

# Extending the Buchla Music Easel

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## Abstract

The Buchla Music Easel is a very well designed musical instrument with a wide array of sounds. For free improvisation though, the time needed to change a patch is too long, and different modulation sources cannot be individually mixed. A solution for this is to design a performance interface and modulation matrix, that makes all the sonic qualities instantly available. The matrix should fit into the enclosure of the Music Easel, while the internal keyboard can be externalised in a wooden frame. One goal of the design is to use only what is available inside the Music Easel already, instead of adding new modules, and to keep this extension restricted to an easy-to-achieve DIY level. Additional to the modulation-matrix, a body-contact keyboard will enhance the playability in an extremely dynamic way.

**Keywords:** Buchla, Music Easel, DIY, modulation extensions, body-contacts.

## The Easel Modulation Weasel

In search of a capable and compact performance synthesizer with a versatile playing interface, the Buchla Music Easel intrigued me. When the Easel-K was introduced, which features the model 223e Kinesthetic Input Port, I decided to go for it. In comparison to Euro-Rack Modular systems, the Easel was lightweight, built into a compact case, and could be patched without creating a jungle-like of cable chaos. With the 223e module, the Easel featured a programmable and very capable keyboard-like interface, that had the capacity to also control other modules and instruments simultaneously.

When exploring the Music Easel and its many sonic capabilities, I soon found that among the few things missing, was the possibility to mix different control-signals with individual levels. This was crucial when a strong signal, such as an envelope, needs to be mixed with a weaker modulation-signal. It also turned out, that patching, while performing improvised music, was too slow and distracting and therefore, some sort of modulation matrix was needed.

Through the EXT/PROG INTERFACE connector, all parameters of the instrument and even some more, that are not directly available on the 208 module, are easily in reach. The idea was, to externalize the Kinesthetic Input Port keyboard, put it in a wooden frame, and free the space for a special modulation module. The idea of The Easel Modulation Weasel was born.

After contemplating different approaches, that included additional active circuitry, I decided to keep it simple, and within the available capabilities of the Musik Easel. The additional circuitry is passive and consists of only a resistor (120 k $\Omega$ ) per input, a potentiometer (100 k $\Omega$ ), a toggle-switch, a momentary-switch and a couple of banana-jacks, for a single modulation element. With the space available on the Easel-K, nine of these units can be fit onto a aluminum front-plate, leaving enough space for four 3,5/6,4 mm jack connectors for external signals. The design of an accurate front-plate is very easy, with the freely available software FrontDesign (1). Meant to directly order with The FrontDesing companies service, the program also exports to DXF, SVG or PDF format, so other services can be used to make the front-plate.

## The Body-Contact interface

One feature that always attracted me with the Buchla Music Easel, is the EXT/PROG Interface. It is meant to be used as a preset-slot for circuit-board cards, "programed" with resistors of certain values. Luckily the connector-type used on the Easel, is commonly used in game-machines and therefore cheaply available.

Its excellent Easel manual, written by Allen Strange, explains in detail how to translate a patch on the 208 Module into the corresponding resistance values. What immediately caught my attention, were the extremely high resistance values, ranging from 120 K $\Omega$  up to 5 M $\Omega$ , spanning a "conductivity range" of 10 down to 0.002. As the Bender of Omnichords, that really comes to live through body-contacts, I knew that this resistance range is just perfect for this kind of interface. First experiments with a program-card

proved my idea. All that was needed was a circuit-board with touchpads, big enough for precise control. Body-contacts turn the player into a living potentiometer, where the resistance values lower, the more the surface is touched. By touching more than two pads, various parameters can melt into each other in a way that is impossible to create otherwise. The instrument reacts in a very complex and dynamic way, almost like a "beast in the machine".

My first attempts to create from scratch a double-sided circuit-board with the powerful open-source circuit-design program KiCad (1), failed pathetically. It turned out to be too difficult and time consuming, both to learn the program and to build a library of all the different big pads needed. Instead, the drawing that I had made, based on the design of the Buchla 223e Kinesthetic Input Port, became the template for a one-sided design that is simple, inexpensive and true DIY. Good enough at least as a proof of concept, until a professional double-sided layout, with a proper connector becomes available.

Things learned along the way: the biggest instantly available circuit-board size is 300 x 200 mm. Everything bigger is only available on special order with a significant price bump. I ordered the board with a local German circuit-board service, and had the copper tin-plated. My attempt to gold plate it with an electrolyte-tampon technique did come out somewhat uneven, the golden surface looks cloudy in some spots. This does not obstruct at all the functionality of the design though. The body-contacts work as expected, and even better than anticipated. Depending on the humidity of the skin, the subtle control of modulations is very precise and full of details that change with every micro-movement of individual fingers. This brings the Easel into new sonic territory: The overall behavior of the instrument becomes wild, untamed and dramatic.

## Conclusion:

The expansion of the Buchla Music Easel is a great improvement and success for me as an electronic improviser. It enables me to quickly change modulation-connections and precisely mix different modulation-sources into one input. The body-contact "keyboard" is an amazing extension, that allows for so-called "melting" modulation between sources and targets in unique way. This leads into sonic territory, unheard of from the Music Easel yet.

## Tables and Figures:

The 100k pot attenuates the modulation signal. The 120kΩ resistor on every individual serves for the minimum resistance/conductance, and allows for direct connection of outputs to inputs. The banana-jacks are spaced 3/4 Inches apart, so Ponomia MDP-8 shorting-bars instead of cables can be used for most connections.

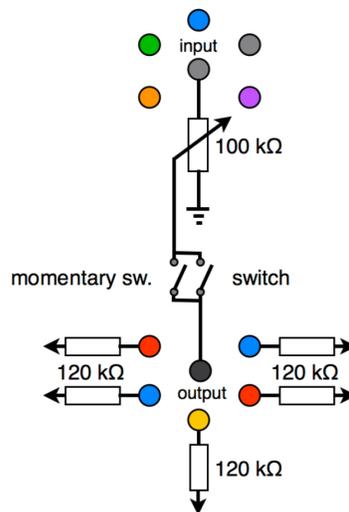


Figure 1. The schematics of one of the 9 summing nodes.

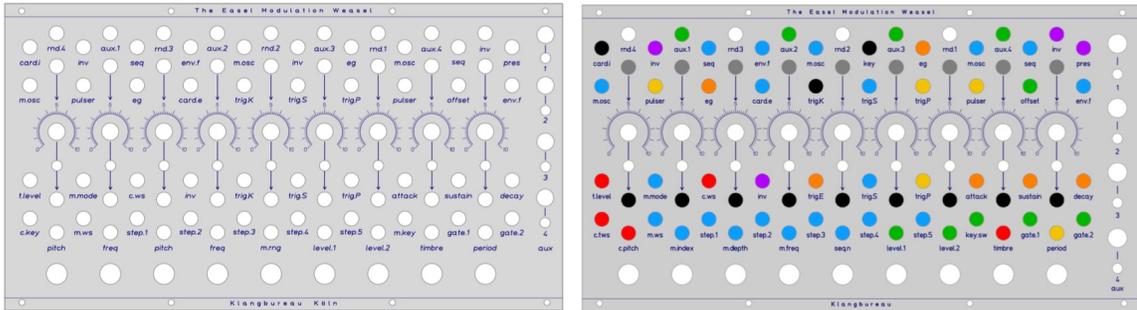


Figure 2. The design of the modulation-matrix, made with the freely available FrontDesign software.

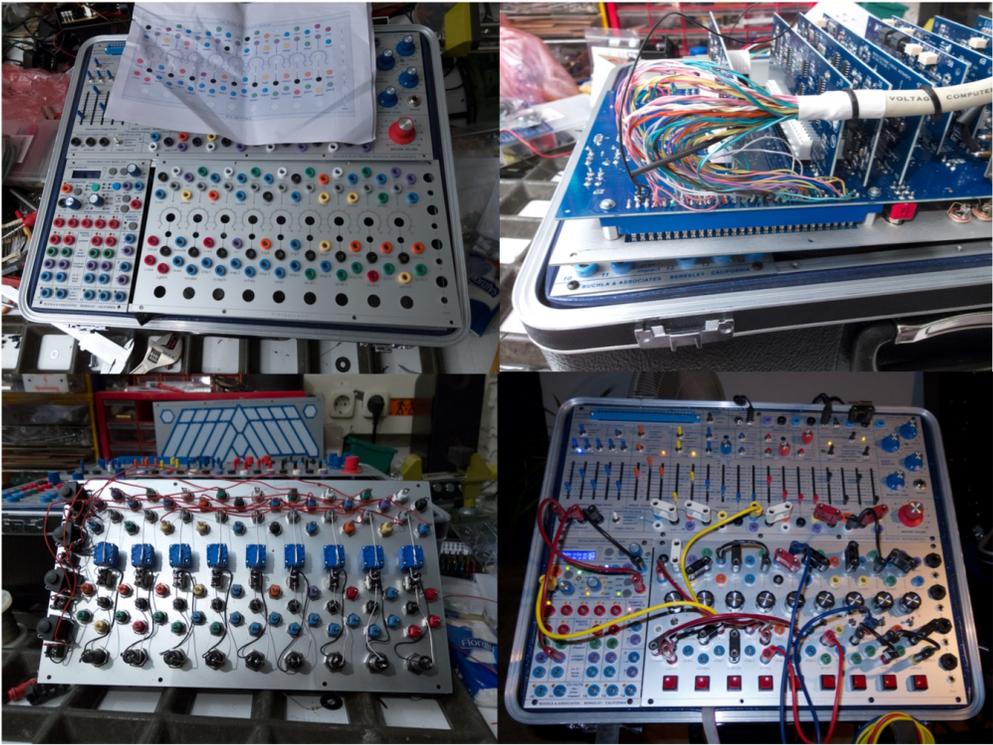


Figure 3. The modulation-matrix is populated with parts and connected to the EXT/PROG INTERFACE connector from the inside, to keep the connector free for use with the bodycontact keyboard.

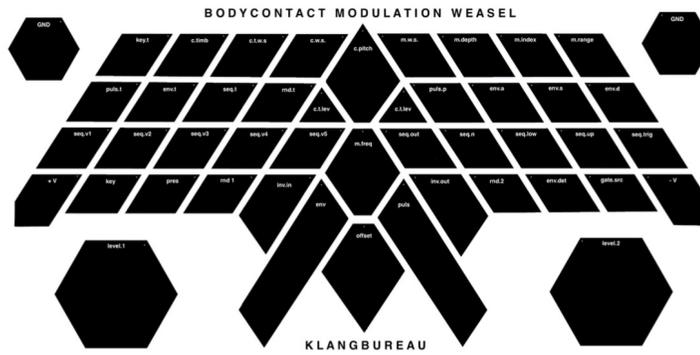


Figure 4. Simple circuit-board design and outcome after etching, gold-plating and connecting.

## Footnotes

(1) KiCad software: <http://kicad-pcb.org>

(2) FrontDesign software:

[https://www.schaeffer-ag.de/en/downloads/front\\_panel\\_designer/?no\\_cache=1](https://www.schaeffer-ag.de/en/downloads/front_panel_designer/?no_cache=1)

## Bibliography

Strange, Allen, Programming and Meta-Programming in the Electro-Organism. An Operating Directive for the Music Easel 2nd Edition. © 2013 by Buchla Electronic Musical Instruments. Originally printed in 1974.