

Portabellabz 208p PCBs build notes

The PCBs are tested and error free except a small trace missing on board 2 (see below). In case assistance is needed please refer to the [build thread](#) on the Muffwiggler forums.

I do not offer individual support for this build, related e-mails or private messages will be ignored but I'll reply as long as I can help on the build thread, thanks for your understanding.

Happy building !

BOM

The BOM and build instructions are the same as

<https://electricmusicstore.com/blogs/build/12614717-stored-program-sound-source-model-208>

The BOM needs in extra

- **2 x 470ohms and 2 x 10k resistors** for the noisy headphones output fix on the motherboard

- **2 x pA726 BOM** <http://www.portabellabz.be/images/pa726/pa726-208.pdf>

Some builders kindly share their **BOM** or **Mouser cart**. I didn't check their content and assume no liability for their accuracy :

http://www.portabellabz.be/images/208/Portabellabz_208p_BOM_by_AshtrayWasp.xls

<https://www.muffwiggler.com/forum/viewtopic.php?p=2739638#2739638>

<https://www.muffwiggler.com/forum/viewtopic.php?p=2967032#2967032>

Many **rare obsolete expensive parts** can be replaced with modern ones, take a look at <http://www.portabellabz.be/208pcbfaq.html#parts> before ordering those.

On board 7, R45 100k angled trimpot instead of 20k eases tracking calibration and **C5 47µF** works fine.

The **standoffs** for the 208 panel mounting should be **M3 15mm**, not 17mm, to ease the switches nuts and transfer card mounting.

The Mouser part 538-09-52-1066 **Molex female connectors** can be replaced with Mouser part # **538-09-48-2061**

Some 4016s are source of issues, use **4066** instead of 4016 should help prevent these. In some builds a 4066 for IC2 on card 8 didn't work and a 4016 was needed although a 4066 works in other builds.

I prefer **soft LEDs** over the bright ones and use Mouser part 696-SLX-LX3044HD, but that's personal taste. These work fine with the BOM series resistors value, which should be increased if very bright LEDs are used, the 70s LEDs were not very bright.

Mount **ICs to sockets** is highly recommended to ease troubleshooting.

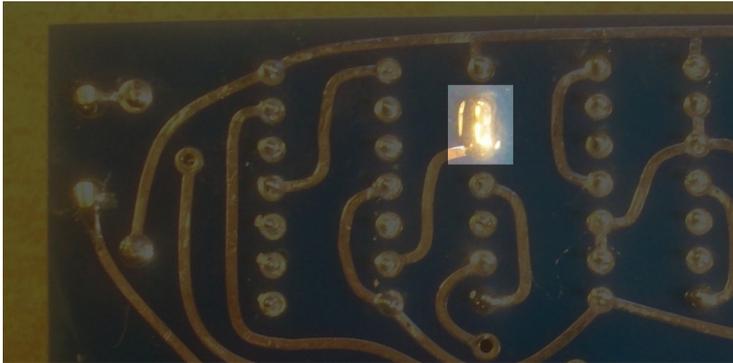
Dave Brown's fixes on <https://modularsynthesis.com/> for the 208r PCBs errors **do not apply to the 208p**.

The only error that needs a fix on the 208p is the small missing trace on board 2 as mentioned below.

Pics of the cards with **components layout and values** are on <http://www.portabellabz.be/images/208/cards.zip>

A few tips...

Fix : on board 2, a small trace is missing between pins 5 and 6 of **IC1**, bridge with solder.



For **board 5** read the calibration notes below.

If PN3565 are used instead of 2N3565 on **board 6** they should be mounted "upside down" with the rounded side pointing to the outside.

On **board 7**, R3 should be selected on test, a value between 1k8 and 12k, depending on the VT1 vactrol, to set the desired timbre amplitude. The higher R3 value, the more foldings. I find 4-5 folding is good, as shown on http://modularsynthesis.com/buchla/208/buchla_208.htm but others prefer more foldings. It's up to the builder to select what best suits his needs. If the timbre reaches its maximum before the slider's top, select another vactrol in VT1.

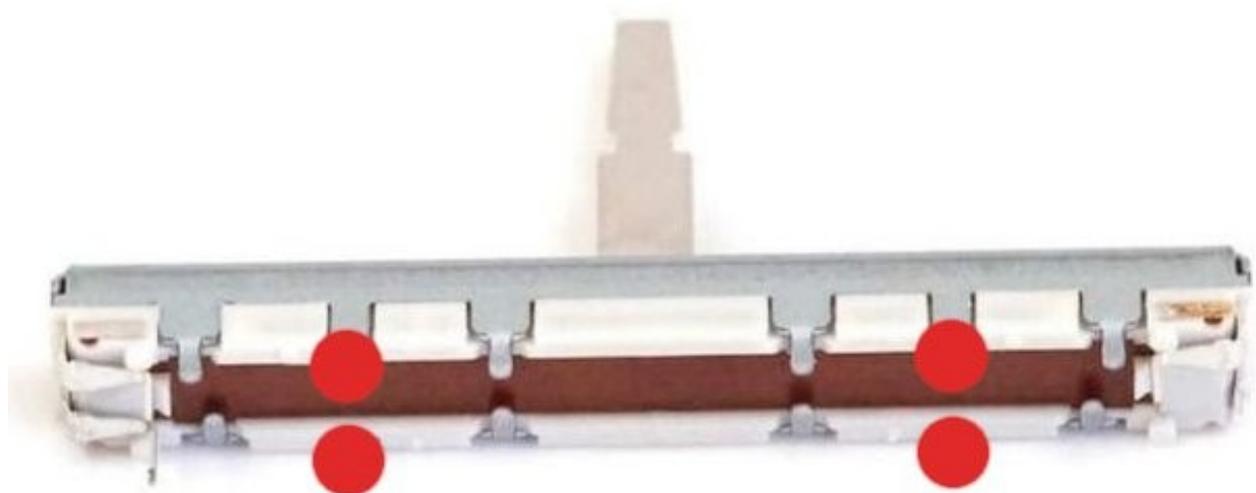
On **board 8** the 2N4339 needs selection on test for proper sine waveshape. This can be compensated by adjusting R41's value.

It's better to use VTL5C3/2 dual vactrols on **boards 10 and 11**.

Before mounting the panel to the motherboard, check that the 3mm **LEDs** that you'll use fit the panel holes easily. If are hard to push in, gently enlarge by hand the panel holes with a 3mm drill.

Before mounting the **9mm Alpha snap-in pots** to the motherboard, bend the metal tab under the CO fine tune and waveshape pots to prevent the risk of short with the PCB trace under the pot.

Before mounting the **Alps faders**, snip the protruding part of their 4 metal tabs to prevent the risk of short with the PCB traces.



Clearance

Some traces come close to some pads or holes but don't do contact with them, this never was a problem in my builds, anyway I recommend to **solder carefully and neatly** using a good iron with thin solder tip and double check for solder bridges.

Transfer card

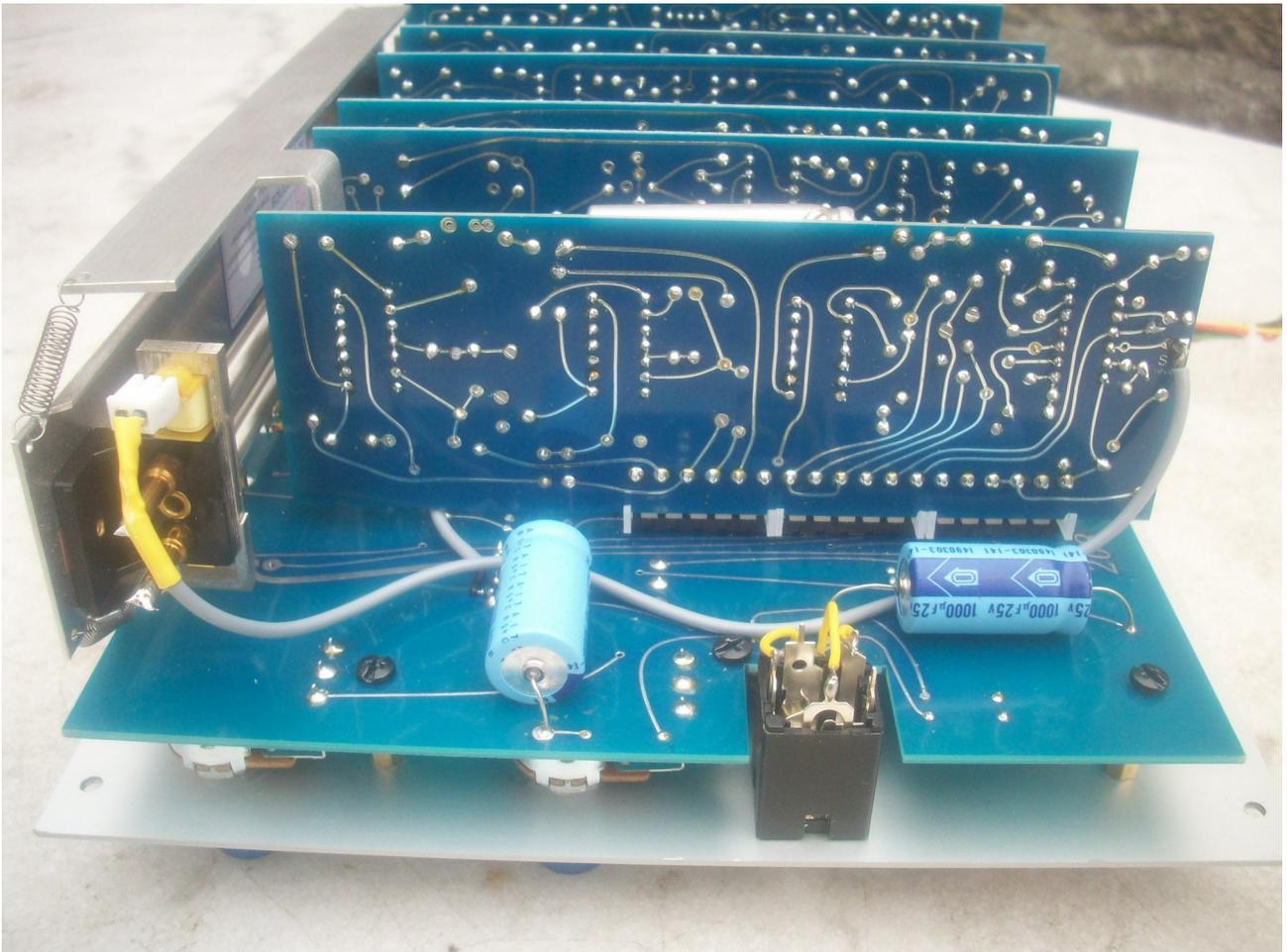
Before soldering it to the panel edge connector, insert it thoroughly into the PCB edge connector with the motherboard mounted to the panel, place the panel edge connector and solder a few contacts as a reference.

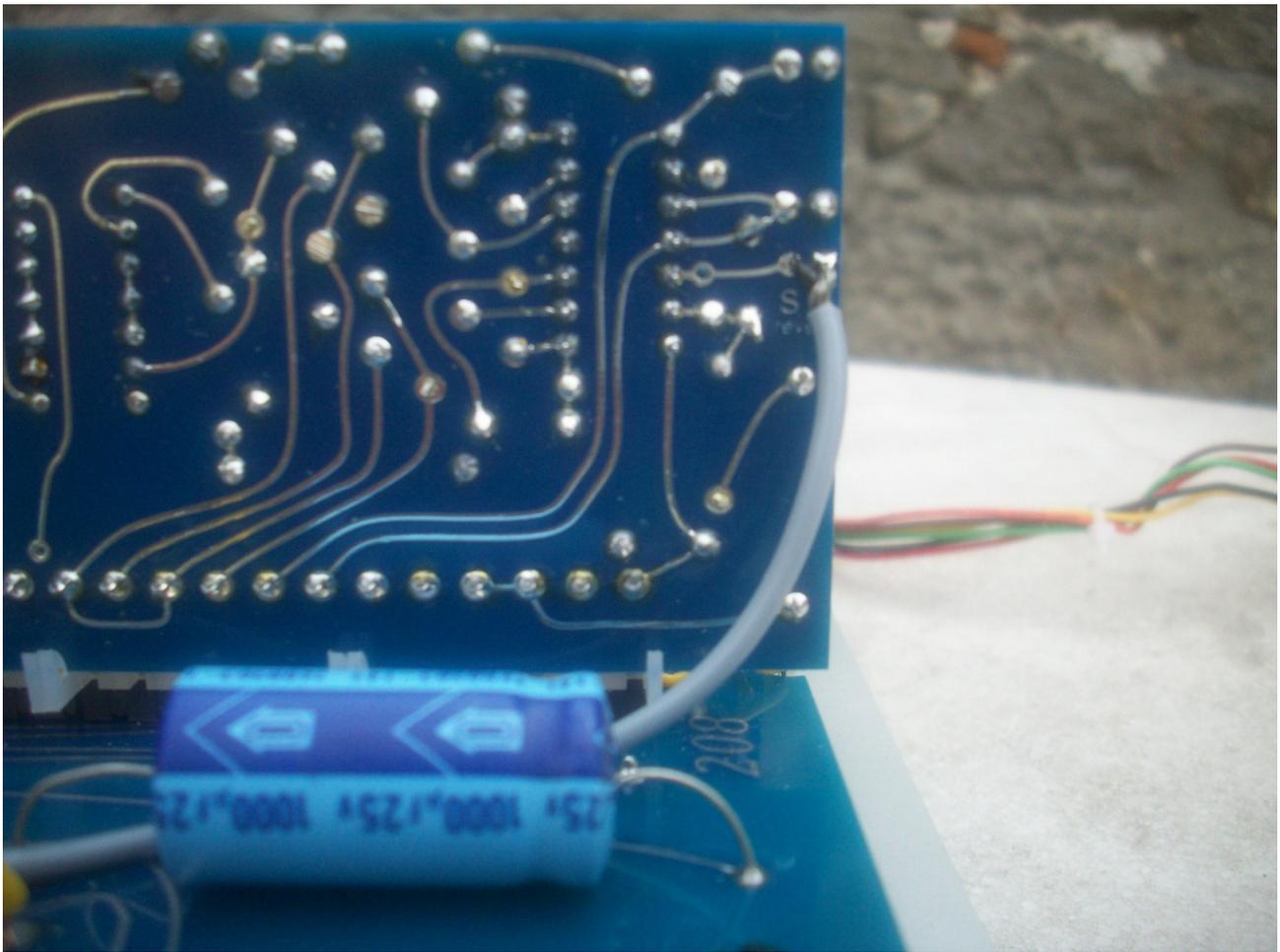
Then remove the panel edge connector and the transfer card and do final soldering.

Reverb

The type is **Accutronics/Belton 1BC2E**, available from <http://www.accutronicsreverb.com> or <http://www.tubeampdoctor.com> or user xpander on Muff Wiggler.

Connect the reverb output to card 12 with a **shielded cable**, shielding to "G" pad, signal to "S" pad. The former PCB trace was removed to avoid crosstalk issues. Snip the former reverb black and blue cables to about 15mm from the plug and solder these to the shielded cable, black to shielding (ground), blue to core (signal). Insulate with heatshrink.





iProgram card

To use the 208 with an iProgram card :

- interconnect the pins 2 of both rows of the edge connector
- interconnect the pins 4 of both rows of the edge connector and connect them to noisy ground

The iProgram card clock connection is on rear/top pin 5 of the card edge connector and on pin 8 of the power connector.

The iProgram card data connection is on rear/top pin 6 of the card edge connector and on pin 9 of the power connector.

LEDs and bleed

The LEDs, mostly the pulser's and envelope's ones, affect the oscillators pitch. This can be attenuated by the addition of series resistors. To add a resistor to the pulser's and envelope's LED, cut the PCB trace between the 2N1711 and Molex connector (there's only one, on the solder side) of boards 3 and 4 and bridge the cut with a resistor.

Add a resistor in series with the other LEDs can be done on the motherboard the same way.

Depending on the LEDs you use, select a resistor in order to achieve the best possible compromise between LED brightness and oscillators drift.

With the LEDs suggested above, 10k resistors are fine.

Sequencer

If the sequencer sometimes erratically skips a step, the 4013s are probably in cause. Some new ones work fine, others don't. All the NOS ones I tested are ok, V4013D available on ebay are fine. Some 4009 may cause steps issues too, replacing it with a 4049 may help but I also happened to see some 4049 causing issues too while a 4009 works fine...

Calibration

Calibration infos are available on Dave Brown's page,
<http://modularsynthesis.com/roman/buchla208v2/208spss.htm>

Here are some extra.

Card 5 - Modulator

Vactrols need selection on test for best performance but this is a PITA and need a lot of vactrols on hand. Dave Brown's Card 5 modifications are a very good alternative that I recommend :
<http://modularsynthesis.com/roman/buchla208v2/208spss.htm>

To select vactrols however, if you don't have a good desoldering tool, it's better not to solder them until you find the good ones, make sure they make good contact by bending the legs in the holes.

Set both MO and CO to high frequency and monitor LPG1 output on a scope, with MO triangle and CO wave, MO modulation switch to AM, LPG to VCA. You'd see losanges, if their top are roundish, swap a vactrol or the other and test, adjusting the trimpot. Adjusting R16's value helps too.

When you have proper losanges lower the MO frequency and adjust the scope horizontal setting to keep a usable display. If a second smaller losange appears between the former ones at lower MO frequency and doubles the MO modulation output frequency, swap the vactrols again and adjust the trimpot until you get a single losange across the whole MO frequency range.

Changing R17's value may help if the trimpot is off range.

A perfect calibration should give a linear AM modulation without waveform "twist".

The difference in the CO output amplitude between AM and FM with index slider can be reduced by selecting R29 on test with the index slider set to 0.

Oscillators tracking

Both MO and CO are able to track on 5 octaves but this needs a fine calibration and subtle selection on test of R5 and R58 on board 6 and R14 and R44 on board 7.

First of all, calibrate both pA726s as described in their own build notes.

In case another μ A726 replacement is used, refer to the manufacturer's instructions.

I calibrate the tracking with a 218 but any keyboard or sequencer or midi to CV interface can do the job. To me, proper calibration means all the notes played with the 218 are in tune with MO initial frequency C0 (32.7Hz) and CO initial frequency C1 (65.4Hz). This not an official procedure but my own conclusions after building and calibrating many 208s and other synths. Feel free to adapt this procedure or do otherwise if you like.

Adjust the offset and range trimpots with a frequency counter in a way the frequencies come close to what's written on the panel.

Then adjust the HF (and LF for the CO) tracking trimpots and the panel "(trim)" ones together, using your ears, a frequency meter or chromatic tuner.

Change the aforementioned resistors if the HF trimpot is off range. A small readjustment of the range trimpot may be needed.

The goal is to get all octaves in tune. When the octaves are in tune, the notes between will be automatically in tune.

Suggestions for 1.2V/oct. :

Board 6
R58 : 390k
R5 : 91k

Board 7
R14 : 44k (68k added in parallel with 120k)
R44 : 150k
R45 : 100k trimpot

These values are suggestions and might not be ideal in another 208 or with another expo converter, why selection on test is needed for R58 and R44.
R5 and R14 values are ok for 1.2V/oct., should be ok for 1V/oct. and might not be ok for 2V/oct.
Warm up time and calibration adjustment are needed for each resistor change.

Card 9 : tracking of both CO oscillators together

This may be a tricky part and needs a proper balance between the CO timbre (TR4) and waveshape (TR7) trimpots on the MB and the one on card 9 to avoid spurious oscillation across the whole CO frequency and timbre range. Some oscillation might occur at specific points of the sliders course, try and adjust the 3 trimpots until you get proper performance, or one you can live with.

CO timbre

The timbre folding depends on vactrol VT1 on card 7. R3 attenuates the CV making a ground connection, increase its value will increase the number of foldings. There's no official number of foldings, some prefer more foldings, others prefer less, select R3 to best fit your own preference, keeping in mind that this may affect the tracking of both CO oscillators together.

Latest update : january 26th 2021