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Yaesu FT-991 HF/VHF/UHF Transceiver

A multimode transceiver that plays well at home, in the car, or in the field.

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In 2002 Yaesu introduced the FT-897, quickly followed by the upgraded "D" model.[1] Well received by the amateur community, the FT-897 offered operators a grab-'n'-go 160–6 meter (100 W), 2 meter (50 W), and 70 centimeter (20 W) multimode radio in a compact package that fit nicely on a desktop, picnic table, or camper shelf. In fact, I remember needing to be "the first kid on the block" to have one of those gems. At the time, portable HF operating was growing in popularity. It increased significantly after the terrorist attacks on September 11, 2001, and again after the four hurricanes in the Southeast in 2004 and hurricane Katrina in 2005. Many hams began assembling "go-kits" and portable stations, and the Yaesu FT-897D remained a choice radio for this type of service for more than a dozen years.

The FT-897D has been discontinued and replaced by the subject of this review — the FT-991.Yaesu teased the crowd at the 2014 Ham Fair in Tokyo by displaying the FT-991 behind a glass showcase. Lucky for me, the Yaesu executives removed the glass case so I could examine the new transceiver more closely. I was intrigued by its touch-screen, bright display, and overall sharp appearance. Like everyone else in attendance, I was eager for its release to the amateur market.

Overview

Public service is just one of many reasons why an amateur might want a feature-packed, portable 100 W transceiver that is capable of HF, VHF, and UHF all-mode operation. The FT-991 is also a natural for anyone looking to set up a mobile station or take along an HF radio while traveling. The FT-991 could easily be the central transceiver in your home station, but don't expect it to outperform competition grade radios such as Yaesu's FTDX3000. The FT-991 does everything it was designed to do and does it all very well. We'll hit the highlights in this review, but it's well worth visiting Yaesu's website to download a copy of the manual and other documentation for an in-depth look at all of the features.

The FT-991 covers the 160 – 6 meter, 2 meter, and 70 centimeter bands. Modes of operation include SSB, FM, AM, and CW. It supports digital modes such as FSK RTTY, as well as PSK and other sound card digital modes. In addition to the more traditional modes, the FT-991 includes Yaesu's C4FM digital voice and data capability. It's also got many features we've come to expect in a modern transceiver, such as digital signal processing (DSP), selectable IF filters, automatic notch filter, CW keyer, and internal automatic antenna tuner for the 1.8 – 50 MHz bands.

The FT-991's rear panel (see Figure 1) has two antenna connectors, one for 160 – 6 meters and the other for 2 meters and

[1]R. Schetgen, KU7G, "FT-897 MF/HF/VHF/UHF All-Mode Transceiver," Product Review, *QST*, May 2003, pp 63 – 67.

Bottom Line

The Yaesu FT-991 can be the center of attention in a portable, mobile, or home station. Its many bands, modes, and features will provide endless hours of enjoyment exploring a wide variety of Amateur Radio activities.

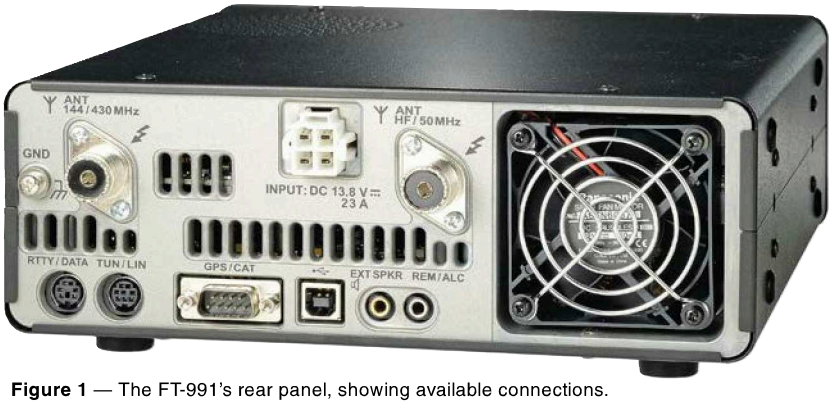

Figure 1 — The FT-991's rear panel, showing available connections.

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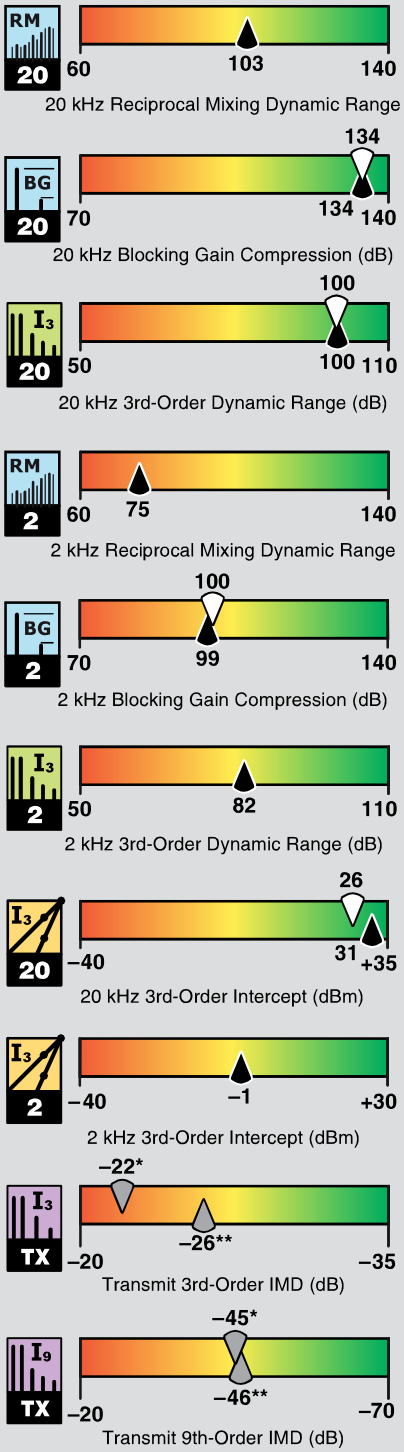
Key Measurements Summary



QS1511-101

Key:

Dynamic range and intercept values with preamp off.
Intercept values were determined using –97 dBm reference.
* Worst case band, 160 meters
** Typical

80 M
20 M

Table 1
Yaesu FT-991, serial number 4N020467

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).	Receive and transmit, as specified.
Power requirements: 13.8 V dc ±15%. Receive, 1.8 A (no signal).Transmit, 23 A (HF/50 MHz, 100 W); 15 A (144/430 MHz, 50 W).	At 13.8 V dc: Receive, 1.58 A (max TFT and dimmer brightness, max volume, no signal); 840 mA (min TFT, min dimmer). Transmit, 6.8 A (min RF output), 19.6 A (max RF output, HF & 50 MHz, typical); 11 A (144 & 430 MHz).
Modes of operation: SSB, CW, AM, FM, C4FM, RTTY, 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 bandwidth: *Preamp* *Off* *1* *2* 0.137 MHz –107 n/a –102 dBm 0.475 MHz –112 n/a –128 dBm 1.0 MHz –113 n/a –133 dBm 3.5 MHz –124 –136 –143 dBm 14 MHz –124 –136 –143 dBm 50 MHz –122 –133 –141 dBm 144 MHz n/a n/a –139 dBm 432 MHz n/a n/a –145 dBm
Noise figure: Not specified.	Preamp off/1/2: 14 MHz, 21/11/4 dB; 50 MHz; 25/14/6 dB. Preamp 2: 144 MHz, 6 dB; 432 MHz, 2 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, 30% modulation, 6 kHz bandwidth: *Preamp* *Off* *1* *2* 1.02 MHz 14.6 n/a 1.23 µV 3.88 MHz 3.59 0.95 0.45 µV 50.4 MHz 6.09 1.43 0.59 µV 120 MHz n/a n/a 0.59 µV 144.4 MHz n/a n/a 0.52 µV 432 MHz n/a n/a 0.42 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 bandwidth: *Preamp* *Off* *1* *2* 29 MHz 2.06 0.52 0.25 µV 52 MHz 2.51 0.62 0.25 µV 146 MHz n/a n/a 0.22 µV 162 MHz n/a n/a 0.18 µV 440 MHz n/a n/a 0.18 µV
Spectral sensitivity: Not specified.	Preamp off/1/2: 102/ 111/ 121 dBm
Blocking gain compression dynamic range: Not specified.	Blocking gain compression dynamic range, 3 kHz roofing filter, 500 Hz DSP BW: *20 kHz offset* *5/2 kHz offset* *Preamp off/1/2* *Preamp off* 3.5 MHz 134/138/133 dB 122/100 dB 14 MHz 134/137/132 dB 123/99 dB 50 MHz 117/115/110 dB 104/93 dB 144 MHz 122 dB (amp 2) 104/90 dB 432 MHz 117 dB (amp 2) 100/91 dB
Reciprocal mixing dynamic range: Not specified.	14 MHz, 20/5/2 kHz offset: 103/86/75 dB
ARRL Lab Two-Tone IMD Testing	See Table 2.
Second-order intercept point: Not specified.	Preamp off/1/2: 14 MHz, +65/+85/+81 dBm; 50 MHz, +93/+77/+77 dBm; 144 MHz, +41 dBm; 432 MHz, +73 dBm.
DSP noise reduction: Not specified.	15 dB.
Notch filter depth: Not specified.	Auto notch: >70 dB. Attack time: 100 ms, one or two tones.

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Manufacturer's Specifications	Measured in the ARRL Lab
FM adjacent channel rejection: Not specified.	Preamp 2 on: 29 MHz, 60 dB; 52 MHz, 58 dB; 144 MHz, 65 dB; 432 MHz, 62 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamp 2 on: 29 MHz, 58 dB*; 52 MHz, 57 dB*; 144 MHz, 65 dB*; 432 MHz, 62 dB*. 10 MHz offset: 29 MHz, 103 dB; 52 MHz, 94 dB; 144 MHz, 88 dB; 440 MHz, 79 dB.
S-meter sensitivity: Not specified.	S-9 signal, preamp off/1/2: 14 MHz, 122/33.1/8.3 µV; 50 MHz, 95.4/24.8/7.0 µV; 144 MHz, 10.3 µV; 432 MHz, 6.2 µV.
Squelch sensitivity: Amp 2 on, 0.35 µV (28 – 30 MHz), 0.125 µV (144 – 148, 430 – 450 MHz).	At threshold, preamp 2 on: FM, 29 MHz, 0.14 µV; 50 MHz, 0.17 µV; 144 MHz, 0.13 µV; 432 MHz, 0.11 µV.
Receiver audio output: 2.5 W into 4 W at 10% THD.	As specified. THD @ 1 V_{RMS}, 1.4%.
IF/audio response: Not specified.	Range at –6 dB points (bandwidth)**: CW (500 Hz): 345 – 840 Hz (495 Hz) Equivalent Rectangular BW, 497 Hz USB (2.4 kHz): 261 – 1925 Hz (1664 Hz) LSB (2.4 kHz): 260 – 1923 Hz (1663 Hz) AM (9 kHz): 56 – 2770 Hz (5428 Hz)
Spurious and image rejection: Not specified.	First IF rejection: 14 MHz, 88 dB; 50 MHz, 76 dB; 144 MHz, 79 dB; 432 MHz, 105 dB. Image rejection: 14 MHz, 91 dB; 50 MHz, 94 dB; 144 MHz, 88 dB; 432 MHz, 61 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: HF, 5 – 100 W (2 – 25 W AM). 144/432 MHz, 50 W.	1.8 – 30 MHz, 4.4 – 100 W typical (AM, 4.4 – 40 W); 50 MHz, 4 – 93 W (AM, 5 – 37 W); 144 MHz, 4 – 48 W (AM, 1.2 – 8 W); 432 MHz, 6 – 45 W.
RF output at minimum operating voltage. Not specified.	At 11.7 V dc: 89 W (HF), 47 W (144 MHz), 43 W, (430 MHz).
Spurious-signal and harmonic suppression: 1.8 – 30 MHz, ≥50 dB; 50 MHz, ≥63 dB; 144/432 MHz, ≥60 dB.	HF, 65 dB typical, 61 dB worst case (24.9 MHz); 50 MHz, 63 dB; 144 MHz, 61 dB; 440 MHz, 63 dB.
SSB carrier suppression: ≥ 50 dB.	>70 dB.
Undesired sideband suppression: ≥ 50 dB.	>70 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	3rd/5th/7th/9th order, HF, 100 W PEP: –22/–32/–39/–45 dBc (worst case, 160 m) –26/–37/–41/–46 dBc (typical) 50 MHz: –21/–34/–40/–41 dBc 144 MHz: –24/–50/–43/–56 dBc 432 MHz: –28/–39/–40/<–44 dBc
CW keyer speed range: Not specified.	4 to 57 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, 39 ms (SSB); 4 ms (FM); 200 ms (C4FM).
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 34 ms; FM, 25 ms; C4FM 26 ms.
Transmitted phase noise: Not specified.	See Figure 4.

Size (height, width, depth): 3.5 × 9.2 × 11.5 inches including protrusions. Weight: 9.5 lbs.

Price: $1550; FH-2 keypad, $100.

*Measurement was noise limited at the value indicated.
**Default values; bandwidth and frequency response are adjustable via DSP.

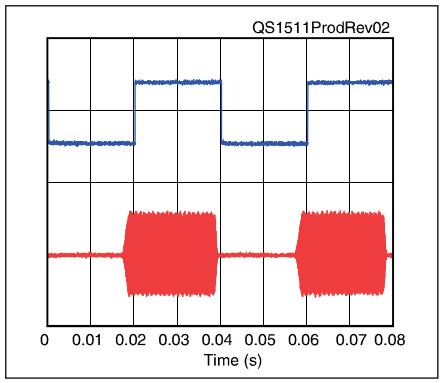

Figure 2 — CW keying waveform for the Yaesu FT-991 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of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

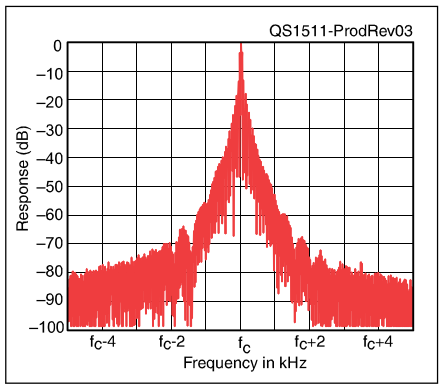

Figure 3 — Spectral display of the Yaesu FT-991 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz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

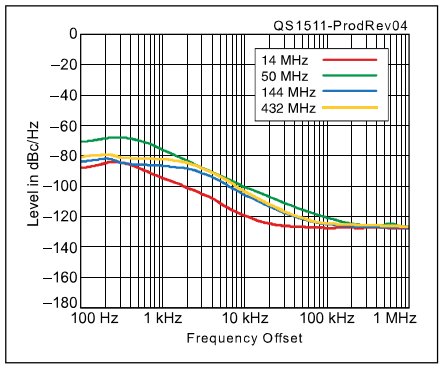

Figure 4 — Spectral display of the Yaesu FT-991 transmitter output during phase noise testing. Power output is 100 W on the 14 MHz band (red trace) and 50 MHz band (green trace), and 45 W on 144 MHz (blue trace) and 432 MHz (yellow trace). The carrier, off the left edge of the plot, is not shown. This 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 dBc/Hz.

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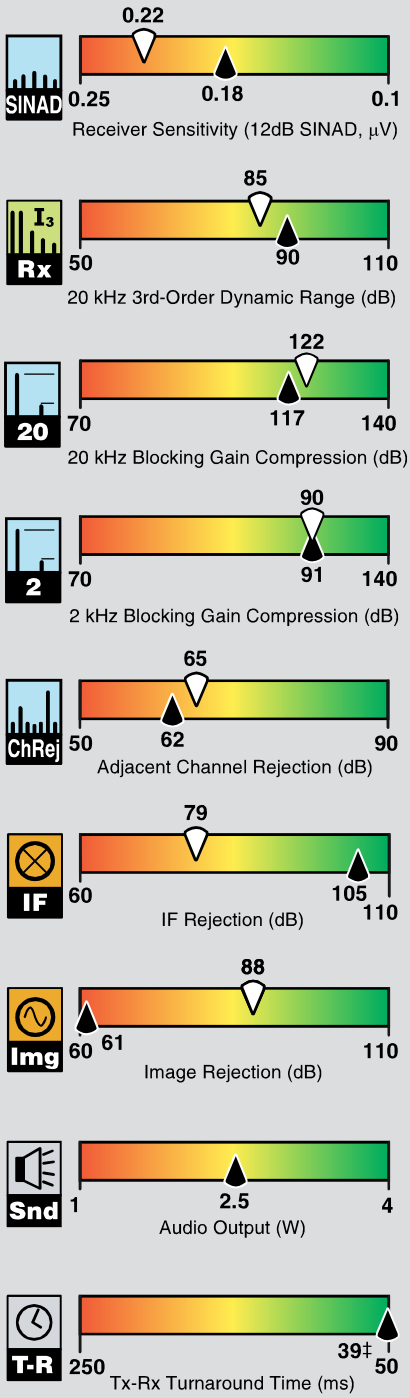
Key Measurements Summary



QS1511-PR099

Key: ‡ Off Scale 2 M 70 cm

Dynamic range values shown are with preamp off.
Sensitivity values shown with preamp on.

70 centimeters. The mini DIN jacks are for digital mode and antenna tuner/linear amplifier connections, while the RS-232 (DB-9) connector is for connecting an external GPS or computer. There's also a USB jack for computer control and data modes.

Out of the box, the first thing I noticed was that the lettering on all the controls was very bright compared to the transceiver that is normally on my operating desk. The white paint appeared to be illuminated under ordinary light. In previous transceiver reviews I had complained about poor visibility on front panels and was happy to see this improvement on the FT-991.

The main display is a full-color, 3.5-inch TFT LCD — and it's a touchscreen. The display is very bright and has good contrast to make viewing very comfortable on the eyes. The operator can adjust the screen brightness by using the menu.

The touchscreen is a nice addition to an amateur transceiver. It's similar to, but not quite like, the typical smartphone screen. I found that the touchscreen makes selecting features much faster than previous navigation schemes. When operating a particular mode, only the relevant menu items are active on the touchscreen. For example, the CW keyer settings are only active in CW mode. This prevents accidental changing of your favorite settings.

Receiver

I found the receiver to be very quiet and offer easy listening through headphones or the built-in speaker. The adjustable receiver audio filter allows some tailoring of the low and high cutoff frequencies separately for the SSB, CW AM, RTTY, and data modes.

The FT-991 includes two preamplifiers (AMP1, 10 dB and AMP2, 20 dB) for 1.8 – 50 MHz. As with other Yaesu models, there's an IPO (intercept point optimization) setting that bypasses the RF preamplifier. AMP1 is not available below 1.8 MHz, and only AMP2 is available at 144 and 430 MHz. There's also a 12 dB attenuator (ATT).

The FT-991 uses a 3 kHz roofing filter on SSB and CW, and a 15 kHz roofing filter for AM, FM, and C4FM.There's a NAR/WIDE button to quickly select DSP IF bandwidth. NAR can be set to 200 Hz – 1.8 kHz for SSB or 50 – 500 Hz for CW, RTTY, and data modes. WIDE can be set to 1.8 – 3 kHz for SSB and 500 Hz – 3 kHz for CW, RTTY, and data modes. AM is fixed at 6 kHz NAR or 9 kHz WIDE, and FM is 9 kHz or 16 kHz.

Other interference-fighting features include IF shift and variable IF width, an IF notch filter, and an automatic notch filter that will attack one or two tones. The auto-notch filter can be activated on CW (attacking desired CW signals), which may confuse some users. The CONTOUR filter allows you to set a peak or null in part of the receiver passband. For CW, the audio peak filter (APF) can help peak up a weak CW signal to separate it from background noise.

Digital noise reduction (DNR) offers 15 different noise reduction algorithms. The IF noise blanker (NB) is adjustable with three levels.

Voice Modes

Operating SSB on the FT-991 is very easy. One can turn on the transceiver, select SSB mode, key the mic, and talk. It does not require much effort to master some of the advanced SSB features.

The transmitted audio is very good using the factory default settings. The user has the option of enhancing the SSB or AM transmitted audio through the use of two parametric equalizers. With two equalizers you can set each one for specific operating conditions. In addition to the equalizer, there's an adjustable SSB speech processor.

SSB transmitted bandwidth is also adjustable. In addition to the default 300 – 2700 Hz setting, 400 – 2600, 200 – 2800, 100 – 2900, and 100 – 3000 Hz are available through menu settings.

During ARRL Lab testing (see Table 1), Senior Test Engineer Bob Allison, WB1GCM, noted that the typical third-order IMD products, only 26 dB below PEP on HF and 21 dB below PEP on 6 meters, could be better. For example, Yaesu's FTDX1200, reviewed in the January 2014 issue of *QST*, showed typical third-order IMD products an impressive 37 dB below PEP. Measurements shown in Table 1 were taken at full RF power output, with minimal ALC. Reducing RF power output by 20% improved the IMD performance. WB1GCM also noted that the FT-991's transmitted phase noise close to the carrier (see Figure 4) is higher than we like to see, particularly at 50 MHz and above.

I use a Heil Pro Set with the HC-6 microphone element. The Heil support page

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provides a good table of DSP settings for Yaesu radios. I always received excellent audio reports using the settings provided for the Heil microphone. You can use the FT-991's transmit monitor while making adjustments, but it's always a good idea to enlist some help on the air to confirm the best-sounding settings.

The transceiver includes a voice keyer that can store five messages of up to 20 seconds each. The voice memories can be controlled from the touchscreen or from the optional FH-2 keypad (more on this later).

With its coverage of the 28, 50, 144, and 430 MHz bands, the FT-991 includes a full set of features for analog FM and repeater operation. Automatic repeater shift makes operation simple, or you can set nonstandard splits manually. CTCSS encode/decode and DCS (digital code squelch) and tone squelch (opens the squelch when receiving the correct CTCSS tone) are controlled by menus.

C4FM Operation

Yaesu's System Fusion uses C4FM for digital voice and data providing superb clarity and the ability to send and receive data on the same voice channel. The FT-991 includes C4FM capabilities that are compatible with Yaesu's VHF/UHF FM transceivers and the growing number of System Fusion repeaters.

In the FT-991, a feature called Automatic Mode Selection allows the transceiver to detect C4FM and analog FM signals then automatically switch the transceiver's operating mode to match that of the incoming signal. This is useful in situations where the FT-991 may be the fixed station radio at an EOC (emergency operations center), for instance, and volunteers are in the field using a variety of C4FM or analog FM mobile and handheld radios. The command station can communicate with anyone in the field. With this scenario, volunteers and club members can upgrade to C4FM mobile and handheld radios as their budgets allow without disrupting service to the community.

For this review, I enlisted some volunteers using FM analog radios and Yaesu C4FM radios to demonstrate the flexibility of the FT-991 using a System Fusion repeater here in the Hartford, Connecticut, area. In the demonstration we used a Yaesu FT-1DR handheld, which has Automatic Mode Selection as well. It was interesting to make a mix of contacts through the repeater using C4FM voice or FM analog.

Table 2
Yaesu FT-991, serial number 4N020467

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

Band/Preamp	*Spacing*	*IMD Level*	*Measured Input Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–24 dBm –15 dBm	–124 dBm –97 dBm	100 dB	+26 dBm +26 dBm
14 MHz/Off	20 kHz	–24 dBm –12 dBm 0 dBm	–124 dBm –97 dBm – 55 dBm	100 dB	+26 dBm +31 dBm +28 dBm
14 MHz/One	20 kHz	–36 dBm –21 dBm	–136 dBm –97 dBm	100 dB	+14 dBm +17 dBm
14 MHz/Two	20 kHz	–43 dBm –28 dBm	–143 dBm –97 dBm	100 dB	+7 dBm +7 dBm
14 MHz/Off	5 kHz	–24 dBm –11 dBm 0 dBm	–124 dBm –97 dBm –60 dBm	100 dB	+26 dBm +32 dBm +30 dBm
14 MHz/Off	2 kHz	–42 dBm –97 dBm 0 dBm	–124 dBm –36 dBm –27 dBm	82 dB	–1 dBm –5 dBm +13 dBm
50 MHz/Off	20 kHz	–22 dBm –12 dBm	–122 dBm –97 dBm	100 dB	+28 dBm +31 dBm
144 MHz/Two	20 kHz	–56 dBm –42 dBm	–141 dBm –97 dBm	85 dB	–13 dBm –14 dBm
432 MHz/Two	20 kHz	–55 dBm –41 dBm	–145 dBm –97 dBm	90 dB	–10 dBm –13 dBm

†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.

The FT-991 includes the Group Monitor (GM) function found on Yaesu's C4FM VHF/UHF FM transceivers. Position and distance can be displayed for up to 24 other stations with GM enabled that are within range. How does the FT-991 know its current location? Hook up a GPS receiver to the GPS/CAT jack on the rear panel.

In July 2015, Yaesu released an FT-991 firmware update that enables the FT-991 operator to connect to a WIRES-X — Wide-Coverage Internet Repeater Enhancement System — Node station and communicate through the WIRES-X VoIP (Voice over Internet Protocol) network, without the need for any additional accessories. WIRES-X is functionally similar to IRLP (including management via a central Internet server). I didn't test this new feature.

CW Operation

The FT-991 includes a versatile memory keyer, or you can use your favorite external keyer, computer software, or straight key. Note that if you use an external keyer, the front-panel KEY jack still requires a stereo phone plug (the ring is not connected). Semi break-in and full break-in (QSK) are available. In the Lab tests, the keying waveform (Figure 2) and keying sidebands (Figure 3) are acceptable.

The built-in keyer offers several different iambic modes, as well as a BUG mode (the keyer sends the dits, you form the dashes manually), plus an ACS mode with fixed character spacing. The keyer has five memories and can automatically insert serial numbers for contesting.

CW pitch is adjustable from 300 – 1050 Hz in 10 Hz steps. Like most current transceivers, the FT-991 offers assistance with tuning in ("zero beating") CW signals. Pressing

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the F(M-LIST) button and then touching ZIN on the LCD will automatically tune the received signal so that the transmit offset is correct. For manual tuning, you can touch SPOT on the LCD to generate a tone you can use to match the pitch of a received signal (and tune a little higher or lower than other stations calling in a pileup).

One thing noticeably missing is a CW tuning indicator, which is a useful visual aid when tuning a CW signal. Perhaps this is wishful thinking on my part, but maybe a future firmware upgrade can add this feature.

Digital Modes and Computer Interface

For RTTY or sound card digital modes such as PSK31 and JT65, traditional connections for FSK keying and sound card audio in and out are available from the RTTY/DATA jack on the rear panel. You can use those, or take advantage of the transceiver's USB port for computer control (CAT — computer aided transceiver) and for audio input and output to be used with sound card digital modes. The USB method eliminates the need for an external computer-to-radio interface, thus eliminating one more item from the go-bag.

Configuring the FT-991 for digital operation and CAT control through the USB port is fairly simple. The drivers are available to download from Yaesu's website at no additional charge. I installed the drivers, then I was able to quickly configure the radio to communicate with some popular contest and logging applications. I had had full control of the transceiver and was keying CW and FSK RTTY via the USB port of my laptop computer. Operating RTTY with the FT-991 was a pleasure. The transceiver's tuning is very smooth, making it easy to fine tune RTTY signals.

The computer connection is also used to update the radio's firmware with new versions downloadable from the Yaesu website. Since we purchased the review unit, Yaesu has released several firmware updates to add features or improve performance.

I am very familiar with setting up this particular software/transceiver configuration, but anyone should be able to achieve positive results using the FT-991's manual and the logging software's documentation.

Other Features

Programming the memory channels of the FT-991 is fairly easy. Setting up duplex or split memories requires an extra step to save the transmit frequency. It took a few attempts to learn the button sequence to set the memory channels. It did not take much effort to program seven memory channels with the information to allow me to operate on amateur satellite SO-50, demonstrating the FT-991's versatility.

Each band has three band-stacking registers that save all of the user settings. I like setting one register each for CW, SSB, and digital operation on each band. That makes mode switching very easy because personalized settings for each mode of operation stay locked into the band registry.

Yaesu offers an optional FH-2 keypad to program and control the built-in voice keyer and CW keyer memories. This is a nice accessory for day-to-day operation or for contest or DXpedition type operating. The popular *N1MM Logger* contest applications can be programmed to activate the FH-2 command by inserting a CAT instruction in the logging software's function configuration. This allows the operator to activate the messages stored in the transceiver by pressing the F1 – F4 keys on the logging computer's keyboard.

A built-in spectrum scope uses the lower half of the color TFT display. The scope can show a traditional spectrum display or a waterfall. The spectrum scope can be operated in the manual mode or using ASC (automatic spectrum scope) control. In the manual mode, touching SWEEP on the LCD activates the spectrum scope, mutes the transceiver audio, and displays a snapshot of the band activity on the screen. Using the transceiver's ASC function, the rig toggles between the spectrum scope and receive audio. I found this to be an annoying way to copy signals. Given the limited functionality of the spectrum scope, I don't think it can outperform a human tuning the dial and listening for signals. Considering all of the FT-991's other features and versatility, for me this limitation is not a deal breaker.

Figure 5 — The FT-991's display is crisp and conveys a lot of information about current operating parameters. The three rows of rectangular labels at the bottom of the screen are touch-sensitive buttons. The buttons change as different modes, features, or menus are selected.

In the Field

To investigate the FT-991's portability, I set it up in our camper using the doublet antenna and auto tuner combination that I usually use from a campsite. Physically the transceiver fit nicely in the compact operating position and offered a comfortable view of all the controls.

The FT-991 performed well in the field. I was easily able to work any station I could hear and many stations responded to my calls. I should mention that the FT-991's antenna tuner works very well with coaxial fed antennas and impedances within its tuning range, but it is not designed to operate with the balanced line fed doublet that I use in the camper.

Final Thoughts

The FT-991 has a bright, easy-to-read display, is easy to operate, and interfaces easily with personal computers and popular Amateur Radio software applications. The

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color touchscreen is sharp and easy to read.

Chasing DX, collecting states or grid squares, using amateur satellites, working in traffic nets, public service, or operating from the campsite, the FT-991 is suitable for any operating environment.

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

Click here for a video overview of the Yaesu FT-991 HF/VHF/UHF transceiver.

Icom IC-2730A Dual-Band FM Transceiver

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As I write this review, it's summertime, and the livin' is easy. There's no better time to cruise around with a new mobile radio — in this case, Icom's dual-band IC-2730A. As a relatively new ham, this was my first experience with a mobile rig, and I was eager to try to make sense of it all. Fortunately, Icom has made it easy with this radio. The box contained a 90-page instruction manual, the radio body, the radio control head, the microphone, a connector cable, a dc power cable, a microphone hanger, and an extra 15 A fuse, but no mounting brackets. Several mounting bracket options are available at additional cost. (The IC-2730A Deluxe package includes the radio and an MBF-5 remote head mounting bracket.) I decided to get acquainted with the radio in the comfort of my home shack before taking it on the road.

The IC-2730A works on 2 meters and 70 centimeters, with three power levels on each band (50/15/5 W). It's got extended receive coverage outside the ham bands, including coverage of the AM aircraft band and the NOAA weather channels and weather alert. You can listen on both receivers at the same time — VHF/VHF, UHF/UHF, or VHF/UHF are all possible. Icom's optional VS-3 Bluetooth headset includes VOX capability for hands-free operation. Icom offers free programming software as a download from the web.

Getting the Lay of the Land

I wired up the IC-2730A to my switchmode power supply, snapped in the appropriate cables to connect the mic and the radio body to the control head, and turned on the radio to find that the front panel of the control head has a large, easy-to-read display (with adjustable brightness and contrast) with a simple white background. Being that this is a dual-band radio, the same pushbuttons (MAIN/BAND, V/MHZ/SCAN, MR/CALL) and knobs (VOL, DIAL, SQL) appear on each side of the display, for easy control of whichever band you're operating on. Four pushbuttons that control monitoring, power output, memory, and menus (MONI/DUP, LOW/DTMF, MW, MENU/LOCK) are located below the display. The layout of the controls is well-thought-out and uncomplicated — good qualities for a mobile radio, as the operator needs to be able to concentrate on driving. Once you get used to the layout, it's easy to find your way around the control head by touch.

The control head is about 5¾ × 1¾ × 1 inches, and though it is lightweight, the construction feels sturdy — a nice balance. The sizes of the buttons and knobs are thoughtfully designed for mobile operation — large enough for an operator to be able to find and use the desired button or knob, and spaced well enough apart that "fat-fingering" will be minimized. The pushbuttons and knobs have a satisfying amount of "weight" to them. There's no wobble to the pushbuttons, and they beep on a tone that corresponds with the band that you're on. The tones for the band on the left-hand side of the display are different from the tones on the right-hand side, and the tones for the main control pushbuttons at the bottom center of the control head shift to match the tone of the band you're operating on — all so you can keep your eye on the road! All the pushbuttons, including the power button, are multi-function, depending on whether you push or hold, and depending on which mode the radio is in.

The volume and squelch knobs rotate smoothly, and the tuning dial rotation is notched — not too wide, not too narrow;

Bottom Line

Rugged and easy to use, Icom's IC-2730A has all the features expected in an up-to-date analog FM VHF/UHF dual-band transceiver.

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