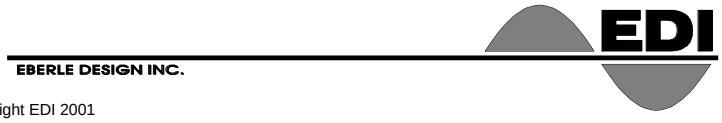
Eberle Design Inc.

SSM-LE Series

RMS Signal Monitor

- Overview -



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SSM-LE series Overview

- The signal monitor has three important tasks to perform:
  - » *Detect* improper signals / voltages
  - » *Display* cabinet status and fault status
  - » *Diagnose* with accurate information
- The EDI SSM-LE series signal monitor brings state-of-the-art advancements to all 3 tasks

The EDI SSM-LE series has been completely redesigned using state-of-the-art technology which vastly improves performance and increases capabilities for the three main tasks of the signal monitor.

Reliable detection of signals has traditionally been adversely affected by changes in phase and frequency, as well as sine wave distortion. The SSM-LE series uses a high speed coprocessor to measure the true RMS voltage and provide reliable detection in the on-street environment.

A full complement of event logging capabilities as well as the signal Trace History display helps present and document accurate status information about the events occurring at the intersection. This information is vital to the technician in repairing a cabinet malfunction and ensuring that the repair corrected the real cause of the malfunction.

Because of the high costs of malfunction maintenance calls and the increased exposure to liability, trouble shooting exercises must be done quickly and effectively. Traffic is not moving efficiently while the intersection is in flash.

Detect Improper Signals / Voltages

- EDI RMS-Engine^{tm} DSP Coprocessor
  - » Over samples each AC input at 1920S/sec using a precision Analog to Digital converter and DSP algorithms to calculate True RMS.
  - » Signal detection is virtually unaffected by changes in phase, frequency, or sine wave distortion.
  - » On / Off status is replaced with actual voltages.
  - » Accurate signal detection reduces nuisance triggering of the monitor.

The SSM-LE series is based on a dual microprocessor architecture. The RMS-Engine coprocessor is dedicated to calculating true RMS analog AC input voltages.

Traditional monitors use a threshold technique which is sensitive to changes in phase, frequency, and wave form distortion. These sensitivities can shift the threshold of detection or produce erroneous results in a noisy environment such as electrical storms, ac line instabilities, etc.

The over sampling technique used in the EDI RMS-Engine produces the correct RMS voltage value regardless of the wave form. It works accurately for ac, dc, sine, triangle, distorted ac, etc. Frequency shifts experienced during power line instabilities no longer can cause detection problems.

As a diagnosis tool, the actual voltage value rather than just the On/Off status of a signal gives one more piece of information needed to home in on the actual cause of a malfunction.

Display Cabinet Status

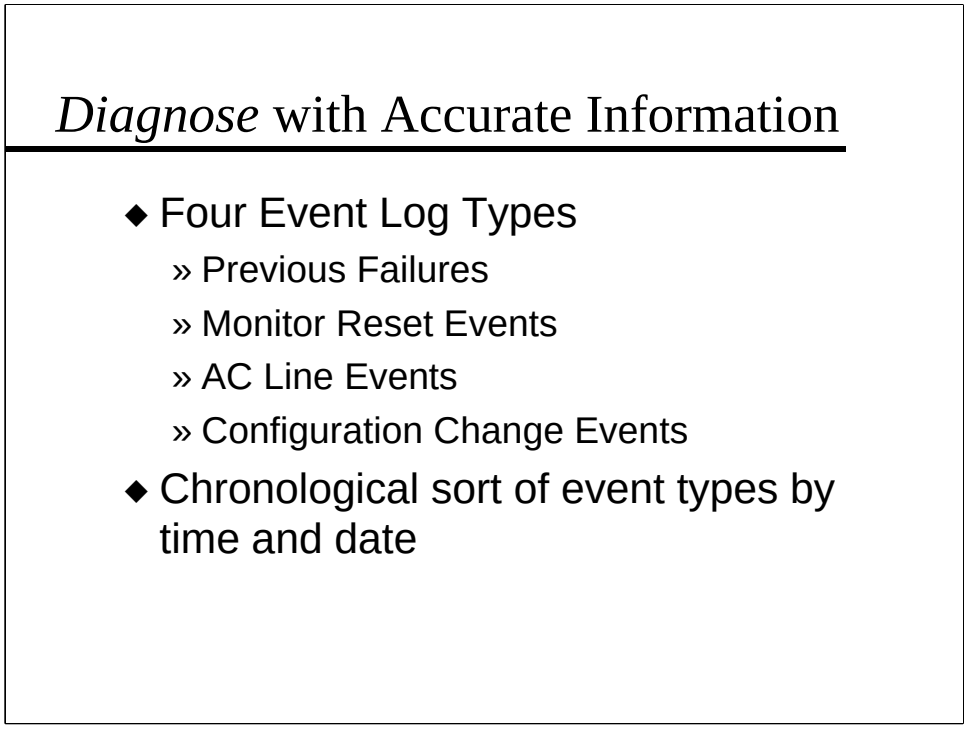
- Full R-Y-G-W Intersection Display
  - » Front panel Liquid Crystal Displays (LCD) show the full status of the intersection simultaneously.
  - » Improper signal displays are instantly recognizable. Separate indicators mark the channels involved in the fault.
  - » ECcom software on a PC displays signal and control RMS voltages in real time.

One of the first tasks of trouble shooting a cabinet is to compare the expected controller outputs to what the signal monitor sensed at the time of the fault. This helps isolate the problem down to the field, the load bay, or the controller.

The full intersection display of the SSM-LE series shows the actual signal status for the Red, Yellow, Green, and Walk inputs to each channel simultaneously. Improper signal displays are instantly recognizable.

This makes the comparison to the load switch input status easy. The SSM-LE series display also shows which channels were involved in the fault if triggered.

ECcom software will present the complete picture if a more detailed view is required.



It is important to use the tools available to the technician to find the cause of a malfunctioning cabinet quickly, and then repair the problem with a high level of confidence that the true cause was found. Call-backs for repeated problems only multiply the effect of the problem. Besides being a source of detailed and accurate information about the state of the intersection at the time of the fault, the event logs can also help provide accurate documentation about the malfunction.

Four Event Log Types

The Previous Failure log contains a record of the field signal voltages, control signal voltages, and cabinet temperature, all time-stamped with the time and date of the event. The Monitor Reset log time-stamps when the intersection was cleared from the fault flash by a monitor reset. The entry to flash and exit from flash are now documented.

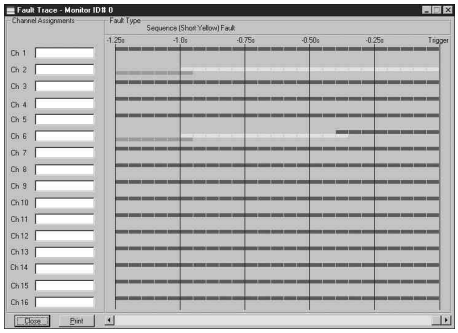
The AC Line log records any event on the AC Line which causes the monitor to transfer to flashing operation (power-down, short interrupt, or brownout), and records the actual line voltage. This helps in trouble shooting intermittent cabinet problems related to power service problems.

The Configuration Change log records any change to the monitor programming including the program card, switches, or jumper selections.

All events are then sorted according to time and date to view them in the real time line they occurred.

Diagnose with Accurate Information

- Signal Sequence History Display
  - » Graphically display signal states for 30 seconds prior to fault trigger.



Ever wonder what the signals did prior to a fault?

Did the controller execute an improper sequence to get a clearance problem or did a field malfunction cause it?

The Signal Sequence History feature of the SSM-LE series will show all field signal states graphically for as much as 30 seconds prior to the monitor trigger point with 50 millisecond resolution.

This information is critical to diagnose signal sequence faults and intermittent flickering or blinking of field signals resulting in faults.

SSM-LE Functions Beyond TS-1

- AC Power Interruption and Low Voltage Monitoring
- Dual Indication Monitoring
- Yellow Clearance Monitoring (Short or Skipped Yellow)
- Recurrent Pulse Detection
- Programmable Configuration Options

1)AC Power Interruption and Low Voltage Monitoring

The SSM-LE unit is the first device to recognize a low AC Line condition, placing the cabinet into flash mode. It is the last device to recognize a proper AC Line condition, placing the cabinet back into operation once all other devices are operating.

2) Dual Indication Monitoring

Detects simultaneous active inputs on a channel. Adds to fault coverage; can also anticipate conflict malfunctions before they are displayed on signals.

3)Yellow Clearance Monitoring (Short/Skipped Yellow)

Used to ensure a minimum clearance time for vehicle channels.

4) Recurrent Pulse Detection

Detects Conflict, Dual Indication, and Red Fail conditions caused by intermittent or flickering signals.

5) Option Programming adds:

- •GY Enable
- •WD Enable
- •Walk Disable
- •CVM and 24V Latch
- •CVM Log Disable

Dual Indication Monitoring

- Detects simultaneous active inputs on a channel.
  - » Adds to potential fault coverage.
  - » Can *anticipate* Conflict malfunctions before they are displayed on the signals.
- GY Enable option works with 5 section heads and GY Overlaps.

Dual Indication Monitoring detects simultaneous active inputs on a channel. It adds to the fault coverage and can also anticipate conflict malfunctions before they are displayed on signals.

If a Green signal stays on due to a faulty Load Switch, the fault will be detected when the Yellow signal goes active and the intersection will be placed into flashing mode. Without this function, the CU would have cycled all the way to the next phase, allowing a conflict to occur before the monitor responded.

The GY Enable option provides Green-Yellow fault coverage for channels which have the Red input tied back to AC Line (five section signal head, GY overlaps, etc.).

Minimum Yellow Clearance

- Ensures that minimum MUTCD Yellow clearance interval of 3.0 seconds is met for vehicles.
- Detects CU Pinwheeling, sequence malfunction, preemption error, etc..

The SSM-LE series monitors the Yellow clearance interval on each selected channel during a Green to Yellow to Red sequence. This ensures that all channels have a minimum clearance period of at least 2.7 seconds.

EDI SSM-LE Series

Setting the Standard
for
Quality and Reliability

Eberle Design Inc.

Thank you for using Eberle Design products.

Our goal is to provide you with the highest reliability, performance, and customer satisfaction possible.

Your inputs and comments are highly appreciated.