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MMU-1600
Malfunction Management Unit

The Model MMU-1600 Malfunction Management Unit (MMU) is a full-featured unit that monitors up to 16 traffic signal channels.

Description

The Model MMU-1600 Malfunction Management Unit is a full-featured unit that monitors up to 16 traffic signal channels for conflicting inputs, improper sequencing, incorrect timing, and invalid signal voltage levels. The MMU-1600 is fully compliant with NEMA Standard TS2-1998. The MMU-1600 can operate in either Type 16-mode (16 channels) or Type-12 mode (12 channels). When configured to operate in Type-12 mode, the unit is downward-compatible with NEMA TS1 Standard.

Red, Yellow, Green, & Walk Indicators

The MMU-1600 has 77 Light Emitting Diodes (LEDs) that are used to convey information to the user. These LEDs are color coded to increase visibility and intuitiveness of the display. The LEDs provide an intuitive indication of input status when the MMU is configured to operate in either Type-12 or Type-16 Mode. The LEDs used are ultra-bright to allow viewing of the front panel indicators in direct sunlight.

Upgradable via Front Panel Mounted Serial Port

The MMU-1600 is designed with flash based memory components. The front panel-mounted RS-232 communications port facilitates software upgrades.

RaeComM Monitor Management Software

The MMU-1600 is designed to be used with RaeComM. RaeComM permits the user to view and save event logs, view and modify configuration parameters, and view the real-time status of all inputs to the monitor. RaeComM also allows viewing and retrieving of internal diagnostic codes and statistics on all communications ports.

Digital Signal Processor

The Digital Signal Processor (DSP) is used to convert AC inputs into true Root Mean Squared (RMS) voltages. All input voltages are sampled at a rate that exceeds 200 samples per line cycle. This virtually eliminates false sensing due to changes in frequency, phase, or sine wave distortion.

Features

- Red, Yellow, Green, and Walk indicators
- Upgradeable via front panel-mounted serial port
- DSP provides:
  - Accurate measurement of AC RMS voltages
  - Sampling speed in excess of 200 samples per line cycle
- Free RaeComM monitor management software
- Event logging:
  - Time change log
  - MMU reset log
  - Configuration log
  - Prior faults log
  - AC line log
  - Signal sequence log
- Flashing "Don't Walk" monitor
- Audible buzzer
- Configuration monitoring
- Built-in memory on program card
- Per-channel Red enable
- Co-channel monitoring
- Modified Conrtoller Voltage Monitor (CVM) latch
- User-configurable high/low voltage alarms
- 12VDC monitoring
- Type-16 mode only
- Disable local flash

Event Logging

When using the MMU-1600 in conjunction with RaeComM software, the MMU functions not only as a Malfunction Management Unit, but also as an event logging system. Six different event logs provide detailed date and time stamped documentation of events that occur in the cabinet. This data is useful in troubleshooting and provides an accurate historical record of cabinet operation. The six event logs are:

- Time change log - 50 most recent time changes
- MMU reset log - 20 most recent resets
- Configuration log - 10 most recent configuration changes
- Prior faults log - 20 most recent faults
- AC line log - 50 most recent changes in AC line status including alarms
- Signal sequence log:
  - Event mode: 60 most recent events preceding the failure
  - Time mode: Two seconds preceding the failure

Flashing "Don't Walk" Monitor

This feature allows the user to ensure that flashing "Don't Walk" displays do not conflict with other Greens, Yellows, or Walks.

Audible Buzzer

The MMU-1600 is equipped with an audible buzzer. This buzzer is used to bring important events to the attention of the user. The buzzer can be disabled for all features except for critical failures.

Configuration Monitoring

The MMU-1600 checks all configuration settings for changes once per second. If a change is found, an audible signal (buzzer) will begin to sound to indicate that a configuration setting has changed. No configuration changes are implemented until the front panel RESET switch or external RESET input is activated (pending changes are not implemented when power to the MMU is cycled.)

Built-in Memory on Program Card

Program cards have an integral serial EEPROM. These program cards are interchangeable with other manufacturer's program cards for the programming of all standard features. The serial EEPROM has a way of storing programming settings for some of the extended NEMA features of our MMU-1600.

Per-Channel Red Enable

The per-channel Red enable feature gives the user the ability to permanently disable the Red enable function and field check for specific channels. The dual indication function will still operate according to the FIELD CHECK/DUAL IND option switches on the front of the MMU-1600.

Co-Channel Monitoring

This feature is useful when a channel may have all of its outputs off, while another channel's output is on for a given movement of traffic. Overlaps and protected/permitted applications are common uses. Under normal operation, the Red enable input would have to be deactivated during the time the channel had no output, to keep a Red fail fault from occurring. The co-channel monitoring feature allows the user to select other channels to be tested along with the parent channel such that a Red fail fault will only occur if the parent channel has no outputs on and the Green, Walk, and optionally, the Yellow of the child channels have no output on. Co-channel monitoring is configured for each channel individually, through the use of the RaeComM software.

Modified CVM Latch

This feature is useful in instances when the CVM input may not always be valid during the programmed minimum flash time and where latched CVM failures are desired. When this feature is enabled and the CVM latch enable jumper is installed on the programming card, the CVM input will not latch a CVM failure until the CVM input has been valid for more than 175 milliseconds.

User-Configurable High/Low Voltage Alarms

When using the MMU-1600 in conjunction with RaeComM software, the user can adjust the high-voltage alarm point and the low-voltage alarm point. An alarm condition and subsequent return to nominal voltage will both create an entry into the AC line log. The factory defaults for these alarm points are 105 volts for the low-alarm point and 135 volts for the high-alarm point.

12VDC Monitoring

This feature converts the +24V monitor II to a +12V monitor. It can be very useful in TS2 cabinets with 12 VDC supplies. The MMU-1600 can now monitor a +12 VDC supply as well as a +24 VDC supply. The operation of the input is the same as if it were the +24V monitor II, except that the voltage levels are changed.

Type-16 Only Mode

This feature is useful in instances when the user is retrofitting a TS2 monitor into a TS1 cabinet and wants to use the Type-16 mode, but the existing connector A harness does not have a wire for Pin HH (Type Select). Activating this feature forces the MMU-1600 to operate in Type-16 mode regardless of the logic level on the Type Select input.

Disable Local Flash

This feature is useful in instances when it is best to ignore a command in order to begin flash operation of the intersection. This command may come from a time clock or an output of the controller that is controlled by Time-of-Day, coordination, or a system master.

3360 E. La Palma, Anaheim, CA 92806-2856
Tel: (714) 630-3700 • Fax: (714) 630-6349
E-mail: sales@econolite.com
www.econolite.com
38413E0607-5

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