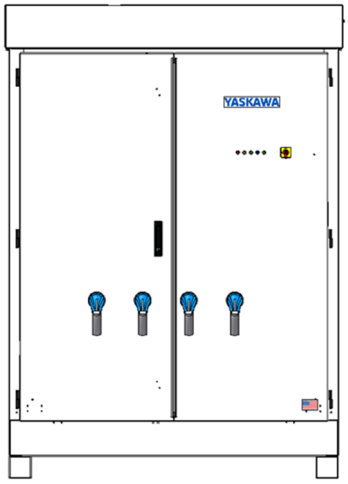
YASKAWA
SOLECTRIA SOLAR

Utility Scale 1500VDC Modular Central Inverter

SOLECTRIA® XGI 1500-1MW

Installation and Operation Guide

Models: XGI 1500-1MW-600
XGI 1500-0.99MW-600
XGI 1500-0.85MW-600
XGI 1500-0.75MW-600
XGI 1500-0.50MW-600
XGI 1500-0.498MW-600



IMPORTANT NOTES

These XGI 1500-1MW-600 inverter models are designed and equipped for use in both *PV applications* and *DC-coupled PV-Plus-Storage applications*.

1. The inverters have a default setup for use in PV applications. Via the user interface, users may select the DC-coupled PV-plus-storage configuration.
2. The inverters have a default setup with DC grounded. In this configuration, the inverters utilize a functionally-grounded DC negative and the internal ground-fault detection system. Note that DC grounding will mitigate potential-induced-degradation (PID), in PV modules susceptible to that phenomenon.
3. Via the user interface, users may select a DC floating configuration. In this configuration, users must supply an external ground fault detection device (refer to 2026 NEC §690.41).

The Yaskawa Solectria Solar Applications Engineering team requires a review and approval of each project's single-line diagram (SLD) and transformer configuration.

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1 IMPORTANT SAFETY INSTRUCTIONS

1.1 Hazard Symbols

Table 1-1. Hazard Symbols

DANGER	**DANGER** indicates a hazardous situation, which, if not avoided, will result in serious injury or death.
WARNING	**WARNING** indicates a hazardous situation, which, if not avoided, could result in serious injury or death.
CAUTION	**CAUTION** indicates a hazardous situation, which, if not avoided, will result in minor or moderate injury.
NOTICE	**NOTICE** indicates a hazardous condition, which, if not avoided, could result in equipment working abnormally or property loss.
INFO→	**INFO** indicates important supplementary information to use the product effectively.

1.2 Symbols on Labels

Table 1-2. Explanation of Symbols

	AC Signal
	DC Signal
	Equipment Ground
	AC Power Phase
	Off
	On
	Refer to Operating Instructions
	Caution: Risk of Electric Shock
	Caution: Risk of Electric Shock Timed Discharge

1.3 General Safety Messages

DANGER	**ELECTRIC SHOCK HAZARD** Components with hazardous voltage and energy will electrocute operator. Operator shall avoid touching live components with hazardous voltage and energy.
WARNING	**UNQUALIFIED OPERATOR HAZARD** Operator may cause a hazardous situation by making incorrect installation or wiring connections. A qualified technician shall do all installation and wiring connections to comply with all local, national, or country specific guidelines for safety.
WARNING	**ELECTRICAL SHOCK HAZARD** Operator may contact components with hazardous voltage and energy. Use proper safety equipment including Personal Protective Equipment (PPE) when de-energizing the unit. De-energize the unit, wait 5 minutes, and verify the absence of voltage before opening the equipment or removing any protective shields.
NOTICE	**GENERAL DAMAGE TO EQUIPMENT** Attempting to service the inverter improperly may result in damage. Contact Yaskawa Solectria Solar Technical Support for maintenance.
INFO→	**READ AND FOLLOW INSTRUCTIONS** Failure to read and follow instructions may void the warranty. Install the inverter according to the instructions in this manual.

SAVE THESE INSTRUCTIONS

This manual contains instructions for these models:

XGI 1500-1MW-600
XGI 1500-0.99MW-600
XGI 1500-0.85MW-600
XGI 1500-0.75MW-600
XGI 1500-0.50MW-600
XGI 1500-0.498MW-600

1.4 Status Panel

The status panel consists of five LEDs that provide useful information to the user regarding the function of the inverter. LEDs are shown in Fig. 1-1 and defined in Table 1-3.



Fig. 1-1. Status Panel

Table 1-3. Explanation of Symbols on Status Panel

	**Ready (Yellow)** ON: Inverter is initialized and ready to operate OFF: Inverter is not ready to operate
	**Network and Communication (Yellow)** ON: Network and communication services are working properly OFF: Network and communication services are offline
	**Power (Yellow)** ON: Inverter is generating AC power OFF: Inverter is not generating AC power
	**Maintenance (Yellow)** ON: Inverter needs maintenance or service OFF: Inverter does not need maintenance or service
	**Ground Fault (Red)** ON: Ground fault that needs service and may be a hazard OFF: There is no ground fault

2 Overview

2.1 Inverter Series Overview

The SOLECTRIA® XGI 1500-1MW series are state-of-the-art Utility-Scale Modular Central inverters designed and manufactured in the USA, using global components. The six models in the series are listed in Table 2-1.

Table 2-1. XGI 1500-1MW Models

MODEL	RATING
XGI 1500-1MW-600	1 MW / 1 MVA
XGI 1500-0.99MW-600	0.99 MW / 0.99 MVA
XGI 1500-0.85MW-600	0.85 MW / 0.85 MVA 0.85 MW / 1 MVA
XGI 1500-0.75MW-600	0.75 MW / 0.75 MVA 0.75 MW / 1 MVA
XGI 1500-0.50MW-600	0.50 MW / 0.50 MVA 0.50 MW / 1 MVA
XGI 1500-0.498MW-600	0.498 MW / 0.498 MVA 0.498 MW / 1 MVA

2.2 Inverter Features

- High conversion efficiency using 3-level power conversion technology.
  - Max efficiency: 99.0%
  - CEC weighted average efficiency: 98.5%
- Grid adaptability
  - Supports multiple grid standards
  - Certified to UL 1741SB with IEEE 1547-2018, IEEE 1547.1 2020, and IEEE 1547a-2020
  - Adjustable reactive power
  - Adjustable power factor (PF) ±0.80 (other ranges apply to certain models)
  - Remote power curtailment
- Ethernet connectivity
- Wi-Fi accessible user interface
- Protective enclosure: UL Type 3R rated enclosure for outdoor use.
- Flexible design: The SOLECTRIA XGI 1500-1MW series inverters provide a flexible solution for utility-scale centralized inverter system architecture.

- PV Source Circuit Combiners: Pair the XGI 1500-1MW series inverters with the Solectria Remote Combiners (CR1500-xxP-yyS-400 series, or CR1500-xxp-yyF-400S series with output fuse, see Fig 2-1 below).

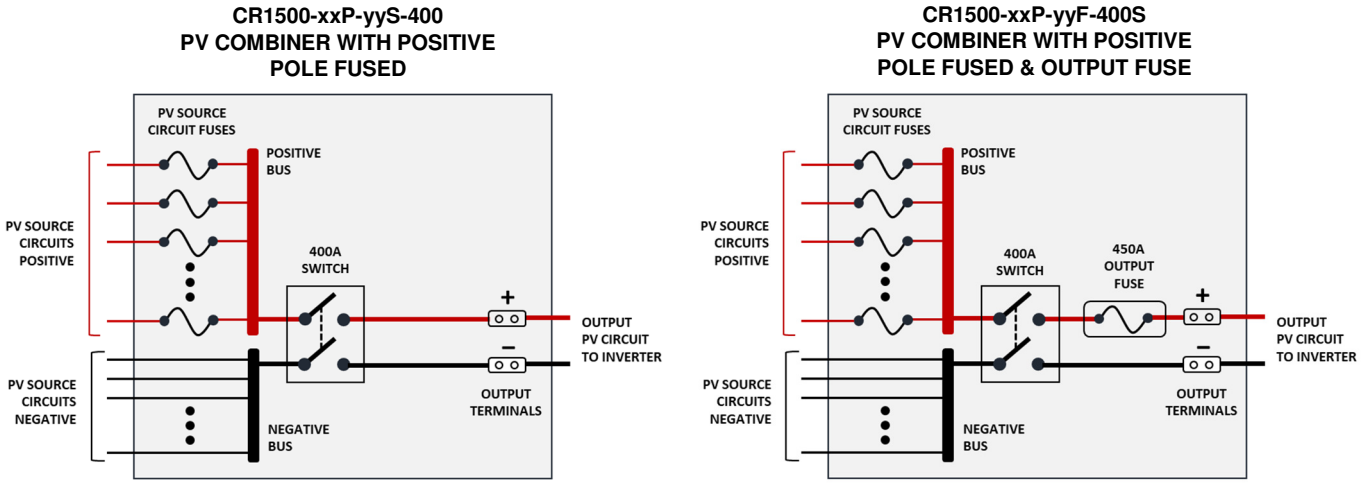


Fig. 2-1. Remote Combiner Options for the XGI 1500-1MW Series Inverters
(visit www.solectria.com for more information)

2.2.1 INVERTER PROTECTION FEATURES

a) Short-circuit protection
b) Anti-islanding protection
c) Input and output surge protection
d) Input over-current protection
e) Self-monitoring variables:
   - ✓ AC output voltage and frequency
   - ✓ Leakage current to ground
   - ✓ DC injection in AC output
   - ✓ Internal ambient temperature
   - ✓ IGBT module temperature

INFO→	**Lightning Strikes - Limited Protection** The XGI 1500-1MW series inverters feature Metal Oxide Varistors (MOVs) that provide surge protection on both DC and AC inputs. While effective, these MOVs provide limited protection and are not designed to serve as primary protection against direct lightning strikes. For effective site-wide lightning protection, consult a qualified engineer to develop an appropriate protection plan.

2.2.2 **COMMUNICATION OVERVIEW**

Users can communicate with the SOLECTRIA XGI 1500-1MW inverters using a Wi-Fi-enabled smart device, such as a laptop, tablet, or smartphone. The SOLECTRIA XGI 1500-1MW inverter monitors internal variables that are sent via a modem or gateway to the Internet cloud. In the cloud these data are stored on the SRV data server where they can be accessed by the end user (additional fee applies). Add-ons such as a weather station and a Data Acquisition System (DAS) are supported using Ethernet cable.

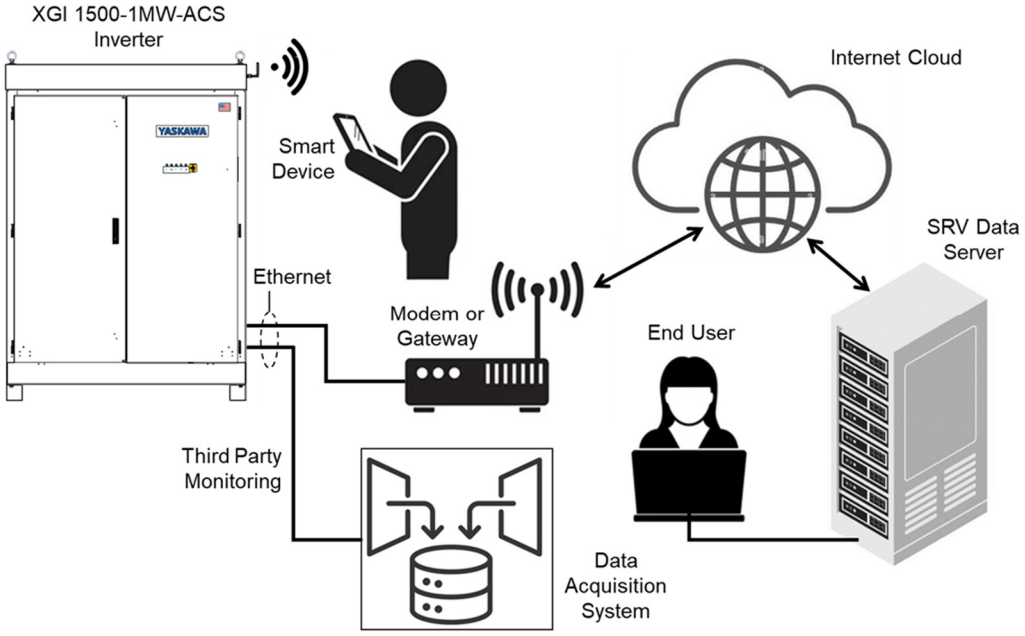


Fig. 2-2. COMMUNICATIONS OVERVIEW

2.2.3 INVERTER EXTERNAL FEATURES AND INTERNAL COMPONENTS

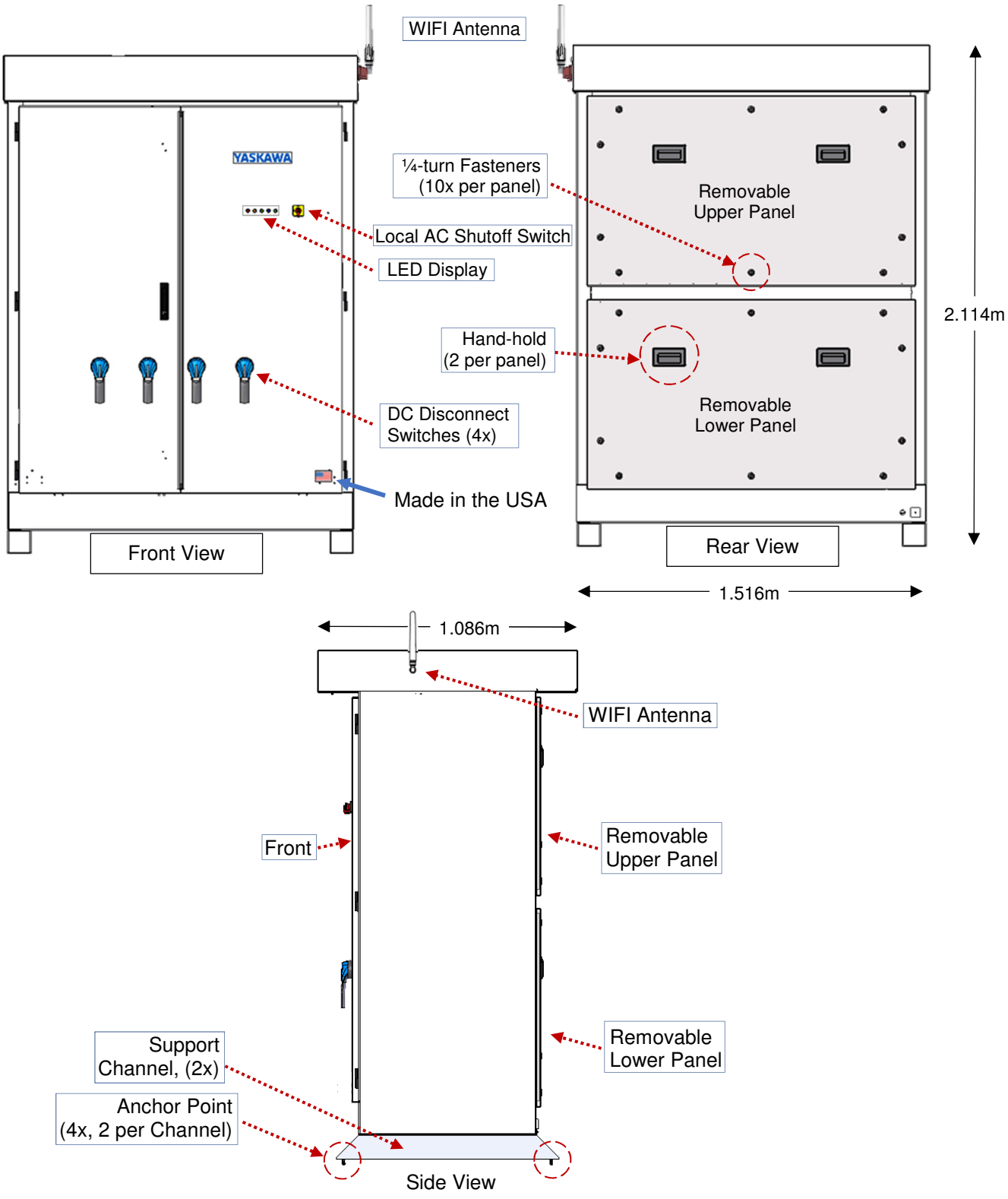


Fig. 2-3. FEATURES OF THE XGI 1500-1MW INVERTER

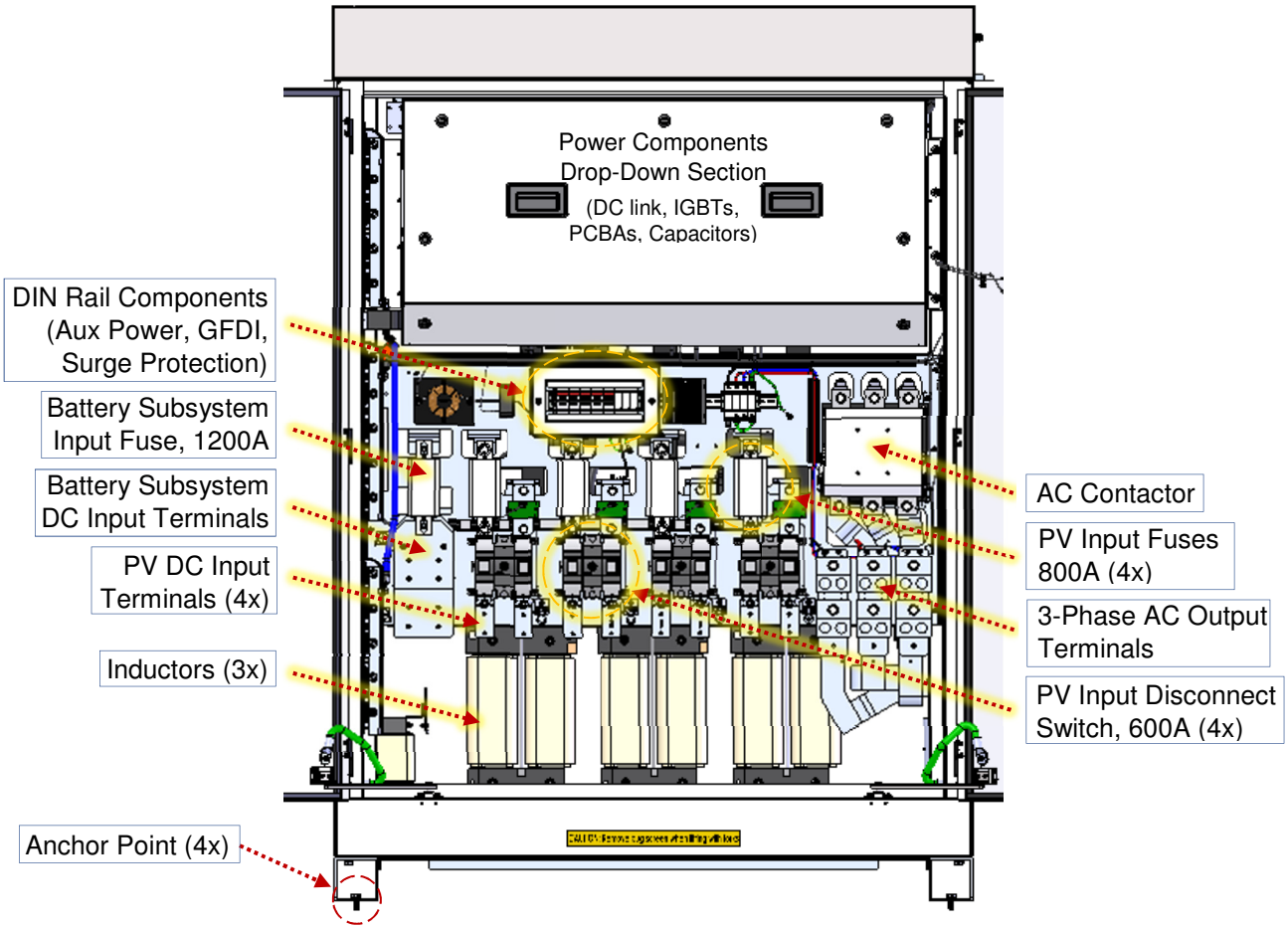


Fig. 2-4. COMPONENTS IN THE XGI 1500-1MW INVERTER

2.3 Inverter Placement

The SOLECTRIA XGI 1500-1MW Series inverters are rated for outdoor use and will operate when the connected solar array provides sufficient voltage and power, and the utility service voltage and frequency lie within their normal bounds. To obtain the best performance and ensure longevity of the inverter, it is recommended to mount the inverter out of the direct sunlight.

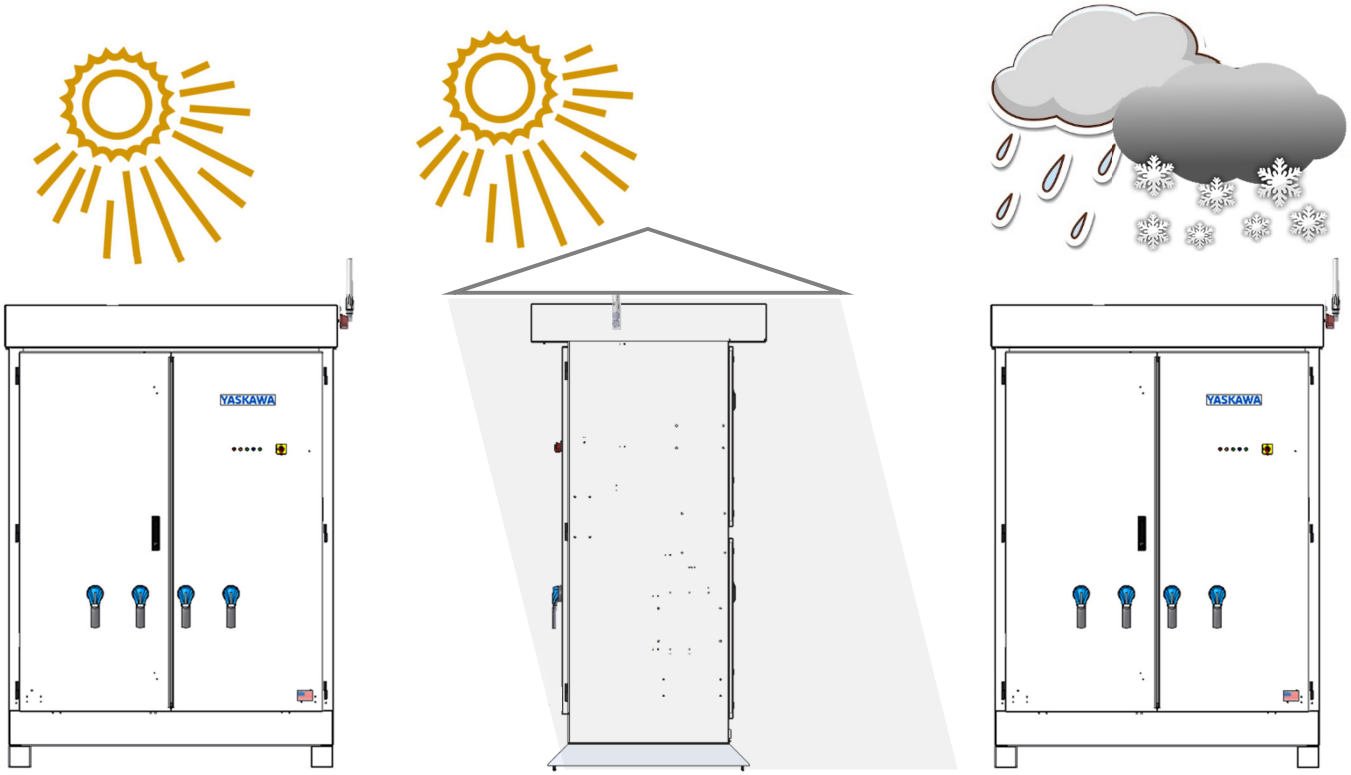


Fig. 2-5. ACCEPTABLE INVERTER ENVIRONMENTS: DIRECT SUNLIGHT, SHADE, AND RAIN / SNOW

INFO→

Required Space Around the Inverter

To allow access to the interior of the inverter with the doors open and also provide for proper air flow, provide separation of at least three feet (3') between inverters:

- ✓ front-to-front
- ✓ front-to-back
- ✓ back-to-back

Side-to-side separation of the inverters requires a minimum of six inches.

(Note: inverters are depicted in plan view.)

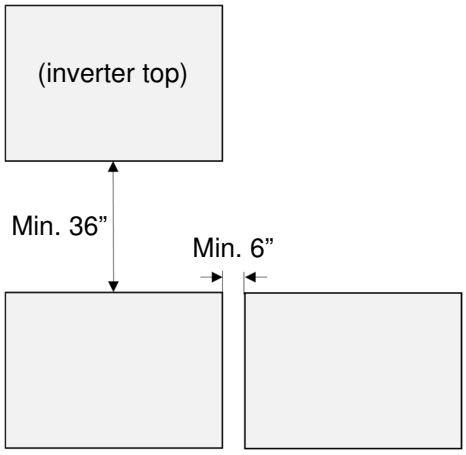


Fig. 2-6. REQUIRED SPACING OF THE XGI 1500-1MW SERIES INVERTERS

2.4 Unpacking

When storing the packaged inverters, keep them in an area where they will not get damaged or flooded. Storage temperatures should be maintained in the range -40°F to +167°F (-40°C to +75°C). Open the box carefully to avoid damaging the contents.

Table 2-2. CONTENTS OF SHIPPING BOX

1. Inverter (XGI 1500-1MW Series, any model)
2. Voltage-Frequency test report
3. One-page Quick-Start Guide for Wi-Fi connection to a smart device
4. Hardware Kit containing: a. Antenna (and fasteners) for Wi-Fi connection to a smart device b. 90-degree coaxial connection (and fasteners) for the antenna

3 Installation

3.1 Installation Procedure Overview

1. Remove the inverter from its container and properly dispose of the packaging material.
2. Secure the inverter to a pad, carefully observing the lifting hazard notice below.

⚠ CAUTION	**Lifting Heavy Object Hazard** Proper lifting equipment must be used in order to avoid injuries. The XGI 1500-1MW series inverters each weigh approximately 887kg (1,955 lbs).

3. Turn OFF the upstream AC breaker and apply a lock.
4. Turn OFF the Local AC Shutoff Switch on the inverter. The Local AC Shutoff Switch sends a signal to the inverter to turn off and open the load-break rated AC contactor.
5. Turn OFF the 4 DC switches on the inverter. The DC switches are load-break rated.
6. Open the left-side, wiring-compartment door.
7. Confirm that the PV Output Circuit conductors (from all PV Combiners) are de-energized. If not, turn OFF the DC switch on each PV Combiner.
8. Connect the AC wires from the grid to the AC terminal block in the wiring compartment.
9. Connect the PV Output Circuit wires from all PV Combiners, to the DC terminals in the wiring compartment.
10. Connect the communication wires.
11. Close and secure the doors.
12. Connect the antenna to the inverter using the 90-degree coaxial connection hardware.

3.2 Securing the Inverter to a Pad or Other Surface

Note there are four 0.75” diameter holes that are the Anchor Points for the inverter (see Fig. 3-1 and Fig. 3-2). Note that the details of anchoring the inverter to a pad or other surface are left to a qualified engineer familiar with site-specific conditions.

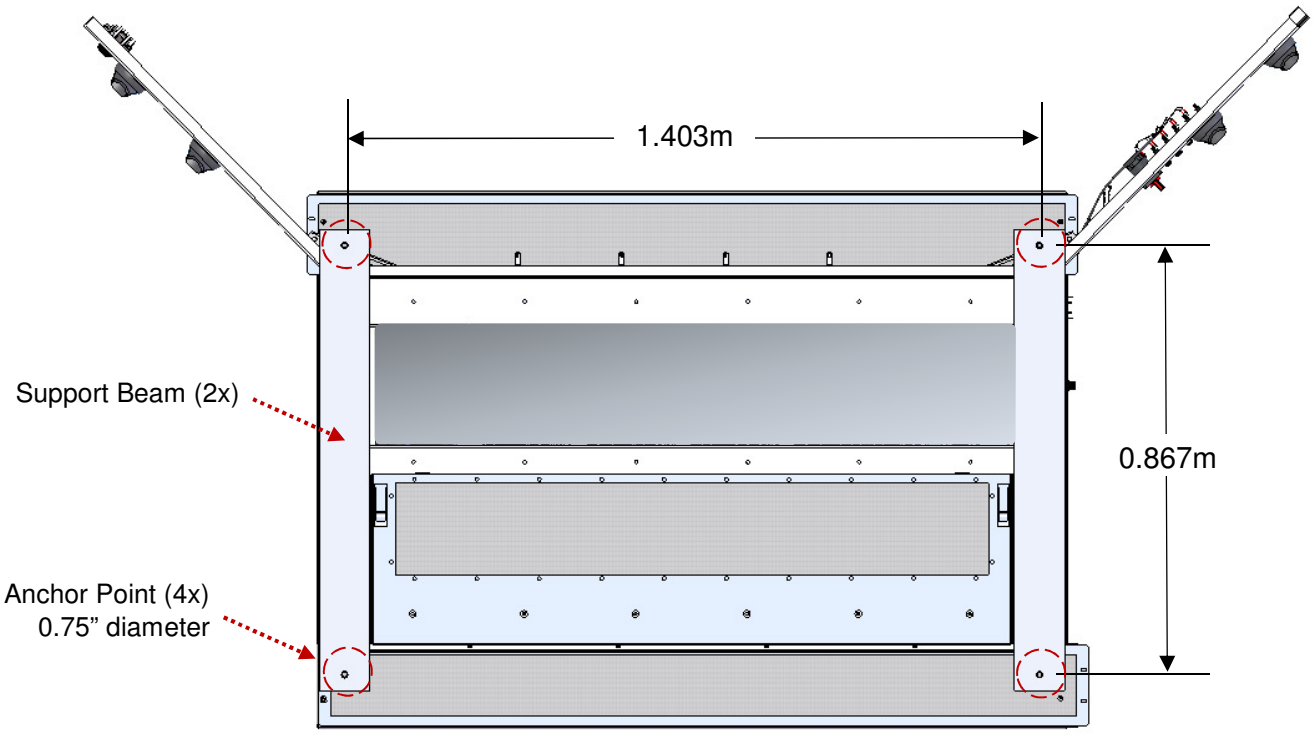


Fig. 3-1. ANCHOR THE XGI 1500-1MW INVERTER USING THE FOUR ANCHOR POINTS AND APPROPRIATE SITE-SPECIFIC DETAILS

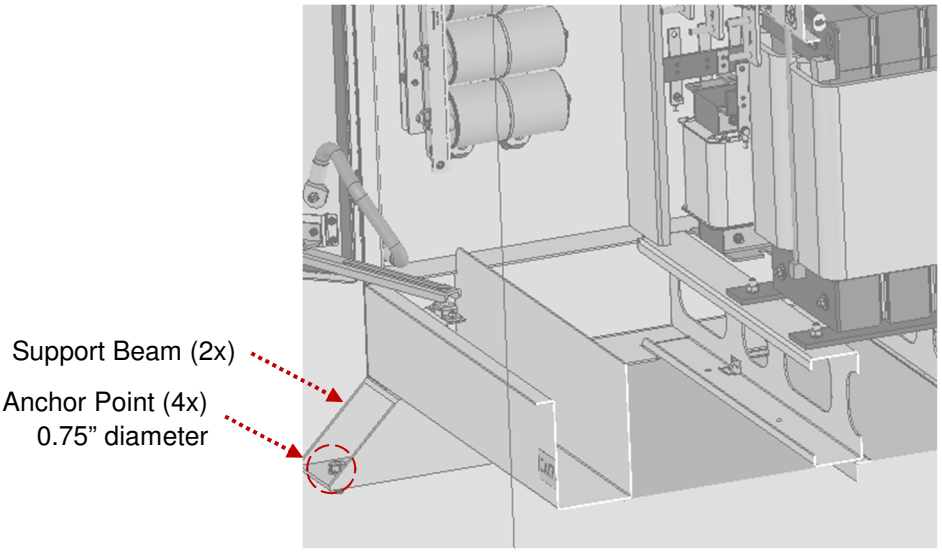


Fig. 3-2. ANCHOR POINTS ARE ACCESSIBLE INSIDE THE OPEN ENDS OF THE SUPPORT CHANNELS

3.3 Conduit Entry Area

Turn OFF the Local AC Shutoff Switch before wiring. The Local AC Shutoff Switch sends a signal to the inverter to turn off and open the load-break rated AC contactor. The Local AC Shutoff Switch is located on the right-hand side of the front of the inverter (see Fig. 3-3).

WARNING	**Turn OFF the Local AC Shutoff Switch on the inverter** Verify the absence of AC voltage

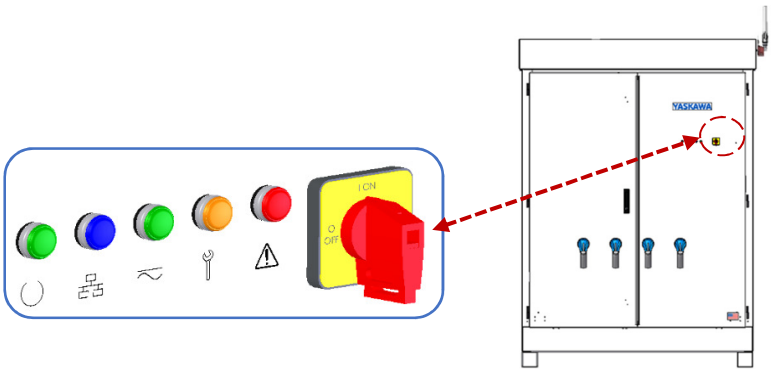


Fig. 3-3. LOCAL AC SHUTOFF SWITCH ON INVERTER COVER

Run the AC and DC wiring in separate conduits. All conduit must be rain-tight. Use wet-location connectors that comply with UL 514B to maintain the inverter enclosure's Type 3R rating. Conduit holes or other modifications to the enclosure are not permitted anywhere on the enclosure except in the designated Conduit Area (see Fig. 3-4, Fig. 3-5).

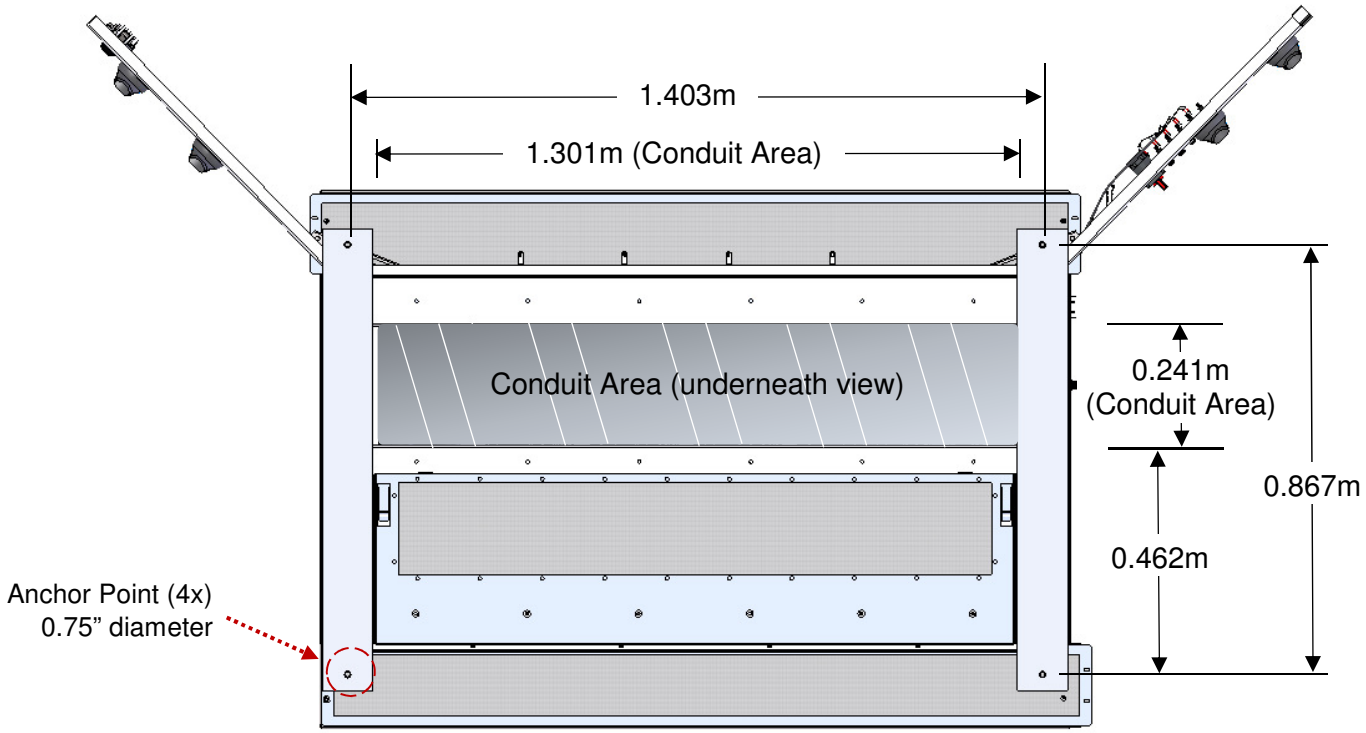


Fig. 3-4. WIRING INTO THE XGI 1500-1MW IS THROUGH THE CONDUIT AREA; ACCESS FROM INSIDE (NOT BELOW) THE INVERTER

Access the Conduit Area from inside the inverter to create conduit entry holes. See images below in Figure 3-2.

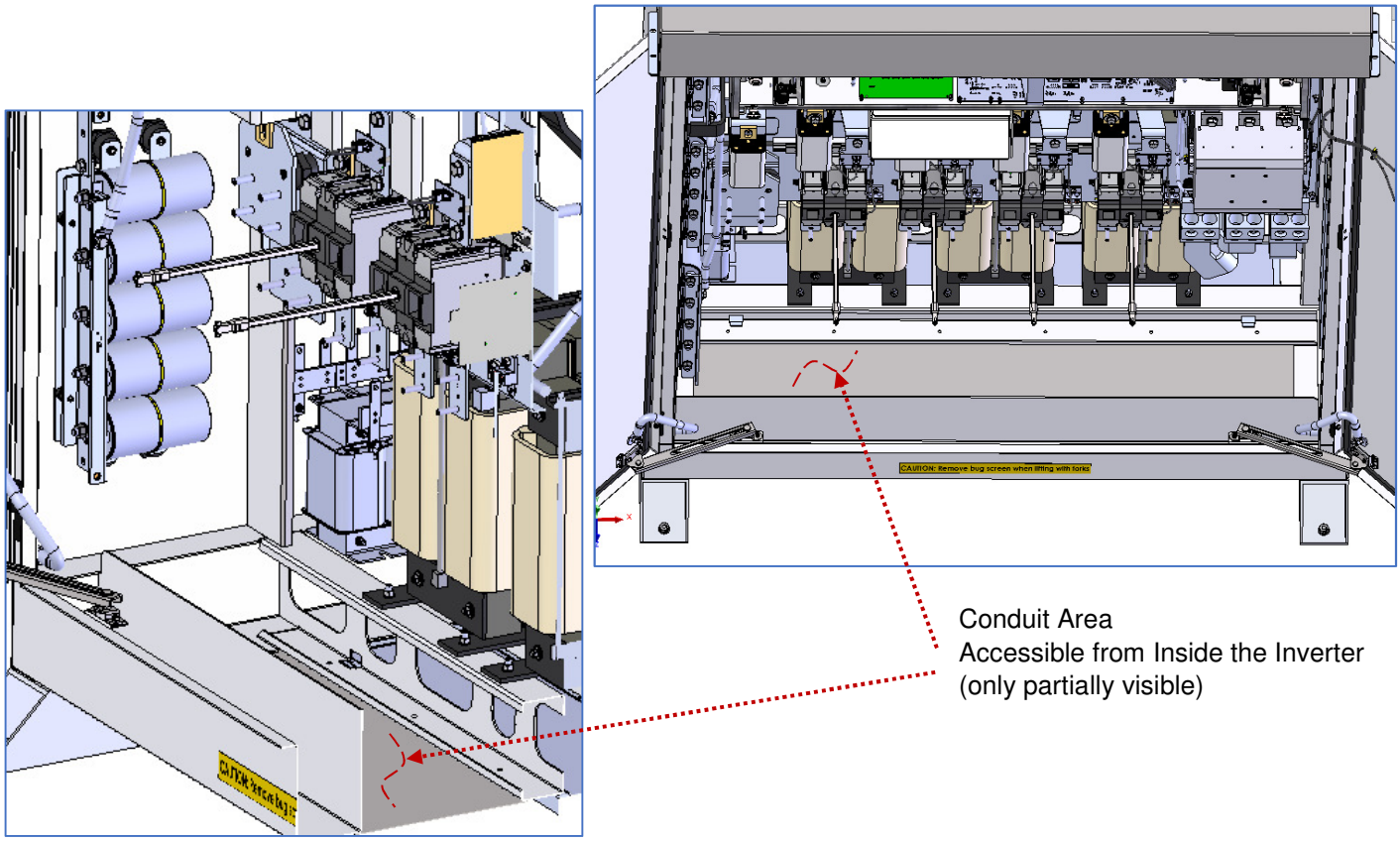


Fig. 3-5. CONDUIT AREA VIEW FROM INSIDE

WARNING	Remove all metal shavings from the inverter after drilling a hole in order to prevent metal chips and other debris from damaging the inverter.

WARNING	Conduit entries into the inverter often allow the introduction of moisture and condensation to form inside the inverter enclosure. Use an appropriately rated sealant for all conduit entries to prevent moisture entry and condensation. Condensation inside the inverter may cause irreparable damage and is not covered under warranty.

4 Inverter Operating Mode: PV or DC-Coupled Storage (ESS)

INFO→	**PV Applications**: The XGI 1500-1MW Series inverters are configured in the factory for use in PV applications (without storage). No adjustment is necessary for use in PV applications. **DC-Coupled Storage Applications**: Users must change the inverter's configuration via the user interface for use in DC-Coupled Storage (ESS) applications.

4.1 Changing Operating Mode from PV (Default) to DC-Coupled Storage (ESS)

Refer to §6 for details on the Graphical User Interface (GUI). The GUI screen for changing the XGI 1500-1MW series inverter from its default factory setting (Default is for PV applications), to the settings for use in a DC-Coupled Storage application (ESS) is shown in Figure 4-1.

- Login as "Admin", and navigate to the **Edit Inverter Model** section.
- In the **System Type** dropdown, choose ESS for use in a DC-Coupled Storage application

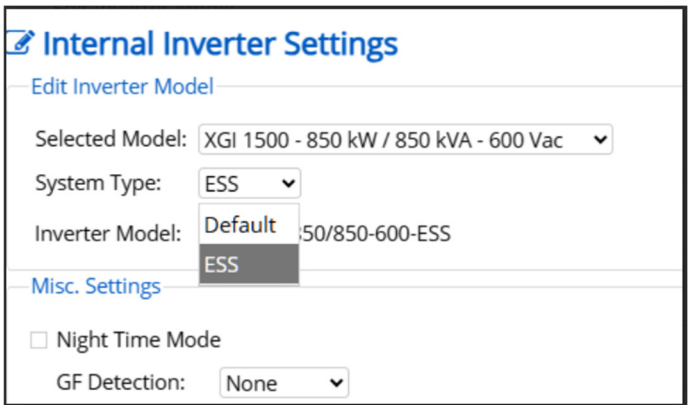


Fig. 4-1. GUI "EDIT INVERTER MODEL" SECTION

4.2 Differences Between PV Mode and DC-Coupled Storage Mode

	PV MODE	DC-COUPLED STORAGE (ESS) MODE
Night/low Power Shutdown	• Shuts down after 30 min below 1% power (or faster on a rapid drop) unless Q-at-Night is used	• Stays on all night • No low-power detection
DC Current Zones	• 4 zones (PV inputs) • Zone 5 unused • Sum of all 4 zone current sensors is checked to monitor health	• 5 zones (4 PV and 1 DC/DC input) • Zone 5 included in sensor check algorithm
Web GUI	• Zone 5 (DC/DC input) is not shown on the live measurements page • Charts will show the 4 zone currents	• Zone 5 connected to a DC/DC is shown on the live measurements page. • Charts will also show Zone 5, battery current

INFO→	In the DC-Coupled Storage configuration (ESS mode), bi-directional power flow is NOT available as a Plant Master Controller (PMC) charge setpoint. That is, the PMC cannot send a "charge X kW" to the inverter. In the ESS mode, the inverter instead maintains DC voltage**.** The magnitude of reverse power will be the current necessary to maintain that DC voltage. If the PV input is disconnected, the inverter continues trying to hold the last MPPT voltage. If the battery was charging prior to PV disconnection, then the inverter will back-feed power and continue charging the battery. Charging stops when the battery/BMS stops accepting current, or the PV connection is restored.

5 DC Grounding Configuration and Applications

INFO→	**DC Grounded:** The XGI 1500-1MW Series inverters are configured in the factory for PV applications, with the DC input grounded through the GFDI breaker. With DC input functionally grounded, the inverter will mitigate potential-induced degradation (PID) in PV modules susceptible to this phenomenon. **DC Floating:** Users may change the inverter's grounding configuration to a DC floating configuration via the user interface. This is the normal configuration for DC-coupled storage applications, where the battery system must be floating. **Either grounding configuration (DC grounded or DC floating) may be used for both PV applications and DC-Coupled Storage applications, if circumstances require.**

5.1 Changing from DC Grounded to DC Floating

The XGI 1500-1MW inverters leave the factory configured with DC grounded for use in a PV application. However, for the DC-Coupled Storage applications users can readily change the DC grounding configuration. In order to change the DC configuration from the factory-standard setting (DC grounded) to a DC floating configuration that aligns with most storage systems, follow these steps.

1. Turn OFF the Local AC Shutoff Switch on the XGI 1500-1MW inverter (see Fig. 3-3.)
2. Turn OFF the four DC disconnect switches on the XGI 1500-1MW inverter
3. Open the XGI 1500-1MW inverter doors
4. Turn OFF the GFDI breaker (see Fig. 5-1.)

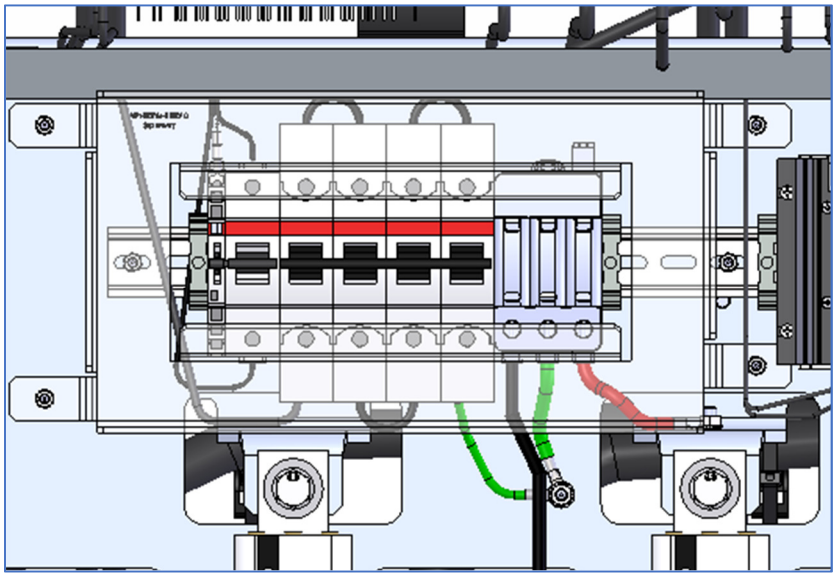


Fig. 5-1. GFDI BREAKER IN THE XGI 1500-1MW INVERTER

5. Turn ON the Local AC Shutoff Switch on the XGI 1500-1MW inverter (see Fig. 3-3)
6. Turn ON the four DC disconnect switches on the XGI 1500-1MW inverter
7. Connect to the web and the Graphical User Interface (see §8).
8. Log in and go to Inverter Configurations -> Inverter Functions -> Inverter Settings -> Internal Inverter Settings.
9. Change “System Type” to “ESS” from the drop-down menu (see Fig. 5-2., left)
10. Change “GF Detection” to “External” from the drop-down menu (see Fig. 5-2., right)

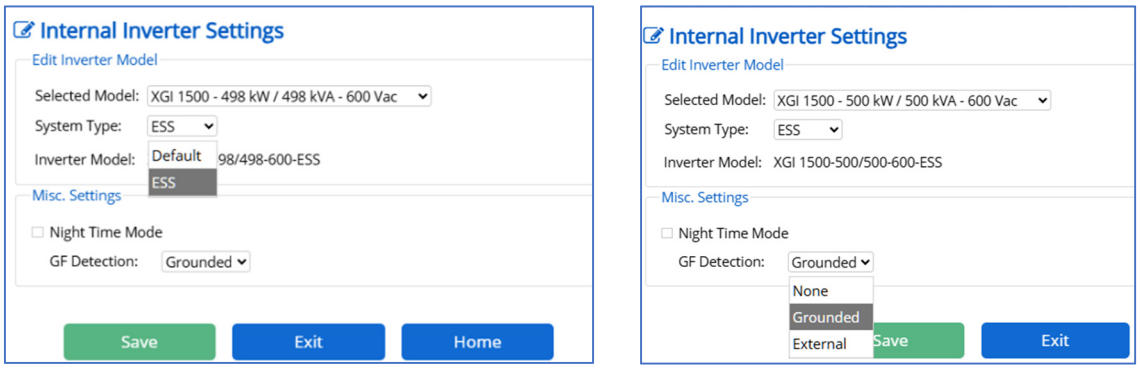


Fig. 5-2. GUI SCREEN SHOTS – CHANGING DC GROUNDED TO DC FLOATING

5.2 PV Application – Grounded DC Input

5.2.1 TYPICAL PV APPLICATION WITH GROUNDED DC INPUT

Grounded DC input is accomplished in the inverter's Ground Fault Detection Interrupter circuit. See §5.2.4 for details.

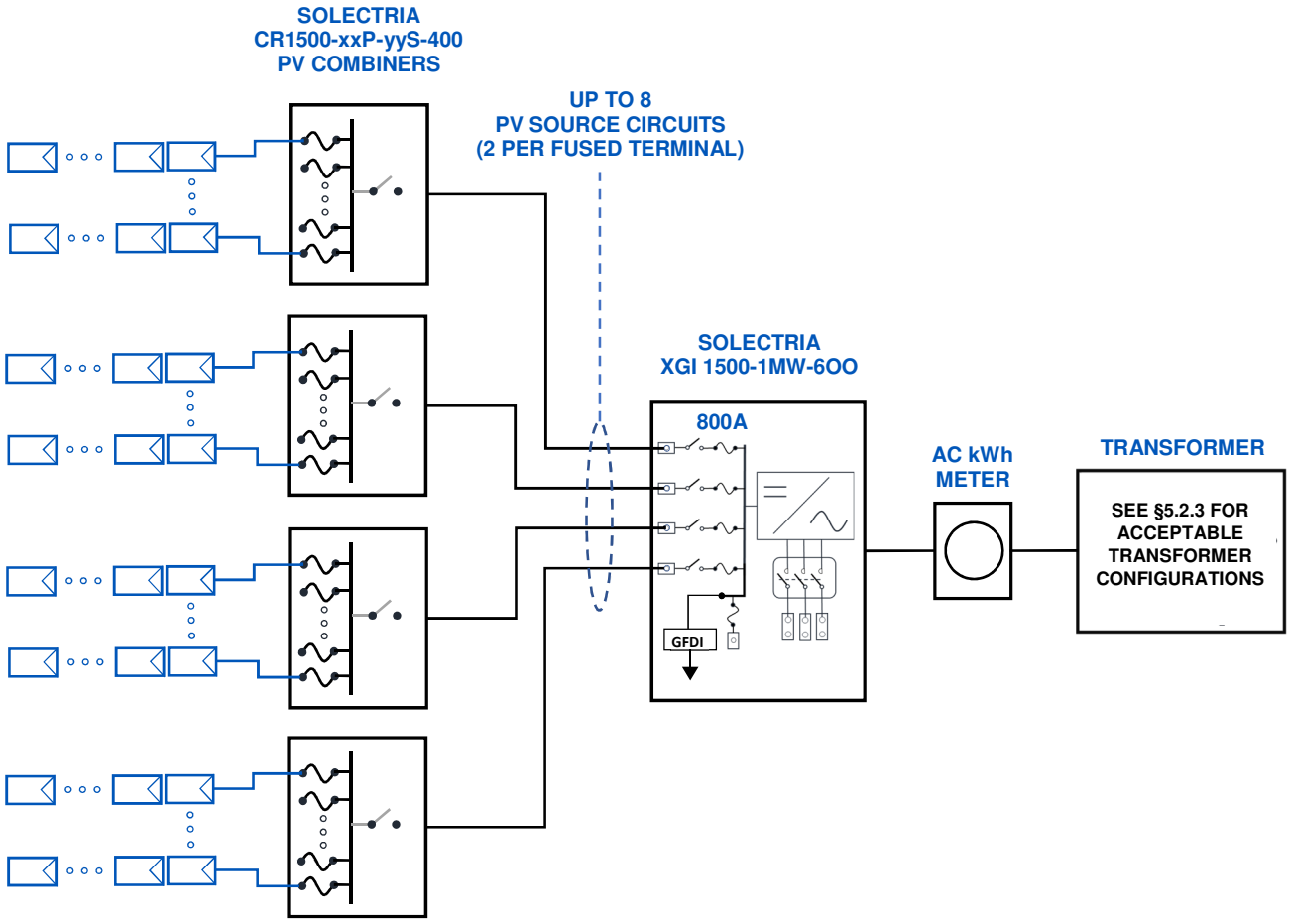


Fig. 5-3. TYPICAL PV APPLICATION WITH GROUNDED DC INPUT

5.2.2 PID Mitigation – Provided by Grounded DC Input

From the factory, the DC input to the XGI 1500-1MW inverters is functionally grounded and thereby prevents potential induced degradation (PID) in PV modules. Grounding the dc input is a straightforward, reliable approach for eliminating PID and maximizing energy production from the PV system over its lifetime.

5.2.3 Transformer Configuration with Grounded DC Input

A grounded DC input requires the AC service to the XGI 1500-1MW inverter to be floating. Note carefully the transformer configurations recommended and the corresponding requirement for external open-phase detection on the high-voltage side of the transformer.

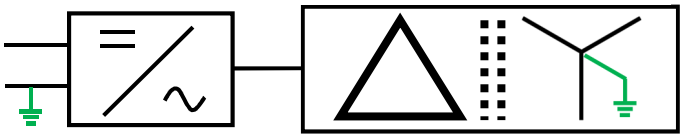
INFO →

Configuration with Grounded DC Input

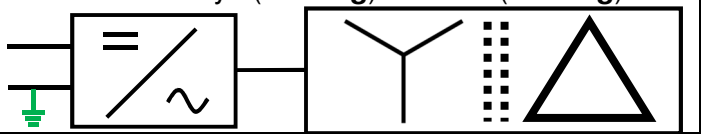
The transformer should be one of the two configurations illustrated:

THESE CONFIGURATIONS REQUIRE SEPARATE HIGH-VOLTAGE-SIDE OPEN-PHASE DETECTION

Delta (**floating**) ↔ Wye (**grounded**)



Wye (**floating**) ↔ Delta (**floating**)



5.2.4 Ground Fault Detector Interrupter (GFDI) Protection

The XGI 1500-1MW inverters come equipped with an internal ground-fault detection and interruption circuit, that functions only when the inverter configuration has DC input grounded. Fig. 5-4. shows the DC Ground Fault Detection and Interruption circuit in the XGI 1500-1MW Series inverters. When the current sensor detects fault current of 4.0A, the breaker is tripped by a signal from the digital signal process (DSP). As a second level of protection, the ground fault circuit breaker will trip at a fault current of 5A.

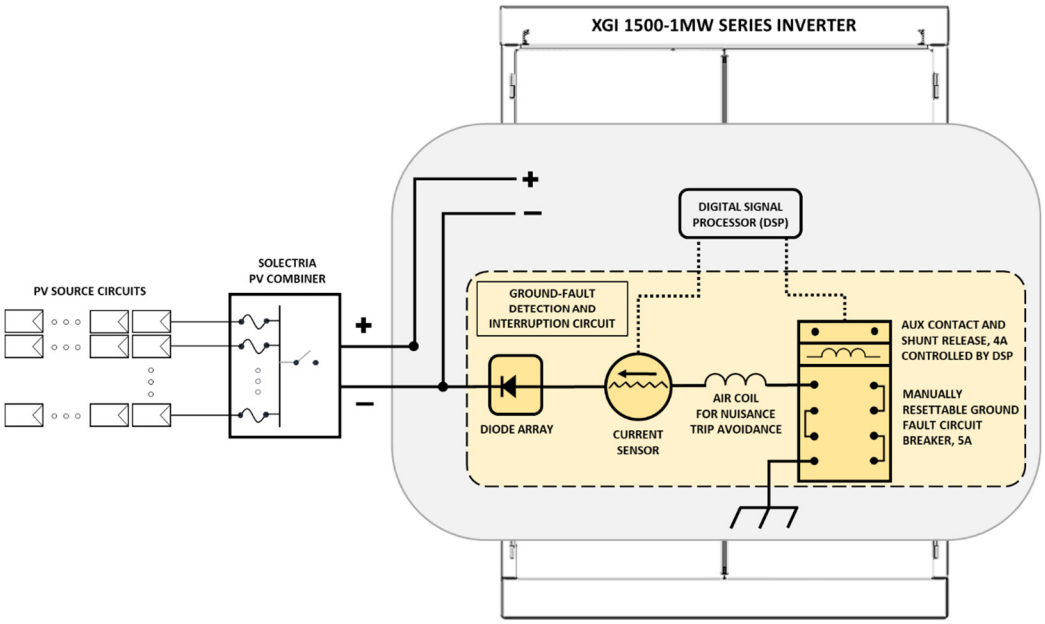


Fig. 5-4. GFDI CIRCUIT IN THE XGI 1500-1MW SERIES INVERTERS

5.2.5 High-Voltage Open-Phase Detection

With a floating Delta transformer (inverter-facing), a loss-of-phase event on the high-side of the transformer can produce a “phantom” voltage for that phase on the Delta transformer. The inverter in this case will be unable to detect the high-side open-phase condition. A separate 3-phase relay or other means must be supplied by the user to detect a loss-of-phase event on the high-voltage side of the transformer, open all three phases, and thereby ensure proper § functionality of the XGI 1500-1MW inverter. The proper functioning of the inverter’s protective relaying functionality upon a loss-of-phase event is necessary for safe operation and is routinely part of system acceptance testing.

5.3 PV Application – Floating DC Input

5.3.1 Typical PV Application with Floating DC Input

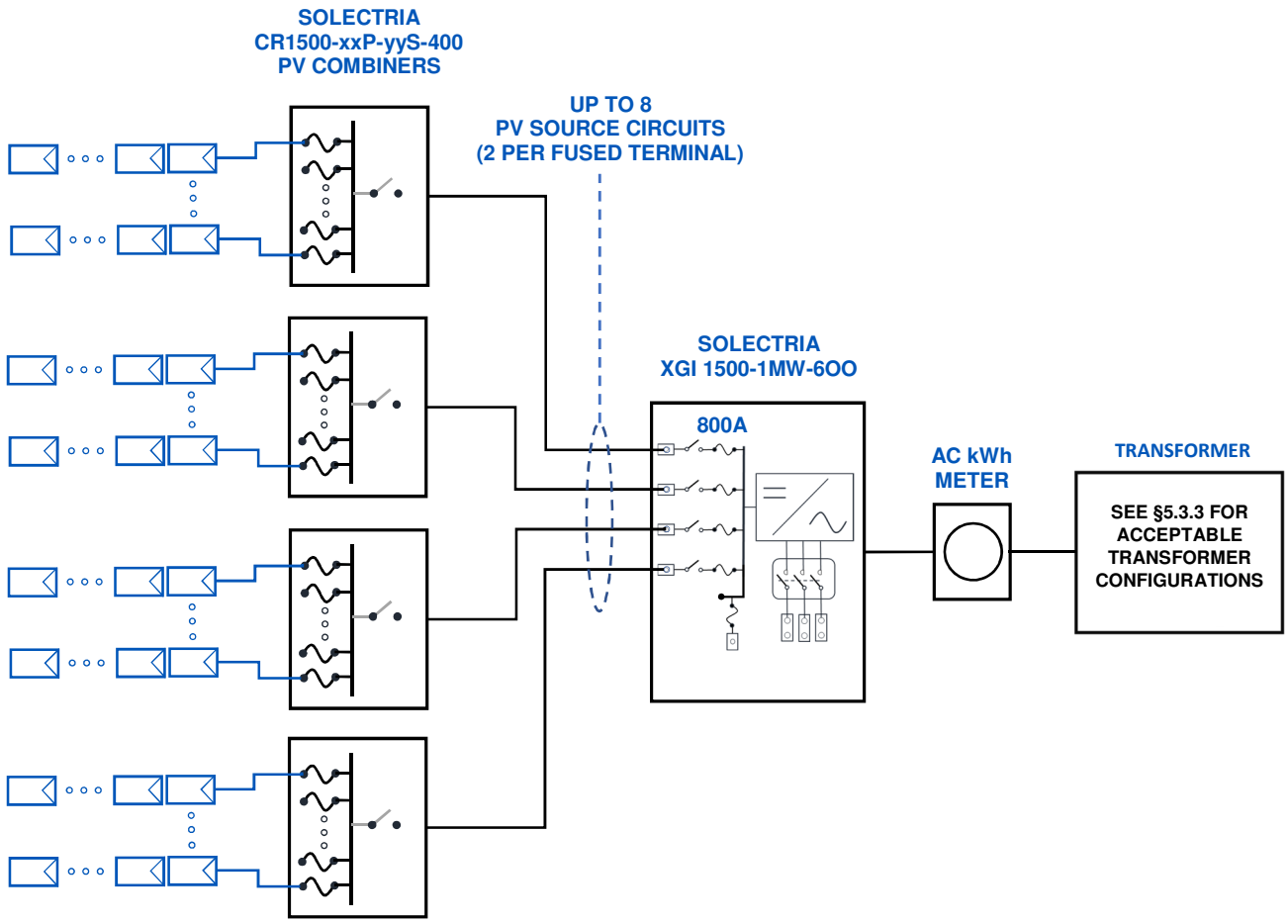


Fig. 5-5. TYPICAL PV APPLICATION WITH FLOATING DC INPUT

5.3.2 **PID Mitigation – Not Provided When DC Input is Floating**

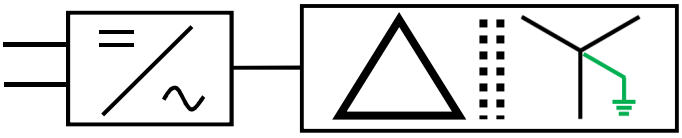
With floating DC input, the XGI 1500-1MW series inverters will not prevent potential induced degradation; an external third-party device would be required for that functionality. Note that the standard configuration of the XGI 1500-1MW inverters for PV applications is with DC input grounded (see §5.2), with one advantage being built-in PID mitigation.

5.3.3 **Transformer Configuration with Floating DC Input**

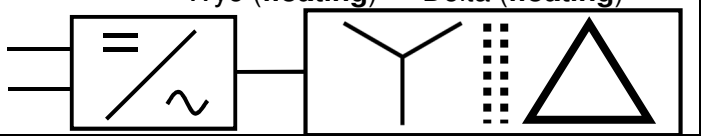
A floating DC input should be matched with a floating AC service to the XGI 1500-1MW inverter. Note carefully the recommended transformer configuration and the corresponding requirement for external open-phase detection on the high-voltage side of the transformer.

INFO→	Configuration with Floating DC Input The transformer should be one of the two configurations illustrated: **THESE CONFIGURATIONS REQUIRE SEPARATE HIGH-VOLTAGE-SIDE OPEN-PHASE DETECTION**

Delta (**floating**) ↔ Wye (**grounded**)



Wye (**floating**) ↔ Delta (**floating**)



5.3.4 **High-Voltage Open-Phase Detection**

With a floating Delta transformer on the inverter-facing side, a loss-of-phase condition on the high-voltage side can produce a “phantom” voltage on the affected phase at the inverter terminals. As a result, the inverter may be unable to detect the high-side open-phase condition. The user must provide a separate three-phase relay or other suitable means to detect loss-of-phase on the high-voltage side of the transformer, and open all three phases. This ensures proper shutdown of the inverter under a high-side open-phase condition. Proper operation of the inverter’s protective functions during a loss-of-phase event is a required safety function and is routinely verified as part of system acceptance testing.

5.4 DC-Coupled Storage Application – Floating DC Input

The standard configuration of the XGI 1500-1MW inverter is with the DC input grounded. However, storage systems typically require the DC to be floating. (Note that the DynaPower DPS-1000 DC/DC converter between the storage subsystem and the XGI 1500-1MW inverter is non-isolating.) To reconfigure the XGI 1500-1MW for a DC input floating configuration, refer to §5.1.

5.4.1 Typical DC-Coupled Storage Configuration with Floating DC Input (FIG. 5-6)

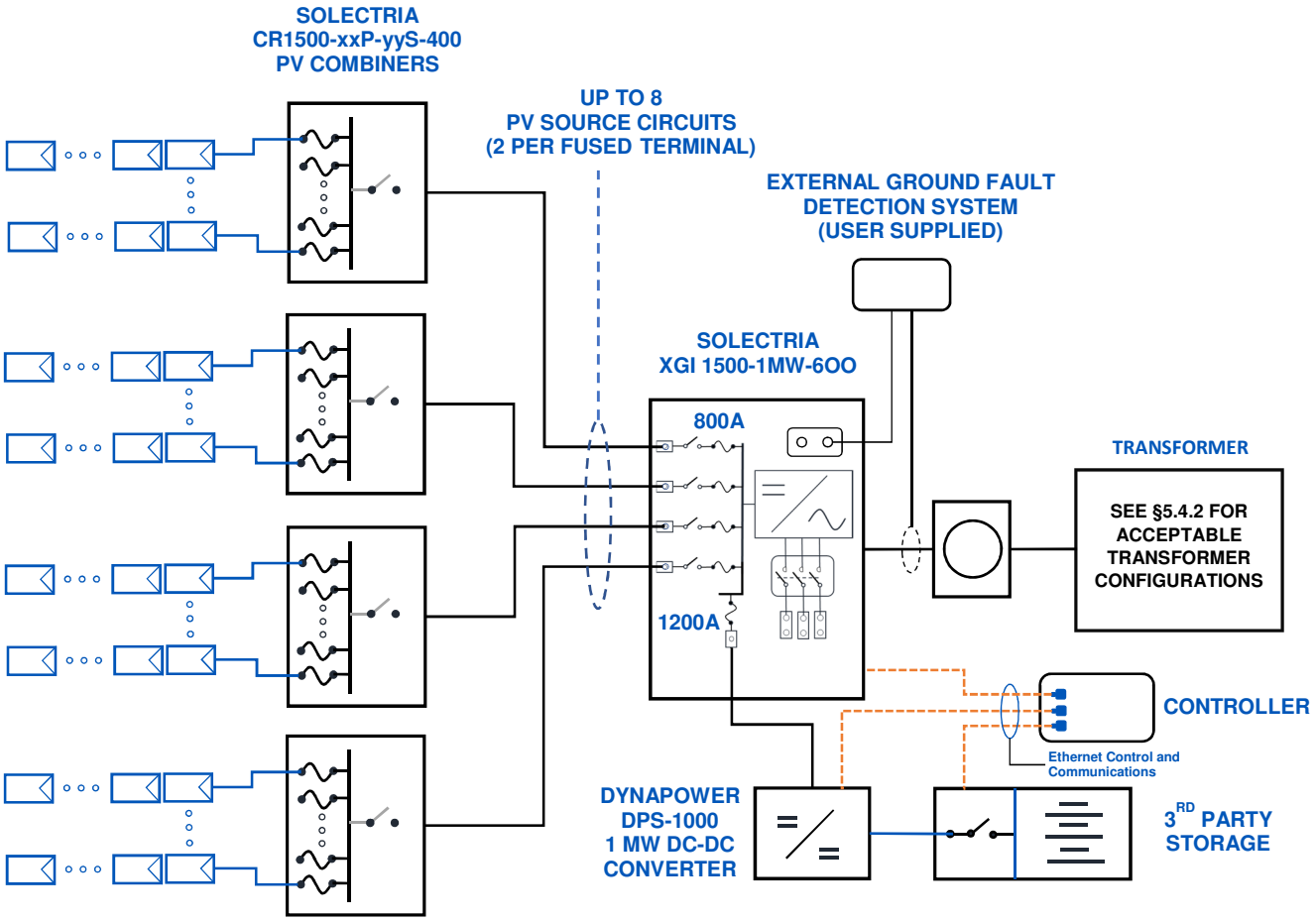


Fig. 5-6. TYPICAL DC-COUPLED STORAGE CONFIGURATION WITH FLOATING DC INPUT

5.4.2 Transformer Configurations

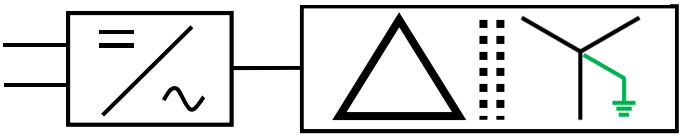
INFO→

Configuration with Floating DC Input

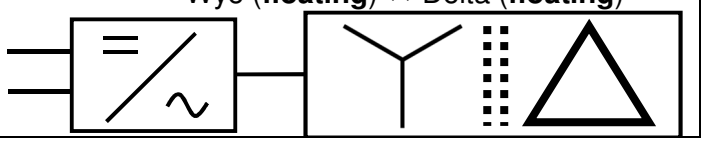
The transformer should be one of the two configurations illustrated:

THESE CONFIGURATIONS REQUIRE SEPARATE HIGH-VOLTAGE-SIDE OPEN-PHASE DETECTION

Delta (**floating**) ↔ Wye (**grounded**)



Wye (**floating**) ↔ Delta (**floating**)



5.4.3 Phantom Voltage and Required High-Voltage Open-Phase Detection

WARNING	With both transformer configurations (see Figs. 5.2.3, 5.3.3, 5.4.2), a loss-of-phase condition on the high-voltage side can produce a “phantom” voltage on the affected phase at the inverter terminals. As a result, the inverter may be unable to detect the high-side open-phase condition. **The user must provide a separate three-phase relay or other suitable means to detect loss-of-phase on the high-voltage side of the transformer, and open all three phases.** This will ensure proper shutdown of the inverter under a high-side open-phase condition.

Proper operation of the inverter’s protective functions during a loss-of-phase event is a required safety function and is routinely verified as part of system acceptance testing.

5.4.4 External Ground Fault Detection Device – Required by Article 690 of the NEC

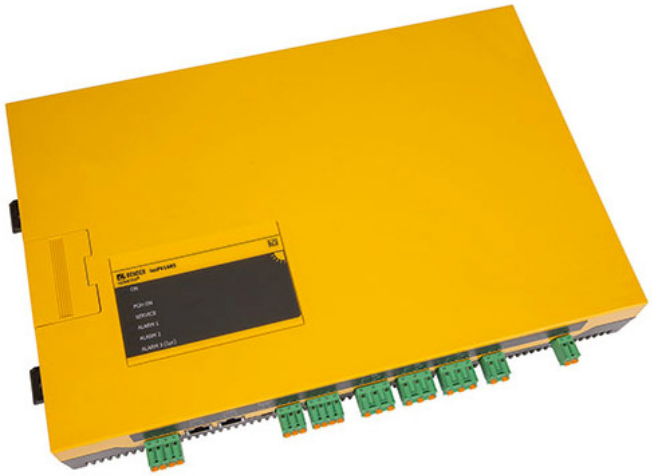
WARNING	The XGI 1500-1MW in a configuration with DC input floating, is not provided with an internal Ground Fault Detection Interrupter (GFDI) device. The inverter must be used with an external GFDI device, as required by Article 690 of the National Electrical Code for the installation location.

5.4.4.1 Example External GFDI Device

With DC input floating, the XGI 1500-1MW series inverter does not provide internal GFDI. Accordingly, the user must provide and install an external GFDI, such as the Bender ISOMETER isoPV1685 device. Some of the features of these devices are the following:

- Ground fault detector for ungrounded three-phase AC and DC systems
- Meets or exceeds code requirements for ground-fault detection on ungrounded systems, including NEC 250.21(B), NEC 250.167(A), and CEC 10-106(2)
- Monitors for ground faults by measuring the system's insulation resistance, allowing for early indication and trending of developing faults before leakage current may be present
- Relay outputs, built-in web server, and built-in Modbus/TCP support

Bender ISOMETER isoPV1685



INFO	Other external GFDI devices may also be compatible with XGI 1500-1MW Series inverters configured with a floating DC input. The selected external GFDI solution must be reviewed and approved by Yaskawa Solectria Solar Application Engineering before installation. Contact Application Engineering at appeng@solectria.com for review and approval.
INFO	Note that when the XGI 1500-1MW series inverters are configured with a floating DC input, and an external GFDI is used, the inverters disable internal GFDI. The external GFDI must provide all necessary fault detection and reporting functionality.

5.4.4.2 **Connecting Relay Outputs from the External GFDI to the XGI 1500-1MW Inverter**

The XGI 1500-1MW series inverters provide two user inputs on the Digital Signal Processing (DSP) PCBA. These terminals are designed to take input signals from a 24V relay system. They are electrically isolated from the inverter and they can therefore be connected to the signal outputs from any external GFDI device.

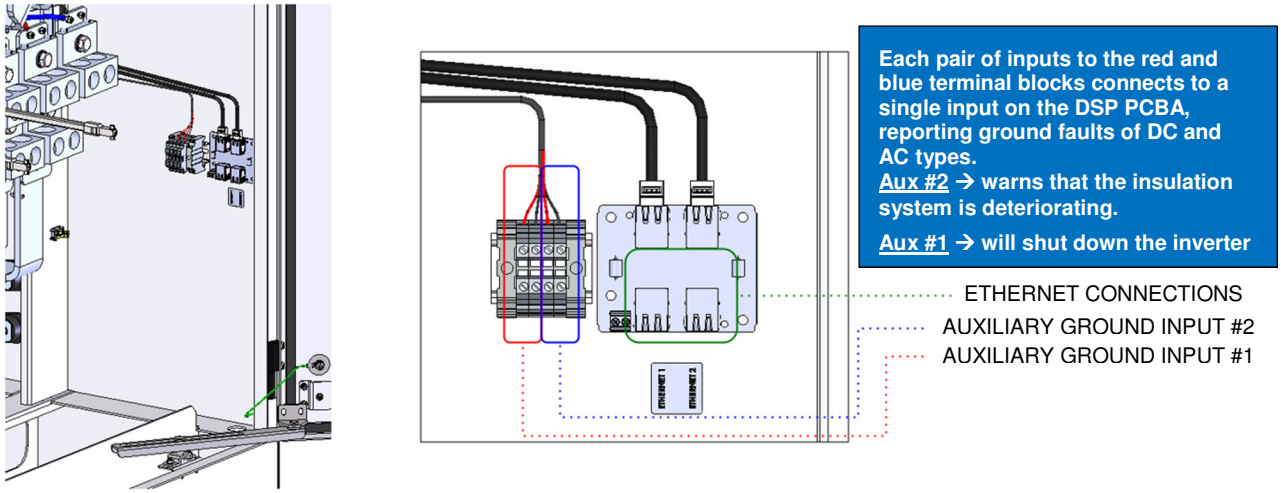


Fig. 5-7. INVERTER TERMINALS FOR SIGNALS FROM THE EXTERNAL GFDI

5.5 DC-Coupled Storage Application – Grounded DC Input

INFO→	DC-Coupled Storage Configuration with Grounded DC Input This configuration is highly unlikely, as most batteries require DC to be floating. However, if a battery system requires the DC to be grounded, contact Yaskawa Solectria Solar's Application Engineer at appeng@solectria.com for further information.

5.6 PV DC Input Wiring

Make sure the DC disconnect switch handles are all in the OFF (**0**) position. The DC disconnect switches are load-break rated. See Figure 5-8.

⚠ WARNING	**Turn DC Switches on the inverter to "OFF"** DC Voltage may remain on the DC terminals. To remove DC Voltage entirely, also turn disconnect switches to OFF on all PV Combiners that are wired to the inverter, and verify the absence of DC Voltage in the inverter.

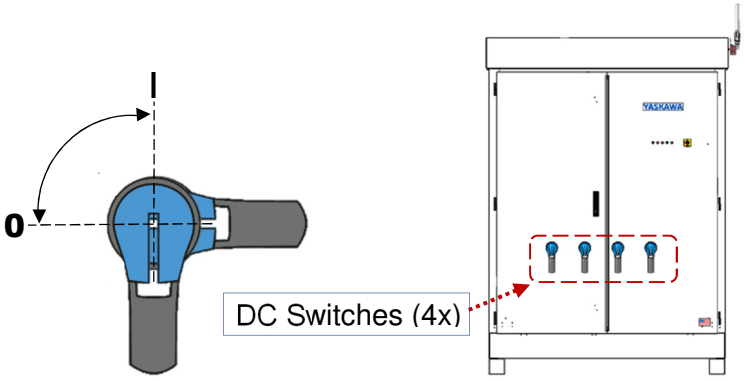
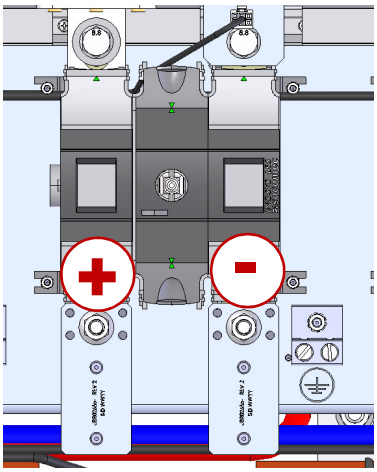


Fig. 5-8. DC DISCONNECT SWITCHES ON INVERTER

As shown in Fig. 5-9, Fig. 5-10 and Table 5-1, for the DC input connections, use 2-hole compression lugs with 1.75" spacing, with a hole for an M10 stud, and sized for the wire gauge used. Wiring terminals are rated for 90°C rated conductors. The stud plates can accommodate 1 or 2 conductors with lugs oriented back-to-back, as in Fig. 5-10. Ensure that all connections comply with the National Electrical Code ANSI/NFPA 70 (NEC) and local electrical codes.



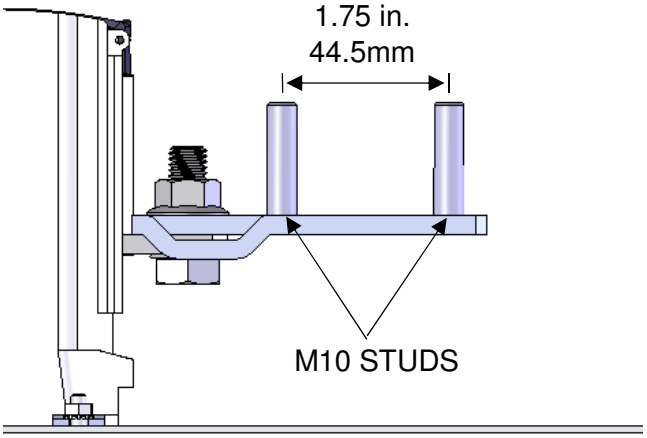


Fig. 5-9. PV DC INPUT WIRING TERMINALS

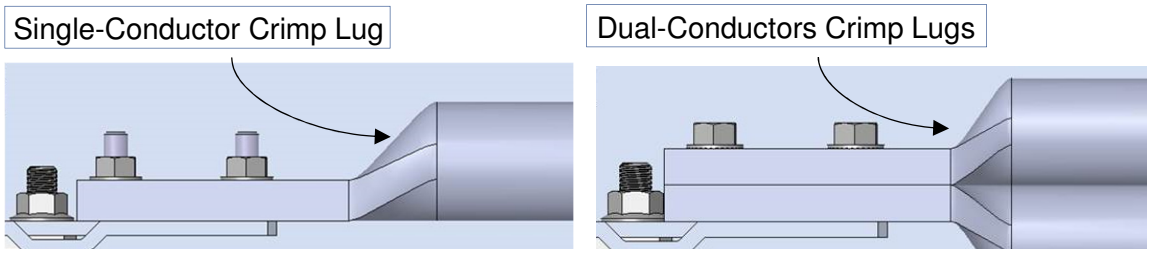


Fig. 5-10. COMPRESSION LUG CONNECTIONS, SINGLE AND DUAL

Table 5-1. DC Input Wiring Specifications

Stud Size (2 per plate)	M10, 1.75” Spacing
Lug Specification	Lug Tongue Width ≤ 2.3” (58.4mm)
Required Fasteners (NOT SUPPLIED)	Hex Nut M10 x 1.5mm, 18-8 SS, McMaster 91828A415, or equivalent
	Bellville Washer M10, 18-8 SS, McMaster 91235A412, or equivalent
	Flat Washer M10, 18-8 SS, McMaster 93849A205, or equivalent
Conductor Compatibility	Copper or Aluminum, 90C rated, 1 or 2 conductors with lugs Min: per NEC Max: 900 kcmil
Temperature Rating	90C rated
Torque (mark when set)	200 in-lbs (25 Nm), using 18mm socket and torque driver

5.7 AC Wiring

Turn the Local AC Shutoff Switch to “OFF” before wiring. The Local AC Shutoff Switch sends a signal to the inverter to turn off and open the load-break-rated AC contactor. The Local AC Shutoff Switch is located on the right-hand side of the front cover (see Fig. 5-11).

WARNING	**Turn Local AC Shutoff Switch on the inverter to “OFF”.** Verify the absence of AC voltage.

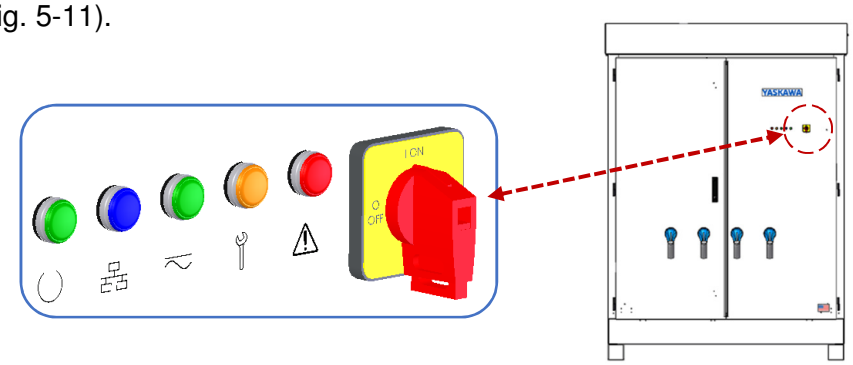


Fig. 5-11. LOCAL AC SHUTOFF SWITCH ON INVERTER

The AC connections consist of the three AC Phases (L1, L2, and L3) and Ground. AC conductors must be rated for at least 600 Vac. Use conductors within the ranges shown in Table 5-2 and sized to comply with the National Electrical Code.

DANGER	**Electric Shock Hazard** Components with hazardous voltage and energy will electrocute the operator. Ensure that AC voltage is not present and that current is not flowing into inverter; verify the absence of AC voltage using a multi-meter.

Wire the AC conductors to the terminals as shown in Fig. 5-12. Each AC phase has two stacked 2-hole lugs. The lug ratings and conductor compatibility are shown in Table 5-2.

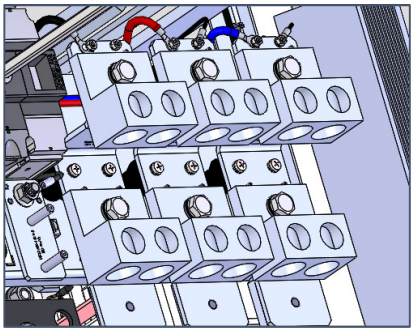


Fig. 5-12. AC PHASE WIRING TERMINALS

Table 5-2. AC Phase Wiring Terminal Specifications

Lugs Configuration	Two stacked and offset 2-hole lugs for each of the three AC phases
Lug Temp Rating	90C
Lug Conductor Compatibility	Cu and Al Lug min: 500kcmil, max: 900kcmil Up to 4 conductors per phase
Lug Material	Aluminum, tin electro-plated 

5.8 AC Phase Wiring Clockwise Rotation

Ensure that the XGI 1500-1MW series inverter is installed with an A-B-C positive sequence phase rotation. An A-C-B negative sequence phase rotation will prevent the inverter from running. If the inverter reports a Phase Lock Loop (PLL) error, or the frequency/voltage measurements seem incorrect, check the phase rotation. Swapping any two AC conductors will reverse the phase rotation.

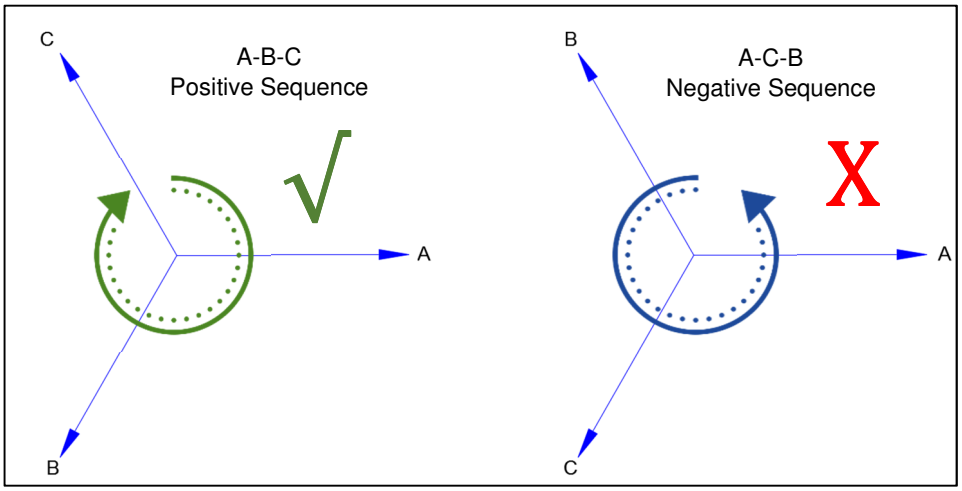


Fig. 5-13. PROPER PHASE WIRING √ IS AN A-B-C POSITIVE SEQUENCE

5.9 DC/DC Converter Input Wiring

When the XGI 1500-1MW inverter is used in a DC-Coupled Storage configuration, there will be a DC/DC Converter between the inverter and a battery subsystem (see Fig. 5-11 for a simplified diagram of the DC-coupled storage configuration). Conductors from the DC/DC Converter land in the XGI 1500-1MW inverter as shown in Fig. 5-12. Note the specifications for the terminations in Table 5-3.

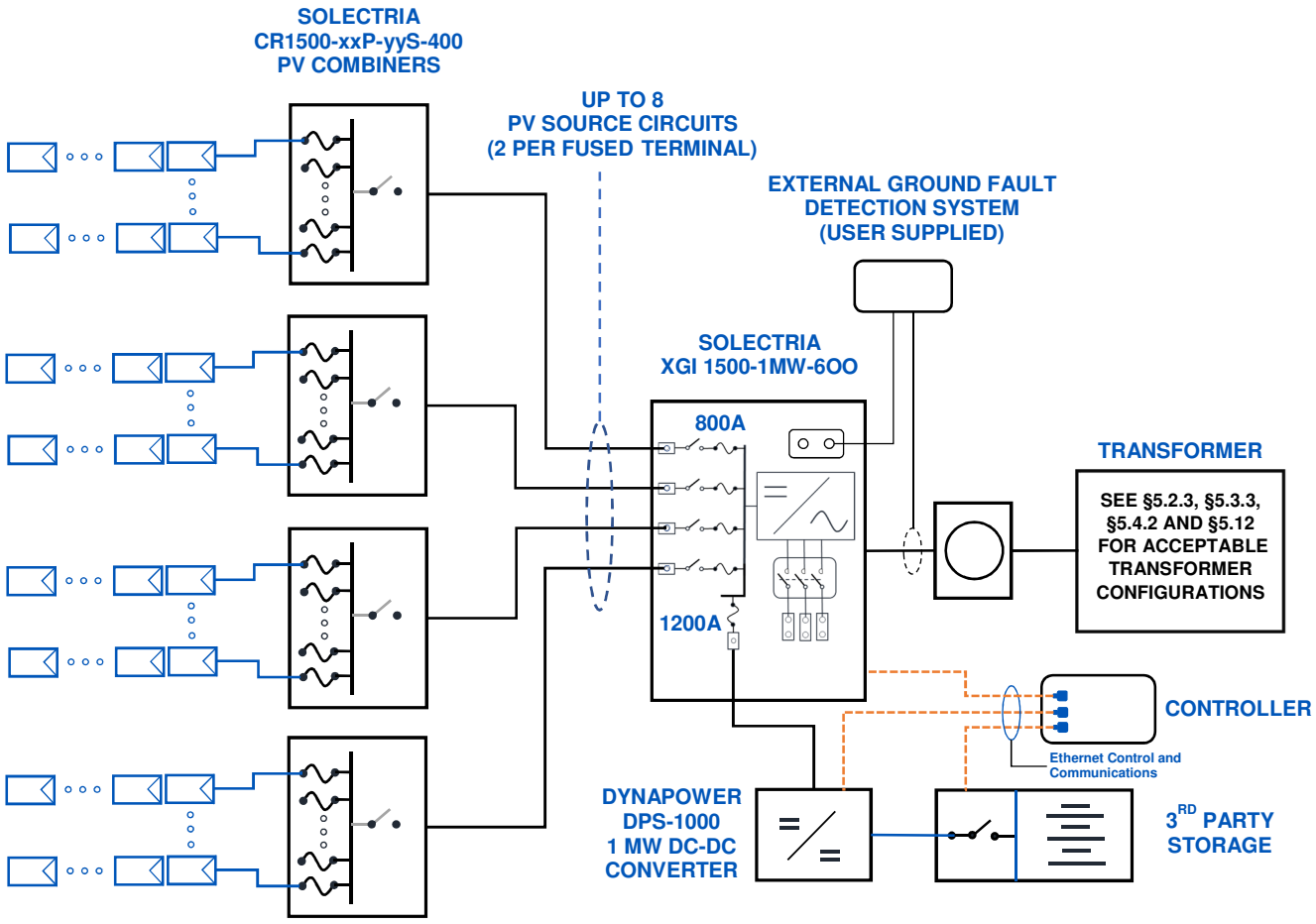


Fig. 5-14. DC-COUPLED STORAGE CONFIGURATION

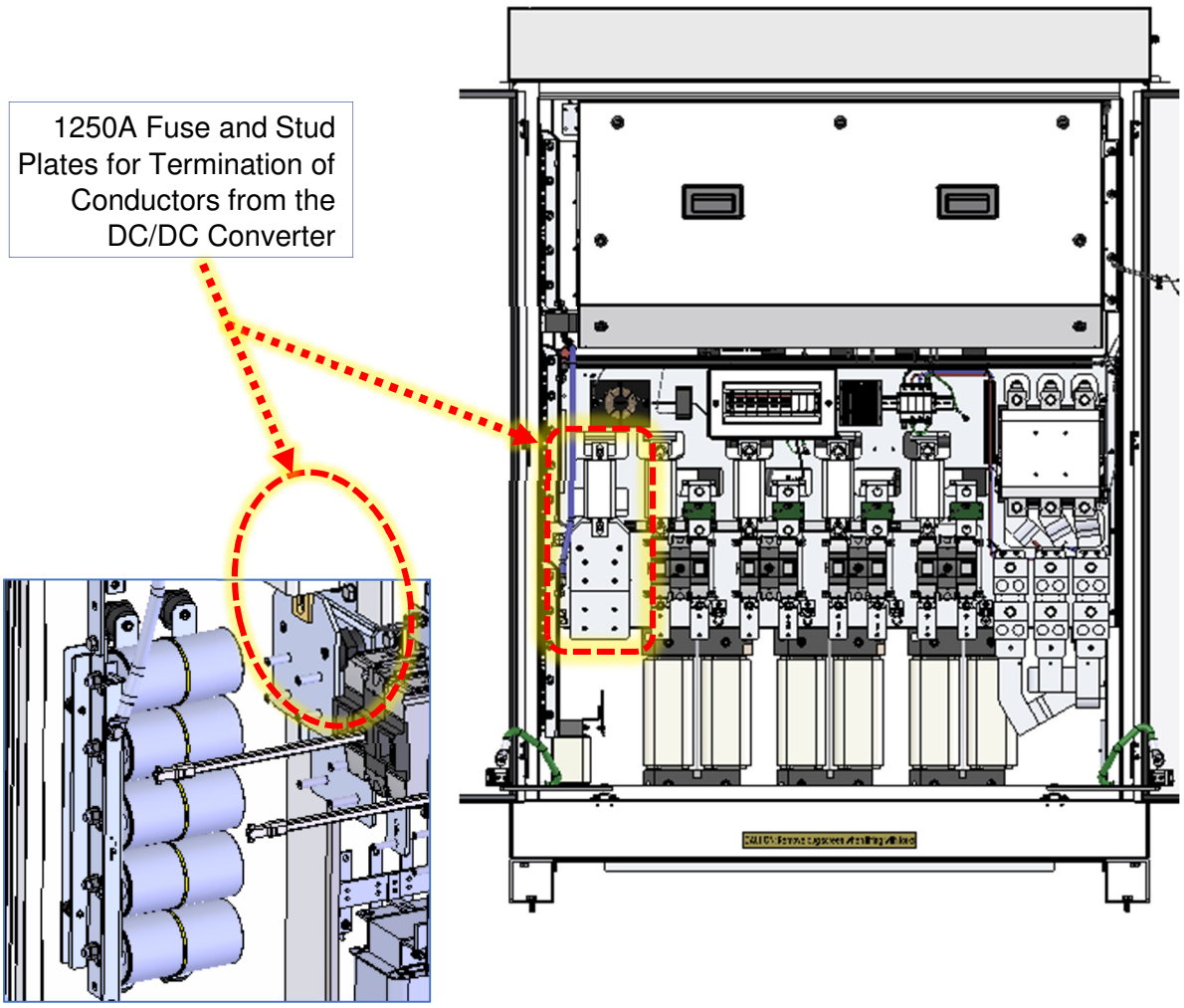


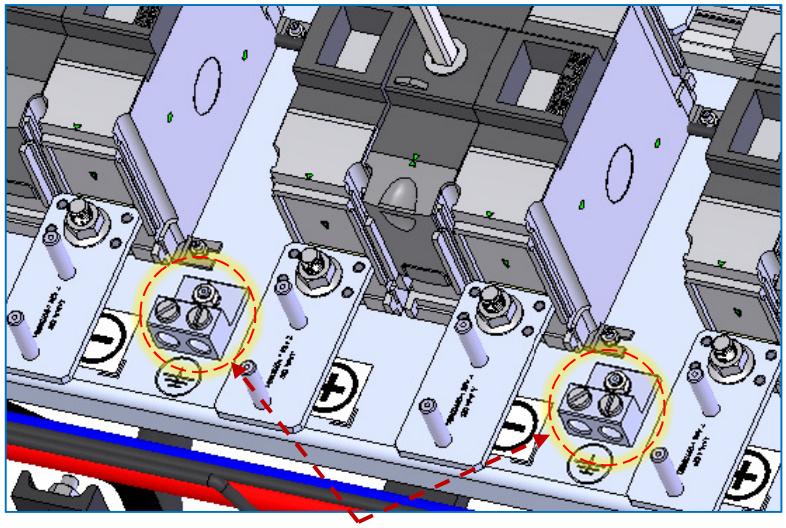
Fig. 5-15. STUD PLATE LOCATION FOR DC/DC CONVERTER WIRING

Table 5-3. DC/DC Wiring Specifications

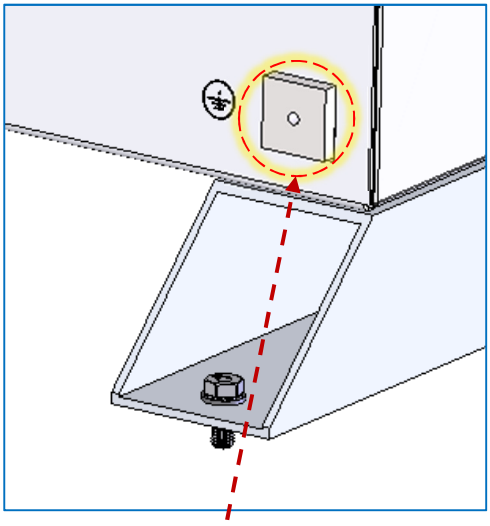
Stud Size (2 per plate)	M10, 1.75” Spacing between studs
Lug (NOT SUPPLIED)	2-Hole Lug, Tongue Width ≤ 2.3” (58.4mm)
Required Fasteners (NOT SUPPLIED)	Hex Nut M10 x 1.5mm, 18-8 SS, McMaster 91828A415, or equivalent
	Bellville Washer M10, 18-8 SS, McMaster 91235A412, or equivalent
	Flat Washer M10, 18-8 SS, McMaster 93849A205, or equivalent
Conductor Compatibility	Copper or Aluminum, 90C rated, 1 or 2 conductors with lugs Min: per NEC Max: 800 kcmil
Temperature Rating	90C rated
Torque (mark when set)	200 in-lbs (25 N-m), using 18mm socket and torque driver

5.10 Equipment Grounding

The XGI 1500-1MW inverters must be bonded using equipment grounding provisions. Note that the negative DC pole is connected to equipment ground internally in the inverter, in the factory. The XGI 1500 1MW models include provisions for terminating equipment grounding conductors and other conductors used for bonding. Lugs with two holes are located inside the inverter adjacent to each of the four disconnect switches (Fig. 5-16, left). Use a 13mm socket and torque to 90 in-lbs (12.2 N-m). On the exterior of the inverter is an M6 threaded insert (Fig. 5-16, right). Torque this customer-supplied fastener to 39 in-lbs (4.4N-m)



Equipment Ground Lug at Each PV Circuit Terminal (4x)



Threaded Insert for External Equipment Ground Connection

Fig. 5-16. EQUIPMENT GROUND TERMINALS INSIDE AND OUTSIDE INVERTER

Table 5-4. Grounding and Bonding Connection Specifications

Equipment Ground Lugs (4x) Conductor Compatibility	Cu and Alum Conductors: 14 AWG to 2/0 AWG, 2 ports in each lug	
Equipment Ground Threaded Insert (Outside Inverter)	M6 threaded insert (user-supplied fastener)	

5.11 Aluminum Conductor Preparation

For aluminum connections, follow these steps to prepare the wires, one wire at a time.

1) Remove the appropriate amount of insulation from the wire.
2) Use a wire brush to remove the oxidation layer from the exposed aluminum conductors.
3) Immediately apply a neutral dielectric grease (such as Ideal Industries' Noalox®) and connect the cable to the terminal.



www.idealind.com

⚠ WARNING	If the aluminum conductor is not secured within 30 seconds of applying the grease, repeat this process, as an oxidized layer may have formed on the surface of the conductor. An oxidized layer is a poor conductor that could lead to thermal issues, production loss, or damage to the inverter.

5.12 Transformer Configurations

INFO→	**Grid Mismatch** If the grid does not match the requirements, the inverter will not start and damage may occur. Check with the local electric utility before selecting a grid standard. The system must comply with the National Electrical Code ANSI/NFPA 70 and with all local rules and safety regulations before the inverter can be operated.

INFO→	**Maximum Number of Inverters on a Transformer Winding** Connect no more than five (5) XGI 1500-1MW Series inverters to the same winding of a transformer. Up to 10 XGI 1500-1MW Series inverters can be connected to a transformer with dual windings, with no more than 5 inverters per winding. All other connections, such as for site loads (lighting, metering, etc), must be galvanically isolated from the inverters. **See the Application Note: *Interconnection Guidelines for the Yaskawa Solectria Solar XGI 1500 Inverters.***

The Yaskawa Solectria Solar's XGI 1500-1MW series inverters must be connected to a dedicated transformer, and only transformer-isolated loads or connections to ground are permitted on the inverter side of the transformer. The two transformer configurations below are acceptable for the XGI 1500-1MW inverters, in both a PV application and a DC-Coupled Storage application.

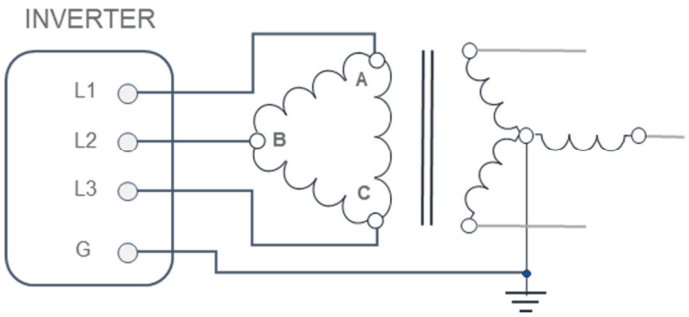


Fig. 5-17. FLOATING DELTA : GROUNDED WYE TRANSFORMER CONFIGURATION

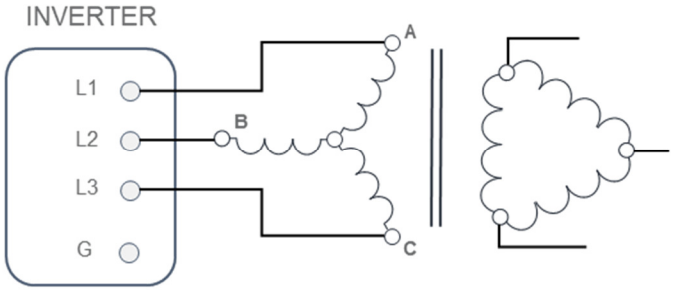


Fig. 5-18. FLOATING WYE : FLOATING DELTA TRANSFORMER CONFIGURATION

⚠ CAUTION	**Improper Transformer Configuration** The inverter will not run and may have hazardous current if an approved transformer configuration is not used. Connect to a transformer in the specified configuration only. Incorrect transformer configuration may cause damage to the inverter.

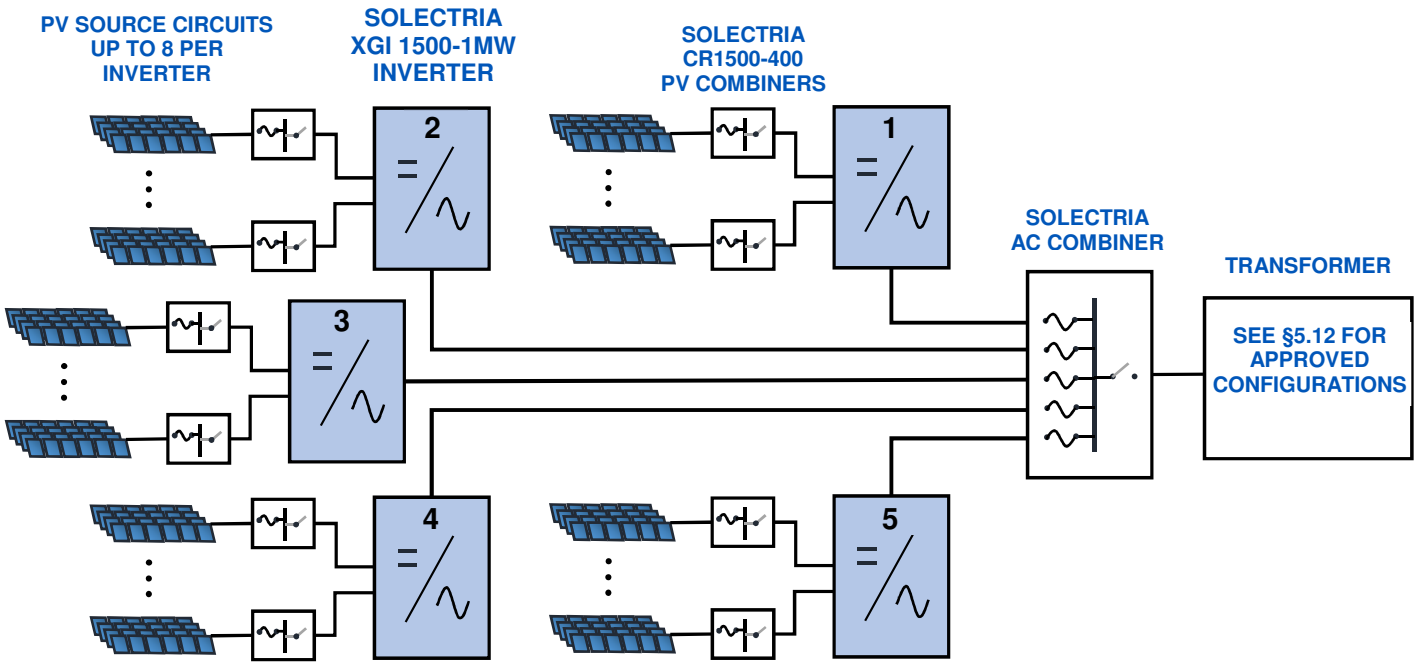


Fig. 5-19. NO MORE THAN FIVE XGI 1500-1MW SERIES INVERTERS IN PARALLEL SHOULD BE CONNECTED TO A SINGLE WINDING OF A TRANSFORMER, TO ENSURE PROPER FUNCTIONING OF THE GFDI FUNCTIONALITY.

5.13 Electrical and Mechanical Specifications

Electrical and mechanical specifications for the DC Input are found in the table below.

Table 5-5. DC Input Specifications

SPECIFICATION		XGI 1500-1MW-600	XGI 1500-0.99MW-600	XGI 1500-0.85MW-600	XGI 1500-0.75MW-600	XGI 1500-0.50MW-600	XGI 1500-0.498MW-600
DC Input	Absolute Maximum Input Voltage	1500 VDC		1500 VDC		1500 VDC	
	Full Rated Power Voltage Range (MPPT)	860 to 1250 VDC		860 to 1250 VDC		860 to 1250 VDC	
	Operating Voltage Range (MPPT)	860 to 1450 VDC		860 to 1450 VDC		860 to 1450 VDC	
	Strike Voltage	920 VDC		920 VDC		920 VDC	
	Number of MPP Trackers	1 MPPT		1 MPPT		1 MPPT	
	Number of PV Input Source Circuits	Four input terminals with 800A fuse and 600A disconnect each Up to two PV Source Circuits per input terminal		Four input terminals with 800A fuse and 600A disconnect each Up to two PV Source Circuits per input terminal		Four input terminals with 800A fuse and 600A disconnect each Up to two PV Source Circuits per input terminal	
	Max Operating PV Current	1,183 ADC	1,182 ADC	1,004 ADC	886 ADC	590 ADC	588 ADC
	Max Operating PV Power	1,020 kWDC	1,010 kWDC	867 kWDC	765 kWDC	510 kWDC	508 kWDC
	Max DC/AC Ratio | Max Rated PV Power	2.5 | 2.5 MWDC	2.53 | 2.5 MWDC	2.94 | 2.5 MWDC	3.33 | 2.5 MWDC	5.0 | 2.5 MWDC	5.0 | 2.5 MWDC
	Max Rated PV Short-Circuit Current (ΣIsc x 1.25)	2,000 ADC		2,000 ADC		2,000 ADC	
	DC Configuration	DC NEG grounded		DC NEG grounded		DC NEG grounded	

⚠ WARNING	**Risk of Electric Shock or Fire** Use only with PV modules, DC conductors, switches, fuses, and fuse holders with a maximum system voltage rating of 1500 VDC or higher.

5.14 Conduit Sealing – A Critical Step

INFO→	**SEAL CONDUIT ENTRANCES** All conduit entrances into an enclosure must be sealed with a properly rated conduit foam. Use a product that is listed for electrical applications. Polywater ® AFT™ Spray Foam Sealant (www.polywater.com) is an excellent option. Follow the manufacturer's recommendations when sealing conduit entrances. 

INFO→	**WATER INGRESS WILL VOID WARRANTY** It is the responsibility of the installer to maintain a dry, moisture-free inverter enclosure; water ingress is not covered under warranty.

WARNING



Condensation and Water Ingress Will Cause Damage: The Solectria XGI 1500-1MW series inverter has a Type 3R enclosure. If not properly installed, or if not properly maintained during extended periods of sitting idle (non-operating), all Type 3R enclosures are susceptible to water ingress and condensation that will damage critical components.

IMPORTANT: After sealing the conduit entrances, the risk of condensation increases when the XGI 1500-1MW inverters are inoperative for an extended period of time. Inverters often sit idle for an extended period between the initial installation and the commencement of normal, autonomous daily operation. Follow these guidelines:

Manage Moisture During Extended Down-Time (non-operating for more than 1 week)

- Extended periods of down-time can occur, for example, if turn-on/start-up is delayed more than one week following initial installation, or if the inverter is idle for more than a week during a service event. For any reason, if an inverter will be idle for longer than one week, install a desiccant pack inside the inverter. See Fig. 5-20 below for placement and orientation of the desiccant pack inside the inverter.
- For long idle periods, visit the inverter at least once per month to inspect the desiccant, remove all moisture inside the inverter, and replace the desiccant pack as necessary.
- Before turn-on/start-up following a period of down-time, inspect the inverter, remove all moisture inside the inverter, and remove the desiccant pack and any debris.
- Desiccant packs are only intended to protect the inverter from moisture during periods of down-time, and *should NOT be left inside an operating inverter*.

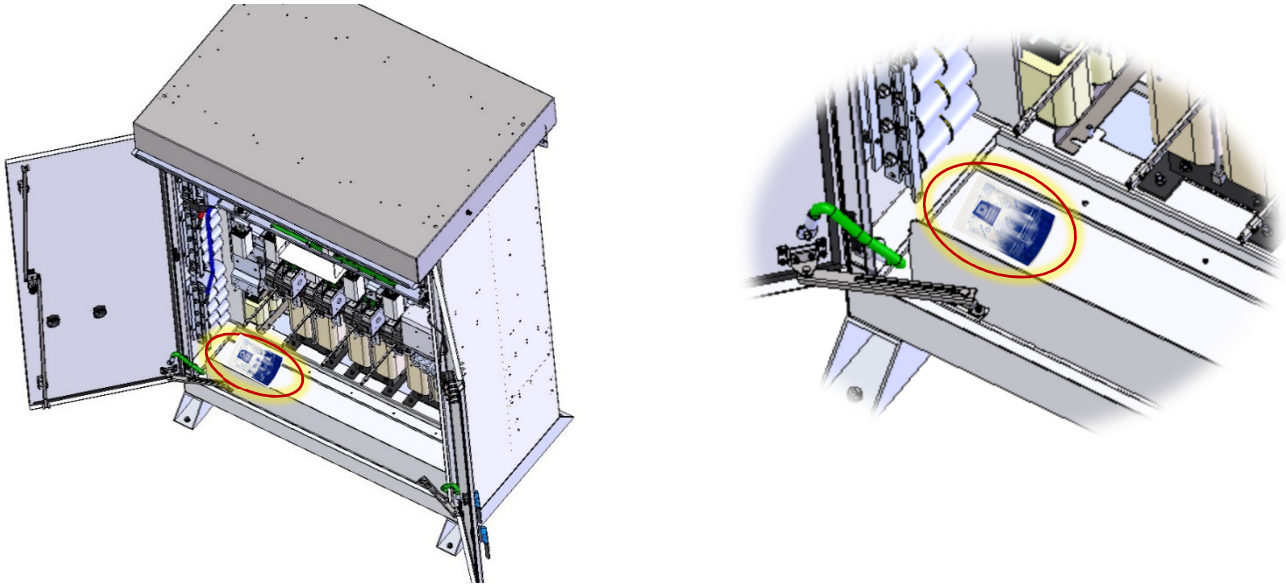


Fig. 5-20. RECOMMENDED DESICCANT PACKET LOCATION

INFO→	**DESICCANT PACKET USAGE** Desiccant packs are only intended to protect the inverter from moisture during periods of down-time, and ***should NOT be left inside an operating inverter***.



Fig. 5-21. RECOMMENDED DESICCANT

5.15 Antenna Mounting

Mount the antenna as shown in

Fig. 5-22. The antenna works best when oriented vertically, as in the figure.

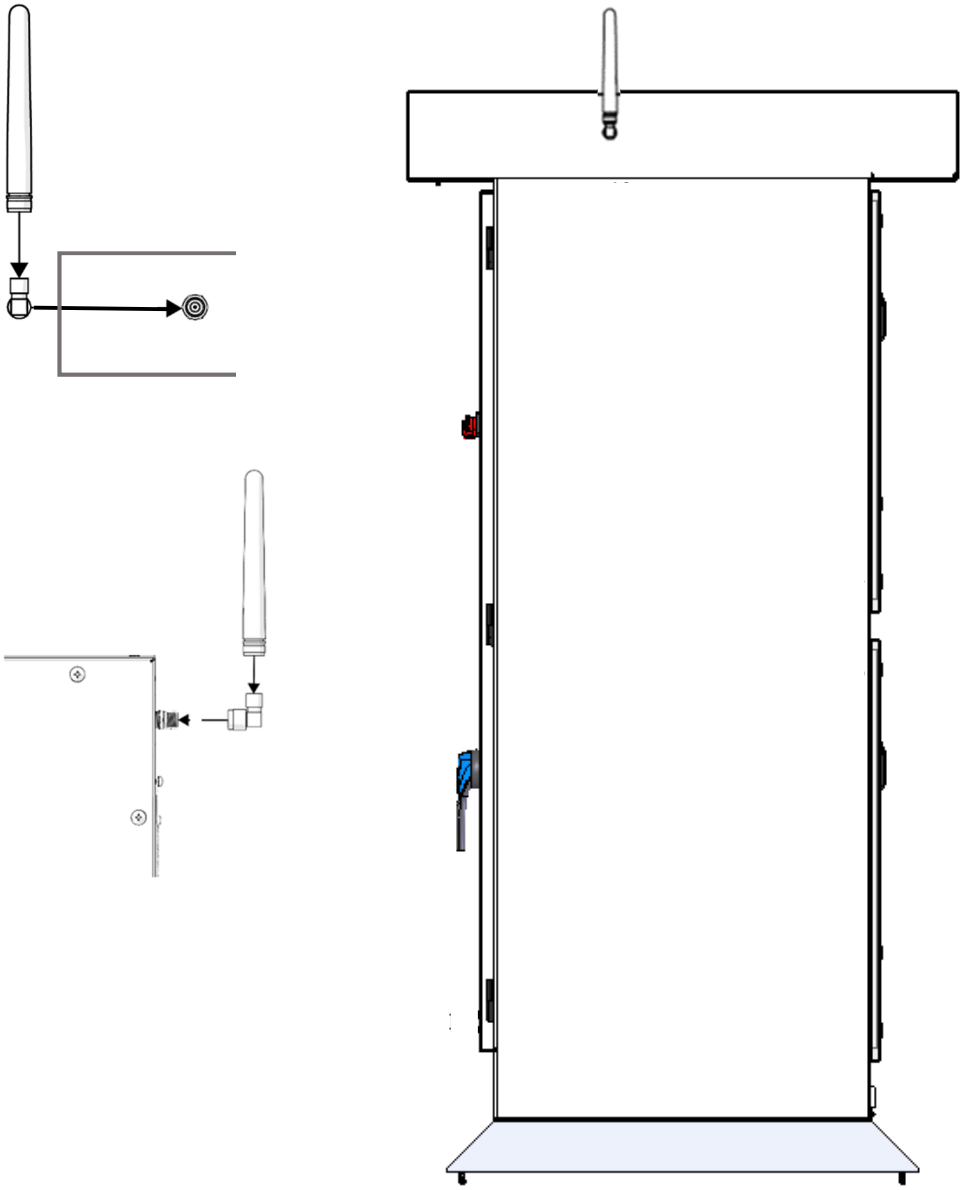


Fig. 5-22. MOUNTING THE ANTENNA

6 Startup and Verification Test

WARNING	**Electrical Shock Hazard** Installer may come into contact with components that have hazardous voltage and energy. Use proper safety equipment when energizing the inverter.

6.1 PV APPLICATION – Startup Checklist

Mechanical Installation

- Make sure the XGI 1500-1MW inverter is securely installed and all mounting fasteners are tightened to the specified torque values.

Electrical Connections

1) Turn OFF the Local AC Shutoff Switch on the inverter (see Fig. 3-3).
2) Turn OFF the four DC Switches on the inverter (see Fig. 5-8).
3) Verify all conductors are landed on the correct terminals.
4) Verify all connections are tightened to the specified torque values.
5) Verify conduits from underground circuits are appropriately sealed

Electrical Check

1) Verify that the AC circuit breaker is appropriately sized.
2) Confirm that the 3-phase AC service voltage is within 5% of nominal:
3) 570Vac - 630Vac for 600Vac service
4) Verify that the AC phase conductors are oriented for clockwise phase rotation (see §5.10)
5) Confirm that the polarity of the DC inputs is correct.
6) Verify that the DC open-circuit voltage of the input PV circuits is less than 1500VDC.

6.2 PV APPLICATION – Startup Steps

Follow these instructions when energizing the unit:

1) Verify inverter doors are secured using all fasteners.
2) After completing the electrical connections and electrical checks, energize the site main AC Breaker to connect grid AC voltage to the inverter.
3) Connect the PV source circuits to the PV combiners and energize the PV output circuit from the PV combiners to the SOLECTRIA XGI 1500-1MW DC terminals.

4) Turn ON the Local AC Shutoff Switch on the inverter (see Fig. 3-3).

5) Turn ON the four DC Switches on the XGI 1500-1MW inverter (see Fig. 5-8).

6) Verify that the Status Panel illuminates READY and that neither the MAINTENANCE nor the POWER FAULT LED is illuminated. If the LEDs are not in this state, see §11 Maintenance and Troubleshooting.

7) Connect to the XGI virtual HMI. Using a laptop, tablet, or smartphone, connect to the gateway inverter's WiFi network, XGI-00-006 (see §7 User Interface).

8) Select the gateway node (in blue) at the top of the list.

9) Log in to the inverter (see Section 8.2.5).

10) Select the "First Time Start Wizard" from the menu under "Inverter Configurations".

11) Follow the instructions of the "First Time Start Wizard". (See Section 10.1)

12) Verify that the Status Panel illuminates READY, NETWORK and COMMUNICATIONS, and POWER.

13) Verify that the inverter is operational by checking production using the virtual HMI or a third-party DAS.

6.3 PV APPLICATION – Initial Commissioning

1) Turn ON the Local AC Shutoff Switch on the XGI 1500-1MW inverter (see Fig. 3-3).

2) Turn ON all 4 of the DC switches on the front of the XGI 1500-1MW inverter (see Fig. 5-8).

3) Use the HMI to verify that settings for voltage protection, frequency protection, and autonomous grid support functions if applicable, are properly configured and compliant with the interconnection agreement.

4) Use a power quality analyzer, oscilloscope, or voltmeter to measure the presence and absence of AC voltage on the inverter side of the PV System Disconnect. The PV System Disconnect is typically the disconnecting means closest to the Point of Interconnection. The meter is used to verify voltage and timing requirements during plant shutdown.

5) Once all XGI 1500-1MW inverters are operating, open the PV System Disconnect. The inverters are expected to cease operation when the PV System Disconnect is open. Listen for the sound of the AC contactor opening inside the XGI 1500-1MW inverter.

6) Verify the absence of voltage using the meter on the XGI 1500-1MW inverter side of the PV System Disconnect.

7) Using the XGI virtual HMI, verify absence of a grid error message and cessation of power production. This information is available on the inverter list page and inverter home page.

8) Close the PV System Disconnect. Verify that voltage has resumed within 5% of nominal.

9) Using the XGI virtual HMI, verify the initiation of a 5-minute timer before resuming operation. This information is available on the XGI 1500-1MW inverter list page and inverter home page.

10) The commissioning and verification test will be complete once the XGI 1500-1MW inverters have resumed operation, 5 minutes after grid power via the PV System Disconnect.

6.4 DC-COUPLED STORAGE APPLICATION – Startup Checklist

Mechanical Installation

- Confirm that the inverter is securely installed and all mounting fasteners are tightened to the specified torque values.

Electrical Connections

1) Turn OFF the Local AC Shutoff Switch on the inverter (see Fig. 3-3).
2) Turn OFF the DC Switches on the XGI 1500-1MW inverter (see Fig. 5-8).
3) Verify that all conductors are landed on the correct terminals
4) Verify that all connections are tightened to the specified torque values
5) Verify that conduits from underground circuits are appropriately sealed

Electrical Check

1) Verify that the AC overcurrent protection (circuit breaker or fuse) is appropriately sized.
2) Confirm that the 3-phase AC service voltage is within 5% of nominal:
    i. 570Vac - 630Vac for 600Vac service
3) Verify that the AC phase conductors are oriented for clockwise phase rotation (see §5.10)
4) Confirm that the polarity of the DC inputs is correct.
5) Verify that the open-circuit DC voltage of the input PV source circuits is less than 1500VDC.

6.5 DC COUPLED STORAGE APPLICATION – Initial Commissioning Procedure

1) Turn OFF and lock out all PV Combiner Boxes.
2) Turn OFF and lock out the AC source to the XGI 1500-1MW inverter.
3) Turn OFF and lock out the Battery source.
4) Turn OFF the red Local AC Shutoff Switch on the XGI 1500-1MW inverter (see Fig. 3-3).
5) Press the DynaPower DPS 1000 emergency OFF (EPO) button on the converter's front panel.
6) Turn OFF all 4 DC disconnect switches on the front of the XGI 1500-1MW inverter (see Fig. 5-8).
7) Turn OFF the DC disconnect switch between XGI 1500-1MW inverter and the Battery source.
8) Open the XGI 1500-1MW doors and verify absence of voltage from all sources.
9) Verify all cabling in the XGI 1500-1MW inverter is installed correctly and torqued appropriately.
10) Energize the Battery source.
11) Turn ON the source of AC power to the XGI 1500-1MW inverter.
12) Turn ON the DC disconnect switches between the XGI 1500-1MW inverter and the Battery source.
13) Turn ON the DC disconnect at each PV Combiner.
14) Turn ON all 4 DC disconnect switches on the front of the XGI 1500-1MW inverter (see Fig. 5-8).
15) Release the DPS 500 emergency off (EPO) button on the front panel of the converter.
16) Turn ON the Local AC Shutoff Switch on the XGI 1500-1MW inverter (see Fig. 3-3).
17) Logon to the network and confirm network access to inverters and controller.

6.6 DC COUPLED STORAGE APPLICATION – System SHUT-OFF Procedure

To turn OFF the XGI 1500-1MW in the DC-Coupled Storage configuration, the following sequence of steps is recommended to avoid unnecessary wear on the components:

1) Turn OFF the red Local AC Shutoff Switch on the XGI 1500-1MW inverter (see Fig. 3-3).
2) Press the DPS 1000 emergency OFF (EPO) button on the front panel of the converter.
3) Turn OFF the AC disconnect switch or breaker on the main AC source to the XGI 1500-1MW inverter.
4) Turn OFF all 4 DC disconnect switches on the front of the XGI 1500-1MW inverter (see Fig. 5-8).
5) Turn OFF the DC disconnect switches between the XGI 1500-1MW inverters and the Battery source.

6.7 DC-COUPLED STORAGE APPLICATION – System TURN-ON Procedure

To turn ON the XGI 1500-1MW in the DC-Coupled Storage configuration, the following sequence of steps is recommended:

1) Close all PV source circuit fuse holders in the PV Combiner Boxes and close the covers.
2) Turn ON the DC disconnect switches between the XGI 1500-1MW inverter and the Battery source.
3) Turn ON the DC disconnect at each PV Combiner.
4) Turn ON all 4 DC disconnect switches on the front of the XGI 1500-1MW inverter (see Fig. 5-8).
5) Turn ON the AC disconnect switch or breaker on the main AC source to the XGI 1500-1MW inverter.
6) Release the DPS 500 emergency off (EPO) button on the front panel of the converter, connecting it to the XGI 1500-1MW inverter.
7) Turn ON the red Local AC Shutoff Switch on the XGI 1500-1MW inverter (see Fig. 3-3).

7 Communication Installation and User Interface

The SOLECTRIA XGI inverters utilize an advanced communication platform that can be accessed over WiFi using a smart device, or over Ethernet using a personal computer.

The SOLECTRIA XGI inverters are compatible with Solectria's SolrenView with no additional hardware required. Yaskawa Solectria Solar also supports integration with other third-party monitoring platforms.

This section includes important information regarding communication design requirements, wiring requirements, and installation instructions.

7.1 Connection to the Internet

Connection to the Internet is strongly recommended for SOLECTRIA XGI inverters. An internet connection will provide the user with several important features including:

- ✓ Automatic firmware updates.
- ✓ Remote diagnostics & troubleshooting.
- ✓ Access for Yaskawa Solectria Solar Technical Support & Service.
- ✓ Access to the user interface via the Remote Access Portal (RAP) (with subscription, optional).
- ✓ Remote monitoring via SolrenView (with subscription, optional).

7.2 Communication Conductors

All communication conductors must utilize **Ethernet Cat 6 Shielded cable and connectors**. The shield must be terminated properly to provide connection with ground.

INFO ✓
Ethernet Cat 6 Shielded Cable: Solar PV inverters create an electrically noisy environment that can disrupt inverter communication. It is important to use Cat 6 Shielded cable and connectors to ensure that communication is not interrupted. **Separate Communication Conductors from Power Conductors:** Never run communication conductors in the same conduit as power conductors. It is important to keep communication conductors away from power conductors to reduce noise. If power conductors must intersect with communication conductors, it is preferable to have the intersection at a 90-degree angle.

7.3 Connecting Multiple Inverters

The SOLECTRIA XGI inverters can be connected in groups referred to as ***Clusters.*** Each XGI Inverter Cluster is defined as a group of inverters connected over Ethernet with one ***Gateway Inverter*** connected to the onsite LAN***.*** The Gateway Inverter is automatically self-configured when it obtains a DHCP address from a DHCP server or when it can be manually programmed using a static IP. Once the Gateway Inverter is configured, the Cluster becomes its own private LAN or **Cluster LAN** protected by a built-in firewall. DHCP or manual static IP configuration is required to form multiple clusters on a single LAN.

XGI Inverters can be clustered using Ethernet daisy chains (Fig. 7-2), mixed networks using Ethernet switches (Fig. 7-1), or any combination to form a multi-cluster configuration (Fig. 7-3).

- The maximum number of inverters in any single daisy chain is 50 inverters.

- When using star or mixed network configurations, the maximum number of inverters from one end of a daisy chain to the end of any other daisy chain within a given Cluster must not exceed 50 inverters.
- The maximum number of inverters in any Cluster must not exceed 50.
- Use shielded Cat6 Ethernet cable ONLY.
- The maximum length between any two devices is 328 ft. (100m) for all inverter Ethernet connections.
- Fiber optic cables can be used for 'long-haul' communication runs with the use of an appropriate switch/converter.

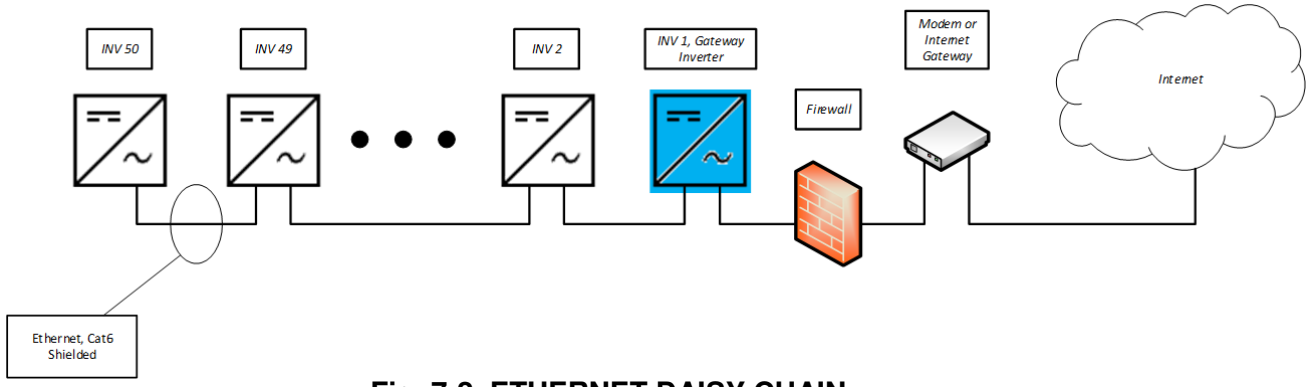


Fig. 7-2. ETHERNET DAISY CHAIN

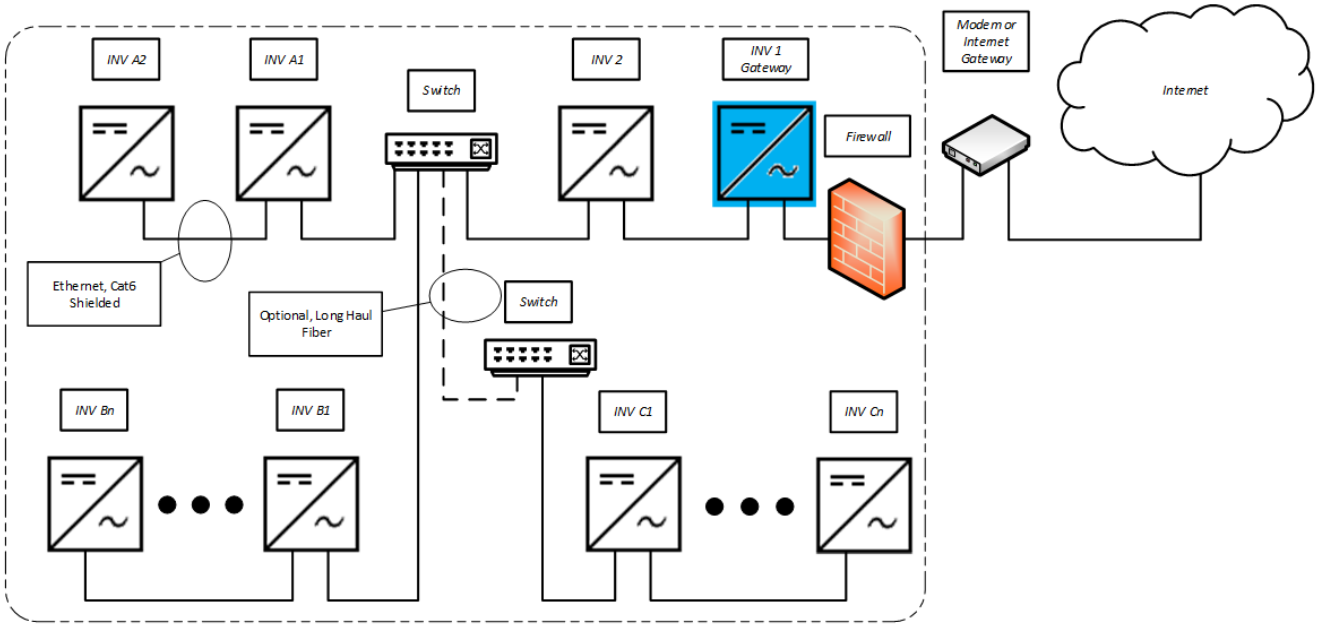


Fig. 7-1. MIXED NETWORK

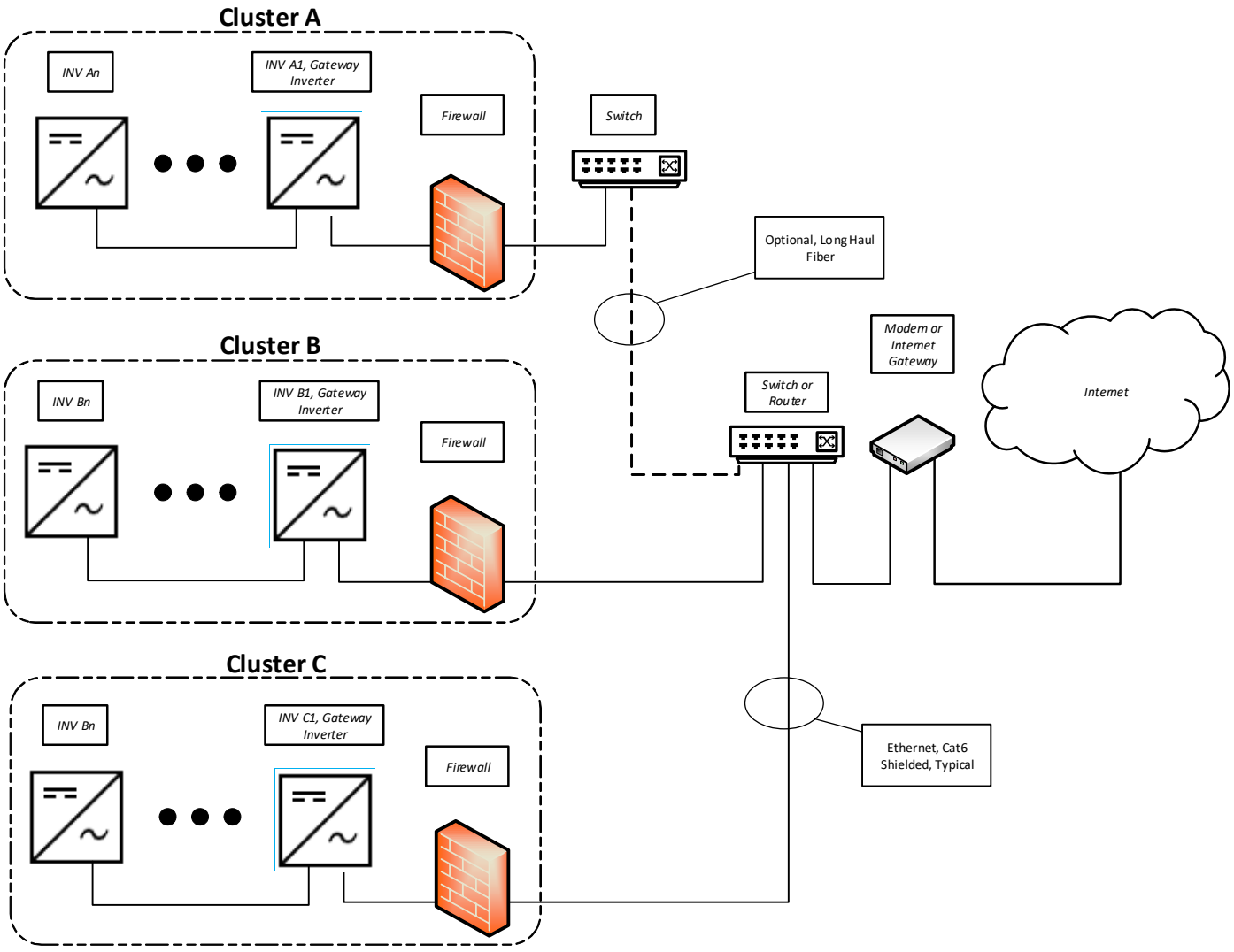


Fig. 7-3. MULTI-CLUSTER SITE

7.4 XGI Gateway Inverters Firewall

SOLECTRIA XGI inverters have a robust built-in firewall that is automatically established on the Gateway Inverter after receiving an IP address assigned via a DHCP or through manual static IP configuration. This act of establishing a firewall also designates an inverter as a **Gateway Inverter**. Once this firewall is established unauthorized inbound or outbound communication is not permitted through the Gateway Inverter.

7.5 Networking with Other Devices

Networking with other Ethernet based devices including revenue grade meters, tracking systems, weather stations, etc. should only be done outside of the inverter Cluster LAN, or outside of the Inverter Gateway Firewall; see Fig. 7-4.

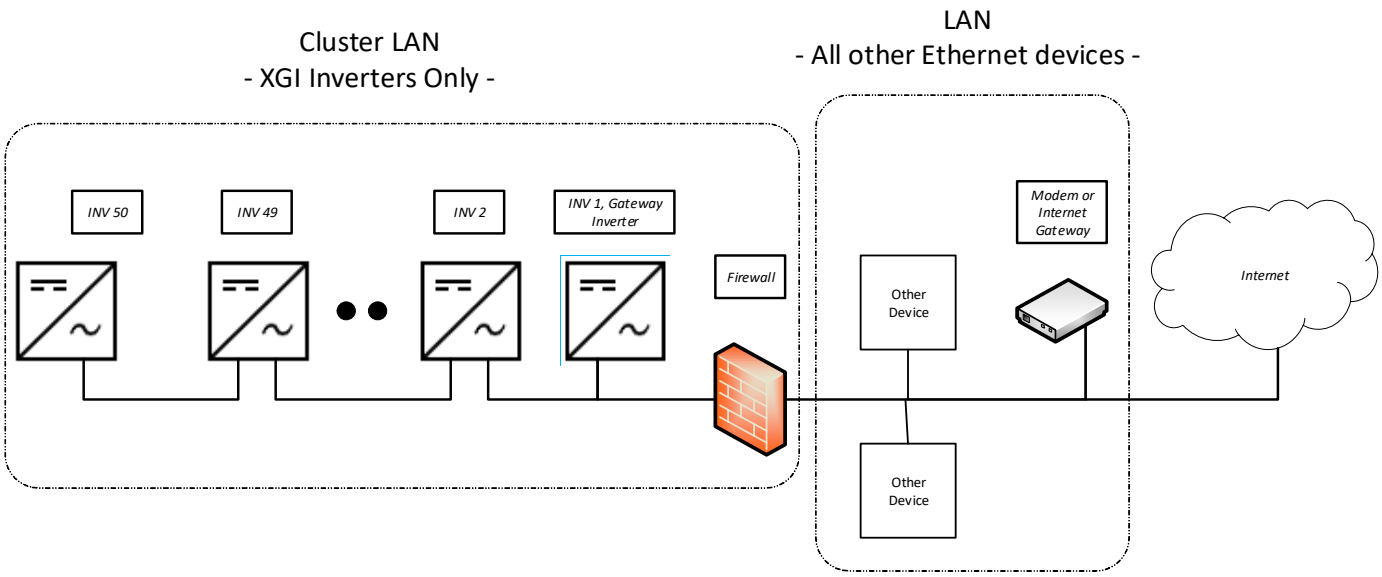


Fig. 7-4. NETWORKING WITH OTHER DEVICES

7.6 Monitoring Compatibility

The SOLECTRIA XGI is compatible with SolrenView and third-party Data Acquisition Systems (DAS). When using SolrenView monitoring no additional hardware is required. When connecting with third-party monitoring providers, Ethernet connections must be used; RS485 is **not** supported.

When integrating SOLECTRIA XGI inverters with third-party monitoring platforms, one of the following methods **MUST** be employed in order for the third-party DAS to reach each inverter as an Endpoint Device; 1. Port forwarding, 2. Static Routing (discussed in detail in §7.7). Be sure to consult with the monitoring provider before installation.

7.7 Third-Party Data Acquisition System (DAS) Connection

NOTICE !
Ethernet Only Connection: The XGI inverter only supports Ethernet connections to a third-party DAS.

Connect the third-party DAS to the onsite LAN, outside of the Cluster LAN(s). Connecting a third-party DAS inside the Cluster LAN will block communication to the DAS outside of the Cluster LAN.

If DHCP is not enabled on the LAN, a static IP assignment for the GUI must be configured. When using DHCP consider using a reserved DHCP address.

To allow a third-party DAS (or any other device) to access inverters within a cluster(s) and treat all inverters as Endpoint Devices, *Port Forwarding* or *Static Routing* must be used.

7.8 Static IP Configuration, Gateway Inverter

Gateway inverters can be manually configured using a static IP. It is important to identify which Ethernet Port is configured with the static IP and ensure this is connected to the LAN. Once a static IP is configured the port will no longer function as a Cluster connection.

Login to the desired gateway inverter and navigate to ***Inverter Configuration → Network Configuration → Advanced Network Configuration → Ethernet Configuration.*** Enter the desired **Static IP, Gateway IP, Netmask,** and **Interface.** See Fig. 7-5

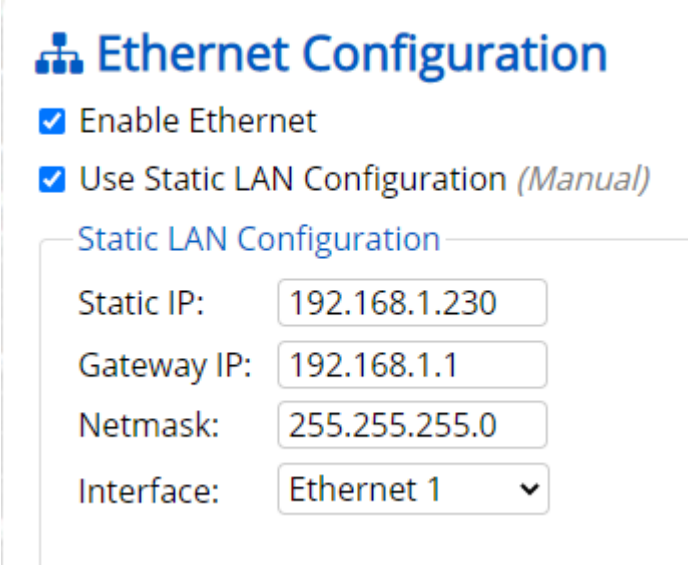


Fig. 7-5. STATIC IP CONFIGURATION

7.9 Port Forwarding

Port forwarding is easily configured with most third-party monitoring providers. Make sure to consult with your monitoring provider before implementing. When Port Forwarding is implemented, a third-party DAS can address each inverter using the *Gateway Inverter External IP* and the specified port for the inverter with the cluster. The *Gateway Inverter External IP* is assigned to the Gateway Inverter via the DHCP or configured manually using a static IP.

7.9.1 PORT FORWARDING, RESERVED DHCP IP ADDRESS

Before configuring Port Forwarding on the Gateway inverters(s) it is important to work with your network administrator to ensure that the gateway IP address(es) are fixed. If using DHCP consider using a reserved lease. If the IP address of the gateway inverter changes, communication to the cluster will fail.

The IP address assigned to the Gateway Inverters(s) must be in a different subnet than internal Cluster IPs within the Cluster LAN.

7.9.2 PORT FORWARDING, CONFIGURING THE GATEWAY INVERTER

To configure Port Forwarding, first ***Enable External Modbus Access*** by selecting the check box using the GUI of the desired Gateway Inverter.

By default the Gateway Inverter will detect and recommend an IP/Subnet from which external devices are allowed through the Inverter Gateway Firewall. For security purposes the user is encouraged to enter the most restrictive value, with preference given to the specific IP address of the external device (DAS). Up to two IP/Subnet pairs can be entered on each gateway.

NOTICE !
CYBER SECURITY! Configuring an entire IP subnet will not only allow the desired DAS device but would also enable all the other devices (authorized or unauthorized) in the subnet to be able to access the Inverter cluste LAN. Use the most restrictive settings possible.

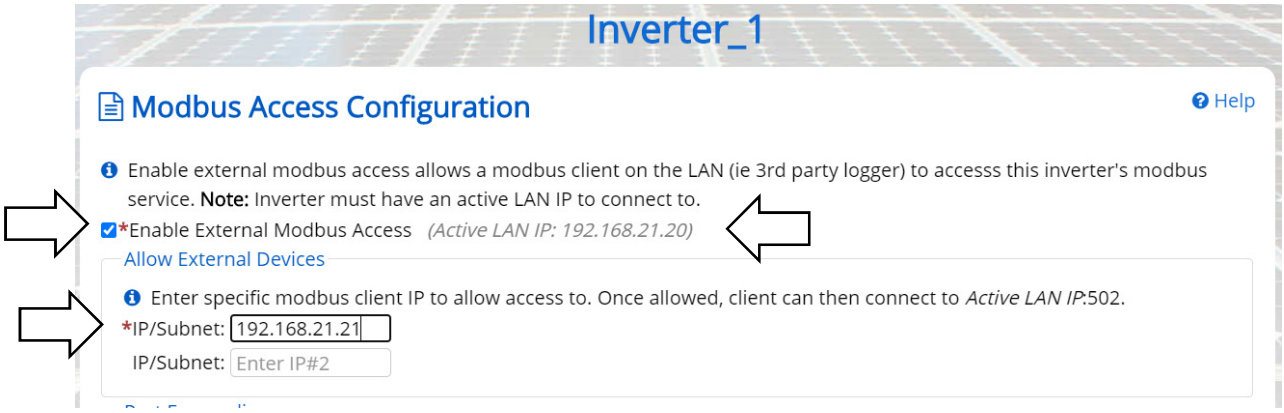
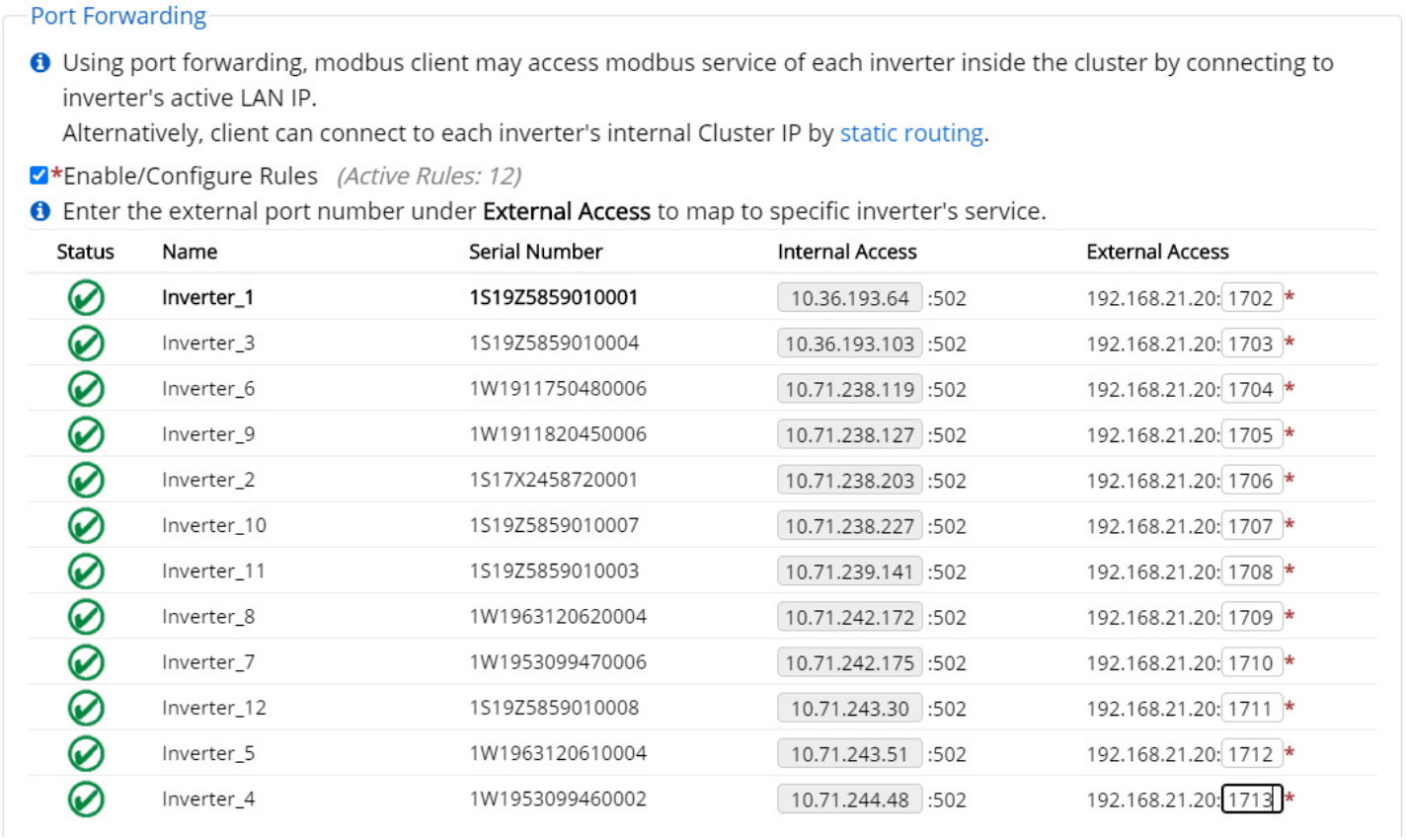


Fig. 7-6. ENABLING EXTERNAL MODBUS ACCESS, PORT FORWARDING

Enable/Configure Rules for Port forwarding by selecting the check box.

Enter all of the desired Ports in the right most column.

Ports must be between and 1702-1752.



Port Forwarding

Using port forwarding, modbus client may access modbus service of each inverter inside the cluster by connecting to inverter's active LAN IP.
Alternatively, client can connect to each inverter's internal Cluster IP by static routing.

*Enable/Configure Rules *(Active Rules: 12)*

Enter the external port number under **External Access** to map to specific inverter's service.

Status	Name	Serial Number	Internal Access	External Access
✓	**Inverter_1**	**1S19Z5859010001**	10.36.193.64 :502	192.168.21.20: 1702 *
✓	Inverter_3	1S19Z5859010004	10.36.193.103 :502	192.168.21.20: 1703 *
✓	Inverter_6	1W1911750480006	10.71.238.119 :502	192.168.21.20: 1704 *
✓	Inverter_9	1W1911820450006	10.71.238.127 :502	192.168.21.20: 1705 *
✓	Inverter_2	1S17X2458720001	10.71.238.203 :502	192.168.21.20: 1706 *
✓	Inverter_10	1S19Z5859010007	10.71.238.227 :502	192.168.21.20: 1707 *
✓	Inverter_11	1S19Z5859010003	10.71.239.141 :502	192.168.21.20: 1708 *
✓	Inverter_8	1W1963120620004	10.71.242.172 :502	192.168.21.20: 1709 *
✓	Inverter_7	1W1953099470006	10.71.242.175 :502	192.168.21.20: 1710 *
✓	Inverter_12	1S19Z5859010008	10.71.243.30 :502	192.168.21.20: 1711 *
✓	Inverter_5	1W1963120610004	10.71.243.51 :502	192.168.21.20: 1712 *
✓	Inverter_4	1W1953099460002	10.71.244.48 :502	192.168.21.20: 1713 *

Fig. 7-7. PORT FORWARDING

7.9.3 PORT FORWARDING, DAS CONFIGURATION

The External Access IP and respective Port settings must be configured on the third-party monitoring platform or DAS. This will allow the DAS to query the desired inverter properly.

7.10 Static Routing

To implement Static Routing the XGI Gateway Inverter(s) will need to be configured and a static routing rule will need to be added to the LAN.

Once implemented, inverters can easily be addressed as an Endpoint Device by a DAS or other external device using the Inverter Cluster IP address and port 502, for example: 10.78.125.31:502. Inverter Cluster IPs can be configured; see §7.11.

7.10.1 STATIC ROUTING, CONFIGURING THE GATEWAY INVERTER

To configure Static Routing first ***Enable External Modbus Access*** by selecting the check box using the GUI of the desired Gateway Inverter.

By default, the Gateway Inverter will detect and recommend an IP/Subnet from which external devices are allowed through the Inverter Gateway Firewall. For security purposes the user is encouraged to enter the most restrictive value, with preference given to the specific IP address of the external device (DAS). Up to two IP/Subnet pairs can be entered on each gateway.

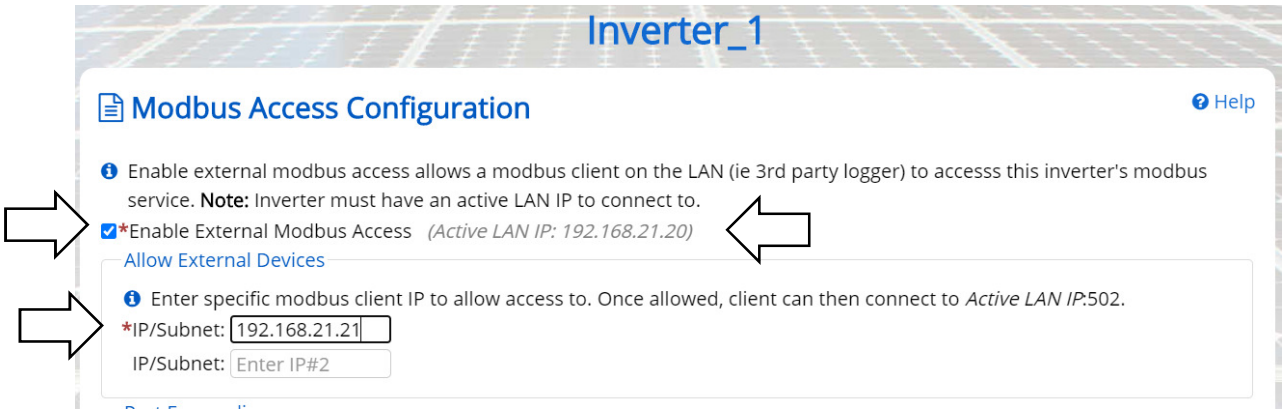


Fig. 7-8. ENABLING EXTERNAL MODBUS ACCESS, STATIC ROUTING

7.10.2 STATIC ROUTING, ENTERING STATIC ROUTING RULE ON LAN

A static routing rule can be implemented on any permanently installed device on the LAN. Most commonly this is configured on the Internet Gateway Modem/Router or the third-party DAS (if feature is provided).

To enter the static routing rule, the following information is required:

- Destination Network:
  - The Gateway Inverter Cluster IP Address. Obtained from the landing page of the GUI
- MASK: Cluster LAN mask
  - Determined by the IP address within the Cluster LAN. By default this is 255.0.0.0, but can be more restrictive if custom inverter Cluster IPs are configured.
- Gateway IP: Gateway Inverter External IP Address
  - Listed as ***Active LAN IP*** on the ***Modbus Access Configuration*** page, see Fig. 7-8

The method of entering static routing rules varies depending on the device or operating system, for more information work with your IT professional.

7.11 Manage Cluster IP Address

The internal Cluster IP Address are automatically assigned to each XGI inverter at the factory. If desired the IP address can be managed and statically assigned. Supported ranges include 10.0.021 – 10.255.255.254 & 192.168.0.21 – 192.168.0.254.

NOTICE !
Internal Cluster IPs: In most applications the internal cluster IPs are only used for communication behind the Gateway Inverters. Exceptions include: (1) utilizing Static Routing, and (2) when no gateway inverter is configured (this is not recommended.)

Login to the inverter using the Admin credentials and navigate to **Inverter Configurations → Network Configurations → Advance Network Configurations → Network Cluster Configurations.** Select the check box **Manage cluster Ip addresses** and edit the **Cluster IPs** as desired, see Fig. 7-9.

Click **Save** to store the changes.

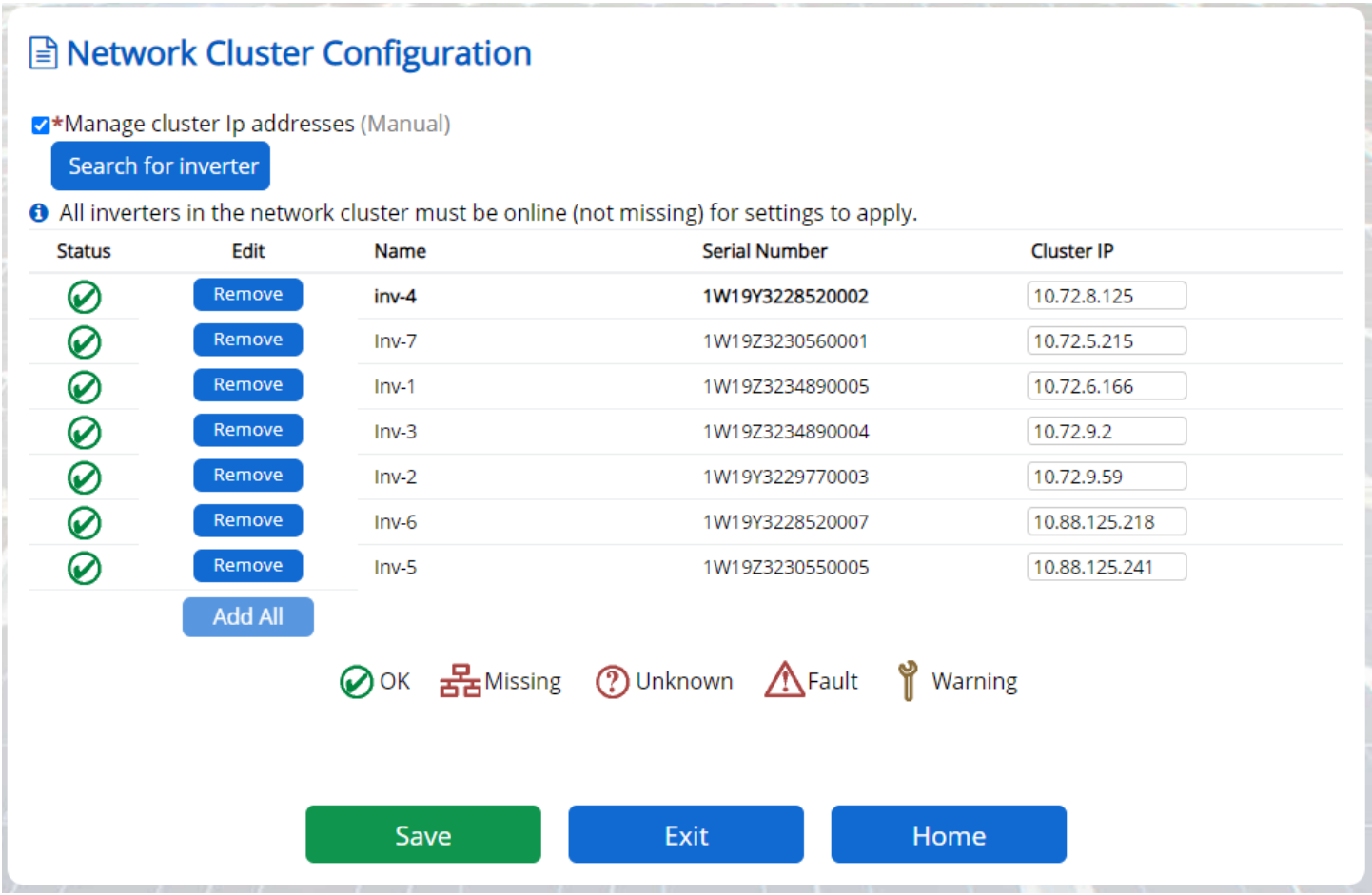


Fig. 7-9. MANAGE IP CONFIGURATION

7.12 Communication and I/O Ports

The SOLECTRIA XGI 1500-1MW has two interchangeable Ethernet Ports. See §8.2.1 for location of the Ethernet ports.

7.12.1 WEATHER STATION CONNECTION (OPTIONAL)

Only use weather stations that connect using Ethernet. As with all other non-inverter Ethernet devices, these should be connected outside of the Cluster LANs.

8 Graphical User Interface

The XGI series of inverters operate on an advanced communication platform that provides the operator with an unparalleled level of access and control. The user interface is designed to be intuitive and easy to use, however, it is important to understand the supported network topologies and some XGI-specific terminology that is used within this document. The reader is encouraged to review and understand Section 8.1 before proceeding.

8.1 XGI Terminology

This section discusses terminology that is used throughout this document.

8.1.1 XGI CLUSTER

The ***XGI Cluster*** or simply ***Cluster*** refers to a group of XGI inverters connected together via Ethernet that share one single common Cluster ***Gateway Inverter***. The Cluster forms its own LAN, protected from the rest of the onsite network by a built-in firewall. Clusters can be configured using daisy chains, star networks, or mixed networks providing flexibility during design and installation.

All inverters within a Cluster are accessible via the GUI which can be accessed by connecting to any inverter within a given Cluster.

INFO ✓
Inter-Inverter Communication Over Ethernet Only All XGI inverters are equipped with a WiFi antenna which is used to tether a smart device to the inverter or Cluster. Inverters do not communicate to each other over WiFi, all inter-inverter communication is over Ethernet only.

8.1.2 XGI GATEWAY INVERTER

Every XGI Cluster has one, and only one, XGI ***Gateway Inverter.*** The Gateway Inverter functions as the master to the rest of the inverters within the Cluster, controlling communication with other devices outside of the Cluster including; access to the local DAS, internet, remote access portal, firmware update server etc.

The Cluster Gateway Inverter is automatically configured when it obtains an External LAN IP address. This can be done by DCHP from the LAN router or statically assigned via the inverter GUI. If there is no DHCP server onsite, a Gateway Inverter will not be configured. Without a Gateway Inverter, much of the built-in functionality is disabled including; remote firmware updates, automatic firmware updates, SolrenView Monitoring, remote diagnostics, and the Remote Access Portal.

8.2 Graphical User Interface (GUI) Overview

The Graphical User Interface (User Interface, or GUI) is accessed using a Laptop PC, PC, or Smart Device. The XGI inverters can be controlled over WiFi, Ethernet, or via an encrypted remote connection (Remote Access Portal available with subscription, optional.)

INFO ✓
No Built in Keypad: To provide a more robust GUI and remove a common failure point, the XGI does not contain a built in keypad. The XGI has an LED Status Panel that provides a visual indication of the inverter status but **does not** allow the user to control the inverter.

The GUI provides the operator a “hands off” means to observe and modify the inverter settings and access all inverters within a Cluster from a single point of connection.

Typically when onsite, the preferred means of connection is using a smart phone, tablet, or PC connected over WiFi for ease of use. Specific operations require, or may be better suited for, an Ethernet connection. Table 8-1 lists common activities and the preferred/required connection type.

Table 8-1. Supported and preferred connection method

ACTIVITY	SUPPORTED CONNECTIONS	PREFERRED CONNECTION
Updating Firmware	Ethernet	Ethernet is required
Communication Commissioning	Ethernet or WiFi	Ethernet
Troubleshooting Coms	Ethernet or WiFi	Ethernet
Troubleshooting Inverters	Ethernet or WiFi	WiFi
General Inverter Interaction	Ethernet or WiFi	WiFi

8.2.1 CONNECTING TO THE INVERTER, ETHERNET

To access the inverter using Ethernet, connect an Ethernet cable from the laptop to the inverter. Connectors are located in the IGBT box on the right pivot arm channel, as in the area indicated in the image, Fig. 8-1. Wait 15 seconds for the laptop to obtain an IP address from the XGI Inverter, DHCP must be enabled on the PC connected to the inverter. Once the laptop recognizes the Ethernet connection, open your preferred web browser (example Firefox or Chrome) and type “xgi.solar” in the address bar, then click Enter to navigate to the website. The laptop should establish a connection with the inverter and display the GUI.

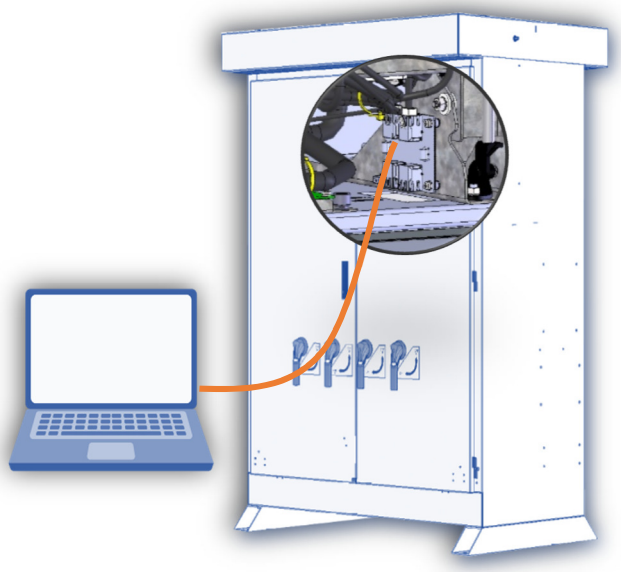


Fig. 8-1. CONNECTION VIA ETHERNET

INFO ✓
Having trouble connecting to the XGI over Ethernet? • Verify that the laptop has connected to the XGI network, look at the LEDs on your Ethernet port to ensure they are illuminated. If no lights are on or flashing check your Ethernet cable and connection. • Ensure DHCP is enabled on your PC. • Try closing your web browser and re-opening a new session. • Check to make sure the XGI network LED is illuminated. The inverter takes approximately 5 minutes to fully boot up, if connecting after a recent power cycle wait 5 minutes and try again. • IP Conflict, it is possible that the network as an IP conflict between the internal Cluster LAN and the site LAN. If the cluster IPs are in the same or over lapping subnet a conflict may prevent the inverter from connecting.

8.2.2 CONNECTING TO THE INVERTER, WIFI

To access the inverter using WiFi, Fig. 8-2, connect the smart device or laptop to the WiFi network (see Table 8-2 for default SSID). Wait 15 seconds for the laptop to obtain an IP address from the XGI Inverter. Open your preferred web browser (example Firefox or Chrome) and type ***xgi.solar*** in the address bar, then click Enter to navigate to the website. The laptop should establish a connection with the inverter and display the GUI.



Fig. 8-2. CONNECTION VIA WiFi

Table 8-2. Default Network Credentials

WiFi SSID (default)	Password (Case Sensitive)
XGI-00-006	**Solectria**

INFO ✓
Having trouble connecting to the XGI over WiFi? • Verify that the laptop has connected to the XGI network, look at the network and internet connections on your PC or smart device to ensure you are connected to the correct WiFi network • Try getting closer to the inverters WiFi antenna. The XGI provides a strong WiFi signal with 75ft and direct line of site • Ensure the WiFi antenna is connected to the inverter • Try closing your web browser and re-opening a new session • Check to make sure the XGI network LED is illuminated. The inverter takes approximately 5 minutes to fully boot up, if connecting after a recent power cycle wait 5 minutes and try again

8.2.3 INVERTER LIST

The Inverter List is the default display shown when first logging into an XGI network cluster. The Inverter List shows a register of all the inverters connected together via Ethernet with one common Gateway Inverter. These inverters are said to comprise a ***Cluster***. To access the Inverter List, connect to any inverter within the Cluster using Ethernet or WiFi, open a browser and navigate to ***xgi.solar.***

The Inverter List displays the names, serial numbers, Cluster IP addresses, and status of the all inverters registered to the Cluster, or currently connected to the Cluster, see Figure 7-9. To navigate to a particular inverter, select the name of the inverter by clicking on it.

The gateway symbol denotes which inverters is configured as the gateway.

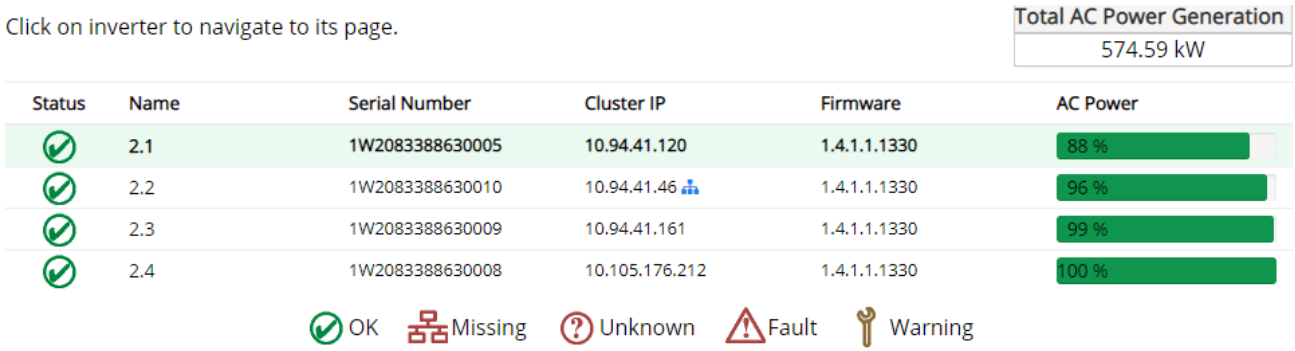


Fig. 8-3. INVERTER LIST EXAMPLE

Table 8-3. Explanation of Symbols in User Interface

Symbol	Explanation
	Inverter OK: This indicates that the inverter is on the Reference List and functioning normally.
	Inverter Missing: This indicates that the inverter is on the Reference List but is undetected.
	Inverter Unknown: This indicates that the inverter detected is not on the Reference List. This icon is overridden if a Fault or warning is present.
	Inverter Warning: This indicates that the inverter has an issue but can produce power.
	Inverter Fault: This indicates that the inverter has an ground fault and cannot produce power.

In the sample inverter list in Figure 8-3, several nodes are worth noting.

- **Inverter 2.1:** This inverter, indicated in **bold**, is the inverter that the smart device or laptop last accessed and it is operating normally.
- **Inverter 2.2:** This inverter is the Gateway Inverter, denoted with the gateway symbol.

8.2.4 INVERTER HOME PAGE

Each inverter has a home page that shows an overview of the inverter. See Figure 8-4. It displays the inverter name, serial number, time, current AC power being produced, energy produced for the day and total lifetime energy produced. Lower on the page is the inverter status, which mirrors the LED Status Panel on the inverter.



Fig. 8-4. INVERTER HOME PAGE (OBSERVER MODE)

Selecting the inverter status icons will give its current state, as shown in Fig. 8-5.

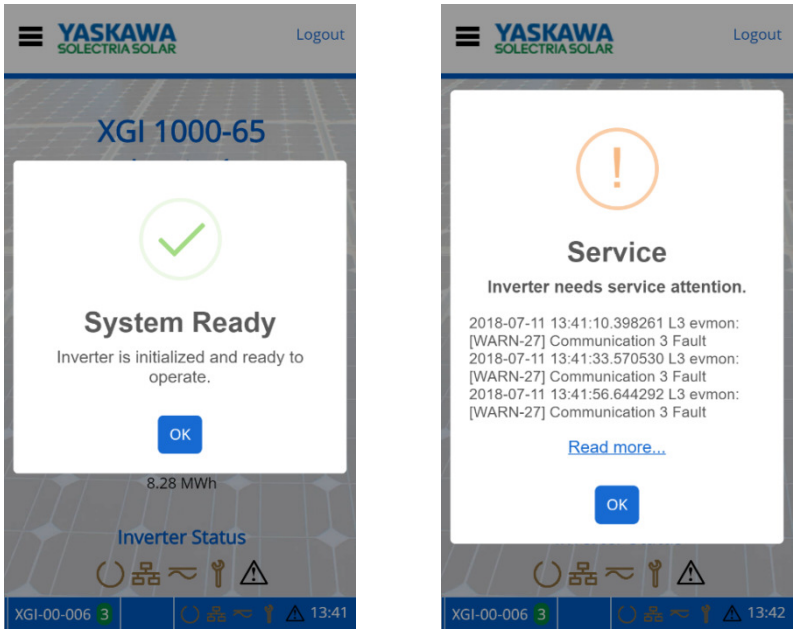


Fig. 8-5. CURRENT STATUS WITH NETWORK AND COMMUNICATION WORKING AND MAINTENANCE WITH AN EVENT

8.2.5 LOGGING IN

The menu button is located in the upper left corner, represented by three horizontal lines (≡). When clicked, a drop-down menu appears. In the upper right is a Login/Logout button.

Before logging in, the user interface is in *observer* mode. Logging in is necessary to view and access the Inverter Configurations options in the menu in *administrator* mode. Everything that is accessible in *observer* mode is also accessible in *administrator* mode. If the Logout button is pressed in *administrator* mode, the user returns to *observer* mode. Table 8-4 shows the credentials needed to login as an *administrator*.

Table 8-4. Default Login Credentials

DEFAULT USER NAME (CASE SENSITIVE)	DEFAULT PASSWORD (CASE SENSITIVE)
admin	SolectriaSolar

The inverter will log the user out automatically after it is idle for 30 minutes.

8.2.6 CHANGING SETTINGS

Changing settings or configurations in the GUI is easy and intuitive. Most pages allow the user to enter text, numbers, select check boxes, or actuate sliders. Once a setting or configuration has been adjusted use the **Save** button to save any changes.

Many fields have ranges that guide the user to input acceptable data.

The **Exit** button can be used to “escape” or back up to the previous page.

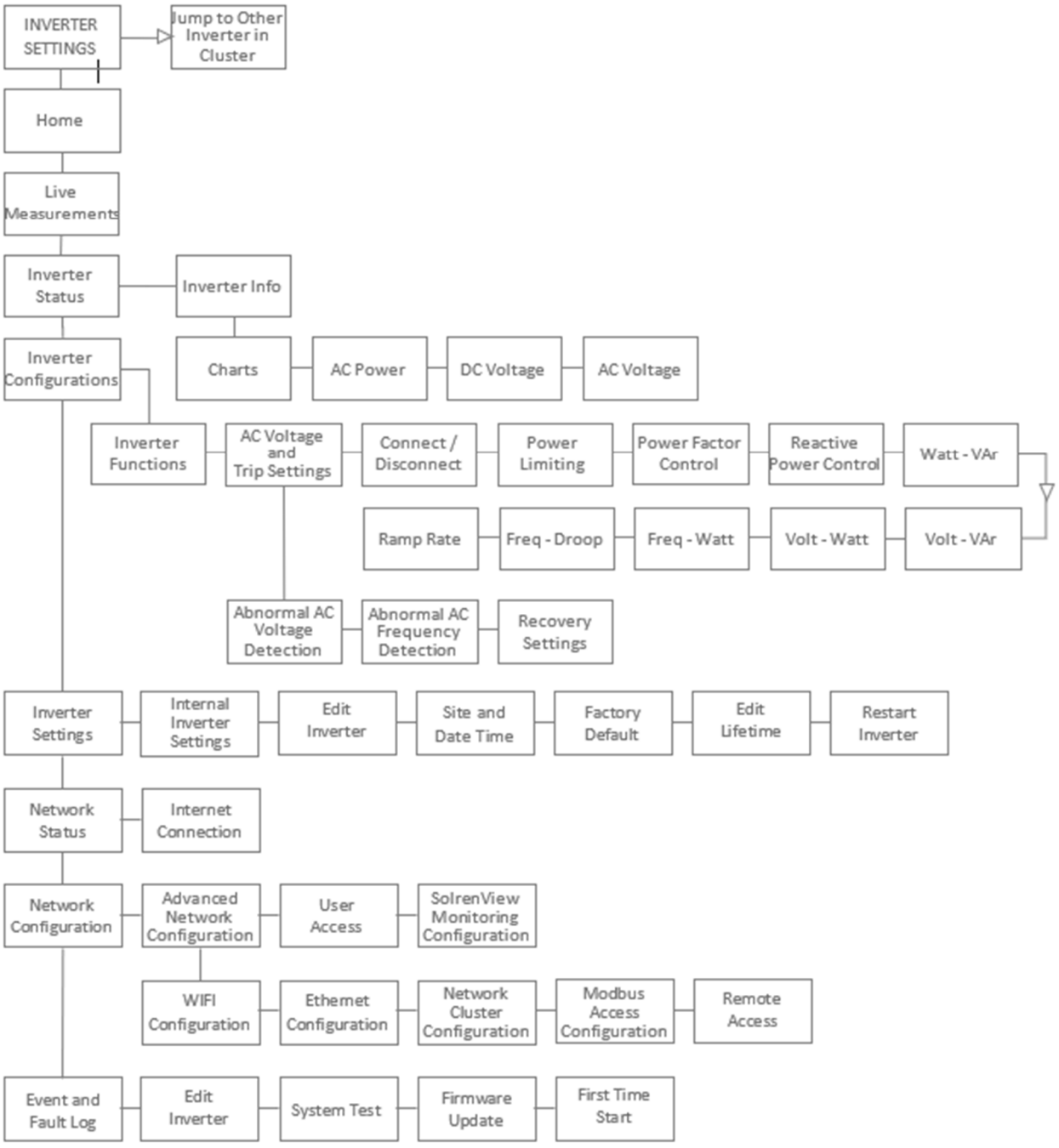
The **Home** button can be used to “escape” or back up to the Home page.

8.2.7 HELP

Many of the pages within the GUI feature a ***Help*** section containing important information regarding the particular settings or functions. Make sure to review the Help sections where applicable.

8.3 Menu Structure

This menu structure is subject to change as firmware updates are released.



9 Firmware Updates

SOLECTRIA XGI inverters support local and remote firmware updates. Remote updates are performed automatically from the Yaskawa Solectria Solar server or manually via the Remote Access Portal (with subscription).

Local firmware updates can be performed with a laptop and an Ethernet cable.

9.1 Automatic Remote Firmware Updates

By default, Automatic Remote Firmware updates are enabled. When selected, the inverter will check for firmware updates and download automatically if one is available. The firmware will be downloaded to the gateway inverter and then distributed across the rest of the network. On the following morning (or after a power cycle), all inverters will perform a self-update. During the self-update the inverters may not produce power. Updates generally occur in the early AM once PV power has stabilized but prior to peak production, reducing lost revenue.

Having the Enable Automatic Remote Firmware update unchecked is not recommended as product improvements may have occurred since the purchase of the product. If the user disables this feature, the site operator will be responsible for performing any firmware updates.

9.2 Manual Firmware Updates, Locally

Manual firmware updates performed locally should be performed with a PC and an Ethernet connection. Firmware updates over WiFi are not supported.

9.3 Manual Firmware Updates, Remote Server

Users that choose not to enable remote firmware updates, but still have onsite internet access can initiate a one-time firmware updates from our remote servers. Remote server paths can be found on our website www.solectria.com or by contacting technical support at 978-386-9700x2.

9.4 Manual Firmware Updates, Remote Access Portal

Manual firmware updates are supported on the Remote Access Portal. For more information regarding the Remote Access Portal and manual remote firmware updates, see *Remote Access Portal Administrator Operations Manual,* which can be found on our website: www.solectria.com.

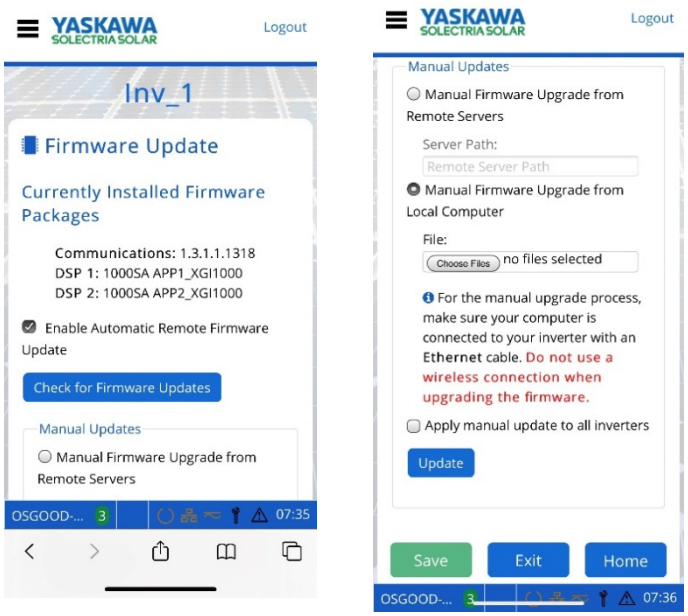


Fig. 9-1. FIRMWARE UPDATE

10 Communication Commissioning

The XGI communications can be commissioned once all inverters are installed and energized. Before proceeding ensure that the following conditions are met:

- ✓ All inverters energized, (DC voltage)
- ✓ All inverters are connected via Ethernet in a supported network topology
- ✓ All gateway inverters are connected to the LAN with DCHP enabled
- ✓ Internet access is available on the LAN (if applicable)

INFO ✓
Don't Break the Chain! When connecting to a Cluster over Ethernet during the commissioning process it is important that the Cluster LAN remain intact. Always connect to an open port on one of the XGI inverters at the end of a daisy chain as not to disconnect any inverters from the Cluster.

INFO ✓
Discovery: When inverters are connected in a Cluster it may take up to 10 minutes for all inverters to discover each other.

10.1 Communication Commissioning Checklist

- ❑ **Connect to the Cluster**
  Connect to the desired Cluster over Ethernet or WiFi using a smart device. If connecting over Ethernet be sure not to disrupt the daisy chain, always connect to an inverter at the end of a chain.

- ❑ **Verify Communication**
  On the Landing Page, verify that all expected inverters appear on the Inverter List. If inverters are missing, check wiring and ensure that all inverters have been powered on for a minimum of 10 minutes.
- ❑ **Startup Wizard**
  Run the **Startup Wizard** by logging into one of the inverters and selecting ***Startup Wizard*** from the main menu.
- ❑ **Name the Inverters**
  Enter a name for each inverter on the list.
- ❑ **Configure the Reference List**
  Add or **Remove** the inverters from the reference list. This list consists of all inverters that are currently communicating in the Cluster AND inverters that were previously added to the Reference List.
- ❑ **Select the Time Zone**
  Select the desired Time Zone from the dropdown list.
- ❑ **Choose a Cluster Name, SSID**
  A Cluster Name or SSID consists of three parts; the Site Name, Cluster ID, and WiFi channel. The Cluster Name generated in this step will determine the WiFi SSID or WiFi network name.

11 Maintenance and Troubleshooting

If an inverter is not running correctly, the Status Panel will show that there is an issue. When the inverter is working normally, the three leftmost LEDs are lit (Ready, Network and Communications, and Power) and the two on the right will be off (Maintenance and Ground Fault). If the Maintenance LED or the Maintenance and Ground Fault LEDs are illuminated, the inverter requires attention. (Refer to Section 11.4)

The User Interface will also show when an inverter is not running correctly. When the inverter is working correctly, the inverter list will show a green checkmark next to the inverter.

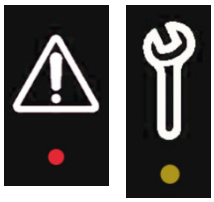


11.1 Event Codes

There are three levels of event codes: critical event, warning event, and information event.

11.1.1 CRITICAL EVENTS

Critical events will always cause the inverter to cease producing AC power and the inverter cannot self-recover. This is indicated by the display illuminating both the red Power Fault LED (triangle) and the Yellow Maintenance LED (wrench). Note that some of these events can create a hazardous situation, indicated by **DO NOT TOUCH** in Table 11-1. Critical Event Codes.



DANGER	**Ground Fault Hazard** Inverter enclosure is an electrical hazard. **DO NOT TOUCH** any equipment (including, but not limited to: the inverter, the PV array disconnect switch, the PV array combiner, the PV panels, or the PV racking system). Immediately contact the installer or another qualified person to locate and repair the source of the ground fault.

Table 11-1. Critical Event Codes

Critical Event Code	Display Message	Description	Troubleshooting
1	Software Parameter Load Failure	An attempt to remote download software parameters has failed.	Attempt to update the firmware and power cycle the inverter. Contact Technical Support.
2	Internal Communication 1 Failure	Internal communication failure detected.	Attempt to update the firmware and power cycle the inverter. Contact Technical Support.
3	Internal Communication 2 Failure	Internal communication failure detected.	Attempt to update the firmware and power cycle the inverter. Contact Technical Support.
5	AC Contactor Failure	The AC grid contactor has failed. Contactor may fail open or closed.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
6	Critical Over Temperature	Internal hardware temperature has exceeded the allowable limits.	Check to ensure external fans are clear of debris and are operating. -If external fans are not operating. Contact Technical Support, fans may need to be replaced.
7	Ground Fault	A ground fault condition has been detected.	**DO NOT TOUCH** any equipment (including, but not limited to: the inverter, the PV array disconnect switch, the PV array combiners, the PV panels, or the PV racking system). Immediately contact the installer or another qualified person to locate and repair the source of the ground fault.
9	Critical Internal Hardware Failure	A critical hardware failure has been detected to the inverter powertrain.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
11	Operational Self Check Failure	Inverter self-diagnostic check has failed during operation. Inverter requires service.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
12	Startup Self Check Failure	Inverter self-diagnostic check has failed at startup. Inverter requires service.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
…			
32		Reserved	

11.1.2 **WARNING EVENTS**



Warning events will always result in the inverter ceasing AC power production, but the inverter can self-recover if conditions causing the event cease. A warning event is indicated by the inverter illuminating the Maintenance LED (wrench).

Table 11-2. Warning Event Codes

Warning Event Code	Display Message	Description	Troubleshooting
1	Internal Over Current/ Over Voltage	Software has detected an over-voltage or over-current event. Power production will temporarily be affected.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
2	Phase Lock Loop Failure	Inverter has failed to synchronize with the grid. Power production will temporarily be affected.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
3	Islanding Detected	An islanding condition has been detected. The inverter will cease production until the event has ended.	Using a CAT III multi-meter verify the AC voltage. If an islanding condition (no AC voltage) is identified check all AC fuses or breakers. Inspect the AC conductors for damage. If AC voltage is present and the inverter will not grid connect contact Technical Support.
4	Open Phase Detected	Open AC phase condition has been detected.	Using a CAT III multi-meter verify the AC voltage. If a phase loss is identified check all AC fuses or breakers. Inspect the AC conductors for damage. If no phase loss is identified contact Technical Support.
5	AC Low Frequency 1 Detected	AC low frequency region 1 detected.	Using a CAT III multi-meter verify the AC frequency. If there is a discrepancy of greater than 2% between the measured results and the frequency reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
6	AC Very Low Frequency 2 Detected	AC low frequency region 2 detected.	Using a CAT III multi-meter verify the AC frequency. If there is a discrepancy of greater than 2% between the measured results and the frequency reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
7	AC High Frequency 1 Detected	AC high frequency region 1 detected.	Using a CAT III multi-meter verify the AC frequency. If there is a discrepancy of greater than 2% between the measured results and the frequency reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.

8	AC Very High Frequency 2 Detected	AC high frequency region 2 detected.	Using a CAT III multi-meter verify the AC frequency. If there is a discrepancy of greater than 2% between the measured results and the frequency reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
9	AC Low Voltage 1 Detected	AC low voltage region 1 detected.	Using a CAT III multi-meter verify the AC voltage. If there is a discrepancy of greater than 2% between the measured results and the voltage reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
10	AC Very Low Voltage 2 Detected	AC low voltage region 2 detected.	Using a CAT III multi-meter verify the AC voltage. If there is a discrepancy of greater than 2% between the measured results and the voltage reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
11	AC Extremely Low Voltage 3 Detected	AC low voltage region 3 detected.	Using a CAT III multi-meter verify the AC voltage. If there is a discrepancy of greater than 2% between the measured results and the voltage reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
12	AC High Voltage 1 Detected	AC high voltage region 1 detected.	Using a CAT III multi-meter verify the AC voltage. If there is a discrepancy of greater than 2% between the measured results and the voltage reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
13	AC Very High Voltage 2 Detected	AC high voltage region 2 detected.	Using a CAT III multi-meter verify the AC voltage. If there is a discrepancy of greater than 2% between the measured results and the voltage reported by the inverter contact Technical Support, otherwise wait for the grid conditions to improve.
…			
25	Communication 1 Fault	Communication processor initialization fault.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
26	Communication 2 Fault	Communication processor application fault.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.

27	Communication 3 Fault	Communication processor hardware fault.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
28	Network Fault	A network connection has failed.	Check to make sure the Ethernet connections are firmly seated. Check the Wi-Fi antennas, ensure they are vertically mounted.
29	Software Update Fault	Communication processor software update fault.	Power cycle the inverter. If the inverter doesn't clear the error, contact Technical Support.
30	Unauthorized Network Access	An unauthorized attempt to access the network has occurred.	Check to ensure there have not been any malicious attempts to access the inverter network.
31	Invalid Configuration Request	An external request to adjust setting beyond the allowable limits.	Check to make sure the value being entered is acceptable and re-enter.
32		Reserved	

11.1.3 **INFORMATION EVENTS**

Information events will not cause the inverter to cease producing AC power and are used for reference. There is no LED for them.

Table 11-3. Information Event Codes

Info Event Code	Display Message	Description	Troubleshooting
1	Power Derating, Temperature	Inverter output power is reduced due to the internal operating temperature of the inverter.	Check to make sure all external fans are operating, replace fans if necessary. Make sure the ambient temperature is within the normal operating range.
2	Power Derating, Customer Command	Inverter output power is reduced in response to user command.	Verify that that a request has been made to de-rate the inverter. If this request has not been made, contact Technical Support.
…32		Reserved	

11.1.4 **DC GROUND FAULTS** (with **Internal Ground Fault Detection** on)

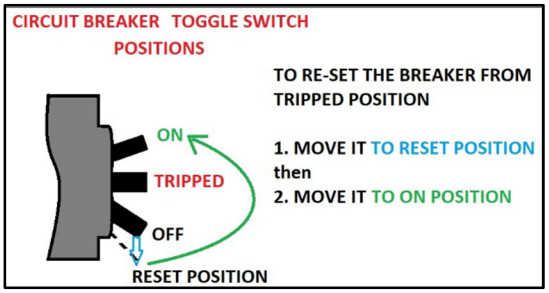
NOTE: GFDI breaker must be OFF when External Ground Fault Detection is used.



In the event of a DC Ground Fault, the right-most LED will illuminate red. As a first step, disconnect the XGI 1500-1MW inverter from all sources of power:

- Switch OFF the PV Combiners that connect to the DC input of the inverter, and
- Switch OFF the main AC power source for the inverter

When power has been safely removed from the inverter, the doors may be opened. Note that the Ground-Fault Circuit Breaker has three positions.



Note: Several paralleled inverters can experience a single ground fault and trip together. To isolate the circuit with the ground fault, turn each inverter on, one at a time, to identify the faulted circuit.

11.2 Regular Preventative Maintenance

Solectria's warranty terms require regular preventative maintenance. It is recommended to perform this service annually, adjusting the service interval as needed depending on site conditions. It may be necessary to perform the preventative maintenance more frequently during the first year to determine the appropriate service interval.

- ✓ The wiring section requires visual inspection and thermography, and
- ✓ The cooling system needs to be clean of debris to operate properly.

Performing these preventative activities will help ensure proper inverter operation, avoid preventable failures, and extend the useful life of the inverter. Inverter damage or failure attributed to a lack of regular preventative maintenance may not be covered by the product warranty.

11.2.1 THERMOGRAPHY AND VISUAL INSPECTIONS

Thermography and visual inspection of the inverter's wiring section may identify issues before a failure occurs. Use a thermal camera to inspect components in the wiring portion of the inverter after the inverter has been running for at least one hour. (Refer to Figure 11-1)

1. Allow the inverter to run for at least an hour above 50% power before performing thermography.
2. Turn off the inverter, first by setting the DC Switches on the inverter to the "OFF" position, then by turning the AC Switch on the inverter to the "OFF" position.
3. Open the enclosure doors
4. Use a thermal camera to inspect for excessive temperatures of the AC terminations, DC terminations, busbar between the AC contactors, and AC filter terminals. Record the ambient temperature. Each component's temperature must be less than the sum of the ambient temperature plus the maximum temperature rise above ambient value. Each component's temperature must also be less than the maximum temperature value. If any of the components in Table 11-4. Component Temperature Limits exceed their temperature limits or vary more than 10°C amongst the three phases, please contact Solectria Technical Support for further assistance.

NOTE:	Components cool off quickly. Attempt to conduct the thermography measurements immediately after system shutdown.

Table 11-4. Component Temperature Limits

Component	Maximum Temp. Rise above Ambient Temp.	Temperature Maximum
AC or DC Termination	50°C	90°C
AC Contactor Busbar	55°C	95°C
EMI Filter Terminals	40°C	90°C

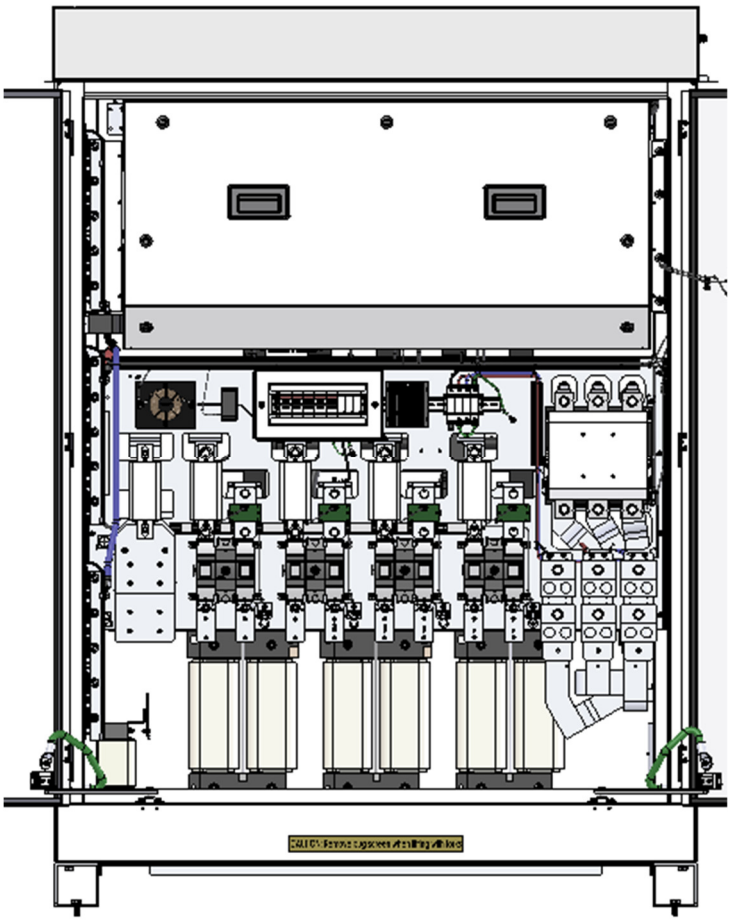


Fig. 11-1. INVERTER WIRING SECTION

5. With the doors open, perform a visual inspection of the wiring compartment, looking for water, debris, discoloration of components, and quality of workmanship, pests, or anything else that may interfere with proper inverter operation.
6. Visually inspect the DC MOVs and AC MOVs for damage or discoloration.
7. Close and latch the doors before re-energizing the inverter.

11.2.2 CLEANING THE AIR-INTAKE LOUVERED PANEL AND AIR-EXHAUST SCREENED PANEL

The XGI 1500-1MW inverters have an air-intake louvered panel beneath the three large inductors near the bottom of the enclosure. This panel should be cleaned of all debris. In addition, the screened air-exhaust panel at the top of the inverter should also be cleaned of any debris. Following are the recommended steps:

To clean the louvered air-intake panel and screened air-exhaust panel:

1. Turn off the inverter, first by rotating the DC Switches on the inverter to the “OFF” position (see Fig. 3-6), then by turning the AC Switch on the inverter to the “OFF” position (see Fig. 3-3).

2. Use a vacuum with a non-metallic nozzle to remove the debris. Use a stiff nylon brush to loosen any stubborn debris.

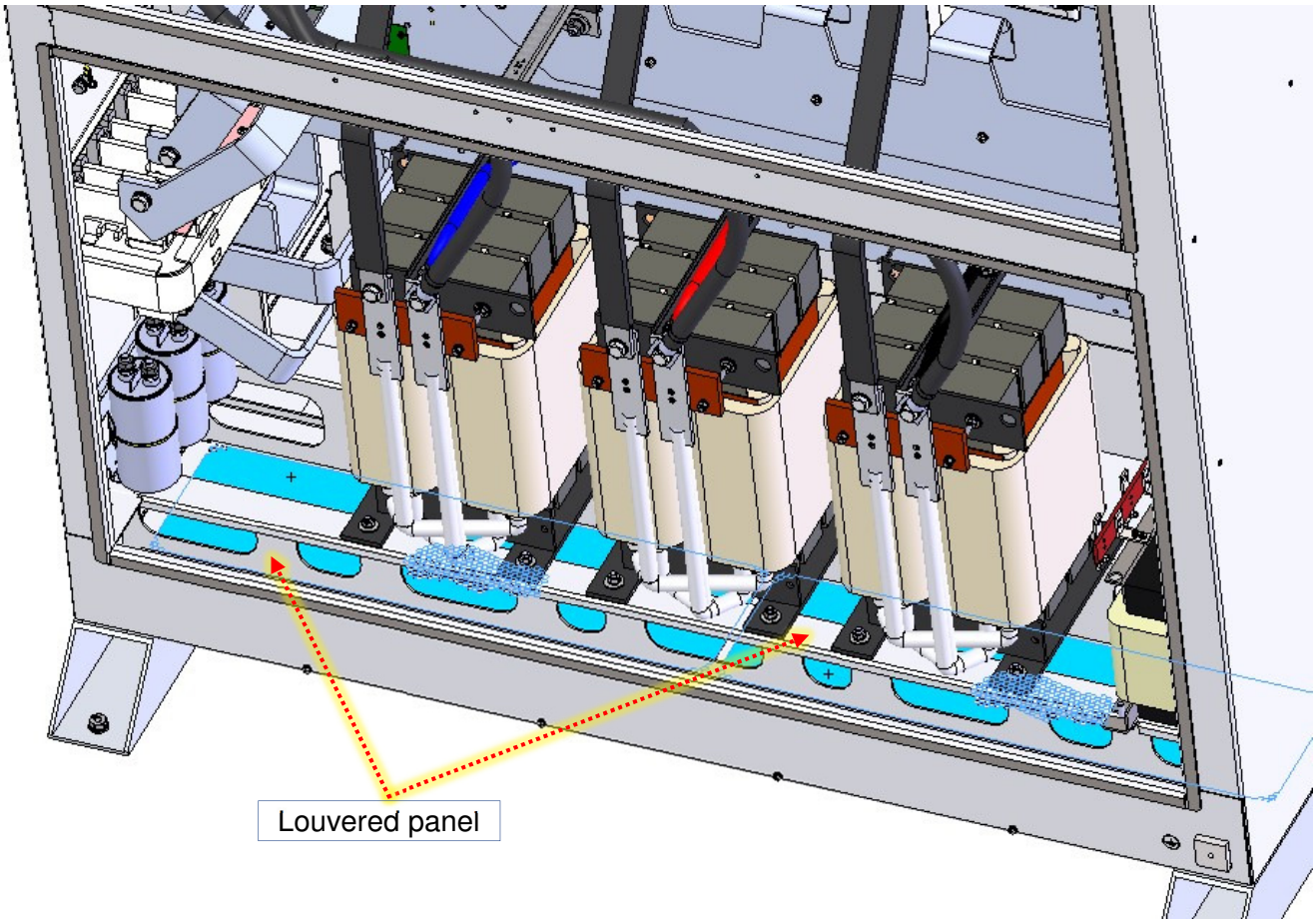


Fig. 11-2. XGI 1500-1MW INVERTER'S LOUVERED PANELS (BELOW INDUCTORS)

WARNING	Do not use any metallic tools within the wiring compartment as this could damage the insulation on the inductors.

INFO→	Failure to keep the inverter properly maintained may cause permanent damage not covered under warranty.

12 Specifications

12.1 General Specifications

Table 12-1. General Specifications

SPECIFICATION		XGI 1500-1MW-600	XGI 1500-0.99MW-600	XGI 1500-0.85MW-600	XGI 1500-0.75MW-600	XGI 1500-0.50MW-600	XGI 1500-0.498MW-600
DC Input	Absolute Maximum Input Voltage	1500 VDC		1500 VDC		1500 VDC	
	Full Rated Power Voltage Range (MPPT)	860 to 1250 VDC		860 to 1250 VDC		860 to 1250 VDC	
	Operating Voltage Range (MPPT)	860 to 1450 VDC		860 to 1450 VDC		860 to 1450 VDC	
	Strike Voltage	920 VDC		920 VDC		920 VDC	
	Number of MPP Trackers	1 MPPT		1 MPPT		1 MPPT	
	Number of PV Input Source Circuits	Four input terminals with 800A fuse and 600A disconnect each Up to two PV Source Circuits per input terminal		Four input terminals with 800A fuse and 600A disconnect each Up to two PV Source Circuits per input terminal		Four input terminals with 800A fuse and 600A disconnect each Up to two PV Source Circuits per input terminal	
	Max Operating PV Current	1,183 ADC	1,182 ADC	1,004 ADC	886 ADC	590 ADC	588 ADC
	Max Operating PV Power	1,020 kWDC	1,019 kWDC	867 kWDC	765 kWDC	510 kWDC	508 kWDC
	Max DC/AC Ratio | Max Rated DC Power	2.5 | 2.5 MW	2.5 | 2.5 MW	2.94 | 2.5 MW	3.33 | 2.5 MW	5.0 | 2.5 MW	5.0 | 2.5 MW
	DC Configuration	DC NEG grounded standard (can be user-set for DC floating)		DC NEG grounded standard (can be user-set for DC floating)		DC NEG grounded standard (can be user-set for DC floating)	
AC Output	Nominal Output Voltage	600 VAC, 3-Ph		600 VAC, 3-Ph		600 VAC, 3-Ph	
	AC Voltage Range	-12% to +10%		-12% to +10%		-12% to +10%	
	Continuous Real Output Power	1 MW	0.99 MW	085 MW	0.75 MW	0.50 MW	0.498 MW
	e34	1 MVA	0.99 MVA	User Selectable 0.85 MVA | 1 MVA	User Selectable 0.75 MVA | 1 MVA	User Selectable 0.50 MVA | 1 MVA	User Selectable 0.498 MVA | 1 MVA
	Maximum Output Current	960 A	953 A	0.85 MW / 0.85 MVA: 818 A 0.85 MW / 1MVA: 960 A	0.75 MW / 0.75 MVA: 720 A 0.75 MW / 1MVA: 960 A	0.50 MW / 0.50 MVA: 480 A 0.50 MW / 1MVA: 960 A	0.498 MW / 0.498 MVA: 479 A 0.498 MW / 1MVA: 960 A
	Fault Current Contribution (1 cycle RMS)	749 A	743 A	638 A / 749 A	563 A / 749 A	375 A / 749 A	374 A / 749 A
	Nominal Output Frequency	60 Hz		60 Hz		60 Hz	
	Power Factor (Unity Default)	+/-0.80 Adjustable		+/-0.80 Adjustable		+/-0.80 Adjustable	
	Total Harmonic Distortions (THD) @ Rated Load	< 5% (at Rated Power)		< 5% (at Rated Power)		< 5% (at Rated Power)	
	Grid Connection Type	3-Ph, (No Neutral), Floating Delta : Grounded Wye		3-Ph, (No Neutral), Floating Delta : Grounded Wye		3-Ph, (No Neutral), Floating Delta : Grounded Wye	
	Reactive Power	Q at Night (Optional)		Q at Night (Optional)		Q at Night (Optional)	
Efficiency	Peak Efficiency	99.0%		99.0%		99.0%	
	CEC Average Efficiency	98.5%		98.5%		98.5%	
	Tare Loss	< 1 W		< 1 W		< 1 W	
Environment	Ambient Temperature Range	-40°F to 140°F (-40°C to 60°C)		-40°F to 140°F (-40°C to 60°C)		-40°F to 140°F (-40°C to 60°C)	
	De-Rating Temperature	45°C (113 F)		50°C (122 F)		60°C (140 F)	
	Storage Temperature Range	-40°F to 140°F (-40°C to 60°C)		-40°F to 140°F (-40°C to 60°C)		-40°F to 140°F (-40°C to 60°C)	
	Relative Humidity (non-condensing)	0 - 95%		0 - 95%		0 - 95%	
	Operating Altitude	3,000 ft (up to 4,000 ft with derating)		3,000 ft (up to 4,000 ft with derating)		3,000 ft (up to 4,000 ft with derating)	
Communications	Advanced Graphical User Interface	WiFi		WiFi		WiFi	
	Communication Interface	RJ-45 Ethernet		RJ-45 Ethernet		RJ-45 Ethernet	
	Third-Party Monitoring Protocol	SunSpec Modbus TCP/IP		SunSpec Modbus TCP/IP		SunSpec Modbus TCP/IP	
	Web-Based Monitoring	Optional		Optional		Optional	
	Firmware Updates	Remote and Local		Remote and Local		Remote and Local	
Testing & Certifications	Safety Listings & Certifications	UL 1741 2021, IEEE 1547, UL 1998, CSA C22.2 No. 107.1-16		UL 1741 2021, IEEE 1547, UL 1998, CSA C22.2 No. 107.1-16		UL 1741 2021, IEEE 1547, UL 1998, CSA C22.2 No. 107.1-16	
	Advanced Grid Support Functionality	CA Rule 21, HECO SRD V2.0, UL 1741SB		CA Rule 21, HECO SRD V2.0, UL 1741SB		CA Rule 21, HECO SRD V2.0, UL 1741SB	
	Testing Agency	TÜV Rheinland®		TÜV Rheinland®		TÜV Rheinland®	
	FCC Compliance	FCC Part 15 (Subpart B, Class A)		FCC Part 15 (Subpart B, Class A)		FCC Part 15 (Subpart B, Class A)	
Enclosure	Acousting Noise Rating	87 dBA @ 1 m; 78 dBA @ 3 m					
	DC Disconnect	Four Integrated, 2-pole disconnects, Both positive and negative poles switched					
	AC Disconnect	Integrated lockable, manually-operated, industrial control switch					
	Dimensions	Height: 83.2 in. (2114 mm) | Width: 59.7 in. (1516 mm) | Depth: 42.8 in. (1086 mm)					
	Weight	1,955 lbs (887 kg)					
	Enclosure Rating, Finish and Material	Type 3R, Polyester Powder-Coated Steel					
Warranty	Standard and Options	5 Years Standard; Option for 10 Years					

12.2 Measurement Accuracy

Table 12-2. Accuracy Specifications

Time frame	Steady-state measurements			Transient measurements		
Parameter	**Minimum measurement accuracy**	**Measure-ment window**	**Range**	**Minimum measurement accuracy**	**Measure-ment window**	**Range**
Voltage, RMS	(± 1% V_{nom})	10 cycles	0.5 p.u. to 1.2 p.u.	(± 2% V_{nom})	5 cycles	0.5 p.u. to 1.2 p.u.
Frequency[b]	10 mHz	60 cycles	50 Hz to 66 Hz	100 mHz	5 cycles	50 Hz to 66 Hz
Active Power	(± 5% S_{rated})	10 cycles	0.2 p.u. < P < 1.0 p.u.	Not required	N/A	N/A
Reactive Power	(± 5% S_{rated})	10 cycles	0.2 p.u. < Q < 1.0 p.u.	Not required	N/A	N/A
Time	1% of measured duration	N/A	5 s to 600 s	2 cycles	N/A	100 ms < 5 s

[a]Measurement accuracy requirements specified in this table are applicable for voltage THD < 2.5% and individual voltage harmonics <1.5%.
[b]Accuracy requirements for frequency are applicable only when the fundamental voltage is greater than 30% of the nominal voltage.

12.3 Enclosure

Table 12-3. Enclosure Information

Enclosure Finish, Rating	Polyester Powder-Coated Steel, Type 3R
Dimensions	Height: 83.2 in. (2114 mm) Width: 59.7 in. (1516 mm) Depth: 42.8 in. (1086 mm)
Weight	1955 lbs (887 kg)
Mounting Angle Range	Vertical Only

12.4 Voltage and Frequency Limits and Trip Times

All models of the SOLECTRIA XGI 1500-1MW series inverters comply with UL1741 Edition 3 (09/28/2021), IEEE 1547.1 2020, and IEEE 1547-2018 requirements. The SOLECTRIA XGI 1500-1MW series inverters comply with IEEE 1547-2018 Normal Operating Performance Category B, and with Abnormal Operating Performance Category III.

The tables below show its standard settings.

Table 12-4. Response to Abnormal Voltages, Category III

Shall Trip – Category III				
Shall Trip Function	**Default Settings**		**Range of Allowable Settings**	
	Voltage (p.u. of nominal voltage)	Clearing Time (s)	Voltage (p.u. of nominal voltage)	Clearing Time (s)
OV2	1.20	0.16	fixed at 1.20	fixed at 0.16
OV1	1.10	13.0	1.10 – 1.20	1.0 – 13.0
UV1	0.88	21.0	0.0 – 0.88	2.0 – 50.0
UV2	0.50	2.0	0.0 – 0.50	0.16 – 21.0

Table 122-5. Voltage Ride-Through Requirements, Category III

Voltage Range (p.u.)	**Operating mode/response**	**Minimum Ride-Through time (s)** (design criteria)	**Maximum Response time (s)** (design criteria)
V > 1.20	Cease to Energize	N/A	0.16
1.10 < V ≤ 1.20	Momentary Cessation	12	0.083
0.88 ≤ V ≤ 1.10	Continuous Operation	Infinite	N/A
0.70 ≤ V ≤ 0.88	Mandatory Operation	20	N/A
0.5 ≤ V ≤ 0.70	Mandatory Operation	10	N/A
V < 0.50	Momentary Cessation	1	0.083

Table 12-6. Response to Abnormal Frequencies, Category I, II and III

Shall Trip – Category III				
Shall Trip Function	**Default Settings**		**Range of Allowable Settings**	
	Frequency (Hz)	Clearing Time (s)	Frequency (Hz)	Clearing Time (s)
OF2	62.0	0.16	61.8 – 66.0	0.16 – 1,000.0
OF1	61.2	300.0	61.0 – 66.0	180.0 – 1,000.0
UF1	58.5	300.0	50.0 – 59.0	180.0 – 1,000.0
UF2	56.5	0.16	50.0 – 57.0	0.16 – 1,000.0

Table 12-7. Frequency Ride-Through Requirements, Categories I, II and III

Frequency Range (Hz)	**Operating Mode**	**Minimum Time (s)** (design criteria)
$f > 62.0$	No ride-through requirements apply to this range	
$61.2 < f \leq 61.8$	Mandatory Operation	299
$58.8 \leq f \leq 61.2$	Continuous Operation	Infinite
$57.0 \leq f < 58.8$	Mandatory Operation	299
$f < 57.0$	No ride-through requirements apply to this range	

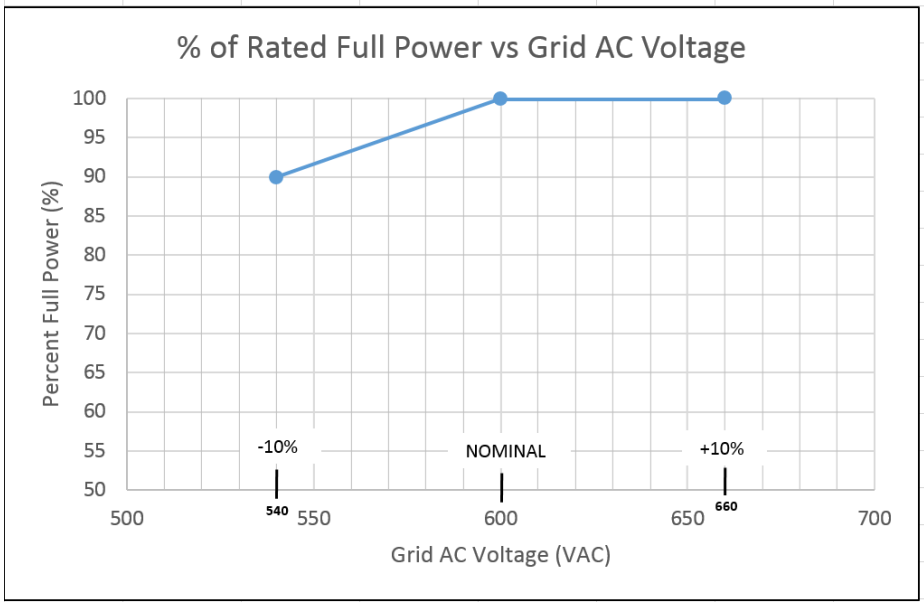


Fig. 122-1. Derating with AC Voltage

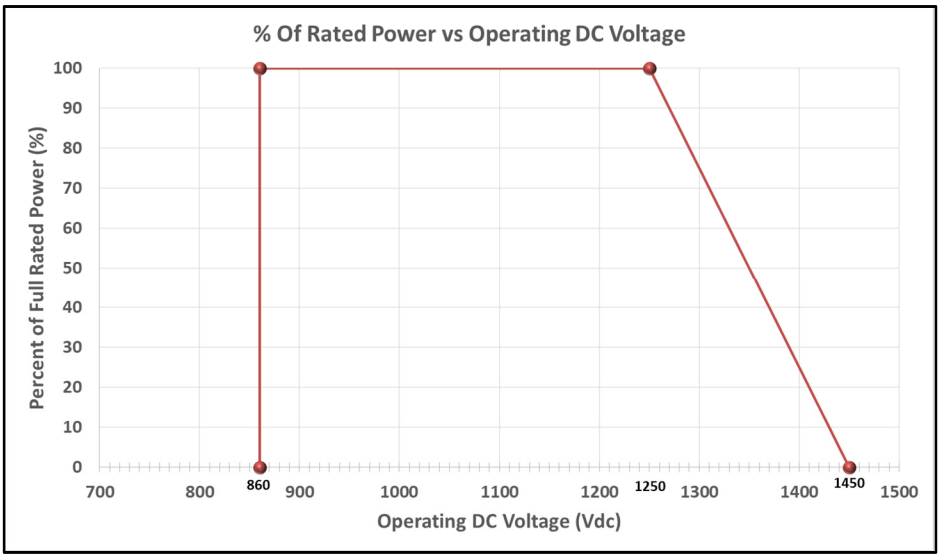


Fig. 122-2. Derating with DC Voltage

12.5 Temperature and Altitude

Table 122-6. Normal Temperature Ranges

	XGI 1500-1MW-600	XGI 1500-0.99MW-600	XGI 1500-0.85MW-600	XGI 1500-0.75MW-600	XGI 1500-0.50MW-600	XGI 1500-0.498MW-600
Ambient Temperature Range	-40°F to +140°F (-40°C to +60°C)					
Derating Temperature	113°F (45°C)	113°F (45°C)	113°F (50°C)	120°F (50°C)	131°F (60°C)	131°F (60°C)
Storage Temperature Range	-40°F to +167°F (-40°C to +75°C)					
Storage Humidity Range	Relative Humidity (non-condensing) 0 to 95%					

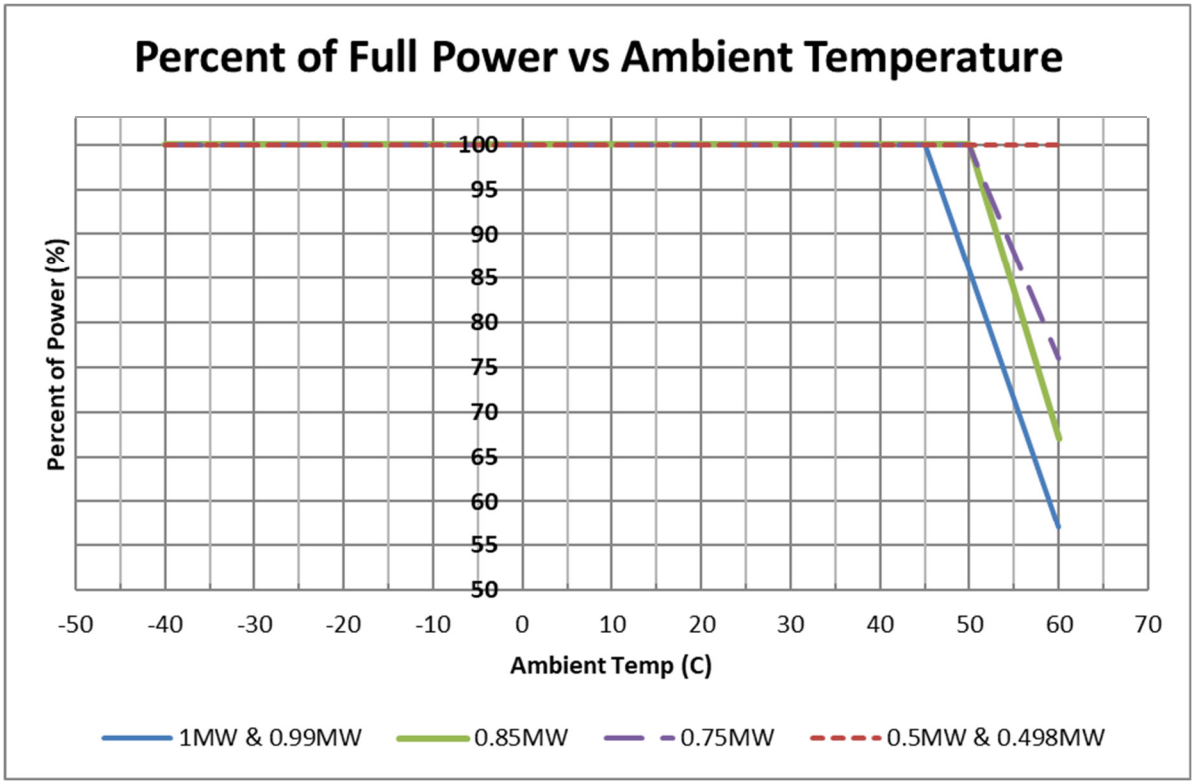


Fig. 12-3. POWER DE-RATING WITH TEMPERATURE (THERMALLY DE-RATED POWER MEASURED AT NOMINAL DC INPUT VOLTAGE)

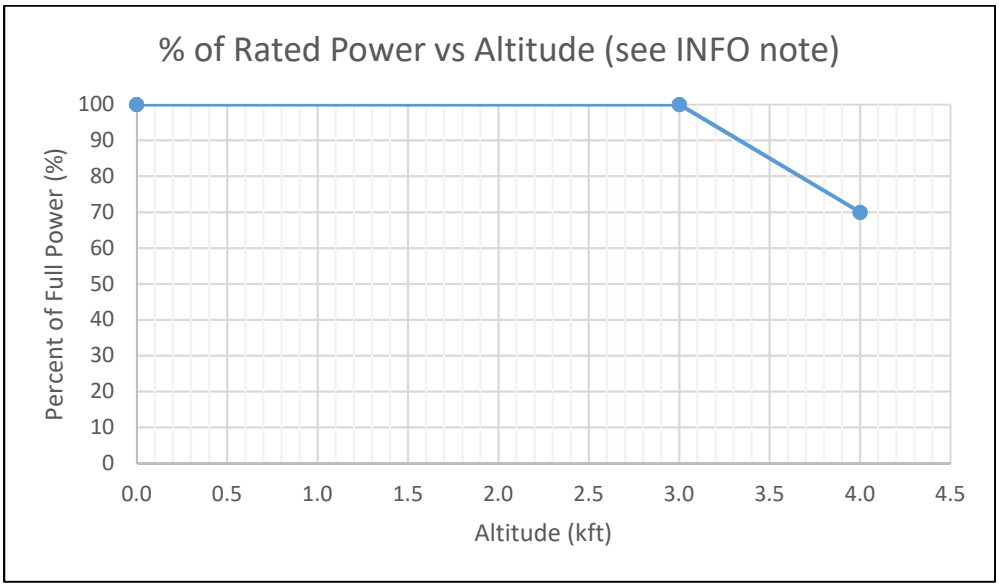
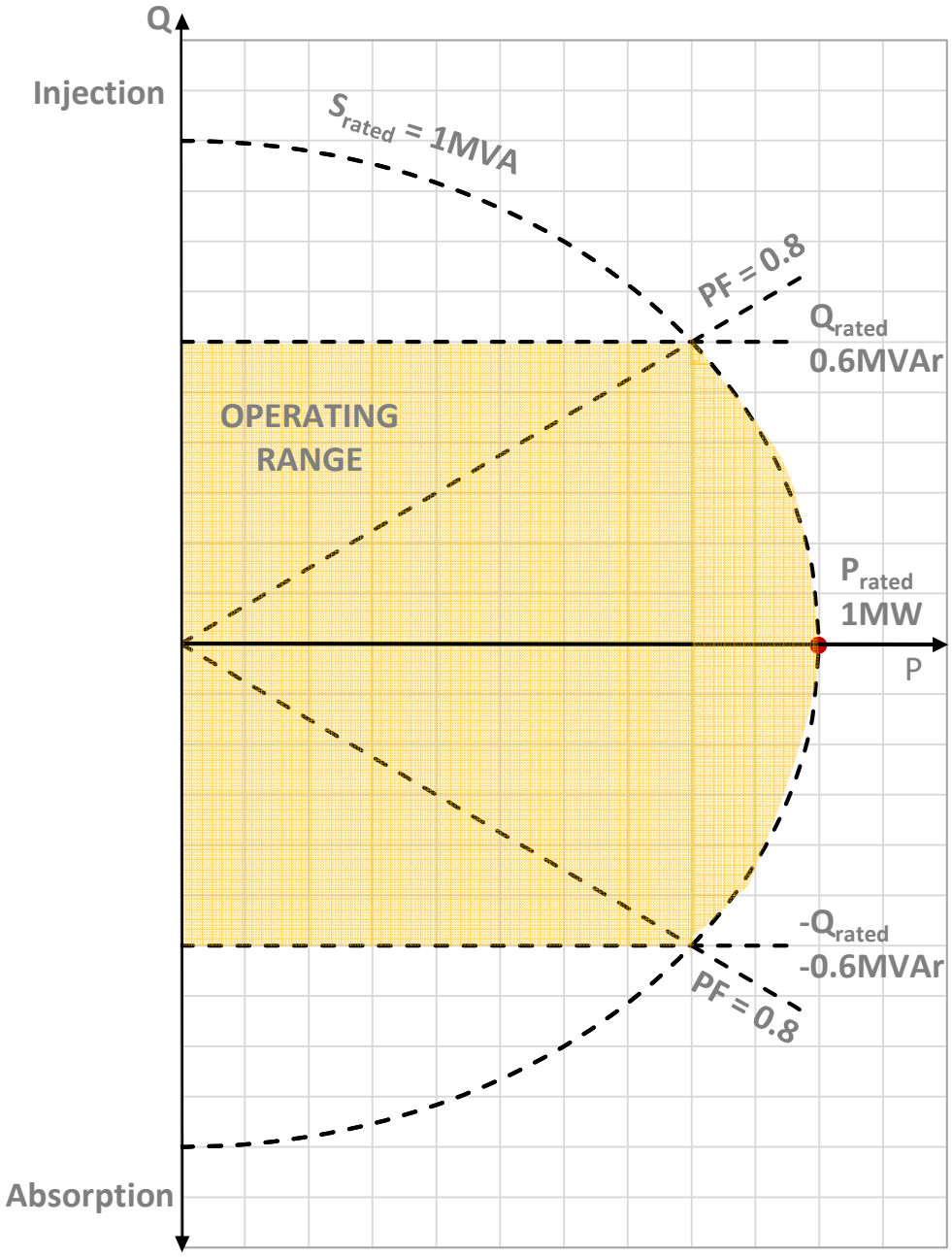


Fig. 12-4. DERATING WITH ALTITUDE

INFO→	**Power De-rating at Altitude** The XGI 1500-1MW inverter's maximum power capability is dependent on altitude and ambient temperature. Generally, the inverter can deliver its rated full power at elevations up to 3,000 ft, and a reduced maximum power at elevations up to 4,000 ft. **Note: The maximum allowable power output may be further reduced at elevated ambient temperatures.**

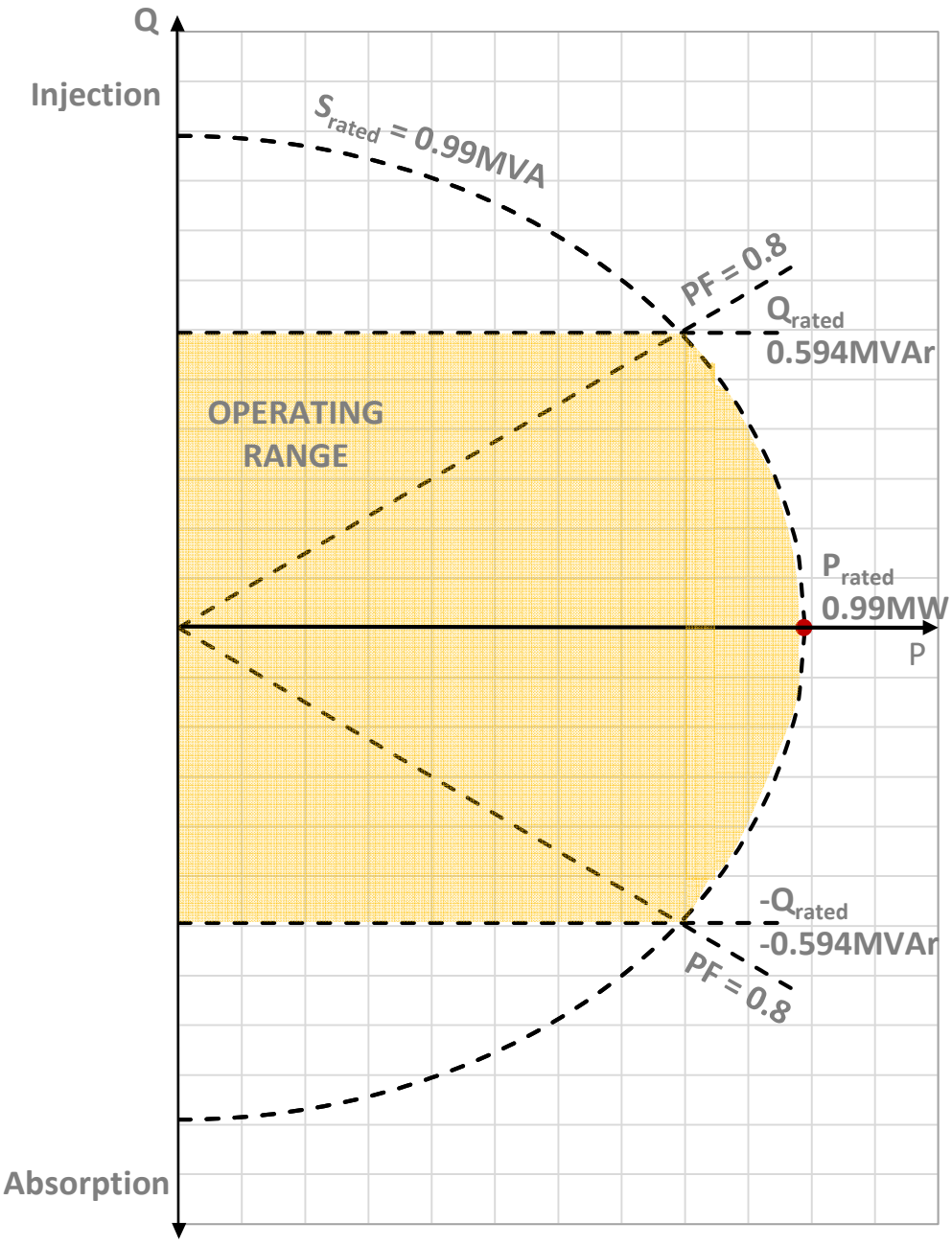
12.6 P-Q Curves

XGI 1500-1MW-600 Reactive Capability Data



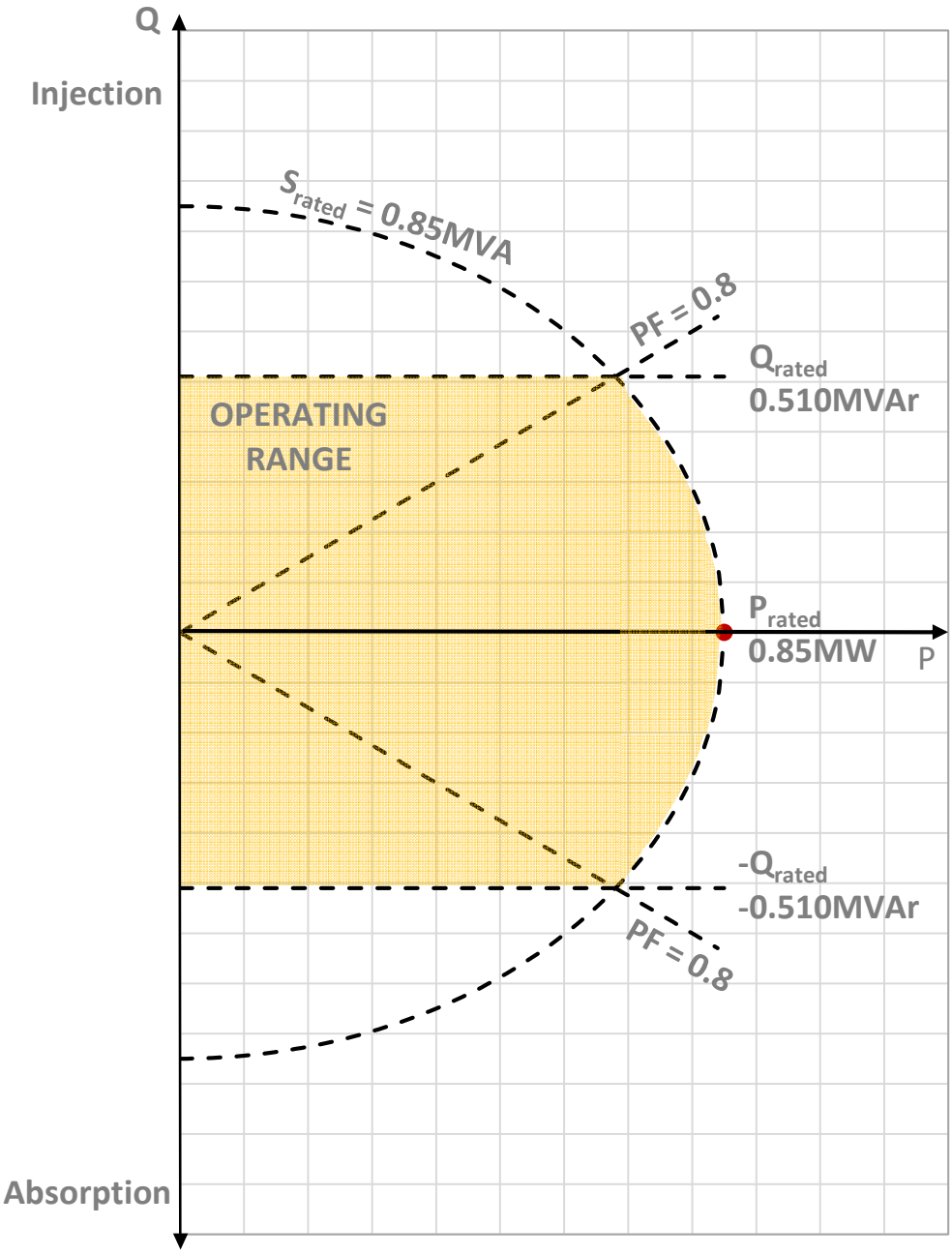
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	1 MVA
P Limit	1 MW
Injection PF limit	0.80
Absorption PF limit	0.80

XGI 1500-0.99MW-600 Reactive Capability Data



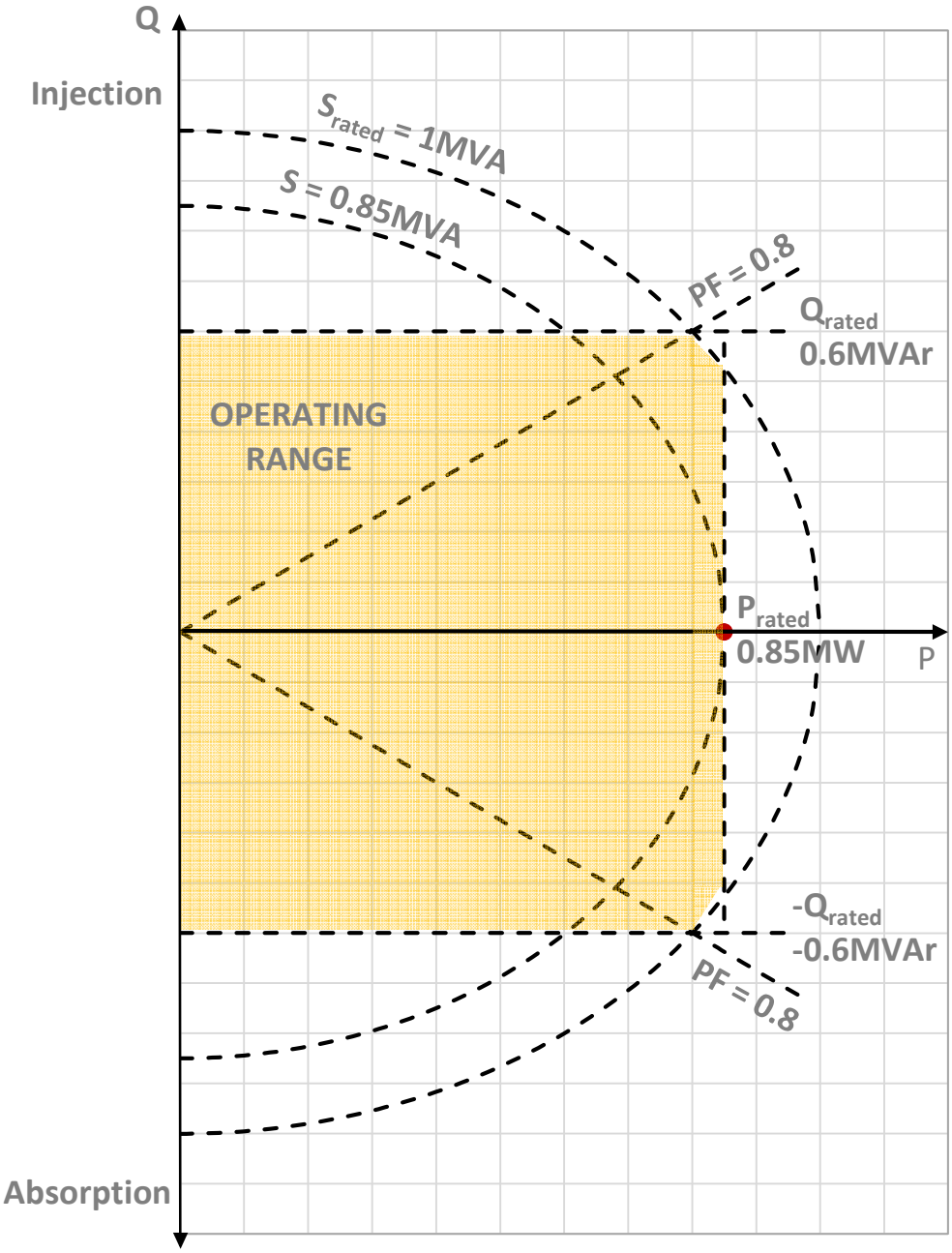
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	0.99 MVA
P Limit	0.99 MW
Injection PF limit	0.80
Absorption PF limit	0.80

XGI 1500-0.85MW / 0.85MVA Reactive Capability Data



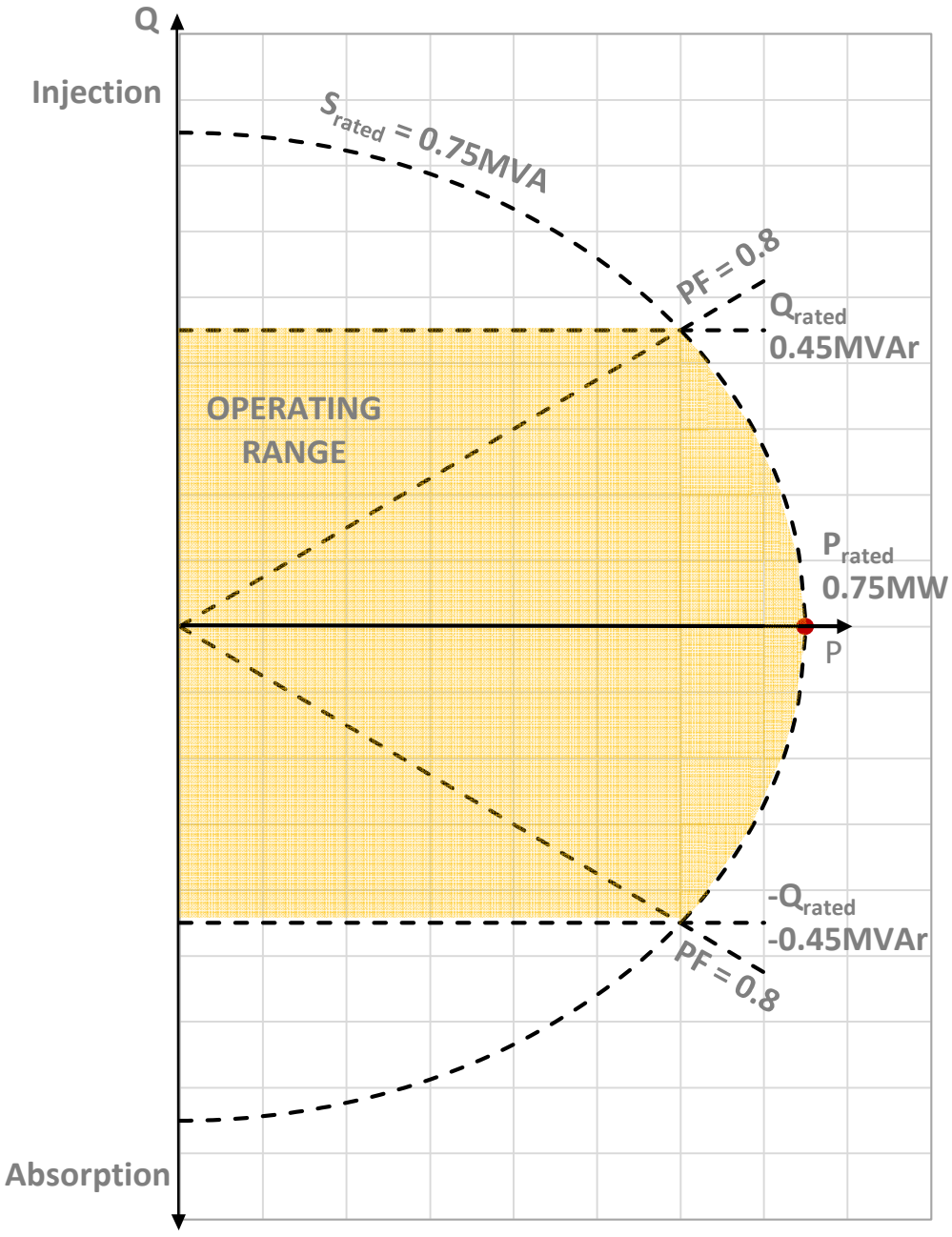
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	0.85 MVA
P Limit	0.85 MW
Injection PF limit	0.80
Absorption PF limit	0.80

XGI 1500-0.85MW / 1MVA Reactive Capability Data



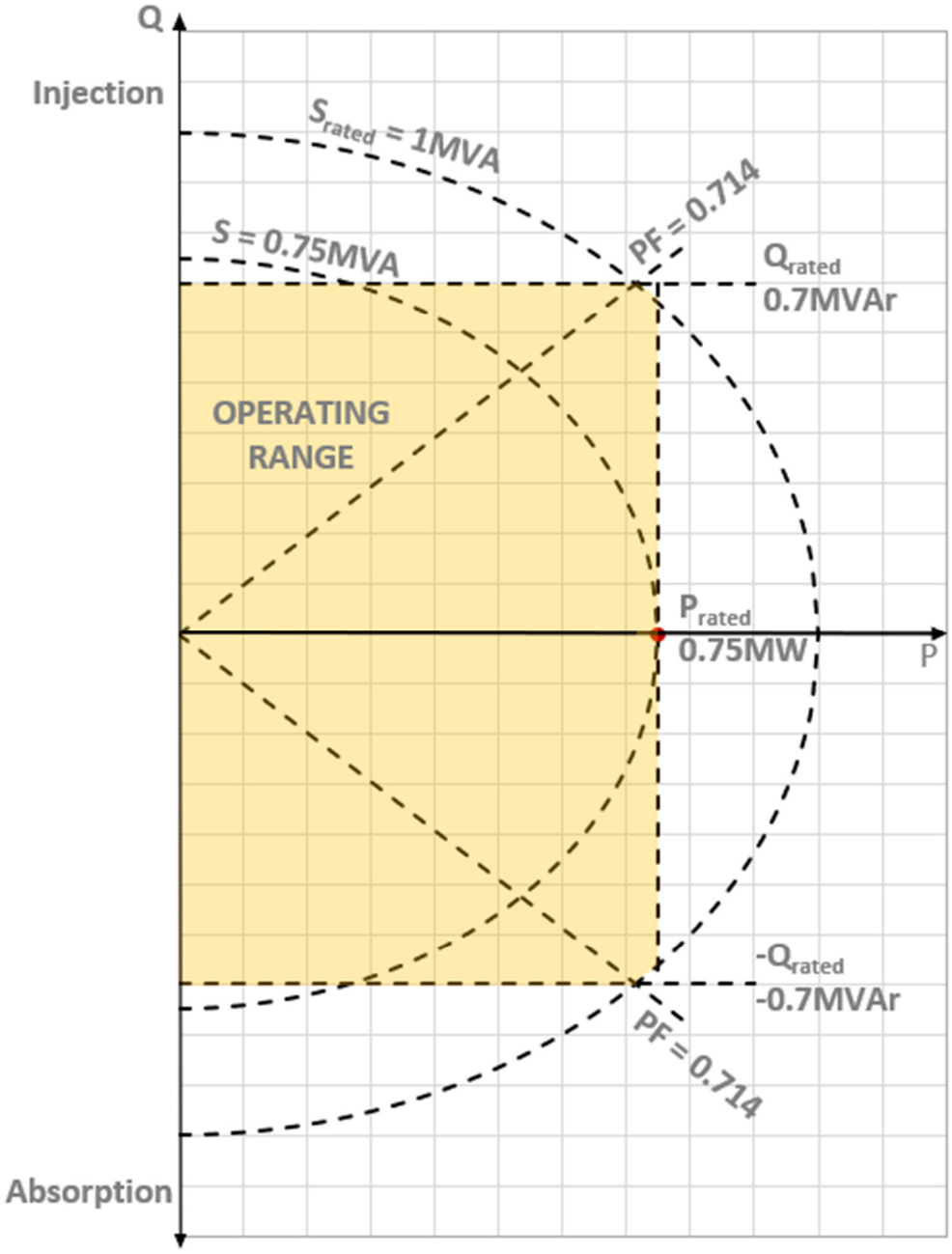
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	1 MVA
P Limit	0.85 MW
Injection PF limit	0.80
Absorption PF limit	0.80

XGI 1500-0.75MW / 0.75MVA Reactive Capability Data



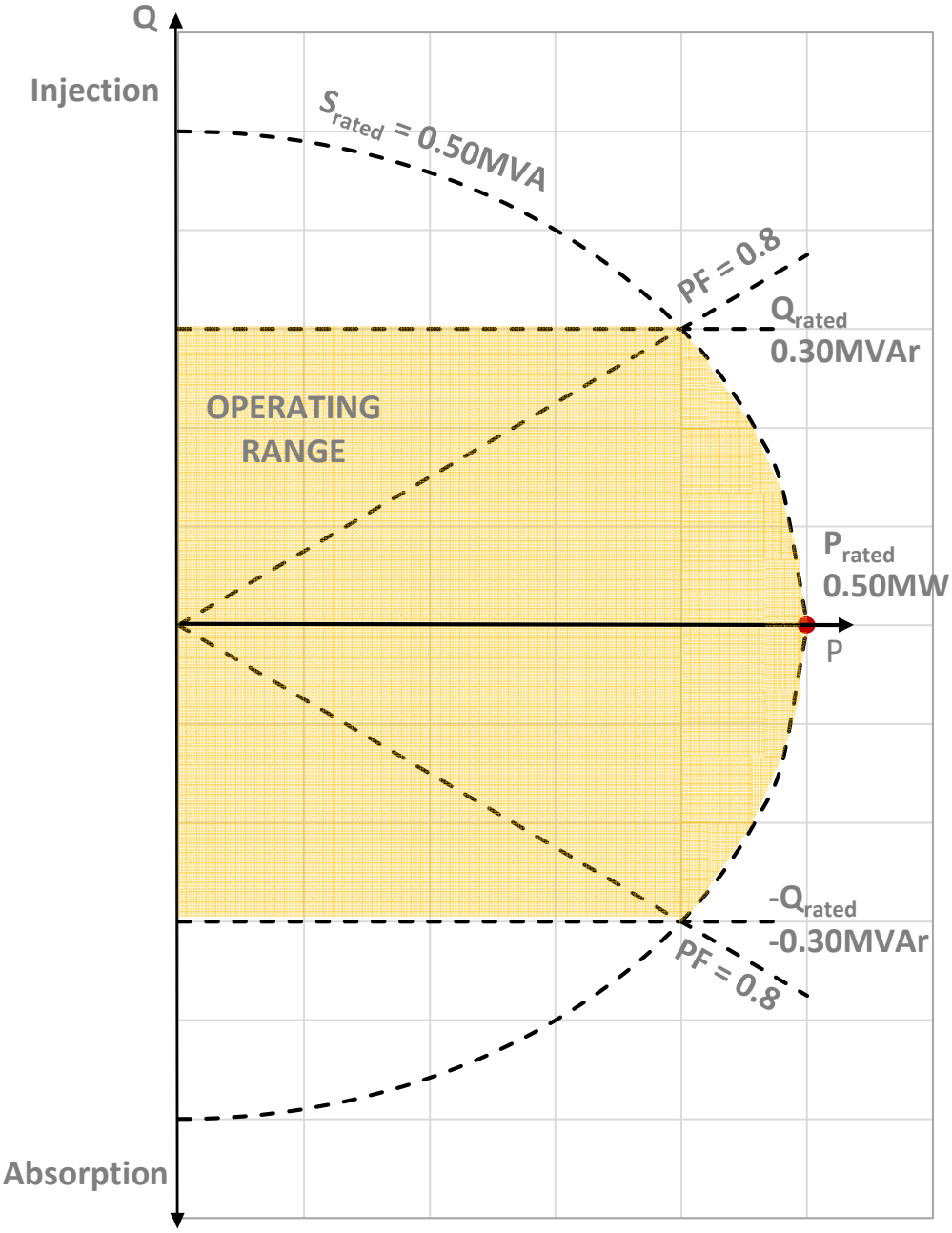
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	0.75 MVA
P Limit	0.75 MW
Injection PF limit	0.80
Absorption PF limit	0.80

XGI 1500-0.75MW / 1MVA Reactive Capability Data



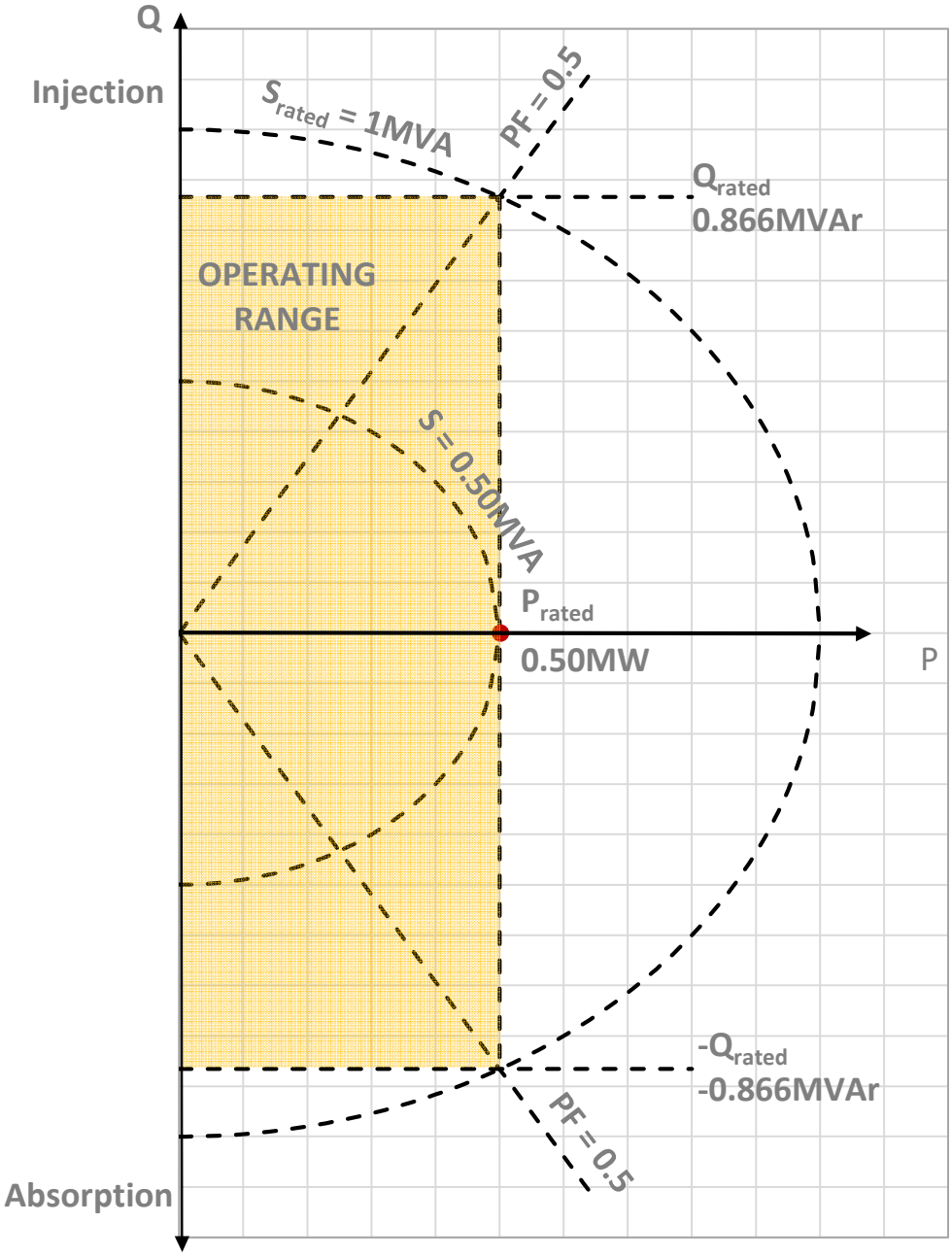
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	1 MVA
P Limit	0.75 MW
Injection PF limit	0.75
Absorption PF limit	0.75

XGI 1500-0.50MW / 0.50MVA Reactive Capability Data



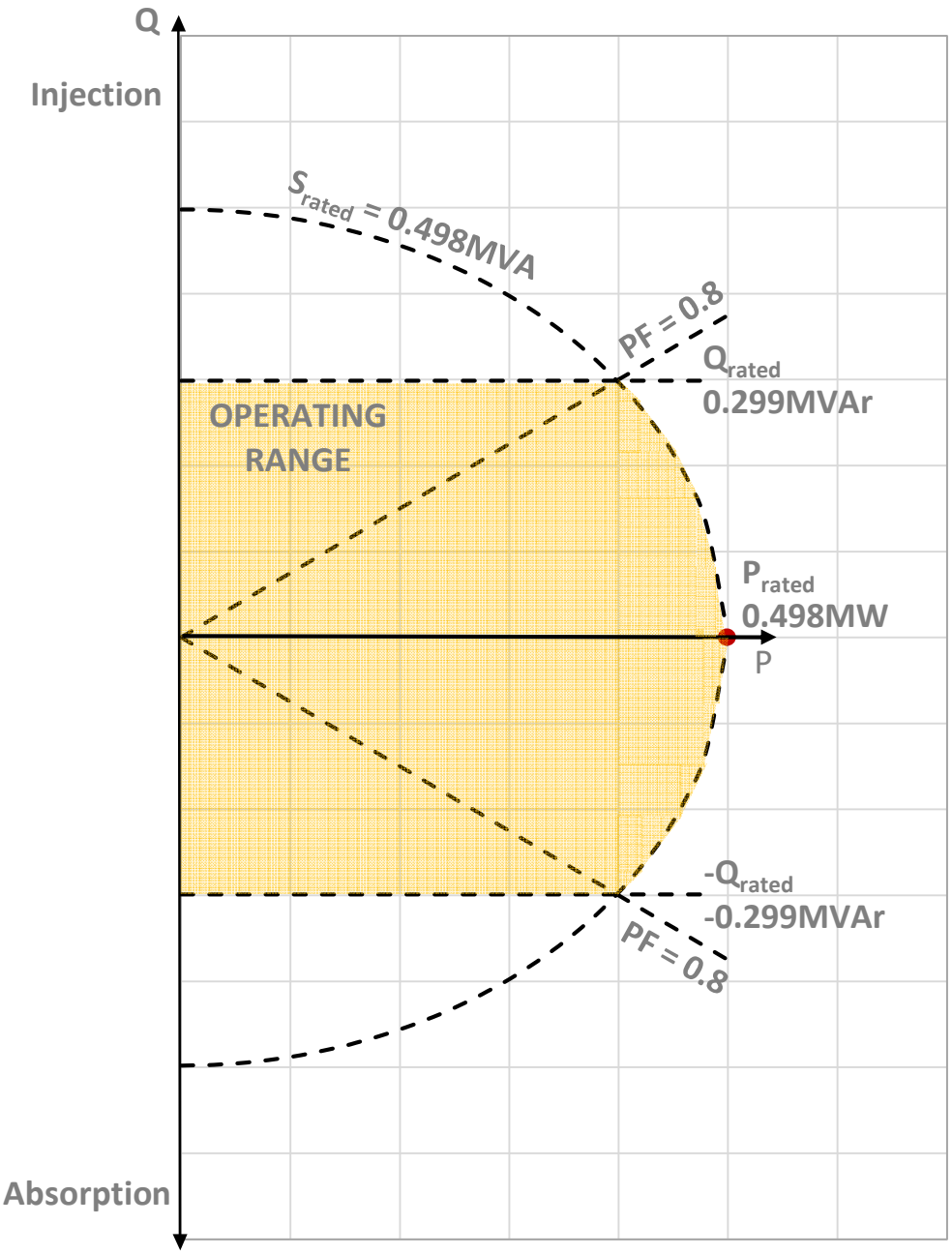
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	0.50 MVA
P Limit	0.50 MW
Injection PF limit	0.8
Absorption PF limit	0.8

XGI 1500-0.50MW / 1MVA Reactive Capability Data



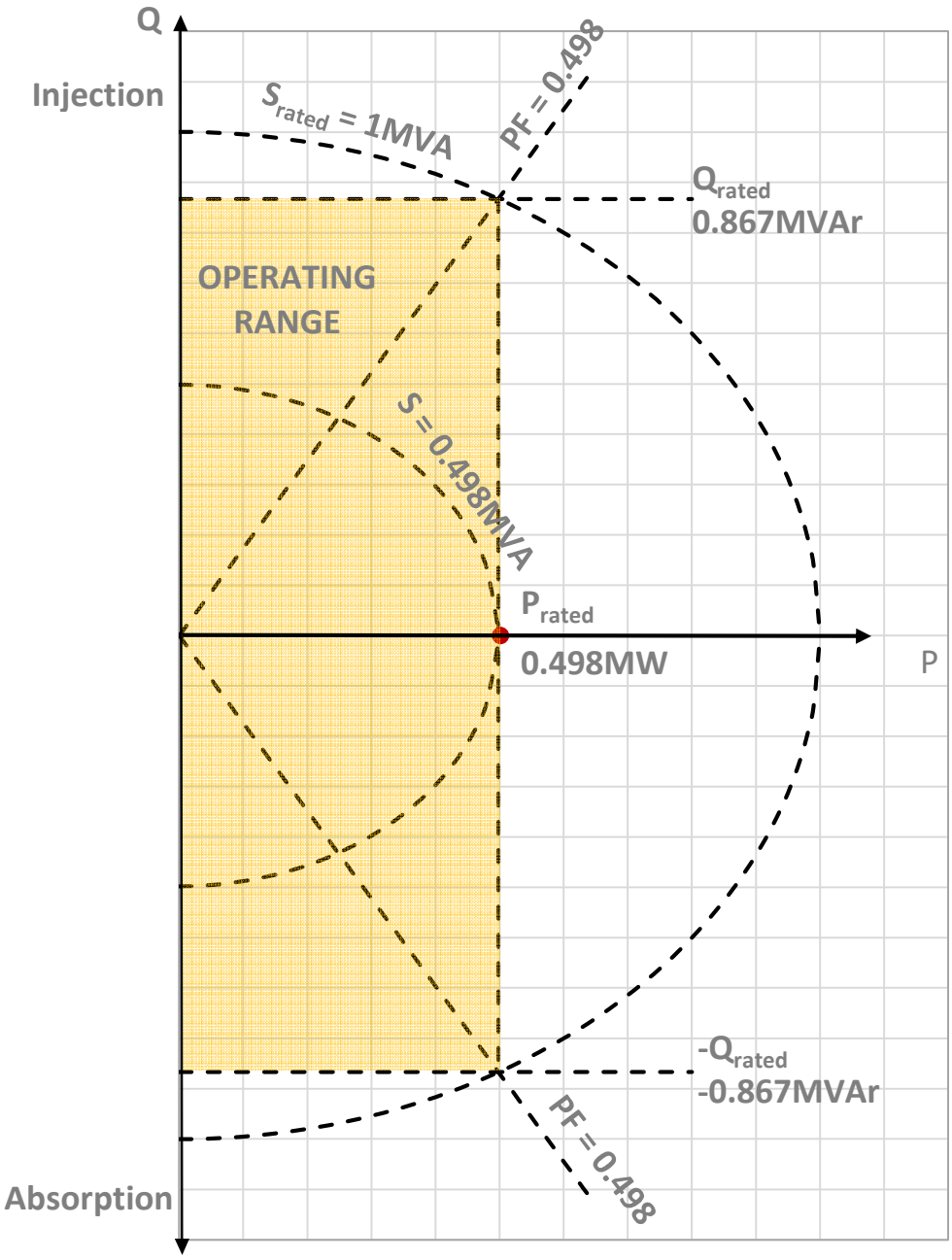
Nameplate Operating Reactive Capability	Inverter Limit
S Limit	1 MVA
P Limit	0.50 MW
Injection PF limit	0.5
Absorption PF limit	0.5

XGI 1500-0.498MW / 0.498MVA Reactive Capability Data



Nameplate Operating Reactive Capability	Inverter Limit
S Limit	0.498 MVA
P Limit	0.498 MW
Injection PF limit	0.8
Absorption PF limit	0.8

XGI 1500-0.498MW / 1MVA Reactive Capability Data



Nameplate Operating Reactive Capability	Inverter Limit
S Limit	1 MVA
P Limit	0.498 MW
Injection PF limit	0.498
Absorption PF limit	0.498

13 Options

Yaskawa Solectria Solar offers 1500V PV combiners designed to pair with SOLECTRIA XGI 1500 inverters. The Remote Combiners (CR1500-xxP-yyS-400 and CR1500-xxP-yyF-400S series) are designed for the XGI 1500-1MW series inverters. The combiners match the XGI 1500 in specifications, quality and appearance. See *SOLECTRIA XGI 1500 PV COMBINERS*, available at *www.solectria.com*.



. **ILLUSTRATION OF THE USE OF THE 400A VERSION OF THE CR1500 COMBINERS**

14 Appendix

14.1 Warranty and RMA Instructions

For all warranty-related information, please see *Grid-Tied Photovoltaic Inverters, Combiners, Monitoring and Accessories Warranty*, at *www.solectria.com*.

14.2 Yaskawa Solectria Solar Contact Information

Table 144-1. Yaskawa Solectria Solar Contact Information

Telephone	978.683.9700
Fax	978.683.9702
Sales Support	inverters@solectria.com
Customer Support	978.683.9700 x 2
Website	www.solectria.com