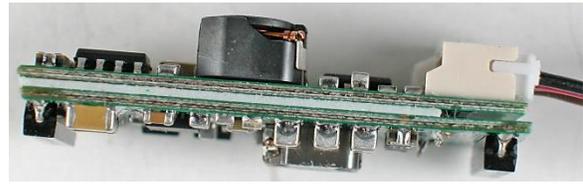
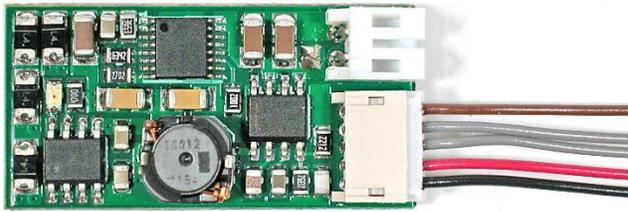
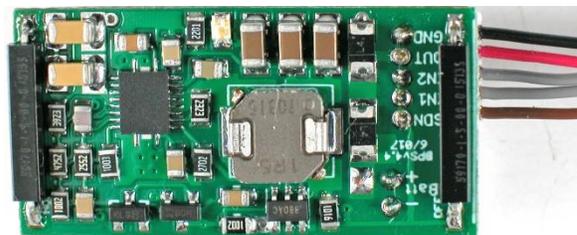
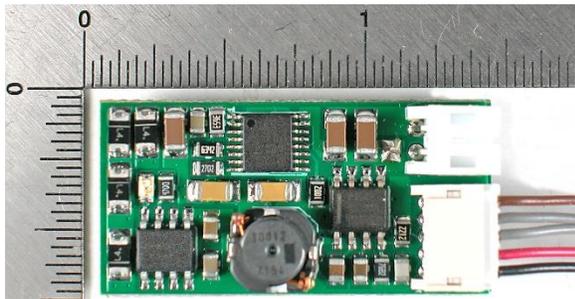


BPS-v4 User Guide

S-CAB 11 volt, 1 amp battery power supply



This fourth generation BPS battery power supply is intended for applications requiring up to 1 amp from a small package. Conceptually, there is no change from previous designs. Energy is provided by one or more lithium polymer (LiPo) cells connected in parallel and higher voltage output is produced electronically using a step-up converter. The functions of battery charging, battery protection and switching are included within the design.



Comparison with Version 3

- Smaller size, 1.35"x0.7"x0.4" (34x17x10 mm). A 22% reduction.
- Output capability is increased to 1 amp at 11 volts. Twice the capability of v3.
- Includes input over-voltage protection.
- Both battery bypass and battery power have overload protection.
- Battery-On and -Off reed switches are now on the circuit board.
- Includes battery on indication. Blue LED.

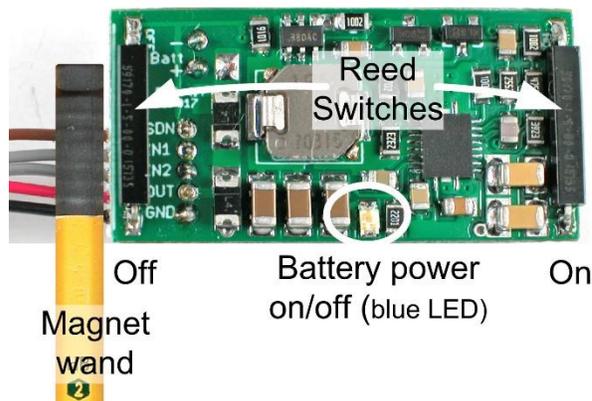
Battery Power Switching

Manual on/off: When there is no track power, the pencil with a magnet instead of an eraser comes in handy. Let's call it a magnet wand, or simply; a "wand". Its job is to activate magnetic reed switches, of which there are two; one for "on", the other for "off".

For best sensitivity, align magnet parallel to reed switch as shown in figure.

Looking at the figure, since reed switches are relatively close together, it's usually easier to swipe the magnetic wand from left to right to turn on and reverse the motion for off.

Automatic On: BPS turns on when track voltage is detected. It's a voltage transient (the sudden change from zero to non-zero voltage) that initiates switch on. A steady or slowly changing voltage will not cause turn on.



Decoder off-command: By default, S-CAB installations with SoundTraxx or NCE decoders are set up to use a decoder 'F5' command to shut down battery power. This requires connection of the BPS shut-down wire (brown) to the appropriate decoder function output. For SoundTraxx, this is a brown wire (output FX4); for NCE decoder, the wire color is purple/violet.

Be careful to turn off battery power when finished operation. Otherwise, the battery may be discharged next time operation is attempted.

Battery power indication: BPS v4 includes a blue LED to indicate battery power on/off status. If the LED is off, the battery is not supplying power to BPS output. This is true, irrespective of BPS input, and maximizes battery charging by disconnecting the step-up converter.

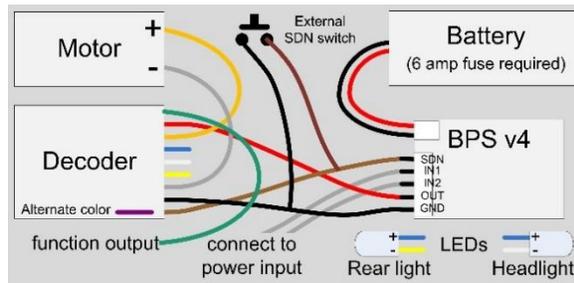
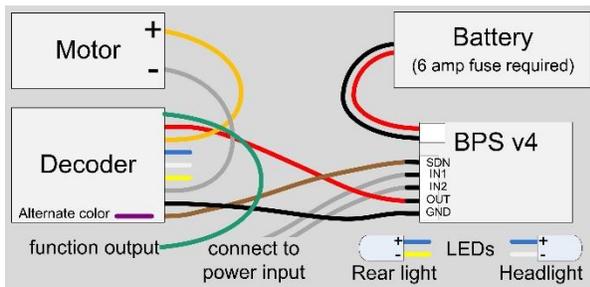
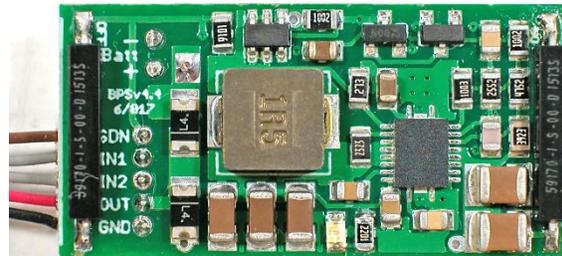
A second benefit of turning off battery power during charging: Everything turns off automatically when BPS power input is terminated deliberately or accidentally.

Battery power is off, but decoder still has power: Since BPS v4 includes battery bypass, input power flows to BPS output, irrespective of whether battery power is on or off. This is true even if the battery is unplugged. Consequently, a connected decoder will always be powered while BPS has input power. If sound is not desired while battery charging, SoundTraxx decoders allow either loco shutdown or sound muting while a decoder remains operational.

Wiring

In a change from previous BPS versions, v4 has a 5-pin JST connector (or directly soldered wires). Previous wire colors are retained and pin labels on circuit board are SDN (brown), IN1 and IN2 (gray), OUT (red), GND (black).

In most deliveries, BPS power output (OUT red and GND black) and SDN (brown) are already connected to a decoder.



Unlike version 3, a second brown wire is not included on version 4. However, it's still possible to connect an external shutdown switch as shown in the second diagram.

BPS Location

Since the magnet wand's maximum activation range is 1/2", the BPS circuit board must be mounted close to an accessible surface (roof of diesel, or side of a tender, for example). When this is not possible, one option is to connect a second reed switch or a momentary contact device mounted somewhere conveniently in the model. Solder wires for this switch to terminals of the reed switch mounted on the BPS circuit board. Avoid removing BPS heat-shrink covering. Just remove enough to access the appropriate reed switch.

Battery Selection

BPS is always delivered with a battery that includes a fuse. A battery used with BPS v4 requires a 6 amp fuse as well as leads and connector capable of carrying up to 4 amps battery current. Obviously, the 3.5 amp fuse used with earlier BPS version is inadequate.

This adds specific requirements to battery specifications:

1. Battery must safely deliver 6 amps
2. Fuse protection should be 6 amps
3. Use a JST PH connector with crimp-type plug and 24 AWG leads

The third requirement eliminates use of insulation displacement connectors, due to voltage drop and connector heating at 4 amps.

Battery Charging

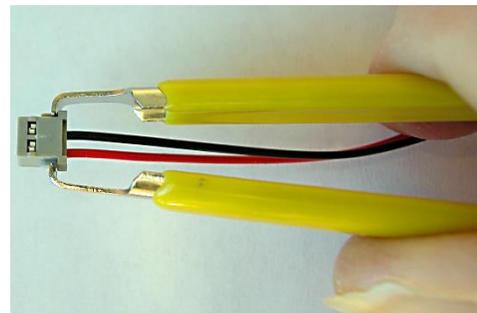
Power for battery charging is typically from track to wheels. It's desirable that charging voltage be well-regulated DC, or DCC from a quality supplier. Set track voltage between 12 and 13 volts for best operation and do not exceed 16 volts.

It's best to avoid hobby-market DC train controllers for battery charging. Alternatively, connect a large capacitor (1000 uF, 35 or 50 volt) to filter the controller's output.

This warning applies explicitly to BPS v3. Version 4 input voltage protection can tolerate voltage peaks up to 30 volts. However, the warning remains relevant since hobby controllers are often unregulated with peak voltages that can damage electronic components.

Battery Leads

Battery plug and socket are tight by design and not intended for frequent disconnection. Please avoid unplugging by pulling the leads. Eventually, a wire will pull out of the connector. An IC Extraction Tool is one simple way to avoid this problem.



Battery Fuse

BPS batteries are protected by a fuse within the battery package and cannot be replaced by user. A blown fuse requires return to factory repair or purchase of a new battery.

The most common cause of a blown fuse is an attempt to measure battery voltage at the BPS battery socket. There is high risk that multi-meter probes will momentarily short-circuit battery output and blow the fuse, clearing the short instantaneously (there won't even be a spark).

Another cause is failure to properly insulate the BPS circuit board during bench testing or installation. The heat-shrink wrapper minimizes this risk and should not be removed.

The most embarrassing mistake is an attempt to shorten battery leads while forgetting to cut each lead separately. Cutting leads simultaneously shorts the battery and blows the fuse.

Battery Bypass

If track voltage exceeds 12 volts, battery bypass supplies BPS output from BPS input without using energy from the battery. This occurs because rectified input (with some filtering) connects through a protection circuit and diode to BPS output, thereby creating two sources of output; one from input; the other from battery. Output is supplied by whichever source reaches BPS output with the highest voltage.