The Model MMU-1600 Malfunction Management Unit is a fully 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 TS 2-2003. The MMU-1600 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.
MMU-1600 ENHANCED FEATURES

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

Hardware Features

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

One of the microcontrollers is dedicated to monitoring diagnostic signals from the other microcontroller, the DSP, and the main microprocessor. This microcontroller holds the main microprocessor 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. The two wires to the front panel fuse are the only exception. This makes the MMU very easy to assemble, disassemble, and maintain. The possibility of wiring errors within the unit has been eliminated.

The MMU has an internal buzzer that stays on to indicate when the main microprocessor 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.

Dual Indication Monitoring

This monitoring feature functions in the manner that its name implies. It monitors for simultaneously active inputs of Green (Walk), Yellow, or Red (Don’t Walk) on the same channel. A set of switches on the front panel labeled FIELD CHECK / DUAL ENABLES is provided to 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 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 12 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 12 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 Indicator Monitoring is enabled by the use of the front panel option switch labeled GY ENABLE. When the GY-Dual Indicator Monitoring option is enabled, all channels which have the front panel FIELD CHECK/DUAL ENABLE switches set to OFF will be individually monitored for simultaneously active Green and Yellow inputs. All channels that have the front panel FIELD CHECK/DUAL ENABLE switches 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 0 Frame from the Controller Unit (Type 1 or Type 2 CU) that contains an image of the Controller Unit and the MMU in a TS2 Cabinet Assembly. The MMU will receive a Type 0 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 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 inputs with information received through the Port 1 communications between the Controller Unit and the MMU in a TS2 Cabinet Assembly. 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