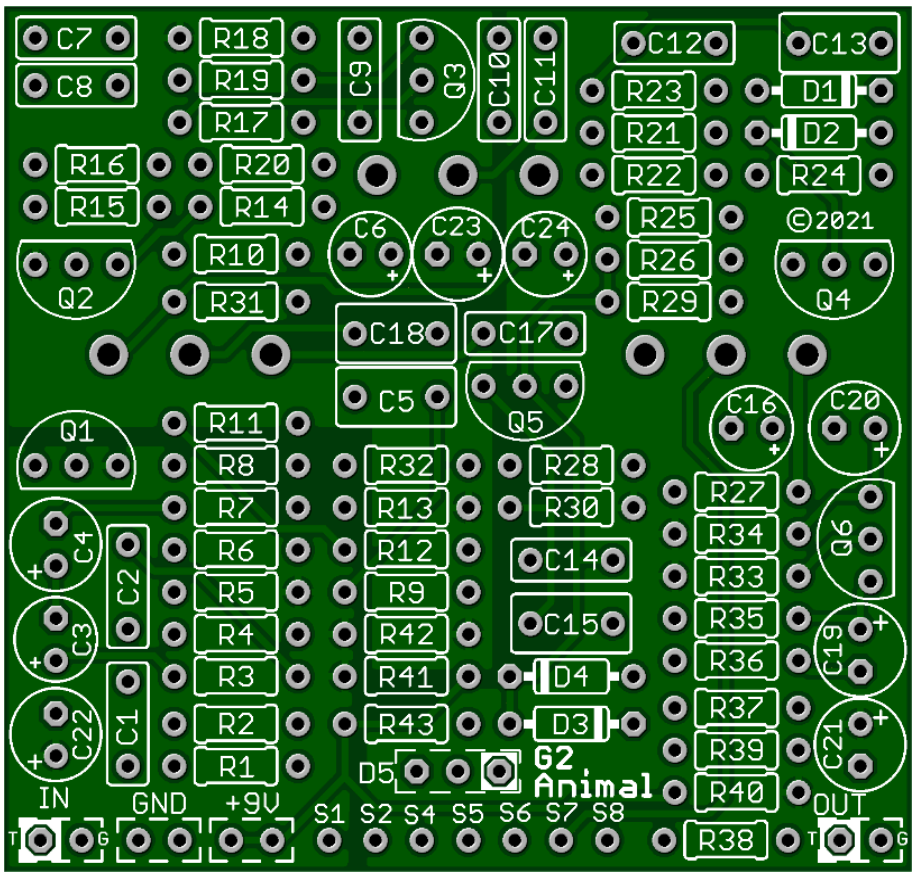
G2 Animal by GuitarPCB v3 (2021)

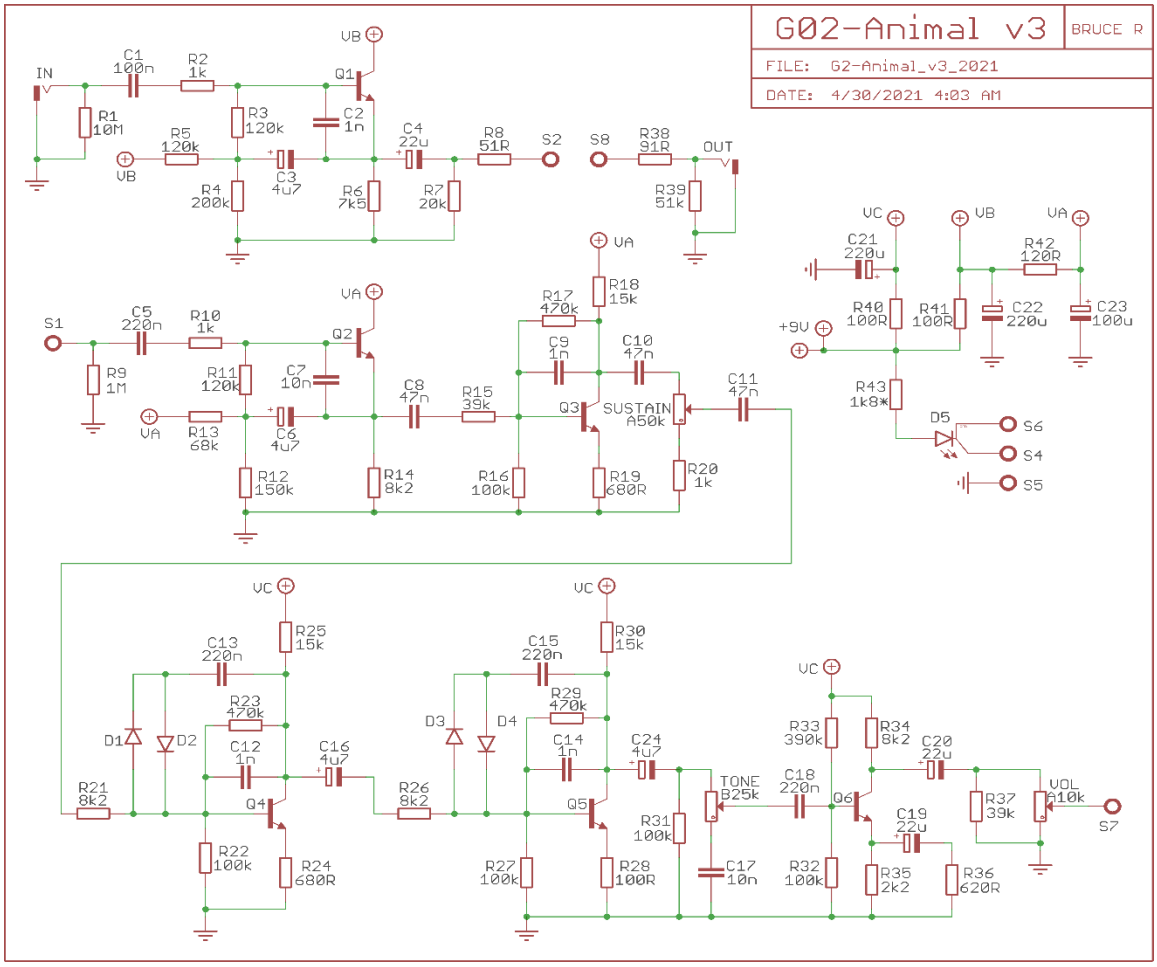
Compared to the famous and practically unattainable Cornish G2™. This is a superior sounding distortion unit. It features a four-stage discrete transistor Class A circuit with additional Germanium diodes that provide warm sounding harmonics. This circuit provides a huge tone with more dynamic, harmonically rich effect than many other distortion pedals.

Additionally, the circuit input utilizes a High Impedance, Unity Gain, Buffer Preamp allowing the pickups to always operate at their optimum and the Unity Gain Buffer also prevents "Ghost Tones" being audible while in Bypass Mode.



Board Dimensions (W x H) 2.20” x 2.05”

Part	Value	Part	Value	Part	Value	Part	Value	Part	Value	Part	Value
R1	10M	R15	39k	R29	470k	R43	1k8*	C13	220n	D5	Status
R2	1k	R16	100k	R30	15k			C14	1n		
R3	120k	R17	470k	R31	100k	C1	100n	C15	220n	*Q1 - Q6	2N5088
R4	200k	R18	15k	R32	100k	C2	1n	C16	4u7		
R5	120k	R19	680R	R33	390k	C3	4u7	C17	10n	SUSTAIN	50KA
R6	7k5	R20	1k	R34	8k2	C4	22u	C18	220n	TONE	25KB
R7	20k	R21	8k2	R35	2k2	C5	220n	C19	22u	VOL	10KA
R8	51R	R22	100k	R36	620R	C6	4u7	C20	22u		
R9	1M	R23	470k	R37	39k	C7	10n	C21	220u		
R10	1k	R24	680R	R38	91R	C8	47n	C22	220u		
R11	120k	R25	15k	R39	51k	C9	1n	C23	100u		
R12	150k	R26	8k2	R40	100R	C10	47n	C24	4u7		
R13	68k	R27	100k	R41	100R	C11	47n				
R14	8k2	R28	100R	R42	120R	C12	1n	*D1 - D4	1N34A GE		



Build Notes:

See our Guides Page at GuitarPCB.com forum for the previous version.

The only component changes to the original concern are the transistors Q1 – Q6. We have changed from the original BC549C transistors to 2N5088 for their more common availability. If you do choose BC549Cs, the transistor pin-out orientation is simply **rotated 180º** when compared to the board silkscreen. Google the Datasheet.

Install sockets and try other types of diodes if you like. Try LED, Schottky, Silicon or germanium diodes.

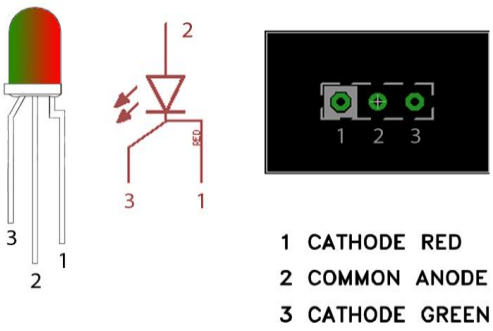
For those people who don't have a wide range of resistor values, the following suggestions might prove helpful and shouldn't have any great effect on the circuit.

R1	10M	1M and Upwards
R4	200k	180k /220k
R6	7k5	8k2
R7	20k	22k
R8	51R	100R
R36	620R	Lower Value -Higher Gain
R38	91R	100R
R39	50k	47k
R42	120R	100R
R43	3k3	LED CLR

In regards to R36, this could be turned into a mod for a Normal/Hot switch. For example: 620R/120R. Pedal kits available from some of our distributors will likely not include this mod.

STATUS LED

D5 is a common anode bi-color LED



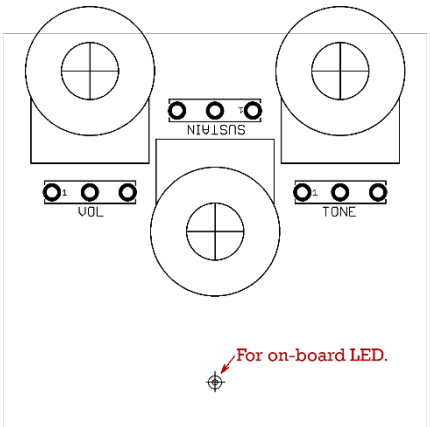
The diagram above shows the pin-out, schematic symbol and pad connection for a common anode LED. The pin-out for the bi-color LED is as follows:

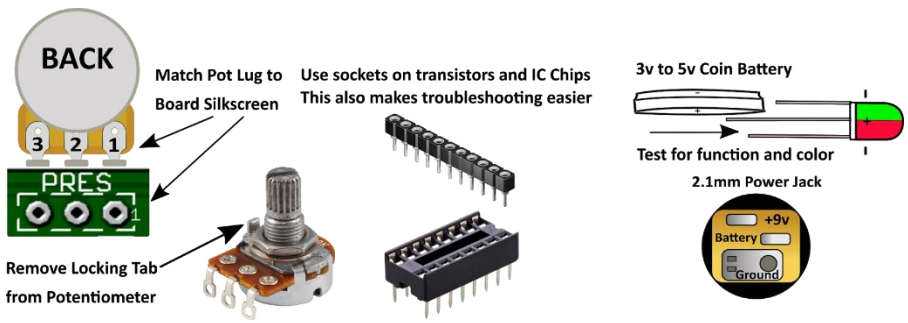
1st Color Cathode	90-degree bend in the lead
Common Anode	Middle lead
2nd Color Cathode	45-degree bend in the lead

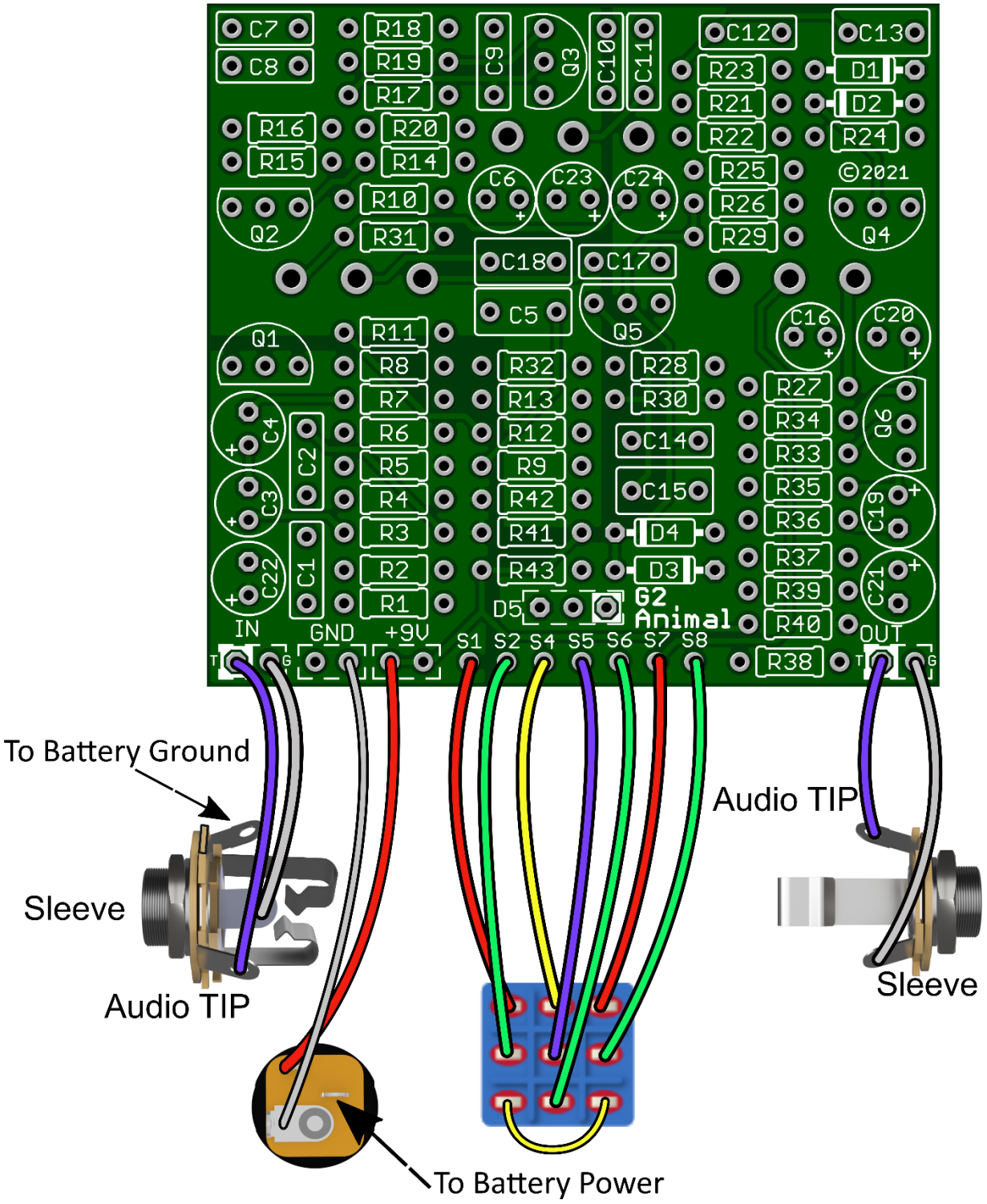
The pad for lead 1 on the circuit board is marked with a white box.
When connected correctly D5 will light red when power is applied and the circuit is in bypass mode and light green when the circuit is in effects mode.

If you wish to use a standard LED the (common anode) is connected to the middle pad and the cathode to the (non-whitened) pad. This will activate when the pedal is engaged.

Drill Tips: Measure your components before selecting a drill bit. We recommend drilling the pot holes, mounting the pots in the enclosure, and then soldering the pots to the board. This approach should resolve the issue of the pots not fitting through the holes after soldering. We also recommend you make the holes for the pots a little larger than the threads in case you decide to remove the board and put it back in during the build, to avoid problems. Use this guide at your own risk. Make sure page scaling is turned off when you print this PDF, or the image above may be smaller than expected. Verify everything before drilling.







The standard circuit employs a buffer stage (Q1 stage) that is permanently connected even when the circuit is in bypass mode i.e., the circuit is not a true bypass system. Because of this you do not use a 3PDT Wiring Board with this circuit. Also, we recommend using the on-board LED pads (D5) as well for your status LED.

Be sure your In/Out Jack wiring is correct. A Stereo Jack (for battery use only) has a RING lug which is used to connect to the battery ground. If you do not intend to use a battery there is no need for a Stereo Jack. If using Stereo then only use the Tip and Sleeve lugs.

A complete breakdown of the circuit with possible mods courtesy of Tonmann:

The circuit is a **Big Muff** regarding sections (Q3 - Q5), with a couple of buffers (Q1 -Q2) tacked onto the front, a very basic high pass/low pass filter (C24 - C17) instead of a Pi filter and a slightly different recovery stage from a **standard muff**.

The input buffer has no gain and shouldn't color the signal (flat frequency response) going into the first stage (Q3), the amount of signal reaching the first stage is determined by R15 - lower value means more signal. This Q3 stage is the first one that provides gain and cuts a bit of the high frequency off - Q4 and Q5 are basically the same gain stages as Q3 (except they have the clipping sections) and Q5 provides a bit more gain than Q4. The tone stage is nothing spectacular and just provides a means of cutting the high frequencies (tone pot and C17). The gain from the recovery stage is quite high, due to C19.
Measure the collector and base voltages of Q3 to Q6. The collector voltages should be around the 4V - 5V range and the base voltages around the 700mV - 1V range, except the base of Q6, this should be about 1.5V - 2V. You could also check the emitter voltage of Q2 which should be in the 4V - 5V range.

Clip your audio probe to lug 3 of the sustain pot, guitar at the input and you should be getting a boosted signal (gain of about 4.5) that sounds a bit low to mid-range. Don't change any component values yet, but bear in mind:
You can increase the signal amplitude to the first clipping stage by changing the amount of signal you let in or out of the first stage or by increasing the gain of the first stage:

Reduce the value of R15 to let more signal through to the transistor stage.
Increase the value of the sustain pot (100 kΩ to let more signal out of the transistor stage.
Decrease the value of R19 and/or increase the value of R18 to increase the gain of the stage (if the output at lug 3 becomes distorted when doing this, check the collector voltage).
Increasing the value of C8 will let more bass frequencies into the transistor stage, increasing C10 will let more bass frequencies out of the transistor stage. Reducing the value of C9 will increase the high frequencies coming out of the stage.
We'll leave the two clipping stages for the moment.

Checking the recovery stage. You can either check the recovery stage alone by disconnecting the wire from lug 2 of the tone pot and connecting your guitar to the wire, or, an easier way is disconnecting the wires from lug 2 of both the sustain and tone pots and connect the tone pot wire to lug 2 of the sustain pot, so you have a circuit consisting of the first stage and recovery stage, bypassing both clipping stages. Guitar at the input socket, output socket connected to amp.

You should have lots of gain here (calculates to a gain of about 50).
If you need more gain from the recovery stage:
Reduce the value of R36 - making this a wire jumper will give maximum gain.

All of the above covers the "pure gain" of the circuit, which I would do first before looking at the clipping stages.

As with the first stage, the amount of gain is not spectacular, but then again, if you are using germanium diodes it doesn't need to be very large to get the diodes to clip.

Rather than changing the gain of the clipping stages, it is better to change the amount of signal applied to each stage. This is done by lowering the values of R21 and R26 for more gain, or increasing the values for less gain.
Two more changes to look at:
Lowering the value of C11 will let more bass frequencies through to the first stage (C16 is already very low and shouldn't need decreasing).
Reducing C12 and C14 will increase the high frequency content of the signal at the output.

This just leaves the diodes and the two capacitors, C13 and C15. I would socket the diodes and possibly the capacitors as well. Although there is not a lot to say here, I would suggest the following.

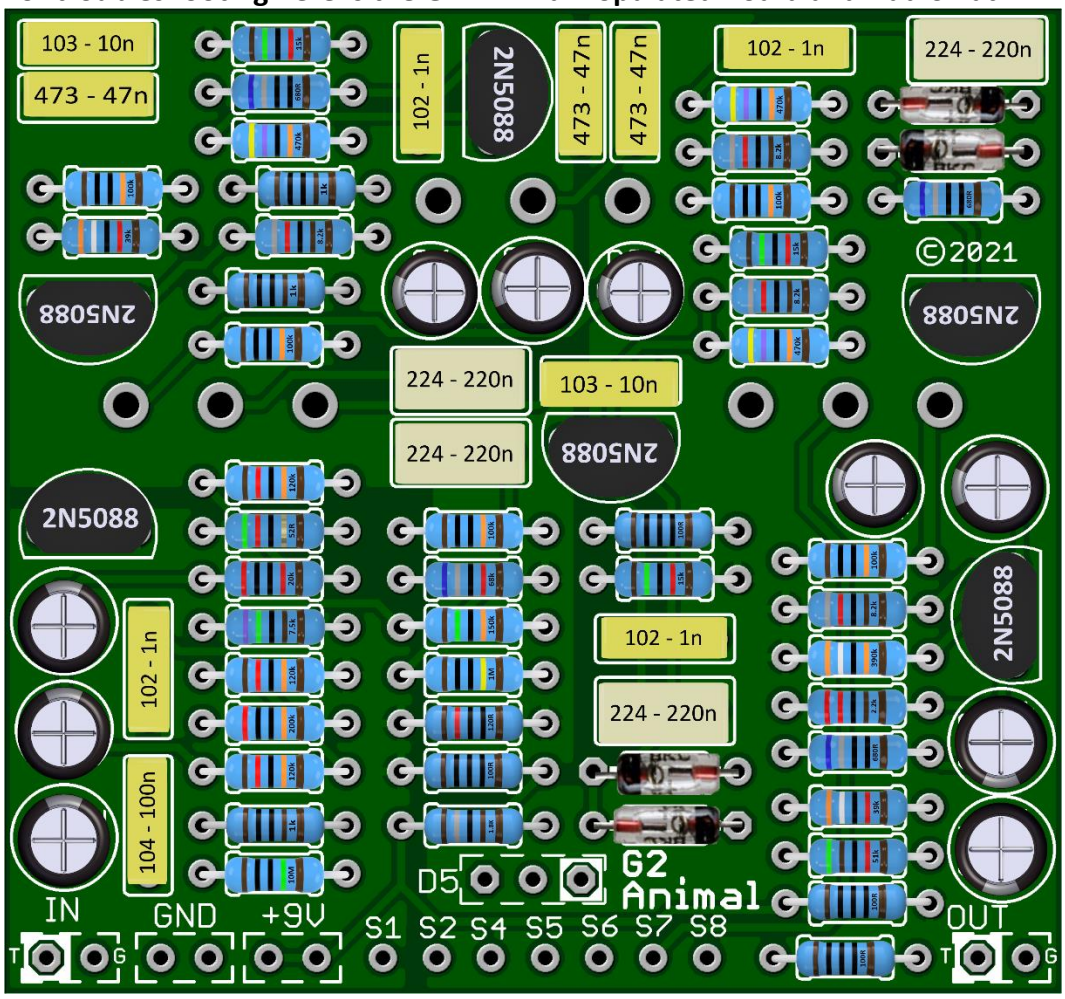
Get a pile of germanium diodes and measure the forward voltages with a DMM and sort them into pairs. Use the pair with the highest forward voltage for D1 and D2 and the pair with the lowest forward voltage for D3 and D4. Doing this (at least in theory) will:
Clip the low frequency end but not the high frequency end of the signal in the first clipping stage.
Clip the low frequency end even more (heavily clipped) and lightly clip the high frequency end in the second clipping stage.

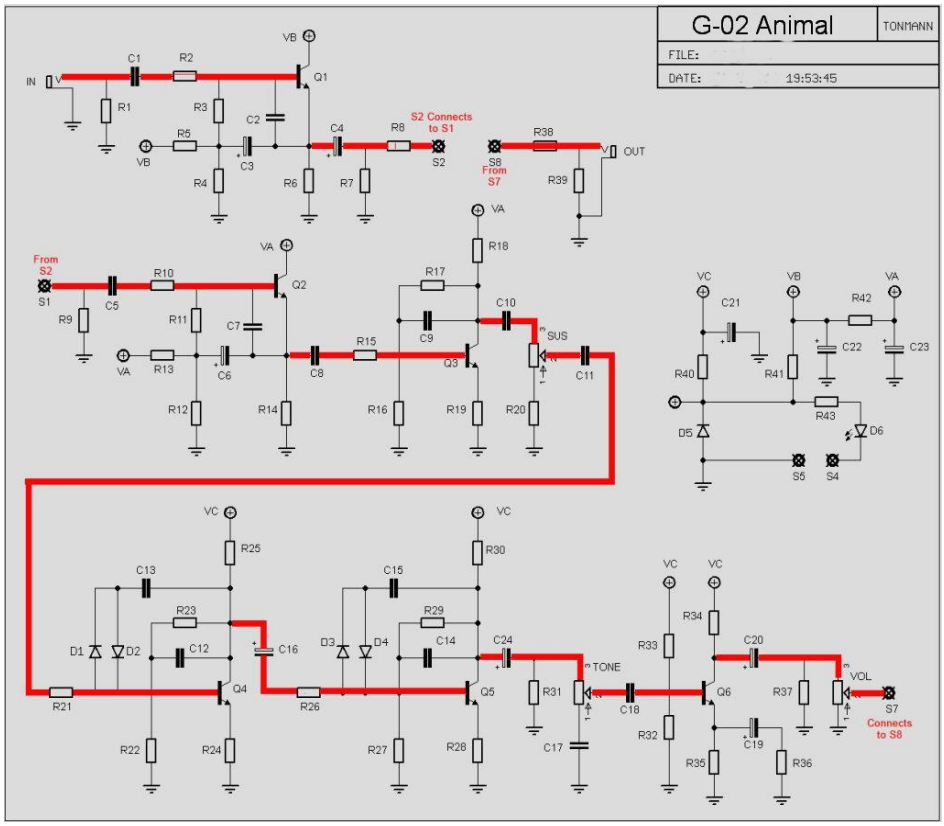
Changing the values of C13 and C15:
As they are - you should be getting a signal that looks like a square wave signal with rounded shoulders. If you reduce the value of these capacitors enough the signal will start to look like a triangle (with an increase in amplitude). Increasing the values will make the signal look a bit like a church with a steeple on the left-hand side (sorry, I can't think of a better way to describe it). It might be fun to experiment with these capacitors.

Proper Voltages of a correctly built circuit.

Q1 E: 4.72 B: 4.53 C: 9.18
Q2 E: 5.27 B: 5.10 C: 9.07
Q3 E: 0.18 B: 0.77 C: 4.87
Q4 E: 0.18 B: 0.77 C: 4.91
Q5 E: 0.03 B: 0.63 C: 4.15
Q6 E: 1.13 B: 1.63 C: 4.95

For troubleshooting here is the G-2 Animal Populated Board and Audio Path.





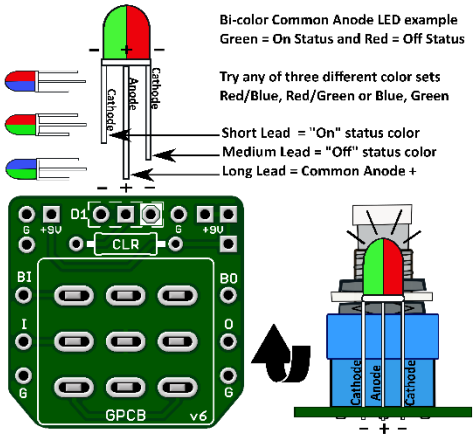
Need a kit? Check out our authorized worldwide distributors:

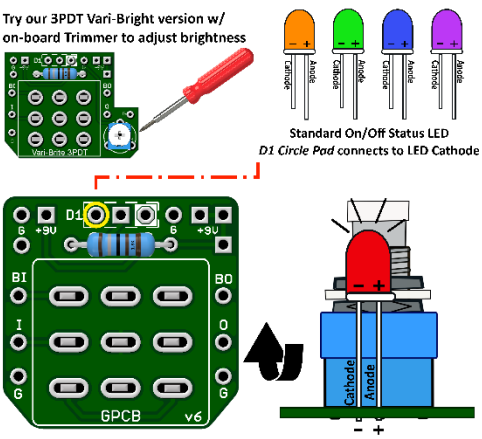
USA – Check out PedalPartsAndKits for all your GuitarPCB kit needs in the USA.

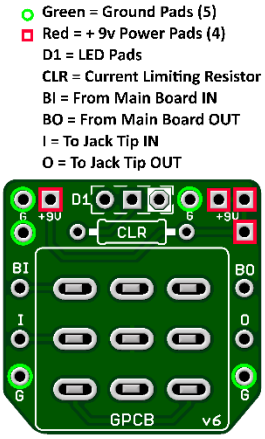
Europe – Das Musikding Order either boards or kits direct from Europe.

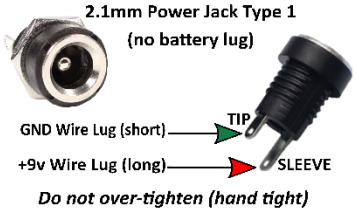
PedalPartsAustralia - Order either boards or kits direct from Australia

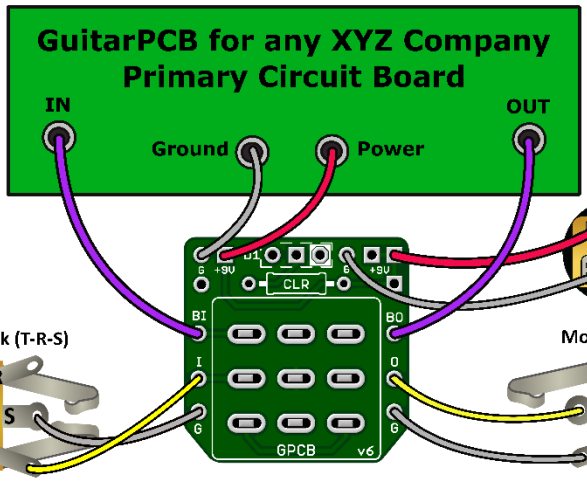
GuitarPCB Tip Sheet

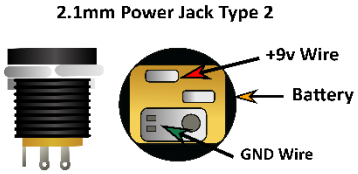












T = Tip
R = Ring
S = Sleeve

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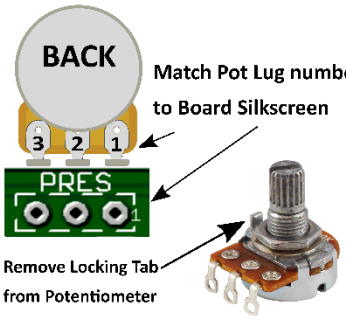
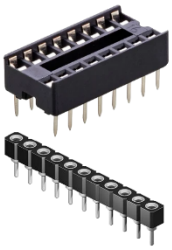
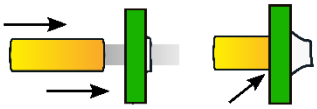
Multiple +9v and Ground Pads are convenient hookup points for additional circuits within the same enclosure. This also allows for diverse wiring schemes to suit indiviual needs.



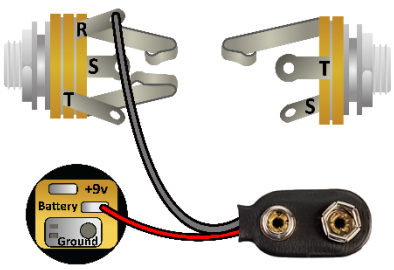
Sockets make troubleshooting easier





When soldering wire to a PCB push the protective PVC jacket flush with the board and pad.

Main Board IN/OUT Pads



Input/Output Jack Wiring

T = Tip | R = Ring | S = Sleeve

A Stereo Jack is only needed if using a Battery. Otherwise use a Mono Jack
Battery Strap RED wire is connected to Power Jack
Battery Strap Black wire is connected to RING (stereo jack)
If wiring an LED to our 3PDT Wiring Board then S4, S5 & S6 are not needed