A Six Band tower switching system

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When I first moved to Mckinney in 2000 and had the luxury of a tower, thoughts started on how to get on as many bands as microwave possible, 902 through 10G). Initial thoughts were to run a feed to each antenna (6 hardlines). However if running a MHP there was a risk of transmitting up the preamp so separate RX and TX lines were needed (12 hardlines + preamp power cables!) The weight of those cables hanging off the tower would be much too high. Thoughts then turned to switching all the tx signals onto one hardline and switching all the RX signals onto another hardline. This would require a pair of 1P6T RF relays on the tower, but the weight hanging off the tower would be lower. At this point I came across some SMA 1P6T relays (for RX) and some N type 1P6T relays with auxiliary switching contacts for which I paid $80 total, so construction could begin. The circuit diagram, Figure 1 shows how it was done with an example of my 2 band configurations; masthead preamp and masthead transverter. Note the transverters do not need a PTT signal, TX/RX switching is done by sending 9V on TX up the IF cable. Not shown are the diodes across the relay coils.

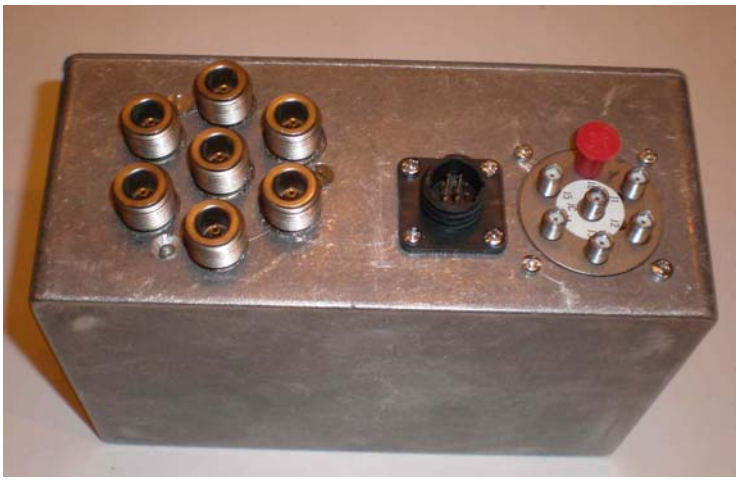
RL1 and RL3 are 1P6T SMA RF relays with six 28V coils I used DowKey type 146C70100-8 relays.
RL2 and RL4 are 1P6T 28V N relays with six 28V coils and 6 auxiliary contacts. I used Quantraton CS-18N16-6 relays.
RL1/1, RL2/1, RL3/1 and RL4/1 are the RF contacts. RL4/2 are the auxuliary switching contacts.. Note there is no failsafe position on any of the relays; with no power all paths are open circuit

SW1 is a 3P6T ceramic switch. SW1/1 switches volts to the appropriate RF relay. SW1/2 selects the appropriate 28V on receive to send to the mashead preamp from the band transverter. SW1/3 drives a visual band indicator, in my case a large double 7 segment display which shows “90” “12” “23” “34” “57” or “10” generated using a diode matrix and a 7447 Binary/7 segment decoder. SW2 turns power off to the masthead preamp box, enabling a check for an increase in RX noise to be observed

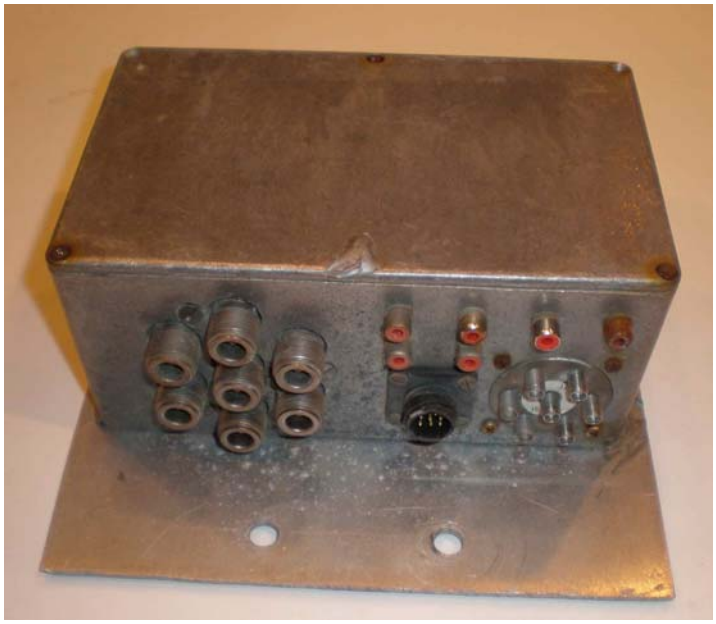
The TX line is LDF5. Note this overmodes around 5GHz which results in excessive loss above 5GHz. This is not an issue in my case as on 5760 and 10GHz I have tower mounted transverters that need 435MHz drive. The RX line is LDF4. It could have been another piece of LDF5 but I went to the LDF4 to save weight. The control cable that goes up the tower (PL1/PL3) to the upper box is a 70’ 8 core rotator cable, one of the thicker cores is used to feed 13.8V to the tower mounted Transverters. The cable has an 8 pin connector on each end. The cable to the lower box (PL2/PL4), located in the shack uses a short length of 8 core screened cable. It is only 6’ long so voltage drop is not a concern. It has identical connectors to the long cable so it doesn’t matter which cable is plugged into SK1 or SK2 as they are wired identically

Construction

The lower box is an 7x3x5” diecast box and has 2 relays and an 8 pin power connector.



The upper box is 7x3x5” diecast box and has 2 relays a power connector and 6 Phono sockets to get the 28V on RX signals from RL4/2 to the preamps.



The control circuitry and indicator are mounted in a 8x6x3” aluminium box.

Figure 1 Circuit of 6 Band switching system

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