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BASTL
INSTRUMENTS

TROMSØ v1.0 - Assembly Guide

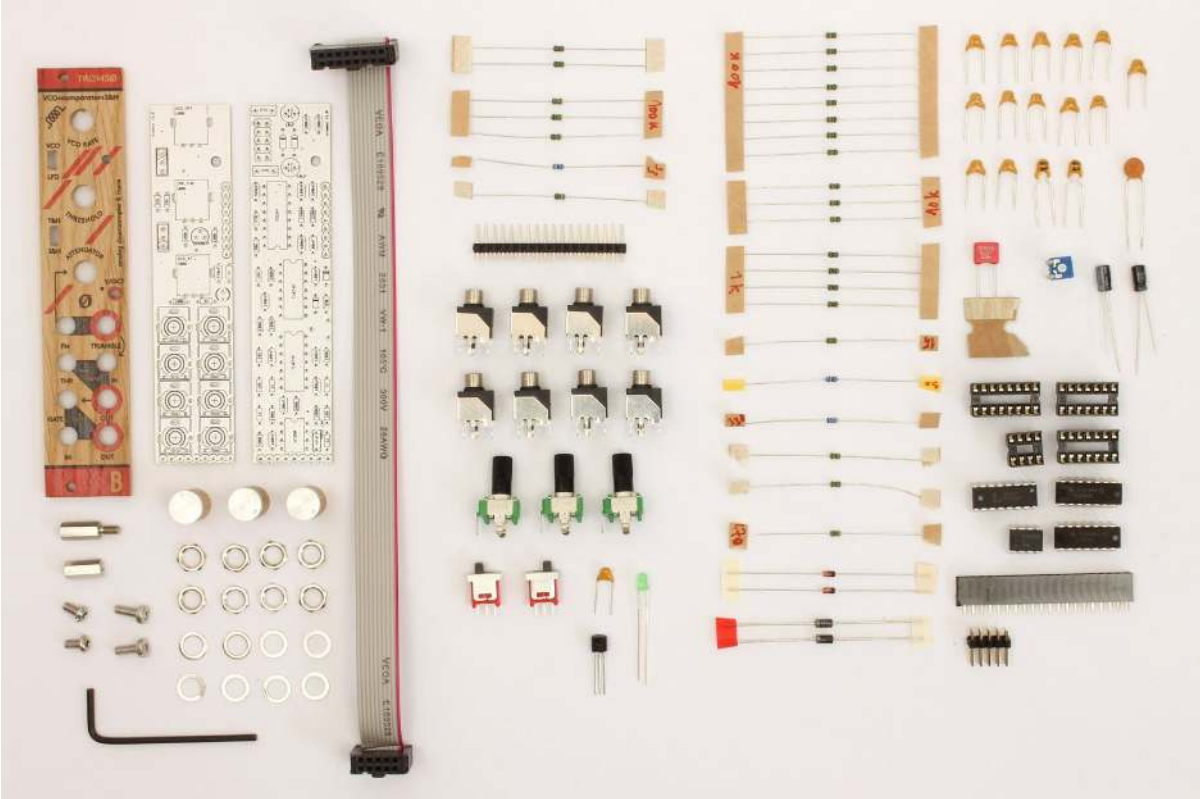
bastl-instruments.com

INTRODUCTION

This guide is for building Tromsø module from Bastl Instruments. It is good to have basic soldering skills and to be able to identify electronic components before starting this kit. However if you have never soldered before, check out this tutorial first[1]. We even included some of the best quality solder to help you solder everything faster and better.

The Tromsø kit consists of two boards. All the parts comes in three bags separated for Top board, Bottom board and Assembly parts. See Bill of Materials (BOM) for detailed list.

[1] http://www.instructables.com/id/How-to-solder/



Before starting this kit, prepare the following tools:

- Soldering iron (15-20W)
- Multi-meter
- Flush cutters
- n2. hex screwdriver or allen key (enclosed with kit)
- Phillips screwdriver
- Wrench No. 8
- Protective eyewear

After the Tromsø is built it should be calibrated. You can use your mobile device with installed tuner application for this purpose. For details see the Calibration part below.

We suggest that you work in a clean and a well lit and ventilated environment to avoid accidents or losing any of the small components.

Also briefly go through this guide and make sure that you understand all the steps.

BOTTOM BOARD

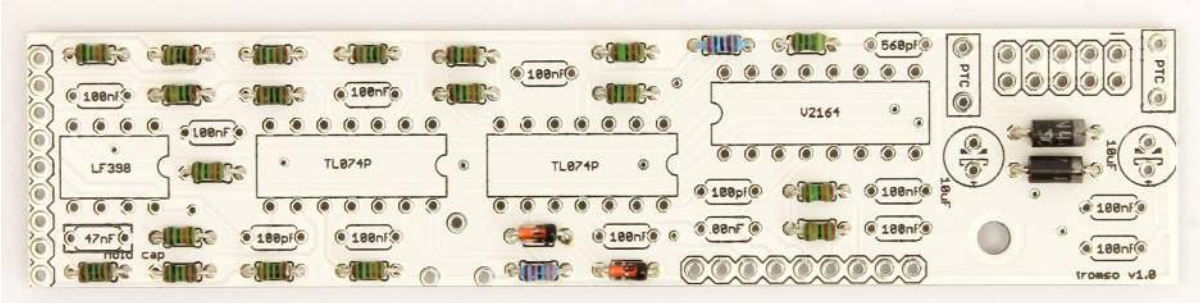
You will start with the bottom board PCB. Before you will start soldering, take your time and find all the **resistors values** using a multimeter[2] (or you can check the color codes if you are seasoned enough):

- **470R** (1x), **1k** (4x), **10k** (3x), **15k** (1x), **30k** (1x), **33k** (1x), **100k** (8x), **150k** (1x), **220k** (1x).

Be careful to insert these **resistors** on the right place and solder them. Then snip the leads close to the PCB (be sure to make this step on all remaining leads in the course of this guide).

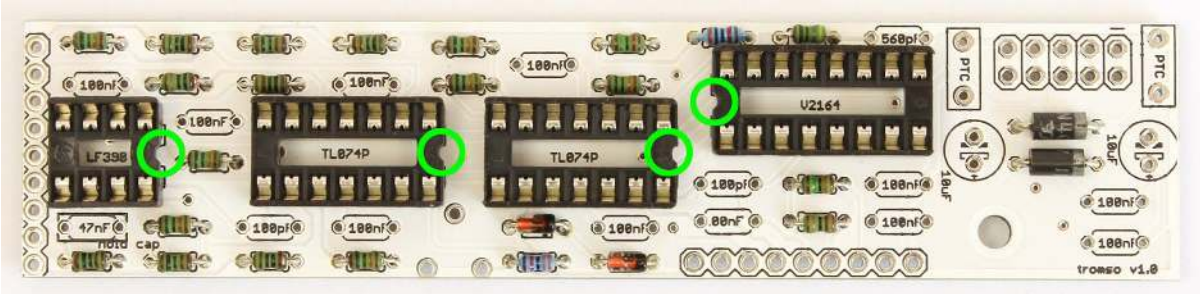
After that solder the **diodes**. There are four of them (2x **1N4148**, 2x **1N4007**). Be careful, **diodes are polarized**! Make sure that the marking ring on the diode body matches the marking on the circuit board.

[2] https://learn.sparkfun.com/tutorials/how-to-use-a-multimeter/measuring-resistance



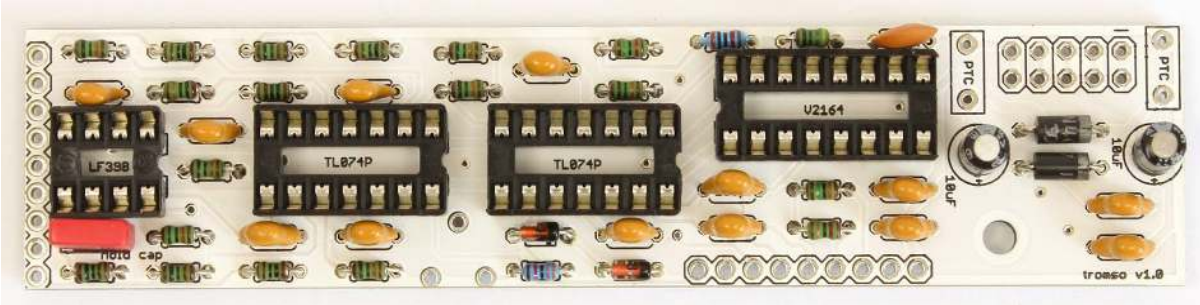
Now you can move to soldering the **IC sockets** (be aware of the right direction, there is a notch on the sockets that has to match with the sign on PCB):

- **8 pin DIL** (1x)
- **14 pin DIL** (2x)
- **16 pin DIL** (1x)

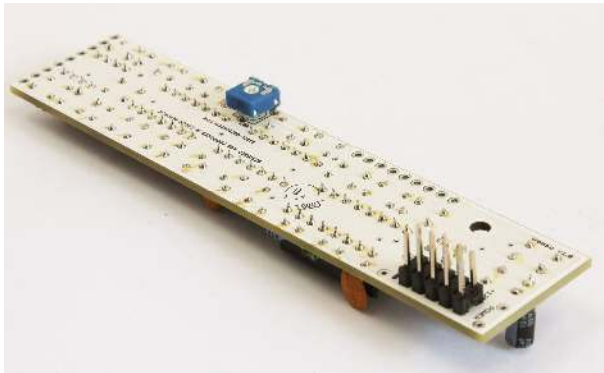


Now let's do some **capacitors**. According to the size insert and solder them in the following order:

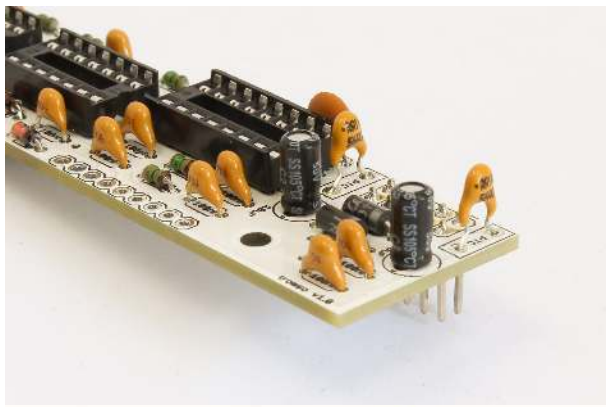
- **100nF** ceramic capacitors (11x, marked "**104**" on itself)
- **100pF** ceramic capacitors (2x, marked "**101**" on itself)
- **47nF/63V** WIMA polyester capacitor (1x)
- **560pF** ceramic capacitor (1x, marked "**561**" on itself)
- **10uF** electrolytic capacitor (2x, there is a plus (+) sign on the PCB that has to match the longer lead of the electrolytic capacitors)



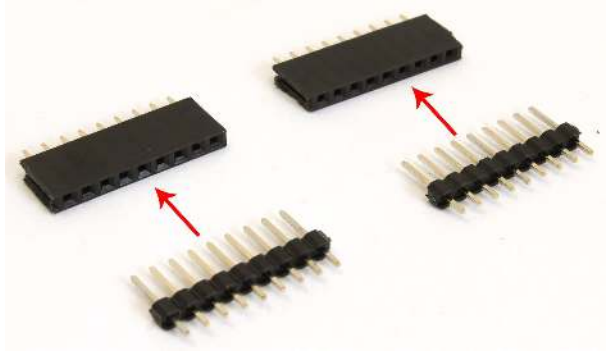
Turn around the PCB to solder the **2x5 pin male header** and solder it. Be careful to solder the headers straight. You may first solder one of the pin, take the board in your hand and re-heat that pin while you are adjusting the header straight. Add also the **trimmer**.



Then you can solder the **fuses**. There are just two of them. They look quite similar to a ceramic capacitors. Place them in the “PTC” rectangular).

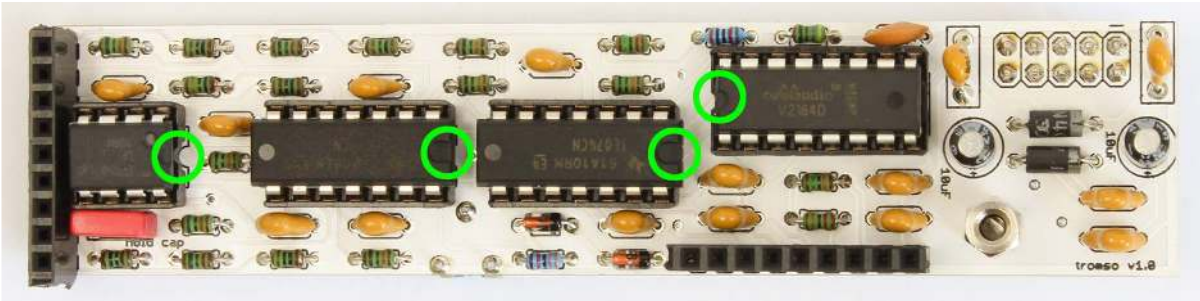


To finish soldering of the bottom board you have to connect the female headers with the male headers from the Top board bag. Use your flush cutters to get two pieces of **1x9 female pinheaders** (you will always lose one pin when cutting the female headers, so be sure to cut it always after the last required pin).



Then take the Top PCB and mount the hex spacers on it: nut-screw spacer on the top connected with the nut-nut spacer from the bottom. Place the headers on the bottom board **facing the female parts downwards**. Now connect the boards together and secure them with the screw from the bottom. Finally you are ready to solder all the male and female headers.

Disconnect the boards. Don’t forget to place the **ICs** into the sockets (2x **TL074**, 1x **V2164D**, 1x **LF398**). There is a notch on each IC that has to match with the notch on the socket.

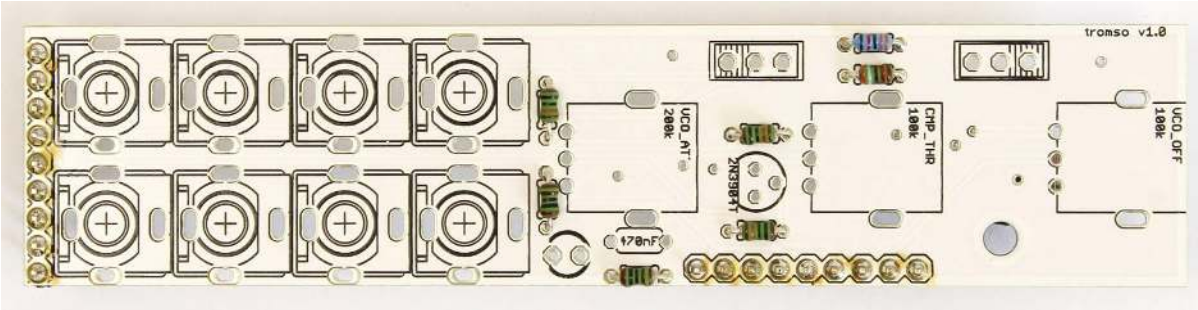


Great, you are done now with the bottom board! Before moving to the next one make the last check that all parts are on the right place and every joint is properly soldered.

TOP BOARD

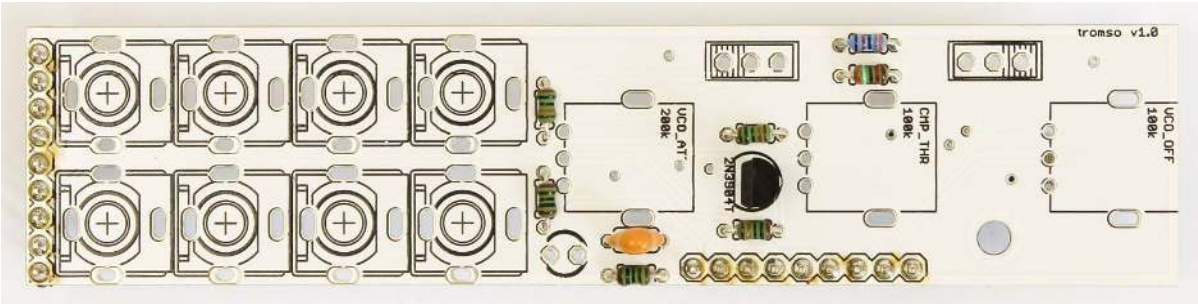
Now let's do the top PCB. Again, start with the **resistors**:

- **1k** (2x), **33k** (1x), **39k** (1x), **100k** (3x)



Then insert and solder some other parts (**capacitor and transistor**):

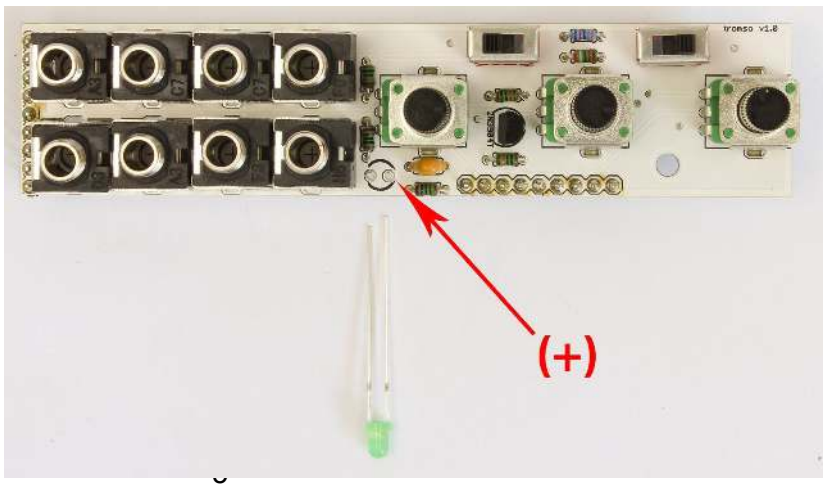
- **470nF** ceramic capacitor (marked "474" on itself)
- **2N3906** transistor (the flat side has to match with the printing on the PCB)

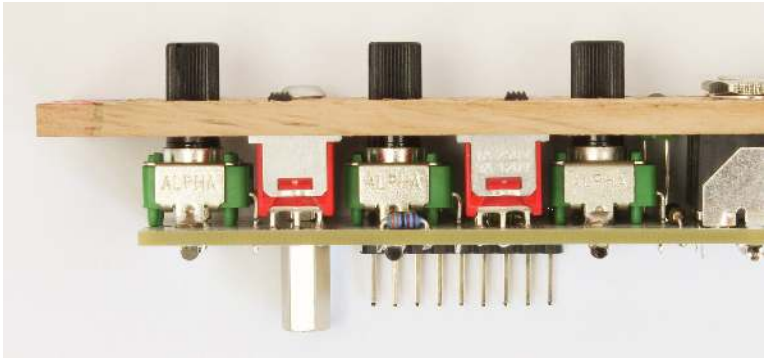


Insert now all the other parts (**jack connectors, potentiometers, switches and LED**) but do not solder them yet:

- **100k linear potentiometers** (2x, marked "B100k" on the PCB and on itself)
- **200k linear potentiometer** (1x, marked "B200k" on the PCB and on itself)
- **Jack connectors** (8x)
- **Switches** (2x)
- **LED** (1x, be careful to put the longer lead into the plus (+) hole)

Be careful to push the potentiometers right down to the PCB. Mount the spacers back again on the PCB. Take the front front panel and lower it down on the board. Hold it together and mount it with the screw, jack washers and nuts (you do not have to tighten them too much as you may damage the panel).

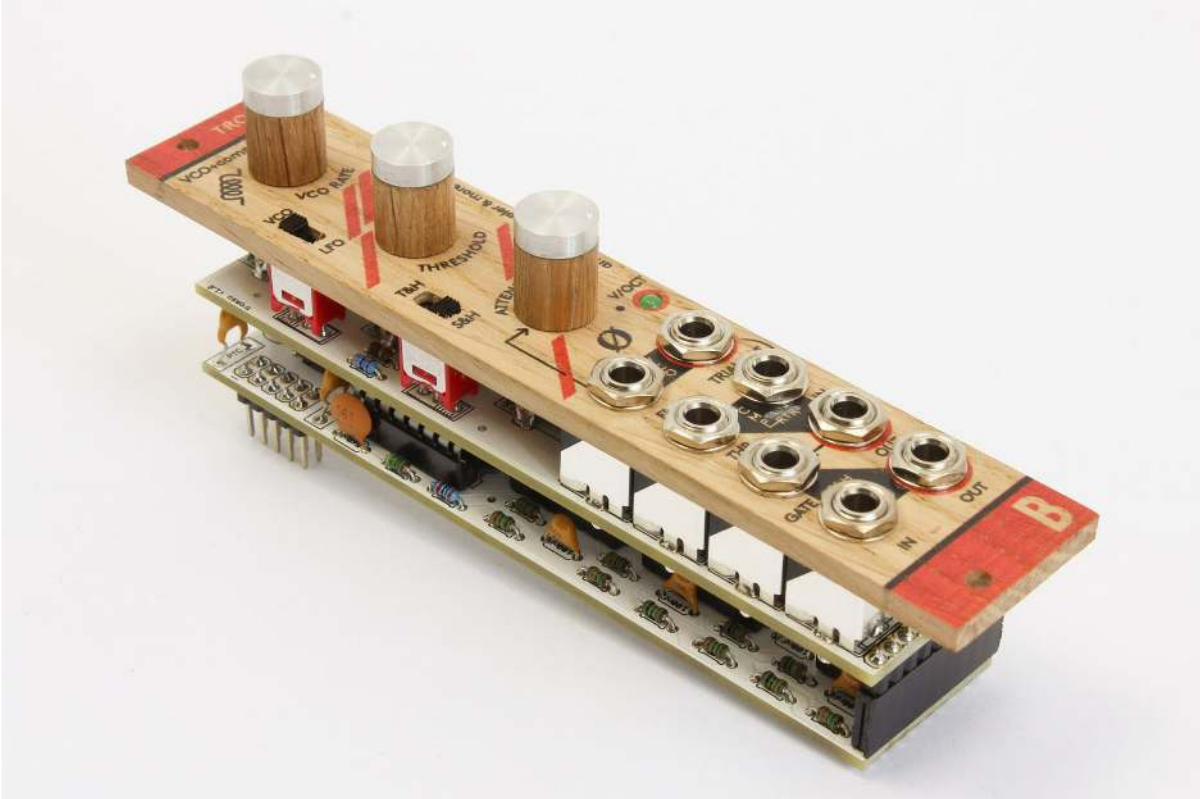




Then turn the unit facing with PCB upwards. Make sure that everything is properly aligned. Push the **switches** and **LED** to be sure that they come through the panel. Now you are finally ready to solder all these inserted parts.

FINAL ASSEMBLY

Congratulations! You have made it through. Now just connect the PCBs together, secure the spacers with screws from the bottom and put the wooden knobs on.



Before you connect anything, make sure that your system is disconnected from power. Also double check the polarity of the ribbon cable, the red cable should match the -12V rail both on the module and on the bus board!

CALIBRATION

At last you have to do the calibration of Tromsø. You need a tool for measuring frequency and a little screwdriver for turning the trimmers. You can use one of free tuner apps for mobile phones (e.g. Tuner T1 for iPhone or Pano Tuner on Android worked pretty well in our testing).

So basically there is just one thing to calibrate: **the volt per octave characteristics of the VCO section when the attenuator is fully open.**

Use Triangle output and amplify it yo so can hear it. Flip all the switches up. Set VCO RATE and ThRESHOLD at twelve o'clock (as precisely as possible) and turn the ATTENUATOR at full. Now turn on your tuner and adjust the trimmer until you will measure 240 Hz and that's it! This process is approximate but really close to the results of precise calibration that we do on our testing station. For more precise calibration you have to connect your volt per octave source and play octaves (1 volt differences) and listen if you hear an octave interval or measure if you get double frequency.

TROUBLESHOOTING

Check the F.A.Q.[3] on our website first. If you are still in trouble the best thing is to take a nap! Especially late at night! Then you can can send the detailed description of the problem with enclosed high-resolution photos on diy@bastl-instruments.com. Consider our "Come to Daddy" service if you think that you are unable to make the module work on your own.

BILL OF MATERIALS

TROMSØ v1.0 BILL OF MATERIALS		
SOLDERING_TOP_TROMSØ		
qty	value	part
2	1k	R-EU_0204/5
1	33k	R-EU_0204/5
1	39k	R-EU_0204/5
3	100k	R-EU_0204/5
1	470nF	ceramic capacitor
1	2N3904	NPN, BULK
2	B100k	linear potentiometer
1	B200k	linear potentiometer
2		switch
8	jack connector	PJ-301BMB
1	difuse green 3mm	LED
1	18 pin	male
SOLDERING_BOTTOM_TROMSØ		
qty	value	part
1	470R	R-EU_0204/5
4	1k	R-EU_0204/5
3	10k	R-EU_0204/5
1	15k	R-EU_0204/5
1	30k	R-EU_0204/5
1	33k	R-EU_0204/5
8	100k	R-EU_0204/5
1	150k	R-EU_0204/5

[3] http://www.bastl-instruments.com/diy-kits-f-a-q/

1	220k	R-EU_0204/5
2	100pF	ceramic capacitor
1	560pF	ceramic capacitor
1	47nF/63V	WIMA polyester capacitor
11	100nF	ceramic capacitor
2	10uF	electrolytic capacitor
2	1N4148	DIODE-D-5
2	1N4007	DIODE-D-7.5
1	8 pin DIL	DIL socket - in foam
2	14 pin DIL	DIL socket - in foam
1	16 pin DIL	DIL socket - in foam
2	TL074	IC in foam
1	V2164D	IC in foam
1	LF398	IC in foam
1	10k	trimr
2	100mA	fuse
1		male 2x5
1	18 pin	female
ASSEMBLY_TROMSØ		
qty	value	part
1		PCB Top
1		PCB Bottom
2	8mm	panel screw
2	6mm	screw
1	nut-screw	hex spacer
1	nut-nut	hex spacer
8		jack washers
8		jack nuts
1		allen key
3		pot knob
1		front panel
1		power cable 10-16pin