Sherwood Engineering HF Test Results

Model FTdx-5000D	Serial # 0F050070	Test Date: 11/25/2010		
IF BW 6000 –6 / -60, Hz	6290 / 8595	Ultimate (noise limited)	90	dB
IF BW 2400 –6 / -60, Hz	2565 / 3275	Ultimate (noise limited)	90	dB
IF BW 500 –6 / -60, Hz	530 / 715	Ultimate (noise limited)	90	dB

Front End Selectivity (A – F)	B	
Spurious 14.2 MHz +/- 42 kHz	85	dB
Worst spurious 14.2 MHz +/- 426 kHz	66	dB

Dynamic Range with radio set to IPO1, 600 Hz roofing, 500 Hz DSP filtering

Dynamic Range 20 kHz	103	#	dB	IP3	+32	dBm
Dynamic Range 5 kHz	102	#	dB	IP3	+30	dBm
Dynamic Range 2 kHz	100	*	dB	IP3	+27	dBm

Combination of phase noise and 3rd order product
* Consisted of phase noise only

Dynamic Range with radio set to Preamp 1, 600 Hz roofing, 500 Hz DSP filtering

Dynamic Range 20 kHz	104	#	dB	IP3	+21	dBm
Dynamic Range 5 kHz	103	#	dB	IP3	+20	dBm
Dynamic Range 2 kHz	101	*	dB	IP3	+17	dBm

Combination of phase noise and 3rd order product
* Consisted of phase noise only

Dynamic Range with radio set to IPO1, 6 kHz roofing, 500 Hz DSP filtering

Dynamic Range 2 kHz	72	dB	IP3	-15	dBm

Dynamic Range with radio set to IPO1, 15 kHz roofing, 500 Hz DSP filtering

Dynamic Range 2 kHz	69	dB	IP3	-20	dBm

Blocking above noise floor, 1uV signal @ 100 kHz, AGC On, 3 Hz filter 127^ dB
^ See notes below on blocking. Measurement is meaningless.

Phase noise (normalized) at 2.5 kHz spacing:	-129	dBc
Phase noise (normalized) at 5 kHz spacing:	-134	dBc
Phase noise (normalized) at 10 kHz spacing:	-135	dBc
Phase noise (normalized) at 20 kHz spacing:	-135	dBc
Phase noise (normalized) at 40 kHz spacing:	-131	dBc
Phase noise (normalized) at 80 kHz spacing:	-126	dBc
Phase noise (normalized) at 100 kHz spacing:	-124	dBc
Phase noise (normalized) at 200 kHz spacing:	-135	dBc
Phase noise (normalized) at 300 kHz spacing:	-129	dBc
Phase noise (normalized) at 400 kHz spacing:	-126	dBc
Phase noise (normalized) at 500 kHz spacing:	-137	dBc

Noise floor, SSB bandwidth 14.2 MHz, IPO2	-108	dBm
Noise floor, SSB bandwidth 14.2 MHz, IPO1	-117	dBm
Noise floor, SSB bandwidth 14.2 MHz, Preamp 1 On	-130	dBm
Noise floor, SSB bandwidth 14.2 MHz, Preamp 2 On	-136	dBm
Sensitivity at 14.2 MHz, IPO2 (10 dB S+N/N)	3.2	uV
Sensitivity at 14.2 MHz, IPO1	1.1	uV
Sensitivity at 14.2 MHz, Preamp 1 On	0.27	uV
Sensitivity at 14.2 MHz, Preamp 2 On	0.13	uV
Noise floor, 500 Hz, 14.2 MHz, IPO2	-113	dBm
Noise floor, 500 Hz, 14.2 MHz, IPO1	-123	dBm
Noise floor, 500 Hz, 14.2 MHz, Preamp 1 On	-135	dBm
Noise floor, 500 Hz, 14.2 MHz, Preamp 2 On	-141	dBm
Noise floor, 500 Hz, 50.125 MHz, IPO2	-108	dBm
Noise floor, 500 Hz, 50.125 MHz, IPO1	-119	dBm
Noise floor, 500 Hz, 50.125 MHz, Preamp 1 On	-131	dBm
Noise floor, 500 Hz, 50.125 MHz, Preamp 2 On	-139	dBm
Noise floor, SSB, 50.125 MHz, IPO2	-101	dBm
Noise floor, SSB, 50.125 MHz, IPO1	-112	dBm
Noise floor, SSB, 50.125 MHz, Preamp 1	-124	dBm
Noise floor, SSB, 50.125 MHz, Preamp 2	-133	dBm
Signal for S9, IPO2	375	uV
Signal for S9, IPO1	108	uV
Signal for S9, Preamp 1	27	uV
Signal for S9, Preamp 2	8	uV
Gain change reference IPO1		
IPO2	-10	dB
Preamp 1	+12	dB
Preamp 2	+23	dB
AGC threshold at 3 dB, IPO2	15.7	uV
AGC threshold at 3 dB, IPO1	4.6	uV
AGC threshold at 3 dB, Preamp 1 On	1.17	uV
AGC threshold at 3 dB, Preamp 2 On	0.33	uV

Notes:

The difference between the 3rd order product on the high side and the low side was only 1 dB, with the high side being 1 dB worse.

When doing the 2 kHz DR3 test, which was phase noise limited, there was no difference between the 600 Hz filter and the 3 kHz filter. If driven harder so the IMD was several dB above the phase noise, the 3 kHz filter was a few dB worse than the 600 Hz. From a practical standpoint on SSB, the 3 kHz roofing filter will not degrade the dynamic range in any practical way. (There is no need for a 2.1 or 1.8 kHz roofing filter.)

The measured bandwidth of the 600 Hz roofing filter was 620 Hz. The measured bandwidth of the 3 kHz roofing filter was 3.09 kHz.

Ultimate rejection within a few filter bandwidths is limited by phase noise to about 90 dB.

Phase noise (measured by reciprocal mixing method) does not significantly improve with spacing. Noise a 2.5 kHz is the same as at 300 kHz. Noise at 10 kHz, 20 kHz and at 200 kHz is the same.

^ Blocking measurement with 3 Hz filter at 127 dB above the -123 dBm noise floor is meaningless. The noise in the 500 Hz CW bandwidth actually goes up 8 dB. The 1 uV signal on the scope is disappearing into the noise, even with the 3 Hz filter. The exact point of 1 dB gain compression was difficult to determine.

Blocking was 121 dB above the -135 dBm noise floor when measured with the preamp 1 enabled, using a 1 uV test signal, the AGC ON with 3 Hz method.

Synthesizer spurious was not an issue, with most spurs down better than 90 dB. The strange images at plus and minus 42 and 426 kHz were unusual. The 426 kHz image down only 66 dB may be a practical issue.

Operational observations made during the 2010 ARRL Sweepstakes SSB contest.

Typical AGC exaggeration of any impulse noise. (Like virtually all the rigs that have come out since 2003 except the K3 and Flex products)

Range of AGC decay not adequate. Default Slow was 3000 msec, and it only goes to 4000 msec. There is no logical reason to limit the adjustment range to that low a value.

Not clear whether the speech processor does much. Due to the ALC problem I can not evaluate the processor at this time.

Non operational issues:

Index in manual close to useless. The manual in general is poor. If it says in the manual one has to hold the Menu button in for 2 seconds to memorize a change, I never saw it. The manual is very unclear what IPO1 does. IPO1 and IPO2 bypass the preamps, but neither the block diagram nor the text explains what IPO1 does. (This was mentioned in the QST review.)

General comments:

I set one of my IC-781s on top of the 5000D and setup separate SP-20 speakers and an Alpha Delta antenna switch so I could instantly A/B the two receivers.
As expected, on weak signal reception on 20 and 15 meters, there is no difference between the 781 and the 5000.
In QRM during Sweepstakes, when the 5000D was set to the same bandwidth as the 781, the reception was virtually the same.
Of course the digital readout of passband position and variable bandwidth on the 5000D is far superior.
On receive the audio feeding an external Icom SP-20 speaker was quite clean, like the 781 and unlike the K3.

As with all Yaesu rigs I have used in the last few years (1000 MP and Mk V Field), the total gain is too low on 20 meters and up with IPO enabled. In the case of the 5000D, IPO1 has a somewhat high AGC threshold, and IPO2 has a really high AGC threshold.

Ergonomics:
Lots of knobs, but some are too close together and hard to adjust, particularly the power output. Every band change likely requires a Power Out adjustment. Hard to read the knob labels. I kept an LED flashlight by the rig so I could read them better. After one memorizes the positions, that will likely not matter.

Main tuning knob excellent.
Secondary 3 knobs to the right of the main knob excellent.

Spectrum scope:
The horizontal width is too large, making it hard to see the whole screen at once. The vertical height is too small. Contrast of the screen very low. That said, the scope provides the needed information. Refresh rate is a bit slow.

When the PA is operated in Class A, the cooling fan comes on often. It is rather noisy, and high pitched, which may discourage use of Class A.

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