The Battery Life Saver electronic device
1 Year Limited Warranty Program

This Battery Life Saver electronic device is warranted to the original purchaser only, to be free of defects in materials and workmanship for one year from the date of purchase without additional charge. The warranty does not extend to subsequent purchasers or users. Battery Life Saver electronic device will not be responsible for any amount of damage in excess of the retail purchase price of the product under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty. This warranty does not apply to damage to units from misuse or incorrect installation. Misuse includes wiring or connecting to improper polarity power sources. This product cannot damage your battery. Battery Life Saver electronic device will not replace any batteries under this warranty.

RETURN/REPAIR POLICY: Contact Battery Life Saver customer service before returning any defective product. Product that is returned to Battery Life Saver within 30 days of the date of purchase will be replaced free of charge. If such a product is returned more than 30 days but less than one year from the purchase date, Battery Life Saver will replace it free of charge, upon determining that the unit is defective. The customer is responsible for the shipping charges on all returned items after 30 days.

LIMITATIONS: This warranty does not cover batteries, defects resulting from normal wear and tear (including chips, scratches, abrasions, discoloration or fading due to usage or exposure to sunlight), accidents, damage during shipping to our service facility, alterations, unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire, flood and Acts of God.

STATE LAW RIGHTS: This warranty gives you specific legal rights. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the exclusions or limitations stated herein may not apply. This warranty gives the purchaser specific legal rights; other rights, which vary from state to state, may apply.

TO REQUEST WARRANTY SERVICE FOR THIS PRODUCT: Contact Battery Life Saver Customer Service by telephone, fax, e-mail or mail. We suggest that you keep the original packaging in case you need to ship the unit. When returning a product, include your name, address, phone number, dated sales receipt (or copy) and a description of the reason for return. After examining the unit, we will make every effort to replace it within four weeks.

ATTN.: CUSTOMER SERVICE / BATTERY LIFE SAVER
805 Park Street
PH: 727-446-8400 ! Fax: 727-446-8900
e-mail: bls@batterylifesaver.com
You may also contact us at our web site www.batterylifesaver.com.
WARRANTY IS NON-TRANSFERABLE AND NON-REFUNDABLE.
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Battery Arrangement for Common Golf Carts
The number indicates the battery’s position in the series. To install the Battery Life Saver electronic device, connect the red wire to the first battery positive terminal (#1 battery) and the black wire to the last battery negative terminal.
How to Revive a Dead Battery

**Precautions**
Be very careful in working with batteries. Batteries contain sulfuric acid that is very harmful. Follow the safety precautions advised by your battery company, including protective eye gear, clothing, and gloves.

**Important - Charge and Discharge Cycle**
Before you start, make sure that the battery is not empty. Use distilled water to cover the plates. Reverse osmosis filtered water is second best. Regular tap water contains minerals and other materials that are not good for your battery.

To restore a battery, you must cycle the battery, back and forth, with a charger and without, all the while using the Battery Life Saver. When the battery is being charged with the Battery Life Saver attached, one set of plates is being handled. When the battery alone is running the Battery Life Saver, another set of plates is being handled.

Ideally, you want to have the battery being charged for about the same amount of time that it is running the Battery Life Saver alone (discharging). The easiest way to do this is with a timer on the charger set to be on for 12 hours and off for 12 hours. For this setup, you need a charger that will automatically cut off or reduce charge when the battery becomes fully charged.

What if the charger will not even start because the battery has too low a voltage?
Some modern “smart” chargers will not even operate on a battery that has too low a voltage. They just assume that the battery is no good. Do not despair - you can restore such a battery. But you will either have to use an old-fashioned manual charger or trick your charger. The way to do this is jumper your bad battery to a good battery to get the charger to start.

What if the battery has a dead cell?
A “dead” cell could mean an open cell, a shorted cell, or a badly sulfated cell. 80% of the time a “dead” cell is a sulfated cell. A sulfated cell is one that has accumulated too much lead sulfate on the plates. The lead sulfate robs the acid, weakening it, and causes the plates to lose conductivity. The Battery Life Saver totally handles sulfated cells by dissolving the lead sulfate that has accumulated and keeping more from accumulating. A shorted cell is one that has had many lead particles shed from the plates and fall to the bottom of the cell, creating a circuit. A primary reason for shedding is the force of gravity on heavy lead sulfate crystals that form and attach to the lead particles of the plates. An open cell has connection points that have been burned out typically from charging at too high a rate*. The Battery Life Saver will not fix an open or shorted cell. However, eliminating the accumulation of lead sulfate will greatly slow down the shedding.

* This is why we do not recommend to equalize batteries. When you equalize a battery, you are overcharging it to eliminate part of the sulfates covering the plates. The problem is those sulfates go to the bottom of the battery and get lost for ever.

Understanding Batteries

Batteries are designed to help you. They store energy for your use; they allow you to start and work machines, they help you get where you’re going. Yet batteries need help to continue to function properly.

**What is a battery?**

A battery is a device in which chemical energy is transformed into electrical energy and that energy can be used in a controlled manner. Inside a lead acid battery you find one to several cells composed of two lead plates, one charged positive (lead oxide) and one charged negative (lead), with chemical solution between them, generally a watery (aqueous) solution of sulfuric acid.

**How does a battery produce electric current?**

When you charge a battery, you put electrons (electrical energy) into the battery through the negative terminal, that energy activates the lead sulfate breaking it into lead, lead oxide, and sulfuric acid. This causes a chemical reaction which stores electricity.

When you use a battery (discharge) the chemical reaction is releasing electric energy through the negative terminal. The reaction of the lead and lead oxide with the sulfuric acid produce lead sulfate, water and releases electric energy (electrons). If you discharge the battery too much you will have mostly water and lead sulfate that in such conditions tends to crystallize.

In summary the chemical reaction which stores electricity in the battery involves transformation of lead sulfate in an aqueous environment into the lead on the negative plate, and the lead oxide on the positive plate, and an aqueous solution of sulfuric acid. Conversely, when the battery is used (discharged) the interaction of the lead and lead oxide with the sulfuric acid produces, lead sulfate, water and electric energy (electrons). These reactions work in both directions.

**What makes a battery slow down, become weak and die?**

There is one tragic flaw! Lead can combine with sulfate in two different ways. The first, discussed above, is beneficial. The second way forms a...
Understanding Batteries Continued

crystal which has very little or no capability to efficiently conduct electricity and cannot easily be converted back to lead or lead oxide. Every discharge leaves a fine layer of crystals on the plates which little by little reduces the battery’s potential to store and release electricity. As a wider and thicker area is covered with the lead sulfate crystal, the battery loses power until it is no longer worth using.

How does the BLS work?

The Battery Life Saver electronic device solves battery problems by dissolving the buildup of lead sulfate crystals. Each crystal is a tiny radio receiver. In fact, when Marconi (or Tesla) invented the radio, he used a lead sulfate crystal for his receiver. The BLS electronic device is like a small radio transmitter. Using breakthrough square wave technology, it sends a radio signal to each of the crystals of lead sulfate causing them to convert back into lead and sulfuric acid. This gradually restores the battery to its original condition and allows the electrical charge to be drawn from the battery.

Battery Safety Precautions

DANGER OF EXPLODING BATTERIES
Lead acid batteries contain sulfuric acid and produce explosive mixtures of hydrogen and oxygen. Because self-discharge action generates hydrogen gas even when the battery is not in operation, make sure batteries are stored and worked on in a well ventilated area. ALWAYS wear ANSI Z87.1 (U.S. standard) approved safety glasses and face shield or splash proof goggles when working on or near batteries:
- Always wear proper eye, face and hand protection.
- Keep all sparks, flames and cigarettes away from the battery.
- Never try to open a battery with non-removable vents.
- Keep removable vents tight and level except when servicing electrolyte.
- Make sure work area is well ventilated.
- Never lean over battery while boosting, testing or charging.
- Exercise caution when working with metallic tools or conductors to prevent short circuits and sparks.
- Always read and follow all precautionary labels on the product.

SAFE CHARGING
Never attempt to charge a battery without first reviewing the instructions for the charger being used. In addition to the charger manufacturer’s instructions, these general precautions should be followed:
- Always wear proper eye, face and hand protection.
- Always charge batteries in a well-ventilated area.
- Keep vents tight and level.
- Turn the charger and timer “OFF” before connecting the leads to the battery to avoid dangerous sparks.
- Never try to charge a visibly damaged or frozen battery.

Connect the charger leads to the battery; red positive (+) lead to the positive (+) terminal and black negative (-) lead to the negative (-) terminal. If the battery is still in the vehicle, connect the negative lead to the engine block to serve as a ground. Be sure the ignition and all electrical accessories are turned off. (If the vehicle has a positive ground, connect the positive lead to the engine block.)
- Make sure that the charger leads to the battery are not broken, frayed or loose.
- Set the timer, turn the charger on and slowly increase the charging rate until the desired ampere value is reached.
- If the battery becomes hot, or if violent gassing or spewing of electrolyte occurs, reduce the charging rate or turn off the charger temporarily.
- Always turn the charger “OFF” before removing charger leads from the battery to avoid dangerous sparks.
- Always read and follow all precautionary labels on the product.
- Battery acid, or electrolyte, is a solution of sulfuric acid and water that can destroy clothing and burn the skin. Use extreme caution when handling electrolyte and keep an acid neutralizing solution - such as baking soda or household ammonia mixed with water - readily available.
- If the electrolyte is splashed into an eye, immediately force the eye open and flood it with clean, cool water for at least 15 minutes. Get prompt medical attention.
- If electrolyte is taken internally, drink large quantities of water or milk. DO NOT induce vomiting. Get prompt medical attention.
- Any spill, neutralize with baking soda, then clean with abundant water.
Troubleshooting

The Battery System performance is decreasing after installing the BLS.

The most common cause for this is a shorted or open cell in one or some of the batteries in the system. The surrounding batteries will be improving, but the one or two bad batteries will start to drain the good batteries quicker, causing for a decrease in performance. Follow the instructions in this manual to find a short or open cell, and replace the bad battery or batteries with another used battery. The BLS does not affect the batteries adversely, but makes it very evident there is a short or open cell in one of the batteries.

The battery indicator gage on my cart is going down quicker than when I installed the BLS.

The BLS will cause a indicator gage that did not come standard with the cart (it was installed as an accessory), not to work properly. The batteries are improving, but the BLS is interfering with the indicator gage. You can disconnect the indicator gage.

I installed the BLS and have yet to see an improvement in the batteries.

The BLS gradually breaks down the sulfates in a battery. It will not change the condition of a battery instantly. The amount of time needed depends on the condition of the battery and how often you cycle the battery (charge and discharge) with the BLS attached. Usual time is between 2 and 6 weeks, but it can vary.

The BLS drained my batteries.

In order for the BLS to work, it draws a small amount of power from the batteries. Typically, if you leave the BLS on a battery or system without charging the battery or batteries for an extended period of time, 5 days or more, your batteries may get drained. If this happens, simply charge the battery or battery system. If the battery or system does not charge, review the section in this manual “How to Revive a Dead Battery”.

The LED (light) is not coming on.

The LED in the Battery Life Saver is not very bright. Cover the BLS with your hand to make sure that the light is really not working. Make sure the connections to the battery terminals are secure. Check to see if the BLS is connected to the proper batteries. If the light still does not come on, please contact Customer Service.

Customer Service: 727-446-8400

Testing for a Short or Open Cell

The Battery Life Saver electronic device will not help a battery or batteries that have an open or shorted cell. In order to tell if a battery as an open or shorted cell, simply perform the following test.

Step 1: Make sure you turn off any instruments or accessories that will drain the battery or battery system during testing.

Step 2: Charge the battery or battery system until it is fully charged.

Step 3: Let the battery or battery system sit for 60 to 90 minutes. This is important because if you measure the voltage immediately after charging, you will not be measuring the true voltage of the battery.

Step 4: With a voltmeter, measure the voltage of each individual battery. In a battery system, you do not need to disconnect each battery, simply connect the voltmeter to the positive and negative terminals of the individual battery.

Step 5: Reference the chart below to determine if your battery or battery system has a shorted or open cell. For example, if a 6 volt battery is reading below 4.3 volts it has an open or shorted cell and the battery must be replaced.

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<tr>
<th>Battery</th>
<th>Voltage Reading of shorted or open cell</th>
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<tr>
<td>6 Volt Battery</td>
<td>Below 4.3 Volts</td>
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<td>8 Volt Battery</td>
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<td>12 Volt Battery</td>
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If you have been using the BLS or plan in using one you will only need to replace the bad battery with another used battery. Now you are ready to connect and start using the BLS....
Installing the BLS

Attention: If you are installing the BLS on a used or older battery or battery system, please review the enclosed document “Testing a Battery for a Shorted or Open Cell.”

1) Connect the red lead to the positive terminal of the first battery – the one that is connected to the positive terminal of the motor controller. Connect the black lead to the negative terminal of the last battery – the one connected to the negative terminal of the motor controller. The battery arrangement for the most common golf carts can be found on the last page of this manual.

2) The BLS works constantly to keep your batteries in like new condition. It draws a small amount of current but could discharge the batteries if the vehicle is not used frequently or not put on the charger when not in use. Follow instructions for Battery Storage below if your vehicle is to be stored.

MOUNTING

The BLS can be mounted to the vehicle using two number 8 screws and nuts or self tapping screws. Mount it with the fins vertical to ensure good cooling. The best location is close to the batteries where it will not get dirty.

BATTERY STORAGE

When batteries are to be stored for extended periods, use BLS with a trickle charger to maintain the battery in good condition. If you are not going use a trickle charger, disconnect BLS while the batteries are stored. Then charge the batteries once per month with BLS attached for 24 hours. It is very important not to let the battery sit for an extended period without a charge and the BLS attached because lead sulfate will build up.

Recording your Progress

The best test to determine the effectiveness of the BLS is to ask yourself, “Are my batteries performing better?” You will start to notice results in about 2 weeks. You will see a definite change in about 6 weeks. If you do not see improvement, see the Troubleshooting section on the next page.

Use this chart to record battery specific gravity (measure with a hydrometer) and voltage. If possible measure the voltage of each cell. Otherwise record the total battery voltage. Check and record the voltage and specific gravity before installing Battery Life Saver electronic device. Then recheck occasionally, every 2 days for the first 10 days, then weekly and then monthly.

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