Sequence of Events Recording (SER)

Reliable power starts with precision timing

Precision timing is essential for modern industrial/commercial power systems. In complex electrical networks, state changes can occur in a quarter-cycle or less, and so system-wide clock synchronization is needed for meaningful analysis.

Understand—Use as a forensics tool to gain knowledge
- Perform root-cause analysis based on reliable data.
- View current and voltage waveforms captured with each event.
- Determine if the initial source was internal or external.

Respond—Verify that systems operated as designed
- Evaluate control sequences, timing, and operator actions.
- Confirm protective device time-current coordination.
- Restore service quickly if an outage does occur.

Prevent—Implement corrective actions to prevent problems
- Resolve or mitigate persistent problems.
- Provide documentation for the electric utility, legal, insurance, etc.
- Identify slow breakers before they can cause an arc flash hazard.

SER systems record the exact time of all events in chronological order. Some events are bad because they cannot be anticipated, and even worse if they cannot be explained. Other events are planned responses (breaker trips, control system actions, etc.). It is equally important to know that these events happened on time as designed—or know if they didn’t and why.

www.cyber-sciences.com/SER
Sequence of Events Recording: part of every Electrical Power Management System (EPMS)

SER: typical monitored points
- Breaker status: open/closed/tripped
- Relay trip signal: normal/trip
- Control switches: open/close commands
- Control scheme status: auto/manual/test
- Auto-transfer switch (ATS) status: normal/emergency/test
- UPS status: normal/transfer/bypass
- Generator status: stopped/running
- Battery status: normal/alarm
- TVSS, transformer temperature, fan status and other auxiliary contacts and alarms

CyTime SER-3200/2408 features
- Status monitoring (32 digital inputs)
- Event recording (1 ms timestamp accuracy)
- Elapsed time, stop-watch function (1 ms)
- Operations counters (individual reset)
- Web interface for setup and monitoring
- Remote control (on/off) via Modbus TCP
- Trigger waveform capture by power meter
- Clock sync via PTP, IRIG-B, NTP or others
- Time master (OUT) via PTP, IRIG-B, DCF77, ASCII/RS-485 or 1per10


Today, EPMS devices can have their clocks synchronized over Ethernet to under 100 µs via Precision Time Protocol (PTP) per IEEE Std. 1588. No special switches are needed, and devices that do not yet support PTP are synchronized easily, using a legacy protocol they do support.

Event reconstruction and analysis
1. Event details, 1 ms timestamps
2. Elapsed time between start-stop pairs
3. Export events to Excel

For system-wide visualization, native drivers for CyTime SER-3200/2408 are available for most EPMS software. Integration is easy via Modbus TCP and web technologies.

Precision Timing for Reliable Power. Simplified.