

The HiFiCollective 45-Way Stepped Attenuator

Neville Roberts

The HiFiCollective 45-way stepped attenuator is based on a shunt design where the signal is fed through a fixed series resistor and the shunt resistor, is selected from 45 values ranging from zero to infinity by means of a selector switch. A simple ladder design has the disadvantage of having a number of resistors in the signal path. A switched ladder switches pairs of resistors, but this required two sets of switch contacts in the signal path, which is undesirable and a more complicated switch is required. Although a shunt design presents a variable input impedance to the signal source, this does not matter in practice and the benefits of a single resistor and switch in the signal path far outweighs this issue.

The value of attenuation for each step has been chosen to provide a fine range at low volumes, getting increasingly coarser as maximum volume is approached (the effect of a 1dB change at loud volumes is much greater as it is a logarithmic scale). Commercial stepped attenuators tend to have a 60dB range (corresponding to the Step 2 attenuation), but I have found in the past that with higher output sources, this is not quite enough.

Resistor packs are supplied to enable 10K, 50K or 100K attenuators to be constructed. The switch itself is a 45-way unit made by Shallco.

Building the Attenuator

Construction of the attenuator is quite straightforward, but will take several hours to complete.

The attenuator is constructed by first fitting the series resistors (Figures 3 and 4).

Then, starting with position 2, fit the step resistors in pairs around the switch, as shown in Figure 5. Continue around until the last resistor at position 44 is reached. Position 45 is left open circuit corresponding to zero attenuation.

The other ends of all the resistors are joined together with a circle of wire, which will be connected to earth and also position 1 of the attenuator, which corresponds to infinite

Step	Attenuation (dB)
1	∞
2	75
3	72
4	69
5	66
6	63
7	60
8	58
9	56
10	54
11	52
12	50
13	48
14	46
15	44
16	42
17	40
18	38
19	36
20	34
21	32
22	30
23	28
24	26
25	24
26	22
27	20
28	18
29	16
30	15
31	14
32	13
33	12
34	11
35	10
36	9
37	8
38	7
39	6
40	5
41	4
42	3
43	2
44	1
45	0

Figure 1. The Attenuator Steps

attenuation, i.e. zero volume, as the first step. The wire supplied is the HGC 99.9% silver solid core wire and all joints are soldered using Mundorf 9.5% silver solder.

Note that the input of the attenuator is the input lead of the appropriate series resistor and the output of the attenuator is the wiper or other end of that resistor.

The attenuator is now complete and ready for installation in your pre-amp (see Figure 6).

It is a good idea to mark the switch with a permanent marker to indicate the input and output connections as this will greatly help when installing the attenuator in your pre-amp.

Testing the Attenuator

It should be noted that this kit was supplied with Shinkoh resistors. Originating from Japan and no longer in production, Shinkohs are commonly regarded as the best resistors in the world!

For this review, the attenuator was installed in a GlassHouse chassis. The Shallco switch is quite large, measuring just under 6cm square and 9cm deep excluding the front shaft! If the unit is to be fitted into your existing preamplifier, you will need to check there is adequate clearance behind the front panel to accommodate the attenuator.

Given that this unit employs the same resistors as used in the GlassHouse 24-way stepped attenuator, I was expecting this device to sound every bit as good. I was not disappointed!

I started my tests with some standard CDs that I know very well. First up was an old favourite: Vivaldi Violin Concertos, Op.6, on Decca 455 653-2. It came across crystal clear with all the detail and clarity that I was used to. However, as the volume was

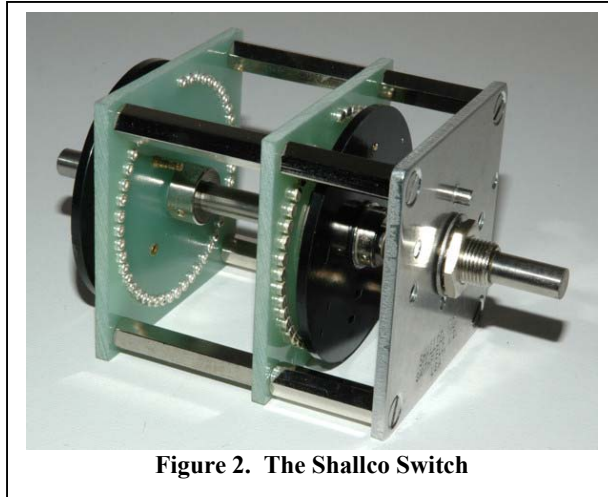


Figure 2. The Shallco Switch

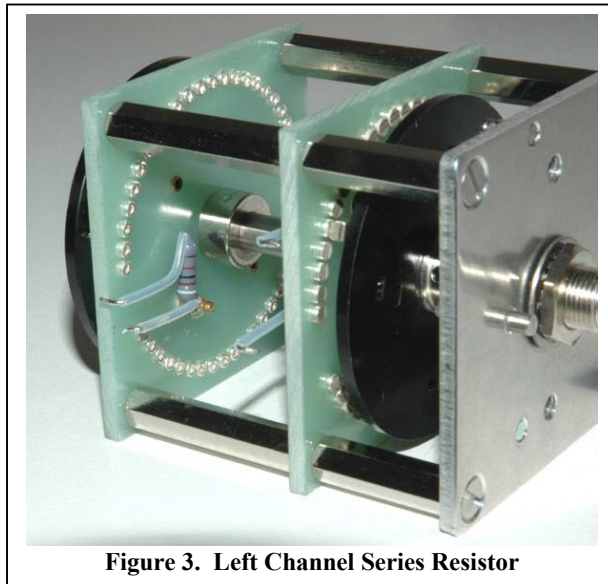


Figure 3. Left Channel Series Resistor

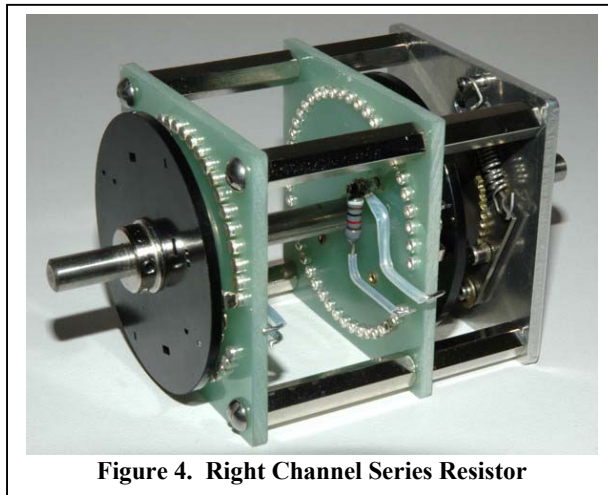


Figure 4. Right Channel Series Resistor

increased from a whisper to full listening volume, the benefits of the 45 steps over the 24-way attenuator became apparent. There was no apparent 'step' change between clicks and it behaved much more like a potentiometer as the volume was increased, with a smooth, gradual increase in volume.

Further listening tests were made with other recordings from early baroque music to full orchestras.

For a complete change of mood, I turned to an absolutely superb recording entitled "The Day the TV Stood Still" (WHRC701), which is a newly released recording from Winchester Hospital Radio and obtainable directly through their web site at <http://www.whr.org.uk/tvstoodstill.html>. This may seem a strange choice for a test CD, but it is one of the best examples of a superbly mastered recording taken from the original master analogue tapes you will find anywhere. The 2-CD set contains a vast range of light music that many will remember as interlude music from the '60s and '70s and provides enough variety to put any piece of equipment through its paces.

The strident brass on the jazz tracks on CD1 were clear, without any trace of harshness. The familiar lilting sound (for those of us of a certain age!) of track 22 "Sun-Ride", a one-minute long tune used between programmes in the 60s and 70s and now heard in stereo, was positively sparking in clarity. Full orchestras, as exemplified by track 5 of CD2 "Children's Hour", were reproduced with effortless ease. At the other end of the spectrum, the balance between the flute, drums and harp on track 8 of CD1, "Flute Allegro", was perfect and all the detail was there, including the breathing of the flautist (I did say that there was a wide range of musical styles on these CDs!).

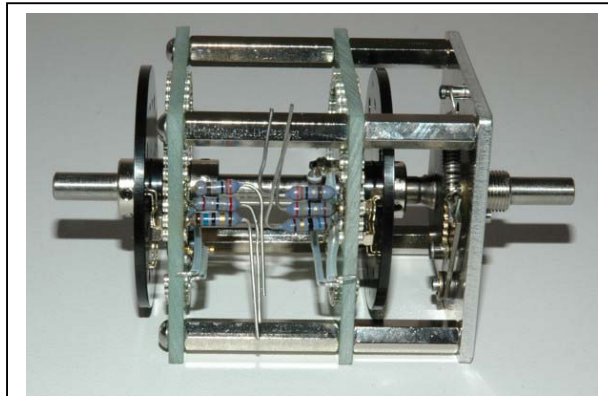


Figure 5. Fitting the Step Resistors

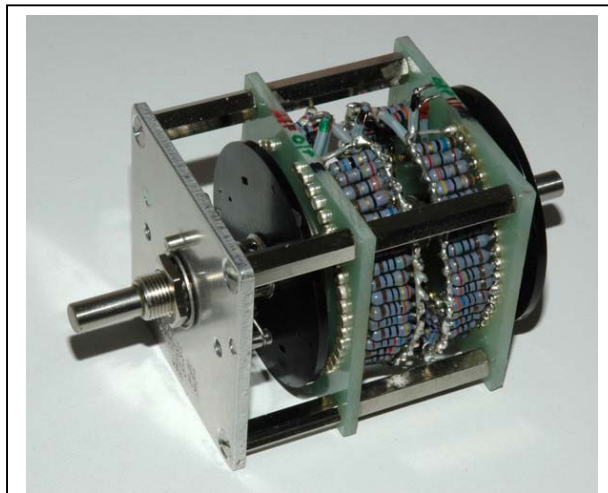


Figure 6. The Complete Attenuator

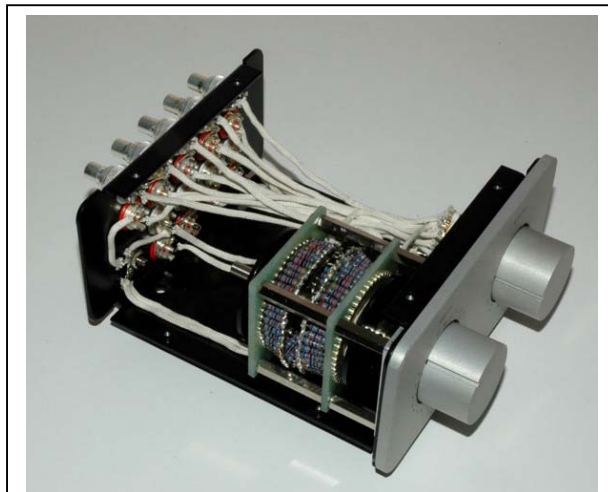


Figure 7. The Attenuator installed in the GlassHouse Chassis

Conclusions

Figure 7 shows the attenuator fitted in a GlassHouse chassis.

This is a superb attenuator and represents the ultimate in attenuator design, giving an exceptionally smooth range across the 45 steps and will be at home installed in the finest audio equipment.

--ooOoo--