

## Patch matrix buffering

Hello

Thank you very much and congratulations for purchasing the buffers PCB kit for EMS Synthi A / AKS / VCS3.

### Disclaimer

**The modification is at your own risk and I assume no liability for personal injury or damage to equipment or loss of use caused directly or indirectly by the use of these PCBs and installation procedure.  
If in doubt, don't do it.**

## Installation

The installation should be performed only by qualified people experienced in electronics.

In some Synthis the boards come near the matrix and socketed ICs on the buffer boards might come too high and touch the Synthi boards, check clearance first if you plan to socket the ICs.

## Modular buffering

The PCBs mount directly to the matrix and need no other support or screw or hole.

No pin resistor value modification is needed.

The mod is 100% reversible.

The PCBs fit both Seaelectro and Ghieletti 621 matrices.

Each small PCB for rows is able to buffer 2 adjacent rows and can be used for 1 only if desired.

The large PCB for columns offers up to 4 buffers directly connected to the oscillator and filter frequency columns. Each buffer is independent, so you can use all 4, or 3, or 2 or even 1 only to match your own needs.

## BOM

### Columns PCB

- 4 x LM358
- 4 x 100nF multilayer ceramic cap
- 2 x 22 $\mu$ F electrolytic cap
- 4 x 2k7 1% resistor
- 8 x 12k 1% resistor

### Rows PCB (each)

- 1 x LM358
- 1 x 100nF multilayer ceramic cap
- 1M or 2M5 3362 type trimpot (optional - see the Joystick note below)

## Columns PCB

1. Populate the PCBs. Mount the electrolytic caps horizontally. Solder the +/0/- power cables to the rear of the PCB, with enough length to easily reach the power rails and ground (orange is +12V, blue is -9V).
2. Open the Synthi A or VCS3 to access the rear of the matrix. In the Synthi A, you'll need to remove boards A and B.
3. Unsolder the wires from the I, J, K, N columns. If you don't want to buffer a frequency column, simply leave the connection as is.
4. Solder these wires to the corresponding pads located on top of the columns PCB. If the Synthi A or VCS3 has a prestopatch, the wires connected to it will need an extension, this can be done with a piece of wire soldered to the wire's end and insulated with heatshrink.
5. Mount the PCB to the matrix's lugs, do not solder it or barely, just what's needed to ensure good contact, so you'll can remove it easily in case something's wrong. Solder it properly only after checking all is good working.
6. Connect the power cables to the appropriate rails.

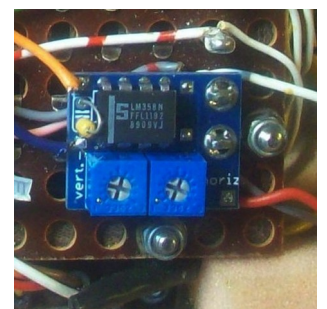
## Rows PCBs

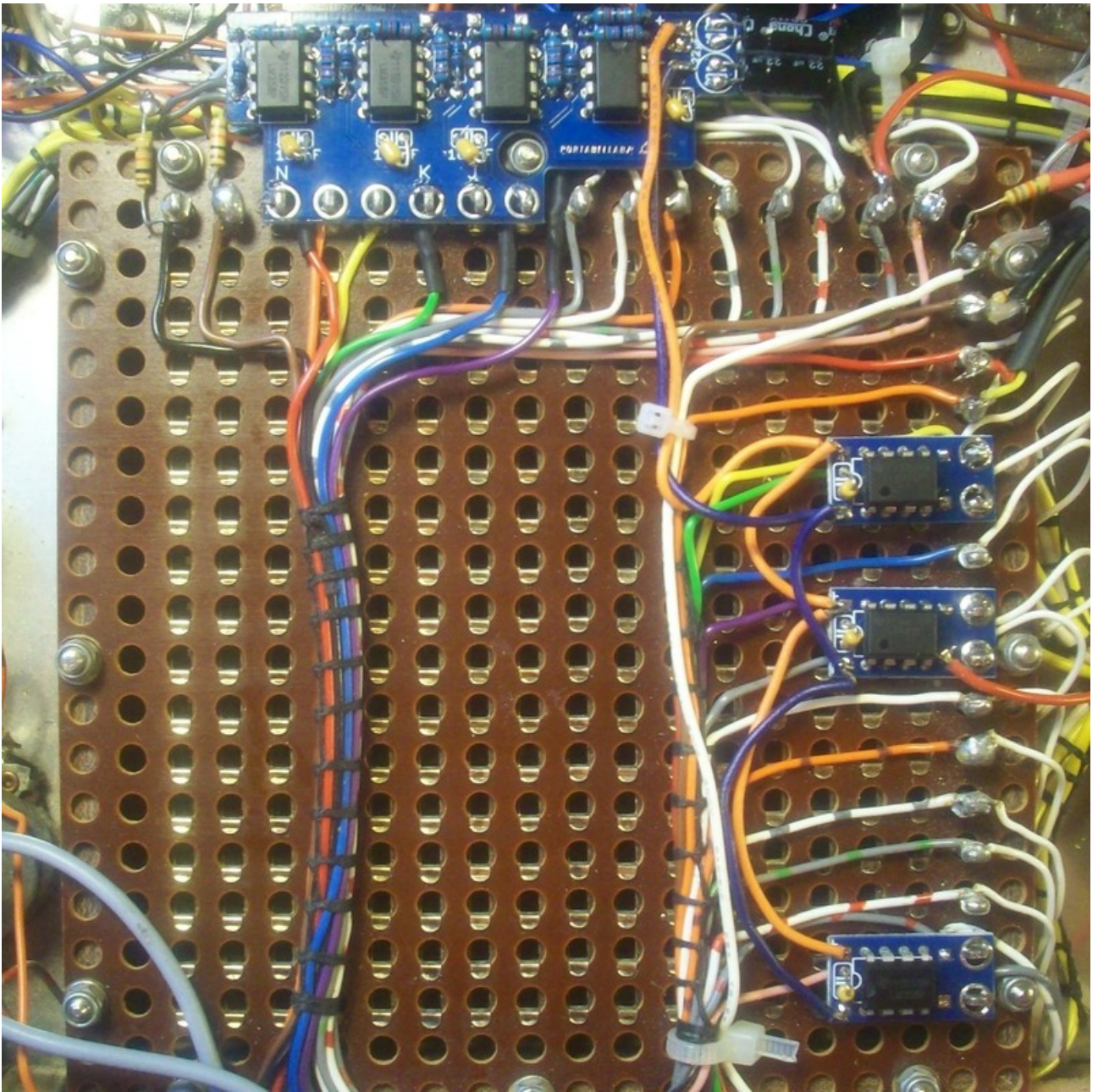
1. Populate the PCBs.
2. Unsolder the wires from the rows you want to buffer.
3. Solder these wires to the corresponding pads located near the LM358's pins 4 and 5, each PCB is good for 2 rows. If you don't want to buffer a row, simply leave the connection as is. Only a half of the LM358 can be used, the unused pins should be tied to 0V.
4. Mount the PCBs to the matrix's lugs, do not solder it or barely, just what's needed to ensure good contact, so you'll can remove it easily in case something's wrong. Solder it properly only after checking all is good working.
5. Connect the power pads located accross the cap to the corresponding pads on the columns buffer PCB, or to another power source if the columns PCB is not used (orange is +12V, blue is -9V). + is near the LM358's pin 8, - near pin 1.

## Joystick

With buffers, the joystick range is increased. If you prefer to keep the range similar to what you're used to, use the row buffer PCB with 2 emplacements for trimpots type 3362. Connect the pad in the bottom right corner to ground.

For use with an EMS sequencer connected to matrix row 16 (KS, TKS, Universal Sequencer) this trimpot is needed otherwise you will no longer be able to scale the sequencer CV properly, even with the pitch spread set to 0 the intervals will remain too large for equally tempered scale. Set the trimpot to get tempered scale with the sequence pitchspread wheel around 4.





## Full buffering

### BOM

12 x TL074

14 x 100nF multilayer ceramic cap

2 x 22 $\mu$ F axial ceramic cap

2 x 1M or 2M5 3362 type trimpot (optional - see the Joystick note above)

16 x 2k7 1 % resistor

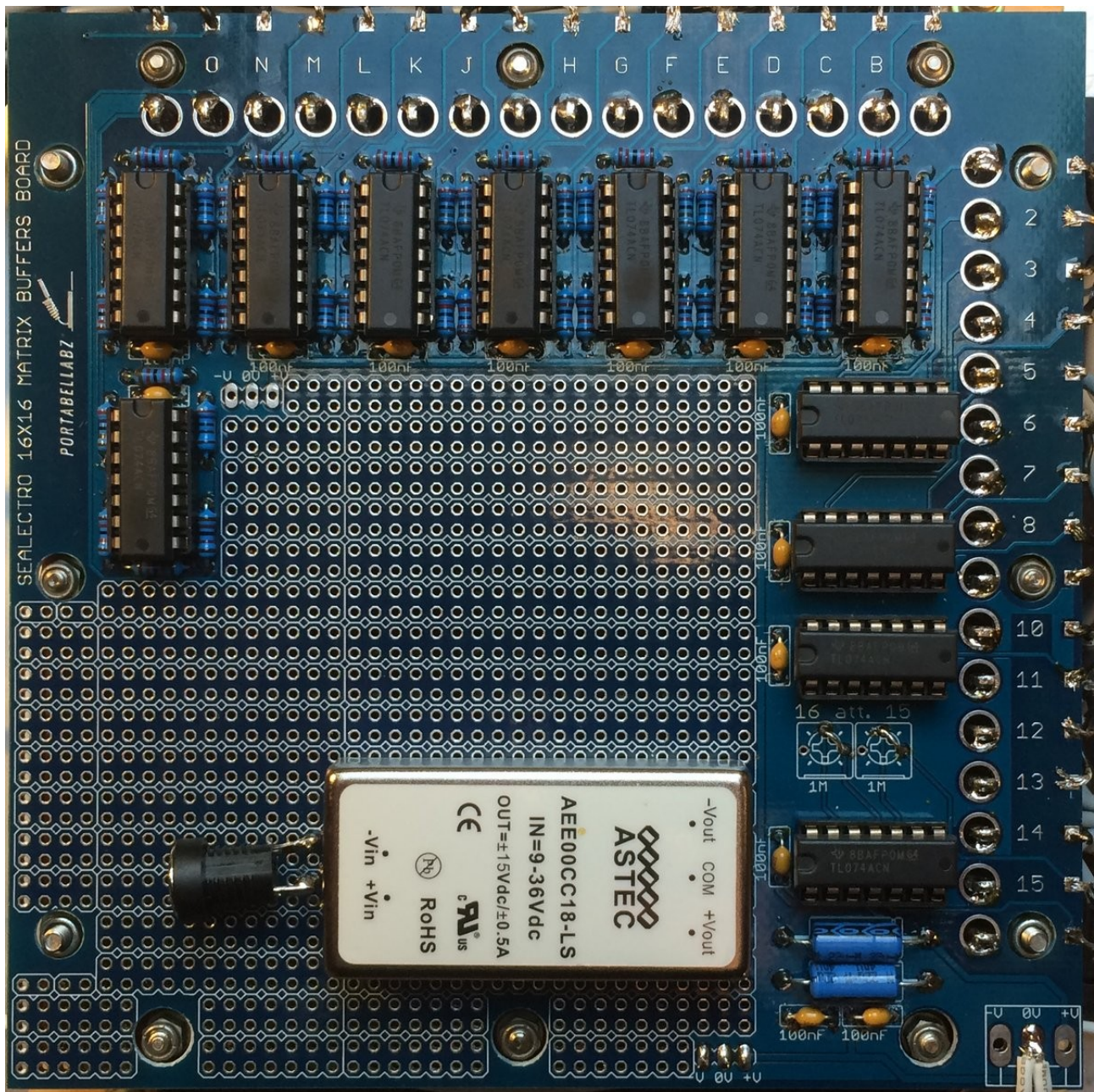
32 x 12k 1 % resistor

The installation procedure is basically the same as above and the same recommendations apply but some specific points require attention :

- Clean the matrix lugs from old solder as good as possible to ease the board placement.
- If the Synthi has a prestopatch, disconnect it too and rewire it on top of the board.
- The board should sit on the matrix screws nuts, if it doesn't fit well, don't force but enlarge some holes with a reamer, be careful as some traces come near a home and you don't want to damage them.
- No protruding component leg should touch the matrix.
- First barely solder the eyelets to the matrix lugs with a very few solder (just enough to make contact, as shown below) in order to be able to unsolder the board in case of problem, test and solder them completely and strongly only if all is working as it should.
- If the attenuator trimmers of rows 15 and 16 are not installed, bridge the center and right pad of the trimmer as shown by the silkscreened small line with a component leg.
- The perfboard can be used to build circuits and add features to the Synthi, the power rails and ground are available in the top left and bottom right corners of the perfboard, needless to say that the circuits should preferably be added and tested before the board is soldered to the matrix.
- In MK1 units the buffers board might draw too much current for the PSU, especially if a DK or Cricklewood keyboard is plugged in. It's good to install an extra PSU as explained in [http://www.portabellabz.be/images/sq1/MK1\\_PSU\\_upgrade.pdf](http://www.portabellabz.be/images/sq1/MK1_PSU_upgrade.pdf) (the -9V regulator can be omitted,  $\pm 12V$  is ok) to power the buffers board without causing extra draw on the Synthi's PSU.



Barely soldered for test :



The DC/DC converter is to power the circuit in my EMS 16x16 Matrixing panel, this board is not installed in a Synthi.



Fully soldered when all is ok :

