

Yaesu FT-7900R Dual Band Mobile Transceiver

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The Yaesu FT-7900R dual band FM mobile is an update of the FT-7800R reviewed back in April 2004.¹ That was a long time ago! What got updated? Not really that much — it didn't need much. It's a very capable radio with a really good receiver. So what I'm going to do is dig deeper and use this radio to discuss some things about FM and repeater operation that affect day-to-day operation.

The first thing I want to do is introduce two acronyms: OBAAT and TWOBAAAT. They stand for *One Band At A Time*, and *Two Bands At A Time*. Since I invented the words, I get to decide how to pronounce them. The *O* in OBAAT is more like the *oo* in boot, so it rhymes with the *two* in TWOBAAAT.

The FT-7900 is an OBAAT. It can transmit on 2 meters or 70 centimeters, but you can listen to just one frequency at a time. Hence the name. The receiver covers 108 MHz to 1 GHz, skipping only the television channels at 500 and 600 MHz and the usual cell phone stuff at 800 MHz. No loss — all that's gone digital, so you couldn't decode it anyway. This receiver coverage is good, but it's not exceptional. Some handhelds cover the shortwave and AM and FM broadcast bands. Shouldn't mobile radios do more than handhelds? *That* would be exceptional in a dual band mobile radio.

What *is* exceptional is the radio's immunity to *intermod* — the mixing of two strong off-channel signals creates a new signal that appears on a third frequency where you don't want it. You'll hear hams say that any receiver with a "barn door" front end (that is, wide enough to tune the business and public safety frequencies far outside the ham bands) will be prone to intermod. But Yaesu's FT-7900 (and '8800 and '8900) have broad receivers with good intermod specs on VHF, so you can have your cake and tune it, too. On 2 meters, the ARRL Lab measured IMD dynamic range at 10 MHz spacing that's considerably better than the typical dual band mobile, and it's even slightly better than many 2 meter only radios we've reviewed in the past few years.

The FT-7900 transmits only FM, wide and narrow. *Wide and narrow*? Yes. For a decade at least, our FM radios have had the option of using the usual 5 kHz deviation (now called wide), or 2.5 kHz deviation, usually called narrow. The 2.5 kHz deviation permits put-



ting channels closer together, squeezing more repeaters into a given amount of spectrum. Few if any ham repeaters are using narrow deviation, as it is somewhat incompatible with wide and there are still plenty of radios in use that only do wide. Narrow deviation will be useful in another few decades when those old legacy radios are toast. Our commercial cousins are required to switch to narrow now.

Transmit audio reports on the '7900 were good. I always wish for a little higher fidelity, but this radio is okay with my voice and some hams rave about it. Some transceivers now have at least a two step MIC GAIN control, but not this Yaesu line. I'm sure you've heard the wide range of transmit audio levels among stations on the repeaters. Crank up the volume to hear station A's near-whisper, and when station B picks it up his booming voice rattles your teeth. Put a MIC GAIN control and mild compression on my wish list. Opposing argument — users will misadjust these controls.

OBAAT or TWOBAAAT?

I prefer TWOBAAATs over OBAATs. I've had the FT-7900's big (and older) brother, the FT-8900, TWOBAAAT, for some time now. TWOBAAATs give you most of the capability of two OBAATs for about 50% more money. They can listen to and display two frequencies at the same time.

When I recommend TWOBAAATs (and I'm using the heck out of the terms to make it hard for the editor to snip out the concept, though I admit it's starting to look silly), hams often ask me how I can listen to two conversations at once. The fact that I can, by adjusting them to different volume levels, is not the point. Usually I'm listening to one repeater frequency that may or may not be busy on side A, while scanning or listening to another frequency on side B. I'll catch any traffic that pops up on side A while still entertaining myself with whatever activity I

can monitor on side B.

This argument fails to persuade many hams. In the likely event you're among them, the '7900 is just right for you. By the way, the '7900 *does* hear our 222 MHz band but doesn't transmit there.

Music Box

All the front panel buttons except the POWER button are backlit and easy to read. Display characters are large and easy to read, too, but there are only six large characters available for the user programmed alphanumeric label for memory channels. The rest of the display is used for the little icons that indicate radio parameters. A nice touch — you can choose between frequency or alphanumeric label on a channel-by-channel basis.

The FT-7800 review noted that the display tended to fade when viewed from off axis. I don't see that with the '7900 except from *way* below, at which point it totally disappears. Side and high angle views are good almost until the body of the radio is in the way. Display brightness is adjustable. Good job!

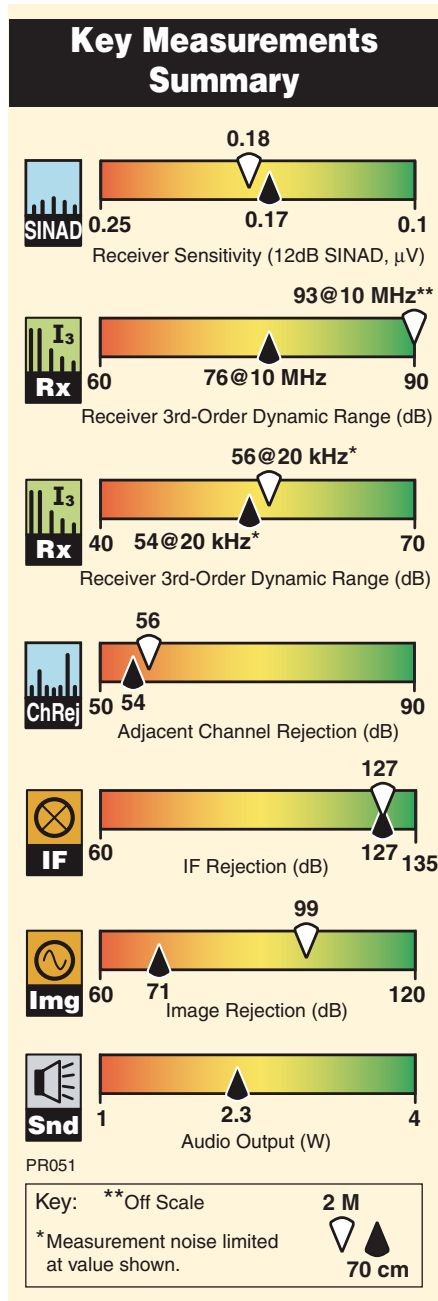
Most of the mic buttons can be lit, but you can turn the light off with a switch on the side to save power if you're operating with limited battery power. The A, B, C and D mic buttons provide additional functions in receive mode.

The front panel buttons make low or high pitched beeps with a logical pattern if pushed. The number keys on the mic all have their own beep tones, pitched low to high corresponding to the numbers. This "music" helps hams with vision limitations a lot, of course. It also helps drivers who should be keeping their eyes on the road. You can turn the beeps off if they bother you.

The panel itself is removable and the body can be remote mounted. The YSK-7800 separation kit is listed as an option, but one came with the review radio as a promotion. It consists of a long cable with RJ-11 con-

¹J. Garcia, NJ1Q, "The Yaesu FT-7800R Dual Band FM Transceiver," Product Review, QST, Apr 2004, pp 78-81.

nectors at each end and a bracket to mount the control head. I like that the microphone plugs into the head, not the radio body, so you don't need a separate cable to extend the mic. The speaker is in the body, of course, so you'll have to use an external speaker if you tuck the body in the trunk or under a seat. The internal speaker is adequate if the radio is nearby, but it sounds better with an external speaker.



Bottom Line

Yaesu's FT-7900R dual band mobile radio includes excellent receiver performance, a wide range of features and relatively simple operation in a sturdy package.

The VOLUME and SQUELCH knobs don't have much friction, so they're easy to mis-adjust in a bouncing car. I recently started appreciating the stiffer knobs on some other radios in my mobile. I think the roads are getting worse.

The back of the radio has the ANTENNA connector, a 1/8 inch mono SPEAKER jack, a six-pin mini-DIN for packet and programming, and a fan that activates during transmit and stays on for a while in receive. The fan is quieter than most.

Simple? It's Manual Time...

Yaesu's Web site says the radio "...is designed for simplicity of operation." Many hams who commented online agree, and they like it. My take: It's true that nothing in the '7900 is overly complex, but there are *dozens* of simple operations. Some are set and forget, but a few routine functions are buried deeper than I'd like. Many functions are clearly labeled on the buttons, but many more are not. The '7900 has 48 items in its SET menu, in alphabetical order if you can decode the sometimes cryptic labels. You'll probably never use some of the features controlled in those menus, and a truly simple radio would do without them, but they don't get in the way. The '7900 is about as simple as a radio can be today.

The manual does a very good job of guiding you through the settings and options in its 78 pages. It includes a narrative description of what a function is for, in addition to the step-by-step instructions of how to set it. It's short and to the point, and most of the time it's clear if you have a basic understanding of FM and repeater operation. As I flipped through the manual, a sheet fell out. It was a full schematic and block diagram. You'll need a magnifying glass, but it's a nice touch.

Tone Deaf

CTCSS (continuous tone coded squelch system, which I'll shorten to *tone*) is a necessary evil. More than half the repeaters on the air require it, and the complaints about it have finally abated. Maybe the last radio that didn't have tone built in finally broke. But tone is still "traveler hostile." Without advance planning and programming, a ham on the road is effectively locked out of tone access repeaters.² Better design could help.

The '7900 is an example of a radio that could do a much better job with tone. You turn tone on and off with a convenient front-panel button, but you set the tone frequency by digging up a menu that can be multiple button pushes and knob twists away.

If you need this radio to hunt up a tone from a new repeater, you're going to have to work for it. *Tone scan* is a feature most radios have to help you find the tone for a repeater you've encountered. While the repeater is on the air, the radio scans through the list of about 50 possible tones and stops when

it encounters the tone that the repeater is sending. A few radios make this easy, with a dedicated one push front panel button. The '7900 makes you dig through a couple of menus to start the scan, and then makes the radio go deaf until the tone is found. You do *not* want to do this while driving.

Banks for the Memories

The FT-7900 has about 1000 memory channels. How many memory channels do you use in your current radio? Less than 10, 0? I hear that a lot.

I admit I'm a power user. I like knowing what's going on with all the repeaters in the area, so I scan a lot. When I'm on the road, I scan the whole band. To do this, I program all the local repeaters into a group of memories. That takes about 70 in my area. Then I program all the 2 meter band plan channels into memory. That uses about 100 memory channels, and I'm a button push away from scanning everything. The memory channels hold the usual suspects — frequency, offset, tone — and one parameter other radio brands I've used don't — power.

You could use the '7900's *band limit scan*, with which you program in the low and high limit frequencies, then scan everything in between. That works okay on UHF, where all the repeater output frequencies are neatly lined up across about 5 MHz of spectrum (but a *different* 5 MHz in different regions of the country, and not in the Northeast, where input and output frequencies may be inverted). On 2 meters, our convoluted band plan doesn't lend itself to that kind of scan at all. Programming *all* the channels into memories makes scanning them more efficient. Even then we have *two* basic band plans to consider. Most eastern states use 20 kHz channels below 146 MHz and 15 kHz channels above. Many western states (and Michigan and Alabama) use all 20 kHz channels. The FT-7900's 1000 memories make it possible to store two sets of band plan channels. You'll want to use the optional ADMS-7900 programming software and cable, not the buttons and dial on the front panel.

Using a radio loaded up with 1000 memory channels is wonderful — until you try to figure out where you are in those 1000 channels, and how to get to where you want to be. If you remember the memory number, you can use the mic to key it in directly (you can also enter frequencies directly in VFO mode). Dialing across 1000 memories takes a while. Speed it up by pressing the MHz button and tuning 10 channels per click.

That's still a lot of dialing, so I'm grateful for the bank system that lets you group memories together, effectively making a much smaller radio. The '7900 lets you place a given memory channel in one or more of 20 banks. If you're in a bank and spin the dial, you dial only the channels in the bank. Push

Table 2
Yaesu FT-7900R, serial number 9L000080

Manufacturer's Specifications

Frequency coverage: Receive, 108-520, 700-999.990 MHz (cellular blocked); transmit, 144-148 MHz, 430-450 MHz.

Modes: FM, NFM, AM (108-136, 300-336 MHz).

Power requirements: 13.8 V dc \pm 15%; receive: 500 mA (squelched); transmit, 8.5 A (144 MHz, 50 W), 9 A (430 MHz, 45 W).

Receiver

FM sensitivity: 12 dB SINAD, 0.2 μ V (137-150 MHz), 0.25 μ V (150-174 MHz), 0.3 μ V (174-222 MHz), 0.25 μ V (222-300 MHz and 336-420 MHz), 0.2 μ V (420-520 MHz), 0.4 μ V (800-900 MHz), 0.8 μ V (900-1000 MHz).

AM sensitivity: 10 dB S+S/N, 0.8 μ V (108-137), 0.8 μ V (300-336 MHz).

FM two-tone, third-order IMD dynamic range: Not specified.

FM two-tone, second-order IMD dynamic range: Not specified.

Adjacent-channel rejection: Not specified.

Spurious response: Not specified.

Squelch sensitivity: >0.16 μ V.

S meter sensitivity: Not specified.

Audio output: 2 W at 10% THD into 8 Ω .

Transmitter

Power output (high, mid 1, mid 2, low): 146 MHz, 50, 20, 10, 5 W; 440 MHz, 45, 20, 10, 5 W at 13.8 V dc \pm 15%.

Spurious signal and harmonic suppression: >60 dB.

Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.

Receive-transmit turnaround time ("tx delay"): Not specified.

Size (height, width, depth): 1.6 x 5.5 x 6.6 inches (w/o knobs); weight, 2.2 pounds.

Price: FT-7900R, \$290; ADMS-7900 Windows programming software and cable, \$50; YSK-7800 separation kit, \$50; CT-39 packet cable, \$12.

*Measurement was noise limited.

Measured in ARRL Lab

Receive, 108-136 (AM), 136-300, 300-336 (AM), 336-520, 700-824, 850-869, 894-914, 939-959, 984-1000 MHz; transmit, as specified.

As specified. AM is receive only.

Receive, 405 mA (max vol, max lights, no signal), 160 mA (standby, no lights). Transmit (high, mid 1, mid 2, low), 146 MHz, 7.8, 4.4, 3.3, 2.4 A; 440 MHz, 7.7, 4.6, 3.4, 2.6 A.

Receiver Dynamic Testing

For 12 dB SINAD, 0.18 μ V (146 MHz), 0.2 μ V (162 MHz), 0.28 μ V (200 MHz), 0.22 μ V (222 MHz), 0.25 μ V (360 MHz), 0.17 μ V (440 MHz), 0.3 μ V (850 MHz), 0.73 μ V (902 MHz).

For 10 dB S+S/N, 0.91 μ V (120 MHz), 0.8 μ V (320 MHz).

20 kHz offset: 56 dB* (146 and 222 MHz), 54 dB* (440 MHz), 50 dB* (902 MHz). 10 MHz offset: 93 dB (146 MHz), 63 dB (222 MHz), 76 dB (440 MHz), 70 dB, (902 MHz).

87 dB (146 MHz), 109 dB (440 MHz).

20 kHz offset: 56 dB (146 and 222 MHz), 54 dB (440 MHz), 50 dB (902 MHz).

IF rejection, 127 dB (146 and 440 MHz), 116 dB (222 MHz), 120 dB (902 MHz). Image rejection, 99 dB (146 MHz), 95 dB (222 MHz), 71 dB (440 MHz), -7 dB (902 MHz).

At threshold, 0.05 μ V (146 MHz); 0.07 μ V (440 MHz).

Full scale: 5.3 μ V (146 MHz), 6.3 μ V (440 MHz).

2.3 W at 3.2% THD into 8 Ω (max volume), THD at 1 V RMS, 1.5%.

Transmitter Dynamic Testing

146 MHz: 44.8, 16.2, 8.0, 4.6 W; 440 MHz: 36.3, 16.3, 8.2, 3.8 W. At 11.4 V dc, 40.9 W (146 MHz), 36.1 W (440 MHz).

69 dB (146 MHz), 68 dB (440 MHz). Meets FCC requirements.

Squelch on, S9 signal, 144 ms.

122 ms (146 MHz), 96 ms (440 MHz).

Programmable Buttons, and Very Programmable Buttons

One function that's buried deeper than it should be is the repeater offset *direction* —

up, down or off (simplex). Fortunately, the '7900 has four programmable buttons on the microphone that can be set to select any of 17 parameters. I keep the offset direction on one of those buttons on my '8900. True, the radio has an automatic offset function, but band plans in many states offer offset options for some channels (especially 147.00 MHz). And the radio leaves the automatic offset *on* for the whole top 10 MHz of the UHF band, even though some of that spectrum is used for simplex. One of the front panel buttons is programmable, too, with a choice of six parameters.

Five front panel buttons *combine* the functions of programmable buttons and memories. These are the HYPER MEMORY buttons located to the left and right of the display. Press and *hold* one of these buttons and it takes a "snapshot" of every parameter and condition of the radio. Press it *briefly*, and it recalls what you set. So put the radio in MEMORY BANK 1, start it scanning, then press and hold HYPER MEMORY 5. Set up for something else, and later, when you press HYPER MEMORY 5, you're back in MEMORY BANK 1, scanning away. The HYPER MEMORY function goes deep into all the SET functions, so be careful what you select. I find these buttons incredibly useful.

The sixth button alongside the display can be used to lock the radio so you don't accidentally bump the dial or change other parameters. That button also activates the WIRES DTMF function. (WIRES is Yaesu's brand of Internet linking for repeaters — think IRLP and Echolink. It's more popular in Europe and Asia than in the US.) Activating it causes the radio to send a programmable series of DTMF tones at the start of each transmission (that's how WIRES works), meanwhile muting the microphone for a while. Turning it on accidentally can cause problems on repeaters that mute for several seconds if receiving DTMF tones — nobody will hear what you say! You'll hear the tone in your speaker, and a little icon appears on the display. I've had to talk many a Yaesu user through how to turn WIRES off when I noticed that the first several seconds of every transmission were muted.

Conclusion

Everybody's product line includes a dual band OBAAT, all priced within a narrow range. The FT-7900R distinguishes itself with a better than average receiver, some unique features you'll appreciate (and I didn't cover them all), and relative simplicity. It's a worthy contender if your needs, wants and budget are modest.

Manufacturer: Vertex Standard, 10900 Walker St, Cypress, CA 90630; tel 714-827-7600; www.yaesu.com.

²With the ARRL's *Travel Plus for Repeater*s and some programming software, you can plan ahead by loading the repeaters you'll pass on your trip into memory, tone and all.

scan, and you scan only the bank. So there's my local group, my airport group, my over-the-road group and my public service event group. Sweet.

A few repeaters use nonstandard offsets. The '7900 gives you a way to program a memory for a nonstandard split without changing the offset setting, using a few extra button pushes and a mic click. This function

will also let you program different tones for transmit and receive. Not many repeaters need that, but if yours does, the feature is handy, and rare.