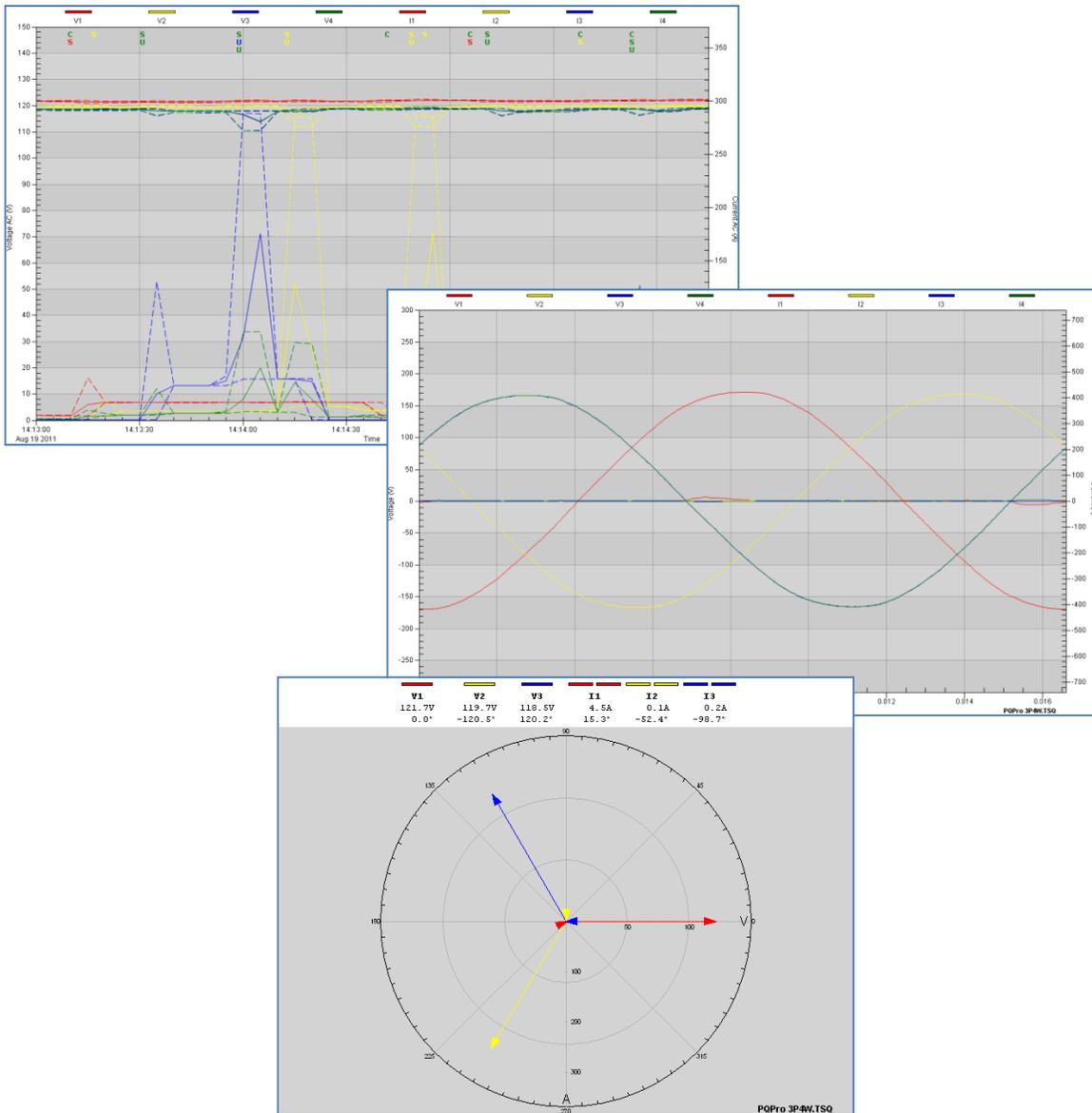


PV II™ for the PQPro™

Data Analysis Software

User's Guide



PV II™ User's Guide

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Table of Contents

- Introduction1
- File Open2
- Page Types.....3
 - Trend..... 4
 - WaveForm 7
 - Vector Page 9
- Graph Play Buttons10
- Data Export.....11
- Preferences13
- Generating a Report14
- Demand and Cost Setup15
- Bluetooth Communication16
 - Status Page 16
 - Meter Page 19
- Notes20

Introduction

PV II™ is the second generation of electrical power data analysis software. It is a totally new application that builds on the knowledge gained from developing the original PowerView software. **PV II™** supports all of Elcomponent's 'Rugged Reliable and Weatherproof' data recorders. Not all features are supported by all the instruments and some features of **PV II™** may only be available for data files from specific instrument models.

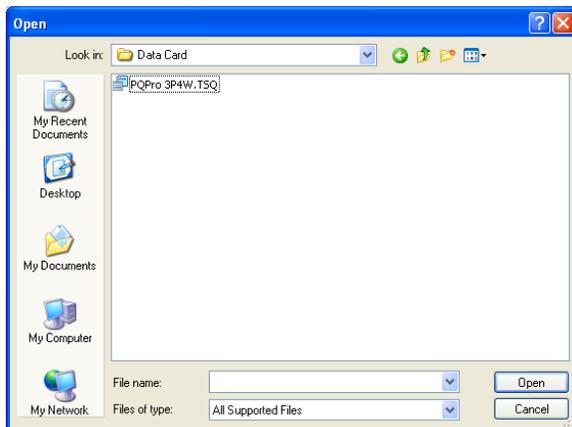
This manual is specific for **PV II™** with data files from the **PQPro™**. **PV II™** has been designed to be easy and intuitive to use.

File Open

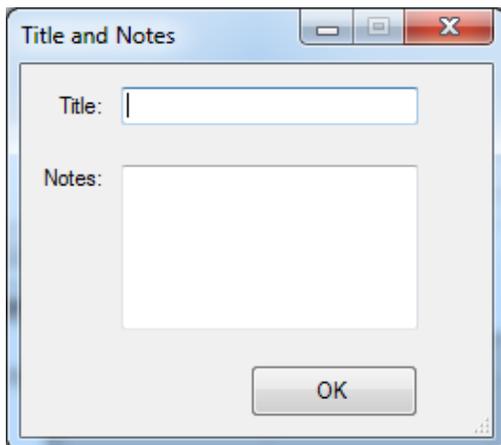
All **PQPro™** data files will have the extension .TSQ. The .TSQ files that are written by the **PQPro™** on to a memory card will be 409M in size independent on the amount of data stored. When the software reads the data file on the memory card it processes the data and then writes it to a new file keeping the .TSQ extension. The processed file will, in many cases, be smaller than the original file

For the purpose of this section the file PQPro 3P4W.TSQ is used. In the supplied USB memory stick, you can find this file under the folder “Data Files \ Data Card” or “Data Files \ Processed”.

As an example, let’s open the data file (before it was processed). On the top tool bar select “File” and “Open”. Then select the drive letter of the USB memory stick, and open “Data Files \ Data Card \ PQPro 3P4W.TSQ”.



After this file has been processed you will be prompted to save the processed file. **PVII™** will automatically keep the same name with the addition of a “p” to indicate it is processed. You may change the name and folder if desired. After clicking “Save” you will be prompted to enter a title and notes to describe the file such as logger settings, location, etc.



When this information has been entered, click “OK”. The RMS voltage and current trend graphs are displayed by default when the data file is first opened.

Page Types

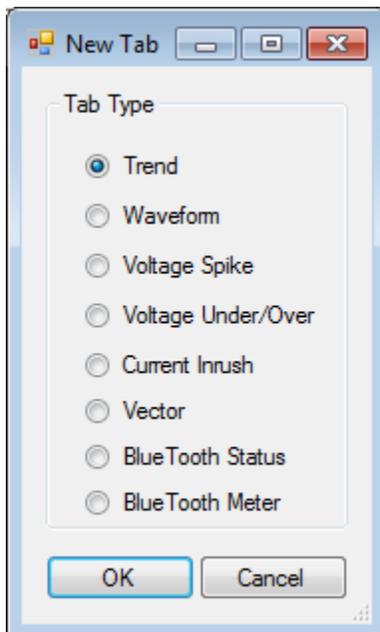


Standard **PQPro**™ data files have eight different types of display pages available:

- Trend
- Waveforms
- Voltage Spike
- Current Inrush
- Voltage Over/Under
- Vector
- Bluetooth Status
- Bluetooth Meter

For continuous **PQPro**™ data files where every cycle on all channels is recorded the pages Voltage Spike, Current Inrush and Voltage Sag/Swell will not be available.

If a page tab is not displayed but is available it can be opened by clicking on the “ * “ tab and selecting the desired page:



Each page can be configured individually. Configuration includes quantities that are graphed, which traces of the different quantities are displayed, the colours and line style of the traces, scaling of the axis and other features. The user can switch back and forth between these pages by clicking on the page tabs. The configuration of each page is maintained while moving between the different pages.

Page Types

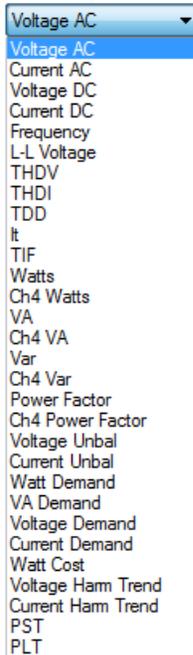
Trend

The Trend page graphs steady state quantities that are recorded at a specific time interval that is determined by the instrument's storage rate. The **PQPro™** has storage intervals that vary from 0.2 seconds to 30 minutes.

Two different quantities can be graphed at the same time, one quantity uses the left axis for scaling and the other quantity uses the right axis for scaling. The bottom axis is the time scale that is common to both quantities.

Both the left and right axis have drop down boxes for selecting the quantity to graph on that axis.

Trend quantities that can be graphed are:



Under the page tabs is a row of tool buttons that can be used to zoom, unzoom, select, place a data box, place a text bubble, query a point on the graph, or take a snapshot of the graph which can be pasted into a Word or Excel document.

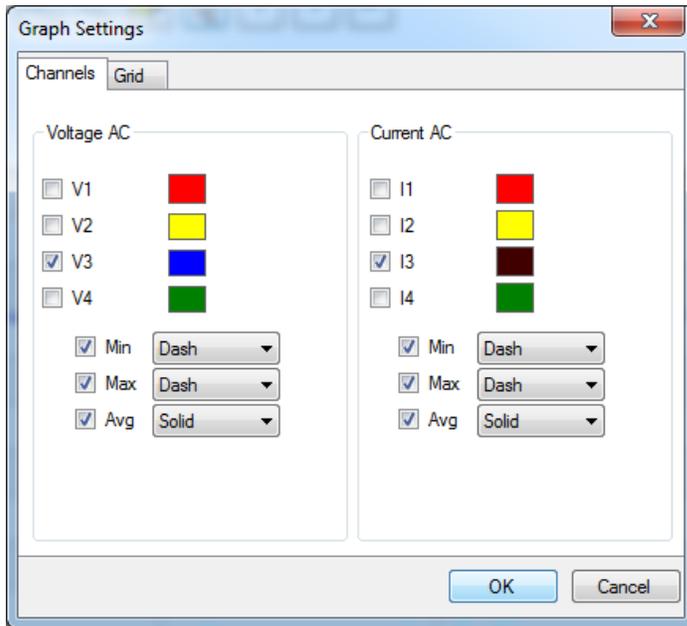


The demo file PQPro 3P4W.TSQ is from a three phase four wire (3P4W) measurement with data stored every 5 seconds. The opening Trend screen shows the 4 voltages, V1 (red), V2 (yellow), V3 (blue) V4 (green) using the left scaling axis. The 4 currents, I1 (red), I2 (yellow), I3 (blue) and I4 (green) are also displayed and they use the right scaling axis.

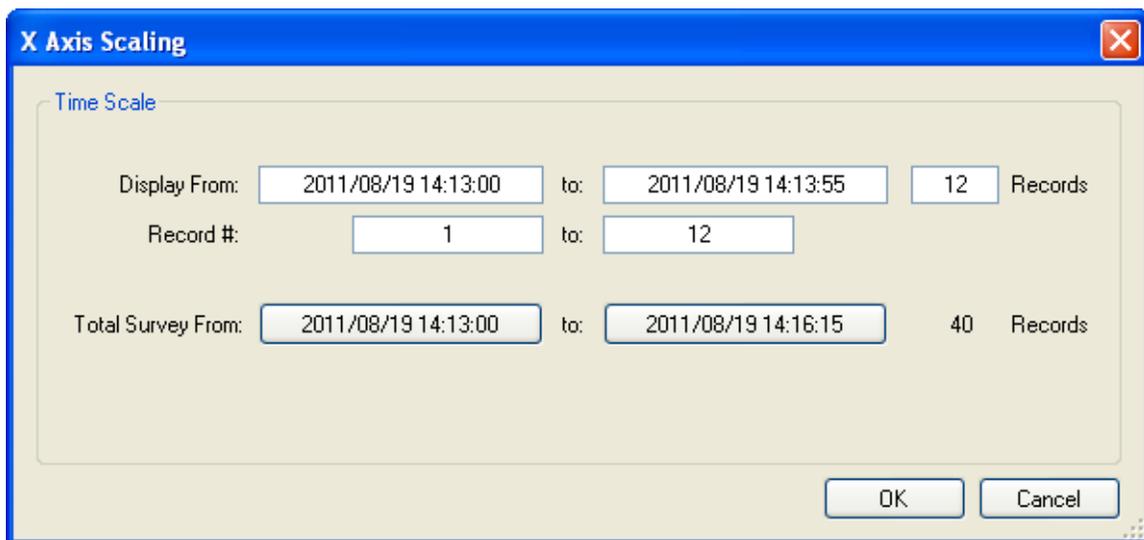
Moving the cursor around the outside of the graph area enables access to some of the page setup features. If enabled, a hint box will appear when a feature is available. Right clicking the mouse button will bring up the dialog box for a specific feature. The hint box can be enabled or disabled from the "Setup - Preferences" dialog box.

Page Types - Trend (continued)

In the PQPro 3P4W.TSQ file in the RMS Trend data there is a disturbance which can be seen in as the dashed blue line (I3 maximum trace) – record #8 at 14:13:35. To view channel 3 voltage and current data in more detail channels 1, 2 and 4 can be turned off. To do this right click with the cursor in the legend area (just above the graph). Unselect V1, V2, V4, I1, I2 and I4 and click on the colour box for I3, change the colour to black and click on “OK”.



Now the graph will only show V3 and I3. To change the current scaling right click in the area to the right of the graph, select “Manual” and adjust the Max value to 500 click “OK”. To change the voltage scaling right click to the left of the graph and select Manual scaling of 100 to 130. Change the time scaling by right clicking below the graph and change the number of records to ‘12’.



Page Types - Trend (continued)

From the Speed Button tool bar select the Data Box tool:



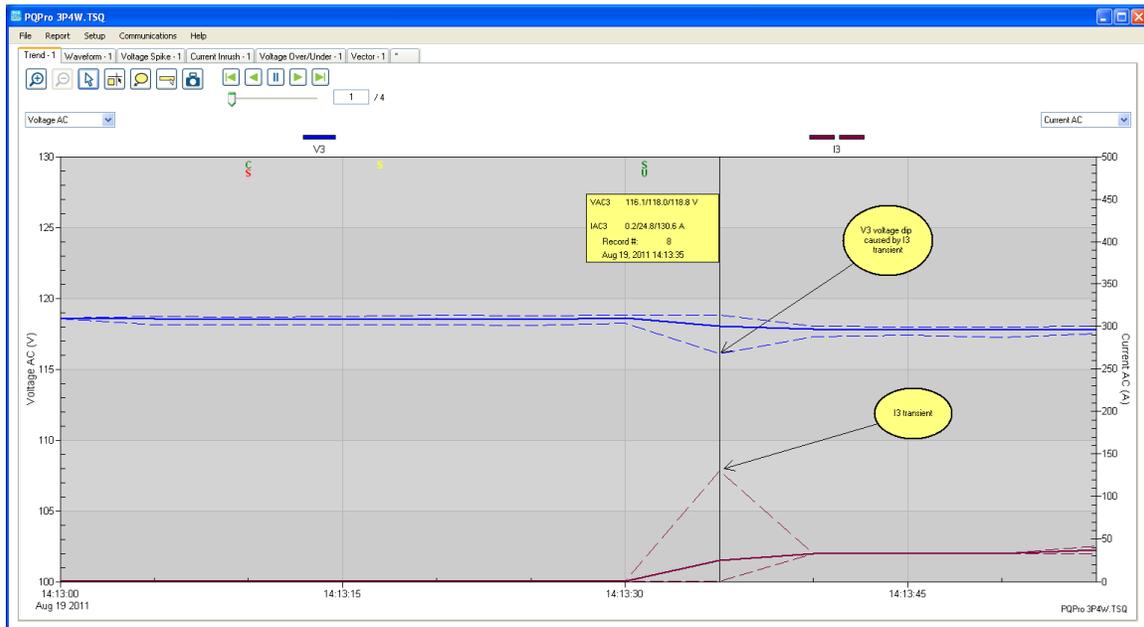
Position the cursor at the location of interest on the graph, in this case at record #8 and click the left mouse button. This will paste the Data Box onto the graph at the desired location.

Move the cursor over the Data Box and hold the left mouse button down. The Data Box can now be repositioned vertically along the reference line or moved from one side of the reference line to the other.

From the Speed Button tool bar select the Text Bubble tool:



Position the cursor near the location of interest on the graph and click the left mouse button. This will paste the Text Bubble on to the graph. To move the Text Bubble arrow position the cursor over the end of the arrow and click the left mouse button - the arrow will become dashed. Move the cursor to the position desired for the head of the arrow and left click – the arrow will be redrawn to go from the Text Bubble to the desired location. To edit the text in the Text Bubble position the cursor inside the Text Bubble and click the left mouse button.



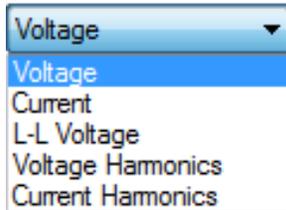
To delete a Text Bubble or Data Box, right click on it and select "Yes".

Page Types

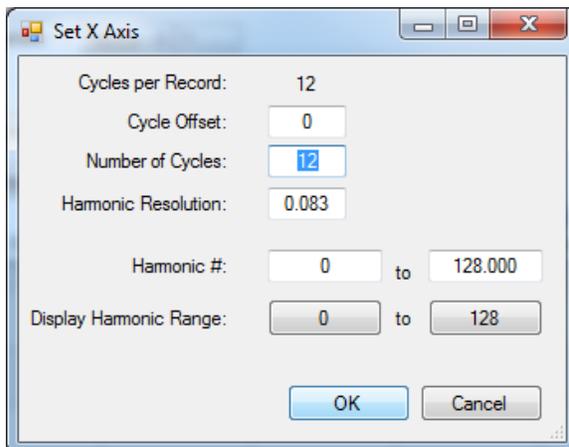
WaveForm

The waveform page graphs the waveform snapshot that is taken once each storage interval. For standard **PQPro™** data files there will be one cycle of data (with Interharmonics Off), 10 cycles of data (Interharmonics On, 50 Hz systems), 12 cycles of data (Interharmonics On, 60 Hz systems) or 40 cycles of data (Interharmonics On, 400 Hz) .

Quantities that can be graphed in the Waveform page are:



Let's open another file that can showcase the Interharmonics functions. From the supplied USB memory stick, you can open the file "Data Files \ Processed \ PQPro Harmonics 60 Hzp.TSQ". After this, open the Waveform tab (note that 12 cycles are displayed). Now change the left axis from Voltage Waveform to Current Harmonics by clicking on the left side drop down box and selecting Current Harmonics (now 1 cycle of current waveform is displayed). To view interharmonics in addition to the harmonics select the X axis scaling by right clicking anywhere on the X axis

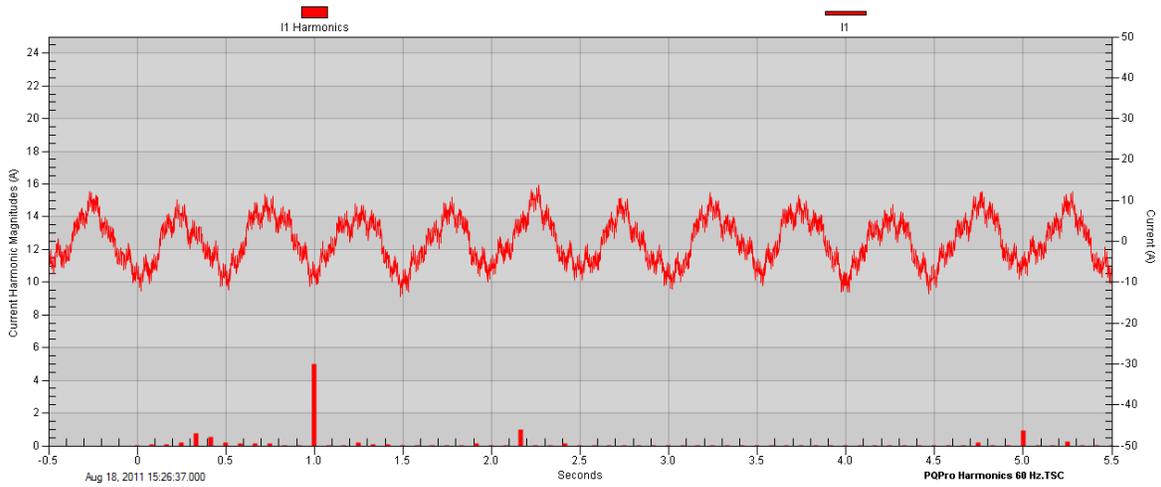


Change the Number of cycles to 12. The interharmonics resolution depends on the number of cycles used. With 12 cycles the interharmonic resolution at 60 hertz is 5 hertz ($60/12$) or in terms of harmonic number the resolution is 0.083 ($1/12$). If 6 cycles are selected then the interharmonic resolution at 60 hertz is 10 hertz or 0.167 ($1/6$).

Turn off channels 2, 3 and 4 in Graph Settings. To view a selected range of interharmonics right click on the X axis and set the Harmonic # to "0 to 5". Change the Record # (top right of screen) to 45.



Page Types – Waveform (continued)



Note that the Y axis can be display in Magnitude, % of RMS or % of Fundamental and the X axis can be display by Harmonic Number (up to 128) or by frequency.

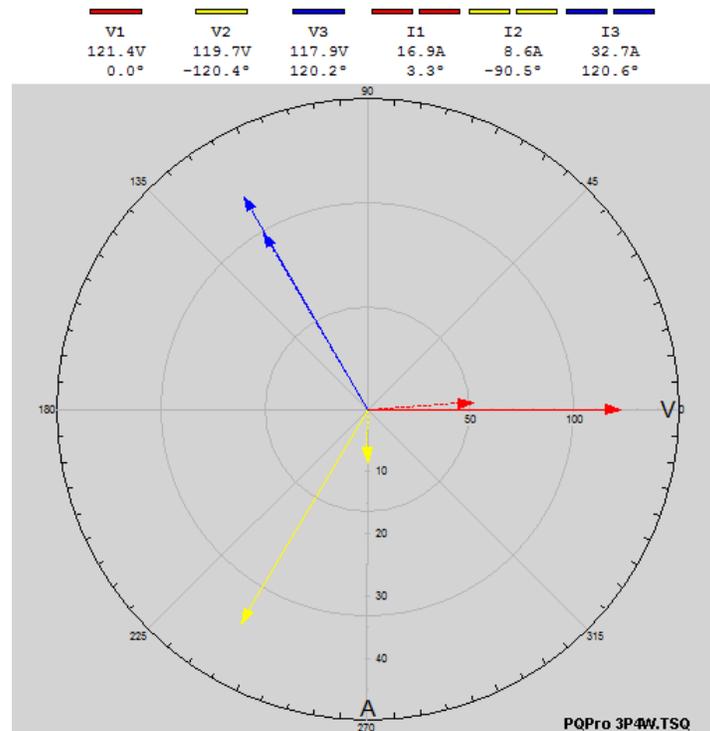
<input type="radio"/> % of Fundamental	<input type="radio"/> Hertz
<input type="radio"/> % of RMS	<input checked="" type="radio"/> Harmonics
<input checked="" type="radio"/> Magnitude	

Pages Types

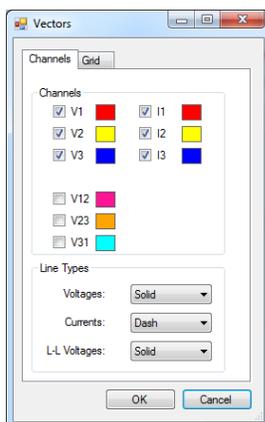
Vector Page

Open the processed file "PQPro 3P4Wp.TSQ" again and click on the Vector tab.

The vector diagram displays the RMS magnitudes and the angles of the fundamental components relative to V1 (V1 always has an angle of 0). As with the other graphs, channels can be turned on and off, line styles changed and colours changed. This is accessed by right clicking in the legend area. Scaling is accessed by right clicking anywhere below the legend area. The diagram below is for record #8 with Current axis set to Manual - Max: 50A.



For connection types that have both Line-Neutral voltages and Line-Line voltages the vector diagram can show both vectors. Initially the Line-Neutral voltage vectors are shown and the user can enable the Line-Line voltage vectors if desired by right clicking in the legend area to open the Vector dialog box.



Graph Play Buttons



These controls enable scrolling through zoomed Trend graphs, waveform graphs and vector diagrams. The   buttons scroll continuously backwards or forwards until the end is reached. The  button stops the continuous scrolling. The   buttons move one record backwards or forwards. A specific record can be displayed by entering the record number in the record number box  / 18 and pressing enter. Records can also be manually scrolled by placing the cursor over the position indicator, holding the left mouse button down and moving the cursor right or left.

Data Export

The user can export a portion of a file or the whole file into three different formats; a .TSQ file compatible with **PV II™**, a .CSV file compatible with Microsoft Excel or a .PQD (PQDIF format) compatible with PQView from Electrotec. These options can be found in the File→Export menu.

When generating a .CSV file the user can choose the class of data, specific quantities and the time period. Changing the class of data will open a submenu where more specific quantities can be included or omitted

Different classes of data that can be exported to .CSV files are:

- Trend
- Demand
- Harmonics
- Events
- Limits
- Waveforms

The resulting CSV file can then be opened in Microsoft Excel.

CSV Export

Title: 3P4W Test File

Notes: Data recorded on Candura Instruments' 3 phase test setup.

Trend Demand Harmonics Events Limits Waveforms

Trend

Voltage AC Power Factor TIF

Current AC Frequency It

Voltage DC THDV PST

Current DC THDI PLT

Watts Voltage Unbal L-L Voltage

VA Current Unbal

Var TDD

Min/Max Avg All On/Off

CSV Time Period

Time Period: 2011/08/19 14:14:55 to: 2011/08/19 14:16:15 17 Records

Record #: 24 to: 40

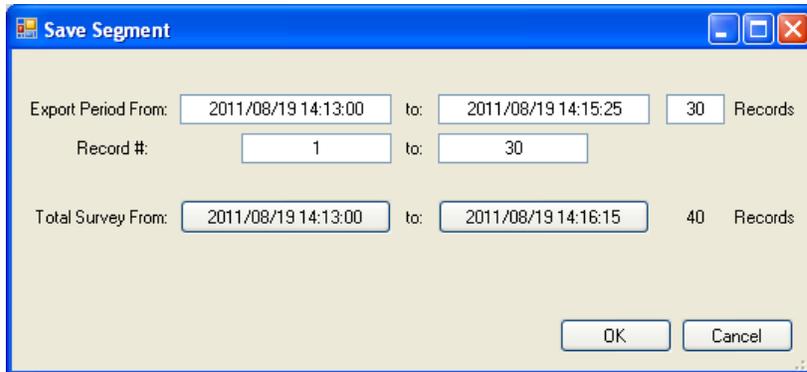
Total Survey: 2011/08/19 14:13:00 to: 2011/08/19 14:16:15 40 Records

OK Cancel

With the exception of Events the user can select a specific time period to export which is set by the Time Period values. Events are exported by event number.

Data Export (continued)

PV II™ allows you to export a portion of a .TSQ file into a separate .TSQ file that can be opened by **PV II™**. Select a start and end time for the new file by either inputting the desired times, clicking the total survey buttons, or by selecting a start time and changing the number of records to export directly. Clicking “OK” will bring up a save file dialog box to select the location and name of the file. Once that is complete the file will be saved, and can be opened in **PV II™**. The purpose of the **PV II™** export function is to generate a smaller file that contains data from a specific time period.



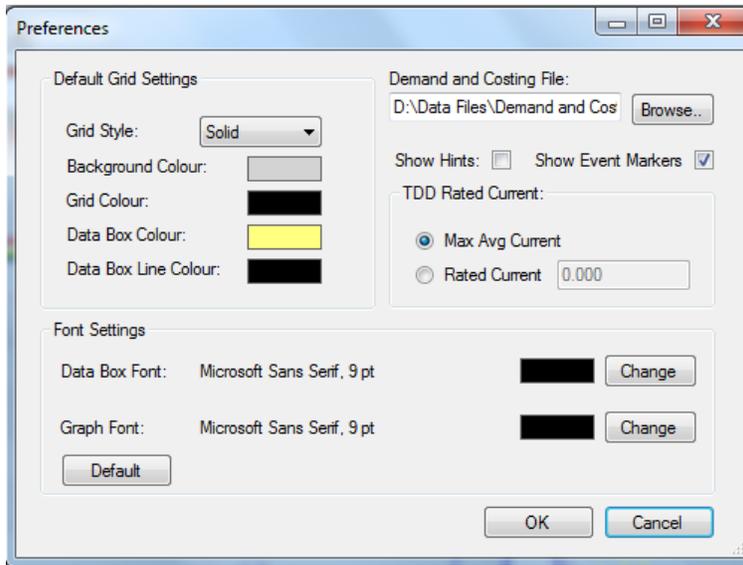
The screenshot shows a dialog box titled "Save Segment" with a blue title bar and standard window controls. The dialog contains three rows of input fields for defining the export segment:

- Export Period From:** 2011/08/19 14:13:00 to: 2011/08/19 14:15:25 30 Records
- Record #:** 1 to: 30
- Total Survey From:** 2011/08/19 14:13:00 to: 2011/08/19 14:16:15 40 Records

At the bottom right of the dialog are two buttons: "OK" and "Cancel".

Preferences

PVII™ 's preferences menu is accessed from the Setup drop down list. It allows you to customize various aspects of the software. Once the preferences have been changed, they will become the default settings that **PVII™** will use when a file is opened.



Grid style is the type of line that is used for the interweaving grid lines in the graph areas. Colours for various aspects of the graphical display can be changed by clicking on the coloured rectangles, then choosing a new colour from the colour menu.

“Demand and Costing file” is the default demand and costing configuration file that **PVII™** will use. Changing this will cause **PVII™** to read from a different file when starting. It will affect changes in the Setup→Demand and Costing menu.

Hints are small message boxes that, when enabled, are displayed when the cursor is in an area where the right mouse button is active.

Event Markers are symbols displayed along the top of Trend pages that indicate the location and type of captured event.

TDD rated current is used in the calculation of Total Demand Distortion (TDD).

Font Settings can be used to change the font style and colour for the Data Box/Text Bubble and the Graph Labels.

Generating a Report

PVI™ can generate a report for a specific time period that determines the minimum, maximum and average values of selected quantities

The type of report, the selected quantities and the time period can be adjusted before the report is generated. Changing the type of report will open a submenu where more specific quantities can be included or omitted from the report. To select a time period for the report, the time values or record# range can be altered manually, or by pressing the “Total Survey” or “Screen Survey” start or end point buttons. The “Total Survey” is the time period spanning the entire file. The “Screen Survey” is the time period spanning the graph on the last page displayed.

Report Input

Title: 3P4W Test File

Notes: Data recorded on Candura Instruments' 3 phase test setup.

Channels

1 2 3 4

Trend Demand Harmonics Events Limits

Trend

Voltage AC Power Factor TIF

Current AC Frequency It

Voltage DC THDV PST

Current DC THDI PLT

Watts Voltage Unbal L-L Voltage

VA Current Unbal

Var TDD

Min/Max Avg All On/Off

Report Period

Report Period: 2011/08/19 14:13:00 to: 2011/08/19 14:16:15 40 Records

Record #: 1 to: 40

Total Survey: 2011/08/19 14:13:00 to: 2011/08/19 14:16:15 40 Records

Screen Survey: 2011/08/19 14:13:00 to: 2011/08/19 14:16:15 40 Records

Graphs/Tables

Table Standard Graph Custom Graph Trend - 1

OK Cancel

The Trend report can include all the quantities that can be viewed in the Trend page or only the selected ones. These minimum, average and maximum values can be displayed in a table. The “Standard Graph” includes a graph of the selected quantity. The “Custom Graph” puts the graph of the last page displayed at the beginning of the report.

Demand and Cost Setup

The software can take the measured power data and calculate demand and energy costing. The Demand and Costing dialog box is accessed from the top tool bar, select “Setup” and “Demand and Costing”. The demand integration period can be set to 1 minute (if the storage interval is a minute or less) or up to 30 minutes. Tariff times and cost can be setup for both weekdays and weekends and holidays. They can be set manually or read in from a configuration file. The active configuration file can be set from the Setup and Costing dialog box or from the Preferences dialog box. To access the Preferences dialog box select from the top menu bar “File” and “Preferences”.

To change tariff times manually, simply type enter an end time for the costing period, and enter the cost of a kWh during that time. Also, select a colour that will represent that time period on the graph. The times on the left are for normal weekdays, and the times on the right are for weekends and holidays. There can be up to six different costing periods in a day, and the day must go from 00:00-24:00.

Weekends are automatically configured. To change holidays, click on the appropriate day in the calendar. Days highlighted in red are holidays. Once clicked, the day will either return to black, or become highlighted in red.

Demand and Costing

File: Ontario Winter Rates 2012 2013.bt

Integration Period: 15 min

Currency: \$

January, 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Tariffs Time and Cost (Weekdays)

00:00	to	07:00	Green	0.063
07:00	to	11:00	Red	0.118
11:00	to	17:00	Yellow	0.099
17:00	to	19:00	Red	0.118
19:00	to	24:00	Green	0.063
:	to	..	Green	

Tariffs Time and Cost (Weekends and Holidays)

00:00	to	24:00	Green	0.063
:	to	..	Green	
:	to	..	Green	
:	to	..	Green	
:	to	..	Green	
:	to	..	Green	

OK Cancel

Bluetooth Communication

The **PQPro™** uses Bluetooth technology to wirelessly connect to a computer running **PV II**. This feature is optional and requires the installation of a license. The installed license can be checked by selecting 'Licensing' in the 'Help' drop down menu. If a Bluetooth license is installed the Bluetooth feature can be accessed from the 'Communications' drop down menu.

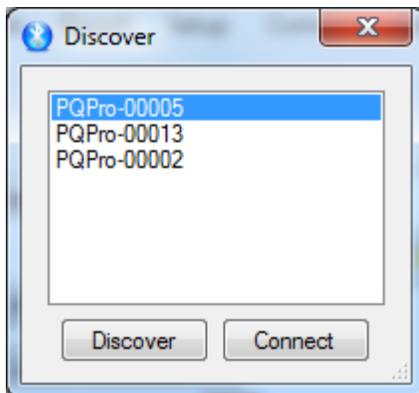
There are two types of Bluetooth pages in **PV II™**:

- Status Page
- Meter Page

Status Page

PV II™ can view instrument status, change configuration parameters, view real-time data and download recorded data wirelessly.

If a Bluetooth connection has previously been established from the computer to the **PQPro™** the serial number will appear in the Discover window. If the serial number does not appear then the 'Discover' button should be clicked. When the serial number appears in the Discover window click on the serial number and then click on 'Connect'.



When connected the Bluetooth Status page will display **PQPro™** configuration information and real time data.

Bluetooth Communication (continued)



A copy of the Bluetooth Status page can be copied and pasted into a Word or Excel document by using the Snapshot button found in the upper right corner of the page.

Both the real time panel of numerical data and the real time panel of Waveforms/Harmonics/Vectors can be maximized to the full screen by clicking the Maximize button found in the upper right of the each panel.

The information displayed in the Setup panel can be modified wirelessly from the computer. Clicking on the Change button will bring up the Setup dialog box.

The **PQPro™** clock can be set to the computer clock to a resolution of 0.01 seconds. The clocks on multiple **PQPro™**'s can be set using this feature resulting in a maximum time difference between instruments of +/- 0.05 seconds.

Bluetooth Communication (continued)

PQPro Setup

Storage Rate: 1 s

Recording Mode: Stop When Full

Interharmonics: OFF

Connection Type: 3P4W

External PT: 1 : 1

External CT: 1 : 1

Phase Volt Nominal: 208 V

Ch4 Volt Nominal: 5 V

Phase CT: 10A Clamp

Ch4 CT: 30A Clamp

Voltage Spike

Capture: ON

Capture Waveforms: 2.0 Cycles

Voltage Spike: 20 % 41.6 V

Ch4 Voltage Spike: 0.5 V

Current Inrush

Capture: ON

Capture Waveforms: 4 Cycles

Capture RMS: 120.0 Cycles

Phase Curr. Inrush: 60.0 % 6 A

Ch4 Curr. Inrush: 10.0 % 3 A

Under/Over Voltage

Capture: ON

Capture Waveforms: 4 Cycles

Capture RMS: 120.0 Cycles

Phase Over Volt: 5.8 % 220.1 V

Phase Under Volt: 11.7 % 183.7 V

Ch4 Over Volt: 100.0 % 10.0 V

Ch4 Under Volt: 100.0 % 0.0 V

Save to File Load File

Update Undo All Done

Bluetooth Communication (continued)

Meter Page

To open a Bluetooth meter page click on the '*' tab and select 'Bluetooth Meter'. Only instruments that have been connected to a Status page will appear in the Meter page. If a Status page is closed then that instrument will no longer appear in the Meter page.



Notes