How do I get started on rtty (or psk)?

The data modes have become particularly popular in recent years, with RTTY and PSK31 being heard almost every evening, particularly on 20 metres. So, now is a very good time to get started. It's also great fun too. I've had many a good qso on both rtty and PSK31.

The simplest, and most popular, way of getting started with RTTY is to use your transceiver with the soundcard in your computer. You will need to connect your computer to the transceiver, install and set up the software and very quickly you will be in a RTTY qso. None of this is difficult at all, but just a matter of a little bit of soldering of plugs and usually reading the 'Getting Started' section of the manual that goes with the software.

There are two ways of producing RTTY. These are known as fsk (frequency shift keying) and afsk (audio frequency shift keying). All transceivers will allow afsk, but you will need specific connections on your receiver for fsk, which not all transceivers will have (unless you enjoy delving around its innards!). Regardless of which method is used, the rf signal that is transmitted is identical. So, for the sake of simplicity I will show you how to set up your transceiver for rtty afsk modulation. You will need to make up three connecting leads and a very small circuit that can be built inside a plug housing. In the following sections a detailed description of how to do this is given, together with a couple of diagrams. These diagrams are taken from elsewhere on the internet, in each case with acknowledgement and thanks.

RTTY 'works' by shifting the transmitted frequency. In afsk mode the software you will use will produce two audio tones (sine waves) that correspond with the 'Mark' and 'Space' components of the rtty signal. Fed into the microphone socket of an SSB transceiver these two tones will shift the transmitted frequency according to the pattern of 'marks' and 'spaces' that make up the rtty code.

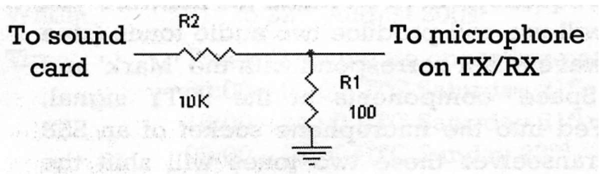
You will probably see advertised many different types of interface that are available to connect computers to transceivers. These generally work very well and usually allow you to configure the connections for any type of transceiver and come complete with all the interconnecting leads, but they are not necessary for successful data modes operation. You can make up the necessary connecting leads for a small fraction of the price of a commercial interface. The choice is yours!

Setting up the hardware

Using screened cable, connect the 'audio out' from the transceiver to the 'line in' or 'mic in' on the computer sound card. The audio out on the transceiver may well be marked as 'speaker' or 'phones' and is often a 3.5m/m jack socket, but check in your manual first. It will almost certainly be mono. The 'line in' and 'mic in' sockets on the soundcard are also usually 3.5m/m jack sockets. However, they are usually stereo (requiring a stereo jack plug), so connect the cable from the transceiver to either the left or the right input channel. This lead takes the rtty signal from your transceiver to the computer, for de-coding by the software. If all you want to do at this stage is to listen, then you need go no further with the hardware set-up.

In order to transmit, again using screened cable, connect the ‘line out’ from the soundcard to the ‘mic in’ on your transceiver, via an attenuator. The audio level from the soundcard is much too high for the microphone input without attenuation and will almost certainly over-drive your transmitter. For this you will need a spare microphone plug for your transceiver into which you can build a two-resistor attenuator. See figure 1 for details. Make sure you connect the lead to the correct pin of your transceiver – the pin numbering is different for just about every make and often different between models by the same manufacturer. Your transceiver manual will almost certainly have an illustration of the pin-outs. This lead takes the audio tones generated by the RTTY software to your transceiver.

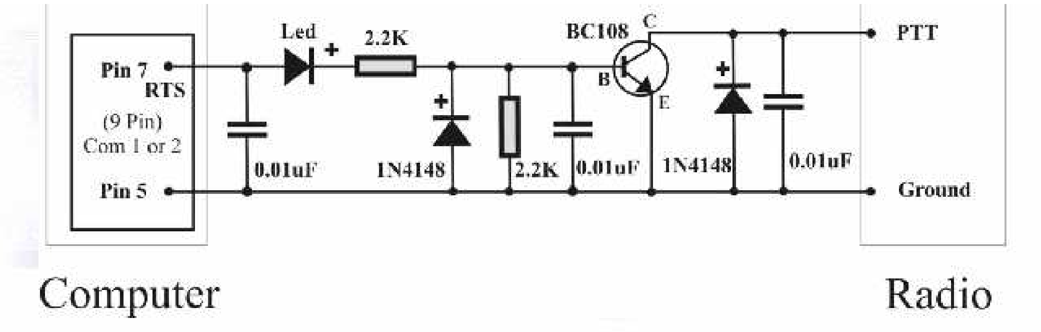
Figure 1



The final part of the hardware set up is the transmit/receive control. There are generally four choices – vox control, mox control (i.e. manually putting the transceiver into transmit – available on some Yaesu radios), direct software commands to the radio and ptt control via the computer COM port. As the first three options are not available on all radios I shall opt for the fourth – and probably the most frequently used – method.

Press-to-talk (PTT) operates by shorting the PTT line to ground; shorting the PTT line places the transceiver into transmit mode; opening the connection returns the transceiver into receive mode. A simple little circuit that operates from the computer COM port (or serial port as it is also known) can accomplish this switching of the PTT line. Make up the circuit shown in Figure 2. This could easily be made to fit inside the COM port plug housing. The left-hand side of the diagram refers to the computer COM port. Note that 25 pin and 9 pin plugs have different pin numbering. Wire up either to the RTS line, or the DTR line, but not both. The other end of this cable is wired into the plug we were using in the previous section, this time to the PTT and PTT ground pins.

Figure 2



For 25 pin COM ports, the RTS line is pin 4, DTR is 20 and ground is 7. For 9 pin COM ports, the RTS line is pin 7, DTR is 4 and ground is 5.

If you do not have a BC108 then any general purpose NPN transistor can be used. Other diodes that can be used include 1N4001's etc.

The radio's PTT switching can now be controlled via the computer's COM port. Any program that requires an audio link to and from your transceiver and PTT control via the COM port can now be used. So, you can now run RTTY, PSK31, many other data modes and even SSTV with the same hardware set up. That is the end of the hardware set up.

If you would prefer to buy a fully built interface or make up an interface from a kit then there are plenty of suppliers on the Internet.

NOTE: There are some (fairly rare) transceivers that have a positive ground. In this case the circuit in Figure 2 would need to be modified. Change the NPN transistor for a PNP transistor and reverse the direction of the diodes.
Increasingly, computers are being built without COM ports. USB to COM port converters are available. Although most will work for this simple switching task, not all will. If you need to go the USB/COM port route an Internet search will assist you in the choice of converter. The Help file of N1MM Logger has a useful discussion on this subject and some suggestions as to what works and what doesn't: www.n1mm.com/html/English/Help.htm" (see 'Interfacing' under the 'Reference' topic).

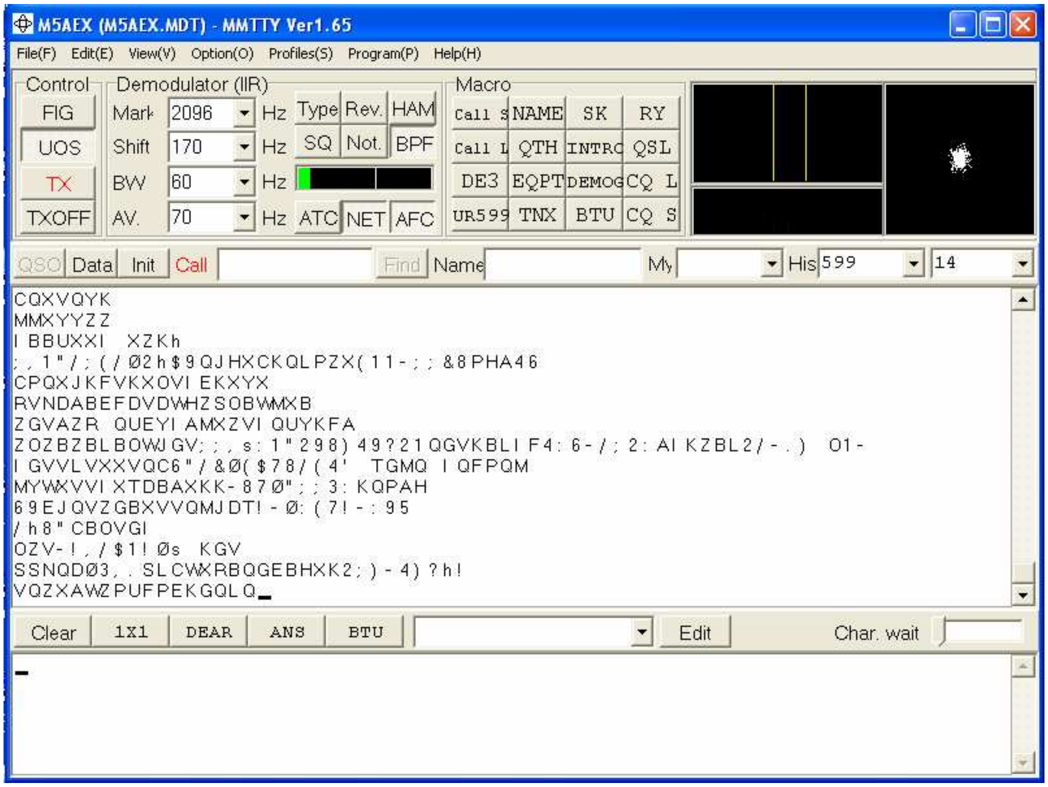
Setting up the software

There are dozens of Windows-based RTTY programs. Some have to be paid for (e.g. Writelog, RCKRtty), some will function in a cut-down form until a donation is made (e.g. Truetty) and some are freeware (such as MMTTY MMVARI and Winwarbler). Because it is free, it is very popular and there is a great deal of support available I have chosen to focus on MMTTY in this instance. It also runs under a wide variety of operating systems – Windows 95/98/ME/NT/2000/XP – and can also be used 'inside' other programs, such as Writelog. Sorry, but I don't have any experience of Mac's.

MMTTY is available from http://mmhamsoft.amateur-radio.ca/ . Install MMTTY as directed – the most recent version is V1.65D. Running the program will present you with a large screen divided up into a number of areas (Figure 3).

The large white area in the middle is the received RTTY. When this screenshot was taken the transceiver was listening to noise – hence the garbage on the screen! The bottom white section is where one types the message to be sent in RTTY. The top section in grey is divided up into a number of sections. Moving from left to right, in the first column the two most important buttons are TX and TXOFF, which act as a manual PTT if you wish. The next column indicates the Mark and Space frequencies. Pressing 'HAM' in the next set of buttons automatically configures MMTTY for the amateur radio RTTY tone frequencies and frequency shift. The black bar underneath indicates the signal level received by MMTTY. The next sets of buttons are user-defined macros (for sending CQ, or details of QTH, etc.). The final two black squares are a waterfall and an oscilloscope, respectively and are used to tune in the RTTY signal. Their presence on the screen and the respective size of these two features is configurable from the 'View' menu at the top of the screen.

Figure 3



Mark 2096 Hz
Shift 170 Hz
BW 60 Hz
AV. 70 Hz
Name
My
His 599
14

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CQXVQYK
MMXYYZZ
I BBUXXI  XZKh
;, 1"/;(/Ø2h$9QJHXCKQLPZX(11-;;&8PHA46
CPQXJKFVKXOVI EKXYX
RVNDABEFDVDWHZSOBWMXB
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SSNQDØ3,.SLCWXRBQGEBHXK2;)-4)?h!
VQZXAWZPUFPEKGQLQ_
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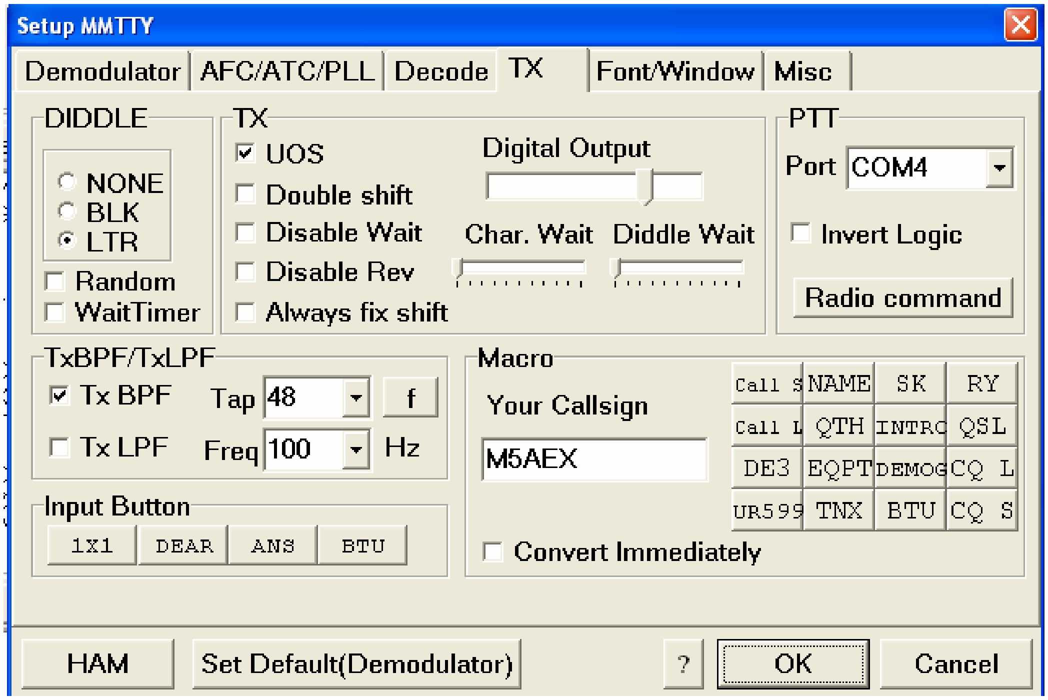
MMTTY needs to be configured before use. Using Option, Set up MMTY presents you with a 'Setup MMTTY screen with six tabs (Figure 4).

Figure 4



DIDDLE: ○ NONE ○ BLK ● LTR

□ Random

□ WaitTimer

☑ UOS

□ Double shift

□ Disable Wait

□ Disable Rev

□ Always fix shift

Port COM4

□ Invert Logic

☑ Tx BPF Tap 48

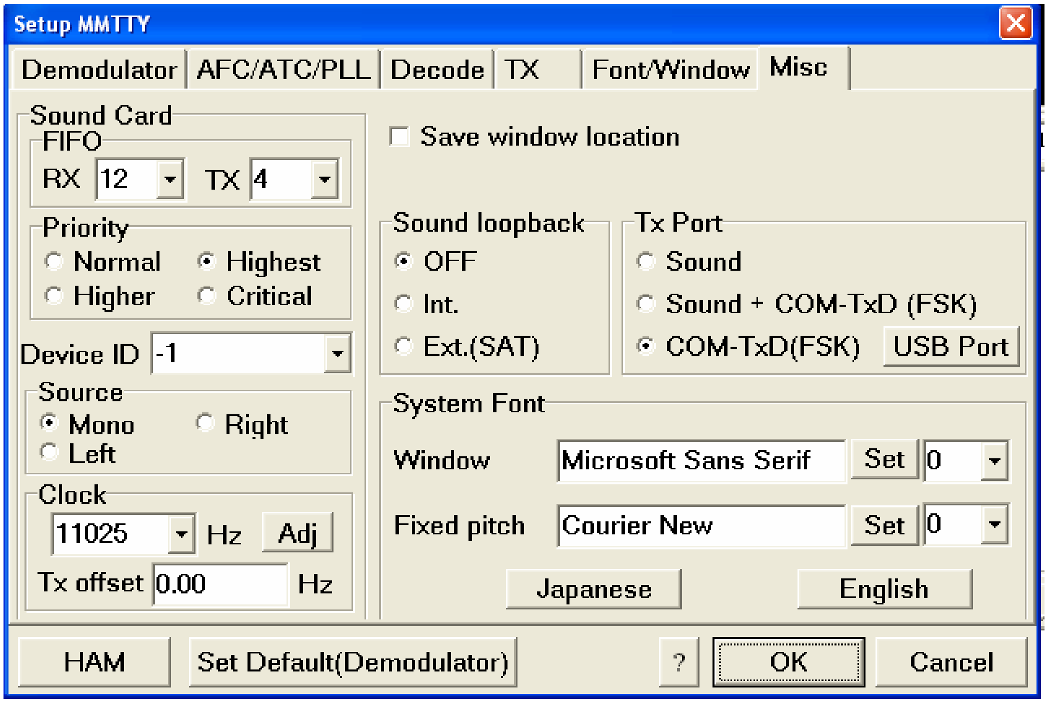
□ Tx LPF Freq 100 Hz

Your Callsign M5AEX

□ Convert Immediately

You only need to change the ‘Decode’ and ‘Misc’ tabs. Looking at the ‘Decode’ tab, enter your callsign (centre) and set the PTT COM port using the drop down menu (top right) to the COM port that you are using to control your radio. You can also configure the macros on this screen (bottom right). Moving to the ‘Misc’ tab (Figure 5) set the ‘Tx Port’ to ‘Sound’. This is the best setting for an AFSK set-up. I use FSK at my QTH, hence the setting in Figure 5.

Figure 5



Sound Card

FIFO

RX 12 TX 4

Priority

○ Normal ● Highest

○ Higher ○ Critical

Device ID -1

Source

● Mono ○ Right

○ Left

Clock

11025 Hz

Tx offset 0.00 Hz

□ Save window location

Sound loopback

● OFF

○ Int.

○ Ext.(SAT)

Tx Port

○ Sound

○ Sound + COM-TxD (FSK)

● COM-TxD(FSK)

System Font

Window Microsoft Sans Serif 0

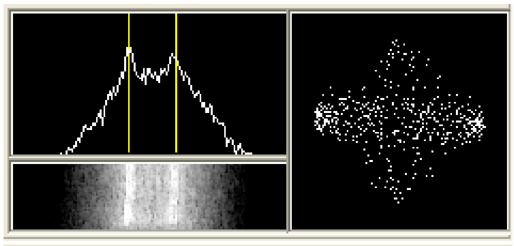
Fixed pitch Courier New 0

The software is now configured to talk to the computer and the radio. The audio input and output levels need to be set, but before that there are a couple of other things to do.

Tuning RTTY signals

Find a RTTY signal. Conventionally amateur rtty uses a speed of 45 bauds and a shift of 170Hz. RTTY signals are usually to be found around 14.080 MHz most evenings. A correctly tuned RTTY signal is shown in Figure 6.

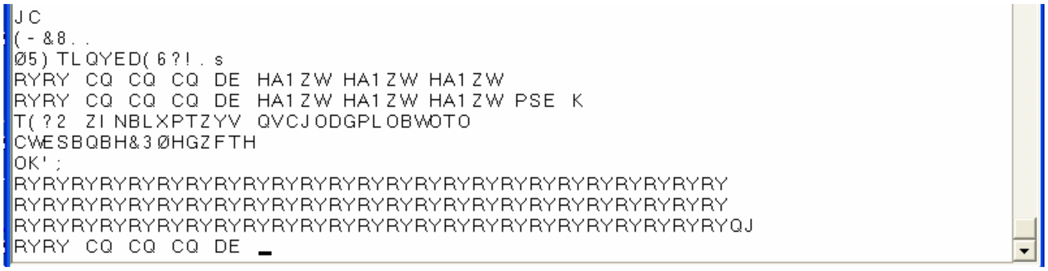
Figure 6



On the left you will see a waterfall display of the RTTY signal (two lines representing the two tones). Clicking on one of these lines will help to finely tune the signal. The XY scope on the right is a most useful tuning aid. With noise, or an incorrectly tuned signal, the display is just random dots; when the signal is fully tuned the display will show a vertical and a horizontal ellipse.

Initially, you might find that the ellipses are not vertical and horizontal; fine-tuning the transceiver will bring them vertical and horizontal, at which point the RTTY will start to be decoded (Figure 7).

Figure 7



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JC
(-&8..
Ø5)TLQYED(6?!.s
RYRY CQ CQ CQ DE HA1ZW HA1ZW HA1ZW
RYRY CQ CQ CQ DE HA1ZW HA1ZW HA1ZW PSE K
T(?2 ZI NBLXPTZYV QVCJODGPLOBWOTO
CWESBQBH&3ØHGZFTH
OK';
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYQJ
RYRY CQ CQ CQ DE _
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Setting audio levels

It is important not to overdrive the MMTTY program with received audio. With a RTTY signal tuned in, pull down the ‘Option’ menu and click ‘Soundcard Output level’. The Windows mixer control will appear. Adjust the audio level until a fully tuned (decently strong) signal just takes the audio bar in the main screen past the white line (Figure 3 shows the signal level with just noise). If, by any chance, you have been unable to get an audio signal into the program, after checking your interconnecting cables for continuity and that they are correctly plugged in to the relevant sockets, make sure that correct channels (microphone, line in) are checked in the Windows mixer control.

Setting the output level is very important, as it is easy to overdrive the transmitter. Referring to Figure 4 (Tx Screen), use the slider to adjust the audio output. If you are not getting any sound out of the soundcard make sure that the relevant channels are checked in the Windows mixer control. The easiest method of adjusting the audio output to the transmitter is to go into transmit mode and whilst sending a ‘diddle’ (RYRYRY continuously) adjust the output level until no further transmit output occurs with increasing audio input and then back the audio output slider down slightly. It is also worth checking with a friendly radio amateur the quality of your transmitted signal.

Duty cycle

RTTY is known as a 100% duty cycle mode. That is, when sending characters, the transmitter is sending at maximum power for the whole time. Speech on the other hand is not 100% duty cycle as many of the components that make up our speech are very quiet and do not push the transmitter to maximum power (hence the use of speech compressors). However, many transceivers are not built to withstand 100% duty cycle at maximum power. The usual recommendation is to set the transmit output power at about 50%

(i.e. at 50 watts for a 100 watt output transceiver), thereby preserving those expensive output transistors!

Using filters

When there are no contests on and signals tend to be widely spaced, the need for filters tends not to arise. I have had many a nice qso with filters set at the ‘standard’ SSB widths of 2.2KHz and 2.4KHz, with no interference. (I was using wide filters because at the time because that was all my transceiver had in place). However, when the contests are happening and the signals tend to be very close, narrower filtering tends to be very useful. During contests I tend to use a filter width of just 200Hz. The wider CW filters can often be pressed into service for data modes. However, not all transceivers will allow an SSB setting (for RTTY) and also allow you to switch in the CW filters (the Yaesu FT847 is like this).

Where next…

This article has been intended to provide just an introduction to getting going on rtty. There are all sorts of refinements that can be made with the software, such as setting up macros, etc. Reading the manual helps enormously – and the MMTTY Help file is very good in this respect. Participating in contests is a great way to learn how the software works and also a great way to increase those DXCCs. One can also set up ‘CAT’ control, if your transceiver allows this, controlling the transceiver band, frequency, mode, filters etc. by software control. It means a few more cables and a little DIY but it greatly extends the versatility of the computer – transceiver combination.

On the air

In order to minimise interference to other users of the amateur bands, each amateur band adopts a 'band plan' and is divided up into segments for different types of transmission mode, such as cw, phone, etc. Use of a band plan in the UK is voluntary, but it is good operating practice to follow them. The UK band plans do not mention specific data modes individually (such as rtty or psk31/63) but refer to them as 'narrow band modes' and the band plan includes a 'narrow band segment'. However, within each segment there could be a variety of different modes - rtty, psk, AX-25, AMTOR, etc. By convention therefore, each narrow band segment tends to be subdivided so that the different modes are kept apart.

Of the data modes, rtty and psk are the most commonly heard. Lets take rtty first. Most HF rtty is to be heard, outside contests, on 20 metres. The 20m rtty segment is usually considered to be between 14.080MHz and 14.099 MHz, with most rtty to be heard towards the bottom end of the range. On the other bands the rtty segments are:

Band	Rtty segment
80m	3.580 – 3.620 (3520 - 3525 in Japan)

40m	7.035 – 7.045 (7.000 – 7.150 in the US)
20m	14.080 – 14.099
17m	18.100 – 18.109
15m	21.080 – 21.100
12m	24.920 – 24.929
10m	28.080 – 28.100

During contests rtty is likely to be heard on all the bands, with the exception of the WARC bands (17m and 12m) as contests do not occur on these bands. Although you may also hear rtty transmissions outside the conventional rtty segment during contests, this should really be avoided as it may interfere with users of other transmission modes.

There are beacons on 14.100MHz, so it is important to avoid this frequency.

PSK31 and PSK63 signals are generally heard slightly lower down the band from rtty signals and again PSK is most frequently heard on the 20 metre band. The main PSK31 calling frequencies are:

Band	PSK31 calling frequency
80m	3.580
40m	7.035
20m	14.070
17m	18.100
15m	21.070
12m	24.920
10m	28.120

PSK63 signals are usually 2KHz higher up the band.

If you look up rtty and psk frequencies on the Internet you will find that there are lots of inconsistencies in what is published. As ever therefore, it is important to make sure that your transmissions do not interfere with others – listen before you transmit!

Finally, the following links provide the UK band plan in a useful tabular form:
http://www.r-clarke.org.uk/ukbandplan.htm
http://www.rsgb.org/bandplans/bandplans.pdf

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