

its incomplete and misleading description of how to set User Definition functions (BFO pitch, 10-Hz display toggle, **EXCITER OUT** enable, and so on). You're told that you can either dial these in with the tuning knob or use the keypad. In fact, *only* the tuning knob selects functions 1 through 14 and *only* the keypad selects functions numbered 21-27 and 169. Snag: The display does not echo (display your keypad entries) as you key in User Definition function numbers—until, that is, you press **ENTER**. In the CPU-reset mode, only the keypad selects CPU-reset enable—but hitting the number you want (0 = reset disabled, 1 = reset enabled) doesn't echo your choice as entered and immediately dumps you out of User Definition set mode. So you have to reenter User Definition set mode to determine if your choice really took!

If you want to reset the CPU, you have to choose 1 at function 169, *then turn the radio off and back on*, to perform the reset.

There's more: Resetting the CPU returns the radio to its optionless factory-default condition, so you must then enable the appropriate non-default User Definition functions one by one. (The *Operation Manual* mentions this only cryptically.) Until you do this, BWC and the notch won't work, and you can't access the 1-kHz IF filter.

The JST-135HP Question

Does the JST-135HP qualify as a competitive, high-performance radio that offers good value for its price? In my opinion, no. The options JRC bundles with the basic JST-135 don't improve its on-the-air utility to a level comparable with competition-grade radios *designed from the start* to sell in or near its price class. Certainly, the JST-135HP can more than hold its own in conversational and casual CW contesting, SSB and data operation—but hams generally don't (and *needn't*) spend \$2700 for a conversation and casual

contesting box.

I think the basic JST-135 platform needs work: Its entire front panel and user interface need rethinking and redesign to dedicate more (and more appropriately sized) controls to frequency/band/mode agility, and AGC control. Its basic and not-so-basic radio performance (QSK, blocking dynamic range, composite noise, IF filtering, AGC attack and RF attenuation) need improvement to put them on par with other radios, even in the price class represented by a stripped-down JST-135. Short of such improvement, I can recommend the JST-135HP only to JRC connoisseurs and those who need the special functions (notch follow, synchronous AM reception, USB-only AM transmit, and so on) of which only the JST-135HP is capable.

I thank Rus Healy, NJ2L; Mark Wilson, AA2Z; and Larry Wolfgang, WR1B, for contributing to this review.

THE DRAKE R8 SHORTWAVE RECEIVER

Reviewed by Jim Kearman, KR1S

The R. L. Drake Company made a name in Amateur Radio with a series of innovative receivers, starting with the Model 1A in 1958 and culminating in the highly rated R7A in the 1980s. Then, as quickly as they came on the scene, Drake receivers disappeared from the market. The company decided to explore the home-satellite-TV market. Now, with the R8, Drake is once again causing a stir in Amateur Radio and SWL circles.

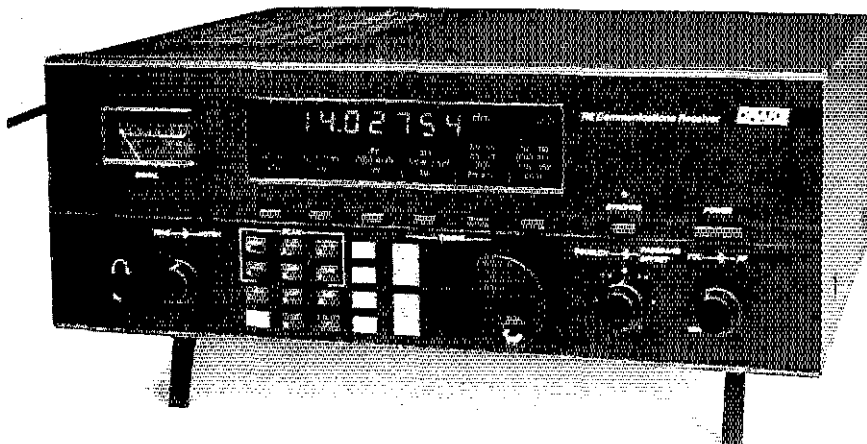
Drake's R8 is as much a departure from contemporary communications receivers as the Model 1A was almost 35 years ago. Compared with other modern receivers, the R8 is Spartan in appearance. Behind the barren front panel, however, lurks a sophisticated receiver.

Overview

The R8 can receive CW, FSK, SSB and AM signals from 100 kHz to 30 MHz. IF bandwidths of 500 Hz and 1.8, 2.3, 4 and 6 kHz are standard. No optional IF filters are available for the R8. The R8 IF filters hark back to the models 1, 2 and early R4, as they are LC tuned circuits, not crystal filters. Crystal filters have gotten more expensive over the years (is the world running out of quartz, too?), and apparently LC filters are now more cost-effective.

Some receiver users claim that LC filters provide better audio response for listening to broadcast stations. From a performance standpoint, I wouldn't have known the R8 had LC filters if I hadn't read about them in the *Owner's Manual*.

You can tune the R8 via its tuning knob, up/down buttons or its keypad. The day of the black-box receiver with nothing on its



front panel is here, and Drake is obviously planning to take the R8 in that direction (it features a serial-interface connector to allow computer control of most functions, although software for this function, mentioned in the manual as a planned option, was not available at this writing). Soon, you'll be tuning your receiver from your computer keyboard or a logging program tied to PacketCluster. The R8's tuning knob reflects this new era. It's lighter and smaller than I'd prefer.

Going to the PROM

Beneath the R8's tuning window is a row of six push-button switches. When the receiver is turned on, their functions become apparent (their labels are part of the multifunction display). The entire row can be "shifted" to perform an additional set of six functions. You select the operating mode with the button farthest to the right. One button for all those modes? Yes—you press and release this button to cycle

through the six mode selections (AM, FM, CW, RTTY, LSB, USB). Mode selection is in one direction only: to go from USB to LSB you have to punch the button five times. Even though this is a "soft-touch" button, it's still not as quick or convenient as separate buttons.

While you're punching this button on the review radio, other things are happening on the display. The bandwidth, AGC and RF indicators are changing too! Welcome to PROM Night. The receiver's microprocessor was programmed to automatically select what the designers considered the best bandwidth, AGC time constant and tuning rate for each mode. "Wait a minute!" you say. "This is a free country, and I don't want to listen to CW with a slow AGC time constant." Okay, okay, take it easy. You can change bandwidth and AGC time constant, and even turn on the preamplifier (above 5 MHz). If you want to listen to the 40-meter Novice/Technician subband at night with the bandwidth at 6 kHz, AGC

Table 2

Drake R8 MF/HF Communications Receiver, Serial Number 10400065

Manufacturer's Claimed Specifications

Frequency range: 100 kHz to 30 MHz.

Modes of operation: AM, CW, FM, LSB, RTTY, USB.

Power requirements: 100, 120, 200 or 240 V ac $\pm 10\%$ at 40 W, or 11-16 V dc at 2 A max.

Sensitivity

CW and SSB (10 dB S+N/N, bandwidth not specified):

0.1-1.5 MHz, 1 μ V (−107 dBm); 1.5-30 MHz, preamp off—0.5 μ V (−113 dBm), 1.8-30 MHz, preamp on, 0.25 μ V (−119 dBm).

AM (10 dB S+N/N, test signal 30% modulated with a 1-kHz tone, bandwidth not specified): 0.1-1.5 MHz, 3 μ V (−97 dBm); 1.5-30 MHz preamp off—1.5 μ V (−103 dBm), 1.5-30 MHz, preamp on, 0.8 μ V (−109 dBm).

FM (12 dB SINAD, bandwidth not specified): 0.5 μ V (−113 dBm) from 1.5-30 MHz.

Dynamic range: 90 dB or more at 20 kHz signal spacing (type and bandwidth not specified).

Third-order input intercept: At least 5 dBm with 20-kHz signal spacing.

Notch filter attenuation: 40 dB or more from 0.5-5 kHz.

S-meter sensitivity: Not specified.

Squelch sensitivity: Not specified.

Receiver IF/audio response: Not specified.

Audio output: 2.5 W or more at 10% distortion into 4 Ω .

Size (height, width, depth): 5.25 $\times$ 13.1 $\times$ 13 inches; weight, 13 lb.

*Blocking dynamic range and third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. *NL* signifies noise-limited dynamic-range measurements.

†Test-equipment limitations inhibit ARRL Lab measurement of notches deeper than about 30 dB.

Measured in the ARRL Lab

As specified.

As specified.

At 13.8 V dc: 1.48 A at min audio output; 1.51 A at max audio output, 1.80 A at max audio output with S9 signal; ac current drain not measured.

Minimum discernible signal, 500-Hz filter:

	Preamp off	Preamp on
1 MHz	−122 dBm	N/A
3.5 MHz	−135 dBm	−139 dBm
14 MHz	−135 dBm	−139 dBm
28 MHz	−135 dBm	−138 dBm

Test signal modulated 30% with a 1-kHz tone, 6-kHz filter:

	Preamp off	Preamp on
1 MHz	−83 dBm	N/A
3.8 MHz	−109 dBm	−113.5 dBm
14.2 MHz	−105 dBm	−117 dBm

12-kHz filter, −101 dBm (preamp on),
−109 dBm (preamp off) at 29 MHz.

Blocking dynamic range:*

Preamp off—3.5 MHz, NL at 123 dB; 14 MHz, NL at 118 dB;
preamp on—3.5 MHz, NL at 112 dB; 14 MHz, NL at 114 dB.

Two-tone, third-order intermodulation distortion (IMD) dynamic range:*

Preamp off—3.5 MHz, 94 dB; 14 MHz, 90 dB;
preamp on—3.5 MHz, 93 dB; 14 MHz, 87 dB.

Preamp off—3.5 MHz, 6 dBm; 14 MHz, 6 dBm;
preamp on—3.5 MHz, 0.5 dBm; 14 MHz, −8.5 dBm.

More than 30 dB.†

For S9 reading at 14 MHz, 60 μ V (preamp off); 20 μ V (preamp on).

12-kHz filter, SSB, −115 dBm min; FM, −106 dBm min.

Receiver IF/audio bandwidth at −6 dB: 6-kHz filter, 5180 Hz; 4-kHz filter, 4072 Hz; 2.3-kHz filter, 3125 Hz; 1.8-kHz filter, 2519 Hz; 500-Hz filter, 803 Hz.

3.6 W at 10% total harmonic distortion (THD) into 4 Ω .

off and preamplifier on, that's your undeniable right. Most of the time, though, I found the default parameters to my liking. Yes, it took a while to get used to mashing the buttons to get what I wanted, sort of like getting used to a new microwave oven or VCR remote control.

Because many R8 users complained to Drake about the radio's automatic return to its default AGC, selectivity and tuning-rate selections every time the mode was changed, they revised the software to return the receiver to the last set of parameters selected on a given mode the next time you change to that mode. All R8s built since the fall of 1991 include the new software. Owners of earlier R8s can purchase the replacement EPROM, which is easy to replace with the instructions Drake provides, for about \$13 plus UPS shipping charges (contact Drake for details). Other details of Drake's latest software include allowing preamplifier use down to 1.8 MHz, provisions for aborting a direct-frequency-entry operation,

preprogramming of the lower ham-band edges, WWV/WWVH frequencies and popular shortwave broadcast frequencies in 20 of the memories, programmable tuning steps per mode (10 Hz with 10-Hz display resolution, 10 Hz with 100-Hz resolution and 100 Hz with 1-kHz resolution). Based on these changes, you can easily tell whether your radio has the updated or the original software. The new software is definitely worth buying if you want the best flexibility and operating pleasure from your R8.

One place Drake *could* have used the microprocessor to help out—but didn't—is in sideband selection as you pass 9 MHz. According to Amateur Radio tradition, lower sideband (LSB) is used below 9 MHz, and upper sideband (USB) is used above. The current crop of amateur transceivers knows this. So, if you wanted to use the R8 as a second receiver during a sideband contest, you'd have to manually switch sidebands. During a contest, for example, you might prefer to use a selectivity of

1.8 kHz. The default SSB bandwidth is 2.3 kHz. Moving from 20 meters to 40 meters then, requires you to:

1) Retune the receiver using your preferred method.

2) Press the **MODE** button five times to go from USB to LSB.

3) Unless you've already set the SSB bandwidth to 1.8 kHz, press the **BW** button five times to go from 2.3 kHz to 1.8 kHz bandwidth.

You probably won't find R8s in use at serious contest stations!

Other selections available from the bank of buttons are VFO A/B (actually two easily selected, tunable memories), three input selections (two antennas and a converter), preamplifier/attenuator, noise blanker, timer, notch filter, tuning-step rate and dial lock. The timer works with an internal clock, which displays the time while the receiver is off. (You can also view the clock while the receiver is on.) The timer can switch an external circuit—to turn on a tape

recorder, for example. The switching circuit *cannot* handle ac line voltage; it's limited to 30 V dc at 1 A.

Using the R8

The first night I used the R8 at home, I started by listening on the ham bands. After wrestling with the buttons a few times I realized the receiver was oriented toward broadcast listening, not Amateur Radio. It was just about sunset, so I headed for the 49-meter shortwave broadcast band (near 6 MHz). I wanted to try out the R8's vaunted synchronous detector, which is intended to improve AM reception with fading signals (see the sidebar on page 71, which describes this feature). I tuned in a rapidly fading broadcast station. Its signal strength varied between S3 and well over S9 about once a second, with the expected audio distortion every time the carrier took a dive. You'd have to *really* want to hear this station to hang in through all that noise! I pressed the **SYNCHRO** button to turn on the synchronous detector. Instantly, the distortion stopped and the signal became not only readable but pleasant to copy. I was impressed!

You can't tune the R8 with the synchronous detector on; it automatically switches off if you bump the tuning knob or switch from AM to another mode. It's easy to enable the synchronous detector, though, and it easily locks onto a signal 2 or 3 kHz away. Lock time depends on signal strength and how close to the carrier frequency you have tuned the receiver. It pays to tune accurately: If you're on the right frequency, the detector locks in almost immediately; otherwise it can take several seconds to synchronize. During this time you hear a heterodyne slowly decreasing in pitch.

Switching bandwidths and adjusting the **PASSBAND OFFSET** control (front-panel knob) allowed me to knock out an interfering adjacent station. In the review R8, a low-level, hummy spur sometimes audible in the receiver audio varies with this control's setting. Because this is present regardless of band and mode, it seems to occur in the IF chain. But the spur level is low enough that you might not notice it at all unless you're adjusting the **PASSBAND OFFSET** control on a quiet band while listening to a relatively strong signal that suppresses band noise. I consider this a minor problem.

The R8's synchronous detector replaces the transmitted carrier and only requires one sideband for detection. By offsetting the passband it's possible to hear sideband audio higher than 5 kHz. Unfortunately, most shortwave broadcast bands are too crowded to allow frequent use of this luxury—but you can switch to the R8's 4, 2.4 or 1.8-kHz filter if necessary. The R8's notch filter effectively reduces heterodyne interference.

The internal speaker is typical of other internal speakers I've heard. Use it to

confirm your receiver works when first unpacked, then forget it. I used the R8 with a variety of external speakers, stereo headphones and even my stereo system (the R8 has two line-level audio outputs on its back panel). As a matter of fact, if I owned an R8 I'd probably leave it connected to my stereo! Its no-nonsense front panel blends well with modern audio/video equipment. You probably wouldn't be embarrassed at having this radio in your living room.

Although I found the R8 cumbersome to operate on the ham bands, I did spend time using it there. The radio's 500-Hz selectivity is fine for tuning the CW subbands and copying weaker signals. My transceiver uses a pair of 500-Hz crystal filters. I used a coaxial switch to transfer the same antenna between the two radios. Using only your ears to compare radios is an unscientific but practical way to detect differences in performance. These differences are obvious to the user, too, not just to the test equipment! One thing worthy of note is that the R8 has a mild AGC attack problem that's most pronounced with strong CW signals and fast AGC. The AGC pops at the onset of each keyed element, making copying such signals fatiguing. Slow AGC and weaker signals help, but the true fix would be improved AGC attack characteristics.

The R8 does not have an external BFO pitch control. The factory-default BFO offset from the IF provides a beat note of about 700 Hz. I used the **PASSBAND OFFSET** control to shift the IF over about 200 to 300 Hz. That way I could copy CW at the pitch I prefer, 400 to 500 Hz. If I tried this trick with my transceiver I wouldn't be able to zero beat the station I was calling. (WJ1Z: The R8 is the only communication-quality MF/HF radio new to the amateur market since the early 1980s that displays CW frequencies correctly only when the radio is tuned *to zero beat* instead of the factory-default receiving pitch (700 Hz). In 1992, a 700-Hz display error when listening to correctly tuned CW on a 10-Hz-display radio is unacceptable. I think this flaw could be corrected in software, and I encourage Drake to do so. [As for a pitch reference—being a receiver, the R8 includes no sidetone capable of serving as a transfer oscillator, of course—how about setting the radio's keypad beep oscillator to 700 Hz and allowing it to be continuously keyed for CW frequency measurements with a keypad button?])

On all modes, including SSB and CW, the R8's tuning rate is just about right. I really dislike the tiny tuning knob, though; scanning the bands looking for DX is a pain. Weighted, larger knobs (about 2 inches in diameter) with rubberized circumferences are supplied on almost all amateur transceivers and shortwave receivers, and for good reason: You can use two or three fingers to keep the knob turning without fatiguing your wrist. If you don't tend to

do a lot of tuning, the R8's diminutive knob may not be a disadvantage.

I found the R8's 1.8-kHz selectivity useful for copying weak SSB signals. When I wanted the full effect of a booming signal I switched to 2.3-kHz selectivity. The wider (2.3-kHz) selectivity is fine for stronger signals, or in casual operation, when you care what the other operator's audio actually sounds like.

On the shortwave broadcast bands, the R8 really struts its stuff. After a few A/B comparisons with my transceiver I knew that the R8 had it beat. The choice of bandwidths and the smooth **PASSBAND OFFSET** adjustment, coupled with the distortion-reducing synchronous detector, makes shortwave broadcast listening with the R8 a real pleasure.

Owner's Manual

Between stints at ARRL Headquarters I worked for 12 years as a technical writer. I've been known to read an owner's manual *before* the roast beef caught fire or the plates on the 3-500Zs melted down. The R8 *Owner's Manual* is well done. It was written for nontechnical people, but it doesn't talk down to them. Except for the lack of a schematic diagram, you tech types won't be offended. Read the manual before you start playing with the receiver; you won't be wasting time.

What impresses me most about the R8 manual is its use of graphics. Drake's foray into consumer electronics certainly taught them how to produce superb manuals. The radio's serial interface is clearly explained; I would have enjoyed using it. Drake: Where's the software? Manual space is also provided to log the contents of the receiver's 100 memories.

Lasting Impressions

If I had more time to spend listening to shortwave broadcasts, I'd like to do it with an R8. I like the way it sounds. I usually know the frequency I want to listen to, so I can just punch it in from the keypad. Once I have the station tuned in, I press the **SYNCHRO** button, then sit back and enjoy the program.

Although its operation is somewhat cumbersome, this receiver is considerably less expensive than similar receivers built overseas. (Yes, the R8 is built in the United States!) The S meter has a real mechanical pointer, rather than the solid-state and fluorescent S meters found on many other receivers.

The R8 can be powered from its internal supply (108-264 V ac, selectable on the back panel). You can also power it from 11-16 V dc. This is convenient for portable operation.

Most modern radios, including the R8, provide scanning modes. The R8 can scan all or selected banks of its 100 memories or between the two VFO frequencies. You can choose between immediate or delayed scan

resumption. The R8 won't scan with the squelch open, but the manual includes useful tips on setting the squelch and RF-gain controls for efficient scanning. For me, the scanning modes will be more useful when Drake produces a VHF/UHF converter for the R8 (as promised in the manual).

Accompanying tables show performance of our R8, as measured in the ARRL Lab. A receiver, however, must be more than the sum of its specifications. Any receiver that's cranky or cumbersome to use—no matter how well it performs electrically—falls short of providing all the enjoyment we want from our hobby. I'd rather Drake had designed the R8 so the bandwidth and mode selections could be done by pressing one button one time, even if they had to charge more for the receiver as a result. But inexperienced receiver users might find making so many decisions (bandwidth? mode?) as stressful as I found using the R8 *without* these features. If you enjoy listening to shortwave broadcasts and appreciate synchronous detection, 100 memories, a timer and passband offset, you'd do well to consider the R8. It's a good value. If your interests lie more in the ham bands, however, you'll find that the operational short-

comings of the R8 are significant relative to some of the alternatives.

Thanks to Dave Newkirk, WJ1Z, for his contributions to this review.

Manufacturer/distributor: R. L. Drake Company, PO Box 3006, Miamisburg, OH 45342, tel 513-866-2421. Price, \$899 plus \$10 shipping and handling (Ohio residents must include sales tax).

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from Amateur Radio 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.

Radio Shack HTX-100 10-meter transceiver (see Product Review, Feb 1992 QST). Minimum bid, \$187.

Ranger Communications Inc RCI-2950 10-meter transceiver (see Product Review, Feb 1992 QST). Minimum bid, \$187.

Sealed bids must be submitted by mail and must be postmarked on or before March 27, 1992. 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.

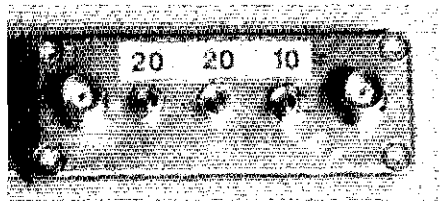
In your bid, please clearly identify the item you are bidding on, using the manufacturer's name, model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail. No other notifications will be made, and no information will be given to anyone regarding final price or identity of the successful bidder.

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

New Products

MOBILE ANTENNA ADAPTER

[An existing car radio antenna can be used for shortwave and scanner reception with the MSW-1 adapter. It operates on 12 Vdc, covers 0.5-1000 MHz and has an internal 10-dB amplifier. Car radio reception is unaffected by the MSW-1, which has Motorola-type connectors and a female BNC jack for your communications receiver. Retail price \$70 plus \$5 s/h. Electron Processing Inc, PO Box 68, Cedar, MI 49621; tel 616-228-7020.



ATTENUATOR BOX FOR TRANSMITTER HUNTING

[The SGR-1 attenuator box reduces strong RF signals to levels that can be read on meters for transmitter hunting, receiver alignment and comparisons of strong signals. The three-section, 50 Ω box features, two female BNC connectors and three toggle switches to select up to 50 dB attenuation in 10-dB increments. Retail price is \$50 plus \$5 s/h. Electron Processing Inc, PO Box 68, Cedar, MI 49621; tel 616-228-7020.

DIPOLE AND YAGI CURRENT BALUNS

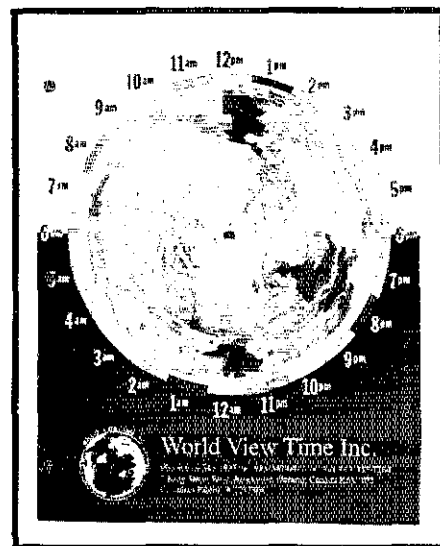
[Hy-Gain offers two new high-power, completely weatherproofed current baluns that match the size of the older BN86 for direct replacement. Ferrite beads over a short length of coaxial cable choke RF flow on the outside of the coax shield. The beads and cable are rated at 2000 W continuous power for RTTY, and 4000 W PEP/2000 W average for SSB/CW. The impedance is 50 Ω from 1.6-30 MHz with less than 0.1-dB insertion loss. The BN4000B is for Yagis and the BN4000D is for dipoles. Each has a suggested list price of \$107. Telex Hy-Gain, 9600 Aldrich Ave S, Minneapolis, MN 55420; tel 612-884-4051, fax 612-884-0043.

FILTER AND TRANSVERTER

[MAS Enterprises offers a 2-meter intermodulation filter to improve the selectivity of hand-held transceivers. The unit is a three-stage helical filter in the receive path with an insertion loss of 8 dB and a center frequency of 146 MHz (or custom tuned), with a 1.5 MHz 3-dB bandwidth. Attenuation at ± 6 MHz is 40 dB. A carrier-operated relay (COR) bypasses the filter on transmit. It measures 1.37 $\times$ 1.18 $\times$ 3.35 inches and uses 12 V at 80 mA. List price is \$60 plus \$5 s/h.

MAS's 6-meter transverter, with 28-MHz and 144-MHz IFs, covers 50-52 MHz with 10 mW-10 W input and 6 W power output. Receiver gain is 18 dB and PTT control switches from transmit to receive. It measures 4 $\times$ 5 $\times$ 2 inches and requires 11.5-14 V. Retail price is \$220 for the kit, \$290

assembled. MAS Enterprises, 104 King St S, St Jacobs, ON N0B 2N0, Canada; tel 519-664-1273, fax 519-664-3082.



HANDY WORLD TIME REFERENCE

[You can determine the time anywhere in the world with the World View Time Indicator. It's an 8½- $\times$ 11-inch plastic-laminated sheet with a coordinated outer band and a rotating South Pole projection of the earth with color-coded standard time zones. The price is \$13.45 US (\$14.95 Canadian), s/h and taxes included. World View Time Inc, PO Box 266, Brockville, ON K6V 5V5 Canada; tel 613-345-1537, fax 613-345-7264.