recording and triggering on other conditions. PQ Analog Current boards are wired in series to a standard analog board wired for current channels.

PQ Sensor connected to a PQ Voltage analog channel with 1Meg Input Impedance

PQ Board connected to a PQ Current analog channel with a fixed full scale of about 5A

The following diagrams illustrate the wiring from a PQ sensor to a PQ Voltage board and an Analog Current board. You will notice these boards have only Current connections or Voltage connections, not both like the standard Analog board.

The Voltage board is connected directly to a PQ Sensor.

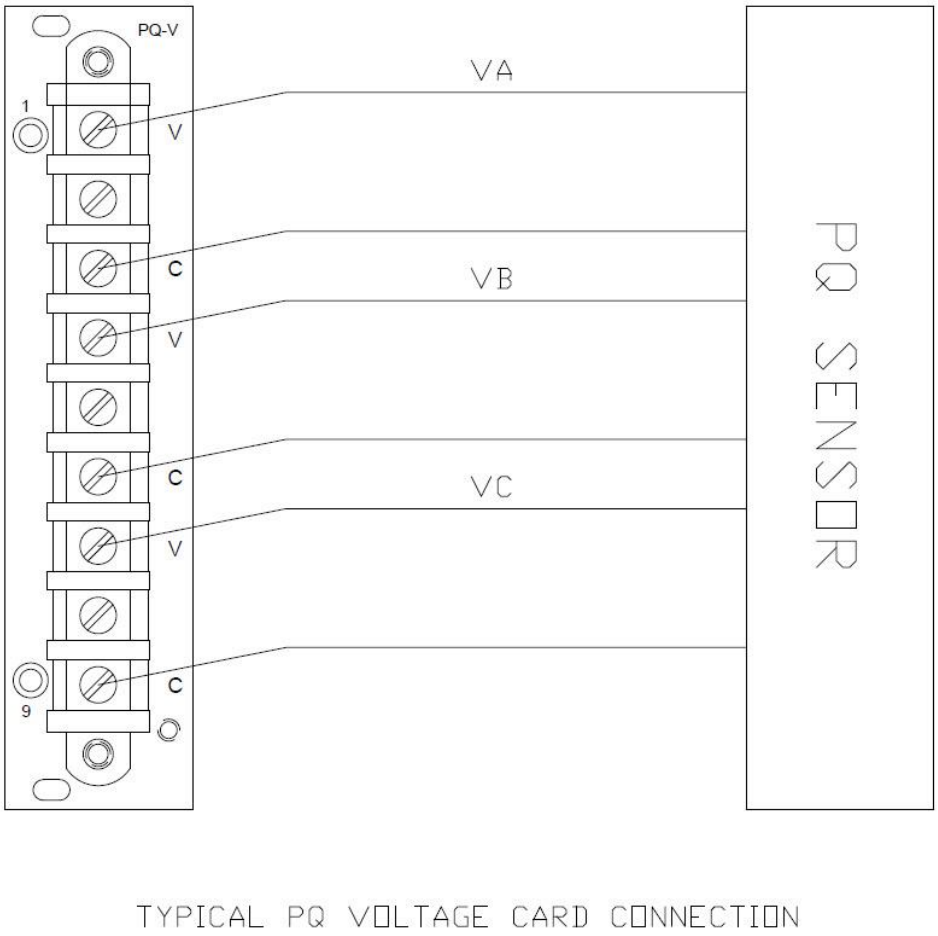


Figure 105 PQ Voltage board wiring

PQ Current boards are wired in series to a standard Analog board wired for the same Current channels being recorded.

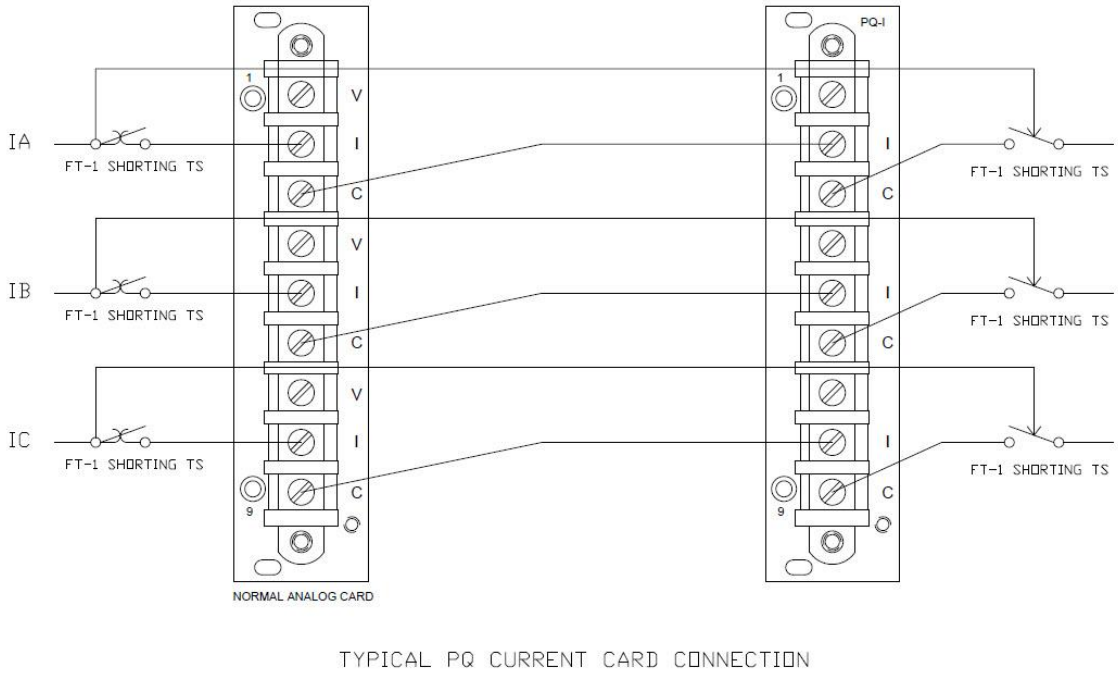


Figure 106 PQ Current Board wiring

14.9 Point Assignment Analog TAB settings

There are PAR settings required or recommended when setting up PQ analog channels. Please see Section 6-1 Managing Point Assignment (PA) Records for more information on the full PAR set up.

To measure out to the 50th Harmonic you must use a Transient Sampling rate of **9600 or higher**.

The Transient Sampling rate is recommended to be no higher than **15360**.

When setting up **PQ current channels**, use Full Scale Setting of **5 and ABS to 20**. This will change slightly when calibration is done.

When setting up **PQ voltage channels,** Full Scale must be set to **115**.

14.10 Power Quality Data Recorder sample Trigger settings

The plant level Data Chassis PQ settings enable you to trigger for Transient Recording as well as Triggers for PQ Continuous Recording. Ideally these triggers will be set up for channels in **Data Chassis 1**. The Figure below shows the typical Trigger settings for recording PQ based on IEEE 2800 Table 19.

Note: When using DSP 7 or higher there is no restriction on how many RVC triggers, or which triggers they are assigned to. With DSP 6 or lower, RVC triggers are limited to six per data chassis and must be assigned to 1 or more of the first 6 triggers only.

14.10.1 Power Quality Data Recorder (PQ DDR)

When utilizing DSP7 or higher in the Data Chassis and running APP Recorder software 3.3.6 or higher the following data shown in the table below is recorded when you have checked the **Include PQ Data** option in the Point assignment Record General Settings TAB and have enabled HD, THD, or TRD Triggers in the Triggers TAB.

Note If you have DSP6 or below and have Include PQ Data checked, you will receive the five files in Table 8 but not the Harmonics files discussed in this section.

Note: If you have both HD and THD triggers set on a channel, only one continuous recording file will be created for the channel (i.e. it won't be duplicated). If you have either HD or THD and TRD Triggers on the same channel, 2 PQ continuous recording files will be recorded for the channel.

Table 8 PQ Data Recorded

Description	File Name	Interval	Typical for IEEE-2800 Triggering & Continuous Recording for Each Mapped Analog Channel	Typical Circular Buffer
3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily	3p-Vrms, 3p-Irms, 3p-W, 3p-Vr, V-Hz, V-Hz Sign, 3p-RVC, 3p-V HD, 3p-I HD, 3p-V THD, 3p-I THD, TRD	10 Days
10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily	Same as above	90 Days
2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly	Same as above	365 Days
Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily	Selected Volt Channels	90 Days
Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly	Selected Volt Channels	90 Days

14.10.2 Individual Harmonics files

If you check the **Include Individual Harmonic Data** check box in the PAR General Settings TAB/Power Quality box, Individual Harmonic files are created to enable easier identification of which Harmonic Order is the largest and above the Standard. The files will be created for any HD, THD, or TRD triggers set. See table below with more details. The following is a summary of the files created and more detail about each file name and sampling intervals.

Table 9 Harmonics File names and descriptions

Description	File Name	Interval	Typical Circular Buffer
3-sec Very Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_VShort_3sec_Daily	3 seconds, daily (1 file a day per Analog Channel with HD as trigger) Each file contains 50 X-axes analyzed to extract the harmonic order values for each analog channel.	30 Days
10-min Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_Short_10min_Weekly	10 min., weekly (5am daily) (1 file a week per Analog Channel with HD as trigger) 50 X-Axes in the file, to find what is the largest harmonic for each analog channel	90 Days
10-min weekly 95th percentile	yyyyIHR##T##A#_Short_10min_Weekly_95	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
10-min weekly 99th percentile	yyyyIHR##T##A#_Short_10min_Weekly_99	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days
3-sec weekly 95th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_95	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
3-sec weekly 99th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_99	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days

Note: The HD and THD measurements are based on IEC 61000-4-7, -30 and IEEE Std 519 up to the harmonic, see table below. Any harmonics beyond the 50th harmonic is not measured or recorded by the DFR.

Transient Sampling	Up to Harmonic
2400 Hz	19th
4800 Hz	39th
9600 Hz and above	50th

3 Second Daily Harmonics - one file per Analog Channel with HD, THD or TRD trigger 3 second samplings daily starting at 5:00 AM for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily. Each file contains 50 X-axes to extract the harmonic order values for each analog channel. Typical Retention is 30 days.

10 Minute Weekly Harmonics - one file per analog channel with HD, THD or TRD Trigger sampled every 10 minutes starting 5am Sunday for a week. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly. Each file contains 50 X-axes to find the 95th percentile. Typical Retention is 90 days.

Yearly Harmonic Percentile - The following Harmonics recording files are contained in APPRecorder\Data\PqData\PQHar folder. You set the retention for all three types of files described below in this field (see **Section 6.19 Configuring General Settings)**. Typical Retention is 365 days.

3 Second 95th Percentile Harmonic files - one file per Analog Channel with HD, THD or TRD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

3 Second 99th Percentile Harmonic files - one file per Analog Channel with an HD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

10 Minute weekly 95th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

10 Minute weekly 99th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

14.10.3 Convert COMTRADE to PQDIF

If you have checked the **Convert COMTRADE to PQDIF Every Day** in the Power Quality area of the PAR General settings TAB, Recorder will create PQDIF files in the **APP Recorder\Data\PQDATA\PQDIFData** folder. The following table lists the PQDif files created automatically every day.

Table 10 Convert to PQDIF files

Location:	Description	File Name	Interval
APPRecorder\Data\PQData\ PQDIFData	3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily
	10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily
	2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly
	Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily
	Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly

14.10.4 Viewing PQ Continuous recording files

View the PQ continuous recording files in Clearview by opening a new Graph then navigating to the APP Recorder/Data/PQData folder and opening the desired file. The following figures show examples of viewing PQ files. **See Section 14.2 Opening the Graphic and Data Analysis Window.** Look at the Figure captions below each image and the filenames at the top to identify which file examples each figure shows.

14.10.5 Harmonics Reports

In addition to viewing Harmonics files in Clearview, five reports to enhance analysis of Harmonics to pinpoint more easily if and where the Standard is not being met based on IEEE-2800 Table 19. These reports are saved in APP Recorder\Data\PQData\PQReport folder and written in HTML format. When you open a report file it will open in your browser application. You can use your browser functions to save to a PDF and Print etc..

Following are the report descriptions.

YYYYMMDD[RecID]VshortHarDailyReport.html
Daily report of individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies the Largest Order and Largest Range. Includes Min (%), Avg(%), Max(%), and 99th(%).

You can Filter on a **Harmonic Order** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

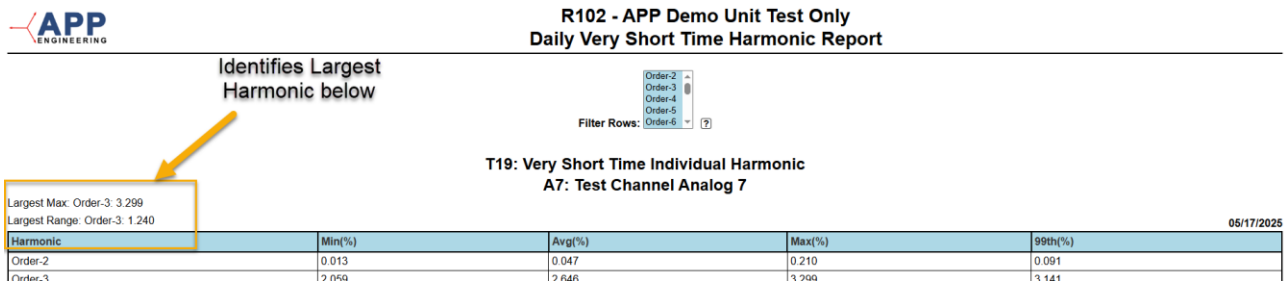


Figure 115 Sample Daily Harmonics Report

YYYYMMDD[RecID]VshortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%).

YYYYMMDD[RecID]shortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on **Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

APP ENGINEERING

R102 - APP Demo Unit Test Only
Weekly Very Short Time Harmonic Report

Filter Rows: 05/13/2025 05/14/2025 05/15/2025 05/16/2025 05/17/2025

T19: Very Short Time Individual Harmonic
A7: Test Channel Analog 7

Date	Largest Max Order	Largest Max (%)	Largest Range Order	Largest Range (%)	Max THD (%)	THD 99th (%)
05/13/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/14/2025	Order-3	0.150	Order-5	0.063	0.374	0.366
05/15/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/16/2025	Order-7	0.220	Order-7	0.177	0.579	0.568
05/17/2025	Order-3	3.299	Order-3	1.240	3.906	3.784

T20: Very Short Time Individual Harmonic
A8: Test Channel Analog 8

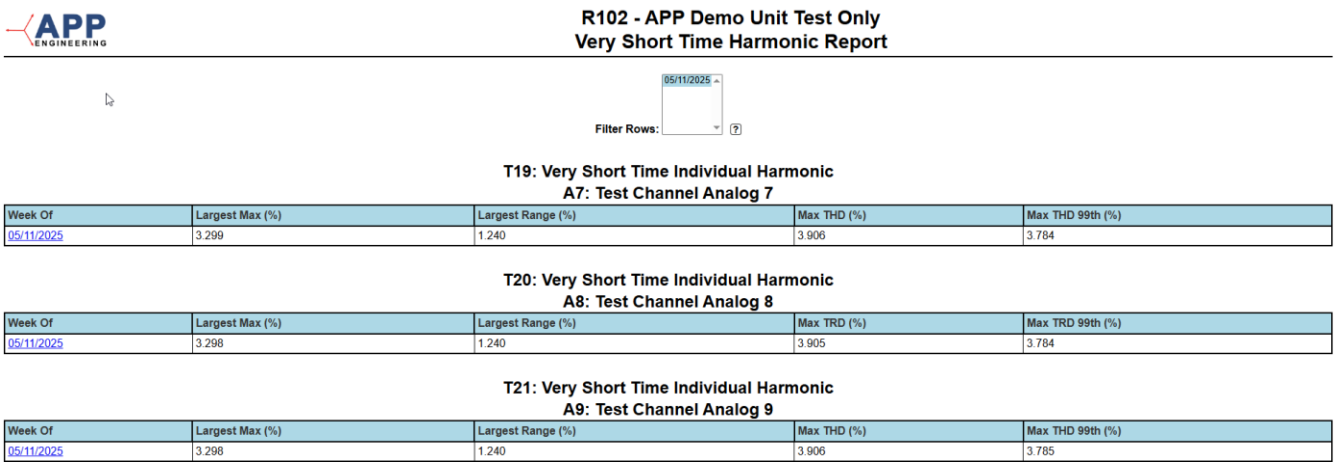
Date	Largest Max Order	Largest Max (%)	Largest Range Order	Largest Range (%)	Max TRD (%)	TRD 99th (%)
05/13/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/14/2025	Order-2	0.184	Order-2	0.087	0.331	0.326
05/15/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/16/2025	Order-5	0.136	Order-5	0.067	0.446	0.436
05/17/2025	Order-3	3.298	Order-3	1.240	3.905	3.784

Figure 116 Sample Weekly Harmonics Report

YYYY[RecID]VshortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%).

YYYY[RecID]shortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on "**Week of" Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.



APP ENGINEERING

R102 - APP Demo Unit Test Only
Very Short Time Harmonic Report

05/11/2025

Filter Rows:

T19: Very Short Time Individual Harmonic
A7: Test Channel Analog 7

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.299	1.240	3.906	3.784

T20: Very Short Time Individual Harmonic
A8: Test Channel Analog 8

Week Of	Largest Max (%)	Largest Range (%)	Max TRD (%)	Max TRD 99th (%)
05/11/2025	3.298	1.240	3.905	3.784

T21: Very Short Time Individual Harmonic
A9: Test Channel Analog 9

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.298	1.240	3.906	3.785

Figure 117 Sample Yearly Report

Managing Line Group Records on page 7-1 for more information on setting up line groups.

You can open up to two line groups simultaneously.

➢ **To Open a Line Group**

1. Click the **Tools Menu – New Graph**
2. From the **File** menu, point to **Open Line Group** and then click one of the following:

   Open Line-Group 1 to select the first line-group record to open

   Open Line-Group 2 to select the second line-group record to open

Note: If you open a record from the Fault Summary Tab/Screen and a Line Group Record is already configured, you do not need to open a Line Group from the Graphics Screen - File Menu.

14.11 Editing a Line Group

In the **Graphics and Data Analysis** window, you can open and edit an existing line group.

➢ **To Edit a Line Group**

1. Open the **Graphics and Data Analysis** window.
2. From the **File** menu, point to **Edit Line Group** and then click one of the following:

   Edit Line-Group 1 to select the first line-group record to edit.

   Open Line-Group 2 to select the second line-group record to edit.
   The Edit Line-Group Record window appears. For information on completing the fields in this window, see *Editing a Line Group Record* on page 8-16

14.12 Configuring a Printer

You can configure how your printer will print information from the Graphics and Data Analysis window.

➢ **To Configure a Printer**

Go to the **Graphics and Data Analysis** window, from the **File** menu, click **Printer Setup**.
The standard Windows Print Setup window appears.

14.13 Printing an Oscillograph

From the **Graphics and Data Analysis** window, you can print an oscillograph. The print feature is similar to the Window Print Screen feature, except that ClearView prints only the shown oscillograms, event data, channel descriptions, and an oscillogram value (such as RMS) for each analog channel. The printed analog channel value reflects the current cursor position in the **Graphics and Data Analysis** window.

You can view a print preview, print the oscillograph, or export the printout of an oscillograph.

➢ **To View a Print Preview of an Oscillograph**

Go to the **Graphics and Data Analysis** window, from the **File** menu, point to **Printer Graph** and then click **Preview**. A print preview window appears.

➢ To Print an Oscillograph

Go to the **Graphics and Data Analysis** window, from the **File** menu, point to **Printer Graph** and then click **Print**. The standard Windows Print window appears.

➢ To Export the Printout of an Oscillograph

Go to the **Graphics and Data Analysis** window, from the **File** menu, point to **Printer Graph** and then click **Export**.
The **Exporting** window appears, as shown in the following figure.

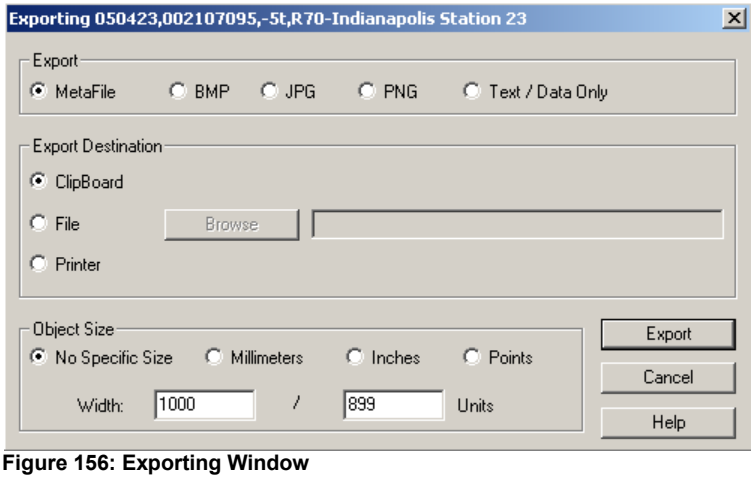


Figure 156: Exporting Window

1. Under **Export**, select the file type.
2. Under **Export Destination**, select to where you want to export the file.
3. Under **Object Size**, select any changes to the oscillograph dimensions.
4. Click the **Export** button.

14.14 Printing All Waveforms

You can configure the print parameters of the analog and digital channels.

➢ To Print All Waveforms

1. Go to the **Graphics and Data Analysis** window, from the **File** menu, point to **Print All Waveforms** and then click one of the following:

   Click **Preview 1** or **Preview 2** to format the printed report of the first oscillograph that is open in the Graphic and Data Analysis window.

   Click **Print 1** or **Print 2** to send the formatted oscillograph to the printer.

   The **Format All Wave Printing** window appears, as shown in the following figure.

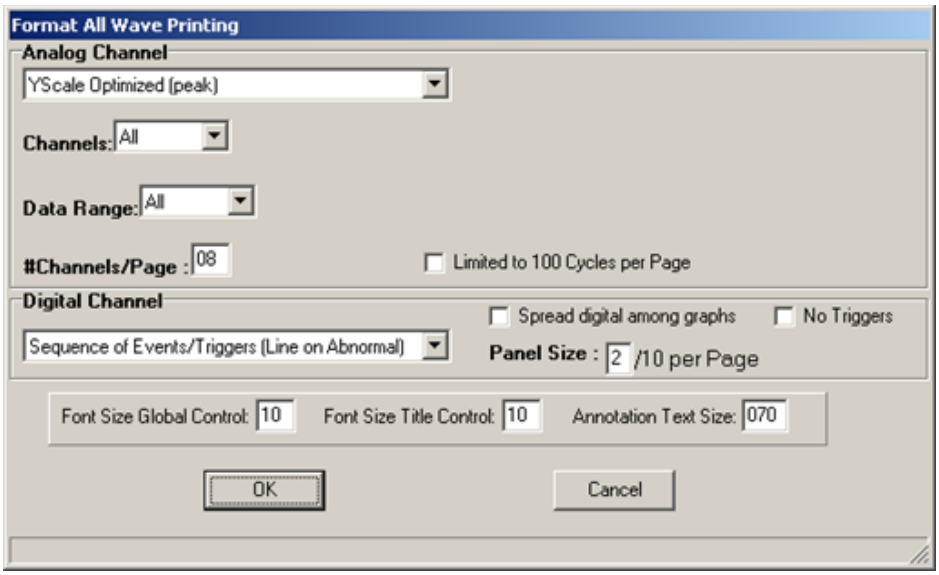


Figure 157: Format All Wave Printing Window

2. From the **Analog Channel Format** list, select the appropriate format:

   YScale Optimized (peak)
   Prints the highest peak value measured to the right-hand side of each oscillogram printed.

   YScale Optimized (unit/cm)
   Prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed.

   YScale = Channel Full Scale Optimized (unit/cm)
   Prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed. The value is based on the full scale setting in the Point Assignment Record and the number of oscillograms printed on the page.

   Yscale = User Select Scale (unit/cm)
   If selected, a user programmable Yscale field appears. The user can enter their desired volts/cm or amps/cm scale. Prints a volts/cm or amps/cm scale to the right-hand side of each oscillogram printed. The value is based on a user entered Yscale (unit/cm). If the scale is too small waveform clipping will occur.

   Yscale Optimized (RMS)
   This selection prints the RMS value to the right side of each oscillogram printed.

   Note: Print fewer channels on a page to increase the resolution on the Yscale.

3. From the **Channels** list, select one of the following choices:

   All
   Prints an oscillogram for each analog channel listed in the Point Assignment Record.

   Selected
   After you select this, click the **Select Channels** button to select the specific channels to print.

   Lines
   Specific preset line groups can be printed.

4. From the **Data Range** list, select the range of records to print:

   All
   Prints the entire length (X-axis) of all the oscillograms selected for printing.

   Selected
   Each data point in an oscillogram has a number. The starting number is "0" which is usually the prefault portion of the waveform. The ending number depends on how long the fault or recording lasted. To print a partial record, (X- axis length), enter the data range.

5. In the **#Channels/Page box,** enter the number of oscillograms you want to appear on each page of the printout.

   Note: Print fewer oscillograms on a page to increase the resolution on the Yscale.

6. **Limited to 100 Cycles per Page** check box causes the report to limit to 100 cycles per page for each channel displayed on a page.

7. There are two types of **triggers**: **analog triggers** and **event triggers**. You can print these triggers in conjunction with oscillograms. Triggers are represented by horizontal lines at the bottom of a printed or displayed page. In the **Digital Channel Format** list, select how the trigger line should appear, whether it is normal or abnormal:

   Sequence Of Events /Triggers (Line on Abnormal)
   This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown, it represents the period of time the event was **abnormal**.

   Sequence Of Events /Triggers (Line on Normal)
   This selection only prints the event channels or analog triggers that caused the system to trigger and record. The state of other event channels is not printed. If a line is shown, it represents the period of time the event was **normal**.

   All Events/Triggers (Line on Abnormal)
   This selection prints the analog triggers and event channels that were in an abnormal state when the record was created. If a line is shown, it represents the period of time the analog trigger or event channel was **abnormal**.

   All Events/Triggers (Line on Normal)
   This selection prints the analog triggers and event channels that were in an normal state when the record was created. If a line is shown it represents the period of time the analog trigger or event channel was **normal**.

8. **Spread digital among graphs,** if Spread Digital check box is **not** checked, the Analog channels are printed then the Event Channels on each page (See Figure 158). With **Spread Digital** check box checked the report shows the digital channels along with the analog lines together. (See Figure 159).

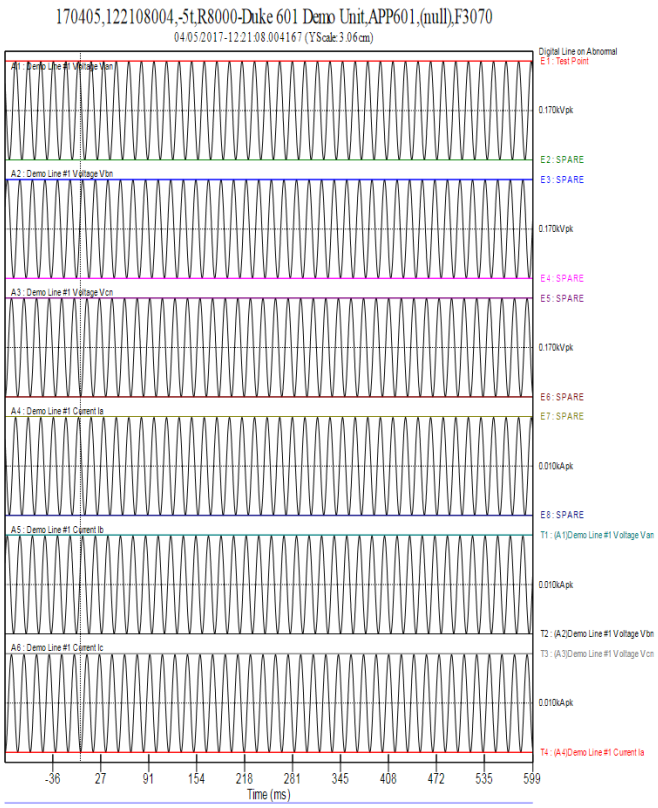


Figure 158: Default Report Format

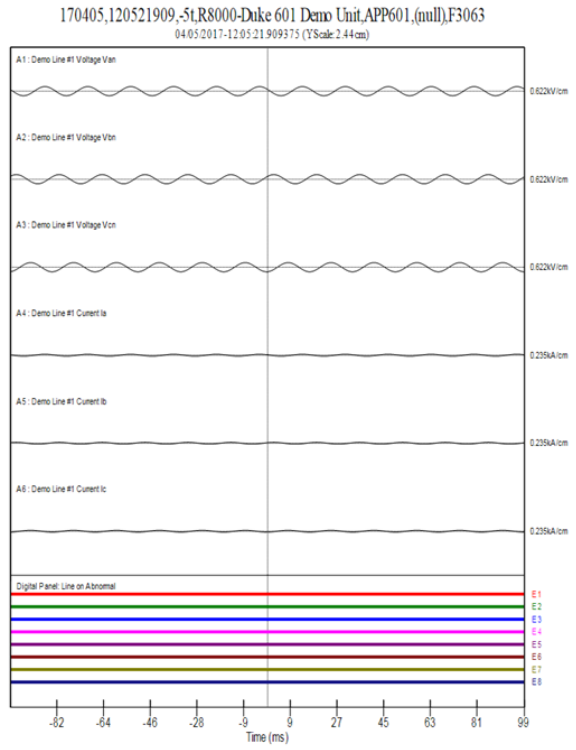


Figure 159: Report with Spread Digital Among Graphs Checked

9. **No Trigger** check box causes the report to exclude Analog Trigger faults from the report. An Event Trigger will still display if an Event Channel is set up, and an Event Channel caused the Trigger or an Event Channel changed state while the record was being created.
10. In the **Panel Size** box, enter the percentage of space the event and analog trigger lines will use at the bottom of a printed page.
11. In the **Font Size Global Control** box, enter the font size to be used for the title of the waveform pages and any annotations that may have been added. You cannot change the font on the **Fault Summary Report**.
12. In the **Font Size Title Control** box, enter the font size for the title that appears at the top of each waveform or oscillogram page.
13. In the **Annotation Text Size** box, enter the font size for any annotations that are added to a waveform or oscillogram page.
14. Click the **OK** button.

14.15 Exporting Graph Analog Data

You can export raw analog data to several formats listed below.

➢ To Export Graph Analog Data

1. In the **Graphics and Data Analysis** window, from the **File** menu, click **Export Graph Data Or Export Graph Data (16 bit) to accommodate Doble test set using COMTRADE files older than 2013**.
   The **Export Graph Data** window appears.
2. From the **Save in** list, select the location for the exported file.
3. In the **File** name box, specify the file name.
4. From the **Save as type** list, select the preferred format.
   - Comtrade in Binary (.dat) – creates the data and associated config file
   - Comtrade in ASCII (.dat) – creates the data and associated config file
   - Comtrade in Binary (.cff) – creates a single common file format file in Binary
   - Comtrade in ASCII (.cff)) – creates a single common file format file in ASCII
   - Excel (.csv) - creates a single CSV file
   - IEEE-1159 <PQDIF> (.pqd) – Creates a PQDIF file intended for viewing with Power Quality Viewers
5. Click the **Save** button.
6. If you use **Excel Format (CSV)**, you will be asked if you want to **Save Data with Phase**?

   If you would like Phase Data in the Excel file, Click **Yes**

   If Not, Click **No**

7. **Swap Analog and Digital Channel ID with Description** window appears, (except when using Excel format), Click Yes or No.

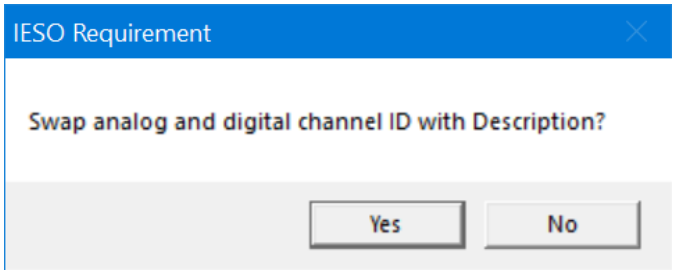


Figure 160: Swap Channel IDs with Descriptions

Below is an example of how analog channel ID and Descriptions are changed depending on the YES or No selection. This example is for three analog channels displayed on the graphics screen with each channel on its own X-axis and channels in A2, A3, A1 order. No matter the choice, a sequential analog channel ID is added to the left during the export process.

Table 15: Channel ID and Description swap examples

Swap ID's	ID & Description Before Export	ID & Description After Export
No	A2:Line XYZ Vb	A1:A2;Vb; Line XYZ Vb
	A3:Line XYZ Vc	A2:A3;Vc; Line XYZ Vc
	A1:Line XYZ Va	A3:A1;Va; Line XYZ Va
Yes	A2:Line XYZ Vb	A1:Line XYZ Vb;Vb;A2
	A3:Line XYZ Vc	A2:Line XYZ Vc;Vc;A3
	A1:Line XYZ Va	A3:Line XYZ Va;Va;A1

14.16 Combining End-1 and End-2 into One File

End-1 and End-2 data can come from the same APP Recorder. Having the same analog channel descriptions could mean that they are coming from the same channel.

The time of the data in the combined file is always referencing the time of End-1 data. For example, before the combining, data 203 of End-1 at time 11/1/2008-09:11:57.662499 is aligned with data 234 of End-2 at time 11/2/2008-23:01:770283. After combining, the time of these two data will both be 11/1/2008-09:11:57.662499. If End-2 file was longer in time than End-1 file, the time will simply extended referencing to End-1 time for the extra data in End-2 file. In other words, in a combined file, the End-2 time is completely eliminated; all times reference the End-1 time.

Therefore, before combining data, align the End-1 and End-2 data by using the **Time Offset (ms)** box.

➢ To Combine End-1 and End-2 into One File

1. In the **Graphics and Data Analysis** window, display End-1 and End-2 data on the graph.
2. From the **File** menu, click **Combine END-1 and END-2 into One File**.
   A confirmation window will appear.

3. Do one of the following:

   Click **Yes**. The channels in End-1 and End-2 with the same description will both be saved into a different channel in the combined file.

   Click **No**. The End-2 channels with the same description as End-1 will be discarded in the combined file.

14.17 Exiting the Graphics and Data Analysis Window

When you exit the **Graphics and Data Analysis** window, you return to the **Fault Summary** tab in the **APP ClearView** window.

➢ **To Exit the Graphics and Data Analysis Window**

In the **Graphics and Data Analysis** window, from the **File** menu, click **Exit**.
The **APP ClearView** window appears.

14.18 Using Graph Controls

The following figure shows the available graph controls.

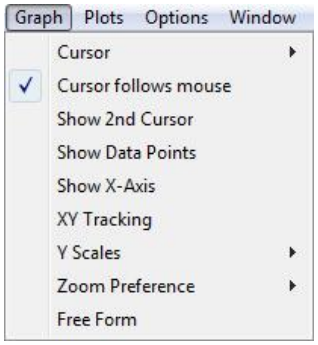


Figure 161: Graph Menu

See the following sections for more information on how to use the graph controls.

14.18.1 Selecting Your Preferred Cursor

You can select the type of cursor you prefer in the Graphic and Data Analysis window.

➢ **To Select Your Preferred Cursor**

In the **Graphics and Data Analysis** window, from the **Graph** menu, point to **Cursor** and then click **Vertical Line**, **Cross Hair**, or **No Cursor**.

14.18.2 Turning On or Off Standard Cursor Movement

By default, the onscreen cursor follows the movement of the mouse. This is standard behavior in Windows applications. However, this behavior can be turned off.

If this behavior is off, then to move the cursor, single-click the position on the graph where you want the cursor to go.

➢ **To Turn On or Off Standard Cursor Movement**

In the **Graphics and Data Analysis** window, from the **Graph** menu, click **Cursor follows mouse.**
One of the following occurs:

If a checkmark appears next to the menu option, it means that the cursor does follow the mouse.

Otherwise, the cursor does not follow the mouse.

14.18.3 Showing a Second Cursor

By default, only one cursor is visible in the Graphics and Data Analysis window. However, you can enable a second cursor in order to see the window in which calculations are performed.

The results of calculations appear in the right-hand side of the **Graphics and Data Analysis** window. You can change values in the **Calculation** pane by right clicking in it and then changing number of cycles used for a calculation.

➢ **To Show a Second Cursor**

In the **Graphics and Data Analysis** window, from the **Graph** menu, click **Show 2nd Cursor.**
One of the following occurs:

If a checkmark appears next to the menu option, it means that the second cursor appears.

Otherwise, the second cursor does not appear.

14.18.4 Showing Data Points

You can display actual data samples on all the oscillograms in the Graphics and Data Analysis window.

➢ **To Show Data Points**

In the **Graphics and Data Analysis** window, from the **Graph** menu, click **Show Data Points.**
One of the following occurs:

If a checkmark appears next to the menu option, it means that the data points appear.

Otherwise, the data points do not appear.

14.18.5 Showing the X-Axis

You can choose to display (or hide) the X-Axis (time in milliseconds) at the bottom of the graph area.

➢ **To Show the X-Axis**

In the **Graphics and Data Analysis** window, from the **Graph** menu, click **Show X-Axis.**
One of the following occurs:

If a checkmark appears next to the menu option, it means that the X-Axis appears.

Otherwise, the X-Axis does not appear.

14.18.6 Enabling XY Tracking

You can enable an XY tracking meter in the tray area at the bottom of the graph area. The x-axis displays time in milliseconds. Because the cursor snaps from data point to data point, XY tracking allows you to read the time between data points.

➢ **To Enable XY Tracking**

In the **Graphics and Data Analysis** window, from the **Graph** menu, click **XY Tracking.**
One of the following occurs:

If a checkmark appears next to the menu option, it means that the XY tracking is enabled.

Otherwise, the XY tracking is not enabled.

14.18.7 Configuring Y Scales

You can configure the appearance of the Yscales in the **Graphics and Data Analysis** window.

➢ **To Configure the Y Scales**

In the **Graphics and Data Analysis** window, from the **Graph** menu, point to **Y Scales** and then click one of the following:

Constant among panels: The Y Scale is determined by the largest signal that is being displayed. The Y Scale of every panel is the same. The Y Scale is displayed in the upper right hand corner of the graphics area.

Optimize each panel: The Y Scale of each individual panel is determined by the largest signal within that panel. The Y Scale of each panel can be different.

Optimize each graph: The Y Scale of each oscillogram is expanded to its maximum extent that will still allow it to fit within its graph panel. The more panels displayed, the smaller the Y Scale.

Tip: Use the **X** and **Ix** magnifiers located on the right-hand side of the **Graphics and Data Analysis** window to magnify a tagged channel or to simultaneously magnify all current channels.

14.18.8 Configuring Your Zoom Preference

You can configure whether you want to be able to zoom in horizontally or both horizontally and vertically.

➢ **To Configure Your Zoom Preference**

In the **Graphics and Data Analysis** window, from the **Graph** menu, point to **Zoom Preference** and then click one of the following:

Horz Zoom: If you select this option, then you can zoom only from left to right.

Horz plus Vert Zoom: If you select this option, then you can simultaneously zoom from left to right and from top to bottom.

Note: To zoom previous or undo zoom, right click in the graph area and select either choice.

14.18.9 Enabling Free Form Graph Movement

You can enable the ability to freely move graphs up and down by dragging the analog channel description.

In the **Graphics and Data Analysis** window, from the **Graph** menu, click **Free Form.**
One of the following occurs:

If a checkmark appears next to the menu option, it means that the free form graph movement is enabled.

Otherwise, the free form graph movement is not enabled, and dragging channel descriptions and graph snap from x-axis to x-axis.

14.19 Displaying Data Plots

Before ClearView can display an impedance plot, you must identify the phases of data by doing any of the following:

14.19.1 Displaying an Impedance Plot

1. Do any one of the following things to identify the phases:

   Define a line group

   Set the phases for the channels in Point Assignment Record

   Show a “Three Phase” graph

2. After you have identified the phases, from the **Plot** menu, click **Impedance**.
   The **Impedance Plot** window appears, as shown in the following figure.

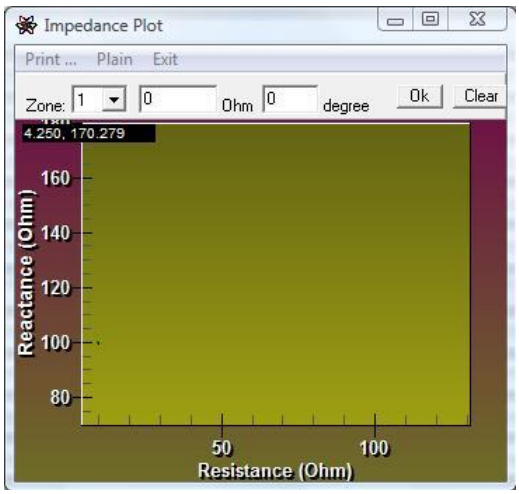


Figure 162: Impedance Plot Window

In an impedance plot, ClearView automatically matches the voltage and the current with the same phase. For example, selecting Va will prompt ClearView to find the first occurrence of Ia on the display to do the impedance plot.

You can define up to 9 zones in impedance plot. Each zone has two parameters: **impedance** and **angle**. If both user-entered parameters are zero, the zone is clear. If one or both user entered parameters are something other than zero, ClearView will draw a circle. The diameter of the plotted circle is equal to the impedance parameter. The larger the user-entered impedance, the larger the circle.

The user-entered angle, referencing to x-axis, is automatically created. A diameter line runs from the graph (0,0) point thru the circle. Where the diameter line intersects the circle a zone label is automatically placed.

If any impedance value gets into the zone, it usually means a fault is occurring at that point in time. To analyze the movement of the impedance over time, zoom in and out on the oscillographs and the impedance plot will update to the display. After zooming in, a scroll bar will appear at the bottom. Scrolling will show movement of the impedance.

By right mouse clicking on the impedance plot, you can select the menu entitled “Point + Line”. This connects the impedance values on the plot indicating what order the impedance values come.

14.19.2 Displaying a DFT Plot

See Section 14.25 *Tool Bar* for more information.

14.19.3 Displaying an FFT Plot

See Section 14.25 *Tool Bar* for more information.

14.19.4 Displaying a Vector Plot

See Section 14.25 *Tool Bar* for more information.

14.19.5 Using the Options Menu

The **Options** menu consists of **Graph Options** and **Fix One Phase**.

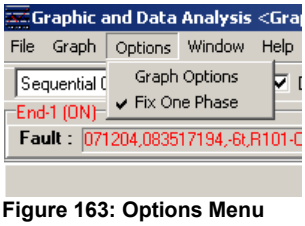


Figure 163: Options Menu

14.19.6 Graph Options

You can select the following graph options:

- How many graphs to display when the **Graphic and Data Analysis** window first opens
- The colors for each voltage and current phase
- Which event channels are displayed, based on the filter you define

Note: Analog phases are defined in the Point Assignment Record.

➢ To Select Graph Options

1. In the **Graphics and Data Analysis** window, from the **Options** menu, click **Graph Options.** The **Graph Options** window appears, as shown in the following figure.

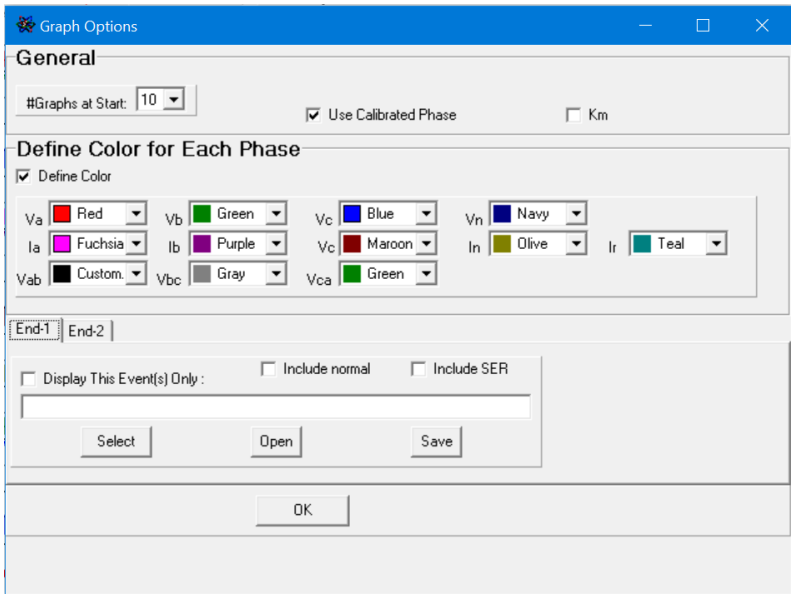


Figure 164: Graph Options Window

2. In the **#Graphs at Start** list, select the number of graphs to display when the **Graphics and Data Analysis** window is opened.

3. Do you want to use **Calibrated Phase** that would have been set in the **Oscope Calibrate Phase** function?

   If **yes**, then click **Calibrated Phase** check box.

   If **no**, skip to the next step.

4. Do you want to display **distance** in **Kilometers**?

   If **yes**, then click **the Km check box**.

   If **no**, skip to the next step.

5. Do you want to define the color to use for each phase?

   If **yes**, then click the **Define Color** check box. Then, for each phase, select a color from its color list.

   If **no**, skip to the next step.

6. **Display This Event(s) Only** to define an Event Filter?

   1. In the **Graph Options** window, click the **End-1** or **End-2** tab, depending on which you want to filter.

   2. Click the **Display This Event(s) Only** check box.

   3. Do you want to select from a list of events?

      If **yes**, then click the **Select** button. From the **Select Event Channels** window, select the event(s) and then click the **OK** button.

      If **no**, skip to the next step.

4. Do you want to open a User-Selected Channel File (*.inf) to select events?
   If yes, then click the Open button.
   In the **Open Display This Events Only** window, navigate to and select the file. Then click the **Open** button.

5. Repeat this step for the other **End-#** tab, as necessary.

6. **Include Normal** – Click the check box to include Trigger and Event Channels in Normal condition. These will be displayed at the bottom of the screen.

7. **Include SER Check Box:** To graphically add events contained in the SER report to the transient fault record, extended oscillography record, and extend RMS record, check mark "Include SER". Only SER events that have a time stamp within the time range of the record will be graphically displayed at the bottom of the graphics screen (no line means normal, and line shown is abnormal.) Concerning the transient fault record which displays asserted analog triggers and event (digital) channels as part of the record, a particular event channel logged to the SER report will not be displayed a second time. If alarms are set to log to the SER report, they will also be graphically displayed in the same manner as an event channel.

8. Do you want to define the filter for determining which **Event Channels** appear?

   If **yes**, follow the procedure *Display This Event(s)* Only to define an Event Filter? on page 14-16
   If **no**, skip to the next step.

9. Click the **OK** button.

14.19.7 Fixing One Phase

By default, a selected analog channel is fixed as a reference phase for other channels for phase calculation and vector display. If the **Fix One Phase** menu option is not selected, then all phase calculations will be referenced to a cosine function.

➢ **To Fix One Phase**

In the **Graphics and Data Analysis** window, from the **Options** menu, click **Fix One Phase.**
One of the following occurs:

If a checkmark appears next to the menu option, it means that a selected analog channel is fixed as a reference phase.

Otherwise, all phase calculations will be referenced to a cosine function.

14.20 Managing the Graphic and Analysis Window

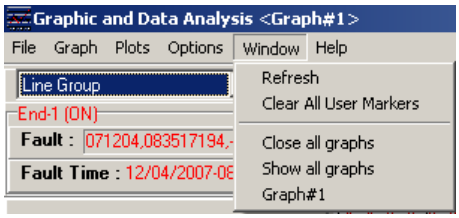


Figure 165: Window Menu

14.20.1 Refreshing the Window

➢ **To Refresh the Window**

In the **Graphics and Data Analysis** window, from the **Window** menu, click **Refresh.**

14.20.2 Clearing All User Markers

You can delete any annotation marks that you have added to the graph.

➢ **To Clear All User Markers**

In the **Graphics and Data Analysis** window, from the **Window** menu, click **Clear All User Markers.**

14.20.3 Closing All Graphs

You can have five graph windows open at once. You can close all open graphs simultaneously.

➢ **To Close All Graphs**

In the **Graphics and Data Analysis** window, from the **Window** menu, click **Close All Graphs.**

You can also close all graphs by clicking the **Close All** tab at the bottom of the window.

14.20.4 Showing All Graphs

You can have five graph windows open at once. You can show all the open graphs.

➢ **To Show All Graphs**

In the **Graphics and Data Analysis** window, from the **Window** menu, click **Show All Graphs.**

You can also open all graphs by selecting the **Show All** tab at the bottom of the window.

14.20.5 Showing a Specific Graph

You can have four graph windows open at once. You can show a specific graph.

➢ **To Show a Specific Graph**

In the **Graphics and Data Analysis** window, from the **Window** menu, click **Show Graph#[*1-4*].**

You can also select open graphs by selecting the **Graph** tab at the bottom of the window.

14.20.6 Viewing Help

You can view the help for the Graphic and Data Analysis window. The About information includes the software version and factory contact information.

Note: If the help files do not answer your question(s), please do not hesitate to contact APP Engineering, Inc. at **(317) 536-5300**.

➢ **To View the Help**

In the **Graphic and Data Analysis** window, from the **Help** menu, click **Help**.

➢ **To View the About Information**

In the **Graphic and Data Analysis** window, from the **Help** menu, click **About**.

14.21 Using the Pop-Up Menu in the Graph Area

In the **Graphic and Data Analysis** window, you can right click anywhere in the graph area to display the menu shown in the following figure.

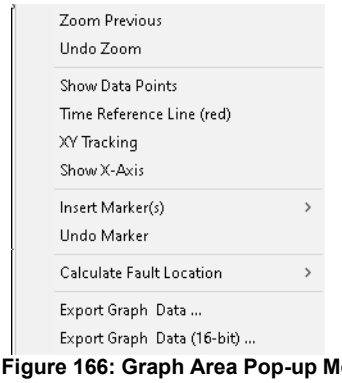


Figure 166: Graph Area Pop-up Menu

Many of the choices shown in this pop-up menu are the same as those under the **Graph** menu, located at the top of the window. See Section 14.18 Using Graph Controls for information not covered in the following sections.

14.21.1 Setting a Reference Line

You can set two references lines: red and blue. The red line is the first line you can set. You can move it by double-clicking anywhere in the graph area.

When you display a red reference line, a delta time and a delta cycles meter is displayed in the tray area at the bottom of the window. The delta time and delta cycles meter changes as the user moves the vertical cursor left or right.

The blue reference line enables you to zoom between reference lines.

➢ **To Set a Red Reference Line**

1. In the Graph area, right-click to display the pop-up menu.
2. Click **Set Reference Line (red)** to set a red reference line.
3. In the Graph area, double-click on the spot where you want the red reference line to be.

Note: Double-clicking on the graph will move only the Red Time Reference Line.

➢ **To Set a Blue Reference Line**

1. After you have set a red reference line, click in the graph where you want the blue reference line to be.
2. In the Graph area, right-click to display the pop-up menu.
3. Click **Set Reference Line 2 (blue).**
   Your blue reference line immediately appears where you clicked before displaying the pop-up menu.

14.21.2 Zooming Between Time Reference Lines

If you need a consistent zoom location, place two time reference lines (red and blue) in the graph. the x-axis will be set as having the time reference lines as endpoints.

➢ **To Zoom In between Time Reference Lines**

1. In the Graph area, set the red and blue reference lines.
2. Right-click to display the pop-up menu.
3. Click **Zoom In between Time Ref Lines**.
   The graph immediately zooms in.

14.21.3 Returning the Graph to the Previous Zoom Factor

You can return the graph to its previous zoom factor.

➢ **To Return the Graph to the Previous Zoom Factor**

1. In the Graph area, right-click to display the pop-up menu.
2. Click **Zoom Previous**.

14.21.4 Undoing the Zoom

You can reverse all zooming actions and return the graph area back to its original state.

➢ **To Undo the Zoom**

1. In the Graph area, right-click to display the pop-up menu.
2. Click **Undo Zoom**.

14.21.5 Inserting a Marker

➢ **To Insert a Marker**

1. In the Graph area, move the cursor to the desired position.
2. Right-click to display the pop-up menu.
3. Point to Insert Marker and then click one of the following:

   With Meter Value: inserts a meter value stamp.

   With User Text: inserts a meter value stamp and allows you to add comments.

   With Date and Time: inserts a date and time stamp; you can add to all at once or one at a time.

Note: Once a marker or annotation is added to a graph, you can move it and its leader line by clicking on it and dragging.

14.21.6 Undo Marker

➢ **To Undo the last Marker**

1. Right click in the Graph Area to display the pop up menu.
2. Click on Undo Marker.

Note: You can repeat the process to undo previous markers in reverse order of markers added.

14.21.7 Calculating the Location of a Fault

In the **Graphic and Data Analysis** window, you can perform a manual fault calculation. A manual fault location may be required if:

- Data is being opened from a recorder other than an APP Recorder.
- The APP Recorder did not contain a Line Group Record when the fault occurred.
- The auto-calculate fault location feature was not enabled at the APP Recorder.
- The Boolean logic filter associated with automatically calculated fault location was not passed.

The APP Recorders use an impedance-based method for calculating the distance to fault. The APP Recorder uses a single-ended calculation. However, you can perform a double-ended calculation by pulling data from each end of a faulted line back to the APP ClearView master station software and manually initiating a double-ended calculation command.

For the APP Recorder to automatically perform a single-ended fault location calculation, the line length, positive resistance (R1), positive reactance (X1), zero resistance (R0), and zero reactance (X0) must be entered into the line group(s). Also, the analog channel physical connection must provide phase-to-ground voltages and currents.

A line group consists of Va, Vb, Vc, Ia, Ib, Ic, and In. The line group table must be completed in order to view line group oscillograms and perform distance-to-fault calculations. For more information, see *Power Quality Recording for* Inverter Based Resources

14.22 Introduction

The increase in penetration levels of inverter-based resources (IBRs) will significantly change the dynamic performance of the bulk electric system. As the penetration levels of inverter-based resources increase and the technology of inverter-based resources evolves, recording equipment with PQ-DDR capabilities are needed to address the performance requirements of inverter-based resources. APP Recorders can provide a one solution system to meet the recording requirements of PRC-002-05, PRC-028, IEEE 2800 Table 19, and allow for model validation per MOD 25, 26, and 27. Points of measure can include the HS of the MPT, low side of the MPT, solar feeder circuits, BESS feeder circuits, cap banks, and other supplemental locations within an IBR plant.

Regarding IEEE-2800, APP recorders can comply with the requirements of IEEE-2800 Table 19 if the proper elements are connected and setup for the APP Data Chassis recording at the point of interconnect with the transmission or sub-transmission system (the plant level). The recorder can perform PQ-DDR on elements with harmonics being recorded or derived out to the 50th harmonic. PQ-DDR and triggering can include Pst, Plt, RVC, very short-term harmonics, short-term harmonics, long-term harmonics, apparent power, active power, reactive power, power factor, frequency, and change of frequency. These quantities can be continuously recorder and trended with the files being in COMTRADE format and can be automatically converted to PQDIFF format.

14.23 IEEE-2800 Table 19 Measurement Data

The following table is based on IEEE 2800 Table 19 and describes the data type, points, sampling rate, retention and duration for Power Quality continuous recording APP Recorder includes. Retention values listed are typical and can be set in the Point Assignment Record. **See Section 6.19 Configuring General Settings**

14.24 PQ Hardware

There are some PQ hardware component required in order for the APP Recorder to receive signals from IBRs for PQ. There are three Analog boards involved when recording for PQ. Analog channels are wired to both Standard Analog boards and to Voltage or Current specific PQ Analog boards. The IBR needs to send voltage signals through a PQ sensor to a PQ Analog Voltage Board. Voltage channels are also wired to a standard analog board for recording and triggering on other conditions. PQ Analog Current boards are wired in series to a standard analog board wired for current channels.

PQ Sensor connected to a PQ Voltage analog channel with 1Meg Input Impedance

PQ Board connected to a PQ Current analog channel with a fixed full scale of about 5A

The following diagrams illustrate the wiring from a PQ sensor to a PQ Voltage board and an Analog Current board. You will notice these boards have only Current connections or Voltage connections, not both like the standard Analog board.

The Voltage board is connected directly to a PQ Sensor.

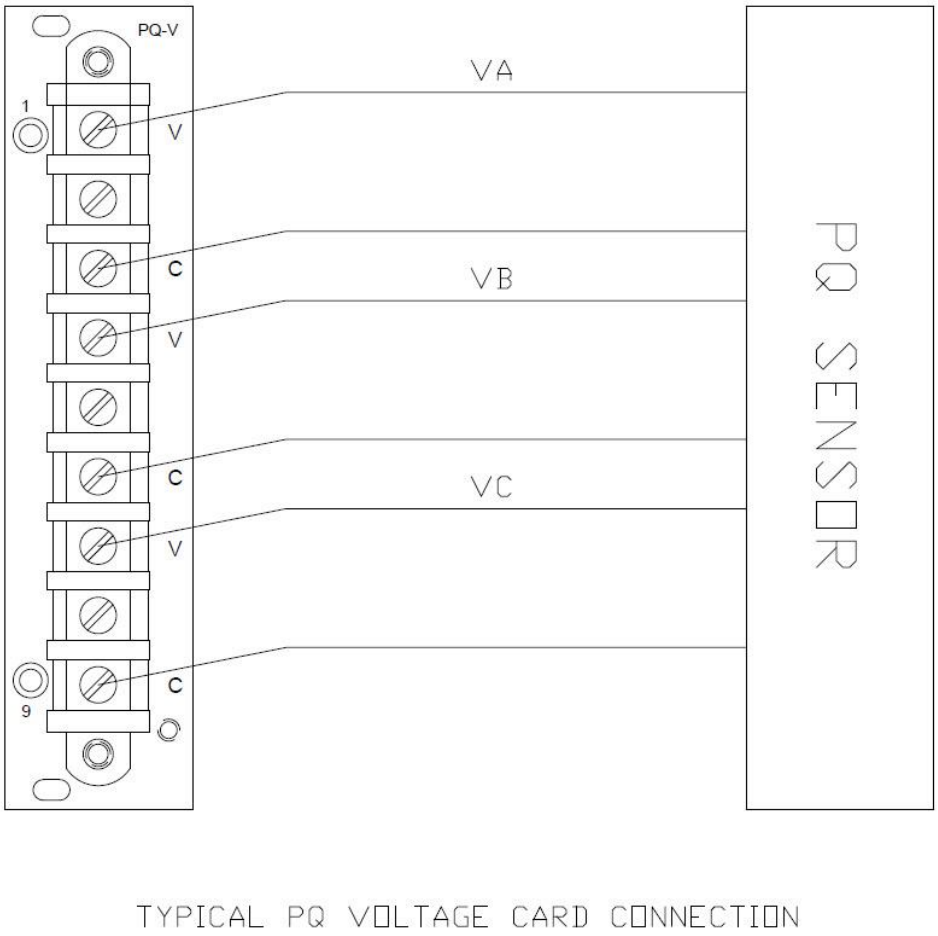


Figure 105 PQ Voltage board wiring

PQ Current boards are wired in series to a standard Analog board wired for the same Current channels being recorded.

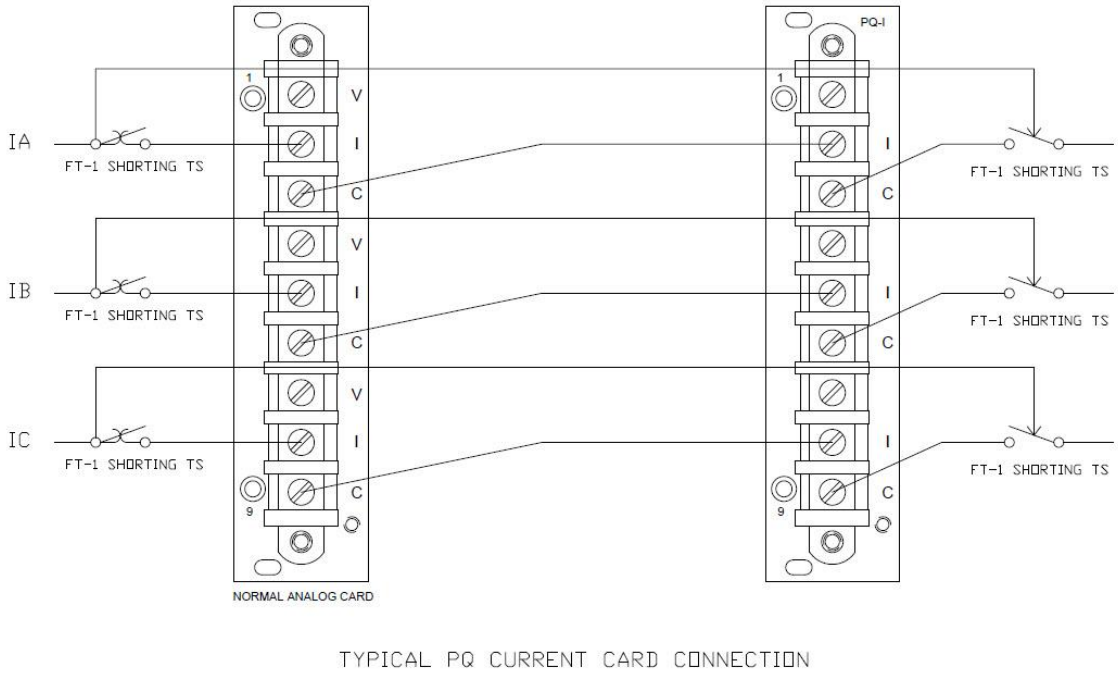


Figure 106 PQ Current Board wiring

14.25 Point Assignment Analog TAB settings

There are PAR settings required or recommended when setting up PQ analog channels. Please see Section 6-1 Managing Point Assignment (PA) Records for more information on the full PAR set up.

To measure out to the 50th Harmonic you must use a Transient Sampling rate of **9600 or higher**.

The Transient Sampling rate is recommended to be no higher than **15360**.

When setting up **PQ current channels**, use Full Scale Setting of **5 and ABS to 20**. This will change slightly when calibration is done.

When setting up **PQ voltage channels,** Full Scale must be set to **115**.

14.26 Power Quality Data Recorder sample Trigger settings

The plant level Data Chassis PQ settings enable you to trigger for Transient Recording as well as Triggers for PQ Continuous Recording. Ideally these triggers will be set up for channels in **Data Chassis 1**. The Figure below shows the typical Trigger settings for recording PQ based on IEEE 2800 Table 19.

Note: When using DSP 7 or higher there is no restriction on how many RVC triggers, or which triggers they are assigned to. With DSP 6 or lower, RVC triggers are limited to six per data chassis and must be assigned to 1 or more of the first 6 triggers only.

14.26.1 Power Quality Data Recorder (PQ DDR)

When utilizing DSP7 or higher in the Data Chassis and running APP Recorder software 3.3.6 or higher the following data shown in the table below is recorded when you have checked the **Include PQ Data** option in the Point assignment Record General Settings TAB and have enabled HD, THD, or TRD Triggers in the Triggers TAB.

Note If you have DSP6 or below and have Include PQ Data checked, you will receive the five files in Table 8 but not the Harmonics files discussed in this section.

Note: If you have both HD and THD triggers set on a channel, only one continuous recording file will be created for the channel (i.e. it won't be duplicated). If you have either HD or THD and TRD Triggers on the same channel, 2 PQ continuous recording files will be recorded for the channel.

Table 8 PQ Data Recorded

Description	File Name	Interval	Typical for IEEE-2800 Triggering & Continuous Recording for Each Mapped Analog Channel	Typical Circular Buffer
3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily	3p-Vrms, 3p-Irms, 3p-W, 3p-Vr, V-Hz, V-Hz Sign, 3p-RVC, 3p-V HD, 3p-I HD, 3p-V THD, 3p-I THD, TRD	10 Days
10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily	Same as above	90 Days
2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly	Same as above	365 Days
Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily	Selected Volt Channels	90 Days
Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly	Selected Volt Channels	90 Days

14.26.2 Individual Harmonics files

If you check the **Include Individual Harmonic Data** check box in the PAR General Settings TAB/Power Quality box, Individual Harmonic files are created to enable easier identification of which Harmonic Order is the largest and above the Standard. The files will be created for any HD, THD, or TRD triggers set. See table below with more details. The following is a summary of the files created and more detail about each file name and sampling intervals.

Table 9 Harmonics File names and descriptions

Description	File Name	Interval	Typical Circular Buffer
3-sec Very Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_VShort_3sec_Daily	3 seconds, daily (1 file a day per Analog Channel with HD as trigger) Each file contains 50 X-axes analyzed to extract the harmonic order values for each analog channel.	30 Days
10-min Short Time Individual Harmonic and THD	yyyymmddIHR##T##A##_Short_10min_Weekly	10 min., weekly (5am daily) (1 file a week per Analog Channel with HD as trigger) 50 X-Axes in the file, to find what is the largest harmonic for each analog channel	90 Days
10-min weekly 95th percentile	yyyyIHR##T##A#_Short_10min_Weekly_95	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
10-min weekly 99th percentile	yyyyIHR##T##A#_Short_10min_Weekly_99	7 days, yearly (5am Sunday) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days
3-sec weekly 95th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_95	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 95th percentile	365 Days
3-sec weekly 99th percentile	yyyymmddIHR##T##A#_VShort_3sec_Daily_99	1 day, yearly (5am daily) (1 file a year per Analog Channel with HD as trigger) 50 X-Axes in a file, 1 point per week to find the 99th percentile (values that exceed 1% for the week)	365 Days

Note: The HD and THD measurements are based on IEC 61000-4-7, -30 and IEEE Std 519 up to the harmonic, see table below. Any harmonics beyond the 50th harmonic is not measured or recorded by the DFR.

Transient Sampling	Up to Harmonic
2400 Hz	19th
4800 Hz	39th
9600 Hz and above	50th

3 Second Daily Harmonics - one file per Analog Channel with HD, THD or TRD trigger 3 second samplings daily starting at 5:00 AM for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily. Each file contains 50 X-axes to extract the harmonic order values for each analog channel. Typical Retention is 30 days.

10 Minute Weekly Harmonics - one file per analog channel with HD, THD or TRD Trigger sampled every 10 minutes starting 5am Sunday for a week. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly. Each file contains 50 X-axes to find the 95th percentile. Typical Retention is 90 days.

Yearly Harmonic Percentile - The following Harmonics recording files are contained in APPRecorder\Data\PqData\PQHar folder. You set the retention for all three types of files described below in this field (see **Section 6.19 Configuring General Settings)**. Typical Retention is 365 days.

3 Second 95th Percentile Harmonic files - one file per Analog Channel with HD, THD or TRD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

3 Second 99th Percentile Harmonic files - one file per Analog Channel with an HD trigger sampled daily at 5am for a year. The filename is [YYYYMMDD]IHR[RecID]T[Trigger#]A[Channel#]_VShort_3sec_Daily_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

10 Minute weekly 95th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_95. Each file contains 50 X-axes 1 sample per week to find the 95th percentile.

10 Minute weekly 99th Percentile Harmonic files - one file per analog channel with an HD Trigger sampled weekly (5am Sunday) for a year. The filename is [YYYY]IHR[RecID]T[Trigger#]A[Channel#]_Short_10min_Weekly_99. Each file contains 50 X-axes 1 sample per week to find the 99th percentile.

14.26.3 Convert COMTRADE to PQDIF

If you have checked the **Convert COMTRADE to PQDIF Every Day** in the Power Quality area of the PAR General settings TAB, Recorder will create PQDIF files in the **APP Recorder\Data\PQDATA\PQDIFData** folder. The following table lists the PQDif files created automatically every day.

Table 10 Convert to PQDIF files

Location:	Description	File Name	Interval
APPRecorder\Data\PQData\ PQDIFData	3-sec Trigger Value	yyyymmddTrR##_3sec	3 seconds, daily
	10-minTrend Trigger Value	yyyymmddTrR##	10 minutes, daily
	2-hr Trend weekly Trigger Value	yyyymmddTrR##_Weekly	2 hours, weekly
	Trend Flicker Pst	yyyymmddFkrR##	10 minutes, daily
	Trend Flicker Plt	yyyymmddFkrR##_Weekly	2 hours, weekly

14.26.4 Viewing PQ Continuous recording files

View the PQ continuous recording files in Clearview by opening a new Graph then navigating to the APP Recorder/Data/PQData folder and opening the desired file. The following figures show examples of viewing PQ files. **See Section 14.2 Opening the Graphic and Data Analysis Window.** Look at the Figure captions below each image and the filenames at the top to identify which file examples each figure shows.

14.26.5 Harmonics Reports

In addition to viewing Harmonics files in Clearview, five reports to enhance analysis of Harmonics to pinpoint more easily if and where the Standard is not being met based on IEEE-2800 Table 19. These reports are saved in APP Recorder\Data\PQData\PQReport folder and written in HTML format. When you open a report file it will open in your browser application. You can use your browser functions to save to a PDF and Print etc..

Following are the report descriptions.

YYYYMMDD[RecID]VshortHarDailyReport.html
Daily report of individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies the Largest Order and Largest Range. Includes Min (%), Avg(%), Max(%), and 99th(%).

You can Filter on a **Harmonic Order** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

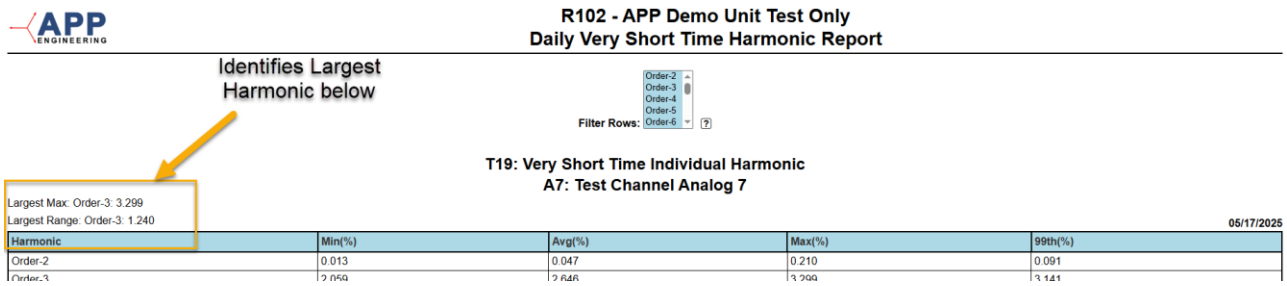


Figure 115 Sample Daily Harmonics Report

YYYYMMDD[RecID]VshortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%).

YYYYMMDD[RecID]shortHarWeeklyReport.html
Weely report of each Daily individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest Order each day for the week. Includes Largest MAX Order, Largest MAX, Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on **Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.

APP ENGINEERING

R102 - APP Demo Unit Test Only
Weekly Very Short Time Harmonic Report

Filter Rows: 05/13/2025 05/14/2025 05/15/2025 05/16/2025 05/17/2025

T19: Very Short Time Individual Harmonic
A7: Test Channel Analog 7

Date	Largest Max Order	Largest Max (%)	Largest Range Order	Largest Range (%)	Max THD (%)	THD 99th (%)
05/13/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/14/2025	Order-3	0.150	Order-5	0.063	0.374	0.366
05/15/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/16/2025	Order-7	0.220	Order-7	0.177	0.579	0.568
05/17/2025	Order-3	3.299	Order-3	1.240	3.906	3.784

T20: Very Short Time Individual Harmonic
A8: Test Channel Analog 8

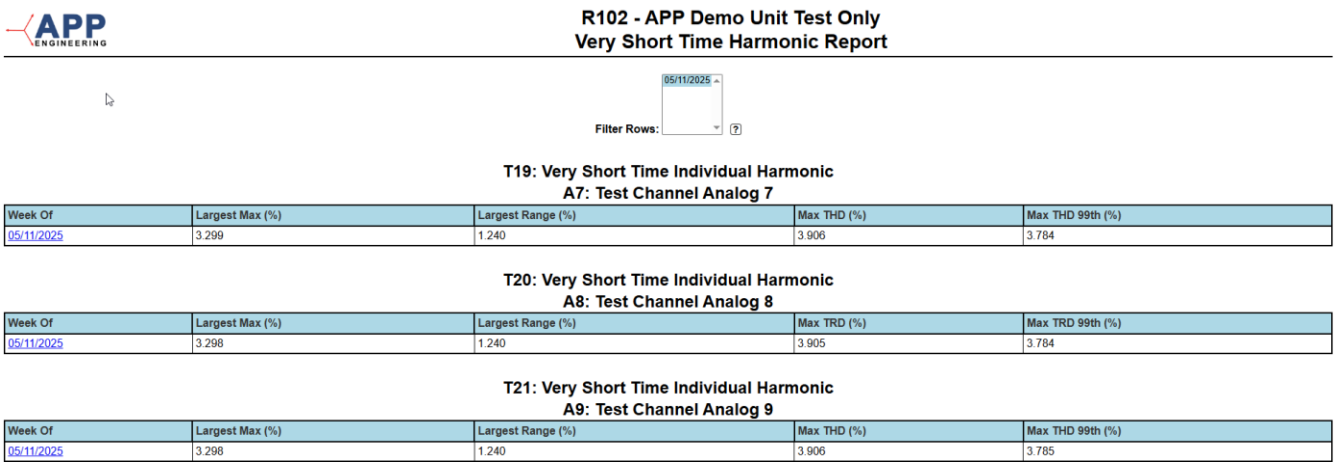
Date	Largest Max Order	Largest Max (%)	Largest Range Order	Largest Range (%)	Max TRD (%)	TRD 99th (%)
05/13/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/14/2025	Order-2	0.184	Order-2	0.087	0.331	0.326
05/15/2025	Order-2	0.000	Order-2	0.000	0.000	0.000
05/16/2025	Order-5	0.136	Order-5	0.067	0.446	0.436
05/17/2025	Order-3	3.298	Order-3	1.240	3.905	3.784

Figure 116 Sample Weekly Harmonics Report

YYYY[RecID]VshortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. Vshort indicates 3 second sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%).

YYYY[RecID]shortHarYearlyReport.html
Yearly report of each Weekly individual Harmonics Order by Trigger and Analog Channel. short indicates 10 minute sampling. It Identifies Largest MAX Range, MAX THD, MAX THD 99th(%)for each week yearly. Includes Largest MAX(%), Largest Range(%), MAX THD(%), THD 99th(%) and 95th(%).

You can Filter on "**Week of" Date** by selecting one or more from the Filter Rows box. Refresh the browser to reset the view back to all rows.



APP ENGINEERING

R102 - APP Demo Unit Test Only
Very Short Time Harmonic Report

05/11/2025

Filter Rows:

T19: Very Short Time Individual Harmonic
A7: Test Channel Analog 7

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.299	1.240	3.906	3.784

T20: Very Short Time Individual Harmonic
A8: Test Channel Analog 8

Week Of	Largest Max (%)	Largest Range (%)	Max TRD (%)	Max TRD 99th (%)
05/11/2025	3.298	1.240	3.905	3.784

T21: Very Short Time Individual Harmonic
A9: Test Channel Analog 9

Week Of	Largest Max (%)	Largest Range (%)	Max THD (%)	Max THD 99th (%)
05/11/2025	3.298	1.240	3.906	3.785

Figure 117 Sample Yearly Report

Managing Line Group Records on page 7-1

➢ To Calculate the Location of a Fault

1. In the **Graphic and Data Analysis** window, in the **Channel Viewing** list, select **Line Group**.

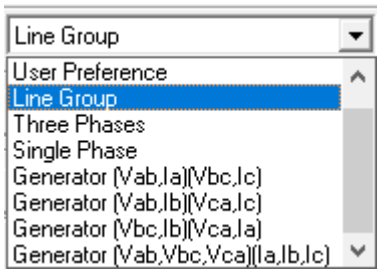


Figure 167: Select Line Group in the View List

2. In the Graph area, right-click to display the pop-up menu.
3. Point to **Calculate Fault Location** and then click one of the following:

   Use End-1 Only: This calculates the distance to fault using data 1 and line group 1.

   Use End-2 Only: This calculates the distance to fault using data 2 and line group 2.

   Use Both Ends: This calculates the distance fault using both l data and line group 1 and 2.

Note: Using both ends is the most accurate method to use, however, you must verify that both correct files are loaded and selected. If you are unable to provide both line records, you may create one for the missing line record.

If the manually activated fault calculation was successful, a window will prompt you whether you would like to see a detailed report. Select one of the following:

No: If you select No, information such as line name, phase involvement, fault duration, and distance to fault will be displayed.

Yes: If you select Yes, the report will contain all the information mentioned plus fault inception time, RMS prefault values, fault magnitude values, and a breaker re-strike flag.

➢ **Performing a Double Ended Fault Location**

Figure 168: Double Ended Fault Location shows pertinent pop-up menus to perform a double ended fault location. Below is a step-by-step procedure for calculating double ended fault location in a typical fashion.

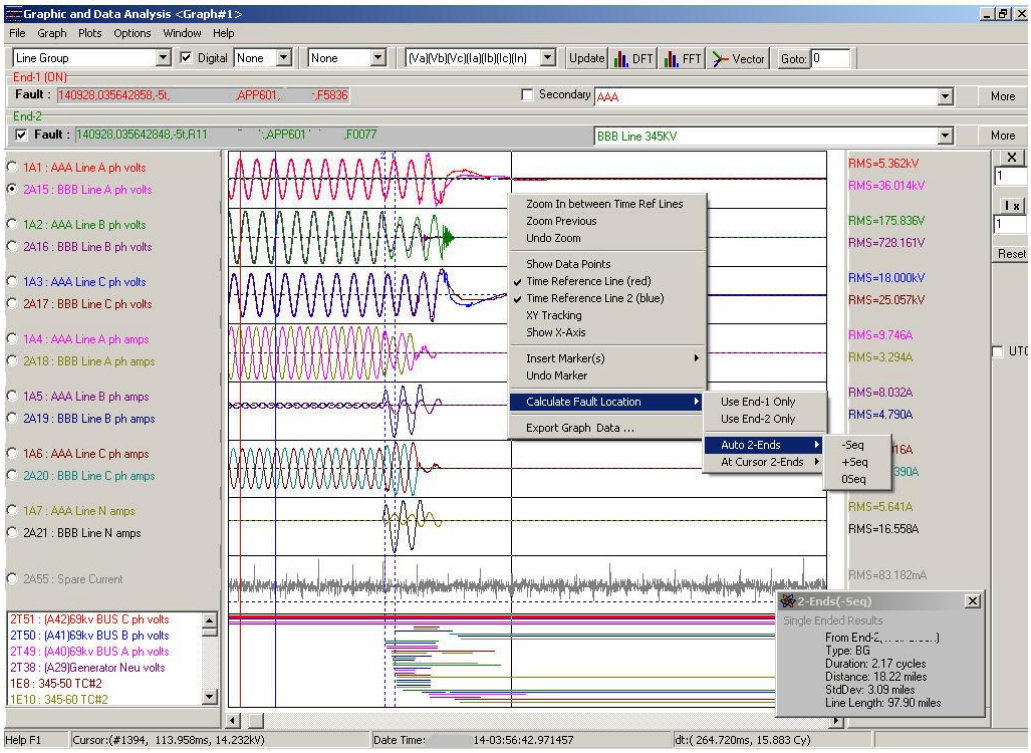


Figure 168: Double Ended Fault Location

1. Open the first retrieved record from the Summary Screen by double clicking on it. The Graph and Data Analysis screen will open.
2. Click on "File," "Open Data," "Open Data 2" and browse to the second fault record and select it. The second record should have been generated by a Recorder at the opposite end of the transmission line at nearly the same time as the first fault record opened.
3. Click on **"File," "Open Line Group," "Open Line Group 2,"** and browse to the Line Group File for the second Recorder and select it (this is needed because it contains names and parameters from that end of the line).
4. At the top left of the graphics screen, click the channel viewing pull down menu and select **"Line Group,"** then check mark the box labeled **End-2 Fault**. This will display the second fault record overlaid on the first fault record.
5. Right click in the middle of the graphics screen and select **"Calculate Fault Location,"** "**Auto2-ends," "-Seq."** This will display a pop-up box containing the Distance to Fault information (DTF). You can bypass any DTF line decision logic that may have been entered for this line (in the Line Group Record,) by Selecting **NO** from the question pop-up menu (not shown in Figure).
6. The **"Auto2-Ends"** selection will automatically find the regions of End 1 and End 2 to do the DTF calculation.
7. If "At Cursor 2-Ends" is selected the program will do the DTF calculation according to where the cursor is (The Black vertical line NOT the Line Ref line).

8. The software also gives you the choice to calculate DTF with other sequence methods (Pos, Neg). Although it is fault dependent, the DTF calculation using–Seq may be more accurate.

14.26.6 Exporting Graph Data

You can export raw analog data to several formats listed below.

➢ **To Export Graph Data**

1. In the Graphics and Data Analysis window, from the File menu, click **Export Graph Data**. Or **Export Graph Data (16 bit)** to accommodate Doble test set using COMTRADE files older than 2013
   The Export Graph Data window appears.
2. From the **Save in** list, select the location for the exported file.
3. In the **File** name box, specify the file name.
4. From the **Save as type** list, select the preferred format.
   - Comtrade in Binary (.dat) – creates the data and associated config file
   - Comtrade in ASCII (.dat) – creates the data and associated config file
   - Comtrade in Binary (.cff) – creates a single common file format file in Binary
   - Comtrade in ASCII (.cff)) – creates a single common file format file in ASCII
   - Excel (.csv) - creates a single CSV file
   - IEEE-1159 <PQDIF> (.pqd) – Creates a PQDIF file intended for viewing with Power Quality Viewers
5. Click the **Save** button.
6. **Swap Analog Channel IDs with Description** window appears (except when using Excel format), Click Yes or No.

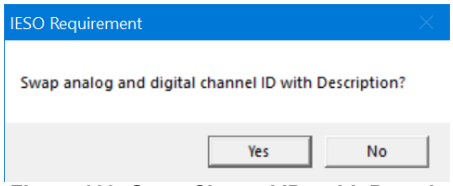


Figure 169: Swap Channel IDs with Descriptions

Below is an example of how analog channel ID and Descriptions are changed depending on the YES or No selection. This example is for three analog channels displayed on the graphics screen with each channel on its own X-axis and channels in A2, A3, A1 order. No matter the choice, a sequential analog channel ID is added to the left during the export process.

Table 16: Channel ID and Description swap examples

Swap ID's	ID & Description Before Export	ID & Description After Export
No	A2:Line XYZ Vb	A1:A2;Vb; Line XYZ Vb
	A3:Line XYZ Vc	A2:A3;Vc; Line XYZ Vc
	A1:Line XYZ Va	A3:A1;Va; Line XYZ Va
Yes	A2:Line XYZ Vb	A1:Line XYZ Vb;Vb;A2
	A3:Line XYZ Vc	A2:Line XYZ Vc;Vc;A3
	A1:Line XYZ Va	A3:Line XYZ Va;Va;A1

14.27 Using The Channel Description Area Menu

You can right-click anywhere in the Channel Description Area to display the pop-up menu shown in the following figure.

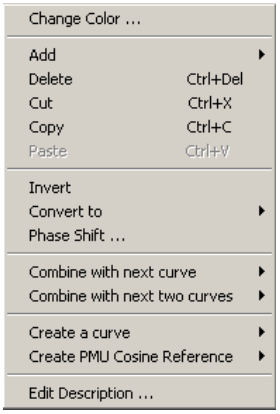


Figure 170: Channel Description Area Pop-up Menu

14.27.1 Changing the Color of an Analog Channel

➢ **To Change the Color of an Analog Channel**

1. In the Channel Description area, click the option button for the channel you want to change.
2. Right-click to display the pop-up menu.
3. Click **Change Color**. A color pallet will appear.
4. Select the color you want and then click the **OK** button.
5. A color change made here will only be "sticky" when looking at channels in sequential order or user preference order.

Tip: It is recommended that you define permanent analog channel colors in both the Point Assignment Record and in the Graphic and Data Analysis window (**Options** menu, **Graph Options** selection). After you define phase colors in a Point Assignment Record, download the Point Assignment Record to its APP Recorder. Any new records from that APP Recorder will automatically follow the phase color parameters.

14.27.2 Adding Analog Channels to the Window

You can add analog channels to the **Graphic and Data Analysis** window.

➢ To Add Analog Channels to the Graphic and Data Analysis Window

1. In the Channel Description area, right click to display the pop-up menu.
2. Click **Add1**.
   The End-1 Add Graph(s) window appears, as shown in the following figure.

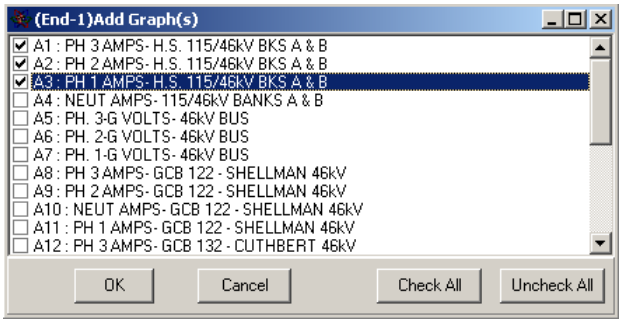


Figure 171: Add Analog Channel Selection Screen

3. Select the channels to be added.

CAUTION **Remember to select the check box; do not just highlight the line.**

If the **Graphics and Data Analysis** window is currently displaying **Sequential Channels**, then the new channel will be added in the appropriate channel order. If the window is currently displaying channels by **User Preference** or **Line Group**, then the channel will be added to the graph panel that has a **Tagged** description.

4. Click the **OK** button.
   The channels are added to the display.

14.27.3 Removing a Channel from the Window

You can remove a channel description from the Graphics and Analysis window.

➢ To Remove a Channel from the Graphics and Analysis Window

1. In the Channel Description area, click the option button for the channel to remove.
2. Right-click to display the pop-up menu.
3. Click **Delete**. The channel is removed from the display.

14.27.4 Cutting/Copying and Pasting a Channel in the Window

You can change the positions of channels in the **Graphics and Analysis** window by cutting and pasting them. You can also copy and paste channels if you want to see the same channel multiple times in the display.

➢ **To Cut/Copy and Paste a Channel in the Window**

1. In the Channel Description area, click the option button for the channel to cut or copy.
2. Right-click to display the pop-up menu.
3. Do one of the following:

   Click **Cut** to move the channel to a new position in the window.
   Click **Copy** to show the channel multiple times in the window.
4. In the Channel Description area, click where the channel should appear.
5. Right-click to display the pop-up menu and then click **Paste**.

14.27.5 Inverting a Channel in the Window

You can invert a displayed oscillogram 180 degrees.

Note: To reverse the inversion, invert the channel a second time. Alternatively, click the **Update** button on the Tool Bar.

➢ **To Invert a Channel in the Window**

1. In the Channel Description area, click the option button for the channel to invert.
2. Right-click to display the pop-up menu.
3. Click **Invert**. The channel is inverted immediately.

14.27.6 Converting a Channel in the Window

You can convert one or more channels in the **Graphics and Data Analysis** window.

Note: To reverse the conversion, click the **Update** button on the Tool Bar.

➢ To Convert a Channel in the Window

1. In the Channel Description area, right-click to display the pop-up menu.
2. Point to **Convert** and then click one of the following options:

    - RMS
    - Frequency
    - Average
    - THD
    - Max Harmonic
    - De-steady State: Removes 60 Hz from the signal, or fundamental frequency, and leaves a display or the harmonics and signal noise
    - De-Spike
    - Filter Harmonics
    - Extract K Harmonics
    - PMU Phase
    - PMU RMS
    - Peak
    - Crest Factor

A **Convert** window appears.

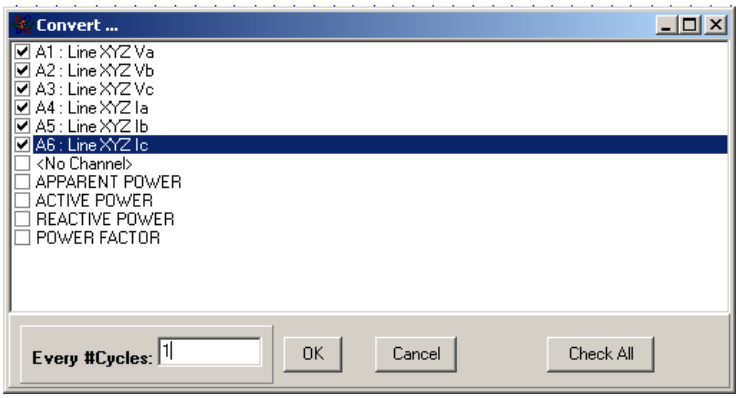


Figure 172: Convert Channel(s) Window

3. Select the channel(s) to convert.
4. If the **Every #Cycles** box appears, type the number of cycles.
   This box does not appear for the **De-steady State**, **De-Spike**, and **Filter Harmonics** options.
5. Click the **OK** button.
   ClearView completes the conversion and plots the result in the Graph area.

14.27.7 Shifting the Phase of a Channel

You can shift the phase of a channel.

Note: To reverse the shift, click the **Update** button on the Tool Bar.

➢ To Shift the Phase a Channel in the Window

1. In the Channel Description area, click the option button for the channel to shift.
2. Right-click to display the pop-up menu.
3. Click **Phase Shift**. The **Shift Phase** window appears.
4. Enter the amount of the shift in degrees and then click the **OK** button. The phase is shifted immediately and the channel description is changed to indicate the phase shift.

14.27.8 Combining with the Next Curve

You can mathematically combine two oscillograms in the Channel Description area by doing any of the following:

- Adding
- Subtracting
- Inverting and then adding
- Inverting and then subtracting

Note: To reverse the mathematical operation(s), click the **Update** button on the Tool Bar.

➢ To Combine Two Oscillograms

1. In the Channel Description area, click the option button for the first channel to combine.

Note: The oscillogram that you select must be listed **above** the oscillogram you want to combine.

2. Right-click to display the pop-up menu.

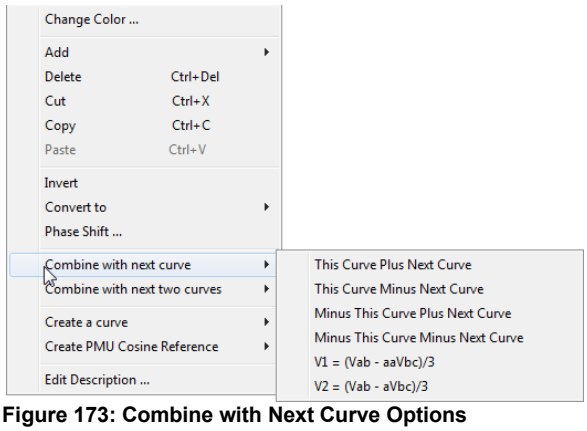


Figure 173: Combine with Next Curve Options

3. Point to **Combine with next curve** and then click the appropriate option.
   The oscillogram that you selected is combined with the oscillogram that follows it, following the mathematical operation you selected.

   The results are shown in an additional graph at the bottom.

14.27.9 Combining with the Next Two Curves

➢ Performing Sequence Calculations on Three Oscillograms

You can perform the following types of sequence calculations on a group of three oscillograms:

- Positive Sequence
- Negative Sequence
- Zero Sequence

Note: To reverse the calculation(s), click the **Update** button on the Tool Bar.

➢ To Perform Sequence Calculations on Three Oscillograms

1. In the Channel Description area, click the option button for the first channel.

Note: The oscillogram that you select must be listed **above** the two oscillograms you want to combine.

2. Right-click to display the pop-up menu.
3. Point to **Combine with next two curves** and then click the appropriate option.
   The sequence calculation that you selected is performed. Results are added at the bottom.

14.27.10 Creating a Custom Curve

If the pre-programmed math functions are not adequate, you can perform extensive, custom math functions on any combination of analog channels.

Note: To reverse the mathematical operation, click the **Update** button on the Tool Bar.

➢ To Create a Custom Curve

1. In the Channel Description area, right-click to display the pop-up menu.
2. Point to **Create a curve** and then click **Create a Curve 1** and then click the appropriate option. The Create a Curve window appears, as shown in the following figure.

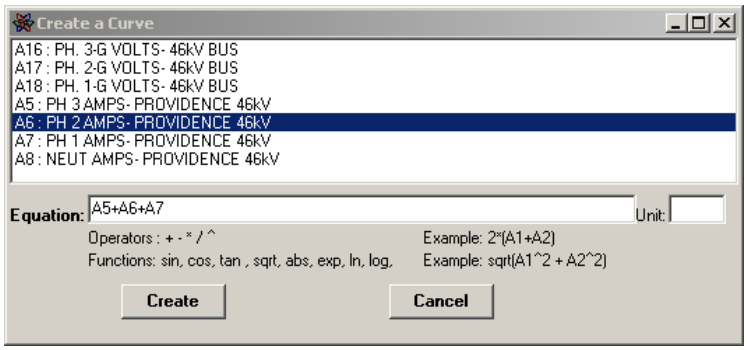


Figure 174: Create a Curve Configuration Screen

3. In the **Equation** box, build your equation by clicking the selected channels and inserting the available operators (shown below the entry field).
4. Click the **Create** button. The curve that you designed is created.

14.27.11 Creating a PMU Cosine Reference

PMU cosine function always measures 0 degrees at the 1PPS mark and is always equal to line frequency.

➢ To Create a PMU Cosine Reference

1. In the Channel Description area, right-click to display the pop-up menu.
2. Point to **Create a PMU Cosine Reference** and then click **Reference 1** or **Reference 2.** The Enter Line Frequency window appears.
3. In the entry field, enter the line frequency in Hz.
4. Click the **OK** button. The curve is created and displayed.

14.27.12 Temporarily Editing an Analog Channel Description

You can temporarily edit an analog channel description, which is the information that appears in the Channel Description area. Your edit is not permanent and does not change the COMTRADE record or Point Assignment Record. It can, however, improve the usability of the Channel Description area.

Note: To reverse the description change, click the **Update** button on the Tool Bar.

➢ To Temporarily Edit an Analog Channel Description

1. In the Channel Description area, click the option button for the channel to edit.
2. Right-click to display the pop-up menu.
3. Click **Edit Description**. The Analog Channel Description window appears.
4. In the entry field, enter the new description.
5. Click the **OK** button.

14.28 Meter Area Menu

Right clicking anywhere in the Metering Area displays the following pop-up menu.

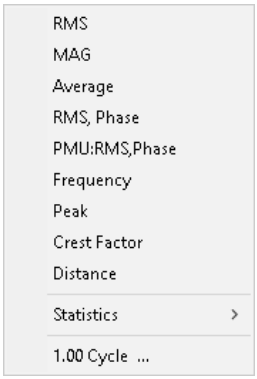


Figure 175: Metering Area Pop-Up Menu

14.28.1 Displaying RMS Values

In the Metering Area, you can display the RMS value of each analog channel. As you move the cursor, the RMS values are automatically updated for you.

The RMS value is calculated on the data that is 1 cycle to the left of the cursor position. You can change the number of cycles by selecting the “Cycle” choice at the bottom of the pop up menu.

➢ To Display RMS Values

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **RMS**.

14.28.2 Displaying MAG Values

In the Metering Area, you can display the instantaneous magnitude value of each analog channel. As you move the cursor, the Magnitude values are updated.

➢ To Display MAG Values

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **MAG**.

14.28.3 Displaying Average Values

In the Metering Area, you can display the DC component of the waveforms. DC is calculated by averaging of the data values. As you move the cursor, the values are updated.

➢ **To Display Average Values**

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **Average**.

14.28.4 Displaying RMS, Phase Values

In the Metering Area, you can display the phase angle of each analog channel along with its RMS value.

If you select the **Fix One Phase** from the **Options** menu, the phase angle will be referenced to a tagged analog channel. Otherwise, it will be referenced to cosine function. As you move the cursor, the values are updated.

➢ **To Display RMS, Phase Values**

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **RMS, Phase**.

14.28.5 Displaying PMU: RMS, Phase Values

In the Metering Area, you can display the phase angle of each analog channel referenced to a PMU cosine function. The angle is always 0 degrees at the 1PPS mark and its frequency is always equal to line frequency. As you move the cursor, the values are updated.

➢ **To Display PMU:RMS, Phase Values**

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **PMU:RMS, Phase**.

14.28.6 Frequency

In the Metering Area, you can display frequency values. As you move the cursor, the values are updated. The Frequency value is calculated on the data that is 1 cycle to the left of the cursor position. The number of cycles can be changed by selecting **Cycle** at the bottom of the pop up menu.

➢ **To Display Frequency Values**

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **Frequency**.

Note: It is recommended to calculate frequency on six or more cycles

14.28.7 Peak

In the Metering Area, you can display the peak value of each analog channel. Peak value is calculated on the data that is 1 cycle to the left of the cursor position. The number of cycles can be changed by selecting **Cycle** at the bottom of the pop up menu. Peak is shown as an absolute number.

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **Peak**.

14.28.8 Crest Factor

In the Metering Area, you can display the crest factor value of each analog channel. Crest Factor (Peak/RMS) value is calculated on the data that is 1 cycle to the left of the cursor position. The number of cycles can be changed by selecting **Cycle** at the bottom of the pop up menu.

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **Crest Factor**.

14.28.9 Distance

In the Metering Area, you can display the Distance value of each analog channel. Distance value is calculated on the data that is 1 cycle to the left of the cursor position. The number of cycles can be changed by selecting **Cycle** at the bottom of the pop up menu. Distance is shown as Miles however, you can use the Options Tab to change the measurement displayed to KM.

1. In the Metering Area, right-click to display the pop-up menu.
2. Click **Distance**.

14.28.10 Viewing Metering Area Statistics

For each data value that you display in the Metering Area, you can also view the following details:

- Peak
- Max
- Min
- Max-Min
- Average

This feature can be valuable when analyzing a continuous record.

➢ **To View Metering Area Statistics**

1. In the Metering Area, right-click to display the pop-up menu.
2. Point to **Statistics** and then click the option you want.
   The Metering Area refreshes. A single value is displayed for each oscillogram.

14.28.11 Changing the Period between Cursors

You can change the period (in number of cycles) between the first and second cursors. This is the period used for calculating the meter values such as RMS, frequency and DC components.

➢ To Change the Period between Cursors

1. In the Channel Description Area, select option button for the channel for which you want to change the period.
2. In the Metering Area, in the box under the **X** (in the upper right corner), type the number of cycles.
3. Click the **X** button. The Graphic Area is immediately updated.

14.29 Digital Area Menu

You can perform digital and analog trigger viewing at the bottom left of the Graphic and Analysis window. Right clicking in the Digital Area displays the pop-up menu shown in the following figure.

Figure 176: Digital Area Pop-Up Menu

You can use these menu choices to move digital and analog trigger traces to the top, delete digital channels from the display, or rebuild the display (reverting back to original display before any moving or deleting was done.)

14.30 Tool Bar

The Tool Bar is located just below the menu items at the top of the **Graphic and Data Analysis** window.

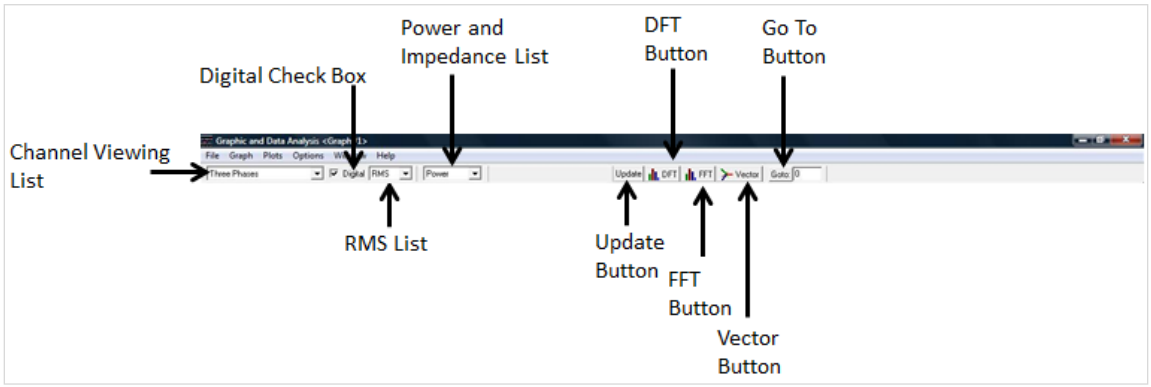


Figure 177: Tool Bar Controls

The following sections describe the controls in the Tool Bar.

Note: The appearance of the Tool Bar changes, based on the selections that you make in the **Graphics and Data Analysis** window. If a control is not appropriate based on your selections, it does not appear in the Tool Bar.

14.30.1 Channel Viewing List

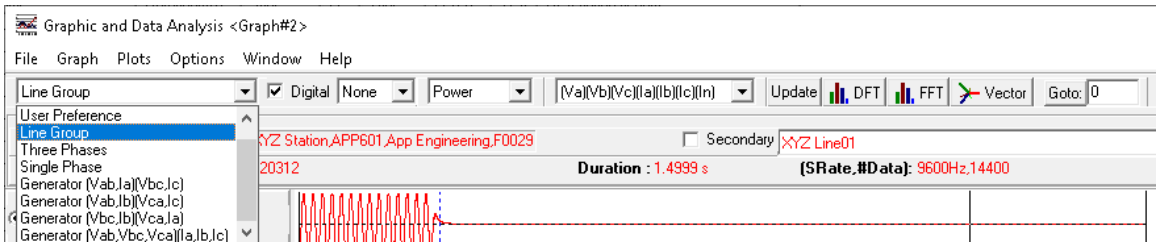


Figure 178: Channel Viewing List

The options in the **Channel Viewing** list are:

- **Sequential Channels:** This selection displays the analog channels in channel number order.
- **User Preference:** This selection allows you to select the channels you prefer to view and save your preferred set with a unique name. When you select **User Preference**, a User Analog Channel Lists window appears, as shown in the following figure. Select the check box for the channels you want to include and then click the **Save** button to save your view with a unique name. Later, you can access this window and click the **Open** button to re-open the same preferred set.

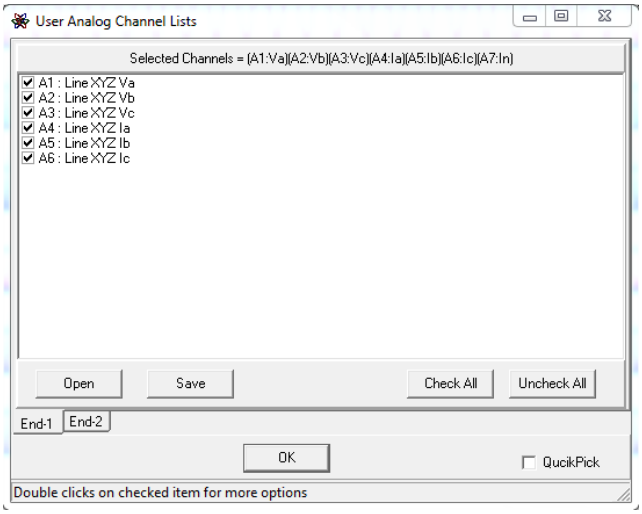


Figure 179: User Analog Channel Lists Window

- **Line Group:** This selection displays the analog channels in the user-defined line group configuration. Since the graph contains both voltages and currents, power and impedance calculations can be made. **When Line Group is selected, additional choices appear in the Tool Bar.** From the Tool Bar, you can select which line group to view, power or impedance calculation, and the channel grouping order.

  Note: In the **Graphic and Data Analysis** window, you can create a line group by clicking the **File** menu, and then clicking **Edit Line Group**. For complete details on Line Groups, see 8.3 Adding a Line Group Record.

- **Three Phase**: This selection allows you to choose three voltage channels and three current channels. Since the Graph Area contains both voltages and currents, power and impedance calculations can be made. **When Three Phase is selected, additional choices appear in the Tool Bar.**

- **Single Phase**: This selection allows you to choose one voltage channel and one current channel. Since the graph contains both a voltage and current, power and impedance calculations can be made. **When Single Phase is selected, additional choices appear in the Tool Bar.**
- **Generator (Vab, Ia)(Vbc, Ic)**, **Generator (Vab, Ib)(Vca, Ic)**, **Generator (Vbc, Ib)(Vca, Ia), or Generator (Vab, Vbc, Vcam Ia, Ib, Ic)** These selections provide you four possible ways of calculating generator power given a phase-to-phase connection to the APP Recorder.

14.30.2 Digital Check Box

You can select whether to view digital or event data at the bottom of the **Graphic and Data Analysis** window.

Figure 180: Digital Check Box

➢ To Select Digital (Event) Data

Do one of the following:

To view **digital data**, select the **Digital** box.

To exclude digital (**event) data**, de-select the **Digital** box.

14.30.3 RMS List

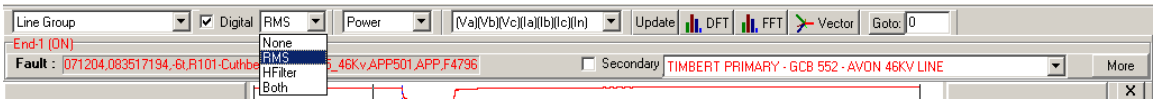


Figure 181: RMS List

Selecting **RMS** causes the software to immediately calculate and display RMS plots for each analog channel. The number of cycles used for the calculation is selected in the **X** box, which is located in the Meter Area. The default value is 1 cycle.

The **HFilter** selection means harmonic filter. This selection filters all harmonics from the displayed signals leaving just the 60Hz (or 50Hz) component.

14.30.4 Power and Impedance List

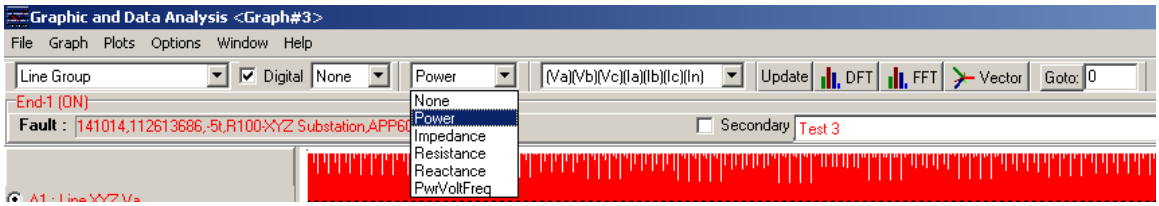


Figure 182: Power and Impedance List

When you select **Line Group**, **Three Phase**, or **Single Phase** from the **Channel Viewing** list. You have the following options to view:

- **Power** - displays Apparent Power, Active Power, Reactive Power, and Power Factor
- **Impedance** - Displays Phase A, B, and C impedance
- **Resistance** - Displays Phase A, B, and C resistance
- **Reactance** - Displays Phase A, B, and C reactance
- **PwrVoltFreq** – Displays Active Power, Reactive Power, +Seq Voltage expressed in RMS, and Frequency. Frequency is based on Phase A by default when in Line Group or Three Phase channel view.

Select **Power** or **Impedance** to display plots at the bottom of the **Graphic and Data Analysis** window.

14.30.5 Update Button

Clicking the **Update** button causes the **Graphic and Data Analysis** window to return to its original state. Any display modifications that you have made, such as moving channels around or math calculations, are immediately reversed.

Note: Any function carried out in the **Graphic and Data Analysis** window will not modify the actual COMTRADE record.

14.30.6 DFT Button

If you click the **DFT** button, a DFT window appears showing total harmonic distortion and maximum harmonic distortion for the presently selected channel.

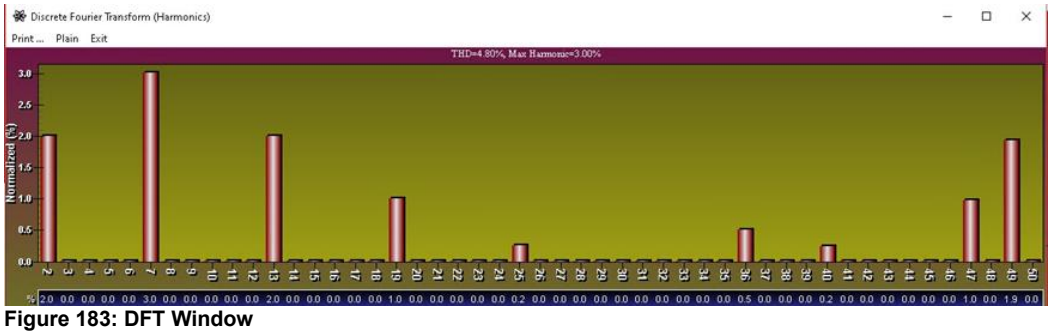


Figure 183: DFT Window

The display will show up to the number of Harmonics based on the Transient Sampling set in the PAR as follows:

Table 17 DFT Display Harmonic Limit

Transient Sampling	Up to Harmonic
2400 Hz	19th
4800 Hz	39th
9600 Hz and above	50th

The main menu in the **DFT** window offers choices of **Print**, **Beautify**, and **Exit**. If you select **Print**, a window appears that allows you to specify the file format, print destination, and other object modifications. If you select **Beautify,** the display becomes more colorful; select it again to remove the coloration. Click **Exit** to close the **DFT** window.

14.30.7 FFT Button

If you click the **FFT** button, the **Fast Fourier Transform** (FFT) window appears, as shown in the following figure. Information for the presently tagged channel is shown in the display.

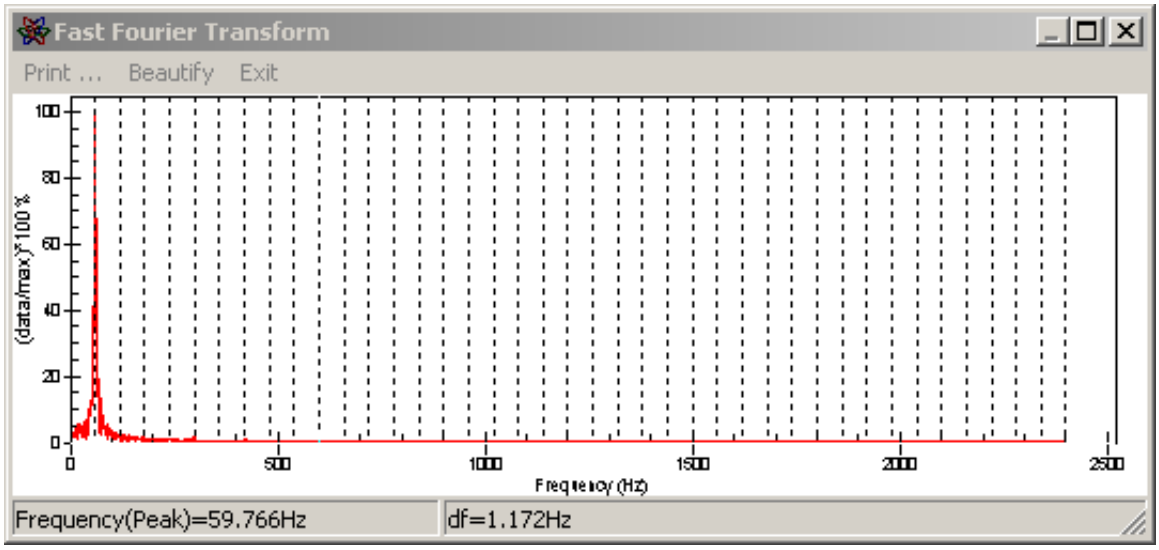


Figure 184: FFT Window

The main menu in the **FFT** window offers choices of **Print**, **Beautify**, and **Exit**. If you select **Print**, a window appears that allows you to specify the file format, print destination, and other object modifications. If you select **Beautify,** the display becomes more colorful; select **Plain** to remove the coloration. Click **Exit** to close the **FFT** window.

Click anywhere in the **FFT** window to display the pop-up menu that contains the following choices:

- **Undo Zoom -** This selection reverses the zooming actions and returns the screen back to its original state.
- **Zoom** - This selection allows you to zoom in any of the following dimensions:

  Horizontal - You can zoom only from left to right.

  Vertical - You can zoom only from top to bottom.

  Horizontal + Vertical - You can simultaneously zoom from left to right and from top to bottom.
- **Type** - This selection allows you to choose from these types of FFT amplitude:

Linear - The FFT amplitude is displayed in terms of percentage.

dB - The FFT amplitude is displayed in decibels.

- **Mark Data Points** - This selection marks the actual sampling points.
- **#Harmonic Lines** - This selection controls the number of dashed vertical lines in the FFT display.

14.30.8 Vector Button

If you click the **Vector** button, the **Phasor Diagram** window appears. The Phasor Diagram window displays only the voltage and current analog channels that are displayed in the Graph Area of the Graphic and Data Analysis window. It does not display any other channels such as power or impedance.

If you have selected the **Fix One Phase** option on the **Options** menu in the **Graphic and Data Analysis** window, then as you move the cursor side-to-side, all the vectors except the tagged channel rotate. Otherwise, all the vectors will rotate referencing to a cosine function. Tag the channel independent of the oscillography by clicking/selecting it in the Description column.

Disabling Vector, Double clicking the Description will **disabl**e the vector from the diagram.

Enable All will enable all the channels after having been disabled from the diagram.

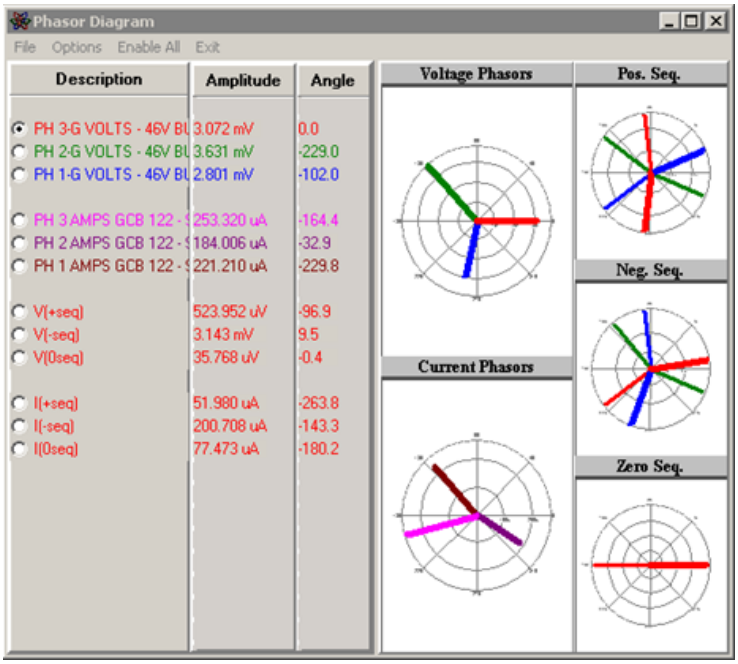


Figure 185: Phasor Diagram Window

In the **Phasor Diagram** window, the **File** menu shown allows you to print voltage or current phasor screens.

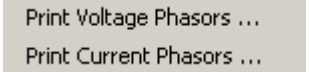


Figure 186: Phasor Diagram Window - File Menu

The **Options** menu, shown in Figure 187, allows you to display voltage and current Phasors in the same graph or in separate graphs. It also allows you to display or not display sequence vectors.

If voltage and current are displayed in the same graph, the voltage vectors are thicker than the current vectors.

For sequence vectors, voltage and current in the same sequence (positive, negative or zero) are always displayed in the same graph, with phase A being red, phase B blue, and phase C green.

For zero sequences, there is only one vector for voltage and one vector for current.

Note: Displaying sequence vectors requires all three phases of voltage/current to be available and to be identified, ClearView assumes the first three voltages/currents shown in the **Graphics and Data Analysis** window to be phase A, B, and C, in that order. If there are more than three, only the first three are used for sequence vectors. Voltages and currents can be interleaved.

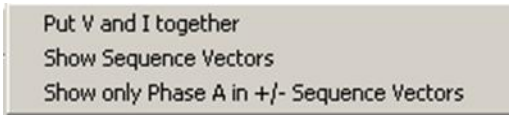


Figure 187: Phasor Diagram Window - Options Menu

14.30.9 Go to Box and Button

An oscillogram is comprised of a number of data points. The first data point is to the left and the last data point is to the right. In the **Go to** box, you can enter a specific data point and the cursor will jump to that data point when you click the **Go to** button.

14.30.10 Secondary Check Box

Check this box to view Secondary values for the channels (i.e. Primary values are factored by the value specified in the Point Assignment Record for CT/PT Ratios for a channel). You can dynamically toggle between viewing Primary values and Secondary values by checking and un-checking the Secondary box.