Mark J. Wilson, K1RO, k1ro@arrl.org

Yaesu FTDX1200 HF and 6 Meter Transceiver

This latest transceiver brings Yaesu's new product line to a lower price point.

Reviewed by Joel R. Hallas, W1ZR
QST *Contributing Editor*
w1zr@arrl.org

The FTDX1200 is the most recent offering in the new lineup of Yaesu HF transceivers. The '1200 shares the cabinet and appearance of its recent sibling, the FTDX3000 HF and 6 meter transceiver, but has a different receiver architecture.[1] While the FTDX3000 shares the top performing downconverting architecture of the FTDX5000, the FTDX1200 has a more commonly encountered upconverting architecture, such as is found in the Yaesu FT-950 and many other recent transceivers.[2] This means that its close-in dynamic receive performance is not quite up to the level of the '3000 or '5000 (see the sidebar "Downconverting, Upconverting — What's the Big Deal?"), but the '1200 performs significantly better in terms of close-in receive performance than the earlier generation FT-950 or many of its competitors.

What Does It Do?

Other than the difference in close-in receive performance and a few items that are standard on the '3000 and optional on the '1200, the two radios appear identical. The FTDX1200 is a very competent new member of the full-size, medium-price, 160 through 6 meter 100 W transceiver family. It offers features we expect in such a radio: DSP filtering with bandwidth step sizes for all kinds of operation, a built-in antenna tuner that remembers the settings for different bands on two antennas, DSP noise reduction and noise blanking, digital notch filter for voice modes, a memory CW keyer, triple band stack registers and even a band scope.

The Front Panel

The front panel is big enough to have room for a good number of knobs and buttons — refreshing for those of us used to more compact radios. The controls and indicators appear in two groups. The large, heavily weighted and smooth main TUNING knob is at the center of one group, while the colorful LCD panel and its controls serve as the other.

The Tuning Cluster

The TUNING knob is surrounded by buttons associated with the tuning process, such as a FAST button that allows quick excursions up and down the band. Knob tension is easily adjustable by turning the ring behind the TUNING knob. Tuning speed is menu selectable with separate choices for SSB, CW, data, AM, and FM — a nice touch. This radio includes two VFOs, and can operate in SPLIT mode between them. Receiver incremental tuning (RX CLAR) and transmit incremental tuning (TX CLAR) are also provided, both with up to a 10 kHz offset. The amount of split, or clarifier (CLAR) offset is indicated below the VFO A frequency on the LCD, in the space that would otherwise be occupied by the VFO B frequency.

To the right of the main TUNING knob are buttons forming a keypad with a dozen buttons that mainly serve as band selectors. Each press of the button associated with a band cycles through three band stack registers, each of which can be set up with the frequency and the operating parameters associated with that frequency including mode, antenna selection (two choices) and bandwidth. This is a very handy feature. The keypad can also be used to enter the frequency directly.

The LCD Panel

The left side of the front panel highlights the LCD (Figure 1). The LCD provides the frequency displays, a virtual analog S meter (or bar type, by menu selection) that can also serve other functions, and a bunch of controls and indicators including a kind of spectrum scope. In normal mode, the top half of the display shows the frequencies, and other half operating parameters and alerts, such as

Bottom Line

The Yaesu FTDX1200 is a very versatile full-featured and full-sized HF and 6 meter transceiver that doesn't give up much compared to its more expensive siblings.

[1]N. Fusaro, W3IZ, "Yaesu FTDX3000 HF and 6 Meter Transceiver," Product Review, *QST*, Apr 2013, pp 48-53. Product Reviews are available to ARRL members online at **www.arrl.org/product-review**.
[2]N. Fusaro, W3IZ, "Yaesu FT-950 HF and 6 Meter Transceiver," Product Review, *QST*, Mar 2008, pp 46-51.

whether or not you are in BREAK-IN mode, or are using compression (COMP). Four graphics indicate bandwidth, passband tuning, notch filter, and contour settings. The bottom half of the display can be set to three different functions — the spectrum scope, menu settings (scroll through all 197 menus with the VFO B knob) or a group of eight soft buttons. The soft buttons let you make decisions such as whether or not VOX, transmit equalization (MIC EQ), or the KEYER is on; which of the metering functions is employed during transmit (power out, SWR, compression, and others); toggling the digital notch filter (DNF) or digital noise reduction (DNR); and generating a SPOT tone. The function is selected by using the up and down buttons and the value is set by pushing the SELECT button.

To the left of the LCD panel are POWER and TUNER buttons, along with MIC, KEY, and PHONE jacks. Beneath the panel are four dual concentric controls and five buttons. The controls provide MIC gain/KEYER speed and processing level (PROC)/carrier level (CAR), passband SHIFT and WIDTH, as well as AF and RF gain with the RF gain menu settable to be a squelch (SQL) control.

Menus

While you might think that a radio with a good sized front panel would not need many menus, the '1200 features 197 of them. Almost all are of the set-and-forget variety. The default values work well, but using them means missing out on one of this radio's many attributes — its flexibility.

The menus are organized by category. Categories include mode with a group for CW, for example. But then there's a separate group called KEYER that, of course, only applies to CW operation, so you still have to hunt a bit. Fortunately, the menu functions are listed in plain text on the LCD screen as you scroll through them.

Menus can be used for functions such as setting the AGC delay and slope, changing the colors or position of elements of the LCD, or selecting S meter type. There are separate audio filter high and low cutoff and slope settings for each operating mode — AM, CW, data, FM, RTTY, and SSB! All of those modes also have their own tuning step size selection as separate menu items.

There are a bunch of settings associated with the spectrum scope function, including the display width with a separate setting for each band. Before you know it, you're up to menu item 197!

Spectrum Scope

The FTDX1200 offers a spectrum scope that operates in an intermittent mode. That is, it automatically and briefly steals the receiver and make a sweep, then returns the receiver to audio use. In between scans, it shows the last snapshot taken.

The scope can be set up so that the display is centered on the operating frequency to show what's happening around you, or it can be set up to always show the same portion of the band. The scope can refresh automatically, which is handy if you're not in actual operation, or manually by a push of the SELECT button. I found the auto mode somewhat distracting while operating, but it could be useful in some circumstances, such as monitoring a band for openings. The bandwidth of the display is independently set for each band by a menu entry. A second push of the SCOPE button gives it the whole LCD screen (Figure 2).

If you have the optional FFT board, the spectrum scope can also function as an oscilloscope to carefully observe either the received signal or your transmit signal in the time or frequency (waterfall) domain. Installing the FFT board (lower left in Figure 4) gave me a glimpse of the inside of the '1200 and I was quite impressed by the quality of the construction — particularly the shielded compartments provided by the cast alloy chassis — nice job!

The Back Panel

The rear panel (Figure 3) provides SO-239 sockets for two antennas and a power cable socket along the top. The busier bottom row includes three connectors for the optional μ-tune preselector, a socket for rotator control from the radio (if you have a recent Yaesu rotator), special mini-DIN sockets for linear amplifier control, an external antenna tuner and a RTTY/DATA socket. Continuing along the bottom are push-to-talk (PTT) sockets — handy for a foot or knee switch — along with an audio jack for recording (REC), a jack for the optional FH-2 keypad (REM), an EXT SPKR jack and a KEY jack, independent of the front panel jack. At the far right is a nine pin CAT (serial computer connection) jack with male pins.

CAT Operation

The FTDX1200 provides a nine pin RS-232 serial port for connection to a PC. While most serial cables for this purpose have a female connector that connects to the PC and a male for the radio end, the '1200's serial connector has male pins; this requires either a straight through (not modem) cable with female connectors on both ends, or a nine pin double female adapter. Fortunately, the latter is available at RadioShack, part number 26-1409. This adapter can be

Figure 1 — The colorful LCD shows many operating parameters.

Figure 2 — Press a button and the spectrum scope goes to full-screen mode.

Figure 3 — The Yaesu FTDX1200 rear panel, showing the available connections.

screwed onto the radio's connector, making it look just like everyone else's serial interface.

Once I had that sorted out and had come to grips with the usual handshaking setup problems, I found that the interface could exchange frequency data in both directions with software I had on my PC including *Ham Radio Deluxe* and *N1MM Contest Logger*.

For those with newer computers that have USB rather than serial connectors, Yaesu offers the SCU-17 USB Interface Unit. In addition to making the serial-to-USB transition, it simplifies data and RTTY operation. I'll have more detail on this feature later.

Internal Antenna Tuner

The FTDX1200 includes a relay operated automatic antenna tuner with 100 frequency memories as standard equipment. It can be selected to operate with either antenna port on a band-by-band basis. As mentioned previously, tuner settings for various band segments can be memorized with the band stacking register.

The internal tuner is rated for up to a 3:1 SWR — most useful for trimming up a matched antenna at the band edges. Yaesu also offers an optional external automatic tuner that has a wider tuning range, but I used a manual tuner for that function.

In the ARRL Lab

Key test results from the ARRL Lab are presented in the "Key Measurements Summary;" detailed results of all tests are presented in Table 1 and Figures 5 through 7. We could summarize by saying that the receiver part of this transceiver, while not quite in the same performance league of its top performing siblings, is far better than its predecessor (the FT-950).

The transmitter passed muster on most criteria, but our initial FTDX1200 (serial number 3F020021) did not meet Yaesu's specifications in terms of its third order transmit IMD. We brought this to Yaesu's attention, and after investigation they redesigned the transmit low-pass filter, changing 13 capacitor values. The test results shown in Table 1 reflect the design changes applied to a second radio, serial number 3H030068.

Yaesu indicates that the modifications were applied to transceivers shipped from Tokyo after September 2013 and are included in new production.

On the Air at W1ZR

The FTDX1200 fit nicely into my station and came into operation without any difficulties. While it has the usual jack for an external speaker, I found that the top firing internal one handled plenty of audio without difficulty and provided good quality communications reception in all modes.

CW Operation

The FTDX1200 is a pleasure to use on CW. The internal keyer works well, in iambic

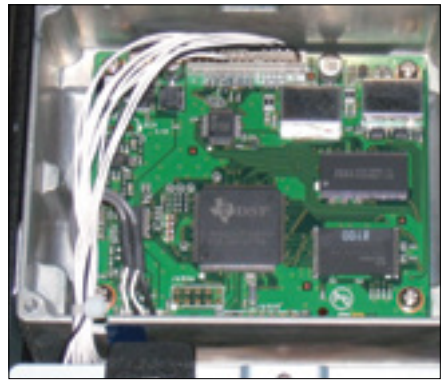
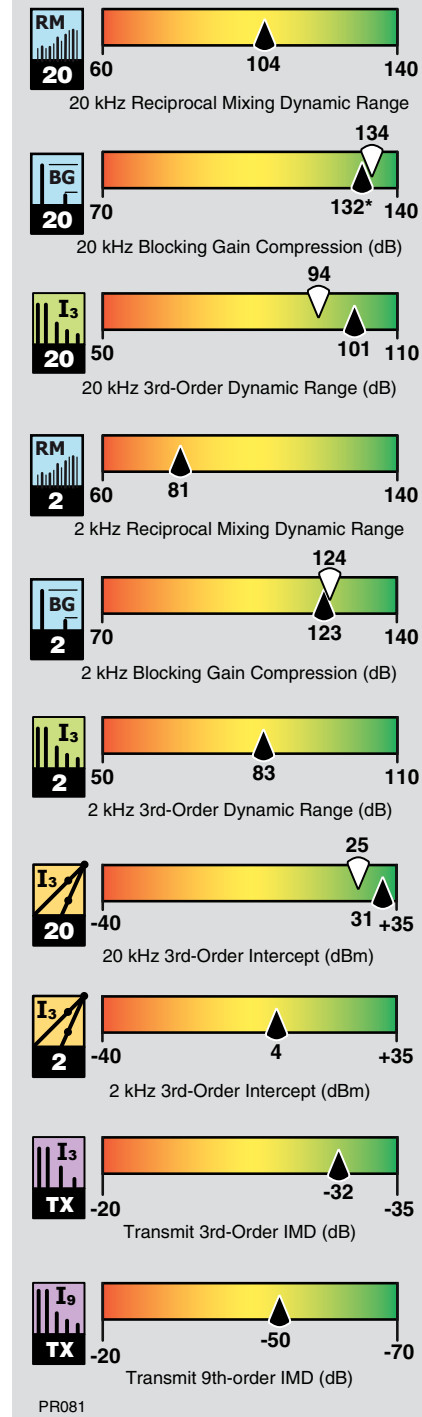


Figure 4 — Close up of the lower left portion of the bottom of the FTDX1200 chassis with bottom cover removed. The optional FFT-1 processor is installed in its own shielded compartment.

Key Measurements Summary



PR081

Key:

80 M

20 M

Dynamic range and intercept values with preamp off.

Intercept values were determined using -97 dBm reference

*Testing stopped after after reaching maximum output from test fixture. See Table 1.

modes A or B. A simulated bug mode is supported, as is an automatic character space (ACS) mode if using one of the iambic modes. There are separately settable front and rear KEY jacks, so one jack can be used with keyer paddles and the other a straight key, if desired. In addition keying from PC software is supported.

The front panel keyer speed control is appreciated. Full or semi break-in operation is supported and the transmit-receive (TR) switching occurs silently — always a blessing. The switching connection to my linear amplifier using the optional Yaesu cable (part number T9207451, though you probably don't want to try to solder to those tiny connectors) also supported full break-in switching with a menu-adjustable transmit delay to avoid hot switching. Five CW memories can be set up using the FH-2 remote control keypad to both to load and access them. The messages can be entered from the internal keyer or via a character text function. The keyer messages can also support sequential contest numbering.

The almost continuously adjustable DSP selectivity made separating stations a breeze, although I had to remember to hit the narrow (NAR) button to move below 500 Hz bandwidth on CW. Once there, it was usable all the way down to a width of 50 Hz without noticeable ringing. A single-button audio peaking filter (APF) provided a very sharp selectivity for CW. My regular 80 meter CW scheduled contact with W1WO went fine and George reported that the full break-in signal sounded fine to his critical ear.

Voice Operation

Voice operation of the FTDX1200 had nothing to apologize for either. Receive audio sounded full and crisp with the smoothly adjustable DSP providing just the needed sharpness and the shift moving the edges where needed to provide clean copy. The digital notch filter (DNF) made any in-channel tones go away completely. The digital noise reduction (DNR) system was effective against many types of noise using the default algorithm, one of 15 available by menu.

Voice operated transmit (VOX) switching is provided and worked well, as did push-to-talk (PTT). The provided PTT hand mic received good reports, as did a headset with the appropriate connector adapter to fit the front panel eight pin jack. A rear panel PTT jack is also available, and I used it with my

Table 1
Yaesu FTDX1200, serial number 3F020021

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-56 MHz (specified performance, amateur bands only); transmit, 1.8-54 MHz (amateur bands only).	Receive and transmit, as specified.
Power consumption: Receive, 1.8 A (no signal), 2.1 A (signal present); transmit, 23 A (100 W) at 13.8 V dc ± 10%.	Receive, 1.63 A (max brightness, max vol, no signal), 1.45 A (min brightness); transmit, 8 A at 5 W RF output, 19 A typical at 100 W RF output at 13.8 V dc. Operation confirmed at 12.4 V dc.
Modes of operation: SSB, CW, AM, FM, RTTY, PSK31.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity: 2.4 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz (preamp 2 on), 2.0 µV; 1.8-30 MHz, 0.16 µV (preamp 2 on); 50-54 MHz, 1.25 µV (preamp 2 on).	Noise floor (MDS), 500 Hz bandwidth, 3 kHz roofing filter: *Preamp* / *Off (dBm)* / *1 (dBm)* / *2 (dBm)* 0.137 MHz / –104 / –116 / –104 0.475 MHz / –122 / –137 / –139 1.0 MHz / –125 / –137 / –141 3.5 MHz / –124 / –136 / –141 14 MHz / –122 / –133 / –140 50 MHz / –122 / –134 / –141
Noise figure: Not specified.	14 MHz, preamp off/1/2: 25/14/7 dB
AM sensitivity: 6 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz (preamp 2 on), 2 µV; 1.8-30 MHz (preamp 2), 2 µV; 50-54 MHz (preamp 2), 1 µV.	10 dB (S+N)/N, 1-kHz, 30% modulation, 6 kHz bandwidth, 15 kHz roofing filter: 1.0 MHz 0.68 µV (preamp 2) 3.8 MHz 0.77 µV (preamp 2) 50 MHz 0.72 µV (preamp 2)
FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 28-30 MHz (preamp 2), 0.5 µV; 50-54 MHz, (preamp 2), 0.35 µV	For 12 dB SINAD, preamp 2: 29 MHz 0.23 µV 52 MHz 0.23 µV
Spectral display sensitivity: Not specified.	Preamp off/1/2: –109/–120/–126 dBm.
Blocking gain compression dynamic range:	Blocking gain compression dynamic range, 500 Hz bandwidth, 3 kHz roofing filter: *20 kHz offset Preamp off/1/2* / *5/2 kHz offset Preamp off* 3.5 MHz 134/140/140 dB / 130/124 dB 14 MHz 132*/138/136 dB / 131/123 dB 50 MHz 129/131/126 dB / 125/119 dB
Reciprocal mixing dynamic range: Not specified.	20/5/2 kHz offset: 104/91/81 dB.

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	–30 dBm	–124 dBm	94 dB	+17 dBm
		–16 dBm	–97 dBm		+25 dBm
14 MHz/Off	20 kHz	–21 dBm	–122 dBm	101 dB	+30 dBm
		–12 dBm	–97 dBm		+31 dBm
		–56 dBm	0 dBm		+28 dBm
14 MHz/Pre 1	20 kHz	–32 dBm	–133 dBm	101 dB	+19 dBm
		–20 dBm	–97 dBm		+19 dBm
14 MHz/Pre 2	20 kHz	–41 dBm	–140 dBm	99 dB	+9 dBm
		–27 dBm	–97 dBm		+9 dBm
14 MHz/Off	5 kHz	–22 dBm	–122dBm	100 dB	+28 dBm
		–13 dBm	–97 dBm		+29 dBm
		–54 dBm	0 dBm		+27 dBm
14 MHz/Off	2 kHz	–39 dBm	–122 dBm	83 dB	+3 dBm
		–30 dBm	–97 dBm		+4 dBm
		–34 dBm	0 dBm		+17 dBm
50 MHz/Off	20 kHz	–28 dBm	–122 dBm	94 dB	+19 dBm
		–20 dBm	–97 dBm		+19 dBm

Second-order intercept point: Not specified.	14 MHz, preamp off/1/2, +71/+69/+69 dBm; 50 MHz, +89/+77/+65 dBm.
DSP noise reduction: Not specified.	Variable, 30 dB maximum.
Notch filter depth: Not specified.	Manual notch: >70 dB, Auto notch: >70 dB, attack time: 100 ms.
FM adjacent channel selectivity: Not specified.	29 MHz, 85 dB; 52 MHz, 77 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamp 2: 29 MHz, 85 dB†; 52 MHz, 77 dB. 10 MHz channel spacing: 29 MHz, 98 dB; 52 MHz, 117 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz, preamp off/1/2: 106/29.5/8.2 µV.
Squelch sensitivity: Not specified.	At threshold: SSB (preamp off), 11.5 µV; FM, 29 MHz (preamp 2), 0.34 µV; 52 MHz (preamp 2), 0.38 µV.
Receiver audio output: 2.5 W into 4 Ω at 10% THD.	2.5 W at 8% THD into 4 Ω (maximum audio). THD at 1 V RMS: 1.15%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth)‡: CW (500 Hz): 445-946 Hz (501 Hz) Equivalent Rectangular BW: 500 Hz USB (2.4 kHz): 160-1788 Hz (1628 Hz) LSB (2.4 kHz): 160-1790 Hz (1630 Hz) AM (6 kHz): 79-2990 Hz (5800 Hz).
Image rejection: 160-10 meters, >70 dB; 50-54 MHz, >60 dB.	First IF rejection, 14 MHz, 101 dB; 50 MHz,72 dB; image rejection, 14 MHz, 101 dB; 50 MHz, 59 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5-100 W, (2-25 W AM).	HF and 50 MHz: CW, SSB, RTTY, PKT, FM, as specified within specified supply voltage range. AM, 1.5-45 W (HF), 4.2-93 W (50 MHz).††
Harmonic suppression: >60 dB (1.8-29.7 MHz), >65 dB (50-54 MHz).	57 dBc (worst case 17 meters), 62 dB typical; 50-54 MHz, 65 dBc. Meets FCC requirements.
SSB carrier suppression: At least 60 dB.	>60 dB.
Undesired sideband suppression: At least 60 dB.	>60 dB.
Third-order intermodulation distortion (IMD) products: –31 dB @ 14 MHz, 100 W PEP.	HF, 100 W PEP, 3rd/5th/7th/9th order: –32/–35/–42/–50 dB (worst case, 12 m); >–37/>–38/>–44/>–50 (typical). See text. 50 MHz, 100 W PEP: –29/–34/–39/–57 dB
CW keyer speed range: Not specified.	4 to 56 WPM; iambic mode A or B.
CW keying characteristics: Not specified.	See Figures 5 and 6.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, AGC fast, 35 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 38 ms; FM, 36 ms.
Composite transmitted noise: Not specified.	See Figure 7.
Size (height, width, depth): 4.5 × 14.4 × 12.3 inches; weight, 21 lbs.	
Price: $1600; FFT-1 FFT unit, $200; SCU-1 SCU-17 USB interface, $200.	

*Blocking gain compression DR exceeded value shown; testing stopped after reaching the +10 dBm maximum output from the test fixture.
**ARRL Product Review testing includes Two-Tone IMD results at several signal levels. Two-Tone, Third-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the 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.
††Carrier level must be lowered to 25% of PEP for proper AM operation, for example 25 W carrier for 100 W PEP.

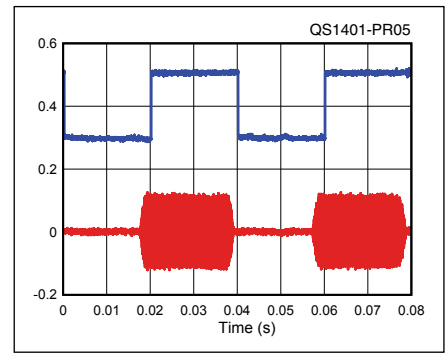


Figure 5 — CW keying waveform for the FTDX1200 showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

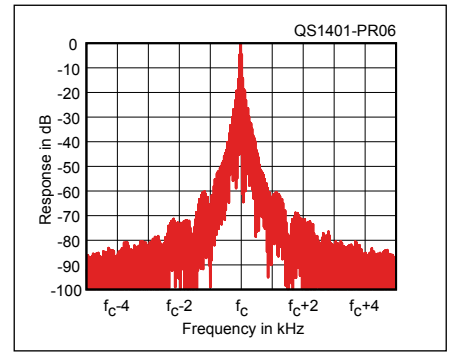


Figure 6 — Spectral display of the FTDX1200 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

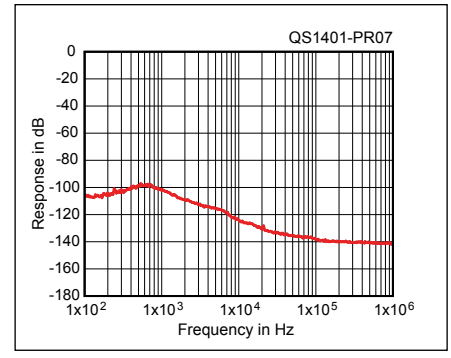


Figure 7 — Spectral display of the FTDX1200 transmitter output during composite-noise testing. Power output is 100 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

Downconverting, Upconverting — What's the Big Deal?

Superhet receivers mix or heterodyne the incoming signal to an *intermediate frequency* (IF) so that all the signal processing can be accomplished at one fixed frequency (or more, in a multiple conversion set) that remains constant no matter what frequency the radio is tuned to. This allows for fixed center frequency filters and reduces the number of circuits that need to be tuned as the frequency is changed.

Every Design is a Compromise

When modern solid state frequency synthesizers that could operate into the VHF region became available, the trend in receiver design was to convert signals to a first IF well above the received frequency range (called *upconverting*). This resulted in a new receiver architecture that had a number of advantages over earlier *downconverting* receivers with an IF in the 9 MHz region. In the upconverting arrangement, a single digital synthesizer, perhaps covering 70 to 100 MHz, shifts incoming HF signals to a VHF IF, often near 70 MHz. A roofing filter at 70 MHz follows the first mixer (see Figure A).

Upconversion offers simplified local oscillator (LO) design and the possibility of excellent image rejection. It also makes it simple for manufacturers to adapt a design to multiple markets and offers an easy path to general coverage reception. Unfortunately, crystal filter technology has only recently been able to produce narrow filters at frequencies as high as 70 MHz, and so far they have much wider skirts than the crystal filters at lower frequencies. Many receivers and transceivers just set this 70 MHz roofing filter bandwidth wider than any needed operating bandwidth and use DSP filtering much later in the signal chain to set the final selectivity bandwidth for each mode.

For a receiver that will receive FM and AM as well as SSB and CW, that usually means a roofing filter with a bandwidth of 20 kHz or so. With this arrangement, all signals in that 20 kHz bandwidth pass all the way through IF amplifiers and mixers and into the A/D converter before we attempt to eliminate undesired signals with DSP filters. By that time, strong signals have had an opportunity to generate intermodulation products or cause the blocking that we are trying to eliminate. The FTDX1200 uses upconversion, but it has three mode-dependent VHF roofing filters at 3, 6, and 15 kHz bandwidth, resulting in improved performance over many earlier sets with this architecture.

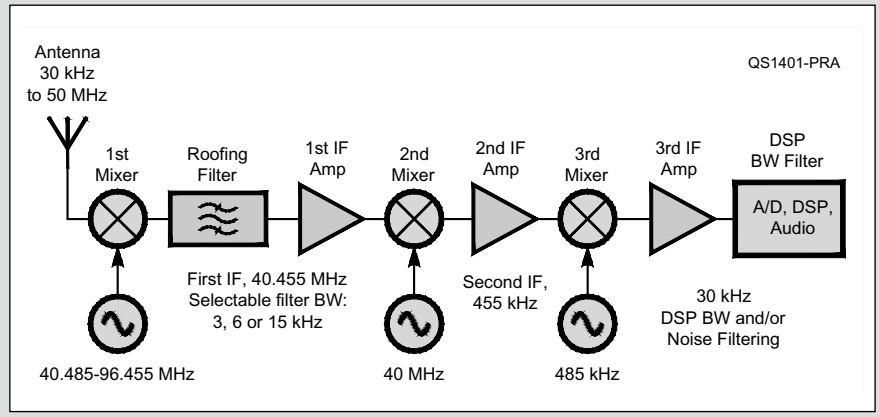


Figure A — Simplified block diagram of a modern upconverting general coverage receiver such as the FTDX1200.

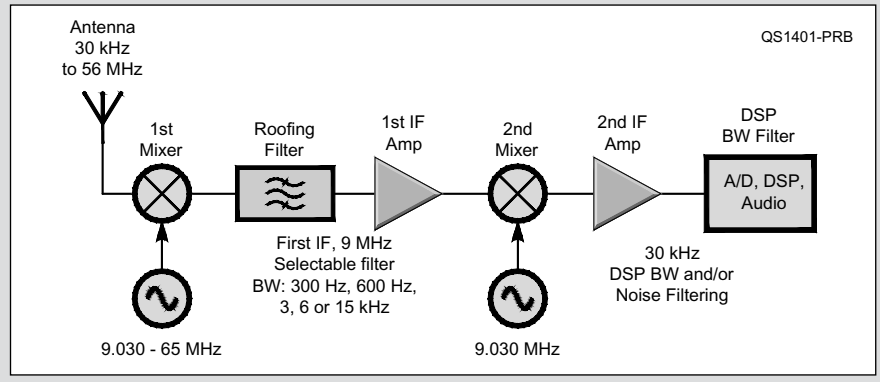


Figure B — Simplified block diagram of a modern downconverting receiver, such as the FTDX3000. Compare the narrowest bandwidth of the roofing filters in the first IF.

Large Signal Overload and Distortion

Operators noticed some new problems with modern superhet receivers. They were given names such as *strong signal desense* and *intermod*. The root of the problem was that signals were not separated until they had been through multiple amplifiers and mixers. If the signals were strong enough, or were strong and close together, they either reduced receiver gain or mixed with their harmonics and made new signals that could not be separated by the filters later in the receiver. We call these effects *blocking gain compression dynamic range* and *third order intermodulation dynamic range* and we carefully measure them in each receiver that we review.

Dynamic range (blocking, IMD and reciprocal mixing — related to oscillator noise) is a major limitation of receiver performance. It's significant for amateurs who operate in contests, DX pileups, or other environments in which there are many strong nearby signals.

The Solution — A Roofing Filter Near the Antenna

In order to minimize the dynamic range problems from strong signals close to the receive frequency, narrow filtering is applied as early in the receiver as possible to eliminate the unwanted signals before they get to the sections of the receiver that generate a problem. In order to have very narrow filters with sharp skirts, they have to operate at lower frequencies, typically in the HF region.

Receivers such as the FTDX3000 use the downconverting architecture shown in Figure B. The only place where the desired and undesired signals all coexist is in the first mixer. If the first mixer has sufficient strong signal handling capability, the undesired signals will be eliminated by the selectable roofing filters immediately behind the first mixer. The later amplifier, mixer and DSP circuits only have to deal with the signal we want. — *Joel Hallas, W1ZR*

desk mounted knee switch while using the headset. We didn't try the optional DVS-6 Voice Memory Unit.

Two different three-band mic equalizers may be used to tailor the frequency response of the system to compensate for your voice characteristics or to eliminate any frequency response tilt of the mic. Not only are the levels of compensation of each band adjustable, but you can also set the center frequency; these features take up 18 menus. One equalizer is available if the speech processor is engaged, the other with the speech processor disabled. This is a nice feature, so you can have one set of transmit audio characteristics for crisp DX or contest operation that will be on if the processor is engaged, and another more natural response for ragchewing that will apply with the processor off. An LCD soft switch can be used to disengage the equalization in either situation. In addition to the equalization, the transmit audio bandwidth and high cutoff frequencies are settable from another menu.

AM voice worked well, with reports of good quality audio, but low modulation, until I found that the front panel MIC GAIN didn't function in AM mode. Instead, there is a special menu setting for AM mode MIC GAIN, and the default value (30) didn't do it for me with the standard mic. Adjust that and the receiving folks will think you are using a Johnson Ranger.

On FM there are automatic receiver offsets, as well as the capability to use nonstandard splits. CTCSS tone squelch is also supported, both for transmit and receive. Channels set up for your 6 and 10 meter repeaters can be memorized for future use.

Digital Modes

Digital mode operation with the '1200 can be supported using SSB transmission in concert with a PC sound card. In addition, direct FSK is supported for RTTY, with all required connections available at the rear panel RTTY/DATA port usable with the optional CT-39A Packet Interface Cable.

In place of the individual leads from the CT-39A cable, the optional SCU-17 USB adapter routes the audio signals to and from the USB connected PC and also manages PTT and FSK options. I found it much easier to set up than the direct CT-39A connections, and it simultaneously supports the CAT function all through a single USB connection to the PC.

The USB connection requires software drivers available in the FILES section of the FTDX1200 page on the Yaesu website. While there are partial installation instructions in both the FTDX1200 *Operating Manual* and the instruction booklet for the SCU-17, to make it play the first time I suggest downloading and following the instructions available on the website.

The optional FFT-1 unit can provide on screen decoding and encoding from the dedicated memories (if the FH-2 keypad is available) of RTTY, PSK31, and even CW without a connected PC. Decoding in data modes requires very careful tuning, while the AUTO ZERO function made CW decode work very well. This unit did a better job of decoding CW than other units I've tried. It won't, however, compensate for poorly sent characters or uneven spacing.

The radio offers DATA and RTTY as separate modes, each with its full set of menu selections. I suspect this is important if you're using direct FSK for RTTY or the optional FFT decoder, but they could be used to have multiple parameter sets available.

Documentation

The FTDX1200 comes with a 136 page instruction manual and a full set of schematic diagrams. The manual is generally well organized and complete, but is occasionally vague. For example, the band stacking registers provide a useful function and I wanted to set them up. The manual provides a good description of what they do and how to use them, but provides the instruction: "Program 14.025 MHz CW Mode, then press the 14 MHz button." This makes sense, but doesn't specifically explain how I should program that frequency. It might have been more clear to say, "Set the frequency and other parameters for the first band stack register, press STO (store) and then 14 MHz."

I found the RTTY and Data sections very focused on the use of the FFT encoder/decoder functions. They just had a connection diagram for the more traditional hookup that I first attempted before turning to the SCU-17.

Manufacturer: Yaesu USA, 6125 Phyllis Dr, Cypress, CA 90630; tel 714-827-7600; **www.yaesu.com**.

See the Digital Edition of *QST* for a video overview of the Yaesu FTDX1200 HF and 6 Meter Transceiver.

New Products

Light Rover Portable Mast Kit

The Light Rover Drive-On Portable Mast Kit from the Susquehanna Astronomical Society is designed for quick deployment by portable or rover stations with assembly by one person. To use it, drive your vehicle over the self-centering base assembly, assemble the mast sections and connectors, attach the antenna to the mast, tighten retaining bolts to prevent rotation, raise the mast into position, and tighten the base retaining bolt. The kit includes a 2 inch OD mast with lengths ranging from 10 to 30 feet (taller masts must be guyed). Prices start at $300 for the 10 foot version. For more information, or to order, visit **www.susq-astro.org/shop/**.

Steve Ford, WB8IMY, wb8imy@arrl.org

Kolin Industries 2Q-Lite Headset

Joel R. Hallas, W1ZR
QST *Contributing Editor*
w1zr@arrl.org

I was surprised to find that the founder of Kolin Industries is a local ham operator. Jay Kolinsky, NE2Q, had been making products for hams since the early 1960s. Jay was disappointed with the quality and production consistency of lightweight headsets available to hams and decided he could do better. He teamed with an old line Japanese manufacturer of commercial quality broadcast headsets to build products that meet stringent specifications. The result was the 2Q-Lite.

What Do You Get?

Upon opening the box it was apparent that this was a very different sort of headset. I immediately noticed that the headband was stainless steel, not plastic. The transducers were clearly precision components and I discovered that they had been individually tested for audio response (a frequency response plot is provided with each unit). The transducers are replaceable, if needed. That's a good thing because this headset is hardly a "use and toss" item — especially at this price point!

The 2Q-Lite is available with an electret or a dynamic microphone element, and I had an opportunity to test both mic versions at W1ZR. The mic boom is attached to a swivel that allows it to be used on either side of the head, although, per the usual stereo convention, the left side is the plan. In addition to the swivel, the mic boom itself is flexible and can be moved to any position — and stays there until you move it again. The headphones and mic are both terminated in plated 3.5 mm phone plugs, stereo for the headphones and mono for the mic.

How Do They Work?

This was the first time I had used a lightweight headset in my station and I must admit that I was impressed, both with how the headset sounded and how well others heard me. I found the 2Q-Lite very comfortable, even after extended periods of use.

The two microphone elements have somewhat different characteristics. The electret has a sensitivity of about –43 dB and a roll off of about 2 dB/decade, while the dynamic has a lower sensitivity (about –55 dB) and an increase in response with frequency of about 4 dB/decade, over the usual 300 to 3000 Hz voice range. The difference in frequency response is not very significant, especially for those who use transmit audio equalizers.

The lower sensitivity of the dynamic mic element should not be a problem for most radios. It could fully modulate the Yaesu FTDX1200 transceiver I happened to have under test at the same time. My usual Elecraft K3 rig has front and back MIC jacks, with a possibility of an additional mic preamp stage via the front. The front jack worked fine with the MIC GAIN set at 14 (out of 60). When using the rear jack without the added preamp I could modulate fully, but only with the MIC GAIN all the way up and the mic quite close to my mouth.

Electret or Dynamic?

Both of the 2Q-Lite microphone elements are of high quality and work well — and are the same price. So how do you choose? Check your radio's user manual. Some transceivers have provisions for electret, others for dynamic. If you plan to use the headset with just one particular rig, its requirements will be the deciding factor.

However, if you are considering the headset for computer applications such as *Skype* or *EchoLink*, choose carefully. Most PC sound equipment that I've encountered is designed to work with electret mic elements with the bias applied directly to the audio leads, which is perfect for this electret headset. Be careful not to apply a bias voltage to a dynamic mic, though. You run the risk of damage to the microphone element or distorted audio at the very least.

As noted above, because electrets have a built-in preamp, they can provide high output from a small device. Dynamic mics, have an output proportional to their diaphragm surface area. While the two mics look similar with their blast shields on, removing them makes this apparent. While the electret element housing has a diameter of only 7/16 inch, the dynamic is more like 5/8 inch.

Some radios, such as my Elecraft K3, have a bias voltage available either on the audio lead as well as on a separate pin on the eight pin front MIC connector. Others, including the Yaesu FTDX1200, only have the bias voltage on a separate pin. In the later case an adapter will be needed between the eight pin connector and the mic plug to route the voltage. The solution is as easy as adding a tiny circuit with one resistor and one capacitor as shown in the "Doctor is In" column in the November 2012 issue of *QST*. For those radios with an eight pin MIC connector, the Heil mic adapter for the correct radio (most radios use different connections on the "standard" eight pin round mic jack) can be used for either the dynamic mic element or for the electret, but only if the radio can provide bias on the audio lead.

Regardless of the mic element choice, the Kolin Industries 2Q-Lite provides outstanding performance. This is an expensive headset by any measure, but the quality seems to match the price.

Manufacturer: Kolin Industries, PO Box 300, Pound Ridge, NY 10576-0300; tel 914-764-5775; **www.2qlite.com; ne2q@2qlite.com**. *Price: with either electret or dynamic mic element, $389.95, including shipping.*