

Specifications

Input impedance \approx 12k ohms, balanced line-to-line, *
 THD $<$ 0.25%, +20 dBu, 20-20 kHz, unity gain, no compression, **
 S/N = 80 dB re +4 dBu, 22 kHz BW, unity gain, ***
 Crosstalk = -60 dB, 20kHz, +4 dBu, channel-to-channel
 Frequency response = 20 - 20 kHz, ± 0.25 dB
 Maximum gain \approx +14 dB
 Output impedance 50 ohms, balanced line-to-line
 Maximum output level +26 dBu

* INA2137 Internal resistors are ratio matched but have $\pm 25\%$ absolute value

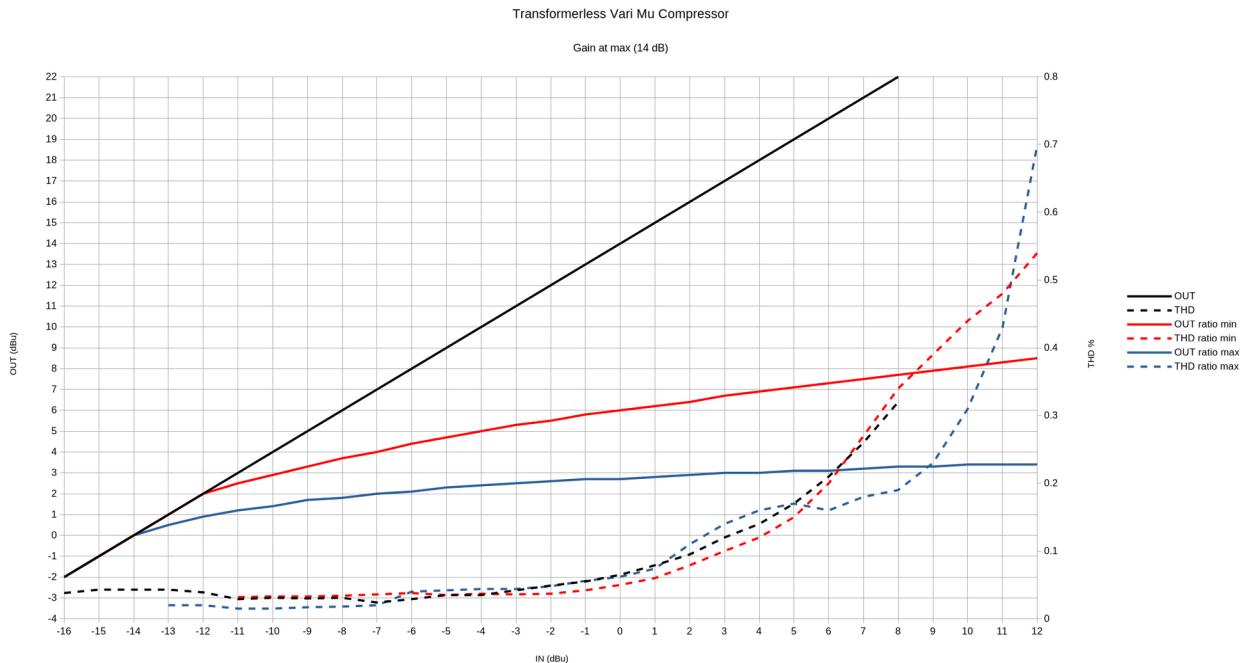
** Will heavily depend on the tubes used

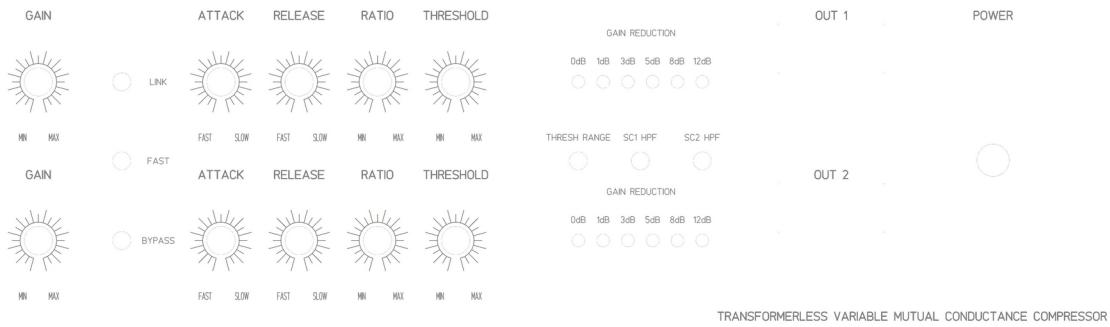
*** Should be better than 80 dB unless the tubes are very noisy

Gain, Attack & Release Rotary Switches

ROTARY SW	GAIN	ATTACK	RELEASE	ATTACK fast	RELEASE fast
1	-8 dB	2 ms	44 ms	1 ms	22 ms
2	-6 dB	4 ms	88 ms	2 ms	44 ms
3	-4 dB	6 ms	132 ms	3 ms	66 ms
4	-2 dB	10 ms	176 ms	5 ms	88 ms
5	0 dB	20 ms	220 ms	10 ms	110 ms
6	+2 dB	30 ms	264 ms	15 ms	132 ms
7	+4 dB	50 ms	308 ms	25 ms	154 ms
8	+6 dB	70 ms	352 ms	35 ms	176 ms
9	+8 dB	90 ms	396 ms	45 ms	198 ms
10	+10 dB	110 ms	440 ms	55 ms	220 ms
11	+12 dB	130 ms	484 ms	65 ms	242 ms
12	+14 dB	150 ms	924 ms	75 ms	462 ms

Real release time is attack + release.





CONTROLS

2 Gain Controls

2 dB steps

Link Switch

Link switch combines the CV voltages by connecting ratio rotary switches parallel. Attack, release and threshold controls still operate independently on both channels.

Fast Switch

Attack and release times are halved

Bypass Switch

Inputs are still being fed while in bypass

2 Attack Controls

12 positions

2 Release Controls

12 positions.

2 Ratio Controls

12 positions. Soft knee.

2 Threshold Controls

12 positions

Threshold Range

Changes range for threshold switches

Sidechain 1 High-pass filter

140Hz sidechain high-pass filter

Sidechain 2 High-pass filter

140Hz sidechain high-pass filter

Calibration

Don't feed any signal to the compressor when adjusting sidechain trimmers RV1, RV2, RV3, RV4 & RV5

Sidechain trimmer RV1

RV1 on the sidechain board adjusts the minimum threshold of the compressor. Adjust trimmer RV1 on the sidechain board until the voltage across D1 is 0V. The adjustment range is between 0.5V and 0V DC. 0V sets the minimum threshold approximately to 0 dBu relative to output.

Sidechain trimmers RV2 & RV3

RV2 on the sidechain board adjusts CH1 tube bias.

RV3 on the sidechain board adjusts CH2 tube bias.

RV2 sidechain

Measure voltage between CV1 and CV0

Adjust trimmer RV2 on the sidechain board until you find the lowest voltage that CV1 - CV0 can adjust to, which is typically around 4V DC. If the lowest voltage you get is 4V, then further adjust trimmer RV2 until the voltage between CV1 and CV0 is 4.1V DC.

RV3 sidechain

Measure voltage between CV2 and CV0

Adjust trimmer RV3 on the sidechain board until you find the lowest voltage that CV2 - CV0 can adjust to, which is typically around 4V DC. If the lowest voltage you get is 4V, then further adjust trimmer RV3 until the voltage between CV2 and CV0 is 4.1V DC.

Sidechain trimmers RV4 & RV5

RV4 adjusts CH1 1dB gain reduction LED

RV5 adjusts CH2 1dB gain reduction LED

Adjust the trimmers until there is only a very light glow on the 1dB LED when not compressing.

Tube balance

To check tube balance, you will need an audio interface and software such as ARTA or Room EQ Wizard. Alternatively, you can use your DAW with a signal generator plugin.

Main board trimmers RV1 & RV2

RV1 adjusts CH1 balance

RV2 adjusts CH2 balance

Channel 1

- Switch link on.
- Turn threshold to max on both channels.
- Turn attack and release on both channels to fast position.
- Turn ratio on both channels to max.

Feed channel 2 input with 50Hz signal. Do NOT feed any signal to channel 1 input!

- Turn channel 2 threshold down until 8 dB LEDs light up on both channels.
The LEDs do not need to be equally bright!

Measure output voltage from channel 1. Adjust balance trimmer RV1 on main board until lowest output voltage is found. The output level should be -40 dBu or even lower if the tubes are in good balance.

Channel 2

- Switch link on.
- Turn threshold to max on both channels.
- Turn attack and release on both channels to fast position.
- Turn ratio on both channels to max.

Feed channel 1 input with 50Hz signal. Do NOT feed any signal to channel 2 input!

- Turn channel 1 threshold down until 8dB LEDs light up on both channels.
The LEDs do not need to be equally bright!

Measure output voltage from channel 2. Adjust balance trimmer RV2 on main board until lowest output voltage is found. The output level should be -40 dBu or even lower if the tubes are in good balance.

Another method of testing tube balance

<https://www.ghr.fi/varimu2/20k.wav>

Turn attack and release to fast position. Turn ratio to max. Play the audio file and and adjust the volume and threshold until 3 dB led lights up and listen for audible "thumps". Adjust balance trimmer for minimal "thump".

Channel Gain balance

Sidechain trimmers RV2 & RV3

Small differences in gain between channels can be adjusted with sidechain trimmers RV2 & RV3

RV2 adjusts CH1 gain

RV3 adjusts CH2 gain

Feed both channels +4 dBu 1kHz signal

- Turn gain switches to same position on both channels
- Turn threshold on both channels to max to make sure no gain reduction is happening

Monitor the outputs and if there is a difference in output levels, adjust the trimmer on the channel with the higher output level.

Modifications

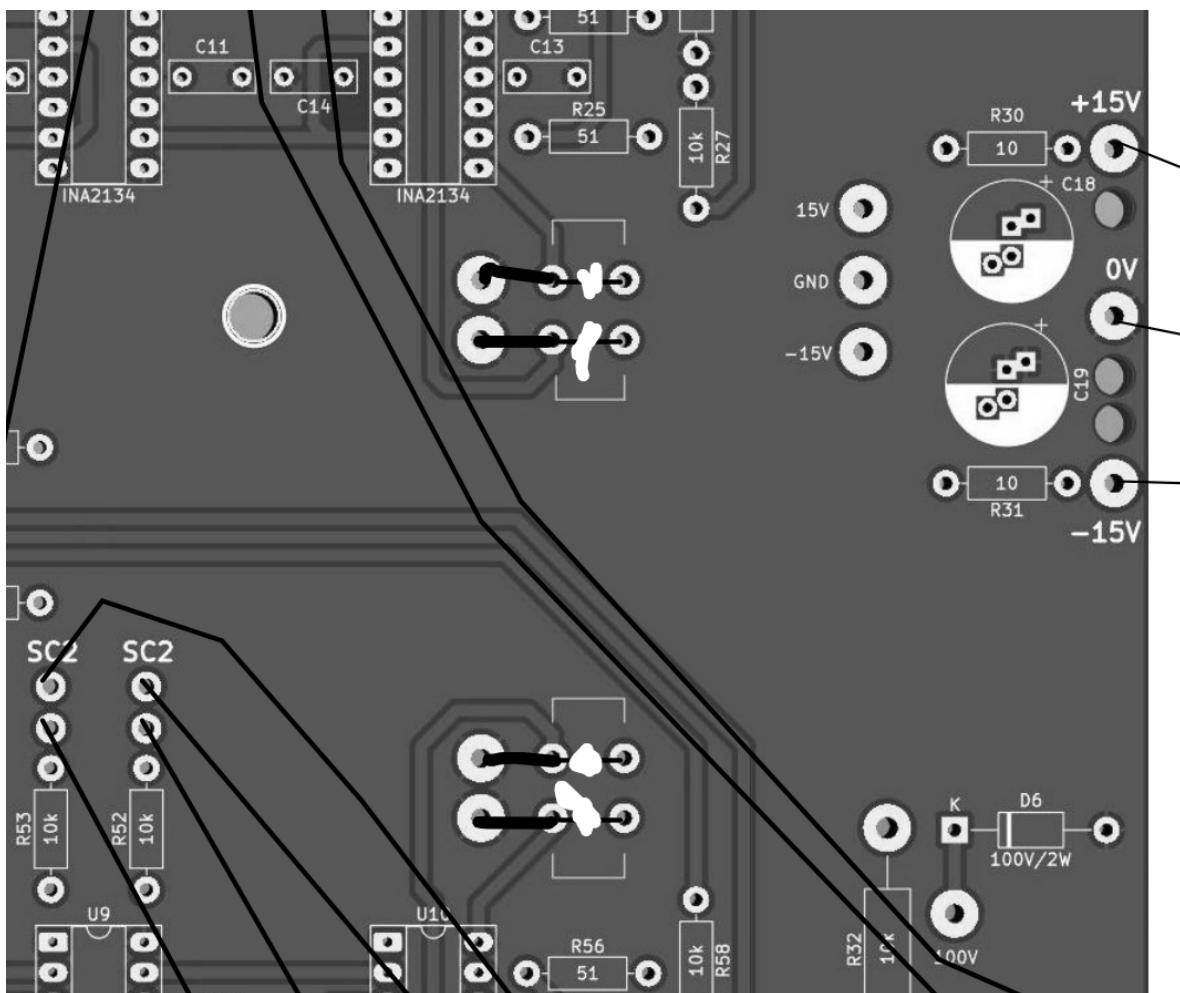
Sidechain LEDs

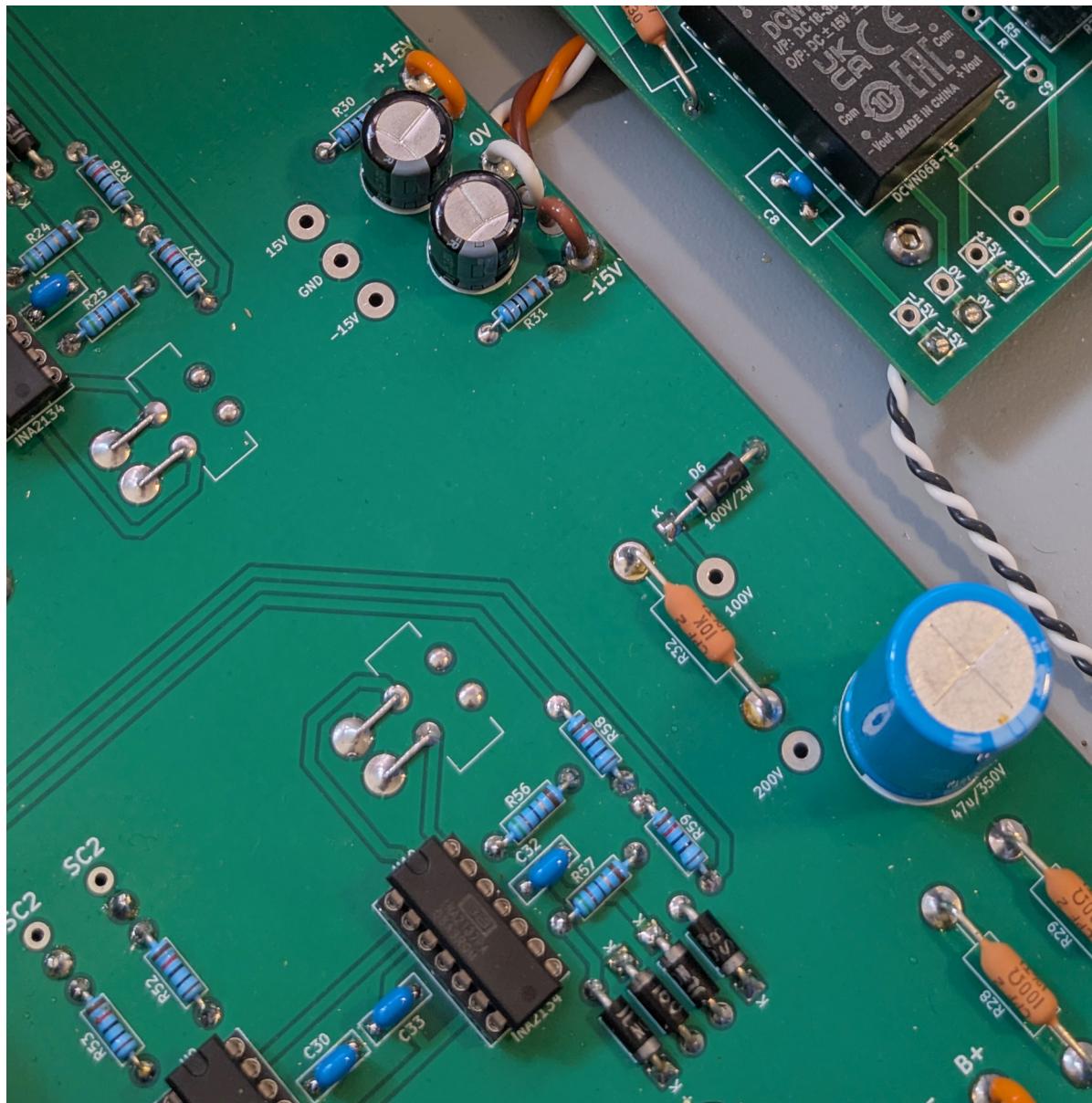
If the gain reduction indicator LEDs light up too early, change R150 & R151 to 12k, 13k or 15k

Quasi-Floating output

By default, the output is connected as a quasi-floating output, which simulates a floating transformer output. A capacitive load might cause high-frequency instability, so it's best to avoid using long output cables or silly billy quad-core cables.

If you experience high-frequency instability, remove the jumpers on the main board and connect them from the center pad to the left pad. This will disable the quasi-floating mode and increase the gain by 6 dB. To return the gain to normal, replace U5 and U10 on the main board with INA2137.





Sidechain R168 & R169

In the first version of the sidechain board, R168 and R169 were 33k ohms. If the 3 dB gain reduction LED lights up too early, change R168 and R169 to 27k ohms or connect 150k ohm resistors in parallel with the 33k ohm resistors.

Feedforward mode

Near the main board inputs, there are two ff1 pads for channel 1 and two ff2 pads for channel 2. To configure the compressor to operate as a feedforward compressor, connect the signal from the main board to the sidechain board using the ff1 and ff2 pads instead of the main board SC1 and SC2 pads.

Adjust RV1 on the sidechain board to set the minimum threshold, if necessary.