Product Review and Short Takes from *QST* Magazine

Month Year
Product Reviews:

Yaesu FTDX9000D HF and 6 Meter Transceiver

Short Takes:

ProLog2K, V 5.76

Yaesu FTDX9000D HF and 6 Meter Transceiver

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Yaesu showed the world a preview of its top of the line FTDX9000D at the 2004 Dayton Hamvention to the interest and accolades of many in the contest and DXer communities, as well as others wanting to stay up with the latest in technology and features. The high performance FTDX9000D transceiver is now generally available and many will consider its performance and refinement well worth the wait!

While at the top of Yaesu's lineup, current Yaesu FT-1000 series owners may find it an easy transition to get to know this high performance radio. Perhaps *radios* would be a more accurate term to describe this set, since it is the first transceiver I'm aware of that can actually operate in single operator-two radio (SO2R) mode from a single box. For the non-contester, this means that you can actually be listening on one band while transmitting on another.

By the way, while only one version of the '9000 was available at the time of our testing, there will be three versions offered, as will be discussed later. One of the versions can be almost custom made to meet your specifications, perhaps a new concept for "production" radios.

First Impressions

The pictures don't do justice to the size of this radio! Its width at 20.4 inches allows the controls to be spaced far enough apart to allow each to be operated easily. And controls it has! I counted 37 rotary controls and 96 push buttons on the front panel. What's nice about this is that many controls serve a single function with menu functions and "soft buttons" mostly reserved for the TFT display. I found all the controls to be of user friendly size—no tweezers required!

The controls provide lots of flexibility and features for the different operational modes, allowing the operator to customize the receive and transmit parameters through variable IF-based DSP to suit a given set of requirements from heavy-duty contesting to casual AM operating.

Comparisons to the ICOM IC-7800,[1] ICOM's entry in the same market niche, are perhaps unavoidable. Both are large, heavy radios, with the '9000D weighing even more than the '7800. The extra size and weight may be more than offset by eliminating the need for a second radio for the SO2R operator. Neither radio will slide around the desk while you are pushing in the headphone plug!

Superficially, both share some general characteristics—each covers the same bands, has 200 W output, built-in ac power supply, two complete (and identical) high-performance general coverage receivers, color TFT display, memory card parameter storage and many other similar functions.

The differences are in the details. The '9000D has three choices for roofing filter bandwidth at 3, 6 and 15 kHz, while the '7800 has two—6 and 15 kHz. The 3 kHz roofing filter and the sharp *μTune* preselector front-end account for the '9000D's 9 dB edge in third order dynamic range at 5 kHz spacing (an impressive 98 dB at 14 MHz, the best we've ever seen!), while the '7800 has a 4 dB edge at 20 kHz. The '7800 uses the TFT display for virtually all of its display functions, while the '9000D offers multiple displays—a large color TFT for information and analysis functions (more later), plus two analog D'Arsonval meters and an LCD panel for primary frequency readout as shown in the above figure. Moving the S-meters out of the TFT provides additional real estate for the display of other information. The '9000D has a fan, but I had to open it up to be sure, since I couldn't ever hear it! Some of the weight goes toward extra cooling capacity!

Bottom Line

The FTDX9000D earns its spot in the upper tier of Amateur Radio products with two top notch receivers, lots of customization possibilities, flexible display options and the ability to operate SO2R from a single box.

And Those Other Versions?

We haven't had our hands on the other two versions, but they were previewed in the FTDX9000D manual.

- The FTDX9000 Contest will be available as a semi-custom unit. In its base form, it's a 200 W radio with a single receiver and no TFT display. In its minimal form, it is expected to sell for about half the price of the FTDX9000D. In place of the TFT display are a small LCD panel and two additional meters, all above four additional rotary controls. As options, a second receiver can be provided as can the data management unit, which can drive either an optional TFT display or an external monitor. Up to three of Yaesu's extra sharp *μTune* preselectors can be provisioned for 160, 80/40 or 30/20 meters depending your operating interests and needs. The VRF tunable preselector is standard for all bands in all models. Most of the options are not user upgradeable and will need to be ordered at the time of purchase.

The FTDX9000MP is a dual receiver radio similar in many respects to the '9000D, the subject of this review. The big difference is that it puts out 400 W instead of the 200 of the "D" model, and it has a separate power supply with speaker. It also has the option

[1] J. Hallas, "ICOM IC-7800 HF and 6 Meter Transceiver," Product Review, *QST*, Feb 2004, pp 64-70.

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of either the TFT display or the additional meters and controls with the small LCD panel as is offered in the Contest model.

So How's it Work?

This is an advanced radio with a comprehensive set of features and high performance capability at every turn. As we did for the IC-7800, we selected specialists able to best test particular aspects of the operation of this equipment. The individual evaluators were as follows:

- Dave Sumner, K1ZZ, ARRL CEO and experienced contest operator, undertook to use the '9000D in the CQ World Wide WPX CW weekend to determine how it would work during a serious CW contest.
- Steve Ford, WB8IMY, QST Editor and Publications Manager, operated the '9000D in digital modes including the Alessandro Volta RTTY contest.
- Dennis Motschenbacher, K7BV, ARRL Sales and Marketing Manager and experienced operator of a serious 6 meter station, reports on how the '9000D fared in the ARRL June VHF Contest.
- Norm Fusaro, W3IZ, ARRL Club Relations Manager, used the radio over the New England QSO Party weekend.

With those folk discussing the key operating environments, I will focus on the equipment features and operation.

Receiver Performance

A primary focus of the FTDX9000 design team was clearly on receiver performance, perhaps the most critical feature for serious DXers and contesters. In summary, this means that an operator will want to be able to receive a weak signal without interference from one or more strong stations very close in frequency to the desired station.

The key parameters that we measure to gain an understanding of a receiver's ability to excel in this respect are *MDS* (minimum discernable signal), a measure of how weak the station can be so we can hear it; *selectivity*, a measure of the bandwidth available to separate signals; *BDR* (blocking dynamic range), a measure of how much stronger than the MDS a signal must be to cause the gain to be reduced, perhaps eliminating the weak signal and, perhaps most importantly in a contest; *IMD* (intermodulation distortion) dynamic range, a measure of how strong two nearby signals must be to generate IMD products that can mask our signal.[2] All parameters are listed in Table 1, with closer-in IMD dynamic range results provided in the Web-based *Expanded Report*.[3]

Yaesu has attacked each of the above parameters in an aggressive manner. The MDS is often not a major concern, since at HF received noise is often much stronger than the receiver noise floor. By having an MDS well below the external noise level (*too* sensitive a receiver), the full BDR and IMD dynamic range are effectively reduced, since they are measured from the MDS and the range between the MDS and the external noise floor is not generally useful. Yaesu has provided a single-button IPO (intercept point optimization) control that eliminates the RF amplifier in front of the first mixer. This effectively shifts the dynamic range to the region at which it can be most useful. In addition, attenuators of 3, 6, 12 or 18 dB can be applied to further reduce the

Table 1
Yaesu FTDX9000D, serial number 5E020015

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60; transmit, 1.8-2, 3.5-4, 5.33, 5.35, 5.37, 5.40, 7-7.3, 10.1-10.15,14-14.35,18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive, transmit; as specified.
Power requirement: 90-264 V ac;	Receive, 100 VA (no signal); transmit, 720 VA (200 W out).
Operating modes: SSB, CW, AM, FM, FSK, AFSK.	As specified.

Receiver

	Measured in the ARRL Lab
SSB/CW sensitivity, 2.4 kHz bandwidth, 10 dB S+N/N: 1.8-30 MHz, 0.2 μV; 50-54 MHz, 0.13 μV.	Noise floor (MDS), 500 Hz filter:

	Preamp off	Preamp on
1.0 MHz	–113 dBm	–121 dBm
3.5 MHz	–122 dBm	–132 dBm
14 MHz	–122 dBm	–134 dBm
50 MHz	–119 dBm	–137 dBm
μTune		
3.5 MHz	–117 dBm	–124 dBm
14 MHz	–113 dBm	–122 dBm
VRF		
50 MHz	–113 dBm	

AM sensitivity, 6 kHz bandwidth, 10 dB S+N/N: 0.1-1.8 MHz, 3.2 μV; 1.8-30 MHz, 2 μV; 50-54 MHz, 1 μV.

10 dB (S+N)/N, 1-kHz tone, 30% mod:

	Preamp off	Preamp on
1.0 MHz	8.7 μV	3.5 μV
3.8 MHz	2.2 μV	0.8 μV
50 MHz	3.0 μV	0.82 μV

FM sensitivity, 12 dB SINAD: 28-30 MHz, <0.5 μV; 50-54 MHz, <0.35 μV.

For 12 dB SINAD:

	Preamp off	Preamp on
29 MHz	1.4 μV	0.47 μV
52 MHz	1.2 μV	0.36 μV

Blocking dynamic range: Not specified.

Blocking dynamic range, 500 Hz filter:

	20 kHz Preamp off/on	5 kHz Preamp off/on
3.5 MHz	135*/131* dB	125*/124* dB
14 MHz	138*/137* dB	127*/127* dB
50 MHz	131*/133 dB	122*/119* dB
μTune		
3.5 MHz	135*/ dB	125*/ dB
14 MHz	>133[2]/ dB	130*/ dB
VRF		
50 MHz	126/ dB	126*/ dB

Two-tone, third-order IMD dynamic range: Not specified, 500 Hz filter.

Two-tone, third-order IMD dynamic range:

	20 kHz Preamp off/on	5 kHz Preamp off/on
3.5 MHz	98/92 dB	95/91 dB
14 MHz	99/99 dB	95/96 dB
50 MHz	93/92 dB	86/89 dB
μTune		
3.5 MHz	97/89 dB	94/88 dB
14 MHz	100/98 dB	98/96 dB
VRF		
50 MHz	89/88 dB	85/84 dB

[2]For a discussion on this topic, see J. Hallas, "International Radio Roofing Filters for the Yaesu FT-1000MP Series of Transceivers," Product Review, *QST*, Feb 2005, pp 76-78.

[3]Available on the ARRL members Web site at **www.arrl.org/members-only/prodrev/**.

Manufacturer's Specifications	Measured in the ARRL Lab	
	20 kHz	5 kHz
	Preamp off/on	*Preamp off/on*
Third-order intercept: Not specified.		
3.5 MHz	+25/+6 dBm	+20/+5 dBm
14 MHz	+27/+15 dBm	+20/+10 dBm
50 MHz	+20/+2 dBm	+9/–3 dBm
	µTune	
3.5 MHz	+29/+10	+24/+8
14 MHz	+37/+25	+34/+22
	VRF	
50 MHz	+21/+8	+15/+2
Second-order intercept: Not specified.	Preamp off/on, +64/+66 dBm; µTune, +71/+70 dBm.	
FM adjacent channel rejection: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 86 dB; 52 MHz, 88 dB.	
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 84 dB; 52 MHz, 79 dB. 10 MHz spacing: 52 MHz, 94 dB.	
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 106 µV; preamp on, 31 µV.	
Squelch sensitivity: Not specified.	At threshold, preamp on: SSB, 2.7 µV; FM, 29 MHz, 0.37 µV; 52 MHz, 0.15 µV.	
Receiver audio out: 2.5 W into 4 Ω at 10% THD.	3.4 W at 10% THD into 4 Ω.	
IF/audio response: Not specified.	Range at –6 dB points (bandwidth): CW: 448-946 Hz (498 Hz)[1]; USB: 324-2520 Hz (2196 Hz); LSB: 316-2425 Hz (2109 Hz); AM: 70-2970 Hz (2900 Hz).	
Spurious and image rejection: HF: 70 dB; 50 MHz: Not specified. image rejection,	First IF rejection, 14 MHz, 107 dB; 50 MHz, 95 dB; 14 MHz, 68 dB; 50 MHz, 76 dB.	

Transmitter	Transmitter Dynamic Testing
Power output: HF and 50 MHz: SSB, CW, FM, 200 W (high), 5 W (low); AM, 75 W (high), 5 W (low); Class A mode, SSB, 75 W (high), 5 W (low).	HF: CW, SSB, FM, typ 200 W, <2 W low; AM, see text; 50 MHz: CW, SSB, FM, typically 190 W high, <2 W low; AM, see text.
Spurious-signal: Not specified.	HF, 46 dB; 50 MHz, 65 dB.
Harmonic suppression : ≥60 dB on HF, ≥70 dB on 50 MHz.	As specified. Meets FCC requirements.
SSB carrier suppression: ≥70 dB.	65 dB.
Undesired sideband suppression: ≥80 dB.	>75 dB (measurement limit).
Third-order intermodulation distortion (IMD) products: –35 dB (200 W PEP); Class A mode, –50 dB typical (75 W PEP).	See Figures 3 and 4.
CW keyer speed range: Not specified.	4 to 56 WPM.
CW keying characteristics: Not specified.	See Figure 5.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 33 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 28 ms; FM, 28 ms. Unit is suitable for use on digital modes.
Composite transmitted noise: Not specified.	See Figure 6.

Size (height, width, depth): 6.5×20.4×17.3 inches; weight, 66 pounds.

*Measurement was noise-limited at the value indicated.
[1]Varies with PITCH control setting.
[2]No blocking response at +20 dBm into the receiver.

input level. If received noise is low, often the case on 6 and 10 meters, the RF amplifier can be switched back in to lower the MDS. The results of their engineering efforts have paid off. This receiver offers excellent performance—many parameters better than we've ever seen on a receiver with a VHF first IF frequency, and in some key respects the best we've ever measured.

The operating selectivity is set by the IF DSP (digital signal processor). The default selectivity is 9 kHz for AM, 2.4 kHz for SSB and 500 Hz for CW. A NARROW button drops the passband to a user-settable narrower width for each mode. In addition, a large pair of concentric knobs can be used to adjust both WIDTH—down to 100 Hz and up to 3 kHz in fixed steps—and IF SHIFT

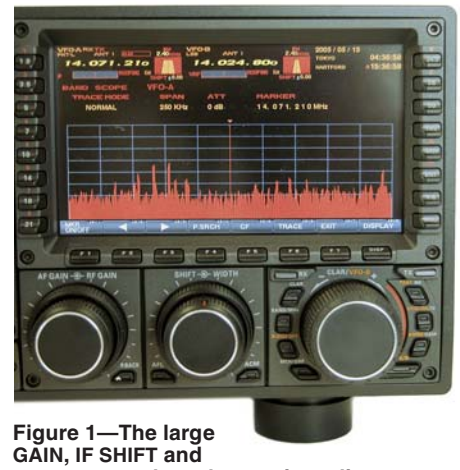


Figure 1—The large GAIN, IF SHIFT and WIDTH controls make precise adjustment easy. The spectrum display is shown above the controls.

(plus or minus 1 kHz in 20 Hz steps) to eliminate interference from the next channel. For all cases, the slope of the selectivity is adjustable via the CONTOUR knob. The WIDTH and SHIFT controls for receiver A are comfortably large as shown in Figure 1. A graphic of the curve with an indication of the shift and width is provided on either the TFT or LCD display (depending on model), as shown on the top of Figure 2.

BDR and IMD rejection are established largely by the first mixer linearity and the bandwidth and skirts of the roofing filter that follows the first mixer. Yaesu has provided 3 bandwidths of roofing filters, 15 kHz, intended for FM and wide AM, 6 kHz for narrow AM, and 3 kHz for SSB and CW. These will change automatically by mode, but you can override the default selection through the menus if desired. The results are shown in Table 1 and are excellent; both parameters are the best we've seen by a wide margin at 5 kHz spacing.

Additional BDR and IMD rejection can be obtained by careful tuning of the variable RF or *µTune* preselector ahead of the first mixer. This can reduce the level of a strong nearby signal. However, it is most effective at rejecting signals more than a few kHz away from the desired signal.

A unique, to my knowledge, receiver feature is a CW tuning indicator that indicates whether you are above or below the proper offset by lighting LEDs just above the main tuning dial. If you're low, one of the LEDs on the left is illuminated, too high and one on the right comes on. As you correct, LEDs closer and closer to the center are illuminated. I've never seen a better tuning indicator for CW. Very nice indeed.

The real-time spectrum display will probably be the most frequently used option for the TFT. Figure 1 shows this useful display. It can be adjusted on the fly from a width of 25 kHz to 2.5 MHz and can display activity from one or both receivers. The

Figure 2—The TFT display showing key parameters, including the IF filter settings for both receivers, along the top. This part of the display is common to most TFT displays. The bottom part of this display is the two-zone clock with approximation of areas of day and night.

former are great for observing calling patterns during a pileup; the wider spans are helpful to watch for band openings.

Transmitter Features

The folks at Yaesu didn't forget the transmitter side while building their competition transceiver! The '9000 includes features for all kinds of operators. For voice operators, two microphone jacks are provided—one on the front panel has a three-wire Cannon XLR connector with balanced input, as is used by many audio pros, while the usual Yaesu-connected eight-pin DIN connector is on the rear. Each can be the default for a particular mode, so you can set up your broadcast quality mic for AM in the front panel connector and your SSB contest mic in the back and they will each be active in the appropriate mode. Similarly, the transmit bandwidth and a three stage parametric equalizer are menu settable to any desired bandwidth up to 3 kHz, also by mode. An IF DSP-based speech processor is also provided to increase effective "talk power." The key transmitter parameters are noted in Table 1 with graphical display provided in Figures 3 through 5.

For those who want the cleanest signal possible, the final amplifier can be set to operate in class A at 75 W output. Instead of a switch setting, on the '9000D, the bias is continuously adjustable from class A to class AB. Some linear amplifiers can provide full output at this level, so it can be a very handy option to minimize "air pollution."

CW operators have a built-in keyer that almost makes 60 words per minute. It can be set to operate as either a semi-automatic (bug) or a fully automatic iambic (A or B) keyer with variable weight. A five memory (50 characters each) contest keyer, including the ability to increment contest exchange serial numbers, is provided. Keyer memory selection and serial number incrementing can be controlled via a supplied touch pad. A similar voice recording function is provided supporting five voice messages of up to 20 seconds each. A nice feature is that the rise and fall time of the CW waveform is menu settable to allow operation with minimal clicks for any given keying speed.

Common Features

The transceiver can interface with up to four transmit/receive antennas plus a single receive only port, likely used by 160 and 80 meter operators for a Beverage or other low-noise receive antenna. The same or different antennas can be applied to the two receivers. Next in the RF chain is an automatic antenna tuner that operates using stepper motor driven air variable capacitors, a departure from many current designs that use relay switched fixed capacitors.

A flash memory card can be used to store your particular parameter settings to support multiple users in a contest environment. Software upgrades will also be distributed from Yaesu using this medium.

Frequency can be set from either VFO A or B and instantly swapped via buttons conveniently located around the tuning dial. A single button can move frequencies, along with filter and other settings into and out of memory.

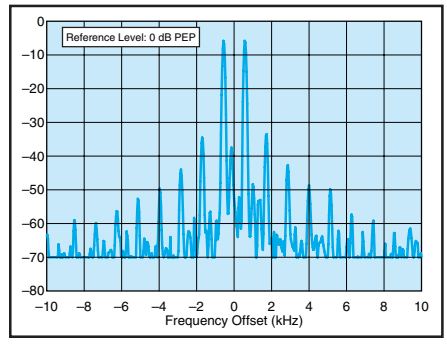


Figure 3—Worst-case spectral display of the FTDX9000D transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 34 dB below PEP output, and the worst-case fifth order product is down approximately 43 dB. The transmitter was being operated at 200 W PEP output at 18.120 MHz.

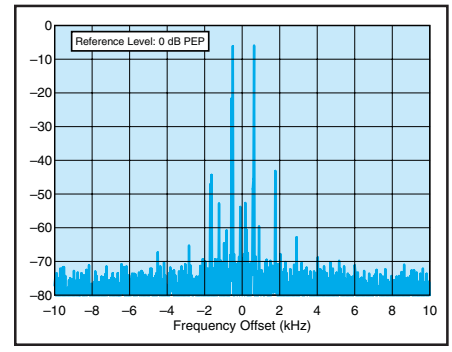


Figure 4—Worst-case spectral display of the FTDX9000D transmitter during two-tone intermodulation distortion (IMD) testing in Class A mode. The worst-case third-order product is approximately 43 dB below PEP output, and the worst-case fifth order product is down approximately 63 dB. Higher order products are not measurable. The transmitter was being operated at 75 W PEP output at 1.850 MHz.

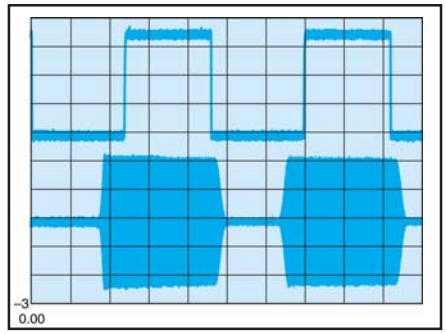


Figure 5—CW keying waveform for the FTDX9000D showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 52 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output at 14.2 MHz. Note that higher speeds could not be achieved as the dits run together.

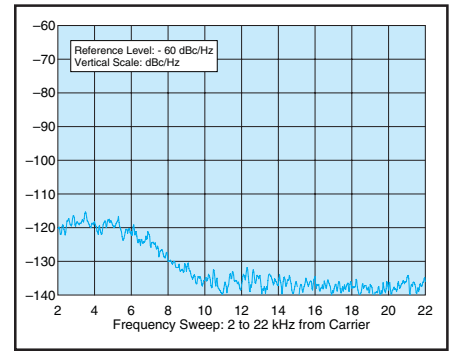


Figure 6—Worst-case spectral display of the FTDX9000D transmitter output during composite-noise testing. Power output is 200 W at 14.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

The TFT allows a multitude of different functions. In addition to menu selection, some of the key display choices are:

- A world clock showing two time zones (I set one for local time and one for GMT) along with a world map providing an approximation of areas of sunlight and darkness.
- A real time spectrum analyzer that displays a span of 25 kHz to 2.5 MHz in seven steps for one or both receivers. A unique *limited bandwidth sweep* function can be employed to increase the speed and resolution of a portion of the display if desired. It can also display a "waterfall" version with a vertical time axis.
- An oscilloscope with audio spectrum analyzer that can observe transmit or receive audio waveforms.
- It actually provides a place for a logbook with data entry via a keyboard (not supplied).
- It can control the position of current Yaesu antenna rotators with a display of antenna azimuth or bearing or direction on a great circle map The great circle map is centered on your QTH and can be used independently of the rotator control.

• Memory channels can be annotated for future reference as shown in Figure 7.

Some features may be more useful to one operator than another, but they're all there if you have a version with a display option.

A Few Rough Edges

We noted a few areas that need some attention in this radio. The first unit we tested actually had an RF GAIN control, or connection to the control, fail during our lab testing. Fortunately, with the help of Yaesu technical support, we were able to use a menu command to move that function to a working control normally on the B receiver, and make use of the radio with a single receiver for operational testing while we obtained another radio for lab testing. This can happen to any equipment and I wouldn't think it would happen any more often here than on any other radio.

While the TFT display provides many useful functions, one likely to be up a lot would be the world time clock. Unfortunately, our unit did not provide an accurate picture of daylight and dark areas making it less useful than it could be. Yaesu indicates that they have a fix that will be distributed to all.

Dave also observed a noticeable thump on the leading edge of received CW signals. This was more troublesome at higher speeds and tended to run character elements together. Yaesu reports that they have found a fix for this as well.

The manual we had was an early one. A new more complete manual set (four volumes, including one dedicated to remote control operation) is now available and will be sent to early purchasers or can be viewed on the Yaesu Web site for those who want to find out more about this radio.

Manufacturer: Vertex Standard, 10900 Walker St, Cypress, CA 90630; tel 714-827-7600; **www.vxstdusa.com**. Price: $11,499.99.

Impressions of the FTDX9000D in a CW Contest Environment

Reviewed by David Sumner, K1ZZ
ARRL CEO

Getting to Know the FTDX9000D

"It's big." That was my first impression of the FTDX9000D. It is more than 4 inches wider and deeper than the FT-1000MP that usually occupies the left side of my two-radio HF operating position. Lift it and you will add, "and heavy." Plug it in and turn it on, and the display may remind you more of an airplane control panel than of any radio you've previously seen.

Nor is this a radio to be piloted without serious time in "flight school" beforehand. My mission was to try the FTDX9000D during the CQ World Wide WPX CW Contest on the last weekend in May. I decided not to make a serious effort, but to spend as much time as I could evaluating the receiver under competitive conditions. It was a good decision for several reasons, not the least of which was the steep learning curve for a radio with 37 knobs and literally dozens of push buttons, a number of them with cryptic labels and unusual functions. Oh, and then there are the 160 menu functions. It would take hours to qualify to "solo" on this rig, but it helped that I was only interested in one mode. It would have been fun try "SO2R" (single operator two radio) with a single transceiver—a unique feature of the '9000 and one reason a serious competitor might want to consider it—but the previously noted control remapping kept the second receiver out of the picture. It might not have done me much good anyway, as it isn't obvious from the instruction manual how one would go about hooking up two separate amplifiers, particularly if they require different drive levels. Besides, I wanted to do some A/B comparisons with the receivers in my regular (and more popularly priced) station equipment.

Even with this many knobs, some of the controls have dual functions that are not intuitively obvious. The large, comfortable tuning knob that dominates the middle of the panel is an exception: It does exactly what you would expect—turn it to the right and the frequency goes up, left and the frequency goes down—and it probably has the best "feel" of any I've ever twirled. The VFO B tuning knob is also smooth, but is smaller and performs three other functions: CLARIFIER, BANDSWITCH and MEMORY CHANNEL SELECTOR. Understanding how to use these different functions requires some practice, and some of the push buttons as-

Figure 7—Memory channel annotation is possible, with data entered via a keyboard (not supplied).

Figure 8—The FTDX9000D set up for RTTY or PSK operation using a laptop PC as terminal.

sociated with them are quite small—you may find yourself using your fingernail rather than your fingertip to activate them.

The WORLD CLOCK feature of the TFT monitor looked intriguing until I realized that the "Daylight Area" display on the world map was not accurate and was not useful even as a general guide; it showed sunset in Arizona when it was still daylight in Connecticut, for example.

And How Does it Play?

At this point it was about time to clamp on the headphones and see how the radio played under combat conditions. I usually like to operate CW contests under crowded band conditions with a bandwidth of about 350 Hz. Unfortunately, the FTDX9000D does not allow this option; the available selectivities in this bandwidth range are in 100 Hz steps. Specifically, the available CW bandwidths are 25, 50 and 100 Hz (bandwidths that I find too narrow for use in a contest); 200, 300, 400 and 500 Hz (all useful bandwidths, but a rather coarse selection when compared to lower-priced competitors using DSP); and 800, 1200, 1400, 1700, 2000 and 2400 Hz (all but 800 Hz too wide for CW contesting in an active band). This may seem like a small point, but it seems a shame not to take better advantage of the capabilities of DSP by offering the operator more choices of selectivity. There are times when it's a great advantage to be able to adjust selectivity in steps of as little as 10 Hz.

The dynamic range of the FTDX9000D's receiver is evident from the lab measurements. In practice, it is rare to encounter a situation that puts a receiver to such a severe test. I had expected that the superior performance of the '9000D might be evident on 40 meters and might allow me to dig out an additional layer or two of weak Europeans in "kilowatt alley" at the bottom of the band. Alas, that was not the case; anything I could hear on the '9000D could also be heard on my regular transceiver. This was not a fault of this radio; perhaps just an indication that pushing the performance envelope this far will not make a difference very often. The WPX CW Contest is not the most competitive event on the contest calendar and the band was a bit noisy, so I would expect the '9000D's performance to offer a competitive edge under more difficult conditions. The receiver did have an unpleasant characteristic that proved a bit tiring over the weekend—a transient "click," apparently a DSP artifact that shouldn't be there, on the leading edge of every CW element.

In summary, this is a radio that has a lot of potential for the serious contester, but could be even more useful with a few carefully selected tweaks in its capabilities.

The FTDX9000D in the New England QSO Party

Reviewed by Norm Fusaro, W3IZ
ARRL Club Relations Manager

At First Glance

I had an opportunity to use Yaesu's newest entrant into the super-radio category during a May weekend. The radio is billed as a *masterpiece* and *the ultimate* with all its standard features. One would have to agree that it is a work of art.

Clearing the Mystery

After a few minutes with the FTDX9000D, its complexity begins to come under control. Because this radio is like having two radios you get two of every control. Thus there are two AF GAIN, RF GAIN and SQUELCH knobs, two of all the DSP controls, etc. This dual radio feature allows you to operate SO2R in a contest with just one rig.

The manual is very straightforward and the radio is pretty intuitive. Anyone using this class of rig has more than likely operated a high-end transceiver before and is probably familiar with some of the features it offers.

The four way antenna switch and triple stacking VFOs per band are great. So are the dual mic inputs. Each microphone input has its own three band parametric equalizer. This feature allows you to have a studio mic in the XLR front panel input and set the EQ for that pleasant full fidelity transmitted audio. Alternately, if you are a fan of the ear piercing, squeaky, fingernails-on-the-blackboard type DX elements you can set up a contest type mic on the rear input and set the EQ for it via the menu. Both equalizers are separate from each other. Each equalizer has three bands and three menu settings for each band that allow you to select the cutoff frequency, level and bandwidth. Add the TX carrier offset and you have 10 variables at your disposal to customize your TX audio.

On the Air

The 200 W from this radio was able to punch through any pileup with its powerful audio. The transmitted audio is excellent and the built-in three band parametric equalizer and adjustable carrier offset allow for full customization to your voice. I tuned the audio and a Heil Goldline mic while listening on the 'MP. By recording and playing back the '9000D's transmitted audio off the MP receiver I was able to fine tune the settings for full fidelity without splattering the entire band.

Abdullah, 9K2GS, complimented me on how well the '9000D sounded and that with the huge pile of kW stations calling my voice just set itself apart from all others. I also had a chance to talk with other stations familiar with the sound of my voice and they all gave excellent reports.

Sunday's band conditions were not as good as Saturday's. I ran stations in the New England QSO Party and had no problems creating mini pileups in this small but popular contest. I also worked several dozen Italian stations in the ARI contest. While neither of these events could provide crowded band conditions such as those found in the ARRL DX or CQ World Wide contests, I was able to check out the '9000D's roofing filters and other QRM-fighting tools by sliding up very close to loud stations and operating without degrading the performance of either station.

The FTDX9000D hears extremely well. In A/B comparisons with my FT-1000MP, the same signals appeared to be much sharper on the '9000D than on the 'MP. Weak European stations that were somewhat muddy on the 'MP were crisper and easier to copy on the FTDX9000D.

Over the years I have become used to using the FT-1000MP and it was nice to be able to isolate a signal so that it appeared as if it were the only one on the band. The new generation of DSPs, as found in the FTDX9000D, makes it seem as if you have peeled back another layer of QRM to copy otherwise unreadable signals.

As with the 'MP, the '9000D has an automatic notch filter that will seek and destroy any annoying heterodyne in your passband.

Overall

This 200 W radio really puts out a commanding signal. The four antenna inputs could be less of an important feature since most contesters and DXers use an amplifier.

I couldn't resist trying some of the many features of the TFT screen. First, I plugged in a keyboard and used the internal logbook. I couldn't use the rotator control screen since it is made to work only with Yaesu rotators. While many of the features may be convenient, many are also found in most of today's popular logging and contest programs.

Although the display looks impressive when running on a large outboard LCD monitor I feel that the TFT screen has more features than are necessary. Yaesu offers an FTDX9000 Contest version, so if you don't require the eye candy, the Contest model without the screen may be worth looking into.

HF Digital with the FTDX9000D

Reviewed by Steve Ford, WB8IMY
QST Editor and Publications Manager

The most popular HF digital mode for

casual operation is PSK31, while RTTY is still a heavy contender in contest and DX circles. Both modes rely primarily on computer sound cards to handle the task of generating transmit signals and decoding received signals.

Considering the top-end design (and price) of the FTDX9000D, you might assume that a sound-card interface would be unnecessary. You might expect to find audio input and output jacks on the rear panel and a serial or USB line for transmit/receive switching. Such an arrangement would make it possible to quickly connect the FTDX9000D to any computer with minimal fuss.

You can imagine our delight when we discovered not only a USB port, but also two nearby audio jacks labeled IN and OUT. The delight was short lived when we consulted the manual. The USB port is for a keyboard to access the smart memory card. The audio jacks are for "future products."

It is tempting to speculate that Yaesu has HF digital in mind for the "future products" applications, but to use this incarnation of the FTDX9000D, we were limited to two standard DIN ports—one for FSK RTTY and another (labeled PACKET) for AFSK RTTY, PSK31, etc. This is the same basic arrangement that transceivers have offered for years. So, to operate HF digital with the FTDX9000D, you still need sound card interface capability—at least for now.

For this review we crafted a five-pin DIN plug for the PACKET jack and used a RigExpert Tiny USB sound-card interface.[4] Alternatively, we could have used the FTDX9000D's DATA VOX function to key the transceiver when transmit audio was present at the PACKET jack. The setup is shown in Figure 8.

Our first test was PSK31. It required a delicate balancing act to adjust the computer audio output and the FTDX9000D's PKT GAIN (menu item 64) to generate the highest output without distortion. We found that it was easy to overdrive the transceiver and create a terribly distorted signal. Fortunately, you can monitor your output waveform on the FTDX9000D's screen and see the distortion with your own eyes.

With the transmit side set up, we settled in for a PSK31 session with *MixW* software on a laptop running *Windows XP*. The sensitivity and dynamic range characteristics of the FTDX9000D became evident as we easily copied some extremely weak PSK31 signals. During the same session, we managed to find a couple of MFSK16 conversations and even a Hellschreiber QSO. The performance with each mode was flawless.

The next HF digital test was with RTTY, putting W1HQ, the ARRL Laboratory station, on the air during the Alessandro Volta RTTY contest. Still using the PACKET jack to operate AFSK, we were able to generate 200 W of undistorted RTTY power. The FTDX9000D manual cautions against using 200 W with a 100% duty cycle mode such as RTTY unless you limit the transmission time to 3 minutes. We chose to be cautious and reduced output to 100 W.

A contest environment presents the ultimate challenge to a receiver and RTTY is no exception. Propagation conditions were dreadful during much of the Volta contest, so stations tended to cluster on 20 meters. Pressing the NAR (narrow) switch enabled the 300 Hz DSP IF filter, which was exactly what the doctor ordered. The FTDX9000D had no problem separating individual signals unless they were right on top of each other.

Using *WriteLog* software and the RigExpert Tiny interface, we worked enough stations to prove that the FTDX9000D is a serious competition radio.

The front-panel RTTY button is strictly for FSK. For the uninitiated, FSK (frequency shift keying) involves sending data, not audio, from the computer to the transceiver. The transceiver, in turn, generates the mark-space RTTY signal directly by shifting its output frequency.

To test the FSK function we used a homebrew FSK keying interface connected to the laptop computer's serial port. The opposite end of the interface was connected to a four-pin DIN plug, which was attached to the rear-panel RTTY jack. Once again, the FTDX9000D performed quite well, generating an exceptionally clean RTTY signal.

During the Volta RTTY contest, we had a unique opportunity to test the effectiveness of the FTDX9000D's 200 W output in poor propagation conditions. Would it really make a difference? As stated earlier, we operated at 100 W most of the time, but on several occasions we bumped the output to 200 W when it became obvious that the other station was not copying W1HQ's signal well. In each case, the 3 dB increase apparently made the critical difference, allowing us to complete the contacts.

THE FTDX9000D ON 6 METERS

Reviewed by Dennis Motschenbacher, K7BV, Sales & Marketing Manager

Give me the radio…GIVE ME THE RADIO!

Getting the FTDX9000D out of the car and upstairs to the shack fulfilled my exercise requirements for the week. I used an FT-1000MP for several years, carrying it on DXpeditions to over 25 different destinations around the globe, something I will *not* do with the FTDX9000D. This is a feature packed radio that is designed to be put in place—and left there—as the focal point of your ham shack for years to come. If you make the decision to do that, you will not be disappointed.

Knob and Button Nirvana

I personally am much more comfortable with knobs and buttons than I am working with menus. Once I figured out the meaning of the FTDX9000D knob and button labeling, I found myself in the driver's set of a flexible control matrix that is easy to quickly manipulate to get the most out of the multiple frequency utility of the FTDX9000D in real time on the air situations. Giving up those knobs and, instead, working through menu driven adjustments would be far less efficient for my skill set. However, I did find the labeling more than a little difficult to read in anything but a well-lighted environment.

I thoroughly enjoyed the experience of putting my hand on the MAIN TUNING knob as well as the other much-used AF GAIN and RF GAIN knobs, and the SHIFT and WIDTH knobs. They are crafted to give one a feeling of solid control of these functions through well thought out detail and size. These controls are large, robust, features of the front panel and so they should be—none of the rest will get as much physical attention. The FTDX9000D spectacularly appeals to my right-handed attribute—I cannot think of one change I would make to control size and placement.

On the Air

Mother Nature's lightning storms and the local power company's inability to deal with her combined to limit my ability to give the FTDX9000D hours and hours of on-the-air time during the ARRL June VHF Contest. However, the time I did get in proved to me that this rig is going to find its way into the shacks of some of the most devout 6 meter fans with the financial assets to back their lust for the ultimate radio. The FTDX9000D performed terrifically here in New England's RF Alley, holding tough against the ERP onslaught of the mountaintop giants that do battle during this contest.

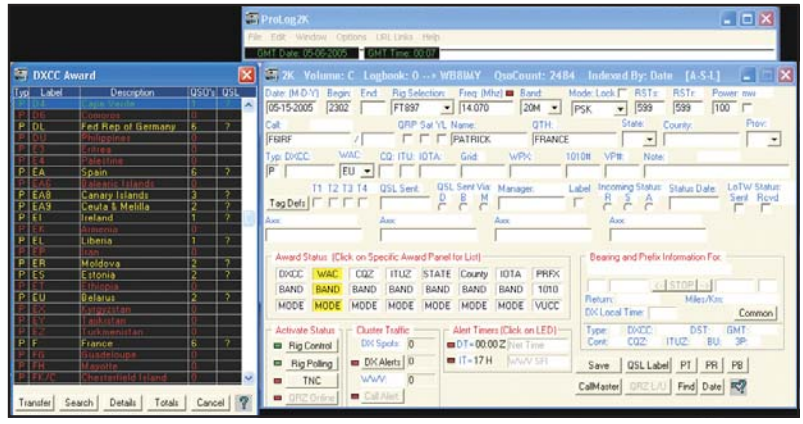
While not getting much opportunity to use the narrow bandwidth features of the radio on CW to their full potential, what I did experience felt new, exciting and full to my ears. From what comparisons I could do with my current rig, I believe that this radio is going to perform extraordinarily well in weak signal endeavors like DX chasing, meteor scatter and Earth-Moon-Earth communications. QST

[4]S. Ford, "MixW RigExpert Tiny," Short Takes, *QST*, Jun 2005, p 56.

ProLog2K, V 5.76

In the software business, five years is an eternity. Back in ancient days, the year 2000 to be precise, I reviewed *ProLog2K version 3* in these pages. Half a decade later, *ProLog2K* has reached *version 5.76* and is still going strong.

Numerous changes have taken place in *ProLog2K*, but the first to catch my eye in 2005 is the addition of ARRL Logbook of The World (LoTW) support. *ProLog2K* can export files compatible with the LoTW *Trusted QSL* software, but more importantly, it automatically keeps itself in harmony with Logbook. You simply grab the latest QSL report from Logbook and *ProLog2K* will update your log according to the LoTW QSL status. If you have uploaded a generous number of contacts to LoTW, this *ProLog2K* feature is a huge benefit, saving you the tedious headache of synchronizing your log manually.



Another nifty addition is the *MixW* and *DigiPan* data interfaces. For those not savvy with the world of HF digital, *DigiPan* is a popular PSK31/PSK63 application and *MixW* is a favorite for operating everything from PSK31 to Hellschreiber. Both programs include a logging function. With *ProLog2K*'s interface, however, any QSO you log in *MixW* or *DigiPan* will be instantly exported to *ProLog2K*. I run *MixW* myself, and it is annoying to have to manually export the *MixW* log to whatever centralized logging application I am using at the moment. Thanks to this feature, I can rest assured that every contact I log in *MixW* will automatically become part of *ProLog2K*.

***ProLog2K*'s DX Summit monitor**

Another new item is the ability to call up Web pages within *ProLog2K*. Assuming your computer is connected to the Internet, you can click, for example, on a link to see a map of the current day/night grayline position. Better yet, you can add your favorite Web links to *ProLog2K* so they are always handy whenever you need them.

The Best of All Worlds

I was pleased to see that *ProLog2K* has maintained its smooth PacketCluster/Internet interface. As I pointed out in 2000, this is a delight when you're just too busy to sit down in front of the radio and cruise the bands looking for a "new one." You can configure *ProLog2K* to grab everything coming from an on-air PacketCluster, a WebCluster or via telnet. Just set up the band and mode filters and *ProLog2K* will alert you when a spot meets your criteria. If North Korea pops up on RTTY (in my dreams!), *ProLog2K* will let me know.

ProLog2K still includes transceiver control for a broad selection of radios. The frequency and mode information changes automatically as you tune your transceiver. Alternatively, you can tune your transceiver from within *ProLog2K*.

Perhaps one of the greatest features of *ProLog2K* when I reviewed it in 2000 was its extraordinary flexibility. This is still the case in *version 5.76*. You can set up more logs than any ham is ever likely to need, print QSL labels, track your progress toward numerous awards (and add new awards yourself), control your antenna rotator and even change *ProLog2K*'s color schemes to suit your fancy.

For this review, I also used the optional QSL route and call sign look-up databases. It is pure pleasure to type in a call sign and instantly see the location, address and QSL manager (if any).

The only item on my wish list for future versions of *ProLog2K* is the addition of BROWSE buttons for operations that require you to enter a file name and location. As it is now, you have to enter the complete path (such as C:/MyDocuments/). A BROWSE button would allow you to quickly navigate to the proper destination on your hard drive and select the file you need.

ProLog2K runs on PCs using *Windows 95/98/2000/NT/XP*. The main program and manual are supplied on CD-ROM. The optional QSL Route Database requires 13 MBytes of hard disk space and the optional CallMaster database requires an additional 150 MBytes.

Manufacturer: Datamatrix, 5560 Jackson Loop NE, Rio Rancho, NM 87144-1590; tel/fax 505-892-5669 (information and tech support); 800-373-6564 (orders); **www.prolog2k.com**. ProLog2K *Logging Program, $50; w/QSL Route Database, $64; QSL Database Update Subscription (6) (sent via e-mail), $36; QSL Database Update Subscription (6) (First Class Mail), $42; IOTA Database, $15. Shipping is additional.* QST

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