

Instructions for Seagull Bluetooth Speaker Retrofit



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<https://seagullelectronickits.com/>

Congratulations on the 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 doing the following:

- Watch our retrofit video. (<https://youtu.be/UbzPoQOolzY>) It shows the entire retrofit and includes many tips and tricks.
- Read this document. It contains details not shown in the video.
- Read the instructions for the [Potentiometer and Wiring Kit](#). They show how to wire all the components.
- Plan your retrofit before you start. If you need help, send email and we'll help you.
- Retrofit your radio. Hopefully you'll enjoy the process as much as we do!

You can download [these instructions](#) and the instructions for the [Potentiometer and Wiring Kit](#) at www.seagullelectronickits.com. The hyperlinks in these documents will save you time scrolling through them.

Important Notice

If you are working in a low-humidity environment, and you are feeling sparks when you touch doorknobs or other metal surfaces, you need to take precautions to prevent static damage to the PCB. If the humidity is low, the risk of damage is lower.



When you handle the PCB, follow these guidelines to protect it from static electricity:

- Leave the PCB in its anti-static bag until you are ready to install it.
- Discharge yourself to a metal surface such as the legs of your workbench before touching the PCB or wires connecting to it.

Document Organization

These notes are divided into four sections:

- [Features and Configuration](#) – This section contains all the details you’ll need for a successful retrofit.
- [Reference Material](#) – This section summarizes all the connections and programming shunts/jumpers on the PCB.
- [Specifications](#) – This section shows performance specifications and mechanical dimensions.
- [Suggestions for Speakers](#) – This section shows sources for speakers.

Features and Configuration

Terminology Used for Connectors, Jumpers, and Shunts

In this document, connector screw terminal connections are referenced as JX-Y where X is the connector number, and Y is the number of the screw terminal. Connector locations and pin numbers are shown in Figure 4.

Solderable jumpers and removable shunts are used for configuring the PCB. Solderable jumpers are referred to as JPX where X is the number of the jumper. Locations of the solderable jumpers and shunts are shown in Figure 4.

Wiring to the Terminal Blocks J1 and J3

When connecting stranded wire to terminal blocks, do NOT tin the wire with solder – tinned connections can loosen over time. Tighten the screws to 3.1 – 3.5 in-lb.

Speaker

If your radio is pre-WWII, it likely has a field coil speaker, and you will have to replace the speaker with a modern 4Ω, 6Ω, or 8Ω speaker. See the [Suggestions for Speakers](#) section for speaker suggestions. To maintain the radio’s collectability, do NOT discard the original speaker. If your radio has a large cabinet, secure the original speaker somewhere in the cabinet to prevent it from getting separated from the radio.

Do NOT connect either speaker connection (SPK+ or SPK-) to ground.

Bluetooth Antenna and Range

The Bluetooth antenna is located on the Seagull PCB as shown in Figure 4. Do not install the PCB in a metal enclosure (such as the chassis), or the RF signal will be blocked. For best Bluetooth connectivity, mount the PCB in the upper part of the cabinet and at least a

few inches from any large metal parts. You should be able to play the powered speaker from about 30 feet if the path is not blocked. The distance decreases if there are walls between your phone and the powered speaker.

Power Connection

An 18 VDC power supply was included with the Seagull PCB. It connects to connector J2.

On/Off Switch

The Seagull PCB is always powered by the 18 VDC power supply. The on/off switch causes the powered speaker to exit the standby mode and turn on. When turned on, the dial lights illuminate, and you can play audio. The Seagull PCB is turned on by grounding J3-6 (/PWR SW). To use the original on/off/vol control knob, disconnect it from the radio's circuitry and connect the switch terminals between J3-6 (/PWR SW) and ground as shown in Figure 3.

If you use a different switch, connect it as shown in Figure 2

Dial Lights

The Seagull PCB will drive the dial (pilot) lights on the radio when it is turned on by the on/off switch. For a traditional look, use a Type 47 (6.3V) incandescent bulb. If you don't want to change dial lights when they wear out (typically after about 1000 hours), use Type 47 LED replacements. Both incandescent and LED dial lights are included in the Potentiometer and Wiring Kit.

The PCB has a connection J1-4 (PIL-I) for an incandescent dial light and a separate connection J1-5 (PIL-L) for an LED dial light. Make sure to use the correct connection for the bulb you select.

Connector pin J1-4 (PIL-I) can drive up to three Type 47 (6.3V) incandescent bulbs connected in parallel as shown in Figure 3. The bulbs are driven by Pulse Width Modulation (PWM), so if you connect a DC multimeter across the bulbs you will only read about 2.4 VDC, but they will have the same brightness, power consumption, and service life as when they are driven with 6.3 VDC or 6.3 VAC. If you are curious about why the DC meter reads 2.4 VDC, see [this article](#). Output pin J1-4 (PIL-I) has crowbar short circuit protection, so if you accidentally short it, just cycle the 18 VDC power.

Output pin J1-5 (PIL-L) will drive up to 3 Type 47 LED replacements in parallel as shown in Figure 3. If there is one LED, do not install shunts C5 or C6. If there are two LEDs install configuration shunt C5. If there are three LEDs, install configuration shunts C5 and C6. Output pin J1-5 (PIL-L) is short circuit protected.

Audio Output Power

The Seagull PCB is configured from the factory for 12 Watts into an 8Ω speaker or 24 Watts into a 4Ω speaker. 12 Watts is sufficient for most upright consoles and larger tabletop units, so simply connecting the Seagull PCB to an 8Ω speaker will work for most retrofits. If more power is desired, use a 4Ω speaker.

Audio power, volume and soft limiting are configured by solderable jumpers JP2, JP3, and JP4. If you are retrofitting a smaller radio, you can reduce the maximum power to 1.9 Watts (8Ω) or 1.25 Watts (8Ω) by installing jumper JP2. See Table 1.

If you like loud music, removing solderable jumper JP2 allows the volume knob to raise the audio level past the point of amplifier distortion. If JP2 is removed, it is recommended that JP4 remain installed to reduce distortion effects.

Table 1 below shows the configuration options for output power.

JP3	JP2	Maximum Power (8 Ω)	Notes
Open	Open	12 W	Allows volume to be raised past the clipping point of the amplifier. Recommend installing JP4 to minimize effects of amplifier clipping.
Open	Closed	12 W	Default configuration. Clipping rarely occurs at maximum volume.
Closed	Open	1.9 W	Use for radios with smaller speakers. Amplifier will not clip.
Closed	Closed	1.25 W	Use for radios with smaller speakers. Amplifier will not clip.

Table 1 – Jumper Selections for Audio control with an 8Ω speaker. These power levels double if a 4Ω speaker is used.

Volume Control

Volume can always be controlled by the Bluetooth host device (phone/computer). The Seagull PCB also allows volume to be controlled by the volume potentiometer. (when you adjust the knob on the radio, you'll see the slider on your phone follow it)

If you are using the on/off/volume potentiometer from the Potentiometer and Wiring Kit, wire it as shown in the [Potentiometer and Wiring Kit Instructions](#). Then install the shunt on C1.

If you are reusing the original on/off/vol control, disconnect it from the radio's circuitry and connect its terminals as shown in Figure 3. If the potentiometer on the radio has an audio

taper, connect the programming shunt across C1. If the potentiometer has a linear taper, do not install the shunt. If you are not sure of the taper, rotate the volume control while watching the volume slider on your phone. If the slider moves to the halfway position when the knob is halfway, the shunt across C1 is correct. The Seagull PCB will work with potentiometers between 1 k Ω and about 800 k Ω . Audio is not passed through the volume control potentiometer, so there is no need to shield the wiring between the potentiometer and the Seagull PCB.

If you want to control the volume using your phone only, connect two resistors between J3-8 (POT CW), J3-7 (POT CCW), and J3-10 (VOL WP) as shown in Figure 2. If you want minimum volume when the Seagull PCB turns on, connect J3-10 (VOL WP) to ground. Do NOT leave J3-10 (VOL WP) disconnected.

Tone Control

The Seagull PCB supports a potentiometer for adjusting tone. If your radio did not have a tone control knob, you can remove the original rotary band switch and replace it with a potentiometer.

If you are using the tone potentiometer from the Potentiometer and Wiring Kit, wire it as shown in the [Potentiometer and Wiring Kit Instructions](#). Then make sure there is no shunt on C2.

If your radio has a tone control knob, and you want to reuse it, disconnect it from the radio's circuitry and connect its terminals as shown in Figure 3. If the potentiometer on the radio has an audio taper, connect the programming shunt across C2. If the potentiometer has a linear taper, do not install the shunt. If you are not sure of the taper, try the shunt in both configurations and see what sounds best. The Seagull PCB will work with potentiometers between 1 k Ω and about 800 k Ω . Audio is not passed through the tone control potentiometer, so there is no need to shield the wiring between the potentiometer and the Seagull PCB.

If you do not want to have a tone control knob, you can configure a fixed tone setting by connecting resistors between J3-8 (POT CW), J3-7 (POT CCW), and J3-9 (TONE WP) as shown in Figure 2. Table 2 below provides resistance values for different levels of bass or treble boost. You can also use a potentiometer instead of the resistors to get a more accurate tone setting. Do NOT leave J3-9 (TONE WP) disconnected.

R ₁	R ₂	Note
0	4.7k	9.6 dB bass boost
750	3.9k	6 dB bass boost
1.5k	3.3k	3 dB bass boost
2.7k	2.7k	0 dB bass boost (flat audio)
3.3k	1.8k	1 dB treble boost
4.7k	820	2 dB treble boost
4.7k	Short	2.6 dB treble boost

Table 2 – Resistor values for setting tone with programming shunt C2 should not be installed. See Figure 2 for connection details

Pairing and Connecting

Pairing is the process that a Bluetooth device (the retrofit) uses when it connects to a host (your phone) for the first time. The device and host remain paired even when they are turned off and on again, so you only need to pair a device once. The retrofit PCB can be paired to multiple devices simultaneously.

To play music through the retrofit, you need to *connect* to it. With the retrofit turned on, go to the settings on your phone, and you’ll see it as a Bluetooth device and tap “Connect.”

Additional information regarding pairing and connecting:

1. Whenever the Seagull PCB is turned on you will have to connect to it. It will not automatically connect back to the last Bluetooth source.
2. Before connecting a device to the Seagull PCB for the first time, the Seagull PCB must be placed in pairing mode, and the Bluetooth source must pair with it.
3. Once a device has paired with the Seagull PCB, it doesn’t need to be paired again. A paired device can connect to the Seagull PCB at any time.
4. If shunt C3 is not installed, the dial lights will flash in pairing mode. If C3 is installed, the dial lights will light solidly whenever the radio is on

Most customers do not use a pairing switch. If a short wire is connected between /PAIR (J1-2) and ground as shown in Figure 1, the Seagull PCB will enter pairing mode when turned on with the power switch. When the dial lights are flashing, you can either pair with it or connect to it. If the Seagull PCB pairs with or connects to a device, or if 5 minutes elapses, the Seagull PCB will exit pairing mode. With J1-2 permanently grounded, just turn the Seagull PCB off and on to force it to pairing mode.

If you want to control Bluetooth pairing from the front of the radio, disconnect two wires from the rotary band switch and use the band switch to ground /PAIR (J1-2) as shown in Figure 3. Grounding J1-2 causes the Seagull PCB to enter pairing mode for 5 minutes.

Aux Audio

The Seagull PCB will accept line level Aux audio from an analog stereo source such as a CD player or turntable¹. Grounding J3-4 (/AUX DET) enables the Aux Audio signal path. If you do not use Aux Audio, leave J3-1 (AUX RET), J3-2 (AUX L), J3-3 (AUX R), and J3-4 (/AUX DET) disconnected as shown in Figure 2.

When the device is placed in Aux mode, it disconnects from your phone, so you can only adjust volume with the knob on the radio.

See [Specifications](#) for the maximum audio level for Aux In.

Wiring Diagrams

If you have the Potentiometer and Wiring Kit, use the wiring diagram in Figure 1.

If you are an advanced installer, Figure 2 shows the Seagull PCB connections for minimum functionality and Figure 3 shows connections for full functionality. Connect your Seagull PCB to use the functionality you need.

¹ If your turntable does not have a preamplifier, you will need one. Most modern turntables have internal preamplifiers.

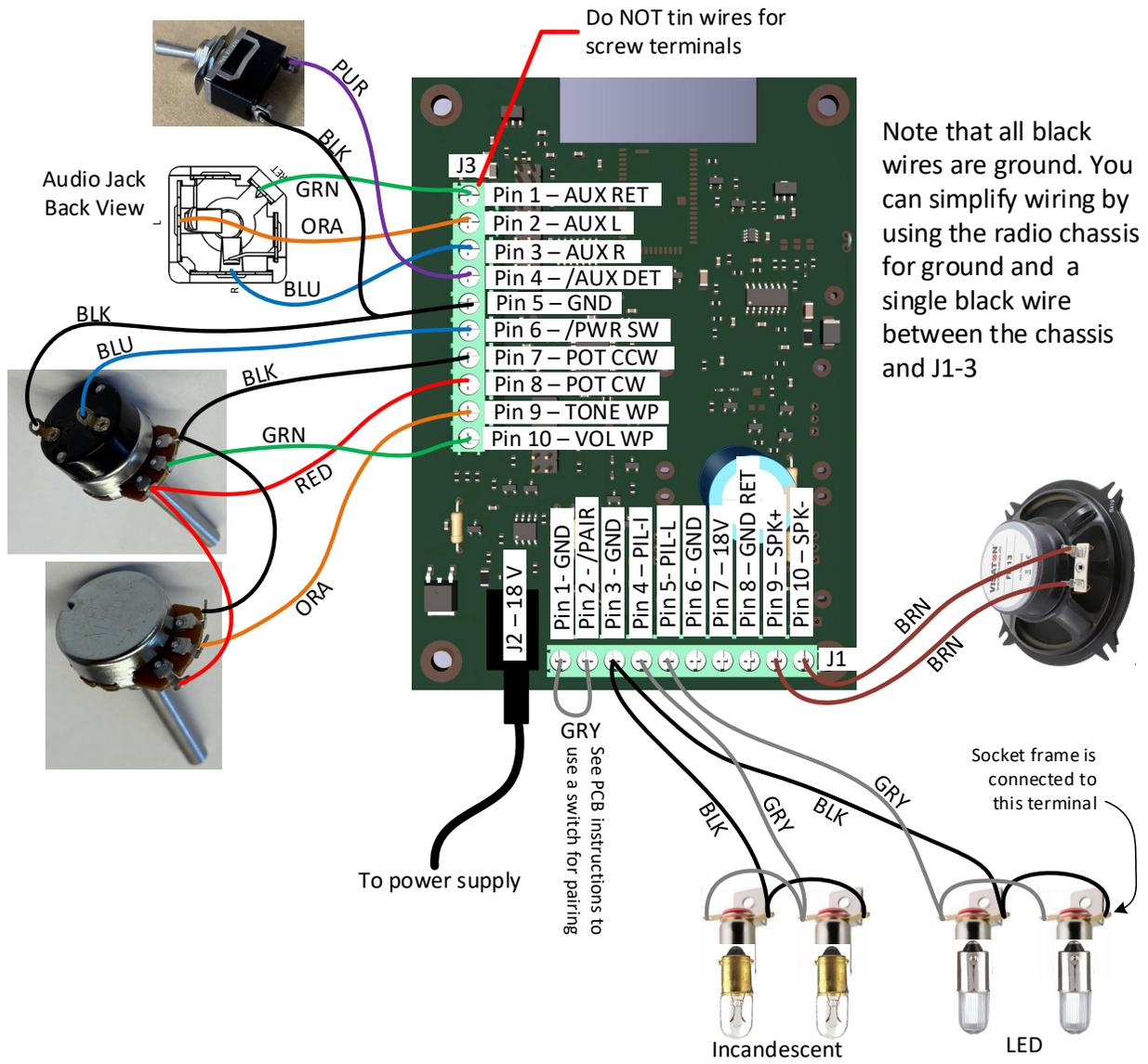


Figure 1 - Use this wiring diagram if you have the Potentiometer and Wiring Kit

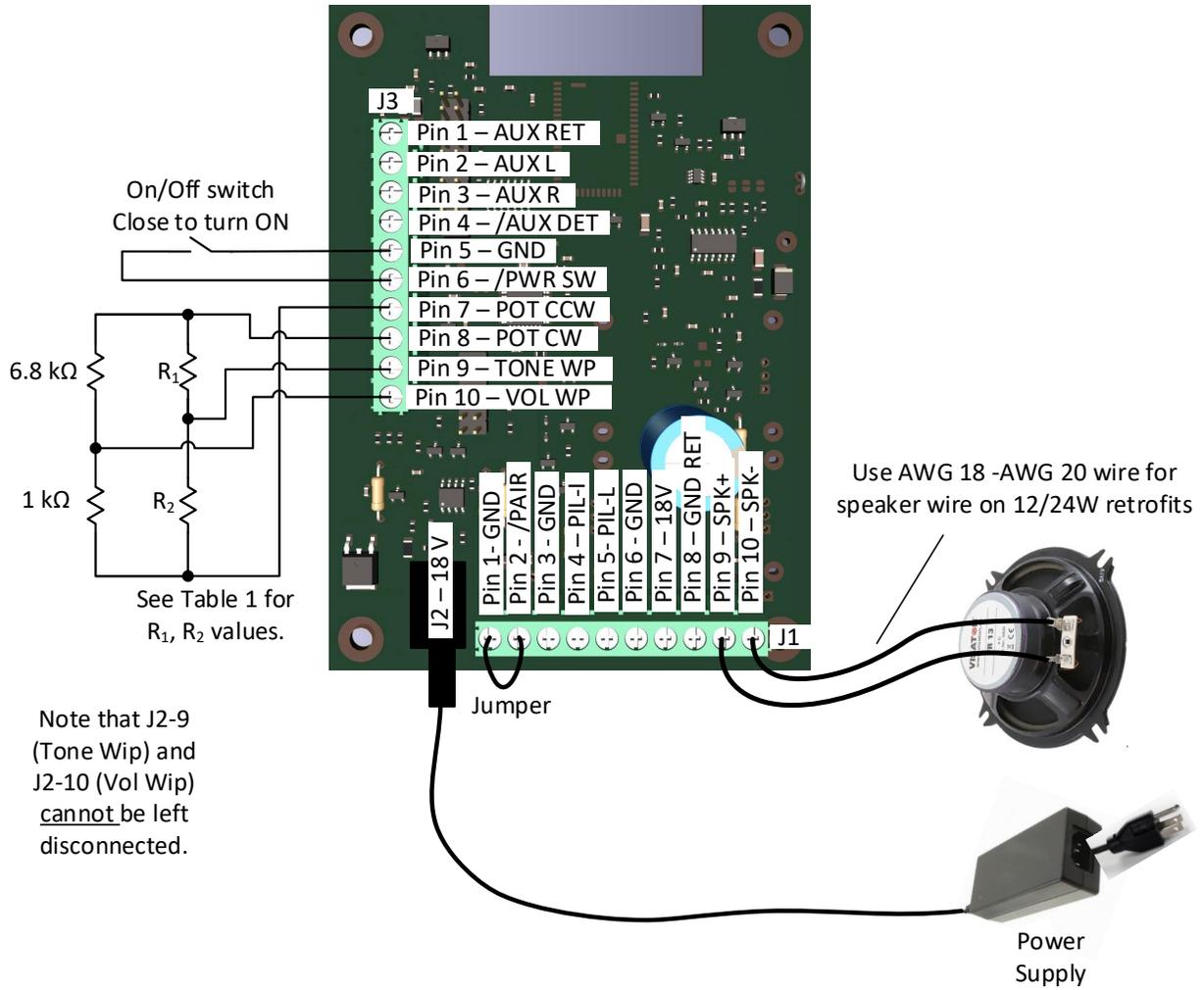


Figure 2 – Wiring diagram – Minimal functionality

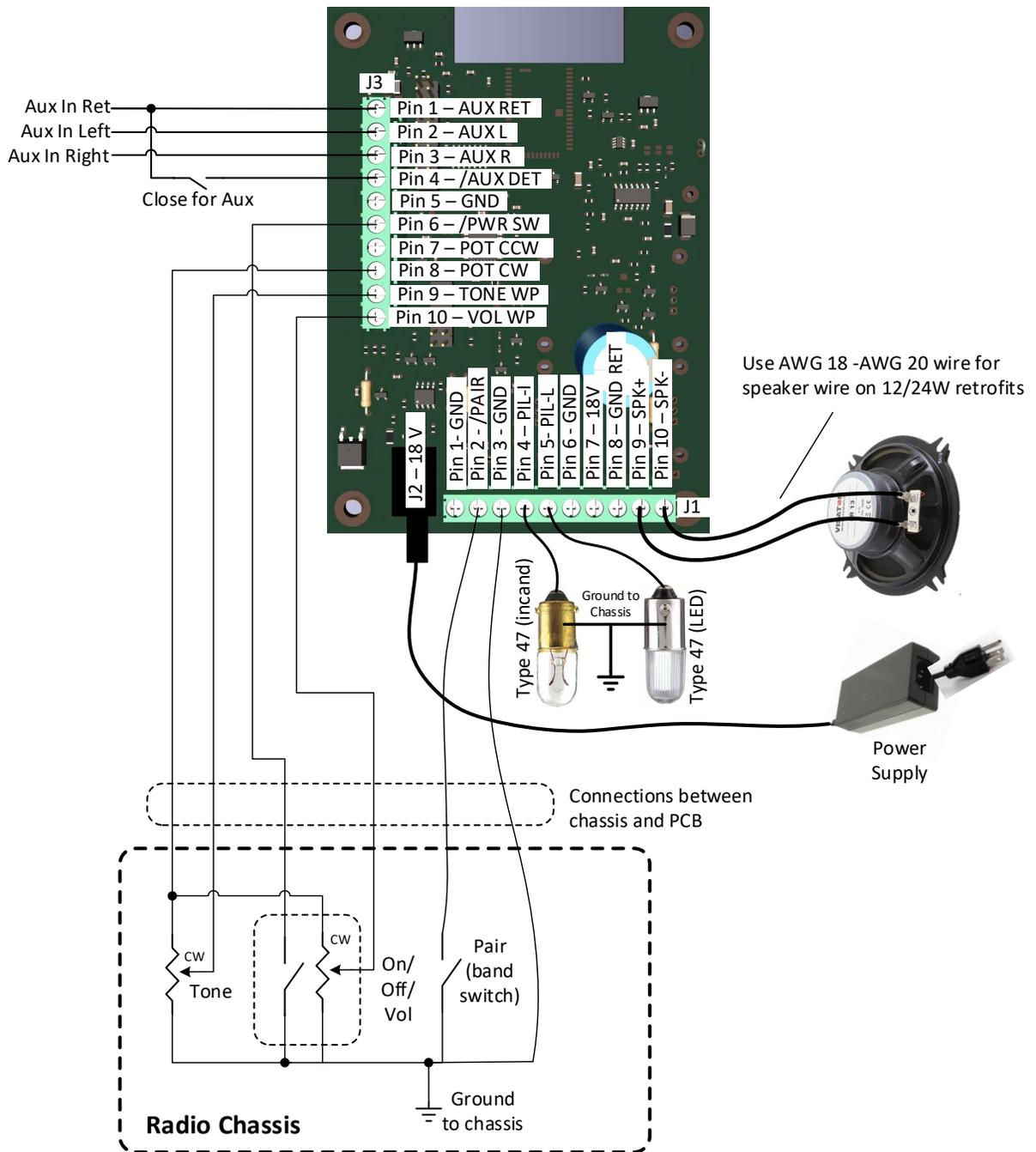


Figure 3 - Wiring Diagram - Full Functionality

Reference Material

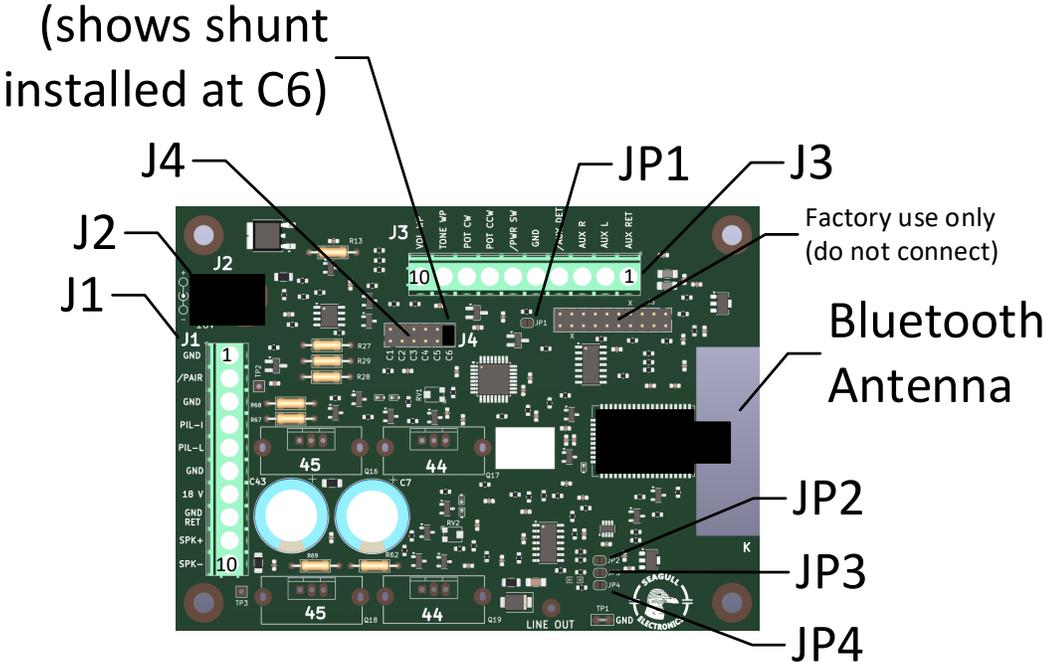


Figure 4 - Connector and Configuration Jumper Locations

Connector J1

Pin	Label	Description	Comments
1	GND	Ground	
2	/PAIR	Connect to ground to enter pairing mode. Ground permanently if you want the radio to enter pairing mode for 5 minutes when the speaker is turned on.	See Pairing Switch
3	GND	Ground	
4	PIL I	Drives type 47 (6.3V) pilot light. Up to 3 bulbs can be connected in parallel.	See Dial Lights
5	PIL L	Drives up to 3 Type 47 LED replacements in parallel.	See Dial Lights
6	GND	Ground	

Pin	Label	Description	Comments
7	18V	Connects to 18 VDC Power Source. No connection needed when power supply is connected to J2.	See Power Connection
8	GND RET	Connect to the ground return of the 18 VDC Power Source. No connection needed when power supply is connected to J2.	See Power Connection
9	SPK+	Connect to one terminal of 4Ω, 6Ω, or 8Ω speaker. Do NOT connect either speaker pin to ground!	See Speaker
10	SPK-	Connect to one terminal of 4Ω, 6Ω, or 8Ω speaker. Do NOT connect either speaker pin to ground!	See Speaker

Connections J3

Pin	Label	Description	Comments
1	AUX RET	Return for AUX Audio (GND on Seagull PCB).	See Aux Audio
2	AUX L	Left channel Aux input	See Aux Audio
3	AUX R	Right channel Aux input	See Aux Audio
4	/AUX DET	Connect to ground to select Aux input	See Aux Audio
5	GND	Ground	
6	/PWR SW	Connect to ground to turn powered speaker on	See On/Off Switch
7	POT CCW	Connect to ground (CCW of volume and tone pots)	
8	POT CW	Output – Connect to CW terminal of volume pot on radio.	
9	TONE WP	Connect to wiper of tone pot on radio	See Tone Control
10	VOL WP	Connect to wiper of volume pot on radio	See Volume Control

Configuration Shunts

Configuration shunts are provided with the kit. They are used to short pins on Connector J4 as shown below.

Position	Shunt Installed	Shunt Removed
C1	Audio taper pot used for volume.	Linear pot used for volume. See Volume Control .
C2	Audio taper pot used for tone.	Linear pot used for tone. See Tone Control .
C3	Dial lights solid when speaker is on.	Dial lights flash in pairing mode. See Pairing .
C4	Unused	Unused
C5	Additional LED	See Dial Lights
C6	Additional LED	See Dial Lights

Solderable Jumpers

See [Audio Output Power](#) for functionality of JP2, JP3, and JP4.

Specifications

Maximum Continuous Audio Power (1% THD), 8Ω speaker	12 Watts
Maximum Continuous Audio Power (1% THD), 4Ω speaker	24 Watts
Frequency Response (3 dB)	90 Hz to 18.2 kHz
Standby Power Supply Current (18 VDC) (excludes dial light current)	< 50 mA
Idle noise	< 1.5 mVAC measured in 11 kHz bandwidth at full volume.
Aux Input Level	< 5.0 Vpp on L or R channel
Physical Dimensions	See Figure 5 below

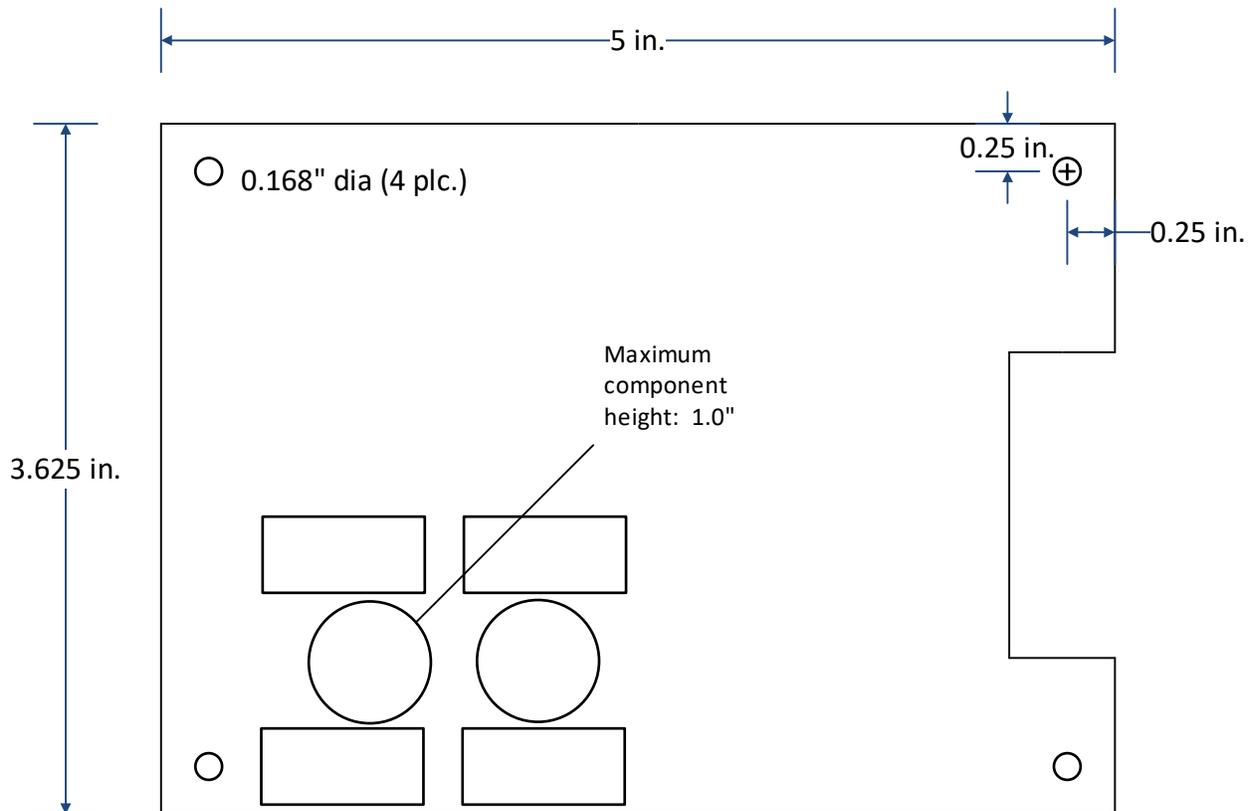


Figure 5 - Seagull PCB Dimensions and Mounting Hole Locations.

Suggested Speakers

[Speaker, Visaton BG-17, 8Ω, 6.5”](#)

[Speaker, Visaton BG-20, 8Ω, 8”](#)

[Speaker, Visaton FR-14, 4Ω, 5”](#)

[Speaker, Visaton W200 S – 8 Ω, 9.1”](#)

[Speaker, Visaton W200 – 8 Ω, 8.1”](#)

[Speaker, Visaton W200 – 4 Ω, 8.1”](#)