



# **FLEXware™** **Surge Protector**

**FW-SP-ACA**

**FW-SP-250**

**FW-SP-R**

## **User's Guide**

Includes Mounting and Installation



## About OutBack Power Systems

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

## Notice of Copyright

FLEXware Surge Protector  
FLEXware Surge Protector-ACA (FW-SP-ACA)  
FLEXware Surge Protector-250 (FW-SP-250)  
FLEXware Surge Protector-R (FW-SP-R)

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## Disclaimer

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## Contact Information

OutBack Power Systems  
19009 62nd Ave. NE, Arlington, WA 98223  
Phone (360)435-6030  
Fax (360)435-6019  
[www.outbackpower.com](http://www.outbackpower.com)

## 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.
- The FW Surge Protector comes with a standard two-year warranty or is covered by any extended warranty of the FX it is connected to, whichever is longer. The product registration must be returned to obtain this extended warranty.

Please read the full warranty at the end of this manual for more information.

# OUTBACK FLEXware Surge Protector

## INSTALLATION GUIDELINES AND SAFETY INSTRUCTIONS

This product is intended to be installed as part of a permanently grounded electrical system .

- The FLEXware Surge Protector is designed for indoor installation or installation inside a weatherproof enclosure.
- For full system protection, one FLEXware Surge Protector per FX Series Inverter/Charger should be installed.

## Models

There are three FLEXware Surge Protector products:

- FW-SP-ACA, which is a combination FW-ACA enclosure and surge protector for the FLEXware 500 and FLEXware 1000 systems
- FW-SP-250, a combination surge protector board and FW250 AC cover which fits onto the FLEXware 250 Enclosure
- FW-SP-R, a replacement surge protector board for the FW-ACA, FW-SP-ACA, and the FW-SP-250

**NOTE:** It is a UL 1741 (2005) requirement for a grid-tie system to have approved surge protection. Installing an FLEXware Surge Protector is also recommended if your AC source is irregular or unreliable with power surges (a lower quality generator or inconsistent utility power, for instance).

## IMPORTANT SAFETY INSTRUCTIONS

Read all instructions, cautionary markings, 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. The FLEXware Surge Protector is designed for dry, indoor installation and should not be exposed to water.

Install all components and wiring according to national (NEC in the United States) and local electrical and building codes. This includes submitting a plan to the local building department and passing an inspection.

**NOTE:** *The FW-ACA, which houses the surge protector, is designed as a wireway between FX Series Inverter/Chargers and OutBack enclosures (508A Industrial Control Panels) including the FLEXware 500 and FLEXware 1000. The FW-ACA's knockouts are not intended for conduit, but can accommodate flexible cables with appropriate strain relief.*

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

## INTRODUCTION

The OutBack FLEXware Surge Protector connects to the following FX Series Inverter/Charger ports:

- DC+
- DC-
- AC HOT IN
- AC NEUTRAL IN
- AC HOT OUT
- AC NEUTRAL OUT
- GROUND

The FLEXware Surge Protector is designed to protect the FX's sensitive components from excessively high voltages (e.g., electrical storms). Thermally fused metal oxide varistors (MOVs) limit or "clamp" these voltages and transfer the resulting current from a higher voltage port to a lower voltage port. The FLEXware Surge Protector features ACTIVE and ERROR LEDs for the DC, AC IN, and AC OUT circuits.

- The yellow ACTIVE LEDs light when power is applied to that circuit.
- A red ERROR light indicates a significant surge has damaged the FLEXware Surge Protector and although decreased protection remains, it is recommended the FLEXware Surge Protector be replaced at this time before further damage to it and ultimately the FX can occur.

**NOTE:** A circuit must be ACTIVE in order for an ERROR indication to occur.



The FLEXware Surge Protector shunts excess current from:

- DC+ —→ GROUND
- AC HOT IN —→ GROUND
- AC NEUTRAL IN —→ GROUND
- AC HOT OUT —→ AC NEUTRAL OUT
- AC HOT OUT —→ GROUND
- AC NEUTRAL OUT —→ GROUND

**Figure 1:** Metal Oxide Varistor (MOV), thermally fused

## Electrical Connections and LED Indicators

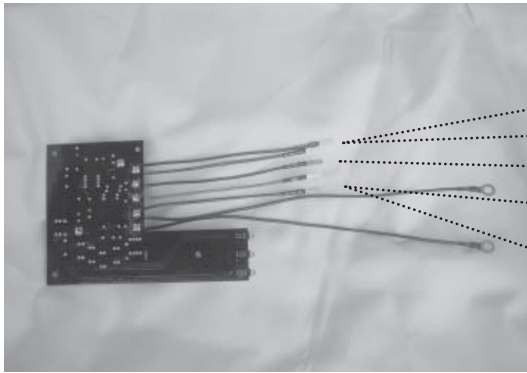
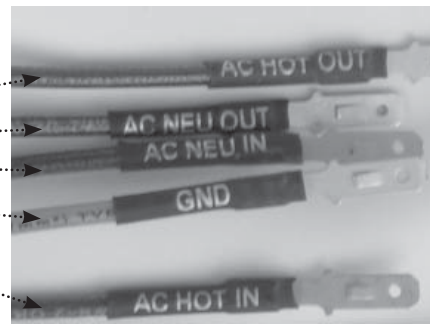


Figure 2: Wiring designations



Each AC and DC wire is marked near the terminal end of each wire.

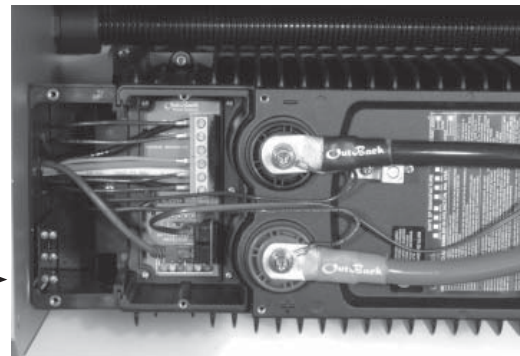
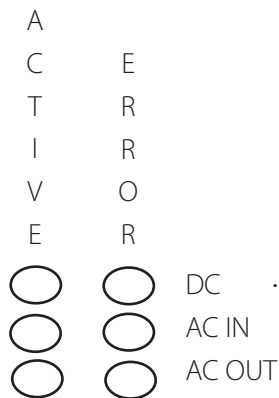


Figure 3: Surge Protector LEDs

### LEDs

- ACTIVE lights are yellow (power is present).
- ERROR lights are red (protection in that circuit is compromised, replacing the surge protector is recommended).
- For the ERROR light to show, its circuit must be powered; its ACTIVE light will also glow.

## The FLEXware Surge Protector Specifications

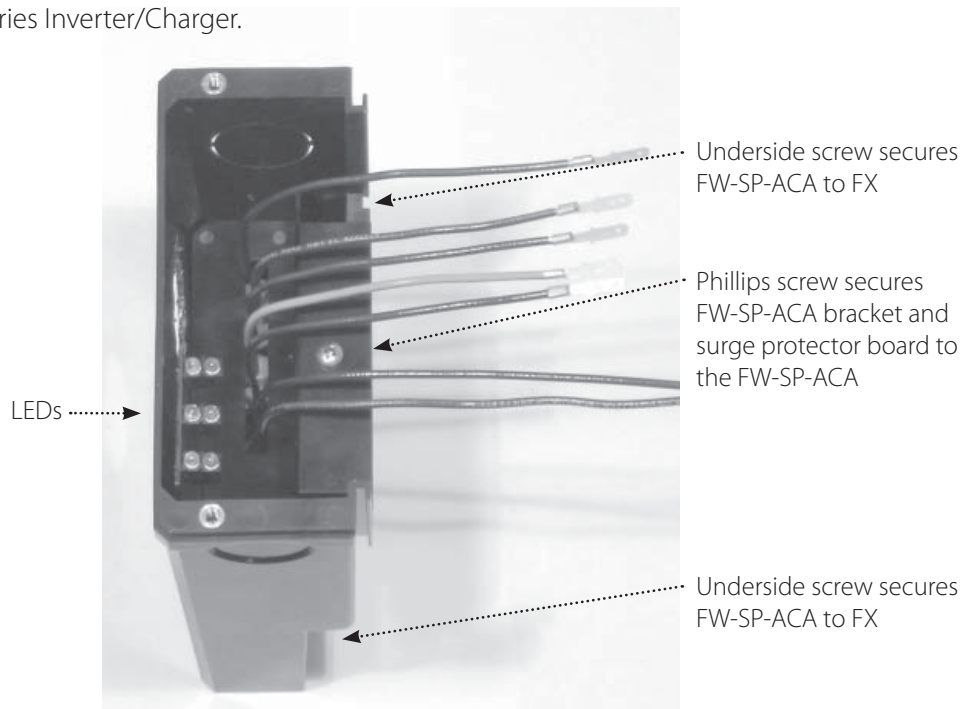
Nominal Voltage	Voltage Protection Level	Maximum Surge Current	Energy Rating	Frequency	Protection Type	Protected Circuit
120-240 VAC 12-48 VDC	390VAC 150 VDC	30kA per circuit	2500 Joules	50/60 Hz	Thermally Fused MOV	2AC 1DC

### Mounting

- FW-SP-250 → Mounts inside an FW250
- FW-SP-ACA → Mounts on an FX
- FW-SP-R (REPLACEMENT) → Mounts inside either the FW250 or the FW-ACA

## FW-SP-ACA

The FW-SP-ACA consists of an FW-ACA with an included surge protector and is installed onto an FX Series Inverter/Charger.



*Figure 4:* FLEXware Surge Protector-ACA

### Tools Required to Install:

- Slotted screwdriver
- Phillips screwdriver
- 13 mm socket (torque ratchet)
- Utility knife
- 4 mm Allen wrench

### Purpose:

- Wiring to the AC wiring block
- Remove and install covers
- Securing wires to FX DC terminals
- Removing plastic knockouts
- Removing and installing FX M5 hex bolts

### Procedure

Turn off the system's DC, AC IN, and AC OUT breakers (if available, use BYPASS mode to power any loads).

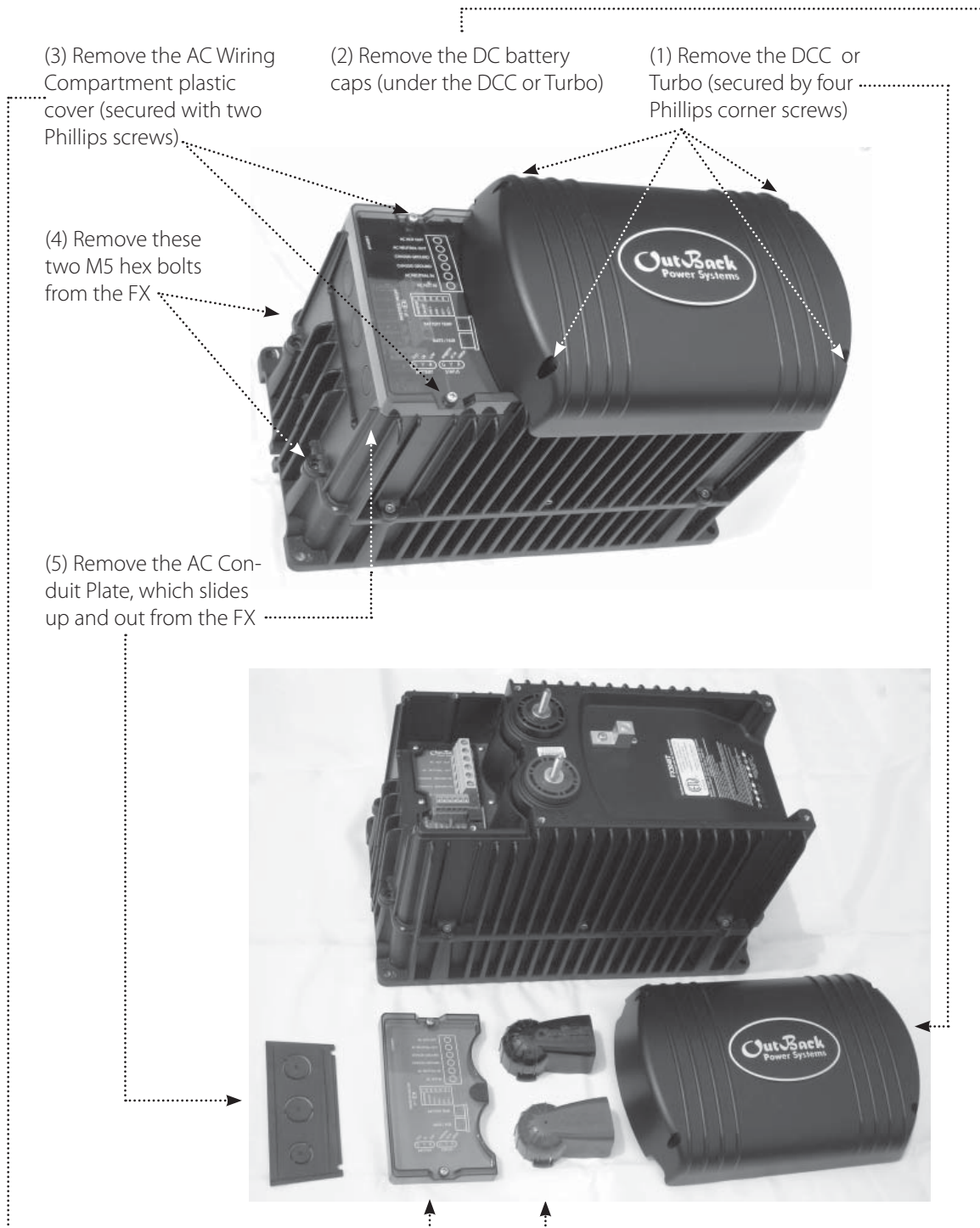
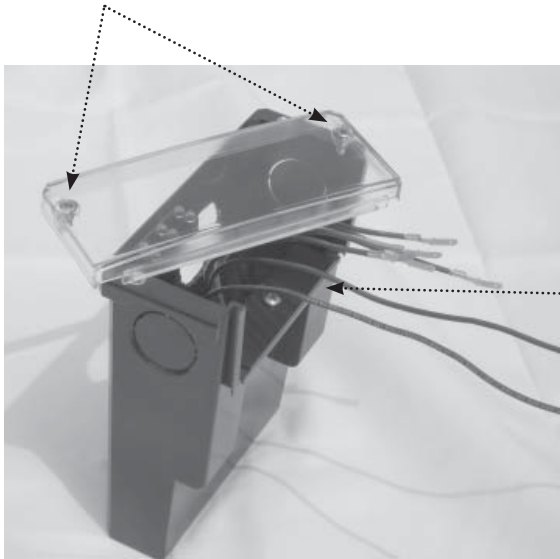


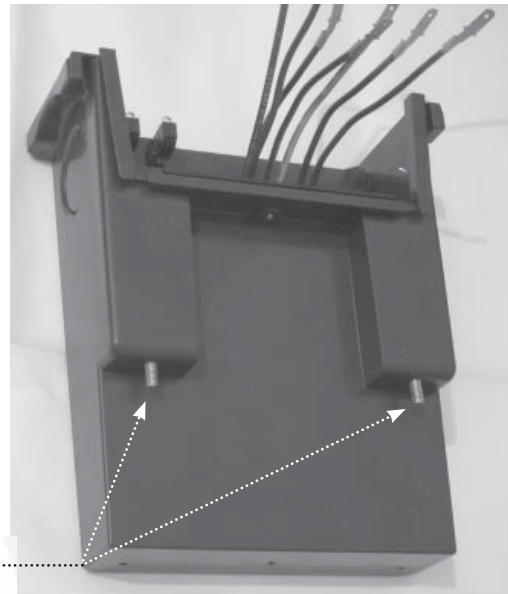
Figure 5: Removing various covers from the FX



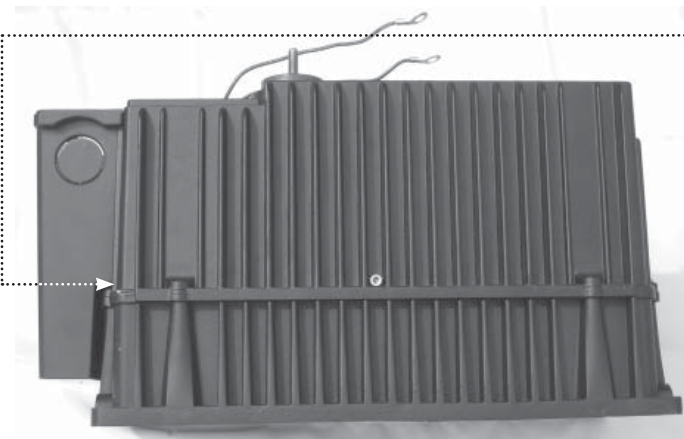
(6) Remove the cover from the FW-SP-ACA (secured with two Phillips screws)



(7) Remove the appropriate knockouts for the individual power application. **Note that knockouts should be scored first with a utility knife and then removed.** The dual, concentric knockout on the back offers openings for the FW500, FW1000, PS2 and PS4 AC enclosures.



(8) Remove any AC wires from the FX AC Wiring Block by loosening the slotted screws. These wires will be installed through the FW-SP-ACA.



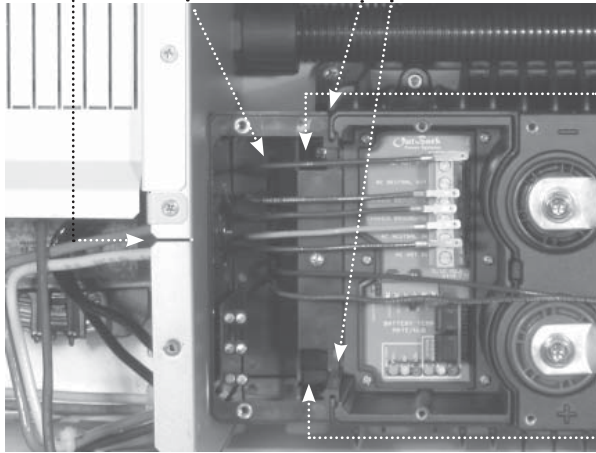
(9) The FW-SP-ACA slides onto the FX in the same location as the now removed AC Conduit Plate and secures to the FX with its own factory-supplied screws in the same location as the removed M5 hex bolts.

**Figure 6:** Preparing and installing the FW-SP-ACA onto an FX

(10) Route the FW-SP-ACA wires through to the AC Wiring Compartment and to the battery lugs

FW-SP-ACA slides down FX slots

(11) Insert a bushing into the AC enclosure (it is not critical that this bushing line up precisely with the FW-SP-ACA); if flexible cable is used instead of an enclosure, appropriate strain relief is required.



Screws (included) secure the FW-SP-ACA to an FX

**Figure 7:** Top view of FW-SP-ACA installed on an FX

(12) Secure the surge protector's wiring in the appropriate locations and replace the various plastic covers as per the wiring instructions on page 16.

## FW-SP-250

The FW-SP-250 is a two-piece combined FLEXware 250 top cover and FLEXware Surge Protector. It replaces an existing FLEXware 250 cover, attaching at the AC end of the FLEXware 250.

### Tools Required to Install:

- Slotted screwdriver
- Phillips screwdriver
- 13 mm socket (torque ratchet)
- Utility knife
- 4 mm Allen wrench

### Purpose:

- Wiring to the AC wiring block
- Remove and install covers
- Securing wires to FX DC terminals
- Removing plastic knockouts
- Removing and installing FX M5 hex bolts

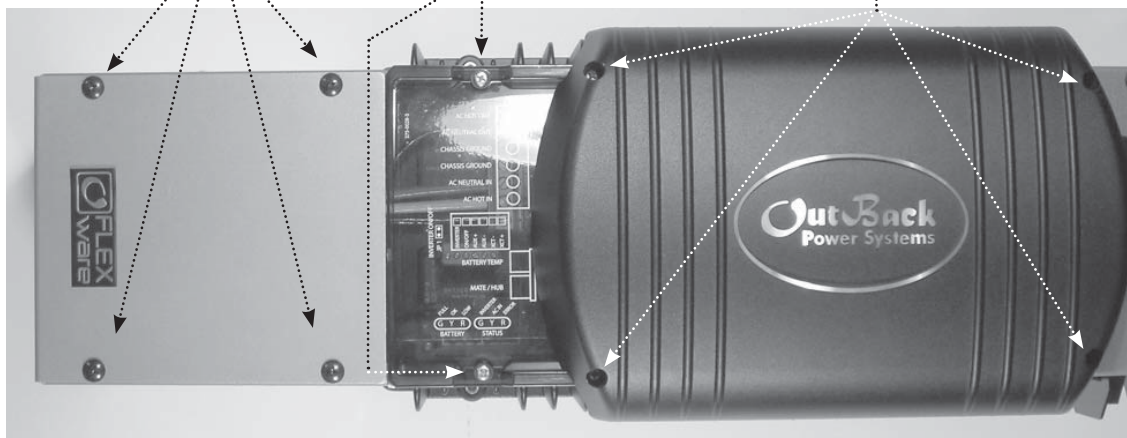
### Procedure

The FLEXware 250 AC should already be installed (see FW250 AC instructions) and all AC and DC power shut off.

(3) Remove the standard FLEXware 250 AC cover (secured by four Phillips screws).

(2) Remove the AC Wiring Compartment cover (secured by two Phillips screws).

(1) Remove the DCC or Turbo cover (secured by four Phillips screws) and the two battery caps.



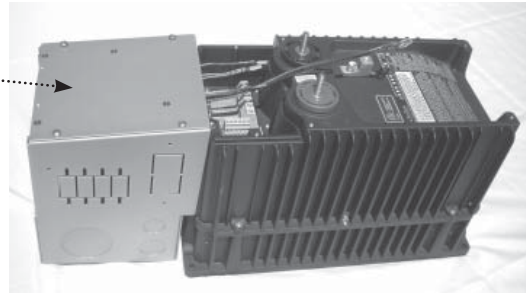
**Figure 8:** FLEXware 250 AC

(4) Replace the standard FLEXware 250 AC cover with the FW-SP-250, securing it with six Phillips screws (four from the removed FW250 AC cover and two additional that come with the FW-SP-250).

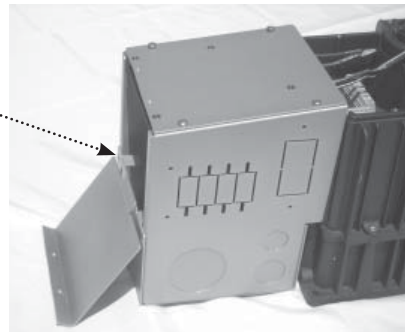


**Figure 9:** FW-SP-250

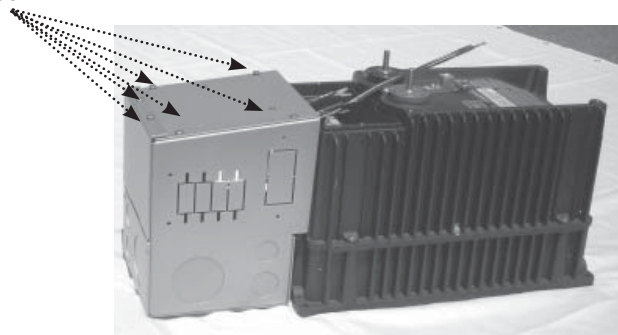
(5) Install the top section of the cover containing the surge protector first.



(6) The lower section of the FW-SP-250 slides inside the FW250 and is then screwed into the previously installed top section. Removing the lower section allows viewing the inside of the FW250 to check the placement of wires and components.



(7) Both sections of the FW-SP-250 are installed and secured with six Phillips screws.



(8) Route the FW-SP-250 wires through to the AC Wiring Compartment and to the battery lugs.

(9) Secure the surge protector's wiring in the appropriate locations and replace the various plastic covers as per the wiring instructions on page 16.

## FW-SP-R (REPLACEMENT) for the FW-SP-ACA or the FW-ACA

An FW-SP-R can replace a damaged surge protector in an FW-SP-ACA or FW-SP-250 or be installed in an FW-ACA when surge protection is desired. The FW-ACA includes a bracket for securing the FW-SP-R.

### Tools Required to Install:

- Slotted screwdriver
- Phillips screwdriver
- 13 mm socket (torque ratchet)
- Utility knife
- 4 mm Allen wrench

### Purpose:

- Wiring to the AC wiring block
- Remove and install covers
- Securing wires to FX terminals
- Removing plastic knockouts
- Removing and installing FX M5 hex bolts

**NOTE:** Always shut off the AC and DC power to the FX before replacing a damaged board or installing a surge protector.

(1) To install an FW-SP-R inside an FW-SP-ACA, remove the FW-SP-ACA by reversing the installation steps on pages 7-9.

## Procedure

Installing an FW-SP-R inside an FW-ACA or an FW-SP-ACA

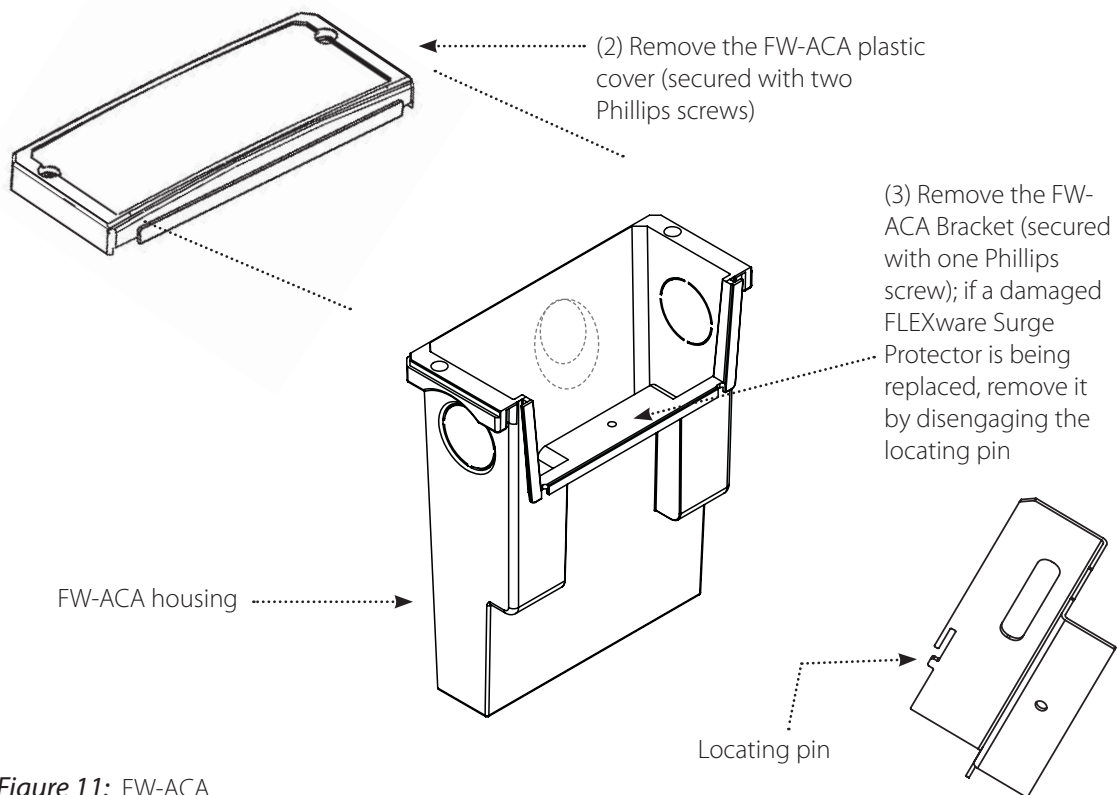
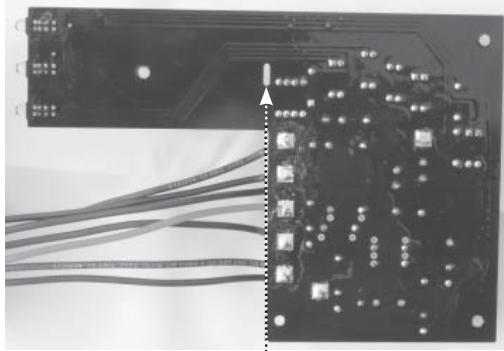
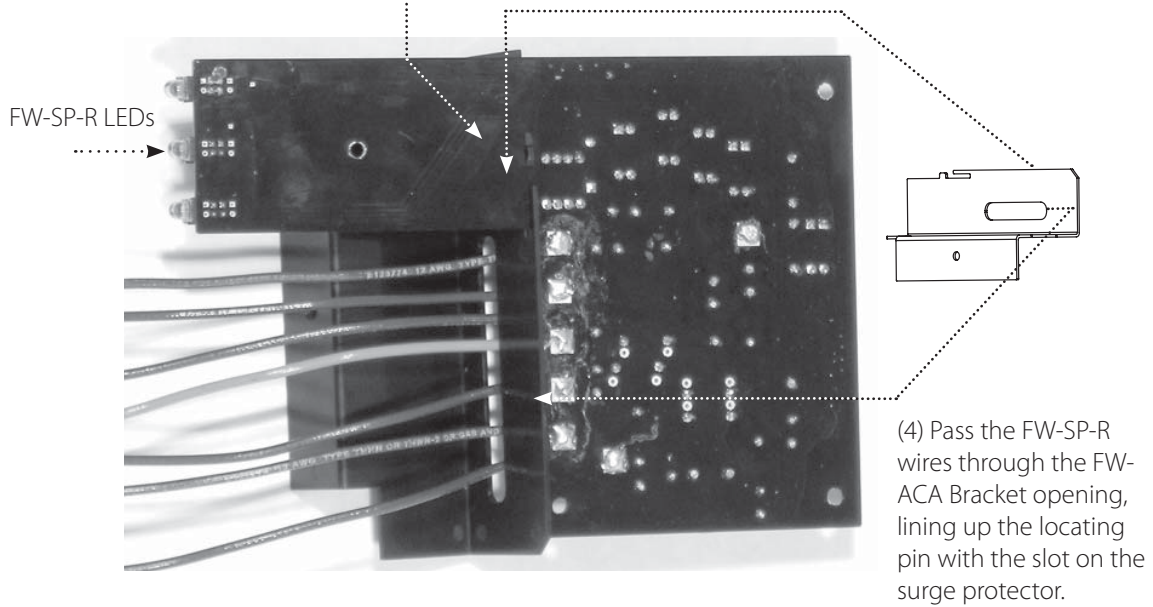


Figure 11: FW-ACA



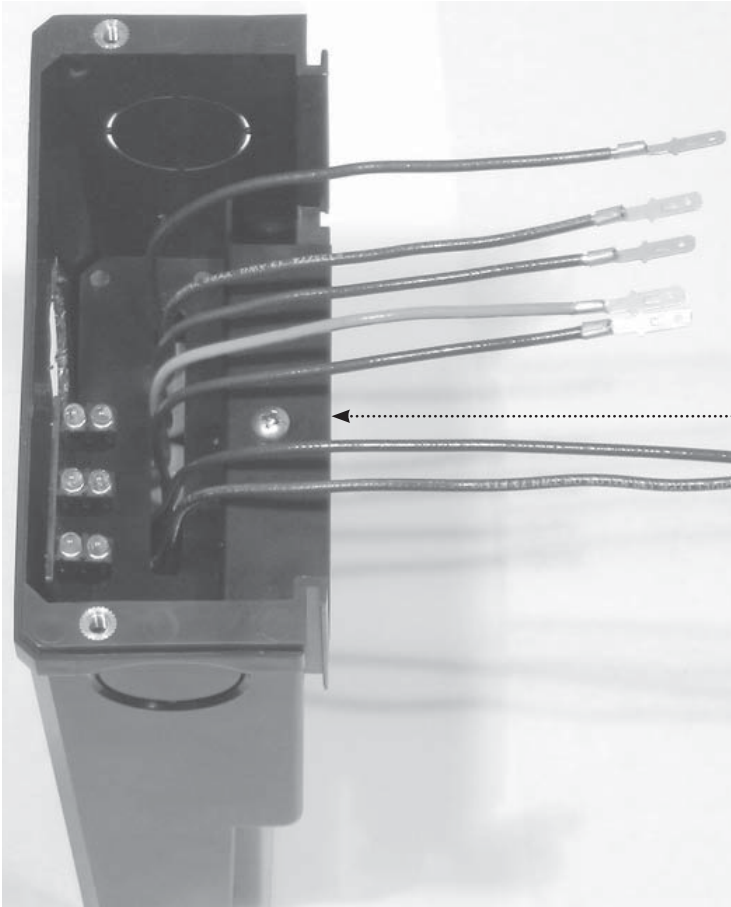
The locating pin on the FW-ACA bracket fits in this slot



Figures 12: FW-SP-R and FW-ACA Bracket

(5) With the FW-SP-R attached to the FW-ACA Bracket, hold the ends of the FW-SP-R wires and slide it and the bracket back inside the FW-ACA to its original location.

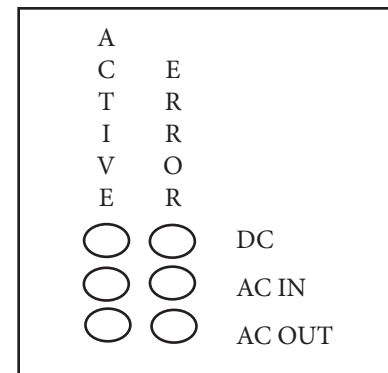
**NOTE:** The FW-SP-R slides into a double slot at the bottom of the FW-ACA. The LEDs should be level with the top of the FW-ACA housing.



**Figure 13:** FW-SP-R installed inside the FW-ACA

(6) Secure the FW-ACA Bracket with Phillips screw

(7) If installing the FW-SP-R in an FW-ACA, place the FW-ACA plastic cover on the housing and attach the LED label to the cover, lining it up with the LEDs below.



LED label

(8) Install the FW-ACA onto the AC side of the FX Series Inverter/Charger (see pages 7-8) and attach the wiring (see page 16).

## FW-SP-R (REPLACEMENT) for the FW-SP-250

In the event an FW-SP-250's board is damaged, it can be replaced without going to the expense of replacing the cover as well.

### Tools Required to Install:

- Slotted screwdriver
- Phillips screwdriver
- 13 mm socket (torque ratchet)

### Purpose:

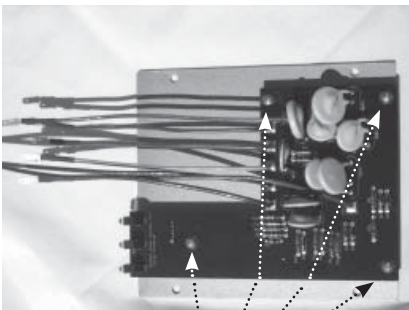
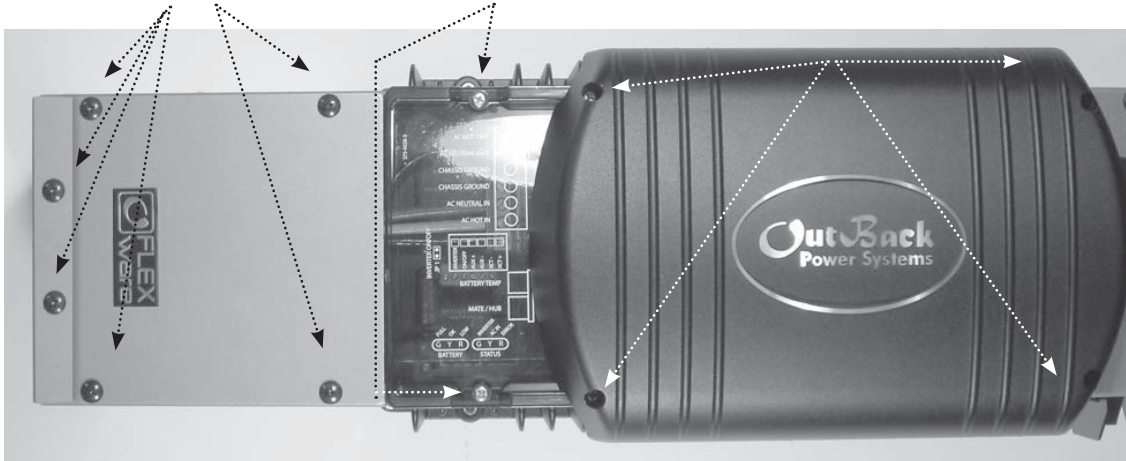
- Wiring to the AC wiring block
- Remove and install covers
- Securing wires to FX DC terminals

**Procedure:** Be sure all AC and DC power to the FX is shut off before installing the FW-SP-250.

(3) Remove the FW-SP-250 (secured by six Phillips screws).

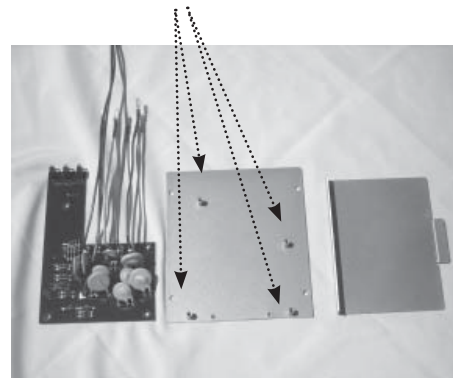
(2) Remove the AC Wiring Compartment cover (secured by two Phillips screws).

(1) Remove the DCC or Turbo cover (secured by four Phillips screws) and the DC battery caps.



(4) Remove the damaged FLEXware Surge Protector by unfastening these four Phillips screws.

(5) The new FW-SP-R installs on these four standoffs on the inside of the FW-SP-250 cover; torque to 8-12 inch-pounds.



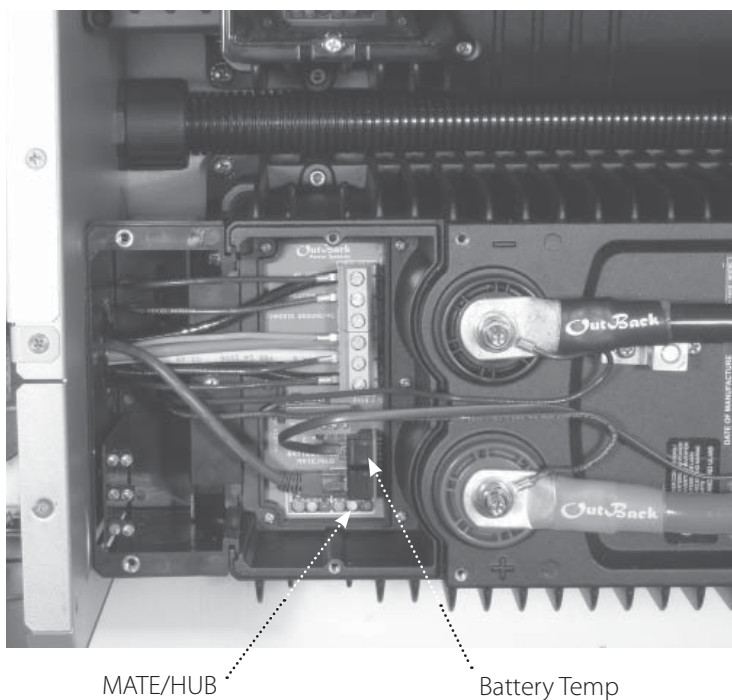
(6) When the new surge protector board has been secured to the FW-SP-250 cover, reinstall the FW-SP-250 as shown on pages 10-11.



## Wiring and Connecting the FLEXware Surge Protector

With the FW-SP-250 or FW-SP-ACA secured, connect all AC and DC wiring as well as any HUB, MATE, AUX, and BATTERY TEMP cables.

- Install all AC and DC power cables first followed by the surge protector wires in their appropriate locations; each wire is labeled on the shrink-wrapped ends near the DC ring terminals and the AC spade lugs
- If the AC cables are already installed, loosen the AC wiring block screws in order to insert the surge protector cables
- Each surge protector wire inserts directly on top of any installed power wire with its label facing up. The surge protector spade lugs will sit on top of the AC wires connected to the wiring block. The surge protector ring terminals will sit on top of the FX's DC lugs
- Secure the AC wiring block screws to 22 inch-pounds and the DC cables to five foot-pounds after installing each power cable and surge protector wire

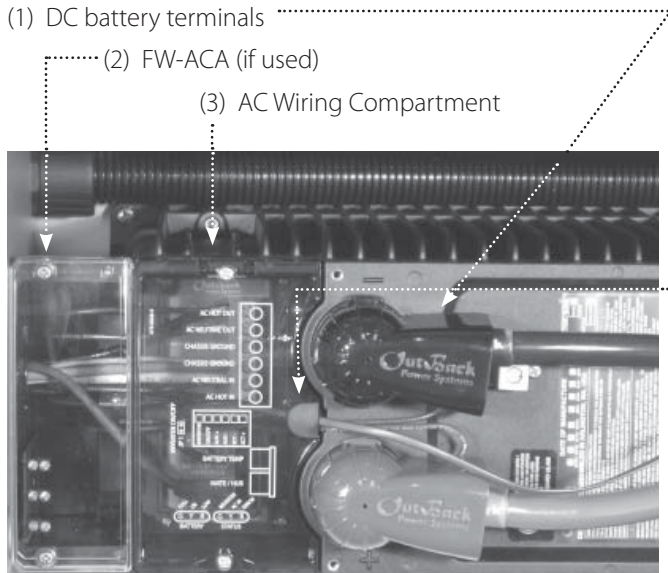


**Figure 15:** Securely connect the surge protector wires to the FX and connect any power, HUB, MATE, AUX, and/or BATTERY TEMP sensor wiring.

### FLEXware Surge Protector Wiring Designations:

- DC+
- DC-
- AC HOT OUT
- AC HOT IN
- AC NEUTRAL OUT
- AC NEUTRAL IN
- GROUND

- Install the various covers in this order with the DCC or Turbo last:



The surge protector's DC + and DC- cables and the BATT TEMP sensor cable pass under this rubber bushing

*Figure 16:* After wiring, install all covers.



*Figure 17:* DCC or Turbo is installed last.

*The system can now be powered up*

- DC power lights up the surge protector's DC ACTIVE LED
- AC OUTPUT from the FX will light up the AC OUT ACTIVE LED
- AC INPUT from a utility grid or generator will light the AC IN ACTIVE LED
- Initially, if any ERROR LED lights, check all wiring and inspect the surge protector circuit board for damage. If no damage or wiring problems are found but the ERROR light stays lit, please contact OutBack Technical Services
- Check the surge protector periodically and particularly after any suspected surge event. If an ERROR occurs, replace the board with an FW-SP-R or contact OutBack Technical Services

## FLEXware™ Surge Protector Limited Warranty

OutBack Power Systems, Inc. ("OutBack") provides a limited warranty ("Warranty") against defects in materials and workmanship for its FLEXware Surge Protector Products ("Product") if installed for use with OutBack FX Series Inverter/Chargers in fixed location applications. The effective time period of this Warranty is determined by the length of the warranty for the FX series Inverter/Charger installed for use with the Product.

For this Warranty to be valid, the Product purchaser must complete and submit the applicable Product registration card within ninety (90) days of the eligible Product's first retail sale and OutBack must acknowledge receipt of the registration card through the issuance of an OutBack 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 with the original OutBack FX Series Inverter/Charger. This 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 the Products. This Warranty does not cover the costs of installation, removal, shipping (except as described below), or reinstallation of the Products.

To request warranty service, you must contact OutBack Technical Services at (360) 435-6030 or [support@outbackpower.com](mailto: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:

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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 warranty certificate for the FX Series Inverter/Charger used with the Product;
3. Description of the problem; and
4. Shipping address for the 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; mark the outside of the container 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 FX Series Inverter/Charger warranty term, whichever is greater.

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## Surge Protector 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:** A 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.

Surge Protector Limited Warranty Registration	
<b>System Owner</b>	
Name:	_____
Address:	_____
City, State, Zip Code:	_____ Country: _____
Telephone Number:	_____ E-mail: _____
Product Model Number:	_____ Product Serial Number: _____
Sold by:	_____ Purchase Date: _____
<i>The following questions refer to the FX Series Inverter/Charger on which the FLEXware Surge Protector is installed:</i>	
FX Series Inverter/Charger Model Number:	_____
FX Series Inverter/Charger Serial Number:	_____
Please circle the three most important factors affecting your purchase decision:	
Price	Product Reputation
Product Features	Reputation of OutBack Power
Value	
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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:	_____ Contractor Number: _____
Installer Address:	_____
Installer City, State, Zip:	_____
Installer E-mail:	_____

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