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# Product Review

# Yaesu FTDX101MP MF, HF and 6-Meter Transceiver


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In the November 2019 issue of *QST*, we reviewed Yaesu's FTDX101D, a 100 W, SSB, CW, AM, FM, and digital-mode transceiver for 160 through 6 meters. In that review, we mentioned that there was also a 200 W version available, the FTDX101MP, which we review this month. You may wish to look at the earlier review to follow along in our discussion of the differences. For those interested in etymology, the "MP" of the product name is in honor of the founder of Yaesu, the late Sako Hasegawa, JA1MP.

## A Full-Size HF Transceiver

While many manufacturers strive to offer a compact, travel-friendly transceiver, the FTDX101MP configuration is based on different design objectives. This transceiver is designed to sit in the center of your operating position with a full-size front panel that includes dedicated concentric controls for most functions.

This radio will be an easy-to-access focal point of a full-featured fixed-station layout. Controls are well marked and identified, but most are not illuminated, so your station should be well-lighted to see the control labels, at least until your muscle memory is well-programmed.

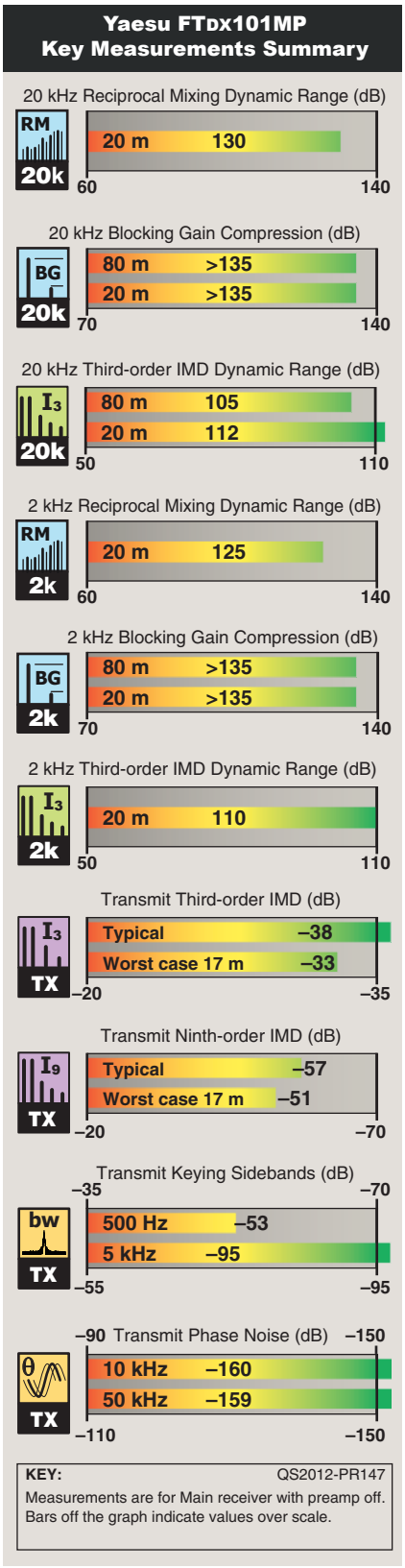
## Changes Between the Models

A look at the front panels of the two transceivers confirms that, other than the model numbers on the upper right, the two panels are identical, with the same controls and indicators in all the same places. There are, however, some important differences that are apparent upon a deeper inspection.

Of course, the most significant difference is that the maximum RF output power of the 'MP is 200 W versus 100 W for the 'D model. This difference, 3 dB, or half an S-unit, doesn't sound like a big improvement, but may be important to some users. For example:

### Bottom Line

The Yaesu FTDX101MP is a very effective, full-size, full-featured, 200 W PEP transceiver that would work well in most stations, especially those involved in serious contesting or DX chasing where strong close-in signals abound.




## Table 1
## Yaesu FTDX101MP, serial number 9M060545

| Manufacturer's Specifications | Measured in the ARRL Lab |
|---|---|
| Frequency coverage: Receive, 0.03 – 75 MHz; transmit, 160 – 6 meter amateur bands only. | Receive and transmit, as specified, including 60 meters on 5.332, 5.348, 5.3585, 5.373, and 5.405 MHz (preset channels). |
| Power requirement: Transmit, 720 VA, Receive (with signal), 120 VA. | Transmit, typically 560 VA, 642 VA max. 310 VA (AM) at maximum RF power Receive, 54 VA (max brightness). Power off, <1 mA. |
| Modes of operation: SSB, CW, AM, FM, FSK, PSK, SSB data modes. | As specified. |

### Main Receiver

SSB/CW sensitivity (preamp 2 on):
0.16 µV (1.8 – 30 MHz)
0.125 µV (50 – 54 MHz)
0.16 µV (70 – 70.5 MHz).

ADC overload level: Not specified.

Noise figure: Not specified.

AM sensitivity: 6 kHz BW, 10 dB (S+N/N), preamp 2 on:
6.3 µV (0.5 – 1.8 MHz)
2.0 µV (1.8 – 30 MHz)
1.0 µV (50 – 54 MHz)
2.0 µV (70 – 70.5 MHz).

FM sensitivity: 12 kHz BW, 12 dB SINAD, preamp 2 on:
0.25 µV (28 – 30 MHz)
0.20 µV (50 – 54 MHz)
0.25 µV (70 – 70.5 MHz).

Spectral sensitivity: Not specified.

Blocking gain compression dynamic range: Not specified.

Reciprocal mixing dynamic range: Not specified.

### Main Receiver Dynamic Testing*

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

| *Preamp* | *Off* | *P1* | *P2* |
|---|---|---|---|
| 0.137 MHz | –121 | –131 | –118 dBm |
| 0.475 MHz | –124 | –133 | –136 dBm |
| 1.0 MHz | –125 | –134 | –138 dBm |
| 3.5 MHz | –125 | –133 | –138 dBm |
| 14 MHz | –125 | –134 | –138 dBm |
| 50, 70 MHz | –127 | –136 | –138 dBm |

>+10 dBm.

Preamp off/1/2, 14 MHz: 22/13/9 dB; 50 MHz, 20/11/9 dB.

10 dB (S+N)/N, 1-kHz tone, 30% modulation, 9 kHz BW:

| *Preamp* | *Off* | *P1* | *P2* |
|---|---|---|---|
| 1.0 MHz | 3.39 | 1.15 | 0.79 µV |
| 3.88 MHz | 4.12 | 1.43 | 0.94 µV |
| 29.0 MHz | 2.98 | 1.02 | 0.87 µV |
| 50.4 MHz | 2.82 | 1.08 | 0.94 µV |
| 70.4 MHz | 3.63 | 1.30 | 1.23 µV |

For 12 dB SINAD, 3 kHz deviation, 16 kHz BW:

| *Preamp* | *Off* | *P1* | *P2* |
|---|---|---|---|
| 29 MHz | 1.17 | 0.41 | 0.35 µV |
| 52 MHz | 1.06 | 0.39 | 0.35 µV |
| 70 MHz | 1.03 | 0.35 | 0.33 µV |

Panadapter and waterfall, preamp Off/1/2
14 MHz, –120/–129/–138 dBm
50 MHz, –125/–133/–141 dBm
3DSS, preamp Off/1/2
14 MHz, –121/–130/–137 dBm
50 MHz, –125/–133/–141 dBm

Blocking gain compression dynamic range, 500 Hz BW, 600 Hz roofing filter**:

| *Preamp* | *20 kHz offset Off/P1/P2* | *5/2 kHz offset Preamp off* |
|---|---|---|
| 3.5 MHz | >135/>143/145 | >135/135 dB |
| 14 MHz | >135/>144/147 | >135/>135 dB |
| 50 MHz | >137/139/133 | >137/>137 dB |

14 MHz, 20/5/2 kHz offset: 130/128/125 dB, for 600 and 300 Hz roofing filter.

ARRL Lab Two-Tone IMD Testing (600 Hz roofing filter, 500 Hz bandwidth)

| *Band/Preamp* | *Spacing* | *Measured IMD Level* | *Measured Input Level* | *IMD DR* |
|---|---|---|---|---|
| 3.5 MHz/Off | 20 kHz | –125 dBm<br>–97 dBm | –20 dBm<br>–5 dBm | 105 dB |
| 14 MHz/Off | 20 kHz | –125 dBm<br>–97 dBm | –13 dBm<br>–5 dBm | 112 dB |
| 14 MHz/P1 | 20 kHz | –134 dBm<br>–97 dBm | –22 dBm<br>–10 dBm | 112 dB |
| 14 MHz/P2 | 20 kHz | –138 dBm<br>–97 dBm | –30 dBm<br>–17 dBm | 108 dB |
| 14 MHz/Off | 5 kHz | –125 dBm<br>–97 dBm | –13 dBm<br>–5 dBm | 112 dB |
| 14 MHz/Off | 2 kHz | –125 dBm<br>–97 dBm | –15 dBm<br>–5 dBm | 110 dB |

| Manufacturer's Specifications | | Measured in the ARRL Lab | | |
|---|---|---|---|---|
| *Band/Preamp* | *Spacing* | *Measured IMD Level* | *Measured Input Level* | *IMD DR* |
| 50 MHz/Off | 20 kHz | –127 dBm<br>–97 dBm | –22 dBm<br>–13 dBm | 105 dB |
| 50 MHz/P2 | 20 kHz | –138 dBm<br>–97 dBm | –36 dBm<br>–24 dBm | 102 dB |

| | |
|---|---|
| Second-order intercept point: Not specified. | Preamp Off/P1/P2<br>14 MHz, +67/+67/+67 dBm<br>21 MHz, +63/+61/+61 dBm<br>50 MHz, +59/+57/+57 dBm |
| IF and image rejection: IF, ≥60 dB (1.8 – 28 MHz, VC on), ≥60 dB (50 MHz); image, ≥70 dB (1.8 – 28 MHz), ≥60 dB (50 MHz). | IF rejection, VC off/on: 7 MHz, 72/105 dB; 10.1 MHz, 70/100 dB; 14 MHz, 102/105 dB, 50 MHz, 105/105 dB.<br>Image rejection, VC off/on:<br>7 MHz, 88/95 dB; 10.1 MHz, 78/105 dB; 14 MHz, 70/89 dB; 50 MHz, 69/69 dB. |
| Noise reduction: Not specified. | Up to 20 dB. |
| FM two-tone third-order IMD dynamic: range: Not specified. | 20 kHz offset, P2 on: 29 MHz, 86 dB†; 52 MHz, 86 dB. 10 MHz offset, P2 on: 29 MHz, 119 dB; 52 MHz, 110 dB. |
| Squelch sensitivity: (preamp 2 on) FM, 28 – 30 MHz, 0.25 µV, 50 – 54 MHz, 0.2 µV, SSB, CW AM, 2 µV. | FM, P2 on: 29 MHz, 0.27 – 0.58 µV; 52 MHz, 0.27 – 0.57 µV.<br>HF squelch: 1.19 – 13.3 µV. |
| S-meter sensitivity: Not specified. | S-9 signal, preamp Off/P1/P2:<br>14 MHz, 132/46.7/17.6 µV;<br>50 MHz, 99/38/14.6 µV;<br>Scaling: 3 dB per S-unit. |
| Notch filter depth: Not specified. | Tunable notch filter, >70 dB; auto notch > 70 dB, attack time 2 ms for one or two tones. |
| IF/audio response: Not specified. | Range at –6 dB points:‡<br>CW (500 Hz BW): 453 – 945 Hz;<br>Equivalent Rectangular BW: 489 Hz;<br>SSB (2.4 kHz BW): 289 – 2406 Hz;<br>AM (9 kHz BW): 98 – 1668 Hz. |
| Audio output: 2.5 W at 10% THD at 4 Ω. | As specified. THD 0.3% at 1 $V_{RMS}$. |
| Receive processing delay time: Not specified. | 25 ms. |

## Transmitter

## Transmitter Dynamic Testing

| | |
|---|---|
| Power output: 5 – 200 W (SSB, CW, FM), 5 – 50 W (AM). | SSB, CW, FM (typical): 1.8 – 30 MHz, 5.0 – 196 W; 50 – 54 MHz; 4.9 – 185 W;<br>AM (typical): 1.8 – 30 MHz, 5.0 – 48 W; 50.4 MHz, 5.1 – 46 W. |
| Spurious-signal and harmonic suppression: ≥50 dB (HF); ≥66 dB (50 MHz). | HF, 69 dB typical; worst case, 58 dB (80 m); 50 MHz, 71 dB. Complies with FCC emission standards. |
| Third-order intermodulation distortion (IMD) products: Not specified. | 3rd/5th/7th/9th order, 200 W PEP:<br>–38/–46/–51/–57 dB (HF typical)<br>–33/–40/–45/–51 dB (worst case, 17 m)<br>–37/–44/–47/–54 dB (14 MHz)<br>–40/–44/–51/–58 dB (50 MHz)<br>At 50 W PEP RF output:<br>–35/–44/–54/–63 dB (14 MHz)<br>–40/–47/–58/–72 dB (50 MHz) |
| CW keyer speed range: Not specified. | 4 to 56 WPM. Iambic mode A, B, Y, ACS, semi-automatic. |
| CW keying characteristics: Not specified. | See Figures 1 and 2. |
| Transmit-receive turnaround time (PTT release to 50% audio output: Not specified. | S-9 signal, AGC fast, SSB: 54 ms; AGC fast, CW, full break-in: 30 ms. |
| Receive-transmit turnaround time (tx delay): Not specified. | SSB, 24 ms; FM, 18 ms (29 & 52 MHz). |
| Transmit phase noise: Not specified. | See Figure 3. |
| Amplifier key line closure to RF output: 15 – 30 ms (adjustable). | As specified. |

Size (height, width, depth, with protrusions): 5.9 × 16.5 × 15 inches; weight, 31.3 pounds.

Second-order intercept points were determined using S-5 reference.
*Sub receiver test results were very similar to the main receiver test results. See **www.arrl.org/qst_in_depth** for complete measurements for the sub receiver.
**Blocking dynamic range exceeds these values. No blocking was observed with up to +10 dBm signal at the antenna jack, the maximum level used in ARRL Lab testing.
†Measurement is noise limited at the value indicated.
‡Default values; bandwidth is adjustable.

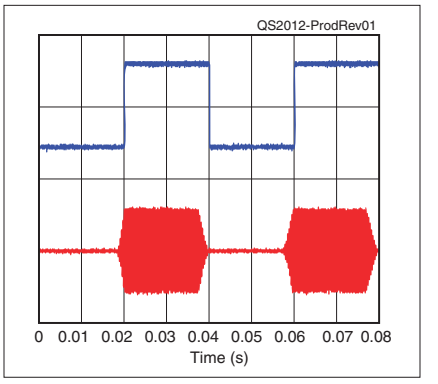



**Figure 1** — CW keying waveform for the Yaesu FTDX101MP showing the first two dits in full-break-in (QSK) mode using external keying and the default rise time setting. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first 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.

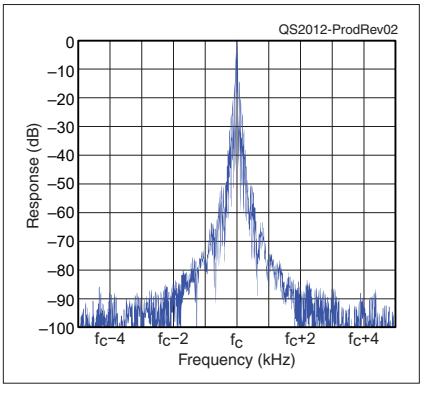



**Figure 2** — Spectral display of the Yaesu FTDX101MP transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying and the default rise time setting. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in decibels.

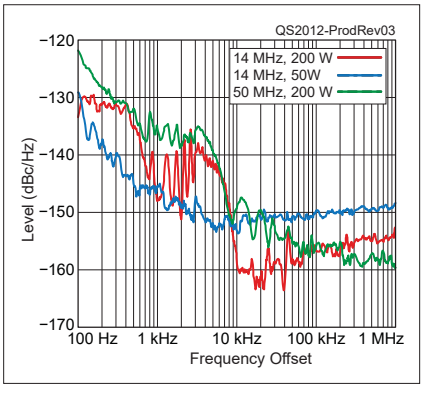



**Figure 3** — Spectral display of the Yaesu FTDX101MP transmitter output during phase-noise testing. Power output is 200 W on the 14 MHz band (red trace), 50 W on the 14 MHz band (blue trace), and 200 W on the 50 MHz band (green trace). The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is –120 dBc/Hz, and the vertical scale is 5 dB per division.

- Amateurs who frequent 30 meters can operate up to the 200 W legal limit, without need for an additional amplifier.
- While 3 dB will not make a noticeable difference during casual contacts when signals are strong, it can easily make the difference between completing a contact and frustration while trying to break through a pileup or when signals are barely out of the noise.
- Some older linear amplifiers need a bit more than 100 W drive to yield full-rated output. In addition, those amplifiers needing close to 100 W drive will generally see a more linear signal from a transceiver operated well below its full-power output.
- Both FTDX101 models operate from external power supplies. The 'MP comes with an included dedicated power supply to provide the 50 V required by the 200 W power amplifier stage. If you were to buy a dedicated 13.8 V, 23 A supply for the 100 W 'D model, it might come out about the same in terms of required space. If you already have a 13.8 V dc distribution system in your station with sufficient capacity, the 'MP model will add an additional box to your station's equipment inventory (and space requirements).
- The 'MP model includes two features that are offered as options on the 'D model (and both must be specified on initial order). These are the 300 Hz bandwidth CW/data roofing filter ($260), and the VCT101 motor-driven RF preselector for the second receiver ($330). Note that both models include a 600 Hz roofing filter as standard equipment, along with selectable DSP filtering down to a bandwidth of 50 Hz, and both models include the preselector in the primary receiver. In addition to providing additional protection from strong close-in signals in CW mode, the 300 Hz filter also provides a small improvement in the already excellent receiver close-in dynamic performance for CW or data mode operation. The 'MP model also brings with it multiple subtle improvements to the display system, presented on a 7-inch TFT (thin-film transistor) color touch-panel display.

If you were to buy an FTDX101D with the optional 300 Hz filter, the optional preselector for the second receiver, and a typical 13.8 V, 23 A power supply, you would add about 60% of the $1,300 (list) price difference between the two radios, perhaps making it easier to decide to purchase the more-powerful 'MP version that includes those functions in its base price.

## How It Works

Both FTDX101 models make use of traditional down-converting superhet architectures in both of the dual

## Lab Notes: Yaesu FTDX101MP

*Bob Allison, WB1GCM*

Receiver testing for FTDX101MP indicates both main and sub receiver offer performance virtually identical to that of the FTDX101D reviewed in the November 2019 issue of *QST*. Two-tone, third-order IMD dynamic range on 20 meters is the highest we have measured, and the receiver exhibits excellent reciprocal mixing dynamic range (RMDR) and blocking gain compression dynamic range as well (see the FTDX101D review for more information).

Transmit intermodulation distortion (IMD) in the FTDX101MP is reasonably low. We generally look for third/fifth/seventh/ninth-order IMD products to be no higher than –30/–40/–50/–60 dB relative to full PEP output. The seventh- and ninth-order products must be kept as low as possible, as they will cause the most interference on adjacent frequencies. The FTDX101MP transmit IMD products are close to or exceed this performance at full PEP power output. Other operators on the band hearing the FTDX101MP will enjoy a respectably clean transmitted signal. At the 50 W PEP output level, typically the power level needed to drive an RF power amplifier, the distortion products are even lower. As always, monitor the automatic level control (ALC) and keep the ALC in the specified range when speaking, and keep the ALC level at zero when transmitting digital modes, such as FT8.

Transmit phase noise is very low, as shown in Figure 3. At 100 Hz away from the carrier, the transmit phase noise is about the lowest we've observed in the ARRL Lab. This means considerably less potential interference to other operators listening very close to the transmitted frequency. Farther away from the carrier, the phase noise is even lower, approaching the noise floor of the test instrument. Excellent keying waveform shaping, with no shortening of the first transmitted dit, and a correspondingly narrow CW bandwidth, makes for a clean transmitter, a complement to this model's top performing receiver.

My only critique of the test data is the S-meter scaling. The widely adopted convention for S-meters is a 50 µV signal level for S-9, and scaling of 6 dB per S-unit. With Preamp 1 engaged, the FTDX101MP's S-meter reads close to S-9 with a 50 µV (–73 dBm) signal level input at the antenna jack, but the scaling is 3 dB per S-unit. This scaling means S-0 is equal to a signal level of –100 dBm, typical of other Yaesu transceivers measured in the ARRL Lab. If the S-meter used 6 dB per S-unit scaling, S-0 would equal –127 dBm.

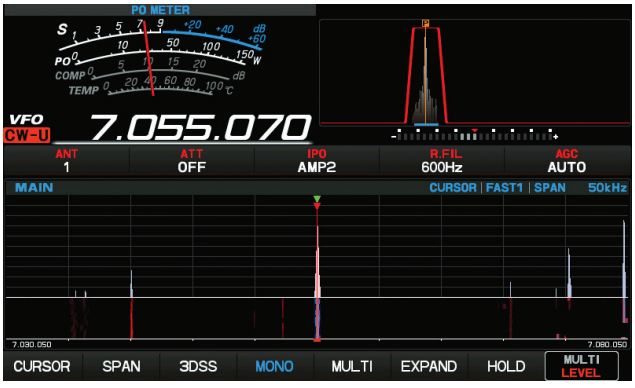



**Figure 4** — Screenshot of the Yaesu FTDX101MP display, showing a single panadapter display, with panadapter below, including the frequency tuned by VFO A. The upper right display shows the received bandwidth with the received signal within. The spectrum span can be adjusted from a width of 1 kHz to 1,000 kHz (50 kHz shown) in 10 steps.

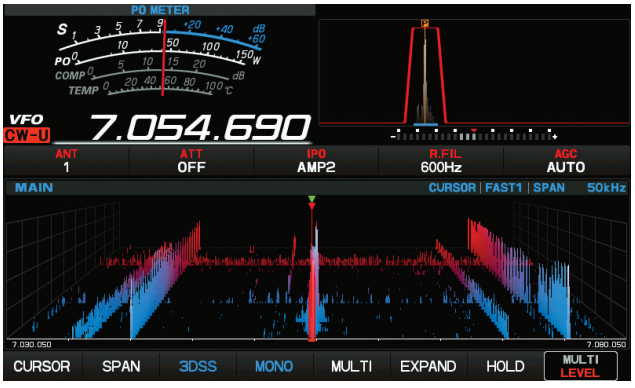



**Figure 5** — Same as Figure 4, except we have tapped the 3DSS on-screen button, and now have a three-dimensional view with time marching out the back of the screen, instead of the waterfall. This way, you can see what happened before, as well as what's happening now.

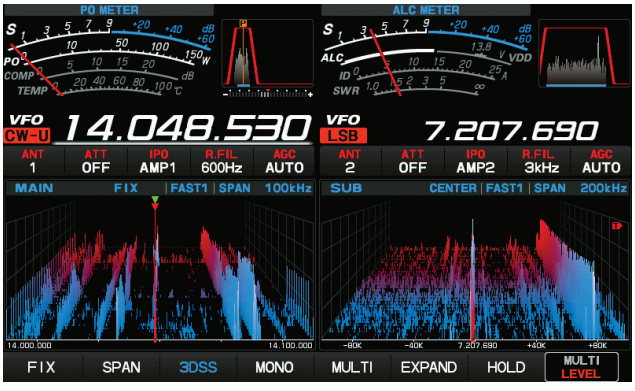



**Figure 6** — Same as Figure 5, except a second spectrum view of the sub-receiver display has been added to the right of the first. Note that the second is on a different band, bandwidth, mode, and antenna. Either can be anywhere within the FTDX101MP's tuning range. The two displays can also be one above the other, if you prefer — lots of flexibility available.


**Figure 7** — Pressing the **FUNC** button below the screen opens up the top menu display. The **MULTI** button is used to select the desired function, and pressing the desired function button brings up the adjustable parameter, or an additional layer of menu items.

receivers, with the result that the very highest close-in receiver dynamic range is achieved. This has been a major competitive marker for some years, and this transceiver, as well as the FTDX101D, puts Yaesu at the top of list, as seen in the ARRL Lab measurements in Table 1 and independently tested and listed in the Sherwood Engineering tabulated summary of receiver performance (**www.sherweng.com/table.html**).

The FTDX101MP controls, in my opinion, are well thought out and well positioned, providing a large measure of flexibility and control. For example, touch the MHz or kHz area of the frequency display to select the tuning knob steps — quite intuitive.

If you are operating using just the primary receiver (press the **MONO** key to select a single receiver), the display for that receiver fills the entire screen (see Figure 4). This can be helpful whether you just look closely at a narrow range, or open up the display width to cover a large segment or even the full band. While the operating frequency is nicely presented in a large, bright font, the frequency scale of the panadapter display is in a very tiny font.

In addition to the typical panadapter presentation, the FTDX101MP offers a three-dimensional view, with the history shown going out the rear, as shown in Figure 5. The spectrum of both receivers can be observed simultaneously, as shown in Figure 6. Additional display and operating options can be selected by pressing the **FUNC** key, with the selection options shown in Figure 7.

Yaesu offers the optional FH-2 Remote Control Keypad for use with the FTDX101MP, as well as other

Yaesu transceivers. While all functions on the remote can be performed from the transceiver's front panel, the FH-2 makes it easier to perform some functions, particularly operating the voice memories and CW keyer memories. Yaesu also recently introduced the SCU-LAN10 unit for remote control of the FTDX101D and FTDX101MP transceivers.

While many manufacturers have chosen to use a simpler direct-sampling SDR architecture, with potential benefits in terms of reduced spurious responses, Yaesu's use of the traditional superhet approach allows a receiver with higher dynamic range than that limited by the closer-to-antenna analog-to-digital conversion stage required in direct sampling receivers. Some day that will likely no longer be a limit, but for now, superhets seem to have the receiver performance edge in amateur transceivers.

## On the Air with the FTDX101MP

The FTDX101MP worked well as the primary transceiver at W1ZR over a number of weeks. I made contacts on both CW and SSB, all with reports of good signal quality. In addition to being easy for me to operate with a minimum learning curve, the operators on the other end also had an easy time copying me on both modes, with me using the Yaesu SSM-75G hand mic for SSB. The operating experience is essentially identical to the FTDX101D — refer to the November 2019 review for more information.

## Documentation

The FTDX101MP comes with a 122-page *Operation Manual*. A complete schematic package is provided on eight double-sided 16 × 12 inch sheets and a 21-page *CAT Operation Reference Manual* is available for download from the Yaesu website. The *Operation Manual* does a reasonably good job at getting you started with the radio. The *CAT Operation Reference* provides a detailed description of the command set needed to communicate from PC to radio — perfect if you want to write your own CAT software, but not so useful in helping you set up a connection from the radio to the CAT PC software that most of us will elect to run on our PCs.

*Manufacturer*: Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630; **www.yaesu.com**. Price: Yaesu FTDX101MP, $4,400; FH-2 Remote Control Keypad; $99.