

# MMU-16E TS2 Malfunction Management Unit



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## About MMU 16E

The MMU-16E is a Malfunction Management Unit (MMU), which meets or exceeds all specifications of Section 4 of the NEMA TS2-2003 Standard. It operates in either a TS2 Type-1 or Type-2 cabinet. Both cabinets require that an MMU be interfaced to the controller via the TS2 standardized high-speed SDLC serial bus. The MMU-16E can also operate as a Type-16 or a Type-12 MMU. Type-16 mode provides 16 channels (typically 8 vehicle, 4 ped, 4 overlap), where each channel consists of three 120 VAC inputs (green/Walk, yellow, red/Don't Walk). Type-12 mode provides 12 channels (typically 8 vehicle, 4 overlap), where each channel consists of four 120 VAC inputs (green, yellow, red, Walk). Type-12 mode provides downward compatibility with a Conflict Monitor Unit (CMU) conforming to TS1. The MMU-16E can serve as an MMU in a TS2 cabinet by any manufacturer or as a spare for a CMU in any 12-channel TS1 cabinet.

### At A Glance

- ▶ Meets NEMA TS2-2003 MMU Standard
- ▶ Compatible with any TS2 Type-1 or Type-2 cabinet
- ▶ Downward compatible with TS1 CMU
- ▶ Full intersection signal display
- ▶ Field Check diagnostic directly pinpoints faulty inputs
- ▶ Full event logging capabilities with Signal Sequence Log
- ▶ A key component for safer traffic control



## Enhanced Safety

The TS2 Standard helps ensure safer traffic control operation than the older TS1 and 170/179 standards. This is in part due to the fact that the TS2-specified MMU provides broader fault coverage than older CMUs. In addition to monitoring load switch outputs, the MMU-16E is in continual communication with the TS2 controller via the SDLC bus; with a data exchange every 100 msec. Both the MMU-16E and controller have access to the same diagnostic information and can put the intersection into flash, thus providing redundancy of the MMU function should the cabinet relay system fail to operate. This communication also provides the basis for the MMU-16E Field Check function.

The MMU-16E provides a full intersection display on the front panel making most improper field signal conditions immediately recognizable. Detailed MMU-16E diagnostics can also be displayed on the screen of the controller or via the EIA-232 port to aid in trouble-shooting. Conditions leading to flash beyond those specified by TS1 include the following:

- Incompatibility between the controller and MMU at the program level. The MMU can-not be more permissive than the controller.
- Dual Indication monitor detects multiple active signal inputs on a channel. This fault may also result from an open-load condition on a field wire.
- Minimum Yellow Clearance monitor detects a missing or short Yellow interval for a vehicle channel.
- Minimum Yellow + Red Clearance monitor detects a missing or short interval between the end of an active Green/Walk and the beginning of the next active Green for a pedestrian channel or overlap without a true Yellow output.
- AC power below 95 Vrms. The MMU-16E recognizes this brownout level as potentially unsafe, even though all TS2 cabinet components are specified to operate down to 89 Vrms.
- Any malfunction of the microprocessor, RAM, or PROM in the MMU, or failure of the SDLC bus or controller.

## Basic Specifications

- ▶ **TS2/TS1 Compatibility**
- ▶ **Hardware**
  - ◉ Enclosure
  - ◉ Electronics
  - ◉ Front Panel & Connectors
- ▶ **Enhanced Functions**
  - ◉ Dual Indication Monitor
  - ◉ Field Check Fault Monitor
  - ◉ Field Check Status Monitor
  - ◉ Recurrent Pulse Error Monitor
  - ◉ External Watchdog Monitor
  - ◉ Type Fault Monitor
  - ◉ Display Functions

