

Guide to HF Operating - Part 1: Getting Set Up

THERE IS A tremendous amount of activity, interest and excitement for those who operate on the HF bands. It's possible to contact stations from all parts of the world, participate in contests, contact DXpeditions, and do so much more on these bands. With the enormous success of the Foundation Licence there are many new people participating in these activities. The Foundation Licence gives excellent access to the amateur bands. Operation is allowed on all UK amateur bands between 135.7kHz and 440MHz, except for the 10m band (28.0 - 29.7MHz). The power limit for Foundation Licensees is 10 watts delivered to the antenna, while for Intermediate Licensees it is 50 watts and for Full Licensees 400 watts.

To make the most of these bands there are some choices that have to be made. Decisions about the equipment, antennas, and possibly which bands to focus on for antennas. By having a good knowledge of the bands more enjoyment can be gained, and more effective use can be made of the time available. People soon build up preferences for particular bands and find they can contact more of the stations they want.

CHOOSE YOUR EQUIPMENT

THE CHOICE OF equipment is important as most of us are on a limited budget and want to spend it wisely. Fortunately there is a wide variety of equipment available at prices that represent excellent value. New equipment has a number of advantages - including a manufacturer's guarantee, but to cut the cost it is possible to buy second-hand equipment. Beware, though, because some private sales may not always represent good value.

by Ian Poole, G3YWX *

With the incredible increase in HF activity since January 2002, thanks to the introduction of the Foundation Licence, we have been asked for a 'beginners' guide' to the HF bands and HF operation, suitable for newly-licensed M3 stations and other absolute newcomers to HF. Ian Poole, G3YWX, first looks at basic HF equipment and antennas and gives a brief guide to the characteristics of each of the HF bands.



Jonathan, M5FUN, has 'fun' operating on HF with this simple station: a 100-watt transceiver powered from a 13.8 volt mains power supply.

It is also worth noting that people with a Foundation Licence are only able to use transmitting equipment that conforms to EC standards, or it must be a commercially-available kit that can only operate inside the amateur bands. Any commercially-made amateur radio transceiver made in the last 20 years or so should conform to this standard. It is also worth noting that kits must

also have a means of measuring power output, or be designed so that they cannot produce power levels over the legal limit. Commercially-manufactured equipment that is capable of running more than the legal power limit is permissible, but it must be operated within the power limitations of the licence.

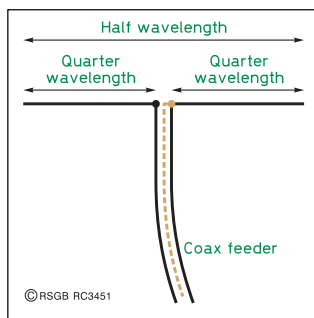


Fig 1: The basic half-wave dipole.

CHOOSE YOUR ANTENNA

AS ANYONE WHO has held a transmitting licence will know, the antenna is crucial to the operation of the station. A poor antenna will limit the performance of the station regardless of the quality of the equipment, but a good antenna will make the most of the station, allowing all the equipment to perform at its best.

Having said this, antennas are usually a compromise. Very few people are able to install a large Yagi on a tall tower at the top of a hill. Most people settle for wire antennas and these can be very successful. They can certainly be the cheapest! Often the most reliable antennas are dipoles (see Fig 1). These are basically single-band antennas, but to give a multiband capability several dipoles can be fed from the same feeder. Alternatively, multiband trap dipoles can be made or bought. Long wires (or more correctly 'end-fed wires') are not ideal because they need to be fed against a good earth and because they radiate along the whole length of the wire their use can often lead to high levels of radiation in and around the shack. This can lead to RF getting into the mains wiring, which can result in interference problems.

Vertical antennas are worth considering - see Fig 2. Having a

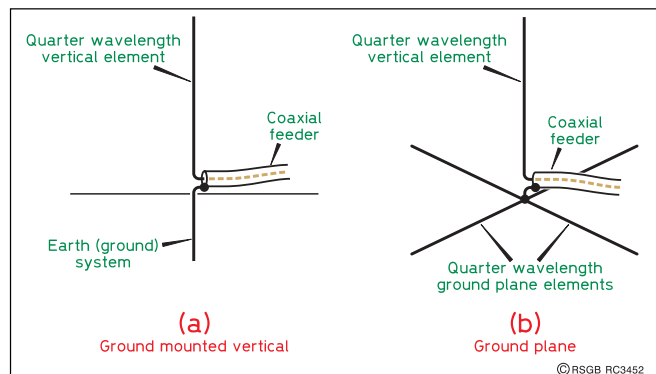


Fig 2: Simple vertical antennas (a) using a direct connection to earth, and (b) using four quarter-wave long 'ground plane' wires or rods.

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A large HF antenna array.

low angle of radiation they are good for DX. Most of these antennas need either a set of radials or a good ground connection. If a ground connection is to be used it is necessary to ensure that it is very effective. Plenty of metal surface area and also as many buried radials as possible will help ensure that the antenna works effectively. However, in areas where soil conductivity is poor results can be disappointing. An

A BEGINNER'S HF VOCABULARY

angle of radiation Angle from the horizontal of most of the radiation of a transmitted signal. The lower the angle (eg 5 - 10°) the greater the signal at the horizon and therefore the better for long-distance communication. The higher the angle (eg 80°, nearly vertically upwards) the worse for long-distance communication (but better for short-distance signals).

beam antenna Antenna consisting of more than one element that provides both directivity and gain.

CW Continuous Wave, usually meaning Morse Code.

director Element of beam antenna placed in front of the dipole; typically a few per cent shorter than the dipole.

DX Any station or signal that is rare or otherwise unusual, either because of distance (eg New Zealand) or because of 'rarity value' (eg Libya, which is only as far away as Malta, but which only has a very small number of amateur stations.) It is also dependent on the band in question: Malta would not be considered DX on 20m, but would be on 2m.

DXCC DX Century Club, an award issued by the American Radio Relay League for confirmed (QSLd) contacts with a minimum of 100 entities or countries.

DXer Amateur who enjoys making contacts with DX stations.

DXpedition Radio operation specifically for the enjoyment of making contacts from a 'rare' or unusual location.

element Single length of wire or rod making up part of an antenna; a dipole is therefore a single-element antenna, a Yagi may be a 2-element, 3-element or more antenna.

end-fed wire More correct name for a long-wire antenna.

fed, feeder 'Feeder' is the cable connecting the station to the antenna.

HF Strictly 3 - 30MHz (100 - 10 metres), but usually taken also to include the 160 metre amateur band.

IOTA Islands On The Air, an award issued by the RSGB for confirmed (QSLd) contacts with a minimum of 100 island groups.

... More next month!

THE UK HF AMATEUR BANDS

160metres, 'Topband' (UK Allocation 1810 - 2000kHz): Although not strictly speaking an HF band because it falls below 3MHz, 'topband' is usually considered with the 'true' HF bands. During the day signals may be heard over distances of 50 miles or more dependent upon the transmitter powers and antennas used. At night distances increase and it is possible to hear stations several hundreds of miles away and on occasions trans-Atlantic or even trans-global contacts can be made. The band suffers from the disadvantage that it is only allocated on a secondary basis to amateurs and there can be interference from other users.

80metres (UK Allocation 3500 - 3800kHz): Like 'topband' this one is also shared with other services and can be noisy, especially at night. During the day the distances that can be reached are greater than those on topband but are usually limited to a few hundred miles. At night stations from further afield can be heard and distances of over 1000 miles are common. Greater distances can be achieved by those with good antennas. The band comes into its own during the years of the sunspot minimum, but it can perform well at any time.

40metres (UK Allocation 7000 - 7100kHz): The 40 metre band is a particularly useful band providing an interesting mix of short haul contacts by day and world-wide communications at night. It is a favourite band for many during the low part of the sunspot cycle, being capable of long haul contacts during the hours of darkness.

30metres (UK allocation 10100 - 10150kHz): This band was released for amateur use after the World Administrative Radio Conference held in 1979 ('WARC 79') and is therefore known as one of the 'WARC bands'. It is still not very widely used, but is capable of giving good results. It is very similar in character to the 40 metre band, being only slightly higher in frequency. Due to the band being only 50kHz wide, only narrow-mode bands such as CW (Morse code) are recommended for use on 30 metres.

20metres (UK Allocation 14000 - 14350kHz): This is the main long haul band for radio amateurs, reliably giving the possibility of long distance contacts during all phases of the sunspot cycle. During the day stations up to about 2000 - 3000 miles can be heard when conditions are good, and there are virtually always stations up to 1500 miles to be heard. The band often closes at night during the winter and during the sunspot minimum. During the summer and at the sunspot maximum it remains open most of the night and stations from many parts of the world may be heard.

17metres (UK Allocation 18068 - 18168kHz): Like the 30 metre band this band is not as widely used as some of the others. It is very much a half-way house between 15 and 20 metres and although rather narrow it is still well worth investigating when conditions look promising. It can offer some excellent opportunities for contacting DX stations. Although beam antennas are available for the band, most stations still use dipoles as those with beams tend to use them on the more traditional DX bands of 10, 15 and 20 metres, thereby limiting the number of strong stations on 17 metres. However, more beam antennas are appearing with the result that more people are using the band.

15metres (UK allocation 21000 - 21450kHz): This band is another popular band but it is more variable than 20metres, being affected more by the state of the sunspot cycle and on some days it may not open at all. During the peak of the sunspot cycle it is open during the day and well into the night when it will support propagation over many thousands of miles.

12metres (UK allocation 24890 - 24990kHz): This band is greatly affected by the position in the sunspot cycle, and has many similarities with 10metres, although it may just support propagation when 10metres cannot. However, it will follow very much the same pattern as the slightly higher frequency band. Like 17metres, this band is quite narrow, but worth investigating when conditions mean the band could be open. Also there are few stations using beam antennas and this makes it a good hunting ground.

10metres (UK allocation 28000 - 29700kHz): This is the highest frequency band in the short wave (HF) portion of the spectrum, but is not available to holders of the Foundation Licence. It is greatly affected by the state of the sun, and during the years of the sunspot minimum it may not normally support long distance communications. However, when conditions are favourable, it can produce some very impressive results, even for those using low powers and with modest antennas.

More details can be found in *Amateur Radio Explained* [1], or for a fuller and easy to understand explanation of radio propagation, refer to the RSGB publication *Your Guide to Propagation* [2] or visit my website (see WWW. below).

alternative is to raise the antenna well above the ground and use a set of radials or a ground plane. As the name suggests these simulate the ground. Several types of vertical antenna are manufac-

tured, and many of them are able to operate on multiple bands. Often if they need radials for their operation, radial kits are available. These usually have coils included in them, making them shorter than the quarter-wavelength radials normally required.

It is not possible to cover the full subject of antennas in a few

short paragraphs. However, far more information can be gained from RSGB publications such as *Backyard Antennas* [3].

CHOOSE YOUR BAND

ONE OF THE secrets of successful operating is knowing where to look and when. Band conditions are always changing, not only over the course of a day, but from day to day, and as a result of the changing seasons. On top of this the day to day state of the sun has a major effect. Experienced operators know how to tell when conditions are likely to be good. Not only is propagation an issue, but also some of the bands are more popular than others. Whilst this means that there are more stations to contact, it also means there is more interference and more competition. By knowing which bands to use, the most efficient use can be made of the station and the time available, especially if power is limited as in the case of the Foundation Licence. This is where the operator's skill can help make up for not having a high-power station with a large antenna on the top of a hill.

SUMMARY

THIS IS NATURALLY very much a whistle-stop tour of getting started on the HF bands. For anyone wanting to read more about this, *HF Amateur Radio* [4] published by the RSGB is a good buy. Next month there will be part two of this article and this will look at actually operating on the bands.

FURTHER READING

- [1] *Amateur Radio Explained*, Ian Poole, G3YWX.
- [2] *Your Guide to Propagation*, Ian Poole, G3YWX.
- [3] *Backyard Antennas*, Peter Dodd, G3LDO.
- [4] *HF Amateur Radio*, Ian Poole, G3YWX.

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WWW.

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