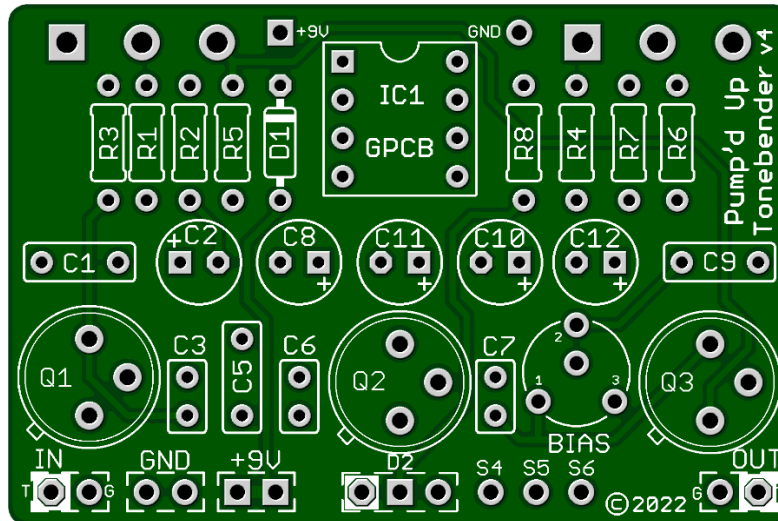


# P.U.T.B. - Pump'd Up Tonebender v4

*This is the Classic Tonebender with a modern twist. Pump'd Up means you can use this circuit with other negative-ground pedals. Since the power section has no effect on the Audio Path, utilizing a Charge Pump to invert to a modern negative ground circuit will not affect the tone of an original Tonebender. This will allow you to daisy chain or use it in a combo build.*



Board Dimensions (W x H): 2.05" x 1.36"

## Bill of Materials

Part	Value
R1	1M
R2	100K
R3	10K
R4	100K
R5	100K
R6	470R
R7	1M
R8	1k8
C1	10n

Part	Value
C2	4u7
C3	220p
C5	100n
C6	220p
C7	220p
C8	4u7
C9	10n
C10	47u
C11	10u

Part	Value
C12	47u
D1	1N5817
D2	Status LED
IC1	7660S
ATTACK	B1K
BIAS	20K
LEVEL	A100K
Q1-Q3	Ge PNP (see text)

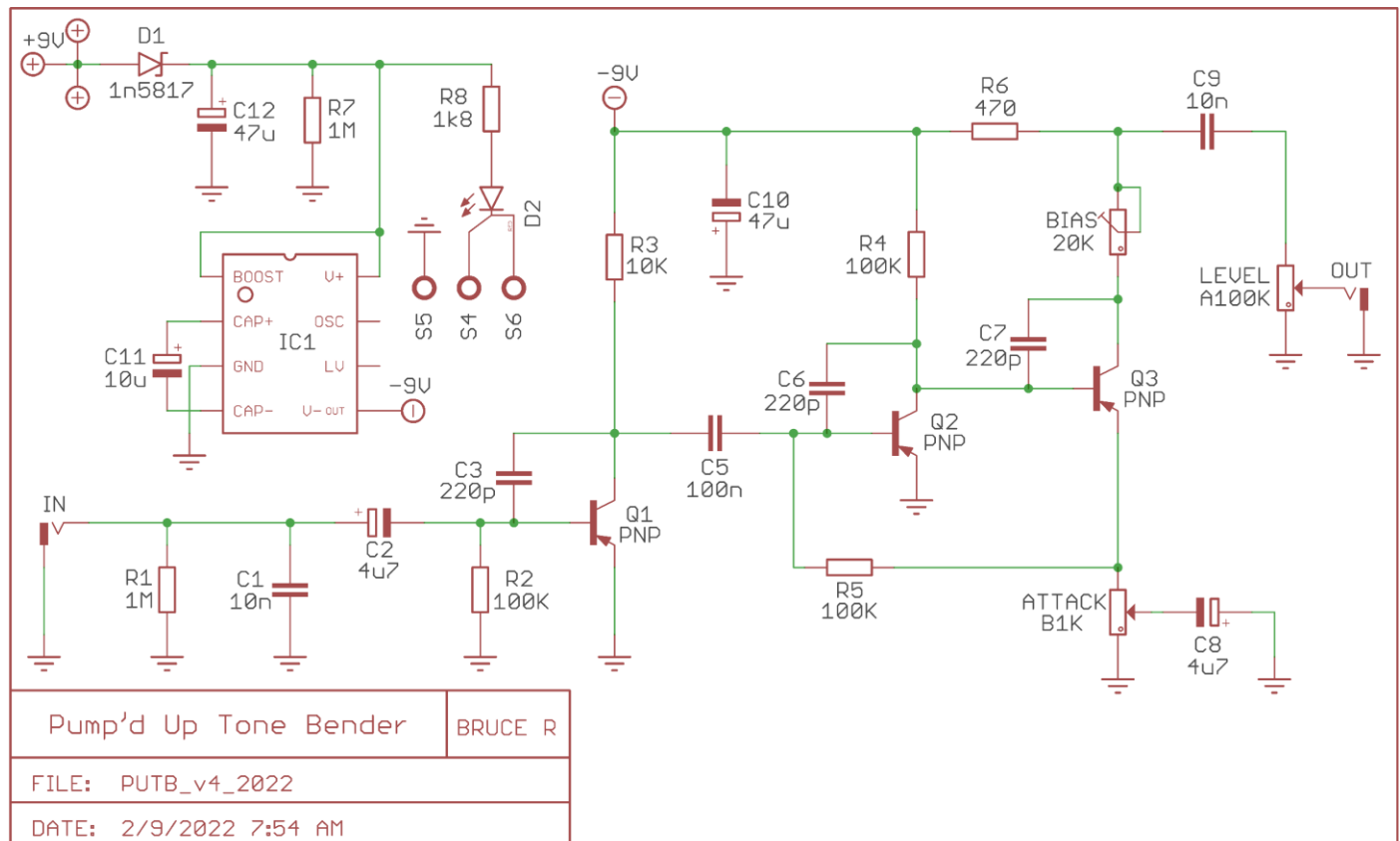
## STATUS LED

\*D2 is a Status LED that can be either a Bi-Color Common Anode or a Standard On/Off LED. (See Tip Sheet)

## New in this GuitarPCB 2021 version release:

- Added all on-board potentiometers. Larger off-board wiring pads.
- 1N5817 circuit protection diode
- Added extra +9v and Ground pads for "Combo Builds" allowing easy wiring options and connectivity.

## Schematic



## Build Notes:

There is a 20K trimmer designed to help you adjust the bias. Using your digital multimeter (DMM), measure the voltage between ground and the collector pin of Q3, and turn the trimmer to the right until your DMM reads around -7V. The bias can be adjusted up or down by a volt or so to your personal liking. In addition to a slight change to the tone, a larger negative bias value will increase the circuit's output level, which may also factor into where you decide to set the bias.

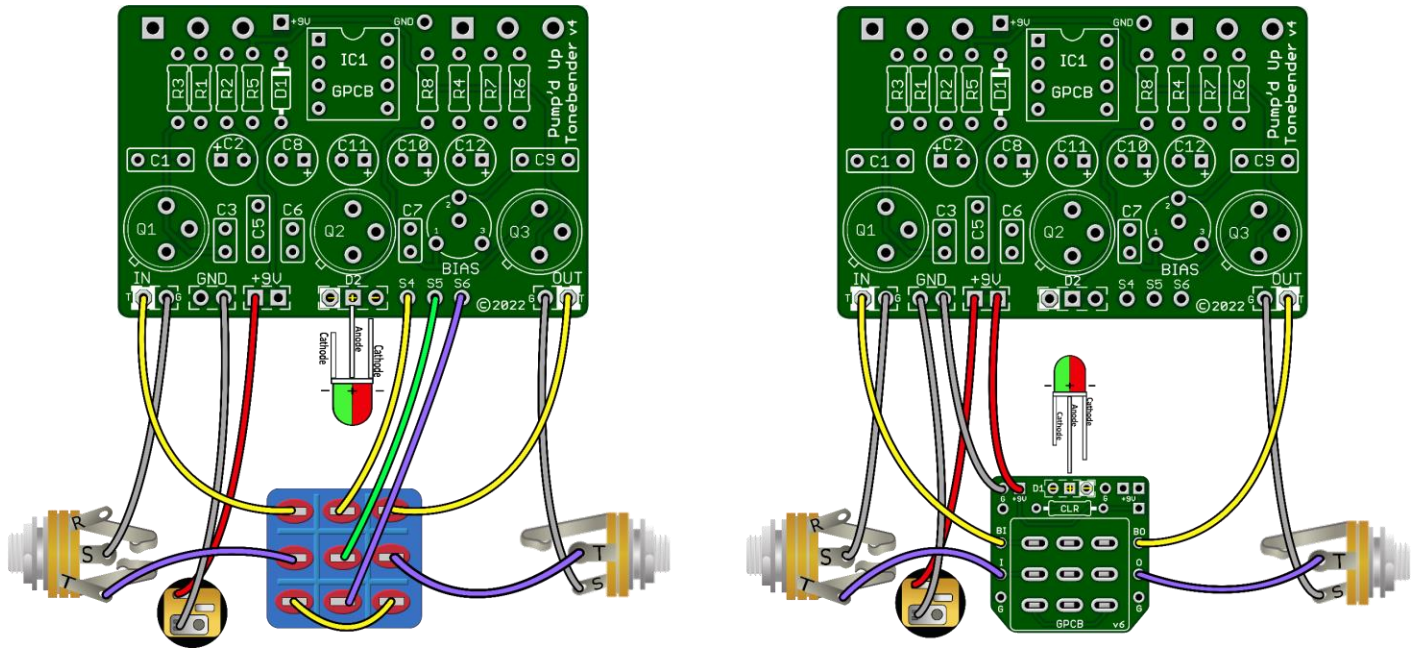
**Transistor Gains:** Suggestions for each of the three transistors: Q1 50-85 hFE, Q2 70-100 hFE and Q3 110-200+ hFE. This is also subjective and considering the limited availability of Germanium transistors it is worth experimenting outside the old standard.

**Charge Pump:** The charge pump you use must be compatible with the **7660S/1044** pin layout. Some charge pumps have a frequency-boost feature which will increase the oscillator from the default 10kHz up to 35-45kHz. We expect you to use a charge pump with this boost feature **7660S** (w/ the S) to avoid any whine or clock noise.

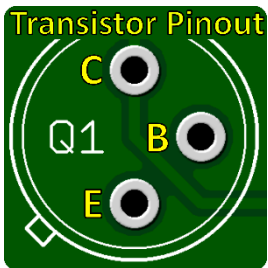
### More Notes about this build

- The original Tone Bender units were equipped with OC81D transistors, which are not very readily available today, and those that do exist are quite expensive. Do not worry about finding old transistors. A quality functioning PNP Germanium or Silicon hybrid is what you need. Examples of these include 2n404, 2n404A, 2n1305, 2n1307, 2n1309, CV7355 and many more. PNP Russian transistors are also excellent.
- Consider using a Hybrid PNP transistor configuration: Q1 Germanium PNP, Q2 Silicon PNP & Q3 Silicon PNP for the best of both worlds.
- Some transistors may generate high-end hiss. This layout includes 3 small capacitors which were not in the original circuit, **C3, C6 and C7**. These act as a filter, but will not affect your guitar tone. Recommended values are 100-220pf. You may also choose not to populate.

## Wiring Diagram



**Note:** If you are using our 3PDT board, you should omit wires and parts from S4, S5 & S6, D2 and R8 (CLR). The CLR and LED will be populated on the 3PDT board instead.



### Bias the Collector of Q3 (always verify Transistor Pinout) ->

Using a 20K trimmer you can adjust the bias. Use a (DMM), measure the voltage between ground and the collector pin of Q3, and turn the trimmer to the right until your DMM reads around -7V. You may easily make this an on-board potentiometer by using the silkscreened lug numbers.

Reports of original vintage tone benders having the bias set as high as -8.5V, while other fuzz pedals like the fuzz face were biased at around -4.7V. This will affect the tone and is subjective to the listener.

For more build guides and tutorials please visit the [Guides Page](#) at GuitarPCB.com

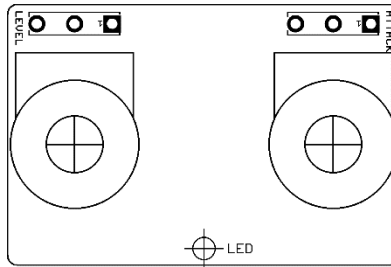
For specific build support please visit our dedicated [Support Forum](#)

[Soldering Tutorial on YouTube](#)

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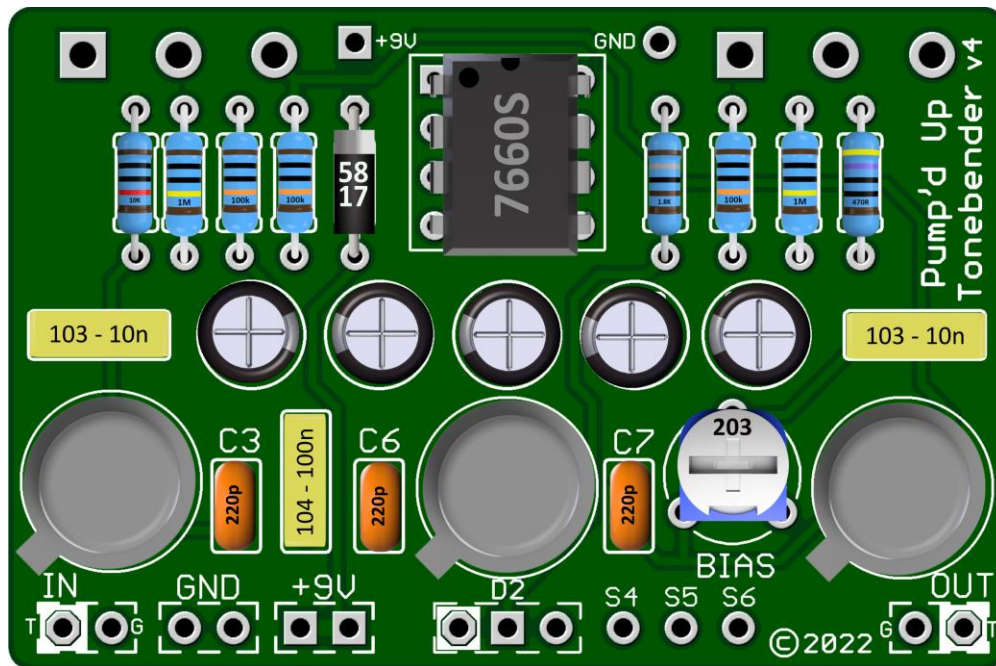
## Drill Template



**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.

Do not drill the LED hole if mounting your LED to our 3PDT Wiring board.

## Populated Board for troubleshooting



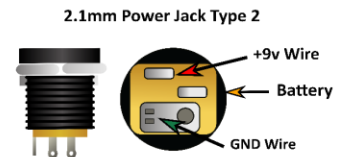
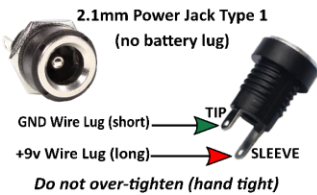
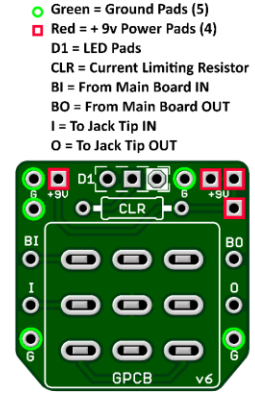
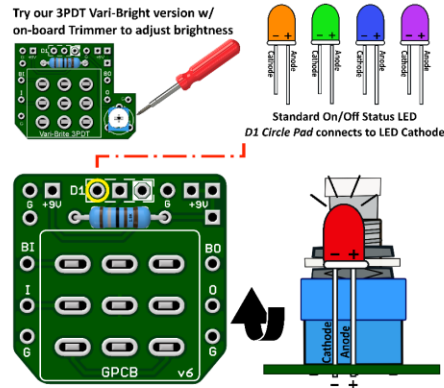
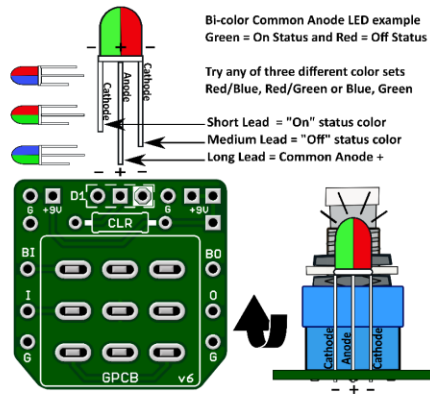
COLOR	1st Band	2nd Band	3rd Band	Multiplier	Tolerance
BLACK	0	0	0	1Ω	
BROWN	1	1	1	10Ω	±1%
RED	2	2	2	100Ω	±2%
ORANGE	3	3	3	1KΩ	
YELLOW	4	4	4	10KΩ	
GREEN	5	5	5	100KΩ	±0.5%
BLUE	6	6	6	1MΩ	±0.25%
VIOLET	7	7	7	10MΩ	±0.10%
GREY	8	8	8	100MΩ	±0.05%
WHITE	9	9	9	1GΩ	
GOLD				0.1Ω	±5%
SILVER				0.01Ω	±10%

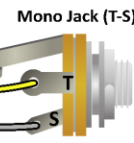
Band 1	Band 2	Band 3	Multiplier	Tolerance
4	7	0	x 1kΩ	470k 1%



# GuitarPCB Tip Sheet

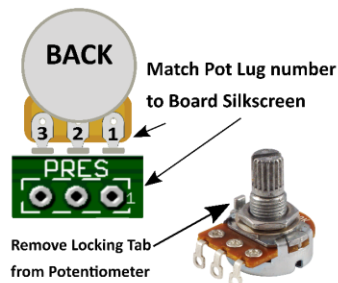


T = Tip  
R = Ring  
S = Sleeve

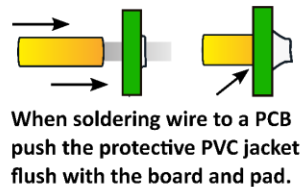
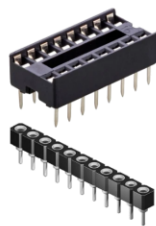


T = Tip  
S = Sleeve

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 individual needs.



Sockets make troubleshooting easier

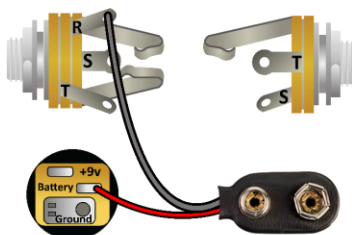


Main Board IN/OUT Pads



Extra Ground Pad

Audio Path to 3PDT



## 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



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