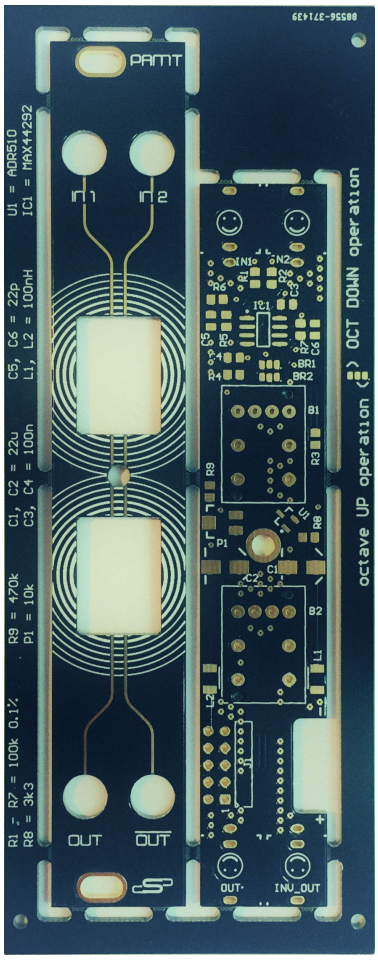
PAMT

DIY Workshop – Precision Add / Manual Transpose

Raffael Segmüller - © by Seismic Industries



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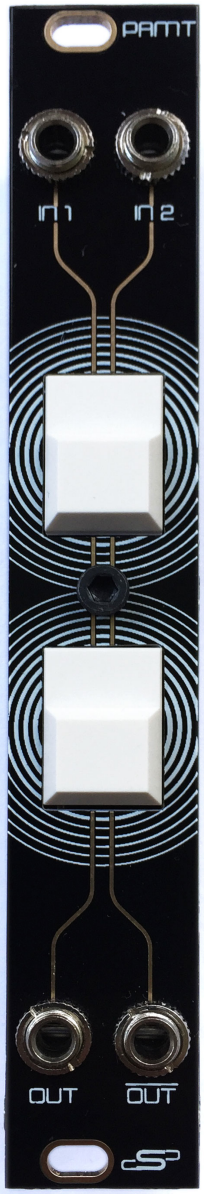
1 Module Description

The PAMT (**P**recision **A**dd / **M**anual **T**ranspose) is a small performance oriented module. The buttons can add or subtract exactly 1Volt from its incoming voltages. This can be used to transpose CV up and down by an octave. It has two signal inputs, which are summed together. This allow to chain PAMT modules to extend the range of the transpose function.



IN1 and IN2 are the signal inputs of the PAMT module.

Both inputs are summed together in the precision summing amplifier of the internal circuit.

Pushbuttons: The pushbuttons of the PAMT can be internally configured by a solderbridge to function as an octave up or down switch.

OUT is the summed output of all voltages, either from the INx jacks or the buttons.

$\overline{\text{OUT}}$ is similar, it's the inverted output of the INx voltages plus the positive configured pushbuttons. Voltages of negatively configured pushbuttons are not calculated with.

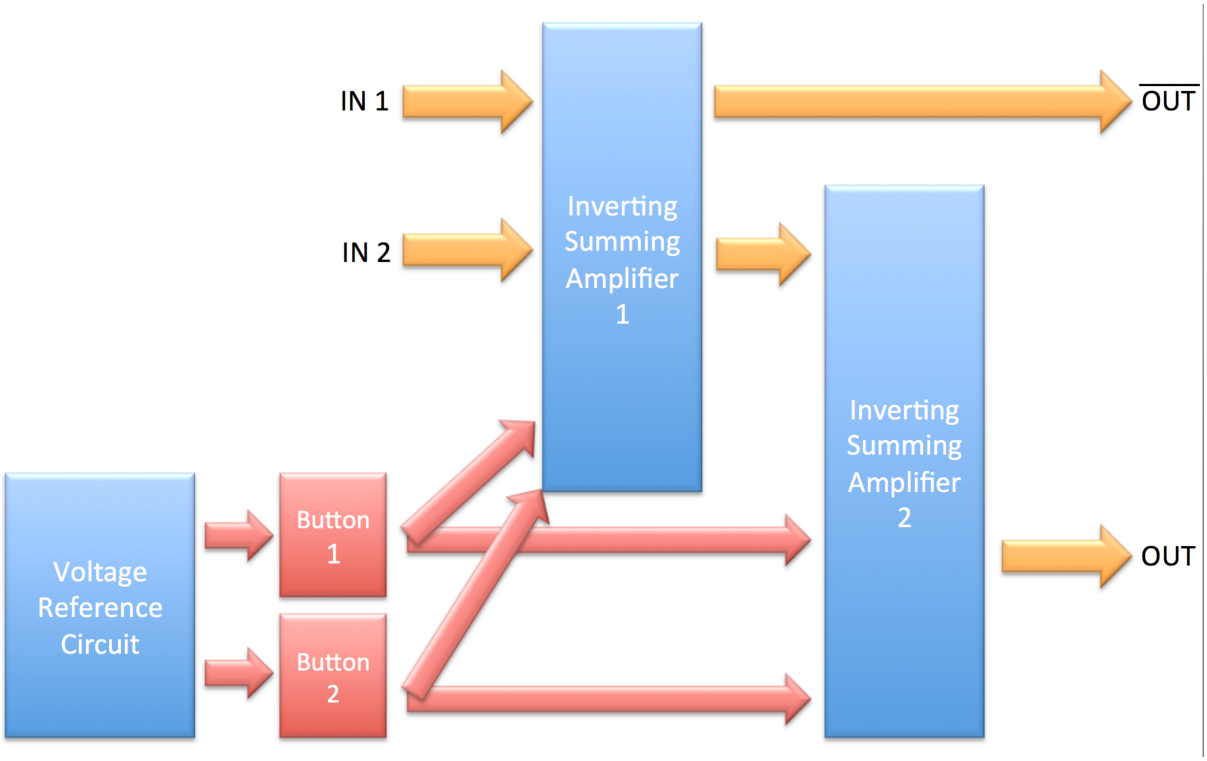
1.1 Known issues with MKI units:

- The marked directions on the PCB border for the solderbridges to configure the octave up and down switches are **inverted**. Please consider this when building the module.
- The cutouts for the SP86 buttons in the frontpanels may be a little to narrow, so you have to rasp/file it little till there is a big enough gap (it takes not much, approx. 0.5mm)

2 Circuit Description

The circuit can be divided into 3 main function blocks:

- Inverting Summing Amp 1
- Inverting Summing Amp 2
- Reference Voltage Circuit



2.1 Inverting Summing Amplifiers

The inverting summing amplifiers form the core of the PAMT module. They are built around a modern high precision dual opamp from MAXIM. The MAX44292 has very low noise figures. Moreover it offers a very low input offset voltage and drift, which is in this case the more important figure.

These very low input offset numbers are so small that there is no need to add a trimmer to zeroize them. According to the datasheet most of the parts (25%) have an offset voltage around 10µV.

2.2 Voltage Reference

The ADR510 is an ultra compact (SOT-23) 1.000Volt precision voltage reference source with no need for an external capacitor.

The circuit has a very good performance, although the initial accuracy is not as good as needed for an octave switch. With the use of the TRIM terminal of the ADR510 the output voltage can be adjusted by ±0.5%, without affecting the overall performance.

2.3 Resistors 100k 0.1%

The resistors, that are involved in processing the signal through the opamps, are high precision types with 0.1% accuracy and very low thermal drift.

This is necessary for the summing amplifiers to deliver exact gain values and achieve high overall system performance and stability.

3 Build Instructions

3.1 Tools

Make sure you have the following tools ready:

- Soldering Iron
- Solder wire, solder wick
- Tweezers
- Side cutting plier (to cutout the PCB and frontpanel)
- Sanding Paper (for smoothing the cut edges of the PCB and frontpanel)

3.2 Build up sequence

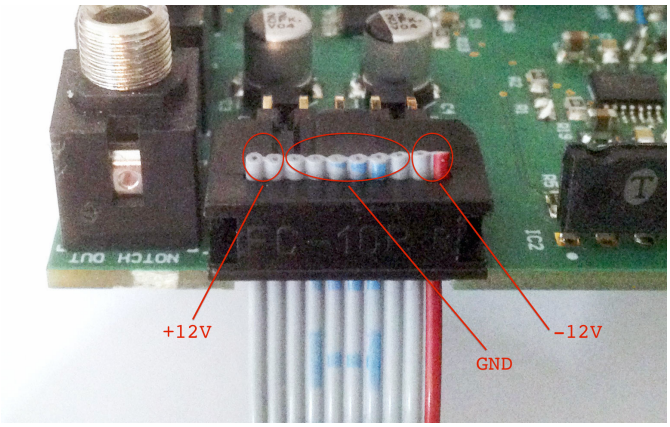
To build the kit you preferably start with the SMT components and then move on to the bigger THT ones. Mount the SMT components from the inside of the board towards the outside.

A possible build up sequence is:

1. Semiconductors (like IC's, Transistors, …)
2. Ceramic Capacitors
3. Resistors
4. Inductors
5. Electrolytic Capacitors
6. Power Connector
7. Jacks
8. LED's
    a. Cutout the frontpanel and “premount” it with loosely tightened knurled nuts to define the length of the LED's legs
    b. Solder and cut the legs
    c. Remove the frontpanel
9. Potentiometers
10. Mechanical
    a. Mount the frontpanel
    b. Tighten the knurled nuts of the jacks
    c. Fasten the knobs of the potentiometers

3.3 Power Connection

Connect the 10-pin ribbon cable like this:



IMPORTANT:

The red wire usually carries the -12V Signal in Eurorack synthesizers. Doublecheck your power rails before powering the module up. **Power inversion will destroy your module.**

4 Calibration / Test Procedure

4.1 Step one - calibrate voltage reference

To calibrate the onboard voltage reference patch the PAMT OUT into a 1V/Oct input of a good tracking VCO. When you push the button on the PAMT, the VCO's output frequency should jump exactly one octave up or down.

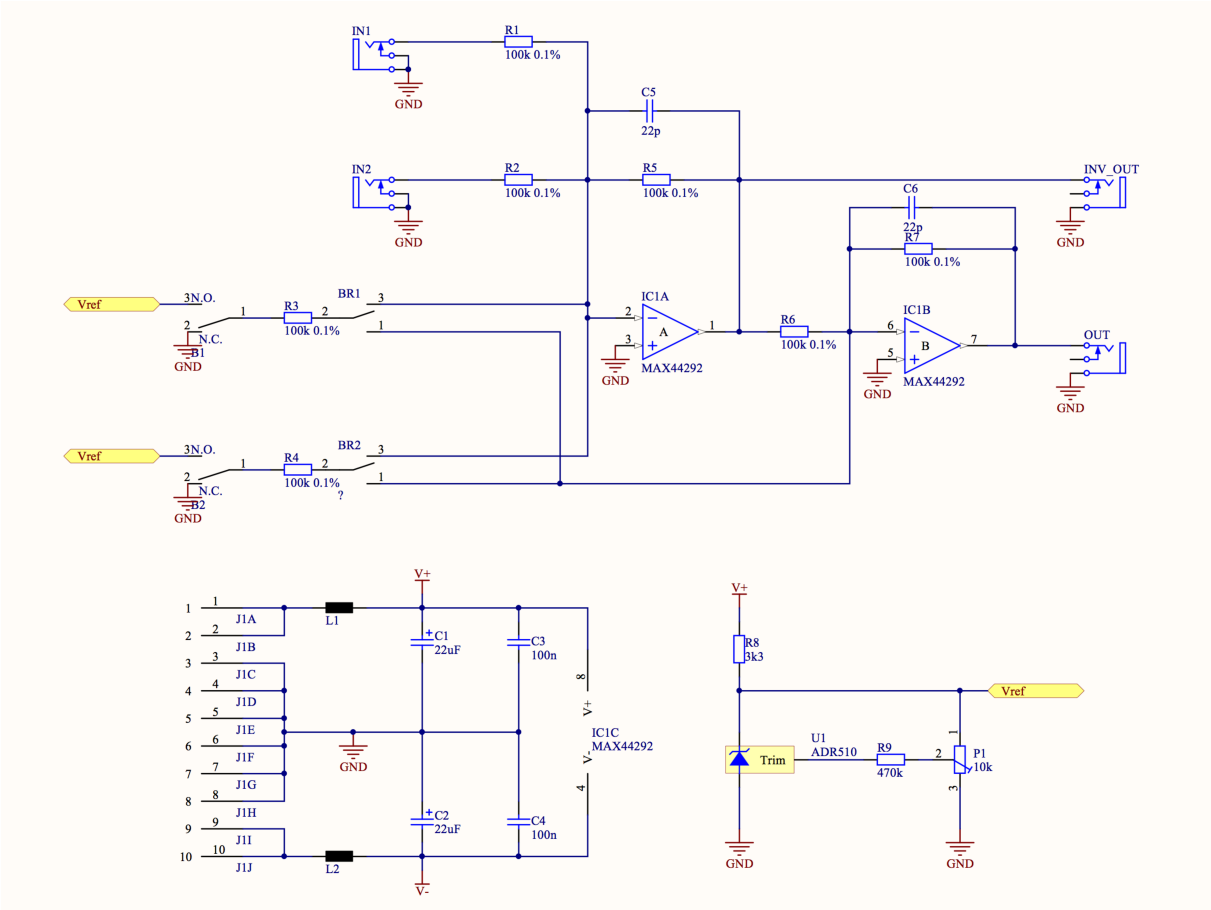
Adjust P1 until it does so.

Better visual feedback can be achieved with the use of a tuner (like a Boss TU-3, or the like).

4.2 Test module inputs.

Test if a voltage is fed trough the IN1 and IN2 inputs to the OUT's. Also check the output voltage on the inverting output.

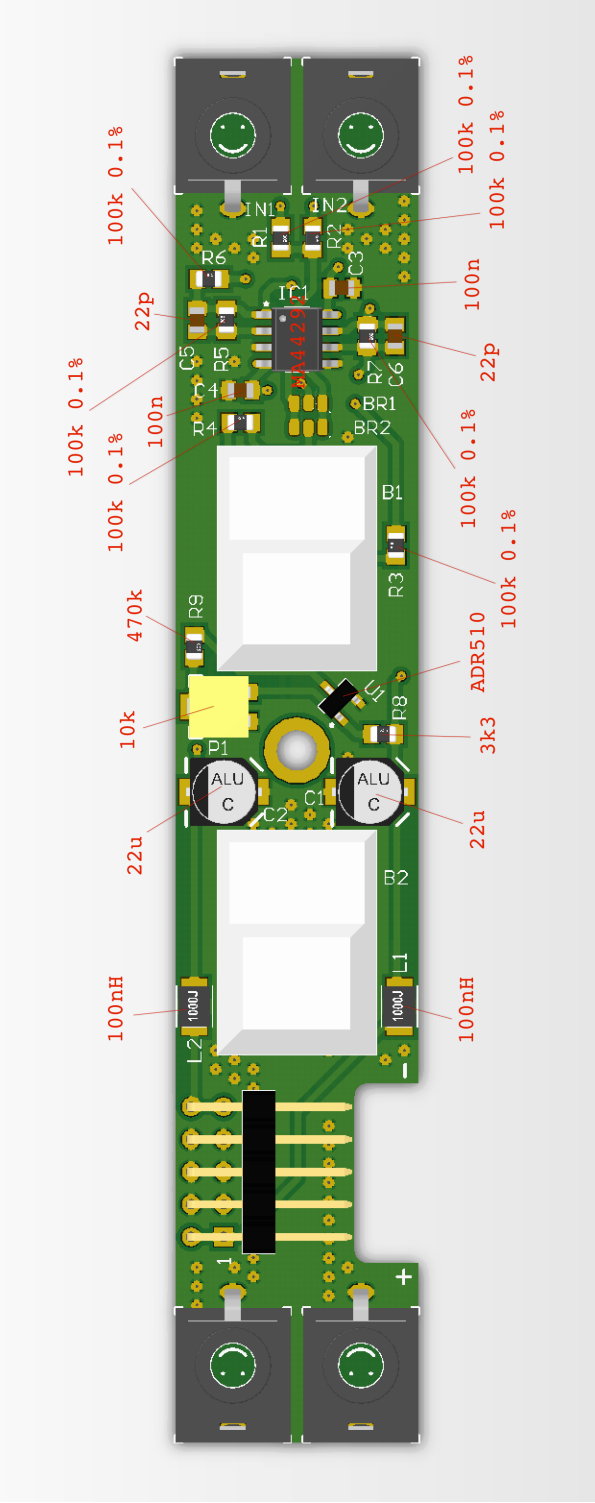
5 Schematic



6 BOM

Comment	Designator	Quantity	Value
CAP PSU	C1, C2	2	22uF
Capacitor 0805	C3, C4	2	100n
Capacitor 0805	C5, C6	2	22p
Inductor PSU 100nH	L1, L2	2	100nH
Phonejack	IN1, IN2, INV_OUT, OUT	4	-
MAX44292	IC1	1	-
Pinhead 10Pole	J1	1	-
ADR510	U1	1	-
Resistor	R1, R2, R3, R4, R5, R6, R7	7	100k 0.1%
Resistor	R8	1	3k3
Resistor	R9	1	470k
SP86	B1, B2	2	-
Trimmer	P1	1	10k

7 Pick & Place


100k 0.1%
100k 0.1%
IN1
IN2
100k 0.1%
100k 0.1%
R6
R1
R2
C3
100n
22p
IC1
TL4429
C5
R5
R7
C6
22p
100k 0.1%
C4
BR1
100n
R4
BR2
100k 0.1%
100k 0.1%
B1
R3
100k 0.1%
470k
R9
ADR510
L1
R8
3k3
10k
P1
ALU
C
ALU
C
C1
C2
22u
22u
B2
100nH
1000J
L2
1000J
100nH
1
+
-