PROJECT NAME

THESEUS

aion
DIY GUITAR EFFECTS

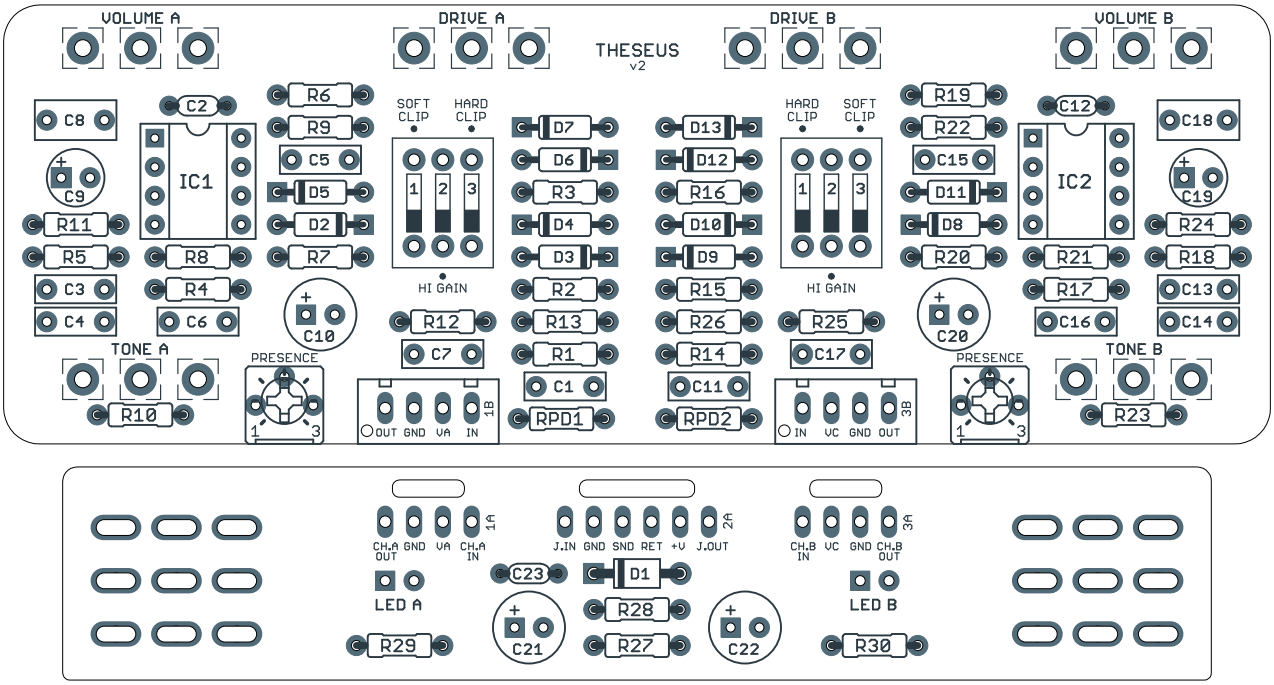
BASED ON
Analogman King of Tone

BUILD DIFFICULTY
Intermediate

EFFECT TYPE
Dual-channel overdrive

DOCUMENT VERSION
2.0.1 (2023-01-23)

PROJECT SUMMARY
One of the earliest boutique “waitlist” pedals, this dual-channel drive is made up of two modified Marshall Bluesbreaker circuits in series.



Actual size is 4.4” x 1.52” (main board) and 4.00” x 0.74” (bypass board).

TABLE OF CONTENTS

1 Project Overview
2 Introduction & Usage
3-5 Parts List
6 Build Notes
7 Schematic
8 Drill Template
9 Enclosure Layout
10 Wiring Diagram
11 Wiring Diagram (no send/return loop)
12 Licensing & Document Revisions

INTRODUCTION

The Theseus Dual Overdrive is based on the Analogman King of Tone, a dual-channel drive pedal first released in 2003 that played a big part in kicking off the boutique/handmade pedal trend. In the past two decades it has only grown in popularity, and last we checked the waitlist is around 4 ½ years.

The King of Tone is essentially two modified Marshall Bluesbreakers in series, each independently switchable so they can be used on their own or stacked one into the other for a more complex and natural overdriven sound. Each channel has an internal presence control as well as DIP switches that control the clipping diode configuration.

In 2009, Analogman began offering a "high gain" modification that can be selected as part of the customization. We've added a third DIP switch position to allow this to be switchable per channel instead of being a hard-wired modification.

Otherwise, the Theseus is a direct clone of the King of Tone, but with one added convenience: a send/return loop between the channels. This allows the two pedals to be split up so you can have more flexibility in where they are used on the pedalboard, or put something in between them such as a boost or EQ for added tone shaping. If nothing is plugged into the send/return jacks, the loop is disabled.

In 2012, Analogman released the Prince of Tone, a single-channel version with a few extra tweaks. The Prince of Tone is available from Aion FX as the Achilles Amp Overdrive.

USAGE

The Theseus has three external controls per channel:

- **Drive** controls the amount of gain going into the op-amp feedback diode clipping stage.
- **Tone** controls the treble response of the channel via a passive filter.
- **Volume** controls the overall output of the channel.

In addition, each channel has four internal controls:

- **Presence** (trimmer) is an additional passive treble control. The default position is all the way down (full CCW) and as you turn it up it adds high-end. Noise or hiss will increase as well.
- **Soft Clip** (DIP switch) enables or disables the soft clipping. Default position is up (enabled).
- **Hard Clip** (DIP switch) enables or disables the hard clipping. Default position is down (disabled).
- **High Gain** (DIP switch) enables or disables the high-gain mode. Default position is up (low gain).

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—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	1M	Metal film resistor, 1/4W	
R2	100k	Metal film resistor, 1/4W	
R3	1k	Metal film resistor, 1/4W	
R4	27k	Metal film resistor, 1/4W	
R5	33k	Metal film resistor, 1/4W	
R6	10k	Metal film resistor, 1/4W	
R7	220k	Metal film resistor, 1/4W	
R8	6k8	Metal film resistor, 1/4W	
R9	1k	Metal film resistor, 1/4W	
R10	6k8	Metal film resistor, 1/4W	
R11	1M	Metal film resistor, 1/4W	
R12	47k	Metal film resistor, 1/4W	
R13	47k	Metal film resistor, 1/4W	
R14	1M	Metal film resistor, 1/4W	
R15	100k	Metal film resistor, 1/4W	
R16	1k	Metal film resistor, 1/4W	
R17	27k	Metal film resistor, 1/4W	
R18	33k	Metal film resistor, 1/4W	
R19	10k	Metal film resistor, 1/4W	
R20	220k	Metal film resistor, 1/4W	
R21	6k8	Metal film resistor, 1/4W	
R22	1k	Metal film resistor, 1/4W	
R23	6k8	Metal film resistor, 1/4W	
R24	1M	Metal film resistor, 1/4W	
R25	47k	Metal film resistor, 1/4W	
R26	47k	Metal film resistor, 1/4W	
R27	47R	Metal film resistor, 1/4W	
R28	47R	Metal film resistor, 1/4W	
R29	10k	Metal film resistor, 1/4W	LED current-limiting resistor (Ch. A) which affects LED brightness.
R30	10k	Metal film resistor, 1/4W	LED current-limiting resistor (Ch. B) which affects LED brightness.
RPD1	1M	Metal film resistor, 1/4W	Channel A input pulldown resistor. Can be anywhere from 1M to 2.2M.
RPD2	1M	Metal film resistor, 1/4W	Channel B input pulldown resistor. Can be anywhere from 1M to 2.2M.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C1	22n	Film capacitor, 7.2 x 2.5mm	
C2	100pF	MLCC capacitor, NP0/C0G	
C3	10n	Film capacitor, 7.2 x 2.5mm	
C4	10n	Film capacitor, 7.2 x 2.5mm	
C5	100n	Film capacitor, 7.2 x 2.5mm	
C6	10n	Film capacitor, 7.2 x 2.5mm	
C7	10n	Film capacitor, 7.2 x 2.5mm	
C8	1uF	Film capacitor, 7.2 x 3.5mm	
C9	1uF	Electrolytic capacitor, 4mm	
C10	100uF	Electrolytic capacitor, 6.3mm	Reference voltage filter capacitor.
C11	22n	Film capacitor, 7.2 x 2.5mm	
C12	100pF	MLCC capacitor, NP0/C0G	
C13	10n	Film capacitor, 7.2 x 2.5mm	
C14	10n	Film capacitor, 7.2 x 2.5mm	
C15	100n	Film capacitor, 7.2 x 2.5mm	
C16	10n	Film capacitor, 7.2 x 2.5mm	
C17	10n	Film capacitor, 7.2 x 2.5mm	
C18	1uF	Film capacitor, 7.2 x 3.5mm	
C19	1uF	Electrolytic capacitor, 4mm	
C20	100uF	Electrolytic capacitor, 6.3mm	Reference voltage filter capacitor.
C21	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C22	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C23	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	BAS33	Switching diode, DO-35	Original uses MA856 diodes. The BAS33 is the closest available diode currently in production. See build notes.
D3	BAS33	Switching diode, DO-35	
D4	BAS33	Switching diode, DO-35	
D5	BAS33	Switching diode, DO-35	
D6	1N914	Fast-switching diode, DO-35	
D7	1N914	Fast-switching diode, DO-35	
D8	BAS33	Switching diode, DO-35	Original uses MA856 diodes. The BAS33 is the closest available diode currently in production. See build notes.
D9	BAS33	Switching diode, DO-35	
D10	BAS33	Switching diode, DO-35	
D11	BAS33	Switching diode, DO-35	
D12	1N914	Fast-switching diode, DO-35	
D13	1N914	Fast-switching diode, DO-35	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
IC1	JRC4580D	Operational amplifier, single, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	JRC4580D	Operational amplifier, single, DIP8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
MODE A	3-pos. DIP	DIP switch, 3-position	
MODE B	3-pos. DIP	DIP switch, 3-position	
PRES. A	50k trimmer	Trimmer, 10%, 1/4"	
PRES. B	50k trimmer	Trimmer, 10%, 1/4"	
DRIVE A	100kB	16mm right-angle PCB mount pot	
DRIVE B	100kB	16mm right-angle PCB mount pot	
TONE A	25kB	16mm right-angle PCB mount pot	
TONE B	25kB	16mm right-angle PCB mount pot	
VOL. A	100kA	16mm right-angle PCB mount pot	
VOL. B	100kA	16mm right-angle PCB mount pot	
LED A	5mm	LED, 5mm, red diffused	
LED B	5mm	LED, 5mm, red diffused	
IN	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
OUT	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
SEND	NMJ6HC-S	1/4" phone jack, stereo, switched	
RETURN	NMJ6HC-S	1/4" phone jack, stereo, switched	
DC	2.1mm	DC jack, 2.1mm panel mount	Mouser 163-4302-E or equivalent.
CH. A	3PDT	Stomp switch, 3PDT	
CH. B	3PDT	Stomp switch, 3PDT	
ENC	1590BBS	Enclosure, die-cast aluminum	

Clipping diodes

The King of Tone uses MA856 diodes, which clip at a slightly higher threshold than standard silicon diodes such as 1N914 (approximately 0.82V compared to 0.7V). These diodes are long out of production and have almost entirely disappeared from the old-stock market, likely all bought up by Analogman and other cloners.

The BA282 and BA283 are very close to the MA856, and were the popular substitute among builders for awhile... until they dried up too.

Now, the closest option is the BAS33. These clip at around 0.8V, still significantly higher than the 1N914 and only very slightly lower than the MA856. We've compared the curves on a Peak DCA75 and confirmed that they closely match the MA856 across the current test range.

The only problem is that the BAS33 went end-of-life in early 2022. Availability is still high, but eventually they'll join the ranks of the others.

Omitting the send/return jacks

The loop between the two channels is a modification that is not in the original King of Tone. This loop automatically shorts together if nothing is plugged in, so it's fully backwards-compatible if you don't use this feature. However, if you do want to omit it entirely, see the alternate wiring diagram on page 11.

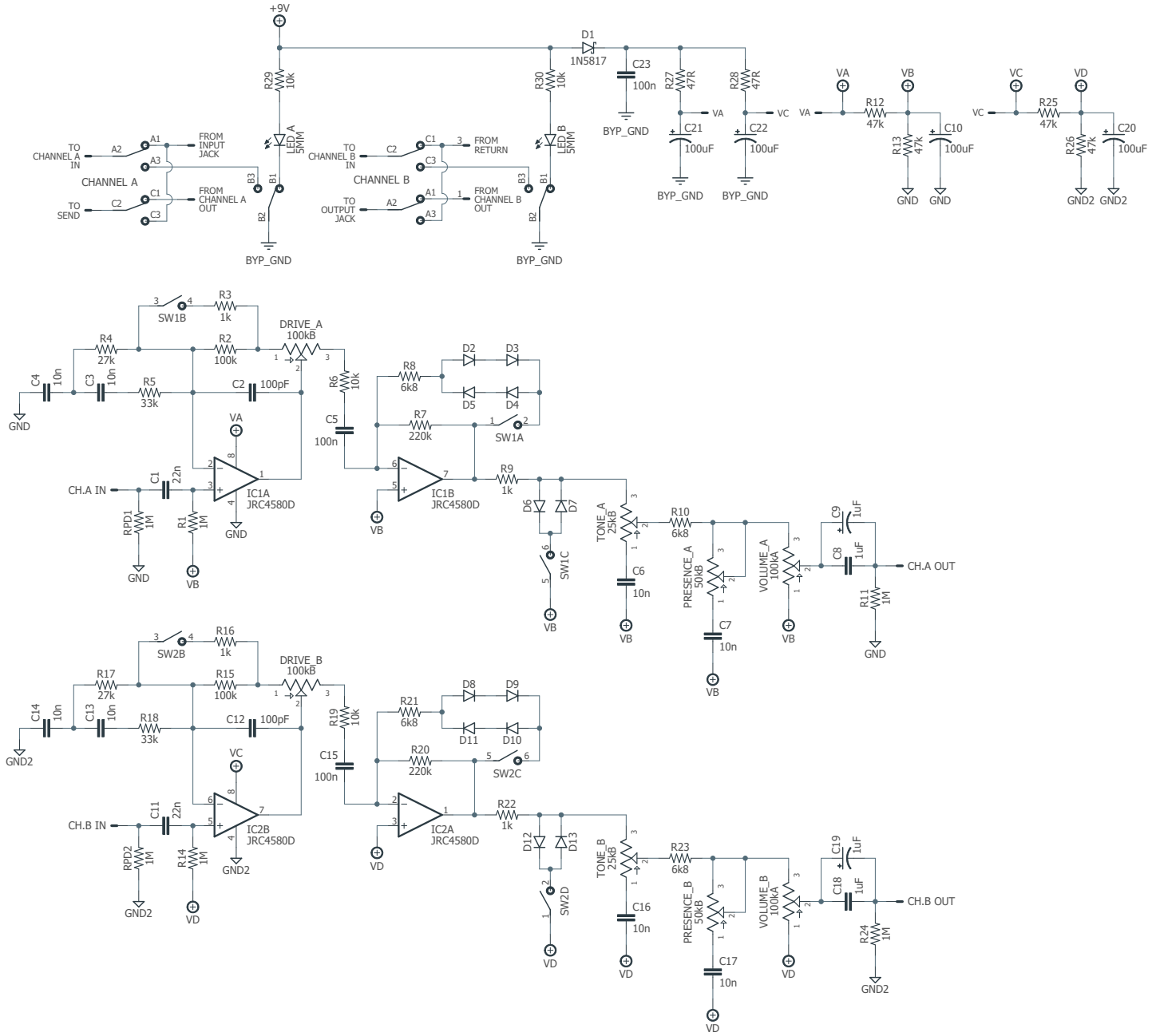
Enclosure size

This project was designed for the **Hammond 1590BBS** enclosure, which has the same height as the 125B or 1590N1. If you don't use the Hammond brand, be careful—not all 1590BBS enclosures are the same. For example, Love My Switches sells two different types, and the CNC Pro version is correct while the standard one is too short.

The 1590BB2 seems like a close equivalent, but it's about 4mm shorter. It may be possible to fit this circuit in a 1590BB2, but we have not tested it, so you're on your own!

Another alternative is the 1590C (also available from Tayda and Love My Switches). It's about 10mm taller than necessary, but if that's all you can find then it will definitely work.

SCHEMATIC

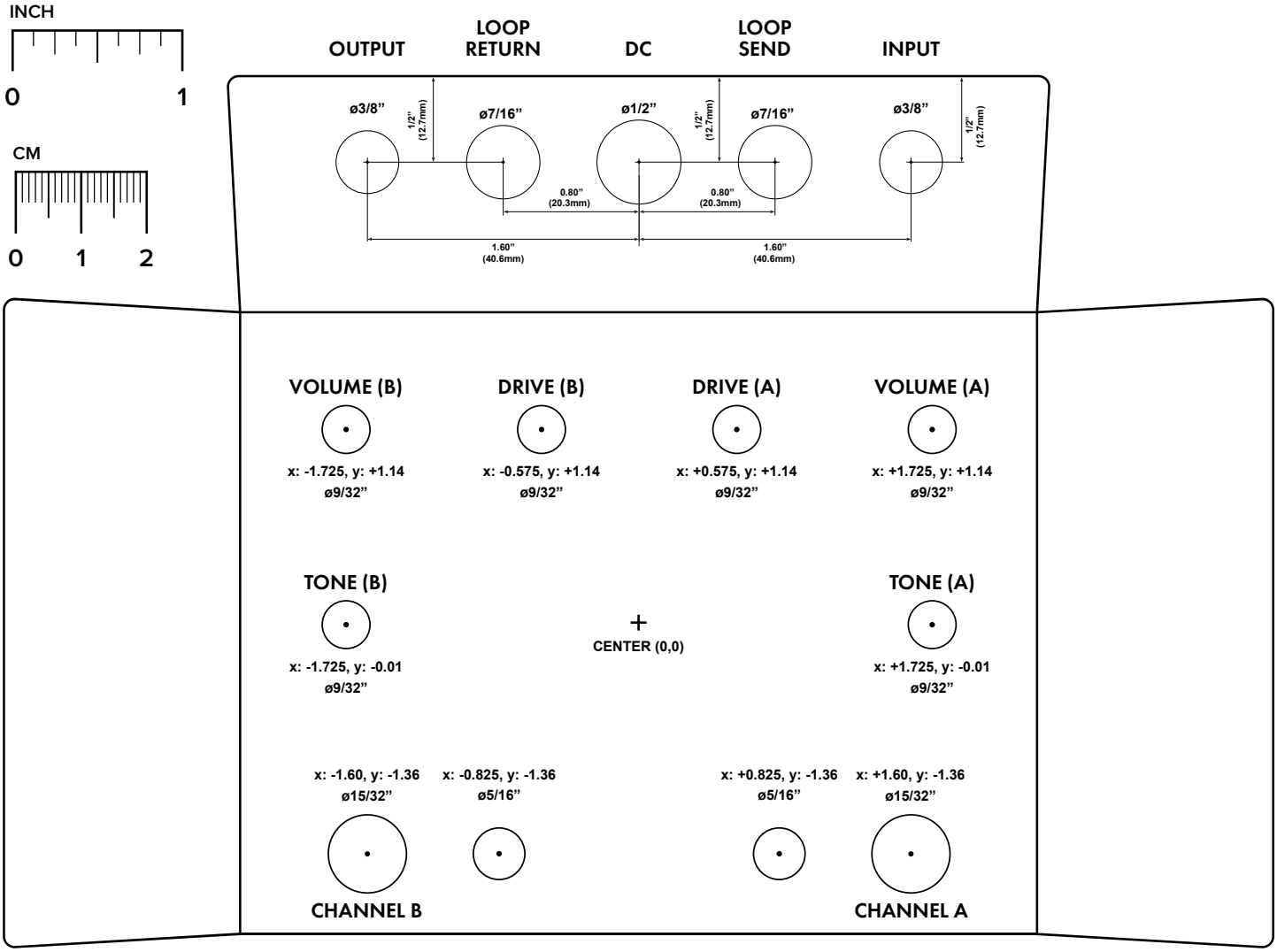

+9V
D1
1N5817
C23
100n
BYP_GND
R29
10k
R30
10k
LED A
5MM
LED B
5MM
R27
47R
R28
47R
VA
VB
VC
VD
R12
47k
R13
47k
C10
100uF
R25
47k
R26
47k
C20
100uF
C21
100uF
C22
100uF
GND
GND2
TO CHANNEL A IN
FROM INPUT JACK
CHANNEL A
TO SEND
FROM CHANNEL A OUT
TO CHANNEL B IN
FROM RETURN
CHANNEL B
TO OUTPUT JACK
FROM CHANNEL B OUT
SW1B
SW1A
SW1C
SW2B
SW2C
SW2D
R3
1k
DRIVE_A
100kB
R4
27k
R2
100k
C4
10n
C3
10n
R5
33k
C2
100pF
R6
10k
C5
100n
R8
6k8
R7
220k
D2
D3
D5
D4
IC1A
JRC4580D
IC1B
JRC4580D
C1
22n
CH.A IN
RPD1
1M
R1
1M
R9
1k
D6
D7
TONE_A
25kB
R10
6k8
C6
10n
PRESENCE_A
50kB
C7
10n
VOLUME_A
100kA
C9
1uF
C8
1uF
R11
1M
CH.A OUT
R16
1k
DRIVE_B
100kB
R17
27k
R15
100k
C14
10n
C13
10n
R18
33k
C12
100pF
R19
10k
C15
100n
R21
6k8
R20
220k
D8
D9
D11
D10
IC2A
JRC4580D
IC2B
JRC4580D
C11
22n
CH.B IN
RPD2
1M
R14
1M
R22
1k
D12
D13
TONE_B
25kB
R23
6k8
C16
10n
PRESENCE_B
50kB
C17
10n
VOLUME_B
100kA
C19
1uF
C18
1uF
R24
1M
CH.B OUT

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.

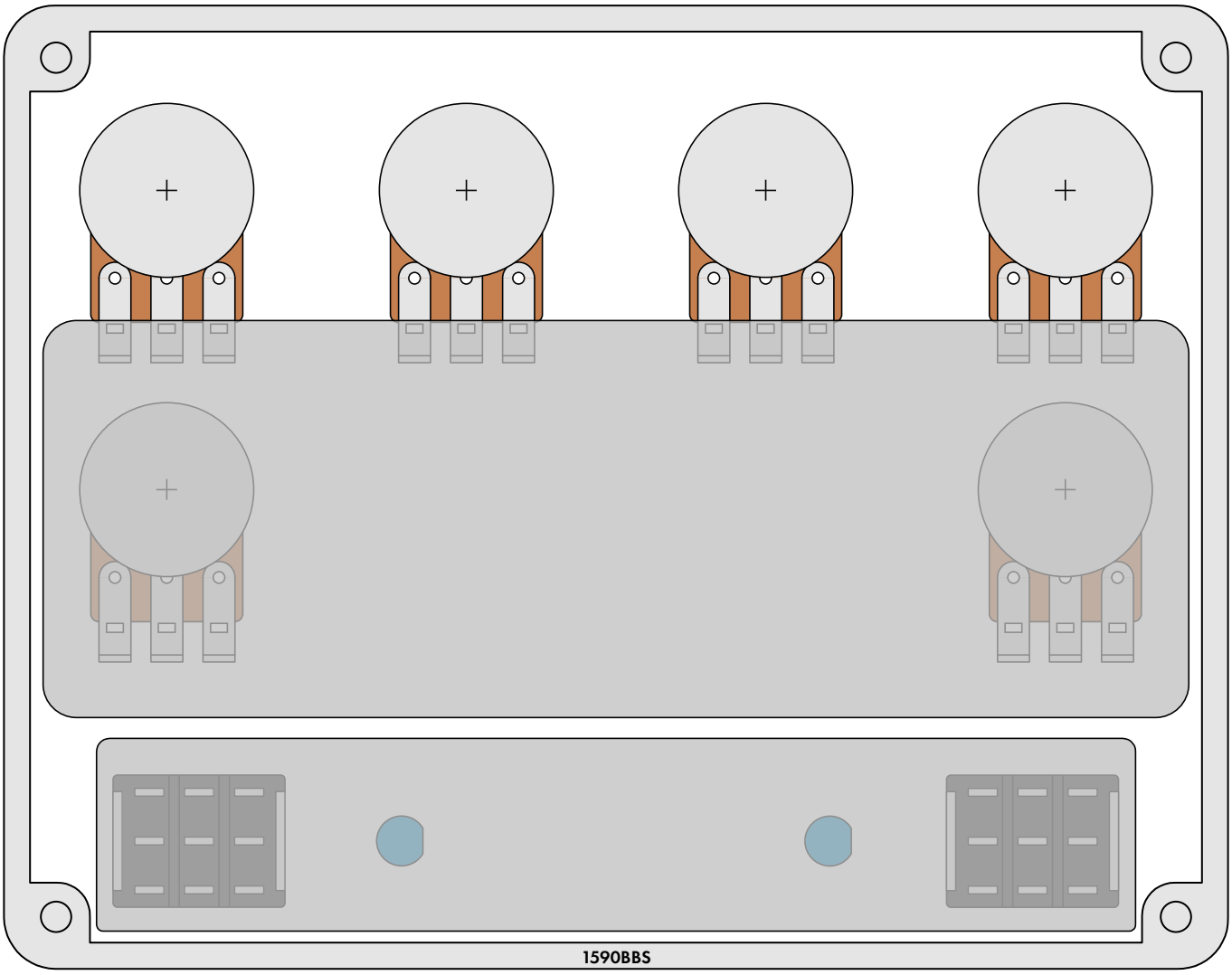
Ensure that this template is printed at 100% or "Actual Size". You can double-check this by measuring the scale on the printed page.

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.



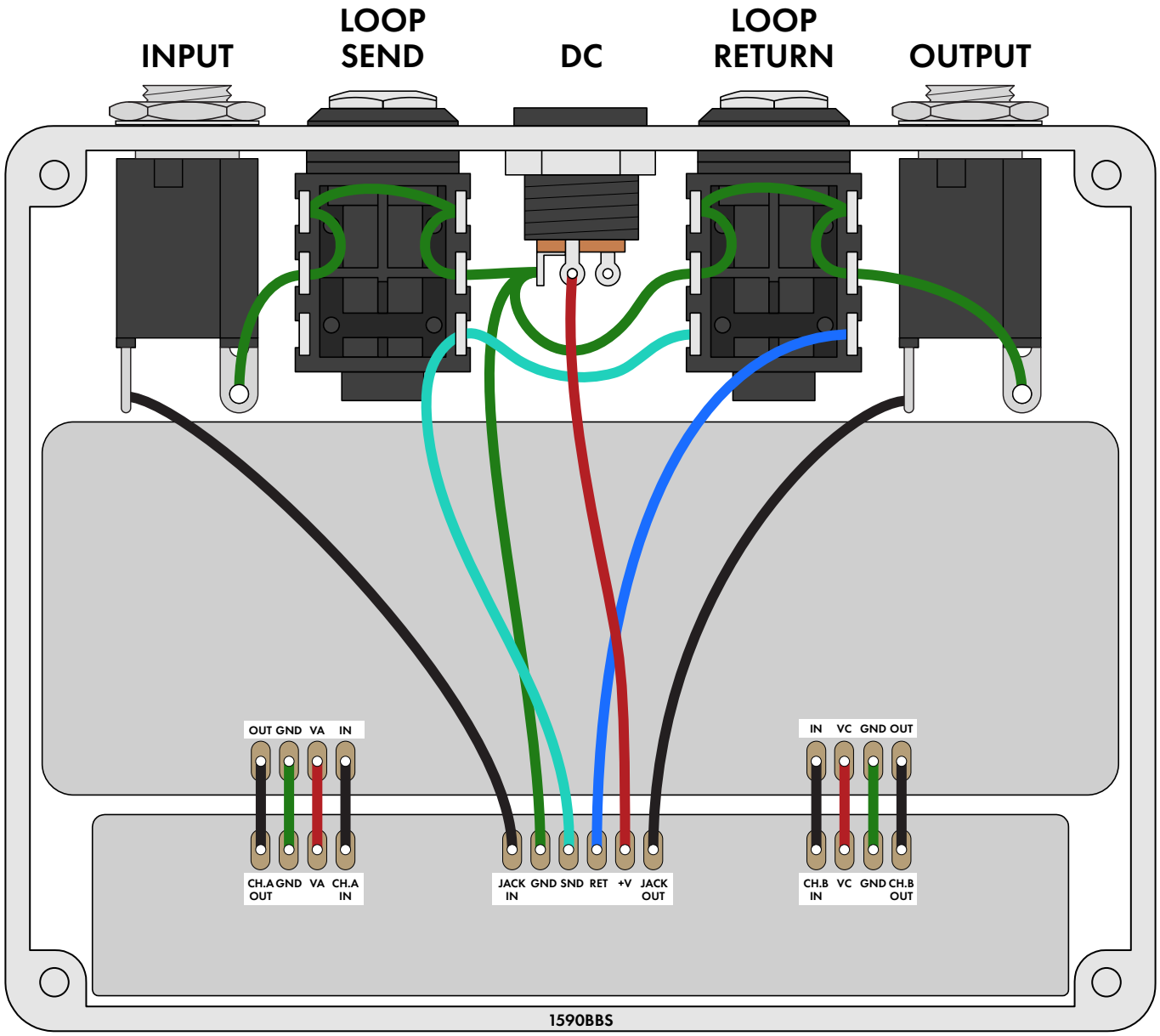
ENCLOSURE LAYOUT

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



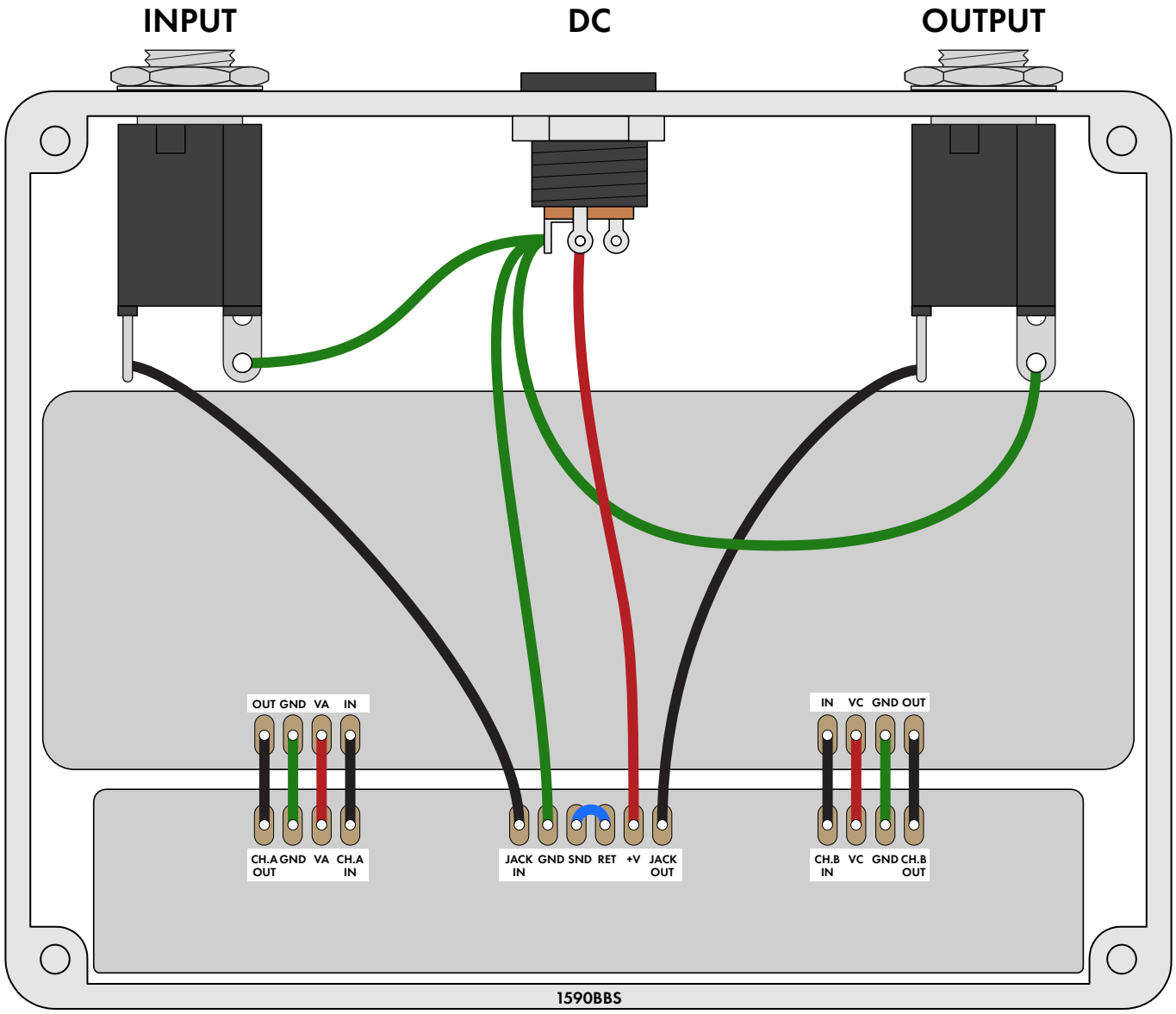
WIRING DIAGRAM

This is the default wiring diagram with the send/return loop. If you want to omit this loop, see the modified wiring diagram on the next page.



WIRING DIAGRAM (NO SEND/RETURN LOOP)

If you want to omit the send & return jacks, use the following wiring diagram. Note the jumper between the SND and RET pads on the footswitch PCB.



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 cannotbe 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

2.0.1 (2023-01-23)
Changed both filter resistors to 47R (from 100R) to increase operating voltage very slightly.

2.0.0 (2022-11-29)
Updated layout, splitting the 6-position DIP switch into two 3-position switches and improving the silkscreen labeling the different settings.

1.0.1 (2022-05-13)
Added note about the 1590BBS enclosure size.

1.0.0 (2022-04-08)
Initial release.