

PROJECT NAME

RADIAN

BASED ON

Dallas Rangemaster

EFFECT TYPE

Germanium treble booster

BUILD DIFFICULTY

■■■■■ Easy

DOCUMENT VERSION

1.0.3 (2024-08-08)

qion
DIY GUITAR EFFECTS

PROJECT SUMMARY

A single-transistor germanium circuit designed to add treble and boost the signal into dark amplifiers to improve the amp's drive tone.



IMPORTANT NOTE

This documentation is for the **kit** version of the project. If you purchased the PCB by itself, please use the [PCB-only version](#) of the documentation instead. The circuit is the same, but the instructions are completely different due to the specialized parts and assembly methods used in the kit.

TABLE OF CONTENTS

1	Project Overview
2	Table of Contents
3	Introduction
4	Packing List
5	Packing List (Cont.)
6	Tools Needed
7	Component Identification
8	Hardware Identification
9	PCB Assembly Overview
10	Resistors
11	Diodes
12	Socket & IC
13	Trimmer
14	Capacitors (Non-Polarized)
15	Wire Headers
16	Capacitors (Polarized)
17	Germanium Transistors: Introduction
18	Germanium Transistor
19	Footswitch PCB
20	Input/Output PCB
21	Enclosure Layout: Panel Mounts
22	Enclosure Layout: Panel Mounts (Cont.)
23	Enclosure Layout: Main & Footswitch PCBs
24	Enclosure Layout: Input/Output PCB
25	Final Assembly & Biasing
26	Final Assembly (Cont.)
27	Schematic
28	Full Parts List
29	Troubleshooting Information
30	Support & Resale Terms
31	Legal Information & Document Revisions

INTRODUCTION

If this is your first pedal, welcome to the hobby and thank you for choosing Aion FX. You've just joined a community of over 100,000 people around the world with a passion for building homemade noise machines using obsolete electronics technology, and we're glad to have you!

If you've done this before, it's great to see you again and we're confident you'll find this build experience an enjoyable one.

Aion FX kits are designed to empower anyone to build a high-quality pedal, no matter the skill level. The pedalbuilding hobby has traditionally had a steep learning curve, but don't be overwhelmed—we've done all the hard work for you. All you need to do is follow these instructions and you'll be on your way to transforming your tone.

There are a few things to go over before you get started.

- **You're going to have to get your hands dirty**—there's no way around it. Nothing here comes preassembled, and you'll have to learn the skills to put it all together. This document will walk you through everything you need, but be prepared to learn a few things along the way.
- **This will take time.** Plan on about two hours start to finish. It may take even longer if it's your first time building. Don't rush it. If you find yourself getting frustrated or overwhelmed, take a break and come back in a couple of hours or the next day.
- **No direct technical support is offered.** There are several DIY forums and Facebook groups with thousands of members who enjoy troubleshooting and teaching. But please be sensitive to the fact that the staff at Aion FX is minimal, and every minute spent helping individuals in private is time that can't be spent on new project development.
- **There is no implied guarantee of a final product.** Aion FX provides the ingredients and the recipe, but you are responsible for putting everything together to make it work. We've tried to make the process as clear and accessible as possible, but it must be expressly stated that purchasing the kit is not a guarantee that you will end up with a working pedal.

It's recommended to read through all of the instructions before you start, particularly if you've never built a pedal before. If you familiarize yourself with the entire process ahead of time and you know what the goal looks like, each step will make more sense.

Now, on to the fun stuff!

PACKING LIST

This is a list of all the parts that are included with the kit, grouped by value. For a list of all the parts based on their PCB part numbers, please see page 28.

If you find that any parts are missing or damaged, please fill out the [Missing Parts](#) form.

Film Capacitors

NAME	QTY
4n7	1
6n8	1
10n (0.01)	1
22n (0.022)	1

Electrolytic Capacitors

NAME	QTY
10uF	1
47uF	2
100uF	1

MLCC Capacitors

NAME	QTY
100n (marked "104")	2

Diodes

NAME	QTY
1N5817	1
1N4742A	1

Resistors

NAME	QTY
1k	1
10k	1
68k	1
470k	1
2M2	1

IC

NAME	QTY
TC1044SCPA or LT1054CP	1
8-pin socket	1

Transistor

NAME	QTY
Transistor, germanium, selected for Rangemaster	1

Trimmer

NAME	QTY
5k trimmer	1

PACKING LIST (CONT.)

Potentiometers

NAME	QTY
10kA	1
Dust cover	1
Knob	1
Mounting nut, potentiometer, 0.44"	1
Lock washer, potentiometer, 0.5"	1
Outer washer, potentiometer, 0.475"	1

Other

NAME	QTY
LED bezel	1
LED, blue	1
9V battery snap	1
DC jack	1
Input/output jack	2
Mounting nut, jack, 0.54"	4
Outer washer, jack, 0.6"	2
Lock washer, jack, 0.5" (thin)	2
Enclosure	1
Enclosure screws	4
PCB, main circuit	1
PCB, footswitch	1
PCB, input/output/DC	1

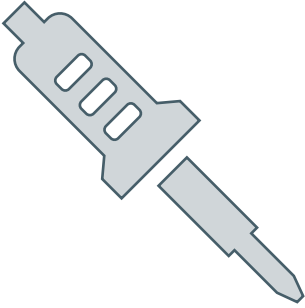
Switches

NAME	QTY
Toggle switch, SPDT on-off-on	1
Mounting nut, toggle switch, 0.36"	1
Lock washer, toggle switch, 0.4"	1
Dress nut, toggle switch, 0.375"	1
Stomp switch, 3PDT	1
Mounting nut, stomp switch, 0.6"	2
Lock washer, stomp switch, 0.6"	1
Dress nut, stomp switch, 0.77"	1

Wiring

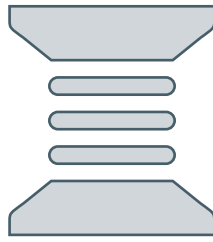
NAME	QTY
3-strand wire assembly, 70mm	2
4-strand wire assembly, 108mm	1
3-pin wire assembly header	2
4-pin wire assembly header	1

TOOLS NEEDED



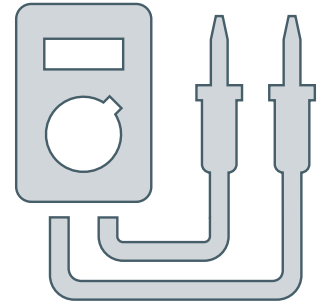
SOLDERING IRON

Temperature-adjustable is recommended. The optimum soldering temperature is 700-725° F (371-385° C) for leaded solder, or 750° F (400° C) for lead-free.



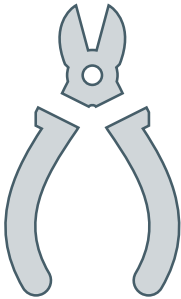
SOLDER

Preferably 63/37 or 60/40 leaded solder. Lead-free is more difficult to use, so if that's the only type you can get, it's best to watch tutorials that are specific to lead-free solder.



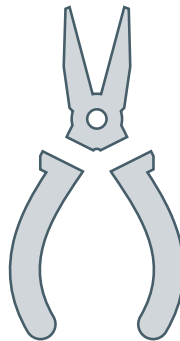
DIGITAL MULTIMETER (DMM)

Most cheap ones in the \$10-30 range are fine for what we're doing. Make sure it has audible continuity testing (i.e. it beeps at the lowest resistance) and transistor hFE measurement.



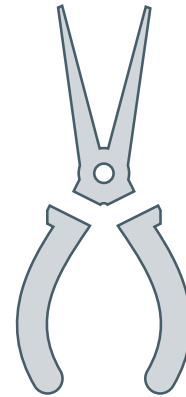
WIRE SNIPPERS

Also called nippers or wire cutters. The Hakko CHP-170 is the best you can get for less than \$10.



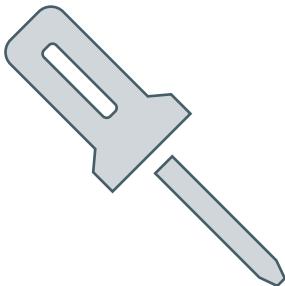
FLAT-NOSE PLIERS

Many general-purpose uses, but particularly tightening the nuts of pots, switches and jacks. Quicker than changing out sockets on a ratchet.



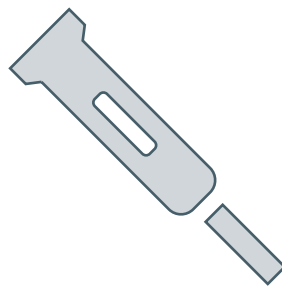
NEEDLE-NOSE PLIERS

These are used for bending leads on components and other general uses. Use the smaller type with a tip that's approximately 0.05" (1.25mm) wide.



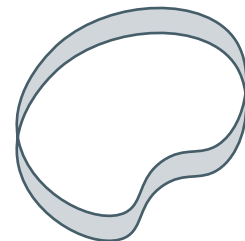
SCREWDRIVER (PHILLIPS)

Used for the enclosure screws. Get a powered driver if you'll be building a lot of pedals!



FLAT SCREWDRIVER (SMALL)

This is used for tightening the set screws on the knobs. The tip should be no more than 0.1" (2.5mm) wide.



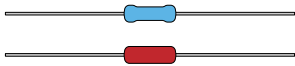
RUBBER BAND

Yes, a plain old rubber band. This is used to tighten the dress nut to avoid scratching or denting it (which can happen with metal tools).

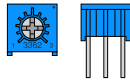
COMPONENT IDENTIFICATION

If you've never built a pedal before, you'll need to know what all the components are. These are shown actual size. (Not all of these types of components may be part of this kit.)

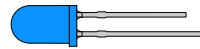
RESISTOR



TRIMMER POTENTIOMETER



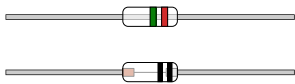
LED



SILICON DIODE



GERMANIUM DIODE



These are very fragile, so be careful when handling them.

RECTIFIER DIODE



SCHOTTKY DIODE

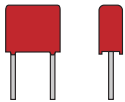


Some Schottky diodes also look like this.

ZENER DIODE



FILM CAPACITOR



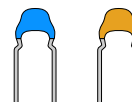
Not polarized. Color may vary by brand and type.

ELECTROLYTIC CAPACITOR



Polarized. The negative side is marked.

MLCC



Not polarized. MLCC stands for "multi-layer ceramic capacitor."

TANTALUM CAPACITOR



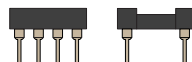
Polarized. The positive side is marked.

OP-AMP / IC

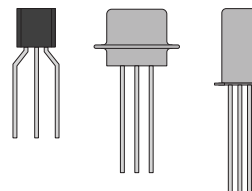


Charge pumps and delay chips also look like this. They may have more than 8 legs.

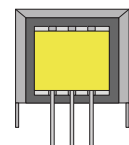
IC SOCKET



TRANSISTOR OR JFET



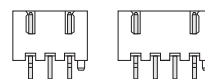
TRANSFORMER



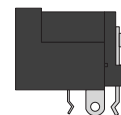
WIRE ASSEMBLY



WIRE ASSEMBLY HEADER



DC JACK

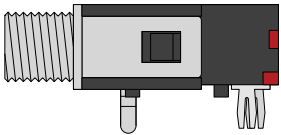
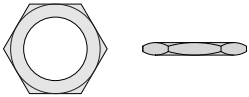
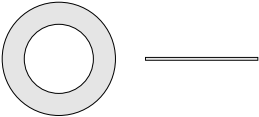
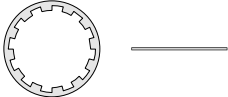


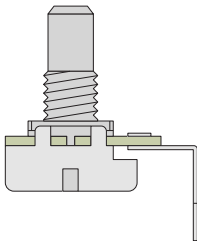
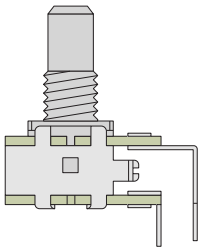
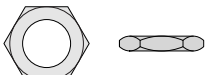
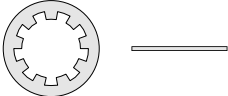
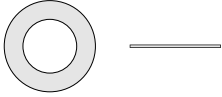

LED BEZEL

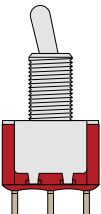

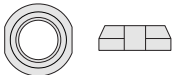
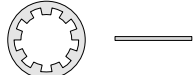


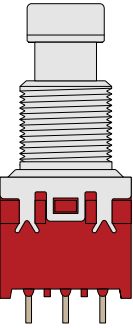
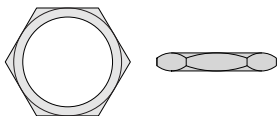
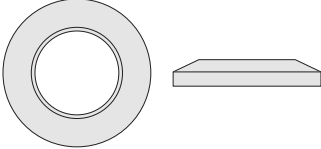
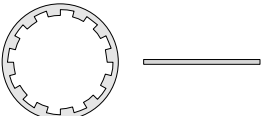
HARDWARE IDENTIFICATION

The hardware comes unassembled, so you'll need to sort & identify each of the pieces. The diagrams below are actual size, so you can set them against the printed page to identify them if needed.

I/O JACK 	MOUNTING NUT  DIAMETER: 0.54" / 13.7mm	OUTER WASHER  DIAMETER: 0.6" / 15.2mm	LOCK WASHER  DIAMETER: 0.5" / 12.7mm
--	--	--	--

POTENTIOMETER (SINGLE) 	POTENTIOMETER (DUAL) 	MOUNTING NUT  DIAMETER: 0.44" / 11.2mm	LOCK WASHER  DIAMETER: 0.5" / 12.7mm
		OUTER WASHER  DIAMETER: 0.475" / 12mm	KNOB 

TOGGLE SWITCH 	MOUNTING NUT  DIAMETER: 0.36" / 9.1mm	DRESS NUT  DIAMETER: 0.375" / 9.5mm	LOCK WASHER  DIAMETER: 0.4" / 10.1mm
---	---	--	--

FOOTSWITCH 	MOUNTING NUT  DIAMETER: 0.6" / 15.2mm	DRESS NUT  DIAMETER: 0.77" / 19.6mm	LOCK WASHER  DIAMETER: 0.6" / 15.2mm
--	---	--	--

PCB ASSEMBLY OVERVIEW

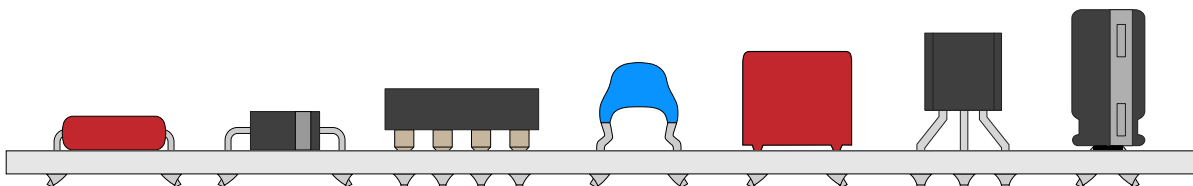
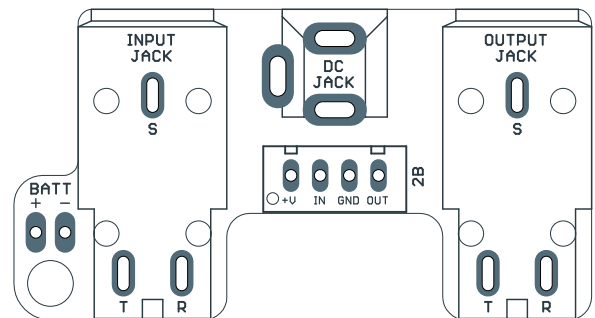
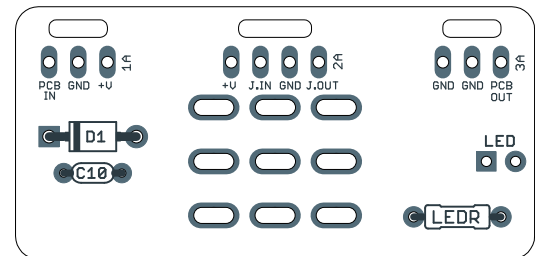
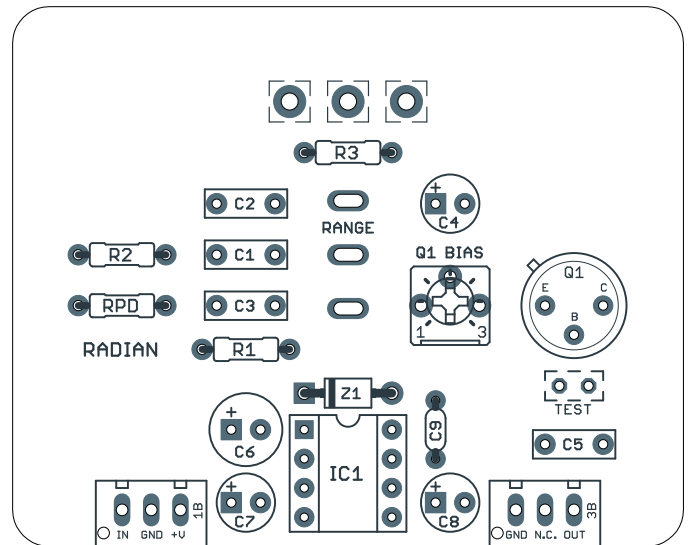
Now it's time to start building!

Before you begin, separate the PCBs into individual boards and break off the tabs from each using needle-nose or flat-head pliers. You should be left with the three PCBs shown to the right.

The general principle for PCB population is that you want to work in layers from shortest components (i.e. lowest-profile) to tallest so that when the PCB is upside-down, everything is making contact with the work surface and is held in place.

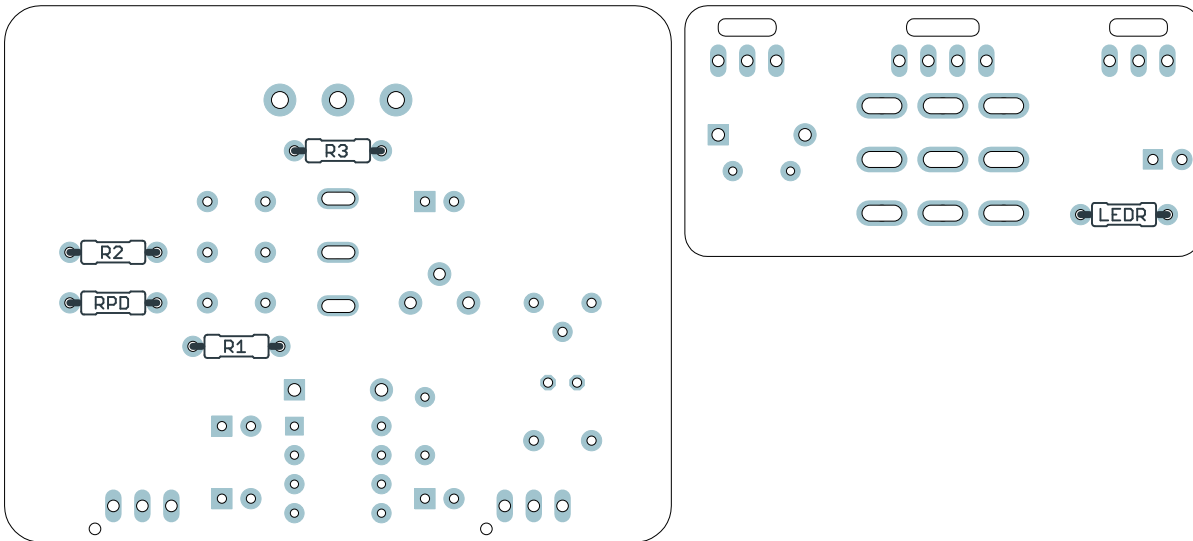
Generally speaking, you should populate the components in this order:

1. Resistors
2. Diodes
3. IC sockets
4. Trimmers
5. MLCC capacitors
6. Film capacitors
7. Electrolytic capacitors
8. Transistors (germanium)

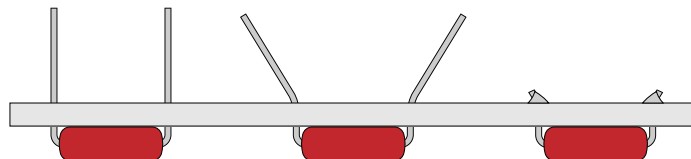


RESISTORS

PART	VALUE
R1	470k
R2	68k
R3	1k
RPD	2M2
LEDR	10k



Using the parts list above, populate the resistors by pushing them through the holes and bending the leads outward at an angle to hold them in place. Resistors are not polarized, so they will work in any direction. Turn the board upside-down to keep the components held in place while you solder.

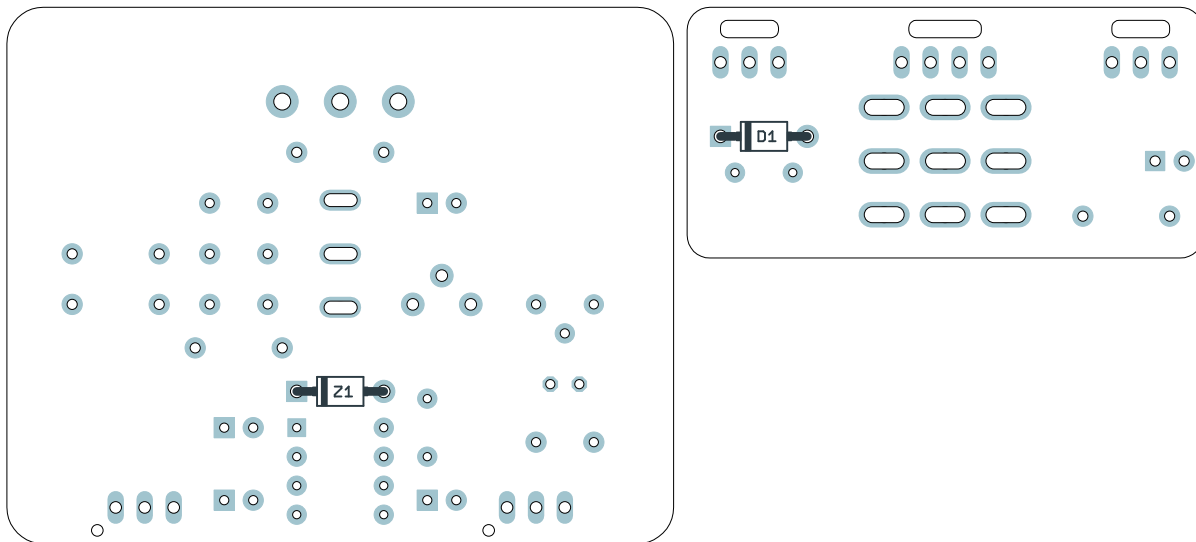


You'll use this same technique for most of the other components as well.

If this is your first time soldering, watch tutorial videos on YouTube and make sure you get it down before you begin. You don't want to practice or experiment on this board!

DIODES

PART	VALUE
D1	1N5817
Z1	1N4742A

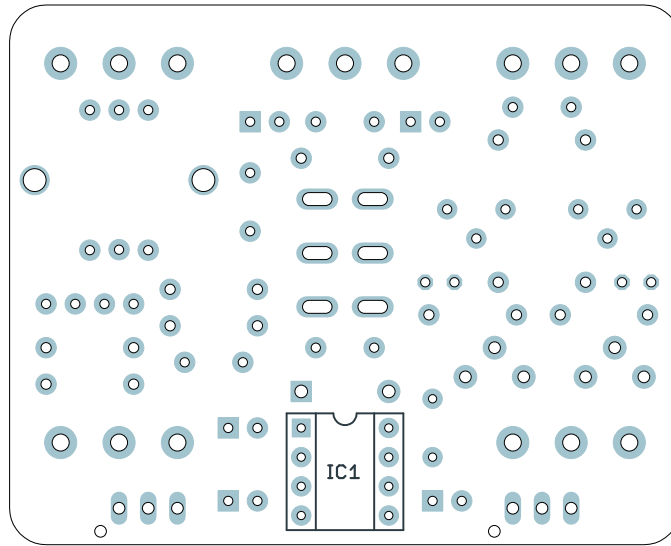


Next, you'll populate the diodes—only one on each board, so this step is pretty simple. The 1N5817 is black with a silver stripe, while the 1N4742A is orange with a black stripe.

Diodes are polarized, so make sure to identify the polarity band (which indicates the “cathode”, or negative side) and match the band to the footprint on the PCB.

SOCKET & IC

PART	VALUE
IC1	TC1044SCPA or LT1054CP



Next up is the IC socket. You can't bend the leads of the sockets like you can with the other components, so they won't stay in on their own until they are soldered.

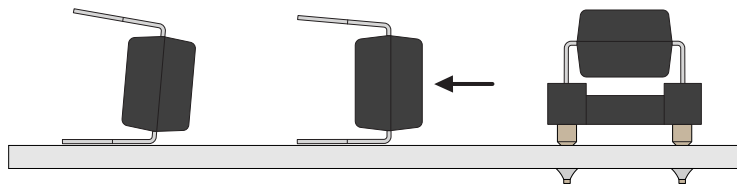
Again, it's much easier to do this with gravity holding them in place for you, so you'll want to do them before you do any of the taller components.

Installing the IC

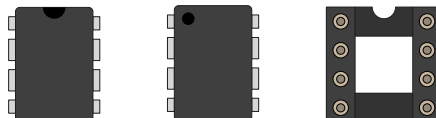
Don't insert the IC into the socket just yet. We will do this in a later step, after we've finished soldering the tallest components (the polarized capacitors). This information is just listed here for reference.

The legs of the IC are bent outward slightly during manufacturing, so they'll need to be bent back inward before they can be inserted into the sockets.

It's easiest to do this by laying the IC legs against the table and bending the body itself so all four legs on the side are straightened out at once. Then, flip it and do the other side.

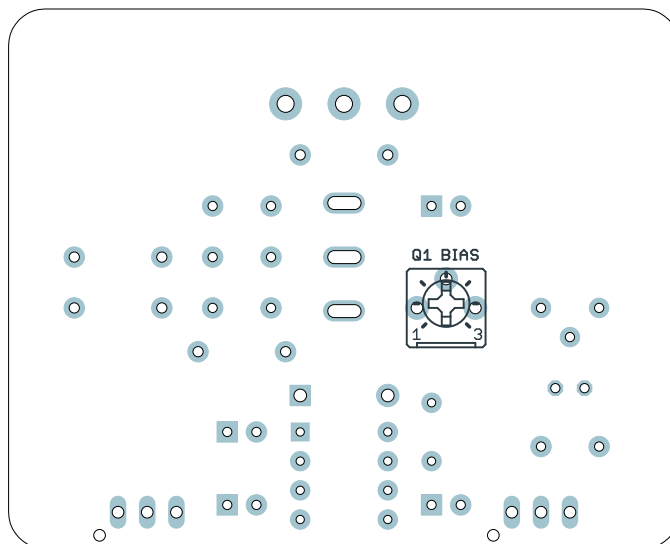


ICs may have two different orientation marks: either a dot in the upper-left or a half-circle notch in the middle of the top side. Some ICs have both marks. This shows which way the IC should be rotated when inserting it into a socket (the socket also has a half-circle notch).

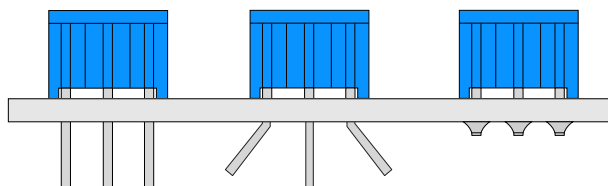


TRIMMERS

PART	VALUE
BIAS	5k (502)



The bias trimmer comes next. It can be soldered like any other component, by bending the legs outward as shown:

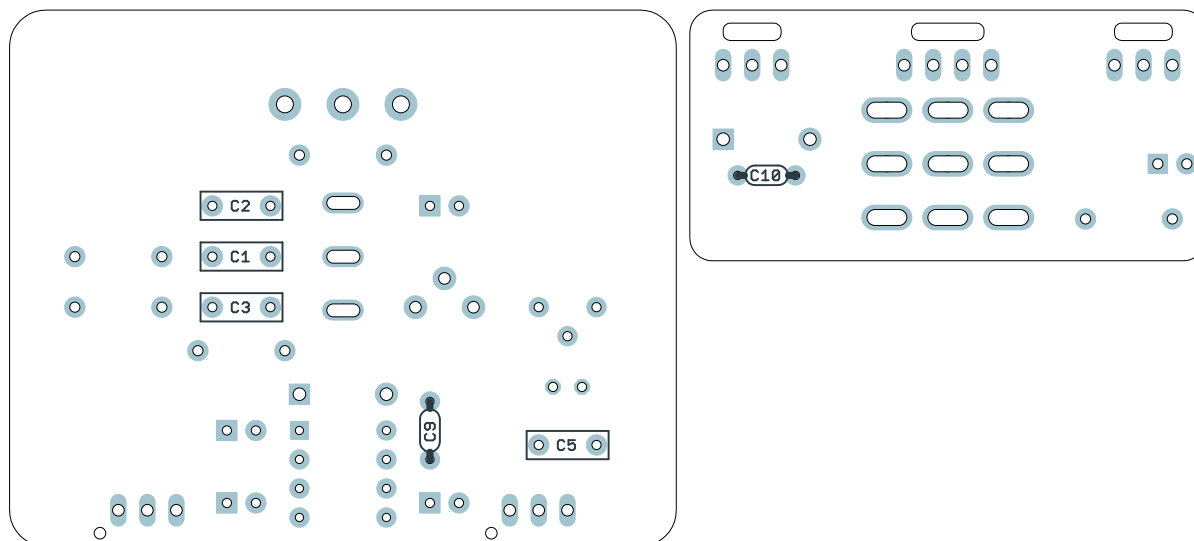


This trimmer is used to bias the germanium transistor. We will adjust it at the end once the pedal is fully assembled.

CAPACITORS (NON-POLARIZED)

PART	VALUE
C1	4n7
C2	6n8
C3	22n (0.022)

PART	VALUE
C5	10n (0.01)
C9	100n MLCC
C10	100n MLCC

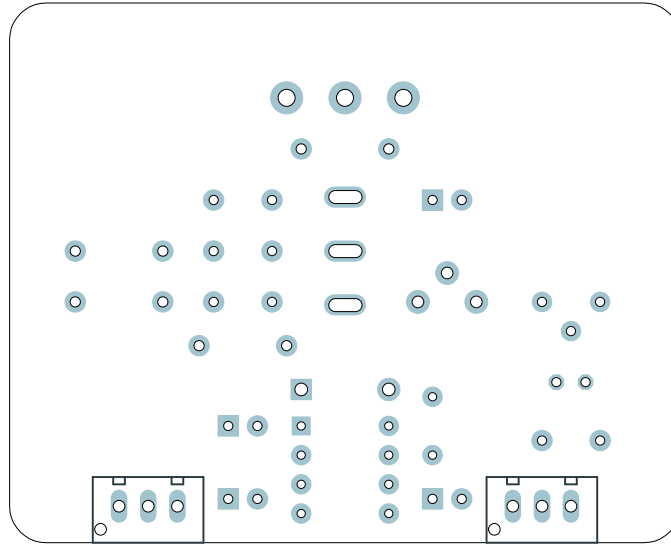


After the trimmer come the box film and MLCC capacitors. These are all several different heights, but there aren't as many, so just do them all at once. Bend the leads at an angle to hold them in place.

MLCCs and box capacitors are not polarized and will work in any direction. To keep things neat, though, it's best to put them all facing the same way so the values can easily be read.

Note: The blue box film capacitors (C1, C2 and usually C5) have the value printed on the top, while the red capacitors have the value on the side. The text on the side of the blue capacitors is not related to the value and can be ignored.

WIRE HEADERS

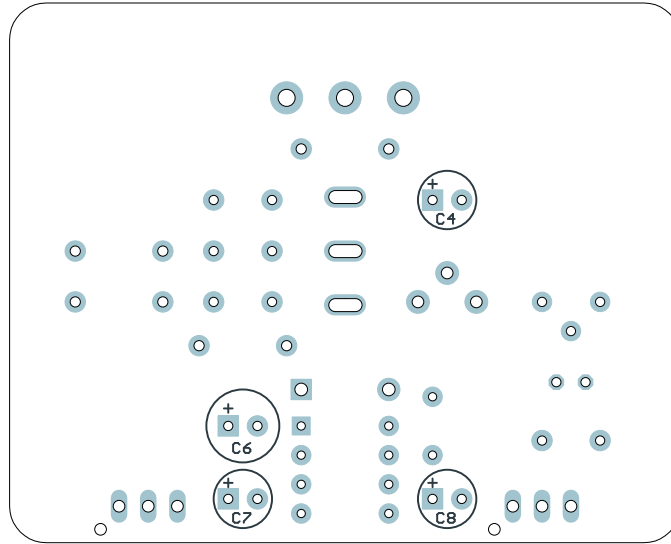


Install the two 3-pin headers (wire connectors) as shown above. These have a polarity pin, so as long as they are pressed all the way down, there's only one possible way to install them. They do fit pretty tightly in the holes, though, so press firmly.

There's also a 4-pin header on the I/O board that we will do in a later step.

CAPACITORS (POLARIZED)

PART	VALUE
C4	47uF
C6	100uF
C7	10uF
C8	47uF

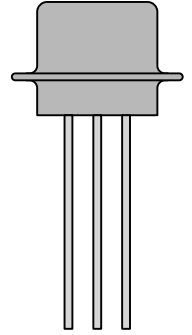


Populate the electrolytic capacitors. They are polarized (i.e. they will only work in one direction), so note the vertical mark that indicates the negative side. The longer leg is positive and fits in the square pad.

At this point, we only have the transistors left to do, so now is a good time to go back and insert the IC into the socket (page 12).

GERMANIUM TRANSISTORS: INTRODUCTION

Next is the germanium transistor. These are very different than modern electronic components, so they need an introduction before we cover how to install them.



Silicon vs. germanium

Compared to silicon, germanium transistors are imprecise and inconsistent, even among the same part number. As a result, when classic fuzz circuits use germanium transistors, it's not the part number that's important, but the specifications of the individual device. Two transistors of different part numbers with identical gain and leakage will sound exactly the same. Conversely, not all transistors of the same part number will work in a particular circuit.

Because of this, be aware that this kit may include any of several different part numbers. In this document we will refer to it Q1, not by specific part numbers such as AC125 or МП16Б.

Temperature sensitivity

Germanium is a delicate semiconductor material and very sensitive to overheating. If the transistor is overheated, it could be permanently damaged. It's recommended to mount the transistor so it is above the PCB by about 3/8" (9.5mm) to allow some of the heat to dissipate before it reaches the body of the transistor. If it takes longer than two seconds for the solder to form a good joint, move to a different component and let the transistor cool a bit before trying again.

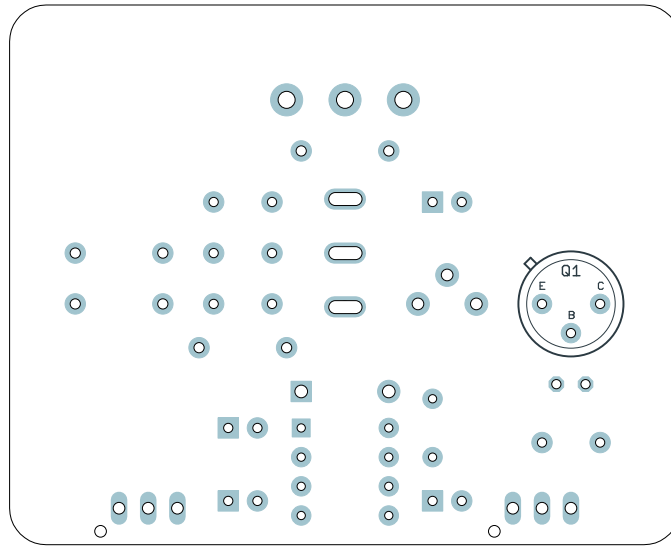
Old-stock precautions

Germanium transistors are not manufactured today except for some expensive industry-specific applications, so nearly all of the germanium transistors used in guitar pedals are old-stock. The transistors in this kit are at least 30 years old, and sometimes 50 or more.

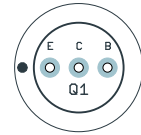
While age has nothing to do with performance of the device itself, the leads may be corroded and solder may not adhere well unless they are cleaned first. If you notice any corrosion on the leads, use medium-grit sandpaper or a fine metal file to remove it, and ensure the leads are shiny before soldering.

GERMANIUM TRANSISTORS

PART	VALUE
Q1	Germanium



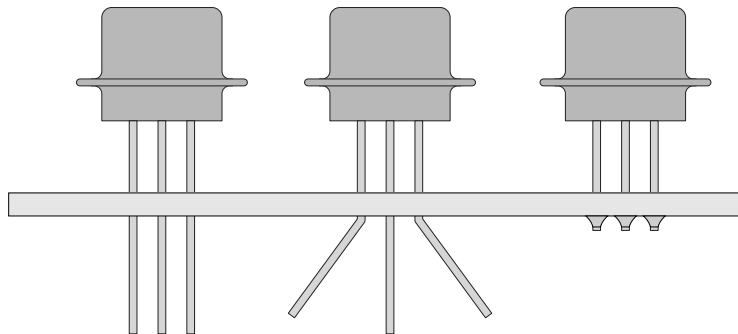
Q1 ALTERNATE CONFIGURATION



Now that we've covered the basics of germanium transistors, it's time to install it.

Note: Q1 may be one of two types, either with its legs in a triangle formation as shown in the main PCB image, or with its legs in a straight line as shown in the diagram on the right. The PCB will match the transistor configuration. **The straight-line transistor has a painted white or red dot on one side** indicating the emitter. Make sure this lines up with the dot on the PCB silkscreen when you install it.

Insert it into the pads on the PCB, being mindful of the orientation (either the "V" pattern or the emitter dot). Keep it raised about 3/8" (9.5mm) above the PCB, then bend the legs on the bottom side to keep it attached. Turn the PCB over and let it hang down while you solder it in place. Be quick and make sure the transistor casing doesn't get too hot or the transistor could be damaged.

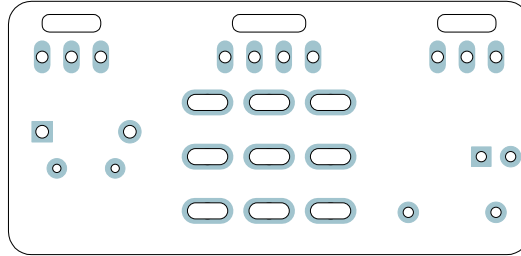


FOOTSWITCH PCB

PARTS

3-strand wire assembly (2)

4-strand wire assembly



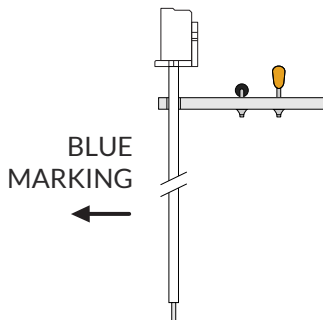
Next, it's time to finish up the footswitch board. You should have done most of the on-board components on this board in a previous step, but if not, go back and do those.

There will be one longer assembly with 4 wires and two shorter ones with 3 wires. The longer one goes in the middle and the shorter ones go on the left and right sides. The wire assemblies should then be soldered to the footswitch board as shown.

STEP 1

First, thread the wire through the strain-relief slots, with the blue side facing outward and the PCB's previously-installed components facing up.

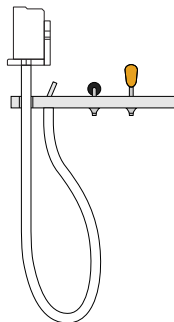
For now, pull it through as far as it can go.



STEP 2

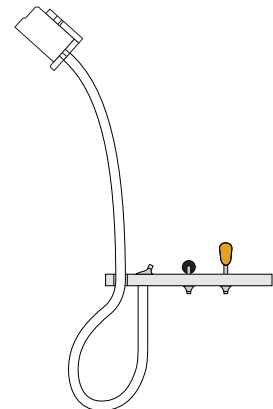
Next, bend the wires back upward and fit the ends of the wires into the solder pads.

On the top side of the PCB, bend the exposed wires backward so it holds the wire in place. Pull the header back up through the slot partway.



STEP 3

Then, solder the wires from the top. This is the trickiest part of the whole build. You want to solder the pads without touching the iron to the wires themselves and risking burning through the insulation. It helps to use a sharp or narrow tip on the soldering iron.



Once all three wire assemblies are soldered, set the footswitch PCB aside. We'll solder the actual footswitch and LED in a later step.

INPUT/OUTPUT PCB

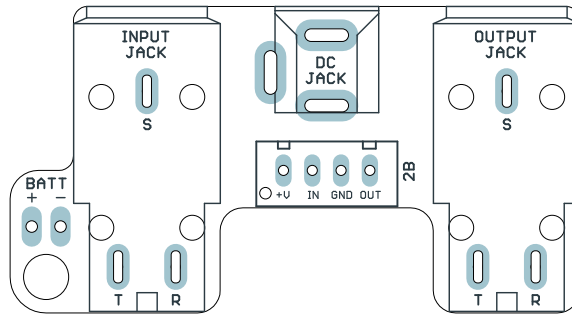
PARTS

Input & output jacks

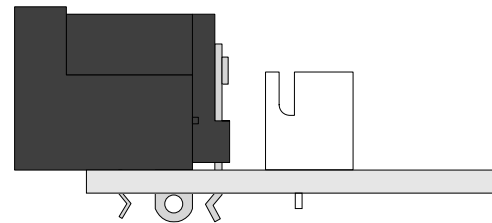
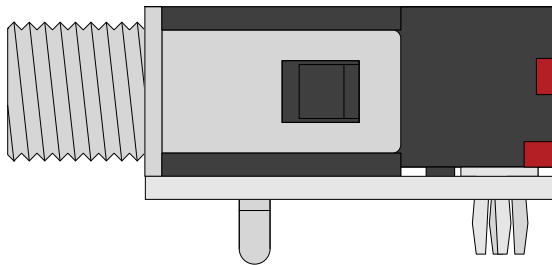
DC jack

Wire header

9V battery snap



Almost done! Get the two input/output jacks, the DC jack and the wire header and snap them in place. The PCB is designed for them to fit securely, so you can do them all at once before flipping and soldering.

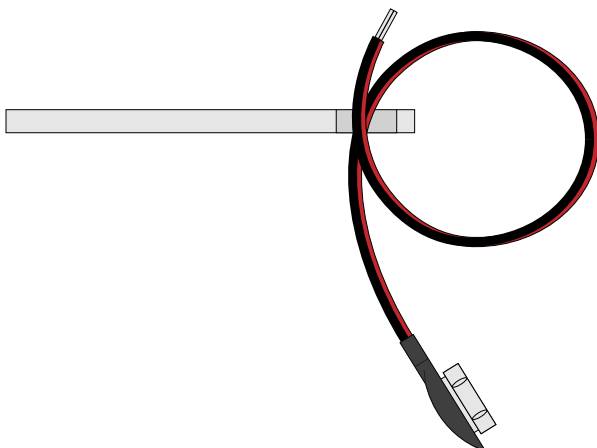


After you've soldered everything, make sure to **snip the leads on the I/O jacks as close as possible to the PCB**. There's not a lot of clearance between the bottom of this board and the top of the main PCB once everything is in place, and you don't want the pins to short against anything on accident.

Next, we'll hook up the 9V battery connector. **This is optional.** Not everyone uses batteries. But, if you do, this pedal should last a long time on a single 9V so you won't need to change it very often.

STEP 1

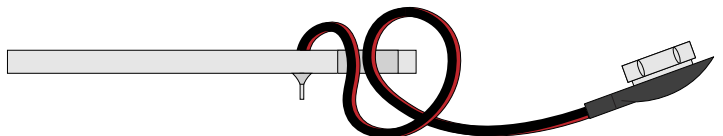
Thread the battery snap leads through the strain-relief hole twice so it forms a single loop.



STEP 2

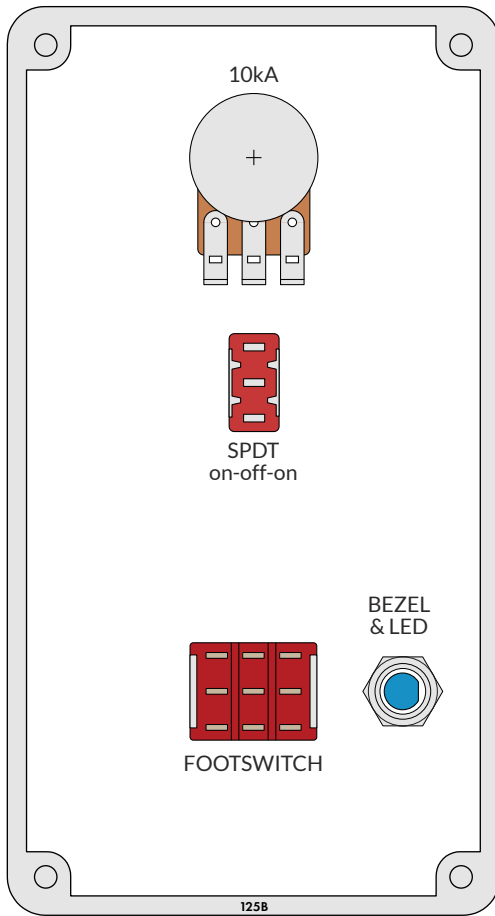
Bend the exposed wires back down and solder them into the pads. Red is positive (+), black is negative (-). After soldering, pull it tight.

For even more strain relief, you can thread the snap through the loop to form a knot. (not shown)

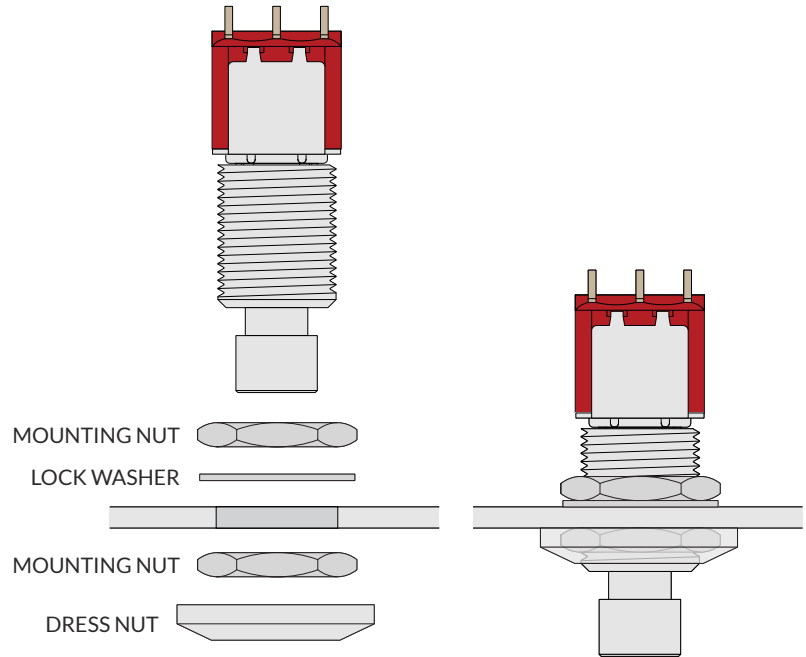


ENCLOSURE LAYOUT: PANEL MOUNTS

Attach the hardware to the enclosure as shown. (The I/O board is done in a later step.)



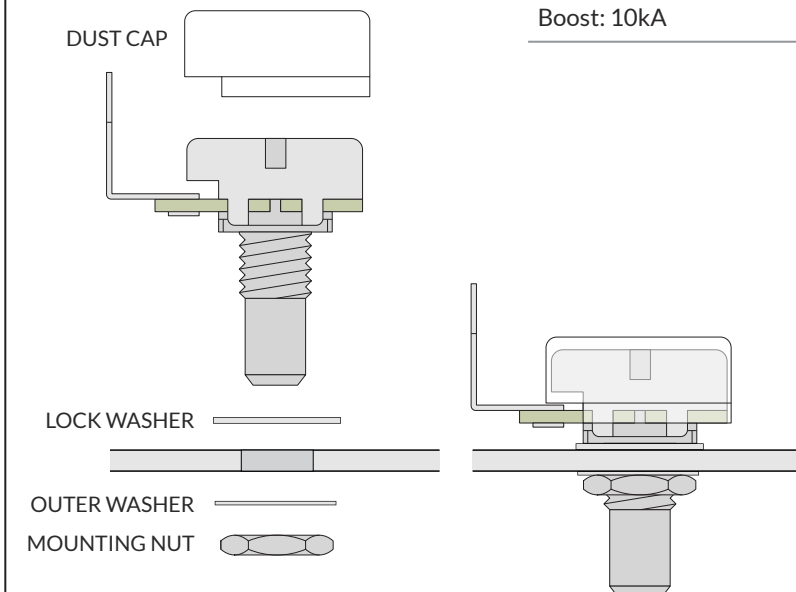
FOOTSWITCH



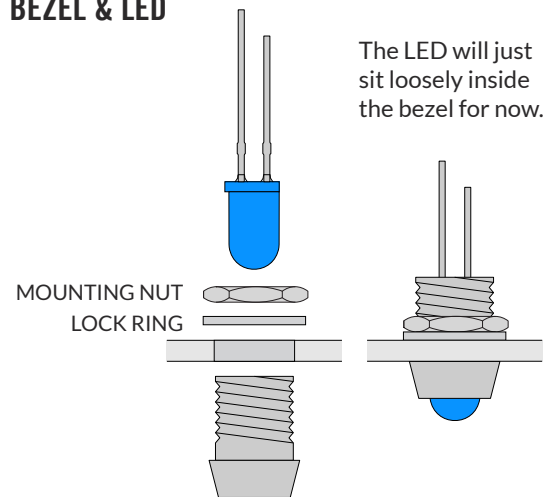
The dress nut fits over the top of the mounting nut and is for aesthetic purposes only. Wrap a rubber band around it to use as a grip when tightening. Do not use metal tools on it or you run the risk of scratching or denting it.

POTENTIOMETERS

Boost: 10kA



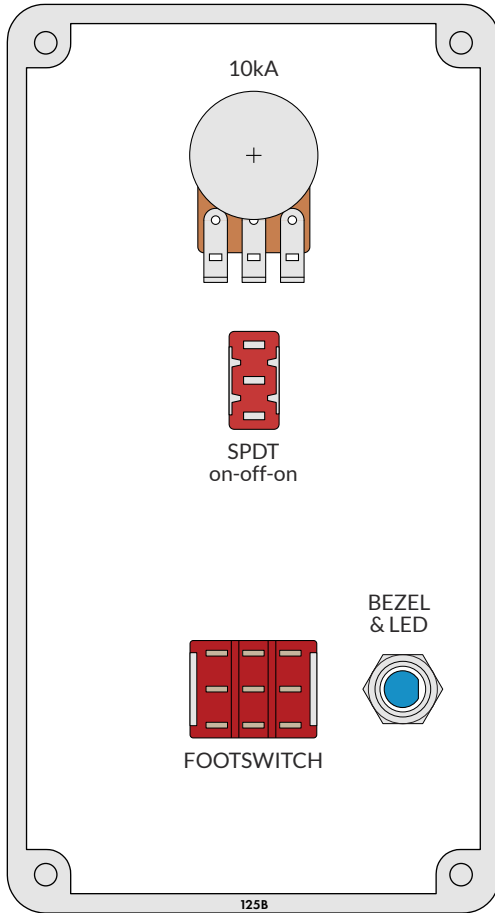
BEZEL & LED



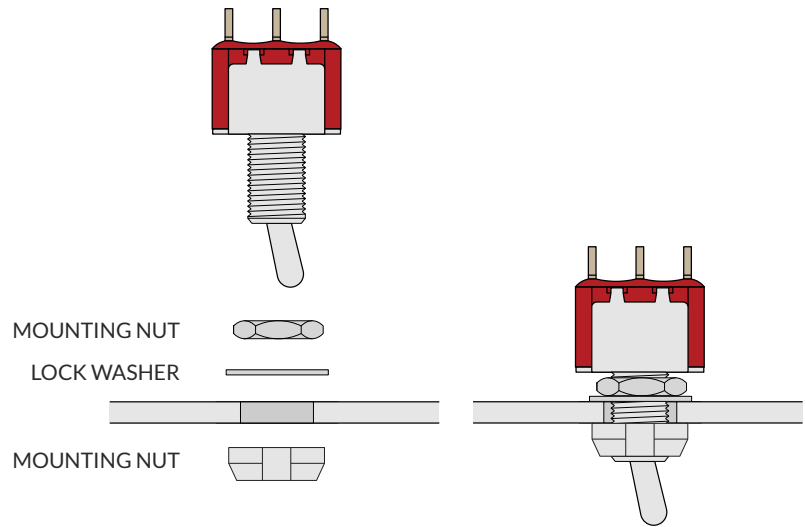
The LED will just sit loosely inside the bezel for now.

You'll need to hold the bezel in place when tightening the nut. The top of the bezel is fairly sharp, so try using a rubber band for grip instead of pressing your finger against the bottom.

ENCLOSURE LAYOUT: PANEL MOUNTS (CONT.)

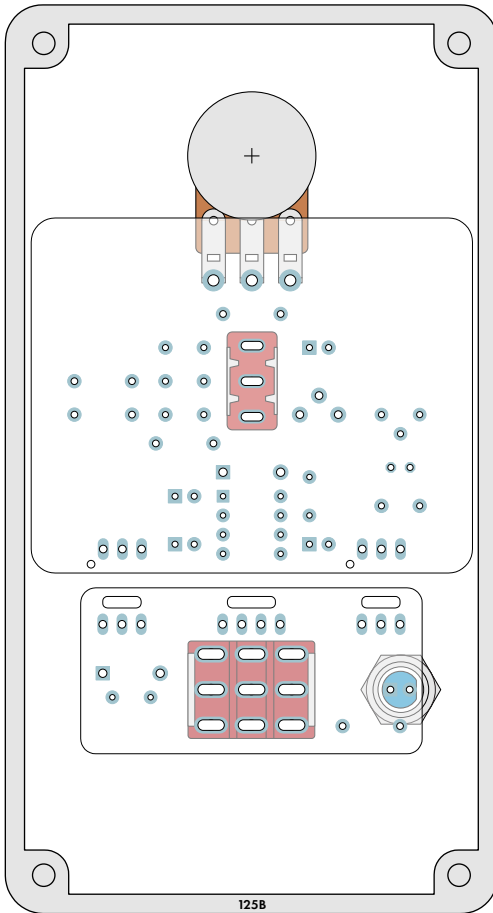


TOGGLE SWITCHES



The dress nut acts as a mounting nut, unlike the footswitch dress nut. Use flat-nose pliers on the flat sides of the nut to tighten securely.

ENCLOSURE LAYOUT: MAIN & FOOTSWITCH PCBs



After all the components are affixed to the enclosure as shown on the previous page, place the main PCB on top of the potentiometer and toggle switch as in the diagram to the left.

You may need to adjust the position of the potentiometer and toggle slightly if they are not aligned straight.

Once all of the pins are through their holes and the PCB is laying flat, solder each of the pins from the top. Be careful not to touch any of the surrounding components with the soldering iron.

After you've finished soldering the pot, **clip the leads as close as you can to the main PCB**. The input/output PCB overlaps them and you need to avoid any of the components shorting. (The toggle switch lugs do not need to be clipped.)

Next, move to the footswitch board and solder the 3PDT switch.

The LED is last. Before soldering the LED, double-check to **make sure the flat side of the LED is facing to the right**, as shown in the diagram, and that the short leg is coming through the pad on the right. It won't work if it's turned the other way. Then, clip the leads of the LED.

Why solder everything inside the enclosure before testing it?

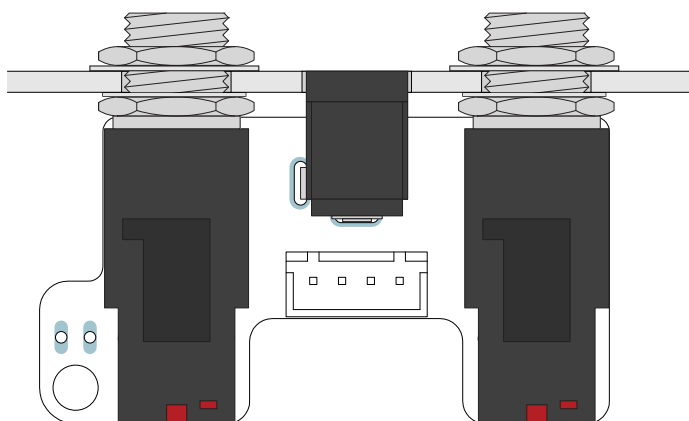
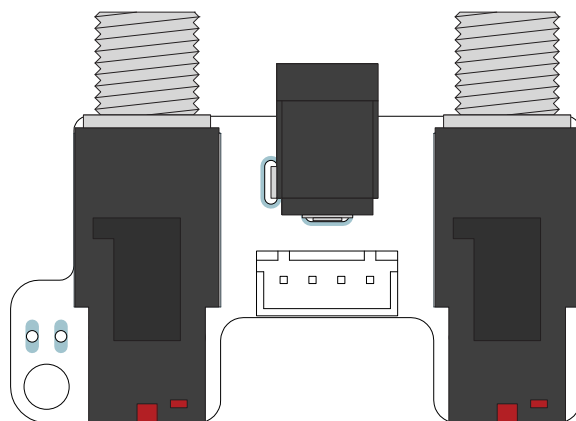
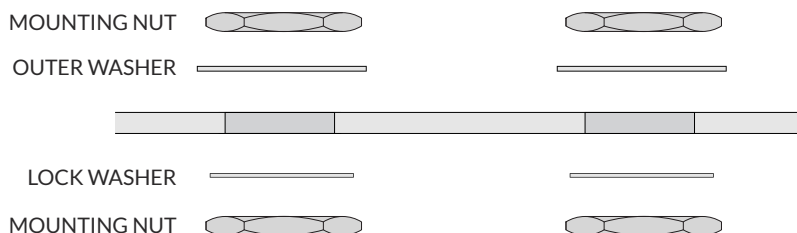
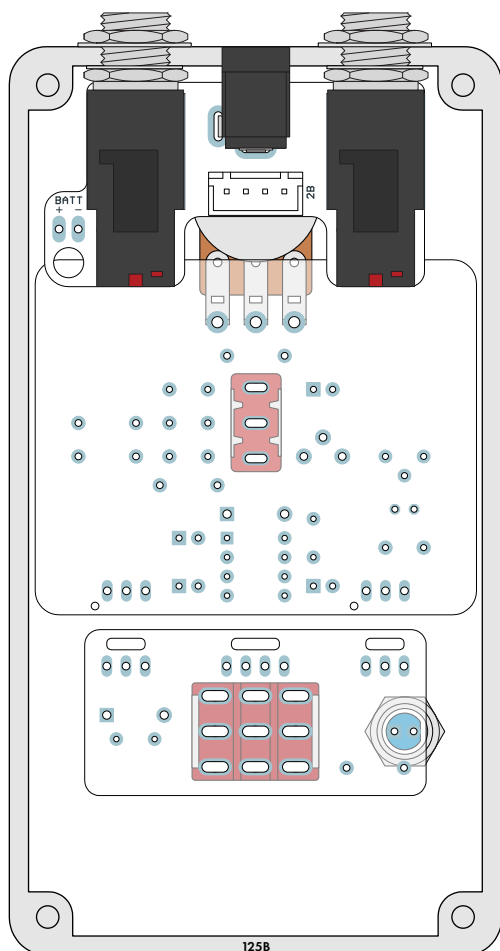
"Rock it before you box it" is conventional wisdom in pedalbuilding, and you'll often hear it recommended that builders should test the circuit before putting everything inside the enclosure. However, Aion FX projects are designed to be extremely easy to remove from the enclosure for troubleshooting, with no desoldering required—so with these kits, it's actually much easier to "box it before you rock it".

If you've read the documentation carefully and followed all the instructions, there's a good chance you will get it right the first time!

ENCLOSURE LAYOUT: INPUT/OUTPUT PCB

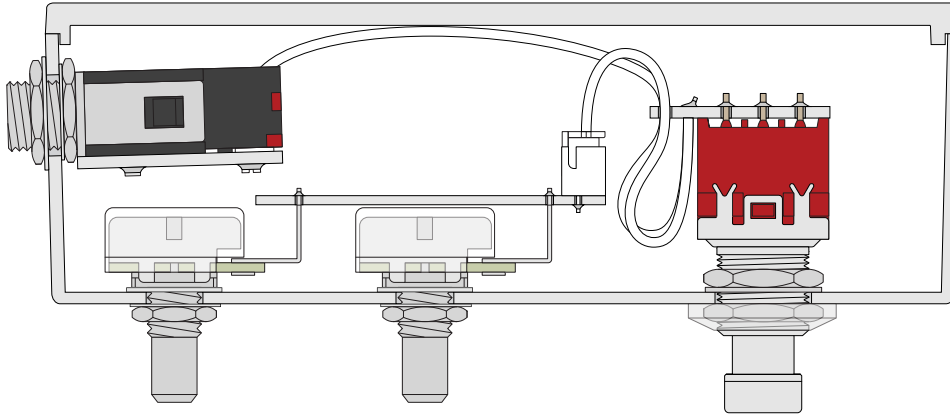
Affix the input/output PCB to the north-facing panel of the enclosure as shown.

Note the use of two mounting nuts on each of the jacks, one inside and one outside. The inner nut acts as a spacer to set the DC jack flush with the outside of the enclosure. The inner nuts should be threaded as far down as they can go.



FINAL ASSEMBLY & BIASING

After everything is in place, just plug the 3 wire assemblies into their respective headers and make sure they're secure. Here is a cross-section of the inside of the completed pedal.



At this point, you have completed the full circuit as far as the electrons are concerned, but we still need to bias the transistor before it will sound right.

Biasing

The trimmers allow for easy biasing of the transistor without having to swap out resistors.

As a starting point, using a small screwdriver, turn the bias trimmer to the halfway position (12:00). Then, with a multimeter, touch the black and red leads to the two pads marked “TEST”.

Adjust the trimmer until the multimeter reads **-7V** (either positive or negative depending on which lead is touching which pad) and then play through it and see how you like it.

The target collector voltage is between -6.8V and -7.1V for a replica of the vintage unit, but you can get a lot more gain out of it if you choose. Let your ear be the final judge.

Testing

Plug in a 9-volt supply and test it out with a guitar and an amplifier.

Test the bypass switch a few times, then start turning the controls and see if everything sounds OK. If it works, great! If not, don't be discouraged. See page 29 for troubleshooting info.

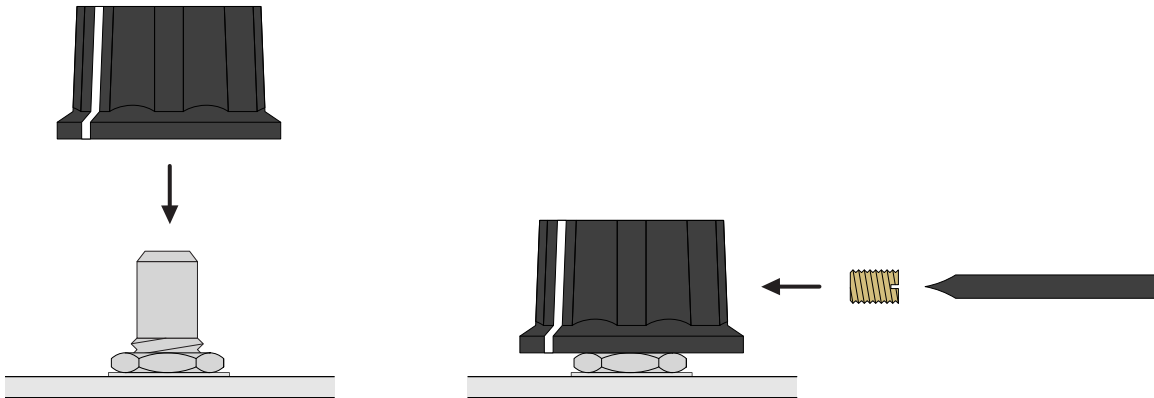
FINAL ASSEMBLY (CONT.)

Finishing touches

Now, just a couple of things for the final assembly. Turn the shaft fully counter-clockwise, then put on the knob and rotate until the indicator line is aligned with the dot on the enclosure that shows the zero point. Affix the knob to the potentiometer shaft as shown in the diagram below.

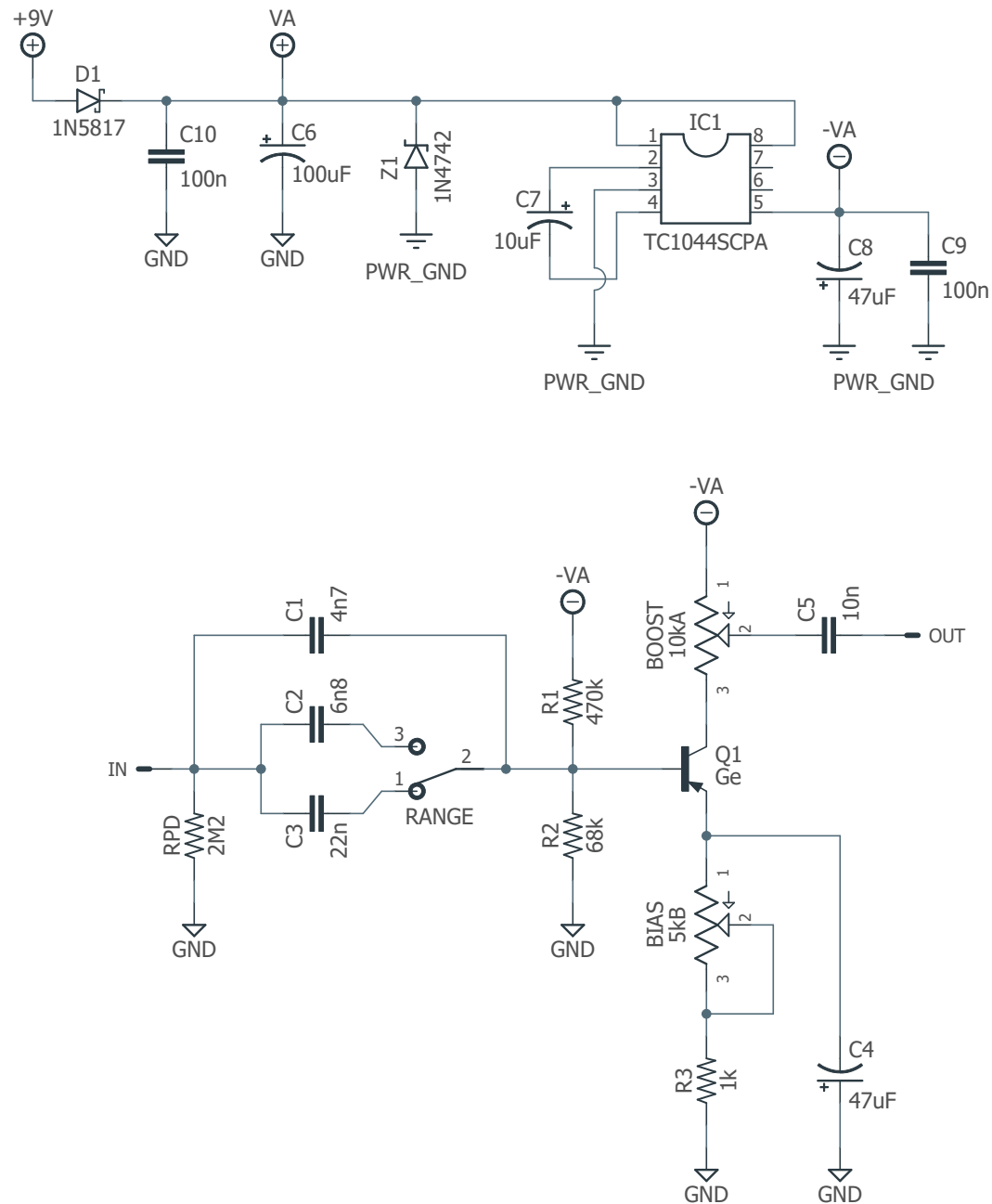
Using a small flat-head screwdriver (no more than 0.1" / 2.5mm in diameter), firmly tighten the set screw until it presses against the shaft of the potentiometer and holds the knob in place.

Be careful not to over-tighten or you may damage the set screw. But if it's not tight enough, the knob will be more likely to fall off or lose its alignment with the markings on the enclosure.



Last, just close the panel on the back using the four screws. That's it!

SCHEMATIC



FULL PARTS LIST

Resistors

PART	VALUE
R1	470k
R2	68k
R3	1k
RPD	2M2
LEDR	10k

Capacitors

PART	VALUE
C1	4n7
C2	6n8
C3	22n (0.022)
C4	47u electro
C5	10n (0.01)

PART	VALUE
C6	100uF electro
C7	10uF electro
C8	47uF electro
C9	100n MLCC
C10	100n MLCC

Transistors

PART	VALUE
Q1	Germanium

Diodes

PART	VALUE
Z1	1N4742A
D1	1N5817

IC

PART	VALUE
IC1	LT1054CP or TC1044SCPA
IC1-S	DIP-8 socket

Potentiometers

PART	VALUE
Boost	10kA

Switches

PART
SPDT on-off-on
3PDT stomp

Trimmer

PART	VALUE
BIAS	5k trimmer

TROUBLESHOOTING INFORMATION

If you finish building the kit and find that it doesn't work right, we've written a separate in-depth [Troubleshooting Guide](#) that applies to all of our kits. The main troubleshooting process is covered there. Here you will find information specific to this kit that will help with that process.

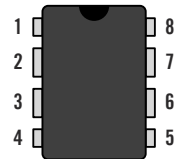
The transistor won't bias correctly.

If you can't get the right test voltage on the transistor as described on page 25, there are a few steps to diagnose the issue.

Is the charge pump putting out the correct voltage?

The charge pump (IC1) is an inverter that converts +9V to -9V so the circuit can be used with a standard center-negative power supply. If it's not inverting properly, nothing else will work.

First, set your multimeter to DC mode with a range of 20V or higher. Touch the black lead to a ground point for the circuit. The easiest spot is inside a tapped screw hole in one of the corners of the enclosure. This way the probe stays in place without needing to use alligator clips. The circuit must of course be fully installed in the enclosure for this to work.



Then, touch the red probe to the lower-right pin of IC1 (pin 5) and read the voltage. Note that IC pins are labeled counter-clockwise from the upper-left, as shown in the diagram to the right. It should measure the inverse of the supply voltage, or slightly less.

If the voltage is not -9V, then there's an issue with the charge pump itself or the surrounding parts.

Is the transistor touching the side of the enclosure or any other nearby component?

Some transistors have the metal case connected to one of the pins, so anything making contact with the transistor will interfere with its operation. Make sure the transistor is angled away from the side of the enclosure, and that it doesn't make contact with the underside of the lid when it's closed.

SUPPORT

Aion FX does not offer direct support for these projects beyond the provided documentation.

Replacements and refunds cannot be offered unless it can be shown that the circuit or documentation are in error or that the included components are non-functional.

Where to get help

The three best places to ask for help are the [DIY Stompboxes forum](#), the [DIY Stompboxes Facebook group](#), and the [r/diypedals subreddit](#). These communities have more than 150,000 members between them and they are very accommodating to new builders.

When posting a troubleshooting request, always include the following:

1. A thorough description of the problem you are experiencing
2. A photo of the inside of the pedal
3. A list of all the measured voltages of each of the pins, described on the previous page

While we cannot offer direct, private support, you may send a link to your public troubleshooting thread to Aion FX using the contact form on the website. There is no guarantee that we will be able to join the discussion and help solve your problem, but this improves the chances.

It benefits the whole community if the troubleshooting process is public because then people who have the same issue in the future may come across it when searching. And if you do get help, remember to pay it forward! The best way to learn new skills is to help others. Even if you've only built one pedal, you have more experience than someone who is brand new, so you have something to offer.

RESALE TERMS

These kits may be used for commercial endeavors in any quantity unless otherwise noted. It's okay to sell individual builds locally or online, or even to offer a service to build pedals based on these kits.

No direct attribution is necessary, though a link back is always greatly appreciated. The only usage restriction is that you cannot "goop" the PCB or otherwise obscure the source. In other words: you don't have to go out of your way to advertise the fact that you use Aion FX kits, but please don't go out of your way to hide it. The guitar effects industry needs more transparency, not less!

LEGAL INFORMATION

All trademarks are property of their respective owners.

Any use of trademarks is for comparative advertising purposes only under fair use. It is not an endorsement of this product by the trademark holders.

These kits are intended to be built by the customer. Aion FX is not responsible for language that may be used by the customer in the marketing or resale of the finished product.

All content and graphics in this document are original works and are copyrighted by Aion FX and may not be used without permission.

DOCUMENT REVISIONS

1.0.3 (2024-08-08)

Added link to troubleshooting guide on page 29.

1.0.2 (2024-03-22)

Updated LEDR (LED current-limiting resistor) to 10k to reduce brightness.

1.0.1 (2022-07-01)

Add LT1054 as an alternate for IC1.

1.0.0 (2022-01-21)

Initial release.