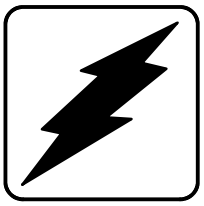
Operation and Installation

Power Monitor



Models:

PM340 Power Monitor

ISO 9001
KOHLER GENERATORS
INTERNATIONALLY REGISTERED
U.S.A. Plant ISO Registered

KOHLER®
POWER SYSTEMS

TP-5875 3/98a

Table of Contents

A power monitor, like any other electrical device, can pose potential dangers to life and limb if improperly installed, maintained, or operated. Only trained and qualified personnel should install, maintain, or operate the power monitor or accessories. The best way to prevent accidents is to be aware of potential dangers and act safely. Please read and follow the safety precautions and instructions below to prevent harm to yourself and others. This manual contains several types of safety precautions which are explained below. SAVE THESE INSTRUCTIONS.

DANGER

Danger indicates the presence of a hazard that *will* cause *severe* personal injury, death, or substantial property damage.

WARNING

Warning indicates the presence of a hazard that *can* cause *severe* personal injury, death, or substantial property damage.

CAUTION

Caution indicates the presence of a hazard that *will* or *can* cause *minor* personal injury or property damage.

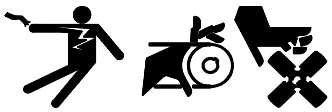
NOTICE

Notice communicates installation, operation, or maintenance information that is important but not hazard related.

Safety decals affixed to the power monitor in prominent places advise the operator or service technician of potential hazards and how to act safely. The decals are reproduced here to improve operator recognition. Replace missing or damaged decals.

Accidental Starting

WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect battery cables before working on generator set. (Remove negative (–) lead first when disconnecting battery. Reconnect negative (–) lead last when reconnecting battery.)

Disabling generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: 1) Turn the generator set master switch to OFF position. 2) Disconnect power to battery charger. 3) Remove battery cables (remove negative (–) lead first). Reconnect negative (–) lead last when reconnecting battery. Follow these precautions to prevent starting of generator set by an automatic transfer switch or remote start/stop switch.

Battery

WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Use protective goggles and clothes. Battery acid can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Battery acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in battery can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash-proof safety goggles when working near the battery. If battery acid is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

WARNING

Explosion.
Can cause severe injury or death.
Relays in battery charger cause arcs or sparks.

Locate battery in a well-ventilated area. Isolate battery charger from explosive fumes.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging. Avoid touching terminals with tools, etc., to prevent burns and sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (–) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together. Sparks could ignite battery gases or fuel vapors. Ventilate any compartment containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is charging. Always turn battery charger off before disconnecting battery connections. Remove negative (–) lead first when disconnecting battery. Reconnect negative (–) lead last when reconnecting battery.

Hazardous Voltage/ Electrical Shock

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening enclosure.

(600 Volt and above)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect power sources before servicing. Install barrier after adjustments, maintenance, or servicing.

(600 Volt and above)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening enclosure.

(under 600 Volt)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect power sources before servicing. Install barrier after adjustments, maintenance, or service.

(under 600 Volt)

Grounding generator set. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Open main circuit breakers of all power sources before servicing equipment. Configure the installation to electrically ground the generator set and electrical circuits when in use. Never contact electrical leads or appliances when standing in water or on wet ground, as the chance of electrocution increases under such conditions.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove wristwatch, rings, and jewelry before servicing equipment.

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Only trained and qualified personnel should open power monitor enclosure.

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Transfer switch or generator set, when part of the system, can automatically energize power monitor or accessories. Disconnect all power sources before opening enclosure. Move generator set master switch on controller to OFF position and disconnect battery negative (–) lead before proceeding.

Current transformer voltage. Hazardous voltage can cause severe injury or death. Do not disconnect current transformer leads and reenergize the power source or equipment damage and personal injury may occur. If the situation requires reenergizing the power source, reconnect the current transformer leads or short leads together first.

Notice

NOTICE

Hardware damage! Power monitor may use both American Standard and metric hardware. Use the correct size tools to prevent rounding of bolt heads and nuts.

NOTICE

When replacing hardware, do not substitute with inferior grade hardware. Screws and nuts are available in different hardness ratings. American Standard hardware uses a series of markings and metric hardware uses a numeric system to indicate hardness. Check markings on bolt head and nuts for identification.

NOTICE

Foreign material contamination! Cover power monitor during installation to keep dirt, grit, metal drill chips, etc., out of components.

NOTICE

Electrostatic discharge damage! Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

Notes

This manual provides operation and initial installation instructions for the Kohler power monitor.

All information in this publication represents data available at time of print. Kohler Co. reserves the right to change this literature and the products represented without incurring obligation.

Read through this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section at the beginning of this manual. Keep this manual with equipment for future reference.

Equipment service requirements are minimal but are very important to safe and efficient operation; therefore, inspect parts often and perform required service at the prescribed intervals. An authorized service distributor/dealer should perform required service to keep equipment in top condition.

List of Related Materials

Consult the power monitor, generator set, generator set controller, transfer switch contactor, or transfer switch logic specification sheets for specifications not supplied in this manual. Consult the generator set, generator set controller, transfer switch contactor, or transfer switch logic service manual, installation manual, engine operation manual, and engine service manual for additional information. Consult the product specification sheets for specifications not supplied in this manual.

A power monitor can communicate with a personal computer (PC) equipped with remote monitoring and control communications software. Refer to the following tables for part numbers of the operation and installation manual for the software and installation instructions for controller communications kits.

Item	Operation/ Installation Manual
Remote Monitoring and Control Communications Software	TP-5823

Item	Installation Instructions
Controller Communications Kits	TT-847

Service Assistance

For sales and service in the U.S.A. and Canada check the yellow pages of the telephone directory under the heading GENERATORS—ELECTRIC for an authorized service distributor/dealer or call 1-800-544-2444.

For sales and service outside the U.S.A. and Canada, contact your local distributor.

For further information or questions, contact the company directly at:

KOHLER CO., Kohler, Wisconsin 53044 U.S.A.
Phone: 920-565-3381
Fax: 920-459-1646 (U.S.A. Sales)
920-459-1614 (International)

Kohler Power Systems, Asia Pacific Headquarters
7 Jurong Pier Road, Singapore 619159
Phone: (65)264-6422
Fax: (65)264-6455

To ensure supply of correct parts or information, make note of the following identification numbers in the spaces provided:

PART NUMBER

The part number is found on the nameplate attached to the power monitor.

Part No. _____

Section 1. Features and Specifications

This section contains an overview of features and specifications for the Kohler power monitor. Consult the product specification sheet for additional specifications.

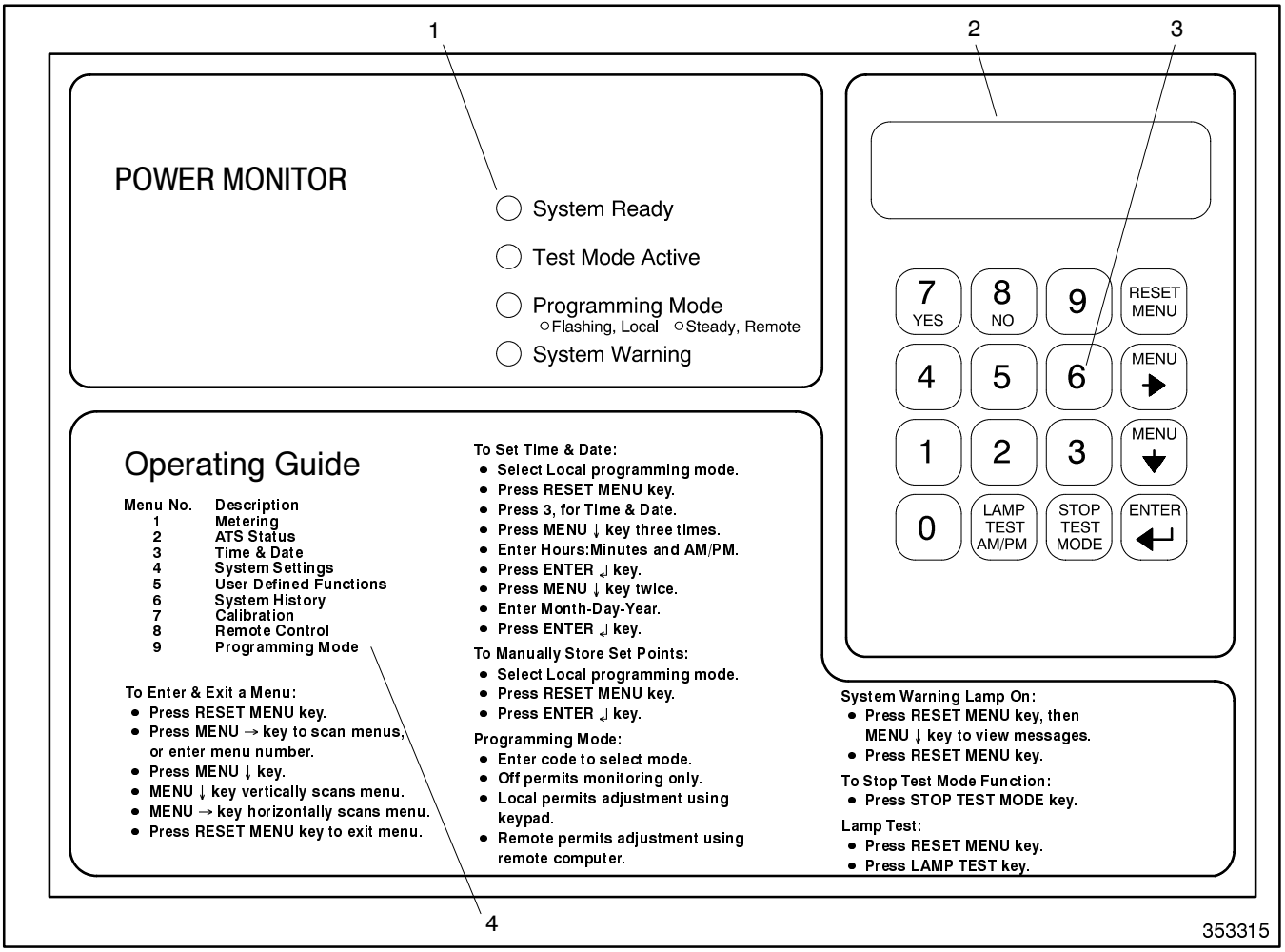
1.1 Features

The power monitor features include local LED indicators, digital display, keypad, fuses, and terminal strips for inputs and outputs. The following paragraphs cover each of these topics.

See Figure 1-1 for an illustration of the power monitor front panel.

NOTE

Press any key on the keypad to turn on the digital display. The digital display turns off 5 minutes after the last keypad entry.



1. Local LED Indicators
2. Digital Display
3. Keypad
4. Operating Guide

Figure 1-1. Power Monitor Front Panel

1.1.1 Local LED Indicators

Four LED indicators provide a local visual display of power monitor status. See Figure 1-2.

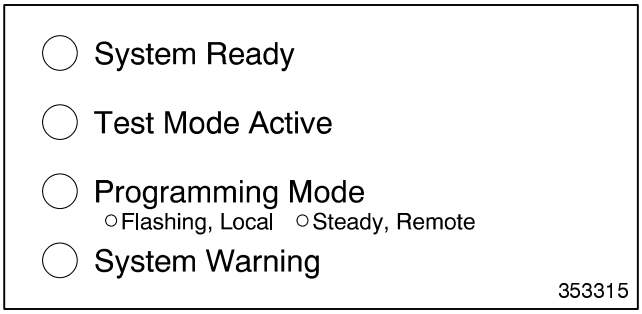


Figure 1-2. Local LED Indicators

The following describes the LED indicators in the order that they appear on the front panel.

System Ready. Green LED lights in the absence of a system warning condition.

Test Mode Active. Yellow LED lights when the ATS test mode is active.

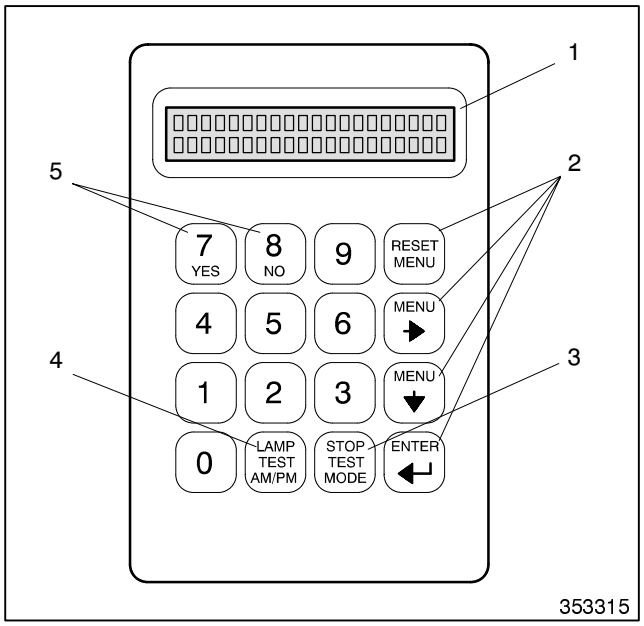
Programming Mode. Yellow LED flashes when the local programming mode is enabled and lights continuously when the remote programming mode is enabled.

System Warning. Red LED lights during a system warning condition. The following fault conditions cause a system warning condition:

- Auxiliary Warning 1-6 (from customer contacts)
- Internal Fault or Power Down Error (internal errors)

1.1.2 Digital Display and Keypad

See Figure 1-3 for an illustration of the digital display and keypad.



1. Digital Display
2. Menu Keys
3. STOP TEST MODE key
4. LAMP TEST and AM/PM key
5. YES and NO keys

Figure 1-3. Digital Display and Keypad

The vacuum fluorescent digital display provides power monitor system information on two lines of 20 characters per line. The following menus provide access to this information.

- **Metering** displays applicable AC line-to-line and line-to-neutral voltages and line currents, system frequency, total kilowatt loading, power factor, kilovolt-amps-reactive (kVAR), DC supply voltage, and analog auxiliary input readings.
- **Automatic Transfer Switch (ATS) Status** displays ATS contactor position, test status, test time, and countdown of time remaining during a timed test. Displays the number of hours in each contactor position (normal, off, and emergency) and contactor type and rating. Displays ATS model, spec, serial, and controller serial numbers.
- **Time & Date** displays time of day, day of week, month, day, and year.
- **System Settings** displays system voltage, frequency, and electrical system type (single- or three-phase wye or delta).
- **User-defined Functions** displays inhibit time delay settings for auxiliary warning contact inputs.
- **System History** displays a history of auxiliary warnings or ATS tests.
- **Calibration** displays the calibrated voltage and current readings.
- **Remote Control** displays settings for online connections.

- **Programming Mode** displays information about the current programming mode.

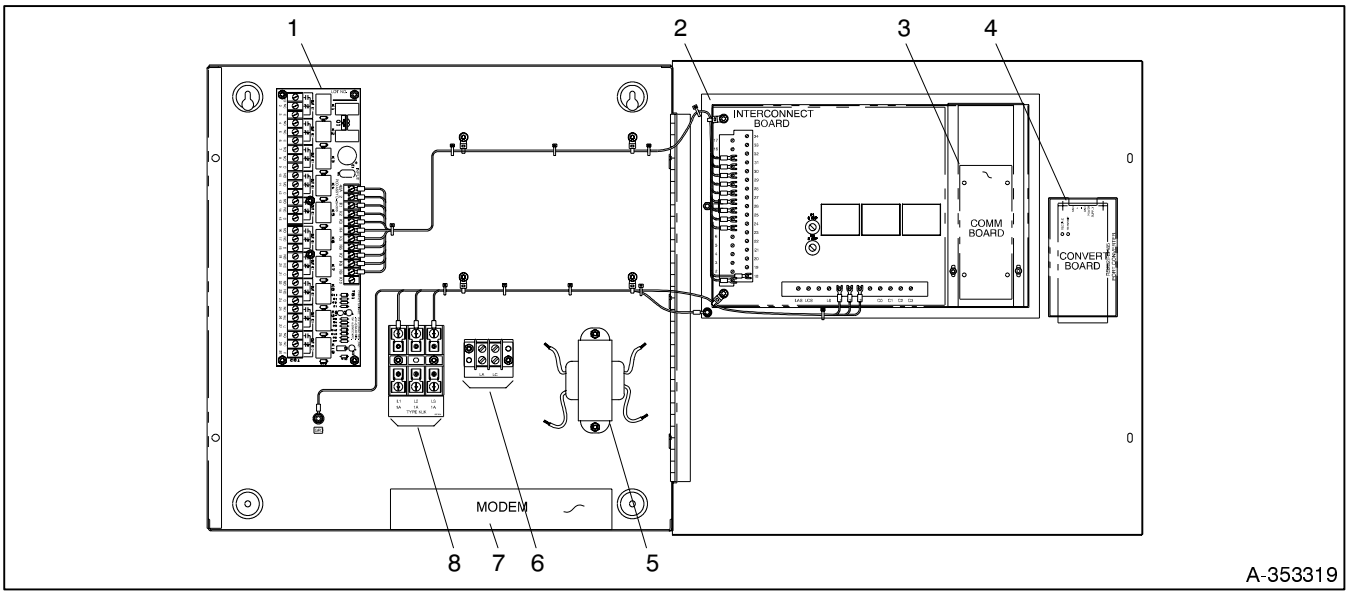
The sealed membrane 16-button keypad enables local access to system information and programming. See Figure 1-3.

The keypad has the following keys.

- **Digits 0-9.** Press to enter numerical data into the power monitor.
- **AM/PM.** Press to toggle between AM and PM to enter the time of day.
- **YES, NO.** Press to answer questions.
- **LAMP TEST.** Press the RESET MENU key and then the LAMP TEST key to turn on all LED indicators and all elements of the digital display to verify their operation.
- **STOP TEST MODE.** Press to deactivate the ATS test mode.
- **RESET MENU, MENU →, MENU ↓, ENTER ↵.** Press these menu keys when viewing information or programming. See Section 2.3.1 Keypad for more information.

1.1.3 Internal Components

The power monitor has several standard and optional internal components. See Figure 1-4.



1. Dry Contact Circuit Board (Optional)
2. Interconnection Circuit Board
3. RS-232 or RS-485 Communications Module, Mounts Behind Metal Cover (Optional)
4. Internal RS-232 to RS-485 Converter Module (Optional)
5. Power Transformer, Not Shown Connected (Optional)
6. AC Power Input Terminal Block (Optional)
7. Modem (Optional)
8. AC Sensing Fuse Block

Figure 1-4. Power Monitor Internal Components (front view with enclosure door open to right)

Dry Contact Circuit Board (optional). When included provides an interface to customer-supplied circuitry that requires normally open (N.O.) or normally closed (N.C.) relay contacts.

Interconnection Circuit Board. Provides terminal strips TB1 and TB2 for connecting inputs and outputs to the power monitor. Also contains fuses F1 and F2 for the power monitor's internal DC power supply and connected accessories.

RS-232 or RS-485 Communications Module (optional). When included, an RS-232 communication module allows the power monitor to communicate with a PC locally up to 50 ft. (15 m) or remotely using telephone lines and a modem. An RS-485 communications module allows the power monitor to communicate over a local area network (LAN) of power monitors, generator set controllers, or transfer switch controllers extending a total length of 4000 ft. (1220 m).

Internal RS-232 to RS-485 Converter Module (optional). When included allows a PC or modem to interface to a local area network of power monitors, generator set controllers, or transfer switch controllers equipped with RS-485 communications modules.

Power Transformer (optional). When included as part of an AC power supply accessory, a power transformer allows the power monitor to operate from an AC power

source instead of a DC supply such as from the battery on a generator set.

AC Power Input Terminal Block (optional). Provides connection terminals for the optional AC power supply accessory.

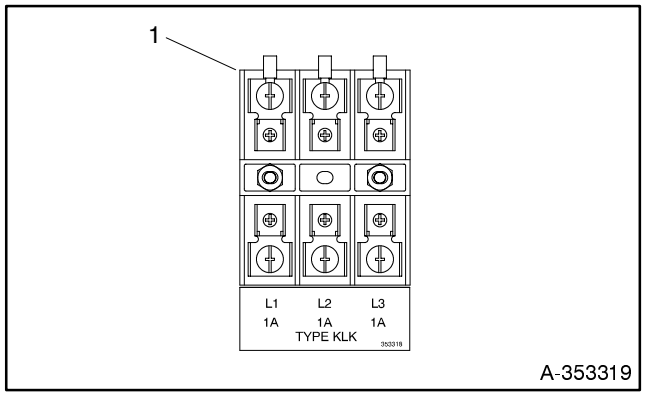
Modem (optional). When included provides an interface between an RS-232 communications module and a telephone line for remote communications with a PC.

AC Sensing Fuse Block. Provides connection points and fusing for monitored AC voltage inputs for lines L1, L2, and L3.

1.1.4 Fuses

AC Circuit Fuses. AC circuit fuses are located inside plastic housings that plug into the AC sensing fuse block at the back of the inside of the power monitor enclosure. A fuse protects the power monitor sensing circuitry on monitored AC voltage inputs L1, L2, and L3. See Figure 1-5.

- **1-Amp (L1).** Protects the L1 input.
- **1-Amp (L2).** Protects the L2 input.
- **1-Amp (L3).** Protects the L3 input.



1. AC Sensing Fuse Block (shown with fuses removed)

Figure 1-5. AC Sensing Fuse Block

DC Circuit Fuses. Fuses for the power monitor's internal DC power supply and connected accessories are located on the interconnection circuit board on the inside of the power monitor's door. See Figure 1-4 for the location of the board and Figure 1-6 for the fuse holder locations on the circuit board.

- **3-Amp (F1).** Fuse protects the power monitor internal DC power supply.
- **3-Amp (F2).** Fuse protects connected power monitor DC accessories.

1.1.5 Terminal Strips

Figure 1-6 shows the locations of the terminal strips on the power monitor interconnection circuit board. These terminal strips provide various input and output connections. For terminal identification, accessory information, and installation instructions, see Section 5—Accessories, Section 6—Wiring Diagrams, and Section 7—Installation.

NOTE

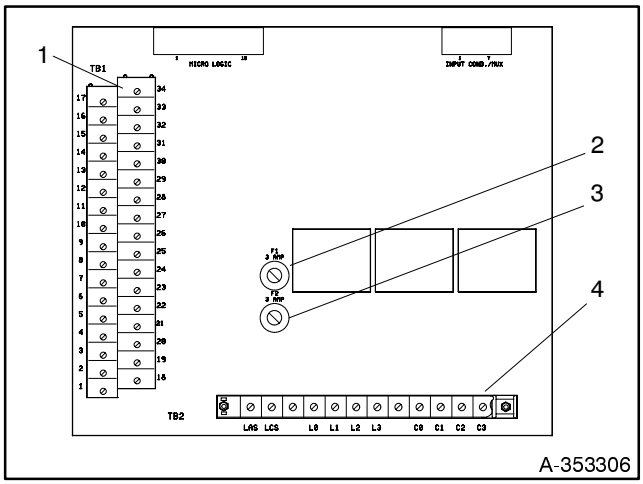
Read and understand all specifications and connection directions for inputs and outputs before making connections to terminal strips.

TB1 Terminal Strip (DC Input and Output Connections). TB1 provides connections for:

- Six auxiliary contact inputs and relay driver outputs (RDOs).
- Three ATS contactor position inputs (Normal, Off, and Emergency) and relay driver outputs (RDOs).
- ATS test mode relay contacts (both normally open and normally closed to common).
- Two 0-32 vdc analog auxiliary DC inputs.
- 10-32 vdc power supply input.
- Fused DC accessory output.

TB2 Terminal Strip (AC Input Connections). TB2 provides connections for:

- Input for optional AC power supply.
- L0 neutral AC input.
- L1, L2, and L3 voltage inputs from AC sensing fuse block.
- Current transformer common C0 and inputs C1, C2, and C3.



1. TB1 Terminal Strip
2. F1 Fuse, 3 Amp., Power Monitor Internal DC Supply
3. F2 Fuse, 3 Amp., Accessory DC Output
4. TB2 Terminal Strip

Figure 1-6. Interconnection Circuit Board

1.2 Specifications

This table lists specifications for power monitor features and functions.

Power Monitor Specifications*

Feature or Function	Menu	Local Display	Input	Output	Panel LED	Setting Range	Default Setting
AC Current, Calibration	7	0-9999 (amps)	0-5 amps AC rms			0-9999 (amps)	
AC Current, Metering	1	0-9999 (amps)	0-5 amps AC rms				
AC Voltage, Calibration	7	105-15000 (volts)	0-480 vac rms line-to-line, 0-277 vac rms line-to-neutral			105-15000 (volts)	
AC Voltage, Metering	1	0-15000 (volts)	0-480 vac rms line-to-line, 0-277 vac rms line-to-neutral				
Accessories, Current Available for			Fused at 3 amps DC				
Address Setting, Network	8	1-128	Local keypad			1-128	1
Analog Auxiliary Inputs 1-2, Calibration	7	0.1-100.0	0.01-10 vdc			1-1000 (0.1-100.0)	
Analog Auxiliary Inputs 1-2, Metering	1	0.0-999.9	0-10 vdc				
ATS Contactor Position	2	NORMAL, OFF, EMERGENCY, or UNDEFINED	ATS position contact inputs†	RDO§			
ATS Contactor, time in each position (Normal, Off, Emergency)	2	0.0-9999.9 HOURS	ATS position contact inputs†				0.0 (hours)
ATS Contactor Rating	2	1-4000 AMPS	Local keypad			1-4000 (amps)	2000 (amps)
ATS Control Number	2	(6 digits)	Local keypad			0-999999	000000
ATS Model Number	2	(26 characters)	Remote communications				Model Number 26 CHARS Here
ATS Serial Number	2	(6 digits)	Local keypad			0-999999	000000
ATS Spec Number	2	(16 characters)	Remote communications				Spec Number (16)
ATS Test Mode, Timed	2	0:00-72:00 (hr:min)	Local keypad	Dry contacts, N.O. & N.C. to common‡	Test Mode Active (yellow, lights)	0:00-72:00 (hr:min)	0:00 (hr:min)
Auxiliary Warning 1-6	6	Auxiliary 1-6 (default)	Auxiliary warning contact inputs 1-6†	RDO§	System Warning (red, lights)		
Auxiliary Warning Contact Inputs 1-6, Inhibit Time Delays	5	0:00-1:00 MIN:SEC	Local keypad			0:00-1:00 (min:sec)	0:00 (min:sec)
Baud Rate	8	2400, 4800, or 9600 (bits per second)	Local keypad			2400, 4800, or 9600 (bits per second)	2400 (bits per second)
Date	3	01-01-00 to 12-31-99	Local keypad			01-01-00 to 12-31-99	
Day of Week	3	MONDAY-SUNDAY	System computes from date				

* Additional information about the local display, panel LED, or setting range, not explicitly shown or entered, is shown in parentheses.

† Requires isolated contacts or open-collector inputs to accessory DC power supply negative. Operating voltage 12 vdc, operating current 10 milliamperes.

‡ Each ATS test mode contact rated 10 amps @ 120 vac max. resistive load, 10 amps @ 28 vdc max., 10 milliamperes @ 28 vdc min.

§ Relay Driver Outputs (RDOs) can drive up to three dry contact circuit board relays.

Power Monitor Specifications* (continued)

Feature or Function	Menu	Local Display	Input	Output	Panel LED	Setting Range	Default Setting
Electrical System Type Setting	4	SINGLE PHASE, THREE-PHASE WYE or THREE-PHASE DELTA	Local keypad			Single-phase, three-phase wye, or three-phase delta	Three-phase wye
Frequency, Metering	1	48-62 HZ	48-62 Hz.				
Kilovar (kVAR)	1	0-9999 (kVAR)					
Kilowatt Loading (kW)	1	0-9999 (kW)					
Lamp Test		All display elements light for 2 seconds	LAMP TEST key pressed on keypad		(All LEDs light for 2 seconds)		
Password	9	Displays an asterisk (*) for each digit pressed	Local keypad			0-999999	0 (zero)
Power Factor	1	0.6-1.0					
Programming Mode, Local	9				Programming Mode (yellow, flashes)		
Programming Mode, Off	9				Programming Mode Off (yellow, off)		
Programming Mode, Remote	9				Programming Mode (yellow, lights steady)		
Relay Driver Outputs (RDOs)				RDO†			
Stop Test Mode	2		STOP TEST MODE key pressed on keypad	Stops ATS test mode			
Power Supply Current, Power Monitor Display On, No Accessory Load			~0.5 amps DC at 12 vdc input, fused at 3 amps DC				
Supply VDC, With DC Power Supply	1	10.0-32.0 (vdc)	10.0-32.0 vdc				
Supply VDC, With Optional AC Power Supply	1	~25.0 (vdc)	19 vac				
Supply VDC, Calibration	7	10.0-32.0 (vdc)	10.0-32.0 vdc or 19 vac			10.0-32.0 (vdc)	
System History	6	(last 4 events)					NO EVENTS
System ID Setting	8	0-999999	Local keypad			0-999999	0
System Frequency Setting	4	48-62 (Hz.)	Local keypad			48-62 (Hz.)	60 (Hz.)
System Ready					System Ready (green, lights)		
System Voltage Setting	4	105-15000 (volts)	Local keypad			105-15000 (volts)	208 (volts)
System Warning		(fault message)	System fault detected		System Warning (red, lights)		
Test Mode Active	2	TEST MODE ACTIVE	ATS Test mode activated locally or remotely	Dry contacts, N.O. & N.C. to common‡	Test Mode Active (yellow, lights)		
Time	3	12:00 AM-11:59 PM	Local keypad			12:00 AM - 11:59 PM	

* Additional information about the local display, panel LED, or setting range, not explicitly shown or entered, is shown in parentheses.

† Relay Driver Outputs (RDOs) can drive up to three dry contact circuit board relays.

‡ Each ATS test mode contact rated 10 amps @ 120 vac max. resistive load, 10 amps @ 28 vdc max., 10 milliamperes @ 28 vdc min.

Notes

This operation section assumes that the power monitor has been installed by trained and qualified personnel. See Section 7—Installation for installation instructions.

2.1 Startup

2.1.1 Prestart Checklist

To ensure continued satisfactory operation, check the following items before each startup and at regular intervals given in the service schedule in Section 3—Scheduled Maintenance.

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening enclosure.

(under 600 Volt)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect power sources before servicing. Install barrier after adjustments, maintenance, or service.

(under 600 Volt)

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Only trained and qualified personnel should open power monitor enclosure.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove wristwatch, rings, and jewelry before servicing equipment.

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Transfer switch or generator set, when part of the system, can automatically energize power monitor or accessories. Disconnect all power sources before opening enclosure. Move generator set master switch on controller to OFF position and disconnect battery negative (–) lead before proceeding.

Current transformer voltage. Hazardous voltage can cause severe injury or death. Do not disconnect current transformer leads and reenergize the power source or equipment damage and personal injury may occur. If the situation requires reenergizing the power source, reconnect the current transformer leads or short leads together first.

NOTICE

Electrostatic discharge damage! Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

Check the condition of the power monitor and accessories. Carefully remove any accumulated debris using a vacuum cleaner. Do not use compressed air because it could cause contaminants to lodge inside internal components and cause damage. Replace any worn or broken components. Tighten any loose hardware.

Check wiring insulation for wear, deterioration, or cracks. After installation or servicing, verify wiring connections against installation instructions and wiring diagrams.

Close the enclosure door, replace and tighten the screws that hold the enclosure door shut before reapplying power.

2.1.2 Powerup Messages

The display should light up and flash a message to set the time and date after application of power to the power monitor. At least one LED should light.

- The System Ready (green) LED lights in the absence of the a system warning condition.
- The System Warning (red) LED lights during a system warning condition. The system briefly displays fault messages if the system warning condition exists when the system is powered up.

NOTE

If the system warning LED lights and no message displays, press RESET MENU and the MENU ↓ key to view the messages.

Press the RESET MENU key and then the LAMP TEST key to verify operation of the LEDs and digital display.

2.1.3 Setting the Time and Date

To set the time and date enable the local programming mode. See Section 2.8.9 Menu 9—Programming Mode. See Section 2.9.3 Menu 3—Time & Date to set the time and date.

2.1.4 Checking Metering Readings

See Section 2.8.1 Menu 1—Metering to monitor AC line-to-line voltages, line-to-neutral voltages, line currents, and line frequency. If the screens shown are not consistent with the electrical system type, readings are higher or lower than expected, or if other problems are encountered see Section 4—Troubleshooting.

2.2 Local LED Indicators

Figure 2-1 shows the four local LED display indicators on the power monitor's front panel. Read these indicators to obtain information on the power monitor status.

NOTE

Press any key on the keypad to turn on the digital display. The digital display turns off 5 minutes after the last keypad entry.

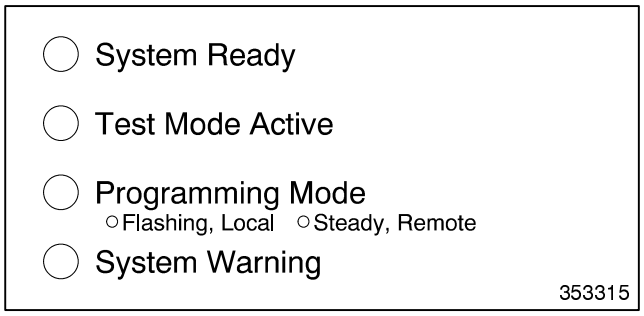


Figure 2-1. Local LED Indicators

2.2.1 System Ready

The green LED lights in the absence of a system warning condition.

2.2.2 Test Mode Active

The yellow LED lights when the ATS test mode is active.

2.2.3 Programming Mode

The yellow LED flashes when the local programming mode is enabled and lights continuously when the remote programming mode is enabled. When the yellow LED is off, the power monitor only displays information and does not allow any programming of settings.

NOTE

See Section 2.9.8 Menu 8—Remote Control and Section 2.9.9 Menu 9—Programming Mode (local programming mode on) for more information on local and remote programming modes. See Section 2.4 Monitoring and Programming Setup or the operation and installation manual for the Remote Monitoring and Control Communications Software for more information on remote programming.

2.2.4 System Warning

The red LED lights during a system warning condition. The system warning condition results from a fault detected in the system. The digital display shows the fault(s) that caused the system warning condition.

NOTE

If the system warning LED lights and no message displays, press RESET MENU and the MENU ↓ key to view the messages.

Auxiliary Warning 1-6. An LED lights if any customer-provided auxiliary warning contact 1-6 closes and the corresponding inhibit time delay completes timing. The system warning condition then remains at least until all auxiliary warning contacts open.

NOTE

Text outside of digital display screen boxes shown in *italics* represent digital display messages.

The digital display shows the auxiliary warning contact that caused the system warning condition by a fault message of the form *Auxiliary 1-6.* The number 1-6 is the auxiliary warning contact input that caused the system warning condition.

Through the remote communications software, the user can rename each of the auxiliary warning inputs 1-6 with an identifying name. The power monitor will use the identifying name in the fault messages to refer to the contact input instead of *Auxiliary 1-6.*

When an auxiliary warning 1-6 occurs, the system logs the event into the system history. See Menu 6—System History.

Internal Error. LED lights if the power monitor internal diagnostics detects a memory problem. A memory problem can cause unpredictable operation. When the power monitor detects a memory problem it attempts to turn all RDOs off and deactivate the ATS test mode before halting. If an Internal Error occurs, the power monitor requires repair. Contact an authorized service distributor for repair.

Power Down Error. LED lights if the power monitor internal diagnostics detect a failure in storing settings in permanent memory when powering down. Check all settings to verify they are retained after powering down. If settings are lost or the Power Down Error fault persists, the power monitor requires repair. Contact an authorized service distributor for repair.

2.3 Digital Display and Keypad

This section shows how to use the keypad to view power monitor information and settings locally on the digital display. See Figure 2-2 for an illustration of the digital display and keypad.

NOTE

Press any key on the keypad to turn on the digital display. The digital display turns off 5 minutes after the last keypad entry.

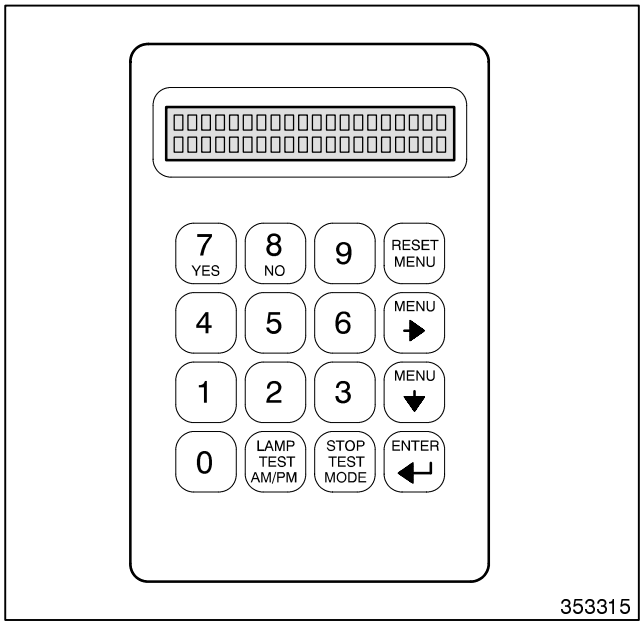


Figure 2-2. Digital Display and Keypad

2.3.1 Keypad

Use the keypad to input information into the power monitor. Some keys have secondary functions.

Digits 0-9 If the power monitor displays a question requiring a numeric answer, the power monitor accepts a keypad number and ignores the secondary function of the key.

YES, NO. Press to answer questions.

AM/PM. Press to toggle between AM and PM to enter the time of day.

MENU ↓ key The power monitor allows access to layered menus of data or programming steps. Use the MENU ↓ key to navigate through the menu layers. Press the RESET MENU key to return to the main menu.

NOTE

Pressing the MENU ↓ key locks the user into the layers of a given menu. Press the RESET MENU key to access other menus.

MENU → key Use to scroll through available menus from the main menu or to access horizontal submenus within the layers of a menu. The right-hand corner of the

display contains an arrow when a horizontal submenu exists.

RESET MENU key Use to clear error conditions or to exit a menu or any layers within that menu.

ENTER ↵ key Use to input information on the display into the power monitor memory.

LAMP TEST key Press the RESET MENU key and then the LAMP TEST key to check the condition of the LEDs and digital display by lighting all LEDs and digital display elements for about 2 seconds.

STOP TEST MODE key Press to deactivate the ATS test mode.

2.3.2 Display Messages

NOTE

Text outside of digital display screen boxes shown in *italics* represent digital display messages.

Right arrow → Directs the user to a submenu within the layers of a menu. Pressing the MENU → key repeatedly loops through these submenus and back to the original starting point in the menu. Some submenus are accessible only with the local programming mode on.

Question mark *?* The power monitor asks a question; answer the question by pressing the YES/NO, digit 0-9, and/or AM/PM toggle keys.

CODE ERROR This message appears after pressing an invalid key. Press the RESET MENU key to clear this error message.

ENTRY ACCEPTED This message appears briefly after entering a valid setting value in the local programming mode.

RANGE ERROR This message appears briefly after entering an invalid setting value in the local programming mode. Check the specifications for valid ranges.

ACCESS DENIED This message appears briefly after attempting to access an unavailable menu or submenu or to enter settings with the local programming mode off. See Menu 9—Programming Mode to change to the local programming mode.

2.4 Monitoring and Programming Setup

This section describes how to set up the remote control and programming modes for monitoring and programming for local or online PC connections. This section also describes the various online PC connections in detail.

2.4.1 Programming Mode

The power monitor has three programming modes: Local, Remote, and Off. Use Menu 9—Programming Mode to change the programming mode. Enabling any one of the programming modes disables the other two. Enable the Local programming mode to program settings using the local display and keypad. Enable the Remote programming mode to program settings using an online PC connection. Enable the Off programming mode to disable any programming. Monitoring capability is not affected by the programming mode.

2.4.2 Remote Control

The settings in Menu 8—Remote Control enable and configure remote communications.

Local Keypad Access. To use the local display and keypad exclusively to perform monitoring or to perform monitoring and programming, enter the settings given in the table in Figure 2-4 to disable online PC connections. Enable the Local programming mode in Menu 9—Programming Mode first, program the settings in Menu 8—Remote Control, and then enable the Off or Local programming mode in Menu 9.

Online Access. An online PC connection is Local meaning a direct cable connection or is Remote meaning a connection using a telephone line and modem. It is possible to connect to a single device or a local area network (LAN) of devices (a generator set controller, automatic transfer switch controller, or power monitor.) This results in four PC connection types: Local, Local Area Network, Remote, and Remote Area Network.

Each of these four PC connection types work with programming on or off for a total of eight combinations of settings for online PC connections. See the table in Figure 2-5 for the settings for each combination. While programming the Menu 8—Remote Control settings, enter the following additional settings as required. See the operation and installation manual for the Remote Monitoring and Control Communications Software for more information.

- **Baud rate.** Set the baud rate to the same value used by the Remote Monitoring and Control Communications Software's COM port.
- **Network Address.** All devices on the same local area network require a unique address 1-128. Typically assign addresses from 1 to the number of devices on the network. If a network is not used leave the network address set to the default value of 1.
- **System ID.** This value works like a password to allow modem access to software having the correct system ID number. If using modem access, change the default value to a value of your choice and enter this value in the appropriate location using the Remote Monitoring and Control Communications Software.

While monitoring the system using an online connection, you can choose to perform programming locally or to disable all programming. See the note at the bottom of the table in Figure 2-3. You can always perform monitoring at the local display regardless of the online PC connection settings.

Enable the Local programming mode in Menu 9 first, program the settings for Menu 8—Remote Control, and then set the programming mode in Menu 9.

	Menu 8—Remote Control					Menu 9—Programming Mode		
User Activity	On Line?	Local?	Local Area Net?	Remote?	Remote Area Net?	Local Programming Mode?	Remote Programming Mode?	Programming Mode Off?
Monitor only	No	–	–	–	–	No	No	Yes
Monitor and Program	No	–	–	–	–	Yes	No	No
– Irrelevant settings.								

Figure 2-4. Settings Required to Use the Local Keypad and Display to Perform Monitoring or Programming

		Menu 8—Remote Control					Menu 9—Programming Mode		
User Activity	Connection Type	On Line?	Local?	Local Area Net?	Remote?	Remote Area Net?	Local Programming Mode?	Remote Programming Mode?	Programming Mode Off?
Monitor only	Local	Yes	Yes	No	No	No	X	No	X*
	Local Area Network		No	Yes	No	No			
	Remote		No	No	Yes	No			
	Remote Area Network		No	No	No	Yes			
Monitor and Program	Local		Yes	No	No	No	No	Yes	No
	Local Area Network		No	Yes	No	No			
	Remote		No	No	Yes	No			
	Remote Area Network		No	No	No	Yes			
X, X* While monitoring the system using an online connection, choose to enable the Local Programming Mode to perform programming locally or the Programming Mode Off to disable all programming. To perform programming locally choose Yes for the setting represented by X. To disable all programming choose Yes for the setting represented by X*.									

Figure 2-5. Settings Required for Monitoring or Programming Using an Online PC Connection

A PC can communicate with one or more generator set controllers, automatic transfer switch controllers, and power monitors. These PC connections require the following optional items.

- Remote Monitoring and Control Communications Software for the PC.
- A communications module in each device (generator set controller, automatic transfer switch controller, or power monitor.)
- Other hardware to connect the devices and the PC.

See the Remote Monitoring and Control Communications Software operation and installation manual for details. Contact your authorized distributor/dealer for availability.

Use only Kohler communications products specified for use with Kohler products. Kohler assumes no responsibility for the use of non-Kohler products.

2.4.3 Local Single Connection

For connections from a PC to one device such as a power monitor use a local single connection.

- For distances up to 50 ft. (15 m) see Figure 2-6.
- For distances up to 4000 ft. (1200 m) see Figure 2-7.

2.4.4 Local Area Network (LAN)

A PC connects to an RS-485 local area network (LAN) of up to 128 devices. Acceptable devices for the LAN include the Decision-Maker™ 340 controller, M340 and M340+ automatic transfer switch controllers, and PM340 power monitor. See Figure 2-8.

2.4.5 Remote Single Connection

A PC connects to a modem and a single device connects to another modem. The PC communicates to the device using the modems and the telephone network. Locate the PC anywhere a telephone line is available. See Figure 2-9.

2.4.6 Remote Area Network

A PC connects to a modem. Up to 128 devices connect to an RS-485 local area network (LAN) interfaced to another modem. The PC communicates with the devices using the modems and the telephone network. Locate the PC anywhere a telephone line is available. Acceptable devices for the LAN include the Decision-Maker™ 340 controller, M340 and M340+ automatic transfer switch controllers, and PM340 power monitor. See Figure 2-10.

2.5 Relay Driver Outputs (RDOs) and Contact Inputs

RDOs are designed for use with the dry contact accessory board. See Section 5—Accessories for more information. When an RDO is connected to a dry-contact accessory board relay input, the relay is in its deenergized position when the RDO is off. When the RDO is on, the relay energizes.

The following sections describe the contact inputs that affect the state of corresponding RDOs. See Section 7—Installation for more information. In the following it is assumed that customer-supplied contacts are connected from the input described to DC power supply negative.

2.5.1 Auxiliary Warning 1-6

When a contact connected to auxiliary warning input 1-6 closes and remains closed for the duration of the inhibit time delay programmed in Menu 5—User-Defined Functions, the corresponding RDO is turned on at the same time as the system warning condition. The RDO then remains on as long as the contact is closed and turns off when the contact opens.

2.5.2 ATS Contactor Position

When a contact connected to the ATS contactor position inputs (normal, off, or emergency) closes the corresponding RDO is turned on. The RDO turns off when the contact opens.

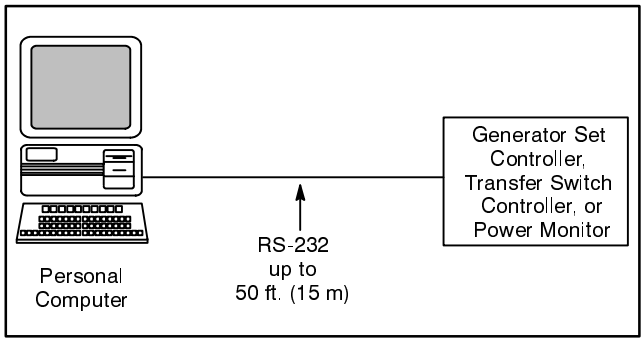


Figure 2-6. Local Single Connection, up to 50 ft. (15 m)

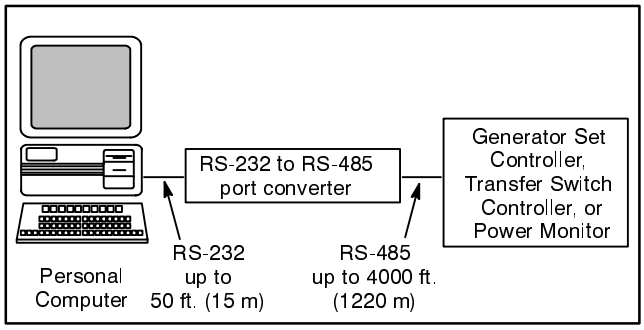


Figure 2-7. Local Single Connection, up to 4000 ft. (1220 m)

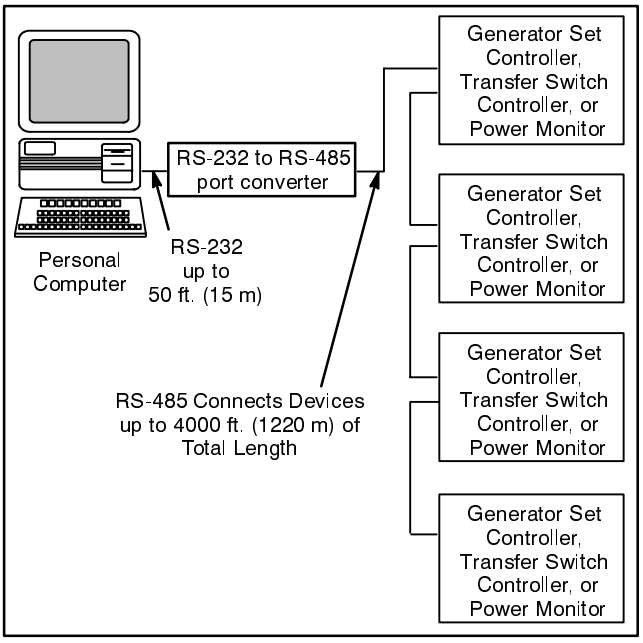


Figure 2-8. Local Area Network

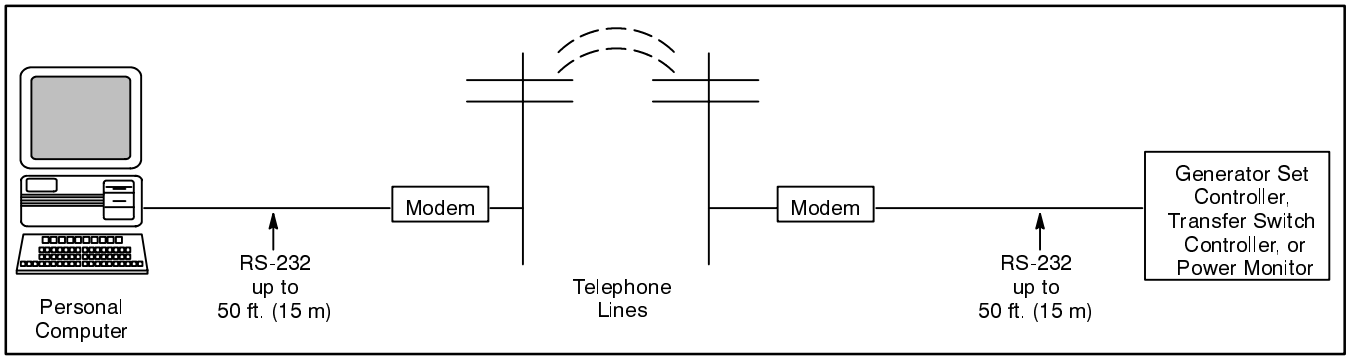


Figure 2-9. Remote Single Connection

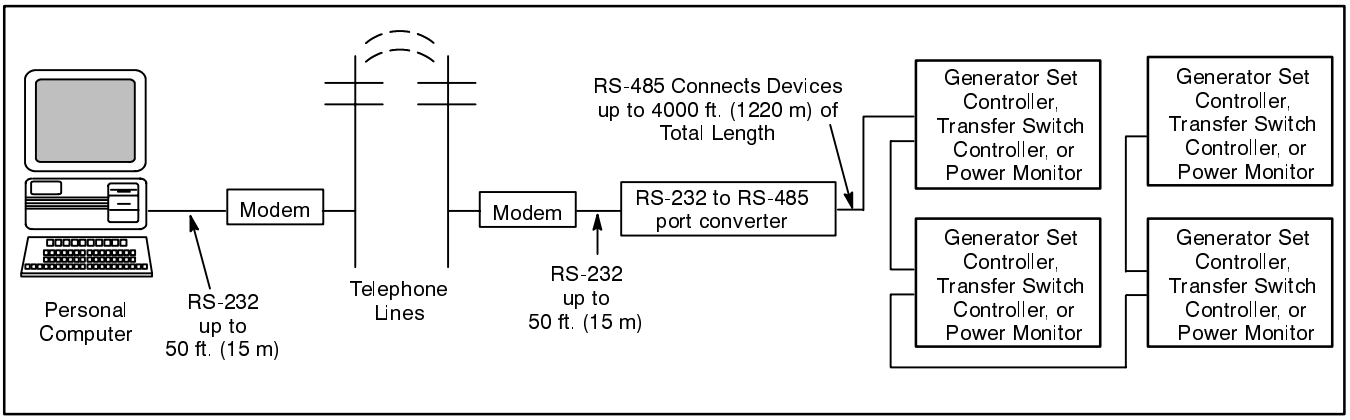


Figure 2-10. Remote Area Network

2.6 ATS Status and Test Mode

NOTE

Supply power to the power monitor from a storage battery or other constant supply if performing ATS tests. A momentary loss of power will occur on the load side of an ATS during testing. If the power monitor is powered from the load side of the ATS under test using an AC power supply accessory, the power monitor will end the ATS test immediately when the momentary loss of power occurs.

The power monitor, when installed with appropriate input and output connections to an automatic transfer switch (ATS) can monitor and test the ATS. In addition, the power monitor can store information about the ATS (contactor type and rating, model number, spec number, serial number, and controller serial number). See Section 2.8.2 Menu 2—ATS Status (Local Programming Mode Off) to view this information or Section 2.9.2 Menu 2—ATS Status (Local Programming Mode On) to test the ATS or change settings.

Activating the ATS test mode causes the normally open (N.O.) and normally closed (N.C.) ATS test mode relay contacts to switch. These contacts switching can start the ATS test mode sequence. The ATS test mode contacts remain in the switched state and the Test Mode Active LED remains lit while the ATS test mode is active.

Pressing the STOP TEST MODE key deactivates the ATS test mode and causes the ATS test mode contacts to return to their normal state.

2.7 Menu List Summary

The menu list on the following pages is an overview of the various menus. Use the menu list to become familiar with the power monitor's features and to determine where to view information or view or change settings.

Details of each menu selection appear immediately after the menu list in two different operating modes—Local Programming Mode Off and Local Programming Mode On. Use the Local Programming Mode Off to view data and some settings without modifying them. Use the Local Programming Mode On to view data and change system settings.

The information in the menu list boxes represents the digital display data. Some digital display data may differ from yours because of application differences. The system allows access to some menus and selections only with the Local Programming Mode On and with certain system settings.

NOTE

Text outside of digital display screen boxes shown in *italics* represent digital display messages.

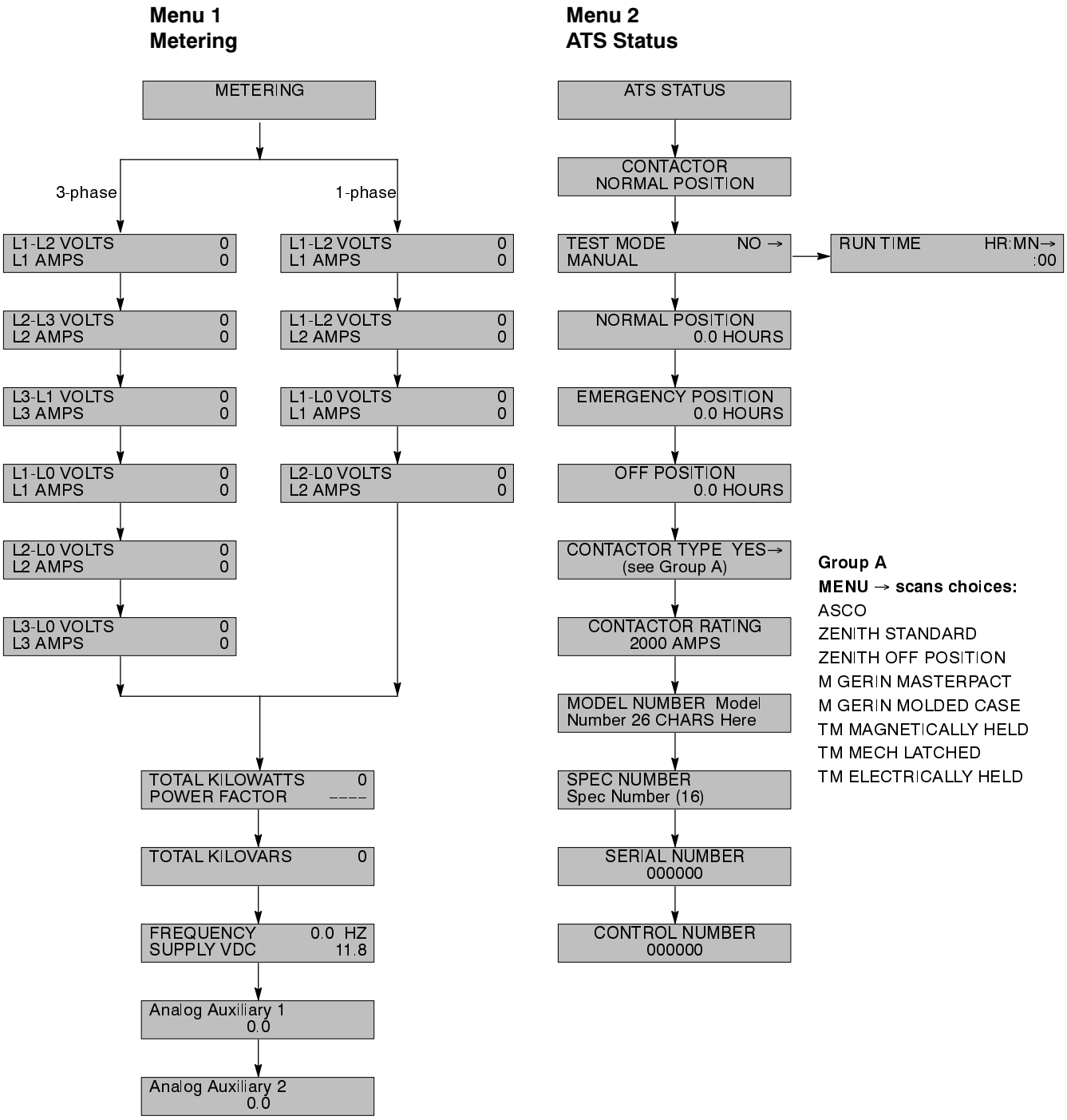
NOTE

Some text displayed on the power monitor's local digital display is reprogrammable using the remote communications software. The digital display screen boxes in following menus and a power monitor with factory default settings show this reprogrammable text in initially capitalized lower case words. For example *Analog Auxiliary 1* and *Auxiliary 1* are reprogrammable names for the analog auxiliary input 1 and auxiliary warning contact input 1 respectively.

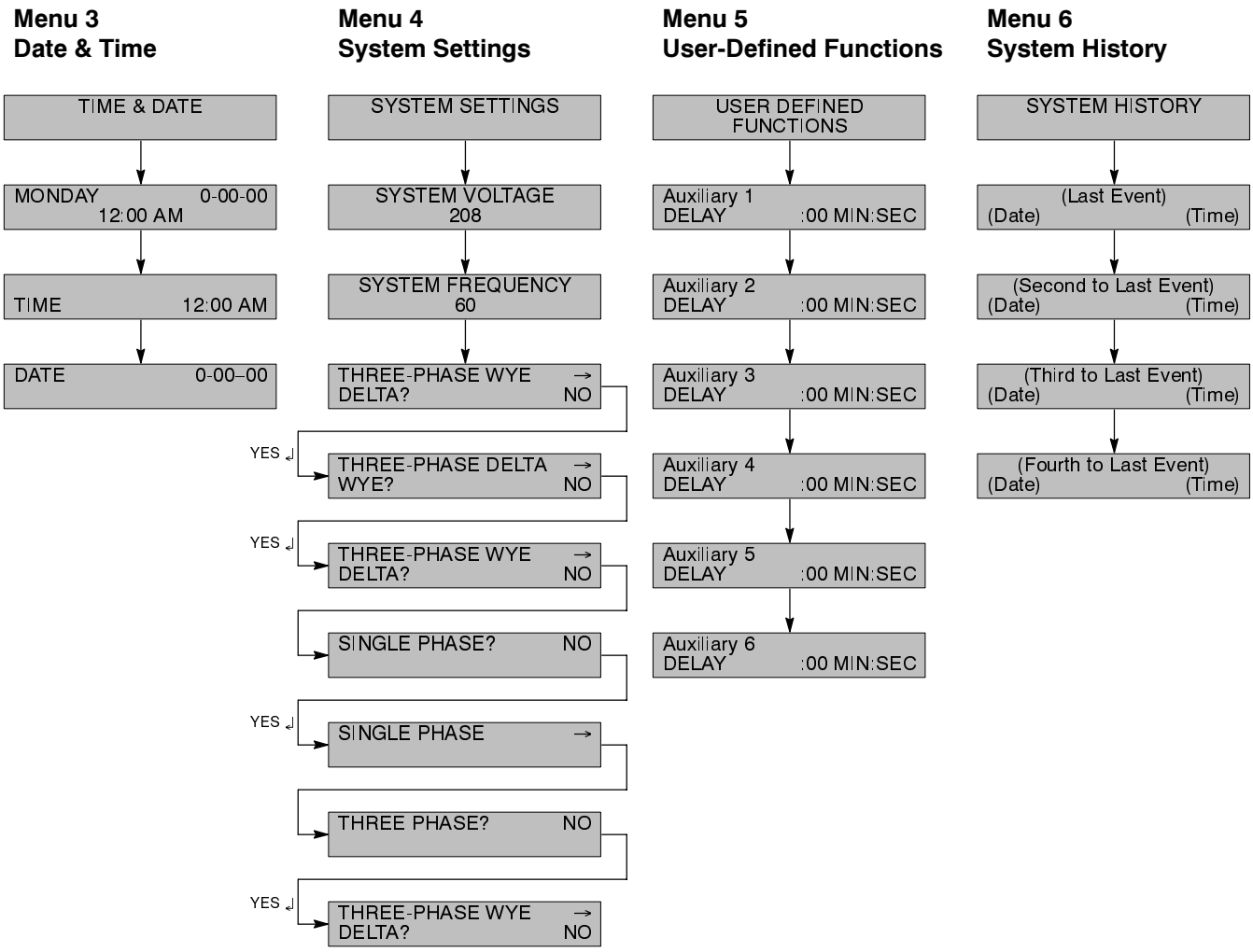
The down arrow key ↓ connecting the boxes represents use of the MENU ↓ key to move to the next screen. The right arrow → connecting the boxes to the side represents the use of the MENU → key or an entry followed by the ENTER ↵ key.

The arrows within the boxes inform the user that submenus are available using the MENU → key. The system allows access to some of these submenus only with the local programming mode on.

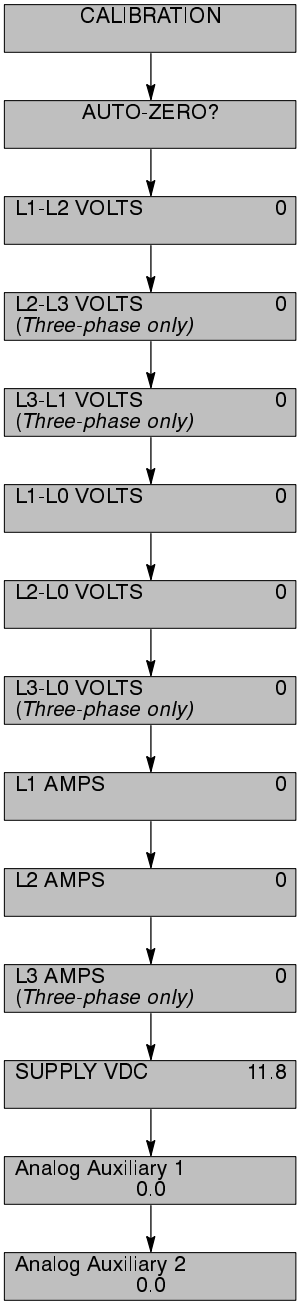
Read and understand the Local Programming Mode On section before programming settings. Reprogrammed settings can affect product operation. Use the YES or NO keys to answer questions or type in numerical data using keys 0-9. Confirm the entry using the ENTER ↵ key and the system responds with *ENTRY ACCEPTED* and returns to the screen with the value changed.


Menu 1
Metering
METERING
3-phase
1-phase
L1-L2 VOLTS 0
L1 AMPS 0
L2-L3 VOLTS 0
L2 AMPS 0
L3-L1 VOLTS 0
L3 AMPS 0
L1-L0 VOLTS 0
L1 AMPS 0
L2-L0 VOLTS 0
L2 AMPS 0
L3-L0 VOLTS 0
L3 AMPS 0
L1-L2 VOLTS 0
L1 AMPS 0
L1-L2 VOLTS 0
L2 AMPS 0
L1-L0 VOLTS 0
L1 AMPS 0
L2-L0 VOLTS 0
L2 AMPS 0
TOTAL KILOWATTS 0
POWER FACTOR ----
TOTAL KILOVARS 0
FREQUENCY 0.0 HZ
SUPPLY VDC 11.8
Analog Auxiliary 1
0.0
Analog Auxiliary 2
0.0
Menu 2
ATS Status
ATS STATUS
CONTACTOR
NORMAL POSITION
TEST MODE NO →
MANUAL
RUN TIME HR:MN→
:00
NORMAL POSITION
0.0 HOURS
EMERGENCY POSITION
0.0 HOURS
OFF POSITION
0.0 HOURS
CONTACTOR TYPE YES→
(see Group A)
CONTACTOR RATING
2000 AMPS
MODEL NUMBER Model
Number 26 CHARS Here
SPEC NUMBER
Spec Number (16)
SERIAL NUMBER
000000
CONTROL NUMBER
000000
Group A
MENU → scans choices:
ASCO
ZENITH STANDARD
ZENITH OFF POSITION
M GERIN MASTERPACT
M GERIN MOLDED CASE
TM MAGNETICALLY HELD
TM MECH LATCHED
TM ELECTRICALLY HELD

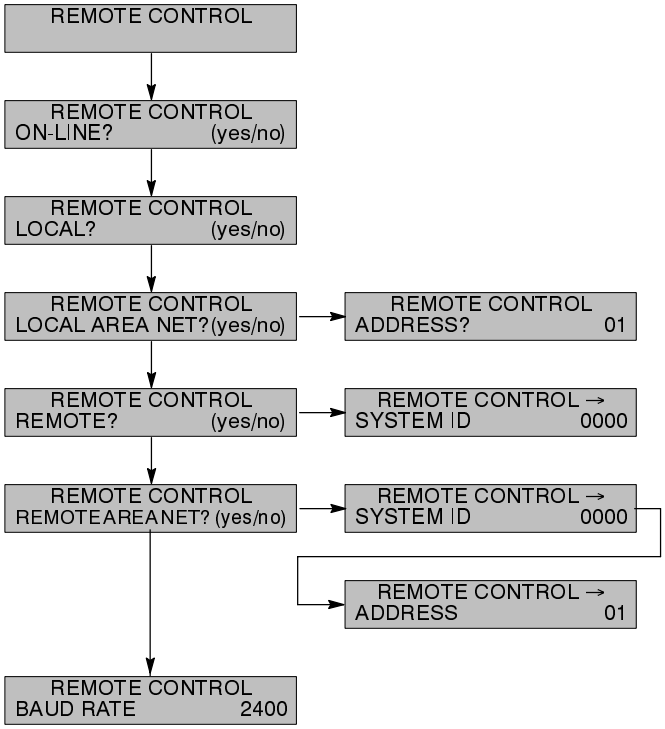
Menu List (continued)



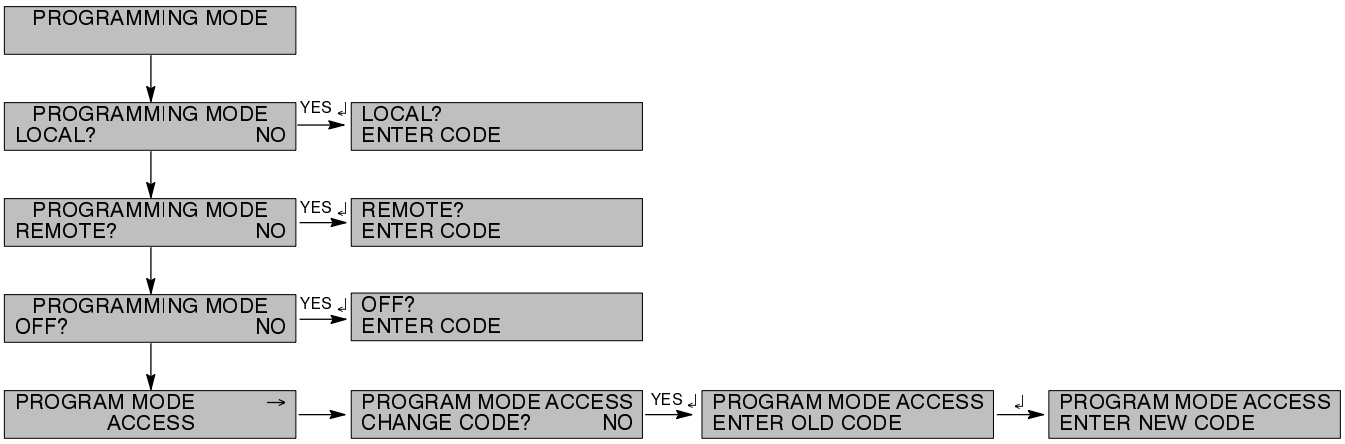
Menu 7
Calibration



Menu 8
Remote Control



Menu 9
Programming Mode



2.8 Local Programming Mode Off

Use this section to view data when no programming is necessary. This section generally shows readings for a new device with factory default settings and only power supply input connections. Your readings may differ.

View most information and settings using the local programming mode off. Read Section 2.9 Local Programming Mode On to perform programming.

NOTES

Text outside of digital display screen boxes shown in *italics* represent digital display messages.

Some text displayed on the power monitor's local digital display is reprogrammable using the remote communications software. The digital display screen boxes in following menus and a power monitor with factory default settings show this reprogrammable text in initially capitalized lower case words. For example *Analog Auxiliary 1* and *Auxiliary 1* are reprogrammable names for the analog auxiliary input 1 and auxiliary warning contact input 1 respectively.

Section headings and pairs of shaded bars group operations together. The word OR between groups help clarify alternatives. The alternative used depends upon the display information or the key to press to perform a certain operation.

Press any key on the keypad to turn on the digital display. The digital display turns off 5 minutes after the last keypad entry.

CODE ERROR This message appears after pressing an invalid key. Press the RESET MENU key to clear this error message.

ACCESS DENIED This message appears briefly after attempting to access an unavailable menu or submenu or to enter settings with the local programming mode off. See Menu 9—Programming Mode to change to the local programming mode.

2.8.1 Menu 1—Metering

Menu 1 provides metering information including line-to-line and line-to-neutral voltages, currents, power factor, total kilowatts, thousands volts-amps-reactive (kVAR), frequency, system supply DC voltage, and analog auxiliary inputs.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
1	MENU NUMBER 1	Enter 1 to access the Metering menu. Press the MENU ↓ key to access menu layers.
MENU ↓	METERING	Displays the top of the Metering menu.

Note: Press the ENTER ↵ key at any screen in the METERING menu to automatically cycle through the metering menu screens, briefly pausing to display each screen. To stop this feature, press any key except the ENTER ↵ key.

Displays the following AC voltages and currents (single-phase systems only.)

Key Entry	Display
MENU ↓	L1-L2 VOLTS 00 L1 AMPS 00
MENU ↓	L1-L2 VOLTS 00 L2 AMPS 00
MENU ↓	L1-L0 VOLTS 00 L1 AMPS 00
MENU ↓	L2-L0 VOLTS 00 L2 AMPS 00

Displays the following AC voltages and currents (three-phase systems only.)

Key Entry	Display
MENU ↓	L1-L2 VOLTS 00 L1 AMPS 00
MENU ↓	L2-L3 VOLTS 00 L2 AMPS 00
MENU ↓	L3-L1 VOLTS 00 L3 AMPS 00
MENU ↓	L1-L0 VOLTS 00 L1 AMPS 00
MENU ↓	L2-L0 VOLTS 00 L2 AMPS 00
MENU ↓	L3-L0 VOLTS 00 L3 AMPS 00

Menu 1—Metering (continued)

Key Entry	Display	Description

The following displays apply to all electrical system type settings.

Key Entry	Display	Description
MENU	TOTAL KILOWATTS 00 POWER FACTOR ----	Displays total kilowatts and power factor.
MENU	TOTAL KILOVARS 00	Displays thousands volts-amps-reactive (kVAR).
MENU	FREQUENCY 0.0 HZ SUPPLY VDC 11.8	Displays monitored line frequency in hertz and power monitor internal DC supply voltage. Supply voltage shown typical when powered by a fully-charged 12 volt lead-acid battery.

Analog Auxiliary.

Note: If the analog auxiliary inputs 1 or 2 are renamed using the remote communications software, the new name appears instead of *Analog Auxiliary 1* or *Analog Auxiliary 2.*

Note: The scale of the following analog auxiliary input readings depend upon the latest calibration. See Section 2.9.7 Menu 7—Calibration (Programming Mode On) for more information.

Key Entry	Display	Description
MENU	Analog Auxiliary 1 0.0	Displays analog auxiliary input 1 reading.
MENU	Analog Auxiliary 2 0.0	Displays analog auxiliary input 2 reading.
MENU	METERING	Returns to top of menu.

2.8.2 Menu 2—ATS Status

Menu 2 provides Automatic Transfer Switch (ATS) information. Use this menu to view the ATS contactor position, test mode status, timed test run time, and time remaining in a timed test. Use this menu to view ATS information including the number of hours in each contactor position, contactor type and rating, model number, spec number, serial number, and controller serial number.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
2	MENU NUMBER 2	Enter 2 to access the ATS Status menu. Press the MENU ↓ key to access menu layers.
MENU ↓	ATS STATUS	Displays the top of the ATS Status menu.
MENU ↓	CONTACTOR NORMAL POSITION	Displays the ATS contactor position according to which ATS contactor position input has contact closure to DC power supply negative: NORMAL, OFF, or EMERGENCY. If none or more than one input has a contact closure to DC power supply negative the contactor position is listed as UNDEFINED. When an ATS position contact closes the corresponding relay driver output (RDO) is turned on.

Press the MENU ↓ key and go to section between the shaded bars based on display information.

The display shows *TEST MODE YES* indicating that the ATS test mode is active.

The display shows *MANUAL* which indicates that the test started in manual mode.

MENU ↓	TEST MODE? YES -> MANUAL	

OR

The display shows *COUNTDOWN* and the run time remaining in hours:minutes for the timed test.

MENU ↓	TEST MODE? YES -> COUNTDOWN 0:59	For example, display shows 0 hours, 59 minutes remaining in the timed test.
MENU →	RUN TIME HR:MN -> 1:00	Displays the previously programmed timed test run time in hours:minutes.

OR

Menu 2—ATS Status (continued)

Key Entry	Display	Description

The display shows *TEST MODE NO* indicating that the ATS test mode is not active.

The display shows *MANUAL* indicating that the timed test run time is zero.

MENU ↓

```
TEST MODE?     NO ->
MANUAL
```

OR

The display shows *COUNTDOWN* indicating that the test mode run time is greater than zero.

MENU ↓

```
TEST MODE?     NO ->
COUNTDOWN      :00
```

MENU →

```
RUN TIME    HR:MN ->
              1:00
```

Displays the previously programmed timed test run time in hours:minutes.

Displays the hours that the ATS contactor has been in the following positions according to the time that corresponding ATS contactor position input has contact closure to DC power supply negative.

MENU ↓

```
  NORMAL POSITION
        0.0   HOURS
```

MENU ↓

```
 EMERGENCY POSITION
        0.0   HOURS
```

MENU ↓

```
    OFF POSITION
        0.0   HOURS
```

Note: The OFF position is only valid for programmed transition ATSs that have a programmable off time.

Displays ATS contactor type and rating.

MENU ↓

```
CONTACTOR TYPE  YES>
       ASCO
```

Displays the ATS contactor. In this example the display shows *CONTACTOR TYPE YES* above the contactor type *ASCO* indicating that the ATS has an ASCO type contactor.

MENU ↓

```
  CONTACTOR RATING
       0 AMPS
```

Displays the ATS contactor current rating.

Displays ATS model, spec, serial, and controller serial numbers.

MENU ↓

```
MODEL NUMBER  Model
Number 26 CHARS Here
```

Displays the ATS model number, 26 character maximum. Programmable only with remote software.

MENU ↓

```
SPEC NUMBER
Spec Number (16)
```

Displays the ATS specification number, 16 character maximum. Programmable only with remote software.

MENU ↓

```
   SERIAL NUMBER
      000000
```

Displays the ATS serial number.

MENU ↓

```
  CONTROL NUMBER
      000000
```

Displays the ATS controller serial number.

MENU ↓

```
    ATS STATUS
```

Returns to top of menu.

2.8.3 Menu 3—Time & Date

Use Menu 3 to view the internal clock time and date. The power monitor uses the clock to time stamp auxiliary warning and ATS test mode occurrence times, to measure time in each ATS contactor position, and to measure the ATS test run time. Upon internal DC power loss the power monitor retains the time and date but stops the internal clock. After restoration of the internal DC power source, the system flashes a message to set the date and time. To view the date and time of power loss, review this menu immediately after restoring power. To set the time and date, change to local programming mode on in Menu 9 and follow Section 2.9.3 Menu 3—Time & Date (Programming Mode On) for instructions.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
3	MENU NUMBER 3	Enter 3 to access the Time & Date menu. Press the MENU ↓ key to access menu layers.
MENU ↓	TIME & DATE	Displays the top of the Time & Date menu.
MENU ↓	MONDAY 0-00-00 12:00 AM	Displays current day of week, month-day-year, and time-of-day.
MENU ↓	TIME 12:00 AM	Displays time-of-day.
MENU ↓	DATE 0-00-00	Displays month-day-year.
MENU ↓	TIME & DATE	Returns to top of menu.

2.8.4 Menu 4—System Settings

Menu 4 shows electrical system settings: the system voltage, frequency, and type (single-phase, three-phase wye, or three-phase delta).

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
4	MENU NUMBER 4	Enter 4 to access the System Settings menu. Press the ↓ arrow key to access menu layers.
MENU ↓	SYSTEM SETTINGS	Displays the top of the System Settings menu.
MENU ↓	SYSTEM VOLTAGE 208	Displays system voltage.
MENU ↓	SYSTEM FREQUENCY 60	Displays system frequency.

Electrical system type setting—three-phase wye or delta connection or single-phase. Screen displayed depends upon the setting. Press the MENU ↓ key and go to the section between the shaded bars based on the menu displayed.

The display shows *SINGLE PHASE.*

MENU ↓	SINGLE PHASE ->	Displays this screen when set to single-phase.
MENU →	THREE PHASE? NO	Pressing MENU → key shows the three-phase choice on the submenu. Change to three-phase with the programming mode on.

OR

The display shows *THREE PHASE WYE* or *THREE PHASE DELTA.*

MENU ↓	THREE PHASE WYE -> DELTA? NO	Displays this screen when set to three-phase wye connection.
OR		
MENU ↓	THREE PHASE DELTA-> WYE? NO	Displays this screen when set to three-phase delta connection.
THEN		
MENU →	SINGLE PHASE? NO	Pressing MENU → key shows the single-phase choice on the submenu. Change to single-phase with the local programming mode on.
MENU ↓	SYSTEM SETTINGS	Returns to top of menu.

2.8.5 Menu 5—User-Defined Functions

Use Menu 5 to view the inhibit time delays for the auxiliary warning contact inputs 1-6.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
5	MENU NUMBER 5	Enter 5 to access the User-Defined Functions menu. Press the MENU ↓ key to access menu layers.
MENU ↓	USER DEFINED FUNCTIONS	Displays the top of the User-Defined Functions menu.

Use the following section to view the inhibit time delays in minutes:seconds for auxiliary warning contact inputs 1-6.

The inhibit time delay is the time after the system detects contact closure on the auxiliary warning contact input before triggering a system warning condition and turning on the corresponding relay driver output (RDO).

Note: If auxiliary warning contact inputs 1-6 are renamed using the remote communications software, the new name appears in the same location in the menu instead of *Auxiliary 1-6.*

MENU ↓	Auxiliary 1 DELAY :00 MIN:SEC
MENU ↓	Auxiliary 2 DELAY :00 MIN:SEC
MENU ↓	Auxiliary 3 DELAY :00 MIN:SEC
MENU ↓	Auxiliary 4 DELAY :00 MIN:SEC
MENU ↓	Auxiliary 5 DELAY :00 MIN:SEC
MENU ↓	Auxiliary 6 DELAY :00 MIN:SEC
MENU ↓	USER DEFINED FUNCTIONS — Returns to top of menu.

2.8.6 Menu 6—System History

Menu 6 contains the last four auxiliary warning or ATS test occurrence times if any exist. The sample events shown illustrate how typical events appear.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
6	MENU NUMBER 6	Enter 6 to access the System History menu. Press the MENU ↓ key to access menu layers.
MENU ↓	SYSTEM HISTORY	Displays the top of the System History menu.

Note: The structure of the System History menu depends upon the number system alert events stored in memory.

Display shows *NO EVENTS* when no events are logged.

MENU ↓	NO EVENTS

OR

Displays 1 to 4 of the last events, most recent first.

The time and date shown is for the start of the event. For *Auxiliary 1-6* it is the time and date that the corresponding inhibit time delay completed timing after contact closure. For *TEST MODE ACTIVE* it is the time and date that the ATS test mode was activated.

Note: If auxiliary warning contact inputs 1-6 are renamed using the remote communications software, the new name appears in the system history instead of *Auxiliary 1-6.*

MENU ↓	Auxiliary 2 9-9-97 1:01 PM
MENU ↓	TEST MODE ACTIVE 8-8-97 9:34 AM
MENU ↓	Auxiliary 1 7-7-97 6:00 PM
MENU ↓	Auxiliary 2 7-7-97 5:59 PM

MENU ↓	SYSTEM HISTORY	Returns to top of menu.

2.8.7 Menu 7—Calibration

Use Menu 7—Calibration (programming mode off) to display the same information as Menu 1 (except power and frequency readings) and to become familiar with the calibration menu without calibrating. See Section 2.9.7—Menu 7 Calibration (programming mode on) for the calibration procedure.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
7 YES	MENU NUMBER 7	Enter 7 to access the Calibration menu. Press the MENU ↓ key to access menu layers.
MENU ↓	CALIBRATION	Displays the top of the Calibration menu.
MENU ↓	AUTO-ZERO?	Displays the autozero option used to calibrate the power monitor for zero input signals. Not accessible with the local programming mode off.

Displays the following AC voltages.

MENU ↓	L1-L2 VOLTS 00	
MENU ↓	L2-L3 VOLTS 00	Displayed for three-phase systems only.
MENU ↓	L3-L1 VOLTS 00	Displayed for three-phase systems only.
MENU ↓	L1-LO VOLTS 00	
MENU ↓	L2-LO VOLTS 00	
MENU ↓	L3-LO VOLTS 00	Displayed for three-phase systems only.

Displays the following AC currents.

MENU ↓	L1 AMPS 00	
MENU ↓	L2 AMPS 00	
MENU ↓	L3 AMPS 00	Displayed for three-phase systems only.

Menu 7—Calibration (continued)

Key Entry	Display	Description

Supply VDC.

MENU	SUPPLY VDC 11.8	Displays the power monitor internal DC supply voltage. Supply voltage shown typical when powered by a fully-charged 12 volt lead-acid battery.

Analog Auxiliary.

Note: If the analog auxiliary inputs 1 or 2 are renamed using the remote communications software, the new name appears instead of *Analog Auxiliary 1* or *Analog Auxiliary 2.*

Note: The scale of the analog auxiliary input readings depend upon the latest calibration. See Section 2.9.7 Menu 7—Calibration (Programming Mode On) for more information.

MENU	Analog Auxiliary 1 0.0	Displays analog auxiliary input 1 reading.
MENU	Analog Auxiliary 2 0.0	Displays analog auxiliary input 2 reading.
MENU	CALIBRATION	Returns to top of menu.

2.8.8 Menu 8—Remote Control

Menu 8 displays remote monitoring and control connection information for on-line PC connections. See Section 2.9.8—Remote Control (Programming Mode On) to change and access all remote control information. Refer to the operation and installation manual for the Remote Monitoring and Control Communications Software for details on remote monitoring and control.

NOTE

There are four remote monitoring and control connection types: Local, Local Area Network, Remote, and Remote Area Network. The display shows only one of these connection types enabled (*YES*) and shows the other three disabled (*NO*).

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
8 NO	MENU NUMBER 8	Enter 8 to access the Remote Control menu. Press the ↓ arrow key to access menu layers.
MENU ↓	REMOTE CONTROL	Displays the top of the Remote Control menu.
On-line.		
MENU ↓	REMOTE CONTROL ON-LINE? NO	Monitoring and control by a PC connection disabled.
OR		
MENU ↓	REMOTE CONTROL ON-LINE? YES	Monitoring and control by a PC connection enabled.
Local connection.		
MENU ↓	REMOTE CONTROL LOCAL? NO	Monitoring and control by a local (direct) PC connection to a single device disabled.
OR		
MENU ↓	REMOTE CONTROL LOCAL? YES	Monitoring and control by a local (direct) PC connection to a single device enabled.
Local Area Network connection.		
MENU ↓	REMOTE CONTROL ->> LOCAL AREA NET? NO	Monitoring and control by a local (direct) PC connection to a Local Area Network (LAN) of devices disabled.
OR		
MENU ↓	REMOTE CONTROL ->> LOCAL AREA NET? YES	Monitoring and control by a local (direct) PC connection to a Local Area Network (LAN) of devices enabled.

Menu 8—Remote Control (continued)

Key Entry	Display	Description
Remote connection.		
MENU ▼	REMOTE CONTROL -> REMOTE? NO	Monitoring and control by a remote (via modem) PC connection to a single device disabled.
OR		
MENU ▼	REMOTE CONTROL -> REMOTE? YES	Monitoring and control by a remote (via modem) PC connection to a single device enabled.
Remote Area Network connection.		
MENU ▼	REMOTE CONTROL -> REMOTE AREA NET? NO	Monitoring and control by a remote (via modem) PC connection to a Local Area Network (LAN) of devices disabled.
OR		
MENU ▼	REMOTE CONTROL -> REMOTE AREA NET? YES	Monitoring and control by a remote (via modem) PC connection to a Local Area Network (LAN) of devices enabled.
Baud Rate.		
MENU ▼	REMOTE CONTROL BAUD RATE 2400	Indicates active baud rate.
MENU ▼	REMOTE CONTROL	Returns to top of menu.

2.8.9 Menu 9—Programming Mode

Use Menu 9 to view and change programming modes. Choose from three programming modes: Local (using the local display and keypad), Remote (using an on-line PC connection), and Off (no programming). Turning one of these modes on (YES) turns all others off (NO).

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
9	MENU NUMBER 9	Enter 9 to access the Programming Mode menu. Press the MENU ↓ key to access menu layers.
MENU ↓	PROGRAMMING MODE	Displays the top of the Programming Mode menu.

Local programming mode—enables programming of settings only from the keypad.

MENU ↓	PROGRAMMING MODE LOCAL? NO	Not in the local programming mode. Press the YES key to turn on the local programming mode.
7 YES	PROGRAMMING MODE LOCAL? YES	Confirm to turn on the local programming mode with the ENTER ↵ key.
ENTER ↵	LOCAL? ENTER CODE *	Type in the password. Initial factory password is the digit 0. An asterisk (*) appears for each digit in the password. Confirm with the ENTER ↵ key.
ENTER ↵	LOCAL? ENTRY ACCEPTED	System confirms entry.
	PROGRAMMING MODE LOCAL? YES	Display indicates that the power monitor is in the local programming mode; the Programming Mode LED should flash continuously. **Note:** Read and understand Section 2.9 Programming Mode On before accessing other menus.

OR

MENU ↓	PROGRAMMING MODE LOCAL? YES	Display indicates that the power monitor is already in the local programming mode; the Programming Mode LED should flash continuously. **Note:** Read and understand Section 2.9 Programming Mode On before accessing other menus.

Menu 9—Programming Mode (continued)

Key Entry	Display	Description

Remote programming mode—enables programming of settings from a PC connection, not the keypad.

Key Entry	Display	Description
MENU ▼	PROGRAMMING MODE REMOTE? NO	Not in the remote programming mode. Press the YES key to turn on the remote programming mode.
7 YES	PROGRAMMING MODE REMOTE? YES	Confirm to turn on the remote programming mode with the ENTER ↵ key.
ENTER ↵	REMOTE? ENTER CODE *	Type in the current password. Initial factory password is the digit 0. An asterisk (*) appears for each digit in the password. Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE? ENTRY ACCEPTED	System confirms entry.
	PROGRAMMING MODE REMOTE? YES	Display indicates that the power monitor is in the remote programming mode; the Programming Mode LED should light continuously. **Note:** Read and understand the operation manual for the remote communications software for changing settings under remote control.

OR

MENU ▼	PROGRAMMING MODE REMOTE? YES	Display indicates that the power monitor is already in the remote programming mode; the Programming Mode LED should light continuously. **Note:** Read and understand the operation manual for the remote communications software for changing settings under remote control.

Programming Off—select to disable all programming.

MENU ▼	PROGRAMMING MODE OFF? NO	Programming enabled. Press the YES key to turn both local and remote programming modes off.
7 YES	PROGRAMMING MODE OFF? YES	Confirm to turn all programming modes off with the ENTER ↵ key.
ENTER ↵	OFF? ENTER CODE *	Type in the password. Initial factory password is the digit 0. An asterisk (*) appears for each digit in the password. Confirm with the ENTER ↵ key.
ENTER ↵	OFF? ENTRY ACCEPTED	System confirms entry.
	PROGRAMMING MODE OFF? YES	Display indicates that all power programming modes are off; Programming Mode LED should be off.

OR

MENU ▼	PROGRAMMING MODE OFF? YES	Display indicates that all power monitor programming modes are already off; Programming Mode LED should be off.

Menu 9—Programming Mode (continued)

Key Entry	Display	Description
Password (cannot change with local programming mode off).		
MENU ▼	PROGRAM MODE –> ACCESS	Programming mode access screen. **Note:** Cannot change the password unless the local programming mode is on. See Section 2.9.9—Programming Mode (Programming Mode On), to change the password.
MENU ▼	PROGRAMMING MODE	Returns to top of menu.

2.9 Local Programming Mode On

Each menu in this section contains a step-by-step procedure for programming the power monitor. See Section 1—Specifications for setting ranges and defaults. This section generally shows readings for a new device with factory default settings and only power supply input connections. Your readings may differ.

Read and understand this section before attempting any programming. The factory settings are adjustable and inadvertent changes can occur without full understanding of the features and functions.

Programming alters stored settings and changes characteristics of the system. Do not operate the power monitor with the programming mode on unless there is a need to edit programming. Limit programming responsibilities to individuals with training and authority.

Use the Local Programming Mode Off mode to view power monitor data and previously-programmed information when you do not need to perform programming.

NOTES

Text outside of digital display screen boxes shown in *italics* represent digital display messages.

Some text displayed on the power monitor's local digital display is reprogrammable using the remote communications software. The digital display screen boxes in following menus and a power monitor with factory default settings show this reprogrammable text in initially capitalized lower case words. For example *Analog Auxiliary 1* and *Auxiliary 1* are reprogrammable names for the analog auxiliary input 1 and auxiliary warning contact input 1 respectively.

Section headings and pairs of shaded bars group operations together. The word OR between groups help clarify alternatives. The alternative used depends upon the display information or the key to press to perform a certain operation.

Press any key on the keypad to turn on the digital display. The digital display turns off 5 minutes after the last keypad entry.

CODE ERROR This message appears after pressing an invalid key. Press the RESET MENU key to clear this error message.

ACCESS DENIED This message appears briefly after attempting to access an unavailable menu or submenu or to enter settings with the local programming mode off. See Menu 9—Programming Mode to change to the local programming mode.

RANGE ERROR This message appears briefly after entering an invalid setting value in the local programming mode. Check the specifications for valid ranges.

Program the settings in Menu 8 and Menu 9 of this section first before performing remote monitoring and programming from a PC. See Section 2.4 — Monitoring and Control Setup.

2.9.1 Menu 1—Metering

Menu 1 provides metering information including line-to-line and line-to-neutral voltages, currents, power factor, total kilowatts, thousands volts-amps-reactive (kVAR), frequency, system supply DC voltage, and analog auxiliary input. There is no alterable data or settings in this menu.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
1	MENU NUMBER 1	Enter 1 to access the Metering menu. Press the MENU ↓ key to access menu layers.
MENU ↓	METERING	Displays the top layer of the Metering menu.

Note: Press the ENTER ↵ key at any screen in the METERING menu to automatically cycle through the metering menu screens, briefly pausing to display each screen. To stop this feature, press any key except the ENTER ↵ key.

Displays the following AC voltages and currents (single-phase systems only.)

MENU ↓	L1-L2 VOLTS 00 L1 AMPS 00
MENU ↓	L1-L2 VOLTS 00 L2 AMPS 00
MENU ↓	L1-L0 VOLTS 00 L1 AMPS 00
MENU ↓	L2-L0 VOLTS 00 L2 AMPS 00

Displays the following AC voltages and currents (three-phase systems only.)

MENU ↓	L1-L2 VOLTS 00 L1 AMPS 00
MENU ↓	L2-L3 VOLTS 00 L2 AMPS 00
MENU ↓	L3-L1 VOLTS 00 L3 AMPS 00
MENU ↓	L1-L0 VOLTS 00 L1 AMPS 00
MENU ↓	L2-L0 VOLTS 00 L2 AMPS 00
MENU ↓	L3-L0 VOLTS 00 L3 AMPS 00

Menu 1—Metering (continued)

Key Entry	Display	Description

The following displays apply to all electrical system type settings.

Key Entry	Display	Description
MENU	TOTAL KILOWATTS 00 POWER FACTOR ----	Displays total kilowatts and power factor.
MENU	TOTAL KILOVARS 00	Displays thousands volts-amps-reactive (kVAR).
MENU	FREQUENCY 0.0 HZ SUPPLY VDC 11.8	Displays monitored line frequency in hertz and power monitor internal DC supply voltage. Supply voltage shown typical when powered by a fully-charged 12 volt lead-acid battery.

Analog Auxiliary.

Note: If the analog auxiliary inputs 1 or 2 are renamed using the remote communications software, the new name appears instead of *Analog Auxiliary 1* or *Analog Auxiliary 2.*

Note: The scale of the following analog auxiliary input readings depend upon the latest calibration. See Section 2.9.7 Menu 7—Calibration (Programming Mode On) for more information.

Key Entry	Display	Description
MENU	Analog Auxiliary 1 0.0	Displays analog auxiliary input 1 reading.
MENU	Analog Auxiliary 2 0.0	Displays analog auxiliary input 2 reading.
MENU	METERING	Returns to top of menu.

2.9.2 Menu 2—ATS Status

Menu 2 provides Automatic Transfer Switch (ATS) information and allows testing of the system when appropriate input and output connections are made to an ATS. Use this menu to view the ATS contactor position, test mode status, and to start a manual or a timed ATS test. Use this menu to view the timed test run time and time remaining in a timed test. Use this menu to view the number of hours in each ATS contactor position. Use this menu to view and change the ATS information including the contactor type and rating, model number, spec number, serial number, and controller serial number.

NOTE

Testing the Automatic Transfer Switch (ATS) can automatically start the generator set and transfer the load from the normal to the emergency source. Use this feature carefully to prevent accidental starting of the generator set or operation of the transfer switch.

NOTE

Supply power to the power monitor from a storage battery or other constant supply if performing ATS tests. A momentary loss of power will occur on the load side of an ATS during testing. If the power monitor is powered from the load side of the ATS under test using an AC power supply accessory, the power monitor will end the ATS test immediately when the momentary loss of power occurs.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
2	MENU NUMBER 2	Enter 2 to access the ATS Status menu. Press the MENU ↓ key to access menu layers.
MENU ↓	ATS STATUS	Displays the top layer of the ATS Status menu.
MENU ↓	CONTACTOR NORMAL POSITION	Displays the ATS contactor position according to which ATS contactor position input has contact closure to DC power supply negative: NORMAL, OFF, or EMERGENCY. If none or more than one input has a contact closure to DC power supply negative the contactor position is listed as UNDEFINED. When an ATS position contact closes the corresponding relay driver output (RDO) is turned on.

Activating the ATS test mode causes the normally open (N.O) and normally closed (N.C) ATS test mode relay contacts on the power monitor to switch. The power monitor remains in the ATS test mode until one of the following occurs.

- The STOP TEST MODE key is pressed.
- The ATS test has been active in the timed test mode for the run time specified.
- The power monitor loses its internal power supply.

Note: If the ATS test mode contacts connect to an automatic transfer switch (ATS) controller at appropriate inputs they can automatically start the generator set and automatically transfer the load from the normal to the emergency source when the emergency source is available.

Start the ATS test in one of two modes.

- Manual—Test mode remains active until the STOP TEST MODE key is pressed.
- Timed—Test mode remains active only for the test mode run time or until the STOP TEST MODE key is pressed.

Press RESET MENU or MENU ↓ twice at this point to skip setting up an ATS test.

Menu 2—ATS Status (continued)

Key Entry	Display	Description

Press the MENU ↓ key and go to the section between the pairs of heavy shaded bars based on the display information.

The display shows *TEST MODE? YES* indicating that the ATS test mode is active.

The display shows *MANUAL* when the ATS test started in manual mode.

MENU ↓

```
TEST MODE?    YES ->
MANUAL
```

OR

The display shows *COUNTDOWN* and the run time remaining in hours:minutes for the timed test mode.

MENU ↓

```
TEST MODE?    YES ->
COUNTDOWN     0:59
```

For example, display shows 0 hours, 59 minutes remaining in the timed test.

OR

The display shows *TEST MODE? NO* indicating that the ATS test mode is not active.

The display shows *MANUAL* when the timed test run time is zero.

MENU ↓

```
TEST MODE?     NO ->
MANUAL
```

OR

The display shows *COUNTDOWN* when the timed test run time is greater than zero.

MENU ↓

```
TEST MODE?     NO ->
COUNTDOWN      :00
```

THEN

To set up an ATS test in manual mode press the MENU → key.

MENU →

```
RUN TIME    HR:MN ->
               :00
```

Displays the ATS timed test run time in hours:minutes. Enter a timed test run time of 0. Confirm with the ENTER ↵ key.

ENTER ↵

```
RUN TIME    HR:MN ->
   ENTRY ACCEPTED
```

The system accepts the entry.

```
RUN TIME    HR:MN ->
               :00
```

ATS timed test run time entered into the system. Press the MENU → key to return to the ATS test mode menu layer.

MENU →

```
TEST MODE?     NO ->
MANUAL
```

Displays *MANUAL* when the run time is zero.
Note: Testing the ATS can automatically start the generator set and transfer the load from the normal to the emergency source.
Press the YES key to start the ATS test mode as a manual test.
Press RESET MENU or MENU ↓ now to not start the ATS test.

7 YES

```
TEST MODE?    YES ->
MANUAL
```

Confirm to start the ATS test mode manually with the ENTER ↵ key.

ENTER ↵

```
TEST MODE?    YES ->
   ENTRY ACCEPTED
```

System confirms the entry and activates the ATS test mode, causing the ATS test mode relay contacts to switch and the Test Mode Active LED to light. The ATS test mode remains active until the STOP TEST MODE key is pressed.

```
TEST MODE?    YES ->
MANUAL
```

The system displays *TEST MODE YES* when the ATS test mode is active and *MANUAL* indicating manual mode.

Menu 2—ATS Status (continued)

Key Entry	Display	Description
	OR	
	To set up an ATS test in timed test mode press the MENU → key.	
MENU →	RUN TIME HR:MN -> :00	Displays the ATS timed test run time in hours:minutes. Use the numeric keys to enter a new non-zero run time in hours:minutes. Confirm with the ENTER ↵ key.
ENTER ↵	RUN TIME HR:MN -> ENTRY ACCEPTED	The system accepts the entry.
	RUN TIME HR:MN -> 1:00	ATS timed test run time entered into the system. Press the MENU → key to return to the ATS test mode menu layer.
MENU →	TEST MODE? NO -> COUNTDOWN :00	Displays *COUNTDOWN* when the run time is greater than zero. **Note:** Testing the ATS can automatically start the generator set and transfer the load from the normal to the emergency source. Press the YES key to start the ATS test mode as a timed test. **Press RESET MENU or MENU ↓ now to not start the ATS test.**
7 YES	TEST MODE? YES -> COUNTDOWN :00	Confirm to start the timed ATS test with the ENTER ↵ key.
ENTER ↵	TEST MODE? ENTRY ACCEPTED	System confirms the entry and activates the ATS test mode causing the ATS test mode relay contacts to switch and the Test Mode Active LED to light. The ATS test mode remains active for the ATS timed test run time or until the STOP TEST MODE key is pressed.
	TEST MODE? YES -> COUNTDOWN 1:00	System displays *TEST MODE YES* when the test mode is active and displays *COUNTDOWN* and the test time remaining in hours:minutes for the timed test mode.

Displays the hours that the ATS contactor has been in the following positions according to the time that corresponding ATS contactor position input has contact closure.

MENU ↓	NORMAL POSITION 0.0 HOURS	
MENU ↓	EMERGENCY POSITION 0.0 HOURS	
MENU ↓	OFF POSITION 0.0 HOURS	**Note:** The OFF position is only valid for programmed transition ATSs that have a programmable off time.

Menu 2—ATS Status (continued)

Key Entry	Display	Description

Display and change the ATS contactor type.

Key Entry	Display	Description
MENU ↓	CONTACTOR TYPE YES> ASCO	Displays *CONTACTOR TYPE YES* in the upper half of the display and a contactor type from the list of available choices below in the lower half of the display. This means that the ATS has the contactor shown in the lower half of the display. If the ATS does not have the contactor type shown, press the MENU → key until the correct contactor type is shown in the lower half of the display. For example, the display shows that the ATS has an ASCO contactor. If the ATS actually has a ZENITH STANDARD contactor, for example, press the MENU → key. ASCO — ZENITH STANDARD ZENITH OFF POSITION — M GERIN MASTERPACT M GERIN MOLDED CASE — TM MAGNETICALLY HELD TM MECH LATCHED — TM ELECTRICALLY HELD
MENU →	CONTACTOR TYPE NO> ZENITH STANDARD	Display shows *CONTACTOR TYPE NO* in the upper half of the display indicating that the ATS does not have the contactor choice on the lower half of the display, *ZENITH STANDARD*. Press the YES key to change the ATS contactor type to the type shown in the lower half of the display, ZENITH STANDARD.
7 YES	CONTACTOR TYPE YES> ZENITH STANDARD	Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	CONTACTOR TYPE YES> ZENITH STANDARD	ATS contactor type changed.

Display and change other ATS information.

Key Entry	Display	Description
MENU ↓	CONTACTOR RATING 2000 AMPS	Displays ATS contactor current rating. Use the numeric keys to change rating. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
ENTER ↵	CONTACTOR RATING 1000 AMPS	Displays new ATS contactor current rating.

Menu 2—ATS Status (continued)

Key Entry	Display	Description
Display and change other ATS information (continued).		
MENU ▼	MODEL NUMBER Model Number 26 CHARS Here	Displays the ATS model number, 26 character maximum. Programmable only with remote software.
MENU ▼	SPEC NUMBER Spec Number (16)	Displays the ATS specification number, 16 character maximum. Programmable only with remote software.
MENU ▼	SERIAL NUMBER 000000	Displays the ATS serial number. Enter a new number with the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	SERIAL NUMBER 654321	ATS serial number changed.
MENU ▼	CONTROL NUMBER 000000	Displays the ATS controller serial number. Enter a new number with the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	CONTROL NUMBER 123456	ATS controller serial number changed.
MENU ▼	ATS STATUS	Returns to top of menu.

2.9.3 Menu 3—Time & Date

Use Menu 3 to view and set the internal clock time and date. The power monitor uses the clock to time stamp auxiliary warning and ATS test mode occurrence times, to measure time in each ATS contactor position, and to measure the ATS test run time. Upon internal DC power loss the power monitor retains the time and date but stops the internal clock. After restoration of the internal DC power source, the system flashes a message to set the date and time. To view the date and time of power loss, review this menu immediately after restoring power and before entering the new time and date.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
3	MENU NUMBER 3	Enter 3 to access the Time & Date menu. Press the MENU ↓ key to access menu layers.
MENU ↓	TIME & DATE	Displays the top of the Time & Date menu.
MENU ↓	MONDAY 0-00-00 12:00 AM	Displays current day of week, month-day-year, and time-of-day.
MENU ↓	TIME 12:00 AM	Displays time-of-day. Enter a new time using the numeric keys and the AM/PM key to toggle between AM and PM. Press the ENTER ↵ key to confirm and return to screen with date and time shown above.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
MENU ↓	DATE 0-00-00	Displays month-day-year. Enter a new date using the numeric keys. Press the ENTER ↵ key to confirm and return to screen with date and time shown above.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
MENU ↓	TIME & DATE	Returns to top of menu.

2.9.4 Menu 4—System Settings

Use Menu 4 to view and change electrical system settings: the system voltage, frequency, and type (single-phase, three-phase wye, or three-phase delta). Recalibrate the unit after changing system settings, see Section 2.9.7—Calibration.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
4	MENU NUMBER 4	Enter 4 to access the System Settings menu. Press the MENU ↓ key to access menu layers.
MENU ↓	SYSTEM SETTINGS	Displays the top of the System Settings menu.
MENU ↓	SYSTEM VOLTAGE 208	Displays system voltage. Use the numeric keys to enter a new voltage. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	SYSTEM VOLTAGE 220	System voltage changed.
MENU ↓	SYSTEM FREQUENCY 60	Displays system frequency. Use the numeric keys to enter a new frequency. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	SYSTEM FREQUENCY 50	System frequency changed.

Electrical system type setting—three-phase wye or delta connection or single-phase. Screen displayed depends upon the setting. Press the MENU ↓ key and go to the section between the heavy shaded bars based on the display information.

The display shows *SINGLE PHASE.*

MENU ↓	SINGLE PHASE ->	Displays this screen when set to single-phase.

To change to three-phase press the MENU → key.

MENU →	THREE PHASE? NO	Displays the three-phase choice on the submenu. Press the YES key if the monitored system is three-phase.
7 YES	THREE PHASE? YES	Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	THREE PHASE WYE -> DELTA? NO	Changed to three-phase wye or delta.

Key Entry	Display	Description
	OR	
The display shows *THREE PHASE WYE* or *THREE PHASE DELTA.*		
MENU ↓	THREE PHASE WYE -> DELTA? NO	Displays this screen when set to three-phase wye connection.
	OR	
MENU ↓	THREE PHASE DELTA-> WYE? NO	Displays this screen when set to three-phase delta connection.
	THEN	
To change to single-phase press the MENU → key.		
MENU →	SINGLE PHASE? NO	Pressing MENU → key shows the three-phase choice on the submenu. Press the YES key if the monitored system is single-phase.
7 YES	SINGLE PHASE? YES	Confirm with the ENTER ↲ key.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	SINGLE PHASE ->	Changed to single-phase.
	OR	
To change the three-phase connection type press the YES key.		
7 YES	THREE-PHASE WYE -> DELTA? YES	To change from three-phase wye to delta. Confirm with the ENTER ↲ key.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	THREE-PHASE DELTA -> WYE? NO	Changed to three-phase delta.
	OR	

Menu 4—System Settings (continued)

Key Entry	Display	Description
7 YES	THREE-PHASE DELTA -> WYE? YES	To change from three-phase delta to wye. Confirm with the ENTER ↲ key.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	THREE-PHASE WYE ->* DELTA? NO	Changed to three-phase wye.
MENU ↓	SYSTEM SETTINGS	Returns to top of menu.

2.9.5 Menu 5—User-Defined Functions

Use Menu 5 to view and change the inhibit time delays for the auxiliary warning contact inputs 1-6.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
5	MENU NUMBER 5	Enter 5 to access the User-Defined Functions menu. Press the MENU ↓ key to access menu layers.
MENU ↓	USER DEFINED FUNCTIONS	Displays the top of the User-Defined Functions menu.

Use the following section to view and set up the inhibit time delays in minutes:seconds for auxiliary warning contact inputs 1-6.

The inhibit time delay is the time after the system detects contact closure on the auxiliary warning contact input before triggering a system warning condition and turning on the corresponding relay driver output (RDO).

Note: If auxiliary warning contact inputs 1-6 are renamed using the remote communications software, the new name appears in the same location in the menu instead of *Auxiliary 1-6.*

MENU ↓	Auxiliary 1 DELAY :00 MIN:SEC	Displays auxiliary warning contact input 1 time delay. Enter a new time delay using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	Auxiliary 1 ENTRY ACCEPTED	System confirms the entry.
	Auxiliary 1 DELAY :33 MIN:SEC	Time delay changed.
MENU ↓	Auxiliary 2 DELAY :00 MIN:SEC	Displays auxiliary warning contact input 2 time delay. Enter a new time delay using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	Auxiliary 2 ENTRY ACCEPTED	System confirms the entry.
	Auxiliary 2 DELAY :02 MIN:SEC	Time delay changed.
MENU ↓	Auxiliary 3 DELAY :00 MIN:SEC	Displays auxiliary warning contact input 3 time delay. Enter a new time delay using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	Auxiliary 3 ENTRY ACCEPTED	System confirms the entry.
	Auxiliary 3 DELAY :56 MIN:SEC	Time delay changed.
MENU ↓	Auxiliary 4 DELAY :00 MIN:SEC	Displays auxiliary warning contact input 4 time delay. Enter a new time delay using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	Auxiliary 4 ENTRY ACCEPTED	System confirms the entry.
	Auxiliary 4 DELAY 1:00 MIN:SEC	Time delay changed.

Menu 5—User-Defined Functions (continued)

Key Entry	Display	Description
MENU ▼	Auxiliary 5 DELAY :00 MIN:SEC	Displays auxiliary warning contact input 5 time delay. Enter a new time delay using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	Auxiliary 5 ENTRY ACCEPTED	System confirms the entry.
	Auxiliary 5 DELAY :59 MIN:SEC	Time delay changed.
MENU ▼	Auxiliary 6 DELAY :00 MIN:SEC	Displays auxiliary warning contact input 6 time delay. Enter a new time delay using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	Auxiliary 6 ENTRY ACCEPTED	System confirms the entry.
	Auxiliary 6 DELAY :45 MIN:SEC	Time delay changed.
MENU ▼	USER DEFINED FUNCTIONS	Returns to top of menu.

2.9.6 Menu 6—System History

Menu 6 contains the last four auxiliary warning or ATS test occurrence times if any exist. The sample events shown illustrate how typical events appear. There is no alterable data or settings in this menu.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
6	MENU NUMBER 6	Enter 6 to access the System History menu. Press the MENU ↓ key to access menu layers.
MENU ↓	SYSTEM HISTORY	Displays the top of the System History menu.

Note: The structure of the System History menu depends upon the number system alert events stored in memory.

Display shows *NO EVENTS* when no events are logged.

MENU ↓	NO EVENTS

OR

Displays 1 to 4 of the last events, most recent first.

The time and date shown is for the start of the event. For *Auxiliary 1-6* it is the time and date that the corresponding inhibit time delay completed timing after contact closure. For *TEST MODE ACTIVE* it is the time and date that the ATS test mode was activated.

Note: If auxiliary warning contact inputs 1-6 are renamed using the remote communications software, the new name appears in the system history instead of *Auxiliary 1-6*.

MENU ↓	Auxiliary 2 9-9-97 1:01 PM
MENU ↓	TEST MODE ACTIVE 8-8-97 9:34 AM
MENU ↓	Auxiliary 1 7-7-97 6:00 PM
MENU ↓	Auxiliary 2 7-7-97 5:59 PM

MENU ↓	SYSTEM HISTORY	Returns to top of menu.

2.9.7 Menu 7—Calibration

Use Menu 7 (programming mode on) to perform calibration. Perform calibration only at installation, after changes in system settings and/or the electrical system, or after servicing of internal components. Only trained and qualified personnel should perform calibration.

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening enclosure.

(under 600 Volt)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect power sources before servicing. Install barrier after adjustments, maintenance, or service.

(under 600 Volt)

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Only trained and qualified personnel should open power monitor enclosure.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove wristwatch, rings, and jewelry before servicing equipment.

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Transfer switch or generator set, when part of the system, can automatically energize power monitor or accessories. Disconnect all power sources before opening enclosure. Move generator set master switch on controller to OFF position and disconnect battery negative (–) lead before proceeding.

Current transformer voltage. Hazardous voltage can cause severe injury or death. Do not disconnect current transformer leads and reenergize the power source or equipment damage and personal injury may occur. If the situation requires reenergizing the power source, reconnect the current transformer leads or short leads together first.

NOTICE

Electrostatic discharge damage! Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

NOTE

Calibration requires a meter with a minimum accuracy of 1% to obtain accurate readings.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
7 YES	MENU NUMBER 7	Enter 7 to access the Calibration menu. Press the MENU ↓ key to access menu layers.
MENU ↓	CALIBRATION	Displays the top of the Calibration menu.

Menu 7—Calibration (continued)

Key Entry	Display	Description

Autozero.

Note: Perform autozero only with all AC voltage, AC current, and analog auxiliary DC inputs at zero. Perform autozero typically at installation only. See Section 7.4.3—Calibrating Unit to zero input signals prior to autozeroing.

MENU ▼	AUTO-ZERO?	Displays the autozero choice menu layer. Perform autozero to calibrate the voltage and current readings to zero for zero input signals. Press the YES key to perform autozero.
7 YES	AUTO-ZERO? YES	Confirm with the ENTER ↲ key.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	AUTO-ZERO?	**Note**: Autozero completed. See Section 7.4.3 step 3 to reconnect all AC voltage, AC current, and analog auxiliary DC inputs before continuing.

AC voltage calibration, single- and three-phase systems.

MENU ▼	L1-L2 VOLTS 00	Measure L1-L2 voltage with a meter and enter voltage using numeric keys. Confirm with the ENTER ↲ key.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	L1-L2 VOLTS 476	The power monitor calibrates L1-L2 to the voltage entered.

AC voltage calibration, three-phase systems only.

MENU ▼	L2-L3 VOLTS 00	Measure L2-L3 voltage with a meter and enter voltage using numeric keys. Confirm with the ENTER ↲ key.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	L2-L3 VOLTS 476	The power monitor calibrates L2-L3 to the voltage entered.
MENU ▼	L3-L1 VOLTS 00	Measure L3-L1 voltage with a meter and enter voltage using numeric keys. Confirm with the ENTER ↲ key.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	L3-L1 VOLTS 476	The power monitor calibrates L3-L1 to the voltage entered.

Menu 7—Calibration (continued)

Key Entry	Display	Description
AC voltage calibration, single- and three-phase systems.		
MENU ▼	L1-L0 VOLTS 00	Measure L1-L0 voltage with a meter and enter voltage using numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	L1-L0 VOLTS 275	The power monitor calibrates L1-L0 to the voltage entered.
MENU ▼	L2-L0 VOLTS 00	Measure L2-L0 voltage with a meter and enter voltage using numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	L2-L0 VOLTS 275	The power monitor calibrates L2-L0 to the voltage entered.
AC voltage calibration, three-phase systems only.		
MENU ▼	L3-L0 VOLTS 00	Measure L3-L0 voltage with a meter and enter voltage using numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	L3-L0 VOLTS 275	The power monitor will calibrate L3-L0 to the voltage entered.
AC current calibration, single- and three-phase systems.		
MENU ▼	L1 AMPS 00	Measure L1 current with a meter and enter current in amps using numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	L1 AMPS 123	The power monitor calibrates L1 to the current entered.
MENU ▼	L2 AMPS 00	Measure L2 current with a meter and enter current in amps using numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	L2 AMPS 123	The power monitor calibrates L2 to the current entered.

Menu 7—Calibration (continued)

Key Entry	Display	Description

AC current calibration, three-phase systems only.

Key Entry	Display	Description
MENU ▼	L3 AMPS 00	Measure L3 current with a meter and enter current in amps using numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	L3 AMPS 123	The power monitor calibrates L3 to the current entered.

The terminals to measure voltages for DC calibration are on terminal strip TB1 of the power monitor interconnection circuit board. See Section 7.5 Terminal Strip Identification.

DC calibration, Supply VDC.

Key Entry	Display	Description
MENU ▼	SUPPLY VDC 11.8	Measure the DC voltage from Accessory DC Power Supply Negative (TB1-1 through TB1-5) to Accessory DC Power Supply Positive (TB1-18 through TB1-20) with a meter and enter the voltage multiplied by ten using the numeric keys. For example, if 12.0 vdc was measured, enter 120. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	SUPPLY VDC 12.0	The power monitor calibrates Supply VDC to the voltage entered.

DC calibration, Analog Auxiliary 1 and 2.

To calibrate analog auxiliary inputs measure the DC voltage on the corresponding analog auxiliary input terminal with a meter and enter the desired display value (from 0.1 to 100.0) at the calibration point multiplied by ten. Record the voltage and display values at calibration for future reference.

Note: Calibrating analog auxiliary inputs when the input voltage is zero or varying can result in inaccurate readings.

Note: Once the display scale for each input is set by calibration, readings for analog auxiliary inputs will display the input voltage 0-10 vdc on the scale linearly subject to the display limit of 0-999.9.

Note: If the analog auxiliary inputs 1 or 2 are renamed using the remote communications software, the new name appears instead of *Analog Auxiliary 1* or *Analog Auxiliary 2.*

Key Entry	Display	Description
MENU ▼	Analog Auxiliary 1 0.0	Measure the DC voltage from Accessory DC Power Supply Negative (TB1-1 through TB1-5) to Analog Auxiliary Input 1 Positive (TB1-17) with a meter and enter the desired display value at the calibration point multiplied by ten. For example, if 5.0 vdc was measured and full scale of 100.0 is the desired display value at 5.0 vdc, enter 1000 using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	Analog Auxiliary 1 100.0	The power monitor calibrates the display of analog auxiliary input 1 to read 100.0 for a 5.0 volt input. The system will display other voltages linearly on this scale. For example, if the input voltage drops to 2.5 vdc it will display 50.0 and if the voltage increases to 10 vdc, it will display 200.0.

Menu 7—Calibration (continued)

Key Entry	Display	Description
MENU ↓	Analog Auxiliary 2 0.0	Measure the DC voltage from Accessory DC Power Supply Negative (TB1-1 through TB1-5) to Analog Auxiliary Input 2 Positive (TB1-16) with a meter and enter the desired display value at the calibration point multiplied by ten. For example, if 3.0 vdc was measured and 30.0 is the desired display value for 3.0 vdc enter 300 with the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	Analog Auxiliary 2 30.0	The power monitor calibrates the display of analog auxiliary 2 to read 30.0 for a 3.0 volt input. The system will display other voltages linearly on this scale. For example, it will display 100.0 if the input voltage is 10 vdc and 10.0 if the input voltage is 1 vdc.
MENU ↓	CALIBRATION	Returns to top of menu.

2.9.8 Menu 8—Remote Control

Use Menu 8 to view and change remote monitoring and control parameters for on-line PC connections.

If a PC connection is not used for monitoring and control, enter NO for *REMOTE CONTROL, ON–LINE*? Refer to the operation and installation manual for the Remote Monitoring and Control Communications Software for details on remote monitoring and control.

NOTE

There are four remote monitoring and control connection types: Local, Local Area Network, Remote, and Remote Area Network. Enabling the setting for one type by entering YES disables the other three.

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
8 NO	MENU NUMBER 8	Enter 8 to access the Remote Control menu. Press the MENU ↓ key to access menu layers.
MENU ↓	REMOTE CONTROL	Displays the top of the Remote Control menu.

On-line—select to use a PC connection.

MENU ↓	REMOTE CONTROL ON-LINE? NO	Monitoring and control by a PC connection disabled. Press the YES key to enable monitoring and control by a PC connection.
7 YES	REMOTE CONTROL ON-LINE? YES	Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL ON-LINE? YES	Monitoring and control by a PC connection enabled.

OR

MENU ↓	REMOTE CONTROL ON-LINE? YES	Monitoring and control by a PC connection enabled. Press the NO key to disable monitoring and control by a PC connection.
8 NO	REMOTE CONTROL ON-LINE? NO	Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL ON-LINE? NO	Monitoring and control by a PC connection disabled. To bypass the rest of this menu press the RESET MENU key.

Menu 8—Remote Control (continued)

Key Entry	Display	Description
Local connection—select to connect a PC directly to the power monitor.		
MENU ↓	REMOTE CONTROL LOCAL? NO	Monitoring and control by a local (direct) PC connection to a single device disabled. Press the YES key to enable this type of connection.
7 YES	REMOTE CONTROL LOCAL? YES	Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL LOCAL? YES	Monitoring and control by a local (direct) PC connection to a single device enabled. Other PC connections are disabled (see NOTE).
OR		
MENU ↓	REMOTE CONTROL LOCAL? YES	Monitoring and control by a local (direct) PC connection to a single device already enabled.
Local Area Network connection—select to connect a PC to a network of devices.		
MENU ↓	REMOTE CONTROL -> LOCAL AREA NET? NO	Monitoring and control by a local (direct) PC connection to a Local Area Network (LAN) of devices disabled. Press the YES key to enable this type of connection.
7 YES	REMOTE CONTROL -> LOCAL AREA NET? YES	Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL -> LOCAL AREA NET? YES	Monitoring and control by a local (direct) PC connection to a Local Area Network (LAN) of devices enabled. Other PC connection types are disabled (see NOTE).
OR		
MENU ↓	REMOTE CONTROL -> LOCAL AREA NET? YES	Monitoring and control by a local (direct) PC connection to a Local Area Network (LAN) of devices already enabled.

To view and set the Address of the device on the Local Area Network press the MENU → key.

MENU →	REMOTE CONTROL -> ADDRESS? 01	Displays the Address of the device on the Local Area Network. Each device must have a unique Address. Enter a new Address using numeric keys and press the ENTER ↵ key to confirm.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL -> ADDRESS? 02	New LAN address entered.

Key Entry	Display	Description

Remote connection—select to connect a PC to the power monitor over modems.

Key Entry	Display	Description
MENU ↓	REMOTE CONTROL REMOTE? NO	Control by a remote (via modem) PC connection to a single device disabled. Press the YES key to enable this type of connection.
7 YES	REMOTE CONTROL -> REMOTE? YES	Confirm with the ENTER ↲ key.
ENTER ↲	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL -> REMOTE? YES	Monitoring and control by a remote (via modem) PC connection to a single device enabled. Other PC connection types are disabled (see NOTE).

OR

Key Entry	Display	Description
MENU ↓	REMOTE CONTROL -> REMOTE? YES	Monitoring and control by a remote (via modem) PC connection to a single device already enabled.

To view and set the System ID for the Remote connection, press the MENU → key.

Key Entry	Display	Description
MENU →	REMOTE CONTROL -> SYSTEM ID 0000	Displays the System ID, a password for remote (via modem) PC connections. Enter a new System ID using the numeric keys. Confirm with the ENTER ↲ key.
ENTER ↲	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL -> SYSTEM ID 1234	New system ID number entered.

Remote Area Network connection—select to connect a PC to a network of devices over modems.

Key Entry	Display	Description
MENU ↓	REMOTE CONTROL -> REMOTE AREA NET? NO	Monitoring and control by a remote (via modem) PC connection to a Local Area Network (LAN) of devices disabled. Press the YES key to enable this type of connection.
7 YES	REMOTE CONTROL -> REMOTE AREA NET? YES	Confirm with the ENTER ↲ key.
ENTER ↲	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL -> REMOTE AREA NET? YES	Monitoring and control by a remote (via modem) PC connection to a Local Area Network (LAN) of devices enabled. Other PC connections are disabled (see NOTE).

OR

Key Entry	Display	Description
MENU ↓	REMOTE CONTROL -> REMOTE AREA NET? YES	Monitoring and control by a remote (via modem) PC to a Local Area Network (LAN) of devices already enabled.

Menu 8—Remote Control (continued)

Key Entry	Display	Description

To view and set the System ID for the Remote Area Network connection, press the MENU → key.

Key Entry	Display	Description
MENU →	REMOTE CONTROL -> SYSTEM ID 0000	Displays the System ID, a password for remote (via modem) PC connections. Use the same System ID for all devices on the same Local Area Network. Enter a new System ID using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL -> SYSTEM ID 4567	System ID entered.

To view and set the Address of the device on the Local Area Network, press the MENU → key.

Key Entry	Display	Description
MENU →	REMOTE CONTROL -> ADDRESS 01	Displays the Address of the device on the Local Area Network. Each device must have a unique address on the same network. Enter a new Address using numeric keys and press the ENTER ↵ key to confirm.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL -> ADDRESS 32	Address entered.

Setting the baud rate.

Key Entry	Display	Description
MENU ↓	REMOTE CONTROL BAUD RATE 2400	Displays the baud rate. Standard baud rates are 2400, 4800, and 9600. Enter a new baud rate using the numeric keys. Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE CONTROL ENTRY ACCEPTED	System confirms the entry.
	REMOTE CONTROL BAUD RATE 9600	Baud rate changed.
MENU ↓	REMOTE CONTROL	Returns to top of menu.

2.9.9 Menu 9—Programming Mode

Use Menu 9 to view and change programming modes. Choose from three programming modes: Local (using the local display and keypad), Remote (using an on-line PC connection), and Off (no programming). Turning one of these modes on (YES) turns all others off (NO).

Key Entry	Display	Description
RESET MENU	ENTER NO. 1 - 9	Press the RESET MENU key to access the main menu.
9	MENU NUMBER 9	Enter 9 to access the Programming Mode menu. Press the MENU ↓ key to access menu layers.
MENU ↓	PROGRAMMING MODE	Displays the top of the Programming Mode menu.

Local programming mode—enables programming of settings only from the keypad.

MENU ↓	PROGRAMMING MODE LOCAL? NO	Not in the local programming mode. Press the YES key to turn on the local programming mode.
7 YES	PROGRAMMING MODE LOCAL? YES	Confirm to turn on the local programming mode with the ENTER ↵ key.
ENTER ↵	LOCAL? ENTER CODE *	Type in the password. Initial factory password is the digit 0. An asterisk (*) appears for each digit in the password. Confirm with the ENTER ↵ key.
ENTER ↵	LOCAL? ENTRY ACCEPTED	System confirms entry.
	PROGRAMMING MODE LOCAL? YES	Display indicates that the power monitor is in the local programming mode; the Programming Mode LED should flash continuously. **Note:** Read and understand Section 2.9 Programming Mode On before accessing other menus.

OR

MENU ↓	PROGRAMMING MODE LOCAL? YES	Display indicates that the power monitor is already in the local programming mode; the Programming Mode LED should flash continuously. **Note:** Read and understand Section 2.9 Programming Mode On before accessing other menus.

Menu 9—Programming Mode (continued)

Key Entry	Display	Description

Remote programming mode—enables programming of settings from a PC connection, not the keypad.

Key Entry	Display	Description
MENU ▼	PROGRAMMING MODE REMOTE? NO	Not in the remote programming mode. Press the YES key to turn on the remote programming mode.
7 YES	PROGRAMMING MODE REMOTE? YES	Confirm to turn on the remote programming mode with the ENTER ↵ key.
ENTER ↵	REMOTE? ENTER CODE *	Type in the current password. Initial factory password is the digit 0. An asterisk (*) appears for each digit in the password. Confirm with the ENTER ↵ key.
ENTER ↵	REMOTE? ENTRY ACCEPTED	System confirms entry.
	PROGRAMMING MODE REMOTE? YES	Display indicates that the power monitor is in the remote programming mode; the Programming Mode LED should light continuously. **Note:** Read and understand the operation manual for the remote communications software for changing settings under remote control.

OR

MENU ▼	PROGRAMMING MODE REMOTE? YES	Display indicates that the power monitor is in the remote programming mode; the Programming Mode LED should light continuously. **Note:** Read and understand the operation manual for the remote communications software for changing settings under remote control.

Programming Off—select to disable all programming.

MENU ▼	PROGRAMMING MODE OFF? NO	Programming enabled. Press the YES key to turn both local and remote programming modes off.
7 YES	PROGRAMMING MODE OFF? YES	Confirm to turn all programming modes off with the ENTER ↵ key.
ENTER ↵	OFF? ENTER CODE *	Type in the password. Initial factory password is the digit 0. An asterisk (*) appears for each digit in the password. Confirm with the ENTER ↵ key.
ENTER ↵	OFF? ENTRY ACCEPTED	System confirms entry.
	PROGRAMMING MODE OFF? YES	Display indicates that all power monitor programming modes are off; Programming Mode LED should be off.

OR

MENU ▼	PROGRAMMING MODE OFF? YES	Display indicates that all power monitor programming modes are already off; Programming Mode LED should be off.

Menu 9—Programming Mode (continued)

Key Entry	Display	Description
Changing the password.		
MENU ↓	PROGRAM MODE -> ACCESS	Displays programming mode access display. Press the MENU → key to access the submenu to change the programming mode password.
MENU →	PROGRAM MODE ACCESS CHANGE CODE? NO	Programming mode password change access submenu. **Note:** Use care when changing the programming mode password. The password is required to change programming modes. Press the YES key to continue the change password dialog. **Press the RESET MENU or MENU → key at any time to abort.**
7 YES	PROGRAM MODE ACCESS CHANGE CODE? YES	Press the ENTER ↵ key to confirm that you want to change the password. **Press the RESET MENU or MENU → key at any time to abort.**
ENTER ↵	PROGRAM MODE ACCESS ENTER OLD CODE *	Type the old password and confirm with the ENTER ↵ key.
ENTER ↵	PROGRAM MODE ACCESS ENTER NEW CODE******	Carefully type the new password using the numeric keys, 6 digits maximum. Record the password and keep it in a safe place or memorize it. Confirm the new password with the ENTER ↵ key.
ENTER ↵	ENTRY ACCEPTED	System confirms entry.
	PROGRAM MODE -> ACCESS	Password changed.
MENU ↓	PROGRAMMING MODE	Returns to top of menu.

Notes

3.1 General

Under normal operating conditions the power monitor requires little service or maintenance. Maintenance procedures include cleaning and inspecting the electrical system components for signs of trouble. Refer to the service schedule below for maintenance procedures and service intervals.

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening enclosure.

(under 600 Volt)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect power sources before servicing. Install barrier after adjustments, maintenance, or service.

(under 600 Volt)

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Only trained and qualified personnel should open power monitor enclosure.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove wristwatch, rings, and jewelry before servicing equipment.

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Transfer switch or generator set, when part of the system, can automatically energize power monitor or accessories. Disconnect all power sources before opening enclosure. Move generator set master switch on controller to OFF position and disconnect battery negative (–) lead before proceeding.

Current transformer voltage. Hazardous voltage can cause severe injury or death. Do not disconnect current transformer leads and reenergize the power source or equipment damage and personal injury may occur. If the situation requires reenergizing the power source, reconnect the current transformer leads or short leads together first.

NOTICE

Electrostatic discharge damage! Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

Check the condition of the power monitor and accessories. Carefully remove any accumulated debris using a vacuum cleaner. Do not use compressed air because it could cause contaminants to lodge inside internal components and cause damage. Replace any worn or broken components. Tighten any loose hardware.

3.2 Service Schedule

Follow the service schedule below for recommended service intervals.

System—Component	Maintenance Procedure					Frequency
	Visually Inspect	Check	Change	Clean	Test	
AC ELECTRICAL SYSTEM						
Lamp test	X				X	W
General Inspection	X					W
Fuses**	X	X	R	X	X	M
Wire abrasions where subject to motion	X	X				Q
Safety and alarm operation		X			X	S
Tighten control and power wiring connections		X				Y
Calibration		X			X	Y
Wire-cable insulation breakdown	X				X	3 Y or 500 hrs
REMOTE CONTROL SYSTEM, ETC.						
Remote control					X	M
Automatic Transfer Switch (ATS) Test					X	M
GENERAL CONDITION OF EQUIPMENT						
Any condition of vibration, leakage, noise, temperature, or deterioration	X	X		X		W
Compartment condition*	X			X		S
Check that all hardware is in place and tightened		X				Y
* Service more frequently if operated in dusty areas ** Do not break manufacturer's seals or internally inspect these devices	X Action R Replace as necessary					W=Weekly M=Monthly Q=Quarterly S=Six Months Y=Yearly

4.1 General

When problems occur, do not overlook simple causes which might seem too obvious to consider. For example, if the power monitor does not display, the display may have shut down automatically because of inactivity or its power supply has been turned off.

Refer to the troubleshooting table below as a guide to possible problems. Causes are listed in the order of likelihood of causing the problem. If these procedures cannot correct the trouble, contact an authorized service distributor/dealer for assistance.

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(under 600 Volt)

⚠ WARNING

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Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Transfer switch or generator set, when part of the system, can automatically energize power monitor or accessories. Disconnect all power sources before opening enclosure. Move generator set master switch on controller to OFF position and disconnect battery negative (–) lead before proceeding.

Current transformer voltage. Hazardous voltage can cause severe injury or death. Do not disconnect current transformer leads and reenergize the power source or equipment damage and personal injury may occur. If the situation requires reenergizing the power source, reconnect the current transformer leads or short leads together first.

NOTICE

Electrostatic discharge damage! Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

4.2 Troubleshooting Chart

Problem	Possible Cause	Maintenance or Service Procedure
Power monitor display is blank	No key pressed on the keypad in the last 5 minutes.	Press any key on the keypad.
	Main AC power input disconnected at circuit breaker or fuse box (AC powered systems).	Reconnect main AC power input at circuit breaker or fuse box.
	Reversed or poor DC power connections (DC powered systems).	Check the connections to DC terminal strip TB1 on the power monitor interconnection circuit board. The negative wire from the DC power supply connects to terminal 5 (DC power supply positive input) and the positive wire connects to terminal 21 (DC power supply positive input). Check that conductors and terminals are clean and terminals are tight.
	Insufficient DC power supply (DC powered systems).	The power monitor requires a minimum of 10 vdc to operate. If the DC power supply is a battery, the battery could need recharging or replacement. If the battery is part of another piece of equipment, consult the operation and/or service manual of that equipment for service information.
	Fuse blown or missing on power monitor interconnection circuit board.	Check fuse F1 on the power monitor interconnection circuit board and replace with the correct type if blown or missing. If fuse blows again contact an authorized service distributor/dealer.
	Failure of main AC power source.	Check for main AC power.
	AC transformer accessory incorrectly wired, failed, or not receiving power (AC powered systems).	Check the connections of the transformer accessory secondary wires (red and blue) to the power monitor interconnection circuit board AC input terminal strip TB2 terminals LAC and LAS. Also check the connections to the primary winding of the transformer accessory (black and white wires).
	Power monitor not receiving power or requires repair.	Contact an authorized service distributor/dealer.
Power monitor displays wrong AC voltage and current screens	Electrical system type setting incorrect.	Check Menu 4—System Settings and reprogram electrical system type if incorrect. Recalibrate unit after changing system settings.
AC voltage and/or current display readings zero	Main AC power input disconnected at circuit breaker or fuse box (DC powered systems).	Reconnect main AC power at circuit breaker or fuse box.
	Full or partial failure of main AC power input (DC powered systems).	Check main AC power.
	Voltage zero: Fuses corroded or dirty, or blown or missing from AC sensing fuse block or inputs not connected properly.	Check AC voltage-sensing input connections. Check fuses on AC sensing fuse block and replace with correct type if blown or missing; clean if corroded or dirty. If fuses blow again, contact an authorized service distributor/dealer.
	Current zero: Actual load currents zero or current transformer/s failed or connected improperly.	Check load. Lines showing zero current might normally have no load, be disconnected, or have a load circuit failure. Check connections to current transformers. If problem cannot be found, contact an authorized service distributor/dealer.

Troubleshooting Chart (continued)

Problem	Possible Cause	Maintenance or Service Procedure
AC voltage and/or current display readings zero (cont'd.)	Power monitor not receiving power input signals or requires repair.	Contact an authorized service distributor/dealer.
AC display readings inaccurate for any phase for voltage, current, kW, kVAR, or power factor	Main AC power supply problems.	Check main AC power.
	Incorrect system voltage or electrical system type settings	Check Menu 4—System Settings and reprogram system voltage or electrical system type if incorrect. Recalibrate unit after changing system settings.
	Incorrectly wired or failed current transformers or current transformers of incorrect rating.	Check current transformer connections, especially their polarity. Verify that the current transformers are rated for 5.0 A AC rms output current at the desired full-scale current being monitored.
	Fuses corroded or dirty, or blown or missing from AC sensing fuse block or inputs not connected properly.	Check AC voltage-sensing input connections. Check fuses on AC sensing fuse block and replace with correct type if blown or missing; clean if corroded or dirty. If fuses blow again, contact an authorized service distributor/dealer.
	Input connections loose, dirty, and/or corroded.	Tighten loose connections. Clean dirty or corroded conductors and terminals and reconnect wires to terminals.
	AC readings need recalibration.	Recalibrate AC readings. See Section 2.9.7 Menu 7—Calibration
	Power monitor receiving incorrect input signals or requires repair.	Contact an authorized service distributor
Analog auxiliary readings unusually high or low	Input connections loose, dirty, and/or corroded.	Tighten loose connections. Clean dirty or corroded conductors and terminals and reconnect wires to terminals.
	Analog auxiliary readings calibrated to an unknown scale and/or require recalibration.	Recalibrate analog auxiliary readings. See Section 2.9.7 Menu 7—Calibration.
	Power monitor receiving incorrect input signals or requires repair.	Contact an authorized service distributor/dealer.
Power monitor supply VDC reading unusually high or low	Input connections loose, dirty, and/or corroded.	Tighten loose connections. Clean dirty or corroded conductors and terminals and reconnect wires to terminals.
	Low DC power supply (DC powered systems).	If the DC power supply is a battery, the battery could need recharging or replacement. Also, the battery charger, alternator, or regulator may not be charging the battery sufficiently. If the battery is part of another piece of equipment, consult the operation and/or service manual of that equipment for service information.
	High DC power supply (DC powered systems).	If the DC power supply is a battery, check the battery charger or regulator; it could be overcharging the battery. If the battery charger or regulator is part of another piece of equipment, consult the operation and/or service manual of that equipment for service information.
	Supply VDC needs recalibration.	Recalibrate supply VDC. See Section 2.9.7 Menu 7—Calibration

Troubleshooting Chart (continued)

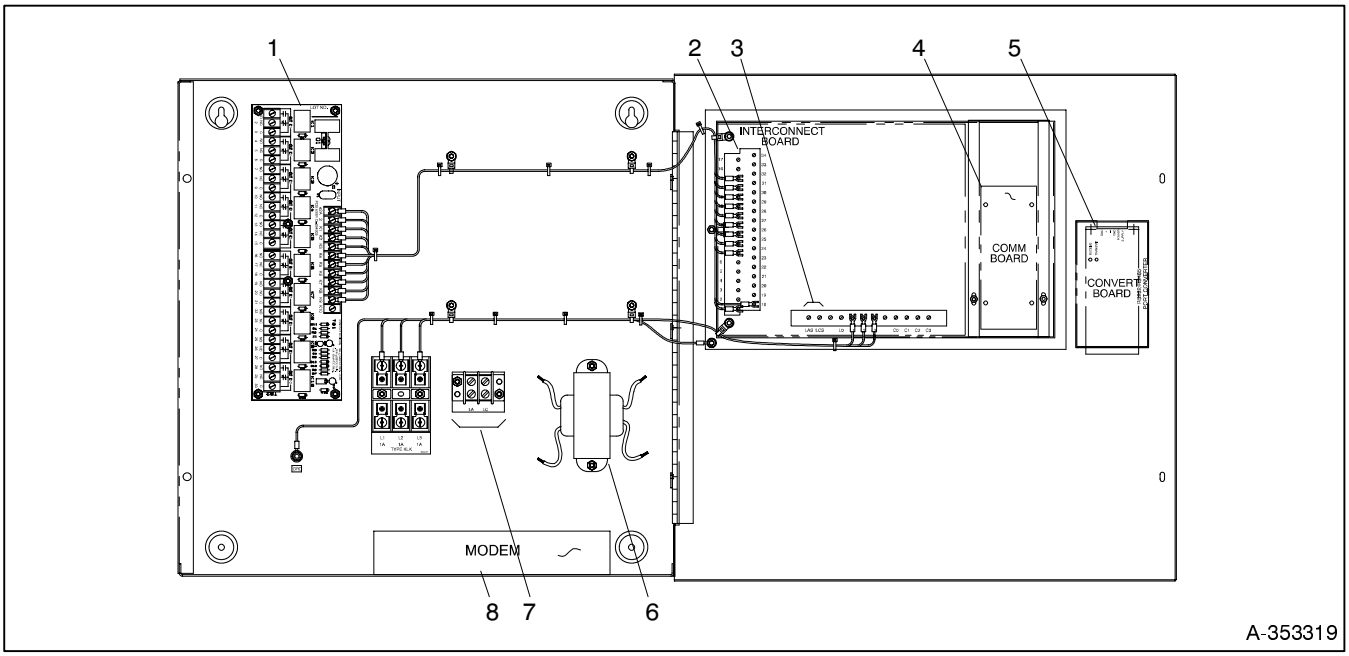
Problem	Possible Cause	Maintenance or Service Procedure
Power monitor supply VDC reading unusually high or low (cont'd.)	Incorrect AC transformer for power input (AC powered systems).	Verify that the transformer part number for the AC power supply accessory is correct for the system voltage. See Section 5—Accessories.
	Power monitor receiving incorrect input signals or requires repair.	Contact an authorized service distributor/dealer.
DC accessories do not work	Loss of power to DC accessories (terminals 18, 19, and 20 of TB1 interconnection circuit board).	Check for blown or missing fuse F2 on power monitor interconnection circuit board. If fuse is blown, check the DC control wiring for a short circuit from accessory power (terminals 18-20 of TB1) to signal ground (terminals 1-5 of TB1). Check for an accessory with power supply wired backwards. If fuse is blown or missing, replace with a fuse of the correct type. If the fuse blows again and you cannot locate the short, contact an authorized service distributor/dealer.
	DC accessories power wired improperly.	Check wiring of DC accessories. Check power supply connections.
	Power monitor or connected accessories require repair.	Contact an authorized service distributor/dealer.
Internal Error message and/or system lockup	Internal error: power monitor has detected an internal memory problem and requires repair.	Contact an authorized service distributor/dealer.
Power Down Error message	Internal error: power monitor has detected a problem storing settings when powering down.	Check the settings to see if they have been retained after power down. If settings are lost or the error message persists, contact an authorized service distributor/dealer.

Section 5. Accessories

This section shows and describes power monitor accessories available at time of print. Accessories are factory-installed or are available as kits.

5.1 Accessory Locations

See Figure 5-1 for a view of the power monitor that shows the mounting locations of accessories.



1. Ten-Relay Dry Contact Circuit Board
2. Terminal Strip TB1 for DC Power and Control Connections (Standard)
3. AC Power Supply Connection Terminals To Terminal Strip TB2 (Standard)
4. RS-232 or RS-485 Communications Module (Mounts Behind Metal Cover)
5. Internal RS-232 to RS-485 Converter
6. AC Power Supply Power Transformer
7. AC Power Supply Input Connection Terminals
8. Modem

Figure 5-1. Power Monitor Accessories (front view with enclosure door open to right)

5.2 Accessory Kits

See the table in Figure 5-2 for a list of available kits. Kit and installation instruction part numbers may change. Obtain the most current accessory information from your local authorized service distributor/dealer.

Kit Description	Kit Part Number	Installation Instructions
AC Power Supply, 50 or 60 Hz,		
110 V, 50 Hz	PA-353399	
120 V, 60 Hz	PA-353400	
190 V, 50 Hz	PA-353401	
208 V, 60 Hz	PA-353402	
220 V, 50 Hz	PA-353403	TT-1202
240 V, 60 Hz	PA-353404	
380 V, 50 Hz	PA-353405	
400 V, 50 Hz	PA-353406	
416 V, 50 Hz	PA-353407	
480 V, 60 Hz	PA-353408	
Ten-Relay Dry Contact	PA-353398	TT-1201
RS-232 Communications	PA-353395	
RS-485 Communications	PA-353396	
Internal RS-232 to RS-485 Port Converter	PA-353397	TT-847
External Modem for Power Monitor	PA-294865	

Figure 5-2. Optional Accessory Kits

Only trained and qualified personnel should install accessories. See the installation instructions supplied with the kit for information on kit mounting location. See Section 6—Diagrams and Drawings and Section 7—Installation for electrical connections not shown in accessory kit instructions or this section.

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Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening enclosure.

(under 600 Volt)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect power sources before servicing. Install barrier after adjustments, maintenance, or service.

(under 600 Volt)

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Only trained and qualified personnel should open power monitor enclosure.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove wristwatch, rings, and jewelry before servicing equipment.

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Transfer switch or generator set, when part of the system, can automatically energize power monitor or accessories. Disconnect all power sources before opening enclosure. Move generator set master switch on controller to OFF position and disconnect battery negative (–) lead before proceeding.

Current transformer voltage. Hazardous voltage can cause severe injury or death. Do not disconnect current transformer leads and reenergize the power source or equipment damage and personal injury may occur. If the situation requires reenergizing the power source, reconnect the current transformer leads or short leads together first.

NOTICE

Electrostatic discharge damage! Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

The instructions provided with accessory kits supersede instructions in this section where there are differences in procedures.

NOTE

Install AC and DC wiring in separate raceways, cables, or conduit. Observe all applicable national, state, and local electrical codes during installation.

5.3 AC Power Supply

NOTE

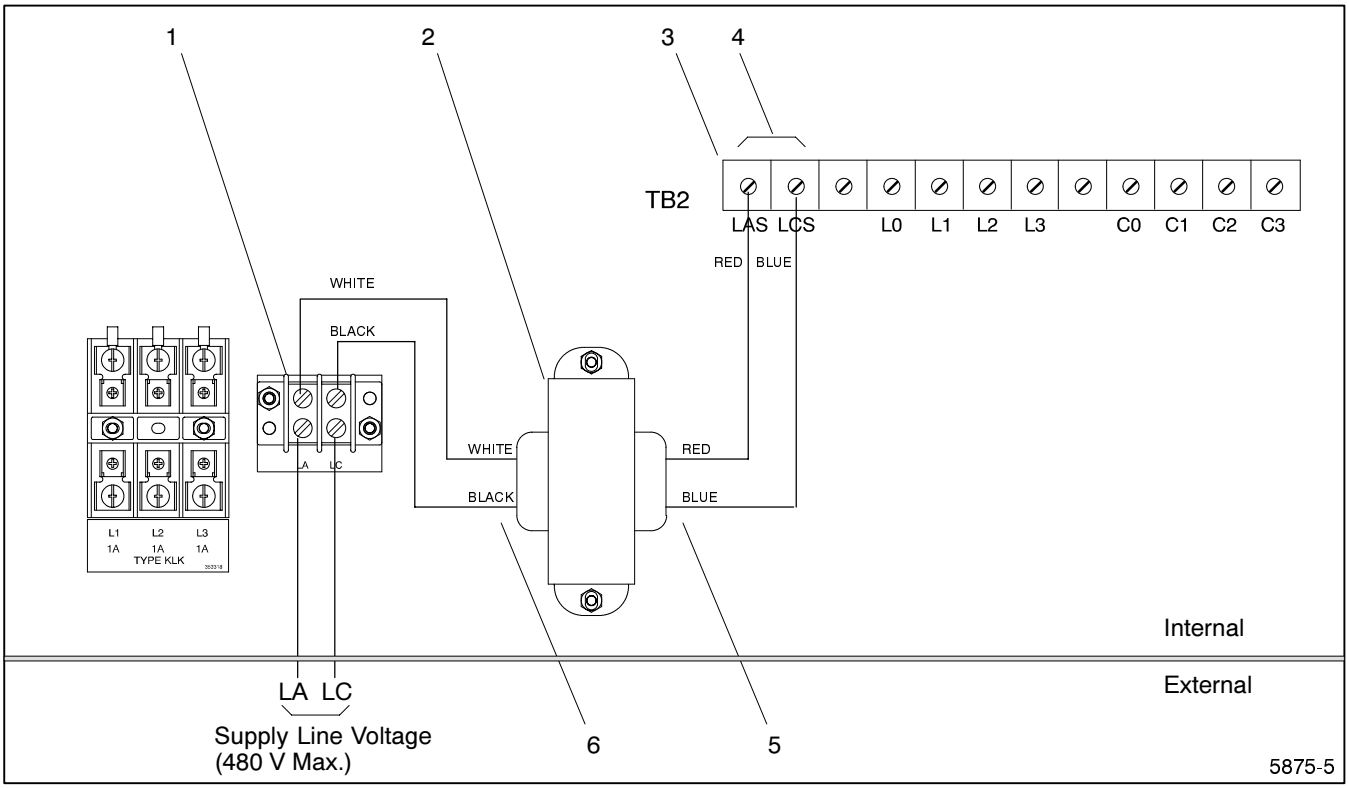
Supply power to the power monitor from a storage battery or other constant supply if performing ATS tests. A momentary loss of power will occur on the load side of an ATS during testing. If the power monitor is powered from the load side of the ATS under test using an AC power supply accessory, the power monitor will end the ATS test immediately when the momentary loss of power occurs.

An AC power supply accessory allows the power monitor to operate from line voltage. The accessory includes a power transformer that mounts on the back of the power monitor to the right of an AC input power terminal block. Accessory kits use different power transformers for each line voltage. See Figure 5-3.

Line Voltage LA-LC	Kit Part No.	Transformer Part Number
110 V, 50 Hz	PA-353399	294644
120 V, 60 Hz	PA-353400	294593
190 V, 50 Hz	PA-353401	294645
208 V, 60 Hz	PA-353402	294594
220 V, 50 Hz	PA-353403	294646
240 V, 60 Hz	PA-353404	294595
380 V, 50 Hz	PA-353405	294596
400 V, 50 Hz	PA-353406	353284
416 V, 50 Hz	PA-353407	294597
480 V, 60 Hz	PA-353408	294598

Figure 5-3. Power Transformers, 50 or 60 Hz

See Figure 5-4 for wiring connections for the AC Power Supply accessory. Connect the primary (white and black) wires of the power transformer to terminals LA and LC of the AC input power terminal block and the secondary (red and blue) wires of the power transformer to the AC input terminals LAS and LCS on terminal strip TB2 of the interconnection circuit board. Connect line voltage to the terminals LA and LC of the AC input power terminal block. Typically the line voltage feeding terminals LA and LC connects on the load side of an automatic transfer switch (ATS) so that power is available to the power monitor in the event of a power failure on the normal or emergency source.



1. AC Input Power Terminal Block
2. Power Transformer
3. Terminal Strip TB2 on Interconnection Circuit Board (For AC Connections)
4. 19 VAC Power Input Terminals LAS and LCS on TB2
5. Secondary of Power Transformer (19 VAC)
6. Primary of Power Transformer (for Supply Line Voltage)

Figure 5-4. Power Transformer Accessory Connections

5.4 Ten-Relay Dry Contact Circuit Board

The ten-relay dry contact circuit board accessory allows the power monitor to provide normally open (N.O.) and normally closed (N.C) contact outputs. These outputs could include auxiliary warning outputs 1-6 and transfer switch position outputs for normal, emergency, and off. If the dry contact circuit board accessory is already installed, it would be located to the left of the AC sensing fuse block at the back of the enclosure. Figure 5-5 shows a factory hookup of the kit where each power monitor relay driver output (RDO) is connected to an input of the dry contact kit resulting in the operation of the normally open (N.O.) and normally closed (N.C.) contact pair corresponding to that output. One relay is unused.

5.5 Communications Accessories

This section describes communications accessories that mount inside the power monitor. See the operation and installation manual for the Remote Monitoring and Control Communications Software and the installation instructions for controller communications kits for more information on communications accessories.

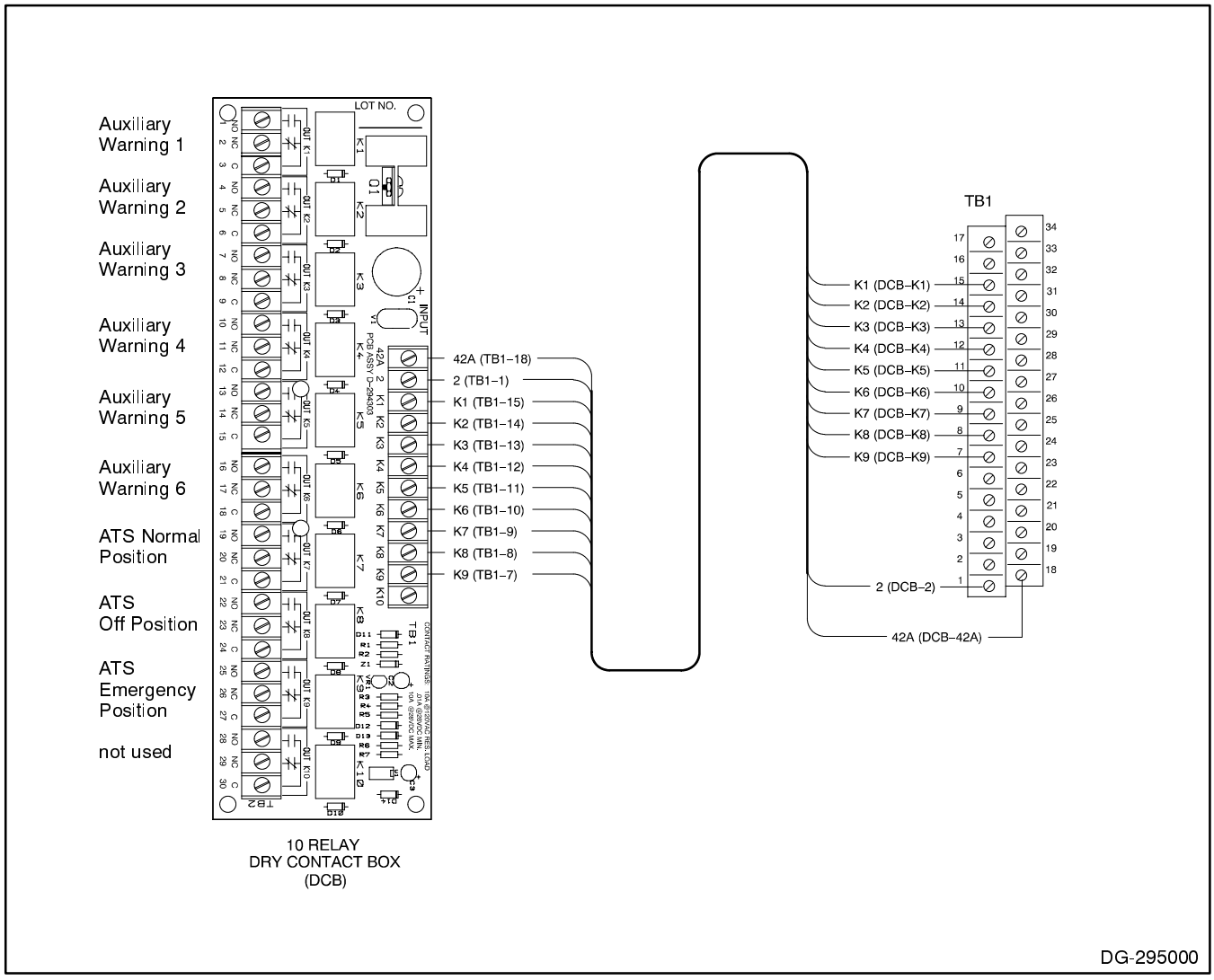


Figure 5-5. Ten-Relay Dry Contact Circuit Board and Wiring (factory hookup)

Use only Kohler communications products specified for use with Kohler products. Kohler assumes no responsibility for the use of non-Kohler products.

5.5.1 RS-232 Communications Module

An RS-232 communications module allows the power monitor to communicate with a personal computer (PC) directly or through telephone lines and a modem. The communications module mounts behind a metal cover to the right of the interconnection circuit board. A ribbon cable connects the communications module to the power monitor's microprocessor circuit board. The RS-232 communications cable attaches to the module. The other end of the RS-232 cable connects to a PC's serial COM port or a modem within 50 ft. (15 m) of the power monitor. See the communications software manual and accessory installation instructions for a complete description.

5.5.2 RS-485 Communications Module

An RS-485 communications module allows the power monitor to communicate with a PC over an RS-485 local area network (LAN) of power monitors, generator set controllers, or transfer switch controllers with a maximum total length of 4000 ft. (1220 m), or a PC connected to an RS-232 to RS-485 converter. The communications module mounts behind a metal cover to the right of the interconnection circuit board. A ribbon cable connects the communications module to the power monitor's microprocessor circuit board. One or more RS-485 communications cables connect to the module.

5.5.3 Internal RS-232 to RS-485 Converter

An internal RS-232 to RS-485 converter allows a power monitor with an installed RS-485 communication module to communicate with a personal computer (PC) directly or through telephone lines and a modem. The internal RS-232 to RS-485 converter mounts inside the power monitor at the far right of the inside of the enclosure door. An RS-485 communications cable connects from the RS-485 communications module inside the power monitor to the internal RS-232 to RS-485 converter. The required AC power supply from a wall-mounted transformer connects to an input on the converter. One end of an RS-232 cable connects to converter. The other end of the RS-232 cable connects to a PC's serial COM port or a modem within 50 ft. (15 m) of the power monitor.

5.5.4 External Modem

An external modem accessory allows a personal computer (PC) to communicate with a power monitor remotely over a telephone line. The modem accessory for the power monitor mounts inside the power monitor and connects to a telephone line and an RS-232 communication module or an internal RS-232 to RS-485 converter. See Figure 5-1. This modem is factory-set to automatically answer calls. The modem accessory for the PC connects to a telephone line and the PC serial COM port with an RS-232 cable. The PC modem is factory-set to originate calls. The modems connect using the telephone network.

Notes

Section 6. Diagrams and Drawings

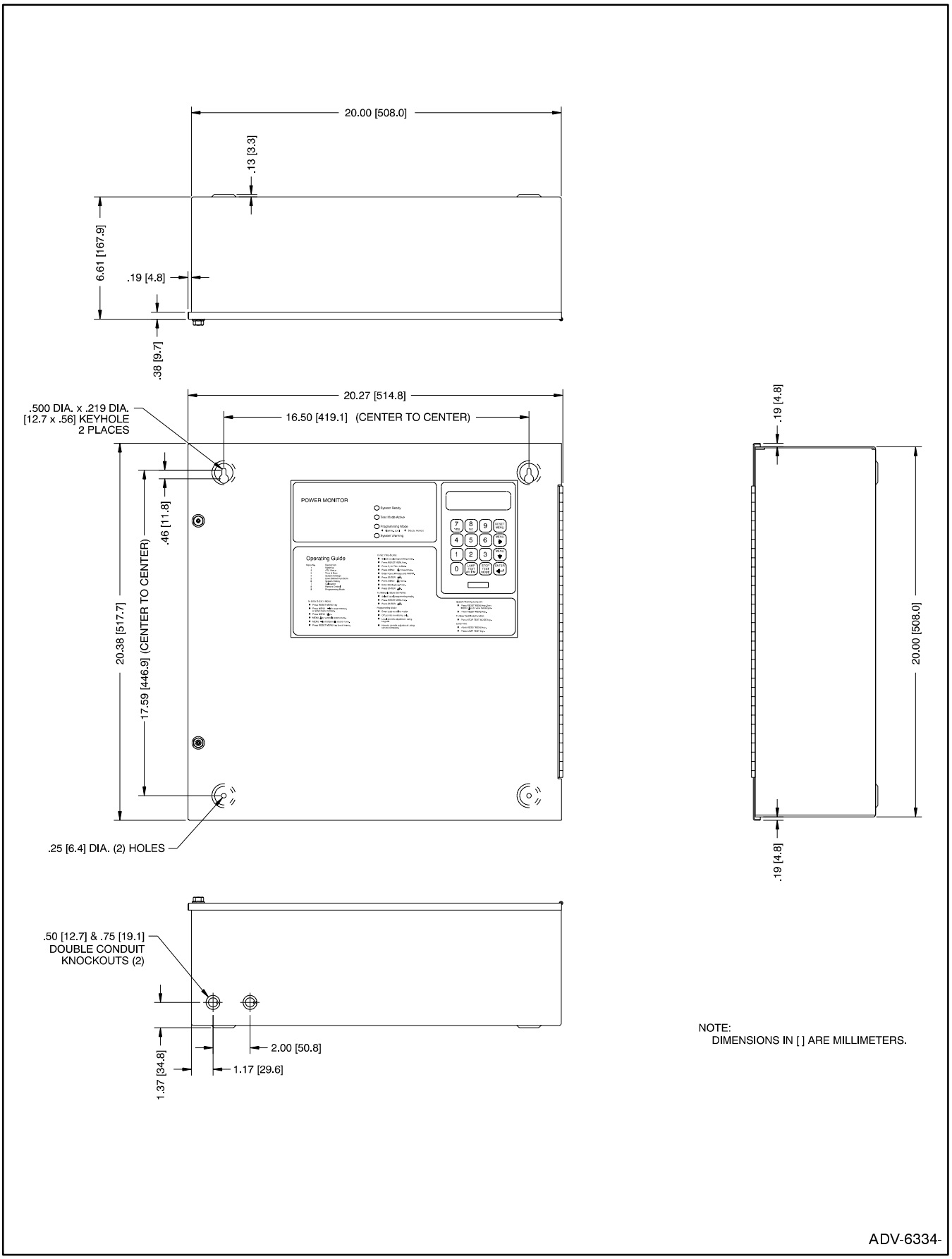


Figure 6-1. Power Monitor Enclosure Dimensions Drawing

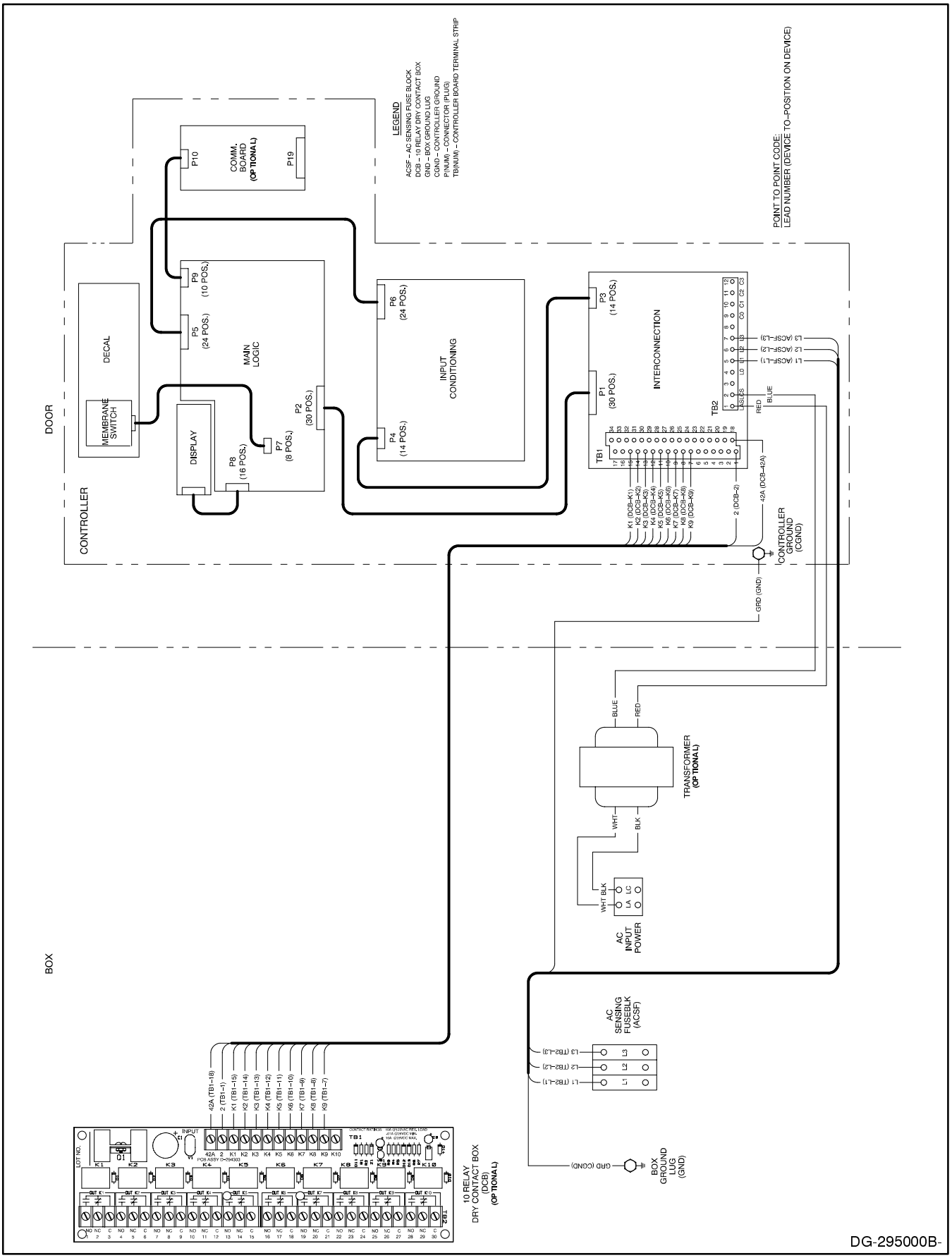


Figure 6-2. Power Monitor and Accessories Schematic Diagram

Notes

Installation of the Kohler power monitor consists of mechanically mounting and electrically wiring the unit to the monitored power source, wiring of accessories and options, and performing initial setup and calibration. Only trained and qualified personnel should perform installation.

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(under 600 Volt)

⚠ WARNING

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Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Only trained and qualified personnel should open power monitor enclosure.

Opening power monitor enclosure. Hazardous voltage can cause severe injury or death. Transfer switch or generator set, when part of the system, can automatically energize power monitor or accessories. Disconnect all power sources before opening enclosure. Move generator set master switch on controller to OFF position and disconnect battery negative (–) lead before proceeding.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove wristwatch, rings, and jewelry before servicing equipment.

Current transformer voltage. Hazardous voltage can cause severe injury or death. Do not disconnect current transformer leads and reenergize the power source or equipment damage and personal injury may occur. If the situation requires reenergizing the power source, reconnect the current transformer leads or short leads together first.

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7.1 Upon Receipt of Unit

7.1.1 Inspection

At time of delivery, inspect the power monitor for signs of shipping damage. If damage and/or rough handling is evident, file a damage claim immediately with the transportation company and promptly notify the distributor/dealer.

7.1.2 Unpacking

If the power monitor has been stored at cold temperatures, allow it to warm to room temperature for 24 hours (minimum) before unpacking to prevent condensation on the components from surrounding moist air.

Unpack the power monitor immediately after receipt (or immediately after warm-up period indicated above if stored at cold temperatures during transit) and inspect for shipping damage. Failure to perform an immediate inspection impedes recovery of losses caused by shipping damage. Use care when unpacking to avoid damaging any of the components. Carefully remove all dirt or loose packing material that may have accumulated in the power monitor with a vacuum cleaner. Do not use compressed air to remove debris because it can cause contaminants to lodge in internal components and cause damage.

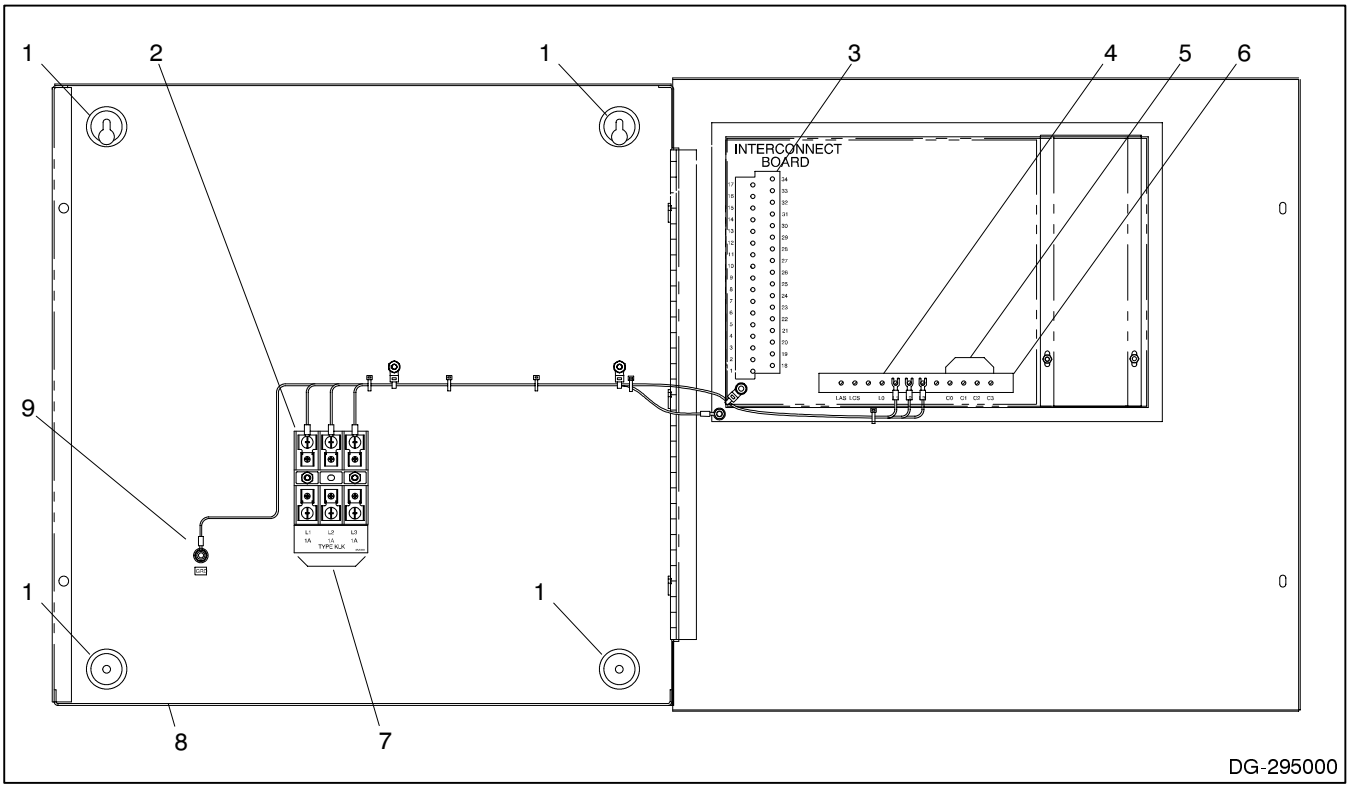
7.1.3 Storage

Repack the power monitor into its protective packing until ready for final installation. Protect the power monitor at all times from excessive moisture, construction grit, and metal chips. Avoid storage in low temperature and high humidity areas where condensation could occur on the unit. Follow the instructions for unpacking when preparing the unit for installation after storage.

7.2 Mounting

To plan the installation, use the dimensions given on the enclosure dimension drawings in Section 5. Select the mounting site to comply with local electrical code restrictions for the enclosure type. Also be sure to allow adequate space for full opening of the enclosure door and servicing of the unit.

Figure 7-1 provides an overall view of the power monitor with important installation details.



1. Keyhole Slots For Mounting
2. AC Sensing Fuse Block
3. Terminal Strip TB1 on Interconnection Circuit Board (for DC Connections)
4. Neutral Conductor Connection to TB2
5. Current Transformer Inputs C0, C1, C2, and C3 on TB2
6. Terminal Strip TB2 on Interconnection Circuit Board (for AC Connections)
7. AC Line Voltage Input Terminals for L1, L2, and L3
8. Conduit Knockouts (2) on Enclosure Bottom for Conductor Entry. See Drawings for Details.
9. Enclosure Ground Terminal

Figure 7-1. Power Monitor Installation Details (front view with enclosure door open to right)

Vertically mount the power monitor to a rigid supporting structure such as a wall. Keyhole slots for mounting purposes are located at the four corners on the back of the enclosure (see Figure 7-1). When mounting these units, plumb the enclosure to ensure that the door hinges are vertical to avoid any distortion of the enclosure or door. Place washers behind the key hole slots to plumb the enclosure.

7.3 Electrical Wiring

Installation of the power monitor requires wiring the power monitor to external devices and wiring optional accessories. Only trained and qualified personnel should perform wiring.

This publication provides a guide to wiring and specific information about the power monitor. Local, state, and national electrical codes take precedence over this publication. Also, because the power monitor may be only part of a total electrical system, only personnel qualified and trained to work on the total system should perform wiring and installation.

Use wire of sufficient gauge and provide adequate physical wiring protection for the current, voltage, distance, and environmental conditions involved.

NOTE

Install AC and DC wiring in separate raceways, cables, or conduit. Observe all applicable national, state, and local electrical codes during installation.

Conductors can enter the enclosure using the knockouts provided or in any other manner allowed by applicable electrical codes. When drilling entry holes for any conductors, cover the power monitor components for protection from metal chips and construction grit. Carefully remove any debris from the enclosure with a vacuum cleaner. Do not use compressed air to remove debris because it can cause contaminants to lodge in internal components and cause damage.

7.3.1 AC Sensing Connections

Figure 7-2 is a close-up view of AC sensing connections to the power monitor. Refer to it when performing the installation.

NOTE

Do not overtighten the terminals or the threads will strip and the connection will not be tight. Check that all the connections are tight and reinstall any protective barriers after performing installation.

Connect the system ground conductor to the enclosure using the ground lug provided to the left of the AC sensing fuse block.

Remove the AC sensing fuses from the AC sensing fuse block to gain access to the voltage-sensing connection terminals. The fuses are contained in individual insulated plastic housings which can be removed from the fuse block.

NOTE

Connect source and load phases as indicated by the markings and drawings. Improper connections may cause inaccurate power readings.

The AC voltage-sensing terminals are clearly labeled on the AC sensing fuse block L1, L2, and L3. Connect each AC line to the corresponding labeled input terminal on the fuse block. On single-phase systems, terminal L3 has no connection. The fused connections from the AC sensing fuse block to the TB2 terminal strip of the power monitor interconnection circuit board are factory wired.

Check that all the terminals are tight and insert the AC sensing fuses back into the AC sensing fuse block.

NOTE

Do not connect a voltage greater than 480 vac rms line-to-line or 277 vac rms line-to-neutral to the power monitor voltage inputs.

NOTE

Do not connect line voltage inputs directly to the TB2 terminal strip on the power monitor interconnection circuit board L1, L2, and L3. Connect only to the labeled terminals L1, L2, and L3 on the AC sensing fuse block.

NOTE

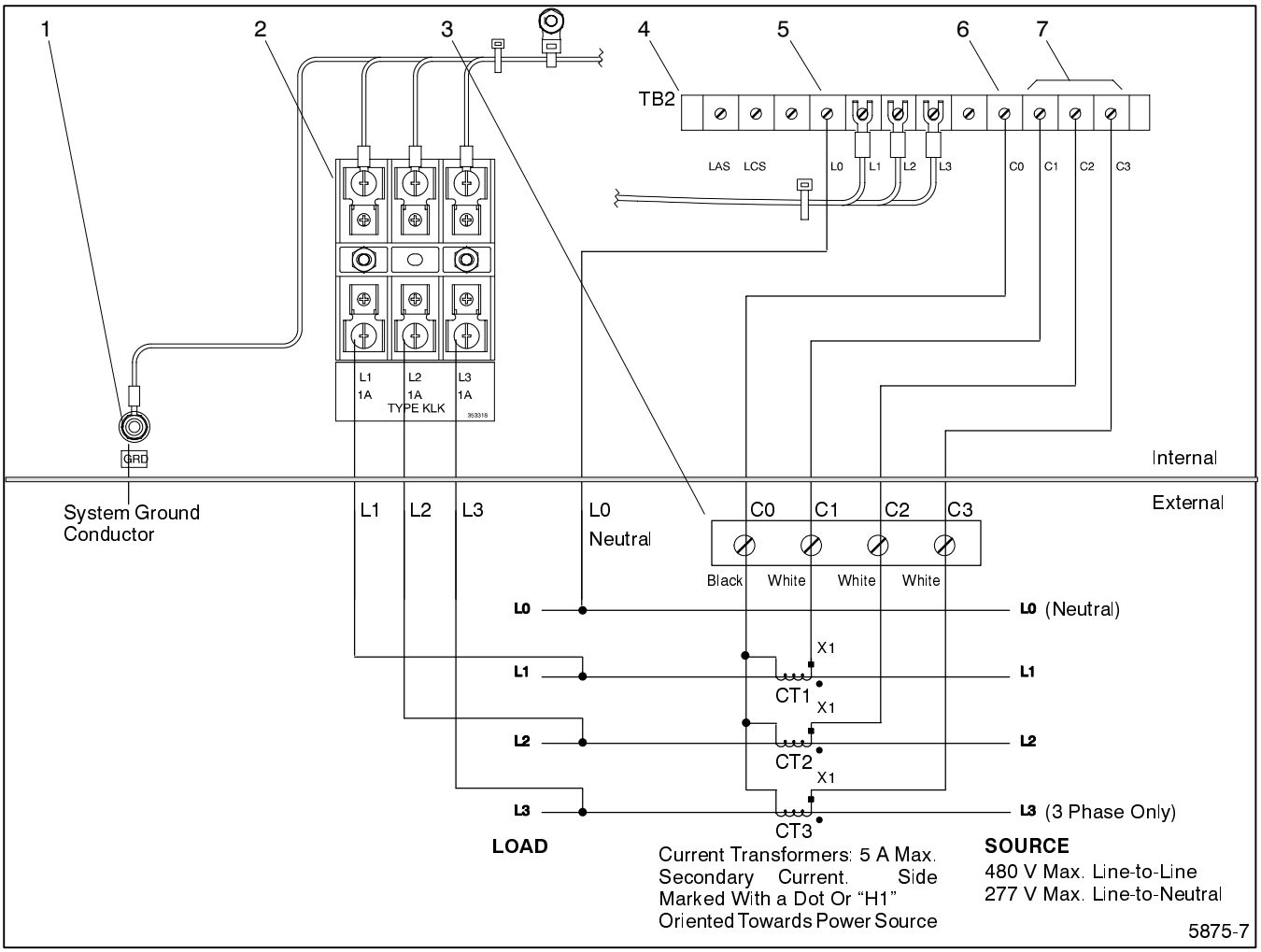
Allow sufficient slack in the wiring to components mounted on the enclosure door to ensure that the enclosure door opens and closes without stress or wear on the wiring. Neatly route or bundle wiring to prevent dangling wires from causing damage to internal components when opening and closing the enclosure door.

The connection for the neutral conductor L0 is clearly marked on the interconnection circuit board below its position on the TB2 terminal strip. Connect the neutral wire to L0 on TB2.

Inputs for the current transformers (CT1-CT3) C0, C1, C2, and C3 are clearly marked below the TB2 terminal strip on the power monitor interconnection circuit board. CT1 senses current on line L1, CT2 senses current on L2, and CT3 senses current on L3.

Install the current transformers on the load current-carrying lines. Position the current transformers so that the side marked with a dot or “H1” is in the direction of the power source. Install a shorting type terminal block as close as possible to the current transformers to allow shorting the current transformer leads together during servicing.

Current transformers are manufactured in a variety of types. Connect the current transformers as shown in Figure 7-2.



1. Ground Terminal
2. AC Sensing Fuse Block (Shown With Fuses Removed)
3. Shorting Type Terminal Strip, Install Near Current Transformers
4. Terminal Strip TB2 on Interconnection Circuit Board (for AC Connections)
5. Neutral Terminal L0 on TB2
6. Current Transformer Common Input C0 on TB2
7. Current Transformer Inputs C1, C2, and C3 on TB2

Figure 7-2. Power Monitor AC Sensing Connections

7.3.2 DC Power Connections

Use this section if 12 or 24 vdc from a generator set electrical system provides power to the power monitor. Refer to Figure 7-3 for typical DC power connections to terminal strip TB1.

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Use protective goggles and clothes. Battery acid can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Battery acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in battery can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash-proof safety goggles when working near the battery. If battery acid is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

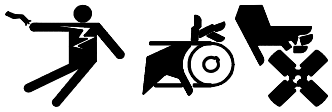
⚠ WARNING

Explosion.
Can cause severe injury or death.
Relays in battery charger cause arcs or sparks.

Locate battery in a well-ventilated area. Isolate battery charger from explosive fumes.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging. Avoid touching terminals with tools, etc., to prevent burns and sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (–) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together. Sparks could ignite battery gases or fuel vapors. Ventilate any compartment containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is charging. Always turn battery charger off before disconnecting battery connections. Remove negative (–) lead first when disconnecting battery. Reconnect negative (–) lead last when reconnecting battery.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect battery cables before working on generator set. (Remove negative (–) lead first when disconnecting battery. Reconnect negative (–) lead last when reconnecting battery.)

Disabling generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: 1) Turn the generator set master switch to OFF position. 2) Disconnect power to battery charger. 3) Remove battery cables (remove negative (–) lead first). Reconnect negative (–) lead last when reconnecting battery. Follow these precautions to prevent starting of generator set by an automatic transfer switch or remote start/stop switch.

Connect the positive (+) wire from the DC electrical system to terminal 21 of terminal strip TB1 on the power monitor interconnection circuit board.

Connect the negative (–) wire from the DC electrical system to terminal 5 of terminal strip TB1 on the power monitor interconnection circuit board.

7.3.3 DC Control Connections

DC control connections include auxiliary warning contact inputs, analog auxiliary inputs, automatic transfer switch (ATS) position contact inputs, ATS position relay driver outputs (RDOs), ATS test mode output contacts, and auxiliary warning RDOs.

NOTE

Supply power to the power monitor from a storage battery or other constant supply if performing ATS tests. A momentary loss of power will occur on the load side of an ATS during testing. If the power monitor is powered from the load side of the ATS under test using an AC power supply accessory, the power monitor will end the ATS test immediately when the momentary loss of power occurs.

Wire all control connections to terminal strip TB1 on the power monitor interconnection circuit board. The terminals are clearly marked on the circuit board to aid in locating the terminal. See Section 7.5 for a complete description of terminals and electrical characteristics. Use Figure 7-3 as a guide to typical DC connections to terminal strip TB1.

Refer to the specification sheets and operation and installation manuals for the automatic transfer switch for the appropriate contact position outputs and test mode input connections.

NOTE

Do not apply negative voltages or voltages in excess of 32 volts DC with respect to terminals 1-5 of TB1 (accessory DC power supply negative) to other terminals on TB1 because damage to the power monitor may result.

7.3.4 Accessory and Customer Wiring

Install and complete the wiring for any other accessories or customer inputs or outputs. Follow the instructions given in Section 5—Accessories and the accessory kit installation instructions for accessories. See Section 7.5 for a complete description of terminals and electrical characteristics.

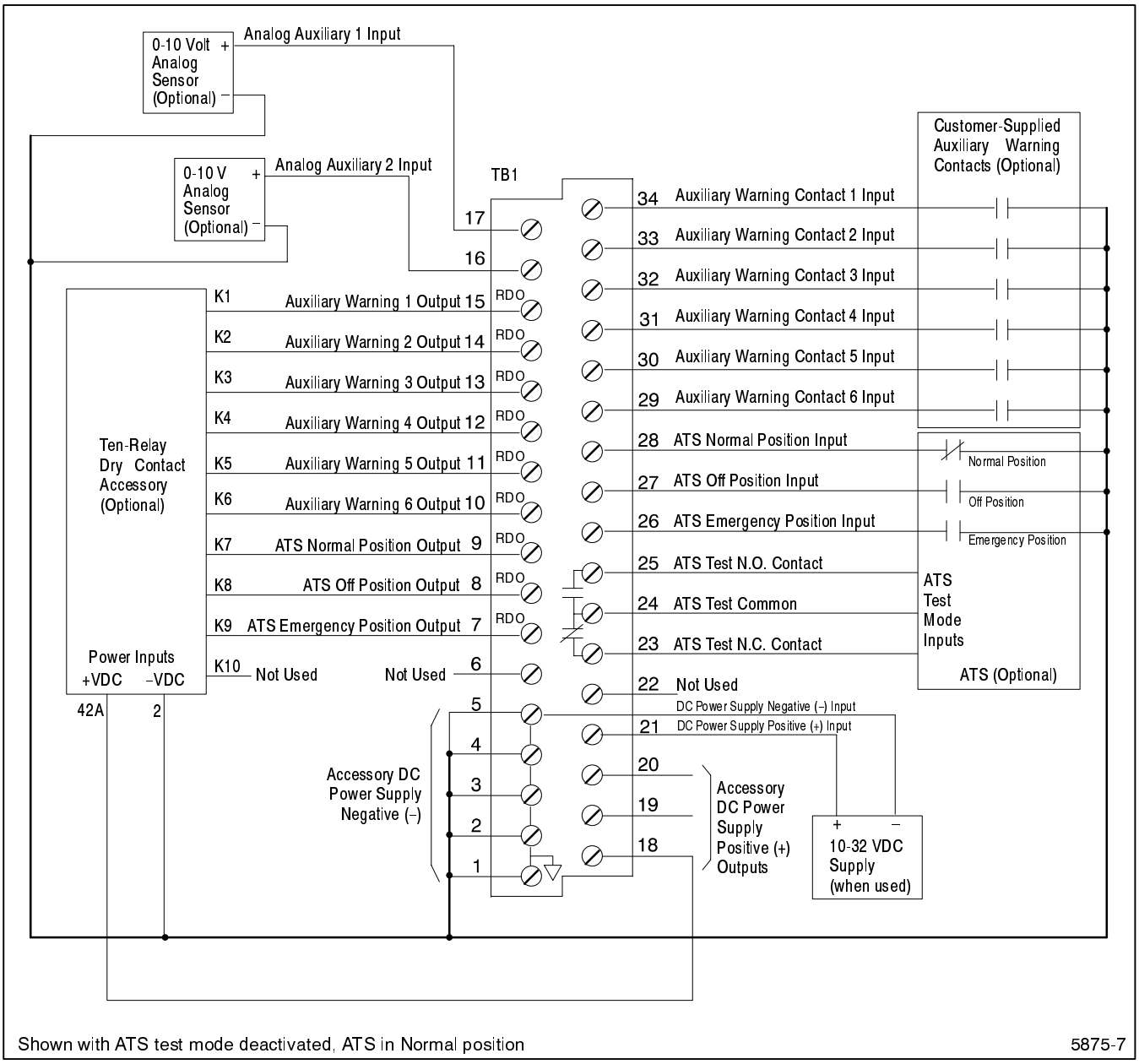


Figure 7-3. Typical DC Power and Controls Connections to Terminal Strip TB1 of the Power Monitor Interconnection Circuit Board for Optional Inputs and Outputs

7.4 Initial Startup and Setup

Perform the following operations before bringing the unit into normal operation.

7.4.1 Starting Unit for the First Time

Apply power to the power monitor. The display should light up and flash a message to set the time and date.

Press the RESET MENU key and then the LAMP TEST key to verify operation of the LEDs and digital display.

To set the time and date enable the local programming mode. See Section 2.8.8 Menu 9—Programming Mode. See Section 2.9.3 Menu 3—Time & Date to set the time and date.

7.4.2 Programming System Settings

See Section 2.9.4 Menu 4—System Settings and program the system voltage to the nominal line-to-line voltage, the system frequency to the nominal frequency, and the electrical system type (single-phase, three-phase delta, or three-phase wye). Any changes to these settings require recalibration.

7.4.3 Calibrating Unit

The power monitor is tested and calibrated at the factory to factory default settings. It will require recalibration when installed in a system that is different from the factory default. Only trained and qualified personnel should perform calibration.

1. **Verify system settings and screens.** View the system settings in Menu 4—System Settings to ensure that system voltage is set for the nominal line-to-line voltage and the system frequency is set for the nominal line frequency. Ensure that the electrical system type is consistent with the application. Check Menu 1—Metering and ensure that the AC screens displayed are consistent with the application.
2. **Perform autozero with inputs zero.** To calibrate the power monitor for maximum accuracy, perform the following autozero procedure with all AC voltage, AC current, and analog auxiliary DC inputs at zero:
   a. Disconnect all power sources before opening any enclosure.
   b. Open circuit breakers or remove fuses in the sensed lines to ensure that the AC sensing voltage inputs are zero.
   c. Ensure that the AC current inputs are zero by 1) opening circuit breakers or removing fuses to remove the load current sensed by the current transformers and/or 2) shorting all current transformer leads together at the shorting-type terminal block. Do not disconnect the current transformer secondary leads!
   d. Temporarily disconnect both analog auxiliary DC inputs at TB1. Ensure that the wires are identified for reconnection and that the bare conductors are electrically insulated.
   e. Close and secure all enclosure doors before restoring power sources necessary to operate the power monitor.
   f. Verify that all inputs are approximately zero by checking Menu 1—Metering. The screens may display small residual readings that autozero will calibrate to zero.
   g. Perform the autozero procedure as shown in Section 2.9.7 Menu 7—Calibration.
3. **Restore inputs after autozero.** Use the following procedure to restore inputs to the power monitor:
   a. Remove electrical insulation from the analog input wires and reconnect them to the analog auxiliary DC inputs at TB1.
   b. Close circuit breakers or replace fuses to restore power to voltage sensing inputs.
   c. Close circuit breakers or replace fuses to restore power to the load and/or unshort the current transformer leads at the shorting-type terminal block if they were shorted.
   d. Close and secure all enclosure doors.
4. **Perform calibration with load connected.** Perform the calibration of all readings with a typical load connected by following the instructions in Section 2.9.7 Menu 7—Calibration. Do not autozero again.
5. **Check calibrated readings.** After calibration, use Menu 1—Metering to examine readings for AC voltage and current, total kilowatts, power factor, kilovars, DC supply voltage, and analog auxiliary inputs. If the power monitor displays readings that differ from those obtained by independently calibrated equipment by an amount exceeding specifications, recalibrate the system. Account for the display scale set at the last calibration of the analog auxiliary inputs to determine if recalibration is necessary. AC recalibration is required after changing system settings. DC recalibration is required to change the display scale of analog auxiliary input readings.
6. **Perform AC recalibration with load connected, when necessary.** Refer to the sections on AC voltage and current calibration in Section 2.9.7 Menu 7—Calibration. Do not autozero again.
7. **Perform DC recalibration with load connected, when necessary or desired.** Refer to the sections on DC supply or analog auxiliary input calibration in Section 2.9.7 Menu 7—Calibration. Do not autozero again.

The system stores calibration information and other settings in permanent memory and retains them in the event of power loss. When power is restored, set only the time and date.

7.4.4 Programming Other Settings and Testing

The installer should program the following settings and test the unit and connected systems before bringing it into normal service.

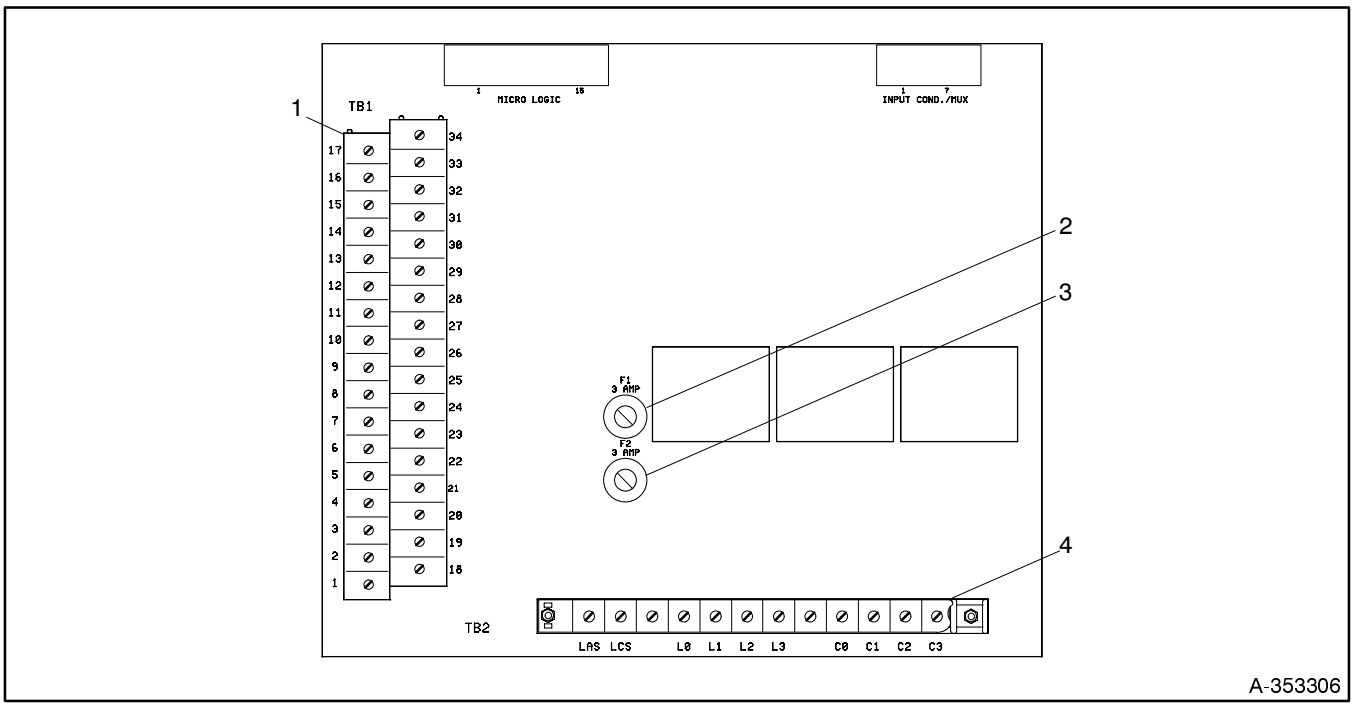
1. **Enter ATS information and test the ATS.** If the power monitor is connected to an automatic transfer switch (ATS), use Section 2.9.2 Menu 2—ATS Status to enter the information about the ATS: contactor type, contactor rating, ATS serial number, and ATS controller serial

number. Use Menu 2—ATS Status to test the ATS by activating the ATS test mode. Remove the ATS from test mode when finished.

2. **Test any customer-supplied circuitry.** The installer is responsible for determining testing requirements and testing procedures for customer-supplied circuitry.
3. **Program remote communications settings (when using remote communications features).** If the unit is equipped with communications hardware, follow the instructions given in Section 2.4 Monitoring and Programming Setup and the operation and installation manual for the Remote Monitoring and Control Communications Software to enter settings that allow connection to a PC. Program any settings not programmable from the local display and keypad using the remote communications software and a PC.
4. **Set initial password and system ID.** Change the password and/or system ID to limit additional programming of settings to trained, qualified, and authorized personnel only. Record the new password and store in a safe location. The password is required for changing the programming mode at the unit.
5. **Set initial monitoring and programming access.** Follow the instructions given in Section 2.4 Monitoring and Programming Setup to set up initial monitoring and programming access.
6. **Complete Installation.** Replace all barriers removed during installation. Replace and tighten the screws that hold the enclosure door closed before bringing the unit into normal service.

7.5 Terminal Strip Identification

Refer to Figure 7-4 for the positions of the terminal strips TB1 and TB2 on the interconnection circuit board.



1. TB1 Terminal Strip, DC Connections
2. F1 Fuse, 3 Amp., Power Monitor Internal DC Supply
3. F2 Fuse, 3 Amp., Accessory DC Output
4. TB2 Terminal Strip, AC Connections

Figure 7-4. Interconnection Circuit Board (top view)

TB1 Terminal Strip—DC and I/O Connections

Term.	Description
1	Accessory DC power supply negative (–). Note 1
2	Accessory DC power supply negative (–). Note 1
3	Accessory DC power supply negative (–). Note 1
4	Accessory DC power supply negative (–). Note 1
5	Accessory DC power supply negative (–). Note 1 Also DC power supply input negative (–) when powered by a DC supply
6	Not used
7	ATS emergency position relay driver output (RDO). Note 2
8	ATS off position relay driver output (RDO). Note 2
9	ATS normal position relay driver output (RDO). Note 2
10	Auxiliary warning 6 relay driver output (RDO). Note 2
11	Auxiliary warning 5 relay driver output (RDO). Note 2
12	Auxiliary warning 4 relay driver output (RDO). Note 2
13	Auxiliary warning 3 relay driver output (RDO). Note 2
14	Auxiliary warning 2 relay driver output (RDO). Note 2
15	Auxiliary warning 1 relay driver output (RDO). Note 2
16	Analog auxiliary input 2 positive (+). Note 3
17	Analog auxiliary input 1 positive (+). Note 3
18	Accessory DC power supply positive (+). Note 4
19	Accessory DC power supply positive (+). Note 4
20	Accessory DC power supply positive (+). Note 4
21	DC power supply positive (+) input 10-32 vdc (when powered by a DC supply). Note 5
22	Not used
23	ATS test mode normally closed (N.C.) contact. Note 6
24	ATS test mode common (C.) contact. Note 6
25	ATS test mode normally open (N.O.) contact. Note 6
26	ATS emergency position contact input. Note 7
27	ATS off position contact input. Note 7
28	ATS normal position contact input. Note 7
29	Auxiliary warning contact 6 input. Note 7
30	Auxiliary warning contact 5 input. Note 7
31	Auxiliary warning contact 4 input. Note 7
32	Auxiliary warning contact 3 input. Note 7
33	Auxiliary warning contact 2 input. Note 7
34	Auxiliary warning contact 1 input. Note 7

TB2 Terminal Strip—AC Input Connections

Term.	Description
LAS	19 vac input, line 1 (from optional power transformer)
LCS	19 vac input, line 2 (from optional power transformer)
-	Not used
L0	(neutral AC line)
L1	AC voltage input for L1 from AC sensing fuse block)
L2	AC voltage input for L2 from AC sensing fuse block)
L3	AC voltage input for L3 from AC sensing fuse block)
-	Not used
C0	(current transformer common lead)
C1	(0-5 amps AC current transformer input)
C2	(0-5 amps AC current transformer input)
C3	(0-5 amps AC current transformer input)

Note 1: Accessory DC power supply negative terminals are common connection terminals for negative DC inputs and outputs.

Note 2: Relay Driver Outputs (RDOs) can drive a maximum of three dry contact accessory relays.

Note 3: Analog auxiliary inputs: voltage range 0-10 vdc, input impedance about 75 kΩ. The use of separate shielded cables for each input recommended for noise immunity.

Note 4: Accessory DC outputs are common terminals for accessory DC power and F2 fuse limits current to 3 amps DC max.

Note 5: DC power supply positive input 10-32 vdc, current requirement approximately 0.5 amps DC with display on and no load on accessory DC power supply positive outputs. Fuses limit input current to about 6 amps DC max.

Note 6: ATS test mode N.O. and N.C. contacts switch during ATS test mode and are each rated at 10 A @ 120 vac max. resistive load, 10 A @ 28 vdc max., 10 mA @ 28 vdc min.

Note 7: Contact inputs connect to isolated contacts or open collector inputs. Complete circuit to accessory DC power supply negative (terminals 1-5 of TB1) to activate. Operating voltage 12 vdc, operating current 10 mA DC min.

Appendix A. Glossary of Abbreviations

Abbreviations are used throughout this manual. Normally in the text they will appear in complete form with the abbreviation following in parenthesis the first time they are used. After that they will appear in the abbreviated form. The commonly used abbreviations are shown below.

AC	alternating current
AISI	American Iron and Steel Institute
Amp	ampere
Amps	amperes
ANSI	American National Standard Institute
API	American Petroleum Institute
approx.	approximate, approximately
A/R	as required, as requested
A/S	as supplied, as stated, as suggested
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
aux.	auxiliary
AWG	American Wire Gauge
AWM	appliance wiring material
BBDC	before bottom dead center
BDC	before dead center
BHP	brake horsepower
bmep	brake mean effective pressure
Btu	British thermal unit
°C	Celsius degree
cc	cubic centimeter
CCA	cold cranking Amps.
CEC	Canadian Electrical Code
cfh	cubic feet per hour
cfm	cubic feet per minute
CID	cubic inch displacement
cm	centimeter, centimeters
cmm	cubic meters per minute
co.	company
cont'd.	continued
CSA	Canadian Standards Association
CT	current transformer
cu. in.	cubic inch, cubic inches
cyl.	cylinder
dB	decibel
dBA	decibels (A weighted)
DC	direct current
DCR	direct current resistance
deg.	degree
dept.	department
dia.	diameter
e.g.	example given
EIA	Electronic Industries Association
EMI	electromagnetic interference
EPA	Environmental Protection Agency
etc.	et cetera (and so forth)
ext.	external
°F	Fahrenheit degree
fl. oz.	fluid ounce, fluid ounces
FM	frequency modulation
ft.	foot, feet
ft. lbs.	foot pound, foot pounds
ga.	gauge
gal./ gals.	gallon, gallons
gph	gallons per hour
gpm	gallons per minute
gr.	grade
grd.	ground
HCHT	high cylinder head temperature
HET	high exhaust (or engine) temperature
Hg	mercury (element)
H_2O	water
HP	horsepower
hr, hrs	hour
Hz	hertz (cycles per second)
ID	inside diameter
IEEE	Institute of Electrical and Electronic Engineers
in.	inch(es)
inc.	incorporated
in. lbs.	inch pounds
int.	internal
int.-ext.	internal-external
ISO	International Standards Organization
J	joule, joules
JIS	Japanese Industry Standard
kg	kilogram, kilograms
kg/cm^2	kilograms per square centimeter
kgm	kilogram meter(s)
kJ	kilojoules (btu cal)
km	kilometer, kilometers
kPa	kiloPascal, kiloPascals
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt amperes
kW	kilowatt, kilowatts
kWH	kilowatt hour
L	liter, liters
LxWxH	length x width x height
LED(s)	light emitting diode
lb., lbs.	pound, pounds
L/hr.	liter per hour, liters per hour
L/min.	liter(s) per minutes
LOP	low oil pressure
LP	liquefied petroleum
m	meter, meters
m^3	cubic meter, cubic meters
max.	maximum
MCM	one thousand circular mils.
megger	megohmmeter
MHz	megahertz
mi.	mile, miles
mil	one one-thousandth of an inch
min.	minimum
mJ	millijoule, millijoules
MJ	mega joule, mega joules
mm	millimeter, millimeters
m^3/min	cubic meters per minute
MPa	megaPascal
mW	milliwatt, milliwatts
MW	megawatt, megawatts
N/A	not available or not applicable
NBS	National Bureau of Standards
N.C.	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	Newton meter, Newton meters
no., nos	number, numbers
NPT	National Standard taper pipe thread per general use
N/R	not required
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OS	overspeed, oversize
O/S	oversize
OSHA	Occupational Safety and Health Act
OV	overvoltage
oz.	ounce, ounces
PF	power factor
PMG	permanent magnet generator
pot.	potentiometer
ppm	parts per million
psi	pounds per square inch
pt., pts.	pint, pints
PVC	polyvinyl chloride
qt., qts.	quart, quarts
qty.	quantity
ref.	reference
RFI	radio frequency interference
r.h.m.	round-head machine (screw)
rms	root mean square
RPM	revolutions per inch
RTV	room temperature vulcanization
SAE	Society of Automotive Engineers
SCR	silicon-controlled rectifier
sec.	second, seconds
spec.	specs, specification
sq.	square
sq. cm	square centimeters
sq. in.	square inch, square inches
tach	tachometer
TDC	top dead center
tech. pub.	technical publications
temp.	temperature
TIF	telephone influence factor
TP, TPs	technical publications
turbo	turbocharger
UHF	ultrahigh frequency
UNC	Unified coarse thread (was NC)
UNF	Unified fine thread (was NF)
UL	Underwriter's Laboratories, Inc.
U/S	undersize
U.S.A.	United States of America
v	volt, volts
vac	volts alternating current
vdc	volts direct current
VHF	very high frequency
W	watt, watts

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