
# RAGCHEW

## JULY / AUGUST 2021

## From the Editor

Following on from last month's article on the **QRP Power Meter** by **Richard M0HNK,** in this issue he describes in detail a **Homebrew Switched Attenuator.**

**Tony G4HBV** continues with his series **"A Brief History of Radio"** and in part 3 explores the work of **Oliver Lodge.**

**Anne 2E1GKY** has installed a **2m Flowerpot Antenna** and in this issue reports some good results.

A group of members took the opportunity to do some **/P operating** at **Crickley Hill Country Park** on **Spring Bank Holiday Monday** - a few photos supplied by **Anne 2E1GKY** in this issue.

A little while back **Gary M0XAC** had a couple of surprise QSOs "across the pond" on 6 metres and shares the details with us.

International Museums weekend took place on **19th - 20th June** and **Gary M0XAC** assisted by a small group of club members set up **GB1TFG** at what was previously the Gloucester Folk Museum, now **The Folk of Gloucester.** As Gary explains, HF conditions were not favourable but the group did have an enjoyable time.

The weekend of the **Practical Wireless 2m QRP Contest** coincided with a spell of settled weather and I took the opportunity to set up a portable station at a farm not far from my home QTH. Using my FT817ND with an 8 element Jaybeam yagi, I notched up 52 qsos in 13 locator squares.

Eagle-eyed readers will have noted the cover title "July/August" - I'm taking a short summer break and the next issue of "Ragchew" will be September, so plenty of time to send me your reports of your summer activities.

Over the summer months I've several antenna projects which I hope to complete, firstly a 6 metre version of the Flowerpot antenna. Next on the list is a long-outstanding issue with a Sandpiper 70cm beam which "sort of works" but on analysis is resonant outside the top end of the band.

The Covid-19 pandemic is still affecting our club activities but all being well we may be able to resume club gatherings in September and of course members will be notified of confirmation of the proposed meeting dates and venue. The Committee are planning to meet in early August so if you have any issues you wish to raise then do please contact garesg4aym@aol.com

As usual, the plea for more articles for "Ragchew" - send to **g4cib@outlook.com.**

That's all for this month

**73 Brian G4CIB**

## Contest Corner

## by Brian G4CIB

In the **CQ World Wide WPX CW** contest (held on 29th - 30th May 2021), the provisional results show that club members **Martin G4ENZ** and **Mike G4IZZ** have each (provisionally) finished as the top 'G Station' in their respective sections. Martin entered the 20m QRP section, and Mike the 20m Low Power section (100W).

The latest results in the **FMAC** series of VHF contests have been published and in the **70cm FMAC** we are in still in **2nd place** in the **Local Clubs** table, with Tall Trees Contest Group hot on our heels**.** It's a similar story on **2m** where we are in **3rd place** and Tall Trees Contest Group literally snapping at our heels in 4th place with just 119 points separating us! In the **UKAC Local Clubs** overall table, we are up a place from last month and now **17th** in the **Local Clubs Overall Table.**

In the **80m Club Championship** the club is now in **9th position**. In the **June CW** contest, the club team notched up its highest score of the year so far with 2993 points. Looking at the spread of scores in the Local Clubs table, at the present rate, reaching 8th position is a possibility but any higher appears to be out of reach - unless we can greatly increase the number of logs submitted!

Just a reminder of the weekly **"Club Contest Net"** hosted by **Martin G4ENZ** on **Friday afternoons at 1530 local time on 145.425 FM** . If you are unable to come on the air for this net there is an opportunity to listen-in via a live internet stream - please contact Martin G4ENZ for details.

## From the Contest Archive

### NFD 1988 - Gordon League Rugby Ground


L-R Pat G3MA, Steve G4HFT, Brian Gifford, SWL Nick (now G3MA), Walter G8WCP, Tony G4HBV, Andrew G7BPX. Seated in front Leta G4RHK

## A Brief History of Radio – Part 3
## by Tony G4HBV

Hertz had used a spark gap as the receiver for his experiments. One of the first improvements to be made in these early days was the discovery of the coherer – this used the fact that metallic filings arranged in a tube and normally non-conducting, would react to radio frequency energy by cohering together and becoming conductive.

The coherer was greatly improved by a scientist, Oliver Lodge (later FRS), who added a tapping circuit to restore the open-circuit condition to the coherer after it had been exposed to RF. Lodge demonstrated this to a meeting of the British Association in 1894 (two years before Marconi came to England). Lodge had been experimenting with RF for a few years previous to this and after his British Association lecture, published almost certainly the first book on the topic of radio engineering,

Perhaps because he was firstly a scientist, he failed to exploit the practical use of his research into RF. He was interested in trying to understand what the transmission medium was, then called "The Ether" and in 1891 and 1892 he spent much time investigating what the properties of this ether might be.

This work however was a dead end and undoubtedly meant his contribution to the early days of radio development was less than it might have been. Lodge's grasp of the subject was almost certainly pre-eminent at this time – he had, using his crude receiver, already tried to detect radio waves from the sun.

As a result of his 1894 lecture, Lodge became associated with Mr. Alexander Muirhead. Before any patent was issued to Marconi, Lodge filed a patent in May 1897 which described a radio communication system. Significantly this included a method of tuning and also a transformer-coupled RF detector. By this time Lodge had entered into a syndicate with Muirhead and with this patent the syndicate was to cause serious problems for Marconi.

## From the Archive

**Scout Activity Day - Kings Square - June 1983**

L-R Pat G3MA, Olive (G3MA XYL), Jerry G4LEX, Nick G6AWT, Frank G5BM

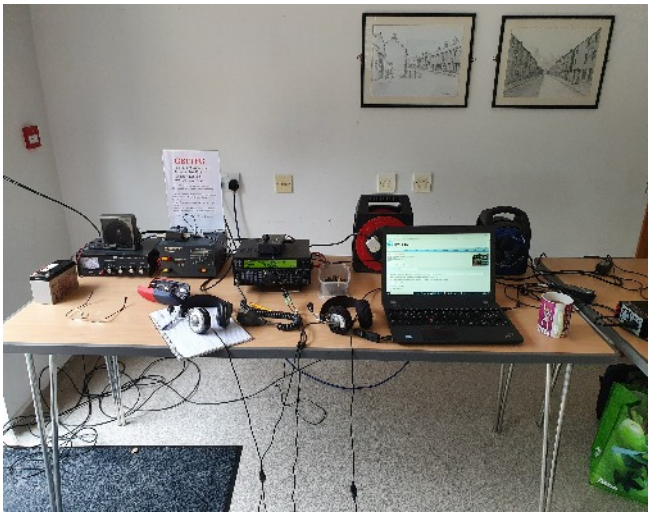
# GB1TFG - The Folk of Gloucester

On Saturday 19th June, the club did the first Special Event Station in nearly two years at the Gloucester Folk Museum, now called 'The Folk of Gloucester', hence GB1TFG. The previous day was aerial day in the rain and we got a lot of the equipment set up as well inside the Edshed which is a newer building at the rear of the site. The Museum itself is open infrequently at the moment.

Unfortunately propagation was not with us on the day and we struggled to make as many contacts as we would have liked. QSB was quick and deep on 40 metres, but we did manage to work some UK stations including some other Museum stations. We had no contacts on 80 metres and even FT8 on 20 metres was poor which tells you everything. The club's receiving loop was higher than last time and helped on some contacts.

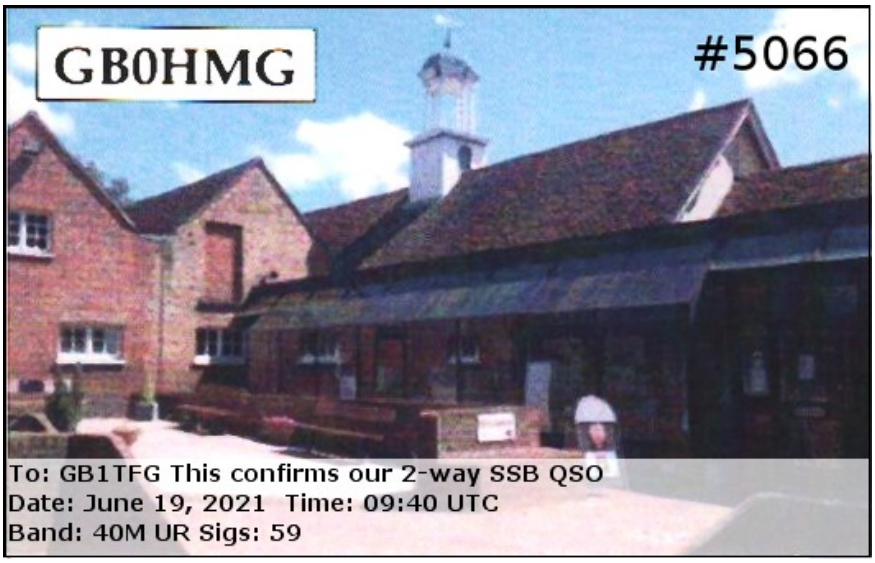
We still had a good day and many thanks go to John M0JVV, Alan G4MGW, Dave G4BCA and Les G0ULH for their help on the day.


**GB1TFG eQSL card sent for the first contact in the log GB0HMG**



**GB1TFG Station**

**(Photo M0XAC)**




**eQSL card received for the first contact in the log from GB0HMG operated by the Harlow and District Amateur Radio Society**

## A Six Metre Surprise

## by Gary M0XAC

On Wednesday 19th May I was casting about the bands looking for stations to work for the Club Challenge and as there appeared to be some Es (Sporadic E) on 6 Metres I went there. Most of the activity was FT8 but scanning elsewhere I saw some stations using single sideband.

Two stations were European so I worked those but the next two surprised me by turning out to be Canadian, **VO1FOG** and **VO1CH** both on the east coast of Canada.

I wasn't expecting much but I had to have a go as both stations were 5-7 on my 3 element yagi but to my surprise I got through. **VO1CH** gave me 5-4. He was running a kilowatt through a 7 element beam and when I checked my power, I was still on 10 watts from the European contacts. Obviously his large beam helped there.

I turned my power up to 350 watts for **VO1FOG** who was also running a kilowatt but through a 4 element beam,just to see what the difference would be. He gave me 5-7. Both the Canadian stations are a only little over 2200 miles away but transatlantic non the less.

My transceiver is a Kenwood TS-590SG, my amplifier an Acom 600S and my yagi is up about nine metres. I have worked further afield on 6 Metres FT8 but the Canadians are my best contacts on single sideband and doing it on low power is always very satisfying. It's worth checking **DXMAPS.com** to get some idea of propagation.

## Promising Results with the 2m Flowerpot Antenna

## by Anne 2E1GKY


Having recently acquired a shed to operate from in the summer months (as reported previously in “Ragchew”), it was time to attach a suitable 2m antenna. The photo (left) shows the 2m “Flowerpot” antenna which **Brian G4CIB** recently made and has kindly given me to evaluate.

Although only some 8 feet or so above ground level in a confined space surrounded by trees, shrubs and fences, initial results were encouraging with good signals from various repeaters including **GB3WR** located on the Mendip Hills.

A few weeks ago I joined in the club net and using 10 watts from my FT1500M was pleased to receive reports from the various members as follows:-

G4AYM S6, M0XAC S9+ (end stopping), G3XMM S4, G0EEA S4, G0VWH S6 and G8DLW S3 with some difficulty.

# A Homebrew Step Attenuator

## by Richard Tofts M0HNK

When I first became interested in radio, I thought that attenuators were probably the most boring bit of test equipment imaginable. But after a while, I began to realise how many test situations there are when an accurate and switchable level of attenuation in carefully chosen steps is essential. You can use them to assess insertion losses, levels of amplification, receiver sensitivity and dynamic range measurements, establish graduation marks on a power meter scale (see my other article) and a whole host of other things. But good quality step attenuators are expensive.

To keep costs down, my first step attenuator was built from a kit (Hendricks – no longer available). I used it for various experiments although I didn't have any reliable way of establishing how good it was. I was somewhat sceptical of its performance at VHF although I had a need for a switched attenuator for experiments in the 173-174MHz range (used for wildlife radio tracking in the UK). When I invested in a spectrum analyser I thought I'd test my attenuator and that's when I understood where its limitations lay. The stated attenuation of 20dB, for example, was reasonably accurate at HF, ranging from 19.5dB at 1MHz to 20.8dB at 30 MHz. But at 173MHz the stated 20dB attenuation was wildly off (38.25dB - Figure 1)!


**Figure 1:** My kit attenuator swept from 1MHz to 200MHz and set to 20dB attenuation. The vertical axis is in 10dB increments, the second horizontal line from the top representing 20dB of attenuation.

A step attenuator consists of a series of adjacent attenuator pads which can be switched in or out of circuit as necessary to give the required level of attenuation. There can be various causes of misbehaviour in attenuators including inductive behaviour of resistors and stray capacitances between attenuator pads and ground, between adjacent pads and also capacitance associated with the switches. I therefore attempted to build a homebrew version that met my needs with an increased range of attenuation (1-81dB rather than 1-41dB).

Each individual attenuation pad in my homebrew version consists of three resistors in a pi-network. And each pad is located in a separate 'cell' of pcb material to minimise stray coupling. The resistor values required to produce a specific value of attenuation can be determined in various ways including using one of the online calculators (e.g. https://chemandy.com/calculators/matching-pi-attenuator-calculator.htm). I used pads of value 1, 2, 3, 5, 10 and 20dB (with two 20dB pads and three 10dB ones), thus giving me the range from 1 to 81dB, depending on which and how many pads were switched in. The basic pi arrangement of resistors is shown at Figure 2.

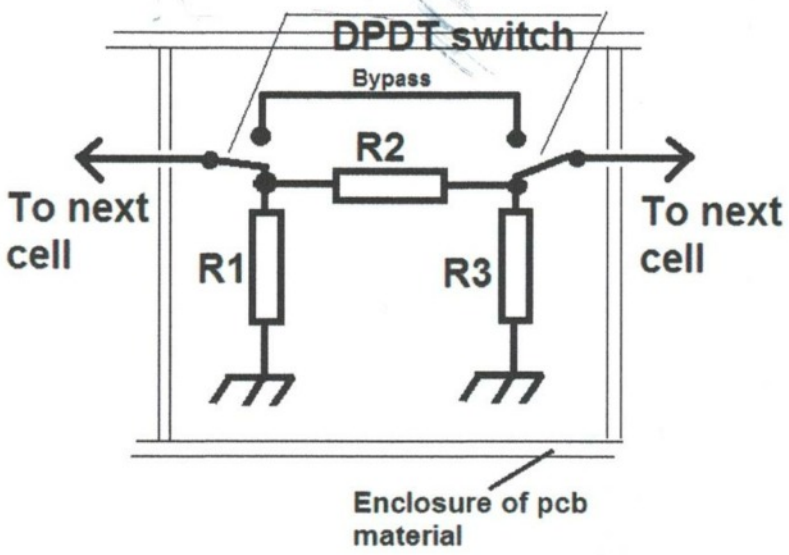



**Figure 2:** One of the series of adjacent attenuator pads. R1 and R3 are the shunt resistors and R2 is the series resistor. The attenuator pad can be bypassed with a switch if not required. Resistor values are given at Table 1.

The resistors needed to give exact integer levels of attenuation are inconvenient values so I chose the closest readily available values, these being set out at Table 1. I used 2W metal film types obtained from various sources.

| Desired attenuation (dB) | Resistor values, shunt (R1 & R3) and series (R2) | Actual attenuation (dB) | Desired attenuation (dB) | Resistor values, shunt (R1 & R3) and series (R2) | Actual attenuation (dB) |
|---|---|---|---|---|---|
| 1 | 900Ω (R1, R3)<br>5.6Ω (R2) | 0.97 | 5 | 180Ω (R1, R3)<br>33Ω (R2) | 5.18 |
| 2 | 470Ω (R1, R3)<br>12Ω (R2) | 1.96 | 10 | 100Ω (R1, R3)<br>75Ω (R2) | 10.07 |
| 3 | 300Ω (R1, R3)<br>16Ω (R2) | 2.83 | 20 | 68Ω (R1, R3)<br>270Ω (R2) | 19.87 |

**Table 1:** Desired level of attenuation (columns 1 & 4), the closest value resistors I could obtain (columns 2 and 5) and the actual levels of attenuation (columns 3 and 6) using the selected resistors. This attenuator arrangement is designed for 50 Ohm terminations and a different termination would necessitate using different resistor values.

I built my attenuator from sheets of copper clad pcb material, soldered to form a box (Figure 3) with a bolt-on back. Each attenuation pad was housed in a shielded compartment with a small hole in the sides to allow electrical connection between cells (Figure 4).


**Figure 3:** Front view of attenuator

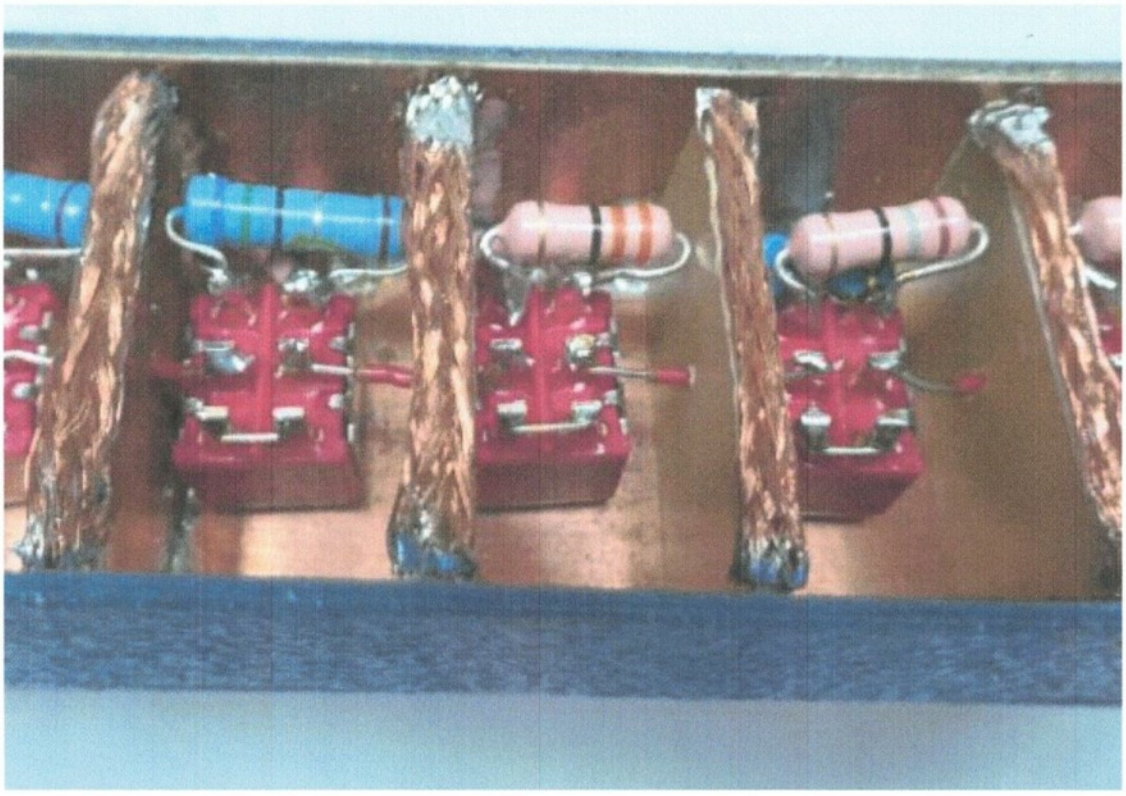


**Figure 4:** Internal view showing individual boxed sections with feedthrough wires.

My first effort was unsuccessful, the levels of attenuation wandering all over the place. I showed my creation to Vernon who flicked one of the toggle switches open and closed with a barely concealed look of disdain. He had good reason, too. They were truly cheap and nasty, adequate for switching a power supply on and off but not nearly good enough to make a decent rf contact at minuscule power levels. I swapped them for good quality toggle switches with silver plated contacts and it made all the difference. DPDT latching on-on switches are needed and I used the RS Pro versions (part no 394-419) at £2.85 + VAT each. They're not cheap but the finished attenuator is a good

quality item that's a lot less expensive than one purchased ready-made. A sweep of my homebrewed attenuator is shown at Figure 5. At 173 MHz the error is less than 1dB and the level of attenuation remains within 2dB of the stated amount all the way out to 500MHz.

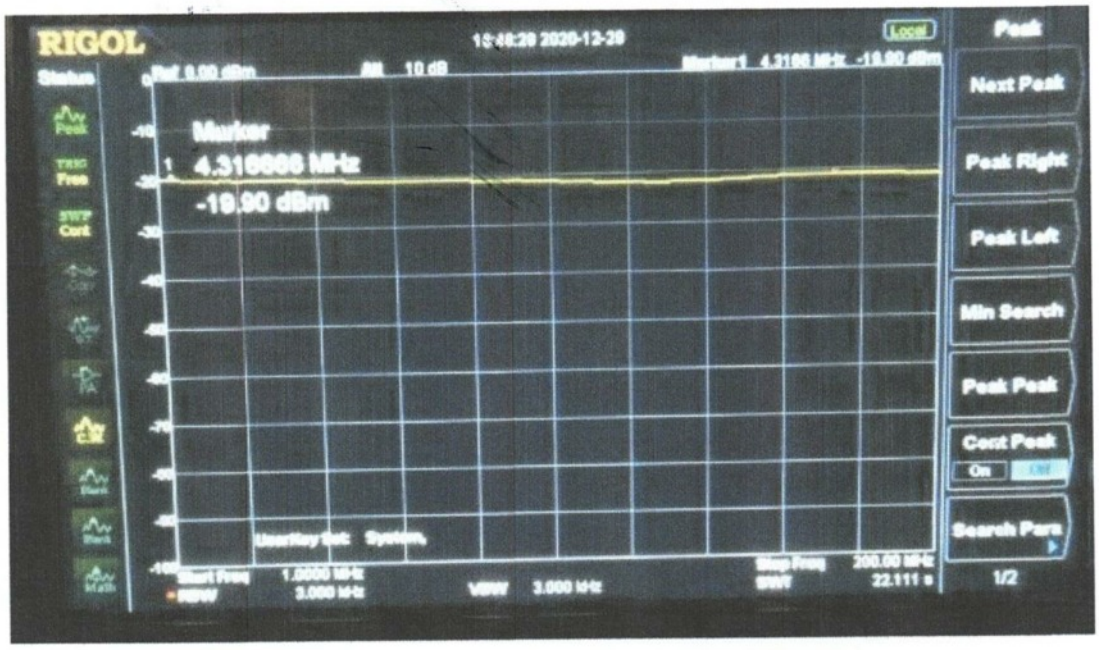



**Figure 5:** My attenuator swept from 1MHz to 200 MHz, with 20dB switched in. The same test as shown at Figure 1 for my previous attenuator but with much better results.

A step attenuator like this is a useful addition to the experimenter's bench and well worth taking care over its construction.

**A note for builders:**

I used 2W metal film resistors with 1% tolerance where possible but in some cases 5% tolerance where I couldn't find 1% types. I did, however, measure them all with a digital multimeter before fitting to select the resistors closest to the value I wanted. (A tip – if you have a close tolerance (e.g. 0.1%) resistor in the approximate range of those needed for this project, check the accuracy on your multimeter first and compensate if necessary when measuring unknown resistors. There may be inaccuracies in the meter itself and the test leads may also affect the reading). Although the resistors are rated at 2W, power dissipation is split between different resistors in various ways, depending on which attenuation pads are switched in. Commercial kits using similar resistors state that the attenuators are fine for 5W continuous power and up to 10W of power applied for short periods. My homebrewed attenuator is likely to be good for similar power levels.

I used single sided pcb material 1.6mm in thickness. The best way I found of cutting the pieces accurately was to score them on both sides using a heavy-duty craft knife and a metal straight edge. All of the exterior parts of the box have the copper side facing inwards. The dimensions are shown at Figure 6. The individual attenuator pad cells (internal dimensions) are 19mm wide, 20mm deep (to accommodate the depth of the switches) and 34 mm long, the only exceptions being the end cells which need a little more space for the BNC connectors and are 22mm wide. I used BNC sockets

which attach to the box by means of four screws because the central part of this type of socket does not project as far into the enclosure, but it would be perfectly possible to use the more common type if the end cells are enlarged appropriately. I soldered brass M3 nuts to the pcb material in the corners to allow the back to be screwed on to the rest of the box. This was a bit of a faff and if I were doing the same thing again, I'd probably use brass hexagonal M3 threaded standoff to run the whole distance between front and back and use M3 bolts on both the front and back panels to avoid the need for soldering.

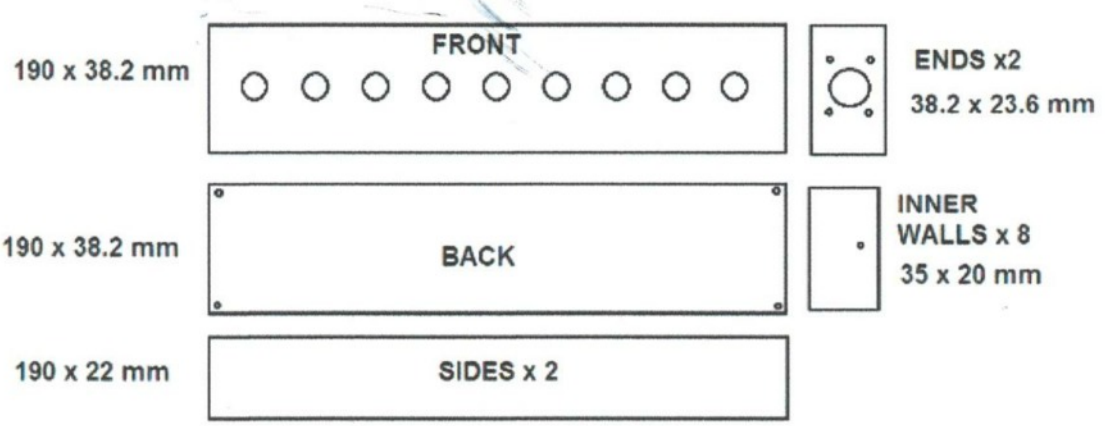



**Figure 6:** PCB sections and their dimensions. The front panel needs to be drilled to fit the toggle switches (in my case 6.5mm). The dimensions can be adapted to suit your needs (fewer or more attenuator sections) but don't forget to leave a bit of extra space at either end to allow for the intrusion of the BNC connector into the cells. The front, sides, ends and inner walls are soldered together to form a compartmentalised box (with the copper clad side facing inwards in the case of the exterior parts and the copper clad side of the inner walls facing the direction of construction - see text for details). After construction, the back is bolted on to the rest of the attenuator box.

There is a knack to putting the whole thing together. Don't build the compartmentalised box first and then expect to populate the separate cells with components afterwards. There just isn't enough space to get the soldering iron where it's needed once all the walls are in place, especially the internal walls. Instead, solder the two long sides to the reverse of the front panel and one of the end panels (with the BNC connector hole in it), tack-soldering first and adjusting the pieces as necessary to get all the angles right. Before fitting the first switch, bridge two of the terminals (see Figure 7, plan view) then solder the two shunt resistors (R1 and R3 of Figures 2 and 7) to where the side meets the reverse of the front panel before fitting the switch. Connect the other ends of the shunt resistors to the switch (see Figure 7 plan and side views) and then solder the series resistor (R2) and make the feedthrough wire connections to the other (input/output) central terminals of the switch as shown at Figure 7. Then repeat with the next cell. Figure 8 summarises the order of building.

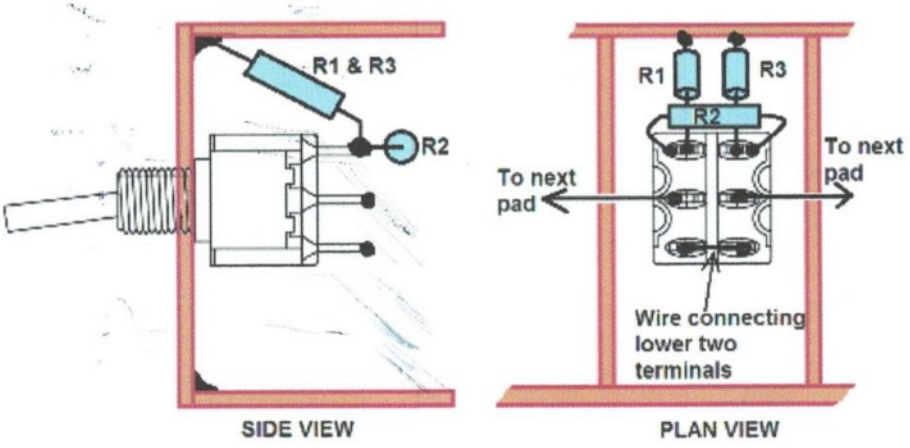



**Figure 7:** Switch connections within a cell.

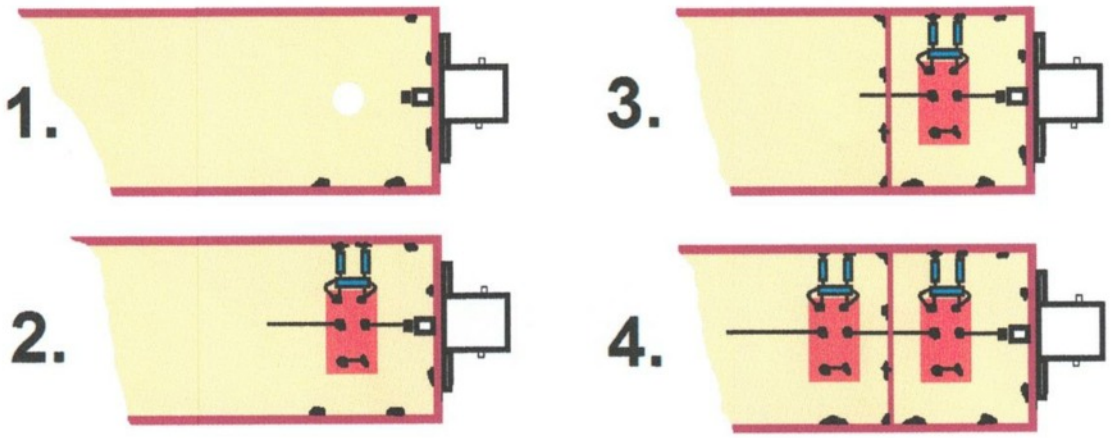



**Figure 8:** Order of building. **1.** Fit front panel, sides and <u>one</u> end plus BNC connector. **2.** Bridge the lower two switch terminals, solder the two shunt resistors (R1 and R3 of Figures 2 and 7) to the box side/front, fit the switch and solder the other ends of R1 and R3 to the switch, then add the series resistor R2. Finally add the input (from BNC) and output wires. **3.** Feed the output wire through an inner wall and slide the inner wall into position before soldering in place. **4.** Repeat the process with the next cell, and so on.

The inner walls have coaxial braid (obtained from a scrap length of 50 Ohm cable I had lying around) soldered across the 'free' edge (the other edges are soldered to the front and sides) to provide a bit more shielding between cells, the object being to assist electrical contact between the inner wall and the back which is subsequently bolted on. Try to solder the braid to the face of the wall and avoid solder blobs creating high points (Figure 9) which may then prevent a flush fit between the back and the rest of the attenuator box.

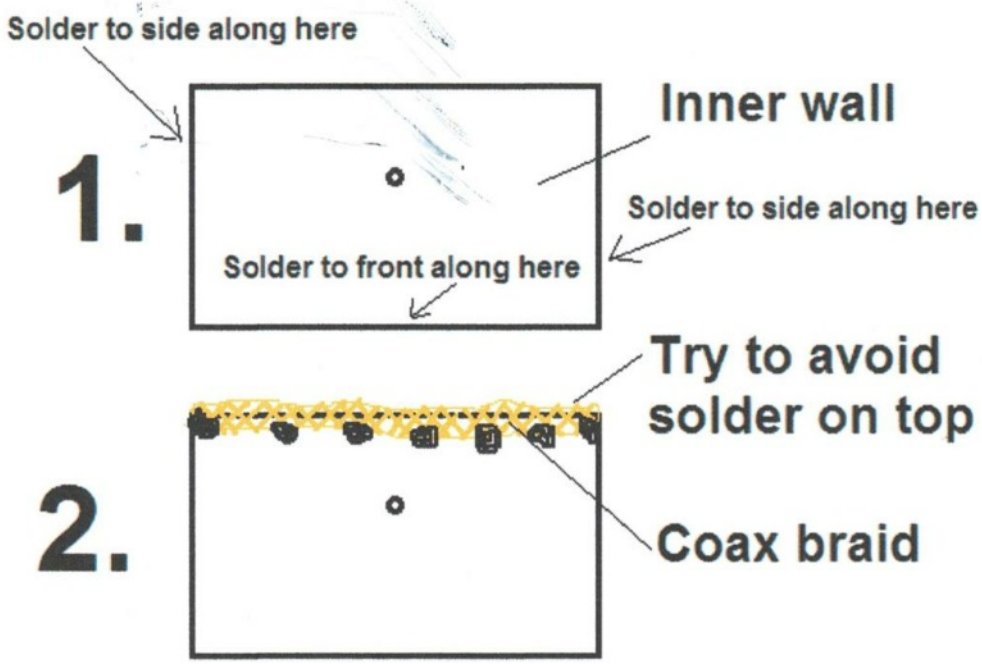



**Figure 9:** Soldering coaxial braid to the inner walls.

## From the Archive

Dave G4HJV presenting the G4HJV DF Trophy to Graeme G0EEA - December 1986

# Early Summer /P Operating


**Club members at Crickley Hill Country Park, Spring Bank Holiday Monday**

(Photos 2E1GKY)

G4CIB/P at Mitre Farm, Corse Lawn. All set up for the Practical Wireless 2 metre QRP Contest.

Above shows the IC202S ready to go, but in the end I used mainly my FT817ND.

The antenna is a very old 8 element Jaybeam mounted on a Jaybeam portable mast, both items dating back to the 1980s