



## SURVEYOR DISTRIBUTED DIGITAL FAULT RECORDER

Complete Transient Fault Recording and  
Analysis

Long Term Phasor Recording

Power Quality Monitoring

Continuous Recording

Complies with

NERC - PRC-002-1

NERC - PRC-018-1

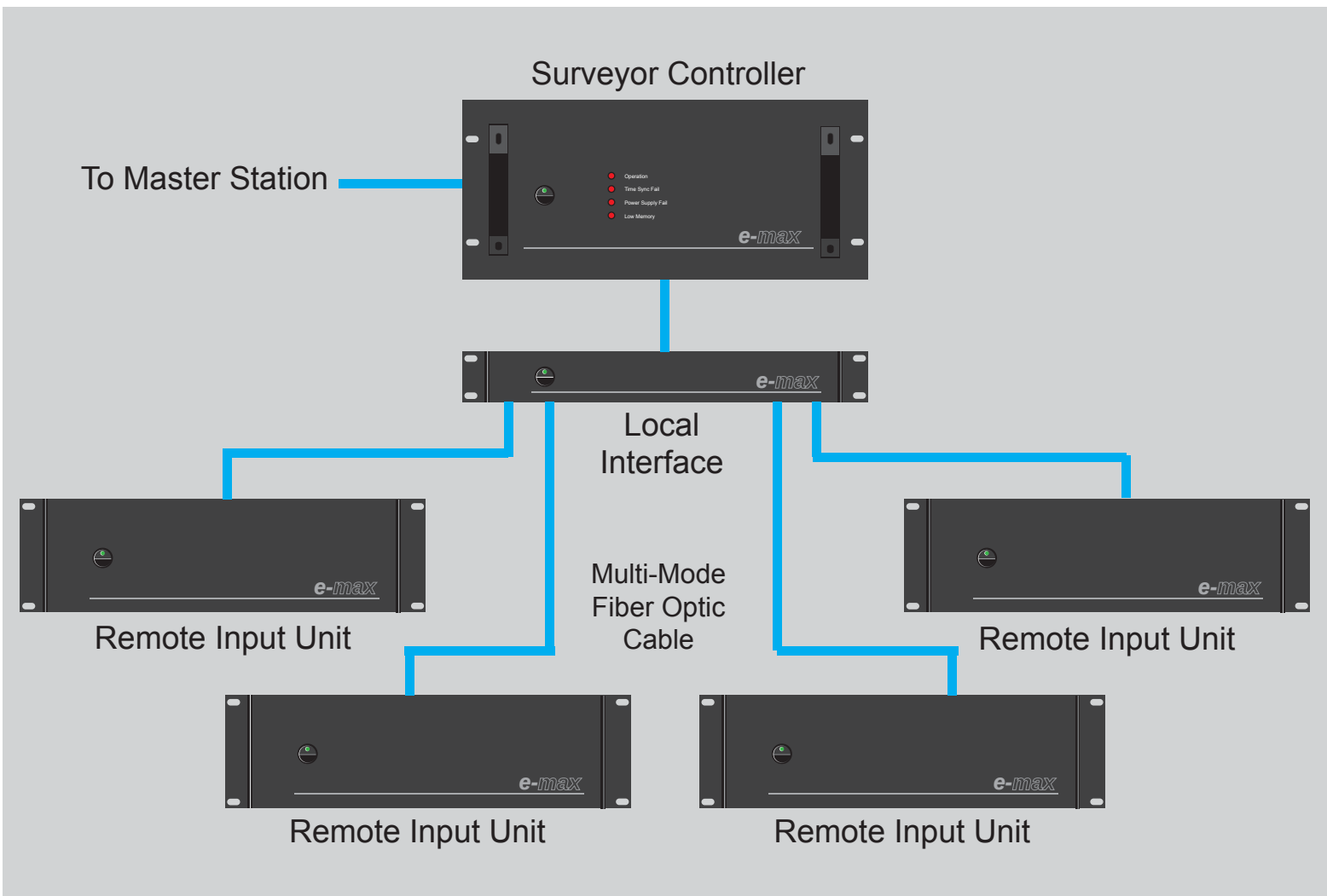
Remote Input communication up to 1500  
meters using multi-mode 62.5/125 fiber optic  
cable.



*Controller With  
Local Interface Unit*



*Remote Input Unit*



A single Controller and Local Interface connects 1-4 Remote Input Units. Each Remote Input Unit can be configured with 8 or 16 Analog Input Channels and 16 or 32 Event Input Channels.

The Surveyor Distributed Recording System employs the same Microsoft Windows 7® operating system as the E-MAX DII DFR. This system features complete Transient and Long-Term Phasor Data Recording, Analysis, and Transmission. The new E-MAX DFR has a maximum capacity of 64 Analog and 128 Digital remotely connected channels. The main hardware components, the Analog and Event Input Cards and the Interface Card, of the Distributed System are identical to those found in the DII DFR.

The networking capabilities of Windows 7® operating system provide the power and capacity to monitor and collect data from other substation equipment. The TCP/IP addressing and data handling also allow communications with a Master Station and other devices. Just like the E-MAX DII system, the Distributed Recording System includes complete remote control.



## Conversion of Record Data

The Surveyor Distributed Recording System continuously monitors all channels. If triggered, the Surveyor will record data to memory and process according to user settings. This System automatically identifies fault type and calculates distance to fault. All E-MAX DFR systems can print, display, fax, transmit and e-mail recorded and calculated data automatically or upon operator request. Converting record data to COMTRADE and PQDIF formats may be done automatically or upon operator request.

## Communication

Remote to Local Fiber Optic; 1500 meters using multi-mode 62.5/125 cable.

Local Interface to Controller; Proprietary parallel interface

Controller to Master Station; 10/100/1000 Mb Ethernet

## DFR and Power Quality Sensors

### Single Phase - One Per Channel

Under Limit Sensors - rms setting	10 - 100 percent
with Hysteresis	up to 5 %
Rate of Change	up to 10 %
Over Limit Sensors - rms setting	95 - 300
with Hysteresis	up to 5%
with Time Delay (selectable)	30 msec
Rate of Change	up to 50% per cycle
Frequency Over and Under	56 - 64 Hz
Frequency Delta Trigger	0.5 - 4 Hz

### Three Phase Triggers

Positive Sequence	0 - 150%
Negative Sequence	0 - 30%
Zero Sequence	0 - 30 %
Real Power	Threshold and Step Change
Reactive Power	Threshold and Step Change
Apparent Power	Threshold and Step Change

### Extended Triggers

Frequency and Delta Frequency	56 - 64 Hz
Power Triggers	3 Phase, Real, Reactive, Apparent
Sequence Triggers	3 Phase, Positive, Negative and Zero
Total Harmonic Distortion	5 - 50%

### Swing Triggers

specified by crest to valley percentage  
5 - 30 % setting and time swing of 0.5 to 4 cycles/second



Analog Inputs:	8 to 16 per Remote, up to 4 Remote Units.
Analog Input Range:	Voltage: 0 to 500 Vac rms or Current: 0 to 200 Amp.
Accuracy:	1 %, calibrated to .5%
Analog Isolation:	2500 Volts rms
Sampling Rate: ond software programmable.	Standard Base Sample Rate — 5760 samples/channel/second with 2880, 1440, 720 Hz, samples/channel/sec-11520 samples/channel/second available.
Digital/Event Inputs:	16 to 32 inputs per Remote, up to 4 Remote Units.
1. Input Configuration	N.O. or N.C. (Software Selected)
2. Input Voltage	125 Vdc Nominal standard —24, 48, 250 Vdc available
3. Isolation	2500 VDC (To Ground) and between inputs
Sensors:	Auto-resetting standard
1. Analog Sensors	Over-, Under- limits and rate software sensors on each channels Symmetrical component, harmonic, frequency swing sensors
2. Operation Limiters	Individual Channel: Software Settable up to 15 minutes per fault
3. Event Sensors	Individual Programmable (N.O., N.C., Trigger on ALARM and/or RETURN)
4. External Sensors	Contact or voltage input
Continuous Recording	Complies with NERC PRC-002-1 and NERC PRC-018-1, PRC-002-2(draft). Records up to 99 Days.
Long term Recording	Phasor recording - simultaneous with Transient recording. Sample rate is software selectable: 1 sample/cycle, 1/2 sample/cycle, 1/4 sample/cycle, 1/8 sample/cycle Programmable Record Length 90 days maximum length Logs of signals, power, and frequency (optional)
High Speed Transient Recording:	
Prefault Period:	Up to 10 seconds. Default setting: 10 cycles.
Postfault Period:	Minimum Record Length can be set with System Parameter file (0.5 sec default). Maximum Postfault Time - Can be set for continuous data streaming to disk capacity. (Longest Postfault captured to date: 31 minutes)
Record Storage:	Nonvolatile data storage on local SATA drive. Optional solid state drive. Capacity determined by disk size and scan frequency.
Resolution:	16 bit
Power Supply:	DC/DC Converter: 48 - 125 Vdc / 120 Vac. 250 Vdc Available. Current Limited / Overvoltage protected.
Controller:	Atom N270 CPU. 2 Gb RAM standard 2 USB 2.0 Ports, 1 Parallel Port, PCI Hard Disk Controller.
Graphic Output:	Supports color inkjet, laser or dot matrix printers Graphics display on optional monitor.
Data Storage:	SATA Hard Disk. Solid State Disk (optional)
Clock Options:	GPS Timing - GPS Receiver or IRIG B Decoder Internal (1 kHz or TTL), External GPS Clock, or Internal GPS
Clock Decoder	Accuracy: Better than 20 $\mu$ s.
Communications Capability:	Data/Fax Modem and Network cards available.
1. To Master Stations	Automatic transmission of data files. Functions with multiple-Master system. Complete Remote Control
2. To Fax Machines	Up to 24 locations. (Up to 8 Fax numbers in each of three outputs.)
3. LAN and WAN	Software supports communication via TCP/IP
Software Supplied:	
1. Master Station & Recorder	Microsoft Windows 7 <sup>®</sup> (Windows 10 <sup>®</sup> available 4th quarter 2015). Complete remote control, test and data retrieval, display and screen manipulation. Remote setting of program and system parameters. Complete data analysis software for Recorder and Master Station included.
2. Communications	Remote Control Computing Program - Communication Software Network control and data transmission (Ethernet)
Environmental Characteristics:	
Operating Temperature	0 <sup>o</sup> To 60 <sup>o</sup> Centigrade
Storage	-20 <sup>o</sup> to 65 <sup>o</sup> Centigrade
Relative Humidity	0 to 95% R.H. non-condensing
Surge Withstand Capability:	ANSI C37.90.1 1989
Quality Certification:	ISO 9001:2008

INTERNATIONAL STANDARDS COMPLIANCE	
<i>Safety</i>	<i>Immunity</i>
IEC 60255-2	IEC 61000-4-2
IEC 60255-4	IEC 61000-4-3
IEC 60255-5	IEC 61000-4-4
	IEC 61000-4-6