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User Guide



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Document History

Revision History

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000	05/20/15	UL Config. Shipping with 6 Breakers installed	SG

Approvals

This document requires following approvals:

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About this guide

This document is divided into the following chapters:

- Chapter 1, “Introducing our device”.
- Chapter 2, “Installation”
- Chapter 3, “Integration”, explains how the **ACXIS™** enclosure interacts with the PV system.
- Chapter 4, “PV System Troubleshooting”, describes built in troubleshooting functions.
- Chapter 5, “Warranty”

Who Should Use It

This guide is intended for users of different degrees of knowledge and experience in photovoltaic system installations. This guide assumes that you have knowledge in the micro-inverter photovoltaic system installation process.

For more information, refer to the inverter manufacturers installation manual, local NEC codes and/or other appropriate documentation.





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IMPORTANT SAFETY INSTRUCTIONS ***SAVE THESE INSTRUCTIONS***

This manual contains important instructions that must be followed during the installation and use of the ACXIS® enclosure.

The ACXIS® enclosures are designed and tested according to international safety requirements. As with all electrical and electronic equipment, certain precautions must be observed when installing the enclosure. To reduce the risk of personal injury and to ensure the safe installation and operation of the enclosure, you must carefully read and follow all instructions and warnings in this Installation Guide.

Safety and Hazard Symbols



This symbol appears beside instructions and warnings that deal with dangerous voltages that can injure people who come in contact with them.

Warnings



WARNING: A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the ACXIS® equipment and/or other equipment connected to the ACXIS® equipment or personal injury.

Warnings may also be accompanied by one or more of the safety and hazard symbols described above to indicate the type of hazard described therein.

Other Symbols

In addition to the safety and hazard symbols described previously, the following symbol is also used in the Installation Guide:

	Direct current supply symbol
	Alternating current supply symbol
	Phase Symbol
	Equipment grounding conductor
	Supplementary information that you should know to ensure optimal operation of the system.



User Guide

1. Introduction

1.1. Overview

The ACXIS® enclosure is an AC branch circuit combiner for micro-inverter installations, that incorporates a communications monitoring device and Ethernet bridge in a custom-designed, weather resistant enclosure. ACXIS® offers system troubleshooting, security, safety and convenience features.

Key features include:

- Listed UL 1741
- NEMA 3RX enclosure with passive ventilation
- Allows up to 12 individual branch circuits that allows wide installation versatility
- 208V Utility voltage indicator lights
- LED branch circuit indicator lights
- AC surge protection
- Power Line Communication (PLC) noise filters
- Simplified input and output wiring

1.2. Unpacking and Inspection

All ACXIS® enclosures are thoroughly checked before they are packaged and shipped. Although they are shipped in sturdy packaging, damage can still occur during shipping and delivery. It is important to carefully inspect the shipping container and contents prior to installation. If you detect any external damage after unpacking, report the damage immediately to your distributor and the shipping company that delivered the unit. Items not rejected within 10 days of delivery are considered accepted without recourse. If it becomes necessary to return the combiner, please use the original packing material.

If you need assistance in dealing with a damaged unit, please contact your distributor.



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2. Installation

2.1. Information for installer:

1. The National Electrical Code, ANSI/NFPA 70 wiring methods are to be used.
2. The AC input and AC output circuits are isolated from the enclosure and that system grounding, if required by Section 250 of the National Electrical Code, ANSI/NFPA 70, is the responsibility of the installer.
3. Photovoltaic System Grounding shall be installed per the requirements of Sections 690.41 through 690.47 of the National Electrical Code, ANSI/NFPA 70 and is the responsibility of the installer.
4. The tightening torque, allowable wire size, and type, for the Field-Wiring Terminals:

<i>Model EN-208</i>	<i>Tightening torque (lb-in)</i>	<i>Wire size (AWG/kCmil/MCM)</i>	<i>Wire type</i>	<i>Wire Temperature rating</i>
<i>Input</i>	<i>Marked on breaker</i>	<i>8 - 14</i>	<i>Cu Stranded</i>	<i>90C</i>
<i>Output</i>	<i>375 lb-in</i>	<i>#1 - 4/0</i>	<i>Cu Stranded</i>	<i>90C</i>
	<i>375 lb-in</i>	<i>300 - 600</i>	<i>Cu Stranded</i>	<i>90C</i>
<i>Grounding Terminal</i>	<i>45 lb-in</i>	<i>4 - 6</i>	<i>Cu Stranded</i>	<i>90C</i>
	<i>40 lb-in</i>	<i>8</i>	<i>Cu Stranded</i>	<i>90C</i>
	<i>35 lb-in</i>	<i>10 - 14</i>	<i>Cu Stranded</i>	<i>90C</i>



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2.2. Enclosure Mounting

The enclosure should be attached flat against an interior/exterior wall. If possible, position the enclosure in the shade to protect it from weather. Locate the enclosure at a convenient height that is within local electrical jurisdiction guidelines and where it will be accessible for maintenance.

1. Mount the enclosure with the exterior voltage indicator lights on right side.
2. Two air vents are mounted per enclosure to ensure sufficient air circulation and prevent internal condensation water. Provide a minimum of 6" on each side of the enclosure to prevent airflow restrictions.
3. Minimum Mounting requirements:
 - a. Drywall:
Minimum 3/8" drywall.
Toggler TB Plastic Toggle 3/8" - 1/2" Drywall Anchor with #8 x 1-1/2" sheet metal screw - 5/16" pre-drilled hole.
 - b. Hardiplank or concrete:
Minimum 1/4" Hardipank
Tapcon Concrete Anchors 3/16" x 2-3/4" - 5/32" pre-drilled hole.
 - c. Plywood and/or wooden wall stud:
#10 x 1-1/2" Wood Screw



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2.3. Enclosure Dimensions

Height	Width	Depth	Dimensions								Bottom screw and door bosses		Internal fixing			Glazed door			
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		U
29.4	21.1	11.8	26.8	18.1	10.9	19.2	9.5	14.9	10.3	12.8	16.7	26.6	13.8	0.6	22.6	15.5			inches
747	536	300	680	460	278	487	241	379	261	325	425	675	350	15	573	394			mm

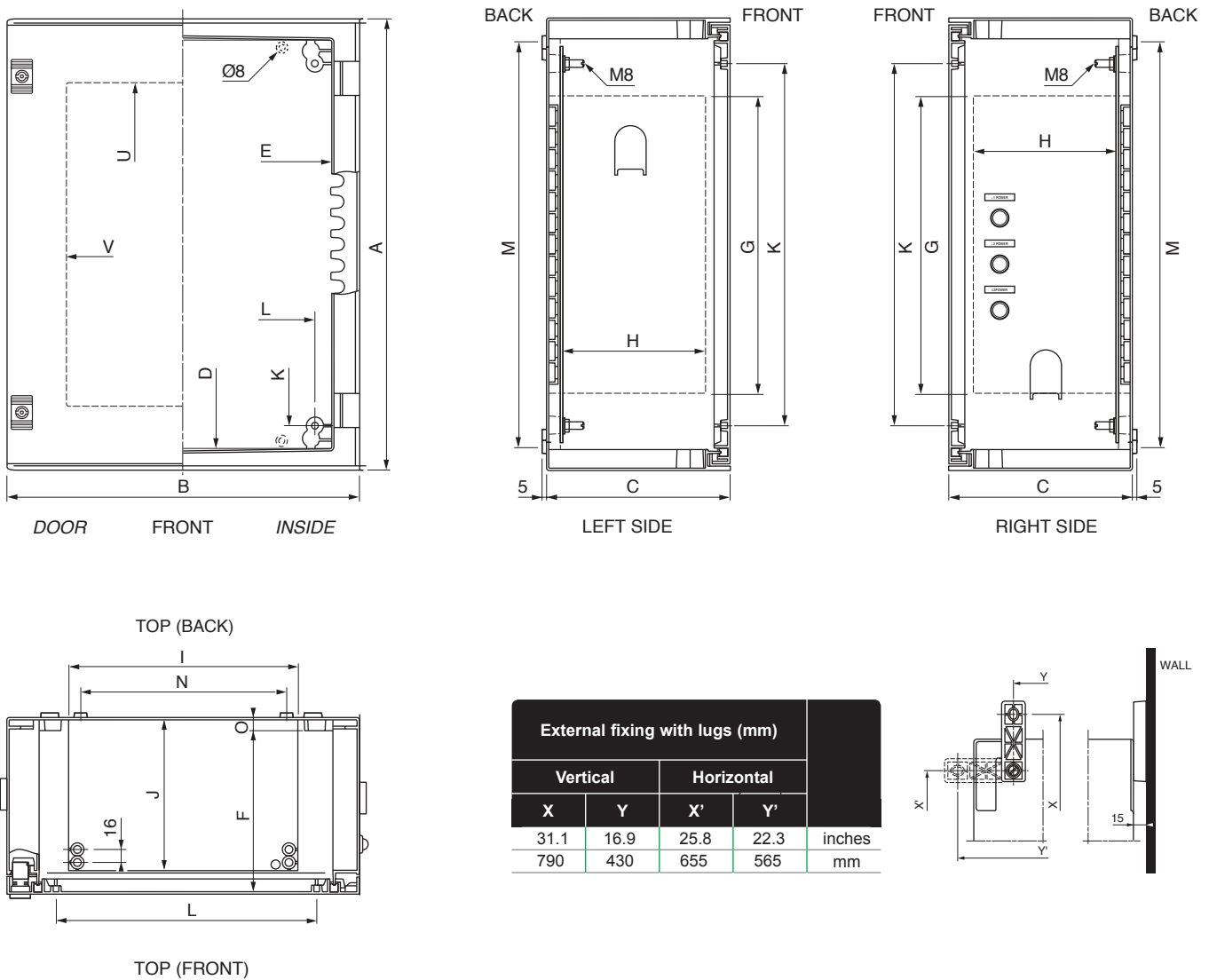


Figure 1. Combiner Enclosure Dimensions



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2.4. Input Wiring

Refer to Figure 2 for the input wiring locations of the **ACXIS**[®] enclosure. Conductors from each individual PV branch circuit conductors are wired into L1, L2 and L3 of dedicated circuit breakers and neutral connection points respectively. All PV safety ground conductors are wired into the ground bus located at the bottom of the enclosure backplate. Refer to Figure 3 for each input connection point.



NOTE: The **ACXIS**[®] enclosure is shipped with no entry holes. A cut-out is required for the appropriate conduit and conductor size. E-Gear recommends wire entry to be made according to Figure 2.



NEMA 4 or 4X applications must use only UL Listed watertight hubs that comply with the Standard UL514B. Use Myers- type, water-tight conduit fittings. Install fittings per manufacturer's recommendations.

2.5. Output Wiring

Refer to Figure 2 for the output wiring locations of the **ACXIS**[®] enclosure. Each individual PV branch circuit is combined into separate L1, L2 and L3 and neutral power terminal blocks for a single output connection of each conductor. Refer to Figure 3 for output connection points.



NOTE: The **ACXIS**[™] enclosure is shipped with no entry holes. A cut-out is required for the appropriate conduit and conductor size. E-Gear recommends wire entry to be made according to Figure 2.



NOTE: NEMA 4 or 4X applications must use watertight hubs that comply with the Standard UL514B. Use Myers type, water-tight conduit fittings. Install fittings per manufacturer's recommendations.



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NEMA 3RX Fiberglass (4XF) (Not to Scale)

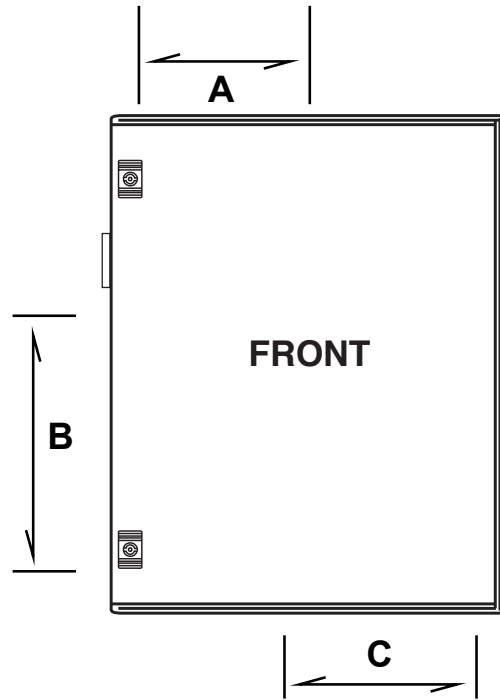


Figure 2. Wire Entry Locations

Dimension “A” and “B” are for input wire locations. Dimension “C” is for output wire location. These locations are recommendations only. Care should always be taken to assure there is enough wire bend space for the desired output wire gauge when choosing a conduit entry location.

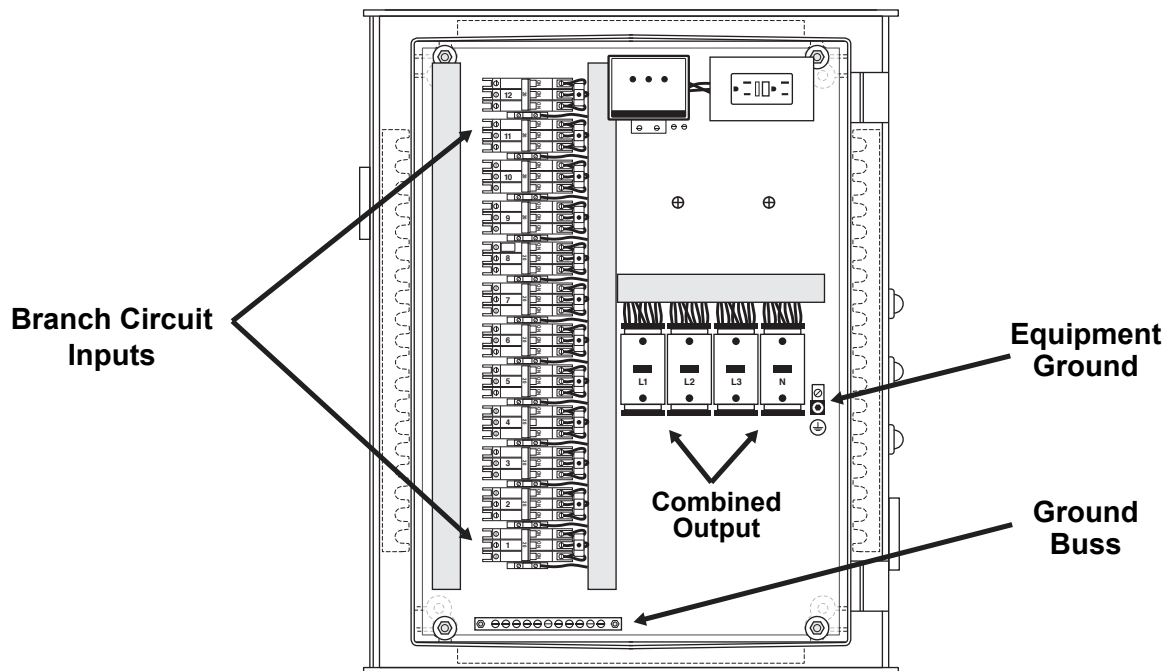


Figure 3. Connection Points

2.6. PV Branch Circuit Breakers & Neutral Terminal Blocks

All ACXIS® enclosures ship configured to accommodate DIN-Rail rear mounted branch circuit breakers and pass through neutral terminal blocks. Refer to your particular inverter manufacturer for maximum number of inverters per branch circuit and proper breaker sizing. Your distributor maintains stock of common breaker sizes if more branch circuits are necessary or spares desired. ** Follow supplied instructions for adding additional branch circuits.



Figure 4. DIN rail Type QCR breaker & Neutral Terminal Block



NOTE: All ACXIS® EN208 Combiners are shipped to accommodate at least six (6) branch circuits, each pre-wired with their own neutral terminal block and 3P 20A circuit breaker. Additional Branch Circuits can be installed in the field up to a maximum of twelve (12) branch circuits. ** Follow supplied instructions for adding additional branch circuits.



WARNING: All electrical installation must be done in accordance with the National Electrical Code ANSI/NFPA 70, local building codes, and the requirements of the authority having jurisdiction.



WARNING: To prevent electrical shock or injury, all wiring and commissioning procedures must be performed by qualified personnel.



WARNING: Before installing or powering on the ACXIS® enclosure, read all of the instructions and warnings on the enclosure and in this Installation Guide.

2.7. Adding Branch Circuit Breakers & Terminal Blocks



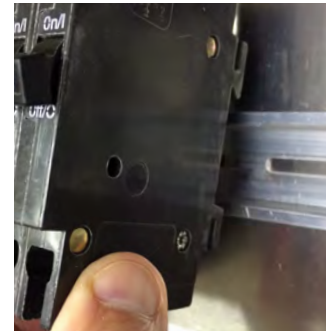
1) Remove wire raceway cover.



2) Snap the Terminal Block onto the DIN Rail.



3) Secure the line side Neutral wire to the terminal block.



4) Snap the Breaker onto the DIN Rail.



5) Secure the line side wires L1, L2, L3 to the top of the Breaker looping the L2 (Center Wire) through the LED Current Indicator.



6) Secure line side L1, L2, L3 & Neutral wires to the top of the Distribution Blocks labeled L1, L2, L2 & N.



7) Replace the wire raceway cover.



WARNING: BEFORE INSTALLING ADDITIONAL BREAKERS, insure that electrical service to the ACXIS® enclosure has been disconnected. All electrical installation must be done in accordance with the National Electrical Code ANSI/NFPA 70, local building codes, and the requirements of the authority having jurisdiction.



WARNING: To prevent electrical shock or injury, all wiring and commissioning procedures must be performed by qualified personnel.



WARNING: Before installing or powering on the ACXIS® enclosure, read all of the instructions and warnings on the enclosure and in this Installation Guide.

3. Integration

3.1. Integration into the PV System

The ACXIS® box is designed to be installed between the PV generation components and the load side of the homes distribution panel as detailed in Figure 5.

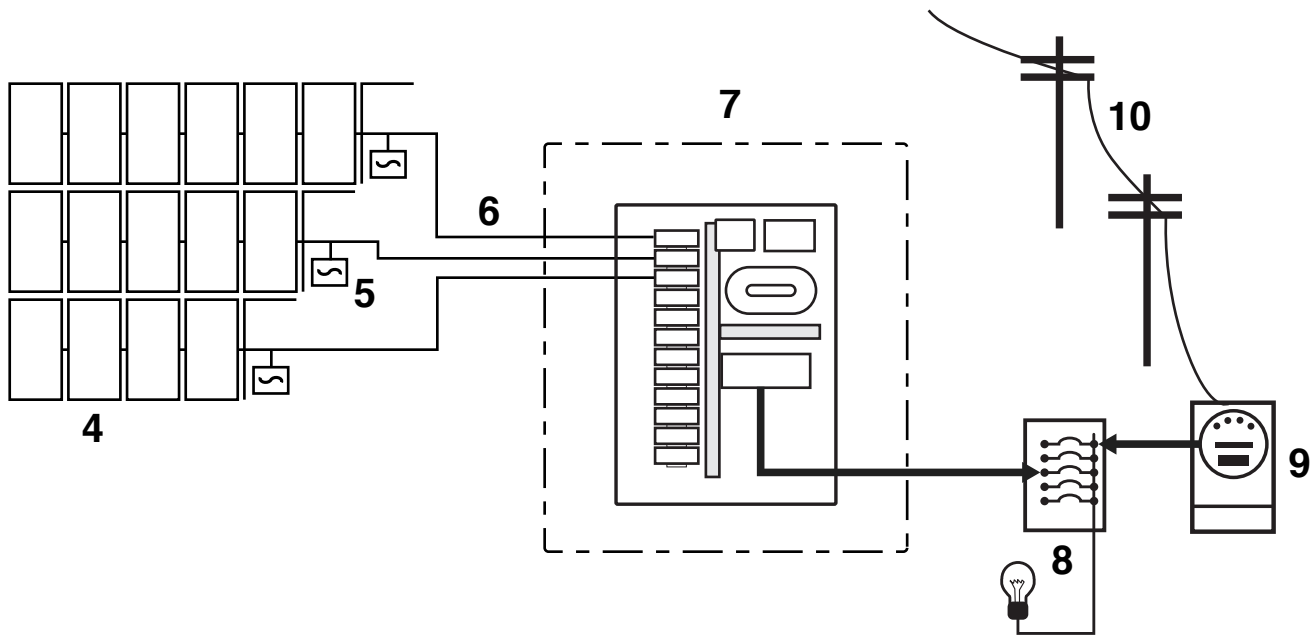


Figure 5. Integration into PV system

- 4. Solar panels
- 5. Micro-Inverters
- 6. Inverter branch circuits
- 7. ACXIS® AC Combiner housing
- 8. Home power distribution panel (Local load)
- 9. Utility meter
- 10. Utility grid

3.2. Overview of Internal Components

Detail of each component as shown in Figure 6

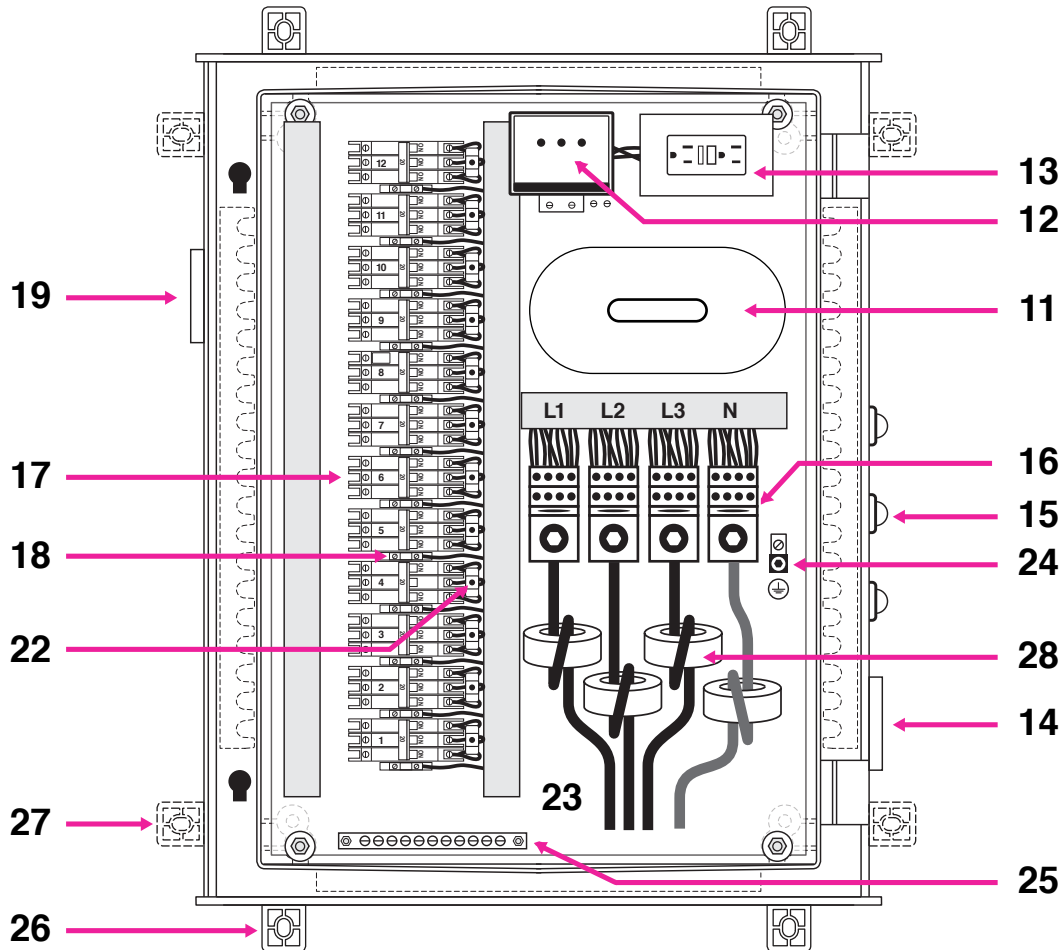


Figure 6. Internal components

11. Solar energy monitoring unit
12. AC surge protection device
13. Electrical outlet
14. Lower ventilation
15. 208V 3PH Voltage indicator lights
16. Output power distribution blocks
17. Input branch circuit over current protection breakers
18. Neutral wire terminal block
19. Upper ventilation
22. Branch Current indicators
23. Mounting plate for electrical components
24. Equipment Grounding Lug
25. Branch Circuit Ground Bus
26. Enclosure mounting bracket location
27. Alternate mounting bracket position
28. Power Line Communication (PLC) noise filters

3.3. Power Line Communication (PLC) Filter Installation

PLC filter “Rings” are installed on the output wiring as illustrated in Figure 7.

Wrap L1, L2, L3, N once through each ferrite ring.

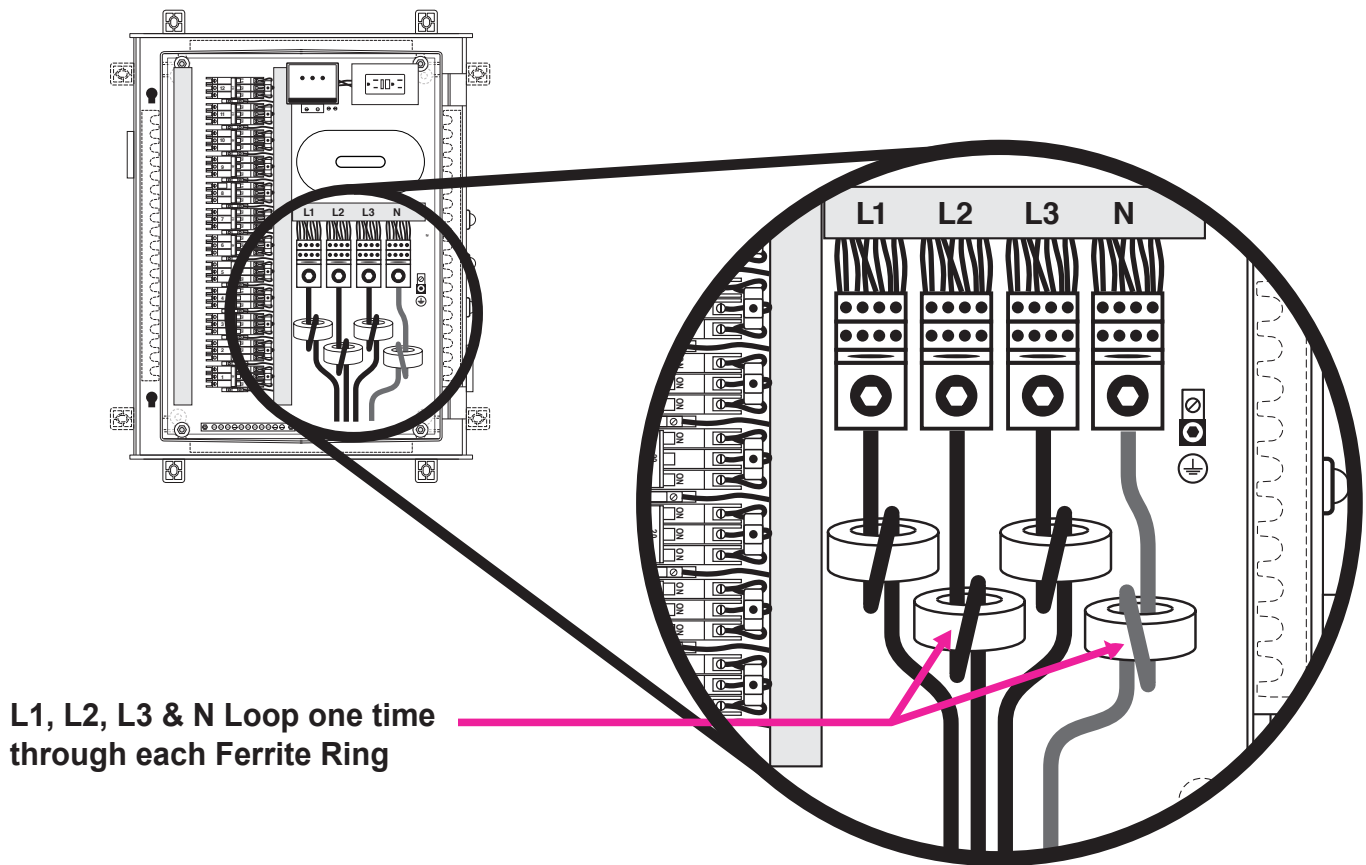


Figure 7. PLC filter installation



NOTE: It is important to separate, physically, the input array wires and output load wires in the **ACXIS®** box. If the wire sets come close to each other, they will crosstalk and effectively bypass the filter made with the beads. Do not run array conductors and load conductors in the same raceway or conduit. Input and output wiring should be separated. You may need additional beads in cases of extreme cases of power line noise.

3.4. Connection to the Internet

Internet Connection within the ACXIS® enclosure:

Your micro-inverter monitoring system comes configured for either wireless or bridge adaptor configurations. Install the wireless internet dongle (A) within the **ACXIS®** enclosure using its included USB cable. Follow wireless dongle instructions for proper connection to the wireless router. (or) Plug the optional ethernet bridge adaptor (B) [Plug#1] into the electrical outlet within the **ACXIS®** enclosure and connect it to the monitoring unit using its included Ethernet cable.

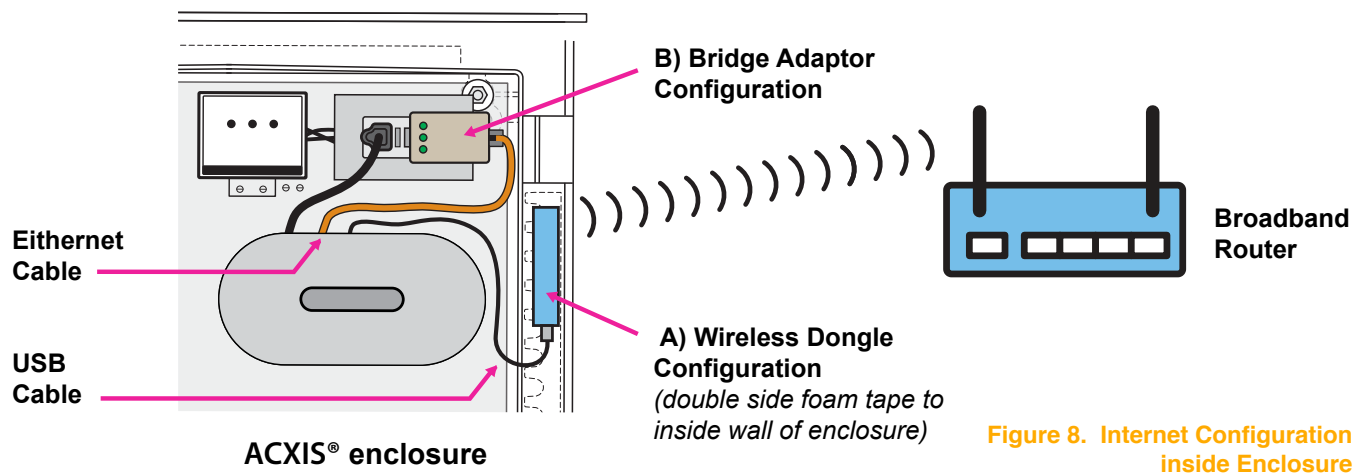


Figure 8. Internet Configuration inside Enclosure

Internet Connection within the building:

If you're using the bridge adaptor internet configuration B), plug the second ethernet bridge adaptor [Plug#2] into an electrical outlet near the building's broadband router as illustrated in Figure 9. The ethernet bridge adaptors allow an ethernet IP connection between the two devices over the building's electrical lines. The solar monitoring gateway will use this IP address/connection to access the Internet and send reports for online monitoring.

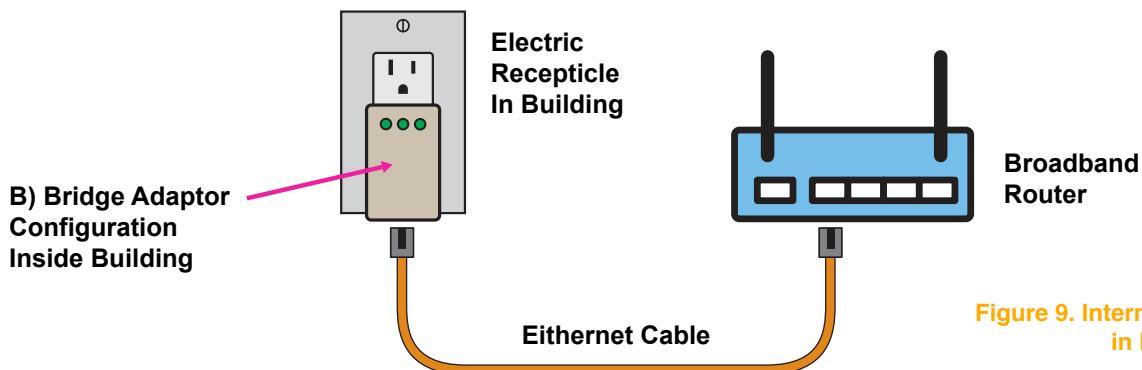


Figure 9. Internet Configuration in Building, Plug #2

Are My Power Line Communication Bridges Working?

Use the status lights to verify connections. The table below describes the lights on the front panel of the unit.

Indicator	State	What it means
Power	On	Indicates device powered on
	Off	Indicates no power
PLC Activity	Blinking	Indicates activity on power line
	Off	Indicates no activity on power line (should blink intermittently)
Ethernet Link	On	Indicates Ethernet connectivity
	Blinking	Indicates Ethernet traffic
	Off	Indicates no Ethernet activity




Figure 10. Bridge Adaptor Communication

4. PV System Troubleshooting

Built into the design of the ACXIS® enclosure are features that aid in the troubleshooting overall PV system production issues.

4.1. Input current indicators

Wire-mounted electrical current indicators provide an effective method of monitoring electrical current. The indicators are attached directly to the input current-carrying wire from the PV arrays. When the current exceeds the turn-on point, the LED will illuminate to indicate the presence of current from each individual branch circuit of micro-inverters. Refer to Figure 6 component #22 for location within the enclosure.

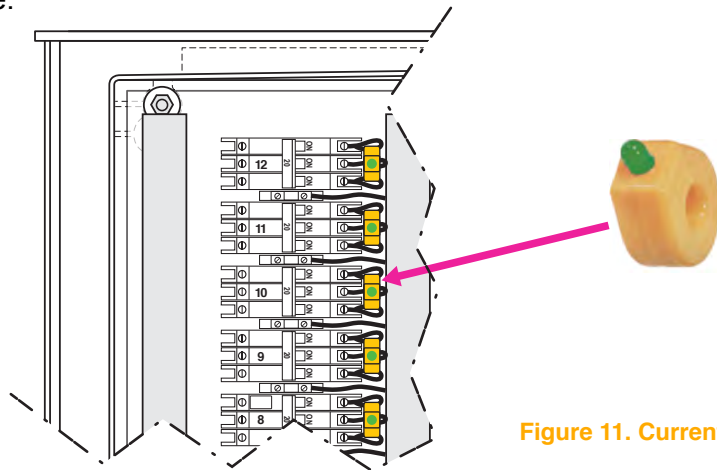


Figure 11. Current Indicators

4.2. Output voltage indicator

208v light indicates the presence of grid voltage from the utility. It will also reveal blown fuses and / or tripped breakers between the ACXIS® enclosure and the point of building interconnection. Refer to Figure 6 component #15 for location on the exterior of the enclosure.

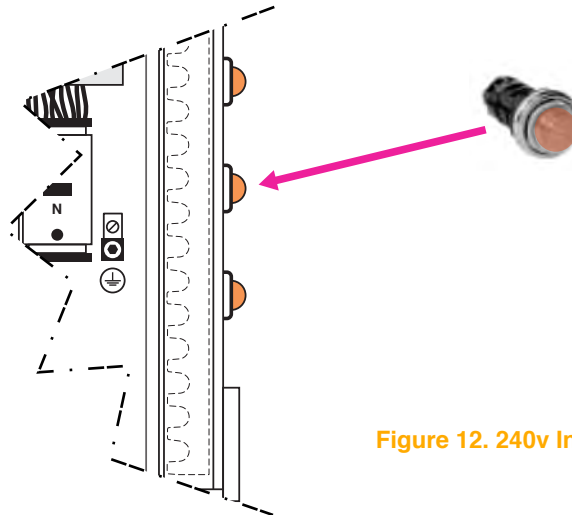


Figure 12. 240v Indicator



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5. Warranty

All **ACXIS**[®] enclosure sold in the USA have a five-year warranty. For warranty coverage, or if you have questions about the **ACXIS**[®] enclosure warranty, contact E-Gear at the address, telephone number, or web site listed on page 1 (to send e-mail, see the contact section of the E-Gear web site: www.ACXIS.us)