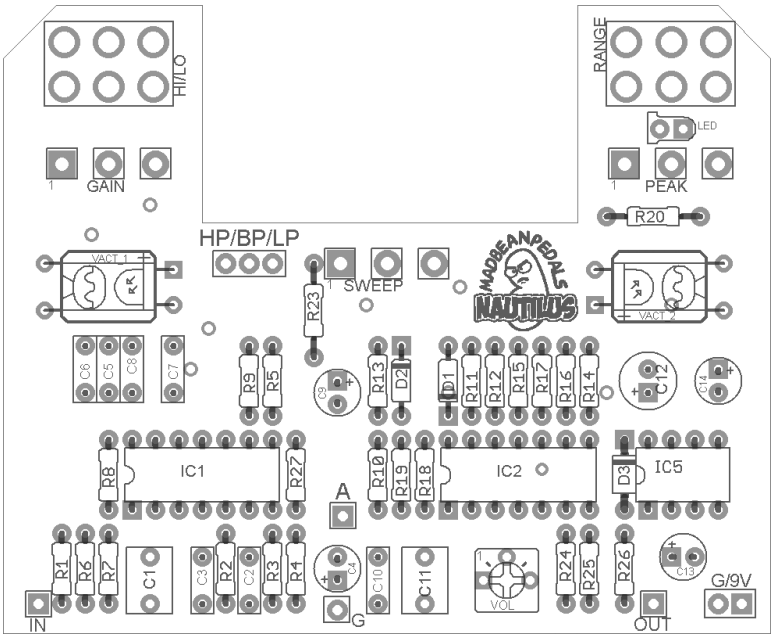
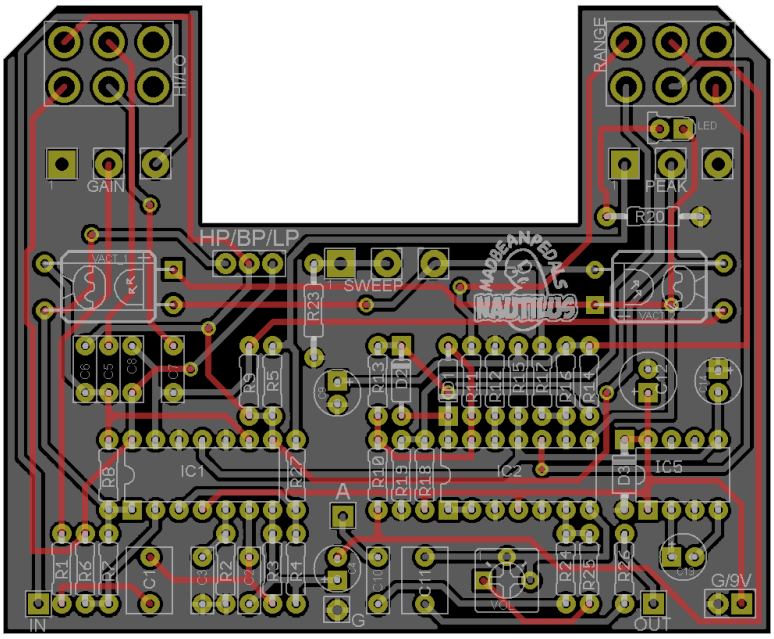
NAUTILUS

fx type: filter

3.275” W x 2.675” H





www.madbeanpedals.com

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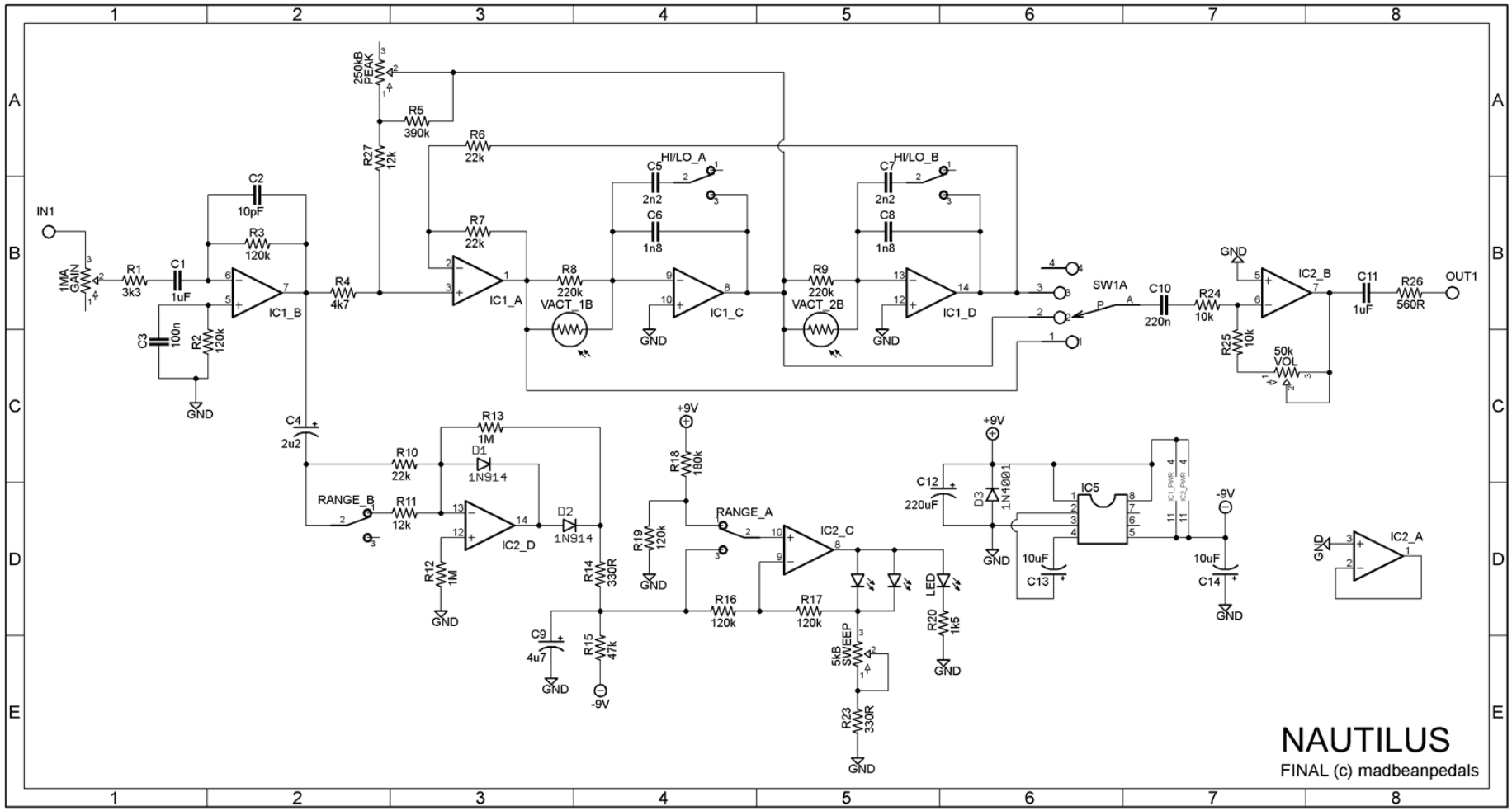
Schematic


NAUTILUS
FINAL (c) madbeanpedals
IN1
1MA GAIN
R1 3k3
C1 1uF
C2 10pF
R3 120k
C3 100n
R2 120k
IC1_B
R4 4k7
250kB PEAK
R5 390k
R27 12k
R6 22k
R7 22k
IC1_A
HI/LO_A
C5 2n2
C6 1n8
R8 220k VACT_1B
IC1_C
HI/LO_B
C7 2n2
C8 1n8
R9 220k VACT_2B
IC1_D
SW1A
C10 220n
R24 10k
R25 10k
50k VOL
IC2_B
C11 1uF
R26 560R
OUT1
C4 2u2
R13 1M
D1 1N914
R10 22k
RANGE_B
R11 12k
IC2_D
D2 1N914
R12 1M
R14 330R
C9 4u7
R15 47k
+9V
R18 180k
R19 120k
RANGE_A
IC2_C
R16 120k
R17 120k
5kB SWEEP
R23 330R
LED
R20 1k5
C12 220uF
D3 1N4001
IC5
10uF C13
10uF C14
-9V
IC2_A
GND

B.O.M.

Resistors		Caps		P4T	
R1	3k3	C1	1uF	D1, D2	1N914
R2	120k	C2	10pF	D3	1N4001
R3	120k	C3	100n	LED	LED3MM
R4	4k7	C4	2u2	**ICs**	
R5	390k	C5	2n2	IC1, IC2	TL074
R6	22k	C6	1n8	IC5	TC1044SCPA
R7	22k	C7	2n2	**Vactrols**	
R8	220k	C8	1n8	VACT_1, 2	see notes
R9	220k	C9	4u7	**Switches**	
R10	22k	C10	220n	RANGE	DPDT On/On
R11	12k	C11	1uF	HI/LO	DPDT On/On
R12	1M	C12	220uF	MODE	3P4T
R13	1M	C13	10uF	**Trimpot**	
R14	330R	C14	10uF	VOL	50k
R15	47k			**Pots**	
R16	120k			PEAK	250kB
R17	120k			GAIN	1MA
R18	180k			SWEEP	5kB
R19	120k				
R20	1k5				
R23	330R				
R24	10k				
R25	10k				
R26	560R				
R27	12k				

Overview

The **Nautilus** is a heavily modified and “modernized” Mutron III; a venerated classic of funk, jam and many other styles of music. The effect is an envelope driven filter with many choices for shaping and refining both how the filter behaves and how it interacts with your guitar dynamics.

The **Nautilus** implements several changes to the original design to accommodate more modern building techniques, as well as part availability. These include:

- True-Bypass operation
- Use of low-noise quad op-amps
- Use of two common vactrols in place of the custom-made dual vac in the original
- Output gain stage
- “Sweep” control
- Bi-polar supply via a common charge pump set-up

- Controls -

- **Gain** – The input gain of the filter effect. This drives not only the filter portion, but also the envelope. As the control is turned up, more overdrive is produced and the envelope becomes more sensitive to dynamics.
- **Sweep** – This control follows directly from R.G. Keen's suggestion. It allows one to make small adjustments to the overall LED brightness in the envelope section. The LEDs are what drive the Vactrols which in turn produce the sweeping filter effect.
- **Peak** – Adjusts the intensity of the resonant peak of the filters.
- **Hi/Lo** – Selects between two sets of filters, high and low.
- **Up/Down** – Selects two different modes for the LED drivers. The Up setting drives the LEDs from dark to light and the Down setting is the opposite.
- **Mode** – Selects three different filter types. HP is high-pass, LP is low-pass and BP is band-pass.
- **Vol** – This trimmer allows you to select the output gain of the effect. It will normally be set full counter-clockwise, but can be adjusted should you experience volume loss when the effect is turned on.

- Links -

Musictronics Mutron III on discofreq.com

Technology of Envelope-Controlled Filters on geofex.com

Notes

The original Mutron used a custom made dual Vactrol which is no longer available. The Vactrol consisted of two photocells, one for each filter stage, and an LED driver in a cylindrical case. The **Nautilus** uses two Vactrol divers so there are two photocells, but one LED per photocell. It is imperative that you use the correct Vactrol for this build, otherwise it will not work.

You should use either the Macron MI1210CLF-R: http://www.smallbearelec.com/servlet/Detail?no=1255

or, the VTL5C3: http://www.smallbearelec.com/servlet/Detail?no=347

If you are unable to get either of these, then roll your own Vactrol using an LED and photocell with specs as close to 20-50k light, 10M dark. The closest match for this is the 9203 photocell listed here: http://www.smallbearelec.com/servlet/Detail?no=711

Do not expect that grabbing a couple of photocells out of the ol' Tayda bag is going to cut it...it won't! For the two LEDs, water clear 3mm or 5mm should be fine.

The other LED on the PCB is tied to the envelope filter. It will light up when the effect is engaged to give you visual feedback on how the envelope is behaving. If you wish to have an indicator LED for bypass, you should wire that separately to your 3PDT (see wiring diagram below).

You must use either the MX1044SCPA, TC1044SCPA or the ICL7660SCPA for IC5. Use only the “SCPA” designation...not the “CPA”.

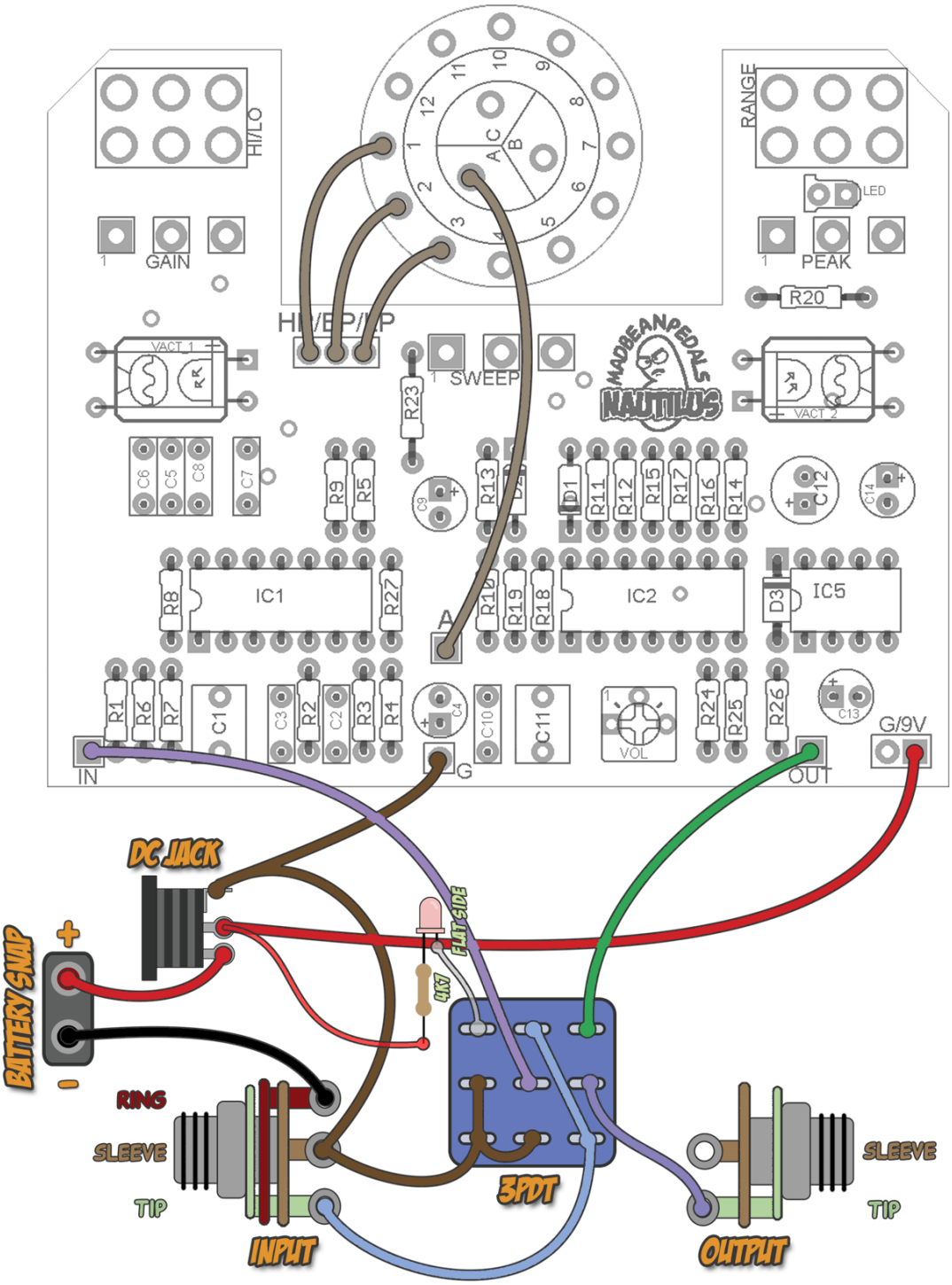
The Mutron used a 150kB pot for the Peak control. This is no longer a common value, so the **Nautilus** uses a 250kB pot with a resistor in parallel to approximate 150k. If you happen to have a 150k pot use that, but make sure to leave the resistor off (R5).

You can use 16mm short-pin PCB mounted pots for the three potentiometers.

The Sweep control is subtle, but will offer some variation in the swept filter by changing the max brightness of the two driver LEDs in the Vactrols. I've found that about 1/3rd up is the sweet spot.

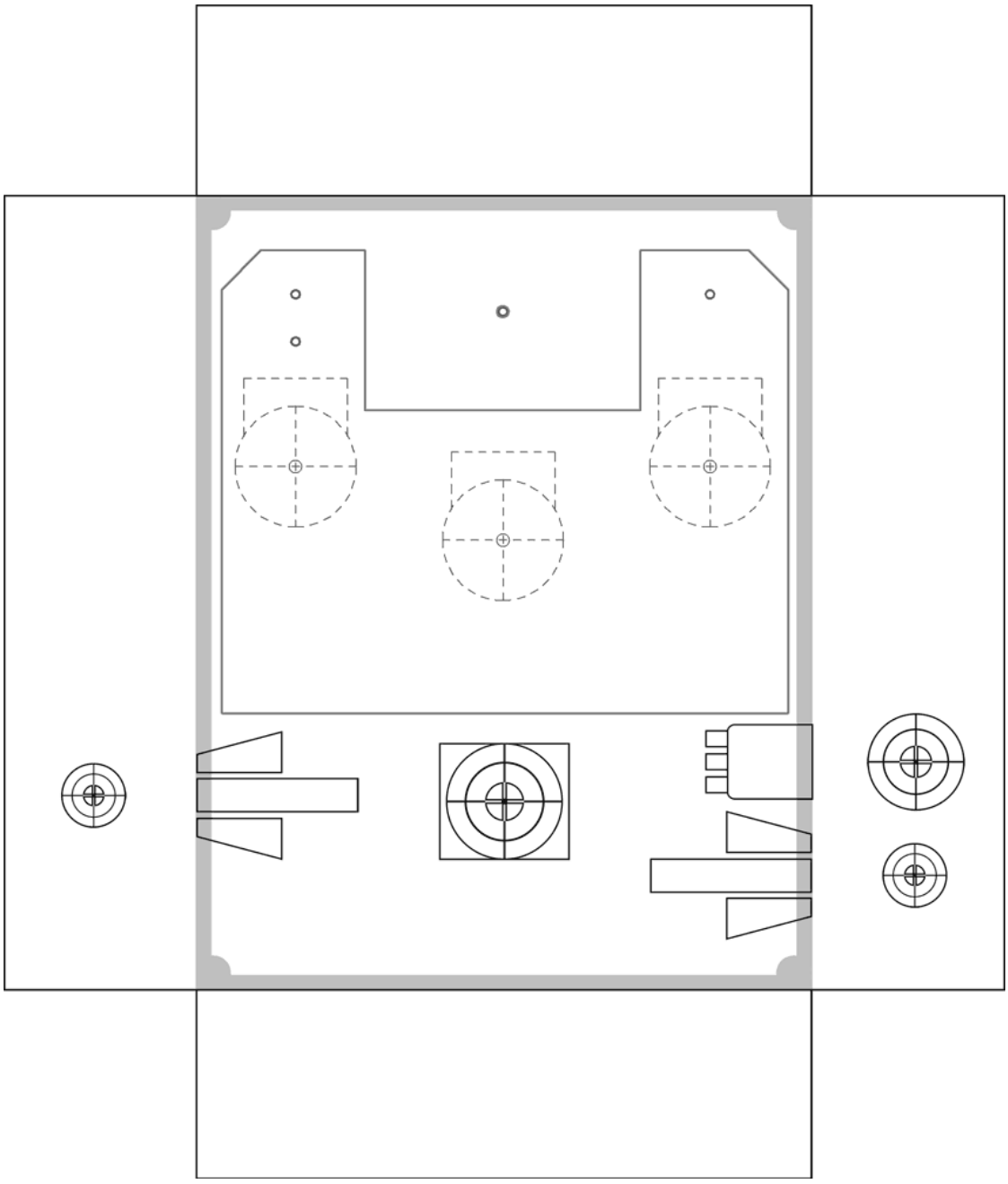
You will likely find the Gain control quite sensitive in the last quarter of its range for *some* settings on the **Nautilus**. You can alter its response by changing to a different taper such as linear or reverse audio (people do seem to prefer a 1MC here).

Wiring


HI/LO
GAIN
RANGE
LED
PEAK
R20
SWEEP
R23
VACT 1
VACT 2
MADBEANPEDALS
NAUTILUS
IC1
IC2
IC5
VOL
IN
OUT
G/9V
DC JACK
BATTERY SNAP
FLAT SIDE
4K7
RING
SLEEVE
TIP
INPUT
3PDT
SLEEVE
TIP
OUTPUT

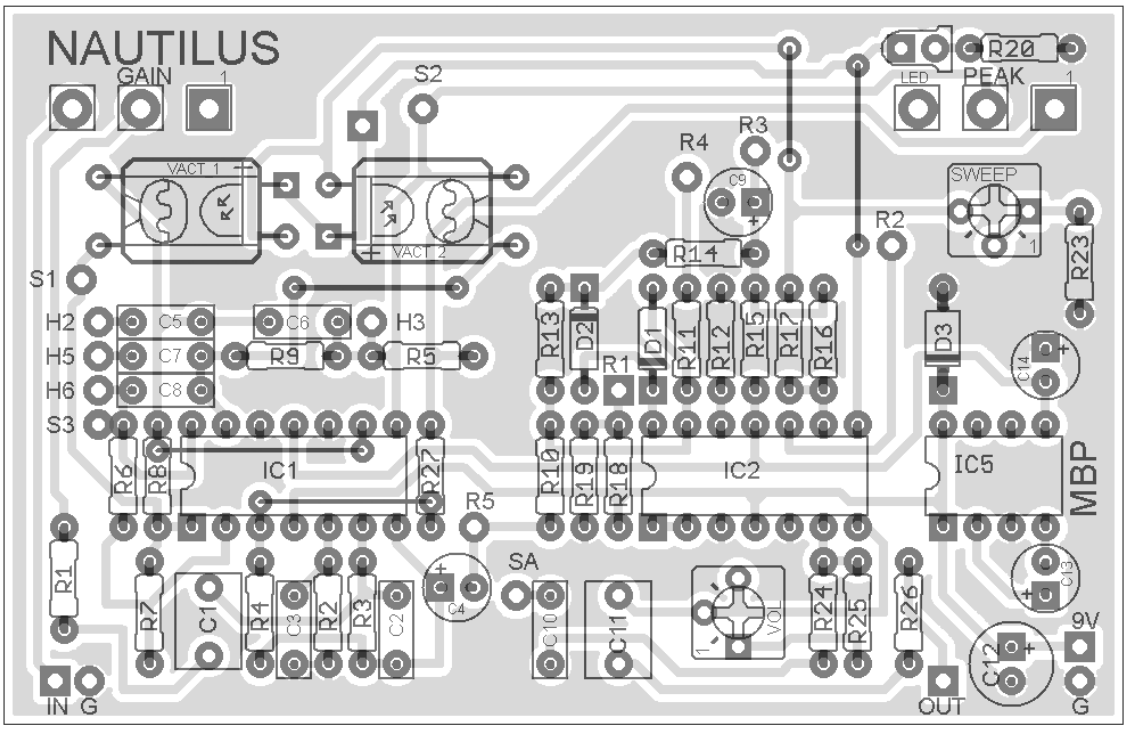
Drill Guide - 1590BB

5.81” W x 6.67” H

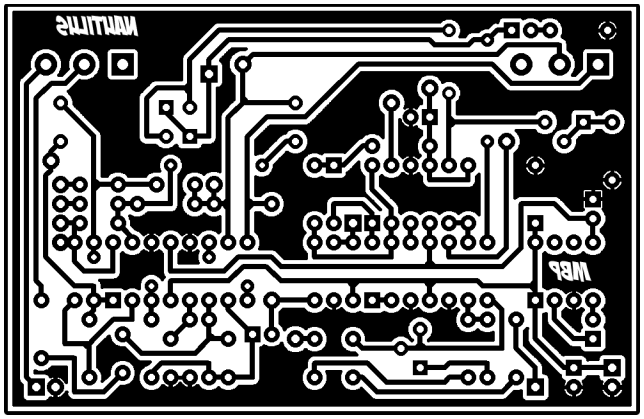


This template is approximate. Please check carefully before committing to drill!

Single Sided Artwork

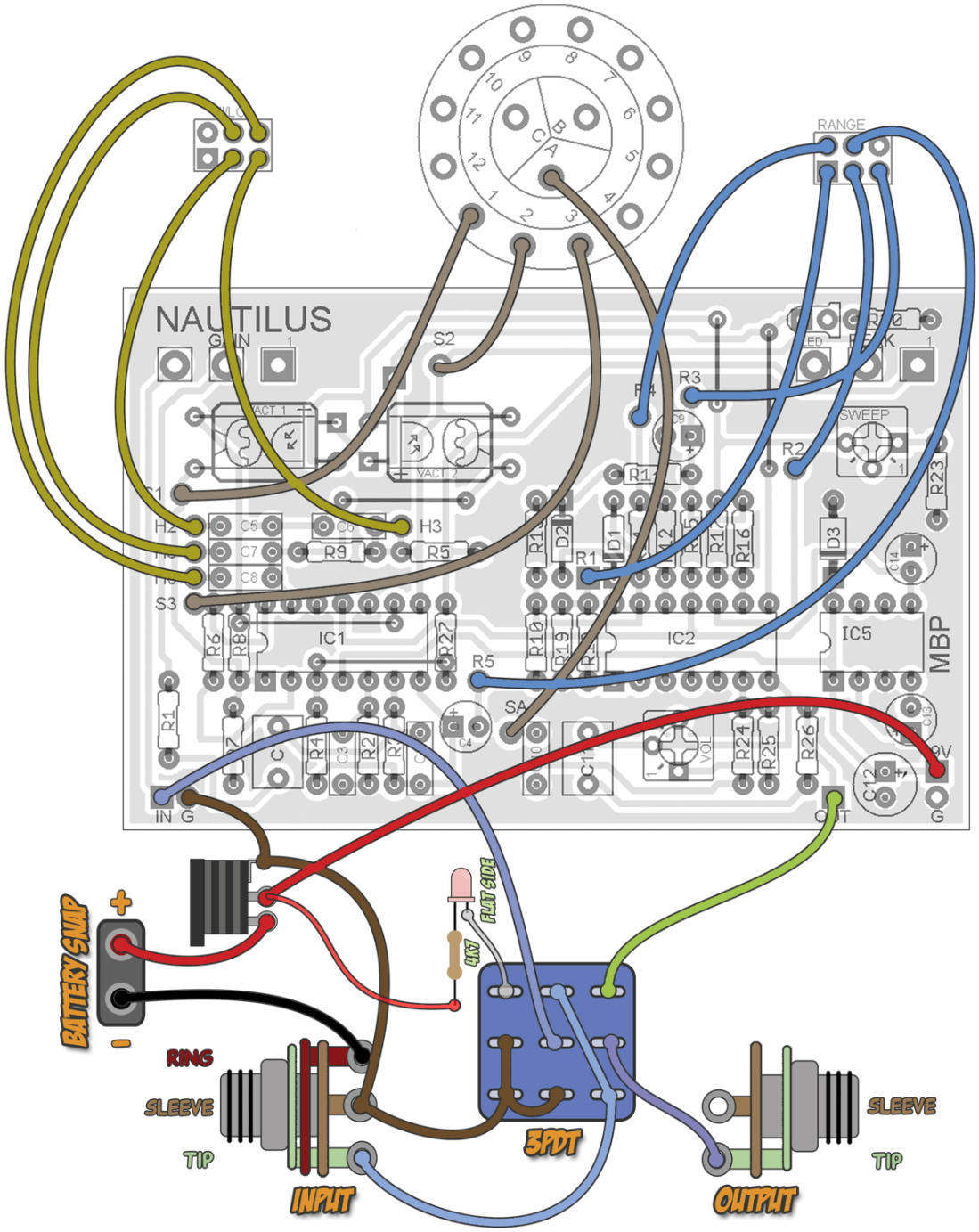


3.31” W x 2.14” H (inc. borders)



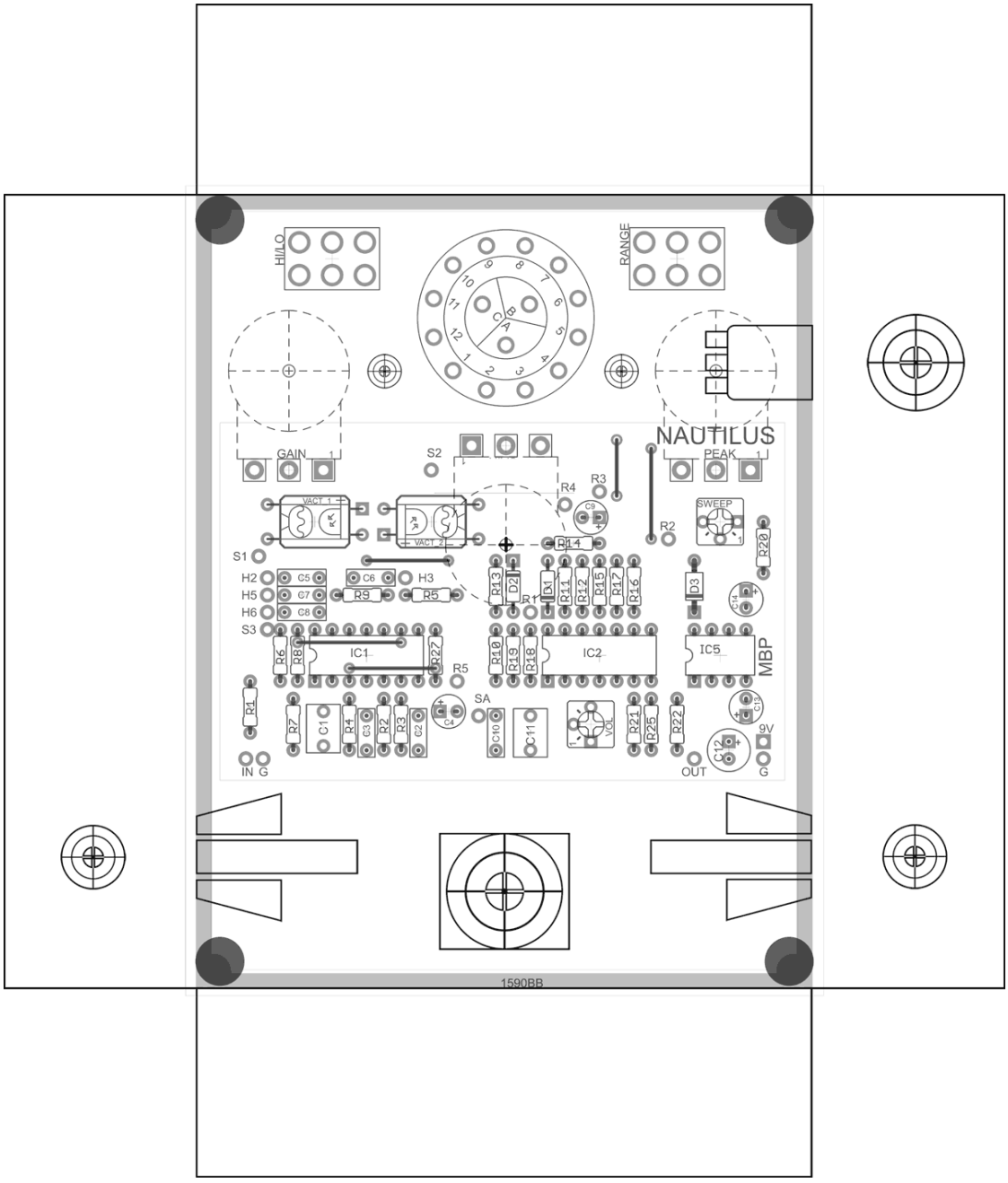
- There are 5 jumpers on this layout.
- You can use either a trimpot or regular pot for the Sweep control.
- You can use 16mm short-pin PCB mounted pots for the Gain and Peak controls.

Wiring – Single Sided



Drill Guide - Single Sided

5.81” W x 6.67” H



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