

## Lesson 7 – Operating Procedures and Practices

Syllabus Sections 8a.1 – 8a.5, 8b.1, 8c.1, 8d.1

### Operating Procedures and Practices

(Syllabus Section 8)

You may or may not have been able to listen to amateurs during your training and therefore your familiarity with typical protocols may vary. It is also true that the standard of operation of many licensed amateurs, even those with considerable experience, may not be that good an example.

(Syllabus Section 8a.1)

When it comes time for your first QSO (radio contact), you can ensure you are welcomed by the way you conduct yourself. Firstly before you make that all important first CQ call always listen and briefly ask if the frequency is in use. This is because you may not be able to hear a distant station but cause interference to a nearer station that is listening to it.

(Syllabus Section 8a.2, 8a.3)

So having determined that the frequency you intend to call CQ on is free you can proceed to call CQ (seek you) which is the common term employed by a station soliciting a response from any station that might be listening.

On VHF and UHF FM there are calling channels so only a short call is required on the calling channel frequency, e.g. "CQ CQ CQ *this is M3ABC calling CQ*". If no-one replies it is worth simply repeating the CQ call. Some people may get only incomplete details and not respond until they are sure of your details. Alternatively some people may be scanning a range of frequencies and have simply missed your first call but will catch and respond to a second. If this second call fails to elicit a response then repeat the call after a minute or so.

On HF SSB things are different as there are no set calling channels and other stations will have to tune you in, so a longer call is required, e.g. "CQ CQ CQ CQ CQ CQ *this is M3ABC calling CQ CQ CQ M3ABC calling CQ*". Listen for a second or two and if no-one replies then repeat the CQ. It may well take several such calls before a station accurately tunes you in and possibly aligns a beam (yagi) antenna and is in a position to respond.

Even if contact is established it may well take the first couple of "overs" for the other station to "net" with you. During this time you should not alter your main transmit/receive frequency. The responsibility of "netting" is with the responding station (them) not the one soliciting the contact (you). If you do alter your transmit frequency you will end up chasing each other across the band in a vain attempt at maintaining contact.

Having said that if after the first couple of "overs" the responding station still sounds a bit "off-tune" judicious use of your RIT (Receiver Incremental Tuning) to offset your received frequency from the fixed main transmit frequency may help restore the quality of the "over". Do not, however, expect a SSB contact to be broadcast quality, in fact do not expect it to be as good as is normally achieved on narrow band VHF/UHF FM. With practice and by training your "ear" good quality contacts are possible.

Remember that we said that on VHF and UHF FM there are designated calling channels, well if you call CQ on one of these and establish contact you should move (QSY) to a clear channel

before continuing with the contact. This leaves the calling channel free for others to use.

Remember that you have to give your callsign at least once every 15 minutes, and every time you change frequency. It is normal practice to give your callsign and the callsign of the station you're in contact with at the end of each over. Remember to give your callsign last e.g. EA6GH from M3ABC.

(Syllabus section 8a.4)

The phonetic alphabet is often used to spell out words and callsigns. You need to learn and remember it:

The phonetic alphabet is good for conveying information in poor conditions, the particular phrases have been selected for their clarity and lack of similarity to other phonetic words. As an example the callsign M3ABC given phonetically would be "*Mike Three Alpha Bravo Charlie*".

Some countries operate slightly different versions of the phonetic alphabet, and there have been some changes, mainly to bring the various versions into some form of alignment, over time and older amateurs may use the phonetic alphabet they were trained with rather than the current version. Then again many amateurs on air seem to make it up as they go along! What we have given here is the currently agreed phonetic alphabet. It is the one you should use and the one that will be examined.

Letter	Phonetic Value	Letter	Phonetic Value
A	Alpha	N	November
B	Bravo	O	Oscar
C	Charlie	P	Papa
D	Delta	Q	Quebec
E	Echo	R	Romeo
F	Foxtrot	S	Sierra
G	Golf	T	Tango
H	Hotel	U	Uniform
I	India	V	Victor
J	Juliet	W	Whisky
K	Kilo	X	X-Ray
L	Lema	Y	Yankee
M	Mike	Z	Zulu

(Syllabus section 8a.5)

Remember that Amateur Radio, as we discussed earlier in this course is for the self training in radio communications. There are certain legal restrictions on how we can operate. In particular

the recording and/or broadcasting of music is strictly outside the terms of our licence.

There are also a number of accepted behaviors. It is not acceptable to use foul or abusive or threatening language on the air no matter the provocation or whether or not you are the instigator or the recipient of such treatment. If you feel that you cannot control the conversation the best advice is simply to shut down or move to another frequency.

Fortunately the number of instances where this occurs is small and you should not add to, condone or encourage the regrettable behavior of a minority.

(Syllabus section 8a.6)

Should you be unfortunate enough to come across bad behavior or deliberate jamming/interference do not add fuel to the fire. By playing to these people you almost certainly will encourage them where as by ignoring them they will ultimately get bored.

Therefore do not try to transmit over an unlicensed broadcast. Note its content, frequency and timing so that a report can be filled. If the incident occurs on a repeater send your report to the repeater keeper in the first instance. Otherwise Ofcom can investigate cases of deliberate interference if sufficient evidence is presented to them.

(Syllabus section 8a.7)

It is no longer a requirement to maintain a permanent log of all calls and contacts.

You may be asked by an officer of Ofcom investigating an incident of interference to keep a log for a duration and the officer will specify the details to be recorded.

However, a log remains a valuable reference and is essential if you want to exchange QSL cards or submit entries for awards or in competition. Again the details you choose to record will, in all probability, be those associated with the award or competition. In the absence of such guidelines the following items of information could prove useful in confirming a QSO:

- Date of contact (QSO)
- Start and End time – usually recorded in UTC
- The frequency, mode of operation and the power used
- The callsign of the station worked (arguably the most important single piece of information)
- Any signal reports exchanged
- Other details such as the name of the other operator and the location of the station

The log, provided it is maintained up to date, is also useful to show when you were operating and will often be accepted as showing you were not the cause of interference.

## **Repeaters**

(Syllabus section 8b.1)

Repeaters are mainly intended to extend the range of hand-held and mobile stations. A repeater is an interconnected transmitter and receiver that re-transmits on another channel the signal picked up by the receiver. The repeater has an input (receive) channel and an output (transmit) channel.

If we consider the local repeater GB3WR, its input frequency is 145.000 MHz and its output frequency is 145.600 MHz. The receive offset is 600kHz. To operate through the repeater you

would have to set a transmitter offset of 600kHz on your transceiver so that the receive frequency is 145.600MHz and the transmit frequency is -600kHz (145.000MHz).

The same offset is used for all UK repeaters on the 145MHz band. The 433MHz band traditionally uses a +1.6MHz repeater offset, however there are now a number of newer UHF repeaters in the 70cm band using an offset of +7.6MHz. A repeater only transmits when there is a valid signal on its input. To wake up or access a repeater it is necessary to transmit a 1750Hz tone for about half a second before you speak.

Some repeaters are equipped with CTCSS (Continuous Tone Coded Signalling System). More information about operating through repeaters is given on page 24 of the manual.

Operating through a repeater is not that different to a simplex contact once the repeater has been "opened", essentially the process is:

- Tune your transceiver to the correct channel ensuring that Narrow FM mode is selected. The correct channel will be the output frequency of the chosen repeater.
- Select the correct repeater offset (typically this is -600kHz on 145MHz and +1.6MHz/7.6MHz on 435MHz)
- Turn on the tone burst feature or select the correct CTCSS sub-audible tone depending on the operation of the chosen repeater
- Push the PTT and call. Typical initial calls through a repeater are "*M3ABC listening through*" or "*This is M3ABC calling and listening*" instead of the more formal CQ type call described earlier.

Once contact is established through a repeater it usually continues to use it. The only circumstances where it is usual to QSY (change frequency) is where both stations are capable of receiving each other on the input frequency of the repeater and are likely to continue to be able to do so for the duration of the QSO. In these cases a change to an agreed simplex frequency is preferable so as to leave the repeater free for other mobile users.

(Syllabus section 8c.1)

To keep the various operating modes separate, each operating band is divided up into different sub-bands. The 14MHz and 144MHz band plans are shown below and on page 21 of the manual. You don't need to remember them but you do need to understand them. A copy will be provided for the exam.

14MHz (20m)	Necessary Bandwidth	UK Usage
14,000 - 14,060 kHz	200Hz	<b>Telegraph - contest preferred</b> 14,055 kHz QRS (slow telegraphy Centre of Activity)
14,060 - 14,070	200 Hz	<b>Telegraphy</b> 14.060 kHz QRP (low power) Centre of Activity
14,070 - 14,089	500 Hz	<b>Narrow band modes</b>
14,089 - 14,099	500 Hz	<b>Narrow band modes</b> - automatically controlled data stations (unattended)
14,099 - 14,101		<b>IBP - reserved exclusively for beacons</b>
14,101 - 14,112	2.7 kHz	<b>All modes</b> - automatically controlled data stations (unattended)
14,112 - 14,125	2.7 kHz	<b>All modes (excluding digimodes)</b>
14,125 - 14,300	2.7 kHz	<b>All modes</b> - SSB contest preferred segment 14,130kHz - digital voice centre of activity 14,195+- 5 kHz Priority for Dxpeditions 14,230 kHz - Image Centre of Activity. 14,285 kHz - QRP Centre of Activity
14,300 - 14,350	2.7 kHz	<b>All modes</b> 14,300 kHz Global Emergency Centre of Activity

**Licence Notes:** Amateur Service - **Primary User**

14,000 - 14,250 kHz Amateur Satellite Service - **Primary User**

### Notes to the Band Plan

#### ITU-R Recommendation SM.328 (extract)

**Necessary bandwidth:** For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under the specified conditions.

The use of Amplitude Modulation (AM) is acceptable in the all modes segments but users are asked to consider adjacent channel activity when selecting operating frequencies.

Foundation and Intermediate Licence holders are advised to check their licences for the permitted power limits and conditions applicable to their class of licence.

144MHz (2m)	Necessary Bandwidth	UK Usage
144.000-144.110 MHz	500Hz	<b>Telegraphy</b> (including EME CW) 144.050 MHz Telegraphy calling 144.100 MHz Random MS telegraphy calling (Note 1)
144.110-144.150	500Hz	<b>Telegraphy and MGM</b> 144.138 MHz PSK31 centre of activity EME MGM activity (Note 7)
144.150-144.180	2700Hz	<b>Telegraphy, MGM and SSB</b>
144.180-144.360	2700Hz	<b>Telegraphy and SSB</b> 144.175 MHz Microwave talk-back 144.195-144.205 MHz Random MS SSB 144.200 MHz Random MS SSB calling frequency 144.250 MHz GB2RS news broadcast and slow Morse 144.260 MHz USB. Can be used by RAYNET 144.300 MHz SSB calling
144.360-144.399	2700Hz	<b>Telegraphy, MGM, SSB</b> 144.370 MHz MGM calling frequency
144.400-144.490		<b>Propagation Beacons only</b>
144.490-144.500		144.4905MHz +/- 500Hz WSPR beacons and beacon guard band
144.500-144.794	20 kHz	<b>All Modes</b> 144.500 MHz SSTV calling 144.525 ATV SSB Talk-back 144.600 MHz RTTY calling 144.600 MHz RTTY working (FSK) 144.6125 MHz UK Digital Voice (DV) calling (Note 9) 144.625-144.675 MHz. Can be used by RAYNET 144.700 MHz FAX calling 144.750 MHz ATV Talk-back 144.775-144.794 MHz. Can be used by RAYNET
144.794-144.990	12 kHz	<b>MGM Packet radio</b> 144.800-144.9875 MHz Digital modes (including unattended) 144.8000 MHz Unconnected nets - APRS, UiView etc 144.8250 MHz Internet voice gateway 144.8375 MHz Internet voice gateway 144.8500 MHz AX25 BBS user access 144.8625 MHz Available for nodes and BBSs on application 144.8750 MHz TCP/IP user access 144.8875 MHz AX25 - priority for DX Cluster access 144.9000 MHz AX25 DX Cluster access 144.9250 MHz TCP/IP user access 144.9500 MHz AX25 BBS user access 144.9750 MHz High speed 25 kHz channel
144.990-145.1935	12 kHz	<b>FM/DV</b> RV48 - RV63 Repeater input exclusive (Note 2) (Note 5)

<b>145.200</b>	12 kHz	<b>FM/DV</b> Space communications (e.g. I.S.S.) - Earth-to-Space 145.2000 MHz (Note 4). Can be used by RAYNET
<b>145.200-145.5935</b>	12 kHz	<b>FM/DV</b> V16-V48 FM/DV simplex (Note 3) (Note 5) (Note-6) 145.2125 MHz Internet voice gateway 145.2250 MHz Can be used by RAYNET 145.2375 MHz FM Internet voice gateway (IARU common channel) 145.2500 MHz Used for slow Morse transmissions 145.2875 MHz FM Internet voice gateway (IARU common channel) 145.3000 MHz RTTY local 145.3375 MHz FM Internet voice gateway (IARU common channel) 145.5000 MHz Mobile calling 145.5250 MHz Used for GB2RS news broadcast. 145.5500 MHz Used for rally/exhibition talk-in
<b>145.5935-145.7935</b>	12 kHz	<b>FM/DV</b> RV48 - RV63 Repeater output (Note 2)
<b>145.800</b>	12 kHz	<b>FM/DV</b> Space communications (e.g. I.S.S.) - Space-Earth
<b>145.806-146.000</b>	12 kHz	<b>All Modes</b> - Satellite exclusive

**Note 1:** Meteor scatter operation can take place up to 26kHz higher than the reference frequency.

**Note 2:** 12.5kHz channels numbered RV48-RV63. RV48 input = 145.000 MHz, output=145.600 MHz.

**Note 3:** 12.5kHz simplex channels numbered V16-V46. V16=145.200 MHz.

**Note 4:** Emergency Communications Groups utilising this frequency should take steps to avoid interference to ISS operations in non-emergency situations.

**Note 5:** Embedded data traffic is allowed with digital voice (DV)

**Note 6:** Simplex use only - no DV gateways

**Note 7:** EME activity using MGM is commonly practiced between 144.110-144.160MHz

**Note 8:** The use of Amplitude Modulation (AM) is acceptable within the All Modes segment.

AM usage may often be found on 144.550MHz although this frequency is not officially recognised within the 2M band plan.

AM users are asked to consider adjacent channel activity when selecting operating frequencies.

**Note 9:** In other countries IARU Region-1 recommend 145.375MHz

**LICENCE NOTES:** Amateur Service and Amateur Satellite Service - **Primary User.**

Beacons may be established for DF competitions except within 50 km of TA 012869 (Scarborough)

### Notes to the Band Plan

#### ITU-R Recommendation SM.328 (extract)

**Necessary bandwidth:** For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under the specified conditions.

The use of Amplitude Modulation (AM) is acceptable in the all modes segments but users are asked to consider adjacent channel activity when selecting operating frequencies.

Foundation and Intermediate Licence holders are advised to check their licences for the permitted power limits and conditions applicable to their class of licence.

(Syllabus section 8d.1)

You will remember from lesson 3 when we considered the basic operation of a simple transceiver that if you connect equipment other than the supplied microphone to your transceiver, such as a TNC, you must make sure that the audio output levels are set correctly to avoid over modulation or over deviation. We repeat this here to reinforce its importance and also to beseech you to make sure the PTT line is correctly wired and tested to prevent it from being jammed on. If at all possible it is advisable to connect TNC or soundcard interfaces to the data jack rather than the microphone input, although this doesn't remove the requirement to check that the transmit function is not being jammed on.

(Syllabus section 8e.2)

One of the most important pieces of information that will be exchanged by stations whether in a contest or not is a measure of the signal strength and readability. This report can be helpful in determining the general performance of a station although it should be remembered that it is somewhat subjective.

The signal report is based on the RST code of Readability, Signal strength and (for Morse only) Tone.

- Readability is on a five-point scale from R1 (unreadable) to R5 (perfectly readable).
- Signal strength is on a nine-point scale from S1 (very faint, barely perceptible signal) to S9 (Extremely strong signals).
- Tone (Morse only) is the quality of the tone from T1 (very rough) to T9 (very pure).

The signal strength may be read from the S meter on the radio where this is fitted. Some radios will have an old fashioned analogue meter whilst some more modern pieces of equipment may make use of LCD bar charts. Signals stronger than S9 may read +10 or +40.

A typical FM or SSB signal report would be 5 and 9 meaning readability 5 and strength 9.

## Next Lesson

Safety

## Lesson 7 – Summary

At the end of this lesson you should be able to:

- Understand why one should listen before calling and then ask if the frequency is in use
- Recall how to make a CQ call
- Understand the need to move off the calling channel (when on VHF/UHF) once contact is established
- Recall the phonetic alphabet
- Recognise the advisability and common practice of keeping a log and the items recorded.  
NOTE: This item will not be examined
- Recall that repeaters are mainly intended to extend the range of mobile stations
- Recall how to use a repeater and understand the need for an access tone or CTCSS and frequency offset
- Recall why band plans are used
- Identify items on a published band plan (e.g. calling frequencies and recommended modes)

- Recall that connecting anything other than the supplied microphone (e.g. packet radio TNCs) to the transmitter requires the correct operation of the PTT line and correct audio signal levels