Product Review

Yaesu FT-991A HF, VHF, and UHF Transceiver

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

The FT-991A is a compact SSB, CW, AM, FM, C4FM, and digital-mode transceiver with coverage of 160 to 6 meters at the 100 W level, as well as 2 meters and 70 centimeters at the 50 W level. The FT-991A's rear panel has one antenna jack for 160 – 6 meters and another for 2 meters and 70 centimeters. Its general-coverage receiver has response from 100 kHz to 74 MHz. Norm Fusaro, W3IZ, reviewed the original FT-991 in the November 2015 issue of *QST*, and I recommend that you read that review as well.

How It Works

The FT-991A is operated by using its colorful touchscreen display (see Figure 1), along with a number of dedicated buttons. All buttons are illuminated with white backlighting, so the radio is easy to operate in low-light conditions. In addition to the dozen operating buttons, there are four knobs: **AF GAIN**, **RF GAIN**, **CLAR/ VFO B**, and **MULTI**. Next to the display are **BAND** and **MODE** buttons, which bring up a set of touchscreen choices that temporarily displace the spectrum scope — straightforward and obvious. Also next to the screen is a **MENU** button, which brings up a screen that can scroll through the 154 menu items using the **MULTI** knob. The current menu item (of the three shown at a time) is highlighted in blue and can be selected by a push of the touchscreen **SELECT** button. The **MULTI** knob is then used to adjust the value.

The extensive menu function is manageable, because the labels are in plain English, mainly clustered by mode or function, and many are set-and-forget configuration items not often needed. For example, each of the two transmit parametric equalizers consumes nine menu items. If there is a menu function that you want to access often, you can program the **C.S** (custom switch) button near the tuning dial to bring up that item with a single press.

The **F/M-LIST** button brings up an array of touchscreen function buttons (60 in all, with six visible at a time) that allow adjustment of the items commonly used during normal operation. Choices include items for **WIDTH**, **DNR**, and **MEM CHAN**. A nice feature is that the function you last selected will continue to be operated by the **MULTI** knob, even after you cancel the function key display. The bottom of the screen, below the spectrum scope, contains four buttons that remain present during normal operation: **METER**, **RF PWR**, **SPEED** or **MIC GAIN** (depending on mode), and **SCOPE**. Selecting one of them provides instant access with the **MULTI** knob. My only suggestion for the function-select operation would be to make it mode-specific. There is no reason why you should have to scroll through pages of keyer and keying settings while using the FT-991A in voice modes, for example.

Other buttons surrounding the tuning knob are used for frequency-selection functions, such as memory storage and retrieval. The 99 memories can be arranged into six groups, if desired. Memories select and manage VFO A or B (including split-frequency operation) and a few other functions.

The FT-991A's built-in automatic antenna tuner is what I call a *trimming* tuner — one that can handle up to a 3:1 SWR, like you might

Bottom Line

The FT-991A would work well as a field, mobile, or home station radio. It covers 2 meters and 70 centimeters, as well as 160 through 6 meters, with all-mode operation, including Yaesu System Fusion (C4FM). This transceiver is packed with features and could replace several radios in a full-capability station.

have from an antenna operated at the other end of the band from its matched frequency. The dedicated **TUNE** button turns on the tuner function; pressing it for 10 seconds initiates the tuning operation. A menu item can select between the internal tuner, an external tuner, or a Yaesu automatically tuned antenna (ATAS), as well as enable the **TUN/LIN** mini-DIN jack on the rear panel or turn off the function. None of these selections results in a steady low-power carrier, which would be a great plus for those using an external manual tuner.

Computer Connectivity

The transceiver can connect to a computer in a number of ways. A traditional nine-pin RS-232 jack provides serial connectivity (the connector has male rather than the usual female pins). This jack can also be menu-specified for connecting an external GPS receiver for System Fusion operation. In addition, the FT-991A has a USB jack that can be used as a CAT (computer-aided transceiver) connection and as a virtual sound card for data mode input and output.

To use the USB jack for CAT operation, download the required *Windows* drivers from the Yaesu website, along with the *FT-991A/SCU-17 USB Driver Installation Manual*. Select the driver that matches your computer bus width (32 or 64 bit), and install it. Two virtual com ports (one standard and one enhanced) are installed. Use your computer's **DEVICE MANAGER** to determine the port number of the enhanced port and set that into your CAT software. You will also need to set menu item 028 (**GPS/232C SELECT**) to one of the GPS choices, otherwise the CAT connectivity will be routed through the RS-232 serial port and not the USB port.

Figure 1 — The FT-991A's colorful touchscreen features a new real-time spectrum display. This view shows both a traditional spectrum scope (panadapter) and a waterfall display.

With the USB connections in place, audio can be exchanged on the same port, or alternately, connected in the traditional analog way to the eight-pin mini-DIN **DATA** connector on the rear. The **DATA** connector can also support direct FSK operation for RTTY operators who prefer that keying choice.

I was successful in getting both the CAT data and audio signals routed between the radio and most of my PC logging and digital mode applications, but it took some fussing with computer settings to route through the appropriate ports. Of course, if the PC were one dedicated to radio operations, it would require reconfiguring the ports only if the radio or PC were changed. Using the USB audio connection saves some cabling compared to separate links, thinning the rats' nest behind my rig — a good thing to be sure.

New Features with the FT-991A

The FT-991A looks exactly like the original FT-991 — at least until you turn it on. The FT-991A's large, colorful display includes a combination real-time spectrum analyzer and waterfall display that can operate continuously (or be set for single-sweep mode) and fills the lower half of the display, unless you select a menu or function display. This is the most significant change from the original FT-991.

The original model did have a spectrum display, but it was the less-useful single-sweep type. In the original, pressing the **SWEEP** button briefly disabled the receiver and initiated a sweep to capture a snapshot of the spectrum. The snapshot stayed in place until the next sweep. While it could be set to automatically sweep periodically, some users found that option disconcerting during normal operation.

The new display can be set by menu to provide a traditional spectrum (panadapter) display, or a combination panadapter and waterfall display. If signals are closer to the noise level, the waterfall often makes it easier to spot signals and to identify the modulation type.

The spectrum display width can be adjusted to 50, 100, 200, 500, and 1,000 kHz, with the default at 100 kHz. The default setting is useful, although I found 50 kHz (±25 kHz, centered on the tuned frequency) more useful at times. Wider scan widths would likely be of particular benefit to those looking for VHF/UHF FM activity.

The amplitude range with panadapter-only display has three horizontal lines above the base, but no calibration marks. I used my Elecraft XG1 receiver calibrator's 40-meter signal to see what the lines meant. As you might expect, the amplitude response depends on preamp and attenuator settings. With the attenuator off and preamp 2 engaged, a 50 µV (S-9) signal put the display just above the top mark, while a 1 µV signal (S-3+, often near the noise level with antenna connected) was at the top of the first line. With the preamps off, 50 µV was at the second mark, while 1 µV was barely visible. In my view, this is a reasonable sensitivity for this kind of casual panadapter.

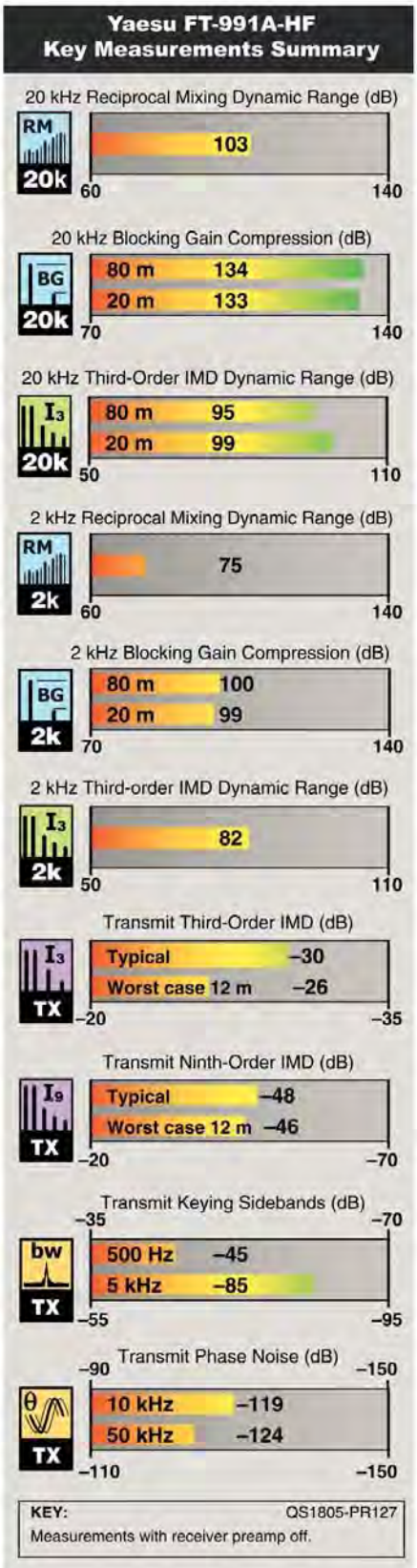


Table 1
Yaesu FT-991A, serial number 6N030598

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.030 – 56, 118 – 164, 420 – 470 MHz. Transmit, 1.8 – 54, 144 – 148, 430 – 450 MHz (amateur bands only).	Receive and transmit, as specified.
Power consumption: Receive, 1.8 A (no signal). Transmit, 23 A (HF/50 MHz); 15 A (144/430 MHz) at 13.8 V dc ±15%.	At 13.8 V dc: Receive, 1.42 A (no signal, max brightness, max volume); 1.25 A (min brightness). Transmit, 6.8 A (min RF output); 14 A (max RF output, HF and 50 MHz, typical); 9 A (144 MHz); 7 A (432 MHz).
Modes of operation: SSB, CW, AM, FM, C4FM, data.	As specified.
Receiver	**Receiver Dynamic Testing**
CW sensitivity, 10 dB S+N/N, 2.4 kHz BW, amp 2 on: 0.158 µV (1.8 – 30 MHz), 0.125 µV (50 – 54 MHz), 0.11 µV (144 – 148, 430 – 450 MHz).	Noise floor (MDS), 3 kHz roofing filter, 500 Hz DSP BW: *Preamp* *Off* *1* *2* 0.137 MHz –122 N/A –107 dBm 0.475 MHz –125 N/A –132 dBm 1.0 MHz –125 N/A –135 dBm 3.5 MHz –124 –136 –144 dBm 14 MHz –124 –135 –143 dBm 50 MHz –117 –132 –141 dBm 144 MHz N/A N/A –142 dBm 432 MHz N/A N/A –143 dBm
Noise figure: Not specified.	Preamp off/1/2: 14 MHz, 23/12/4 dB; 50 MHz; 30/15/6 dB. Preamp 2: 144 MHz, 5 dB; 432 MHz, 4 dB.
AM sensitivity, 10 dB S+N/N, 30% modulation, 400 Hz tone, 6 kHz BW, amp 2 on: 5 µV (0.5 – 1.8 MHz), 1.6 µV (1.8 – 30 MHz), 1.25 µV (50 – 54 MHz).	10 dB (S+N)/N, 1-kHz tone, 30% modulation, 6 kHz BW: *Preamp* *Off* *1* *2* 1.02 MHz 4.16 N/A 1.00 µV 3.88 MHz 3.80 1.24 0.41 µV 29.0 MHz 4.57 1.26 0.61 µV 50.4 MHz 7.15 1.68 0.62 µV 144.4 MHz N/A N/A 0.65 µV
FM sensitivity, 12 dB SINAD, 15 kHz BW, amp 2 on, 0.35 µV (28 – 30, 50 – 54 MHz), 0.18 µV (144 – 148, 430 – 450 MHz).	For 12 dB SINAD, 3 kHz deviation, 16 kHz BW: *Preamp* *Off* *1* *2* 29 MHz 1.82 0.51 0.28 µV 52 MHz 3.02 0.71 0.26 µV 146 MHz N/A N/A 0.19 µV 440 MHz N/A N/A 0.15 µV
Spectral sensitivity: Not specified.	Panadapter and waterfall, preamp 2: 14 MHz, –123 dBm; 50 MHz, –115 dBm; 144 MHz, –125 dBm; 432 MHz, –125 dBm.
Blocking gain compression dynamic range: Not specified.	Blocking gain compression dynamic range, 3 kHz roofing filter, 500 Hz BW: *20 kHz offset* *5/2 kHz offset* *Preamp off/1/2* *Preamp off* 3.5 MHz 134/136/135 122/100 dB 14 MHz 133/135/133 121/99 dB 50 MHz 114/119/115 100/89 dB 144 MHz —/—/121 106/102 dB 432 MHz —/—/116 99/89 dB
Reciprocal mixing dynamic range: Not specified.	14 MHz, 20/5/2 kHz offset: 103/85/75 dB.
ARRL Lab Two-Tone IMD Testing	See Table 2.
Second-order intercept point: Not specified.	Preamp off/1/2: 14 MHz, +79/+75/+71 dBm; 50 MHz, +93/+77/+77 dBm; 144 MHz (preamp 2), +39 dBm; 432 MHz (preamp 2), +97 dBm.
DSP noise reduction: Not specified.	15 dB.

Manufacturer's Specifications	Measured in the ARRL Lab
Notch filter depth: Not specified.	Auto notch: >70 dB. Attack time: 100 ms, one or two tones.
FM adjacent channel rejection: Not specified.	Preamp 2 on: 29 MHz, 62 dB; 52 MHz, 61 dB; 144 MHz, 69 dB; 432 MHz, 70 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamp 2 on: 29 MHz, 62 dB*; 52 MHz, 61 dB*; 144 MHz, 69 dB*; 432 MHz, 70 dB*. 10 MHz offset, preamp 2 on: 29 MHz, 126 dB; 52 MHz, 99 dB; 144 MHz, 93 dB; 440 MHz, 85 dB.
S-meter sensitivity: Not specified.	S-9 signal, preamp off/1/2: 14 MHz, 151/39.8/10.8 µV; 50 MHz, 110/27.5/7.9 µV; 144 MHz, 12.6 µV; 432 MHz, 9.8 µV.
Squelch sensitivity: Preamp 2 on, 0.35 µV (28 – 30 MHz), 0.125 µV (144 – 148, 430 – 450 MHz).	At threshold, preamp 2 on: FM, 29 MHz, 0.16 µV; 50 MHz, 0.44 µV; 144 MHz, 0.13 µV; 432 MHz, 0.13 µV.
Receiver audio output: 2.5 W into 4 Ω. at 10% THD.	2.3 W into 4 Ω at 10% THD. THD at 1 V_{RMS}: 1.9%.
Receive processing delay time: Not specified.	15 ms.
IF/audio response: Not specified.	Range at –6 dB points:** CW (500 Hz BW): 453 – 938 Hz; Equivalent Rectangular BW: 499 Hz; USB (2.4 kHz BW): 289 – 2,132 Hz; LSB (2.4 kHz BW): 289 – 2,089 Hz; AM (9 kHz BW): 85 – 2,336 Hz.
Spurious and image rejection: Image rejection, ≥70 dB (1.8 – 50 MHz), ≥60 dB (144 – 430 MHz band).	First IF rejection: 14 MHz, 83 dB; 50 MHz, 72 dB; 144 MHz, >152 dB; 432 MHz, >153 dB. Image rejection: 14 MHz, >134 dB; 50 MHz, 103 dB; 144 MHz, >153 dB; 432 MHz, 70 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5 – 100 W (2 – 25 W AM).	1.8 – 30 MHz, 5 – 100 W typical (AM, 5 – 40 W). 50 MHz: 5 – 94 W (AM, 5 – 39 W). 144 MHz: 6 – 54 W; (AM, 6 – 20 W). 432 MHz: 6 – 52 W.
RF output at minimum specified operating voltage: Not specified.	At 11.7 V dc: HF, 61 W; 50 MHz, 57 W; 144 MHz, 44 W; 432 MHz, 42 W.
Spurious-signal and harmonic suppression: HF, >50 dB; 50 MHz, >63 dB; 144 and 430 MHz, >60 dB.	HF, 63 dB (worst case 10.1 MHz), ≥68 dB typical; 50 MHz, 68 dB; 144 and 440 MHz, >70 dB. Meets FCC requirements.
Third-order intermodulation distortion (IMD) products: Not specified.	3rd/5th/7th/9th order, 100 W PEP: –30/–39/–47/–48 dB (HF, typical) –26/–37/–41/–46 dB (worst case, 12 m) –28/–38/–45/–68 dB (50 MHz) –28/–47/–58/–59 dB (144 MHz, 50 W) –30/–46/–53/–58 dB (432 MHz, 50 W)
CW keyer speed range: Not specified.	6 to 56 WPM; iambic Mode A and B.
CW keying characteristics: Not specified.	See Figures 2 and 3.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S-9 signal, AGC fast: 35 ms (SSB); 35 ms (FM); 200 ms (C4FM).
Receive-transmit turnaround time (TX delay): Not specified.	SSB, 32 ms; FM, 24 ms; C4FM 26 ms.
Transmit phase noise: Not specified.	See Figure 4.

Size (height, width, depth, incl. protrusions: 3.5 × 9.2 × 11.5 inches; weight, 9.5 pounds.

Second-order intercept points were determined using S-5 reference.

*Measurement was noise limited at the value indicated.
**Default values; bandwidth is adjustable via DSP.

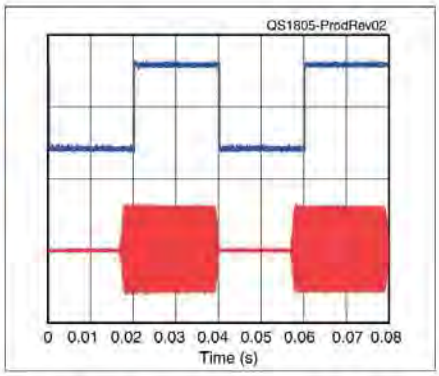


Figure 2 — CW keying waveform for the Yaesu FT-991A showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 milliseconds. The transceiver was being operated at 100 W output on the 14 MHz band.

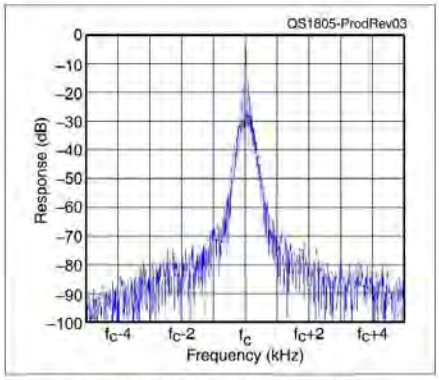


Figure 3 — Spectral display of the Yaesu FT-991A transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz 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.

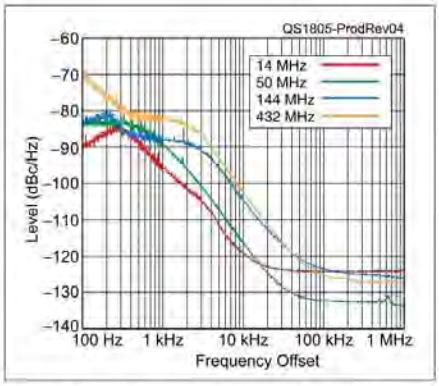


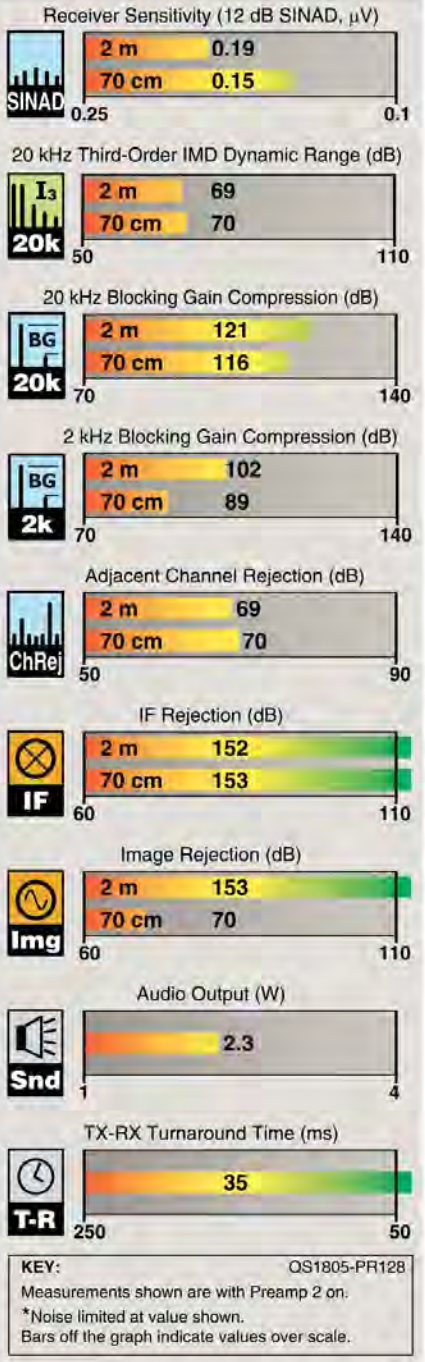
Figure 4 — Spectral display of the Yaesu FT-991A transmitter output during phase-noise testing. Power output is 30 W on the 14 MHz band (red trace) and 50 MHz band (green trace), and 20 W on the 144 MHz (blue trace) and 432 MHz (yellow trace) bands. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is –60 dBc/Hz, and the vertical scale is 10 dB per division.

Table 2
Yaesu FT-991A, serial number 6N030598

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

Band/Preamp	Spacing	Measured IMD Level	Measured Input Level	IMD DR
3.5 MHz/off	20 kHz	–125 dBm –97 dBm	–30 dBm –19 dBm	95 dB
14 MHz/off	20 kHz	–124 dBm –97 dBm –39 dBm	–25 dBm –17 dBm 0 dBm	99 dB
14 MHz/1	20 kHz	–135 dBm –97 dBm	–37 dBm –25 dBm	98 dB
14 MHz/2	20 kHz	–143 dBm –97 dBm	–47 dBm –33 dBm	96 dB
14 MHz/off	5 kHz	–124 dBm –97 dBm –39 dBm	–26 dBm –17 dBm 0 dBm	98 dB
14 MHz/off	2 kHz	–124 dBm –97 dBm –37 dBm	–42 dBm –34 dBm 0 dBm	82 dB
50 MHz/off	20 kHz	–117 dBm –97 dBm	–23 dBm –16 dBm	94 dB
144 MHz/2	20 kHz	–142 dBm –97 dBm	–58 dBm –43 dBm	84 dB
432 MHz/2	20 kHz	–143 dBm –97 dBm	–55 dBm –40 dBm	88 dB

Yaesu FT-991A – VHF/UHF Key Measurements Summary



The bandwidth of the panadapter response does not change with the receiver bandwidth and seems a bit wider than necessary to me, with a strong carrier using up to 5 kHz of the display space. For busy band conditions, the waterfall may provide more information about individual signals, while the panadapter indicates activity in general.

During operation, the receive frequency, indicated by a dashed green line, remains at the center of the display. If the transmit frequency is different, for example during split-frequency operation or with RIT/XIT offset enabled, it is shown as a red dashed line (assuming it is within the selected sweep span). If you are operating on a single frequency, with no split or offset, the lines merge to a single line, with **R** and **T** shown next to each other at the top. This is a useful feature and can help you remember what is going on. It also allows you to slide your transmit signal where you want it by making use of visual clues.

During testing, the ARRL Lab noticed a few other improvements compared to the original model. The keying spectrum in the FT-991A is a bit narrower (better) than in the original with the 4 ms (default) setting. The receiver sensitivity on 137 and 475 kHz is improved in the A model, as is sensitivity on 2 meters and 70 centimeters. Transmit intermodulation distortion (IMD) products are improved as well. See the "Lab Notes" sidebar for more information.

On the Air with the FT-991A

I enjoyed using the FT-991A as my main station radio for several weeks. Voice modes all worked well, with good audio reports received on SSB, FM, and AM. The transceiver is supplied with a handheld MH-31 dynamic microphone. My usual radio co-conspirator, the late Bruce Moore, N1ZU, (who knew my voice well) observed that while I was using the MH-31, I sounded as if I were using a hand mic, but he thought it did sound like me. We also tried the optional, and quite fancy, Yaesu M-100 Dual-Element Microphone (see the review elsewhere in this issue), and Bruce said it sounded much better. With either mic, Bruce recognized my voice and indicated that the audio quality was good.

The radio... YAESU

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The transceiver includes two transmit voice equalizers, one for regular operation and the other for use with the speech processor engaged. This makes sense. If you leave the processor off during casual operation and turn it on during tough conditions in which you need all the help you can get, you can have more focused and articulated speech only when you need it. The equalizers are different than many in that they act on three frequency ranges — low, middle, and high — each with an adjustable center frequency, Q or width, and level. This seems to get the job done — use the **MONITOR** function to listen to yourself with headphones as you adjust. Five voice message memories are provided, each 20 seconds long. Memories can be initiated using the touchscreen or the optional FH-2 keypad.

Bruce and I also checked out operation via a local 2-meter analog repeater. The FT-991A supports both analog and digital tone access codes and is set up for standard offsets. One of our local repeaters has a nonstandard offset, so I memorized the two frequencies in one memory position using the split-frequency mode. Everything worked as expected, once I discovered that there is a separate **MIC GAIN** for FM operation.

CW Operation

The FT-991A designers included many useful features for the CW operator. Full or semi-break-in operation is supported, and while a relay is used for transmit-receive switching, it is not noticeable with the sidetone on at normal level.

The built-in keyer can be adjusted from 6 to 56 words per minute (as measured in the Lab). In addition, multiple sending modes are supported including iambic modes A, B, and Y. The **ACS** setting forces automatic spacing between characters. Up to five CW memories, each up to 50 characters long, can be programmed. These can be entered either by text characters from the touchscreen or by sending the message via your key. They can be selected by a page on the function screen, or via a button on the optional FH-2 remote keypad. If the function screen is used, it takes up the panadapter portion of the display. While it can be toggled back and forth, using the FH-2 eliminates the need for that.

The receiver has a very good DSP system, with settings for both **NARROW** and **WIDE** selectivity. The **NARROW** selection results in selectivity adjustable from a 50 to 500 Hz bandwidth in 50 Hz steps, and I kept my **MULTI** knob on that selection during normal CW operation. The **WIDE** selection provides for setting from 500 to 3,000 Hz bandwidth in steps of a few hundred hertz.

CW operators can also use a very sharp audio peaking filter (**APF**) as well as a manual notch filter that is very sharp and can completely eliminate a strong signal in the passband. There is also a very effective digital notch filter (**DNF**) that can work well to eliminate a carrier during SSB opera-

Lab Notes: Yaesu FT-991A

Bob Allison, WB1GCM, ARRL Assistant Laboratory Manager

Lab testing showed the receiver dynamic ranges were virtually the same as the original FT-991 at 20 and 2 kHz spacing, with reciprocal mixing being the lowest dynamic range — 75 dB with 2 kHz spacing at 14 MHz. The dynamic range figure is quite adequate for a radio amateur who has a modest antenna system, but not enough when used with a high-gain antenna system during crowded band conditions with one or more very strong signals present.

The transmit intermodulation distortion (IMD) of the FT-991A is significantly better than with the older model. Transmit phase noise is also a bit better, though this improvement came about after our first round of testing. The first FT-991A we tested showed phase noise that measured higher than Yaesu and the Lab wanted to see. Yaesu sent a second unit that had recently come off of their assembly line. This unit exhibited lower phase noise, with test results seen in Figure 4. It must be noted that there is still room for improvement with transmit phase noise, but it is comparable to some other transceivers in this price class.

Visit https://youtu.be/cewqzoSTMoQ to see our review of the Yaesu FT-991A HF, VHF, and UHF Transceiver on YouTube.

tion. Note that the **DNF** can be enabled in the CW mode and will completely eliminate the CW signal you are trying to copy — perhaps a candidate for change in the next firmware upgrade?

In addition, the FT-991A has an automatic CW zero-beat function (**ZIN**). A push of this button tunes the transceiver so that the station you are listening to is set to your desired pitch frequency.

C4FM Operation

As with the original FT-991, the '991A is equipped for Yaesu's System Fusion C4FM digital voice and data mode. It is compatible with Yaesu's VHF/UHF System Fusion transceivers and repeaters, as well as Yaesu's WIRES-X internet linking system.

System Fusion's Automatic Mode Selection allows the transceiver to detect C4FM and analog FM signals and then automatically switch the transceiver's operating mode to match that of the incoming signal. The group monitor (**GM**) function can display position and distance up to 24 other stations with **GM** enabled that are within range. (This feature requires connecting a GPS receiver to the FT-991A's rear panel **GPS/CAT** jack.)

Documentation

Our FT-991A came with a comprehensive 150-page *Operating Manual* that includes a description of every control, along with a short description of the choices. There are step-by-step instructions for each function, including links to the applicable menu choices. Additional manuals for special functions are available from Yaesu's website, as are periodic firmware upgrades that add or improve features.

The 154 menu items are described in the context of the function that they relate to, as well as a summary listing in numerical order, followed by a detailed description of the choices of each menu item. I found the summary very handy when trying to navigate through the menus quickly.

Wrapping Up

In summary, the FT-991A is a very effective transceiver that would work well as a field or mobile radio or be appropriate in a home station environment. It is packed with many more features than we can cover here, and does them quite well. The receiver performance is good, but as you might expect, not quite up to the dynamic performance of more top-of-the-line competition-oriented full-size transceivers. Still, it covers a wide range of bands and modes, so it could replace a number of radios in a full-capability station.

Manufacturer: Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630; tel. 714-827-7600; **www.yaesu.com**. Price: FT-991A, $1,400; FH-2 keypad, $91; FC-40 wire antenna tuner, $275.

Depstech Wireless Endoscope

Reviewed by Steve Ford, WB8IMY
QST *Editor*
wb8imy@arrl.org

There are times when you want to get a look inside a piece of equipment without disassembling the entire device. There are also times when you want a peek behind the drywall to see what is there before you tear into it with a hammer or saw.

Bottom Line

The Depstech Wireless Endoscope is useful for poking around inside ham gear, as well as exploring hidden spaces around the house.