

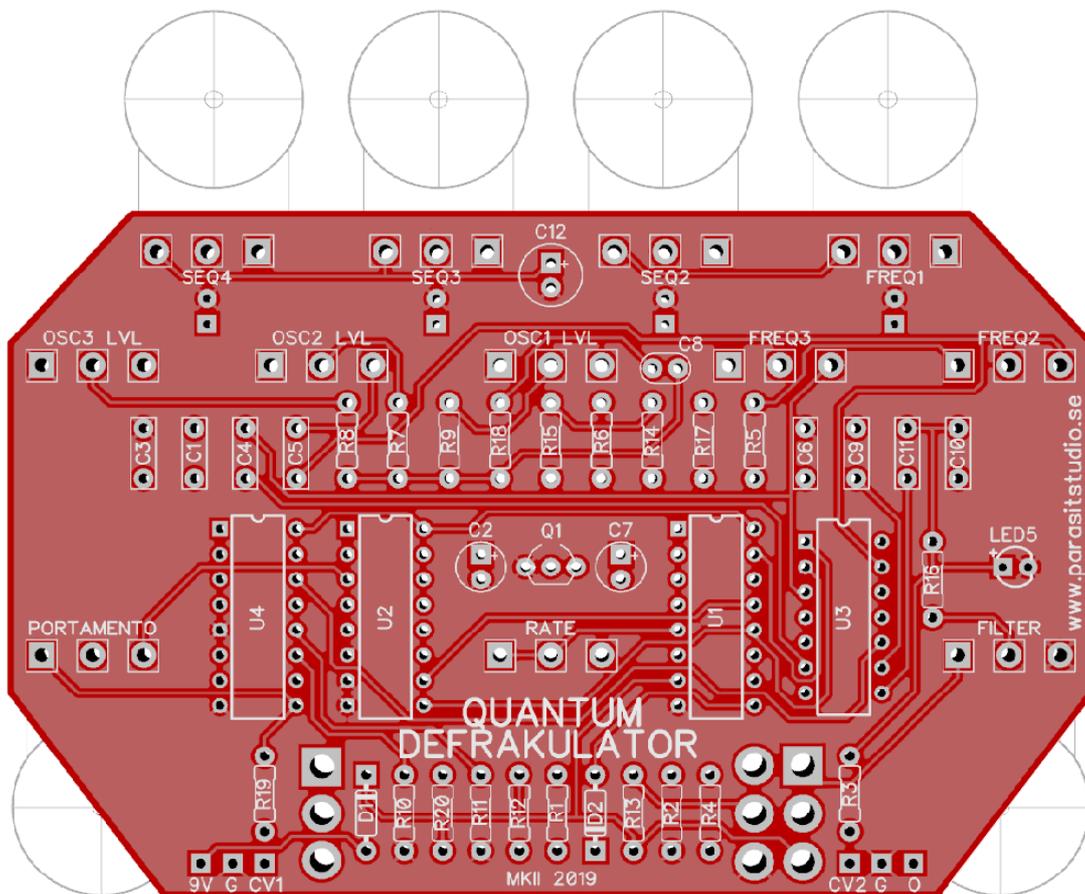
PARASIT STUDIO

QUANTUM DEFRAKULATOR MK2

Build Document last updated august 2019
for PCB version 2.0

The Quantum Defrakulator is a drone synthesizer with 3 square wave oscillators and one LFO (low frequency oscillator). Each oscillator has independent controls for frequency and volume. With the LFO engaged, oscillator 1 turns into a 3 or 4-step sequencer.

Have fun!



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UPDATE 2019-12-10

Some people have reported that the LFO for the sequencer isn't running. To fix this, two resistor values has changed.

R12 has been changed to 22K (was 10K)

R4 has been changed to 10K (was 18K)

Changelog MK2 (PCB 2.0)

- The circuit has been redesigned from scratch so that new features could be added
Thus the component count has increased, as the first version was as bare bones as possible, but it's still an easy and straight forward build.
- 3 or 4 sequencer steps (insted of fixed at 4 steps)
The LFO button has been replaced with a 3-way switch that toggles between 3 steps, off and 4 steps (insted of the push button).
- Portamento added
With a potentiometer for adjusting the amount of glide between the sequencer steps.
- Ringmodulation added
With a switch to turn on/off the a ringmod setting. It will modulate the oscillator 1 frequency against the oscillator 2 frequency.
- The output filter has been replaced
The simple RC filter has been replaced with a resonant lowpass filter (with a fixed resonance) for a nicer sounding cutoff response.
- Control Voltage inputs * (optional)
 - CV input for the frequency of oscillator 1 (insted of the sequencer, or used with the sequencer for wierd results).
 - CV input for the filter cutoff frequency.

** The CV input range is 0-9 volts, but 0-5 volts works great aswell.*

Notes

- *The Quantum Defrakulator output is meant to hook up to an amplifier like a guitar amp or through a mixer to a PA system.*

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It can't drive a speaker directly. If you want to drive a speaker you will need to add an amplifier at the output, such as a LM386 or similar. There's plenty of simple 9v amplifier projects around if you do a search. :-)

- *The LFO takes a second or two to start up, especially if the rate is to the slowest setting, so turn the rate up for a quicker start.*
- *It's also normal for the LFO to be off when first powering up the Quantum Defrakulator, even if the LFO switch is on. Just toggle the switch off and back on to get it going.*



General builds tips

- Solder the low profile components first, from short to tall. Recommended order: resistors, diodes, IC socket, film-caps, electrolytics, pots.
- CMOS chips are very sensitive to static charges and can be easily damaged. It's a good idea to wear an anti-static wristband or at least avoid wearing a wool jumper and petting your cat/dog while building...
- Always use sockets for IC chips to avoid heating them directly. It also makes it much easier to swap them out if needed.
- Pay special attention to the orientation of the diodes and electrolytics.
- This PCB is designed for board mounted angled pots, but if you want to use regular solderlug-pots, the square holes represent pin 1 of the pot.
- Cover the backside of the pots with pot covers or tape, so they don't short out anything on the PCB.

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Resistors		Capacitors		IC's			
R1	2.2M	C1	220nF	U1	CD4015BE		
R2	2.2K	C2	22uF	U2	CD4052BE		
R3	47K	C3	220nF	U3	CD4069UBE		
R4	10K	C4	220nF	U4	CD4046BE		
R5	4.7K	C5	220nF	Transistor(s) Q1 2N3904			
R6	4.7K	C6	100nF				
R7	220K	C7	2.2uF	Potentiometers RATE C500K FREQ 2 C100K FREQ 3 C100K PORTAMENTO A1M rest of the pots (x8) B100K			
R8	220K	C8	220pF				
R9	220K	C9	100nF				
R10	15K	C10	4.7nF				
R11	330K	C11	6.8nF				
R12	22K	C12	100uF				
R13	100K	Diodes D1 1N4001 D2 1N4148				Switches LFO/STEPS DPDT on/off/on RINGMOD SPDT on/on	
R14	100K						
R15	100K	LED5** 3mm normal red diffused LED 4x LED's (for the sequencer)					
R16	47K						
R17	22K						
R18	330K						
R19	100K						
R20	CLR*						

Quantum Defrakulator MK2 Bill of Materials

- * Current Limiting Resistor for the sequencer LEDs. They share a single resistor since there's always just one LED engaged at the time. Use the appropriate value for your LED type.
- I recommend using a 4.7K resistor for a diffused LED or a 15K resistor for a clear superbright LED.
- I recommend using multilayer ceramic capacitors for the 220nF caps to keep the size down. For the larger values use electrolytic capacitors as usual.
- ** LED5 is not supposed to be external. It's just part of the filter circuit, so just mount it on the PCB on the component side like the rest of the components. The LED type/size and colour is not critical.

Things not included in the BOM that you will also need:

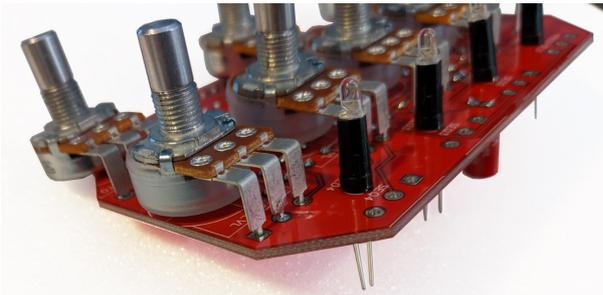
- 1x Hammond BBDD/JJ enclosure
- 1x DC jack
- 1x 6.3mm mono jack for the output
- 12x knobs
- 4x LED bezels (optional)
- 2x 3.5mm jacks (optional, for the CV inputs)

Fitting everything inside the enclosure

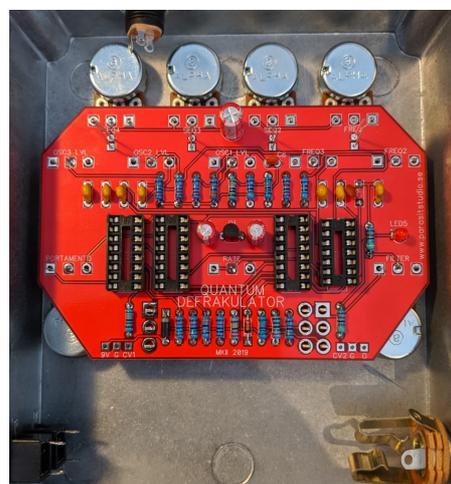
Getting everything mounted inside the enclosure can be a bit tricky because of all the pots, leds and switches. Here's what I do.

1. Solder the middle leg of the potentiometers to the PCB first (that way the pots won't fall out when you try to insert the board into the enclosure, but they will still have some movement for adjustment).
2. Place the switches inside the enclosure.
3. Put the LED's in the PCB (without soldering).
4. Carefully put everything together and make sure that everything lines up.
5. Solder everything in place.

In this picture example I put the top four pots inside the enclosure first, since the DC jack was in the way, but it's much easier to solder them to the PCB insted which I was doing on later builds.



When using a pot cover I usually keep the legs of the pots a bit liften from the hole so that the pot sits flush against the PCB.



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Offboard Wiring

- 9V pad to DC jack positive lug (or battery clip +)
- G pad to DC jack negative (or battery clip -)

- O pad to output jack Tip
- G pad to output jack Sleeve

If you want to drive this effect from a 9 volt battery, I recommend using an extra switch (like a SPST, or a SPDT using two of the pins) as an on/off switch, to disengage the battery while not in use.

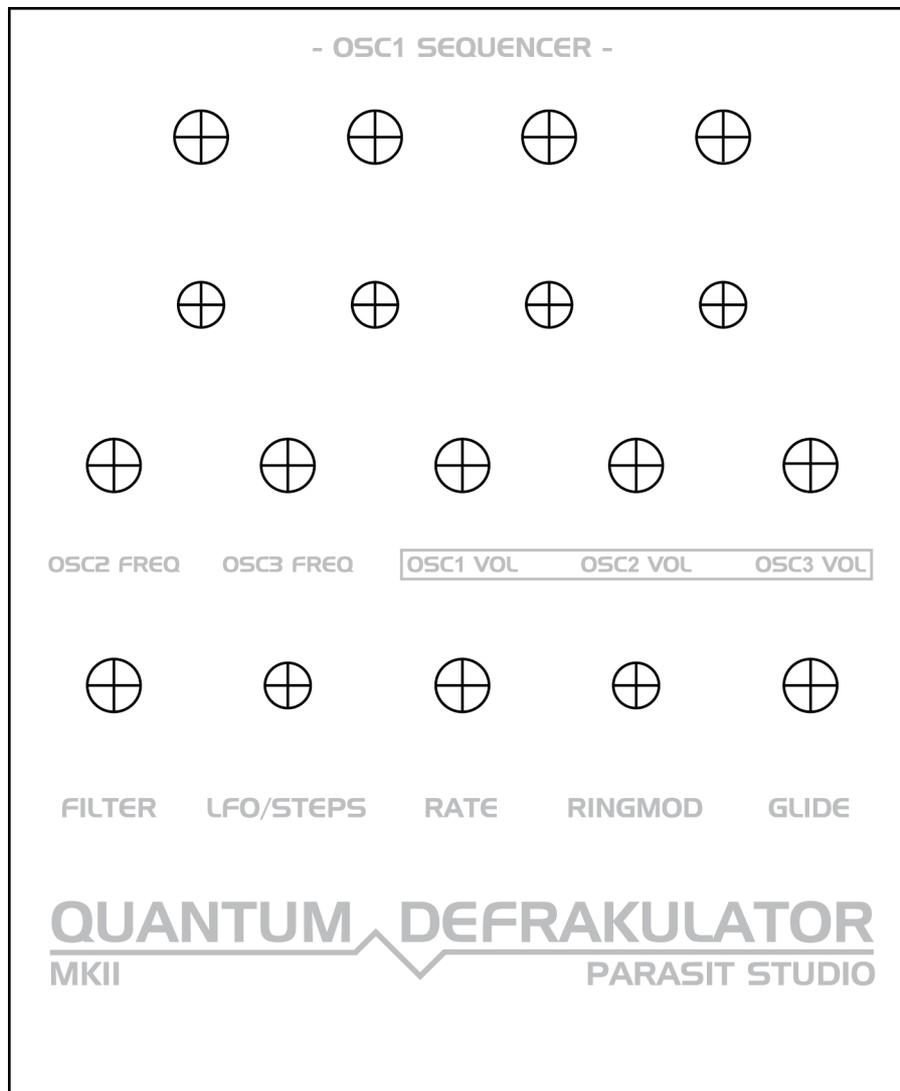
CV jack Wiring

- To hook up the CV (control voltage) input jacks, connect the CV pad on the PCB to the tip of a 3.5mm jack (or jack of your choice). Make sure that the sleeve of your jack is connected to ground (it usually is connected to ground via the enclosure unless you have an isolated jack type). If you use a stereo/balanced jack, just leave the ring lug unconnected.

CV1 = oscillator 1 frequency

CV2 = filter cutoff

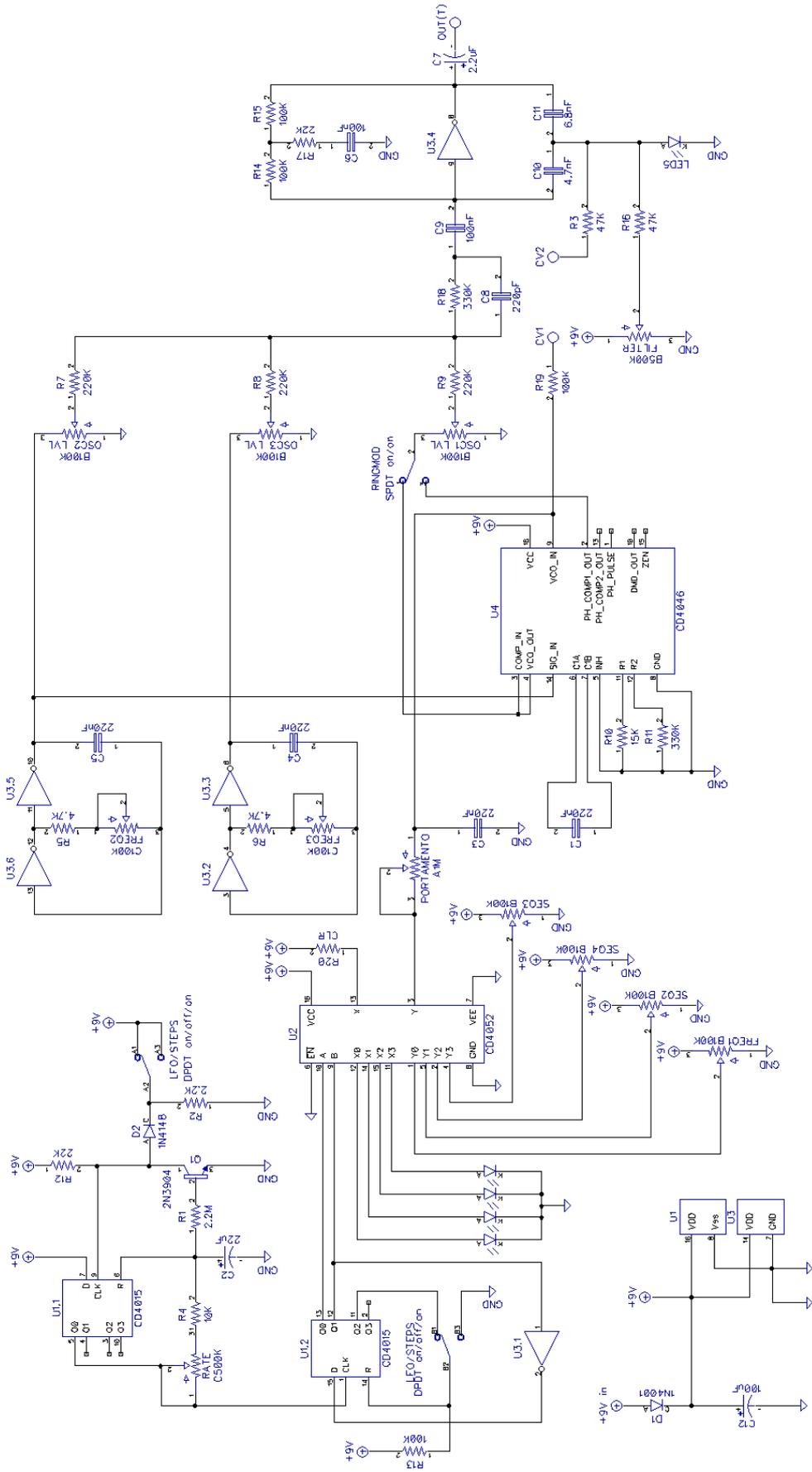
Drilling template (Hammond BBDD/JJ)



- *Drill holes on the sides for the output jack and the DC jack to your own preference.*
- Make sure your printer is printing 100% print size and isn't doing any scaling.
- Use at your own risk! This template is approximate.
- **Measure and confirm before drilling!**

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Schematic



Troubleshooting

There's always a chance of running into trouble. To minimize error, follow the BOM and general building tips carefully. Take your time and don't rush. Take a break now and then. Use good solder, and it helps to have a decent soldering station instead of a cheap iron.

If you are still having trouble, please visit the madbean forum Parasit Studio subforum section and ask for help there.

<http://www.madbeanpedals.com/forum/index.php?board=84.0>

If you have bought the Musikding kit and have received a faulty or missing component, please contact musikding directly.

kontakt@musikding.de

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