SER—SEQUENCE OF EVENTS RECORDER

GUIDE SPECIFICATION

All or part of this text may be copied and inserted into a project specification, as desired. In the US, Sequence of Events Recording (SER) is typically part of CSI spec section 26 09 13—Electrical Power Monitoring System (EPMS).

1. SYSTEM DESCRIPTION

A Sequence of Events Recording (SER) system provides a system-wide, computerized event log with a list of all events, ordered and categorized by various attributes, such as time-stamp, equipment/circuit name, event type, state change, time-quality indicator and unique sequence number. The SER system enables “root-cause analysis” to identify potential problems before they lead to an outage—or to answer the question “what happened and when?” to minimize downtime if it does occur. In addition, SER data enables other diagnostics tools, such as measurement of circuit breaker operating times to compare with benchmarks for preventative maintenance.

SER units shall be equipped with “high-speed” (1 ms response) digital inputs for monitoring and recording all state changes (Off-to-ON and ON-to-Off), including the following:
- Breaker status: OPEN (via “a” aux. contact, normally-open)
- Breaker status: CLOSED (via “b” aux. contact, normally-closed, redundant to ensure positive indication)
- Breaker trip: TRIPPED (via relay “trip” or “bell alarm” contact)
- Drawout breaker position: Racked OUT/IN (via cell switch, or TOC)
- Electrically-operated breaker manual OPEN/CLOSE indication (via switch contacts, allows measurement of operating time)
- Differential relay, ground fault, TVSS, undervoltage, overvoltage, reverse power, sync check (normal, alarm/tripped)
- Auto-transfer status (source1, source2, test)
- UPS switching status (normal, static bypass, maintenance bypass)
- Other alarm conditions (see drawings)

2. PRODUCTS

SER Event Recorders shall be provided as shown on the drawings. Event Recorders shall be CyTime™ model SER-3200 (32 digital inputs) or SER-2408 (24 digital inputs and 8 relay outputs) from Cyber Sciences, or approved equal.

A. Event Recording. The Event Recorder shall be equipped with “high-speed” (1 ms response) digital inputs for 32 channels to monitor and record all state changes (Off-to-ON and ON-to-Off). To ensure reliable operation and avoid over-sensitive, “nuisance” event recording, each input channel shall be individually configurable as follows:

1. Filter (minimum time delay to avoid false events caused by noise)
2. Debounce (temporarily disable event recording following an event, to prevent generation of multiple event records for a single state change)
3. Chatter (max. number of events for a given input channel, to avoid filling memory with erroneous events associated with a faulty input signal)
4. Scan Status (0 = disabled, 1 = enabled)
5. Channel Description (32 characters)
6. Off-state Description (16 characters)
7. On-state Description (16 characters)
8. Inverted (0 = normal, 1 = inverted—reports status opposite sensed state)
9. Trigger Output (0 = disabled, 1 = enabled)
B. Event Log. The Event Recorder shall monitor the status of all input/output channels and record up to 8192 events in non-volatile memory, accessible from multiple masters. Each event record shall contain descriptive information as follows:

1. Date/time stamp (1ms resolution)
2. Channel name
3. Event type
4. Input/output status
5. Time quality
6. Unique sequence number

C. Relay Outputs. The Event Recorder [model SER-2408] shall have eight (8) relay outputs, controllable remotely (open/close) over an Ethernet network using Modbus TCP.

D. Discrete Trigger Output. The Event Recorder shall have a discrete output, configurable to trigger an action coincident with an event, such as waveform capture (WFC) by a compatible power monitor.

E. Data Logs for EPSS Test-Compliance Reports. The Event Recorder shall have sixteen (16) configurable data logs with group assignments to facilitate reporting of Emergency Power Supply System (EPSS) testing. When any group member (input or output) changes state, all members’ states are recorded.

F. Operations Counters. The Event Recorder shall maintain counters for each channel to count all transitions (Off-to-ON and ON-to-Off), as well as date/time of last reset, individually per channel.

G. Ethernet Network Communications. The Event Recorder shall support Ethernet network communications using Modbus TCP and embedded web server. The device shall automatically sense network operating parameters, such as network speed (10/100 Mbps) and wiring polarity.

H. Web Interface. The Event Recorder shall feature an embedded web server to allow monitoring and setup over an Ethernet network using a standard web browser. The following functionality shall be provided via the web interface, even over a network:

1. Status Monitoring page shall display on/off status of each input (and output).
2. Events Monitoring page shall display event log, with sort-able columns for date/time, channel, type, status, time quality, and unique event sequence number.
3. Data web page shall display all counters and last-reset date/times for each channel. A separate Resets web page allows counters to be reset individually or all at once.
4. Test page shall provide a means for performing a simulation test to override status of inputs to test application software.
5. Setup pages shall allow the user to change setup parameters and store them in device non-volatile memory.
6. Diagnostics page shall provide device information and statistics to aid analysis and troubleshooting.
7. Custom page(s). In addition to the standard web pages above, the Event Recorder shall provide one or more custom web pages which can be used as-is or further customized by the user to provide additional functionality while maintaining its navigation framework. Custom web pages may be added at any time for further customization by the user.

I. Precision Time Reference. The Event Recorder shall accept a precision time reference signal from a Global Positioning System (GPS) receiver or other device as follows:

1. IRIG-B time code signal (Unmodulated, 5Vdc nominal DCLS, accepts codes B004 through B007).
2. DCF77 precision time reference (24 Vdc nominal)
3. Inter-device, RS-485 multi-point time signal from another Event Recorder (time sync master).
4. NTP (from network time server).
5. Modbus TCP (periodic update by supervisory software, over the network)

J. Time Sync Master. The Event Recorder shall be capable of serving as a time sync master for additional Event Recorders via a multi-point RS-485 signal, using the IRIG-B006 time code or DCF77 signal, depending on its input. Alternately, this output shall
be configurable to provide an ASCII time-code over RS-485 suitable to sync select power meters, such as PowerLogic ION7650 meters from Schneider Electric.

K. **Local Display/Keypad.** The Event Recorder shall have a backlit LCD display, 4-line by 20 characters, and keypad to display key data to facilitate commissioning. Displayed items shall include status of inputs/outputs, time sync, current date/time, and device settings. Local setup of Ethernet communications shall also be supported.

L. **SD Flash Memory Card.** The Event Recorder shall store all setup parameters in an XML file format on a removable 2GB SD flash memory card to facilitate setup of multiple devices using templates, and to allow rapid device replacement since setup data is on removable SD card. The SD card’s file system shall also be accessible over the network to provide distributed storage of user files, such as instruction bulletins, equipment drawings, etc. [Optional: Expand on-board memory to 32GB.]

M. **DB15 to Screw-terminal Adapter.** As an option to facilitate wiring of the precision time input, an adapter shall be provided to connect to the Event Recorder’s DB15 connector and offer a screw-type terminal to facilitate wiring and a diagnostics LED to indicate the presence (or absence) of a valid IRIG-B or DCF77 signal, to assist in commissioning.

N. **DIN-rail Mounting.** The Event Recorder shall be designed for standard DIN-rail mounting (EN 50022, 35 mm x 15 mm).

O. **Multiple Masters.** The Event Recorder shall be capable of operating with multiple masters. At least 32 simultaneous Modbus TCP sockets shall be supported. In addition, multiple, simultaneous web browsing sessions (HTTP) shall be possible.

P. **Regulatory Compliance.** The Event Recorder shall be tested to applicable standards as follows:
   3. ANSI C62.41 Surge Immunity.

Q. **Technical Specifications.** The Event Recorder shall meet or exceed the following:
   1. Inputs. Rated for 24Vdc.
   2. Outputs. Rated for 24Vdc, 2.0A continuous.
   3. Control power. Nominal rating of 24Vdc, 10VA burden.
   4. Operating temperature. -25C to +70C.
   5. RoHS-compliant and lead-free to meet environmental requirements.