



# Welcome



OutBack Power Systems is proud to begin another year of designing and manufacturing solutions with you, the customer, in mind. OutBack maintains the philosophy that listening to our customers and innovating to meet their needs is paramount to our success.

This past year OutBack's engineering, marketing and operations teams have been focusing on taking the suggestions provided by our customers to develop a new line of products called FLEXware. FLEXware is an evolution in balance of system components which are simple to order, easy to assemble and fast to install. In conjunction with this product development, we have made efforts to further enhance our industry-leading level of customer service by building our team of qualified technical and order service personnel.

OutBack is excited about what the future will bring. We will continue to listen to and learn from our customers, and continue to innovate. The power electronics and communications technologies we have developed over the past several years will allow OutBack to continue to provide the cutting edge solutions our customers are looking for as we move ahead.

We are confident that OutBack will continue to lead the way in bringing the solutions and services that people have come to depend on.

Thank you for your support as we continue *Powering the Planet.*

## History

**2001** OutBack Power started by a passionate group of engineers whom wanted to bring power conversion electronics technology into the 21st century.

This small startup quickly grew by offering innovative and well designed solutions to renewable energy problems. OutBack listened to their customers and made many of the changes that were suggested, creating a truly customer focused company in the power conversion electronics industry.

**2002** OutBack introduces its first sealed sinewave inverter/charger, the FX2024 - with resounding success.

This single model changed the way people looked at system design by offering unprecedented flexibility in system design and expansion while the sealed construction allowed for uses which previously would have been considered too "extreme" for other inverter/chargers.

OutBack releases the MX60 solar MPPT charge controller redefining performance and value.

This revolutionary product changed the way solar systems were being installed and quickly gained a reputation for getting the most power possible from a PV array - often making it more expensive to not use one.

**2003** OutBack launches the first of the vented versions of the FX series inverter/chargers.

These VFX models were introduced in direct response to our customer's requests providing higher power at a similar price as the sealed counterpart.

OutBack launches the PS2, value priced system integration accessories.

This line of accessories addressed the needs of our customers for competitively priced system integration accessories for smaller systems.

**2004** OutBack releases the world's most efficient grid-interactive inverter/charger.

These models raise the bar for performance and value for battery-connected grid-interactive inverter/charger systems. OutBack introduces the PS1 fully integrated grid-interactive power system.

This unique system sets a new standard for system integration, performance and ease of installation in grid-interactive applications.

**2005** OutBack reaches milestones in product deliveries and product recognition.

**MX60 and FX inverters production lines each ship 10,000 unit.**

OutBack Power equipped teams sweep the top three places in the 2005 Solar Decathlon, a competition between International universities to develop and build the most energy efficient home.

# Index



**3**  
Sinewave Inverter/Charger

**6**  
Charge Controller

**7**  
System Display and Controller

**8**  
Communications Manager

**9**  
Remote Temperature Sensor

**10**  
Auto Transformer

**11**  
OutBack System Stacking

**12**  
Grid-Interactive System



Design by Karen O'Bryan  
Photography by Erik Stuhau



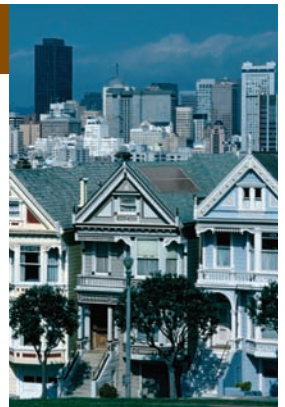
## Off-Grid

Solar. Wind. Hydro. Generator. No matter what your energy source OutBack's products are engineered to provide your home or business with reliable electricity day-in and day-out. The OutBack modular system architecture allows your system to grow along with your power needs up to 36,000 watts. Power hungry appliances like washing machines, air conditioning and power tools are easily started by our inverter's substantial surge power capability. When not being used, the inverter enters a power save mode, which consumes as little as 3 watts, saving your battery power for when you need it the most. OutBack's innovative Maximum Power Point Tracking (MPPT) technology gets the most from your solar array or can also control hydro or wind turbine charging sources. Complete system status and control is easily monitored by a single control, instead of requiring the user to keep an eye on multiple displays and status indicators.



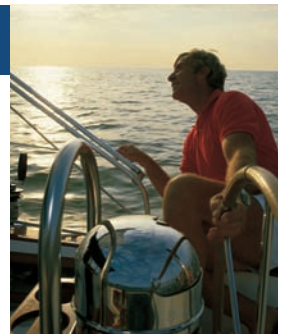
## Grid-Interactive

Grid-Interactive renewable energy systems enable you to demonstrate your personal commitment to a renewable energy future. With the OutBack grid-interactive system, backup AC power is made available 24 hours a day in the event of a utility outage, providing reliable power and peace-of-mind. At night, the inverter's automatic power save mode ensures that energy is not wasted by needlessly charging your batteries from the utility grid. An average conversion efficiency of 91% using the California Energy Commission (CEC) test protocol provides greater savings and a shorter time period for system payback. OutBack's grid-interactive technology provides you more than a typical solar inverter, we also have an unmatched ability to utilize solar, wind and hydropower sources.



## Mobile and Marine

OutBack's Mobile and Marine inverter/charger models provide the high performance and reliability you need no matter where your travels take you. Our die-cast metal construction allows mounting in any position, even upside down. The required AC input neutral/ground switching is taken care of by a fully integrated 30 amp AC transfer switch for shore chord or generator hook-up. Three circuit boards and a simple design make field servicing the unit easy no matter where you are. Rigorous testing at the factory ensures that each inverter/charger works the first time as well as for many years to come.



## European and Exports

Wherever you are in the world, OutBack's European and Export off-grid inverter/chargers are engineered to provide your home or business with reliable 50 Hz AC power. Our high surge power capability starts the most demanding of 230 volt appliances and the modular system architecture makes expanding a system's power capacity or switching to three-phase output power simple and trouble free. Both sealed (FX) and vented (VFX) models are available with 50 Hz output to match your installation's environmental conditions. The inverter/chargers low weight (as low as 27 kilograms) and compact dimensions allow easy transport and installation in less than ideal locations. Our field serviceable design eliminates the need to ship inverters if repair or upgrades are required. Superior technical support is available from our European office, allowing questions to be promptly answered and any problems to be quickly resolved.



# Sinewave Inverter/Charger

OutBack inverter/chargers are the next generation in advanced power management. Each is a DC to AC sinewave inverter, battery charger and AC transfer switch housed within a tough die-cast aluminum chassis.

Just like the local utility grid, the inverter produces true sinewave AC electricity for your stand-alone or backup power needs. Computers, TVs and pumps are just some of the examples of modern electronics that last longer and run better when powered with true sinewave electricity from an OutBack inverter. Starting up your air conditioning, washing machine or well pump is worry-free because of our high surge power capability.

Batteries and generators are the costly consumables when using inverters to generate electricity. The integrated smart battery charger uses multiple stages to perform quick recharging while prolonging battery life, saving your batteries and generator from unnecessary wear. Automatic switching between AC power sources is seamless due to an AC transfer switch that reacts in less than 16 milliseconds.

Unique networked communication is built into all OutBack products providing complete integration. Expanding your system with your growing power needs is as simple as adding additional inverters with modular architecture. Further flexibility is provided with the ability to be connected at any time in either parallel, series or three-phase power configurations. Industry leading OutBack reliability is achieved through simplified design and rugged construction.



## FX Sealed Inverter/Chargers

The FX series is designed to survive in environments that would normally destroy other inverter/chargers. Protection for internal components is provided by our die-cast aluminum chassis with a powder coated finish to prevent corrosion. Internal and external cooling fins allow for passive heat transfer, enabling peak operating efficiencies as high as 93% and looking cool while doing it. Water and small particles are kept out through the generous use of gaskets and O-ring seals on all seams and openings. A protective conformal coating on all circuit boards provides the final line of defense against corrosion. The now standard externally mounted “TURBO” cooling system improves performance in hot conditions.

## VFX Vented Inverter/Chargers

The VFX series is designed for more protected installations. By utilizing an efficient active cooling design, the VFX models are available with AC output up to 3.6 kilowatts. Our tough die-cast aluminum chassis physically protects the internal components while the air intake includes an easily cleaned filter, which allows for ventilation while also keeping bugs and other debris out. All circuit boards are conformal coated to prevent corrosion from airborne moisture in humid conditions. The now standard DC wiring cover (DCC) protects the DC terminals and battery cables from damage.



Off-Grid Specifications	Sealed Models			Vented Models		
	FX2012T	FX2524T	FX3048T	VFX2812	VFX3524	VFX3648
Nominal DC Input Voltage	12 VDC	24 VDC	48 VDC	12 VDC	24 VDC	48 VDC
Continuous Power Rating at 25° C	2000 VA	2500 VA	3000 VA	2800 VA	3500 VA	3600 VA
AC Voltage/Frequency	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz
Continuous AC RMS Output at 25° C	17.0 amps AC	20.8 amps AC	25.0 amps AC	23.3 amps AC	29.2 amps AC	30.0 amps AC
Idle Power	Full	≈ 20 Watts	≈ 20 Watts	≈ 20 Watts	≈ 20 Watts	≈ 23 Watts
	Search	≈ 2.6 Watts	≈ 2.6 Watts	≈ 2.6 Watts	≈ 2.6 Watts	≈ 2.6 Watts
Typical Efficiency	90%	92%	93%	90%	92%	93%
Total Harmonic Distortion	Typical	2%	2%	2%	2%	2%
	Maximum	5%	5%	5%	5%	5%
Output Voltage Regulation	± 2%	± 2%	± 2%	± 2%	± 2%	± 2%
Maximum Output Current	Peak	56 amps AC	70 amps AC	70 amps AC	56 amps AC	70 amps AC
	RMS	40 amps AC	50 amps AC	50 amps AC	40 amps AC	50 amps AC
AC Overload Capability	Surge	4800 VA	6000 VA	6000 VA	4800 VA	6000 VA
	5 Second	4000 VA	4800 VA	4800 VA	4000 VA	5000 VA
	30 Minutes	2500 VA	3200 VA	3200 VA	3200 VA	4000 VA
AC Input Current Maximum	60 amps AC	60 amps AC	60 amps AC	60 amps AC	60 amps AC	60 amps AC
AC Input Voltage Range (MATE Adjustable)	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC
AC Input Frequency Range	54 to 66 Hz	54 to 66 Hz	54 to 66 Hz	54 to 66 Hz	54 to 66 Hz	54 to 66 Hz
DC Input Voltage Range	10.5 to 17.5 VDC	21.0 to 34.0 VDC	42.0 to 68.0 VDC	10.5 to 17.0 VDC	21.0 to 34.0 VDC	42.0 to 68.0 VDC
Continuous Battery Charge Output	80 amps DC	55 amps DC	35 amps DC	125 amps DC	85 amps DC	45 amps DC
Minimum Recommended DC Breaker	OBDC-250	OBDC-175	OBDC-100	OBDC-250	OBDC-250	OBDC-175
Warranty	Standard 2 year / Optional 5 year			Standard 2 year / Optional 5 year		
Weight	Unit	56 lbs (25 kg)			54 lbs (25 kg)	
	Shipping	67 lbs (30 kg)			62.2 lbs (28 kg)	
Dimensions (H x W x L)	Unit	13 x 8.25 x 16.25" (33 x 21 x 41 cm)			12 x 8.25 x 16.25" (30 x 21 x 41 cm)	
	Shipping	21.75 x 13 x 22" (55 x 33 x 56 cm)			21.75 x 13 x 22" (55 x 33 x 56 cm)	

Grid-Interactive Specifications	Sealed Models		Vented Models	
	GTFX2524	GTFX3048	GVFX3524	GVFX3648
Nominal DC Input Voltage	24 VDC	48 VDC	24 VDC	48 VDC
Continuous Power Rating at 25° C	2500 VA	3000 VA	3500 VA	3600 VA
AC Voltage/Frequency	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz
Continuous AC RMS Output at 25° C	20.8 amps AC	25.0 amps AC	29.2 amps AC	30.0 amps AC
Idle Power	Full	≈ 20 Watts	≈ 20 Watts	≈ 20 Watts
	Search	≈ 2.6 Watts	≈ 2.6 Watts	≈ 2.6 Watts
Typical Efficiency	92%	93%	92%	93%
Total Harmonic Distortion	Inverting	2%	2%	2%
	Selling	< 5%	< 5%	< 5%
Output Voltage Regulation	± 2%	± 2%	± 2%	± 2%
Maximum Output Current	Peak	70 amps AC	70 amps AC	70 amps AC
	RMS	50 amps AC	50 amps AC	50 amps AC
AC Overload Capability	Surge	6000 VA	6000 VA	6000 VA
	5 Second	4800 VA	4800 VA	5000 VA
	30 Minutes	3200 VA	3200 VA	4000 VA
AC Input Current Maximum	60 amps AC	60 amps AC	60 amps AC	60 amps AC
AC Input Voltage Range (MATE Adjustable)	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC
AC Input Frequency Range	58 to 62 Hz	58 to 62 Hz	58 to 62 Hz	58 to 62 Hz
DC Input Range	21.0 to 34.0 VDC	42.0 to 68.0 VDC	21.0 to 34.0 VDC	42.0 to 68.0 VDC
Continuous Battery Charge Output	55 amps DC	35 amps DC	85 amps DC	45 amps DC
Minimum Recommended DC Breaker	OBDC-175	OBDC-100	OBDC-250	OBDC-175
Warranty	Standard 2 year / Optional 5 year		Standard 2 year / Optional 5 year	
Weight	Unit	56 lbs (25 kg)		54 lbs (25 kg)
	Shipping	67 lbs (30 kg)		62.2 lbs (28 kg)
Dimensions (H x W x L)	Unit	13 x 8.25 x 16.25" (33 x 21 x 41 cm)		12 x 8.25 x 16.25" (30 x 21 x 41 cm)
	Shipping	21.75 x 13 x 22" (55 x 33 x 56 cm)		21.75 x 13 x 22" (55 x 33 x 56 cm)

Mobile Specifications	Sealed Models			Vented Models			
	FX2012MT	FX2524MT	FX2532MT	VFX2812M	VFX3524M	VFX3232M	
Nominal DC Input Voltage	12 VDC	24 VDC	32 VDC	12 VDC	24 VDC	32 VDC	
Continuous Power Rating at 25° C	2000 VA	2500 VA	2500 VA	2800 VA	3500 VA	3200 VA	
AC Voltage/Frequency	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	120 VAC 60 Hz	
Continuous AC RMS Output at 25° C	17.0 amps AC	20.8 amps AC	20.8 amps AC	23.3 amps AC	29.2 amps AC	26.6 amps AC	
Idle Power	Full	≈ 20 Watts	≈ 20 Watts	≈ 21 Watts	≈ 20 Watts	≈ 21 Watts	
	Search	2.6 Watts	2.6 Watts	2.6 Watts	2.6 Watts	2.6 Watts	
Typical Efficiency	90%	92%	92%	90%	92%	92%	
Total Harmonic Distortion	Typical	2%	2%	2%	2%	2%	
	Maximum	5%	5%	5%	5%	5%	
Output Voltage Regulation	± 2%	± 2%	± 2%	± 2%	± 2%	± 2%	
Maximum Output Current	Peak	56 amps AC	70 amps AC	56 amps AC	56 amps AC	70 amps AC	
	RMS	40 amps AC	50 amps AC	40 amps AC	40 amps AC	50 amps AC	
AC Overload Capability	Surge	4800 VA	6000 VA	4800 VA	4800 VA	6000 VA	
	5 Second	4000 VA	4800 VA	4000 VA	4000 VA	5000 VA	
	30 Minutes	2500 VA	3200 VA	2500 VA	3200 VA	4000 VA	
AC Input Current Maximum	30 amps AC	30 amps AC	30 amps AC	30 amps AC	30 amps AC	30 amps AC	
AC Input Voltage Range (MATE Adjustable)	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	80 to 150 VAC	
AC Input Frequency Range	54.0 to 66.0 Hz	54.0 to 66.0 Hz	54.0 to 66.0 Hz	54.0 to 66.0 Hz	54.0 to 66.0 Hz	54.0 to 66.0 Hz	
DC Input Range	10.5 to 17.0 VDC	21.0 to 34.0 VDC	28.0 to 45.3 VDC	10.5 to 17.0 VDC	21.0 to 34.0 VDC	28.0 to 45.3 VDC	
Continuous Battery Charge Output	80 amps DC	55 amps DC	35 amps DC	125 amps DC	85 amps DC	45 amps DC	
Minimum Recommended DC Breaker	OBDC-250	OBDC-175	OBDC-125	OBDC-250	OBDC-250	OBDC-175	
Warranty	Standard 2 year / Optional 5 year			Standard 2 year / Optional 5 year			
Weight	Unit	56 lbs (25 kg)			54 lbs (25 kg)		
	Shipping	67 lbs (30 kg)			62.2 lbs (28 kg)		
Dimensions (H x W x L)	Unit	13 x 8.25 x 16.25" (33 x 21 x 41 cm)			12 x 8.25 x 16.25" (30 x 21 x 41 cm)		
	Shipping	21.75 x 13 x 22" (55 x 33 x 56 cm)			21.75 x 13 x 22" (55 x 33 x 56 cm)		

European Specifications	Sealed Models			Vented Models			
	FX2012ET	FX2024ET	FX2348ET	VFX2612E	VFX3024E	VFX3048E	
Nominal DC Input Voltage	12 VDC	24 VDC	48 VDC	12 VDC	24 VDC	48 VDC	
Continuous Power Rating at 25° C	2000 VA	2000 VA	2300 VA	2600 VA	3000 VA	3000 VA	
AC Voltage/Frequency	230 VAC 50 Hz	230 VAC 50 Hz	230 VAC 50 Hz	230 VAC 50 Hz	230 VAC 50 Hz	230 VAC 50 Hz	
Continuous AC RMS Output at 25° C	8.7 amps AC	8.7 amps AC	10.0 amps AC	11.3 amps AC	13.0 amps AC	13 amps AC	
Idle Power	Full	≈ 20 Watts	≈ 20 Watts	≈ 23 Watts	≈ 20 Watts	≈ 23 Watts	
	Search	2.6 Watts	2.6 Watts	2.6 Watts	2.6 Watts	2.6 Watts	
Typical Efficiency	90%	92%	93%	90%	92%	93%	
Total Harmonic Distortion	Typical	2%	2%	2%	2%	2%	
	Maximum	5%	5%	5%	5%	5%	
Output Voltage Regulation	± 2%	± 2%	± 2%	± 2%	± 2%	± 2%	
Maximum Output Current	Peak	28 amps AC	35 amps AC	35 amps AC	28 amps AC	35 amps AC	
	RMS	20 amps AC	25 amps AC	25 amps AC	20 amps AC	25 amps AC	
AC Overload Capability	Surge	4600 VA	5750 VA	5750 VA	4600 VA	5750 VA	
	5 Second	4000 VA	4800 VA	4800 VA	4000 VA	4800 VA	
	30 Minutes	2500 VA	3100 VA	3100 VA	3100 VA	3300 VA	
AC Input Current Maximum	30 amps AC	30 amps AC	30 amps AC	30 amps AC	30 amps AC	30 amps AC	
AC Input Voltage Range (MATE Adjustable)	160 to 300 VAC	160 to 300 VAC	160 to 300 VAC	160 to 300 VAC	160 to 300 VAC	160 to 300 VAC	
AC Input Frequency Range	44 to 56 Hz	44 to 56 Hz	44 to 56 Hz	44 to 56 Hz	44 to 56 Hz	44 to 56 Hz	
DC Input Voltage Range	10.5 to 17.0 VDC	21.0 to 34.0 VDC	42.0 to 68.0 VDC	10.5 to 17.0 VDC	21.0 to 34.0 VDC	42.0 to 68.0 VDC	
Continuous Battery Charge Output	100 amps DC	55 amps DC	35 amps DC	120 amps DC	85 amps DC	42 amps DC	
Minimum Recommended DC Breaker	OBDC-250	OBDC-175	OBDC-100	OBDC-250	OBDC-250	OBDC-175	
Warranty	Standard 2 year / Optional 5 year			Standard 2 year / Optional 5 year			
Weight	Unit	56 lbs (25 kg)			54 lbs (25 kg)		
	Shipping	67 lbs (30 kg)			62.2 lbs (28 kg)		
Dimensions (H x W x L)	Unit	13 x 8.25 x 16.25" (33 x 21 x 41 cm)			12 x 8.25 x 16.25" (30 x 21 x 41 cm)		
	Shipping	21.75 x 13 x 22" (55 x 33 x 56 cm)			21.75 x 13 x 22" (55 x 33 x 56 cm)		

# Charge Controller

## MX60

The MX60 raises the bar for high performance solar controllers. OutBack's ingenuity and engineering experience has been combined to maximize the output power of your expensive solar array. Our real time active Maximum Power Point Tracking (MPPT) system ensures that your solar array is operating at its peak power point regardless of age, shading or environmental conditions. Systems with large solar arrays are now a snap thanks to the MX60's 60 amp DC output current rating for 12, 24 or 48 VDC systems - all with just one product model!

Real wiring flexibility of your solar array is finally here because of the MX60's wide range DC input, up to 150 VOC. The ability to step-down a high voltage solar array to a low voltage battery can save you money by reducing the size of wire required and making the installation simpler and faster. Our smart multistage recharging process ensures your batteries are recharged efficiently and gently to prolong battery life and achieves the highest possible performance.

All of the MX60's status information is displayed on the large built-in 3.1" (8 cm) backlit LCD screen. Monitoring your solar array's performance is easy because of included data logging system that automatically records the last 64 days of system operation. OutBack's network communication system allows your MX60 to communicate with the rest of your OutBack system, eliminating multiple product interaction problems and allowing remote monitoring via the OutBack MATE display up to 1000 feet / 300 meters away.



### MX60 Specifications

Nominal Battery Voltage		12, 24, 32, 36, 48, 54 or 60 VDC (Single model)
Output Current		60 amps maximum with adjustable current limit for smaller systems
Maximum Solar Array Size		12 VDC systems 800 Watts / 24 VDC systems 1600 Watts / 48 VDC systems 3200 Watts
PV Open Circuit Voltage (VOC)		150 VDC absolute maximum coldest conditions / 135 VDC start-up and operating maximum
Standby Power Consumption		1 Watt or less
Charging Regulation		Five Stages: Bulk, Absorption, Float, Silent and Equalization
Voltage Regulation Setpoints		13 to 80 VDC User adjustable with password protection
Equalization Voltage		Up to 5.0 VDC above Absorb Setpoint Adjustable Timer - Automatic Termination when completed
Battery Temperature Compensation		Automatic with optional RTS installed / 5.0 mV per °C per battery cell / 30 mV per °C for a 12 VDC system
Voltage Step-Down Capability		Can charge a lower voltage battery from a higher voltage PV array
Power Conversion Efficiency	Typical	98% at 60 amps with a 48 V battery and nominal 48 V solar array
Status Display		3.1" (8 cm) backlit LCD screen with 4 lines / 80 alphanumeric characters total
Remote Interface		Proprietary network system using RJ 45 Modular Connectors with CAT 5e Cable (8 wires)
Data Logging		Last 64 days of operation amp hours, watt hours and time in float for each day along with total lifetime power production
Hydro / Wind Turbine Applications		Consult factory for approved turbines
Positive Ground Applications		Requires two pole breakers for switching both positive and negative conductors on both solar array and battery connections
Operating Temperature Range		Minimum -40° to maximum 60° C (Power capacity of the controller is derated when above 25° C)
Environmental Rating		Indoor Type 1
Conduit Knockouts		Two .5" (13 mm) and .75" (19 mm) on the back; One .75" (19 mm) and 1" (25 mm) on each side; Two .75" (19 mm) and 1" (25 mm) on the bottom
Warranty		Standard 2 year / Optional 5 year
Weight	Unit	11.6 lbs (5.3 kg)
	Shipping	14 lbs (6.4 kg)
Dimensions (H x W x L)	Unit	13.5 x 5.75 x 4" (40 x 14 x 10 cm)
	Shipping	18 x 11 x 8" (46 x 30 x 20 cm)

Use appropriate wire size in accordance with NEC.

Note \* Add 1% to the solar arrays open circuit voltage for every 2.5° C expected below the 25° C standard panel rating (STC). The resulting value must be below 150 VDC at the lowest expected temperatures conditions and less than 135 VDC for typical conditions to ensure reliable operation.

# System Display and Controller

## MATE

The MATE system display and controllers are complete management tools for your OutBack Power system. Through the use of a single MATE you can remotely manage and monitor multiple inverter/chargers, MX60s and any future OutBack power conversion and control products.

The MATE and MATE2 are packed full of features to make system management simple. The easy-to-read 3.1" (8 cm) LCD is backlit for dark operating conditions. Four soft keys allow easy context-based navigation of menus and functions. Two hot keys give immediate access to AC and inverter functions.

A built-in clock and calendar function enables timer based programming of inverter and charger operation. This permits you to set the system to work with time-of-day power rates or to limit a generator's run time to a specific time period of the day or week. All of your settings are stored in permanent memory to eliminate the need to reprogram in the event of a system shutdown or battery replacement. The MATE and MATE2 include a RS232 port with DB9 jack for connection to the serial port of a PC computer. Through the use of optional WinVerter software you can perform such operations as data logging and graphical display of the system's operation and performance.



**MATE**



**MATE2 and MATE2M**

## MATE2M

The MATE2M is the same technology as the MATE and MATE2 but is designed to be used with your M-series inverter/chargers in mobile applications. Incorporating a more simplified menu, the settings needed for mobile power system management are more quickly accessed. A flush mount case design makes installation in boats and RVs more compact and attractive.

*Communication with multiple products requires optional HUB*

### MATE Specifications

MATE	Surface mount with RS232	Grey
MATE2	Flush mount with RS232	Black
MATE2M	Flush mount without RS232	Black
Interface Display	3.1" (8 cm) backlit LCD	
Control Keypad	6 backlit silicone keys - dedicated inverter and AC input keys	
Status Indicators	Two LED Status Indicators	
Communication Protocol	Proprietary OutBack Multi-drop using an OutBack HUB4 or HUB10	
Interconnection Cabling	Standard CAT 5 network cable with RJ45 modular jack - 50' (5 m) included	
PC Computer Interface	RS232 opto-isolated DB9 jack 9600 baud serial communication	
Microprocessor	16 MHz low power consumption version	
Setpoint and Data Memory	32K non-volatile flash RAM	
Clock / Calendar	On-board real time clock with battery backup	
Environmental Rating	Indoor Type 1	
Maximum Cable Length	1000' (300 m)	
Warranty	Standard 2 year / Optional 5 year	
Weight	Shipping	1 lb (.5 kg)
Dimensions (H x W x L)	Shipping	5.75 x 4.25 x 2" (15 x 11 x 5 cm)

# Communications Manager

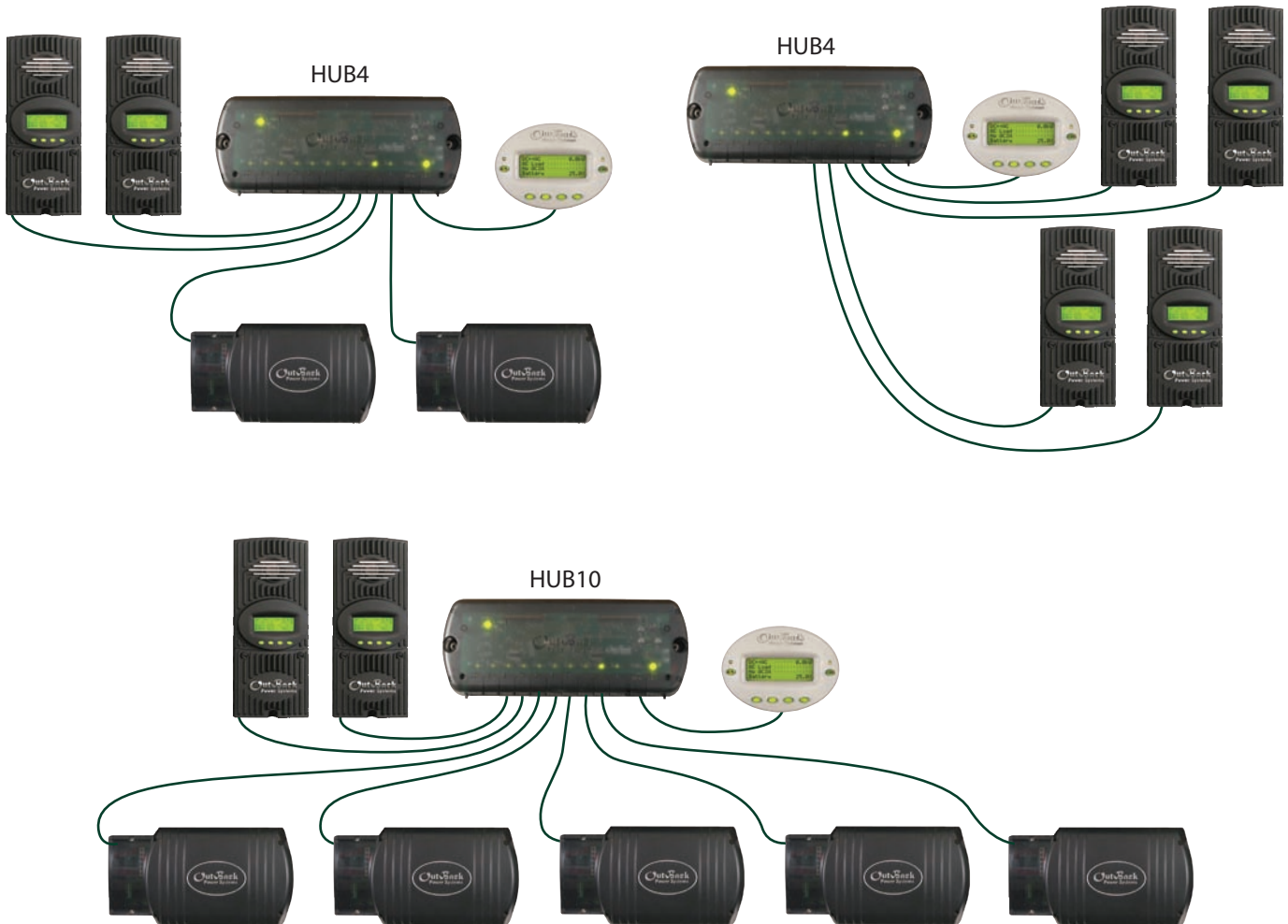
## HUB

The HUB system communications managers are the backbone of your networked OutBack power conversion system. The OutBack HUB communicates stacking, load share and power save off/on signals. Interconnection cabling is standard Ethernet CAT5 with RJ45 modular jacks. Through the use of a HUB, your system is completely coordinated and managed by the MATE.



### HUB Specifications

HUB Specifications		HUB4	HUB10
Number of Ports		4 Plus MATE	10 Plus MATE
Weight	Unit	1 lb (.5 kg)	1 lb (.5 kg)
	Shipping	3 lbs (1.4 kg)	3 lbs (1.4 kg)
Dimensions (H x W x L)	Unit	10.5 x 6.25 x 1.27" (27 x 16 x 3 cm)	10.5 x 6.25 x 1.27" (27 x 16 x 3 cm)
	Shipping	12 x 6 x 5" (31 x 15 x 13 cm)	12 x 6 x 5" (31 x 15 x 13 cm)



# Remote Temperature Sensor

## RTS

The OutBack Remote Temperature Sensor (RTS) is a necessary tool for proper battery charging. All OutBack products with integrated battery charging have a temperature compensation system built-in which benefits from the installation of the optional RTS. The RTS ensures that your OutBack system knows the precise ambient temperature so that it can recharge your batteries safely and efficiently. Systems with multiple OutBack products connected to one HUB4 or HUB10 require only a single RTS to be installed.



15' (5 m) cable

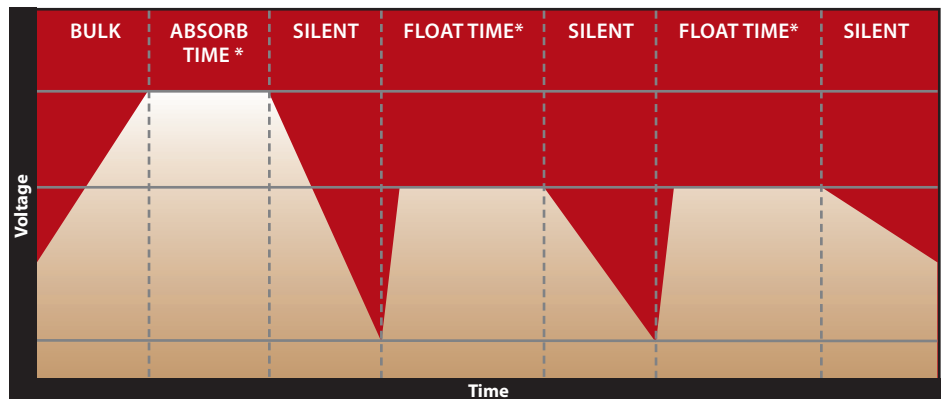
## Battery Charging

Batteries are a key component in backup and off-grid systems, often serving as the only energy storage device. To guarantee that they function properly it is important that your batteries are maintained. A chief part of this maintenance is proper charging. Your batteries should always be maintained above a 50% level of charge and receive a complete recharge once a month to ensure operation at peak performance. Prolonged use of the battery below a 50% state of charge will adversely affect the long-term health of the battery and can result in premature failure.

The multistage charging process uses several regulation stages to allow fast recharging of the battery energy storage system while ensuring a long battery life, high performance and efficient operation of the overall system. The charging process begins with the **BULK** stage, where maximum current is sent to the batteries until the target “absorb” voltage is reached and the absorb stage of the charge begins. During **ABSORB**, the charger provides the batteries with the just enough current to hold at the set voltage for a preset amount of time. Following this cycle, the charging system changes between available OutBack charging products. Using the MX-60, the batteries enter the **FLOAT** stage where they are given a maintenance charge until there is no excess renewable energy. The FX or VFX inverter/charger will go into **SILENT** mode where the charger turns off until the battery voltage drops to the “re-float” setting. At this point the inverter/charger initiates the maintenance float charge. This method reduces fuel and utility consumption.

It should be noted that the temperature of your batteries has an impact on the charging process. The OutBack RTS should be used to monitor this. In higher ambient temperatures, the battery charging regulation settings will be reduced to prevent overcharging of the batteries. Conversely, in lower ambient temperature conditions, the regulation settings will be increased to ensure complete recharging of the batteries.

Batteries are composed of a group of individual cells. Through normal use, the charge of each individual cell will not be equal to the other cells. To address this, your batteries should be **EQUALIZED** either once each month or once every few months depending on usage. During the equalization charge the electrolyte in the battery is stirred up by gas bubbles, which help to create an equal mixture of water and acid. Simultaneously the full cells are overcharged which allows the low cells to “catch up” and all of the active material in the battery to be reconverted to its charged state. Depending on usage, the hardened battery plate material that is no longer active in the battery-sulfation can also be reduced by an equalization charge.



\* MATE Adjustable

# Auto Transformer



## PSX-240

The OutBack PSX-240 auto transformer can be used for step-up, step-down, generator and split phase output balancing or as a series stacked inverter to load balancing auto-former. Incorporating a transformer with 120 volt/30 amp primary and secondary side, a temperature activated cooling fan and a 25 amp dual breaker in a steel enclosure, the PSX-240 is ready to install in your custom application. Use for 120 or 240 VAC 60 Hz systems only.

Powering 240 volt items like deep well pumps with a single 120 volt inverter is possible thanks to the PSX-240's step-up capability. Its step-down feature allows you to charge your batteries with a 240 volt generator through a single 120 volt inverter.

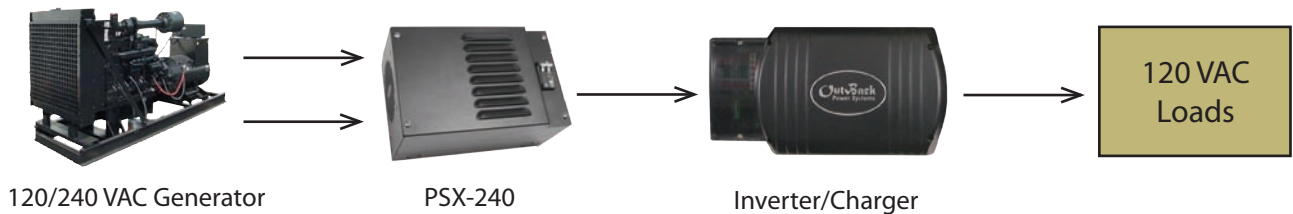
The PSX-240's ability to balance the output of series stacked inverter/chargers makes it a critical item when using the OutBack stacking 120/240 VAC configuration.

*The X-240 is also available without the enclosure, for installation inside the PS2AC or PS4AC enclosures.*

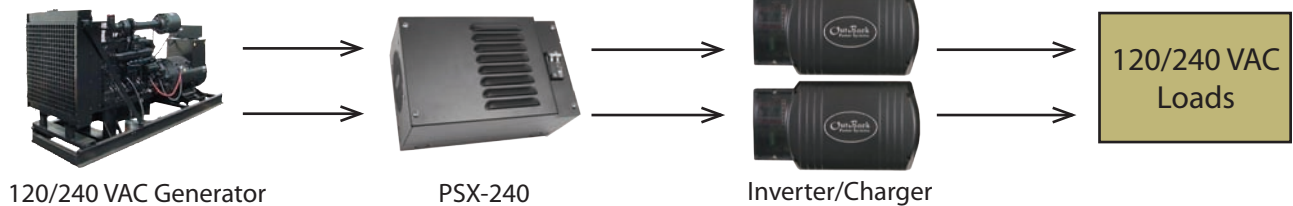
### Step-Up



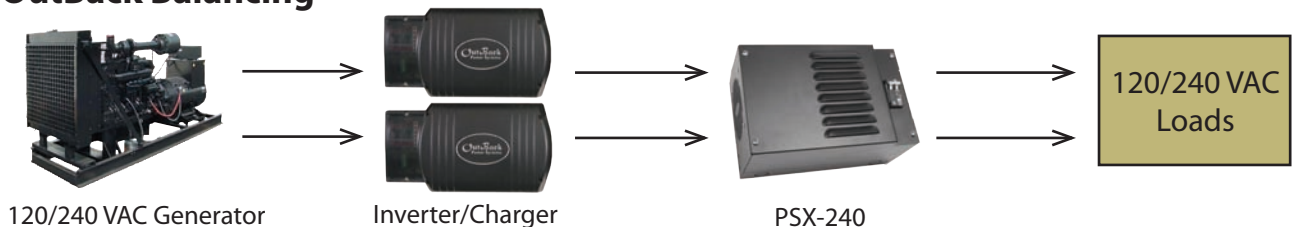
### Step-Down



### Generator Balancing



### OutBack Balancing



# Stacking

At OutBack, we adhere to a philosophy that a power system should be fully customizable to address your specific needs. Therefore we set out to create the world's only group of inverter/chargers that use a truly modular architecture. This modular architecture uses the next generation of a technique referred to as "stacking" to enable you to tailor your system for higher output power, increased charging capabilities and/or three-phase power configuration.

Whether stacked in parallel, classic series, series/parallel or three-phase there is always an inverter/charger which performs the task of Master. The Master talks to the other units through the HUB system communications manager while performing three major roles, keeping all inverter/chargers properly phased, controlling inverter and charger output levels, as well as putting unused inverters into Power Save mode to improve efficiency at low AC load levels.

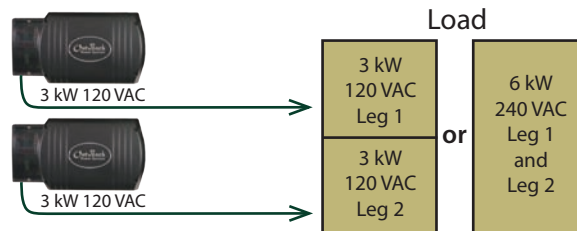
## Parallel Stacking - More power at same output voltage

When the inverter/chargers are stacked in parallel all inverter and charger outputs are combined. This means that each inverter's AC output is added up to equal your total system AC output, up to 36,000 watts, in phase at the same 120 VAC/60 Hz or 230 VAC/50 Hz output voltage. Charging output amperage is also combined in this same manner.



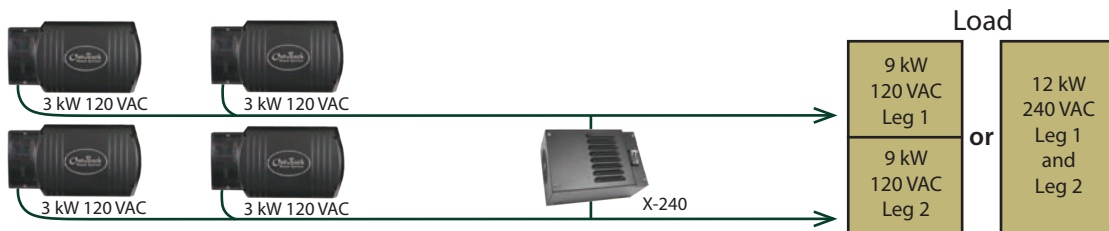
## Classic Series Stacking - More power at higher output voltage

Stacking inverter/chargers in classic series provides a system with split phase 120/240VAC. This method does not allow balancing between separate legs on a system and is can only be used in dual inverter/charger systems without the X-240 Auto Transformer.



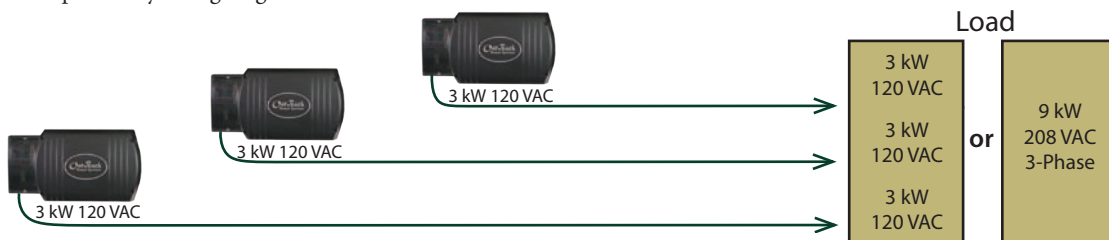
## OutBack Series/Parallel Stacking - More power at all output voltages

Series/Parallel stacking or OutBack (OB) stacking is unique to OutBack inverter/chargers. Never before has it been possible to have inverter/chargers balancing loads intelligently between two legs of AC power while seamlessly changing between series and parallel. OB Stacking uses the X-240 auto transformer to balance the loads between the two separate series legs of a system. The X-240 allows AC loads on leg 1 and leg 2 to be powered by any combination of inverter/chargers within your system. Even if there are only two inverter/chargers, connected in series, they can also function as if connected in parallel. This allows larger AC loads to be operated by a system without risking overloading one of the 120 VAC outputs.



## 3-Phase Stacking - More power for three-phase loads

Three inverter/chargers can be configured to provide 120/208 VAC or 230/400VAC four wire "Wye/Star" three-phase AC Power. An inverter/charger is used to power each of the three legs for 3-phase AC power. The loads on each of the inverters does not need to be kept balanced, each phase is independently voltage regulated.



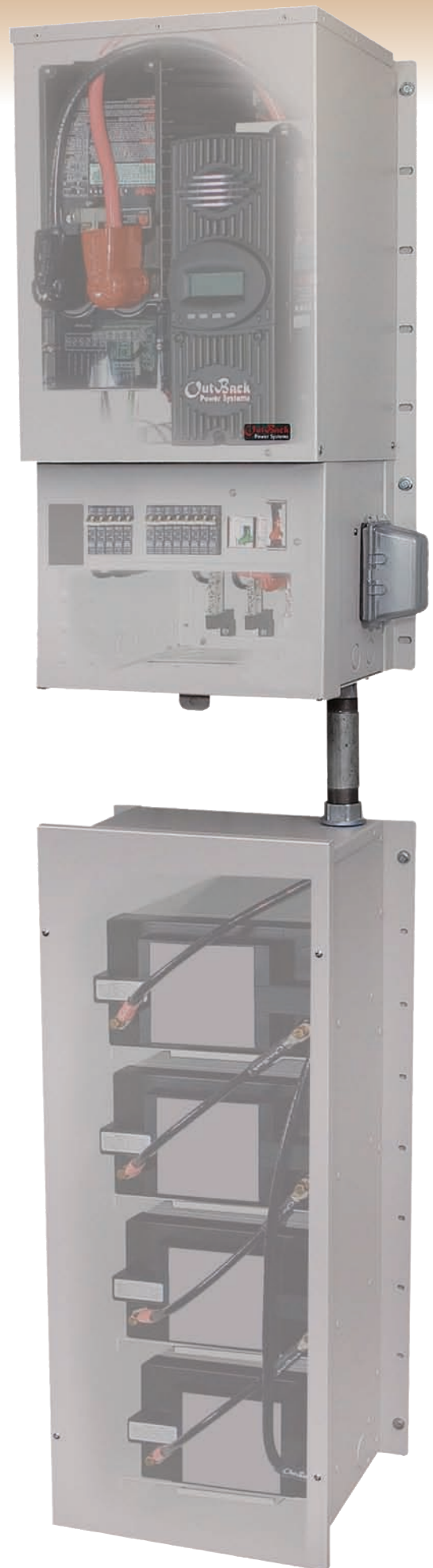
# Grid-Interactive System

## PS1

The PS1 is advanced engineering and refinement that you have come to expect from OutBack Power in a next generation grid-interactive solar electric system. The system's battery backup is a silent and hands-off alternative to noisy and maintenance intensive generators.

In side-by-side “real world” testing the PS1 system performs within 5% of the industry leading battery-less grid-tie inverter, translating into more savings when using net metering. The same field proven MPPT technology found in the MX60 solar charge controller is featured in the PS1. This cutting edge concept gives the system the ability to use your PV array at its peak output. Uninterrupted AC power is provided by the PS1's system's true sinewave inverter that has an industry leading, California Energy Commission (CEC) certified, efficiency of 91%, thus guaranteeing that your household appliances run seamlessly while utilizing all available solar power. Your recommended AGM batteries are maintained and charged by an innovative OutBack multistage charging process, a valuable feature that assists in providing reliable backup power and a battery life up to 10 years. An ultra-fast 16 millisecond transfer switch guarantees that even sensitive backup loads, such as computers, never know when a grid outage occurs.

Like every OutBack Power product, the PS1 is rugged. All components are protected within an aluminum type 3R rainproof enclosure. The ETL listed system is pre-wired by OutBack engineers to ensure that the PS1 system works reliably for years to come. A standard 5 year warranty provides peace of mind and satisfies state rebate requirements.



### PS1 Specifications

Model	Description
PS1 - 3000	Vented Inverter/Charger with MX60 and HUB4
PS1 - 2500	Sealed Inverter/Charger with MX60 and HUB4
PS1 - BE	Battery Enclosure with all cables (Order batteries separately)

### PS1 Options

Model	Rating	Version	Width
OBAC-20	25 amp 120 VAC	Single Pole OutBack	.05" (13 mm)
OBAC-15	15 amp 120 VAC	Single Pole OutBack	.05" (13 mm)

Model	Rating	Version	Width
OBPV-8	8 amps 125 VDC	Single Pole OutBack	.05" (13 mm)
OBPV-10	10 amps 125 VDC	Single Pole OutBack	.05" (13 mm)
OBPV-15	15 amps 125 VDC	Single Pole OutBack	.05" (13 mm)

PS1 Specifications		Sealed Models		Vented Models	
		PS1-2500		PS1-3000	
Continuous Power Rating	At 40° C	2500 VA		3000 VA	
	At 25° C	3000 VA		3600 VA	
AC Voltage / Frequency Output		120 VAC 60 Hz		120 VAC 60 Hz	
AC Input Current Maximum	AC Transfer Switch	50 amps AC		50 amps AC	
	Battery Charger	16 amps AC with automatic back-off		20 amps AC with automatic back-off	
Maximum AC Surge Current	Peak (1 millisecond)	70 amps AC		70 amps AC	
	RMS (5 seconds)	50 amps AC		50 amps AC	
Maximum PV Array Wattage		3300 watts DC stc rating		3300 watts DC stc rating	
PV Open Circuit Voltage	Maximum	150 VDC		150 VDC	
MPPT Input Voltage Range		44 to 135 VDC		44 to 135 VDC	
PV Array Ground Fault Protection		Standard - 80 amp DC		Standard - 80 amp DC	
Inverter Efficiency	Typical	91% (not CEC Certified)		91% (CEC Certified)	
	Peak	93%		93%	
MPPT Efficiency		98%		98%	
Overall System Efficiency	Typical	89%		89%	
	Peak	92%		92%	
Battery Voltage - Nominal		48 VDC		48 VDC	
Minimum / maximum operating range		40 to 60 VDC		40 to 60 VDC	
Battery Charge Rate	Inverter	35 amps DC		45 amps DC	
	MX60	60 amps DC		60 amps DC	
AC Output Voltage Regulation	Typical	5%		5%	
	Nominal	120 VAC		120 VAC	
AC Output Current	Inverting	25.0 amps AC		30.0 amps AC	
	Selling	20.8 amps AC		25.0 amps AC	
Total Harmonic Distortion	Inverting	2% VAC THD		2% VAC THD	
	Selling	< 5% current THD per UL1741 conditions		< 5% current THD per UL1741 conditions	
AC Transfer Switch Speed	Typical	< 16 Milliseconds		< 16 Milliseconds	
Battery Temperature Sensor		Included		Included	
Operating Temperature Range		-40° C to 60° C (power derated above 25° C)		-40° C to 60° C (power derated above 25° C)	
Recommended Minimum Energy Storage		4 kWhRS at 80% discharge		4 kWhRS at 80% discharge	
Recommended Batteries		Four AGM type 31 or type 27 sealed VRLA		Four AGM type 31 or type 27 sealed VRLA	
Communications		Optional MATE system display with RS232 port		Optional MATE system display with RS232 port	
Enclosure Materials		Powder coated aluminum, stainless steel hardware		Powder coated aluminum, stainless steel hardware	
Mounting		Wall mount, 16 on center studs		Wall mount, 16" on center studs	
Recommended Mounting Hardware		5/16 x 2.5" Lag Bolts - three per side minimum		5/16 x 2.5" Lag Bolts - three per side minimum	
System Enclosure Dimensions (H x W x D)	Unit	31.3 x 17.25 x 12.9" (80 x 44 x 33 cm)		31.3 x 17.25 x 12.9" (80 x 44 x 33 cm)	
	Shipping	40.5 x 20.5 x 17.25" (103 x 52 x 44 cm)		40.5 x 20.5 x 17.25" (103 x 52 x 44 cm)	
Battery Enclosure Dimensions (H x W x D)	Unit	36.25 x 17.25 x 12.55" (92 x 44 x 32 cm)		36.25 x 17.25 x 12.55" (92 x 44 x 32 cm)	
	Shipping	43.25 x 20.25 x 16.75" (110 x 51 x 43 cm)		43.25 x 20.25 x 16.75" (110 x 51 x 43 cm)	
System Weight	Unit	107 lbs (49 kg)		107 lbs (49 kg)	
	Shipping	117 lbs (53 kg)		117 lbs (53 kg)	
Battery Enclosure Weight (without batteries)	Unit	29 lbs (13 kg)		29 lbs (13 kg)	
	Shipping	47 lbs (21 kg)		47 lbs (21 kg)	
Certifications		ETL certified to the UL1741 standard		ETL certified to the UL1741 standard	
Anti-Islanding Measures		UL1741 compliant		UL1741 compliant	
Warranty		5 year limited repair warranty standard		5 year limited repair warranty standard	
Field Installed Options	MATE or MATE2 remote system display		MATE or MATE2 remote system display		
	OBAC breakers for additional AC load circuits		OBAC breakers for additional AC load circuits		
	OBPV breakers for PV array series string protection		OBPV breakers for PV array series string protection		



**Main Office**

19009 62nd Avenue NE  
Arlington, WA 98223 USA  
Phone: (360) 435.6030  
Fax: (360) 435.6019

**European Office**

Urb. Garraf II, Buzón 214  
C/. Eramprunya #26  
08860 - Les Botíques de Sitges  
Barcelona, ESPAÑA  
Phone: (+34) 600.843.845

[www.outbackpower.com](http://www.outbackpower.com)

C980-0022-1