

Contesting



PHOTO 1: Don, G3BJ's station equipped for SO2R operation.

This month, we are considering equipment for progression on the HF bands.

After considering the options for antenna improvement in a contest station, let's turn to the components in the radio shack that are desirable for a contest station with improved competitiveness. We will set an aspiration that we wish to have our station equipped to be able to compete using SO2R (Single Operator Two Radios) operation – that is to be able to transmit on one band whilst listening on another (Photo 1). Of course, to operate using SO2R takes practice and experience, plus for contests with slower run rates, SO2R is easier. For the purposes of this article we will concentrate on the equipment required rather than how to operate it.

We will not recommend particular manufacturers, but will suggest available examples as we examine the key functionality that is required in the station.

What do we need, that isn't needed for everyday single-band operation?

- Assuming that our contest station will be used for multi-band events, it is important that we are able to listen on one band whilst transmitting on another band
- Band changes should involve few manual interventions and no lengthy tuning procedures

Radios

What is the best transceiver for contesting? Initially, the radio that you already have is the best one. But if you are keen to invest in new kit, what should you consider?

The facility to listen on both your transmit frequency, and on another frequency on the same band at the same time, is an advantage. A radio with two receivers is hugely helpful. Here it is likely that a radio that is good for contesting will also be good for chasing DX (able to listen to a DX station's run frequency and to their pile-up at the same time).

Many modern radios have excellent waterfall displays which enable you to see where other stations are and, if you are looking for a run frequency, they show where there is a gap to try.

Radios improve as technology moves on. Receivers with SDR technology seem to be quieter than earlier models. If you want to compare specifications, the Rob Sherwood NCOB receiver sensitivity test tables are useful [1].

As for transmitters, arguably there is little to choose between them, but some are known to generate more noise than others – whether this be by key-clicks, splatter or broadband transmitted noise. This is likely to affect reception on other bands, quite apart from the likelihood of your interfering with other amateurs.

Ergonomics are a consideration too. If you are going to be operating two radios together, it is likely to be easier if they are the same as each other, or at least very similar.

Amplifiers

In contesting, an amplifier may be used to increase your signal strength, which will make it easier for other stations to copy your signal. A louder signal may improve the likelihood of you achieving your contest objectives. Of course, there are contest sections for which amplifiers must not be used. However, for high-power sections, to be competitive, you will need an amplifier to put you on an equal footing with other entrants in your section who have similar locations and antennas to you.

Why enter a high-power section?

1. You are more likely to be able to hold a run frequency despite QRM from other entrants
2. Your run rate is likely to be higher than it would be at lower power, which is evidenced in contest records
3. When trying to work new multipliers you are likely to be heard sooner than other callers

What characteristics are important in an amplifier for contesting? Here again, automatic operation is a big advantage. For a valve amplifier, we do not want to be adjusting it for each band or frequency change. Solid state amplifiers are often easier to operate although, arguably, are more susceptible to damage if they encounter an unexpected change in load.

Many contesters choose to run low power (100W) or QRP (5W). For them the challenge is different than for a high-power entrant, but the rewards can be just as great.

Remember also, as mentioned in previous articles, it is the effectiveness of your antennas that will influence your success more than the raw power that you are transmitting.

Computer equipment dedicated to the radio station

For ease of use, having one or more computer screens above the radios with keyboards in front of the radios, works well. Being able to touch-type is an advantage and reduces tiredness as you don't have to keep moving your eyes from keyboard to screen. Large, high-resolution monitors are also useful and these no longer necessarily come at a high cost. You may use a single computer for two radios, which is a common preference, or a computer for each radio. There are a number of small PCs available that can mount on the back of a monitor which have become popular for contest stations. Alternatively



PHOTO 2: Remote antenna relay switch unit housed in an IP65 enclosure.



PHOTO 3: Martin, GW4XUM with antenna switches and band-pass filters

you may use a laptop with an external monitor and keyboard, as this can double for any portable operating that you may wish to do.

For SO2R operation, using two keyboards (one for radio 1 and another for radio 2), enables a relatively-simple transition from single radio operation to two radios and makes it less likely that you will log a QSO on the wrong band.

How well can you see your radio and your computer screens?

If you wear glasses, consider asking your optician to prescribe a pair with fixed lenses that are optimised for computer work. These can make a big difference if you are contesting for long hours, as your eyes will be less tired. Furthermore, if you wear varifocals you will not have to keep moving your head.

How to key the radios

For SSB, a footswitch is great, perhaps even essential, for selecting transmit. You will have both hands free for typing your log or adjusting your radio. You certainly don't want to be holding a fist mic and VOX is not snappy enough for contest exchanges.

For CW and data modes, or when using a voice-keyer (DVK) with SSB (typically to send a recorded CQ message), you should have no need to select transmit but should key automatically from your logging or data modes software.

On the subject of voice keyers, it is valuable to be able to edit your recorded voice message using a sound recording editor, to remove all empty time at the start and end of a message – making the message as snappy as you can. There are lots of free audio editors available such as Audacity [2], which will make light work of cropping your messages.

Auto band detection

Of course you can see which band your

radios are switched to but for automation you will need circuitry that can switch antennas and select band-pass filters automatically to correspond to the radios' selections. Auto Band Detection and associated circuitry avoids you having to manually switch antennas and filters.

Commercial units are available which can decode Yaesu, Kenwood and Icom band data and provide separate output signals for each band. There are plenty of options available, some of which are devoted to a particular radio manufacturer's band data protocol. There is an opportunity here for some simple homebrew circuits which can interface between band data and relays for switching external equipment.

Band-pass filters

Firstly, we consider low-power band-pass filters that are installed at the RF input/output of a transceiver and before any amplifier that we might be using. These have several functions: they protect the front-end of the receiver that is listening while transmitting on another radio and they reduce noise at that receiver too. The band-pass filter in the transmit circuit will reduce spurious signals and noise that is generated outside of the transmit band. The band-pass filter in the receive circuit will reduce breakthrough into that receiver from the transmitting band. Typically, these filters will handle up to 100W continuous power. Multi-band units are available where switching can be automated in conjunction with band detection.

Secondly, we may have high-power band-pass filters which are often combined with a high-power triplexer to allow a multi-band antenna to be used simultaneously on two or more bands. Being able to transmit with high power on one band whilst listening to low-strength signals on another band on the same antenna, is a powerful facility for those who cannot have multiple monoband antennas.

Try to avoid listening on frequencies that are a harmonic of your transmit frequency. You will notice that DXpeditions, that are activating multiple bands, will choose frequencies that avoid direct multiples of frequencies on lower bands as no band-pass filter can completely eliminate direct harmonics.

Antenna switching

Antenna switching is a prime candidate for automation using band detection (**Photo 2**). The ideal is to be able to change band and to have a resonant antenna selected immediately. This is where 50Ω co-ax feeders show their worth.

There are a number of commercially-available antenna switches that provide co-

ax outputs to two radios and inputs from antennas on the contest bands from 160 to 10m. Typically, you might design your antenna system so that the switching is mounted in a weather-proof housing and is operated remotely from your radios.

This is another area where home-brew equipment is relatively simple to build.

SO2R controller

Simplistically, this provides the interface between your contest logging software and your radios to enable you to transmit on one radio whilst listening on the other. This includes routing microphone, footswitch, PTT lines, CW keyer and AF output from your radios and headphones. Niceties may include linear amplifier keying with a configurable delay before keying your transmitter and a CW keying chip.

Several commercial options are available which are likely to have features that you don't need in addition to those that you do. This is another area where a home-brew route can be followed.

The simple functionality that you will probably want is to be able to listen on one radio in each ear when not transmitting and to switch to listening to your second radio in both ears when transmitting on your first radio – and vice versa.

Featured Contester: Martin Platt, GW4XUM

Martin, GW4XUM (MW4R) (**Photo 3**) has built a competitive SO2R station in Flintshire North Wales and can often be heard in the major HF contests.

His station is fully automated using a Flex6600 (which provides two-band operation) and two quad-band Yagis with extensive band-pass filtering which is used to reduce interference between bands. This enables Martin to CQ and make QSOs on one band whilst interleaving QSOs on another band – effectively almost doubling his QSO rate.

References

- [1] Sherwood NCOB receiver sensitivity test tables:
<http://www.sherweng.com/table.html>
- [2] Audacity Audio File Editor:
<https://sourceforge.net/projects/audacity/>

Useful resources

- [1] RadCom Contesting:
rsgb.org/radcom-contesting
- [2] Email: contestclub@rsgbcc.org

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