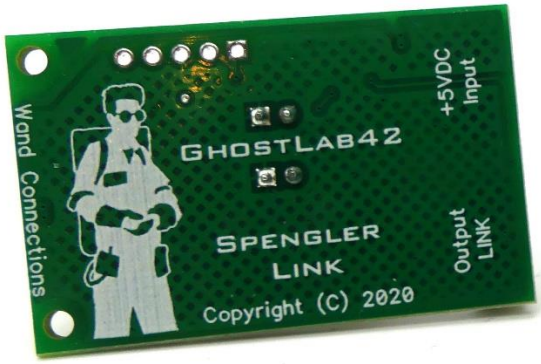
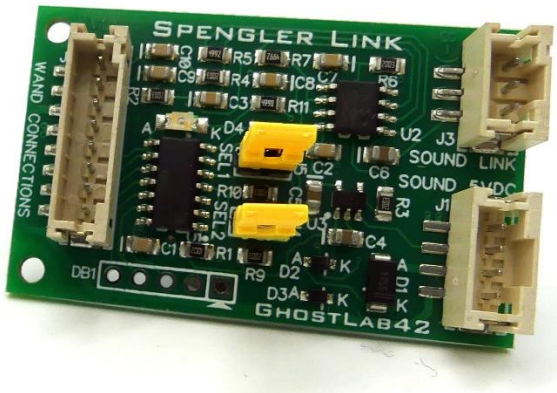
Introduction

Congratulations on purchasing the Spengler Keep Alive Kit that allows the Hasbro Ghostbusters Plasma Series Spengler's Neutrona Wand Stay powered on until you turn it off!

The Spengler Link Kit is designed to be permanently installed inside the wand and then provide just one function: Keep the wand powered up so that it does not shut down automatically after 30 seconds of inactivity.

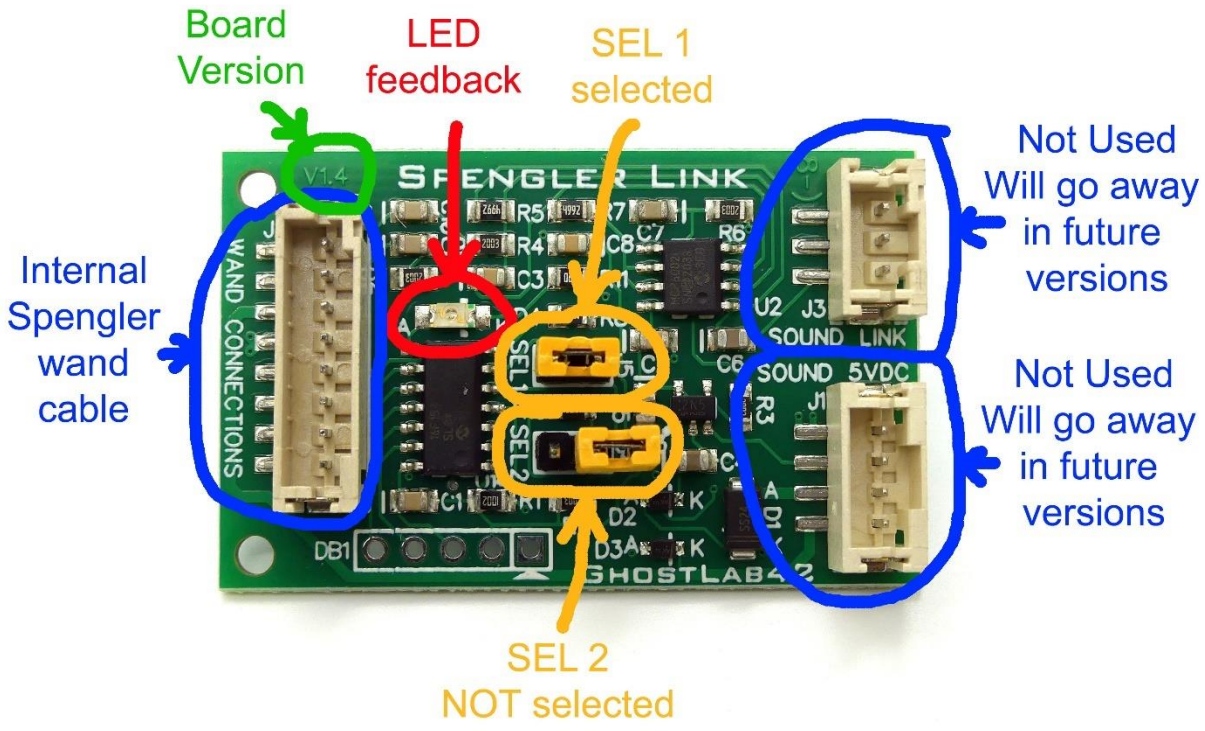
The Spengler wand will still shut down if the rumble motor is running or if you fire long enough to trigger the overheat functions. There is some concern that leaving the rumble motor running for extended periods of time is not good, so this does not even try to keep that going.





The Spengler Keep Alive board does use some additional battery current even when the wand is shut down so it is recommended that you remove the batteries if the wand will not be used for extended periods of time.

Connections and Settings:



There is only one cable connection used of the current 3 that are available:

1) WAND CONNECTIONS, 8 pin connector (PH style, 2.0mm pitch)
   An 8-wire connector that provides the actual connections to Spengler Wand's electronics.

2) SOUND LINK, not used. Will be removed from future versions.

3) SOUND 5VDC, not used. Will be removed from future versions.

Feature Selection.

There are two jumpers that can be used to select one of several features:

SEL1	SEL2	Description
Off	Off	N/A, was used for normal operation of the Link, but not this Keep Alive board
Off	ON	N/A
ON	off	Keep Alive, do not power down when idle for long periods
ON	ON	Test mode

The above image shows the "Keep Alive" feature that is the normal operating mode.

A jumper is considered "ON" when the small shorting part is connected to both pins, like shown for SEL1. A jumper is considered "off" when it is not connected to both pins like is shown for SEL2. Yes, you could just remove the shorting part completely, but since it is easy to misplace, I like to keep it on one pin only so that it will be handy when you want to use it later.

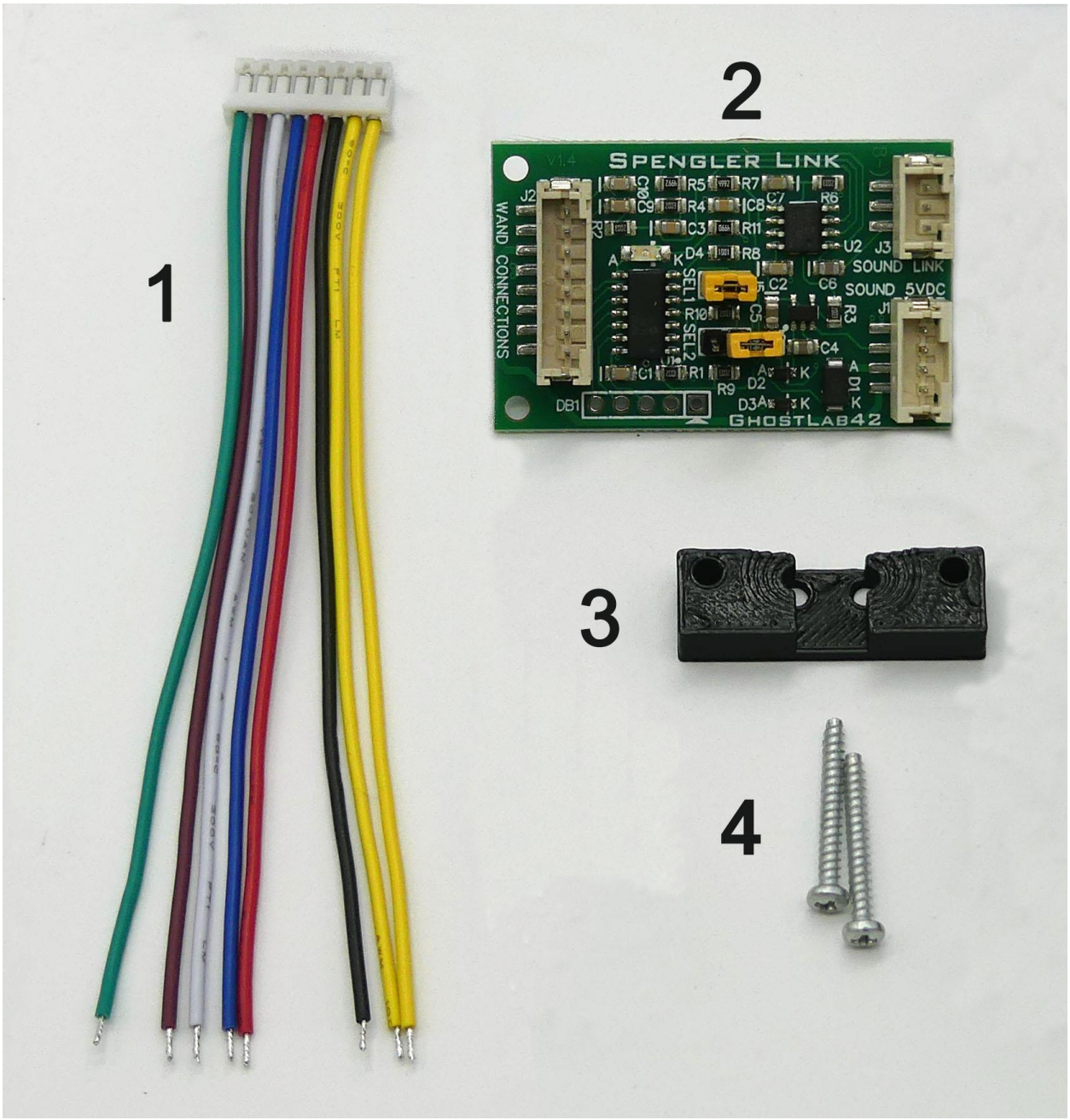
LED Feedback

The Test mode will display the firmware version and then have you go through a is a sequence of steps you need to perform to make. During the test mode, the RED LED will provide feedback so you know that each step has been completed. See the Test Mode section towards the end of this document.

Board Version

Separate from the firmware version is a board version number that is part of the copper on the top side of the board.

Spengler Link Kit Contents:



The Spengler Link contains multiple parts to complete the installation into your wand.

1) Wand Connections 8-wire cable (internal connections to the wand circuit board)
2) Spengler Keep board (Currently Spengler Link)
3) Mounting Bracket (Secures the Spengler Keep to the wand)
4) Mounting screws (holds Spengler Keep board on bracket and wand)

Installation into the Spengler Wand

Getting started:
The first step is to unscrew the end cap from the handle and remove the battery pack so that nothing will be powered while we perform the disassembly and subsequent installation of the new electronics board.

***** ZAP WARNING RANT *****
A note of caution about static electricity. That zap you can give to someone or something when you rub you shuffle across carpet on a dry day and then feel and hear when you come in contact with someone or something like a doorknob is an ESD event (Electro-Static Discharge). This can be annoying or fun or both but can be very damaging to electronics.

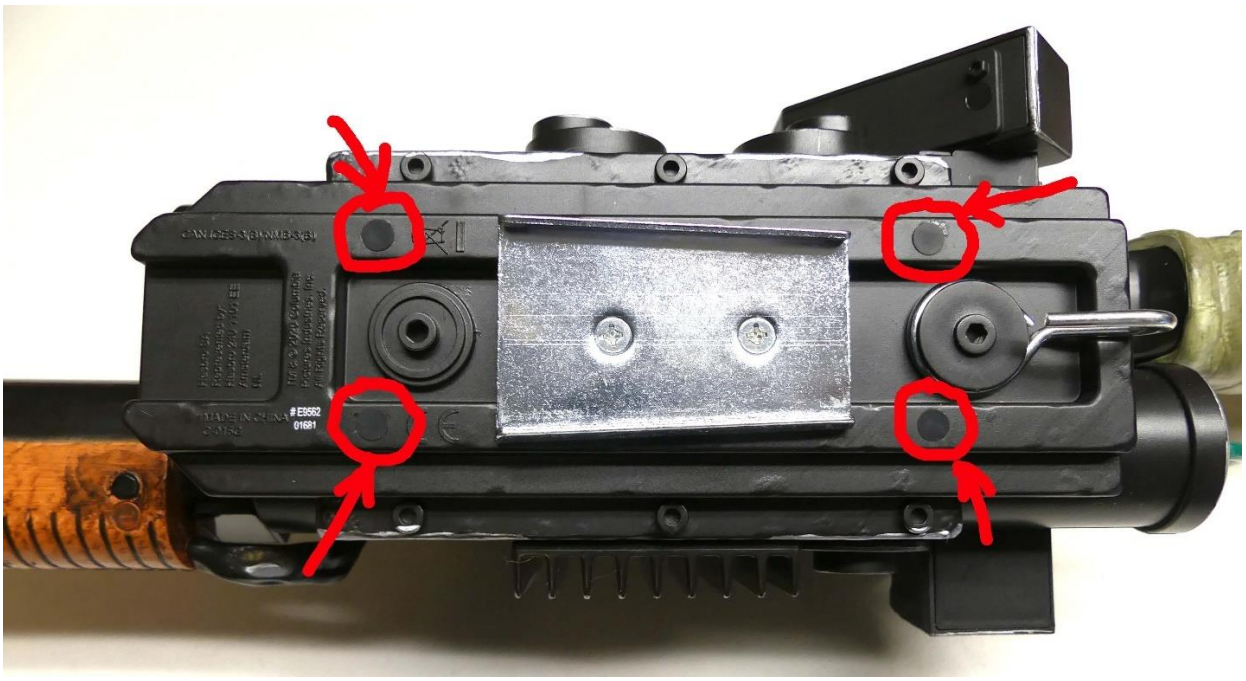
It is best to discharge yourself before touch any of the internal electronics or any of the electronics you are going to put in the wand, like the Spengler Link board. You can do this by touching something that is metal and is plugged into a 3 prong (grounded) output. If this is not practical, try not to walk around much when working on the electronics and do go touch those doorknobs before you start working on this.

Also be careful others that may try and zap you while you are working, either intentionally or unintentionally! Just walking up and touching you while you are touching the electronics may cause problems.
***** END OF ZAP WARNING RANT *****

Open the wand up:
Start by removing the rails from the back of the Spengler Wand so we can access the inside of the wand.

Tools Needed:
- 1/8” drill bit and drill
- Small-Medium Philips head screwdriver
- Dental pick or needle – some small pointy thing

There are four screws holding the rails to the back of the wand and they are covered by glued on caps that and are located here:



Use the drill on low speed (screwdriver speed) and start to drill the center of the cap that covers the screw with the 1/8" drill bit. You want to drill in far enough for the bit to "grip" the cap, but not so deep that you will drill the head of the screw. The caps are about ¼" deep, but you only need to drill in about 1/16" to get the bit to grip onto the cap.

Stop drilling with the bit in the cap and pull then pull the drill away. It should pop the cap out. Keep the caps for when you want to cover back up the screw heads.
I tried with smaller bits and they did not provide enough grip and just pulled the bit out and left the cap in place. Tried to pry that out with the dental pick but they were too stubborn.

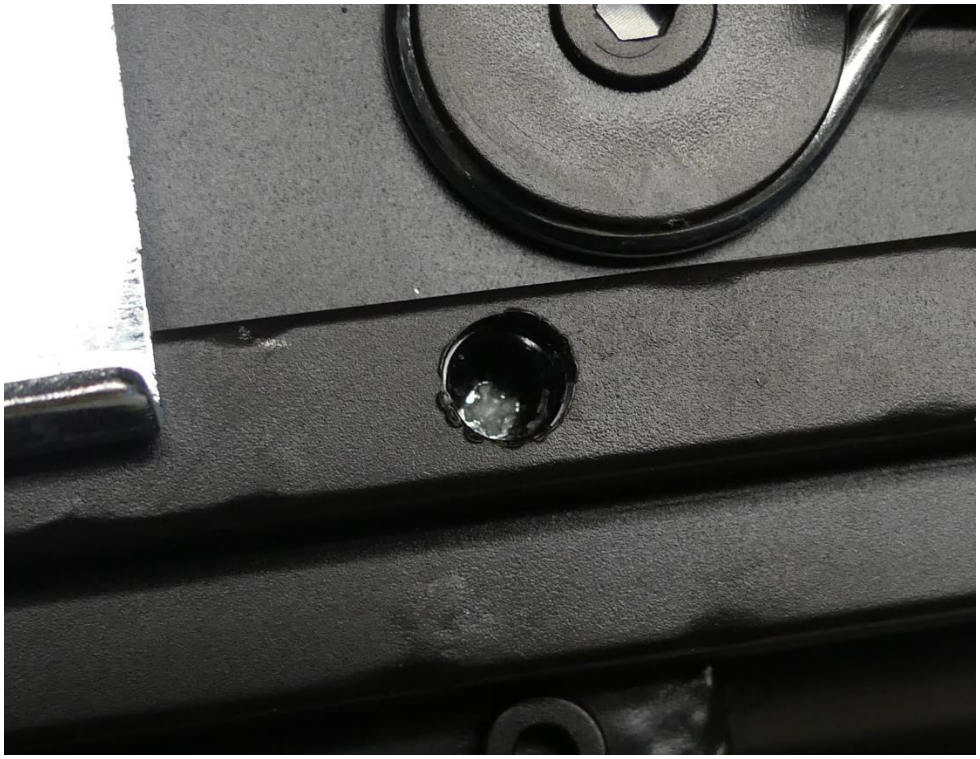


Once the caps are out you may have glue sitting in the hole and filling the head of the Philips screw making it difficult to unscrew. Use the dental pick (or needle) to scrape out the glue and clean it out of the Philip's head slots so that the screwdriver can have a good connection with the screw head.

Before:



After:

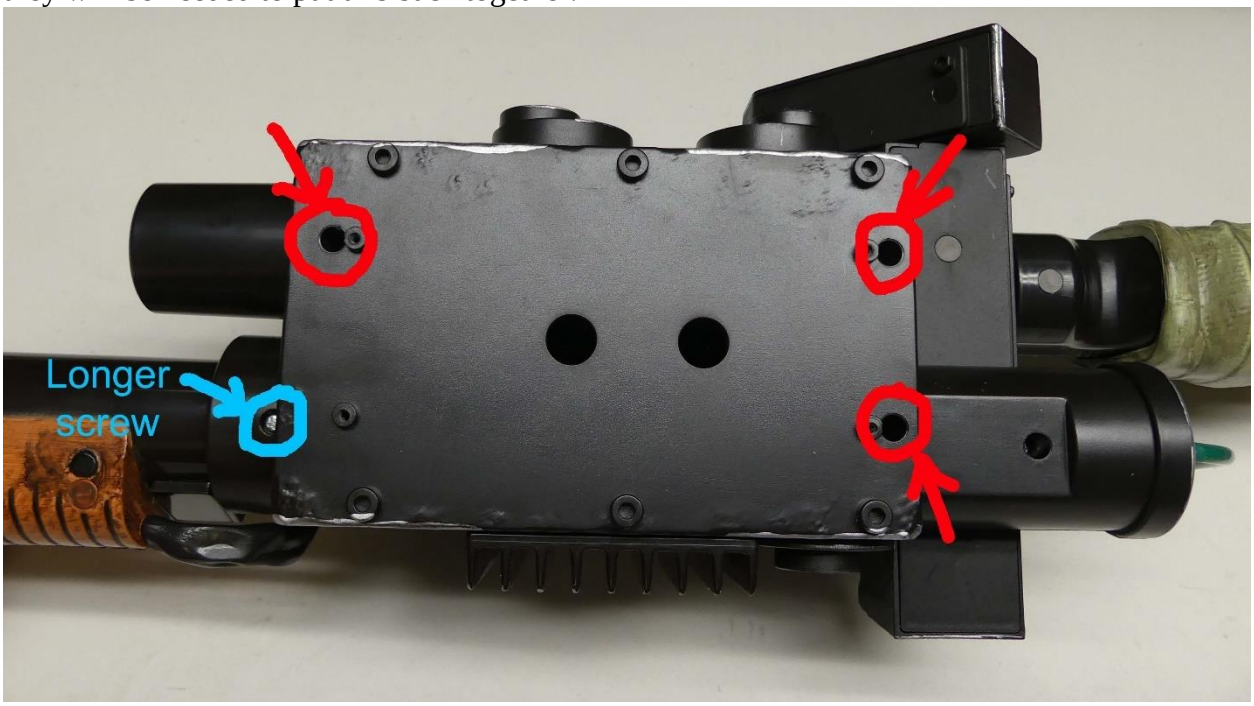


Once the glue residue has been removed, use the screwdriver to remove the four screws. Keep the four screws so you can put them back in when we are done installing the electronics and cables. I use an egg carton to hold, separate and organize the tiny parts that I am removing.

Remove and set aside the rails.

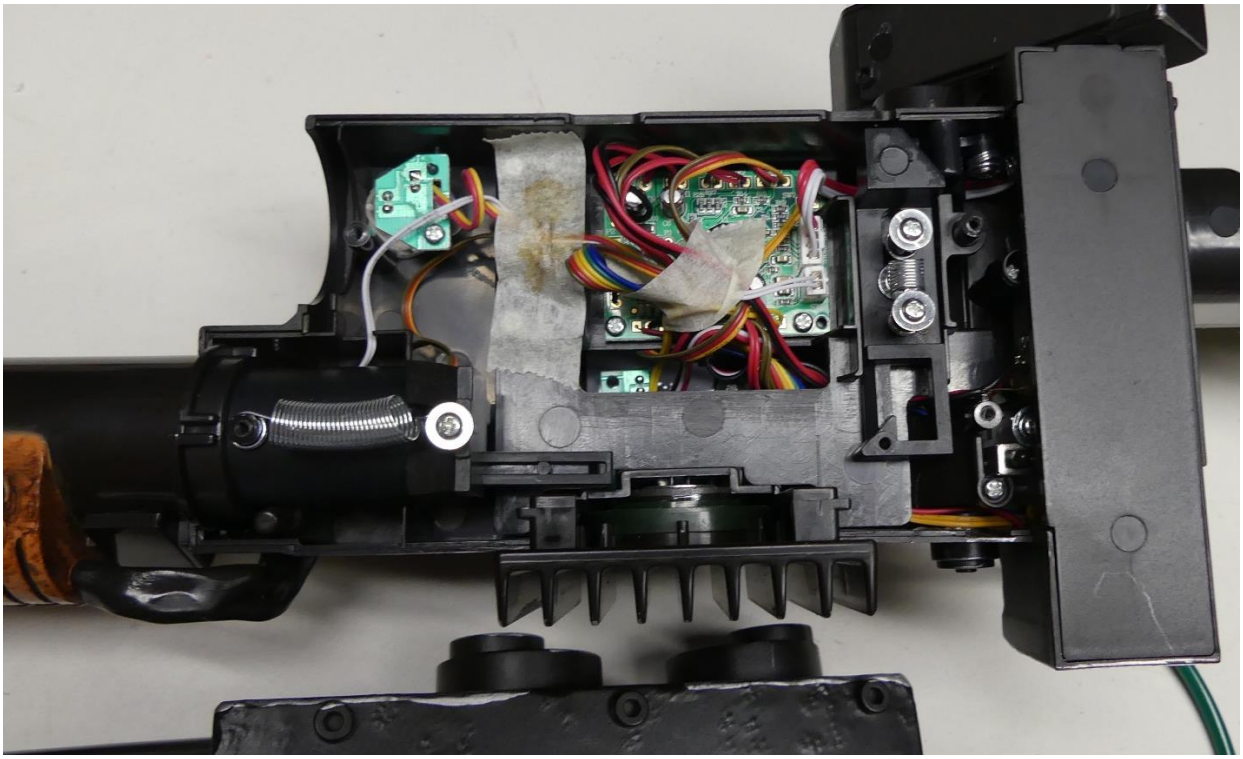
Remove the wand body bottom:
We do want the wand tip popped out so there is more room for us to maneuver around, so if the wand top is pushed in, pull on the green level and have the wand pop out before you remove the screws from this bottom piece.

Remove the next set of 4 screws that are holding the bottom piece in place: 3 short screws in the main body of the wand and one longer screw that goes into the wand tube. Keep the screws since they will be needed to put this back together.



Lift the bottom piece off and leave the heat sink and speaker in place attached to the wand. The wires that go to the speaker may become damaged if you remove the heatsink/speaker and just let it dangle and bounce around while doing the rest of the mods. The green tubing will keep this bottom panel close by, but it is a pain to remove so leaving it attached and dangling should not be a problem.

You should now have a nice view of the internal workings of the wand:



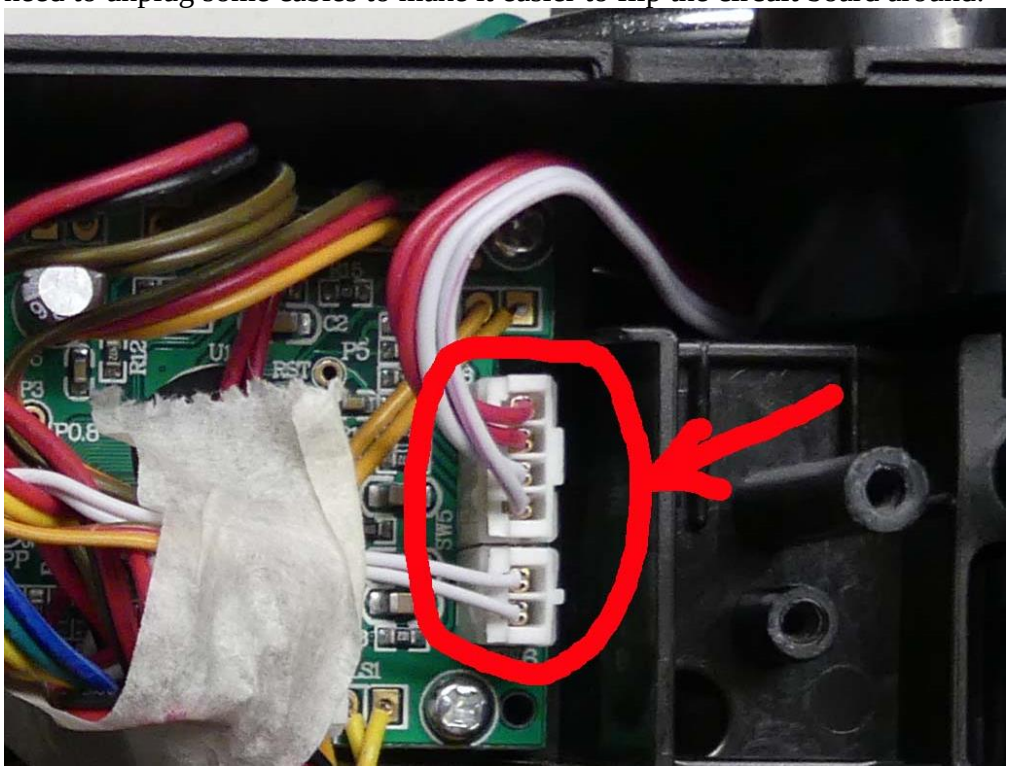
Preparing for the new addition:

In this step we need to clear a place to mount the New Spengler Keep board to the wand.

Tools Needed:

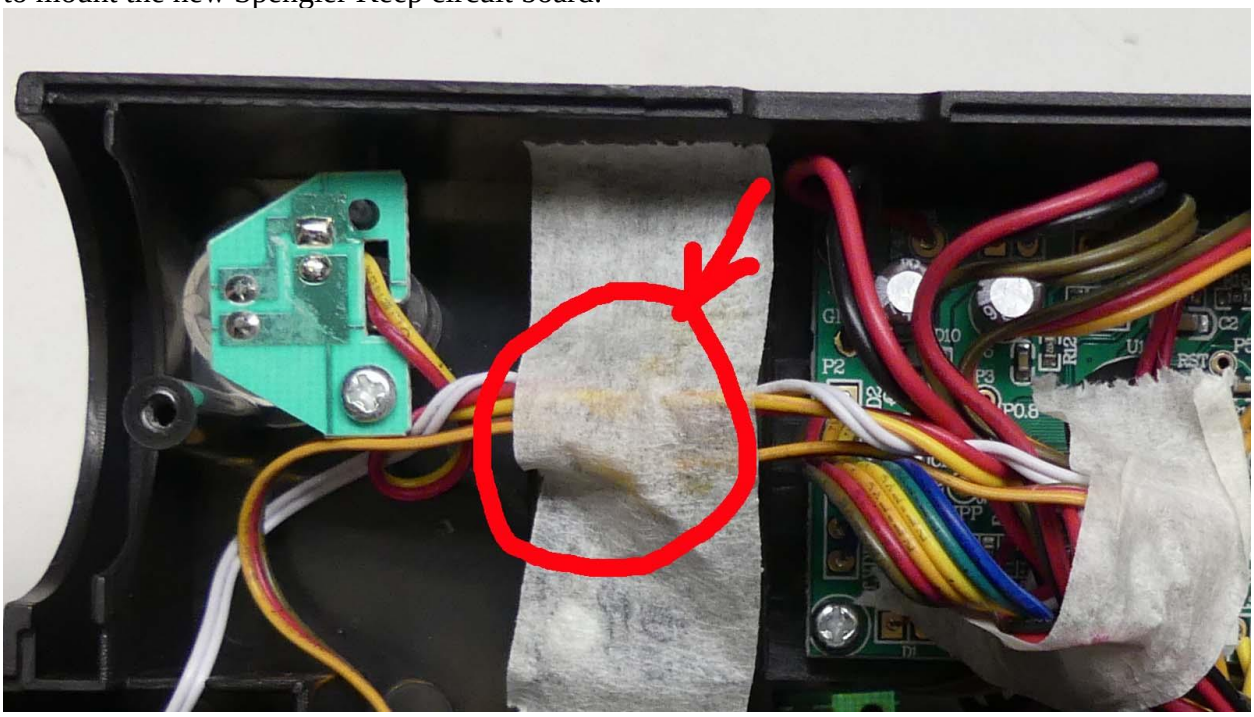
- Dental pick
- Needle nose pliers

Next, we need to unplug some cables to make it easier to flip the circuit board around:



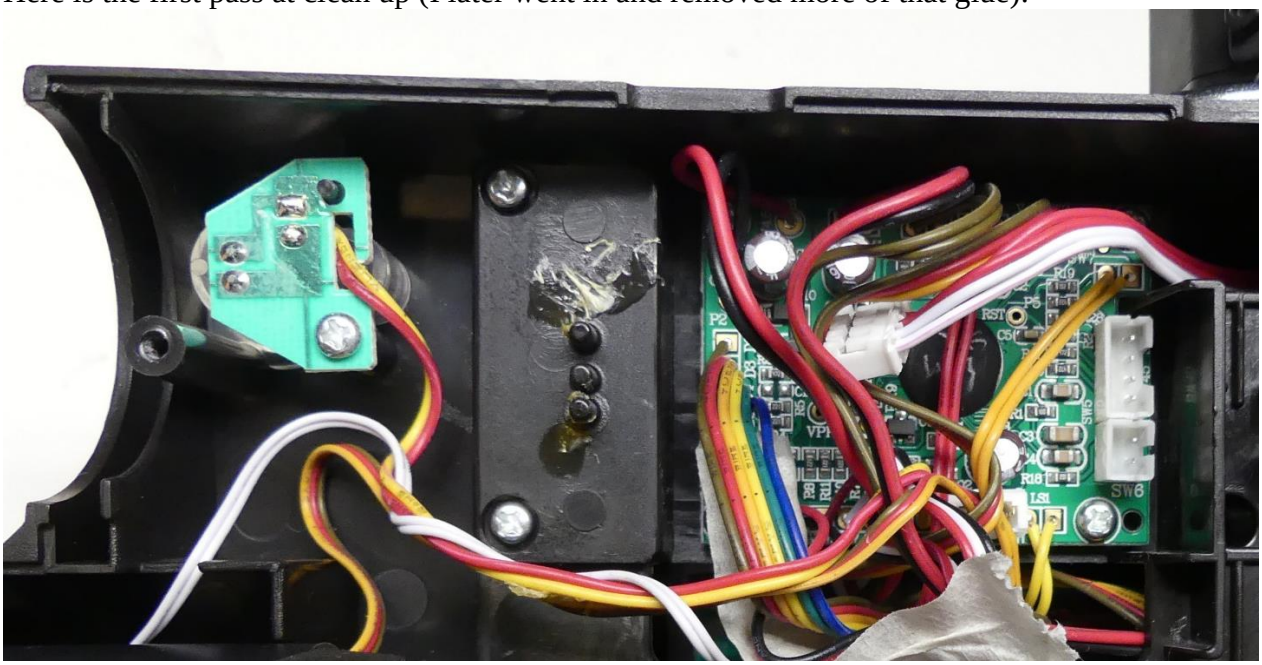
The cables are held in place by a couple of tabs on the right-hand side of the connector that go into indents on the socket. It is just friction but hold them tightly. Not sure the best way to remove these – you can pull from the wires and they will give, but it does stress the wires to do that. I use a curved dental pick and pry them up from the sides of the connectors where there is a lip for the pick to grab on to. I tried pliers and that did not go too well since the connectors are quite easy to squeeze and possibly damage.

Next let's clear a path for the few cables that are currently glued and taped down where we want to mount the new Spengler Keep circuit board:

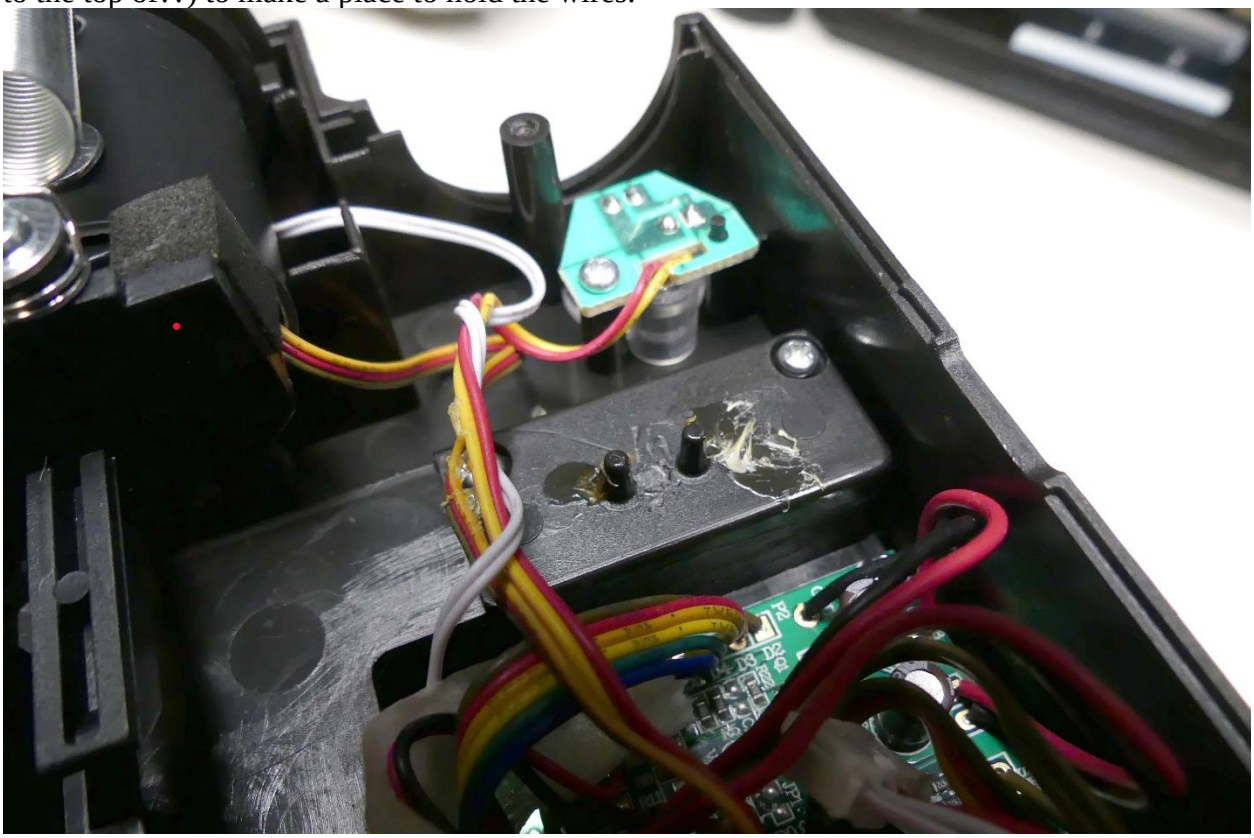


Peel off the white table and the wires should be exposed. They are glued down around (haphazardly!) under the tape, so just take your time and free the wires from the posts. Then remove the glue around the posts. A small flat screwdriver or your favorite dental pick both work well ad removing the sticky stuff.

Here is the first pass at clean up (I later went in and removed more of that glue):



I then removed the center of the three posts (why are there three posts that they glued the wires to the top of??) to make a place to hold the wires:



Two remove the center post, I just used needle nose pliers and grabbed the center post as close to the base as possible and then rocked it to the side and it came off easily.

Soldering the Spengler Cable to the original electronics circuit board

In this step you will solder the Spengler Link cable to the original electronics board so the Spengler link can see what is happening and either supply or receive power.

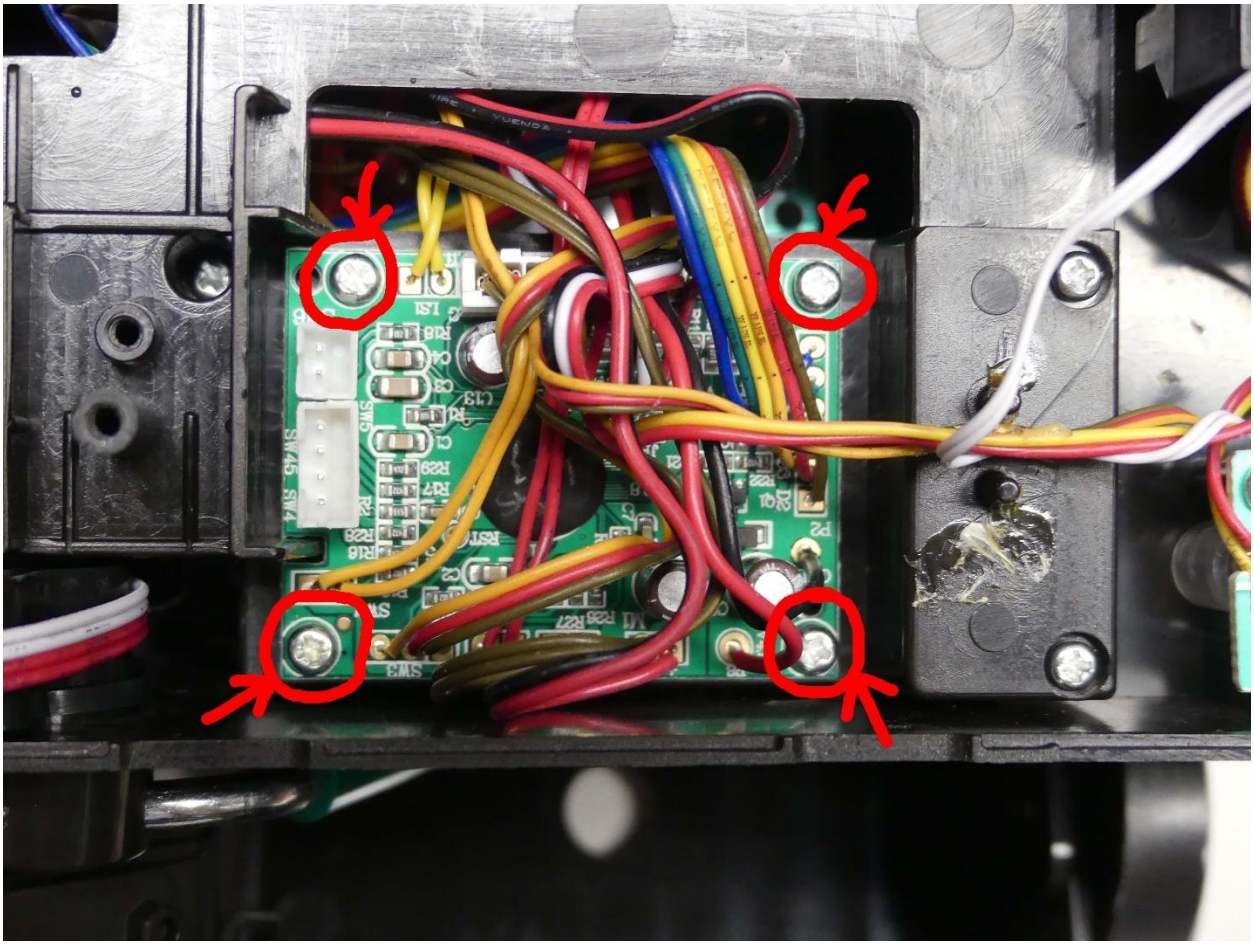
Tools Needed:

- Small-medium Philips head screwdriver
- Soldering iron and solder
- Wire cutters (diagonal or flush)

Parts needed

- 8-wire cable #1

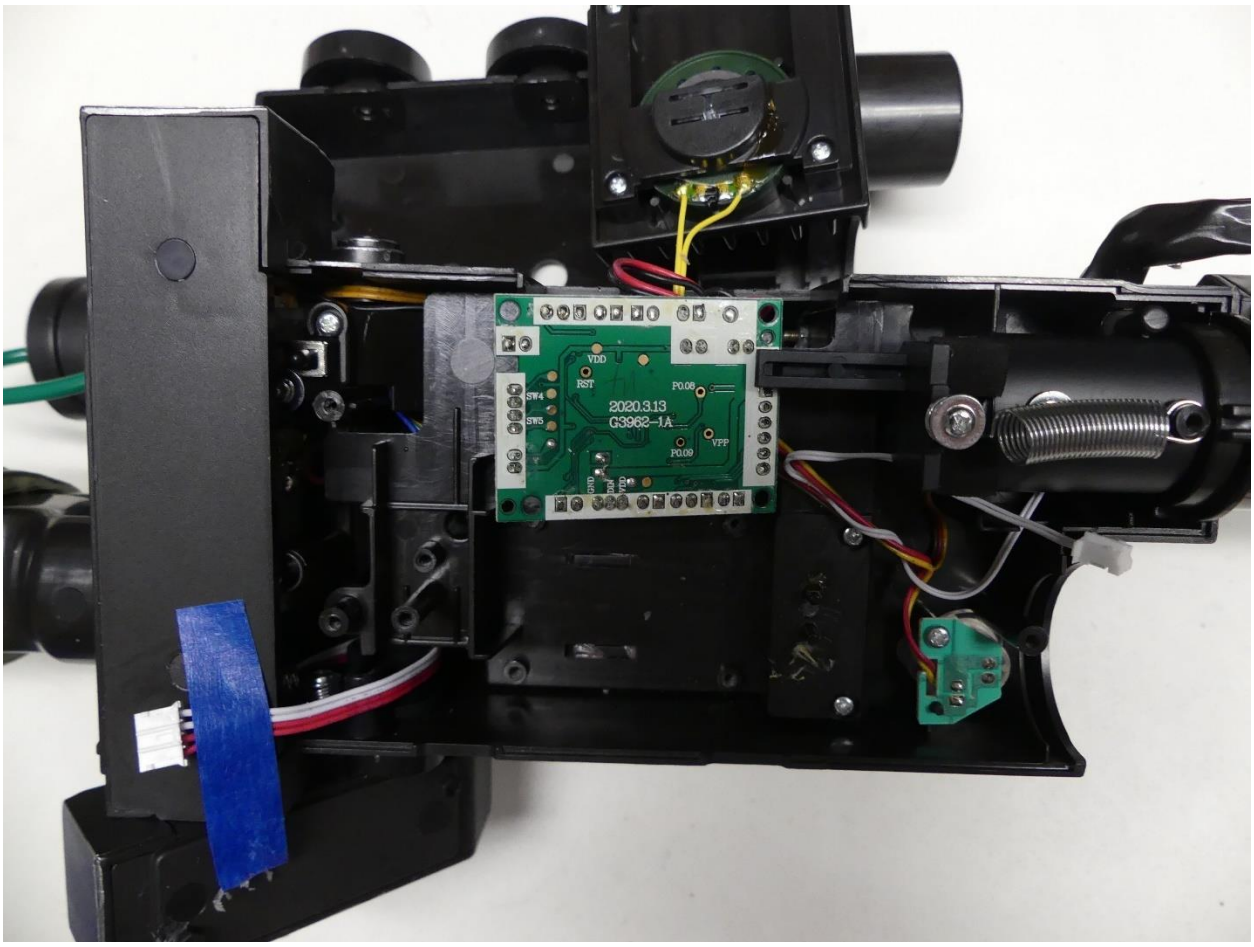
Remove the four screws that are holding the original electronics circuit board in place. The Latch mechanism was removed for these photos, but it should be able to be left in place.



Keep these four screws since you will be needing them to hold this board in place after the soldering has been completed.

I did lift and pull out the heat sink with the attached speaker to perform the soldering. Take care not to pull on the speaker wires.

Lift up slightly and flip the board over in a position that will allow soldering to the bottom of this circuit board. You may want to remove the tape and make sure not to pull to much on any of the whiles while repositioning the board. The end of the lathing mechanism on the wand tube held the board in place quite nicely:



All 8 wires of the cable #1 will be attached to different locations on this board.

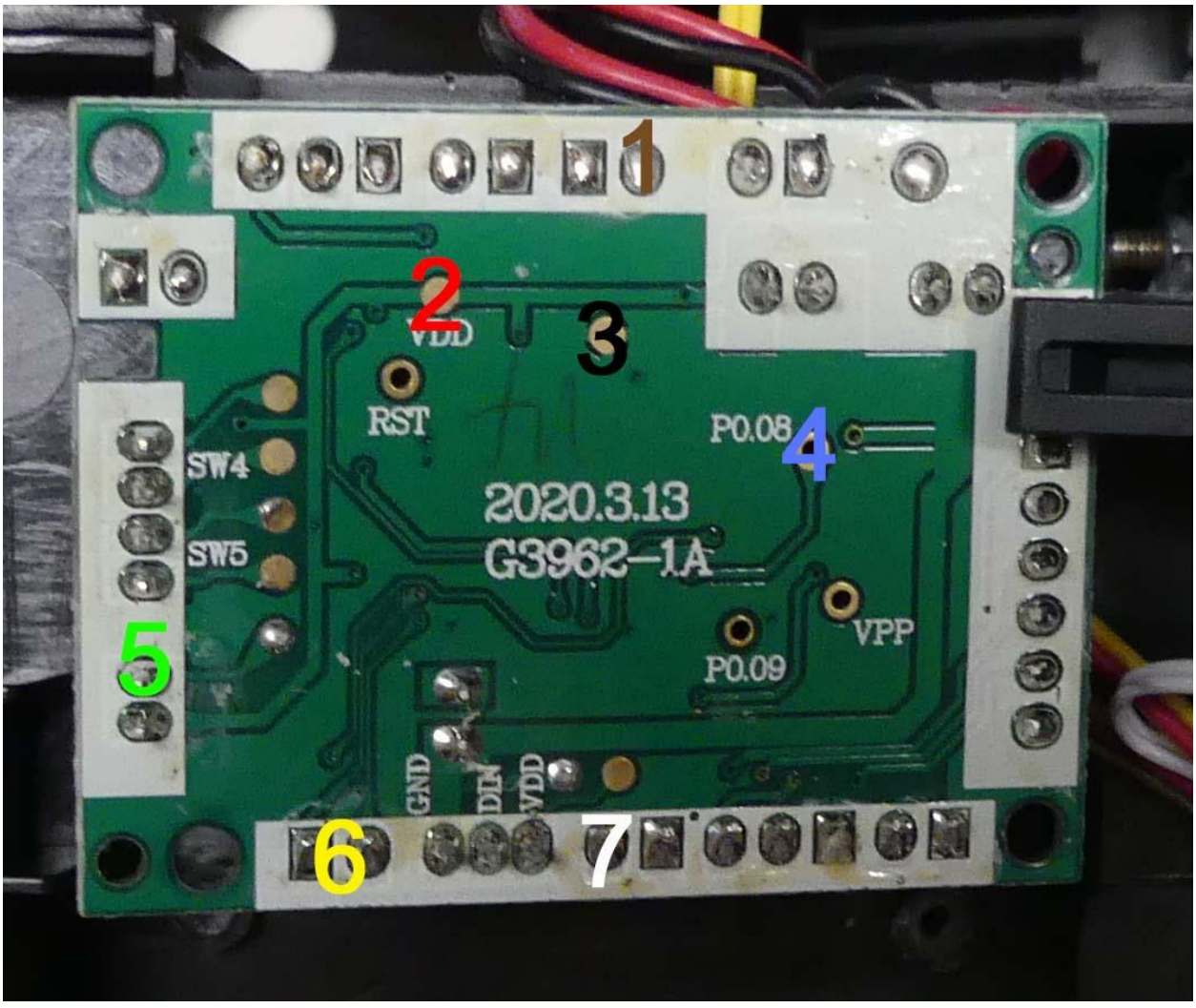
When soldering, tin the wires (even though they are already tinned) and the pads to be soldered to prior to making the connection. Having the same solder on each will make it easier for the soldering process.

Also note:

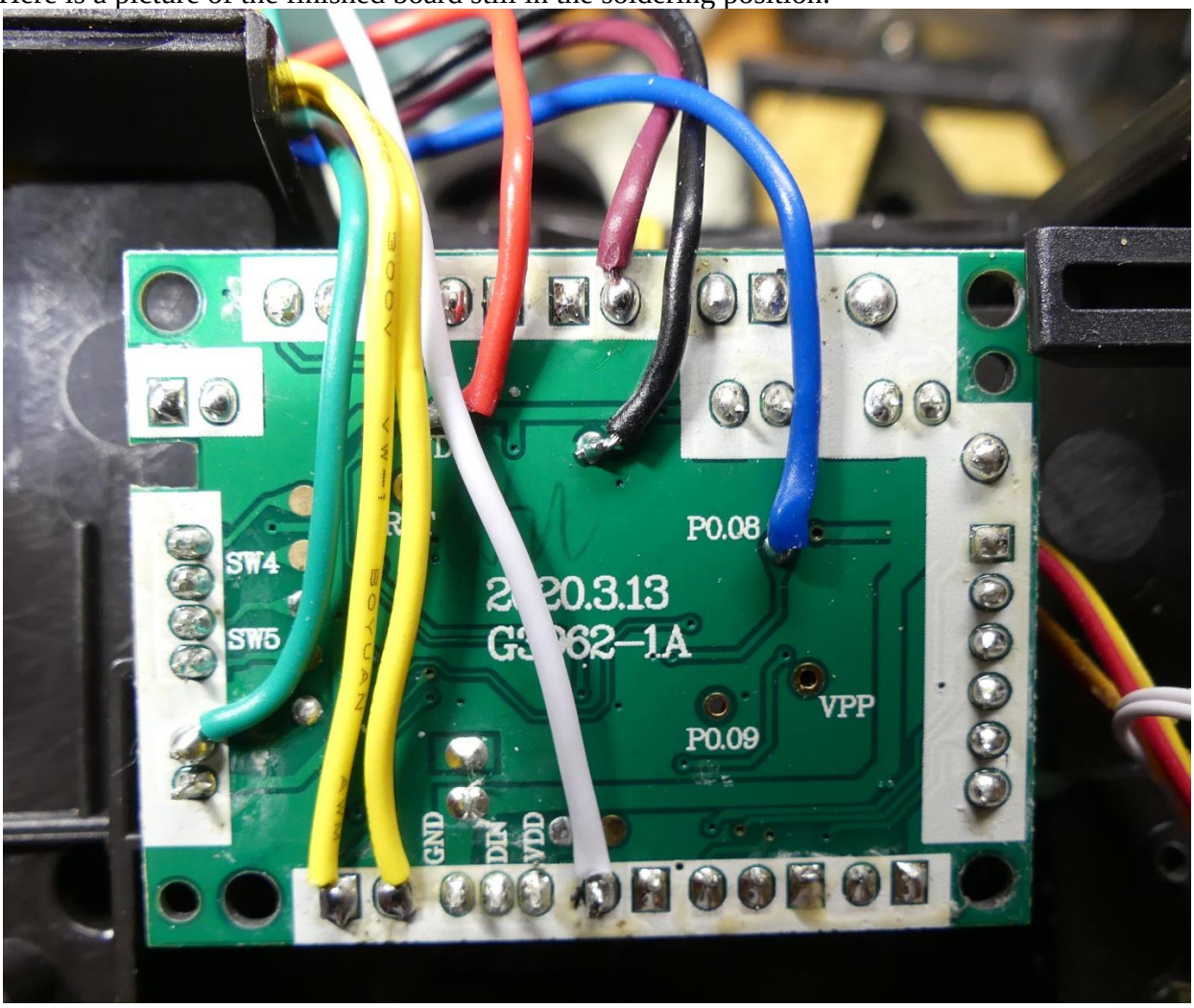
- Do not overheat the wire as it can melt the insulation
- Keep the tinned end of the wire short enough not to stick out of the solder pad area and onto an adjacent pad or wire end (use a flush or diagonal wire cutter)
- Make sure the solder does not bridge to an adjacent solder pad or wire

Recommended order of soldering:

1) BROWN wire, top of the board, 4th pad in from the right
2) RED wire, upper middle left on a gold pad labeled “VDD”
   Pre tin the gold solder pad
3) BLACK wire to a gold pad to the right of where you soldered the red wire
   Pre tin the gold solder pad
4) BLUE wire to the open pad that is to the right of the black wire marked “P0.08”. The blue wire may be able to be inserted into the hole and then soldered or just soldered to the surface like the previous wires. If you stick it through the hole, take care that it does not protrude out the other side and touch some other wire. It will get hot enough to melt insulation on some other wire if it is touching. If it sticks out too far on the other side it could also be bent over and make electrical contact with something it shouldn’t, so be sure and cut off any excess amount of tinned wire that sticks out.
5) GREEN wire, left side of the board, the second pad from the bottom
6) 2x YELLOW wires, bottom of the board, leftmost two pads
   Order does not matter, just one yellow wire to each of the two pads. Make sure they are not shorted together.
7) WHITE wire, bottom of board, the 6th pad from the left.



Here is a picture of the finished board still in the soldering position:

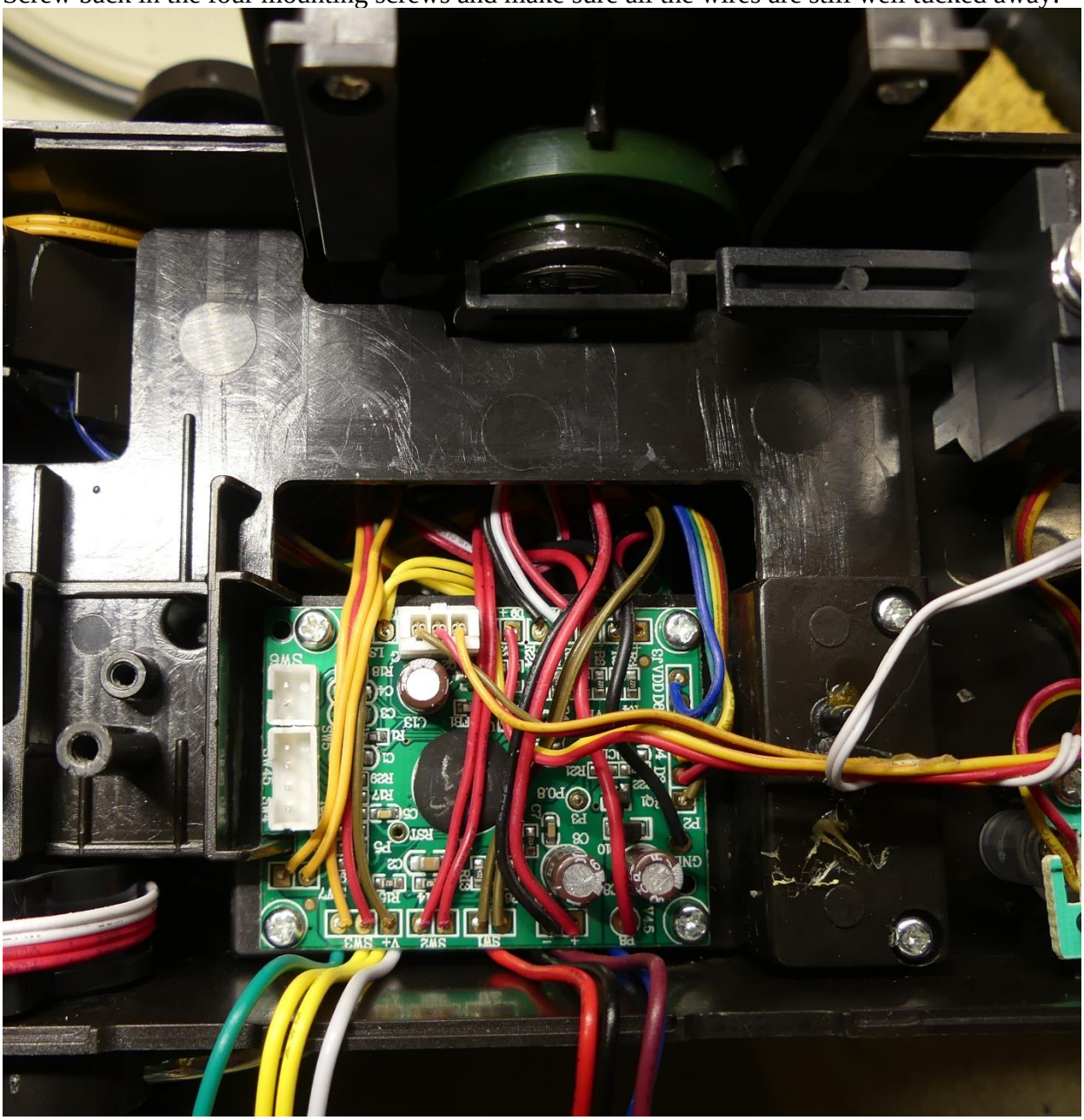


Make sure the wires all reach the upper edge of the board and stay flat against the board. Try to order the wires so there are no overlapping wires that will get squished when we mount the board.

Once the wires look good, carefully flip the board over and place it back where it used to be mounted. Fold the new wires out of the way and see if you can dress the remaining wires so that none will stick up and interfere with anything. Focus on keeping the original wires tucked under where the tube slides in and out so they will not get caught in the moving tube mechanisms.

You may want the heat sink and speaker to be out of the wand while you dress the wires, so you have more access to the wires. Once you have that done put the heat sink and speaker back in place and be careful not to trap any wires between the heat sink and the wand body.

Screw back in the four mounting screws and make sure all the wires are still well tucked away:



Recommended interim testing:

Put enough back together to be able to test that the wand still works as before:

1) Plug in the two original cables that were unplugged before (2 wire white and 4 wire red and white) back into the board,
2) put the batteries back in the wand and secure them,
3) you should be able to test the wand and make sure that everything works as before:
    a. Power up the wand (bottom face toggle switch, speaker makes sound and slo-blo LED comes on),
    b. make sure the vent light still works (top face toggle switch),
    c. activate the rumble motor (make sure motor works works and the bar graph display),
    d. press the ear button to change to slime blower,
    e. fire to make sure the Wand tip and other LEDs are operating properly.
    f. Power the wand back down (bottom face toggle switch)

When done, remove the battery so we do not accidentally short something will adding the Spengler Keep board.

Installing the Spengler Link Board

In this step you will install the Spengler Link board inside the wand.

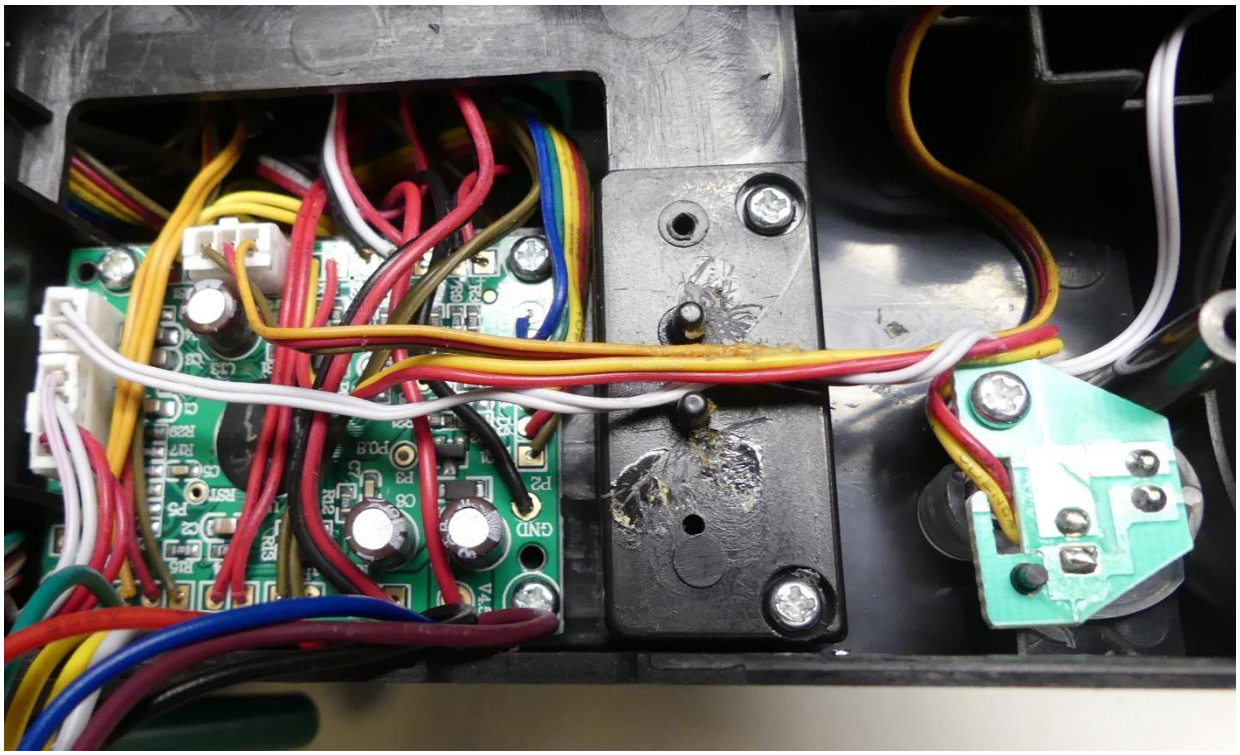
Tools Needed:

- 1/16” drill bit and drill
- Small-medium Philips screwdriver

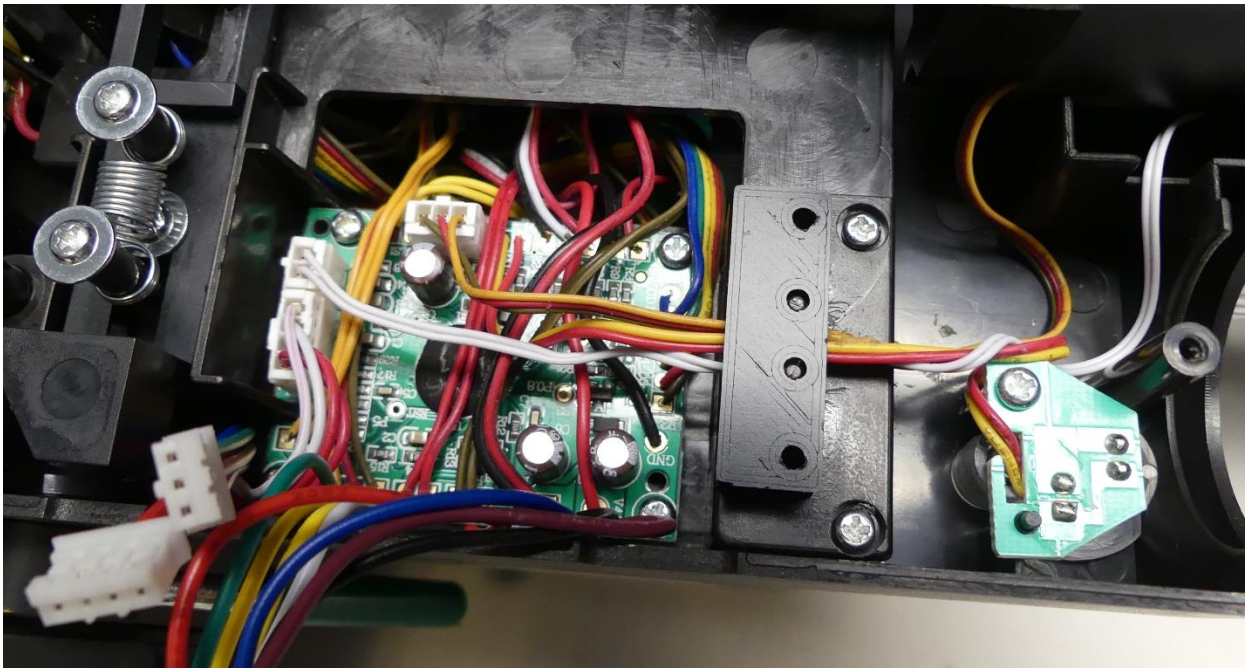
Parts needed

- Mounting bracket #3
- Mounting screws #4 (two screws)
- Spengler Link board #2

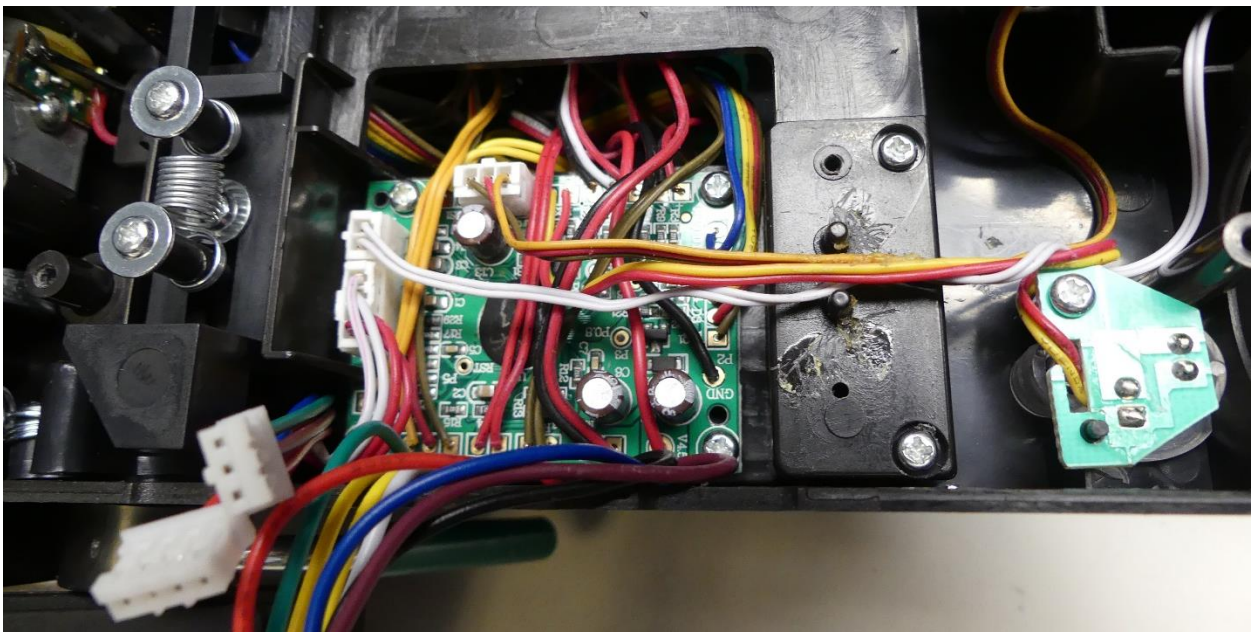
Start by placing some wires in between the two posts:



Place the Spengler Keep mounting bracket #3 over those wires and posts for a test fit. I did need to clean up the area a bit more that what is shown in the above image. The mounting bracket should sit flat and not pinch any of the wires it is holding in place. Once you have it able to sit comfortably in place, you need to drill two small holes for the mounting screws to use.



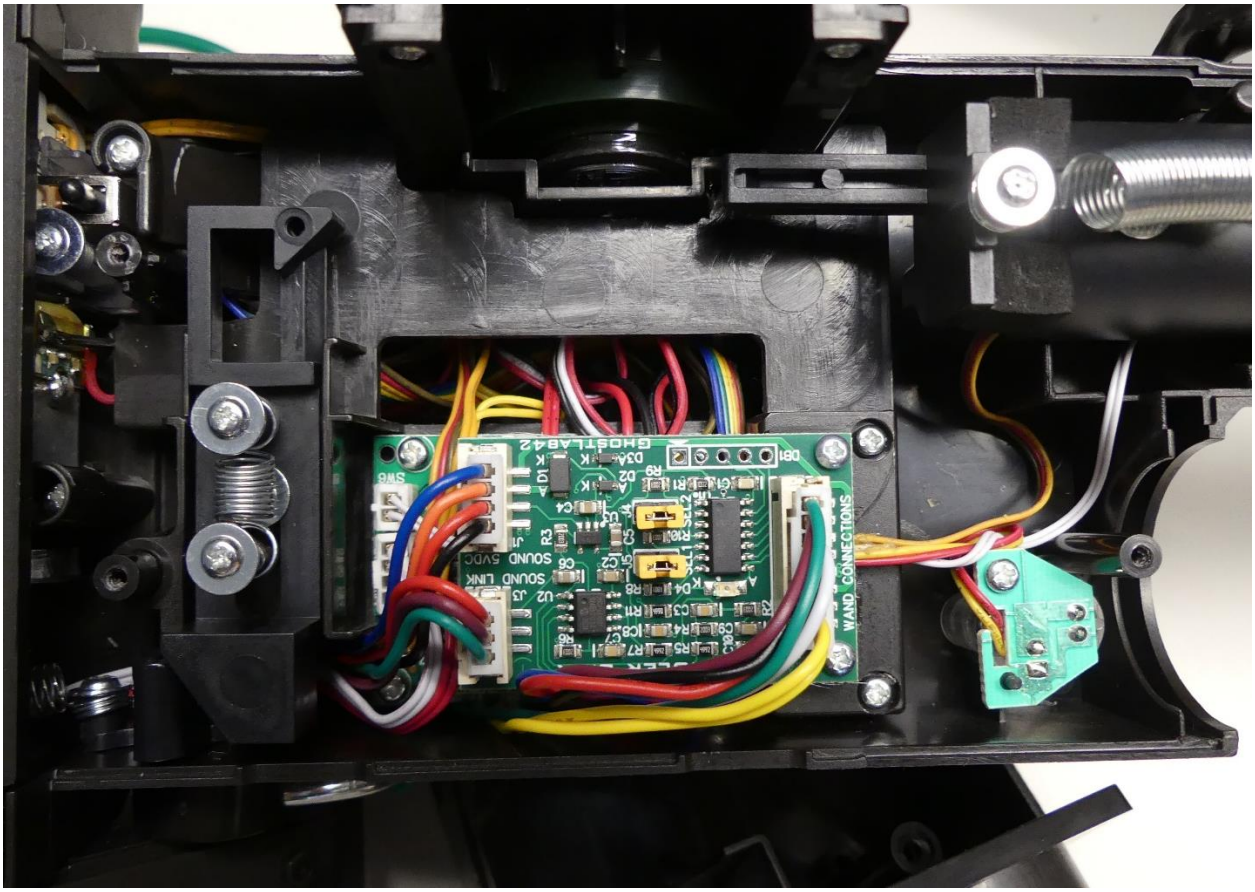
Drill holes with a 1/16” bit centered in each of the two outside mounting holes. I lifted the mounting bracket off for the following image so you could see the two holes that were just drilled. The mounting bracket should be on, and no trapped wires should be between it and the wand when fully seated before proceeding to the next step.



Ignore the two or three cables in the above images – those are from the Spengler Link install and should not be present with the Spengler Keep.

Once in place use the two mounting screws #4 through the Spengler board mounting holes on both sides of the wand connector, through the mounting bracket #3 and into the wand body. Do not overtighten and strip the plastic.

Here is the board in position and the cables have been arranged to not interfere with any moving mechanism and allow access to the jumpers and the feedback LED.



Jumpers shown in test mode position.

And the two cables plugged into the left had side of the Spengler Keep board shown above will not be present: those tow sockets (if present) should not be used.

Testing the Spengler Link Board

In this step you test the Spengler Link board to make sure the internal wand connections are working.

Parts needed

- Batteries for the wand

Verify that the wand is getting power
Put the batteries in the wand handle and screw in the end cap. Turn on the wand and make sure it functions normally. If not, look at the power sources and determine what is not powered or connected. Also make sure the connectors are fully seated in the Spengler Link Board.

Perform the Self-Test
Step 1:

Place all the wand's toggle switches in the down position (wand off, vent light off, activate off)

Step 2:

Place both jumpers on the Spengler link and immediately watch the feedback LED.
It will flash to indicate the firmware version and then wait for you to perform the next step.
For firmware version "1.2" the LED with flash one time for the main version, a series of short flashes to indicate a decimal point and then two flashes for the minor revision number.

** Troubleshooting **
If you do not get any flashing at this point check that the battery or power supply is connected. Verify that the wand has power by powering it up and down.

If the wand appears to have power, then this is an indication that the RED and BLACK wires of the Wand Connection cable #1 may not be attached in the correct place or may not be soldered properly. If you have a Voltmeter or DMM you can check that there is voltage between these two locations and then check that the board has voltage: You should be able to measure a voltage of 2.5V to 5V between pads 1 and 3 (one is the square pad) on the 5 pads labeled DB1 on the bottom edge of the board.

Also verify the wand connection cable is fully seated in the Spengler Link board.

Step 3:

Remove both jumpers. Nothing should happen!

Step 4:

Place one jumper on SEL1. As long as the jumper is on SEL1 it should flash one time and then pause. Remove the Jumper and the flashing should stop.

** Troubleshooting **
If you do not get any flashing at this point check that the power up/down switch on the wand is in the power down position. If it is not, place it in the down position and remove and put back on SEL1.

If the feedback LED does not flash, then it is an indication that the BROWN wire of the wand connection cable #1 is not making a good connection with the wand's circuit board. Remove the battery and remove the mounting screws for the Spengler Link and the original circuit board. Move the Spengler link off to the side and flip the original circuit board over and verify that the BROWN wire is in the correct position and that it is not shorted to something next to it.

Also verify the wand connection cable is fully seated in the Spengler Link board.

Step 5:

Place a jumper on SEL2. As long as the jumper is on SEL2 it should flash two times and then pause. Remove the jumper and the flashing should stop.

Step 6:

Turn the wand on (lower face plate toggle switch to the up position). The feedback LED should flash three times to indicate the Spengler link noticed the power up.

** Troubleshooting **
If you do not get any flashing at this point check that the power up/down switch on the wand is in the power up position. If it is not, place it in the up position.

If the feedback LED does not flash, then it is an indication that the BROWN wire of the wand connection cable #1 is not making a good connection with the wand's circuit board. Remove the battery and remove the mounting screws for the Spengler Link and the original circuit board. Move the Spengler link off to the side and flip the original circuit board over and verify that the BROWN wire is in the correct position and that it is not shorted to something next to it.
Also verify the wand connection cable is fully seated in the Spengler Link board.

Step 7:

Press and hold the wand ear button. The feedback LED should flash four times, pause, and repeat as long as the button is held to indicate the Spengler link noticed the ear button press. The flashing should stop when the button is released.

** Troubleshooting **
If you do not get any flashing at this point check that the ear button is being pressed firmly.

If the feedback LED does not flash, then it is an indication that the GREEN wire of the wand connection cable #1 is not making a good connection with the wand's circuit board. Remove the battery and remove the mounting screws for the Spengler Link and the

original circuit board. Move the Spengler link off to the side and flip the original circuit board over and verify that the GREEN wire is in the correct position and that it is not shorted to something next to it.

Also verify the wand connection cable is fully seated in the Spengler Link board.

Step 8:

Flip the activate toggle switch to get the wand's rumble motor activated. The feedback LED should flash five times to let you know the Spengler Link has seen the rumble motor working. It will then pause for a short moment and then cause a wand mode change and then flash six times to let you know that it has tried to change the wand mode.

** Troubleshooting **
If you do not get any flashing at this point check that the rumble motor has started up.

If the motor is started and the feedback LED did not flash, then it is an indication that the BLUE wire of the wand connection cable #1 is not making a good connection with the wand's circuit board. Remove the battery and remove the mounting screws for the Spengler Link and the original circuit board. Move the Spengler link off to the side and flip the original circuit board over and verify that the BLUE wire is in the correct position and that it is not shorted to something next to it.

Also verify the wand connection cable is fully seated in the Spengler Link board.

Step 9:

Flip the vent light toggle switch up (top toggle switch on the face of the wand) and the feedback LED should flash seven times to let you know the Spengler Link has seen the Vent light turn on.

** Troubleshooting **
If you do not get any flashing at this point check that the orange light by the Clippard valve is turned on. Make sure the correct toggle switch was used and that the vent light is controlled by the toggle switch while the rumble motor is running.

If the switch was in the up position when the activate switch was turn on (and the motor started), this test will run immediately after the Step 8 tests so you may miss the flashing for this step.

If the orange light is on and the feedback LED did not flash, then it is an indication that the WHITE wire of the wand connection cable #1 is not making a good connection with the wand's circuit board. Remove the battery and remove the mounting screws for the Spengler Link and the original circuit board. Move the Spengler link off to the side and flip the original circuit board over and verify that the WHITE wire is in the correct position and that it is not shorted to something next to it.

Also verify the wand connection cable is fully seated in the Spengler Link board.

Step 10:

Flip the power up/down toggle switch (bottom face plate toggle switch) down to power down the wand. The feedback LED should flash rapidly to let you know the Spengler Link has seen the power down and has exited test mode.

Put the wand back together

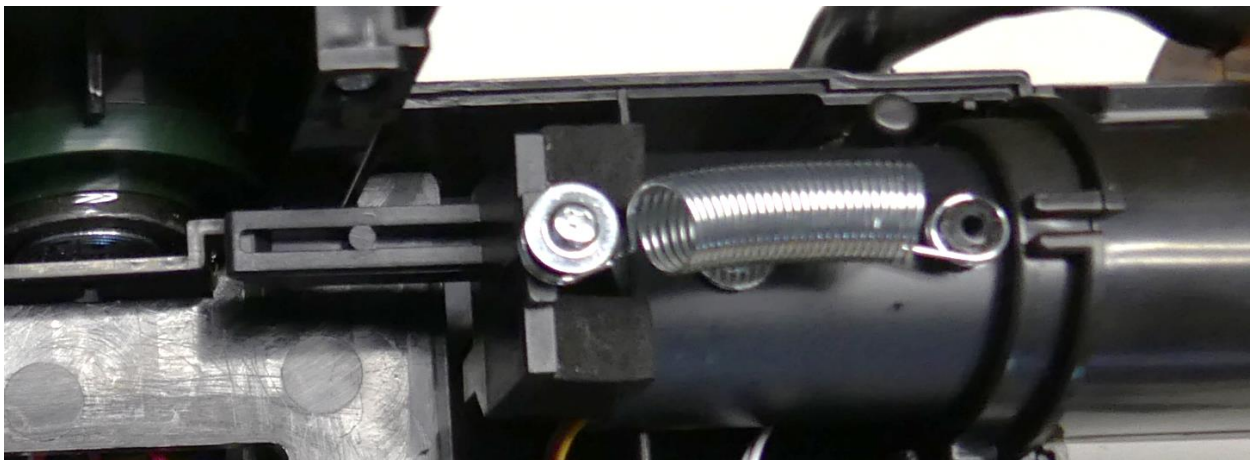
In this step you will be putting the wand back together. Basically putting the pieces you took apart back together now that you have verified that the wand is working properly.

Parts needed

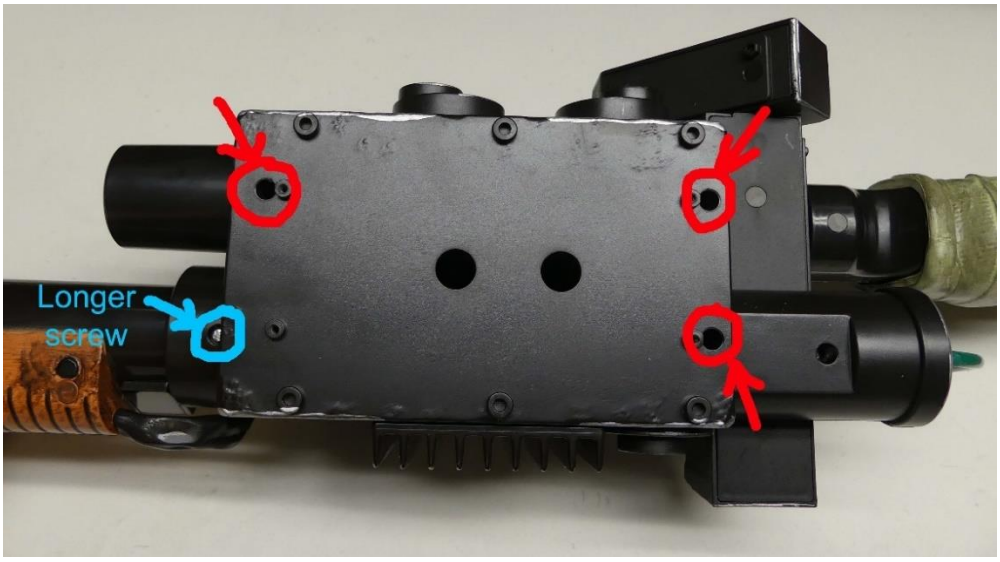
- Small-medium Philips screwdriver

Make sure all the wires are tucked away and routed away from any of the sliding latch or tube mechanisms.

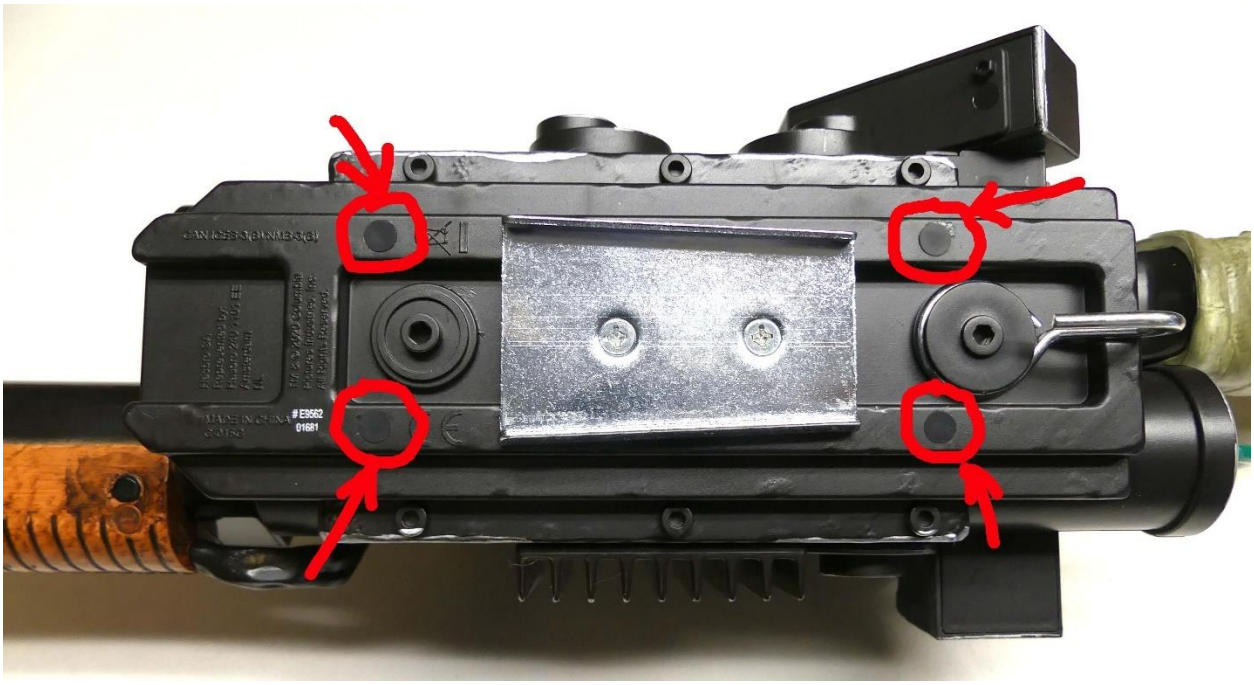
Make sure the wand tube is extended out and attach the free end of the spring from the wand tube mechanism to the post that has a place for a screw:



Place the bottom cover on and hold in place and make sure the pop mechanism is working. Once verified, secure it with the 4 screws you removed (1 longer screw by the wand tube and 3 shorter screws):



Then reattach the rails with the four screws that were removed earlier:



You can put the caps that covered the screws back in if desired. They do now have holes in them, but you can fill those holes before painting if that is something you want to do. Do not get any filler into the screw heads since you may want access to the inside sometime in the future and you will want to be able to uncover those screws!

Have fun and keep Bustin!