

Instructions for Seagull Bluetooth Speaker Retrofit



Rev B1

<https://seagullelectronickits.com/>

Congratulations on your purchase of the Seagull Bluetooth Speaker PCB. This is the only Bluetooth retrofit designed specifically for antique radios. Your retrofit radio will provide outstanding audio while maintaining the look, feel, and user experience of the original. These notes provide guidance so you can take full advantage of the Seagull PCB's features and update your radio so it will be enjoyed for many years.

For the best results, we recommend the following:

- Watch our retrofit video. (<https://youtu.be/UbzPoQOolzY>) It shows how to do the retrofit and includes many tips and tricks.
- Read the section [Key Considerations for the Retrofit](#) on page 2. It will serve as your guide to the rest of the instructions.
- Read the Section [Items in the Parts Bag](#) on Page 10. It describes the pieces in the parts bag.
- Plan your retrofit before you start. If you need help, send email and we'll help you.

You can download these instructions from our website www.seagullelectronickits.com.

Important Notice

The PCB can be damaged by static electricity. When you handle the PCB, follow these guidelines to protect it from static damage:



- Whenever handling or wiring the PCB, place the anti-static wrist strap on your wrist and connect the alligator clip to the radio chassis or another grounded surface. (the metal back of your desktop computer is ideal)
- Handle the board by its edges only.
- Leave the PCB in its anti-static bag until you are ready to install it.
- Use the [Mounting Template](#) on page 17 instead of the PCB for locating mounting holes and routing/cutting wire.
- Do not “bench test” the PCB by itself on a workbench. Test it after it is fully installed in the radio.

Key Considerations for the Retrofit

Soldering Tools

If you don't have a soldering iron, we recommend the Plusivo Soldering kits. They have a range of kits, but [this one](#) is available on Amazon for about \$12.00 and works great.

Power Cord

The kit does not include a power cord. The power cord from any computer or monitor will work. You probably have one sitting around your home or at work. [Power cords with a right-angle connection at the power supply](#) are often preferred because they take up less room in the radio chassis or cabinet.

Speaker

If your radio is pre-WWII, it probably has a field coil speaker, and you will have to replace it with a modern 4 or 8 Ohm speaker. In most cases, you will need to cut an adapter plate from thin plywood as shown in the instruction video at 6:35. See [Speakers](#) on page 4 for guidance on selecting a speaker.

Knobs and Potentiometers

The knobs on the original radio are mated to the shafts of the original potentiometers that are mounted in the radio chassis. For the retrofit, you will replace the old potentiometers with the ones provided in the kit¹. For most antique radios, you'll just need to shorten the shafts of the new potentiometers and file a flat side in the shaft. See the instruction video (at 4:16 and 11:08) for guidance on trimming the shafts.

If the shaft of an original potentiometer has a cut in the middle of the shaft, if a potentiometer has an inner and outer knob, or if the shafts of the potentiometer from the kit are too short, get in touch with us and we'll help you find a solution.

Placing the PCB in Your Radio

Cut out the [Mounting Template](#) from page 17 and use it (instead of the PCB) to determine where the PCB will mount in your radio and where to drill pilot holes for the mounting screws. Do not install the PCB in the metal chassis or the Bluetooth radio signal will be blocked. For best Bluetooth connectivity, mount the PCB in the upper part of the cabinet and as far away as possible from any large metal parts.

¹If your radio has been sitting for many years, the old potentiometers may have internal corrosion, or they may fail once you begin using them. We recommend that you use the new potentiometers but zip-tie the old ones in the chassis to preserve the radio's originality.

Placing the Power Supply in Your Radio

Use the two “D-Rings” and the large zip ties to secure the power supply to the cabinet as shown at 9:59 in the retrofit video. You can also remove some of the electronic components in the radio’s chassis and place the power supply inside where it won’t be seen. If the AC power cord causes the power supply to take up too much room, consider a 90° power cord like [this one](#).

Dial Lights

The PCB will drive up to four incandescent dial lights or three LEDs². In nearly all cases, you will be able to install the bulbs from the kit into the original sockets and reuse the wiring connecting the sockets. Antique radios use two different methods for connecting dial lights. See [Dial Lights](#) on page 5 for guidance on connecting them. Sometimes customers stress over shorting the dial lights to ground and damaging the PCB. Don’t worry – if you short the dial light outputs to ground, the PCB will protect itself. Just cycle power, fix the problem, and try again!

Aux Audio

The Seagull Retrofit has a Line Level stereo audio input so you can connect your CD player, modern turntable³, or other audio source. The audio jack and switch included with the kit are used for connecting and playing Aux audio. The instruction video (8:26) provides guidance for installing the jack and switch. The jack is a standard 3.5 mm stereo jack that will connect to your device with a 3.5 mm to RCA stereo audio cable like [this one](#).

Wiring

Use the [Wiring Diagram](#) on page **Error! Bookmark not defined.** and the Instruction video (12:30) for guidance on doing the wiring. Note the use of the uninsulated buss wire used as a central ground point. (it is shown on the wiring diagram but not part of the video) Also, instead of using the screws on the Aux switch, just remove them and solder to the terminals. Finally, when connecting stranded wire to the green terminal blocks, do NOT tin the wire with solder – tinned connections can loosen over time. Tighten the screws and give the wires a gentle tug to make sure they are secure.

Tape the [Mounting Template](#) from page 17 to the radio cabinet so you can mark the mounting screw locations and do the wire routing, cutting, and stripping without having to expose the PCB to static electricity. Without the PCB, you don’t have to wear the wrist

² You can add as many LEDs as you wish, but brightness will decrease with more than 3. If you like lots of light, you can use both incandescents and LEDs.

³ Modern turntables have an internal phono preamplifier, so they output line levels. If you use the antique turntable, you’ll need a preamplifier.

strap! After preparing the wires, put on the wrist strap, connect the wires to the PCB and secure it in the cabinet.

Using Your Radio

It's easy to pair and connect to the Seagull PCB. [Using Your Radio](#) on page 8 will give you additional guidance.

Speakers

The Seagull PCB provides high quality audio, and antique radios make great speaker cabinets. This section provides guidance for selecting and mounting a speaker.

- Do not buy an inexpensive speaker with a high-power rating. These speakers are often rated for 100 or 200 Watts. The PCB outputs a maximum of 25 Watts, so the speaker would be underdriven and sound lean. A speaker with a 40 ~ 80-Watt RMS rating will provide the best sound.
- Buy a full range speaker. The PCB will only drive one speaker, so you need one that covers the full frequency range.
- The PCB will drive 4, 6, or 8 Ohm speakers. A 4 Ohm speaker will be slightly (3 dB) louder than an 8 Ohm speaker.
- You don't need to replace your speaker with one that is the same diameter. Modern speakers are very efficient, and 8 inches is as large as you'll ever need. If needed, cut a plywood adapter plate that seals the front of the radio as shown in the video (6:34)
- If your radio doesn't have a back, don't install one. Radios are usually placed with their backs to the wall and that is sufficient.

There are many speaker options. If you find one you like, send us a link and we'll look at it. We recommend the Visaton speakers because they are high quality, affordable, and available. Visaton also provides excellent datasheets with mechanical dimensions. You can buy them at [Amazon](#), [DigiKey](#), or [Parts Express](#). Here are a few of our favorites:

Model	Diameter	Depth (front to back)	Impedance	Approximate Cost
FX-10	4 inches	1.8 inches	4 Ohms	\$29.00
FR-13	5 inches	1.8 inches	4 Ohms	\$22.00
FR 6	5 Inches	2.32 inches	8 Ohms	\$29.00
FX-16	6.5 inches	2.4 inches	4 Ohms	\$37.00
BG-20	8 Inches	3.5 inches	8 Ohms	\$49.00

Dial Lights

Dial Light Wiring

Antique radio dial lights are typically wired using one of the two configurations shown in Figure 1 and Figure 2 below.

Figure 1 shows sockets with single wire connected to them. Your radio may have one or more of these sockets. The power for the sockets comes from the wire, and the ground path is the mechanical connection between the socket and the radio chassis. To reduce stress on the socket, cut the wire an inch or so from the socket and splice the gray wire as shown in the video (15:05)

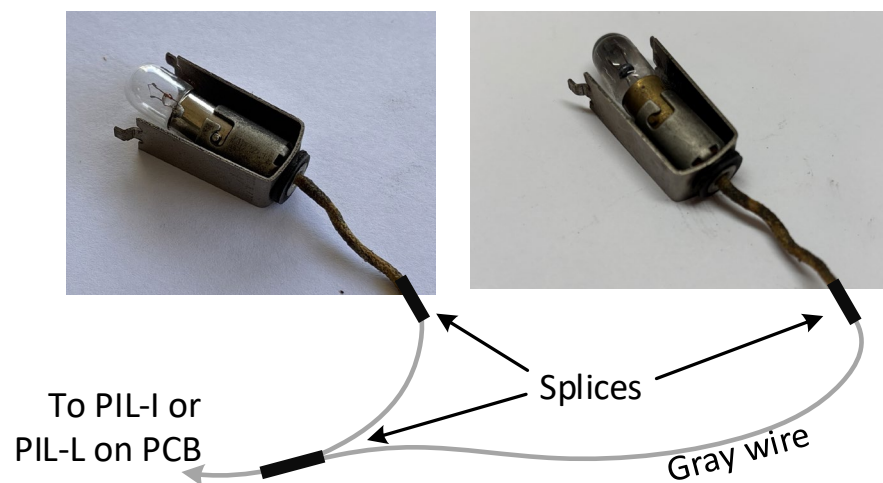


Figure 1 - If the dial lights on your radio have a single wire connected to them, connect as shown. Use heat shrink tubing to insulate the splices.

If the radio has multiple dial lights, they are likely connected as shown in Figure 2. The wires are connected together at each socket, and the current flows from the wire to each bulb, and then through each mechanical connection to the chassis ground. The wiring between the sockets may look bad, but you can usually reuse it. To reduce stress on the socket, cut the wire an inch or so from the socket and splice the gray wire as shown in the video (15:05)

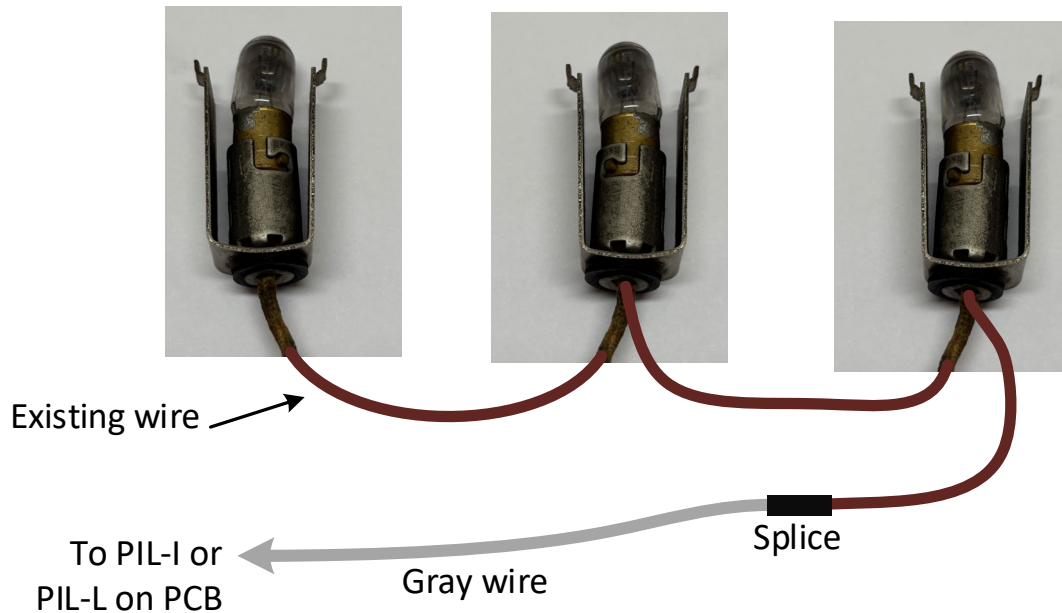
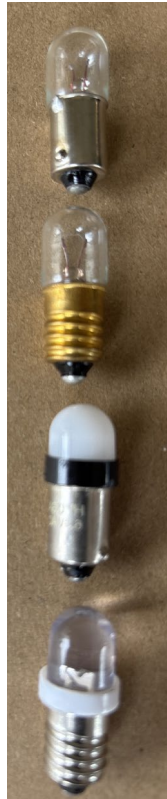


Figure 2 - if the dial lights on your radio have two wires connected to them, connect as shown. Use heat shrink tubing to insulate the splices.

Types of Dial Lights

Your radio likely has either the incandescent bayonet base or incandescent screw base dial lights as shown in Figure 3. You can use any of the lights shown in Figure 3. The kit contains bayonet base bulbs since they are the most common. The advantage of incandescents is their warm glow, however, they will need to be replaced after about 1000~2000 hours. The LEDs have a slightly harsher glow but will last much longer.

When wiring the dial lights, connect incandescent lights to PIL-I (J1-4) and LEDs to PIL-L (J1-5).



(a) - Incandescent, Bayonet Base
6.3V, Type 47, BA9s Base

(b) - Incandescent, Screw Base
6.3V, Type 47, E10 Base

(c) - LED, Bayonet Base
6.3V, ~22 mA, 2700°K, BA9s Base

(d) - LED, Screw Base
6.3V, ~22 mA, 2700°K, Screw Base

Figure 3 - Dial lights that can be used for the Seagull retrofit

Replacement Dial Lights

Replacement dial lights are readily available from many sources. When searching for them, use the terms shown in Figure 3. Here are some links where they can be purchased:

[Incandescent, Bayonet Base](#)

[Incandescent, Screw Base](#)

[LED, Bayonet Base](#)

[LED, Screw Base](#)

Adjusting the LED Brightness

The programmable shunts shown in Figure 4 below can be installed if you are using more than one LED. Make sure to wear the wrist strap when installing or removing shunts.

- If you are using only one LED, do not install either C1 or C2.

- If you are using a total of two LED's, you can install the shunt at C1 to make them brighter. Do not install the shunt at C2 because it will overdrive the LED.
- If you are using three or more LED's, you can install shunts at C1 and C2 to make them brighter.
- You can add as many LEDs as you want, but the additional LEDs will reduce the brightness of all the LEDs.

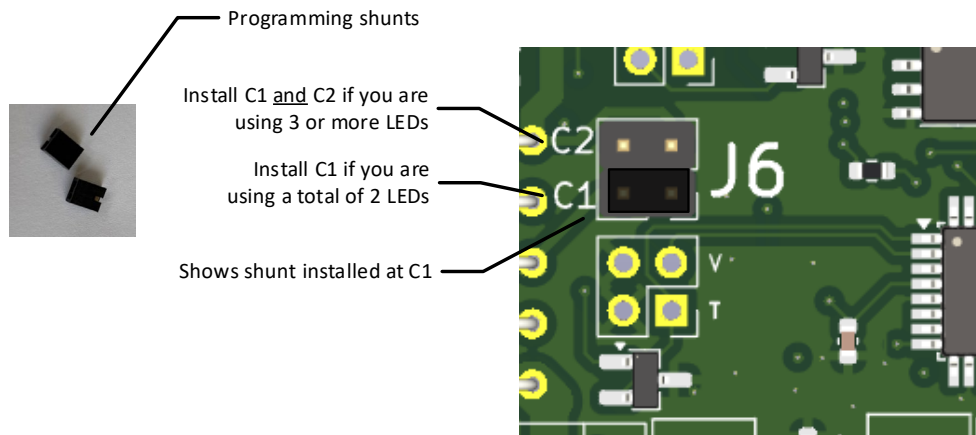


Figure 4 – Programming shunts at C1 and C2 are used to increase brightness if you are using more than one LED

Using Your Radio

Turning on the Power

Turn the On/Off/Vol knob fully counterclockwise so it clicks off. Place the Aux switch in the OFF position. Plug the radio into the wall and turn it on with the On/Off/Vol knob.

If you connected the Pair input (J1-2) to ground with a jumper wire, the dial lights will flash, indicating the PCB is in the pairing mode. If you installed a pairing switch, turn it on and the dial lights will flash.⁴

Connecting to Your Phone and Playing Audio

With the dial lights flashing, go to “Settings” on your device (phone or computer) and click “Add new Bluetooth Device.” You will then see the pairing message, “Seagull⁵.” Click on it and the dial lights will turn on solidly. Your device is now paired and connected to your

⁴ If the lights are on solid, it is because either the pairing input (J1-2) is not grounded or because the Aux switch is in the ON position. If the lights don't turn on, continue with the pairing process. If it pairs and plays music, the problem is that the dial lights are incorrectly wired.

⁵ If you specified a custom pairing message, you will see it instead of “Seagull” on your device.

radio, and you can play audio. Adjust the volume using either your device or the On/Off/Vol knob.

The device and radio will remain paired when they are turned off. (In Bluetooth-speak “paired” means that the devices have been introduced and are allowed to “connect.”) The next time you turn on the radio, your phone will show the Seagull in its list of devices, and you’ll just need to connect to it.

Playing Aux Audio

Connect the cable between your device and the Aux connector on the back of the radio. Then switch the Aux switch to the ON position and play your music. Since Aux mode disconnects your phone from the radio, you can only adjust the volume with the On/Off/Vol knob.

To exit Aux mode, just turn the Aux switch off. The dial lights will flash, and you can reconnect with your phone.⁶

Reducing the Output Level Range for a Small Radio

If you installed the retrofit in a smaller radio, you may want to limit its output power. Get in touch with us and we’ll show you how to configure the PCB for reduced audio power.

⁶ If you try to connect your phone to the radio when it is in Aux mode, the dial lights will blink quickly for several seconds to remind you that it will not connect in Aux mode.

Items in the Parts Bag

This section describes each of the pieces in the Parts Bag.



Figure 5 - The Anti-Static Wrist Strap should be worn whenever you work with the PCB.

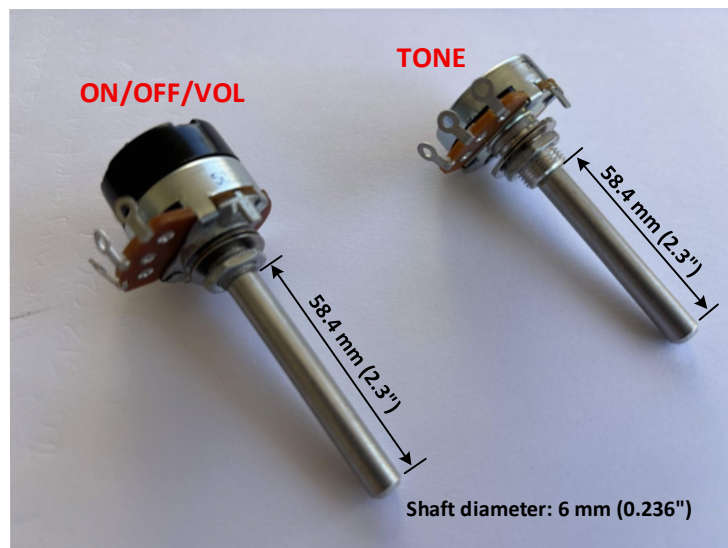


Figure 6 - The On/Off/Volume and Tone Potentiometers replace the original potentiometers. They mount in the metal radio chassis. In rare cases they can be mounted to the wooden cabinet face using the Potentiometer Mounting Plates and screws

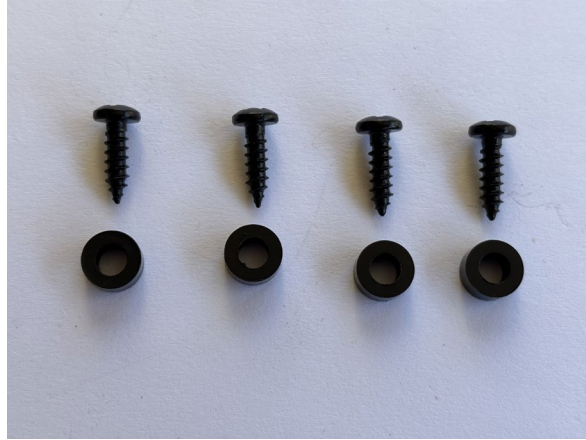


Figure 7 - The PCB Mounting Screws and Spacers are used to secure the PCB to the radio cabinet. A shallow pilot hole makes installation easier.

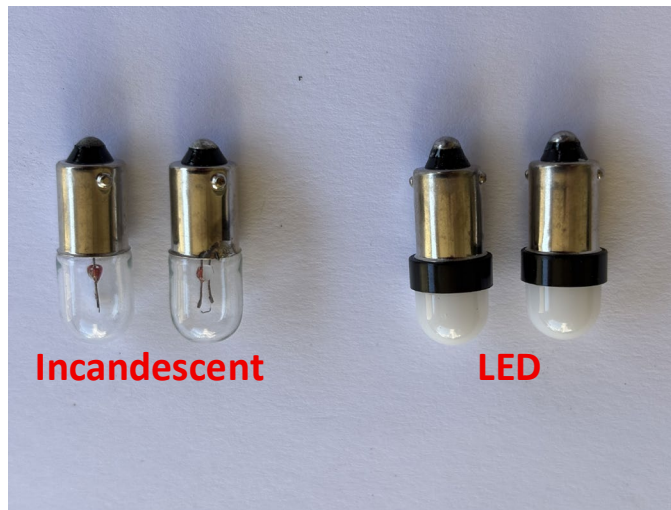


Figure 8 - Incandescent and LED Bulbs replace the original dial lights.

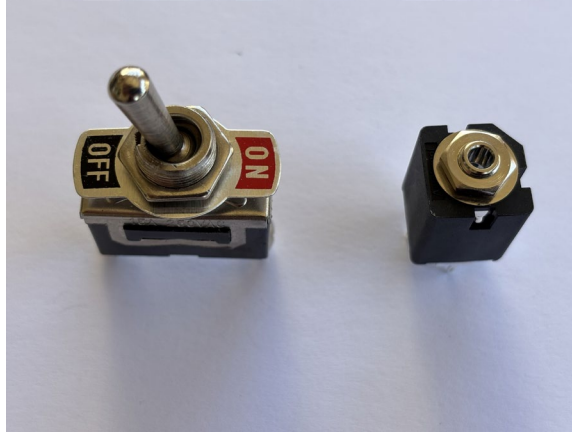


Figure 9 - The Aux Audio Panel Switch and Audio Jack are used for auxiliary audio sources such as CD players or turntables. They are typically mounted on the rear of the metal radio chassis.



Figure 10 - Wire is used to connect the components in the system to the PCB. The wiring diagram shows where each color should be used.

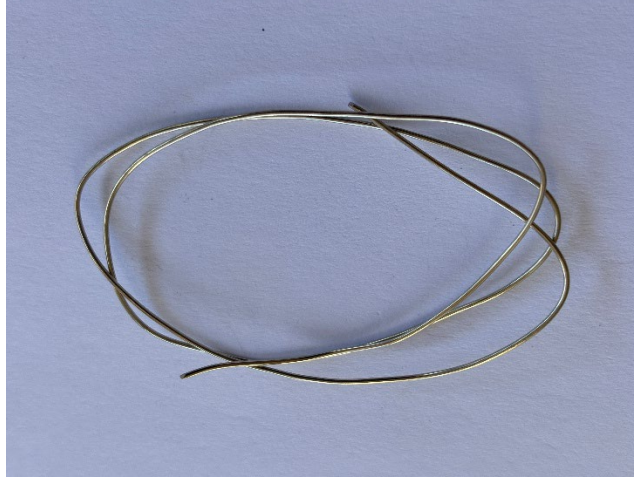


Figure 11 - Uninsulated buss wire is used to create a convenient ground rail in the radio chassis.



Figure 12 –Heat shrink tubing is used to cover wire splices. When heated it will shrink snugly around the splice. Many online sources show how to apply heat

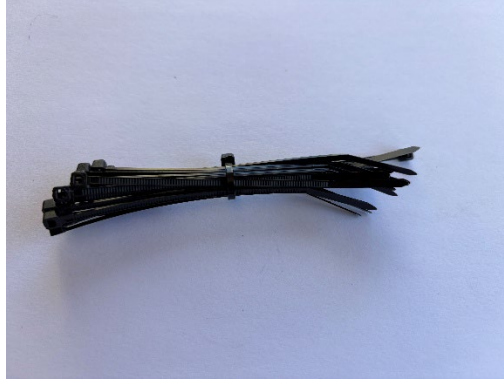


Figure 13 –Small zip ties are used to bundle the wires between the PCB and chassis for a clean appearance.

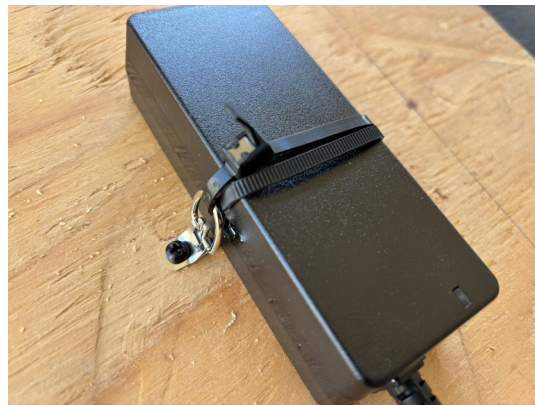
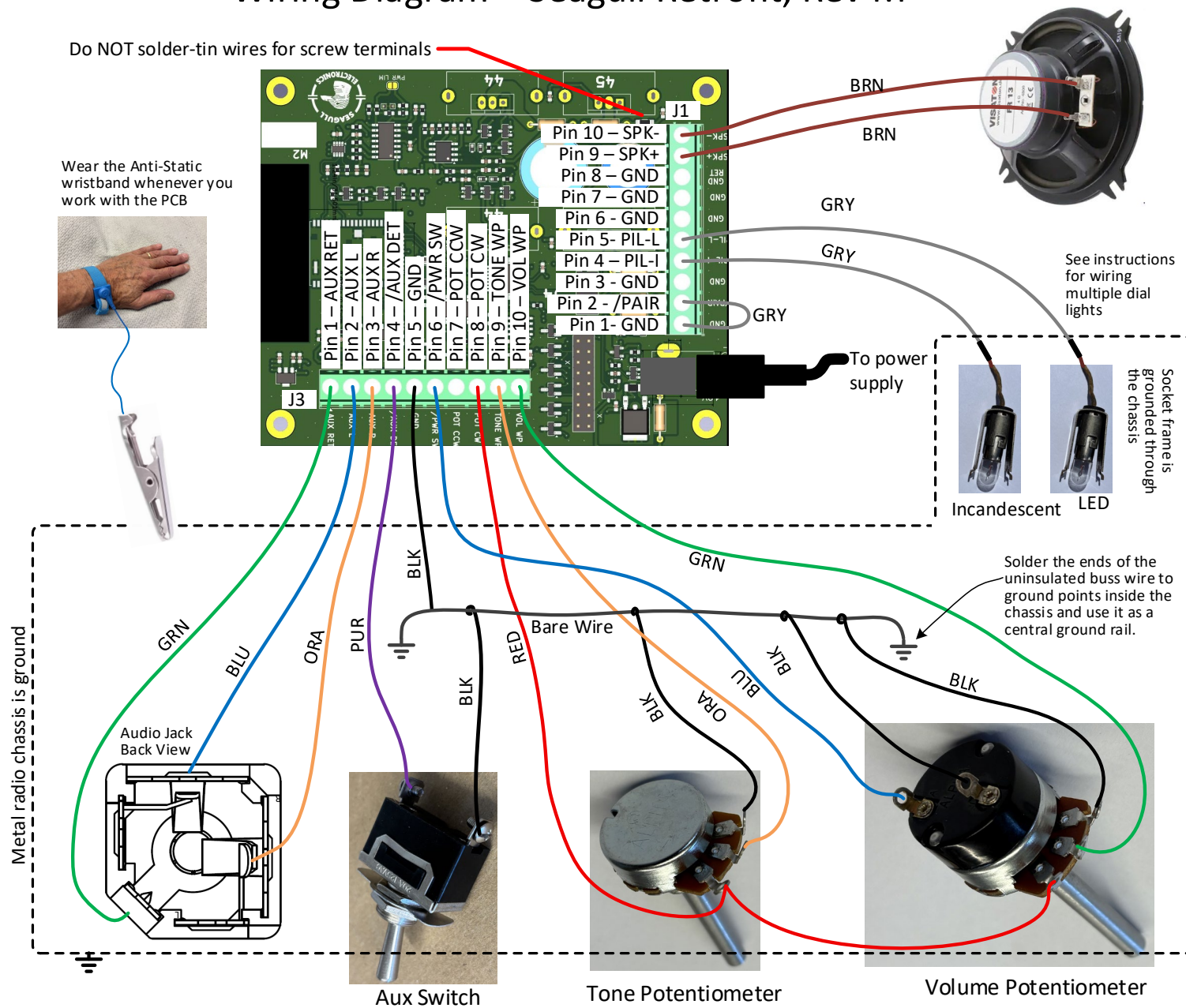


Figure 14 - Large zip tie, D-Rings, and screws are used to secure the power supply to the cabinet.

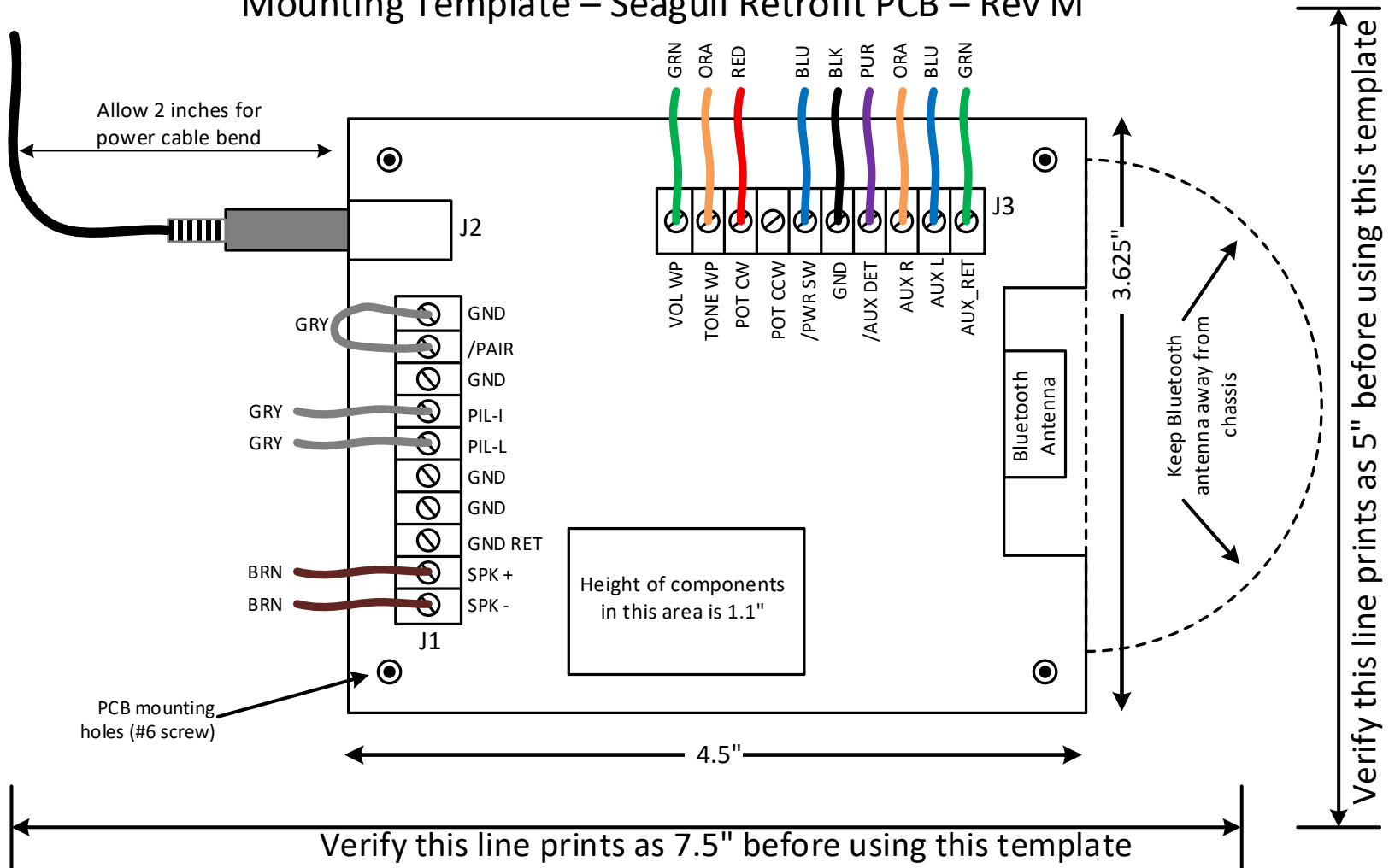


Figure 15 - Pot Adapter Plates and Screws. In rare instances you'll have to mount the pots to the inside of the cabinet using these plates and screws instead of mounting them in the metal chassis.

Wiring Diagram – Seagull Retrofit, Rev M



Mounting Template – Seagull Retrofit PCB – Rev M



Specifications

Power Supply Input Voltage Range	90 – 264 VAC
Power Supply AC Connector	IEC 320-C14
Maximum Continuous Audio Power (1% THD), 8 Ω speaker	12 Watts
Maximum Continuous Audio Power (1% THD), 4 Ω speaker	24 Watts
Frequency Response (3 dB)	65 Hz to 7500 Hz
Idle noise	< 1.5 mVAC measured in 11 kHz bandwidth at full volume.
Aux Input Level	Audio Line Level
Physical Dimensions	See Mounting Template (page 17)