Coax Notch Filters ... John Crowder G0GDU

When you run JOTA or other special event stations, do you run more than one transceiver, and have you experienced receiver overload problems?

If so, then you may like to consider and benefit from our experience.

In 1993, at a special event station for the Sherwood International Camp, we were running simultaneously on 80m, 40m, 20m and 15m or 10m. Whilst more pronounced on some bands than others, each station experienced receiver overload. Having subsequently read an article about the experiences of a DXpedition group, we contacted the author and as a result of the ensuing discussions, it was suggested that we try using Coax Filters and were provided with a copy of an article by Fred Lass (K2TR).

During the preparations for Sherwood 98 we followed up these suggestions and made up a number of Coax Filters that were incorporated into the various stations. Their use virtually eliminated the problems we had experienced 5 years earlier.

Coax filters are simple to make, and in addition to preventing receiver overload, more than 20dB of harmonic rejection is possible with their use.

Materials Required

A Coax Filter is simply made from a length of coaxial cable cut to a specific length dependent on the frequency band it is required to null. Any coax with a solid dielectric can be used. Foam dielectric cables have varying dielectric constants and are not suitable if accuracy is desired.

Consideration must be given to the amount of power that will be dissipated in the cable. For power levels of up to 100 Watts you can use RG58 or URM76. Where you intend to use power levels over 100 Watts, then it is better to use a cable with higher power handling characteristic such as RG213 or URM67. Where more than one stub filter is attached to a transmitter then it is better to ensure that each is made from the same type of cable.

A PL259 plug, size dependent on the type of coaxial cable used, will be required for each coax stub to connect it to the feedline.

For each coax filter, you will also require SO259 Female Tee adaptor. If you are to fit two or more filters onto one transceiver then you will also need a PL259 back-to-back straight adapter. You may be able to eliminate the use of the straight adapters if you are lucky enough to find a Tee with a PL259 plug on one end and SO259's elsewhere.

Construction

Coaxial Filters stubs are simply made from a length of Coaxial Cable one end of which is terminated with a PL259 of the appropriate size. The other end is either left open or shorted depending on its function. The advantage or using Coaxial cable is that it can be tied up into small coils to take up minimal space without adversely affecting performance.

Having cut the cable to the required length it is recommended that:
for open ended stubs, remove about a 1/4" (6mm) of the outer insulation and braid from the end to remove the potential of accidental shorting;
for shorted stubs, remove about 1/4" (6mm) of the outer insulation. Then fold back the braid before removing the inner insulation. The braid and centre conductor should then be soldered to provide a good electrical contact.

Seal the end of the stubs with several layers insulation tape or self amalgamating tape.

The length of each coax stub is dependent on the design frequency. The basic formula for the length of a shorted 1/4 wave stub is 246xV/f (in feet); where V is the velocity factor of the cable, and f is the frequency in MHz. (75xV/f in metres)

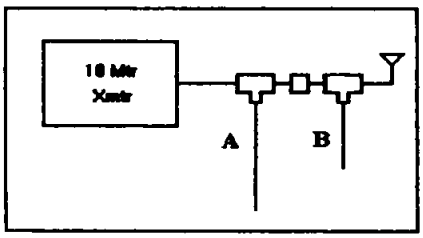
Original article by John Crowder G0GDU

Connection

Use a short length of coax, typically 4 - 5 feet (1.2 – 1.5m), which is terminated each end with a PL259 and used to connect the transceiver (or linear amplifier, if used) to the transmission line through a Tee piece. This length is usually sufficient to enable the Coaxial Filters to be placed on the floor or other out-of-the-way position.

Connect the short length of coax from to the main transmission line using an SO259 Tee adapter, and connect the Coax Filter to the third socket on the Tee.

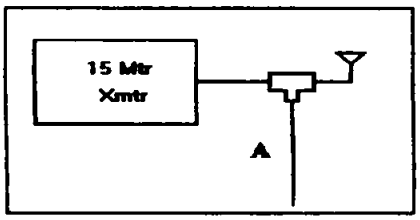
The table below gives construction and connection details of the coax filters required for each band and the effect of their use. Coaxial filters are reasonably broad band, but the table is optimised for SSB operations. On 80m if you are using are CW and SSB then a second filter may be required cut for the CW end.



10 Metre Transceiver

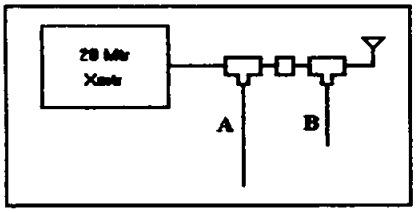
A. nulls 20m; length 11' 5 1/4" (3.486m) , end open.

B. nulls 40m & 15m; length 22' 10 3/8" (6.969m) , end open



15 Metre Transceiver

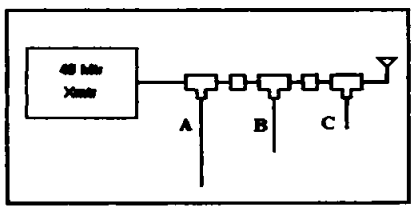
A. nulls 20m and 10m; length 22' 10 3/8" (6.969m) , end shorted



20 Metre Transceiver

A. nulls 40m & 15m; length 22' 10 3/8" (6.969m) , end open

B. nulls 10m; length 11' 5 1/4" (3.486m) , end shorted

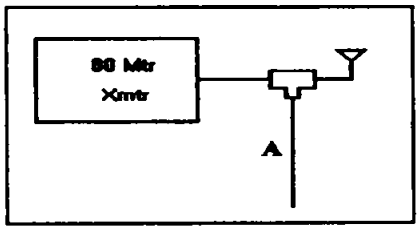


40 Metre Transceiver

A. nulls 20m & 15m; length 22' 10 3/8" (6.969m) , end shorted

B. nulls 15m; length 15' 3" (4.648m) , end shorted

C. compensates for reactance from filter B, this pair works out to a 1/4 wave on 40m; length 7'8" (2.337m) , end open



80 Metre Transceiver

A. nulls 40m, 20m, 15m and 10m; length 45' 8 3/4" (13.938m) , end shorted.