Introduction

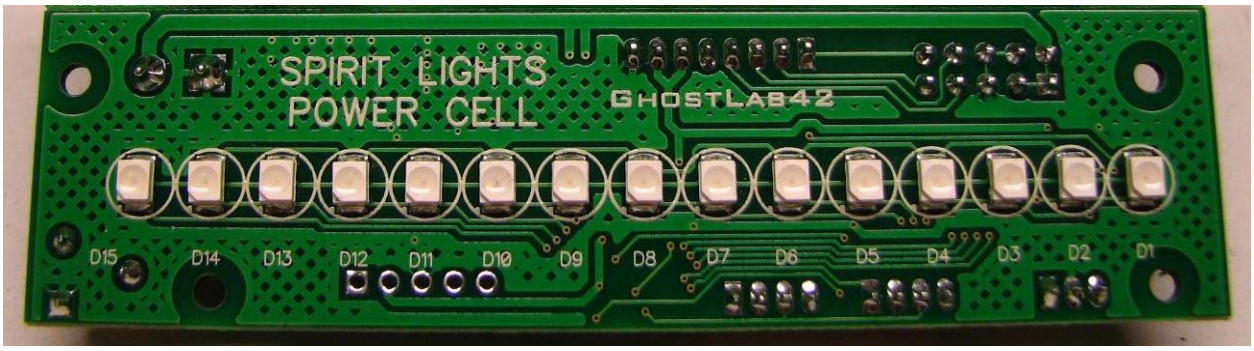
Congratulations on purchasing the Spirit Pack Lights Upgrade Kit that adds some serious lighting effects to your nuclear accelerator!

The Spirit Light Kit is designed to work in a generic Proton Pack and can be used with a wide range of battery sources. The board can be used with additional switch controls, the Spirit Blaster board, the Matty Blaster board or the GBFans Sound Board. Selection of different operating modes and the speed of the normal lighting sequences can be adjusted by rotating the potentiometer. This Spirit Pack Light Kit also receives commands from the Spirit Blaster, Matty Blaster or the GBFans Sound Board, which adds other interesting effects like overheating, venting, and the video game modes.

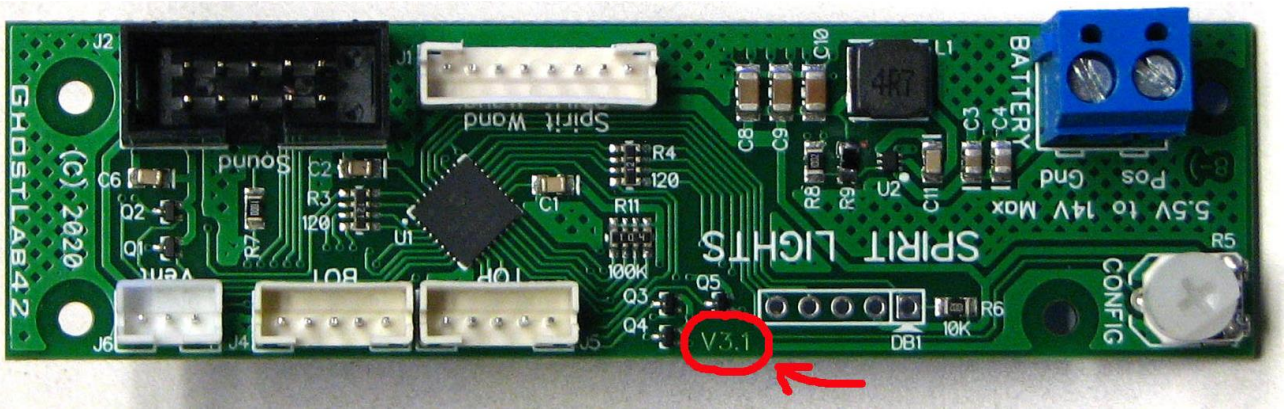
Power Cell and Cyclotron Light Kit features:

- 15 wide-angle diffuse Blue LEDs on the main Power Cell circuit board
- 4 wide-angle Ultra Bright diffuse Red/Green//Blue LEDs for the cyclotron Lights
- 1 connection to support a Bright White LED or vent relay for venting affects
- Works with battery voltages from below 3V to 14V (V2.0) or 7V to 14V (V3.1)
- High efficiency switching power supply for longer battery life
- Easy wiring with a single cable connection for power and control from the Spirit Blaster, Matty Blaster or GBFans Sound Board
- Easy wiring for stand-alone operation with a separate set of battery connection screw terminals (not used when connected to a Spirit Blaster, Matty Blaster or GBFans Sound Board)
- Cables are keyed to only fit only in one orientation
- Capable of providing additional light sequences while powering up and down, firing, overheating, venting (Spirit Blaster, Matty Blaster and GBFans Sound Board) and crossing the streams (Matty Blaster only).

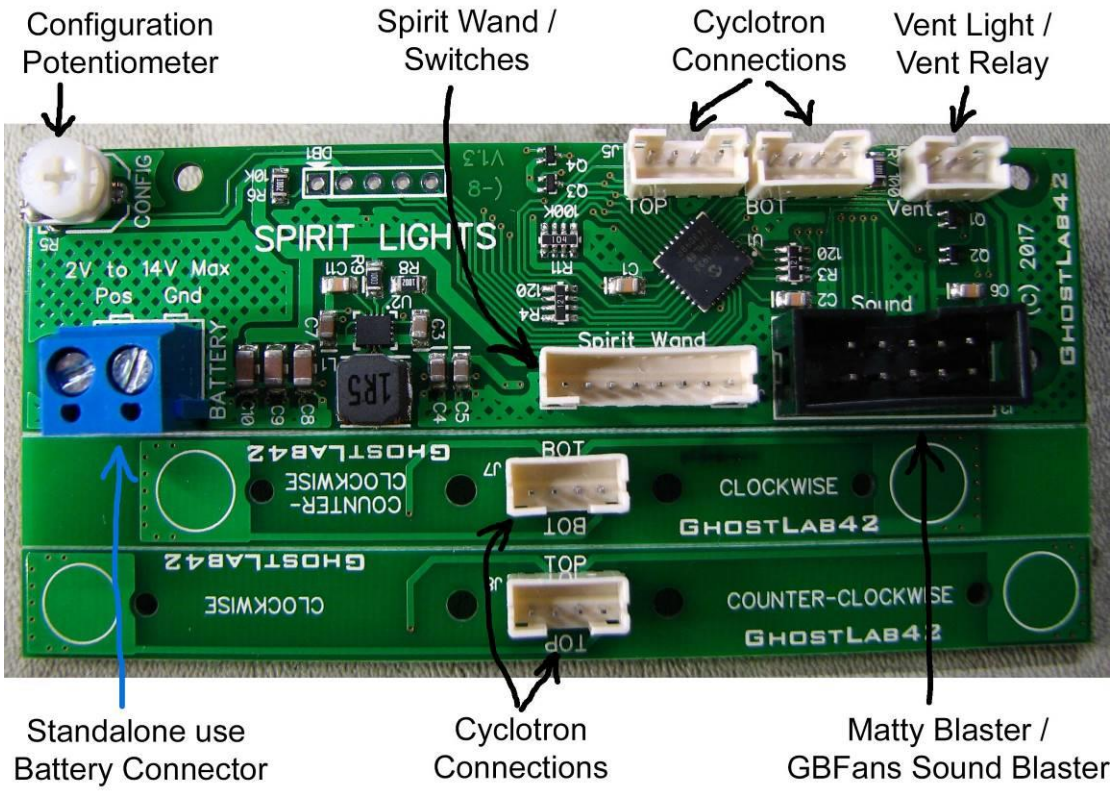
Front:



Back:



Back:



The Light Kit has a White configuration potentiometer on the back of the board to select between four main modes of operation:

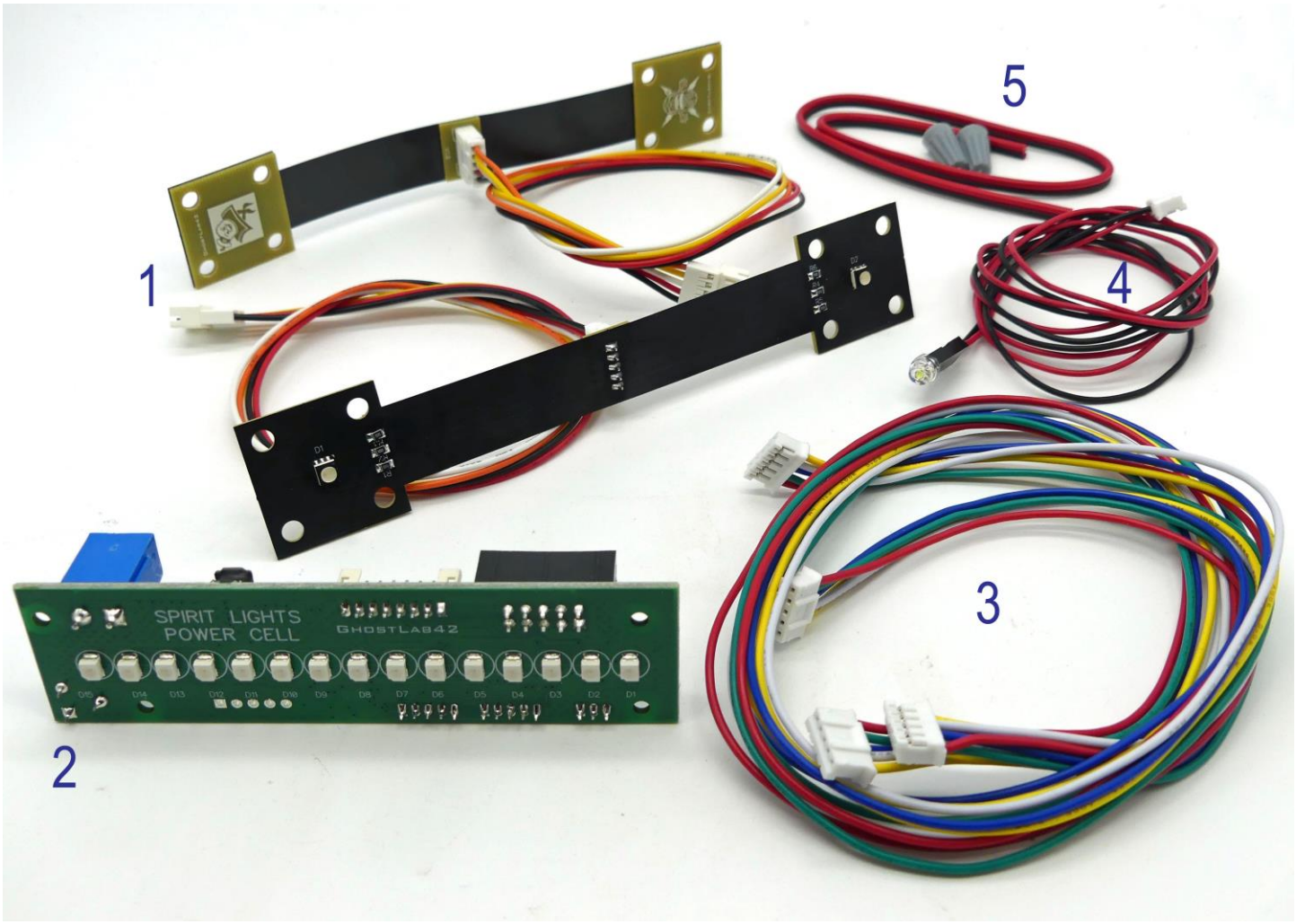
1) Firmware Version Display and Cyclotron Test
   (Configuration potentiometer fully counterclockwise)
   a. The Power Cell LEDs will show the firmware version number
   b. The Cyclotron LEDs will show what is on the 4 digital inputs (all on in stand-alone mode) in Yellow lights (Red and Green both on)
   c. The White Vent LED will be turned on if connected to the vent cable.

2) Red Cyclotron Only Mode
   (Configuration potentiometer counterclockwise half of the range)
   a. No separate power-up sequence
   b. Each Cyclotron Light will snap on and fade off more quickly
   c. Rotate Counterclockwise for slower or Clockwise for faster sequencing

3) Multi Color Cyclotron Mode
   (Configuration potentiometer clockwise half of the range)
   a. Separate power-up sequence
   b. Cyclotron lights will snap on and fade off slowly like in the Video Game
   c. Rotate Counterclockwise for slower or Clockwise for faster sequencing

4) Power Cell Test Mode
   (Configuration potentiometer fully clockwise)
   a. All Power Cell LEDs will be constantly on
   b. All Cyclotron and Vent LEDs are off
      (Well, one cyclotron likes to flash – haven't tracked that down yet…)

Spirit Pack Lights Kit For Generic Pack Contents:



The Spirit Pack Lights Upgrade Kit contains multiple parts to complete the installation into your pack.

1) 2x Cyclotron flex circuit boards with cable extensions
2) Spirit Pack Lights Powercell board
3) 2x Cyclotron connection cables with 5 wires each
4) Vent light cable assembly
5) Power wire to connect the battery to the Spirit board and 2x wire nuts

Advanced Standalone Operation

For those adventurous enough to make their own cable and connect their own switches, the Advanced Standalone mode has additional capabilities compared to the standalone mode when no sound board in control.

The Advanced Standalone mode does support up to four additional switch connections wired directly to a "Spirit Wand" connector cable:

1) PowerUp/Down toggle switch
    a. Enables a power up sequence (if the configuration allows) when the switch is open
    b. Enables a power down sequence when the switch is closed
    c. If power is applied and the switch is closed, the board waits for the switch to be opened
2) Fire momentary switch
    a. Will cause the sequence to speed up when the switch is closed
    b. Will slow back down to the normal sequence speed when the switch is open
3) Vent momentary switch (or toggle)
    a. Vent sequence when the switch is closed (if allowed)
4) Pack Selection toggle switch
    a. The Proton Pack mode is selected when this switch is open
    b. The Slime Thrower mode is selected when this switch is closed

The inputs are all single ended and the switches would need to share a common ground signal (one of the 2 "Gnd" signals in the cable) and just short the selected input to Gnd. If this does not make sense, don't try this advanced operation mode!

"Spirit Wand" 8 pin connector (JST PH style 2mm pitch) Pinout:

Pin "1" is Next to "J1" label
1: PowerUp/Down (Gnd = PowerDown), has a 100KΩ pullup to +5VDC
2: Fire (Gnd = Fire), has a 100KΩ pullup to +5VDC
3: Vent (Gnd = Vent), has a 100KΩ pullup to +5VDC
4: Pack Select (Gnd = SLIME Thrower), has a 100KΩ pullup to +5VDC
5: GND, connected to "Gnd" Standalone use Battery Connector
6: +5V from on-board voltage regulator
7: +5V from on-board voltage regulator
8: GND, connected to "Gnd" Standalone use Battery Connector

"Sound" board 10 pin connector (IDC 0.1" pitch 2x5) pinout:

1-3: +VBattery (3VDC to 14VDC), connected to "Pos" Standalone use Battery Connector
4-6: GND, connected to "Gnd" Standalone use Battery Connector
7: Pack Select (Gnd = SLIME Thrower), has a 100KΩ pullup to +5VDC
8: Vent (Gnd = Vent), has a 100KΩ pullup to +5VDC
9: Fire (Gnd = Fire), has a 100KΩ pullup to +5VDC
10: PowerUp/Down (Gnd = PowerDown), has a 100KΩ pullup to +5VDC

Pins 7-10 are encoded as a group when the Sound board is in control. This allows for more precice control of the pack lights sequences.

Problem Debugging

Hopefully you never need to use this section!

First thing to do is remove the main control cable from the sound board or wand lights (if used) and only have 3 connections to this board: a Battery (3V to 14V) and the two cyclotron connection cables.

Check the board operation in both test modes by carefully turning the Configuration Potentiometer ("CONFIG") first fully clockwise and verify that all 15 blue LEDs light up, and then fully counter-clockwise and verify all four cyclotron LEDs light up with specific colors in sequence: Red, Green, Blue, all-off.

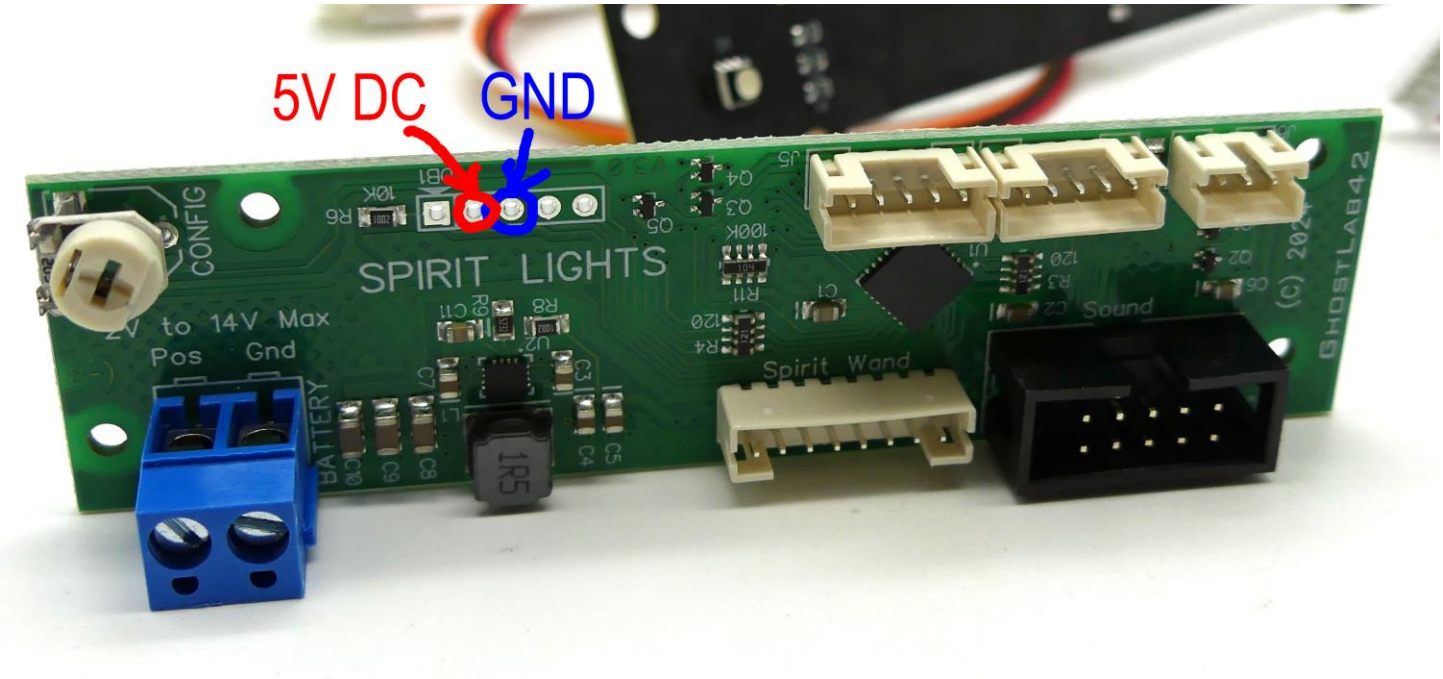
If one of the Cyclotron LEDs colors does not light up:
Still in the test mode (CONFIG fully counterclockwise), we need to see if it is the cyclotron board, cable or powercell board causing the issue.

Try swapping the cable connections to the cyclotron boards: just swap the ends that are plugged into the cyclotron boards.

Does the problem follow the cable or the cyclotron board?

- If the problem stays with the cyclotron board (same LED color on that board always fails) the problem is on the cyclotron board.
    - The LEDs have current limiting resistors on them that can be damaged if the boards are not carefully separated as described on pages 9 and 10. Carefully examine the tiny parts to see if they are damaged.
    - Each LED color has a separate part, so there are 6 resistors on each cyclotron board.
    - 4 are 100 ohms (For the Green and Blue LEDs) and 2 are 150 ohms (for the Red LEDs)
    - They can be cracked and still look OK, but if damaged the cyclotron board will need to be repaired.
- If the problem follows the cable, then either the cable or the powercell board driving the cable is a problem.
    - If it follows the cable, swap the other end of the cables that connect to the powercell board. Does it follow the cable or the powercell board connection?
        - If the problem follows the cable, the cable is the problem. Check to see if the wires are fully seating in the connector on both ends. Sometimes they can get pushed slightly out of the connector and that can cause lights to not work.
        - If the problem follows the connector on the powercell board, then the problem is on that board. Remove the cable and look into the connectors that the cable connected to, or are there any bent over pins? If the pins are bent over, try straightening them and repeat the testing. If a pin is missing or they look fine, the powercell board needs to be repaired.

If you have a DMM / Voltmeter, it is also good to verify that the voltage regulator is outputting a 5VDC value (+/- 5%).



The DB1 connector has the following pinout:
Pin 2: 5VDC
Pin 3: GND (common)