

S METER STANDARD

In the early days everyone had a different idea and "in-house" standard. Note, the standard was not set until in 1981, long after these vintage radios were designed and built. The lack of uniformity and complaints in the 70's about "S-UNIT advertising bias" were the root of the 1981 publication and adaptation of the "standard". The standard had and has no authority and was and is just a guideline. The only authority it held was when RFP's and RFB's contained a stipulation for the standard applied to S-unit measurements. It also gave Technicians and Engineers a standard for comparing performance from radio to radio.

There was no standard when Hallicrafters existed, however everyone was "in the ballpark". Hallicrafters had a very loose spec, in the case of the SR series, S-9 will be achieved between 50 and 100uv

The S meter on most ham gear was not meant to be a precise measurement. The goal was to achieve S5 at 3.0uv and S9 at 50uv in. In the 30's attempts were made to create standards for S units. It did not work. It was soon found that different bands required different tables. LF, HF, UHF and so on and each required different specs. Also, a little loss in gain, although corrected by AGC, in the front end of a receiver skewed the S meter response one way. Loss of gain in the rear end skewed it the other. So as a definitive measure the S unit was abandoned. For definitive measurements gain and sensitivity was settled upon.

The SR-150 for instance: The sensitivity spec is 1uv in for 20DB S+N:N ratio, the gain spec is for 1uv in 1/2 watt audio out.

IARU Region 1 Technical Recommendation R.1

In the 1930s it was already agreed that for the HF bands, S9 corresponds to 50 μV at the input terminal of the receiver, but this was not a measure of the power received because the input impedance of receivers was not standardized. Receiver input Z_0 varied from 30 ohms to 600 ohms.

The International Amateur Radio Union (IARU) Region 1 agreed on a technical recommendation for S Meter calibration for HF and VHF/UHF transceivers in 1981.

IARU Region 1 Technical Recommendation R.1 defines S9 for the HF bands to be a receiver input power of -73 dBm. This is a level of 50 microvolts at the receiver's antenna input assuming the input impedance of the receiver is 50 ohms.

For VHF bands the recommendation defines S9 to be a receiver input power of -93 dBm. This is the equivalent of 5 microvolts in 50 ohms.

The recommendation defines a difference of one S-unit corresponds to a difference of 6 decibels (dB), equivalent to a voltage ratio of two, or power ratio of four. Signals stronger than S9 are given with an additional dB rating, thus "S9 + 20dB", or, verbally, "20 decibels over S9", or simply "20 over 9" or even the simpler "20 over."

Examples

A weak signal with signal strength of S2 corresponds to received power of -115 dBm or 0.40 microvolts RMS in 50 ohms on HF.

A strong signal with signal strength of S8 corresponds to received power of -79 dBm or 25 microvolts RMS in 50 ohms on HF.

Some signal generators are calibrated in dB above $1\mu\text{V}$ and have an output in emf. For example to set an HF receiver's S-reading to S9 set the signal generator output to 34 dB above $1\mu\text{V}$

S-reading	HF μV (rms, Relative to 50Ω)	Signal Generator emf	
		dBm	dB above $1\mu\text{V}$
S9+10dB	160.0	-63	44
S9	50.2	-73	34
S8	25.1	-79	28
S7	12.6	-85	22
S6	6.3	-91	16
S5	3.2	-97	10
S4	1.6	-103	4
S3	0.8	-109	-2
S2	0.4	-115	-8
S1	0.2	-121	-14