

Ranger Power Master 4000 (PM4000)

8 Input Power Quality Recording Analyser with Waveform Capture

Full Power Quality Survey. No Fuss.

- Pre-loaded PQ survey configuration means hook-it up and start recording. No thresholds, no fuss, all the results you need.

Nuisance Tripping? Record Without Thresholds.

- No thresholds need to be set for detailed event or waveform capture. Is it the supply or your installation causing the trip?



Check Pre and Post Equipment Installation

- Benchmark before and check after the installation of new equipment to ensure quality of service has been maintained.

Safe, Long Term Recording .

- A 600V Cat IV (1000V Cat III) analyser powered off phase A or 12Vdc charger. Remote comms available via our mobile app. **PMGateway**.
- With FIFO mode and automatic download to USB, carry on recording until a specific event occurs, then collect your data.

Solve Customer Complaints Quickly.

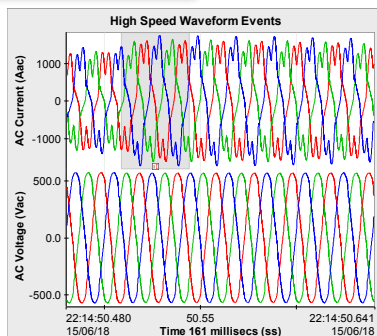
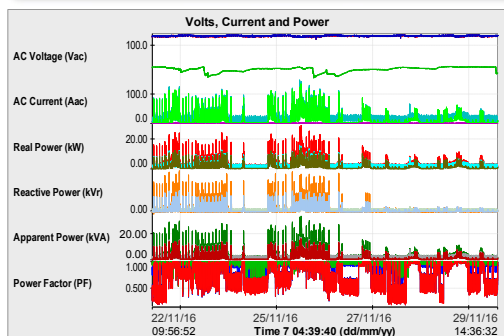
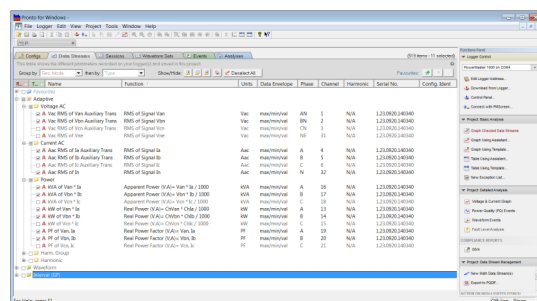
- Advise customers competently on voltage surges, dips, flicker or harmonics problems comparing any data streams in the Outram Research Ltd Software, **Pronto for Windows**, e.g. RMS voltage and Instantaneous Flicker, on the same graph.
- Minimise customer disruption by finding problems quickly using **Adaptive Store™**. Record single cycle detail during events with no thresholds set.
- Comprehensive, quick, consistent reports using graph and table templates in **Pronto for Windows**.

Preventative Maintenance

- Monitor your power quality over time to detect any problems before they cause equipment failure or costly down time.

Monitor Your Motor Performance.

- Are your machines deteriorating due to poor power quality? Observe the supply to your motors, checking for unbalance and harmonics in real time.

Event	Time	Value	Unit	Limit	Event	Time	Value	Unit	Limit
AC Voltage (Vac)	22/11/16 09:56:52	230.0	V	230.0	AC Voltage (Vac)	22/11/16 09:56:52	230.0	V	230.0
AC Current (Aac)	22/11/16 09:56:52	10.0	A	10.0	AC Current (Aac)	22/11/16 09:56:52	10.0	A	10.0
Real Power (kW)	22/11/16 09:56:52	2.36	kW	2.36	Real Power (kW)	22/11/16 09:56:52	2.36	kW	2.36
Reactive Power (kVr)	22/11/16 09:56:52	0.00	kVr	0.00	Reactive Power (kVr)	22/11/16 09:56:52	0.00	kVr	0.00
Apparent Power (kVA)	22/11/16 09:56:52	2.36	kVA	2.36	Apparent Power (kVA)	22/11/16 09:56:52	2.36	kVA	2.36
Power Factor (PF)	22/11/16 09:56:52	0.99	PF	0.99	Power Factor (PF)	22/11/16 09:56:52	0.99	PF	0.99

Technical help: support@outramresearch.co.uk +44 (0)1243 573050
Sales enquiries: sales@outramresearch.co.uk +44 (0)1243 573050



PRODUCTS
designed and
manufactured
in the UK by



August 2018

Extensive 3 Phase Power Quality Analyser with Waveforms, Harmonics and Flicker

- ◆ Measurements to IEC6100-4-30 Class A or more accurate.
- ◆ Harmonics measured to IEC61000-4-7, Flicker Measured to IEC61000-4-15
- ◆ Events captured to the EN50160 Standard.
- ◆ Rugged, portable case is pad-lockable. Unit is IP65, reliable and easy to use.
- ◆ 32 Channels of detailed recording down to a single cycle when an event occurs, without setting any thresholds.
- ◆ Waveforms recorded on 8 inputs simultaneously. Select transients, notches, rings, sags, surges, THD, and/or TH Current. No need to set thresholds.
- ◆ 13 Pre-loaded configurations are set for 3 and single phase hook ups with a variety of recording channels. These are selected for measuring voltage, current, real power, reactive power, apparent power, power factor, harmonics, flicker, unbalance, distortion and more.
- ◆ The PM4000 runs off the voltage being measured. For voltages < 104V use an AC/DC 12V charger.
- ◆ Battery back up provides 10 minutes resettable, timed ride-through in case of power outage. Automatic start up when power returns if within recording period or in FIFO mode.
- ◆ PM4000 user interface, PMScreen, is available as an Android mobile phone app. This phasor diagram display is a graphical touch screen interface that enables configuration, ensures correct hook up, provides suggestions upon detecting errors and advises if a current sensor is the wrong way round.
- ◆ HELP in PMScreen guides users through configuration and hook up - just hold down the relevant button.
- ◆ Safety: 600V Cat IV, 1000V Cat III, pollution level 2 unit. Compact, will fit in most panels and allow the door to be closed. Safely review data via Bluetooth while the unit is locked away in a cupboard.
- ◆ Hook-Up Guide and Configuration Guide as well as a manual help you get your set-up right every time.
- ◆ Data analysis is easy with our comprehensive, in-house software Pronto for Windows (included in your kit). Data also available as .xls, .csv, PQDIF.
- ◆ Fused voltage leads and internally fused voltage inputs protect this valuable equipment.
- ◆ Capable of storing up to 127 configuration or data files.
- ◆ Field programmable software and firmware updates.

	PM3000HFB	PM4000
Voltage Channels	3	4
Current Channels	3	4
Ability to Measure Neutral	✓	✓
Differential Voltage channels	✓	✓
Detailed Recording Channels	16	32
DC Measurement	Optional	
Flicker (Plt, Pst, Pinst, Pflag)	✓	✓
Highest order of individual harmonics	15th	50th
THD and THCurrent	✓ to the 25th	✓ to the 50th
kW, kVA, kVAR, Power Factor, Unbalance (V&I)	✓	✓
Frequency 45-65Hz (can automatically detect 50 or 60Hz nominal)	✓	✓
InRush Current	✓	✓
K Factor		✓
Symmetrical Components	✓	✓
Single Cycle Adaptive Store	✓	✓
Data logging time interval single cycle to 12 hrs or Auto-variable with Adaptive Store	✓	✓
Sag / Swell / Outage Monitoring	✓	✓
Waveform recording with Auto-Ranking Waveform Capture		✓ at 19.2k Samples/sec
Transient detection	✓ (down to single cycle)	✓ (both cycle & sub-cycle)
CBEMA / ANSI / ITIC curve plots		✓
Onboard Display	✓ Touch Screen	✓ Phase/ Recording/ Power indicator
Live Results	On screen or using PMMeter or PMScreen	Using PMMeter, PMWave or PMScreen
Bluetooth	✓	✓
USB	USB	USB
Remote screen using PMScreen on Android or PC	✓	✓
Remote Communications via PMGateway	✓	✓
Time Synchronisation over mobile phone or PC		✓
Memory storage for recorded data (MB)	8, 16, 32	32
Expandable Memory with memory Stick or Hard Drive		✓
FIFO mode	✓	✓
Self Powered (powered from Phase A)	✓	✓
Charged from mains if necessary (12V DC charger)	✓	✓
Portable	✓	✓
Operating Temperature	-10 to 60°C	-20 to 60°C
Safety Rating	600V Cat III	600V Cat IV, 1000V Cat III (Fuses removed)
IP Rating	IP51	IP65
Software: Pronto for Windows	✓	✓

PM4000 Kit

- Ranger PM4000 Power Quality Analyser
- Four 24" 6000 Amp Flexible Current Clamps (max conductor size 8"), braided
- Five Voltage Probes 600V Cat IV (1000V Cat III), braided, with 5 Voltage Extension Leads
- Three Neutral Common Leads
- Mains Lead and USB Lead
- Pronto for Windows Analysis Software
- Customer CD with Operation Manual
- Hook-up Checklist and Configuration Guide
- Customised Bag
- Tablet or 'Phone for Bluetooth comms (optional)
- Low Current CTs and extensions (optional)
- USB Memory stick for additional memory storage (optional)



Single Cycle Adaptive Store™

"Starting from scratch we would have spent weeks zeroing in on something like this on a conventional recorder, but the PM7000 caught it on the first try, with no special setup"

Pat Coleman, Southern Company, USA.

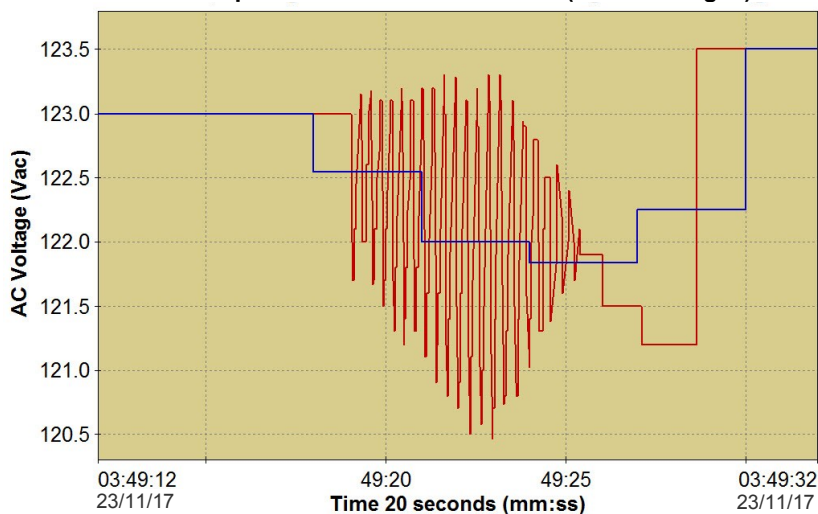
Adaptive Store is our patented compression technology available in all PM Series Analysers. It automatically records the chosen parameters in great detail and at high sampling rates when anomalies and deviations from the predicted trend occur.

Adaptive Store is designed to make the best use of available memory, whilst meeting two conflicting requirements:

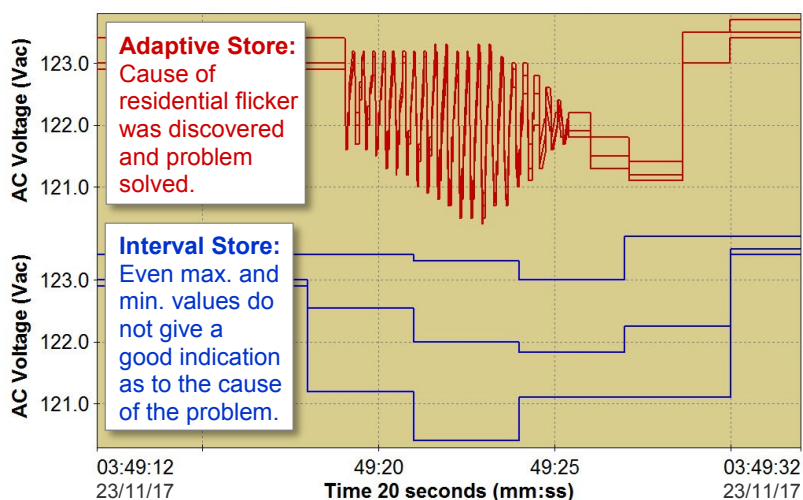
- to provide long-term trend data, observing the worst extremes of max and min values, and;
- to provide detail where new activity occurs, i.e., detecting and capturing sudden changes.

Adaptive Store assesses signal conditions in real time without having to set thresholds. The only required user parameter is the total time of the recording.

Outram's Adaptive Store vs. Interval Store (3 sec averages) of Van



Max, Min and Average of Van: Adaptive Store vs. Interval Store



Adaptive Store recognises the unpredictability of future signal activity

This unique method of *anticipating* the possible signal path has many advantages. For example:

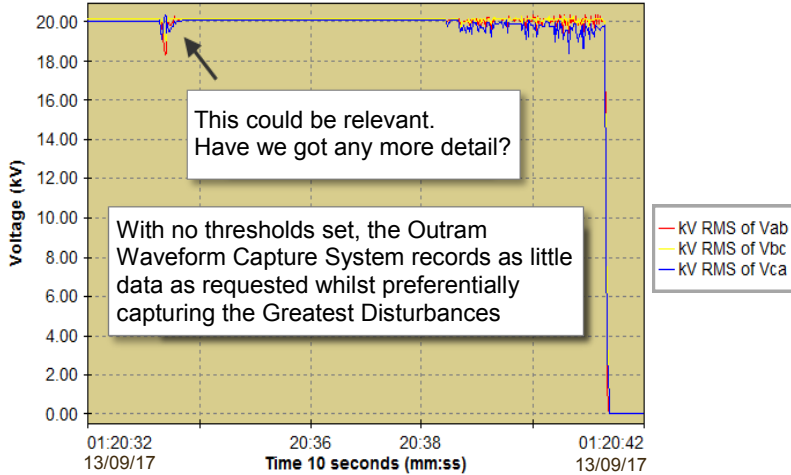
- it allows for immediate reaction to transients capturing the entire duration of the disturbance, and;
- it works with extremely long recording periods.

By automatically adjusting the thresholds distinguishing the anomalies from the trend as signal dynamics change or the available memory becomes full, Adaptive Store ensures that less significant phenomena can be summarised and greater detail recorded for abnormal behaviour.

The Single Cycle Adaptive Store™ recording mode is the most powerful automatic data compression system available in any data logger on the market.

Auto-Ranking Waveform Capture

Voltage transient occurs 8 secs before voltage collapse



Outram's **Auto-ranking Waveform Capture** is designed to manage the waveform data measured by the PM4000.

It tracks and ranks multiple categories of **sub-cycle transient and other problem event types**, such as sags, surges, notches and rings. It then discards smaller events when larger ones occur.

This automatic real time data management process has these advantages:

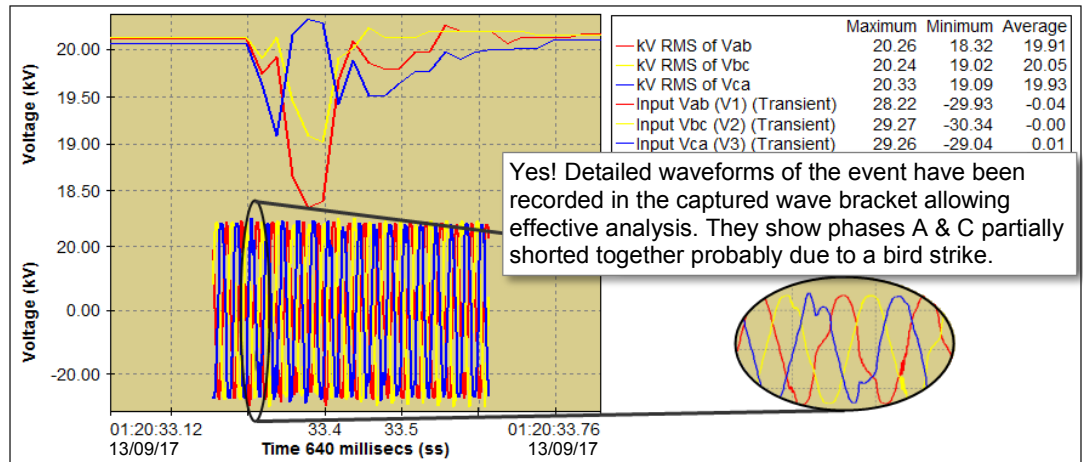
- It fills the allocated memory at the start of a recording with anything the analyser sees, then discards the least interesting disturbances, as more 'exciting' ones come along.
- It captures the best, most revealing events without any prior knowledge of what might happen. **Setting thresholds is not necessary.**

- It increases the quality of data at the same time as reducing volume, consequently speeding up download time as well as making data review easier.

- It works equally well over short and long recording periods.
- It is continuously re-triggerable and does not require re-arming.

The waveforms captured are normally up to 2 cycles before the event and up to 5 cycles after.

Voltage transient occurs 8 secs before voltage collapse

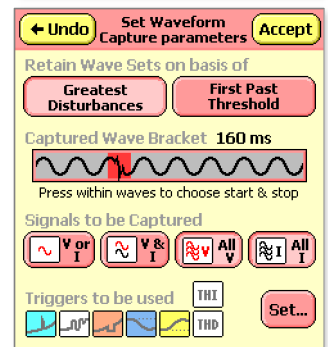
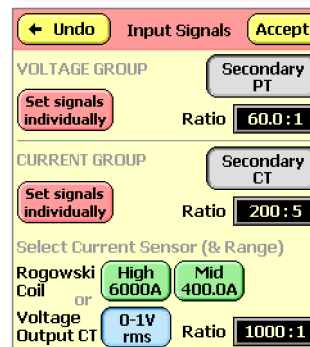
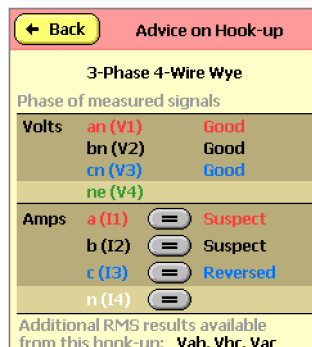
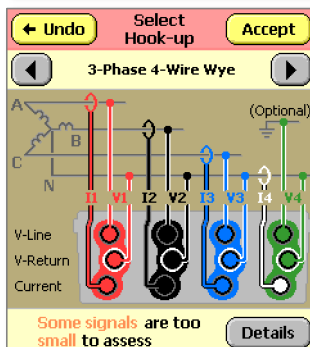
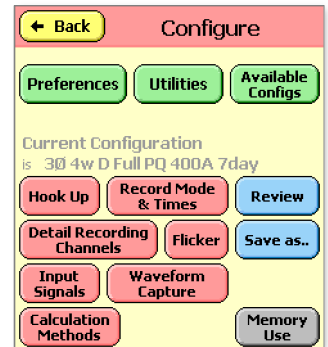
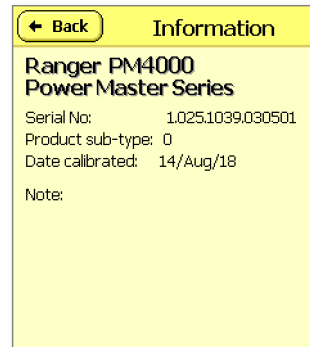
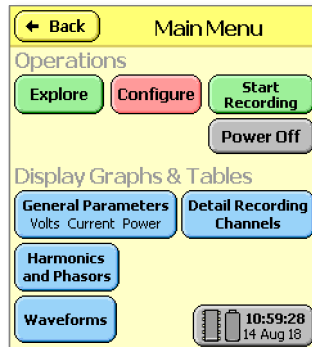
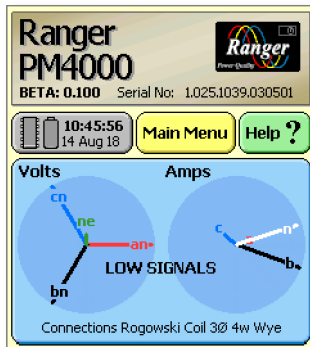


PMScreen, PMWave and PMMeter on a 10" Tablet

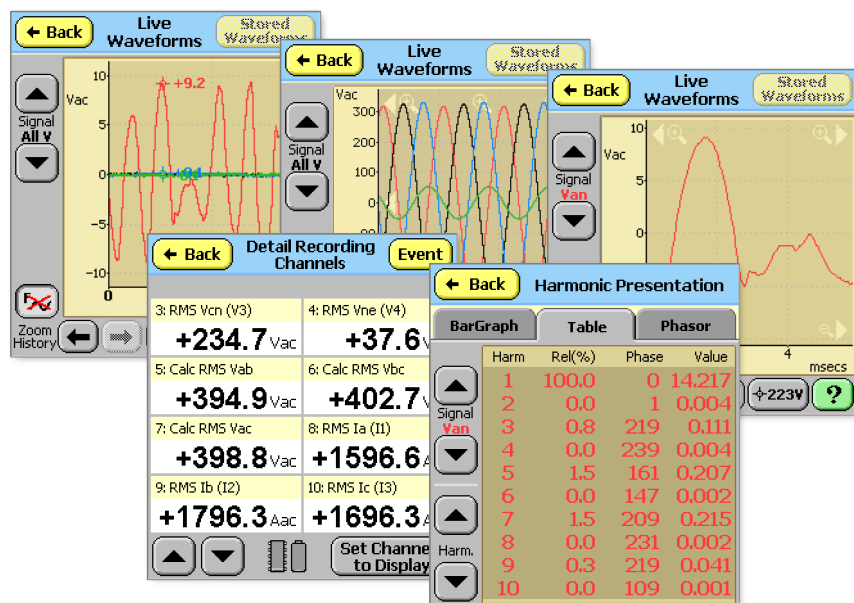


The Measure of Power Quality

Example Screens of the Ranger PM4000



PMScreen example screens cont.



View data in multiple forms

Detailed Recording Channels

View all detailed recording channels live from your tablet or phone, even when your PM4000 is up a pole or in a locked cabinet.

Harmonics

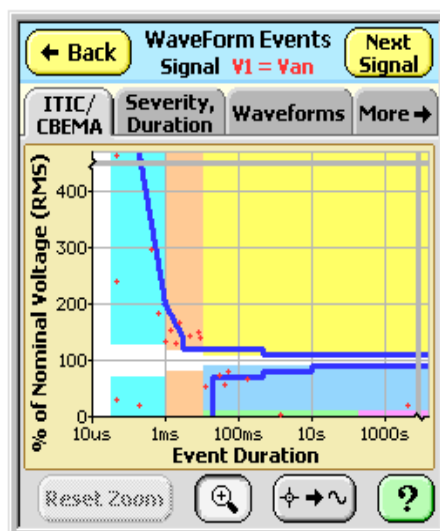
View live harmonics results on all 8 channels up to the 50th Harmonic before choosing which to record in detail.

Waveforms

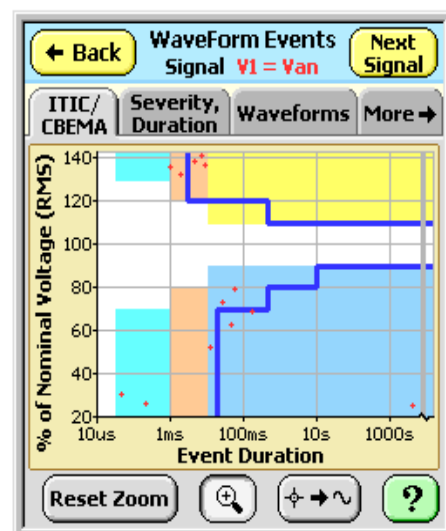
View waveforms on all channels, volts and current, with or without the fundamental.

ITIC (CBEMA) Curve

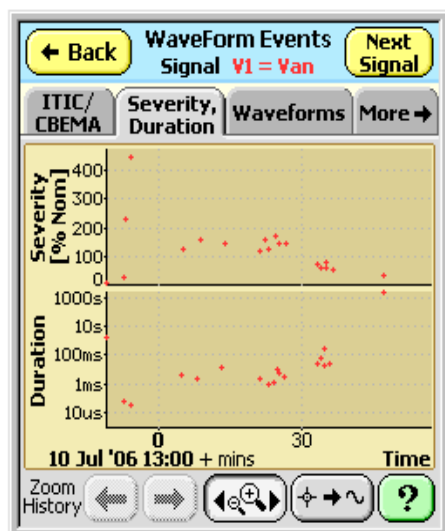
The screens to the right and below show different ways of presenting recorded event data. Screen a) is the conventional ITIC (CBEMA) presentation. This graph can be zoomed (b) to distinguish elements of a cluster, then the relevant waveform can be displayed. This ITIC information can be reproduced in our software Pronto once the recording has finished.



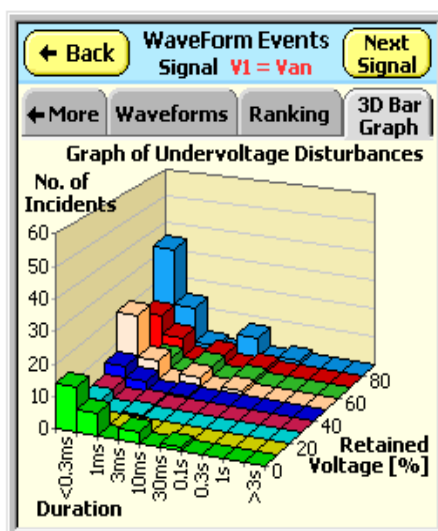
Screen a)



Screen b)



Screen c)



Screen d)

Severity / Duration Curve

Screen c) shows event severity and duration against time for the recording. This too can be zoomed in.

3D Undervoltage Disturbance Graph

Screen d), the 3D Undervoltage Disturbance Graph, shows how serious the supply disruptions have been in terms of an industrial process being disturbed.

Remember that sags/dips may effect processes more seriously than complete outages.

Exclusive Software, Pronto for Windows



How to make the most of all your recorded data:
Use our **Pronto for Windows Software**, the best graphing software on the market for use with all PM Analysers

UPSTREAM OR DOWNSTREAM?

Our Adaptive Store recording regime can deliver enough detail to indicate whether a disturbance is coming from upstream or downstream of where the measurement was taken. Work it out by looking at the relationship between the voltage and current data streams.

COMPARE LIKE WITH LIKE?

From your own recorded data in Pronto you can load the same configuration back into the analyser to record the same measurements again and again. Compare data from different analysers on the same graph.

TECHNICAL SUPPORT

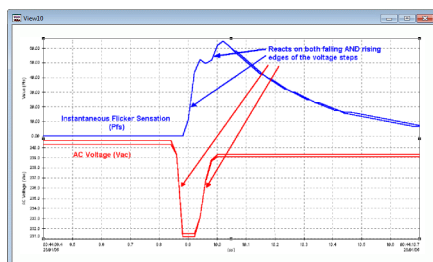
Technical support is available from those who either designed the unit or have over 20yrs experience with the Ranger PM series.

Who better to instruct you on how to make the most of your analyser?

EVENT CAPTURE

Standard Power Quality Events are captured automatically and listed on the 'events' tab for easy analysis.

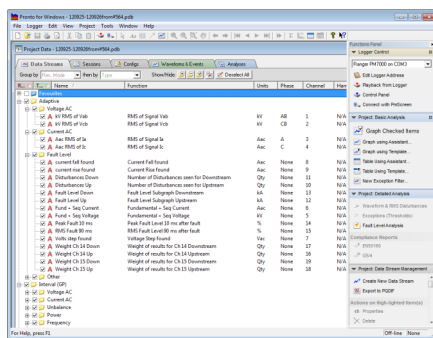
Pronto for Windows is a full-featured, Windows based program designed to extract data from the Power Master series and present it either graphically or in tables for straightforward analysis.



Analyse detailed data that Single Cycle Adaptive Store™ has captured automatically

Pronto for Windows is the only program you will need to communicate, analyse, report, and manage your data as well as configure the analyser itself.

Through the use of easy to follow 'assistants' and pre-loaded templates, create graphs and tables for emails and hard copy reports simply and quickly. Manage and save your favourites to create the same graphs recording after recording.



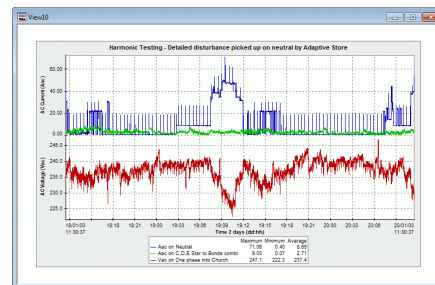
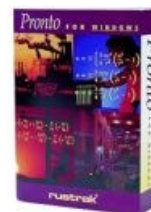
Pronto for Windows Project Browser

The selection of icons on the toolbar makes all commonly used instructions such as zooming, statistical analysis, annotation, downloading, and printing as easy as pointing and clicking the mouse.

Simply 'copy & paste' graphs into any word processing program and export tables straight to Excel or PQDIF for further analysis.

Sales enquiries: sales@outramresearch.co.uk
+44 (0)1243 573050

Technical help: support@outramresearch.co.uk
+44 (0)1243 573050



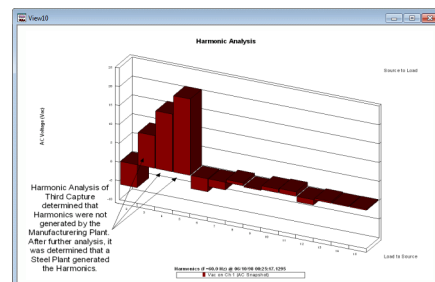
Sample Graphical Data of Voltage & Current

More Pronto Features:

- Analyser configuration is saved with data for retrieval any time
- Easy file management tools
- Watch our video tutorials on-line
- Reporting Tools:
 - Automatic G5/4 Harmonic Survey reports (PM7000/ PM7000FLM/ PM7500 only)
 - Exception reports
 - Automatic ITIC Graphing
 - Summary statistics
 - Tabular Listings
 - Custom Reports saved as templates



- Unlimited traces on a screen
- Arrange traces on any axis, full freedom of editing on all aspects of a graph
- A comprehensive, context-sensitive help system



Harmonic Analysis of Waveform Events (PM4000, PM7000, PM7000FLM and PM7500 series only)

Power Master PM4000 Specification

Input Voltage: 4 input channels. 0-600Vac or 0-1000Vac (if internal AC power supply disconnected). Sensors: In-line shrouded 4mm banana sockets. Fused voltage leads, crocodile clip.

Input Current: 4 input channels. Sensors: Two ranges on two types. Menu Selectable Rogowski coil 0-6000A, 0-400A, or Voltage Type 0-2 Vac. Safety BNC Socket. Phase reversal in software.

Four distinct simultaneous Recording Systems:

Waveform capture: 19.2kHz sampling on all inputs. 2MB of waveform data available.

Troubleshooting: Utilising the patented single cycle Adaptive Store™ to capture comprehensive detail over long recording periods on up to 32 selected parameters.

Harmonics: 1-50th selectable on 32 Adaptive Store channels.

RMS Event Database: Monitoring for 'official' power quality events such as sags/surges/interruptions.

Configurations: Space for over 200 files. These may be used for configuration or recording sessions.

Accuracy*: 0.2%. 0.1% in reference range 20-30°C (excluding sensors). +/-2LSB.

Resolution: Programmable to 0.1 Vac. Programmable to 0.1 Aac on Rogowski Coils. Resolution variable if secondary CTs or PTs used.

Troubleshooting Maths Functions:

AC Single Phase Installation: RMS, Stray Voltage RMS Hi Res < 35V, (line-neutral, line-line where appropriate). Real power W, Reactive Power VARS, Apparent Power VA, Power Factor PF, Displacement Power Factor, Phase Angle, Frequency, Instantaneous Flicker Sensation, Short Term & Long Term Perceptibility, Flicker Flag, Distortion Power (when IEEE100 power calculation selected).

AC 2 (split) Phase Installation: Real Power, Reactive Power VARS, Apparent Power, Power Factor.

AC 3 Phase Installation (Delta, Wye and variants): Real Power, Reactive Power VARS, Apparent Power, Power Factor, Voltage Unbalance, (Conventional & Sequential Components), Current Unbalance. Distortion Power, Positive Sequence Fundamental Real & Reactive Power.

Harmonics: Odds, Evens, Triplens, Individual Harmonics value and % and Harmonic Direction to the 50th, K Factor, % Total Harmonic Distortion, Total Harmonic Value.

Symmetrical Components: Positive, negative, zero

sequence: NPS, NPS/PPS (Voltage and Current), ZPS, ZPS/PPS (Voltage).

Other Maths Options: Channel X * Constant, Channel X / Channel Y, Filtered Channel X, Internal Temperature, On Charge, Battery Volts.

Waveform Capture: Sample rate - up to 19.2 ks/s (~ 384 samples/cycle at 50 Hz) on 8 channels. Events examined, **Ranked** & stored in real time.

Selectable waveform parameters:

Wave Retention Basis: Greatest disturbances (automatic ranking and low rank discard) or conventional threshold exceeded.

Capture wave bracket: Wave Sets: from 20ms up to 120msecs. Can be contiguous; no re-arming.

Signals to be captured: offending wave / complementary current or voltage, All Voltages, All Currents.

Triggers to be used: Transient, Ring, Notch, Sag, Surge, THD Volts, THD Current.

Wave Allocation: Waves allocated across trigger functions (selectable).

Frequency:

Automatic frequency tracking in 50 or 60Hz regions. Normal range 45-64Hz.

Memory: 32MB Flash memory for all files. Expansion with USB Memory Device.

User Preferences - Stored in non-volatile Flash Memory.

Portable Device Requirements for PMScreen and PMGateway: Android or Windows compatible.

Data Retention: During recording sequential data is saved to Flash memory. Waveform capture data is held in RAM and transferred to Flash memory when recording ends. Configurations etc. stored in Flash memory.

User Interface via remote screen: PC via Bluetooth or USB running PMScreen, or tablet/mobile phone via Bluetooth running PMScreen. Setup/Configuration and Data Review via remote screen. Data analysis using Pronto for Windows. Automatic download to USB stick.

Displays On PMScreen: Power & Energy, Waveforms, Harmonics, Phasors, Harmonic Phasors, Trends, List of Channels and more.

Communications:

Bluetooth: Wireless interface (isolated).

PMGateway App.: Enables Android mobile phone to act as a Gateway. Send data files to your inbox or dropbox; start and stop recordings.

USB: Memory module interface (non-isolated).

PM4000 Specification cont.

USB: Serial interface to PC (isolated > 2.5kV) download to PC & control through Pronto for Windows.

Protocol: MODBUS ASCII.

Power: Requires 100-600 VRMS, 15 W Max from Phase A voltage measurement (40 - 64Hz Rated power consumption 11Watts) or separate power supply at 12Vdc, 6 W.

Burden: Normally <10 VA from Phase A. If a charger is used the Power Supply is automatically disconnected from Phase A (input impedance per phase 32MOhms).

Battery Capacity: 2100mAhrs (5 HI-Temp NiMH batteries).

Battery Ride Through: Ten minutes at a time.

Charge Method: From V1 input or from 12V Wall Charger (auto switching).

A/D Converters: 24 bit at 19.2 kSps, top 16 bits used normally for harmonics, power & energy, Flicker.

Measurement & Reporting Standards:

IEC 61000-4-15, IEC 61000-4-30, IEEE1453 (Flicker), IEEE100.

Safety Standards: IEC 61010, (600v Cat. IV, pollution level 2, 1000V CAT III if PSU fuses removed), CE Fused voltage leads (lead fuses 500mA, 700V, 50kA rupture current), IEC 61326 (EMC).

Internal fusing: PSU (x2), Charger input, Battery stack, Internal Thermal Switch (x2).

Computer Requirements for Pronto Software: Windows 2000, XP, Vista, 7, 8, 10; 250MB hard drive space.

Case: Pelican 1150 Guard Box: Dimensions. 22.9 x 19.1 x 11.0cm.

Weight: 3.5 kg. without leads and clamps.

Operating Temp: -20°C (-4° F) to 60°C (140° F).

Environmental: IP65. Main unit will tolerate momentary emersion when lid sealed. Leads and their connections are not watertight and for safety reasons we strongly recommend that the operator does not connect and disconnect the unit in wet environments.

Applicable Patents: 6424277, 0230712, 4910692.



HARMONIC SURVEYS

Want to carry out Harmonics Surveys or measure to ENA Recommendation G5/4?

Ask us about our PM7000-I Power Quality Monitor. It can measure 1-100th harmonics in the same recording, on all 4 phases, on either volts or current or 1-50th on all 8 channels (400 Harmonics).

DIG INTO THE DETAIL

Single Cycle Adaptive Store™ records more detail when the measurement deviates from the predicted trend.

This PM series EXCLUSIVE storage technique means only the necessary information is captured in detail making the most of the unit memory and reducing analysis time.

AVAILABLE FOR HIRE

All of our PM series Analysers are available for hire. Give one a go today.

For more information on any of our products or services please contact us:

by phone on 01243 573050,

by email at sales@outramresearch.co.uk

or visit us on the web at www.outramresearch.co.uk

Outram (Ranger) Analyser Quick Comparison Chart

Outram Ranger Analyser Quick Comparison Chart	PM7000 FLM	PM7000 S, H and T	PM7503	PM4000	PM3000HF	PM2000F	PM2000F- 300	PM1000F
No. Voltage Channels	4	4	4	4	3	3	3	2 (L-N, N-E)
No. Current Channels	4	4	4	4	3	2	2	1
Ability to Measure Neutral	Y	Y	Y	Y	Y			Y
Differential Voltage channels	Y	Y	Y	Y	Y			
Detailed Recording Channels	32	32	32	32	16	16	16	16
General Parameters* ¹	Y	Y	Y					
DC Measurement			Y		Optional			
Fault Level	Y	Optional	Optional					
Flicker (Plt, Pst, Pinst, Pflag)	Y	Y	Y	Y	Y	Y	Y	Y
Highest order of individual harmonics	50th (127th Optional)* ²	50th (127th Optional)* ²	50th (127th Optional)* ²	50th	15th			
Interharmonics	Optional	Optional	Optional					
THD and THC	To the 50th (127th Optional)	To the 50th (127th Optional)	To the 50th (127th Optional)	To the 50th	To the 25th	To the 25th	To the 25th	To the 25th
kW	Y	Y	Y	Y	Y	Y	Y	Y
KVA	Y	Y	Y	Y	Y	Y	Y	Y
KVAR	Y	Y	Y	Y	Y	Y	Y	Y
Power Factor	Y	Y	Y	Y	Y	Y	Y	Y
Unbalance (V & I)	Y	Y	Y	Y	Y	Y	Y	Y
Frequency 45-65Hz (can auto-detect 50 or 60Hz nominal)	Y	Y	Y	Y	Y	Y	Y	Y
InRush Current	Y	Y	Y	Y	Y	Y	Y	Y
K Factor	Y	Y	Y	Y				
Symmetrical Components	Y	Y	Y	Y	Y			
Temperature	Internal Temp. only	Internal Temp. only	Internal Temp. only	Internal Temp. only	Internal Temp. only	Internal Temp. only	Internal Temp. only	Internal Temp. only
Single Cycle Adaptive Store	Y	Y	Y	Y	Y	Y	Y	Y
Data logging time interval single cycle to 12 hrs or Auto-variable with Adaptive Store	Y	Y	Y	Y	Y	Y	Y	Y
Sag / Swell / Outage Monitoring	Y	Y	Y	Y	Y	Y	Y	Y
High Speed Waveforms with AutoRanking Waveform Capture	Y at 19.2k Samples/sec	Y S = 19.2k Samples/sec H = 153.6k Samples/sec T = 1,228.8k Samples/sec	Y at 19.2k Samples/sec	Y at 19.2k Samples/sec				
Transient detection	Y (both cycle & sub-cycle)	Y (both cycle & sub-cycle)	Y (both cycle & sub-cycle)	Y (both cycle & sub-cycle)	Y (down to single cycle)	Y (down to single cycle)	Y (down to single cycle)	Y (down to single cycle)
CBEMA / ANSI / ITIC curve plots	Y	Y	Y	Y				

*1: > 470 parameters recorded in GP at the same time as those recorded on the 32 detailed recording channels

*2: V & I harmonics to the 50th recorded on all phases (standard set up) or with Interharmonics upgrade choose I harmonics to the 100th or V harmonics to the 100th on all phases automatically & simultaneously.

Outram (*Ranger*) Analyser Quick Comparison Chart Continued

Outram Ranger Analyser Quick Comparison Chart	PM7000 FLM	PM7000 S, H and T	PM7503	PM4000	PM3000HF	PM2000F	PM2000F- 300	PM1000F
Onboard Display	Phase/ Recording/ Power indicator	Phase/ Recording/ Power indicator	Phase/ Recording/ Power indicator	Phase/ Recording/ Power indicator	Touch Screen Display	Phase/ Recording/ Power indicator	Phase/ Recording/ Power indicator	Phase/ Recording/ Power indicator
Live Results	Using PMMeter PMWave or PMScreen	Using PMMeter PMWave or PMScreen	Using PMMeter PMWave or PMScreen	Using PMMeter PMWave or PMScreen	On screen or using PMMeter or PMScreen	Using PMMeter or PMScreen	Using PMMeter or PMScreen	Using PMMeter or PMScreen
Bluetooth	Y	Y	Y	Y	Y	Y	Y	Y
Ethernet	Optional	Optional	Y					
USB, RS232 or Infra-Red Communication	USB	USB	USB	USB	USB	Infra-Red	Infra-Red	Infra-Red
Remote screen with PMScreen	Y	Y	Y	Y	Y	Y	Y	Y
Remote Communications via PMGateway	Y	Y	Y	Y	Y	Y	Y	Y
Time Synchronisation over mobile phone or PC	Y	Y	Y	Y				
Memory storage for recorded data	128MB	128MB	128MB	32MB	8MB, 16MB, 32MB	1MB	1MB	1MB
Expandable Memory with a memory Stick or Hard Drive	Y	Y	Y	Y				
FIFO mode	Y	Y	Y	Y	Y	Y	Y	Y
Self Powered (powered from Phase A)	Y	Y	n/a	Y	Y	Y	Y	Y
Can be charged from the mains if necessary (12V DC charger unless otherwise specified)	Y	Y	Y	Y	Y	Y	Y	Power Lead
Portable/Fixed	P	P	F	P	P	F	F	P
Operating Temperature	-20 to 60° C	-20 to 60°C	-20 to 60°C	-20 to 60°C	-10 to 60°C	-30 to 65°C	-30 to 65°C	-10 to 60°C
Safety Rating	600V Cat IV, 1000V Cat III (Fuses removed)	600V Cat IV, 1000V Cat III (Fuses removed)	300V Cat IV	600V Cat IV, 1000V Cat III (Fuses removed)	600V Cat III	300V Cat III	300V Cat III	300V Cat III
IP Rating	IP65	IP65	IP40	IP65	IP51	Not applicable	Not applicable	IP40
Software	Pronto for Windows	Pronto for Windows	Pronto for Windows	Pronto for Windows	Pronto for Windows	Pronto for Windows	Pronto for Windows	Pronto for Windows

Errors and Omissions excepted. This datasheet may change at any time.

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