Sherwood Engineering HF Test Results

Model Yaesu FTdx-3000 Serial # 2K020075 Test Date: 12/12/2012

IF BW 2400 –6 / -60, Hz 2590 / 3740			Ultimate	85	dB
IF BW 500 –6 /-60, Hz 480 / 1620			Ultimate	80	dB
Front End Selectivity (A – F)				B	
First IF rejection @ 9 MHz				74	dB

Dynamic Range with radio, no preamp

Dynamic Range 20 kHz	105*	dB	IP3	dBm
Dynamic Range 5 kHz	93*	dB	IP3	dBm
Dynamic Range 2 kHz	82*	dB	IP3	dBm

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

Dynamic Range with radio, Preamp 1

Dynamic Range 20 kHz	dB	IP3	dBm
Dynamic Range 5 kHz	dB	IP3	dBm
Dynamic Range 2 kHz	dB	IP3	dBm

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

Dynamic Range with radio, 2nd radio

Dynamic Range 20 kHz	dB	IP3	dBm
Dynamic Range 2 kHz	dB	IP3	dBm

Dynamic Range with radio, alternate conversion scheme

Dynamic Range 20 kHz	dB	IP3	dBm
Dynamic Range 2 kHz	dB	IP3	dBm

Blocking above noise floor, 1uV signal @ 100 kHz, AGC On 500 Hz bandwidth. RMS measurement	132	dB

Phase noise (normalized) at 2.5 kHz spacing:	-112	dBc
Phase noise (normalized) at 5 kHz spacing:	-120	dBc
Phase noise (normalized) at 10 kHz spacing:	-127	dBc
Phase noise (normalized) at 20 kHz spacing:	-133	dBc
Phase noise (normalized) at 40 kHz spacing:	-137	dBc
Phase noise (normalized) at 80 kHz spacing:	-138	dBc
Phase noise (normalized) at 100 kHz spacing:	-138	dBc
Phase noise (normalized) at 200 kHz spacing:	-135	dBc
Phase noise (normalized) at 300 kHz spacing:	-135	dBc
Phase noise (normalized) at 400 kHz spacing:	-137	dBc
Phase noise (normalized) at 500 kHz spacing:	-136	dBc

Noise floor, SSB bandwidth 14 MHz, no preamp		-121	dBm
Noise floor, SSB bandwidth 14 MHz, Preamp 1 On		-133	dBm
Noise floor, SSB bandwidth 14 MHz, Preamp 2 On		-136	dBm
Sensitivity SSB at 14 MHz, no preamp		0.57	uV
Sensitivity SSB at 14 MHz, Preamp 1 On		0.15	uV
Sensitivity SSB at 14 MHz, Preamp 2 On		0.11	uV
Noise floor, 500 Hz, 14.2 MHz, no preamp		-127	dBm
Noise floor, 500 Hz, 14.2 MHz, Preamp 1 On		-138	dBm
Noise floor, 500 Hz, 14.2 MHz, Preamp 2 On		-142	dBm
Noise floor, SSB, 50.125 MHz, no preamp		-123	dBm
Noise floor, SSB, 50.125 MHz, Preamp 1		-135	dBm
Noise floor, SSB, 50.125 MHz, Preamp 2		-137	dBm
Sensitivity, SSB, 50.125 MHz, no preamp		0.47	uV
Sensitivity, SSB, 50.125 MHz, Preamp 1		0.12	uV
Sensitivity, SSB, 50.125 MHz, Preamp 2		0.10	uV
Noise floor, 500 Hz, 50.125 MHz, no preamp		-127	dBm
Noise floor, 500 Hz, 50.125 MHz, Preamp 1 On		-139	dBm
Noise floor, 500 Hz, 50.125 MHz, Preamp 2 On		-141	dBm
Signal for S9, no preamp	-67 dBm	91	uV
Signal for S9, Preamp 1	-79 dBm	24	uV
Signal for S9, Preamp 2	-88 dBm	9	uV
Gain of preamp(s)			
Preamp 1		12	dB
Preamp 2		21	dB
AGC threshold at 3 dB, no preamp		3.8	uV
AGC threshold at 3 dB, Preamp 1 On		1.0	uV
AGC threshold at 3 dB, Preamp 2 On		0.36	uV

Notes:

The one factor that most limits the performance of the FTdx-3000 is the synthesizer phase noise. While the phase noise of the FTdx-3000 is similar to the Icom IC-7700 close in, the Icom is 11 dB lower at 100 kHz. This would be noticeable on Field Day, for instance, if a CW and SSB station were on the same band. It may also be an issue for local hams on the same band.

The band scope is only modestly useful, as it is only about one half inch high, significantly limiting resolution. Any of the Icom radios from the old IC-781 to present provide much more useful information when looking for holes or stations in a contest. Of course the SDR radios, like the Flex or Perseus, have even better band scopes, though require a computer for operation. It would be interesting to hook up an Elecraft P3 FFT band scope to the FTdx-3000.

Ergonomically some sore thumbs stick out in this Yaesu product. There are almost 200 menu choices, but some settings that cry out for a dedicated knob require multiple operations to adjust.

For me, the most egregious is the way power output is set. Of course if one is running barefoot, it doesn't matter. Many ceramic-tube linears require between 35 and 70 watts of drive. When on CW, there is a knob that sort of sets the power output level. If the menu setting #177 is set to 100 watts, then one can tune up a linear properly. In my case it was an Alpha 89, that requires about 65 watts of drive. Switching to SSB, one finds the power knob does nothing, and one has to go into the menu 177 and back the maximum power off to a lower setting. In the case of the Alpha, it only takes 55 watts to drive the linear to 1500 watts output. But the catch is when you want to tune the linear up again, possibly on another band, the maximum power you can get out of the rig on CW is 55 watts. So then the operator has to go back into the menu, change the maximum power to something higher than needed by the linear, tune it up, and then set it back to a somewhat lower value. This is totally unacceptable. The number of button pushes and knob turns to accomplish these adjustments can be four, five or more, depending on what menu number first comes up after pushing the menu button, plus you have to do all this twice (for tuning and operation on SSB).

While using the rig over a weekend, I noted that I could hear no more high frequency audio (or noise) as I widened out the passband on SSB or on CW. This was traced down to the DSP audio filtering menu choices 99 – 102 on SSB and 55-58 on CW. These adjust the low and high frequency roll off points, and the slope (dB / octave) of the roll-off. For me, the default settings make band noise on CW sound strange, and on SSB there was no point in widening out the passband past 2.7 kHz. After some time playing with these settings, I decided to turn off the roll-off completely.

The ALC of the FTdx-3000 operates like all the Yaesu rigs I have used recently, including the FTdx-5000D, the FT-950 and this new FTdx-3000. The time constant is very fast, and Yaesu has purposely made this design choice to enhance its speech processing. Personally I think processing should all be done either in the IF (RF compression or RF clipping) or in DSP, but not with the ALC. In the case of the 5000D, the fantastically clean signal one can put on the air when the exciter is in class A is degraded significantly when ALC is used even to a modest amount. All three of these rigs limit the peak power on SSB to an absolute value. If monitoring on a scope, there is no variation in the peak power from word to word. It is as if the peak power is clipped, which in effect it is. Luckily the radio does not badly splatter, but a more normal less

aggressive ALC allows for some normal variation in peak power from word to word, with less affect on transmitted IMD products.

One has to venture into the menus to adjust the noise blanker setting (#033) and the noise reduction setting (#110). These would be much more convenient if adjustable with a dedicated knob, or at least via a single button push, as is the case on many Icom rigs.

QSK is a dream on the 3000, particularly with a PIN-diode switched linear like the Alpha 89 or Alpha 87A. Full or semi-breakin is set with menu 061, and the break-in delay is set with 062. The range of the delay is odd, adjustable from 30 msec to 3 seconds. The menu adjustment didn't react as I expected, so I just set it to the minimum 30 msec.

Transmit audio on SSB was excellent according to on-air reports from people who are used to the sound of my other rigs. No EQ was necessary with a Heil GM-5 microphone. One can setup three presets for equalization, EQ1, EQ2 and EQ3 for different mics or different operators, though how one selects among those three presents was not clear to me at this time.

Switching the LCD panel among some of the readouts is cumbersome. The Scope button is pushed several times, and then one may select PO, ALC, SWR, COMP, ID or VDD readings. It would be more convenient to be able to monitor more than one function on the LCD screen at a time, or at least to be able to select the functions with fewer button pushes.

One nice improvement over the FT-950, one does not need a proprietary plug to connect the rig to a linear key line, as it is a normal RCA jack on the back of the rig. Also, thankfully, the key or keyer jack is ¼ inch, not a $1/8^{th}$ inch mini-jack like on some of the Ten-Tec rigs.

It is likely that some of the clumsiness of adjustments requiring several operations to change one setting can be side-stepped with computer programs such as Ham Radio Deluxe. The problem with that for contesters is the computer is likely already tied up with N1MM, or similar logging program. Trying to do logging and rig operation with one computer is a compromise at best, and causes serious problems of "focus" at worst. This is one reason the Flex radios have not as of yet become popular with contesters. One wrong mouse click or key stroke, and one can end up on some other band or mode!

Rev C2