

# Kenwood TS-590SG

## An update for a well-respected HF & 50MHz transceiver

**INTRODUCTION.** The Kenwood TS-590S was launched late in 2010 and I reviewed the radio in the January 2011 *RadCom*. A 13.8V-operated, mid-sized, 100W radio covering all bands from HF to 50MHz with a generous set of features and a high performance at an attractive price, it has proved a popular choice for many users. Kenwood has now updated the radio with some additional functions and features and some enhancements to the hardware to further improve the performance in a number of key areas. The new 'SG' version has now replaced the 'S' version in production.

**FEATURES SUMMARY.** The radio uses a single receiver with a rather novel configuration. Over most of the tuning range it is a triple conversion superhet, up-converting to a first IF of 73MHz, then to 10.7MHz and 24kHz. On certain amateur bands (160, 80, 40, 20, 15m) and with bandwidths less than 2.7kHz, a separate first mixer down-converts directly to the second IF, now at 11.374MHz, and bypasses the up-conversion process. Narrow roofing filters of 2.7kHz or 500Hz bandwidth are selected automatically in the down-conversion path, yielding much better close-in performance compared to the up-conversion path, which uses wider filters.

A low-level output (about 1mW) provides a transmit signal on the 136kHz band as well as transverter drive from any of the HF bands. Following a firmware update in late January, the low-level LF transmit range has been extended to cover the 472kHz band. This extension of coverage is also available via a firmware update for the earlier model.

The functions provided are extensive, similar to most modern high-end radios. Individual buttons select bands and modes, generally more convenient than scrolling buttons. The receiver channel filters are



The TS-590SG looks almost identical to its predecessor, the TS-590S: the improvements are all under the skin.

very comprehensive with fully adjustable slopes, shifts and widths. Four different notch circuits are included, an adjustable manual and an auto notch at IF (auto notch is normally an audio function) and two beat cancellation filters at AF. All were extremely effective. Two DSP noise reduction functions are provided and there are two separate noise-blanking systems. AGC is fully adjustable and may be switched off.

On transmit, an auto ATU is provided operating up to 50MHz. On voice modes, the audio bandwidth may be tailored with adjustable low cut and high cut filters and an additional equaliser is also provided with six selectable profiles. On CW, a full message keyer is included with adjustment of the envelope shaping.

A USB port is fitted and this can be used to provide PC control of the radio and for passing audio to and from external applications. This is in addition to the COM port and normal audio interfacing lines that are also provided. Software and port drivers are available from the Kenwood website.

There are dual antenna connectors and a separate receive-only antenna input, and separate CW key jacks on the rear panel for paddle and external keying. A voice guide and message store is an optional extra, providing voice readout of button presses and contest message stores with the ability to record and playback the last 30 seconds of receiver audio.

The menu system is very comprehensive, easy to access and set with scrolling display annotation. There are 99 adjustable items, increased

from 88 in the earlier model and two entirely separate sets of parameters may be stored, menu A or menu B. This can be useful for optimising different operating environments such as contesting and local rag-chewing or for field day operation where two operators have different preferences for the way the radio is set up.

This is just a brief summary; for a full description of all the features and functions, refer to the earlier review in the January 2011 *RadCom*.

**NEW FEATURES AND FUNCTIONS.** The TS-590SG includes a number of hardware changes and firmware upgrades. Some small cosmetic changes have been made to the knobs, lettering and trim to complement the style of the top-end TS-990S. LCD backlight colour selections have been increased from two to ten, all variations on amber and green.

A Morse code data decoder is now built in, displaying up to eight characters in the space on the display normally allocated to the split operating frequency. It tracks over a reasonable range of speeds and up to quite high values but, as with all such decoders, it is only effective on really accurately sent Morse (eg from a computer) with low levels of noise and interference. Its greatest use is perhaps in building confidence on receiving Morse code.

The low-level drive output connector, originally provided for transverter drive or LF transmission, can now be assigned to provide an antenna feed to an external receiver. This yields a 3dB loss on both paths if enabled.

The number of programmable function keys on the front panel has been increased from two to six by allowing the RIT, XIT and



CW decoding is now included and characters appear in the 'sub' display area.

CL keys to be reassigned for this purpose and fitting the MULTI click-step rotary with a push-button. In split frequency operation it is now possible to enter split shifts directly in integer kHz units up to ±9kHz.

Two different methods are used to set the IF channel bandwidth, using dual concentric rotary controls. In the original design, these controls provided independent tailoring of the low and high cut-off frequencies on voice modes as a means of setting the overall bandwidth. On CW and data modes, these controls set the bandwidth and centre frequency (shift). With the TS-590SG, both methods of control are available on SSB voice and SSB data modes by setting an appropriate menu item. However, the finer control provided by the original method is more appropriate for voice modes and is the default setting.

A number of minor circuit changes have been made to improve the overall performance. In the original design, some slight power overshoot was seen on the first CW transmit character. In most situations this was not a problem but some users with linear amplifiers driven to near full output experienced over-power tripping. Kenwood produced a fix for this issue, which was implemented in production models from the beginning of 2014. In the SG version, the ALC circuitry has been redesigned to eliminate this problem. Some redesign of the circuitry around the first mixer and synthesiser has been made to improve further the close-in dynamic range. In the original design, strong close-by signals falling inside the roofing filter bandwidth could desensitise the receiver by capturing the IF element of the AGC. The AGC is applied in several places. In the SG version, the AGC has been re-optimised to avoid this problem.

**MEASUREMENTS.** I limited my detailed measurements to those areas that had been addressed by circuit changes. In other areas a brief check showed a similar performance to the measured results for the TS-590S.

Dynamic range figures for intermodulation and reciprocal mixing at greater than 10kHz spacing were broadly similar to the TS-590S. These are excellent figures in line with the top end radios currently on the market. Close-in there was no sign of AGC desensitising but there was

CLOSE-IN INTERMODULATION. 500Hz BANDWIDTH. PREAMP OFF				
Spacing	-----RX1 on 7MHz-----		-----RX2 on 10MHz-----	
	3rd order intercept	2 tone dynamic range	3rd order intercept	2 tone dynamic range
1kHz	-10dBm	81dB	-18.5dBm	76dB
1.5kHz	-4dBm	85dB	-18.5dBm	76dB
2kHz	-1dBm	87dB	-18.5dBm	76dB
3kHz	+5dBm	91dB	-12.5dBm	80dB
4kHz	+9.5dBm	94dB	-9dBm	82dB
5kHz	+12.5dBm	96dB	-6dBm	84dB
7kHz	+17dBm	99dB	0dBm	88dB
10kHz	+27.5dBm	106dB	+10dBm	95dB
15kHz	+35dBm	111dB	+28dBm	107dB
20kHz	+30dBm	107dB	+28dBm	107dB
25kHz	+31dBm	108dB	+28dBm	107dB

  

--- RECIPROCAL MIXING 500Hz BANDWIDTH ---				
Frequency offset	RX1	RX1	RX2	Transmit noise
	7MHz	21MHz	16MHz	7MHz
1kHz	89dB (-116dBC/Hz)	85dB (-112dBC/Hz)	73dB (-100dBC/Hz)	-100dBC/Hz
2kHz	99dB (-126dBC/Hz)	95dB (-122dBC/Hz)	79dB (-106dBC/Hz)	-107dBC/Hz
3kHz	104dB (-131dBC/Hz)	99dB (-126dBC/Hz)	82dB (-109dBC/Hz)	-110dBC/Hz
5kHz	110dB (-137dBC/Hz)	106dB (-133dBC/Hz)	87dB (-114dBC/Hz)	-112dBC/Hz
10kHz	117dB (-144dBC/Hz)	112dB (-139dBC/Hz)	98dB (-125dBC/Hz)	-120dBC/Hz
15kHz	120dB (-147dBC/Hz)	116dB (-143dBC/Hz)	105dB (-132dBC/Hz)	-126dBC/Hz
20kHz	122dB (-149dBC/Hz)	117dB (-144dBC/Hz)	108dB (-135dBC/Hz)	-132dBC/Hz
30kHz	123dB (-150dBC/Hz)	120dB (-147dBC/Hz)	110dB (-137dBC/Hz)	-133dBC/Hz
50kHz	116dB (-143dBC/Hz)	118dB (-145dBC/Hz)	108dB (-135dBC/Hz)	-134dBC/Hz
100kHz	127dB (-154dBC/Hz)	125dB (-152dBC/Hz)	115dB (-142dBC/Hz)	-136dBC/Hz

  

----- BLOCKING PREAMP OFF -----			
Frequency offset	RX1	RX1	RX2
	2.7kHz roof	500Hz roof	2.7kHz filter
1kHz	noise limited	noise limited	noise limited
2kHz	noise limited	noise limited	noise limited
3kHz	noise limited	noise limited	+2dBm
5kHz	> +17dBm	+20dBm	+2dBm
10kHz	> +17dBm	> +20dBm	+6dBm
15kHz	> +17dBm	> +20dBm	+14dBm
20kHz	> +17dBm	> +20dBm	+20dBm
30kHz	> +17dBm	> +20dBm	+20dBm
50kHz	> +17dBm	> +20dBm	+20dBm
100kHz	> +17dBm	> +20dBm	+20dBm

a drop-off in dynamic range as the roofing filter sides were approached, perhaps rather more than I was expecting. With the earlier TS-590S review, AGC affected the close-in measurement and resulted, I realise now, in false high measured figures.

The overall AGC attack and decay performance was similar to the earlier model, with a 5 to 10ms hole inserted in the signal on the attack response. Commonly seen on many DSP implemented radios, this can degrade readability of weak signals in noisy situations. Backing off the RF gain control and turning off the AGC may help in these specific situations. The receiver is generally very clean from spurious responses. The weak birdie on

1827.5kHz in the 160m DX sector reported in the earlier review is still there, although on the review SG radio it is at a lower level than the earlier model and unlikely to be an issue.

On transmit, the keying envelope was nicely shaped with no overshoot visible at any power

level. The default rise/fall times are 6ms and this gives a clean result but faster times down towards 1ms give noticeable clicks on adjacent frequencies and even further out. Transmitter noise output is similar to the TS-990S and better than some recent introductions.

**CONCLUSIONS.** The TS-590SG performs in a similar fashion to the earlier model. It is an excellent all-round radio, packed with useful features, is easy to operate with well thought out and friendly ergonomics and has a very readable display. The on-air performance was very good with clean results on weak and strong signals and it received good transmission reports. The changes and additions enhance an already excellent radio. Some of the enhancements have also been implemented in a firmware update to the earlier model.

Available from the usual retailers for around £1350, the TS-590SG is excellent value for money.

**ACKNOWLEDGEMENT.** I would like to express my gratitude to Kenwood Electronics UK for the loan of this radio.



The clean TS-590SG rear panel is unchanged from the TS-590S.