



**FX SERIES
INVERTER/CHARGER
FX/ VFX/GTFX/GVFX/MOBILE
Installation Manual**

Warranty Introduction

Dear OutBack Customer,

Thank you for your purchase of OutBack products. We make every effort to assure our power conversion products will give you long and reliable service for your renewable energy system.

As with any manufactured device, repairs might be needed due to damage, inappropriate use, or unintentional defect. Please note the following guidelines regarding warranty service of OutBack products:

- Any and all warranty repairs must conform to the terms of the warranty.
- All OutBack equipment must be installed according to their accompanying instructions and manuals with specified over-current protection in order to maintain their warranties.
- The customer must return the component(s) to OutBack, securely packaged, properly addressed, and shipping paid. We recommend insuring your package when shipping. Packages that are not securely packaged can sustain additional damage not covered by the warranty or can void warranty repairs.
- There is no allowance or reimbursement for an installer's or user's labor or travel time required to disconnect, service, or reinstall the damaged component(s).
- OutBack will ship the repaired or replacement component(s) prepaid to addresses in the continental United States, where applicable. Shipments outside the U.S. will be sent freight collect.
- In the event of a product malfunction, OutBack cannot bear any responsibility for consequential losses, expenses, or damage to other components.
- Please read the full warranty at the end of this manual for more information.

About OutBack Power Systems

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

Notice of Copyright

FX Series Inverter/Charger FX/VFX/GTFX/GVFX/MOBILE Installation Manual © 2008 All rights reserved.

Disclaimer

UNLESS SPECIFICALLY AGREED TO IN WRITING, OUTBACK POWER SYSTEMS:

(a) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN ITS MANUALS OR OTHER DOCUMENTATION.

(b) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSS OR DAMAGE, WHETHER DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION. THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK.

Contact Information

OutBack Power Systems

19009 62nd Ave. NE

Arlington, WA 98223 Phone (360) 435-6030 • Fax (360) 435-6019 www.outbackpower.com

Date and Revision • June 2008 REV B

TABLE OF CONTENTS

Welcome to the OutBack Power Systems FX Series Inverter/Charger System	2
FX Series Inverter/Charger Models.....	2
Parts Included.....	2
Safety Instructions.....	3
System Protection.....	5
DC Wiring Origination.....	5
AC Wiring Origination.....	6
AC Wiring Compartment Board.....	6
Low Voltage Terminals.....	7
AC and DC Grounding Requirements.....	8
FX Parts and Accessories.....	9
Mounting.....	10
Wire Connections.....	11
AC	11
DC	12
Battery Wiring Samples.....	13
AC Wiring Notes for the Non-Mobile FX.....	20
AC Wiring Notes for the Mobile FX.....	21
Low Voltage Wiring.....	22
Inverter and On/Off.....	22
Auxiliary Output (AUX+ / AUX-).....	23
XCT+ / XCT-.....	23
RTS, MATE/HUB Wiring.....	24
System Installation.....	25
Single FX System.....	25
Series or Series Parallel Dual FX Configuration	26
Paralleled Dual FX System.....	28
Series/Parallel Quad FX System	29
3-Phase System.....	31
Mobile Single FX.....	33
Generator Interfaces.....	34
Mobile FX Information.....	35
Installation Check List.....	36
Appendix Ratings.....	37-44
Voltage, Current, and Frequency Ranges	45-47
Maximum Overcurrent Protection Ampacity	48
FX Default Values	49
Wire Sizes.....	50
Maintenance.....	51
Warranty.....	52-53
Product Registration.....	55
10 Year Limited Warranty (California)	55-56
10 Year Warranty Registration (California)	57

Welcome to the OutBack Power Systems FX Series Inverter/Charger System

The FX Series Inverter/Charger offers a complete power conversion system—DC to AC, battery charging, and an AC transfer switch—and can be used as a stand-alone or back-up application. It is designed for indoor or enclosed locations.

OutBack Power Systems does everything possible to assure the components you purchase will function properly and safely when installed as instructed according to local and national electrical codes (NEC). Please read all of the following instructions and the instructions that come with any other OutBack components that make up your power system. Further instructions on individual FX set-ups as well as systems assemblies are included with the FLEXware manuals.

- The non-Mobile FX is ETL listed to UL1741 (Inverters, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources).
- All Mobile FX Series Inverter/Chargers are ETL listed to UL 458.

The *FX and VFX Series Inverter/Charger Installation Manual* covers the following information:

- Safety
- FX parts, standard and optional
- Initial inspection of the component
- Preparing the mounting surface
- Fastening the FX to the mounting surface
- General electrical information



FX Series Inverter/Charger Models

Sealed Units (designed for harsher environments, but still require enclosed protection)

- FX2012 T (12 VDC/2000 VA)
- FX2012 MT (12 VDC/2000 VA)
- GTFX2524 (24 VDC/2500 VA)
- FX2524 T (24 VDC/2500 VA)
- FX2524 MT (24 VDC/2500 VA)
- GTFX3048 (48 VDC/3000 VA)
- FX3048 T (48 VDC/3000 VA)
- FX2532 MT (32 VDC/2500 VA)
- (MT= Mobile GT= Grid-Tie)

Vented Units (designed for protected environments)

- VFX2812 (12 VDC/2800 VA)
- VFX2812 M (12 VDC/2800 VA)
- GVFX3524 (24VDC/3500 VA)
- VFX3524 (24 VDC/3500VA)
- VFX3524 M (24 VDC./3500 VA)
- GVFX3648 (48 VDC/3600 VA)
- VFX3648 (48 VDC/3600VA)
- VFX3232 M (32 VDC/3200 VA)

Each model FX has a single phase output marked with this symbol: 
Each inverter puts out a sine wave waveform marked with this symbol: 

Parts Included

- One FX Series Inverter/Charger
- One “WARNING ELECTRICAL SHOCK” sticker to place on the exterior of the FX
- One packet of silicone grease to protect CAT 5 cable connections
- One installation manual
- One programming manual
- One Turbo Kit (sealed units)
- One DC Wiring Cover or DCC (vented units)



IMPORTANT SAFETY INSTRUCTIONS

READ FIRST!

SAVE THESE INSTRUCTIONS

Read all instructions and cautionary markings on the FX, the batteries and all appropriate sections of this installation and user manual as well as other component manuals before using the system.

Be cautious around electricity, electrical components, and batteries. Shocks, burns, injury, and even death can occur if an installer comes in contact with electricity.

Install all components and wiring according to national and local electrical and building codes. This includes:

- Submitting a plan to the local building department
- Passing inspection
- Requiring a licensed electrician to do the work when mandated

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

Use only the recommended DC and AC wire sizes or greater. Be sure all wires are in good condition.

Install the FX in a dry location, preferably indoors.



- Install the FX in a shaded area out of direct sun light for best operation.
- For installations where the FX may be exposed to water spray, a sealed FX must be used and mounted either with the base down (shelf mounting) or with the AC wiring compartment facing down (wall mounting).
- If mounted with the base down, water cannot be allowed to accumulate around the FX's base. There is a drainage system on the base of the FX to dispel condensation.
- If submerged, water can enter this drain and cause failure.
- The Vented FX (VFX) must be installed in a weather-proof enclosure or enclosed area. It is not designed for exposure to water or excessive wind-blown dust and debris.

INITIAL INSPECTION

Your FX is stoutly packaged for secure shipping. Please inspect the packaging and component for damage prior to installation.

WARNING: WORKING NEAR LEAD ACID BATTERIES CAN BE DANGEROUS.
BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION.

Design the battery enclosure to prevent accumulation and concentration of hydrogen gas in “pockets” at the top of the enclosure. Vent the battery compartment from the highest point to the outside. A sloped lid can also be used to direct the flow of hydrogen to the vent opening.


CAUTION


To reduce risk of injury, charge only deep-cycle lead acid, lead antimony, lead calcium, gel cell or absorbed glass mat type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage. Never charge a frozen battery.

PERSONAL PRECAUTIONS

- Someone should be within range of your voice to come to your aid if needed.
- Keep plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
- Wear complete eye protection. Avoid touching eyes while working near batteries. Wash your hands with soap and warm water when done.
- If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters an eye, flood the eye with cool running water at once for at least 15 minutes and get medical attention immediately following.
- Baking soda neutralizes lead acid battery electrolyte. Keep a supply on hand in the area of the batteries.
- NEVER smoke or allow a spark or flame in vicinity of a battery or generator.
- Be extra cautious to reduce the risk of dropping a metal tool onto batteries. It could short-circuit the batteries or other electrical parts which can result in fire or explosion.
- Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery or other electrical current. A battery can produce a short circuit current high enough to weld a ring or the like to metal, causing severe burns.

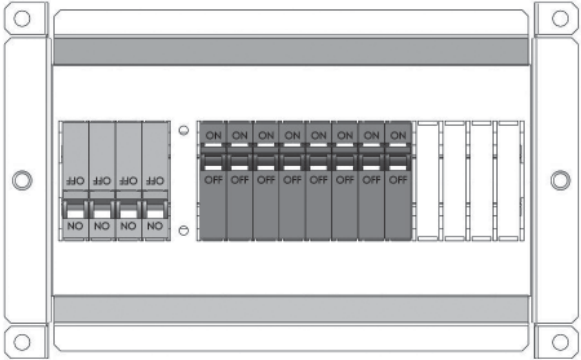
PLEASE NOTE THE FOLLOWING SYMBOLS:

 Pertains to a Grid-Tie FX

 Pertains to a Mobile FX

SYSTEM PROTECTION

Electrical systems are designed to protect you, the wires, the components, and the devices served by the system.



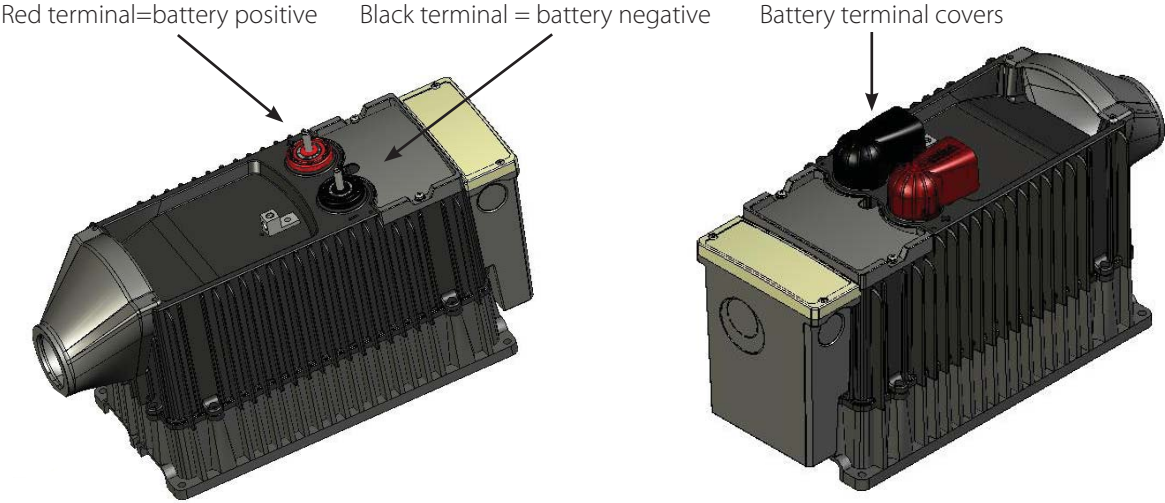
Each FX must be part of a permanently grounded electrical system (see page 8). Grounding protects people and equipment from electrical shock. Grounding must be done according to local and national electrical codes.

OutBack circuit breakers—rated at 100% duty cycle— protect wiring by limiting the amount of current entering a system. All wired electrical systems require circuit breakers or fuses for protection.

OutBack offers both breakers and fuses for over-current protection. If they are provided by other vendors, they must be properly rated.

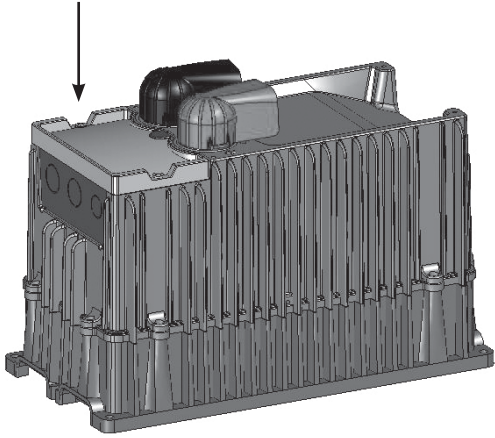
DC WIRING ORIGINATION

DC brass battery terminals with 8M x 1.00 stainless steel threaded studs

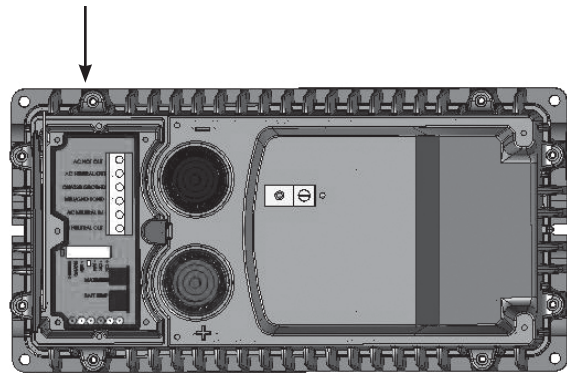


AC WIRING ORIGINATION

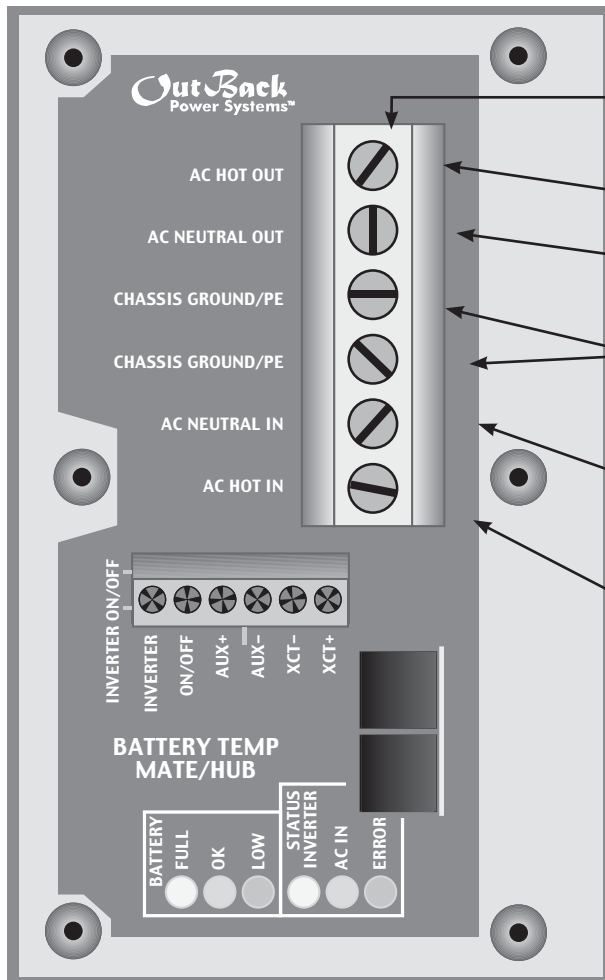
Lexan cover protects AC Wiring
Compartment Board



AC Wiring Board



AC WIRING COMPARTMENT BOARD



AC Terminal Block--secures AC connections to the FX using set screws

AC HOT OUT supplies power to the loads.

AC NEUTRAL OUT acts as neutral leg for loads supplied by the FX.

CHASSIS GROUND connections are common and act as grounds for both the incoming and outgoing AC circuits.

AC NEUTRAL IN acts as the neutral leg for AC power supplied by either the grid or a generator to the FX.

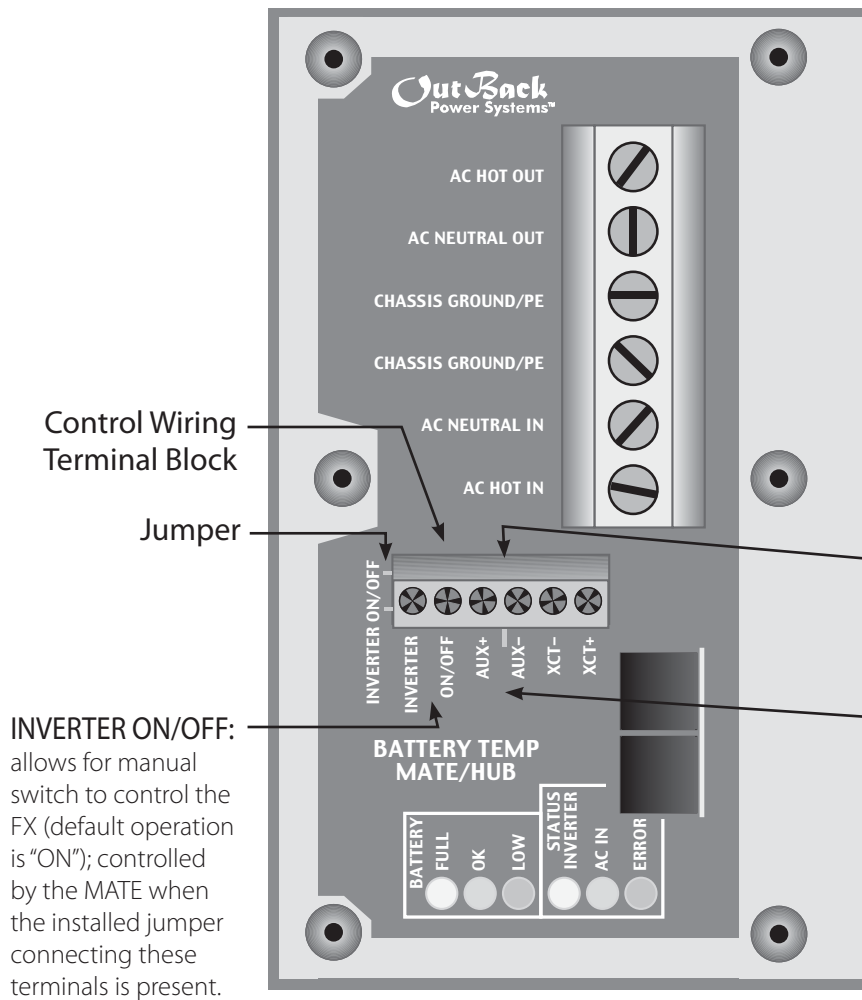
AC HOT IN connects incoming AC from the grid or a generator to the FX. This AC is used to run loads and recharge batteries.

M

NOTE: "CHASSIS GROUND" in the AC terminal block reads as "NEU/GROUND BOND" ON FX MOBILE SERIES (see page 21).

NOTE: 6 AWG (4.11 mm) is the largest wire size the AC Wiring Compartment Board can accommodate.

LOW VOLTAGE TERMINALS



Control Wiring Terminal Block

Jumper

INVERTER ON/OFF: allows for manual switch to control the FX (default operation is "ON"); controlled by the MATE when the installed jumper connecting these terminals is present.

NOTE: Keep Control Wiring Terminal Block screws tight and the block itself secured tightly to AC Board. Otherwise, the FX can malfunction. The Terminal Block can be unplugged for easier wire installation and removal/reinstallation of the FX.

AUX OUTPUT (AUX+/AUX-): 12VDC at 0.7 amps (8.4 watts) maximum is available at these terminals; the AUX's default is to drive cooling fans or the Turbo Fan.

XCT+/XCT- are non-operational terminals (do not connect).

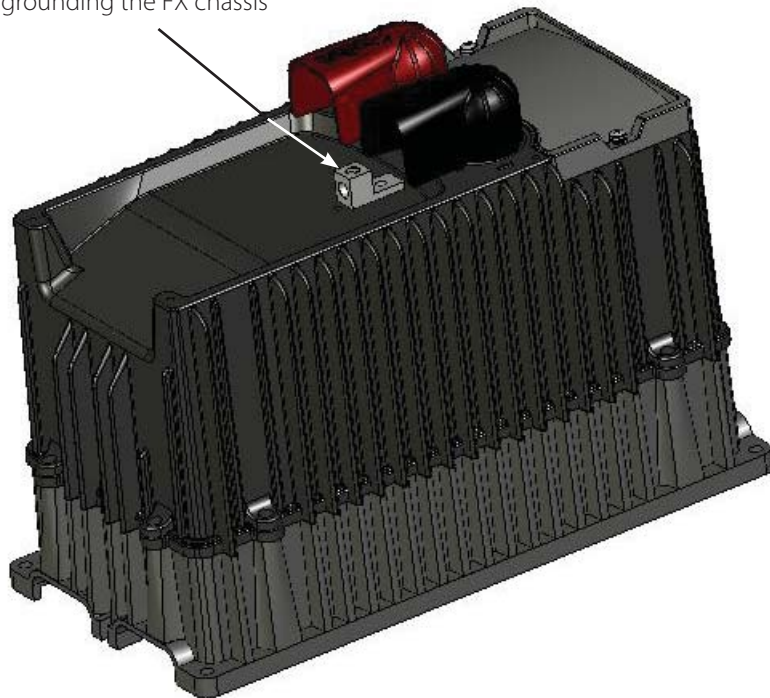
AC AND DC GROUNDING REQUIREMENTS

- Connect only to a grounded, permanent wiring system. Ensure there is only one neutral-ground connection in the system at any time. Some codes require this connection be made at the main panel only.
- Some generators have their own neutral ground connection. If a generator is used, its neutral-ground connection will need to be disengaged for proper system operation.
- For all installations, the negative battery conductor should be bonded to the grounding system at one (and only one) point in the system.
- OutBack products are not designed for use in a positive grounded system. Please contact OutBack Technical Support for further information.

The equipment ground on each is marked with this symbol:



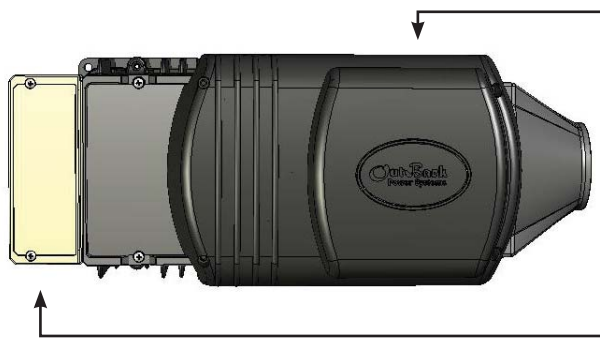
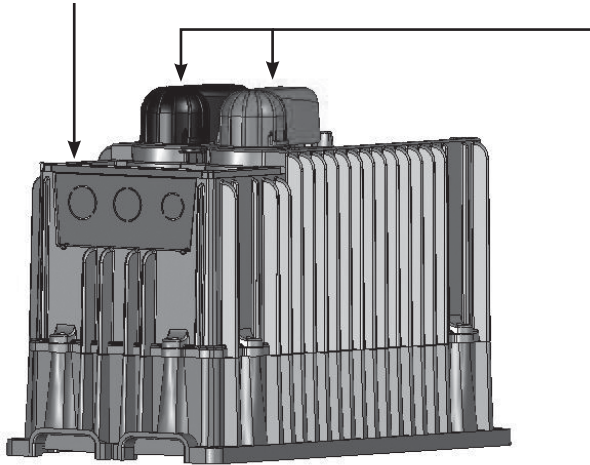
Box lug for grounding the FX chassis



FX PARTS AND ACCESSORIES

AC CONDUIT PLATE*

- AC conduit connects to the AC Conduit Plate for installations which do not utilize an optional FW-ACA.



BATTERY TERMINAL COVERS

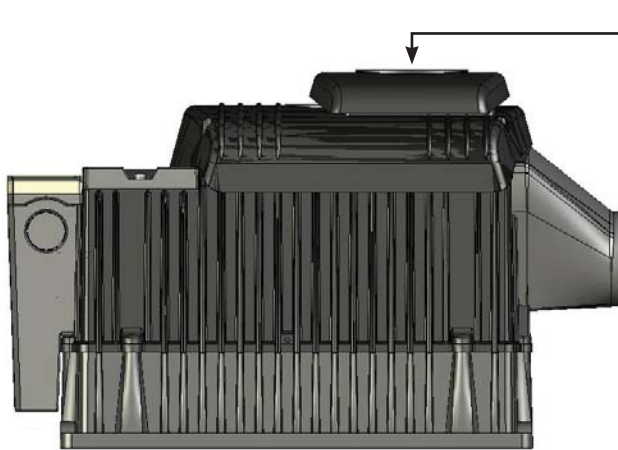
- The caps are made of stiff plastic with a snap-on design; remove them carefully using a flat-blade screwdriver inserted into the slots on the sides of each cover.
- DC conduit may be required for exposed installations.
- The DCA cover option (see below) allows conduit connection.
- Always keep the battery terminal covers installed.

DCC (DC COMPARTMENT COVER)

- Covers the DC terminal area and provides space to mount other components such as a DC current shunt
- Can be used with or without the DCA
- This is an optional accessory.

FW-ACA (AC CONDUIT ADAPTER)

- Extends the AC wiring compartment
- Connects to OutBack's FLEXware enclosures
- Protects and secures flexible cable with strain relief
- Houses the FLEXware Surge Protector
- Knockouts are intended for cables/strain relief
- This is an optional accessory.



TURBO FAN COVER

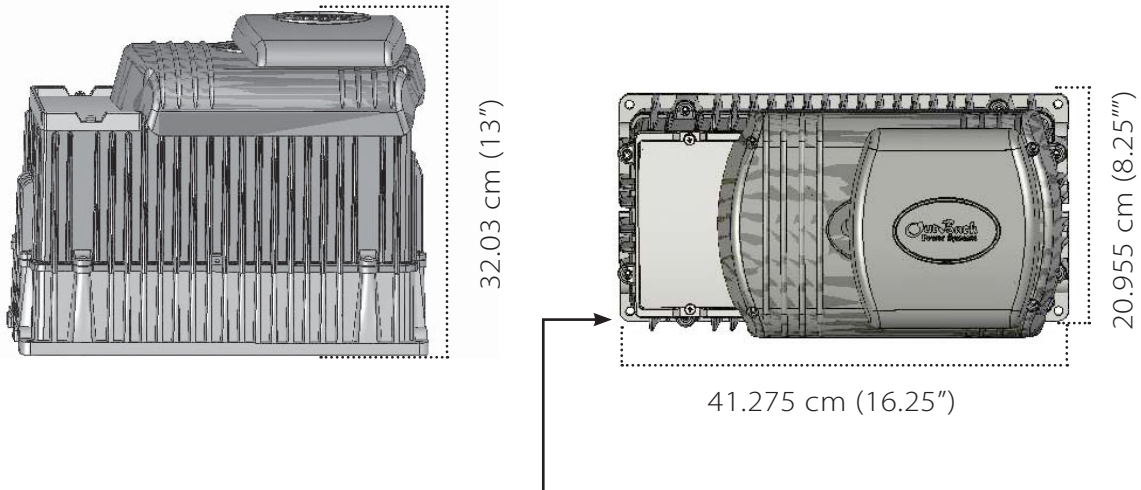
- Included in place of a DCC on sealed FXs

DCA (DC CONDUIT ADAPTER)

- Allows the connection of two-inch TSC (Trade Size Conduit) to the FX
- Connects to OutBack's FLEXware enclosures



*NOTE: A GTFX requires an OutBack FLEXware Surge Protector per the UL 1741 listing.



- Insert appropriate fasteners at all four corners of the FX for a secure installation.
- Weight varies from 56-62.6 pounds (25.40 - 28.395 kg) depending on the model

MOUNTING

- The FX Series Inverter/Charger is approved for indoor or enclosed protected mounting only.
- An FX must be secured with appropriate fasteners to a sturdy mounting surface capable of supporting its weight. It is easier for two people to install the FX due to its weight.
- OutBack FXs can be mounted in any position, but they perform better in locations offering plenty of air circulation.
- **NOTE:** If using an OutBack FLEXware Mounting Plate, avoid large air gaps behind the plate which can result in louder mechanical noise during inverting/charging under heavy loads.
- Due to the variance in other mounting methods, OutBack only endorses the use of FLEXware or previous versions of its mounting plate for installing the FX and associated system components using M6 X 20mm machine screws (stainless steel for FLEXware and self-tapping for older mounting plates), one per corner. Follow the instruction manual that comes with each mounting system.
- If mounting the FX on other surfaces such as plywood, wall studs, or masonry, use appropriate fasteners to support approximately its weight. OutBack cannot be responsible for damage to the FX if it is attached with inadequate fasteners.
- Install and secure each FX before attaching any wiring.

WIRE CONNECTIONS

NOTE: A system's individual voltage requirements (120 single phase, 120/240 split phase, or 3-phase) as well as how each FX is to function all determine how the FXs are wired. Each FX must be wired to the logical leg or phase of the system. Each FX must be programmed or "stacked" according to this phase. Please see the *FX and VFX Series Inverter/Charger Programming Manual* before connecting any wires to or from the FX.

AC

Follow these steps to wire the FX to your system:

1. Shut all AC breakers off or remove any fuses before connecting any wiring.
2. Shut off all DC breakers, including the PV breakers.
3. With all power off, run lengths of 6 AWG (13.3 mm²) wire between the AC Wiring Compartment Board AC out terminals and sufficient over current protection via an AC circuit breaker whose ampacity matches or exceeds the maximum AC input current of the FX model used in the system (see FX product specifications). The breaker should be installed inside of a metal chassis such as OutBack's FLEXware series or an existing panel.
4. With the over current protection connected, run lengths of 6 AWG (13.3 mm²) wire between the AC Wiring Compartment Board AC IN terminals and the AC input breaker. The breaker should be installed inside of a metal chassis such as OutBack's FLEXware series or an existing panel. The AC input hot conductor must be supplied through an AC branch-rated circuit breaker whose ampacity matches or exceeds the maximum AC input current of the FX model used in the system (see FX product specifications)

M **NOTE:** Connect Mobile FX equipment to an AC circuit with 30 amp maximum branch-circuit over-current protection (as per NEC, ANSI/NFPA 70).



While 60 amp over-current protection reduces the risk of fire, for further reduction, do not connect a single FX to both hot legs of a 120-240 VAC AC load center having multi-wire (common neutral) branch circuits connected. Use either two FX Series Inverter/Chargers wired in a series configuration or an FW-X240 Auto Transformer.

DC

- Use crimped and sealed copper ring terminal lugs with 5/16" (.79 cm) hole or compression-type lug to connect battery cables to DC terminals. Soldered cable lugs are also acceptable.
- Use recommended cable sizes (see page 51) to reduce losses and ensure high performance of FX (smaller cables can reduce performance and possibly damage the unit).
- Keep cables together (e.g., using a tie-wrap) as much as possible.
- Ensure cables pass through the same knockout and conduit fittings to allow inductive currents to cancel.

TORQUE REQUIREMENTS

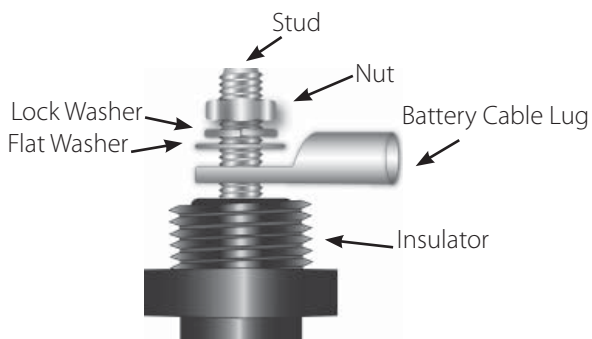
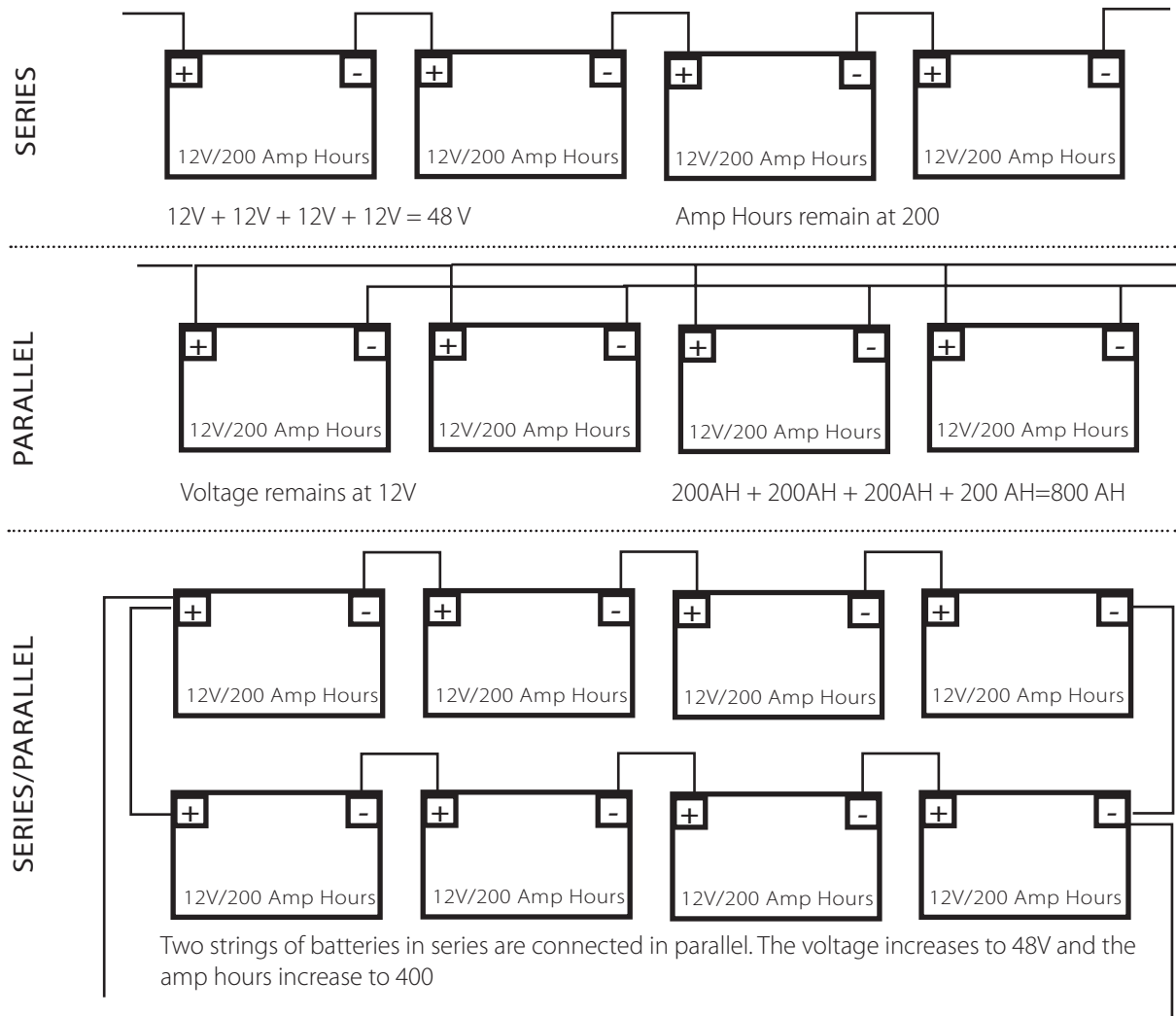
CONNECTION	TORQUE IN POUNDS/Nm
AC and PV breakers	to 22 inch-lbs/2.48 Nm
DC shunt	to 15 foot-lbs/20.4 Nm
DC battery connections	to 10 foot-lbs/13.6 Nm
FX's DC terminals	to 5 foot-lbs/3.38 Nm
FX's AC terminals	to 30 inch-lbs/3.38 Nm

Table 1 Torque Values for Installation

Battery Wiring Examples

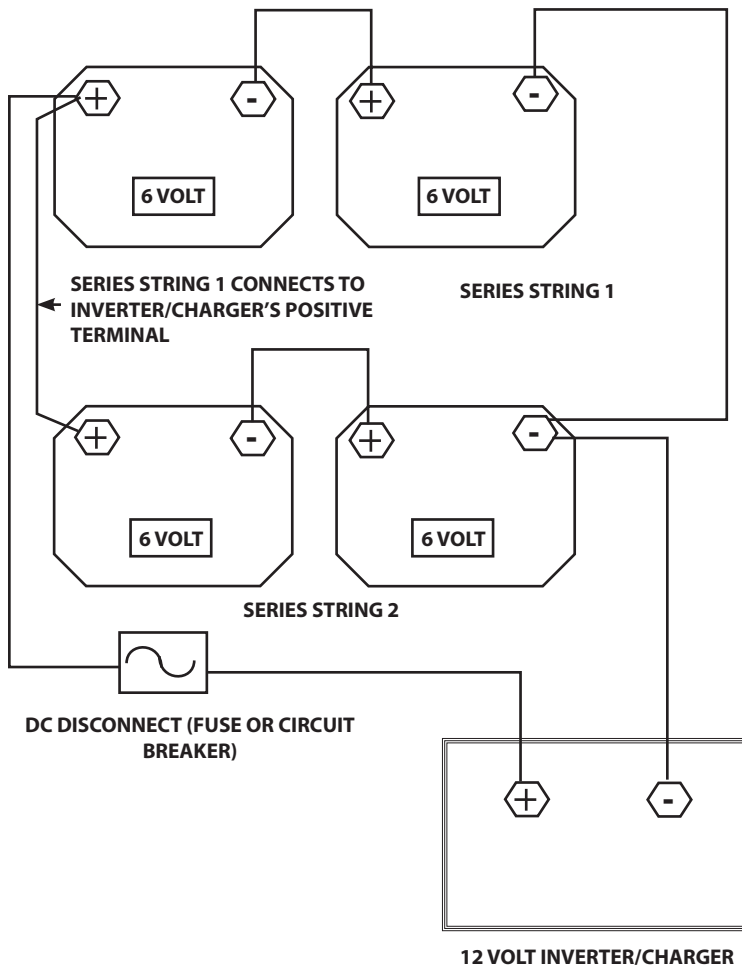
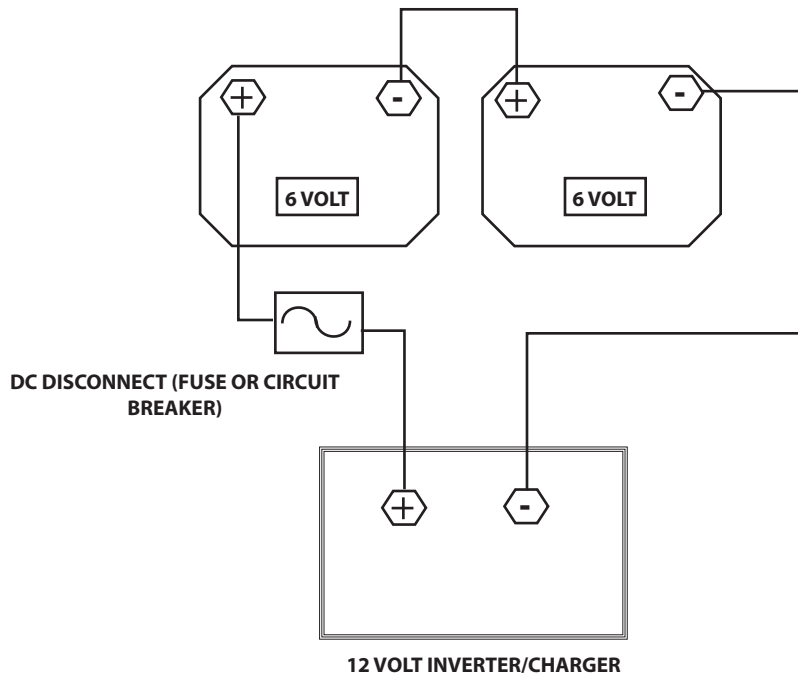
In renewable energy systems, batteries are connected to each other in one of three ways:

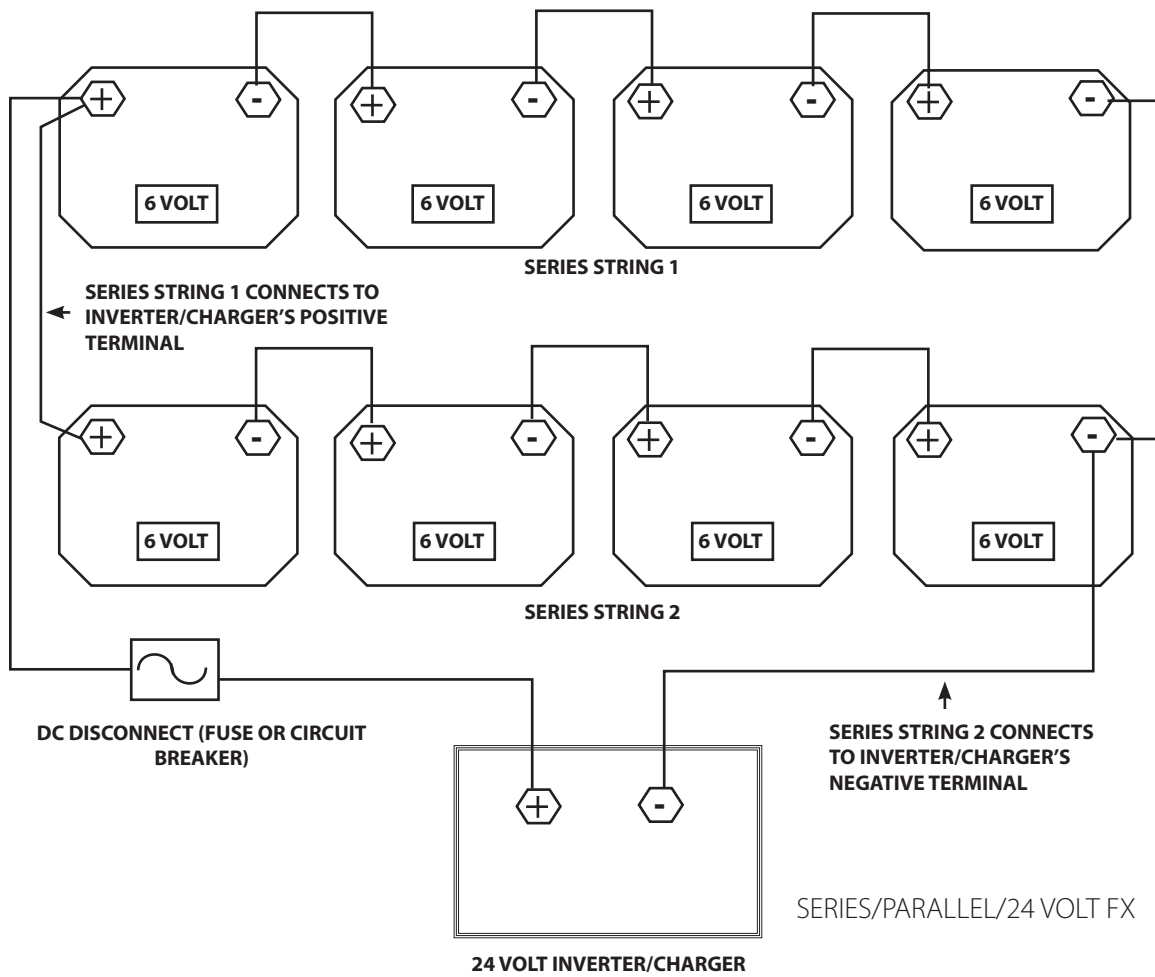
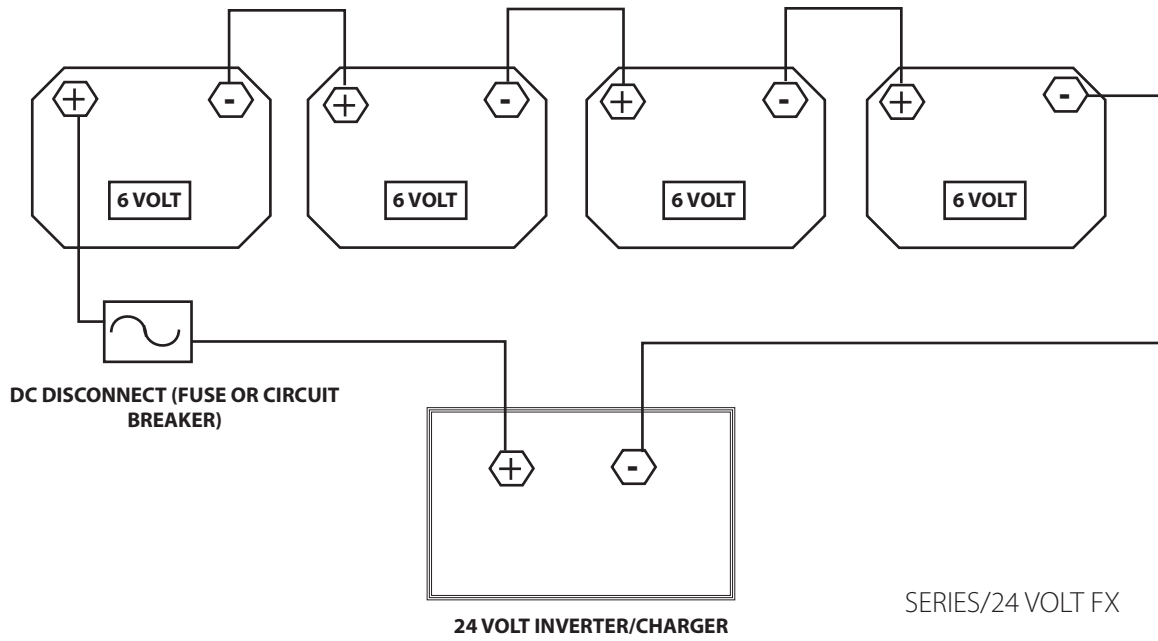
- Series (voltage increases, amperage stays the same as a single battery)
- Parallel (voltage stays the same as a single battery, amperage increases)
- Series/Parallel (both voltage and amperage increase)

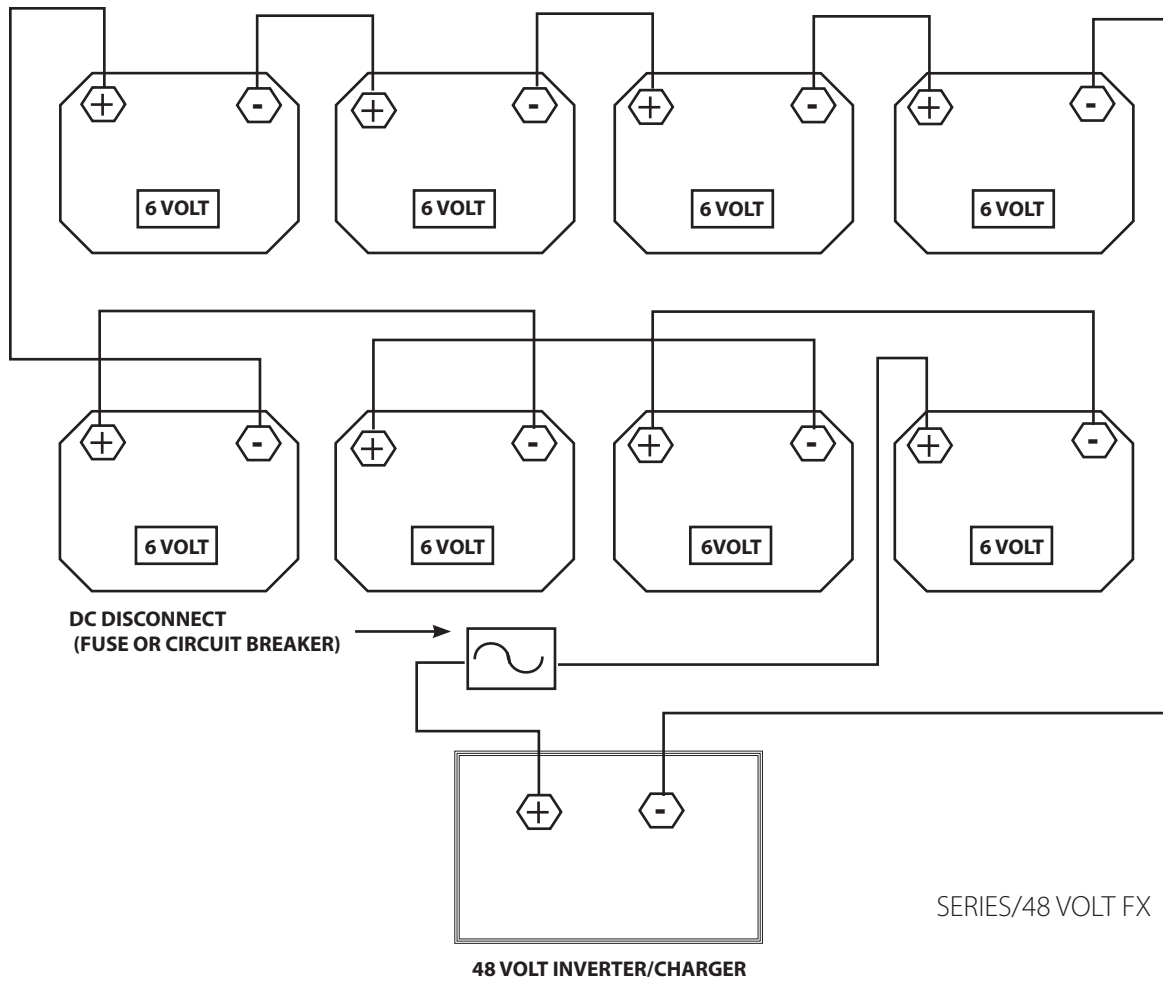


- Never install extra washers between the terminal mounting surface and the battery cable lug—the connection must be direct and secure.
- Always install breakers or fuses within the positive battery cable.
- Torque 2/0, (67.4 mm²) 4/0 (107 mm²), or larger code-approved cables rated 75°C or higher to 60-inch pounds/6.77Nm.

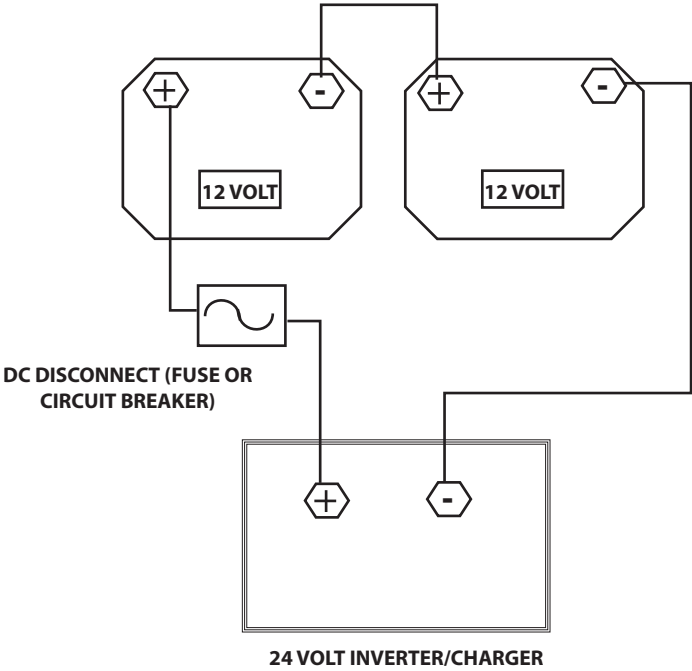
6V Battery Wiring Examples



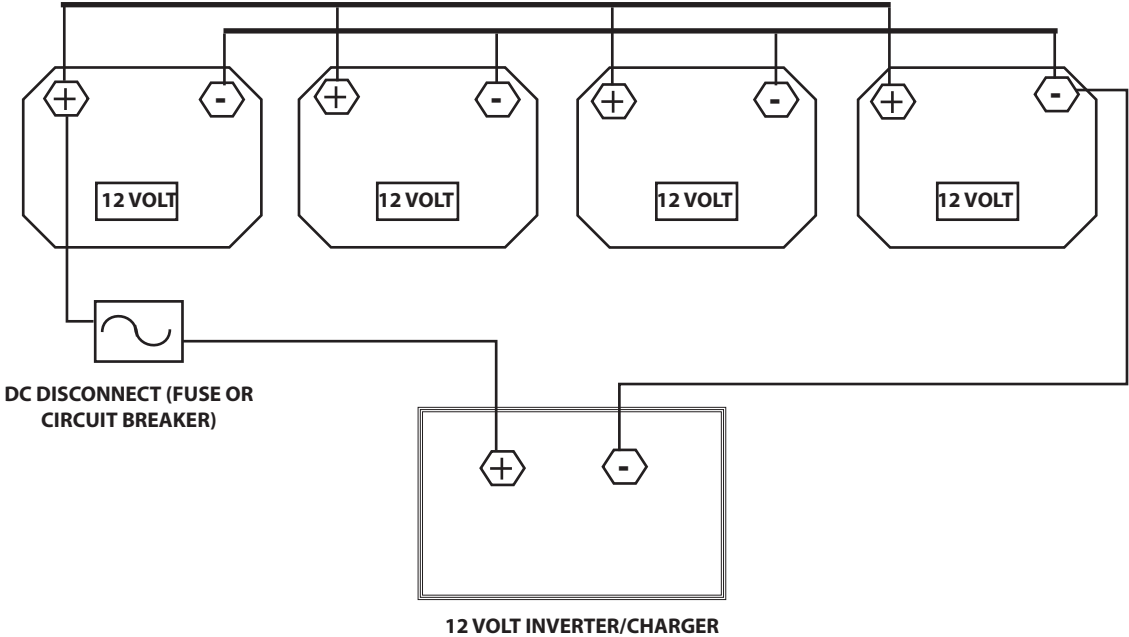




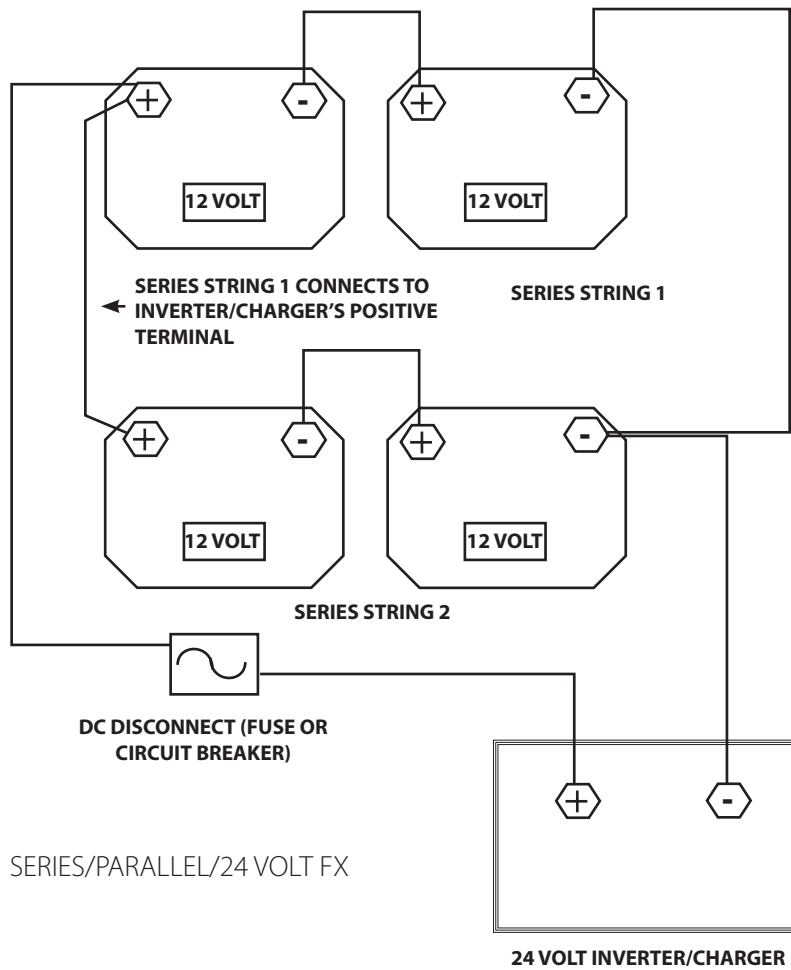
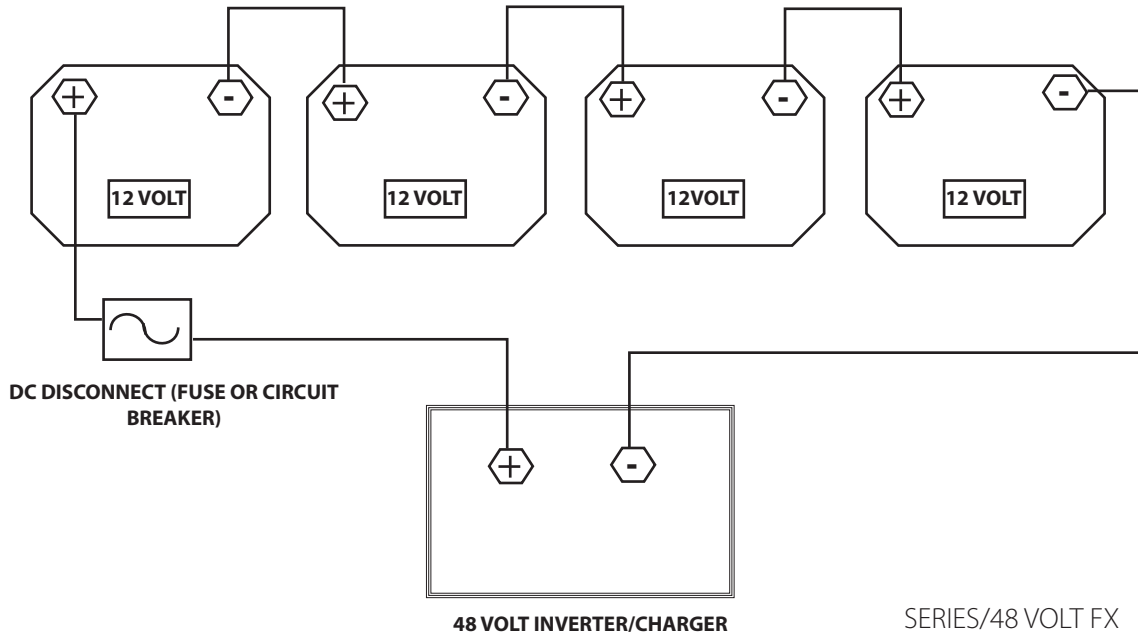
12V Battery Wiring Examples

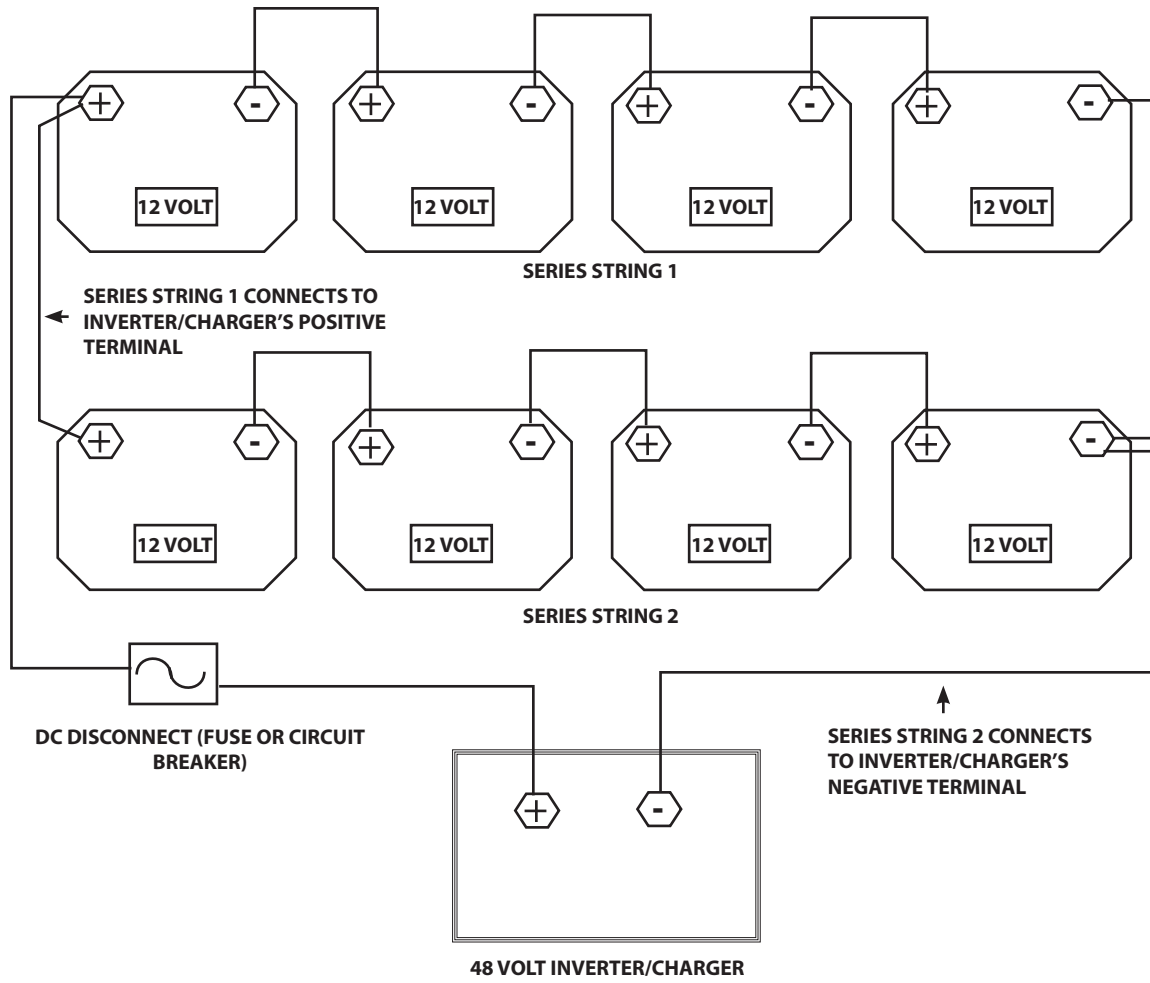


SERIES/24 VOLT FX



PARALLEL/12VOLT FX





SERIES/PARALLEL/48 VOLT FX

AC WIRING NOTES FOR THE NON-MOBILE FX

AC HOT OUT

- AC hot output conductor (black) wire gauge must be sized to the breakers and loads.

AC NEUTRAL OUT/AC NEUTRAL IN

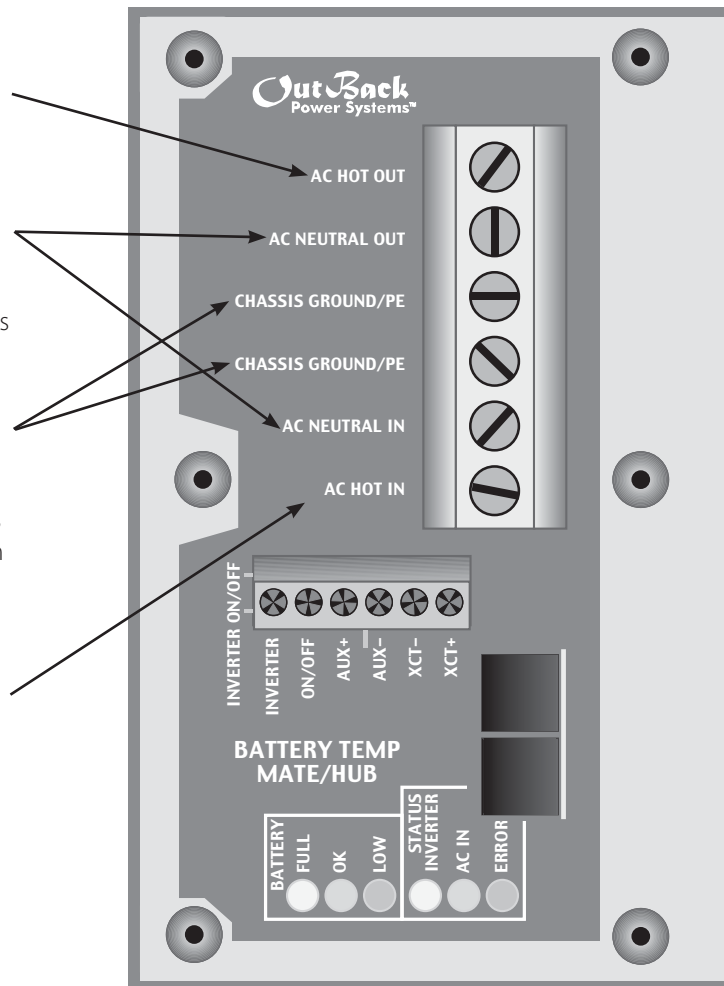
- Both neutral terminals are common with each other within the FX.
- Only one neutral needs to connect at the terminal if a separate common neutral bus bar is installed.

CHASSIS GROUND

- Both CHASSIS GROUND terminals are common within the FX.
- The AC input and AC output ground wires can connect to these terminals or one can be connected if a common ground bus bar is installed.

AC HOT IN

- The AC hot input conductor (black) must be supplied through a 60 amp maximum AC branch rated circuit breaker.
- 6 AWG (.184" or 4.11 mm) wire is recommended for the FX's AC transfer relay.



M AC WIRING NOTES FOR THE MOBILE FX

AC HOT OUT

- Supplies the AC hot output conductors through a 30 amp maximum AC branch rated circuit breaker using 10 AWG (.102" or 2.59 mm) wire and connect to the AC

AC NEUTRAL OUT/AC NEUTRAL IN

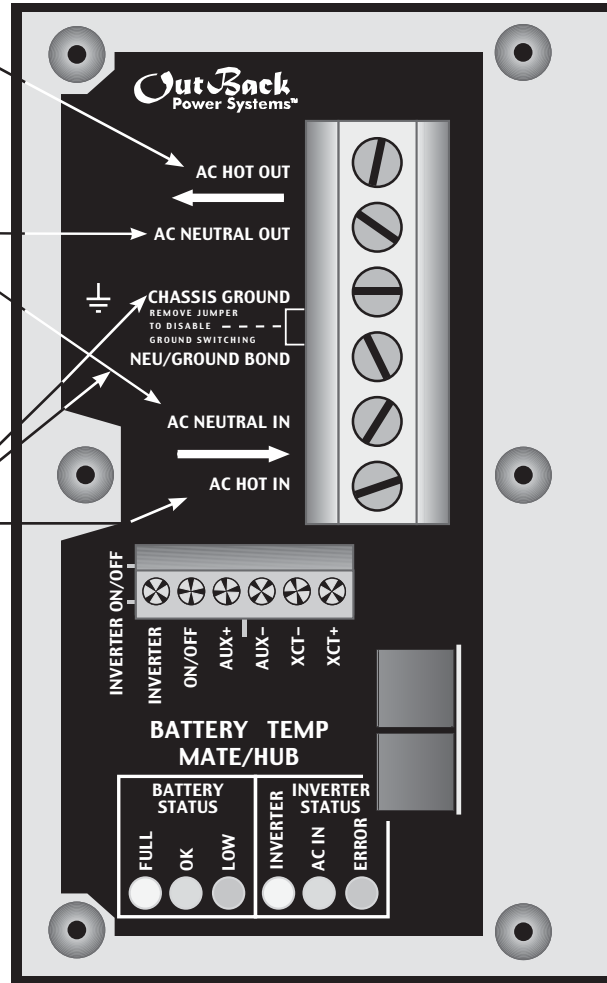
- Connects the AC neutral input conductor to the AC NEUTRAL IN terminal.
- Connects the AC neutral output conductor to the AC NEUTRAL OUT terminal.
- These terminals are common in the Mobile FX only when an AC source is applied.
- The NEUTRAL IN and NEUTRAL OUT conductors should not be common (connected in any way) prior to connection with a Mobile FX

CHASSIS GROUND

- Connects both the AC input and AC output ground conductors to the CHASSIS GROUND and NEU/GROUND BOND terminals.
- If there is only one Mobile FX in the system, leave the copper bus (provided) installed between the CHASSIS GROUND and NEU/GROUND BOND terminals. If there is more than one Mobile FX in the system, remove the copper bus from every Slave FX.

AC HOT IN

- The AC hot input conductor (black) must be supplied through a 30 amp maximum AC branch rated circuit breaker and connected to the AC HOT IN.
- 10 AWG (.102" or 2.59 mm) wire is required for the FX's AC transfer switch.



LOW-VOLTAGE WIRING

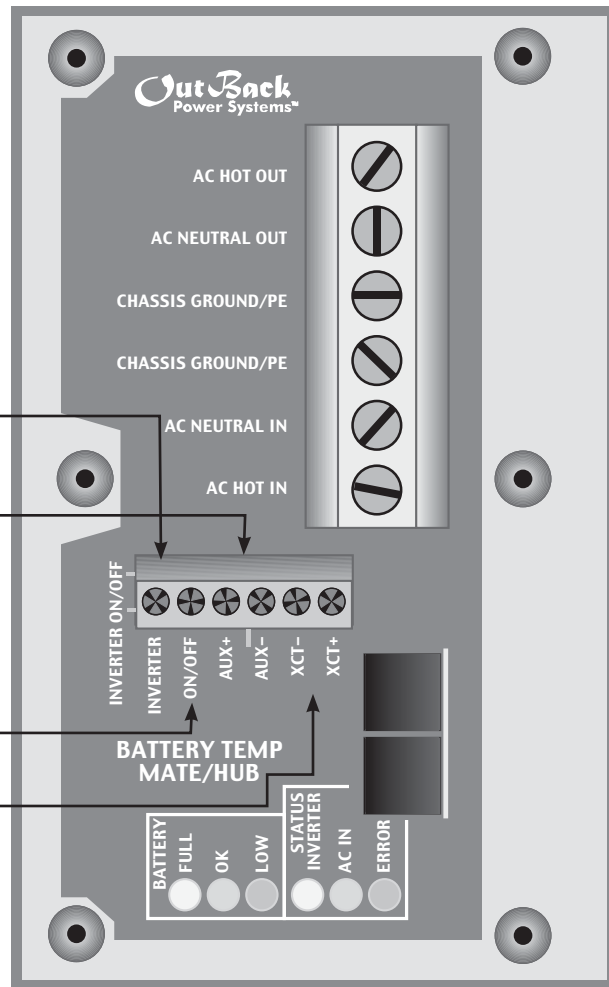
This six-position terminal block can be unplugged to make wiring easier and to simplify the removal and reinstallation of an FX. It must be securely and completely plugged in for proper FX functioning. Otherwise, operational errors can occur.

Control Wiring Terminal Block

12VDC at 0.7 amps (8.4 w) is available at the AUX+/AUX- terminals

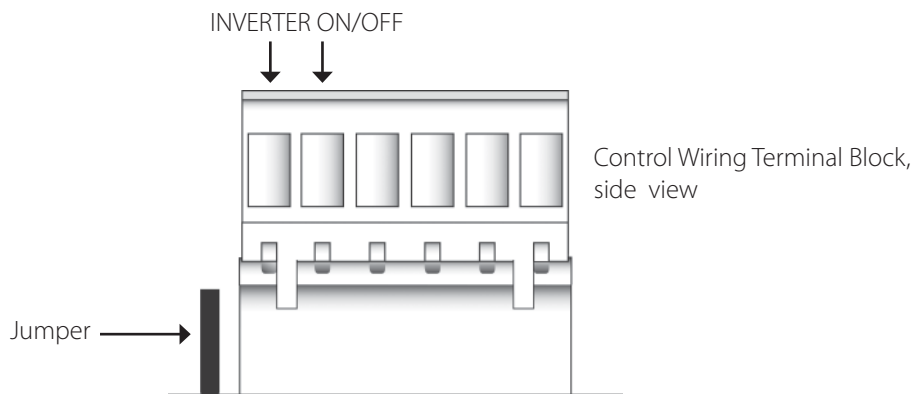
A switch can be wired to the INVERTER and ON/OFF terminals to manually control the FX

XCT+/XCT- are not operational



INVERTER and ON/OFF

- Replacing the pre-installed jumper (connecting the ON/OFF terminals) with a switch allows manual control of the FX.
- When a jumper is installed in either location, the inverter will be ON.
- When a switch is installed, the inverter is ON when the switch is closed and OFF when the switch is open.





Prior to installing an ON/OFF switch, if the FX's AC output is off, check that the jumper is present and well-connected before installing a switch. You want to confirm the system is in good working order.

Should you decide to install an OutBack MATE at a later date, bear in mind the installed switch overrides the control provided by the MATE if the switch is set to OFF. If the switch is set to ON, the MATE will function normally and control the inverter(s).

- When a system is ordered with a MATE, the MATE handles all FX ON/OFF functions.

AUXILIARY OUTPUT (AUX + / AUX -)

The Auxiliary output system uses the AUX + and AUX – terminals. It is programmed through the MATE to do a variety of tasks:

- The default use for these terminals drives the OutBack FX Turbo Kit or DC12-FAN fan for external cooling.

NOTE: These terminals should not be connected to any type of DC load greater than 0.7 amps.

- The FX includes internal electronic over-current protection for the AUX 12VDC output circuit which auto resets if it is short-circuited. No additional fuses are required.
- For automatic or advanced generator start functions, the Auxiliary Output can drive a 12V automotive relay for the two-wire starting circuitry of a generator. OutBack recommends a good quality gold-plated relay.

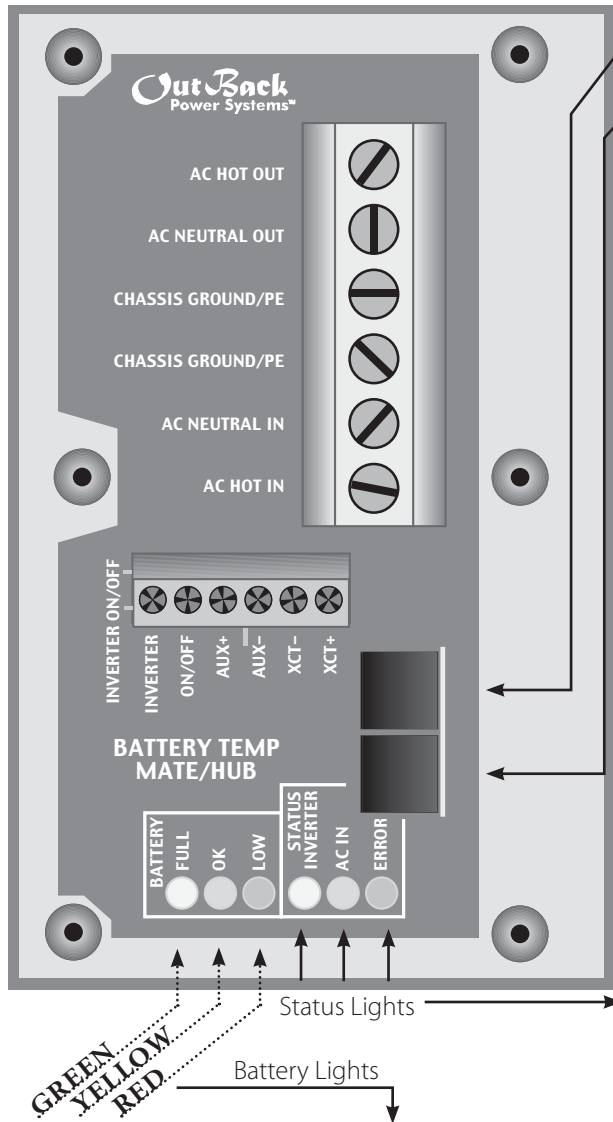
NOTE:

- (1) The FLEXnet DC comes with an internal relay for this use.
- (2) OutBack Power Systems does not support three-wire start generators; however, a three-wire to two-wire conversion kit is available from an electronic control manufacturer such as Atkinson Electronics (www.atkinson.com)
- (3) Either the MATE or the FLEXnet DC can be programmed for Auto-GenStart (please refer to component manuals for more information).

XCT + / XCT -

These terminals are not operational at this time.

RTS, MATE/HUB WIRING



- RJ-11 modular jack connects the RTS, the external battery temperature sensor.
- RJ-45 jack is used for external communications.
- RJ-11 modular jack connects RTS, the optional external battery temperature sensor.*
- RJ-45 jack connects MATE or HUB to FX using CAT5 cable.**

*When a HUB is used, plug the RTS into the Master FX, which should be plugged into HUB's Port 01. The RTS cable is folded and routed under the AC Wiring Compartment's Lexan cover, fitting into a small indentation in the aluminum casting between the battery terminals. ONLY USE THE OUTBACK RTS; OTHER BRANDS YIELD INCORRECT READINGS.

**If the system has multiple FXs and/or OutBack Charge Controllers, a HUB is required.

LED Color	LED Action	LED indicates
GREEN	GREEN	Inverter ON
	Flashing GREEN	Search mode or Slave power
	Off	Inverter OFF
YELLOW	Solid YELLOW	AC source is connected
	Flashing YELLOW	AC input live, waiting to connect to OBX-IC
	Off	No AC input present
RED	Solid RED	Fatal Error, contact OutBack Power Systems
	Flashing RED	Warning, a non-critical error has occurred

LED Color		12 VDC	24 VDC	48 VDC
GREEN	(FULL)	12.5 or higher	25.0 or higher	50.0 or higher
YELLOW	(OK)	11.5 to 12.5	23.0 to 25.0	46.0-49.6
RED	(LOW)	11.5 or lower	23.0 or lower	46.0 or lower

WARN(ING) Screens

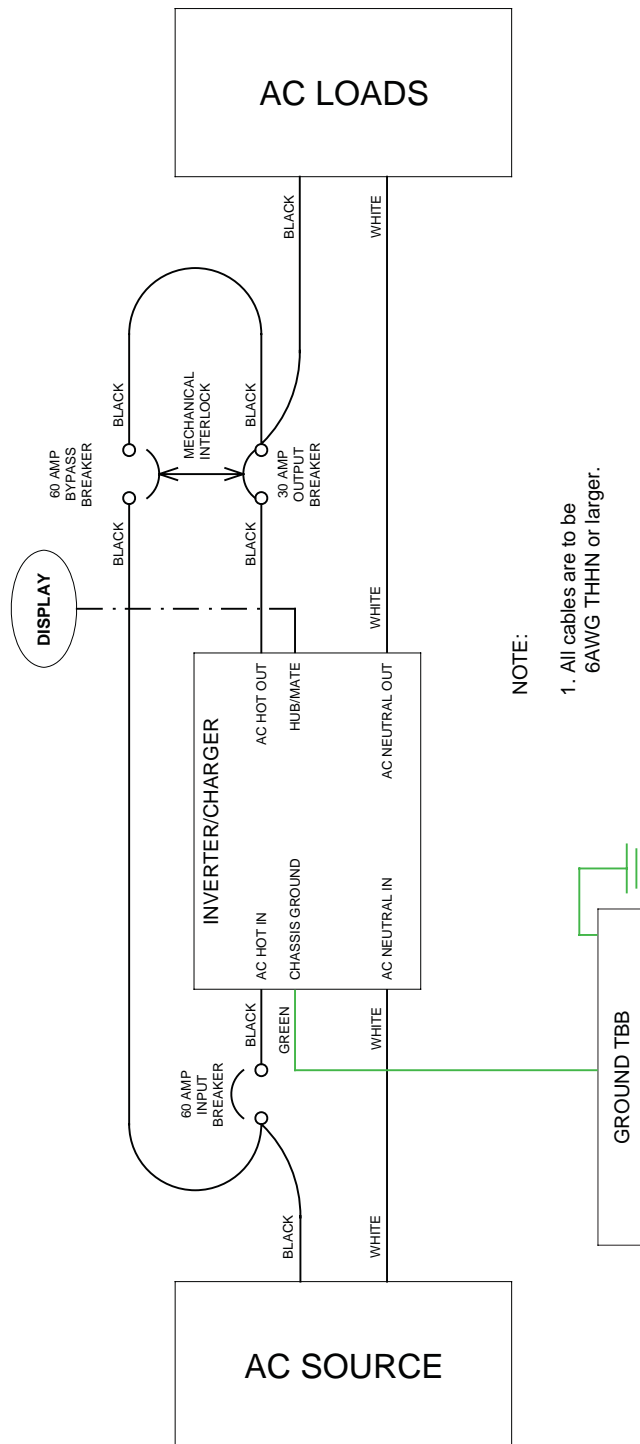
- acin freq too high: AC source is above 66 Hz (upper limit) and will be dropped if frequency gets much higher
- acin freq too low: AC source is under 54 Hz (lower limit) and will be dropped if frequency gets much lower
- acin voltage too high: AC source's voltage is over 140 VAC (default limit) and risks loss of FX connection
- acin voltage too low: AC source's voltage is under 108 VAC (default limit) and risks loss of FX connection
- acin input current exceeds max: AC loads are drawing more current than the rating of the FX allows
- temperature sensor fault: an internal FX temperature sensor is malfunctioning
- internal comm. error detected: there is a communication problem between the MATE and the FX
- internal fan failure detected: the FX's internal cooling fan is not operating properly
- airtemp: displays a numeric value representing the air temperature around the FX*
- fettemp: displays a numeric value representing the temperature of the FETs (Field Effect Transistors)*
- captemp: displays a numeric value representing the temperature of the ripple capacitors*

*These values are used for troubleshooting purposes. The higher the numerical value, the cooler the temperature.

SAMPLE INSTALLATIONS

SINGLE FX SYSTEM

- All non-Mobile FX AC wiring must handle 60 amps AC or more.
- A 60A input breaker must be used for a non-Mobile FX and a 30A input breaker for a Mobile FX.
- A single FX can continuously power 2.0kW to 3.6kW of loads depending on which model is used.



NOTE:

1. All cables are to be 6AWG THHN or larger.

SERIES or SERIES/PARALLEL DUAL FX CONFIGURATION

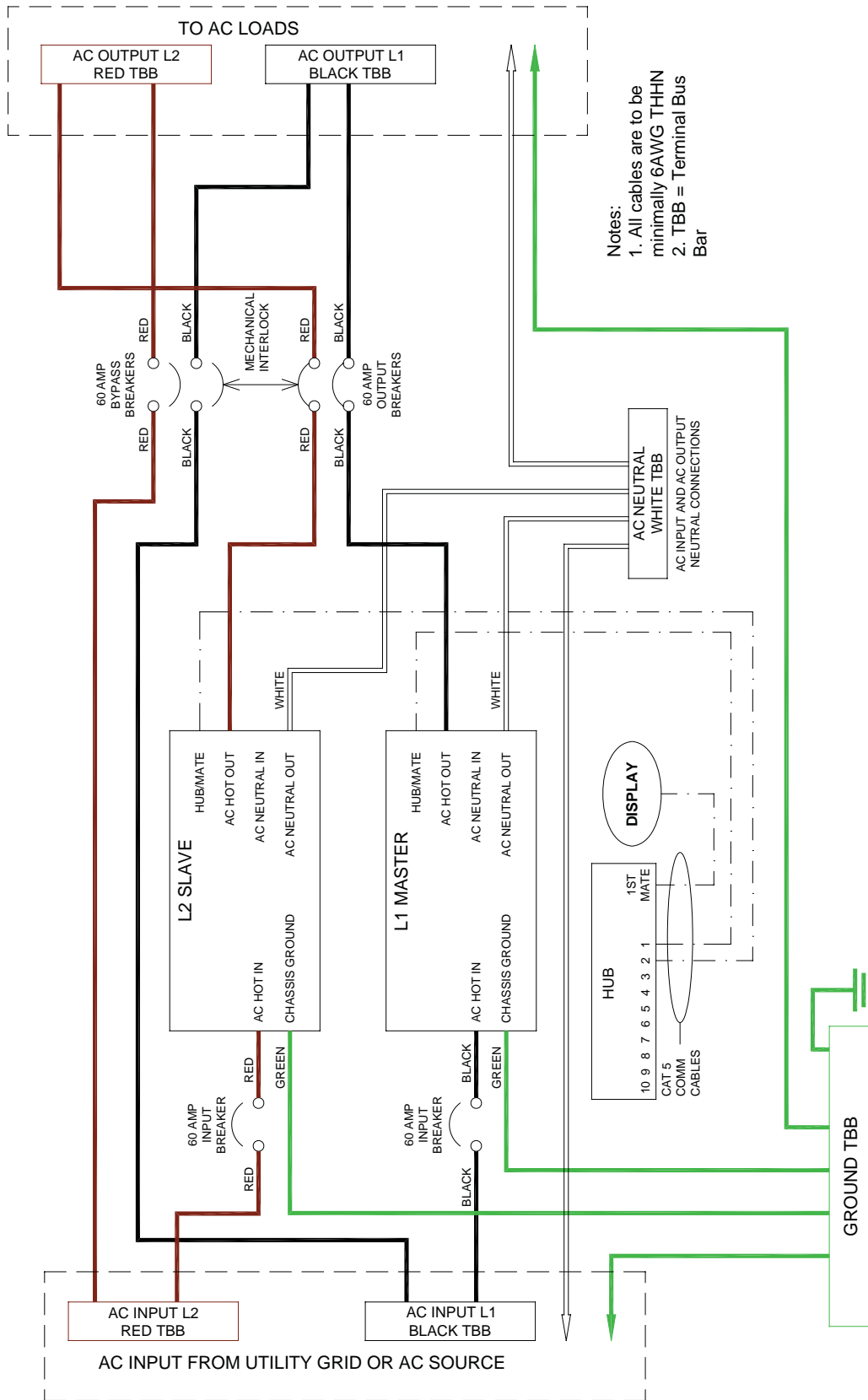
- This system can continuously power between 4.0kW and 7.2kW of loads depending on which model is used.
- All non-Mobile FX AC wiring must handle 60AAC or more.
- A Mobile FX requires 30A input breakers.

NOTE:

- Stacking FXs in series/parallel means there are FXs directly connected to two separate 120VAC output legs. These legs produce 240VAC between them (the series portion). This allows all of the FXs to power either of the 120VAC output legs (the parallel portion). Series/parallel stacking requires an FW-X240 Auto Transformer and must use "OutBack" stacking programming.
- When the FXs *are connected in series for 120/240 VAC, the FW-X240 Auto Transformer can be connected to the AC output; both FXs are then available on either 120VAC output circuit. This allows higher efficiency and better performance as heavy 120VAC loads are powered by both FXs. The FW-X240 Auto Transformer also allows the Master to power loads on either 120VAC output circuit with the Slave FX off, reducing idle power consumption and improving system efficiency.
- The Slave FX must be programmed through the MATE as a "Classic Slave" (series stacking, no FW-X240 Auto Transformer) or as "OB Slave L2" (series/parallel stacking, FW-X240 included)*. The FX connected to Port 01 of the HUB is always the Master (1-2ph MASTER)



*Grid-Tie FXs *cannot* be used with the FW-X240 Auto Transformer.



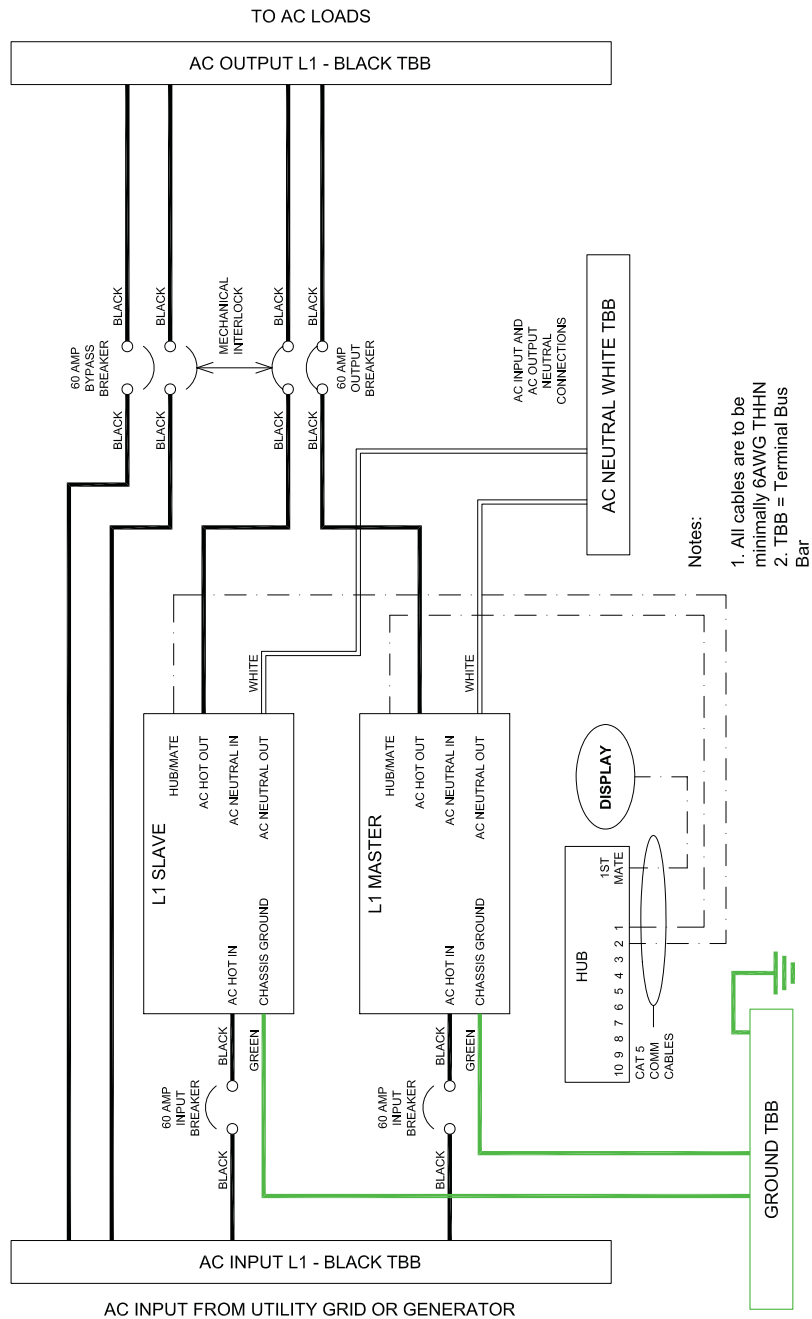
Series/Parallel Using Two FXs

PARALLELED DUAL FX SYSTEM

- All AC wiring from the AC source and to the AC loads must collectively handle 100 amps AC or more.
- All other AC wiring capacity must equal 60 amps AC (Mobile FX units must handle 30 amps AC).
- A paralleled dual FX system can continuously power 4.0 Kw to 7.2kW of loads depending on which model is used.

NOTE: Program the lowest-installed FX as Master (1-2ph MASTER) and the second FX as an OutBack L1 Slave (OB SLAVE L1)

GT Grid-Tie FXs cannot be used with this configuration.



Parallel/Dual System with Two FXs

SERIES/PARALLEL QUAD FX SYSTEM

- All AC wiring from the AC source and to the AC loads must collectively handle 120 amps AC or more.
- All other AC wiring must handle a capacity of 60 amps AC (Mobile FX AC wiring must handle 30 amps).
- This system can continuously power up to 14.4kW of loads depending on which model is used.
- Connecting more power than the continuous rating of the FX may cause breakers to trip or the FX to shut off its AC output.
- A HUB, MATE, and FW-X240 must be connected to successfully stack these FXs in series/parallel.

NOTES:

- Program the lowest-installed FX as the Master (1-2ph MASTER), the first Slave as an Outback L1 Slave (OB Slave L1), and the second and third Slaves as OutBack L2 Slaves (OB SLAVE L2) as shown in the *MATE User's Manual*.
- An FW-X240 Auto Transformer must be used when three or more FXs are series stacked.
 - ➔ When the FXs are connected in series for 120/240VAC, the FW-X240 Auto Transformer can be connected to the two AC output legs to provide all FX capacity to either of the 120VAC output circuits. This allows higher efficiency and better performance as heavy 120VAC loads are powered by all the FXs.
 - ➔ The FW-X240 Auto Transformer also allows the Master to power loads on either of the 120VAC output circuits with the Slave off. This reduces the idle power consumption and improves the system efficiency.



Grid-Tie FXs cannot be used with this configuration.

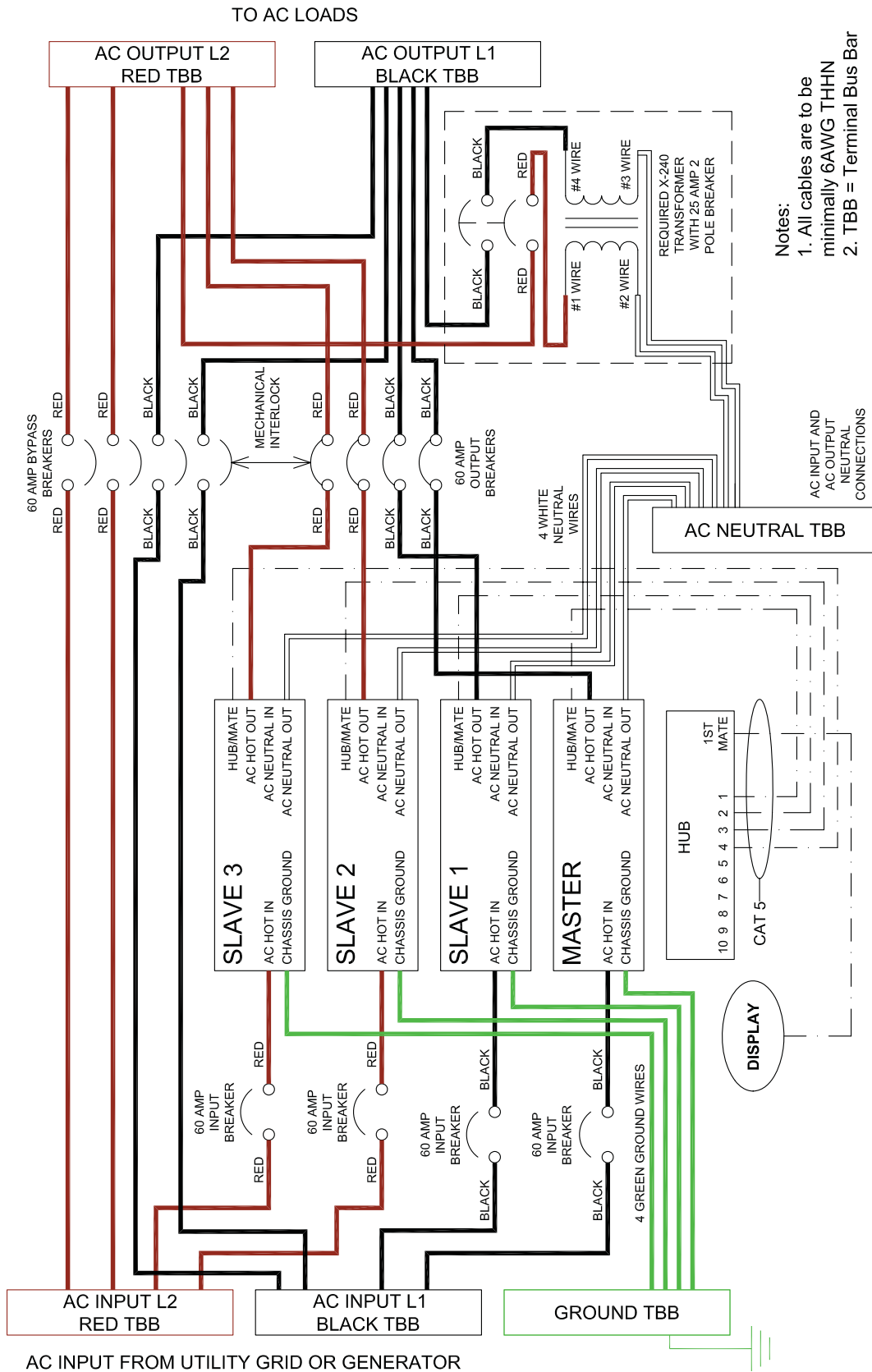
PARALLELED QUAD FX SYSTEM

- All AC wiring from the AC source and to the AC loads must collectively handle 200 amps AC or more.
- All other non-Mobile FX Series Inverter/Charger models' AC wiring must handle a capacity of 60 amps AC.
- This system can continuously power up to 14.4kW of loads depending on which model is used.
- Connecting more power than the continuous rating of the FX may cause breakers to trip or the FX to shut off its AC output.
- Refer to Parallel/Dual System drawing on page 28 and expand accordingly.

NOTES: Program the lowest-installed FX as Master (1-2ph MASTER) and the three remaining FXs as OutBack L1 Slaves (OB SLAVE L1)



Grid-Tie FXs cannot be used with this configuration.



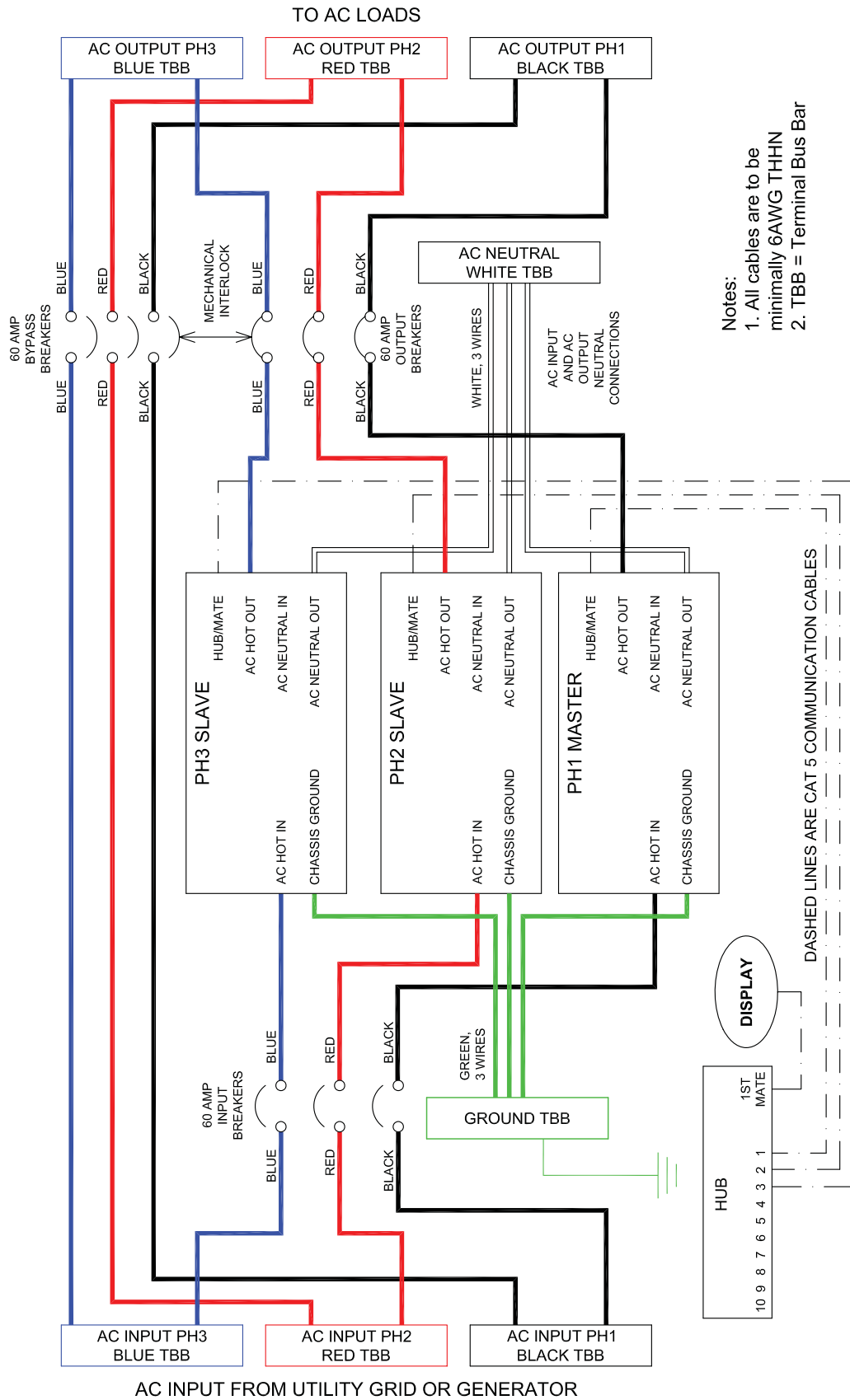
Series/Parallel Using Four FXs

3-PHASE FX SYSTEM

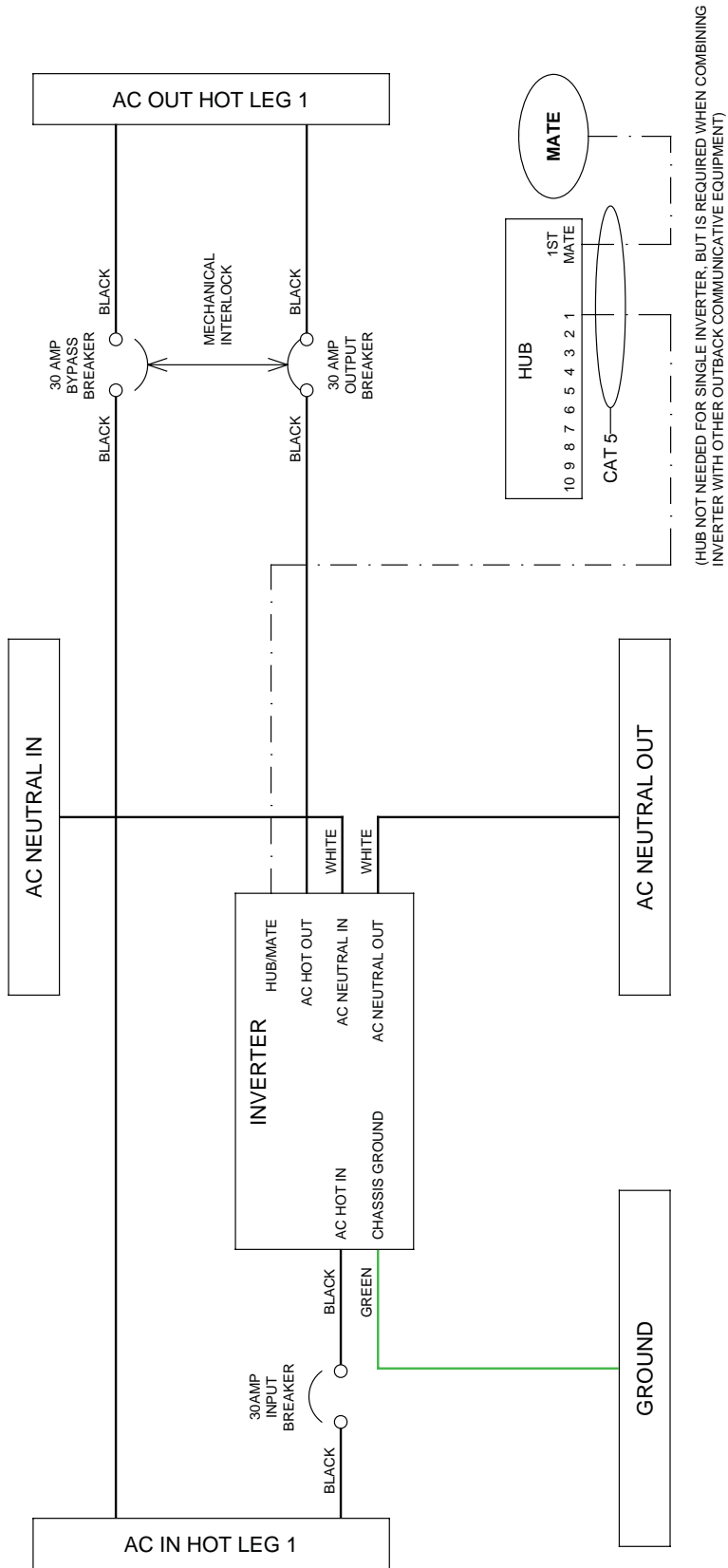
- This system produces 120VAC per phase and 208VAC from phase to phase. There can only be one FX per phase on a 3-phase system.
- The non-Mobile AC wiring from the AC source and to the AC loads must handle 60 amps AC.
- All other non-Mobile AC wiring must handle a capacity of 60 amps AC; Mobile must handle 30 amps AC.
- This system can power continuously up to 10.8kW of loads depending on which model is used.
- Connecting more power than the continuous rating of the FX may cause breakers to trip or the FX to shut off its AC output.
- The jumper in the HUB must be moved for 3-phase configuration (please see the HUB Installation and User Guide).

NOTE: Program the bottom FX as Master (3ph MASTER) and the two lower FXs as 3-phase Slaves (3ph SLAVE). Keep the phases in order: phase one is connected to the FX programmed L1; phase two is connected to L2; and phase three to L3 (or phases A, B, and C to inverters A, B, and C).

 Grid-Tie FXs cannot be used with this configuration.



Three-Phase System

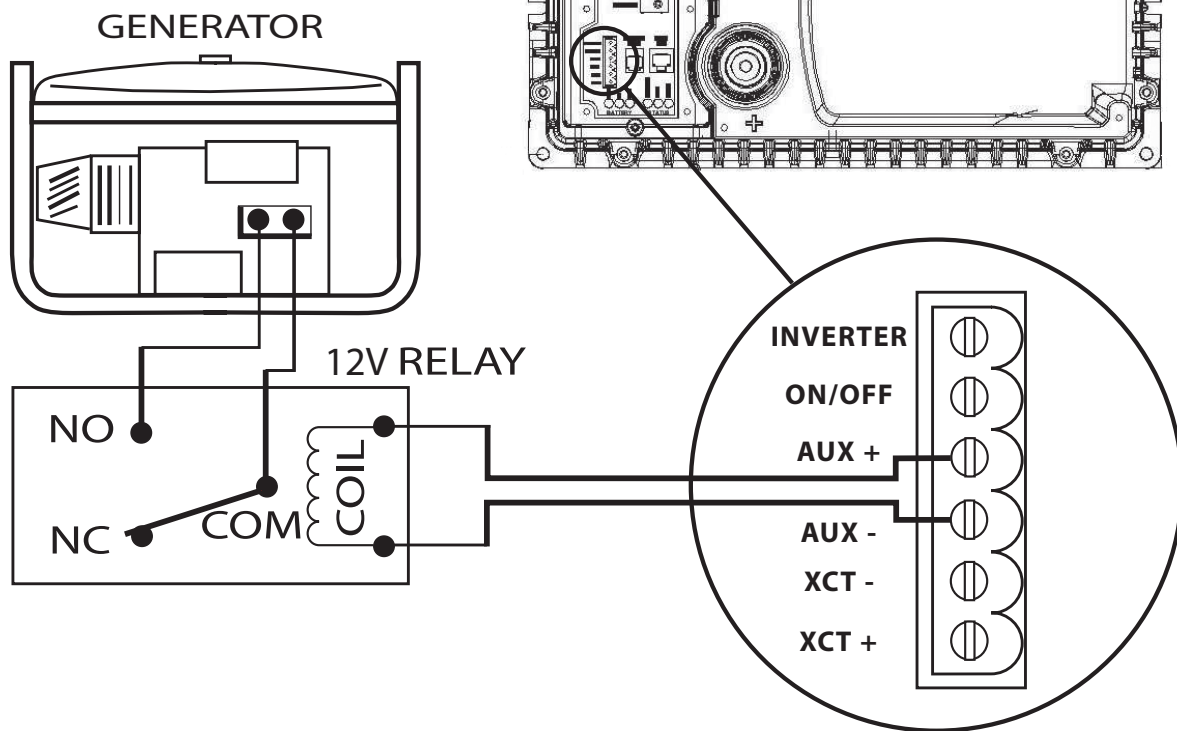


Mobile Single FX Series Inverter/Charger

GENERATOR AUTO START

The following schematic shows how to hook up a relay that interfaces with the two-wire start generator. Three-wire start generators require an adapter like the Atkinson GSCM available at www.atkinsonelectronics.com.

TWO WIRE START GENERATOR HOOK UP

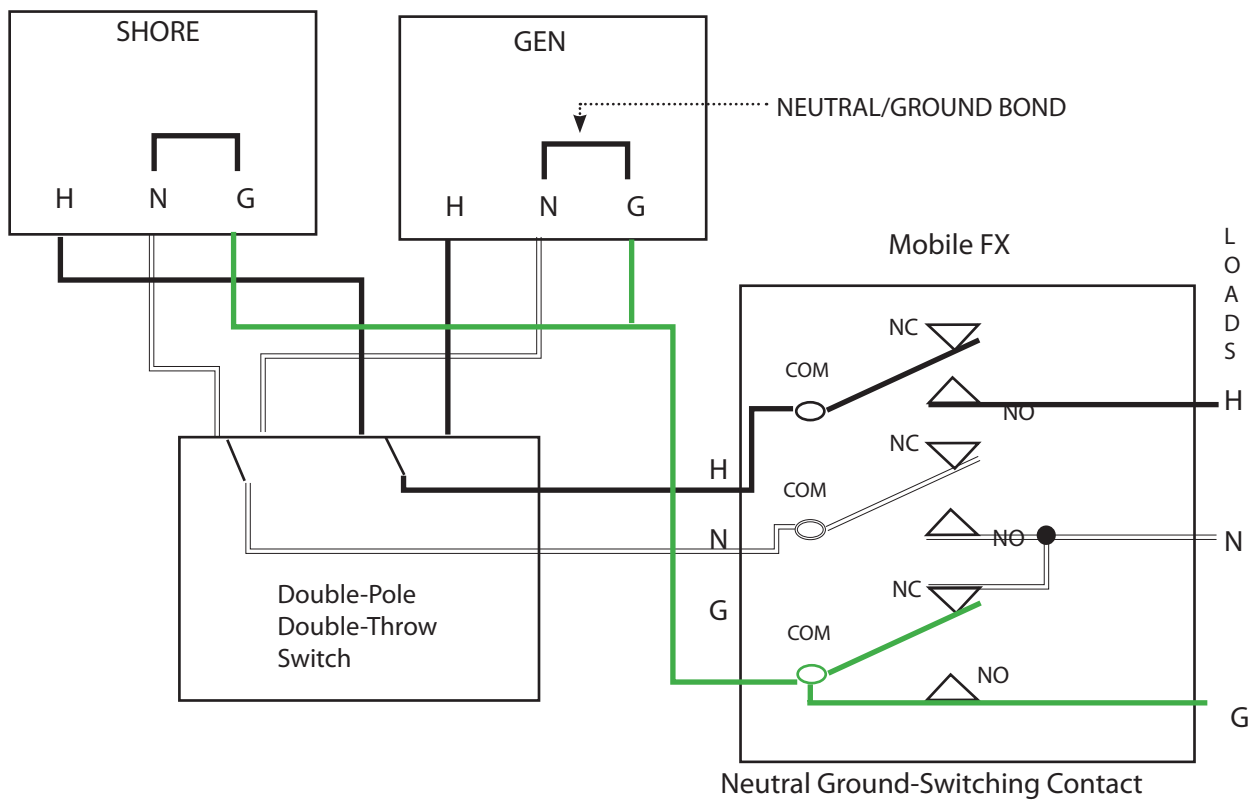


Most 12V relays will work for generator starting.
Select one between 2 and 30 amp contacts.

M MOBILE FX INFORMATION

When a Mobile system has the option of using either an onboard generator or the utility grid or shore power (see next diagram) as their AC input:

- Both the AC “Hot” and AC “Neutral” lines must be connected to the appropriate source.
- A connection can be made using a double-pole, double-throw switch (currently unavailable from OutBack, but available from electrical component suppliers) which has one connection each for AC hot and AC neutral.
- This switch must be rated to handle the system’s maximum AC voltage and AC current.



The Mobile FX’s AC input consists of a Hot (H), Neutral (N) and Neu/Ground Bond (G). The Mobile FX has an internal “Ground-Switching Contact” that will open when it connects to an AC input.

INSTALLATION CHECK LIST

<i>ITEM</i>	<i>YES</i>	<i>NO</i>
All manuals read and reviewed?		
▶ FX		
▶ OutBack Charge Controller		
▶ MATE		
▶ HUB		
System mounted with the recommended number and sized fasteners?		
System installed according to National Electrical Code (NEC) and local codes?		
System inspected?		
System permanently grounded?		
Did the installer use OutBack recommended wire type and gauge adjusted for temperature ratings and length?		
▶ All AC wiring rated for 75° C or higher?		
▶ Battery cables rated 75° C or higher?		
▶ 6 AWG (.184" or 4.11 mm) wire used for non-Mobile FX AC Input Hot?		
▶ 10 AWG (.116" or 2.59 mm) or larger wire used for AC HOT OUT?		
▶ 10 AWG (.116" or 2.59 mm) wire or larger used for Mobile FX AC Input Hot?		
Non-Mobile FX connected to AC circuit with 60 amp maximum branch-circuit over-current protection?		
Mobile FX connected to AC circuit with 30 amp maximum branch-circuit over-current protection?		
▶ All cables torqued to OutBack specifications?		
▶ AC and PV breakers to 22 inch-lbs/2.48 Nm?		
▶ All DC connections to 10 foot-lbs/13.55 Nm?		
▶ FX AC terminals to 30 inch-lbs/3.38 Nm?		
▶ FX battery breaker to 45 inch-lbs/5.08 Nm?		
All terminal block screws torqued to 2.5 foot-lbs/3.38 Nm?		

APPENDIX RATINGS

FX2012T

Nominal DC Input Voltage Range	12VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	2000VA
Continuous AC RMS Output at 25°C	17.0 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	90%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	56 amps AC
Maximum Output Current - RMS (100 mSec)	40 amps AC
AC Overload Capability - Surge	4800VA
AC Overload Capability - 5 Second	4000VA
AC Overload Capability - 30 Minutes	2500VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	10.5 to 17.5 VDC
DC Input Current – Rated Power	200 Amps DC
Continuous Battery Charger Output	80 Amps DC

FX2524T

Nominal DC Input Voltage Range	24VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3000VA
Continuous AC RMS Output at 25°C	250 Amps AC
Idle Power - Full AC Output	≈ 23 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	93%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	4800VA
AC Overload Capability - 30 Minutes	3200VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	21.0 to 34.0 VDC
DC Input Current – Rated Power	75 Amps DC
Continuous Battery Charger Output	35 Amps DC

FX3048T

Nominal DC Input Voltage Range	48VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3000VA
Continuous AC RMS Output at 25°C	25.0 Amps AC
Idle Power - Full AC Output	≈ 23 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	93%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	4800VA
AC Overload Capability - 30 Minutes	3200VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	42.0 to 68.0 VDC
DC Input Current – Rated Power	75 Amps DC
Continuous Battery Charger Output	35 Amps DC

GVFX3524

Nominal DC Input Voltage Range	24VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3500VA
Continuous AC RMS Output at 25°C	29.2 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	5000VA
AC Overload Capability - 30 Minutes	4000VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	58.0 to 62.0 Hz
DC Input Range	21.0 to 34.0 VDC
DC Input Current – Rated Power	175 Amps DC
Continuous Battery Charger Output	85 Amps DC

GVFX3648T

Nominal DC Input Voltage Range	48VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3600VA
Continuous AC RMS Output at 25°C	30.0 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	5000VA
AC Overload Capability - 30 Minutes	4000VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	58.0 to 62.0 Hz
DC Input Range	42.0 to 68.0 VDC
DC Input Current – Rated Power	90 Amps DC
Continuous Battery Charger Output	45 Amps DC

GTFX2524

Nominal DC Input Voltage Range	24VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	2500VA
Continuous AC RMS Output at 25°C	20.8 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	4800VA
AC Overload Capability - 30 Minutes	3200VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	58.0 to 62.0 Hz
DC Input Range	21.0 to 34.0 VDC
DC Input Current – Rated Power	125 Amps DC
Continuous Battery Charger Output	55 Amps DC

GTFX3048T

Nominal DC Input Voltage Range	48VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3000VA
Continuous AC RMS Output at 25°C	25.0 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	4800VA
AC Overload Capability - 30 Minutes	3200VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	58.0 to 62.0 Hz
DC Input Range	42.0 to 68.0 VDC
DC Input Current – Rated Power	75 Amps DC
Continuous Battery Charger Output	35 Amps DC

VFX2812

Nominal DC Input Voltage Range	12VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	2800VA
Continuous AC RMS Output at 25°C	23.3 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	90%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	56 amps AC
Maximum Output Current - RMS (100 mSec)	40 amps AC
AC Overload Capability - Surge	4800VA
AC Overload Capability - 5 Second	4000VA
AC Overload Capability - 30 Minutes	3200VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	10.5 to 17.0 VDC
DC Input Current – Rated Power	280 Amps DC
Continuous Battery Charger Output	125 Amps DC

VFX3524

Nominal DC Input Voltage Range	24VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3500VA
Continuous AC RMS Output at 25°C	29.2 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	5000VA
AC Overload Capability - 30 Minutes	4000VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	21.0 to 34.0 VDC
DC Input Current – Rated Power	175 Amps DC
Continuous Battery Charger Output	85 Amps DC

VFX3648

Nominal DC Input Voltage Range	48VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3600VA
Continuous AC RMS Output at 25°C	30.0 Amps AC
Idle Power - Full AC Output	≈ 23 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	93%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	5000VA
AC Overload Capability - 30 Minutes	4000VA
AC Input Current Maximum	60 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	42.0 to 68.0 VDC
DC Input Current – Rated Power	90 Amps DC
Continuous Battery Charger Output	45 Amps DC

VFX2812M

Nominal DC Input Voltage Range	12VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	2800VA
Continuous AC RMS Output at 25°C	23.3 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	90%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	56 amps AC
Maximum Output Current - RMS (100 mSec)	40 amps AC
AC Overload Capability - Surge	4800VA
AC Overload Capability - 5 Second	4000VA
AC Overload Capability - 30 Minutes	3200VA
AC Input Current Maximum	30 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	10.5 to 17.0 VDC
DC Input Current – Rated Power	280 Amps DC
Continuous Battery Charger Output	125 Amps DC

VFX3232M

Nominal DC Input Voltage Range	32VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3200VA
Continuous AC RMS Output at 25°C	26.6 Amps AC
Idle Power - Full AC Output	≈ 21 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	56 amps AC
Maximum Output Current - RMS (100 mSec)	40 amps AC
AC Overload Capability - Surge	4800VA
AC Overload Capability - 5 Second	4000VA
AC Overload Capability - 30 Minutes	4000VA
AC Input Current Maximum	30 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	28.0 to 45.3 VDC
DC Input Current – Rated Power	120 Amps DC
Continuous Battery Charger Output	45 Amps DC

VFX3524M

Nominal DC Input Voltage Range	24VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	3500VA
Continuous AC RMS Output at 25°C	20.0 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	5000VA
AC Overload Capability - 30 Minutes	4000VA
AC Input Current Maximum	30 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	21.0 to 34.0 VDC
DC Input Current – Rated Power	175 Amps DC
Continuous Battery Charger Output	85 Amps DC

FX2532MT

Nominal DC Input Voltage Range	32VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	2500VA
Continuous AC RMS Output at 25°C	20.8 Amps AC
Idle Power - Full AC Output	≈ 21 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	56 amps AC
Maximum Output Current - RMS (100 mSec)	40 amps AC
AC Overload Capability - Surge	4800VA
AC Overload Capability - 5 Second	4000VA
AC Overload Capability - 30 Minutes	2500VA
AC Input Current Maximum	30 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	28.0 to 45.3 VDC
DC Input Current – Rated Power	93.75 Amps DC
Continuous Battery Charger Output	35 Amps DC

FX2524MT

Nominal DC Input Voltage Range	24VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	2500VA
Continuous AC RMS Output at 25°C	20.8 Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	92%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	70 amps AC
Maximum Output Current - RMS (100 mSec)	50 amps AC
AC Overload Capability - Surge	6000VA
AC Overload Capability - 5 Second	4800VA
AC Overload Capability - 30 Minutes	3200VA
AC Input Current Maximum	30 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	21.0 to 34.0 VDC
DC Input Current – Rated Power	125 Amps DC
Continuous Battery Charger Output	55 Amps DC

FX2012MT

Nominal DC Input Voltage Range	12VDC
Nominal AC Voltage / Frequency	120VAC / 60 HZ
Continuous Power Rating at 25C Ambient	2000VA
Continuous AC RMS Output at 25°C	17.0Amps AC
Idle Power - Full AC Output	≈ 20 Watts DC
Idle Power - Search Mode	2.6 Watts DC
Typical Efficiency	90%
Total Harmonic Distortion - Typical	2%
Output Voltage Regulation	± 2%
Maximum Output Current – Peak (1 mSec)	56 amps AC
Maximum Output Current - RMS (100 mSec)	40 amps AC
AC Overload Capability - Surge	4800VA
AC Overload Capability - 5 Second	4000VA
AC Overload Capability - 30 Minutes	2500VA
AC Input Current Maximum	30 Amps AC
AC Input Voltage Range	80 to 150VAC
AC Input Frequency Range	54.0 to 66.0 Hz
DC Input Range	10.5 to 17.0 VDC
DC Input Current – Rated Power	200 Amps DC
Continuous Battery Charger Output	100 Amps DC

RATINGS

NOMINAL AC OUTPUT VOLTAGE OF AN FX SYSTEM

Single Phase	120VAC at 60 Hz
Series Stacked	120VAC at 60 Hz per AC output leg / 240 VAC at 60Hz between the AC output legs
Parallel Stacked	120 VAC at 60 Hz on one AC output leg
Three Phase Stacked	120 VAC at 60 Hz per AC output leg (limit three) / 208VAC at 60 Hz between AC output legs

RECOMMENDED FX DC VOLTAGE RANGE

NOTE: The last two digits in the model number designate the nominal DC voltage.

Example: FX2024MT =24V DC Voltage.

12V Systems	11 – 16VDC (VDC = volts DC)
24V Systems	22 – 32VDC
32V Systems	29 – 43VDC
48V Systems	44 – 64VDC

MAXIMUM DC INPUT CURRENT

NOTE: This is the maximum DC current the FX will draw from the battery when starting very large AC loads. It is not used for sizing the DC disconnect or selecting DC cable gauge. It is used to select the minimum reasonable battery capacity.

12V FXs	600ADC per FX (ADC = amps DC)
24V FXs	300ADC per FX
32V FXs	225ADC per FX
48V FXs	150ADC per FX

RATED DC INPUT CURRENT

NOTE: This is the maximum continuous DC current that the FX will draw from the batteries when inverting.

FX2012MT	190ADC (ADC = Amps DC)
FX2524MT	95ADC
FX2532MT	90ADC
FX3048T	60ADC
VFX2812M	265ADC
VFX3524M	170ADC
VFX3232M	115ADC
VFX3648	85ADC

AC INPUT OPERATING VOLTAGE RANGE

NOTE: This is the recommended AC input voltage range to be supplied to the FX. Voltages outside of this range may damage AC loads connected to the FXs AC output terminals.

All FX Series Inverter/Chargers	90 – 150VAC (VAC = volts AC)
---------------------------------	------------------------------

MAXIMUM AC INPUT CURRENT

An AC input source connected to the FX supplies power for two separate internal AC circuits – the AC transfer switch and the battery charging system. The AC transfer switch transfers the AC input power to the AC loads. The FX's battery charger will "back off" if the total AC loads—including the charger—exceed the AC input current limit (default setting is 28AAC). This "Input Limit" can be adjusted using the MATE to avoid overloading a generator or trip a circuit breaker. If your generator cannot produce 28AAC or you are connecting to an AC input source that has a breaker that is rated for less than 30AAC, please refer to the FX and VFX Series Inverter/Charger Programming Manual to change this setting.

All "Mobile" FXs	30AAC per FX (AAC = Amps AC)
All 120VAC FXs	60AAC per FX (AAC = Amps AC)

MAXIMUM CURRENT FOR BATTERY CHARGER

Due to heat restraints, the FX limits incoming AC current to recharge the battery. Please refer to the FX and VFX Series Inverter/Charger Programming Manual to adjust this setting. The battery charger has an efficiency of better than 80%. Other factors, such as cable losses, might reduce this efficiency.

MAXIMUM AND DEFAULT AC INPUT AND DC (bulk stage) OUTPUT VALUES

FX2012MT	AC Max = 12AAC (Default = 10AAC)	DC Max = 100ADC
FX2524MT	AC Max = 14AAC (Default = 12AAC)	DC Max = 55ADC
FX2532MT	AC Max = 14AAC (Default = 12AAC)	DC Max = 40ADC
FX3048T	AC Max = 14AAC (Default = 12AAC)	DC Max = 35ADC
VFX2812M	AC Max = 16AAC (Default = 14AAC)	DC Max = 125ADC
VFX3524M	AC Max = 20AAC (Default = 18AAC)	DC Max = 85ADC
VFX3232M	AC Max = 20AAC (Default = 18AAC)	DC Max = 60ADC
VFX3648	AC Max = 20AAC (Default = 18AAC)	DC Max = 45ADC

AC INPUT FREQUENCY RANGE

NOTE: If the AC input source is out of the range noted below, the FX will not connect or stay connected.

All FX Models	56 - 64 Hz
---------------	------------

MAXIMUM AC OUTPUT CURRENT

This is the amount of surge current that the FX will quickly supply for a split second. Depending on the size of the surge, the FX can be overloaded for a minimum time of 5 seconds to a maximum time of 30 minutes.

All 12 VDC FXs	56AAC per FX for 1 millisecond
All Other FXs	70AAC per FX for 1 millisecond

MAXIMUM CONTINUOUS OUTPUT POWER

An FX Series Inverter/Charger's model number indicates its maximum continuous output power by changing the last two digits to zeros. For instance, an FX2012MT has a maximum continuous output power of 2000VA (volt-amps).

FX2012MT	2000VA (VA = volt-Amps)
FX2024MT	2000VA
FX2532MT	2500VA
FX2548T	2500VA
VFX2812M	2800VA
VFX3524M	3500VA
VFX3232M	3200VA
VFX3648	3600VA

MAXIMUM OVERCURRENT PROTECTION AMPACITY

This rating specifies the proper overcurrent protection ampacity.

- OBB breakers are panel-mount circuit breakers.
- Class T DC fuses are terminal-mounted and should always be used in conjuncture with a disconnect mechanism.
- FXs used in home installations should use properly sized DC circuit breakers.
- A DC breaker includes both overcurrent protection and disconnect capability.
- OutBack Power Systems recommends Class T fuses for marine installations where a DC disconnect is not required.

MODEL	AMPACITY	DC BREAKER	DC FUSE
FX2012MT	200 amps	OBDC-250	Class T-400 (Mobile Only)
FX2024MT	175 amps	OBDC-175	Class T-300 (Mobile Only)
FX2532MT	175 amps	OBDC-175	Class T-300 (Mobile Only)
FX2548T	100 amps	OBDC-100	Not Recommended
VFX2812M	200 amps	OBDC-250	Class T-400 (Mobile Only)
VFX3524M	260 amps	OBDC-250	Class T-400 (Mobile Only)
VFX3232M	175 amps	OBDC-175	Class T-300 (Mobile Only)
VFX3648	175 amps	OBDC-175	Not Recommended
GTFX 2524	125 amps	OBDC-175	DO NOT USE
GTFX 3048	75 amps	OBDC-100	DO NOT USE
GVFX 3524	175 amps	OBDC-250	DO NOT USE
GVFX 3648	90 amps	OBDC-125	DO NOT USE

12 VDC System	DEFAULT	MINIMUM	MAXIMUM
Float Voltage	13.6V	12V	15V
Absorb Voltage	14.4V	13V	16V
EQ Voltage	14.4V (24VDC Grit-Tie=29.2)	14V	17V
ReFloat	12.5V	11V	13V
LBCO	10.5V	9V	12V
LBCI	12.5V	10V	14V
Sell RE	13V	10V	15V
Gen Alert			
Off Set Point	14V	12V	18V
On Set Point	11V	10V	14V
Load Shed Off Set Point	11V	10V	14V
Vent Fan ON Set Point	13V	10V	16V
Diversion ON Set Point	14.6V	12V	16V
Absorb Time	1.0 hours	0.0 hours	24.0 hours
EQ Time	1.0 hours	0.0 hours	24.0 hours
Float Time	1.0 hours	0.0 hours	24.0 hours
AC2/Gen Transfer Delay (Cycles for AC)	60 cycles* (*20 for Grid-Tie)	0 cycles	240 cycles
Search	6	0	50
Grid Lower Limit	108V	40V	115V
Grid Upper Limit	140	80V	220V
Grid Upper Limit	140V	130V	150V
Grid Connect Delay	.5 min	.2 min	15.0 min
DROP or USE	USE	N/A	N/A
Charger OFF/AUTO/ON	AUTO		
AUX Output Option	COOL FAN		
Gen Alert ON Delay	4 min	0 min	240 min
Gen Alert OFF Delay	9 min	0 min	240 min
Vent Fan OFF Delay	5 min	0 min	30 min
Gen Window Lower Limit	108V	40V	115V
Gen Upper Window Limit	140V	130V	150V
AC1/Grid Transfer Delay	6 Cycles of AC	0 Cycles of AC	240 Cycles of AC
Set AUX Control	AUTO		
Search Pulses	8	2	20
Search Pulse Spacing	60 Cycles Ac	4 Cycles AC	120 Cycles AC
Stacking Phase	1 or 2 phase		
InPut Select	Master Gen		
Charge Rates			
Vented 24 & 48 VDC	18 AAC	0 AAC	20 AAC
Vented 12 VDC	12 AAC	0 AAC	14 AAC
Sealed 24 & 48 VDC	10 AAC	0 AAC	14 AAC
Sealed 12 VDC	10 AAC	0 AAC	12 AAC
Grid Input Settings			
Set AC Input Size			
Mobile	28 Amp	5 Amp	30 Amp
Non-Mobile U.S.	48 Amp	5	
Grid-Tie	50 Amp		
Gen Input Settings			
Mobile	28 Amp	2Amp	30 Amp
Non-Mobile U.S.	48 Amp	2 Amp	60 Amp
Grid-Tie	50 Amp		
Set VAC	120V (230V Export)	110V GT (210V Export, 105V Off-Grid and Mobile)	125V (240V Export)

Correction Factor •24VDC: Multiply 12VDC values by 2 •32VDC: Multiply 12VDC values by 2.64 •48VDC: Multiply 12VDC values by 4

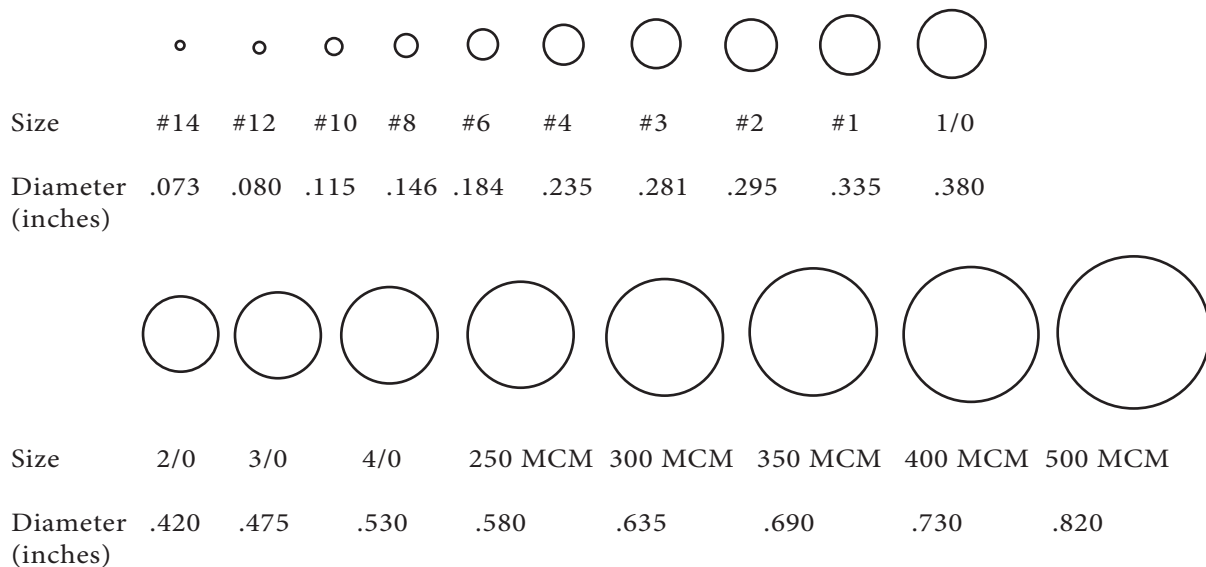
WIRE SIZES

The following chart contains information on wire sizes, the DC resistance of the wires and the corresponding diameters and areas of these wires. This information can be used to calculate the voltage drop of the wires or to find an equivalent wire size.

SIZE	DC (AWG) Resistance in Ohms (1000 feet)	CROSS-SECTIONAL AREA	
		INCHES	MILLIMETERS
14	3.14	.0032	2.08
12	1.98	.0051	3.31
10	1.24	.0082	5.26
8	0.78	.0130	8.37
6	0.50	.0206	13.30
4	0.31	.0328	21.15
2	0.19	.0521	33.62
1	0.15	.0657	42.41
1/0	0.12	.0829	53.50
2/0	0.10	.1045	67.43
3/0	0.08	.1318	85.01
4/0	0.06	.1662	107.20

AWG Wire Sizes

NOTE: These sizes represent the conductor only without any insulation.



Recommended Wire Sizes by Length

FX Model	Typical DC AMPS	NEC AMPS	1-3' one way	3-5' one way	5-10' one way
FX 2012T	167	208	4/0	4/0	4/0
FX2524T GTFX252	104	130	2/0	2/0	2/0
FX3048T GTFX3048	63	78	1/0	1/0	1/0
VFX2812	233	292	4/0	4/0	300 MCM
VFX3524 GVFX3524	146	182	4/0	4/0	4/0
VFX3648 GVFX3648	75	94	1/0	1/0	1/0

MAINTENANCE

If damaged or malfunctioning, the FX should be repaired by a qualified user, installer, or service center following OutBack Power Systems' instructions and guidelines. Please contact your energy dealer for assistance. Incorrect repairs and/or reassembly risks malfunction, electric shock or fire.

For routine, user-approved maintenance:

- Disconnect all circuit breakers and related electrical connections before doing any cleaning or adjustments.
- Solar modules may produce hazardous voltages when exposed to light; cover them with opaque material before servicing any connected equipment or service at night.
- If a remote or automatic generator start system is used, disable the automatic starting circuit and/or disconnect the generator from its starting battery while servicing. This will prevent accidental it to starting or operation.



TWO YEAR LIMITED WARRANTY INFORMATION

FX Series Inverter/Charger Products

OutBack Power Systems, Inc. ("OutBack") provides a two year (2) limited warranty ("Warranty") against defects in materials and workmanship for its FX/VFX Series Inverter/Charger products ("Product(s)") if installed in fixed location applications.

The term of this Warranty begins on the Product(s) date of manufacture or the initial purchase date as indicated on the warranty registration card submitted to OutBack, whichever is greater. This Warranty applies to the original OutBack Product(s) purchaser, and is transferable only if the Product(s) remains installed in the original use location. The warranty does not apply to any Product(s) or Product(s) 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 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(s), or any Product(s) part, shall be limited to the repair or replacement of the Product(s), at OutBack's discretion. OutBack does not warrant or guarantee workmanship performed by any person or firm installing its Product(s). This Warranty does not cover the costs of installation, removal, shipping (except as described below), or reinstallation of Product(s).

To request warranty service, you must contact OutBack Technical Services at (360) 435-6030 or support@outbackpower.com within the effective warranty period. OutBack Technical Support will attempt to troubleshoot the product and validate that the failure is product related. If warranty service is required, OutBack will issue a Return Material Authorization (RMA) number. A request for an RMA number requires all of the following information:

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

After receiving the RMA number, pack the Product(s) authorized for return, along with a copy of the original purchase invoice, in the original Product(s) shipping container(s) or packaging providing equivalent protection and mark the outside clearly with the RMA number. The sender must prepay all shipping charges to the agreed upon OutBack Power Systems location, and insure the shipment, or accept the risk of loss or damage during shipment. 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(s), OutBack determines the Product(s) 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(s) to the purchaser freight prepaid, non-expedited, using a carrier of OutBack's choice, where applicable.

The warranty period of any repaired or replacement Product is twelve (12) months from the date of shipment from OutBack, or the remainder of the initial warranty term, which ever is greater.

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. 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.



Limited Warranty Registration

Complete this form to request a Limited Warranty, and return it to:

Outback Power Systems Inc.
19009 62nd Ave. NE
Arlington, WA 98223

NOTE: Please submit a copy (not the original) of the Product purchase invoice, which confirms the date and location of purchase, the price paid, and the Product Model and Serial Number.

Two Year Limited FX Warranty Registration

System Owner

Name: _____ Country: _____
Address: _____ Telephone Number: _____
City, State, Zip Code: _____ E-mail: _____

Product

Product(s) Model Number(s): _____ Sold by: _____
Product(s) Serial Number(s): _____ Purchase Date: _____

Please circle the three most important factors affecting your purchase decision:

- Price
- Product Reputation
- Product Features
- Reputation of OutBack Power Systems
- Value

System

System Install/Commission Date: _____ Total Nominal System AC Output in KW: _____
Nominal System AC Voltage: _____ System Battery Bank Size (Amp Hours): _____
Type of Batteries: _____

Are you using a generator with this system? (Circle One): Yes No

If yes, please list the make and model: _____

If yes, is the generator's output is (Circle One): AC DC

Installer

Name (If Applicable): _____ Address: _____
City, State, Zip: _____ E-mail: _____
Contractor Number: _____

*Extended Warranty

OutBack Power Systems offers an optional three (3) year extension to the standard two (2) year Limited Warranty for the FX/VFX Series Inverter/Charger product. To request a 3-year Limited Warranty extension for a total effective warranty coverage period of five (5) years; include a check or money order in the amount of \$300USD payable to OutBack Power Systems, Inc. along with your Warranty Registration.

Revision.2008-04-01

10-Year Limited Warranty (California) **GTFX, GVFX and PS1 Products**

OutBack Power Systems, Inc. ("OutBack") provides a ten-year (10) limited warranty ("Warranty") against defects in materials and workmanship for its GTFX, GVFX and PS1 products ("Products") if installed in fixed location applications within the State of California.

For this Warranty to be effective, the Product purchaser must complete and submit the applicable Product registration card within ninety (90) days of the eligible Product's first retail sale. The term of this Warranty is governed by the date issued by OutBack on the 10-year Warranty Certificate. 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 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.

To request warranty service, you must contact OutBack Technical Services at (360) 435-6030 or support@outbackpower.com within the effective warranty period. If warranty service is required, OutBack will issue a Return Material Authorization (RMA) number. A request for an RMA number requires all of the following information:

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. OutBack issued 10-year warranty certificate;
3. Description of the problem; and
4. Shipping address for the repaired or replacement equipment.

After receiving the RMA number, 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 protection and mark the outside clearly with the RMA number. The sender must prepay all shipping charges, and insure the shipment, or accept the risk of loss or damage during shipment. 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 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 to the purchaser freight prepaid, non-expedited, using a carrier of OutBack's choice within the continental United States, where applicable.

Shipments to other locations will be made freight collect. The warranty period of any repaired or replacement Product is twelve (12) months from the date of shipment from OutBack, or the remainder of the initial warranty term, whichever is greater.

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. 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.



10-Year Warranty Registration - California

To request a 10-year Limited Warranty; complete this form along with a check or money order in the amount of \$599 USD payable to OutBack Power Systems, Inc., and return it to:

Outback Power Systems Inc.
19009 62nd Ave. NE • Arlington, WA 98223

NOTE: A 10-Year Limited Warranty Certificate will only be issued if this registration card is received by Outback within 90 days of the date of the first retail sale of the eligible product. Please submit a copy (not the original) of the product purchase invoice, which confirms the date and location of purchase, the price paid, and the product model and serial number. The warranty certificate is available only for and will only be issued for GTFX, GVFX and PS1 products installed in fixed location (non-mobile) applications within the state of California.

10-Year Warranty Registration for GVFX, GTFX and PS1-California

System Owner

Name: _____

E-mail: _____

Address: _____

City, State, Zip Code: _____

Country: _____

Telephone number: _____

Product

Product model number: _____

Product serial number: _____

Sold by: _____

Purchase date: _____

Please circle the three most important factors affecting your purchase decision:

- Price
- Product Reputation
- Product Features
- Reputation of OutBack Power
- Value

System

System install/commission date: _____

System array size: _____

System array nominal voltage: _____

Type of PV modules: _____

System battery bank size (amp hours): _____

Type of batteries: _____

Please list other sources of back-up power: _____

Installer

Installer: _____

Installer e-mail: _____

Installer address: _____

Installer City, State, Zip: _____

Contractor number: _____



Corporate Office
19009 62nd Avenue NE
Arlington, WA USA
(+1) 360-435-6030

www.outbackpower.com

European Sales Office
C/ Castelló, 17
08830 - Sant Boi de Llobregat
BARCELONA, España
+34.93.654.9568

900-0083-01-00 REV B