

PROJECT NAME

PARHELION

BASED ON

Boss® OD-1 OverDrive

BUILD DIFFICULTY

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EFFECT TYPE

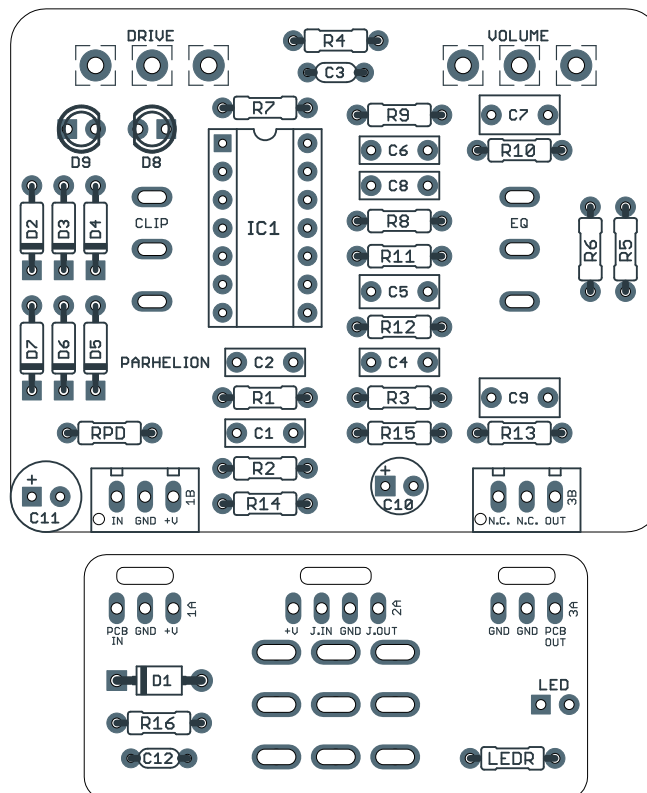
Overdrive

DOCUMENT VERSION

1.0.2 (2022-03-04)

PROJECT SUMMARY

A precursor to the Tube Screamer, known for being the first overdrive effect to utilize diodes in a negative-feedback arrangement for clipping purposes.



Actual size is 2.3" x 1.86" (main board) and 1.78" x 0.86" (bypass board).

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INTRODUCTION

The Parhelion Vintage Overdrive is based on the Boss OD-1 OverDrive, originally released in 1977 as one of their first compact pedals alongside the SP-1 Spectrum and PH-1 Phaser.

The OD-1 is notable for being the first overdrive effect to utilize diodes in an op-amp's negative feedback loop for clipping purposes. Like the Distortion+, it lacks a tone control, but most who play through it say it doesn't need one.

The OD-1 had two different versions. The original 1977 version used the Raytheon RC3403 quad op-amp (called the "quad version"). The second version from December 1980 used a single 4558 dual op-amp (the "dual version") and changed the input & output buffers to transistor emitter followers as a cost-savings measure, as in most of their later pedals. The original quad version is said to sound better and is what the Parhelion project is based on.

While the RC3403 is long out of production, they can still be found without too much trouble. The NJM3403 is an exact substitute and still in production. They share a standard pinout with other quad op-amps such as the LM324 and LM348, so there are many other options that will perform similarly.

The Parhelion has two toggle switches allowing for a little more flexibility. A clipping switch selects between three different sets of diodes, and an EQ switch changes the gain structure of the op-amp clipping stage for higher gain and more bass.

Note: The legacy 1590B version of the Parhelion was called the Corona. The updated version was given a new name upon release in 2021 for obvious reasons.

USAGE

The Parhelion has the following controls:

- **Drive** controls the amount of gain in the op-amp feedback diode clipping stage.
- **Volume** controls the overall output of the effect.
- **Clip** (toggle switch) selects between three sets of diodes: 1x silicon (stock), 2x silicon, and LEDs.
- **EQ** (toggle switch) selects between two different tones: stock mode (similar to the Tube Screamer) and another mode with slightly higher gain and less bass cut.

PARTS LIST

This parts list is also available in a spreadsheet format which can be imported directly into Mouser for easy parts ordering. Mouser doesn't carry all the parts (most notably potentiometers) so the second tab lists all the non-Mouser parts as well as sources for each.

[View parts list spreadsheet](#) →

PART	VALUE	TYPE	NOTES
R1	1k	Metal film resistor, 1/4W	
R2	220k	Metal film resistor, 1/4W	
R3	10k	Metal film resistor, 1/4W	
R4	33k	Metal film resistor, 1/4W	
R5	4k7	Metal film resistor, 1/4W	
R6	3k3	Metal film resistor, 1/4W	
R7	10k	Metal film resistor, 1/4W	
R8	10k	Metal film resistor, 1/4W	
R9	10k	Metal film resistor, 1/4W	
R10	4k7	Metal film resistor, 1/4W	
R11	470k	Metal film resistor, 1/4W	
R12	470R	Metal film resistor, 1/4W	
R13	100k	Metal film resistor, 1/4W	
R14	33k	Metal film resistor, 1/4W	
R15	33k	Metal film resistor, 1/4W	
R16	100R	Metal film resistor, 1/4W	Power supply filter resistor.
RPD	2M2	Metal film resistor, 1/4W	Input pulldown resistor.
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	100n	Film capacitor, 7.2 x 2.5mm	
C2	47n	Film capacitor, 7.2 x 2.5mm	
C3	47pF	MLCC capacitor, NP0/COG	
C4	47n	Film capacitor, 7.2 x 2.5mm	
C5	330n	Film capacitor, 7.2 x 2.5mm	
C6	18n	Film capacitor, 7.2 x 2.5mm	
C7	1uF	Film capacitor, 7.2 x 3.5mm	
C8	100n	Film capacitor, 7.2 x 2.5mm	
C9	1uF	Film capacitor, 7.2 x 3.5mm	
C10	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C11	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C12	100n	MLCC capacitor, X7R	Power supply filter capacitor.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
D1	1N5817	Schottky diode, DO-41	
D2	1N914	Fast-switching diode, DO-35	
D3	1N914	Fast-switching diode, DO-35	
D4	1N914	Fast-switching diode, DO-35	
D5	1N914	Fast-switching diode, DO-35	
D6	1N914	Fast-switching diode, DO-35	
D7	(jumper)		Jumper for stock OD-1.
D8	3mm LED	LED, 3mm, red diffused	
D9	3mm LED	LED, 3mm, red diffused	
IC1	NJM3403AD	Operational amplifier, quad, DIP-14	Original uses Raytheon RC3403. NJM version is an exact substitute.
IC1-S	DIP-14 socket	IC socket, DIP-14	
DRIVE	1MA	16mm right-angle PCB mount pot	
VOL.	10kB	16mm right-angle PCB mount pot	
CLIP	SPDT cntr off	Toggle switch, SPDT on-off-on	
EQ	SPDT on-on	Toggle switch, SPDT on-on	
LED	5mm	LED, 5mm, red diffused	
IN	1/4" stereo	1/4" phone jack, closed frame	Switchcraft 112BX or equivalent.
OUT	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
DC	2.1mm	DC jack, 2.1mm panel mount	Mouser 163-4302-E or equivalent.
BATT	Battery snap	9V battery snap	Optional. Use the soft plastic type—the hard-shell type will not fit.
FSW	3PDT	Stomp switch, 3PDT	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

BUILD NOTES

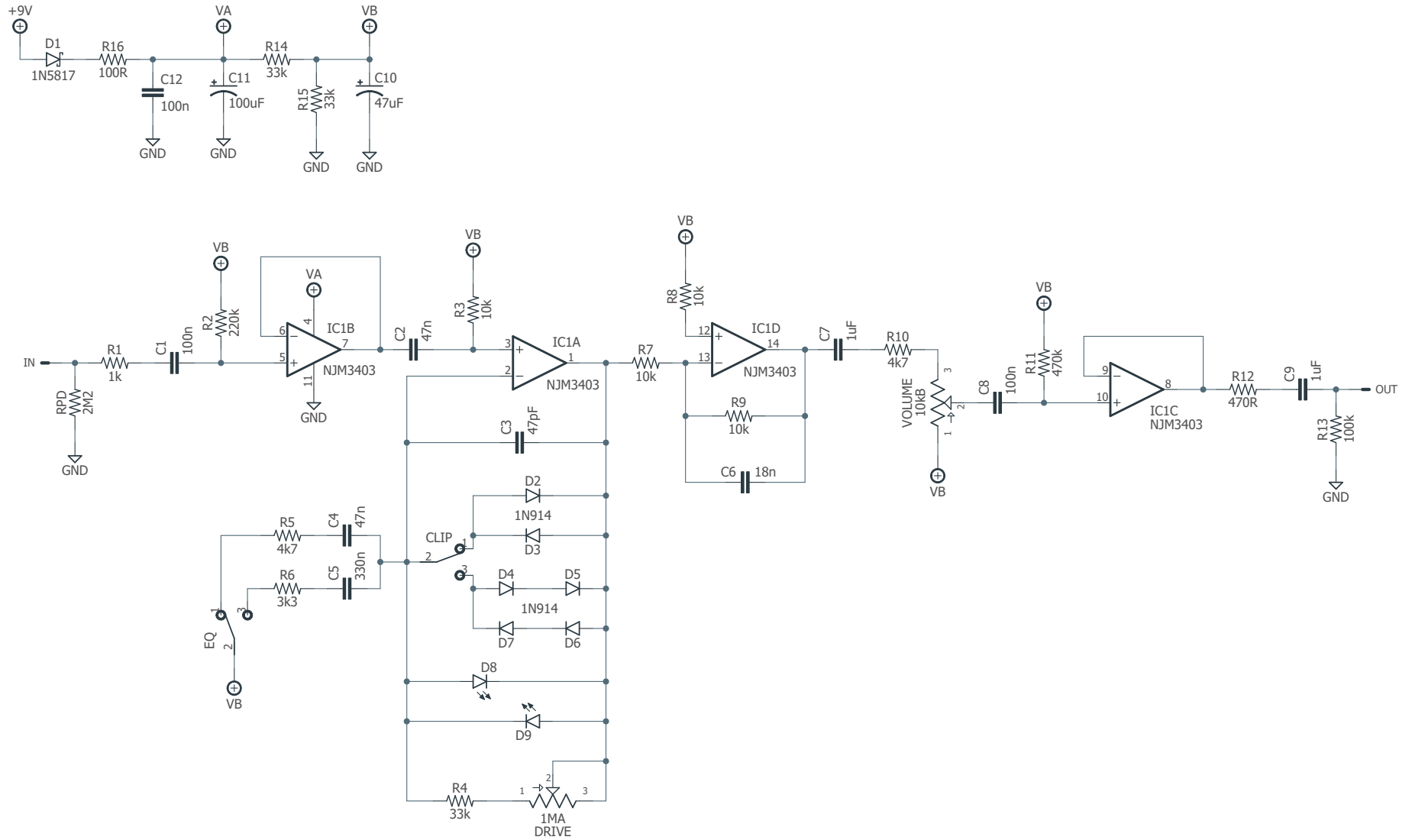
Clipping diodes

The original OD-1 used asymmetric clipping, with one diode in one direction and two in the other. An extra diode has been included on the Parhelion in case you want to experiment with other clipping options, but for the stock mode you will want to jumper **D7**.

The “up” position of the toggle switch engages this mode, while the “down” position is adapted from the Tube Screamer (one diode in each direction).

If you include D7, the clipping will be symmetrical in the “up” position, but at a higher threshold that could be described as slightly more open or transparent.

SCHEMATIC



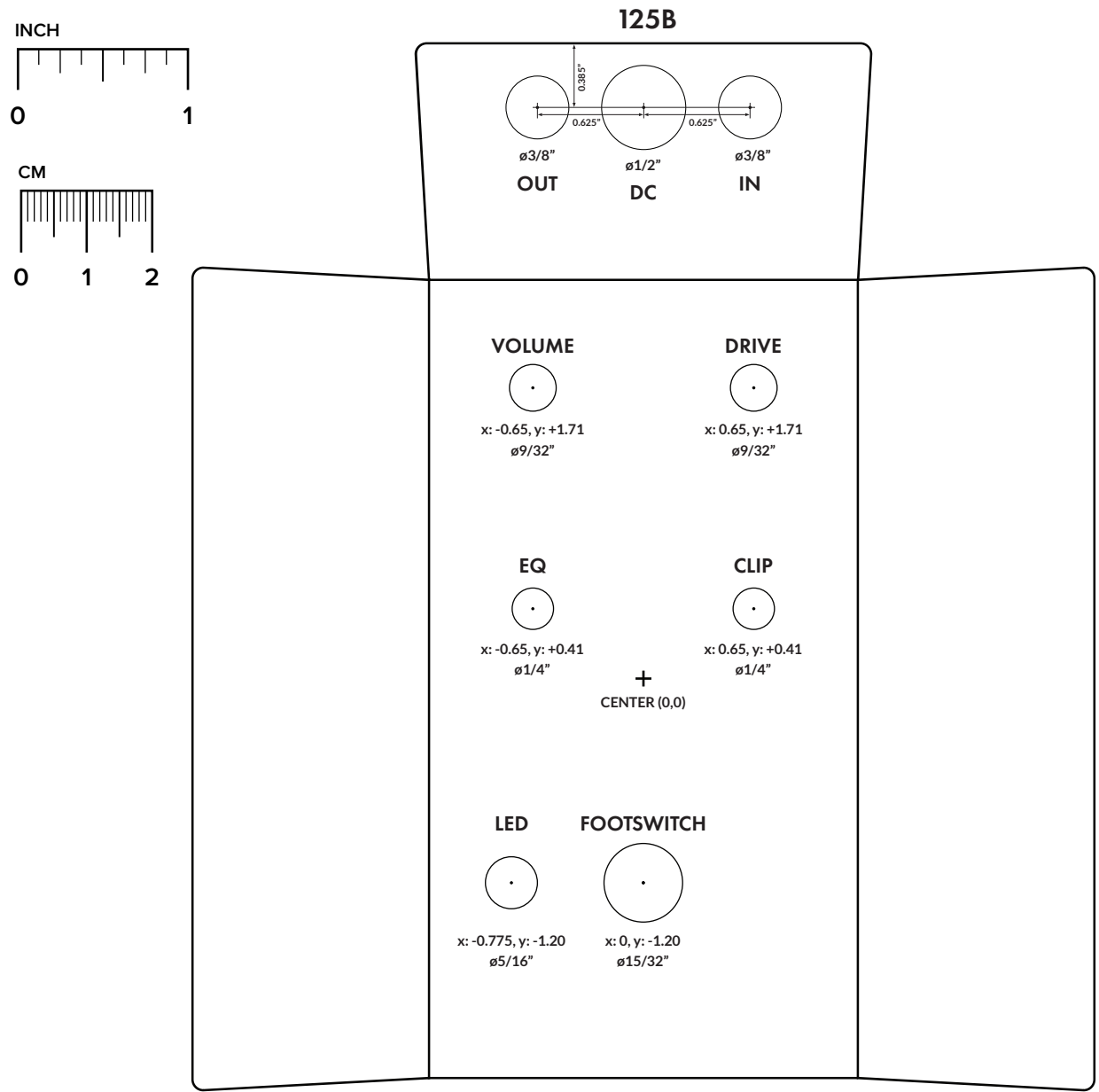
DRILL TEMPLATE

Cut out this drill template, fold the edges and tape it to the enclosure. Before drilling, it's recommended to first use a center punch for each of the holes to help guide the drill bit.

Ensure that this template is printed at 100% or "Actual Size". You can double-check this by measuring the scale on the printed page.

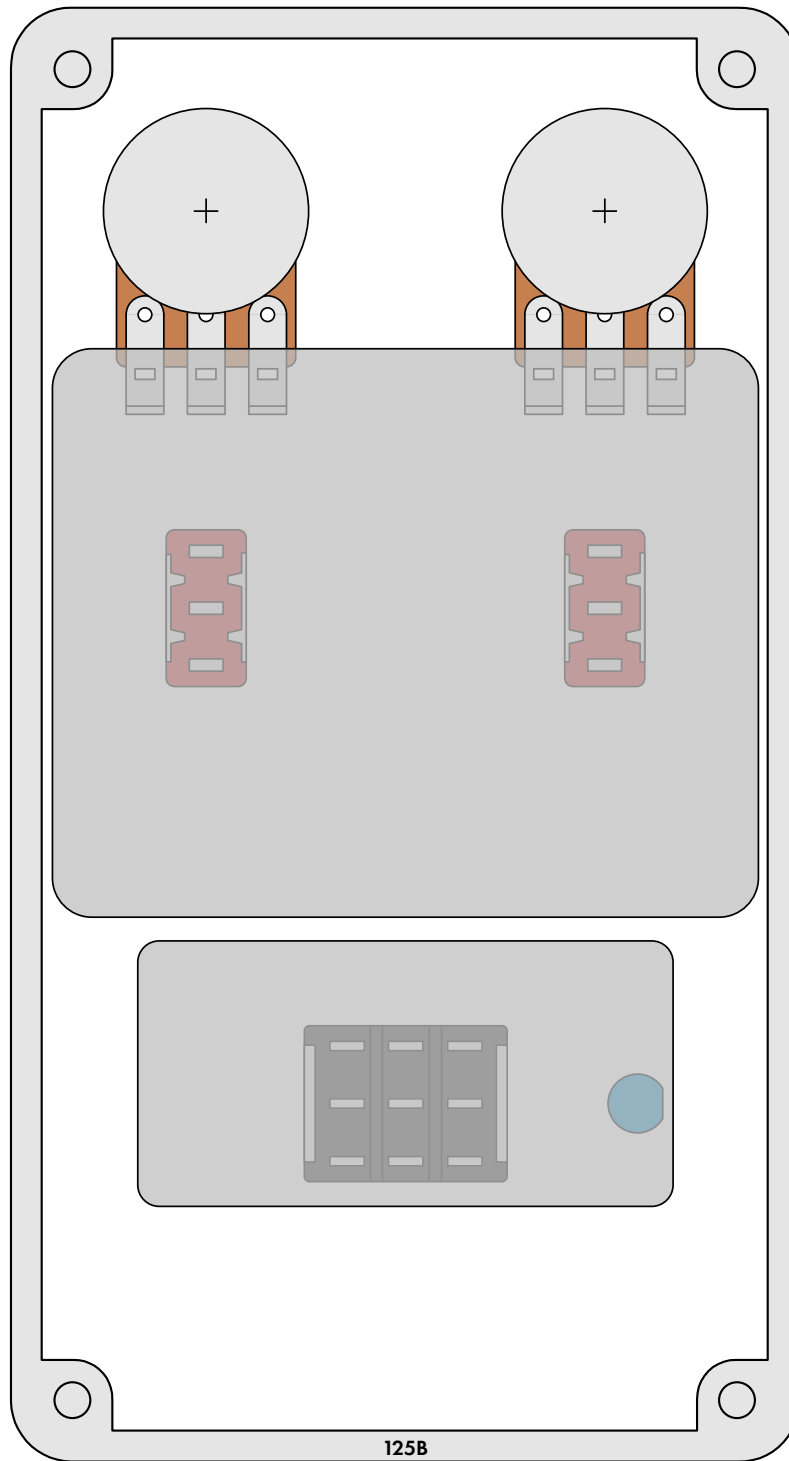
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

LED hole drill size assumes the use of a [5mm LED bezel](#), available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.



ENCLOSURE LAYOUT

Enclosure is shown without jacks. See next page for jack layout and wiring.



WIRING DIAGRAM



*Shown with optional 9V battery. If battery is omitted, both jacks can be mono rather than one being stereo.
Leave the far-right lug of the DC jack unconnected.*

LICENSE & USAGE

No direct support is offered for these projects beyond the provided documentation. It's assumed that you have at least some experience building pedals before starting one of these. Replacements and refunds cannot be offered unless it can be shown that the circuit or documentation are in error.

All of these circuits have been tested in good faith in their base configurations. However, not all the modifications or variations have necessarily been tested. These are offered only as suggestions based on the experience and opinions of others.

Projects may be used for commercial endeavors in any quantity unless specifically noted. No attribution is necessary, though a link back is always greatly appreciated. The only usage restrictions are that **(1) you cannot resell the PCB as part of a kit without prior arrangement, and (2) you cannot “goop” the circuit, scratch off the screenprint, or otherwise obfuscate the circuit to disguise its source.** (In other words: you don't have to go out of your way to advertise the fact that you use these PCBs, but please don't go out of your way to hide it. The guitar effects industry needs more transparency, not less!)

DOCUMENT REVISIONS

1.0.2 (2022-03-04)

Changed IC recommendation to NJM3403, which is an exact substitute for the original Raytheon chip and still in production.

1.0.1 (2021-04-02)

Corrected D7 in parts list, which should be jumpered for the stock OD-1 circuit.

1.0.0 (2021-03-19)

Initial release.