

Remote Operation (Part 1)

Don Field G3XTT takes a look at the reasons for remote operation and some of the issues surrounding why you might want to operate remotely as well as what is and isn't allowed. Later articles will focus on the technological solutions currently available.

it up and to operate his station remotely. Others have used VHF radio links to control an HF station.

Here in the UK, the issue for many years was not the technology but the licensing. Not surprisingly, our licensing body has always been cautious about allowing remote operation, primarily because a fault condition could lead to a permanent carrier or other out of band spurious emissions, with no way to close the station down. This is why there have always been quite strict rules regarding repeaters and beacons in terms of site access, nominated contacts and so on. However, the advent of the internet has encouraged the development of remote control technology and the UK regulator has recognised that there is an increasing demand for such operation.

Why Remote

The first question to ask, though, is why anyone might be interested in operating an amateur radio station remotely. Once we have answered that one, we can start to think about how it can be achieved.

Probably the two biggest challenges to amateur radio in the UK are planning restrictions and man-made noise. Between them, these two restrictions can make it difficult and in some cases impossible to enjoy the hobby to the full from your home. One solution, popular with many, is to head out mobile or portable. However, this doesn't give you 24-hour access to the airwaves. In contrast, a remote station can do exactly that. In the US, there are some well-equipped amateurs offering remote access to their stations for an annual fee, Fig. 1. Commercial operation of an amateur radio station is specifically prohibited in the UK amateur licence. In any case, somehow this doesn't gel with my own view of what amateur radio is about but there may be other solutions.

You may, for example, have a relative or friend who lives out in the country and is prepared to allow you to install a station on their property. It need not be anything ambitious – a discreet vertical and a small transceiver may well be more than you can manage at home and you can probably control them via the relative's existing internet connection without them even noticing. The bandwidth requirement to run a remote station is quite modest.

Some people get involved with remote operation for quite the opposite reason. That is to say, they want to be able to operate their existing home station when elsewhere such as from their office or from a hotel when travelling. It's particularly handy if you are a DX chaser. The DX

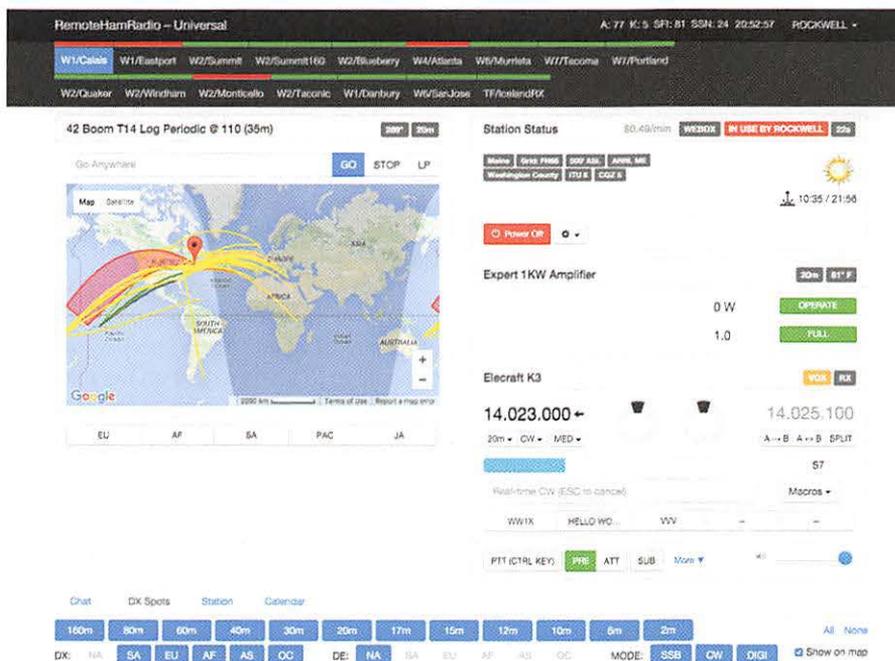


Fig. 1: Control interface for the commercial RemoteHamRadio offering (remotehamradio.com). Such commercial offerings are not allowed under the UK licence.

Some months ago we promised an article on remote operation. I apologise that it hasn't appeared sooner but we have had so many other excellent articles to run that this one has been delayed.

In the May 2014 issue of *PW* we carried an article about remote internet receivers and, not surprisingly, we received questions about remote transmitting.

There is nothing new about amateur radio stations being operated remotely. In some parts of the world this has been common for many years. I have a British friend, for example, who moved to Canada some years ago and was able to get his hands on a disused commercial antenna site for his amateur radio activities. However, the winter weather can be so extreme where he lives that it becomes impossible to drive to the site so he installed a telephone line at the remote site, allowing him to dial

doesn't always respect office hours or holiday plans but you may be able to work that rare station during a coffee break at the office.

Another increasingly important reason to look at remote operation is so that elderly amateurs, for example, no longer able to have a big station of their own, might be able to continue in the hobby. A local club could possibly make time available on the club station. In a situation such as this, with shared access, a number of considerations arise to do with equitable sharing of time slots, keeping track of who the operator is at any given time and so on. The RSGB is currently working with Ofcom to achieve clarity in this important area. There is a whole section on the RSGB website on the subject, including the following overview statement, "*The Society believes that the amateur radio community is interested in both remote operation of an individual's station, as well as remote-stations being set up expressly for a group or club for its members. The benefit would be for students, the elderly or disabled amateurs or others who, for a variety of reasons, cannot set up an effective station at their home*".

Regulatory Issues

There are no regulatory issues pertaining to remote receivers. However, where remote transmitters are concerned, it becomes something of a minefield. The UK licence now allows you to have a remote transmitter although this is a relatively recent innovation (see sidebar for the current wording). **David G3UEG** was the first to get a Notice of Variation (NoV) for remote operation, back in 2001. However, since 2006 it's been built in to the licence. David's experiments were reported in the RSGB's *RadCom* in its August, September and October 2005 issues. More recently, at the RSGB 2013 Convention, **John Regnault G4SWX** described not only the reasons for and rules pertaining to remote operation in the UK but also described his own remote station and other hardware solutions available at that time.

Safeguards

There are, of course, stipulations about the safeguards you need to put into place to ensure that a remote station can be rapidly switched off if problems occur. These rules simply follow the requirements that have been in place for repeaters for many years. The overriding principle is that the operator, whether physically present or remote, must be in control of the amateur

station at all times. In the special case of amateurs operating under supervision, it is the responsibility of the supervising amateur to exercise such control. Other considerations include:

1. The licensee should have the means to shut down the radio equipment remotely if required, either because a fault has developed or if ordered to do so. This can be achieved relatively simply nowadays from something like a Smartphone App controlling an intelligent switch at the transmitter site. This must turn off all power to the station, not just to the transmitter. The station should, in any case, be fail safe, for example by having a timer that shuts it down automatically under certain predetermined fault conditions. Remotely controlling a PC that subsequently controls a transmitter is not adequate because a failure in communications or a lock-up in the PC will leave the transmitter in an uncontrolled state.
2. The licensing authority (Ofcom) should have on file contact details of how to contact the station owner. It is the responsibility of the licence holder of the station in question to be on call and to be able to switch off the radio equipment if the necessity arises.
3. Remote operation should not in any way be commercial. Not only does this mean that the US rental system I mentioned above would be unacceptable in the UK. Renting premises or land for an amateur station, fixed or remote is fine because you are paying for the facilities that support your amateur station. However, you cannot be seen to be paying for the actual operation of the station. Specifically, what the UK licence does not permit is selling access or time on an amateur station.

Some countries are very lax regarding remote operation or have simply not woken up yet to the extent of this sort of activity. Others are strict. Cross-border remote operation is even more complex. The rules are changing all the time. What you should be aware of, though, is that the CEPT licensing arrangement whereby UK amateurs, for example, can operate amateur radio from a large number of European and other countries without having to apply for a reciprocal licence, does not apply to remote operation. Remote operation is quite simply a 'no no' under the auspices of the CEPT licensing arrangements. There is nothing, though, to stop you sitting in a hotel room in Paris or Bangkok and controlling your UK station from there, provided the three principles I mentioned earlier are adhered to, particularly the requirements concerning

station closedown You are a UK amateur operating your UK station, albeit with a rather long microphone cable and PTT switch!

Just to be absolutely clear, therefore, US licensee AB1UO is not permitted to remotely use a UK amateur station as G/AB1UO. Neither am I allowed to sit in the UK and sign F/G3XTT by remotely operating a friend's station in Paris. However, a UK licensed amateur is allowed to remotely use his UK station from overseas provided that he can satisfy all of the other constraints of the licence. If I were operating my home station from a hotel in Germany, for example, I would still sign G3XTT.

Ethical Issues

If you take part in the competitive side of amateur radio, there are ethical issues involved in any sort of remote operation, whether receiving or transmitting. At least part of the problem is that many contest organisers and award sponsors have yet to get their heads around the issues associated with remote operation. For the time being, the only advice we can give is to read and follow the rules pertaining to the specific activity you are taking part in while, of course, also obeying the regulations as they apply to you and your station.

If you use a remote transmitter and/or receiver in a different country, then other ethical issues come into play, again depending to some extent on the rules of the award you are chasing or contest you are taking part in. For a while, the CQWW contests allowed an 'Extreme' category whereby the entrants in that category were encouraged to use technology to the limit. A well equipped US contest station could, for example, use a remote receiver in Europe to hear the European QRP operators who were calling him. However, if I'd been one of those European QRPers who thought his weak signal had been heard in the USA, only to discover it had actually been copied on an internet receiver just down the road, I suspect I would have been rather disappointed, to say the least.

The same scenario plays out the opposite way, too. Let's suppose an unscrupulous UK station needs a particular Caribbean country on 80m, checks out the internet and finds a resident amateur there who he e-mails for a schedule. The Caribbean amateur only runs a few watts to a poor antenna but our UK friend has a high dipole and 400W, so he is pretty sure that if he picks the right time of the day he will be audible in the

What the UK Amateur Licence Says

- 10 Unattended and remote control operation
- 10(1) The Licensee may conduct unattended operation of Radio Equipment provided that any such operation is consistent with the terms of this Licence. Additional Restrictions which apply to the Unattended Operation of Beacons are specified in Schedule2 to this Licence.
- 10(2) Subject to Clause10(3) the Licensee may also conduct Remote Control Operation of Radio Equipment (including, for the avoidance of doubt, Beacons) provided that any such operation is consistent with the terms of this Licence.
- 10(3) This Clause 10 does not permit the Licensee to install Radio Equipment capable of Remote Control Operation for general unsupervised use by other Amateurs.
- 10(4) Any communication links used to control the Radio Equipment or to carry Messages to or from the Radio Equipment in accordance with Clause 10(2) must be adequately secure so as to ensure compliance with Clause 3 of this Licence. Any security measures must be consistent with Clause 11(2) of this Licence.
- 10(5) The use of any such communication links referred to in Clause 10(4) must be fail safe such that any failure will not result in unintended transmissions or any transmissions of a type not permitted by this Licence.

Caribbean. However, what to do about hearing the Caribbean station? He decides to listen on an internet-connected receiver in Florida and, lo and behold, the schedule is made successfully. Is the contact valid for an award? Maybe. Many award sponsors have yet to address the whole subject of remote operation so their rules may be sufficiently open as to make this contact allowable. However, I and many others would consider that it was outside the spirit of any awards programme and wouldn't feel happy about claiming such a contact. The ARRL has recently updated its rules about what is and isn't acceptable for the popular DXCC Awards Programme



Fig. 2: The RC-1216H switch from Microbit (remoterig.com) allows control of accessories such as a linear amplifier, SteppIR antenna or antenna rotator.

but many other award sponsors have yet to make similar rulings.

The Technology

We will look at the technology in later articles. Early users of remote operation had, for the most part, to devise homebrew solutions. Nowadays there are a number of commercial solutions available although none are exactly plug-and-play. At the basic level, the need is to be able to turn on and off a remote transceiver, to tune it and operate other key controls and to be able to send and receive voice and/or Morse transmissions. If you are wanting to operate on phone, for example, you need a control channel to handle the interface with the transceiver, essentially replicating what you already have on the operating table between transceiver and PC (usually by way of an RS-232 or USB interface). You also need a voice channel. Some users have simply turned to readily available solutions for this, such as having a Skype session open at both ends.

Morse can be more of a challenge because of latency in any internet link – even slight transmission delays can make it tough to send Morse correctly if, for example, you are listening to your sidetone coming back from the remote transceiver. By the time your data packets have crossed the internet, been processed at the far end and routed to the transmitter, there is often a delay of several tens or even hundreds of milliseconds. If, for example, you are sending Morse at 25WPM, the latency can be equivalent to the length of a couple of dots. If you are trying to use full or even semi-break-in operation, this can present problems. Similarly, if you have a duplex channel and are trying to listen

to your voice transmission, you will hear your voice slightly behind your speaking – this can quickly reduce you to talking complete gibberish. The good news is that as equipment and the internet have improved in respect of processing speed and bandwidth, latency has gradually been reduced. Often, if you are using your home station to work someone, you won't be aware that they are running a remote transmitter unless they specifically tell you so because they will be responding in near enough real-time when, for example, you pass the transmission back to them.

Where the technology starts to get rather more complex is when you want to control other equipment at the far end. Some users have solved this to the extent that they can switch on and off a remote linear amplifier, select and rotate antennas and bring other devices on and off line. However, that's beyond the scope of much of the equipment currently available on the commercial market although solutions are becoming available. RemoteRig's solution for the Acom linear amplifier is a good example and also allows the user to remotely control the Acom ten-way antenna switch, **Fig. 2**. Several models of antenna rotator also lend themselves to remote control. Remote metering has been a challenge but solutions are starting to emerge. It's getting easier all the time, with intelligent switches, Arduino processors and the like. Many of the principles have been described in **Mike Richards G4WNC's Data Modes** columns here in *PW*.

Some transceivers lend themselves well to remote operation, the Kenwood TS-480 and the Icom IC-7100 with their separate control heads being good examples. Whether the link between control head and main unit is a few inches or a few



Fig. 3: The Elecraft K3/0-mini replicates the front panel of the K3 transceiver to allow remote control over the internet.



Fig. 4: Microbit supply generic interface boxes as well as products specifically tailored to Elecraft and to Yaesu equipment.

hundred miles is, fundamentally, of no consequence except, as mentioned earlier, for the issues arising from network latency. Elecraft have taken a different approach with the K3 transceiver, which is to offer the K3/0, **Fig. 3**, which integrates with a remote control solution from RemoteRig. This is, in effect, the front panel of a K3 that can be used remotely to operate a full K3 at a remote location. The Elecraft remote approach currently has far lower latency than some of the solutions from other vendors and is therefore proving very popular.

The K3 can also be controlled from a Smartphone or tablet PC with the

right software. However, this technology involves the use of a host PC at the station end, which, arguably, does not satisfy the licence conditions unless there is another channel of ultimate station control.

Those SDR transceivers that have the audio processing on board (the Flex Signature series being a good example) also lend themselves to remote control because there is relatively little data passing between the transceiver and the PC that is controlling it. Again, though, a strict interpretation of the Ofcom rules would require a separate channel for ultimate station control.

We will take a look at some of the interface devices, **Fig. 4**, available in a future article. In the meantime, a Google search for "amateur radio remote station operation" or similar will bring up plenty of hits. Bear in mind, though, that what is now normal practice in some countries (particularly the USA) is not necessarily acceptable under the terms of the UK licence. My thanks to David G3UEG, David G4FRE, John G4SWX and Justin G4TSH for help in preparing this article. Any errors are mine.



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