

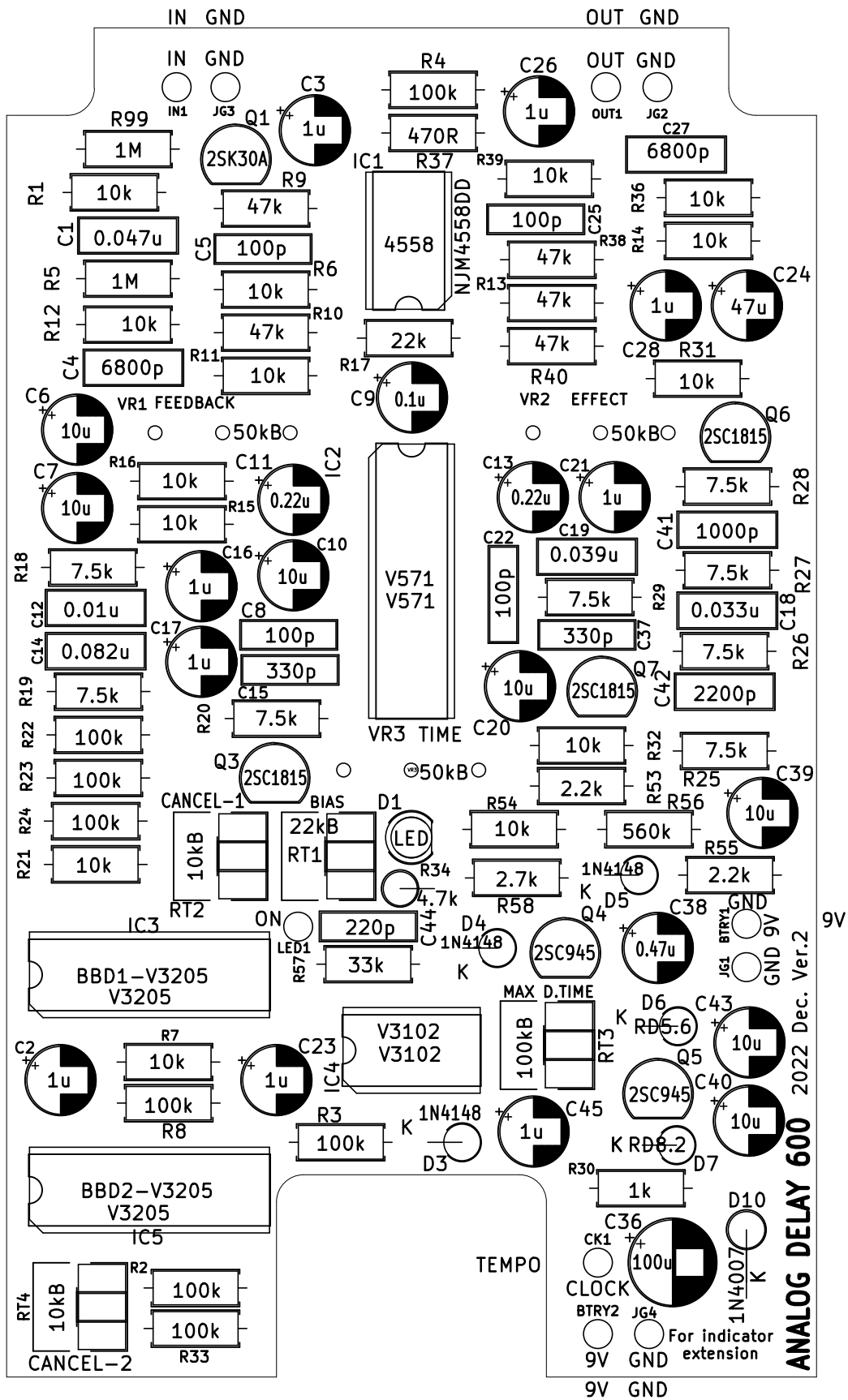
Analog delay 600 based on DM-3
 - V3205, V3102 and V571 (the second source ICs) used
 - Removed FET electronic switches
 - Changed transistors to easily obtainable ones (2SC945, 2SC1815)
 - Two BBDs (V3205) used to get longer delay time

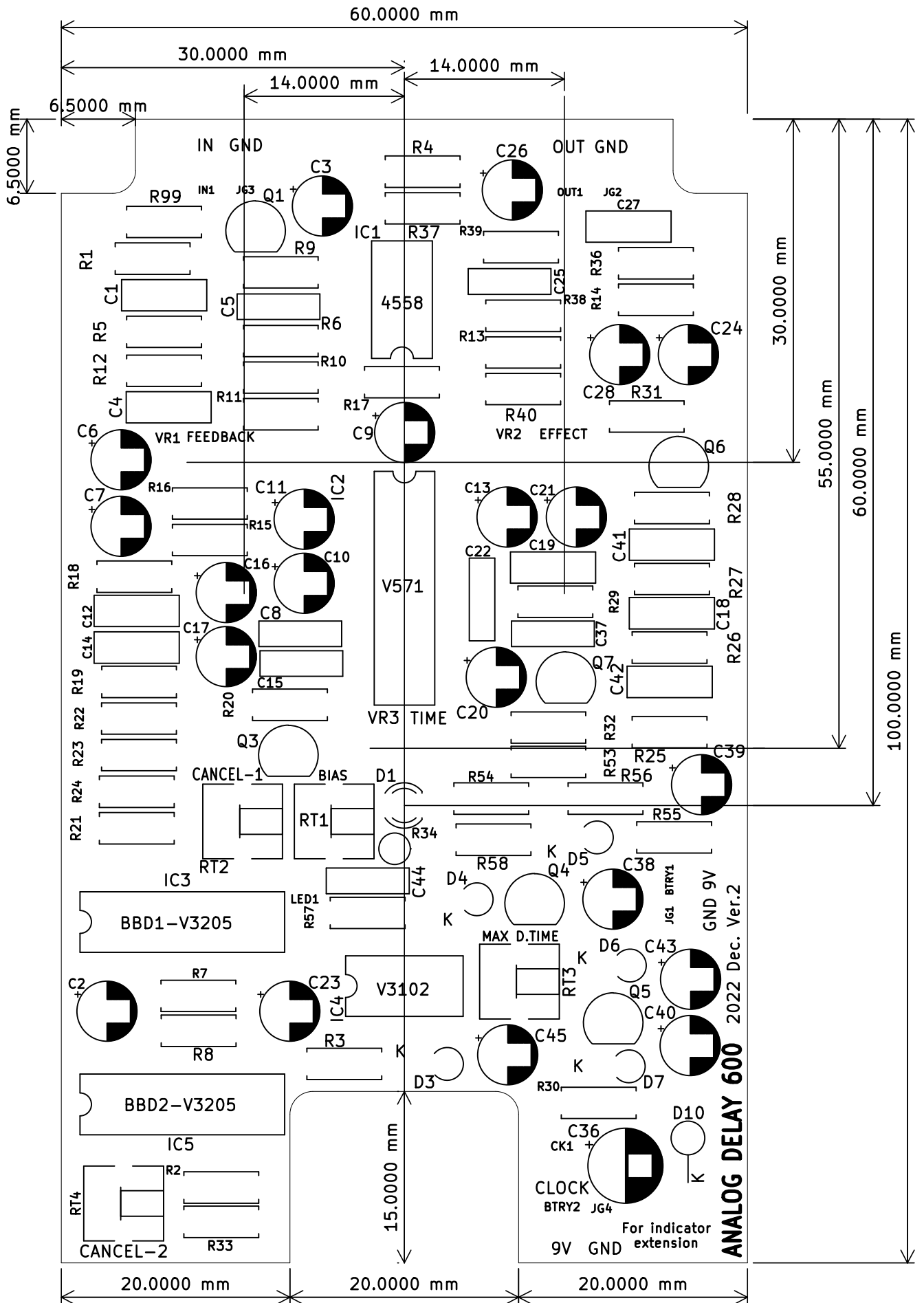
http://toshi.life.coocan.jp/review/en_diy_analog_delay.html

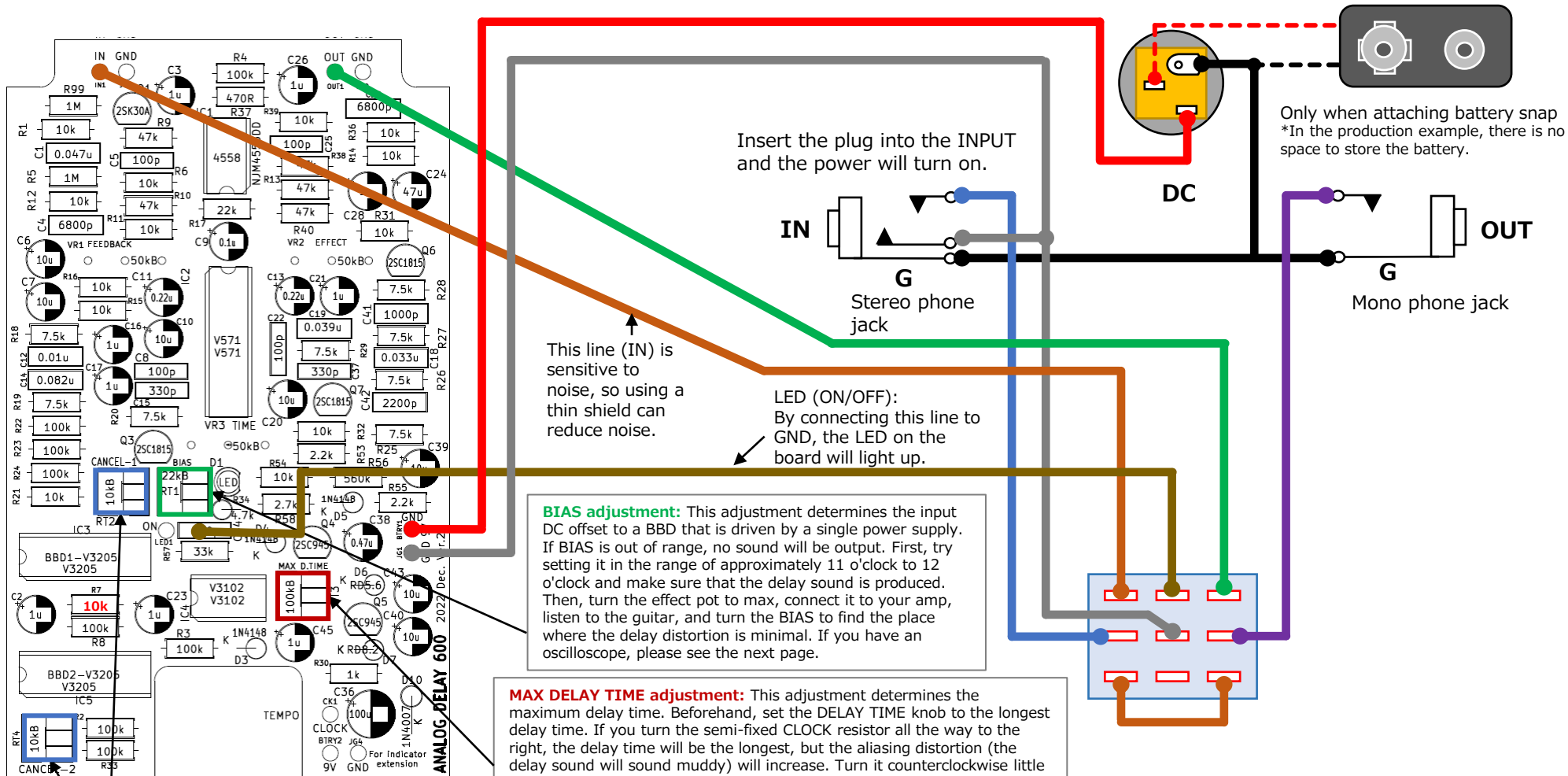
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Title: Analog Delay 600 (DM-3 MOD)	
Size: A4	Date: Dec., 2022
KiCad E.D.A. kicad (6.0.4)	Rev: 2.0
	Id: 1/1

Analog Delay 600 Part List

No.	Reference(s)	Value	Qty	Note
1	C1	0.047u	1	Metallized polyester (Box type)
2	C2, C3, C16, C17, C21, C23, C26, C28, C45	1u	9	Electrolytic
3	C4, C27	6800p	2	Metallized polyester (Box type)
4	C5, C8, C22, C25	100p	4	Ceramic (disc type)
5	C6, C7, C10, C20, C39, C40, C43	10u	7	Electrolytic
6	C9	0.1u	1	Electrolytic
7	C11, C13	0.22u	2	Electrolytic
8	C12	0.01u	1	Metallized polyester (Box type)
9	C14	0.082u	1	Metallized polyester (Box type)
10	C15, C37	330p	2	Ceramic (disc type)
11	C18	0.033u	1	Metallized polyester (Box type)
12	C19	0.039u	1	Metallized polyester (Box type)
13	C24	47u	1	Electrolytic
14	C36	100u	1	Electrolytic
15	C38	0.47u	1	Electrolytic
16	C41	1000p	1	Metallized polyester (Box type)
17	C42	2200p	1	Metallized polyester (Box type)
18	C44	220p	1	Ceramic (disc type)
19	D1	LED	1	3mm
20	D3, D4, D5	1N4148	3	Small signal diode (Replaceable)
21	D6	RD5.6 (1N4734)	1	5.6v Zener (5.1V available)
22	D7	RD8.2 (1N4738)	1	8.2v Zener
23	D10	1N4007	1	Rectifier diode (replaceable)
24	IC1	NJM4558DD	1	Operational amplifier
25	IC2	V571	1	Compander
26	IC3, IC5	V3205 or MN3205	2	BBD (4096-stages)
27	IC4	V3102 or MN3102	1	Clock generator
28	Q1	2SK30A	1	Nch JFET (2SK2880 available)
29	Q3, Q6, Q7	2SC1815	3	NPN transistor (replaceable)
30	Q4, Q5	2SC945	2	NPN transistor (replaceable)
31	R1, R6, R7, R11, R12, R14, R15, R16, R21, R31, R32, R36, R39, R54	10k	14	1/4W carbon
32	R2, R3, R4, R8, R22, R23, R24, R33	100k	8	1/4W carbon
33	R5, R99	1M	2	1/4W carbon
34	R9, R10, R13, R38, R40	47k	5	1/4W carbon
35	R17	22k	1	1/4W carbon
36	R18, R19, R20, R25, R26, R27, R28, R29	7.5k	8	1/4W carbon
37	R30	1k	1	1/4W carbon
38	R34	4.7k	1	1/4W carbon
39	R37	470R	1	1/4W carbon
40	R53, R55	2.2k	2	1/4W carbon
41	R56	560k	1	1/4W carbon
42	R57	33k	1	1/4W carbon
43	R58	2.7k	1	1/4W carbon
44	RT1	22kB	1	Semi-fixed resistor (Tokyo Cosmos, etc.)
45	RT2, RT4	10kB	2	Semi-fixed resistor (Tokyo Cosmos, etc.)
46	RT3	100kB	1	Semi-fixed resistor (Tokyo Cosmos, etc.)
47	VR1, VR2, VR3	50kB	3	16mm potentiometer
48	ケース	1590N1	1	HAMMOND
49	フォンジャック (ステレオ)	#111X	1	Switchcraft
50	フォンジャック (モノラル)	#112BX	1	Switchcraft
51	DCジャック	2.1mm	1	General purpose
52	フットスイッチ	3PDT	1	General purpose
53	ノブ	20mm	3	General purpose







Insert the plug into the INPUT and the power will turn on.

Only when attaching battery snap
*In the production example, there is no space to store the battery.

This line (IN) is sensitive to noise, so using a thin shield can reduce noise.

LED (ON/OFF):
By connecting this line to GND, the LED on the board will light up.

BIAS adjustment: This adjustment determines the input DC offset to a BBD that is driven by a single power supply. If BIAS is out of range, no sound will be output. First, try setting it in the range of approximately 11 o'clock to 12 o'clock and make sure that the delay sound is produced. Then, turn the effect pot to max, connect it to your amp, listen to the guitar, and turn the BIAS to find the place where the delay distortion is minimal. If you have an oscilloscope, please see the next page.

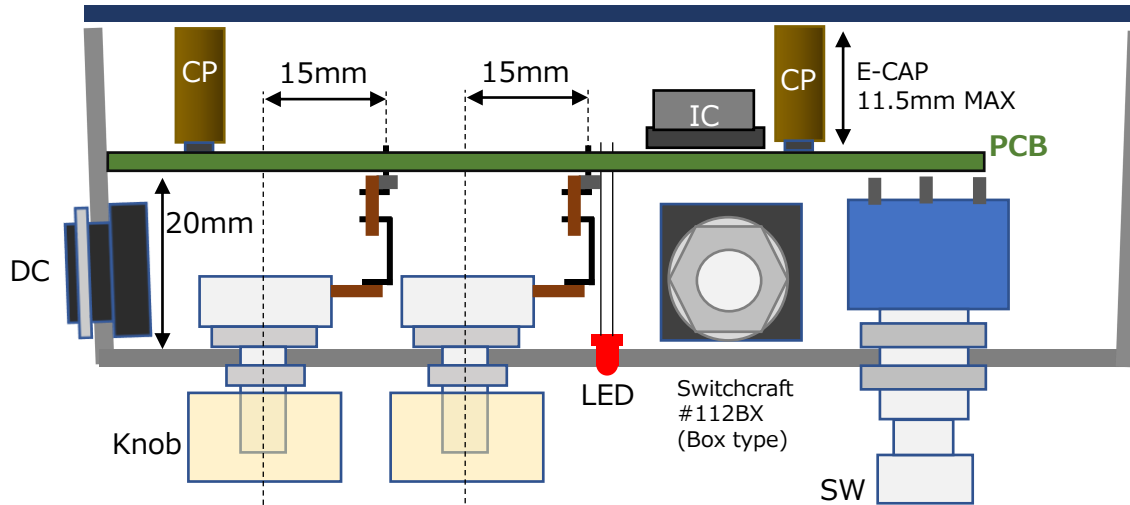
MAX DELAY TIME adjustment: This adjustment determines the maximum delay time. Beforehand, set the DELAY TIME knob to the longest delay time. If you turn the semi-fixed CLOCK resistor all the way to the right, the delay time will be the longest, but the aliasing distortion (the delay sound will sound muddy) will increase. Turn it counterclockwise little by little, and while listening to the delay sound, set it to a point where you can no longer hear aliasing distortion (as far as you can tolerate). By design, the maximum delay time is approximately 500ms. The approximate position of the semi-fixed resistor is around 3 o'clock.

CANCEL adjustment: This is an adjustment to minimize the leakage of the BBD drive clock pulse. The two BBDs have separate adjustments. First, turn the delay time knob to maximum (longest delay). Set the EFFECT knob to MAX, connect it to an amplifier, listen to the sound, and turn the semi-fixed resistor CANCEL to find the place where the oscillation (which sounds like distortion) on the delay sound is minimized. If there is no guitar input, the V571 expander is closed and the delay sound itself will not be output. Therefore, some input is required. By lowering the guitar TONE and adding a sound similar to a muffled sine wave, the outgoing noise will be easier to hear. It's better to use headphones.

Regarding FEEDBACK sensitivity: R7 (10k) allows you to adjust the sensitivity of the FEEDBACK knob. If the oscillation is too much, or if you do not need the oscillation effect, you can lower the sensitivity by increasing R7 (20k or more).

HAMMOND 1590N1

INSIDE: 60.2-62.1 width, 115.9-117.7 length, 35.3 height (mm)

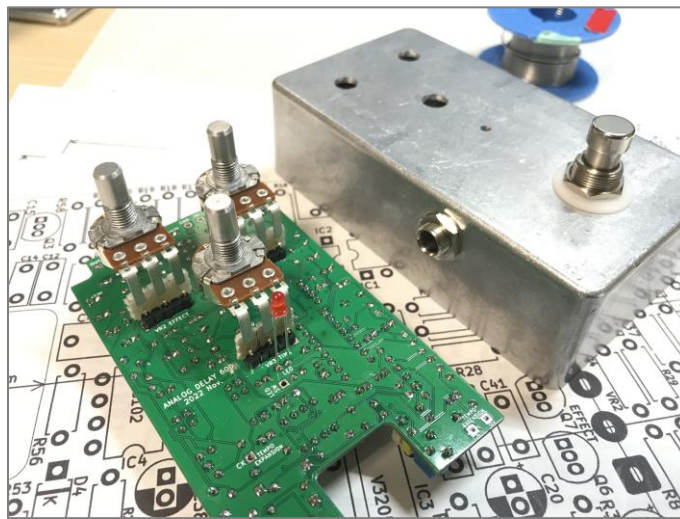
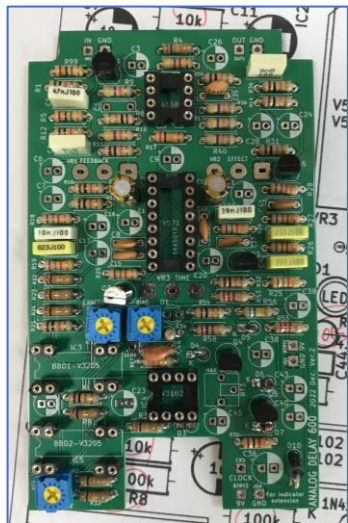
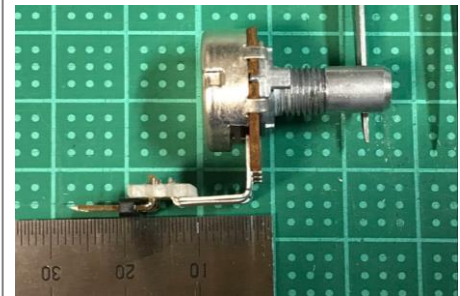


By connecting the pot lead and L-shaped pin header with a universal board and processing the pot so that its height is 20 mm, it will fit perfectly into the 1590N1 type enclosure.

The example in the photo on the right uses a special pot with long leads, but it is also possible to use a pot with normal lead length by extending it using a universal board and an L-shaped pin header.

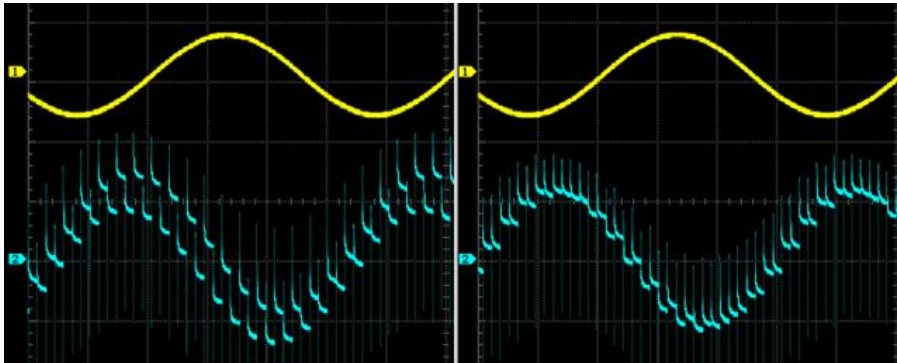
Determine the enclosure hole position according to the shape of the processed pod.

If it is difficult, you can wire it, but you will need to think about how to fix the board yourself.



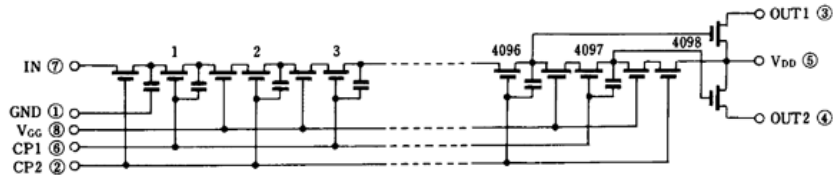
Check the CANCEL signal with an oscilloscope:

In the waveform below, the top (yellow) is the input to the BBD, and the bottom (blue) is the 2nd pin of the CANCEL semi-fixed resistor.



Waveform example: In the waveform on the left, the mixing balance of the CANCEL semi-fixed resistor is poor, and the outputs of odd and even stages are not connected smoothly. In this case, the clock sound will be mixed into the final output. The CANCEL adjustment on the right side is good, and the outputs of the odd and even stages are well connected.

■ 回路図 / Circuit Diagram



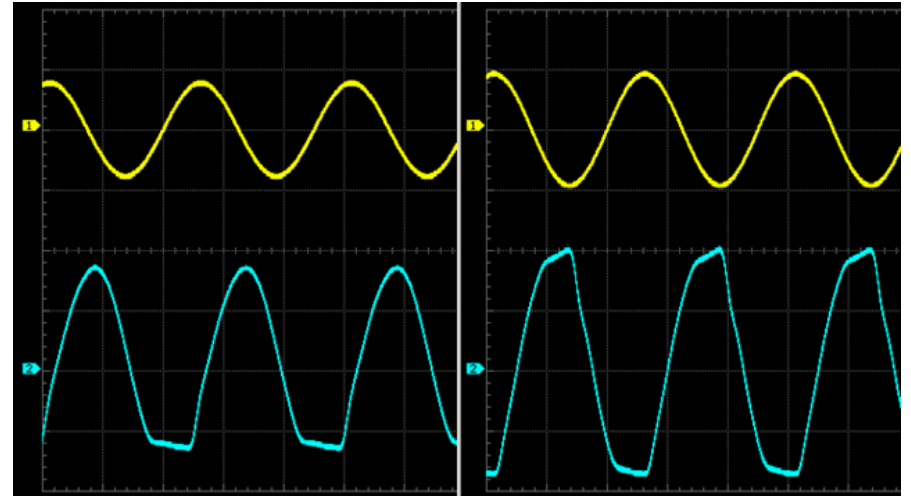
How BBD works:

As shown in the circuit diagram above, 4098 bucket elements (capacitors) are arranged in order inside the BBD. The bucket elements are grouped into even and odd numbers, and each has a switch driven by a clock of opposite phase (CP1, CP2). In accordance with the clock, the charges stored in the bucket are transferred in the order of [odd] -> [even] -> [odd] -> [even].

In the part that outputs the charge from the last bucket, the 4097th and 4098th charges taken from different pins (OUT1, OUT2) need to be connected outside the IC. By mixing these with a CANCEL semi-fixed resistor, the clock leakage is reduced.

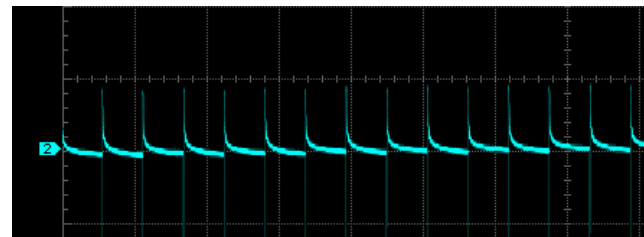
Check the BIAS signal with an oscilloscope:

In the waveform below, the top (yellow) is the input to the BBD, and the bottom (blue) is the output of the V571 (pin 10). A large level input is given at which the output begins to distort. The waveform on the left is distorted at the bottom, but not at the top. This is a condition where the BIAS (center level of the waveform) is too low. On the right, the top and bottom are equally distorted, with BIAS centered between the top and bottom thresholds. This is the proper state.



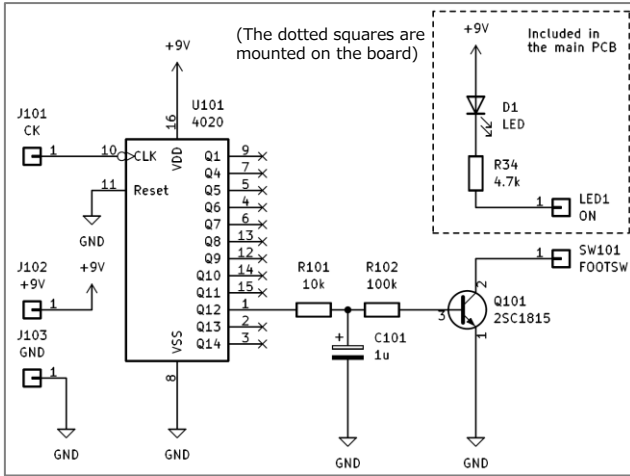
When using an oscilloscope, CANCEL adjustment can be easily done by muting the input. At this time, adjust so that the outputs of pin 2 of the CANCEL semi-fixed resistor are aligned as shown in the waveform below.

*A needle-like pulses can be seen in the waveform, but these are reduced by the low-pass filter after the BBD and do not appear in the output.



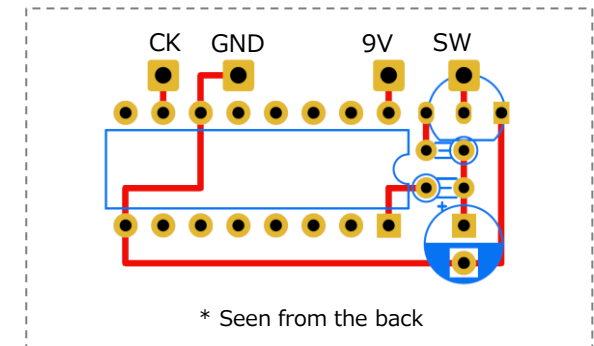
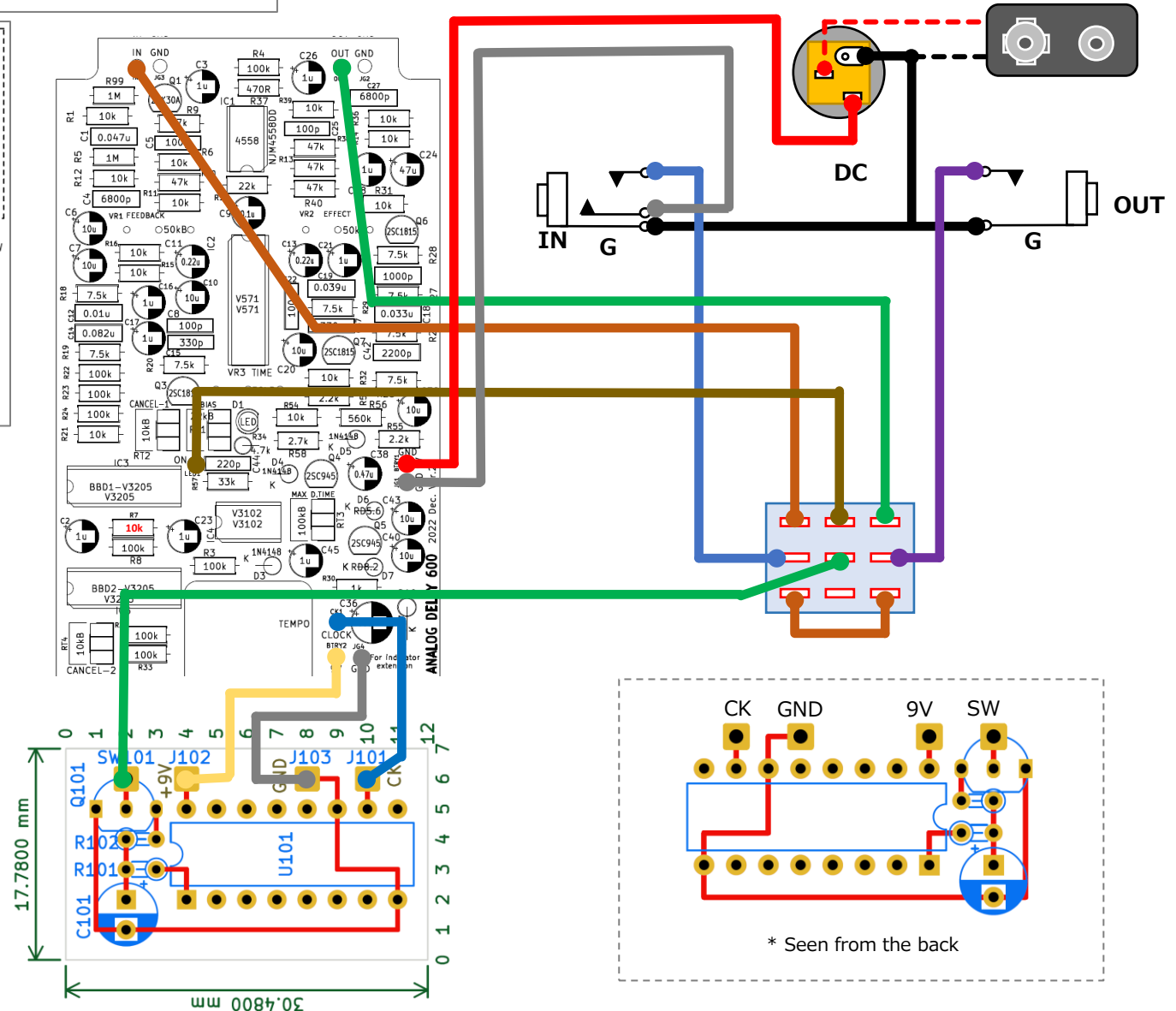
MOD that makes the LED blink in sync with the delay time:

By using a versatile board and adding a circuit, you can make the LED blink in sync with the delay time.



Part list:

- U101: TC4020BP (14-Stage Binary Counter)
- R101: 10k
- R102: 100k
- C101: 1u
- Q102: 2SC1815(Replacable with another NPN)



* Seen from the back

This printed circuit board has been confirmed to be functional with the components mounted as shown in the photos in this document. However, the following disclaimer has been set.

Reference page: http://toshi.life.cocacn.jp/review/en_diy_analog_delay600.html

Disclaimer:

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