



GS Load Center

Installation Manual





About OutBack Power Technologies

OutBack Power Technologies is a leader in advanced energy conversion technology. OutBack products include true sine wave inverter/chargers, maximum power point tracking charge controllers, and system communication components, as well as circuit breakers, accessories, and assembled systems.

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Warranty Summary

OutBack Power Technologies Inc. warrants that the products it manufactures will be free from defects in materials and workmanship for a period of five (5) years subject to the conditions set forth in the warranty detail, found inside the back cover of this manual.

OutBack Power Technologies cannot be responsible for system failure, damages, or injury resulting from improper installation of their products.

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Important Safety Instructions






READ AND SAVE THESE INSTRUCTIONS!

This manual contains important safety instructions for the GS Load Center. Read all instructions and cautionary markings on the GS Load Center and on any accessories or additional equipment included in the installation. Failure to adhere to these instructions could result in severe shock or possible electrocution. Exercise extreme caution at all times to prevent accidents.

Audience

These instructions are for use by qualified personnel who meet all local and governmental code requirements for licensing and training for the installation of electrical power systems with AC and DC voltage up to 600 volts.

Symbols Used

Symbol	Description
	Ground
	AC Current
	DC Current
	Single-Phase
	Sine Wave



WARNING: Hazard to Human Life

This type of notation indicates that the hazard could be harmful to human life.



CAUTION: Hazard to Equipment

This type of notation indicates that the hazard may cause damage to the equipment.



IMPORTANT:

This type of notation indicates that the information provided is important to the installation, operation and/or maintenance of the equipment. Failure to follow the recommendations in such a notation could result in voiding the equipment warranty.

Important Safety Instructions




Definitions

The following is a list of initials, terms, and definitions used in conjunction with this product.


Table 1 Terms and Definitions

Term	Definition
AC	Alternating Current; refers to voltage produced by the inverter, utility grid, or generator
AUX	One of several auxiliary outputs on the GS inverter/charger.
CSA	Canadian Standards Association; establishes Canadian national standards and the Canadian Electrical Code, including C22.1 and C22.2
DC	Direct Current; refers to voltage produced by the batteries or renewable source
DVM	Digital Voltmeter
GFDI	Ground Fault Detector Interrupter; a safety device for PV systems
PV	Photovoltaic
RE	Renewable Energy
UL	Underwriters Laboratories; refers to a set of safety standards governing electrical products






General Safety

	WARNING: Limitations on Use This equipment is NOT intended for use with life support equipment or other medical equipment or devices.
	CAUTION: Equipment Damage Only use components or accessories recommended or sold by OutBack Power Technologies or its authorized agents.
	IMPORTANT: Do not attempt to install this equipment if it appears to be damaged in any way. See the Warranty section for instructions on returning the equipment.



Personal Safety

	WARNING: Personal Injury This equipment weighs in excess of 25 lbs (11.5 kg). Use safe lifting techniques when lifting this equipment as prescribed by the Occupational Safety and Health Association (OSHA) or other local codes. Use standard safety equipment such as safety glasses, ear protection, steel-toed safety boots, safety hard hats, etc. as prescribed by the Occupational Safety and Health Association (or other local codes) when working on this equipment. Use standard safety practices when working with electrical equipment (e.g., remove all jewelry, use insulated tools, wear cotton clothing, etc.) Never work alone when installing or servicing this equipment. Have someone nearby that can assist if necessary.
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Inverter Safety

	<p>WARNING: Lethal Voltage</p> <p>Review the system configuration to identify all possible sources of energy. Ensure ALL sources of power are disconnected before performing any installation or maintenance on this equipment. Confirm that the terminals are de-energized using a validated voltmeter (rated for a minimum 1000 Vac and 1000 Vdc) to verify the de-energized condition.</p> <p>Do not perform any servicing other than that specified in the installation instructions unless qualified to do so and have been instructed to do so by OutBack Power Technologies Technical Support personnel.</p>
	<p>WARNING: Burn Hazard</p> <p>Internal parts can become hot during operation. Do not remove the cover during operation or touch any internal parts. Be sure to allow them sufficient time to cool down before attempting to perform any maintenance.</p>
	<p>WARNING: Fire Hazard</p> <ul style="list-style-type: none"> ➤ Do not place combustible or flammable materials within 12 feet (3.7 m) of the equipment. ➤ Use only the recommended cable sizes (or greater) for AC and DC conductors in compliance with local codes. For cable sizes, see the installation manual for the inverter, charge controller, or other devices used with this product. Ensure all conductors are in good condition. Do not operate the unit with damaged or substandard cabling.
	<p>CAUTION: Equipment Damage</p> <p>When connecting cables from the GSLC to the battery terminals, ensure the proper polarity is observed. Connecting the cables incorrectly can damage or destroy the equipment and void the product warranty.</p>
	<p>CAUTION: Equipment Damage</p> <p>Thoroughly inspect the equipment prior to energizing. Verify that no tools or equipment have been inadvertently left behind.</p>

PV Safety

	<p>WARNING: Shock Hazard</p> <p>Photovoltaic (PV) arrays can be energized with minimal ambient light available. Therefore to ensure a safe disconnect from the system, be sure to install a PV disconnect, breaker, or accessible fuse box (depending on local code requirements).</p>
	<p>CAUTION: Equipment Damage</p> <p>PV Arrays must be wired with correct polarity (positive-to-positive, negative-to-negative). Connecting the cables incorrectly can damage or destroy the equipment.</p>

Battery Safety



WARNING: Explosion, Electrocution, or Fire Hazard

- Use the battery types recommended by OutBack Power Technologies. Follow the battery manufacturer's recommendations for installation and maintenance.
- Ensure the cables are properly sized. Failure to size the cables properly can result in a fire hazard.
- Ensure clearance requirements are strictly enforced around the batteries.
- Ensure the area around the batteries is well ventilated and clean of debris.
- Never smoke near, or allow a spark or flame near, the batteries.
- Always use insulated tools. Avoid dropping tools onto batteries or other electrical parts.
- Keep plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
- Wear complete eye protection and clothing protection when working with batteries. Avoid touching bare skin or eyes while working near batteries.
- If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters the eye, immediately flood it with running cold water for at least 20 minutes and get medical attention immediately.
- Never charge a frozen battery.
- Insulate batteries as appropriate against freezing temperatures. A discharged battery will freeze more easily than a charged one.
- If you need to remove a battery, always remove the grounded terminal from the battery first. Make sure all devices are de-energized or disconnected to avoid causing a spark.
- If a remote or automatic generator control system is used, disable the starting circuit and/or disconnect the generator from its starting battery while performing maintenance to prevent accidental starting.



IMPORTANT:

Baking Soda neutralizes lead-acid battery electrolyte.
Vinegar neutralizes NiCad and NiFe battery electrolyte.
Have a supply of either substance readily available if using these types of batteries.

Required Resources

This product is required to be installed according to pertinent safety codes and standards. If installed in the United States, wiring practices must meet the requirements of the National Electrical Code (NEC). If installed in Canada, wiring practices must meet the requirements of the Canadian Electrical Code.

- National Electrical Code (NEC)/NFPA 70, Current Edition
- Canadian Electrical Code, C22.1, Current Edition

Additional Resources

The following are references which may be used when installing this equipment. Depending on the nature of the installation, it may be highly recommended to consult any or all of these resources.

- National Electrical Code (NEC)/NFPA 70 Handbook, Current Edition
- UL 1741, Current Edition, Static Inverter and Charge Controllers for Use in Photovoltaic Power Systems
- International Building Code (IBC), Current Edition
- Photovoltaic Power Systems and the 2005 National Electrical Code: Suggested Practices

Recycling Information

**IMPORTANT: Recycle Electronics and Batteries**

Batteries are considered hazardous waste and must be recycled according to local jurisdiction. Inverters and other electronics contain metals and plastics that should be recycled. The following websites and phone numbers provide additional information for recycling electronic products and batteries.

Earth 911, USA

Web site: www.Earth911.com
Address: 14646 N. Kierland Blvd., Suite 100
Scottsdale, AZ 85254
Phone: +1.480.337.3025 (direct)

OurEarth.org, USA

There is a place on the website for contacting OurEarth.org using email. No direct email address is provided.

Web site: <http://www.ourearth.org>
Address: P.O. Box 62133
Durham, NC 27715
Phone: +1.410.878.6485

Environmental Protection Agency, USA

Web site: www.epa.gov/recyclecity/
Email: r9.recyclecity@epa.gov
Phone: +1.415.947.8000
(Monday –Friday 8:00 AM to 12:00 PM and 1:00 PM to 4:00 PM PST)

Important Safety Instructions

Keep America Beautiful, USA

Web site: www.kab.org/
Email: info@kab.org
Address: 1010 Washington Boulevard
Stamford, CT 06901
Phone: +1.203.659.3000 (Main number)
Fax: +1.203.659.3001

Natural Resources Canada

Web site: <http://www.nrcan-rncan.gc.ca/mms-smm/busi-indu/rec-rec-eng.htm>
Address: 580 Booth, Ottawa, ON K1A 0E8
Phone: +1.613.995.0947
TTY: +1.613.996.4397
(Phone and TTY: Monday to Friday, 8:30 a.m. to 4:30 p.m. ET)

Office of Waste Management, Canada

Web site: http://www.portaec.net/library/recycling/recycling_in_canada.html
Address: Office of Waste Management
Conservation and Protection
Environment Canada
Ottawa, Ontario K1A 0H3
Phone: +1.819.997.2800

National Institute of Recyclers, Mexico

Web site: <http://www.inare.org.mx/>
Email: a57841279@prodigy.net.mx, margarita@inare.org.mx
Phone: +1.55.57.85.9160
Fax: +1.55.57.84.1279

EuroRecycle.net, Europe

The following website provides general information about recycling in Europe. It also provides a list of companies and organizations that provide recycling information or assistance.

Web site: <http://euro.recycle.net>
E-mail: <http://euro.recycle.net/cgi-bin/feedback1.cgi?w=27>
(This is an online form providing a means to contact the owners of the website.)



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Introduction

Welcome to OutBack Power Technologies

Thank you for purchasing a GS Load Center (GSLC) from OutBack Power Technologies. The GSLC is a balance-of-systems enclosure intended to work with the Radian Series (GS) inverter/chargers, FLEXmax Charge Controllers, and OutBack HUB Communications Manager.

It is designed in three options:

- **GSLC** – GS Load Center for Radian Series. Recommended for custom-built systems. Recommended for use with multiple Radian inverters (one GSLC per inverter). Can be used with other inverter models. The term “GSLC” is also used to refer generically to the product line.
- **GSLC175-120/240** – GS Load Center for AC Applications, factory prepared with dual 175 Adc inverter circuit breakers, dual AC inputs, and 120/240 Vac maintenance bypass assembly. Recommended for systems which have a single Radian inverter and an AC source, but can be customized in other ways.
- **GSLC175-PV-120/240** – GS Load Center for PV and AC Applications, factory prepared with dual 175 Adc inverter circuit breakers, dual AC inputs, 120/240 Vac maintenance bypass assembly, PV GFDI, and two PV array inputs, FLEXnet DC battery monitor and three shunts. “Plug and play” for systems which have a single Radian inverter and two charge controllers and need battery monitoring.



The enclosure provides mounting holes for the HUB Communications Manager and for up to two charge controllers.

The removable front cover allows for opening from either side of the enclosure.

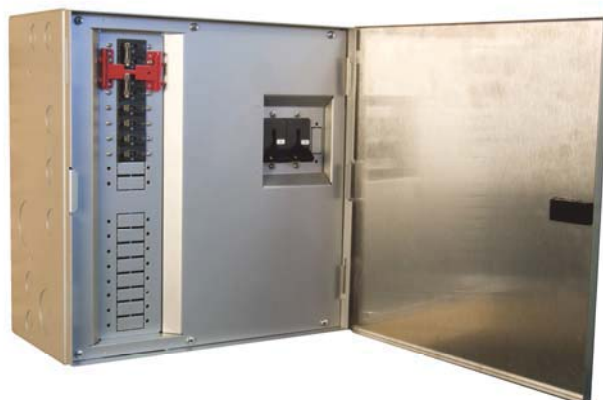


Figure 1 **GS Load Center (GSLC)**

GSLC – Components

Legend

- ① Inverter (negative) DC Bus Bars
- ② Negative Terminal Bus Bar (TBB)
- ③ Ground TBB
- ④ Neutral TBB
- ⑤ PV (Positive) TBBs
- ⑥ Shunt

Inverter positive DC bus bars and DC positive bus plate are also included in kit.

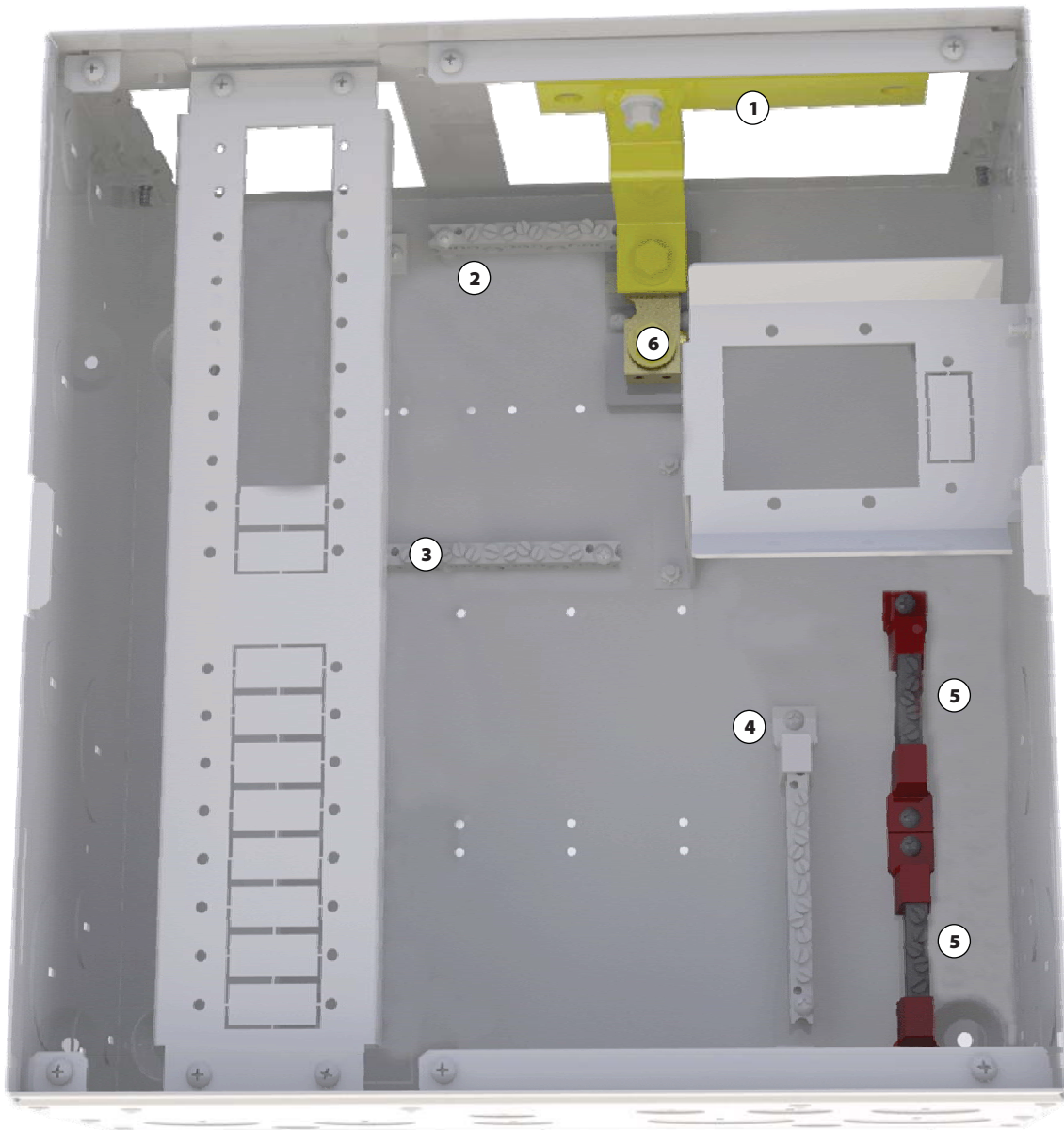
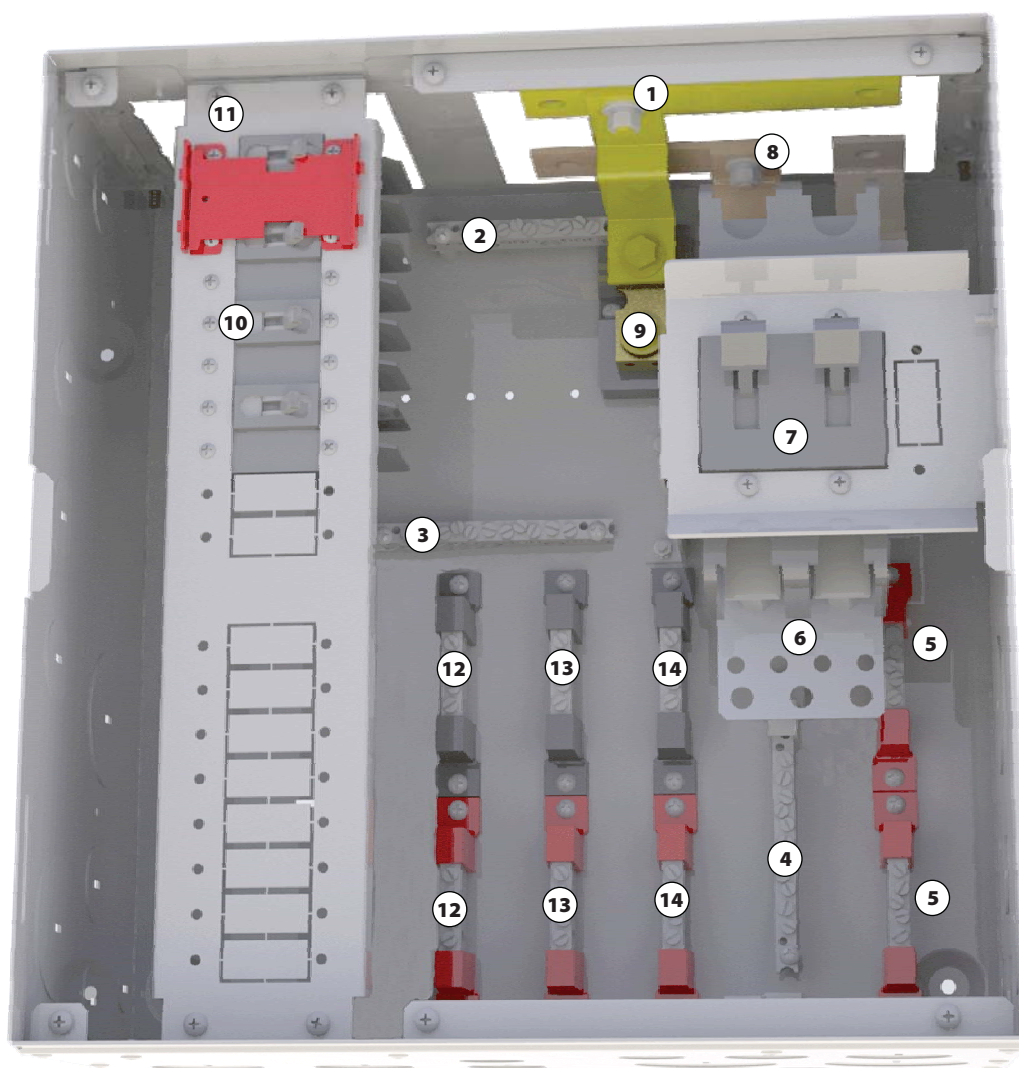


Figure 2 **GSLC**

GSLC175-120/240 – Components

Legend

- | | |
|-----------------------------------|------------------------------------|
| ① Inverter (negative) DC Bus Bars | ⑧ Inverter (positive) DC Bus Bars |
| ② Negative Terminal Bus Bar (TBB) | ⑨ Shunt |
| ③ Ground TBB | ⑩ AC Circuit Breakers |
| ④ Neutral TBB | ⑪ Maintenance Bypass Interlock |
| ⑤ PV TBBs | ⑫ AC TBBs (Inverter Output) L1, L2 |
| ⑥ DC Positive Cable Plate | ⑬ AC TBBs (Grid) L1, L2 |
| ⑦ Main Inverter Disconnect(s) | ⑭ AC TBBs (Generator) L1, L2 |



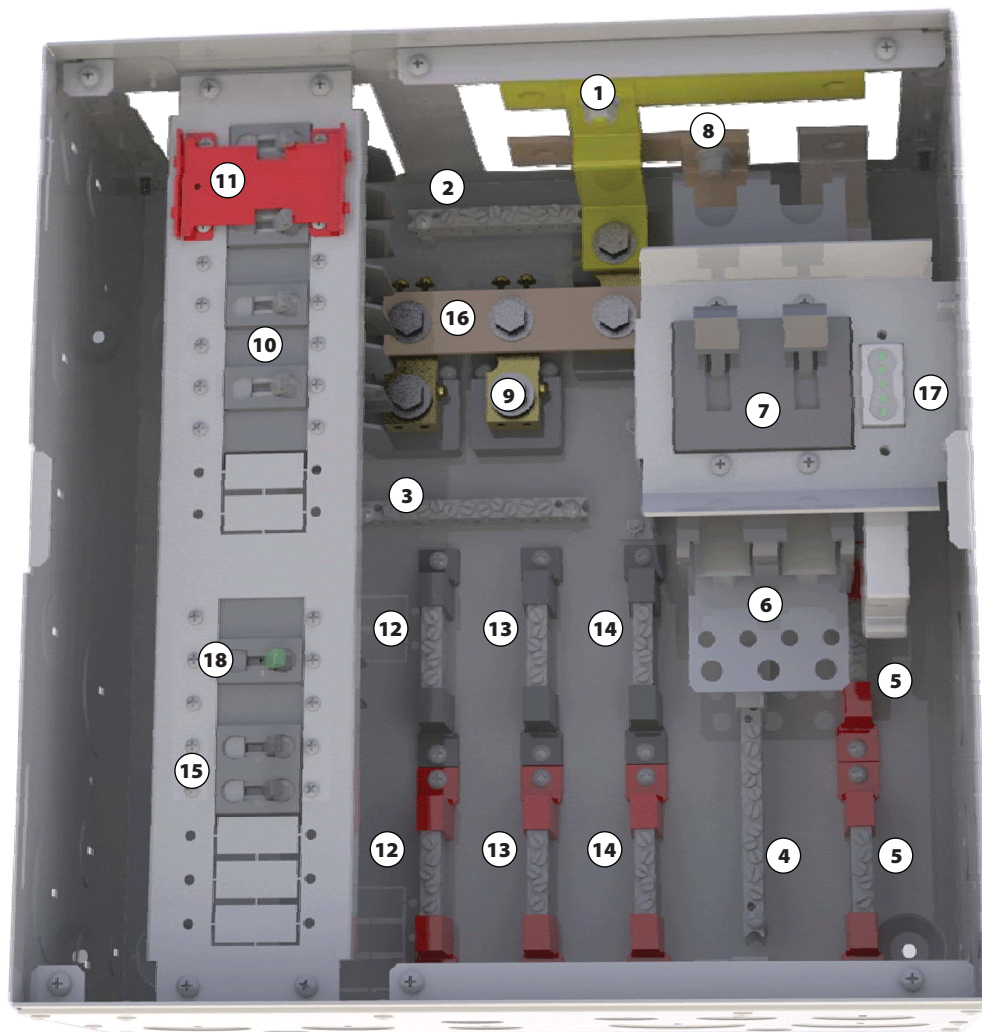
NOTE: The factory wiring has been omitted from this illustration for clarity.

Figure 3 **GSLC175-120/240**

GSLC175-PV-120/240 – Components

Legend

- | | |
|-----------------------------------|------------------------------------|
| ① Inverter (negative) DC Bus Bars | ⑩ AC Circuit Breakers |
| ② Negative Terminal Bus Bar (TBB) | ⑪ Maintenance Bypass Interlock |
| ③ Ground TBB | ⑫ AC TBBs (Inverter Output) L1, L2 |
| ④ Neutral TBB | ⑬ AC TBBs (Grid) L1, L2 |
| ⑤ PV TBBs | ⑭ AC TBBs (Generator) L1, L2 |
| ⑥ DC Positive Cable Plate | ⑮ PV Input Disconnects |
| ⑦ Main Inverter Disconnect(s) | ⑯ Shunt Bus |
| ⑧ Inverter (positive) DC Bus Bars | ⑰ FLEXnet DC |
| ⑨ Shunt(s) | ⑱ PV GFDI |



NOTE: The factory wiring has been omitted from this illustration for clarity.

Figure 4 **GSLC175-PV-120/240**



Planning

Tools Required

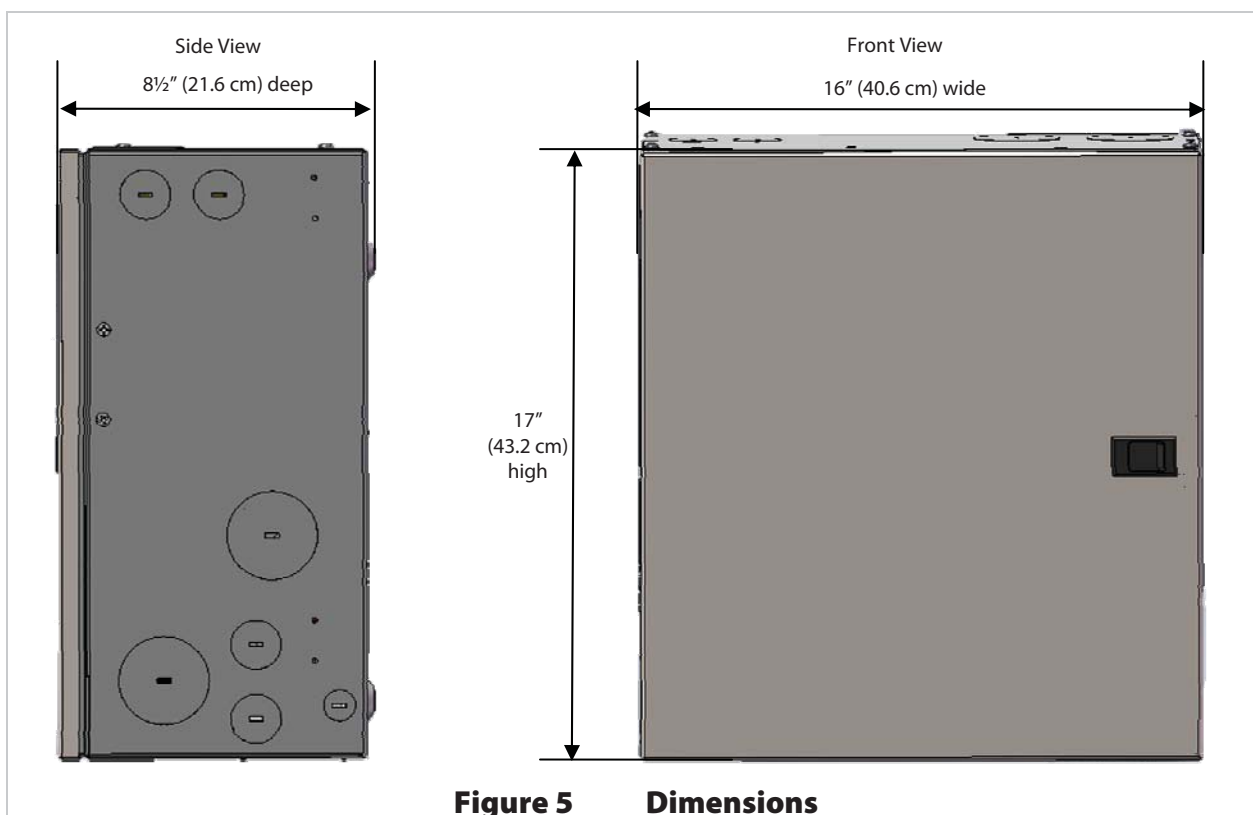
- Open-ended wrenches (13 mm and 9/16")
- Wire cutters/strippers
- Torque wrenches
- Assorted insulated screwdrivers
- Digital Voltmeter (DVM) or Regular Voltmeter

Materials Required

- Conductors for wiring
- Conduits

Location/Environmental Requirements

- Indoor mount only



Legend

- | | |
|-----------------|------------------------------|
| ① 2" Knockouts | ⑦ Mounting holes for HUB |
| ② 1½" Knockouts | ⑧ Mounting holes for FLEXmax |
| ③ 1¼" Knockouts | |
| ④ 1" Knockouts | |
| ⑤ ¾" Knockouts | |
| ⑥ ½" Knockouts | |

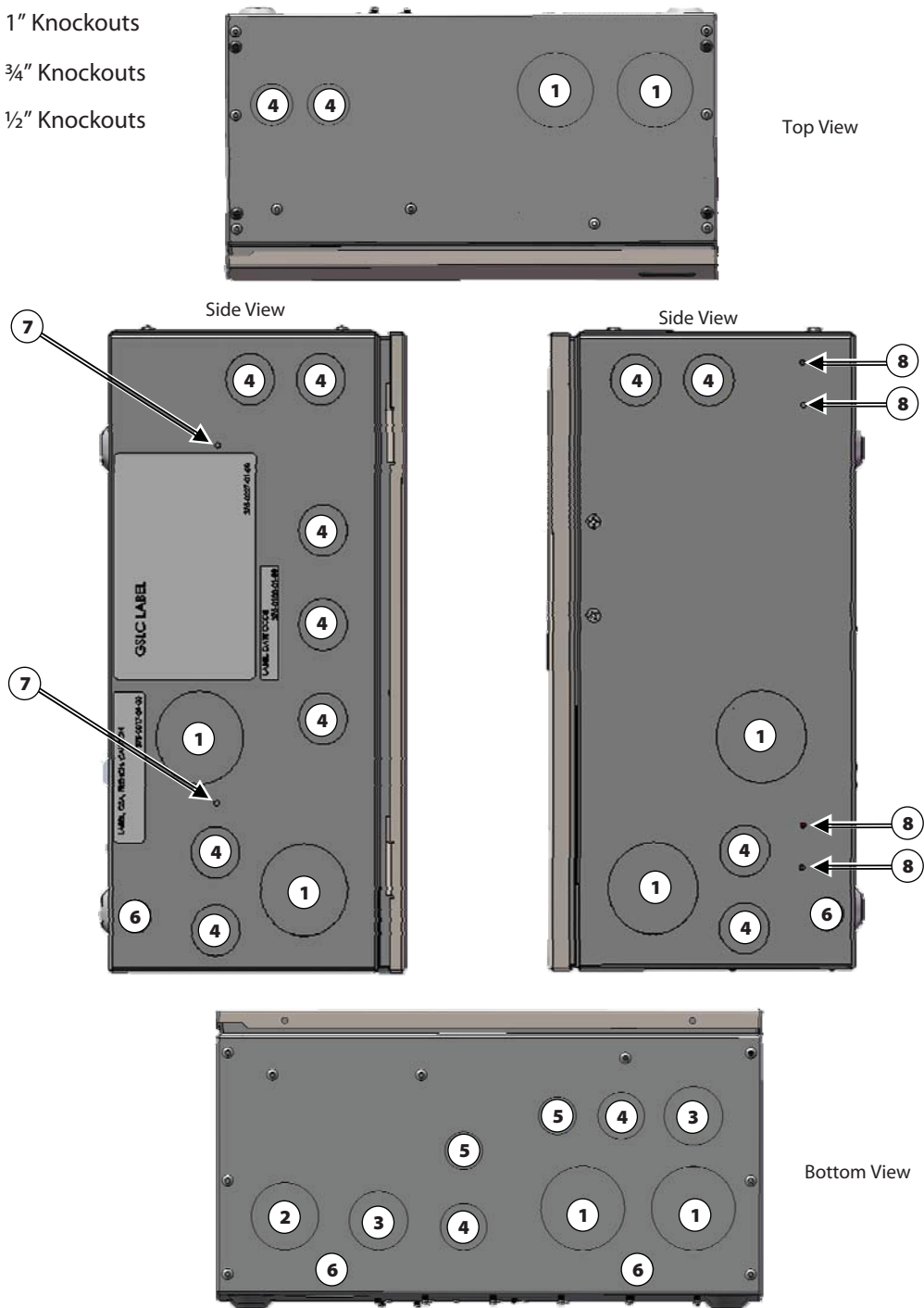


Figure 6 Knockouts and Mounting Holes for FLEXmax and HUB



Installation

Hardware Options

The three versions of the GSLC come with different components already installed.

- **GSLC**, the “basic” or “empty” version, requires almost all components to be installed if they are needed. Instructions for this product begin on page 17.
- **GSLC175-120/240**, the “AC only” version, requires certain components to be installed if they are needed. Instructions for this product begin with the DC shunts, on page 21.
- **GSLC175-PV-120/240**, the “fully-loaded” version, has all components already present and needs only to have external wiring and devices added. Users with this version can skip to page 27, where wiring is discussed.

The following components are sold separately for the GSLC:

- Inverter Main Disconnects (required for inverter installations)
- AC Maintenance Bypass Assembly
- AC Terminal Bus Bars (TBBs)
- DC and AC Circuit Breakers
- PV Ground Fault Detector-Interrupter (GFDI)
- FLEXnet DC Battery Monitor (see page 30)
- Additional DC shunts and GS-SBUS (if desired)

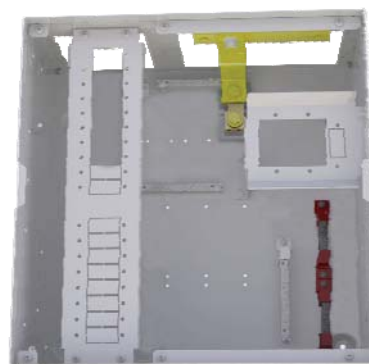


Figure 7 **GSLC (basic) – Additional Components**

The following components are sold separately for the GSLC175-120/240:

- AC Load Circuit Breakers
- PV and DC Circuit Breakers
- PV Ground Fault Detector-Interrupter (GFDI)
- FLEXnet DC Battery Monitor (see page 30)
- Additional DC shunts and GS-SBUS (if desired)

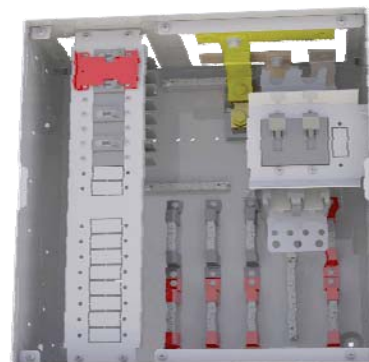
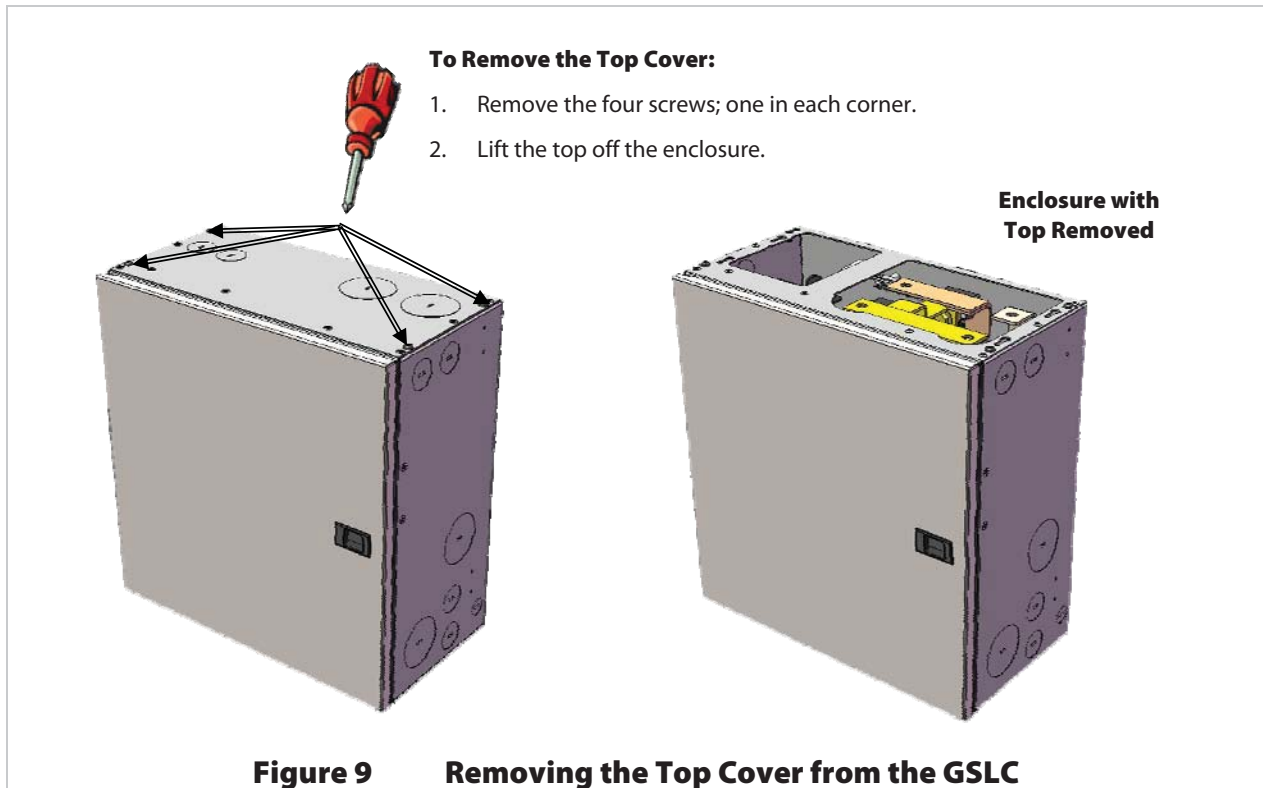
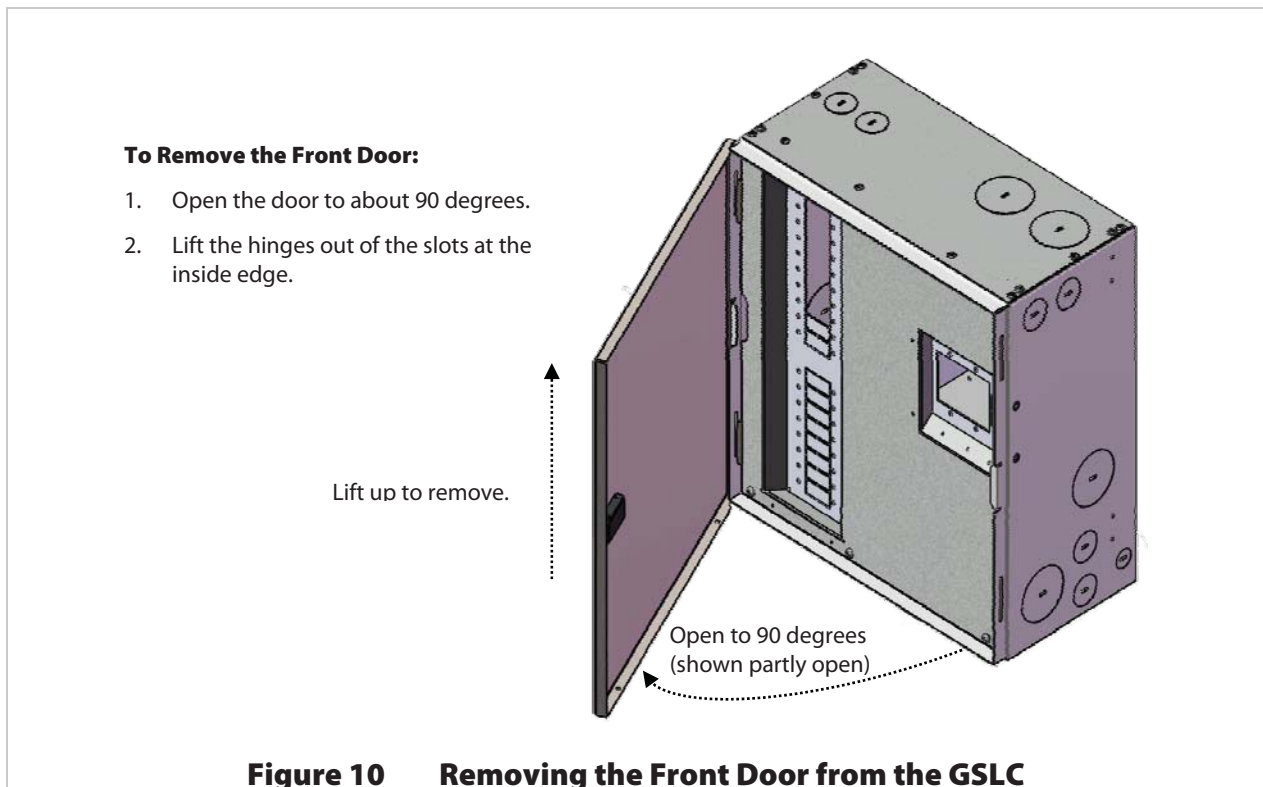


Figure 8 **GSLC175-120/240 – Additional Components**

Remove Top Cover



Remove Front Door



Remove Interior Cover

In order to make any wiring connections or install components, the interior cover must be removed to expose the interior of the enclosure.

To Remove the Interior Cover:

1. Remove the three screws along the top of the enclosure.
2. Remove the three screws along the bottom of the enclosure.
3. Lift the front cover off the enclosure.

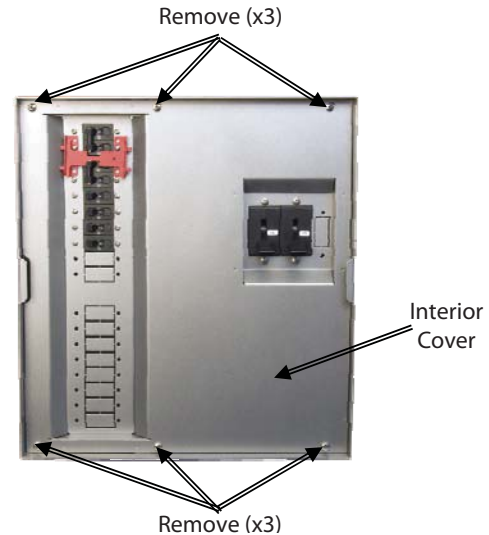


Figure 11 Removing the Interior Cover from the GSLC

Installing the Internal Hardware

Table 2 Bus Bar and Circuit Breaker Size and Torque Requirements

Item	Terminal/Bolt Size	Torque Requirements
Inverter Positive Bus Bars	M8	60 in-lb (6.8 Nm)
Shunt Bolts	3/8"	60 in-lb (6.8 Nm)
DC Positive Cable Plate	Top Holes (x3)	60 in-lb (6.8 Nm)
	Bottom Holes (x7)	50 in-lb (5.7 Nm)
Circuit Breaker Studs	M8	20 in-lb (2.3 Nm)
	1/4"	35 in-lb (4 Nm)
	5/16"	50 in-lb (5.7 Nm)
	3/8"	225 in-lb (25.5 Nm)

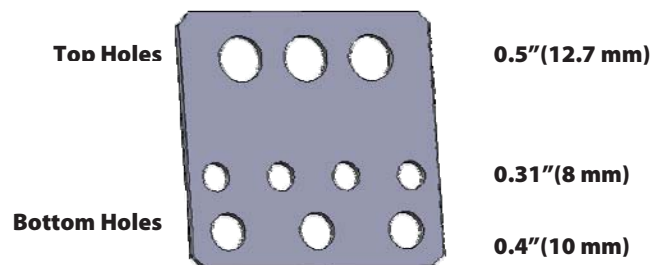


Figure 12 DC Positive Cable Plate

Assembling DC Positive Cable Plate

The bottom of each DC disconnect is bolted to a bus plate which receives the inverter's positive battery cables.

To assemble the DC Positive Plate:

1. Remove the nuts and other hardware (washer, lock washer, hex nut) from the bottom terminal in the back of each DC disconnect.
2. Place the two disconnects side by side.
3. Orient the DC positive plate so that the three largest holes are at the top. These holes have a diameter of 0.5 inch (1.3 cm). Insert the studs on each disconnect through the first and third holes.
4. Replace the disconnect hardware (washer, lock washer, hex nut). Tighten the nuts to the values shown in Table 2 on page 17. The plate will hold the two breakers together as a set.

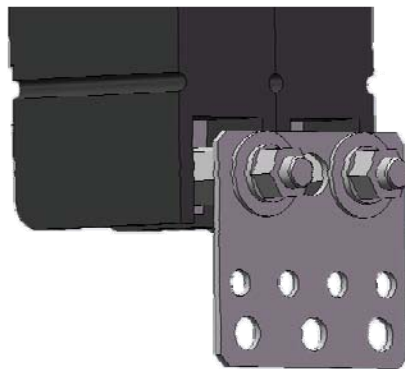
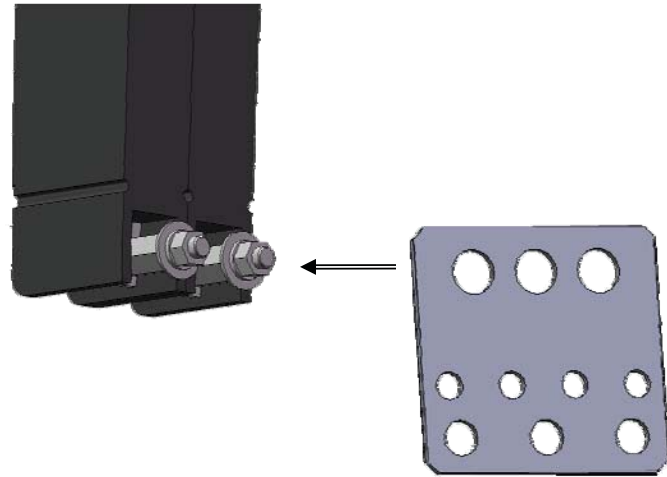
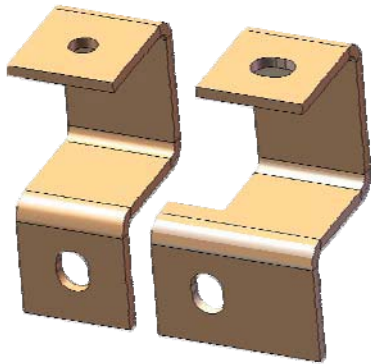


Figure 13 Assembling the DC Positive Cable Plate

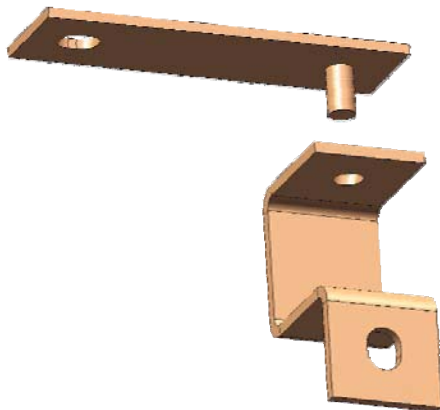
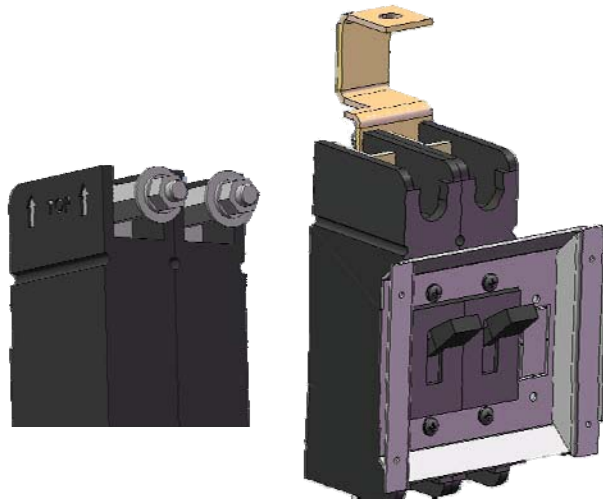
Installing Inverter Positive Bus Bars



The GSLC parts kit contains two bus bars which attach to the tops of the DC disconnects. These bus bars make the connections with the Radian inverter's positive DC terminals. Although they have similar shapes, the bus bars are not interchangeable.

To assemble the Inverter Positive Bus Bars:

1. Attach the wider of the two bus bars to the top terminal of the disconnect on the right, using the stud and hardware on the back of the disconnect. Tighten the nuts to the values shown in Table 2 on page 17.



2. The GSLC's hardware kit contains a top bar which attaches to the narrower bus bar. Attach these two bars together using a 5/16" flat washer, a 5/16" lock washer, and an M8 nut (included in hardware kit). Tighten to the value shown in Table 2 on page 17.

3. Mount the narrower bus bar and its top piece to the top terminal of the disconnect on the left. Tighten to the value shown in Table 2 on page 17.

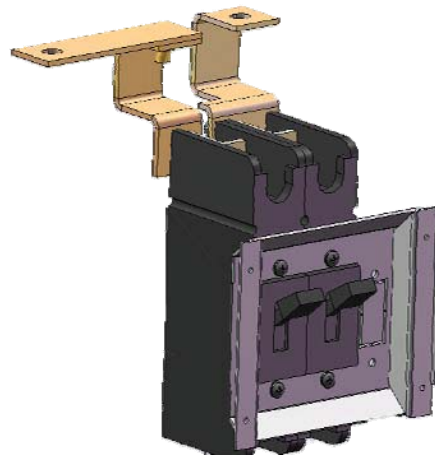
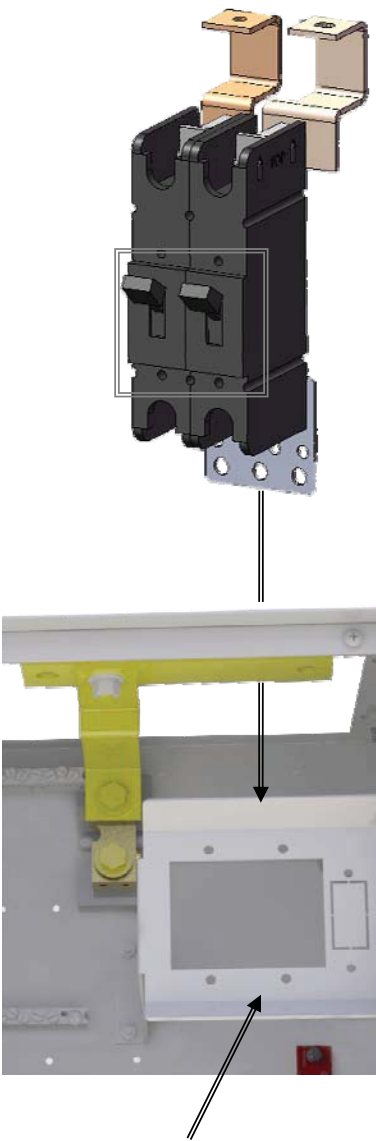


Figure 14 Inverter Bus Bars

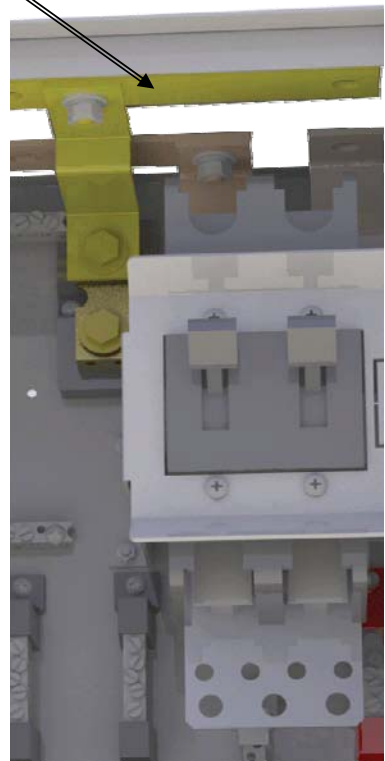
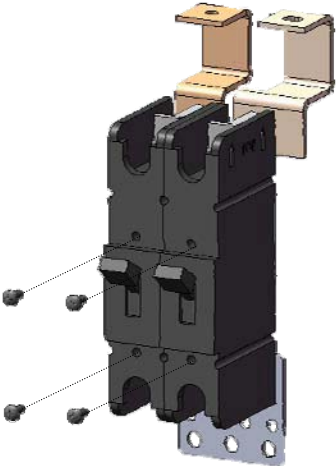
Installing Inverter Main Disconnects



Premounted bracket

To mount the inverter disconnects:

1. If the negative top bar is installed, loosen or remove it.
2. Slide the disconnect assembly through the opening in the top of the GSLC and place it behind the premounted bracket. Center the disconnect assembly so that the raised area around the switch protrudes through the bracket. It may be necessary to hold the assembly in place by hand.
3. Take the mounting screws provided with the circuit breaker and insert them from the outside into the GSLC bracket.
4. Tighten until secure, but do not over-tighten.
5. Reattach the negative top bar. Tighten to the value shown in Table 2 on page 17.



These instructions assume that the GSLC has not yet been mounted to the Radian inverter and that the top is open. If the GSLC's top is closed or inaccessible, remove the premounted bracket. Attach the disconnect assembly to it. Finally, re-install the bracket.

Figure 15 Inverter Main Disconnects

Installing DC Shunts



A single 500 Adc/50 mV shunt is included with the GSLC. Up to two more shunts can be installed as needed. These shunts are used in conjunction with the FLEXnet DC battery monitor. See page 29 for more instructions on wiring.

To mount DC Shunts:

1. Place new shunts to the left of the existing one. They will not be exactly parallel to the first shunt, but will be mounted to the lower left of it.
2. Four mounting holes are located to the lower left of the first shunt. Center each shunt across one pair of mounting holes. These should line up with the mounting holes built into each shunt.
3. Using the screws included with the shunt, attach each shunt to the GSLC enclosure.
4. Tighten until secure, but do not over-tighten.

NOTE: The GS-SBUS can be purchased and installed to connect the three shunts together. See Figure 25 on page 30.

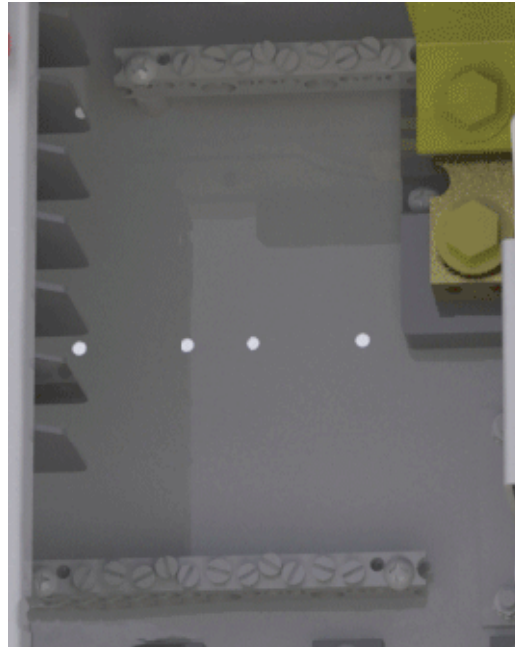
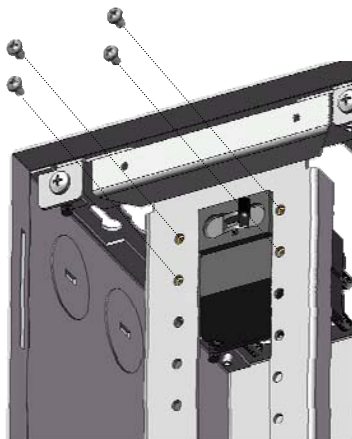


Figure 16 DC Shunts

Installing PV and AC Circuit Breakers and GFDI

To mount circuit breakers:

1. It may be necessary to remove the knockout from the location where the circuit breaker is to be placed to make room for the circuit breaker to be installed. Be sure to remove any debris that may occur from removing the knockout.
2. Place each circuit breaker behind the premounted rail. Center the device so that the raised area around the switch protrudes through the bracket. It may be necessary to hold the device in place by hand.
2. When the circuit breaker is in place, insert the screws included with each breaker through the holes in the mounting rail.
3. Tighten until secure, but do not over-tighten.



NOTES

- The circuit breakers may not all have the same number of poles. AC circuit breakers used with the Radian inverter, such as the one shown to the left, are dual-pole and require two rail slots. Make certain to plan the layout accordingly.
- Although there are no specific designations, the upper end of the mounting rail is generally used for AC devices (including the maintenance bypass). The lower end is generally used for DC devices, including the GFDI. The preassembled GSLC models follow this convention.
- A PV ground-fault device may be required. The OutBack GFDI comes prewired for this purpose in some GSLC versions. It can also be purchased separately. The GFDI mounts the same way as other circuit breakers. Once mounted, see page 31 and the GFDI manual for wiring instructions.
- Some installations may require an AC maintenance bypass. The bypass comes prewired for a single Radian inverter in some GSLC versions. It can also be purchased separately. See page 33 and the GS-IOB manual for mounting and wiring instructions.

Dual-pole
Circuit Breaker



Figure 17 **Circuit Breakers**

Mounting on the Inverter



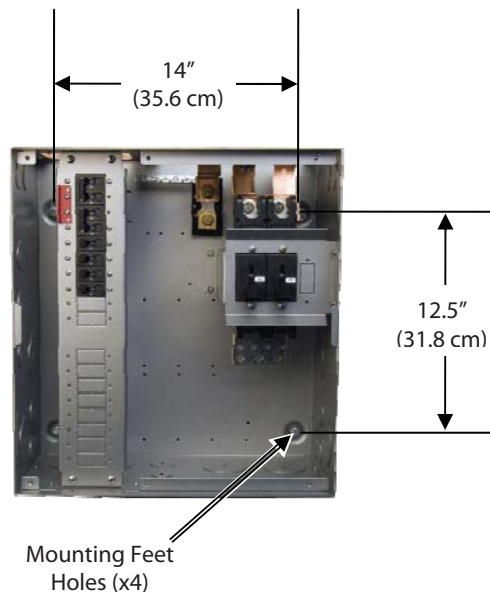
IMPORTANT:

The Radian inverter and GSLC are intended for indoor use only. Ensure that the mounting surface is strong enough to support the full weight of the Radian inverter/charger and the GSLC. If in doubt, use a 3/4" sheet of plywood to strengthen the wall surface.



To mount the GSLC to the Radian inverter:

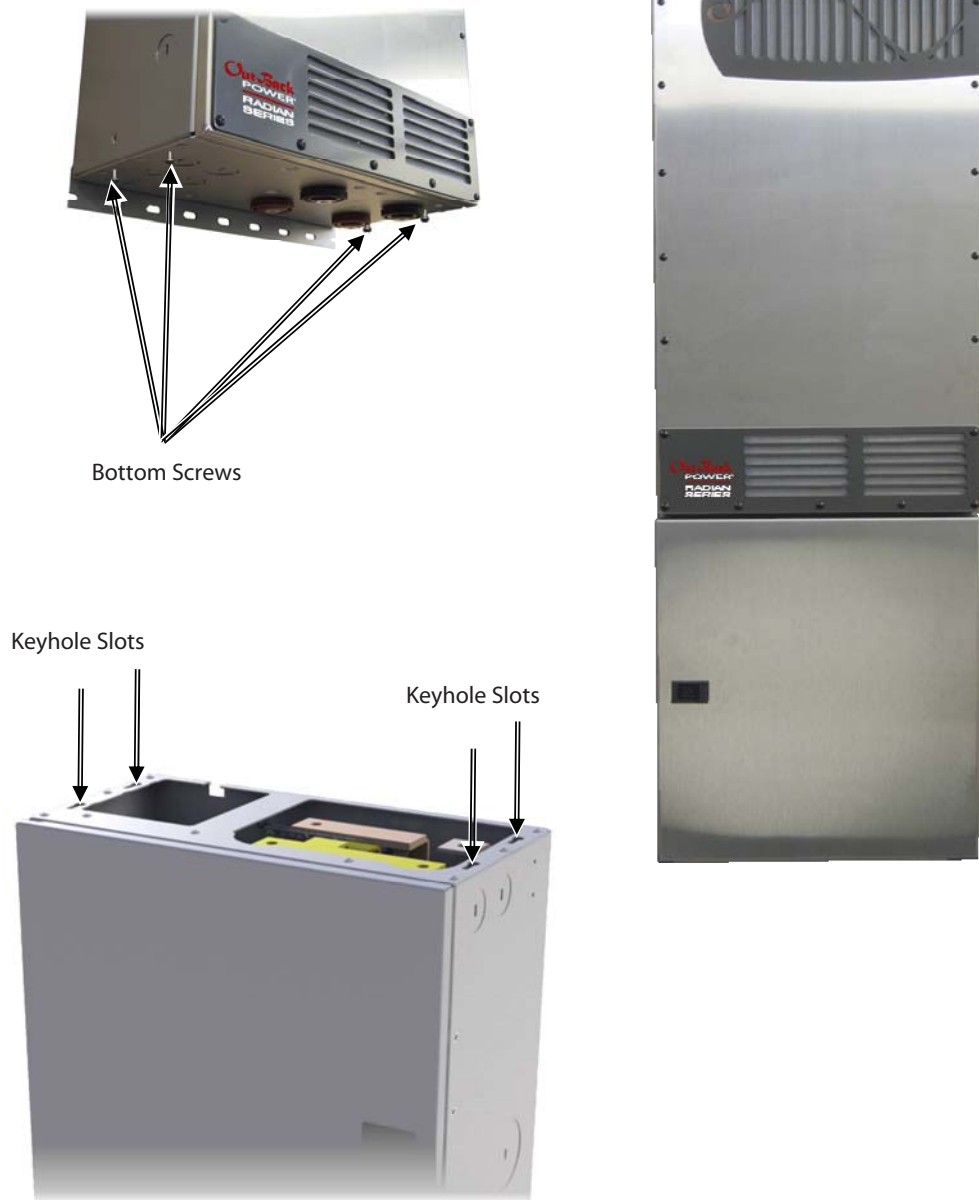
1. Install the Radian inverter onto the mounting bracket as instructed in the Radian Series Inverter/Charger Installation Manual.
2. Back out bottom screw(s) approximately 1/4 inch (0.6 cm) to 3/16 in (0.5 cm).
3. Remove the front and interior covers from the GSLC if necessary, as described on page 16.
4. Align the GSLC along the bottom of the inverter and slide the mounting screws onto the keyhole slots.
5. Hanging the GSLC from the screws and holding it flush against the bottom of the inverter, mark the spots for the holes for the mounting feet. These are located in the rear of the GSLC and are marked below.
6. If using wall anchors (included): Remove the GSLC and drill leader holes for the hardware to be used to secure the GSLC to the surface. Install the wall anchors. If mounting on a solid surface like plywood, this step can be skipped.



Continued on the next page....

Figure 18 Mounting the GSLC

...continued from the previous page.

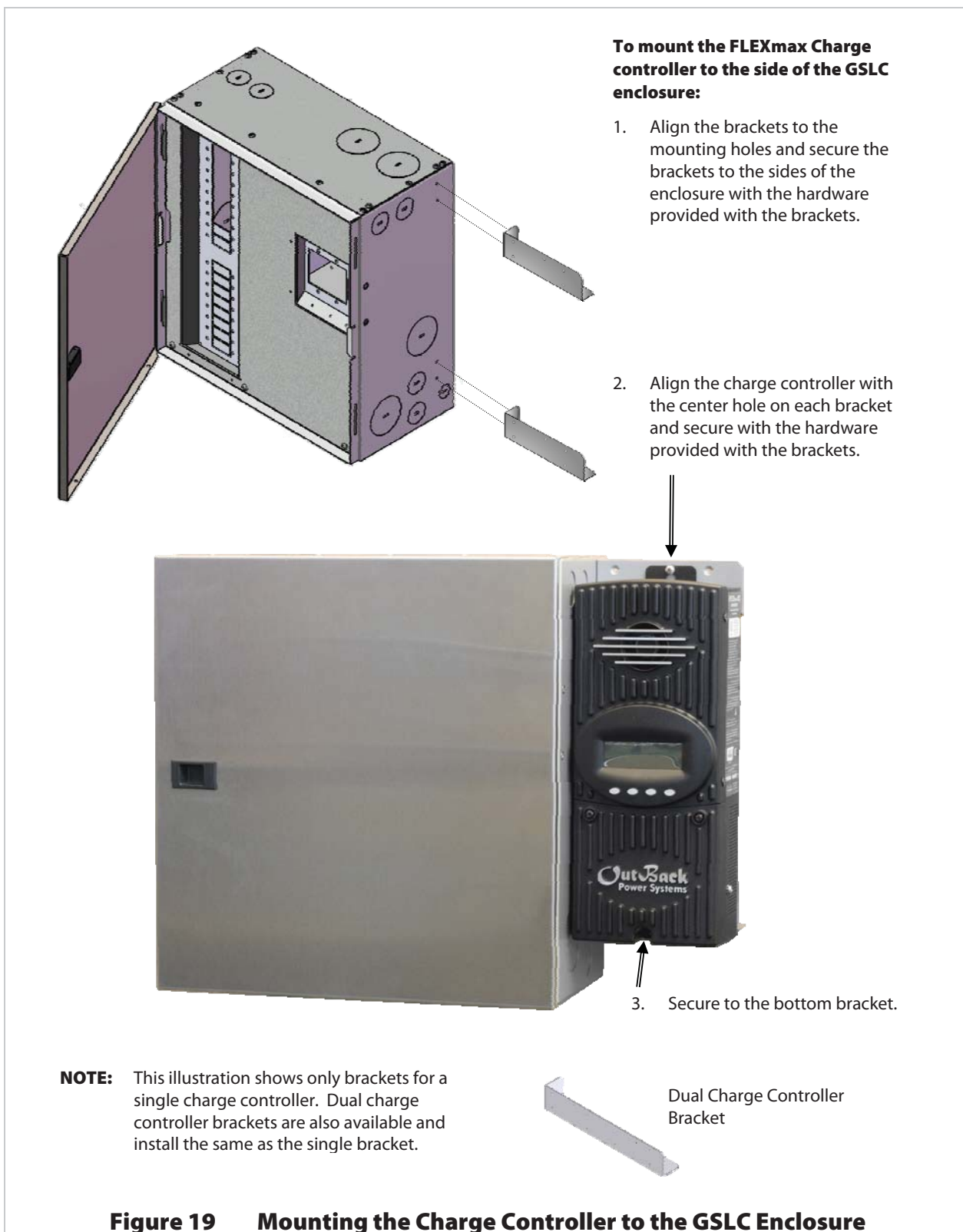


7. Re-hang the GSLC using the keyhole mounts.
8. Secure to the mounting surface using all four mounting feet holes.
9. Using the bolts provided on the Radian inverter's battery terminals, connect the terminals to the GSLC's inverter bus bars. Tighten to the value shown in Table 2 on page 17. For more information on the Radian terminals, see the *Radian Series Inverter/Charger Installation Manual*.)
10. Leave the door and interior cover removed until all components have been installed and all wiring is complete.

Figure 18 Mounting the GSLC (continued)

Mounting Charge Controller

The GSLC enclosure accommodates up to two FLEXmax charge controllers and a HUB Communications Manager.



Mounting the HUB Communications Manager

The GSLC provides mounting holes to support a HUB Communications Manager.

To mount the HUB Communications Manager to the side of the GSLC enclosure:

1. Locate the mounting holes on the side of the GSLC enclosure as shown in Figure 6 on page 14.
2. Align the HUB (vertically) over the mounting holes with the HUB's ports facing forward.
3. Take the mounting screws provided with the HUB and insert them from the outside into the GSLC enclosure.
4. Tighten until secure, but do not over-tighten.
5. Remove the knockouts, add bushings, and install CAT5 cabling as needed.
6. Install the HUB's protective shield.

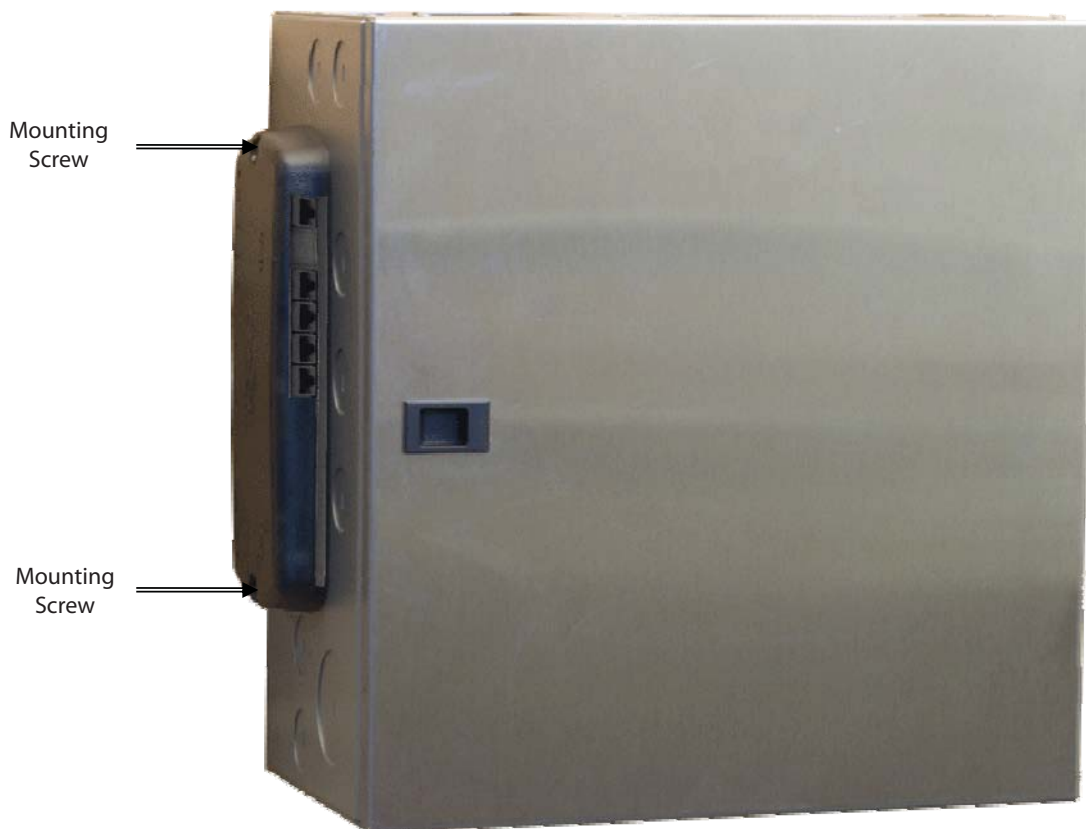


Figure 20 **Mounting the HUB to the GSLC Enclosure**

Wiring

Table 3 Terminal Bus Bar (TBB) Wire Size and Torque Requirements

Conductor Size		Torque Requirements	
AWG	mm ²	In-lb	Nm
#14 – #10	2.5 – 4	20	2.3
#8	6 – 10	25	2.8
#6 – #3	16 – 25	35	4.0
#2	35	40	4.5
#1 – 1/0	50	50	5.7

Grounding



WARNING: Shock Hazard

The unit must be connected to a grounded, permanent wiring system. If a bond is made between neutral and ground, make sure only one bond is present in the AC system at any time. **The GSLC comes equipped with a neutral-ground bond.** This bond may need to be disconnected. Some codes require the bond to be made at the main panel only.



WARNING: Shock Hazard

For all installations, the negative battery conductor should be bonded to the grounding system at only one point. **The GSLC comes equipped with a negative-ground bond.** This bond may need to be disconnected. If the OutBack GFDI is present, it can provide the bond. See page 28.



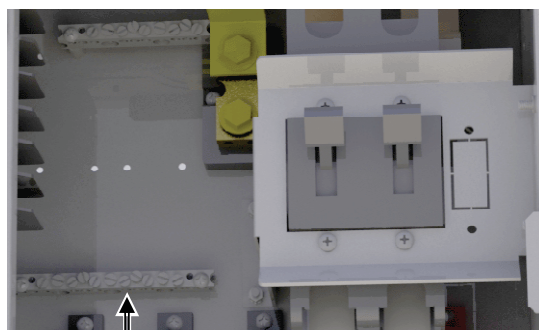
IMPORTANT:

OutBack products are not designed for use in a positive-grounded system. If it is necessary to build this system with OutBack products, contact OutBack Technical Support at +1.360.618.4363 before proceeding. Additionally, consult the online forum at www.outbackpower.com/forum/, where this subject has been discussed extensively.

The GSLC's grounding TBB, which is bonded to the GSLC chassis, is located to the lower left of the main inverter disconnect. It accepts conductors from 1/0 to #14 AWG in size.

This TBB accepts ground connections from the Radian inverter, FLEXmax charge controllers, the OutBack GFDI, the Grounding Electrode Conductor (GEC) or external earth ground, and other equipment.

See the *Radian Series Inverter/Charger Installation Manual* for recommendations on ground conductor sizing. Once the size is determined, see Table 3 for required torque values.



Ground TBB

Figure 21 Grounding

Bonding

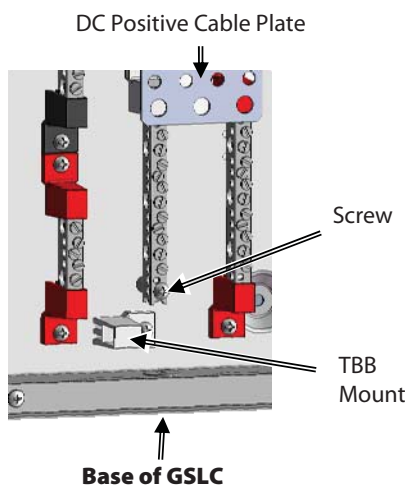
The GSLC is equipped with a mechanical bond between AC neutral and ground. It is also equipped with a mechanical bond between DC negative and ground. These can be useful in stand-alone systems where no other bond is provided. If other bonds are present, however, the GSLC bonds need to be removed.



WARNING: Shock Hazard

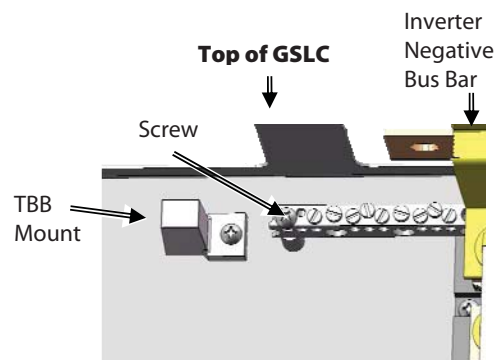
If the OutBack GFDI is installed (see page 22 and the GFDI manual), the bond between negative and ground must be removed. This must also be done if any other PV ground-fault device is present that establishes its own negative-ground bond.

The GSLC's **neutral bus bar** is located in the lower right portion of the GSLC. The neutral-ground bond is established at one end of the bar, near the base of the GSLC.



Neutral-Ground Bond

The GSLC's negative bus bar is located near the top of the GSLC. It is attached to the inverter **negative bus bar** and its shunt.



Negative-Ground Bond

To remove either of the bond connections:

1. Using a Phillips screwdriver, remove the screw shown above.
2. Remove the metal standoff beneath the bus bar. The screw and bus bar provide the mechanical bond to the chassis ground.
3. Rotate the TBB mount and insert the bus bar into the open end so that the TBB mount supports it. It may be necessary to loosen the TBB mount screw before rotating it.
4. Retighten the screw that secures the TBB mount.

NOTE:

If the TBB is connected directly to the enclosure by a screw, then the bond is connected.

If the TBB is held by the TBB mount and the TBB mount is secured to the enclosure, the bond is disconnected.

Figure 22 Disengaging Bonding Connections

DC Wiring



WARNING: Shock Hazard

Ensure all circuit breakers or disconnect devices are turned off or disconnected before wiring.

Inverter Wiring

The DC disconnects are connected directly to the inverter using bus bars during the process of mounting. See page 24 for more information.

Battery Wiring

The Radian inverter requires two positive and two negative cables for proper installation. Consult the *Radian Series Inverter/Charger Installation Manual* for cable sizing and length recommendations appropriate for the specific installation. (The GSLC bus connections may allow a single larger conductor to be brought in from the battery, if sized correctly.)

The battery positive cables connect to the DC positive wiring plate. This plate is located directly beneath the main inverter disconnects. It is intended for several ring lugs to be bolted to it.

- The smaller holes have a diameter of 0.31 inches (8 mm).
- The larger have a diameter of 0.4 inches (10 mm).

The battery negative cables connect to the pre-installed shunt. This shunt is located to the upper left of the main inverter disconnect. It is designed for several ring lugs to be bolted to it, with openings of 3/8" diameter.

See Table 2 on page 17 for required torque values.

Ensure DC disconnects are turned to the OFF position and All DC sources are disconnected (i.e., unbolt the battery end of the wires) before proceeding.

See the inverter's installation manual for additional information on battery wiring.

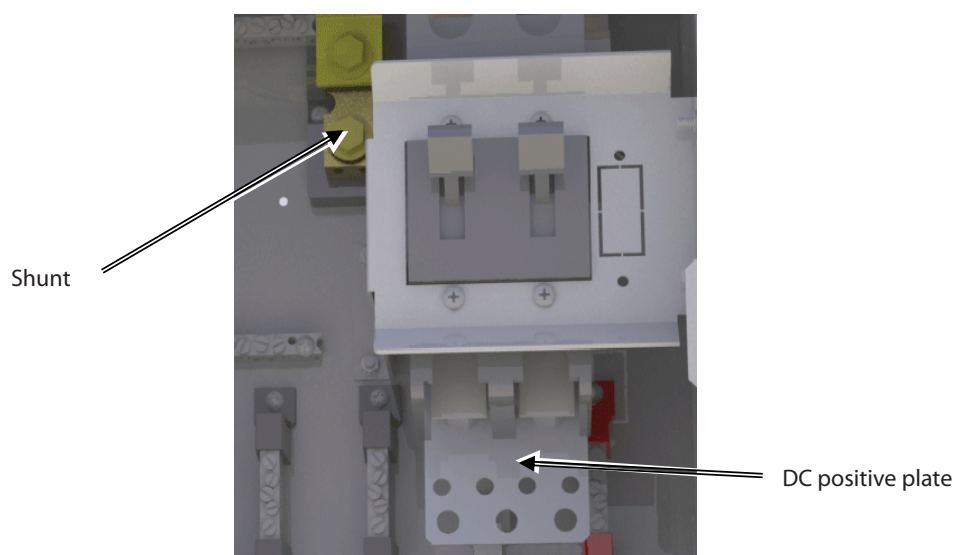
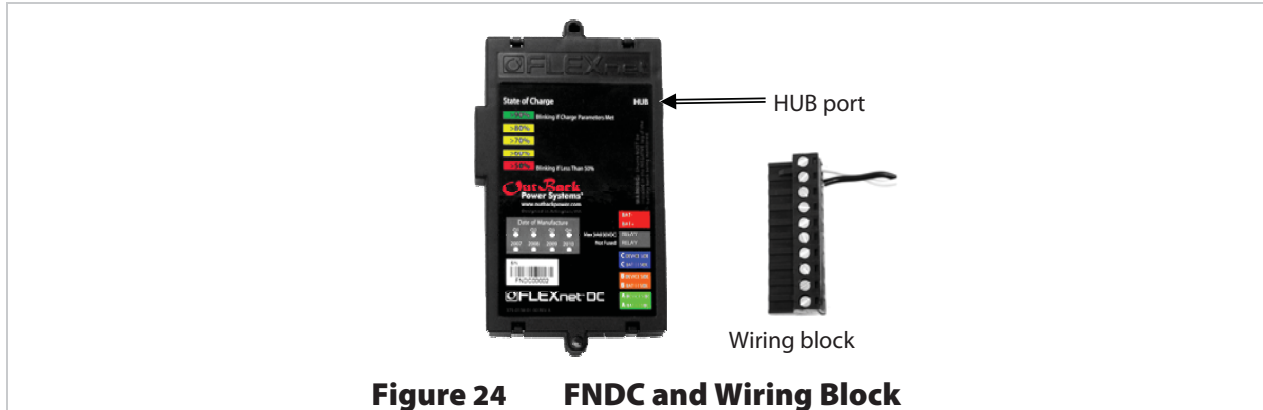


Figure 23 Battery Connections

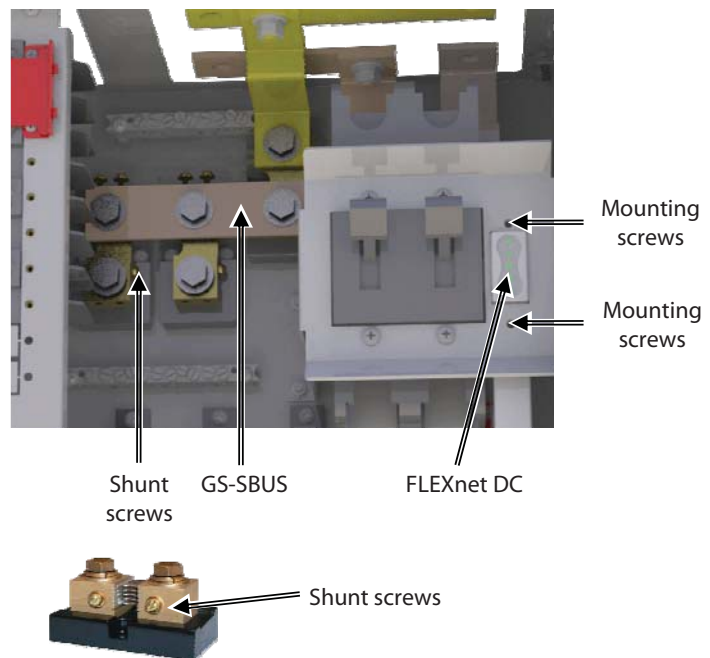
Installing the FLEXnet DC

The OutBack FLEXnet DC (FNDC), or a similar battery monitor, may be added to the GSLC for observing DC current flow and providing battery state-of-charge information.



To install the FN-DC :

1. Assemble the FNDC wiring as shown in the manual for the FNDC.
 - Attach sense wires to FNDC wiring block and plug it into the FNDC.
 - Plug the CAT5 cable into the port labeled HUB.
2. Connect FNDC wiring to the GSLC.
 - The positive and negative battery voltage sense conductors should connect directly to the battery bank.
 - The shunt sensing wires should connect to the screws on each shunt. It may be necessary to remove the GS-SBUS to reach the screws.
3. Mount the FNDC by inserting it into the opening to the right of the inverter disconnects. It may be necessary to hold it in place.
4. Secure the FNDC with mounting screws above and below. Tighten until secure, but do not over-tighten.



When connecting sensing wires: The end of the shunt connected to the GS-SBUS is the negative battery connection and should be wired accordingly. The other end of the shunt is the "device" or "load" end and should be wired accordingly.

See the FLEXnet DC manual for more information on these connections. See Figure 34 on page 39 for an example of typical system wiring.

DC Devices

In addition to inverter- or PV-related connections, other devices may be connected to the GSLC, such as DC loads or sources. The wiring on these devices will vary with the application. In most cases the device will have a separate circuit breaker which is mounted on the rail as shown on page 22. It will be wired into the battery system using the existing bus bars or shunts. The number and location of these connections will vary with the model of GSLC and the accessories installed. See pages 10 through 12 for details.

PV and Charge Controller Wiring

When wiring the FLEXmax series or another charge controller to the GSLC, a number of elements are involved: the PV or RE source, the battery connections, the disconnect circuit breaker, the PV ground-fault device, and the charge controller. These instructions are written for a PV source which uses the OutBack FLEXmax series charge controller and the GFDI. Other applications will be similar.

To make PV and charge controller connections:

1. Connect the PV positive wire to the GSLC's PV positive TBB (see Figure 26).
2. Connect the PV negative wire to the charge controller's PV negative terminal (see Figure 27).
3. Install a wire from the PV TBB to the PV disconnect circuit breaker (see Figure 26).
4. Install a wire from the PV disconnect to the charge controller's PV positive terminal.
5. Install a wire from the GSLC's positive cable plate to one pole of the GFDI.
6. Install a wire from the GFDI to the charge controller's positive battery terminal.
7. Install a wire from the charge controller's negative battery terminal to the GSLC's negative TBB. If the FLEXnet DC or another battery monitor is in use, this wire should connect to the shunt which monitors that charge controller.
8. Repeat all steps for a second charge controller, if necessary.

NOTES:

- Each TBB accepts conductors from 1/0 (70 mm²) to #14 AWG (2.5 mm²) in size. See Table 3 on page 27 for required torque values.
- For other GSLC required torque values (such as shunts and circuit breakers), see Table 2 on page 17.
- For torque values, wire sizes, and other information concerning the FLEXmax charge controller, see the FLEXmax Series Charge Controllers Owner's Manual.
- For more information on specific wiring of the GFDI, see the GFDI manual.
- A diagram that shows typical wiring for a PV system, including the FLEXnet DC, GFDI, and other elements of the system, is shown on page 39.
- A fully-assembled GSLC diagram with the elements mentioned above (as well as the AC system) is shown on page 39.

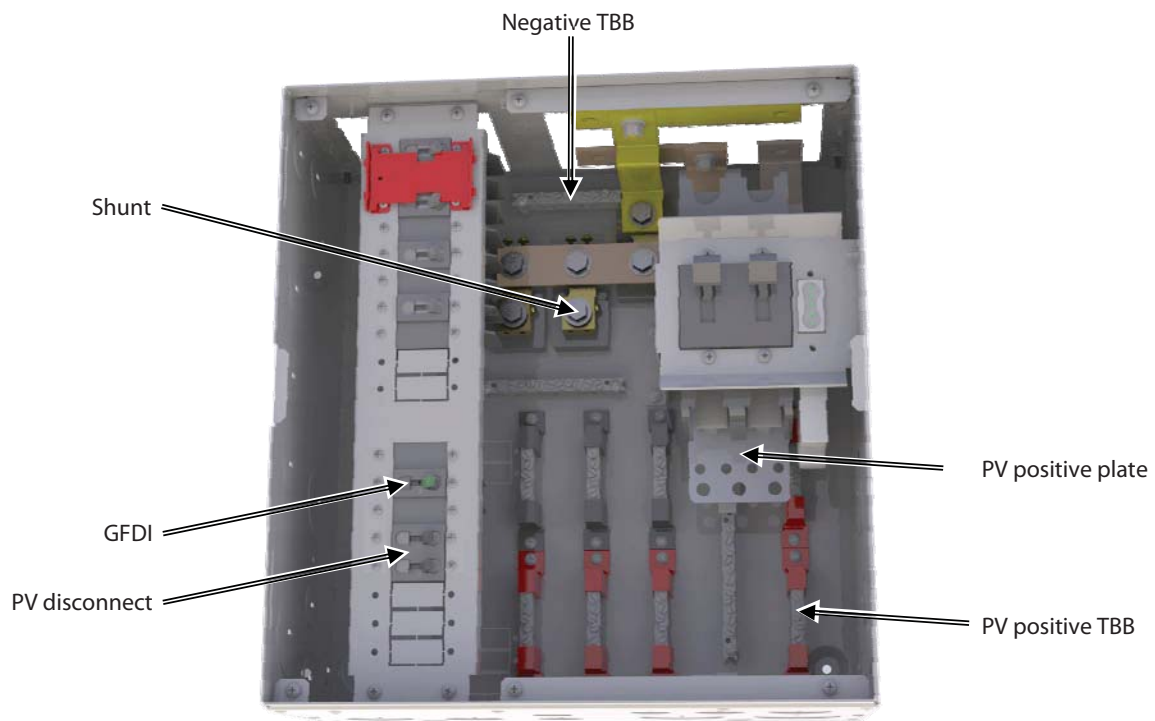


Figure 26 PV Connections in the GSLC

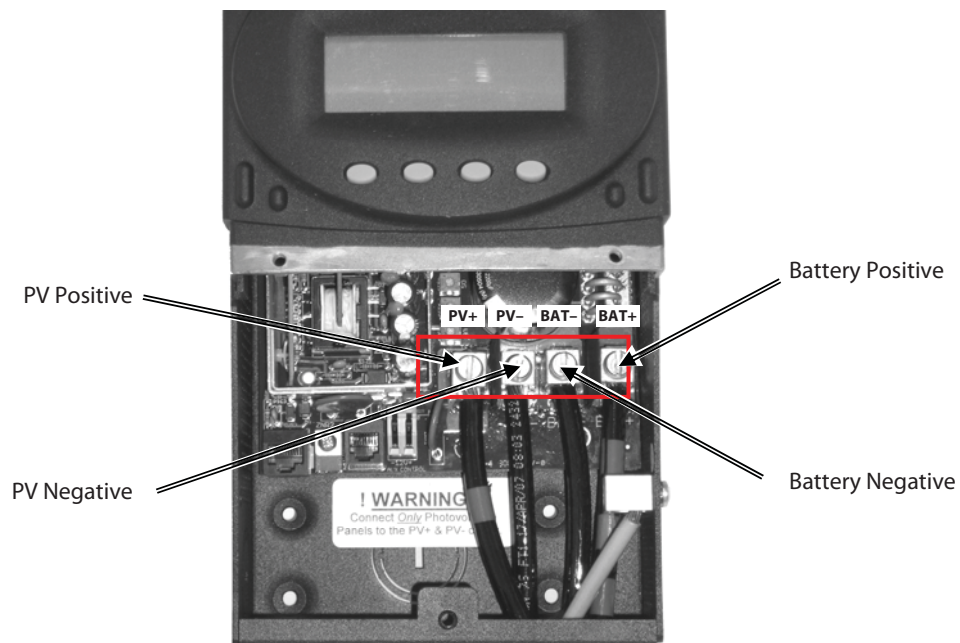


Figure 27 PV Connections in the FLEXmax Charge Controller

AC Wiring



WARNING: Shock Hazard

Ensure all circuit breakers or disconnect devices are turned off or disconnected before wiring. Make certain the inverter and other active devices are turned off or disabled before wiring.

The GSLC can have multiple terminal bus bars for multiple AC connections. Because the Radian inverter possesses two sets of AC input connections and one set of output connections, up to three TBB sets are available. Each set of bus bars are paired in red and black, for the 120/240 Vac connections required by the Radian inverter.

The TBB set on the left is generally used for the inverter's AC output connections. The central TBB set is for utility grid connections and the right TBB set is for a generator. The preassembled GSLC models follow this convention.

Each TBB accepts conductors from 1/0 (70 mm²) to #14 AWG (2.5 mm²). See Table 3 on page 27 for required torque values.

If steps are inappropriate for a given system (such as instructions for a generator when none is present), they can be ignored.

To make the external AC connections to the GSLC:

1. Connect the L1 wire from the AC load panel to the black TBB on the left (AC Output). Connect the L2 wire from the AC load panel to the red TBB on the left.
2. Connect the neutral wire from the AC load panel to the neutral TBB.
3. Connect the L1 wire from the utility grid panel (if present) to the black TBB in the center (Grid). Connect the L2 wire from the utility grid panel to the red TBB in the center (Grid).
4. Connect the neutral wire from the utility grid panel (if present) to the neutral TBB.
5. Connect the L1 wire from the generator (if present) to the black TBB on the right (Generator). Connect the L2 wire from the generator to the red TBB on the right (Generator).
6. Connect the neutral wire from the generator (if present) to the neutral TBB.



Figure 28 AC Terminal Bus Bars

To make the connections to the Radian inverter:
(See Figure 33 on page 38.)

1. Choose the AC circuit breaker set at the top and designate it as the inverter AC output disconnect. Install a wire from the black TBB of the AC output circuit (as shown in Figure 28) to the right side of the **upper** pole of that disconnect.
2. Install a wire from the red TBB of the AC output circuit to the right side of the **lower** pole on the same disconnect.
3. Install wires on the left side of each pole of the disconnect. Connect these wires to the appropriate L1 and L2 output terminals on the Radian inverter.
4. Choose the third AC circuit breaker from the top and designate it as the disconnect for one AC source (Grid or Gen). Install a wire from the black TBB of the appropriate source circuit (as shown in Figure 28) to the left side of the **upper** pole of that disconnect.
5. Install a wire from the red TBB of the source circuit to the left side of the **lower** pole on the same disconnect.
6. Install wires on the right side of each pole of the disconnect. Connect these wires to the appropriate L1 and L2 input terminals on the Radian inverter (the terminals labeled either GRID or GEN).
7. If a second AC source is present, repeat these steps using the second circuit breaker.
8. Install a wire on the inverter's NEU terminal and connect it to the GSLC's neutral TBB (as shown in Figure 28). *Only one neutral connection is required.*

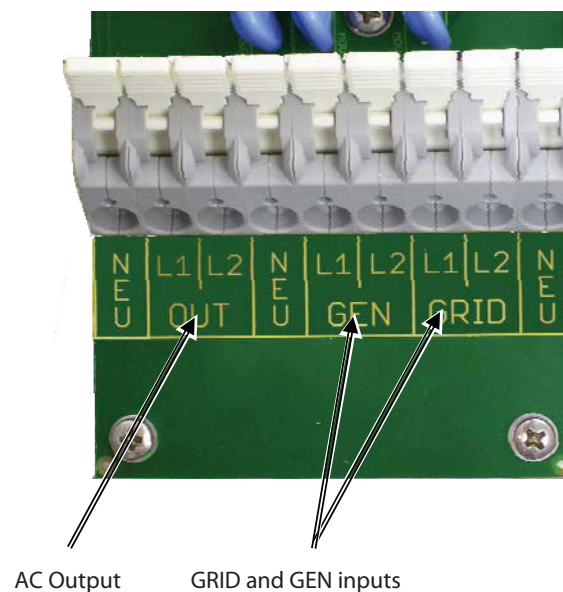
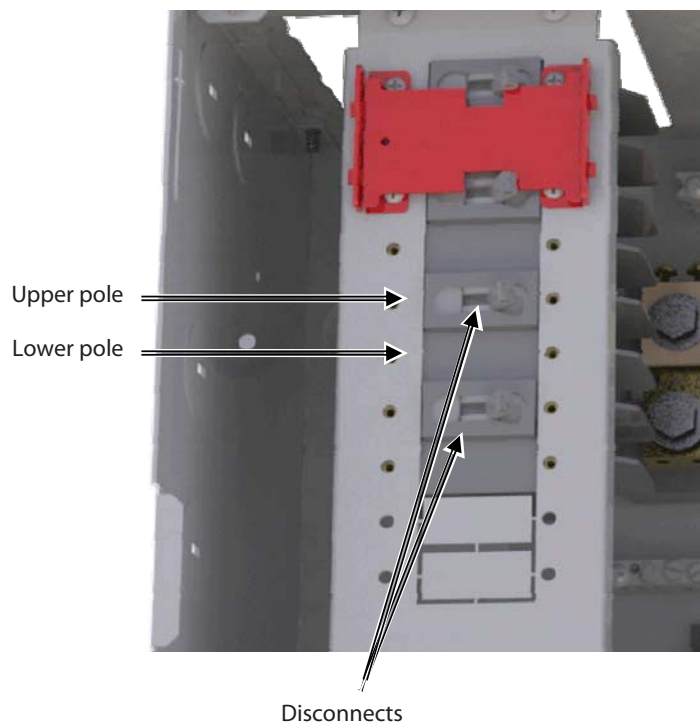


Figure 29 Inverter AC Connections

Installing the AC Bypass Assembly

The GSLC175-120/240 and GSLC175-PV-120/240 comes equipped with a maintenance bypass assembly. The GSLC can be equipped with a bypass assembly using the GS-IOB accessory kit. The GS-IOB should be installed according to its own instructions. Once installed, it can be wired by following the steps shown here.

A fully-assembled GSLC diagram with the bypass wiring (as well as the rest of both the AC and DC systems) is shown on page 39. It shows the utility grid circuit connected to the bypass assembly.

NOTE: Only one AC source may be bypassed with this assembly. If two sources are present, one may be connected using the instructions below.



WARNING: Shock Hazard or Equipment Damage

If multiple inverters are in use, see page 36 before attempting to install or use the bypass assembly.

To make the connections to the GSLC bypass assembly: (See Figure 33 on page 38.)

1. Choose the disconnect for the AC source that will power the loads when the inverter is bypassed. On the left side of that disconnect, install a wire from the **upper** pole. Connect it to the **upper** pole of the input bypass switch as shown to the right.
2. From the same disconnect, install a wire on the left side of the **lower** pole. Connect it to the **lower** pole of the input bypass switch.
3. On the right side of the input bypass switch, install a wire on the lower pole. Connect it to the right side of the **lower** pole on the output switch. Install a second wire between the **upper** poles of each switch.

Output
bypass

Input
bypass

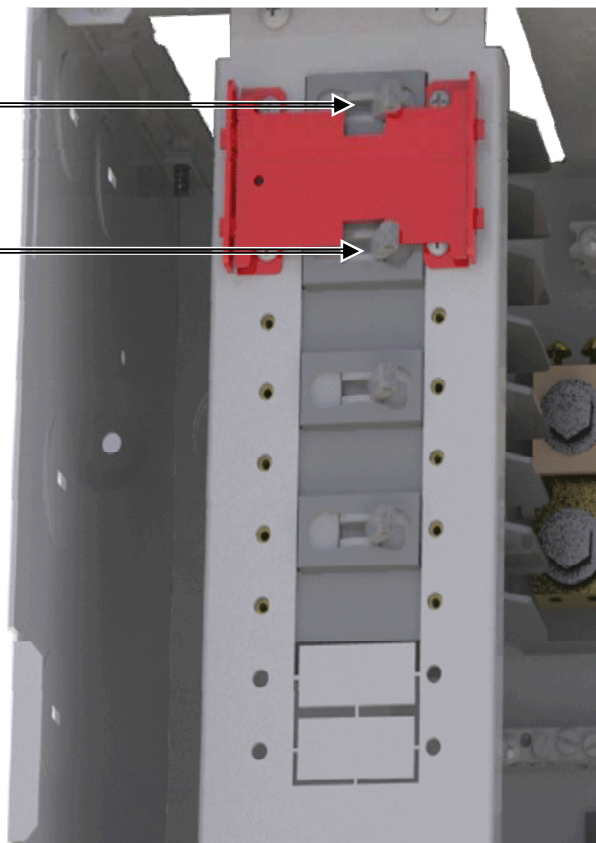


Figure 30 Maintenance Bypass Connections

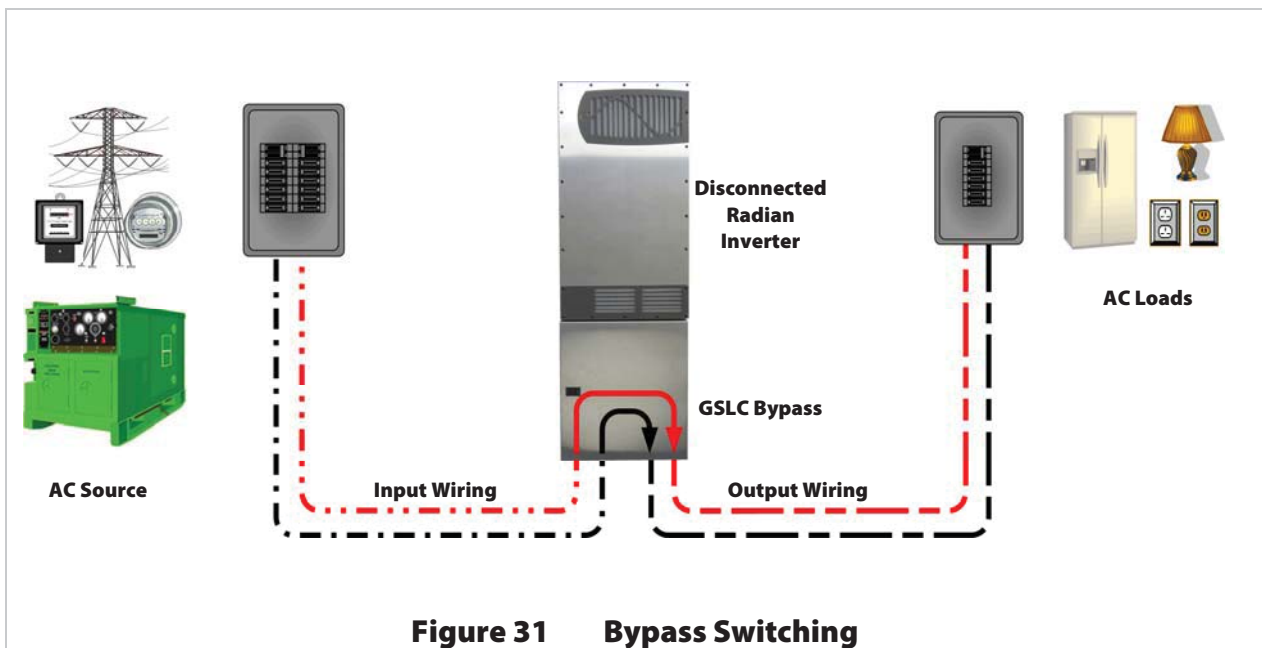
Multiple-Inverter Installations (Stacking Inverters)

When multiple Radian inverters are stacked for additional power, the basic wiring is repeated for each inverter. However, several factors need to be considered.

- One GSLC is required per Radian inverter. A single GSLC cannot be sized to handle the requisite current for multiple Radian inverters.
- If more than two Radian inverters are installed, it is recommended to install a separate distribution panel to distribute incoming power to each GSLC individually. It may be advisable to install separate AC distribution panels to distribute input and output power to each GSLC.
- The GSLC maintenance bypass assemblies cannot be used when more than one Radian inverter is stacked. See the next section.

Bypass Switches

Inverter systems are often equipped with AC maintenance bypass switches or interlocks. If the inverter system ever needs to be shut down or removed, its AC sources and loads must be disconnected. A bypass device allows the AC source to deliver power directly to the loads, bypassing the inverter. This can minimize disruption to the system and avoids the need for extensive rewiring.



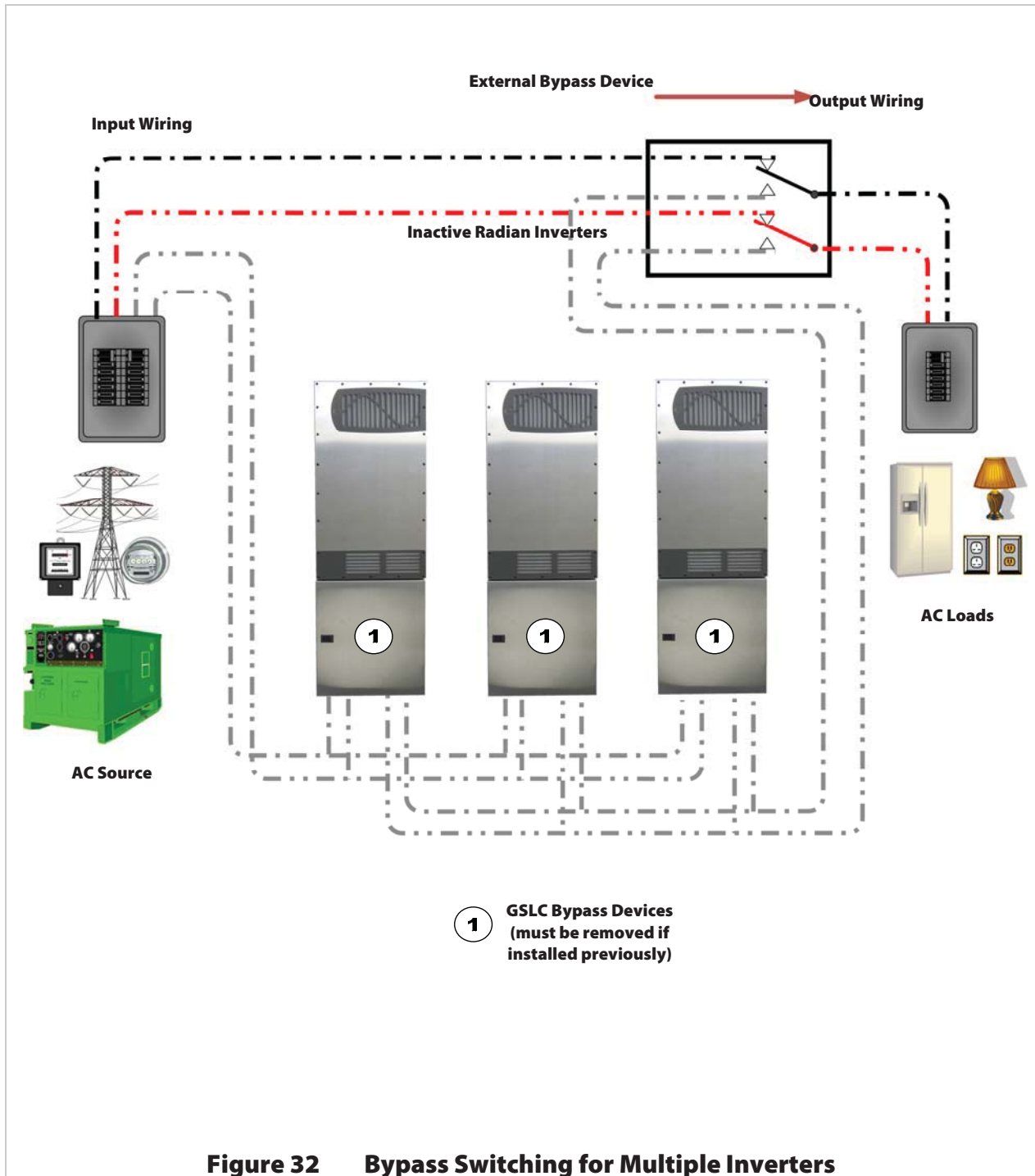
The GS175-120/240 and GS175-PV-120/240 are equipped with bypass circuit breakers for this purpose, and the basic GSLC has a bypass option (the GS-IOB) which can be installed. However, if multiple Radian inverters are stacked in a single system, then these devices cannot be used. The bypass function must be simultaneous for all inverters. The GSLC bypass kits operate independently, not simultaneously.

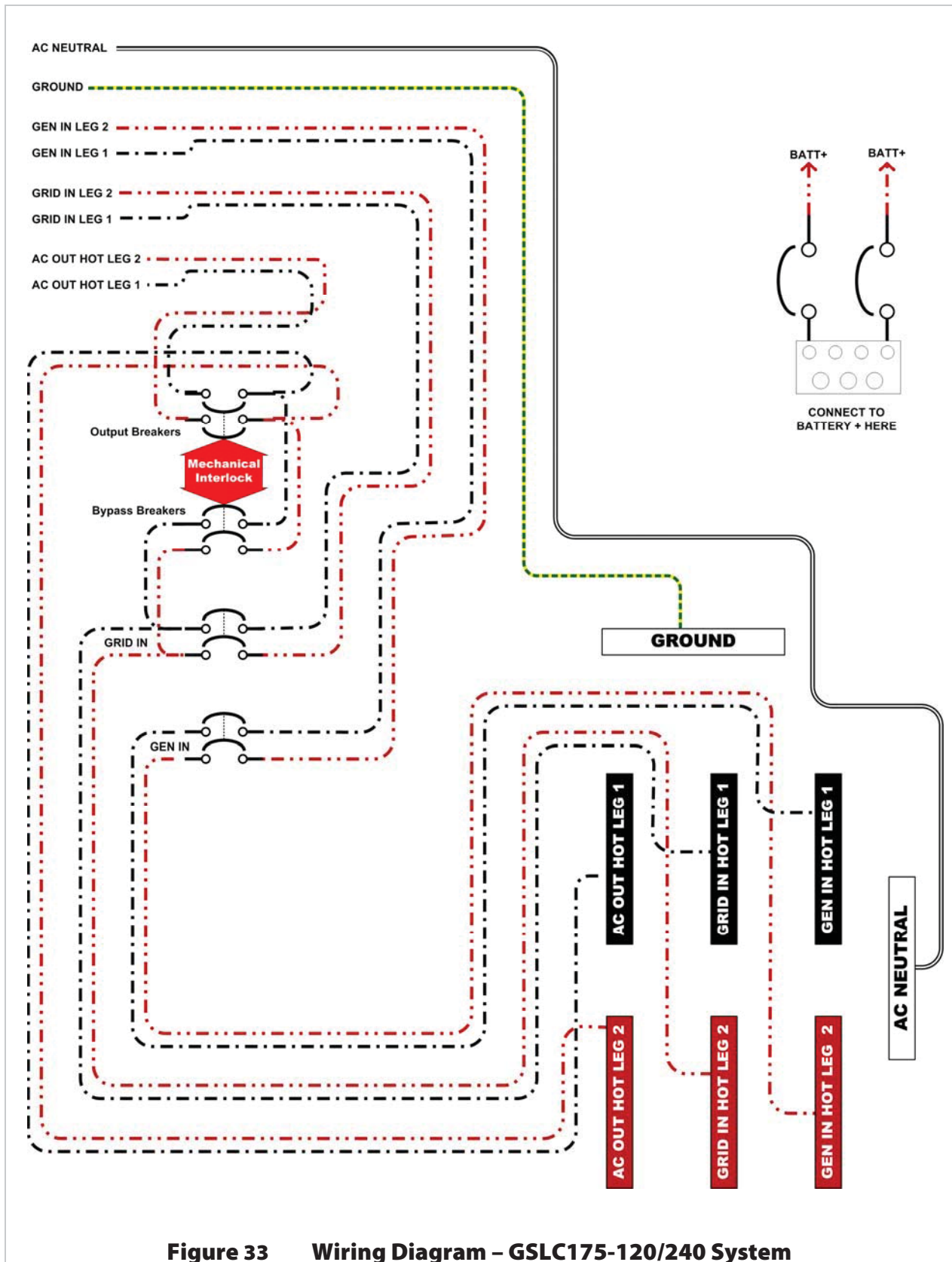
Both manual and automatic double-pole, double-throw bypass switches are commonly available in a range of sizes and options. These are highly recommended for systems larger than a single inverter. In a new system with multiple Radian inverters, the basic GSLC should be used in conjunction with an external assembly of this kind, as shown in Figure 32. The GS-IOB should not be installed, or if previously installed, should be removed and all wires disconnected.



WARNING: Shock Hazard or Equipment Damage

Using independent bypass devices on multiple inverters can result in power being routed to inappropriate places. This could lead to an electric shock, or to equipment damage.





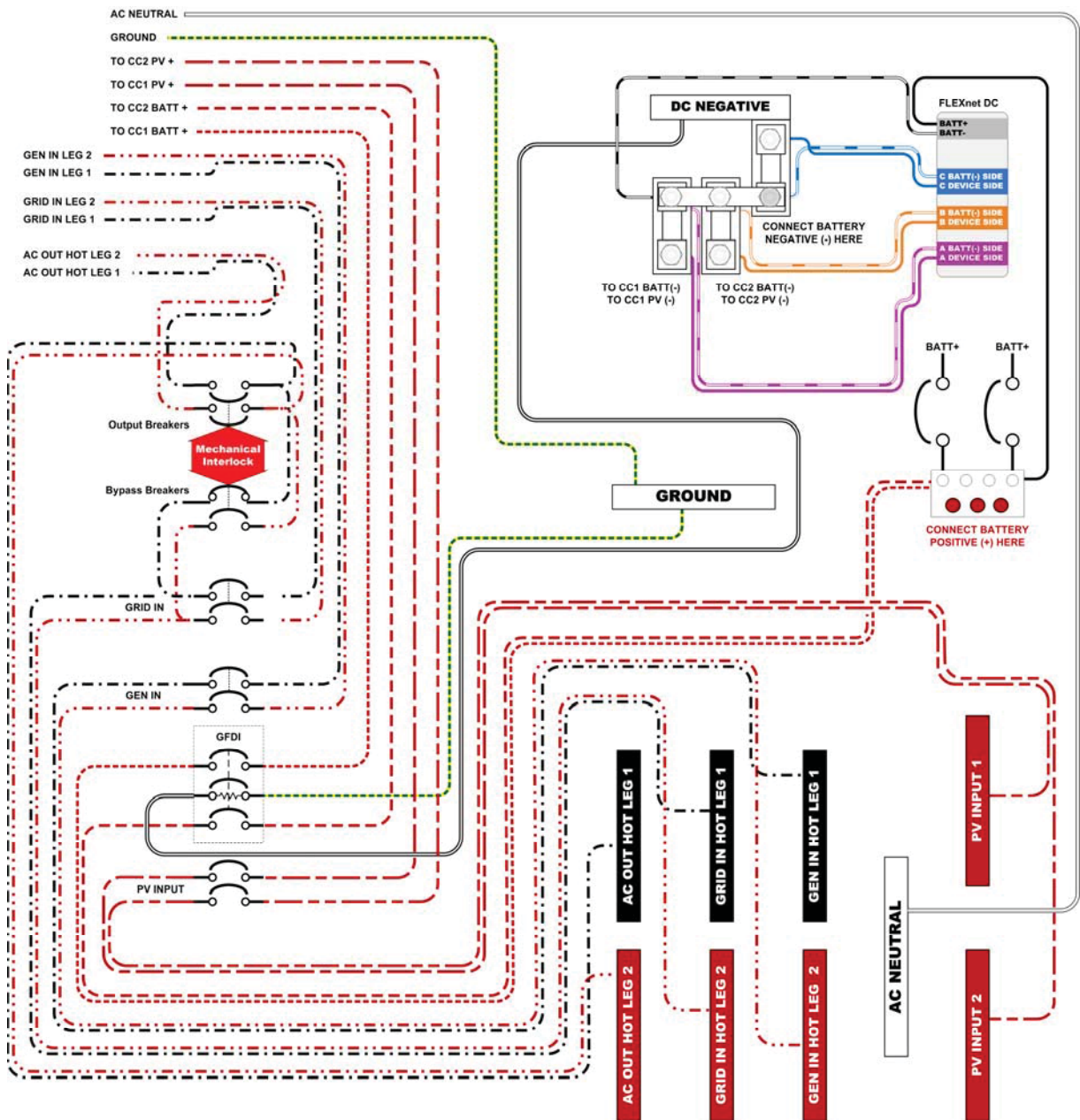


Figure 34 **Wiring Diagram – GSLC175-PV-120/240 System**

Installation

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Specifications

Electrical Specifications

Table 4 Electrical Specifications

Specification	Measurement
Maximum Input Voltage	600 Volts
Maximum Input Current	500 Amps
Operating Frequency Range	50/60 Hz to DC

Mechanical Specifications

Table 5 Mechanical Specifications

Specification	Measurement
Dimensions (H x W x D)	17" x 16" x 8.5" (43.2 cm x 40.6 cm x 21.6 cm)
Shipping Dimensions (L x W x H)	23.25" x 20.5" x 13.25" (59.1 cm x 52.1 cm x 33.7 cm)
Weight	
GSLC	26 lb (11.8 kg)
GSLC175-120/240	37 lb (16.8 kg)
GSLC175-PV-120/240	38 lb (17.2 kg)
Shipping Weight	
GSLC	34 lb (15.4 kg)
GSLC175-120/240	45 lb (20.4 kg)
GSLC175-PV-120/240	47 lb (21.3 kg)
Enclosure Type	Indoor

Regulatory Specifications

- UL 1741, 2nd Edition, Revised January 28, 2010, Static Inverter and Charge Controllers for Use in Photovoltaic Power Systems
- Canadian Electrical Code, Part I (CSA C22.2 No. 107.1-01 (R2006))

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Product Registration

The purchase of an OutBack Power Technologies product is an important investment. Registering the products will help us maintain the standard of excellence you expect from us in terms of performance, quality and reliability.

Please take a moment to register and provide us with some important information.

Registration can be done as follows:

- Go to the following web site.
<http://www.outbackpower.com/resources/warranty/>
or
- Fill out the information on this form (pages 43 and 44) and return a paper copy using a postal service to the following address:

OutBack Power Technologies

Attn: Warranty Registration

5917 – 195th Street N.E., #7
Arlington, WA 98223 USA

Be sure to keep a copy for your records.

SYSTEM OWNER	
Name	
Address	
City, State, Postal or Zip Code	
Country	
Telephone Number	
E-mail	
SYSTEM PURCHASE	
Product Model Number	
Product Serial Number	
Sold by	
Purchase Date	

Product Registration

INSTALLATION INFORMATION	
System Install/Commission Date	
System Array Size	
System Array Nominal Voltage	
Type of PV Modules	
System Battery Bank Size (Amp-Hours)	
Brand and Model of Batteries	
Does this system include an auxiliary AC generator?	
If yes, please specify brand and model of generator	
INSTALLER INFORMATION	
Contractor Number	
Installer Name	
Installer Address	
Installer City, State, Postal or Zip Code, Country	
Installer Telephone/E-mail	

Please check ALL factors affecting purchase decision:

- ☐ Grid-Interactive Capability
- ☐ Product Reputation
- ☐ Back-up Capability
- ☐ Reputation of OutBack Power Technologies
- ☐ Value
- ☐ Looks
- ☐ Other



Warranty

5-Year Limited Warranty for the GS Load Center

OutBack Power Technologies, Inc. ("OutBack") provides a five-year (5) limited warranty ("Warranty") against defects in materials and workmanship for its GS Load Center ("Product").

The term of this Warranty begins on the Product(s) initial purchase date, or the date of receipt of the Product(s) by the end user, whichever is later. This must be indicated by the warranty registration submitted to OutBack (online registration or warranty card contained in this manual). This Warranty applies to the original OutBack Product purchaser, and is transferable only if the Product remains installed in the original use location. The warranty does not apply to any Product or Product part that has been modified or damaged by the following:

- Installation or Removal;
- Alteration or Disassembly;
- Normal Wear and Tear;
- Accident or Abuse;
- Corrosion;
- Lightning;
- Repair or service provided by an unauthorized repair facility;
- Operation or installation contrary to manufacturer product instructions;
- Fire, Floods or Acts of God;
- Shipping or Transportation;
- Incidental or consequential damage caused by other components of the power system;
- Any product whose serial number has been altered, defaced or removed; or
- Any other event not foreseeable by OutBack.

OutBack's liability for any defective Product, or any Product part, shall be limited to the repair or replacement of the Product, at OutBack's discretion. OutBack does not warrant or guarantee workmanship performed by any person or firm installing its Products. This Warranty does not cover the costs of installation, removal, shipping (except as described below), or reinstallation of Products or parts of Products.

THIS LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY APPLICABLE TO OUTBACK PRODUCTS. OUTBACK EXPRESSLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTIES OF ITS PRODUCTS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. OUTBACK ALSO EXPRESSLY LIMITS ITS LIABILITY IN THE EVENT OF A PRODUCT DEFECT TO REPAIR OR REPLACEMENT IN ACCORDANCE WITH THE TERMS OF THIS LIMITED WARRANTY AND EXCLUDES ALL LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR LOST REVENUES OR PROFITS, EVEN IF IT IS MADE AWARE OF SUCH POTENTIAL DAMAGES. IF YOU ARE A CONSUMER THAT PURCHASED THIS PRODUCT IN A MEMBER STATE OF THE EUROPEAN UNION, YOU MAY HAVE ADDITIONAL STATUTORY RIGHTS UNDER DIRECTIVE 1999/44/EC. THESE RIGHTS MAY VARY FROM EU MEMBER STATE TO EU MEMBER STATE. SOME STATES (OR JURISDICTIONS) MAY NOT ALLOW THE EXCLUSION OR LIMITATION OF WARRANTIES OR DAMAGES, SO THE ABOVE EXCLUSIONS OR LIMITATIONS MAY NOT APPLY TO YOU.

How to Arrange for Warranty Service

During the warranty period beginning on the invoice date, OutBack Power Technologies will repair or replace products covered under this limited warranty that are returned to OutBack Power Technologies' facility or to an OutBack Power Technologies authorized repair facility, or that are repaired on site by an OutBack Power Technologies authorized repair person.

**IMPORTANT:**

For full Warranty description, see previous page.

Contacting OutBack

To request warranty service:

- call OutBack Technical Support at **+1.360.435.6030**, or direct at **+1.360.618.4363**, or
- send an email to Technical Support at **support@outbackpower.com**.

To ensure warranty coverage, this contact must be within the effective warranty period. If service is required, the OutBack Technical Support representative will issue a Return Material Authorization (RMA) number.

Troubleshooting

In the event of a Product failure, the customer will need to work with an OutBack Technical Support representative to perform the necessary troubleshooting. This is a required step before a return can be performed. Troubleshooting requires a qualified technician to be present at the site of the Product, with a quality voltmeter that measures both DC and AC. The OutBack representative will request voltmeter readings, Product error messages, and other information. Many, many problems can be resolved on-site. If the customer is not willing or able to provide these readings (or is not willing or able to visit the site), and the Product is found to have no problems upon return, OutBack may choose to charge additional labor and handling fees up to \$180.00 U.S.

Return Material Authorization (RMA)

A request for an RMA number requires all of the following information:

Product model and serial number;

1. Proof-of-purchase in the form of a copy of the original Product purchase invoice or receipt confirming the Product model number and serial number;
2. Description of the problem; and
3. Shipping address for the repaired or replacement equipment.

Upon receiving this information, the OutBack representative can issue an RMA number.

Returning Product to OutBack

After receiving the RMA number, the customer must pack the Product(s) authorized for return, along with a copy of the original purchase invoice and warranty certificate, *in the original Product shipping container(s) or packaging providing equivalent or reasonable protection*. The RMA number must be written on the outside of the packaging where it is clearly visible.

If Product is within the warranty period, OutBack will cover pre-paid shipping with prior arrangement.

The Product(s) must be shipped back to OutBack Power Technologies in their original or equivalent packaging, to the following address:

OutBack Power Technologies

RMA # _____
6115 192nd Street NE
Arlington, WA 98223 USA

The customer must insure the shipment, or accept the risk of loss or damage during shipment. If a shipping box is needed for return of a Product, OutBack will send a shipping box upon request.



IMPORTANT:

OutBack is not responsible for shipping damage caused by improperly packaged Products, the repairs this damage might require, or the costs of these repairs.

If, upon receipt of the Product, OutBack determines the Product or Product part is defective and that the defect is covered under the terms of this Warranty, OutBack will then, and only then, ship a repaired or replacement Product or Product part to the purchaser freight prepaid, non-expedited, using a carrier of OutBack's choice, where applicable.

If Product fails in ninety (90) or fewer days from original purchase date, OutBack will replace with a new Product. If Product fails after ninety (90) days and up to expiration of warranty, OutBack will, at its discretion, either repair and return a Product, or ship a replacement Product. OutBack will determine whether a Product is to be repaired or replaced in accordance with Product age and model. OutBack will authorize advance shipment of a replacement based on Product age and model.

In cases where an OutBack dealer or distributor replaces a Product more than ninety (90) days old with a new Product, OutBack will NOT compensate that dealer or distributor with new stock unless the exchange was authorized in advance by OutBack.

Out of Warranty

If Product is out of warranty, OutBack will repair and return Product for a fee. Alternately, if applicable, upon request, OutBack will advance-ship replacement parts for a fee.

If a shipping box is needed for return of out-of-warranty Product, OutBack will send a shipping box upon request. The customer is responsible for paying shipping to OutBack.

The warranty period of any repaired or replacement Product or Product part is ninety (90) days from the date of shipment from OutBack, or the remainder of the initial warranty term, whichever is greater.

This Warranty is void for any Product that has been modified by the customer without authorization by OutBack. A Product with a voided warranty will be treated the same as one with an expired warranty.

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