

# AMU-214

## Auxiliary Monitor Unit Operations Manual

THIS MANUAL CONTAINS TECHNICAL INFORMATION FOR THE AMU-214 SERIES ITS CABINET AUXILIARY MONITOR UNIT. INCLUDED ARE GENERAL DESCRIPTION, OPERATIONAL DESCRIPTION, INSTALLATION, AND SPECIFICATIONS.

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### **MAINTENANCE NOTE**

**THIS EBERLE DESIGN INC. AUXILIARY MONITOR UNIT HAS BEEN CAREFULLY INSPECTED AND TESTED TO ENSURE PROPER OPERATION. IT IS RECOMMENDED THAT THE AUXILIARY MONITOR UNIT BE TESTED AT LEAST ANNUALLY TO ENSURE PROPER OPERATION AND COMPLIANCE WITH FACTORY SPECIFICATIONS.**

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## Section 1 GENERAL

### 1.1 OVERVIEW

The model CMU-212 Cabinet Monitor Unit (CMU-212) is the principle part of the ITS Traffic Control Cabinet Monitoring System. It is resident in the Power Distribution Assembly and communicates with an Auxiliary Monitor Unit (AMU) located in each Output Assembly via Serial Bus #3. The role of the CMU-212 is to query various cabinet conditions and, if the application requires action, the CMU-212 will transfer control from the Advanced Traffic Controller (ATC) to a flashing control mode. The role of the AMU-214 is to collect voltage and load current data for each Output Assembly and report this data to the CMU-212 via Serial Bus #3. For further information concerning the CMU-212, see the Eberle Design **CMU-212 Operations Manual**.

The Eberle Design AMU-214 meets with or exceeds all specifications outlined in the AASHTO/ITE/NEMA **Intelligent Transportation Systems (ITS) Standard Specification for Roadside Cabinets V01.02.17b** document.

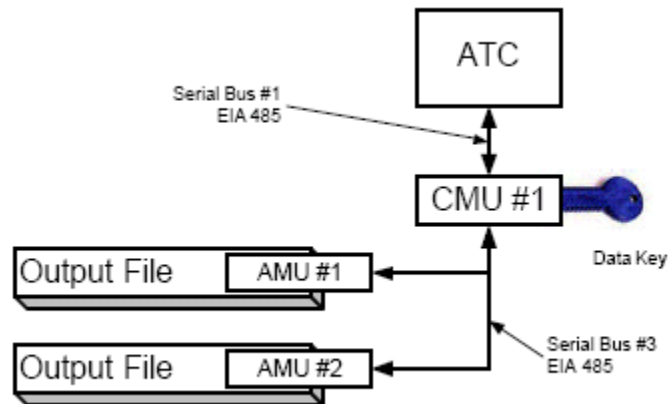


Figure 1

### 1.2 CHANNEL CONFIGURATION

The AMU-214 can be configured to monitor up to 14 physical load switch channels of three inputs per channel. Each input is monitored for true RMS voltage and each channel is monitored for total channel true RMS load current. Depending on the address mode selected, the AMU-214 will operate as a six channel unit or a fourteen channel unit.

### 1.3 AMU-214 ADDRESSING

The Address Select input pins ADDRESS 0, ADDRESS 1, and ADDRESS 2, define the Serial Bus #3 address of the AMU-214 and the number of channels reported. The pins are left open for a logical False, and are connected to ADDRESS COMMON for a logical True.

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Mode	Assembly	ADDRESS 2	ADDRESS 1	ADDRESS 0	SB #3 Address
14 Ch	1 and 2	False	False	True	0x01
14 Ch	3 and 4	False	True	True	0x03
6 Ch	1	True**	False	True	0x05
6 Ch	2	True**	True	False	0x06
6 Ch	3	True**	True	True	0x07
6 Ch	4	True**	False	False	0x04

A 14 Pack assembly configured in position 1 and 2 responds as AMU #1 with AMU #2 reserved. A 14 Pack assembly configured in position 3 and 4 responds as AMU #3 with AMU #4 reserved.

\*\*Note: The 6 Pack Output Assembly will have ADDRESS 2 permanently connected to ADDRESS COMMON in the Output Assembly.

**- NOTE -**

The RESET button of the AMU-214 must be pressed following any change in the AMU-214 Serial Bus #3 Address Inputs. The AMU-214 will only recognize a new address following a RESET or Power-up cycle.

**- WARNING -**

The ATC must verify that all Output Assemblies being driven by a Serial Interface Unit (SIU) are being monitored by an AMU-214, and that each AMU-214 is enabled by the programming in the CMU-212. Failure to provide this check may result in unmonitored load switch outputs. This could occur as a result of improper configuration of the cabinet, improper address assignment for one or more AMU-214 units, improper address assignment for one or more SIU units, or improper programming of the ATC.

## Section 2 AMU-214 FUNCTIONS

### 2.1 AC VOLTAGE SENSING

All AC RMS voltage measurements are made over an RMS period of 33.3 milliseconds (two AC Line cycles). A True RMS voltage measurement is made regardless of phase or wave-shape, including both positive and negative half wave sinusoids, over the voltage range of 0 to 135 Vrms.

#### 2.1.1 Field Signal Sensing

Three inputs are provided for each of fourteen channels (52 total) to permit the monitoring of voltages at the Green, Yellow, and Red signal field terminals. The AMU-214 is designed such that unused Green, Yellow, or Red signal inputs are sensed as non-active signals (<15 Vrms).

#### 2.1.2 AC Line Sensing

The AMU-214 includes the capability of monitoring the AC Line voltage applied to its AC+ RAW input.

#### 2.1.3 Flasher Input Sensing

Four inputs are provided for sensing of voltages at the FLASHER #1-1, FLASHER #1-2, FLASHER #2-1, FLASHER #2-2 signal input terminals of the Output Assembly.

NOTE: The cabinet Power Distribution Unit (PDA) should supply load capacitors of at least 1 uF on each Flasher output.

### 2.2 AC CURRENT SENSING

All AC RMS current measurements are made over a period of two AC Line cycles (33.3 milliseconds). A True RMS current measurement is made regardless of phase or wave-shape, including both positive and negative half wave sinusoids.

#### 2.2.1 Load Switch Current Sensing

The AMU senses the total output load current of each load switch. The input impedance of the COIL+ input with respect to the COIL- input is 1000 ohms. Full scale current is set by the number of primary turns through the transformer and can be a maximum of four turns. The number of turns actually provided in the Output Assembly must be programmed into the CMU-212.

#### 2.2.2 Current Transformer Parameters

The load switch current sensing transformers shall meet the following requirements:

Accuracy                                    +/-25% ( $R_{in} = 1000$  ohms)  
Primary Current                            10 Amp maximum

The transformer shall output a voltage of 1.0 Vrms (+/- 5%) across 1K ohms when driven by 1.0 Arms sinusoidal current through one primary turn. Sufficient secondary turns shall be provided to compensate for differences in core material and losses to produce the 1.0 Vrms output.

### 2.3 +24VDC MONITOR SENSING

The AMU senses the state of the +24VDC MONITOR input. Voltages at or greater than +22 Vdc are considered proper for Assembly operation. Voltages at or less than +18 Vdc are considered improper for Assembly operation. The +24VDC MONITOR circuitry is electrically isolated from the AC- RAW referenced circuitry.

## **2.4 DIAGNOSTIC ERROR**

The AMU-214 is provided with a resident series of self-check diagnostic capabilities. When a Diagnostic Error is detected the AMU-214 will illuminate the DIAGNOSTIC indicator on the front panel and stop responding to Serial Bus #3 command frames. This indicates a failure of the AMU-214 hardware or firmware and the unit should be removed from service for maintenance.

## **2.5 SERIAL BUS #3**

### **2.5.1 Electrical**

The Tx Data+, Tx Data- and Rx Data+, Rx Data- circuit pairs consist of two interface links conforming to the requirements of the Electronic Industries Association EIA-485, Standard for Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multipoint Systems, dated April 1983.

All voltage potentials on the Tx Data+, Tx Data-, Rx Data+, and Rx Data- interface links are referenced to AC- RAW (Neutral). If provided, shields shall be terminated to Equipment Ground.

### **2.5.2 Frame Types**

The AMU-214 is configured to respond to frame Types 1 and 2. For details on frame definitions and protocol, refer to the documents referenced in Section 1.1

## Section 3 FRONT PANEL DESCRIPTION

### 3.1 INDICATORS

#### 3.1.1 Power Indicator

A green POWER indicator will illuminate to indicate AC+ RAW voltage is proper. It will remain Off when the AC+ RAW voltage is less than 80 Vrms.

#### 3.1.2 Diagnostic Indicator

A red DIAGNOSTIC indicator will illuminate when the AMU-214 has detected an internal Diagnostic fault. This indicates a failure of the AMU-214 hardware or firmware and the unit should be removed from service for maintenance. See Section 2.42.4.

#### 3.1.3 SB #3 RxD Indicator

A yellow SB #3 RxD indicator will pulse On each time the AMU-214 correctly receives a frame on Serial Bus #3. See Section 2.5

### 3.2 RESET BUTTON

Depressing the RESET button resets the AMU-214. When the RESET button is depressed all front panel indicators will be illuminated for 300 milliseconds. Continuously depressing the Reset button will not affect AMU-214 operation.

#### 3.2.1 SB #3 Address Assignment Report

The AMU-214 will report its current Serial Bus #3 address using the SB #3 RxD indicator. When the RESET button is held depressed, the AMU-214 will pulse the SB #3 RxD indicator for a count sequence equal to the address assignment. See Section 1.3. This count sequence will repeat as long as the RESET button is held depressed. The AMU-214 will continue to operate normally in this mode.

Serial Bus #3 is used to transfer data from a maximum of four AMU-214 units to the CMU-212. The CMU-212 will poll each enabled AMU-214 for its voltage and load current data. The CMU-212 then maps the retrieved data to the proper logical input and channel.

## Section 4 SPECIFICATIONS

### 4.1 ELECTRICAL

#### Power Requirements

Operating Line Voltage .....	75 to 135 Vac
Operating Line Frequency .....	60 ± 3 Hz
Power Consumption .....	10 Watt Maximum

#### AC Voltage Monitors

Field Signal Inputs .....	135 Vrms Maximum
Flasher Signal Inputs .....	135 Vrms Maximum
AC Line Input .....	135 Vrms Maximum
Accuracy .....	± 2 Vrms

#### +24VDC Monitor

Fault .....	less than 18Vdc
No Fault .....	greater than 22Vdc

#### Logic Inputs

Address 0, Address 1, Address 2 (Reference Address Common)

Not Active (False) .....	greater than 16 Vdc
Active (True) .....	less than 8 Vdc

#### AC Current Monitors

Field Signal Inputs .....	10 Vrms Maximum
Input Impedance .....	1000 ohms ± 5%
Accuracy (excluding transformer conversion accuracy) .....	± 10%

### 4.2 MECHANICAL

Height .....	4.500 inches
Width .....	2.340 inches
Depth (front panel to rear edge of DIN connector) .....	6.868 inches

### 4.3 ENVIRONMENTAL

Storage Temperature Range .....	-45 to +85 °C
Operating Temperature Range .....	-34 to +74 °C
Humidity (non-condensing) .....	0 to 95% Relative

## Section 5 CONNECTOR ASSIGNMENTS

### 5.1 MAIN DIN CONNECTOR

The AMU-214 main connector is a three row DIN 4161296 Header Type. Pins A31 (Equipment Ground), B32 (AC-RAW), and C32 (AC-RAW) pre-mate before all other pins:

Pin #	Description	Pin #	Description	Pin #	Description
A1	Logic Ground	B1	+24 VDC Monitor	C1	Address Common
A2	SB3 Clock+	B2	SB3 TxData -	C2	SB3 TxData+
A3	SB3 Clock-	B3	SB3 RxData -	C3	SB3 RxData+
A4	Address 0	B4	Address 1	C4	Address 2
A5	LS3 Coil +	B5	LS2 Coil +	C5	LS1 Coil +
A6	LS3 Coil -	B6	LS2 Coil -	C6	LS1 Coil -
A7	LS6 Coil +	B7	LS5 Coil +	C7	LS4 Coil +
A8	LS6 Coil -	B8	LS5 Coil -	C8	LS4 Coil -
A9	LS9 Coil +	B9	LS8 Coil +	C9	LS7 Coil +
A10	LS9 Coil -	B10	LS8 Coil -	C10	LS7 Coil -
A11	LS12 Coil +	B11	LS11 Coil +	C11	LS10 Coil +
A12	LS12 Coil -	B12	LS11 Coil -	C12	LS10 Coil -
A13	LS14 Coil +	B13	LS13 Coil -	C13	LS13 Coil +
A14	LS14 Coil -	B14	FL2 - 1	C14	FL1 - 1
A15	Reserved	B15	FL2 - 2	C15	FL1 - 2
A16	Channel 1 Green	B16	Channel 1 Yellow	C16	Channel 1 Red
A17	Channel 2 Green	B17	Channel 2 Yellow	C17	Channel 2 Red
A18	Channel 3 Green	B18	Channel 3 Yellow	C18	Channel 3 Red
A19	Channel 4 Green	B19	Channel 4 Yellow	C19	Channel 4 Red
A20	Channel 5 Green	B20	Channel 5 Yellow	C20	Channel 5 Red
A21	Channel 6 Green	B21	Channel 6 Yellow	C21	Channel 6 Red
A22	Channel 7 Green	B22	Channel 7 Yellow	C22	Channel 7 Red
A23	Channel 8 Green	B23	Channel 8 Yellow	C23	Channel 8 Red
A24	Channel 9 Green	B24	Channel 9 Yellow	C24	Channel 9 Red
A25	Channel 10 Green	B25	Channel 10 Yellow	C25	Channel 10 Red
A26	Channel 11 Green	B26	Channel 11 Yellow	C26	Channel 11 Red
A27	Channel 12 Green	B27	Channel 12 Yellow	C27	Channel 12 Red
A28	Channel 13 Green	B28	Channel 13 Yellow	C28	Channel 13 Red
A29	Channel 14 Green	B29	Channel 14 Yellow	C29	Channel 14 Red
A30	Reserved	B30	AC+ RAW	C30	AC+ RAW
A31	Equipment Ground	B31	Reserved	C31	Reserved
A32	Reserved	B32	AC- RAW	C32	AC- RAW