

## The Dale Vishay Stepped Attenuator

A new addition to the Hi-Fi Collective components catalogue is a stepped attenuator that utilises high quality Vishay Dale resistors in a switched ladder configuration.

With reference to Figure 1, it can be seen that each step consists of a pair of resistors,  $R_x$  and  $R_y$ , to provide the required attenuation. Both  $R_x$  and  $R_y$  are selected by a high quality military specification 4-pole 23-way switch with silver-plated contacts to select the appropriate pair of Vishay-Dale metal film resistors (see Figure 2).

The advantage of this design is that there is only one pair of resistors in the circuit at any one time, as compared to a resistor string attenuator where all the resistors are in circuit. As every resistor generates its own noise, minimising the number of resistors in the signal path is very desirable. This design also presents a constant input impedance to the signal source.

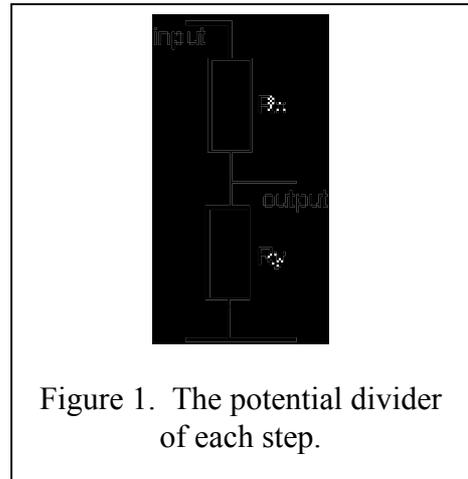


Figure 1. The potential divider of each step.

The approximate attenuations for each position are shown in the following table:

Step	Attenuation (dB)
1	Infinity
2	60
3	55
4	50
5	45
6	40
7	38
8	36
9	34
10	31
11	29
12	27
13	25
14	23
15	21
16	18
17	16
18	14
19	12
20	10
21	6
22	3
23	0

The unit is beautifully made with the switch having an aluminium end plate fitted to help keep the contacts clean, and the contacts themselves have been coated with a special lubricant. Even the nuts clamping the whole assembly together had been painted with a locking varnish!

However, it is a good idea to run all the resistors in before fitting into a preamp. Compared to a high quality potentiometer, a brand new attenuator will add depth to the sound, but the full clarity and detail will only be realised once the resistors have been run in. A burning-in period of around 100 hours is required before the attenuator will achieve its full potential.

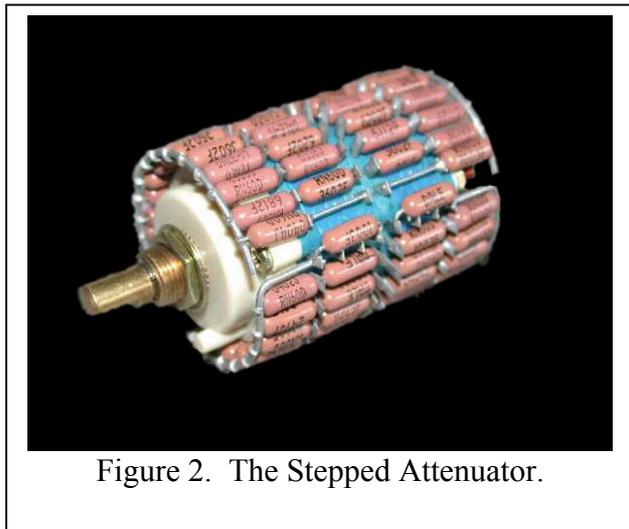


Figure 2. The Stepped Attenuator.

Of course, one could simply leave the pre-amp on for four days playing a CD on repeat, but this would only run in one position of the switch and this would need to be repeated for each position. A better way is to find a way of running the attenuator with a signal passing through all the 88 resistors simultaneously. This is not as difficult as it might at first seem and was accomplished by connecting all 23 steps of both channels in parallel. The trick is to run loops of wire around the top ends of the Rx resistors and solder the wire to each leg. The temporary loops of wire for each channel can be seen at points 'X' in Figure 3. Connect an audio signal to this wire and the earth end wire on both channels and you will have signal running through all the resistors.

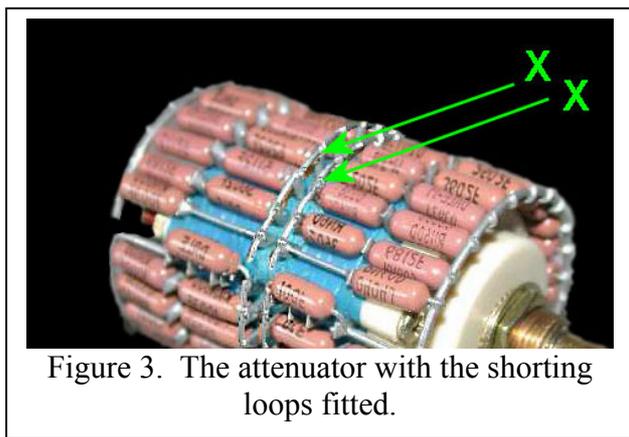


Figure 3. The attenuator with the shorting loops fitted.

A makeshift signal generator can be created with the aid of a computer fitted with a normal sound card and using a little program downloaded from the internet that produces white noise or sine waves. It is bundled with a package called Audio Test Bench which is available from <http://www.HigherFi.com> from their software downloads section. To set things up, simply wire the attenuator to a plug that fits into the sound card output socket from the computer. With a 100K $\Omega$  attenuator wired up as previously described will load the computer's sound card with just over 4K $\Omega$  on each channel, which is well within the capabilities of the computer to supply a signal of an acceptable level. Set the program to produce either a steady tone, or better still white noise so that signal across the entire audio spectrum is being generated and leave the computer running for four days. After this treatment, remove the temporary loops of wire. The attenuator is now ready for action and will be thoroughly run-in - on all steps!

The attenuator will make a substantial improvement over any potentiometer. The Vishay-Dale ladder attenuator is an essential upgrade to any high-end pre-amp and is a real bargain at £45 from Hi-Fi Collective.

**Neville Roberts**