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Section 1

INTRODUCTION

1.0 General – The Assemblies Electronic Monitor (AEM), Figure 1.1, is a microprocessor-based, self-contained, door-mounted device designed to monitor and display parameters of up to forty breakers equipped with Digitrip RMS 700 or Digitrip RMS 800 Trip Units. (For information on the trip units see I.L.'s 29-853 and 29-854 respectively.) The two-way communication between the trip units and the AEM utilizes integral INCOM chips and is accomplished using a single twisted pair of conductors.

The parameters it displays are:

- Breaker Status
- AC Current (each phase and ground, if the trip unit has a ground element)
- Cause of Breaker Trip
- Breaker Address
- High Load Condition

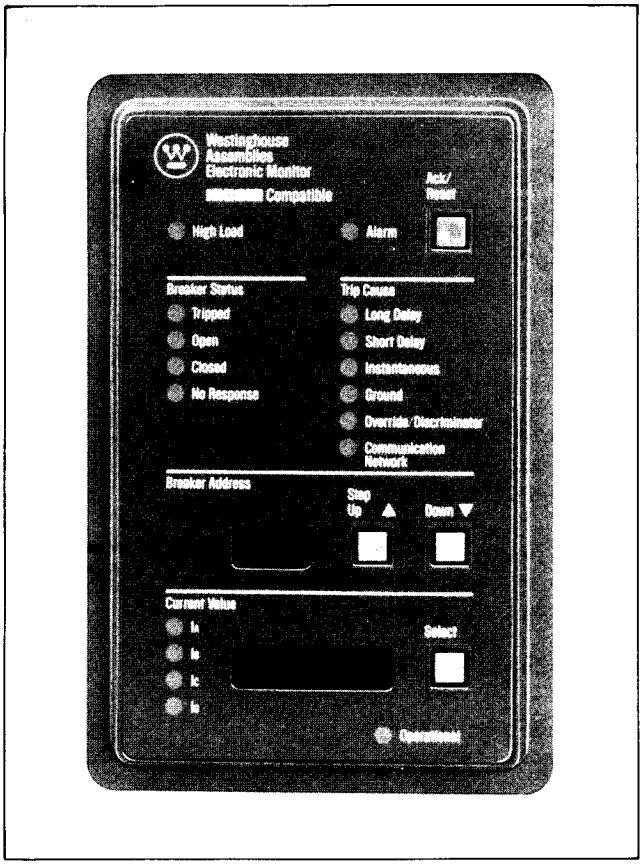

Figure 1.1 Assemblies Electronic Monitor

A listing of the displayed parameters appears on the unit's faceplate, as shown in Figure 1.1. When used with the remote communication option, the AEM will also pass through data to a computer from IQ Data Plus metering and protection units equipped with the communication module option. (See TD 17195 for information on the IQ Data Plus.)

The program directing the functions of the AEM is permanently stored in the AEM; there is no need to reload after an AC power loss.

The unit's functions are pre-programmed in the form of software supplied as standard and are resident in the AEM microprocessor.

The number and types of devices stored in memory during the learn mode is also retained throughout a power loss. Unless there has been a change, it is not necessary to re-enter the learn mode after a power loss.

The operator panel (Figure 1.1), which makes up the unit's front face, supports a Current Value window, which visually indicates the actual value of the current being displayed, and a Breaker Address window to show the identification of the breaker being monitored. The operator panel also contains Breaker Status LEDs, Trip Cause LEDs, Alarm LEDs and four pushbuttons. The Breaker Status LEDs indicate the status of the breaker whose address appears in the Breaker Address window. If a breaker trips, the Trip Cause LED will indicate the reason for the trip, and the address of the tripped breaker will appear in the Breaker Address window. In addition, the value of the current causing the trip will appear in the Current Value window with the faulted phase(s) or ground LED lit.

The unit's primary function is to monitor and display at a common location the load currents, status, and cause of trip, if any, of all the breakers in an assembly. A total of forty breakers may be monitored on one AEM.

The unit's secondary functions are to:

1. Enable internal high load and trip alarm relays. Contacts from these relays may be used to sound a remote alarm.

2. Provide for optional remote communications.

The AEM is a single-model product with remote communications as the only option. The remote communications option is accomplished with an additional communication module which may be added at any time. No change in software is required.

1.1 Features and Options – A list of features and benefits is given in Table 1.A. Since the AEM is a standardized package, only one option of remote communications is available. This remote communications option is accomplished with any one of several additional external components available from Westinghouse, such as the Time Stamp Filter (TSF) or the variety of Product Operated Network Interface (PONI) modules. Therefore, the remote communications option can be added at any time. The remote communications option enables the AEM to carry on external data exchange with a host computer. Electrical operating data supplied over a two-wire communication link will support plant energy management systems.

1.2 Required External Hardware – A 120 volt AC 50/60 Hz. supply is required for power to the AEM. A communication module that mounts on the rear of the AEM is required for the remote communication option.

1.3 Use of Manual – This manual is designed for use during installation, trouble-shooting and, if necessary, unit replacement. It also has information of specific importance for the user's application engineer who is planning the overall system.

The manual is broad enough in scope to form the basis of new employee familiarization, refresher training sessions, and on-going maintenance.

It is strongly advised that the application engineer carefully read Sections 2 thru 5 before producing the application's wire plan drawings. Installation teams should carefully read all of Section 5 BEFORE starting final installation. Maintenance personnel should be familiar with Section 6 before attempting to service the AEM.

1.4 Level of Repair – This manual is written with the assumption that only unit-level trouble-shooting will be performed. If the cause of the malfunction is traced to an AEM, the unit should be replaced with a spare. The malfunctioning unit should then be returned to Westinghouse for factory repairs.

Table 1.A

AEM FEATURES AND BENEFITS

Features	Benefits
• Microprocessor-based control	• Reliable service
• Non-volatile Memory	• No lost programs or special back-up batteries
• Simplified Operator Panel	• No elaborate, complex keyboard or confusing, multi-function readings
• Ease of Startup	• Quick assembly and installation • No programming of devices required. • Self-learning system.
• Separate High Load and Trip Alarm Relay Contacts	• Allow control of external devices
• Minimum Wiring	• Only one two-wire twisted pair daisy chained from breakers to AEM and two wires for 120 vac supply
• Reduced Number of Devices	• Ammeters and switches with attendant current transformers for each circuit breaker not required
• Centralized Monitoring	• Minimizes chances for errors
• Ease of adding remote communication	• No re-programming • Retrofit at anytime

Section 2

HARDWARE DESCRIPTION

2.0 General – The purpose of this section is to familiarize the reader with the AEM hardware, its nomenclature, and to list the specifications of the unit.

2.1 Hardware Description – The AEM is designed to be mounted through a cutout in a panel. (This will generally be a cabinet's face or door.) Dimensions of the AEM are shown in Figure 2.1.

The description is divided into the following:

- Operator Panel (Paragraph 2.1.1)
- Rear access area (Paragraph 2.1.2)
- External hardware (Paragraph 2.1.3)

2.1.1 Operator Panel – The Operator Panel (See Figure 1.1), which is normally accessible from the outside of the panel or door, provides a means to:

- Determine which breaker is being monitored.
- Monitor the actual current values on the Display Window.
- Determine which current value is being displayed by means of an illuminated LED located at the left of the Display Window.
- Select the current value to be displayed.
- Determine the status of a breaker.

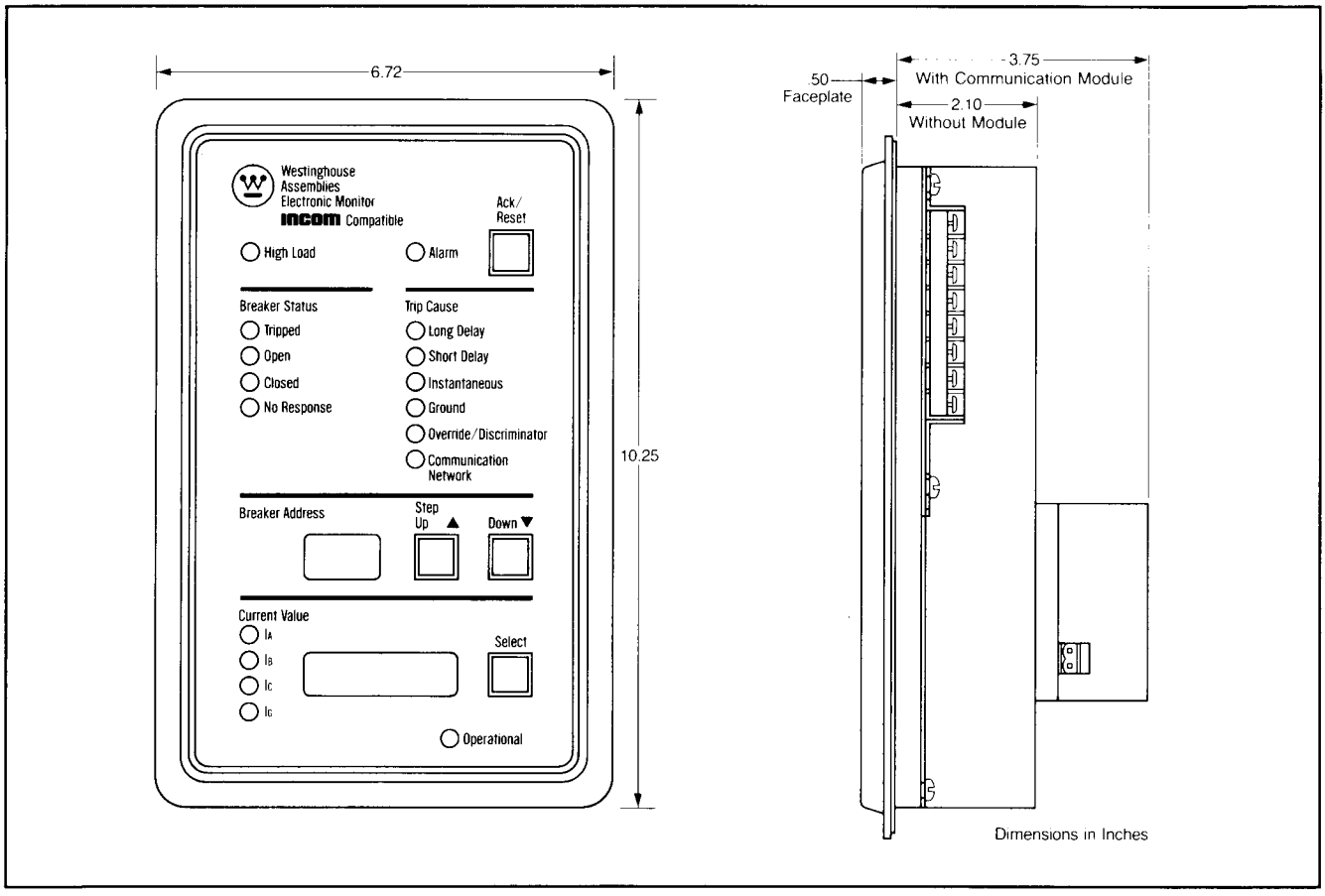

Figure 2.1 Dimensions

- Determine that a trip or alarm condition exists by means of two distinct LEDs.
- Acknowledge that a trip condition exists and silence a remote alarm by means of the Ack/Reset pushbutton.
- Determine the cause of a trip by means of distinct LEDs.
- Determine the value of current causing the trip condition.
- Attempt to reset the AEM after a trip condition has occurred by means of the Ack/Reset pushbutton.

The use of the Operator Panel is detailed in Section 4.

2.1.2 Rear Access Area – The rear of the AEM is normally accessible from the rear of the panel door. All wiring connections to the AEM are made at the chassis' rear.

Study Figure 2.2 and note the following items:

1. The 120 volt AC input connect to the Alarm Terminal Block at the top left of the AEM.
2. Connections with controlled external devices, if used, are made at the Alarm Terminal Block. Alarm relays energize on Trip or High Load conditions. Terminal Block Label shows contacts in De-energized position. (These connections may be made at the NO or NC pairs (Form C) associated with the internal Alarm Relays.)
3. A Mode Switch located on the rear right side of the chassis places the AEM in the "Learn Network" or "Operational" mode.
4. A two-connector port is located on the upper right of the chassis to connect to the AEM local network.
5. A Communication Port, located on the right center portion of the chassis, is designed to connect with the optional Communication Module for the remote communications option.

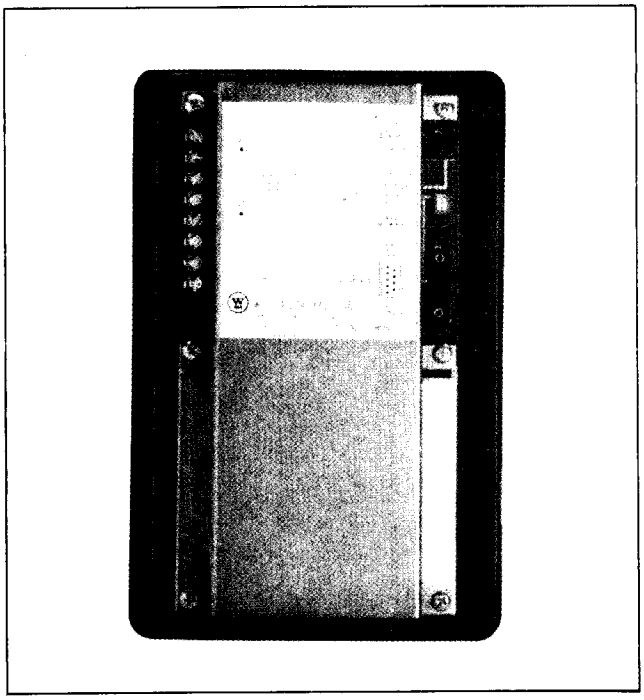

Figure 2.2 Rear Access Area

2.1.3 External Hardware – Each AEM requires that a customer supplied 120 volt AC 50/60 Hz supply be wired into the 8 point Terminal Block located at the upper left rear of the AEM (See Figs. 2.2 and 5.2).

2.2 Specifications – The specifications of the AEM are contained in Table 2.A.

Table 2.A

GENERAL SPECIFICATIONS

Device's Power Requirement
10 VA Maximum

Frequency
50/60 Hz

Line Characteristics
120 Volts AC + 10%, −20%

Operating Temperature
0° to 70°C
(32° to 158°F)

Storage Temperature
−20° to 85°C
(−4° to 185°F)

Humidity
0 to 95% R.H.
noncondensing

Alarm Contact Ratings
10 amperes @ 240 VAC (Resistive)
10 amperes @ 30 VDC (Resistive)

Section 3

OPERATION

3.0 Introduction – This section describes the operation of the AEM.

3.1 Power-Up – On power-up (initial application of 120 volts AC to the AEM), the microcontroller will do an internal RAM check and then a check of the non-volatile RAM. If these two tests are passed, the microcontroller will initialize the displays to the breaker address of the first Digitrip RMS Trip Unit on the AEM local network. The phase A current value of that unit will also be displayed.

At this point, the microcontroller will go into its normal mode of requesting status and buffer data information from Digitrip RMS trip units and IQ Data Pluses, whose addresses were previously stored in the AEM's memory. The breaker address "Step Up/Down" and current value "Select" pushbuttons are all active at this time.

If a bad internal RAM check is encountered, **all** the seven segment displays will alternate at once a second between zeros and all blanks. All the LEDs will be off and all the pushbuttons will be inactive. The Mode Switch on the rear of AEM will also be inactive, and therefore, no "Learn Network" operations are obtainable. The AEM should be disconnected and replaced.

If an incorrect non-volatile RAM check-sum is found, the microcontroller will initiate a learn mode operation automatically without any input from the Mode Switch on the rear of the AEM to reinitialize the system addresses. If a proper check-sum cannot be written to the non-volatile RAM at the end of this learn mode operation, the AEM will react the same as it does for a bad internal RAM check in the previous paragraph.

3.2 Learn Mode – When the Mode Switch on the back of the AEM is placed in the "Learn Network" position (See Figure 2.2), the microcontroller will initiate a learn mode. A learn mode condition is where all addresses between 001 and 048 connected to the AEM local network will be polled automatically to learn which addresses are on the local network.

If a Digitrip RMS trip unit* or IQ Data Plus* exists at any of the valid addresses (001 through 048), it will be logged and stored in the non-volatile portion of the AEM memory. There is a maximum of 40 Digitrip trip units and 8 IQ Data Pluses that can be logged by the AEM.

During the learn mode, all the LEDs except the "No Response" and "Operational" LEDs will be on. Note that the "Operational" LED will flash only while the AEM is polling the network. This is done to:

1. Check that the LEDs are operational.

2. Show that the unit is in the learn mode.

The "Current Value" display will be blank and the "Breaker Address" display will cycle through the addresses found during the polling operation from lowest address to highest with the highest address found being displayed when the polling is completed. The cycle rate is 3 seconds per address. It is recommended that the addresses being learned by the AEM be noted by the operator to determine that all desired devices on the AEM local network are logged into the AEM memory. This is especially important when the communications option is used and the network contains IQ Data Pluses since the address of an IQ Data Plus is displayed on the AEM only during this time. The "Operational" LED will continually flash until all 48 addresses have been polled and then will turn off.

As soon as the AEM enters the learn mode, the Mode Switch could be put back into the "Operational" position. Polling of the network will continue until completed.

When the learn mode ends (i.e., all 48 addresses have been polled), the AEM will check the position of the Mode Switch. If the switch is in the "Learn Network" position, the breaker address display will stay locked with the last unit found. If no units were found, the display will stay blank.

If there were no units found and the Mode Switch is put back in the "Operational" position, the two breaker address seven segment displays will alternate between zero and blanks once each second. The "No Response" LED will also be on. All of the pushbuttons will be inactive, although the Mode Switch is active and will allow the AEM to re-enter the learn mode again if so desired.

If units were found and the Mode Switch is in the "Operational" position, the AEM will display the first Digitrip RMS trip unit that was found and that unit's phase A current value.

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* Note that these devices must contain an INCOM chip which is inherent in the Digitrip RMS 700 and 800 trip units and contained in the optional Communication Module available with the IQ Data Plus.

NOTE: Since the AEM identifies the software version of an IQ Data Plus only in the "Learn Mode", it is necessary to place the AEM in the "Learn Mode" whenever an IQ Data Plus is replaced on the AEM local network. This is not necessary when Digitrip RMS trip units are replaced, since their software version is identified by the AEM during the "Operational Mode".

3.3 High Load – When a Digitrip RMS trip unit is in a high load condition (current through the breaker equal to or greater than 85% of the trip unit's Long Delay Setting for approximately 40 seconds), the high load relay will pick-up. If the AEM is monitoring a breaker other than one with a high load, the display will remain on that breaker address and not change to the breaker address that has the high load condition. The "High Load" LED will turn on only when the address of the breaker with the high load condition is being displayed.

For the high load relay operation, the AEM identifies the first unit to go into the high load condition. If the identified unit drops back out of the high load condition, the high load relay will drop-out. If another unit is also in a high load condition, it then becomes the identified unit and the high load relay will pick-up again.

3.4 Trip – When a Digitrip RMS Trip Unit is in a Tripped condition, the AEM will log the address and the buffer data from that unit. The AEM will log up to three tripped Digitrip RMS trip units. The alarm relay will pick-up at this time, and the "Alarm" LED will flash on and off at one second intervals. The AEM will blank the display briefly as the latest trip buffer data is being read from the tripped unit(s). The display will show:

1. Flashing "Alarm" LED.
2. "Tripped" LED on under Breaker Status.
3. An LED on under Trip Cause to show what caused the trip.
4. Address of the tripped breaker.
5. Value of current at the time of trip.

The only pushbutton that is active is the "Ack/Reset" pushbutton. The Mode Switch will also be active so that the AEM can enter the learn mode at any time.

If a second and/or third Digitrip RMS trip unit trips during the alarm mode, their breaker buffer data will also be logged and the display will alternate once every four seconds between the tripped units, displaying their cause of trip and the current at the time of trip.

At this moment, the AEM is waiting for an acknowledgment from the operator. All the causes of trip and the current magnitudes are stored in the non-volatile RAM memory and are not updated until the AEM is reset. Even if the Digitrip RMS trip units are reset, the AEM will continue to display the tripped parameters at the time of the trip unless the "Ack/Reset" pushbutton is depressed twice - once to acknowledge and once to reset.

3.4.1 Trip Acknowledge – To acknowledge the trip condition, the operator must press the "Ack/Reset" pushbutton. The AEM will then drop-out the alarm relay and display the tripped unit being displayed at the time of acknowledgment, and that unit's phase A current magnitude at the time of trip. After acknowledgment, the "Alarm" LED is on steady and the "Step Up/Down" and "Select" pushbuttons are active. The operator is now able to step between all units in the same manner as if there was no tripped breaker. The "Alarm" LED remains on even when the address of a non-tripped breaker is in the Breaker Address display window. This indicates that there is a tripped breaker logged in the AEM. The "Alarm" LED goes out only when all tripped breakers have been cleared from the AEM. When the Breaker Address is stepped to the address of a tripped breaker, the AEM will display the logged tripped parameters at the time of trip. These logged tripped parameters remain in the AEM until the Digitrip RMS Trip Unit **and** the AEM have been reset (see Paragraph 3.4.2). Unless the Digitrip RMS Trip Unit has been reset, any further pressing of the "Ack/Reset" pushbutton will have no effect.

After an alarm has been acknowledged, a subsequent alarm will return the AEM to the alarm mode (alarm relay energized, Alarm LED flashing, alarmed units cycling on the display) unless it already has three logged units.

3.4.2 Trip Reset – The operator **must** reset the tripped Digitrip RMS trip unit before its logged data can be purged from the AEM. Clearing the logged data for an address is accomplished by pressing the "Ack/Reset" pushbutton while the desired address is displayed in the breaker address display window and the Alarm LED is on and not flashing. The AEM will then display the present status of the unit whose logged data was purged. If the Digitrip RMS trip unit has not been reset, then the AEM will not clear that unit, and the display for that unit will remain on the logged data. If the unit clears and there is no other tripped unit, the "Alarm" LED will go off. The "Ack/Reset" pushbutton provides no action during the normal operational mode.

It is possible to open a breaker through the AEM from a remote computer when the remote communication option is used. Opening of a breaker by this means is considered a normal operation. However, the Breaker Status "Tripped" and Trip Cause "Communication Network" LED's will turn on. The AEM will not go into the trip mode of operation described previously in this section.

Section 4

OPERATOR PANEL

4.0 Introduction – This section describes the operator panel of the AEM. The operation of the AEM as described in Section 3 should be read and understood before reading this section. This section is divided into the following three sub-sections:

- Pushbuttons (Paragraph 4.1)
- LEDs (Paragraph 4.2)
- Display Windows (Paragraph 4.3)

4.1 Pushbuttons – The Operator Panel supports four pushbuttons (See Figure 4.1). The pushbuttons perform the following functions:

NOTE

THE FUNCTION OF THE PUSHBUTTON IS ACCOMPLISHED WHEN THE PUSHBUTTON IS RELEASED AFTER IT HAS BEEN DEPRESSED.

- Ack/Reset

1. Following a tripped condition (except for "Communication Network" trip) the Alarm LED flashes and the alarm relay is energized. Depressing this pushbutton will acknowledge the alarm and:

   a. Change the alarm LED from flashing to steady on
   b. De-energize the alarm relay

2. After acknowledging the alarm (1. above) **and** resetting the Digitrip RMS trip unit, depressing the pushbutton will reset the AEM, which:

   a. Turns off the alarm LED
   b. Removes the tripped breaker's logged data from the AEM's memory.
   c. Displays present status and values for the reset breaker.

- Step Up/Down

These pushbuttons are used to step through the breaker addresses that are stored in the AEM's non-volatile memory. The Step Up/Down pushbuttons raise/lower breaker addresses accordingly. Each time one of these pushbuttons is pressed, the breaker address in the display window will change. The addresses are in a loop to go back and forth from the highest and lowest addresses. For example, if breaker address 30 is the highest address in the memory and is being displayed, pressing the Step Up pushbutton will change the display to 01 (assuming there is an address 01).

- Select

Pressing this pushbutton will step through the four currents (I_A, I_B, I_C, I_G) listed under current value on the AEM faceplate. Each time the pushbutton is pressed, the LED at the left of the newly selected current is illuminated. The current that is illuminated will be the one that is being displayed in the display window. Note that I_G current will be displayed in the display window only if the Digitrip RMS Trip Unit is a model containing ground protection.

4.2 LEDs – The Operator Panel LEDs are divided into five types:

4.2.1 Alarm LEDs

- High Load

When the current flowing through a displayed breaker is equal to or greater than 85% of the long delay setting on the Digitrip RMS trip units for approximately forty seconds or more, this LED will be illuminated.

- Alarm

This LED will be illuminated whenever:

a) A breaker is tripped by any of the listed causes under Trip Cause except for a "Communication Network" trip.

b) There is no response from a logged breaker address.

c) There is a tripped breaker logged in the AEM.

When this LED is flashing, it indicates that the "Ack/Reset" pushbutton has not been depressed to acknowledge the alarm (see Paragraph 3.4.1).

4.2.2 Breaker Status LEDs

- Tripped – indicates that breaker was tripped by one of the causes listed under Trip Causes. When this LED is illuminated, the alarm LED (not for "Communication Network" trip (see Paragraph 4.2.1) and one of the trip cause LEDs will also be illuminated. Note that when this LED is illuminated, except for "Communication Network" trip, it requires that the Digitrip RMS trip unit be reset before this LED can be turned off. Following a "Communications Network" trip, this LED will turn off if the breaker is reclosed from the remote computer via the communications network or the Digitrip RMS trip unit is reset.

- Open – indicates breaker is in the open position by virtue of normal operator action. Note that opening the breaker through the communication network is considered a trip of the breaker and not a normal operator action. Note also that when the Digitrip RMS Trip Unit **and** AEM are reset following a trip operation and the breaker is open, this LED will be on.

- Closed – indicates breaker is in the closed position.

- No Response – indicates that a Digitrip RMS trip unit address that has been logged and stored in the AEM non-volatile memory has not responded to the AEM request for data. See Section 6.1 for possible causes for this response.

4.2.3 Trip Cause LEDs

- Long Delay – Trip action initiated as a result of an overload. Clear overload, reset trip unit and AEM and reclose breaker per customer's operating procedure.

- Short Delay – Trip action initiated as a result of fault exceeding trip setting. Examine breaker to insure reclosing action is appropriate. Reset trip unit and AEM and reclose breaker only after reason for trip has been cleared.

- Instantaneous – Trip action initiated as a result of fault exceeding trip setting. Examine breaker to insure reclosing action is appropriate. Reset trip unit and AEM and reclose breaker only after reason for trip has been cleared.

- Ground – Trip action initiated as a result of ground fault exceeding trip setting. Examine breaker to insure reclosing action is appropriate. Reset trip unit and AEM and reclose breaker only after reason for trip has been cleared.

- Override/Discriminator – Trip action initiated by override circuit indicative of a high level fault or the Discriminator circuit – most likely on initial breaker closing action. Examine breaker to insure reclosing action is appropriate. Reset trip unit and AEM and reclose breaker only after reason for trip has been cleared.

- Communication Network – Trip action initiated by a command from a remote computer. This is available only with the remote communications option. This is the only "Trip Cause" that does not place the AEM in the Alarm mode. The breaker can be reclosed by a command from the remote computer. To reclose the breaker from other than the remote computer, the Digitrip RMS Trip Unit on the breaker must first be reset or the breaker will be "trip free".

4.2.4 Current Value LEDs – Indicates the current value (I_A, I_B, I_C, I_G) being displayed in the display window. Note that I_G) will be displayed only when the Digitrip RMS Trip Unit is a model containing ground protection.

4.2.5 Operational LED – This LED flashes to indicate that the AEM is polling the network.

4.3 Display Windows

4.3.1 Breaker Address – The two-digit LED display window displays the address of the breaker being displayed on the AEM faceplate. When the Mode Switch is in the "Learn Network" position, the addresses of the devices found on the AEM local network cycle in the display window (see Section 3.2).

4.3.2 Current Value – The five-digit LED display window displays the current value identified by the illuminated LED to its left of the breaker whose address appears in the breaker address window.

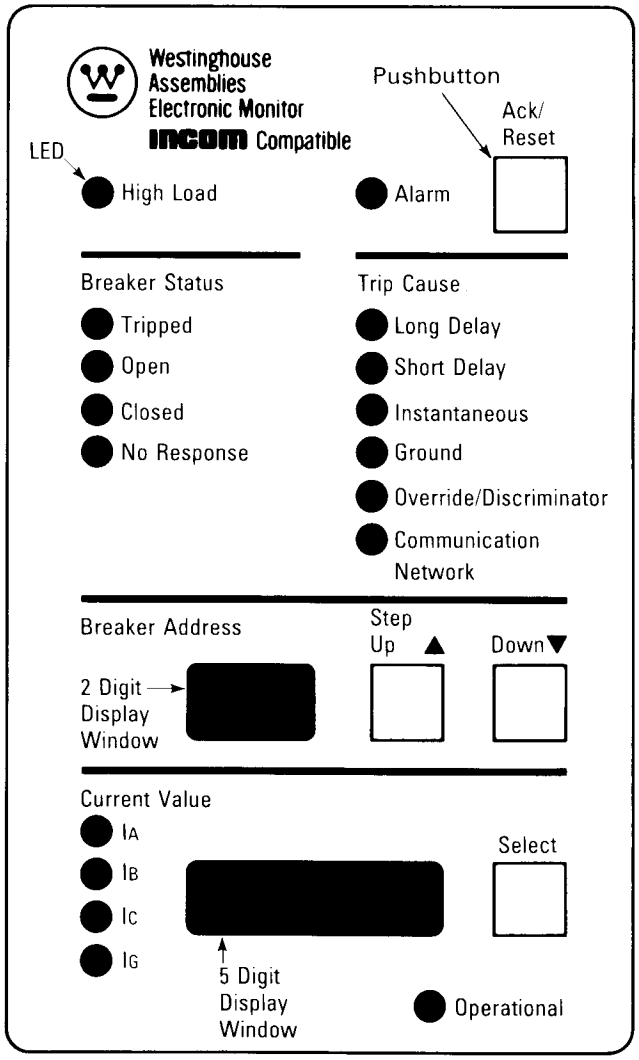

Figure 4.1 Operator Panel

Section 5

INSTALLATION AND STARTUP

5.0 Introduction – This section describes the following items associated with the installation and startup of the AEM:

- Mounting (Paragraph 5.1)
- Wiring (Paragraph 5.2)
- Initial startup (Paragraph 5.3)

Earlier sections, especially Section 2, Hardware Description, should be read by anyone using this section to install an AEM.

5.1 Panel Preparation – This paragraph describes the panel preparation and mounting of the AEM.

5.1.1 Cutout, Clearances – Since the AEM is typically mounted on a cabinet door, it is necessary to prepare a cutout in which it will be placed. The dimensions for this cutout, along with the location of six mounting holes, are shown in Figure 5.1. Before actually cutting the panel, be sure that the required 3-dimensional clearances for the AEM chassis allow mounting in the desired location. (Dimensions are shown in Figure 2.1.)

It is necessary to hold fairly close to tolerances when making the cutouts and placing the holes for the mounting screws. In particular, the horizontal dimensions between the center of the mounting holes and the cutout's vertical edge must be within 0 and +0.050 in. (0.13 cm).

5.1.2 Mounting – Do not use a tap on the face since this will remove excessive plastic from the holes, resulting in less threaded material to secure the AEM to its mounting panel.

Place the AEM through the cutout in the panel. Be sure the Operator Panel faces outward. Use 0.5 in. (1.2 cm) long screws (included with the AEM) to mount the unit on a single-thickness panel. Be sure to start the screws from INSIDE the panel so that they go through the metal first.

5.2 Wiring – The wiring of the AEM must follow a suitable "wiring plan drawing". The term wiring plan, as used here, refers to the drawings made for the specific application. It describes all electrical connections between the AEM and external equipment. This drawing is made up by the user or OEM.

A typical wiring plan is shown in Figure 5.2. Note the following:

1. NO and NC contacts from the High Load and Alarm relays can be used to control external devices. These contacts are rated at 10 amperes for 115 VAC or 30 VDC.

2. The wires to the AEM 8 point Terminal Block must not be larger than AWG No. 14. Larger wire will not connect properly with the terminal block.

3. The terminal block has No. 6-32 sems pressure saddle screws.

All wiring must conform to applicable federal, state and local codes.

WARNING

INSURE THAT THE INCOMING AC POWER AND ALL "FOREIGN" POWER SOURCES ARE TURNED OFF AND LOCKED OUT BEFORE PERFORMING ANY WORK ON THE AEM OR ITS ASSOCIATED EQUIPMENT. FAILURE TO OBSERVE THIS PRACTICE CAN RESULT IN SERIOUS OR EVEN FATAL INJURY AND/ OR EQUIPMENT DAMAGE.

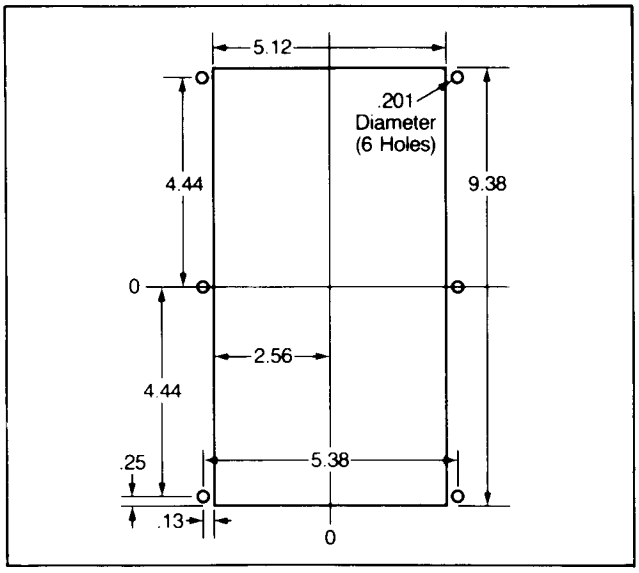

Figure 5.1 Chassis Cutout Dimensions
These dimensions must be −0 and +0.050 in.

5.3 Initial Startup – The information here is intended to be used when first applying AC power to the AEM.

5.3.1 Before Power Application

a. Verify that all wiring is correct, as shown on the wiring plan drawing.

b. When possible, disable the AEM until the rest of the equipment has been checked out.

c. Set the address of each Digitrip RMS trip unit per the instructions in Paragraph 5.4. It is recommended that the address assigned be marked on the front face of the Digitrip RMS trip unit in the space provided for this purpose.

d. If the remote communications option is utilized, set the address of each IQ Data Plus that is to feed into the remote communication network through the AEM.

Notes:

1. The AEM will communicate only with devices that have addresses 001 through 048. Therefore, use only these addresses.

2. Each AEM and the local devices that communicate with it are considered a local network. Do not use a duplicate address for any device connected to the same AEM.

5.3.2 Initial Power Application

a. Apply 120 VAC power to the AEM. (Refer to Paragraph 3.1 Power-up)

b. Make sure all the breakers that are to be in the AEM local network are in the connected position with their addresses set per Paragraph 5.4. Note that the AEM will poll and read addresses of draw-out circuit breakers that are in their "Test" position. To prevent this, the use of truck operated cell (TOC) switch contacts to open the communication wires is recommended.

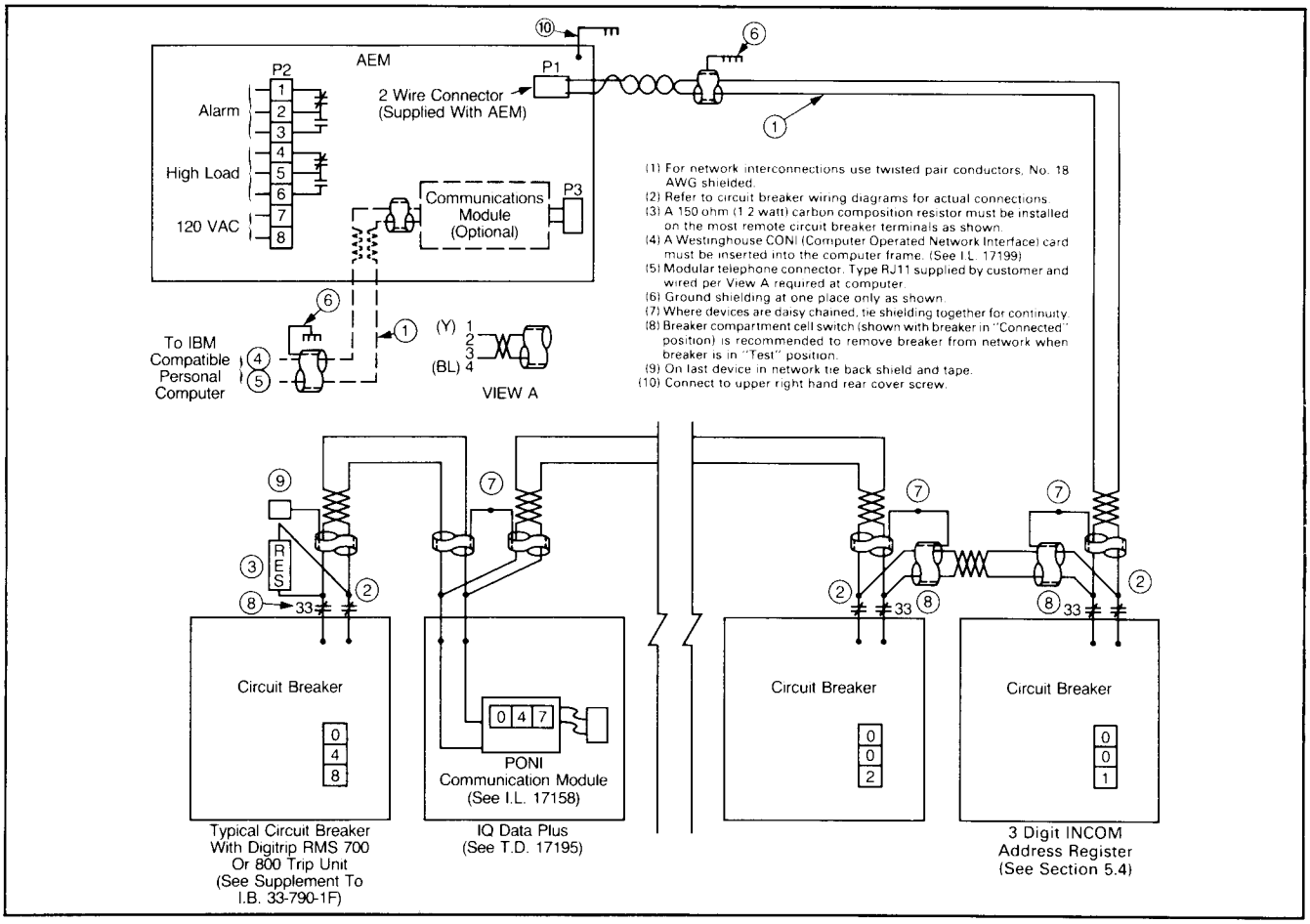

Figure 5.2 Typical Wiring Diagram

c. Set the Mode Switch on the rear of the AEM to "Learn Network" position. The AEM will log and store the addresses of each device in the AEM local network. See Paragraph 3.2 for details. Note that the AEM will poll and read addresses of drawout circuit breakers that are in their "Test" position. To prevent this, the use of truck operated cell (TOC) switch contacts to open the communications wire is recommended.

d. Set the Mode Switch on the rear of the AEM to the "Operational" position. The AEM local network is now operational.

Note: Any time a device is removed or added to the AEM local network, steps d. and e. must be repeated. If this is not done:

1. When a device is added, the AEM will not know it is there and will not communicate with it.

2. When a device is removed, the AEM will receive a "No Response" alarm for that device.

5.4 Address System – To enable the individual monitoring of multiple circuit breakers, each Digitrip RMS 700 and 800 trip unit is equipped with an adjustable address register. As shown in Figure 5.3, the three-digit INCOM address register is located at the right side of the rating plug cavity on the Digitrip RMS trip unit. It is accessible only when the rating plug is removed.

CAUTION

REMOVAL OF THE RATING PLUG WITH THE BREAKER CLOSED AND CONTROL POWER AVAILABLE WILL TRIP THE BREAKER.

Each of the three digits in the trip unit address is independently set by rotating the ten-position selector switch for each digit with a small screwdriver. As the selector switch is rotated, the address digit is displayed in the viewing window. Since the AEM will recognize only addresses 001 through 048, the top switch must be set on zero. Only adjustment of the lower two switches should be done.

As indicated in Figure 5.3, each trip unit is provided with a space on the front face for marking the selected INCOM address. To insure that the communication link is correct, reflecting the output of the correct circuit breaker position, a space is also available on the face of each trip unit to record the cell designation in which the circuit breaker is installed. It is recommended that these spaces be properly utilized.

NOTE

TO INSURE COMMUNICATIONS WITH THE PROPER CIRCUIT BREAKER, CARE MUST BE EXERCISED BY MAINTENANCE PERSONNEL TO REPLACE ANY CIRCUIT BREAKER THAT MAY HAVE BEEN REMOVED FROM THE CELL BACK INTO ITS PROPER CELL WHEN THE MAINTENANCE OPERATION IS COMPLETED.

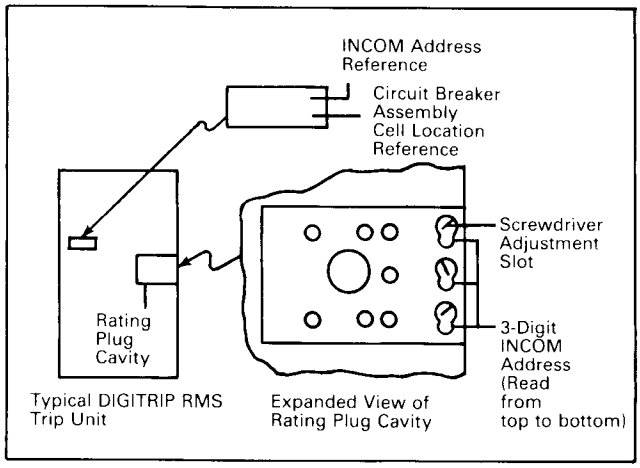

Figure 5.3 INCOM Address System

Section 6

MAINTENANCE

6.0 General – This section describes maintenance procedures for the AEM. The information contained here is divided as follows:

- Isolating a Malfunction (Paragraph 6.1)
- Replacing the AEM (Paragraph 6.2)

Earlier sections of this manual, especially Section 2 – Hardware Description, Section 3 – Operation, Section 4 – Operator Panel and Section 5 – Installation and Startup, should be read thoroughly to familiarize the maintenance personnel with the AEM.

6.1 Troubleshooting – This paragraph lists procedures to follow when the AEM is not operating properly. Table 6.A lists the probable causes and solutions for each of a number of symptoms.

CAUTION

ALL MAINTENANCE PROCEDURES MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE AEM AND ASSOCIATED DEVICES BEING MONITORED. FAILURE TO OBSERVE THIS CAUTION CAN RESULT IN EQUIPMENT DAMAGE.

Table 6.A

TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
All Operator Panel LEDs off	• 120 VAC Power Supply is deficient	• Locate cause of deficiency
	• AEM is malfunctioning	• Replace the unit (see paragraph 6.2)
All displays in Display Windows alternate between zeros and blank	• Defective RAM	• Replace the unit (see paragraph 6.2)
"No Response" LED on and Breaker Address display alternates between zero and blank	• Defective Communications • No devices on local network	• Verify Digitrip RMS trip unit and IQ Data Pluses on network are functional. • Verify devices on the AEM local network have valid address setting (addresses 001 through 048) • Verify continuity of twisted pair communication wire
	• AEM is malfunctioning	• Replace unit (see paragraph 6.2)
All Operator Panel LEDs on except for "No Response" and "Operational" LED	• Defective non-Volatile RAM • Mode Switch in "Learn Network" position	• Check position of Mode Switch. If switch is in "Operational" position, move it to "Learn Network" position and then back to "Operational" position. If LEDs do not go off, replace unit. If switch is in "Learn Network" position, move it to "Operational" position

Table 6.A (Contd.)

TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
With Mode Switch in "Learn Network" position, an LED other than "No Response" and "Operational" LEDs is off	Defective LED	• Replace the unit (see paragraph 6.2)
"Operational" LED off	• 120 VAC Power Supply is deficient	• Locate cause of deficiency
	• Defective LED	• Replace the unit (see paragraph 6.2)
	• Mode Switch in "Learn Network" position. (Other LEDs would be on)	• Move Mode Switch to "Operational" position
With Mode Switch in "Learn Network" position, Breaker display Window is blank	• Defective Communications • No devices on local network	• Verify digitrip RMS trip unit and IQ Data Pluses on the AEM local network are functional. • Verify devices on the AEM local network have valid address setting (addresses 001 through 048) • Verify continuity of twisted pair communication wire
	AEM is malfunctioning	• Replace unit (see paragraph 6.2)
Address of a specific breaker(s) is not displayed	• Address not in AEM memory	• Put Mode Switch in "Learn Network" position and then return it to "Operational" position. View breaker Display Window to determine if address is on network. a) Check that breaker is in "Operate" position b) Check that breaker Digitrip RMS trip unit is operational
No I_G current value	• No ground protection on Digitrip trip unit	• If I_G is required, replace Digitrip RMS trip unit with correct model containing ground protection
Alarm LED will not turn off Trip log data remains on display	• Breaker Digitrip RMS trip unit not reset	• Push Reset button on breaker Digitrip RMS trip unit and then depress "Ack/Reset" pushbutton on AEM
High Load Alarm relay energized but High Load LED not on	• Breaker Address not on breaker with High Load	• Step through breaker addresses until High Load LED comes on

Table 6.A (Contd.)

TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
"No Response" LED on, Breaker Address normal	• Defective communications	• Verify Digitrip RMS trip unit is functional • Verify continuity of twisted pair communication wire
	• Breaker not in "Connected" position	• Verify breaker is in connected position
Alarm LED on but the "Tripped", "No Response" and/or a Trip Cause LED is not on	Breaker Address display window shows an address other than the alarmed breaker(s)	• Use "Step-Up/Down" pushbuttons to scroll through breaker addresses until Breaker Status and Trip Cause LEDs indicate the alarmed breaker(s)
Alarm LED and "Tripped" LED on but no "Trip Cause" LED is on. Current value present on I_A, I_B, I_C, and I_G	Digitrip RMS trip unit has defective or missing rating plug.	• Insert/replace Digitrip RMS trip unit rating plug

6.2 Unit Replacement – Follow this procedure to replace the AEM.

Step 1 – Remove AC power at the main disconnect or isolation switch of the 120 VAC supply. If the switch is located at a distance from the AEM, lock it out to guard against personnel accidentally turning it on.

Step 2 – Verify that all "foreign" power sources wired to the AEM are de-energized. These may be present on the Alarm Terminal Block.

Step 3 – Before disconnecting any wires from the unit, make sure they are individually identified to assure that reconnection will be correctly performed. Make a sketch to help with the task of terminal and wire identification.

Step 4 – If an optional cable connects with the Communications Port, carefully unplug it. The connectors may be screwed together.

Step 5 – Loosen each screw terminal where there is a wire connection. Remove the associated wire.

Step 6 – Remove the 6 mounting screws holding the unit against the door or panel. These are accessed from the AEM's rear.

CAUTION

BE PREPARED TO SUPPORT THE AEM FROM ITS FRONT SIDE ONCE MOST OF THE SCREWS ARE LOOSENED OR REMOVED. WITHOUT SUCH SUPPORT, THE UNIT COULD FALL OR THE PANEL COULD BE DAMAGED.

Step 7 – Carefully lay the screws aside for later use.

Step 8 – Read Paragraph 5.1.2 before attempting to mount the replacement unit.

Step 9 – Reverse the procedure noted in Steps 4 thru 6.

Step 10 – Using the sketch noted in Step 3, above, replace each wire at the correct terminal. Be sure each is firmly tightened.

Step 11 – Restore AC power (See Paragraph 5.3.2 – Initial Power Application).

Tear along perforation. Fold the top half down and tape.

COMMUNICATION PRODUCT USER MANUAL
Customer Comments

What type and number of communication products do you have?

IQ-1000 _____ IQ-DATA PLUS _____ AEM _____

DIGITRIP RMS _____ ADDRESSABLE RELAY _____

Did you find any corrections that need to be made to this manual? (Include page number.)

_____

_____

_____

Were any parts of the manual unclear? Do any require further detail or description? (List parts.)

_____

_____

_____

What are your special application needs?

_____

_____

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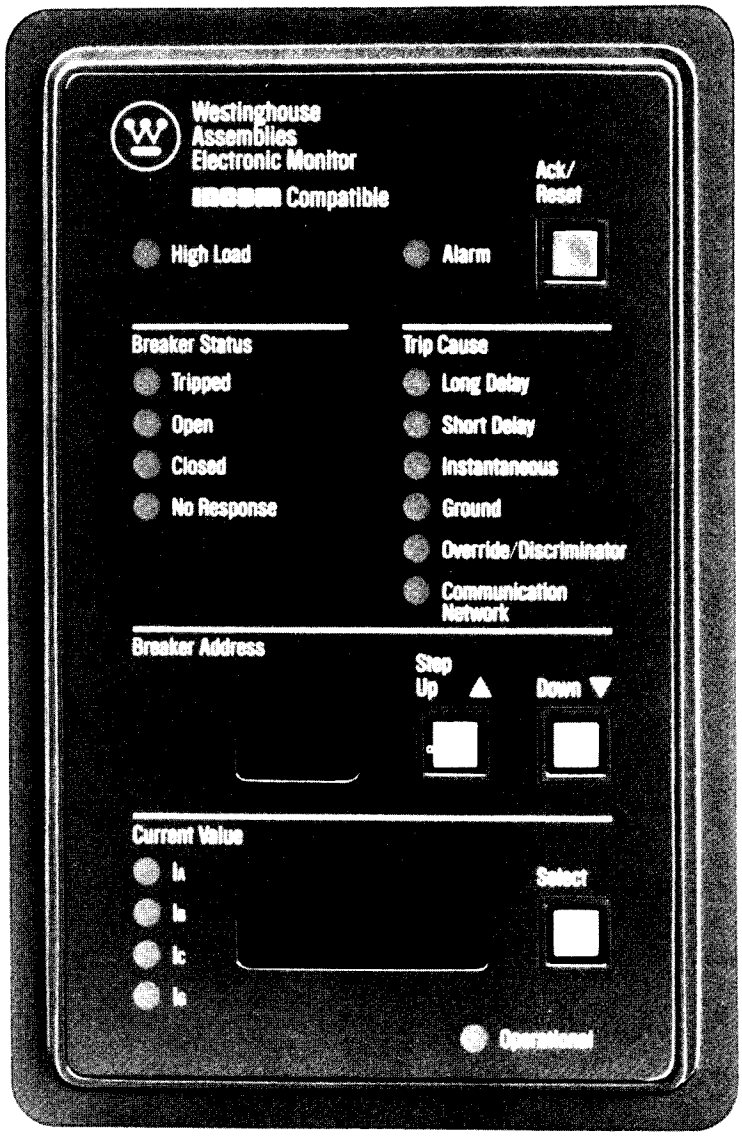

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Effective April, 1989

ELECTRICAL COMPONENTS DIVISION

NOTE

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.

Effective April, 1989

Westinghouse Electric Corporation
Distribution and Control Business Unit
Electrical Components Division
Pittsburgh, PA 15220

First Printing: April, 1989