BEFACO

THANKS FOR CHOOSING ONE OF OUR KITS!
This manual has been written taking into account the common issues that we often find people experience in our workshops. The order in which the components are placed on the board is meant to make assembly as easy as possible.
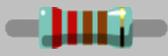
Some steps are not obvious, so even if you're an experienced DIYer please read the steps thoroughly before starting.

If this is your first project, please read this article before you start assembling the kit: www.befaco.org/howto/

GOOD LUCK!

MAIN PCB (THE SMALL ONE)
OPEN MAIN BOARD BAG A

RESISTORS			
Qty	Value	Code	Name on PCB
12	10k	Brown, black, black, red, brown	R5, R9, R10, R11, R14, R18, R25, R26, R28, R32, R34, R38,
7	100k	Brown, black, black, orange, brown	R7, R15, R23, R31, R33, R35, R36
3	20k	Red, black, black, red, brown	R13, R17, R29
2	1K	Brown, black, black, brown, brown	R2, R21
2	2k2	Red, red, black, brown, brown	R19, R20
2	4k7	Yellow, violet, black, brown, brown	R24, R30
2	47k	Yellow, violet, black, red, brown	R27, R37
1	390 Ohm	Orange, white, black, black, brown	R12
1	820 Ohm	Gray, red, black, black, brown	R39
1	2k	Red, black, black, brown, brown	R40
1	2k7	Red, violet, black, brown, brown	R3
1	6K2	Blue, red, black, brown, brown	R8
1	12k	Brown, Red, black, red, brown	R4
1	330K	Orange, orange, black, orange, brown	R22
1	470k	Yellow, violet, black, orange, brown	R16

DIODES	
Solder the diodes **respecting the polarity**. Black or white line on the diode must be in the same place as white line on diode symbol on PCB silkscreen.	
Qty	Value	Name on PCB
2	1N5817 (Black)	D22, D23
2	1N4148	D1, D2

FERRITE

Solder the two ferrite beads by using a recycled resistor leg passed through each ferrite and proceed as if it were a resistor. Ferrite beads don't have polarity.

Qty	Name on PCB
2	FERRITE+, FERRITE-

OPEN ICs BAG

ICs

First **place the sockets** (taking care to orientate them properly – the notch or dot on one end of the IC should match the image on the silkscreen) and solder them into their correct positions.

Next place the ICs in their respective sockets (again taking note of their orientation – the notch or dot on the top of the IC must match that of the socket and silkscreen).

Qty	Value	Name on PCB
3	TL072	IC1, IC2, IC3
1	LM393	IC4
1	LF398	IC5

OPEN MAIN BOARD BAG B

CAPACITORS

Identifying capacitors can be quite tricky. Codes stated are indicative, please take a look at this guide for help identifying capacitors: http://www.wikihow.com/Read-a-Capacitor

Qty	Value	Code	Name on PCB
7	100n	104	C1, C4, C7, C9, C11, C15, C16
3	2n2	222	C6, C8, C12
1	10n	103	C2
1	1n	102	C5
1	47p	47p	C10
1	100p	101	C3

ELECTROLYTIC CAPACITORS

Values are written on the side of the capacitor. Mind their polarity (The long leg of the capacitor is the positive (+)).

| Qty	Value	Code	Name on PCB
2	10µF	10µF	C13, C14

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TRANSISTORS

Be sure they are orientated correctly. The curved and flat sides of the silkscreen outline of the transistor on the PCB must match that of the transistor's body.

Qty	Value	Name on PCB
6	2n3904	T1, Q1, Q2, Q3, Q4, Q5

TRIMMER

Solder the 10k trimmer at "V/Oct" where the silkscreen indicates on the PCB, with the screw facing out from from the edge of the PCB.
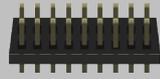
MALE PIN HEADERS

Place and solder the Male Pin Headers on the silkscreen side where the silkscreen indicates (it is the shorter pins that you are soldering).

POWER CONNECTOR

Solder the power connector at "EPOWER". The small arrow on the connectors must be on the side with the thick white line.

Buen trabajo! You've already made it quite far through the build. How are your focus and energy levels? Do you think a 15 minute break would better prepare you for the rest of the build? Maybe you could call someone you haven't talked to in a while or do something useful like debate politics on facebook or look at videos of cats being jerks?

CONTROL PCB

OPEN CONTROL BOARD BAG A

RESISTORS
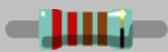
Qty	Value	Code	Name on PCB
8	18k	Brown, gray, black, red, brown	R103, R104, R105, R106, R107, R108, R109, R111
3	100K	Brown, black, black, orange, brown	R100, R114, R115
2	3k9	Orange, white, black, brown, brown	R102, R110
1	1M	Brown, black, black, yellow, brown	R112
1	180k	Brown, gray, black, orange, brown	R113
1	1K	Brown, black, black, brown, brown	R101

DIODES

Solder the diodes **observing their polarity**. The black or white line on the diode must match with the white line on the diode symbol on the PCB silkscreen.

Qty	Value	Name on PCB
1	1N4148	D100

CAPACITORS

Qty	Value	Code	Name on PCB
1	100n	104	C100

FEMALE PIN HEADERS

Place and solder the female Pin Headers on the silkscreen side where the silkscreen indicates

[CONTINUED ON NEXT PAGE]

FRONT PANEL COMPONENTS MOUNTING TIPS:

Now we will proceed to mount the jacks, potentiometers, switches and LEDs. This part of the assembly is CRITICAL. Please take your time and read the following instructions carefully. These components must **NOT** be soldered until they are placed on the PCB and fully attached to the front panel.

There are two reasons for this:

- The height of the panel components are not all the same. Because of this, if not attached properly before soldering, they will not stay properly seated against the panel. This might cause mechanical stress reducing their life expectancy and in the worst case cause them to break.
- The second reason is that it is very difficult to align the components to the holes if the panel is not positioned prior to soldering. In the case of the LEDs, they are almost impossible to set to the correct height without reference to the front panel.

LEDs
Place the LEDs onto the PCB minding, their polarity, but **don't solder them** until the front panel is in place. This is the only way to solder them in the right position. The long leg is the positive and the short the negative. On the PCB the square pad indicates the negative side and there is a + symbol to indicate the positive.

Qty	Name on PCB
8	D3, D4, D5, D6, D7, D8, D9, D10

OPEN CONTROL BOARD BAG B

SPACERS
Secure the spacer onto the CONTROL PCB (through the hole with the silver outline) with the main body of the spacer on the component side, and the nut on the opposite.

MINI-JACKS
Place all the mini-jacks onto the PCB ensuring they are on the silkscreen side, but **don't solder yet**. **Caution:** the switch nut and the jack nuts look the same, but they are not equally sized and will not fit in each others' thread, so make sure to keep them separate!

POTENTIOMETERS
Now place potentiometers on the PCB but... **don't solder them**. Do not put them all the way down. They must be flat against the panel and leveled with minijacks. Also, you could short circuit pins underneath!!

Qty	Type	Name on PCB
2	Single (3pin) 100K	FINE, COARSE

[CONTINUED ON NEXT PAGE]

SWITCHES

Place the toggle switches but **don't solder them** until they are secured to the front panel. This way it's easier to solder them in the right position.
You will know which one is the two and tree position by flipping the switch and noting how many positions it can rest at.

Qty	Type	Name on PCB
1	Single two position	SW1
8	Single Three position	SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9

FRONT PANEL

Attach the **front panel** adjusting the parts one by one if necessary until they fit. At this point a pair of fine tweezers can be helpful.

To finish:
        - Secure the parts to the panel in this order: A) **Mini-jacks** B) **Switches and** C) **Pots**

        - Ensuring all of the above parts are flush with the panel then you can finally **solder** them!

        - Next, adjust the **LEDs** so that they are flush with the panel and solder them.

        - Connect the **main PCB** to the **control PCB** using the pin headers and by threading the M3 screws through the main PCB and securing it to the spacer. The main PCB should be orientated so that the component side is facing towards the front panel.

        - Put the **knobs** on the potentiometers and the **caps** on all switches.

        - Connect the **power ribbon cable**: The red wire (-12V) on the power ribbon cable corresponds to pin number one on the male power connector. The number one pin is indicated with a small triangle on the male power connector and a white line on the main PCB. A white or black line (or "-12v") marked on your power bus normally indicates the corresponding pin.

CALIBRATION

Most of the features of the sampling modulator will work correctly after assembly, but in order to achieve precise V/Oct tracking you should adjust the **V/Oct** trimmer carefully using the following method:

You will need:
        - A decent multimeter.
        - A small flat-head screw driver (or better yet a trimming tool).
        - An electronic instrument tuner.
        - A calibrated DC voltage source.

If you do not have a DC voltage source to hand you can create one with a multi-turn potentiometer (set up as voltage divider) using the following method
        •   Connect Leg 1 to a positive voltage source, Leg 3 to negative (or ground) and use Leg 2 as your voltage source output. **NOTE**: Always measure your voltages when they are connected to **CV IN**.

The calibration process is an iteration of successive approximations as follows:

        •   Connect a tuner to the **CLOCK OUTPUT** or to Pin 1 of IC3, the:

1 - Move the **RATE** and **FINE RATE** pots on the module until you have an E2 on your tuner.

2 - Add 3.000 Volts to the **V/Oct CV** input using your voltage source. Measure this voltage once it has been connected to the module to ensure it is 3.000 (3 volts)

3 - Adjust **RATE** until you have E5 (+/- 0 cents) on your tuner.

4 - Disconnect the voltage source from **CV IN3** and adjust the **V/Oct** trimmer until you reach E2 + 0 cents
5 – Go back through steps **2 - 4** until there is no need of adjustment after adding the 3.000 volts.

You can also use a decent MIDI to CV interface or any device that can send pitch CV accurately as the voltage source. Just move within three octaves to make sure it's tracking properly.

ENJOY YOUR NEW BEFACO MODULE!

BLOCK DIAGRAM