Introduction

Congratulations on purchasing the Spengler version of the Spirit Blaster Sound Kit that adds some serious sound effects to your nuclear accelerator!

The Spengler Spirit Blaster Kit is designed to work with the Spengler Link board that needs to be installed in a Hasbro Spengler Neutrona wand (Spengler Link and Spengler wand are not included.)

This board can be purchased separately or with Spirit Halloween Pack hardware and Speaker for use in a Spirit Halloween Deluxe Proton Pack.

The Spengler Spirit Blaster will connect to the Spengler Link with one or two cables. One audio cable for sound and control signals from the link and a separate cable to provide power to the Spengler wand. The board can control a GhostLab42 Spirit Pack Lights kit or a GBFans Powercell and Cyclotron Kit so that the wand can control the pack lights by enabling some fun special lighting sequences or can turn on/off some other Pack Lights board. There is support for the four operating modes of the Spengler wand and can also play a vent sound or the theme song.

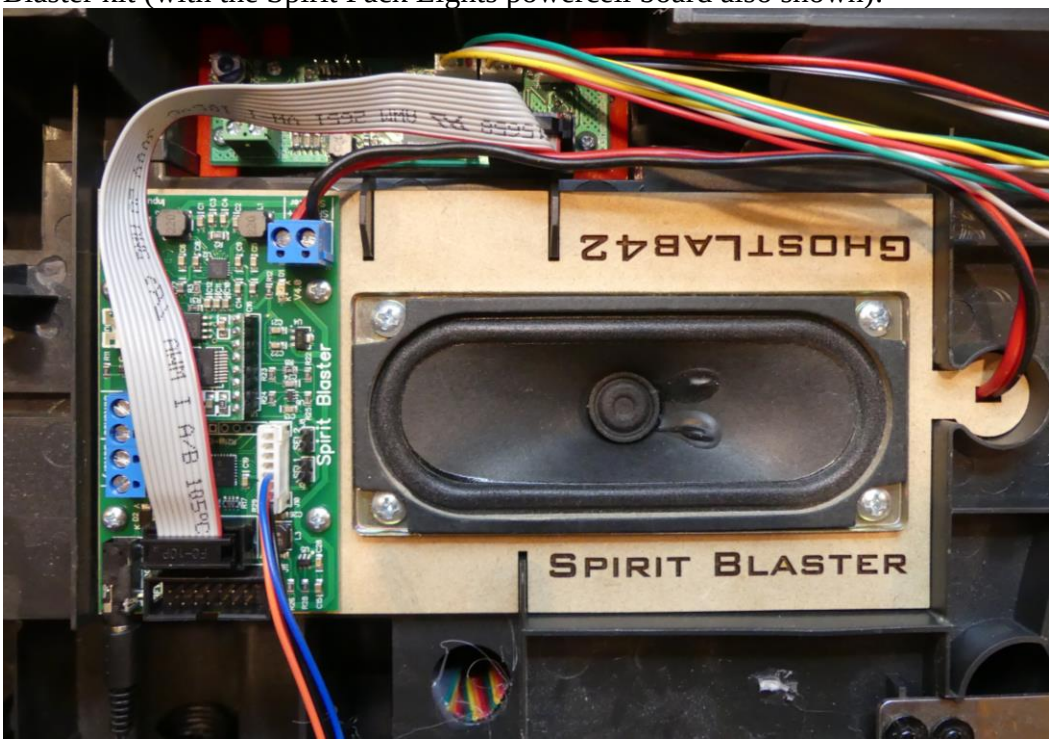
The Spengler Spirit Blaster Kit features:

- Sound module that can must be controlled by the Spengler Link
- 10 W audio amplifier
- Volume control potentiometer mounted on a separate cable
- Cable to control the Spirit Pack Lights or the GBFans Powercell and cyclotron kit.

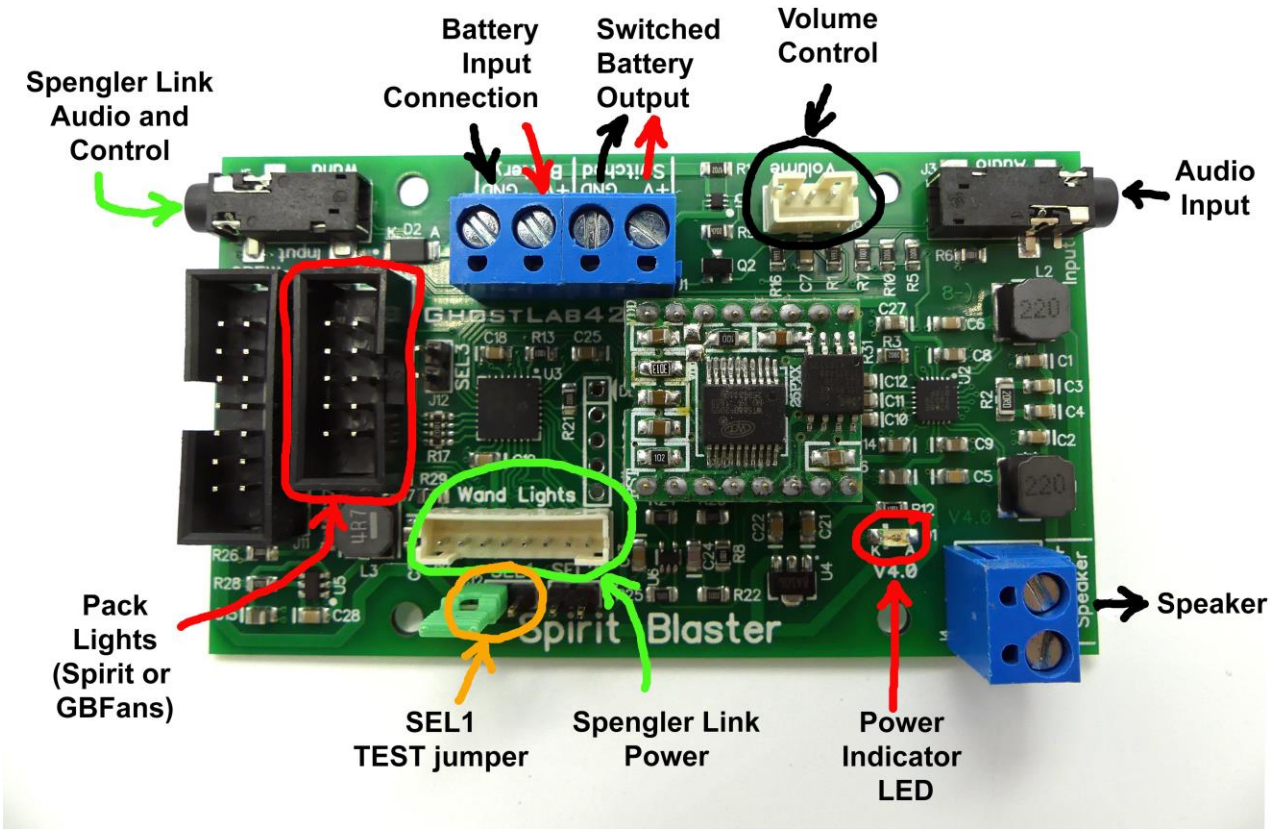
And if you also have the Spirit Halloween Pack Hardware and speaker

- A full range 8-ohm speaker
- A mounting platform for easy installation in the Spirit Pack
- Mounting hardware for the speaker and circuit board
- Connection cable for the speaker

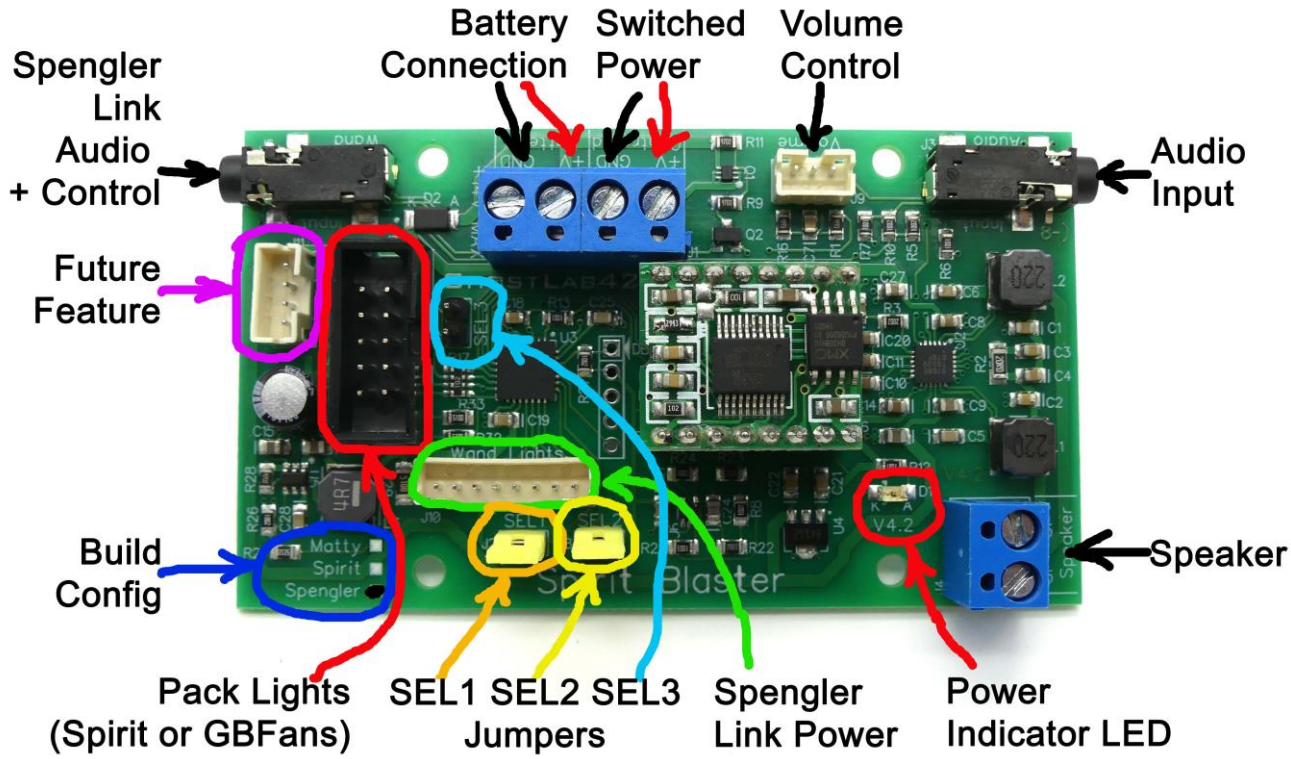
Installed Spirit Blaster kit (with the Spirit Pack Lights powercell board also shown):



Spengler Spirit Blaster Circuit Board V 4.0:



Spengler Spirit Blaster Circuit Board V 4.2:



There are several connections:

Battery connection screw terminals

A 9V to 12V (12V recommended) battery connection screw terminals used to power this board, the attached powercell board and the Spengler wand itself. One battery to rule them all…

+V for the positive, (Power or Red) connection

GND for the ground (negative, common or Black) connection

Switched Power output connection screw terminals

A transistor-controlled output of the connected battery voltage. This terminal can supply up to 1Amp of current and will supply the power to the connector when the pack is fully powered up. This can be used to power separate powercell lights kits that are not compatible with the Pack Lights ribbon cable control. The powercell lights must be able to withstand the battery voltage connected to the Battery screw terminals. (Spirit Pack Lights and GBFans Pack Lights can handle up to 14V).

+V for the positive, (Power or Red) connection, switched power, so can be 0V when off

GND for the ground (negative, common or Black) connection, always connected

Volume control

3 pin connection to an external volume control potentiometer. With nothing plugged in, the volume defaults to a mid-volume level.

Audio input

Standard 3.5mm stereo audio input jack designed to allow an external music player to be connected to the audio amplifier. The audio is mixed with the sound effects from the sound module so both can be playing at the same time.

Speaker

An 8-ohm full range speaker will be connected across these two screw terminals. The speaker should be rated at 10W or more. A 200W capable speaker can work fine, so don't be scared by high numbers.

Spengler Link Power (AKA "Wand Lights")

The 8-pin (1x8 2mm spacing) connector is provided to plug in the 8-pin multi-colored cable that can supply power to the Spengler Link board and the Spengler wand. If not used, the Spengler wand must have batteries in the wand to power itself and the Spengler Link board.

PackLights

The 10-pin connector (2x5 pin shrouded header) is provided to plug in a ribbon cable that can supply power and control to the Spirit Pack Lights or the GBFans Powercell and cyclotron Lights kit. If this cable is used to connect to the powercell board, the powercell board does NOT need a separate battery connection since power is supplied with this ribbon cable.

Spengler Link (AKA "Wand")

This audio style jack shown in the upper right-hand corner is not used on this board. It is used in the Matty Blaster version of this board, so I don't have to make two separate boards to support these two very different sound board applications. The Matty Blaster does require separate code for the controller and different sound programmed in, so not something that you can easily change.

Future Feature ("GBF Wand")

This 14-pin connector is for different versions of the board and is not used for the Spengler Sound board configuration.

Power Indicator LED

A RED LED will dimly glow when battery power is applied to the circuit board "Battery Connection" screw terminals.

Operation Selection jumpers (V4.0)

There are three selection jumpers on the board, but only one is used in the Spengler Sound Board configuration. Shorting the SEL1 jumper will cause the board to go into test mode. This jumper is normally left open.

Operation Selection jumpers (V4.2)

There are three selection jumpers and two shunts to make selections. Being "ON" means that the shunt is connected to both pins of SELx. "OFF" would be no shunt or the shunt only connected to a single pin for safe keeping (they are easy to misplace!)

Description	**SEL3**	**SEL2**	**SEL1**
GB1 startup w/o wand only	off	off	off
Afterlife short startup w/o wand only	off	off	ON
Afterlife full startup w//o wand only	off	ON	off
TEST mode	off	ON	ON
GB1 startup w/o wand and with wand startup	ON	off	off
Afterlife Short startup w/o wand and with wand startup	ON	off	ON
Afterlife full startup w/o wand and with wand startup	ON	ON	off
TEST mode (needs 3 shunts, so not really used)	ON	ON	ON

For example: With shunts on SEL3 and SEL2, if no wand is connected to the sound board the Afterlife startup sound will play when power is applied to the sound board. If you have the wand plugged in when the sound board power is applied, the board will be silent. When the wand is powered up, both the regular wand startup sound will play and also the Afterlife pack full startup sound will play, so you can have the afterlife powerup sound play each time the wand is powered up.

Other parts needed:

Battery

The Spirit Blaster works with a 9V to 14V battery, but the 10W audio amplifier works best with a 12V battery that can supply a lot of current! The same battery can also be used to power the pack lights kit, so check to make sure the lights kit can handle the same voltage as the battery provides.
If you use the GhostLab42 Spirit Pack Lights or GBFans' Powercell and Cyclotron light kit, the one battery can also be used to power a vent relay and e-cig smoke setup to enable producing smoke during the venting sound sequence.

Be sure to check the connection polarity with a voltmeter since each battery can be different.

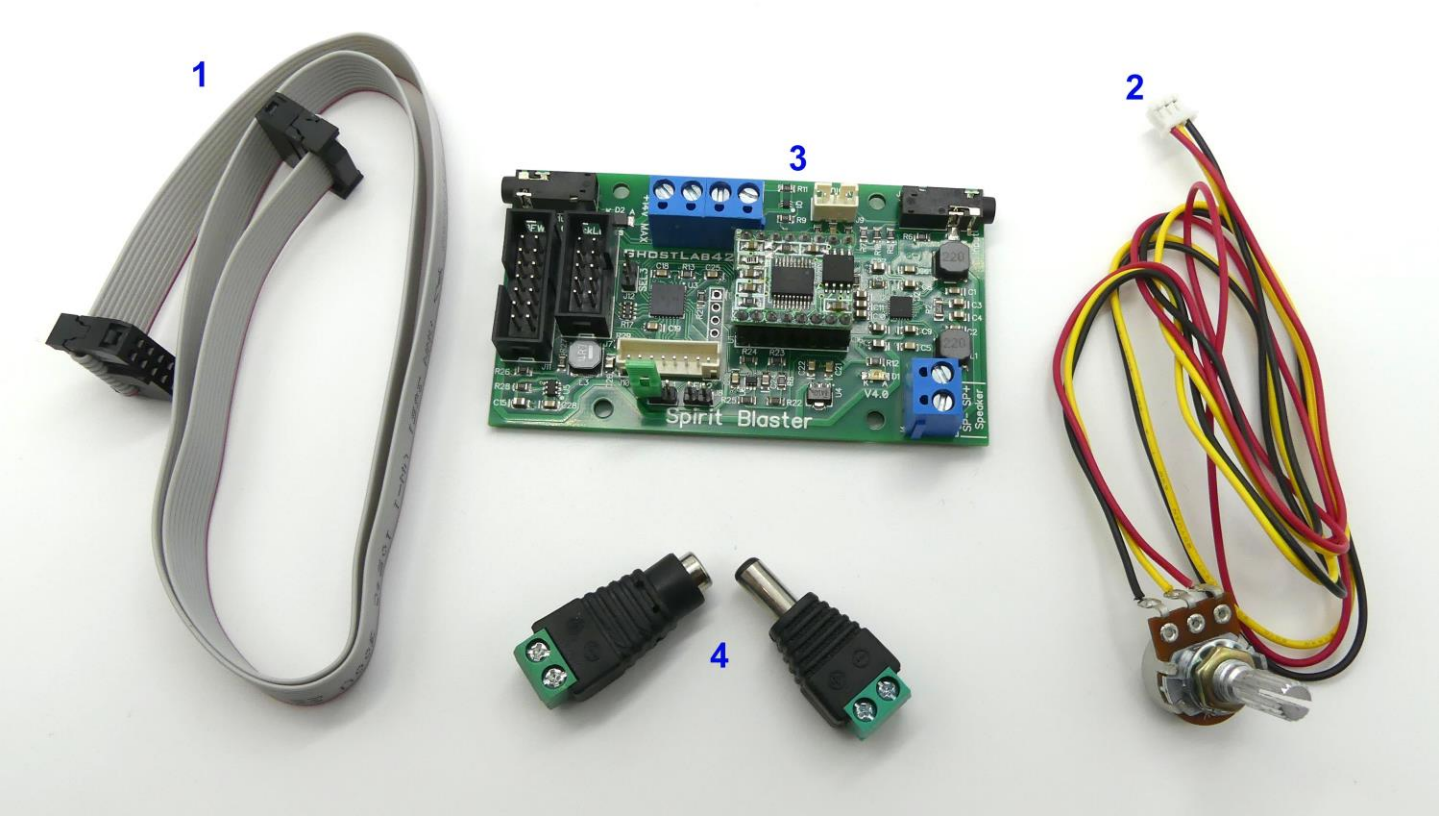
A power switch

Depending on the battery, how it is going to be wired for recharging and where you want a switch to disconnect the main battery, you may want to add a separate power switch to the wiring of this system.

Battery connection wire

For connecting the battery to the board, 18AWG to 22AWG stranded wire is recommended. Solid core wire will also work, but it is stiffer and does not allow you to bend it as often as stranded wire allows. The same kind of wire can be used for the speaker and the battery, though color coding the wires may make it easier to verify that it is wired up correctly.

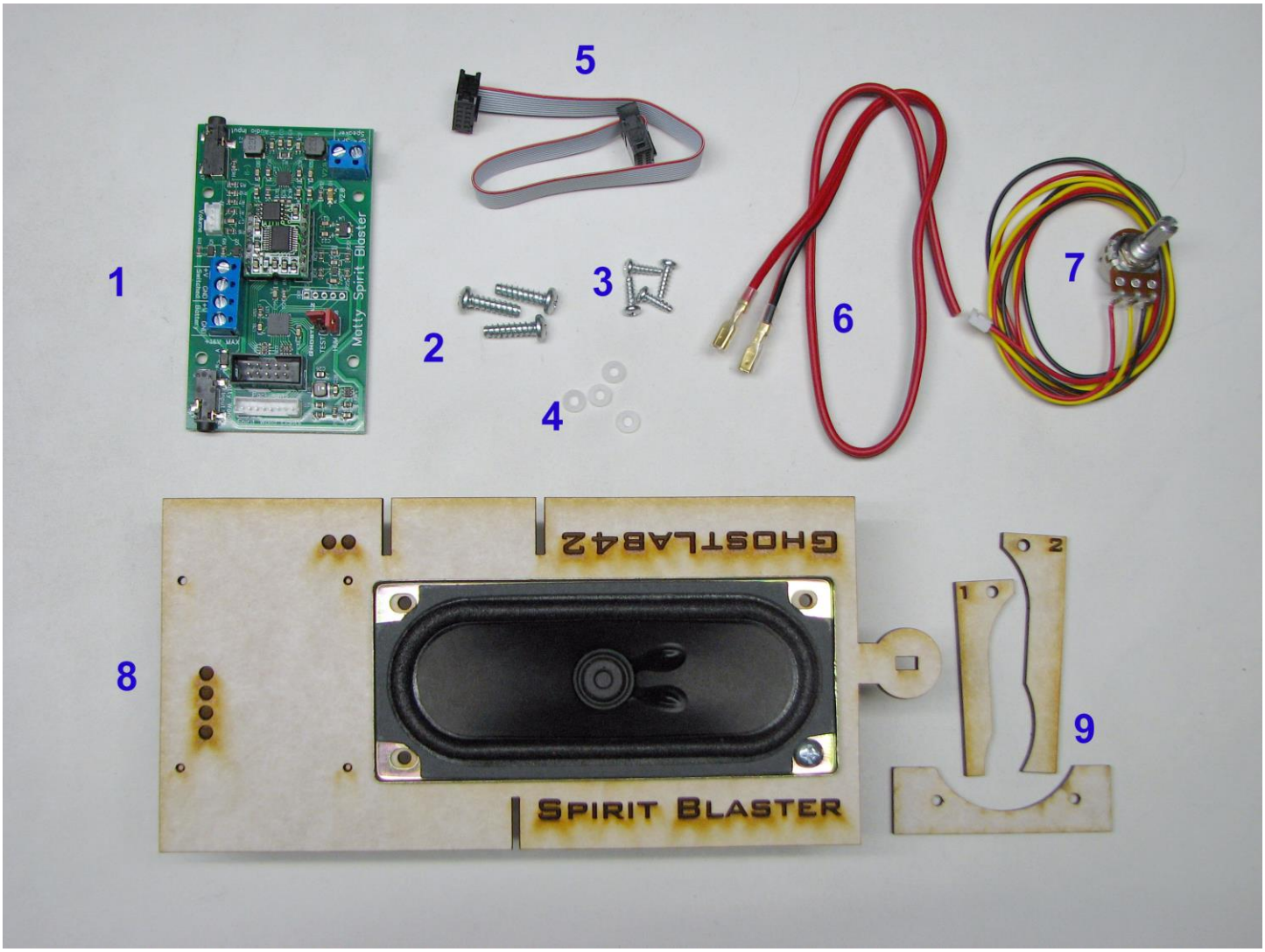
Spengler Sound Kit Contents



The Spengler Spirit Blaster Sound Board Kit contains the following parts:

1) Spirit Pack Lights (or GBFans powercell board) connecting ribbon cable
2) Panel mount volume control with connecting cable
3) The Spengler Spirit Blaster circuit board (ships in an ESD protective Bag)
4) Adapters that may fit your 12V rechargeable battery (5.5mm x 2.1mm male and female screw terminal adapters)

Spengler Sound with Spirit Pack Hardware Kit Contents



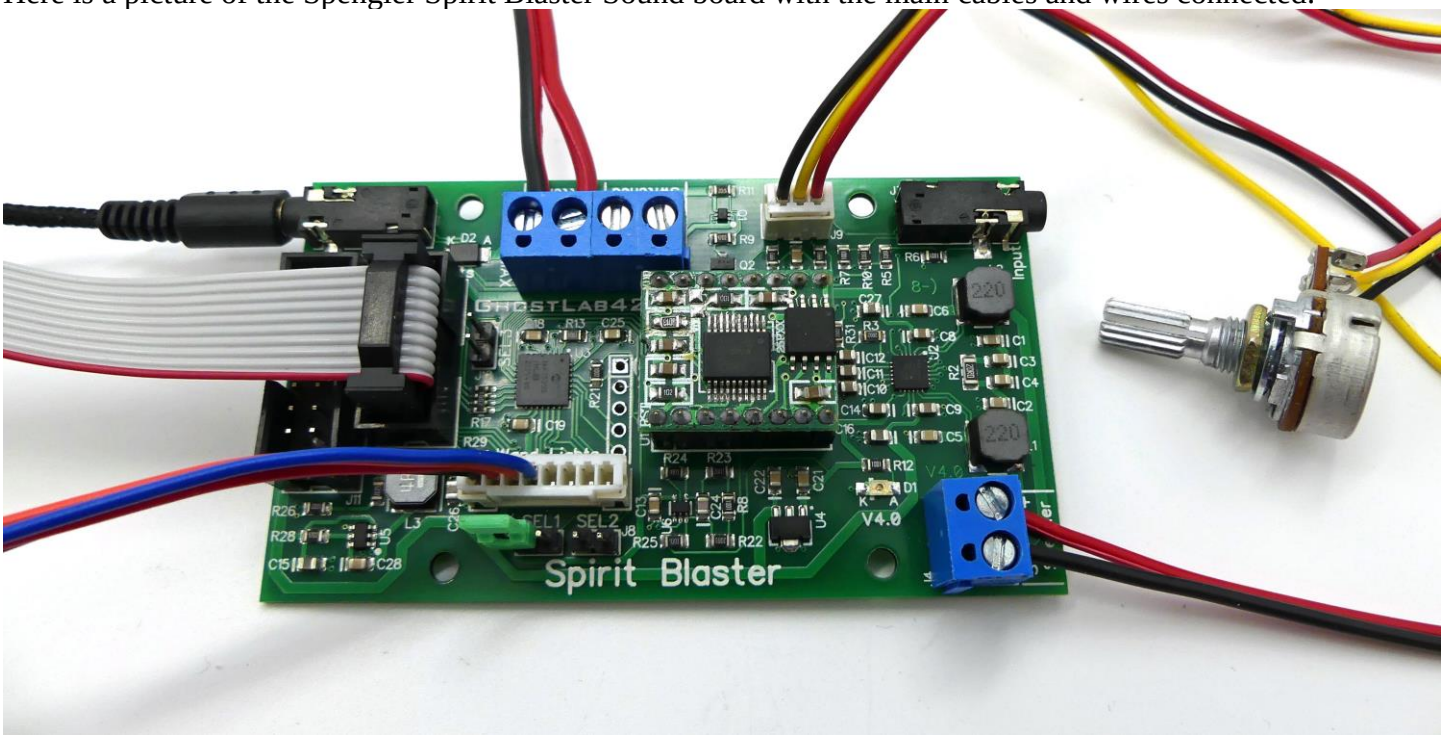
The Spirit Blaster Sound Board Kit contains multiple parts to complete the installation into your pack.

1) The Spengler Spirit Blaster circuit board (ships in an ESD protective Bag)
2) 3x screws to hold the speaker on the main mounting board (#8)
   The 4th screw is shipped in the mounting board to hold the speaker in place during shipping
3) 4x screws to mount the Spirit Blaster circuit board (#1) to the main mounting board (#8)
4) 4x nylon spacers to go between the circuit board (#1) and the main mounting board (#8) around each screw (#3)
5) Spirit Pack Lights (or GBFans powercell board) connecting ribbon cable
6) Speaker connection wire
7) Panel mount volume control with connecting cable
8) Main mounting board
9) Mounting board additional support pieces

Mounting board pieces #8 and #9 are laser cut and appear to be scorched. They are covered in protective paper that you will peel off so the board will look very nice (even though they are inside the pack).

Spengler Sound connections

Here is a picture of the Spengler Spirit Blaster Sound board with the main cables and wires connected:



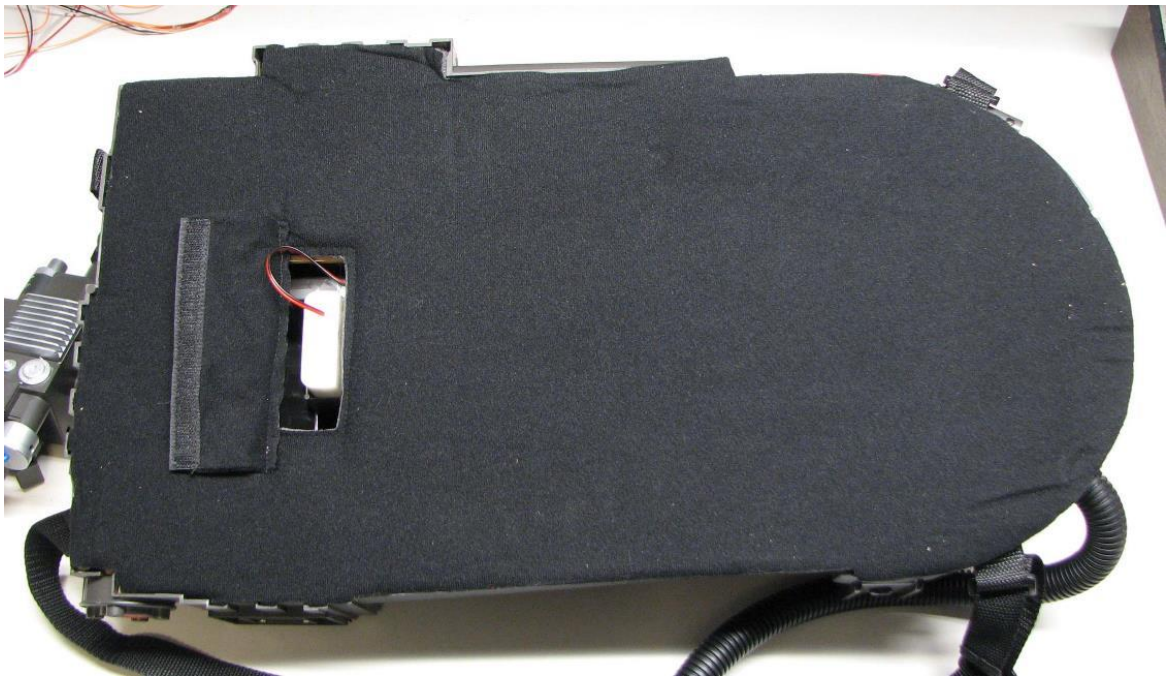
And a wider-angle picture that also shows the battery connection:



Installation of main parts in the Spirit Pack

Getting started:
The first step is to remove the back of the Spirit Pack so we can access the inside of the pack shell.

Flip the pack over and we need to locate the screws that hold the fabric covered cardboard “motherboard” to the back of the pack.



You have two main choices here, 1) remove the fabric to expose the cardboard and then glue the fabric back on when done, or 2) make small cuts in the fabric above each screw and leave the fabric attached to the cardboard. I liked option #2 as I expect to open up the pack again.

Open the battery cover and then stick your hand between the cardboard and the fabric that is glued to the cardboard around the edges. You can feel around and locate 4 of the 5 screws that are holding the cardboard to the plastic pack.

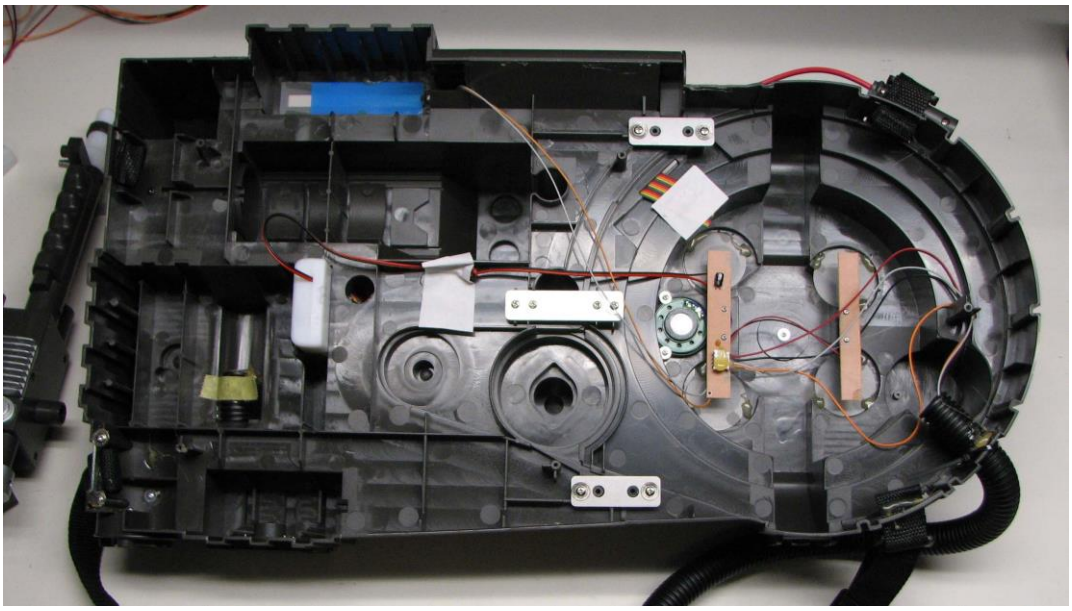
When located, use the X-acto knife or razor blade to make a small cut in the fabric to expose the head of the tiny Philips head screw. I could reach 4 of the screws, but the 5th I could not feel from inside, so pressed around the material from above and located the screw. Knowing where they are would have helped, so here I pulled the material around the screw and washer so you could easily see where you _*should*_ find these screws:



After re-installing the back cover, the screws can still be essentially hidden and only small cuts in the material above them allow easy access for the next time you want access in to the pack.

The screws aren't the only thing holding the cardboard onto the pack, and the cardboard is not very stiff, so great care should be taken removing the cardboard backing from the pack. Near the straps, the loom and some random spots along the edge, glue to hold those items of the fabric also oozed out enough to connect the cardboard to something else in the pack. I used a flat screwdriver to carefully separate the cardboard and the pack plastic, frame or loom while slightly lifting the cardboard. I worked my way all around the edge before lifting the cardboard fully from the pack. I did not have any places in the middle of the pack have glue, it was only around the outside edges.

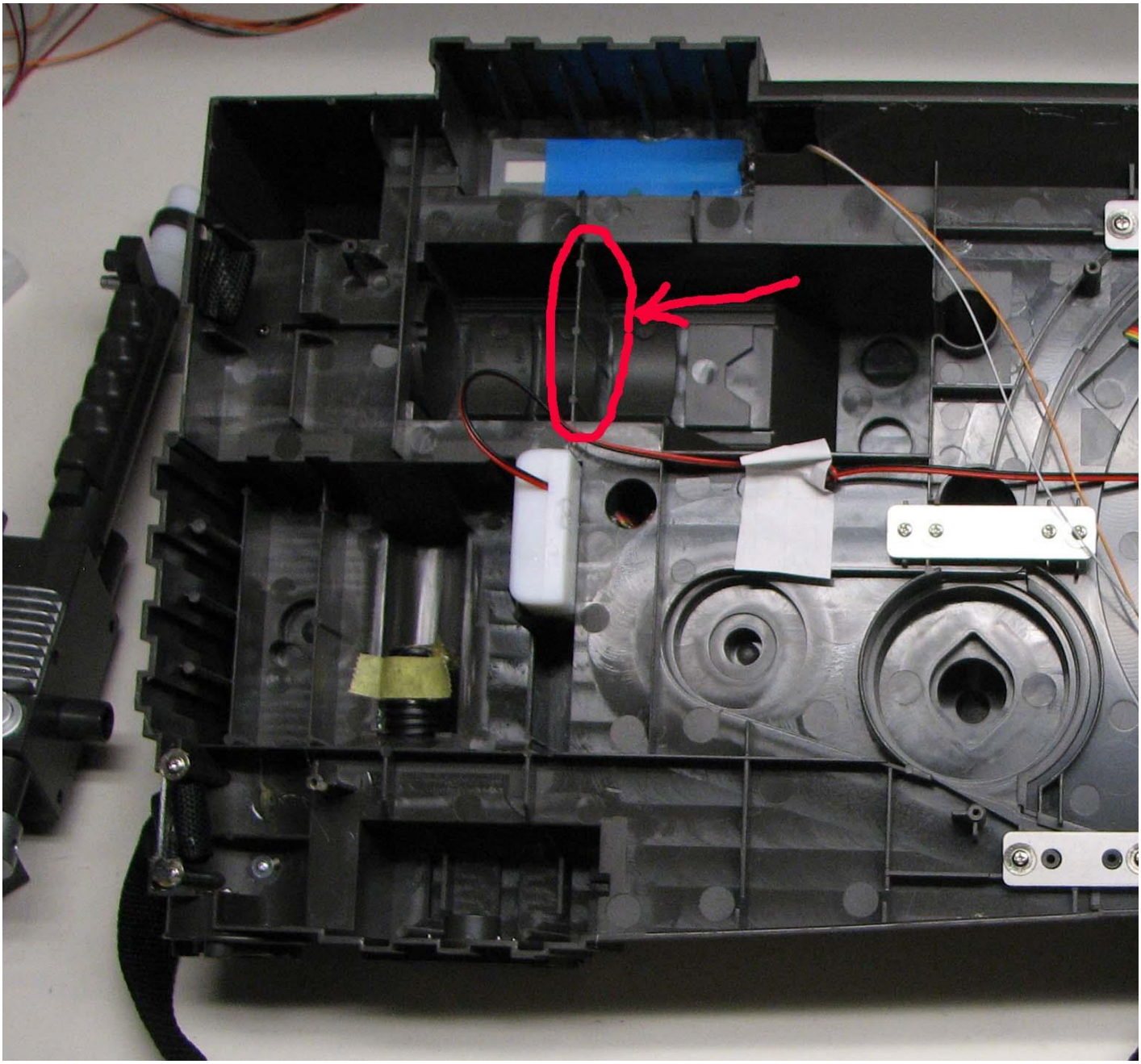
Once you get the back removed, here is the view inside the pack:



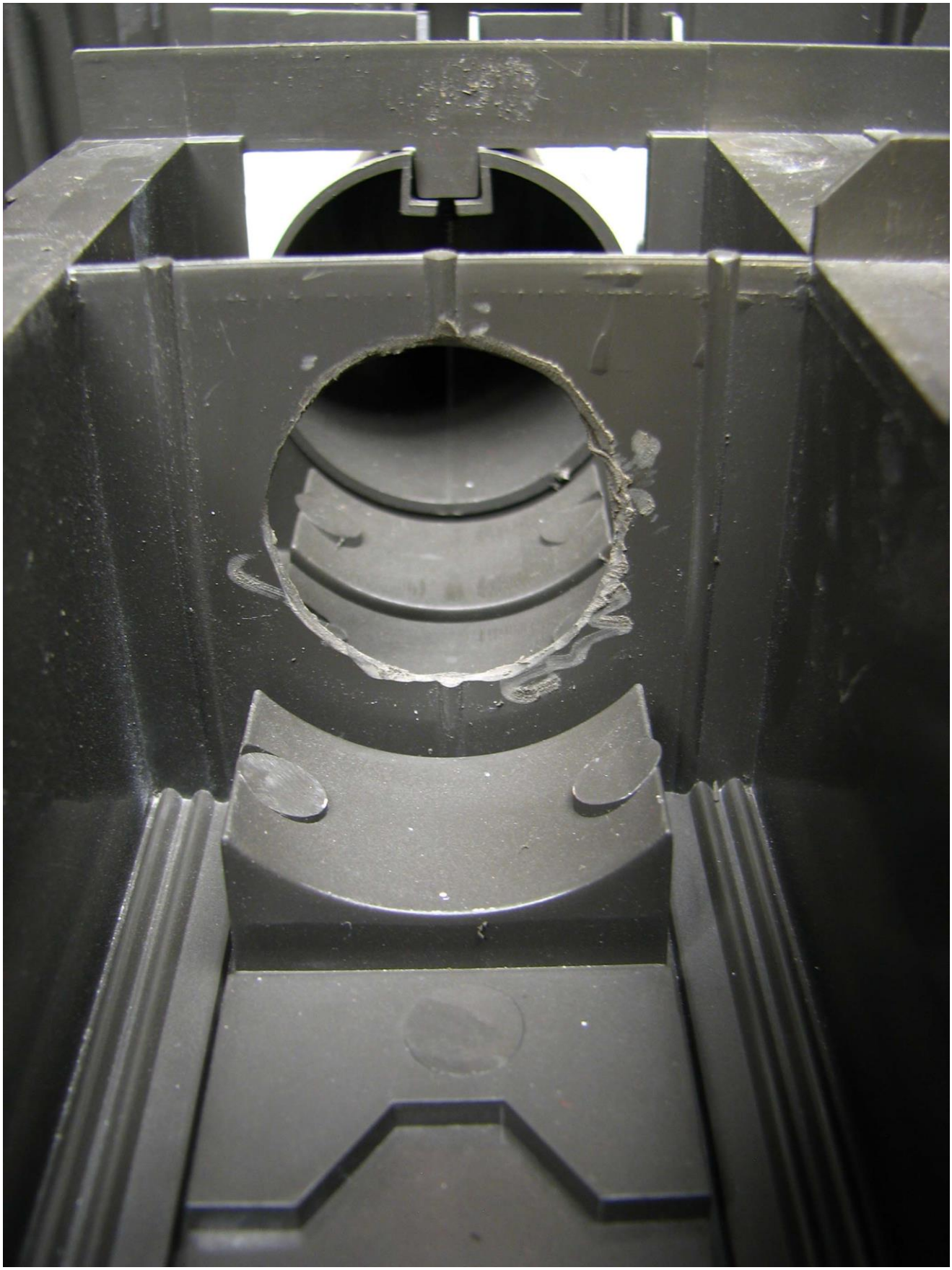
You can leave the screws in the cardboard or remove them and put them in the posts they come from so they don't get lost.

Making a larger back area for the speaker "cabinet":

To make a larger cavity under the speaker and also help let more sound get out, make a hole in the support material that will end up under the main board (#8) between the circuit board and the speaker. The support material is circled in RED in the image below:



I used a 1.25” hole saw bit on my drill and made an opening. After a little sanding to clean up the edges here is what it looks like:



Once you have drilled this hole and cleaned up the mess, it works out best to install the Spirit Pack Lights kit, the GBFans powercell and cyclotron kit or some other pack lights kit before installing the sound board.

There are many options to mounting a battery, and many different battery sizes, so at this point it is up to you to figure out where and how to mount a battery inside the pack. I will probably remove some support material and mount a Blue brick up near where the current small 3xAA battery pack is placed. Hopefully the battery can be located so that the on/off switch on the battery and the charger connections can be accessed in the same area as where the small battery pack is currently accessible.

Clean up and assemble the main board (#8 and #9):

Remove the screw holding the speaker to the main board (#8) and place the screw with the other 3 screws (#2) that will be used to mount the speaker back to this board.

Remove the protective paper from all four of the laser cut parts so they look so much better and can be glued to each other.



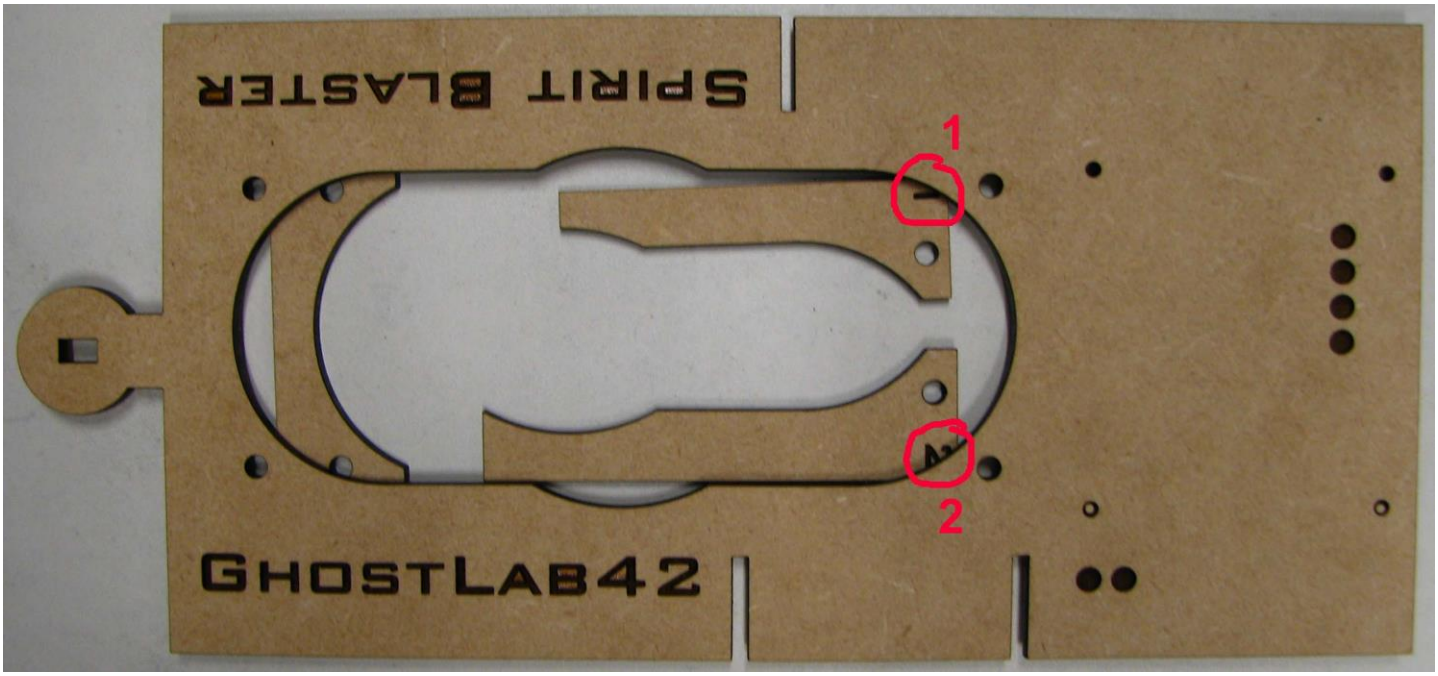
There are also bits of paper that can be removed in some of the characters, like the “O” in GhostLab42. Clean those up just because…

To add more strength to the mounting board (#8), the three additional pieces (#9) should be glued in place on the bottom side of the board.

If the screw caused some of the board to roughen up, you may need to sand flat the bottom of the main board (#8) where the screw was used to hold the speaker in place during shipping.

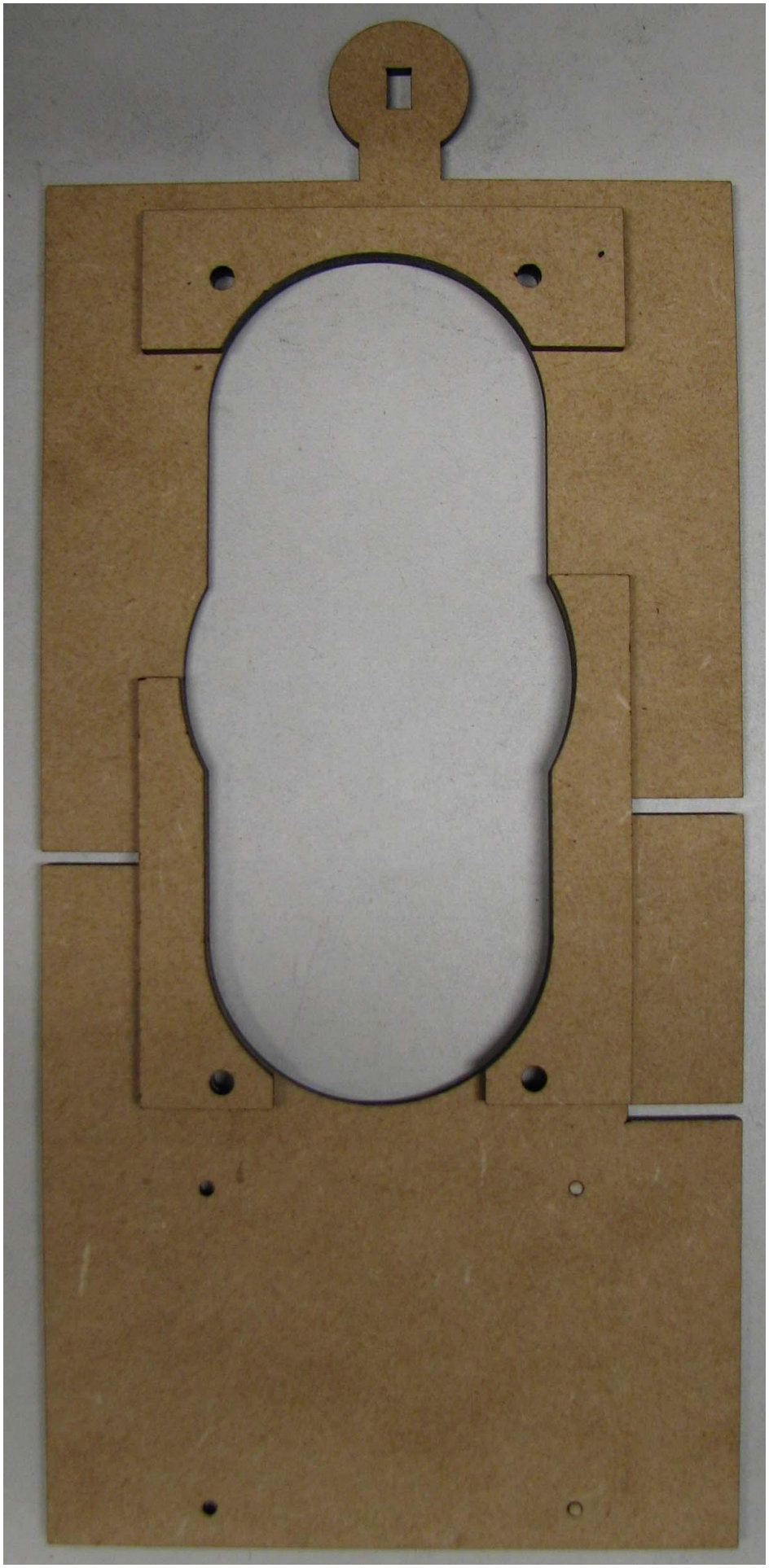
Each of the additional pieces (#9) has a screw hole or two that needs to be aligned with the screw hole in the main board (#8). The edges around where the speaker will go also need to be aligned so we do not make it hard to mount the speaker (if extended into the speaker hole edge) or no longer fit in the Spirit Pack's plastic housing (if mounted too far away from the speaker hole edge).

Each of the three pieces is a different size and care needs to be used to make sure they are place correctly when glued in. The pieces will be glued to the bottom side and glue will be placed on the numbered surfaces. When viewed from the top:

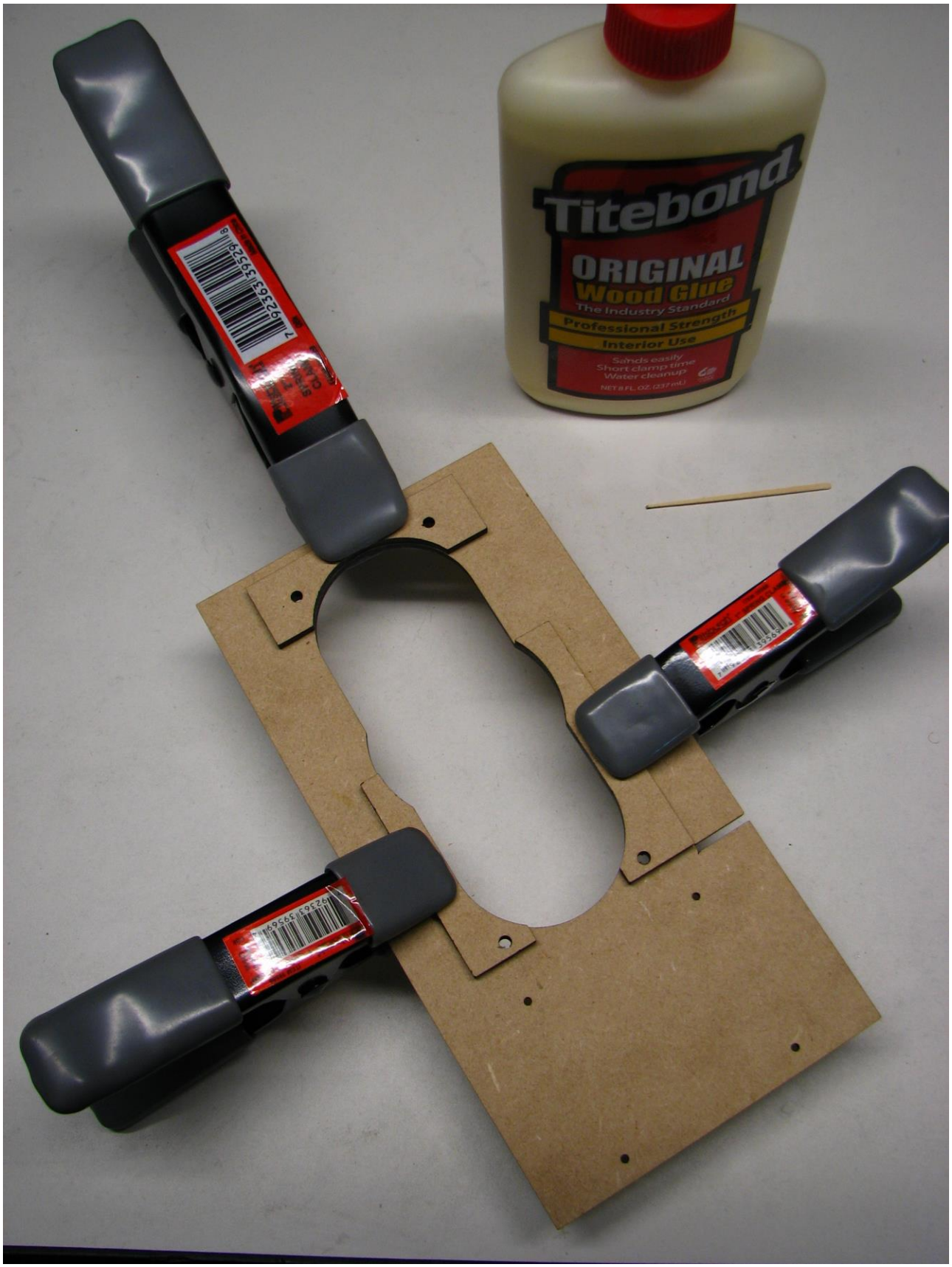


I used a good wood glue and applied it to the 3 small pieces on the numbered surface (the 3rd piece may not be numbered in the first sets of parts, so care must be taken since one side extends farther past the mounting hole than the other side).

Below is a look at the bottom side with the pieces placed where they will be permanently glued.



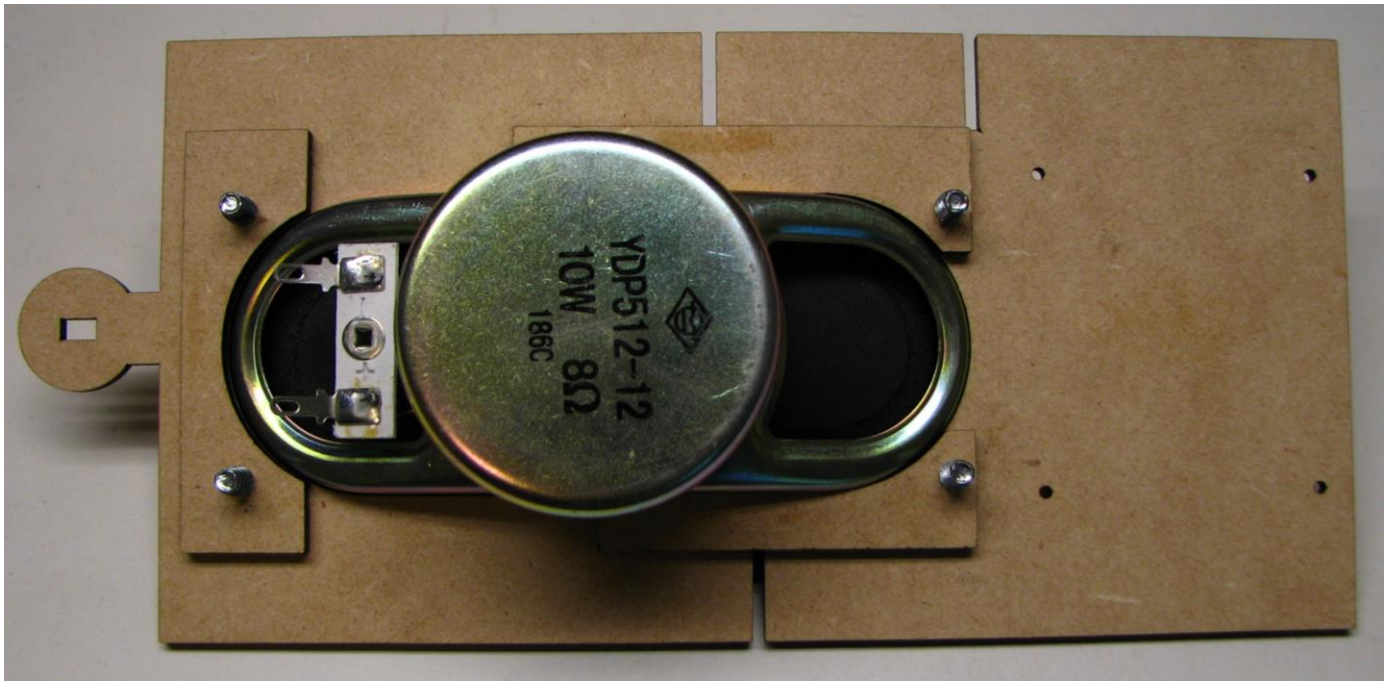
After applying glue, the pieces are clamped in place and allowed to dry. I also checked to make sure the holes were still aligned and had to clean them out with a toothpick to see the hole alignments much more clearly.



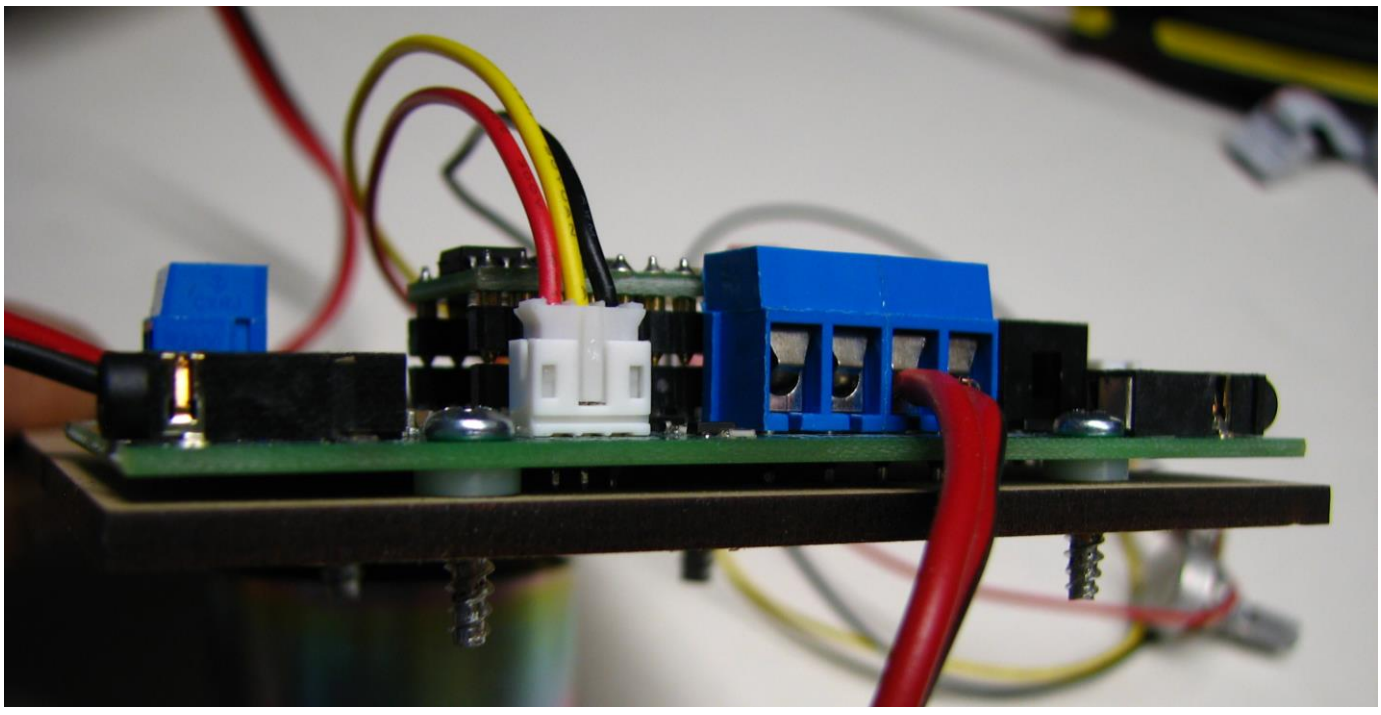
Mounting the speaker and the circuit board:

Next you can mount the speaker using the four screws (#2). Rotate the speaker so that the wire connections are closest to the rectangular hole in the extended circle of the mounting board. This will keep the speaker wires from dangling inside the cabinet where they could make some unwanted noise.

After the four screws (#2) have secured the speaker in place, it is time to mount the main Spirit Blaster circuit board.



To mount the main circuit board, place the smaller screws (#3) in the circuit board from the top side then place the white nylon spacers (#4) on the bottom side of the board. You may need a screw driver to start the spacers since they are a tight fit on the screws. Screw in the four screws and the spacers should keep the board mounted close to the main board (#8), but with a small gap so the leads will not be bent or bend the circuit board.

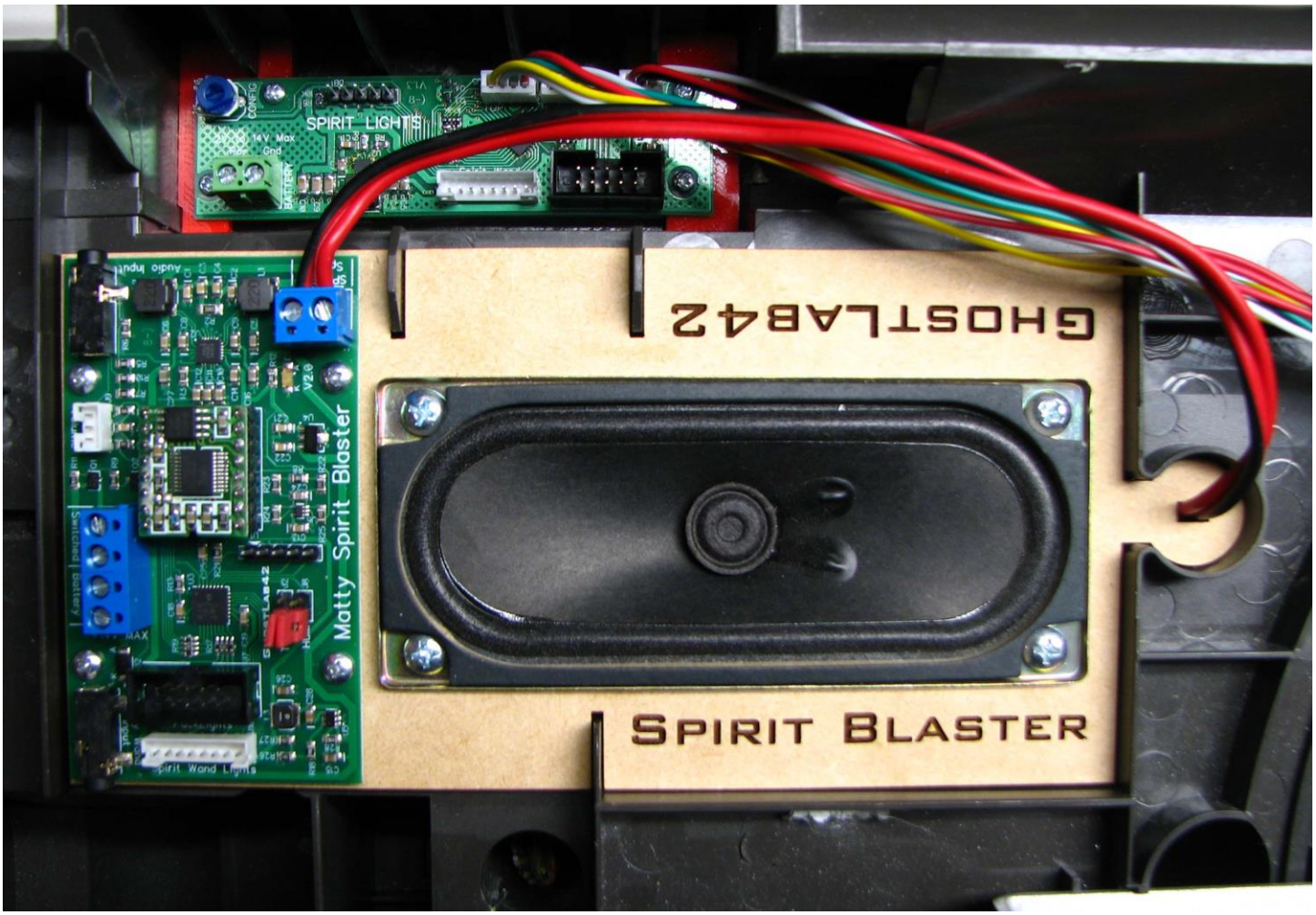


Once the circuit board (#1) has been mounted, if you want to remove the board care must be taken since the spacers will cause the board to lift when unscrewing the screws. Only unscrew a screw by a single turn or less, then do the same for each of the screws. Keep repeating this to slowly and evenly remove the screws without damaging the circuit board (#1).

Next connect the speaker to the circuit board with the speaker wire (#6). The wire has connectors that match the speaker terminals on one side. Press each one on a speaker terminal, the order does not matter. Then thread the wire through the rectangular hole in the round protrusion in the main mounting board (#8) so there is not much extra wire dangling between the speaker terminals and the rectangular hole.

The other end of the wire pairs needs to go to the speaker screw terminals on the circuit board (#1). You will need to strip the ends of the wire a short amount so that the wire will make contact with the metal screw terminals. You may want to cut the wire to length prior to stripping.

Test fit that full assembly in the spirit pack:



I keep taking this in and out for making these instructions so have not glued it in place yet. It should fit snuggly but is not a tight enough fit that it can hold well in a pack you are going to be walking around with. I will be using hot glue or epoxy to hold the main board (#8) in place on the Spirit Pack plastic casting and also sealing the hole around the speaker wire.

Connecting all the wires for a full system

Multiple connections to the Spengler Spirit Blaster circuit board need to be made.

1) The speaker wires should already be connected to the two "Speaker" connector screw terminals if you have the Spirit Halloween Pack hardware kit. If not you need to wire between the two "Speaker" screw terminals on the Spirit Blaster board and the Speaker.
   An 8 ohm, full range (not just woofer or tweeter) speaker is needed that is rated for 10W or more.

2) Plug the 8 pin (1x8) 4-wire cable from the Spengler Link into the "Wand Lights" connector on the Spirit Blaster circuit board if you are going to power the Spengler wand from the pack's main battery. The on-board regulator will provide a lower voltage that is required by the Spengler wand.

3) If you have a Spirit Pack Lights kit installed or a GBFans Powercell and Cyclotron kit installed:
   a. With the Spirit Halloween Pack Hardware kit,
      i. plug the non-strain relief side of the ribbon cable (#5) into the "Spirit Pack Lights" 10 pin connector (2x5 shrouded header).
      ii. Plug the other side with the strain relief into the matching socket on the Spirit Pack Lights powercell board or the GBFans powercell board.
      iii. The ribbon cable is keyed so that either end can go into either board. The strain relief is fairly thick and there is very little space between the board and the backpack's "motherboard", so to keep the height of the sound board as low as possible it is recommended to place the ribbon cable without the strain relief in the Spirit Blaster board connector.
   b. With out the Spirit Halloween Pack hardware kit,
      i. Plug the ribbon cable (#1) into the Pack Lights board (Spirit Pack Lights or GBFans Powercell and Cyclotron kit). This cable has strain reliefs on both ends and is a longer cable than the one that comes with the hardware kit.
      ii. The ribbon cable is keyed so that the connector will only easily go in the correct way. Either end can go in the Pack Lights or the Spirit Blaster board.

4) If you have some other pack lights kit and can use the switched power output from the Spirit Blaster to turn on and off the pack lights, first make sure that the pack lights can handle the battery voltage. If they can, wire between the "Switched Power" screw terminals on the Spirit Blaster circuit board and the battery input connections on the pack lights kit. This is NOT needed if you are using the ribbon cable and connect the GhostLab42 Spirit Pack Lights kit or the GBFans powercell and cyclotron light kit.

5) Plug the volume control cable's connector into the "Volume Control" connector on the circuit board.

6) If you have an audio player, you can connect it to the audio input jack with a 3.5mm stereo cable (not included). There is not much room to connect, and you may need a cable with a right angle plug to be able to connect to the jack.

Configure the one jumper:
This is only for test, so normally the jumper would not be installed.

Power up the board:
Now make sure the battery has been fully charged and is now connected to the board. Turn on the batteries power switch (if available) and verify your pack is working before putting the motherboard back on and closing the pack.

When power is applied, the red "Power Indicator LED" on the circuit board will softly glow.

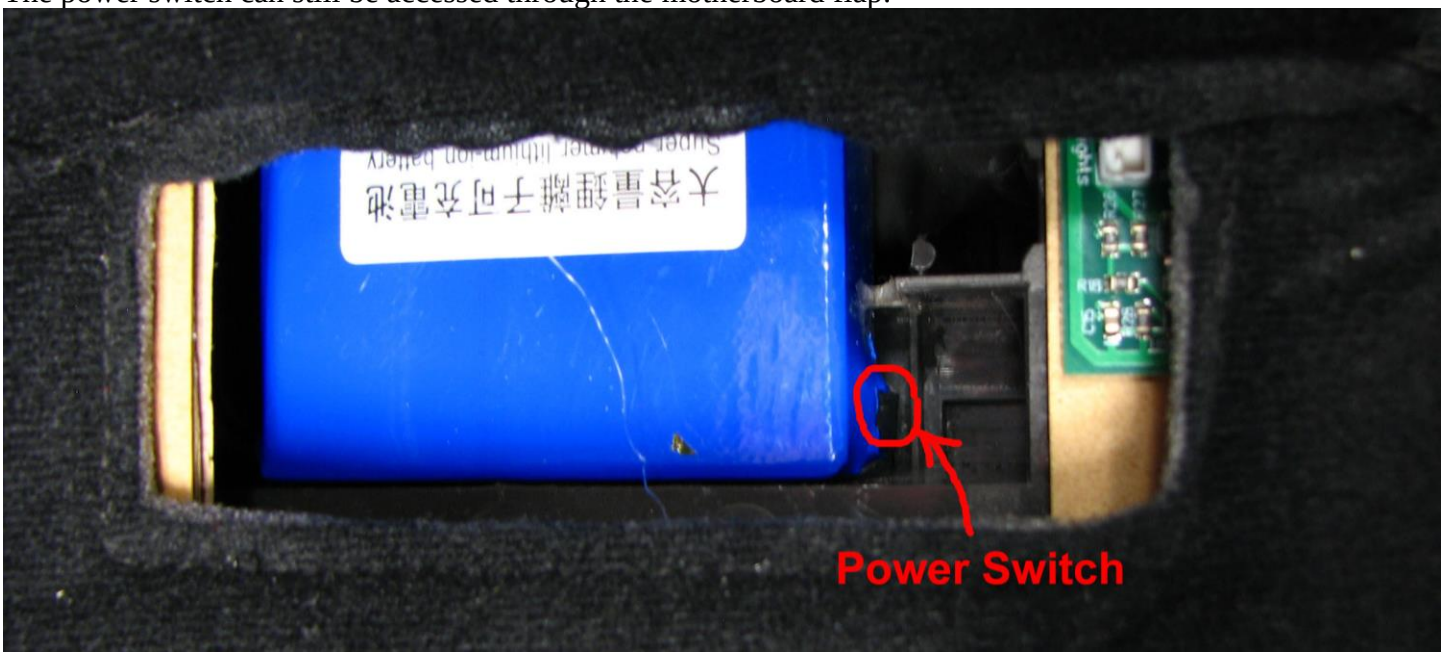
Battery Information

A 12V rechargeable battery (not included) is recommended. Be sure and get one with a charger. It should have a capacity of 4000 mAH or more. The one in the photos is a 9800mAH battery pack. If it also includes a power switch it can make it easier to install since no separate power switch has to be added between the battery and the sound board connections.

After some removal of upper portions of the internal supports, here is where I am mounting the battery. I will probably 3D print some brackets for holding and easy removal of the battery pack. Look for the 3D print files brackets to show up on thingiverse so anyone can print them once I have the design completed.



The power switch can still be accessed through the motherboard flap:



Advanced Information

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

Pin "1" is Next to "R26" and "R27"

8: GND, connected to "Gnd" Standalone use Battery Connector
7: +5VDC regulated power output to the Spirit Wand
6: +5VDC regulated power output to the Spirit Wand
5: GND, connected to "Gnd" Standalone use Battery Connector
4: Not supported
3: Not supported
2: Not supported
1: Not supported

"Spirit Pack Lights" 10 pin connector (2x5 shrouded header) Pinout:

1: +VBattery (9VDC to 14VDC), connected to "Pos" Standalone use Battery Connector
2: +VBattery (9VDC to 14VDC) , connected to "Pos" Standalone use Battery Connector
3: +VBattery (9VDC to 14VDC) , connected to "Pos" Standalone use Battery Connector
4: GND, connected to "Gnd" Standalone use Battery Connector
5: GND, connected to "Gnd" Standalone use Battery Connector
6: GND, connected to "Gnd" Standalone use Battery Connector
7: GhostLab Encoded control signal
8: GhostLab Encoded control signal
9: GhostLab Encoded control signal
10: GhostLab Encoded control signal

Troubleshooting:

When trouble shooting the Spirit Blaster board it is important to remove as many of the connections as possible.

1) Make sure the battery pack is fully charged or has fresh batteries.
2) Only have the battery and speaker connected. Remove all other connections.
3) Make sure the battery is not powered on (or connected if you do not have a power switch).
4) Place the jumper on SEL1, so the board will go into the TEST mode.
5) Turn on the battery power switch or connect the battery.
6) The "Power Indicator" red LED should light up.
7) The board should announce "TEST" and the firmware version of the board.
   It will then announce the inputs that are active. The SEL1, SEL2 and SEL3 jumpers are all monitored. With the SEL1 jumper still installed for test mode, it will announce "1" over and over until the jumper is removed.
8) The audio amplifier should still work, so plugging some music player into the Audio input jack should let you know if the audio amplifier is working.
9) You can also plug the music player into the Wand input jack should also produce some sound, though at a lower volume level. Only a single channel is used; the other channel is for control, but the Spirit blaster will generally ignore that other channel if audio is connected to it.

If still no sound, check the speaker wire connections to make sure they are secure. You can also plug in the volume control potentiometer and vary the potentiometer position to see if that allows you to hear any sounds.

The sound board will work with most home theater speakers, so you can also try connecting the home stereo speaker into the speaker jack and see if that allows you to hear sounds.