

BATTERY SAVER (BS)

**Photovoltaic Low-voltage Load Disconnect Device (BS1) (or)
Photovoltaic Low-voltage Generator Start Device (BS6)**

Installation and Operation Manual

SPECIALTY CONCEPTS, INC.

8954 Mason Ave.

Chatsworth, CA 91311 USA

MODELS COVERED: BS1 and BS6 (12, 24, 36, 48 volt units)

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GENERAL DESCRIPTION

The BATTERY SAVER (BS) is a versatile device for the protection of batteries from low voltage. Versions can be ordered to disconnect a load or start a generator.

The BATTERY SAVER consists of a relay with a voltage sensing circuit and a red light to indicate operation. It is housed in an anodized aluminum chassis suitable for wall mounting with a terminal block for up to 10 gauge wire or spade connector.

FEATURES

LOW-VOLTAGE LOAD DISCONNECT (BS1) or LOW-VOLTAGE GENERATOR START (BS6)

- 25 amp load, 12 or 24 volt
- 15 amp load, 36 or 48 volt

DESIGN FEATURES

- Indicator light
- Input noise suppression
- Reverse polarity protection
- Adjustability; set-point and span
- Indoor wall mount chassis

SPECIFICATIONS

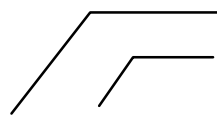
PARAMETERS	UNITS	NOMINAL VOLTAGES			
		12 v	24 v	36 v	48 v
System Voltage, Max	(Volts)	17.0	34.0	51.0	68.0
Load Current, Continuous (1)	(Amps)	25	25	15	15
Load Current, Max (60 seconds) (2)	(Amps)	30	30	19.5	19.5
System Voltage, Max.	(Volts)	17.0	34.0	51.0	68.0
Operating Voltage @ Battery, Min.	(Volts)	9.6	9.6	19.2	19.2
Quiescent Current (3)	(Milliamps)	8.2	12	10	10
Current Consumption, Energized (Load Disconnected / Gen Start) (4)	(Milliamps)	107	116	75	75
Voltage Drop, Typ. (Battery to Load)	(Volts)	.03	.03	.03	.03
Low-voltage Set-point, Factory Set					
Load Disconnect , (BS1)	(Volts)	11.5 ± .3	23.0 ± .6	34.5 ± .9	46.0 ± 1.2
Generator Start , (BS6)	(Volts)	11.5 ± .3	23.0 ± .6	34.5 ± .9	46.0 ± 1.2
Adjust. Low-voltage Set-point Range (5)	(Volts)	10.5 to 12.5	21.0 to 25.0	31.5 to 37.5	42.0 to 50.0
Resumption Voltage, Factory Set					
Load Reconnect (BS1)	(Volts)	13.0 ± .3	26.0 ± .6	39.0 ± .9	52.0 ± 1.2
Generator Stop (BS6)	(Volts)	13.0 ± .3	26.0 ± .6	39.0 ± .9	52.0 ± 1.2
Adjustable Resumption Range, Typ. (5)	(Volts)	12.2 to 14.0	24.4 to 28.0	36.6 to 42.0	48.8 to 56.0
Time Delay, Typ. (6)	(Seconds)	2	2	2	2
Operating Temp. Range	(°C)	-20 to 50	-20 to 50	-20 to 50	-20 to 50
Storage Temp. Range	(°C)	-55 to 85	-55 to 85	-55 to 85	-55 to 85

Notes:

- (1) Non-inductive.
- (2) Carry only, Non-switching
- (3) Relay unenergized, red L.E.D. off, typical value.
- (4) LVD/Gen. start relay energized, red L.E.D. on, typical value.
- (5) Higher and lower settings can be reached but are not recommended.
- (6) Prevents nuisance disconnects.

PART NUMBERING KEY

EXAMPLE:



Model

Nominal Voltage

BS1 - 12

MODEL	NOMINAL VOLTAGE
BS1 - (Low-voltage Load Disconnect)	12
BS6 - (Generator Start)	24
	36
	48

APPLICATIONS

Deep discharge damage to lead acid battery banks is often a major concern, both as a system reliability issue and an economic issue relating to replacement costs of batteries and cycle life based on depth of discharge. The BATTERY SAVER (BS) can reduce damage to expensive batteries by controlling deep discharge.

VERSIONS

The BS1 can be used as a low-voltage load disconnect (LVD) to automatically turn lights or other non-essential loads off when battery voltage drops too low. These loads are reconnected after the systems has recharged some. Loads can be staged for disconnect, turning off the least useful ones first and leaving the essential loads on, by using multiple BATTERY SAVERs.

The BS6 can be used to signal the start of a stand-by generator or other auxiliary charger to recharge the battery, avoiding deep discharge without temporarily losing the loads.

The BATTERY SAVER can be used as the only control in a small stand alone systems, or as one of many control elements in large, modular control system for multi-kilowatt applications. In many small applications charge regulation is not as much a concern as deep discharge damage. In these cases LVD can be the only type of control electronics needed. Some systems that already have charge regulation may need the addition of a LVD circuit. The BS1 can be added to existing systems without requiring a complete new control.

RELATED SYSTEM EQUIPMENT

The BATTERY SAVER is an integral part of a low voltage D.C. power system that includes a charging source, a battery and a load. These items should be installed according to the instructions provided by the equipment supplier, and this manual assumes that the rest of the equipment installation has been properly completed.

CHARGING SOURCES: Connect charging sources with their own regulation devices directly to the battery, using properly rated over-current protection devices.

Note: The BATTERY SAVER can remain connected to a battery being charged by an alternator, battery charger, etc. without damage to the BATTERY SAVER. No disconnect or isolation switches are required.

BATTERIES: The BATTERY SAVER is designed to be used with the most common lead-acid batteries. These are wet cell batteries using pure lead, lead antimony and/or lead calcium grids. The factory standard set-points are selected to correspond to approximately an 80% depth of discharge. These settings may need to be adjusted when using sealed, maintenance free batteries, or vented pocket plate nickel-cadmium batteries. For these batteries, consult the battery manufacturer for recommended set-points.

LOADS: The load is considered the item or equipment that the PV system is powering. System loads such as lights, radios, DC/AC inverters, etc. must be rated for the proper DC input voltage. DC loads not exceeding the rated BS1 load current (see specification section) can be connected to the load terminals of the BS1, which provides the automatic LVD function. Higher current, or inductive loads such as pumps, motors or inverters should be connected directly to the battery, using properly rated over-current protection devices (fuses or circuit breakers).

GENERATORS (for Generator start): The BATTERY SAVER (version 6) can automatically turn on a standby generator when the battery voltage drops low. The generator must be equipped with a two wire auto-start feature.

INSTALLATION

BATTERY PRECAUTIONS

WARNING: Follow all safety precautions of the battery manufacturer. Proper ventilation must be provided for the batteries. Most batteries produce hydrogen gas when charging, which is extremely explosive. Provide adequate battery ventilation. **DO NOT** expose the battery to open flame, matches, cigarettes or sparks. **DO NOT** mount the BATTERY SAVER in an unventilated enclosure with the battery, since the BATTERY SAVER relay can generate sparks when switching.

BATTERY SAVER PRECAUTIONS

CAUTION: DO NOT exceed the maximum voltage or current rating of the BATTERY SAVER model as stated in the specification sheet.

NOTE: Inductive loads such as compressors or pumps often have starting surges that exceed the running current. Check the specifications of these loads to insure that the starting surge does not exceed the rating of the BATTERY SAVER.

LOCATION / WIRING

GENERAL - The BATTERY SAVER 1 (BS1) is a low-voltage load disconnect. It should be mounted as close to the battery as possible, and wires should be of sufficient gauge to carry the required load current without excessive voltage drop. The BATTERY SAVER 6 (BS6) is a generator start unit, which can be mounted at the battery or the generator, whichever is most convenient. Wire gauge will depend upon the current required by the generator auto-start circuit.

WIRING - Start by connecting the battery plus and minus to the terminals marked "Batt +" and "Batt -" respectively.

BATTERY SAVER 1 (BS1) - Connect the load negative to the terminal marked "Load -". With the load turned off, connect the load positive to the terminal marked "Load +".

BATTERY SAVERS 6 (BS6) - The terminals labeled "Load +" and "Load -" are connected to the contacts of the relay. These are voltage free contacts and have no polarity.

FIGURE 1 BATTERY SAVER MODEL 1

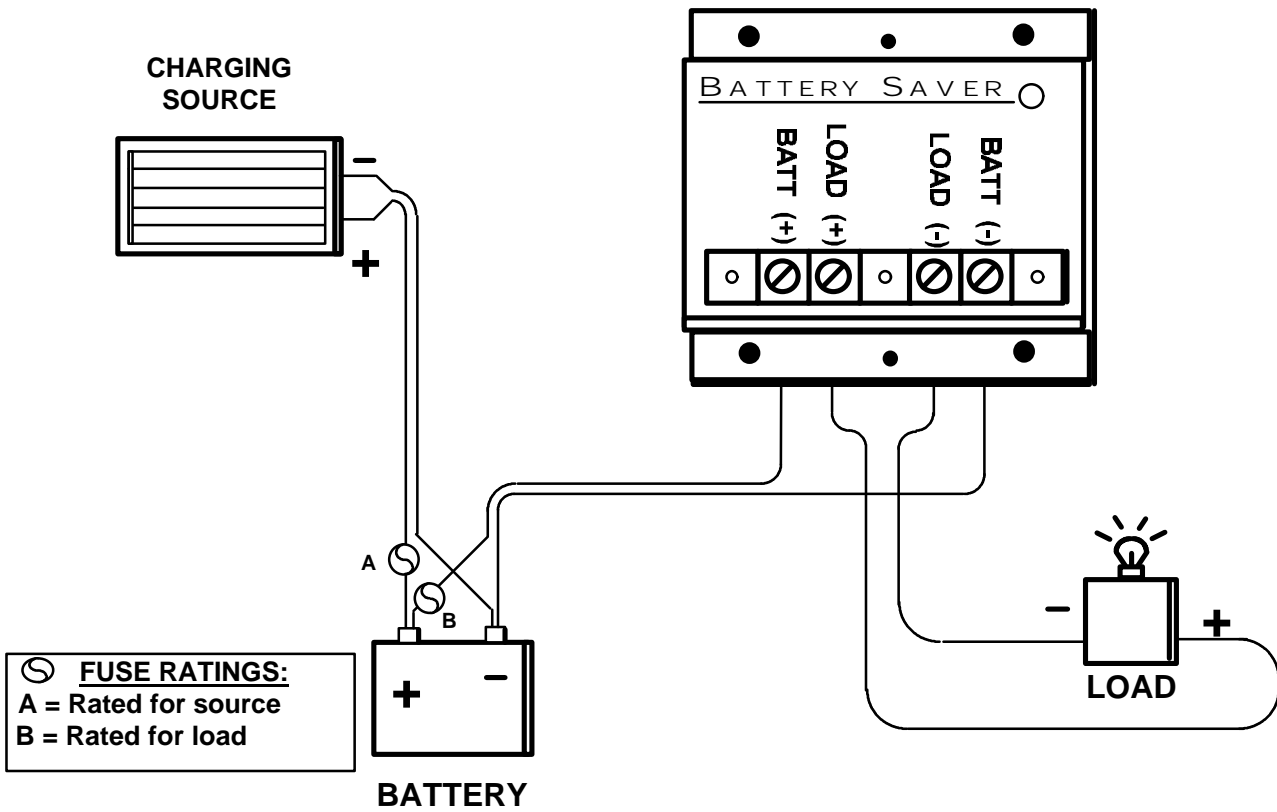
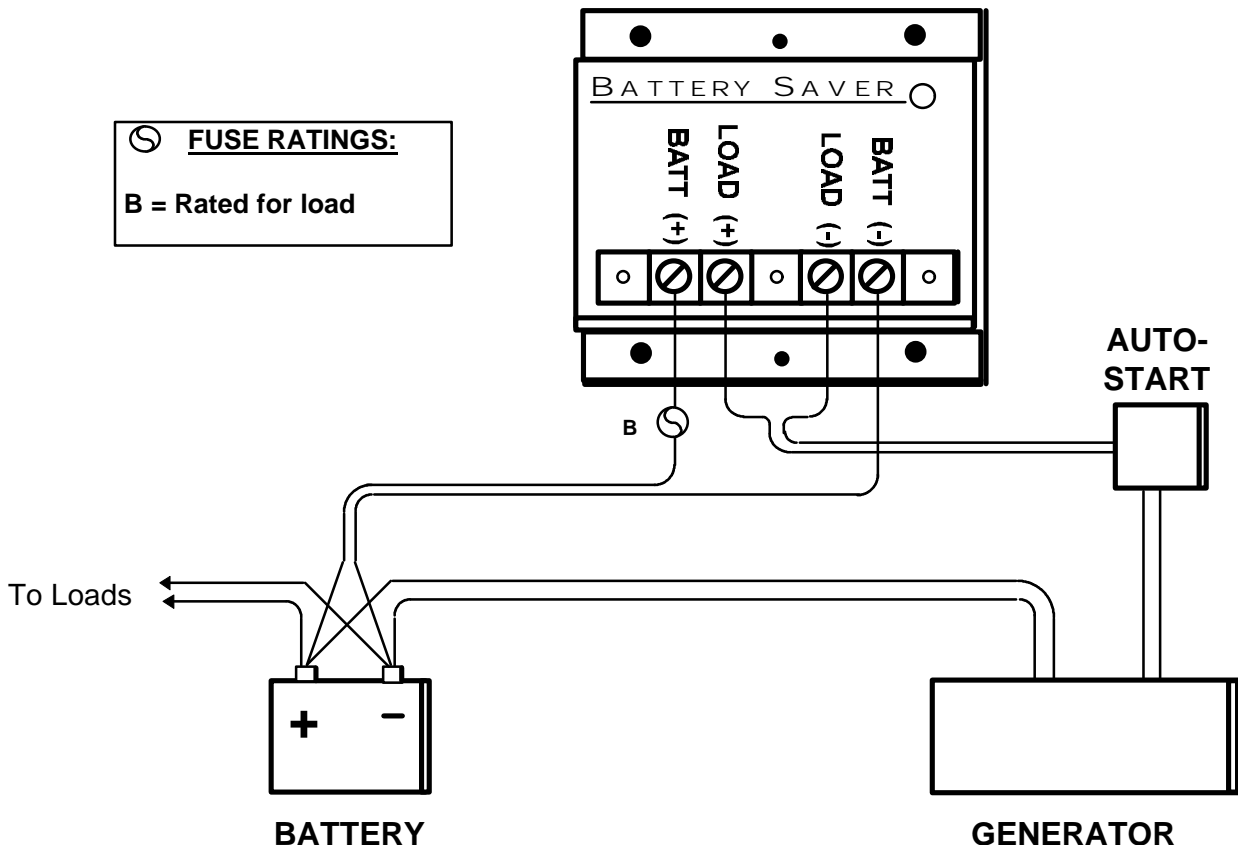


FIGURE 2 BATTERY SAVER MODEL 6



ADJUSTING THE VOLTAGE SET-POINTS

The operating voltage set-points can be changed via adjustment screws accessible from the front. On both BATTERY SAVER Models 1 and 6, two pots are provided for adjustment, one for the LVD (or generator start) set-point and one for the SPAN or voltage change before a reset.

Equipment required: Variable power supply with meter, small adjustment screwdriver.

- 1) Disconnect BATTERY SAVER from system.
- 2) Connect the power supply plus and minus to the terminals marked "Batt+" and "Batt-" respectively.
- 3) Vary the power supply voltage in the area where the LVD (or GENERATOR START) is set, observing when the LED light goes on and off.
- 4) Subtract the value of the desired LVD (or GENERATOR START) voltage from the desired stop voltage. This becomes the "SPAN" value.
- 5) Set the desired span via adjustment of the "SPAN ADJ." adjustment screw. Turning the screw clockwise increases the span, counter-clockwise decreases it.
- 6) Vary the power supply voltage once again to determine the new span value.
- 7) Repeat steps 5 and 6 until the desired span is achieved. The LVD (GENERATOR START) value will not be correct.
- 8) Turn the LVD (START ADJ.) adjustment screw clockwise to decrease the set-point, and counter clockwise to increase it.
- 9) Vary the power supply voltage to determine the new start value.
- 10) Repeat steps 8 and 9 until the desired set-point is achieved, repeat step 3 to verify the accuracy of the new set-points.

OPERATION

Once the BATTERY SAVER is installed, the operation is automatic, and specific to each model.

BATTERY SAVER 1 (BS1) - Low-voltage load disconnect -

When battery voltage reaches the low-voltage threshold, the normally closed relay will energize and open. The red Light Emitting Diode (L.E.D.) on the front panel will light and the load will be disconnect. When battery voltage rises, indicating charging has occurred, the load will be automatically reconnected.

BATTERY SAVER 6 (BS6) - Generator Start -

For systems designed with stand-by generator backup, the BATTERY SAVER can signal when low batteries need additional charging. When battery voltage reaches the low voltage threshold, the normally open relay will energize, closing the contacts and lighting the red L.E.D. on the panel. When battery voltage rises to the reconnect threshold, indicating charging has occurred the contacts will open.

TROUBLE SHOOTING GUIDE FOR THE BATTERY SAVER

BATTERY SAVER MODEL 1 (BS1) -

PROBLEM - DEAD BATTERY

POSSIBLE REASON - THE LOAD DISCONNECT RELAY COULD HAVE FAILED

If the red light is on, but the load is not disconnected, the LVD relay may have failed. Check for battery voltage at the LOAD (+) and LOAD (-) terminals of the BS1. If there is not voltage at the load terminals when the light is on, the BS1 is operating and the battery is dead for another reason.

POSSIBLE REASON - BS1 DISCONNECTED THE LOAD, BUT RECONNECTED THE LOAD AT VERY LOW VOLTAGE, ALLOWING THE BATTERY TO GO DEAD

Under normal conditions, the BS1 disconnects the load when the battery voltage drops to the low-voltage set point, as factory set or adjusted by the installer. The relay energizes to disconnect the load. If the system does not charge up, and the battery voltage continues to drop, when it reaches the minimum operating voltage for the BS1, the relay will drop out and the load will be reconnected.

PROBLEM - BS1 CYCLES ON AND OFF RAPIDLY, OR DISCONNECTS THE LOAD TOO SOON

POSSIBLE REASON - VOLTAGE DROPS IN THE LINE FROM THE BS1 TO THE BATTERY CAUSE ERRORS IN VOLTAGE MEASUREMENT

Measure the voltage at the BS1 and at the battery when the load is running to determine if there is a voltage difference between the two.

POSSIBLE REASON - OLD BATTERY

An old battery will change voltage rapidly with little load or charge current.

**LIMITED FIVE YEAR WARRANTY
SPECIALTY CONCEPTS, INC.**

1. Specialty Concepts, Inc. warrants all its products for a period of five (5) years from the date of shipment from its factory. This warranty is valid against defects in materials and workmanship for the five (5) year warranty period. It is not valid against defects resulting from, but not limited to:
 - A. Misuse and/or abuse, neglect or accident.
 - B. Exceeding the unit's design limits.
 - C. Improper installation, including, but not limited to, improper environmental protection and improper hook-up.
 - D. Acts of God, including lightning, floods, earthquakes, fire and high winds.
 - E. Damage in handling, including damage encountered during shipment.
2. This warranty shall be considered void if the warranted product is in anyway opened or altered. The warranty will be void if any eyelets, rivets, or other fasteners used to seal the unit are removed or altered, or if the unit's serial number is in any way removed, altered, replaced, defaced or rendered illegible.
3. The five (5) year term of this warranty does not apply to equipment where another manufacturers' warranty is available. An example of such equipment may be, but is not limited to, an electronic enclosure. The time limit for this warranty may be for less than the Specialty Concepts limited warranty. Specialty Concepts will assist the claimant in attempts to seek warranty claims for such equipment, where appropriate.
4. Specialty Concepts cannot assume responsibility for any damages to any system components used in conjunction with Specialty Concepts products nor for claims for personal injury or property damage resulting from the use of Specialty Concepts' products or the improper operation thereof or consequential damages arising from the products or use of the products.
5. Specialty Concepts cannot guaranty compatibility of its products with other components used in conjunction with Specialty Concepts products, including, but not limited to, solar modules, batteries, and system interconnects, and such loads as inverters, transmitters, and other loads which produce "noise" or electromagnetic interference, in excess of the levels to which Specialty Concepts products are compatible.
6. Warranty repair and/or evaluation will be provided only at Chatsworth, California facility of Specialty Concepts. Units for such repair and/or evaluation must be returned freight prepaid to Specialty Concepts with a written description of any apparent defects. Specialty Concepts will not be required at any time to visit the installation site wherein Specialty Concepts' products are subject to warranty repair and/or evaluation.
7. Only Specialty Concepts is authorized to repair any of its products, and they reserve the right to repair or replace any unit returned for warranty repair. The party returning a unit for repair is responsible for proper packaging and for shipping and insurance charges, as well as any other charges encountered, in shipping to and from Specialty Concepts.
8. This warranty supersedes all other warranties and may only be modified by statement in writing, signed by Specialty Concepts.

W

warranty terms effective as of April 1, 1999

REPAIR INFORMATION

Directions for returning units needing repair.

1. Write up a note with the following information:
 - Name / Company Name
 - Return Address : (For USA/Canada: UPS Deliverable. Avoid PO Boxes)
 - Daytime Phone
 - Description the failure
 - Specify amount of repair charges preapproved (we will contact you if repair charges are larger than this amount.)
2. Box up unit with copy of sales receipt (if available).
3. Send by UPS or Parcel Post to :

Specialty Concepts, Inc.
Attn : Repair Dept.
8954 Mason Ave
Chatsworth, CA 91311 USA

If the Repair is not covered under warranty, the repair charges will not exceed 30% of the value of a new unit. (shipping and handling not included) Domestic charges are collected via UPS-COD. For non-warranty repairs, repaired portion features an additional one-year warranty.

SPECIALTY CONCEPTS, INC.

8954 MASON AVE., CHATSWORTH, CA 91311 USA PH: (818) 998-5238, FAX: (818) 998-5253