Introduction

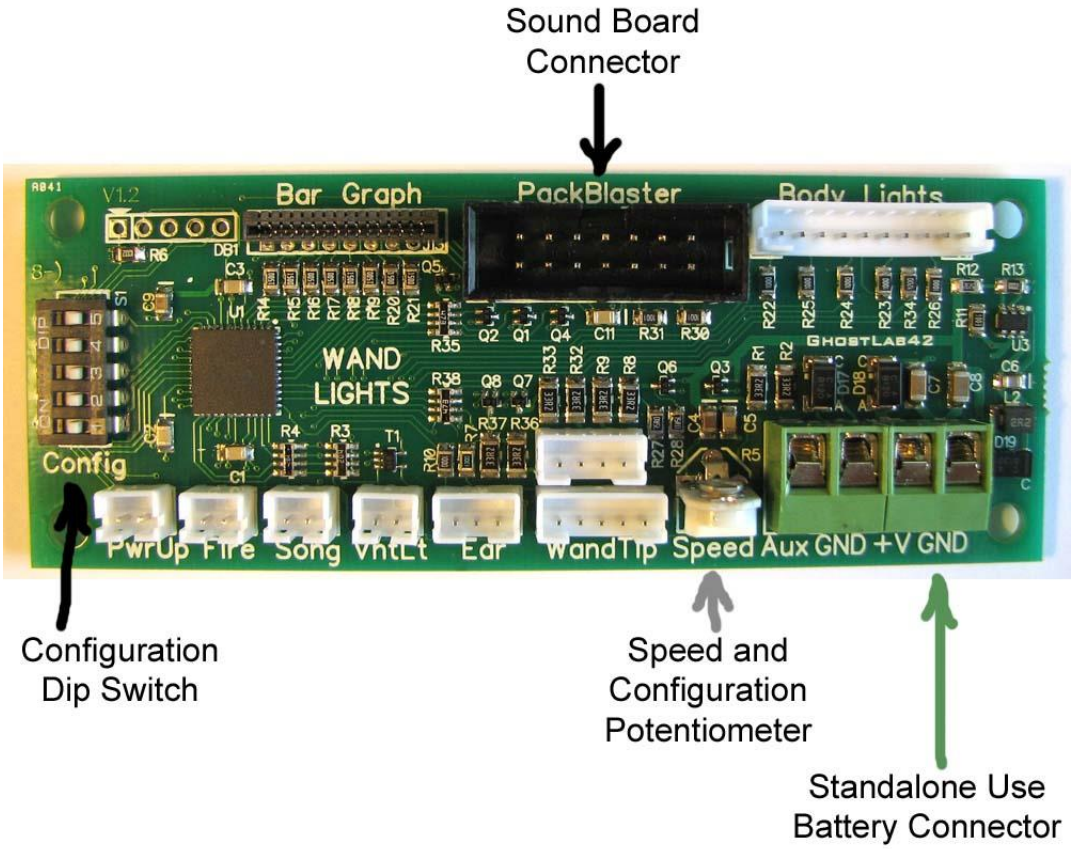
Congratulations on purchasing the WandLights Kit that adds some serious lighting effects to your nuclear accelerator's wand!

The WandLights Kit plugs in directly to the GBFans Sound Board, or can be used stand-alone by connecting to a battery pack. Movie accurate mode can be activated by rotating a potentiometer (which also controls the speed), turning it further activates a special effects mode that will add awesome animations to your Bar Graph display! This WandLights Kit also supports other cool effects like overheating, venting and support for the video game modes. So many features packed into one low priced kit.

WandLights Kit features:

- 28 Segment LED Bar Graph display
- 3 Toggle switches
- 2 Pushbutton switches (one Red and one Black)
- 6 Wide angle LEDs
    - 1 Clear 3mm Red LED for SLO-BLO illumination
    - 3 Clear 3mm Warm White LEDs for Wand body indicators
    - 1 Diffused 10mm Warm White LED for Vent illumination
    - 1 Clear 3mm Orange LED for the Ear Orange Hat illumination
- 1 Clear 10mm RGB LED for the wand tip illumination
- Works with battery voltages from 7V to 14V
- High efficiency switching power supply for longer battery life
- Easy wiring with a single cable connection for power and control from the GBFans Sound Board
- Easy wiring for stand-alone operation with a separate set of battery connection screw terminals (not used when connected to a GBFans Sound Board)
- LED and switch cables are keyed to only go in one direction
- Supports an optional Super High brightness White LED or Vibration/rumble motor for additional affects during the firing sequence.
- Optional WandTip Expansion kit with super High brightness LEDs and a separate set of high brightness LEDs for illumination of the Clear Acrylic Tube with Frosted surfaces will be available for purchase. This expansion kit replaces the clear 10mm RGB LED included in this kit.

WandLights controller board:



The WandLights board has configuration switches on the board to select between three main modes of operation:

1) Movie Wand
2) Movie Wand with Heating affects
3) TVG Wand, cycles through 8 different TVG wand affects

TVG Wand mode includes distinct sequencing for Proton Stream, Boson Dart, Slime Blower, Slime Tether, Stasis Stream, Shock Blast, Overload Pulse and Meson Collider operation.

The heating for mode 2 has been adjusted to match the R2DEVO lights' timing. The wand does not "remember" how long it has been since the last firing, so you always get up to 12 seconds of firing before overheating.

An Auxiliary connection is also included to drive a Super High Brightness White LED for start-of-firing flashbulb affects or for a rumble/vibration motor for adding force feedback during firing affects. The Super High Brightness White LED and rumble motor are not included in this kit.

Five switches are included for dynamically controlling the WandLights and Sound Board operations:

1. **PowerUp/Down Toggle Switch**
   Controls the WandLights power up and power down operation. This is only functional when a battery is connected and is not used to connect/disconnect a battery.

   Power Down operation (PowerUp/Down toggle is Off and Vent Light toggle is Off):
   the Red SLO-BLO LED will occasionally flash to let you know that the battery is connected.

   Standby operation (PowerUp/Down toggle is Off and Vent Light toggle is ON):
   the Red SLO-BLO LED will be on and one of two sets of lights will be on, controlled by pressing the Fire pushbutton and the Ear pushbutton.

   Power Up operation (PowerUp/Down toggle is ON):
   the Red SLO-BLO LED will be on, several LEDs will be flashing and the bar graph display will be working.

2. **Black Fire Pushbutton Switch**
   The pushbutton operation is a little different than having a dedicated Fire button wired directly to the GBFans Sound Board for TVG pack selection. There is no longer the need for the "Quick Tap" of the fire button to change the modes as the separate Ear Pushbutton switch will provide the mode change operation in the WandLights kit.
   a. Press and hold for continuous firing sounds, like the Proton Stream
   b. Press, hold and release for single shot sounds, like the Boson Darts in either TVG sounds configuration

   Standby operation (PowerUp/Down toggle is Off and Vent Light toggle is ON):
   the Fire Pushbutton toggles between two different sets of light sequencing that is remembered when the wand light is in Power Down mode (but still has power applied):
   - Red SLO-BLO LED on, a blinking warm white LED in the clear Cliplights cover and the bar graph display is off. This is the default selection when power is first applied.
   - Red SLO-BLO LED on, the warm white LED in the White Hat Lens on and the bar graph display is operating in the standard sequence.

   Power Up operation (PowerUp/Down toggle is ON):
   the Fire Pushbutton is pressed to start the wand firing!

3. **Song Toggle Switch**
   When the WandLights board is connected to the GBFans Sound Board, this switch can start the Ghostbusters' theme song. The WandLights board does not use or monitor this switch.

   Use this switch anytime power is applied to start or stop the Sound Board playing of the theme song.

4. **Vent Light Toggle Switch**
   Standby operation (PowerUp/Down toggle is Off and Vent Light toggle is ON):
   this switch enables a standby mode of operation with some active light sequencing. This allows the faithful recreation of the operation of the wand in the rooftop scene from Ghostbusters 1 when turning on the wand.

   Power Up operation (PowerUp/Down toggle is ON):
   this switch controls the warm white Vent Light LED in the Wand main box and also controls what function the Ear pushbutton has on the wand.

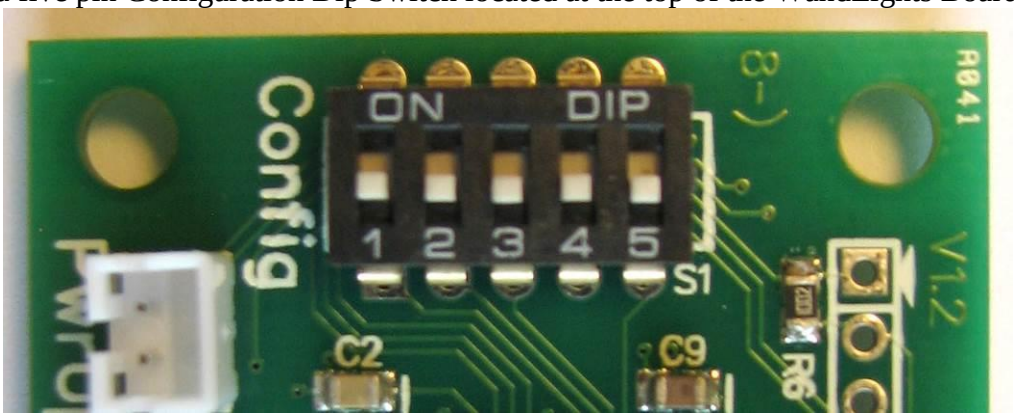
5. **Ear Pushbutton Switch**
   Standby operation (PowerUp/Down toggle is Off and Vent Light toggle is ON):
   the Ear Pushbutton toggles the Ear's Orange Hat Light LED, so you can have the Ear Orange HAT lens orange LED on or off when the Wand is powered up or in standby mode.

   Power Up operation (PowerUp/Down toggle is ON):
   the Ear Pushbutton switch can have several different functions depending on the configuration switch settings and the Vent Light toggle switch position:
   - Pack Vent,
   - Alternate Fire button, and
   - TVG pack mode selection.

   The position of the Vent Light toggle switch is used to select between the two functions that the Ear Pushbutton can perform. When the wand is powered on and the Vent Light is on, the Ear pushbutton will function as either an alternate Fire button (first 6 dip switch configurations) or a TVG pack mode selection button (for the last two dip switch configurations). When the Vent Light is off, the Ear pushbutton will enable a Pack Vent operation.

Configuration Dip Switch Settings:

There is a five pin Configuration Dip Switch located at the top of the WandLights Board:



The switches are defined to be able to select one of 8 different wand configurations when the board is powered on (switches 1, 2 and 3), and select the intensity of the Vent Light with switch 5. Switch 4 is currently not used and should be left in the "OFF" position.

Here is a table of the Wand Configuration selections:

Description	**Ear Function**	**1**	**2**	**3**	**4**	**5**
Movie Wand Aux: Flash at start of 2nd Fire	2nd Fire or Vent	OFF	OFF	OFF		
Aux: Rumble while Firing	2nd Fire or Vent	OFF	OFF	ON		
Aux: Rumble at start and end of Firing	2nd Fire or Vent	OFF	ON	OFF		
Movie Wand w/Heating affects Aux: Flash at start of 2nd Fire	2nd Fire or Vent	OFF	ON	ON		
Aux: Rumble while Firing	2nd Fire or Vent	ON	OFF	OFF		
Aux: Rumble at start and end of Firing	2nd Fire or Vent	ON	OFF	ON		
TVG Wands Aux: Rumble while Firing	Mode or Vent	ON	ON	OFF		
Aux: Rumble at start and end of Firing	Mode or Vent	ON	ON	ON		

Here is a table of the Vent Light Intensity selections:

Description	**Ear Function**	**1**	**2**	**3**	**4**	**5**
Vent Light Max						ON
Vent Light Mid						OFF

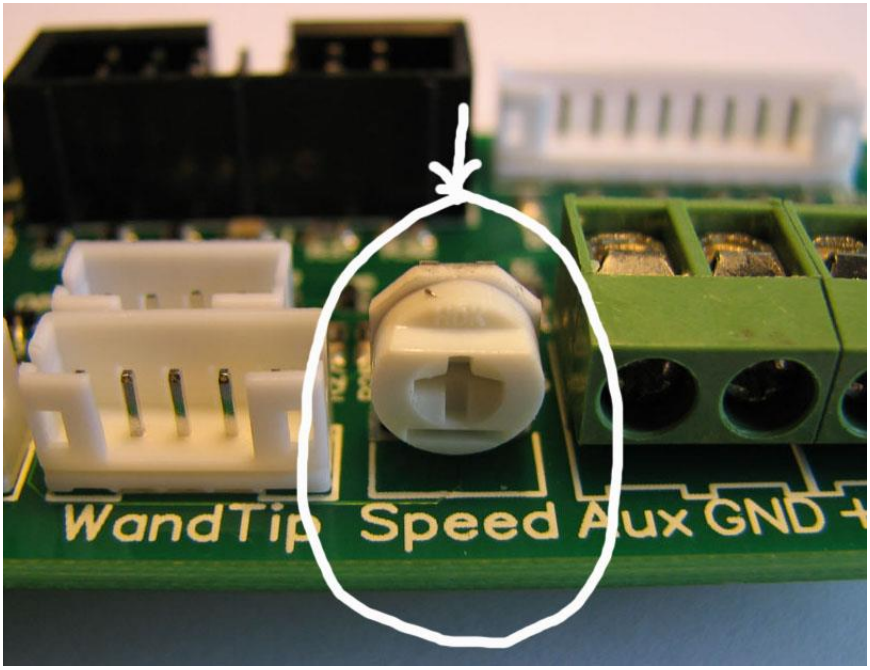
Here is the reserved switch:

Description	Ear Function	1	2	3	4	5
Reserved					OFF	

“ON” is the switch in the upper position and “OFF” is the switch in the lower position.

Configuration Potentiometer Settings:

There is a White “Speed” configuration potentiometer located at the bottom edge of the WandLights Board:



The White “Speed” configuration potentiometer on the board is used to select between four main modes of operation and is normally used to set the nominal speed of the Bar Graph sequencing:

1) Firmware Version Display and Tip Lights Test
   (Configuration potentiometer fully counterclockwise)
   a. The Bar graph LEDs will show the firmware version number
   b. The Tip Lights will cycle through the three primary LED colors
   c. The Aux port will strobe

2) Movie Accurate Mode
   (Configuration potentiometer counterclockwise half of the range)
   a. No separate power-up sequence
   b. Bar graph fills bottom to top, no change when firing
   c. Rotate Counterclockwise for slower or Clockwise for faster sequencing

3) Special Affects Mode
   (Configuration potentiometer clockwise half of the range)
   a. Separate power-up sequence
   b. Bar graph changes when firing to a center out sequence
   c. Rotate Counterclockwise for slower or Clockwise for faster sequencing

4) Test Mode
   (Configuration potentiometer fully clockwise)

a. The Bar graph will fully light for several seconds, then change to a single LED that cycles through all positions
b. Switch tests
    i. The Fire button will turn on the Red SLO-BLO LED
    ii. The top toggle switch will turn on the White LED in the clear cap next to the vent slits
    iii. The bottom toggle switch will turn on the White LED in the White/Orange Buried Hat next to the vent slits when in the UP position
    iv. The Ear pushbutton will turn on the diffused White LED used as a Vent Light underneath the vent slits
    v. The incoming 5th signal from the Pack Sound Board Sound Board will control the White Hat Lens LED next to the Clippard valve.
c. Aux will be disabled
d. The wand tip LEDs will be off

Installation:

1. Mount the Switches and LEDs in the Wand

Mount the switches in wand body. Route all of the cables into the main wand body, where the circuit boards will be mounted.

If you want to delay mounting of the LEDs to verify their operation prior to mounting, this is also fine and can be deferred until after the last step listed below.

2. Mount the Circuit Boards

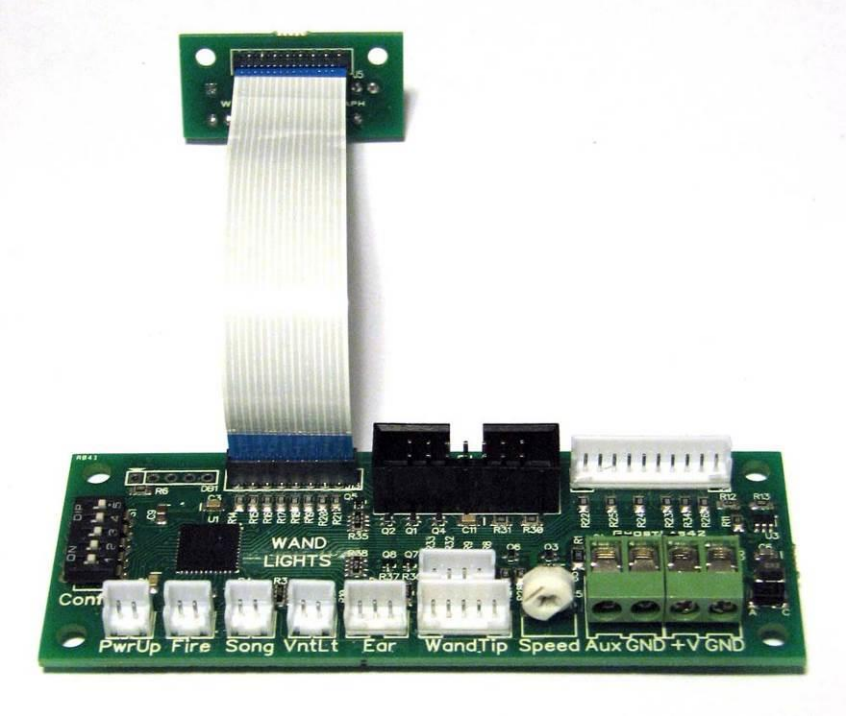
Mount the board inside the wand body. Four mounting holes, one in each corner are provided to allow the board to be attached inside the wand body. The board was designed to mount on the side of the body opposite the heat sink, to allow additional space for wand tip pop out mechanisms. Orient the main board so you can adjust the configuration potentiometer and be able to access the side screw terminals for the Aux and Battery connections.

The bar graph display board should also be mounted to the wand body at this time. Orient the bar graph display board such that the mounting holes will be next to the two toggle switches.

3. Bar Graph Connection

After the board has been mounted, the first connections to be made should be the bar graph display. A flat flex cable is used to connect the Bar Graph display circuit board to the WandLights main circuit board and does have a preferred way to be positioned in the sockets:

- WandLights: Blue stiffener is facing towards the inside of the board
- Bar Graph: Blue Stiffener facing the outside of the circuit board (away from the display)

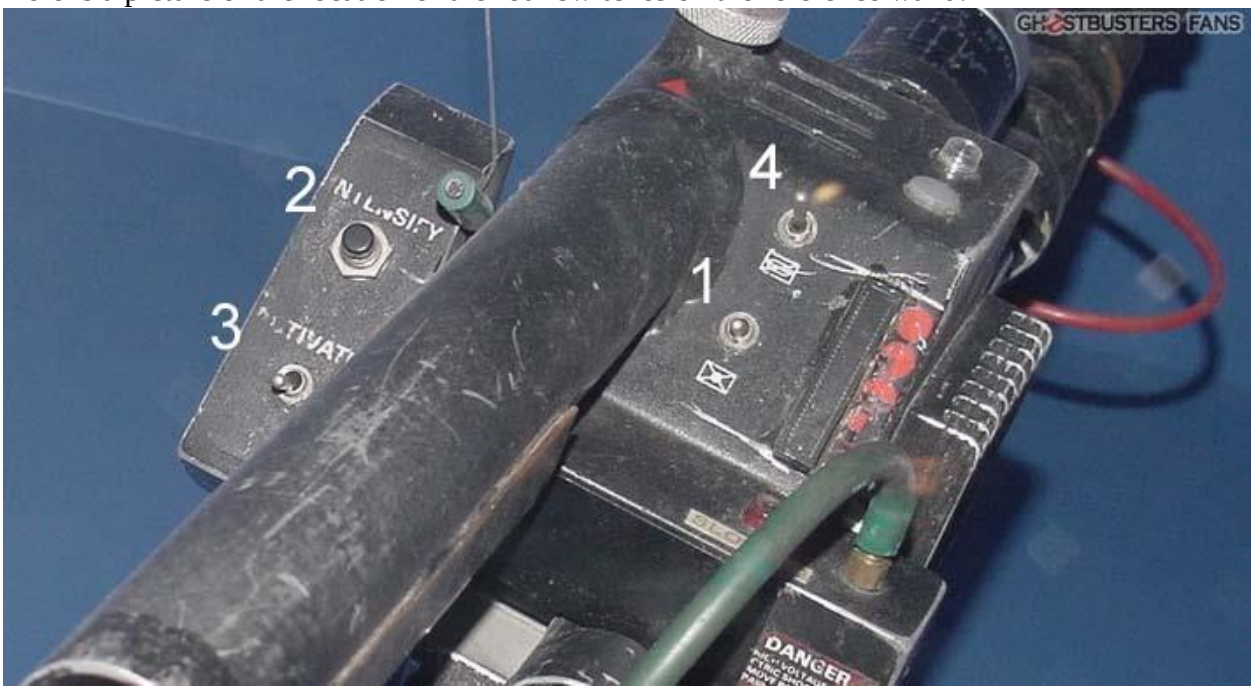


4. Switch Connections

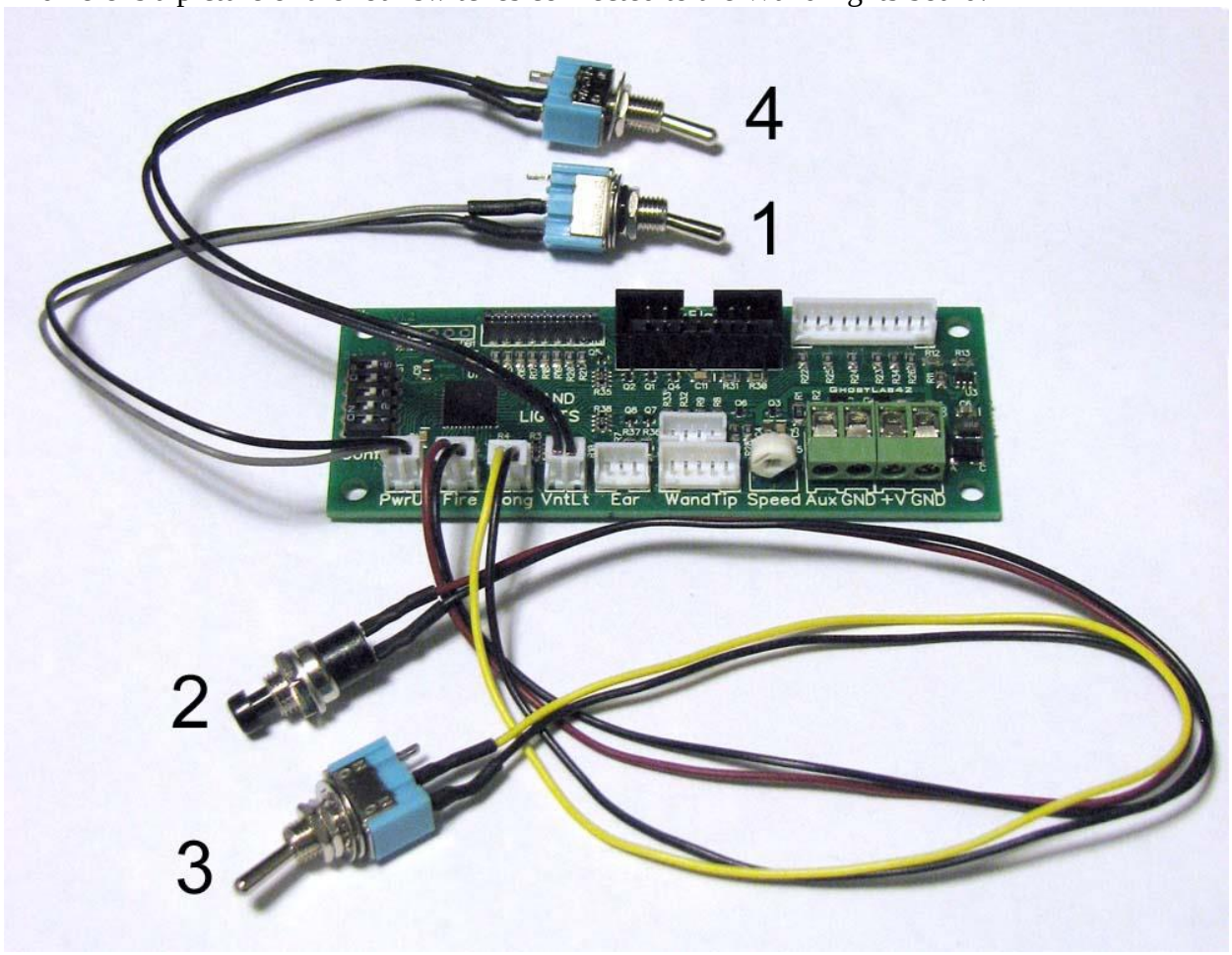
The next connections to be made will be four switch connections: PwrUp, Fire, Song and VntLt. Toggle switches should be mounted with the attached wires towards the bottom of the main wand body (toward the mounting rails).

1. **PwrUp Toggle Switch**
   Grey and Black colored wires in a 2 pin connector
   Bottom Toggle switch on the back of the main wand body
2. **Black Fire Pushbutton Switch**
   Brown and Black colored wires in a 2 pin connector
   Top switch to the left of the handle – usually labeled "Intensity"
3. **Song Toggle Switch**
   Yellow and Black colored wires in a 2 pin connector
   Bottom switch to the left of the handle – usually marked "Activate"
4. **Vent Light Toggle Switch**
   Dark Purple and Black colored wires in a 2 pin connector
   Top Toggle switch on the back of the main wand body

Here is a picture of the location of the four switches on the reference wand:

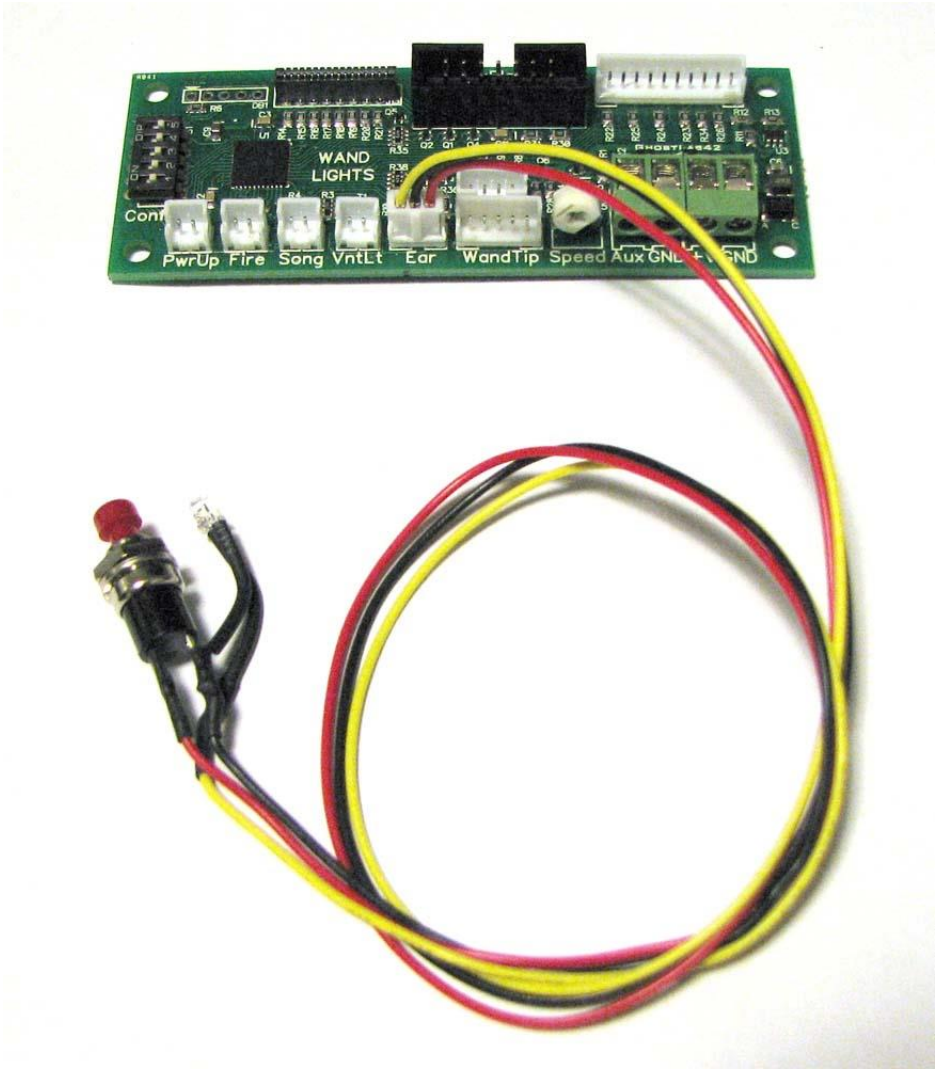


And here is a picture of the four switches connected to the WandLights board:



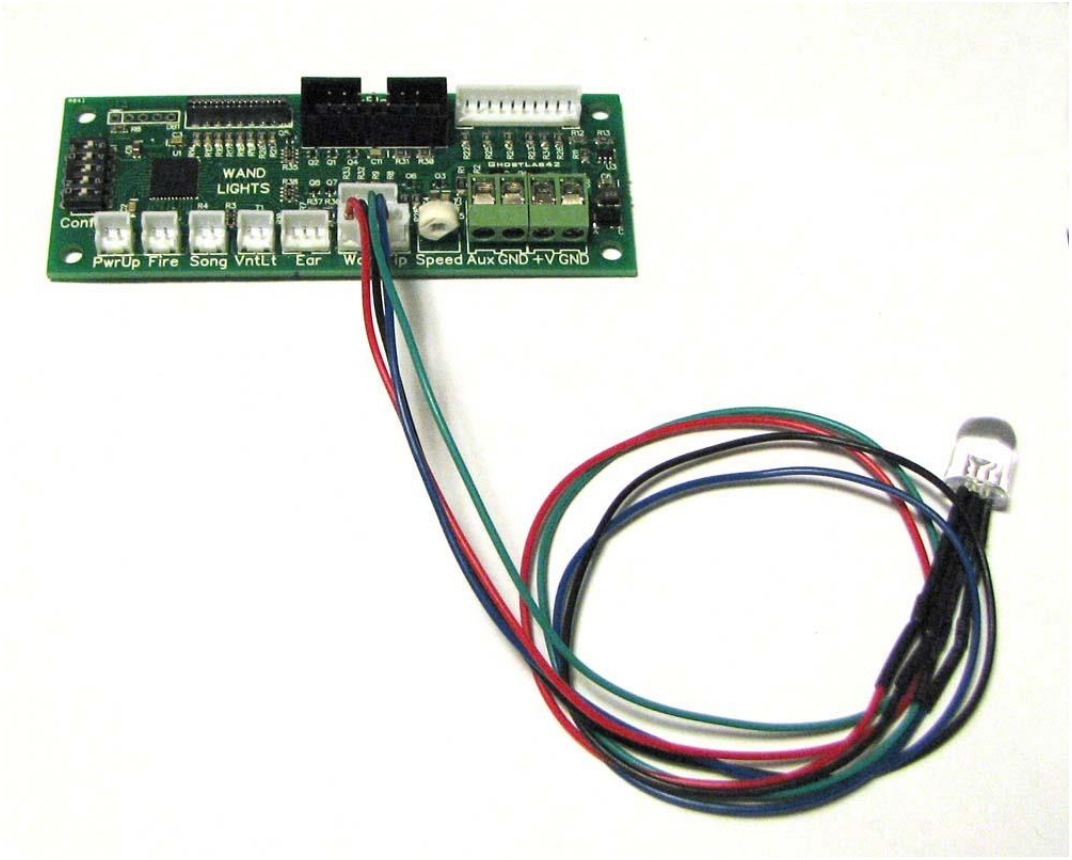
5. Ear Connection

The next connection to be made will be the Ear connection. This connection is for the Red pushbutton and the Orange LED that are mounted in the Ear.
Yellow, Black and Red colored wires in a 3 pin connector.



6. Wand Tip Connection

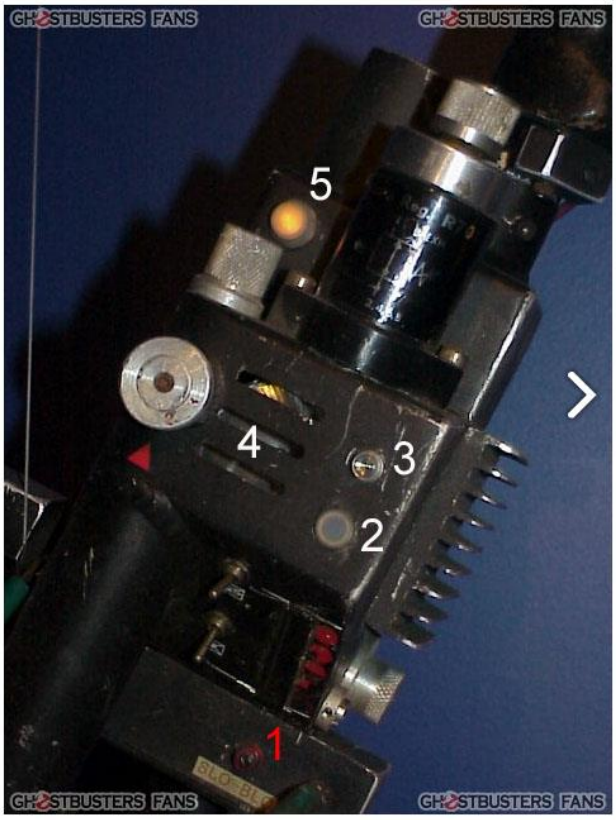
The next connection to be made will be the WandTip connection. This connection is for the RGB LED that is used to illuminate the wand tip.
Red, Black, Green, Blue wires and a No Connect in a 5 pin connector.

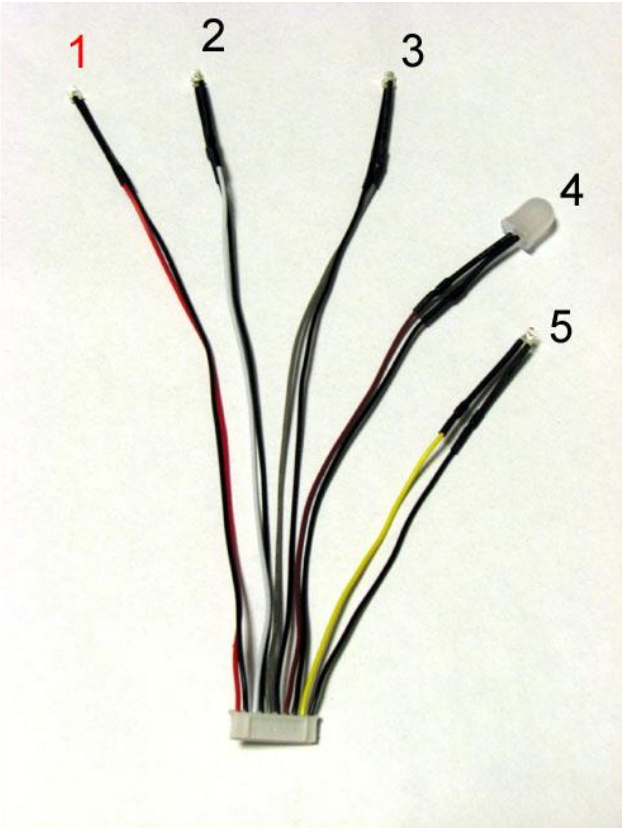


7. Body Lights Connection

The next connection to be made will be the Body Lights connection. This 10 pin connector is used to connect 5 LEDs that are mounted around the main wand body.

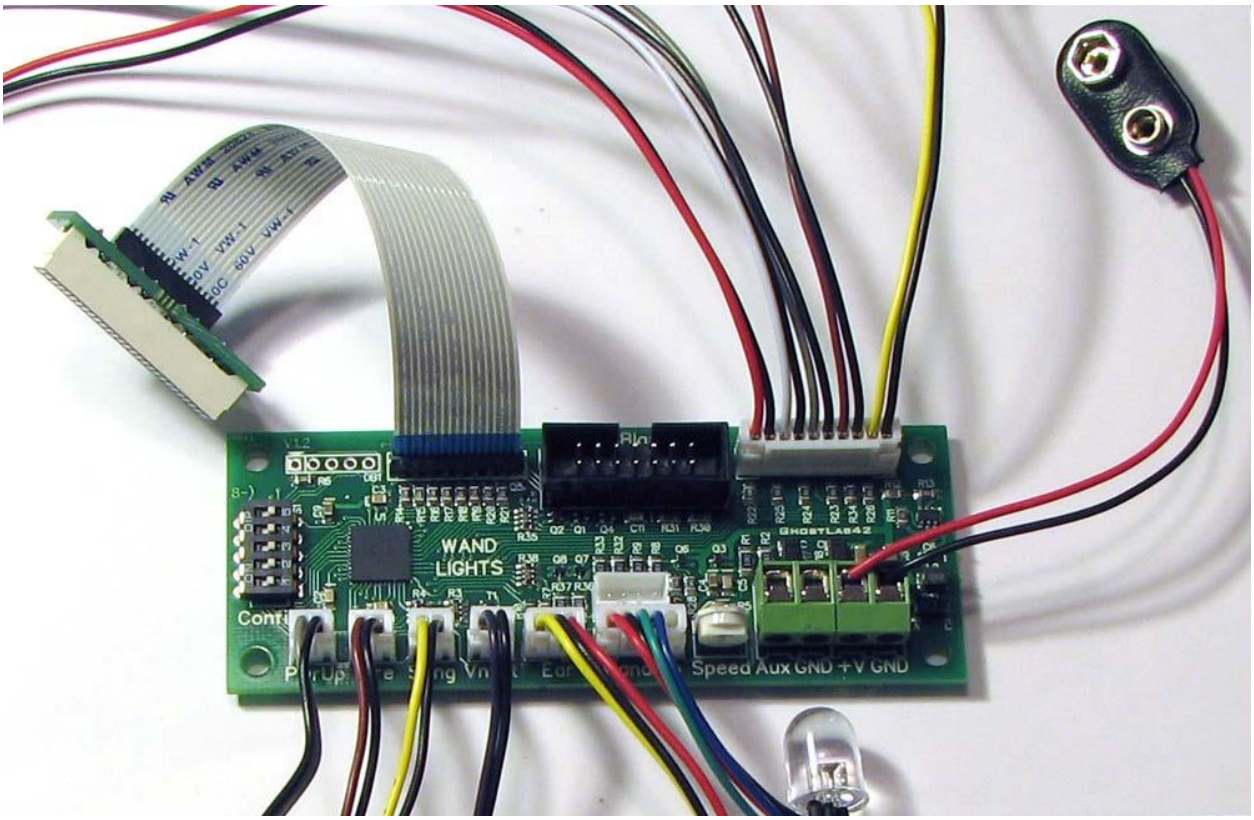
1. **SLO-BLO 3mm Red LED in Red Cliplights cover**
   Red and Black colored wires
   Back of the main wand body below the bar graph display – usually marked SLO-BLO
2. **3mm Warm White LED in buried Orange or White Hat Lens**
   White and Black colored wires
   Top of the main wand body closest to the Bar Graph display
3. **3mm Warm White LED in Clear Cliplights cover**
   Grey and Black colored wires
   Top of the main wand body to the right of the vent slots
4. **Vent Light 10mm diffused Warm White LED**
   Brown and Black colored wires
   Inside the main wand body underneath the main body vent slots
5. **3mm Warm White LED in White Hat Lens**
   Yellow and Black colored wires
   To the left of the Clippard Valve on the front shelf of the main wand body





8. Standalone Battery Operation

The next connection to be made will be the battery connection, if standalone operation is desired (no Pack Sound Board sound board).

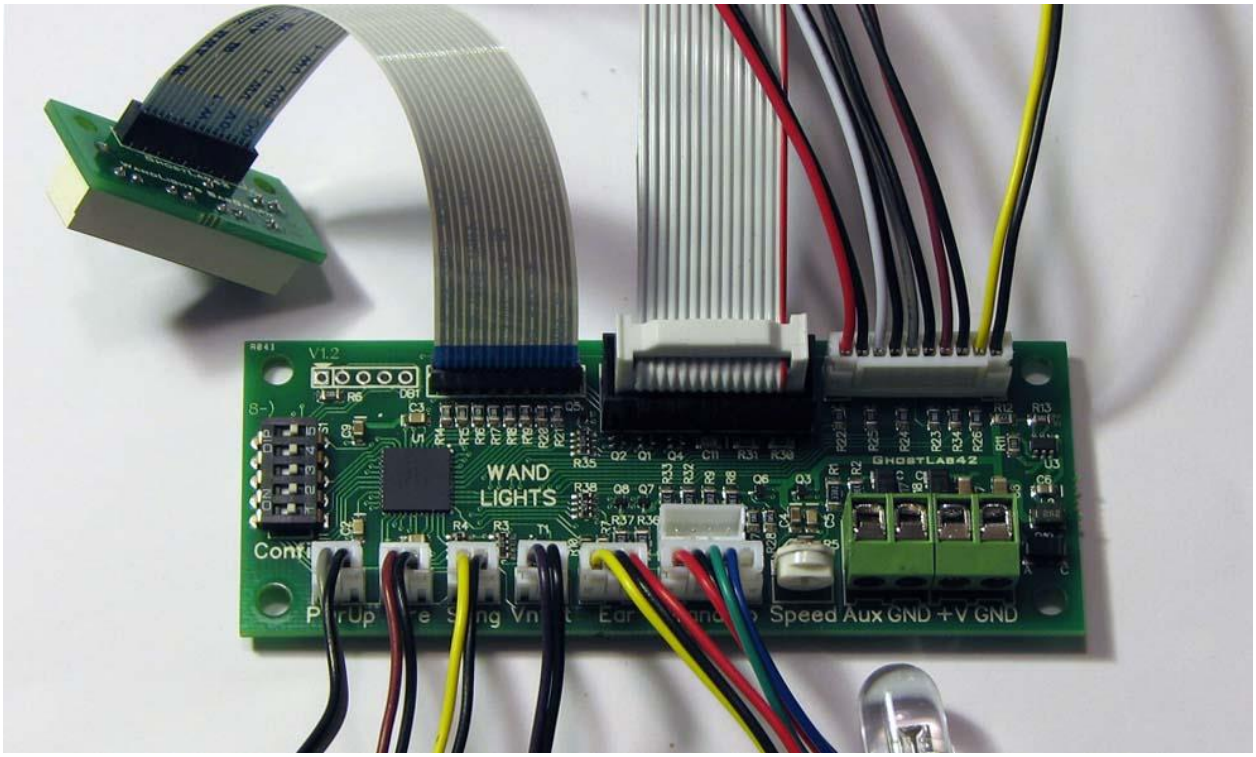


When there is no connection to the Pack Sound Board connector, then a battery will need to be connected directly to this board. A 7V to 14V battery pack is used to power this board.

The battery's ground connection (**Black**, negative or "-") should be connected to the "GND" screw terminal to the right of the "+V" screw terminal. The "+V" screw terminal should be connected to the battery's positive connection (**Red**, or "+"). You may wish to add a power switch in the positive connection to the battery so you can easily disconnect power when wand will be powered down for some length of time. Even when "powered down" the wand will consume some power and will flash the SLOBLO LED to let you know that the battery is connected.

9. Pack Sound Board Connection

The last connection to be made should be the Pack Sound Board Control and Power cable. When the Pack Sound Board is connected to a battery, this same battery will automatically be connected to the WandLights board through this cable.



When the Pack Sound Board Connection cable is to be used, then the battery screw terminals on the WandLights are not needed and no additional battery should be connected here.

Connecting to the Aux and GND screw terminals

The Aux screw connections are available to support a higher power (100mA) White LED to act as a Flash Bulb replacement or a rumble/vibration motor to add force feedback when firing.

The circuit is a switched 5V to the Aux connection with an internal 16 ohm 1/2W 16 ohm series current limiting resistor. If you use an external resistor, this same port can be used to control lower current devices.

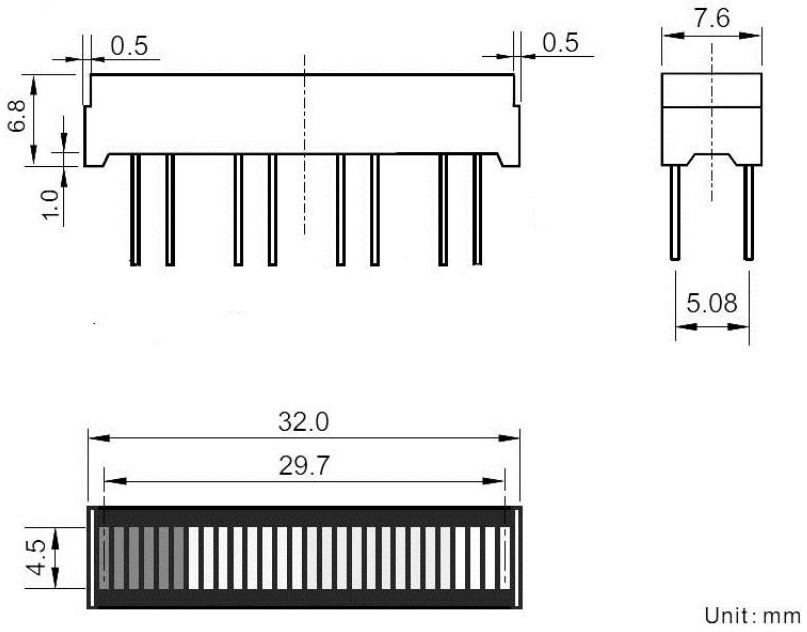
The activation of the Aux circuit is shown in the Configuration Dip Switch Settings and three different configurations are available:

1) Flash at start of 2nd Fire
   The Aux port is turned on for a short amount of time when the Ear pushbutton is first pressed and when it is used as a 2nd Fire button. The Regular Fire pushbutton will not activate the Aux connection. This is used to simulate the Movie prop wands that had flash bulbs go off in the wand tip when the Ear button was pressed.

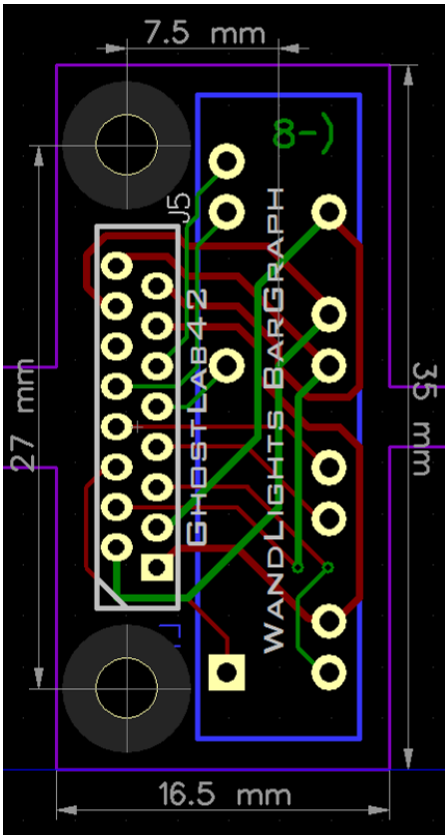
2) Rumble while Firing
   The Aux connection is activated when either Fire pushbutton is pressed and some Fire action can take place.

3) Rumble at start and end of Firing. Rather than staying on the entire time the wand is firing, the Aux connection is only activated for a short time at the start and end of each firing.

Bar Graph Display Dimensions



The Circuit board that holds the display is 35mm x 16.5mm and the center of the display is 7.5mm away from the center of the mounting holes:



WandLights to Sound Board Cable Construction

The single ribbon cable that is used to connect the WandLights board and the GBFans Sound Board may require some assembly. To fit the ribbon cable through a clear tube inside the black wire loom may require that at least one end of the ribbon cable does not have a connector attached.

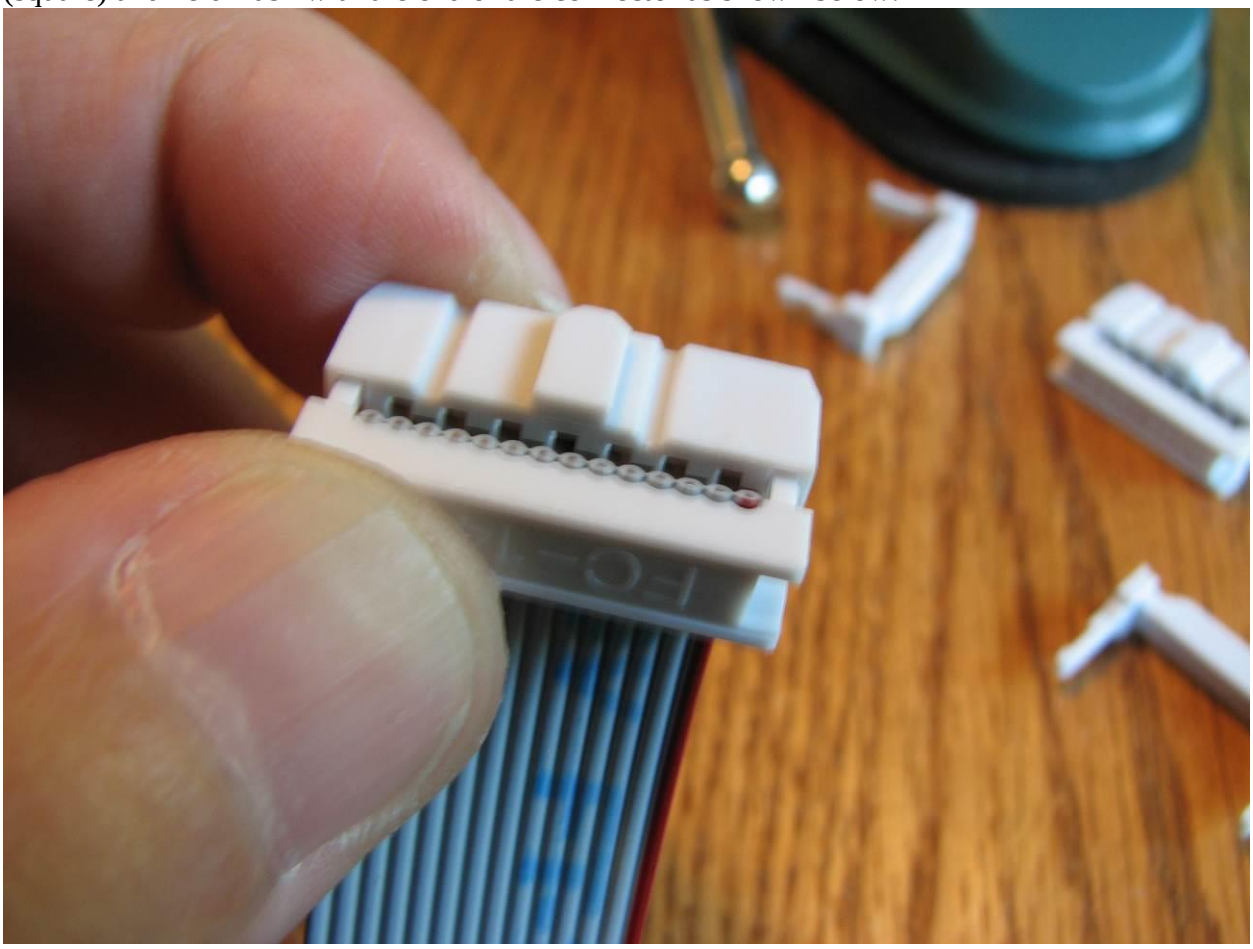
The following will show what is recommended for both ends of the long ribbon cable.

The parts and tools you will need:

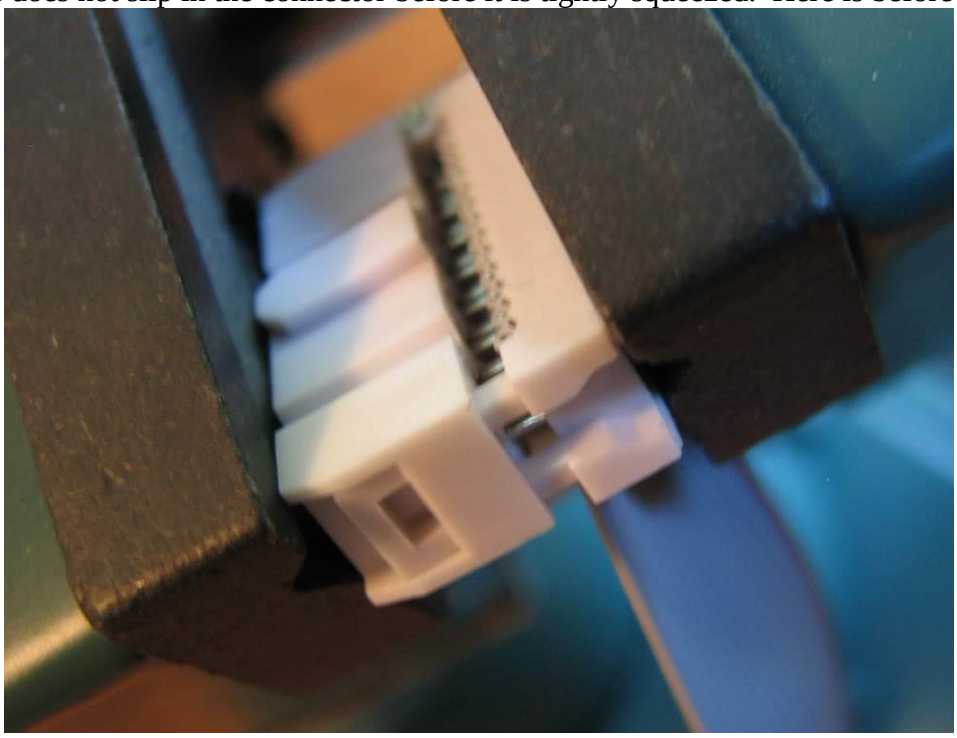
1) Small Vise – to squeeze the connector closed without damaging the connector or cable
2) 14 conductor 28AWG ribbon cable, 0.050 pitch, cut to the desired length to go through the black wire loom and still be able to reach the sound board in the pack and the WandLights board in the wand
3) Two 14 pin connectors
4) Two 14 pin strain reliefs

Both ends of the cable will be constructed the same way. You may wish to only add the connector to one end, thread the cable through the loom and then add the connector on the other end. The Pack will usually have the most extra length of ribbon cable, so start with the connector end in the Wand and then add the connector to the pack side after the wire has been threaded through the wire loom that connects the wand to the pack.

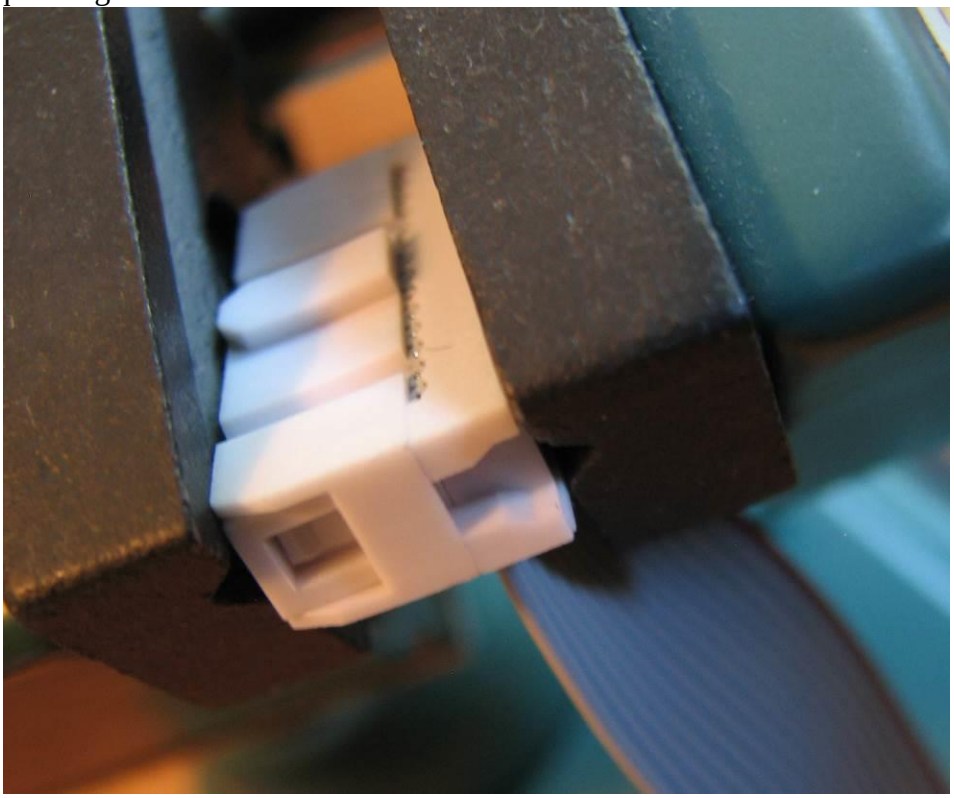
Have the connector key away from the cable and the Red wire to the right of the connector so that it will indicate pin 1. The end of the ribbon cable should be cut at right angles to the cable (square) and held flush with the end of the connector as shown below:



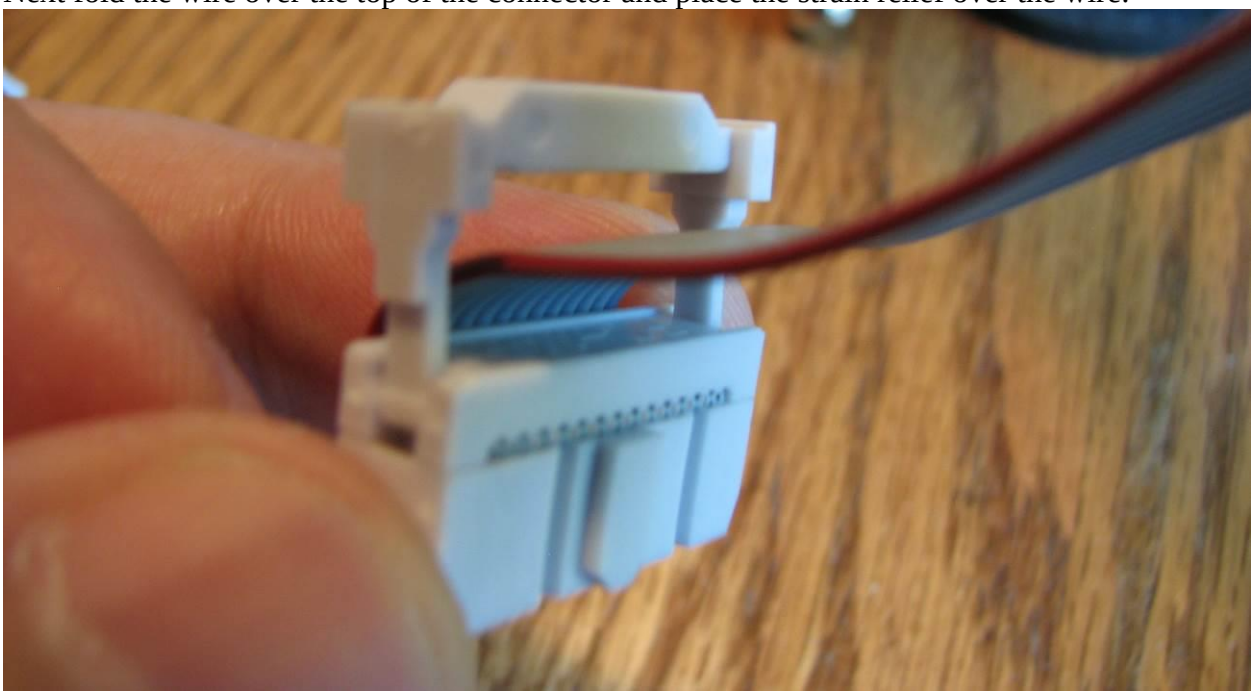
Pressing the connector closed is best done in a vise. When loading the connector make sure the ribbon wire does not slip in the connector before it is tightly squeezed. Here is before squeezing:



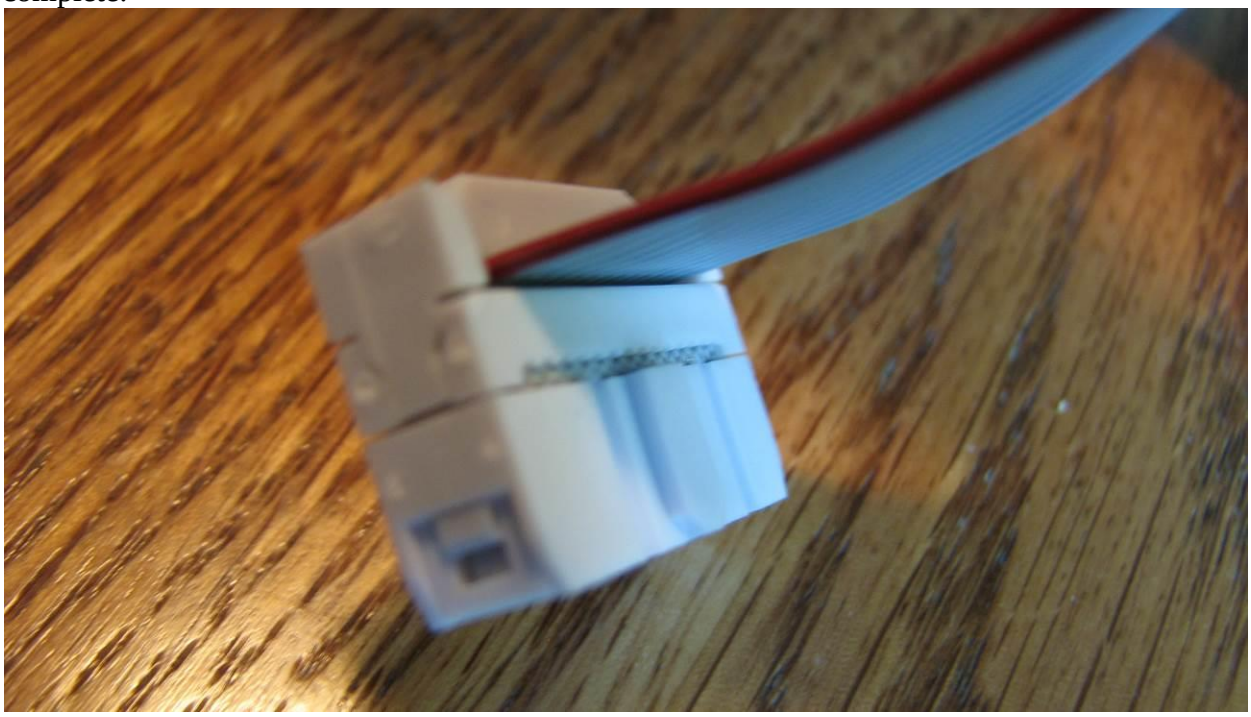
And after squeezing:



Next fold the wire over the top of the connector and place the strain relief over the wire:



Just press the strain relief in all of the way (your fingers can easily do this) and the end is complete:



When both ends are completed, they should look identical:

Since both ends are the same it does not matter which end is used for the Sound Board and the WandLights board. The connector is keyed, so it will only go in one way on each board.

WandLights to Sound Board Cable Pin Out

The single ribbon cable that is used to connect the WandLights board and the GBFans Sound Board has defined the pin out as follows:

Pin #: Description

1: +Vbat, 7V to 14VDC
2: +Vbat, 7V to 14VDC
3: +Vbat, 7V to 14VDC
4: +Vbat, 7V to 14VDC
5: GND
6: GND
7: GND
8: GND
9: Power Up, toggle switch, 200K ohm pull-up to +5V. shorts to GND when closed. Powers up when closed.
10: Fire, N.O. pushbutton switch, 200K ohm pull-up to +5V, can be actively driven from 5V controller GPIO through a 1K ohm series resistor, shorts to GND when closed. Fires when closed.
11: Song, toggle switch, toggle switch, no pull-up, will short to GND when closed. Plays song when closed.
12: Vent, simulated switch, actively driven from 5V controller GPIO through a 1K ohm series resistor. Activates Vent when closed.
13: Sound Board output, Driven by 5V controller through a 10K ohm resistor, WandLights has a 1K series resistor and a built in pull-up resistor that is 20-100Kohms (not well controlled). Signal should be +5V for high, and < 2.5V for low, so not TTL or CMOS levels. The Sound Board uses this signal to indicate an autovent condition by pulling the output lower and was used starting with firmware revision 1.3.
14: N.C., no connection on either end