

## Product Review

# Yaesu FT-70DR Analog and System Fusion Dual-Band Handheld Transceiver

Reviewed by  
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With so many good handheld radios on the market, it can be hard to know which one to buy. Yaesu's made a good case for you to choose their FT-70DR, a 5 W handheld for 2 meters and 70 centimeters that gives you access to C4FM System Fusion digital, as well as traditional analog FM communications, for less than \$200 at the time of writing. If you're not up to speed on System Fusion, please see the sidebar, "Yaesu System Fusion for Beginners," to learn more.

### Introduction

The FT-70DR fills a niche as Yaesu's lowest cost digital-compatible handheld radio. It's a simpler radio than its big brother, the FT-2DR, and looks more like the original FT-1DR, with a smaller non-touch display and extensive buttons for controls. It sheds some of the conveniences of the prior C4FM handhelds, such as dual watch and a dot-matrix liquid crystal display (LCD), to keep its cost more reasonable. It retains a sensitive and selective receiver, with wideband coverage including the aircraft band.

### Bottom Line

Well priced and capable — this radio is a good choice for analog handheld use or for a gateway to System Fusion use.

The box contains the radio and a battery, a power supply for charging, a flexible antenna, a belt clip, and a basic user manual. (An advanced user manual can be found on Yaesu's website, along with programming software and firmware updates.) I usually replace the stock antenna with a telescoping higher-gain antenna, such as Diamond's SRH779, and I did my testing using both of these antennas.

### Physical Description

The FT-70DR is a substantial-feeling radio, belying its modest price point. It features a small segmented LCD; small but tactile buttons on the face; a single large knob on the top for adjusting frequency or programmed entries and volume, and four buttons on the left side (push-to-talk, a monitor button, an angled button to enable the main knob's volume controlling feature, and a power button). It's not a tiny radio, but it doesn't feel unwelcomingly large. As with Yaesu's other handhelds, the antenna jack is a standard SMA — one that lets hams swap antennas, as I tend to do.

The display's segmented characters are sufficiently large and quite readable, although not quite as pretty as dot-matrix displays can render. While small, the front buttons are easy enough to control — but I found that the raised ridges between them require an accurate press for actuation. (This does help to prevent depressing the wrong button.)

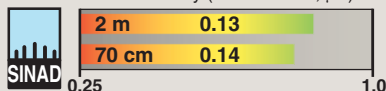


The 0 button is on the bottom row to the right of the 9, and not below the 8, so some care is required if you are searching number keys by feel. The side-mounted buttons, on the other hand, are large and easy to find by fingers alone.

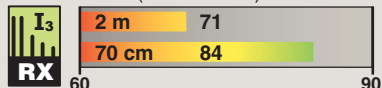
The chunky knob at the top of the device controls both tuning (by frequency and by memory programs) and volume. The latter is enabled by pressing the third button on the left side, which is conveniently angled to make it easy to differentiate from the other side buttons. At first, adjusting volume this way was not intuitive for me, but after a few days, I found that the procedure was automatic. An upside to this setup is that it is nearly impossible to change the volume accidentally.

## Yaesu FT-70DR Key Measurements Summary

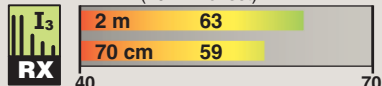
Receiver Sensitivity (12dB SINAD,  $\mu\text{V}$ )



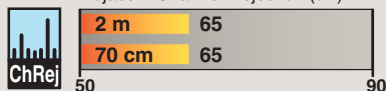
Receiver Third-Order Dynamic Range (dB)  
(10 MHz offset)



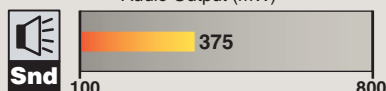
Receiver Third-Order Dynamic Range (dB)  
(20 kHz offset)



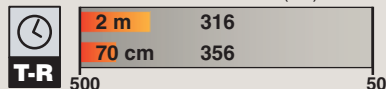
Adjacent Channel Rejection (dB)



Audio Output (mW)



TX-RX Turnaround Time (ms)



**KEY:** QS1803-PR125  
Bars off the graph indicate values over or under scale.

As with other Yaesu handhelds, the battery attaches securely but is not difficult to remove. The right side of the radio has a single 3.5-millimeter speaker-microphone jack, a data connection (for programming and firmware updates), and a charging/power jack.

## Radio Programming

At initial power-up or after factory reset of the configuration, the radio prompts for a call sign to be entered, which enables using the radio in System Fusion mode. Once this is done, the radio is ready for you to enter a frequency and necessary parameters, or for memory programming.

**Table 1**  
Yaesu FT-70DR, serial number 7H021187

Manufacturer's Specifications	Measured in ARRL Lab
<p>Frequency coverage: Receive, 108 – 137, 137 – 580 MHz. Transmit, 144 – 148, 430 – 450 MHz.</p> <p>Modes: Receive, AM, FM, C4FM. Transmit, FM, C4FM.</p> <p>Power requirements (at 7.4 V dc): Receive, 180 mA (3/4 volume), 120 mA (standby, saver off), 70 mA (saver on). Transmit, at 5 W RF output, 1.6 A (144 MHz), 1.9 A (430 MHz). Power off, 400 <math>\mu\text{A}</math>.</p>	<p>Receive: 108 – 136.995 MHz (AM), 137 – 173.995 MHz (FM and C4FM), 174 – 419.995 MHz (FM), 430 – 469.995 MHz (FM and C4FM), 470 – 579.995 MHz (FM). Transmit, as specified.</p> <p>As specified.</p> <p>At 8.2 V dc (full charge): Receive, 442 mA (no signal, max volume, lights on), 342 mA (lights off), 118 mA (standby, saver off), 72 mA (saver on). Transmit (H/M/L): 1.35/0.79/0.47 A (144 MHz). 1.76/1.16/0.64 A (430 MHz).</p>
Receiver	Receiver Dynamic Testing
<p>FM sensitivity: 12 dB SINAD, 0.16 <math>\mu\text{V}</math> (137 – 174 MHz), 0.1 <math>\mu\text{V}</math> (174 – 222 MHz), 0.5 <math>\mu\text{V}</math> (300 – 350 MHz), 0.2 <math>\mu\text{V}</math> (350 – 400 MHz), 0.18 <math>\mu\text{V}</math> (400 – 470 MHz), 0.35 <math>\mu\text{V}</math> (470 – 580 MHz).</p> <p>AM sensitivity: 10 dB S/N, 1.5 <math>\mu\text{V}</math>.</p> <p>Two-tone, third-order IMD dynamic range: Not specified.</p> <p>Adjacent-channel rejection: Not specified.</p> <p>IF and image rejection: Not specified.</p> <p>Squelch sensitivity: Not specified.</p> <p>Audio output: 300 mW at 10% THD into 8 <math>\Omega</math>.</p>	<p>For 12 dB SINAD: 146 MHz, 0.13 <math>\mu\text{V}</math>. 162 MHz, 0.13 <math>\mu\text{V}</math>. 440 MHz, 0.14 <math>\mu\text{V}</math>.</p> <p>For 10 dB S+N/N: 0.5 <math>\mu\text{V}</math> (120 MHz).</p> <p>20 kHz offset: 63 dB (146 MHz), 59 dB (440 MHz). 10 MHz offset: 71 dB (146 MHz), 84 dB (440 MHz).</p> <p>20 kHz offset: 65 dB (146 MHz), 65 dB (440 MHz).</p> <p>IF rejection: 81 dB (146 MHz), 131 dB (440 MHz). Image rejection: 73 dB (146 MHz), 52 dB (440 MHz).</p> <p>Squelch range: 0.12 – 0.28 <math>\mu\text{V}</math> (146 MHz), 0.16 – 0.35 <math>\mu\text{V}</math> (440 MHz); 0.13 – 0.28 <math>\mu\text{V}</math> (120 MHz AM).</p> <p>375 mW at 9% THD into 8 <math>\Omega</math>. THD at 1 V<sub>RMS</sub>, 2.5%.</p>
Transmitter	Transmitter Dynamic Testing
<p>Power output: H/M/L, 5 / 2 / 0.5 W at 7.4 V dc.</p> <p>Spurious signal and harmonic suppression: <math>\geq 60</math> dB (H/M), <math>\geq 50</math> dB (low).</p> <p>Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.</p> <p>Receive-transmit turnaround time ("TX delay"): Not specified.</p> <p>Size (height, width, depth): 4.4 × 2.7 × 1.2 inches (including protrusions); antenna length, 7 inches. Weight, 9.0 oz. with battery, belt clip, and antenna.</p> <p>†7.4 V, 1,800 mAh Li-ion battery standard. SBR-24LI replacement battery, \$40. SBH-28 rapid charger stand, \$30.</p>	<p>At 8.2 V dc (full charge), H/M/L: 5.0 / 2.0 / 0.5 W (146 MHz). 4.5 / 2.0 / 0.5 W (440 MHz). With 13.8 V dc external power: 5.0 / 2.6 / 0.6 W (146 MHz). 4.5 / 1.9 / 0.47 W (440 MHz).</p> <p>146 MHz: <math>&gt;70</math> dB (H/M), 64 dB (low). 440 MHz: <math>&gt;70</math> dB. Meets FCC requirements.</p> <p>Squelch on, S-9 signal: 316 ms (146 MHz), 356 ms (440 MHz).</p> <p>33 ms (146 MHz), 39 ms (440 MHz).</p>

The FT-70DR is fairly easily configured by hand. When I get a new handheld, I intentionally try to configure the parameters for my portable Internet Radio Linking Project (IRLP) node, which requires me to override automatic repeater offsets and to enable a CTCSS (tone) frequency — an excellent test of how intuitive the radio is for a ham with a few years of experience. I was able to get all but CTCSS done without referring to the manual, and needed to download the *Advance Manual* from Yaesu's website to figure out the mystery. Despite all this, I only needed a few minutes.

Yaesu supplies free programming software on its website, and I recommend that memories be programmed this way. Note that each memory channel can store the mode of operation (analog or digital). This software also enables much easier programming of memory banks, which is convenient when you use the radio in multiple locations. I took advantage of the rig's AM air band compatibility to program in some frequencies for local air traffic control and air-to-air communications (more on this later). I found this program to be pretty intuitive and straightforward — even easier than software for the FT-2DR and FT-400XDR, which are my primary handheld and mobile radios, respectively.

## Operation

If you're familiar with other Yaesu handhelds, particularly System Fusion models, you should find operation to be quite intuitive. The display does a good job of describing how the radio is configured. A pair of fairly wide light-emitting diodes (LEDs) at the top will illuminate in different colors to indicate what is happening — analog reception, digital reception (see Figure 1), transmission, mis-configuration of digital or analog tone squelch mode, and some System Fusion group communication modes. I found this feature helpful.

## Yaesu System Fusion for Beginners

Yaesu System Fusion (also known as C4FM or YSF) has experienced a significant growth in popularity in the last few years, as Yaesu has provided aggressively priced repeater hardware to radio clubs. Compared to other VHF/UHF digital voice modes, System Fusion has a gentle learning curve that requires no preparation other than programming your call sign into your radio. Check with your local club, the *ARRL Repeater Directory*, or RFinder online to see what repeaters near you support the mode.

System Fusion supports two-way communication of physical location via the use of GPS, but the FT-70DR lacks a GPS receiver and cannot send your coordinates during digital transmissions. While higher-end C4FM radios will display other hams' distance from your position, the FT-70DR is not capable of this feature.

System Fusion supports a higher-bandwidth mode that sacrifices this position information. Although this mode is not commonly used on repeaters and internet-transported reflectors, it does provide a higher-quality digital audio experience. The FT-70DR is easily put into this mode.

If you don't have a local System Fusion repeater, it is possible to connect to public reflectors that connect various nodes and repeaters together. *QST* has reviewed several devices that can give you this compatibility: the DV4Mini (in the December 2016 issue), Micro-Node Nano-DV (in the August 2017 issue), and OpenSPOT (in the May 2017 issue).

Like other C4FM radios, the FT-70DR can be configured to set the transmission mode automatically, whether digital or analog. This is particularly handy on repeaters that operate in both modes, but some care has to be taken to ensure that you are in the right mode when transmitting. (By default, the last mode received is also the transmit mode.) Of course, you can also set the mode manually.

The built-in speaker, while small, sounds reasonably rich and has excellent volume. Outgoing audio, whether by speaker-mic or the built-in microphone, sounded fine to other hams. I run a weekly IRLP net via handheld, which gives me an excellent opportunity to thoroughly test both inbound and outbound audio, and I found this radio to work very well for the purpose.

Connecting the charging cable is somewhat fiddly, but the radio does display a clear **CHARGING** on the



**Figure 1** — Display while receiving a C4FM signal from a local System Fusion repeater, indicated by the glowing LEDs at the top.

display to make it obvious that the connection is working. Yaesu offers an optional fast-charging cradle that would probably make a good purchase for a heavy user of handhelds.

The radio is a convenient general receiver for a wide range of FM bands. It is capable of tuning in to frequencies between 137 and 580 MHz (which includes the 1.25-meter band, but excludes the broadcast FM band). The FT-70DR also offers AM reception between 108 and 137 MHz. This latter capability allows you to tune into the aviation band.



**Figure 2** — Close-up of the illuminated display while tuned in to an AM aviation band frequency (Winnipeg Centre). Compatibility with the aviation band makes this radio a fun travel companion. The keypad illuminates with the same color.

If you, like I, are an avid listener outside the amateur bands, you might find this radio to be an excellent portable answer to monitoring aircraft frequencies (see Figure 2). I listened to air traffic control from Seattle's Boeing Field on a recent trip, and use the radio's scanning feature to run through a list of programmed aviation-band frequencies used near my Saskatchewan home. The scanner's quick operation allows you to check many frequencies very fast. (I even discovered that Asian nonstop flights to Las Vegas often fly over Regina.) Features like this make the radio a fun travel companion.

Some hams may prefer this radio to touchscreen devices, such as the Yaesu FT-2DR series. Configuring various settings of the FT-70DR is somewhat more intuitive, as you don't have to guess which menu hides a certain setting. If you find more complicated user interfaces to be frustrating, you might prefer this handheld's simpler interface.

I have very few criticisms of the device. Volume control operation, as described earlier, is the most obvious issue, but a few days of use make this pretty instinctive. I like how

## Lab Notes: Yaesu FT-70DR

*Bob Allison, WB1GCM, Assistant Laboratory Manager*

The Yaesu FT-70DR's transmitter exceeds FCC requirements for harmonic and spurious suppression. Transmitter RF power output stays fairly constant over a wide range of supplied dc voltage, dipping only 100 mW or so from a full battery charge of 8.2 V dc, to minimum operating voltage (6 V dc for the battery or 11 V dc from an external power supply).

The receiver is sensitive and covers additional spectrum. Third-order IMD dynamic range at both 20 kHz and 10 MHz spacing is average, meaning that no unwanted mixing should occur unless the user is in a spectrally dense location. The audio output from the speaker jack is 375 mW at 9% THD (total harmonic distortion), not 10% THD as normally quoted, due to the volume control steps.

I found the squelch level control to be rather narrow, from  $-125$  to  $-118$  dBm. That means the entire squelch level range is for weak signals only. This can be an issue in locations with a high (manmade) noise level, bleed-through from computers, or nuisance carriers from television systems.

Yaesu does provide two green LED (bar) indicators above the display to draw your attention to incoming signals. A weak signal will light only the left side LED if the signal is not strong enough to break the squelch. Both LEDs light when the signal is strong enough to break the squelch. A Set Mode menu setting provides nine steps of an RF squelch threshold adjustment.

Overall, the FT-70DR performs as it should and comes with a comprehensive, easy-to-read manual.

many handhelds have modes operating at very low power, which can be convenient for using hotspots or when in easy range of repeaters. The FT-70DR allows power settings of 5, 2, and 0.5 W — better than some radios offer, but I'd like a 0.1 W setting. I also find myself missing dual watch, which I have on my FT-2DR, but that feature isn't typically included at this price point.

One other circumstance of note: because the FT-70DR lacks a global positioning satellite (GPS) receiver, it cannot send your location when using System Fusion mode, and the display cannot display incoming position information received in the mode from other amateurs. This is a fun feature found on the more expensive Yaesu handhelds, but it's not critical.

## Final Thoughts

This radio is attractive as the lowest-priced new radio compatible with System Fusion, but it is an excellent analog radio as well — for not much more money than good-quality, analog-only handhelds. The build quality seems high, and the wide receive range and aviation-band compatibility add some fun flexibility. This radio would make a great starter handheld for a new ham, or a capable primary handheld for an amateur on a budget.

*Manufacturer:* Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630; tel. 714-827-7600; [www.yaesu.com](http://www.yaesu.com).  
Price: \$199.