Sherwood Engineering Test Results

Model Yaesu FTX-1 Optima Serial # 5F020211 Test Dates: 05/29/2025 - 6/18/2025

Measurements on 20 meters unless otherwise noted.

IF BW 3000 –6 /-60 Hz 3026 / 3570 *	Ultimate	100+ dB @ 2 kHz
IF BW 500 –6 /-60 Hz 507 / 661	Ultimate	90+ dB @ 500 Hz
IF BW 250 -6/-60 Hz 256 / 360	Ultimate	90+ dB @ 500 Hz

* Note the default SSB bandwidth is 3000 Hz not 2400 Hz

Front End Selectivity (A – F)	C bandpass
First IF rejection +/- kHz	N/A

Dynamic Range no preamp		
Dynamic Range 20 kHz	91	dB
Dynamic Range 10 kHz	91	dB
Dynamic Range 5 kHz	91	dB
Dynamic Range 2 kHz	91	dB

Dynamic Range preamp #1		
Dynamic Range 20 kHz	90	dB
Dynamic Range 10 kHz	90	dB
Dynamic Range 5 kHz	90	dB
Dynamic Range 2 kHz	90	dB

Blocking or ADC overload above noise floor

1uV signal @ 100 kHz, AGC On,	129 *	dB

* Note: The FTX-1 blocks like a superhet. Tested from 100 kHz to 10 kHz.

Reciprocal Mixing Dynamic Range (RMDR)

Spacing kHz		
2.5	110	dB
5	113	dB
10	115	dB
15	118	dB
20	119	dB
50	120	dB
100	120	dB
200	120	dB
300	122	dB
400	122	dB
500	122	dB

Phase noise (normalized) at 2.5 kHz spacing:	-137	dBc/Hz
Phase noise (normalized) at 5 kHz spacing:	-140	dBc/Hz
Phase noise (normalized) at 10 kHz spacing:	-142	dBc/Hz
Phase noise (normalized) at 15 kHz spacing:	-145	dBc/Hz
Phase noise (normalized) at 20 kHz spacing:	-146	dBc/Hz
Phase noise (normalized) at 50 kHz spacing:	-147	dBc/Hz
Phase noise (normalized) at 100 kHz spacing:	-147	dBc/Hz
Phase noise (normalized) at 200 kHz spacing:	-147	dBc/Hz
Phase noise (normalized) at 300 kHz spacing:	-149	dBc/Hz
Phase noise (normalized) at 400 kHz spacing:	-149	dBc/Hz
Phase noise (normalized) at 500 kHz spacing:	-149	dBc/Hz

Noise floor, SSB bandwidth 14 MHz, no preamp	-118	dBm
Noise floor, SSB bandwidth 14 MHz, Preamp 1 On	-128	dBm
Noise floor, SSB bandwidth 14 MHz, Preamp 2 On	-134	dBm

Sensitivity SSB at 14 MHz, no preamp	0.9	uV
Sensitivity SSB at 14 MHz, Preamp 1 On	0.25	uV
Sensitivity SSB at 14 MHz, Preamp 2 On	0.13	uV

Noise floor, 500 Hz, 14.2 MHz, no preamp	-124	dBm
Noise floor, 500 Hz, 14.2 MHz, Preamp 1 On	-134	dBm
Noise floor, 500 Hz, 14.2 MHz, Preamp 2 On	-141	dBm

Noise floor, SSB, 50.125 MHz, no preamp	-116	dBm
Noise floor, SSB, 50.125 MHz, Preamp 1	-127	dBm
Noise floor, SSB, 50.125 MHz, Preamp 2	-132	dBm

Sensitivity, SSB, 50.125 MHz, no preamp	1.12	uV
Sensitivity, SSB, 50.125 MHz, Preamp 1	0.32	uV
Sensitivity, SSB, 50.125 MHz, Preamp 2	0.18	uV

Noise floor, 500 Hz, 50.125 MHz, no preamp	-122	dBm
Noise floor, 500 Hz, 50.125 MHz, Preamp 1 On	-133	dBm
Noise floor, 500 Hz, 50.125 MHz, Preamp 2 On	-139	dBm

Noise floor, 500 Hz 144.200 MHz, Preamp On	-140	dBm
Noise floor, 500 Hz 432.200 MHz, Preamp On	-140	dBm

Dynamic Range (DR3) Preamp On 2m & 70cm

DR3 2m 20 – 2 kHz spacing	83	dB

DR3 70cm 20 – 5 kHz spacing:	82	dB
DR3 70cm 2 kHz spacing	81	dB

RMDR 144.2 MHz			RMDR 432.2 MHz		
Spacing			Spacing		
2.5 kHz	91	dB	2.5 kHz	89	dB
5 kHz	94	dB	5 kHz	92	dB
10 kHz	96	dB	10 kHz	94	dB
20 kHz	100	dB	20 kHz	97	dB
50 kHz	105	dB	50 kHz	100	dB
100 kHz	106	dB	100 kHz	99	dB

Phase noise at the same offsets dBc/Hz			
2.5 kHz	-118	2.5 kHz	-116
5 kHz	-121	5 kHz	-119
10 kHz	-123	10 kHz	-121
20 kHz	-127	20 kHz	-124
50 kHz	-132	50 kHz	-127
100 kHz	-133	100 kHz	-126

Signal for S9, no preamp	112	uV
Signal for S9, Preamp 1	32	uV
Signal for S9, Preamp 2	9	uV

Gain of preamps		
Preamp 1	11	dB
Preamp 2	11	dB

AGC threshold at -3 dB, no preamp	4.5	uV
AGC threshold at -3 dB, Preamp 1 ON	1.4	uV
AGC threshold at -3 dB, Preamp 2 ON	0.4	uV

Transmit Composite Noise (CN) dBc/Hz 20 meters

Offset kHz	100 watts	30 watts
2.5	-124	-120
5	-126	-122
10	-130	-125
20	-134	-128
50	-137	-132
100	-141	-136

Transmit IMD	100 watts	30 watts
3rd	-27 dBc	-28 dBc
5th	-36 dBc	-41 dBc
7th	-47 dBc	-58 dBc
9th	-56 dBc	-61 dBc

Notes:

To convert transmit IMD in dBc to PEP add 6 dB. This doesn't change the actual distortion but it makes the numbers bigger.

The radio might boot up when the 13.8 volt power supply is turned on.
If not, the ON/OFF switch is a long push of the LOCK button labeled in red.

The bulk of the tests were made on 20 meters. Additional tests were also run on 6m which has become standard band for modern HF radios.

On 2m and 70cm only 500-Hz noise floor and dynamic range (DR3) measurements were made in the standard 500-Hz bandwidth. Test spacings for DR3 were the standard 20, 10, 5 and 2 kHz values.

The FTX-1 is listed as direct sampling superheterodyne up through 48 MHz. Not sure what that means. Above 48 MHz it is IF sampling single conversion. The radio blocks like a normal superheterodyne on 20m where the majority of the measurements were made. The radio does not over-range at some point like most direct sampling radios. This would typically occur between -10 dBm and 0 dBm, depending on the design parameters. This is associated with the gain ahead of a rig's ADC chip and is not a function of third-order dynamic range.

Note: The FT-710 also exhibited a superhet-style of blocking, atypical of a direct sampling architecture. This may be attributed to the undocumented ADC driver chip beginning gain compression before the ADC over-ranges.

While the AF gain knob is detented, a 1 dB change in the audio level often requires several detent clicks.

RMDR / phase noise did not impact any of the basic measurements.
RMDR = Reciprocal Mixing Dynamic Range

The new averaging option for the band scope works well, and I chose a setting of 4.

The FTX-1 Optima has two antenna ports for HF and one antenna port for VHF/UHF.

Overall this transceiver does not appear to compete with the higher third-order dynamic range of the FTdx10 or the FT-710 which test at 107 dB. That said, for most operators a dynamic range of 90 dB is completely acceptable in many RF environments.

Current HF to UHF or VHF/UHF only rigs exhibit a significantly lower dynamic range above 6 meters than is typical on HF. A high-end transverter plus a 100 dB dynamic range HF transceiver is likely favored by serious VHF/UHF contesters.

I expect most operators of all the current Yaesu rigs to be operated with preamp 1 enabled on 20m and up for best AGC operation. There is no practical dynamic range difference with preamp 1 vs. IPO (preamp off).

Rev F