Assembly Instructions

ARCHAEA

READ THIS FIRST!

Before you begin there are a few things you'll need in order to assemble your Loki synthesiser. You'll need to know how to solder 'through hole' components. If you are a beginner, check out one of the many good tutorials online. This is a medium complexity kit to assemble, it is important to follow the steps in order to keep the process as simple as possible. Most of the complex circuitry in Loki is machine assembled. The remaining components that need to be hand soldered are mainly front panel controls and sockets, interconnects and trimmer pots. Besides soldering, Loki is completed by screwing the PCBs together and by calibrating the circuits with the onboard trimmer pots.

The basic equipment you'll need is as follows:

1. Soldering iron, a basic 15-30W iron is fine.
2. Solder, a roll suitable for electronics.
3. Side cutters.
4. Small pliers.
5. Pozi head screwdriver (PZ1, or Philips PH1 will do).
6. A small flat head screwdriver (2mm), ideally with a large soft handle for precision turning.
7. A basic multimeter, with a function for measuring frequency (or a frequency measuring phone/computer app will do) and a pair of test clips.
8. Large square filling knife, or similar stiff thin flat sheet.

TIP: If you build a lot of modules, a knurled nut driver and a set of plastic hex nut drivers are worth having to tighten nuts without risking damaging the front panel.

Disclaimer: We are not responsible for any harm, including fire, electric shock, soldering accidents or damage to any equipment, caused by assembling this kit. All assembly is undertaken at your own risk!

archaea.co.uk

info@archaea.co.uk

PARTS PACKING LIST

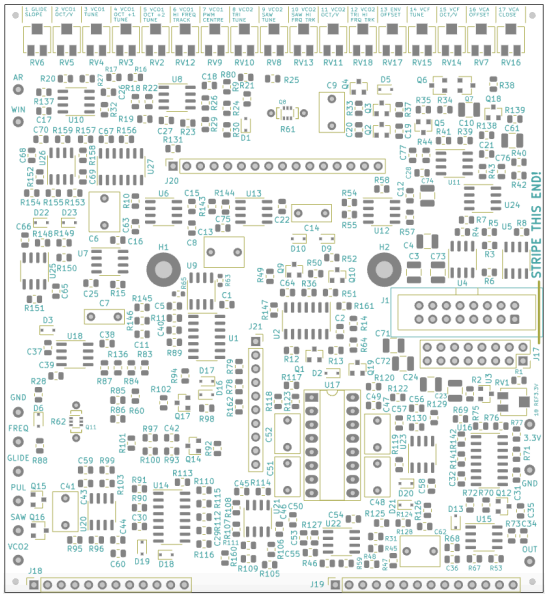
The kit parts are split into a number of packages. The main components are easily identifiable. Observe static handling precautions with the SSI2144 filter subboard found in the small anti-static bag. All other parts are contained in the paper packages labelled as shown below.

Main Components	Qty	ON-ON Switches	Qty
Eurorack power cable	1	Switch Dailywell 1MS1 SPDT on-on	1
Panel	1	Switch Dailywell 1MD1 DPDT on-on	1
Main PCB	1	**ON-ON-ON Switches**	**Qty**
Front PCB	1	Switch Dailywell 1MD6 DPDT on-on-on	5
SSI2144 filter subboard	1	**Jacks**	**Qty**
Capacitors	**Qty**	Mono jack socket PJ-301BM	16
2.2uF	3	**Hardware**	**Qty**
6.8nF	3	Standoff 14mm	2
2.7nF	2	LED spacer 10mm	3
10nF	1	Washer M7 (ID 7mm, OD 13mm) 0.5mm	2
0.22uF	1	Washer M7 (ID 7mm, OD 13mm) 1mm	9
560pF	1	M3 screw 6mm	8
Knobs	**Qty**	Knurled Nuts	16
Grey slider caps	7	**Connectors**	**Qty**
White 1900H T18	2	Header pins 40-way 15-mm	2
Grey tall trimmer toppers	4	Header socket 10-way	1
A Pots	**Qty**	Header socket 12-way	1
Song Huey R0904N A10K	1	Header socket 14-way	1
Song Huey R0904N A100K	2	Header socket 16-way	1
Song Huey R0904N A1M	3	Header socket 2x8-way	1
B Pots	**Qty**	Shrouded header pins 2x8-way	1
Alpha RD9 Pot B10K	2	**Misc**	**Qty**
Song Huey R0904N B10KC	3	Tempco Resistors	2
Song Huey R0904N B100K	5	LED ultra bright red, green, blue	3
		Testpoints	11

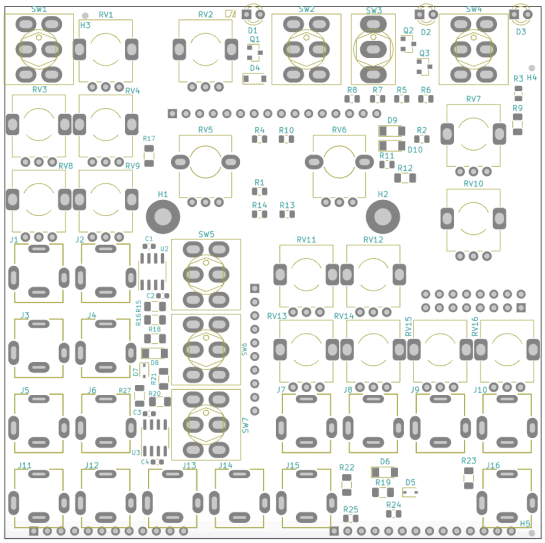
ASSEMBLY

There are two circuit boards to solder, the main and front panel boards. Observe anti-static precautions when handling the boards. The Loki interactive bill of materials (IBOM) webpages on the Archaea website can help show where each parts is placed on the boards and can help you keep a track of which parts have already been placed and soldered.

Click the links below to open the IBOM pages:



Main Board IBOM



Front Board IBOM

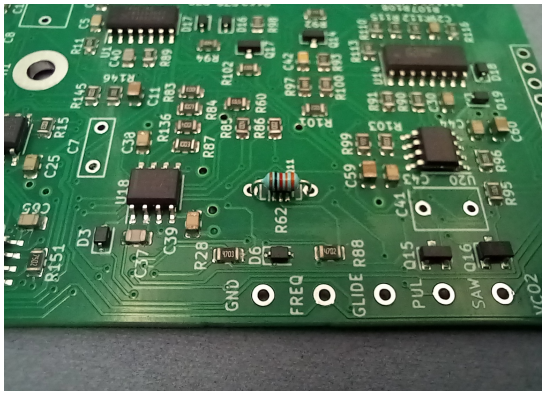
MAIN BOARD

There are a number of ways to solder the through-hole components of the main board. We suggest an approach based on:

1) inserting a group of components,
2) flipping the board over and resting it on the components on a flat surface and
3) soldering.

The components are assembled in order from the lowest to the highest height. A square filling knife or similar rigid flat sheet can be used to hold the components in place while flipping the board over. If you use this approach then the components should be assembled in the order listed below. The fastest way is to insert all the components listed in a step, flip them all in one go, and then solder, before moving on to the next step. Any long pins should be trimmed after soldering with some side cutters. Alternatively, the pins can be bent slightly to hold the components in place when the board is upside down.

1. Tempco resistors



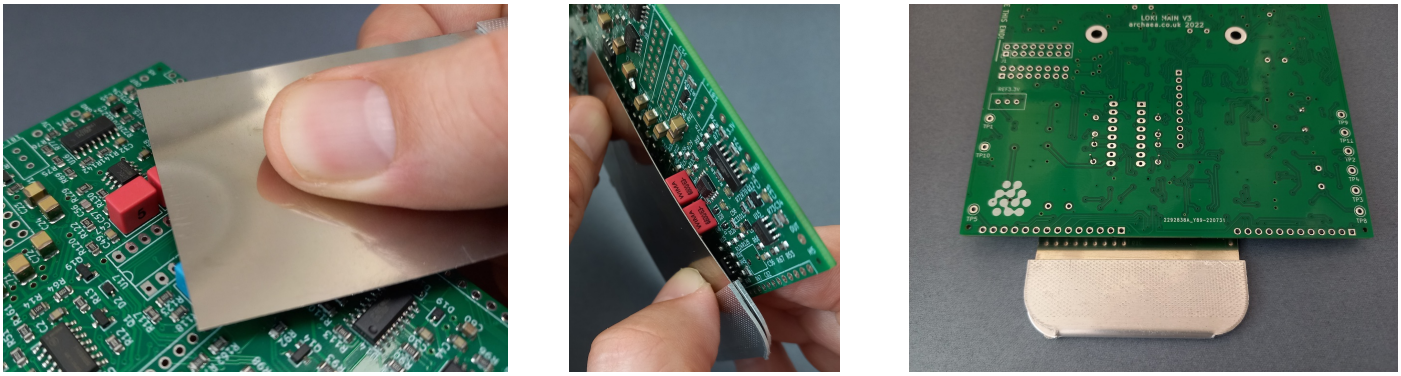
Tempco resistor placement.

The temperature compensation resistors are the small through hole resistors R61 and R62 found in the **Misc** parts package. Bend the legs at right-angles where they meet their bodies to get the correct width for the holes. They can be placed either way round. They should sit on top of the surface mounted transistor pairs Q8 and Q11, with their bodies making contact (so they maintain as close to the same temperature as possible when in operation). Eliminate any air gap by reheating the pads and pushing the resistors against the transistors while the solder is molten.

IMPORTANT: Make sure only the resistor and transistor bodies are touching, and that the resistor leads do not short out any of the transistor leads!

2. Capacitors: 6.8nF, 560pF

Solder 'polybox' capacitors C47, C48, C51 and C52, either way round is fine. They are found in the **Capacitors** parts package. The 6.8nF capacitors can be identified by the markings that include 6800 and and 560pF by the marking 560p. Polyboxes can be soldered using the insert a group of components, flip with a filling knife and solder method.



Holding the polybox capacitors in position before flipping the board over for soldering.

3. Capacitors: 2.7nF, 10nF

Solder capacitors C9, C41 and C7, either way round is fine. The 2.7nF capacitors can be identified by the markings that include 2700 and and 10nF by the marking 0.01.

4. Capacitor: 0.22uF

Solder capacitor C14, either way round is fine. The 0.22uF capacitor can be identified by the marking 0.22.

5. Pin Sockets

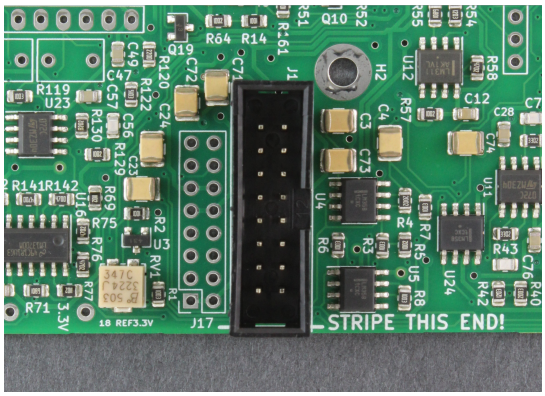
Solder the connectors J17 - J21 found in the **Connectors** parts package. Solder the pins at each end of all the connectors. Make sure each socket is perpendicular and flat to the board. If it needs adjustment, reheat each end pin as necessary and adjust while it is molten.

6. Shrouded Pin Header: 2×8 (optional: front of board)

The shrouded 2×8 pin header J1 is the Eurorack power connector found in the **Connectors** parts package.

IMPORTANT: The header MUST be oriented such that the slot aligns as marked on the silkscreen.

If a shallow case is being used (such as a 4MS pod) then the Eurorack power connector can be placed on the front of the PCB. Alternatively, it can be placed on the back of the PCB for easy connection in a deeper rack. If you plan to mount it on the front of the PCB then solder it in this step. Otherwise skip this step and solder it later in step 9.



Pin header position: front of board.

Once inserted, solder the pins on the other side of the board, starting with 2 opposite corner pins. Ensure the header is flat to the board, reheating the pins to melt the solder as necessary, before soldering remaining pins.

7. Capacitors: 2.2uF

Solder capacitors C6, C13, C14 and C62, either way round is fine.

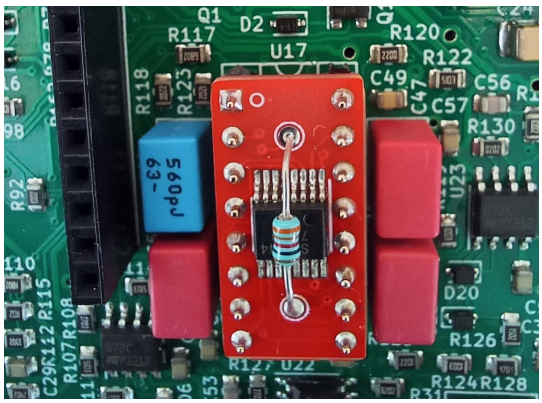
8. Filter Subboard

The subboard U17 is assembled and tested before shipping, and contains the SSI2144 filter IC and a temperature compensation resistor. This is contained in the small anti-static package.

IMPORTANT: the board must be inserted the correct way round, which is indicated by the circle in the left top corner of the subboard at the same end of the socket marking on the main board with the semicircle and U17 text.

This must be soldered onto the main board trying to avoid applying heat for too long to prevent damage to the sensitive semiconductor component. To ensure the subboard is soldered flat to the main board, solder two corner pins first then check if the subboard is sitting flat. If not, reheat the corner pins and push the subboard onto the main board while the solder is molten. Then solder all the remaining pins.

IMPORTANT: observe anti-static precautions when handling the filter subboard!

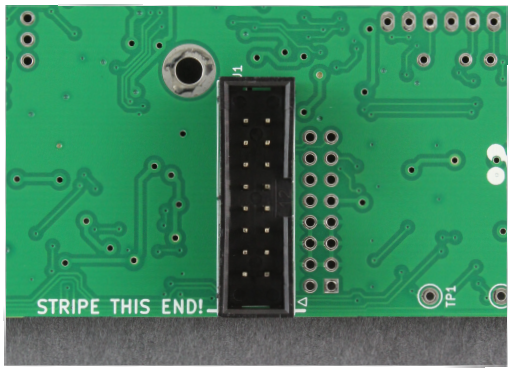


Alignment of the filter subboard.

9. Test Points

The test points TP1-11 will hold themselves in place once inserted and so can simply be placed and the board flipped over for soldering. They are needed during calibration. They are found in the **Misc** parts package.

10.Shrouded Pin Header: 2×8 (optional: back of board)



Eurorack power header position:
back of board.

If you are mounting the Eurorack power connector J1 on the back of the board then solder it now.

IMPORTANT: The header MUST be oriented such that the slot aligns as marked on the silkscreen.

Finally, inspect all solder joints to check that there are no dry joints, bridges or missed connections.

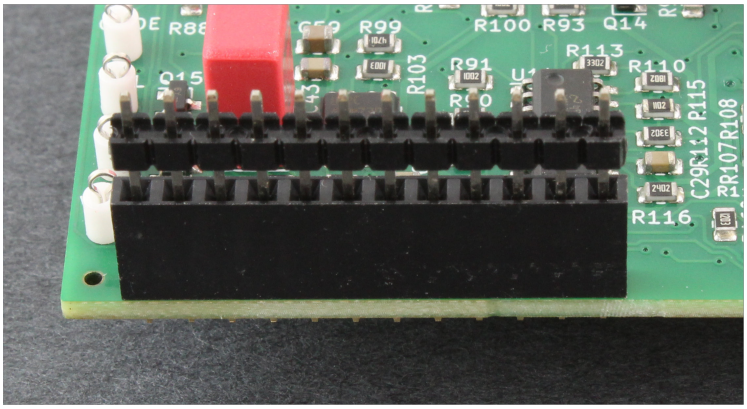
FRONT BOARD

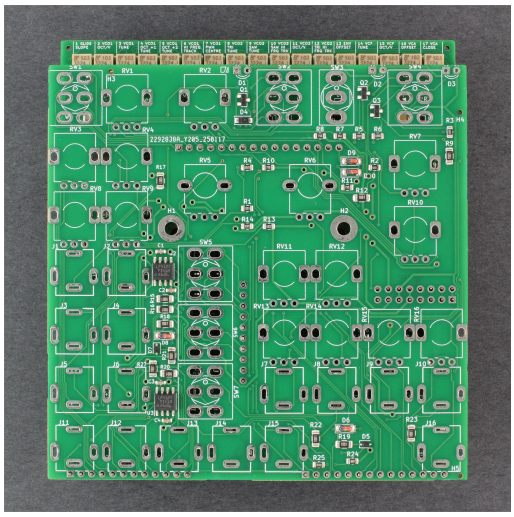
The front board holds the panel components which must soldered while aligned to the front panel board. To do this, the parts are inserted and the front panel attached before soldering.

IMPORTANT: The steps below must be followed in order to successfully align the panel components with the panel holes.

1. Pin Headers

Solder the connectors J17-J21 found in the **Connectors** parts package. Two 40-pin sets of headers are provided which must be cut to length using side cutters. Cut the headers to the following set of lengths: 8, 8, 10, 12, 14 and 16. The headers are soldered on the rear of the board. An easy way to align and hold the headers during soldering is to insert them into the main board pin sockets, and then place the front board onto the top of the pins. The two 8-pin headers go side by side into J17.





Insert the pin headers in the main PCB sockets (left)
and then place on the front PCB (right) before soldering.

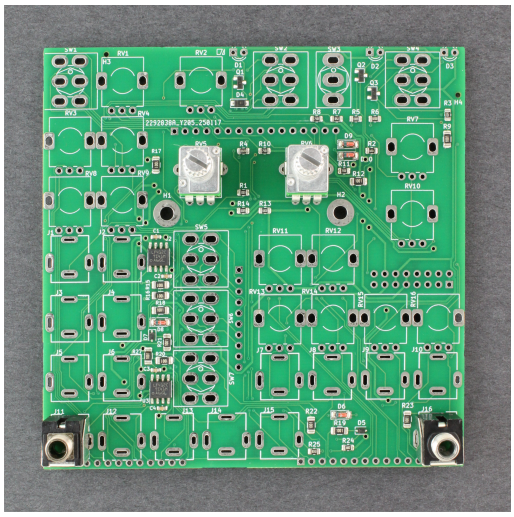
Solder all the pins making sure the headers are flat to the front board, starting with the end pins. The PCBs may have a slight warping so may need to be pushed down on the pins during soldering. After soldering, remove the front board from the main board header sockets.

2. Place First Parts to Set Panel Alignment

Solder in pots RV5 and RV6 (**B Pots** parts package), and jack sockets J11 and J16 (**Jacks** parts package) to provide anchor points for the panel. RV5 and RV6 can be identified by the metal knurled shaft. Make sure they are flat to the board before soldering all pins.

3. Standoffs

Screw the standoffs H1 and H2 to the rear of the board with two M3 screws and tighten (**Hardware** parts package).



Parts for panel alignment.

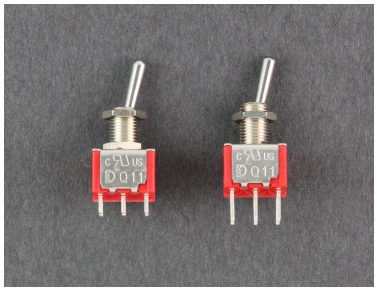
4. Place Remaining Parts and Panel

Place all the remaining panel parts.

IMPORTANT: the tall trimmer pots and switches look similar but are different!

The IBOM makes locating the positions of the different parts much easier.

- Place in all remaining jack sockets J1-J10, J12-J15.



- Place all the switches SW1-7. Either way round is fine, but you might want to align the notch in the screw thread in the same direction on all switches. **IMPORTANT: make sure SW6 is the 6-pin 2 position switch, which is identified on the side as ON-ON (ON-ON Switches** parts package). All other 6-pin switches are the 3 position type and are identified on the side as ON-ON-ON (**ON-ON-ON Switches** parts package). Switch SW3 has 3 pins. Switch all switches to the top position to make putting the panel on easier. The switches rock on the PCB, but are aligned and secured by the panel before soldering. Note: the switches can be supplied either with long legs or short tabs (see right), but both are soldered the same way into the circuit board.

- Place washers (**Hardware** parts package) on pots RV5 and RV6, and switches SW1 - SW7.

- LEDs D1, D2 and D3 are red, green and blue respectively (**Misc** parts package). Insert the LEDs into the LED standoffs (**Hardware** parts package) and insert into the board. The short lead (cathode) is inserted through the square pad.

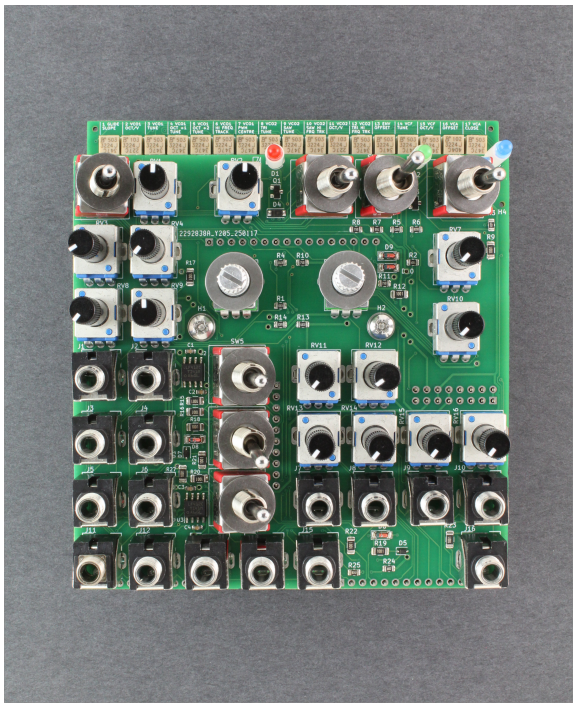
- Place tall trimmer pots RV1-RV4 and RV7-RV16. The values to identify them are either printed on the side or on their bottom. The iBOM refers to the side identifier, however some pots only have a bottom identifier. The table below shows the corresponding identifiers, the parts packages and PCB identifier.

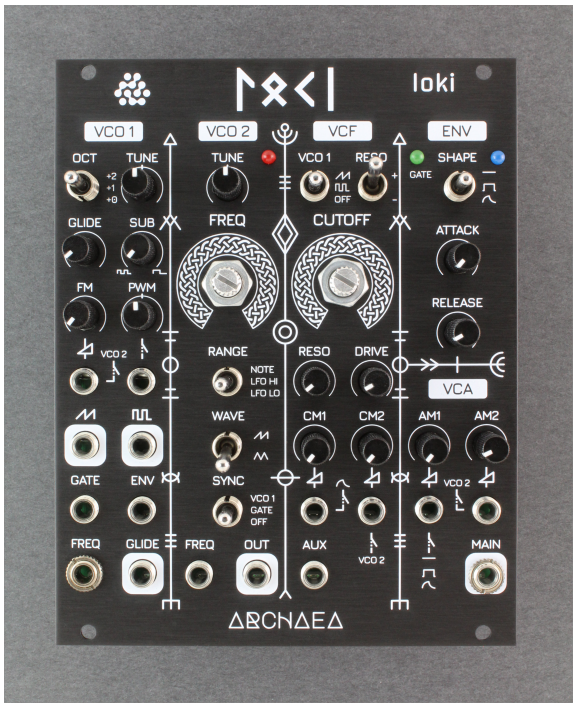
Parts Package	Side Identifier	Bottom	PCB Identifier
B Pots	B100K	B1 04	RV4, RV13, RV14, RV15, RV16
B Pots	B10KC	B1 03	RV1, RV2, RV9
A Pots	A1M	A1 05	RV3, RV7, RV10
A Pots	A100K	A1 04	RV8, RV12
A Pots	A10K	A1 03	RV11

- Place the panel over the components by threading the switch levers through the panel holes first, then line up the panel with the pot shafts. Once the pots are all through their holes, rock the switches left and right until all their shafts are lined up with their holes and push the panel down over the jack sockets and LEDs. You might need to use a long screwdriver to help align the pot shafts.

- Tighten the nuts on all the switches SW1 - SW7, pots RV5 and RV6, and jacks J11 and J16. The two larger hex nuts are used with RV5 and RV6 which can be tightened with some small pliers. **IMPORTANT: grip the nuts with the pliers taking care not to damage the front panel!** Two knurled nuts are used with J11 and J16 (**Hardware** parts package). It is usually enough to hand tighten the switch and jack nuts.

- Make sure all trimmer pots are fully seated on the PCB and can turn freely.





Parts and panel placement before final soldering. The switch nuts are not shown above but be sure to put these on and tighten these too before soldering. Note that some kits use a different style of trimmers on the main board than shown above, but the function is the same.

5. Solder Remaining Parts

Turn the front board over and solder all the remaining component pins. Inspect all solder joints to check that there are no dry joints, bridges or missed connections.

6. Nuts

Tighten all the remaining jack nuts on the front panel parts. It is usually enough to hand tighten the remaining nuts.

7. Switch Caps

Push on the grey switch caps on all the switches (**Knobs** parts package).

8. Knobs

Push the grey trimmer topper caps on the RESO, DRIVE, ATTACK and RELEASE pots. Finally, push on the two large white knobs on the FREQ and CUTOFF pots.

FINAL ASSEMBLY

The final assembly is completed by connecting the boards together. If you mounted the Eurorack power connector on the front of the main board, connect your power cable now.

IMPORTANT: Make sure the red stripe on the Eurorack power cable is aligned as marked on the board before turning the power on otherwise this could damage the circuitry!

Align the header pins on the front board with the main board header sockets. Gently push the boards together until the PCB standoffs on the front board touch the main board and the boards are parallel. Insert the remaining M3 screws into the standoffs through the main board and tighten.

If you mounted the Eurorack power connector on the back of the main board, connect the power cable now.

CALIBRATION AND TESTING

Your Loki needs to be calibrated before it can be played. Calibration is done by measuring of various circuit test points with a multimeter and then adjusting of the trimmer pots with a 2mm flathead screwdriver. Turning a trimmer clockwise (CW) increases a quantity, and counter-clockwise (CCW) decreases a quantity. Calibration will also test most of the functions of the Loki are working correctly. If any of the steps do not produce the described function, then check all solder joints for dry joints or bridges and fix any issues before retesting.

The Loki needs to be powered up while providing access to the trimmers at the top of the main board. You will need to be able to plug the power cable into your Eurorack power supply while standing the Loki upright with access to the trimmers at the top. Either stand it upright just outside a Eurorack case using the supplied power cable or use an extension power cable. The Loki can be propped upright and held still with some putty tack on the main board. Before starting calibration, set the panel controls as shown below.

Panel settings to begin calibration.

Work through the all the calibration steps below in order. The trimmers are numbered 1-17 at the top edge of the main board, with a further trimmer 18 at the right edge. The test points are on the left and right edges of the main board and are named by function. The trimmer numbers and test point names are referred to in the steps below. Some adjustments need only small movements of the trimmers so go slow and easy. A screwdriver with a large soft handle for precision work can help.

Be patient! It can be tricky to tune the oscillators, it might require a few passes of the tuning steps before tuning across the full 6 octave range is achieved. Note that 1Hz is more significant to the ear in the lower octaves than in the higher octaves. The analog oscillators will naturally move slightly around their tuned frequency. If you see the frequency drifting around randomly when measuring the frequency by a fraction of a Hz, this is normal. Most importantly, if the tuning sounds good enough to your ears then it is probably good enough as ears are very sensitive to frequency!

1. Reference voltage

Test Point/s	Trimmer	Parameter
3.3V	18	REF3.3V

i. Stand Loki vertically and prop up main board (e.g. on some putty tack to hold still).
ii. Adjust until multimeter shows 3.333V (or as close to this as possible) in VDC mode.

2. Glide slope

Test Point/s	Trimmer	Parameter
FREQ, GLIDE	1	GLIDE SLOPE

i. Connect CV to the VCO1 FREQ input with CV=8V or highest CV output if lower (i.e. play the corresponding note on your CV controller keyboard/sequencer, check the jack lead connections with a multimeter to confirm).
ii. Measure FREQ using the VDC mode on multimeter.
iii. Measure GLIDE and adjust until GLIDE voltage = FREQ voltage.

3. ENV offset

Test Point/s	Trimmer	Parameter
AR	13	ENV OFFSET

i. Connect GATE input and set ATTACK and RELEASE to min.
ii. Turn the GATE input on (i.e. hold down a note on a controller keyboard).
iii. Measure VDC with multimeter and adjust until it rises just above 5V when GATE is on. This often needs no adjustment.

4. VCO 1 PWM centre

Test Point/s	Trimmer	Parameter
PUL	7	VCO1 PWM CENTRE

i. Set the CV=2.75V (e.g an A2 note) and set PWM to centre. Note your CV source may not produce exactly 2.75V for an A note according to your multimeter.
ii. If your multimeter has a duty cycle measurement, measure PUL and adjust until the duty cycle is as close to 50% as possible. Alternatively connect PUL to an amplifier and listen and adjust until the output sounds as 'square' as possible, i.e. contains the loudest sounding low frequency content.

5. VCA offset

Test Point/s	Trimmer	Parameter
OUT	16	VCA OFFSET

i. Set VCF VCO1 to square wave, AM1 to max, filter fully open, SUB to min and CV=5V.
ii. Change the ENV SHAPE to continuous (top switch position). Measure OUT using the VDC mode on multimeter and adjust until the measured voltage is as close to 0V as possible.

6. VCA close

Test Point/s	Trimmer	Parameter
AR	17	VCA CLOSE

i. Turn CW until pot at max (approx. 10 turns).
ii. Switch ENV SHAPE to window (middle switch position). Turn AM2 to max. Set VCO 2 to LFO HI and triangle wave, and adjust until it is approximately 10Hz.
iii. Connect the MAIN out to an amplifier and listen to output and turn CCW until no sound is heard when GATE is off. You may need to turn the volume up and listen on headphones. While turning the trimmer you will hear VCO 1 faintly, and then clicking from VCO 2, until the output becomes silent.

7. VCO 1 tune, step 1: Zero hi track

Test Point/s	Trimmer	Parameter
PUL	6	VCO1 HI TRACK

i. Set VCO 1 TUNE to centre.
ii. Turn CCW until pot at min (approx. 10 turns) to zero the high frequency tracking.

8. VCO 1 tune, step 2: Base tuning

Test Point/s	Trimmer	Parameter
PUL, GLIDE	3	VCO1 TUNE

i. Set CV=2.75V (e.g. play note A2), confirm by measuring GLIDE with multimeter in VDC mode.
ii. Measure frequency fPUL at PUL with multimeter in frequency mode. Note: if you are using computer software (or a phone app) to measure the frequency then use the pulse patch output of VCO 1 to connect to your audio hardware.
iii. Adjust until frequency fPUL=110Hz.

9. VCO 1 tune, step 3: Oct/V

Test Point/s	Trimmer	Parameter
PUL	2	VCO1 OCT/V

i. Set CV=3.75V (e.g. play note A3).
ii. Measure frequency fPUL.
iii. Adjust V/oct accordingly if less/greater than double the frequency. This parameter scales the difference between octaves for a change in 1V at the FREQ input. It scales **all** of the tuning, so unfortunately the tuning of the oscillator set in step 8 is also changed.
iv. Set CV=2.75V and adjust VCO 1 TUNE on the front panel to give fPUL=110Hz again.
v. Repeat **VCO 1 tune, step 2** to give CV=2.75V, fPUL=110Hz and CV=3.75, fPUL=220Hz.

NOTE: The "TuneIt: Multi Instrument Tuner" app for Mac, iPhone and iPad makes this process easier as it shows the notes of an octave arranged in a wheel. When you move an octave higher in frequency, the needle will not move when OCT/V is correctly trimmed, regardless of the starting note frequency. Using this, you can simply move between CV=2.75V and CV=3.75V and trim until the needle is stationary between octaves, without needing to retune each time. The absolute tuning of CV=2.75V, fPUL=110Hz can then be set by repeating **VCO 1 tune, step 2**.

10. VCO 1 tune, step 4: Hi track

Test Point/s	Trimmer	Parameter
PUL	6	VCO1 HI TRACK

i. Set CV=6.75V (e.g. play note A6).
ii. Turn CCW until fPUL=1760Hz.
iii. Set CV=5.75V (A5). Like OCT/V, the hi track will affect all frequencies. Retune using VCO1 TUNE on the front panel to fPUL=880Hz and repeat from i. until the two frequencies for 5.75V and 6.75V are 880Hz and 1760Hz. Again, TuneIt makes this process easier as the needle only needs to be stationary between octaves before a final tune.
iv. Repeat **VCO 1 tune, step 2**. Check A2-A6 are now in tune. If they are not, then it is likely because OCT/V was slightly out. By repeating **VCO 1 tune, step 3 and 4** you can trim the tunings more accurately by making small adjustments.

11. VCO 1 tune, step 5: Oct +1 tuning

Test Point/s	Trimmer	Parameter
PUL	4	VCO1 OCT+1 TUNE

i. Set VCO 1 OCT to +1, CV=5.75V.
ii. Adjust until fPUL=1760Hz.

12. VCO 1 tune, step 6: Oct +2 tuning

Test Point/s	Trimmer	Parameter
PUL	5	VCO1 OCT+2 TUNE

i. Set VCO 1 OCT to +2, CV=4.75V.
ii. Adjust until fPUL=1760Hz.

13. VCO 2 tune, step 1: Zero triangle hi track

Test Point/s	Trimmer	Parameter
VCO2	12	VCO2 TRI TRACK

i. VCO 2 TUNE to centre, set VCO 2 FREQ to min, set VCO 2 WAVE to triangle, set RANGE to NOTE.
ii. Connect patch from GLIDE output to VCO 2 FREQ input.
iii. Turn CCW until pot at min. (approx. 10 turns) to zero triangle tracking.

14. VCO 2 tune, step 2: Zero saw hi track

Test Point/s	Trimmer	Parameter
VCO2	10	VCO2 SAW TRACK

i. Turn CCW until pot at min. (approx. ten turns) to zero saw tracking.

15. VCO 2 tune, step 3: Triangle base tuning

Test Point/s	Trimmer	Parameter
VCO2	8	VCO2 TRI TUNE

i. Set CV=2.75V (e.g. play note A2).
ii. Measure frequency fVCO2 at VCO2 with a multimeter. Note: if you are using software to measure the frequency then use the OUT patch output of VCO 2 to connect to your audio hardware.
iii. Adjust until frequency fVCO2=110Hz.

16. VCO 2 tune, step 4: Oct/V

Test Point/s	Trimmer	Parameter
VCO2	11	VCO2 OCT/V

Repeat exactly what you did for VCO 1 in **VCO 1 tune, step 3**, except for VCO 2.

17. VCO 2 tune, step 5: Triangle hi track

Test Point/s	Trimmer	Parameter
VCO2	12	VCO2 TRI TRACK

Repeat exactly what you did for VCO 1 in **VCO 1 tune, step 4**, except for the VCO 2 triangle wave.

18. VCO 2 tune, step 6: Saw base tuning

Test Point/s	Trimmer	Parameter
VCO2	9	VCO2 SAW TUNE

i. Set CV=2.75V (e.g. play note A2), set VCO 2 WAVE to saw.
ii. Adjust until frequency fVCO2=110Hz.

20. VCO 2 tune, step 7: Saw hi track

Test Point/s	Trimmer	Parameter
VCO2	10	VCO2 SAW TRACK

Repeat exactly what you did for VCO 1 in **VCO 1 tune, step 4**, except for the VCO 2 saw wave.

21. VCF tune, step 1: Filter base tuning

Test Point/s	Trimmer	Parameter
OUT	14	VCF TUNE

i. Set VCO 1 to OFF, RESO to max, CM2 to max, set ENV SHAPE to drone, connect GLIDE output to CM2 input.
ii. Set CV=2.75V and CUTOFF to 90° CCW from centre.
iii. Measure frequency fOUT at OUT with a multimeter. Note: if you are using software to measure the frequency then use the MAIN patch output of the VCA to connect to your audio hardware.
iv. Adjust until frequency fOUT=110Hz.

22. VCF tune, step 2: Filter Oct/V

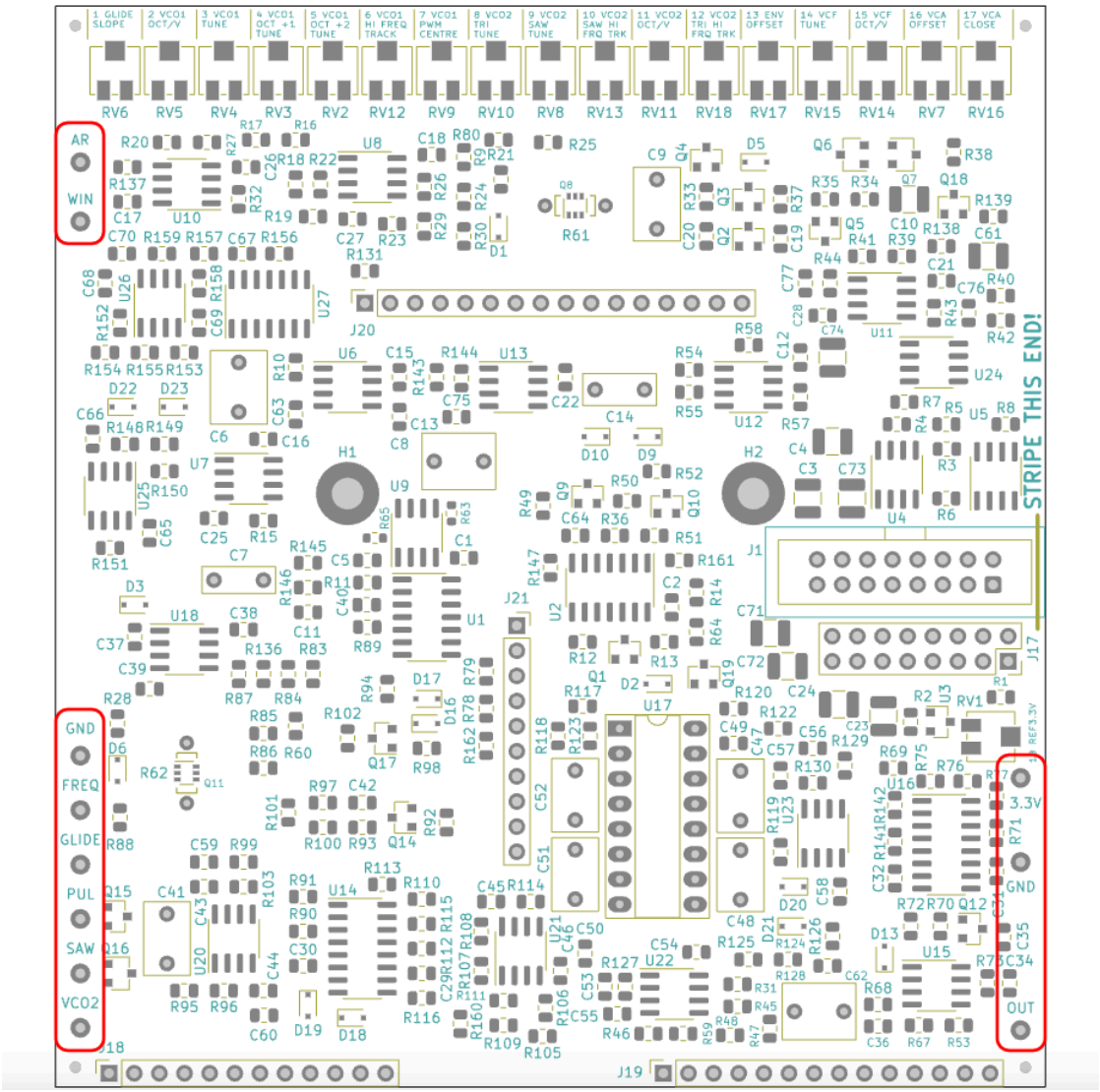
Test Point/s	Trimmer	Parameter
OUT	15	VCF OCT/V

i. Set CV=4.75V.
ii. Measure frequency fOUT.
iii. Adjust V/oct accordingly if fOUT≠440Hz.
iv. Repeat from **VCF tune, step 1** until CV=2.75V and fOUT=110Hz, CV=4.75V and fOUT=440Hz. The filter is not designed to track precisely over more than 3 octaves, so expect that the tuning will be a bit sharp around CV=3.75V and then flat beyond CV=4.75V.

CALIBRATION REFERENCE DATA

Trimmer	Parameter	Trimmer	Parameter
1	GLIDE SLOPE	10	VCO2 SAW TRACK
2	VCO1 OCT/V	11	VCO2 OCT/V
3	VCO1 TUNE	12	VCO2 TRI TRACK
4	VCO1 OCT+1 TUNE	13	ENV OFFSET
5	VCO1 OCT+2 TUNE	14	VCF TUNE
6	VCO1 HI TRACK	15	VCF OCT/V
7	VCO1 PWM CENTRE	16	VCA OFFSET
8	VCO2 TRI TUNE	17	VCA CLOSE
9	VCO2 SAW TUNE	18	REF3.3V

The trimmer pot parameters.



The test point locations on the main board.

ARCHAEA

FINAL TESTING

The remaining functions of Loki can now be tested by the following simple tests. Before testing, reset the controls back to the settings used before calibration.

- Connect a CV note source (keyboard/sequencer) to FREQ on VCO 1 and a gate source to GATE. Connect MAIN to an amplifier/mixer/audio interface input and play a note. You should hear a square wave from VCO 1 and the notes should sound in tune. Switching VCF VCO 1 to saw wave should change the waveform to a saw wave.

- Twist the VCO 2 FREQ knob and you should see the red LED blinking at different rates. The green LED should flash with each gate pulse and the blue LED with the envelope.

- Turn the CUTOFF counter-clockwise while playing a note and you should hear the square wave being filtered. Twist the RESO knob clockwise and you should hear the emphasis around the cutoff frequency increasing. Switching RESO to + will increase the bass loudness and increasing drive will add gain and eventually distortion.

- Connect GLIDE to FREQ and VCO 2 OUT to VCF AUX using patch cables. Switch VCF VCO 1 to OFF and VCO 2 RANGE to NOTE. Play a note and you should hear a triangle or saw wave from VCO 2 depending on the WAVE switch position. Switching SYNC to VCO 1 and sweeping the FREQ will give a hard-sync effect.

- Switch RANGE to LFO HI and SYNC to OFF. Switch VCF VCO 1 to a pulse wave. Disconnect GLIDE from FREQ and OUT from AUX. Increase CM 2 and you should hear the filter cutoff being modulated by VCO 2 when playing.

- Switch SYNC to GATE and you should hear VCO 2 as an LFO applied to the cutoff being reset each time a note starts.

- Increase SUB and you should hear a note an octave down being mixed into the sound of VCO 1. Adjusting PWM should audibly change the pulse width. Increasing FM should make the pitch start moving with VCO 2.

- Increasing GLIDE should start to ramp the frequency between notes when a note is held on before pressing the next note. IMPORTANT: Your gate generator (e.g. CV/gate keyboard or MIDI to CV/gate convertor) must provide a constant high gate output when switching between notes in this way, i.e. not momentarily switching to a low gate output before the next note.

- If your keyboard or CV/gate convertor has a modulation output, e.g. for note velocity, then connecting this to the ENV input will modulate the envelope level.

Following these tests, you can try the remaining controls to hear the effects of applying the envelope to the filter, VCO 2 to the VCA, etc. to check these functions work as expected.