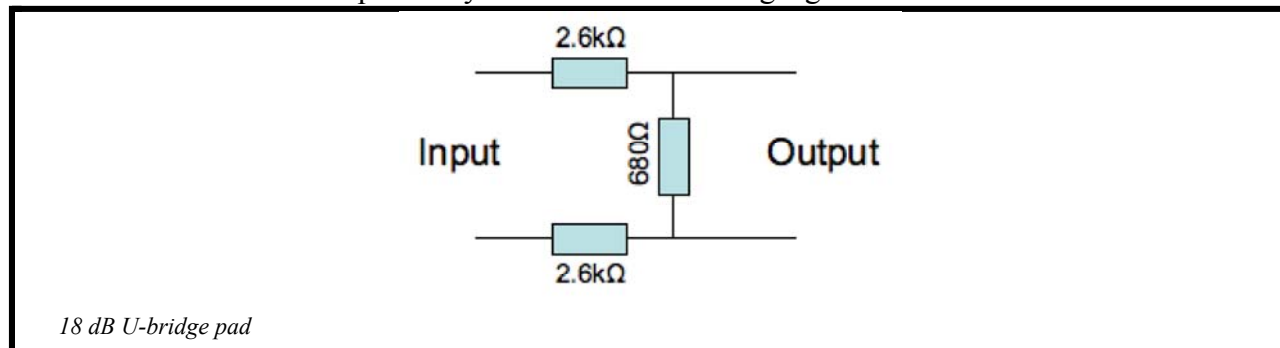


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18 dB self-made attenuator pad for line-level signals

Ok, the Zoom's line input is too hot. What we need is an attenuator pad to get it right. Fortunately this can be fabricated easily with just a few resistors. All the technical details are [here](#).

I have played with a couple of variants (9 dB, 12 dB, 18 dB and 24 dB) and found the 18 dB worked best. This pad will give you a record setting between 30 and 40 with strong line signals. 24 dB is a little over the top. You may not be able to get to 0 dBFS even with hot signals and a record level of 100. The other two pads may be too weak for strong signals.

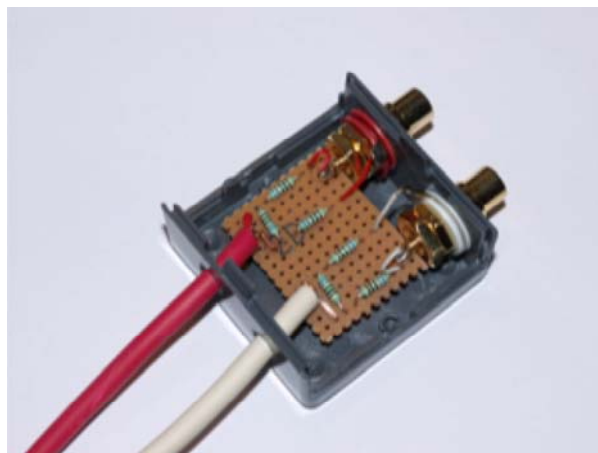


I recommend using a U-bridge as in the circuit diagram on the left. You will need three resistors per channel. One is 680 ohms and the other two are 2.6 kohms. It is not important to use exactly these values - just see which resistors you can get. But make sure you use 1% metal film resistors for improved common mode rejection.

The input impedance of this pad is a little low (only 5.9 kohms) but a fair compromise. The output impedance is 680 ohms and that's pretty ok.

The attenuation is exactly 18.7 dB and perfect for our needs.

A few simple parts will do the job. For the input I used ordinary RCA connectors. The output are two short cables ending in 1/4" TRS plugs which can be plugged directly into the Zoom H4n. If you examine the image closely you'll discover three identical 680 ohms resistors per channel. This was my first version with 9.5dB attenuation. It turned out that was ok but not quite good enough. For standard line signals the Zoom's record level had to be set to 10 which still meant quite a lot of distortions.



How to calculate the resistors

Calculating resistors for other attenuations is really not difficult. Firstly, you need to determine the attenuation factor (F) from the dampening value (D). These two formulas may come in handy:

$$D = 20 \times \log F$$

$$F = 10^{(D/20)}$$

In the example above, the attenuation factor is the impedance on the input side ($2600 + 680 + 2600 = 5880$) over the impedance on the output side (680): $F = 5880 / 680 = 8.65$. This leads to a dampening

of $D = 20 \times \log 8.65 = 18.7 \text{ dB}$.

Now the other way around:

Say you want to create a pad with 9 dB attenuation. The attenuation factor is $F = 10^{(9/20)} = 2.81$

If we keep the output resistance at 680 ohms (it could be lower - a couple of hundred ohms will do) then the input impedance should be $680 \times 2.81 = 1910 \text{ Ohms}$. So the two resistances on top and bottom of the circuit need to be: $(1910 - 680) / 2 = 615 \text{ Ohms}$. You may not be able to find exactly these values but a close approximation will not generate much error.

For example, say you have two 600 ohm resistors and combine them with the 680 ohm resistor in the middle, the dampening becomes:

$$F = (600 + 680 + 600) / 680 = 2.76$$

$$D = 20 \times \log 2.76 = 8.8 \text{ dB}$$

The result is not really far apart from the intended 9 dB and should be fine.

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