Product Review

Yaesu FTM-500DR C4FM/FM 144/430 MHz Transceiver

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The Yaesu FTM-500DR is what I call a "kitchen sink" transceiver, and that's intended as a compliment. It is just another way of saying that this radio includes everything except, as the old saying goes, the "kitchen sink."

The FTM-500DR operates either analog FM or C4FM digital on the 2-meter and 70-centimeter bands, but it also receives at all frequencies from 108 to 999.995 MHz (cellular frequencies blocked, of course; see Table 1). The transceiver offers RF output levels of 5, 25, and 50 W with a single SO-239 antenna port.

Like a number of Yaesu transceivers available today, the FTM-500DR is a System Fusion radio — that is, it can sense the modulation scheme of a received signal and adapt accordingly. When you have the Automatic Mode Select (**AMS**) function enabled, you may be called by someone on FM simplex, or through an analog FM repeater, and the FTM-500DR will configure itself for analog FM operation automatically. But if someone calls you using digital C4FM, the radio will instantly jump to C4FM mode without any input from you. While operating in digital mode, you can select between two modes: Voice Wide (**VW**) and Digital Narrow (**DN**). The **DN** mode carries 6.25 kHz of audio data and 6.25 kHz of other information, such as location data — all this simultaneously. If you go into the menu system, you can add the ability to operate in **VW**, which transmits a broader digital signal using the full 12.5 kHz for audio that permits higher fidelity. I found the **DN** mode to be sufficiently clear for my purposes, but the fidelity improvement when I tried **VW** mode was impressive.

The radio body has a slender profile, at about 5.5 × 1.7 × 5.2 inches. As you can see in the lead photo, the detachable control head is significantly larger, at 6.1 × 2.5 × 2.3 inches. The size disparity is understandable when you realize that the control head includes a 2.4-inch touchscreen that is used to display signals from two bands simultaneously, not to mention an optional band scope. The FTM-500DR also offers a sizable tuning knob, and other knobs and buttons that are sized and positioned for maximum ergonomic efficiency. The main and sub bands each have their own dedicated volume controls on the left-hand side of the head; you can adjust the squelch level with a single press on the desired volume knob.

The control head also includes its own speaker, which appears along the bottom of the unit. Another larger speaker is available on the body as well (we'll discuss the speakers in more detail later).

Of course, you have the option to relocate the body elsewhere in your vehicle, such as under the seats, but you'll need to purchase an optional extension cable to

Bottom Line

The FTM-500DR is a fully featured radio, but Yaesu's simplified approach makes it easy to operate even for beginners. The innovative Acoustic Enhanced Speaker System (AESS) is astonishing, especially for mobile use, and is something you really must hear for yourself.

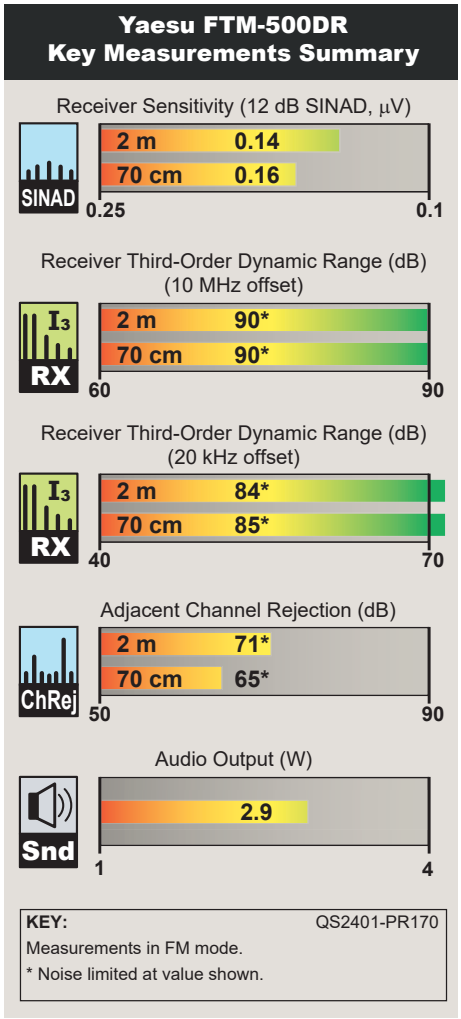

Table 1

Yaesu FTM-500DR, serial number 3E020243
Firmware: Main – 1.02, Sub – 1.02, DSP – 7.20

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: receive, 108 – 137 MHz (air band), 137 – 174 MHz (144 MHz ham / VHF band), 174 – 400 MHz, 400 – 480 MHz (430 MHz ham / UHF band), 480 – 999.995 MHz (USA cellular blocked); transmit, 144 – 148, 430 – 450 MHz (FM).	As specified.
Modes: FM, digital voice, data.	As specified.
Power requirements: receive, 500 mA; transmit, 10 A on 144 and 430 MHz, 50 W at 13.8 V dc.	Receive, 462 mA (max volume, max lights, no signal, each receiver), 420 mA (max volume, min lights, no signal); transmit, 146 MHz, 9.1/5.8/2.8 A (high/med/low), 440 MHz, 9.9/6.8/3.3 A (high/med/low) at 13.8 V dc.
Receiver	**Receiver Dynamic Testing***
Sensitivity: FM (12 dB SINAD), 0.2 µV (137 – 150 MHz), 0.25 µV (150 – 174 MHz), 0.3 µV (174 – 222 MHz), 0.25 µV (222 – 300, 336 – 420 MHz), 0.2 µV (420 – 520 MHz), 0.4 µV (800 – 900 MHz), 0.8 µV (900 – 999.99 MHz); AM 10 dB S/N, 0.8 µV (108 – 137, 300 – 336 MHz).	FM (12 dB SINAD), 0.14 µV (144 MHz), 0.16 µV (440 MHz), 0.14 µV (WX), 0.48 µV (223 MHz), 0.44 µV (902 MHz); AM (10 dB S+N/N), 0.72 µV.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, 146 MHz, 84 dB†, 440 MHz, 85 dB†; 10 MHz offset, 146 MHz, 90 dB†, 440 MHz, 90 dB†.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 95 dB, 440 MHz, 115 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset, 146 MHz, 71 dB†, 440 MHz, 65 dB†.
Spurious response: Not specified.	If rejection, 146 MHz, 103 dB; 440 MHz, >136 dB; image rejection, 146 MHz, >137 dB, 440 MHz, 73 dB.
Squelch sensitivity: 0.16 µV (144/430 MHz).	At threshold, 146 MHz, 0.09 µV, 0.30 µV (max), 440 MHz, 0.15 µV, 0.36 µV (max).
S-meter sensitivity: Not specified.	S-9, 3.7 µV (144 MHz), 4.8 µV (440 MHz).
Audio output: 3 W at 10% THD into 8Ω.	2.9 W, 10% THD into 8Ω. THD at 1 V_{rms}, 1.6%.
Transmitter	**Transmitter Dynamic Testing**
Power output: 50, 20, 5 W (high, med, low). At 13.8 V dc nominal.	As specified.
Minimum operating voltage: Not specified.	At 12 V dc, 144 MHz, 47/24/5 W output.
Spurious signal and harmonic suppression: >60 dB.	≥60 dB, meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch off, S-9 signal, 146 MHz, 356 ms; 440 MHz, 360 ms. With AMS on. 146 MHz, 100 ms; 440 MHz, 102 ms. With AMS off.
Receive-transmit turnaround time ("tx delay"): Not specified.	146 MHz, 74 ms; 440 MHz, 75 ms.

Size (width, height, depth): 6.1 × 2.5 × 2.3 inches (control panel without knobs); 5.5 × 1.7 × 5.2 inches (radio unit).

Weight: 3.1 pounds (control panel + radio unit + control cable).

*"Main" and "Sub" receivers measured identically, unless noted.
†Measurement was noise limited at the value indicated.

do this, such as the 10-foot SCU-62 or the 20-foot CT-132. Note that a common Ethernet cable is not recommended, as it will impact the operation. The good news is that the large multifunction microphone can plug directly into the control head. Unlike some transceivers, you won't need to run a separate microphone cable to the body of the unit.

The FTM-500DR is a sharp-looking radio overall, and it is packed with so much functionality; the details can't be contained within a single operating manual (or within the confines of a single *QST* review). That's why the manual included with the radio highlights only the most used

features. If you want information about more advanced features, such as WIRES-X or the Automatic Packet Reporting System (APRS), you will need to download separate detailed manuals in PDF format from the Yaesu website.

The FTM-500DR Operating System

In a radio as complex as the FTM-500DR, anything that can be done to streamline operation for the user is worthwhile. Yaesu's solution is the Easy to Operate (E2O)-IV operating system. The short summary of E2O-IV is that it consolidates several potentially complicated functions, making the FTM-500DR much easier to learn and operate, even for a beginner.

Consider the **TOUCH & GO** and **SEARCH & GO** functions as examples. With the band scope running in the display, you can use **TOUCH & GO** to jump to a desired frequency with a single touch on a signal bar. With **SEARCH & GO**, a short press on the band scope will start simultaneous reception of that frequency and the main frequency. Another short press will return you to the scope screen.

E2O-IV also streamlines your ability to monitor up to five separate frequencies simultaneously. You "register" your favorites in the Primary Memory Group (**PMG**) with the touch of a button (see Figure 1). You can register up to five. When you press and briefly hold the **PMG** key, the radio begins scanning through the registered channels and displaying activity via vertical bars in the lower half of the display. If you notice that a frequency suddenly appears to be active, a single touch on the bar will take you to that frequency, which replaces the bars in the lower portion of the display.

Another E2O-IV enhancement is the Customized Function List (**CFL**). As with any feature-rich radio, there are some functions you'll use frequently, but others you'll rarely use at all. **CFL** allows you to create a quick-access list of only those functions you use most often. You can add up to eight functions to the list (such as **SCAN**, **APRS ON/OFF**, **TX PWR**, etc.) and then access the list with just a single press of the **FUNC** knob.

Figure 1 — The Yaesu FTM-500DR PMG feature.

E2O-IV makes it easy to group memories within the same frequency bands for easier scanning and recall. You can even choose to eliminate reception of a given band if it doesn't interest you. Not interested in listening to aeronautical traffic? Use the VFO Band Skip function to temporarily remove it from available bands. When you press the **BAND** button to toggle between bands, the aviation band (108 to 137 MHz) will no longer appear.

AESS

The Acoustic Enhanced Speaker System (**AESS**) is a feature unlike anything I've seen before in an amateur radio transceiver. While it can be described in words, **AESS** is something you really must hear for yourself.

Imagine that you have the FTM-500DR control head mounted beneath the dashboard of your vehicle while the transceiver body is resting beneath a back seat. As I mentioned previously, both units have speakers, and these speakers can be active simultaneously. But if your vehicle is like mine, you know it has its own peculiar acoustic environment. Some sounds you can hear well, but others not so much.

With **AESS**, you can adjust high- and low-frequency emphasis and total volume balance for each speaker independently. You can also adjust the phase balance between the two speakers, effectively introducing a slight delay in either the front or the rear. The effect in my SUV was astonishing. I found myself playing with the **AESS** for quite a while, just listening to the various effects. Your experience will vary depending on your vehicle, but I found **AESS** to be innovative and useful.

Memories and MicroSD

The FTM-500DR has more memories than most of us will ever use. The memory complement includes 1,104 channels with five "home" channels, 50 sets of memories for programmable memory scanning, and 999 "basic" memories.

Yaesu offers free software for managing memories (*ADMS*), but you will need to purchase the SCU-56 cable, which is included in the SCU-58 kit for about $40, in order to connect the radio to your computer. RT Systems (**www.rtsystems.com**) offers a software and cable package for $49.

The FTM-500DR can also accommodate a microSD memory card, and I found that it was possible to write the memory contents to the card, read the card into my computer, and then edit the information there. That's a multi-step process, however, and editing memories with a cable and software is much easier.

That said, I found it relatively straightforward to manipulate the memories via the transceiver's touchscreen. Yes, you have to go through a few steps, but I programmed the FTM-500DR this way initially, and it wasn't overly difficult.

Bluetooth

The wireless Bluetooth feature in the FTM-500DR is well designed. I have a Bluetooth microphone/headset that I use for online conferencing, and I was able to easily pair it with the transceiver. With the FTM-500DR's voice-operated switch (VOX) feature, all I had to do was speak and the radio began transmitting automatically. It pays to be careful if you use a wireless headset with the FTM-500DR in this fashion; you could transmit some utterances best kept to yourself!

Also, if you're considering using a headset as a wireless option while driving, check with your state motor vehicle department first. Some states prohibit headsets completely, while others allow them if they cover only one ear.

APRS

The APRS is a digital communication system for tracking moving objects (such as vehicles), but it also supports other data exchanges such as text messaging, weather information, and more (see Figure 2). In the FTM-500DR, Yaesu has included full-featured APRS functionality. There is a highly sensitive Global Positioning System (GPS) receiver on board that can determine your location within a few meters. The information can then be shared with the built-in terminal node controller (TNC) for transmission to the APRS network.

The APRS modem/TNC defaults to "off" out of the box, so you need to switch it on in the menu system. You will also need to input your APRS call sign and extension. Once you've completed these steps, and set the radio to 144.39 MHz, the FTM-500DR will begin displaying beacon data received from other stations.

I set up the transmit beacon function and drove around the area with the FTM-500DR blasting out my position at regular intervals. I even managed to get a couple of my beacon packets relayed by the digipeater aboard the International Space Station. Not bad for just 25 W to a magnetic mount antenna.

While the FTM-500DR can, of course, send and receive APRS text messages, entering a message for transmission is not easy. A convenient addition to a future transceiver would be the ability to interface a wireless keyboard.

At the rear of the FTM-500DR you'll find a data port to connect to a personal computer (see Figure 3). You can send APRS data to software on your PC, and you can even tap into the GPS data stream for use with another device.

It is also worth noting that the transceiver allows you to record your travel route to a microSD memory card for later viewing on an application such as Google Earth.

Group Monitor

Yaesu has included the Group Monitor feature in the FTM-500DR. While its use is limited to communicating with other Yaesu C4FM transceivers, it has the potential to be quite handy.

Figure 2 — The Yaesu FTM-500DR APRS screen.

Figure 3 — The Yaesu FTM-500DR rear panel.

Group Monitor essentially creates a kind of ad hoc network between compatible transceivers. Let's say you and several friends all own Yaesu C4FM transceivers with Group Monitor functionality. When the Group Monitor function is enabled (it is just a single button push on the top of the FTM-500DR control head), the radio begins pinging and listening for others who are in Group Monitor mode.

As responses are received, you can see a display of call signs, locations, and distances from your position. You can communicate with individuals in the group and even exchange text messages.

Unfortunately, I didn't have anyone nearby with a compatible transceiver, so I wasn't able to try Group Monitor myself. The Group Monitor feature is sufficiently complex to require its own manual, which is downloadable from the Yaesu website (**www.yaesu.com**).

WIRES-X

Perhaps the most interesting aspect of the FTM-500DR's digital functionality is its ability to interface with the WIRES-X network. The network is composed of nodes that act as portals to the network (see Figure 4). Most WIRES-X nodes are incorporated into System Fusion repeaters, but that doesn't mean that every Fusion repeater is hooked up to WIRES-X. In my immediate vicinity I found six Fusion repeaters, but only two supported WIRES-X. The easiest way to check is to go to the Yaesu WIRES-X Active Node ID List at **www.yaesu.com/jp/en/wires-x/id/active_node.php**. This list includes not only WIRES-X-capable repeaters, but simplex nodes as well.

Through WIRES-X you can enjoy conversations with amateurs all around the world, using the internet as a bridge to pass audio data and other information back and forth. Accessing the WIRES-X network is remarkably easy. I just selected a nearby WIRES-X repeater (I had programmed it into a memory slot) and then pressed the **DX** button on the top of the control head. The transceiver immediately attempted to establish a digital connection. It announced its success on the display, and I used the multifunction microphone to punch in the code for one of my favorite WIRES-X "rooms" (a room is like a reflector, or a group chat). Once I was connected, I soon heard a CQ from a station in the United Kingdom. At the same time, his call sign appeared in the display. I answered and we began carrying on a conversation while I zoomed along the interstate. It was a bit surreal to be doing this with a VHF/UHF transceiver.

Figure 4 — The Yaesu FTM-500DR connected to the WIRES-X network repeater node.

Please note that with the optional SCU-58 cable you can connect this radio directly to the WIRES-X network using a computer in portable digital node (PDN) mode. The PDN mode allows the FTM-500DR to act as a digital C4FM hotspot or a digital internet radio. If you opt for the optional HRI-200, all the necessary cables are provided. These features are covered in more detail in the Yaesu FTM-200DR review in the September 2023 issue of *QST*.

And That's Not All

The FTM-500DR is so feature rich, I tend to focus on the aspects that are new or novel. Of course, the FTM-500DR offers all the other features you've come to expect in a modern VHF/UHF transceiver. There are multiple frequency scanning modes, weather broadcast reception, a microphone with DTMF buttons and several multifunction programmable buttons, a powerful and quiet cooling fan, two speaker ports on the main body that can be dedicated to main or sub-band audio, and AM reception on the aeronautical band.

But there are also several other items that caught my attention. The first was a new dual CTCSS paging function. It combines two CTCSS tones as a reliable, yet unobtrusive, way of sending and receiving paging signals.

And thanks to its ability to accommodate a microSD card, the FTM-500DR allows you to record any received audio you wish. It will record your own transmissions as well. Install a card with sufficient capacity, and it will record for quite a while. I found the audio quality to be very good, and I can imagine using this feature during public service operations as a means of keeping a record of what transpired.

This may seem trivial, but I liked the fact that I could rotate the control head about 20 degrees to face upward. I haven't seen that feature on other radios lately,

and it can do wonders for display readability in a mobile environment. Yaesu also offers different mounting options for the remote head, like the SJMK-500 (Swing-Head Kit) and the MMB-103 (Dash Mount Bracket).

Finally, there is the "Super DX" function. This feature is a bit of a head scratcher because the manual has little to say about it, other than to note that pressing the **S-DX** button on the top of the control head improves sensitivity. That's it. It seemed to work at the frequencies I tried, but the effect was difficult to quantify in the field. I noticed a definite improvement with weak FM signals, roughly two S-units on 2 meters, for example.

Conclusion

If you are a fan of C4FM and System Fusion, it isn't hyperbole to say that the FTM-500DR is the ultimate transceiver in its class. It offers performance and features that are heads above any other FM/C4FM combo radio.

Manufacturer: Yaesu Musen Co., Ltd., Tokyo, Japan.