PM7000 POWER QUALITY RECORDING ANALYZER

Each Unit Includes

- **FIVE FUSED VOLTAGE PROBES 600V CAT IV POLLUTION LEVEL 2**
- **FOUR 24" 6000A/400.0A FLEXIBLE CURRENT CLAMPS (MAX CONDUCTOR SIZE 8")**
- **PRONTO FOR WINDOWS ANALYSIS SOFTWARE**
- **OPERATION MANUAL ON CD**
- **BLUETOOTH ADAPTER FOR LAPTOP OR PC**
- **12 VOLT CHARGER & CARRYING CASE**
- **1 YEAR WARRANTY**
- **NO COST LIFETIME UPGRADES FOR SOFTWARE & FIRMWARE**
- **CONFORMS TO IEEE 1453 FLICKER**

10 Reasons to Consider Ranger PM7000

1. Input leads fusing is - *STANDARD,* because for us*, SAFETY is NUMBER 1—EXCLUSIVE* Also, Isolation, both between channels AND for Communications

2. **Compliant to IEEE 1453 Flicker Specification** released May 2005. **ONLY** Ranger loggers can provide the required "NEW" **Instantaneous Flicker** Output for the

   ENTIRE LENGTH OF RECORDING with FLICKER FLAG VALIDATION FOR SHORT & LONG TERM FLICKER

3. RECORDS **32 Detail Channels** simultaneously with single cycle resolution on changes, BECAUSE of our: **EXCLUSIVE PATENTED "SINGLE CYCLE ADAPTIVE STORE"**

4. High speed sampling on ALL inputs including CURRENT.

5. Auto-ranking of waveform capture greatest disturbances—Ranger *EXCLUSIVE*

6. 128 Meg on board memory. USB Memory Device auto write, is standard (very powerful)

7. Wireless communications to remote screen (PDA), allows utility personnel access to PM7000 display, without suiting up as required by NFPA 70. Check out our ITIC/CBEMA event display.

8. Supports IEEE100, IEEE1459 & power triangle power math methods, making available "Distortion Power" (IEEE100), "Non-Fundamental Apparent Power" & "Fundamental Positive Sequence Reactive Power" (IEEE1459) - for sizing Power Factor Correction capacitors.

9. InterHarmonics Option-PM7000 is the best instrument on the market-we're the experts, Page 14 & 15

10. Phasor Diagram Display of individual harmonics, NOT just the fundamental

PM7000 SPECIFICATIONS

Input Voltage	**FOUR FUSED** 0-600 Vac Safety Banana Leads	**Configurations**	**On Board Storage** of over 200 **configs**
Input Current	**Four** Sensors 2 ranges 6000A or 400.0A	**Data Retention**	**Flash Memory:** During recording sequential data is saved to Flash memory. Waveform capture data is held in RAM and transferred to Flash memory when recording .
Channels	**32 Channels Single Cycle Adaptive Store™ for detail data and troubleshooting,**		
Accuracy	< 0.25% excluding sensors, +/- 2LSDs (in target ranges)	**User Interface**	**Via Remote Screen:** PC via Bluetooth or USB Running PMScreens or Pronto, Pocket PC provided with each unit via Bluetooth running PMScreens
Programmable Math Channels Recorded using Adaptive Store For extra detail and/or troubleshooting	**AC 1 Phase:** RMS, Stray Voltage RMS Hi Res < 35V, Real power, VARS, Apparent Power, Phase angle, Power Factor (Real & Displacement), Frequency, Instantaneous Flicker Sensation, Flicker Flag, (Pst, Plt already recorded)		**Setup/Configuration:** Via remote screen **Data Review:** Real Time via Bluetooth Pocket PC, laptop or PC
	AC 2 Phase: Real Power, VARS, Apparent Power, Power Factor	**Displays**	**PMScreen:** Pocket PC over Bluetooth to program and display Power & Energy, Waveforms, Harmonics, Phasors, Harmonic Phasors, Trends, Statistics, list of channels & more
	AC 3 Phase: Real Power, VARS, Apparent Power, Power Factor, Voltage Unbalance (Conventional & Sequential Components), Current Unbalance		
	Harmonics: Total Harmonic Value, % Total Harmonic Distortion, Odds, Evens, Triplens and individual harmonics with direction, K-Factor **Interharmonics, optional**	**Communications**	**Bluetooth:** Wireless interface (isolated) **USB:** Serial interface to PC (isolated > 2.5kV)
	Basic Maths: Channel X * Constant, Channel X/ Channel Y, Filtered Channel X, Internal Temperature, On Charge, Battery Volts	**Power**	**Requirements:** Powered from V1 input (90-660 VRMS, 15W Max) OR from charger input @ 12Vdc, 6W Max.—Auto Switching
Waveform Capture	Sample Rate: 8 channels at up to~ 1.2288Ms/s (~20,480 samples / cycle)		**Battery Capacity:** 1600mAhrs (5 HI-Temp NiMH batteries)
Wave Allocation	Waves allocated across trigger functions		**Charge Method:** From V1 input or from 12V Wall Charger (auto switching) Battery
Wave Sets	Dependent of length of capture, pre/post buffers	**A/D Converter**	**Resolution:** 24 bit (top 16 bits used normally)
Recording	**PM7000S —Sample rate per cycle ~ 320** **PM7000H —Sample rate per cycle ~ 2560** **PM7000T —Sample rate per cycle ~ 20,480**	**Resolution**	Programmable to 0.1 Vac and 0.1 Aac (0.01V high res mode)
Memory	128MB Flash memory for all files 32MB RAM for waveform capture data 64MB working RAM Firmware (program memory) 2MB Flash upgradeable User Preferences - Stored in non-volatile RAM/ EEPROM	**Environmental**	**Operating & Storage Temp:** -10º F to 140º F **Case Type:** Pelican 1150 Box **Dimension:** 9" x 7.5" x 4.3" **Weight:** 7.7 LBS
Recording Mode and Rate	**Point Store:** Selectable from single cycle rate to once every 12 hours	**Certification**	IEC 61010 (600V Category **IV.** Pollution level 2,1000V Cat III if PSU fuses removed), CE Fused voltage leads (lead fuses 500mA, 1000V, 50kA rupture current), GS38 compliant Internal Fusing: PSU (x2), Charger input, Battery stack Internal Thermal Fuse IEC61326 (EMC), IEC61000-4-15, IEEE1453 (Flicker)
	Adaptive Store: Extended recording with single cycle (half cycle?) resolution on changes. Statistics closed (at least) every 5 minutes. **General Store:** Statistics to IEC EN50160 via PC Software **Waveforms:** Examined RANKED and stored in real time at full speed—*Exclusive*		
Fixed Functions Recorded on (selected) Intervals (Max, Min, Avg) >492 CHANNELS	Voltage & Current RMS (8 inputs), THD/Harmonic Value (8 inputs), Power (kW, VAR, AP, PF) Individual Harmonics 2-51 (8 * 50 signals) (127th with Interharmonics option) General Store avg. adjustable 1 sec— 1 hour	**Computer Requirements**	For Pronto Software: Windows 9x, ME, NT, XP , Vista & Windows 7
		PDA Requirements	For PMScreens: Microsoft Pocket PC 2003
		Applicable Patents	6424277, 0230712, 4910692

Screen 1 — Ranger PM7000

Ranger PM7000
BETA: 0.206   Serial No: 1.018.0246.550203
14:16:12 10 Jul 06 | Main Menu | Help ?
Volts | Amps
cn / an / ne / bn
c / a / n / b
Connections Rogowski Coil 3Ø 4w Wye

Screen 2 — Main Menu

← Back   Main Menu
Operations
Explore | Configure | Stop Recording
Power Off
Display Graphs & Tables
General Parameters — Volts Current Power | Detail Recording Channels
Harmonics and Phasors | Compare to Standards — EN50160 G5/4 IEEE519
Waveforms | 14:26:03 10 Jul 06

Screen 3 — Information

← Back   Information
Ranger PM7000
Power Master Series
Serial No: 1.018.0246.550203
Date calibrated: 4/Jul/06

Screen 4 — PM7000 Help

← Back   PM7000 Help
Help for the PM7000 series products is available primarily by pressing a button and holding it down for a second or more.
Try it here... | Contents
Then press briefly for more help. | Index
| General
Press here to skip this introduction in future (re-enabled on next Logger power-up). | Skip

Screen 5 — Configure

← Back   Configure
Preferences | Utilities | Available Configs
Current Configuration is Initial Config
Hook Up | Record Mode & Times | Review
Detail Recording Channels | Save as..
Input Signals | Waveform Capture | Flicker

Screen 6 — Select Hook-up

← Undo   Select Hook-up   Accept
◄ 3-Phase 4-Wire Wye ►
(Optional)
A / B / C / N
I1 V1 I2 V2 I3 V3 V4
V-Line
V-Return
Current
Some connections may be suspect | Details

Screen 7 — Input Signals

← Undo   Input Signals   Accept
VOLTAGE GROUP | Secondary PT
Set signals individually | Ratio 20.0:1
CURRENT GROUP | Secondary CT
Set signals individually | Ratio 200:5
Select Current Sensor (& Range)
Rogowski Coil | High 3000A | Mid 320.0A
or
Voltage Output CT | 0-1V rms | Ratio 10:1

Screen 8 — Set Waveform Capture parameters

← Undo   Set Waveform Capture parameters   Accept
Retain Wave Sets on basis of
Greatest Disturbances | First Past Threshold
Captured Wave Bracket 100 ms
Press within waves to choose start & stop
Signals to be Captured
V or I | V & I | V | All V | All I
Triggers to be used | Set

Screen 9 — Setup Record Mode & Times

← Undo   Setup Record Mode & Times   Accept
General Parameters
Record Every 1 min
Detail Recording (Trouble Shooting)
Storage Mode | Adaptive Store | Point Store
Record Time | 7 days
Recycling FIFO On Off

Screen 10 — Detail Recording Channels

← Undo   Detail Recording Channels   Accept
Setup the recording channel functions: (press function TWICE to edit or use buttons) | Suggest New Functions
▲ | 10 RMS Ic (I3) | Aac
Clear | 11 RMS In (I4) | Aac
Clear All | 12 Flicker Sensation Van | Pfs
Re-order | 13 Flicker Sensation Vbn | Pfs
| 14 Flicker Sensation Vcn | Pfs
▼ | 15 Flicker PLT Van (V1) | Plt
List by: Channel | Name | Signal

Screen 11 — Edit Channel Function

← Undo   Edit Channel Function   Accept
+/- % One Harmonic | Apply to Channel: 16
1 2 3 4 5 | (Change Channel)
6 7 8 9 10
11-20 21-30 31-40 41-50 | Units %
of Signal
Van Vbn Vcn Vne
Ia Ib Ic In
High Alarm | Low Alarm
+0.0 Off | +0.0 Off

Screen 12 — Recording Suggestions

Recording Suggestions | Return to List
Most recent channel defined: (press to edit, or clear using button)
7 Calculated RMS Vac | Vac | Clear
No. of next channel to be defined: | 8
Suggestions for next channel: (press on a function to select then edit above)
RMS Ia (I1) | Aac
THD Van (V1) | %
Other

Screen 13 — Detail Recording Channels

← Back   Detail Recording Channels
1: RMS Van (V1) +222.1 Vac | 2: RMS Vbn (V2) +0.0 Vac
3: RMS Vcn (V3) +0.1 Vac | 4: RMS Vne (V4) +0.0 Vac
5: Calc RMS Vab +222.1 Vac | 6: Calc RMS Vbc +0.1 Vac
7: Calc RMS Vac +222.2 Vac | 8: RMS Ia (I1) +12. Aac
▲ ▼ | Set Channels to Display

Screen 14 — General Parameters - Live Summary

← Back   General Parameters - Live Summary
Summary | Volts | Current | Volts Flicker

Signal	V-rms [V]	Signal	I-rms [A]
Van	222.0	Ia	12.
Vbn	0.1	Ib	0.
Vcn	0.1	Ic	6.
Vne	0.0	In	7.

Parameter		Parameter	
Unbal %	199.73	kW	+2.
NPS/PPS	100.00	kVar	+0.
PF	+0.94	kVA	2.
Freq. (Hz)	49.89	kWHr	7.

Screen 15 — Harmonic Presentation (BarGraph)

← Back   Harmonic Presentation
BarGraph | Phasor | Trend | Table
Signal All
Harm. 1-21
222.4V 100.0% Voltage
1 3 5 7 9 11 13 15 17 19 21
12.A 100.0% Current
1 3 5 7 9 11 13 15 17 19 21
F Remove Fund. | Show Direction

Screen 16 — Harmonic Presentation (Table)

← Back   Harmonic Presentation
BarGraph | Phasor | Trend | Table
Signal Van
Harm.

Harm	Rel(%)	Phase	Value
1	100.0	0	222.6
2	0.0		0.0
3	0.9	204	1.9
4	0.0		0.0
5	0.9	114	1.9
6	0.0		0.0
7	1.9	189	4.3
8	0.0		0.0
9	0.3	236	0.7
10	0.0		0.0

Screen 17 — Live Waveforms

← Back   Live Waveforms | Stored Waveforms
Signal Van
300 200 100 0 -100 -200 -300 Vac
0 20 40 60 msecs
Zoom History | ◄ ► | 223V | ?

Screen 18 — Live Waveforms

← Back   Live Waveforms | Stored Waveforms
Signal All V
+9.2
10 5 0 -5 -10 Vac
0 10 20 msecs
Zoom History | ◄ ► | 223V | ?

Screen 19 — Live Waveforms

← Back   Live Waveforms | Stored Waveforms
Signal Van
10 5 0 -5 -10 Vac
0 2 4 msecs
Zoom History | ◄ ► | 223V | ?

Screen 20 — Live Waveforms

← Back   Live Waveforms | Stored Waveforms
Signal Van
1 0 -1 -2 -3 -4 -5 Vac
0.0 0.5 1.0 msecs
Zoom History | ◄ ► | 223V | ?
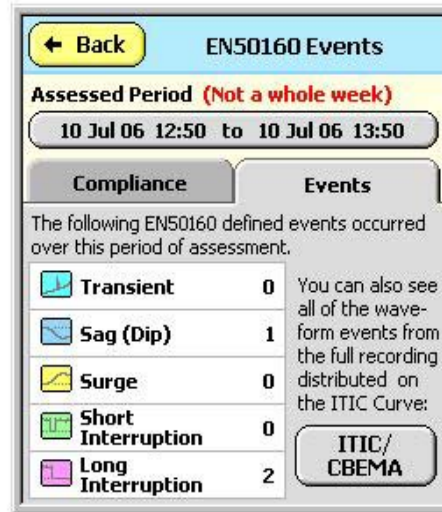
Screen a)

Screen b)

Recorded results may be compared against various Standards, for example EN50160 the European Public Voltage Supply characteristic.

The screens here show examples a) of the summaries for compliance of the supply during the assessed period, and b) the number of specific events.

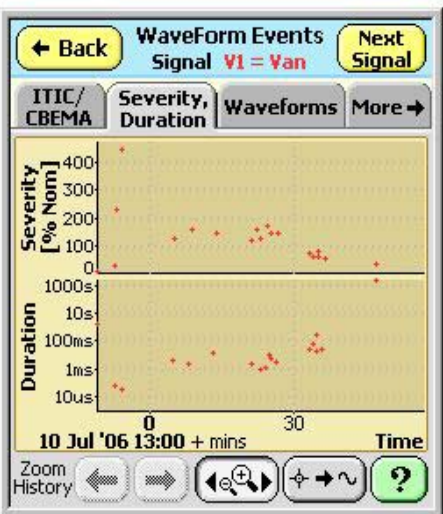For both of these screens the assessment period can be adjusted.

The screens to the right and below show different ways of presenting recorded event data. Screen c) is the conventional ITIC (CBEMA) presentation. This graph can be zoomed (d) to distinguish elements of a cluster, then the relevant waveform can be displayed.
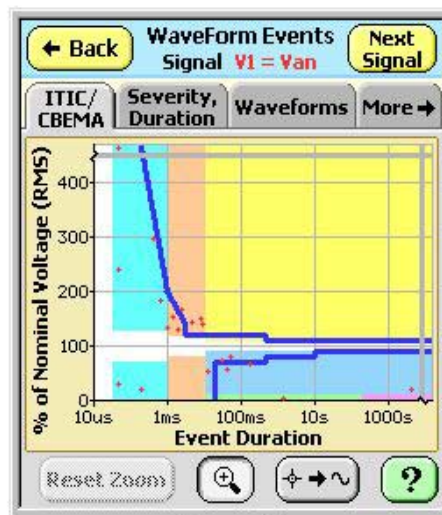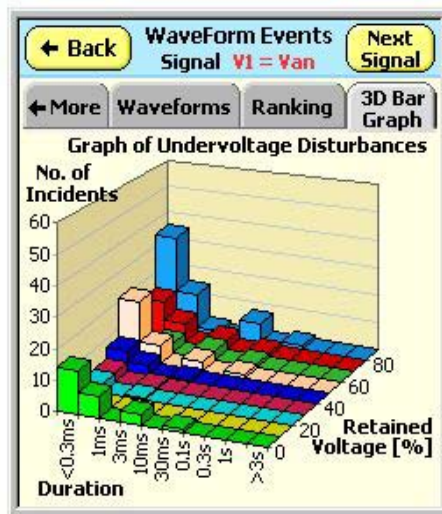

Screen c)
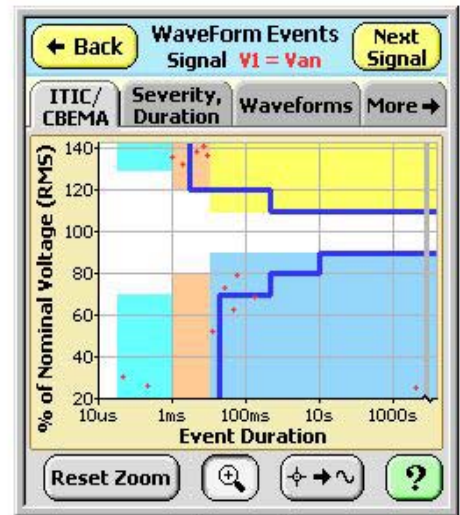
Screen d)

Screen e)

Screen f)

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

Screen f), 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 affect processes more seriously than complete outages.