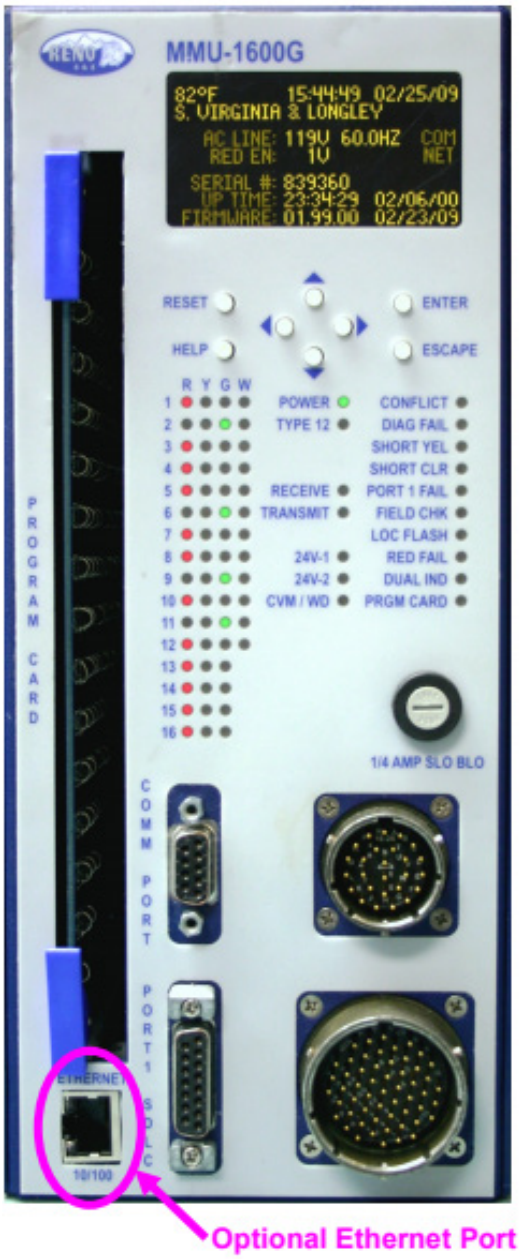
MMU - 1600GE

Malfunction Management Unit



- Meets and/or exceeds all NEMA TS 2 specifications (NEMA TS 1 compatible – Type 12 operation)
- Organic Light Emitting Diode (OLED) display provides outstanding readability in any light condition and functions reliably over a temperature range of -22° F to +176° F (-30° C to +80° C)
- All AC field voltages can be displayed on a single screen, making viewing of leakage voltages on all load switch output a simple task
- Context sensitive Help system to assist with configuration and troubleshooting tasks
- 77 front panel LEDs provide a clear, concise, real-time indication of the status of all channel inputs and fault conditions
- Event logging provides a detailed, time-stamped record of time changes, monitor resets, configuration changes, prior faults, AC line voltages, and signal sequence data
- The most advance Flashing Yellow Arrow Left Turn monitoring available in the industry
- LED signal head thresholds provide enhanced monitoring for LED indications
- Front panel mounted RS-232 Communications Port facilitates in-field firmware upgrades and access to stored logs
- Ethernet Port allows communications with the monitor through a settable Ethernet network IP address. Both the Ethernet port and the RS-232 Port can be used at the same time
- Configuration Wizard easily configures the monitor for most applications in just a few minutes
- All configuration data can be stored on a Reno A&E Program Card and can be copied from monitor to monitor
- Canadian Flashing Green Monitoring version available

The Model MMU-1600GE 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 voltage levels. The MMU-1600GE is fully compliant with NEMA Standard TS 2-2003. The MMU-1600GE can operate in either Type 16 mode (sixteen channels) or Type 12 mode (twelve channels). When configured to operate in Type 12 mode, the unit is downward compatible with NEMA Standard TS 1-1989. The MMU-1600GE features an Organic light Emitting Diode (OLED) display that sets a new standard for user-friendly monitor configuration.

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MMU - 1600GE Enhanced Features

The following is a list of features included in Reno A&E's Model MMU-1600GE Malfunction Management Unit which enhance the safety and operation of the unit. These features extend the operational capabilities of the MMU-1600GE beyond the requirements set forth in NEMA Standards Publication TS 2-2003.

Hardware Features: The MMU-1600GE unit incorporates a 16-bit microprocessor as the main processing unit, a digital signal processor (DSP), and two micro-controllers. The main microprocessor can be upgraded via the front panel RS-232 port. The DSP and the micro-controllers are flash based and can be programmed in circuit.

One of the micro-controllers is dedicated to monitoring diagnostic signals from the DSP and the main microprocessor. This micro-controller holds the main processor in the reset state until the AC Line voltage and all supply voltages have been verified as being within operational ranges.

The MMU is entirely connectorized internally with the exception of the two wires to the front panel fuse and an earth ground wire. This makes the MMU very easy to assemble and maintain. The possibility of wiring errors within the unit has been eliminated.

The MMU has an internal buzzer that indicates when the main processor is not running. This will only occur very briefly during power up, 1.5 seconds after loss of AC power, and during major diagnostic failures.

Graphics Display: The MMU-1600GE uses an Organic Light Emitting Diode (OLED) display. This display provides outstanding readability form -22° F to +176° F (-30° C to +80° C). The display is graphics based with a resolution of 128 x 64 and supports 16 shades of gray. The display has a contrast ratio of 2000:1.

Ethernet Port: The monitor supports a 10/100 Ethernet port. This port can be used simultaneously with the front panel RS-232 port. The Ethernet port is read-only when the monitor powers up. In order to write data through the Ethernet port, the reset button must be pressed and released. This action will cause the Ethernet port to be read-write for the next 15 minutes. This read-only function ensures that data in the monitor cannot be changed without someone physically being at the location of the monitor. This ensures that the IP address is correct and that changes cannot be implemented without physical access to the monitor.

Voltage Display Screens: The monitor has a special display mode that can show all of the AC field inputs in real-time or the values at the time of the last fault. It can also show all of the DC voltages in real-time or at the time of the last fault. The user can navigate between the four possible screens using the four arrow buttons. The real-time AC field voltage screen is very helpful in seeing the leakage voltage of load switches.

Configuration Wizard: The Configuration Wizard in the monitor can quickly configure the monitor for most intersections with 8 phases or less and running dual ring. The wizard can configure the following settings: Dual Indication / Field Check, Green-Yellow Monitoring Enable, Red Enables, Pedestrian Monitoring, Flashing Yellow Arrow Left Turns, Co-Channels, LED Thresholds, and External Watchdog Enable.

The wizard will also provide warnings about program card settings that do not agree with the configuration information entered in to the wizard.

Context Sensitive Help System: The monitor implements an advanced help system that will provide additional information based on what the user is currently doing or the fault currently being displayed. If the graphics display is showing a fault, pressing the HELP button will display information about this type of fault, common causes of this fault, and how to troubleshoot this type of fault.

Program Card Memory: Reno A&E MMU program cards have always contained a serial EEPROM memory device. The program card will work in any manufacturers MMU as a standard program card. But, when installed in a Reno A&E MMU, the monitor will copy all configuration data to the memory device. As of the 01.07.07 version of firmware, the storage of data was standardized across all Reno A&E MMU models. This allows the user to remove the program card from any model Reno A&E MMU and insert it into the MMU-1600G. Once powered up, the monitor will prompt the user whether the configuration stored on the program card or the configuration stored in the monitor should be used. If program card is selected, all configuration data stored on the program card will be copied into the monitor and used. If the monitor configuration is selected, the monitor configuration data will be copied to the program card.

Dual Indication Monitoring: This monitoring feature detects simultaneously active inputs of Green (Walk), Yellow, or Red (Don't Walk) on the same channel. The DUAL INDICATION / FIELD CHECK settings allow Dual Indication monitoring to be enabled on a per channel basis.

Type 12 – When the MMU is operating in this mode; Dual Indication monitoring detects simultaneously active inputs of Green and Yellow, Green and Red, Yellow and Red, Walk and Yellow, or Walk and Red on the same channel. When any two inputs of a channel are sensed as active for more than 1000 milliseconds, the MMU transfers the Output relay contacts to the fault condition and illuminates the DUAL IND indicator.

Type 16 – When the MMU is operating in this mode; Dual Indication monitoring detects simultaneously active inputs of Green and Yellow, Green and Red, or Yellow and Red on the same channel. When any two inputs of a channel are sensed as active for more than 1000 milliseconds, the MMU transfers the Output relay contacts to the fault condition, illuminates the DUAL IND indicator, and sets the Spare Bit #2 bit (bit 68) of the Type 129 Frame to 1.

Dual Indication monitoring is disabled when the Red Enable input is not active or if the Load Switch Flash bit (bit 112) of the Type 0 Frame is set to 1.

The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of Dual Indications on a channel prior to the MMU Power Failure.

GY-Dual Indication Monitoring: This monitoring function detects simultaneously active inputs of Green and Yellow field signal inputs on the same channel. When the Green and Yellow inputs of a channel are sensed as active for more than 1000 msec the MMU transfers the Output relay contacts to the fault condition, illuminates the DUAL IND indicator, and sets the Spare Bit #2 bit (bit 68) of the Type 129 Frame to 1.

The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of GY-Dual Indications on a channel prior to the MMU Power Failure. GY-Dual Indication Monitoring may be enabled concurrently with Dual Indication Monitoring.

GY-Dual Indication Monitoring is enabled by the use of the GRN-YEL MON ENABLED setting. When the GY-Dual Indication Monitoring option is enabled, all channels which have DUAL INDICATION / FIELD CHECK set to OFF will be individually monitored for simultaneously active Green and Yellow inputs. All channels that have DUAL INDICATION / FIELD CHECK set to ON will function as described above in Dual Indication Monitoring.

GY-Dual Indication monitoring is disabled when the Red Enable input is not active or if the Load Switch Flash bit (bit 112) of the Type 0 Frame is set to 1.

Field Check Monitoring: This monitoring function combines information about active field inputs with information received through the Port 1 communications between the Controller Unit and the MMU in a TS2 Cabinet Assembly. The MMU will receive a Type 0 Frame from the Controller Unit (Type 1 or Type 2 CU) that contains an image of the controller output commands to the load switches.

When the field signal input states detected as active or inactive by the MMU do not correspond with the information received from the Controller Unit in the Type 0 Frame for 10 consecutive 100 millisecond periods, the MMU will enter the fault mode, transfer the Output relay contacts to the Fault position, illuminate the FIELD CHK indicator, and set the Spare Bit #1 bit (bit 67) of the Type 129 Frame to 1.The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of Field Check fault prior to the MMU Power Failure. Field Check Monitoring is enabled concurrently with Dual Indication Monitoring.

Field Check Monitoring is enabled for each channel, individually, through the use of DUAL INDICATION / FIELD CHECK per channel settings. Field Check Monitoring is disabled when the RED ENABLE input is not active.

LED Thresholds: The monitor can use the standard incandescent field display thresholds or enhanced LED field display thresholds. The monitor normally uses 15 VAC as off and 25 VAC as on for Green, Yellow, and Walk displays and uses 50 VAC as off and 70 VAC as on for Red displays. With the LED thresholds active, the monitor uses the same voltage thresholds for all displays but will use different voltage thresholds based on the test being performed. For Conflict, Dual Indication, and Field Check the monitor uses 15 VAC as off and 25 VAC as on. For Red Fail, Short Yellow, and Short Clearance the monitor uses 50 VAC as off and 70 VAC as on.

Flashing Yellow Arrow Left Turn Monitoring: The monitor supports four section Flashing Yellow Arrow (FYA) left turn displays. Faults monitored for include: Dual Indication, Red Fail, Flashing Yellow Arrow must flash, and a solid Yellow Arrow terminating a Green Arrow must conflict with the opposing through Green and Yellow. Reno A&E monitors provide the most flexible and advanced Flashing Yellow Arrow Left Turn monitoring capabilities available in the industry.

Modified CVM Latch: This feature is useful in cabinets where the CVM input may not always be valid within the programmed Minimum Flash time and where latched CVM failures is desired. In the modified mode of operation, the MMU will not latch a CVM failure until the CVM input has been valid for more than 175 milliseconds.

This function is enabled by the setting MODIFIED CVM LATCH. This feature only has an effect if the CVM Latch jumper is installed on the programming card.

Type 16 Only Mode: This feature is useful in cabinets where the user is retrofitting a TS 2 monitor into a TS 1 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 to operate in the Type 16 mode regardless of the logic level on the Type Select input. While this feature is on, the TYPE 12 LED will show the Function Disabled indication (50 milliseconds on, once every two seconds).