ezPAC™

The "Add-On" Automation Solution

SA300

Unlimited Measurement, Power Quality Analysis, Control and Communication for Distribution and Automation

SATEC

Powerful Solutions

4 X 20A Accurate Current Inputs

Or 4 X 20/150A Current Inputs

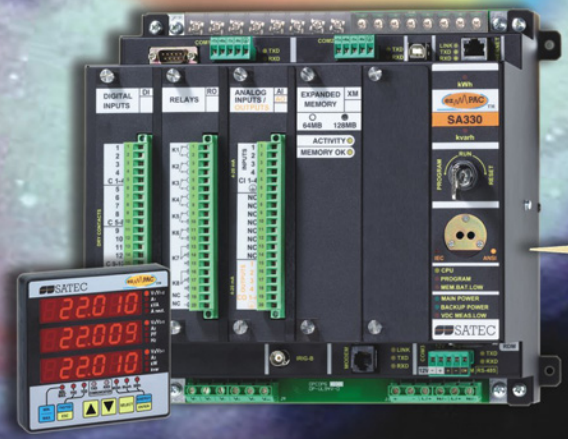
4 X 150A Fault Current Inputs

4 AC Voltage Inputs

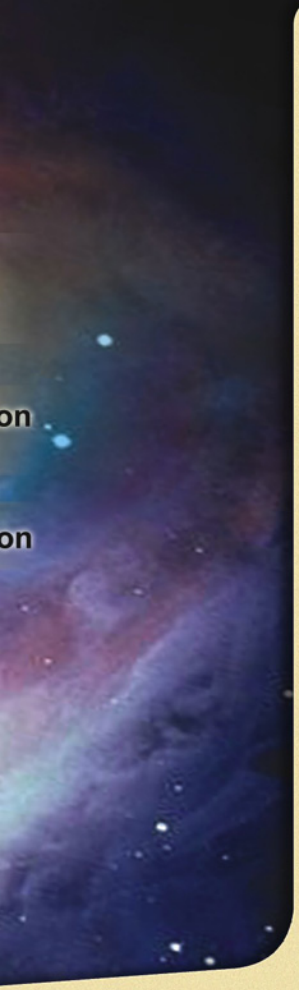
Fast I/O trip indicati control & reclose

GPS Time Sync 1 msec

Analog Indicati



ez



General

The SATEC ezPAC™ SA300 of Series Power Intelligence Units (PIU) is an advanced power analysis and control device unmatched in the utility and industrial environments.
The SATEC ezPAC™ SA300 Series is a fusion of many Intelligent Electronic Devices (IED) combined into one single powerful unit. The SATEC ezPAC™ SA300 Series unites Distributed Fault-Recording, Sequence of Events (SOE), Revenue Metering, Power Quality, Back up Protection equipment and control devices to provide a complete solution for substation and industrial automation.
The unique modular expansion chassis of the SATEC ezPAC™ SA300 Series assures the capability of meeting the needs of today and the future by selecting different plug-in options for multiple applications. The ezPAC™ allows a relatively low cost upgrade to be accomplished with just minimal panel and wiring changes. Modular I/O design enables a custom-made product according to specific needs

Fast Data Logging Recorder

From 1/2 cycle RMS to 2-hour envelopes are provided. Most useful in quickly determining relay operation by recording the RMS value of each cycle and displaying the entire trend when the breaker clears, resets, lockouts or fails to operate; up to 20 pre-fault cycles; Programmable post fault on any internal and external trigger condition.

Waveform Capture

The ezPAC™ SA300 provides simultaneously capture **for all** voltage and current channels with choice of samples up to 128 sample/cycles. Selectable pre-fault/post-fault recording cycles, sub-cycle disturbance capture recorder up to several minutes.

Full Harmonic Analyzer

Total Harmonic Distortion for V&I and up to the 63rd and individual harmonics distortion for V, I, P, Q, ϕ. Including directional power harmonics (Load or Source), power factor, K factor, vector diagram and symmetrical components.

High Speed Sampling

The utilization of the latest **DSP** technology and the innovative data concept allow very long recording periods without compromising the high level of accuracy. Simultaneous sampling with individual A/D conversions assures no phase differential for 12-channels of AC, 1 VDC and digital inputs recording.

Multi-Function Powermeter

Real time cycle by cycle measurement of high accuracy, true RMS voltage, current, power, demand and energy with continuous sampling of 32, 64, 128 samples/per cycle.

Accurate Revenue Billing

Meets IEC687 (0.2s Class) or ANSII C12.20 (0.2 class) Advanced Time-of Use (TOU) feature for any complex billing scheme is provided, KYZ or KY outputs and LED for test. Totaling from multiple energy and demand registers from energy pulses via external watt-meters.

External Time Synchronization

Provides 1 mSec time resolution via IRIG-B time-code input or GOES type **satellite** clock for common base time.

Dual Independent Power Supplies

Primary AC/DC and Secondary power supply provide continuous reliable operation (automatic switching for backup).

Wide Range Voltage and Current Input Channel

❖ **Four 5.5kV Galvanically Isolated AC voltage inputs**
Wide range application: 120V up to 690V.
❖ **Four Galvanically Isolated AC current inputs**
Combination of metering (10A/IEC or 20A/ANSI) and extended input range up to 3000% (150A) for fault current.
❖ **A second set of four Galvanically Isolated current inputs (Model SA330 only)**
In addition to the high measurement CT an additional

set of CT inputs (10A/IEC or 20A/ANSI input currents) is used for precise energy metering thus eliminating expensive revenue billing meters. Separate metering and protection CT.

❖ **DC voltage input**
Used for station battery monitoring (up to 300VDC). Set point triggers and alarming.

THE SA300 COMBINES IN A SINGLE ENCLOSURE FOR:

❖ Substation automation upgrade
❖ Power Quality Analyzer
❖ Disturbance Fault Recording
❖ Precise Sequence-of-Events Recorder (SOE)

PLATFORM COMMUNICATION FOR ANY NEED

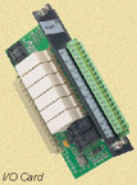
❖ Three independent universal serial communications ports (RS-232, RS-422/RS-485, up to 115,200 bps, Modbus RTU/ASCII and DNP3.0 protocols).
❖ Infrared port (Modbus RTU/ASCII and DNP3.0 protocols).
❖ Embedded 56K modem for communications through public telephone lines(Modbus RTU/ASCII and DNP3.0 protocols).
❖ Ethernet 10Base-T port (Modbus/TCP and DNP3.0/TCP protocols, up to five non-intrusive simultaneous connections, Telnet service port).
❖ USB 1.1 port (Modbus RTU protocol, 12 Mbps) for fast local communications and data retrieving.
❖ Alarm messages to Pager or E-mail (notification of priority problems via dial-out modem or Ethernet) - future.

Each port is an independent protocol up to 10MBs simultaneously, with protocol Modbus & Modbus TCP/IP and DNP3.0& DNP3.0 TCP/IP.

Communication Connections

UPGRADEABLE FIRMWARE

The SATEC SA300 uses flash memory for storing device firmware that allows future upgrading of the device without replacing any hardware components. You no longer have to replace EPROM and remove from service. New features can be easily added to your device by simply replacing the firmware through a local RS-232 port or Ethernet port.



I/O Card

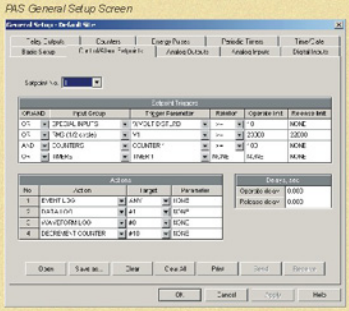
DIGITAL AND ANALOG I/O OPTIONS

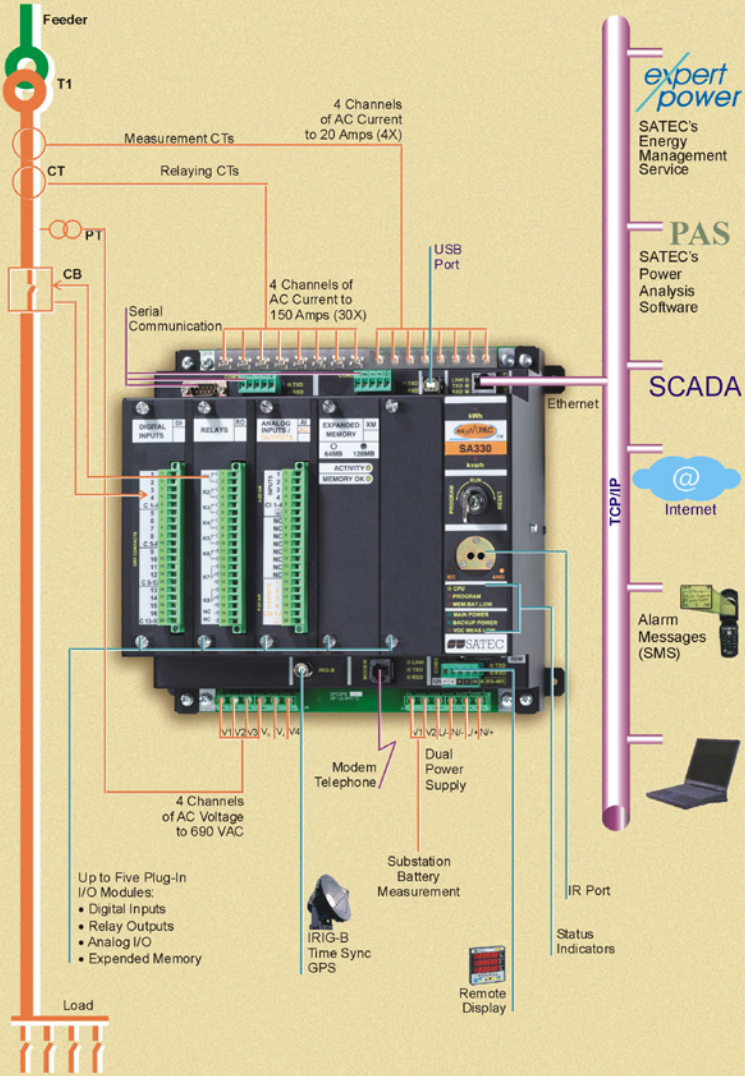
The SA300 has five I/O expansion slots for wide range plug-in I/O modules:
❖ DI - High Speed Digital Inputs Module
❖ RO - Relays Module
❖ AI/AO - Mixed Analog Input and Output Module
❖ Expanded memory module (64M ro 128M)

LOGGING, RECORDING AND PROGRAMMING

❖ **Programmable Controller** (32 control setpoints, OR/AND logic, extensive triggers, programmable thresholds and delays, relay control, event-driven data recording)
❖ **1-ms satellite-synchronized clock** (IRIG-B time-code input)
❖ **Eight fast Waveform Recorders** (simultaneous 8-channel AC, one VDC and 16-channel digital inputs recording in a single plot; selectable AC sampling rate of 32, 64 or 128 samples per cycle; 20 pre-fault cycles, 1-ms resolution for digital inputs; up to 3 min of continuous recording with 4-Mbyte onboard memory
❖ **Sixteen fast Data Recorders** (from 1/2 cycle RMS to 2-hour RMS envelopes; up to 20 pre-fault and post-fault cycles; programmable data logs on a periodic basis and on any internal and external trigger)
❖ **Revenue Class 3-phase Power meter** (true RMS, volts, amps, powers, power factor, unbalance, neutral current)
❖ **Demand Meter** (amps, volts, harmonic demands)
❖ **Precise Energy and Power Demand Meter** (TOU, 16 Summary energy and demand registers for substation energy management, accumulation of energy pulses from external watt-meters, block and sliding demands, up to 64 energy sources)
❖ **Harmonic Analyzer** (to 63rd harmonic volts and amps, directional power harmonics and power factor, phasors, symmetrical components)
❖ **32 digital counters** for counting pulses from external sources and numerous internal events
❖ **16 programmable timers** from 1/2 cycle to 24 hours for periodic recording and triggering operations on a time basis

PAS General Setup Screen



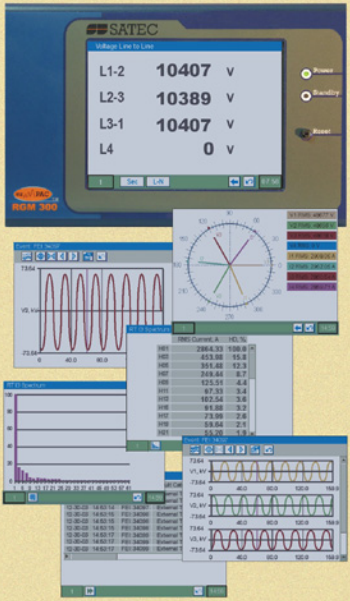

Feeder
T1
CT
PT
CB
Load
Measurement CTs
4 Channels of AC Current to 20 Amps (4X)
Relaying CTs
4 Channels of AC Current to 150 Amps (30X)
Serial Communication
USB Port
Ethernet
TCP/IP
expert power
SATEC's Energy Management Service
PAS
SATEC's Power Analysis Software
SCADA
Internet
Alarm Messages (SMS)
SA330
4 Channels of AC Voltage to 690 VAC
Modem Telephone
Dual Power Supply
Substation Battery Measurement
IRIG-B Time Sync GPS
Remote Display
IR Port
Status Indicators
Up to Five Plug-In I/O Modules:
• Digital Inputs
• Relay Outputs
• Analog I/O
• Expended Memory

REMOTE GRAPHIC MODULE

There are three types of Display Modules that can accompany the SA300 series: RDM-LED Remote Display Module, RDM312 Multi-Window Display Module and RGM300 Remote Graphic Module. All three have a fast RS485 port and communicate with the SA300 series through the Modbus RTU protocol. Remote displays can be located at distances of up to 1.2km from the device. An Ethernet 10Base-T (TCP/IP) port can communicate with the SA300 devices through any network using the RGM300 Module.

RGM300

The RGM300 Remote Graphical Module is a **Color** graphical LCD display with touch screen, designed for use with the SA300 series. The RGM300 is panel mounted and may be installed as far as 1.2 km from the SA300. The RGM300 communicates with the SA300 using RS485 communications at speeds up to 115kBaud through the Modbus protocol. The RGM300 enables viewing information from the SA300 such as fault and power quality information in a graphical form, waveforms, harmonic spectrum, phasors and data trends, review latest fault and power quality reports for fast fault analysis, and much more.



RDM LED

The RDM has three six-digit windows with bright LEDs well suited for direct sunlight applications. It allows the user to view real-time RMS and harmonics measurements, status indication parameters, and perform basic setup operations when installing and servicing the device.

RDM312

The RDM312 is a large multi window display that includes 12 Bright LED windows designed for use with the SA300 series and well suited for direct sunlight applications. The RDM312 is panel mounted and may be installed as far as 1.2 km from the SA300. The RDM312 communicates with the SA300 using RS485 communications at speeds up to 115kBaud through the Modbus protocol. It allows the user to view simultaneously 12 real-time RMS measurements: 3 phase Volts and Amps, Neutral Current, Active Reactive and Apparent Power, Power Factor and Frequency. The RDM has three six digit windows with bright LEDs well suited for direct sunlight applications.

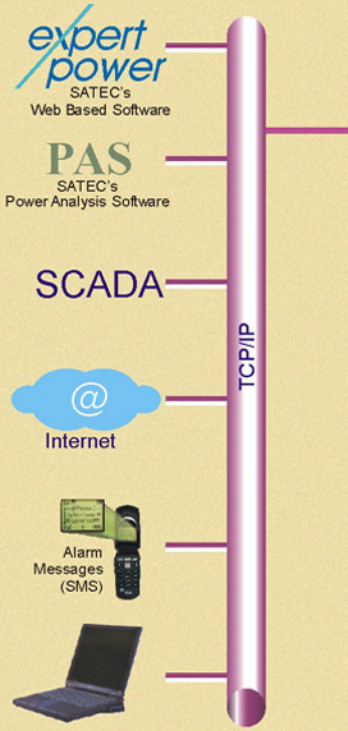
Substation Automation

The SATEC ezPAC™ SA300 Power Intelligence Unit is an ideal cost effective means of automating an electrical substation. The SATEC ezPAC™ can be installed at a fraction of the cost and time involved in replacing protection relays. By adding one SATEC ezPAC™ Model on each feeder circuit, ALL the information needed for substation automation is provided. The SATEC ezPAC™ SA300 extends the life expectancy of electromechanical relays for many years to come by providing "*INFORMATION*" lacking in electromechanical devices without interfering in the protection scheme.

Before

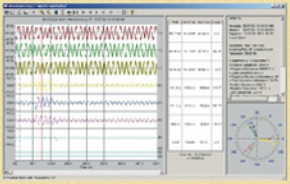
After

The ezPAC™ allows a relatively low cost upgrade to be accomplished with just minimal panel and wiring changes. Modular I/O design lets you order a custom-made product according to your needs.



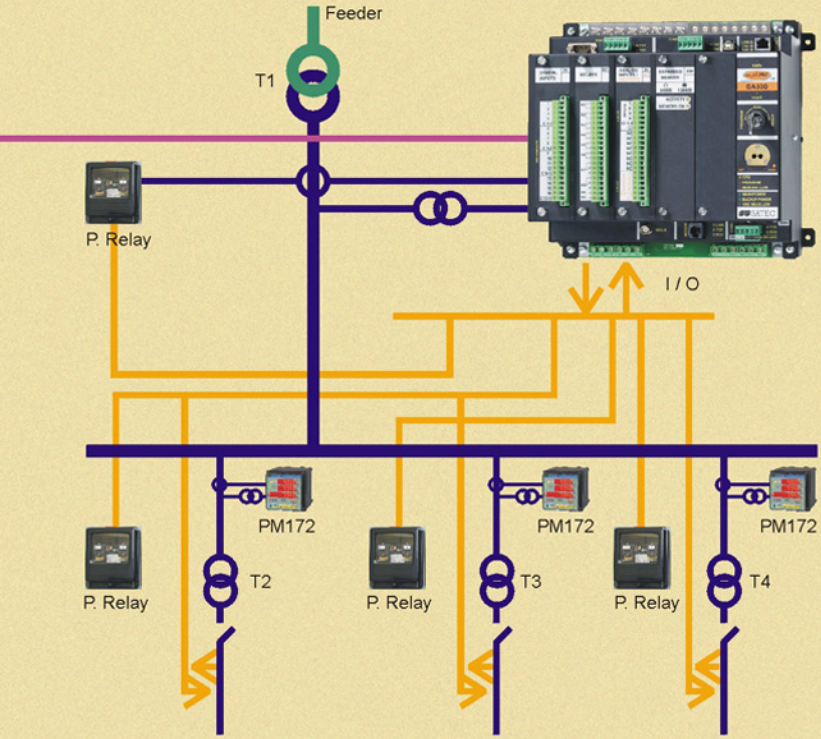
RELAY TARGET INFORMATION

Which Relay Tripped, Which Phase, Time Delay or Instantaneous, How Many Times, When (Time-tagged), etc.



"ADD" PROTECTIVE RELAYING BACK-UP / REPLACEMENT

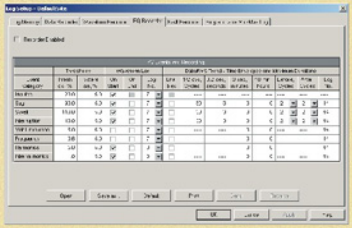
Under/Over Frequency Relay
Automatic Load Shed & Restore (0.01 Hz. with adjustable time delay)
Reclosing Relay
Multi-Shot Automatic Reclosing
Synchro-check and LLDB/LBDL Supervision
Permit / Block reclose
Synchrocheck Relay
Phase Angle, Slip Frequency, LLDB/LBDL Control
Time Overcurrent Relay Backup
Back Up Prime TOC Relay Curve with up to 32 Current Magnitude and Duration Set Points



Power Quality Recorder

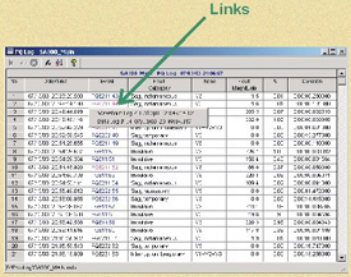
Advanced power quality monitoring reporting as per IEEE 1159 standard Report by exception with programmable thresholds and hysteresis, ready-for-use reports; transients, impulses, sags/swells, interruptions, inter-harmonics as per IEEE519, frequency, variations, volts unbalance.

The Power Quality (PQ) Recorder **automatically** logs the IEEE 1159 power quality events to the PQ Log file. The PQ Recorder setup allows to adjust thresholds and hysteresis for different PQ triggers, and to define the waveform and data log options for PQ events.



Viewing the Power Quality Log

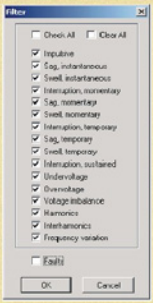
PQ log files are displayed in a tabular view, one event per row. PAS loads the entire database table to a window, so that you can scroll through the log to view its contents. The PQ log normally contains both power quality and fault events.



PAS will establish links between the event and database records where it finds a relationship between the recorded data and the event. For example, it will link a setpoint event to a waveform recorded at the time of the event **even if the waveform was triggered by another event.** When PAS finds data related to the event, it shows the event ID in the blue color. To check a list of the event links, click on the colored event ID with the left mouse button. To directly move to the related waveform or data log record, click on the selected list item with the left mouse button.

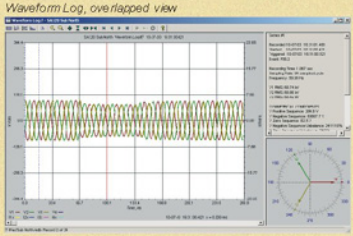
Filtering Events

You can use filtering to find and work with a subset of events that meet the criteria you specify.



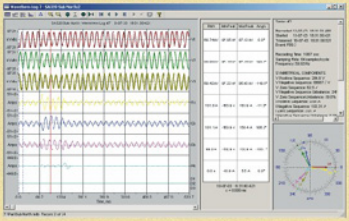
When displaying the PQ report, PAS establishes links between the event and waveform and data log records related to the event. Data log records associated with the event are taken into a separate window for easy viewing and trending.

Waveform Log, overlapped view

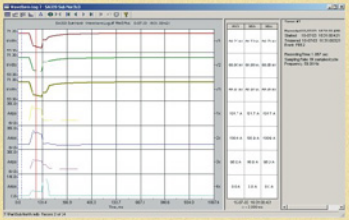


Power Quality Recorder

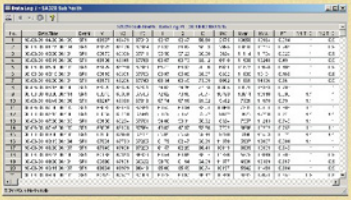
Waveform Log, polywave view



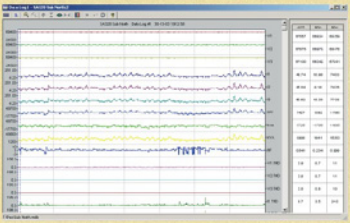
Waveform Log, RMS view



Data Log



Data Log Trend



Power Quality Monitoring and Analysis

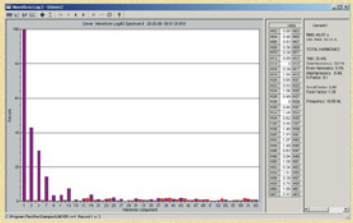
Immediate Disturbance Identification with Event Classification per IEEE1159 (or EN50160) Categories:

- Impulse
- Under-Voltage
- Interrupts
- Sag
- Over-Voltage
- Swell
- Frequency Variation
- Transient / Impulse Detection
- Voltage Imbalance
- Harmonics
- Interharmonics
- and more...

The ezPAC™ SA300 will provide automatic analysis and report on the following:

- Event Summaries by Category with Worst Case
- Report by Exception
- RMS Time Plots of Events and Trends

Harmonic Spectrum



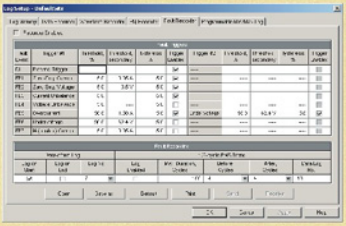
Installed ezPAC™

Fault Recorder

The ezPAC™ includes true digital fault recording, Sequence 0f Event (SOE) recording, and disturbance recording of four current channels for up to 150 Amps of fault currents (30X). Four AC voltage channels and DC measurement input channels are also included. Multiple ezPAC™ can cross trigger for up to 20 cycles of pre-fault information for distributed recording. Fault information can be exported to optional COMTRADE format via PAS software.

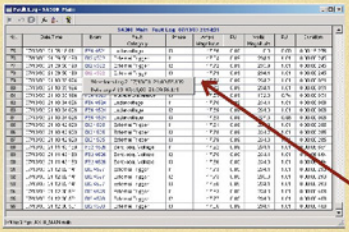
The Fault Recorder can be triggered by the embedded fault detector or externally through any digital input. External triggers are automatically enabled for the Fault Recorder.
When the Fault Recorder is enabled, it **automatically** records all internally detected and externally triggered fault events to the Fault Log file and to the Sequence-of-Events Log.

Fault Record Set Up



The Fault Recorder setup allows you to adjust thresholds and hysteresis for different fault triggers, and to define the waveform and data log options for recording fault events.

Fault Log Record

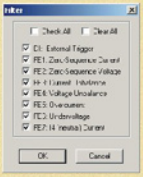


Viewing the Fault Log

Fault log files are displayed in a tabular view, one event per row. PAS loads the entire database table to a window, so that you can scroll through the entire log to view its contents or a particular event loaded from the SA300 separately (for fast loading fault).

Filtering Events

You can use filtering to find and work with a subset of events that meet the criteria you specify.



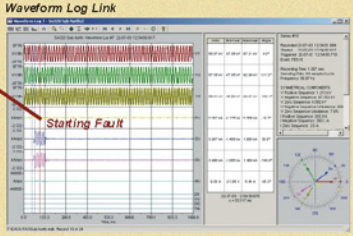
Sorting Events

You can use Sorting by Data/ Time or category.

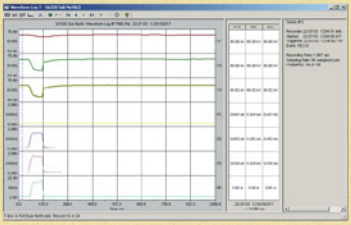
Linking to the Waveform and Fault Data Log

When displaying the fault report, PAS establishes links between the event and waveform and data log records related to the event. Data log records associated with the fault event are taken into a separate window for easy viewing and trending.

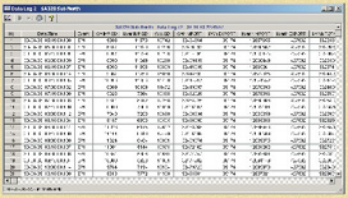
Waveform Log Link



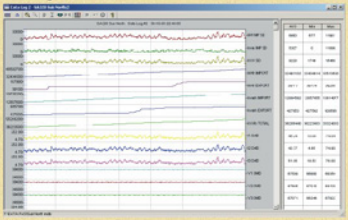
Waveform Log on RMS Link



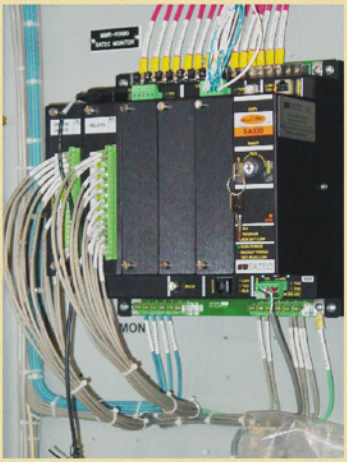
Data Log Link



Data Log Trend Link

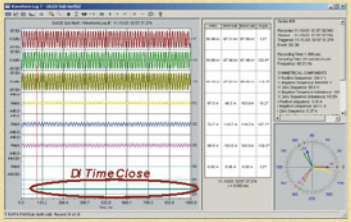


ezPAC™ on Site



FAULT RECORDER BY DIGITAL INPUT

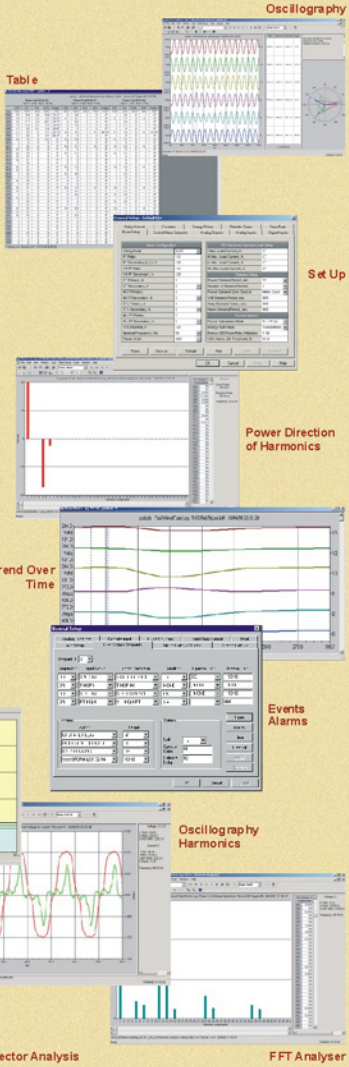
Waveform Log



PAS, Power Analysis Software

PAS is **SATEC**'s specially designed software for use with all **SATEC** instruments. Its versatility stems from its numerous features:

- Windows environment for easy multi-tasking
- Simple offline instrument setup
- Direct data access for status monitoring or analysis
- Wide range of communication platforms:
  - RS standard serial lines
  - TCP/IP
  - USB
  - Telephone/Modem
- Sophisticated analysis:
  - Data logs historical or current
  - Trends individual or 3 phases together
  - Trend over time data log or oscillography
  - Trend based on user-selected parameters or limits
  - Harmonic spectrum
  - Harmonics power direction
  - G5/4 comparison tables for HV and LV applications
  - Vector analysis/phasor diagram
  - Complete categories of events
  - ITI (CBEMA) Curve
  - Automatic sort and filter capabilities
  - Automatic billing program
  - Uploading on schedule
  - Alarms with variable setpoints
- Self-test
- Easy transfer to spreadsheet, Word and Excel or database,
  Extensive graphic and report capabilities:
  - Waveforms
  - Harmonics
  - Billing
- Export COMTRADE (IEEE standard common format for transient data exchange).

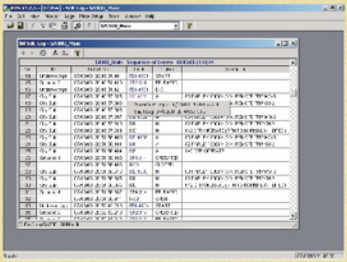


Sequence Of Events

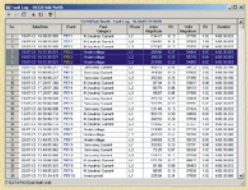
Designed for an electrical utility substation or industrial environment to record contact openings and closings of field devices such as electromechanical and microprocessor controlled relays.16 digital inputs are provided and can easily expand up to a total of 48 digital inputs (wet or dry type) with a 1 mSec time resolution between events.

The Sequence of Events (SOE) Recorder can log four types of events: Digital input events, Relay output events, Fault events and setpoint events.

Viewing the Sequence-of-Events Log



When displaying the SOE Log reports, PAS establishes links between the event and other database records where it finds a relationship between the recorded data and the event.
Each input point is programmable to be normally open or normally closed. Programmable Status words and a 96 alphanumeric character descriptor for each input point is provided. De-bounce times for nuisance chattering of contacts are programmable from 1 to 256msec in groups of eight. Wet or dry contacts can be mixed for up to 48 discrete inputs.



expertpower

Web Based Energy Management Service

eXpertPower™ is an energy technology company specializing in Intelligent Total Energy Management (**ITEM**™), offering the *first-ever* complete solution for energy distribution, utilization, management and control from the substation down to the household. **ITEM**™ is offered as a service to **eXpertPower's**™ customer base of power utility companies and other prominent players in the market. Power utility companies and general users can now receive on-line information in real-time and use it to optimize their service and energy quality.

The **ITEM**™ system utilizes advanced data collection and transmission technologies that gather important power usage information from intelligent devices positioned throughout the energy distribution system and various markets. An application service provision (ASP) framework will process the data through a multitude of applications and present the final reports on a Web site that will be easily accessed through any standard browser.

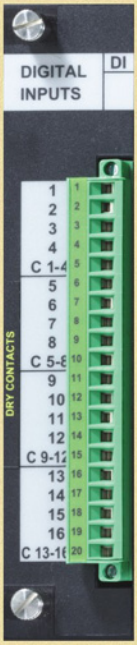
eXpertPower's™ mission is to provide a low-cost and easy-to-implement solution that provides a complete picture of energy distribution and utilization and revolutionize the electric utility industry.

Plug In Modules

The ezPAC™ SA300 includes five expansion slots for removable plug-in I/O modules. The ezPAC™ SA300 can automatically identify modules that are plugged in for easy installation.

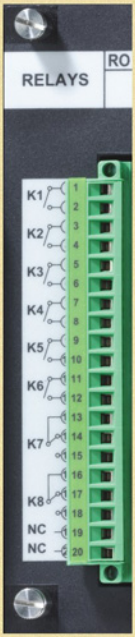
DI - Digital inputs

16 optically isolated inputs per module, up to 3 modules per device; programmable de-bounce time from 1 ms to 1 sec; quick and easy linkage to Sequence-of-Events Recorder, Fault Recorder, control Setpoints, Pulse Counters and Energy/TOU Subsystem.



RO - Relay outputs

8 relays per module, up to 4 modules per device; unlatched, latched and pulse operations, failsafe operation for alarm notifications; programmable pulse width; direct remote relay control through communications.



Options:

- **DRC:** Dry contact
- **V24:** 24 (10-30VDC)
- **V48:** 48 (20-60VDC)
- **V250:** 235 (30-100VDC)

Features:

- 6relays form A, heavy duty 125VDC, 5A
- 2relays form C
- KYZ pulses

AI/AO - MIXED ANALOG INPUT / OUTPUT

4 optically isolated Analog Inputs and 4 Analog Outputs. Internal power supplies. Up to 4 modules per device.
200% overload current for 0-1mA and ± 1mA AI/AO.

OPTIONS:

- **A1:** 0-1mA
- **A2:** 0-20mA
- **A3:** ±1mA
- **A4:** 4-200mA

EXPANDED MEMORY

Easily expand the internal 4MB of memoryt 64MB / 128MB to assure system integrity of long term analysis for year's worth of data collection.

OPTIONS:

- **XM1:** 64MB
- **XM2:** 128MB

Measurement Specifications

Input Ratings

3 AC Voltage Inputs: V1, V2, V3, VN

Direct input and input via PT up to 828VAC line-to-line, up to 480VAC line-to-neutral
Burden for 400V: < 0.35 VA
Burden for 120V: < 0.03 VA
Overvoltage Withstand: 1000VAC continuous, 2500VAC for 1 sec.
Galvanic Isolation: 5500V for 1 minute
Wire Size: up to 10 AWG (up to 6 mm^2) Terminals Pitch 9.5 mm

Auxiliary AC Voltage Inputs: V4, V4N

Direct input and input via PT up to 480VAC
Burden for 400V: < 0.35 VA
Burden for 120V: < 0.03 VA
Overvoltage Withstand: 1000VAC continuous, 2500VAC for 1 sec.
Galvanic Isolation: 5500V for 1 minute
Wire Size: 10 AWG (up to 6 mm^2) Terminals Pitch: 9.5 mm

Standard AC Current Inputs: I1, I2, I3, I4

Input via CT with 5A secondary
Operating range: continuous 20A RMS (ANSI C12.20) or 10A RMS (IEC687)
Fault Currents: up to 150A RMS (30x) for 3 sec. 100A RMS for 10 sec.
Burden: < 0.15 VA
Overload Withstand: 20A RMS continuous, 400A for 1 sec.
Wire Size: 10 AWG (2.5 to 6 mm^2) Terminals Pitch: 13 mm

Input via CT with 1A secondary

Operating Range: continuous 4A RMS (ANSI C12.20) or 2A RMS (IEC687)
Fault Currents: up to 30A RMS for 3 sec.
Burden: < 0.02 VA
Overload Withstand: 4A RMS continuous, 80A for 1 sec.
Wire Size: 10 AWG (2.5 to 6 mm^2) Terminals Pitch: 13 mm

Second AC Current Inputs: I5, I6, I7, I8

Input via CT with 5A or 1A secondary
Operating Range and Burden as Standard AC Current Input.
Wire Size: 12 AWG (1.5 to 3.5 mm^2) Terminals Pitch: 10 mm

VDC Voltage Input

Operating Range: 2-290 VDC
Burden: < 0.2 W Accuracy: ± 0.5%
Galvanic Isolation: 3250V RMS, 60Hz for 1 minute
Wire Size: 10 AWG (up to 6 mm^2) Terminals Pitch: 9.5 mm

Power Supplies (Main and Backup)

Isolation: galvanically isolated
Option 120/230 VAC-110/220 VDC: Rated input 85-265VAC 50/60 Hz, 88-290VDC, Burden 20W
12 VDC Option: Rated input 9.6-19 VDC
24 VDC Option: Rated input 19-37 VDC
48 VDC Option: Rated input 37- 72 VDC

Communication Ports

COM1

Serial EIA RS-232 optically isolated port
Connector Type: DB9 male.
Serial EIA RS-422/RS-485 optically isolated port
Connector Type: removable, captured-wire, 5 terminals. Wire Size: up to 12 AWG (up to 2.5 mm^2) .Baud Rate: up to 115,200 bps.
Supported Protocols: Modbus RTU/ASCII, DNP3.0.

COM2

Serial EIA RS-422/RS-485 optically isolated port
Connector type: removable, captured-wire, 5 terminals.
Baud Rate: up to 115,200 bps.
Supported Protocols: Modbus RTU/ASCII, DNP3.0.

COM3

Serial EIA RS-485 optically isolated port with 12VDC supply voltage for the RDM.
Connector Type: removable, captured-wire, 5 terminals.
Baud Rate: up to 115,200 bps.
Supported Protocols: Modbus RTU/ASCII, DNP3.0.

USB Port

Non-isolated USB 1.1 port.
Wire Type: standard USB cable, max. length 2 meters.
Supported protocols: Modbus RTU.

Ethernet Port

Transformer-isolated 10Base-T port.
Connector Type: RJ45 modular.
Supported Protocols: Modbus TCP (Port 502), DNP 3.0/TCP (Port 20000).
Number of simultaneous connections (sockets): 5.

Modem Port

Transformer-isolated internal 56K modem.
Connector Type: RJ11.
Supported Protocols: Modbus RTU/ASCII, DNP 3.0.

Infrared Port

Optional optical IEC/ANSII head.

Real-time Clock

Accuracy: maximum error 15 seconds per month @ 25°C

Log Memory

Standard onboard memory: 4 Mbytes.
Plug-in expansion memory module: 64/128 Mbytes

IRIG-B Port

Optically isolated IRIG-B port.
Time code signal: unmodulated (pulse-width coded).
Connector Type: BNC.
Recommended cable: 51Ohm low loss - RG58A/U (Belden 8219 or equivalent), TNC connector.
Recommended GPS time code generator: Masterclock GPS-200A.

Environmental Conditions

Operating Temperature: -20°C to 60°C (-4°F to 140°F)
Storage Temperature: -25°C to 80°C (-13°F to 176°F)
Humidity: 0 to 95% non-condensing

Construction

Overall Dimensions

Length: 284.00 mm (11.181 Inches)
Width: 255.24 mm (10.05 Inches)
Depth: 185.00 mm (7.28 Inches)
Weight: 5.0kg (11.02 Lb)

Measurement Specifications

Parameter	Full Scale @ Input Range	Accuracy			Range
		% Reading	% FS	Conditions	
Voltage V1-V4	**400VxPT @ 690V**	0.2	**0.02**	10% to 115% FS	0 to 999.99kV Starting 0.6% FSU
SA310, SA320 Line current I1-I4	**CT**	0.2 0.2 0.2	0.02 0.01	ANSI C12.20: 1% - 120% FS 120% - 400% FS IEC 687: 1% - 200% FS	0 to 999.99kV Starting 0.2% FSI Starting current 0.1% FSI
Fault current I1-I4	CT	2.0		400% - 3000% FS	0 to 9999.99A
SA330 Line current I5-I8	**CT**	0.2 0.2 0.2	0.01 0.01	ANSI C12.20: 1% - 120% FS 120% - 400% FS IEC 687: 1% - 200% FS	0 to 9999.99A
DC Voltage	220V		0.3	10% to 120% FS	0 to 290VDC
Active power	0.36xPTxCT @ 120V 1.2 xPTxCT @ 690V	0.2 0.2	**0.01** **0.01**	|PF| ≥ 0.5 and ①	-2,000,000 to +2,000,000 kW
Reactive power	0.36xPTxCT @ 120V 1.2 xPTxCT @ 690V	0.2 0.3	**0.015** **0.015**	|PF| ≥ 0.9 and ①	-2,000,000 to +2,000,000 kvar
Apparent power	0.36xPTxCT @ 120V 1.2 xPTxCT @ 690V	0.2 0.2	**0.01** **0.01**	|PF| ≥ 0.5 and ①	0 to 2,000,000 kVA
Power factor	1.000		0.35	|PF| ≥ 0.5, I ≥ 2% FSI	-0.999 to +1.000
Frequency		0.02			40.00 Hz to 70.00 Hz
Total Harmonic Distortion, THD V (I), $\%V_f$ ($\%I_f$)	100	1.5	0.2	THD ≥ 1% FS, V ≥ 10% FSV I ≥ 10% FSI	0 to 999.99
Total Demand Distortion, TDD, %	100		1.5	TDD ≥ 1% FS, I ≥ 10% FSI	0 to 100
Active energy Import & Export		Class 0.2 (ANSI C12/20-1998) Current class 20 Class 0.2s (IEC 687-1992-6)			0 to 999,999.999 MWh
Reactive energy Import & Export		**As reactive power**			0 to 999,999.999 Mvarh
Apparent energy		Class 0.2 under conditions as per ANSI C12.20-1998 Class 0.2 under conditions as per IEC 687-1992-6			0 to 999,999.999 MVah
Volt-hours		Class 0.2		20%-120% FS	0 to 999,999.999 kVh
Ampere-hours		Class 0.2		10%-200% FS	0 to 999,999.999 kAh
Symmetrical components	Voltage FS Current FS Current FS	1 1 3		10%-120% FS 10%-200% FS 200%-300% FS	
Phase angle		1 degree			

Key:
PT - external potential transformer ratio ① @ 50% to 120% of voltage FS and 2% to 200% of current FS
CT - primary current rating of external current transformer
FSV - voltage full scale; FSI - current full scale
V_f - fundamental voltage; I_f - fundamental current

Note:
1. Accuracy is expressed as ± (percentage of reading + percentage of full scale) ±1digit. This does not include inaccuracies introduced by the user's potential and current transformers. Accuracy caclulated at 1 second average.
2. Specifications assumed: voltage and current waveforms with THD ≤ 5% for kvar and PF; reference operating temperature: 20°C - 26°C.
3. Measurement error is typically less than the maximum error indicated here.

ezPAC™ Ordering Information

Model
- SA310
- SA320
- SA330

Accuracy class 0.2
- A (per ANSI C12-20)
- E (per IEC687)

Current Input

5	5 Ampere
1	1 Ampere

Power Supply - Main

ACDC*	85-265VAC AND 88-290VDC
1DC	9.6VDC-19VDC
2DC3	19-37VDC
3DC	37-72VDC

Power Supply - Backup

BACDC*	85-265VAC AND 88-290VDC
B1DC	9.6VDC-19VDC
B2DC	19-37VDC
B3DC	37-72VDC

Digital Input (Module 16 Input)

DRC*	Dry contact
V24	24VDC
V48	48VDC
V250	125/250VDC

Modem

0	No modem
MO	Modem

Infra-Red Port

0	No IR port
IR	IR port

* Standard

Ordering Example:
SA300-5-ACDC-B2DC-V250-MO-IR

ezPAC™ Optional Plug In Module Ordering Information

AIO Analog Input/Output

A1	(+/-1mA)
A2	(0-20mA)
A3	(0-1mA)
A4	(4-20mA)

RLY Output Relay

8R	8 relays

DI 16 Digital Input

V24	24VDC
V48	48VDC
V250	125/250VDC
DRC	Dry contact

EM Expanded Memory

64	64MB
128	128MB

ezPAC™ Display Modules Ordering Information

RDM LED Remote Display Module

O	V/kW, kvar, kva
U	kV/MW, Mvar, MVA

Mounting Panel

M	Panel Mounted
P	Portable

RDM312 Multi Window Display

0	Standard
M	Meter Select Option

RGM300 Remote Graphic Display

0	None
T	Ethernet port TCP/IP

IQC pending

Standards Compliance

Standards

Complied with: EMC: 89/336/EEC as amended by 92/31/EEC and 93/68/EEC
LVD: 72/23/EEC as amended by 93/68/EEC and 93/465/EEC
Harmonized standards to which conformity is declared:
EN55011:1991; EN50082-1:1992; EN61010-1:1993; A2/1995
ANSI C37.90.1 1989 Surge Withstand Capability (SWC)
EN50081-2 Generic Emission Standard - Industrial Environment
EN50082-2 Generic Immunity Standard - Industrial Environment
EN55022: 1994 Class A
EN61000-4-2
ENV50140: 1983
ENV50204: 1995 (900MHz)
ENV50141: 1993
EN61000-4-4:1995
EN61000-4-8: 1993

BB0129 REVA2

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