A simple and versatile Remote Antenna Switch.

By Chris, G4ZCS

I have successfully built, modified, and used my “PicaTune” remote ATU for a number of years, and had built an “antenna switching” add-on unit for it.

I have recently found that the operation of the antenna change is a little unwieldy and too slow to activate for my present operating requirements.

For those not familiar with the “PicaTune” system, it uses a series of slow Morse codes to allow you to remotely interrogate, monitor, change functions and switch combinations of the remote ATU without leaving the shack.

I decided to investigate remote switches but found precious few available, and those that were, were in my opinion, very expensive. Time to put the thinking cap on to see what might be involved in making one.

The first thought was the possible cost of cables, as my ATU is over 30m (100 ft) away from the house; second was how to keep any design as simple as possible as in the winter it’s a long walk in the cold to fix a problem, especially one of those caused by hungry squirrels nibbling exposed cable.

I came up with a need to switch between any one of four antennas using an instantaneous, or very quick, method of switching, and most importantly doing it as cheaply as possible.

Powering the switch unit by adding DC to the core of the coax is out of the question for me, as that is already used by the “PicaTune”. Apart from “Junk sale” wire, the cheapest 3 core wire I can find is 1mm Twin & Earth used in the UK for lighting circuits.

The first thought is naturally to run out two wires for each relay required, fine if you only need one as an isolator or changeover, however if you want eight relays you will need up to sixteen wires or eight and a common return.

So, could I get a 4 way switch to work using twin and earth? Back to my old college days with Boolean algebra and binary maths, (don’t worry I didn’t understand it at the time either)

Using 2 control wires you can get 4 combinations;

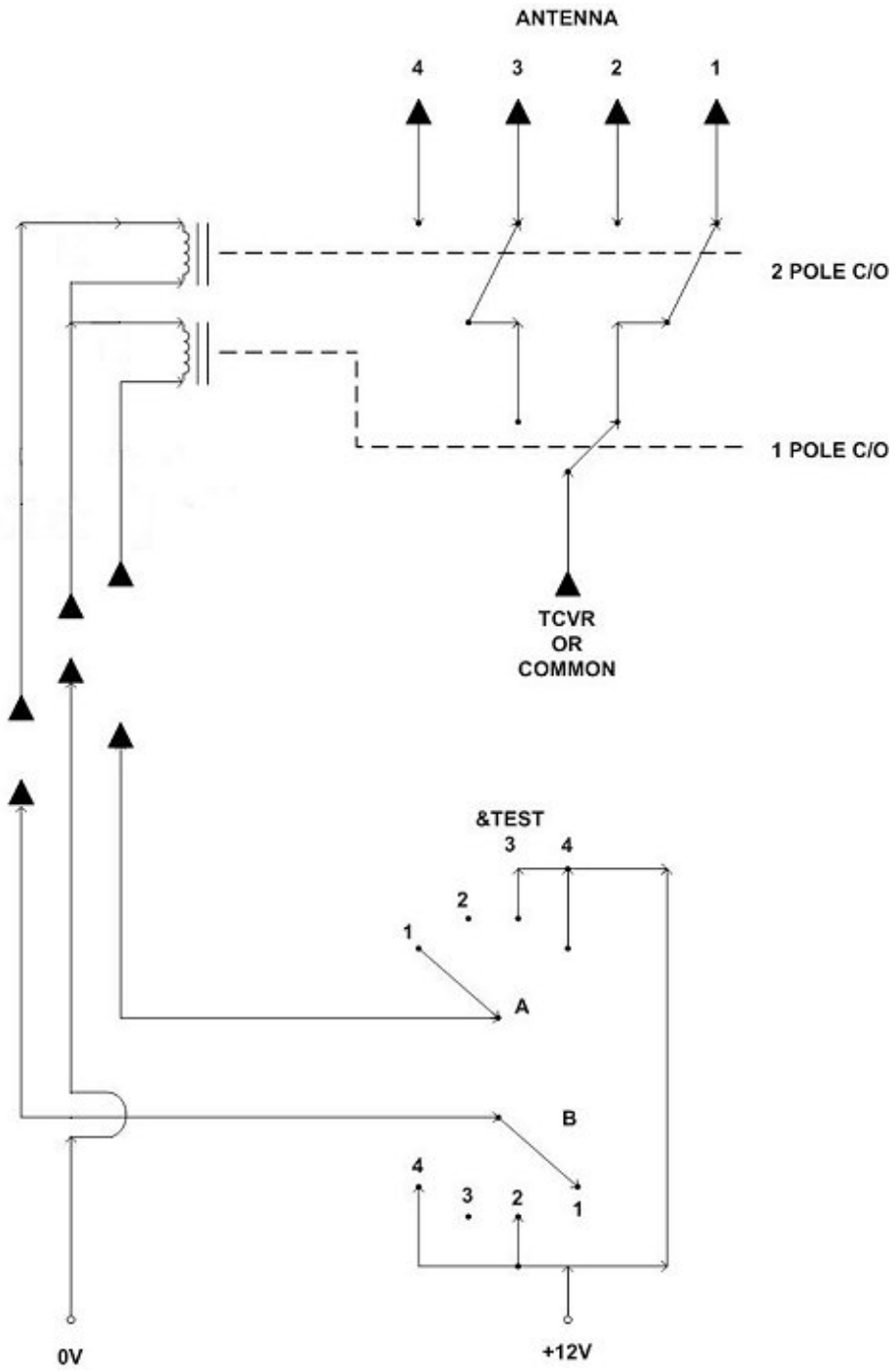
1, 0 volts on wire 1, and 0 volts on wire 2.
2, + volts on wire 1, and 0 volts on wire 2.
3, 0 volts on wire 1, and + volts on wire 2.
4, + volts on wire 1, and + volts on wire 2.

And, a negative return wire of course.

So now to get some relays to do the business.

See Diagram One. That’s how to do it!

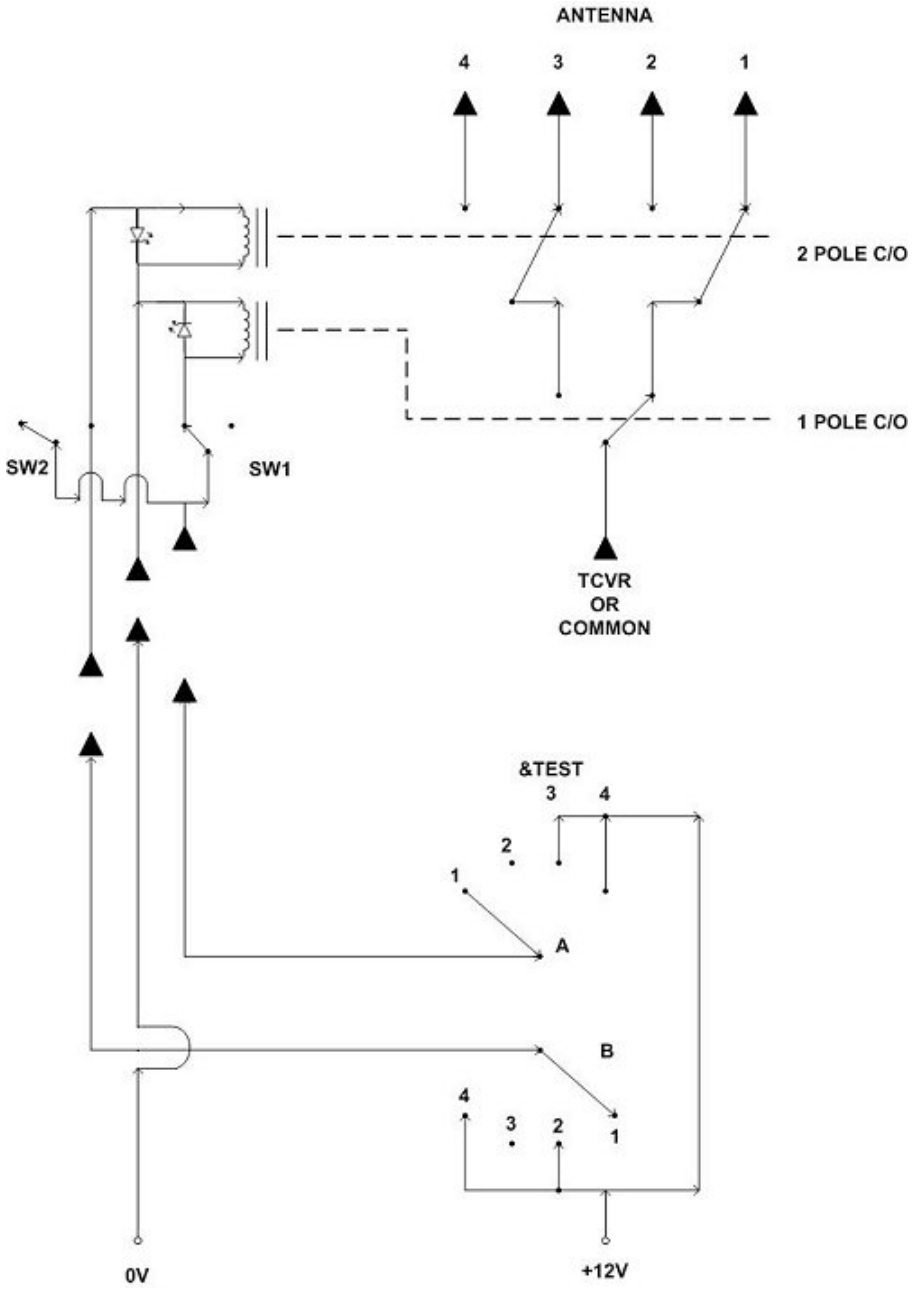
Diagram One (Basic Circuit Diagram)



The circuit consists of: A rotary switch, one single pole changeover relay, and one two pole changeover relay. For simplicity I decided to power the system from the 12V bus in my shack.

Now just to complicate things, I thought how do I test this when it is down the garden? Simple, add two small slide switches next to the relays (see Diagram Two)

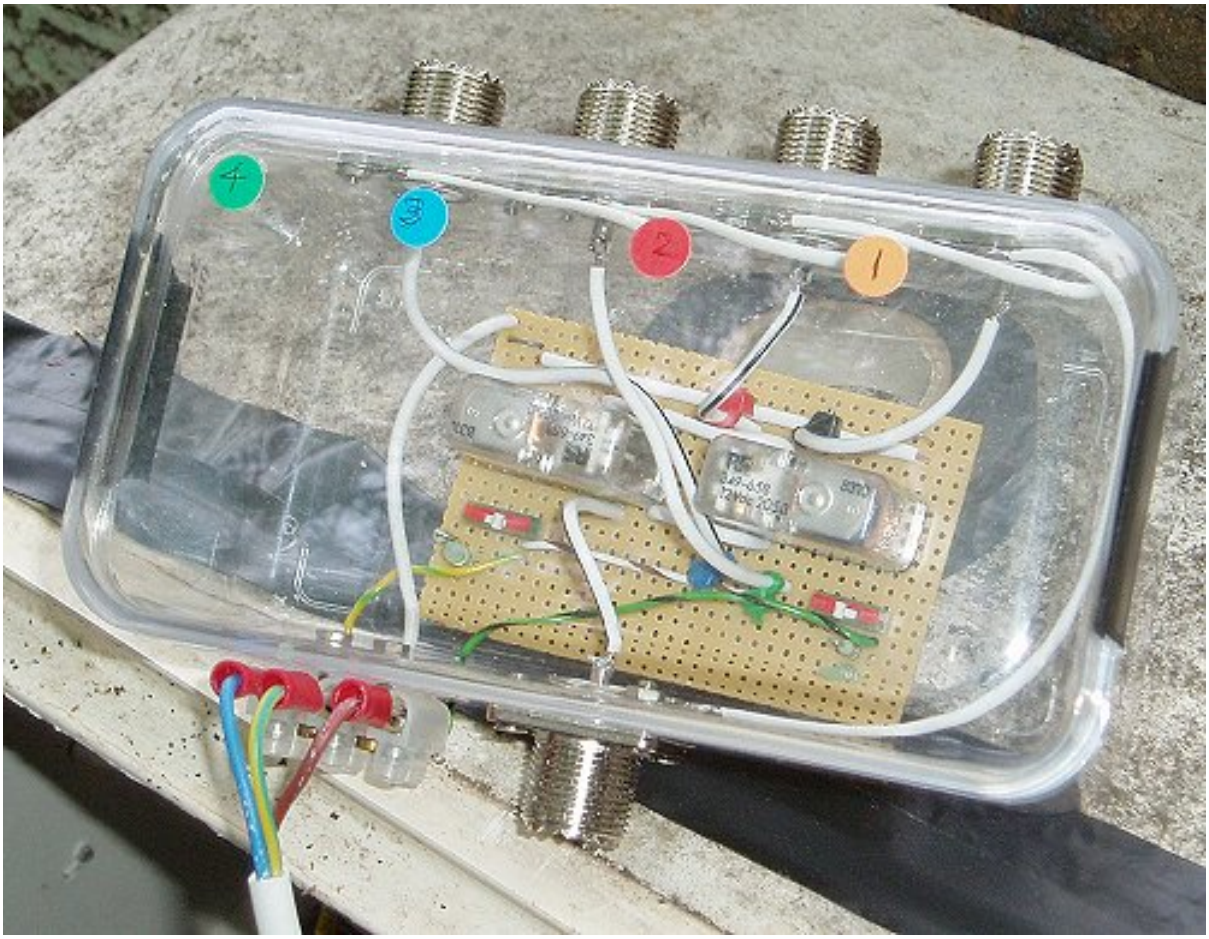
Diagram Two (Advanced Circuit Diagram)



Operating switches SW1 and SW2, will allow tests without long walks, (and having to take your boots off every time you come back to the shack) when a change is needed. I also added two small LED's (3 really) as one went BANG during testing. Make sure you have the right value series resistor to indicate the presence of volts at the relay coils.

The two relays can be used either to switch RF between coax sockets, or to switch supply volts to "slave" relays for any purpose you can think of. This would be very useful if you possess proper relay operated coax switches. However I decided to try switching RF using SO239s as shown in the photograph. See Picture One..

Picture One (showing remote relay antenna switches)



Construction is really straight foreword using a prepared PCB or Vero board.

The switch end (see picture two) requires no board; however using one does simplify the wiring.

All that is required is to connect the 12V supply to the 4 terminals of the rotary switch indicated, and the two switch lines to the wipers of two sections of the switch.

Adding options, and simplification.

If you use a 3 section 4 way switch, like mine, you can use the spare section to operate some LED indicators. I used a pointer knob on the front panel of my box. A lot simpler, as not much can go wrong!

The photo shows the switch fitted to my system box. If you are happy to do so, you can consider using the co-ax braiding as the negative return.

This reduces the number of wires to 2 and the cost even lower, as then bell flex or 2 core lighting cable can be used. Note, however that the presence of RF currents on the outside of

the coax will cause untold problems unless you take great care to ensure none is present. I use the W2DU choke balun on the shack end of my buried feeder, just where it enters the station “system tidy box” (SWR meter, PicaTune power feed, switches, meters etc.)

The wiring is a case of connecting the switch via a panel terminal (I used a 3 way Din plug and socket), to the cable and connecting the remote end to its terminals.

The only thing to take care with is connecting the wires the right way round. This is where the test LEDs come in useful! My only complication during the installation, was finding the underground duct draw cord had been “eaten” by a small rodent, this meant pulling ALL the cables out of the duct and then feeding them ALL back again!

I think the rodent was called Murphy! All that was needed now was to use the kit as was intended, down the garden. I found that the only onerous task (apart from the cabling run) was walking back and forth to check the polarity of the wires and to test all 4 combinations with my trusty test meter. I did that on a nice dry sunny day, so it was not too bad!

Happy soldering, Chris G4ZCS.

Picture Two

(Showing 4 way panel switch fitted)

Sub Note
This design was primarily put together to provide a 4 way antenna switch for quick - fire switching between antennas for propagation phase QSB monitoring. To assist illustrate the

principles, a clear plastic enclosure was used, however a metal Faraday cage would be more practical near RF fields as would shielding between the relays.

It had to be cheap, junk box friendly, and reliable in service. The basic design lends itself to expansion and modification; a further wire, different switch, and 2 more relays will expand the system to 8 ways!

The switch need not operate antenna connections, it could switch anything. The design uses the shack 12V supply, but any low voltage would do with suitable rated components.

Consideration should be given to very long cable runs, to ensure that resistance does not cause undue line loss problems, also induced RF if the cable is to be run adjacent to a Coax with RF currents on the outer surface.

First described in the journal of the Mid Sussex ARS “Mid Sussex Matters” July 2011.

Original PicaTune design by Peter Rhodes RadCom Sept 2000 to Jan 2001.

PicaTune construction and modification notes: MSARS Feb 2004 - My PicaTune has been modified from the original design, notably using PTFE dielectric in the capacitors.

Chris G4ZCS