

The Yaesu FT-2500M

A rugged mil-spec radio.

Ah yes, there's nothing like unpacking a new piece of equipment—makes you wonder how they cram it all in the box. If you want an interesting exercise sometime, try repacking the radio and the accessories back in the box in the exact same manner that it was originally packed. You can't do it; it takes special training.

The FT-2500M's size in inches, which is not given in any of the ads, is 7.75 by 6.3 by 2.0. The measurements include the length of the knobs which, incidentally, are covered with that magic rubber that gives what I call a "tactile feel."

Appearance and Construction

The radio looks neat and rugged, and projects a functional appearance. Square, no fancy curves. All the gee-whiz buttons that you occasionally use are hidden away under the secret access door located on the right side of the front panel under the tuning knob. The top and bottom covers on the chassis are made of tight-fitting, rugged ABS plastic. I would have preferred metal covers for better shielding, but later testing in a strong RF field resulted in no problems.

The power leads for the radio have a fuse holder in both sides of the line, which is a definite plus. The fuse holders are rugged and totally "grab" the fuse, not just touch the ends of it. The SO-239 antenna connector is mounted in a recessed area of the heat-sink portion of the large one-piece diecast chassis. The connector has real threads that match your connectors. I tried several makes of PL-259 connectors and they all screwed onto the radio without any problems. The recessed area of the heat sink provides some protection for the SO-239 antenna connector.

Bench Testing

I fired the radio up and quickly checked the power and receiver specs. At 13.8 volts I measured 52 watts and found the power to be the same at both ends of the band. The power levels are selectable and can be

programmed for each channel. The operators' manual gives instructions on how to open up the unit and set pots for the different selectable power levels. Mounting a quarter-wave ground plane antenna a foot away and standing behind a shield, I made several short transmissions with 50 watts. The unit operated in this unusually strong RF field with no problems. The automatic transmit power control was tested into several resistive loads representing SWR values starting with 3 to 1. Each test resulted in progressive lowering of the power. The final test consisted of just putting an emergency 19-inch wire in the rear connector and testing on the local repeater. Plenty of RF was available and the radio did not shut down. I don't recommend using just a 19-inch wire as a normal operation due to the radiation hazard and the poor load for the radio, but in an emergency it will work on the FT-2500M.

The transmitter has a "time-out timer" which can be programmed for five to 60 minutes. First thing I did was put in a five-minute limit. The timer resets each time you press the push-to-talk button and gives a little "beep" when the timer expires to remind you that you may be sitting on the mike button. I tested the timer on five minutes with 50 watts and, as expected, the heat sink got pretty warm but the power remained steady. There is also an automatic power-off timer, "APO," which will put the radio to sleep if you forget

to turn it off. Since Yaesu recommends "direct" connection to your battery, this is a nice feature.

The radio looked clean on the service monitor and demonstrated a nice IDC (instantaneous deviation control) circuit which prevented me from over-deviating no matter how hard I yelled into the mike. Third harmonics in the 440 MHz band were well below 60 dB suppression.

Bench-checking the receiver sensitivity was better than the specs of 0.2 μ V for 12 dB SINAD. Now for the first acid test of the system. I programmed the receiver to scan from 144 to 148 at 5 kHz increments to see if there were any internal "birdies;" none were found with or without an antenna. The image rejection specifications call for better than 70 dB. During the mobile testing I drove through two of our local "RF alleys" to check for desense and overload. The receiver reacted very well and responded with just a little noise from a local high-power paging unit with the squelch wide open. However, it was not enough to break a normal squelch setting. Checks for desense with an adjacent mobile working on the same repeater were excellent. One of our club members tried running 25 watts in close proximity but still did not cause any desense problems.

Yaesu appears to have built a pretty bullet-proof receiver using their "Advanced Track Tuning (ATT)." Quoting from the receiver sec-



tion of their technical supplement manual, "after passing the antenna switching network signals (received) within the frequency range of the transceiver are then passed through a varactor-tuned bandpass filter before RF amplification. The amplified RF is then bandpass-filtered again by varactor-tuned resonators to ensure pure in-band input to the 1st mixer."

Military Specifications

One of the reasons I purchased the radio was the "mil-spec" advertisement. I contacted Mr. Chip Margelli K7JA, the Customer Service Manager at Yaesu, and he sent me a copy of the testing procedure using MIL-STD-810C, the vibration test accomplished by United States Testing Company Inc. in February, 1994. A portion of the testing included mounting the radio to a test fixture. Then the fixture was "bolted to the shaker." The transceiver was then vibrated for three hours along several different axes at different frequency ranges varying from 5 Hz to 500 Hz.

After this was over they conducted the shock test series! Quoting from the United States Testing Company report, "The transceiver was activated and subjected to three shocks in each of the plus and minus directions of each axis, for a total of six shocks on each axis. The pulses consisted of a sawtooth waveform with a peak amplitude of 40 "G"s over a duration of 11 milliseconds." The United States Testing Company reported that the transceiver was "fully operational at the conclusion of the vibrations test" and "there were no physical anomalies noted."

Bells and Whistles and Other Features

The microphone uses a now-industry-standard telephone eight-wire modular plug. These rugged connectors can be purchased at any telephone supply store and are easy to crimp on. You can now put on a mike connector in 30 seconds instead of spending 30 minutes trying to solder those elusive little tiny wires. The microphone looks complicated and busy, but feels light to the touch. The mike has a "lock" switch on the rear which, when activated, locks up all the buttons except for the touch-tones. I spent quite a bit of time on the bench trying to get the radio to scan and then finally found the lock switch. But get this: *The mike glows in the dark!* Actually, just the buttons glow, but this lighting feature will help make those midnight autopatch calls a little easier. If you don't like your mike to glow in the dark there is a switch to turn the light off. Yaesu supplies the MH-27 mike with the radio but you can purchase the simpler MH-26 without the touch-tone pad.

There are 31 memory channels. Now, I know some of you will scoff and insist that you need at least 100 channels, but for me 31 was fine. All I wanted was a tough simple radio. You can program a "name" for each channel (for example, CLUB, MARS, etc.). The names may be up to four characters

long. There are provisions for the usual channel scanning or programmed limit scanning, but there are no provisions for storage of telephone numbers. As is standard in a lot of commercial equipment, this radio can clone (program) another radio with its stored information via the optional cloning cable. Once nice feature is that in the event you decide to start over with the memory channels there are provisions for accomplishing a general memory reset to clear all information.

The radio is equipped with CTCSS encode but you have to purchase the decode module and install it. I purchased the CTCSS FTSK-17A and installed it myself. I followed the instructions supplied with the FTSK-17A but found that the mounting location for the module did not match my radio. Now what? If all else fails go to the operating manual, and indeed the correct picture and instructions were in the manual. I did not review the DTMF paging system as our local repeater will not pass DTMF codes, which is quite common in some repeater controller configurations. I have to mention the "Ringer Melody Settings" which can be utilized during DTMF paging. We have finally gotten to the peak of the "bells and whistles" phenomena. If you are in-

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to serious bells and whistles you may program a user-ringer melody using up to 16 digits which correspond to notes from the traditional music scale! If you are bored while driving down the highway you can play back the melody with a test sequence. Personally, I prefer the straight ringing sound which sounds just like a phone.

Not only is the microphone lit but you can also adjust the radio panel backlighting on the LCD display to a manual setting or let the photosensor adjust the brilliance of the LCD display. The large LCD display is very easy to read. Night is the best display, with a yellowish background which can be controlled by the photosensor. In very bright direct sunlight the LCD panel changes to a black-on-gray high-contrast display.

Modifications

It's time to get the soldering iron out.

Packet modifications: The unit is not, I repeat, not 9600-baud packet-ready. However, there are simple instructions with pictures in the operating manual. Basically it consists of mounting three chip resistors, two jumpers and a chip tantalum capacitor. These are chips and require quite a bit of soldering skill. The manual states that "if you are not confident then contact your Yaesu dealer for assistance." According to their customer service

department, the 9600-baud kit is available for \$1.

Since I am involved in DFing, or foxhunting, I immediately realized that the packet modification soldering pad connections gave me access to the receiver audio prior to the audio gates, de-emphasis, and high-pass filtering. Now I have a good clean audio connection point for my foxhunting equipment. Yaesu even provides a small cutout which allows for the exit of cables that is located in the rear of the unit. This cutout is normally sealed with a plastic plug.

The radio receiver section comes out of the box ready to cover 140 to 174 MHz. The transmitter unmodified covers 144 to 148 MHz. I wanted to modify the unit for USAF MARS but instead of using the instructions from one of those thick modification books that you can buy at hamfests I decided to write to Yaesu and ask for their official modification sheet. I included my MARS license, my amateur license, and a copy of my purchase invoice. The instructions received from Yaesu were clear and easy to follow and contained all the necessary cautions about out-of-band operations.

Operating Manual and Technical Supplements

I thought that the small operating manual was well-written. I reviewed the "in case of trouble" pages, which are designed to correct for "operator errors." The handbook contains the usual circuit diagrams and flow charts as well as diagrams for the optional modules. However, all it contains for the microphone is the pinout pattern for the connector.

You will have to purchase the technical supplement if you want circuit diagrams of the mikes.

The small operators' handbook is in English and Spanish so you can brush up on either language. I kind of miss those earlier Japanese manuals that were written in a strange kind of technical English with wording that seemed to have several meanings requiring hours to decipher. These new manuals take all the adventure out of purchasing a new Japanese radio. The "Yaesu Technical Supplement" (service manual) is up-to-date and was immediately available. It contains all the diagrams of the mikes, and includes instructions for lithium backup battery replacement and panel lamp replacement, which require good desoldering skills.

Overall Evaluation

I liked the radio. It's easy to operate and has a very readable front panel display. The alternate function buttons are reasonable in their organization and the clever bells and whistles are still there, with most of them hidden underneath the secret door. The unit appears to be really rugged. The best overall attraction for me was the receiver front end and its ability to work in a multi-transmitter high-RF environment and to resist basic front end overload.