Attenuverter/Mixer

Kassutronics

Board revision 1.0, documentation revision C

August 13, 2018

Description

This is a PCB for a 4-channel "attenuverter", i.e. 4 buffered attenuators that can also invert the signal. It further has a mixing section with sum output of all attenuverters and an additional unity-gain auxiliary input.

The PCB fits behind a 6hp eurorack panel, with all controls and circuitry integrated on the single PCB. It uses 0805-size SMD components and SOIC-size ICs. If you are comfortable soldering basic SMD parts, this should be an easy build.

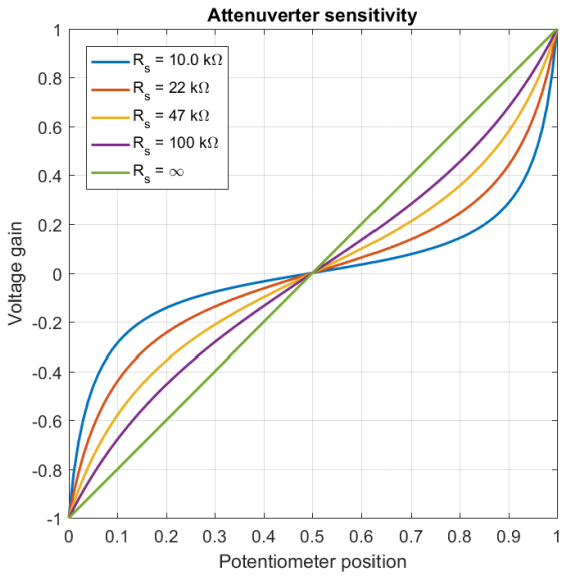
Features

- Four attenuverters
- Adjustable control curves
- Optional offset trimmers for use with center-detent potentiometers
- 9mm pots, Thonkiconn jacks
- Single PCB construction
- 6hp Eurorack format

Special features and build notes

Adjustable control curves

A special feature of this circuit is that the attenuverter response curve can be chosen by using different resistor values, as shown in the following figure:



With the suggested value of Rs = 47k, the potentiometer curve will be "logarithmic" like (yellow curve). This gives extra sensitivity near the center for small amounts of modulation. The value of Rs can be adjusted for a stronger or weaker logarithmic effect, or Rs can be omitted completely to get the standard linear response (green curve). Note that there are 8 resistors in total for this purpose: R22 through R29 all have the value Rs.

Offset trimming potentiometers

There is provision for an offset trimming potentiometer on each channel. These are only useful if you use center-detent potentiometers, and allow you to set exactly 0 gain when the pot is centered (without a center detent, you can adjust the knob position to achieve this goal). Note that the trimmers replace the Rs resistors: a 100k trimmer has the same effect as Rs = 47k. If you can't find 100k center-detent pots, any other similar value will do (say in the 50k to 1M range). Keep the trimmer value the same as the potentiometer value.

Important component notes

- The PCB and schematic specify 100μF power supply capacitors. This is overkill, I recommend 10μF (C1 and C2). Note the package dimensions in the BOM. I also recommend using a maximum height of 9mm and placing them on the front side of the board (the silk screen for C1 and C2 is on the back side). That way there is enough space to plug in the power connector without hassle. I use Nichicon UST1H100MDD.
- If you use the trimmer pots, they should be of the Bourns 3296X style, or compatible (I use T910X series from TME). The X version has the screw on the side, which is important so the trimmer fits under the front panel.

Alternative builds

The same PCB can be used to make normal (non-inverting) buffered attenuators or a mixer. Some examples are:

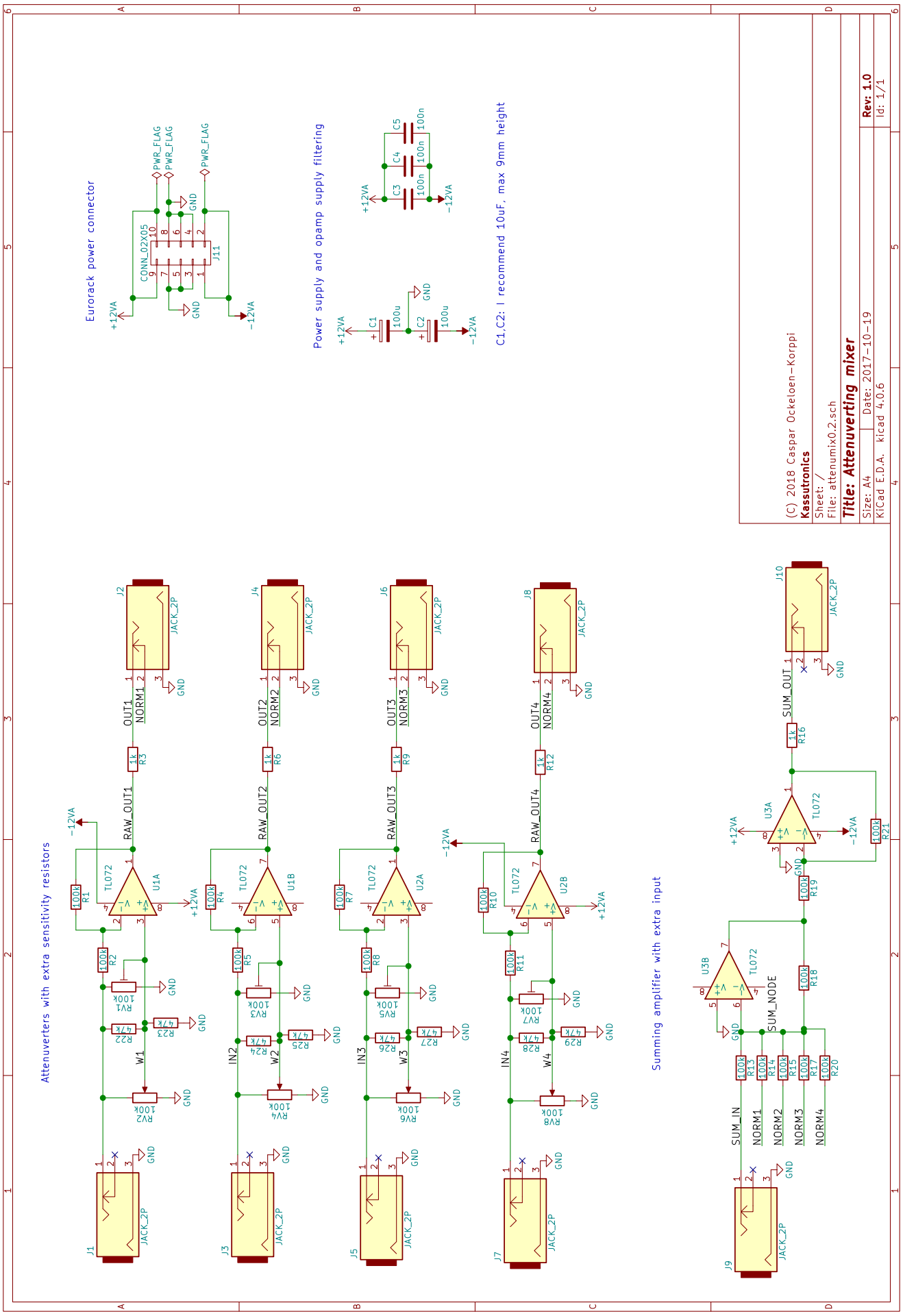
1. Buffered attenuators with logarithmic-like (audio) response:
   Do not place R2,R5,R8,R11,R22,R24,R26, R28,RV1,RV3,RV5,RV7 (leave open)

2. Buffered attenuators with linear response:
   In addition to alternative 1, also do not place R23,R25,R27,R29.

3. Four-channel mixer (either log or linear):
   In addition to alternative 1 or alternative 2, also do not place the output jacks J2,J4,J6,J8. Place a wire link between the tip and normal connections of J2,J4,J6,J8. Use the mixer panel layout, which has fewer holes.

Bill of materials

Qty	Designator	Value	Note
2	C1,C2	10u	Diameter 6.3 mm, pitch 2.5mm, max height 9mm. I recommend UST1H100MDD.
3	C3,C4,C5	100n	X7R ceramic, 0805
10	J1,J2,J3,J4,J5,J6,J7,J8,J9,J10		Thonkiconn jack
1	J11		2x5 unboxed pin header
16	R1,R2,R4,R5,R7,R8,R10,R11,R13, R14,R15,R17,R18,R19,R20,R21	100k	All resistors 0805 SMD
5	R3,R6,R9,R12,R16	1k	
8	R22,R23,R24,R25,R26,R27,R28,R29	47k	Value = Rs (see documentation)
4	RV2,RV4,RV6,RV8	100k	Alpha 9mm vertical
4	RV1,RV3,RV5,RV7	100k	Optional, replaces R22-R29 (see documentation)
3	U1,U2,U3	TL072**D	SOIC package


Eurorack power connector
Power supply and opamp supply filtering
C1,C2: I recommend 10uF, max 9mm height
Attenuverters with extra sensitivity resistors
Summing amplifier with extra input
(C) 2018 Caspar Ockeloen-Korppi
Kassutronics
Sheet: /
File: attenumix0.2.sch
Title: Attenuverting mixer
Size: A4
Date: 2017-10-19
Rev: 1.0
KiCad E.D.A. kicad 4.0.6
Id: 1/1

Revision history

Board revisions

1.0 Initial design.

Documentation revisions

A Initial documentation for board revision 1.0

B Re-formatted small fixes to documentation.

C Fixes to alternative build 3.

Contact

Check for updated documentation and other information on my blog at kassu2000.blogspot.com.
I am always happy to answer questions and receive feedback at kassutronics@gmail.com.