Product Review and Short Takes from *QST* Magazine

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Product Reviews:

Short Takes:

PRODUCT REVIEW

ICOM IC-R1500 Communications Receiver

Reviewed by Steve Ford, WB8IMY
QST *Editor*

The ICOM IC-R1500 is a black-box receiver in the most literal sense of the word. If you tossed it into the lap of an average consumer, he or she would have no idea that they were looking at a radio. The body of the IC-R1500 (Figure 1) is housed in a sleek box with little more than a speaker, power switch, BNC antenna connector, USB port for connection to the computer, 12 V dc power jack, external speaker jack and a PACKET data port. Within the nondescript enclosure, however, is a wideband receiver that covers an astonishing range of frequencies — 10 kHz to 3300 MHz — and demodulates CW, SSB, FM and AM along the way.

We've seen computer-based receivers from ICOM before, notably this radio's predecessor, the IC-PCR1000, reviewed in July 1998 *QST* (see **www.arrl.org/members-only/prodrev/**). What makes the IC-R1500 unique, however, is its remote-control head. This unassuming bit of hardware greatly expands the utility of the radio, making it possible to take the receiver anywhere you wish — including your automobile — without the need for a computer. Strictly speaking, it's a misnomer to label the IC-R1500 a "computer-controlled" receiver since you can enjoy most of the radio's features without ever owning a computer of any kind.

In terms of functionality, this product is essentially *two* separate devices: the receiver you control by computer, known as the IC-*PC*R1500, and the receiver you operate from the control head, which is the IC-R1500 configuration. This distinction is more than mere semantics. There are substantial differences between the two configurations. ICOM even includes individual PCR1500 and R1500 manuals in the package.

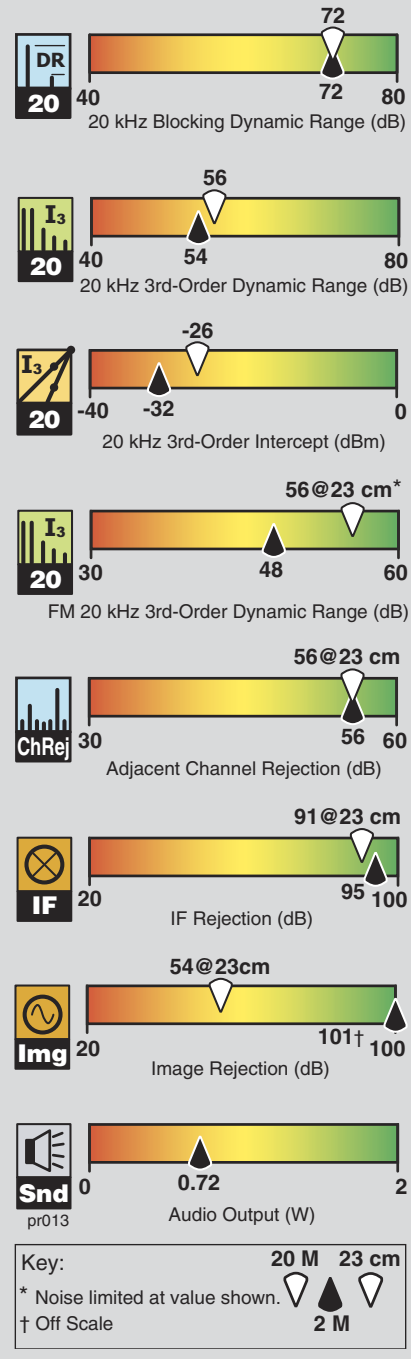
Setup

Like many amateurs, I own a laptop computer running the *Windows XP* operating system. My machine is a clunky "old" Dell Latitude, but it is adequate for most ham tasks. It had no trouble whatsoever with the IC-PCR1500 software. I popped in the ICOM CD and the application loaded without a hitch.

The IC-R1500 arrives with its own

Figure 1 — The "black box" receiver requires just a handful of clearly labeled connections. The hardware control head plugs into the CONTROLLER jack, or you can run everything from your computer via the USB jack.

Key Measurements Summary



Bottom Line

ICOM's latest wideband computer-controlled receiver adds a remote control head that's terrific for mobile operation or times when you just don't want to boot up the computer to access control software. Dynamic range is modest compared to ham transceivers, but that generally doesn't get in the way of enjoyable listening.

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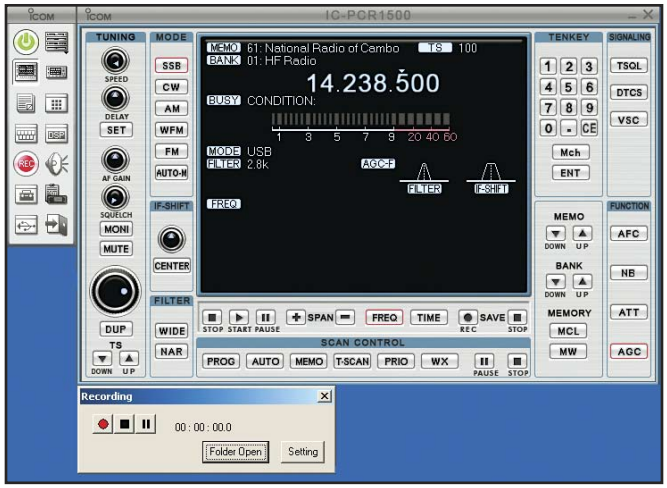


Figure 2 — The basic radio software screen, one of three that you can select.

Figure 3 — The "simple" control screen.

wall-cube power supply. However, ICOM doesn't include a coaxial dc power connector and cord for those of us who want to use other power sources (automobile electrical systems, for instance). I resolved that issue by taking a drive to my local RadioShack and picking up one of their interchangeable-adapter power cords and an appropriate adapter plug. For anyone interested in doing the same, the plug you'll need is model 273-1711, otherwise known as "Adaptaplug H." Another solution is ICOM's accessory cigarette lighter power cable, model CP-12L.

The real challenge occurs when you fire up the radio and connect the supplied USB cable. The IC-PCR1500 manual goes into great detail about how to load the USB drivers from the CD. The short version of the story is that your computer senses the presence of the radio and "asks" for the proper drivers to communicate with it. You respond by telling the computer to seek them in the appropriate directory on the ICOM CD. In my case, the computer grabbed the *XP* drivers from the CD and I was good to go in just a couple of minutes.

The IC-R1500 comes with a small telescoping antenna, but I opted to connect the receiver to my ham antennas for initial testing. ICOM also offers their AH-7000 discone antenna for use between 25 and 1300 MHz. We purchased an AH-7000 for this review and I'll detail my experiences with the antenna in an accompanying sidebar.

There is a built-in speaker and a jack for an accessory speaker. For most of my tests, I used the built-in speaker, which offered good fidelity considering its size. Received audio is also passed to the computer via the USB connection and is available for whatever sound-card-based software application you may be running. I had some concerns about the ability of my laptop to sort out the signals and processes, but I was pleasantly surprised — no program stalls or other strangeness while running the IC-PCR1500 software

Table 1
ICOM IC-R1500, serial number 0501174

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.01-810, 851-867, 896-1810, 1852-1868, 1897-2306, 2357-2812, 2853-2669, 2898-3110, 3136-3155, 3181-3300 MHz.	Receive, as specified.[1]
Modes of operation: FM, WFM, AM, SSB, CW.	As specified.
Power requirements: 1.2 A (max audio), 10-13.8 V dc.	1.1 A (max volume, no signal), tested at 13.8 V dc.
CW/SSB sensitivity (10 dB S/N): 0.5-1.8 MHz, 5 μV; 1.8-50, 700-1300 MHz, 0.5 μV; 50-700 MHz, 0.4 μV.	Noise floor (mds), dBm: 1.0 MHz, –116; 3.5 MHz, –130; 14 MHz, –130; 50 MHz, –132; 144 MHz, –134; 222 MHz, –135; 432 MHz, –126; 902 MHz, –130; 1240 MHz, –129.
AM sensitivity (10 dB S/N): 0.5-1.8 MHz, 25 μV; 1.8-50, 700-1300 MHz, 2.5 μV; 50-700 MHz, 2 μV.	10 dB (S+N)/N, 1-kHz tone, 30% mod: 1.0 MHz, 4.1 μV; 3.8 MHz, 0.86 μV; 53 MHz, 0.67 μV; 120 MHz, 0.82 μV; 146 MHz, 0.65 μV; 440 MHz, 0.68 μV; 902 MHz, 0.73 μV; 1240 MHz, 0.89 μV; 2400 MHz, 3.9 μV.
FM sensitivity (12 dB SINAD): 28-50 and 700-1300 MHz, 0.63 μV; 50-700 MHz, 0.5 μV; 1300-2300 MHz, 5.6 μV; 2300-3000 MHz, 18 μV.	FM narrow, 12 dB SINAD: 29 MHz, 0.3 μV; 52 MHz, 0.27 μV; 146 MHz, 0.25 μV; 222 MHz, 0.21 μV; 440 MHz, 0.26 μV; 906 MHz, 0.29 μV; 1296 MHz, 0.33 μV; 2400 MHz, 1.6 μV.
WFM sensitivity (12 dB SINAD): 50-700 MHz, 1.4 μV; 700-1300 MHz, 1.8 μV; 1300-2300 MHz, 18 μV; 2300-3000 MHz, 56 μV.	100 MHz, 0.6 μV.
Blocking dynamic range: Not specified.	CW mode, 20 kHz offset: 3.8 MHz, 73 dB; 14 MHz, 72 dB; 50, 144 MHz, 72 dB; 222 MHz, 74 dB; 432 MHz, 68 dB; 902 MHz, 78 dB; 1240 MHz, 77 dB; 5 kHz offset: 3.8 MHz, 72 dB; 14 MHz, 71 dB; 144 MHz, 71 dB.[2]
Two-tone, third-order IMD dynamic range: Not specified.	Third-order dynamic range, 20 kHz offset: 3.8 MHz, 55 dB; 14 MHz, 56 dB; 50 MHz, 54 dB; 144 MHz, 54 dB; 222 MHz, 59 dB; 432 MHz, 50 dB; 902 MHz, 55 dB; 1240 MHz, 57 dB; 5 kHz offset: 3.8, 14 MHz, 46 dB; 144 MHz, 48 dB.[2]
Third-order intercept: Not specified.	Intercept point, 20 kHz offset: 3.8 MHz, –27 dBm; 14 MHz, –26 dBm; 50 MHz, –30 dBm; 144 MHz, –32 dBm; 430 MHz, –31 dBm; 902 MHz, –27 dBm; 1240 MHz, –25 dBm; 5 kHz offset: 3.8 MHz, –33 dBm; 14 MHz, –32 dBm; 144 MHz, –38 dBm.[2]

alongside ham applications such as *MixW*.

Here is a quick software tip that I discovered the hard way, though: Do *not* unplug the USB cable or toggle off the radio's front-panel POWER switch while the IC-PCR1500 software is running. If your computer behaves like mine, it will hang in the worst way. Even a CONTROL-ALT-DELETE sequence won't unlock it. Pressing and holding your computer's POWER switch until the machine shuts down is the only means of escape. Your computer may respond differently, but in any case I wouldn't recommend shutting off power to the receiver while the software is running.

Features and Functionality

The IC-R1500 has all the features you'd expect to find in a quality communications receiver, with a particular emphasis on flexibility. For example, when you're controlling the receiver with the IC-PCR1500 software, you have your choice of three displays ranging from "simple" to "component." These are shown in Figures 2, 3 and 4. I tended to prefer the component screen since it gives you easy access to all features, including a band scope that graphically displays all signals above and below the primary frequency (the band scope range is adjustable).

IF Bandwidth

IF filters are selectable (but not adjustable), depending on the mode. The IF bandwidth for wide FM is 230 kHz. At the opposite end of the scale, the narrowest AM, CW or SSB bandwidth is 2.8 kHz. That's a bit problematic for CW monitoring since an awful lot of signals and interference can squeeze into 2.8 kHz, although the radio *does* include an adjustable IF shift function. Yes, I would love to have IF bandwidths down to 100 Hz, but that would have increased the IC-R1500 price tag. Besides, it is important to remember that the IC-R1500 isn't designed for ham applications; this is a radio for a broad market of consumers and shortwave/scanner hobbyists. Most of these buyers have little need for tight IF filters.

Squelch Functions

The radio has squelch, mute and monitor (momentary squelch disable) functions similar to a handheld transceiver. The squelch delay is adjustable, which I've never seen in a receiver before. This is a great feature when you want to keep the squelch from opening in response to brief signal bursts or noise. There is also a *Voice Squelch Control* function that only opens the squelch in response to a modulated voice signal. This worked well for me, but it isn't foolproof. Modulated noise can trigger it just as easily.

NOAA Weather

Weather channel monitoring is nicely implemented in the IC-R1500. Not only are the NOAA weather station frequencies preprogrammed, the receiver can be set to monitor for NOAA alerts, checking every few seconds for activity while you listen elsewhere. If alert tones are detected, the "WX Alert" message blinks on the screen and a beep sounds continuously until you switch to the weather channel frequency.

Scanning

The R1500 really shines in the scanning mode. From memory scan to program scan, there is a scanning mode for every application. To fill one of the memory banks with 2 meter and 222 MHz FM activity, for example, I used the *memory-write* scan. I programmed the scan to set the start frequency at 145 MHz and end frequency at 225 MHz, and added a "skip" from 148 to 222 MHz. The scan speed is adjustable, so I set it to full throttle, which is blazingly fast. The bank filled rapidly and the R1500 didn't duplicate frequencies; when it found activity, it wrote the frequency to the memory channel and then skipped that frequency the next time around. The only downside was that wide signals would wind up filling two or even three memory channels as the '1500 scanned through them. You just have to go back and do a bit of editing.

The IC-R1500 will scan for subaudible CTCSS (continuous tonecoded squelch system) and DTCS (digital tone-coded squelch) tones, which is a highly useful function when you're trying to determine which tone a ham or commercial repeater system is using. The receiver can also be set up for "tone squelch" functionality in which the squelch will only

Manufacturer's Specifications	Measured in the ARRL Lab
Second-order intercept point: Not specified.	14 MHz, +28 dBm.
FM adjacent channel rejection: Not specified.	20 kHz offset: 29 MHz, 61 dB; 52 MHz, 58 dB; 146 MHz, 56 dB; 440 MHz, 55 dB; 906 MHz, 59 dB; 1240 MHz, 56 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 29 MHz, 50 dB; 52 MHz, 52 dB; 146 MHz, 48 dB; 440 MHz, 51 dB; 906 MHz, 52 dB; 1240 MHz, 56 dB*; 10 MHz channel spacing: 52 MHz, 95 dB; 146 MHz, 93 dB; 440 MHz, 82 dB.
S-meter sensitivity: Not specified.	S9 indication: 1 MHz, 98 μV; 14 MHz, 120 μV; 50-1240 MHz, 100 μV.
Squelch sensitivity: AM, 0.5-1.8 MHz, 18 μV; 1.8-50 and 700-1300 MHz, 0.89 μV; 50-700 MHz, 0.71 μV; FM, 28-50, 700-1300 MHz, 0.63 μV; 50-700 MHz, 0.5 μV; 1300-2300 MHz, 5.6 μV; 2300-3000 MHz, 18 μV; WFM, 50-700 MHz, 5.6 μV; 700-1300 MHz, 7.1 μV; 1300-2300 MHz, 71 μV; 2300-3000 MHz, 224 μV.	At threshold: SSB, 14 MHz, 0.4 μV; FM, 29 MHz, 0.3 μV; 52 MHz, 0.26 μV; 146 MHz, 0.26 μV; 440 MHz, 0.27 μV; 906 MHz, 0.3 μV; 1240 MHz, 0.36 μV.
Audio output: 0.5 W at 10% THD into 8 Ω load.	0.72 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW: 208-3068 Hz (2860 Hz); USB: 195-3380 Hz (3185 Hz); LSB: 224-3622 Hz (3398 Hz); AM: 85-3146 Hz (3061 Hz).
Spurious and Image rejection: Not specified.	IF: 14 MHz, 93 dB; 50 MHz, 99 dB; 144 MHz, 95 dB; 222 MHz, 51 dB; 430 MHz, 77 dB; 902 MHz, 98 dB; 1240 MHz, 91 dB; Image: 14 and 50 MHz, 90 dB; 144 MHz, 101 dB; 222 MHz, 102 dB; 440 MHz, 61 dB; 902 MHz, 52 dB; 1240 MHz, 54 dB.
Bit-error rate (BER), 9600-baud: Not specified.	146 MHz: BER at 12-dB SINAD, 2.5×10^{-3}; BER at 16 dB SINAD, 4.1×10^{-4}; BER at –50 dBm, 5.5×10^{-5}; 440 MHz: BER at 12-dB SINAD, 3.9×10^{-3}; BER at 16 dB SINAD, 3.8×10^{-4}; BER at –50 dBm, 4.5×10^{-5}.
Size (height, width, depth): main unit, 1.6 × 5.8 × 8.1 inches; controller, 1.6 × 4.4 × 1.0 inches; weight: main unit, 2.6 pounds; controller, 7.5 ounces.	

*Measurement was noise-limited at the value indicated.
[1]Receive sensitivity degraded below 0.5 MHz.
[2]Filter blow-by was observed at 5 kHz offset. At 2 kHz offset, the offset signal was within the filter passband.

open when the radio senses the required subaudible tone.

Speaking of tones, one unique feature of the IC-R1500 is the ability to not only decode DTMF (*TouchTone*) tones, but also activate a *Windows* program in response to a DTMF string you specify! In other words, when the receiver picks up the correct tone sequence, it will start the *Windows* application of your choice. I suppose you could call this a limited form of "remote control."

Perhaps the easiest way to monitor a number of channels simultaneously is to do it visually. That's the function of the multichannel monitor. When this tool is active, you're presented with a window divided into 25 individual squares, not unlike a small calendar. Within each square, you'll see the frequency of the channel being monitored, plus a horizontal S-meter bargraph display. The neatest aspect of the multichannel monitor is that each square changes color according to the signal strength. You can monitor activity from across the room! If a particular channel tickles your interest, click your mouse on the square and start listening.

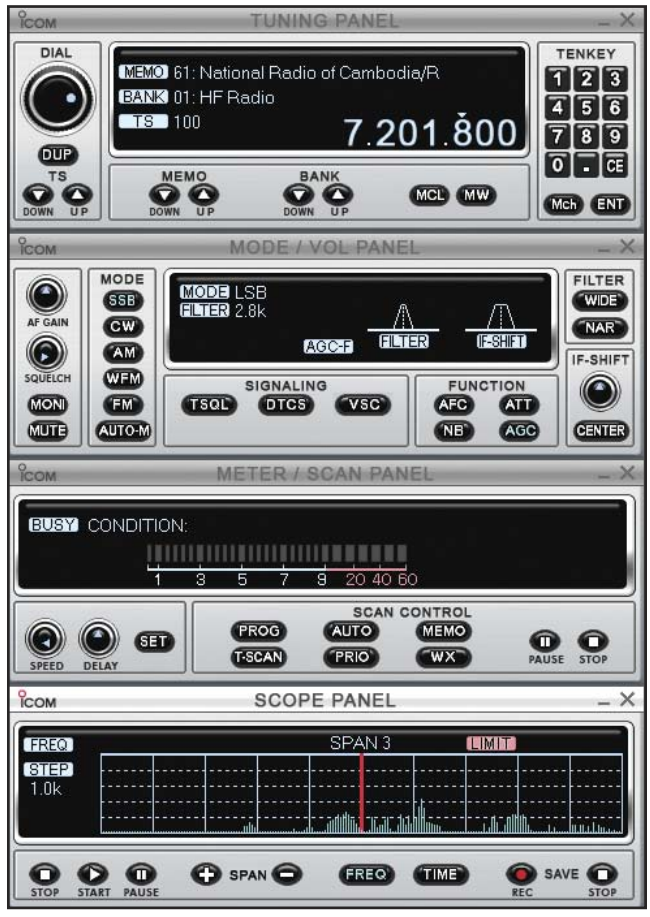


Figure 4 — The "component" screen that includes the band scope (bottom).

Band Scope

I mentioned the band scope function earlier, but it bears a little more discussion. Many modern receivers and transceivers have a band scope that provides a visual indication of nearby signals on a graphic display. In that regard, the IC-R1500 is similar, but there is a crucial difference—the ability to *record* the band scope activity. You can configure the R1500 to monitor and record activity up to 200 kHz above and below the center frequency. This data can be "played back" for later analysis. You can also record activity by time. That is, you can set the R1500 on a particular frequency and have it record the strength and duration of any signals it receives. This would be terrific for long-term propagation analysis.

The IC-R1500 can also record received audio to WAV files on your hard drive. You can start and stop recording manually, or set the R1500 to record only when a signal breaks the squelch. If you'd like to hear this recording function in action, you can download an MP3 audio compilation of Field Day recordings made with the R1500.[1]

"Cloning" Issues

Most hams think of memory cloning as it applies to handheld radios. The idea is that you can transfer the memory contents of your handheld to your friend's handheld, or vice versa, as long as your transceivers are the same make and model. This is handy when you travel to a new city and don't want to go through the hassle of reprogramming your radio.

But "cloning" in the IC-R1500 is fundamentally different. The cloning we're talking about involves the transfer of memories between the receiver and your computer. The problem is that the radio and computer memories are structured differently. For example, there are 2600 *computer* memory channels per file, but the *radio* can only hold 1000 channels plus another 100 scan-edge memories. Because of the capacity differences and other configuration requirements, you can't swap data directly between the computer and the radio.

There is a separate instruction sheet that's dedicated to explaining the cloning function, but the explanation falls short. The idea that needs to be communicated up front is the fact that the radio and computer memories are different and that the data needs to pass through a "conversion" step before a transfer can take place. The cloning sheet *does* state this, but it's in a small paragraph at the end of the document. You really need to understand this fact *first*. Otherwise, you're likely to make mistakes as you step through the somewhat complicated cloning process. On my first cloning attempt, I managed to completely erase the receiver memories!

There was also one cloning oddity that I never did resolve. The IC-R1500 has the ability to tag memory channels with helpful text labels such as "Local Police" rather than a numeric frequency display. However, when I transferred the computer memory channels that I had added manually, the software stripped out my labels. The R1500 software comes with 99 preprogrammed shortwave broadcast memories with labels and these would transfer smoothly, albeit in a truncated form. Why my labels wouldn't make it from the computer to the radio, I have no idea.

The bottom line is that the instructions need some work. Just make sure you read the sheet carefully and completely before you attempt cloning. It's a good idea to start with just a few memories and get comfortable with the process before moving large amounts of data.

The Remote Control Head

As I've mentioned, the hallmark of the R1500 is the ability to use the receiver without a PC. I took the R1500 mobile in this configuration (see Figure 5) and I loved it! With an adhesive hook-and-loop fastener, I attached the tiny 4 × 2 inch control head to my dashboard. The radio itself was parked under the passenger seat with an external speaker attached.

I have a 30-minute commute to the office (each way) and it was a delight to monitor aircraft, repeaters, shortwave — you name it. Even with a ¼ wavelength 2 meter whip antenna, I was able to enjoy the English service of the Korean Broadcast System on 9 MHz on my way into work. When you arrive at your destination, you can unplug the receiver in seconds and slip it into your briefcase for safekeeping while the control head remains in the car.

The only problem I experienced on the road was with the noise blanker. The R1500 noise blanker is poor at best; I could barely tell that it was working. An optional DSP module, the UT-106, adds DSP noise reduction and an audio notch filter for AM, SSB and FM to the R1500. The UT-106 has been around a while as an option for the IC-706 series, the IC-718, the IC-PCR1000 and other radios. Although we didn't test the module for this review, we tested a UT-106 with the IC-PCR1000 reviewed in 1998. In that

[1] **www.arrl.org/files/qst-binaries/.** Look for the file Field Day Audio 2006.mp3.

Figure 5 — The IC-R1500 control head installed on the dashboard of my car. What a great way to cruise the radio spectrum while cruising the highway!

The AH-7000 Antenna

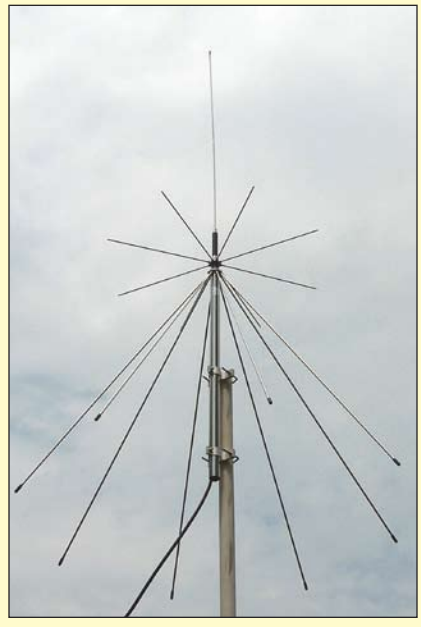


Figure A — The ICOM AH-7000 discone antenna.

The AH-7000 is ICOM's "recommended" antenna for use with the IC-R1500. It is an omnidirectional discone antenna designed to cover 25 to 1300 MHz. For those unfamiliar with the discone, this type of antenna is composed of downward sloping elements arranged to form a cone shape at the base. A set of short horizontal spokes rests atop the cone elements, forming a disk. In addition to the traditional discone structure, there is a base-loaded vertical element. Discones are favorites among scanner enthusiasts because they offer wideband coverage in a relatively small space. The ICOM AH-7000 is 5½ feet tall. It can be mounted by attaching it to a mast up to 2 inches in diameter using a set of U bolts.

Assembly was simple. ICOM supplies an Allen wrench, but you'll also need a Phillips head screwdriver and an adjustable wrench. After attaching the supplied coaxial cable to the hub (through the short mast section), all that's left is to attach the collection of elements. After about half an hour, I was finished and the antenna was ready to use — no tuning required.

The coaxial cable that comes with the AH-7000 has type N connectors on each end, so I had to use an N to BNC adapter to attach it to the R1500. Even though the antenna was mounted near the ground for this review, the performance was quite good, especially on the higher frequencies. The police department in a nearby city uses 825 MHz as its primary dispatch frequency and despite the terrain, vegetation and other obstructions, I was able to monitor the action with ease. No doubt a roof-mounted AH-7000 would perform even better.

The AH-7000 is rated for transmitting on all ham bands from 6 meters through 23 cm, except 222 MHz. During this review I did some transmit tests on 6 meters, 2 meters and 70 cm. In each case, I saw a maximum SWR of 1.7:1 with good broadband performance, considering the omnidirectional design. *— Steve Ford, WB8IMY*

review, we reported that the noise reduction "turned in a stellar performance." It would likely be a worthwhile upgrade for this receiver as well.

Overall Performance

I used the IC-R1500 to eavesdrop on everything from shortwave broadcasts to satellites. I was quite pleased with the performance. In most Lab tests, the R1500 is very similar to the PCR1000. As shown in Table 1, the dynamic range characteristics aren't up to what we would expect in an amateur transceiver, but they are more than adequate for casual listening. Sensitivity was good and, with the selectable IF filters and IF shift, I was able to deal with most interference issues.

Tuning with software takes a bit of getting used to, but if it becomes a pain, just attach the R1500 control head and return to the good old days. Remember that the control head isn't just for mobile use; you can stuff the radio into a convenient location (under a shelf, for instance) and have the elegant little control head as the only "human interface."

My IC-R1500 Wish List

Overall, I fell head-over-heels for the IC-R1500. This is a terrific VHF/UHF scanner and a competent shortwave receiver. The R1500 remote control head feature is definitely a home run.

No receiver is perfect, and I have my own wish list for future versions of this remarkable radio…

- A synchronous AM detector. This would greatly improve shortwave broadcast reception, going a long way to minimize harsh fading effects.
- A better noise blanker. The current blanker doesn't do much for ignition noise.
- Better cloning software and a much better instruction sheet to explain its function. (At least correct the mangled phrase that pops up in the software to announce a successful cloning operation: "Cloning is succeeded!")
- The audio recording function is nice, but add the ability to schedule automatic recording sessions in advance by date, time and duration.
- A 12 kHz IF output that you can feed to a computer soundcard to decode Digital Radio Mondiale (DRM) shortwave broadcasts.

In the July 1998 review, we said that the PCR1000 was a "*fun* product." With the control head, improved software and increased capability, the IC-R1500 is even more so.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004, tel 425-454-8155; **www.icomamerica.com**. Price: IC-R1500 receiver, $699; OPC-254L fused dc power cord, $11; OPC-441 speaker extension cable, $25; UT-106 DSP module, $139; AH-7000 discone antenna, $169.

Green Heron RT-20 Rotator Controller

Reviewed by Norm Fusaro, W3IZ
Affiliated Club/Mentor Program Manager

Hams and ham radio have changed drastically over the last half-century. No longer are we builders and tinkerers, cannibalizing discarded television sets for parts to make continuous wave transmitters. Today's radio amateur is an integrator of sophisticated software and hardware components, enabling the operator to customize systems capable of accomplishing a desired communications need.

Today, computers can be an integral part of amateur stations and are used for more than just basic logging. Much of our modern equipment is fully controllable with a computer. It's thus not surprising that automated operations are very popular among active hams.

Green Heron Engineering is on the cutting edge when it comes to meeting the needs of 21st century communicators with the introduction of their new microprocessor-based RT-20 Universal Digital Rotator Controller. At first one might ask: "Why would I need a digital controller for my antenna rotator when it already came with one from the manufacturer?" Well, the answer can be quickly found in the name of this unit.

First, it's *universal* — it works with any manufacturer's rotator. The RT-20's manual includes detailed information on using the controller with many popular rotators from Alfa-Spid, Alliance, Create, Hy-Gain, Orion, Rotor Doctor and Yaesu. The RT-20 is a great way to add modern features to an older but still reliable motor. And if you have rotators from more than one vendor up the tower, you can standardize on RT-20 controllers and bring some consistency to your shack.

Second, it's *digital* — microprocessor control makes many sophisticated features possible, even for old rotators that came with an ultra-simple control box. Digital also means that the RT-20 works under computer control if you have software that supports rotator control.

Features and Benefits

The rotator can be commanded to turn the antenna by turning the "point and shoot" preset knob on the RT-20's front panel, by issuing commands from compatible software (not supplied) running on an attached PC, or manually by pressing the CW/CCW (clockwise/counterclockwise) switches.

Several of the RT-20's features may help prolong the life of your rotator, particularly if you turn large antenna arrays. At the start and end of rotation, the controller allows gradual starts and stops by ramping the motor voltage up and down. Motor speed can be set in 11 steps (10% to 100%, plus a 100% setting with no ramp-up or down). Note that these features don't work equally well with all rotator motors. Check the downloadable instruction manual and other information on Green Heron's Web site for information on specific rotator models.

Another setting adjusts the delay before allowing rotation in the opposite direction. Adjustable in 100 ms increments up to 5.9 seconds, this setting allows the antenna to coast to a full stop before attempting to reverse direction. An adjustable brake delay for Hy-Gain HAM and TailTwister series rotators allows the antenna to stop turning before the mechanical wedge brake engages. There's even a special routine for TailTwisters that rocks the antenna slightly at startup to avoid a common problem with the brake sticking.

Because you can set the start/stop points for both CW and CCW rotation ("soft limits" on antenna travel as opposed to hardware limit switches), the RT-20 is an excellent controller for antennas that must be limited to less than 360° rotation. This includes antennas mounted on the side of the tower that need to stop before hitting a tower leg. No longer will you have to keep an eye on the visual markers written on your old rotator's display or risk crashing your side mounted beam into the tower. Once you have set the soft limits, the RT-20 remembers them and will only move within the specified arc of rotation. If your rotator supports more than 360° rotation ("over-travel"), the RT-20's soft limits allow up to 720° rotation (two full turns).

Some rotators are "north centered," meaning that the center of travel is 0° and the stops are at ±180°. Others are "south centered" with the center of travel at 180°. Using the RT-20's OFFSET option, you can change from north centered to south centered at will. The OFFSET is fully adjustable, so you can use this feature to compensate for an antenna or mast that has slipped in the wind. Another application mentioned in the manual is adjusting the OFFSET to keep antennas oriented properly for a mobile rover station that changes positions frequently.

Users can update the RT-20's software via the serial port as new versions are available. Green Heron indicates that they welcome requests for customization. Customized versions are available for KØXG Systems rotating towers and K7NV prop pitch rotators.

More than One Antenna?

The more complicated your antenna system, the more the RT-20 shines. The product has the capability of connecting several "slave" RT-20 controllers to a "master" RT-20

Table 2
Green Heron RT-20 Rotator Controller

Manufacturer's Specifications

Power requirement:	115/230 V ac.
Rotator motor voltage:	18-36 V ac; 24-48 V dc.
Position indicator:	Potentiometer, 150 Ω to 10 kΩ; variable resistor, 500 Ω; proximity/reed switch, 33 closures per deg.
Heading accuracy:	Up to ⅓ deg for potentiometer; up to ⅒ deg for proximity/reed switch.

Size (height, width, depth): 3.9 × 8.1 × 7.25 inches; weight, 7.5 pounds.

Bottom Line

Green Heron's RT-20 Digital Rotator Controller offers an easy way to add the latest features to an existing rotator. It really shines in a more complicated setting with multiple antennas and rotators.

unit. This is done simply using the DB-9 serial connection on the rear of the units and accessing the menus on the individual controllers to set one as master and the others as slaves.

Setting several RT-20s in a master/slave configuration allows the units to work together as a system. This capability allows complex control of antenna arrays on single or multiple towers all from a single control point, either at the station or remotely. One common application is turning all antennas in a stacked array to the same heading simultaneously.

Another common configuration is a rotating tower with a separate rotator for the antenna or antennas at the top. With one RT-20 controlling the tower movement and another controlling the tower-top rotator, you can program the top rotator to maintain its heading regardless of tower movement.

Setting it Up

Setup for the RT-20 is simple and straightforward. Because it works with any manufacturer's rotator, you simply locate your model in the manual and set the internal jumpers. Pay close attention when doing this, as some jumpers are numbered left to right and others right to left. The manual provides a worksheet to help you configure the unit for a rotator that is not listed in the manual. You will need to have the rotator's manual or specifications handy to do this.

Once the internal setup is complete, it's time to connect the rotator to the unit via a multiconductor control cable. I found the terminal strip on the rear of the RT-20 clearly labeled, so connecting the control cable is simple and straightforward. Again, refer to the manual for proper terminal connection for your specific rotator.

After connecting the rotator to the RT-20, the final step is setting the software parameters and calibrating the clockwise and counterclockwise start/stop points. The manual cautions you to be careful during setup. If your rotator doesn't have mechanical stops, it's easy to turn the antenna too far and stress the feed line.

Pressing and holding the SETUP/ITEM button for a few seconds accesses the menu. Pressing this button momentarily allows you to page through the various menus. Keep the manual handy during setup because some parameters must be set in a certain order. Some of the settings are rotator-specific. Others are for soft rotation limits and position calibration.

Setup took less than an hour. Please take the time to read the manual and familiarize yourself with the layout of the board. I found the manual to be clear and complete and didn't have to make any calls to tech support. Other RT-20 users have told me that the folks at Green Heron are quick to answer and are extremely helpful.

After the initial setup was complete, the RT-20 was turning a Yaesu GS-800 that I had mounted on the bench for this review. The bright green LCD shows antenna heading in large characters, as well as direction of travel, position of the point-and-shoot control and operating state (manual, preset, remote, master/slave and so on). Other indicators show when the rotator is in over-travel, when a soft limit is reached, and when a brake is engaged.

Software Control

As I mentioned, the RT-20 interfaces with most logging software via a computer serial port. According to the manual, if your software is compatible with the Hy-Gain DCU-1 protocol, it will probably work with the RT-20.

In about three minutes I had the controller working with *LOGic 8* logging software. When you enter a call sign in the log, the software calculates both short path and long path headings to the station from your location. You can select one of the paths with a simple keystroke, and *LOGic* will tell the RT-20 to point the antenna right toward the station you want to work. The RT-20 moved the antenna to the exact position each time.

LOGic software also has a feature that allows you to drag your mouse cursor over a compass rose and click on a heading. With a single mouse click your antenna is moving toward a selected heading and the position is verified on the RT-20's large display. Pressing CANCEL on the RT-20 or using the software's stop feature will stop the motor's movement at any point during the rotation.

The RT-20 also performed flawlessly with *WriteLog* contest logging software, which has similar provision for moving the antenna toward the station you are working. *WriteLog* allows the user to specify a keystroke to start the rotator.

Final Thoughts

Green Heron did a nice job with the packaging. Fit and finish are excellent, and the controls have a nice feel. The 46 page instruction manual is quite detailed, and I found it to be clear and helpful. Once setup is complete, operation is straightforward. Perhaps the hardest part, after years of pressing manual buttons, is remembering to use all the features the RT-20 offers.

If you have an older rotator that you would like to modernize with some new operating features without climbing the tower, or if your contest station requires flexible control of multiple rotating arrays, or if you simply appreciate the ease of operation in a modern automated station, then the Green Heron RT-20 is an accessory that belongs in your station.

Manufacturer: Green Heron Engineering, 1107 Salt Rd, Webster, NY 14580; tel 585-217-9093; **www.greenheronengineering.com**. Price $549. QST

New Products

CONTEST VIDEO ESSAY FROM K4ZA

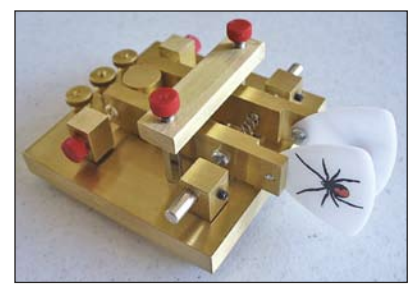
◊ What makes a proficient contester? What makes a good operator? Don Daso, K4ZA, explores those questions in *Contest Video Essay: A Look At Radiosport*. The video essay draws upon the experience, wisdom, and opinions of 50 of today's contesters in one place and provides some unique and personal insights into this aspect of ham radio. Running time is 2 hours, 49 minutes. Price: DVD (set of two), $40; VHS tapes, $20. Contact **k4za@juno.com** for ordering details.

HY-GAIN 65 FOOT TELESCOPING MAST

◊ Hy-Gain's ATM-65 is an 11-section aluminum telescoping pole that can be used as vertical antenna element or as a mast to support wire antennas. Intended for temporary or portable use, the ATM-65 extends to 65 feet, and guying is required if it's extended more than 30 feet. The top section is 0.625 inch OD, and the bottom section is 2 inches OD with a 0.12 inch wall. Sections are secured with supplied hose clamps. Collapsed length is 6 feet. Price: $189.95. To order or for your nearest dealer, call 800-973-6572 or see **www.hy-gain.com**.

BLACK WIDOW PADDLE KIT FROM W5JH RADIO PRODUCTS

◊ The Black Widow CW paddle kit features all-brass construction. The paddle uses both spring and magnetic return force, and the arms ride on precision ball bearings. Contacts are silver plated, and each arm has a separate silver plated ground wire. Bearing tension, contact spacing and magnetic return force are all adjustable. Set screws lock down parts after adjustment. The Black Widow base measures 3 × 3 inches and the key weighs about 1.5 pounds. All parts are machined and tumbled, and kit assembly requires only finish sanding and coating the brass parts with lacquer or another protectant. No special tools are required. Assembly is said to require 3-4 hours over several days. Price: $55. For more information and ordering information, see **www.W5JH.net/Black_Widow.htm**.



microHAM Digi Keyer

"One box does it all." Yes, that's a shopworn cliché, but it applies very well to the new microHAM Digi Keyer. Within a small aluminum enclosure you'll find a deluxe interface that allows you to operate any sound-card-based mode simply and efficiently. The Digi Keyer even supplies the "sound card" in the form of a sound chipset. This means that the Digi Keyer can put you on the air without tying up your computer sound card (this is a big plus when using an older PC with a sound card that is, shall we say, less than optimum). The Digi Keyer can also be used for keyboard CW.

In addition to sending and receiving signals, this versatile box will pass control data and other information back and forth between your computer and your transceiver. Most modern rigs have computer control capability and this is very handy for automatic frequency logging and remote station control. The catch is that you usually have to purchase an extra interface to allow the radio to communicate with the computer. Not so with the Digi Keyer. You don't need to buy a "level converter" or any other extraneous hardware. Just connect the Digi Keyer and your rig-control software will soon be engaging in a lively data discussion with the radio. During this review, I used it with *TRX Manager* software to control my transceiver via the Internet. Other than the unavoidable delays caused by Internet "propagation," the remote setup worked quite well.

Don't worry about the lack of available serial ports on your PC; the Digi Keyer doesn't need one. Instead, it connects with a single USB cable using the native drivers your computer already has. It doesn't get much easier than that.

Installation

You have to jump through a couple of hoops to get the Digi Keyer up and running the first time. Before you even think of hooking it up, you have to open the enclosure and set a few jumpers to configure the Digi Keyer for your transceiver. There is a well-written manual on the Digi Keyer CD-ROM that guides you through this process.

The next step is to install the *Windows* "USB Router" software on your computer of choice. This application talks to the Digi Keyer and sets up the virtual COM ports that you'll need for your operating software. When setting up *WriteLog* to use the Digi Keyer, for example, I needed to "tell" the software to look for the interface on COM 5 — a virtual COM port established by the Digi Keyer.

Thanks to the custom cable used to connect the Digi Keyer to your transceiver, the rest of the installation process is highly streamlined. Interestingly, the Digi Keyer is not powered from your computer's USB port. Instead, the "transceiver side" of the Digi Keyer draws power from your radio — if it can — through the custom cable. This trick doesn't work with the Elecraft K2, Yaesu FT-847/FT-736 or any Kenwood transceivers, though. For these rigs you'll need to supply the power yourself or purchase the external Digi Keyer power supply ($10).

Taking it to the Air Waves

My first test of the Digi Keyer was during Field Day when I connected it to my Yaesu FT-817 transceiver and ran digital QRP. The Digi Keyer was as smooth as proverbial silk. Thanks to the Digi Keyer's front-panel transmit and receive audio controls, I didn't have to fumble with the awkward *Windows* sound mixer in my laptop. (The Digi Keyer has two receive-audio channels with dedicated gain controls. This is ideal for dual-receiver rigs.)

The built-in sound chipset was superb with remarkably low noise. With the receive audio properly set, the *MixW* water-fall display was nearly black in the areas where signals were not present. It was also nice to see that the Digi Keyer didn't appear to introduce noise of its own. I didn't notice any spurious signals that I could attribute to the Digi Keyer.

The specifications recommend an 800 MHz Pentium PC as a minimum computer configuration. I ran the Digi Keyer from an old 800-MHz laptop with no problems. I should mention that the Digi Keyer provides hardware frequency shift keying (FSK) for RTTY operating, if your transceiver supports an FSK mode. This allows the interface to apply the MARK/SPACE RTTY data directly to the radio. The result is usually a cleaner signal and the ability to select narrower RTTY IF filters in the receiver.

Finally, VHF operators should take note of the Digi Keyer's built-in *T/R sequencer*. I've never seen anything quite like this in a computer/radio interface. For those who are unfamiliar with the term, a sequencer makes sure that sensitive components, such as receive preamplifiers, are switched out of the antenna system whenever the transceiver is keyed. The user can set up the Digi Keyer to impose a slight transmit delay while it switches the preamp, transverter, etc, out of the line before keying the radio to apply RF.

If you want to completely integrate your computer with your station, the microHAM Digi Keyer is worth a serious look. The quality is top-notch and the no-hassle installation is icing on the cake.

Manufacturer: microHAM, distributed in the US by microHAM America, PO Box 1257, Geneva, FL 32732; e-mail **info@microHAM-USA.com**; *Web* **www.microham-usa.com/**. *$289.* QST

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