



# TR-2000 Multi-Function Recorder

FOR GENERATION, TRANSMISSION, AND DISTRIBUTION POWER SYSTEM MONITORING



## MULTI-FUNCTION RECORDER

For all types of power system events, the TR-2000 Multi-Function Recorder provides all the information you need to capture the complete picture. With the true integrated functionality of the TR-2000, you have one place for all your answers. Simultaneously perform: transient recording, disturbance recording, phasor measurements, power quality analysis, and sequence of events recording. The TR-2000 provides answers when you need them with as much information as you need to get results quick. The system can operate automatically to retrieve events and perform an expert analysis so you have the answers fast, saving time and money. The TR-2000 Multi-Function Recorder takes the place of several devices, integrating their functions into one unit, saving you money on equipment and installation while providing all the answers in one software platform. All of these functions are performed at the highest level so it will meet your needs of today and in the future. In a deregulated environment, the TR-2000 is the best tool to provide the necessary data to increase revenues and retain your customers.

Optimize your power system to improve reliability, shorten your fault clearance times, and verify correct operation of your switchgear and protection equipment. The TR-2000 is ideally suited for your generation, transmission, and distribution power system monitoring.

The TR-2000 can be matched to any application with models available for:

- 8 Analog/16 Digital Inputs
- 16 Analog/32 Digital Inputs
- 24 Analog/48 Digital Inputs
- 32 Analog/64 Digital Inputs



## FEATURES AND BENEFITS

- Very high-speed transient recorder—analyze switching transients, lightning strikes
- Transient fault recorder—post fault analysis to verify protection and circuit breaker operations, fault clearance times
- Disturbance recorder/logger—analyze power system stability by recording reclose sequences, power swing, and frequency oscillations
- Trend recording—verify voltage regulation and balancing
- Power quality monitor—voltage and frequency profiles, voltage dips and surges, loss of supply, harmonic content, flicker, voltage and current imbalance
- Phasor Measurement Unit—synchronized phasor measurements, in accordance with IEEE STD 1344-1995
- Fault locator—calculates distance to fault based on configurable line model
- Real time monitor—view analog, digital inputs, and computed values in near real time
- Sequence of events recorder—1 msec or better resolution on digital contacts



## SPECIFICATIONS

### INPUTS

#### Number of Channels

- 8, 16, 24, or 32 Analog
- 16, 32, 48, or 64 Digital (larger systems available)

#### Voltage Inputs

- 63.5 or 110 V RMS nominal

#### Current Inputs

- 1 A or 5 A RMS nominal (thru current shunts/CICT's)

#### Frequency Response

- DC – 1/2 sampling rate

#### Accuracy

- Better than 0.1% of full scale

#### Digital Inputs

- 24/48/125/250 VDC normally open or closed wetted contact

### RECORDING (TRANSIENT)

#### Recording Resolution

- 16 bits, 65536 levels (15 plus sign)

#### Sample Rate

- TR-2100 – up to 384 samples per cycle
- TR-2200 – up to 195 kHz

#### Pre-fault Time

- 2 to 500 cycles

#### Post-fault Time

- Fault length will extend as long as a trigger condition exists. Minimum is 8 to 100 cycles

#### Safety Window

- Recording time after active trigger: 4 to 16 cycles

#### Maximum Record Length

- Maximum size 1 to 30 sec. (this prevents memory filling with a continuous trigger)

### RECORDING (DISTURBANCE)

#### Sample Rate

- 2 x supply frequency (100/120 Hz)

#### Pre-fault

- 10 sec. to 10 min.

#### Post-fault Time

- Fault length will extend as long as a trigger point condition exists. Minimum value is 30 sec. to 5 min.

#### Maximum Record

- Absolute maximum: 30 minutes

#### Computed Values

- Voltage and current, real power, reactive power, apparent power, power factor, total harmonic

distortion and frequency (x2), positive, negative and zero sequence, voltage imbalance

### RECORDING (DISTURBANCE LOGGING) – OPTIONAL

#### Sample Rate

- 1/2 x supply frequency (25/30 Hz)

#### Recording Time

- 2 weeks (circulating buffer)

### RECORDING (TREND)

#### Sampling Interval

- 1 minute, or 10 minutes – data can be retrieved at up to a 60 minute interval

#### Record Length

- 52 weeks (circulating buffer)

#### Stored Parameters

- Maximum, minimum, and average voltage, current, frequency (2), power, flicker, harmonics, and imbalance. Digital data in SER format at user defined time resolution.

### TRIGGERING (TRANSIENT)

#### Analog Channels

- Over/under RMS level, Rate-of-Change and THD. Positive, zero and negative sequence triggers, over, under and R-o-C frequency triggers, differential frequency

#### Digital Channels

- Normal to alarm state and return to normal state. Edge or level sensitive.

### TRIGGERING (DISTURBANCE)

#### Analog Channels

- Under/over level of fundamental and R-o-C, frequency and ROCOF, power and frequency oscillation, imbalance and impedance, cross trigger from transient recorder

### SYSTEM TIMING

#### Time Source

- Internal GPS receiver with 1 PPS output for phasor measurement
- Optional IRIG-B

#### Accuracy

- Normally better than +/- 60 ns

#### Synchronization

- 1 pulse per second on optical port. Any number of systems can be linked together.

### COMMUNICATIONS

#### Serial Ports

- Up to 4 x RS232 type

#### Default Setting

- 57.6 kbaud, 8 bits, 1 stop, no parity. Rates can be set up to 115 kbaud.

#### Modem

- Hayes compatible type internal or external, fax compatible

#### Phone Line Sharing

- External unit to share a single phone line with a station phone

#### Network

- 10Base2 (50 ohm coax and BNC), 10baseT, Fiber
- Network protocol: TCP/IP

### DATA STORAGE

#### Permanent Storage

- 13 GB Hard Disk

### POWER SUPPLY

#### Input Voltage Options

- 100 to 300 VDC, 85 to 264 VAC, (optional 85 to 150 VDC, 85 to 264 VAC)

#### Power Requirement

- 60VA (16 channel), 70VA (32 channel)

### VOLTAGE WITHSTAND

Isolation, Impulse Voltage, RFI and ESD per IEEE/IEC Standards

### ENCLOSURE

#### Cabinet

- 8 and 16 channel – 6U, 24 and 32 channel – 8U

### ENVIRONMENT

#### Operating Temperature

- 14° to 131°F (-10° to 55°C)

#### Relative Humidity

- 0 to 97% non-condensing

### CERTIFICATION

CE

