

MMU-16Eip-LSU

RMS Signal Monitor Operations Manual

Addendum to the MMU-16E Operations Manual Firmware Version 16ME54xx



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Table of Contents

| | |
|---|----------|
| Section 1 GENERAL | 1 |
| 1.1 Overview | 1 |
| 1.1.1 <i>MMU-16Eip-LSU</i> Malfunction Management Unit (MMU)..... | 1 |
| 1.1.2 Load Sensor Unit (<i>LSU</i>) | 1 |
| 1.2 <i>MMU-16EIP-LSU</i> Data Interfaces..... | 1 |
| 1.2.1 Port 1 | 2 |
| 1.2.2 Field Signal Voltage Port..... | 2 |
| 1.2.3 Load Sensor Unit Port..... | 2 |
| 1.2.4 ECom Port | 2 |
| 1.2.4.1 Ethernet Port | 2 |
| 1.3 <i>MMU-16EIP-LSU</i> Physical Package..... | 3 |
| 1.4 Load Sensor Unit (<i>LSU</i>) Package..... | 3 |
| 1.4.1 Load Sensor Unit Cable | 4 |
| 1.4.2 Load Sensor LED..... | 4 |
| Section 2 INSTALLATION | 5 |
| 2.1 <i>MMU-16E-LSU</i> Unit..... | 5 |
| 2.2 Load Sensor Unit (<i>LSU</i>) | 5 |
| Section 3 SPECIFICATIONS..... | 6 |
| 3.1 Modifications to the <i>MMU-16E</i> Operation Manual..... | 6 |
| 3.2 Torroidal Transformers | 6 |
| 3.3 Load Current Measurement..... | 6 |
| 3.4 AC Mains Voltage Measurement | 6 |

Section 1 GENERAL

1.1 OVERVIEW

The *MMU-16EIP-LSU* system consists of a NEMA TS2 MMU (MMU-16E-226) that has been modified to provide field load current sensing information from a Load Sensor Unit (*LSU*). The target cabinets are deployed as conventional 220 Vac / 60 Hz powered NEMA TS2 cabinets with sixteen channel capacity. The *MMU-16EIP-LSU* system will replace the standard MMU currently installed in the cabinet.

It should be noted that the *MMU-16EIP-LSU* system is compatible with any NEMA TS2 cabinet that operates with LED signal heads that are compatible with a NEMA TS2 MMU and Load Switch. See the referenced ITE LED Signal standards documents for details.

1.1.1 *MMU-16EIP-LSU* MALFUNCTION MANAGEMENT UNIT (MMU)

The *MMU-16EIP-LSU* is a variant of the EDI standard MMU-16E Malfunction Management Unit (MMU) and has been modified from the standard product as follows:

- Modified for 220 Vac 60 Hz operation (MMU-16E-226),
- Added the *LSU* interface port,
- An Ethernet port has been substituted for the EIA-232 ECcom communications port,
- Added new message types to the ECcom port to support the load current reporting function.

The Load Sensor current mode is only intended to operate in the MMU Type 16 mode; 16 channels of RYG.

1.1.2 LOAD SENSOR UNIT (*LSU*)

The Load Sensor Unit (*LSU*) provides the signal processing function to transform the load current waveforms to RMS current values. The sensing technology is a non-intrusive toroidal current transformer. One transformer is used for each monitored output for a total of 48 transformers (sixteen channels of three outputs RYG). These load current values will reflect the RMS value of the load current through the transformer primary to the LED signal heads.

These transformers are mounted to a rectangular PCB such that the associated field wire to each signal branch can be passed through the center hole of the transformer. The *LSU* device can be placed in the bottom of the cabinet near the field terminals or wherever this wiring makes the installation convenient.

1.2 *MMU-16EIP-LSU* DATA INTERFACES

As shown in Figure 1-1, there are five data interfaces to the *MMU-16Eip-LSU* unit.

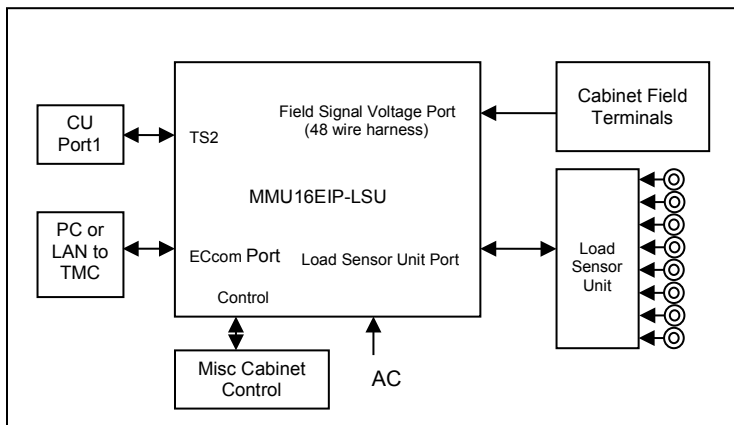


Figure 1-1

1.2.1 PORT 1

The Port1 is the SDLC interface to the Controller Unit. It shall comply with the requirements of NEMA TS2 and is not modified in this product.

1.2.2 FIELD SIGNAL VOLTAGE PORT

The field inputs to the *MMU-16EIP-LSU* are the standard voltage monitoring inputs of the MMU. They shall comply with the requirements of NEMA TS2 and are not modified in this product other than the thresholds are adjusted to accommodate 220 Vac operation as described in Section 3 of this *MMU-16EIP-LSU* Operation Manual.

1.2.3 LOAD SENSOR UNIT PORT

The Load Sensor Unit port is an EIA-485 asynchronous communications port that interconnects the *MMU-16EIP-LSU* and *LSU* for load current data transfer and control functions.

1.2.4 ECCOM PORT

The ECom port is used to send and receive data to the EDI Windows PC based program, ECom. The ECom program is used to display status and event logs from the MMU. This operation is unchanged from the standard MMU-16E-226 product. The ECom protocol is a proprietary product of EDI using a command / response structure and fixed length message frames.

The following additional message types have been added to the *MMU-16EIP-LSU* to support the operation of the *LSU*.

- Type 163: Get Load Current Status (instantaneous)
- Type 164: Get Load Current Minimum Report (filtered view)
- Type 165: Get Load Current Maximum Report (filtered view)

This port may also be connected to networking devices that provide access from a remote TMC workstation.

1.2.4.1 ETHERNET PORT

The *MMU-16EIP-LSU* provides an Ethernet port on the front panel to interface to the ECom data. The Ethernet port operates at 10 Mbs half-duplex. For details of the features

and functions of the Ethernet port see EDI document *Ethernet Quick Start Operation Manual* (pn 888-1000-101).

1.3 MMU-16EIP-LSU PHYSICAL PACKAGE

Figure 1-2 shows a front view of the *MMU-16EIP-LSU* MMU package. The unit form factor is unchanged from the EDI standard MMU-16E product. An Ethernet port has been substituted for the EIA-232 port and an RJ45 connector added for the *LSU* port.

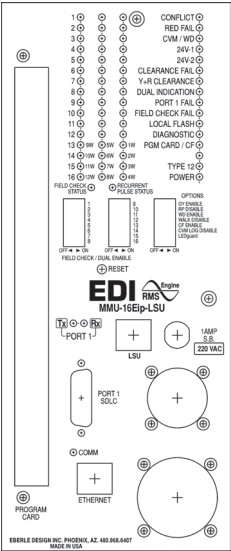


Figure 1-2

1.4 LOAD SENSOR UNIT (LSU) PACKAGE

Figure 1-3 shows a front view of the *Load Sensor Unit* package. The hole size is 0.26 inches (6.6mm) in diameter. Slots are provided in the feet of the unit to facilitate mounting with #10 screws. The *LSU* cable is connected to the LSU PORT RJ-45 connector on the front surface of the *LSU*.



Figure 1-3

1.4.1 LOAD SENSOR UNIT CABLE

The *LSU* cable is a standard Ethernet CAT5 cable and has a length of two meters. This cable will install into a connector on the front panel of the *LSU* and front panel of the *MMU-16EIP-LSU*. The connector is an RJ-45 type. This cable provides power to the *LSU* and EIA-485 data communications signals. Either a straight through or cross-over type of cable will work correctly.

| LSU CONNECTOR PIN ASSIGNMENTS | |
|-------------------------------|------------------|
| Pin | Function |
| 1 | DC Power (8 Vdc) |
| 2 | LSU Resetx |
| 3 | DC Ground |
| 4 | TxData + |
| 5 | TxData - |
| 6 | LSU Resetx |
| 7 | RxData + |
| 8 | RxData - |

1.4.2 LOAD SENSOR LED

The LED indicator next to the *LSU* port on the front panel of the *MMU-16EIP-LSU* will flash each time a message is correctly received from the *LSU*.

Section 2

INSTALLATION

2.1 MMU-16E-LSU UNIT

The *MMU-16EIP-LSU* is installed in the cabinet in the same fashion as a standard MMU-16E unit. No changes to the cabinet or cabinet wiring are required. For details on the operation and installation see the *MMU-16E Operation Manual (pn 888-0016-001)*.

2.2 LOAD SENSOR UNIT (LSU)

The *LSU* should be secured to a position in the cabinet where clear and easy access to the signal field wires can be obtained. For each color (R, Y, G) of each channel, the field wire should be inserted through the associated hole in the *LSU*. The wires may be inserted from the front side or the back side, but should be done consistently for each hole. If multiple field wires are inserted into the hole, the reported load current will be the RMS sum of the individual currents.

Section 3
SPECIFICATIONS

3.1 MODIFICATIONS TO THE MMU-16E OPERATION MANUAL

Section 7.1, Electrical

Modify this section to read:

| | |
|--------------------------------|-----------------------|
| Operating Line Voltage..... | 150 to 270 Vrms |
| Operating Line Frequency | 60 \pm 3Hz |
| Power Consumption | 5W (nominal) |
| Green Signal Inputs | |
| No Detect..... | less than 30 Vrms |
| Detect | greater than 50 Vrms |
| Yellow Signal Inputs | |
| No Detect..... | less than 30 Vrms |
| Detect | greater than 50 Vrms |
| Walk Signal Inputs | |
| No Detect..... | less than 30 Vrms |
| Detect | greater than 50 Vrms |
| Red Signal Inputs | |
| No Detect..... | less than 100 Vrms |
| Detect | greater than 140 Vrms |
| Red Enable Input | |
| No Detect..... | less than 140 Vrms |
| Detect | greater than 178 Vrms |
| <u>Power Fail Monitor</u> | |
| AC Line Input | |
| Dropout..... | less than 194 Vrms |
| Restore | greater than 204 Vrms |

Section 2.6, MMU Power Failure Detection

Modify this section to read:

"When the AC LINE voltage is below the minimum drop-out level of 194 Vrms..."
"When the AC LINE voltage returns above the maximum restore level of 204 Vrms..."

3.2 TORROIDAL TRANSFORMERS

| | |
|--|----------|
| Maximum Continuous Primary Current | 1 Amp |
| Insulation Voltage (1 minute) | 3500 Vac |

3.3 LOAD CURRENT MEASUREMENT

Note: Based on one primary turn of the field wire.

| | |
|-------------------------------------|-----------------|
| Load Current Measurement Range..... | 20 to 500 mArms |
| Load Current Accuracy | +/- 4 % |
| Load Current Resolution..... | 2 mArms |

3.4 AC MAINS VOLTAGE MEASUREMENT

| | |
|-----------------------------------|---------------|
| Voltage Measurement Range | 0 to 270 Vrms |
| AC Mains Voltage Accuracy | +/- 3 % |
| AC Mains Voltage Resolution | 2 Vrms |