

This information sheet provides details about Private Business Radio (PBR). A business radio system is used to pass messages between a base station and mobile sets and mobile to mobile as an aid to conducting business. The different Business Radio licences allow the licensee to operate different types of systems in accordance with licence conditions and Wireless Telegraphy legislation.

## **Signalling Systems**

**OfW55 (formerly Radiocommunications Agency information sheet RA 373)**

### **1. Introduction**

This information sheet explains Ofcom's (the Office of Communications) policy regarding the use of signalling tones or codes on Private Business Radio (PBR) systems. It covers the following types of signalling system:

- continuous tone controlled signalling system (CTCSS);
- digitally coded squelch (DCS);
- selective calling (Selcall);
- POCSAG;
- hexadecimal sequential coding (HSC); and
- dual-tone multi-frequency (DTMF).

### **2. Why are tones/codes needed?**

Where different users share a business radio channel, the use of signalling codes/tones enables a group of users (i.e. a single business) to communicate without receiving the transmissions of other user groups (i.e. other businesses).

If users have to listen to both wanted and unwanted transmissions throughout the day, they are likely to 'switch off' mentally and not pay attention to the wanted messages.

If a signalling code/tone is fitted, a user will hear only those transmissions that are meant for his/her user group (although not necessarily for that particular user), and not those meant for a different user group.

### **3. Different types of signalling**

#### ***a) Continuous tone controlled signalling system (CTCSS)***

CTCSS is also known as 'continuously tone-controlled sub-audio squelch'. The key word is 'Continuous', as the tone will be present throughout the entire transmission until the 'Press to Talk' (PTT) button on the equipment is released. Different terms for the same function include 'Tone Lock', 'Private Line' or 'PL'.

There are 32 available tones; the same tone is allocated to every user in a particular group. The tone is transmitted continuously during each transmission, but is below the normal speech frequencies passed by the receiver so it cannot be heard in the loudspeaker of the receiving set.

The facility works like a lock for a door: only the correct 'key' from the available 32 will unlock the receiver 'door' and allow the message to pass through.

CTCSS can be used with Selcall (see below) – which uses its own discrete frequencies – if required.

### ***b) Digitally Coded Squelch (DCS)***

DCS works in a similar way to CTCSS. An inaudible digital code is sent with each transmission and is recognised by selected receivers, enabling them to receive the transmission. Receivers that do not recognise the code remain silent.

The DCS codeword consists of a 23-bit frame, transmitted at 134.4 bit/s. This is below the frequency normally used for speech on PBR, so it is fairly simple to filter out the code in the receiver so that the user is unaware of it. A total of 104 codes are available; however, only 52 codes are normally assigned for use on PBR bands, as the other 52 are the 'inverted' or 'complementary' codes (e.g. a codeword such as 10010 is the complement of 01101).

DCS can be used with Selcall (see below) – which uses its own discrete frequencies – if required.

### ***c) Selective calling (Selcall)***

Also known as 'Five tone', this is a means of generating tones for identifying individual or groups of radios. MPT 1316 is a code of practice covering the installation, adjustment and use of Selcall. The actual tone system used is HSC (see below).

Some users have both CTCSS or DCS and Selcall fitted, but some equipment cannot offer full Encode and Decode for both.

### ***d) Hexadecimal Sequential Coding (HSC)***

HSC is the system normally used for Selcall. A number of audio tones (usually five) are transmitted in sequence; each tone is at a different frequency from the preceding one. These tones are easily detected by audio filters or by computer software. A tone set comprises ten different tones and an 11th as the repeat tone. Also in the set is a group tone plus four others (usually designated as A, B, C and D).

## **4. Licensing**

For details of different PBR licenses, see Ofcom information leaflet Of20.

### ***a) Assignment of CTCSS tones and DCS codes***

All licensees are automatically assigned both a CTCSS tone and a DCS code whenever their licence is issued or amended.

When issuing a PBR UK General licence – which allows you to operate a number of hand portables (with no base station) anywhere in the country – we will automatically assign three DSC codes and CTCSS tones. This is to give you some flexibility if you encounter a co-channel interference problem.

We strongly recommend that either CTCSS or DCS is installed and functional from the outset on all new systems, and – if it can be installed easily – following a technical change to an existing system.

If you report interference to us, our Technical Investigation Officers will not take any action until the assigned tone/code as detailed on your licence schedule has been installed on your equipment (provided that your equipment is capable of having it installed).

### ***b) Use of Selcall***

The use of Selcall to identify an individual or a group of mobiles on shared PBR channels is authorised automatically on a Wide-Area or On-Site PBR Speech and Data Systems licence.

## **5. Equipment**

All equipment you use must comply with the relevant UK Radio Interface Requirement published by Ofcom in accordance with Article 4.1 of European Directive 1999/5/EC on radio

equipment and telecommunications terminal equipment (R&TTE) and the mutual recognition of their conformity.

As the licensee, it is your responsibility to ensure that your system meets these requirements and complies with the technical parameters detailed in the schedules. You must be able to provide acceptable documentary evidence, on request within 28 days, for all or any part of your system to a representative of Ofcom.

## 6. Common Base Stations

If you operate a Common Base Station (CBS) and you want to use a signalling system, you should apply in writing to the local Ofcom office that normally deals with your licence.

You will be assigned up to four groups of codes from the list below. If you wish to use a specific code group, you may request it – but we cannot guarantee to assign it to you. If you are already using CTCSS, we can also assign you DCS code groups, which you may use in conjunction with your CTCSS tone. A CBS using more than one channel on a site will have the same DCS code groups allocated to all co-sited channels.

### ***a) Carrier shift and logical inverts***

Some equipment transmits the DCS codeword by increasing the carrier frequency for a logical 1 and decreasing it for a logical 0 – this is called positive carrier shift. Other equipment does the reverse, i.e. it decreases the carrier frequency for a logical 1 and increases it for a logical 0 (negative carrier shift).

As a result, your equipment may decode both its own correct code and the logical invert of systems operating on the other system nearby. To avoid this, we omit the logical inverts of allocated codes from the code groups, so that operators have a free choice of equipment employing either positive or negative carrier shift.

You may use logical inverts on a site-by-site basis to double the codes available, provided that all equipment used on a particular site employs the same carrier shift system (i.e. either all positive or all negative).

If you have any questions about the use of DCS on CBSs, contact your radio dealer or the Ofcom Contact Centre – see Section 7 below.

### ***b) DCS code groups for CBS operators***

Group A: 023, 043, 114, 115, 212

Group B: 025, 053, 122, 125, 243

Group C: 026, 054, 131, 132, 246

Group D: 031, 065, 134, 143, 252

Group E: 071, 072, 145, 155, 255

Group F: 073, 074, 156, 162, 266

Group G: 116, 165, 205, 311, 315

Group H: 226, 261, 325, 331, 332

Group I: 032, 343, 346, 371, 432, 466

Group J: 036, 431, 565, 606, 624, 654

## 7. Further information

For more information about the use of signalling codes, please contact:

### **Ofcom Contact Centre**

Riverside House  
2a Southwark Bridge Road  
London  
SE1 9HA

Tel: 0845 456 3000

Fax: 0845 456 3333

Email: [contact@ofcom.org.uk](mailto:contact@ofcom.org.uk)

Web: [www.ofcom.org.uk](http://www.ofcom.org.uk)