

SPCPro2

USER MANUAL



www.spcloggers.co.uk

SPCPRO2 User's Guide

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Symbols:

The following symbols may be used in this manual



WARNING: Failure to follow the instructions may result in personal injury or damage to the instrument.

PC Specification:

The Logger requires a PC of the following minimum specification to make best use of the product's capabilities.

Windows:	Vista or XP Pro
Processor:	Pentium 4 or Centrino mobile 2.0 GHz+
RAM:	256MB+
Display:	32 bit colour 1024 x 768 minimum
USB:	

A lower spec PC may provide satisfactory performance, but the graphing capability, particularly with larger surveys will be slower. Download speed is dependent on the USB port spec.

21.07.2015

INTRODUCTION

The **SPCPro2** and its dedicated PC software package 'PowerPackPro' combine new technology and years of experience into an unbeatable low-cost package.

It is the latest development of the well-proven "3 currents, 1 voltage" design, which allows accurate 3 phase power and energy measurements to be made safely. The unit uses 3 off flex type CTs (current transformers) for current measurement, and a standard wall socket plug for voltage measurement and power supply. Set up and download of the **SPCPro2** is via a USB connection to any PC running Windows XP or later software, and all survey data and user settings are securely saved in non-volatile 'flash' memory.

The instrument uses a sophisticated auto-ranging measurement technique which ensures that excellent accuracy is maintained from 2 amps to 2000 amps without the need for any user-setting of range, or swapping of CTs. It has been developed with ease-of-use as a No 1 priority and is therefore simple to set up, connect and download, assuring even non-technical or inexperienced users of correct results from day one.

DESCRIPTION

The **SPCPro2** is a professional-grade instrument for the measurement and logging of three-phase and single phase electrical loads. It is able to measure the following parameters:

Voltage amplitude x 1 Current amplitude x 3 Current phase angle* x 3

*Referenced to the measured voltage

From the above data, the following parameters are presented via the instrument's dedicated software package 'PowerPackPro'.

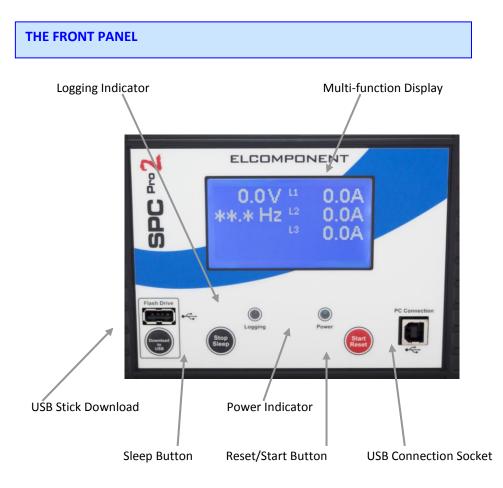
Voltage (1 phase) Current (3 phases) Power Factor (3 phase average) kW (active power (3 phase total) kWh (active energy) (3 phase total) kVArh (reactive energy) (3 phase total) Cost CO² Emissions (kg)

The unit is fully self-contained and is supplied with a set flex-type CTs, plus voltage connection and PC connection (USB) cables. The rechargeable battery provides on-board power for surveys of up to 2 weeks duration where mains power is not available.

The **SPCPro2** uses a rechargeable internal battery to provide power for surveys where a mains voltage is not available, and to provide back-up power in the event of a mains failure during a normal survey. The battery will charge whenever the unit is connected to a mains supply, but a faster charge rate is achieved with the unit switched off. It is strongly recommended that the battery is charged for a minimum of 12 hours prior to commencing a survey. Battery condition may be checked via the software interface.

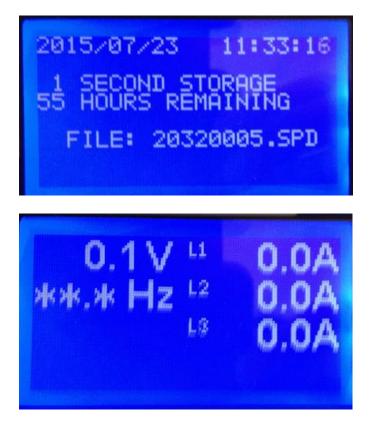
The unit requires little or no set up prior to commencing a survey, as the only user-definable variable is the survey storage period/survey length. This is set via the PC software. Once the storage rate has been set, it is not necessary to repeat the procedure for future surveys unless the rate is changed.

Note: If the instrument does not power up as expected, or does not communicate correctly with the PC, a GENERAL RESET may be carried out by pressing and holding both buttons simultaneously for 3 seconds. The unit will reboot when the buttons are released.



Display:

On start-up the display shows the logger status, followed by measurement values for current and voltage.



Return to the logger status screen by briefly pressing the "Start/Reset" button.

Sleep Button:

The 'stop/sleep' button will switch the unit into standby mode. If the unit is recording when the button is pressed, the display will warn that the survey will terminate, and provide a 5 second countdown to avoid unintended operation.

Reset/Start Button:

Pressing the 'Reset/Start' button initiates a 5 second countdown prior to commencing logging.

NOTE: Any data stored in logger memory is erased when a new survey is started.

NOTE: The USB Memory Stick memory **will not** be erased when a new survey is started.

Power Indicators:

The blue 'power' indicator will illuminate when the unit is connected to a valid supply voltage (175-300 VAC). When the led is 'off' the **SPCPro2** is operating from battery power.

Logging Indication:

The red 'logging' indicator provides a short flash every few seconds whilst a survey is taking place.

USB Connection Socket:

The **SPCPro2** is connected to a PC from this port using a standard USB 'A to B' interface cable (supplied).

SETTING UP

Refer to the 'PowerPackPro' section of this manual for detailed instructions on setting up the **SPCPro2** prior to commencing operation.

CONNECTING UP

Voltage Connection:

Mains connection should be carried out via the supplied lead to a 230VAC wall socket. If a wall socket of the correct type is not available refer to Elcomponent for availability of alternative connection cables.



Warning: The connected voltage must not exceed 300VAC. Exceeding the voltage will damage the instrument and could be hazardous.

Current Connection:

The **SPCPro2** is suitable for use on both single phase and three phase supplies. Current measurement connections are made by clipping the flex-type CTs around the conductors as shown in the following diagrams and pictures.

NOTE: It is important to be able to identify cables correctly when carrying out electrical surveys. Failure to do so may compromise the accuracy of results obtained. Please refer to Appendix 2 for information on UK wiring connections. If you are working outside the UK, additional information may be required.

NOTE: Single Phase Connection – CT connection must be made using L1. If mains connection is made, this should be V1. If this cannot be checked the survey can be carried out on battery.

SINGLE PHASE CONNECTION LOAD 230 VAC SPC PRO SUPPLY THREE PHASE CONNECTION LOAD 230 VAC 1.23 L1 L2 L3 Ν SUPPLY SPC PRO

NOTE: It is <u>essential</u> to orientate the CTs with the arrow pointing towards the load as shown.

NOTE: It is <u>essential</u> that the phase cables are correctly identified when connecting the flex CTs. (See Appendix 2 for more information on phase identification).

NOTE: It is not necessary to have a wall socket voltage connection available to carry out a survey. The **SPCPro2** will continue to operate on battery power for up to two weeks on a fully charged battery. In this case, power and energy values are based on user-defined references.

STARTING A SURVEY

Once the unit is connected, logging is initiated by pressing and holding the 'Start/Reset' button for 5 seconds. Note that the display will 'count down' to the survey start. Logging is confirmed by the red 'logging' led flashing every few seconds.

For "Good Housekeeping" – press the "start/reset" button briefly to show the logger set-up screen.



ENDING A SURVEY

A survey may be ended <u>manually</u> by pressing & holding the 'sleep' button.

Surveys will end automatically if the programmed survey duration is reached, or if the power is removed and the battery life exceeded.

In all cases the recorded data will be securely saved for download.

DOWNLOADING A SURVEY

Please refer to sub-heading "Connecting the **SPC Pro2**" in the following section for details on data download and presentation.

USING THE SOFTWARE

OVERVIEW

The **SPCPro2** ships complete with a dedicated PC utility program which provides communication, set up and data presentation capabilities. PowerPackPro is designed to run on Windows XP and later platforms.

PowerPackPro is a task-orientated program and is extremely easy to drive, even for new users. It provides the following functionality for the **SPCPro2**

Logger Set Up Logger Status Check Logger Download Data Configuration Multiple Trace 'Zoom' Graphing Carbon Footprint Calculation Multi-rate Tariff costing Alarm Reporting Statistical Analysis Summary Reporting Data Export to MS Office

LOADING THE SOFTWARE

To load PowerPackPro, install the CD and follow the on-screen instructions.

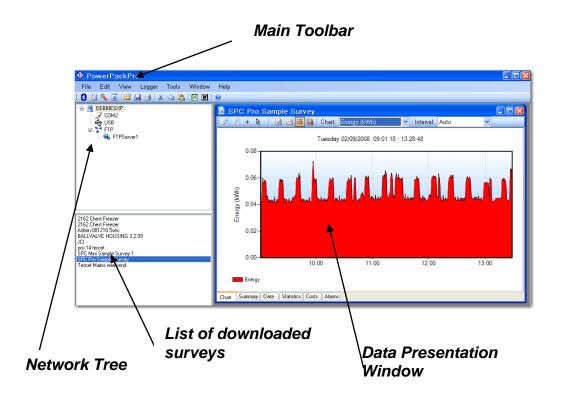
NOTE: PowerPackPro is available for free download at <u>www.spcloggers.com</u> However to avoid potential driver problems it is important to load the software on the CD supplied with the unit, even if a downloaded copy has already been installed.

Future software updates may then be downloaded from the website and installed as normal.

OPERATION

Getting Started:

Open the software by clicking the desktop icon and double click 'SPCPro2' Sample Survey' to show the following screen.



The software ships with some sample data pre-loaded which can be used for familiarisation of the package, and is used in the examples in the 'Using The Graphing Package' section.

CONNECTING THE SPCPro2

Connect the **SPCPro2** to the PC using an A to B type USB cable, and an unused USB port on the PC.

NOTE: Ensure that the CD supplied is present in the CD drive when the **SPCPro2** is first connected.

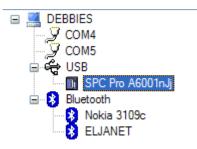
The PC will automatically recognise the **SPCPro2** (indicated by the "Found New Hardware" message) and will install the necessary drivers to allow communications to be established.

NOTE: the drivers are included on the CD supplied with the unit. This must be present in the CD drive at this stage in the proceedings. The successful completion of the process is indicated by a "Your hardware is installed and ready to use" message appearing. Within a few seconds PowerPackPro will locate the **SPCPro2** and generate a new message.

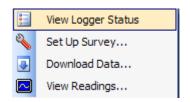
PowerPa	ackPro 🛛 🔀
٩	New logger found.
	ОК

NOTE: If the Windows device recognition/drivers load process fails to function if may be necessary to load the drivers manually. See Appendix 1 for details on this procedure.

Click OK and the logger will appear on the tree at the upper left of the screen as shown.



Right click the **SPC** Icon to open the command menu



This provides four options:

'View Logger Status' (also available via the 💷 icon).

SPC Pro 2 Status	
	Serial Number: 2032 Serial ID: A704771C Description: SPC Pro 2
	Firmware Version: SPCPRO -REV0.022 Firmware Date: 29/05/2015 00:00:00 Calibration Date: 30/06/2015 00:00:00
Battery Voltage: 4.10	Last Log Start: 14:42:17 on 22/07/2015 Logging Interval: 1 second Records: 32 Free memory: 100.0%
Logging Off	ОК

Battery voltage should read over 3.7 volts. If it is lower than this the logger may shutdown if it is not connected to a mains supply.

Details of the device and any recorded data are shown, along with the logging status indicator. Green for 'on' and red for 'off'.

'Set Up Survey' (also available via the 🌂 icon.

et Up Survey - SPO	C Pro 2				
	Computer Time: Tue 21/07/2015 15:15:56 Logger Time: Tue 21/07/2015 15:16:05	synchronized when the			
Survey	Duration: 1 v weeks 0 v days Interval: 3 v seconds To: Tue 28/07/2015 15:15:56 Use DTM	Information Set the survey duration to cover the survey period. Shorter logging intervals give better accuracy.			
Status Logging interval is set to 1 second. Please note -logger memory contains 80602 data records.					
	Set Logger Exit				

This screen allows the following parameters to be set.

NOTE: Ensure your PC clock is correct!

NOTE: This will erase all survey data on the logger!

NOTE: Should the unit not respond a General Reset may be required – Hold down the Reset/Sleep button together until the unit restarts.

Storage Interval – Select the desired data storage interval from the available options. Note that the "Interval" pane will alter to show the storage interval at the selected survey duration, and the end time/date of the proposed survey, based on the current time.

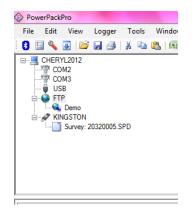
Click 'Set Logger' to update the unit.

Downloading via the USB Memory Stick

To download the survey via the memory stick you will need to press the 'Download to USB' button and wait for the survey to download.



Once the download has completed then plug your USB into the PC and you will see the PPP software show the memory stick as follows:



Double click on the survey file and then continue through the download steps below.

'Download Data' (also available via the 💷 icon).

Download Logger Data	×
	Step 1 Download logger data Available loggers: SPC Pro 2032 Note - the logger memory will not be cleared.
Cancel	< Back Next >

Step 1

Click 'next' to download the data.

NOTE: This does not clear the logger memory.

Step 2

When the download reaches 100%, click 'next' to enter the survey name, location and any relevant notes.

Step 3 (Voltage present)

Downloa	ad Logger Data		×
	p 3 of 4 Specify Voltag	je Phase	
		Auto detect	
Pov	wer Factors		
	Phase 1	0.99	
	Phase 2	0.91	
	Phase 3	0.88	
Note	e: this setting may be cha	anged later when viewing survey.	
Can	cel	<pre></pre>	

This screen shows the results of the autodetect sequence for voltage phase detection. In this example ph3 has been selected, and the resulting phase power factors shown in the lower pane.

As the survey data are downloaded, the software checks the phase angle measurements for all phases to ascertain the phase which was used for the voltage connection (usually unknown to the operator). The screen shows the selected voltage phase at the top, and the phase power factor below. In exceptional circumstances (e.g. very poor actual PF) it may be necessary to override the auto-detection. This is achieved by unchecking the 'Auto detect' box and clicking on the desired voltage phase.

Note that the phase power factors are automatically adjusted to reflect the revised selection.

SPC Pro2	Step 3 of 5 Enter supply voltage:
	240 Volts
	Enter supply voltage:

Step 3 (Voltage not present only)

This screen appears if the software detects that no voltage was measured consistently through the survey (e.g. battery powered survey), and manual input is required.

Enter the supply voltage as a **phase to neutral value**. If the survey was carried out on a 3 phase 3 wire system (where no neutral is present) it is necessary to enter the value from phase to earth. On standard 3ph systems the phase to neutral value may be derived from the phase to phase value by dividing it by $\sqrt{3}$. E.g. $400V \div \sqrt{3} = 230V$

Step 4 (Voltage not present only)

Download Logge	r Data	
	SPC Pro2	Step 4 of 5
		Enter load type:
io	ELCOM	Type - Power Factor
10	ELCOMPONEN	Unice - 0.30
		Please choose the load type and power factor that correspond most closely to the supply on which the survey was carried out.
Cancel		<back next=""> @</back>

Select a load type, or enter the power factor of the load if known.

STEP 4

Select a tariff from the drop down menu for use in cost calculations.

Download Logger Data	×
	Step 4 of 4
	(Default Day & Night Rate) ▼ Further tariff data may be entered on the 'Costs' tab when viewing the survey.
Cancel	< Back Next > 🕡

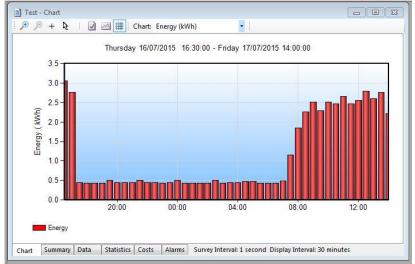
NOTE: PowerPackPro is pre-loaded with default single rate and day/night tariffs. Other tariffs may be added by the user

Click 'finish' to open a graph showing the survey results

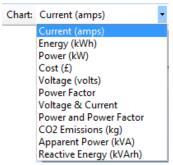
USING THE GRAPHING PACKAGE

PowerPackPro will automatically open a graph after a survey has been successfully downloaded. Graphs may also be opened by clicking on the relevant survey in the survey list, or via the *icon*.

Depending on the length of the downloaded survey, the default settings will create a graph of the entire survey, or in the case of longer surveys create a graph using a 30 minute data interval with an initial view of a 1 week period. These settings may be altered manually if desired. PowerPackPro is shipped with a SPCPro2 sample survey pre-loaded which is used in the following pages.



Selecting the Measurement Units:



Click on the drop-down list on the toolbar to select the desired unit.

The graphing engine uses a bar chart format for kWh, cost and carbon values, and a line chart for amps, volts, kW & PF.

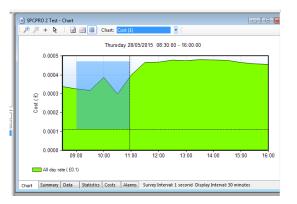
Dual trace graphs use the LH & RH Y axis to define the trace values.

USING THE GRAPH TOOLS

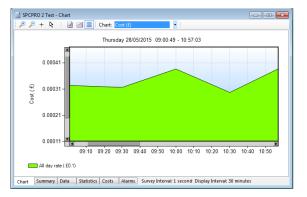
Data View Options

Zoom:

Click the zoom tool buttons 2 p to activate the zoom cursor. Drag the cursor over the desired graph area whilst holding down the left mouse button to define a zoom area.



Release the mouse button to display the zoom area

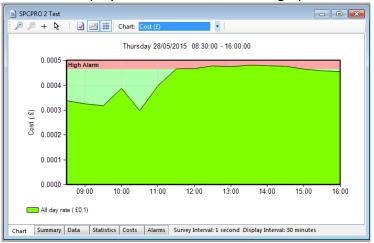


NOTE: The zoom function can be repeated as many times as necessary to provide a macro zoom capability. The platton reverses the zoom-in process by one step per click.

Show Data Values:

Click the + crosshairs button to enable this feature. Place the crosshairs at any point on the data trace to display the value and time stamp below the title bar.

Show Alarm Levels:



Click the 🖾 button to display the alarm values on the graph.

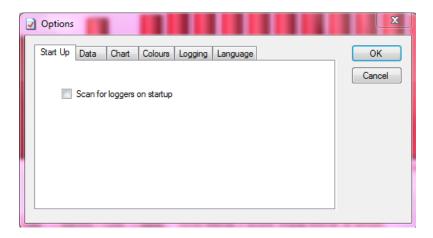
Show Gridlines:

Click the *button to toggle the graph gridlines on and off.*

Options:

Click the 📝 icon to open the options screen.

'Start Up'



'Data' Set Detault intervals Ammend CO2 emmissions calculation figure

Options	X
Start Up Data Chart Colours Logging Language Data interval for analysis: Auto	e OK Cancel

'Chart' Change line thickness

 Options
 X

 Stat Up
 Data
 Chart
 Colours
 Logging
 Language
 OK

 Initial chart view:
 Full survey
 ✓
 Cancel

 Chart line thickness:
 1
 ✓

'Colours'

Change current phase colours

Start Up	Data	Chart	Colours	Logging	Language	ОК
						Cancel
	0	Line 1	Line 2	Line 3		
	0	Red	Yellow	Blue		
	r	Line 1	Line 2	Line 3		
	۲	Brown	Black	Grey		
					-	

'Logging' External Logs

Start-Up is selected by Default

Communications can be enabled if experiencing difficult communicating with logger.

2	Options	×
	Start Up Data Chart Colours Logging Language	ОК
	Start-up logging	Cancel
	Communications logging	

ADDITIONAL GRAPH FUNCTIONS

Export to Microsoft Office:

Click the \bowtie Excel or \bowtie Word buttons on the main toolbar to export the graph image to either of these programs. (This can also be done using the 'Edit/Select All' function on the menu bar or from the graph toolbar icon \bowtie , and copy and paste buttons on the toolbar).

Sharing Surveys

Click the button on the main toolbar to email the survey to a third party. This will open Outlook with the files already inserted, with a reminder /weblink to the recipient that they will need to have PowerPackPro running on their PC to view the survey. These files should not be opened in Excel.

SUMMARY TAB

Click the 'Summary' tab at the bottom of the chart window to open the survey summary page.

🖹 SPC Pro Sample S	urvey - Summary	X
Title:	SPC Pro Sample Survey	^
Location:	Office	
Created By:	ELCOMPONENTLTD\bill	
From:	02 September 2008 09:01:18	1
To:	02 September 2008 13:29:48	1
Log Interval:	30 seconds	1
Logger Type:	SPC Pro	1
Logger Name:	FT245R USB FIFO	
Logger Number:	7	
Supply:	Three-Phase	
Voltage Phase:	3	-
Current 1 Factor:	1	1
Current 2 Factor:	1	1
Current 3 Factor:	1	1
Notes:		~
Chart Summary Data	Statistics Costs Alarms	

The following fields may be edited as required.

- Title
- Location
- Created By
- Voltage Phase
- Current Multiplier
- Notes
- Voltage*
- Power Factor*

*When present (only shown for "voltage not present" surveys) The 'Current Multiplier' allows adjustments to be made to the measured current values to allow for additional external CTs.

NOTE: changes are indicated by the text changing from black to red. The option to 'save changes' appears when existing from the summary page. Click 'yes' to save changes.

DATA TAB

Click the 'data' tab to display the survey data in tabular format.

NOTE: The data displayed will match the graph settings for analysis data interval (see options) and graph period selected.

Selecting Data:

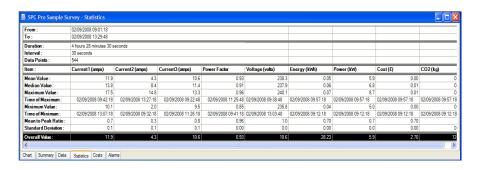
Hold down the left mouse button and drag the cursor to select data. To select the whole table click "Edit/Select All' button on the main menu bar.

Selected data may be copied and pasted as required using the relevant buttons on the main toolbar.

Exporting Data:

Data may be exported in tabular form to Excel or Word by clicking the relevant buttons \square on the main toolbar or emailed to a third party by clicking the \square button.

STATISTICS TAB



Click the 'Statistics' tab to display the stats window showing the key values and ratios for all parameters.

COSTS TAB:

Click the 'costs' tab to display the costing window.

PowerPackPro is supplied with two preloaded tariffs (Default Single Rate and Default Day & Night Rate). These are provided as examples and do not necessarily reflect actual tariffs.

5urv	ey 1 - Costs					
ariff:	(Default Single Rate)		•			
	Description	From	To	Cost Rate (p/k₩h)	Energy (k₩h)	Cost (£)
1	All day rate	00:00	00:00	10.000	5438.3	543.8
2						
3						
4						
5						
otal	Î.	Ú.	Ú.	10.000	5438.3	543.8

ADDING AND AMENDING TARIFFS:

PowerPackPro supports the entry of multiple tariffs with up to 5 time bands.

NOTE: Time bands cannot span a date change. If a desired time band runs across midnight it must be entered as two bands.

To amend an existing tariff, overtype the description field as required and enter the desired cost rates also. Note that costs are entered as p/kWh. Select the desired start/finish times from the drop-down menu.

Amended values will change from black to red. Click the 'recalculate' button to apply the revised rates to the survey data.

To create a new tariff, proceed as above, adding additional bands if required.

The option to save changes appears when exiting from the costs page. Click 'Yes' to save changes. Enter a new tariff name in the 'Save Tariff As' box to create a new tariff, or save as the existing name to amend a tariff.

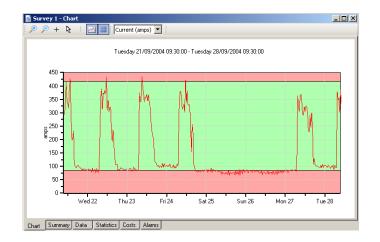
ALARMS TAB

Click the 'Alarms tab to display the alarm screen.

	e: Current 1 (amps)	🖌 🖌 Н	igh 17.133	3	🖌 Low	10.518				
	Date	Cost (£)	Energy (kWh)	Power (k₩)	Power Factor	Current 1 (amps)	Current 2 (amps)	Current 3 (amps)	Voltage (volts)	CO2 (kg)
Tue	02/09/2008 09:01:18	0.00	0.0	5.0	0.94	10.4	2.1	9.7	239.0	0.0
Tue	02/09/2008 09:01:48	0.00	0.0	5.0	0.94	10.4	2.0	9.7	239.2	0.0
Tue	02/09/2008 09:02:18	0.00	0.0	5.0	0.94	10.4	2.0	9.8	239.1	0.0
Tue	02/09/2008 09:10:48	0.00	0.0	5.0	0.94	10.5	2.0	9.8	238.5	0.0
Tue	02/09/2008 09:12:18	0.00	0.0	5.0	0.94	10.4	2.0	9.8	238.2	0.0
Tue	02/09/2008 09:12:48	0.00	0.0	5.0	0.94	10.5	2.2	9.8	238.0	0.0
Tue	02/09/2008 09:18:18	0.00	0.0	5.0	0.94	10.5	2.0	9.7	238.6	0.0
Tue	02/09/2008 09:20:18	0.00	0.0	5.0	0.94	10.5	2.1	9.7	238.7	0.0
Tue	02/09/2008 09:28:18	0.00	0.0	5.0	0.94	10.5	2.0	9.8	239.3	0.0
Tue	02/09/2008 09:30:18	0.00	0.0	5.0	0.94	10.5	2.0	9.8	239.6	0.0
Tue	02/09/2008 09:30:48	0.00	0.0	5.0	0.94	10.5	2.0	9.8	239.6	0.0
Tue	02/09/2008 09:32:48	0.00	0.0	5.0	0.94	10.5	2.0	9.7	239.2	0.0
Tue	02/09/2008 09:33:18	0.00	0.0	5.0	0.94	10.5	2.0	9.7	239.2	0.0
Tue	02/09/2008 09:42:18	0.01	0.1	7.6	0.86	17.5	5.4	13.2	239.7	0.0
Tue	02/09/2008 10:12:48	0.00	0.0	5.1	0.95	10.5	2.3	9.7	239.7	0.0
Tue	02/09/2008 10:23:18	0.00	0.0	5.2	0.95	10.5	2.6	9.8	239.8	0.0
Tue	02/09/2008 10:23:48	0.00	0.0	5.2	0.95	10.5	2.6	9.8	239.5	0.0
Tue	02/09/2008 10:25:48	0.00	0.0	5.1	0.94	10.5	2.4	9.7	239.3	0.0
Tue	02/09/2008 10:26:18	0.00	0.0	5.1	0.94	10.5	2.4	9.8	239.5	0.0
Tue	02/09/2008 10:26:48	0.00	0.0	5.1	0.94	10.5	2.4	9.8	239.3	0.0
Tue	02/09/2008 10:29:48	0.00	0.0	5.2	0.95	10.5	2.6	9.7	239.1	0.0
Tue	02/09/2008 10:41:48	0.01	0.1	7.1	0.96	10.4	11.0	9.7	238.9	0.0
Tue	02/09/2008 10:42:18	0.01	0.1	72	0.96	10.5	11.2	9.6	238.9	0.0

Select the desired parameter from the drop-down menu at top left. Enable high and low alarms via the checkboxes provided. Enter your desired alarm thresholds as required and press the 'enter' key to activate. The alarm events will be listed in the main window.

NOTE: Alarm thresholds may also be viewed on the chart, with the alarm zones appearing in pink



File Structure:

To establish the file location of surveys on your PC click the 'Find Survey' button on the file tree

Survey Folders		
My Surveys	▼ Find Survey	•
SPCPRO 2 Test		

This will give a window that tells you where the files are located:

* indicates default	Path
Surveys [*] Samples My Surveys	C:\Program Files\Elcomponent\PowerPackPro\Surveys\Samples
	Open folder location
Add Remove Rename Set as default	

If you wish to open the folder location press the bar `

New Folders may also be created by pressing the "Add New" button

🛅 Add 🕯	Survey Folder	×
Name:	New Folder	ОК
Path		Cancel

This option also enables you to remove folders and rename them.

REPORT FACILITY

In addition to the export functions for creating reports PowerPackPro provides a quick report summary.

Select "File/Print Report" and change paper orientation to landscape. This will provide a 3 page report displaying the currently displayed graph, survey summary, survey statistics and costings. This method can also be used to save the report as a PDF file.



From:	16/07/2015 16:00:00				
To:	17/07/2015 15:00:00				
Duration:	23 hours				
interval:	30 minutes				
Data Points:	45				
item:	Current 1 (amps)	Current 2 (amps)	Current 3 (amps)	Power Factor	
Mean Value:	5.16	2.15	4.19	-0.28	
Median Value:	6.69	3.40	6.58	-0.07	
Maximum Value:	10.80	5.80	12.89	-0.99	
Time of Maximum:	16/07/2015 17:00:00	16/07/2015 17:00:00	16/07/2015 17:00:00	16/07/2015 22:00:00	
Minimum Value:	2.59	1.01	0.26	0.85	
Time of Minimum:	16/07/2015 19:00:00	17/07/2015 05:30:00	17/07/2015 07:30:00	17/07/2015 14:30:00	
Mean to Peak Ratio:	0.48	0.37	0.33	0.28	
Standard Deviation:	0.49	0.22	0.80	0.13	
Overall Value:	5.16	2.15	4.19	0.94	

APPENDIX 1

LOADING THE SPC DRIVERS

All SPC devices link to the PC via a USB connection. This provides fast reliable communications, and requires no additional configuration by the user. However, in most cases the PC must load the necessary driver files before it will recognise the SPC connected to it. Almost all communication problems can be traced to missing or incorrect drivers.

Normally the load process is automatic, but depending on PC settings, web connection and Windows platform, there may be occasions when drivers do not load as they should. In this situation some manual intervention may be necessary. In the event that the PC does not recognise an SPC device, please proceed as detailed below.

Windows 7:

Windows 7 is designed to obtain any driver files that it needs from the web via the 'windows update' function. If the PC has a web connection, and this behaviour has not been disabled, driver file installation is automatic and seamless.

To check if automatic driver loading is enabled, click the start button and select 'devices and printers'. One of the available devices is the PC itself. Right click on the PC icon and select 'Device Installation Settings'. Ensure the 'automatic' option is selected and reconnect your SPC device to a spare USB port. If the PC is connected to the web, the drivers will now load.

Device Installation Settings
Do you want Windows to download driver software and realistic icons for your devices?
Yes, do this automatically (recommended)
No, let me choose what to do
Why should I have Windows do this automatically?
Save Changes Cancel

If no web connection is available the drivers can be loaded manually as follows:

Ensure that your SPC Device is connected to the PC

Ensure the CD minidisk supplied with your SPC device is installed in the CD drive on your PC.

Click the start button and select Control Panel. Click 'Device Manager". (You may need to select 'large icons' from the 'viewing' menu at the top right of the page).

From the Device Manager list, select 'Other Devices'. Note: There will be a yellow warning triangle showing, which may be identified as 'SPC xxx'. Click on the yellow triangle, and click 'Update Driver'

Select the option which allows the driver to be installed from a location on the PC (<u>not</u> the automatic search).

Browse to the CD location [DRIVE]:\V.*.**.SPC----Drivers\ and click 'next'. **Please note**: if you have downloaded the drivers from the web, you will need to browse to the location that you saved them to.

Click install, and exit when complete. Note: It may be necessary to load a second driver for the COM port. If the Device Manager list shows a second yellow triangle, click on this and repeat the above procedure

Windows Vista:

Windows Vista is designed to obtain any driver files that it needs from the web via the 'windows update' function. If the PC has a web connection, and this behaviour has not been disabled, driver file installation is automatic and seamless.

To check if automatic drivers loading is enabled click the start button and select 'control panel' and click the 'system' icon (you may need to select 'classic view' from the sidebar)

Select 'advanced system settings' from the sidebar and click the hardware tab and select 'Windows Update Driver Settings' to display the following screen



Ensure that 'Check for drivers automatically' is selected and reconnect your SPC device to a spare USB port. If the PC is connected to the web, the drivers will now load.

If no web connection is available the drivers can be loaded manually as follows:

Ensure that your SPC Device is connected to the PC

Ensure the CD Minidisk supplied with your SPC device is installed in the CD drive of your PC

Click the start button and select control panel and click the device manager icon (you may need to select classic view from the side bar)

From the Device Manager list, select 'Other Devices'. Note: There will be a yellow warning triangle showing, which may be identified as 'SPC Pro'. Click on the yellow triangle, and click 'Update Driver'

Select the option which allows the driver to be installed from a location on the PC (<u>not</u> the automatic search).

Browse to the CD location [DRIVE]:\V.*.**.**\SPC----Drivers\ and click 'next'. **Please note**: if you have downloaded the drivers from the web, you will need to browse to the location that you saved them to.

Click install, and exit when complete. Note: It may be necessary to load a second driver for the COM port. If the Device Manager list shows a second yellow triangle, click on this and repeat the above procedure

Windows XP:

The later versions of Windows XP Pro (Service Packs 2 & 3) are designed to obtain any driver files that are needed from the web via the 'windows update' function. If the PC has a web connection, and this behaviour has not been disabled, driver file installation is automatic and seamless.

To check if automatic drivers loading is enabled click the start button and select 'control panel' and click the 'system' icon. Select the hardware tab and click the 'Windows Update' button to display the following screen



Select either of the first two options to enable Windows Update reconnect your SPC device to a spare USB port. If the PC is connected to the web, the drivers will now load.

If the above option is not present, proceed as follows:

Ensure that your SPC Device is connected to the PC

Ensure the CD Minidisk supplied with your SPC device is installed in the CD drive of your PC

Open "Control Panel" from the Windows 'Start' button.

In XP, select 'System' and click the 'Hardware' tab, and then 'Device Manager'. From the Device Manager list, select 'Other Devices'. Note: There will be a yellow warning triangle showing, which may be identified as 'SPC Pro'. Click on the yellow triangle, and click 'Update Driver'

Select the option which allows the driver to be installed from a location on the PC (<u>not</u> the automatic search).

Browse to the CD location [DRIVE]:\V.*.**.SPC----Drivers\ and click 'next'. **Please note**: if you have downloaded the drivers from the web, you will need to browse to the location that you saved them to.

Click install, and exit when complete. Note: It may be necessary to load a second driver for the COM port. If the Device Manager list shows a second yellow triangle, click on this and repeat the above procedure.

APPENDIX 2

EUROPEAN SETTINGS

PowerPack Pro should be set for English Regional and Language Settings . Instructions for carrying this out follows below:

WINDOWS 7

Select Control Panel and "Clock, Language, and Region"

Clock, Language, and Region Change keyboards or other input methods

Selection Region & Language / Change the date, time or number format

Region and Language Change location | Change the date, time, or number format | Change keyboards or other input methods

Format should be English (United Kingdom) and set as below dd/MM/yyyy

Region and Languag	e X					
Formats Location Keyboards and Languages Administrative						
Format:						
English (United Kingdom) 🗸						
Date and time form	ats					
Short date:	dd/MM/yyyy					
Long date:	dd MMMM yyyy					
Short time:	HH:mm 🔻					
Long time:	HH:mm:ss 🔹					
First day of week:	Monday					
What does the nota	tion mean?					
Examples						
Short date:	21/08/2012					
Long date:	21 August 2012					
Short time:	08:43					
Long time:	08:43:29					
	Additional settings					
Go online to learn ab	out changing languages and regional formats					
	OK Cancel Apply					

Select "Additional Settings". Ensure that the Decimal symbol is a full stop (.) this can simply be overwritten in the box below. Secondly, ensure that the list separator is a comma (,).

Numbers Cu	rrency Time Date		
Example			
Positive:	123,456,789.00	Negative: -123,456,78	39.00
Decim	al symbol:		-
No. of	digits after decimal:	2	•
Digit g	rouping symbol:	<i>i</i>	-
Digit g	rouping:	123,456,789	•
Negative sign symbol:		-	•
Negative number format:		-1.1	•
Display	leading zeros:	0.7	•
List sep	parator:	,	•
Measu	rement system:	Metric	•
Standa	rd digits:	0123456789	•
Use na	tive digits:	Never	•
	to restore the system de urrency, time, and date.	ault settings for	Reset

Select "Currency". Ensure that the Decimal symbol is a full stop (.) this can simply be overwritten in the box below. Secondly, ensure that the list separator is a comma (,). At the present time PowerPackPro displays in £ only.

Se Customize Format	
Numbers Currency Time Date	
Example	
Positive: £123,456,789.00	Negative: -£123,456,789.00
Currency symbol:	£ v
Positive currency format:	£1.1
Negative currency format:	-f1.1 •
Decimal symbol:	•
No. of digits after decimal:	2 •
Digit grouping symbol:	· •
Digit grouping:	123,456,789
Click Reset to restore the system defaul numbers, currency, time, and date.	It settings for Reset
	OK Cancel Apply

Next, select "Time". Ensure time format is HH:mm:ss

🔗 Customize Format	x					
Numbers Currency	Time Date					
Examples	Examples					
Short time:	09:46					
Long time:	09:46:07					
Time formats						
Short time:	HH:mm 👻					
Long time:	HH:mm:ss 👻					
AM symbol:	AM 👻					
PM symbol:	PM -					
What the notatio	ns mean:					
h = hour m = m s = second (long						
tt = A.M. or P.M.	une only)					
h/H = 12/24 hou	h/H = 12/24 hour					
hh, mm, ss = disp h, m, s = do not o	olay leading zero display leading zero					
Click Reset to resto numbers, currency,	re the system default settings for Reset time, and date.					
	OK Cancel Apply					

Finally, select "Date". Ensure that date settings are dd/MM/yyyy

🔗 Customize Format		×
Numbers Currency Tim	e Date	
Example		
Short date:	21/08/2012	
Long date:	21 August 2012	
Date formats		
Short date:	dd/MM/yyyy	•
Long date:	dd MMMM yyyy	•
Calendar	mean: ddd = day of week; M = month; y = year :ar is entered, interpret it as a year between:	
1930 and	2029	
First day of week:	Monday	•
Click Reset to restore t numbers, currency, tir	he system default settings for Rese	t
	OK Cancel	Apply

WINDOWS XP

Select Control Panel and "Regional & Language Options"

G.	X	6	-	4	8	P	1	۶
Accessib Options	Add Hardware	Add or Remov	Administr Tools	Automatic Updates	Bluetooth Configura	Date and Time	Display	Flash Player
I		S	(Y)		(R))	R	9	
Folder Options	Fonts	Game Controllers	HP 3D DriveGuard	HP Quick Launch	HP Wirele	Indexing Options	Internet Options	Java
-		C					-	-
Keyboard	Mail	Mouse	Network Connecti	NVIDIA Cont	NVIDIA nView	Phone and Modem	Power Options	Printers a Faxes
*	Q	۲	3	3	۲		O,	2
ProtectT Security	QuickTime	Regional and	Scanners and Ca	Scheduled Tasks	Security Center	SoundMAX	Sounds and Audio De	Speech
3		Language Options	3	6				
System	Taskbar and Start Menu	User Accounts	Windows CardSpace	Windows Firewall	Wireless Netwo			

Regional Options Format should be English (United Kingdom)

gional Options Standards and This option al dates, and tin	formats fects how some programs		rs, currencies,
Select an iter your own form	n to match its preferences	, ar click Custa	mize to choose
English (Unit		~	Customize
Samples			
Number:	123,456,789.00		
Currency:	£123,456,789.00		
Time:	09:31:23		
Short date:	21/08/2012		
Long date:	21 August 2012		
Location			
	ces provide you with local ct your present location:	information, su	ich as news and
United Kingo	lom		~

Select "Customize"/Numbers

Ensure that the Decimal symbol is a full stop (.) this can simply be overwritten in the box below. Secondly, ensure that the list separator is a comma (,).

lumbers Currency Time Date	e	
Sample Positive: 123,456,789.00	Negative: -123,456,	789.00
Decimal symbol:	I	~
No. of digits after decimal:	2	~
Digit grouping symbol:		~
Digit grouping:	123,456,789	~
Negative sign symbol:	- •	~
Negative number format:	-1.1	~
Display leading zeros:	0.7	~
List separator:		~
Measurement system:	Metric	~
Standard digits:	0123456789	~
Digit substitution:	None	~

Select "Currency". Ensure that the Decimal symbol is a full stop (.) this can simply be overwritten in the box below. Secondly, ensure that the list separator is a comma (,). At the present time PowerPackPro displays in £ only.

Sample			
Positive	£123,456,789.00	Negative: -£123,45	5,789.00
Curre	ncy symbol:	3	~
Posit	ive currency format:	£1.1	~
Nega	tive currency format:	-£1.1	~
Decir	nal symbol:	1	*
No. c	f digits after decimal:	2	~
Digit	grouping <mark>symbol</mark> :		~
Digit	grouping:	123,456,789	~

Next, select "Time". Ensure time format is HH:mm:ss

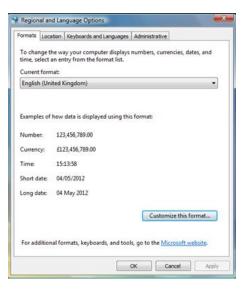
ample		
îme sample:	09:34:02	
ime format:	HH mm ss	•
îme separator:	ş	*
M symbol:	AM	-
M symbol:	PM	*
ime format nota = hour m = r i = 12 hour t = 24 hour		am or pm

Finally, select "Date". Ensure that date settings are dd/MM/yyyy

Calendar		
When a two-digit ye	ar is entered, interpret it as a year betw	een:
1930 and	2022	
•		
Short date		
Short date sample:	21/08/2012	
Short date format	dd/MM/www	
		120
Date separator:		
Long date		112
Long date sample:	21 August 2012	
Long date format:	dd MMMM yyyy	
LUNG UDIC JUNIOL.	CC INTIALIALIAL AAAA	1000

WINDOWS VISTA

Select Control Panel and "Region & Language". Under "Formats" tab select English (United Kingdom)



Select "Customize this format" / Numbers. *Ensure that the Decimal symbol is a full stop (.) Secondly, en<u>sure that the list separator is a comma (,)</u>.*

😌 Customize I	Regional Options			×
Numbers Cur	rrency Time Date			
Example Positive:	123,456,789.00	Negative:	-123,456,789.00	
Decima	al symbol:	1	-	
No. of	digits after decimal:	2	•	
Digit gr	rouping symbol:	,	•	
Digit gr	rouping:	123,456,78	9 👻	
Negativ	ve sign symbol:	•	•	
Negativ	ve number format:	-1.1	•	
Display	leading zeros:	0.7	•	
List sep	araton	÷	-	
Measur	rement system:	Metric	•	
Standa	rd digits:	012345678	9 •	
Use nat	tive digits:	Never	•	
	to restore the system defau urrency, time, and date.	It settings for	Reset	
	(OK	Cancel	pply

Next, select "Currency". Ensure that the Decimal symbol is a full stop (.) Secondly, ensure that the list separator is a comma (,).

umbers Currency Time Date		
Example		7
Positive: £123,456,789.00	Negative: -£123,456,789.00	
Currency symbol:	•	
Positive currency format:	£1.1 ·	
Negative currency format:	-f1.1 •	
Decimal symbol:	. •	
No. of digits after decimal:	2	
Digit grouping symbol:	, –	
Digit grouping:	123,456,789 💌	
Click Reset to restore the system def numbers, currency, time, and date.	fault settings for Reset	

Next, select "Time". Ensure time format is HH:mm:ss

😌 Customize Region	al Options	×
Numbers Currency	Time Date	
Example		
Time:	15:20:02	
Time format:	HH:mm:ss 🔹	
AM symbol:	AM 👻	
PM symbol:	PM 👻	
What the notatio	ons mean:	
h = hour m = n tt = A.M. or P.M.	ninute s = second	
h = 12 hour H = 24 hour		
	play leading zero display leading zero	
n, m, s = do not	display leading zero	
Click Reset to resto numbers, currency	ore the system default settings for , time, and date.	Reset
	ОК	Cancel Apply

Finally, select "Date". Ensure that date settings are dd/MM/yyyy

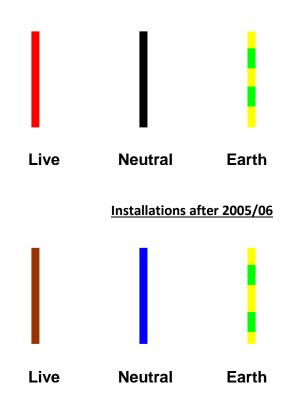
umbers Currency	Time Date
Example	
Short date:	04/05/2012
Long date:	04 May 2012
Date formats	
Short date:	dd/MM/yyyy
Long date:	dd MMMM yyyy
What the notat	ions mean
Calendar	dd, dddd = day of week; M = month; y = year
d, dd = day; d Calendar	

APPENDIX 3

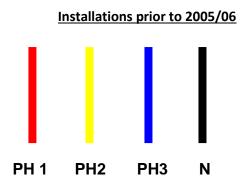
WIRING COLOURS

Installations prior to 2005/06

MAKING SINGLE PHASE MEASUREMENTS:



MAKING 3 PHASE MEASUREMENTS:



Installations after to 2005/06

