User Manual

Original Instructions

Allen-Bradley

i-Sense Voltage Monitor

Catalog Numbers 1608S-3V480E, 1608S-3V480K, and 1608S-6V480K

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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Who Should Use this Manual?

Use this manual if you install, configure, or troubleshoot i-Sense® Voltage Monitors. This manual introduces you to the key components of the voltage monitor, and describes installation, configuration, operation, and troubleshooting of the monitor.

Summary of Changes

Topic	Page
Modem communication option and associated information removed from document.	throughout

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
i-Sense Voltage Monitor Installation Instructions, publication 1608S-IN001	Provides information to install and do basic configurations.
i-Sense Power Quality Monitors Product Profile, publication 1608-PP001	Brief description and features and benefits information on the i-Sense voltage monitor.
Power Quality: The Overlooked Productivity Variable, publication POWER-BR011	Description of Allen-Bradley power quality product offering.
Automotive Industry Solution – Power Quality, Application Profile, publication 1608-AP001	Overview of how power quality products can contribute to uptime and protect Integrated Architecture investments.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http:/www.rockwellautomation.com/literature/.

Notes:

About the i-Sense Voltage Monitor

Introduction

The i-Sense voltage monitor captures and records voltage disturbances on the electric power service, and long-term voltage trends. Voltage disturbances are the most common power quality (PQ) problems and include voltage sags (dips), swells, or interruptions and outages. Many different mains voltages are used internationally and the monitor can be easily configured to operate with most of them.

The monitor is a part of the i-Grid voltage network that enables the service to report and alert. Operation of the monitor requires daily communication with the i-Grid® servers via the internet. Instructions for setting up an Internet connection are included in this manual.

TIP The latest support information is available at www.igrid.com.

Before You Begin

Before you begin installation of your i-Sense® voltage monitor, complete these steps.

1. Inspect the monitor for shipping damage. If any damage is seen, contact the shipper.
2. Record the **Serial Number:**
   _____ - _____ - _____
   The S/N label is on the bottom of the unit and required for registration.
3. Register the monitor:
   – Go to www.igrid.com.
   – Log in, or follow the online instructions to register as an i-Grid user.
   – Follow the online instructions to register your new monitor.

   The monitor subscription is included with purchase. Future renewals are required to continue accessing data.

4. Configure the monitor hardware to match your nominal voltage:
   - Find your Nominal Voltage (Table 4 on page 16) and record Voltage Settings and Type.

Type:	☐ 1608S-3V480K (3-channel)		☐ 1608S-6V480K (6-channel)	
Voltage	☐ 480V	☐ 120V	☐ Other _____	
Wiring:	☐ LL	☐ LN	☐ S1: Single-Phase	☐ S2: Split-Phase
Power Supply Plug JP1:		☐ White (< 250V):	☐ Red (> 250V):	

   - Remove the right-side cover (two Phillips screws, top and bottom).
   - Verify that plug JP1 is installed correctly for your voltage (Table 5 on page 17).
   - Verify that INPUT jumper wires are installed according to your wiring diagram (Table 5 on page 17).
5. Configure the software and communication (See Configuration on page 9), Perform this step either before or after installation. Needed supplies:
   - A supply of power for the monitor: either (A) the external power supply (not provided), plugged into the 9V DC jack or (B) AC mains power, after installation. In normal operation, the monitor is powered by the mains connection at INPUT_1.
   - A laptop personal computer or workstation with Ethernet network card and web browser.
   - Standard Ethernet Cat.-5e cable (an Ethernet cross-over cable is required for direct connection to older personal computer network-interface cards).
   - Phillips screwdriver.
   - Information from your IT department (See Ethernet Communication Setup on page 10).
6. Install the monitor (See Installation on page 15).
7. A qualified electrician or technician must install in an appropriate environment (See Technical Specifications on page 23).
   - Follow the installation instructions.
     (See Communication Connections on page 18)
8. Perform step 5, if skipped earlier.
9. Verify communication: press ♡ to generate a Heartbeat event.
10. Verify that the event is logged at www.igrid.com.

Configuration

The monitor records measurements on three (or six) voltage channels. Typically, these channels are the three line-to-line (LL) or three line-to-neutral (LN) voltages of the three-phase AC mains. The monitor can also measure single-phase or split single-phase systems. A few settings must be performed to achieve safe operation and to record the proper measurements.

Configure for Your Nominal Voltage

Select your voltage and 3-wire or 4-wire settings, then configure as shown in Table on page 16. If your voltage is not shown, contact Rockwell Automation. All monitor channels will be configured for the same nominal voltage. Remove the right-side cover to access the AC input terminals (two Phillips screws, top and bottom). For 6-channel i-Sense monitor models, the INPUT_1 and INPUT_2 terminal blocks must be configured identically.

It is important that the power supply jumper JP1 and the INPUT jumper wires be connected correctly. Follow the instructions in Table 4 and Table 5 .

Finally, connect to the i-Sense Management Console, as explained on page 12, to set your nominal voltage level.

In the U.S., common nominal service voltages are 480V and 208V 3-wire (LL) three-phase, 277Y/480V and 120Y/208V 4-wire (LN) three-phase, and 120V single-phase or 120/240V split-phase. If a neutral (fourth wire) is available, it should be used.

Configure Communication Settings

The monitor is pre-configured for Ethernet-based communication; even so, network settings may need to be entered to make connection to the Internet. An on-board web server, the i-Sense Management Console is the interface for quick configuration using your web browser (Internet Explorer, Firefox, Safari, Chrome) application. To get started, either (1) connect directly from a personal computer to the monitor using an Ethernet cross-over cable (or regular Ethernet cable if the personal computer's network interface card supports Gigabit Ethernet) cable (cross-over cable may be required with older personal computers), or (2) connect the monitor to a local area network (LAN), as described on page 10.

IMPORTANT The i-Sense communicates to the i-Grid over Ethernet only, no modem communication is supported.

Ethernet Communication Setup

There are several ways to configure the monitor for networking. Contact your IT department or System Administrator to discuss the optimal configuration method for your network.

Network Security and Firewall Requirements - Ethernet-to-Internet

The monitor sends measurement data to the i-Grid servers over the Internet on port 80 via the HTTP protocol. The site firewall must allow outbound HTTP traffic from the IP address assigned to the monitor. This is the same requirement needed to open a personal computer's web browser and access www.igrid.com. There are no additional firewall requirements. If a personal computer with an assigned IP address can access www.igrid.com, then the monitor can use that IP address as well.

The monitor always initiates the (outbound) connection to the i-Grid servers via Ethernet to exchange configuration information and upload voltage event data. The i-Grid servers cannot initiate communication to the i-Sense monitor.

Default Auto-Sensing Configuration - Ethernet

The monitor requires an IP address and related information (see below for details). The process of assigning an IP address is simplified by an Auto-Sensing process: The monitor will first attempt to contact a DHCP server for an IP address. If a DHCP server responds with networking settings, the monitor will use those settings. If no DHCP server responds, the monitor will fall-back to the last-used manual (static) networking settings. Once the desired networking settings are entered, the auto-sensing feature can be disabled.

Even when the network settings will be manually entered (See Manual Configuration - Ethernet or Direct Connection to a Personal Computer on page 11), the monitor can be temporarily connected to a network that supports DHCP to more easily acquire those settings. The desired static IP address can then be entered prior to installation.

To connect your web browser to the i-Sense Management Console over the local network, the monitor IP address must be known. And if you are using DHCP, the IP address might not be evident.

Manual Configuration - Ethernet or Direct Connection to a Personal Computer

To manually configure the monitor with a static IP address: The following network information is needed. When the monitor initially powers up, it will attempt DHCP configuration, then default to these values listed below

Table 1 - i-Sense Monitor Default Network Settings.

i-Sense Monitor Network Setting	Default Value
Static IP Address	192.168.1.200
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
Primary DNS Server	192.168.1.201
Secondary DNS Server	192.168.1.200

A standard Ethernet cable is required for static IP address configuration via direct connection to a personal computer (an Ethernet cross-over cable may be required with older personal computer network interface cards).

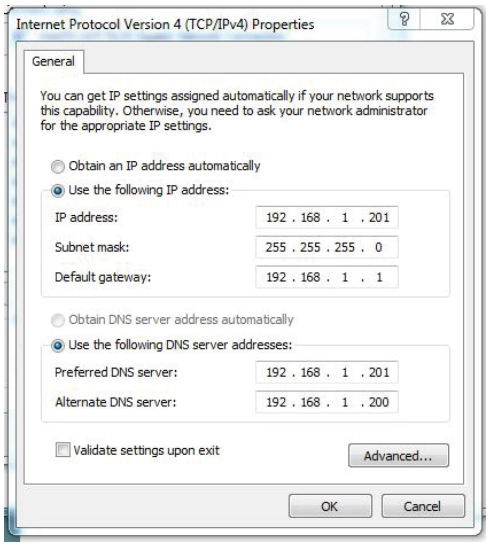
To communicate with the monitor in the default mode, the networking settings on the personal computer must be changed temporarily to the values listed.

Table 2 - Computer Network Settings

Computer Network Settings	Value
IP Address	192.168.1.201
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
Primary DNS Server	192.168.1.201
Secondary DNS Server	192.168.1.200

The Microsoft Windows Internet Protocol (TCP/IP) Properties configuration window below is typical

Figure 1 - Typical Microsoft Windows Internet Protocol (TCP/IP) Properties window.



If the personal computer was already set to “Use the following IP address:” then those settings should be recorded for later restoration.

The i-Sense Management Console

Connect to the monitor by typing http://192.168.1.200 (replace with the actual IP address) into the web browser address bar. The i-Sense management console will prompt for a valid username and password. The factory-default user credentials are:

Username: admin
Password: password

Change the username and password from the default values during initial setup. Click on the “Security” menu item to change the default values.

If the username or password is lost or the monitor is not able to communicate with the i-Grid website, you will need to reset the user credentials and networking options back to their default values using the push-buttons.
See Management: Reset to Factory Defaults on page 13 for more details.

Management

After connecting to the monitor, select the Ethernet left menu item. The top section of the page displays the active Ethernet settings. The following settings are displayed:

Configuration Mode shows how the Ethernet settings were last configured:

Table 3 - Configuration Mode

Configuration Mode	Description
Auto-Sense Automatic (DHCP)	Configured by DHCP (auto-sensing was enabled)
Auto-Sense Manual (static)	No DHCP server was found; Previous static IP address is used (auto-sensing was enabled)
Automatic (DHCP)	Configured by DHCP (auto-sensing was disabled)
Manual (static)	Manually configured (auto-sensing was disabled)

- **Active Networking Settings:** IP Address, Subnet Mask, Default Gateway, Preferred DNS Server, Alternate DNS Server, MAC Address
- **Settings:** The auto-sensing feature is initially enabled to simplify the configuration process. Auto-sensing can be disabled, in which case selection must be made either to always use DHCP or to use static settings.
  - **DHCP Configuration**
    Select Obtain an IP address automatically to use automatic configuration via a DHCP server. To override the DHCP server-assigned DNS addresses, select Use the following DNS server addresses.
  - **Manual (Static) Configuration**
    Select Use the following IP address to configure with static settings. Update the IP Address, subnet mask, default gateway, preferred DNS server and alternate DNS server with the values provided by your IT department or System Administrator.

Click the Restart Ethernet button to use the new Ethernet settings. If the IP address has changed, update the IP address in the browser's address bar to reconnect to the monitor.

Management: Reset to Factory Defaults

Press both RESET and ♡ push-buttons (located beneath left-side cover)for 10 seconds to reset the networking and security username and password to the default values. Both status indicators (green and red) will blink rapidly for 2 seconds when the settings are reset. The Ethernet interface will be restarted after a few seconds.

Notes:

Installation

Pre-installation

1. Inspect the device for shipping damage.
2. See Before You Begin on page 7.
3. Record the i-Sense monitor serial number.
4. Register the monitor at www.igrid.com.
5. Configure the monitor hardware for the service voltage.
6. Configure the communication software using the Ethernet port (this can be done after installation and power-up).

WARNING: Do not apply power to the monitor until the wiring is completed and right-side cover is replaced. Installation must be performed by an electrician, in accordance with all local, and national codes.

Environmental Conditions

The monitor is rated for installation in the following environment:

- Indoor use only, no conductive pollution.
- Altitude up to 2000 m (6500 ft).
- Temperature range 0...40 °C (32...104 °F).
- Maximum relative humidity 95%, noncondensing.

Mounting Instructions

- Provide 10 in. (250 mm) clearance around the monitor for cooling and access.
- Remove the left and right covers (four Phillips screws, two at the top and two at the bottom).
- Mount the monitor to a vertical surface using the four mounting holes. Two of the four mounting screws should penetrate into studs at least 1 in. (25 mm), screws at least 1.5 in. (38 mm) long recommended.

Electrical Connections

1. Install branch protection: upstream fuse or circuit breaker protection rated 20 A or less is required. Protection rated less than 5 A is not recommended.
2. Conduit entry available from the top or bottom.
3. Connect the Ground (Earth) wire to the #10-32 stud near the bottom knock-out.
4. Connect mains line to the INPUT_1 terminal block, according to the proper wiring diagram from Table 5. For the 6-channel version only: if the INPUT_2 terminal block is present, wire the second 3-phase set using the same wiring diagram.

5. Verify that the JP1 plug is properly configured, per Table 4: The plug with RED wires must be installed if the channel voltage is greater than 250V AC.

WARNING: This unit is not rated for 600V AC or 690V AC L-L installations. 600Y/346V installations require 4-wire L-N wiring method. The neutral must be connected as shown inTable 5.

6. Replace the right-side cover and tighten the two screws.

Nominal Voltage Configurations

Table 4 - Nominal Voltage Configurations (shipped standard with 480V (L-L)

Your Voltage	Nominal Volts per Channel(2)	Channels	Mains Wires	Wiring Diagram Table 2 on page 11	Power Supply Jumper JP1
Any single-phase voltage ≤240V	nominal	1	2	S1	White wires
100 (L-N for 100/200V split-phase)	100	2	3	S2	White wires
105 (L-N for 105/210V split-phase)	105	2	3	S2	White wires
110 (L-N for 190Y/110V 3-phase)	110	3	4	LN	White wires
115 (L-N for 200Y/115V 3-phase)	115	3	4	LN	White wires
115 (L-N for 115/230V split-phase)	115	2	3	S2	White wires
120 (L-N for 208Y/120V 3-phase)	120	3	4	LN	White wires
120 (L-N for 120/240V split-phase)	120	2	3	S2	White wires
125 (L-N for 216Y/125V 3-phase)	125	3	4	LN	White wires
127 (L-N for 220Y/127V 3-phase)	127	3	4	LN	White wires
133 (L-N for 230Y/133V 3-phase)	133	3	4	LN	White wires
139 (L-N for 240Y/139V 3-phase)	139	3	4	LN	White wires
190 (L-L for 190Y/110V 3-phase)	190	3	3	LL	White wires
200 (L-L for 100/200V split-phase)	200	1	2	S1	White wires
208 (L-L for 208Y/120V 3-phase)	208	3	3	LL	White wires
210 (L-L for 105/210V split-phase)	210	1	2	S1	White wires
216 (L-L for 216Y/125V 3-phase)	216	3	3	LL	White wires
220 (L-L for 380Y/220V 3-phase)	220	3	3	LL	White wires
230 (L-L for 230Y/133V 3-phase)	230	3	3	LL	White wires
230 (L-N for 400Y/230V 3-phase)	230	3	4	LN	White wires
240 (L-L for 120/240V split-phase)	240	3	3	LL	White wires
240 (L-N for 415Y/240V 3-phase)	240	3	4	LN	White wires
254(1) (L-N for 440Y/254V 3-phase)	254	3	4	LN	Red wires
277 (L-N for 480Y/277V 3-phase)	277	3	4	LN	Red wires
346 (L-N for 600Y/346V 3-phase)	346	3	4	LN	Red wires
346 (L-L for 346Y/200V 3-phase)	346	3	3	LL	Red wires
380 (L-L for 380Y/220V 3-phase)	380	3	3	LL	Red wires
400 (L-L for 400Y/230V 3-phase)	400	3	3	LL	Red wires
400 (L-N for 690Y/400V 3-phase)	400	3	4	LN	Red wires

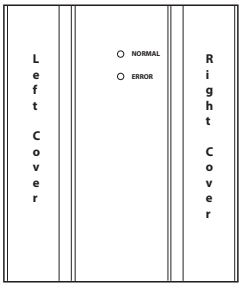
Table 4 - Nominal Voltage Configurations (shipped standard with 480V (L-L)

Your Voltage	Nominal Volts per Channel(2)	Channels	Mains Wires	Wiring Diagram Table 2 on page 11	Power Supply Jumper JP1
415 (L-L for 415Y/240V 3-phase)	415	3	3	LL	Red wires
440 (L-L for 440Y/254V 3-phase)	440	3	3	LL	Red wires
440 (L-L for 220/440V split-phase)	440	3	3	LL	Red wires
460 (L-L, at point of use)	460	3	3	LL	Red wires
480 (L-L for 480Y/277V 3-phase)	480	3	3	LL	Red wires
600 (L-L 3-phase) not allowed	No	No	No	No	No
690 (L-L 3-phase) not allowed	No	No	No	No	No

(1) Nominal 254V source must operate normally at > 240V (95% of nominal)

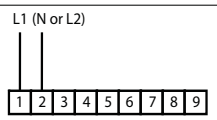
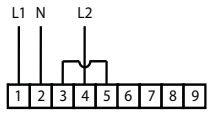
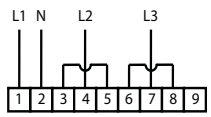
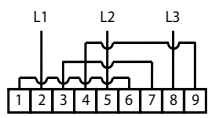
(2) Maximum 480V per channel. 575Y/332V and 600Y/346V systems must use the 346 (L-N) configuration. 690Y/400V systems must use the 346 (L-N) configuration.

1. Select your voltage configuration from Table 4 and follow the instructions in the corresponding wiring diagram from Table 5.
2. Use the appropriate wiring diagram and jumper wire positions. The monitor is shipped with jumper wires in the LL configuration. The LL and LN diagrams are also shown inside the monitor cover. Move or remove jumper wires as needed.



IMPORTANT
- There should be no more than one wire installed at each terminal block position
- Maximum 480V per channel
- 575Y/332V and 600Y/364V systems must use the 346 (L-N) configuration
- 690Y/400V systems must use the 400 (L-N) configuration

Table 5 - Wiring Diagrams

Source Type	Wiring Diagram	
S1 Single phase		1 channel sensing 2 wires + ground required No jumper wires Use 0.50…2.5 mm² (AWG 14…22), 600V AC conductors Tighten screws to 0.9 N•m (8 lb•in) Tighten ground stud nut to 3.4 N•m (30 lb•in) The ground stud is #10-32.
S2 Split-phase		2 channel sensing 3 wires + ground required Jumper pins 3-5 Use 0.50…2.5 mm² (AWG 14…22), 600V AC conductors Tighten screws to 0.9 N•m (8 lb•in) Tighten ground stud nut to 3.4 N•m (30 lb•in) The ground stud is #10-32.
LN 3-phase 4-wire		3 channel sensing 4 wires + ground required Jumper pins 3-5 & 6-8 Use 0.50…2.5 mm² (AWG 14…22), 600V AC conductors Tighten screws to 0.9 N•m (8 lb•in) Tighten ground stud nut to 3.4 N•m (30 lb•in) The ground stud is #10-32.
LL 3-phase 3-wire		3 channel sensing 3 wires + ground required Jumper pins 1-6 & 3-7 & 4-9 Use 0.50…2.5 mm² (AWG 14…22), 600V AC conductors Tighten screws to 0.9 N•m (8 lb•in) Tighten ground stud nut to 3.4 N•m (30 lb•in) The ground stud is #10-32.

IMPORTANT See The i-Sense Management Console on page 12 to set the nominal voltage.

Communication Connections

1. Remove the left-side cover (two Phillips screws at the top and bottom).
2. Conduit entry available from top or bottom.
3. Install the appropriate communication cable.
   (See Configure Communication Settings on page 9):

   8P8C (RJ45) modular Ethernet cable. Pass the Ethernet cable through the included RF filter core, and close the core securely, as shown in Figure 2. Failure to install the cable filter may result in RF emissions beyond the standards of the European Union's electromagnetic compatibility (EMC) directive.

Figure 2 - Ethernet cable filter installation. The clip-on filter core is supplied with the monitor.

Final Check

Follow these steps to make final communication checks.

1. Check all connections.
2. Replace left and right-side covers.

External Power Supply

The external 9V DC power supply (not provided) is used only during configuration; it should not be used in normal operation. Remove the left-side cover to access the 9V DC jack.

Initial Battery Charge Time

The rechargeable batteries may become discharged after some time on the shelf. Allow 30 minutes charge time after power-up before the monitor is ready to record voltage interruption events.

Operation, Maintenance, and Troubleshooting

The left-side cover can be removed to access the communication ports.

User Controls and Indicators

These user controls and indicators are available:

- The i-Sense® Management Console (requires an Ethernet connection to monitor)
- The www.igrid.com website (available from any web browser)
- Red and Green status indicators (see Table 6 and Table 7 below)
- RESET push button (located inside left cover)
- Heartbeat ♡ push button (located inside left cover)

Status Indicators

The status indicators will flash to indicate status; the flash codes are listed in the tables below. Additional status information is available by connecting to the i-Sense Management Console via the Ethernet port.

Startup/Confirmation Blink: At power-up and to confirm a push-button operation, both status indicators will blink rapidly for a few seconds.

Table 6 - Green NORMAL Status Indicator Flash Codes

Flash Rate	Meaning
Off	No Power
1	OK
2	Voltage events captured, waiting to transmit
3	Voltage deviation event detected, voltage has not yet returned to normal (PQ event in progress)
4	Establishing connection to the i-Grid servers
5	Connected to the i-Grid servers, uploading PQ event data
Constant	Not operating properly. Push RESET button

Table 7 - Red ERROR Status Indicator Flash Codes

Flash Rate	Meaning/Possible Causes
Off	OK
1	Communication error on the last attempt to contact the i-Grid servers. Will retry the connection after a period of time
2	Ethernet interface is not configured and connected to a network Ethernet interface is initializing Network cable is unplugged *Note: Only in Ethernet mode*
3	Voltage is low. The monitor has not detected an AC signal above 90% nominal on each of the enabled voltage channels
4	Both Ethernet and event detection are not initialized yet (combination of status 2 and 3) *Note: Only in Ethernet mode*

Reset Communication

If Ethernet port communication fail, the monitor has an assigned IP address that may be incompatible with your current LAN. Reset the monitor IP address to the default value by simultaneously pressing the RESET and Heartbeat ♡ buttons for 10 seconds. This will also reset the security user name and password to their default values. The Ethernet connection will restart after 5 seconds. Then follow the Ethernet Communication Setup on page 10 to assign a new IP address and change username and password from default values.

Hard Reset

If the monitor fails to respond, press and hold the RESET buttons for 4 seconds to perform a hard reset. This will not erase stored event data, but will cause a power-up event to be recorded.

Planned Shutdown

The monitor will normally record an interruption event whenever mains power is disconnected. It is often preferable to exclude maintenance shutdowns from your site's power data record. To shut down the monitor without recording an interruption event, push and hold the Heartbeat ♡ button for 10 seconds, until the Status Indicator blinks rapidly. The monitor will automatically restart the next time power is cycled, or when the button is held for another 10 seconds.

SHOCK HAZARD: Do not remove the right cover while main voltage is applied. The middle cover should never be removed.there are no user-serviceable parts inside.

Battery Replacement

WARNING: To reduce risk of explosion or fire, replace only with same battery type: Rechargeable NiMH, size AA, 1.2V, 2000. . .3000mAh. Obey polarity markings (+ / -).

The monitor uses rechargeable batteries to allow continued operation during power interruptions. The batteries will last for several years in normal operation, but will need to be replaced at some point. Battery health is shown on the i-Sense Management Console. The battery cover is located on the bottom surface of the monitor. Battery replacement may be safely performed while main power is applied. To replace or check batteries:

- Loosen two Phillips screws and remove the battery cover to access the battery holder.
- Carefully disconnect the battery plug and pull the battery holder straight out.
- Replace or check batteries. Use only the same type rechargeable battery: Nickel-metal-hydride (NiMH), 1.2V AA-size, rated 2000...3000mAh. Do not use any other battery type.
- Important: be sure that battery polarity matches the markings on the battery holder (+ and -)
- Replace battery holder straight into the unit. Carefully reconnect he battery plug.
- Be certain leads are not pinched. Replace cover. Tighten screws.

Waste batteries should be separated from the normal municipal waste stream and collected separately for local recycling

Notes:

Technical Specifications

Table 8 - Electrical Specifications

Attribute	Value
Nominal Voltage	User-selectable, 100V-480Vrms, 1-Phase or 3-Phase Immune to voltage fluctuation up to ±10% of nominal and transient over voltages typically present on mains supply (impulse withstand Category II of IEC 60364-4-443)
Frequency	45…65 Hz, auto-sensing
Measurement inputs	1 to 3 channels, Cat. No.: 1068S-3V480K (3-channel) Up to 6 channels, Cat. No.: 1068S-6V480K (6-channel)
RMS voltage measurement accuracy	0.2% typical, ± 2% maximum (of full-scale) True rms
Sample rate	5760 sample/second
Waveform capture rate	32 samples/cycle
Time Stamp	±0.1 seconds typical accuracy Real-time clock synchronized to UTC (NIST standard) daily, via i-Grid and SNTP protocol
Data Storage	Non-volatile event storage > 300 events Memory cleared after automatic up load to i-Grid.
Voltage Deviation Event detection trigger.	1/2-cycle rms voltage ≤ 87% or ≥115% of set nominal Adaptive waveform deviation detection of transient events.
Voltage Deviation Event Storage	8 cycles waveform data (-1…+3 cycles at event start and -3…+1 cycles at the event end) Continuous rms voltage trend, up to 2 minutes
Periodic (PRMS) Data Logging	Minimum, Maximum and Average rms voltage recorded for each 10-minute period. Min./Max. are lowest/highest sliding 1/2 -cycle rms period
Power supply and battery backup	Powered from Channel 1 (L1-L2 or L1-N), < 25VA load 9VDC external power supply (not provided - for configuration only) Rechargeable batteries enable measurement & communication during power interruptions for up to 2 minutes

Table 9 - Mechanical and Environmental Specifications

Attribute	Value
Enclosure	NEMA 1 (IP20). Indoor use only. Only non-conducting pollution (degree II) Dimensions: 291 x 247 x 75 mm (11.4 x 9.7 x 3.0 in.)
Weight	8.5 lb (3.6 kg)
Operating Temperature	0… 40 °C (32…104 °F)
Storage Temperature	-40…+75 °C (-40…+167 °F)
Relative Humidity	0…95%, non-condensing
Altitude 2000 m	6 562 ft at 40 °C (104 °F)

Table 10 - Communication Specifications

Attribute	Value
Internet Communication	Over port 80 via HTTP protocol. Outgoing only.
Ethernet	IEEE 802.3 10 Base-T (10 Mb/s), 8P8C (RJ45) modular connector
Indicators	Red and green front-panel status indicators
i-Sense Management Console	On-board web server for configuration and status, password protected.

Table 11 - Standards and Certifications

Attribute	Value
Standards and Certifications	• cTUVus (OSHA NRTL) listed • Tested to UL and CSA safety standards • CE mark (Safety and EMC) • RoHS compliant • FCC part 15 (Emissions)

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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Publication 1608S-UM001C-EN-P - November 2018

Supersedes Publication 1608S-UM001B-EN-P - August 2015

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