TS-590S HOWTO: AUTO Mode

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Introduction

This HOWTO explains how to use the TS-590S AUTO Mode, with particular emphasis on how AUTO Mode can help to keep SSB transmissions (voice or data) in band on 60m.

Background

Most of the amateur bands occupy a continuous spectrum, without gaps (for example, 20m extends from 14.000 -14.350 MHz) and the band edge frequencies are easy to remember. But on 60m in some countries the band is fragmented into several non-contiguous channels or segments, and it can be more difficult to remember where to set the VFO to stay in band.

In the United States the situation is straightforward. There are just five individual fixed-width channels on 60m, each 2.8 kHz wide. You can simply set up five memory channels in the TS-590S, and set Menu #18 (Tunable Memory Recall) to OFF, to lock the VFO on the selected channel.

In the United Kingdom, however, there are no fewer than 11 separate band segments on 60m, varying in width from 3 kHz to 12.5 kHz – see the chart in Appendix 1. It is possible to set up memory channels for favorite frequencies, but this is not a particularly flexible approach. Also, Menu #18 would have to be set to ON to allow VFO tuning, which could lead to the risk of accidentally transmitting out of segment.

The TS-590S AUTO Mode

The TS-590S AUTO mode lets you specify up to 32 frequencies that separate different modes of operation. For example, you could specify that CW is to used up to 1.843 MHz, then LSB up to 2.000 MHz. Once you have set up the frequency/mode pairs and activated AUTO mode, the radio will then automatically select the correct mode as you tune across the band.

Unfortunately however, the TS-590S Instruction Manual [1] is somewhat vague in explaining exactly how to set up the frequency/mode pairs in the AUTO mode channels. This is perhaps understandable, since the process of selecting suitable frequency values is not at all obvious or intuitive. This HOWTO provides the missing detail.

The UK 60m Band

Appendix 1 contains an example of a complete list of AUTO Mode frequency/mode pairs for 30 kHz up to 21 MHz and beyond. This includes pairs that define the edges of the SSB segments in the UK 60m band.

AUTO Mode on other Kenwood Transceivers

Although this HOWTO specifically covers how AUTO Mode works on the TS-590S, the principles apply also to other Kenwood transceivers, including (at least) the TS-2000 and TS-990S.

Configuring the AUTO Mode Channels

There are many ways of configuring the AUTO Mode channels, depending on the required TX modes and frequency limits for each mode. To keep things simple, this HOWTO concentrates on setting up LSB and USB over the voice/data segments of the HF bands, and the remaining spectrum is set to CW [1]. Once the basic principles are understood, the settings may be refined to suit individual circumstances.

Figure 1 shows a very approximate representation of the SSB voice/data segments on the lower HF bands (not drawn to scale).
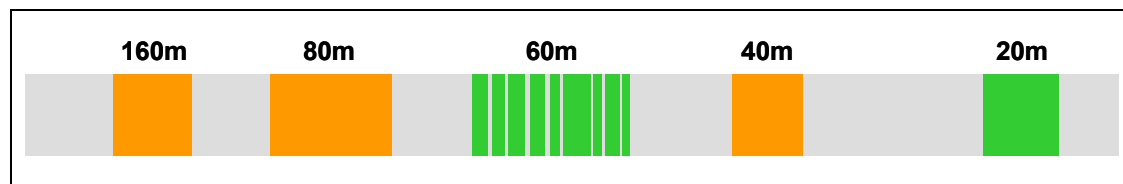

Figure 1: The LSB (orange) and USB (green) voice/data segments on the lower HF bands. The remaining spectrum (gray) is set to CW mode

This HOWTO explains how to:

- Set CW up to the bottom of the 160m band SSB segment.
- Set LSB over the 160m band SSB segment.
- Set CW between the top of the 160m SSB segment and the bottom of the 80m SSB segment.
  and so on.

The 60m band in this example is split into several very small SSB segments. These will be set to USB, with CW in between each segment.

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[1] Choosing CW for non-SSB segments can be helpful in preventing out of band transmission. For details, see page 8.

A Closer Look at Band Segments

The upper half of Figure 2 shows the relevant frequencies of interest for 160m and 80m.
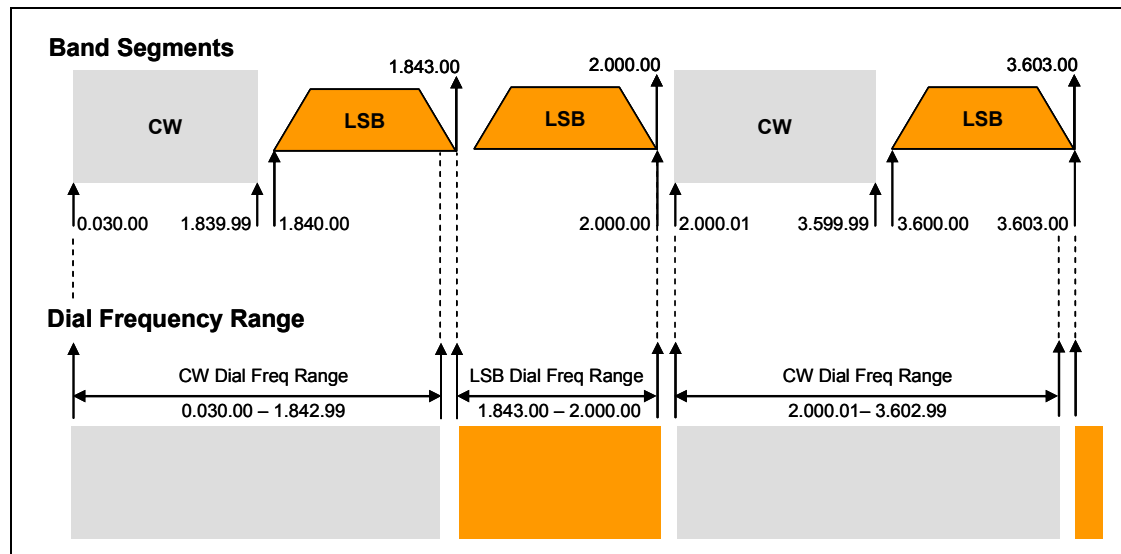

Figure 2: Band segments and AUTO frequency settings for 160m and 80m (not to scale)

A few observations:

- Frequency values are shown with a dot separating MHz and kHz, and another dot separating kHz and tens of Hz, exactly as displayed on the front panel of the radio. For example, 2 MHz is shown as "2.000.00".
- All frequencies are shown to the nearest 10 Hz (= 0.000010 MHz). For example, "1.839.99" means 1.839990 MHz.
- The smallest settable AUTO Mode frequency step is 10 Hz. Thus, for example, the next settable frequency above 1.839990 MHz is 10 Hz higher at 1.840000 MHz.
- All SSB voice/data signals are 3 kHz wide.

Figure 2 shows that the 160m LSB segment extends from 1.84 to 2 MHz, and the 80m LSB segment starts at 3.6 MHz.

From this information you can build a table showing the frequency limits of CW and SSB (voice/data) band segments. The first CW segment starts at 30 kHz, the lowest possible TS-590S dial frequency.

The first few lines of the table will look something like this (LSB highlighted in orange, USB in green):

Band Allocation		
Mode	*Segment*	
CW	0.030.00 – 1.839.99	
LSB	1.840.00 – 2.000.00	160m band SSB
CW	2.000.01 – 3.599.99	
LSB	3.600.00 – 3.800.00	80m band SSB
CW	3.800.01 – 5.275.99	
USB	5.276.00 – 5.284.00	First 60m band SSB segment

Dial Frequency Range

Having defined the band segments, the next step is to define the permissible dial frequency ranges for each mode.

Returning to Figure 2, the first 160m 3 kHz LSB signal is right at the bottom of the segment, extending from 1.840.00 up to the VFO dial frequency (1.843.00). Thus when setting up the AUTO frequency limits, the dial frequency for the LSB segment must not be allowed to go below 1.843.00. This means that the CW dial frequency will be allowed to extend up to 1.842.99 – see the lower half of Figure 2.

Similarly, for an LSB signal right at the bottom of the 80m segment, the lowest permissible dial frequency is 3.603.00, and the CW dial frequency will be allowed to extend up to 3.602.99.

You can now extend the Band Allocation table, by adding a column showing the permissible Dial Frequency Range:

Band Allocation		Dial Frequency Range
Mode	*Segment*	
CW	0.030.00 – 1.839.99	0.030.00 – 1.842.99
LSB	1.840.00 – 2.000.00	1.843.00 – 2.000.00
CW	2.000.01 – 3.599.99	2.000.01 – 3.602.99
LSB	3.600.00 – 3.800.00	3.603.00 – 3.800.00
CW	3.800.01 – 5.275.99	3.800.01 – 5.275.99
USB	5.276.00 – 5.284.00	5.276.00 – 5.281.00

Thus, as you sweep the VFO up the band, you will see that the mode:

- is CW up to and including 1.84299 MHz
- changes to LSB at exactly 1.843 MHz
- remains on LSB up to and including 2.000 MHz
- changes back to CW at 2.00001 MHz
- remains in CW up to 3.60299 MHz
- changes to LSB at exactly 3.603 MHz
  and so on.

Defining the AUTO Mode Settings
You are now ready to define the AUTO Mode settings. To do this, extend the above table by a further three columns, showing:

- The AUTO Mode channel number (there are 32 channels in total, numbered from 00 to 31).
- The dial frequency at which the mode _in the next channel_ starts (indicated by the red rings).
- The mode of the current channel (indicated by the purple rings).

Band Allocation		Dial Frequency	AUTO MODE SETTINGS		
Mode	Segment	Range	Channel	Freq	Mode
CW	0.030.00 – 1.839.99	0.030.00 – 1.842.99	00	1.843.00	CW
LSB	1.840.00 – 2.000.00	1.843.00 – 2.000.00	01	2.000.01	LSB
CW	2.000.01 – 3.599.99	2.000.01 – 3.602.99	02	3.603.00	CW
LSB	3.600.00 – 3.800.00	3.603.00 – 3.800.00	03	3.800.01	LSB
CW	3.800.01 – 5.275.99	3.800.01 – 5.275.99	04	5.276.00	CW
USB	5.276.00 – 5.284.00	5.276.00 – 5.281.00	05	5.281.01	USB

Another way to interpret the AUTO Mode settings is to say that, for each channel, the specified mode is active up to 10 Hz _below_ the specified frequency. For example, channel 00 shows that CW is the operational mode up to (1.843.00 minus 10 Hz); that is, 1.842.99.

Strange but true!

Configuring the AUTO Mode Channels

Having defined the three yellow columns in the table, you can now configure the AUTO Mode channels in the radio.

The setup and use of AUTO Mode are described in detail on page 51 of the TS-590S Instruction Manual [1]. [2]

There are two alternative ways of setting up the AUTO Mode channels:

1. Enter the Frequency/Mode information from the radio's front panel:

- Turn the radio off, press and hold the LSB/USB key and turn the radio back on again.
- Enter the frequency/mode pair into each of the 32 AUTO memory channels.
- Press the CLR key to exit AUTO configuration and resume normal radio operation.

2. Enter the Frequency/Mode information using ARCP-590 [2]:

- Start ARCP-590.
- Click on Mode > Auto Mode Frequency (see Figure 3a).
- When the "Setup Auto Mode Frequency" window appears, click on "Add to List" to enter each frequency/mode pair (see Figure 3b).
- When all frequency/mode pairs have been entered, click on "Write to Radio".
- Close the "Setup Auto Mode Frequency" window.
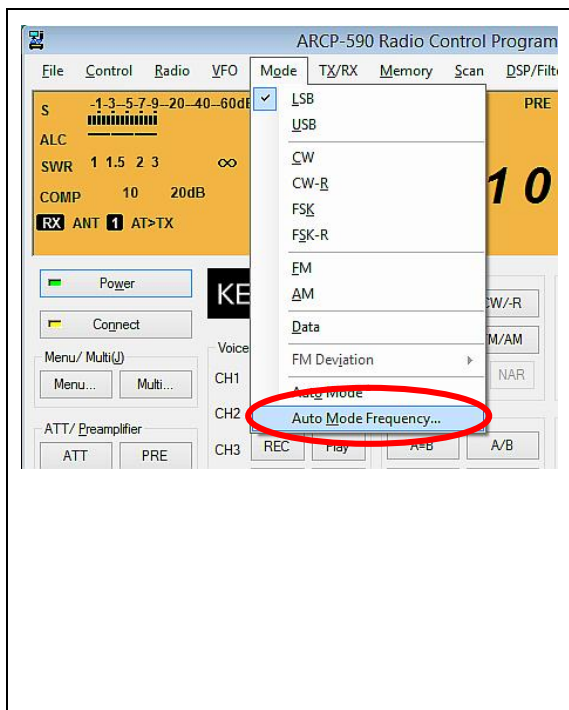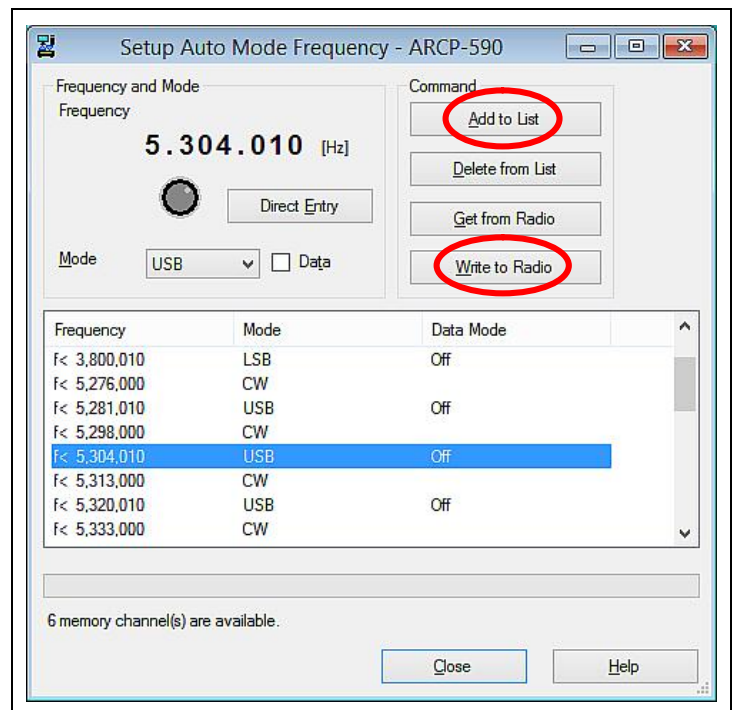- Exit ARCP-590.

Figure 3a: Starting Auto Mode entry   **Figure 3b: Entering frequency/mode information**

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[2] Note that the example on page 52 of the manual is very misleading and contains several errors. It is best ignored.

Backing up the AUTO Mode Settings

Once you have configured AUTO mode channel settings, it is a good idea to back them up, using ARCP-590:

- Click on File > Save Settings from Radio to Data File.
- Check "Auto Mode Frequency" (see Figure 4).
- Click on OK to save the settings.
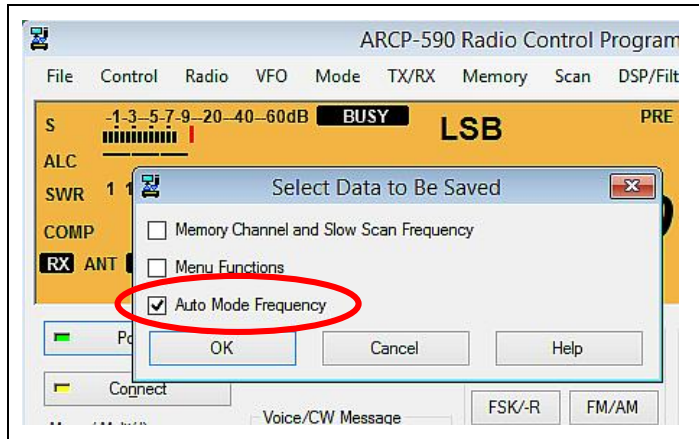
Figure 4: Saving the AUTO Mode settings

Activating AUTO Mode

Once you have configured and backed up the AUTO Mode settings, you now need to activate AUTO Mode. To do this, select Menu #23 and set to ON. From now on, the mode will be set automatically as you tune across the bands.

To return to non-AUTO operation, simply set Menu #23 to OFF.

Using the AUTO Mode Channels

Note that although AUTO mode will automatically set up the predefined mode for any AUTO channel, you can override the mode at any time, by manual selection on the front panel of the radio.

> However, be aware that if you do this, the radio remembers the manually selected mode, and will no longer automatically set the predefined mode on this channel.

To restore automatic mode selection, you need to sweep the VFO backwards and forwards through the frequency that is defined for the channel. For example, using the channels defined in the table above, you could manually set the mode to AM at 1.900 MHz. The mode will then remain as AM until you sweep the VFO through 2.00001 MHz.

Restricting Transmission to the SSB Segments

When AUTO Mode is configured as described above, you can transmit SSB (voice or data) in the defined SSB channels and CW in the defined CW channels. But be aware that, by default, if you stray into a CW segment and press the mic PTT button, the radio will transmit a continuous carrier.

To prevent this happening, you can simply insert an unwired ¼-inch (6.3mm) jack plug into the KEY jack on the rear panel of the TS-590S. See Figure 5.

¼-inch (6.3mm) jack plug (unwired)
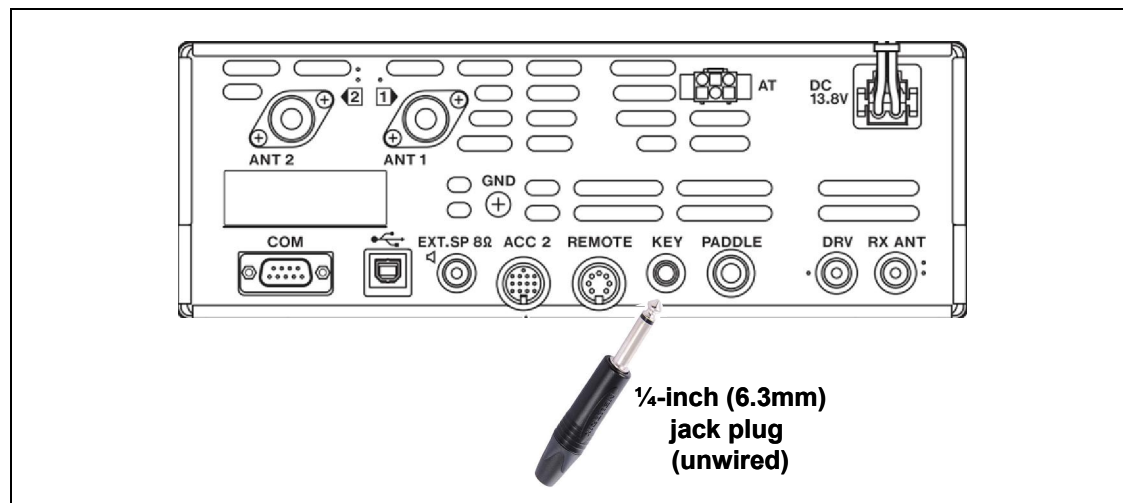
Figure 5: An unwired jack plug prevents the TS-590S transmitting in the CW segments in AUTO Mode

Now, as you tune across the band, you can transmit in the SSB segments, but if you enter a CW segment and inadvertently press PTT, transmission is automatically inhibited – the red TX LED on the front panel lights up, but no RF is transmitted.

Practical Use

Using AUTO Mode with a jack plug inserted in the radio is very helpful in preventing out-of-band SSB transmission on 60m. There is the added benefit that you can hear when the VFO strays out of an SSB segment – the audio suddenly switches from the selected SSB bandwidth to the selected CW bandwidth (perhaps much narrower), and the change is instantly recognizable [3].

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[3] This is particularly effective where an SSB segment is exactly 3 kHz wide. If the dial frequency is spot on the correct value, you will transmit SSB, but if the dial frequency is just 10 Hz too low or 10 Hz too high, transmission is inhibited.

APPENDIX 1: A Complete Example of AUTO Mode Settings in the UK

SSB on 60m generally uses upper sideband, for voice and data transmission. Thus you could conceivably configure AUTO Mode to specify that USB is to be used for all segments in the band.

However, by convention, certain segments may be used for CW or other modes instead. Transmission may even be discouraged altogether in other segments (such as the beacon segment in the UK). See the chart in Figure A1-1.

In the detailed example shown in the table on the next page, the 32 AUTO mode channels are defined to automatically select either LSB or USB for the UK SSB segments, including 60m, and CW elsewhere.

(It is left as an exercise for the reader to modify the first few lines of the table to allow USB between 1.840.00 and 1.849.99 for data transmission and LSB between 1.850.00 and 2.000.00 for voice).

Example of AUTO Mode Settings for the UK

Band Allocation		Dial Frequency Range	AUTO MODE SETTINGS		
Mode	Segment		Channel	Freq	Mode
CW	0.030.00 – 1.839.99	0.030.00 – 1.842.99	00	1.843.00	CW
LSB	1.840.00 – 2.000.00	1.843.00 – 2.000.00	01	2.000.01	LSB
CW	2.000.01 – 3.599.99	2.000.01 – 3.602.99	02	3.603.00	CW
LSB	3.600.00 – 3.800.00	3.603.00 – 3.800.00	03	3.800.01	LSB
CW	3.800.01 – 5.275.99	3.800.01 – 5.275.99	04	5.276.00	CW
USB	5.276.00 – 5.284.00	5.276.00 – 5.281.00	05	5.281.01	USB
CW	5.284.01 – 5.297.99	5.281.01 – 5.297.99	06	5.298.00	CW
USB	5.298.00 – 5.307.00	5.298.00 – 5.304.00	07	5.304.01	USB
CW	5.307.01 – 5.312.99	5.304.01 – 5.312.99	08	5.313.00	CW
USB	5.313.00 – 5.323.00	5.313.00 – 5.320.00	09	5.320.01	USB
CW	5.323.01 – 5.332.99	5.320.01 – 5.332.99	10	5.333.00	CW
USB	5.333.00 – 5.338.00	5.333.00 – 5.335.00	11	5.335.01	USB
CW	5.338.01 – 5.353.99	5.335.01 – 5.353.99	12	5.354.00	CW
USB	5.354.00 – 5.358.00	5.354.00 – 5.355.00	13	5.355.01	USB
CW	5.358.01 – 5.361.99	5.355.01 – 5.361.99	14	5.362.00	CW
USB	5.362.00 – 5.374.50	5.362.00 – 5.371.50	15	5.371.51	USB
CW	5.374.51 – 5.377.99	5.371.51 – 5.377.99	16	5.378.00	CW
USB	5.378.00 – 5.382.00	5.378.00 – 5.379.00	17	5.379.01	USB
CW	5.382.01 – 5.394.99	5.379.01 – 5.394.99	18	5.395.00	CW
USB	5.395.00 – 5.401.50	5.395.00 – 5.398.50	19	5.398.51	USB
CW	5.401.51 – 5.403.49	5.398.51 – 5.403.49	20	5.403.50	CW
USB	5.403.50 – 5.406.50	5.403.50 – 5.403.50	21	5.403.51	USB
CW	5.406.51 – 7.039.99	5.403.51 – 7.042.99	22	7.043.00	CW
LSB	7.040.00 – 7.200.00	7.043.00 – 7.200.00	23	7.200.01	LSB
CW	7.200.01 – 10.129.99	7.200.01 – 10.129.99	24	10.130.00	CW
USB	10.130.00 – 10.150.00	10.130.00 – 10.147.00	25	10.147.01	USB
CW	10.150.01 – 14.099.99	10.147.01 – 14.099.99	26	14.100.00	CW
USB	14.100.00 – 14.350.00	14.100.00 – 14.347.00	27	14.347.01	USB
CW	14.350.01 – 18.094.99	14.347.01 – 18.094.99	28	18.095.00	CW
USB	18.095.00 – 18.168.00	18.095.00 – 18.165.00	29	18.165.01	USB
CW	18.168.01 – 21.099.99	18.165.01 – 21.099.99	30	21.100.00	CW
USB	21.100.00 – 59.999.98	21.100.00 – 59.996.98	31	59.999.99	USB

In summary, these settings allow the following dial frequencies:

160m: CW up to 1.842.99, LSB from 1.843.00 to 2.000.00
80m: CW up to 3.602.99, LSB 3.603.00 to 3.800.00
60m [4]: CW in segment 1 and the beacon segment, USB in remaining segments
40m: CW up to 7.04299, LSB from 7.043.00 to 7.200.00
30m: CW up to 10.12999, USB from 10.130.00 to 10.147.00
20m: CW up to 14.099.99, USB from 14.100 to 14.347.00
17m: CW up to 18.094.99, USB from 18.095.00 to 18.165.00
Remaining HF bands, plus 6m: CW up to 21.099.99, USB from 21.100.00 upwards

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[4] See the chart on the next page for details of UK 60m band segments.

5252	5254	5256	5258	5260	5262	5264	5266	5268	5270	5272

5258.5 — 5264.0
CW

5272	5274	5276	5278	5280	5282	5284	5286	5288	5290	5292

5276.0 — 5284.0
USB

5288.5 — 5292.0
Beacons

5292	5294	5296	5298	5300	5302	5304	5306	5308	5310	5312

5298.0 — 5307.0
USB

5312	5314	5316	5318	5320	5322	5324	5326	5328	5330	5332

5313.0 — 5323.0
USB

5332	5334	5336	5338	5340	5342	5344	5346	5348	5350	5352

5333.0 — 5338.0
USB

5352	5354	5356	5358	5360	5362	5364	5366	5368	5370	5372	5374

5354.0 — 5358.0
USB

5362.0 — 5374.5
USB

5374	5376	5378	5380	5382	5384	5386	5388	5390	5392	5394

5378.0 — 5382.0
USB

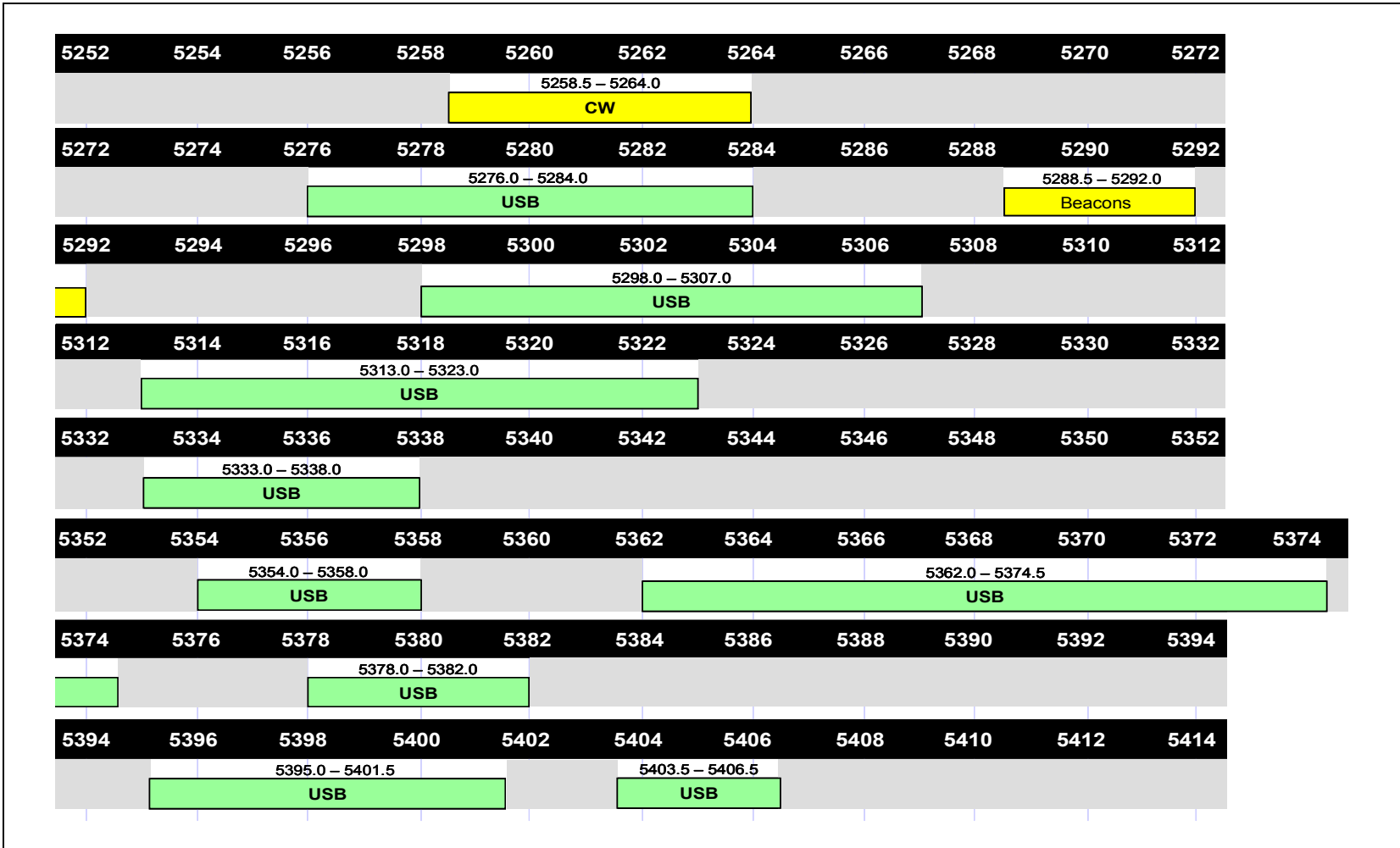	5394	5396	5398	5400	5402	5404	5406	5408	5410	5412	5414

5395.0 — 5401.5
USB

5403.5 — 5406.5
USB

Figure A1-1: The UK 60m band, showing the 11 band segments used in setting up the AUTO Mode entries in the table on the previous page. There is no formal bandplan for this band, so some of the segments may be used for other modes

References

	Resource	*URL*
[1]	Kenwood TS-590S Instruction Manual	Go to the "TS-590S Resources Page": http://homepage.ntlworld.com/wadei/ts-590s.htm Click on the "KENWOOD TS-590S DOCUMENTATION" button. Select item # 2 from the list.
[2]	ARCP-590 Radio Control Program	http://www.kenwood.com/i/products/info/amateur/ts_590/arcp590_e.html

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