

S METER CALIBRATION

of Yaesu FTdx-3000

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The International Amateur Radio Union (IARU) Region 1 Technical Recommendation R.1 defines S9 for the HF bands to be a receiver input power of -73 dBm. This is equivalent to 50 μ V into 50 Ω . The IARU also defines an S unit to be an increment of 6 dB. 6 dB is a power ratio of four or a voltage ratio of two. Thus S0 is -127dBm, S1 = -121dBm, etc. The max. S unit is S9. Inputs above S9 are expressed in dB over S9.

I recently purchased a new, Yaesu FTdx-3000 HF transceiver. I am very impressed and pleased with this rig. As part of my evaluation, I decided to check out it's S meter calibration. I used my Fluke model 6060B synthesized signal generator as my calibration standard to test the new rig. The Fluke covers from 10 kHz to 1050 MHz. It's calibrated output goes from -127 dBm (0.1 μ V) to +13 dBm (1 V) in 0.1 dB steps.. It's uncalibrated output covers even further from -147 dBm (0.01 μ V) to +18dBm (1.8 V).

I set the FTdx-3000 to receive on 20 meters (14.250 MHz), upper side-band, 3 kHz bandwidth roofing filter, with the pre-amps and front end attenuators turned off. I put in the IARU standard S9 signal of 50 μ V (-73 dBm). I found that the Yaesu's S meter read S7, not S9 !

What I discovered was that Yaesu is using a different definition for S units. They apparently use 100 μ V (-67 dBm) for S9. Further I found that for each -3dB change in input power lowered the S meter by one S unit. Thus S0 was -94 dBm, not -127 dBm.

Based upon Yaesu's own S definition, I did find their S meter to be quite accurate within ± 1 dB. It was also accurate for the dB levels above S9 up to S9 +40 dB. Above there it started to compress. I also checked the S meter data the Yaesu sent over the USB bus to my computer. I was running Ham Radio Deluxe, ver. 6.0, to communicate with the rig. I found the S meter readings reported by HRD were the same as displayed on the rig's S meter for S9 and above. Below S9, the HRD reading was one S unit low. I also tested the rig on all the other ham bands from 160 m thru 6 m and got identical results.

I also tested the rig's pre-amps and front end attenuators. I found they met specifications. Amp #1 had 12dB gain, while Amp #2 had 20dB gain. The choice of attenuators was -6 dB, -12 dB and -18 dB. I also tested the rig for sensitivity. I adjusted the Fluke signal generator down to very low levels to just hear a 1 kHz CW tone (3 kHz bandwidth, ssb filter) at about 3 dB S/N. The results I got were: IPO (i.e. no pre-amp) = -124 dBm (0.14 μ V), AMP1 = -134 dBm (0.045 μ V) and AMP2 = -139 dBm (0.025 μ V).

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