# Yaesu VR-5000 Communications Receiver

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A ham friend spotted the VR-5000 sitting on a table next to my amateur station. "Hey! New transceiver?" he asked. "No," I said. "It's Yaesu's new dc-to-daylight receiver-scanner."

My friend seemed a little disappointed, and that's a common reaction among those who believe that anything in a box with a dial, buttons and a frequency display must also be capable of transmitting to have real value.

While it's true that many of us amateurs live to transmit there are occasions when *just listening* can be as much or even more fun.

The Yaesu VR-5000 communications receiver gives you access to a lot of wide-open listening spaces. It also includes some dandy features you probably don't have on any of your amateur transceivers.

## A Quick Overview

What's in the little black box? Well, it's a general-coverage, multimode receiver that can help you get acquainted with the radio frequency real estate between 100 kHz and 2600 MHz (cellular excluded). This includes nearly all of the major Amateur Radio allocations as well as some potential bands we haven't yet acquired title to but might, such as 136 kHz and 5 MHz. The VR-5000 also can give you entrée to UHF bands your H-T or VHF-UHF mobile likely do not cover. For example, AO-40 (as of press time) was transmitting telemetry only on its 2.4 GHz beacon. Unfortunately for scanner fans, the VR-5000 lacks trunk-tracking capability, a desirable feature found in scanners within the same general price range.

Available modes for the main receiver include FM (narrow and wide), AM (narrow and wide), LSB/USB, and CW. The sub-receiver operates either in AM or FM.

Other goodies include 2000 regular memories, 50 band-edge memories, and five preset channels. With that many memories, you should not have a problem storing all of your favorite short-wave and public safety frequencies. Additionally, the 50 programmable search ranges allow setting up many discrete spectrum segments for searching. The five preset memories are great for quickly getting to those most special frequencies—the local repeaters, for example, or possibly the Amateur Radio on the International Space Station—or ARISS—2-meter downlinks. There's a sub-receiver that lets you make excursions from the main dial setting up to 20 MHz away.

Connectors on the rear apron let you hook up a coaxial fed antenna (there's an SO-239) or an unbalanced high-impedance antenna. Also on the back of the radio are a **MUTE** jack, a switch to select the antenna jack, A or B, an external speaker jack, a record jack (constant 8 mV) that provides output unaffected by the volume or tone controls; a +8 V jack for accessories, an IF output jack (10.7 MHz), and a nine-pin *Computer Aided Transceiver*, or CAT, serial (RS-232C) computer control jack.

The serial jack suggests the option of greater external control than is actually possible. PC control of the VR-5000 is limited to the main VFO frequency, receive mode and channel step.

One neat feature is called *Programmable Memory Recall*. PMR lets you set up the radio to monitor activity on up to 50 memory channels at the same time. Why would you want to do that? Glad you asked. Yaesu suggests that this capability could come in handy if you wanted to monitor traffic levels on several repeater sites. The PMR Board on the display gives a graphical representation of channel occupancy at a given time.

Another is the *Band Scope*. This lets you view activity on either side of your current operating frequency. Move the channel marker to a signal you spot, and you're there.

For prospective short-wave listeners (SWLs), Yaesu has thoughtfully programmed a block of popular international broadcast outlets, such as *Radio Nederland*, *Radio Australia* and *Deutsche Welle*. This is a great help to new hams who often cut their radio teeth as SWLs.

### Bottom Line

The VR-5000 Communications Receiver opens the door to endless exploration in a nearly boundless range of radio spectrum—but don't forget to bring along the manual!

## Using It

We amateurs tend to expect receivers to be uncomplicated devices that are simple to use. After all, there's no transmitter in the box—how hard could it be, right? Well, not so fast there, VOX breath! We determined that while the VR-5000 is pretty easy to hook up and get squawking, making it do what we wanted takes a bit more TLC.

Our resident scanner buff tried putting the *Operating Manual* aside to see how easy it would be to play with the features and how much he could figure out on his own. "While I was able to operate in the VFO mode, it was not long before I had to hit the book," he reported.

In short, the VR-5000 is not always very intuitive to use, and on occasion it could get downright frustrating when you'd unintentionally back yourself into some nook or cranny by pushing a wrong button. There are a keypad and a lot of buttons, most of them with at least two discrete functions and not all obvious by their labels. On the other hand, some buttons that seemed to be obvious—weren't! Pushing the **BANK** key is supposed to select the desired memory bank. On all occasions, pushing this button took us to a setup menu that let the user modify the current memory bank or create a new one altogether.

It can take many keystrokes on the VR-5000 to reach a desired state or to program a block of channels. Going strictly by the book, it takes a dozen steps to set the handy on-screen world clock (with accompanying map graphic) that gives time reference to 66 different areas of the world. We found that it was easy to mess up on the steps, and that programming

## Table 2
## Yaesu VR-5000, serial number 0K030164

| *Manufacturer's Claimed Specifications* | *Measured in the ARRL Lab* |
|---|---|
| Frequency coverage: 0.01-824; 849-870; 894-2600 MHz. | As specified. |
| Modes of operation: FM, WFM, AM, AM-N, WAM, USB, LSB, CW. | As specified. |
| Power requirements: 0.7 A (maximum volume), 13.5 V dc ±15%. | 0.76 A (maximum volume, no signal), tested at 13.8 V dc. |
| Size (HWD): 2.8×7.1×8 inches; weight, 4.2 pounds. | |
| CW/SSB sensitivity (10 dB S/N): 0.2-0.5 MHz, 4.8 μV; 0.5-1.8 MHz, 1.0 μV; 1.8-4 MHz, 0.6 μV; 4-30 MHz, 0.3 μV; 30-2000 MHz, 0.3 μV; 2000-2600 MHz, 1.8 μV. | Noise floor (MDS): 1.0 MHz, –118 dBm; 3.5 MHz, –124 dBm; 14 MHz, –128 dBm; 50 MHz, –133 dBm; 144 MHz, –133dBm; 222 MHz, –125 dBm; 432 MHz, –133 dBm; 902 MHz, –128 dBm; 1240 MHz, –122 dBm; 2400 MHz, –128 dBm. |
| AM sensitivity (10 dB S/N): 0.2-0.5 MHz, 10.8 μV; 0.5-1.8 MHz, 4.0 μV; 1.8-4 MHz, 2.5 μV;4-30 MHz, 1.1 μV; 30-2000 MHz, 1.2 μV; 2000-2600 MHz, 1.8 μV. | AM narrow, test signal modulated 30% with a 1-kHz tone, 10 dB (S+N)/N: 1.0 MHz, 3.2 μV; 3.8 MHz, 1.2 μV; 53 MHz, 0.55 μV; 120 MHz, 0.53 MHz; 146 MHz, 0.7 μV; 440 MHz, 0.71 μV. |
| FM narrow sensitivity (12 dB SINAD): 28-30 MHz, 0.35 μV; 30-2000 MHz, 0.45 μV; 2000-2600 MHz, 0.8 μV. | FM narrow, 12 dB SINAD: 29 MHz, 0.33 μV; 52 MHz, 0.21 μV; 146 MHz, 0.24 μV; 222 MHz, 0.58 μV; 440 MHz, 0.23 μV; 906 MHz, 0.41 μV; 1296 MHz, 0.69 μV; 2400 MHz, 0.49 μV. |
| FM wide sensitivity (12 dB SINAD): 30-2000 MHz, 1.5 μV. | 100 MHz, 1.8 μV. |
| Blocking dynamic range: Not specified. | CW mode: 3.8 MHz, 70 dB; 14 MHz, 70 dB; 50 MHz, 72 dB; 144 MHz, 69 dB; 222 MHz, 68 dB; 432 MHz, 76 dB; 902 MHz, 69 dB; 1240 MHz, 81 dB. |
| Two-tone, third-order IMD dynamic range: Not specified. | CW mode dynamic range and third-order intercept point<br>*Frequency (MHz)* / *Dynamic Range (dB)* / *Intercept point[1] (dBm)*<br>3.8 / 61 / –32<br>14 / 63* / –35<br>50 / 63* / –38<br>144 / 62* / –40<br>432 / 65* / –36<br>902 / 60* / –38<br>1240 / 71* / –17 |
| Second-order intercept point: Not specified. | +11 dBm. |
| FM adjacent channel rejection: Not specified. | 20 kHz channel spacing: 29 MHz, 49 dB; 52 MHz, 48 dB; 146 MHz, 47 dB; 440 MHz, 47 dB; 906 MHz, 39 dB; 1296 MHz, 50 dB. |
| FM two-tone, third-order IMD dynamic range: Not specified. | 20 kHz channel spacing: 29 MHz, 49 dB*; 52 MHz, 49 dB*; 146 MHz, 46 dB*; 440 MHz, 48 dB*; 906 MHz, 40 dB*; 1296 MHz, 51 dB*; 10 MHz channel spacing: 52 MHz, 72 dB; 146 MHz, 68 dB; 440 MHz, 65 dB. |
| Squelch sensitivity (threshold): Not specified. | At threshold: SSB, 14 MHz, 1.9 μV; FM, 29 MHz, 1.5 μV; 52 MHz, 1.0 μV; 146 MHz, 1.1 μV; 440 MHz, 1.1 μV; 906 MHz, 1.8 μV; 1296 MHz, 1.8 μV. |
| Audio output: 1.0 W into 8 Ω (THD not specified). | 1.0 W into 8Ω (maximum output)[2] |
| IF/audio response: Not specified. | Range at –6 dB points, (bandwidth): CW: 174-2222 Hz (2048 Hz); USB: 174-2222 Hz (2048 Hz); LSB: 174-2222 Hz (2048 Hz); AM: 140-1326 Hz (1186 Hz). |
| Spurious and Image rejection: Not specified. | IF: HF, 40 dB; VHF, 39 dB; UHF, 13 dB; Image: HF, 86 dB; VHF, 87 dB; UHF, 81 dB. |

Except as noted, all dynamic range measurements were taken using the ARRL Lab standard spacing of 20 kHz.

[1]Third-order intercept points were determined using noise floor reference.
[2]THD at max output was 50% with signal at maximum indication on S-meter (5 bars). Minimum THD was about 15%.

some features took a few tries to get right.

We were dismayed to discover that the VR-5000 is not computer programmable, although it's possible to use a PC to *control* some functions, such as the main VFO frequency. Our scanner aficionado says that the ability to use software to set up the memories would be extremely helpful; the VR-5000's manual approach translates into a lot of button-pushing. "This is one radio you'd get programmed and not fool with too much," he predicted.

Our scanner guy appreciated that the VR-5000 did not greet him with one of those cutesy messages that often confront owners of newer ham transceivers—or cellular telephones—these days. "When I power up, I like to get to work," he said. "The display, with adjustable brightness and contrast, is easy to see."

Unfortunately, the manual does not always describe some of the symbols and icons that popped up. An annotated display graphic would be a helpful and useful addition to the manual, which earned a "fair" rating. A radio at this level of sophistication, complexity and multiple features should have a better-detailed and more clearly written manual and a quick-reference card to avoid dog-earing the manual's pages through repeated look-ups. This manual was just not up to Yaesu's typically excellent standards.

## Keeping It Simple

Hams are used to twisting dials and maybe pushing a button or two or even entering a frequency on a keypad. That's the place to start with the VR-5000, then work your way up into the more complex stuff like creating, programming and labeling memory banks. The VR-5000 lets you apply alphanumeric names to memory banks and to individual channels alike, and this is one feature that's simple and fun to take advantage of.

Fortunately, there is a nice little rubber-covered, detented tuning knob to twirl. Entering a frequency on the keypad is very simple too. So is moving around using the manual controls. Pushing the **F** key and then turning the dial moves you in 1-MHz steps; pushing the **F** key and the **>** or **<** button shifts your frequency in 10 MHz increments up or down. You can change the tuning step at the push of a button too.

Out of the box, the VR-5000 automatically selects the receiving mode based on the frequency the main receiver is tuned to. You can shift modes manually and override this feature, however.

The main and sub-receiver audio gain controls are simple rotary pots like the ones you'd find on the typical amateur mobile transceiver. Sharing the shaft with the main volume knob is the outer **SQL** (squelch) control. The sub-receiver volume control, which does not quite kill the audio completely when turned fully counterclockwise, is backed by a **TONE** knob that alters the receiver's audio response on both channels. Another surprise was that there is no way to squelch the sub-receiver, which limits the flexibility of having a sub-receiver to start with. If you don't want to hear the sub-receiver, the manual advises you to simply turn down the volume control.

## Greater Complexity

Trying to set up and program a memory bank with discrete channels sent me scrambling for the *Operating Manual*. It takes a bit of patience to get a handle on this receiver, and you'll want to keep the manual close at hand. But there's lots of memory to fill (remember, 2000 of them plus 100 memory banks), and there are lots of things you can do in terms of memory operation.

We already mentioned the ability to apply alphanumeric tags to memories and memory groups (banks). You can choose from among 74 characters that include numerals, upper and lower-case letters, and several special characters. The VR-5000 gives you the capability to search for these labels; you also can sort memories by using their alphanumeric tags.

Speaking of sorting, it's possible to sort memory channels by frequency, by receive mode or by channel number—and you can delete vacant memories automatically.

Memories can be protected from inadvertent erasure or deletion. It's also possible to mask certain memory channels that you don't need to recall—and unmask them later if it turns out you need them in the rotation again. There's a priority feature that lets you monitor a memory channel while checking a priority channel every five seconds for activity.

Yaesu has included *Smart Search* in the VR-5000, a feature that's proven handy in its Amateur Radio products, including the very popular FT-817 transceiver (see "Product Review," *QST*, Apr 2001). Smart Search can take some of the pain out of loading the VR-5000's many memories, although it can load a strong signal into more than one channel, so you might have some cleaning up to do once you've let it do its thing.

Scanning comes in several flavors, but our scanner buff didn't like that the VR-5000 does not let you scan only selected memory banks. In general, you can scan memory channels only, scan while in VFO mode, scan according to S meter level (on an arbitrary scale of 0 to 255) or scan just to find voice channels. It's possible in VFO scanning to set the radio up to scan only a portion of the VFO's range instead of the whole radio. Using the programmable memory scan (PMS) feature, you can set up the VR-5000 to scan between up to 50 separate upper and lower-limit pairs. It's possible to reverse the scan direction in midstream by simply turning the **DIAL** knob one click clockwise (to scan upward) or counter-clockwise (to scan downward). The scan resume mode can be set to hold when the scanner encounters a signal longer than two seconds; delay or hold until the signal disappears, then resume after two seconds or another user-settable interval, or pause for a user-settable interval then resume.

## Special Features

The VR-5000 offers some interesting and useful sideshow features. We've mentioned some already. Others include putting the receiver to use as a comparative field strength meter with a bar graph representation of test and reference signals. The receiver also can be set up to display audio waveforms on the LCD screen.

It's possible to clone memory data from one VR-5000 to another. The *Operating Manual* also includes the CAT (*Computer Aided Transceiver*) computer-control protocols.

## A Word on Performance

While our scanner friend was happy with the VR-5000's performance on HF and VHF using mostly modest antennas, I was a little disappointed in the receiver's performance on HF. It's important to bear in mind that that the VR-5000 was never intended to serve as a second receiver in an HF contest station. The ARRL Lab test results bore this out. The radio's dynamic range measurements at the standard 20-kHz spacing were well below the numbers we typically see even on low-end amateur transceivers, but is in line with the level of performance we've observed in some of the other LF to microwave receivers. Intercept numbers were well into the negative range. Apparently, even at this price range, there are some trade-offs to be made. When purchasing a receiver like this you pay for wide frequency coverage and programming, scanning and memory features, not strong-signal performance.

One VR-5000 feature that's helpful in this regard is *RF Tune*, which lets you shift the RF passband to maximize sensitivity and minimize the impact of other nearby signals on what you're trying to hear. This is a sort of preselector, to use a term from an earlier era. I found using an antenna tuner ahead of the receiver was beneficial, too.

## Random Thoughts

The world clock feature is very nice, but the VR-5000 lacks any kind of back-up battery for the clock, so you have to supply power to the radio at all times to preserve its time setting.

While we're on the subject of power: The radio operates on 13.8 V dc and comes complete with one of those "wall wart" supplies everyone loves to hate. A separate dc cord for hooking it up in your car or wiring to your existing station supply is also included.

The size and weight are easy to handle, so this is a receiver that could easily go mobile, although no bracket was supplied for mobile mounting.

There's plenty of audio from the little speaker, although it will distort pretty quickly at higher volume settings. An external speaker helps.

In general, while the VR-5000 offers many features, it might be a tad too busy for less experienced (or less adept) users who just want a decent receiver to play with. The multiplicity of keystrokes sometimes required to take advantage of certain functions tended to blunt the convenience of having those features in the first place.

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*Manufacturer*: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90703; 562-404-2700; fax 562-404-1210; **www.yaesu.com**. Manufacturer's suggested list price: $1099; Typical current street price: $890. List prices of selected accessories: DSP-1 Digital Signal Processing Unit: $119.95; DVS-4 Digital Voice Recorder: $47. QST