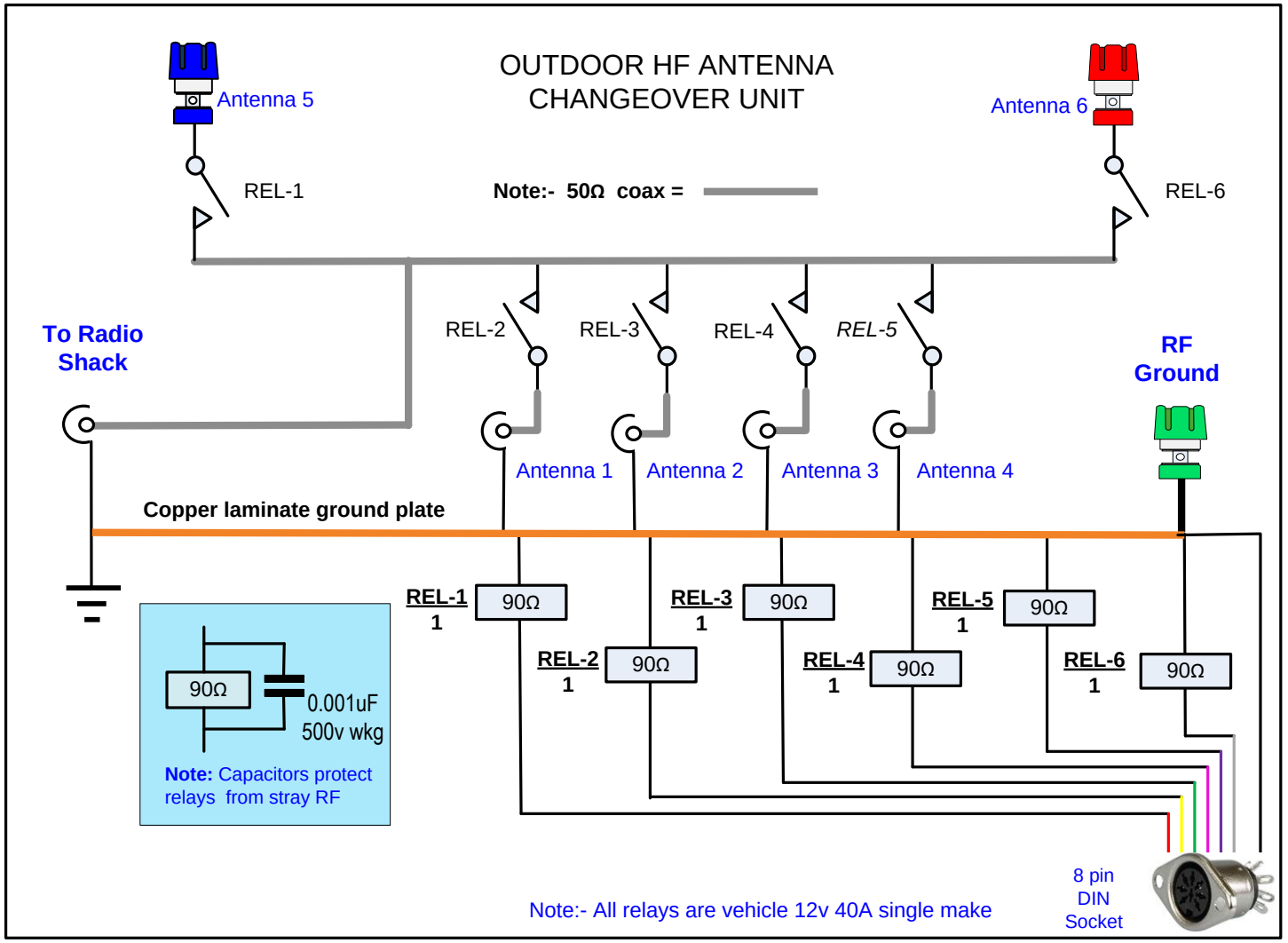
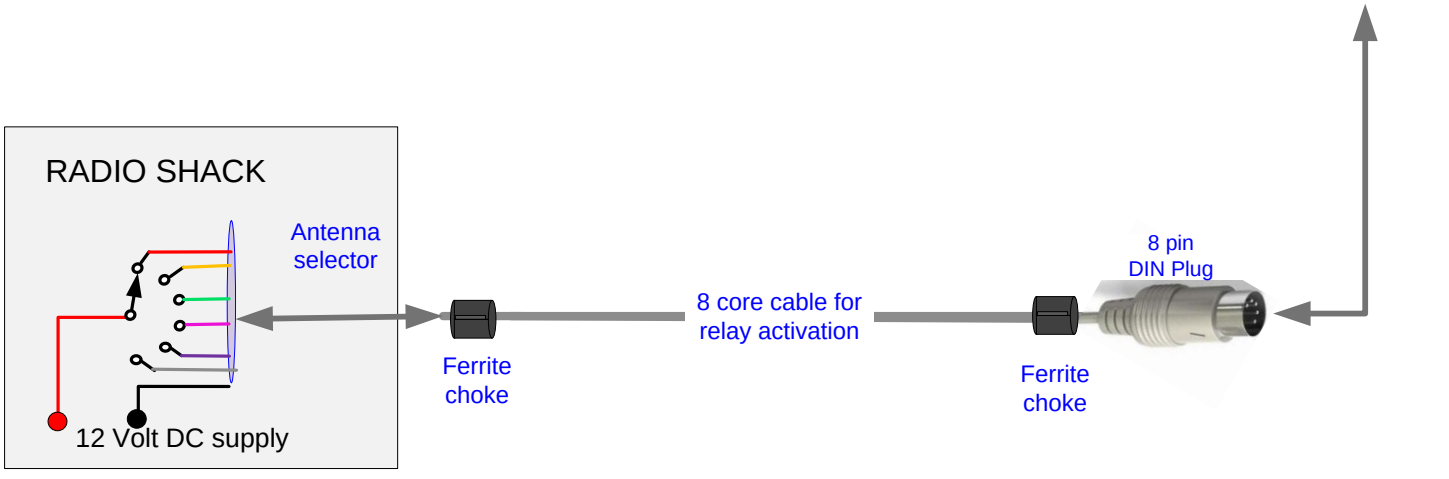
OUTDOOR HF ANTENNA CHANGEOVER UNIT

With special thanks to Barry G3YEU who helped edit this article

The unit was designed to assist with antenna comparisons. Over the last couple of years whilst writing these articles there have been times when it would have been useful to quickly check one antenna against another's performance. The IP56 rated box I used is one I recycled from work, giving it a new life. All it needed was a little bit of patching to cover up some holes on the top edge to make it water tight.

Mario G8ODE





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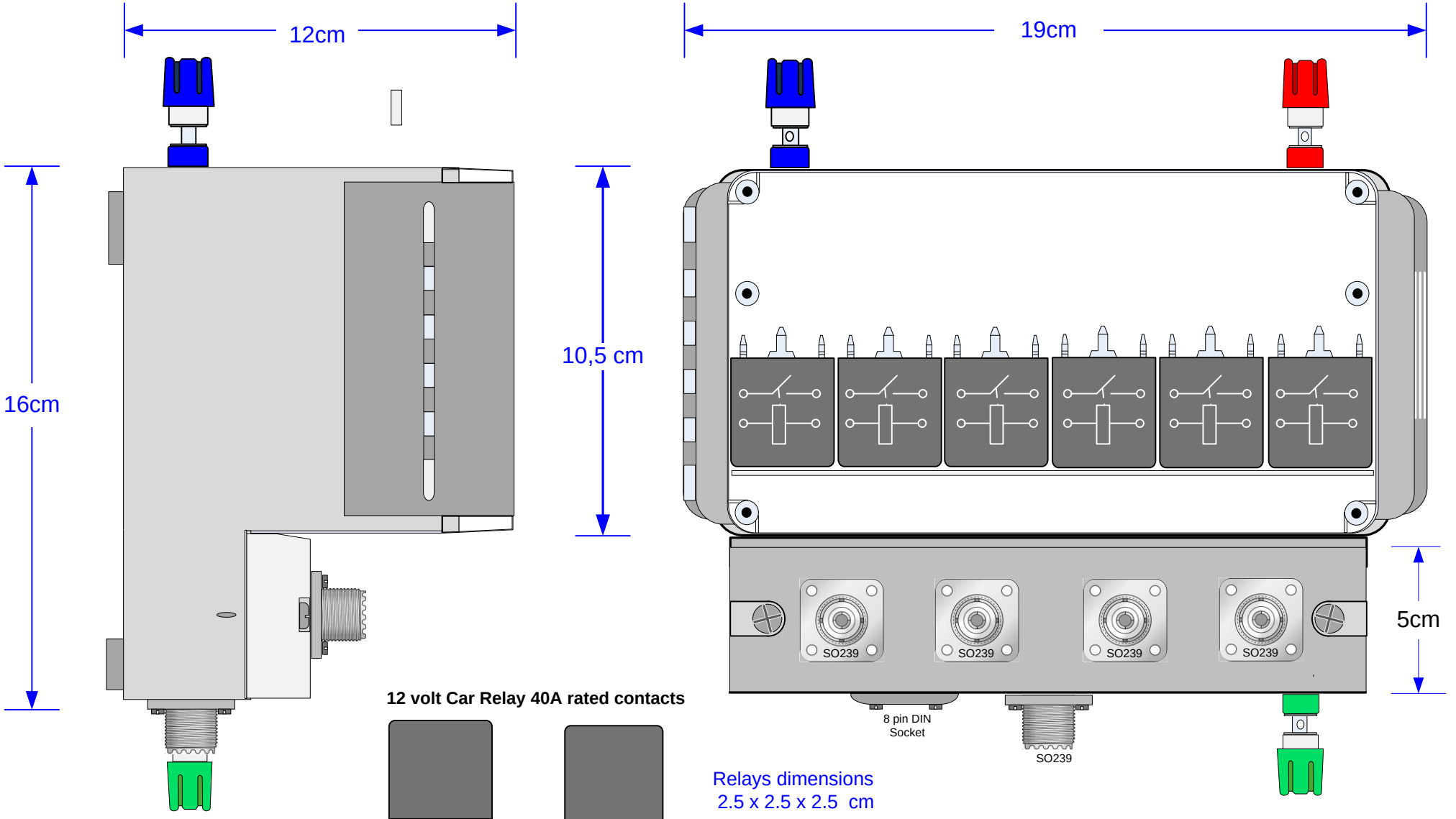

12 volt Car Relay 40A rated contacts

Plug-in type

PCB Mounting type

Relays dimensions
2.5 x 2.5 x 2.5 cm

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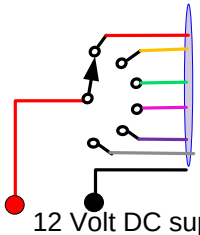
RELAY MOUNTING

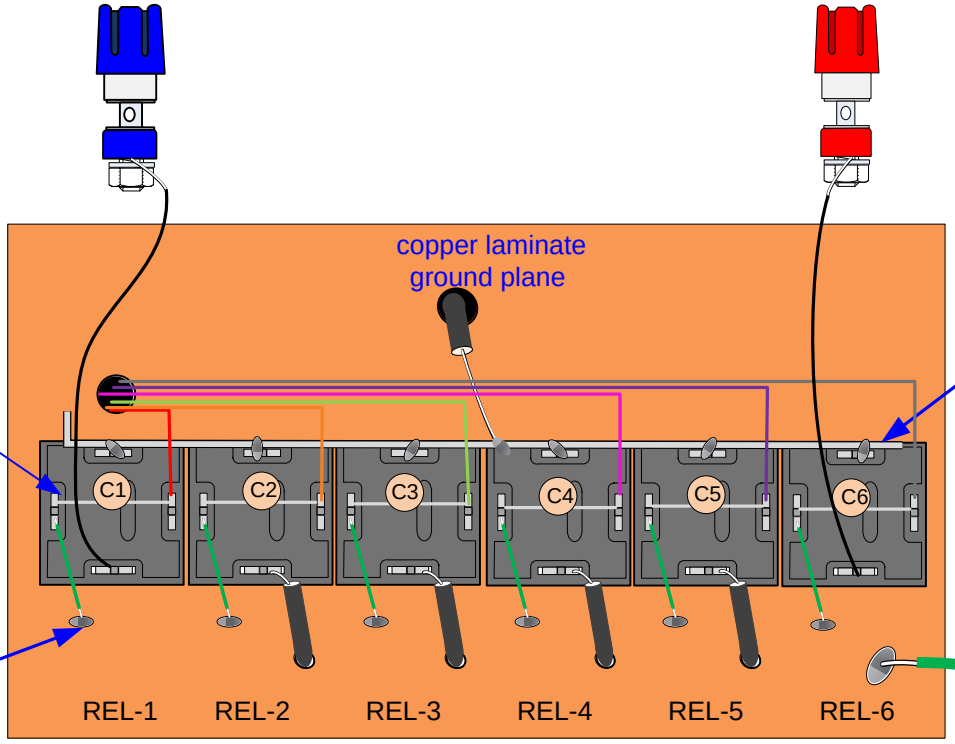


12 Volt DC supply

Coax braid soldered to Ov side of the relay coil to provide screening

Short insulated wire links soldered to copper laminate to provide 0v return for the relay coils

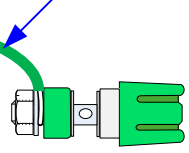
Plan view



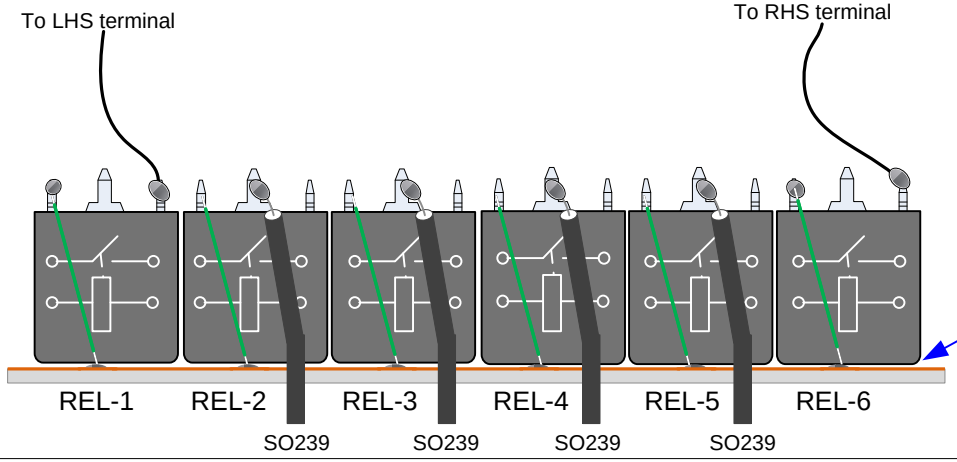
Front edge

Stiff silver plated wire soldered to the common side of all the relays

2.5mm multi-strand wire or piece of braid for the RF ground connection



Front elevation



The 6 antenna relays are secured to the copper laminate with double-sided tape adhesive

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Construction Notes & Parts List

PARTS LIST.

1. *IP56 rated box or other watertight box. -- some clear bath seal may also be useful.*
2. *SO239 connectors - 5 off*
3. *4mm screw terminals - 3 off - colours to suit individuals needs or availability*
4. *Copper laminated board - 1 off size to suit box - double sided will not warp in the heat of the sun*
5. *Disc ceramic capacitors - 6 off - 0.001uF 300-500v DC working*
6. *8 core insulated cable - length to suit local needs , can be CAT 5 or CAT 6 data cable.*
7. *8 pin DIN Connectors - 1 off female socket & 1 off male 8 pin plug*
9. *Ferrite clamp on beads - 2 minimum, fitted each end of the 8 wire cable.*
10. *Relays - 6 off – designed for cars 12 volt coils with single make rated at 40 A.*
11. *Capacitors – disc ceramic -6 off 0.001 uF 300-500 v working*
12. *Nuts, bolts & washers - 20 off*
13. *Connecting wire - 25cm silver plated 12 / 14 gauge & 50cm of green 1.6 mm wire.*
14. *Thin Coax cable - RG174 / U – 50 Ohm Polythene insulation 1500V 2.6mm diam*

CONSTRUCTION.

1. The circuit is relatively straight forward, but care is taken to keep the RG174 connections and ground wires as short as possible.

2. The RF and DC ground only connect to a single point to prevent ground loops and all coax cables braids are connected to ground at one end only.

3. To facilitate access to the relay connections the copper laminated board is allowed to slide forward. The coax cable from each of the SO239 connectors is cut longer than necessary in order to form a swan's neck , which can be secured to the rear underside of the relay board using small wire loops. The loops are passed through two small holes in the board and are twisted to secure the coaxes. Similarly the wires from the two long-wire terminals are each formed with a swan's-neck.

4. The ground terminal is connected by a thick multi-strand piece of wire that is soldered to the bus-bar. This is done to try to equalise, as much as possible, the ground impedance presented to each of the SO239 Connectors.

5. The 8 pin DIN socket is wired with 7 different coloured wires to ensure that the 6 relays REL-1 through to REL-6 were wired correspond to the socket's pin connections 1-6.

6. The relays are fitted with 750v DC wkg 0.005 capacitors to limit the effects of stray RF on the relays activation wires. The multi-core cable is also fitted with a clamp-on ferrite at each end to further reduce the effects of stray RF on the relays and also to prevent getting RF getting back into the Shack and damaging the DC power supply used to energise the relays.

7. The box used to house the circuit is IP56 rated and is rainproof.

Mario G8ODE

TESTING.

Confirm that all SO239 connectors have no shorts across them when all the relays are de-energised and that when one relay is energised the input is connected to the selected output and nowhere else. Check to see that the unit, when in circuit, does not significantly change the selected antenna's original SWR. If it does then the wiring will need to be rechecked.

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Photographs of the final assembly

Front view of the outdoor HF antenna changeover unit.

The input SO239 connector has a male-male SO239 connector fitted and acts as a leg to enable the photograph to be taken. It was also used to connect the AUTEK VA1 Antenna analyser used to measure the effects the unit had on SWR when a precision 50 ohm load was connected to the output SO239 connectors.

Smaller photo below RHS shows the Autek test set up

The AutekVA1 results showed that the SWR:-

from 1.0-16.0 MHz was <1.11 :1
18.2 MHz was 1.30 :1,
21.2 MHz was 1.56 :1,
25.0 MHz was 3.31 :1, - *no reason found for this.*
28.5MHz was 1.47 :1

Since this was designed to be used 80-15m the results appear to be satisfactory

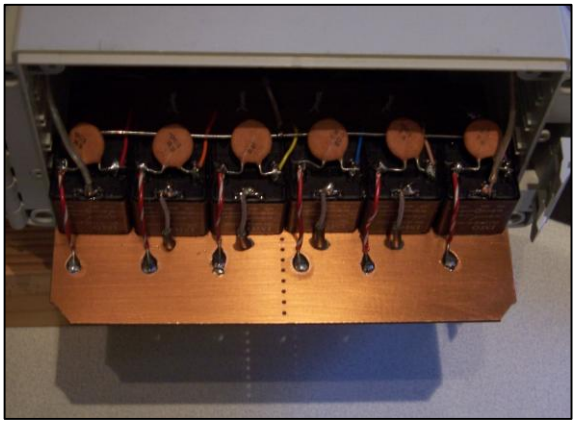
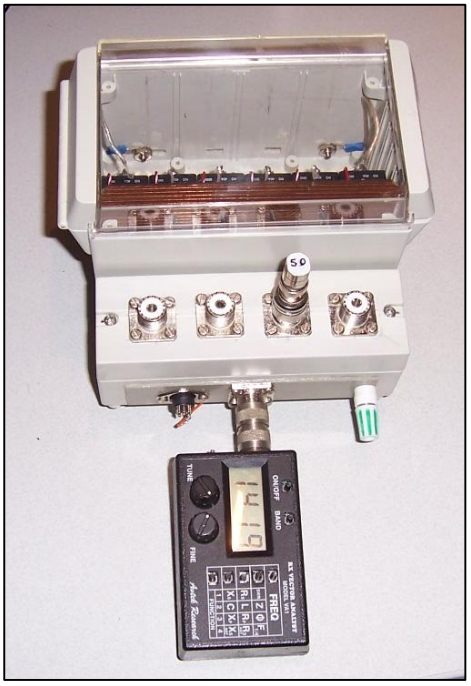
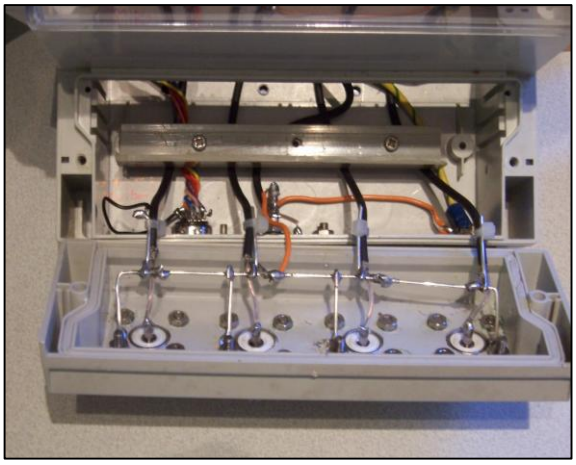


Photo on the LHS shows the copper laminate board pulled forward to provide access to the relay connections. The RG174 coaxes are secured at the rear underside of the board with insulated wire loops. The slack enables the board to be pulled forward.





Bottom photo shows the removable front panel with the four SO239 sockets. The silver plated wire support, which is used to secure the braid of the RG174 coax can be seen. The inner is cut slightly longer than the braid so that the braid takes any strain and prevents the inner from breaking off if the cable is accidentally pulled.

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