8PRN

Digital Fault Recorder

A compact solution featuring up to 384 samples per cycle with Ethernet accessibility

No need for shunts or external devices.

Up to 16 analog channels.

Better than 0.1% metering accuracy for both AC and DC.

Selectable full scale value.

Versatile trigger and storage modes.

Fault locator.

Contributing to improve Safety, Quality of Service and Profitability of Electrical Systems

8PRN

Description

ZIV model **8PRN** is a digital fault recorder featuring the best metering accuracy and a large storage capability to record disturbances in power systems. The unit is complemented by a user-friendly software package to program settings and collect and manage the recorded information.

In addition to data recording for system disturbances analysis, both captured and calculated metering data is available directly via the HMI display, communications or printer. Real time instantaneous values for frequency, active and reactive power, sequence components, etc. facilitate maintenance procedures of the installation. These features make the **8PRN** a valuable tool for maintenance and operations personnel.

The **8PRN** is based on a flexible modular design that allows expansion of the system according to the needs of the installation.

A large selection of communications ports is available to connect peripherals and computers either locally or via the different remote access modes (modem, LAN, etc.)

Time synchronizing inputs are also available for IRIG-B and NMEA signals, allowing for precise analysis of recorder data and comparison to data from other recorders in the same or different substations.

ZIV model **8PRN** features state of the art technology on data acquisition, storage and data management. The design concept has the future in mind regarding connectivity among substation equipment and integration in enterprise networks.

General Characteristics

Inputs, Outputs, and LEDs:

- 8 analog inputs. Programmable to accept currents or voltages (expandable).
- 16 digital inputs (expandable).
- 7 auxiliary outputs.
- 1 “in service” output.
- Programmable LED targets.
- Communication ports activity LEDs.
- 16 programmable logic signals.

Instantaneous Metering Values:

- Current and Voltages.
- Power (S, P and Q).
- Frequency, Power Factor.
- Sequence components.
- Harmonics.
- Phasors of every phase.

Connectors:

- RS-232 configuration port (front panel).
- External USB Hard Drive port (front panel).
- Full modem / FO communications port (rear panel).
- Serial RS-232 / RS-485 / FO port (rear panel).
- Ethernet 10/100 Base-T RJ-45 port (rear panel).
- USB Printer port (rear panel).

Time Synchronization:

- IRIG-B BNC port.
- NMEA fiber optic port.

The design concept for the 8PRN provides irreplaceable features for the maintenance and improvement of power systems. Suitable for applications in generation, transmission, distribution and point of use of electric energy.

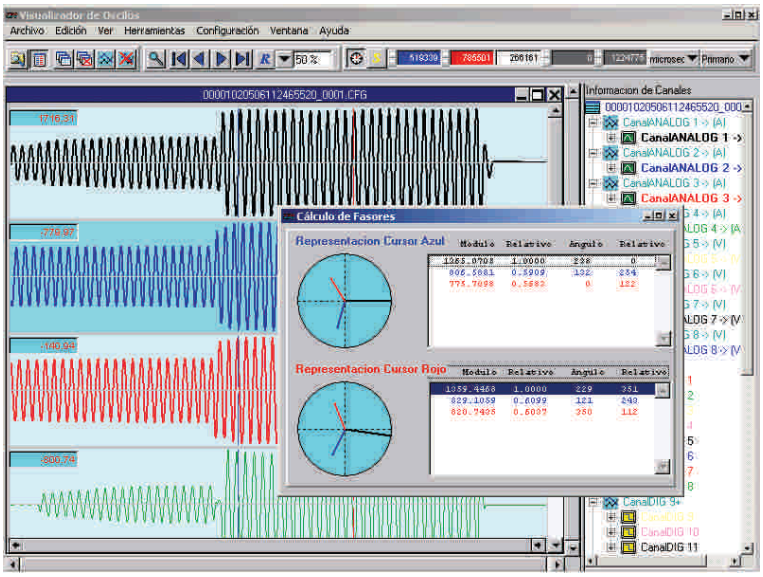
The **8PRN** general data management and user interface functions are controlled by a high speed CPU. Data acquisition and calculations are performed by a DSP connected to the main CPU via a DMA Channel (Direct Memory Access). This architecture enables an elevated information transfer rate, as required by the high sampling rates featured.

This architecture combined with optimized resources for calculations, allows accuracy to reach levels better than 0.1% at full scale, with every analog channel synchronized without phase errors (<0.1 µs).

The basic model in the **8PRN** series is capable of recording up to 8 analog quantities and 16 digital signals. Analog signals (current or voltage selectable via settings and connected to independent contacts) have a direct connection to the existing instrument transformers without the need for external adaptors.

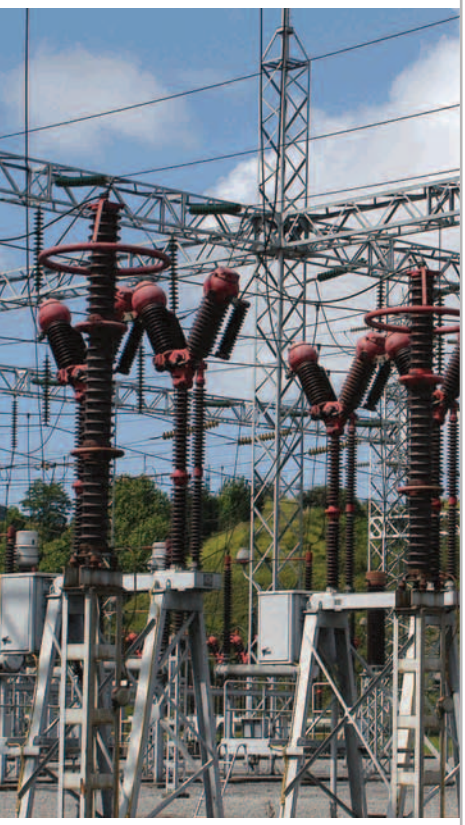
Expansion modules are available for monitoring of up to 16 analog quantities and 32 digital signals.

Also, the IED manages 16 Boolean logic signals (AND/OR combinations of digital inputs and internal states). These logic signals can be used as triggers for the oscillography.



Accuracy better than 0.1% with all channels synchronized.

Sampling rates of up to 384 samples per cycle provided detailed evolution of the monitored quantities.



Trigger Modes

Analog Channels:
- Threshold Exceeded (above/below).
- Gradient (positive/negative).
- Specific harmonic content.
- Total harmonic content.

Calculated Frequency:
- Threshold (above/below).
- Gradient (positive/negative).

Calculated Positive Sequence:
- Threshold (above/below).
- Gradient (positive/negative).

Calculated Negative Sequence:
- Threshold (above).

Zero Sequence:
- Threshold (above).

Digital Channels:
- Rising or falling edge.

Others:
- External trigger (cross-triggering - signal initiated by another DFR to initiate recording).
- Manual trigger from HMI.
- Trigger via communications.

Functions

Recording

The main function of the **8PRN** digital fault recorder is the sampling and recording of variations of analog and digital signals connected to its channels for later printing, analysis, and handling.

It is possible to vary the sampling rate of the **8PRN**, to address different requirements depending on the particular application or user practices. Sampling rates can be set from 10 samples per cycle up to 384 samples per cycle, providing a very detailed record of the evolving signals.

Records are stored in COMTRADE format in all its different versions: Standard 1991, Standard 1999, ASCII or binary.

The fault locator improves the efficiency of the maintenance personnel.

Firmware

Firmware upgrades can be performed without loosing existing configuration settings or recorded data. Upgrades are done via local communications with the unit without the need for internal hardware changes or handling. This feature enables future improvements to the software without disrupting the normal operation of the installation (please refer to firmware loading ports in the communications section)

Metering

The **8PRN** metering function operates in parallel with the recording of data, taking advantage of the computing power of the unit to the full extent. The following metering data is available in real time:

- Voltage and current sequence components.
- RMS values of the analog channels.
- Phasors.
- Frequency.
- Harmonic content.
- Active, reactive and apparent power.
- Power factor.

Optical Targets

There are two sets of LED targets in the **8PRN**.

One set consists of 4 programmable LEDs indicating the state of the assigned digital signals.

A second set provides information of the communications status of the different ports. There are two LEDs, red and green, per port.

Complementary Functions

The **8PRN** also features a sequence of events recorder, metering log, and fault locator (in the display).

Printing

Manual or automatic printing of oscillography captures is available. The printer can be connected directly to the **8PRN** via its USB port or can be shared by different units via Ethernet.

HMI Interface

The **8PRN** offers two different operator interfaces (HMI):

Alphanumeric Keypad and Display

The IED includes a front panel alphanumeric display (4 lines of 20 characters) with a 16 key keypad plus 4 function keys.

This interface can be used for the following operations: Viewing and modifying settings; input, output, and self-diagnostic alarm status; access to record information; print settings; trigger recording; and delete records.

Communications software

The communications software provides an HMI that can be used in either local or remote mode.

The standard communications for the IED is PROCOME 3.0; an open protocol based on the IEC 105 family. Other protocols can be implemented for communicating with the unit.

Programming Tools

ZIVercom® software provides a user-friendly interface to communicate with the **8PRN** either, in local mode or via the remote communications ports or Ethernet port located on the rear panel of the equipment. The software package provides an intuitive interface to perform the operations required for: parameter settings; recorded data access; basic record analysis, printing management; etc.

Both the IED and the software are password protected to avoid unauthorized access.

ZIVercom® software is an intuitive program that utilizes graphical interface menus and submenus to display information and settings. The software does not require extensive computer knowledge for operation.

A separate advanced software package is also available. This program has expanded functionality that allows for complete fault analysis, including: sequence component management; harmonic content management; phasor diagram display; combination of recorded channels (i.e. remote ends of a power line); analog channel editing; and fault location.

Communication Ports

Front Panel:
- RS-232 configuration port.
- External USB Hard Drive port.

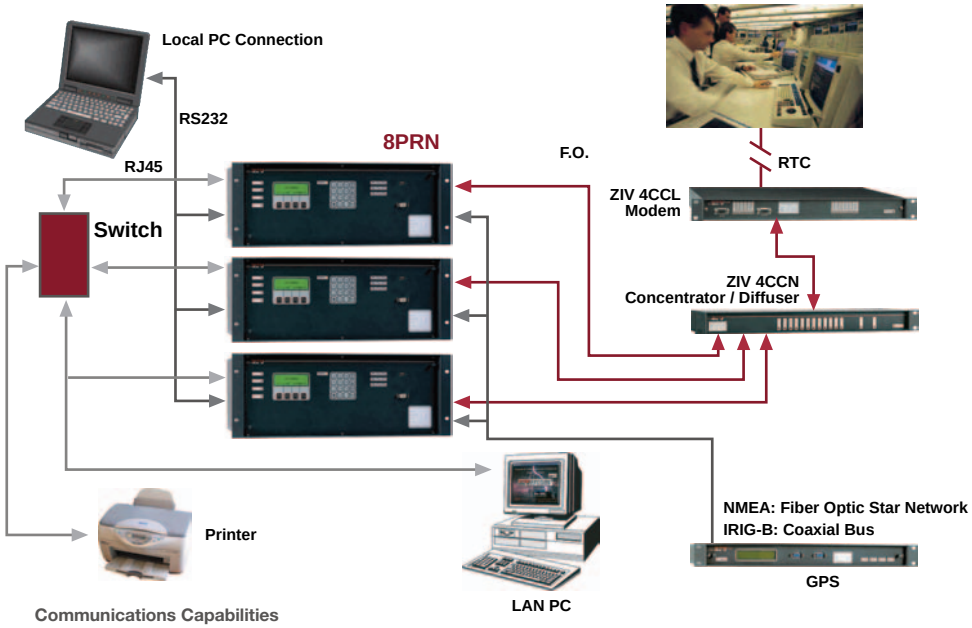
Rear Panel:
- Full modem / FO communications port.
- Serial RS-232 / RS-485 / FO port.
- Ethernet 10/100 Base-T RJ-45 port.
- USB Printer port.
- IRIG-B BNC port.
- NMEA FO port.
- Fiber optic port (cross-trigger) IN + OUT.
- Additional glass FO port.

Communications

One of the key features on the **8PRN** is the communication capabilities via the following communications ports:

- One front panel RS-232 port for IED configuration via local connection to a PC: programming of digital inputs, auxiliary outputs, LEDs, analog inputs, and settings; oscillography triggering, blocking, and deletion; downloading of oscillography records, events, metering, and trend logs.
- One front panel USB port for connection of printer or external Hard Drive for storage of settings, oscillography records, and loading firmware upgrades.
- One rear panel RS-232 full modem port or Fiber Optic port for remote communications: programming of digital inputs, auxiliary outputs, LEDs, analog inputs, and settings; oscillography triggering, blocking, and deletion; downloading of oscillography records, events, and metering.
- One rear panel serial RS-232, RS-485 or Fiber Optic port for integration in a system or for remote communications: programming of digital inputs, auxiliary outputs, LEDs, analog inputs, and settings; oscillography triggering, blocking, and deletion; downloading of oscillography records, events, metering, and trend logs.
- One rear panel Ethernet 10/100 Base-T RJ-45 port to integrate the IED into a network. Enables programming of digital inputs, auxiliary outputs, LEDs, analog inputs, and settings; oscillography triggering, blocking, and deletion; downloading of oscillography records, events, metering, and trend logs; and firmware upgrades. This port also enables access to the printer network from the **8PRN** and access to oscillography records stored on network PCs via FTP.
- One rear panel USB port for connection to a local printer.
- One rear panel BNC port for connection to an external GPS synchronizer (IRIG-B protocol).
- One rear panel glass fiber optic port for time synchronization via NMEA Standard.
- One rear panel fiber optic port for cross-trigger function IN + OUT.

The available assortment of communications ports provides unbeatable versatility and integration flexibility with other systems.



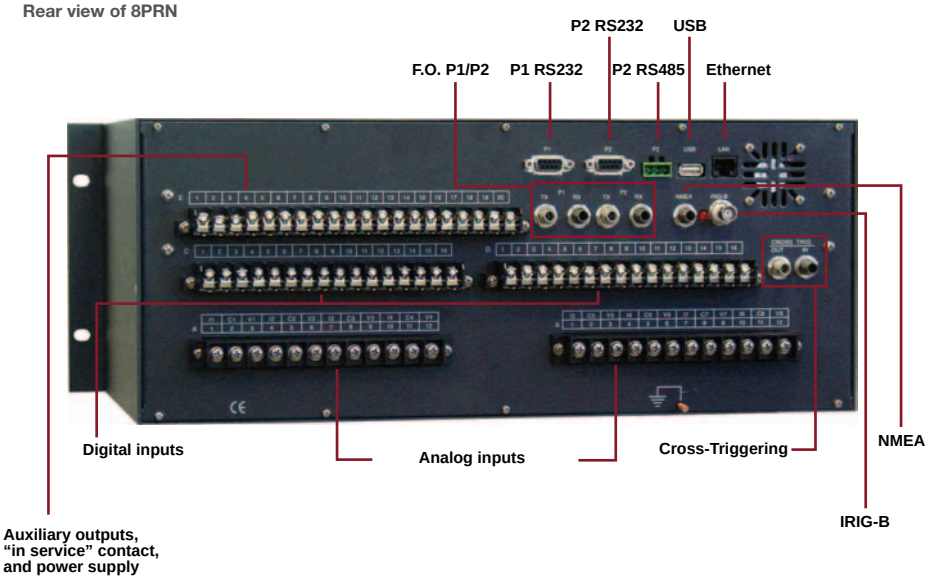
Communications Capabilities

Construction

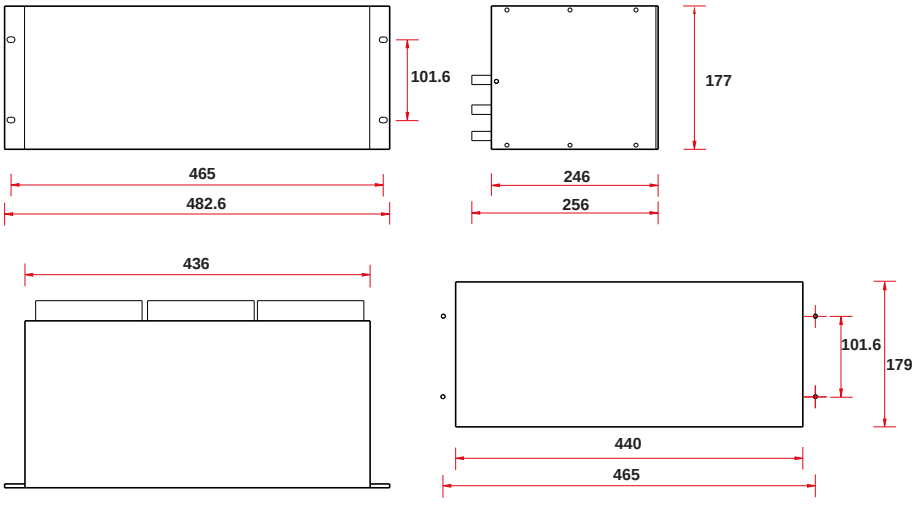
8PRN units are designed for mounting in 19” racks, and are four standard units high.

Ring lug terminal blocks are located in the rear of the unit. Connectors accept lugs for wires up to AWG 10 (6mm²).

Rear view of 8PRN



Dimensions



Enclosure Type K
Dimensions in mm.
Mounting holes 8 mm.

Settings Ranges

General

Unit In Service	YES/NO
HMI Language	
Facility ID	
DFR ID	
Active Table	
Contrast	

Synchronization

Main Sync Source	IRIG-B / NMEA
NMEA Lost Signal Timeout	1-300 s
NMEA UTC Time	Local Time UTC Time
DLS NMEA	1 (YES) / 0 (NO)
IRIG-B Lost Signal Timeout	1-300 s

Printing

Printer Connection	Local Remote Win Remote LPD
Local Printer Port	USB
Draft Mode	YES / NO
Color Printing	YES / NO
Analog Channels per Page	1- 8*
Digital Channels per Page	1-16*
Maximum Page Length	500 - 5000 ms
Expanded Printed Channels	YES / NO

Communications

IED Address	0 - 254
Baud Rate - Local Port	300-115,200bps
Baud Rate - Remote Port 1	300-115,200bps
Baud Rate - Remote Port 2	300-115,200bps
Password Enable	YES / NO
Stop Bits	1-2
Parity	0-No Parity 1-Even
Time Out	1-1,440 min

Digital and Logic Channels

Channel Enable	YES / NO
Name	20 Characters
Oscillography Mask	YES / NO

Records

Frequency	50 / 60 Hz
Sampling Rate	16 - 384 s/c
Record Type	Continuous Separated Ignored
Pre-fault Time	2-300 cycles
Post-Fault Time	10-600 cycles
Maximum Record Time	50-1,800 cycles
Blocking Time	5-600 cycles
Auto Delete	YES / NO
Format	COMTRADE (BIN/ASCII, 1991/1999)
Memory Near Limit Alarm	5 - 95%
Memory Full Alarm	5 - 95%
Auto Printing	YES / NO

Analog Channels

Channel Enable	YES / NO
Channel Type	I / V
Name	[20 characters]
Polarity	Direct Inverse
Data recorded	Primary Secondary
Scale (full scale = 5 x setting)	0.2 - 25 A 5 - 72 V
Transformer ratio	1 - 4000
Activation Enable	High Level Low Level Positive Ratio Negative Ratio Harmonic Distortion

Trigger Enable

High Level	0-300 V 0-100 A
High Level Timer	0-200 cycles
Low Level	0-100 V 0-20 A
Low Level Timer	0-200 cycles
Positive Change Ratio	0-20 V 0-20 A
Positive Change Ratio Timer	1-20 cycles
Negative Change Ratio	0-20 V 0-20 A
Low Change Ratio Timer	1-20 cycles
Harmonic number	0-15
Harmonic Percentage	1-20%
Harmonic Timer	1-200 cycles
Total Harmonic Distortion	0-20%
Total Harmonic Distortion Timer	1-200 cycles

(*) Basic Model

Settings Ranges

Sequence 1

Activation Enable	High Level I1 Low Level I1 Pos Ratio I1 Neg Ratio I1 High Level I2 High Level I0
Oscillography Activation Enable	High Level I1 Low Level I1 Pos Ratio I1 Neg Ratio I1 High Level I2 High Level I0
Phase A Metering Channel	(1-8) (1-16)*
Phase B Metering Channel	(1-8) (1-16)*
Phase C Metering Channel	(1-8) (1-16)*
Positive Sequence High Level	0-300 V / A
Positive Sequence High Level Timer	0-200 cycles
Positive Sequence Low Level	0-100 V / A
Positive Sequence Low Level Timer	0-200 cycles
Positive Sequence Positive Change Ratio	0-20 V / A
Positive Sequence Positive Change Ratio Timer	1-20 cycles
Positive Sequence Negative Change Ratio	0-20 V / A
Positive Sequence Negative Change Ratio Timer	1-20 cycles
Negative Sequence High Level	0-100 Hz
Negative Sequence High Level Timer	0-200 cycles
Zero Sequence High Level	0-100 Hz
Zero Sequence High Level Timer	0-200 cycles

Sequence 2

Activation Enable	High Level I1 Low Level I1 Pos Ratio I1 Neg Ratio I1 High Level I2 High Level I0
Oscillography Activation Enable	High Level I1 Low Level I1 Pos Ratio I1 Neg Ratio I1 High Level I2 High Level I0
Phase A Metering Channel	(1-8) (1-16)*
Phase B Metering Channel	(1-8) (1-16)*
Phase C Metering Channel	(1-8) (1-16)*
Positive Sequence High Level	0-300 V / A
Positive Sequence High Level Timer	0-200 cycles
Positive Sequence Low Level	0-100 V / A
Positive Sequence Low Level Timer	0-200 cycles
Positive Sequence Positive Change Ratio	0-20 V / A
Positive Sequence Positive Change Ratio Timer	1-20 cycles
Positive Sequence Negative Change Ratio	0-20 V / A
Positive Sequence Negative Change Ratio Timer	1-20 cycles
Negative Sequence High Level	0-100 Hz
Negative Sequence High Level Timer	0-200 cycles
Zero Sequence High Level	0-100 Hz
Zero Sequence High Level Timer	0-200 cycles

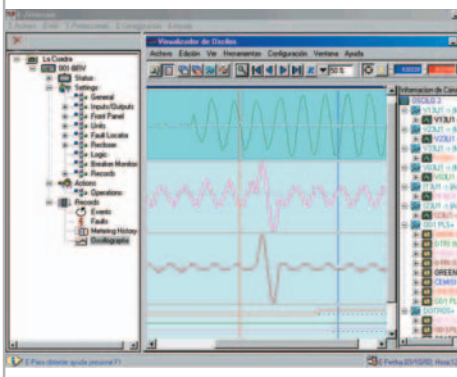
Frequency

Activation Enable	High Level Low Level Positive Ratio Negative Ratio
Frequency Metering Channel	(1-8) (1-16)*
High Level	40 - 70 Hz
High Level Timer	0 - 200 cycles
Low Level	40 - 70 Hz
Low Level Timer	0 - 200 cycles
Positive Change Ratio	0.5 - 3 Hz
Positive Change Ratio Timer	1 - 20 cycles
Negative Change Ratio	1 - 20 cycles
Low Change Ratio Timer	0.5 - 3 Hz

Power

Phase A Current Channel	(1-8) (1-16)*
Phase A Voltage Channel	(1-8) (1-16)*
Phase B Current Channel	(1-8) (1-16)*
Phase B Voltage Channel	(1-8) (1-16)*
Phase C Current Channel	(1-8) (1-16)*
Phase C Voltage Channel	(1-8) (1-16)*

(*) Model Dependent



Technical Assistance

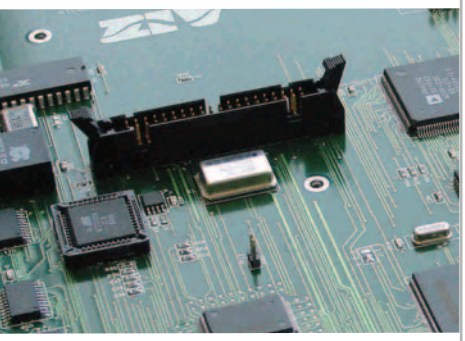
High-quality local technical service is available to customers worldwide, either from our own personnel (in Spain, Brazil and the USA) or from our extensive network of local collaborators in other countries.

Several “around-the-clock” help services are available (24 hours/day, 365 days/year) for immediate attention.

24 h. service in Spain and Europe

24 h. service in Brazil and South America

24 h. service in the USA and Canada



Warranty

All new products sold to customers are warranted against defects in design, materials, and workmanship for a period of ten (10) years from the time of delivery. Contact ZIV for complete details.

Quality

ZIV p+c is an **ISO 9001** Certified Company.

ZIV p+c is firmly committed to a Plan of Continuous Improvement within the framework of a policy of Total Quality that covers all stages from feasibility studies through commissioning of the complete system.

Technical Characteristics

Power Supply

Voltage Ranges	110 - 125 Vdc (± 20%)
	220 - 250 Vdc (± 20%)
Burden	40 W

Current Inputs

Programmable Full Scale	0.2 A
	0.5 A
	1 A
	2 A
	5 A
	10 A
	20 A
	25 A
Metering range	up to 5X of full scale
Thermal withstand capacity	25A (continuous)
	125A (for 3 s)

Voltage Inputs

Programmable Full Scale	5 V
	10 V
	20 V
	50 V
	72 V
Metering range	up to 5X of full scale
Thermal withstand capacity	72V (continuous)
	360V (for 3 s)

Digital Inputs

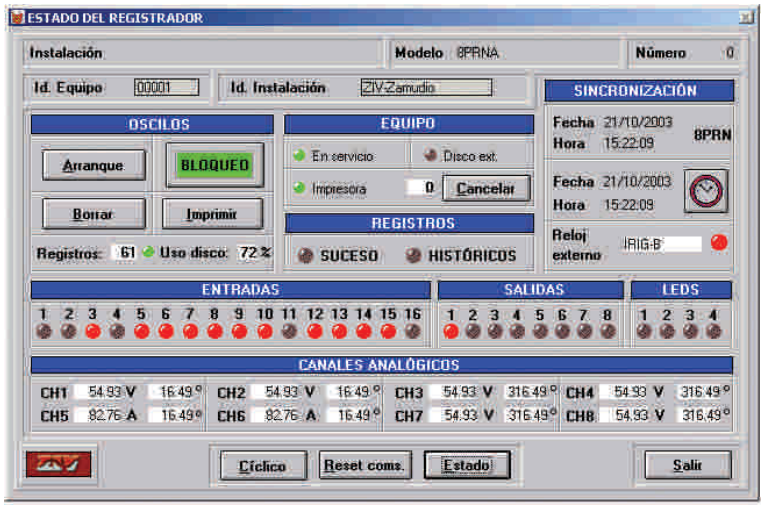
Rated voltage (Vn)	same as power supply
Range	110 Vdc (± 20%)
	250 Vdc (± 20%)
Activation/Reset Threshold	
for Vn= 110 Vdc	70 Vdc
for Vn= 250 Vdc	120 Vdc
Burden	
for Vn= 110 Vdc	0.8 W (6.7 mA)
for Vn= 250 Vdc	1 W (4.5 mA)

Auxiliary outputs

Make and Carry (resistive)	5 A for 1 s
Continuous (resistive)	3 A
Close	2000 W
Break capacity (resistive)	75 W (48 Vdc)
	40 W (80 - 250 Vdc)
	1000 VA
Break capacity (L/R=0.04 s)	20W at 125Vdc
Closing Voltage	250Vdc

Metering Accuracy

Current	0.1% of selected full scale
Voltage	0.1% of selected full scale



Model Selection

Select the most suitable model for your application using the following table:

8PRN-

Functions — Cod.

Basic Recorder	A
A + Integrated Fault Locator	B

Hardware — Cod.

Basic Model: Keypad, display, LEDs, Ethernet LAN connector, USB connectors (2) + 128MB Compact Flash	1

Integrated Hardware — Cod.

Basic Model (IRIG-B 123)	A
A + NMEA-0183 Serial Synchronization	B
A + Pulse Input Synchronization	C

Rated Voltage — Cod.

Power Supply	Digital Inputs	
110-125 Vdc (± 20%)	110 Vdc (± 20%)	2
220-250 Vdc (± 20%)	250 Vdc (± 20%)	3

Language — Cod.

English+Spanish+Portuguese+French+TDB 1+TBD 2	0

Communications — Cod.

FRONT	REAR P1	REAR P2	
RS232	RS232+GFO(ST)	RS232+GFO(ST)+RS485	1
RS232	RS232+PFO(1mm)	RS232+PFO(1mm)+RS485	2
RS232	RS232(FM*)+GFO(ST)	RS232+GFO(ST)+RS485	3
RS232	RS232(FM*)+PFO(1mm)	RS232+PFO(1mm)+RS485	4

I/O Module — Cod.

Basic Module: 8 Analog + 16 DI + 8 Aux Out	0
Expanded Module: 16 Analog + 32 DI + 8 Aux Out	1

Software Options — Cod.

USB Printer + LAN Printer	1

Spare — Cod.

Spare	0

Size — Cod.

4U x 19" Rack (Basic Model)	K
6U x 19" Rack (Expanded Model)	A

Communication Protocol — Cod.

PROCOME 3.0	D

Enclosure — Cod.

Standard without cover	--
Stainless Steel without Cover	A
Stainless Steel with Cover	C

(*) RS232 Full Modem

Standards and Type Tests

Insulation Test

Between circuits and ground	2 kV at 50/60 Hz for 1 min
Between independent circuits	2 kV at 50/60 Hz for 1 min

Voltage Impulse Test IEC-60255-5 (UNE 21-136-83/5)
5 kV; 1.2/50 µs; 0.5 J

Surge Immunity Test IEC-61000-4-5 (UNE 61000-4-5)

Between conductors	4 kV
Between conductors and ground	4 kV

1 MHz Burst Test
IEC-60255-22-1 Class III (UNE 21-136-92/22-1)

Common mode	2.5 kV
Differential mode	2.5 kV

Fast Transient Disturbance Test
IEC-60255-22-4 Class IV (UNE 21-136-92/22-4)
(IEC 61000-4-4)
4 kV ±10%

Radiated Electromagnetic Field Disturbance

Amplitude-modulated (EN 50140)	10 V/m
Pulse modulated (EN 50204)	10 V/m

Conducted Electromagnetic Field Disturbance
EN50141 Clas III

Amplitude-modulated	10 V

Electrostatic Discharge Test
IEC-60255-22-2 Class IV (UNE 21-136-92/22-2)
(IEC 61000-4-2)

On contacts	±8 Kv ±10 %
In air	±15Kv ±10 %

Temperature

Operating temperature range	-40º C to +85º C
Storage temperature range	-40º C to +85º C
Humidity	95% (non-condensing)

Power Supply Interference and Ripple
IEC 60255-11 / UNE 21-136-83
< 20%

Resistance of Ground Connection IEC 1131-2
< 0.1 ohm

Inverse Polarity of Power Supply IEC 61131-2

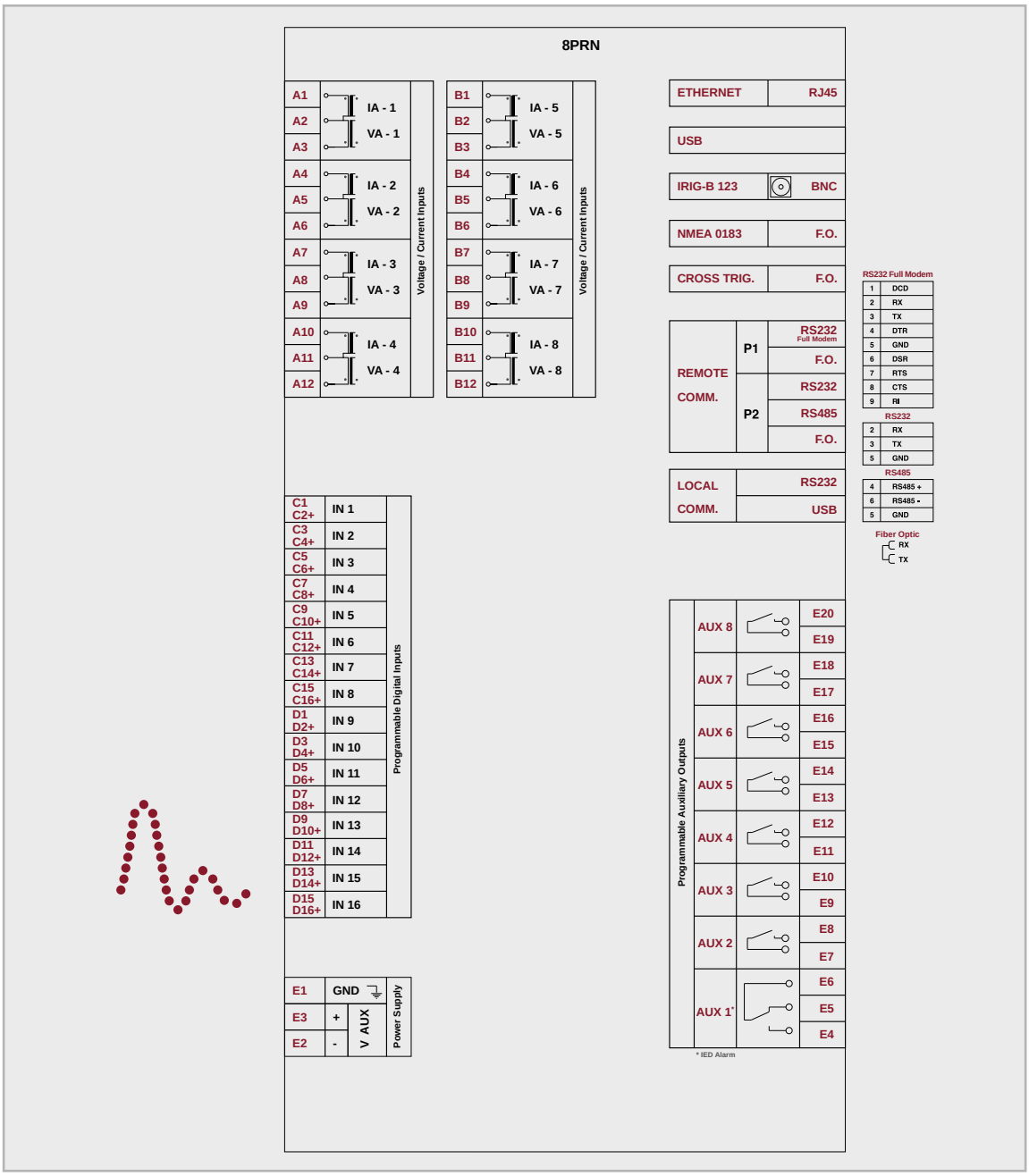
External Protection Level

Vibrations (sinusoidal)	IEC 60255-21-1 Class I
Mechanical Shock	IEC 60255-21-2 Class I

8PRN systems comply with the Directive 89/336/EEC of electromagnetic compatibility.

CE

External Connections



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www.ziv.es

Please visit our website for local contact information in your area.