

PRODUCT REVIEW

Yaesu FTDX5000D HF and 6 Meter Transceiver

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Yaesu's latest colossus *rules*, delivering top tier performance at a *substantially* less than a top tier price. The FTDX5000 series establishes a new benchmark, the highest close-in IMD dynamic range and third-order intercept we've ever measured. It *can* and *will* do the heavy lifting for the most demanding DXer or contester.

This radio shares DNA with earlier Yaesu offerings. Over the past several years, Yaesu has deployed an array of such signature signal enhancing features as *Contour*, *VRF*, *μ-Tune* and *Class A*. As with the FT-2000 and FTDX9000 models reviewed previously, the FTDX5000 builds upon this legacy, and it may be helpful to reread those reviews (you *did* read them already, right?).¹ Three FTDX5000 models are available according to option package: The FTDX5000, the FTDX5000D and the FTDX5000MP. The basic 5000 is very well equipped. The D model adds the SM-5000 monitor scope, and the MP adds the SM-5000, 300 Hz roofing filter (optional on the other models) and high stability oven controlled crystal oscillator.

The FTDX5000D with optional 300 Hz roofing filter reviewed here is a transceiver for the discriminating contester or DXer, who may even consider its roughly \$6000 price a bargain. Although extremely rich in performance, it lacks some "convenience" features. For example, you cannot connect a keyboard for digital modes or data entry. Then again, you don't put a backup cam on an Indy car. Optional Yaesu accessories let you trick out your ride.

Some Broad Strokes

Main (A) and subreceiver (B) performance tops that of several vaunted radios already on the market, although the main



receiver does outperform the subreceiver (see Table 1). The two discrete and comparable receivers make it possible to transmit and/or receive on separate bands — SO2R in a box (details to come)!

Both receivers cover from 0.03 to 60 MHz. Receiver A is double conversion, with the first IF at 9 MHz and the second DSP IF at 30 kHz for SSB and CW and 24 kHz for AM and FM modes. Receiver B is a triple-conversion design, with the first and second IFs at 40.455 MHz and 455 kHz, respectively, and the DSP third IF identical to the second IF in the main receiver. The 300 and 600 Hz roofing filters are not available to the sub-receiver.

The radio delivers 200 W on HF and 6 meters on SSB and CW. Yaesu advises reducing the power to 1/2 to 1/3 of maximum when using high duty cycle modes such as RTTY or PSK31 for "longer than a few minutes," and rolling back to 50 W on AM.

As revisions become available, you can update the radio's firmware via an RS-232 port using files downloaded from the Internet. Since most new PCs don't come with RS-232 serial adapters/ports, USB would have been a nice option; there are arguments on both sides of this technological issue, however. A serial to USB adapter (Prolific chipset) worked fine for me. We did not perform a firmware update on our review radio, since this would have presented a moving target for evaluating performance. The procedure is relatively straightforward, and Yaesu has resolved early issues with the update writer.

The FTDX5000 takes DSP noise reduc-

tion to a new level — absolutely the best implementation I've ever experienced. It's just spectacular and could even make the horrid racket from my neighbor's solar array system melt into the background.

To enhance selectivity, the '5000 offers a selection of six pole crystal roofing filters (300 Hz, 600 Hz, 3 kHz, 6 kHz and 15 kHz are available for the main receiver), a feature several quality transceivers have begun offering. On CW the 300 Hz roofing filter is amazing. Coupled with a narrow DSP filter, you can sidle up to the strongest signals on the band to pull someone out.

In general, the radio's various DSP tools may impart some echo — the audio equivalent to "ringing" — especially at more extreme settings. This apparently is a result of latency.

A 46.3 Pound Gorilla in the Shack

This is a substantial radio, although it doesn't match the girth or weight of the FTDX9000MP reviewed in July 2010 *QST*, nor that radio's 400 W output. The ac power supply is built in. The FTDX5000 presents the user with a surfeit of knobs, buttons and displays that let you know you're at the helm. The ample main tuning knob augments this sense of control. It can be daunting at first. Some controls probably could have been relegated to menus; MIC gain, for example, is not something you typically adjust on the fly.

The front panel layout is sensible, although I did wish the legends were in a more contrasting shade. Style does *not* triumph over substance here. I'd expressed similar

¹The following *QST* Product Reviews may be of interest: FT-2000 (Feb 2007), FT-2000D (Oct 2007), FTDX9000D (Aug 2005), FTDX9000 Contest (Mar 2006) and FTDX9000MP (Jul 2010). Past *QST* reviews are available to ARRL members at www.arrl.org/product-review.

concerns in reviewing the FTDX9000 Contest (see “Product Review,” Mar 2006 *QST*). On the other hand, all readouts are easy on the eyes. The three subdisplays are crisp, organic light emitting diode types. The multipurpose meter has a D’Arsonval movement. As in earlier Yaesu incarnations, a system summary panel, part of the main display, shows basic signal paths and settings for the main receiver (VFO A) and the subreceiver (VFO B) per the antenna, attenuator, IPO, roofing filter and AGC settings.

A couple of things struck me. First, there is no separate indication on the main display to let you know when VOX is enabled, beyond a tiny red LED on the VOX button. Second, there is no main display SPLIT indicator. You must instead pay attention to whether the TX indicator adjacent to the VFO B knob is illuminated. (You’ll also see the TX indicator switch to VFO B when transmitting.)

The VFO A and VFO B subdisplays continue to show the set value, even after the function is off. For example, if you turn off the NR, the display dims, and turning the knob still changes the displayed setting while not affecting reception. Enabling another function shifts the subdisplay’s focus to the new function.

Through menus, the operator can set individual brightness levels for the analog meter, main frequency display, subdisplays and SM-5000 when the DIM switch is pressed. Color and contrast are not adjustable. There are several color choices for the SM-5000 screen, but color and contrast are not adjustable on the main radio displays.

The FH-2 keypad accessory can be used for controlling the built-in CW memory keyer and voice keyer, as well as for frequency adjustments. At first I didn’t figure the FH-2 would come in handy, but it turned out to be just the thing for those times when you’re repeatedly calling a DX station that’s generated a massive pileup (and you’re running 200 W to wires).

A Problem Solved

Out of the box, our ’5000 would not key properly, especially with an external keying source. We found dit shortening at 60 WPM, which was not affected by the waveform shaping menu or by adjusting the break-in (QSK) delay. In addition, while using the internal keyer in full break-in, unwanted spikes materialized between dits above 33 WPM, possibly a result of some sort of relay bounce. ARRL Lab Test Engineer Bob Allison, WB1GCM, described these as “phantom spikes” that looked “like triangles in the blank spaces between dits, causing a not so pretty keying waveform.”

A Yaesu-provided circuit modification fixed the problem. The manufacturer says its production line incorporated the keying modification starting with Lot 2, although not all Lot 2 radios were modified. The

problem has been corrected in all Lot 3 and later radios, however, and Yaesu says it will fix any radios already in the hands of customers.

A Problem Unsolved

So called “spurs” in the ’5000’s main receiver generated considerable chatter among owners and wannabes on the Yaesu FTDX5000 reflector. While Yaesu is looking into this issue, it remained unresolved as this review went to press. Here’s the thing: You have to be looking for these artifacts (they are not “spurs” in the true sense of the word) in order to hear them. If the radio is set for 1 Hz resolution and a signal — preferably a strong one — is on or near certain frequencies in certain bands, you can hear a faint blip as you turn the VFO knob past certain *other* specific frequencies. They’re easy to miss altogether and may give the impression of tuning past a real signal very quickly, but there is no spur that you can actually tune to. Some users consider this a serious issue that’s deserving of Yaesu’s attention.

High Fidelity

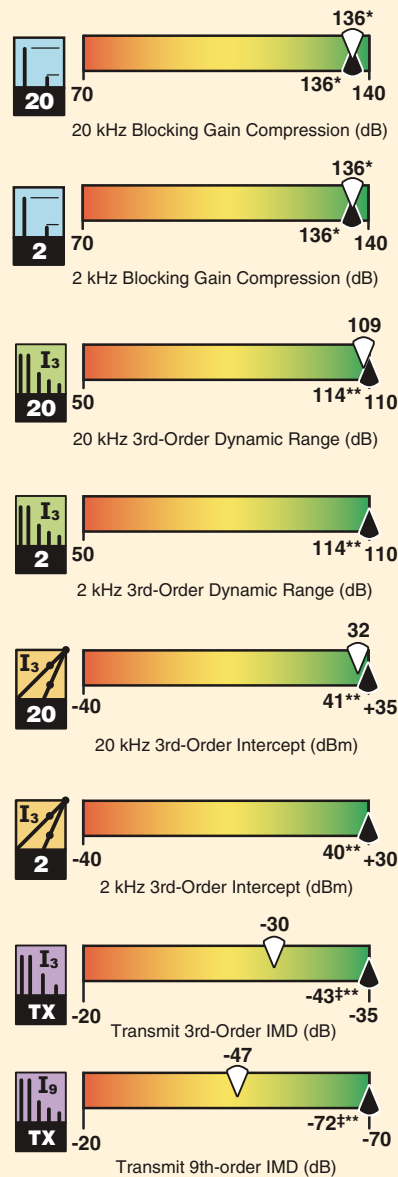
SSB enthusiasts will enjoy the FTDX5000’s comprehensive transmit audio tailoring capabilities using the three octave equalizer. There are two tiers of settings — one for when the processor is off, the other for when it’s on. The PROC button steps through MIC EQ and PROC steps, as indicated on the main display. These settings allow you to adjust gain, bandwidth and even Q for each bandwidth range in the equalizer, punching up one range of frequencies and tempering another to suit your voice. This is akin to the sort of audio processing broadcasters use on their studio microphones to make even the most modest voice sound appreciably more robust.

The equalizer can take some time to set up, and for situations in which multiple operators will be using the radio, you may just want to go with the *flat* response defaults and trim your audio using any adjustments available on your mic or headset. The radio is capable of enhanced SSB (ESSB) operation. The FTDX5000 offers similarly extensive audio tweaking capabilities for the receivers’ audio.

Intercept Point Optimization and Preamps

Yaesu employs IPO buttons on its HF transceivers. The ’5000’s main receiver has two IPO settings, IPO1 and IPO2; the subreceiver has just IPO1. IPO stands for *intercept point optimization*, referring to third order intercept point (IP3), a popular metric that takes into account a receiver’s sensitivity and dynamic range (see Table 1). What the IPO buttons *actually* do is turn *off* any preamps, which typically degrade dynamic range. Pushing the IPO button can improve the dynamic range on a band that has external

Key Measurements Summary



PR053

Key: ** Off Scale
Values shown are for Receiver A with 600 Hz roofing filter.
Dynamic range and intercept values with preamp off.
Intercept values were determined using -97 dBm reference.
* Blocking exceeded the levels indicated.
See Table 1.
† Class A operation.

Bottom Line

An extraordinary transceiver for the discerning contestor or DXer. This one will become the gold standard for operators seeking the best receive performance and best value in its class.

noise well above the receiver noise. This doesn't show up in lab testing, but can make a difference with an antenna connected — especially on the bands lower in frequency than 14 MHz.

Just why the main receiver has *two* IPO levels is unclear. The IPO2 setting routes the signal directly to the first mixer. The manual says only that the IPO1 setting “improves the IPO.” The radio also has twin preamps, and Yaesu recommends using PREAMP1 for the higher bands (there are three levels of attenuation as well). I found no occasions when I needed to use PREAMP2, although the attenuator came in handy.

SO2R in a Box!

A growing number of contesters are adopting the single operator/two radio (SO2R) operating model. The SO2R shack utilizes two transceivers. The main transceiver is the “run radio” for calling CQ; the secondary transceiver is the “multiplier radio” for tuning around. The typical SO2R setup also employs separate antennas for each transceiver.

The FTDX5000 opens the door to SO2R with a single box and, if desired, just *one* antenna. Both receivers can use the same antenna at the same time, although with four antenna ports on the rear apron, they don't have to. While running SO2R you can still log contacts as though you were using one radio. Swapping the transmit VFO from B to A lets your logger record the contact on the correct band.

The Stats

Subjective observations aside, the numbers tell the big story here. Don't be misled by nomenclature. Both FTDX5000D receivers outperform the FTDX9000MP's roughly equivalent receivers in terms of dynamic range and IP3.

For Receiver A, at the where-it-really-matters 2 kHz spacing, the two-tone third-order IMD dynamic range at 14 MHz is just as good as at 20 kHz spacing. In all cases, IMD dynamic range was well over 100 dB. This is the receiver with a 9 MHz first IF and narrow roofing filters, currently the hot setup for top-of-the-line close-in dynamic range. One interesting phenomenon was noted during the testing. The sensitivity (MDS) of receiver A lowered by a few dB after the radio had been in use for a few hours. This did not change the excellent measured dynamic performance. This represents *excellent* real-world performance, which holds up right through 6 meters!

For Receiver B, with a VHF IF and without the narrow roofing filters, the *worst*-case dynamic range was 88 dB on 14 MHz at 2 kHz spacing; all other numbers were in the 90s, the best being 98 dB on 14 MHz at 5 kHz spacing, yielding an IP3 of +25 dBm.

Table 1

Yaesu FTdx5000, serial number 00020034

Manufacturer's Specifications

Frequency coverage: Receive, 0.03-60 MHz; transmit, 1.8-2, 3.5-4, 5.3305, 5.3465, 5.3665, 5.3715, 5.4035, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.44, 24.89-24.99, 28-29.7, 50-54 MHz.

Power consumption at 117 V ac: receive, no signal, 70 VA; signal present, 80 VA; transmit, 200 W output, 720 VA.

Modes of operation: SSB, CW, AM, FM, RTTY, PKT.

Receiver

SSB/CW sensitivity: 2.4 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 2.0 μ V; 1.8-30 MHz, 0.2 μ V (Amp 2); 50-54 MHz, 1.25 μ V (Amp 2). Preamp not available below 1.8 MHz.

Noise figure: Not specified.

AM sensitivity: 6 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 6 μ V; 1.8-30 MHz, 2 μ V (Amp 2); 6 meters, 1 μ V (Amp 2).

FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 0.1-30 MHz, 0.5 μ V (Amp 2); 50-54 MHz, 0.35 μ V (Amp 2)

Spectral display sensitivity: Not specified.

Blocking gain compression: Not specified.

Reciprocal Mixing (500 Hz BW): Not specified.

ARRL Lab Two-Tone IMD Testing (300 Hz bandwidth, 300 Hz roofing filter)**

Band/Preamp	Spacing	Input Level	Measured IMD Level	Measured IMD DR	Calculated IP3
3.5 MHz Off	20 kHz	-17 dBm -11 dBm	-126 dBm -97 dBm	109 dB	+38 dBm +32 dBm
14 MHz/Off	20 kHz	-12 dBm -5 dBm 0 dBm	-126 dBm -97 dBm -84 dBm	114 dB	+45 dBm +41 dBm +42 dBm
14 MHz/Pre 1	20 kHz	-24 dBm -22 dBm	-136 dBm -97 dBm	112 dB	+34 dBm +28 dBm
14 MHz/Pre 2	20 kHz	-36 dBm -22 dBm	-143 dBm -97 dBm	107 dB	+18 dBm +16 dBm
14 MHz/Off	5 kHz	-12 dBm -6 dBm 0 dBm	-126 dBm -97 dBm -82 dBm	114 dB	+45 dBm +40 dBm +41 dBm
14 MHz/Off	2 kHz	-12 dBm -6 dBm 0 dBm	-126 dBm -97 dBm -82 dBm	114 dB	+45 dBm +40 dBm +41 dBm
50 MHz/Off	20 kHz	-14 dBm -8 dBm	-120 dBm -97 dBm	106 dB	+39 dBm +37 dBm

Second-order intercept point: Not specified.

DSP noise reduction: Not specified.

Notch filter depth: Not specified.

FM two-tone, third-order IMD dynamic range: Not specified.

Measured in the ARRL Lab

Receive and transmit, as specified.

Receive, no signal, 61 VA; receive signal present, max audio, 66 VA; transmit, 481 VA at 200 W RF output.

As specified.

Receiver Dynamic Testing, Receiver "A"

Noise floor (MDS), 500 Hz bandwidth, 600 Hz roofing filter:

Preamp	Off	1	2
	(dBm)	(dBm)	(dBm)
0.137 MHz	-116	—	—
0.505 MHz	-117	—	—
1.0 MHz	-118	—	—
3.5 MHz	-126	-136	-143
14 MHz	-126	-136	-142
50 MHz	-120	-131	-140

14 MHz, preamp off/1/2: 21/11/5 dB

10 dB (S+N)/N, 1-kHz, 30% modulation, 9 kHz filter, 15 kHz roofing filter:

1.0 MHz	8.60 μ V
3.8 MHz	0.47 μ V (Preamp 2 on)
50 MHz	0.59 μ V (Preamp 2 on)

For 12 dB SINAD, preamp 2 on:

29 MHz	0.22 μ V
52 MHz	0.23 μ V

-115 dBm maximum with optional SM-5000 station monitor.

Gain compression, 500 Hz bandwidth, 600 Hz roofing filter:

	20 kHz offset Preamp off/1/2	5/2 kHz offset Preamp off
3.5 MHz	136*/146/142 dB	136*/136* dB
14 MHz	136*/146/142 dB	136*/136* dB
50 MHz	130*/141/137 dB	130*/127 dB

20/5/2 kHz offset: -109/-109/-104 dBc.

14 MHz, Preamp off/1/2: +65/+71/+71 dBm.

Variable, 30 dB maximum.

Manual: >70 dB, auto: >70 dB.

Attack time: 60 ms.

20 kHz offset, Preamp 2: 29 MHz, 100 dB $\dagger$; 52 MHz, 96 dB $\dagger$.

10 MHz channel spacing: 52 MHz, 91 dB.

Receiver

S-meter sensitivity: Not specified.

Squelch sensitivity: Not specified.

Receiver audio output: 2.5 W into 4 Ω at 10% THD.

IF/audio response: Not specified.

Spurious and image rejection: 160-10 meters, >70 dB; 50-54 MHz, >60 dB.

SSB/CW sensitivity: 2.4 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 2.0 μ V; 1.8-30 MHz, 0.2 μ V (Amp 2); 50-54 MHz, 1 μ V (Amp 2).

Noise Figure: Not specified.

AM sensitivity: 6 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 6 μ V; 1.8-30 MHz, 2 μ V (Amp 2); 6 meters, 1 μ V (Amp 2).

FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 0.1-30 MHz, 0.5 μ V (Amp 2); 50-54 MHz, 0.35 μ V (Amp 2)

Blocking gain compression: Not specified.

Reciprocal Mixing (500 Hz BW): Not specified.

ARRL Lab Two-Tone IMD Testing (500 Hz bandwidth, 3 kHz roofing filter)**

Band/Preamp	Spacing	Input Level	Measured IMD Level	Measured IMD DR	Calculated IP3
3.5 MHz/Off	20 kHz	-26 dBm	-124 dBm	98 dB	+23 dBm
		-17 dBm	-97 dBm		+23 dBm
14 MHz/Off	20 kHz	-24 dBm	-122 dBm	98 dB	+25 dBm
		-16 dBm	-97 dBm		+25 dBm
		0 dBm	-53 dBm		+27 dBm
14 MHz/Pre 1	20 kHz	-34 dBm	-132 dBm	98 dB	+15 dBm
		-23 dBm	-97 dBm		+14 dBm
14 MHz/Pre 2	20 kHz	-42 dBm	-136 dBm	94 dB	+5 dBm
		-29 dBm	-97 dBm		+5 dBm
14 MHz/Off	5 kHz	-24 dBm	-122 dBm	98 dB	+25 dBm
		-14 dBm	-97 dBm		+28 dBm
		0 dBm	-52 dBm		+26 dBm
14 MHz/Off	2 kHz	-34 dBm	-122 dBm	88 dB	+10 dBm
		-17 dBm	-97 dBm		+28 dBm
		0 dBm	-52 dBm		+26 dBm
50 MHz/Off	20 kHz	-27 dBm	-120 dBm	93 dB	+20 dBm
		-20 dBm	-97 dBm		+19 dBm

Second-order intercept point: Not specified.

DSP noise reduction: Not specified.

Notch filter depth: Not specified.

Receiver Dynamic Testing, Receiver "B"

S9 signal at 14.2 MHz, preamp off/1/2, 135/36/10 μ V.

At threshold: SSB, 14.6 μ V; FM, 29 MHz (preamp 2), 0.32 μ V; 52 MHz, 0.12 μ V.

2.8 W at 8.7% THD into 4 Ω .

THD at 1 V RMS: 0.7%.

Range at -6 dB points, (bandwidth): †
CW (500 Hz filter): 435-950 (515 Hz) †
Equivalent Rectangular BW: 506 Hz
USB: (2.4 kHz filter): 268-2628 (2360 Hz)
LSB: (2.4 kHz filter): 268-2622 (2354 Hz)
AM: (9 kHz filter): 137-3410 (6546 Hz).

First IF, 14 MHz, 99 dB; 50 MHz, >111** dB; image, 14 MHz, 60 dB; 50 MHz, 73 dB.

Noise floor (MDS), 500 Hz bandwidth, 3 kHz roofing filter:

Preamp	Off	1	2
	(dBm)	(dBm)	(dBm)
0.137 MHz	-111	—	—
0.505 MHz	-113	—	—
1.0 MHz	-113	—	—
3.5 MHz	-124	-133	-137
14 MHz	-122	-132	-136
50 MHz	-120	-131	-136

14 MHz, preamp off/1/2, 25/15/11 dB

10 dB (S+N)/N, 1-kHz, 30% modulation, 9 kHz filter, 15 kHz roofing filter:

1.0 MHz	15.1 μ V
3.8 MHz	0.86 μ V (Preamp 2 on)
50 MHz	1.16 μ V (Preamp 2 on)

For 12 dB SINAD, preamp 2 on:

29 MHz	0.46 μ V
52 MHz	0.46 μ V

Gain compression, 500 Hz bandwidth, 3 kHz roofing filter:

	20 kHz offset Preamp off/1/2	5/2 kHz offset Preamp off
3.5 MHz	130/134/129 dB	126/105 dB
14 MHz	130/133/128 dB	126/106 dB
50 MHz	129/133/127 dB	122/103 dB

20/5/2 kHz offset: -109/-101/-94 dBc.

Band/Preamp	Spacing	Input Level	Measured IMD Level	Measured IMD DR	Calculated IP3
3.5 MHz/Off	20 kHz	-26 dBm	-124 dBm	98 dB	+23 dBm
		-17 dBm	-97 dBm		+23 dBm
14 MHz/Off	20 kHz	-24 dBm	-122 dBm	98 dB	+25 dBm
		-16 dBm	-97 dBm		+25 dBm
		0 dBm	-53 dBm		+27 dBm
14 MHz/Pre 1	20 kHz	-34 dBm	-132 dBm	98 dB	+15 dBm
		-23 dBm	-97 dBm		+14 dBm
14 MHz/Pre 2	20 kHz	-42 dBm	-136 dBm	94 dB	+5 dBm
		-29 dBm	-97 dBm		+5 dBm
14 MHz/Off	5 kHz	-24 dBm	-122 dBm	98 dB	+25 dBm
		-14 dBm	-97 dBm		+28 dBm
		0 dBm	-52 dBm		+26 dBm
14 MHz/Off	2 kHz	-34 dBm	-122 dBm	88 dB	+10 dBm
		-17 dBm	-97 dBm		+28 dBm
		0 dBm	-52 dBm		+26 dBm
50 MHz/Off	20 kHz	-27 dBm	-120 dBm	93 dB	+20 dBm
		-20 dBm	-97 dBm		+19 dBm

14 MHz, Pre off/1/2: +71/+37/+31 dBm.

Variable, 30 dB maximum.

Manual notch: >70 dB, auto: >70 dB.

Attack time: 64 ms.

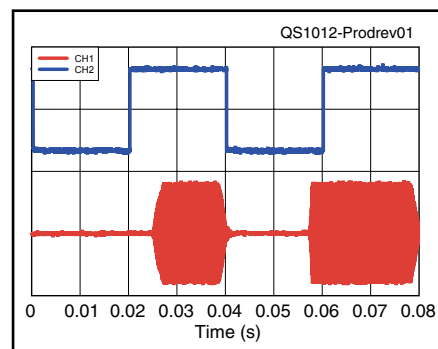


Figure 1 — CW keying waveform for the FTdx5000D showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output on the 14 MHz band.

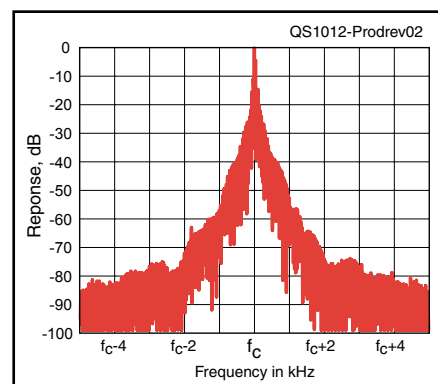


Figure 2 — Spectral display of the FTdx5000D transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output on the 14 MHz band, and this plot shows the transmitter output $\pm$ 5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

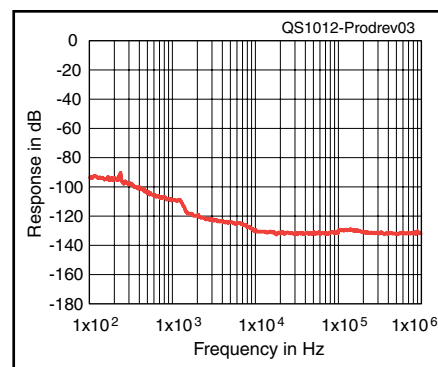


Figure 3 — Spectral display of the FTdx5000D transmitter output during composite-noise testing. Power output is 200 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

[Table 1 continues on next page.]

Going Digital

There are separate RTTY (FSK) and PKT (packet) modes and jacks; the PKT jack works for AFSK data modes such as PSK31, what the manual calls “SSB-based AFSK data modes.” You can adjust various AFSK and RTTY parameters separately via the menu. It will do either HF PKT (LSB) or FM PKT. In our radio the IF notch did not function in the USB/PKT setting, only in LSB/PKT. Yaesu has addressed this via a firmware update. It’s possible to set up AFSK modes to work in VOX mode, obviating the need for a PTT connection.

SM-5000 Spectrum Scope

The separate SM-5000 spectrum scope comes standard with the D and MP models. Yaesu provides hardware to secure it in place atop the radio. I have to agree with those who deem the speakers in the SM-5000 spectrum scope *terrific*. The spectrum scope display, however, is not terribly sensitive to weak signals, which seem to hover at or below the horizon. It’s two tone and best viewed straight-on. Perhaps I’ve been spoiled by the color spectrum scopes on other radios.

The SM-5000’s PEAK HOLD is great for seeing CW signals, which can be rather evanescent otherwise. Signal levels must be fairly high before they’re very visible on the scope, although maybe that’s just because I don’t have three elements at 150 feet on 40 meters. The menu’s LBWC 1 setting shows what’s in your immediate and general vicinity, depending upon the selected frequency span (25 to 2500 kHz).

Automatic Antenna Tuner

The effective automatic antenna tuner puts out a low level signal when it’s working. Heard on another receiver, this sounds a bit like PSK31. When it’s in action you can hear the relays clicking as the tuner seeks the most appropriate component combination to bring the SWR into line. The ATU does *not* affect the received signal.

During initial setup, the tuner takes a little time to find a match and memorize settings for a given frequency (The tuner reserves one main setting for each band; the other 89 are up for grabs.) The next time it tunes to that frequency, it checks the memory and quickly makes adjustments. This means that if you use more than one antenna for a given band and, as I do, have only one feed line coming into the shack and a remote switch outside, you will have to retune as you swap antennas. Our FTDX5000 would not recall ATU memory settings after powering down. Yaesu has since corrected this via a firmware update.

Simply Awesome!

Yaesu has scored several home runs with the FTDX5000. Here are a few highlights we’ve not yet mentioned, in random order.

Receiver

FM two-tone, third-order IMD dynamic range: Not specified.

S-meter sensitivity: Not specified.

Squelch sensitivity: Not specified.

Receiver audio output: 2.5 W into 4 Ω at 10% THD.

IF/audio response: Not specified.

Spurious and image rejection: 160-10 meters, >70 dB; 50-54 MHz, >60 dB.

Transmitter

Power output: 10-200 W, (5-50 W AM); 10-75 W (Class A mode, SSB).

Spurious-signal and harmonic suppression: >60 dB, 1.8-54 MHz.

SSB carrier suppression: >60 dB.

Undesired sideband suppression: >60 dB.

Third-order intermodulation distortion (IMD) products: -31 dB @ 14 MHz, 100 W PEP below peak output, -40 dB, Class A, 75 W PEP below peak output.

CW keyer speed range: Not specified.

CW keying characteristics: Not specified.

Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.

Receive-transmit turn-around time (tx delay): Not specified.

Composite transmitted noise: Not specified.

Size (height, width, depth): FTDX5000D 5.3 $\times$ 18.2 $\times$ 15.3 inches; weight, 46.3 lbs; SM-5000 station monitor: 1.8 $\times$ 18.5 $\times$ 7.2 inches; weight, 5.5 pounds.

Price: FTDX5000D, \$5500; XF-126CN 300 Hz roofing filter, \$170.

*Exceeded figures indicated, +10 dBm maximum output from test fixture.

**ARRL Product Review testing now includes Two-Tone IMD results at several signal levels.

Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The optional 300 Hz roofing filter (standard on MP) was used. The 600 Hz filter gave similar results. The “IP3” column is calculated Third-Order Intercept Point. Second-order intercept points were determined using -97 dBm reference.

†Measurement was noise-limited at the value indicated.

‡Default values; bandwidth and cutoff frequencies are adjustable via DSP. CW bandwidth varies with PBT and Pitch control settings.

Receiver Dynamic Testing, Receiver “B”

20 kHz offset, Preamp 2: 29 MHz, 84 dB†; 52 MHz, 85 dB†.

10 MHz spacing: 52 MHz, 87 dB.

S9 signal at 14.2 MHz: preamp off/1/2: 240/69/26 μ V.

At threshold: SSB, 24.8 μ V; FM, 29 MHz (preamp 2), 1.10 μ V; 52 MHz, 1.49 μ V.

2.3 W at 1.0% THD into 4 Ω .

THD at 1 V RMS: 1%.

Range at -6 dB points, (bandwidth): ‡

CW (500 Hz): 391-928 Hz (537 Hz) ‡

Equivalent Rectangular BW: 531 Hz

USB: (2.4 kHz): 147-2417 Hz (2270 Hz)

LSB: (2.4 kHz): 144-2395 Hz (2251 Hz)

AM: (9 kHz): 116-2845 Hz (5458 Hz).

First IF reject, 14 MHz, 89 dB; 50 MHz, 44 dB; image reject, 14 MHz, 101 dB; 50 MHz, 48 dB.

Transmitter Dynamic Testing

CW, SSB, RTTY, FM, typ 10-202 W, AM, 4-67 W; Class A (SSB), typ 10-75 W PEP.

Worst: 54 dBc emission at 19.460 MHz, carrier freq of 21.020 MHz at 10 W RF output. Meets FCC requirements.

As specified.

As specified.

3rd/5th/7th/9th order (worst case):

HF, 200 W PEP, -30/-48/-46/-47 dB;

HF, CI A 75 W PEP, -43/-64/-68/-72 dB;

50 MHz, 200 W PEP, -30/-48/-52/-58 dB.

4 to 56 WPM.

See Figures 1 and 2.

S9 signal, AGC fast, 66 ms.

SSB, 37 ms; FM, 36 ms.

See Figure 3.



Figure 4 — Close-up of the main display and SM-5000 station monitor screen. To the left of the frequency display is information about the status of antenna, attenuator, filter, preamp, roofing filter and AGC settings for each receiver.

Another Perspective

Well-known Delaware contester and DXer Jon Zimes, AA1K, ran the FTDX5000 through its paces. Here are his observations.

A lot of features will take a more thorough absorption of the manual to master; a few things didn't seem very intuitive, and I'm a longtime previous Yaesu user. But it certainly has the feel of a quality radio, and I really like the way it sounds! It has a quiet band floor and handles noise very well.

The receiver seems nice and tight. I never encountered any problems with overload while tuning across the band, even with the 20 meter Yagi stack aimed toward Europe and many strong signals. While transmitting on a separate radio on 1820.6 kHz with 1.5 kW and with no extra band-pass filters in line, I could hear no interference across 20 meters while beaming right at the transmitting antenna.

The 300 Hz roofing filter really makes for nice tight skirts on CW. The APF also was very effective for isolating really close-in signals, making the desired one pop right up.

The separate SM-5000 band display makes it easy to find signals on a quiet band. A way to "point and shoot" with a mouse would be nice. Also, I never found a setting that yielded optimal contrast yet was still bright enough.

Some ergonomic concerns: If sitting upright at normal distance to reach tuning knob and other controls, one cannot see the top of the S meter and the top row of labels of the main display. In addition, the light-gray lettering on the charcoal panel is very difficult to read, even under bright lighting, and this made for a more difficult learning curve.

I found the relative placement of the VFO A and VFO B AF GAIN controls confusing. The VFO B control is to the left of the VFO A AF GAIN control, but the VFO A and B subdisplay clusters are just the opposite. For me this was counterintuitive.

At first I thought the ATU was going bonkers as the dial lights flashed HI SWR and TUNE in rapid succession after I held in the TUNE button. But after a few seconds it had tuned the radio to a flat SWR on 7295 kHz with my 40 meter beam, which is cut for the low end of CW and has a high SWR at the high end. *Nice!*

Some front-panel buttons have an integrated LED to indicate when the function is on, but others do not. You have to look at the main display to see if the function has been toggled on or off.

■ The very effective DSP CONTOUR feature allows additional filter shaping within the receive passband.

■ The FTDX5000 has two notches. The IF notch can be set to narrow or wide via the menu. The DNF (digital notch filter) is automatic and fixed.

■ Everyone's radio should have the FTDX5000's CW tuning guide, especially those folks who persist in calling you 300 Hz off frequency when you're running a tight filter. You can repurpose the CW tuning guide to serve as a CLAR (clarifier or RIT) offset bar.

■ The APF is great, particularly on CW. It lets you tease otherwise barely audible stations out of the noise.

■ You can toggle between narrow and wide noise blanker settings.

■ It's possible to set certain parameters to be band-specific.

■ The menu permits a wide range of DSP filter customization, including steep, medium or gentle shape factors.

■ When setting certain parameters, such as RF output or keyer speed, its value appears briefly on the main display.

■ The MONI knob also sets the CW sidetone level, typically a separate adjustment on lesser transceivers (and some-

times hidden in a menu).

■ The VRF, inserted in the signal path between the antenna and the band-pass filter and RF amplifier, is handy to enhance noise reduction on a very noisy band, although it's not really intended for that.

■ The NAR (narrow) button is an excellent feature that expands the WIDTH range downward to 500 Hz or less for a given receiver. This two-tier system lets you use the NAR button to toggle between one very narrow setting and one not-so-narrow setting.

■ The CLASS A setting greatly reduces third and fifth-order transmit IMD (ie, "splatter") at a 75 W output level that's sufficient for most amplifiers.

■ The full break-in keying sounds great, but as is the case with many radios you can hear the TR relay clicking along as you send.

■ The FTDX5000 provides two options for filling CW keyer memories: Send the desired message and record it in one of the memory positions, or "dial in" the text, one character at a time, using the text message programming setting.

■ The cooling fan is whisper quiet.

Not So Much

Despite its overall outstanding perfor-

mance, our FTDX5000 did not *quite* represent the apex of Amateur Radio transceiver enterprise. Yaesu has addressed several issues through firmware updates or hardware modifications, but others are simply design drawbacks. Here are some kinks we spotted, again in no particular order.

■ A front panel label on earlier-run FTDX5000s (including ours) misspelled the word "transceiver." This has been fixed in later production runs, and some already are calling units bearing the TRANCEIVER label "The Collectors' Edition."

■ The 176 item menu system is a huge improvement over what I've seen from Yaesu in the past, but it still mandates occasional visits to the manual to decipher. Other manufacturers have implemented plain language menus; Yaesu is behind the curve on this one.

■ The 144 page *Operating Manual* has a lot of information about setting up and using the many features this radio offers, but it could use some improvement. Among other things it lacks a CAT reference as well as a detailed index, although Yaesu does provide supplementary information on its Web site. The downloadable PDF version is easily searchable.

■ I detected a low level hum or tone when turning the VFO A AF GAIN control past about 12 o'clock. Yaesu said it would look into this.

■ With headphones connected, the speaker comes on for about a second when you turn off the radio.

Close the Door and Have a Seat

The FTDX5000 represents a giant leap forward for Yaesu in the high end transceiver market, and it already has begun to attract an enthusiastic following.

Given the FTDX5000's price class and intended market, we are compelled to comment on the apparent lack of attention to some details. [Of course as noted in other reviews, Yaesu is not alone in making updates as issues are discovered in early release radios. Another way to look at it is that in previous generations of radios, fixes to major problems were slow to come and minor issues were rarely resolved. — Ed.]

As noted throughout the review, Yaesu has addressed reported issues through firmware updates or hardware modifications (in some cases requiring the radio to be shipped back for service). Current production radios should not exhibit many of the issues encountered in our early production model.

Yaesu is to be commended for combining top tier receiver performance and a clean Class A transmitter with the features and functions users expect, all in a competitively priced package.

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