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Yaesu FT-891 HF and 6-Meter Transceiver

A compact transceiver especially oriented to mobile and portable operators.

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The FT-891 is a 100 W 160 – 6 meter SSB, CW, AM, FM, and data-mode transceiver that includes a general coverage receiver with response from 100 kHz to 74 MHz. The previous generation Yaesu compact 100 W transceivers included two distinct models with similar architectures but different form factors. The FT-857D (still available at the time of this writing) was designed especially for mobile operation, while the FT-897D, with its provision for an internal battery pack, was more oriented for portable operation. Of course, either radio could be adapted to either role, and both have also served as compact home stations.

The FT-891 has dimensions that are almost identical to those of the FT-857D (just 0.6 inches shorter), so a comparison is perhaps appropriate. The FT-891 adds:

- IF digital signal processing (DSP) with variable width filters for all modes, in place of the two slots for optional crystal filters in the '857D. The DSP also provides automatic notching, peaking, and noise rejection. A new 3 kHz wide roofing filter in the first IF improves dynamic range on CW, SSB, and data modes.
- A spectrum display (panadapter) that timeshares the receiver with normal audio operation.



bilities — without looking at the control panel size and capabilities — the '891 is similar to its larger brother. However, it gives up VHF and UHF capability, digital voice, the color display, and the additional controls associated with the larger panel. While the dynamic performance isn't quite up to that of the FT-991 in most respects, it does track fairly closely.

Controls and Indicators

The compact and easily removable front panel includes a 1 $\frac{5}{8}$ -inch diameter main tuning knob on the right that tunes with a smooth, weighted feel. Drag is adjustable, which is a great feature for a mobile rig because hitting a bump with your hand near the dial invariably results in changing the VFO frequency. Alternatively, a quick tap of the POWER button, just above the TUNING knob, locks the frequency until tapped again.

On the left side of the front panel are two smaller knobs. On top is a concentric pair providing AF GAIN and RF GAIN adjustment (becomes a SQUELCH control for FM operation). The lower knob is a single MULTIFUNCTION knob that also has a pushbutton capability. The knob can be used to either move the main (VFO A) frequency in 500 kHz steps to change bands or segments, or with a push of the knob, it

- A larger, easier to read, multi-line display.

The FT-891 gives up operation on 144 and 432 MHz in SSB, CW, and FM modes.

It may also be appropriate to consider the FT-891 in comparison to its sibling, the FT-991A.¹ The '991A is a larger, more expensive (about \$700 for the '891 versus \$1,400 for the '991A), and more capable portable transceiver — perhaps functionally a closer relative to the now-discontinued FT-897D model. If you look at just the '891's HF capa-

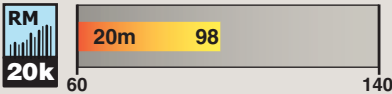
Bottom Line

The Yaesu FT-891 brings improved receiver performance and functionality compared to Yaesu's previous generation compact transceivers, making it a good candidate for a portable or mobile HF rig.

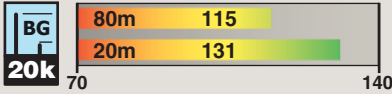
¹N. Fusaro, W3IZ, "Yaesu FT-991 HF and 6 Meter Transceiver," Product Review, QST, Nov. 2015, pp. 45 – 49.

Yaesu FT-891 Key Measurements Summary

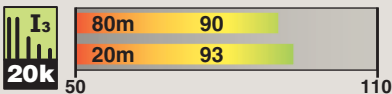
20 kHz Reciprocal Mixing Dynamic Range (dB)



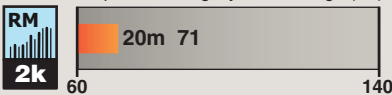
20 kHz Blocking Gain Compression (dB)



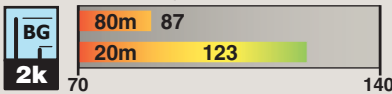
20 kHz Third-order IMD Dynamic Range (dB)



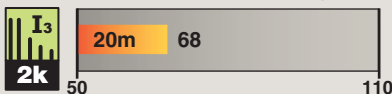
2 kHz Reciprocal Mixing Dynamic Range (dB)



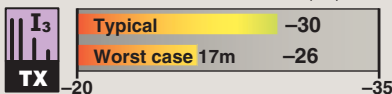
2 kHz Blocking Gain Compression (dB)



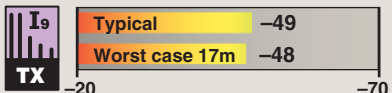
2 kHz Third-order IMD Dynamic Range (dB)



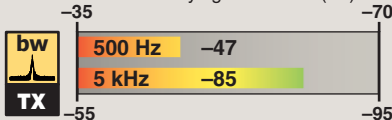
Transmit Third-order IMD (dB)



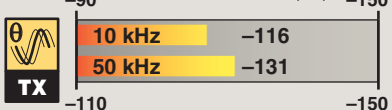
Transmit Ninth-order IMD (dB)



Transmit Keying Sidebands (dB)



Transmit Phase Noise (dB)



KEY: QS1706-PR118
Measurements with receiver preamps off.
Bars off the graph indicate values over scale.

Table 1
Yaesu FT-891, serial number 6K020054 v01.03

Manufacturer's Specifications

Frequency coverage: Receive, 0.03 – 54 MHz; transmit, 160 – 6 meter amateur bands.

Power requirement: Receive, 2.0 A; transmit, 23 A at 13.8 V dc \pm 15%.

Modes of operation: SSB, CW, AM, FM.

Measured in the ARRL Lab

Receive, 0.100 – 74 MHz; transmit, as specified.

At 13.8 V dc: Transmit, 18 A (typical), 19 A (maximum). Receive, 1.03 A (max volume, no signal, max backlights); 997 mA (backlights off); 1.01 A (standby, FM only). Power off, 19 mA.

As specified.

Receiver

SSB/CW sensitivity: (S/N 10 dB), 0.16 μ V (1.8 – 30 MHz), 0.16 μ V (50 – 54 MHz).

Noise figure: Not specified.

AM sensitivity: (S/N 10 dB), 5 μ V (0.5 – 1.8 MHz); 1.6 μ V (1.8 – 30 MHz); 0.16 μ V (50 – 54 MHz).

FM sensitivity: (12 dB SINAD), 0.35 μ V (29 MHz and 50 – 54 MHz).

Blocking gain compression dynamic range: Not specified.

Reciprocal mixing dynamic range:

ARRL Lab Two-Tone IMD Dynamic Range Testing (500 Hz bandwidth)

Band/preamp	Spacing	Measured IMD Level	Measured Input Level	IMD DR
3.5 MHz/off	20 kHz	-129 dBm	-39 dBm	90 dB
		-97 dBm	-28 dBm	
14 MHz/off	20 kHz	-129 dBm	-36 dBm	93 dB
		-97 dBm	-28 dBm	
		-28 dBm	0 dBm	
14 MHz/on	20 kHz	-140 dBm	-47 dBm	93 dB
		-97 dBm	-33 dBm	
14 MHz/off	5 kHz	-129 dBm	-38 dBm	91 dB
		-97 dBm	-28 dBm	
		-22 dBm	0 dBm	
14 MHz/off	2 kHz	-129 dBm	-61 dBm	68 dB
		-97 dBm	-50 dBm	
		-10 dBm	0 dBm	
50 MHz/off	20 kHz	-129 dBm	-30 dBm	99 dB
		-97 dBm	-19 dBm	
50 MHz/on	20 kHz	-141 dBm	-47 dBm	94 dB
		-97 dBm	-28 dBm	

Receiver Dynamic Testing

Noise floor (MDS), 500 Hz BW:

	Preamp off	Preamp on
0.137 MHz	-80 dBm	-97 dBm
0.475 MHz	-111 dBm	-123 dBm
1.0 MHz	-113 dBm	-125 dBm
3.5 MHz	-129 dBm	-140 dBm
14 MHz	-129 dBm	-140 dBm
50 MHz	-129 dBm	-141 dBm

Preamp off/on: 14 MHz, 18/7; 50 MHz, 18/6 dB.

10 dB (S+N)/N, 1 kHz, 30% modulation, 6 kHz BW:

	Preamp off	Preamp on
1.0 MHz	19.7 μ V	4.62 μ V
3.8 MHz	3.75 μ V	0.92 μ V
29.0 MHz	3.31 μ V	0.87 μ V
50.4 MHz	3.20 μ V	0.79 μ V

For 12 dB SINAD, 16 kHz BW:

	Preamp off	Preamp on
29 MHz	0.72 μ V	0.19 μ V
52 MHz	0.82 μ V	0.19 μ V

Blocking gain compression dynamic range, 500 Hz BW:

	20 kHz offset Preamp off/on	5/2 kHz offset Preamp off
3.5 MHz	115/115 dB	107/87 dB
14 MHz	132/131 dB	123/123 dB
50 MHz	119/113 dB	103/90 dB

14 MHz, 20/5/2 kHz offset: 98/82/71 dB

Manufacturer's Specifications

Second-order intercept point: Not specified.

FM adjacent channel rejection: Not specified.

FM intermodulation distortion dynamic range: Not specified.

DSP noise reduction: Not specified.

Notch filter depth: Not specified.

S-meter sensitivity: Not specified.

Receive processing delay time: Not specified.

IF/audio response: Not specified.

IF rejection: Not specified.

Image rejection: Not specified.

Transmitter

Power output: 100 W (40 W AM).

Spurious-signal and harmonic suppression: >50 dB (HF); >63 dB (50 MHz).

SSB carrier suppression: Not specified.

Third-order intermodulation distortion (IMD): Not specified.

Transmit bandwidth: Not specified.

CW keyer speed range: Not specified.

CW keying characteristics: Not specified.

Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.

Receive-transmit turn-around time (tx delay): Not specified.

Composite transmitted noise: Not specified.

Size (height, width, depth, including protrusions): 2.2 × 6.4 × 10 inches. Weight, 4.7 lb.

Price: FT-891, \$699; FH-2 keypad control, \$91; FC-40 wire antenna tuner, \$275; FC-50 coax antenna tuner, \$324; YSK-891 separation kit, \$74.

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 settings.

Measured in the ARRL Lab

Preamp off/on: 14 MHz, +79/+73 dBm; 21 MHz, +77/+69 dBm; 50 MHz, +91/+73 dBm.

Preamp on, 29 MHz, 66 dB; 52 MHz, 65 dB.

Preamp on, 20 kHz spacing:
29 MHz, 66 dB*,
52 MHz, 65 dB*. 10 MHz spacing:
29 MHz, 129 dB, 52 MHz, 114 dB.

10 dB, maximum.

>60 dB (tunable notch filter).

S-9 signal, preamp off/on 14 MHz, 138/32.3 μV; 50 MHz, 78.5/66.6 μV.

At speaker, 12 ms.

Range at -6 dB points (bandwidth):**
CW (500 Hz): 345 - 860 Hz (515 Hz);
Equivalent Rectangular BW: 509 Hz;
USB (2.4 kHz): 272 - 2,680 Hz (2,408 Hz);
LSB (2.4 kHz): 281 - 2,680 Hz (2,399 Hz);
AM (6 kHz): 225 - 2,725 Hz (5,000 Hz).

14 MHz, 129 dB; 50 MHz, 96 dB.

14 MHz, 123 dB; 50 MHz, 123 dB*.

Transmitter Dynamic Testing

5 - 100 W (CW, SSB, FM); 5 - 40 W (AM).
RF power output at minimum specified voltage: 76 W (HF), 73 W (50 MHz).

HF, typically ≥66 dB; 61 dB worst case (60 m). 50 MHz, 74 dB. Complies with FCC emission standards.

>70 dB.

3rd/5th/7th/9th order, 100 W PEP:
HF, -30/-39/-45/-49 dBc (typical);
-26/-40/-45/-48 dBc (worst case, 17 m);
50 MHz, -22/-34/-38/-42 dBc.

Range at -6 dB points, 200 - 2,800 Hz (default).

4 to 59 WPM, iambic modes A and B.

See Figures 1 and 2.

S-9 signal, AGC fast: SSB, 37 ms;
CW, 30 ms.

SSB, 49 ms; FM, 28 ms.

See Figure 3.

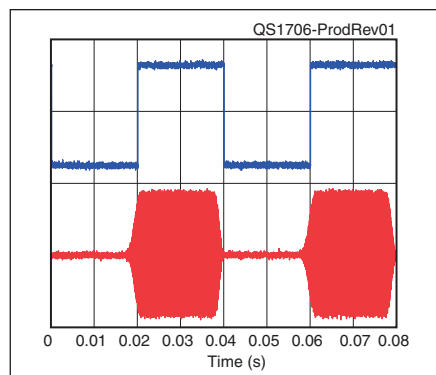


Figure 1 — CW keying waveform for the FT-891 showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transmitter was being operated at 100 W output on the 14 MHz band.

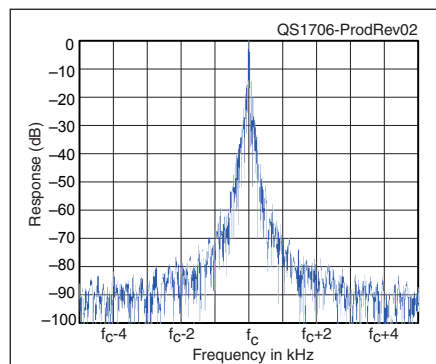


Figure 2 — Spectral display of the FT-891 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 s. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

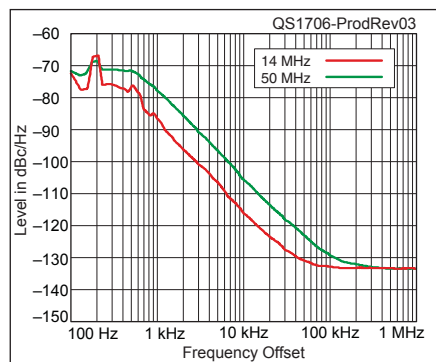


Figure 3 — Spectral display of the FT-891 transmitter output during phase-noise testing. Power output is 100 W on the 14 MHz band (red trace) and 50 MHz band (green trace). The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is -60 dBc/Hz, and the vertical scale is 10 dB per division.

will toggle to adjust the VFO B or secondary frequency at normal rates. This knob and button are also major players in the selection of functions and menu items, to be discussed later.

On the top of the front panel is a row of eight illuminated buttons that provide memory storage and retrieval, VFO A/B selection, BAND selection (a long press provides MODE selection), a FAST key for quicker tuning (but not as quick as the 500 kHz steps of the MULTIFUNCTION knob), and a POWER on/off and LOCK button. The FAST button is very handy for band segment changes. In SSB mode, for example, the very comfortable SSB tuning default rate of 2 kHz per turn (menu settable) jumps to 20 kHz per knob revolution in FAST mode — great for a quick look over the band, or to change segments.

The bottom of the front panel contains five more buttons. The left-hand F button is used to enter the FUNCTION mode. Repeated pressing of the button cycles through four screens with a total of about 28 function choices. One of the four screens is CW specific, while the others are general. In addition, using the menu, special screens for FM (five functions), recording and playback (eight functions), and ATAS antenna control (RAISE and LOWER buttons) can be included in the function selection process.

The FT-891 provides a lot of capability and many configuration and operational choices. A natural consequence is that many adjustments need to be made via menu and function key selection. A long press of the F key moves you into MENU mode, allowing the choice of no less than 184 menu items in 18 groups. Most, but not all, are set-and-forget items. There are so many because of the flexibility offered. Fortunately, they are all in plain English, although some abbreviations will take a look-up the first time.

The bottom right-hand CLAR button

serves as receive-incremental tuning (RIT) by default, but it can be changed by a menu item to offset the transmit or transceive frequencies, if desired.

The three middle buttons are labeled A, B, and C. These come configured by default as IF SHIFT (SFT), SPECTRUM DISPLAY INITIATE (SCP), and NOISE BLANKER (NB). By a press of one of the buttons while in FUNCTION mode, the selected function will be set into place with whatever key is pressed.

Fortunately, the function labels (as in the default items in parentheses above) appear above the key on the LCD display after assignment. This is a very useful capability. I gave up the SCP function in favor of the NAR function that selects the narrower receive bandwidth for each mode.

Behind the front panel is a SPEAKER/PHONES switch. This sets the level of the combined rear panel SPEAKER/PHONES jack (labeled SPKR) to avoid injury due to high audio levels while plugging in headphones. While we're here, the MIC connector is also behind the front panel on the main unit. The optional YSK-891 separation kit provides the cables and hardware to allow the front panel to be mounted separately from the main equipment chassis. This is particularly handy for mobile installations to allow the front panel to be dash mounted with the main radio body installed under the seat or in the trunk.

There are 99 regular memories, as well as nine pairs of scan range memories, and 10 memories preset for the five US 60-meter channels (five each for CW and SSB). To access the memories, you have to first push the V/M button to enter memory mode. Then you will be able to roll through the memories with the MULTIFUNCTION knob, and be able to transmit on the channels. There are also five one-push "quick memories," accessed by the dedicated QMB button.

Connections and Connectors

The rear panel has all the connectors,

except for the eight-pin RJ-45 type MIC connector behind the front panel. The rear panel offers a GROUND terminal, a FIRMWARE UPDATE switch, an eight-pin DIN-type TUN/LIN connector for connecting a Yaesu or compatible antenna tuner, such as the FC-40 or 50, or a VL-1000 amplifier, and a USB jack for interconnection to a PC. The antenna connects to an SO-239 socket.

There are three 3.5-millimeter phone jacks. The first is a REM/ALC stereo jack for either the optional FH-2 keypad or ALC input from a linear amplifier. The next is another stereo jack, this one for CW keying. It can be menu set to use a hand key (or external keyer) or paddles for the internal electronic key. And finally a mono jack for speaker or phones, as set by the switch behind the front panel.

Scope Function

The FT-891 offers a spectrum scope function. The scope time-shares the single receiver, and while on, the soft A, B, and C buttons become scope specific. The display is centered on the receive frequency, and the span can be set to ± 17.5 , 35, 70, 175, or ± 350 kHz using the SPN button.

I found that the scope could be used in a number of ways. In the default mode, it makes a single sweep each time the soft SWEEP (SWP) button is pressed — handy to check nearby signals during a lull in the conversation. A third soft button (LV1-LV3) gives three level options to compensate for different signal or noise levels and set the amplitude range of the display. You can change the transceive frequency while in this mode, and the center cursor will move as you tune. The next time you hit SWP, the display will re-center, so you can easily tune to a displayed signal. The top of the display shows the receive frequency as you tune.

The scope can be set to run continuously, with the receiver muted, by a longer push of the SWP button. This can be handy if you like to monitor a

band for openings or pileups while working on something else. The occasional glance at the screen can tell you about the activity across the band, or in your chosen segment. In this mode, the cursor stays centered as you tune, so you quickly move to the center of activity, and a short push of the SWP button returns you to normal operation. While not quite as handy as a full-time independent display, this turned out to be a more useful feature than I expected.

Computer Functionality

The FT-891 supports PC connection options via a USB port. The Yaesu software download website includes a virtual COM port driver needed to use the USB connection. Instructions for installation of the drivers are in a separate manual, also available from the website. The manuals don't provide a lot of information about operating the FT-891 with a computer, except to note that unlike other radios in its family, it doesn't support audio interfacing with an internal sound-card function via the USB connection. A few interface (CAT) menu settings, such as data rate, are provided.

During Lab testing, we were able to successfully download a new firmware version. While an update to the *NIMM+* logging software (version 1.0.6033) that was released during the evaluation listed the FT-891 as a supported radio, it did not communicate at W1ZR for some reason. For those who want to modify or develop their own CAT software, another manual on their website, *FT-891 CAT Operation Reference Book*, provides the details of the command language. A separate DIN RTTY/DATA jack on the rear panel provides connectivity for digital modes.

On the Air at W1ZR

SSB Operation

I used the FT-891 to check into a local radio club net on 75-meter SSB, and then we moved to 40 meters. Reports

Lab Notes: Yaesu FT-891 HF/6-Meter Mobile Transceiver

Bob Allison, WB1GCM, ARRL Laboratory Assistant Manager

The Yaesu FT-891 is most suitable for mobile, portable, and home station work, using simple antenna systems with low gain. In other words, it's not a high-performing contest transceiver. Its lowest receive dynamic range at 2 kHz spacing is 68 dB (third-order IMD DR). On the transmit side, the transmit phase is about the highest we've yet seen at the Lab. For this reason alone, I would be wary of pairing this transceiver with an RF amplifier. Users of the FT-891 must watch the ALC level when transmitting voice, because transmit IMD levels tend to get high if the ALC indicator reaches the top end of the scale. Keep it halfway or lower for SSB operation. The indicated ALC level should be minimal when using digital modes, the same as with all other transceivers. The transmitter does have excellent harmonic and spurious suppression, typically at or greater than 66 dB on the HF bands. This is always helpful during Field Day, or appreciated by your neighborhood radio amateur.

One other notable test result: When operating at the minimum specified voltage (11.7 V), the RF power output drops 25%. Though this power reduction will not make a big difference at the receiving end, it is something to keep in mind during battery-powered portable operation. I listened carefully using a test receiver and heard no audio distortion or frequency shifts while operating at the minimum specified voltage.

One operating observation: Filter bandwidth settings are not saved when switching bands. If 500 Hz CW bandwidth is assigned to a band and then the band is changed, then back to the original band, the CW bandwidth reverts to 2,400 Hz.

Overall, this is an easy radio to operate with its flexible menu. The frequency display is larger than most transceivers of its size — a good feature for mobile operation. The FT-891 hears well on 6 meters, too — a band where a low noise floor is helpful.

were better after we moved to 40 meters, which had less noise and better propagation. The supplied microphone has a TONE switch on the rear that can select a FLAT (1) or EMPHASIZED (2) audio response. The consensus was that, for my voice, 1 was a better choice, with 2 sounding too bassy. I found the three-range transmit equalizer more effective in making me sound better on the air. It can be easily adjusted while listening to your audio with the MONITOR on, while using headphones to avoid feedback. The group agreed that using the parametric equalizer made a big difference.

I found that the VOX (voice-operated transmit switching) function worked quite smoothly. This is turned on via a function, with the gain, delay, and anti-vox set from a menu. The transmit gain and compression levels are also set using menu items. The Lab noticed that, as with many radios, if the gain or compression is set to drive the transmitter too hard, the distortion goes up quickly. I received solid reports by keeping the gain and compression levels such that the ALC meter stayed near

the middle of the range and the peak power just touched a peak of 100 W on occasions.

Other Voice Modes

The FT-891 supports both AM and FM voice operation in addition to SSB. On AM, the transceiver can put out a carrier level of up to 40 W. AM operation seemed straightforward with good audio on both transmit and receive. FM operation is well supported, including a special function screen that allows setup of repeater offsets, CTCSS tones and DCS (digitally coded squelch) codes. For the first time, I actually was able to make a contact with someone using a 10-meter FM repeater — N2ACF/R located across the Hudson in Rockland County, New York. It seemed to work fine with good reports in both directions — thanks to Ray, K2NET, for being there.

It was easy to set the frequency, offset, and tones into memory. I found that repeaters with different offsets on the same band could not be stored in different memory channels — the last offset entered would apply to all memo-

rized channels on that band. I had to set the offset per band to the standard value (the memory would store a plus or minus offset) and then use the split frequency (SPL) function to set up a repeater with an unusual offset.

CW Operation

The FT-891 was a joy to operate on CW. The built-in electronic keyer worked very well, offering speed selection by function selection from an indicated 4 to 60 words per minute. The key input can be function selected for use with a straight key (or external keyer) or paddles. The paddles can be operated in multiple keyer modes, or be used as a semi-auto (bug) emulation.

I usually operate in full break-in (QSK) mode, to allow hearing interfering signals while I transmit, and the break-in was smooth with just a mildly audible relay sound — well below the monitor level that I used. The relays were not audible to me at all while using headphones. Semi break-in is also provided with a “hang” delay menu adjustable from 30 ms to 3 s. The lower values acted about like full break-in at my keying speeds. The dot/dash weight and waveform rise time are also menu settable between 2 and 4 ms. The spectrum test data was taken with the 4 ms setting, and I would not suggest going for a quicker rise time. A slower rise time would likely improve the bandwidth of the transmitted keying sidebands.

The CW keyer includes five memories, each of up to 50 characters, that can be used in regular or contest mode, with automatically sequenced numbers. The memories can be stored or accessed either through function keys or by using the optional FH-2 keypad. The keypad offers the advantage that the main display, including frequency and functional indicators, can be observed while keying.

I found the rig to be a good performer on CW. My first CW contact happened as I was listening around and heard an

old friend, Tony Berg, W1OT, now in Williamsburg, Virginia. I worked with Tony during my first (1969) engineering job in Massachusetts, while Tony managed an HF receiver systems engineering group. He knows his stuff, and he thought my signal sounded as good as with my usual radio.

For my operating preferences on CW, I adjusted the wide bandwidth from its default of 2,400 to 1,200 Hz, set the narrow (NAR) function into button B (instead of the default spectrum display), and set the narrow bandwidth to 250 Hz. These bandwidth settings can be made separately for each mode.

Antenna Tuner Options

The FT-891 does not include a built-in antenna tuner. This won't be a problem for operators who have resonant antennas. In my experience, many antennas (including most HF mobile antennas) have limited bandwidth, and a tuner can be a real plus. The FT-891 does have a jack designed for connection to one of Yaesu's two available auto tuners, either the FC-40 wire antenna tuner, or the FC-50 coax antenna tuner. The jack can also be menu configured to interface with a linear amplifier, or raise and lower their ATAS mobile antenna.

I am sure that the '891 will work seamlessly with one of their auto tuners, or perhaps with a compatible aftermarket unit. Unfortunately, I had a manual-tuned tuner at hand. In order to tune to a new frequency, I had to go to a menu to set the power output to 10 W, then use a function key to change the meter to standing-wave ratio (SWR), change the key to straight key, key the transmitter, and adjust the tuner for minimum SWR. Then remember to go back and reset everything and hope the station I was going to call was still there. I propose that Yaesu consider another option in their TUNER SELECT menu — how about a choice of EXTERNAL? Then, with a single push of the TUN function, all of those actions could occur, with normal operation returning

with another push. Fortunately, during the testing, W1ZR added a high-power auto tuner that could tune while 100 W was applied — problem solved — although perhaps not the least expensive solution!

Documentation

Our FT-891 came with a 58-page *Operating Manual* that includes a reference to an *FT-891 Advance Manual*, available for download on their website. You might think that the *Advance Manual* is something to look at only if you are interested in doing some advanced functionality, but it is much more.

While the *Operating Manual* includes a description of every control, along with a short description of the choices, it takes the 113-page *Advance Manual* to find details of what each of the choices means, along with step-by-step instructions for each function, including links to the applicable menu choices.

With a total of 184 menu items in 18 groups, 28 standard functions on three pages, plus extra pages that can be enabled for CW and FM function choices — you really need to look at both volumes to know how to use this radio to its full capability. Once I downloaded the *Advance Manual*, I found the pair of manuals complete, well written, and easy to follow.

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



Visit https://youtu.be/G_4qi-JeX1Q to see our review of the Yaesu FT-891 HF and 6-meter transceiver on YouTube.