PV 8 Combiner
PV 12 Combiner
User’s Guide
Includes Mounting and Installation Instructions
About OutBack Power Systems
OutBack Power Systems is a leader in advanced energy conversion technology. Our products include true sine wave inverter/chargers, a maximum power point charge controller, system communication components, as well as breaker panels, breakers, accessories, and assembled systems.

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TABLE OF CONTENTS

Warranty Introduction ....................................................................................................................................................................3
Safety Instructions .............................................................................................................................................................................4
Requirements .........................................................................................................................................................................................5
FWPV-8 Combiner Features ..........................................................................................................................................................7
Sample FW-CBUS-8 (Bus Bar) Installations ...........................................................................................................................8
FWPV-8 Combiner ...............................................................................................................................................................................9
FWPV-8 Knockouts and Dimensions ....................................................................................................................................10
FLEXware PV-8 Combiner Wiring Sample (Circuit Breakers) ..............................................................................................11
   Wiring Diagram ............................................................................................................................................................................12
FLEXware PV-8 Combiner Wiring Sample (Fuses) .................................................................................................................13
   Wiring Diagram ............................................................................................................................................................................13
Fuse Holder Installation ...............................................................................................................................................................14
FWPV-12 Combiner Features ....................................................................................................................................................16
Sample FW-CBUS-12 (Bus Bar) Installations .............................................................................................................................17
FLEXware PV-12 Combiner ........................................................................................................................................................18
FWPV-12 Knockouts and Dimensions ..................................................................................................................................19
FLEXware PV-12 Combiner Wiring Sample (Circuit Breakers) ..........................................................................................20
   Wiring Diagram ............................................................................................................................................................................21
FLEXware PV-12 Combiner Wiring Sample (Fuses) ................................................................................................................22
   Wiring Diagram ............................................................................................................................................................................23
Product Registration ..................................................................................................................................................................24
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.
IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

The OutBack FLEXware PV-8 and PV-12 Combiners are listed by ETL as PV Combiners under the following standards:

- UL 67, 11th Edition
- UL 1741, First Edition
- CSA C22.2, No.29-M1989

These enclosures meet Type 3R rainproof requirements when mounted vertically or leaning back to 14 degrees (3/12 pitch).

This enclosure is rated for up to 150VDC circuit breakers and up to 600VDC fuses.

Grounding Instructions – Each enclosure should be connected to a grounded, permanent wiring system. For most installations, the negative battery conductor should be bonded to the grounding system at one (and only one) point in the DC system. All installations must comply with all national and local codes and ordinances. System grounding as required by the National Electric Code, ANSI/NFPA 70-1996, or other appropriate codes is the responsibility of the system installer.

The equipment ground on FLEXware PV Combiner is marked with this symbol: 🔧

NOTE: Solar panels produce electrical current when light is present, even during overcast weather. Do not wire from the array to the PV-8 or the PV-12 Combiner. Complete all connections inside the combiner first and then connect at the array.

OutBack Power Systems’ FLEXware

FLEXware is a convenient system of all-aluminum, powder-coated modular enclosures with associated mounting hardware and stainless steel fasteners for housing OutBack power components. Our indoor-rated enclosures and mounting plates offer secure and centralized installations for various combinations of FX Series Inverter/Chargers, OutBack Charge Controllers, the OutBack HUB, MATE, and Auto-Transformer, as well as breakers, bus bars, and balance-of-system components.

General Wiring and Installation Instructions

- Remove any necessary knockouts before securing the combiner to its mounting surface.
- Mount the combiner, securing it appropriately.*
- Slide the circuit breakers or fuse holders onto the DIN rail and lock in place.
- Secure the box lugs to the Combiner Bus Bar.
- Install the Combiner Bus Bar and secure it to either the fuse holders or the circuit breakers.
- Connect all wires to the fuse holders or circuit breakers and the box lugs, securing them according to the listed torque values.
- Connect the wires to the solar array.

*FLEXware PV-8 and PV-12 Combiners are designed for weather-resistant outdoor installation when appropriate fasteners and secure mounting surfaces are used. The back of each combiner has knockouts to accommodate fasteners, U-bolts, or other hardware for secure attachment to a solid surface, including pole mounting. Both the surface and the fastening hardware must be sufficient to support the weight of the combiner.
Requirements

- Use minimum 75°C copper conductors.
- Use only code-approved, appropriately listed circuit breakers, fuse holders, and fuses.

<table>
<thead>
<tr>
<th>Maximum Fuse Rating</th>
<th>15 AMP, 600VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Circuit Breaker Rating</td>
<td>15 AMP, 150VDC</td>
</tr>
</tbody>
</table>
| Total Maximum Current Rating  | PV8—120 AMPS DC  
                                    | PV12—180 Amps DC |
| Maximum Fuse Short Circuit Current| 10kA          |
| Maximum Breaker Short Circuit Current| 10kA for 80V; 100A for 150V |

Torque Data* for DC Negative Bus Bar Small Holes

<table>
<thead>
<tr>
<th>WIRE SIZE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG mm²</td>
<td>in lbs</td>
</tr>
<tr>
<td>14-10 2.1-5.3</td>
<td>20    2.3</td>
</tr>
<tr>
<td>8 8.4</td>
<td>25 2.8</td>
</tr>
<tr>
<td>6 13.3-21.2</td>
<td>35 4.0</td>
</tr>
</tbody>
</table>

Torque Data* for Box Lug

<table>
<thead>
<tr>
<th>WIRE SIZE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG mm²</td>
<td>in lbs</td>
</tr>
<tr>
<td>14-10 2.1-5.3</td>
<td>35 4.0</td>
</tr>
<tr>
<td>8 8.4</td>
<td>40 4.5</td>
</tr>
<tr>
<td>6-4 13.3-21.2</td>
<td>45 5.1</td>
</tr>
<tr>
<td>2/0-3 13.3-21.2</td>
<td>50 5.7</td>
</tr>
</tbody>
</table>

Torque Data* for DC Negative Bus Bar Large Holes

<table>
<thead>
<tr>
<th>WIRE SIZE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG mm²</td>
<td>in lbs</td>
</tr>
<tr>
<td>14-10 2.1-5.3</td>
<td>35 4.0</td>
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<tr>
<td>8 8.4</td>
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</tr>
<tr>
<td>6-4 13.3-21.2</td>
<td>45 5.1</td>
</tr>
<tr>
<td>2/0-3 13.3-21.2</td>
<td>50 5.7</td>
</tr>
</tbody>
</table>

Torque Data* for Ground Bus Bar

<table>
<thead>
<tr>
<th>WIRE SIZE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG mm²</td>
<td>in lbs</td>
</tr>
<tr>
<td>14-10 2.1-5.3</td>
<td>20 2.3</td>
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<tr>
<td>8 8.4</td>
<td>25 2.8</td>
</tr>
<tr>
<td>6-4 13.3-21.2</td>
<td>35 4.0</td>
</tr>
</tbody>
</table>

DIN Rail Mounted Breaker and Fuse Holder Terminals are torqued 22 in lbs/2.5 Nm

*Data is also listed on the product label attached to the combiner box.
FWPV-8 Combiner Features

- Accommodates circuit breakers or fuse holders using a reversible* combiner bus bar
- Two output set screw lugs for parallel positive strings capable of accepting 2/0 AWG/67.4 mm² output wires
- Comes with one ground bus bar and one negative bus bar
- 1" EKO bottom knockout punchable to 2" EKO
- 1" back knockout punchable to 1.5"
- Can be mounted on a 3”, 4” or 6” pole**
- Roof mountable at an angle down to 3-in-12 pitch (14°)

*NOTE: A combiner can use either circuit breakers or fuses depending on the installation requirements, but it cannot use both at the same time.

Each FWPV-8 comes with appropriate hardware for securing either circuit breakers or fuses and their conductors. Please see the separate FW-CBUS-8 Instructions for further information.

**Requires fasteners not available from OutBack Power Systems
Sample FW-CBUS-8 (Bus Bar) Installations

Circuit breaker installation using included bus bar hardware

Fuse holder installation

Bus bar hardware installed

Optional DIN Rail End Clamp (FW-EC-DIN)
FWPV-8 Combiner

Two #12 sheet metal screws* secure the combiner’s front cover.

A 7/16” lock hole accepts a padlock to secure the cover.

Houses up to:
- Six “touch safe” OBFH fuse holders and knockouts for six input strings
- Eight DIN mount OBB circuit breakers
- Electrical knockouts capable of accommodating copper wire sizes from 2/0 to 14 AWG (67.4 mm² to 2.08 mm²)

*Finish torque to 14 in-lbs
Knockouts and Dimensions

FWPV-8 Combiner

Knockouts for 3", 4", and 6" U-bolts (pole mount installation)

Knockouts for flat surface installation

\( \phi 0.5" \) EKO [EACH SIDE] [PUNCHABLE TO 1"

\( \phi 1" \) EKO [PUNCHABLE TO 1.5"

\( \phi 0.25" \) EKO [2 PLACES]

\( \phi 0.1" \) EKO [PUNCHABLE TO 0.2"

Front View

Side View

Bottom View
FLEXware PV-8 Combiner Wiring Sample (Circuit Breakers)

COMB(iner) Bus—combines all the PV array output “strings” or wiring at one bus which connects to the OutBack Charge Controller(s); lugs can accept cable sizes ranging from 2/0 to 14 AWG (67.4 mm² to 2.08 mm²) copper wires.

Individual PV circuit breakers (up to 15 amp/150 VDC) are available from OutBack.

Circuit breakers must be secured to the DIN rail and installed flush against the dead front mounting flange.

Dead front mounting flange.

Negative Terminal Bus Bar

Back chassis knockout

Individual array wiring enters through the bottom knockouts to stay weather resistant.
PW NEGATIVE TBB

GROUND BUS

UP TO DUAL 2/0 AWG OUTPUT WIRES

TO CHARGE CONTROLLER OR INVERTER

BREAKERS

FWPV-8 with circuit breakers

GROUNDING ELECTRODE
FLEXware PV-8 Combiner Wiring Sample (Fuses)

COMB(iner) Bus—combines all the PV array output "strings" or wiring at one bus which connects to the OutBack Charge Controller(s); lugs can accept cable sizes ranging from 2/0 to 14 AWG (67.4 mm² to 2.08 mm²) copper wires.

Individual PV array fuses and fuse holders (up to 15 amp/600 VDC) are available from OutBack.

Fuse holders must be secured to the DIN rail and installed flush against the dead front mounting flange.

Individual array wiring enters through the bottom knockouts to stay weather resistant.

Dead front mounting flange

Negative Terminal Bus Bar

Ground Bus Bar

Back chassis knockout

DIN rail

Dead front
PV NEGATIVE TBB

GROUND BUS

FUZEHOLDERS WITH FUSES

POSITIVE COMBINATION BUS

UP TO DUAL 2/0 AWG OUTPUT WIRES

TO CHARGE CONTROLLER OR INVERTER

FWPV-8 with fuses

GROUNDING ELECTRODE
FWPV-12 Combiner Features

- Accommodates circuit breakers or fuse holders using a reversible* combiner bus bar
- Four output set screw lugs for positive parallel strings capable of accepting 2/0 AWG (67.4 mm²) output wires
- Comes with two ground bus bars and two negative bus bars
- 1" EKO bottom knockout punchable to 2" EKO
- 1" back knockout punchable to 1.5"
- Can be mounted on a 6" or 8" pole
- Roof mountable at an angle down to 3-in-12 pitch (14°)

*NOTE: A combiner can use either circuit breakers or fuses depending on the installation requirements, but it cannot use both at the same time. Positive combiner bus bars can be combined per NEC 2008 standards.

Each FWPV-12 comes with appropriate hardware for securing either circuit breakers or fuses and their conductors (see next page).
Sample FW-CBUS-12 (Bus Bar) Installations

Fuse holder installation using included bus bar hardware

Circuit breaker installation

Optional DIN Rail End Clamps (FW-EC-DIN)

Bus bar hardware installed
FLEXware PV-12 Combiner

Two #12 sheet metal screws* secure the combiner’s front cover.

A 7/16" lock hole accepts a padlock to secure the cover.

Houses up to:
- Eight “touch safe” OBFH fuse holders and OBF fuses and knockouts for eight input strings
- 12 DIN mount OBB circuit breakers
- Electrical knockouts capable of accommodating copper wire sizes from 2/0 to 14 AWG (67.4 mm² to 2.08 mm²)

Combiner shown with optional fuse holders mounted to DIN rail.

Tinted polycarbonate dead front with breaker and fuse knockouts secures with four #12 sheet metal screws*.

Negative Terminal Bus Bars

Ground bus bars

*Finish torque to 14 in-lbs
Knockouts and Dimensions

FWPV-12 Combiner

Front View

Knockouts for flat surface installation

Bottom View

Knockouts for 6" and 8" U-bolts used in pole mount installation
FLEXware PV-12 Combiner Wiring Sample (Circuit Breakers)

COMB(iner) Bus Bars—combine all the PV array output "strings" or wiring at two bus bars which connect to the OutBack Charge Controller(s); lugs can accept cable sizes ranging from 2/0 to 14 AWG (67.4 mm² to 2.08 mm²) copper wires.

Circuit breakers must be secured to the DIN rail and installed flush against the dead front mounting flange.

Individual PV circuit breakers (up to 15 amp/150 VDC) are available from OutBack.

Dead front mounting flange

DIN rail

Negative Terminal Bus Bar

Back chassis knockout

Ground Bus Bars

Individual array wiring enters through the bottom knockouts to stay weather resistant.
FWPV-12 with circuit breakers
COMB(iner) Bus Bars—combine all the PV array output "strings" or wiring at two bus bars which connect to the OutBack Charge Controller(s); lugs can accept cable sizes ranging from 2/0 to 14 AWG (67.4 mm² to 2.08 mm²) copper wires.

Individual array wiring enters through the bottom knockouts to stay weather resistant.

Fuse holders must be secured to the DIN rail and installed flush against the dead front mounting flange.

Individual PV array fuses and fuse holders (up to 15 amp/600 VDC) are available from OutBack.

Dead front mounting flange

DIN rail

Negative Terminal Bus Bar

Back chassis knockout

Negative Terminal Bus Bar

Ground Bus Bars

Individual array wiring enters through the bottom knockouts to stay weather resistant.

NOTE: Please see page 15 for fuse holder installation information.
UP TO DUAL 2/0 AWG OUTPUT WIRES

FUSEHOLDERS WITH FUSES

GROUNDING ELECTRODE

FWPV-12 with fuses
NOTE: Please complete one form for all installed FLEXware product.

<table>
<thead>
<tr>
<th>FLEXware Product Registration</th>
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<tbody>
<tr>
<td><strong>System Owner</strong></td>
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<tr>
<td>Name: _______________________</td>
</tr>
<tr>
<td>City, State, Zip Code:</td>
</tr>
<tr>
<td>Telephone Number: ___________</td>
</tr>
<tr>
<td>Address: ____________________</td>
</tr>
<tr>
<td>Country: ____________________</td>
</tr>
<tr>
<td>E-mail: ____________________</td>
</tr>
<tr>
<td><strong>Installer</strong></td>
</tr>
<tr>
<td>Company: ____________________</td>
</tr>
<tr>
<td>Contractor Number: ___________</td>
</tr>
<tr>
<td>Installer Address: ___________</td>
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<tr>
<td>Installer City, State, Zip:</td>
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<tr>
<td>Installer E-mail: ___________</td>
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<tr>
<td><strong>System</strong></td>
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<tr>
<td>System Install/Commission Date:</td>
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<tr>
<td>Sold by: ____________________</td>
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<tr>
<td>Purchase Date: _______________</td>
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<tr>
<td><strong>Please circle type of application:</strong></td>
</tr>
<tr>
<td>Off-Grid</td>
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<tr>
<td>Grid-Interactive</td>
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<tr>
<td>AC Coupled</td>
</tr>
<tr>
<td>Backup</td>
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<tr>
<td>Mobile</td>
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<td><strong>Please circle installed components:</strong></td>
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<tr>
<td>FLEXware Enclosures and Mounting Components</td>
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<tr>
<td>FLEXware 250</td>
</tr>
<tr>
<td>FLEXware 500 AC</td>
</tr>
<tr>
<td>FLEXware 500 DC</td>
</tr>
<tr>
<td>FLEXware PV 8</td>
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<td>FLEXware PV 12</td>
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<tr>
<td>FLEXware 1000 AC</td>
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<tr>
<td>FLEXware 1000 DC</td>
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<tr>
<td>IOB Kits</td>
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<tr>
<td>FW-IOB-S-120VAC</td>
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<td>FW-IOB-S-230VAC</td>
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<tr>
<td>FW-IOB-D-120/240VAC</td>
</tr>
<tr>
<td>FW-IOB-D-120VC</td>
</tr>
<tr>
<td>FW-IOB-D-230VAC</td>
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<tr>
<td><strong>The system is equipped with (circle one):</strong></td>
</tr>
<tr>
<td>FW-X240</td>
</tr>
<tr>
<td>PSX-240</td>
</tr>
<tr>
<td>PSX-240-Relay</td>
</tr>
<tr>
<td><strong>Please circle the three most important factors affecting your purchase decision:</strong></td>
</tr>
<tr>
<td>Price</td>
</tr>
<tr>
<td>Product Reputation</td>
</tr>
<tr>
<td>Product Features</td>
</tr>
<tr>
<td>Reputation of OutBack Power Systems</td>
</tr>
<tr>
<td>Value</td>
</tr>
<tr>
<td><strong>I am interested in receiving information concerning OutBack Power Systems products and events (circle one):</strong></td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Please take a moment to register and provide us with some important information and return it to: Outback Power Systems Inc. 19009 62nd Ave. NE Arlington, WA 98223