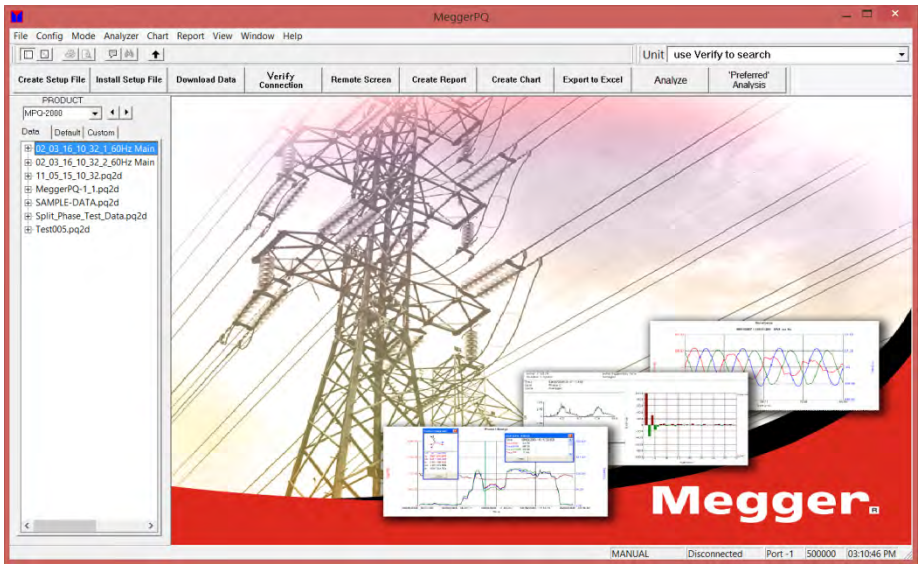
User Manual
MEGGERPQ
PQ Software



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MEGGERPQ
PQ Software

The information presented in this manual is believed to be adequate for the intended use of the product. If the product or its individual instruments are used for purposes other than those specified herein, confirmation of their validity and suitability must be obtained from Megger. Refer to the warranty information below. Specifications are subject to change without notice.

WARRANTY

Products supplied by Megger are warranted against defects in material and workmanship for a period of one year following shipment no other warranty. The warranty is void in the event of abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.

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Introduction

The MEGGERPQ Power Quality Software has been designed with emphasis on reliability, simplicity and ease of use. It will provide you with the information you need to create configuration setup files for the MPQ Series of power quality analyzers. This software will also allow you to performed detailed analysis of the MPQ Series of data files.

Purpose of this manual

This document is the operator manual for the MEGGERPQ PC Software. It provides a description of the installation and operating instructions. Read this manual before using this software. Special emphasis should be placed on all safety discussions.

Audience

This manual is written for technical personnel who are familiar with the various measurements performed by power analyzers and have a general understanding of their use and operation. Such personnel should also be thoroughly familiar with the hazards associated with the use of this equipment and should have received proper safety training.

If you find any discrepancies in this software or have any comments, please send them to Megger via fax, e-mail or phone.

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MEGGERPQ Software License

Megger Software License Agreement

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Overview of MEGGERPQ PC Software

The MEGGERPQ Software is an IBM compatible interface for the Megger MPQ line of power quality analyzers. This software supports the following functionality.

Some of the Power Analyzer's features include:	
1	Communications to the Megger line of MPQ Analyzers through a USB port.
2	Communications to the Megger line of MPQ Analyzers through Ethernet.
3	Ability to transfer MPQ configuration setup files to the MPQ unit via a USB stick or an SD Card.
4	Ability to import MPQ configuration setup files from the MPQ unit via a USB stick or an SD Card.
5	Ability to transfer MPQ configuration data files to the MPQ unit via a USB stick or an SD Card.
6	Ability to import MPQ configuration data files from the MPQ unit via a USB stick or an SD Card.
7	Create configuration setup files for the Megger line of MPQ Power Quality Analyzers.
8	Create automated reports from the recorded data files of the MPQ line of power quality instruments.
9	Create automated charts from the recorded data files of the MPQ line of power quality instruments.
10	Perform detailed harmonic analysis from the recorded data files of the MPQ line of power quality instruments.
11	Analyze recorded event data from the MPQ line of power quality analyzers.
12	Export data to Excel and Adobe
13	Print reports
14	Cascade and Tile charts and reports.

Applications

The features of the MEGGERPQ software make the software capable of performing various applications.

- EN50160 Analysis
- Power Quality Studies
- Energy Analysis and Audits

- Troubleshooting Analysis
- Motor Start Up
- Automated Data Analysis
- Reliability Studies

Definitions

Clock Hour Orientation	A setup feature in the PQ software that when selected will delay the start of the recording until the real time clock in the PQ Device reaches a time interval that is a multiple of the selected storage interval. This will keep each interval from having fractional time stamps.
CT Full Scale	The specified maximum RMS current range of the current clamp in use with the PQ Analyzer
Data File	An electronic file that contains the aggregated measurements of the PQ Analyzer.
Default Frequency	The user selectable frequency in the setup file that the PQ Analyzer defaults to if the phase lock loop is lost.
EFT	**Extremely Fast Transient** - Transients that have rise and fall times in the nanosecond region.
Flicker	An impression of unsteadiness of the visual sensation, induced by a light stimulus with a luminance fluctuates over time.
Harmonics	A sinusoidal component of a periodic wave or quantity having a frequency that is an integral multiple of the fundamental frequency.
Hysteresis	A user selectable value that sets a buffer between the trigger level that starts a sag or swell event and the trigger level that ends the event. This value is displayed as a percentage of the user programmed limit.
Imbalance	The ratio of the negative sequence component of a voltage or current to the positive sequence component of that voltage or current, typically expressed as a percentage.
Inter-Harmonics	A harmonic component of a periodic quantity that is not an integer multiple of the fundamental frequency that the supply system is operating.
Phase Angle	The delay between the zero crossing of the fundamental voltage signal and the fundamental current signal represented in degrees.
Post-Triggers	A user selectable value in the setup file that defines the number of cycles the unit will record after a cycle has occurred that has exceeded the user programmed event limits.
Power Factor	The ratio of the total power input, in watts, to the total volt-ampere input to the converter.

Pre-Triggers	A user selectable value in the setup file that defines the number of cycles the unit will record before a cycle has occurred that has exceeded the user programmed event limits.
Rapid Voltage Change	A variation of the rms or peak value of a voltage between two consecutive levels that is sustained for a given durations.
Ratio	A user selectable value in the setup file that defines a value that shall be used to multiply the recorded voltage and / or current values. This feature is used when recording secondary values of a PT or a CT and the operator wishes to record and view the primary value.
Response Interval	A user selectable value in the setup file that allows the user to define the aggregation length of each RMS calculation. Programmed in cycles.
RMS Current	The **Root Mean Square** value of the **current,** derived from the summation of the square root of the arithmetic mean (average) of the squares of the original current samples.
RMS Voltage	The **Root Mean Square** value of the **voltage**, derived from the summation of the square root of the arithmetic mean (average) of the squares of the original voltage samples.
Sag	An instantaneous or momentary decrease in the steady state RMS value.
Sample	The actual discrete instantaneous measurement the MPQ-2000 performs 256 times per cycle.
Scheduled Run	A recording mode in the setup file that will allow the user to select a date and time that the MPQ-2000 will start recording.
Setup File	An electronic file that contains the measurement configuration that shall be used by the PQ Analyzer during its recording.
Storage Interval	A selection in the MPQ-2000 setup file that allows the user to determine how often the unit saves the aggregated data.
Sub-cycle	A power quality event in which the duration is less than a cycle.
Swell	An instantaneous or momentary increase in the steady state RMS value.
TDD	**Total Demand Distortion** is a measurement of the current THD taking into account the average current load on the circuit during the recording interval.
THD	The ratio of the root-mean-square of the harmonic content to the root-mean-square value of the fundamental quantity, expressed as a percent of the fundamental.
Transient	A sudden non-power frequency change in the steady state condition of voltage or current.
Vars	A unit which is the imaginary counterpart of the watt. The relationship between a VAR and a watt in an alternating-current electrical system is determined by the power factor.

Volt Amps	A measurement of apparent power.
Watts	A unit of energy equivalent to one joule per second.
Waveform Capture	A selection in the MPQ-2000 setup file that allows the unit to record waveforms based on timed intervals. NOTE: The unit will always capture waveforms when an out of limits event occurs.

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Safety

Warnings and Safety Precautions

WARNING!

Death, serious injury, or fire hazard could result from improper use/installation of this instrument. Read and understand this manual before installing this instrument.

Installation of this instrument MUST be performed in compliance with the National Electric Code and any additional safety requirements applicable to your installation.

Installation, operation and maintenance of this instrument MUST be performed by qualified personnel only. The National Electrical Code defines a qualified person as one familiar with the construction and operation of the equipment and the hazards involved.

Safety Precautions

The following safety precautions MUST be taken whenever the Power Quality instrument is installed.

- Wear safety glasses and insulated gloves when making connections to power circuits
- Hands, shoes, floor/ground must be dry when making any connection to a power line
- These warnings and safety precautions are to be used where appropriate when following instructions in this manual.

CAUTION!

The equipment could be impaired from improper use. Read the complete manual before use.

WARNING!

The equipment should not be used if there is any visible damage to the case or if the hardware holding the unit together has been loosened.

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Installing the Megger PQ Software

Install the Power Quality software into an IBM compatible PC as follows.

1. Verify the PC meets or surpasses the minimum requirements of the software.
    a. Operating System Windows 7, Windows 8 or Windows 10.
    b. 1 GHz Processor minimum
    c. 2 Gig RAM
    d. 1000 Meg free hard drive disk space
    e. USB port
2. Verify the PC is powered up and there are no open programs.
3. Insert the Megger PQ USB Stick into the PC.
4. Double Click on "MY COMPUTER".
5. Double Click on the USB Stick Drive.
6. Double Click on Megger PQ executable.
7. Follow the Software instructions displayed on the screen until the software is installed. The installation may take up to 2 minutes.
8. Execute the software once it is installed.
9. *After* the software opens plug in the MPQ-2000 unit to one of the computers USB ports, using the USB communications cable.
10. Once the driver has successfully been installed click on VERIFY CONNECTION in the software.

11. The software will automatically scroll through the COM ports until it locates the MPQ-2000.

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MEGGERPQ Operation

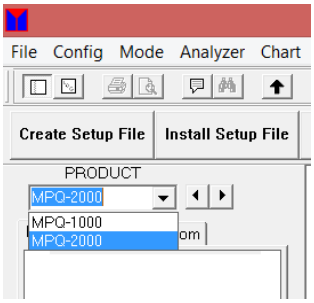
The following section describes the operation of the MPQ-2000 unit. This section will describe in a step by step manner how to setup, program, install and download data from the MPQ-2000.

Setting Up Software Preferences

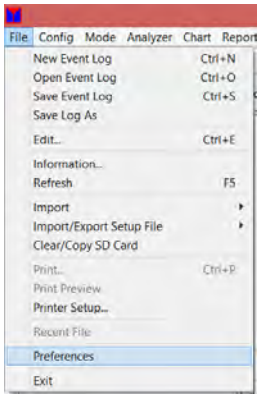
The software contains folders for both data files as well as setup files. The operator can select the desired path of both folders. In addition the operator can create multiple folders and configure the software to view the desired folder.

1. Select the MPQ instrument, using the PRODUCT drop down menu.

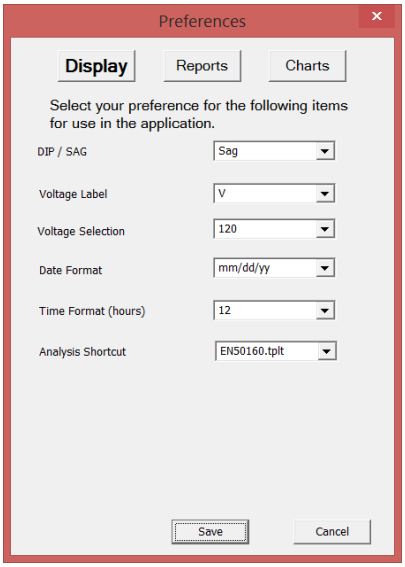
> ***NOTE:*** *The software will only display the data files and setup files for the model instrument selected.*



2. Click FILE, then PREFERENCES.



3. Click DISPLAY to set the *Display Preferences*.

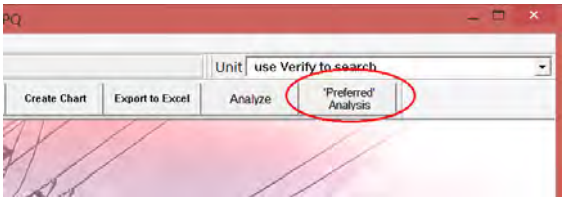


From this screen you can set the local terminology. You can select, a reduction in voltage referred to as a dip or a sag. You can also select what symbol you would like to have the software use to represent voltage (V, U or L).

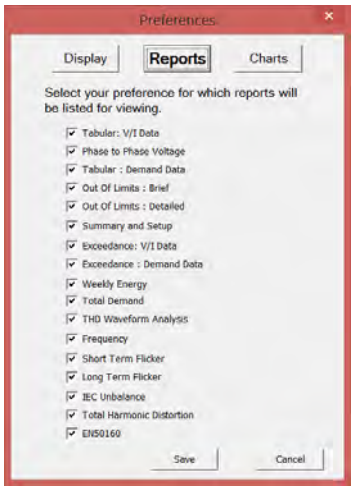
From this screen you can also choose the date and time format for your local

This screen also allows you to select the Default Data Analysis Template, in the *Analysis Shortcut* dropdown field. This will allow you to perform your desired (or most common) data analysis by simply clicking on the *Preferred Analysis* button.

NOTE: *See the section in the manual on Data Analysis Templates for more information.*

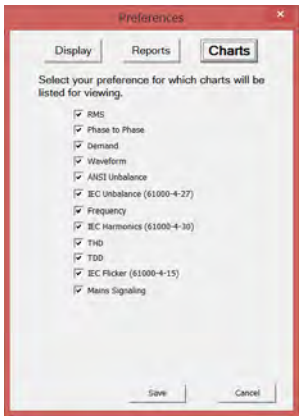


4. Click REPORTS to set the *Report Preferences*.



From this screen you can disable or enable your desired reports. This way only the ones of interest are displayed.

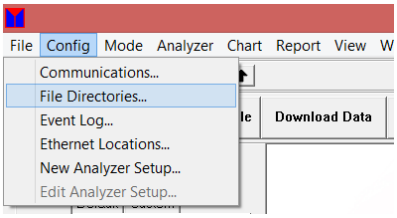
5. Click CHART to set the *Chart Preferences*.



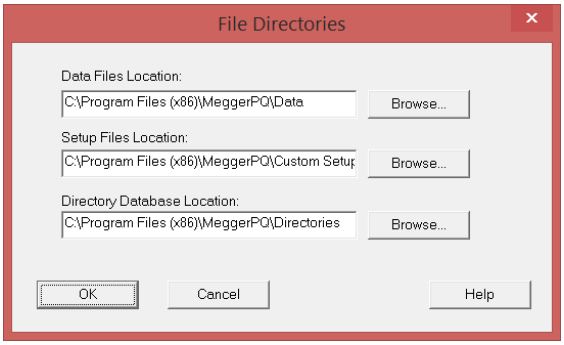
From this screen you can disable or enable your desired charts. This way only the ones of interest are displayed.

Configuring File Directories

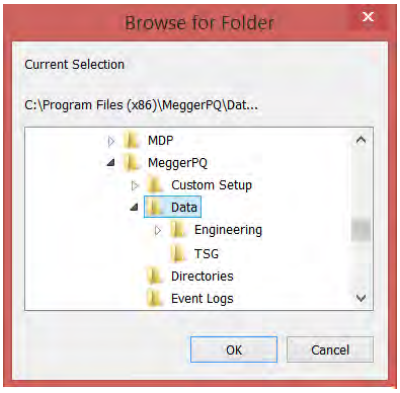
1. Click CONFIG then FILE DIRECTORIES.



a. Click BROWSE for either the *Data Files Location* or the *Setup Files Location,* which ever you wish to modify.



b. Select the desired path and then click OK to close the *Browse for Folder* window.

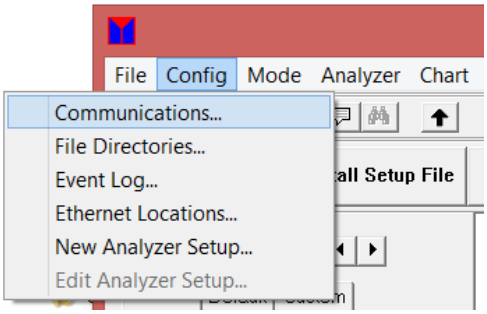


c. Click OK to close the *File Directory* window.

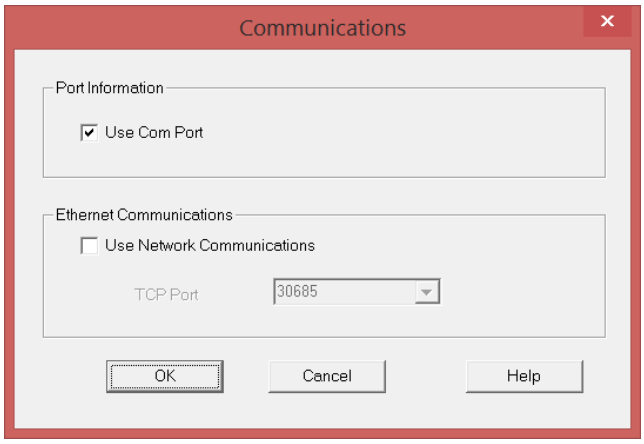
Configuring USB Communications

The communications needs to be configured in order to tell the PC whether to use USB communications or Ethernet communications. To configure the software for USB communications please perform the following procedure.

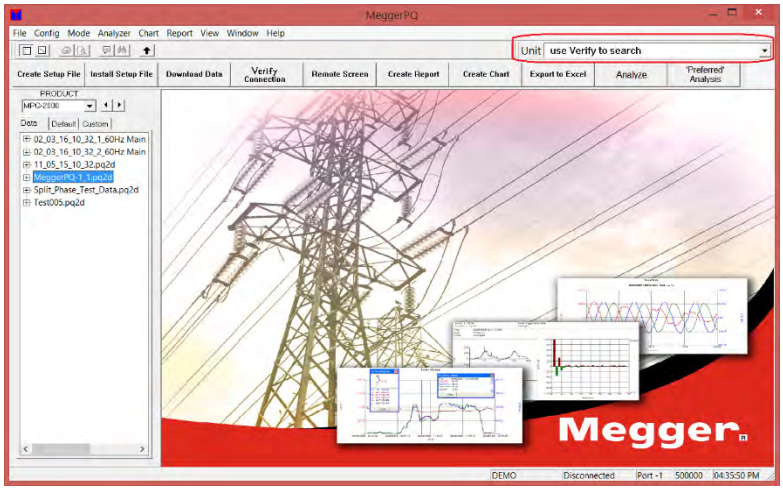
1. Click CONFIG then COMMUNICATIONS.



2. In the *Communications* window check USE COM PORT.



The software will now display the active COM ports in the upper right hand corner.



3. Select the COM port in use.

4. With the MPQ unit powered up and plugged into the proper COM port click VERIFY CONNECTION button. The software should now connect to the unit.

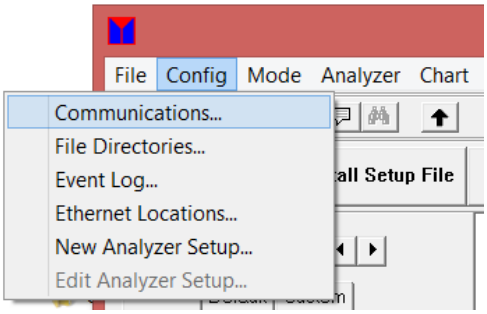
NOTE: *The software will automatically scan all COM ports if it does not find a unit at the selected COM port.*

The software will support up to 128 COM ports.

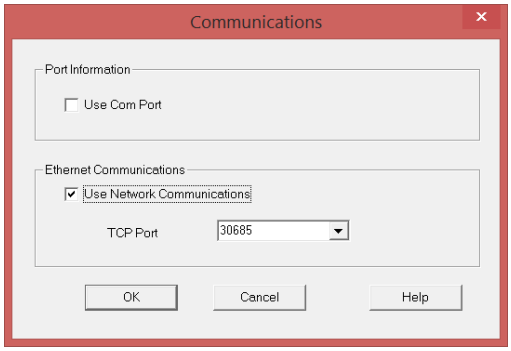
Configuring Ethernet Communications

The communications needs to be configured in order to tell the PC whether to use USB communications or Ethernet communications. To configure the software for Ethernet communications please perform the following procedure.

1. Click CONFIG then COMMUNICATIONS.



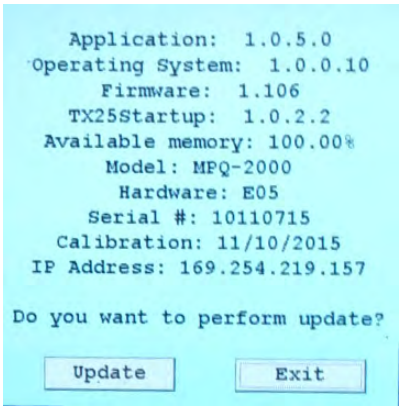
2. In the *Communications* window check USE NETWORK COMMUNICATIONS.



3. Connect the MPQ unit to the network using the Ethernet connection. The Ethernet LED on the unit should illuminate, indicating communications with the network.

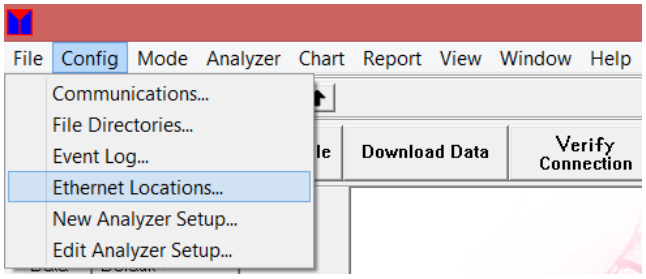
The unit will now be assigned an IP address. This can take up to 2 minutes. To view the address, go to the MPQ units help screen as follows.

4. Press the HELP button.

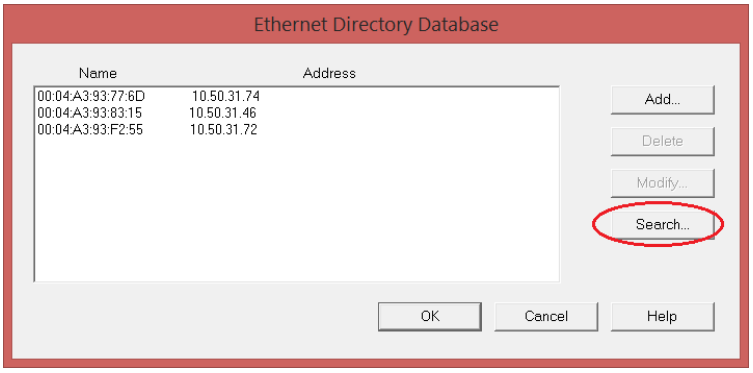


NOTE: This is a static screen that does not update. To refresh the screen you will need to exit the screen and re-open the help screen.

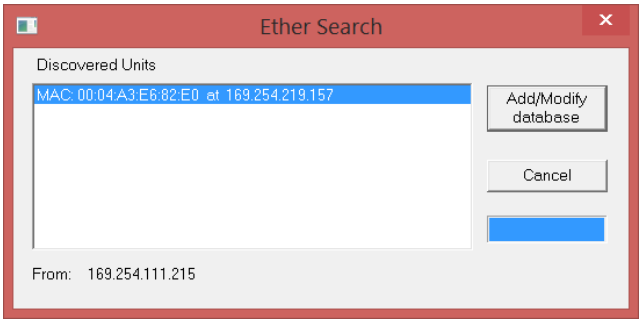
5. In the PC software click CONFIG then ETHERNET LOCATIONS.



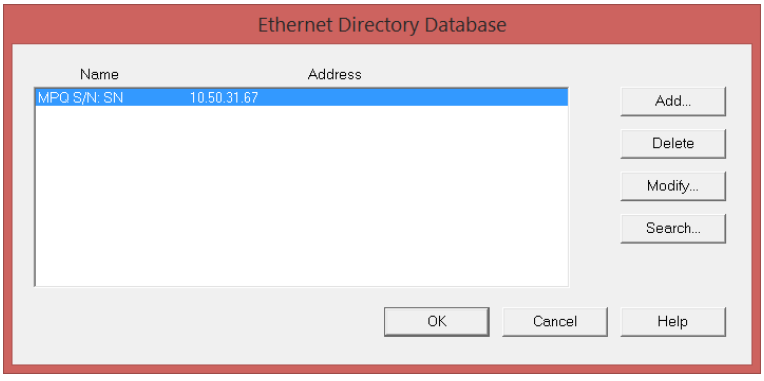
a. An *Ethernet Directory Database* window will open. With the unit connected click SEARCH.



b. The software will search the network for all active MPQ units. They will be displayed in the *Ethernet Search* window. Select the desired unit and click ADD / MODIFY DATABASE. This will add the unit to the database.



6. In the *Ethernet Directory Database* window, select the desired unit, then click OK.



The software will now display the active Ethernet locations in the upper right hand corner. *Select the desired unit.*

1. Click VERIFY CONNECTION. The software should not connect to the unit. The software should now connect to the unit.

Transfer a Setup File from the PC to the MPQ Analyzer

A setup file is used to program the unit to perform different types of recording. Multiple setup files can be installed into the unit. These setup files can be activated from the front panel of the unit or using the Megger PQ software.

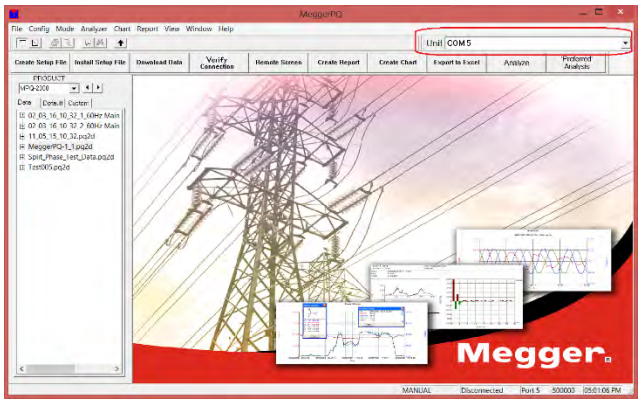
Uploading a setup file from the PC using the Megger PQ software

1. Verify the batteries in the unit are fully charged or connect the unit to the AC adapter and plug it into an AC outlet.

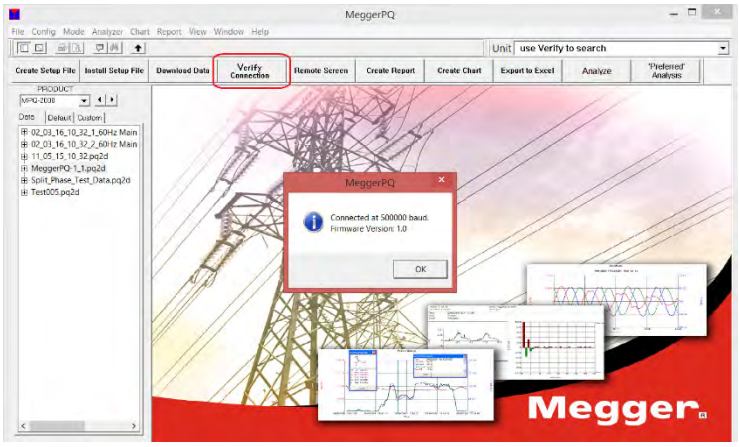
    a. Connect the unit to the PC via the USB cable.

    b. Execute the Megger PQ software.

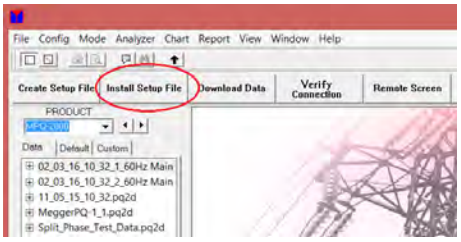
    c. Select the COM Port in use.



2. Verify communication by clicking VERIFY CONNECTION.



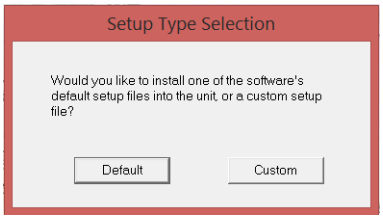
3. Click INSTALL SETUP FILE in order to select a setup program for the unit.



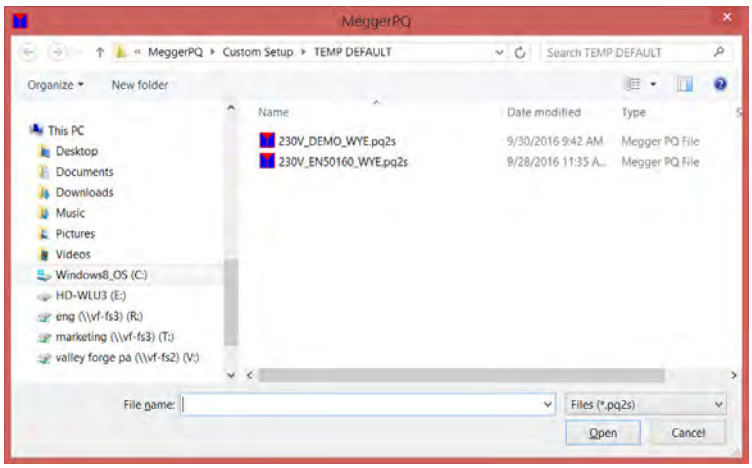
4. Select the *type* of setup you would like to select.

    a. Default: Pre-made setups in the unit.

    b. Custom:



c. The setup folder window will open. Select the desired setup file and click OPEN. See the section on *Creating Setup Files*.



The software will now upload the setup file to the unit and activate that setup and sync the date and time of the unit to the PC date and time.

Transferring a Setup file from the PC to a USB stick

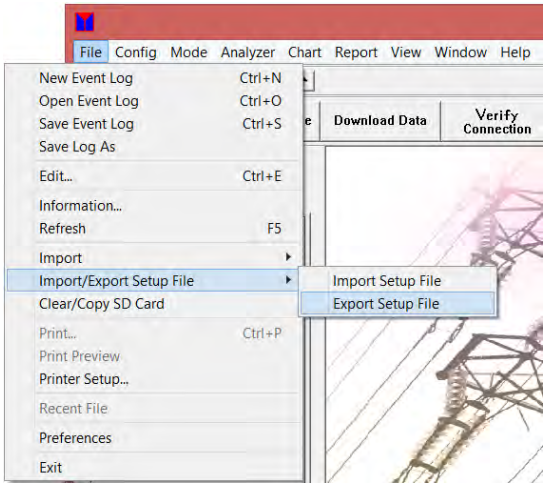
1. Open the Megger PQ Software.

   a. Plug the USB stick into the USB port of the PC.

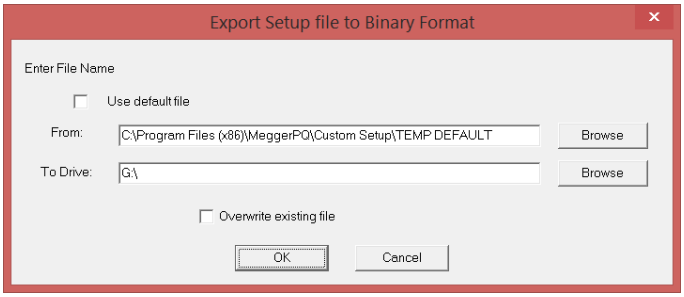
   b. Execute the Megger PQ software.

   c. Click on FILE then IMPORT / EXPORT SETUP FILE.

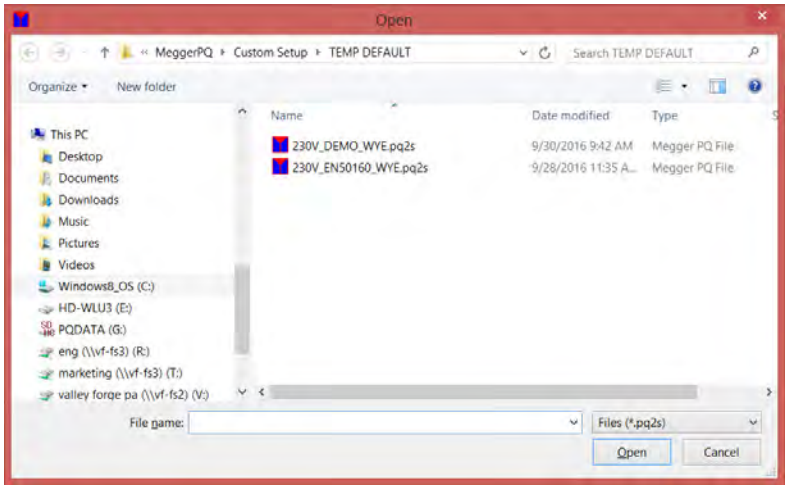
   d. Click on EXPORT SETUP FILE.



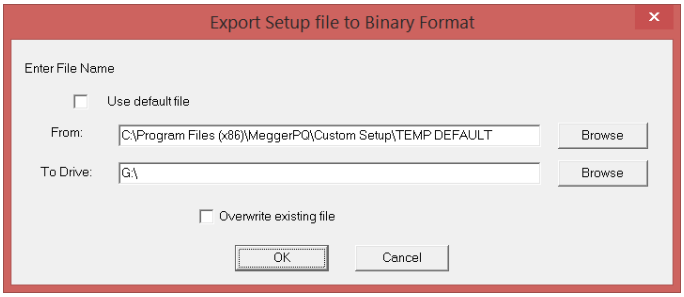
2. The *Export Setup File to Binary Format* window will open. Click BROWSE next to the *From* field, to search for desired setup file.



   a. The *Open* window will open. Select the desired setup file and then click OPEN.



   b. The *Export Setup File to Binary Format* window will open again with the selected setup file in the *From* field. Select the path to the USB stick in the *To Drive* field then click OK.



The setup file will now be written to the USB stick.

Transferring a Setup File from the PC to an SD Card

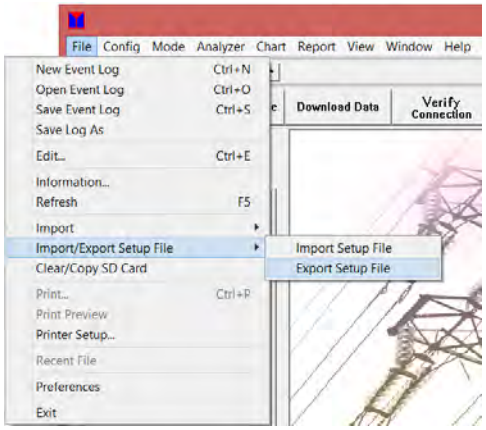
1. Open the Megger PQ Software.

    a. Plug the SD Card into the SD Card port of the PC.

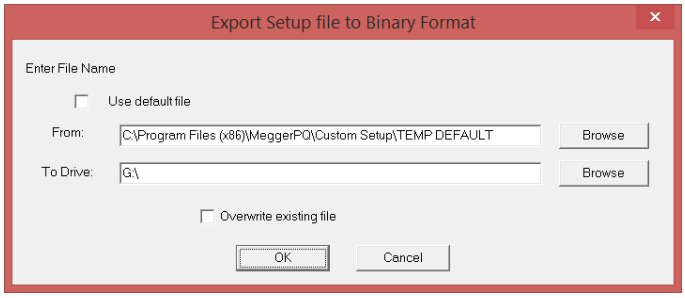
    b. Execute the Megger PQ software.

    c. Click on FILE then IMPORT / EXPORT SETUP FILE.

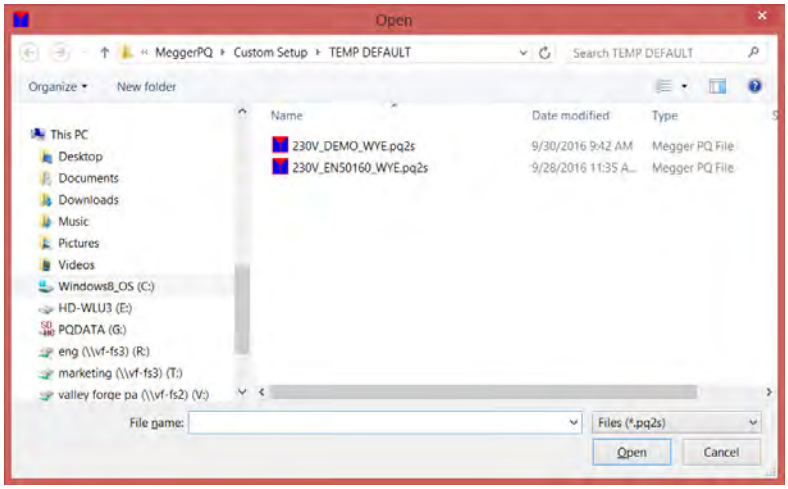
    d. Click on EXPORT SETUP FILE.



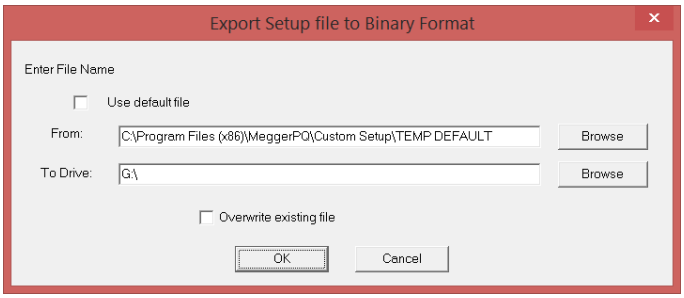
2. The *Export Setup File to Binary Format* window will open. Click on BROWSE next to the *From* field, to search for desired setup file.



3. The *Open*-window will open. Select the desired setup file and then click OPEN.



4. The *Export Setup File to Binary Format* window will open again with the selected setup file in the *From* field. Select the path to the SD Card in the *To Drive* field then click OK.



The setup file will now be written to the SD Card.

Transferring Data from the MPQ unit to the PC

The data from the MPQ Analyzer can be transferred to the PC in several different manners.

- The data can be transferred through the type B USB Port directly to the PC.
- The data can be transferred through the Ethernet Port directly to the PC.
- The data can be transferred to a USB stick plugged into the type A USB port.
- The data can be imported directly from the SD Card.

Transfer data to a PC using a USB or Ethernet port

1. Power up the MPQ unit.

If communicating using the USB port perform the following steps.

a. Connect the unit to a PC using the USB communications cable.

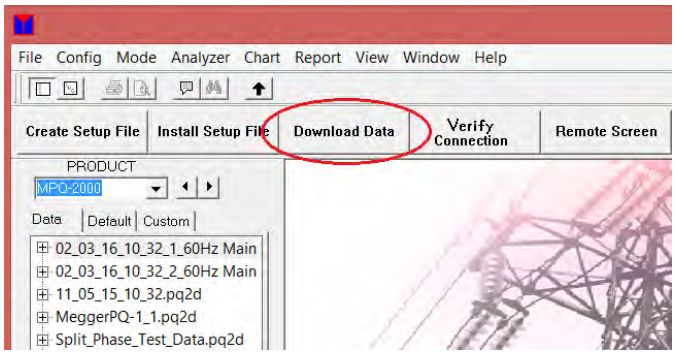
b. Setup the USB communications as described in the "Configure USB Communications" section of this manual.

If communicating using the Ethernet perform the following steps

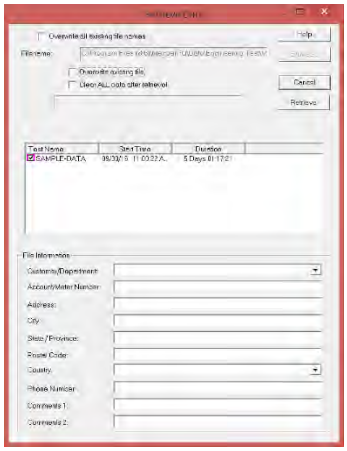
a. Connect the unit to the network using the Ethernet communications cable.

b. Setup the Ethernet communications as described in the "Configure Ethernet Communications" section of this manual.

2. Once communications is established click DOWNLOAD DATA.



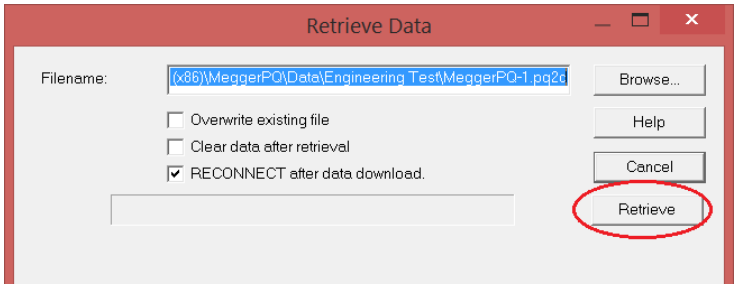
The following *Retrieve Data* window will open.



3. Select the data files to be downloaded.

4. Input the desired customer information or notes you like. This data will be saved in the data file.

5. Click on RETRIEVE.



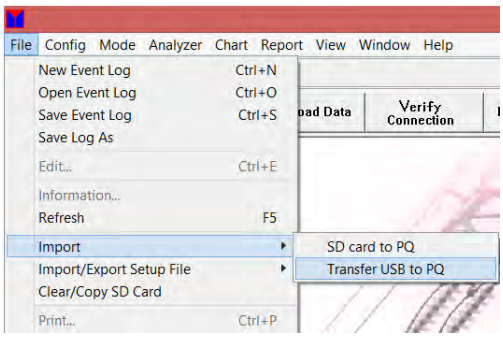
6. The data transfer shall now begin. Once the data download is complete *disconnect the unit*. The data file shall be displayed in the *Data File Bar*.

Transfer Data to a PC using a USB stick

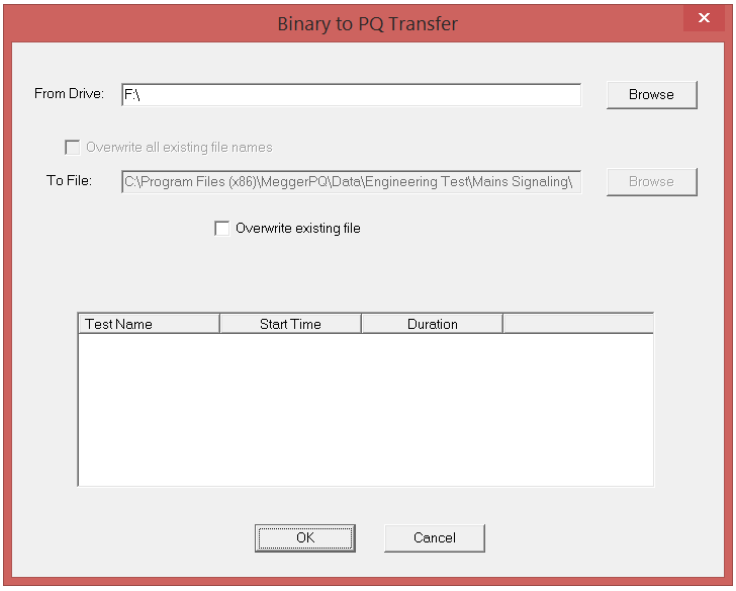
1. Insert the USB stick containing the data into the PC USB stick port.

    a. Open the Megger PQ software.

    b. Click FILE then IMPORT then TRANSFER USB to PQ.

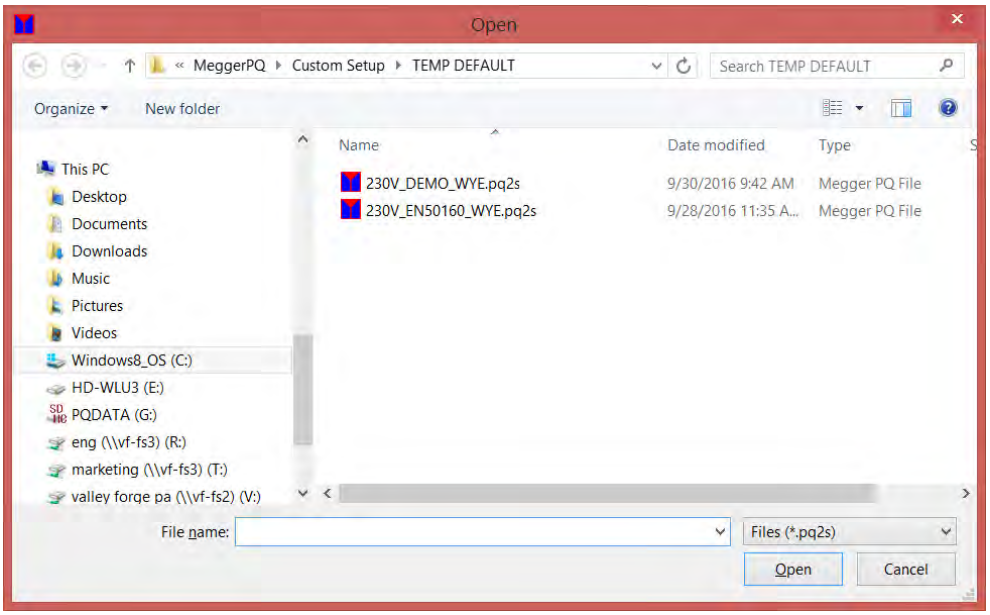


2. The *Binary to PQ Transfer* window will open. Click on *From Drive* BROWSE to select USB path.

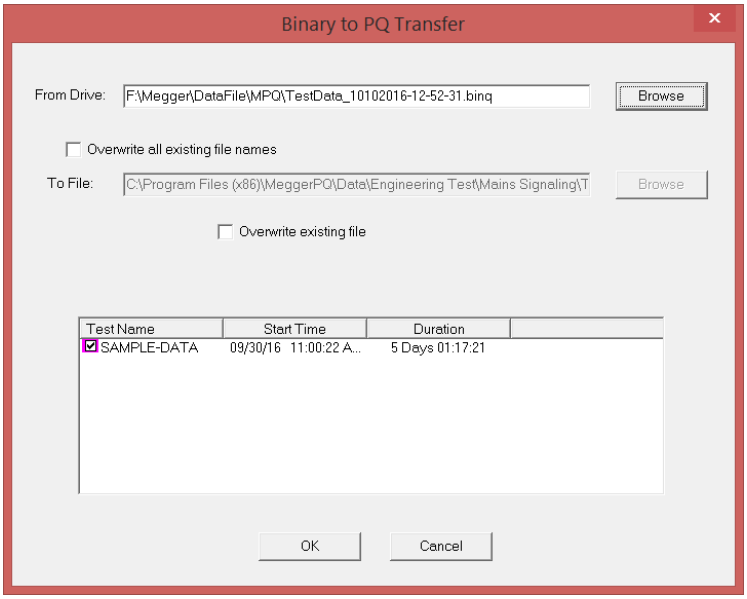


3. Select the *path* and the *Data File Folder*.

NOTE:The data file will reside in the following path on the USB stick.
MEGGER / Datafile / MPQ.



4. Select the desired data file to import then click OK.

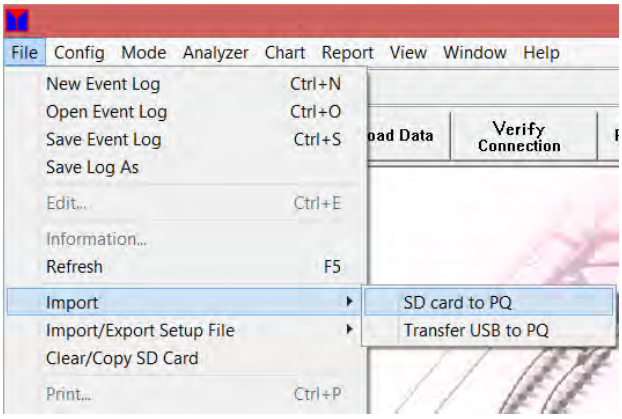


Transfer Data to a PC using an SD Card

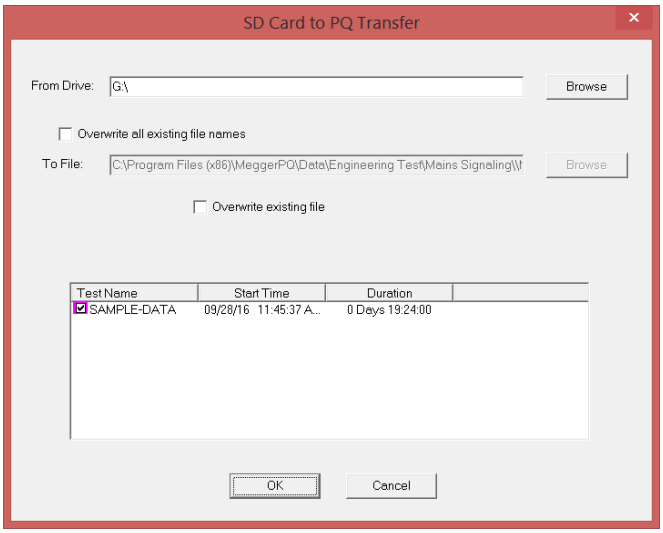
1. Remove the SD CARD from the unit and place it in the SD Card reader slot of the PC.

   a. Open the Megger PQ software.

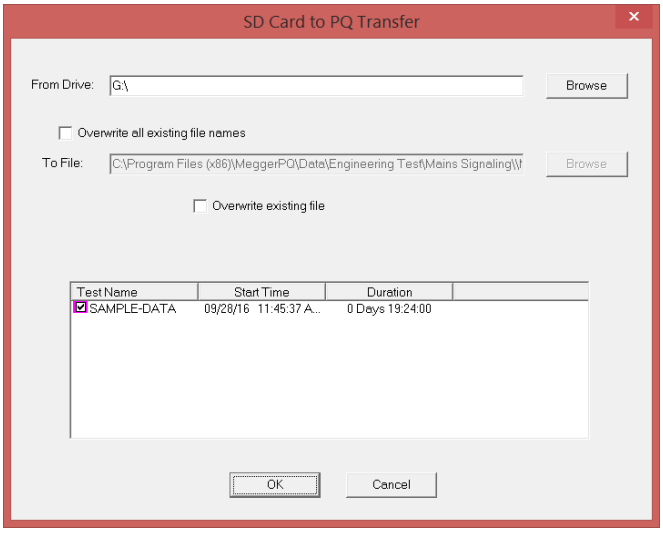
   b. Click FILE then IMPORT then SD CARD TO PQ.



2. The *Binary To PQ Transfer* window will open. Click *From* BROWSE to select path.



3. Select the *data file* to be transferred, then click OK.

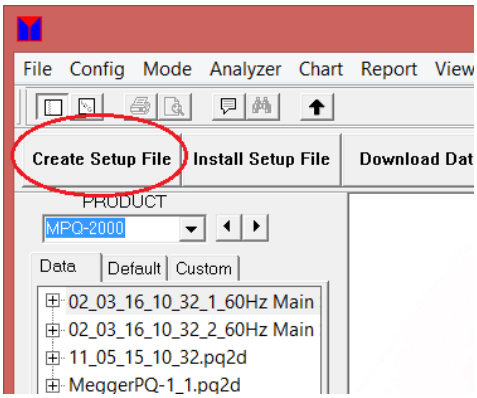


7

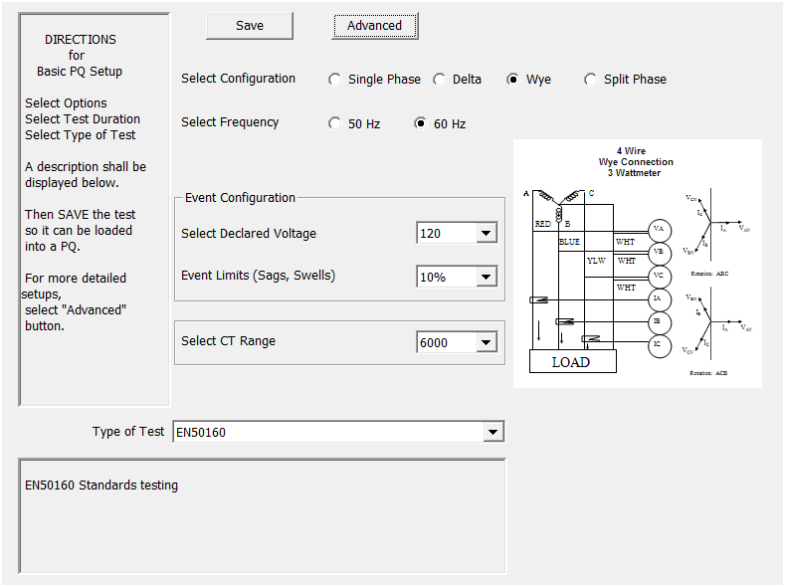
Creating a Setup File

Creating a Basic Setup File

1. Click on CREATE SETUP FILE



The following screen shall be displayed.



2. Select the desired parameters as described in Table 1.0.

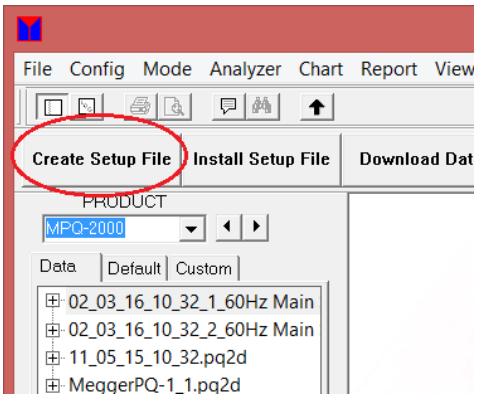
Table 1.0	
Select Configuration:	Select the wiring configuration that the unit will be connected. If the wiring configuration is not displayed then open the advanced setup screen, by clicking the ADVANCED button.
Select Frequency:	Set the frequency of the fundamental voltage. The unit has a phase lock loop and will lock on the existing frequency. If there should be a power outage then the unit will default back to this selected default frequency.
Event Configuration / Select Declared Voltage:	Select the nominal voltage that shall be on the network to be measured.
Event Configuration / Event Limits (Sags and Swells):	This value sets the maximum allowable deviation from the nominal voltage that is permitted. Any RMS value beyond this point triggers an out of limits event.
CT Range:	Select the full scale range of the CT to be used.
Select Voltage Ratio (Multiplier):	Input the PT ratio, if a PT is being used.
Type of Test:	Select the type of test to be performed from the list provided. A description of each test type is provided below this field. The software will analyze the selections and automatically create the optimized setup file.

Creating an Advanced Setup File

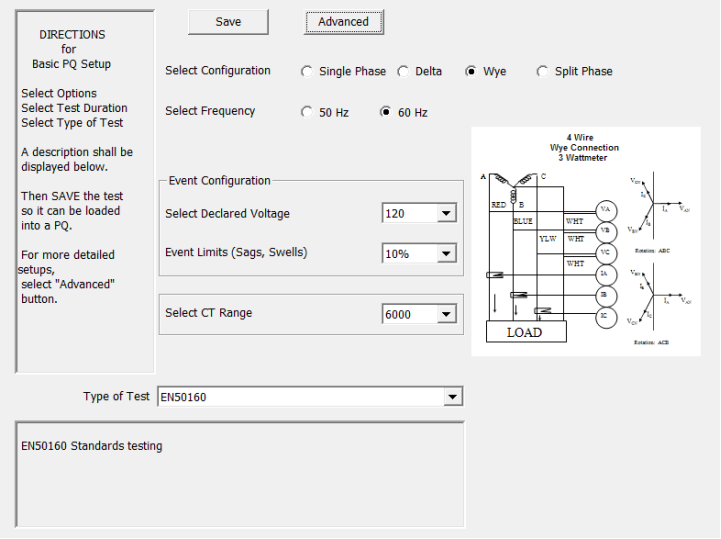
The advanced setup file will allow the operator to configure every parameter in the analyzer setup file.

> ***NOTE:*** *The Megger PQ software has built in safeties to stop an operator from creating a setup file that will overdrive the processor. However there are so many possible combinations of settings that is may be possible to over-drive the processor when creating very aggressive setup files with short storage intervals.*

1. Click on CREATE SETUP FILE.

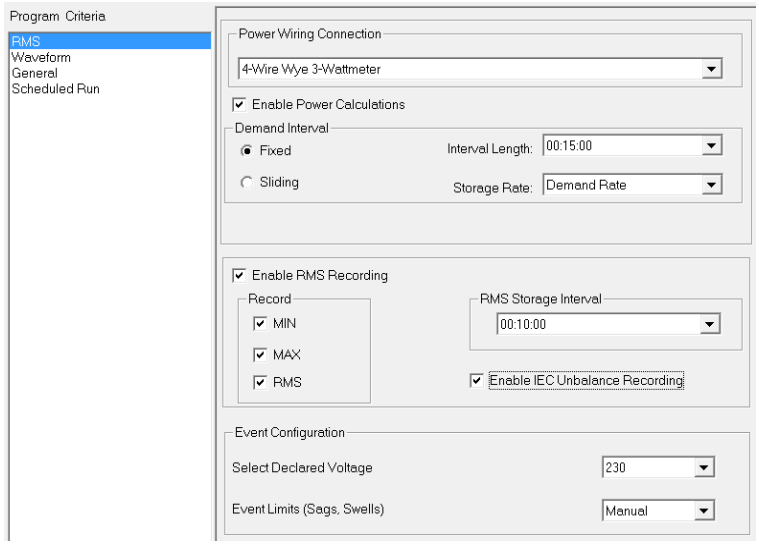


The following screen shall be displayed.

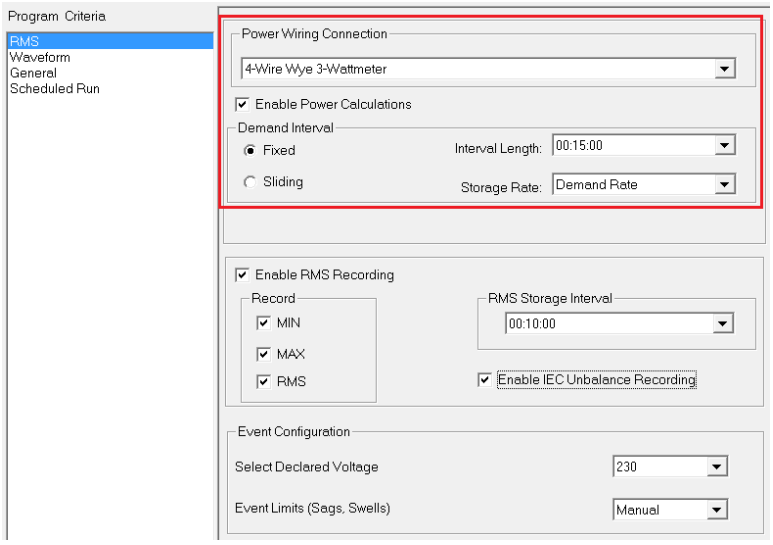


2. Click ADVANCED to view the configuration pages.

RMS Page



If you want **to record** Demand Information, which includes KW, KVAR, KVA, PF and DPF the f**ollowing setup is required**. If you **do not want to record** demand information then **de-select** *Enable Power Calculations* and proceed to the next step.



Enable Power Calculations: If enabled the unit will record demand information. If disabled the unit will not record demand information.

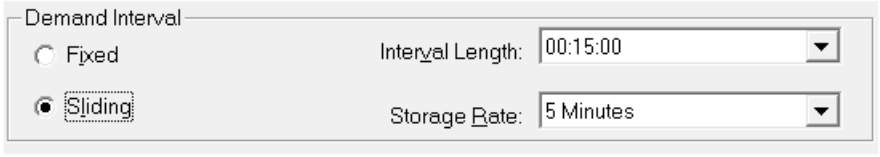
Power Wiring Connection: This needs to be selected if you have enabled power calculations. This selection must match the wiring setup of the unit to the circuit. In order to see selections available; click on the down arrow next to the Power Measurement Method. Then just click on the one you need.

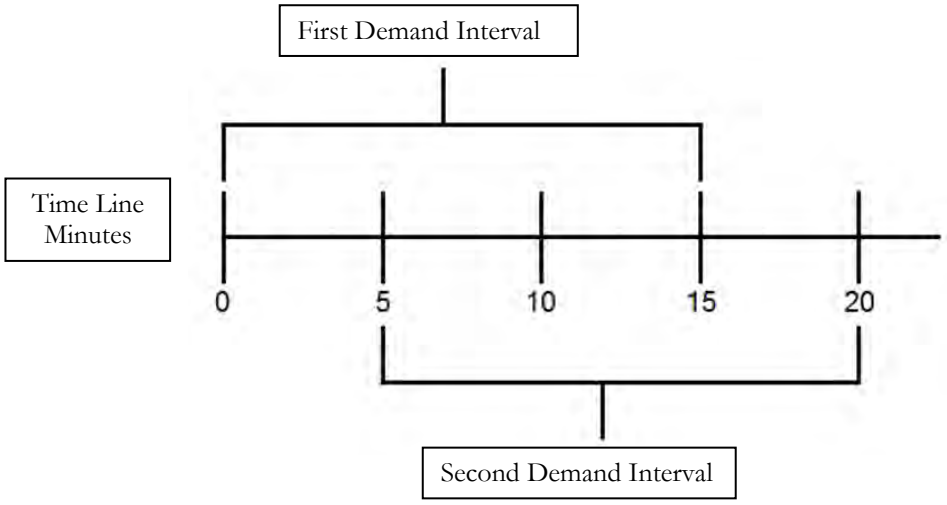
Demand Interval Length: This is the time interval the unit uses to calculate the demand parameters. So if the demand interval length is set to 00:15:00, then the unit will calculate the demand parameters every 15 minutes.

Demand Storage Rate: This is time interval the unit waits until it stores the calculated demand information to the unit's non-volatile memory. So if the demand storage rate is set to "Demand Rate" then the unit will save the calculated demand information to memory every demand interval length.

Demand Interval: The user has a choice of selecting either a fixed window or a sliding window. If a fixed window is selected then at the end of each demand interval the power parameters will be calculated and stored. If a sliding window is selected then at the end of the first demand interval the demand parameters will be calculated. Then from there on, after at the end of each demand storage rate, the window will slide by the amount of time in the demand storage interval and the demand parameters will be calculated and stored again.

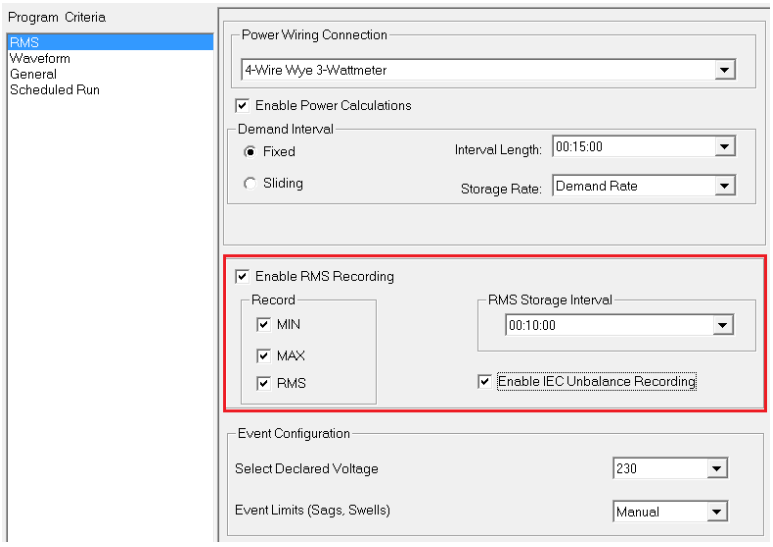
Example: With the following Sliding Demand settings this would be the Demand Interval window.





RMS Recording: If you want to record RMS data then the following setup is required. If you do not want to record RMS data then de-select "Enable RMS Recording" and proceed to the next step.

NOTE: *If the recording of every RMS cycle is desired, as in a motor start up test then* ***disable*** *RMS recording and set the demand recording to 1 cycle.*

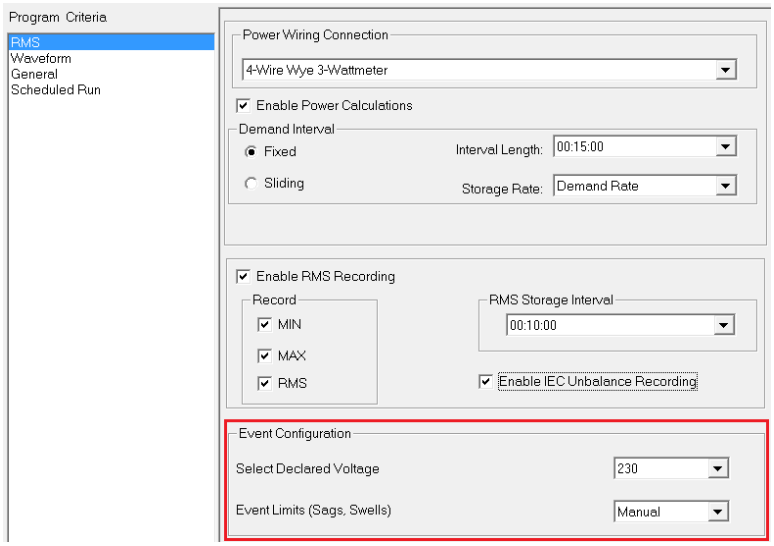


Enable RMS Recording: With this checked the unit will record RMS data. If this is not checked then the unit will not record RMS data.

RMS Storage Interval: If the RMS Storage Interval is set to time then the unit will save RMS data to memory at the end of the set storage interval. So if time is selected and the time is set to 0000:10:00 then the unit will save the RMS data to memory every 10 minutes. This can be set to 0.2 seconds, 3 seconds 10 minutes or 2 hours.

Record (Min, Max and RMS): At the end of each RMS storage interval the unit will save the minimum RMS value (MIN), the maximum RMS value (MAX) and the average RMS value (RMS) to memory for that interval if Min, Max and RMS are all checked. If any of them are not checked then that value will not be saved to memory.

Enable IEC Unbalance Recording: With this checked the unit will record the unbalance between the phases based on the IEC 61000-27 standards.

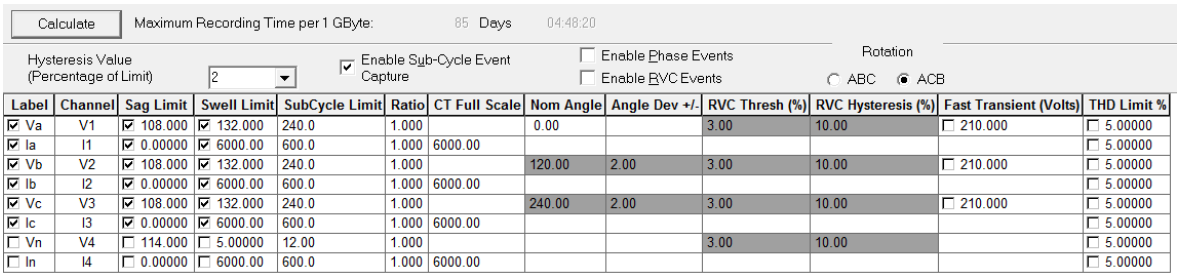


EVENT CONFIGURATION

Select Declared Voltage: Select the nominal voltage that shall be on the network to be measured.

Event Limits: This value sets the maximum allowable deviation from the nominal voltage that is permitted. Any RMS value beyond this point triggers an out of limits event.

Setting up the event limits: The user can select event limits, which if exceeded will cause an out of limits event to be recorded in the out of limit reports.



Label	Channel	Sag Limit	Swell Limit	SubCycle Limit	Ratio	CT Full Scale	Nom Angle	Angle Dev +/-	RVC Thresh (%)	RVC Hysteresis (%)	Fast Transient (Volts)	THD Limit %
☑ Va	V1	☑ 108.000	☑ 132.000	240.0	1.000		0.00		3.00	10.00	☐ 210.000	☐ 5.00000
☑ Ia	I1	☑ 0.00000	☑ 6000.00	600.0	1.000	6000.00						☐ 5.00000
☑ Vb	V2	☑ 108.000	☑ 132.000	240.0	1.000		120.00	2.00	3.00	10.00	☐ 210.000	☐ 5.00000
☑ Ib	I2	☑ 0.00000	☑ 6000.00	600.0	1.000	6000.00						☐ 5.00000
☑ Vc	V3	☑ 108.000	☑ 132.000	240.0	1.000		240.00	2.00	3.00	10.00	☐ 210.000	☐ 5.00000
☑ Ic	I3	☑ 0.00000	☑ 6000.00	600.0	1.000	6000.00						☐ 5.00000
☐ Vn	V4	☐ 114.000	☐ 5.00000	12.00	1.000				3.00	10.00		☐ 5.00000
☐ In	I4	☐ 0.00000	☐ 6000.00	600.0	1.000	6000.00						☐ 5.00000

Label: This column allows the user to turn on and off individual channels. It also allows the user to rename the channel. If a channel is checked then it will record data. If a channel is not checked then it will not record data. To rename a channel just highlight the label and type in the new name.

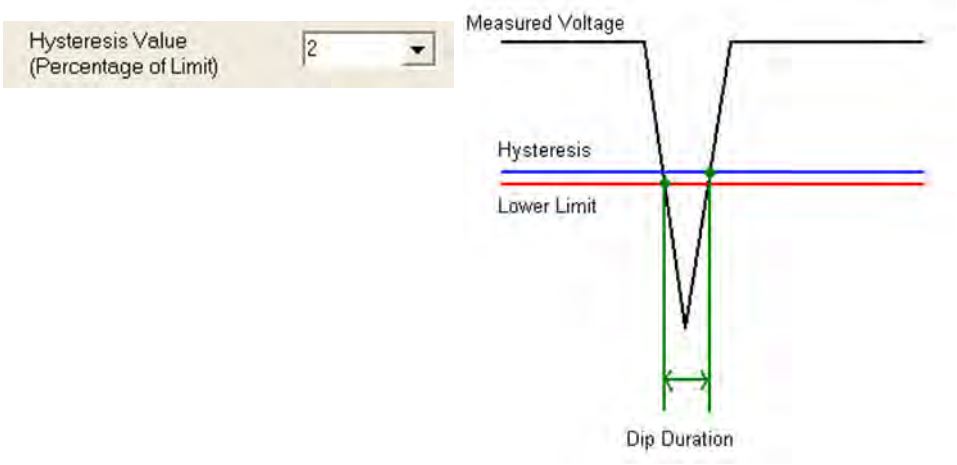
Channel: This column is to let the user know what channel each row is related to. This column is not user adjustable.

Sag Limit: This column allows the user to turn on and off and set the lower limit of each channel. When the limit is checked and a value is set, if the

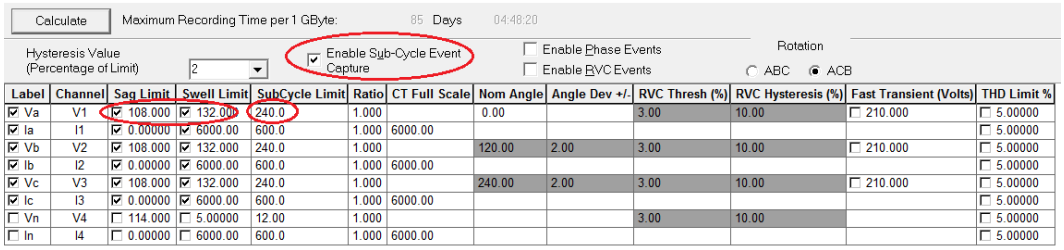
measured RMS value goes below this setting, an out of limits event will occur. This event can be viewed in the out of limits report.

Swell Limit: This column allows the user to turn on and off and set the upper limit of each channel. When the limit is checked and a value is set, if the measured RMS value goes above this setting, an out of limits event will occur. This event can be viewed in the out of limits report.

Hysteresis: This feature allows the user to set a percentage difference between the trigger value that starts an event and the trigger value that ends an event. For example; if a voltage Sag limit is set to 100V this means that if the RMS value drops below 100V an out of limits event begins. If the hysteresis is set to 2 (2% of the limit 100V = 2V) then the event will not end until the RMS voltage rises above 102V instead of 100V. This feature greatly reduces the amount of multiple and false triggers that can be detected. The hysteresis value can be set from 0 to 20. This feature only applies to Sag and Swell events NOT sub-cycle or THD.



Sub-Cycle Limit: This allows the user to program the unit to capture events that last less than 1 cycle (sub-cycle events). In order for option to be active then the "Sub-Cycle Event Capture" must be checked in the setup file and the sag and swell limits must be checked for each channel the user wants to capture sub-cycle events on and a limit must be set. The unit will then compare each sample of each cycle to the corresponding sample of the previous cycle. If the difference is greater than the limit programmed in the setup file then an out of limits event occurs. This event can be viewed in the out of limits report.



Label	Channel	Sag Limit	Swell Limit	SubCycle Limit	Ratio	CT Full Scale	Nom Angle	Angle Dev +/-	RVC Thresh (%)	RVC Hysteresis (%)	Fast Transient (Volts)	THD Limit %
☑ Va	V1	☑ 108.000	☑ 132.000	240.0	1.000		0.00		3.00	10.00	☐ 210.000	☐ 5.00000
☑ Ia	I1	☑ 0.00000	☑ 6000.00	600.0	1.000	6000.00						☐ 5.00000
☑ Vb	V2	☑ 108.000	☑ 132.000	240.0	1.000		120.00	2.00	3.00	10.00	☐ 210.000	☐ 5.00000
☑ Ib	I2	☑ 0.00000	☑ 6000.00	600.0	1.000	6000.00						☐ 5.00000
☑ Vc	V3	☑ 108.000	☑ 132.000	240.0	1.000		240.00	2.00	3.00	10.00	☐ 210.000	☐ 5.00000
☑ Ic	I3	☑ 0.00000	☑ 6000.00	600.0	1.000	6000.00						☐ 5.00000
☐ Vn	V4	☐ 114.000	☐ 5.00000	12.00	1.000				3.00	10.00		☐ 5.00000
☐ In	I4	☐ 0.00000	☐ 6000.00	600.0	1.000	6000.00						☐ 5.00000

Ratio: This value is used when the unit is measuring the secondary of a step down transformer. This value will be multiplied by the actual measured value the unit reads and recorded. This will allow the unit to record primary values.

CT Full Scale: This value should be set to the full scale value of the current probe being used. The current probes used with this unit actually output 0-1 volt to the unit. So if a 6000A CT is being used and the MPQ unit measures the input from the 6000A CT as 0.5V this value will then be multiplies by the CT full scale value. The MPQ unit will record the 0.5V output from the 600A CT as 3000.0 Amps.

Nom Angle: These fields allow the user to select the nominal voltage phase angles for phase B and C, as referenced to phase A. These angles are used for calculating the phase deviation when "Enable Phase Events" has been selected.

Angle Dev (+/-): These fields allow the user to select the phase shift trigger value. When the voltage phase angles for phase B or C exceed these limits a phase angle event will be triggered, when "Enable Phase Events" has been selected.

Rotation: This field allows the user to select the phase rotation that will be used to calculate phase events, when "Enable Phase Events" has been selected. Please note the unit must be connected in the same phase rotation as selected to insure the proper triggering of phase events.

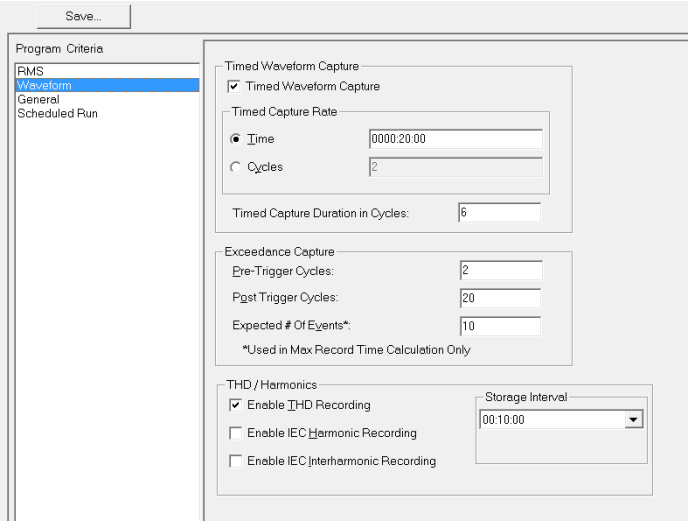
RVC Threshold (%): This value is set to a percentage of the declared voltage. (The declared voltage is set on the General page of the advanced setup. The declared voltage represents the nominal voltage of the line under test. After a steady state condition has been achieved an RVC event will be triggered when a single Urms(1/2 cycle) interval deviates by more than the RVC Threshold from the declared voltage.

RVC Hysteresis (%): This value is set to the percent of the RVC threshold. The RVC event will end (in a 50Hz system) when 100 consecutive Urms(1/2 cycle) intervals do not deviate more that the RVC Event End Threshold from the RVC Interval. The RVC event will end (in a 60Hz system) when 120 consecutive Urms(1/2 cycle) intervals do not deviate more that the RVC Event End Threshold from the RVC Interval.

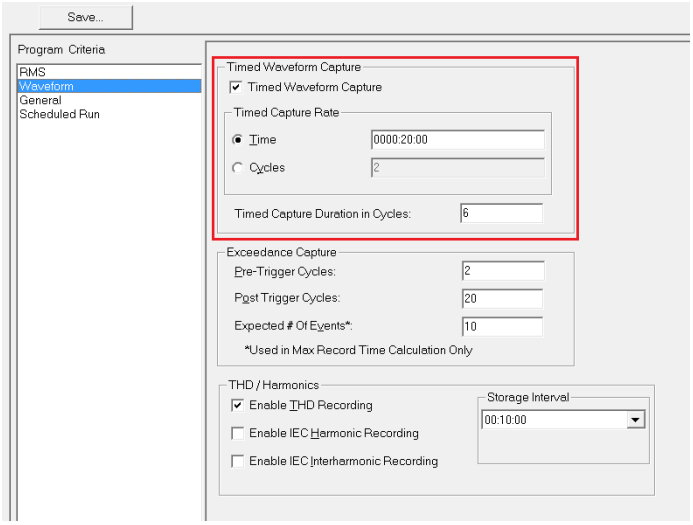
Fast Transient (Voltage): The high speed transient function will capture high speed transients from 1 to 64μsec. The high speed transient limit is a value that is set relative to 0V. When programmed this value must be higher than the standard sub-cycle limit. It is recommended to be at least 2x the peak voltage. The Megger PQ software will not allow the operator to set the High Speed transient limit to less than the 175% of the declared voltage. This will help ensure a low trigger does not trigger false transient events.

THD Limit: If this is checked and a limit is set it will allow the unit to record Total harmonic Distortion events. If the total harmonic distortion exceeds the user programmed percentage of the fundamental amplitude then a THD event will be recorded. This can be viewed in the out of limits report.

When the RMS page setup configurations are complete; click on *WAVEFORM* to proceed to the *Waveform Capture and Harmonic Setup* page.



Waveform Page

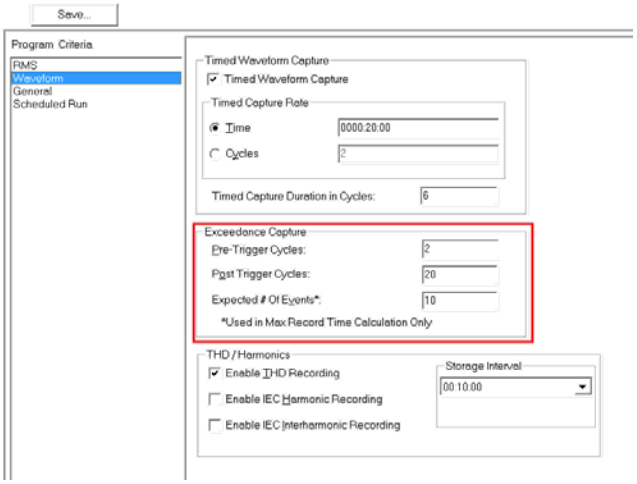


Timed Waveform Capture: When this feature is enabled the unit will record waveforms on all enabled channels periodically. If this feature is disabled the unit will still capture waveforms triggered by out of limit events.

Timed Capture Rate: This field instructs the unit how often to record waveforms. This can by time or by cycles.

Timed Capture Duration: This field defines how many cycles will be captured for each timed triggered waveform capture.

Exceedance capture: Allows the configuration of event triggered waveforms.



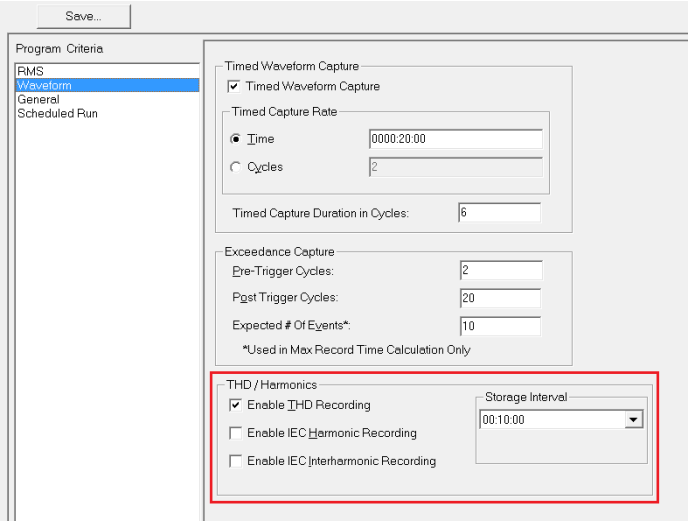
Pre-Trigger Cycles: If an "Exceedance Trigger Mode" is being used then the unit can be programmed to capture a pre-trigger cycle. This would be the cycle before the actual cycle that caused the exceedance event. The unit can capture up to 9 pre-trigger cycles per waveform capture.

Post Trigger Cycles: This will tell the unit how many cycles to capture after the first cycle. The unit can capture up to 99 post-trigger cycles per waveform capture.

Example: If the user programs in 1 pre-trigger cycle and 10-post trigger cycle, the unit will capture 12 cycles each time a waveform capture occurs.**(i.e. 1 Pre-trigger, the actual cycle and 10 post trigger cycles)**

Expected # Of Events: If waveform capture is set to exceedance mode then the number of waveforms captured will depend on how many times the inputs to the unit exceed their programmed limits. This means the software cannot accurately determine the "Maximum Recording Time" the unit can record. So the user can program in the expected number of events, then press the calculate button in the software. This will show the user how long the unit will record if that number of waveform captures occur (this is only an estimate). **This does not affect the unit's programming at all; it is just a tool so the user can get an idea of how long the unit can record.**

THD / Harmonics: Allows configuration of the aggregation rate of continuous THD and Harmonic recording.



Enable THD Recording: When this feature is enabled the unit will record Total Harmonic Distortion (THD) continuously for all enabled channels.

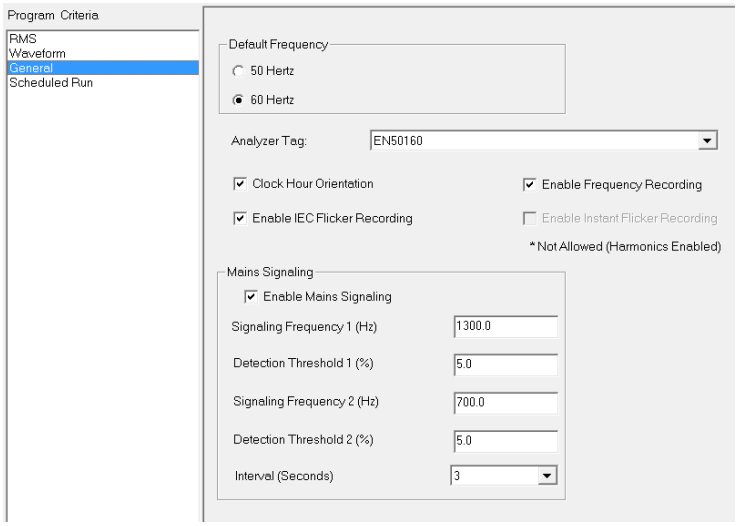
Enable IEC Harmonic Recording: When this feature is enabled the unit will record Harmonic continuously for all enabled channels. This is performed per IEC standards.

Enable IEC Interharmonic Recording: When this feature is enabled the unit will record Inter - Harmonic continuously for all enabled channels. This is performed per IEC standards.

Storage Interval: This field instructs the unit how often to aggregate and record the THD, Harmonic and Inter-harmonic data. This field can be set to 0.2 seconds, 3 seconds, 10 minutes or 2 hours.

When the Waveform page setup configurations are complete; click on GENERAL to proceed to the *General Setup* page.

General Page



Default Frequency: This sets the frequency the phase lock loop will default to should the measured frequency drop below 42.5 Hz.

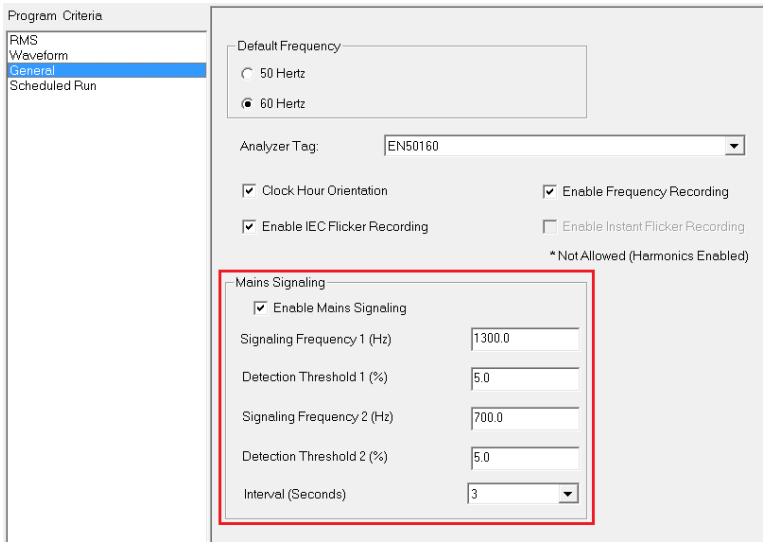
Analyzer Tag: This field allows you test set a descriptor of the test for reference purposes. These descriptors will match the test types indicated in the basic set up screen

Clock Hour Orientation: If this is checked it will cause the unit to delay recording until the next synchronized storage interval. The unit divides an hour into whole number of storage intervals. When asked to record, it will delay recording until its real time clock reaches the beginning of one of these storage intervals.

Enable Frequency Recording: With this checked the unit will record the frequency of the phase A voltage input channel.

Enable IEC Flicker Recording: With this checked the unit will record IEC Flicker per the IEC61000-4-15 specification (Pst and Plt) on Phase A, B and C voltage channels.

Enable Instant Flicker Recording: With this checked the unit will record instantaneous flicker every 200ms on Phase A, B and C voltage channels. *When Instant Flicker Recording is enabled the unit cannot record harmonics or inter-harmonics.*



Mains Signaling: Allows the configuration of the trigger points for the mains signaling events.

Enable Mains Signaling: The mains signaling function looks for two separate frequencies. One frequency (signal frequency 1, for example) could be the frequency to turn off an appliance while the other frequency (signal frequency 2, for example) is the frequency to turn on an appliance.

Signal Frequency 1 (Hz): Set this to the desired frequency in Hz.

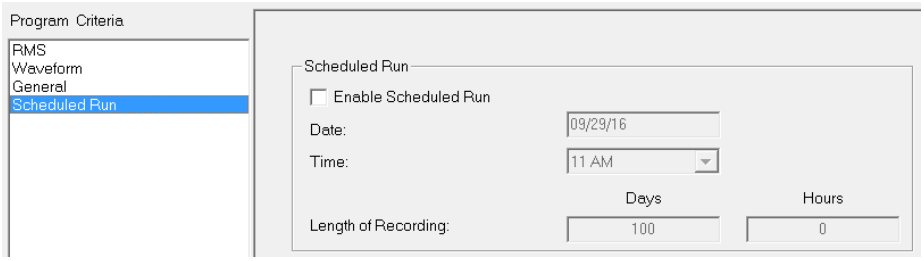
Detection Threshold 1 (%): This is the trigger that initiates the event detection. This is measured as a percentage of the declared voltage.

Signal Frequency 2 (Hz): Set this to the desired frequency in Hz.

Detection Threshold 2 (%): This is the trigger that initiates the event detection. This is measured as a percentage of the declared voltage.

Scheduled Run Page

Scheduled Run: Allows the MPQ unit to be configuration to automatically start recording at a specific time and record for a specified duration.



Enable Scheduled Run: When this field is enabled the unit will start recording at the specified date and time, and stop recording after the programmed length.

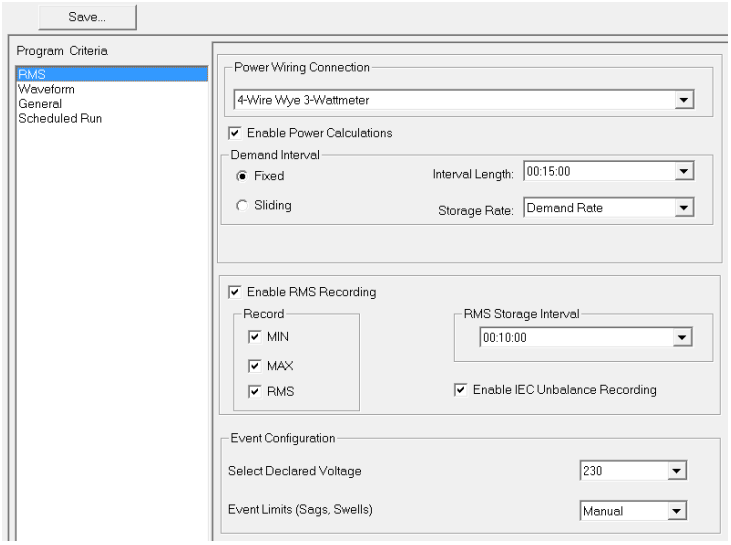
Date: Enter the date you wish the unit to start recording.

Time: Select the time you wish the unit to start recording.

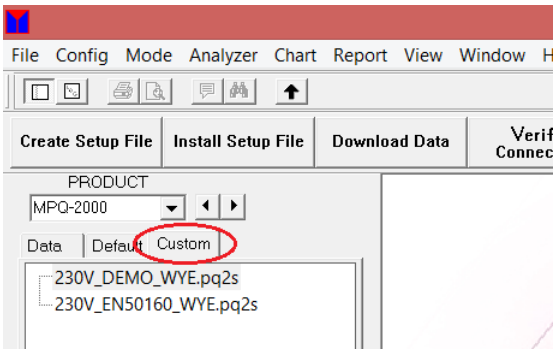
Length: Enter the length you want the unit to record for, in days and hours.

Save the Setup File

Saving a Setup File: After a setup file is created, it can be saved by clicking SAVE.



The software will then prompt the user to name the file. The file will then be saved in the setup folder. After the setup is saved the file can be viewed in the *Data File Bar* by clicking CUSTOM.



8

Viewing Downloaded Data

The MPQ-2000 software allows the user to view recorded data as either text reports, or in chart format. The software also allows the user to export the recorded data to Excel, for further custom analysis. This section of the manual will describe the various software features available for charts and reports.

Charting Data

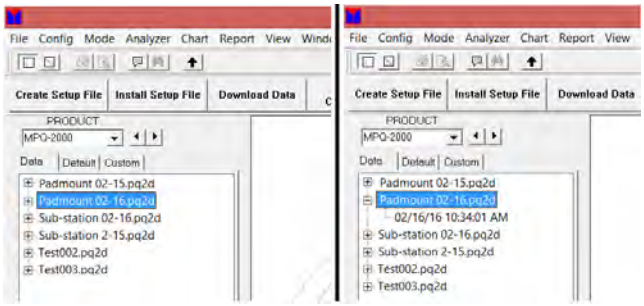
The software allows you to create the following type of charts.

- RMS Data
- Imbalance
- Waveform
- Demand(KW, KWH, KVAR, KVARH, KVA, KVAH, DPF and TPF)
- THD / TDD
- Harmonics
- Flicker PST / PLT

Creating a Chart

1. Highlight the data file you wish to review.

> ***NOTE:*** *Click the Plus (+) sign next to the data file to see the date and time of the start of the test.*



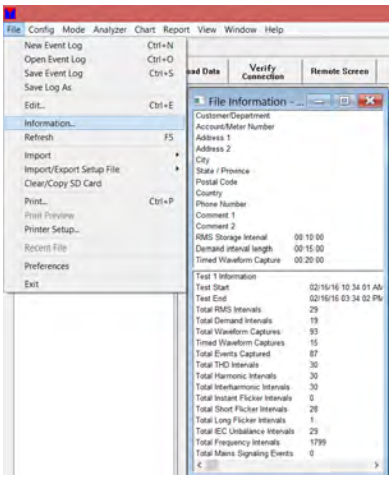
2. **Viewing File Information.** File information will allow the user to view any input customer information, the date the test started, the date the test ended, the total number of intervals in the test and the total number of waveform captures in the test.

   To view this information, do the following.

   a. Highlight the desired data file in the *Data File Bar*.

   b. Click FILE.

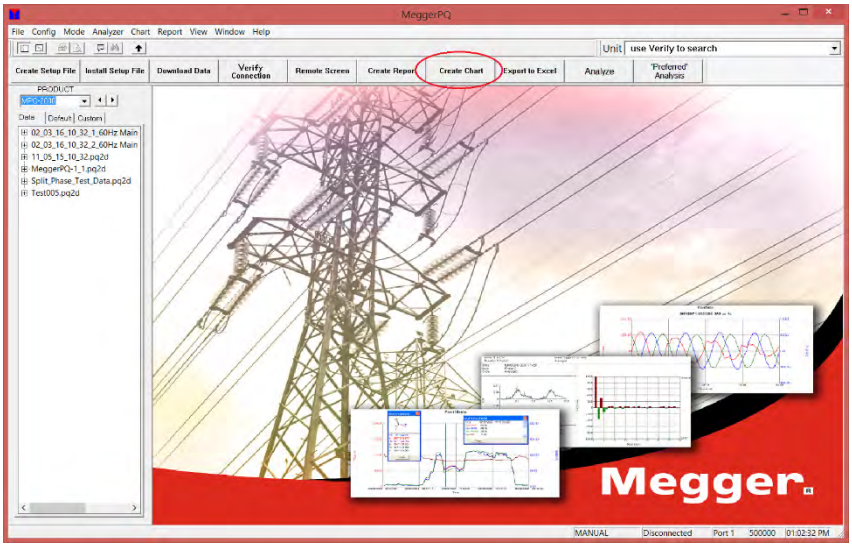
   c. Click INFORMATION.



3. To create a chart, do the following.

   a. Highlight the desired test in the data file bar.

   b. Click CREATE CHART.



   c. Select the desired chart type.

   d. Fill out the chart setup as desired.

   e. Then click CREATE.

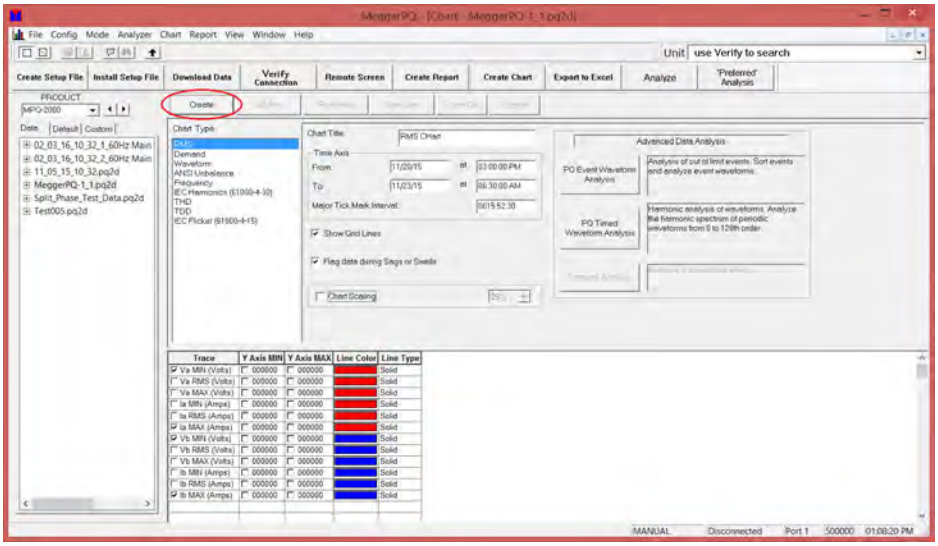
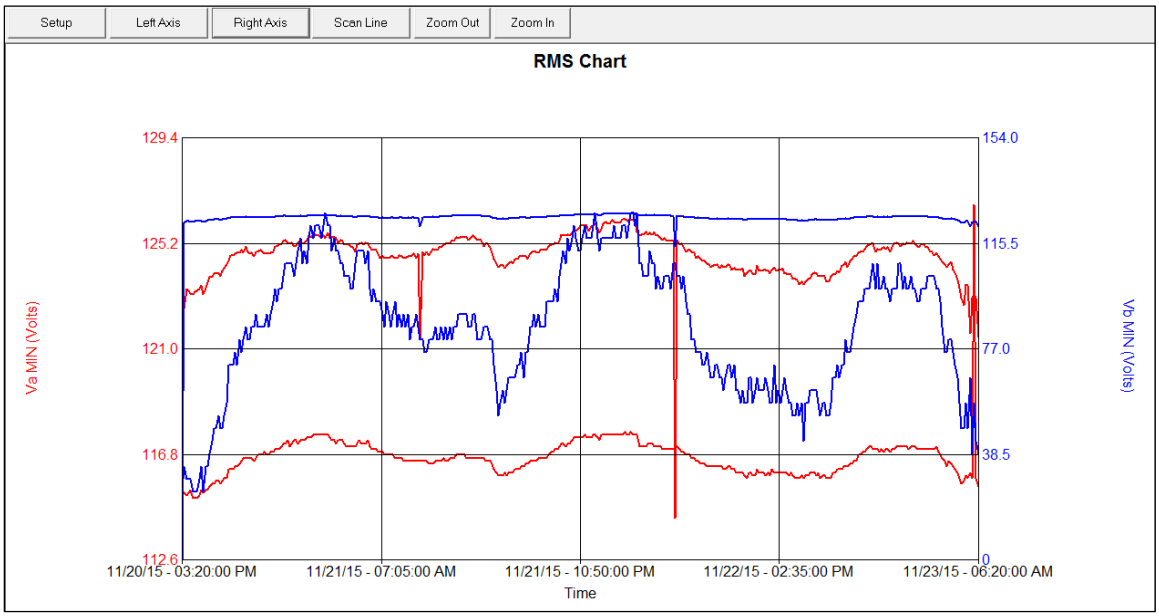


Chart Type:	Allows you to select the type of chart you wish to create. Highlight the chart type you wish to create by clicking on it once.
Chart Title:	In this location you can enter a label. This will appear on the chart and on the print out.
Time Axis:	This is the start and end time of the plot. This is user selectable.
Major Tick Interval:	Lets the user know the amount of time between the vertical grid lines in the generated chart. This is not user selectable; it is a function of the start and stop sign.
Show Grid Lines:	Allows the user to either display or not display the grid lines on the generated charts.
Flag Data during Sags or Swells:	Will display markers on the chart that indicate an out of limits event was occurring during that interval.
Chart Scaling:	This field provides a method of auto scaling. The chart scaling shall be set to a percentage above the peak value displayed in the chart trace. This field can be set to either 10%, 25%, 50%, 75% or 100%.
Trace:	Allows the user to plot specific channels. Just select the check box next to the desired trace title. If the check is present then that channel shall be plotted. If the check is not present then that trace shall not be plotted.
Y axis MIN - Y axis MAX:	This field enables the user to manually set the Y axis range of the chart. If a box is not checked then the software will auto scale that channel. If a box is checked then the software will use the user input value for the range.
Line Color:	Allows the user to select the line color of each trace.
Line Type:	Allows the user to select either a solid or a dashed line for each trace.

f. Once the chart is created there are various charting tools that can be utilized to help view the data.



Left Axis – Right Axis:	Allows the user to view the scale for various traces on the chart. Click the RIGHT AXIS or LEFT AXIS buttons. The *Label* and *Scale* on the right or left axis will then scroll showing the scale for the different traces.
Scan Line:	A scan line will tell the user the exact value of any point on the graph and the exact time this value occurred. To create a *Scan Line* first create a chart then click on SCAN LINE. To move the scan line, move the arrow on the screen using the mouse. Then right click on the location in which you want the scan line. If you wish to move the scan line one recorded point at a time then press the left or right arrow keys. *Note: Moving the scan line one point at a time is usually only done when the user has zoomed in on the chart.*
Vector Diagrams:	This will show the user the positional vectors of each phase. The currents phase angle will be referenced to the voltages phase angle. The actual value of the voltage and current will be displayed as well. To view a vector diagram create a *Demand Chart.* Then click on CHART and verify that SHOW VECTOR DIAGRAM has a check next to it, then click on SCAN LINE. Now both a scan line and a vector diagram will be created.

See picture below for examples of Scan Line and Vector Diagram.

Zoom: To zoom in on portions of the chart using the mouse place the arrow on the chart. Then hold down the left key of the mouse and drag the mouse diagonally across the chart. A dotted line box should appear. When you release the left mouse key the chart will zoom into the area within the dotted line box. Or, just click on the ZOOM IN Button.

See below picture for example of ZOOM

Zoom Out: To Zoom Out just click on the ZOOM OUT button.

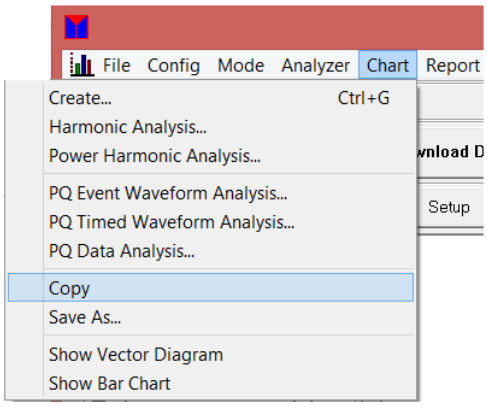
Event: This feature allows the user to scroll through the waveform captures, by clicking on the up / down buttons. This feature applies to the Waveform Charts ONLY.

4. To copy a chart into Word, do the following.

    a. Create the chart using Metrosoft for Windows software.

    b. Click CHART.

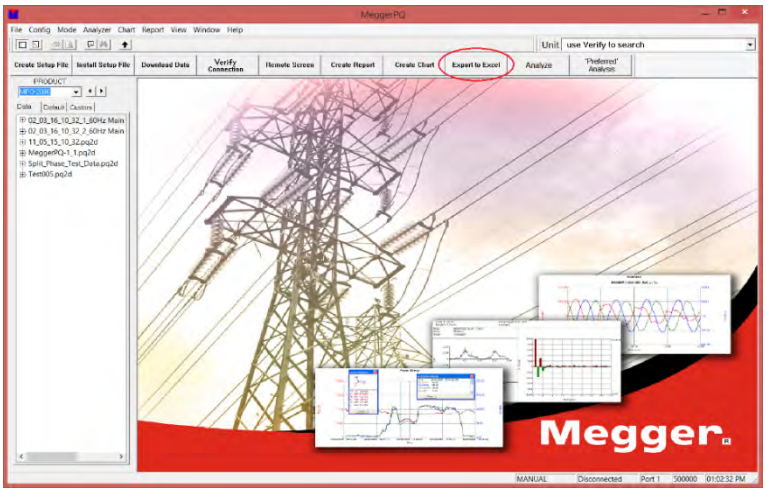
    c. Click COPY.



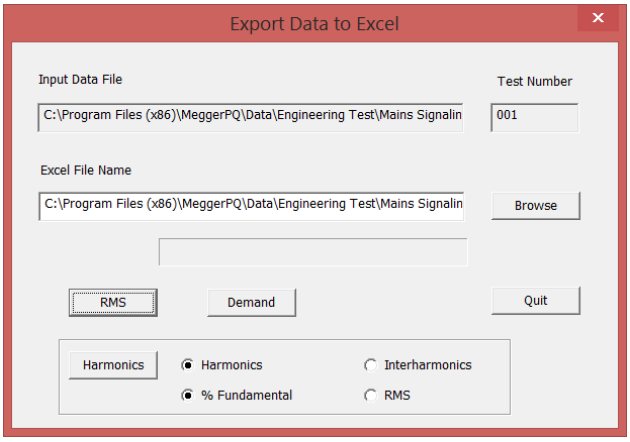
5. The chart is now in the computer clipboard. It can now be pasted into Word.

Exporting RMS and Demand Data to Excel

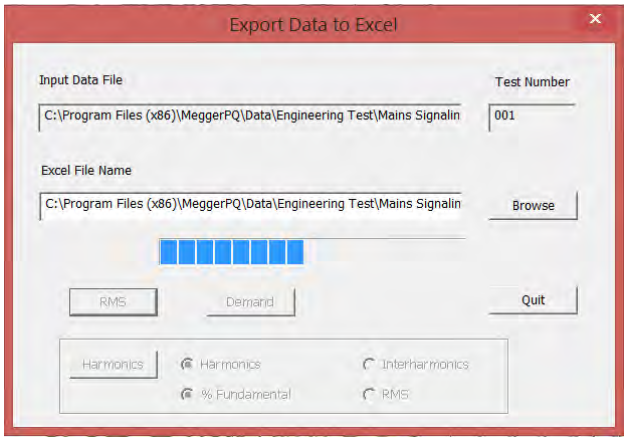
1. Select the desired data file in the data file bar then click EXPORT TO EXCEL.



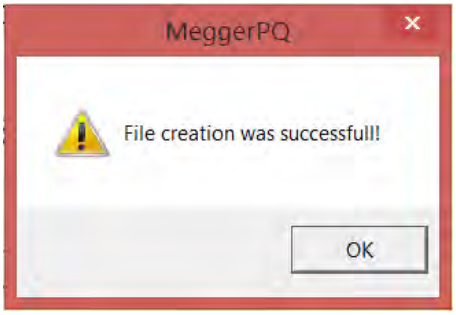
2. The following screen appears. Click on either RMS or DEMAND.



a. The export shall now begin



b. The following message shall appear when the export is complete.

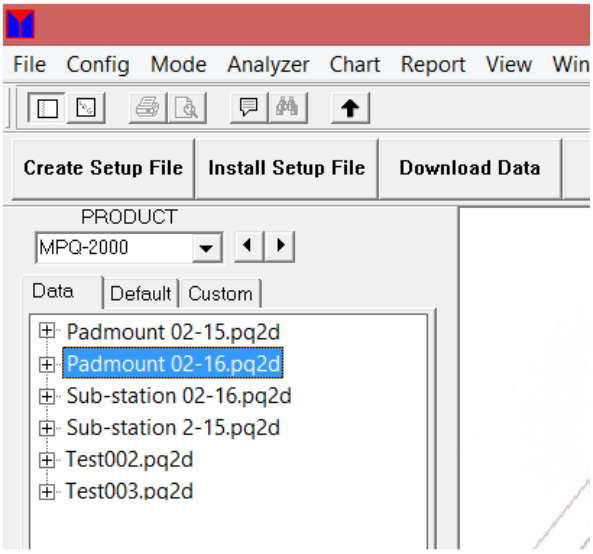


Detailed Harmonic Analysis

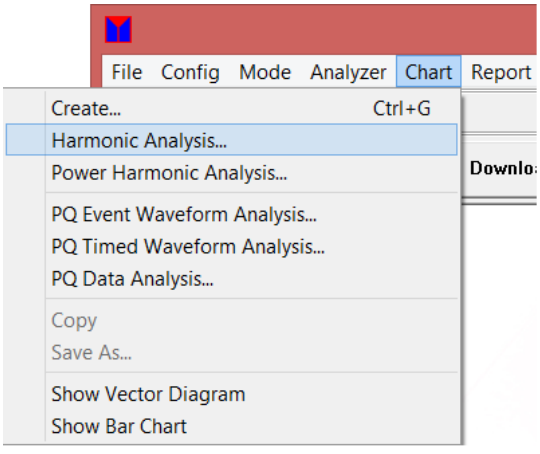
The MPQ-2000 software has the ability to create a detailed harmonic analysis of any captured waveform. This feature will analyze any single cycle through the 128th harmonic. The data will be presented as either text data or as a bar chart.

Creating a Detailed Harmonic Analysis

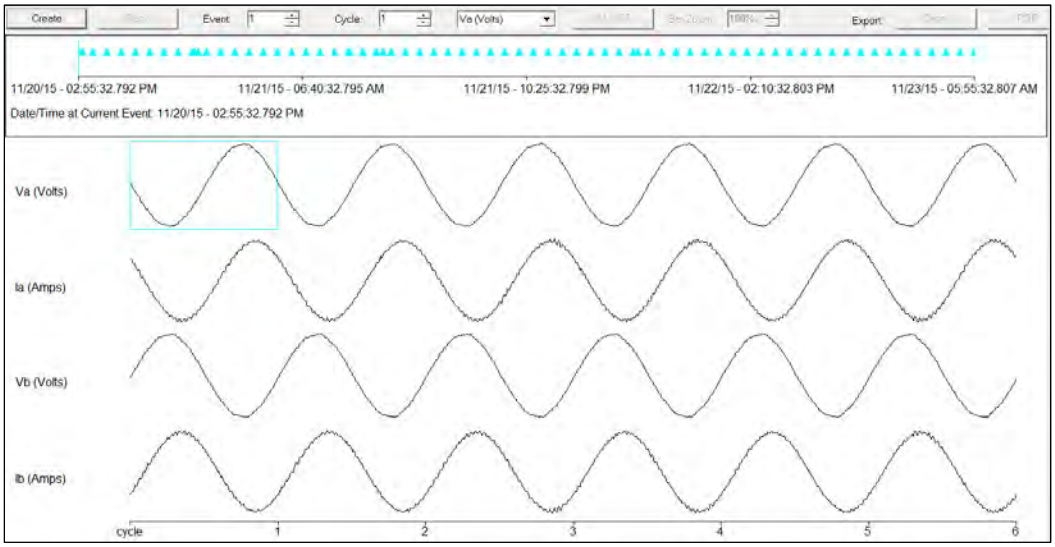
1. Select desired data file by highlighting data file in *Data File Bar*.



2. Click on CHART / HARMONIC ANALYSIS.



The following screen will open.



This screen shall support the following features.

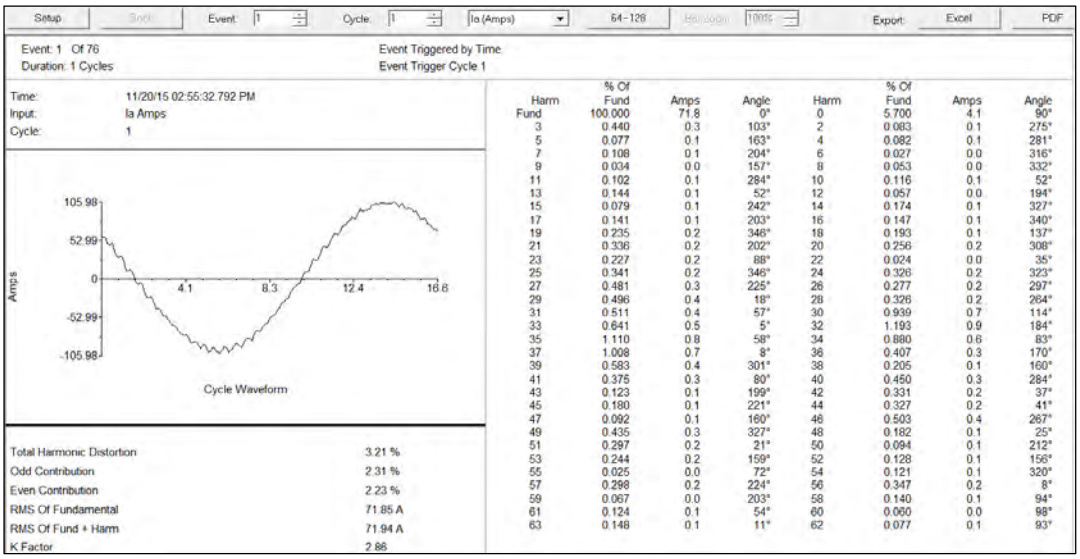
Create: When CREATE is clicked a detailed harmonic analysis shall be created for the cycle that is selected.

Event: This feature allows the use to scroll through the various recorded waveforms.

Cycle: This feature allows the user to place the select box over different cycles within the waveform capture.

Channel: This feature allows the user to place the select box over cycles of different channels within the waveform capture.

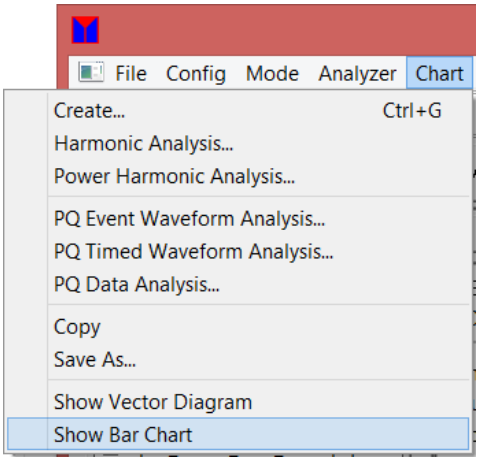
3. Select the desired cycle to be analyzed, by clicking on it.
4. Click CREATE. The following detailed harmonic analysis shall be created.



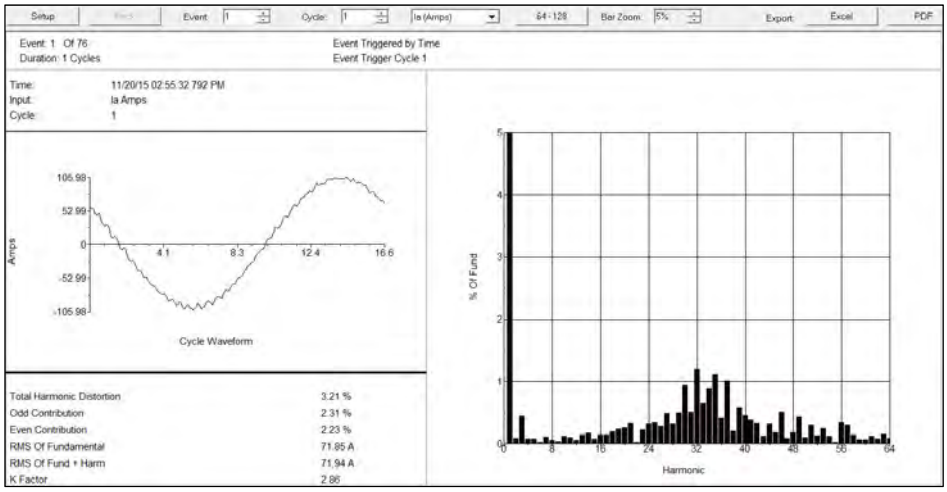
This screen shall display the amplitude of each harmonic, through the 128th as a percentage of fundamental. This screen will also display the Odd and Even contribution as well as displaying the RMS value of the fundamental without harmonics.

In order to select another cycle to be examined, click SETUP to back up one screen. Or, you can scroll through the channels and cycles using the EVENT and PHASE up / down keys.

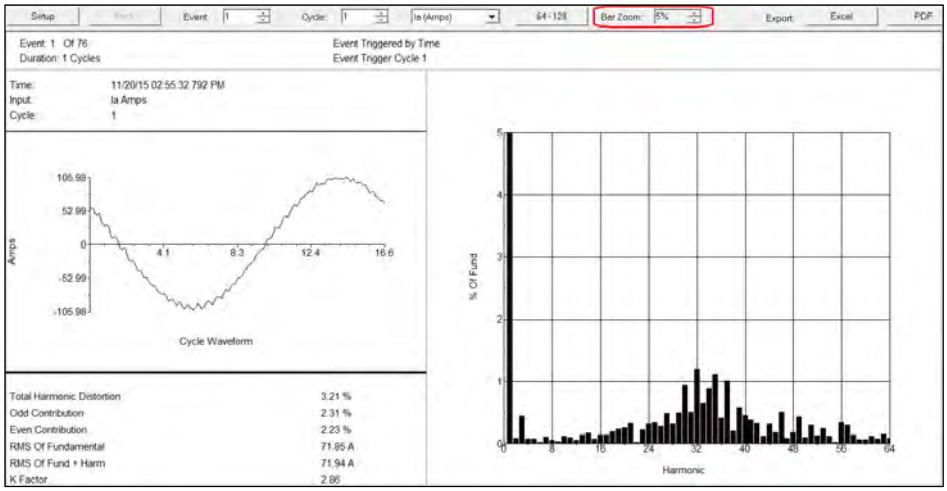
5. **Creating a BAR CHART:** In order to display a bar chart, click on CHART/SHOW BAR CHART.



The following bar chart shall be displayed.



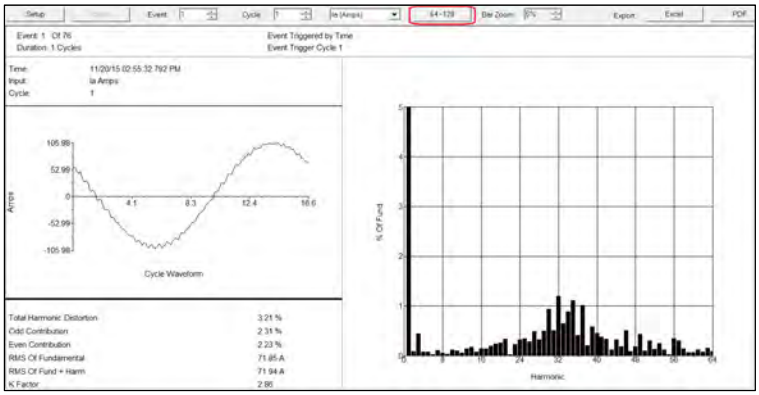
The scale of the harmonic bar chart can be adjusted using the *Bar Zoom* feature.



Viewing High Frequency Harmonics

The Megger PQ software allows you to view the harmonic up to the 128th order.

To view the 64th through 128 harmonic orders, click 64-128 button.

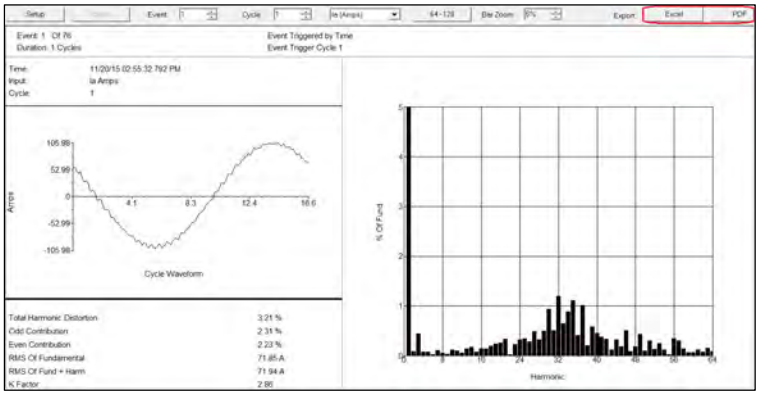


Printing Harmonic Report

The Megger PQ software allows you to export the harmonic data as either Excel data or in a PDF report.

a. To export the data to an excel file click EXCEL.

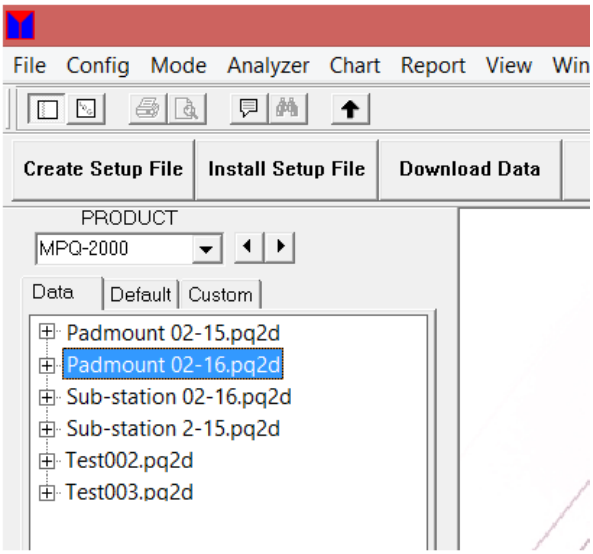
b. To export the data to a PDF file click PDF.



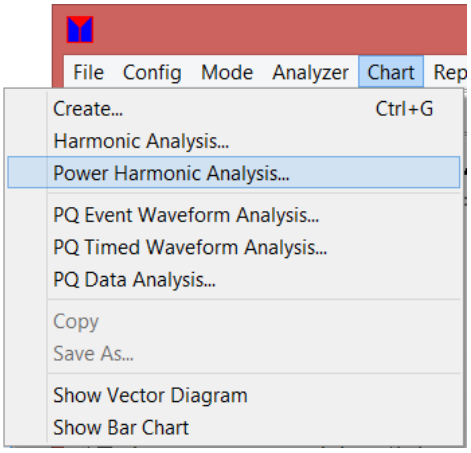
NOTE: If 0-63 is selected report will consist of only these orders.
If 64-128 is selected report will consist of all orders.

Viewing Harmonic Direction

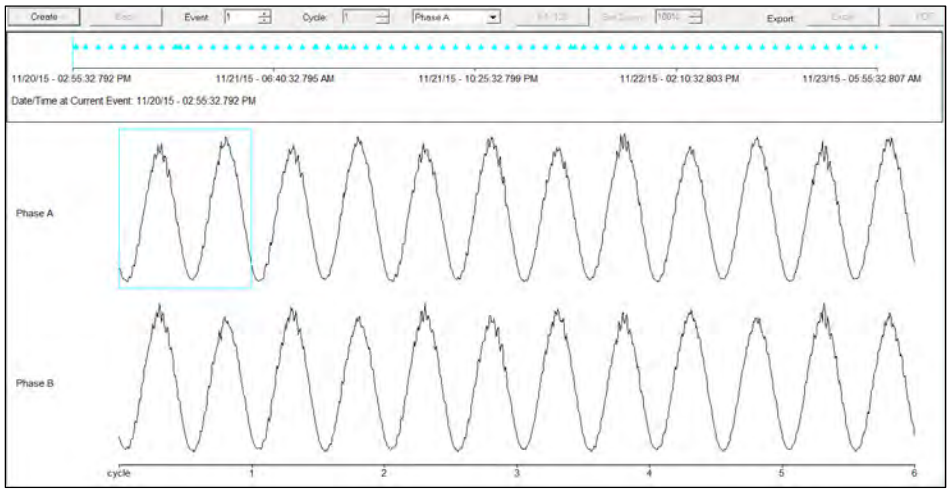
1. Select desired data file by highlighting the *data file* in *Data File Bar*.



2. Click on CHART / POWER HARMONIC ANALYSIS.



The following screen will open.



This screen shall support the following features.

Create: When this button is clicked a detailed harmonic analysis shall be created for the cycle that is selected.

> ***NOTE**: If a current cycle is <u>below</u> 10 amps then a detailed Harmonic analysis will <u>not</u> be available.*

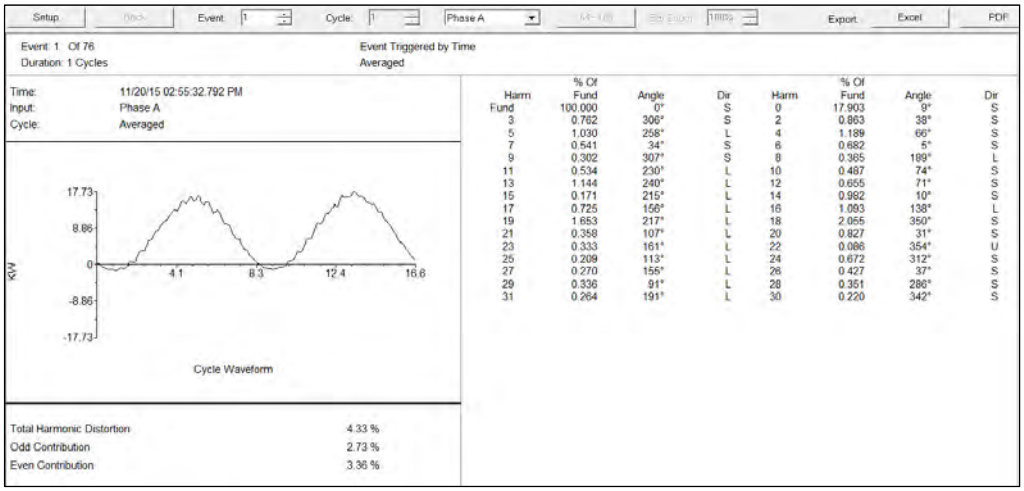
Event: This feature allows the use to scroll through the various recorded waveforms.

Cycle: This feature allows the user to place the select box over different cycles within the waveform capture.

Channel: This feature allows the user to place the select box over cycles of different channels within the waveform capture.

3. Select the desired cycle to be analyzed, by clicking on it.
4. Click CREATE.

The following detailed power harmonic analysis shall be created, with harmonic directions.

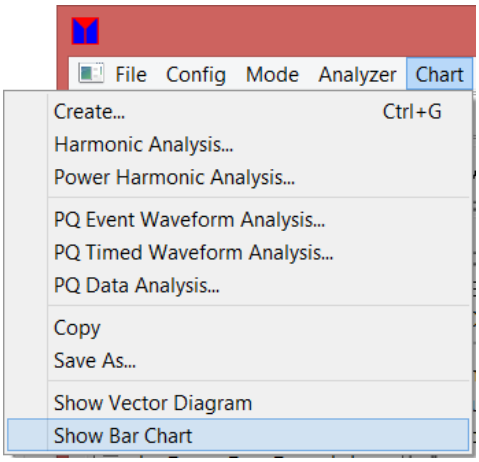


S = Source, L = Load and U = Undefined (Too small to determine)

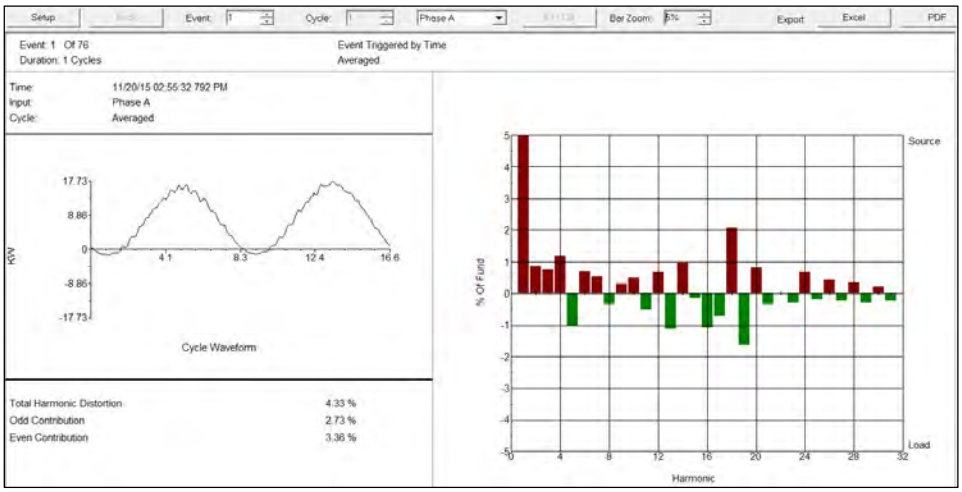
This screen shall display the amplitude of each harmonic, through the 31st as a percentage of fundamental. This screen shall also display the Odd and Even contribution as well as displaying the RMS value of the fundamental without harmonics.

In order to select another cycle to be examined, click on SETUP to back up one screen. Or you can scroll through the channels and cycles using the EVENT and PHASE up / down keys.

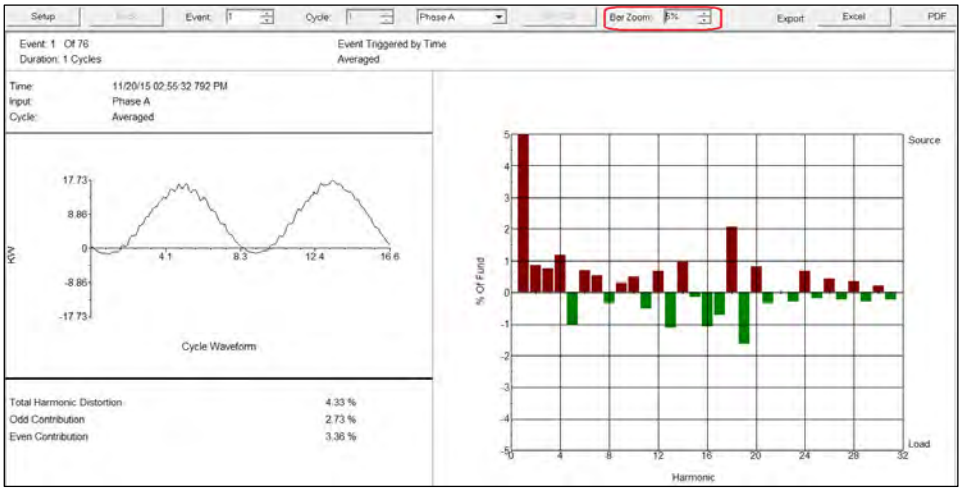
5. **Creating a BAR CHART:** In order to display a bar chart click on CHART / SHOW BAR CHART.



The following bar chart shall be displayed.

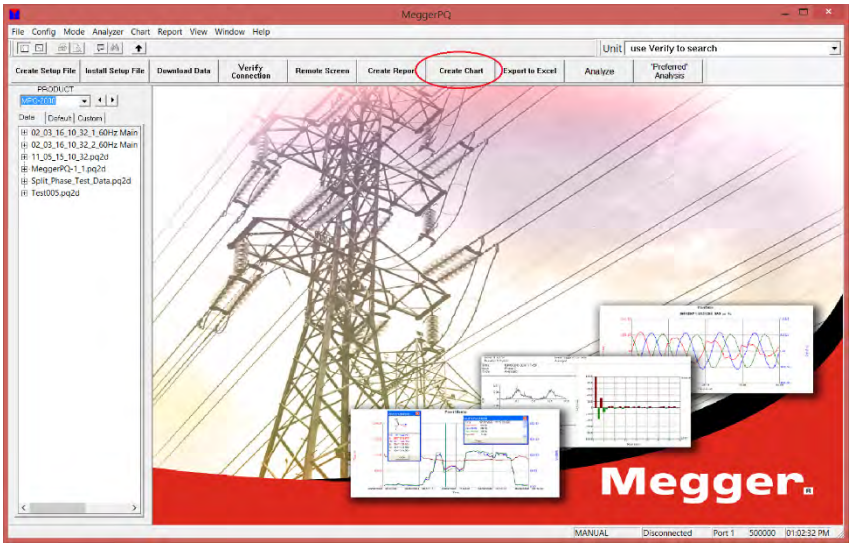


The scale of the harmonic bar chart can be adjusted using the Bar Zoom feature.

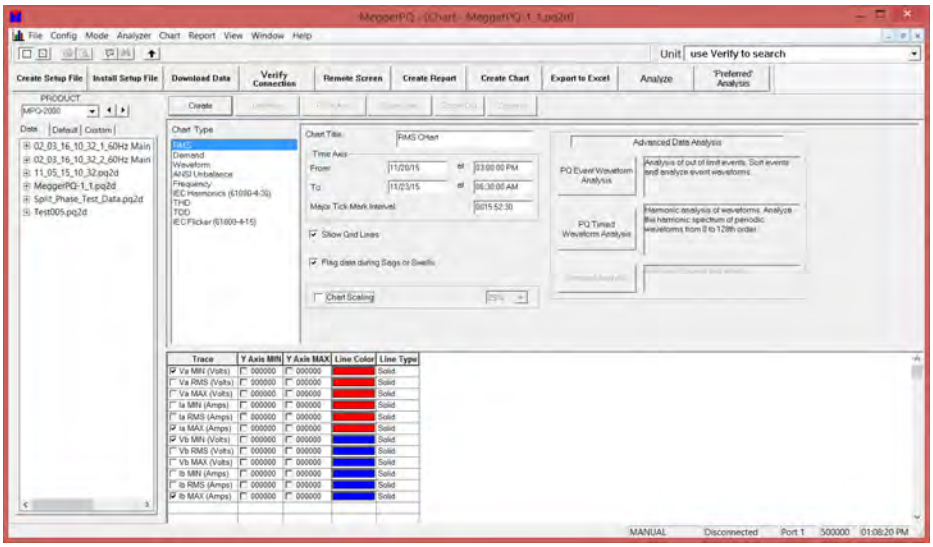


PQ Event Waveform Analysis Screen

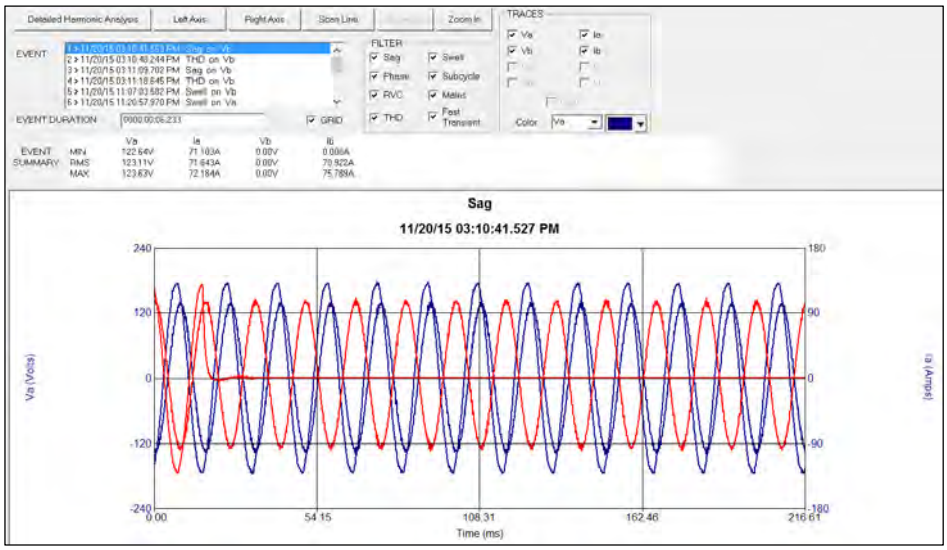
1. Select desired data file by highlighting *data file* in *Data File Bar* and then click CREATE CHART.



The following screen will open.



2. Click on the *PQ Event Waveform Analysis* and the following screen shall open.



This screen shall support the following features.

Left Axis: When this button is clicked the Y axis label and scaling, on the left side of the chart will cycle through the traces displayed on the chart.

Right Axis: When this button is clicked the Y axis label and scaling, on the right side of the chart will cycle through the traces displayed on the chart

Scan Line: This button will enable and disable the scan line on the chart.

Zoom Out: This button will Zoom out of any Zoomed in views on the chart.

Zoom In: This button will Zoom In on the traces of the chart.

Event: This window will display all the events recorded in the test interval.

Filter: The filter will allow to user to only view the selected event types in the Event Window.

Traces: Allows the operator to select the desired channels that will be viewed in the advanced analysis chart.

Color: Allows the operator to select the colors of the various traces in the advanced analysis chart.

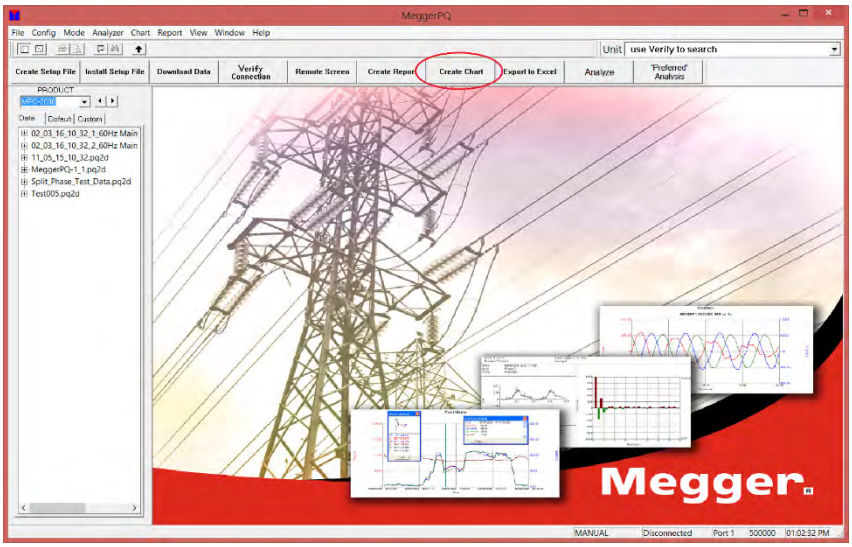
Event Duration: Displays the duration of the event selected in the Event Window.

Event Summary:	Displays the event data of the event selected in the Event Window.
Grid:	Allows the operator to turn on and off the grid lines in the advanced analysis chart.

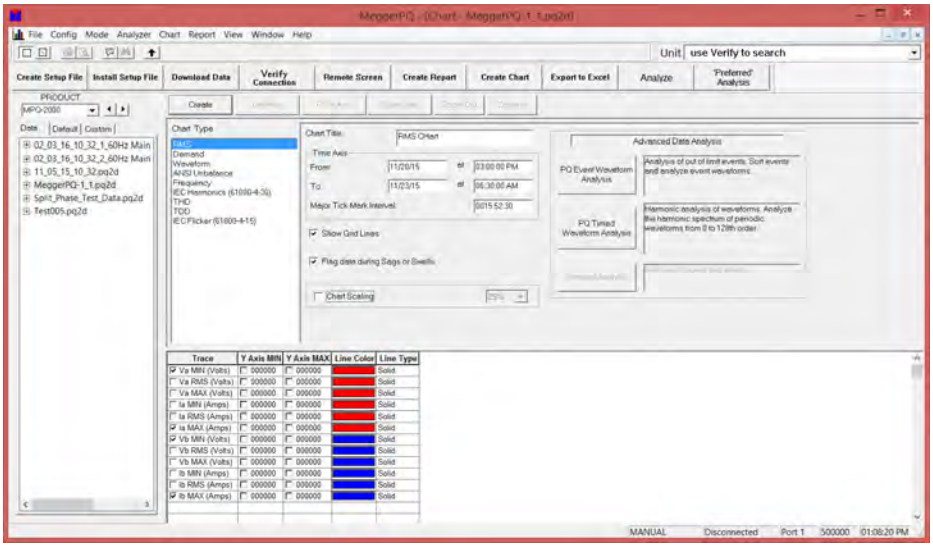
Timed Waveform Analysis Screen

This feature allows the operator to analyze timed waveform captures. The software will average together the waveform cycles and then calculate the individual harmonic orders. This screen will trend the individual harmonic orders, display the raw waveforms and show a detailed harmonic bar chart of the selected waveform.

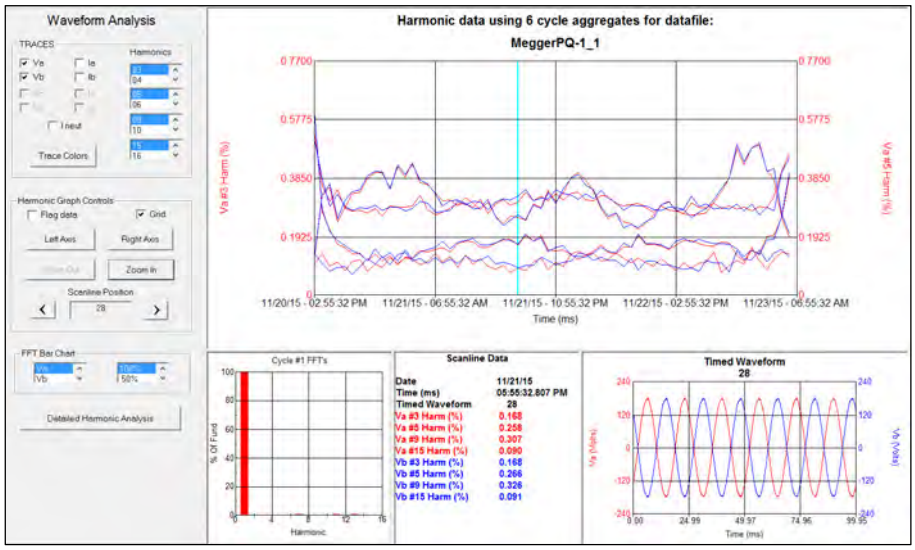
1. Select desired data file by highlighting *data file* in *Data File Bar* and then click CREATE CHART.



The following screen will open.



2. Click *PQ Timed Waveform Analysis* and the following screen shall open.



This screen shall support the following features.

Left Axis: When this button is clicked the Y axis label and scaling, on the left side of the chart will cycle through the traces displayed on the chart.

Right Axis: When this button is clicked the Y axis label and scaling, on the right side of the chart will cycle through the traces displayed on the chart.

Scan Line: This button will enable and disable the scan line on the chart.

Zoom Out: This button will Zoom out of any Zoomed in views on the chart.

Zoom In:	This button will Zoom In on the traces of the chart.
Harmonics:	Allows the operator to select the harmonics to be viewed in the trended harmonic chart.
Waveform Event:	This window will display the waveform event being analyzed.
Traces:	Allows the operator to select the desired channels that will be viewed in the advanced analysis chart.
Color:	Allows the operator to select the colors of the various traces in the advanced analysis chart
FFT Bar Chart:	Allows the operator to select the channel to be viewed in the bar chart. In addition it allows the operator zoom in and out of the bar chart.
Detailed Harmonic Analysis:	Short cut key that allows the operator to view the waveform being analyzed in the detailed harmonic screen.
Grid:	Allows the operator to turn on and off the grid lines in the advanced analysis chart.
Trace Colors:	This selection allows the user to select the trace colors for each phase.

9

Creating Reports

The MPQ-2000 software allows the user to view recorded data as either text reports, or in chart format. This section of the manual will describe the various software features available for reports.

Report Types

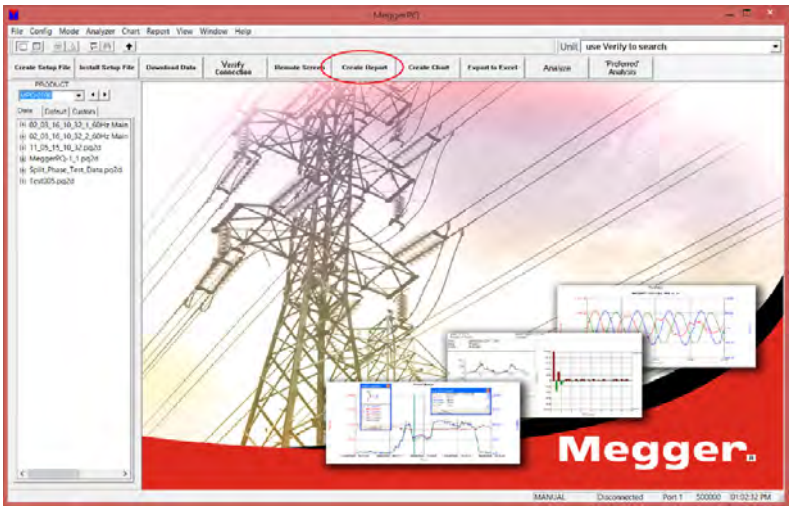
The software allows you to create the following type of charts, provided the data is available. (See Table 2.0 for descriptions)

- Tabular: V/I Data (RMS Voltage and Currents)
- Phase to Phase Voltage
- Tabular Demand Data (KW, KVAR, KVA and PF)
- Out Of Limits: Brief
- Out Of Limits: Detailed
- Summary and Setup
- Exceedance: V/I Data
- Exceedance: Demand Report
- Weekly Energy
- Total Demand
- THD Waveform Analysis
- IEC Unbalance
- Total Harmonic Distortion
- EN50160

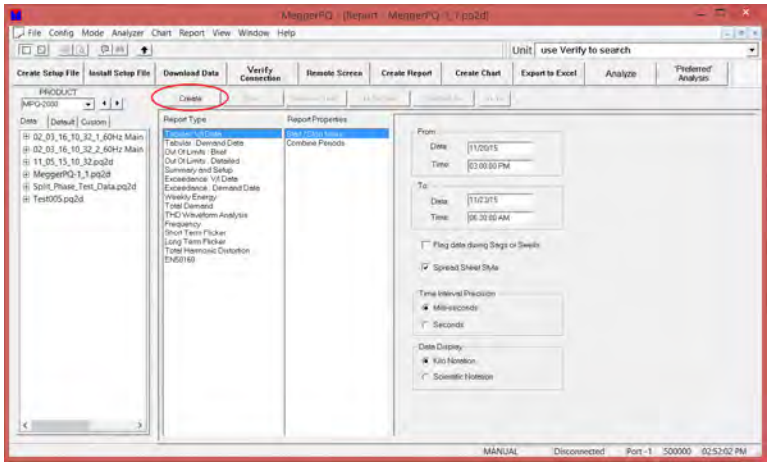
Table 2.0	
RMS Tabular Data	This report will display the values of each channel for every recorded interval.
Phase to Phase Voltage	When phase to neutral data is recorded the software will calculate and plot the phase to phase voltage based on the phase to neutral voltage.
Total Demand Data	This report will display the power values (KW, KVAR, KVA and PF) for the total of all phases.
Out Of Limits: Brief	This report will display the out of limits or “event” data. Only the channel that triggered the out of limits event shall be displayed.
Out Of Limits: Detailed	This report will display the out of limits or “event” data. The state of all the channel at the time of the event shall be displayed.
Summary and Setup Report	This report will display the overall totals for the test. This report will also display the setup of the MPQ-2000.
Exceedance: V/I Data	This report displays the values of each channel for every interval that is either higher or lower than the limits programmed in the report setup.
Exceedance: Demand Report	This report displays the power values of each phase of every interval that is either higher or lower than the limits programmed in the report setup.
Weekly Energy	This report breaks will display the selected energy parameter aggregated over 60 minute intervals for a period of 1 week.
Total Demand	This report will display the sum total of all the power and energy parameters recorded.
THD Waveform Analysis	This report will display the calculated Total Harmonic Distortion for the first cycle of each timed waveform captured.
IEC Unbalance	This report will display the unbalance between the channels based on the IEC61000-4-27 standards. To view ANSII unbalance open the “Tabular: V/I Data” report.
Total Harmonic Distortion	This report will display the recorded IEC Total Harmonic Distortion recorded over the test interval.
EN50160	This report will report if the recorded values passed or failed the EN50160 requirements. NOTE: If the recorded parameters are not configured for the proper aggregation as required by the EN50160 standard then this shall be indicated in the report.

Creating a Report

1. Select desired data file by highlighting *data file* in *Data File Bar* and then click CREATE REPORT.



2. The following window shall open. Select the desired report and any desired selections and then click CREATE.

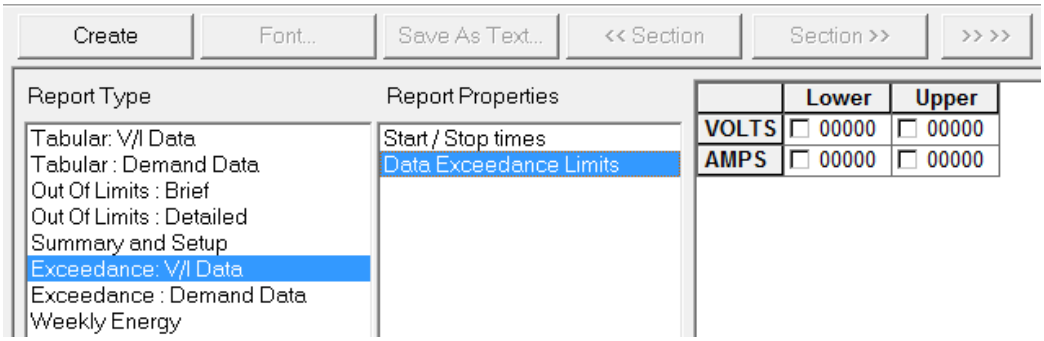


From – To:	Allows the user to select the start date and time and the end date and time of the report.
Spread Sheet Style:	Displays the data in a spread sheet format
Time Interval Precision:	Allows the user to set the precision of the time of each interval to either seconds or milliseconds.
Display Data Notation:	Allows the user to select whether the data should be viewed in Kilo Notation or Scientific Notation.
Combine Periods:	This feature allows the user to average together multiple intervals in order to create a smaller report.

Exceedance Reports

There are two types of Exceedance Reports that can be selected, using the MPQ-2000 software, Exceedance: V/I Data *or* Exceedance: Demand Data. Both of these reports allow the user to input limits. Only the intervals that exceed these limits shall be displayed.

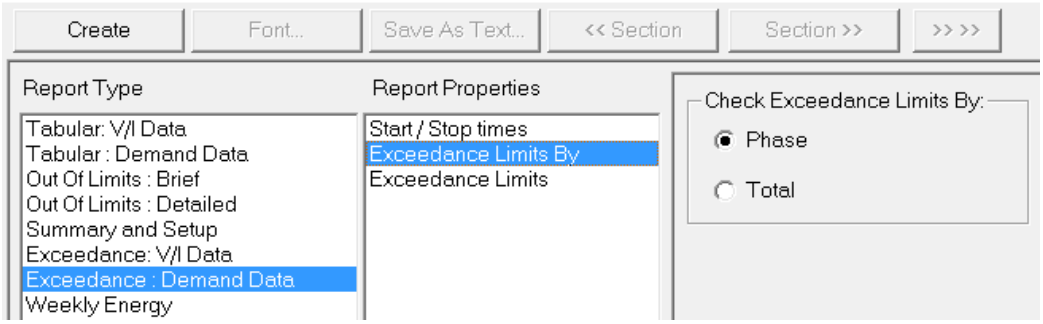
Exceedance: V/I Data



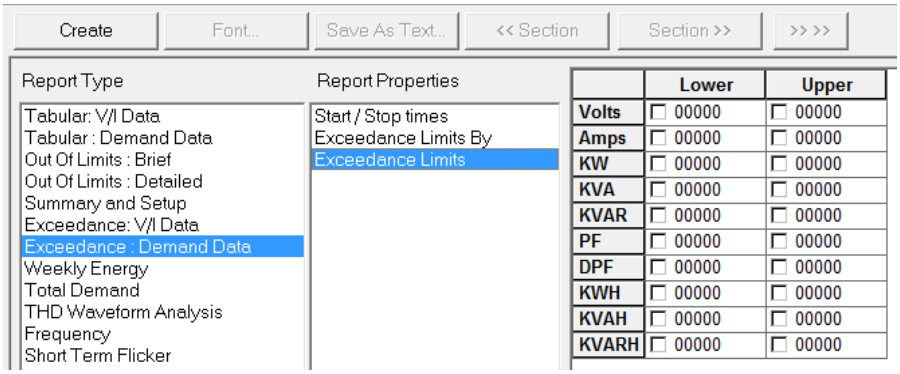
Sag: If the Sag box next to a desired channel is selected and a limit input then the software will only display intervals below this limit, in the report.

Swell: If the Swell box next to a desired channel is selected and a limit input then the software will only display intervals above this limit, in the report.

Exceedance: Demand Data



Check Exceedance Limit By: This feature allows the user to compare lower and / or upper limits to either the power measurements of each individual phase or the power measurements of the total of all phases.

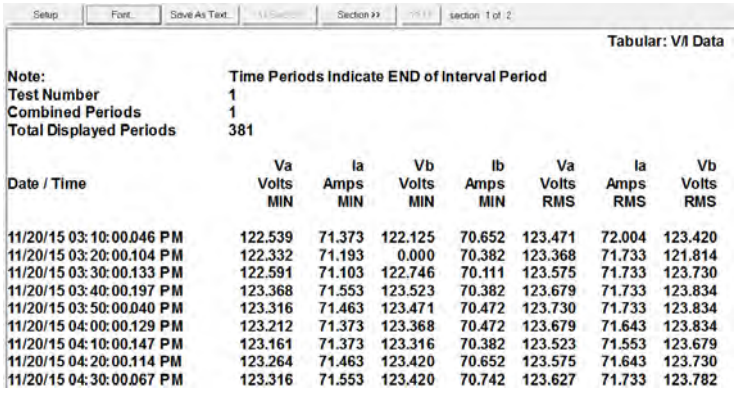


Sag: If the Sag box next to a desired measurement is selected and a limit input then the software will only display intervals below this limit, in the report.

Swell: If the Swell box next to a desired measurement is selected and a limit input then the software will only display intervals above this limit, in the report.

Report Options

After a report is created the user has several options for viewing and saving the data.



Tabular: V/I Data

Note: Time Periods Indicate END of Interval Period
Test Number 1
Combined Periods 1
Total Displayed Periods 381

Date / Time	Va Volts MIN	Ia Amps MIN	Vb Volts MIN	Ib Amps MIN	Va Volts RMS	Ia Amps RMS	Vb Volts RMS
11/20/15 03:10:00.046 PM	122.539	71.373	122.125	70.652	123.471	72.004	123.420
11/20/15 03:20:00.104 PM	122.332	71.193	0.000	70.382	123.368	71.733	121.814
11/20/15 03:30:00.133 PM	122.591	71.103	122.746	70.111	123.575	71.733	123.730
11/20/15 03:40:00.197 PM	123.368	71.553	123.523	70.382	123.679	71.733	123.834
11/20/15 03:50:00.040 PM	123.316	71.463	123.471	70.472	123.730	71.733	123.834
11/20/15 04:00:00.129 PM	123.212	71.373	123.368	70.472	123.679	71.643	123.834
11/20/15 04:10:00.147 PM	123.161	71.373	123.316	70.382	123.523	71.553	123.679
11/20/15 04:20:00.114 PM	123.264	71.463	123.420	70.652	123.575	71.643	123.730
11/20/15 04:30:00.067 PM	123.316	71.553	123.420	70.742	123.627	71.733	123.782

Setup: By clicking SETUP the user can back up one screen to create a new report.

Font: This option allows the user to change the font type and size of each report.

Save as Text: This option allows the user to save the report as a text file.

>>Section: Each report is created in sections. This button allows you to move forward to the next section.

Section <<: Each report is created in sections. This button allows you to move backwards to the last section.

>>>>: Each report is created in sections. This button allows you to move forward to the last set of sections.

PQ Data Analysis Screen

This software will compare the recorded data file to a set of predefined limits. The results will then be display in a bar chart format.

The software allows the operator to create a series of *Data Analysis Templates*.

These *Data Analysis Templates* can be used to analyze the data in the Megger PQ software or they can be uploaded to the MPQ unit.

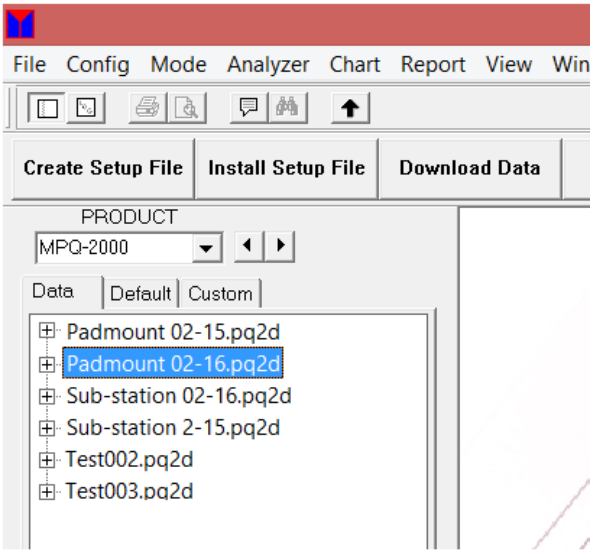
If the data analysis is uploaded to the MPQ unit then the data analysis can be performed on the unit.

The data analysis operates by comparing each interval of data to a set of predefined limits. That data interval is either within or outside the limits. A running tally is maintained. At the end of the analysis the software determines the percentage of time the data intervals were within the user defined limits and reports this. The operator can set two sets of limits. One set of limits defines a narrow band of time while the other set of limits defines a wide band of time.

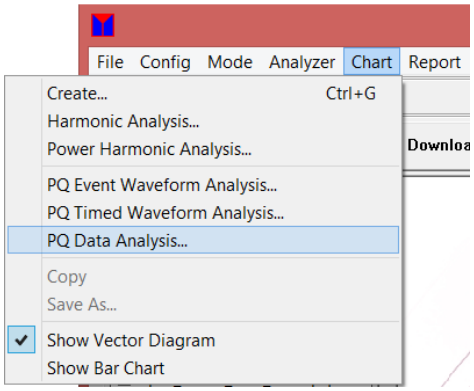
For example, one could analyze the voltage by saying it must be within 5% of nominal for 95% of the time and must be within 10% of nominal for 100% of the time.

Selecting a Template

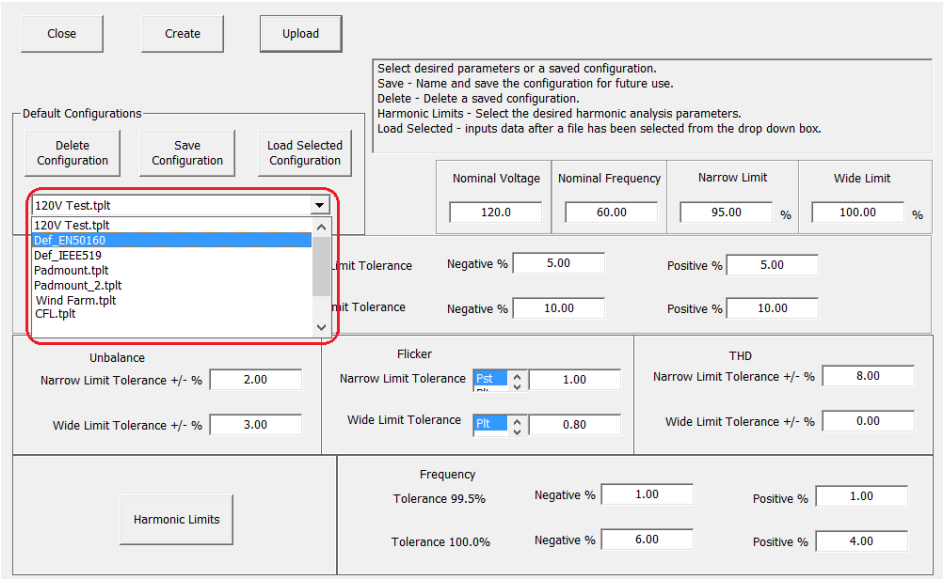
1. Select the desired data file by highlighting *data file* in *Data File Bar*.



2. Click CHART then PQ DATA ANALYSIS to open *Data Analysis* screen.



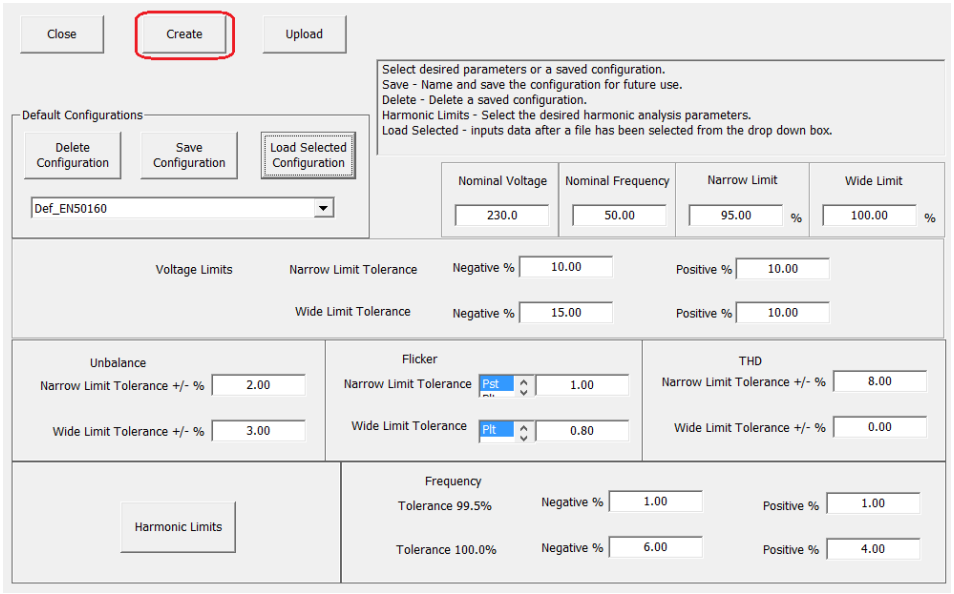
3. Select the desired template from the drop down menu in the *Default Configurations* field.



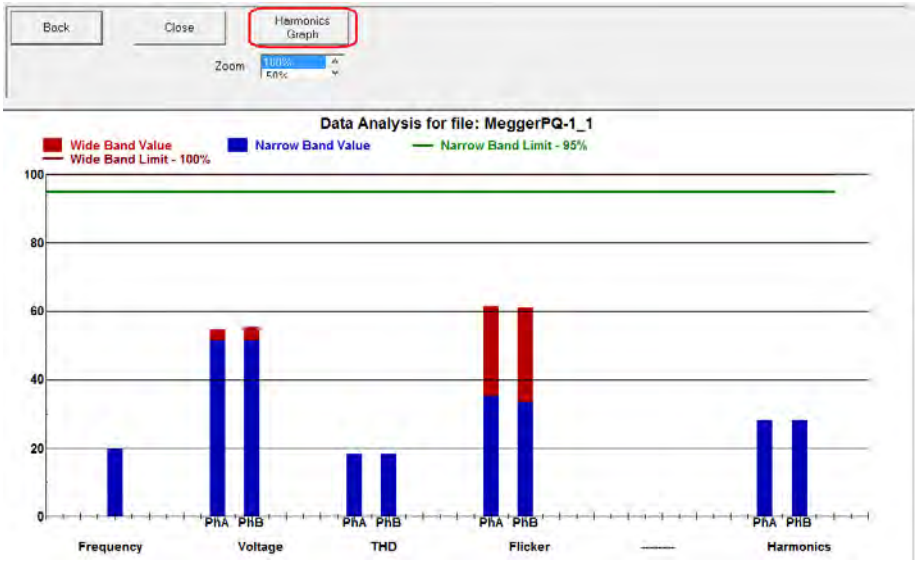
4. Click LOAD SELECTED CONFIGURATION.

Performing a Data Analysis on the PC

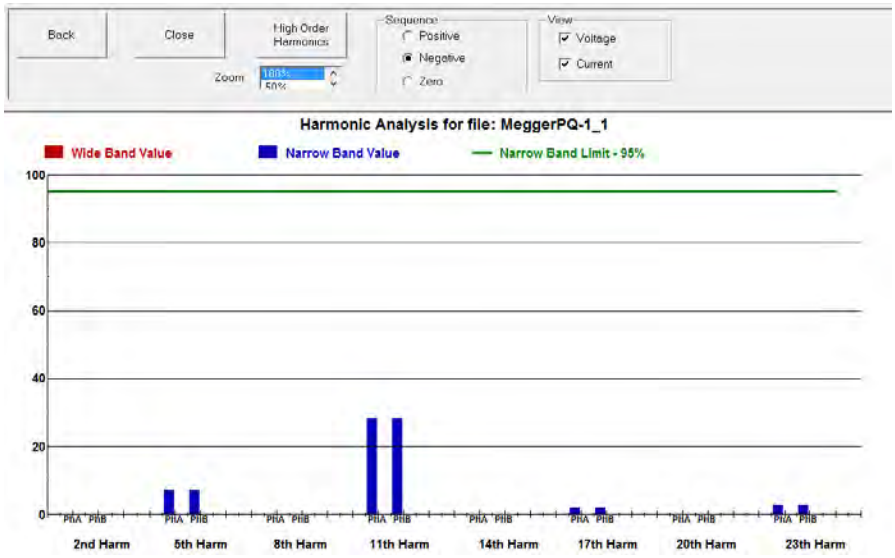
1. Once the desired template is selected click CREATE. The main data analysis shall now commence.



2. To view a harmonic data analysis click HARMONIC GRAPH. This graph will allow you to view *Positive Sequence Harmonics*, *Negative Sequence Harmonics* as well as *Zero Sequence Harmonics.*

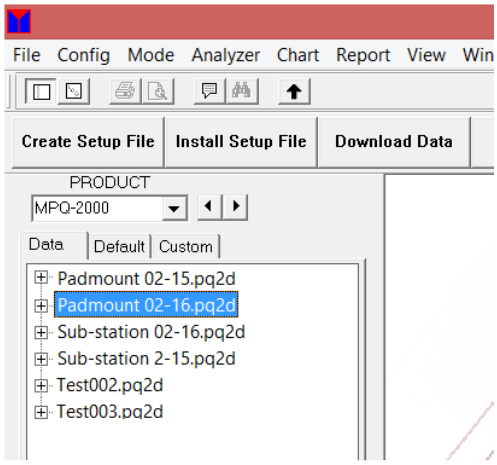


3. To perform a data analysis on the higher order harmonics click HIGH ORDER HARMONICS.

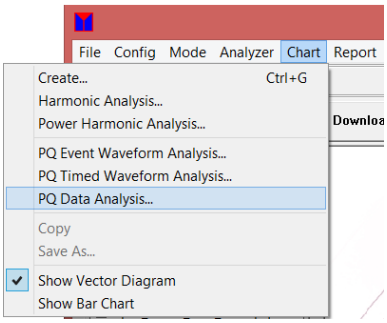


Creating a New Template

1. Select the desired data file by highlighting *data file* in *Data File Bar.*



2. Click CHART then PQ DATA ANALYSIS to open *Data Analysis* screen.



3. Make the desired selection in each field of the data analysis template, as defined in Table 3.0.

Table 3.0

Nominal Voltage	Enter the nominal voltage. This value shall be used as a reference for the data analysis calculations.
Nominal Frequency	Enter the nominal frequency. This value shall be used as a reference for the data analysis calculations.
Narrow Limit	Enter the percentage of time (0 to 100%) that the recorded data must remain within the user defined narrow tolerance limits.

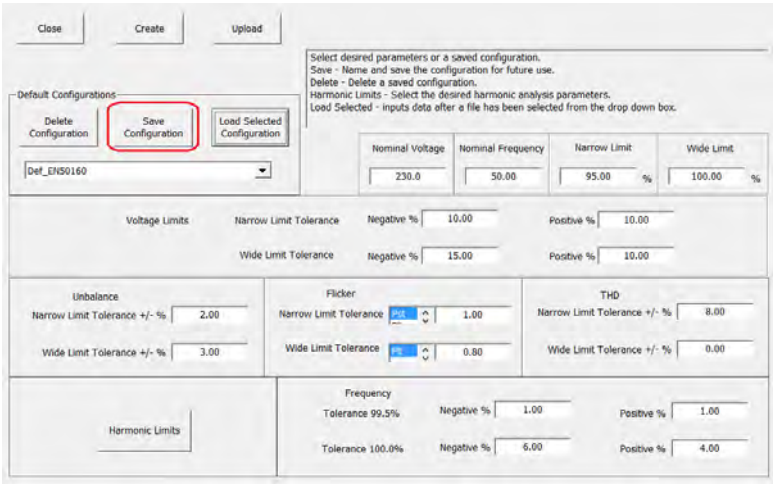
Wide Limit	Enter the percentage of time (0 to 100%) that the recorded data must remain within the user defined wide tolerance limits.
Voltage Limits: Narrow Limit: Negative	Enter the negative voltage limit to be used for the narrow tolerance.
Voltage Limits: Narrow Limit: Positive	Enter the positive voltage limit to be used for the narrow tolerance.
Voltage Limits: Wide Limit: Negative	Enter the negative voltage limit to be used for the wide tolerance.
Voltage Limits: Wide Limit: Positive	Enter the positive voltage limit to be used for the wide tolerance.
Unbalance: Narrow Limit Tolerance	Enter the unbalance limit to be used for the narrow tolerance.
Unbalance: Wide Limit Tolerance	Enter the unbalance limit to be used for the wide tolerance.
Flicker: Narrow Limit Tolerance	Enter the flicker limit to be used for the narrow tolerance.
Flicker: Wide Limit Tolerance	Enter the flicker limit to be used for the wide tolerance.
THD: Narrow Limit Tolerance	Enter the THD limit to be used for the narrow tolerance.
THD: Wide Limit Tolerance	Enter the THD limit to be used for the wide tolerance.
Frequency: Tolerance 99.5%: Negative	Enter the negative frequency limit to be used for the 99.5% tolerance.
Frequency: Tolerance 99.5%: Positive	Enter the positive frequency limit to be used for the 99.5% tolerance.
Frequency: Tolerance 100%: Negative	Enter the negative frequency limit to be used for the 100% tolerance.
Frequency: Tolerance 100%: Positive	Enter the positive frequency limit to be used for the 100% tolerance.
Note: To disable a field set the value to zero.	

4. To set harmonic limits click HARMONIC LIMITS.

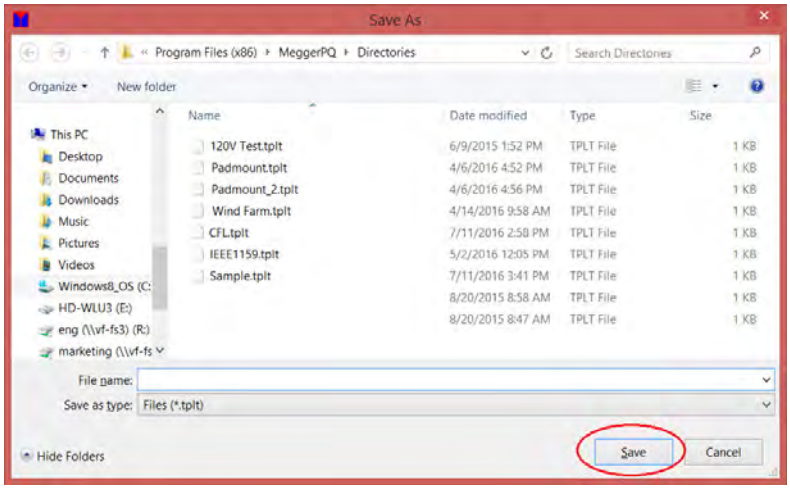
5. Make the desired selection in each field of the harmonic limits template, as defined in Table 4.0. When complete click OK to return to the *Main Template* page.

Table 4.0	
Voltage Analysis	Click the box to enable the voltage harmonic analysis.
Current Analysis	Click the box to enable the current harmonic analysis.
High Frequency Harmonics	Click the box to enable the high frequency harmonic analysis above the 25th order.
HF Limit	Enter the limit for the harmonic above the 25th order. This is set as a percentage of the fundamental.
Must be in tolerance for below percentage of time.	Enter the percentage of time that the harmonics must be within their defined limits.
Voltage Harmonic Limit	Enter the limit for the voltage harmonic orders. This is set as a percentage of the fundamental.
Current Harmonic Limit	Enter the limit for the current harmonic orders. This is set as a percentage of the fundamental.

6. Save the template by clicking SAVE CONFIGURATION. A *Save As* window will open.



7. Input the desired template name and the click SAVE. The template will now appear in the drop down menu in the *Default Configurations* field.

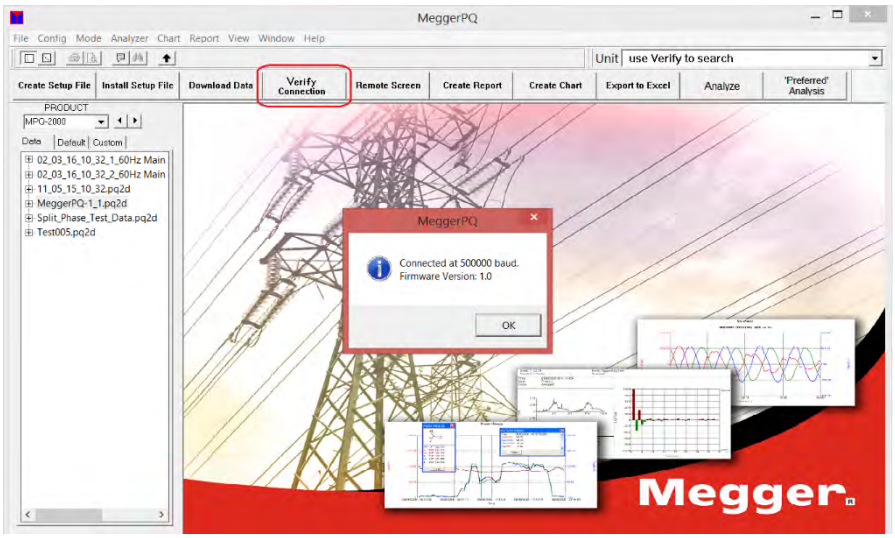


Uploading a Template to the MPQ Unit

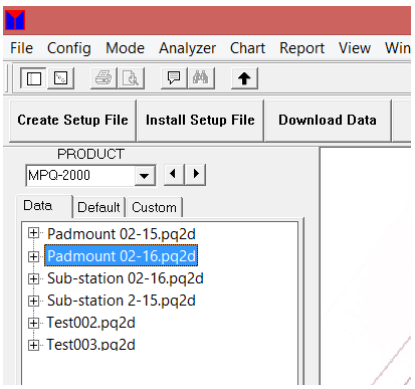
1. Connect the MPQ unit to the PC.

   a. Set the COM port.

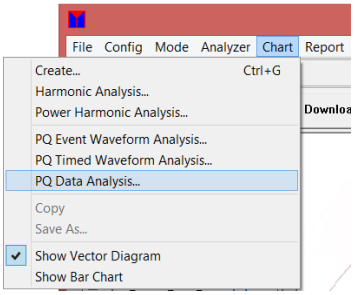
   b. Verify communications with the MPQ unit, by clicking on the VERIFY CONNECTION.



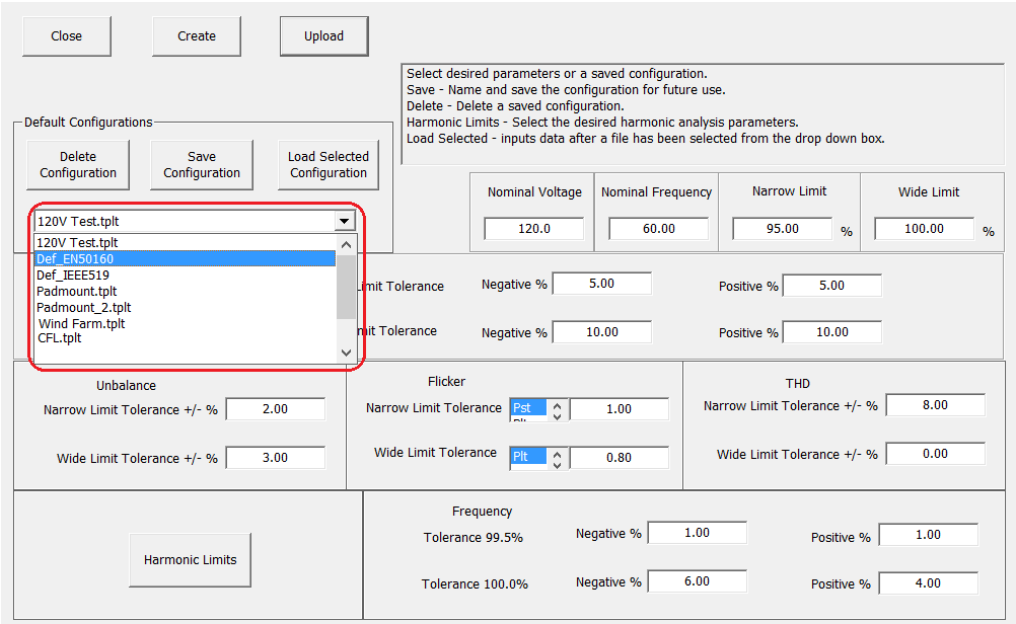
2. Click on any data file by highlighting *data file* in *Data File Bar*. This enables the data analysis screen.



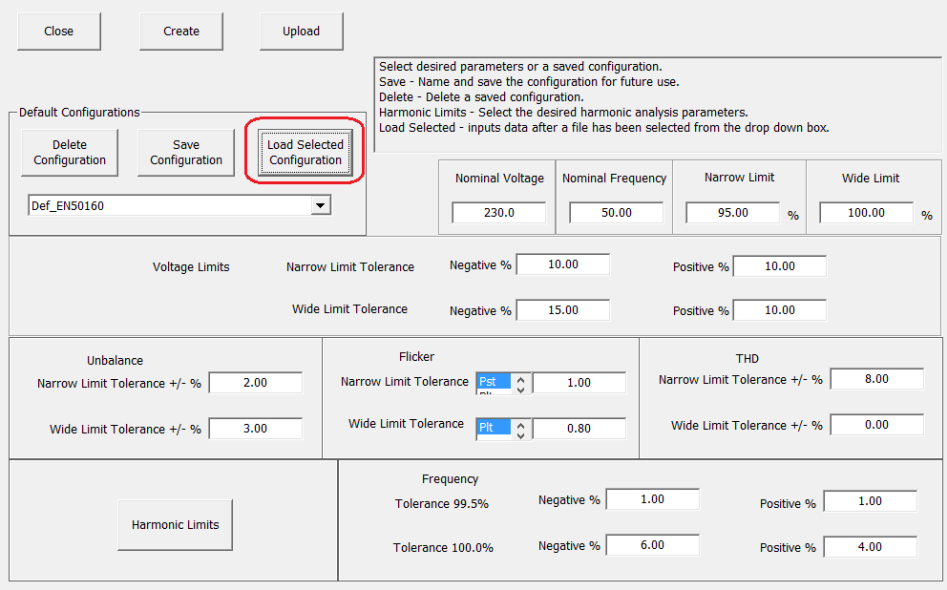
3. Click CHART then PQ DATA ANALYSIS to open *Data Analysis* screen.



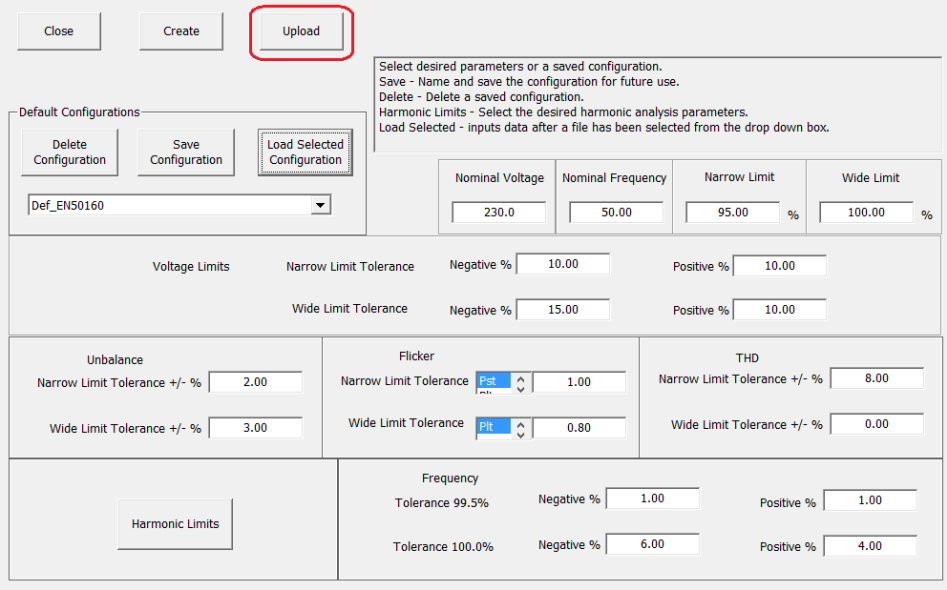
4. Select the desired template from the drop down menu in the *Default Configurations* field.



5. Click on LOAD SELECTED CONFIGURATION.



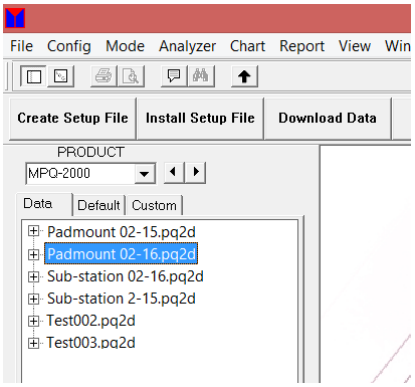
6. Click UPLOAD. The template will now upload to the unit.



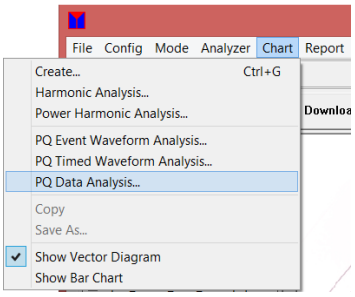
7. When complete disconnect unit from PC.

Deleting a Template

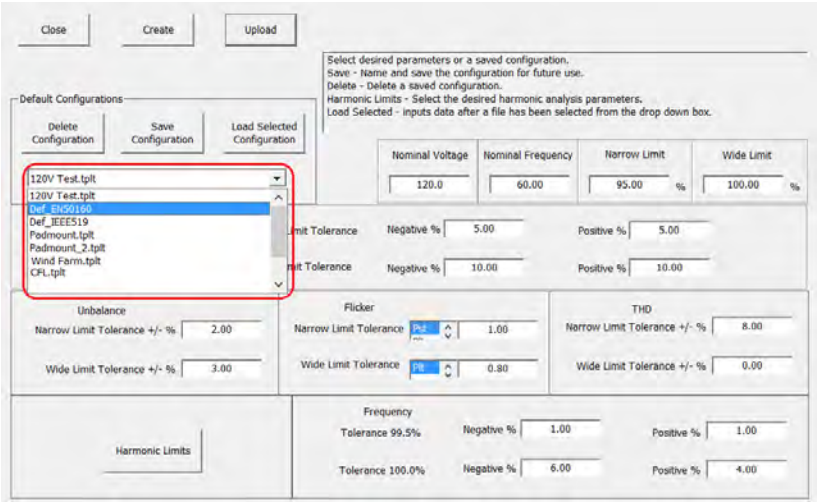
1. Select the desired data file by highlighting the data file in *Data File Bar*.



2. Click on CHART then on PQ DATA ANALYSIS to open *Data Analysis* screen.



3. Select the desired template from the drop down menu in the *Default Configurations* field.



4. Click DELETE CONFIGURATION. The template will now be deleted.