Product Review Column from *QST* Magazine

April 1997

TASCO Electronics TSC-70U Slow-Scan TV System

ICOM IC-R8500 Communications Receiver

Tigertronics BayPac BP-2M Multimode Modem

Alpha Delta Commumications Model VRC Variable Response Console

Edited by **Rick Lindquist, N1RL**• Senior Assistant Technical Editor

TASCO Electronics TSC-70U Slow-Scan TV System

Reviewed by Larry Wolfgang, WR1B
Senior Assistant Technical Editor

Slow-scan TV is a mode I've wanted to try for some time, so I didn't hesitate when the opportunity arose to check out the TASCO system. When the modest stack of boxes showed up, however, I began to wonder what I was getting into. It turned out that the boxes contained the basic SSTV system (less a monitor) and several accessories.

For a simple system, you can begin with the TSC-70U Telereader Color Scan Converter and a TV set. Connect the audio output from your transceiver or receiver to the TSC-70U and a video cable from the '70U to the video input of the TV. If your TV doesn't have a video input, you can run it through a VCR or RF modulator (fortunately, I had one of those). The TSC-70U requires an external power source of 11 to 15 V dc at "more than 300 mA." With this basic system you can copy pictures off the air to your heart's content. You can also retransmit pictures that you receive simply by connecting a line from the 9-pin D connector **RADIO** jack on the back of the TSC-70U to your transceiver's microphone input; after all, SSTV signals are comprised of audio frequencies in the range of 1500 to 2300 Hz (with a 1200-Hz sync signal).

You must use the remote control unit to select receive or transmit functions, select the slow-scan operating mode (Robot 36 or 72-second color, Martin 1 or 2 or Scottie 1 or 2), select the memory page 1 or 2 picture and acquire a picture from a video source.

Yes, you can capture video frames and send pictures from a video source, such as your video camera, VCR or other video signal source. Simply plug the video source into the phono jack on the back of the TSC-70U. Press the **ACQUIRE** button on the remote to tell the unit you are going to capture an image, then press the button again as the desired picture appears. Easy!

Our review unit had the optional module to add a second page of memory to the TSC-70U. This was quite simple to install. This lets you have two images ready to send. Or you can keep one page for receiving and the other for sending.

To simplify the connection to your mike plug, you may want the "Radio Box" accessory. If you have an ICOM, Kenwood or Yaesu radio, the appropriate radio box is ready to connect between the TSC-70U and your mike input (we purchased the ICOM radio box with our system). Connect your mike to the radio box, and you can talk and send pictures without having to change connections. If your radio doesn't use one of these standard mike wiring patterns, you can always rewire the mike connector.

The Computer Connection

The proliferation of home computers has helped to renew the popularity of SSTV in the last few years. As you copy a few pictures you will discover a wide range of graphics effects. Some operators add fancy type with their call sign, name, location or CQ message to basic pictures. Other operators have created cartoons or added special effects to the pictures they transmit.

Before long you will want to join in this creative fun, and for that you will need to connect your TSC-70U Telereader to a computer. If your computer has an unused serial port, you can use the EB-232V accessory. The EB-232V package includes a cable to connect between your computer and the TSC-70U's **COM** port, plus a disk of PC control software.

If you don't have an available serial port, but have an open slot in your computer, then the EB-70V accessory is for you. This unit comes with an interface card to plug into your computer, a cable to connect between the card and the TSC-70U **RADIO** connector and, of course, the required software, which runs under DOS or in a DOS window in *Windows* 3.x or in a DOS session under *Windows 95*. I tried both accessories for this review, and both worked without problems.

BOTTOM LINE

The TASCO Telereader TSC-70U is a plug-and-play SSTV system that you can take almost anywhere. It worked great—with or without a computer!

The software for the EB-232V and the EB-70V is identical except for the computer port it addresses. With either software you can load graphics files from your computer to the TSC-70U and save pictures from the TSC-70U to the computer. The TSC-70U works with files in "SSV" format—apparently Tasco's own format—but the software can convert files to and from JPEG (JPG) and bit-mapped (BMP) files. The bit-mapped files can be in a variety of resolutions. You can load the JPEG or BMP files directly into the TSC-70U memory, or you can convert them to the SSV format first. The pictures seem to load into the unit a bit faster from the SSV format; other than that, I noticed no particular difference.

Obviously this capability presents many options for creating images for SSTV transmission. I had a couple of rolls of 35 mm slide film processed with Seattle Film Works' "Photos on Disk" (many photo finishers now provide this service—*Ed*) and used the software that came with those photos to convert them to JPEG format. There are numerous images available from a variety of sources, and these can provide plenty of picture material to transmit. Animal pictures and cartoon drawings seem to be quite popular. Computer programs for manipulating and modifying such images also are

Figure 1—Bert, W5ZR, was one of the first SSTV operators I met on the air. He uses a computer system to add many special effects to his pictures.

Figure 2—The operator who sent this pictures used his digital camera to capture an image of his dog. Then he duplicated the image several times to create an interesting special effect.

readily available (you can edit .BMP files using the *Windows Paintbrush* program—*Ed*). You can add lettering and other special effects and then save the modified file for use with your slow-scan system. TASCO says that SSTVer Tom Jenkins, N9AMR, has developed graphic software for the TSC-70U. It's a TASCO version of the Robot 1200C *HighRes* program, called *HighRes-70*.

Using the Software

Some editing features are included on the control software. For instance, you can enter your call sign and the call sign of the station you are working, and these will be placed on the picture in memory. You can also create text files using the Vtype command, and then insert them into pictures later. While you can use several colors for the letters in your type, and even use a different color for each letter, I found this capability rather limited. The letters are quite large, and only nine characters fit across the screen, with no more than six lines per screen. You can move a small block on the TV screen to select the position where the text will be placed, but this is rather limited because of the size.

When you are loading a picture from computer disk to the TSC-70U, you can select to place it on the full screen, or you can place a smaller image in any quadrant of the screen. This means you can actually load four pictures to a single frame.

When saving an image from the TSC-70U, you can select either the full frame or you can cut only part of the screen. This cut image can then be placed onto another image in the TSC-70U. This presents a number of interesting possibilities.

Other software features include the ability to convert files between various formats, place a color-bar pattern or rainbow effect on the screen as a background and change the default directories where the program looks for image files. Press the Shift key to reach a second set of menu options. This list matches those items you can control with the remote, such as changing memory pages, switching to transmit or receive mode, and acquiring an image from live video.

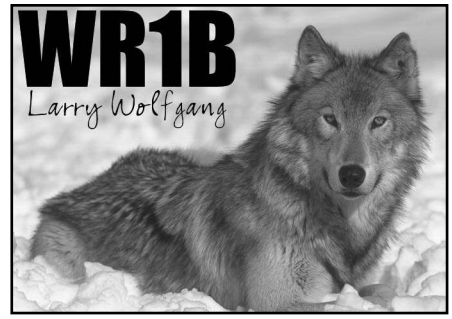

Figure 3—My son, Dan, developed this "wolf" image for me to use on the air.

The software control offers two additional slow-scan operating modes—the AVT 90-second and AVT 94-second Amiga Video Transceiver modes, from an interface and software written for the Amiga computer. (The basic TSC-70U will receive and retransmit AVT-format images.)

Documentation

The TSC-70U comes with a small 12-page booklet that contains minimal operating details. Most of the booklet describes how to connect the system to your radio and computer. There is detailed information about the connections at the **RADIO** port, which is most helpful if you're wiring your own cable for your radio.

The EB-232V and EB-70V computer interface accessories come with 9 photocopied pages of instructions. These had all the information I needed to operate the software, although I had to read several sections a few times and practice with the software to fully understand it. There is a list of files on the two software disks, and both list a .DOC file of "technical documentation," although neither disk with the review unit included such a file.

The radio box was pretty simple to hook up, with clear labels on the various jacks to help you make the appropriate connections. It's a good thing, because the only documentation with the radio box was a small sheet printed in Japanese (it does have a hookup diagram).

Look, Ma! I'm on SSTV!

This was my first stab at SSTV, and I found it really interesting. A lot of SSTV operation takes place on 20 meters on or around the calling frequency of 14.230 MHz (14.233, 14.236 and 14.239 MHz also are used when 14.230 is especially crowded; other SSTV calling frequencies include 3.845, 7.171, 21.340 and 28.680 MHz). Stations sometimes contact each other on voice first, but more often than not, stations will just send images, then identify on voice or CW. Copying the pictures exchanged on the weekend slow-scan nets was a *lot* of fun! It also was a great learning experience. After my first few transmissions, I was told that my images lacked a header. I wasn't sure what this meant, but I learned that most SSTVers place a section of text at the top of each picture that typically contains their call sign, name and location. The documentation doesn't mention it, but the TASCO unit does not support headers. Since I hadn't even seen headers on the pictures I was copying, I investigated further. Because of the overscan typical of many TV sets, my TV wasn't displaying the full picture area—the top 10 or so scan lines didn't show up on screen, and I probably missed some from the bottom as well. Another TV set gave the same results. I did sometimes get to see the header on a picture, though. By *manually* starting the receive mode before the picture began, I could copy a few lines of noise at the top of the screen, and the actual picture image would start part way down the screen. Of course this resulted in more picture lost at the bottom of the screen.

Tasco's Vtype editor produces text that is coarse and crude compared to a lot of the character generator–type text I copied off the air. While I could use a graphics program to edit the files before loading them into the

TSC-70U, this makes it nearly impossible to receive a picture, personalize it, and retransmit it—something I saw quite a bit of on the air. Retransmitting the original image makes it available to other SSTVers who didn't (or couldn't) copy the original transmission.

Typically, SSTV systems use information encoded digitally in the vertical sync period (called vertical-interval signaling or VIS) to set the correct mode. The TSC-70U can automatically determine the SSTV mode of the received signal as soon as it copies the first part of the picture transmission. Most of the time this worked very well, although occasionally I copied garbage from what sounded like a perfect signal.

By the way, some amateur TV enthusiasts send live SSTV images as audio along with their ATV images, so the TSC-70U might appeal to the ATV crowd also.

TASCO SSTV gear is now available from a mainland supplier as well as directly from TASCO in Hawaii. TASCO's Izumi Soma, KH6JDU/JA1KZS told us that Wyman Research Inc—run by SSTV pioneer Don Miller, W9NTP, and his wife, Sue, W9YL—now handles and distribues TASCO products on the US mainland. (Don says he's even taken his TASCO '70U mobile!)

TASCO plans to soon debut a little "docking station," model TDL-70K, for the TSC-70U scan converter. It will include a four-inch LCD color display and a microphone patch. It's expected to sell for $295.

Manufacturer: TASCO Electronics USA, Box 11106, Honolulu, HI 96828; tel/fax 808-524-7788 (SSTV). *Mainland US distributor-retailer:* Wyman Research Inc, 8339 S 850 W, Waldron, IN 46182; tel 317-525-6452; fax 317-525-4810; e-mail **w9ntpdon@ind.tds.net**. Manufacturer's suggested retail price: TSC-70U NTSC scan converter, $498; EB-70V SSTV PC interface, $98; MR-70 radio box, $85; EB-232 PC interface cable accessory and software, $68; EM-70 second-page memory, $98; *HighRes-70* software, $100 (available from Wyman Research Inc).

ICOM IC-R8500 Communications Receiver

By Bill Moore, NC1L
DXCC Supervisor

At first glance, the average ham might easily confuse the IC-R8500 with a typical HF transceiver—indeed it sells in the same price class as some of today's better transceivers. Despite its transceiver look and feel, the ICOM IC-R8500 is a communications receiver that covers the proverbial "dc to daylight"—from 0.1 to 2000 MHz—in all modes (with cellular telephone frequencies blocked out). While some monitoring enthusiasts might call it a "mega-receiver," ICOM calls it a "super wideband all-mode receiver."

The IC-R8500 is the heir apparent to ICOM's IC-R7100 (see "Product Review," *QST*, Apr 1993), which tuned from 25 to 2000 MHz, so one big change is the inclusion of the LF and MF bands and the complete HF spectrum in the later receiver. Another improvement (among many) is the smaller minimum tuning step available on the R8500—10 Hz vs 100 Hz. Our Lab tests also indicate improved dynamic range (see Table 1). Our dynamic range measurements on the IC-R8500, taken at 20-kHz spacing, were better than those taken on the R7100 at 50-kHz spacing. Something you might *miss* if you're considering "upgrading" to the R8500 is the five-event timer in the earlier receiver. The R8500 is not equipped for timer-operated, unattended recording.

Memories

The R8500 offers 1000 channels of memory within 20 storage banks (the R7100 offered 900 channels plus 20 band-edge memories in nine banks). Complementing this huge memory capacity is a large, easy-to-read display that details all that the radio can do. Alphanumeric memory naming lets you label everything you listen to, something that comes in handy when you start trying to remember what you've got in those 1000 channels and 20 storage banks. You can label each 40-channel bank with up to five characters (names can include the period, apostrophe, hyphen, asterisk and the colon). ICOM has applied default bank names (USR-A through USR-T) to get you started. Individual channel names can have up to eight characters (also including the same punctuation marks). So, you might have a memory bank called "POLICE" and, within it, the names of the different departments whose frequencies you've put in to individual memories.

A word of caution: it's almost *too* easy to write to or to clear data from a memory—you just hold in the appropriate button until you hear three beeps. Each channel individually stores frequency, mode, tuning step, attenuator setting, name and even passband width—all of this without affecting the scanning rate of the radio. You can readily "cut and paste" data from one memory to another.

In addition to its 20 memory banks, the receiver has an *Auto* bank for storing up to 100 frequencies located during a programmed scan; a *Skip* bank to temporarily store another 100 frequencies you want to keep, but not scan through, perhaps because they are frequently too busy; and a *Free* bank to place frequencies you do not want to lose, for later memory reassignment. The R8500 lets you delete channels (one at a time) from a memory bank. Deleted channels go into the *Free* bank.

You also can add up to 10 programmable upper-and-lower search limits, so your favorite bands or frequency ranges will be programmed for searching anytime you want. The R8500 lets you move easily among search ranges, too.

BOTTOM LINE:

A top-notch receiver/scanner with quality and features to please the discriminating and serious SWL or monitoring buff.

Front Panel Controls

Prominent on the front panel is the large tuning knob, which has an indentation for fast finger-spinning and a screwdriver adjustment to set the amount of "drag." An **AUTO TS** (tuning speed) selection on the Quick Set menu lets you choose if you want the tuning rate to increase when you spin the knob rapidly—a nice touch for a receiver that lets you cover so much territory. Buttons adjacent to the tuning knob let you set the

Table 1

ICOM IC-R8500 Communications Receiver, serial number 01170

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive, 0.1-824; 849-870; 894-2000 MHz.	As specified.
Modes of operation: FM, WFM, AM, USB, LSB, CW.	As specified.
Power requirements: 2 A (max volume), 13.8 V (±15%).	1.7 A (max volume, no signal), tested at 13.8 V.
Size (HWD): 4.5×11.5×12.4 inches; weight, 15.4 lb.	
CW/SSB sensitivity (10 dB S/N): 0.1-0.5 MHz, 1.0 μV; 0.5-1.8 MHz, 2.0 μV; 1.8-2.0 MHz, 0.25 μV; 2.0-30 MHz, 0.2 μV; 30-1300 MHz, 0.32 μV.	Minimum discernible signal (500-Hz filter): 0.18 MHz, –132 dBm; 0.5 MHz, –129 dBm; 1.0 MHz, –131 dBm; 3.5 MHz, –139 dBm; 14 MHz, –138 dBm; 28 MHz, –141 dBm; 50.1 MHz,–138 dBm; 144.1 MHz, –139 dBm; 222.1 MHz, –138 dBm; 432.1 MHz, –139 dBm; 903.1 MHz, –137 dBm 1296.1 MHz, –135 dBm; 1806.1 MHz, –133 dBm.
AM narrow sensitivity (10 dB S/N): 0.1-1.8 MHz, not specified; 1.8-2.0 MHz, 2.5 μV; 2.0-1300 MHz, 2.0 μV.	AM narrow, test signal modulated 30% with a 1-kHz tone, 10 dB (S+N)/N: 0.18 MHz, 1.1 μV; 0.5 MHz, 2.1 μV; 1.0 MHz, 1.4 μV; 3.8 MHz, 0.5μV; 14.2 MHz, 0.5 μV; 29 MHz, 0.4 μV; 52 MHz, 0.5 μV; 98 MHz, 1.5 μV; 120 MHz, 0.5 μV; 146 MHz, 0.4 μV; 223 MHz, 0.6 μV; 440 MHz, 0.4 μV; 903 MHz, 0.6 μV; 1296 MHz, 0.9 μV; 1806 MHz, 1.1 μV.
FM-narrow sensitivity (12-dB SINAD): 28-1300 MHz, 0.5 μV.	FM narrow, 12-dB SINAD: 29, 52, 98, 146, 223, 440 MHz, 0.2 μV; 903 MHz, 0.3 μV; 1296 MHz, 0.4 μV; 1806 MHz, 0.5 μV.
FM-wide sensitivity (12-dB SINAD):30-1000 MHz, 1.4 μV.	98 MHz, 0.7 μV.
Blocking dynamic range: Not specified.	CW mode, 500-Hz filter: 0.5 MHz, 111 dB; 1.0 MHz, 108 dB; 3.5 MHz, 109 dB; 14.0 MHz, 108 dB; 28.0 MHz, 111 dB; 50.1 MHz, 96 dB*; 144.1, 99 dB; 222.1, 99 dB; 432.1, 98 dB.
Two-tone, third-order IMD dynamic range: Not specified.	CW mode dynamic range and third-order intercept point (500-Hz filter):

Frequency (MHz)	*Dynamic Range (dB)*	*Intercept point (dBm)†*
0.5	86	+7.0
1.0	88	+5.1
3.5	86	–3.6
14	86	–4.1
28	87	–6.9
50.1	80*	–8.4
144.1	81*	–5.2
222.1	82*	–4.4
432.1	76*	–6.2

At 10-MHz spacing, 146 MHz, 96 dB; 440 MHz, 96 dB.

Second-order intercept point: Not specified.	+52.8 dBm.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): AM-M: 90-3670 Hz (3580 Hz); AM-W: 90-6310 Hz (6220 Hz); AM-N: 90-1435 Hz (1345 Hz); FM: 231-1420 Hz (1189 Hz); FM-N: 231-1331 Hz (1100 Hz); FM-W: 90-5230 Hz (5140 Hz); USB: 279-2844 Hz (2565 Hz); LSB: 141-2501 Hz (2360 Hz); CW: 91-1871 Hz (1780 Hz) CW-N: 527-1071 Hz (544 Hz).
Spurious and Image rejection: Below 30 MHz, greater than 60 dB; 30-1000 and 1240-1300 MHz, 50 dB (typical).	IF: 14.2 MHz, 94 dB; 146 MHz, 113 dB. Image: 14.2 MHz, 94 dB; 146 MHz, 102 dB.
Squelch sensitivity (threshold): SSB/CW/AM-N, 1.8-30 MHz, 10 μV; 30-1000 and 1240-1300 MHz, 4.5 μV; AM/AM-W, 1.8-30 MHz, 0.5 μV; 30-1000 and 1240-1300 MHz, 0.4 μV; FM, 28-30 MHz, 0.5 μV; 30-1000; 1240-1300 MHz, 0.4 μV; WFM, 30-1000 and 1240-1300 MHz, 4.5 μV.	As specified.
S-meter sensitivity: Not specified.	S9: 3.5 MHz, 42 μV; 14 MHz, 53 μV; 28 MHz, 52 μV; 144 MHz, 21 μV; 903 MHz, 40 μV.
Audio output: Greater than 2 W at 10% distortion into an 8-Ω load.	2.2 W at 9% THD into an 8-Ω load.
Audio output at **RECORD** jack: 100-300 mV RMS into a 4.7-kΩ load.	100 mV into 4.7-kΩ load, measured at 29 MHz, USB, S9 signal.
AGC output at **AGC** jack: 1-2.4 V (2.2 MΩ).	No signal, 2.37 V; S5, 1.85 V; S9, 1.64 V; S9 + 20 dB, 1.47 V; 0 dBm, 1.14 V.

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

*Measurement was noise-limited at value shown.

†Third-order intercept point was determined using S5 reference.

tuning step (available steps are 10, 50, and 100 Hz; 1, 2.5, 5, 9, 10, 12.5, 20, 25 and 100 kHz; and 1 MHz).

An alphanumeric keypad lets you directly enter a frequency or memory number (it's also used for naming memories). A double row of buttons on the right sets scanning functions, while another double row on the left makes mode selection a breeze. The R8500 lets you choose narrow (5.5 kHz), normal (12 kHz) and wideband (150 kHz) FM, plus USB or LSB (2.2-kHz), narrow (2.2 kHz), medium (5.5 kHz) and wide (12 kHz) AM, and—with the optional narrow FL-52A filter, both narrow (500-Hz) and wide (2.2 kHz) CW. You can select any mode anywhere in the radio's tuning range—with the exception of wideband FM while you're in the HF range (why would you *want* to?).

Another set of four buttons selects memory functions. The receiver has rotary controls for **AF GAIN**, **SQUELCH**, **APF** (audio peak filter), **IF SHIFT**, **M-CH** (memory channel) and **DELAY/SPEED**. In the FM mode, the **APF** (which is concentric with the **IF SHIFT** control) works as a "tone" control. This came in handy to clarify muddy audio on some FM signals. When used for CW or SSB reception, the **APF** has a wide and narrow position. A 1/4-inch front-panel stereo jack lets you plug in low-impedance headphones; there are mini-phone jacks—**REC OUT** and **REC REMOTE**—for taping. When I first turned on this receiver, I noticed it made a clicking sound when it stopped on a received signal and another click when the carrier dropped. After some investigation, I determined the sound came from the relay used to start and stop a tape recorder (via the **REC REMOTE** jack). You have to go to the Initial Set menu to turn it off.

To take advantage of the IC-R8500's more sophisticated (and handy) features, you'll need to spend some time with the manual. The R8500 is not completely intuitive, but its manual is well organized and definitely not wordy. Sometimes, though, a little more description on features would have been nice. It has sections marked "**Convenient**" to explain certain features. I found these helpful.

Scanning

I found the IC-R8500 compared favorably to my other scanners (I've got several Radio Shack Pro-series scanners and a handheld scanner) in terms of receiver sensitivity and memory storage, although no single scanner had all the features of the R8500. It performed well with a discone antenna and even while using an indoor whip. Its top-firing speaker delivered surprisingly rich and pleasant audio and plenty of it (although I prefer an external front-firing speaker).

Scanning on the R8500 is pretty flexible. It scans at 40 channels per second in programmed or memory scan; delay time is continuously adjustable from 3 to 18 seconds. There are three delay modes.

Priority scan checks a priority channel. It checks at intervals (selectable) of anywhere from 1 to 16 seconds.

The R8500 can do programmed scan (where the radio is set to search a given frequency range), memory scan, priority scan, selected-mode memory scan (ie, only stops for signals of a particular mode, say FM), auto-memory write scan and memory select scan. The receiver's voice scan control (VSC) function is a nice touch. When it hears a voice signal, it pauses, but if it stops for noise, it resumes scanning after about one second, without opening the squelch.

The R8500 lets you insert frequencies anywhere in memory (shifting the other frequencies accordingly). This is nice if, say, a police department you monitor a lot adds or deletes frequencies and you don't want to rearrange the memories.

But I wasn't entirely happy with the R8500's scanning system. For scanning, the R8500 only allows you to scan either a single memory bank or all 20 tuning banks. This means that if you like to designate different memory banks for different services—say, fire departments in one bank, rescue squads in a second and police departments in a third—you can't scan just among those memory banks. The ability to scan only designated memory banks is a feature fairly common among scanners costing far less than the R8500. This lack of scanning flexibility could diminish the appeal of this radio among avid scanner users. ICOM says it has software in the development stage that will let users select several banks for scanning.

Three improvements would have made this more useful as a scanner. The first would be a zero-delay feature. It takes at least three seconds to resume scanning after the carrier drops—quite a long time if you like to scan multi-frequency trunking systems. For these, you want scan to resume immediately. Most scanners let you turn the delay off. The second would be tone-encoded squelch (CTCSS), which is becoming more common in these days of frequency sharing. With CTCSS, listeners could block out all but the agency they wanted to monitor. Also desirable: the ability to select a separate CTCSS tone for each channel. The third would be direct-searching capability. This lets you begin a search directly from a frequency on a memory channel. Monitoring buffs find this useful for locating frequencies of agencies that move off their main channel.

What else can it do?

Given the huge expanse of spectrum the R8500 gives you access to, you could almost overlook the fact that it covers MF and HF plus AM standard broadcast and the nether regions of LF. In addition to monitoring and scanning on VHF and UHF, I used the receiver to monitor HF WEFAX (using an AEA WEFAX decoder) and RTTY signals (using a KAM TNC), and it performed fine here. Both HF and VHF packet decoded as you'd expect. It worked nicely with SSTV signals too. The R8500 also can be used for receiving 1200-baud data in any mode or 9600-baud packet in the FM mode. If you're one of the vanishing breed of hams that still build their own transmitting gear (or enjoy firing up those classic rigs of yesteryear), the R8500 can easily serve as a station receiver. You can also hook up the R8500 for transceive operation with an ICOM transceiver.

There's no RF gain control, so the **ATT**enuator settings came in handy on the more-crowded MF and HF bands (the 10 and 20-dB attenuators can be combined for 30 dB). So did the **APF** control, which is nice for CW, especially in the **APF-N** (narrow) setting. The concentric-mounted **IF SHIFT** works only on SSB and CW; it's a little inconvenient for someone with big fingers, but it does have one nifty feature: the IC-R8500 lets you adjust the BFO frequency ±1.2 kHz (by holding in the **SSB/CW** mode button) to improve the audio quality when using the **IF SHIFT** on SSB. You can switch between fast and slow AGC (an **F** shows up on the display when you're in the fast setting), but you can't turn the AGC off. The tuning step buttons next to the main tuning dial make it a cinch to navigate; so does the direct keypad frequency entry. During Lab testing, however, we did find that dial calibration got progressively worse as we went higher in frequency—as much as 1.9 kHz at 1806 MHz. This is within the ±0.0003% tolerance, however. The optional CR-293 high-stability crystal unit provides ±0.00006% tolerance above 30 MHz.

Also during Lab testing, we encountered some sensitivity anomalies on VHF (98, 120 and 146 MHz), where the radio did not meet specifications. However, a second R8500 we tested performed as specified, and Table 1 reflects data obtained from the second radio at those frequencies.

When you switch from one mode to the next via the front-panel buttons, a little "bandwidth" icon pops up on the display, briefly replacing the name of the selected memory bank. The little icon apparently is supposed to graphically represent the bandwidth of the selected mode (eg, narrow, medium or wide on AM), but it's only there for one second, barely long enough to register.

Monitoring earthbound and satellite signals is just part of the fun of having a receiver like this. The SETI League—which has mounted a privately funded search for extraterrestrial intelligence—says SETI searchers (many are hams) can couple radios like the IC-R8500 to an antenna feed horn and a low-noise preamp to check the "traditional water-hole frequencies" of 1440 to 1600 MHz." (The SETI League Web page at **http://seti1.setileague.org/** explains how you can get involved in the search.) The ability to computer control the IC-R8500 could be of benefit in this regard. Other possible applications for a "mega-receiver" like this include propagation monitoring, by using distant TV station signals to tell when VHF and UHF bands are open.

Other neat features

- S meter squelch (receive only signals that exceed a preset S-meter reading)
- AFC centering feature that brings you right on frequency

• HI/LO display dimmer
• Main-panel lock
• Menu setting for either a 50-Ω or 500-Ω antenna
• Sleep timer (30, 60, 90 or 120 minutes)

There is a optional speech unit for voice annunciation in both English and Japanese, and you can connect other ICOM radios to the R8500 (see below).

Rear-panel Connections

On the back side, the R8500 has three antenna connectors: an SO-239 and a phono connector for below 30 MHz, and a type-N connector for above 30 MHz. You'll also find an **RS-232** computer interface (a DB-25 connector; not tested), for professional-style scanning and frequency storage (this is becoming a popular way to scan). The manual does not mention software for PC control, but it does provide a command table and data format if you enjoy rolling your own. ICOM says it is developing compatible software. A **REMOTE** jack can connect directly to an ICOM CI-V system transceiver or another ICOM receiver, or allows PC control of several ICOM receivers (which requires the optional CT-17 CI-V level converter). The radio has both a **DC 13.8 V** jack and a **DC IN** jack. The ac adapter that came with our R8500 plugs into the **DC IN** jack, and you must use a jumper (supplied) in the **DC 13.8 V** jack.

The rear panel also offers an **IF OUT** jack (for use with the optional TV-R7100 television receive adapter), and **AGC** jack (also for use with the TV-R7100), and an external speaker jack. By changing an internal jumper, you can also pick off FM audio output (prior to de-emphasis) via the **AGC** jack for 9600-baud data detection. There's also an **EXT**ernal **SP**eaker jack and a **GROUND** terminal with a handy wing nut.

Conclusion

When using a radio with such broad frequency coverage, you have to keep reminding yourself that you can listen to only one frequency at a time—although the 1000 memories sure let you store plenty for later perusal.

Mainly because of its scanning limitations, the IC-R8500 was not the perfect receiver for my scanning needs, but the overall positive features of this receiver more than overshadowed the few negatives I encountered. This handsome receiver is a terrific centerpiece or complement to any listening shack. It's also a hefty set (just over 15 lb), and the inclusion of the MB-23 carrying handle as standard equipment instead of an option would have been helpful.

Some might balk at the $2400 price tag, even for such a superb receiver and all its features. After all, one could buy a LF/MF/HF receiver and a VHF/UHF scanner separately for much less. But then, you'd be without some of the extras the IC-R8500 has to offer. For the listener looking for an all-in-one box, it would be hard to top the R8500 in this price class.

Manufacturer: ICOM America Inc, 2380 116th Ave NE, Bellevue, WA 98004, tel 206-454-8155; fax 206-454-1509. Manufacturer's suggested retail price: IC-R8500, $2400; FL-52A 500-Hz CW filter, $196; CR-293 high-stability crystal unit, $304; SP-21 external speaker, $110; UT-102 voice synthesizer, $59; TV-R7100 TV/FM adapter, $341; AH-7000 discone antenna, $165.

Tigertronics BayPac BP-2M Multimode Modem

Reviewed by Rick Lindquist, N1RL
Senior Assistant Technical Editor

What's that old saying about good things coming in small packages? Well, that certainly applies to the BayPac BP-2M multimode modem from Tigertronics. This is a teeny, tiny little TNC that's only slightly larger than the typical DB-25 connector on the end of your printer cable. It's software driven—the actual TNC emulation happens in the software and the PC that's attached—so how well it works highly depends on the quality of the program you run.

Packet radio was the reason I fell in love with the little BP-2M. Friends have been after me for months to get on the local packet node, but for a variety of reasons, I never got around to it. Yes, I've got a "conventional" (and much larger) TNC I bought several years ago. But it was hooked up to my HF rig for RTTY. Putting it on packet meant having to wire up another connector, then resetting the modem. Besides, my only 2-meter radio at the time was in my car. Oh, the bother! So, I kept putting it off.

Finally, I got a 2-meter radio inside the shack, and I decided to give the BP-2M a try. An optional interfacing cable let me hook the little box up to the DB-9 serial port on an aged 80286 laptop computer. I didn't avoid having to wire up the BP-2M cable to the microphone input, PTT line and audio output circuits of my 2-meter transceiver, but it was not nearly as painful as I'd envisioned. The cable interfaces with the little TNC via a telephone-type modular plug. Tigertronics supplies very thorough *Installation and Operation* instructions with the unit. By the way, to

use the BP-2M with an HT that does not have a separate PTT line, you need to install a little jumper (supplied) on the unit that activates an internal 3-kΩ keying resistor.

Since the quality of the BP-2M's operation depends almost entirely on the quality and compatibility of the software you're running it with, Tigertronics supplied some software that it knew would work nicely with the BP-2M. I installed the two disks on my hard drive and fired up the *BPMODE* program. As John Olson, WA6IKO, of Tigertronics explained to me, the *BPMODE* program makes the BP-2M "reconfigure itself into an entirely different modem" depending on the settings you choose. It's also a nice little diagnostic and calibration tool to make sure you're transmitting tones at the correct levels (the BP-2M has a little level adjustment, but you shouldn't have to touch it), have your volume control set high enough, and that the unit keys the PTT line in transmit. You must run *BPMODE* to set the BP-2M for the mode(s) you intend to operate. It's a very simple program, and since it runs under DOS, you can put that relatively primitive PC you've had sitting around to good use in the ham shack.

One note for *Windows* wonks: Tigertronics says you can't run the *BayCom* packet software under *Windows*, not even as a full-screen DOS application. This has to do with the way *Windows* handles system interrupts. However, a relatively new packet program, *WINTNC* ver 1.01, available as shareware (the latest version is Rev F), will run under *Windows* 3.x and *Windows 95*, although Tigertronics warns that it's "not quite up to par with *BayComm* in performance." You still can't run your multimode software in *Windows*, however. Tigertronics says this will always be the case. For some at least, this might be a major disadvantage to the BP-2M. The latest (and last) shareware version of *BayCom* is 1.4. This is now a commercial product, so getting the latest version now will cost $20 (plus $5 S&H). As the instructions declare: "*BayCom* requires the *total undivided attention* of the computer to work reliably." You should not be running

BOTTOM LINE

A neat and inexpensive little package that puts packet and other digital modes within easy reach of anyone with a PC—even an old DOS clunker.

any TSR (terminate and stay resident) programs either.

Once I'd determined that the unit was hooked up correctly, I set the unit to Mode 1, which is VHF/UHF packet. Then, I ran the *BayComm* program included with the unit. The program was written by DL8MBT, so don't be surprised when you see occasional DOS command-line messages in German. Once I got familiar with the common packet commands, I was able to log onto my local packet node the first time out! (I've become a pretty regular visitor, and being on the *PacketCluster* was a real help during the Heard Island VK0IR DXpedition.) *BayComm* offers a split-screen mode: what you send is on the top half of the screen; what you receive is on the lower half of the screen.

After returning to BPMODE to reset the BP-2M to work with multimode software (Mode 3), I tried a copy of the *HamCom* shareware program—also from Germany—to run RTTY. Once I got it set up correctly and learned how to navigate the program, it worked super. The BP-2M is so small (and requires no external power source) it puts mobile RTTY (or other digital modes) within easy reach! (If you look carefully at the front cover of the March 1997 *QST*, you might notice that I'm using a BP-2M hooked to a palmtop PC to run 2-meter packet with a venerable ICOM IC-2AT.)

We also successfully tested the BP-2M on FAX, SSTV, CW and AMTOR.

Tigertronics Web site, **http://www.tigertronics.com**, offers more information on this unit, plus the latest software updates and links to sources of shareware that Tigertronics has found to be compatible with the BP-2M.

Manufacturer: Tigertronics Inc, Box 5210, Grants Pass, OR 97527; tel 800-822-9722; 541-474-6700; fax 541-474-6703. Manufacturer's suggested retail price: BP-2M multimode modem, $69.65; model BP-2 packet-only modem, $49.95; nine-pin to 25-pin serial adapter, $6.

Alpha Delta Communications Model VRC Variable Response Console

Reviewed by Rick Lindquist, N1RL
Senior Assistant Technical Editor

By and large, amateurs are not audiophiles. With a few exceptions (mainly traditional AM aficionados who pride themselves on flat audio response), hams are content with "communications-quality audio," so at first glance, a tuned-port speaker with a built-in audio equalizer (plus peak and notch filters) might not be high on your wish list. But, if you enjoy "good" audio or are not content with the audio quality of the typical built-in transceiver speaker or even the available external speakers, the Model VRC Variable Response Console might be just the solution.

The VRC is a solid little block (the case is a heavy cast aluminum with a black matte finish) containing a 4-inch speaker and a tuned port baffle. As we indicated, this is more than just a speaker (although Alpha Delta also offers the Model VRC-2—just the tuned-port speaker and no electronics). An ac wall-outlet adapter cube supplies 12 V dc to the unit via a rear-panel coaxial connector. During ARRL Lab testing, we found that the wall cube would not power the VRC to full audio output (greater than 2 W). We measured approximately 1.3 W of audio into an 8-Ω load using the wall cube, but 4.7 W using a huskier 13.8-V dc bench supply. We'd recommend using a bigger supply for best dynamic range.

The front panel is nearly equally divided between the speaker grill on top and the control subpanel on the bottom (the PC board containing the electronics is directly behind this subpanel). The most prominent feature of this subpanel is the x-y style bar graph of green LEDs. This graphically displays low-frequency boost or cut in dB (vertical axis) and high-frequency cutoff point in kHz (horizontal axis). By the way, we discovered a "typo" on the kHz scale on our unit's graphic display. Instead of "1" at the 1 kHz LED, the scale reads ".1" (which would be 100 Hz). The graphic display also serves as a pilot light. You turn on the VRC with an orange pushbutton. Three black pushbuttons engage **NORM**al mode, **PEAK** or **NOTCH** (peak and notch functions are mutually exclusive). Four rotary controls set the desired equalization and adjust the response of the peak and notch filters. There's also a tiny set-and-forget **ADJ**ust **VOL**ume control; although this is an amplified speaker, Alpha Delta instructs users to set volume level using the AF gain or volume control on their transceiver or receiver. The **ADJ VOL** knob controls an audio attenuator that comes after the filtering networks but before the AF power amp that drives the speaker. If you turn it up *too* high, you might hear some strange noises resulting from internal audio heterodynes generated in the filtering circuits. Under some circumstances, you could hear this when using headphones, but it's not noticeable with the **ADJ VOL** knob at a typical setting—approximately 1/4 turn.

BOTTOM LINE

The model VRC is a "sound" investment for those who enjoy and appreciate good audio.

A centrally located 1/4-inch monaural **PHONES** jack provides output to headphones or an auxiliary 8-Ω speaker. A phono jack on the rear of the VRC provides approximately 0.5 V of audio through a separate amplifier to feed a tape recorder or other device. This level is independent of the **ADJ VOL** control setting, but not independent of your receiver's volume control.

The VRC is very easy to use, but the little six-panel *Instruction Manual* (a brochure, really) explains all quite well and even includes a block diagram and various frequency response curves that describe the effects of the front-panel controls on the audio. As the block diagram explains, audio entering the unit from your transceiver or receiver via the rear-panel mini-phone jack (a connecting cable is supplied) passes through a low-frequency network that permits increasing or attenuating low-frequency audio via the **LOW FREQ** control on the front panel.

The response curves in the *Instruction Manual* suggest a maximum boost of approximately 6 to 12 dB and an average roll-off of approximately 15 dB at 100 Hz or less. In the ARRL Lab, we found approximately 9 dB of boost (maximum boost setting) and 14 dB of cut (maximum cut setting) at 100 Hz. The boost/cut adjustment primarily affected frequencies from approximately 25 to 400 Hz. On the other end of the spectrum, the **HIGH FREQ** control adjusts a low-pass filter (an active four-pole Butterworth design). Lab tests confirmed that this sharply attenuates frequencies above the setpoint (adjustable from approximately 500 Hz to 10 kHz. You

can tinker with the equalization in any of the unit's three modes. In the Lab, 0 dB low-frequency boost and minimum high-frequency cutoff settings yielded an overall –6 dB bandwidth of nearly 11 kHz (from 20 to 11,000 Hz). The minimum –6 dB bandwidth we obtained by just using the boost and cut controls was 469 Hz (from 21 to 490 Hz).

For the peak and notch functions, the VRC uses separate SCAF filters. Pushing the **NORM**, **PEAK** or **NOTCH** mode pushbuttons creates an annoying pop in the speaker (it also pops when you first turn on the power). A **P/N FREQ** control sets the peaking or notching frequency (from approximately 400 Hz to 10 kHz), while the **P/N BW** control sets the peak or notch response—from wide to sharp. Alpha Delta's response curves for the sharpest **P/N BW** setting, suggest a maximum peak of up to 20 dB and a maximum null of up to 25 dB or so (approximately what we measured in the ARRL Lab in both cases). In practice, the peak and notch filters worked very effectively. On CW, I found the peak filter worked great. It was also a nice complement to my external DSP box (plus, you can roll off the higher frequencies to further reduce noise). The notch filter would be especially beneficial to those who enjoy listening to shortwave broadcasts and need to eliminate the occasional heterodyne. But it's superb for those who like to work 40-meter SSB among the broadcasters in the evening, too.

The VRC really shone when receiving SSB or AM signals. Voices I was already familiar with sounded more natural, and the ability to boost the bass provided additional presence, while the high-cut eliminated annoying high-frequency noise. I caught some especially good audio one evening from a couple of fellows on 160-meter SSB who had taken pains to tinker with their audio using various high-quality microphones and external equalizing units. Their efforts would have been lost on a lesser speaker, but on the VRC, they started approaching AM-broadcast quality. Of course, you can also take advantage of the VRC's electronics with a good pair of headphones.

While the VRC (and the passive VRC-2) is designed to provide high-fidelity audio, it's not going to make your transceiver sound like a Bose Wave. This is because most MF/HF transceivers and communications receivers are designed with a limited "communications-quality" audio passband that rolls off higher and lower frequencies accordingly. (This is even more true of the typical FM transceiver.) And, if you feed the speaker via another intermediary device (as I did going from my HF transceiver through my external DSP box for some of the time), the speaker probably won't sound as good as it might if it were working with "flat" audio from your stereo, for example. While the bass boost feature will help to recover some of the lost or rolled-off low frequencies, the VRC offers no way to brighten the treble end of the scale. With these limitations taken into account, the VRC delivers lots of nice, clean, clear, crisp audio, and it can make good audio sound even better. The QRM-fighting features are icing on the cake.

Manufacturer: Alpha Delta Communications Inc, Box 620, Manchester, KY 40962; tel 606-598-2029; fax 606-598-4413. Manufacturer's suggested retail price, $250; Model VRC-2 (tuned-port speaker without equalizer or filters), $99.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

ICOM IC-821H VHF/UHF multimode transceiver with 500-Hz CW filter, (see "Product Review," Mar 1997 *QST*). Minimum bid: $1181.

ICOM IC-R8500 communications receiver (see "Product Review," Apr 1997 *QST*). Minimum bid: $1290.

MFJ Versa Tuner V model MFJ-989C antenna tuner (see "Product Review," Mar 1997 *QST*). Minimum bid: $194.

N4XM XMatch antenna tuner (see "Product Review," Mar 1997 *QST*). Minimum bid: $690.

Nye-Viking MB-V-A antenna tuner (see "Product Review," Mar 1997 *QST*). Minimum bid: $528.

TASCO TSC-70U scan converter, EM-70, EB-232, MR-70I and EB-70 SSTV system (see "Product Review," Apr 1997 *QST*). Minimum bid: $572.

Tucker T-3000 antenna tuner (see "Product Review," Mar 1997 *QST*). Minimum bid: $230.

Sealed bids must be submitted by mail and must be postmarked on or before May 1, 1997. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494. QST

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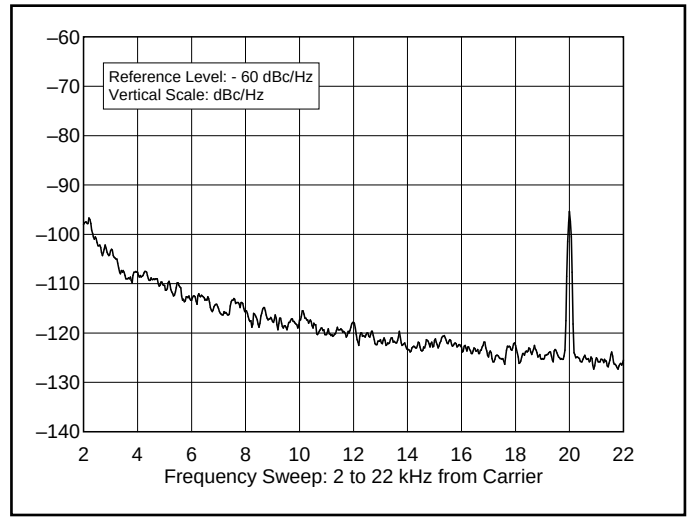

Because of a production error, an incorrect graph appeared in the January 1997 "Product Review" of the Kenwood TS-570D. The correct graph for Figure 3 on page 75 is reproduced here.

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