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Product Review

Yaesu FTM-300DR Dual-Band FM/Digital Mobile Transceiver

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The latest entry in the Yaesu System Fusion lineup boasts two completely independent receivers. With the FTM-300DR, you can monitor two separate VHF frequencies, two UHF frequencies, or whatever combination you like. This includes the ability to monitor two C4FM digital signals simultaneously, or listen to an analog FM signal with one receiver and a C4FM signal with the other. Extended receive coverage is split among several bands from 108 MHz to 999.99 MHz.

Yaesu packs all this functionality into a compact package. The control head is detachable so that you can install the body of the transceiver out of sight. In fact, the radio includes a 20-foot cable to connect the two units. The transceiver body houses the top-firing speaker, so if you place it in a location where you can't hear it, you'll need to attach an external speaker that you can mount near your operating position. Unless you are using a wireless headset, you will also need to attach an extension cable, such as the 10-foot Yaesu MEK-2, between the microphone and the transceiver body. The rear panel sports a single antenna jack with an SO-239 connector, two external speaker jacks (one for each receiver), a data jack for remote operation or connection to other devices, and an extremely quiet fan.

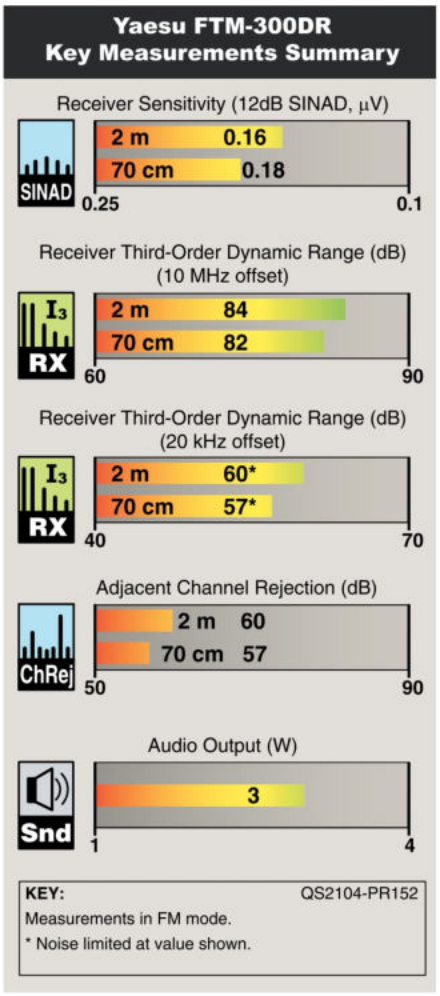
Bottom Line

Packed with features for analog FM and C4FM System Fusion operation, the FTM-300DR offers two completely independent receivers that can monitor two separate VHF or UHF frequencies simultaneously. A GPS receiver, APRS capability, and colorful display are standard.

Table 1
Yaesu FTM-300DR, serial number 0G020476

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 108 – 999.999 MHz (cellular blocked); transmit, 144 – 148, 430 – 450 MHz.	Receive: 108 – 823.995, 849.1 – 868.995, 894.1 – 938.295, 965.2 – 983.295 MHz. Transmit: as specified.
Modes: FM, FM-N (FM-Narrow), C4FM digital voice, data, AM (receive only).	As specified.
Power requirements: transmit, 11 A at 50 W RF output; receive, 0.5 A at 13.8 V dc.	At 13.8 V dc: Receive, no signal, max. audio and backlights, 500 mA; standby, 275 mA. Power off, 3 mA. Transmit (hi/med/low): 146 MHz, 8.25/5.17/2.67 A; 440 MHz, 10/6.2/3.03 A.
Receiver	**Receiver Dynamic Testing***
Sensitivity: FM 12 dB SINAD: 137 – 150 MHz, 0.2 µV; 150 – 174 MHz, 0.25 µV; 174 – 222 MHz, 0.3 µV; 222 – 300 and 336 – 420 MHz, 0.25 µV; 420 – 520 MHz, 0.2 µV; 800 – 900 MHz, 0.4 µV; 900 – 999.99 MHz, 0.8 µV. AM: 10 dB S/N, 108 – 137, 300 – 336 MHz, 0.8 µV.	FM, 12 dB SINAD, 146 MHz, 0.16 µV; 223 MHz, 0.18 µV; 440 MHz, 0.18 µV; 902 MHz, 0.22 µV. AM, as specified.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 146 MHz, 60 dB,† 440 MHz, 57 dB;† 10 MHz offset: 146 MHz, 84 dB, 440 MHz, 82 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 92 dB; 440 MHz, 108 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 146 MHz, 60 dB; 440 MHz, 57 dB.
Squelch sensitivity: Not specified.	At threshold: 146 MHz and 440 MHz, 0.11 µV. Maximum, 0.28 µV.
S-meter sensitivity: Not specified.	For S-9 signal, 2.24 µV.
Audio output power: 3 W into 8 Ω at 10% THD.	As specified. THD at 1 V_{RMS}, 2.4%.
Transmitter	**Transmitter Dynamic Testing**
Power output: High/medium/low power, 50/25/5 W.	At 13.8 V dc, high/medium/low power: 146 MHz, 50/25/4.9 W 440 MHz, 52/26/4.8 W.
Power output at minimum specified operating voltage: Not specified.	At 11.7 V dc, high power: 146 MHz, 48 W; 440 MHz, 49 W.
Spurious signal and harmonic suppression: ≥60 dB.	146 MHz and 440 MHz, >70 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S-9 signal: 146 MHz, 278 ms; 440 MHz, 268 ms.
Receive-transmit turnaround time (TX delay): Not specified.	146 MHz, 50 ms; 440 MHz, 42 ms.
Size (height, width, depth): Control head: 2.6 × 5.6 × 0.7 inches, including protrusions. Radio body: 1.7 × 5.6 × 5.2 inches, without fan.	
Weight 3.9 pounds (radio body and control head with microphone and power cord).	

*Receivers A and B tested identically. Test results shown are for standard FM mode. Sensitivity and adjacent channel selectivity increased by 1 dB in FM narrow mode.
†Measurement was noise limited at the value indicated.



The control head offers a 2-inch color TFT display that can be read even in bright daylight (see Figure 1). At either side of the screen are separate audio and frequency controls for each receiver.

There isn't a dedicated squelch knob, but this adjustment is easy. You simply tap the **SQL** button and the two right-hand knobs become squelch controls for the individual receivers. Within a couple of seconds after you've made your adjustments, they revert to being frequency controls again.

With a maximum 50 W output power, the FTM-300DR is ideal for either mobile or fixed station applications. And like all Yaesu System Fusion radios, the FTM-300DR will automatically switch from analog FM to digital C4FM according to the nature of the received signal thanks to its automatic mode selection (AMS) function. You can also elect to operate analog or C4FM exclusively with a push of a button.

An Abundance of Standard Features

The FTM-300DR comes with so many standard features, several of which are optional on other pieces of equipment, that it isn't practical to

Figure 1 — The FTM-300DR's colorful display is readable even in bright daylight.

discuss them all in a single review. Instead, I'll touch upon the ones I found particularly intriguing.

Bluetooth

In many transceivers, the ability to use a Bluetooth wireless headset is an option you must purchase separately, but not with the FTM-300DR. It can be paired with nearly any Bluetooth audio device for hands-free operating. The Bluetooth function includes a VOX (voice-operated switch) in case your chosen headset lacks a transmit/receive switch.

I didn't have a Bluetooth headset to fully test this feature, but I do own Bluetooth headphones. Following the instructions in the manual, I paired the headphones with the FTM-300DR without difficulty. Once the device successfully pairs, the FTM-300DR's speaker goes silent, and all audio is directed to the headphones. You need only go through the pairing steps once for each device.

It was fun to walk around the house with my headphones while listening to activity on the bands. I set up the FTM-300DR's scanning function and busied myself with other things while monitoring the local fire dispatch channel and the UNICOM frequency of a nearby airport. I even managed to pair the FTM-300DR with my Apple Air Pods.

Memory Channel Grouping

All transceivers these days have frequency memories, and the FTM-300DR is no exception, with more than 1,000 memories available. What's interesting about the way the transceiver handles memories is in its memory channel grouping function.

I found that I needed to experiment with this feature to fully understand and appreciate it. The short explanation is that it allows you to assign memory channels to specific groups of your choosing and then recall them for operating or scanning as the need arises. It is somewhat analogous to memory blocks familiar to scanner owners. For instance, you can place all the repeaters you normally use for your local area into one group, but then create another group for, say, the city where you work. The FTM-300DR makes it easy to switch from one group to another as you travel from place to place.

You can also segregate memory groups according to function. If you have several repeaters in your area dedicated to ARRL Amateur Radio Emergency Service (ARES®) activities, you can place all those repeaters into one memory group for easy access during deployments. The function is highly flexible for memory monitoring when necessary.

GPS and APRS

A sensitive Global Positioning System (GPS) receiver is standard in the FTM-300DR. Thanks to the FTM-300DR's crisp display, you can use the GPS receiver directly for real-time navigating. It even includes a backtrack feature to help you retrace your route back to a given location.

The GPS receiver is quite sensitive. From within my car, it had no trouble locking onto several satellites and determining a position fix within seconds after I powered up the radio. Even when I operated the transceiver indoors — inside my aluminum-sided home — the receiver still managed to acquire the needed satellites.

Of course, GPS and the Automatic Packet Reporting System (APRS) go hand in hand, which is why the FTM-300DR also includes a 1,200/9,600-baud packet modem as standard equipment. When operating APRS, the FTM-300DR will use its own screen to display information, but it also makes the AX.25 packet data available at the rear-panel data port. This means you can attach a computer and use your own APRS software or grab the modem data for other applications.

To activate the APRS function, you must first go into the menu system and turn on the modem. You also must input your APRS call sign, beacon message, and other parameters. Fortunately, the FTM-300DR's menu system is well designed, and I found it easy to navigate from the front-panel screen. Unlike some transceivers, menu choices are displayed in plain English rather than cryptic abbreviations. It is a matter of using a VFO knob to select what you want (the screen highlights your selections with red backgrounds) and then giving the knob a brief push.

With the APRS properly configured, I selected 144.39 MHz and the FTM-300DR began displaying decoded APRS data. The information is easy to read and includes a compass heading to the station in question (see Figure 2).

If you are new to APRS, it is best to download the FTM-300DR's dedicated APRS manual. Despite not having done this at first, I found it straightforward to pick my way through the menus and set up all the necessary parameters.

Snapshot

One clever feature that I didn't have an opportunity to try was the Snapshot function. This allows you to send and receive images using the optional MH-85A11U camera microphone. This ability has been present in Yaesu System Fusion radios for years, but not all transceiver models can support it. The FTM-300DR's high-resolution display is ideal for this, albeit with small images. Still, it is a cool function to have available, especially when you're doing public service work with other System Fusion users with compatible displays.

Band Scope

When the band scope is active, it sweeps above and below the midpoint of the signal frequencies being received by the receiver and displays the results as a sea of flickering pixel blocks. I found the band scope to be most useful when the receiver was in memory mode rather than free-tuning VFO mode. In VFO mode, there was simply too much to see, and the result was somewhat incoherent.

However, in memory mode, the band scope shows activity on programmed channels rather than a range of frequencies. This gives you a convenient visual sense of the activity. Twisting the upper VFO knob slides the pixel display right or left until you position a signal spike beneath the downward-pointing arrow at the top center of the band scope.

MicroSD Storage

The FTM-300DR offers a slot on the control head for inserting a microSD memory card (not included). The card has several applications in this transceiver. You can record received and transmitted audio, which can be useful in several situations. You can also back up the FTM-300DR's memory information to the card.

Naturally, you'll need to purchase a microSD card, but these are inexpensive. You'll also need a memory card reader to access the card with your PC or laptop.

Figure 2 — Monitoring APRS activity with the FTM-300DR.

These are also inexpensive and simply plug into an available USB port.

Memory Programming with External Software

Yaesu offers free software for Windows that you can use to conveniently manage the contents of the FTM-300DR's many memory channels. This is my preferred method of management just because it is so much easier to do from my desktop or laptop.

To access the FTM-300DR memories directly you must purchase an SCU-20 data cable. Yaesu used to sell this cable separately, but now it is only available as part of the SCU-40 kit that allows the FTM-300DR to be connected to external WIRES-X node hardware. Selling at about $70, this is a pricey way to obtain a single cable.

The cost-saving alternative is to use the microSD card instead. You can write the transceiver's memories to the card, move the card to your computer, and then read its contents into the software. When you're finished, write the data back to the card, place the card into the transceiver, and then load the information to transceiver's memory.

I happened to have an SCU-20 on hand, so I used it instead. The software worked perfectly, making it a pleasure to input new memory information, or delete and modify existing information. I simply used the **READ** function to grab the data from the FTM-300DR and then wrote it back to the radio when I was finished.

On the Air

The FTM-300DR's 50 W output is ideal for solid mobile coverage. You can set it to lower output levels, but I enjoy operating simplex, and with my little mag-mount antenna on the car, I needed all the help I could get.

Speaking of simplex, the ARRL Lab was made aware of a quirk concerning 70-centimeter operation. In the

Figure 3 — Connecting to a System Fusion repeater, and then connecting to the America Link group on the Yaesu WIRES-X network.

US, 446.0 MHz is the national simplex calling frequency. However, when the FTM-300DR's automatic +/– frequency shift function is enabled, it insists on regarding this frequency as a repeater channel and shifts the transmit frequency accordingly. I verified that it will indeed recognize 445.0 MHz as a simplex frequency, but not 446.0 MHz. The workaround is to temporarily deactivate the auto-shift feature if you need to operate simplex on 446.0 MHz. Yaesu indicates that they will correct this issue in a future FTM-300DR firmware update. I checked my Yaesu FTM-7250DR transceiver and discovered the same behavior.

I'm fortunate to have Yaesu System Fusion activity in my vicinity, and most of it is connected via the internet to the Yaesu WIRES-X network. If you haven't tried operating through a linked network, it can be a blast. Thanks to a couple of local repeaters and nodes, I chatted with hams in Europe and Japan while driving around town with the radio. The FTM-300DR's screen displayed the other station's call signs and link/reflector information (see Figure 3). If you want to get the most out of WIRES-X, download the FTM-300DR WIRES-X manual from the Yaesu website.

The cost of the FTM-300DR may make some amateurs a bit hesitant, but it is important to consider what you're receiving for your investment. Yaesu has packed a remarkable number of features and performance into the FTM-300DR — so many that it may not be an exaggeration to call it the ultimate C4FM radio. If you have System Fusion activity in your area and want the ability to enjoy digital and analog operating to the fullest, the FTM-300DR is a serious contender.

Manufacturer: Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630; **www.yaesu.com**. Price: $450.

SharkRF openSPOT3 Multimode Digital Hotspot

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In the past few years, the digital voice modes have rapidly grown to be popular on the VHF/UHF bands. It would be nice if radio manufacturers had all chosen the same digital voice mode, but that is not the case. On the other hand, for many hams, this is part of the fun because it gives them the opportunity to experiment with different approaches, and to meet the challenge of bridging together certain modes with virtual repeaters (called *reflectors*) that are accessed via the internet. This brought the introduction of multimode digital hotpots, and the openSPOT3 is one of the latest models. Basically, the openSPOT3 is a digital radio internet gateway with a low-power (20 mW) 70-centimeter transceiver to communicate with an amateur radio digital-mode transceiver.

There are several general concepts that are important to understanding the key differences between the

Bottom Line

Building on the previous model, the openSPOT3 multimode digital hotspot offers improved transcode performance for seamlessly allowing operators using different digital modes to talk with each other.