


OutBack

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EnergyCell FLA Series

Owner's Manual



About OutBack Power Technologies

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

Applicability

These instructions apply to OutBack EnergyCell FLA series batteries only.

Contact Information

Address:	Corporate Headquarters 17825 – 59 th Avenue N.E. Suite B Arlington, WA 98223 USA	European Office Hansastraße 8 D-91126 Schwabach, Germany
Website:	http://www.outbackpower.com	

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Introduction

Audience

This manual is intended for experienced installers familiar with the mechanical and electrical requirements of battery systems. Familiarity with battery test equipment such as DVM and hydrometer are required. Review all documentation to become familiar with all of the features and functions of the EnergyCell FLA series before proceeding. Failure to install and/or use this equipment as instructed can result in damage to the equipment. This product is only serviceable by qualified personnel.



WARNING:

- ❖ All lead acid batteries generate highly flammable hydrogen gas. If ignited, the gas may explode violently. When working near batteries, always wear safety glasses, do not smoke or use open flame near the batteries, remove watches and jewelry, and avoid causing sparks with tools.
- ❖ Battery electrolyte is corrosive and can cause blindness or severe burns. If exposed to battery electrolyte, immediately flush with water and seek medical attention.
- ❖ The batteries in your equipment are electrically live at all times. Keep the top of the batteries clean and dry to prevent ground shorts and corrosion.
- ❖ Do not tip a battery beyond a 45° angle in any direction. This would allow battery electrolyte to push through the battery vent assembly.

Products

This manual covers the handling and maintenance of battery models EnergyCell 290FLA, EnergyCell 525FLA, and EnergyCell 1400FLA.

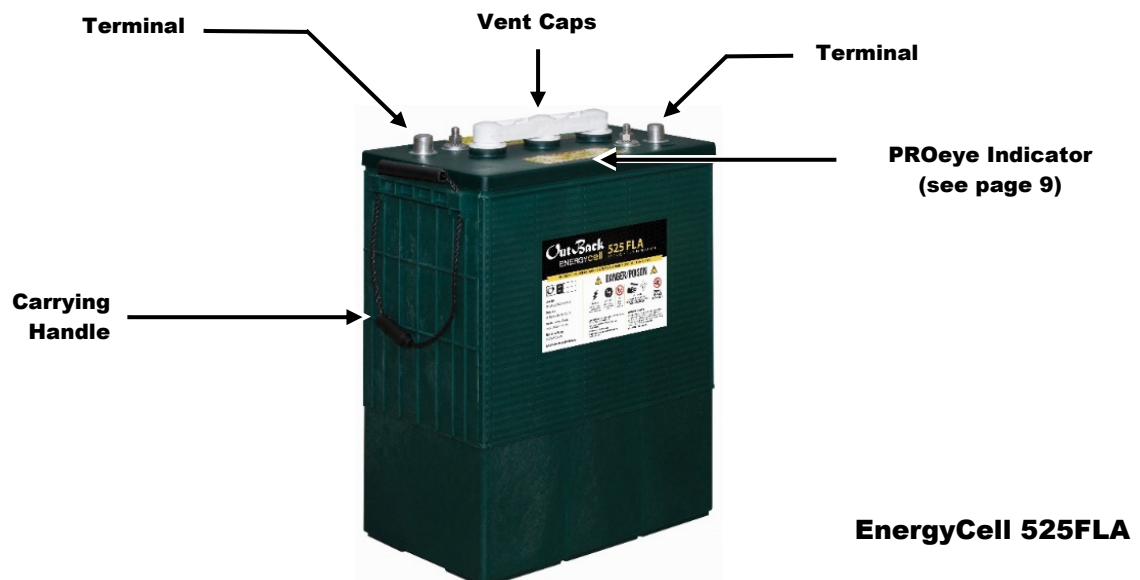


Table 1 Specifications

Model:	EnergyCell 290FLA	EnergyCell 525FLA	EnergyCell 1400FLA
Cells Per Unit	3	3	1
Voltage Per Unit	6V	6V	2V
Operating Temperature Range ¹	-40° to 120° F (-4° to 49° C)	-40° to 120° F (-4° to 49° C)	-40° to 120° F (-4° to 49° C)
Optimal Operating Temp. Range	40° to 80° F (4° to 27° C)	40° to 80° F (4° to 27° C)	40° to 80° F (4° to 27° C)
Specific Gravity	Full charge specific gravity (100% state of charge): 1.275 Full discharge specific gravity (100% depth of discharge): 1.125		
Float Charge Voltage (Unit Average 77°F)	6.75 Vdc	6.75 Vdc	6.75 Vdc
Absorbed Voltage	7.26 Vdc	7.26 Vdc	7.26 Vdc
Equalized Voltage	7.74 Vdc	7.74 Vdc	7.74 Vdc
Max. Charge Current (48V)	60 Adc	100 Adc	275 Adc
Equalization Charge Frequency	Equalize charge every 30 days, systems that are regularly discharged below 50% of stored capacity should be equalized every 14 days		
Self Discharge	Fully charged batteries that are stored at a temperature of 80°F (27°C) will self-discharge at a rate of 3.5% per week		
Charging Temperature Compensation Factor	±3 mV / °C / cell	±3 mV/°C/cell	±3 mV/°C/cell
Terminal	Standard type with stainless steel	Standard type with stainless steel	Insert Terminal
Terminal Torque ²	Stainless thread, 100 to 120 in-lb / 11 to 14 Nm	Stainless thread, 100 to 120 in-lb / 11 to 14 Nm	90 to 105 in-lb / 10.7 to 11.9 Nm
Vent Cap	Bayonet	Bayonet	Water-Miser
PROeye™ Electrolyte Level Indicator	No	Yes	No
Weight	63 lb / 28.6 kg	122 lb / 55.3 kg	136 lb / 62 kg
Dimension L x D x H	10.25 × 7.06 × 10.94" / 260 × 179 × 278 mm	12.38 × 7.19 × 16.13" / 314 × 183 × 410 mm	7.56 × 6.56 × 25.75" / 192 × 167 × 654 mm
Warranty	2 years	2 years	4 years

Table 2 Ampere-Hour Capacity to 1.75 Volts Per Cell at 20°C

Discharge in Hours:	1	3	4	5	24	100
EnergyCell 290FLA	126	156	164	172	233	290
EnergyCell 525FLA	215	268	282	298	409	525
EnergyCell 1400FLA	409	640	679	725	1050	1400

Handling

Preventative Maintenance

- Battery covers and terminals should be kept clean, dry and free of corrosion. Battery vent caps must be secured to the batteries during use and charging period. Remove vent caps only to inspect electrolyte levels or specific gravities.
- When batteries or terminals require cleaning, use only biodegradable cleaner-neutralizer solutions that can be safely applied and disposed of through a common sanitary sewer. Other chemical-based solutions are often dangerous, ineffective and cannot be disposed of in an environmentally safe manner.
- If electrolyte is spilled onto batteries or the battery compartment area, neutralize it with a cloth moistened with a solution of baking soda and water mixed in the proportion of one pound of baking soda to one gallon of water. When the electrolyte is neutralized, wipe the affected area with a water-moistened cloth to remove all traces of soda.
- Inspect cable-to-terminal connections to ensure connections are tight and free of corrosion. Battery cables must be intact with no exposed wires.
- Preventative maintenance practices should include periodic inspection of battery specific gravity and open circuit voltage. See page 8. An imbalance of specific gravity and open circuit voltage is usually a sign of improper charging, service infrequency, or a bad cell condition.

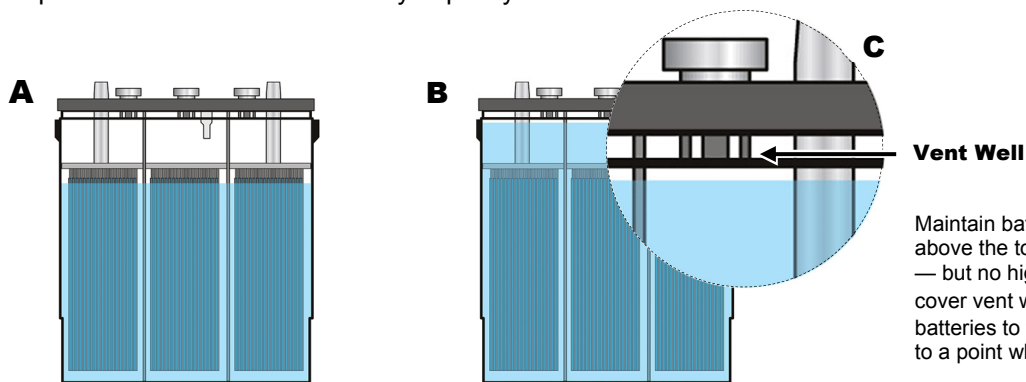
Watering Service

Deep cycle batteries begin service consuming relatively low amounts of water. In RE service, the real need to add water to batteries may vary from weekly service to monthly service depending upon the operating environment and other external factors. As batteries age they will use more water. In warmer climates batteries will require more frequent service. Equipment owners or users must be vigilant in performing regular watering service to ensure premium performance and life.

Over-watering and under-watering can each be harmful to batteries. Over-watering dilutes the sulfuric acid levels inside the battery, which results in poor battery performance. Under-watering leads to a service-related overcharge condition, which will shorten battery running times and life.

Several other rules apply when watering:

- USE ONLY DISTILLED or DE-MINERALIZED WATER.
- Never add battery acid, commercial additives, or other foreign material to the batteries.
- Never charge batteries if the battery plates are not completely submerged in electrolyte (see **A**). If this condition is found before charging, fill the battery until the top of the plates are covered with liquid as in **B**.
- In all other cases, watering service should occur only after charging service is completed. Watering before charging service will result in overflow of the battery's electrolyte — causing a dangerous chemical spill condition and loss of battery capacity.



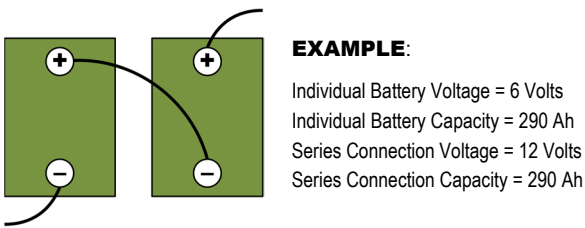
Maintain battery liquid levels above the top of the battery plates — but no higher than the battery cover vent well as in **C**. Never fill batteries to the brim of the cell or to a point where they overflow.

Battery Strings

Certain systems require the installation and connection of multiple batteries to accommodate minimum voltage or capacity specifications. Connect these batteries in series, parallel, or other string combinations as appropriate. Technicians should always confirm that batteries are oriented in proper position according to battery terminal polarity — as indicated by the raised polarity mark on the battery cover. Cables and connectors should be secured with the appropriate terminal hardware and tightened to the torque values specified on page 4.

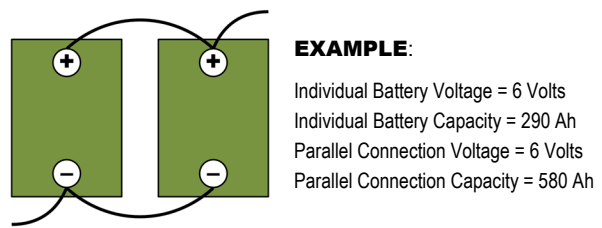
Series Connection

Connect the batteries in series as shown to increase voltage.



Parallel Connection

Connect the batteries in parallel as shown to increase electrical capacity.

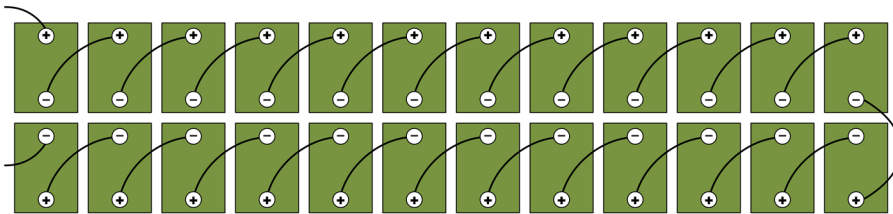


Series Connection (2-volt)

This is an example of 24 cells of 2 volts each connected in a single 48-volt string.

EXAMPLE:

Individual Battery Voltage = 2 Volts
Individual Battery Capacity = 1400 Ah
Series Connection Voltage = 48 Volts
Series Connection Capacity = 1400 Ah

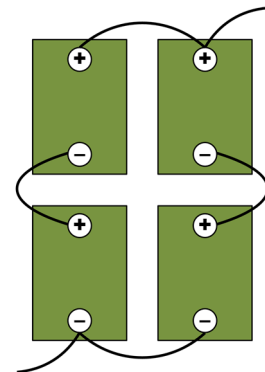


Series-Parallel Connection

Connect the batteries as shown to increase both voltage and electrical capacity.

EXAMPLE:

Individual Battery Voltage = 6 Volts
Individual Battery Capacity = 290 Ah
Series Connection Voltage = 12 Volts
Parallel Connection Capacity = 580 Ah



Renewable Energy (RE) Charging Systems

To maximize performance and life, batteries should be recharged fully after each discharge period. To verify full recharging, regularly monitor individual battery voltage and specific gravity. As a general rule, the total input amperes from the RE charging source should be between 10% and 20% of the total ampere-hours (24-hour rating) of the battery system.

OutBack charge controllers and chargers have adjustable equalization settings that ensure batteries are regularly restored to full capacity. Batteries used in RE systems should be equalized every thirty days at a minimum — with more frequent equalization occurring for battery systems routinely discharged below 50% of their rated capacity. Please refer to the following chart for additional charge control setting information:

Table 3 Specifications

Measurement	VPC	System Voltage		
		12 Volts	24 Volts	48 Volts
Daily Charge (Absorption)	2.42	14.5	29.0	58.1
Equalize	2.58	15.5	31.0	61.9
Float	2.25	13.5	27.0	54.0

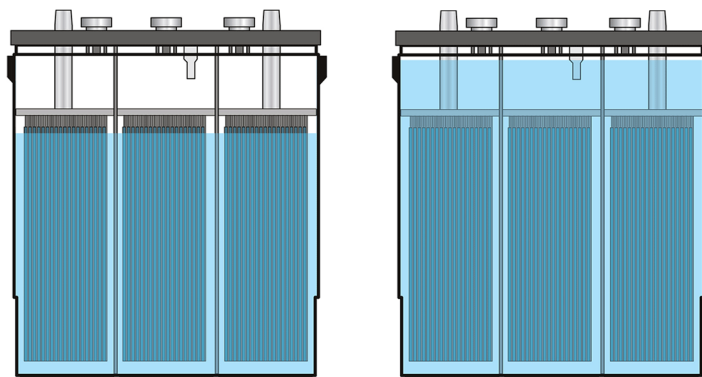
Inspection and Test

General Procedure

A common procedure for checking battery performance involves three steps.

Visual Inspection

Check the age of all batteries, or check the length of service if available. Inspect each battery for damage. When physical damage to the battery container or terminals is present, replace the battery. If batteries are undamaged, check each battery’s cell electrolyte levels. Fluid levels should be above the top of plates in all cells, and no higher than the battery cover vent well. (See page 5.)



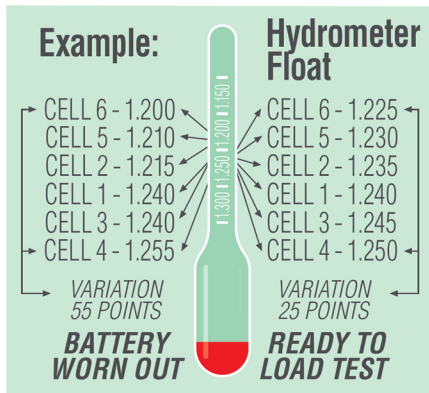
If the top of a battery’s plates are not covered with liquid, add water, replace vent caps and charge the battery. Be sure no open flame or spark is near while the battery’s vent caps are removed from the battery. If the batteries are sufficiently filled with electrolyte, proceed to the next step.

Specific Gravity Inspection

Hydrometer reading of all cells should be at least 1.225 and show less than 50 points difference between high and low.

- More than 50 points difference: replace the battery.
- Less than 50 points, but some cells read less than 1.225: recharge the battery.

Replace the vent caps during recharge. Charge the battery using a properly matched automatic charger until all cells measure a specific gravity of 1.265 to 1.275. If charging does not increase the specific gravity, replace the battery.



State of Charge Level	Specific Gravity
100%	1.265 or Greater
75%	1.225 - 1.230
50%	1.185 - 1.190
25%	1.140 - 1.175
Discharged	1.125 or Less

Open-Circuit Voltage and Electrical Load Test

Battery open-circuit voltage can be an effective indication of battery state of charge. Make measurements with a high-quality voltmeter. Determine the approximate state of charge from the following chart.

NOTE: This method is accurate only when batteries are at room temperature and have been at rest for several hours in advance of testing. "At rest" means no loads and no charging.

Table 4 Open-Circuit Voltages

State of Charge	Model Voltage	
	2-Volt Model	6-Volt Model
100%	2.10 or greater	6.30 or greater
75% to 100%	2.05 to 2.10	6.16 to 6.30
50% to 75%	2.00 to 2.05	6.00 to 6.16
25% to 50%	1.97 to 2.00	5.90 to 6.00
0% to 25%	1.93 to 1.97	5.80 to 5.90
0%	1.93 or less	5.80 or less

This chart assumes a full-charged specific gravity of 1.265

Table 5 Load-Test Voltages (under 15-second load)

State of Charge	2-Volt Model	6-Volt Model	Specific Gravity
100%	2.10	6.30	1.270
75%	1.58	4.75	1.225

If the test voltage is above the minimum, return the battery to service. If the test voltage is below the minimum, replace the battery.

Batteries with less than 75% state of charge should be charged before an electrical load test is applied to the battery. When load-testing batteries, remove all battery cables, disconnecting the negative cables first. Make sure the battery terminals are free of corrosion and dirt.

For batteries with stainless threaded stud terminals, attach a lead charging post to the threaded stud terminal before testing. Using a carbon-pile load tester, apply a 50- to 75-ampere load for 15 seconds; remove the load. Refer to Table 5 to determine the minimum passing voltage.

NOTE: Electrical load testing is an effective troubleshooting technique for identifying batteries with internal defects — but it is not an approved method for measuring deep cycle battery capacity. For this reason, OutBack recognizes load test results as useful only for identifying batteries having bad cell conditions.

PROeye Indicator

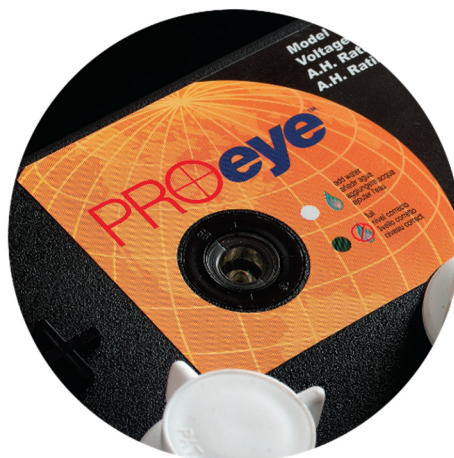
The EnergyCell 525FLA features the PROeye indicator. This optical indicator shows the user when watering service is required.

When the color of the PROeye is:

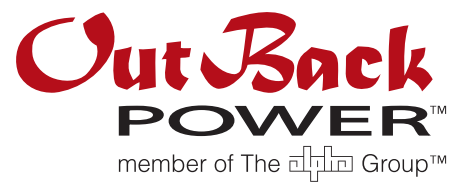
Green No watering service is required

Clear or White Watering service is required

The PROeye is an indicator only. It is designed to aid users with determining when individual cell inspection and / or watering service is required. Because watering service is most effective at the completion of charging service, the PROeye should be inspected at the completion of charge or before the start of duty cycle.



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Corporate Headquarters
17825 – 59th Avenue N.E.
Suite B
Arlington, WA 98223 USA

European Office
Hansastraße 8
D-91126
Schwabach, Germany