

Product Review

Conducted By Paul K. Pagel,* N1FB

Yaesu FT-101ZD Transceiver

Another FT-101 series transceiver? Well, "yes," but more definitively, "no." The similarity to previous FT-101 models ends with the equipment number. The main frame and the innards are completely different. In the writer's opinion, a more appropriate equipment designator would have been the FT-901-S (S standing for simplified). Outwardly, the '101ZD closely resembles the FT-901DM. Internally, one notices that the fundamental circuitry is that of the '901, but with fewer circuit gee-gaws.

Notable among the features which have been deleted from the fancier '901DM are the RC active audio filter, built-in Curtis Keyer, PA protective drop-out circuit and frequency-memory programming system. Most of the other significant and useful features remain, such as RX-TX RIT, digital frequency readout, analog readout, noise blanker, speech processor, variable i-f bandwidth from 300 Hz to 2.4 kHz, provision for a 600-Hz cw i-f filter and front-panel VOX controls. For those who wish to use the transceiver as a mobile rig, there's even a dimmer control for diminishing the intensity of the LED frequency display and panel-meter lamp. This feature is especially beneficial during nighttime operation when too bright a display might distract the driver.

The push-button switches at the lower center of the front panel are used for programming an external VFO — the FV-901DM, which is a synthesized, scanning type of external VFO. It can't be used with the FT-101Z, which is the less expensive analog-only version of the transceiver. This is because the FV-901DM has no digital readout of its own. The VFO can be used for establishing an external transceiver, transmit or receive frequency through proper actuation of the push buttons on the FT-101ZD panel. The outboard VFO sells for \$415.

Equipment Performance

With due respect to the manufacturer of an early product (FT-101B) which filled a great amateur need for equipment compactness and portability at moderate cost, Yaesu has taken giant strides forward in transmitter and receiver performance. Many of us were willing to trade off poor receiver dynamic range (very poor) and transmitter spurs (minor — which in some areas were troublesome to the operator) for a rig which worked on 160 meters and could be hand-carried almost anywhere. The FT-101 and '101B rigs were, for many, almost as basic as apple pie — despite their foreign origin.

The FT-101ZD has good spectral purity from the transmitter and the receiver dynamic range is similar to that of the better transceivers



The Yaesu FT-101ZD transceiver makes a really compact package. The unit is completely self-contained (including the power supply). Both the digital display and the analog dial are amber tones, complementing the two-tone gray enclosure. The optional dc-to-dc converter plugs in at the rear of the transceiver. As with other Yaesu equipment, a carrying handle and additional side-mounted feet make for easy portability of the unit.

on today's market. Fig. 1 shows the worst-case spectral condition of the six amateur bands covered by the transceiver. Here we see the 80-meter output at full rated power. The vertical divisions are 10 dB and the horizontal ones are 5 MHz, as viewed on a Hewlett-Packard spectrum analyzer. The full-scale pip is the 3.5-MHz carrier. To its left is a low-level spur. The large response at the far left is the

zero-frequency reference of the analyzer. Immediately to the right of the carrier we see the second harmonic. It is 45 dB below peak power. Next, to the right, is the third harmonic — 62 dB below peak power. The fourth, fifth and sixth harmonics are down near the base line of the display. The seventh harmonic, however, at 24.5 MHz, is some 58 dB below peak carrier power, suggesting that the

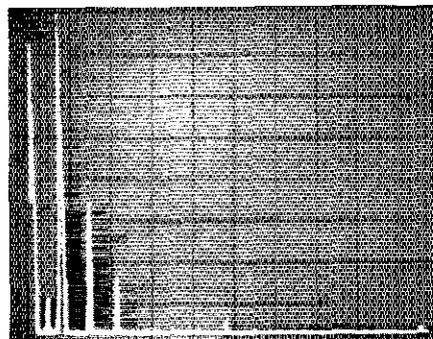


Fig. 1 — Spectral display of the FT-101ZD output on 80 meters (see text).

Yaesu FT-101ZD HF/MF Transceiver

Claimed specifications

Size (HWD): 6 x 13-1/2 x 12.8 inches (157 x 345 x 326 mm).
Weight: 33 pounds (15 kg).
Power requirements: 85 W (receive) and 330 W (transmit) from 117-V ac line. For dc operation, 13.5 volts at 1.1 A (receive) with heaters off, or 5.5 A (receive) with heaters on. Transmitter draws 21 A, key down.
Frequency coverage: 1.8-2.0, 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5 and 28.0-29.9 MHz. WWV/JJY band is from 5.0-5.5 MHz.
Color: Two-tone light and dark gray.
Price class: \$900.
Manufacturer: Yaesu Electronics Corp., 15954 Downey Ave., Paramount, CA 90723. Phone: 213-633-4007.

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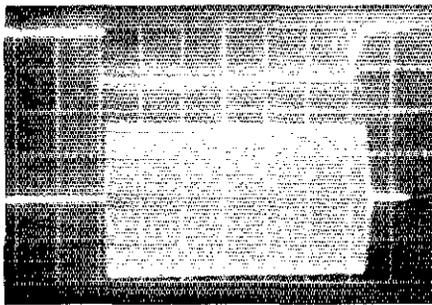


Fig. 2 — The cw keying waveform of the Yaesu FT-101ZD is shown here and in Fig. 3. Tests were performed in the ARRL lab. Each division of the horizontal axis is 5 ms. The upper trace shows the actual key-down time. Roughly 2 ms after key-up, the wave starts to decay. Note the difference in the leading edge (left-hand side of the photo) of the waveform in this photo and that of Fig. 3. Here, the drive control was adjusted for maximum output.

transmitter PA pi network may have poorer rejection (or switch leakage) on 80 and 20 meters than on the other bands. This trait is observed only on 80 and 20 meters. However, the harmonic level is so low that it is of no consequence: FCC requirements are that all spurious energy is 40 dB or greater below peak power in the hf spectrum. This transceiver uses a pair of 6146B tubes in the final amplifier rather than a pair of sweep tubes, as were used in the 101B and 101E models. A 12BY7 tube serves as the driver.

During tests being performed in the ARRL lab, the spectrum analyzer showed the third- and fifth-order distortion products to be down only 20 dB from peak carrier power on 20 meters. This was quite far from the acceptable norm of 30-32 dB. Yaesu was informed of the findings and proposed that rf feedback into the mic amplifier was the problem. The factory suggested bypassing the mic and PTT leads with 0.01- μ F disc-ceramic capacitors. This was done and the problem was eliminated. The results may be seen in the accompanying spectrum analyzer photo of the transmitter IMD characteristics. At this time, Yaesu is installing these bypass capacitors in all production models.

The sidetone oscillator of the FT-101ZD was noted to be "clicky." There are definite "key clicks" (on the break) audible during cw keying

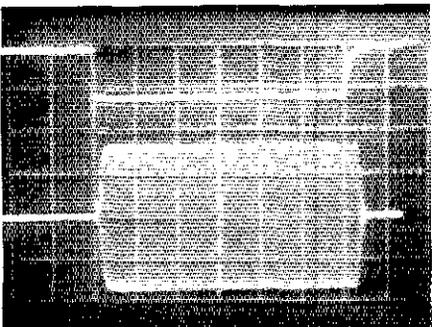


Fig. 3 — In this photo, the drive control of the FT-101ZD was adjusted for slightly less than full drive. This resulted in a much more suitable leading edge (note rounder corners). The sharp edges of the trailing edge of the wave could produce mild clicks.

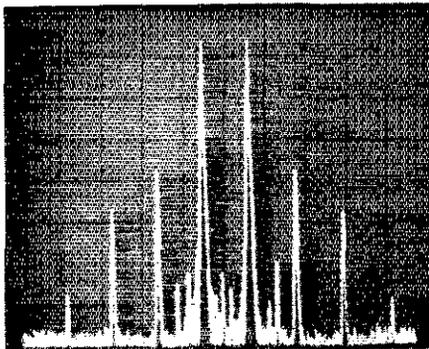


Fig. 4 — Spectral display of the transmitter IMD characteristics at 14 MHz during a two-tone test. Vertical divisions are 10 dB; horizontal divisions are 1 kHz. Third-order distortion products are down approximately 38 dB from the PEP output. The individual tones are 6 dB down from the PEP output. All measurements were taken in the ARRL lab.

which can be annoying. These clicks do not appear on the transmitted signal and may be eliminated easily by the addition of a single electrolytic capacitor. To avoid altering the transmitted waveform of the 'ZD, the added capacitor must be placed correctly. The proper location for the capacitor is at the anode end of the D06 on the af board, PB-1964. This point may be accessed by scraping off the coating on the upright lead of R38. The positive lead of a 12- μ F, 25-V electrolytic is attached at that point. The negative lead of the capacitor may be soldered to the ground lug of the terminal strip on the chassis wall nearby. A larger value of capacitance will provide a softer break and may be tailored to give a characteristic "bell-like" tone to the monitor signal.

The keyed cw waveform of the FT-101ZD is well shaped and has sharp, clean sound on the air. Figs. 2 and 3 show the cw keying waveform of the FT-101ZD. These tests were performed on 80 meters. Two traces are shown in each photo. The upper trace shows the actual key-down time. This amounts to 30 ms. The lower trace is the output of the transmitter. The sharp edges of the waveform shown in Fig. 2 would tend to produce some on-the-air clicks. By reducing the drive slightly (as was done during operation of the review unit), the leading edge of the wave becomes slightly rounded, thereby eliminating harsh clicks. The trailing edge is a bit sharp, though, and a smoother decay would remove any traces of clicks. Most of the time, clicks (and chirps in some instances) go unnoticed and are not reported to the transmitting operator.

Fig. 4 shows the transmitter IMD characteristics as displayed on the spectrum analyzer. The third-order two-tone distortion products are approximately -38 dB. The fifth-order products are down 47 dB from peak power. This spectral display is one of the cleanest we've observed in recent years at the ARRL lab, respective to transmitter IMD.

With regard to receiver performance, relative tests were performed over a period of many weeks at W1FB (two blocks from W1AW). At no time, other than when the 3-element triband Yagi was bore-sighted on W1AW, was it necessary to employ the receiver front-end attenuator to prevent blocking or cross-modulation effects from W1AW.

Receiver dynamic-range tests performed in the ARRL lab yielded these results: MDS (minimum discernible signal) = -139 dBm. Blocking above MDS = 112 dB, IMD = 78 dB. These are worst-case numbers which were measured on 20 meters with a 600-Hz i-f filter. This equates to an input intercept of -22 dBm.

Although definitive measurements of local-oscillator noise output are beyond the present capability of the League's lab, it appears that the FT-101ZD has an exceptionally clean LO system. The residual noise in the receiver is very low. This becomes especially important when strong signals are in the i-f passband. A noisy LO chain will have a number of undesirable effects on overall receiver performance, but the most apparent is observed when tuning off a strong signal: Hash can be heard in the receiver output, even though the signal itself is not discernible. The hash appears each time the strong-signal operator speaks into the microphone or keys the carrier on cw. When the LO chain is clean, as in the '101ZD, nothing other than man-made or atmospheric noise is heard between signals. However, if the strong signal originates very near the operator's QTH, white noise from the other station's amplifier may be heard across the band during key-down periods. This does not indicate a receiver design fault.

Power input to the transmitter PA stage is 180 watts dc. Frequency stability shows a drift of less than 300 Hz after a 10-minute warmup period and is less than 100 Hz after a 30-minute warmup. The microphone input impedance is 500 to 600 ohms. Audio output from the receiver is 3 watts at 10 percent THD into a 4-ohm load, although loads up to 16 ohms are suitable.

Unwanted sideband suppression is rated at 40 dB or greater, with carrier suppression in excess of 40 dB. Transmitter audio response is 300 to 2700 Hz at the 6-dB points of the curve. Receiver sensitivity is 0.25 μ V for a 10-dB signal-to-noise ratio. Image rejection is in excess of 60 dB on 160 through 15 meters. It is better than 50 dB on 10 meters.

A PA cooling fan can be added as an optional feature. Similarly, a plug-in dc-to-dc converter for mobile operation is available. It attaches to the rear panel of the transceiver.

Yaesu enthusiasts from the '101B days should find this new gray box a fine replacement for their earlier units. It certainly is a top performer, comparatively speaking, and the price tag is probably on par with that of the early units in view of present-day inflation in the USA. — Doug DeMaw, W1FB

DIELECTRIC RF WATTMETER MODEL 1000-A

The model 1000-A is a directional rf wattmeter designed for 50 ohms. It measures power flow and load match in coaxial lines. It may be used with all types of modulation — cw, a-m, ssb, fm and TV. The wattmeter should *not* be used to check pulse transmitters.

Description

The cabinet style, large, square easy-to-read meter and dielectric-white color make this a very attractive wattmeter. When hooking up the model 1000-A, this reviewer found that its "bench stability" was very good. The large rubber feet mounted on the base, which measures 4 x 5 inches (101 x 127 mm), prevented movement during testing. With a