Amateur Radio

CQ

SERVING AMATEUR RADIO SINCE 1945

FEBRUARY 1994

1945 Our 50th Year 1994

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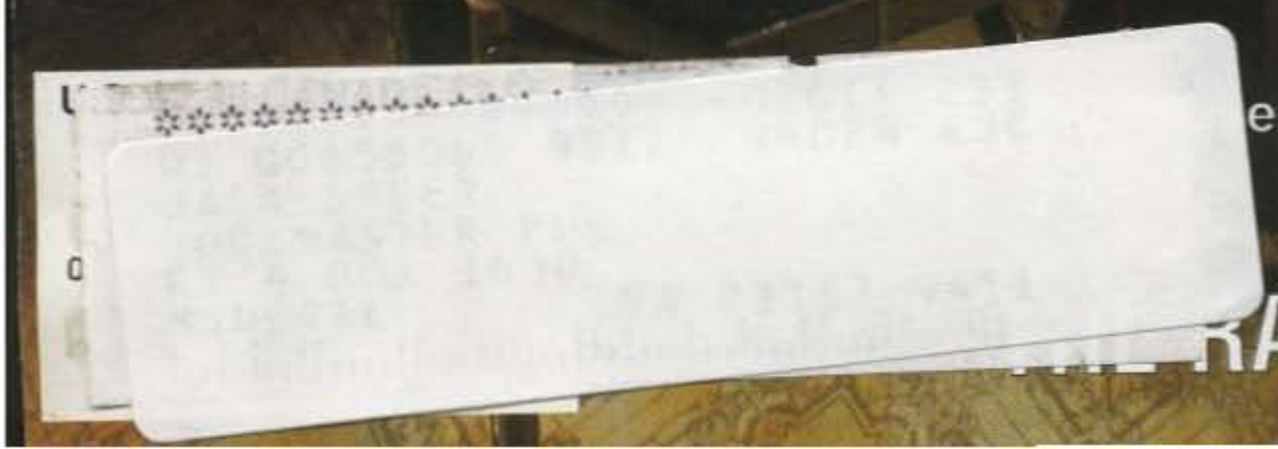

er: Ralph Bellas, K9ZO, Bloomington, Illinois

RADIO AMATEUR'S JOURNAL

You Asked for It, And Kenwood Delivers !

Attention 6 meter ops!

NEW TS-60S:
Super Compact, 90W, 6 meter Transceiver

TS-50S:
Super Compact 100W, HF Transceiver

Meet the new set of twins from Kenwood -- The TS-60S all mode, 6 meter, 90W transceiver, and the TS-50S all band, 100W HF transceiver with general coverage receiver. Due to the amazing response to our super compact TS-50S transceiver, we have come up with a companion 6 meter transceiver in the same package, the TS-60S. Compact enough to mount in a vehicle or take into the field, both models provide desktop power and such sophisticated features as 100 memory channels, microprocessor controlled Direct Digital Synthesis (DDS) with innovative "fuzzy logic" control, and Kenwood's own AIP for superior dynamic range. There's also IF shift and CW reverse mode for interference reduction, TF-SET, and a noise blanker - plus everything you need for split - frequency operations. The menu function enables you to customize and select operating features to suit your individual needs.

TS-50S and TS-60S -- the new set of twins from Kenwood. Innovative, rugged, super compact - choose one for your shack, mobile, or portable operations today!

Features

- 100W (TS-50S), 90W (TS-60S) on SSB, CW, FM modes, 23W on AM mode
- 100 memory channels
- DDS(Direct Digital Synthesizer) with fuzzy logic control
- Large LCD panel with digital bar meter
- Auto-mode capability
- Menu system selects custom operating features
- AIP (Advanced Intercept Point) for increased receiver dynamic range
- Switchable AGC Circuit (SLOW/FAST)
- All-mode squelch
- CW reverse mode
- Full break-in and semi break-in
- 20dB attenuator
- Relay & ext. ALC terminals
- Multi-function microphone supplied
- Auto power off function
- 3-position RF output power control
- Optional 500Hz CW filter (YK-107C)
- Optional AT-50 external antenna tuner (TS-50S only)
- Optional computer interface (IF-10D)

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AMATEUR RADIO PRODUCTS GROUP
P.O. BOX 22745,2201 East Dominguez St.,Long Beach,CA.90801-5745
KENWOOD ELECTRONICS CANADA INC.
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KENWOOD

93ARD-0840

Kenwood's TH-22AT/42AT: The Compact Solution!

144 MHz/450 MHz single band HTs

More Power !

Features

- 3-watt output from MOS FET power module and supplied 6-volt battery (TH-22AT: approx. 3 watts, TH-42AT: approx. 2.5 watts), and 5-watt output with optional PB-34!
- Compact design: 2-3/16 x 4-5/8 x 1 in.
- Built-in DTMF keypad with monitor
- Built-in DTSS page system ■ Large 1-7/16" speaker
- 41 E²PROM channel memories (including 1 call channel)
- Multiple scan functions (VFO, call & memory)
- Carrier-operated & time-operated scan stop modes
- Tone alert with elapsed time indicator
- Battery-saver circuit and auto power-off function to extend battery life ■ Selectable squelch configuration
- RF output power control (Hi/Low/EL)
- Built-in CTCSS encoder, optional TSU-8 decoder (any tone can be stored in any channel)
- User-friendly menu system to customize your operating preferences ■ Easy to program and use
- Modifiable for MARS and CAP. Specifications guaranteed for Amateur bands only. Permits required for MARS and CAP use.
- Wide range of accessories to enhance operating convenience and enjoyment

Slim, compact, lightweight. These words describe the exterior of the new TH-22AT Series HTs. Rugged, innovative, sturdy. These words describe what is on the inside. Because along with the beauty, this new series of HT has all the things you want in a portable communications package. Like a streamlined, easy to program interface, one touch controls, and a simplified menu of functions that you can customize to suit your needs. Even a DTMF memory that stores five of your favorite 15 - digit telephone numbers for autopatch use. Wide band receive - 136 to 173.99 MHz. A new innovative microprocessor and final amplifier circuit enables a full five watts, while conserving battery power. (The supplied battery provides **3 watts**.) Easy mobile operation with optional PG-3H cable.

As always, a full line of accessories is available to enhance your operating enjoyment!

See your favorite Authorized Kenwood Amateur Radio Dealer for all the details!

Modifiable for MARS/CAP use. Permits required. Specifications guaranteed for Amateur band only.

93ARD-0829

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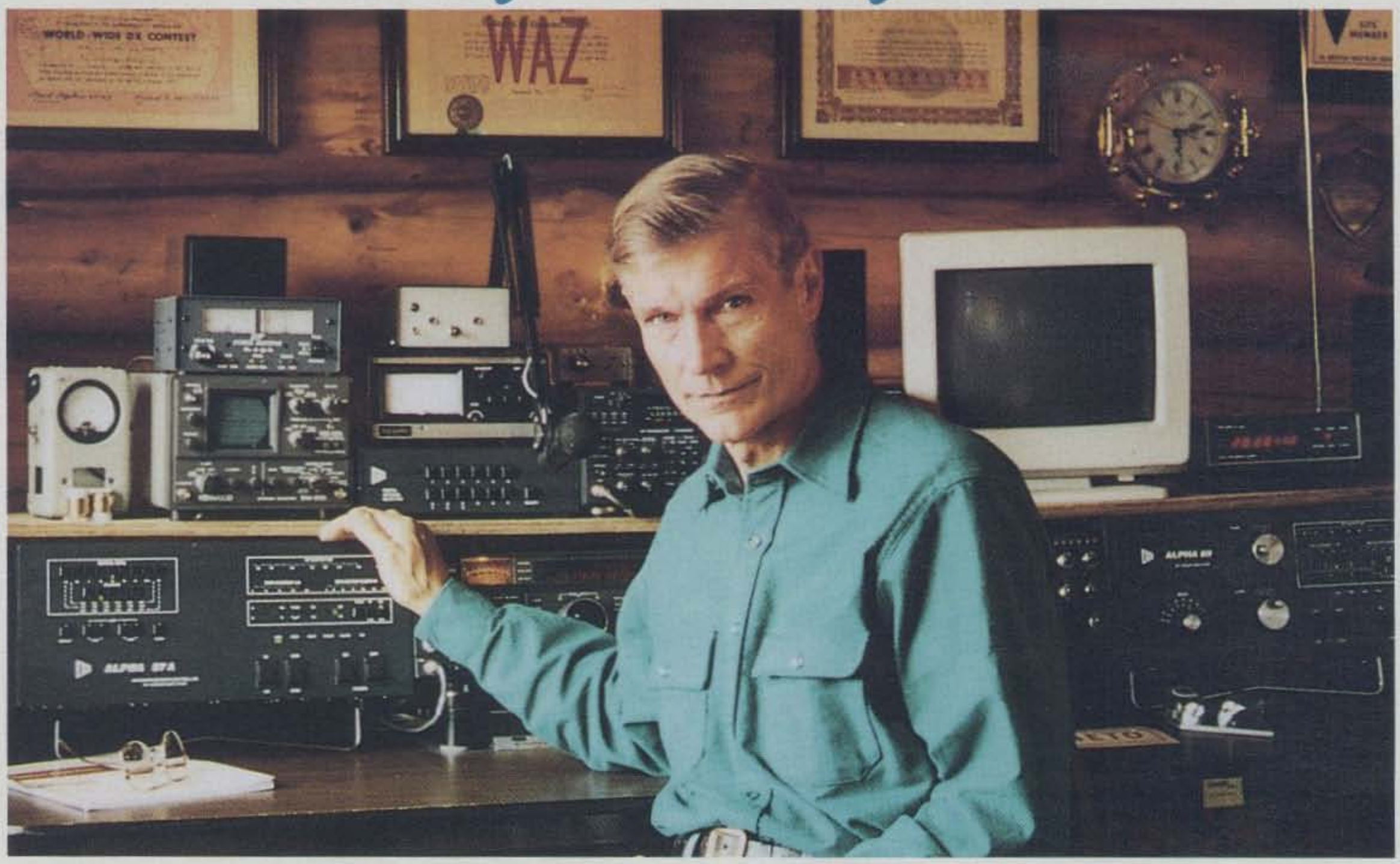
KENWOOD

Don't let anyone kid you...



Nothing else is even close to an ALPHA 87A!

I guarantee* **it'll spoil you for any other amplifier!**

The ***ALPHA 87A*** gives you *both...*

- *1.5 kW RF output, "locked-key all day" —same average and reserve power as the famous **ALPHA 77Dx!***

and

- *fully automatic, one-second bandchange with any amateur transceiver.*

No other maximum legal power HF amp gives you bandchanging that's *either* near-instantaneous *or* automatic. And even the 500-1000 watt solid state amplifiers can't change bands automatically with *all* transceivers.

The ***ALPHA 87A*** truly is in a class by itself. Its complement of exclusive and practical features is too lengthy to describe here. Two examples:

- Microprocessor-based protection - "(it's) practically impossible to damage an ***'87A*** through improper operation." (QST, 6/92)
- Full computer control, local or remote via telephone or radio.

For more details, get our new " home video," *The Ultimate Linear.* In it, W4ETO informally demonstrates many of the ***'87A's*** remarkable capabilities that owners have called "great," "fantastic," "incredible!" The video is $12 postpaid.

Why not enjoy a new *ALPHA 87A* this season? It *will* put new fun and efficiency into your operating and spoil you for any other amplifier...or your money back! **Ask for a copy of ETO's 30 day money-back guarantee.*

Call Ray Heaton now to order for quick delivery. Or ask for *The Ultimate Linear* video and a full color brochure.

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CIRCLE 145 ON READER SERVICE CARD

The Radio Amateur's Journal

FEBRUARY 1994 VOL. 50, NO. 2

ON THE COVER: Look for Ralph Bellas, K9ZO, in just about every meaningful contest, operating from this neat setup at his Bloomington, Illinois QTH. (Photo by Larry Mulvehill, WB2ZPI)

FEATURES

DEPARTMENTS

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ZERO BIAS

EDITORIAL

I have to admit that I'm a contest dilettante. I enjoy taking part in several contests and QSO parties each year, but I never send in a log—well, maybe not *never*. I did send in one for our CQ WW DX Contest this past year. The last log I had submitted was for another contest about thirty years ago. It's not that I'm not competitive. It's just that I've chosen different quarry.

While I greatly admire the skill, tenacity, and endurance exhibited by active contesters, it just isn't my thing. This past solar cycle I began to chase paper. I began slowly with seeing how many countries I could work, and then spread quickly to continents, states, prefixes, counties, and islands. This year I might even find a new category or two to add to my list. There are also some really nice special-event certificates regularly offered for just a single contact, which makes that contact a bit more memorable.

Contests and QSO parties for me are two of the quickest ways to assure a maximum amount of band activity. I know that's anathema to some of you, but the rest of us look at it as an amateur radio metaphysical phenomenon. Even during the worst propagation conditions and a completely dead band, comes the start of a contest and suddenly they are all there. The thrill of the hunt is definitely exciting.

Everyone has his or her own little quirks regarding amateur radio. Over the years I've met countless thousands of amateurs who viewed paper chasing or the acquisition of another country (or whatever) with several distinct points view. The first group would look at you almost as if to pat you on the head while saying "I have that." The second group would also say "I have that," but you could never really be sure they did. The third group would say "I could get that if (a) I did the paperwork, (b) I utilized the wonderful capabilities of my super-enhanced computer which could do it all in nanoseconds, (c) I sent or received the cards, (d) I did what you did, or (e) all of the above.

The last group does "all of the above" to attain the card, the award, or the particular achievement. Admittedly, there are parts of me in all of these groups. I have done the paperwork for some of the achievement awards and "could" do the work for a few others in which I'm interested. I look at it more as a geopolitical stalemate if I hold back for a while. After all, I'm the one who just completed all the paperwork and accumulated enough cards for the Russian R-100 Oblast Award the day the country dissolved, and with it the award. I promise to keep future enthusiasm in check.

As of now I've been focusing on completing the basic requirements for our USA-CA Counties Award. The basic award requires 500 confirmed counties, which always sounded easy until I tried to get them. At the beginning of December I still needed 44 counties confirmed to make 500. Along came the ARRL 10 Meter Contest, which was not particularly good for DX, but proved great for working counties. I was able to work about 90 new ones. My cards are all out there, and with any luck by the time you read this I will have the 44. Of course, I still will have to fill out one of our County Record Books and send it in to WA3RTY. The same contest also yielded another new island for me, plus a batch of new prefixes.

For me, at least, contests and other operating events serve in a lot of ways to enhance my amateur radio fun. If I ever get to the point where my shack is totally operational, I might even try to see what I can do for the whole contest period. Right now I'm enjoying my dilettante status, but that could change by the next CQ World-Wide. The point is my interest in amateur radio keeps changing, and there are always new things out there to try. Otherwise, I'd still be in my building phase and would still be wondering where I was going to get the tubes I needed, let alone the sockets.

The next time you hear a contest going on, stop and think about how much more that activity can be in terms of enjoying yourself and having a good time. Sometimes it can be a whole lot more than racking up a big score.

In Memorial

As the Christmas holiday approached, amateur radio lost two more stalwart proponents—Lloyd Colvin, W6KG, and Tom McMullen, W1SL. Lloyd was probably better known by most of you as half of the dynamic DXing duo Lloyd and Iris. Together they operated from more than 200 countries around the world, giving many amateurs their first chance at working DX. Operating under the aegis of the YASME Foundation, the Colvins made DXing their lives, and one was always assured of receiving a QSL from them.

Lloyd and Iris were in Turkey on a YASME DXpedition when Lloyd suffered a massive stroke, succumbing before he could be returned to the US. It was a poetic end for a peripatetic DXer, to end his days in the active pursuit of his passion. Our sympathies go to Iris for her great loss.

The second amateur radio proponent to leave us was Tom McMullen, W1SL. The things you suddenly remember or note about him were his smile; his very quiet, almost shy, demeanor; and of course his crewcut. Tom was an active VHFer and moonbounce enthusiast with a wealth of knowledge gained from many years of experimentation. I met Tom when he worked at the ARRL's Technical Department and followed his career to *Ham Radio Horizons* magazine, where he was Managing Editor. In later years he worked for Motorola in Florida, where he and his wife Eleanor lived. Our condolences to Eleanor and the McMullen family.

The Hamfest Season Begins

It's time to get the suitcases out of the attic and dust them off. February begins our official hamfest season, and the first one we'll attend is Miami. If you need any excuse at all to get away from the cold weather, plus enjoy a really great hamfest, write yourself a note and head to Miami. For several months now the intrepid *CQ* staffers have lolled around at home, reacquainting themselves with family and loved ones, eating normal food, and keeping regular hours. It's time for greasedogs, hospitality suites, fleamarkets, and row upon row of great exhibits featuring the latest and best in amateur radio gear.

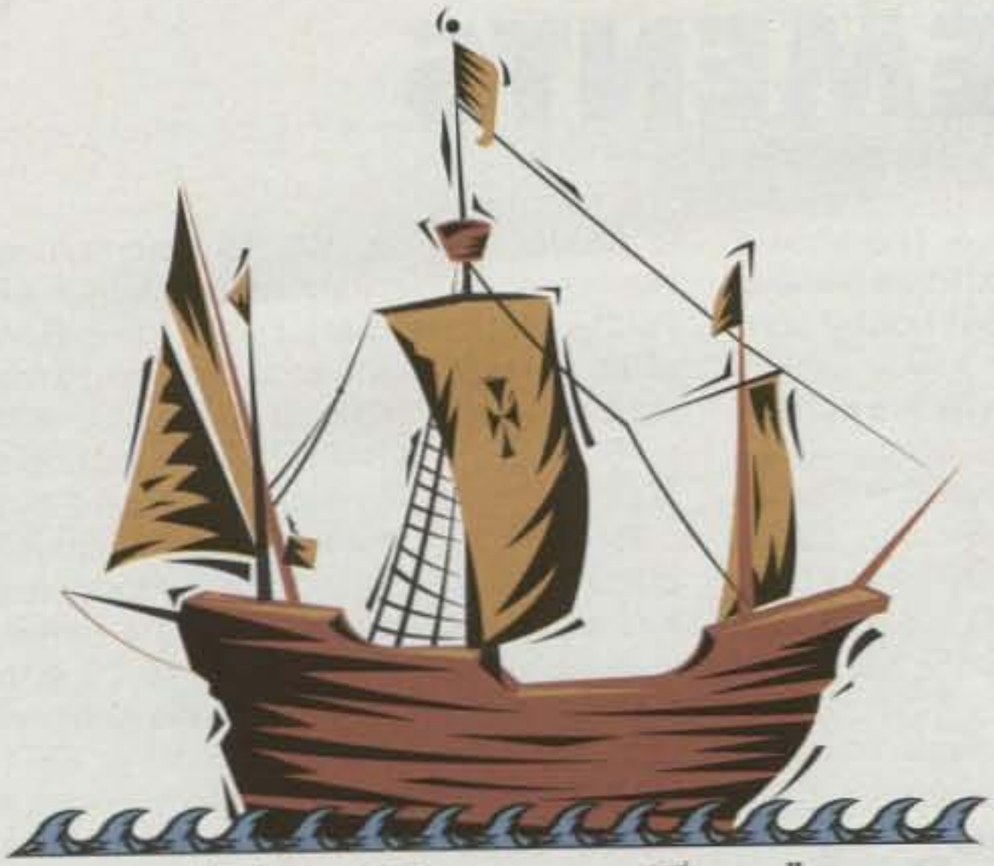
If you can manage to stay in Florida an extra week or two, the Orlando hamfest is in February this year, moving up from the traditional March conflict with the Charlotte hamfest. The Miami hamfest will be held the weekend of the 5th and 6th of February, and you can head up north to Orlando to be in time for their hamfest on the 19th and 20th. There will be no excuse to eat regular food, keep normal hours, or talk about anything but amateur radio this month. If you have to sit down at all, you can take in the talks and seminars at these events and catch up on the latest doings by some of amateur radio's most famous people.

There's a lot going on in amateur radio that takes place outside the shack. You can either stay at home and complain that things aren't the way they used to be and that there's too much around of whatever annoys you, or you can simply get out and enjoy what is. I've been telling you for years that it's time to get out and support your local or regional clubs and attend some of these hamfests. Not only will you keep up with what's going on and what's available, but best of all, you'll have a good time.

Correction

In my December editorial I mentioned my experiences taking my Novice test at the FCC, and "Mr. Finkelstein," who administered them. Evidently, time has reshaped my memory of the man. Bob Reed, WB2DIN, called our offices to let us know that the man's name actually was Henry Finkleman. While I stand corrected with regard to his name, his impact and image are still with me.

73, Alan, K2EEK



"The World is Flat"

"That Thing Will Never Fly"

"That Antenna is Too Small to Work"

There's one in every crowd—one that pushes the limits and proves the skeptics wrong. The world sailed into a new era of discovery with Columbus. The Wright brothers propelled us into the age of air travel. AEA advances into the ranks of these distinguished pioneers with the IsoLoop 10-30 HF antenna—a 35" loop antenna with low-angle performance that is better than many full-size HF antennas.

One IsoLoop 10-30 HF pioneer offers this: "Big-gun DXers will tell you nothing *that* small can work. They will continue to tell you this after you work a couple hundred countries with it. Ignore them. In 24 months, I have worked 213 countries and confirmed 198."

The reason you get such a big performance in a small package is the efficiency of the IsoLoop 10-30 HF; it's 72% on 20m, rising to 96% on 10m. The main loop serves as an inductor, tuned with a 10,000 volt variable capacitor. Frequency range is 10 MHz to 30 MHz with continuous coverage. The unique compact design is also ideal if you're facing space limitations—mount it in your attic, on a balcony, or go mobile.

With the optional IT-1 Automatic Antenna Tuner (below), tuning your IsoLoop 10-30 HF becomes an adventure in speed— 2 or 3 seconds is typically all the time it takes before you're tuned and ready to go. (Antenna comes standard with a manual tuner.)

Discover the world of big antenna performance in a small antenna. Call our literature request line at (800) 432-8873 and request the "Inside Story" on the IsoLoop 10-30 HF or call us direct at (206) 774-5554. For best pricing, see your favorite amateur radio equipment dealer.

AEA

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ANNOUNCEMENTS

•Phoenix, Arizona – Ham Radio & More, a local radio call-in talk show for 2½ years, has gone national! At 6:00 PM EST, the show, with host Len Winkler, KB7LPW, broadcasts nationwide on the Talk America Network. Ham Radio & More has weekly guests, FCC news, give-aways, listener call-ins, DX news, and more. The show can be heard locally in Phoenix on KFNN 1510 AM. To receive a list of Talk America Network affiliates call 602-861-0303. The show can also be picked up via satellite on Satcom C-5, Transponder 19, 6.0 audio and Galaxy 2, Transponder 3, Channel 55.4. The show's intention is to increase the public awareness of amateur radio and to help the hobby continue to grow.

•The following Special Events are scheduled for February:

WA2KKF, from 27th Annual Ice Camp, Cuba Lake, Cuba, NY; Boy Scouts; 2300Z Feb. 18 through 1500Z Feb. 20 on or about 3.950, 7.260, 14.275, 21.350, 28.400, and some VHF freqs. QSL with SASE via Scout op worked.

N4BV, from George Washington's home at Mount Vernon, VA, to commemorate Washington's birthday; Mount Vernon ARC; 1600Z–200Z February 19–20; lower General 80–15 meter subbands, Novice 10 meter subband. For certificate, send QSL and 9" × 10" SASE to WB4EEA, Steve Schneider, 8602 Cushman Pl., Alexandria, VA 22308.

N4CBR, from The Abraham Lincoln Birthplace National Historic Site in Hodgenville, KY; to commemorate Lincoln's birthday; multi-op team; Feb. 12–13 on 15, 20, 40 meters just inside General phone subbands, and 28450 on 10 meters, 6 meter SSB on 50.200, and 2 meter FM 146.520 simplex. QSOs available in English, Spanish, and French.

5-land, from Boles Junior High School, Arlington, TX; to celebrate Texas Public School Week; Boles Junior High School ARC (BARC); February 28 to March 5 from 2100 to 2300Z; Novice bands (SSB). For special event certificate, send a #10 SASE to KB5UNX, 3200 Kenilworth Dr., Arlington, TX 76017-5206.

NW7H, from Evanston, WY; to celebrate the Chinese New Year; The Uinta County ARC; Feb. 12–13 from 1500Z–2400Z; phone 10X on 28.395, 24.945, 21.325, 18.140, 14.245. For certificate, send QSL with 9 × 12 SASE to Vranish, P.O. Box 2048, Evanston, WY 82931-2048.

N8LBI & KA7HVA, from commemoration of the *USS Langely CV1/AV3*, 1922–42; Chesterland, OH; The Covered Wagon Association; Feb. 27 1500–2400 UTC; operation will be about 7.250 and/or 14.250 MHz SSB, CW near bottom of 40 and 20 meter General bands. For QSL, send QSL and SASE to John Cokor, N8LBI, 11643 County Line Rd., Gates Mills, OH 44040.

N8GBA, from Marquette, Michigan; to honor the up 200 Sled Dog Championship; The Hiawatha ARA; 1700Z Feb. 18 to 1700Z Feb. 20; lower end of 10, 15, 20, and 40 meter phone bands. Send large SASE with 2 stamps for an unfolded certificate to: Richard Schwenke, N8GBA, 21 Smith Lane, Marquette, MI 49855.

•The following hamfests, etc. are slated for Feb.:

Feb. 5, **The Niagara Peninsula ARC 16th Annual Big Event Hamfest,** C.A.W. Hall, 124 Bunting Road, St. Catharines, Ontario. Contact N.P.A.R.C. Inc., P.O. Box 20036, Grantham Postal Outlet, St. Catharines, Ontario, L2M 7W7 (905-937-6208).

Feb. 5, **Kerbela Hamfest,** sponsored by The Shriners of the Kerbela ARS; Kerbela Shrine Temple, Knoxville, TN. Contact Paul Baird, KY4A, 1500 Coulter Shoals Circle, Lenoir City, TN 37771 (615-986-9562). (Exams by WCARS-VEC. Pre-registration until 9:30 AM. Code test 10:00 AM. Written test 11:00 AM. Mail completed 610 form with check for $5.75 payable to WCARS-VEC to Ray Adams, N4BAQ, 5833 Clinton Hwy., Suite 203, Knoxville, TN 37912-2545 (615-688-7771).

Shortcut to Maximum Performance

Take the guesswork out of getting maximum antenna performance—use the SWR-121 VHF/UHF or the SWR-121 HF Antenna Analyst. A graphic display shows what's happening with your antenna's SWR vs. frequency. Rugged design and battery operation let you use these Antenna Analyzers anywhere—at a Field Day site, up the tower, or from your shack!

Testing coax has never been quicker or easier! Use your Antenna Analyst to measure the return/loss in dB in a length of coax . . . no more guessing!

Optional software lets you view, save, and print SWR plots on your PC-compatible computer.

For more information on the SWR-121VHF/UHF (120-175MHz, 200-225MHz, 400-475MHz) or the SWR-121 HF (1-32MHz) Antenna Analyst, call AEA's Literature Request Line at (800) 432-8873, or call us direct at (206) 774-5554. Contact your favorite ham radio equipment dealer for best pricing.

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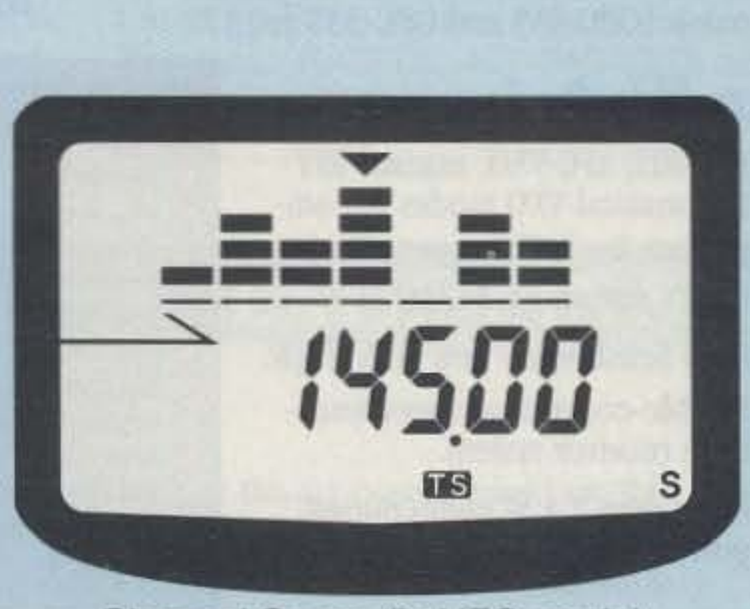
ALINCO Scores Another First
Built-In Spectrum Analyzer

Finally. A New Feature That's Really Useful.

Alinco's newest 2-Meter HT, the DJ-G1T, offers the new "Channel Scope" built-in Spectrum Analyzer. This remarkable feature lets you visually monitor band activity, much like a commercial Digital Spectrum Analyzer.

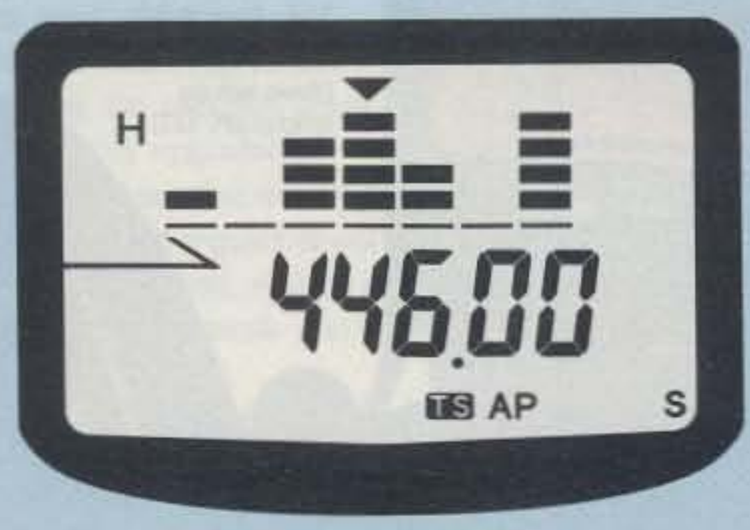
Channel Scope (in memory mode)

The over-sized display shows seven bar graphs, each of which can be assigned to an independent memory channel. This lets you monitor activity on seven different memory channels simultaneously, and instantly, with just a glance at the display. If one or more memory channels becomes active, the corresponding bar graph lets you know, and also gives you information on apparent signal strength.



Channel Scope (in VFO mode)

Alternately, the Display can be used to show band activity in the frequency domain, in either 5, 10, 12.5, 15, 20, 25, 30, or 50 KHz steps. **Hunting for band activity just got easier.**



2m/70cm Dual Band Receive

Some of the DJ-G1T's outstanding features include:

- 440 Receive (440 - 449.995 MHZ)
- 80 Memory Channels
- Channel Scope
- AM Aircraft receive
- 5 Autodialer Memories
- Programmable Delay for Autodialer
- DSQ for Private Paging
- Exceptional Audio quality (True FM)
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- CTCSS Encode built in
- 6 Scan Modes
- Odd-Splits on all Memory Channels

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The Choice is Yours

DJ-580T

Loaded Package

Ergonomic design, combined with excellent sensitivity and unbelievably great sound put the DJ-580T in a class by itself. Some of the outstanding features include extended receive range (including AM aircraft), Cross-Band Repeat function, backlit keypad, 8 scanning features, CTCSS encode/decode, DSQ Paging, and much more.

The DJ-580T will deliver a solid 5 Watts of power with the optional 12 Volt battery, and our EMS-8Z Remote Speaker Microphone offers remote control of Memory Channels and Scanning features.

DJ-F1T / DJ-F1TH

Sometimes Smaller is Better

Rugged construction and the most advanced technology make the DJ-F1T the best 2-Meter value available. The DJ-F1TH (High Power version) is the smallest 5-Watt rig you can buy.

Both of these models feature 40 memory channels, extended receive range (including AM aircraft), CTCSS encode, Superior audio quality, "battery save" function, and a backlit keypad.

All this is packed into a cast aluminum frame and tough poly-plastic case that has set a new industry standard for durability.

Double Discounts Available

Alinco will accept our SPRING coupons at DOUBLE VALUE thru Feb. 28, '94.

DJ-580T $15 x 2 = $30
DR-600T $15 x 2 = $30

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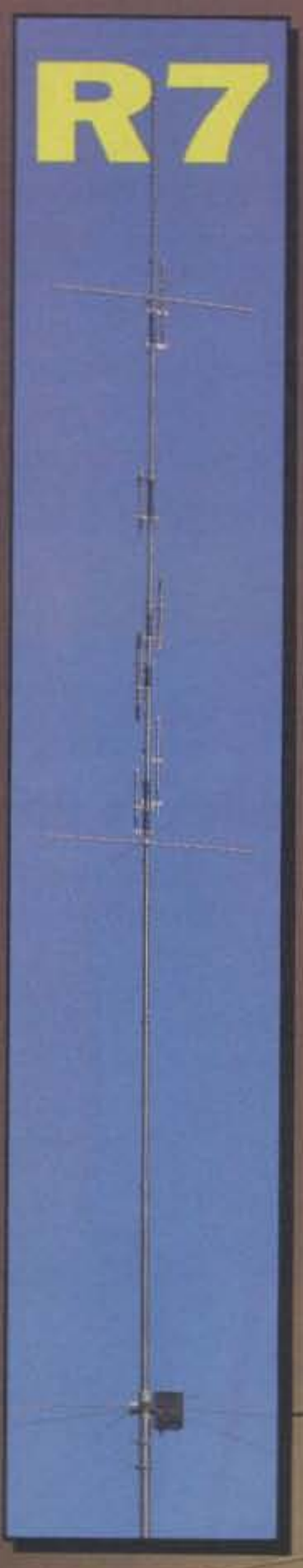
CIRCLE 3 ON READER SERVICE CARD

10, 12, 15, 17, 20, 30 & 40 Meters

There's never been an antenna like this!

R7



Look all you want–you won't find another multiband vertical with the quality, features and performance of the Cushcraft R7. The R7 is a combination of exceptional half-wave performance and user friendly features such as compact size, no moving parts or ground radials and mount-anywhere convenience.

R7 puts the fun back into ham radio. It can be assembled and on the air in less than an hour. Its convenient size and lack of radials make it easy to locate for home, vacation or portable stations. Mount it anywhere from ground level to tower top.

JOIN THOUSANDS OF SATISFIED OWNERS.

"Tropical storm Zelda struck Kwajalein on Thanksgiving Day . . . Harbor Control clocked gusts at 87 knots (100 mph) . . . As the beams blew down, my R7 vertical stayed up. I maintained communications for the entire storm." V73CT

"My first QSO was ZA1A in Albania with my R7." NE8Z / HC1MD

"Metalwork, machining and traps well made . . . Assembly was straight forward and easy." WX6W

SPECIFICATIONS

Frequency, MHz	28, 24, 21, 18, 14, 10, 7
Gain, dBi	3
Electrical Wavelength	Half-wave
SWR 2:1 Bandwidth	10m-2 MHz / 12m-100 KHz 15m-450 KHz / 17m-100 KHz 20m-250 KHz / 30m-25 KHz 40m-75 KHz
Power Rating, Watts PEP	1800
Radiation Angle, degrees	16
Frequency Selection	Automatic
Horizontal Radiation Pattern, degrees	360
Height, ft (m)	22.5 (6.9)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)
Wind Load, ft² (m²)	2.25 (.21)
Weight, lb (kg)	12.3 (5.6)
Counterpoise Radials Supplied	7
Wind Survival, mph (kph)	80 (128)

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Determination, ingenuity, and skill can create a monumental contest effort. You don't always need the most hardware to succeed. This is the story behind the Oceania team during the 1993 CQ WW WPX Contest.

The P20X Contest Operation

BY DAVE IMMEL,* P29DK

The tropical sun beat down on the make-shift shelter covering the engine of the Cessna 185 that I was working on. Even though I was in the shaded area, the lack of any breeze seemed to pull the heat right through the blue tarp into my work area. Now that I had found the problem and the pressure was off, my thoughts more frequently wandered to the upcoming weekend.

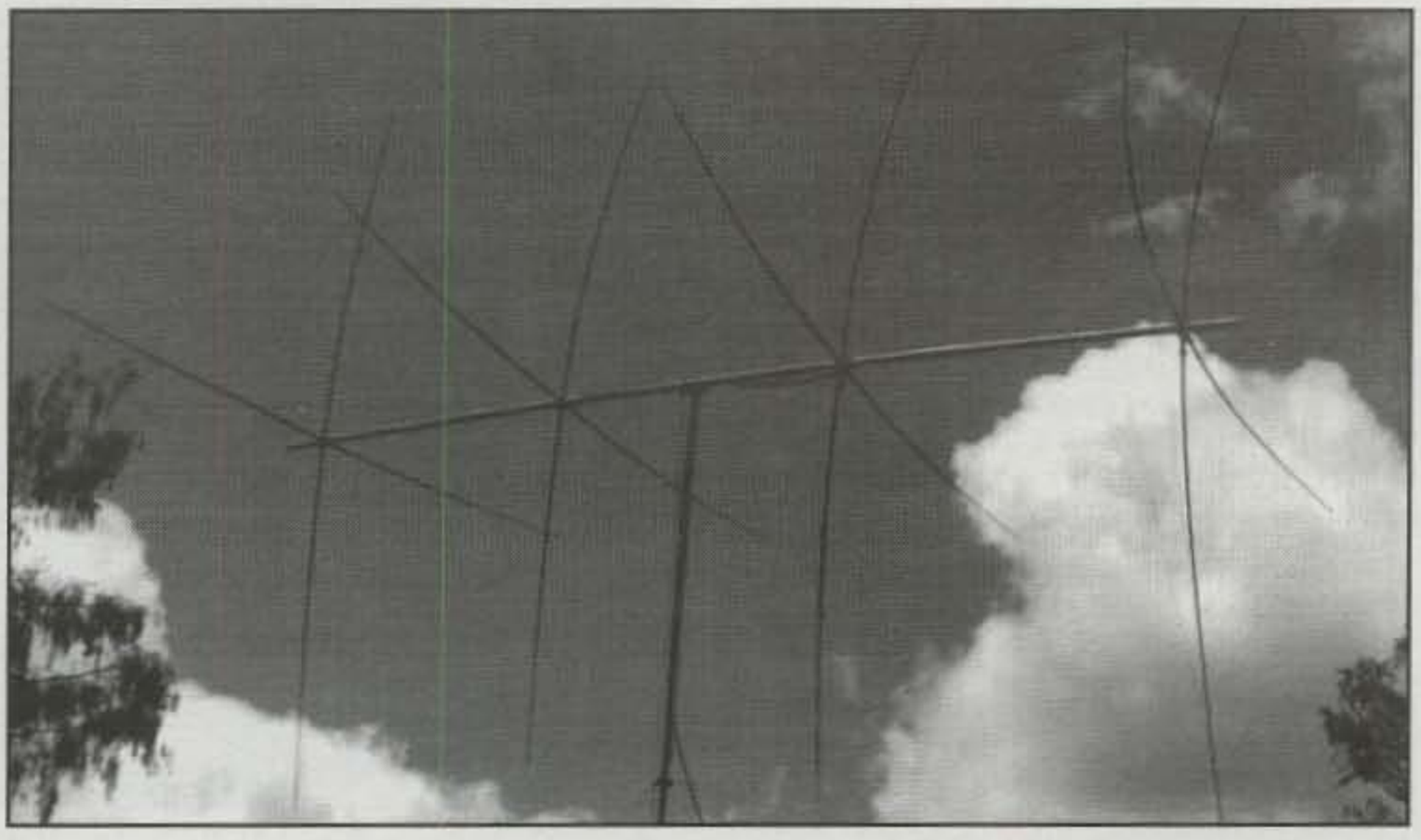
For the past few days I had been in Wau, a small town located in the mountains of Morobe Province, Papua New Guinea. I'd been dispatched here to help a missionary pastor troubleshoot an engine problem he was having with his Cessna aircraft. The next morning, Friday, I was to catch a flight to Port Moresby, the capital city, to join several other Papua New Guinea amateurs for the CQ WW SSB Contest, which was to take place over the coming weekend.

It was about 9 PM when the phone rang, and to my surprise it was Steve, P29DX, on the other end. He had some disappointing news: The location from which we had planned to operate the contest was not going to work out. I therefore reluctantly made the decision to return home in the morning and operate the contest from my home QTH, instead of proceeding on to Port Moresby.

During my conversation with Steve on the phone that night in Wau, he mentioned that I should consider, with the help of some other Highlands amateurs, trying to put together a contest operation from my QTH for the CQ WPX Contest in March, which would be the next major SSB contest, although it was six months away.

I live and work near Goroka, which is the provincial capital of Eastern Highlands Province. Specifically, we are located 35 air miles east of Goroka, and 80 miles south of Madang, which is on the north coast. We are situated in a beautiful valley at an elevation of 5100 feet above sea level, which makes for a really ideal climate. Temperatures get down near 40 degrees on clear July nights and up as high as the low 80s on a sunny afternoon. Our rainy season runs from December up through May or June with an annual rainfall of just over 100 inches. My wife, Patsy, P29PI, three daughters, and I live at Ukarumpa, the support center for The Summer Institute of Linguistics, an organization doing linguistic research and Bible translation among the many different language groups of PNG. We have a

The P20X operators. Back row (left to right): P29DS, P29KH, P29CW, and P29JA. Front row (left to right): P29NB, P29KS, P29DX, and P29DK.



The monster triband quad at P20X.

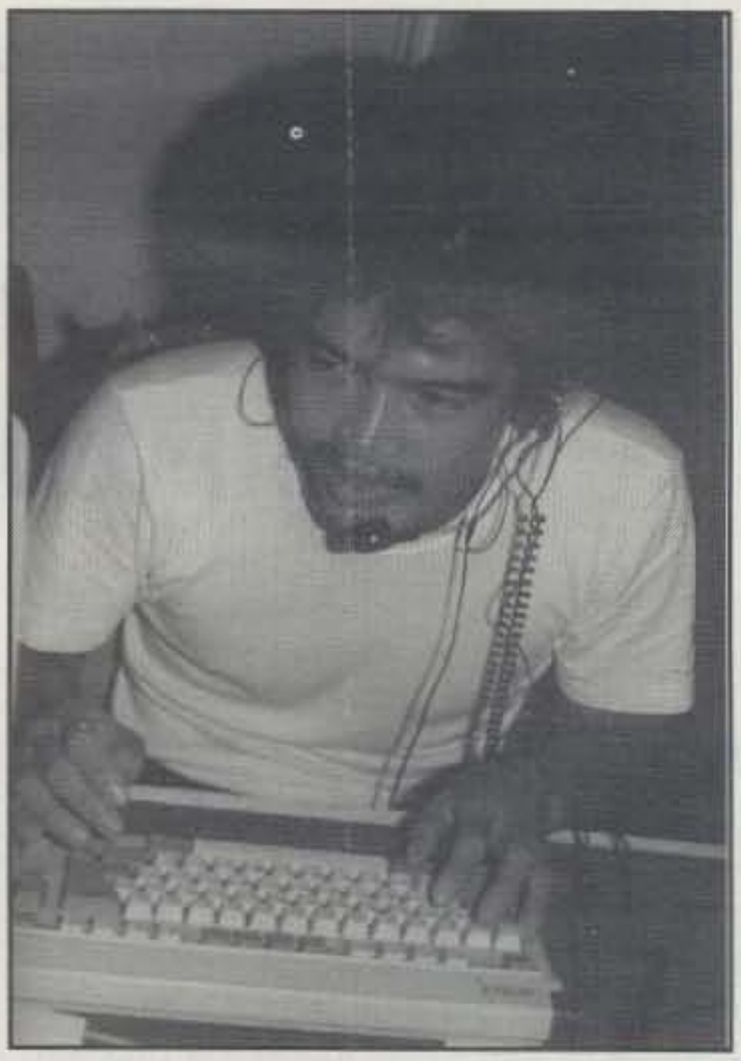
*Box 173, Ukarumpa via Lae, Papua, New Guinea

small fleet of aircraft and I, along with a number of PNG nationals and expatriate mechanics and pilots, keep these aircraft serviceable and flying people and supplies into the remote and isolated areas of the country.

There are currently ten other expat amateurs living and working here at Ukarumpa, some more active than others. I really didn't have a clue as to what type of response I'd get if I tossed out the idea of putting together a contest operation, but to my surprise the idea was met with enthusiasm and a lot of cooperation. The adventurous group included Pete, P29CW; Dave, P29DS; Kim, P29KS; and Norm, P29NB. Kyle, P29KH, volunteered to join us from Madang, along with Shoji, P29JA, and Steve, P29DX, from Port Moresby.

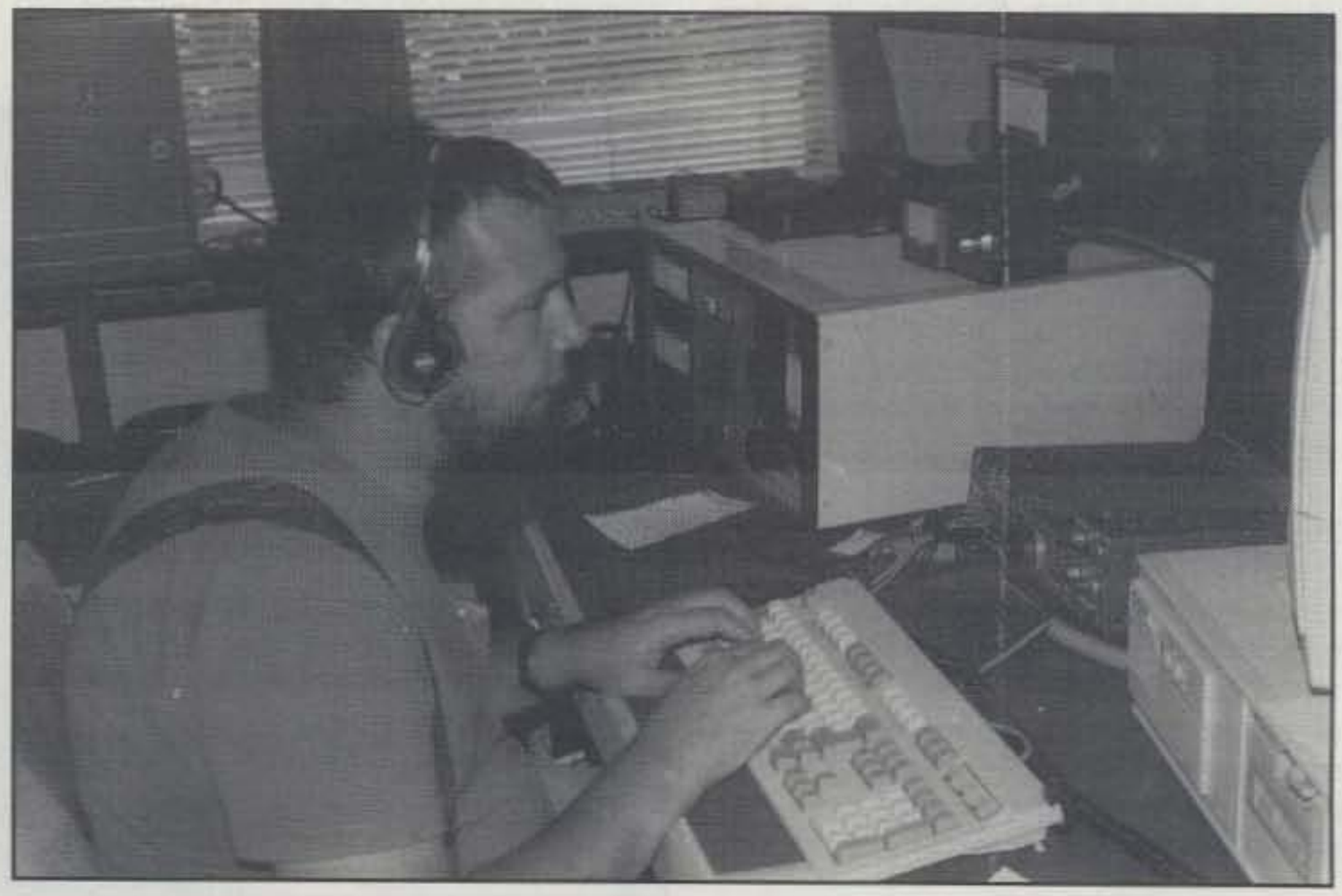
The first step was to locate a favorable location, which would have to have an acceptable antenna. Although it needed to be rotated by the "armstrong" method, the obvious choice was the four-element quad at the QTH of Steve, P29SC. Steve, an avid DX chaser, was enthusiastic about a contest operation from the first suggestion, and he gave us the nod on using his QTH. Great! But as the weeks went by, we were disappointed to learn that Steve would be out at his language allocation near Lae, and would not be able to participate in the contest. However, he and his wife graciously consented to allow the contest operation to take place at their unoccupied house. We were unfortunate to have lost Steve as a participant, but the use of the house was a real plus for the operation.

We tossed around ideas and suggestions about strategy, equipment, antennas, etc., for some weeks, and finally decided that if this was to be a serious contest effort we'd need to power the



Shoji, P29JA, is shown here running JAs.

computer and rig on batteries or some sort of an uninterruptable power supply. Our commercial power, generally speaking, is pretty reliable, but on occasion the power company will decide to shut things down for up to six or eight hours to do repairs, so it wasn't worth taking that chance. To our good fortune Pete led us to six 2.2 volt 550 amp-hour deep-cycle lead acid battery cells that were inherited by our communications department and were not being used at the time. Also, much to our delight, we discovered an unused 250 watt UPS that one of our translators was trying to sell, with little interest to any buyer because of its size



Pete, P29CW, is shown here several hours into the contest.

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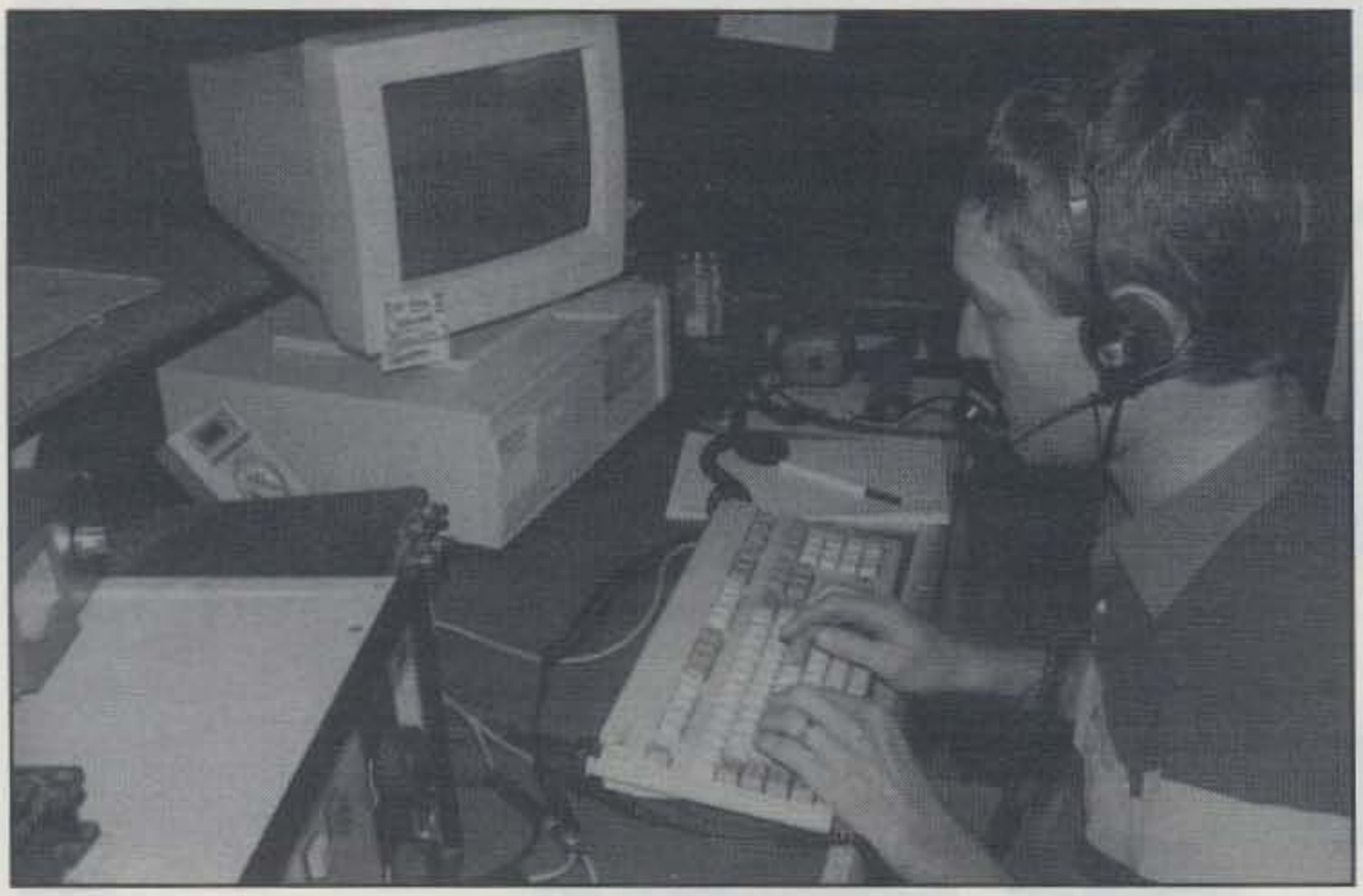


Kim, P29KS, part of the P20X team.

and weight. We decided to go with the battery/UPS setup, running with a large battery charger on commercial power to keep the batteries topped off. This would continuously power the computer and run the HF rig, a Kenwood TS-440S, belonging to Kyle. Steve would bring his Henry amplifier up with him from Port Moresby on Friday before the contest, and we would run it on commercial power.

We felt we needed some sort of edge on 40 or 80 meters, more than a wire antenna could offer, to take advantage of the higher QSO points available for contacts on those bands. It was decided to utilize two Butternut verticals in phase, switchable broadside to the U.S. and end fire to Europe. Thanks to the antenna expertise of Pete, we ended up with the Butternuts roof-mounted and working very effectively on 40. We decided that 40 was the best bet to run the score up on the three low bands, so we elected to stick with the one low band.

From the start we were in weekly contact with Steve and Shoji in Port Moresby via FAX, phone, and SSB, discussing the contest details, including the callsign. We realized we'd be working a lot of JAs, so acting on Shoji's advice that X or "x-ray" was more easily understood by most Japanese than V, B, or some other letters, we decided on P20X. A FAX to Post and Telecommunications in Port Moresby got the needed permission to use the special prefix for the contest period. Kyle volunteered to handle the QSLs from Madang, so we were nearly set.

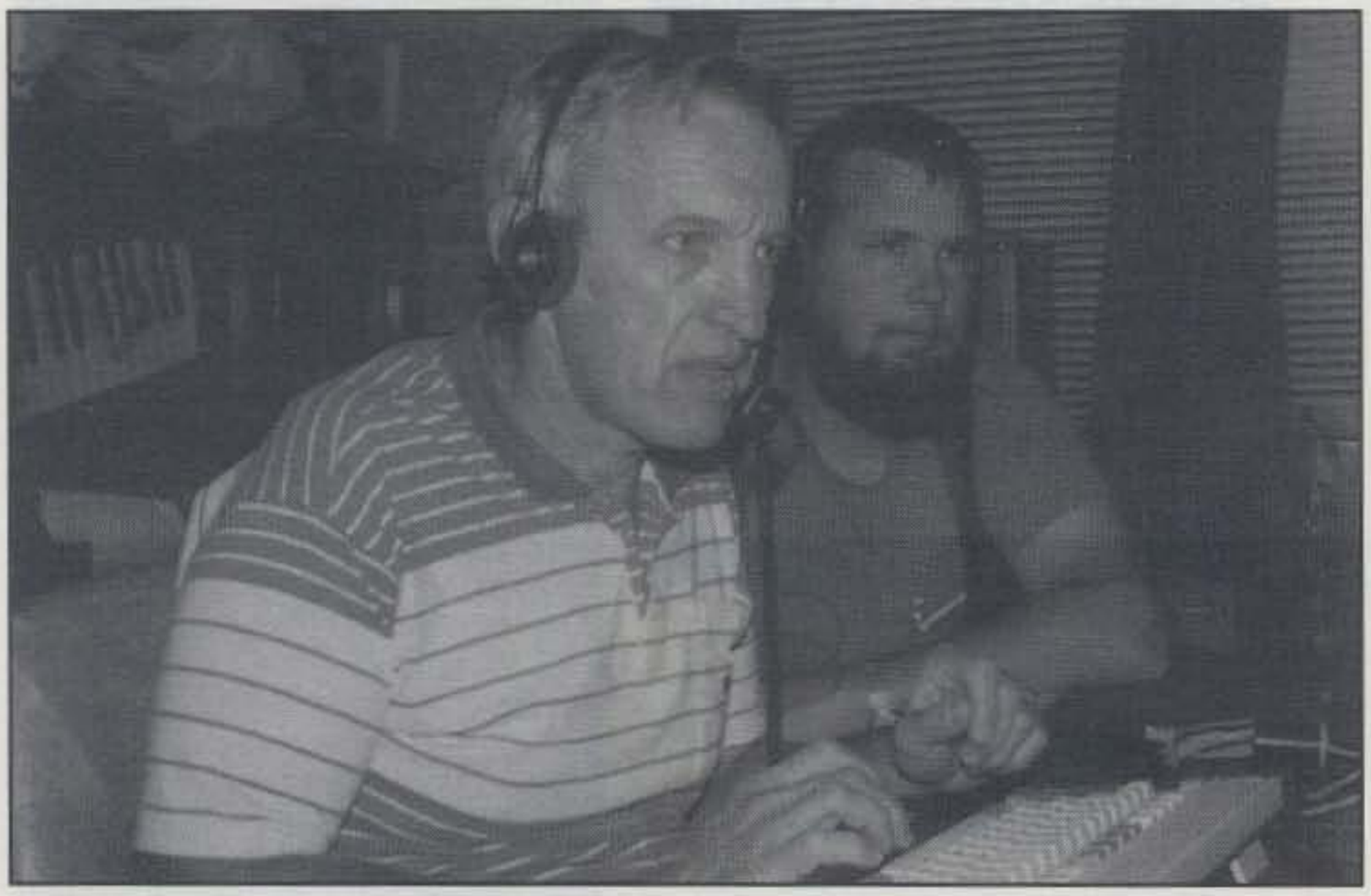
The week of the contest we planned on doing some final checks with the antennas, as well as checking out the computer for any RF interference problems. By Friday things were all in place. Steve and Shoji were to fly in from Port Moresby, arriving around noon, and Kyle would arrive later in the afternoon from Madang, rounding out the operating crew.

It would work out just right. Steve and Shoji would arrive in time to participate in a Highlands mumu (pronounced moo-moo) which was to be drummed up by the national workers in our Aviation Department. A mumu is a large meal of locally grown vegetables and meat (usually consisting of chicken, lamb, or sausages) that is cooked in the ground. The process resembles pressure cooking, as the food is placed on top of hot rocks and covered with banana leaves, and then water is poured in a small opening in the banana-leaf cover. The hole is then sealed and the food left to cook for several hours. The mumu is common in the Highlands and lends itself well to large get-togethers and celebrations.

Friday was a perfect day, with clear skies and plenty of sunshine. As the Britten Norman Islander circled overhead, Pete and I waited at the airstrip with those lingering "what do these guys look like in person?" questions, as neither one of us had met Steve or Shoji in person before. I've been an amateur for over thirty years and still find it interesting that no one ever looks in person like he or she sounds on the air. It was great meeting these guys in person for the first time, but had Murphy ridden along up from the capital? Steve didn't look like I thought he would, but did he naturally look this pale? After introductions Steve promptly told us he was not feeling well at all and it didn't appear to be a case of air sickness, as he said he felt it coming on the night before. We took the amp to the shack and got Steve and Shoji situated at our guest house. Steve was feeling pretty miserable by that time and went right to bed, while Shoji and I partook of the mumu.

After lunch a check on Steve showed a worsening condition, so arrangments were made for him to visit the doctor at our clinic in the afternoon. The prognosis? "Just a flu virus, and it'll have to run its course." So we put Steve back to bed and hoped for the best.

We had intended to have a meeting of the operating crew that evening, but with Steve not being able to attend we felt we couldn't cover all the areas of strategy, operating schedule, and get clarification on some of the "how to's" of the contest. We did complete a short course on the



Dave, P29DK, working 40 meters with Pete, P29CW, looking on.

use of CT, however, and everyone came away at the end of the evening feeling a bit more confident about contesting with the computer. Shoji gave the gear a good checkout that evening as well, and we were all fascinated with the way he handled the JA pileups using Japanese.

Saturday morning dawned bright and clear, and the big question concerned Steve's condition. I dropped by the guest house around eight to find him and Shoji at the breakfast table eating cinnamon rolls, with Steve looking much, much better than the previous day. He assured me he was feeling pretty good, so we proceeded to muster the crew for a pre-contest meeting, while Pete did some final tweaking on the verticals.

Considering the fact that several of the fellows had to get back to jobs on the Monday morning just before the contest ended, we designed an operating schedule that consisted of two crews, evenly dividing the operating time. It was up to each team as to who on the team would man the operating position during the time blocks.

During the preceding weeks we'd been looking at the previous year's high multi-single score of 9.5 million set by V73DH, and wondering if we would be able to beat that score and perhaps even succeed in beating the all-time Oceania record of 11.5 million set by AHØK in 1991. If our strategy was correct, and the propagation co-operated, we felt we could possibly achieve that goal despite the fact that our total contest operating experience was lacking a bit.

Now it was obvious, as the countdown to the start of the contest continued, that Steve was feeling better with each passing minute, for which we were very grateful. Since he was the most experienced op and his team was to operate first, it made good sense to let him begin the contest to show us all just how it was to be done.

Throughout the weekend the bands were in good shape. We began with 10 meters, which was open nicely to the U.S. Three hours into the contest we lost propagation to North America, but we worked our first large run of Japanese. The QSO rates continued at over 100 per hour for the first 8 hours, but slowed as we went to 40 meters just after sunset. The times just before our sunrise also proved difficult as far as producing good QSO rates and multipliers. All bands, except for 40, seemed to yield good rates, but that's to be expected. During the openings to North America the displayed score on CT would increase by huge amounts as we worked the many available multipliers the U.S. has to offer. The evening hours netted good rates and multipliers out of Europe as well. Band changes were made with input from the team members, and looking back, almost all band changes we made were for the good.

Twelve hours into the contest we were up to 1564 QSOs with 425 multipliers, and at the end of the first day we were at 2831 and 631, increasing our hopes of being able to at least come close to the previous year's high score.

As the hours slipped by we were content with our efforts, and the operating schedule seemed to be working out nicely. We discovered that having eight operators involved in the contest was a real advantage when it came time to take a turn operating. The problem of operating fatigue didn't seem to exist, and during the nighttime hours we made use of the empty beds in the house to catch up on needed sleep. The battery system and all the gear, including the coffee maker, hummed along with no hint of a problem. Having to armstrong the monster quad offered the only inconvience, and that was easy to live with.

Before dawn on Monday we made the transition to the little Ameritron amp that would see us through until the contest ended, as Steve needed to carry the Henry amp with him back to Port Moresby. Kyle, Shoji, and Steve all needed to be at the airstrip for their trips back to Madang and Port Moresby around seven, so we loaded their things and got them on their way.

By that time it was obvious that we would exceed our expectations on the score. The last several hours of the contest therefore were spent trying to bring the multiplier count up to further increase the overall point total.

After straightening out a few prefixes in the logging program, the final score ended up being 13.4 million points, much to our delight and satisfaction. Needless to say, the overall effort was well worth it, and we learned a lot from the experience.

Our special thanks go to Steve, P29DX, for all of his encouragement and input in making our team effort a success, and to those of you who made a contribution the P20X score. Perhaps we'll be back for the '94 WPX Contest with another special prefix from "The Land of the Unexpected."

Note: All-Time WPX Records, March 1993 *CQ*, p. 108, Oceania, AHØK ('91) 11,552,112.

1992 Multi-Single scores, *CQ* March 1993, p. 30, Oceania, V73DH, 9,546,910.

CQ REVIEWS:

The Radio Shack HTX-404

440 MHz FM Handheld Transceiver

BY JOE LYNCH,* N6CL

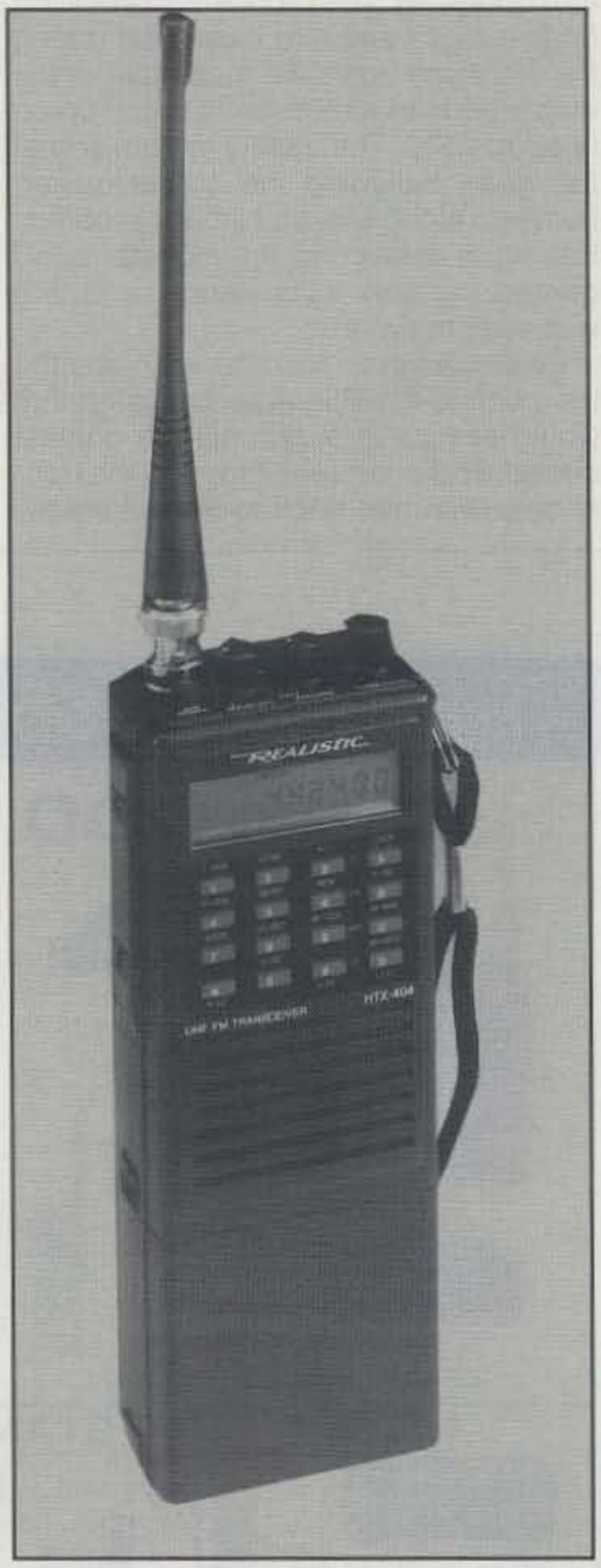
Not a week goes by without a visit to the local Radio Shack store. It seems I always need something, whether it's cable TV connectors for my fiancee's father's television or something around the shack.

Over the many years of my visiting Radio Shack stores I have noted with pleasure their continued and increasing interest in the amateur radio community. I observed the addition of their popular 10 meter radio several years ago (it is now discontinued) and the subsequent addition of their extremely popular 2 meter radio (the HTX-202) several years ago.

Now, staying in the same family line as the 2 meter radio, they have added another radio, the HTX-404, a 440 MHz FM handheld.

I was quite impressed with this nifty radio. Surprisingly, one of the first things that caught my eye was the inclusion of the alkaline battery case, a feature they introduced with the 2 meter radio. How many times have you been somewhere using your handheld and had the battery pack go dead. You know that you should have a spare battery pack and you probably do, but it's home hooked to the charger and you are somewhere else. Well, now with this battery case you can run into the grocery store, buy a package of alkaline batteries, and keep on playing with this handheld, albeit with a bit lower power. Nevertheless, it will get you by until you can get your charged battery pack or your battery pack charged.

The next thing that impressed me about the radio was the manual. You know you are supposed to read the manual before using the radio. I know that you don't, but I do. The manual is very well written, with complete instructions on all aspects of the radio. Most important, up front it introduces you to amateur radio and tells you the positive aspects of being in the hobby and the consequences for using the radio without a license. Furthermore, it gives the American Radio Relay League's address in bold print as a source for information on becoming an amateur.



The Radio Shack HTX-404, a 440 MHz FM handheld transceiver.

Radio Shack has received criticism in the past for selling amateur radio products capable of transmitting to non-amateurs. I feel that most of the criticism is unwarranted, because try as you might, no one can entirely keep products out of unauthorized hands who insist on having them.

Nevertheless, Radio Shack has gone out of its way to caution the purchaser of this product against using it in the transmit mode without the correct amateur radio license. There is a large-print "attention" line, as well as several references to amateur radio on the box. And in at least three places in the manual, the user is told not to transmit without the proper license. What else, except point-of-sale license checking (which no dealer really wants to do), can you do?

What about the radio? It is packed with features. It can operate from high or low power with a change of a push button. It can operate from the car using an optional adapter. (Note: When using this adapter, be sure to plug the power cord's barrel plug into the EXT DC jack and not the battery. If you plug it into the battery pack, you may damage it by overcharging it.)

It tells you when you're running low by having the word "BATT" appear on the display when you press the PTT switch. It can also operate from AC power with an optional 1 amp 12 VDC adapter. It can even operate from their 2.5 amp power supply, and complete instructions for hooking up the required connector are included. The radio can run up to 5 watts with the use of a 13.8 VDC power source.

As equipped, the radio can transmit and receive on the 440–450 MHz portion of the 70 cm band. Instructions are included for expanding the frequency coverage through to 430 MHz, the bottom of the band. However, the portion of the band between 430 and 440 MHz is reserved for weak signal, EME, satellite, and ATV, all operating in modes other than FM. For the most part, you would never have any use for that portion of the band. Nevertheless, it is there if you need it.

Frequency entry is either by direct entry through the keypad (which doubles as a DTMF pad on transmit), by turning the Tune control on the top of the radio, or by scanning the memory channels. Because my fiancee is visually impaired, I am sen-

P.O. Box 73, Oklahoma City, OK 73101

sitive to features of radios that make them more usable for her. The direct frequency entry satisfies her requirement for frequency selection. The unique tone sequence of several high pitches for each entry until the last entry, which is low pitched, gives a positive indication that the correct number of digits have been entered.

If you make a mistake, just re-enter the digits. Additionally, you can lock the keypad to keep from accidentally entering a change of frequency.

Speaking of memories, you can program each of them with a different frequency offset and subaudible tone (CTCSS). You have a total of 16 memories (more than adequate)—12 of them are for regular use, 3 for priority, and one for a calling frequency. Once in memory, you can move that frequency to the VFO mode.

The radio has a power-saver feature that turns on the receiver for 1/20 of a second (factory setting) to listen for any activity and then turns it off. You can reset this feature for 1/2, 1/4, 1/8, or 1/16 second.

For autopatch use, the radio can store up to five 15-number DTMF sequences, again more than adequate for most users. Additionally, it uses the DTMF tones for selective paging by setting your radio to receive only a particular sequence of tones before opening the squelch.

If you are a user of 2 meter repeaters in your neighborhood, why would you want to go to 70 cm? Because in many areas it is less crowded, and if you are inside some buildings, believe it or not, the shorter wavelength of the 70 cm signal can get outside of the building and to the repeater better than the 2 meter radio.

If you are into packet radio, the manual gives you instructions on how to hook up the radio to your packet station. Also, the manual gives instructions on how to hook the radio to an external speaker and through your car's cassette tape player, including the part numbers of the Radio Shack products that you need to do so.

The radio comes with the above-mentioned accessories, plus a belt clip and a wrist strap. It also has the required heavy-duty flexible antenna and wall charger.

In short, this radio is very complete. And judging by the success of its 2 meter predecessor, you won't go wrong with it. Even if you do have a problem, Radio Shack's nationwide support system, with their good reputation for customer assistance, is there to take care of it.

You can obtain your HTX-404 from your nearest Radio Shack store for the very economical price of $299.99. The optional DC power cord (catalog number 270-1533) for use with the cigarette lighter is $3.99. ■

It isn't too often you get to combine several interests and a DX pedition at the same time. WA3CUC takes us along on such a journey.

A ZS/K9 Bunny Hunt

BY HENRY HILL,* WA3CUC

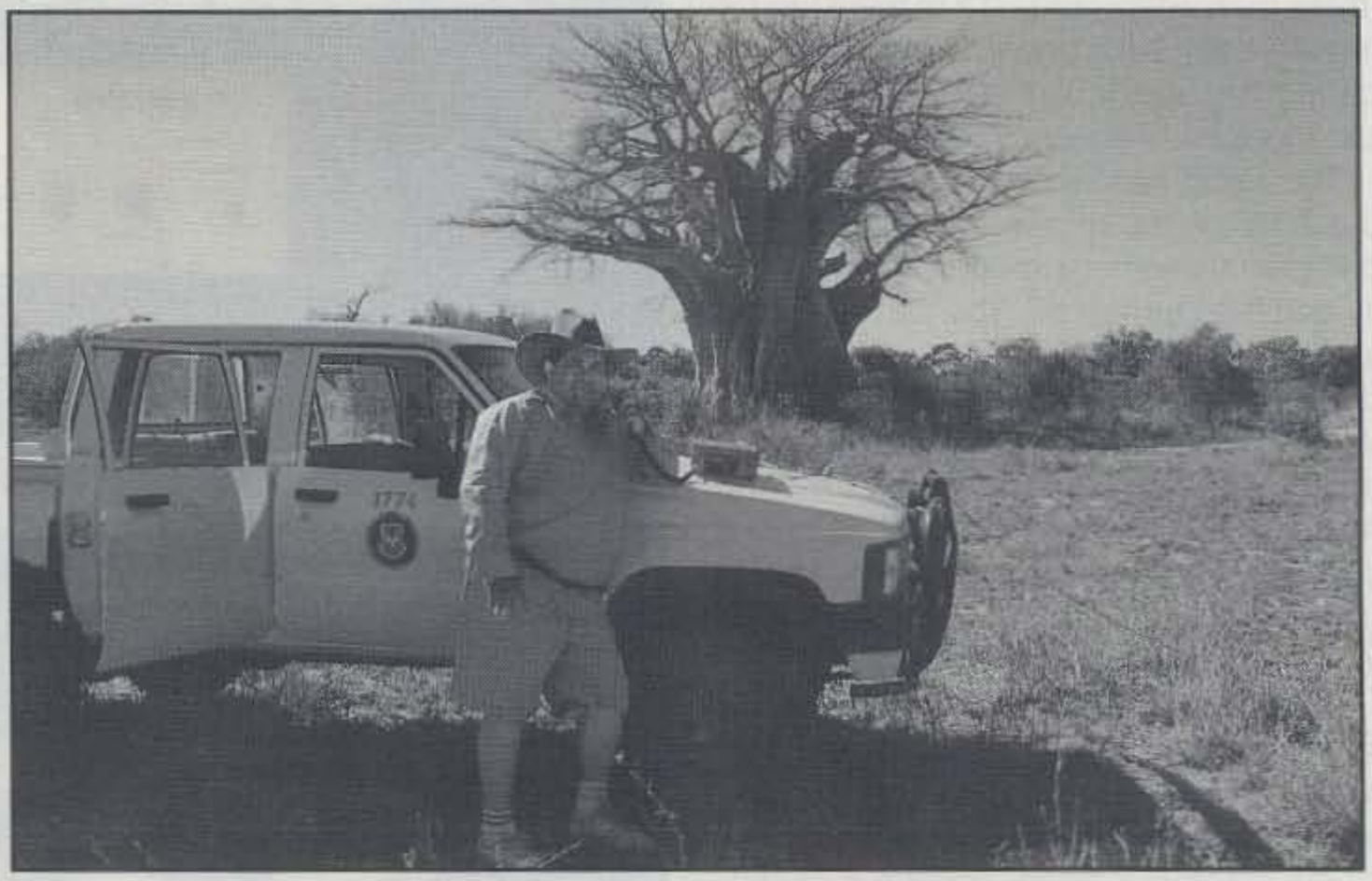
Light beams danced across the glass of the Coleman lantern at the end of the dining hut table while a mesmerizing moon shown over the Sabie River in a glow of ghostly white light. The symphony of bush sounds was overwhelming; through the Transvaal grass on the other bank a lion growled in a deep, skin-crawling tone over the yelps and cries of baboons in the big baboa tree, accompanied by the cackles, howls and screeches of a pack of hunting hyenas.

The sound of WQ6I coming across the speaker of my ICOM 735 brought me back to the present. As I tuned the SSB signal to the right frequency, I smiled, for this was my first contact with home since the Colorado Springs airport disappeared out of the aircraft window; that was twenty five hours of flying, with stops in Paris, Zurich, and Johannesburg, before arriving in Kruger National Park.

Kruger National Park is located in the Northern Transvaal of South Africa along the Mozambique border. It has approximately the same land area as the state of Massachusetts. No other park in the world is superior to the Kruger National Park as far as animal variety is concerned. Apart from the 122 different species of mammals, there are also 33 species of amphibians, 45 fish and 106 reptile species, and about 450 species of birds. You couldn't find a more exciting place for a first-time photo safari and research into the use of radio tracking for animal conservation.

Since that unforgettable day back in 1965, when I first received my WA3CVC call, I have been dreaming of doing a combination safari/DXpedition. The idea of combining two or more hobbies into one big trip was a dream that finally came together in July 1991. My portable call was ZS/WA3CVC—my first DX call!

While in the Kruger National Park I was assisted by Dr. Mills, who is the head of the park's carnivore research and animal radio tracking program. Dr. Mills uses 2 meter equipment (148–150 MHz) to track wild dogs so he can study why wild dogs have such a high turnover rate. The radio program is also used for various species of animals when needed for research.



ZS/WA3CVC operating battery-powered portable.

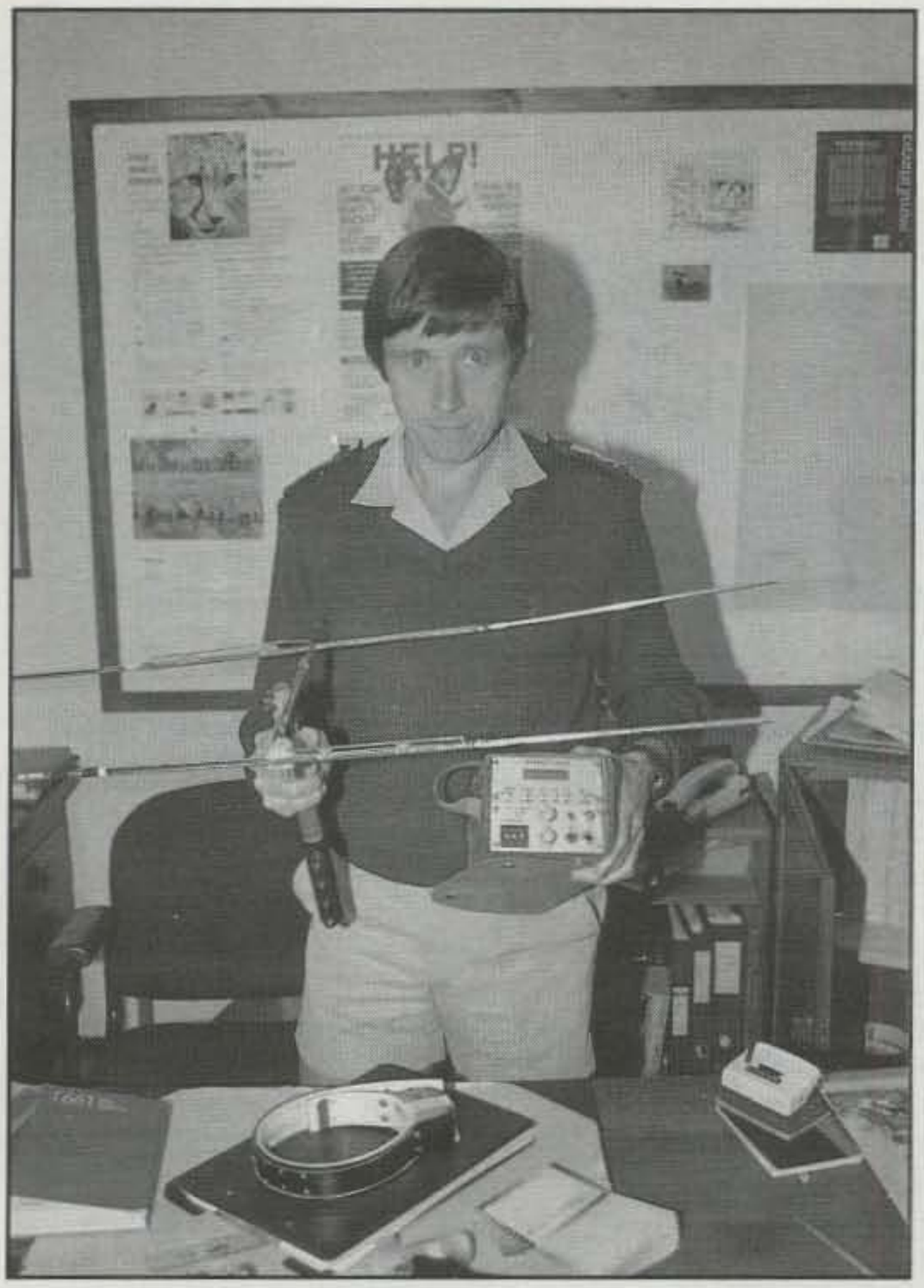
There are approximately 370 wild dogs in Kruger National Park. Tracking them is done by using helicopters or fixed-wing aircraft. Transmitters of two types are used to track the dogs: a radio collar and an implanted transmitter. The radio collar has a range of approximately 20 km when tracked by air. The implanted transmitter is made of an inert material and is surgically placed in the stomach area of the animal. The range is only 60% of the effective range of the radio collar. The implant will last up to 18 months, while the radio collar will last up to 3 years. Dr. Mills uses a portable receiver and a 3 element beam to track the low-powered signal. The beam is hand held out of the window of the helicopter to obtain readings. The radio will lead the doctor and his team of researchers right to the pack, where a physical count can be made. This data is put into a computer which tracks the numbers of the dogs as well as other animals.

Wild dogs are very similar to our own wolves in their family structure and behavior. They tend to migrate over large distances, depending on food and water. Wild dogs are very elusive and are rarely found without the use of the radio collars.

The aircraft/radio tracking of the animals is also beneficial in keeping track of poaching. Poachers from neighboring countries are the biggest threat to species such as elephants and rhinos. South Africa is one of the last sanctuaries for surviving numbers of black rhino and elephants due to the super job done by the park rangers, lead by Bruce Bryden (the head of Nature Conservation).

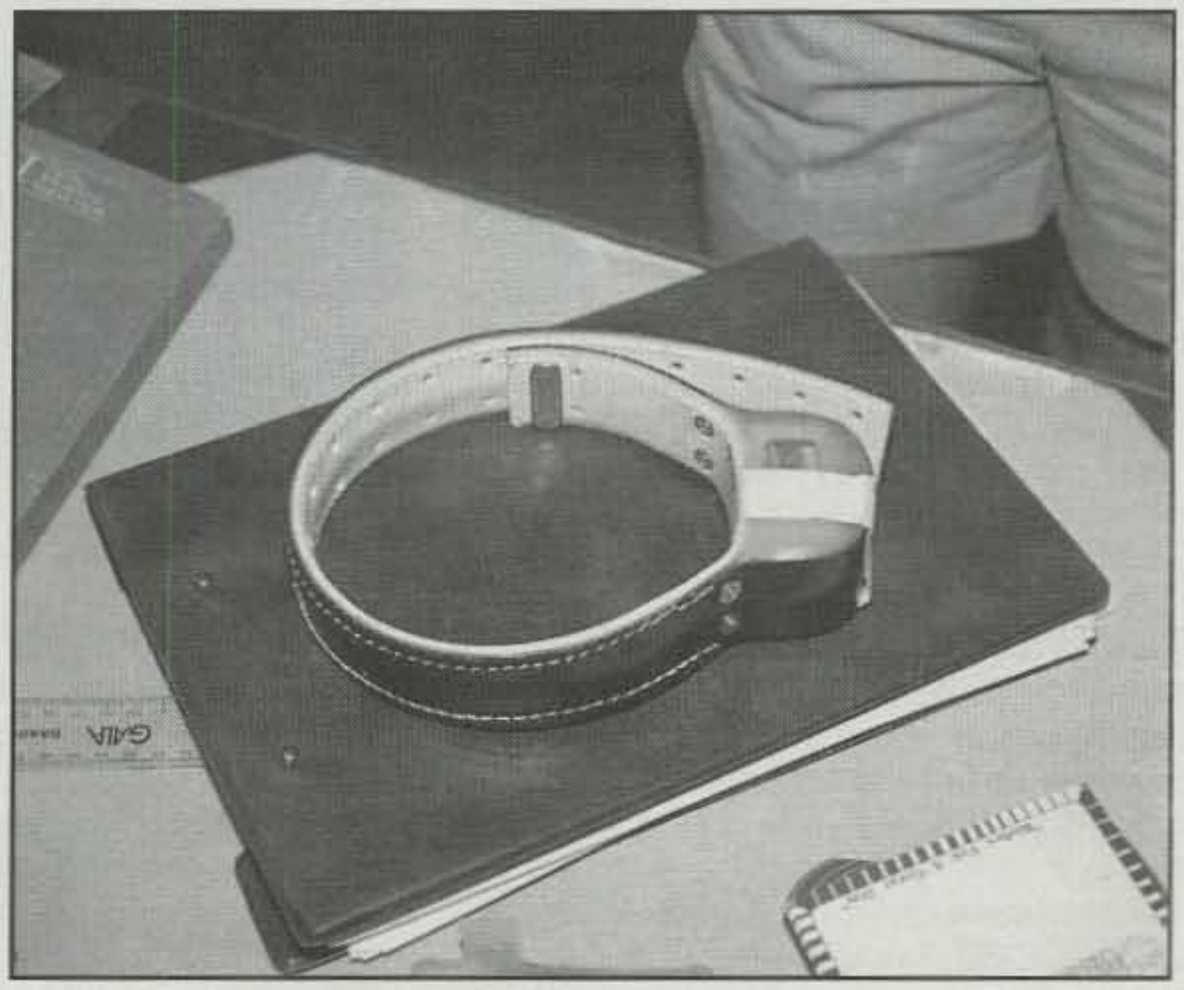
I did all of my amateur radio operating by battery power. I used an ICOM 735 barefoot to a 20 meter double bazooka antenna. The double bazooka makes a great traveling antenna because it is constructed of RG58 and 300 ohm twin lead,

**318 Upper Twin Rock Rd., Florissant, CO 80816*

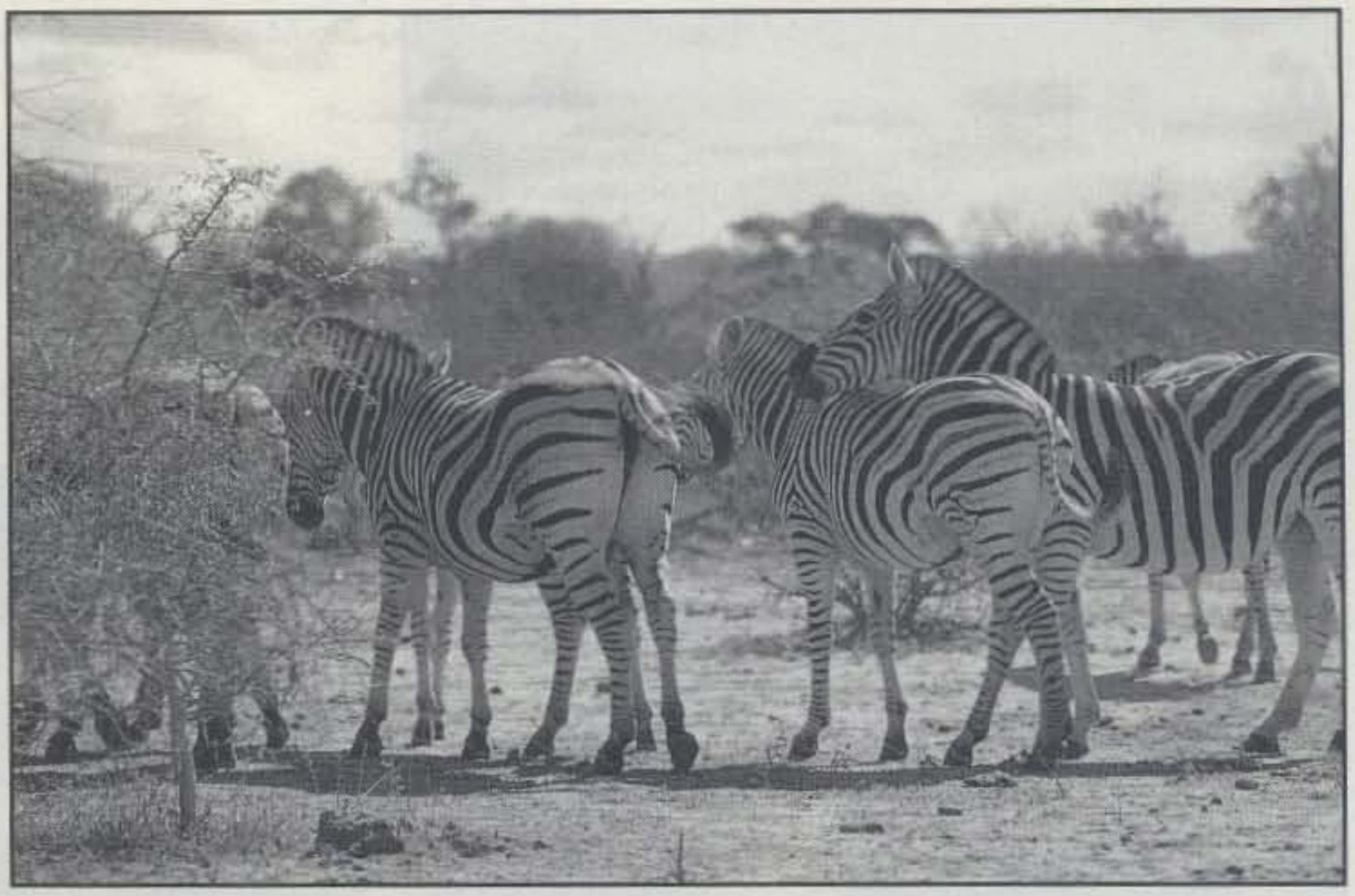


Dr. Mills with tracking antenna and receiver.

The radio collar.



A huge male lion, photo taken at less than 10 yards from the ranger vehicle. When you get this close, you wish you were somewhere else.



A herd of zebra oblivious to our presence.

making it very flexible and easy to carry plus put up. Working 20 meters from the opposite side of the world was a different experience indeed. Hearing booming DX signals that normally are weak back in my home state of Colorado was quite a thrill. Some people got confused over my call, ZS/WA3CVC, because they are used to the host prefix coming last, but South Africa puts the ZS first.

Of all the stations I worked, Jay, K6UMB had the biggest signal down in South Africa. Jay was also very helpful in passing traffic back home by phone. The contrast of sitting in the wilds of Africa while talking back home on my ICOM was very exciting for me. I had come a long way from the days of working AM stations on my Heathkit Tenner while in my tent in the backyard during the late sixties in Pittsburgh, Pennsylvania. Due to the 8 hour time difference, I made most of my contacts in the evening, which was morning in the U.S. Being DX sure made getting contacts a lot easier!

The safari as a whole was great! The people in South Africa were friendly and helpful. The country is beautiful and a place that has to be seen to be appreciated. Watching how radio is making a major impact on animal conservation was tremendous. Programs such as South Africa's Nature Conservation will ensure the survival of many endangered species. South Africa has done so well with elephants, that they sold or traded over 100 to animal conservation groups last year alone. The continued research and use of modern radio technology by Dr. Mills and men like him will be the shot in the arm some species need.

South Africa has gotten a lot of bad press the last few years, some deservedly so. They will be the first ones to admit that. They, like our own country, have problems unique to their own history and region. I found the atmosphere to be friendly and cordial, a very safe place to visit. You have to go to the right areas, as anywhere, but I would not pass up a trip to Kruger National Park if you are interested in seeing one of the last great places to view African wildlife in a safe, stable country.

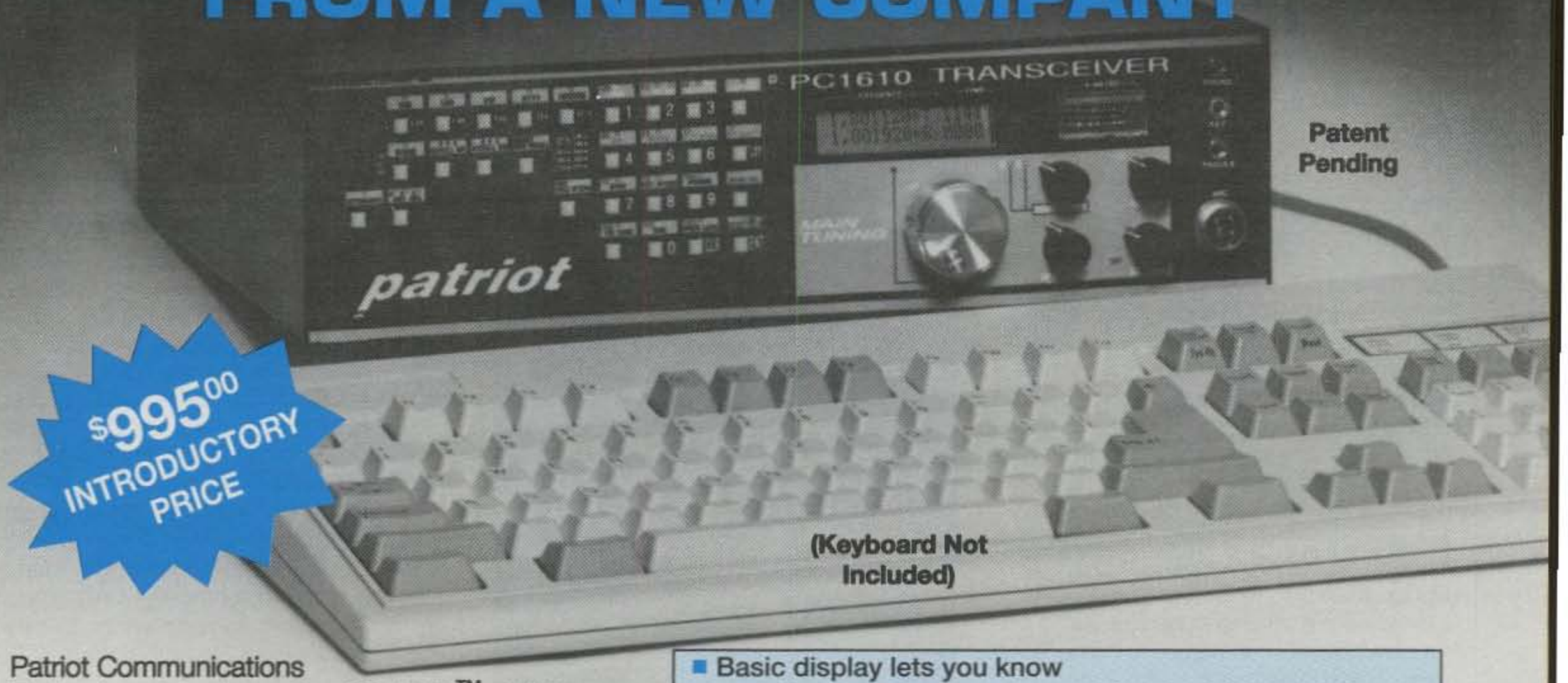
I will admit that most of the really big dreams and hopes that I planned for never lived up to what I had expected, until now. My first African safari was better than I had envisioned. Africa gets in your blood; the very beat of life throbs through the earth into your feet there. I know that I will miss Africa and that I will return. My radio and I, for one more adventure, then another and another and another . . .

As I climbed the stairs to board the South African Airways jumbo jet, I took one last look around as the African sun was setting on the horizon. I was sad to leave such a grand place, but I knew in my heart that I would return.

I wish to thank the South African Tourist Board for their help in my making contact with Dr. Mills and other park officials.

For more information on traveling to South Africa contact: Peter Celliers/Ellis Associates, SATOUR, 41 Union Square West, Suite 420, New York, NY 10003 (212-645-4440). ■

A NEW CONCEPT IN HF TRANSCEIVER DESIGN FROM A NEW COMPANY



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In this concluding installment, W5QJM reassures us how easy it is to not only use, but make our own open-wire line.

Working With Balanced Line—Part II

BY FRED BONAVITA*, W5QJM

High in the litany of problems allegedly faced by those who use balanced feedline to get their signal to the antenna is the question of which line is best.

Being among those who see no problem there at all, I use whatever is convenient and works under the circumstances. Those circumstances, however, can vary by application. For instance, I use TV-type 300 ohm ribbon from Radio Shack to feed a simple, compact antenna for vacations, camping, and other portable operations away from home. In addition to costing only pennies a foot, it is easy to work with, light, and flexible. It is much easier to pack 50 feet of 300 ohm ribbon than 50 feet of RG-58 coax.

I would not willingly use the same line for a permanent installation at home, however. There I use much sturdier stuff. Ribbon feeders with a plastic dielectric (i.e., 72, 300, and 450 ohm) can change impedance when wet. If 300 ohm line must be used in a permanent installation, make it the heavier-duty "windowed" variety available from several sources which advertise in these pages.[1]

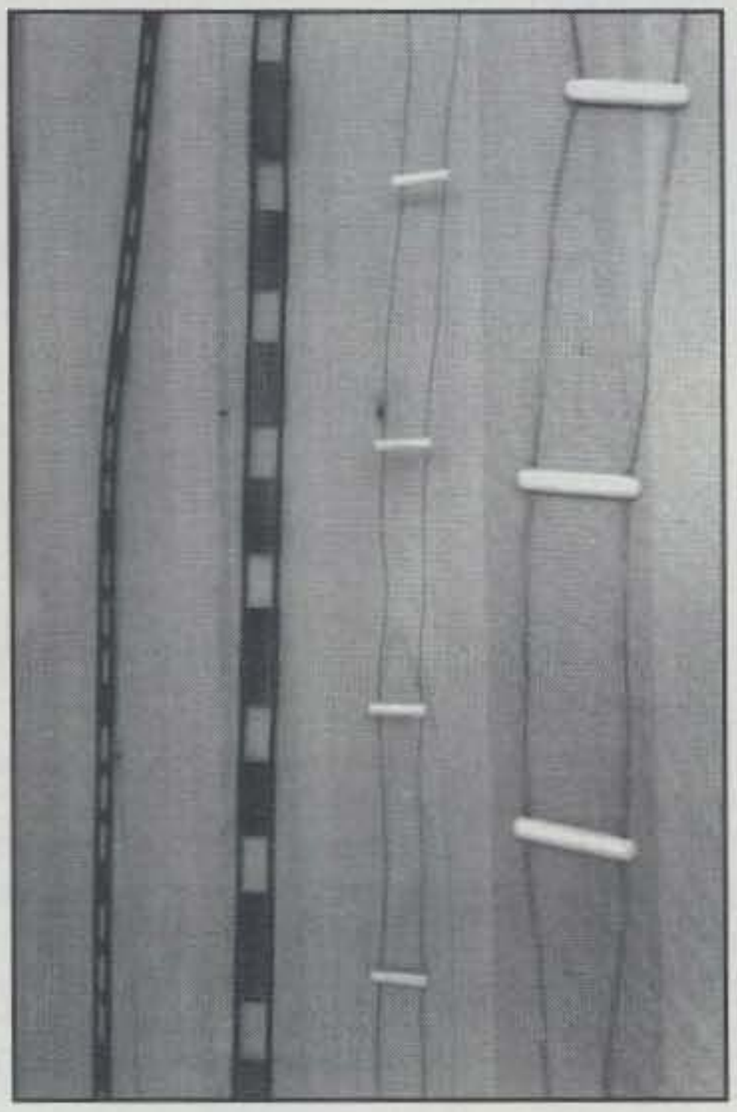
It also is easier to pass off 300 ohm line as TV lead-in where an outdoor antenna may be a no-no, for instance. The same holds for 72 ohm twinlead. Although 72 ohm ribbon line is available, it is slightly more expensive than the others, and it rarely is called for these days.

Another drawback to ribbon line, especially the type using copper-coated steel wire, is that a break in a feeder cannot be seen because of the plastic dielectric. Super-cold temperatures and strong winds can play havoc with long runs of even "windowed" feedline; coax is similarly vulnerable. The effects of wind can be lessened by twisting ribbon line about two turns in every three feet.

The best solution is to roll your own open-wire (air-dielectric) feedline. It won't change impedance when wet.

Relax. It's an easy job and rewarding in that you know *you* are producing the best possible feeder. It's also cheaper than commercially made line and far cheaper than coax. Like I said: Roll your own for fun and profit.

It was not long ago that TV-type, open-wire line—a 450 ohm, bare-wire line with plastic spreaders spaced every 6 or 12 inches and costing about $12 per 100 foot roll—was available commercially. It was troubled, however, by poor physical properties, including plastic spreaders that easily pulled free from the feed line.



A family portrait. From left are 300 ohm TV-type twinlead (72 ohm is similar), "windowed" 300 ohm, "windowed "450 ohm ladder line, all-but-extinct 450 ohm TV-type "ladder line," and home-made open-wire with 2 inch spreaders. (Photos by Don Randall, WB5ROU)

Wire for balanced feeders is readily available from many sources, some of which are cited in the footnote at the end of this article. No. 14 stranded wire is commonly used because of its availability and price. For a concealed application something as thin as No. 20 will work, but is more vulnerable to breakage.

I have used No. 12 or 14 solid copper wire, the type electricians use to wire houses. It comes in 500 foot rolls for literally pennies a foot at building supply stores. The insulation must be stripped from it, however, but that's an easy task. (This wire with black insulation is less visible than No. 14 stranded wire for those instances where an outdoor antenna must be concealed.)

Before going further, I need to say a word about the impedance of balanced line. For the most part and for our purposes here, it matters little whether the antenna is fed with 72, 300, 450, or 600 ohm line, or something in between. A good coupler will make the match for the transmitter, and couplers will be discussed later. For those rare instances, however, where a specific impedance is required, it can be calculated easily.[2]

Once the size of wire and the length of the run are known, it is time to consider spreaders. They can be had from many suppliers listed in footnote 1 and range from 2 to 6 inches in length. Prices vary from a quarter (Fair Radio Sales) to several dollars (Radioware and Ocean State Electronics), depending on length.

Some suppliers also offer ceramic feedpoint insulators as companions to spreaders. But be careful handling anything made of ceramic, as it will shatter if dropped on a concrete floor or driveway or other hard surface.

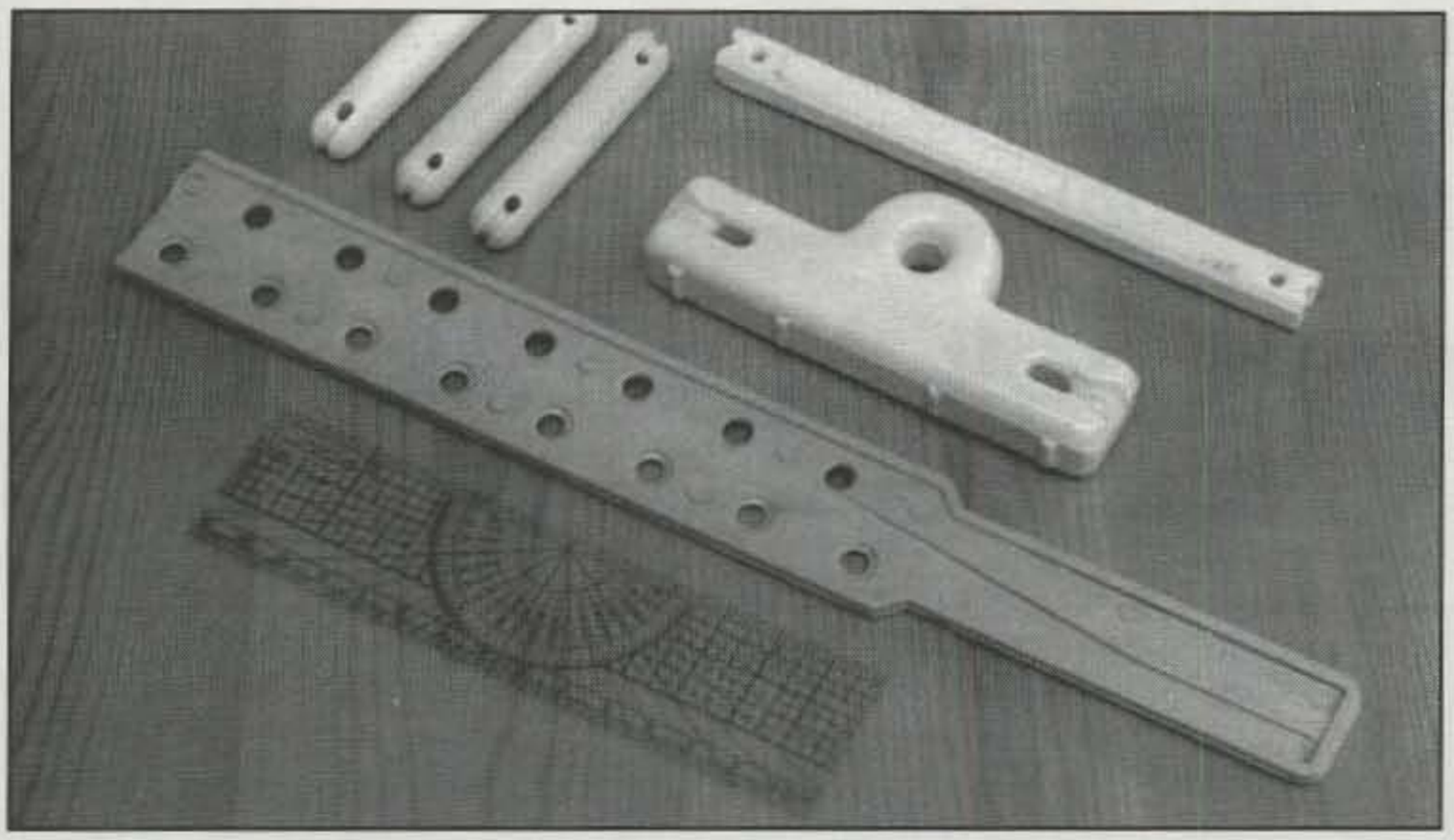
Less vulnerable and usually cheaper, but equally as effective are do-it-yourself spreaders made from almost anything that is light enough, is an insulator, and can withstand exposure to the sun's ultraviolet rays.

Early spreaders were made by cutting lengths of half-inch wood dowels, drilling them for the feed wires, and boiling them in wax to permeate and protect them. While this method is practical, it's not without its problems. C.F. Rockey, W9SCH, a self-styled "feeder-spreader boiler," cautions: "In the past I boiled lots and lots of dowel-rod spreaders. It's a pain in the posterior and can be dangerous, too. Burning wax is worse than napalm!"

Today's home-brewed spreaders are more often crafted from PVC pipe, plastic paint stirrers (try Sears), plastic rod, and the like. Several articles on making spreaders can be found in various publications.[3]

The most prevalent method of fastening line to spreaders is to thread the line through the holes in the spreaders and leave the outside notches for the holding wires to keep the spreaders in place. Some favor just the opposite: Feed the

P.O. Box 2764, San Antonio, TX 78299



Building blocks for open-wire line. From upper left are three 2 inch ceramic spreaders with a ceramic feedpoint insulator. Above it is a 5 inch spreader, and below is a plastic stirrer for paint. It can be cut as needed to make spreaders.

holding wires through the spreader holes and put the line in the notches on the outside. Most commercially made spreaders allow either, and home-brewed spreaders can be made to suit. The latter is simpler, but the former is sturdier and is recommended. However, once a line has been threaded through the hole and the holding wires soldered on the outside, replacing a broken spreader in the middle of a run can be a chore. A broken spreader is easier to replace with the feed wire on the outside. The holding wire can be removed far easier than having to undo part of a line to replace a broken spreader.

Tying feed wires to spreaders is easy, too. If you use stranded wire for feed line, cut a few 3 inch lengths from one end, peel one strand free, and use it to snug the line to the spreader with pliers. I prefer to solder holding wires in place, but others have found a dollop of so-called "super glue" over the joint works, too.

How many spreaders are needed? The literature and experience say only as many as it takes to keep the lines from shorting and to provide a physically sound run from the tuner to the feedpoint. One well-informed source suggests one every 12 inches, which if nothing else makes it easy to keep track of how many feet of line are in use. Others have said one spreader every 2 feet is sufficient, and I have found this to be true.

All this supposes the use of an antenna system tuning unit, or coupler. I would not be without one. One of the best for tuning balanced feeders is by Charles Lofgren, W6ZZJ, [4] and it can be built as easily as the lines it will tune. Even Louis Varney, G5RV, designer of the popular antenna bearing his call, has come up with a coupler for balanced feeders (see books by Heys and David in the footnotes). Read Lofgren, Varney, Moxon, and others on the merits of couplers, if you have any doubts.

I will be happy to answer questions about balanced feeders from those who send along a stamped, self-addressed envelope for a reply.

Footnotes

1. Among sources for commercially made balanced line, wire, spreaders, center insulators, and the like are:

Radioware, P.O. Box 1478, Westford, Massachusetts 01886 (1-800-950-9273). Free catalog.

The Wireman Inc., 261 Pittman Road, Landrum, South Carolina (1-800-727-9473). Catalog $2.

Ocean State Electronics, P.O. Box 1456, Westerly, Rhode Island 02891 (1-800-866-6626). Free catalog.

Fair Radio Sales Co., P.O. Box 1105, Lima, Ohio 45802 (1-419-223-6763). Free catalog.

Kilo-Tec, P.O. Box 1001, Oakview, California 93022 (1-805-545-9645). Free catalog.

The Radio Works, P.O. Box 6159, Portsmouth, Virginia 23703 (1-804-483-1873). Catalog $2.

2. *The ARRL Antenna Book,* 16th ed., p. 24–26.

H. Turner, "Open Wire Transmission Lines: Tools for Design and Analysis," *Communications Quarterly*, Winter 1991.

E. David, "HF Antenna Collection," Radio Society of Great Britain, 1991, p. 4.

3. L.A. Moxon, "HF Antennas for All Occasions," RSGB, 1988, pp. 248–249.

J.D. Heys, "Practical Wire Antennas," RGSB, 1991, pp. 15–24.

L. McCoy, "Open-Wire Feed Lines, A Time for Revival?" *CQ*, Aug. 1982, p. 40.

R. L. Measures, "Constructing Ladder (Open-Wire) Transmission Line," *QST*, Feb. 1990, pp. 35–36.

4. C. A. Lofgren, "The Z-Match Coupler—Revisited and Revised," *The ARRL Antenna Compendium*, Vol. 3, pp. 191–195.

Heys, *ibid*, pp 85–86.

David, *ibid*, pp 113–119.

Bill Orr, "The Z-Match Antenna Tuning Unit," *CQ*, August 1993, p. 50; "The Z-Match Revisited," *CQ*, Sept. 1993 p. 91; and "The Z-Match ATU for 160 Meters," *CQ*, Oct. 1993, p. 86.

David Jackson, "Compact Z Match A.T.U.," *G-QRP Club Antenna Handbook*, 1992, pp. 20–22.

Note: RSGB publications are available from Townsend Electronics Inc., Box 415, Pierceton, Indiana 46562 (1-800-944-3661) free catalog; from the ARRL; and from other sources. ■

W2FMI presents this epilogue to his series on transmission line transformers. He also presents us with a challenge for the future.

A Subsequent Look At 4:1 Baluns

BY JERRY SEVICK*, W2FMI

The June 1993 issue of *CQ* contained an article[1] of mine on baluns entitled "A Balun Essay." It presented six designs with the following ratios: 1:1, 1.5:1, 2:1, 4:1, 6:1, and 9:1. All were of the "current" type which have lately found favor in the amateur literature. The article also included a little history and theory of these devices. If you read the article, you would have found that I was also quite critical of recent articles which appeared in the amateur journals proposing new 1:1 designs using coaxial cables either wound around ferrite cores or threaded through ferrite beads.

More recently *CQ* published another balun article of mine entitled "Baluns for Antenna Tuners."[2] It introduced a new look at the 4:1 Ruthroff[3] (voltage) balun under a balanced-to-ground condition, which is the usual case with balanced antenna systems. It also presented an improved design of McCoy's balun,[4] which uses powdered-iron toroids with a permeability of 10 and has been successfully utilized in antenna tuners for many years. Powdered-iron cores with permeabilities greater than 10 were also investigated. Permeabilities of 20 to 35 looked somewhat promising but needed accurate insertion loss measurements in order to prove their usefulness. Their bulk-resistivities of less than 1000 times that of the No. 2 mixture, which has the permeability of 10, cast some shadow of a doubt.

This article is really an extension of my recent publication on baluns for antenna tuners. It not only presents new designs using Ruthroff's approach, but also gives some history and an evaluation of what has appeared in the amateur radio literature on 4:1 balun designs. It is then followed with a section on suggested applications for the various 4:1 designs, and finally, a brief overview of this technology known as transmission line transformers.

A Little History and Design

Looking back at my old issues of amateur radio handbooks (and I have some missing), I found that the first presentation on broadband 4:1 baluns was in the 1955 edition. The section was called Coil Baluns. The schematic diagram, which is shown in fig. 1(A), was taken from Guanella's classic 1944 paper[5] which introduced the concept of a broadband balun. What surprised me was that this section appeared to use many of the important words contained in Guanella's paper. It mentioned that the choking action of the coiled transmission lines should be great enough to isolate the input from the output at the lowest frequency of interest. It also included the requirement on the characteristic impedance of the coiled transmission lines; namely, that the characteristic impedances should be equal to $R_L/2$, where R_L is the load.

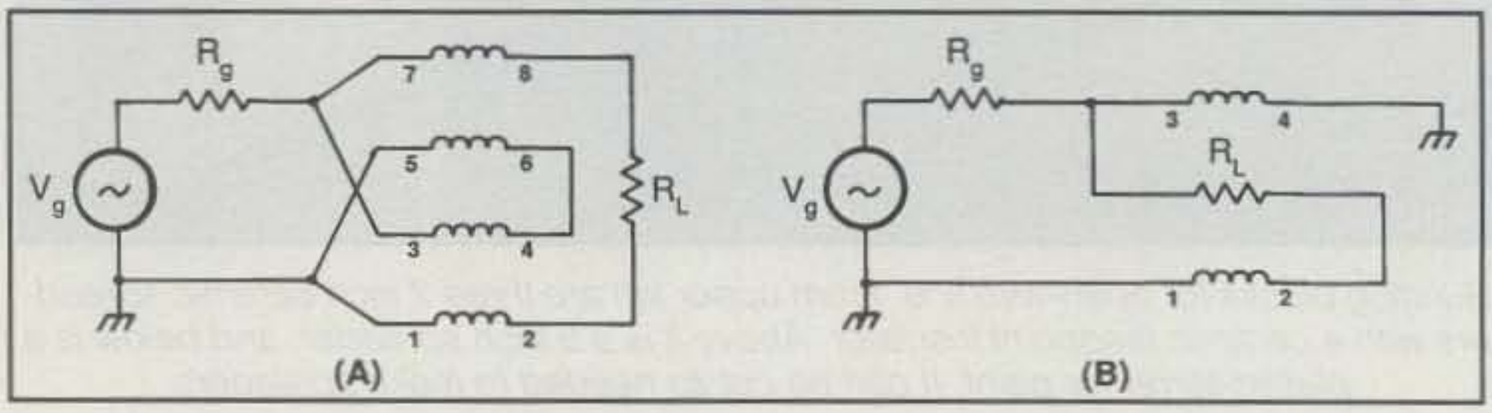


Fig. 1– High frequency models of the two 4:1 baluns: (A) Guanella (current) balun; (B) Ruthroff (voltage) balun.

The section included two other statements which are not correct in today's design practices. One recommended that the length of the winding in each coil be equal to about a quarter wavelength. The other stated that the principal application is in going from a 300 ohm balanced line to a 75 ohm coaxial line. With ferrite cores, the length of windings is now considerably shorter than a quarter wavelength, and the applications include a host of different impedance levels.

Recent issues of the handbooks now include the 4:1 broadband coil balun (with the same write-up as in the 1955 edition) and one with the windings on ferrite cores. They are now called 4:1 air-core current baluns and "just plain" 4:1 current baluns (ferrite cores being assumed). But what is now lacking in the description of the 4:1 current balun is the importance of the characteristic impedance of the windings and the value of the permeability of the ferrite cores. They state that 8 to 10 turns (of No. 14 Formvar-coated, close-spaced wire, I guess) on a toroidal core or 10 to 15 turns on a rod are typical values for the HF range. Ferrite cores with permeabilities from 850 to 2500 are also suggested. Also, nothing is mentioned regarding the dimensions of the cores.

In essence, there is very little information available today in our handbooks on how to understand and construct the "popular" current balun. Even the choices of ferrites to be used are found wanting. Accurate loss measurements[6] have shown ferrites with permeabilities of 850 to 2500 to be lossy in balun (and unun) applications. Only when the permeabilities of ferrites are 300 or less will baluns exhibit the very high efficiencies of which they are capable. For more information on the theory and construction of current baluns, I refer the reader to my June 1993 article in *CQ*.[1]

Even though the 4:1 "voltage" balun has actually had a shorter history than the current balun, considerably more construction detail (including an actual photograph) has been available in the ama-

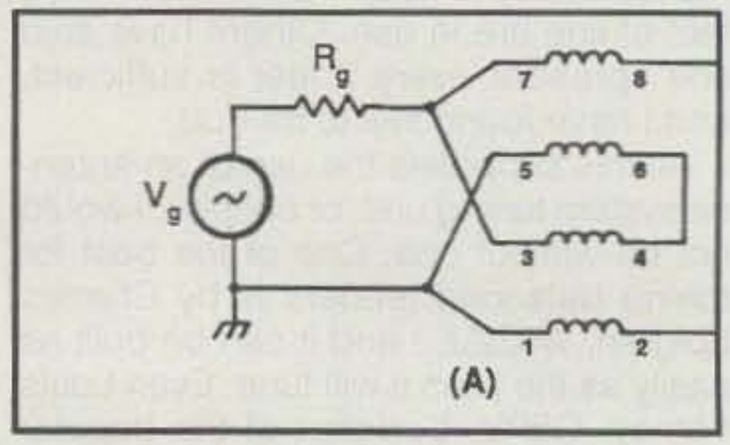


Fig. 2– Pictorial representation of the 4:1 Ruthroff (voltage) balun.

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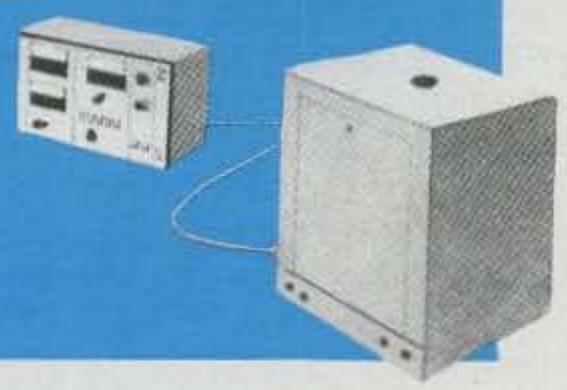

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teur radio handbooks. As far as I can tell, the first presentation took place between 1965 and 1968. In looking through succeeding issues (including the 1993 issue), I find the write-up has not changed much (if any) over the years.

Fig. 1(B) shows the schematic diagram of the 4:1 Ruthroff (voltage) balun.[3] Fig. 2 shows a pictorial representation of the balun. Photo A (on the left) shows my construction of a design close to the one shown in the handbook's photographs. It has 10 bifilar turns of No. 14 Formvar-coated wire (close-spaced, I assume) on a 2.4 inch OD ferrite toroid with a permeability of 40. Fig. 3 shows a plot of the input impedance versus frequency when the 200 ohm load is center-tapped-to-ground (which is close to the actual case when matching into balanced antenna systems). As you can see, when compared to a design that has the proper characteristic impedance of the winding and sufficient choking, the response is very poor. Although this balun has been rated at 1000 watts of RF power from 1.8 through 60 MHz, I would suggest it not be used below 6 MHz for fear of excessive flux in the core (especially when the magnitude of the load is greater than 200 ohms). Also, above 14 MHz the transformation becomes considerably greater than 4:1.

My design, on the right in photo A, has 14 bifilar turns of No. 14 tinned copper wire on a 2.4 inch OD ferrite toroid with a permeability of 125 or 250. The wires are threaded through No. 13 Teflon tubing with a wall thickness of 20 mils. As you can see by its excellent high frequency response in fig. 3, the characteristic impedance of the bifilar winding must be very close to the ideal value of 100 ohms. Photo B shows two different views of my design mounted in a 4"L × 3"W × 2.25"H Bud CU 234 aluminum box. The balun, which is placed equidistant between the top and bottom and the sides of the enclosure, is securely mounted when soldering its leads to the two feed-through insulators and the SO-239 chassis connector.

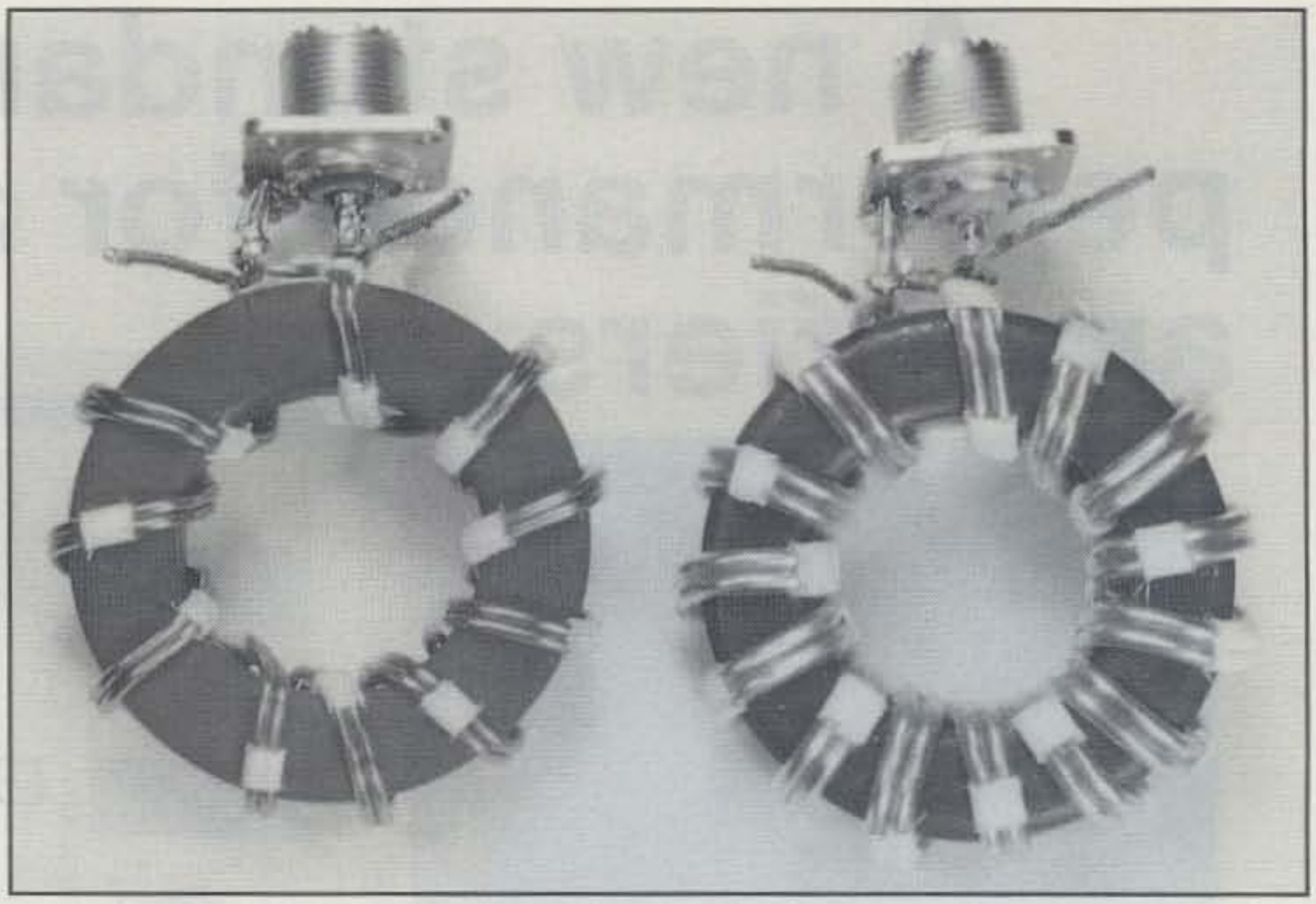


Photo A– Two designs of the 4:1 Ruthroff (voltage) balun. The one on the left is taken from the amateur radio handbook. The one on the right is my improved version.

It should be mentioned that if the balun is mainly to be used on the lower portion of the HF band (including 160 meters), then the 250 permeability ferrite is recommended. Even though the difference in low frequency response between permeabilities of 125 and 250 doesn't show up in fig. 3, the 250 permeability would give an extra degree of safety margin (from flux in the core) at the low frequency end. The trade-off is in giving up a little in efficiency (about 1 percent) for an increase in the safety margin (a factor of 2) at the low end.

Incidentally, the handbooks also state that the balun can be used between a balanced 300 ohm point and a 75 ohm unbalanced line. Since I suspected this statement as well, I again measured the input impedances versus frequency of both baluns when terminated in a 300 ohm center tapped to ground load. Fig. 4 shows the deterioration, which especially takes place at the high end. Even a balun well designed for a 50:200 ohm impedance level is not recommended for the 75:300 ohm level. Because the length of the transmission line becomes significant beyond 10 MHz, standing waves then change the impedance ratio due to the mismatch with the balun's transmission line. My design also shows more safety margin at the low end. I am sur-

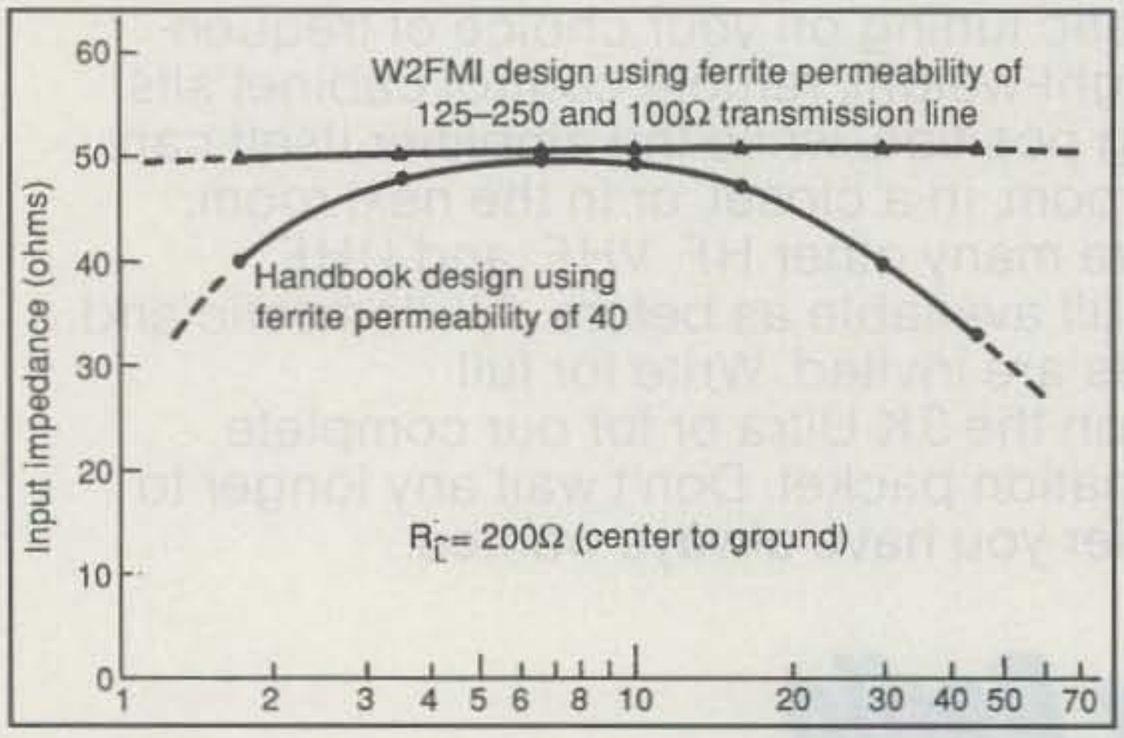


Fig. 3– The input impedance versus frequency for a 4:1 Ruthroff (voltage) balun design from the amateur radio handbook and one optimized for the 50:200 ohm level. The load is grounded at its center.

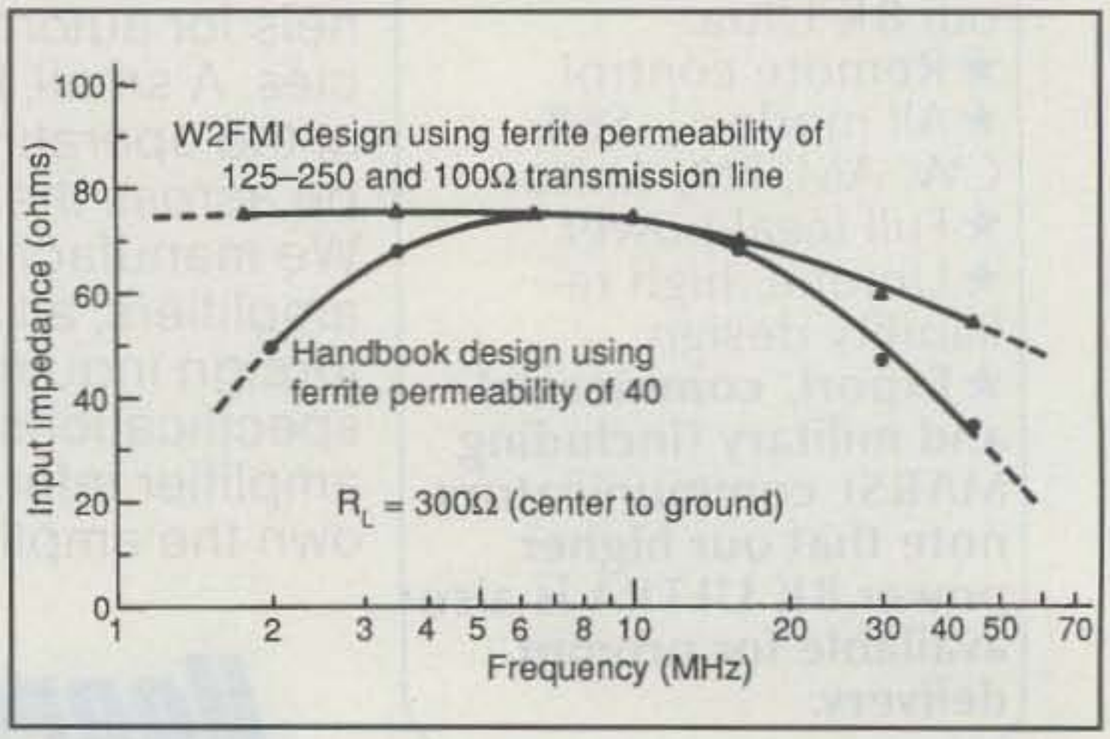


Fig. 4– The input impedance versus frequency for the two 4:1 Ruthroff baluns of fig. 3, but with a 300 ohm load. Note the deterioration of the W2FMI design which was optimized for the 50:200 ohm level.

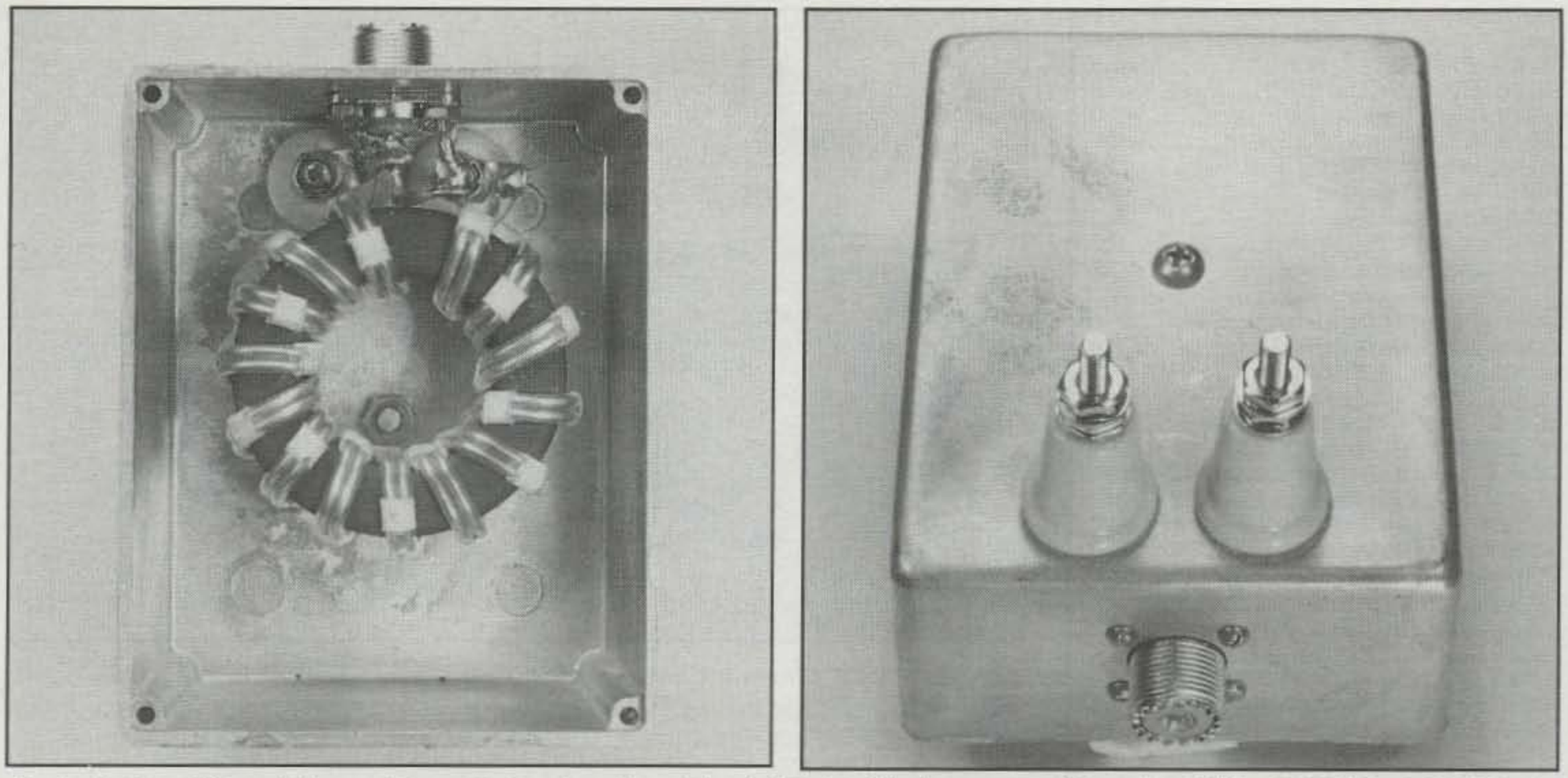


Photo B– Two different views of the optimized version of the 4:1 Ruthroff balun mounted in a 4"L × 3"W × 2.25"H Bud CU 234 aluminum enclosure.

prised that these simple measurements were not made many years ago.

The balun shown in the handbook, however, does have one interesting feature. It uses a very low permeability ferrite (40) which has been shown by very accurate insertion loss measurements[6] to yield efficiencies in baluns (and ununs) of 99 percent at the 50:200 ohm impedance level! This is even a percent or two better than the ferrite with a permeability of 125. Since this ferrite permeability is so low, the major problem is in obtaining sufficient choking reactance at the lowest frequency of interest so that only trans-

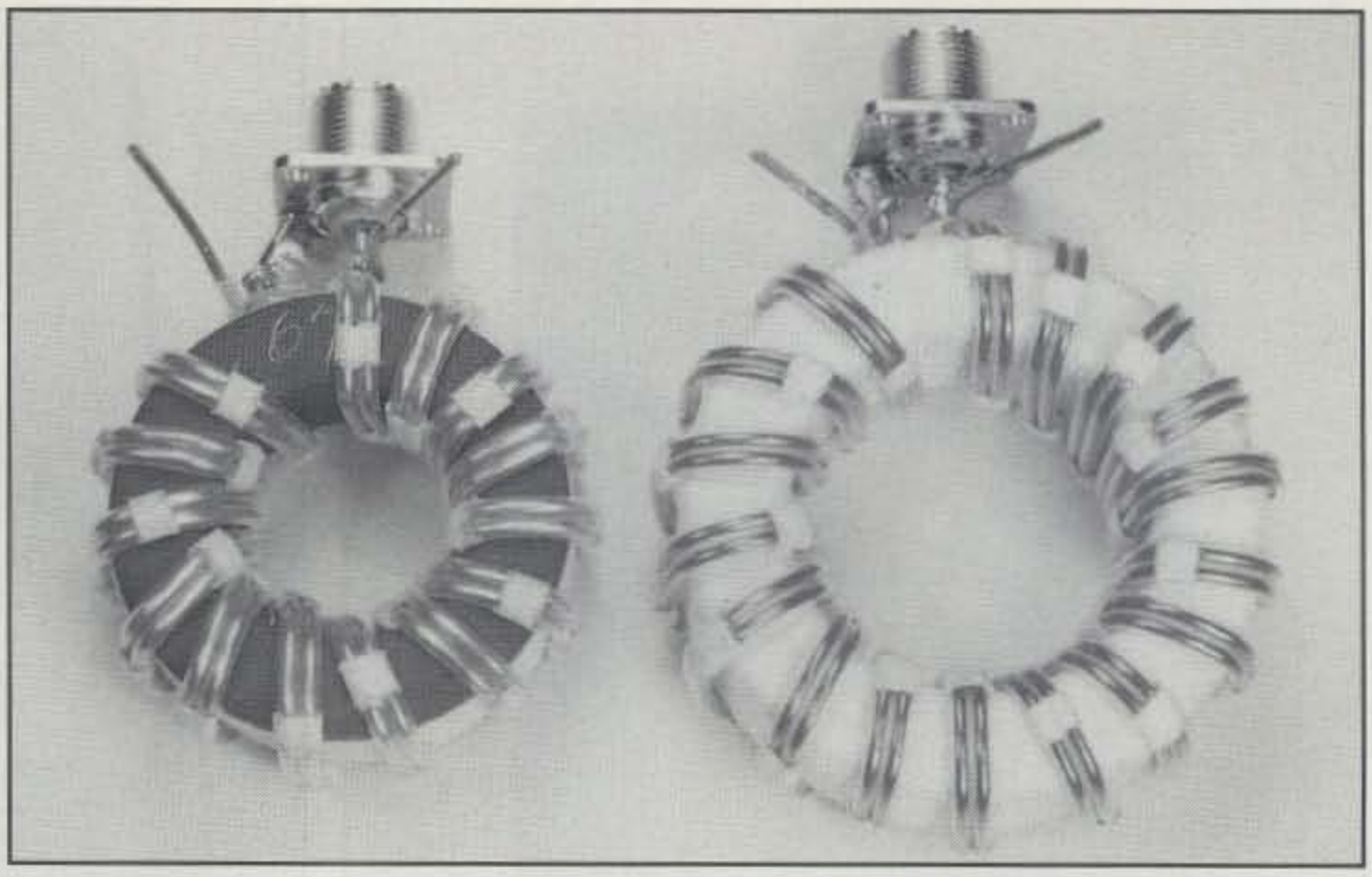


Photo C– Two 4:1 Ruthroff (voltage) baluns capable of handling 10 kW of peak power and 5 kW of average power. The one on the left uses two ferrite cores (stacked) with permeabilities of 40. The one on the right uses a large (3 inch OD) powdered-iron core with a permeability of 10.

mission line currents are allowed to flow.

The design chosen (in order to exploit this very high efficiency) is shown on the left in photo C. It uses 14 bifilar turns of the same wire, as with my previous balun shown on the right in photo A, on two 2.4 inch OD cores (bound together with No. 27 glass tape) with permeabilities of 40. Photo D shows three views of this low-loss 4:1 Ruthroff (voltage) balun. The unmounted view shows how the two cores are bound together by glass tape. The other views attempt to give an example for mounting the balun. The balun is supported by two acrylic end pieces which are, in turn, held fast to the enclosure by a long bolt. The balun is placed equidistant between the top and bottom and the sides of a 5"L × 3.5"W × 2.25"H aluminum enclosure. A few washers at the point where the bolt comes through the enclosure help to position the balun between the top and bottom.

When matching 50 ohms (unbalanced) to 200 ohms (balanced), the response of this balun is practically the same as mine shown in fig. 3 using a single core. From 1.7 MHz to 30 MHz it can certainly handle the full legal limit of amateur radio power with an efficiency close to 99 percent. But if the operation of this balun is restricted to the HF band only (that is, 3 to 30 MHz), then it could be conservatively rated at 10 kW of peak power and 5 kW average power. It would be an ideal balun for a log-periodic beam antenna.

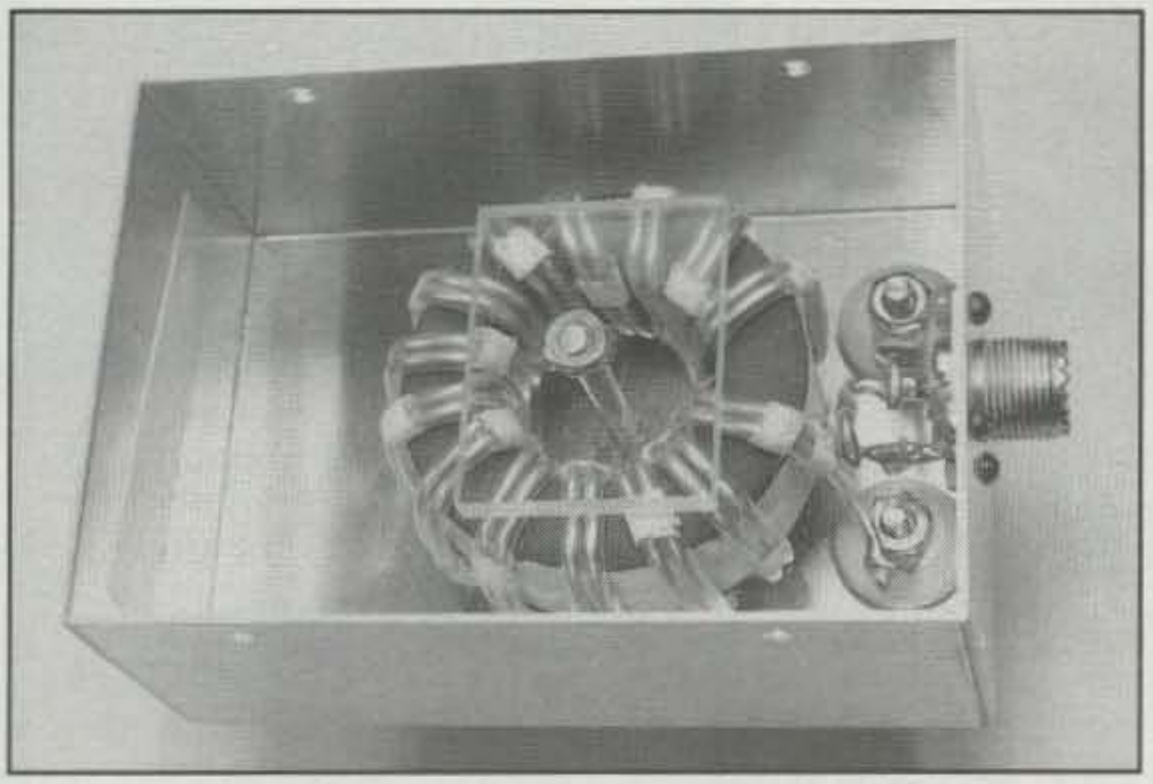
On the right in Photo C is shown a very high power 4:1 balun using a powdered-iron core with a permeability of 10. In its passband it also demonstrated efficiencies approaching 99 percent.[6] It has 17 bifilar turns, of the same wire as above, on a 3 inch OD, 1 inch high powdered-iron toroid. It was primarily designed for use in antenna tuners where hostile conditions (very high impedances) can exist. Since its permeability is one fourth that of the ferrite of the very high power balun (on the left in Photo C) and the effective path length is larger, the increase in the number of turns from 14 to 17 does not give it quite as much choking reactance, hence the same low frequency response.

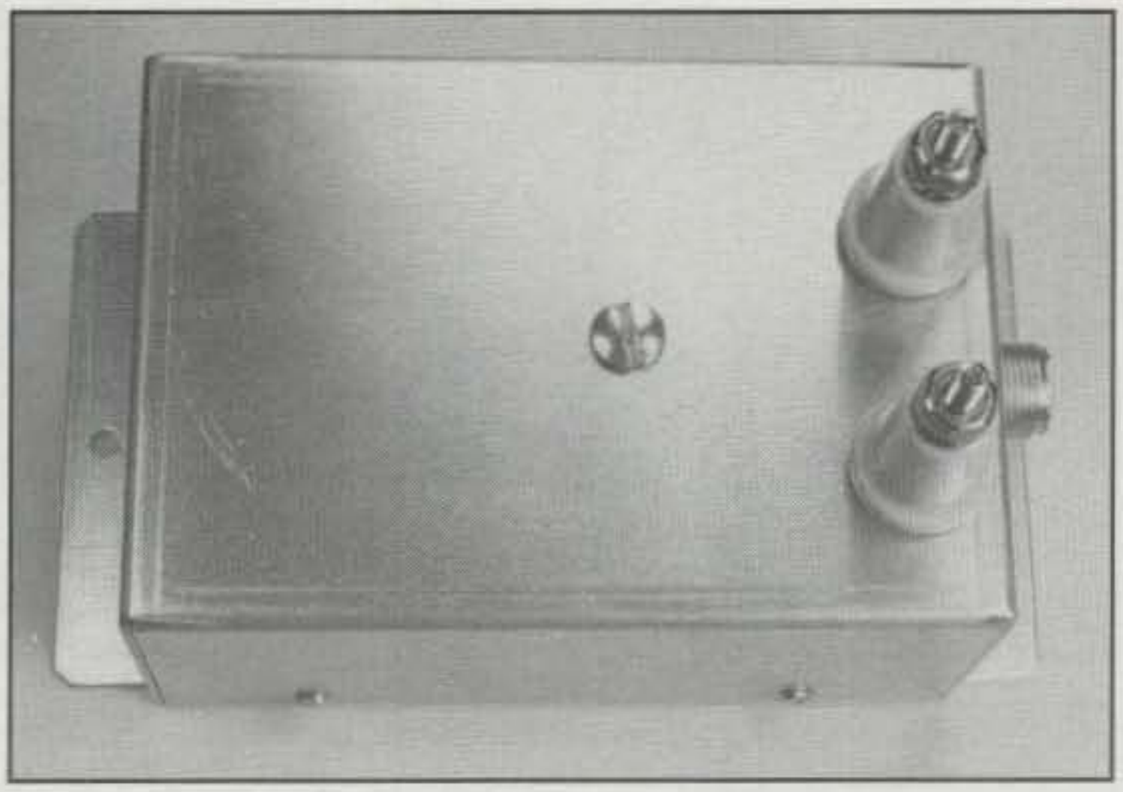
This powdered-iron balun, which is more completely described in a recent *CQ* issue,[2] can handle the full legal limit of amateur radio power from 3 to 30 MHz. Because of its comparable very high efficiency,[6] it could very well be rated at 10 kW of peak power and 5 kW of average power from 6 MHz to 30 MHz. It does have an advantage over its ferrite counterpart in that it is less prone to damage due to flux in the core. Furthermore, powdered-iron is a more linear material.

Finally, photo E shows three different views of a low power 4:1 Ruthroff (voltage) balun designed to easily handle the output power of any HF transceiver. It has 10 bifilar turns of No. 18 hook-up wire on a 1.5 inch OD ferrite toroid with a permeability of 250. The enclosure is a 2.75"L × 2.125"W × 1.625"H CU-3000-A minibox.

4:1 Balun Applications

As was shown in fig. 1, there are two different designs for the 4:1 balun. One uses Guanella's approach[5] of connecting two transmission lines in series at one end and in parallel at the other. It has recently been called in the amateur radio literature a "current" balun. The other uses





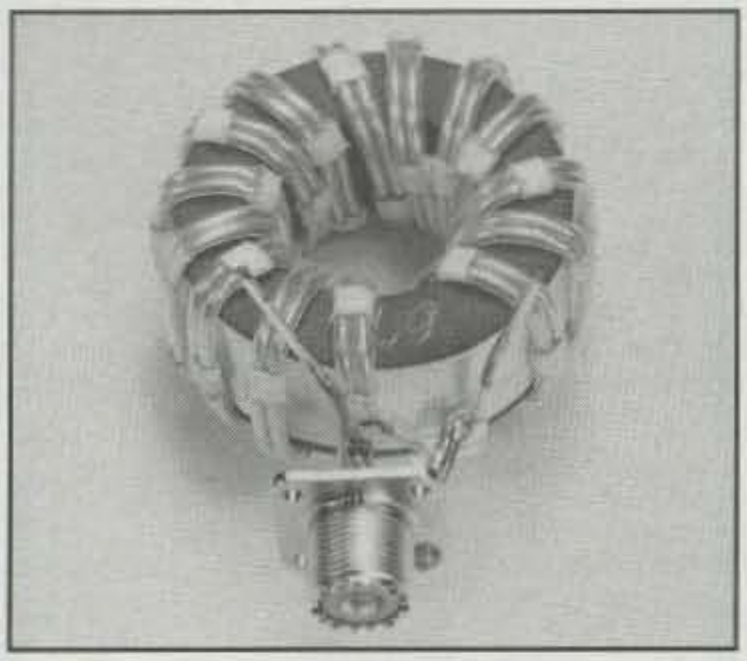
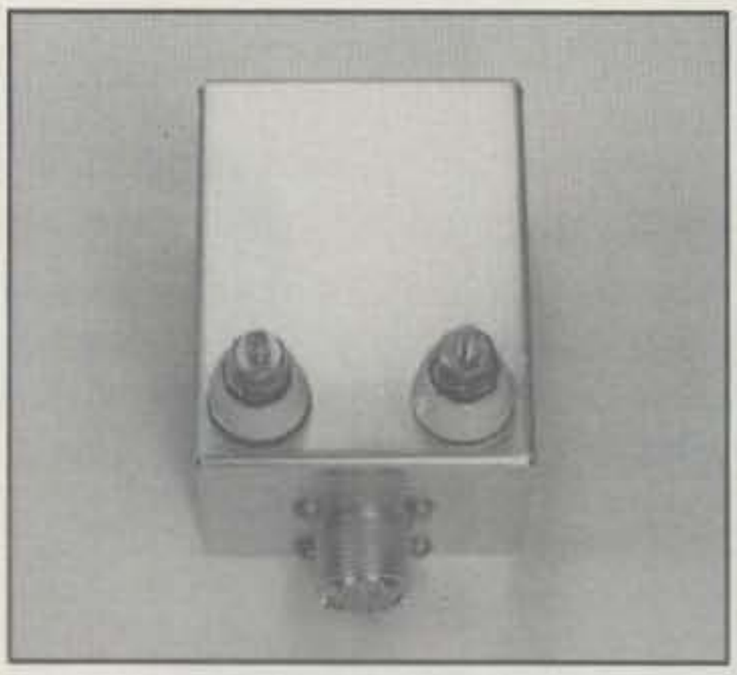


Photo D– Three views of the very high power 4:1 Ruthroff balun using two low permeability (40) ferrite cores. The aluminum enclosure has the dimensions 5"L × 3.5"W × 2.25"H.

Ruthroff's approach[3] of using a single transmission line in a "phase-inverter" configuration.[1] His approach is called a "voltage" balun. Since we presently have two baluns which appear to perform the same function and one takes two transmission lines (and cores) and the other only one, questions arise as to which balun should be used and why. The following are suggestions for some of the more common uses.

a) Antenna Tuners. Baluns are primarily used in antenna tuners to convert the balanced input to an open-wire or twin-lead transmission line to an unbalanced impedance which can easily be handled by L-C networks. Antenna tuners provide the most hostile environments for baluns. With poor antenna designs,[2] the impedances seen by the balun can be very high, and hence harmful due to excessive flux in the core or voltage-drops along the length of the transmission lines. Since powdered-iron is much hardier than ferrite (and more linear as well), I would recommend it in a 4:1 voltage balun for use in antenna tuners. Until more insertion-



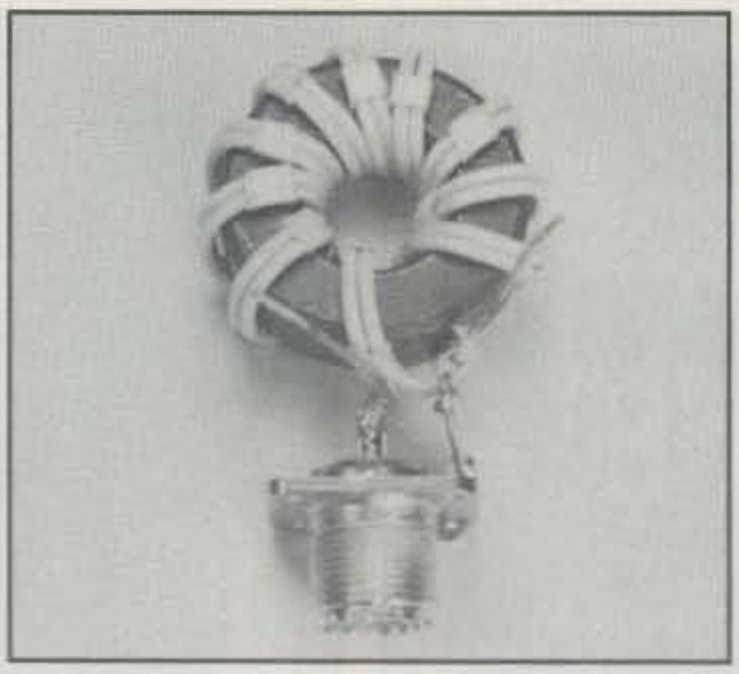


Photo E– Three different views of the low power 4:1 Ruthroff balun designed to handle the output of any HF transceiver. The enclosure is a 2.75"L × 2.125"W ×1.625"H CU-3000-A minibox.

loss information is available on powered-irons with permeabilities in the range of 20 to 35, I suggest using my design, shown on the right in photo C (which uses a permeability of 10).

b) Folded Dipoles. If a folded half-wave dipole, using 300 ohm TV ribbon, is erected at a height of about 0.17 wavelengths above ground, its resonant input impedance is close to 200 ohms. Experiments[2] have shown that a 4:1 voltage balun performs as well as a current balun under normal conditions (that is, the coax feedline comes away at right angles from the dipole). Therefore, depending upon the power level and frequency range, this article has supplied four new useful designs.*

c) Off-Center-Fed Dipoles. When a dipole is fed off center, there is no ground-plane (or zero-potential-plane) bisecting the drive point. In other words, the load is not grounded at its center. Thus, the "current" balun is recommended since it accommodates itself to a ground at any place along the load. But the penalty for this flexibility is that it requires two windings (and cores) like the one used in the Ruthroff (voltage) balun. They are then connected in a series-parallel arrangement as shown in fig. 1(A). This is the classic Guanella approach. In some cases when dipoles are unintentionally unbalanced or have their feed lines at poor angles from the antenna, current baluns are also recommended.

For more information on current baluns, reference is made to my June 1993 *CQ* and Fall 1992 *Communications Quarterly* articles.[1,7]

d) Log-Periodic Beam Antennas. If the frequency range is limited to the HF band (that is, 3 to 30 MHz), then I would recommend the voltage balun shown on the right in photo A using a single ferrite core with a permeability of 125. It can easily handle the full legal limit of amateur radio power in this application where the input impedance can be said to be "well-behaved." For much higher power applications I would recommend the double-stacked core arrangement using two low permeability cores of 40. This is shown in photos C and D.

e) 300:75 ohm Applications. As was shown in this article, well-designed 200:50 ohm baluns are not really made to adequately handle the 300:75 ohm impedance level. It can provide a good 4:1 impedance ratio on the lower portion of the frequency range where the transmission line(s) are very short compared to the wavelength. But at the high end of its response the transmission line(s) is mismatched and standing waves cause an increase in the impedance ratio. The ratio also takes on a capacitive reactance component. However, 300:75 ohm baluns can successfully be designed with coiled transmission lines of No. 16 wire covered with Teflon tubing and further separated by a hollow Teflon tubing. This would yield the 150 ohm characteristic impedance, which is the optimum value. Furthermore, this balun could be connected in series with a 1:1.5 unun, resulting in a very efficient and broadband 6:1 balun.[1]

f) The G5RV Antenna. In giving talks at local radio clubs, I find that the topic of baluns for G5RV antennas always arises. Some think a 4:1 balun is necessary,

and others, a 1:1 balun. If one studies this very popular multiband antenna, one finds that the magnitude of the impedances seen at the input to the 34 foot open-wire line is close to 100 ohms on most bands. On 20 meters it is a center-fed, three half-wave dipole with a transmission line acting as a 1:1 transformer. Therefore, on this band the resonant impedance seen at the input to the feedline should be very close to 100 ohms. As a result, the most logical balun appears to be one with a 2:1 ratio. It would be interesting to try out this balun[1] and see how many of the bands can successfully be operated without an antenna tuner. Incidentally, Varney[8] (G5RV) himself recommended that his antenna design only be matched with an antenna tuner. An adequate 2:1 balun design was not available then.

A Brief Overview

Until very recently the radio amateur only had two types of baluns available in the literature and on the market. They were the so-called 1:1 and 4:1 "voltage" baluns. As was shown in my June 1993 *CQ* article, the comparisons by others with new 1:1 designs using coaxial cable (called "current" baluns) were made with an inferior trifilar-wound balun instead of Ruthoff's design which appeared in his 1959 paper and became the industry's standard. Ruthroff's third conductor on his 1:1 balun was on a separate part of the toroid, thus giving it practically the same characteristics as the Guanella ("current") balun. These recent articles on new designs not only gave a new language to our baluns, but also questionable statements regarding their performances. It would be interesting if the authors of these articles compared their baluns with well-designed Ruthroff or Guanella baluns using 50 ohm bifilar windings on low-loss ferrite toroids (less than 300 permeability). I am quite sure their claims would be greatly diminished.

As was noted in this article, the 4:1 voltage balun appeared in the amateur radio journals about 25 years ago (the same time as the "inferior" 1:1 voltage balun). Considerable design information appeared in the handbooks then regarding the construction and performance of this balun. Furthermore, this information also stayed the same over these many years. But as was shown in this article, the design was found lacking. However, with some rather simple changes, such as doubling the cross-sectional area of the core, increasing the number of turns from 10 to 14, and using extra insulation on the wires to increase the characteristic impedance of the coiled transmission line from about 50 ohms to 100 ohms (the objective), a much better design emerged. In fact, for balanced antenna systems, this new design might well be described as "peerless."

Lately a 4:1 Guanella (current) balun appeared in our handbooks. This more flexible balun uses two transmission lines wound on separate cores and connected in series on one end and in parallel on the other end. Literally no design information is given on its construction. What is given are recommendations for the permeability of the ferrite cores. Values from 850 to 2500 are proposed. However, using these high permeabilities would result in lossy baluns.

I also found it interesting in my work on these devices that the classic papers of Guanella[4] and Ruthroff[3] are still the cornerstones of this technology known as Transmission Line Transformers. To be sure, some of us have extended the works of these two by using better measuring equipment, using more complicated configurations, and finding new applications. But from the publications in the amateur radio journals and discussions on the air and at club meetings, most radio amateurs still perceive these devices as conventional transformers. They don't look at these devices as Guanella and Ruthroff did—as chokes and transmission lines. As a result, there has been a lack of good design information in our literature.

This lack of good design information is not only endemic to the amateur radio literature. It also applies to the professional literature as well. Very little progress has been made in this field since Ruthroff's classic 1959 paper. From my vantage point, I see that the transmission line transformer technology has been literally frozen in time! However, there are many new and useful designs possible with this technology. They include higher power levels, applications in the VHF and UHF bands and above, and new baluns and ununs with ratios other than $1:n^2$ where n = 1, 2, 3, etc.

I see two reasons for the lack of emergence in this technology. They are:

1. This subject is not adequately covered in any college textbook, and it certainly has not been of interest to academics who rightfully view their role as basic research and not applications. Therefore, there are very few (if any) graduates with any skill in this technology. This is in contrast to the areas of transmission line, waveguide, and antenna theory.

2. The professional societies don't receive enough application papers. Although much of the research and development work performed in industry is highly innovative, important to the advancement of the technology, and certainly publishable in scientific journals, corporations are often reluctant to allow publication for fear of "aiding" their competition. It has been stated[9] that in the last fifteen years, the submission of application papers to the technical journals of the IEEE has taken an inexorable slide. A recent survey by one of the technical societies showed that 85 percent of the submissions now come from universities!

In closing, I would like to say that unless a request is received for a balun design that is of general interest and is feasible, this article could well be the last in my series on practical articles on baluns and ununs in *CQ*. The same can be said about my in-depth series on baluns in *Communications Quarterly*. I want to thank the editors of both journals for giving me the space to express my views and to present my latest designs of these broadband and highly efficient matching devices.

After reading articles in these two series, some might think that I was overly critical and didn't agree with any of the designs presented in the amateur radio literature (which is quite true). But I was also overly critical for another reason. In being so, I was hoping to provoke, in return, critical comment on my work. In this way we can help our amateur friends by advancing the understanding and applications of these very useful transformers. Who knows? We could even help our professional friends.

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gave me better results. Clover, Version 6.0, was used in the "Normal" bias mode.

Results

After a few months I got lists and lists of figures, and the temptation was great to do all sorts of fancy statistical tests on the figures. I decided to keep it simple, and the final results are shown in fig. 1, where the rates of transfer in the two different modes are given for every test. The results of some of the tests are not given, and the reason for this is that the board could not be activated in the alternative mode. I gave one simple statistic in fig. 1: The mean value of the transfer rate in every mode for all the tests shown in the figure. I am not sure if this is valid, as the conditions varied from test to test, but is perhaps the simplest way to compare the two modes. The theoretical maximum values for Amtor, Pactor ("Long Path"), and Clover ("Normal" bias) are also shown in fig. 1. Maximum value for Pactor ("Short Path") is 16.0.

Test no.	Clover	Pactor
1	13.1	8.3
2	8.8	8.6
3	8.5	5.9
4	11.9	10.9
5	14.3	11.8
6	10.3	10.7
7	11.2	8.8
8	17	2.5
9	16	11.8
10	25.1	11.5
11	19.5	12.2
12	9.8	11
13	8.3	10.5
14	17.4	8.8
15	15.7	7.4
16	12.9	10.1
17	17.1	10.2
18	11.6	9.1
19	11.1	9.6
20	19.4	8.5
21	34.3	11.2
22	28.7	10.6
23	14.4	10.7
24	15.3	11.5

Table I – Values used in fig. 1.

Remarks About Some Of The Results In Fig. 1

a) I can't explain the low value for Pactor in test number 8. As I had no valid reasons to disregard the test, I had to include it in the results.

b) A glimpse of the potential of Clover came through in test number 21 when a transfer rate of 34.3 bytes/second was obtained.

c) A comparison amongst tests 10, 11, 12, and 13 are very interesting. Tests 10 and 11 were done on a Saturday about noon, and as you can see Clover was substantially better than Pactor. Tests 12 and 13 were done on the next day, also about noon, and as you can see on this day Pactor was better than Clover. In fact, the Clover rates were lower than the previous day. I can't explain this, but this is part of the fascination of HF propagation.

Conclusions

I must mention I am not biased towards any of the modes, so the following conclusions are just based on the results of the tests. Anyway, the reader can draw their own conclusions from fig. 1.

a) In three of the 24 tests under the described conditions Pactor was better than Clover. In all the other cases Clover was better.

b) In six of the tests Clover was more than a factor 2 better than Pactor. In all other tests in which Clover was better, the advantage of Clover varies between 2% and 98%.

c) In all tests in both modes, except two in the case of Pactor, the transfer rate easily exceeded the maximum rate of Amtor.

d) In 13 of the tests Clover equals or exceeds the maximum "Long Path" rate of Pactor. In nine of the tests Clover equals or exceeds the maximum "Short Path" rate of Pactor.

e) The mean values of the transfer rates of all the tests given in fig. 1, e.g. Clover = 15.5 bytes/second and Pactor = 9.7 bytes/second, show that in this experiment and under these variable conditions, Clover was on the average 59.8% better than Pactor.

f) It will be most interesting if these types of tests are repeated in other parts of the world, especially over DX-distances under weak conditions. Perhaps then Packet, Amtor, Pactor, and Clover can all be included.

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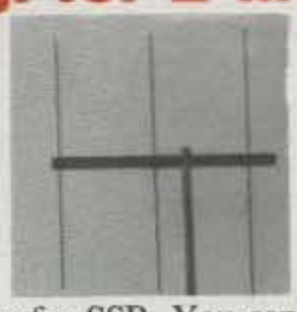

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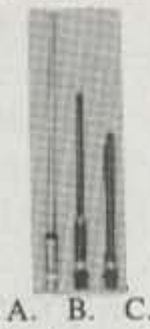

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The Myths of Low-Band DXing

BY GERRY HOHN*, VE6LB

The following sounds like a typical 20 meter exchange: "VE6LB, you're 58 on Norfolk Island, over." "VK9NS, thanks, Jim, you're 59 here in Calgary, 73s." Yes, the exchange is typical, but the DX is semi-rare and the band is 80 meters.

I am surprised at the number of amateurs who comment that they have never heard DX on 80 meters, much less worked any. The purpose of this article is to dispel some of the myths of working DX on the low bands.

As the sunspot cycle declines and propagation on the higher frequencies diminishes, there will be more of an operating focus on the low bands (40, 80, and 160 meters) less affected by solar conditions. The prospects for working DX on these bands will increase due to the increased activity (as the higher bands will be closed more often) and the lower atmospheric noise because of lower levels of solar activity. My examples will refer to 80 meters, although the same basics apply to the other low bands.

Myths

There are a number of common myths about low-band DXing that I hope to dispel. These are:

1. There is no (or little) DX on the low bands.

2. You need a big antenna and high power (it's only for the big guns) to work DX on the low bands.

3. DX is so scarce that you need to spend many hours (mostly late at night) to find DX on the low bands.

4. Any DX to be found on the low bands is on CW.

5. There is no low-band DX during the summer.

6. The low bands are too noisy to work DX.

Before attacking these myths, I'd like to relate my success in working DX on 80 meters with modest means.

Over the last three years I've worked over 100 countries on 80 meters, on all continents, split about 40% SSB and 60% CW. The first 50 countries were worked with a garage-roof-mounted GAP DX VI and 100 watts. The balance were worked using an inverted "L" wire antenna stapled to our two-story wood-frame house with a wood pole 12 feet long above the roof (to get the antenna apex up to 25 feet). The balance of the antenna length, 30 feet, was tied back to the far end of the house at a slight downward angle. The power was also increased to 500 watts for the second (tougher) 50 countries.

De-Myths

Now to dispel the myths point by point, provide some tips on low-band DXing, and then get on with successful low-band DXing.

1. There is a surprising amount of DX on the low bands. The secret is to know when and where to listen for it (this also applies to the high band). During the hours of darkness the low bands are often open to various parts of the world, depending on the time and season. More on this in the following tips.

2. Simple vertically polarized wire or tubing antenna, with a good ground, will do a surprisingly good job. The vertical polarization will provide a low angle of radiation and will minimize the path losses to the DX station. These types of antennas will not be star performers for short-hop work.

3. You don't have to spend your life in front of the rig to work low-band DX (this applies equally to high-band DXing). The secret is to make effective use of your time by being in front of your rig when there is a high probability of the DX also being there. By understanding propagation characteristics and the operating habits of your target DX, you can be in the shack when you have the best chance of working DX. It is true that to be wildly successful at low-band DXing you will have to give up some sleep late at night and early in the morning to be at the rig. I had the good fortune to have a dog who understood my need to catch a few new ones and scratched at the door to go out in the wee hours. She became known locally as "the DX dog," as more often than not there was a new one on the air during her nocturnal trips.

4. There is lots of DX on both SSB and CW, but you have to know where on the band to find them. The DX frequents specific areas of the low bands, sometimes by convention, and in some countries by regulation. More on this in the following tips.

5. There is considerable and unique DX on the low bands during the summer. Although the low bands are noisier due to summer static and electrical storms, there are still excellent openings, especially in the morning hours when the bands quiet down. Also, there is a different selection of DX opportunities in the summer due to the unique alignment of the Gray Line, and therefore the Global darkness pattern, compared to winter propagation patterns. Don't forget: summer in North America is winter in Australia.

6. Yes, the low bands are generally noisier than the higher bands, but that noise comes from two sources. One is atmospheric noise, storms, static, etc., and the other is local manmade noise. The good news is you can often reduce the manmade noise with a bit of detective and corrective work. Much of the "noise" is manmade and is likely to be within or near your home. In my case the major source of "noise" was a couple of older light dimmers that put out significant (S9 on 80) interference.

Tips to Successful Low-Band DXing

1. When to listen: Openings to South America and the Caribbean start at our sunset and continue until our or DX local sunrise. Openings to the Pacific start after our sunset and after sunset at the DX's location. The most valuable tool to pre-

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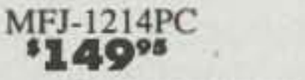

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dict when the band may be open is a computerized (DX Edge, Geoclock, Miniprop Plus, etc.) or paper (DX Edge) tool that shows the Gray Line. The Gray Line is the period of semi-darkness that is created as the Earth rotates from night to day and day to night. This Gray Line, or "Terminator," changes with the seasons as the tilted axis Earth rotates around the Sun. This change in Gray Line patterns with the seasons has a major effect on what DX can be worked when.

2. Coincident Gray Line Openings: The optimum time to work east/west (including N/E, S/E, N/W, and S/W) DX is when both ends of the path are in near darkness, which is when they are both in their respective Gray Lines. This is due to a refraction effect in the ionosphere which "ducts" the signals between the coincident Gray Lines. This includes the long path when, as an example, fall and early winter offer some great long-path openings to Europe around our sunrise (their sunset).

3. Contests and DXpeditions: Many times the low bands are open to some exotic location, but due to their time of day, nobody is on the air. During contests and DXpeditions there are good opportunities to increase your low-band country count, as these operations are on the air at all hours and on all bands that are open. I've worked at least 50% of my low-band DX during contests. These operators know when it is sunset/sunrise in North America and specifically look for us. "QRZ North America only" can often be heard from a DXpedition.

4. Low-Band Openings: The opening on the low band can be very localized. I have experienced many occasions when rare DX (e.g., 6W6 or AH5) was calling CQ and few or no stations came back to them. In these cases working them was quite easy.

5. Information Sources: There are many good sources of information on DX including DX packet clusters, packet DX bulletins (LS DX), various general amateur publications (*CQ*, *QST*, etc.), DX bulletins and magazines (*QRZ DX*, *The DX Bulletin*, *DX Magazine*, *Canadx*, etc.), DX Nets (INDEXA 14.236 @ 23:30Z daily), and on-th-air discussions with other low banders.

6. Intelligence: One sure way to improve your success in low-band DXing is to gather as much intelligence as possible about DX stations operating the low bands. From various sources of information as discussed previously, determine the operating habits of the target DX, when and where they have been heard in your area, and plan your operating plan accordingly.

7. WWV: Understand how the propagation information broadcast on WWV at 18 minutes after the hour affects the low bands. Basically a low K-index (0–2) and quiet or better solar forecast improves your chances of hearing low-band DX.

8. Where to Find DX: Low-band DX can be found in very specific places on the band, more specifically than on the higher bands.

On CW: Most DX frequent the very low end of the bands, usually the bottom 10 kHz. The exception to this is contests, where up to 30 kHz may be occupied, and DXpeditions, which will give specific frequencies.

On SSB: Most of the SSB DX operates in specific "windows" in the low bands, as follows.

40: 7050 to 7100, but mostly nearer 7050 with the DX listening on their frequency and/or a declared split in the US phone band.

80: The DX window is 3790 to 3800 and this is where most of the activity happens. Many countries do not allow amateur operation above 3800 kHz, although some DX such as South America and some Pacific can be found above 3800 and down as low as 3775. The area of activity expands during contests.

160: from 1800 to 1850 for both CW and SSB, as many countries only allow amateur operation in this narrow window.

9. Noise: As mentioned earlier, noise can be a problem on the low bands. There are several ways to reduce the noise component of the wanted signal, such as noise blankers, external (audio) bandpass/noise filters, adjustment of tone, and IF shift controls. One trick is to run your AGC off or fast and turn back your RF gain. Also, the use of your high-band antenna for receive can often improve the signal-to-noise ratio.

There is not a lot of information published about subjects related to low-band DXing. The following are a few publications that I have found useful, all of which are available from the ARRL: *Low Band DXing* by ON4UN, *All About Vertical Antennas Handbook* by W6SAI/W2LX, *The Complete DXer* by W9KNI, and *Radio Frequency Interference: how to find it and fit it* by the ARRL.

Similar operating strategies apply to the high band. In the last three years I have been successful in working over 300 countries and 5BDXCC using simple wire and vertical antennas such as the R5/GAP and conservative power of 100 and 500 watts.

One of the greatest feelings, even for an old high-band DX hound, is to work even a semi-rare one on 80 meters. It can be done, and it doesn't take big antennas, high power, or living in your shack. It does take working smart!

Happy and effective low-band DXing!

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SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

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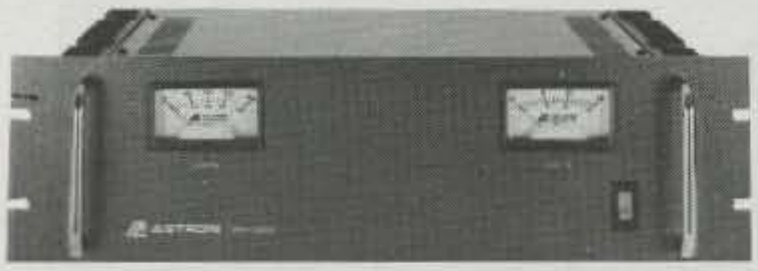
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



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MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES

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MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

No need to leave your antenna home when you go "on the road again," as WDØP explains. Why not take advantage of all that metal in your RV to keep you and your signal going—not all at the same time, however.

A Simple, Easy-Up, Easy-Down All-Band Antenna For Your RV

BY PHIL MORGAN*, WDØP

Since 1983 much of my operating, both HF and VHF, has been done from our recreational vehicle. In January 1990 my XYL and I sold our home, stored most of our belongings, and moved into our motorhome for a life of full-time traveling. Space is limited, but I still managed to find room for the HF transceiver, 1 KW amplifier, transmatch, 2 meter HT with TNC for packet, and our PC, complete with a color monitor and printer.

As we all know, the key to happy hamming is a good antenna, and RV hamming is no exception—just a greater challenge.

I have received many comments over the years on my portable HF antenna installation, along with requests for pictures of the tilt-up mounting system and instructions for building it, so I decided to put together this article (photo 1).

The average aluminum-skinned RV provides an adequate ground plane (approximately 800 sq. ft. on mine) for excellent operation of the typical vertical antenna. That is at least part of the reason why one hears so many excellent signals emanating from many hundreds of RVing amateur stations around the continent. Since the rest of my station is typical of thousands of others, the antenna must be at least partly responsible for the good signal reports I have received.

In my case I wanted all of the HF bands available to me. Experience had revealed that a transmatch in line would nearly always be necessary, even with so-called multiband antennas. Furthermore, I had experienced problems with the short, trapped, one-quarter vertical antenna when operating at high power on 40 and 80 meters. The high voltages developed can play havoc with traps and capacitors.

Photo 1– WDØP's motorhome with folded monopole vertical shown here in the operating position.

My feeling was, if I must always keep a transmatch in line anyway, why bother with traps at all? I decided to dump them and go with a simple 29 ft. (8.84 meter) vertical aluminum mast, feed it at the base with coax, and tune the system on all bands with my transmatch. If we know we are going to have the motorhome parked in one spot for more than a day or two and I plan to work any contacts on 160 meters, I simply alligator clip a 100 ft. (30.5 meter) length of #18 stranded hookup wire to the top of the vertical and attach the opposite end to some convenient anchor away from the RV, such as a tree or post, with an insulator and some nylon string. Attaching the top loading wire is simple enough to do before raising the vertical to its operating position, and this wire does not have to be straight. It can be bent to fit the available space.

I use RG-8 between the feed point and the transmatch. Since my situation requires only about 40 feet of coax, any losses resulting from somewhat high SWR on some bands is not significant

*GS627933, P.O. Box 6031, Agoura, CA 91376

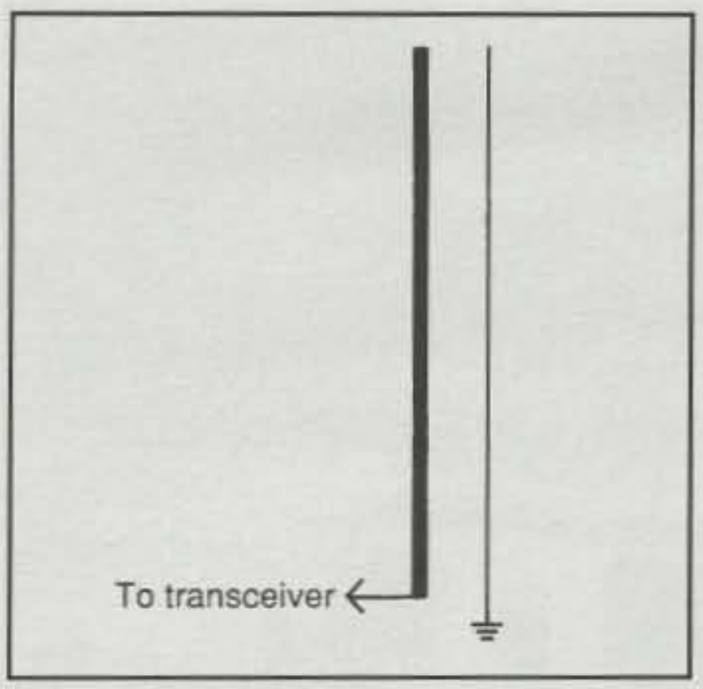

Fig. 1– Folded monopole vertical.

on HF and LF. I have run up to 1 KW on 40, 75, and 160 meters with no arcing problems.

When operating on 75 meters and higher frequencies, the top loading wire is not necessary. And on any wavelengths shorter than 40 meters, the antenna should display lower radiation angles.[1]

If you look closely at the photographs, you'll notice a drop wire from an 8 inch (20.3 cm) long metal bracket at the top of the antenna, held away from the mast by plastic stand-offs (fig. 1). The reason for this wire is because I feed my vertical as a folded monopole. I have also tried feeding it as a more conventional series-fed vertical, but my experiments have convinced me that my transmatch has an easier time matching the antenna over a wide range of amateur bands in the folded-monopole mode than it did when I was using the series-feed method. The stand-off at the top of the antenna is metal; the rest of the stand-offs are plastic. They are made from pieces of plastic clothes hangers and they hold the drop wire about 8 inches (20.3 cm) away from the mast. I feed the mast and ground the drop wire. The results have been most gratifying on 10 through 160 meters.

In any event, the ability to easily raise and lower this vertical is one of its most attractive features. There is no driving of stakes in the ground, no stringing of radials, and the antenna is self-storing for travel to be raised ready for action in 90 seconds (photo 2).

The design of the mount is super simple (photo 3). One length of thick-walled aluminum conduit is mounted to the side of the RV at the right-rear of the unit. Mine is 1¾ in. × 4½ ft. (4.45 cm × 1.37 m). You will have to select a length that is appropriate for your RV, dictated by location of trim lines, frame members, etc. I used ordinary aluminum pipe-hanging strap with 1½ in. (3.81 cm) long

lag screws at two locations to hold this mounting pipe firmly to the side of the RV. In my case a couple of strips of aluminum on top of the metal and plastic trim on the RV shims the pipe away from the side about 1/4 in. (.64 cm). (See photo 4.) This is important, as you'll see later. The lag screws should be firmly anchored into the frame of the RV beneath the skin. The top end of this conduit is aligned roof high, and a hole is drilled through it to accept the pivot bolt. Small sheet-metal screws are screwed through the holes in both top and bottom straps into the conduit to keep it from twisting.

A second 1 3/4 in. × 4 ft. (4.45 cm × 1.22 m) piece of thick-walled conduit is mounted to the base of the antenna (photo 5). A pivot bolt hole is drilled through the conduit just below the antenna base. Using a 3/8 in. × 4 1/2 in. (.95 cm × 11.43 cm) hardened pivot bolt, a jam nut, and appropriate metal washers, the antenna conduit assembly can now be mounted to the mounting conduit already attached to the side of the RV. The antenna should be temporarily placed on the roof near the edge. It is raised to a vertical position by grasping the bottom of the base conduit and pulling down. It will take a tug, but it will lift easily into operating position. Another 3/8 in. (.95 cm) hole is then drilled through both conduits to accept the second bolt, which will lock the antenna in the vertical position. Now you see why a small space, referred to earlier, is necessary between the mounting conduit and the side of the RV. It is so that you can get a nut between them with a "C" wrench or pliers.

There you have it—your vertical nicely in position with the feed point nearly even with the roof.

Run your coax as you prefer, according to the needs of your particular installation. Mine runs nearly the full length of the RV underneath the rig, then up through the center of the mounting conduit to the feed point. I slipped six large ferrite beads over the outside of the RG-8 at the feed point to prevent RF on the outside of the coax shield. Be sure to keep the coax away from the RV engine exhaust system and any moving suspension parts which might damage it.

Look closely at the accompanying photos, and you will see a bolt projecting from the pivot conduit near the bottom end (an idea of my good friend Carl Landers, NØDKI), which allows me to toss a length of nylon cord over the pipe and pull down (photo 6), raising the antenna into position without the cord sliding off the end of the pipe. This allows the antenna to be raised and lowered from ground level without having to climb a ladder to reach the pivot pipe.

Photo 2– WDØP raising the folded monopole RV antenna from the horizontal traveling position to the vertical operating position.

Using a length of shield braid from some old RG-8, I attached a jumper from the ground side of the antenna feed to the skin of the RV. I also recommend jumpering all the seams between roof sections and siding sections to improve the electrical bond at RF. I have found that, most of the time, connection to an external ground rod is not necessary. At long-term winter parking spots, however, I have used an external ground connection to a pair of copper-clad 8 ft. ground rods. This is a commendable safety precaution, helps keep the FCC happy, but plays no part in the effectiveness of the antenna.

Theoretically, the location of this vertical, in relation to the body of the RV, should skew maximum signal strength in the direction of the largest portion of the vehicle. However, in use I have not been able to detect any significant directionality.

To support the antenna in its horizontal traveling position I formed three simple brackets out of aluminum strips (photo 7) and attached them to the RV roof right above the trim line between the roof and the side panel. Your individual situation may dictate a different solution. Some of my friends have constructed quite elaborate support brackets. They accomplish the same task, and usually are neater than mine. While traveling, my antenna is held in place right above my awning with three "bunji" cords, the other ends of which are anchored to any convenient object on the side of the RV, such as awning hardware (photo 8). I have traveled many thousands of miles, occasionally in high winds, with this arrangement and have never had the antenna bounce loose.

If your RV is one of those with a Fiberglass skin, you might have a problem, but not necessarily. Check to see if your RV has an aluminum or steel frame under the skin. If it does, you just drill through into the frame for your mounting and your RF ground. The metal cage will perform nearly as well as a metal skin as a collector of return currents for your vertical. If you have a Fiberglass skin and wood frame, things become more complicated. You might still be able to use this installation, but you will have to string a few radials out in different directions to give the vertical something to work against.

There you have my RV antenna system. It works amazingly well on all frequencies from 160 meters (with top-loading wire) through 10 meters. It goes from travel position to operating position in 90 seconds or less. It has no lossy traps. I have worked the world with it and best of all, it is cheap to build.

If this installation sounds complicated, it really isn't. Just study the pictures, tailor it to your own particular needs, and plunge ahead. A look at the sparse parts list reveals just how simple it is.

Good DX and Happy RVing!

Parts List

One length of thick-walled aluminum conduit 1.75 in. × 4.5 ft. (4.45 cm × 1.37 m).

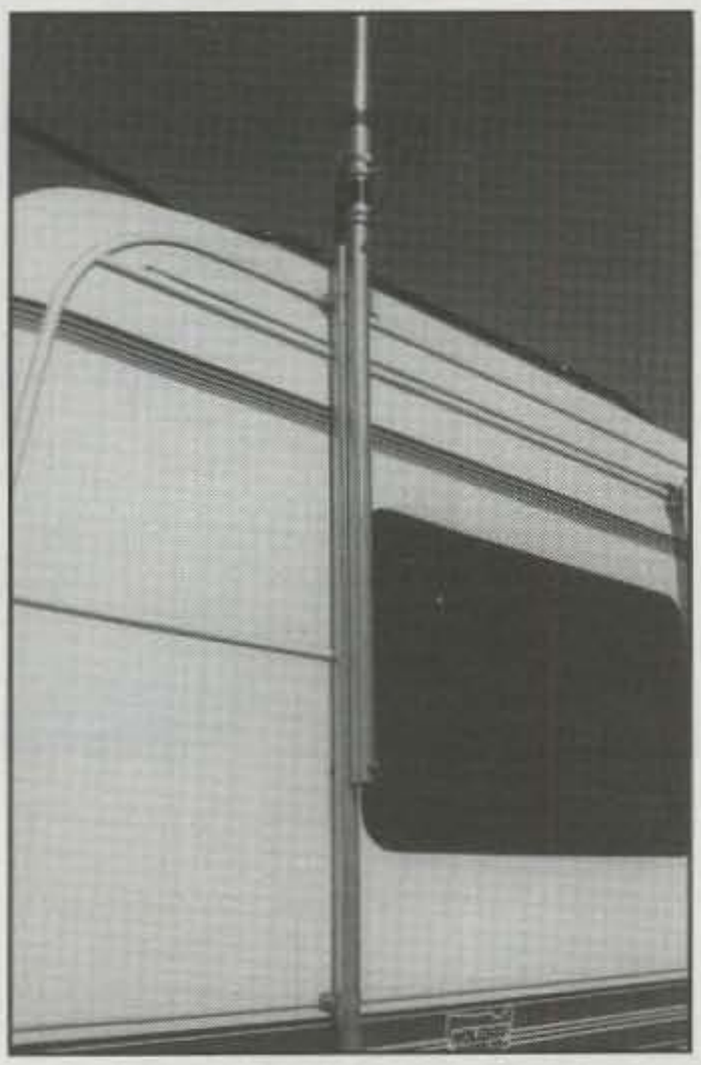

Photo 3– Mount for RV vertical is attached to the motorhome or trailer-frame members behind the trim lines with lag screws.

One length of thick-walled aluminum conduit 1.75 in. × 4 ft. (4.45 cm × 1.22 m).

Four lag screws, each 1.5 in. (3.81 cm) long.

1 to 2 feet (30.4 to 61 cm) of galvanized pipe-hanging strap.

One 2 3/8 in. × 4 1/2 in. (.95 cm × 11.43 cm) hardened bolt & nut.

6 in. (15 cm) copper coax shield braid.

Assorted sheet metal screws.

3 to 4 feet (91.5 cm to 1.22 m) of 3/4 in. × 1/8 in. (1.9 cm × .32 cm) aluminum strip.

Two or three plastic clothes hangers.

Footnotes/References

1. Lee, Capt. Paul H., USN(RET), N6PL,

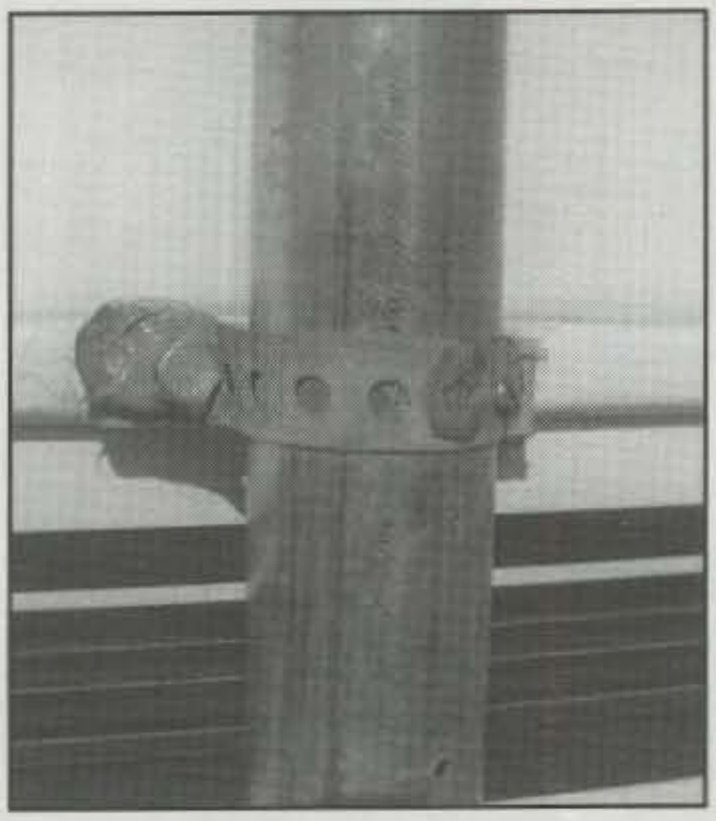

Photo 4– Pipe-hanging strap wraps neatly around the mounting conduit.

Photo 5– Pivot conduit with antenna mounted. The hardened pivot bolt passes through both conduits.

The Amateur Radio Vertical Antenna Handbook, CQ Publishing, Inc., 1984, p. 13, fig. 4.

The ARRL Antenna Book, 16th ed., ARRL, 1991, pp. 2-40 to 2-42.

A. C. Doty, Jr., J. A. Frey and H. J. Mills, "Vertical Antennas: New Design and Construction Data," in *The ARRL Antenna Compendium, Vol. 2*, ARRL, 1989, pp. 2–9. ■

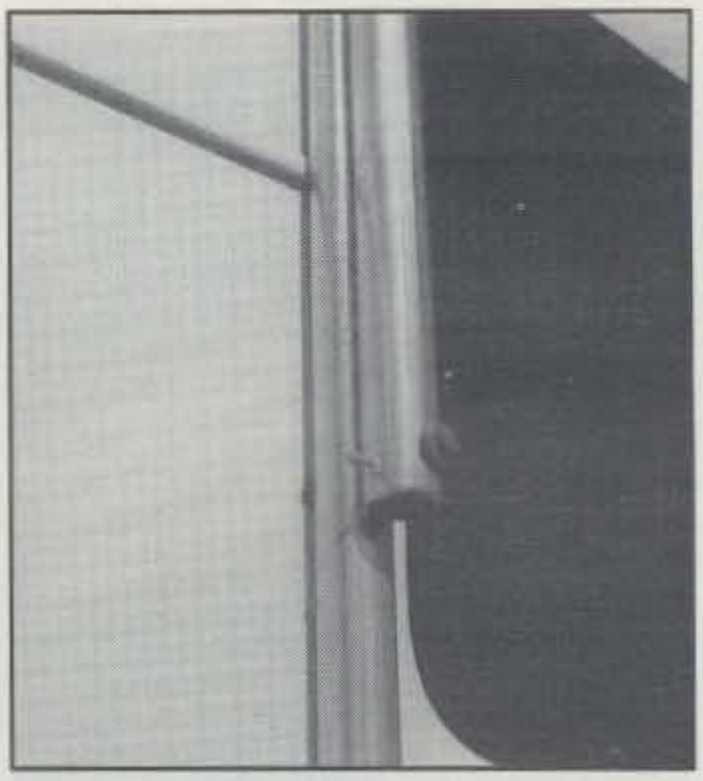

Photo 6– Second bolt is inserted after the antenna is raised, holding it firmly in place. Note the small bolt protruding near the bottom end of the pipe to keep the "pull-down" rope from slipping off.

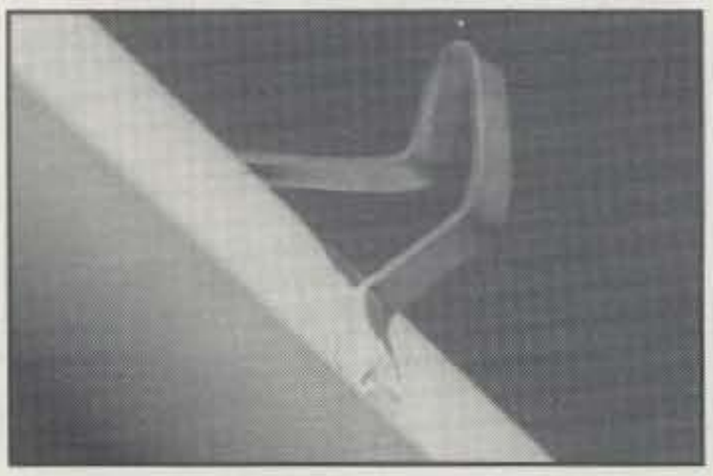

Photo 7– Three aluminum brackets are mounted to the RV above the awning to support the antenna in the horizontal traveling position.

Photo 8– WDØP's RV vertical in the travel position, ready to go.

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FT-470	2m/70cm hand-held	**Call**
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RS-20M	16	20	**112**
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RS-35M	25	35	**162**
VS-35M	25	35	**179**
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A=Plain M=Meters V=variable DC

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1.500"	.058"	1.384"	1.40/Ft.
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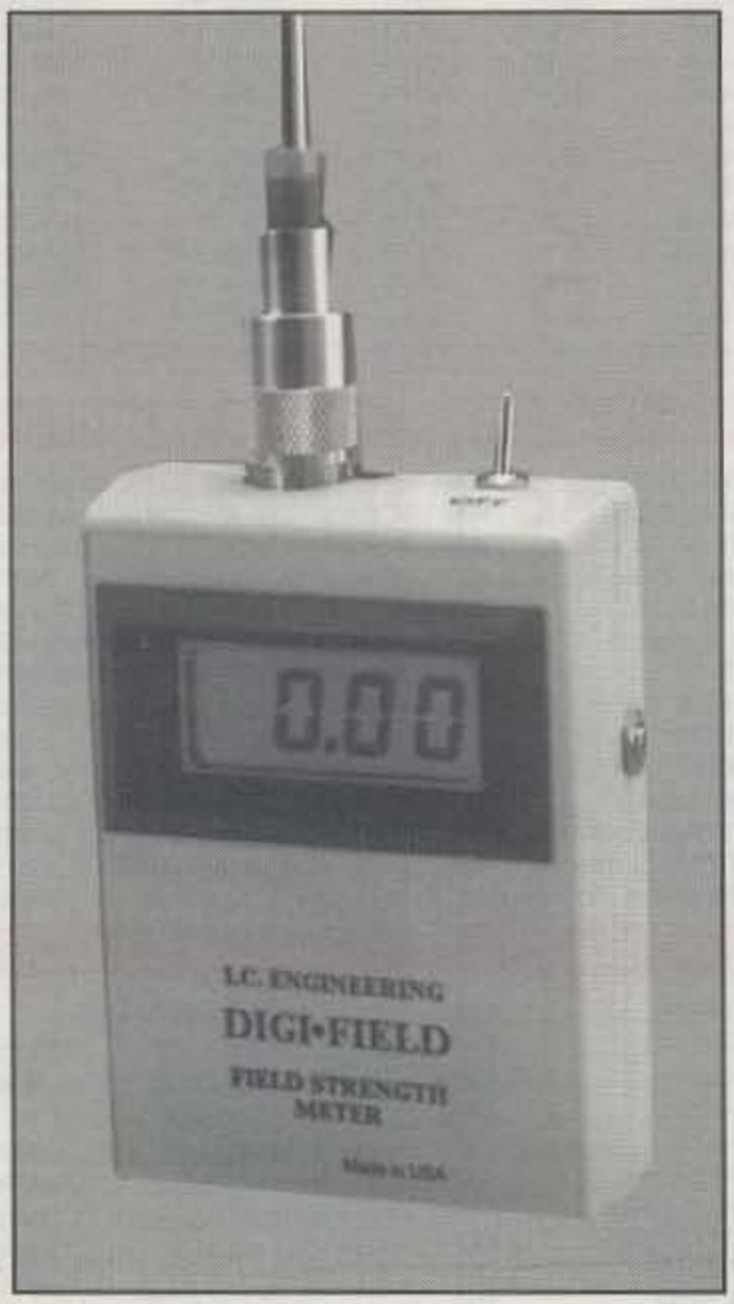

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For more information, contact I.C. Engineering, 16350 Ventura Blvd., Suite 125, Encino, CA 91436 (818-345-1692; FAX 818-345-0517), or circle 110 on the reader service card.

Radio Works' 1994 General And Reference Catalogs

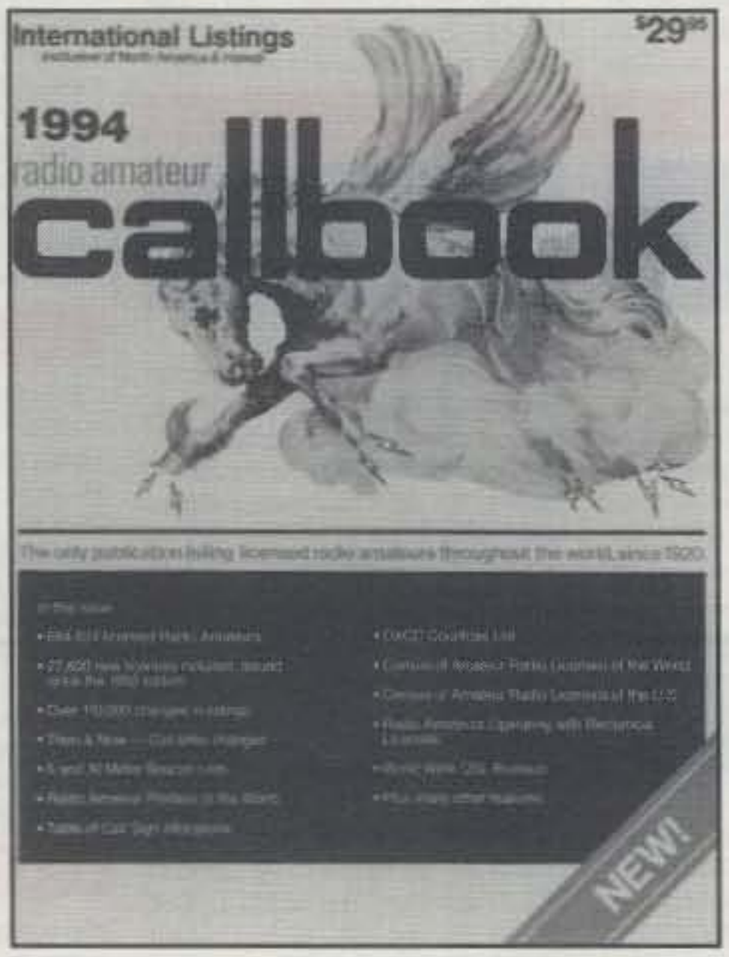
The 1994 issue of the Radio Works' General Catalog, #941, is now available. It has been expanded to 64 pages and features their selection of baluns, Line Isolator, coax, connectors, antenna wire, and more. The cover price of catalog 941 is $3, but for *CQ* readers it is free. (If you want your copy extra fast, send $2 to cover first-class postage). To foreign addresses, the price is $5.

The Radio Works' Reference Catalog contains 128 pages of wire antennas, antenna charts, specifications, and antenna articles. Order both the Reference and General Catalogs for $4 ppd., $8 foreign, ppd.

For more information, contact The Radio Works, Box 6159, Portsmouth, VA 23703 (804-484-0140; FAX: 804-483-1873), or circle number 107 on the reader service card.

1994 Callbooks

Radio Amateur Callbook has updated its North American and International Listing to include address additions and changes. The book includes listings of licensed radio amateurs, call-letter changes, 6 and 10 meter



Beacon Lists, prefixes of the world, a table of callsign allocations, DXCC countries list, a census of amateur radio licenses of the world and the U.S., a list of radio amateurs operating with reciprocal licenses, and a listing of worldwide QSL Bureaus.The books are priced at $29.95 each.

For more information, contact Radio Amateur Callbook, P.O. Box 2013, Lakewood, NJ 08701, or circle number 104 on the reader service card.

SGC Antenna Coupler Lock

SGC, Inc. has unveiled a new product called the SmartLock™ to pair up with their SG-230 Smartuner™. SmartLock is designed to control two antenna conditions. When there is a significant change in antenna conditions, but retuning is not desireable, the SmartLock control box allows current coupler settings to be locked in place until released by the operator; and the SmartLock allows forced retuning when a small change of operating frequency occurs and the VSWR on the system is still below th 2:1 ratio which triggers retuning of the coupler. The SmartLock may be used with SG-230 Smartuners manufactured after Sept. 1, 1993. The control box attaches to the

Smartuner with 9 feet of cable. It is available from SGC as part number 54-63 for $59.95.

For more information, contact SGC, Inc., SGC Building, 13737 S.E. 26th Street, Bellevue, WA 98005 (206-746-6310; FAX: 206-746-6384), or circle number 103 on the reader service card.

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Bencher, Inc. has introduced their "RJ" hand Morse keys. Features include oil-impregnated sintered bearings used for the pivot points, and stainless steel adjustment screws used throughout. A complete range of locking adjustments for all movements and tensioning is also provided.

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For more information, contact Bencher, Inc., 831 N. Central Street, Wood Dale, IL 60191 (phone 708-238-1183; FAX 708-238-1186), or circle number 105 on the reader service card.

CQ Books and Videos

The Quad Antenna

Hams love antenna books and this book is no exception. Written by world renowned author Bob Haviland, W4MB, The Quad Antenna is the authoritative technical book on the design, construction, characteristics and applications of Quad Antennas. Discover how to easily build a quad antenna for your station that will help you fill your logbook with rare DX that you have only dreamed about before. **Order No. QUAD..... $15.95**

The Packet Radio Operator's Manual

This book is written by CQ columnist and Amateur Radio Packet authority Buck Rogers, K4ABT. An all new introduction and guide to packet operation, it is the perfect single source, whether you're an advanced user or just starting out. Learn about packet radio without all the technical jargon. Also included are detailed hookups for dozens of radio/packet controller/computer combinations, making this book the definitive resource for the active packet user. **Order No. PROM..... $15.95**

Ham Radio Horizons: The Book

Written by Peter O'Dell, WB2D, this is a book about ham radio that every beginner can enjoy! If you want to get in on the fun and excitement of Amateur Radio, Ham Radio Horizons is the perfect way to get started. HRH is full of tips from expert hams in: DXing, Contesting, Serving the Public, Ham Radio in Space, Experimenting, Digital Communications — you name it! This exciting book is an excellent gift to a prospective ham or for use in your club's licensing classes and library.
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Keys, Keys, Keys

Enjoy nostalgia with this visual celebration of amateur radio's favorite accessory. Written by the well-known author and CQ columnist Dave Ingram, this book is full of pictures and historical insight that only K4TWJ can provide. If you've ever wondered about the old days of Morse, this book's for you.
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PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

BY BUCK ROGERS, K4ABT

The Care and Feeding of Nodes

While defining how we go about building a node in the August and September 1993 issues of *CQ*, I failed to cover an important part of node maintenance. Mind you, I said "maintenance."

Because many SYSOPs are converting from other types of node and switch firmware, the TNC in use may have been in service for a year or two. For this reason alone, it is necessary to perform some needed maintenance on the TNC-2 or clone.

To go about making the necessary maintenance checks and tests we need a model to go by. Since many nodes employ the TNC-2 clones, I'll be using the MFJ-1270B as a model for this month's "Packet User's Notebook."

Building this month's column has put the AutoDesk AutoCADD LT™ (Generic CADD™ for Windows) through its paces. The text portion of this month's article will be short, while the drawings and illustrations will tell most of the story.

The "Node" TNC Is How Old?

If your "node" TNC uses a battery to back up the RAM, make sure it is in good condition. To put a node atop a mountain with a defective lithium battery (BATT1) could mean that each time the site loses power, the parameters, features, and mode memory will be lost, causing the node to revert to defaults.

In most TNC-2 clones the RAM (memory) is the low-power HM62256LP-12 Hitachi version. A good SYSOP preventive maintenance practice is to replace the 3 volt, lithium battery every two years. The battery is about the size of a quarter and is located near JMP5 (right front, see fig. 1). I've found the 3 volt replacements at some Radio Shack stores.

Having made the battery check/change, we now move to the maintenance step, which makes a difference.

Calibrating and Aligning The TNC

Before installing the X-1J node EPROM, use the standard TNC EPROM to calibrate the TNC. Don't make the mistake that some SYSOPs make by thinking the TNC is okay, especially if the TNC has been in node or switch service for more than a year. Although the user may be able to connect to the node, there may be marginal connects due to component "cook-in," which occurs over a period of time. Heat can cause components to change values that in turn cause changes in levels and tones within the TNC. At least check the TNC oscillator frequency to be confident the crystal is operating at 4.915205 MHz. This clock frequency is critical to precise operation of the CPU and the internally generated tones of the TNC. In any case, this is the first step we perform when calibrating the TNC. The following is a checklist for the steps that I follow when preparing a TNC for X-1 node service. See fig. 1 for component and test-point locations.

211 Luenburg Drive, Evington, VA 24550

Alignment of The MFJ-1270B & 1274

1. Connect a frequency counter to U21, pin 20. Turn power on and set C47 to 4.915205 MHz.

2. Turn power OFF and install jumpers at JMP4 and JMP7.

3. **Do not turn power on before setting DIP switches!** Switch [5] and 6 ON. (Brackets [ ] equal terminal speed at 9600 baud.) There is a row of 8 DIP switches on the rear of the TNC.)

4. Turn power ON.

5. At the cmd: prompt type **CAL <enter>**.

6. Type **K :**. Note PTT and DCD LEDs should be ON.

7. Connect counter to JMP9 (next to C40).

8. Set R78 to 1200 Hz. **Be sure HF/VHF switch is OUT.** Press SPACEBAR to toggle 2200 Hz.

9. Set R77 to 2200 Hz.

10. Push HF/VHF switch IN.

11. Set R106 to 1600 Hz. After setting R106, toggle to other tone (1800 Hz) with the SPACEBAR.

12. Set R105 to 1800 Hz.

13. Type **D** to toggle both tones ON . . . two tones.

14. Connect a scope to JMP10 next to Q14. Adjust R79 for square wave. Be sure both top and bottom of each pulse are equal.

15. (1274 only) Set R212 for LED tune indicator under the "U" in the word TUNE while in dual tones.

16. (1274 only) HF/VHF switch OUT, check for LED tune indicator under the "E." If it is not, check step 14 again.

After calibration and alignment of the TNC is complete, set the DIP switches to the appropriate settings. If you are using the node(s) in a gateway configuration, set the DIP switches for 9600 baud data port speed (usually DIP switch #5 ON). Set the radio baud-rate DIP switch according to the over-the-air (radio port) speed (1200 baud, usually DIP switch #7 ON). **Remove jumpers from JMP4 and JMP 7.**

Installing The D Board In The X-1J Node

The TNC *must have* the X-1J (or later) EPROM (27C512) installed before adding the Suffolk Digital Society (MFJ-52) PC board. For complete details on the G8KBB X-1J firmware see the "Packet User's Notebook" column in the August and September 1993 issues.

For complete details of the GØJVU deviation (MFJ-52) add-on PC board, see the column in the November 1993.

Without going into a lot of dialog, I'll let fig. 2 provide the balance of the information on how-to install the MFJ-52 deviation PC board in the MFJ-1270B.

Notice the "note" on how some smaller TNC-2 clones do not have enough headroom to allow the DEV PCB installation.

The GØJVU deviation PCB (MFJ-52) is available in the USA, wired and tested, from MFJ dealers for $29.95 each.

Ideal Packet Deviation

Even with the nodes, the amount of deviation is important. The ideal packet radio modulation (deviation) is between 3.0 and 3.5 kHz. Since installing the DEV PCB into the nodes here in Virginia, we've seen packet stations connect to the nodes and have read their level of deviation from the MHEARD list.

When the level is above 4 kHz, they will remain connected and turn the deviation down in their TNC or transceiver until it

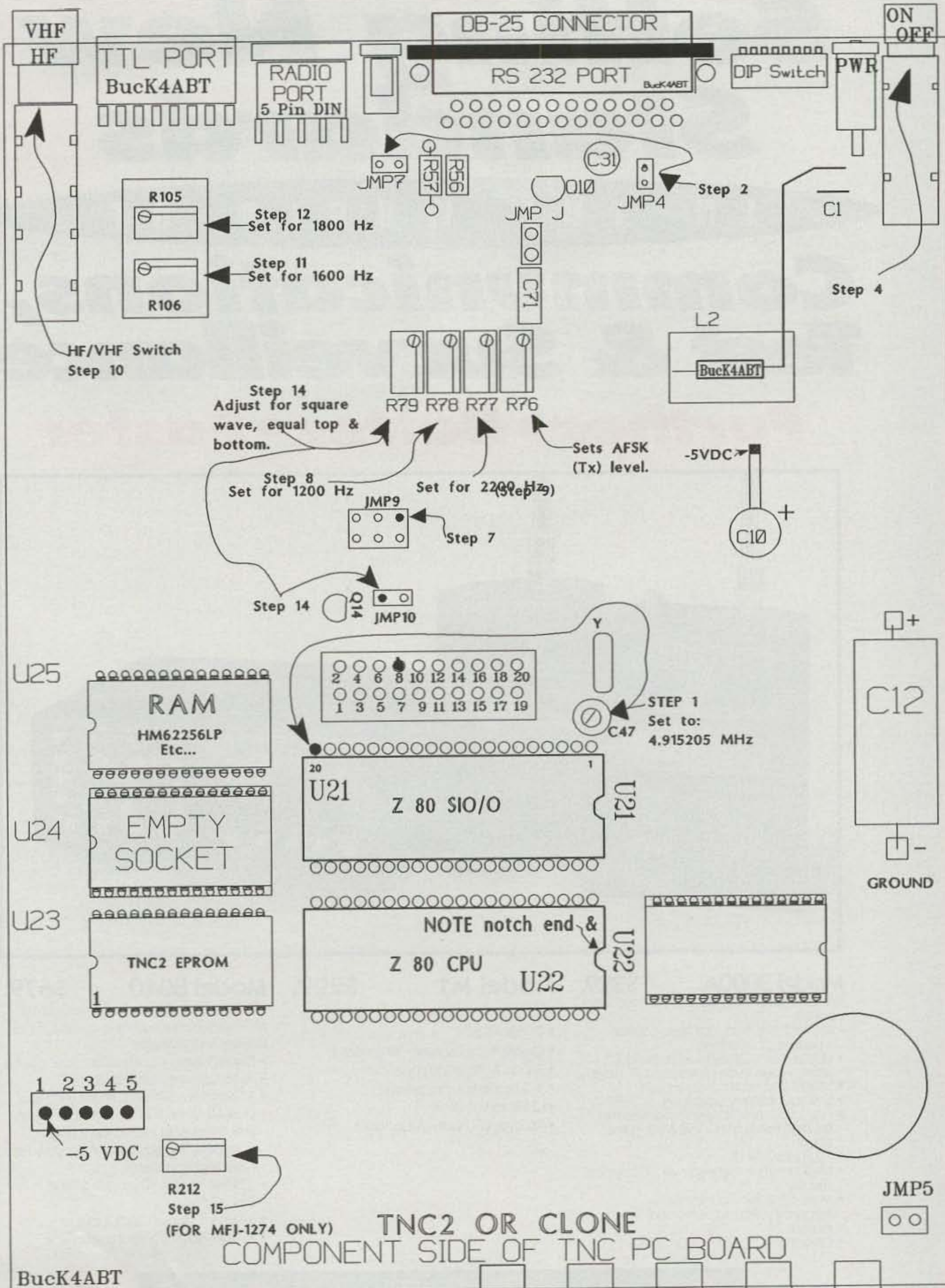

Fig. 1– TNC-2 or clone, component side of the TNC PC board. (See text for details.)

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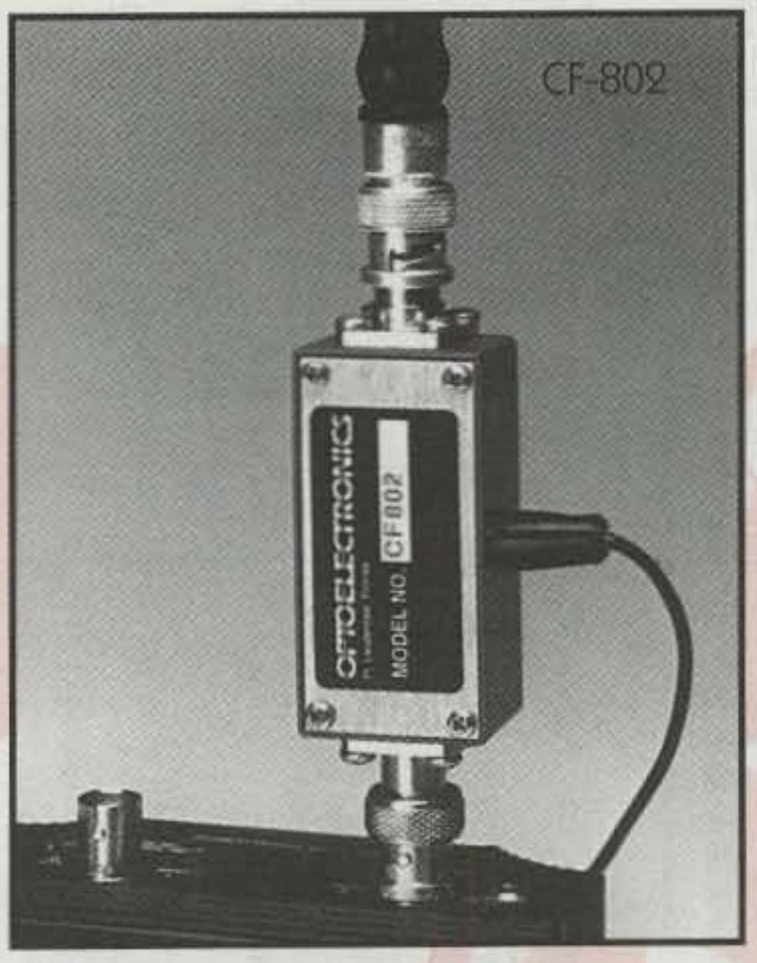

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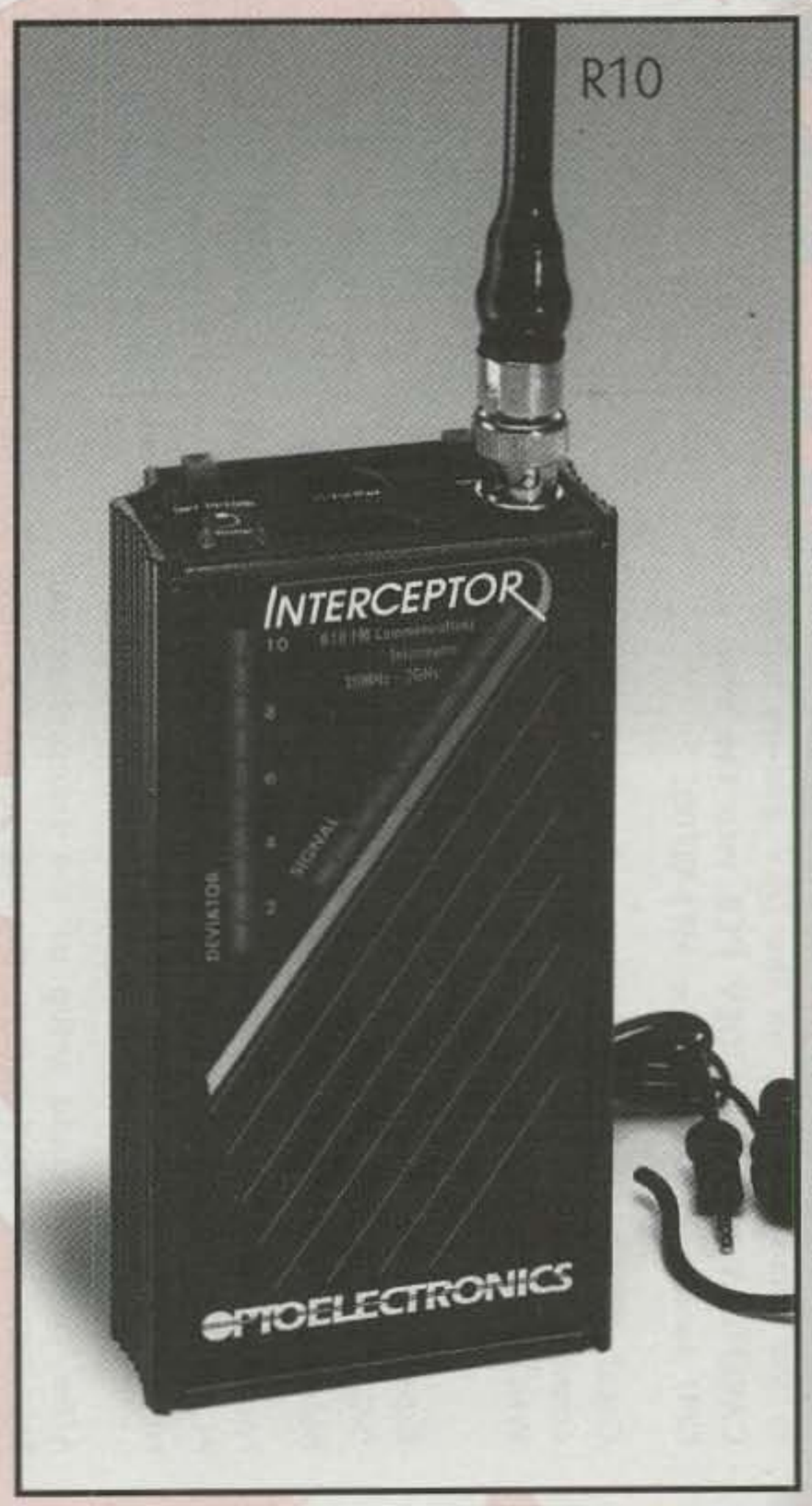

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CAREFULLY remove Z80 (CPU) from socket U22. Install Z-80 CPU into 40 pin socket on the DEV PC board. Use care to be sure no pins are bent. NOTE position of the CPU notch and position it in the same direction on the DEV add-on board. CAREFULLY install the DEV PCB into the now vacant CPU socket at U22 of the MFJ-1270B.

Carefully solder the three wires from the (supplied) connector as shown. Blue is minus 5 volt line, WHITE is the receive audio line, and BLACK is ground.

Experience has shown a range of 35 to 45 for the "METER" feature command. If audio at U1 PIN 3 is below 1.5 VDC (open squelch), METER may be set higher.

For the initial setup of the transceiver, and the TNC/DEV PC board, You should use an FM service monitor similar to the "IFR" 1200S. This insures correct readings by users.

After calibration and setup of the transceiver and TNC/DEV, DO NOT MOVE the transceiver volume control.

With squelch OPEN, use R3 to set voltage at U1 PIN 3 near 1 to 2 VDC.

In most installations, Ive found that setting R3 full clockwise gives about 1.5 volts at U1, pin 3.

Set R6 first, read U1 PIN 8 and adjust R6 for 3.0 VDC

NOTE After installing the DEV PCB in some of the smaller TNC2 clones, I was unable to replace the TNC cover (HACK-SAW to the rescue).

BEND PIN ONE (1) OF 27C512 OUTWARD SO IT WILL NOT ENTER THE SOCKET AT U23 (PIN 1). CAREFULLY SOLDER ONE END OF A 4 INCH (#22 OR 24) JUMPER WIRE TO PIN ONE OF THE EPROM. SOLDER THE OTHER END OF THE WIRE TO PIN 8 OF THE 20 PIN MODEM HEADER AS SHOWN.

X1 EPROM USER SUPPLIED. X1 CODE IS AVAILABLE FROM MANY HAM BBS, Cleveland HamNET, etc... See November 93 CQ Magazine (Packet Users Notebook) for complete details for obtaining X-1 EPROM code.

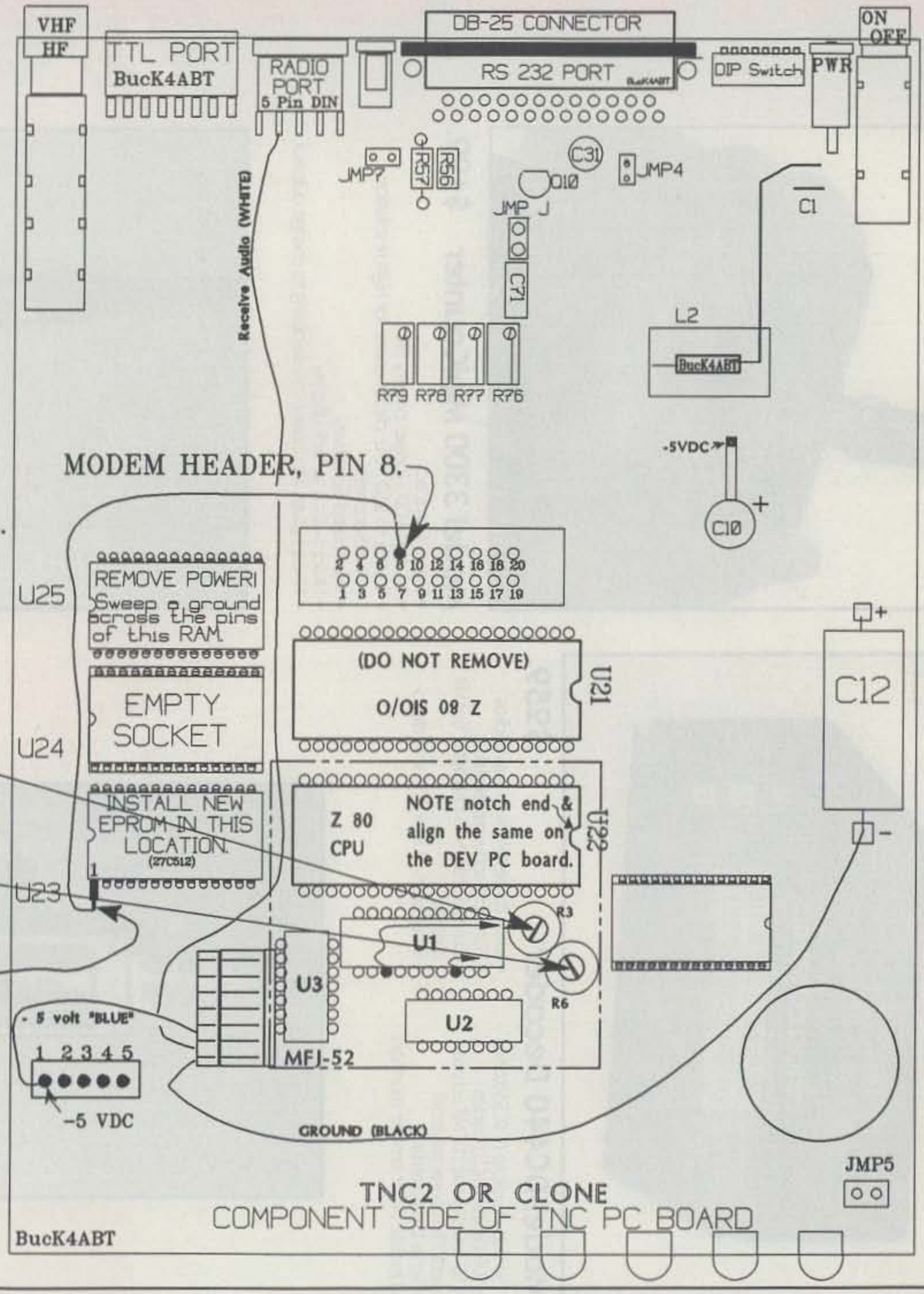


Fig. 2– Installing the MFJ-52 deviation PC board into the MFJ-1270B.

reads in the 3.0 to 3.5 kHz region. Each time the M is sent to the node, the node updates the DEV column in the MHEARD list to display the latest reading from their station.

I've had numerous users connect to me and remark how much better their packet station performed after having set the deviation to the levels mentioned here. Retries seem to go away, and easier connects happen. The real satisfaction, however, comes when they thank us for providing this kind of service in the node. The cost is minimal, but the rewards are many.

More Audio Drive? No Problem!

Some years back I had an ICOM IC-25 which needed an amplified microphone to produce enough audio for 4 kHz deviation. When I tried this same transceiver with my TNC, the audio level from the TNC was not enough to produce even 2 kHz deviation.

Later I began building nodes using the GE (Ericsson ///) MASTR II's. Again I found that I did not have enough AFSK from the TNC to drive the MASTR II to 3.5 kHz deviation.

The solution to this problem is shown in fig. 3. In this illustration I've shown several ways to make the MFJ-1270B provide additional AFSK output. First there is level control R76, which enables the user to fine-tune the level. Next there are the solder pads at JMP "J" and so on. I'll leave the rest to the user, as you may combine the coarse and fine adjustments in your application by referring to fig. 3.

BucK4ABT @ WD4ELJ.VA.USA

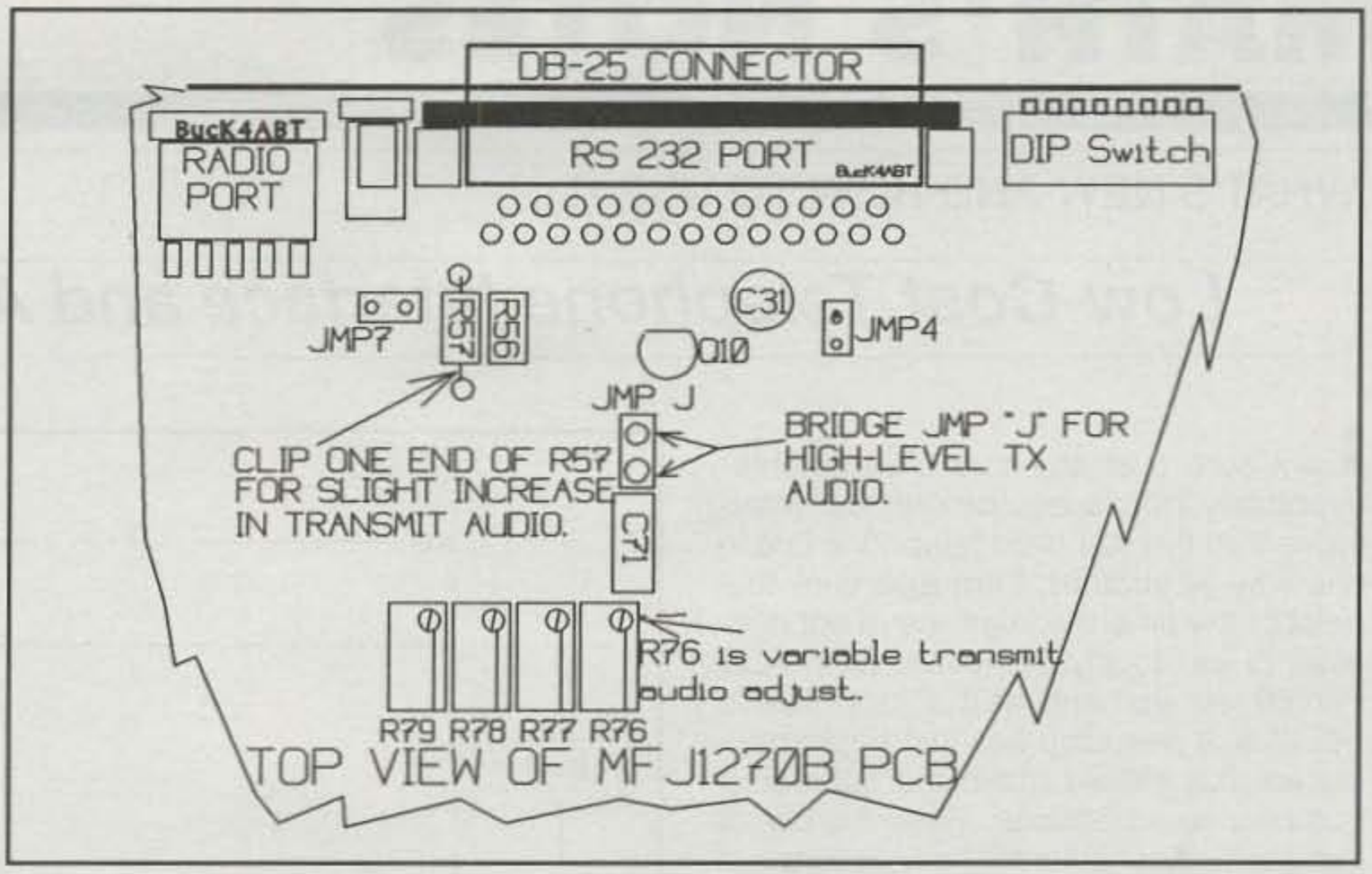


Fig. 3– Top view of the MFJ-1270B PC board. When using the Ericsson /// or GE MASTR II transceiver with the MFJ-1270B/C and MFJ-1274 TNCs, it may be necessary to make one or more minor modifications to the TNC AFSK circuitry. When the two solder pads at JMP "J" are bridged, it may be possible to obtain almost 2 volts of audio output from the TNC.

MATH'S NOTES

BY IRWIN MATH, WA2NDM

WHAT'S NEW AND HOW TO USE IT

Low-Cost Telephone Interface and A Novel Antenna

I am sure that any true experimenter eventually builds equipment that interfaces with the standard telephone line in one way or another. I am also sure that most of the time the interface is not necessarily as "totally compliant" with FCC Part 68 requirements as it is supposed to be. Well, a new chip has just been introduced that should make the subject of compliance a bit easier. While the use of this chip will not automatically assure that strict legal compliance will be met, at least the chip itself meets all of the requirements of Part 68. As a result, if any volume production of devices using this part is anticipated, the cost for the required approval from a private testing lab will be minimal.

The part I am talking about here is the XE0052SIP, a new chip manufactured by XECOM Incorporated, 374 Turquoise St., Milpitas, CA 95035 (408-945-6640). The device consists of a complete FCC Part 68 telephone-line interface containing a two-wire to four-wire converter, an off-hook detector circuit, and a ring detector. All of this is packaged in a single 8-pin in-line package (or SIP), as shown in fig. 1. Furthermore, the unit operates from a single-ended 5 volt power supply and only draws approximately 10 to 20 milliamps.

Connecting the unit is quite easy. As already indicated, a single-ended 5 volt supply is necessary, and the connections for this supply as well as the various inputs and outputs are shown in fig. 2. Audio input and output are referenced to ground and must be capacitively coupled, as there is a bias voltage present on both pins 4 and 7. Input and output impedances are nominally 600 ohms, so a value of 1 to 2 uF can be used for a low-frequency roll-off of about 300 Hz. The chip itself will limit the upper frequency roll-off to about 3 to 4 kHz.

Some other important parameters are: telephone-line impedance match, 600 ohms; attenuation between transmitter input and receiver output (hybrid loss), 18 dB; ring detect, 38 volts RMS; ring detect output voltage, 0.2 volts; off-hook output voltage, 3 volts; and current drawn from telephone line when in off-hook position, 20 to 100 ma.

In addition to the above, the XE0052SIP requires a delay of 2 seconds after going to the off-hook state before information can be conveyed. This is to accommodate some billing schemes in use by private carriers.

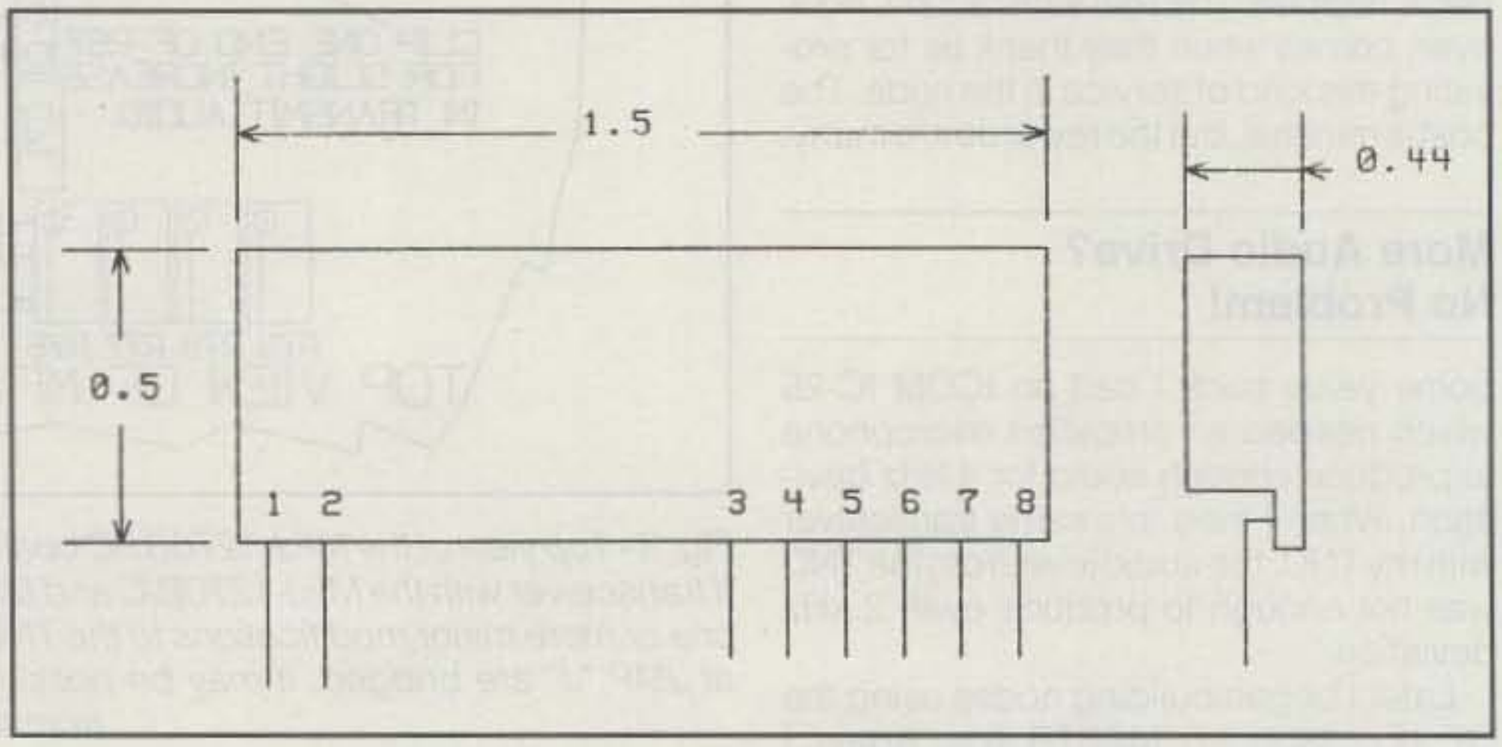


Fig. 1– Physical dimensions of XECOM XE0052SIP.

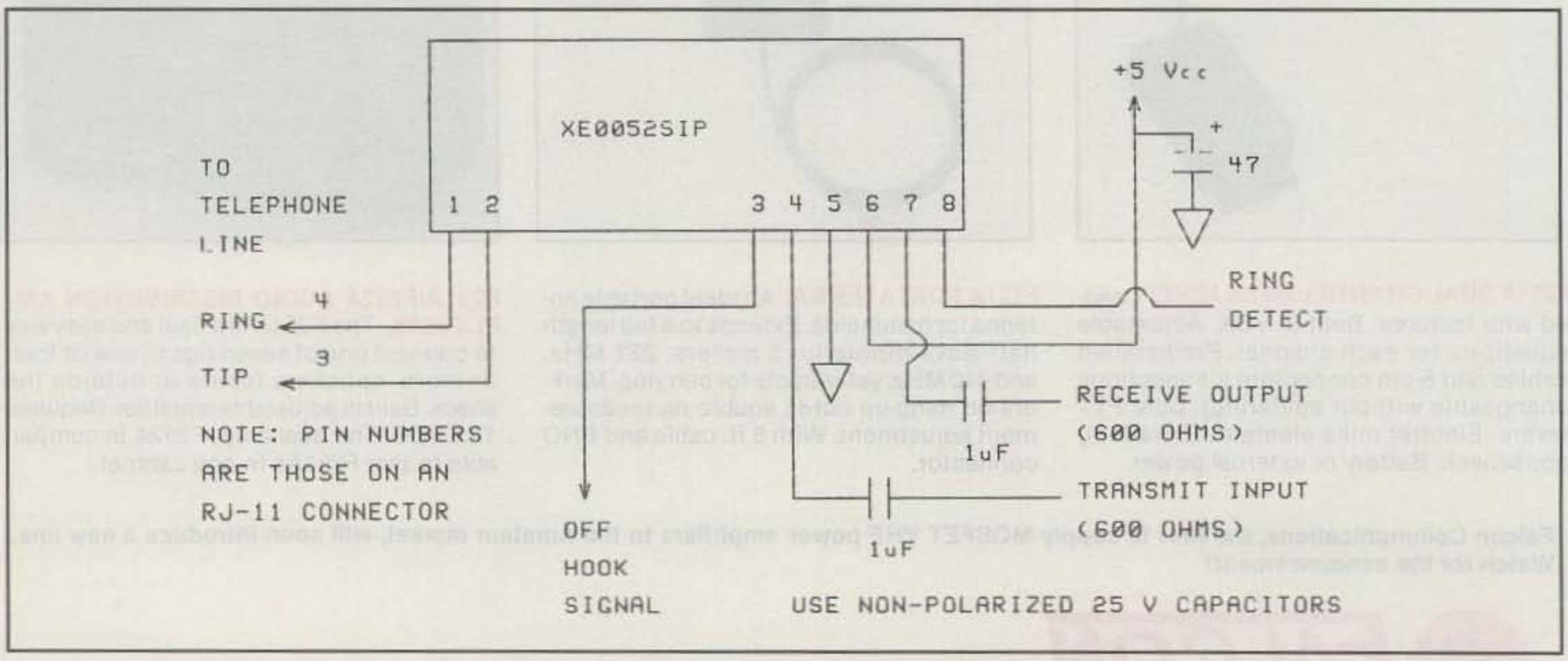
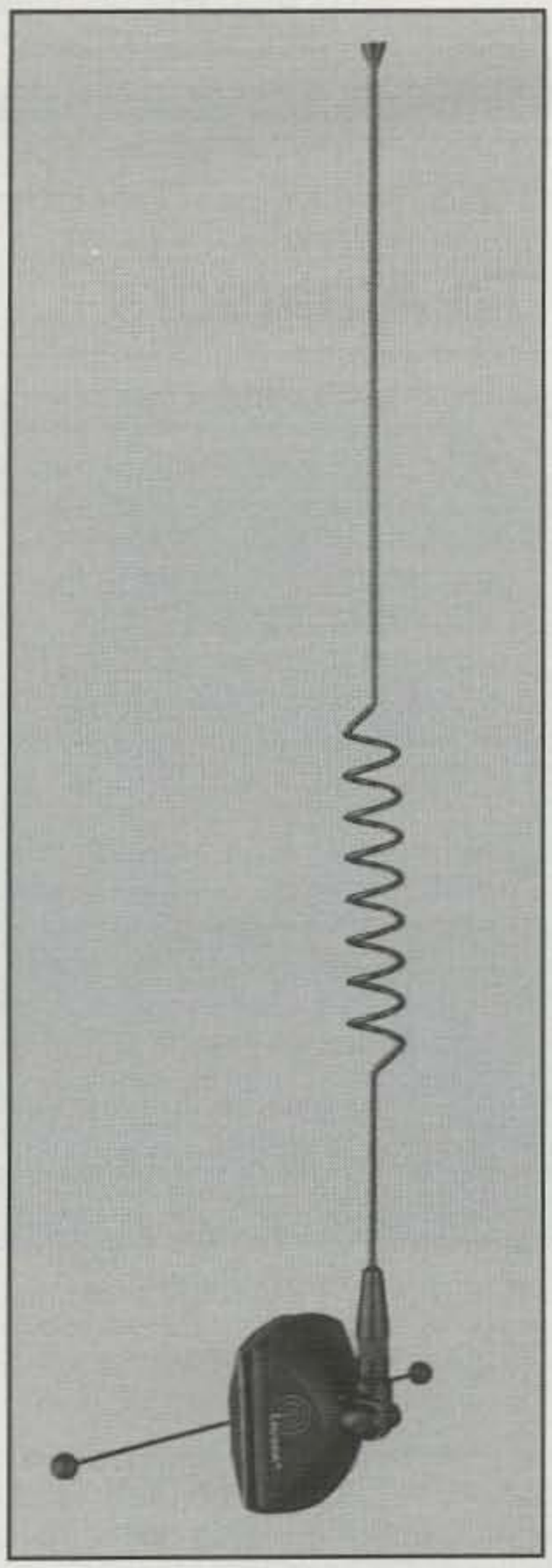


Fig. 2– Hookup details of XE0052SIP chip.

c/o CQ magazine



The "passive repeater" antenna.

For more information, prices, availability, and a complete data sheet on the chip contact the manufacturer.

Passive Repeater Antenna

For the second part of this month's column I would like to mention a device that I came across in a mail-order catalog which might be of interest to HT users. This device, shown in the photograph, is a "passive repeater antenna" normally designed for use with a portable cellular telephone in a car. The device is intended for mounting on a car's rear window with adhesive pads, or a side window with a clamp, and apparently couples the radiated 900 MHz signals from the hand-held telephone to the outside world. From the photo it seems as if there is a half-wave dipole on one end which receives the cellular signal, a capacitively coupled feedthrough of some sort to pass the signals through the glass, and a center-loaded ($^5/_8$ wave?) whip on the outside which reradiates the signal. I don't know how well it actually works, but the idea is certainly interesting. If it does work, the efficiency might not be too great, but it would certainly be better than a rubber duck by itself in a steel car. If any reader has any ideas or more information on this or a similar device (obviously for amateur use) or has experimented along these lines, please let me know and we will describe here what you have found. The unit seems to be made by Larsen and is called a "Call Booster."

See you next month.

73, Irwin, WA2NDM

BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

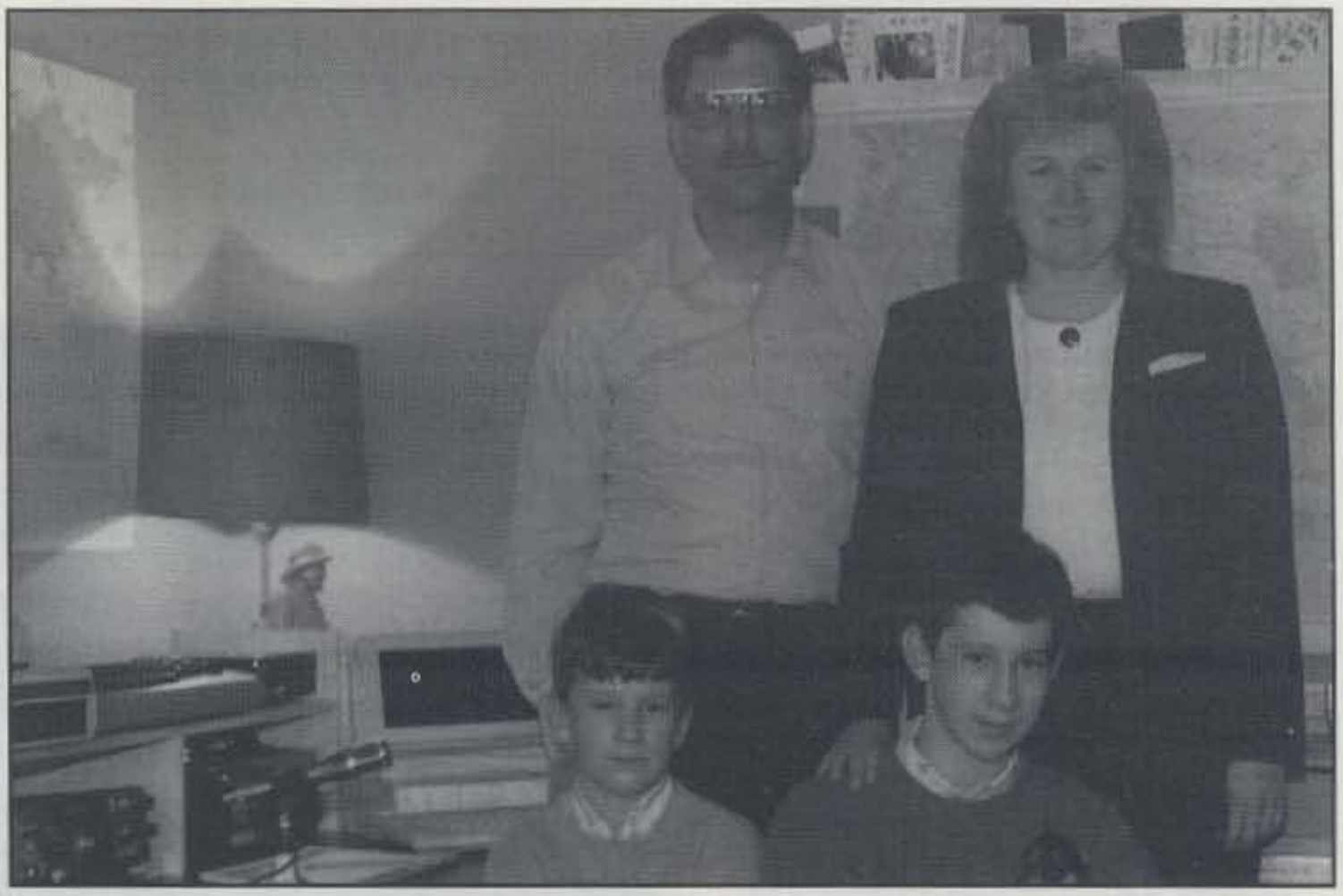
International Agreements Applicable To Amateurs

Our government has two sets of international agreements which are particularly important in regard to operation by United States amateur radio operators. The current reciprocal operating and third-party traffic agreement lists are dated 26 October 1993 and 25 October 1993, respectively, by the Federal Communications Commission. We have reciprocal operating agreements with 75 countries, and third-party traffic agreements with 45 countries. We have both reciprocal-operating and third-party traffic agreements with 37 countries. In some cases an agreement with one country (such as France or England) constitutes an agreement with many other places which have DXCC credit.

One set of agreements (reciprocal operating) permits USA amateurs to operate in foreign countries, and it permits amateurs of those countries to operate in this country. This is called reciprocal operating. In neither case are amateurs required to pass tests to operate in the other country; all nations' licenses are accepted as proof of operating qualification. This reciprocal operating system is greatly appreciated by active amateurs who visit other countries.

The other set of agreements (third-party traffic) concerns the exchange of noncommercial (personal) traffic (via amateur radio) between people in different countries, which is greatly appreciated as a person-to-person service.

Table I shows the countries with which we have reciprocal operating (R) and/or third-party traffic (T) agreements.



Here is the all-amateur Breish family. The father is Joseph, WV3M, and the mother is Sharon, N3IWL. Christopher, KA3YFK, is to the left in front of his parents, and his brother Jay, N3LQV, is beside him.

Reciprocal Operating And Licensing

The FCC only issues reciprocal operating permits to visiting alien amateur radio operators who are licensed by (and are citizens of) the indicated countries. Alien amateurs must apply for a permit to operate from any area where amateur radio is controlled by the FCC. USA citizens are not eligible to receive an FCC-issued reciprocal operating permit. Similarly, an alien holding a USA amateur radio license is not eligible to receive an FCC-issued reciprocal operating permit. If an alien amateur holds an FCC-issued reciprocal operating permit, it is superseded by whatever FCC-issued USA amateur radio license she/he obtains. In this case, the alien's operating privileges are no longer related to her/his home country's privileges; they are the privileges of the class of FCC-issued amateur license she/he earned. Foreign amateurs are encouraged to obtain USA licenses, if they are going to be in this country a long time. Except for representatives of foreign governments, anyone may apply for a USA amateur radio license. Such applicants simply have to pass the same examination elements administered to Americans.

Alien amateurs may apply for a permit by completing an FCC form 610-A, attaching a copy of her/his (foreign) valid amateur license, and mailing these items to the Federal Communications Commission, Consumer Assistance Branch, 1270 Fairfield Road, Gettysburg, Pennsylvania 17325-7245 USA. The telephone number of the Personal Radio Branch in room 5322 is 202-632-4964. Some USA missions (in foreign countries) have the FCC form 610-A, and it can be obtained by writing to the FCC, 1919 M Street NW, Washington, DC 20554 USA. The form 610-A one uses must be dated August 1986 or later. Earlier versions will not be accepted; they will be returned without action. An FCC-issued permit is valid for one year, until the alien's home country amateur license expires, or until the alien obtains a USA amateur license, depending on which occurs first.

Operating privileges of a permit holder are detailed in the FCC Rules and Regulations. Part 97 governs the USA Amateur Radio Service. Basically, the permit holder is limited to the operating privileges that apply to her/his class of license in her/his home country. However, FCC regulations must be obeyed and USA Extra class operating privileges may not be exceeded by reciprocal licensees, regardless of the privileges existing in their home countries. As an example of this, reciprocal licensees are not allowed to transmit (on voice) in the 14,100 to 14,150 kHz portion of the 20 meter DX voice segment. Reciprocal permit holders have only the privileges of their own licenses, but not to exceed USA Extra class operating privileges. Violations should be reported to the FCC. The exact callsign shown on the permit must be used by the reciprocal licensee when identifying her/his station. The appropriate USA letter-numeral prefix precedes the reciprocal licensee's home callsign. As an example, if CP5WDX is operating

45527 Third Street East, Lancaster, CA 93535-1802

Country	R	T
Antigua & Barbuda	•	•
Argentina	•	•
Ascension Island (see United Kingdom)		
Australia	•	•
Austria	•	
The Bahamas	•	
Bailiwick of Guernsey (see United Kingdom)		
Barbados	•	
Belgium	•	
Belize	•	•
Bermuda (see United Kingdom)		
Bolivia	•	•
Bonaire (see Netherlands Antilles)		
Bosnia-Herzegovina		•
Botswana	•	
Brazil	•	•
British Virgin Islands (see United Kingdom)		
Canada	(1)	•
Cayman Islands (see United Kingdom)		
Chile	•	•
Colombia	•	•
Costa Rica	•	•
Cuba		•
Curaçao (see Netherlands Antilles)		
Cyprus	•	
Denmark	(2)	
Dominica	•	•
Dominican Republic	•	•
Ecuador	•	•
El Salvador	•	•
England (see United Kingdom)		
Falkland Islands (see United Kingdom)		
Federal Islamic Republic of Comoros		•
Federal Republic of Germany	•	
Federated States of Micronesia	•	•
Fiji Islands	•	
Finland	•	
France	(3)	
French Guiana (see France)		
French Polynesia (see France)		
The Gambia		•
Gambier Island (see France)		
Ghana		•
Gibraltar (see United Kingdom)		
Gough Island (see United Kingdom)		
Great Britain (see United Kingdom)		
Greece	•	
Greenland (see Denmark)		
Grenada	•	•
Guadeloupe (see France)		
Guatemala	•	•
Guernsey (see United Kingdom)		
Guyana	•	•
Haiti	•	•
Honduras	•	•
Hong Kong (see United Kingdom)		
Iceland	•	
Ile Amsterdam (see France)		
Ile Saint-Paul (see France)		
Iles Crozet (see France)		
Iles Kerguelan (see France)		
India	•	
Indonesia	•	
Isle of Man (see United Kingdom)		
Israel	•	•
Italy	•	
Jamaica	•	•
Japan	•	
Jersey (see United Kingdom)		
Jordan	•	•
Kiribati	•	
Kuwait	•	
Liberia	•	•
Luxembourg	•	
Marquesas (see France)		

(Continued on page 66)

Country	R	T
Martinique (see France)		
Mexico	•	•
Monaco	•	
Montserrat (see United Kingdom)		
Netherlands	•	
Netherlands Antilles	•	
New Caledonia (see France)		
New Zealand	•	
Nicaragua	•	•
Northern Ireland (see United Kingdom)		
Norway	•	
Panama	•	•
Papua New Guinea	•	
Paraguay	•	•
Peru	•	•
Philippines	•	•
Portugal	•	
Republic of Ireland	•	
Republic of South Africa	•	
Republic of the Marshall Islands (see United Kingdom)		
Reunion Island (see France)		
Saba (see Netherlands Antilles)		
Saint Kitts & Nevis Islands		•
Saint Helena Island (see United Kingdom)		
Saint Lucia	•	•
Saint Pierre & Miquelon Islands (see France)		
Saint Vincent & The Grenadines	•	•
Seychelles	•	
Sierra Leone	•	•
Sint Eustatius (see Netherlands Antilles)		
Sint Maarten (see Netherlands Antilles)		
Society Islands (see France)		
Solomon Islands	•	
South Georgia Islands (see United Kingdom)		
South Sandwich Islands (see United Kingdom)		
Spain	•	
Surinam	•	
Swaziland		•
Sweden	•	
Switzerland	•	(4)
Thailand	•	
Trinidad & Tobago	•	•
Tristan da Cunha Island (see United Kingdom)		
Tuamoto Archipelago (see France)		
Tubuai Island (see France)		
Turks & Caicos Islands (see United Kingdom)		
Tuvalu	•	
United Kingdom	(5)	(6)
Uruguay	•	•
Venezuela	•	•
Yugoslavia	•	

Notes

(1) No reciprocal operating permits are required between Canada and the United States.

(2) Also applies to Greenland.

(3) Also applies to French Guiana, French Polynesia (Gambier, Marquesas, Society, and Tubuai Islands, plus Tuamotu Archipelago), Guadeloupe, Ile Amsterdam, Ile Saint-Paul, Iles Crozet, Iles Kerguelan, Martinique, New Caledonia, Reunion, Saint Pierre and Miquelon, plus Wallis and Futuna Islands.

(4) USA/ITU agreement authorizes third-party traffic to be exchanged between the USA and 4U1ITU (Geneva, Switzerland) and 4U1VIC (Vienna, Austria).

(5) Reciprocal licensing also applies to Bermuda, British Virgin Islands, Cayman Islands, Channel Islands (including Guernsey and Jersey), Falkland Islands (including South Georgia Islands and South Sandwich Islands), Great Britain, Gibraltar, Hong Kong, Isle of Man, Montserrat, Northern Ireland, Republic of the Marshall Islands, Saint Helena (including Ascension Island, Gough Island, and Tristan da Cunha Island), plus Turks and Caicos Islands.

(6) Third-party traffic may be exchanged with United Kingdom special events stations (GB prefixes), except stations with the GB3 prefix.

Table 1–List of countries with which the USA has reciprocal operating (R) and/or third-party traffic (T) agreements.

in California, his identification is W6/CP5WDX (code) or W6 "stroke" (or "slash") CP5WDX (voice). The entire callsign must be used when identifying a station. In this example, do not shorten it to W6/CP5WD. The reciprocal licensee is required to indicate (in English) the approximate geographic location (city and state, etc.) from which she/he is operating. This information is required at least one time during each contact. Canadian amateurs still identify the original way with the American indicator following their callsign, such as VE7SR/W6.

USA amateurs who want to obtain reciprocal operating permits from the countries with which we have such agreements should request the appropriate forms from officials of those countries. USA-based foreign embassies and legations may have the required forms; if not, they should be able to provide information about where such forms can be obtained. Forms may also be obtained by requesting them from the amateur radio licensing authority of the country you intend to visit. The ARRL has a reciprocal licensing expert who provides names, callsigns, addresses, telephone numbers, and related data in response to requests for reciprocal licensing information received from American amateurs. The ARRL's address is 225 Main Street, Newington, CT 06111.

When USA amateurs operate (as reciprocal licensees) in other countries, they must abide by the regulations which apply to those countries. ITU Region II (North, Central, and South Americas) regulations do not go with you when operating in ITU Region I (Europe and Africa) or ITU Region III (Australasia and the rest of the Southern Hemisphere). All licensees must abide by the radio regulations of the International Telecommunications Union (ITU).

Third-Party Traffic

Third-party traffic involves at least one person in addition to the operators who are handling the traffic. Third-party traffic includes message traffic handled directly between amateurs, plus telephone (phone) patch traffic, in which people (not just amateurs) speak to each other directly (normally using the telephones in their homes) via amateur radio. Any recognized language may be used when handling international third-party traffic, but station identification must be in English. AMTOR, ASCII, RTTY, and other modes may also be used. Third-party traffic must be of a personal nature. Business messages are prohibited, except in emergencies. FCC licensed amateurs are not allowed to exchange third-party traffic with amateurs in countries with which this country does not have a third-party traffic agreement. Amateurs are not allowed to accept money, services, or goods in exchange for handling third-party traffic.

Only personal messages may be handled by amateur radio operators under normal circumstances. These messages must be such that they would not normally be sent by any existing means of electrical communications, or would not be sent by any means except for an amateur radio station being available. These messages must be in plain language.

The callsigns of both (foreign and American) stations must be transmitted to identify stations handling third-party traffic. Your own callsign (alone) does not suffice in this case.

If you have a question about the status of a country (in regard to these lists), you could call the ARRL or the Personal Radio Branch of the FCC at 202-632-4964 to obtain the latest information.

USA amateurs are allowed to communicate directly with all other amateurs throughout the world; there is presently no country which has issued notice that it objects to USA amateurs contacting their amateurs. Such contacts do not constitute the exchange of third-party traffic.

Expanding The Opportunities

The US Government is willing to establish reciprocal operating and/or third-party traffic agreements with other countries. Such agreements are negotiated through the US Department of State. The support of the other country's amateurs is necessary to initiate meaningful negotiations. It is best to have action initiated by the country seeking to reach an agreement with the USA, since their cooperation is essential in getting the task completed. Our government is receptive to providing draft notes, which could form the basis of such agreements, to any interested country. Notes can be requested from the US Department of State or from the Federal Communications Commission. The FCC address is Washington, DC 20554, and requests should be directed to the Chief of the Spectrum Engineering Division. DX amateurs are urged to initiate appropriate action in their countries, if they do not presently have both agreements with the USA. American amateurs could help expand these lists by discussing these agreements with foreign amateurs, particularly when visiting their countries.

Printed Aids

My previous columns contain information that is useful to new and aspiring amateurs. Many of these items have been reprinted for distribution to students of licensing courses I instruct. For ease of use, these printed aids have been separated into six categories. These categories are introduction, code, theory, station, operating, and miscellaneous. Outdated items are continually replaced with newer material. Fifteen dollars brings a complete set of current printed aids, including shipping costs: A list of these printed aids will be send to anyone who requests it and sends a business-size (#10) self-addressed and stamped envelope to my California address. Licensing course instructors are welcome to revise and/or duplicate these items to suit their requirements.

Photographs Wanted

Photographs of new amateurs in their shacks provide introductions to a few of the new licensees. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one-year *CQ* subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs. 73, Bill, W6DDB

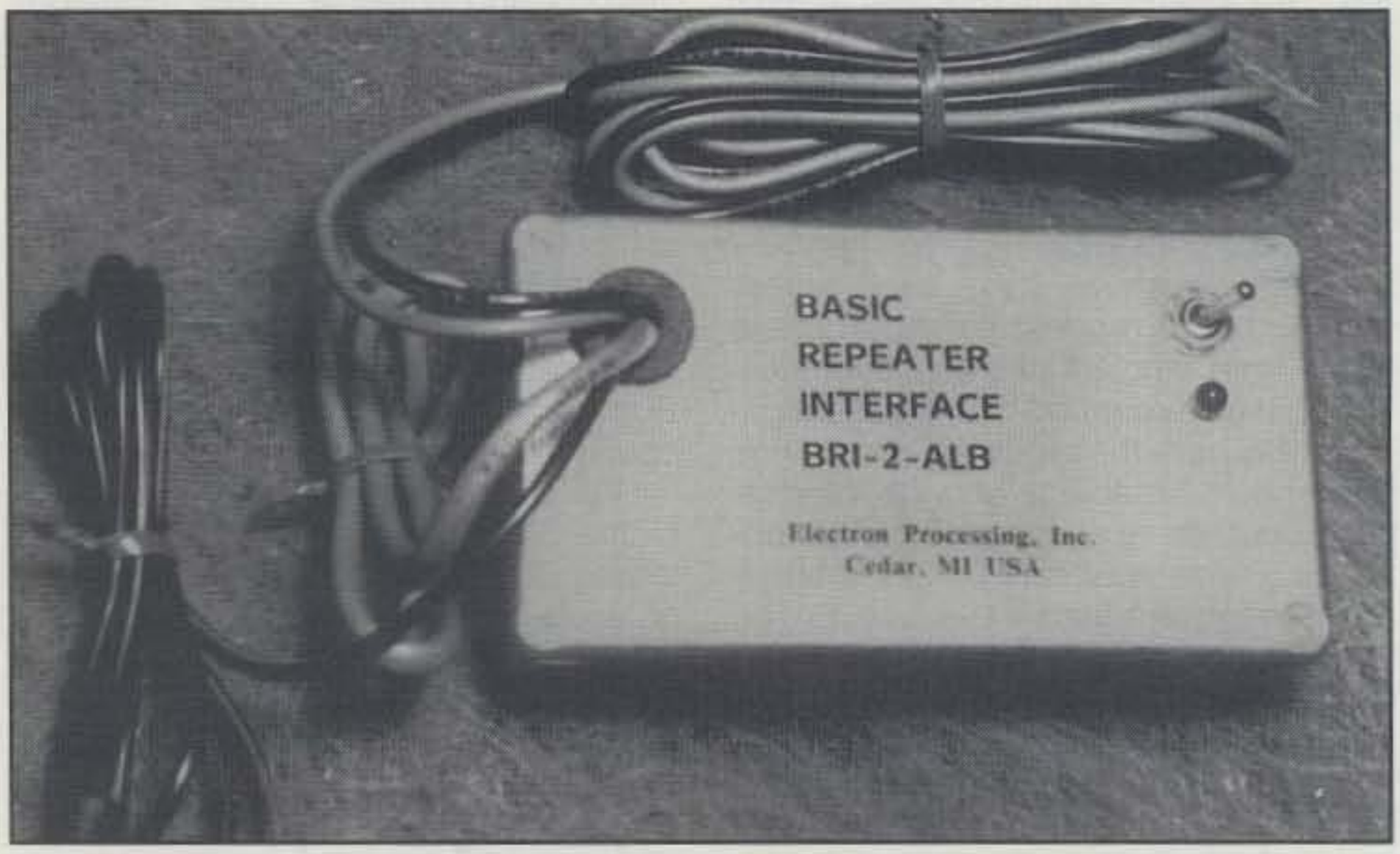
ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

Update '94

This time we'll revisit and update many of the Antennas and Accessories topics we covered in earlier columns, and we'll also break some new ground. Let's get started.



Electron Processing's BRI-2-ALB Basic Repeater Interface is made rugged for use where either the RF or mechanical environment demands more than a standard enclosure. The unit, housed in a strong cast-aluminum box, contains all of the features of the standard model, including VOX and both hang and timeout timers. A heavy-duty transmitter keying relay handles up to 10 amperes of keying current. The unit is $70. (Photo courtesy Electron Processing)

Antenna Update

J. Martin "Ground It" Bus. This small Connecticut firm has introduced an inexpensive accessory bus to facilitate proper station grounding. The bus helps protect equipment and makes chassis ground connections short and neat, with all the benefits good grounding brings. The "Ground It" system, said to install in 2 minutes, is a 1/8 inch by 1/2 inch solid copper bus that provides an equipment grounding stud every 6 inches. All stainless steel hardware is provided. Four standard lengths are available, from 2 to 6 feet, priced from $11.95 to $31.95 plus shipping and handling. Special lengths also are available.

The manufacturer properly notes in its ad literature that the "Ground It" bus is for equipment chassis grounding *only*. AC input power should have surge suppressor equipment installed, and antenna coaxial cable should have its own protection at the entrance point to the ham-shack. The firm recommends that a short but heavy-gauge wire or grounding strap be used to make connections to a good earth ground, such as an 8 ft. ground rod. Gas or electrical conduit pipe shouldn't be used for grounding.

For more information, contact J. Martin Systems, 35 Hilltop Ave., Stamford, CT 06907.

New LPS Enterprises Product Line. Interest has increased recently in providing positive means of protecting expensive radio, computer, and other electronic equipment from damaging electrical surges. I know *I'm* interested, as a result of separate 1990 and 1993 incidents in which I lost several favorite pieces of electronic and computer gear as a result of nearby electrical storms. LPS Enterprises has revised its lines of antenna switching and automatic antenna, modem, and rotor disconnect products, according to proprietor Pete Nicholls, N4BHB.

Centerpieces of the LPS line are its ASW series coaxial antenna switches, with or without the automatic antenna disconnect feature. These electronically switch between two or three antennas and protect your equipment from damaging static discharges when it's not being used. The coaxial antenna switches operate on 12 VDC, using the same power source as your equipment: when power is shut down, the antennas are disconnected and equipment inputs are grounded. Several compact versions are available from $39, with a choice of SO-239, BNC, TNC, or N style connectors for use to 900 MHz or higher. Each connector type is available with or without the auto disconnect feature. Kit versions and custom configurations also are offered.

New is the AMD-1 Automatic Modem Disconnect system. It protects your computer modem from damaging static discharges and voltage surges. The unit operates from the same power source as your equipment; when you shut down, the phone line to your modem or phone patch is disconnected. According to Pete, the $15 unit conforms to FCC Part 68 rules of surge withstand voltage. It's available with or without an AC/DC adapter.

Even newer is the ARD-1 Automatic Rotor Disconnect. It protects your rotor control box in a manner similar to the other devices. When power is shut down, the control box is disconnected and inputs to your rotor are ground. The $39 device disconnects and grounds up to eight different control lines.

More information on the products is available from LPS Enterprises, 308 Sterling Dr., Warner Robins, GA 31088 (912-929-9416).

M² Enterprises Update. We've mentioned the antenna products offered by M² Enterprises several times, most recently in the December 1991 column. The firm is going strong today with its HF Yagis and log periodics; 6 and 2 meter beams, loops, and EME/OSCARs; and UHF and microwave beams and accessories, including power devices, mobile mounts, power dividers, and phasing cables. The firm's special focus is on tropo, meteor scatter, and EME communications, but other operating and propagation modes aren't slighted antenna-wise.

The M² antennas are based on designs by Mike Staal, K6MYC, who was a KLM Electronics cofounder and until 1986 was KLM's antenna designer. The name M² Enterprises stands for Mike and Myrna Staal, and the company was started about three years before Mike left KLM. Myrna's original M² business was computerized typesetting, but in early 1987 the typesetting function gave way to computerized antenna design and manufacturing.

Mike takes great pride in the quality of M²'s machined parts and the antennas' mechanical features. The firm has a 10,000 sq. ft. manufacturing facility, its own welding and lathe capabilities, and its own testing facility. A family enterprise, son Matt handles the manufacturing, purchasing, and shipping.

For a catalog, contact M² Enterprises, 7560 N. Del Mar, Fresno, CA 93711 (209-432-8873).

Electron Processing Update. On several occasions we have noted the variety of antenna accessories offered by John Martin, WB2VTN, of Electron Processing. To recall, EP offers many accessories, including active (amplified) vertical receiving antennas, window mounted antennas, a multiple receiver adapter, mobile through-the-window couplers, scanner boosters and filters, preamps, indoor receiving antennas, and other goodies. Many of the EP products are what might be termed "receiving enhancers": preamps, boosters, interference filters, small amplified and non-amplified antennas, and the like.

A new 15-page catalog is available which summarizes about two dozen RF and RFI-relat-

289 Poplar Drive, Millbrook, AL 36054

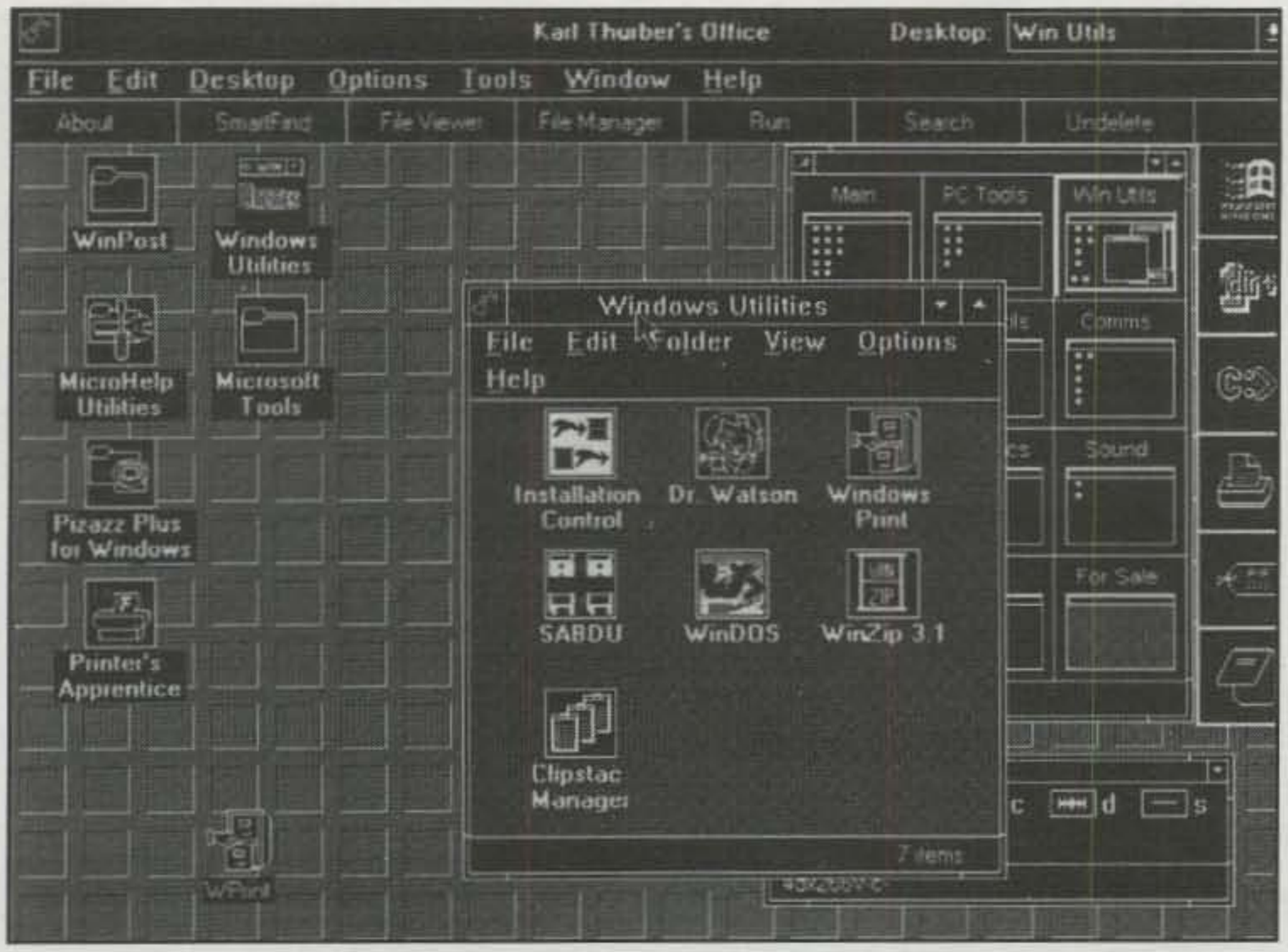


Fig. 1– PC Tools for Windows is a very well thought out Windows enhancement. The product is a fundamental extension to the operating environment, designed to make Windows much easier to use. The new package has many features; one of the best is MultiDesk™, which organizes work and simplifies file access by letting you set up a series of project-oriented "virtual desktops" which reduce the clutter common with Windows.

ed enhancement products, many of which we have briefly profiled in these pages. I also notice in this catalog that John has broadened the line of inexpensive repeater interface units. One new unit is the BRI-2-ALB, made rugged for use where either the RF or mechanical environment demands more than a standard enclosure. Housed in a strong cast-aluminum box, it contains all of the features of the standard model, including VOX operation and both hang and timeout timers. A heavy-duty transmitter keying relay also is included which handles up to 10 amperes of keying current. The unit is $70; it's also available prewired for various radios upon request.

For a free catalog, contact Electron Processing, Inc., P.O. Box 68, Cedar, MI 49621 (616-228-7020).

Software Update

NEC/Yagis 2.0. Brian Beezley, K6STI, is well known for his line of high-accuracy antenna modeling and design software. One relatively new product—in addition to his popular MN, YO, and AO optimizers—is NEC/Yagis. We described V1.0 in March.

As noted, NEC/Yagis provides high-accuracy analysis of Yagis with the professional-standard Numerical Electromagnetics Code. The new, copy-protected NEC/Yagis 2.0 features increased computational speed and improved graphics, and it can now model large

arrays of Yagis. A special feature quickly synthesizes the pattern and gain for an array of Yagis from the pattern of a single antenna. This feature allows you to quickly determine optimal E- and H-plane spacing for large EME arrays. The program is simple to use and includes a separate program, PLOT 6.0, for plotting polar and rectangular radiation patterns. The amateur version is $100. The professional version, NEC/Yagis-Professional, is $300; it includes a commercial-use license.

While we're into Brian's software offerings, we should note that he admits to recently becoming addicted to cranking out IBM PC utility programs. In his words, "I started writing my own utilities just for fun and now I can't stop."

In a prior column we mentioned COIL.EXE, for high-accuracy inductance calculations. We also noted Brian's distribution scheme, in which he posted it on various bulletin boards (BBSes) that cater to amateur radio applications. The program is crippled in its free form; for proper operation, as we pointed out, you need to send Brian a $10 bill and SASE to receive a custom activation code. A set of DOS system font programs, FONT and KEYBUF, is offered in a similar manner.

Recently Brian also developed V.EXE, a simple but powerful ASCII/hex file viewer, in which he's paid special attention to eliminating annoying video glitches, flashes, and other "jarring phenomena." V.EXE is available from Brian for $25, or $10 if you don't need a disk. It's not crippled or copy-protected.

Contact Brian Beezley, K6STI, 507½ Taylor, Vista, CA 92084 (619-945-9824). Note that COIL.EXE and FONT/KEYBUF are not available from him directly; you'll have to find them on a BBS.

HB-232 Scanner/Computer Interface. Computer-assisted radio operation isn't limited to amateur transceivers and shortwave receivers. Now a scanner interface, the HB-232, is available.

The HB-232 is an RS-232 controller and data acquisition interface for the Realistic™ PRO-2004, 2005, and 2006 VHF/UHF scanners. The unit and a PC together control these scanners and the collection of data from them; there's also a reduced capability for other scanning receivers.

The hardware/software unit programs all supported scanners and scanner functions using plain-text files, with up to 400 channels of frequencies and custom settings. The software logs reception parameters to a text file that covers more than 10 status and content items, including channel, frequency, modulation mode, scanner operating mode, delay/lockout status, date and time of logging, transmission duration, and other user-selected data. You can connect a printer for online hardcopy loggings, create scripts for receiver automation, and reject lockups from "birdies" and other undesired frequencies.

The HB-232 Scanner/Computer Interface is available in several configurations, from a kit of essential parts at $194.95 to a fully assembled unit with scanner cable for $344.95. Some internal scanner rewiring is required to accept the HB-232.

For more details contact Bill Cheek at COMMtronics Engineering, PO Box 262478, San Diego, CA 92196 (619-578-9247; from 1:30 PM to 5:30 PM PST, weekdays).

HamWindows Plus™. Last May we put the spotlight on HamWindows. It's a Windows-based amateur radio application that stresses the fact that amateur radio is evolving technologically, slowly embracing the concept of the computer as the heart of the high-tech amateur station.

HamWindows was developed by California Software for most Kenwood radios and many ICOM, Yaesu, and other receivers and transceivers, plus several terminal node controllers (TNCs). The $139.95 program works in the graphical user interface (GUI) environment offered by Microsoft Windows™. This allows it to take advantage of many neat Windows features, especially Dynamic Data Exchange (DDE) to allow efficient and consistent exchange of data among program modules and with other Windows programs.

HamWindows, in addition to logging and awards tracking, offers callsign and other information lookup (country, zone, beam heading and distance, etc.); a grayline propagation map and regional maps; a SWL window; an amateur radio almanac for each country; a terminal node controller (TNC) window for packet DX spotting; a control window for Kenwood radios; utility routines; a setup window for system configuration; and online help.

California Software now has introduced an upgraded version, Ham Windows Plus, which it even more ambitiously envisions as a "personal communications control center," a sort of bridge between the "amateur communications world" and the "world of personal computers." In their view, using PCs (and programs such as HamWindows) to control amateur stations ultimately will lower manufacturing costs (and thus retail prices) of radio equipment, and

JRC

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Fully Automatic MOSFET HF LINEAR AMPLIFIER

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The JRL-2000F is the world's first MOSFET HF linear amplifier, designed using the same high technology found in JRC's professional high-power radio transmitters. Featuring a heavy-duty power amp that incorporates 48 RF power MOSFETs to ensure low distortion and clean output up to 1,000 watts (100% duty cycle, 24 hour) SSB/CW, plus a high-speed automatic antenna tuner with memory capacity of 1820 channels for instant QSY. Plus a high efficiency switching power supply (80V-264V) with power factor correction to supress AC line currents, an automatic antenna selector for up to four antennas and a wireless remote control unit.

JRC Japan Radio Co., Ltd.

430 Park Ave, 2nd Floor New York. NY 10022
Phone : (212)355-1180 Fax : (212)319-5227
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computers will greatly enhance the number of equipment features and the flexibility of how those features interact.

HamWindows Plus controls both HF and VHF radios, as well as TNCs, at the same time. It includes the WARC bands; enhanced awards tracking, including DXCC, WAS, and WAZ; a TNC Window; the Radio Construction Set (a graphic radio components database used to design and control your station); *CIA World Fact Book* based information; SWL data from the *World Radio TV Handbook*; and more. It's also capable of Super VGA graphics on a properly equipped PC. The new Ham Windows Plus is $189.95; various options and upgrades also are available.

Information is available from California Software, Inc., 2121 E. Pacific Coast Hwy. #220, Corona del Mar, CA 92625-3235 (714-729-4222).

Two from Ivanhoe Software. Steven G. Steltzer, WF3T, has announced two new and easy-to-use programs. One is the Blackbook Database, a specialized personal information manager (PIM) designed for radio amateurs. Originally for use in maintaining club membership and mailing lists, the program allows you to maintain lists in four separate categories. It also has a full-featured editor, a viewer mode, and an autodialer. The program is $19.95 plus $2 shipping and handling.

A second program, CLUSTER.EXE, is a terminal program for the AEA PK232™ multimode data controller and is primarily intended for the DX PacketCluster™ user. However, since the program uses the host command mode of the PK232, other modes can be accessed when not connected to another station. CLUSTER .EXE offers various one-key macro commands, a ten-page scroll-back buffer, and the ability to capture all inbound and outbound data to a disk file. It's $15.95 plus $2 S&H.

Both programs are included in a $30.95 package (plus $2 S&H) from Ivanhoe Software, Inc., 944 Cedars Road, Lewisberry, PA 17339 (717-766-6361).

QTH Version 1.4. Namlulu Communications recently released an update to their specialized QTH (location) database. The new QTH program returns continent, country, capital, or major city, where appropriate; latitude and longitude; and CQ/ITU zone when you enter a contact or a prefix. There's also a band allocation chart, Q-signal reporting list, and DXCC countries list.

The $7.95 program is available from Namlulu Communications, 1120 Meadowview Road, Willard, OH 44890 (419-935-0270).

PC Tools™ for Windows. Over the years we have increasingly been impressed with each new version of Central Point Software's PC Tools for DOS. In recent columns we discussed Version 8. It's a powerful group of integrated utilities designed to make computing simpler and faster, and provide needed insurance against data loss. The package includes hard-disk backup and disaster recovery; virus protection; a memory optimizer; a remote device mapper; a task switcher; and more.

Now Central Point Software has outdone itself with what I believe is its most impressive product ever, PC Tools for Windows. It's intended to work closely with Microsoft's MS-DOS 6 and Windows, supporting them both. The new product is a fundamental extension to the operating environment presented by DOS and Windows, to make Windows much

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THE STANDARD BY WHICH ALL OTHERS ARE JUDGED

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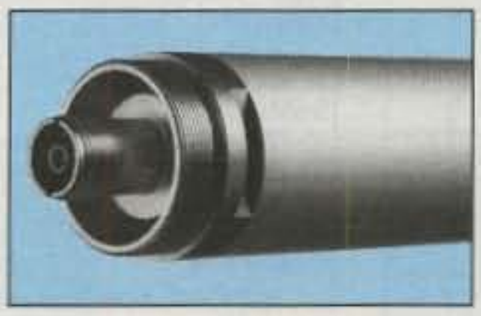
●HIGHEST GAIN ●UPS SHIPPABLE ●HIGH WIND RATING ●FIBERGLASS RADOME
●DC GROUNDED ●STAINLESS HARDWARE

X-500HNA

RUGGEDIZED BASE/
REPEATER ANTENNA



COAX CONNECTION
AT BASE END

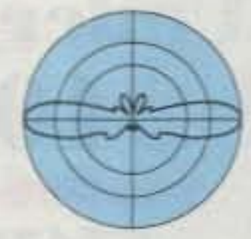
HEAVY DUTY BASE/
RADIAL ASSEMBLY

STRONG JOINT COUPLINGS

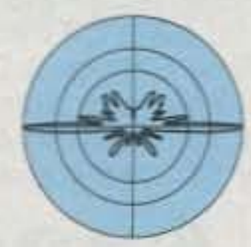
Xseries

MODEL	BAND(MHz)	GAIN(dBd.)	WATTS	CONN.	HT. Ft.	RATED WIND/ MPH
X-50A	144/440	4.5/7.2	200	UHF	5.6	135
X-200A	144/440	6.0/8.0	200	UHF	8.3	112
X-300A	144/440	6.5/9.0	200	UHF	10.2	112
X-510NA	144/440	8.3/11.7	200	N	17.2	90
X-510MA	144/440	8.3/11.7	200	UHF	17.0	90
X-500HNA	144/440	8.3/11.7	200	N	17.8	90+
X-700HA	144/440	9.3/13.0	200	UHF	24.0	90
X-2200A	144/222	6.0/7.8	150	UHF	11.5	112
X-3200A	144/222/440	6.0/7.8/8:0	100/200	N	10.5	112
X-6000A	144/440/1240	6.5/9.0/10.0	100/100/60	N	10.5	112

BAND: 144=144 - 148MHz. 222=222 - 225MHz. 420=420 - 430MHz.
430=430 - 440MHz. 440=440 - 450MHz. 1240=1240 - 1300MHz.
* X510NJ :144 - 147 / 430 -440MHz

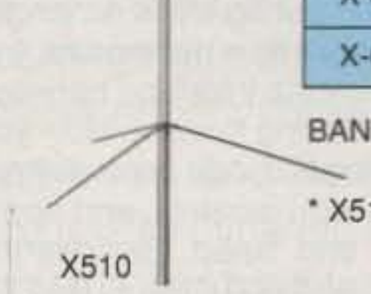


147MHz



445MHz

RADIATION PATTERNS FOR
X-500HNA/X-500MA/X-510NA

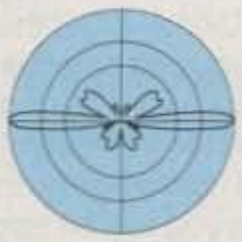


X510

GH/F/U&V series

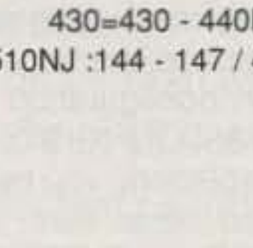
MODEL	BAND(MHz)	GAIN(dBd.)	WATTS	CON N.	HT. Ft.	RATED WIND/ MPH
DP-GH62	50	6.0	200	UHF	21.0	78
F-22A	144	6.7	200	UHF	10.5	112
F-23A	144	7.8	200	UHF	15.0	90
F-142A	222	5.5	200	UHF	6.0	110
F-718A*	440	11.5	250	N	15.0	110
F-1230A	1240	13.5	100	N	10.5	90
U-200A	440/1240	8.3/11.7	100	N	5.9	135
U-300A	440/1240	8.6/13.2	100	N	8.3	110
U-5000A	144/440/1240	4.5/8.3/11.7	100	N	5.9	135
V-2000A	50/144/440	2.1/6.2/8.4	150	UHF	8.3	110

*F-718A:440 - 450MHz, F-718J:430 - 440MHz, F-718L:420 - 430MHz



U-300A 440MHz

F-22



U-300A 1200MHz

F22 U5000 GH62

plication's icon or the program's executable file. Just finding the changes the application made, much less correcting them, is a real chore, even for an experienced Windows user. For a beginner, it may prove to be too difficult.

While there's no "magic bullet" to facilitate this task, MicroHelp's UnInstaller makes the task of removing an application much easier. The program analyzes your system and offers to delete everything necessary to completely remove an application.

Bundled with the copy of The UnInstaller I received was the IniClean™ utility. It's a specialized .INI file editor that lets you edit the various WIN.INI sections and view .INI files created by other applications. You can use it to wipe clean the most common of the "fingerprints" left on your system if you removed an application without using The UnInstaller. A particularly handy feature is the following: when editing the WIN.INI file, you can tell IniClean to display all entries, non-standard entries, or entries made since you last used IniClean. These features let you conveniently track and keep on top of the changes made to your WIN.INI file by other programs.

The UnInstaller is list priced at $79. For more information, contact MicroHelp, Inc., 4359 Shallowford Industrial Parkway, Marietta, GA 30066 (1-800-922-3383).

As this issue of *CQ* went to press, MicroHelp announced a new and more powerful version 2.0 of The UnInstaller, and also reduced its price to $69.95. We hope to look at the new version in a future column.

Pizazz Plus for DOS and Windows. Pizazz Plus is no stranger to this column. We reviewed earlier versions on several occasions, most recently V3.0 for DOS in June 1992.

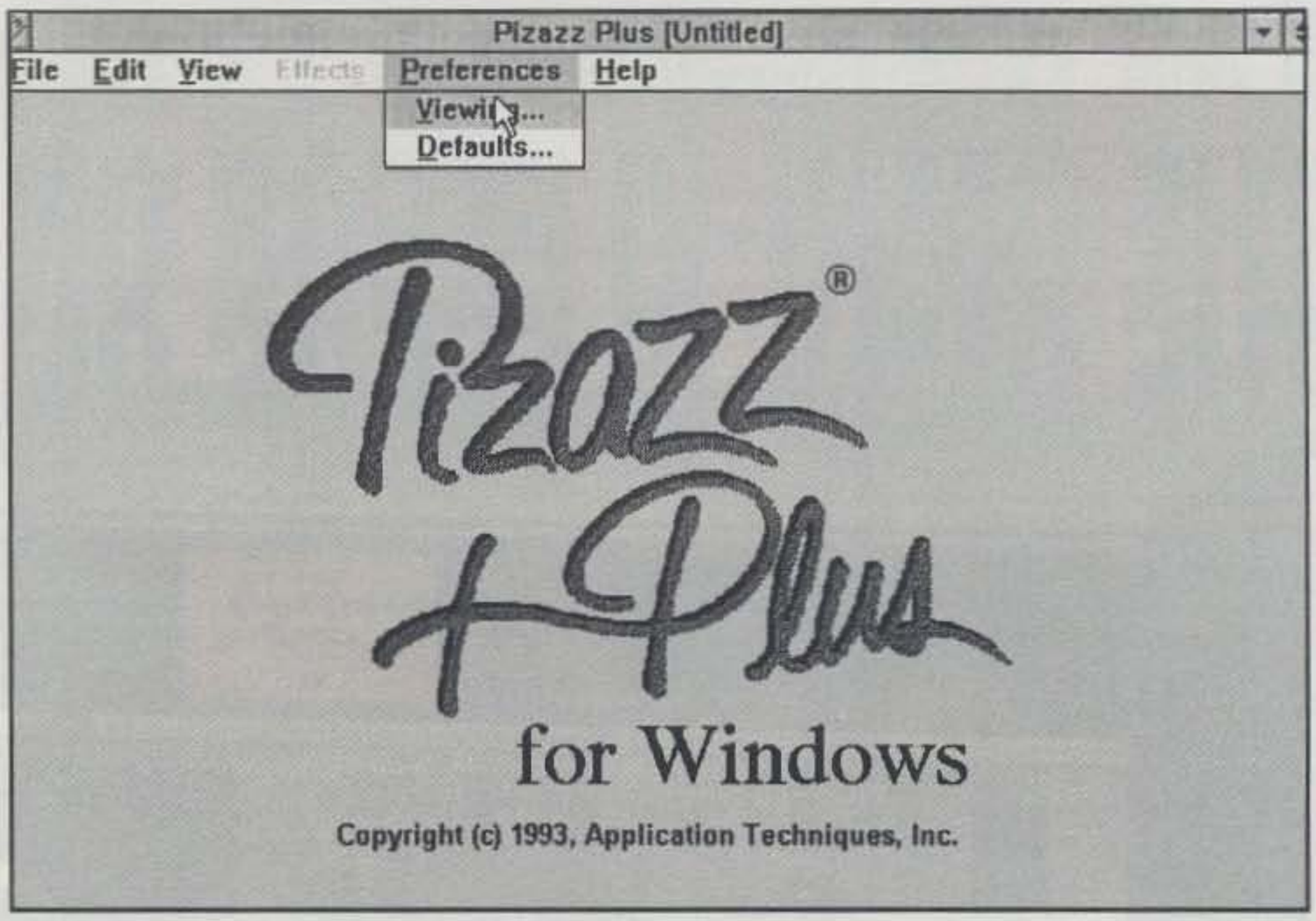


Fig. 3– Pizazz Plus Version 4 has two complete versions in a single package—one for Windows and one for DOS. Both offer screen capture, image manipulation, image file conversion, and high-quality printing. While there is some difference between the two versions, they accomplish basically the same thing. Both support more than 500 different printers and many new video boards.

Pizazz Plus Version 4 offers Windows and DOS screen capture, image manipulation, image file conversion, and high-quality printing in color and black-and-white. You also can use the program to import and display graphic images you've obtained from other sources such as CompuServe or CD-ROM collections. The program is compatible with most video boards and with more than 500 different printers. (Photo courtesy Application Techniques, Inc.)

Pizazz Plus is a sophisticated IBM PC graphics screen capture and print utility. The program, in effect, provides a customizable, high-tech screen-dump replacement for the relatively simple screen print program that comes with DOS. Pizazz Plus lets you capture almost any black-and-white or color image you can display on your computer's monitor, graphics or text, from any applications program. The program then allows you to manipulate the captured images in various ways and print them out or store them in a disk file in various formats.

Now there's Pizazz Plus Version 4, which contains *two* complete versions in a single package—one for Windows and one for DOS. Both versions offer screen capture, image manipulation, image file conversion, and high-quality printing. While there is some difference between the two versions because of the differences in requirements between DOS and Windows, the two programs accomplish basically the same thing. Both support more than 500 different printers (including the popular HP DeskJet 550C and LaserJet 4) and most video boards.

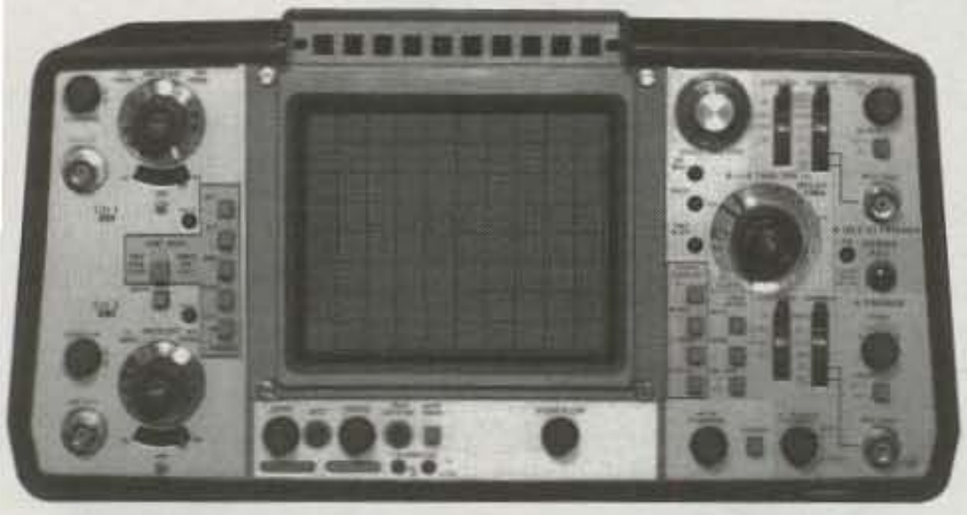
Especially noteworthy are the Windows version's features. When you need to capture a Windows screen, Pizazz Plus lets you capture the entire screen, the active window, or just the "client area" within the active window; you also can capture the cursor if you like. When you grab a screen, you can indicate the file format you need, saving your screen image in any of several dozen different file formats. The Windows version also includes special printer drivers that let you produce better quality prints than you usually can obtain from Windows; I'm using them on all the Windows screen prints you see in this month's column. ATV and SSTV buffs, take note!

Pizazz Plus for Windows and DOS is $149; registered users of earlier versions can upgrade for $59. For more details, contact Application Techniques, Inc., 10 Lomar Park Drive, Pepperell, MA 01463 (1-800-433-5201).

Short Bursts

New from Universal Radio. Many SWLs and scanner enthusiasts have long been intrigued by ACARS, the Aircraft Communications Addressing and Reporting System. This specialized aviation teletype mode can be likened to a sort of "commercial packet" that uses the AM

WE'RE PRACTICALLY GIVING 'EM AWAY!



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$695

Why Pay Over $1200 For A New 50 MHz Or 60 MHz Dual Trace Oscilloscope, When You Can Own A Tektronix 100 MHz Scope For Only $695?

This is the first time we have been able to offer such a quality scope, with its' excellent bandwidth for this super-low price. You must act now- quantity is limited! Tektronix built these instruments rugged, with ease of serviceability in mind. They were built to work in such extreme temperatures from Tulle, Greenland to Mojave, California. They tested it to work at 15,000 feet, and subjected it to 30g's shock, why, they even dropped tested it from eight inches on each corner and face, a total of 14 drops. That's why we think you will get years of carefree service from it. This instrument would be just as home in a Fortune 500 company's test lab or some individual's Ham Shack. Since it draws only 60 watts of power, with a small 12 volt inverter, you can work on your boats' radios and radar, your cars' 2-way radios, and if you have an airplane you can probably figure a way to work on your instruments and radios.

Specifications...

Vertical Section:

- Bandwidth: DC to 100 MHz with or without probe
- Bandwidth limit mode: bandwidth limited to 20 MHz
- Rise time: 3.5 nS or less
- Deflection Ranges: 5 mV/div. to 5 V/div. in 10 ranges (1-2-5 sequence)
- Max. Input Voltage: ±250 VDC peak AC at 50 Hz
- Display Modes: CH 1, CH 2, (normal or inverted), Alternate, Chopped (250 Hz rate), Added, X-Y

Horizontal Section:

- Time Base A: 0.5 S/div. to 0.05 µS/div. in 22 steps (1-2-5 sequence). X10 magnifier extends fastest sweep rate to 5 nS/div.
- Time Base B: 50 mS/div. to 0.05 µS/div. in 19 steps (1-2-5 sequence. X10 magnifier extends fastest sweep rate to 5 nS/div.
- Mixed Sweep Accuracy: A portion: ±4%; B portion: ±2%
- Horizontal Display Modes: A, A intensified by B, B delayed by A, mixed

Sweep Section:

- Calibrated Delay Time: Continuous from 0.1 µS to a least 5 S after the start of the delaying A sweep
- Differential Time Measurement Accuracy: For measurements of two or more major dial Divs.: +15° C to +35° C, 1% +0.1% of full scale

Power Requirements:

100 V to 132 V or 200 V to 264 V RMS. 48 Hz to 440 Hz. Maximum power consumption of 60 W at 115 V, 60 Hz

Weight: 27 lbs

Size: 13.6"W x 7.0"H x 24.4"D

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We're Not Sure How Long We Can Supply The Tek 465M At The $695.00 Price.

We're going to sell all of our existing stock at this price, however when they are gone, we either won't have anymore for sale or the price may go up! A lot of our customers were disappointed last year when we ran out of the USM338's, and if you have seen our recent catalog, we had to increase the price because of increased cost for us to obtain them. Don't hesitate!! Get your order in today!!

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- HEWLETT-PACKARD: 1740A, 339A, 400FL, 435A, 436A, 478A, 8478B, 8481A, 3312A, 3314A, 3325A, 3457A, 3466A, 3468A, 3478A, 3488A, 3577A, 3580A, 4191A, 4192A, 4193A, 4342A, 4261A, 4328A, 4329A, 5315A, 5316B, 5342A, 5370B, 6000series of power supplies, 8111A, 8350B, 8510B, 8568B, 8656A, 8753A, 8756A, 8901A, 8920A, 44421A, 86603A, and Many More Related Items. Let Us Know What You Have!
- TEKTRONIX: 212, 465, 465B, 492, 577, 1405, 1420, 1502B, 2215, 2236, 2465, 5110, 5111, 5CT1N, 7A29, AA501, AM503, FG501A, PG506, SG503, SG504, TM5006 and Many More.
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EXPLORE T

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NEW

Icom IC-T21A

2m Handheld w/440 MHz Receive

$Call for price

The ultimate in 2m handhelds! 2m transceive and 440 MHz receive permit full duplex operation. The exclusive Whisper Mode allows telephone-like conversations while in duplex mode. The large display and backlit keypad provide ease of use. The new SC-1257 power module delivers a powerful 6 W of output power with 13.5 VDC- Another Icom first! Up to 6 hours of operation time is possible with its power-saving features. Tone scan automatically selects subaudible repeater tones, 114 memory channels store all necessary repeater settings and 5 DTMF memories allow for easy dialing of your favorite phone numbers from an autopatch. This radio even scans 3 to 4 times faster than most other handhelds! Step up to the new Icom T21A today! Also available: T41A, 440 MHz version.

SUPER PRICE, 7W!

Icom IC-2GAT

2M HT $319

The IC-2GAT is the only handheld on the market which gives you 7 watts capability. It also includes 20 memories, CTCSS encode, call channel, multiple scan modes, and a rugged durable design.

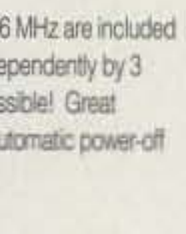
Icom IC-2SAT/3SAT/4SAT

Handheld Transceivers

IC-2SAT 2m HT (with FREE BP-82).....$299
IC-3SAT 220 MHz HT.....$339
IC-4SAT 440 MHz HT.....$399

These great little handhelds are another marvelous breakthrough from Icom in the field of handheld miniaturization. They feature a convenient keyboard, 5 W of extraordinarily high output power(with optional battery) 48 memories, a call channel and more. You can use the internal batteries or add a variety of external battery packs for more life/power. It can also be powered from a 6 to 16 VDC supply. Other great features include a built-in clock, numerous tuning step increments, 4 output power levels, high sensitivity (less than .18 µV) and that legendary Icom rugged construction and dependability.

Order the IC-2SAT today and we'll include a FREE BP-82 7.2 V 300 mAh extra battery!



HUGE FACTORY DISCOUNT! FINAL PRICE TOO LOW TO PRINT! CALL FOR MORE INFO!

Icom IC-2iA

Handheld HT ~~$309~~

This shirt-pocket sized radio eliminates the myriad of buttons found on most other HTs and allows the simplest operation of any handheld. Sophisticated features such as 10 memories, scan modes, 24 hour clock, advanced power saving functions, tone squelch, and much more are included. Up to 5 W output is available in this unit that measures only 2.3" x 3.6" x 1.2". Leave all those complicated buttons behind- step up to the simple-to-use but powerful IC-2iA!

Icom IC-Δ1A

Tri-Band HT

~~$989~~

HUGE FACTORY DISCOUNT! CALL FOR MORE INFO!

The IC- Δ1A is the first tri-band handheld in the amateur world! 2m, 440 MHz and 1296 MHz are included in one compact body. All 3 bands can be received simultaneously and controlled independently by 3 volume controls and 3 main dials. Full cross-band double duplex operation is now possible! Great standard features like 78 memories, built in DTMF encoder/decoder, programmable automatic power-off and many more make this the best of the best in handhelds.

NEW

Icom IC-281H

2m Mobile with 440 MHz Receive

$Call for price

This rugged new mobile from Icom features 2m transceive and bonus 440 MHz receive coverage allowing full duplex crossband operation between these bands! 60 memories are standard plus 10 scratch pad memories that store your 10 previously transmitted frequencies for instant recall. An optional tone scan feature automatically sets the subaudible tone for easy repeater access while traveling. An optional voice synthesizer announces your operating frequency. The built-in data jack connects a TNC directly to the modulation circuit for packet convenience and 9600BPS capability is standard. 50 W power output, a large display, auto-dialing capability, auto power off and much more round out your best choice in a 2m mobile.

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erience the customer service and support of Tucker tomorrow!

Icom IC-2GXAT

INTRODUCTORY SPECIAL $10 OFF NOW... $289

2m Handheld

The new IC-2GXAT offers surprisingly simple operation with the features and performance amateurs have come to expect from Icom products. 7 W of output power make hitting those repeaters a breeze. The display can be set to indicate memory channel numbers only. This keeps frequencies secret, restricts operating frequencies or simplifies operation for an unfamiliar user. The auto repeater operation automatically activates the correct duplex direction when the receiver frequency tuned is within the repeater output frequency range. 40 memory channels, 5 DTMF auto dial memories, power saver features and a die-cast aluminum rear case with a splash-resistant body round out this outstanding new offering.

Icom IC-Δ 100H

NEW

Triple Band Mobile (2m/440/1.2 GHz) $1389

Three independent band units for 2m, 440 MHz and 1.2 GHz operation (simultaneous receive) with three independent displays that display S/RF, volume and squelch levels. Each display is controlled by a separate volume and tuning knob and the audio can be selected from 3 external speaker jacks. Each band has a separate antenna connector to enable duplexer/triplexer use without any mismatching antenna loss. Cross-band double duplex (transmit on one band while receiving on two others) and full cross band duplex is now possible in a mobile! The head can be detached from the front panel and mounted separately. Other great features include 2.4 W of audio power, priority watch, 642 memory channels and much, much more!

Icom IC-707

CALL FOR SPECIAL PRICING!

HF Transceiver ~~$839~~

For someone just starting out or wanting a simple to use radio, the new 707 is a great choice. It has easy to use push-button functions, a large LCD display that won't wash out, an easy to hear front-mounted speaker, rugged Icom quality and a price that will fit your budget. Of course it has many of the features found in more expensive radios such as 32 memory channels, dual VFO, RIT, a general-coverage receiver and much more. In short, the 707 is the easiest introduction ever to Icom performance and quality.

Bearcat BC 890 XLT

200 Channel Scanner-With 800 MHz!

$275

This new item from Bearcat has frequency coverage through 956 MHz* with 200 channels of action in 10 banks! The turbo scan feature lets you zip through the channels in lightning speed. 10 priority channels let you scan important frequencies every 2 seconds. It even includes a VFO knob for up-down frequency control. Other features include weather search, auxiliary tape output, weather alert, illuminated LCD display, reception counter, and step select. Frequency Range: 25 to 956 MHz * Cellular Blocked- modifiable.

GREAT FOR HT'S!

ANLI SB-152

Portable Power Pack $59

This portable power pack supplies 12 Volts at 6.5 Amps & 3, 6, and 9 Volts. Loaded with features including easy-to-read voltage meter, AC adapter, power lamp, and handle for easy transportation. If you need a portable power pack get the SB-152!

AEA PK232MBX

Multi-Mode Controller

$317

With over 50,000 units sold worldwide, the PK-232MBX is the world's leading multi-mode data controller. Combining all amateur data communication modes in one comprehensive unit, the PK-232MBX offers Morse code, Baudot, ASCII, AMTOR/SITOR 476 and 625, HF and VHF Packet, WEFAX receive and transmit, as well as commercial standard NAVTEX/AMTEX automated marine/ARRL information services. The PK-232MBX provides any RS-232 compatible computer or terminal with complete amateur digital operating capabilities. All decoding, signal processing and protocol software is on ROM in the PK-232MBX. Only a simple terminal program is required to interface the PK-232MBX to your computer. The PK-232MBX package includes an RS-232 interface cable that connects the unit directly to the RS-232 port of the computer.

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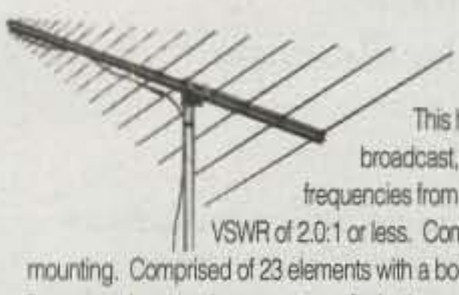
SPECIAL PURCHASE! *Daiwa PS140II*

13.8 V, 14 A Power Supply $69

The PS140II is perfect for use with VHF/UHF mobiles, handheld transceivers and cellular phones. Built-in cigarette lighter socket. 12 A continuous. 5" x 4" x 9", 11 lbs.



Create 5130-2

LOG Periodic Antenna $199

This high gain, wide band VHF/UHF antenna is excellent for DXing, Amateur Radio, FM broadcast, scanners, VHF/UHF television, government, cellular, and business band use. Covers all frequencies from 105 to 1300 MHz with outstanding performance such as excellent forward gain and VSWR of 2.0:1 or less. Compact and lightweight, all aluminum design with multi purpose horizontal or vertical mounting. Comprised of 23 elements with a boom of 4.6 ft and the longest element of 4.6 ft. If you are thinking about getting your license and want only one antenna for both scanner and amateur radio use, get it all with this great antenna!

Alinco DR600T

$30 COUPON SPECIAL FINAL PRICE $589

High Power Remoteable VHF/UHF Mobile $619

Alinco invented the remote control transceiver in 1990 and now re-defines it with the DR600T. Standard features include FULL remote control with or without a security code. The user can exercise control over BOTH BANDS from one control channel. This means that a single band HT is all that is required to take full advantage of this feature. Also included is DSQ for private paging, auto dialer channels, direct frequency input from microphone, CTCSS encode and odd splits on every memory channel. This rig also features state of the art sensitivity and selectivity, including Air band reception capability with a simple modification. For security and convenience, the head can be mounted separately from the main unit with the optional separation kit. Measures 5 7/8" x 2" x 7".

EDC-20 Separation Kit: 16' Cable $43.95 EJ-7U Tone Squelch Uni $62.95

New Tucker Packet Computer

Your choice of either desktop or mini-tower case-style!

New from Tucker Electronics, your complete source for Amateur Radio and computers comes a product that combines our expertise in both fields, the Tucker Packet Computer. The Tucker Packet Computer combines a Tucker PC compatible computer with our line of amateur radio equipment to form a complete, ready-to-operate 2M packet radio setup. No longer do you have to worry about buying separate TNC's, radios and a computer...we at Tucker Electronics have done the work for you! The Packet Computer combines a powerful Tucker 386/SX33 with 1 MB of RAM, your choice of a high-density 5 1/4" or 3 1/2" floppy drive, mono monitor, serial and parallel ports and a keyboard. Packet control is provided by the DRSI PC Packet adapter 1 which fits inside the case and includes software for easy control. RF is provided by the Alinco DR-1200T 2M Data Radio which features 25 W RF output, 14 memory channels and much more. It is completely self-powered, just plug in an antenna and go! Custom configurations are listed below. Get into the exciting world of Packet Radio without all the hassle- order a new Tucker Packet Computer today!

Base system: $749 Your choice of either desktop or mini-tower case-style

Custom Configurations: With a 40 MB hard drive, add $125, With a 120 MB hard drive, add $200, With CGA color, add $50, With VGA color, add $200. We can customize the system further to your specifications. Call for more information.

Kantronics KPC-3

Packet TNC $117

The KPC-3 is a small-sized, low power, full featured packet TNC designed with the new user in mind while providing all the power required by experienced packet radio operators. The KPC-3 incorporates the Kantronics full-featured PBBS, including reverse forwarding to a BBS, mail waiting LED, and remote sysop access. It comes complete with version 5.0 firmware, DB-9 connector, 2.1mm power connector, and two manuals: one a quick-start manual, the other a complete reference manual. Measures 0.8" x 5.2" x 5.2" and requires 6-25 VDC at only 40 mA max.

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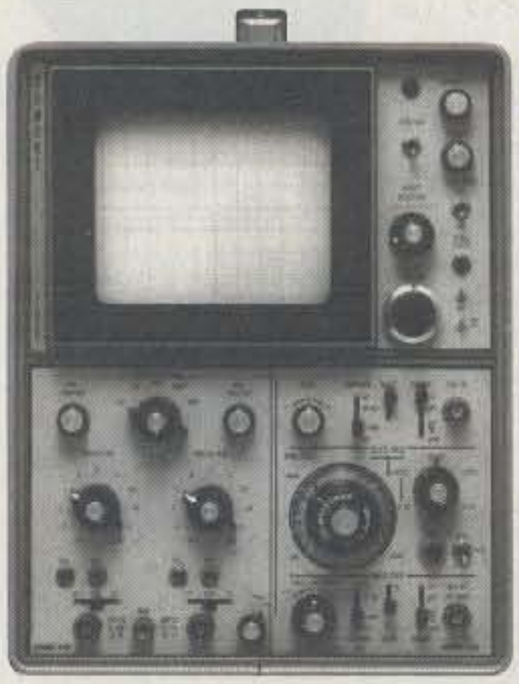
HP 141T/8552B/8554B

Spectrum Analyzer System

$2995

This system package offers absolute amplitude calibration capabilities from +10 dBm to -125 dBm over a frequency range of 100 kHz to 1250 MHz. The 141T storage display allows easy viewing even at the slowest of sweep speeds. Sensitivities: to -125 dBm (125 nV). Bandwidth Ranges: 100 Hz to 300 kHz in 1-3-10 sequence. Scan Widths: 2 kHz/div to 200 MHz/div in 2-5-10 sequence. Display Ranges: LOG, 10 dB/div & 2 dB/div, LINEAR. Scan Times: 0.1 msec/div to 10 sec/div in 1-2-5 sequence. Tuning Stabilization available at scan widths of 100 kHz/div or less.



Military 50 MHz Solid-State Oscilloscope

(USM 281E, Manufactured by Dumont)

$299

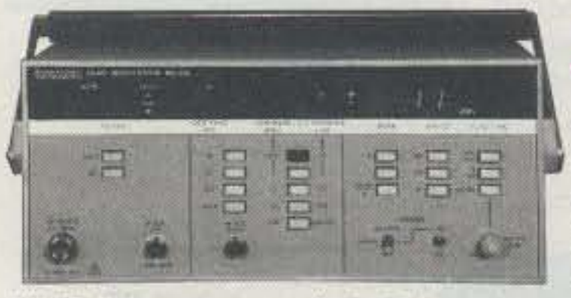
You've been asking for a low cost, dependable Dual Trace Oscilloscope and you won't find a better deal than this! Designed to meet strict military specifications, this solid-state scope is quite capable of accurately displaying and measuring simple and complex waveforms from DC to 50 MHz. Portable, dependable, and easy-to-use, consists of mainframe, vertical, and horizontal plug-in units. Loaded with features found in much more expensive units, this scope offers vertical deflection factors from 5 mV/div to 10 V/div in 11 calibrated steps with an accuracy of ±2%. Vertical input impedance is 1 MΩ (±2%) paralleled by 24 pF (±1 pF). A crisp, bright display is provided by a 8 cm x 10 cm, internal graticule, flat face CRT incorporating P31 aluminized phosphor and a 12 kV acceleration potential. Dual channel with dual trace in alternate, chopped and added algebraically modes. Horizontal plug-in provides a time base of 0.1 µS/div to 2 S/div in 22 steps and includes a X10 magnifier. Delayed sweep is also included as are multiple options of coupling and triggering modes including internal/external triggering sources and low/high frequency reject coupling. Works with 47.5 to 430 Hz power input including aircraft power! Includes front and rear covers, calibrator output, Z input, and Gate outputs. User friendly front-panel controls means even the most inexperienced user will be up and making measurements in no time! Portable (43 lbs).

PRD 2020/2021

Vector Voltmeter System

$995

Here's an easy way to measures the amplitude and phase relationship of two RF voltages. Frequency range from 1.5 MHz to 2.4 GHz. Sensitivity is -65 dBm. Incorporates twenty-three position range switch, selects overlapping bandwidths, fine tuning is fully automatic. Includes 0 to 1 V recorder output. Equipped with the S3 Sampling Head.



Boonton 82AD

Modulation Meter $1295

If you're looking for a handy portable or bench digital modulation meter, look no further! This meter allows FM modulation measurements to 300 kHz and AM modulation depth to 300% over a frequency range of 10 MHz to 1.2 GHz. The readout is made on a 4-digit LED display to an accuracy of ±2%. Tuning may be accomplished automatically or externally on the highest signal level present. Functions available include kHz Deviation, %AM, and Level. Ranges (10, 30, and 300), readings may be taken as Positive, Negative, or Peak to Peak divided by 2. Push button switch filtering includes High Pass of 10, 30, 300, or 3000 Hz, and Low Pass of none, 3, 15,120, or 200 kHz. De- emphasis of 50, 75, 750, or 6 dB/oct/1 kHz. Other specifications include: maximum safe input level of 7 V rms, acquisition time of 100 mS at 100 MHz, 50 Ω input impedance, sensitivity of 10 mV rms to 520 MHz and 30 mV rms to 1.2 GHz, dimensions 12.5" wide, 15.7" deep, 6.4" high, 14 pounds.

HP 4260A

Universal Bridge

$495

Digital readout of resistance (10 Ω to 10 MΩ), capacitance (1 nF to 1000 mF) and inductance (1 mH to 1000 H). Also measures dissipation factor (0.001 to 50) and quality factory (0.02 to 1000). Has electronic auto balance and single control null.

Systron-Donner 6152A

512 MHz Timer/Counter

$199

The 6152A is an easy to use counter with large 7-digit readout, covers the frequency range from 0 to 50 MHz (DC), 10 Hz to 50 MHz (AC), 10 to 512 MHz (prescaler range). Resolution of 0.1 Hz to 1 MHz in decade steps. Sensitivity of "A" input 100 mV rms (DC to 200 MHz), "B" and "C" inputs DC to 10 MHz, "D" input 10 mV rms (10 to 512 MHz). Period measurements (DC to 10 MHz) 1 period to 10^8 periods in decade steps and Time Interval measurements from 0.1 µS to 10^8 Sec. Ratio measurements: fA/fB with multiplier from 1 to 10^8 in decades steps; range of 0 to 200 MHz (fA), 0 to 10 MHz (fB). Scaling: 0 to 200 MHz with scale factors of 10 to 10^8 in decade steps. Features include: display storage, 500 µS to 5 Sec sampling times plus hold, and marker outputs. A versatile counter capable of a wide range of applications.

HP 608E

Signal Generator $350

- 10 MHz to 480 MHz
- 0.1 µV to 1.0 V OUT
- 0 to 95% AM MOD; + CW or PULSE
- ±0.5% frequency accuracy

HP 606A

HF Signal Generator $250

The widely used and important frequencies of 50 kHz to 65 MHz are delivered by this versatile performing generator. The basic frequency stability of the 606A is excellent , less than 0.005% after warm up. Very fine frequency adjustment is achieved through incorporation of a ΔF control which provides better than 10 ppm resolution. To improve frequency accuracy, a crystal calibrator with checkpoints at 100 kHz and 1 MHz intervals is included. The use of feedback in the power amplifier section also yields excellent amplitude modulation characteristics. Up to 95% modulation can be achieved with modulation frequencies ranging from DC to 20 kHz. Internal oscillators of 400 Hz and 1 kHz are also provided. The output level from the 606A is continuously adjustable from 0.1 µV to 3 VRMS into a 50 Ω load. Direct calibration is provided in both volts and dBm (+23 to -120 dBm) and the output calibration is accurate to ±1 dB.

B+K Precision 2707 $89 FACTORY NEW!

"Tool Kit" Digital Multimeter

This 3 1/2 Digit Multimeter is called the "Tool Kit" and the reason is simple, it does it all! In this one handheld meter you have the power to measure all basic multimeter functions including DC & AC Volts, DC & AC Current, and Resistance, plus the extra added functions of Capacitance, Frequency, Transistor Tester, Logic Probe, Diode Tester, and Continuity Tester. Can you imagine, just about anything you need to measure, all with one handheld? You can now!

- Basic Accuracy: DCV ±0.5%
- Resolution of 100 µV, 0.1Ω, 0.1 µA, 1 pF, 1 Hz
- Single function and range control
- DCV: 200 mV to 1000 V; ACV 200 mV to 750 V; Capacitance: 2 nF to 20 µF; DC & AC Current: 200 µA to 200 mA & 10 A; Resistance: 200 Ω to 200 MΩ; Frequency: 2 kHz to 200 kHz
- Features include: Auto polarity, auto zero, overrange indication on all ranges, and overload protection.

Electro Impulse DPM-3

RF Power Meter $169

The DPM-3 has 50 & 150 watt ranges and covers the frequency range of 2 to 500 MHz. N(f) input connector, air cooled, 50 ohm impedance. Refurbished unit.

Call, write or fax for a **FREE** *copy of our latest catalog!*

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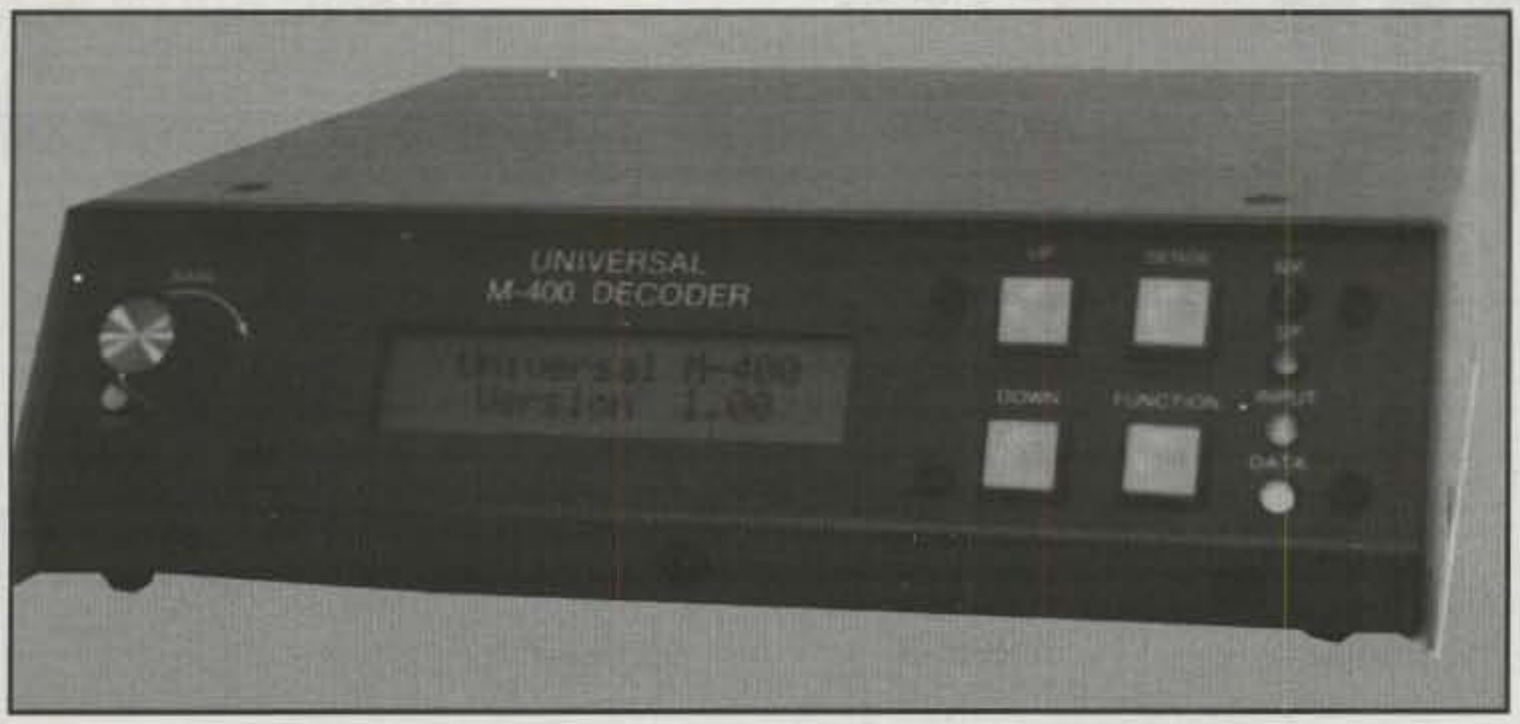


The Universal M-400 teletype reader decodes a wide variety of teletype formats, including ACARS, the Aircraft Communications Addressing and Reporting System, mentioned in this month's column in connection with Ed Flynn's new booklet on the subject. The M-400 features a two-line, 40-character LCD display; it is self-contained and has a parallel printer port. Price is $399.95. (Photo courtesy Universal Radio, Inc.)

mode (since the airborne VHF radio is also used for voice communications); burst transmissions are used with a limit of 220 characters per message. The system is used to transmit data and messages between commercial aircraft and airport ground stations. These messages deal with weather, schedules, engine performance, fuel usage, emergency situations, and private communications. ACARS can be monitored on any scanner capable of receiving the VHF aircraft band, or at least 129–132 MHz, where most ACARS activity is found.

A new booklet, *Understanding ACARS*, by Ed Flynn, sheds some light on this specialized aircraft communications; it provides the information you need to interpret and understand the messages. ACARS message types and formats are defined, and there are useful tables of airline and airport identifiers. The 53-page booklet is $4.95 from Universal Radio, Inc.

Postscript: Until recently it was quite difficult to decode ACARS messages, but newly introduced decoders such as the Universal M-400 teletype reader (see photo) and the M-1200 decoder card now include ACARS capability in addition to decoding of more conventional signals such as Baudot and ASCII RTTY, FAX, SITOR, ARQ, FEC, and related modes. The most recent editions of the Universal Radio catalog (free by fourth class mail, $1 for first class) include a useful comparison chart showing reception modes, shifts, printer control, and other features of Universal's and competitors' readers, decoders, and cards.

For more information, Contact Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068 (1-800-431-3939).

Wrap-Up

That's all for this time, gang. Next time more Antennas & Accessories topics of current interest. See you then.

Overheard: Wouldn't you know? It always seems that complex problems have very simple and easy-to-understand wrong answers!

73, Karl, W8FX

DOUG'S DESK

BY DOUG DeMAW, W1FB

CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORYs

Enhanced Audio Quality On Transmit

If one tunes across his or her favorite phone band a few times, it becomes apparent that audio quality is not everyone's most important product. Some signals are so badly distorted that it's nearly impossible to extract intelligence from the person's transmission. Other signals have excessive high- or low-frequency response, and depending upon the operator's voice, the lack of sufficient "lows" or "highs" can render the signal difficult to read. In this context, horrendous audio quality is heard all too often from rigs the operators of which can't resist using the speech processor, which, if adjusted correctly, can add some worthwhile "presence" to a signal without compromising the audio quality. Most processed signals sound like trash because the operator cranks up his mic gain excessively and uses 20 or more dB of compression. Not only does the signal sound bad on the operating frequency, but it spreads out across a wide frequency range because of distortion products. This unfairly interferes with communications that are in progress up and down the band from the offender's operating frequency. Ironically, we often hear the offender's brethren tell him that he sounds great and has no distortion. I have spoken in person to some operators who can't seem to operate without a lot of compression and excessive mic gain, only to be told that "I get out better that way." No amount of well-intentioned counsel can change their minds about this common misuse of the transmitter audio circuit.

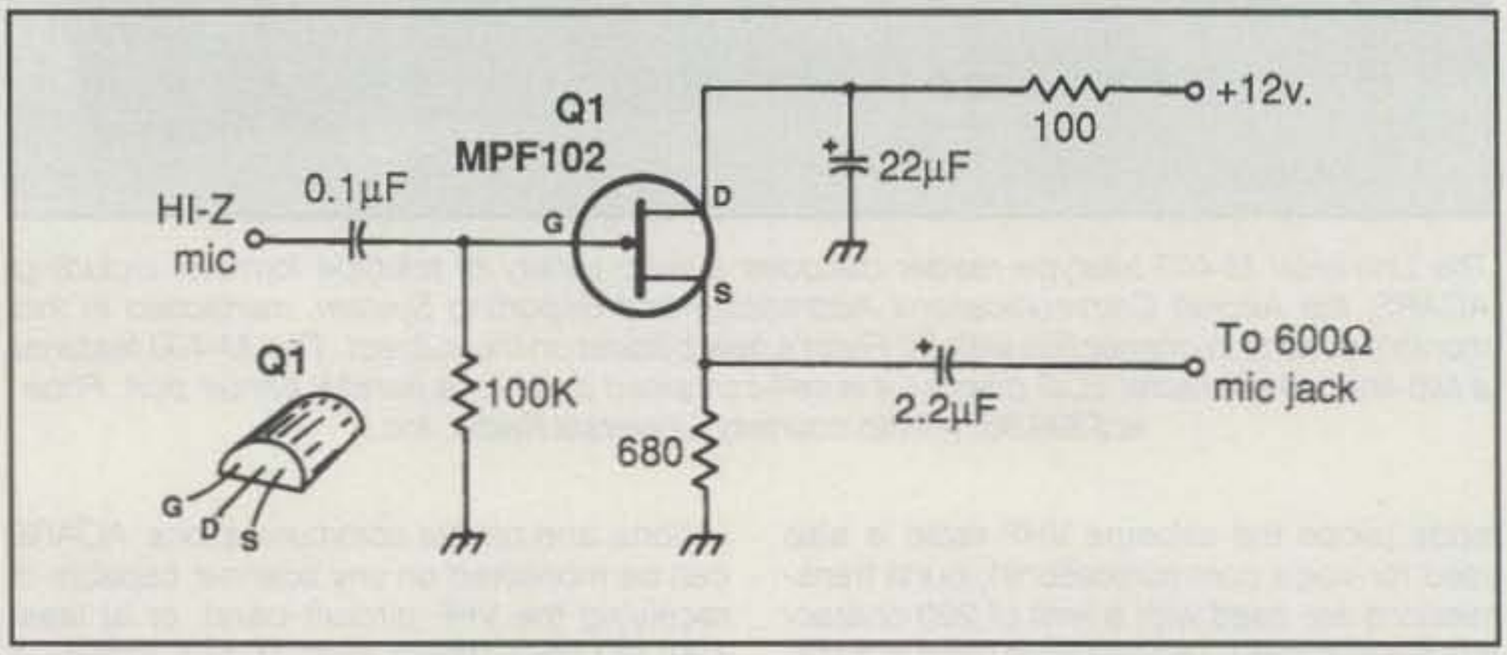


Fig. 1– Circuit for a simple microphone step-down impedance matcher for using a 50K ohm mic, such as a D-104, with a modern transmitter that has a 600 ohm mic input circuit. Any N-channel JFET may be used at Q1.

Speech Processing in General

A speech processor increases the *average* output power of the transmitter, which in effect fills in the valleys between signal peaks. It is easy to detect heavy processing by observing your S meter when copying such a signal. In a worst-case example the S meter remains constant (receiver slow AGC setting) as the person talks, whereas normally (no processing or light processing) there will be a decline in the S-meter reading between words. This excessive or heavy signal processing destroys the audio quality and makes the signal difficult to copy, even when the signal is 20 or more dB above S9. Excessive processing is hard on a linear amplifier because the duty cycle is such that the tubes have little chance to rest between words. Many a 3-500Z tube has had its life shortened by many hours because the operator used too much processing most of the time.

Most modern transmitters or transceivers are designed to permit reading the processing level in dB. If the operator sets his mic level correctly and uses no more than 6 dB of compression during processing, the signal will sound great and will have just enough added punch to make it stand out in QRM. This assumes, or course, that the unprocessed audio sounds good in the first place. I have often wished that equipment manufacturers were required to limit the amount of compression to 10 dB by means of a built-in governor circuit!

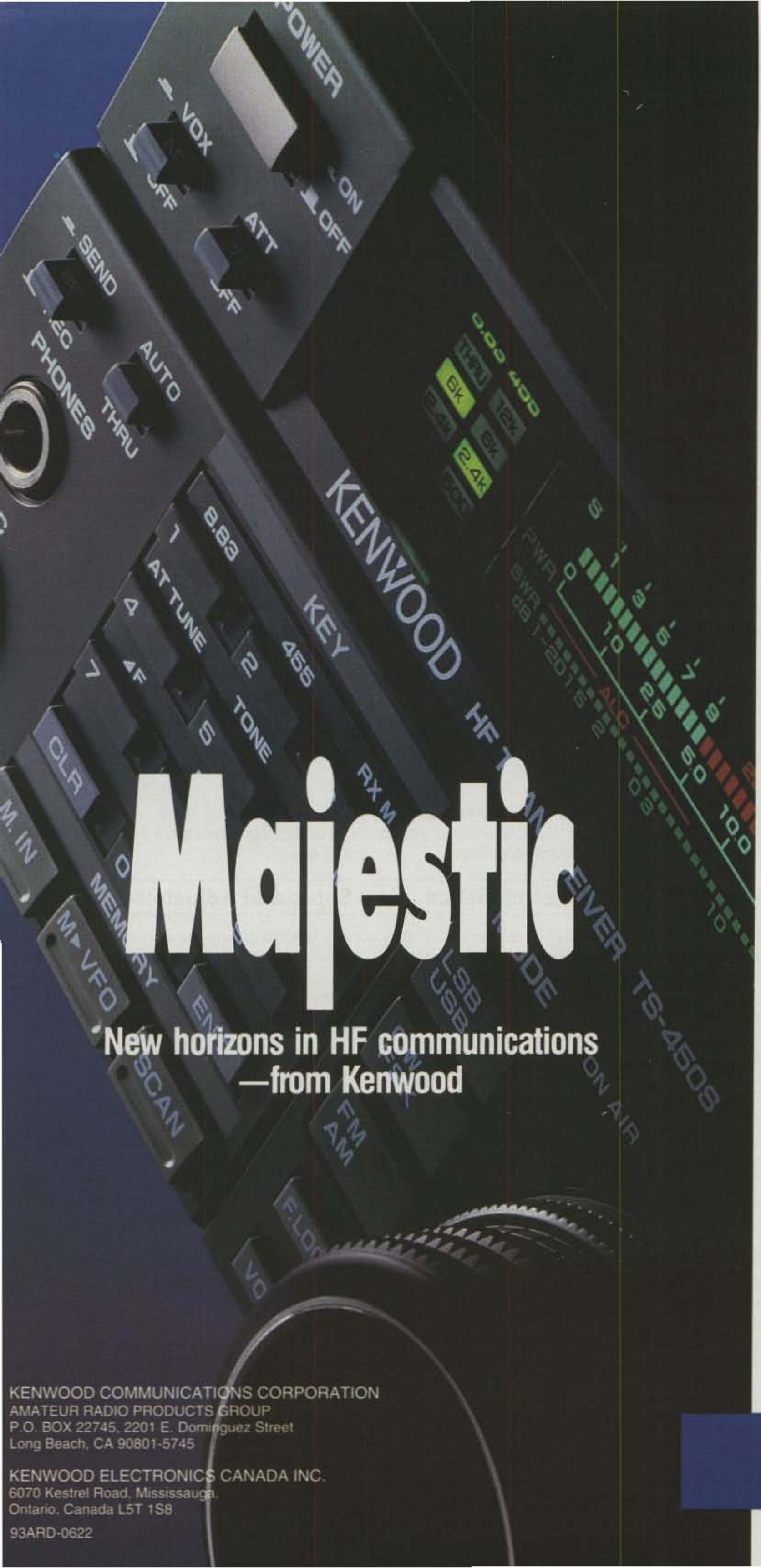
P.O. Box 250, Luther, MI 49656

Match the Mic Impedance

The wrong mic with a specified transmitter can make it sound as if it has a "screech" amplifier rather than a speech amplifier. Most modern equipment is designed for a 600 ohm microphone. Despite this fact there are a number of operators who prefer, for example, the once-famous D-104 desk microphone. These "lollipop" mics have excellent output quality if they are connected to the right load. However, they have a characteristic impedance on the order of 50K ohms. Interfacing the D-104 to a 600 ohm port not only spoils the low-frequency response, it effectively reduces the mic output level. Here again we must recognize that maximum power transfer can only occur when unlike impedances are matched. Some operators have applied a simple-fix "bandaid" to overcome the mismatch problem by placing a 100K ohm resistor in series with the audio line from the mic. This provides a better load for the mic, but the resistor attenuates the high-frequency response somewhat. A better method for obtaining an impedance match is seen in fig. 1, where a JFET is utilized as an impedance transformer.

Hand-Held Microphones

Audio response is often restricted by the elements found in hand-held mics that come as standard equipment with transceivers. Most of the elements are the dynamic type and they seem to favor the lower frequencies. Persons with bassy voices (I am one) are told that their audio is difficult to copy because there are no "highs." I find it incredible that $1500 (or more) transceivers don't come equipped with mics that deliver the same audio quality as the desk mics made by the same manufacturer. Part of the problem is that the desk mics generally contain electret elements, which produce excellent audio quality. I have heard some hand-held mics on new rigs that sound no better than a carbon mic, no matter how the operator adjusts the mic level of the rig. If you are told that you have "tinny" audio with your hand-held mic, then give



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- **AIP system**
  Kenwood's exclusive AIP (Advanced Intercept Point) circuit raises the receiver's intermodulation dynamic range to 108dB, while lowering the noise floor level.
- **Superior interference reduction controls**
  IF shift, AF notch, dual noise blankers, CW reverse mode, and pitch control. IF filter settings can be stored in memory.
- **Ultra-fine tuning (SSB, CW and FSK modes)**
  By engaging the FINE key, the operator can tune precisely in 1Hz steps, thanks to the Direct Digital Synthesizer (DDS).
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  The internal antenna tuner can automatically establish the optimum match between 20 and 150 ohms in the 80 to 10 meter band. The optional AT-300 automatic external tuner covers 160-10m, and can also be used to tune single-wire antennas.
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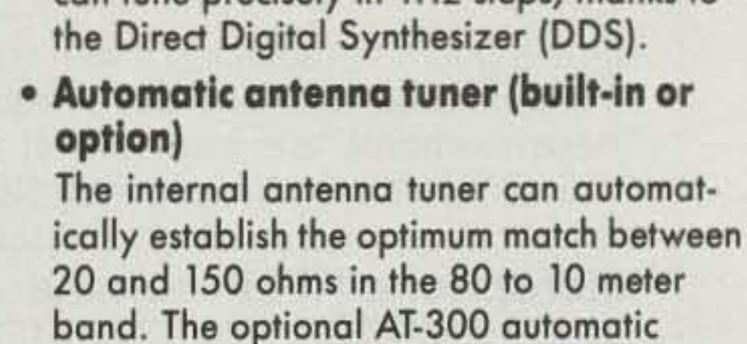
The TS-450S can be computer-controlled with the optional IF-232C and HamWindows software. See your Authorized Dealer for more details.



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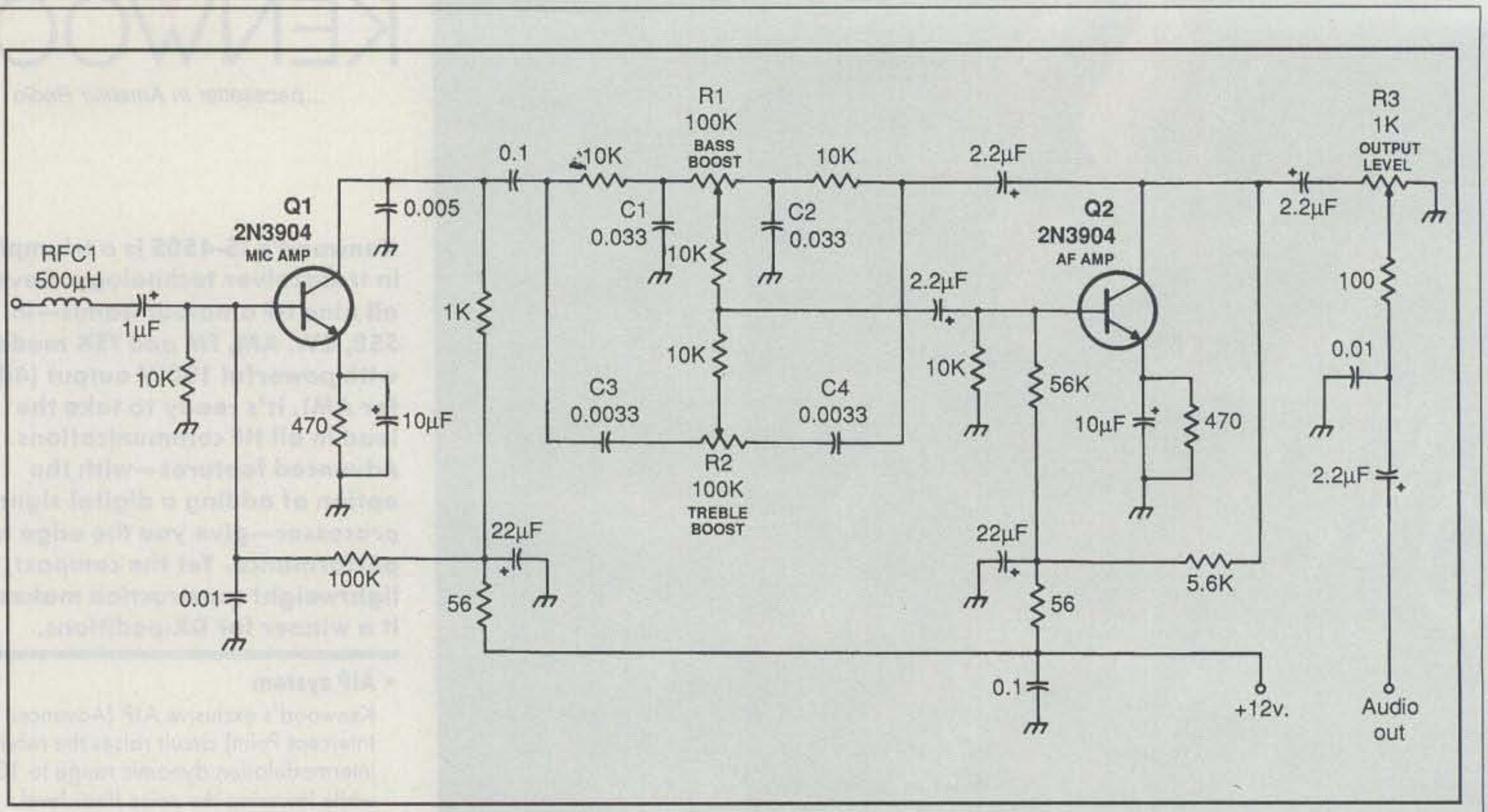


Fig. 2– Schematic diagram of a mic amplifier with bass and treble boost circuitry. RFI suppression has been included. Decimal value capacitors are in µF and resistors are in ohms. K = 1000. The resistors are ¼ watt carbon film units. Polarized capacitors are electrolytic or tantalum. C1 through C4 should be high-Q capacitors such as mylar or polystyrene. R1, R2, and R3 are PC-board-mount trimmer controls. This circuit will operate properly from a 9 volt transistor-radio battery if +12 volts is not available. RFC1 is a small molded RF choke.

some thought to replacing it with a quality desk mic, or install an electret element. These elements are available at most Radio Shack stores for less than $2.

Microphone RFI Problems

One of the most common causes of distorted audio is RF energy getting into the microphone electronics or the speech amplifier of the transceiver. This usually occurs when the operator is using a desk mic that has an internal amplifier. I have cured the RFI problem in Kenwood and ICOM desk mics by adding simple RFI-suppression components. The suppression methods I used were utilized in an amplified homemade electret desk mic I described in August 1989 *QST*, page 19.

A miniature 500 or 1000 µH RF choke needs to be located at the input to the mic preamp within the mic stand. A 0.01 or 0.02 µF bypass capacitor is added between the preamp input terminal and ground. The leads that exit the mic stand (PTT, +12 V and audio lines) should also be bypassed to prevent RF energy from migrating to the electronics within the mic stand. Again, you may use 0.01 or 0.02 µF miniature disc ceramic capacitors. These values do not roll off the audio highs sufficiently to be detected by ear. These capacitors also help prevent RF energy that is picked up on the mic cable from entering the transceiver and affecting its internal speech amplifier.

Your Voice Characteristics

Your natural voice may lack lows or highs. Developing "talk power" is sometimes difficult if your voice consists mainly of high-frequency components. Conversely, a lack of highs can render your voice difficult to copy if QRN or QRM is present. I am one of those people who is troubled by having a bassy voice, and this frequently prompts people to accuse me of being too high in frequency during SSB communications. A solution to both problems (too many highs or lows) is found in the use of bass- and treble-boost circuitry immediately after the mic preamp. Fig. 2 contains a circuit I developed for my use with electret mic elements. I roll off the lows and accentuate the highs, which makes my transmissions more intelligible without sacrificing signal quality. Trimpots® are used to control bass and treble boost and are preset for the desired frequency response. A third Trimpot® is used to set the output level from the mic amplifier.

A 2N3904 audio amplifier, Q2, interfaces the mic electronics to the mic input circuit (600 ohms) of the transmitter. The audio-output level is set by means of the 1K ohm potentiometer in the collector circuit of Q2.

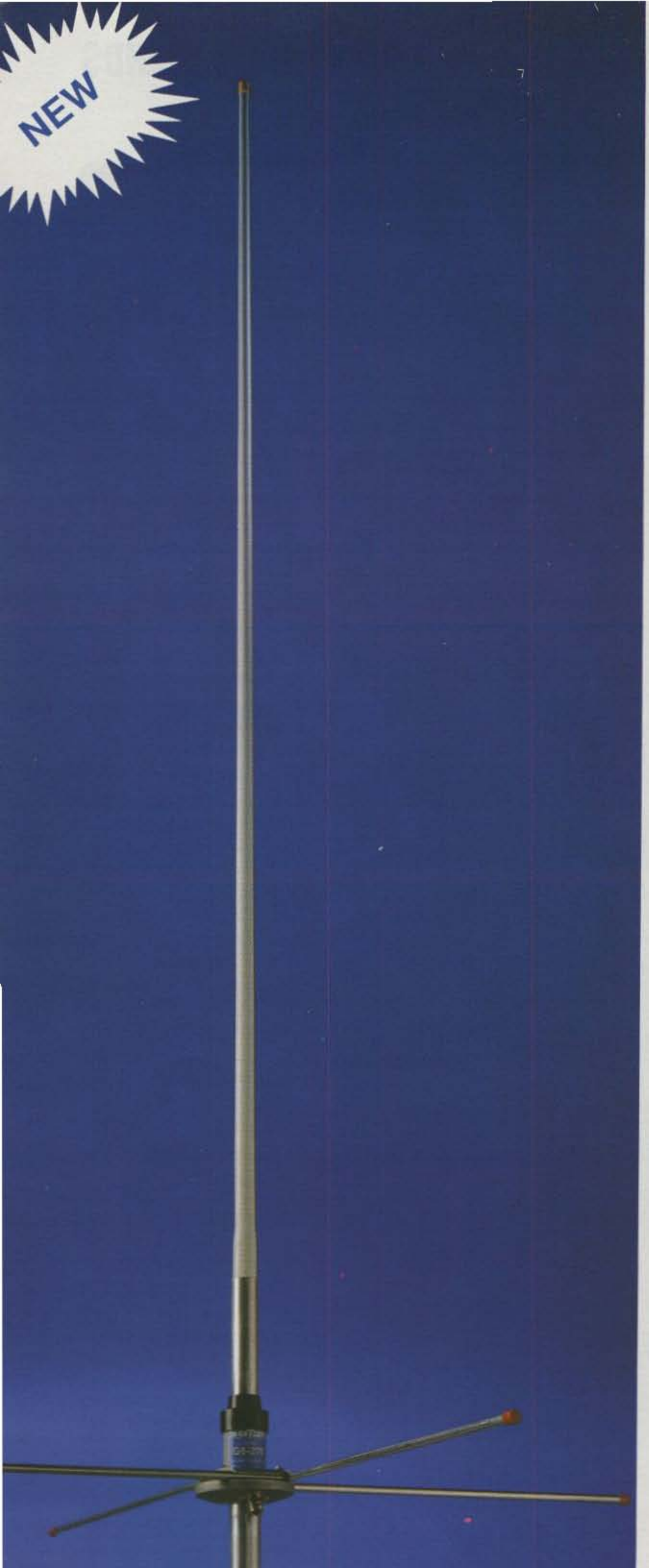
Setup and Adjustment

It is best to adjust the mic-gain control of the transmitter for the correct level, consistent with the required undistorted power output, while using an unamplified mic of the proper impedance. The amplified mic is now connected and R3 is adjusted to provide the same transmitter output power. This ensures that the first speech stage in the transmitter is not overdriven, which would cause distortion.

The R1 and R2 (the boost controls for the Baxandall circuit) are adjusted while monitoring your transmitter output signal with a receiver, or by using the built-in monitor circuit of your transceiver if it has that feature. Recheck the R3 setting once the boost circuit is set for the audio characteristics you desire.

Alternatives

It may be more convenient for you to build the microphone electronics in a separate enclosure to permit using any mic you may have available. The operating voltage for the mic amplifier/booster can be obtained from the mic jack of most mod-



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Gain:	6 db VHF 6 db UHF
Bandwidth:	10 MHz UHF 3MHz VHF
Design:	4x5/8 wave collinear 440 5/8 over 5/8 collinear 2 meters Shunt fed-DC ground
Length:	100 inches
Weight:	6 lbs
Wind Survival:	100 mph
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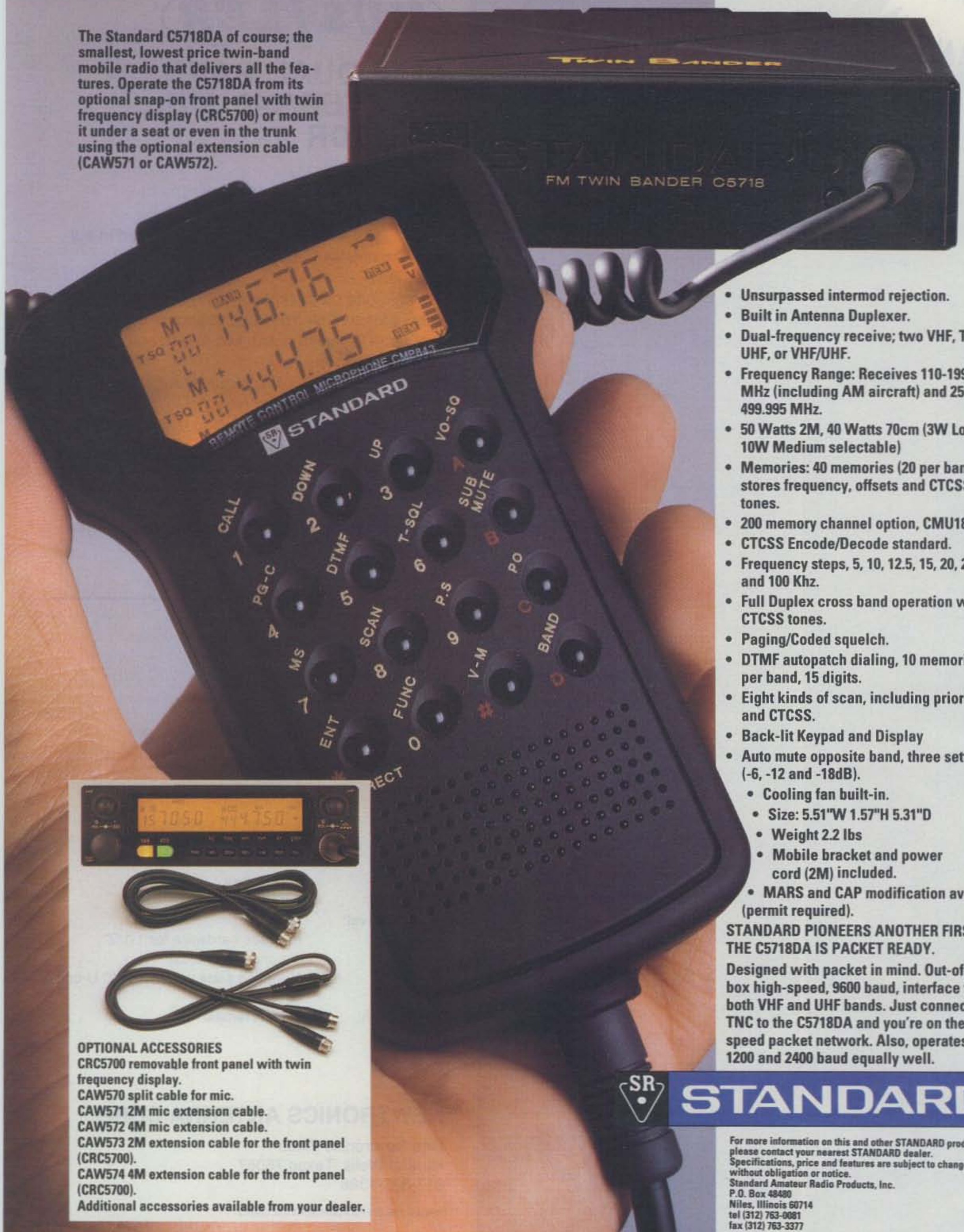

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- Eight kinds of scan, including priority and CTCSS.
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- Size: 5.51"W 1.57"H 5.31"D
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ern rigs. There is usually a pin that provides +12 V. Should this voltage not be available, you may power your mic amplifier with a 9 V transistor radio battery. Be sure to include an ON-OFF switch if a battery is used. Failure to turn the circuit off when it is not in use will greatly shorten the battery life.

In Summary

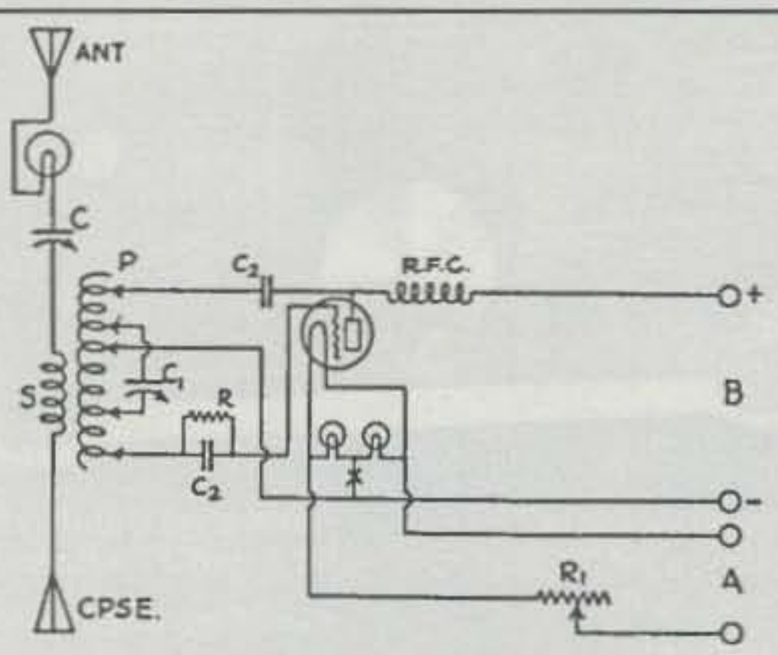
You may have concluded that I am a grouch of the first magnitude for having been so candid with my views concerning poor audio quality and distortion in our amateur bands, but there is no excuse for using 20 "yards" of audio gain and speech processing, just because the controls make it possible to abuse your signal. There was a time in our amateur radio past when nearly everyone loved to be told "you have broadcast quality, OM." It is my sincere wish that this article will help you to improve your signal quality. Certainly, good audio and no distortion will make your QSOs more effective, while at the same time preventing your signal from occupying more bandwidth than it should. It should go without saying that there's no better way to ensure that your signal is clean than to monitor the transmitter output with an oscilloscope!

Radio FUNdamentals

BY BILL ORR, W6SAI

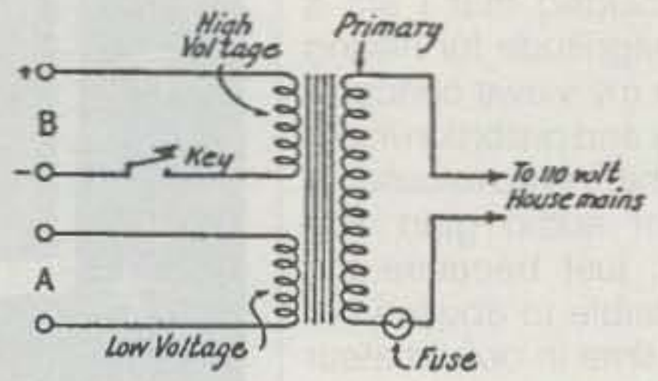
THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

QRH? QRH?



THE INDUCTIVELY COUPLED HARTLEY CIRCUIT

SCHEMATIC DIAGRAM FOR SIMPLE LOW-POWER TRANSMITTER



THE SIMPLEST POWER SUPPLY CIRCUIT FOR A TRANSMITTER

A three-winding transformer or separate filament and plate transformers may be used. The signal put out by a transmitter with such a power supply is known as ACCW.

Fig. 1– Early amateur rig used self-excited oscillator with AC plate supply. One tube does it all! (Radio Amateurs Handbook, *1926.*)

"Charlie, please give me a frequency check."

"Roger, I read you at 14,203.45 kHz. QSL?"

Easy, isn't it? The now-generation of amateur transceivers can read out the operating frequency to 10 Hz, and the long-term frequency stability is very good. Almost like having WWV in your pocket!

Well, it wasn't always like that. It took a long time to get to where we are today in terms of frequency stability and readout! Here's part of the story, as seen from the amateur point of view.

If you were licensed about 1924 and were eager to get on the air, your first problem was to determine where the amateur bands were on your receiver dial! Although the HF amateur bands were wider than those of today, it wasn't easy to find them on an uncalibrated homemade receiver. However, if you listened around long enough, you could get a rough and ready idea of where the bands were supposed to be. You would soon find out, for example, that the 40 meter band was somewhere between XDA on the low side and WIZ on the high side. And if you were lucky, you might hear some amateur signals between these two loud commercial stations. You would mark these points on your receiver dial, or on a handy piece of paper. That would give you an approximate idea of where the band was.

The next problem was to place your one-tube, self-excited transmitter in the band. Easier said than done!

If you took the antenna off your two-tube regenerative receiver, you could try to listen to your transmitter. No way. the transmitter would be loud enough to block the receiver! That wasn't much help in determining the frequency of your transmitter.

In 1924 every amateur rig was self-excited. That was the only way to go. Worse, many oscillators operated with raw AC as a plate supply (fig. 1). The note and frequency stability of these rigs was very, very bad. Some transmitters would drift 100 kilocycles (kiloHertz) during a transmission, waltzing right out of the band! And the note! It would be an act of charity to describe it as other than a wobbly, splattery signal.

If you were lucky enough to own a calibrated wavemeter (fig. 2), you could measure your frequency to about 50 kHz, if you knew your onions. Problem was, if you had such a device, how would you calibrate it? You couldn't rely on harmonics of the local braodcast station, as its frequency was questionable. The only sure thing was to log as many shortwave commercial stations as you could, and those whose frequency (wavelength) was known, and try to draw a calibration graph for your receiver, in terms of wavelength.

If you were well-heeled, you could buy a General Radio type 358 calibrated wavemeter for about $20 (equal to about $400 in today's depreciated currency). That would spot you in a given amateur band.

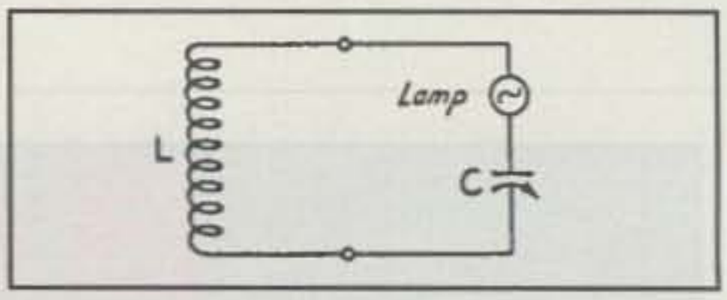


Fig. 2– A simple wavemeter. Tune to the transmitter frequency and the bulb lights! (Radio Amateurs Handbook, *1934.*)

The inexpensive idea was to find a loud, consistent amateur signal and snuggle up against him, frequency-wise, and *hope* that he was somewhere inside the amateur band.

The "Official Wavelength Stations"

In late 1924 the ARRL gathered a group of prominent amateurs who had well-calibrated wavemeters and who agreed to end their transmissions by giving their wavelength in meters. The original group had 10 stations, but it quickly expanded to 40 stations in all parts of the country. They were known as "Official Wavelength Stations—OWLS." These signals helped

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- Simple hookup to the radio (audio and PTT line)
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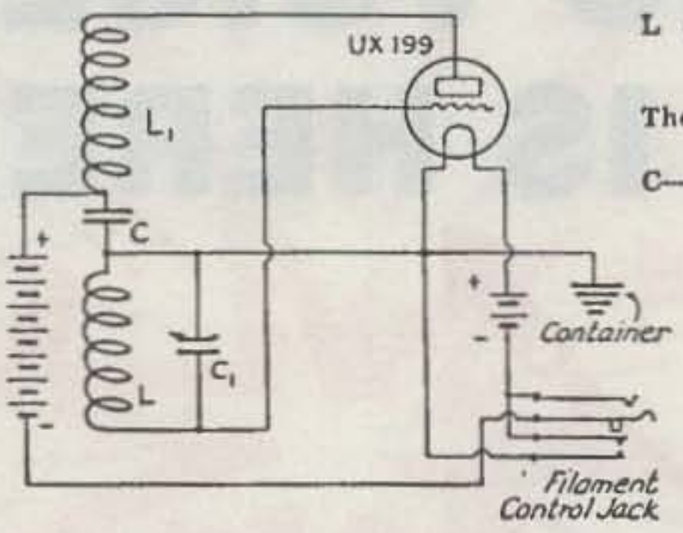


WIRING DIAGRAM OF PORTABLE RECEIVER-OSCILLATOR

L and L1 = 5 and 9 turns of 22 guage for 20 meters.
12 and 15 turns of 22 guage for 40 meters.
26 and 26 turns of 30 guage for 80 meters.

The coils are wound on a bakelite tube socket (1⅜" diameter).

C—1000 micromicrofarads fixed.

*Fig. 3– One-tube monitor for transmitter. (*Radio Amateurs Handbook, *1926.)*

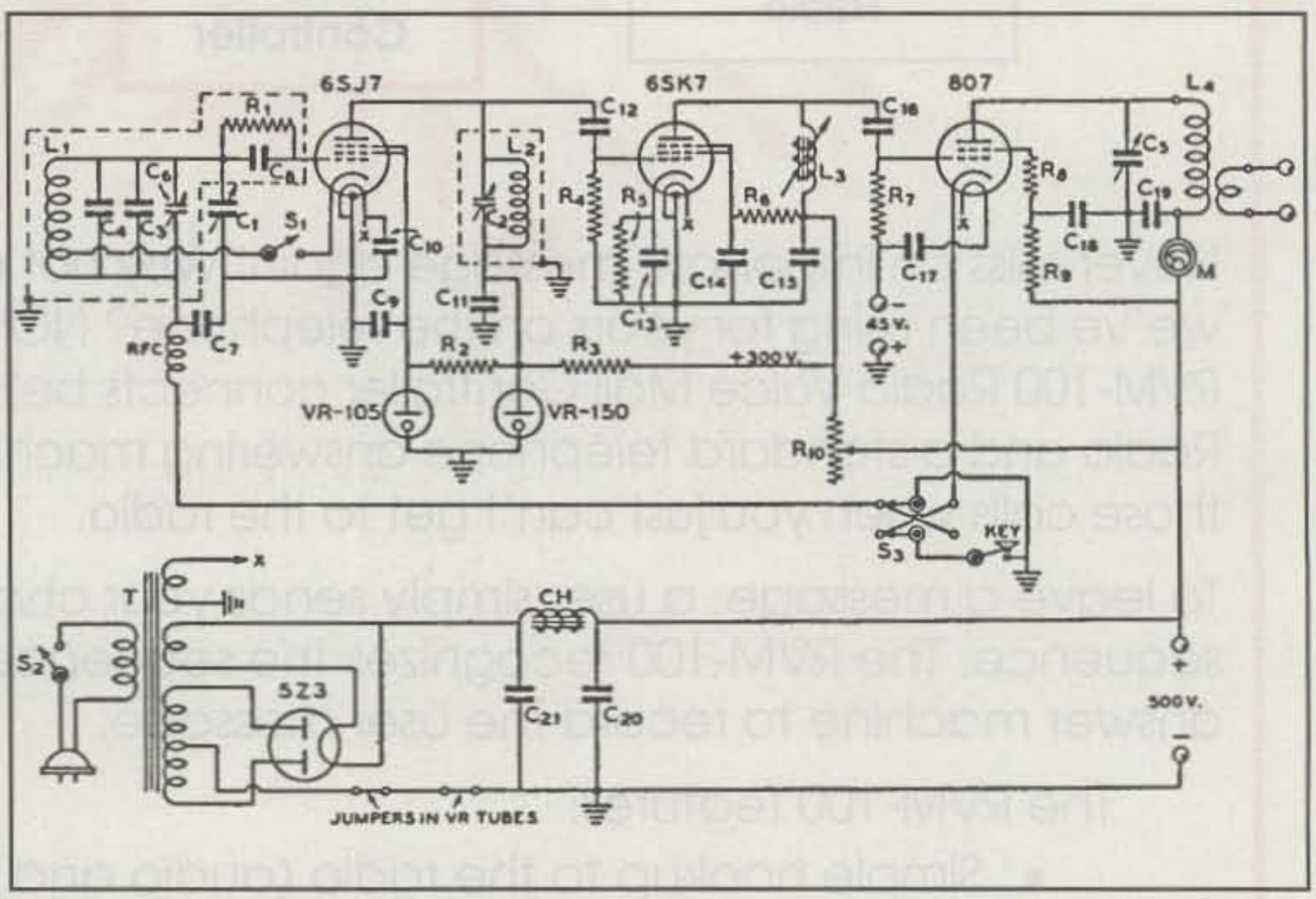


*Fig. 4– Twenty-five watt VFO-exciter. This type of exciter quickly replaced direct crystal control. (*Radio Handbook, *1938.)*

other amateurs calibrate their receivers and transmitters.

National Bureau of Standards Station WWV

In early 1923 the National Bureau of Standards, recognizing the general problem of determining frequency not only for amateurs but for other users of the radio spectrum as well, set up a standard frequency station, WWV. This station sent test transmissions on 24 different frequencies between 2400 and 200 meters (125 to 1500 kHz). Each spot transmission lasted eight minutes, and the transmissions ran from 11 PM to 12:30 AM EST. Frequency stability was as good as could be expected from a self-excited oscillator.

If you could hear the transmissions, you could calibrate your receiver over this range. Then you would build up a low-power oscillator to tune the range, zero-beat it to WWV, and listen to its harmonics. With a little luck, you could establish frequency charts for your receiver up to 40 meters or so, with reasonable accuracy.

To check your transmitting frequency, you needed another device—a monitor. This was a one-tube battery operated receiver built in a shelded box (fig. 3). This could be tuned to your transmitter and you could check the operating frequency as well as monitor the transmitter note.

Eventually you would be able to draw a wavelength versus dial reading chart for both your transmitter and receiver, and armed with your monitor, you could keep check of things from day to day.

Greater Frequency Stability From A Crystal!

A solution to the frequency control problem was the introduction of crystal control about 1924. The crystal "resonator" had been developed by Dr. W. G. Cady in 1922, but it wasn't until H. S. Shaw (1XAU) of General Radio Co. wrote a *QST* article[1] about oscillating crystals that amateurs knew anything about this fascinating device. Although Shaw had a crystal-controlled 10 watt transmitter on the air, he thought that crystal control might be a little "premature" for general amateur use. He was right. Crystals were very expensive ($40 to $50, complete with holder) and were prone to failure if the oscillator was not tuned properly.

As time passed things improved quickly. The Official Wavelength Stations slowly shifted to crystal control and broadcast their exact frequency in kilocycles (kiloHertz) at the end of QSOs. Amateurs could now determine their frequency within 5 or 10 kilocycles, even if they were not crystal controlled. And gradually, as circuit technology advanced, the problem of transmitter drift abated.

During the same period the price of amateur-band crystals dropped slowly, and by 1926 the price of a calibrated crystal was well within the means of many amateurs.

Well, between crystal control and the O.W.L.S., by 1926 frequency determination in the shortwave spectrum was established to such a degree that WWV announced that its services seemed no longer to be required and that it would probably close down in the near future. Sufficient economic and technical reasons existed, however, to keep WWV on the air to the present day.

The Eclipse of Direct Crystal Control

Direct crystal control was nice, but it prevented QSY, unless the operator had a handful of crystals. The solution was the stabilized variable frequency oscillator (VFO), which by 1941 became popular as amateurs realized the benefits of quick QSY, especially in the exotic art of working DX (fig. 4).

By 1947 the VFO had matured into a very stable device (remember the popular Collins 75A receivers and 32V transmitters?). This equipment used variable oscillators that were a direct descendant of the oscillator circuits used in the famous World War II Collins-designed ART-13 transmitter.

Oscillators of this general type were the circuits of choice until the advent of the synthesized frequency control circuit in the '70s. This quickly became the stan-

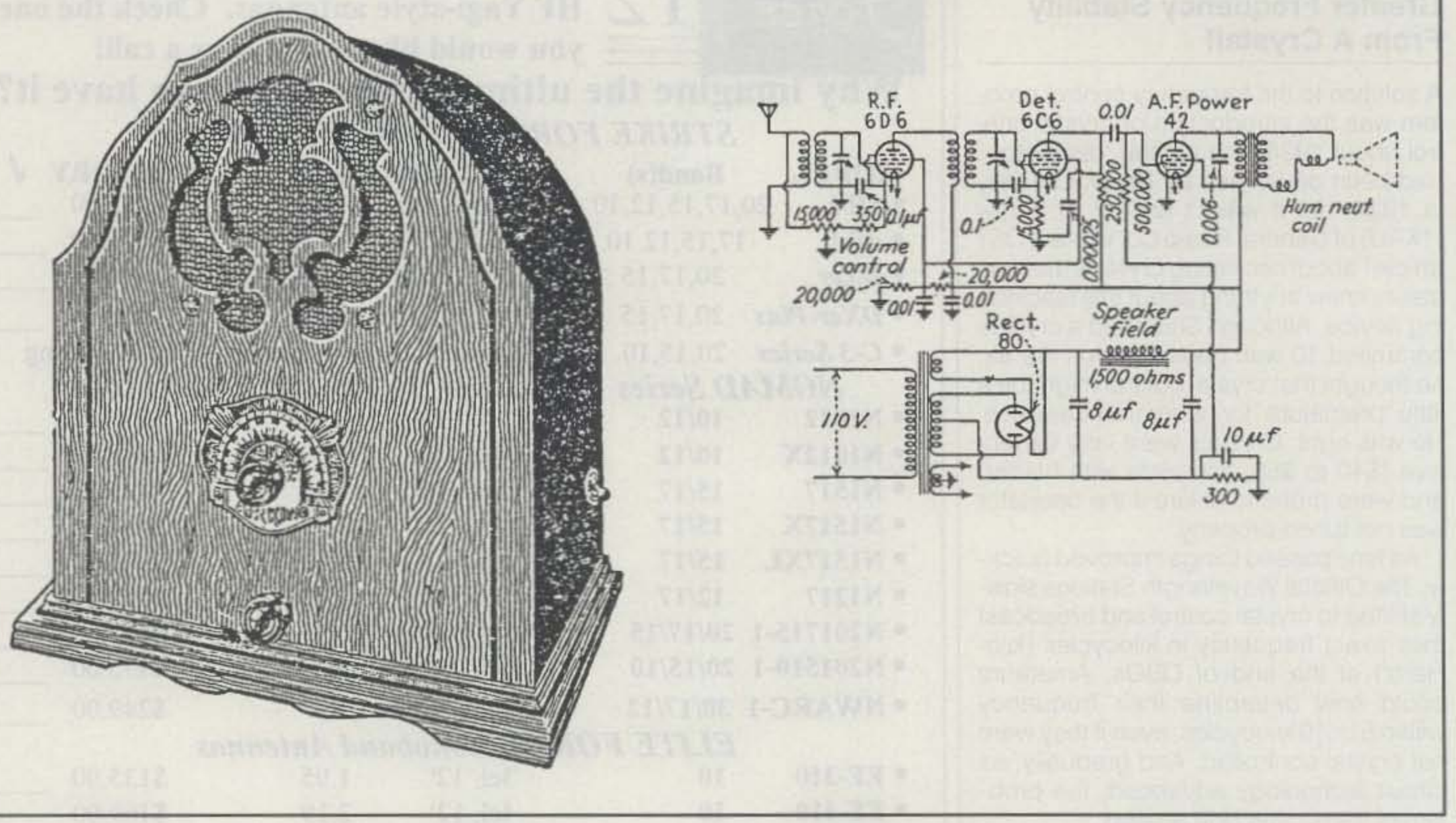


Fig. 5– An early attempt at an inexpensive broadcast receiver.

dard control device for HF transmitters and receivers, and has been during the past 15 years. Frequency determination was now a matter of cycles!

And here we are! It was a long and rocky path from the wavemeter of the '20s, and the progress of frequency stability in amateur radio mirrors the advance of amateur radio in other communication techniques. What will the next decade bring now that the basic problem of frequency stability has been solved?

Early AC-Operated Receivers

At the same time radio amateurs and members of other services were winning the battle of frequency stability, another fascinating development was taking place in entertainment radio.

The advent of AC-operated tubes in the early '30s gave a tremendous impetus to broadcast listening. Gone were expensive dry batteries and messy wet cells. You could just plug the radio into the light socket and it would play!

The theory of the AC, indirectly-heated cathode was known as early as 1914, but the first AC-operated tube wasn't developed until 1925.[2] The first commercially available AC tubes were intended as replacements for battery-type tubes and were not an instant success. Finally, in 1927 Arcturus and RCA brought out the first indirectly-heated cathode tube designed for new receivers—the UY-227. This was soon followed by a small family of tubes specifically designed for AC-operated sets.

Although AC-operated broadcast sets were soon on the market, they were bulky and expensive. What was needed was a cheap, dependable receiver that would appeal to the working man who didn't want to spend a bundle on a bulky receiver resembling a large piece of furniture!

The first attempt at a cheap broadcast receiver was a midget set employing a tuned RF stage, a detector, and a pentode audio amplifier (fig. 5). This little "single dial" set worked okay if you had a big antenna on it, and if there were not too many stations in your vicinity. As you might guess, selectivity was poor.

The biggest cost factor in this set was the power transformer and speaker, which together cost more than all the other components, including the cabinet. The life of this set was short, and poor performance and the cost to the consumer (about $18) quickly pushed the design off the market.

The AC-DC Receiver

The advent of a series of 6.3 volt heater-type tubes designed for automobile radios (types 75, 76, 77), plus the development of a rectifier and audio output tube (25Z5 and 43) with 25 volt heaters, made elimination of the costly power transformer possible. The tube heaters were strung in series with a resistor built into the line cord. The rectified line voltage powered the set (fig. 6). This was a step in the right direction, but the receiver still suffered from the defects of the tuned-RF autodyne circuit. The major receiver manufacturers knew it was necessary to design an inexpensive superhet circuit that would provide sensitivity and selectivity and still work with a series-string filament and a simple half-wave power supply.

"The All-American Five"

The "All American Five" is a good example of early system engineering wherein the tubes and the circuit were matched to provide an inexpensive 5-tube superhet receiver that had adequate sensitivity and selectivity (fig. 7). To reduce power lost in the heater resistor, the new tubes (12SA7, 12SK7, 12SQ7) employed a 12.6 volt heater at a current of 150 ma. The audio and rectifier tubes had 50 and 35 volt heaters, respectively (50L6 and 35Z5).

Either an external antenna or a built-in loop could be used. The receiver was termed "AC-DC," but few persons took advantage of operating the receiver on DC, because by the '30s there were very few communities that had a DC utility. (Certain portions of New York City, for example, had 110 volt DC mains until well into 1934.)

The "All-American Five" receiver was very compact and cheap to build. The first receivers were made by well-known com-

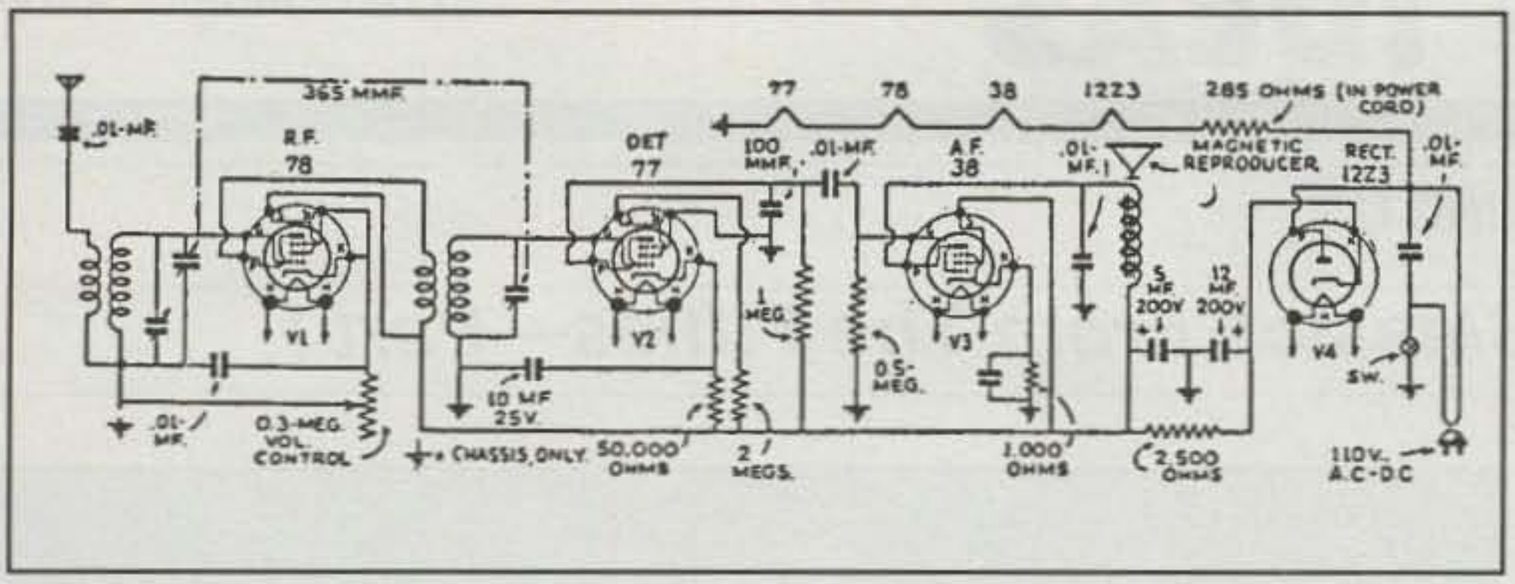


Fig. 6– Circuit of early AC-DC receiver.

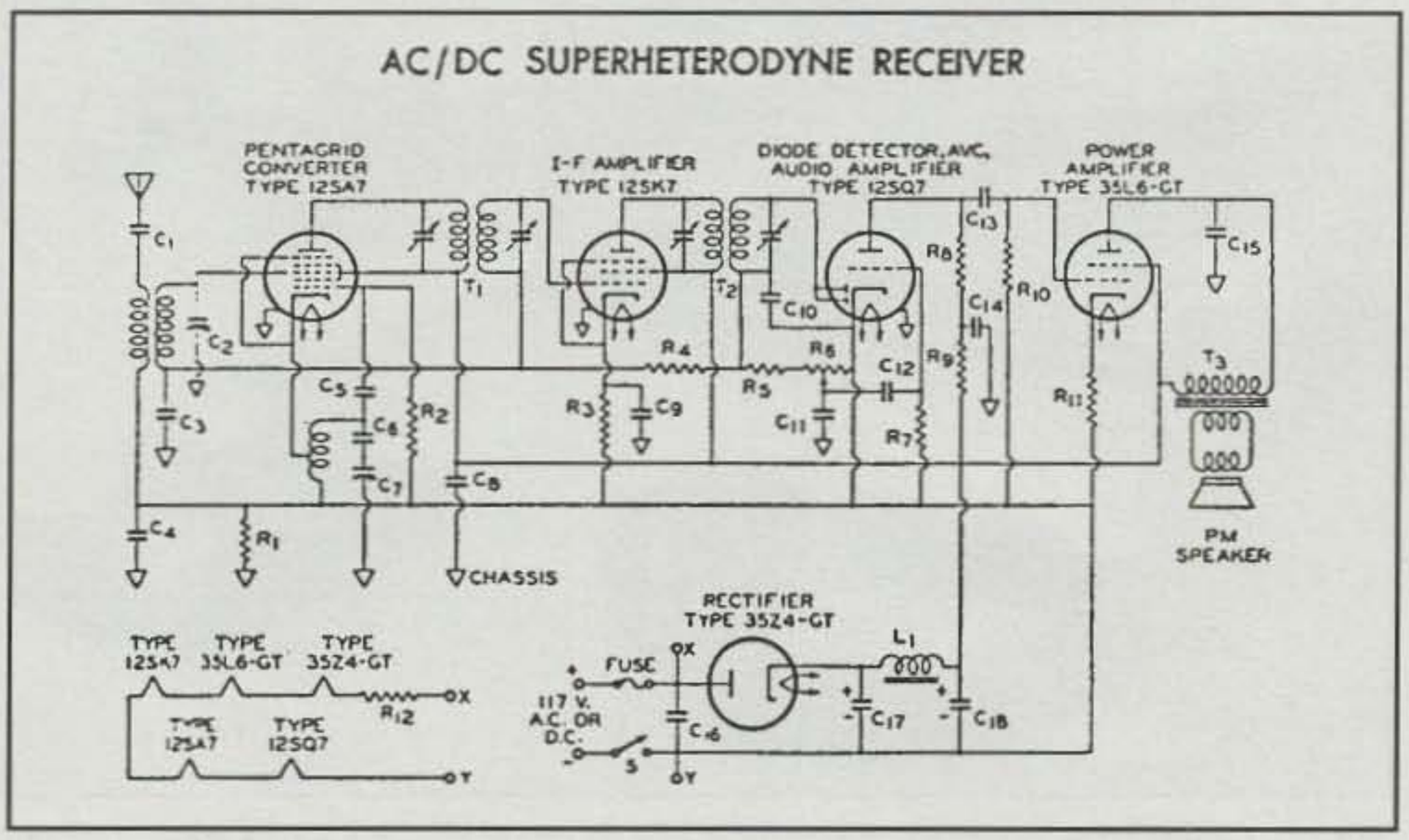


Fig. 7– Popular All American Five receiver. (RCA Receiving Tube Manual, RC-14.)

panies (RCA, Emerson, Admiral, Stewart-Warner, Stromburg-Carlson, and others) who churned out thousands of the receivers, which sold from $15 to $20. In 1939 RCA brought out its model 9TX-31 "Little Nipper" receiver, which set the pace by retailing for $9.95 (less tubes). The name, Little Nipper, came from the RCA dog mascot.

Other manufacturers helped to fill the expanding market for the little 5-tube superhet. It worked very well, and eventually the price stabilized at between $12 and $15 for a set, complete with tubes.

Quickly the receivers became available in drug stores and furniture and hardware stores and were bought by the thousands by teenagers and college kids who wished to hear the "Lucky Strike Hit Parade" and "Kay Kyser's Kollege of Musical Knowledge" while they were supposed to be doing their homework! Why, it was even possible to have a little radio in the kitchen for Mom!

This small receiver quickly dominated the AM broadcast field and virtually spelled the end of the big receiver encased in a massive mahogany console. The radio had ceased to be a piece of furniture and joined the toaster and the vacuum cleaner as a home appliance item.

The Hallicrafters S-38

During World War II the manufacture of home entertainment equipment came to an abrupt halt. The Echophone division of Hallicrafters, however, adapted the All-American Five circuit into a shortwave receiver, the EC-1. This AC/DC set added a 12SQ7 as a beat-oscillator and a noise limiter. Only one additional tube was required. The set covered 550 kc/s to 30 mc/s, after a fashion. The military bought large numbers of these sets for entertaining personnel in PXs and canteens all over the world.

Based on the success of this design, shortly after the end of the war Hallicrafters brought out the S-38, an improved version of the Echophone. The latter quickly slipped into limbo. The National Company, following the trend, brought out the NC-55, an improved version of the Hallicrafters unit.

Meanwhile the All-American Five prospered. It was adapted to miniature tubes (12BA6, 12BE6, etc.) and commanded an important place in the home entertainment market, until the advent of transistors made the tube-type receiver obsolete.

In retrospect, the AC-DC receiver was a profound concept. In one form or another the design lasted over 25 years. That's a lifetime in the electronics business!

Today a "clean" All American Five, in working order, with tubes, is a collector's dream. I wish I had never junked mine! And it would be nice to have an S-38 in a corner of the shack!

Many Thanks!

I appreciate hearing from readers of this column. It helps me to keep in touch with the real world! Thanks to the following who took the time to write to me: W2FMI, LA9MIA, W6TC, KB7Z, W6IVW, WØSVM, VE7BS, and W2YYI.

Footnotes

1. Shaw, H.S., "Oscillating Crystals," *QST*, July 1924, pp. 30–33.

2. Tyne, Gerald F., "Saga of the Vacuum Tube", pp. 319–321 and 341–351. Howard W. Sams Co., Indianapolis, IN 46268.

73, Bill, W6SAI

WORLD OF IDEAS

BY DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Homebrew Classics From The Fifties—Part I

Heads up, gang! We are back with another blowout trip down memory lane, and this time we are revisiting everyone's favorite era of the fabulous fifties. The main stars of our tour are Knight Kits' famous "Ocean Hopper" series of regenerative receivers—those inexpensive little delights that introduced many of today's amateurs to the exciting world of shortwaves. I also added a low-power transmitter from this same time period with two purposes in mind—rescuing yet another golden oldie from extinction, and recapturing the romance of eras past with a true entry-level station. Here is your golden opportunity to relive those "good old days" with a genuine zero-budget Novice rig. Further, an even more basic two-tube Hopper and another one-tube transmitter will be featured next month in Part II of this column.

In today's world of super-feature transceivers and high-power communications gear, some amateurs may question the logic in using a bare-bones setup. The answer, naturally, is its unique dimension of classic amateur radio fun. Modern transceivers with fully automatic amplifiers are great for quick-tuning bands, minimizing QRM, pulling in weak stations, and working them on the first (or second) call. Missed contacts are more the exception than the rule. The situation reverses when using no-frills gear, however, and truly proves "the operator rather than the rig makes the difference!" Making contacts involves tuning in stations on an uncalibrated receiver dial, holding your fingers steady on the knob to avoid losing a desired signal due to hand capacity or drift, and hoping the refrigerator does not switch on and change line voltage. It also requires an expertise in listening to a particular station's CW tone while ignoring louder off-frequency tones (mental selectivity) and sharp transmitting techniques (a special skill). The challenge is supreme, but each successful QSO holds the same pride in accomplishment as working the rarest DX!

Before continuing, I wish to thank two outstanding amateurs who helped inspire this '50s revisit: Bill Albrant, K7YJE, and Dave Ishmael, WA6VVL. Between Bill's series of Ocean Hopper news sheets (which were self-produced a few years ago and are no longer available) and Dave's restoration of several damaged Hoppers, the rig has become a genuine classic. An additional word of thanks to professional photographer Joe Veras, N4QB, for shooting the pictures in this month's column (a true labor of love, as Joe also used an Ocean Hopper during his early days in amateur radio). Jolly good show, guys! This is enough background data. Now let's bring the rigs onto center stage!

4941 Scenic View Drive, Birmingham, AL 35210

Fig. 1– Classic rigs need not be complex or expensive to be fun! Ocean Hopper receiver can be restored or "replicated" in a weekend. Battleship-gray front panel measures 6 inches high by 10 inches wide. Complementing wood cabinet is covered in light-gray contact paper and measures 6¾ by 10¾ by 5½ inches (H,W,D). Mating 6L6 transmitter is crystal controlled, features wide range pi-net output, and runs 3 to 6 watts output. Receiver is owned by Dave Ishmael, WA6VVL. The transmitter and bug are K4TWJ's. (Thanks to Joe Veras, N4QB, for professional photo.)

The Ocean Hopper Story

The Ocean Hopper was produced by The Knight Kit division of Allied Radio Company in Chicago between 1939 and 1958. The first models used two metal tubes (6J7 and 6C5) and were battery powered. Later models used a mixture of three tube line-ups with AC/DC power supplies. A portable Hopper with two 1S5 tubes was also produced around 1956, and the well-known Space Spanner succeeded the Ocean Hopper series in the late fifties. Surely the most popular version of the Ocean Hopper was the "740," which Allied sold during the mid-'50s for only $16.95 plus $2.95 for a full set of coils (see photo 1). A large number of Ocean Hopper 740 kits were sold, but most of these little gems have been lost or damaged over the years. Likewise, some owners of like-new models may feel the units are not worth digging out to sell, or they may ask an unnecessarily high price for the receiver. Striving to find a solution to those entanglements, I applied the theory of "if securing the genuine article in like-new condition is not feasible, homebrew a replica." Yes, indeed! Popular old-time radios need not be expensive to be classics! Does that mean you can actually build a Hopper "from scratch"? Excluding

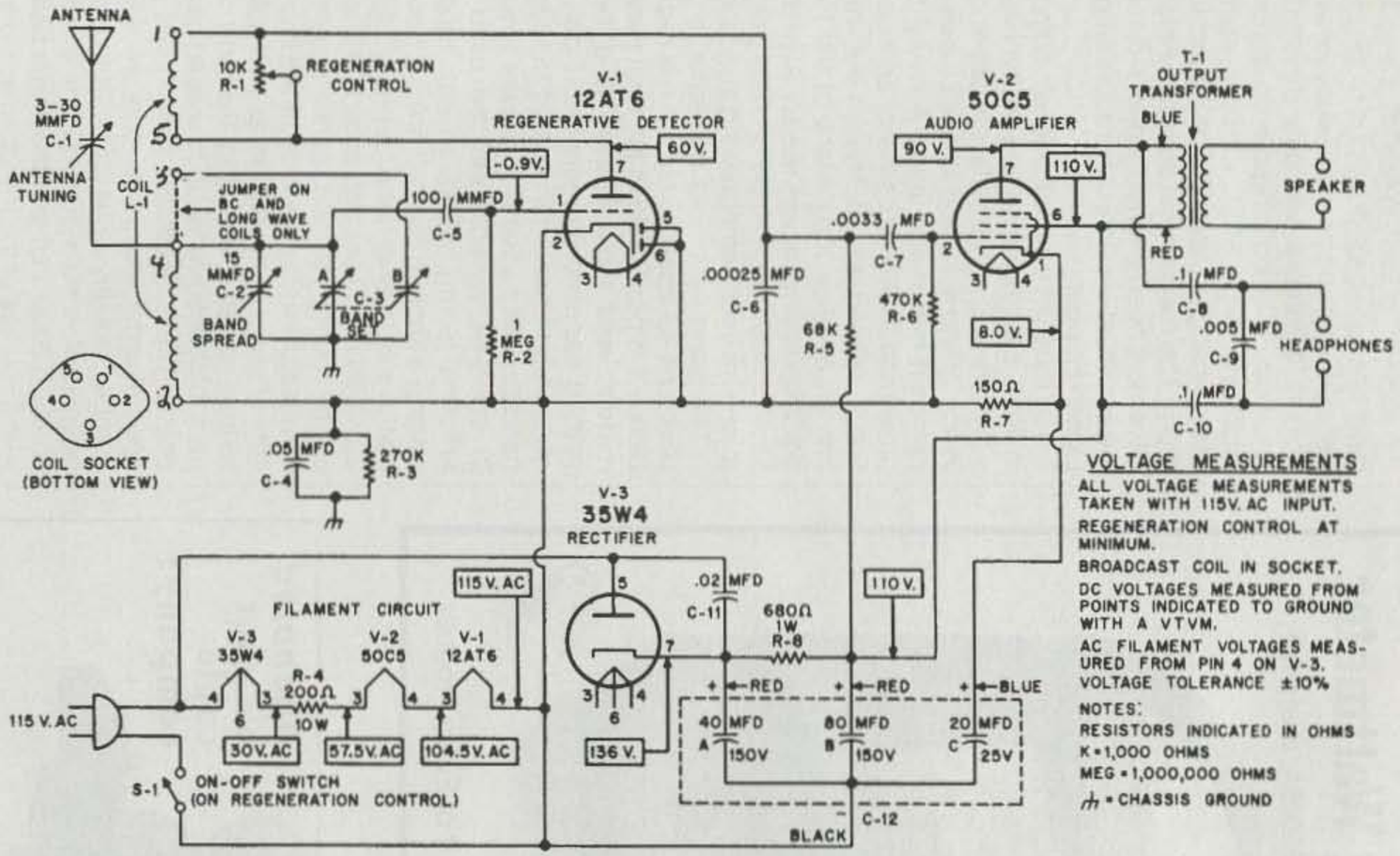
Ocean Hopper.

RESISTANCE CHART

All readings taken from point indicated to chassis ground except * readings taken from point indicated to B+. Control positions not significant. Power plug removed from power source. Variation in readings of ±20% will not affect operation. All measurements made with VTVM.

TUBE	PIN 1	2	3	4	5	6	7
V-1 12AT6	1.3Meg	270K	270K	270K	270K	270K	68K*
V-2 50C5	270K	740K	270K	270K	740K	O*	200*
V-3 35W4	O*	NC	270K	270K	270K	270K	680*

NC — not connected



PARTS LIST

CAPACITORS

Symbol No.	Description	Part No.
C-1	ANTENNA TUNING 5-80 μμfd	283000
C-2	BAND SPREAD 15μμfd	281000
C-3	BAND SET	282004
C-4	Paper .05-400V	245055
C-5	Mica .0001 μfd	266017
C-6	Mica .00025 μufd	266258
C-7	Disc, .0033 μf	276337
C-8	Paper .1 μfd-200V	243014
C-9	Paper .005 μfd-600V	247056
C-10	Paper .1 μfd-200V	243014
C-11	Paper .02 μfd-400V	245025
C-12	Electrolytic 30-30-20 μfd/150-150-25V	213301

COIL

L-1	Broadcast coil	111204

RESISTORS

R-1	REGENERATION control 10KΩ (Includes S-1)	390002
R-2	1 megΩ, ½ W	301105
R-3	270KΩ, ½ W	301274
R-4	200Ω, 10 W	374001
R-5	68KΩ, ½ W	301683
R-6	470KΩ, ½ W	300474
R-7	150Ω, ½ W	301151
R-8	680Ω, 1 W	304681

SWITCH

Symbol No.	Description	Part No.
S-1	OFF (Attached to R-1)	(See R-1)

TRANSFORMER

T-1	Output	102200

TERMINAL STRIPS

TS-1	3-terminal	440301
TS-2	2-screw terminal	441201
TS-3	2-terminal	502227

TUBES

V-1	12AT6	611014
V-2	50C5	610026
V-3	35W4	610029

MISCELLANEOUS

Description	Quantity	Part No.
Cabinet	1	702006
Chassis	1	461314
Clip, fahnestock	1	533003
Dial Scale	1	870009
Grommet, ⅜"	1	830200
Knob, control	2	762201
Knob, BAND SET	1	764503
List, SW stations	1	750098
Panel, front	1	462211
Socket,	3	501070

Fig. 2– Circuit diagram of the Knight Kit 740 Ocean Hopper receiver. Notice only one of the (dual 365 pFd) band set tuning capacitor's sections is used for shortwave reception. Also C6 is 250 pFd (.00025 mFd). We renumbered coil pins, as they were incorrect in the original schematic, and thus "generic" coils would not work in the Ocean Hopper.

perfectly duplicating the main tuning dial, the answer is yes! WA6VVL, Dave Ishmael has full-scale drawings of the Hopper's chassis and front-panel layout available to amateurs seriously devoted to refurbishing or building the rig at home. Include a large SASE with two stamps when writing to Dave and be patient for a reply. The mechanical stumbling blocks have now been averted, so let's discuss the electrical aspects of homebrewing an Ocean Hopper.

The receiver's circuit diagram is shown in fig. 2, plus its inside and underchassis views illustrating parts layout are shown in figs. 3 and 4. Notice all three tubes are common miniatures found in many '50s table model AM radios (what an inspiration to rebuild an old "thrown out" radio into an amateur rig!). Many of the Hopper's components are readily available, so let's now concentrate on "fine points" to ensure your homebrewing success.

The band set/tuning capacitor is 365 pFd, just as used in old 5-tube radios. Notice it is positioned in the front panel's middle, and the small 15 pFd band spread capacitor is mounted under the chassis and behind the panel to reduce hand capacity effects. A regular trimmer or open-air variable can be used for antenna tuning. Although not "stock," adding a knob to its shaft is most beneficial in minimizing hand capacity. If the 20/40/80 mFd filter capacitor, C12, cannot be found, you can readily assemble a substitute using three separate capacitors of equal or higher rating. Just solder all their negative wires together and connect their positive leads to related circuit points. The audio output transformer is a special-order item with only an Allied number, but any small 2K or 4K to 8 ohm equivalent should substitute fine. Alternately, a 2000 ohm ½ watt resistor can be wired in place of the transformer's primary (in other words, connected between pins 6 and 7 of 50C5). Your 2000 ohm earphones then parallel-connect "across" the 2000 ohm resistor and .1 mFd capacitors on each connection block DC. Eliminating the transformer precludes speaker hookup, but that is okay; phones ensure you hear weaker stations.

Remember, the Hopper is an AC/DC receiver. Do not connect a ground to its metal chassis (ere sparks may fly). If a hum in the earphones is noticed, reverse the AC line cord. If you are worried about shock hazards, consider adding a small 115-to-115 volt isolation transformer "between" the Hopper's AC plug and wall socket.

Plug-in coil information for the Ocean Hopper is included in fig. 5. Primary and secondary (tickler) coils should be wound in the same direction, with the tickler closest to the base. Space apart the primary and secondary windings as follows for

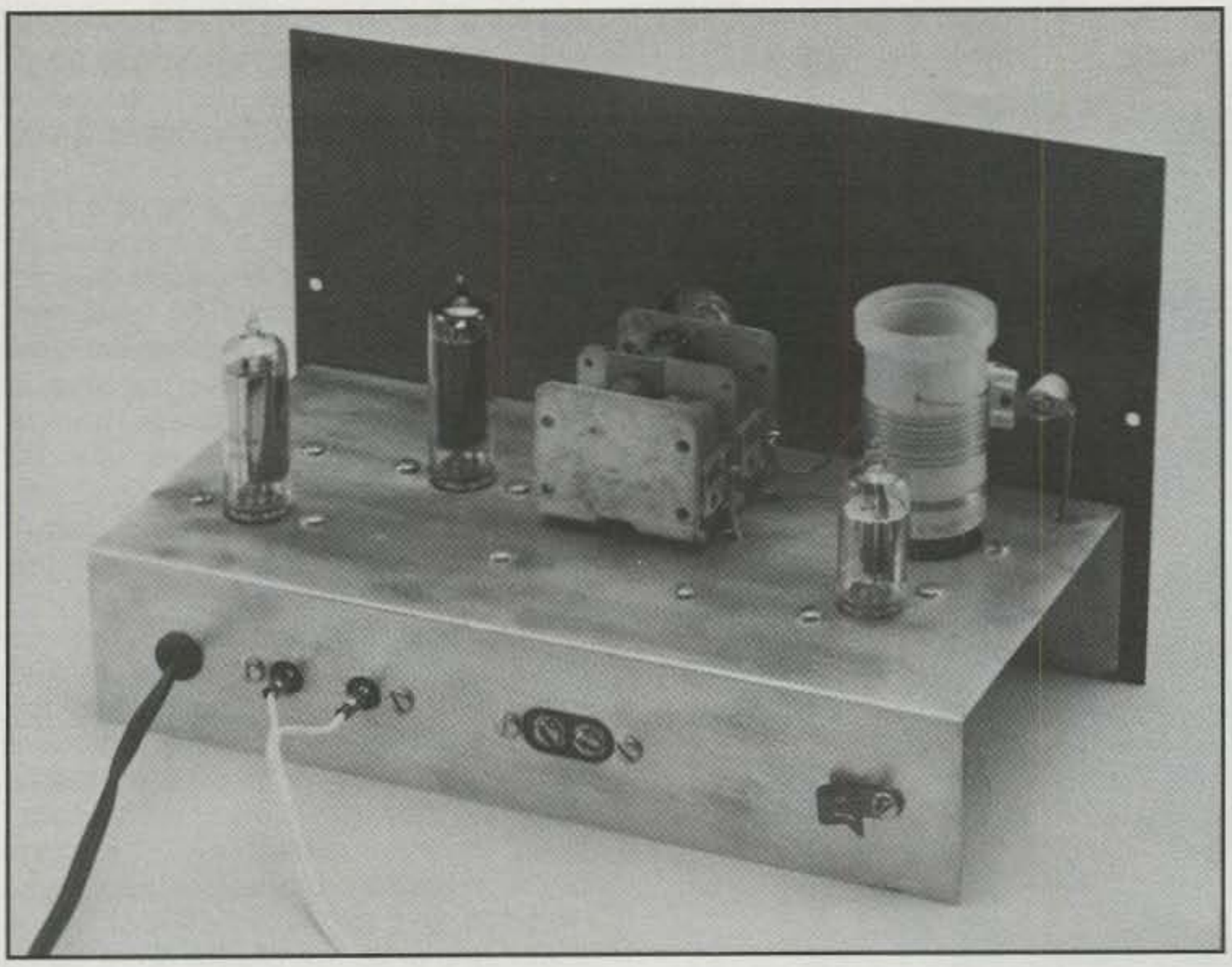


Fig. 3– The Ocean Hopper's wood cabinet was removed for this photo to show you its tube and tuning capacitor layout. The 35W4 is in the left rear section, 50C5 is beside the band set condensor, and 12AT6 is behind the coil form. Receiver is owned by WA6VVL and was photographed by N4QB.

best results: 11/32 inch spacing for coil #2 (7.0–17.5 MHz), 1/4 inch for coil #3 (2.9–7.3 MHz), 9/32 inch for coil #4 (1.6–4.1 MHz), and 5/32 for coil #5 or 6 (broadcast or long-wave bands). Close wind the primaries of coils 6, 5, and 4. Space primary turns a wire thickness apart (double spacing) on coil 3, two wire thickness apart (triple spacing) on coil 2, and three or four wire diameters apart on coil 1.

I should also mention here that the Hopper is mainly useful on 160 through 40 meter operation (sensitivity and stability are poor above 12 MHz). Also, the second section of its dual section band-set tuning capacitor is used only for BC and LW reception. If you cannot find original Ocean Hopper coils or even blank 1 1/2 inch diameter forms for "rolling your own," consider making substitutes by gluing toilet-tissue rollers to salvaged tube bases. In this case, exact pin connections are not important. Just be sure the tickler connects to the 12AT6 plate, and reverse its wires if regeneration does not occur properly. Using exact gauge wire and precise diameter coil forms is also not mandatory; just add a couple of extra turns when winding, and then remove some turns to "tweak" the final in-socket tuning range.

Assuming you have a digital frequency counter, try this quick-and-easy way to check a coil's range. Place the counter's pickup probe near the receiver's antenna connection, adjust the regeneration control for oscillation in the earphones, then read the Hopper's tuned-in frequency on the counter. Double check by keying your mating old-time transmitter (its signal will override the Hopper's regeneration) and reading its frequency.

Once you acquire a "feel" for regenerative receivers, using an Ocean Hopper becomes fun. Adjust its regen control clockwise to the point oscillation is noticed on a strong incoming signal. Next, key your transmitter on low power and adjust the band set control to "find your signal." Then connect a random-length wire to the receiver's antenna input. Tweak the antenna trimmer, and use the band spread control for final frequency tuning. Copy some CW signals for an hour or two, and you will learn how to fine-tune the antenna trimmer and bandspread for smooth operation. When you reach that point, it's time to build a mating QRP transmitter and get on the air with an all-classic station!

Completing The Ocean Hopper Station

Amateurs using Ocean Hopper receivers were usually limited to a similar "low budget" transmitter. Thus, built-from-scratch (junk?) 6L6 or 6V6 rigs were commonplace. If you were a Southern poor boy like me, just acquiring the tube and a power supply for it was a major obstacle. My own "improvisation" involved borrow-

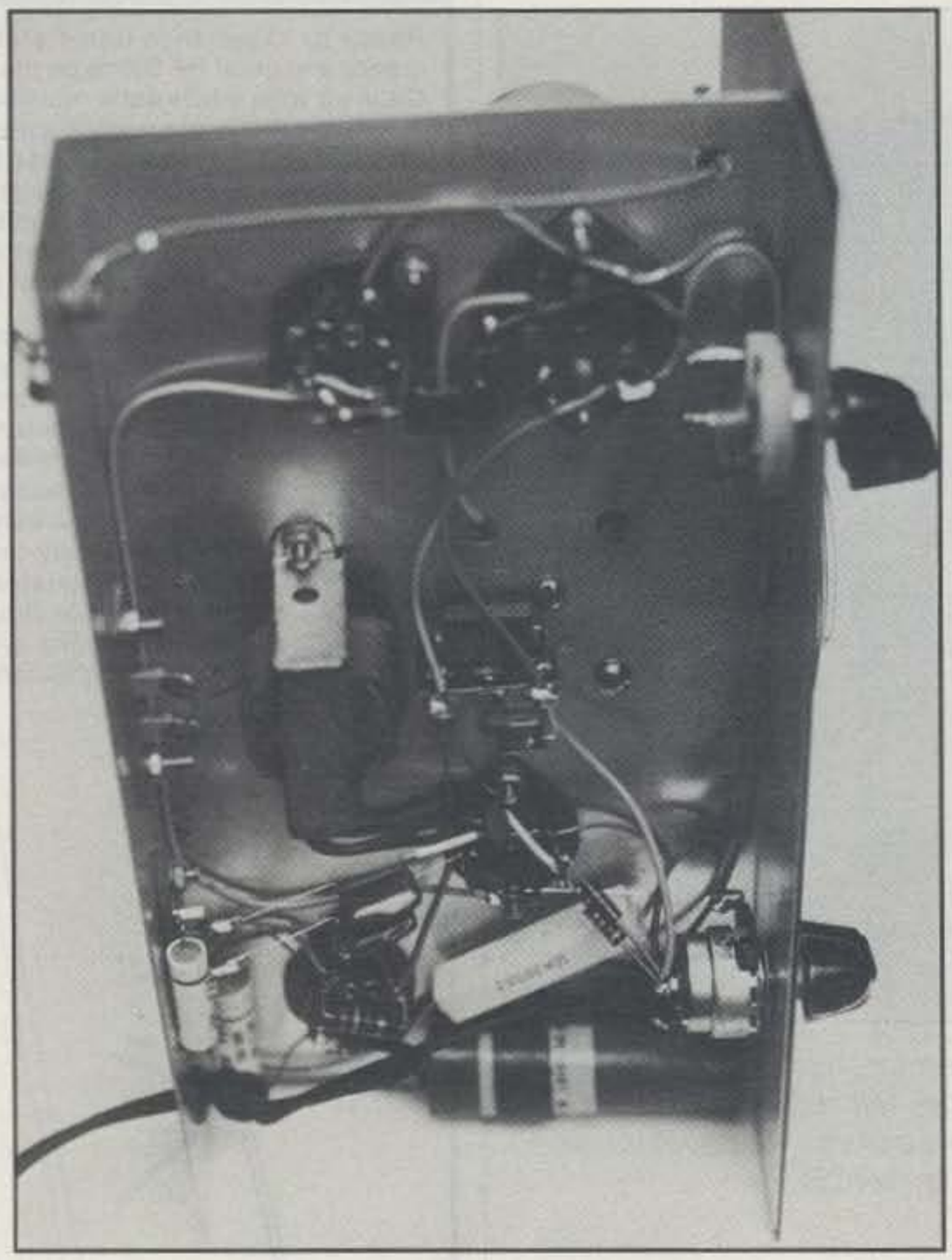


Fig. 4– Under-chassis view of the Ocean Hopper illustrating parts layout. All capacitors and resistors have been replaced with new equivalents to restore new condition.

ing the 6L6 from the family's floor-model radio, then plugging a homemade adapter and cable into the removed tube's socket for rig power. The method was sneaky, but effective!

6L6 transmitters were assembled in a wide variety of physical configurations during the '50s, but their circuit diagram was quite generic (see fig. 6). There were 6L6 rigs built on breadboards, cigar boxes, wood frames, QSL-size chassis, and even metal file-card boxes. The most unusual one I have seen was arranged with the 6L6 (or was it a 6AG7?) mounted horizontally and extending from a breadboard's rear. In fact, the 6L6 transmitter in fig. 1, photographed during assembly, could be changed to a horizontal tube layout by adding angle brackets to support the tube and crystal sockets. Hopefully, these descriptive ideas will inspire your creativity in 6L6 rig layout. Why, you may ask, is my 6L6 transmitter in fig. 1 not completed? N4QB shot the photo on the Saturday before this column was due, and then I finished assembling it at night while the photos were being processed. I also used genuine Testors glue rather than screws to hold various pieces in place—authentic '50s style!

Now refer to the schematic and let's review some tips for easy rig assembly. First, the plate coil is 1½ inches in diameter and 3 to 3½ inches long (not critical—a plug-in form or self-supporting

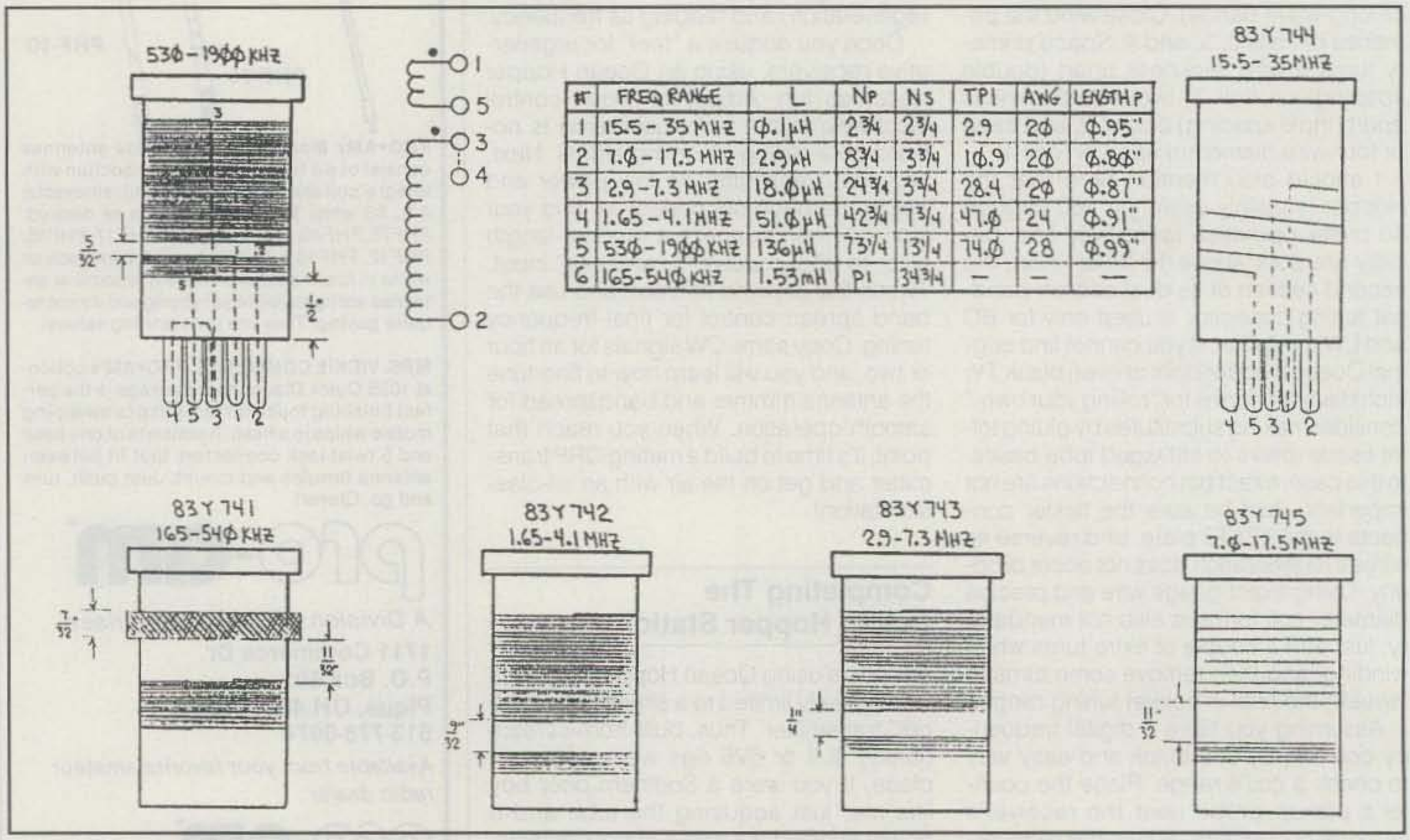


Fig. 5– Plug-in coil data for Ocean Hopper receiver. Conventional 5-pin coils may also be used, if you can find them. (Thanks to Dave Ishmael for coil info.)

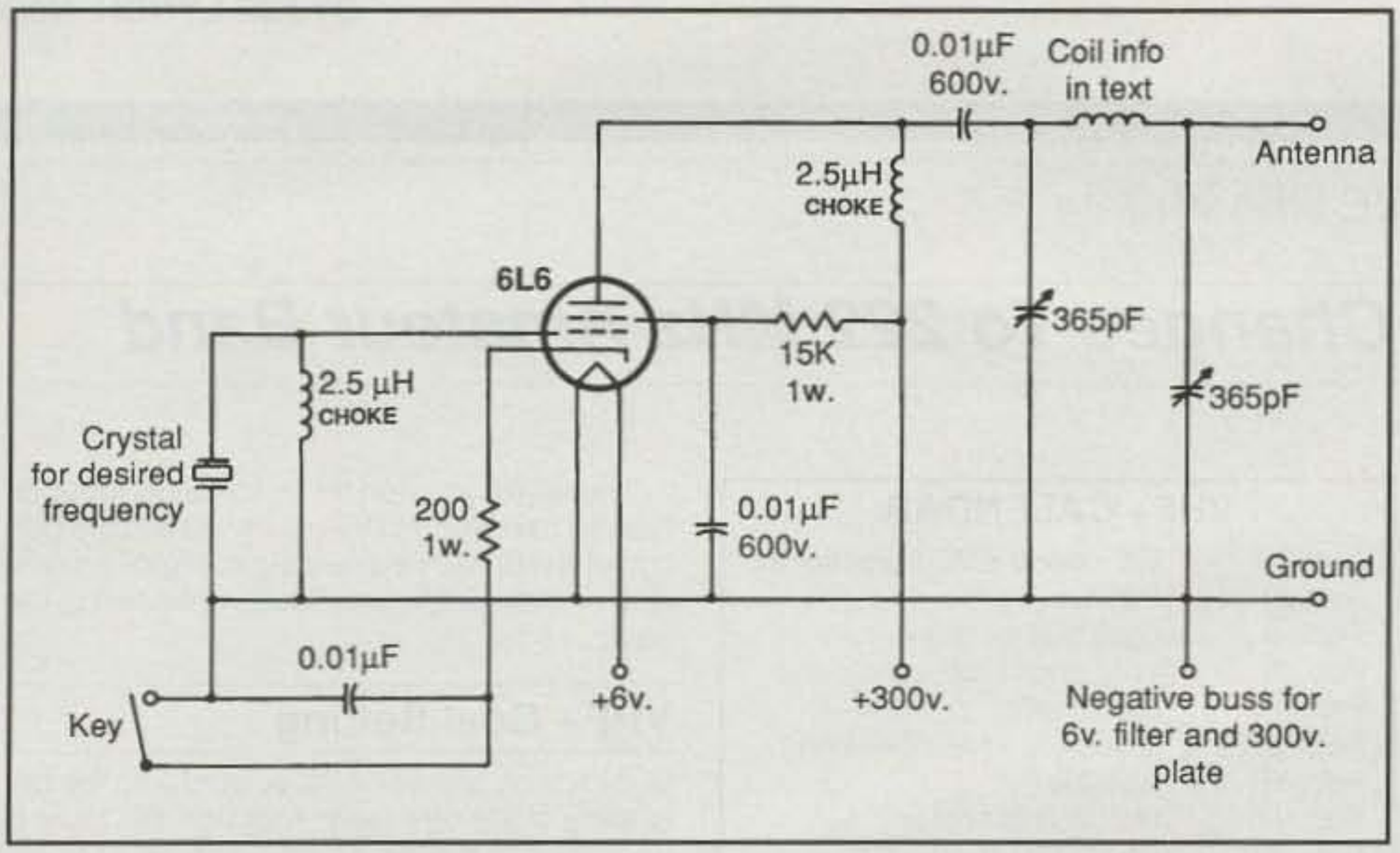


Fig. 6– Circuit diagram of the 6L6 transmitter shown beside the Ocean Hopper receiver in fig. 1. Unit can be assembled in variety of ways and always works fine.

type can be used). Number 18 or 20 wire is utilized for the coil. Wind 34 turns for 80 meters, 16 turns for 40 meters, or 12 turns for 30 meters. Open-air-style 365 pFd capacitors removed from old five-tube radios work fine for plate loading and antenna tuning. Need crystals in a hurry? Call Jan at 1-800-JANXTAL and use their quick order service. If you can find a nice 50 or 100 ma panel meter, wire a .1 mFd capacitor across its terminals, and connect it in series with the key for a tuning aid. Alternately, use your station's wattmeter and receiver as monitors and tune the transmitter for maximum output consistent with a clean signal.

One final note: Any well-filtered 150 to 350 volt DC power supply works fine with this 6L6 rig, but tube-type transformers with real high voltage are becoming scarce. You can make an acceptable substitute by wiring two hefty 115 to 6.3 volt transformers "back to back," tapping "between them" for filament voltage, and rectifying the 115 volt output for plate voltage. Don't snicker! The results will be an impressive 2 watt output signal!

Looking Ahead

This month's available space has been filled to capacity, and the good information keeps on coming! We will simply have to continue next month with Part II of this revisit to the fabulous '50s!

Next month will feature full "build it from scratch" details on a dual 1S5 Li'l Hopper portable receiver plus a deluxe 6AG7 transmitter from 1956. You can homebrew various units from the two columns to make your own nostalgia special setup.

Meanwhile, here is a final quick-start tip for enjoying your '50s rig on the air. Connect a high-mounted dipole to the 6L6 transmitter's output and connect a single 30 or 40 foot insulated wire strung at right angles to (and its end pointed toward) the dipole to the receiver's input post. This arrangement lets both units work simultaneously for full break-in operation.

73, Dave, K4TWJ

VHF PLUS

BY JOE LYNCH, N6CL

ALL ABOUT THE WORLD ABOVE HF

FCC Authorizes Changes To 222 MHz Amateur Band

In a Report and Order issued 2 December 1993, the FCC made two significant changes to the 222–225 MHz amateur band. Both changes are effective 1 February 1994. The first, and most significant to those of us who operate weak signal, is the creation of an exclusive "weak signal" portion of the band between 222.000 and 222.150 MHz. The second authorizes Novice class operators full operating privileges throughout the 222–225 MHz amateur band. The emphasis is on operating, because while a Novice class licensee can now operate in any part of the band, he or she can still only run 25 watts PEP.

These two items were part of a consolidated PR Docket 92-289, which also included proposing authorizing of control operator privileges to Novice class licensees in their portions of the VHF+ amateur bands. The FCC received significant opposition to this proposal, the reasons centering on the Novice's lack of experience and the lack of testing material on such privileges found within the Novice class license examination. In light of this opposition the FCC declined to authorize such control operator privileges to the Novice class licensee.

In creating the exclusive weak signal portion to the band the FCC noted that they had received "many comments in this proceeding both favoring and opposing the creation of a small frequency sub-band for experimentation [purposes] . . . " Nevertheless, the FCC went on to say, "We have considered carefully the comments for and against establishing a protected sub-band. In our view, the public interest requires that there be sufficient opportunities available for experimental activities."

Opposition to the weak signal portion was keen from California. And unfortunately, indications are that it will be a difficult situation to bring into full implementation by the effective date, particularly because raw feelings continue to exist.

With regard to authorizing Novice class licensees operating privileges throughout the entire band, the FCC received " . . . a very favorable response from the commenters." With this creation, Novice class licensees now have access to a "weak signal" portion of a VHF+ amateur band.

How will these changes affect the future of the 222–225 MHz amateur band? For the past several years weak signal activity has virtually been put on hold. Very few VUCC awards and no WAS awards have been issued in quite some time. Few reports have been received by VHF+ editors. All of this lack of activity revolved around the uncertainty of the band.

Now that a portion of the band has been defined as experimental, it is our responsibility to do something with it. Because no manufacturer is currently marketing a multi-mode radio for the band, it is necessary to either buy a used radio or (heaven forbid!) build something. Nevertheless, it appears from listening to initial on-the-air reaction there will be renewed interest in this band, particularly via EME.

Incidentally, for those of you who read this column regularly, you might remember that it was exactly one year ago that your editor announced that the FCC had issued the NPRM. At that time I said that if approved, the NPRM would be a two-edged sword. It would provide us with the protected spectrum. But our not using the spectrum would also provide the opposition with the ammunition they need for some possible future re-evaluation of the band.

We now have that two-edged sword. It is up to us to use it beneficially, because as we well know, what the FCC giveth the FCC can taketh away.

Therefore, your editor is soliciting input on how we can best use this newly authorized portion of the band. Please send to me or in some way communicate your ideas concerning the band.

VHF+ CALENDAR

Jan. 30	Very good EME conditions.
Jan. 31	Perigee.
Feb. 3	Last quarter moon.
Feb. 6	Very poor EME conditions.
Feb. 10	New moon.
Feb. 13	Moderate EME conditions.
Feb. 15	Apogee.
Feb. 17	First quarter moon.
Feb. 20	Poor EME conditions.
Feb. 26	Full moon.
Feb. 27	Very good EME conditions.
Feb. 28	Perigee.

VHF+ Goal Setting

Goal setting is usually associated with the beginning of the new year. Although this topic is appearing in this month's column, most of you will have received it by 20 January or so, certainly not too late to set your goals for 1994, if that is your inclination.

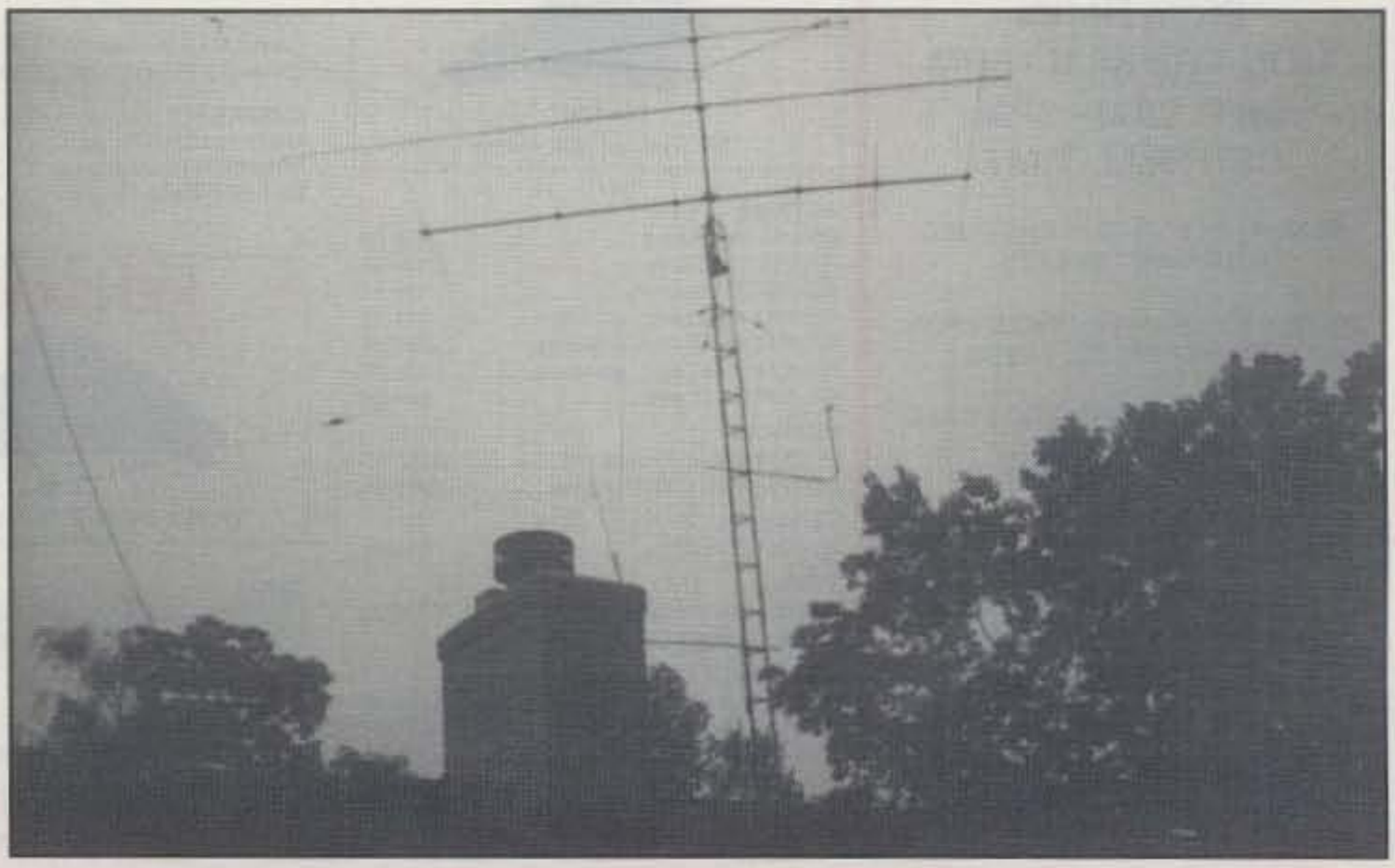
Goal setting in amateur radio usually revolves around trying to accomplish the requirements for particular awards. The VHF+ frequencies are no different. Once you've made a decision to go to these bands, your next decision is whether or not to pursue goals.

If you do so, then there is a principal difference between HF and VHF, that being time. While, as you will see below, some of the requirements for popular VHF+ awards can be met in as short a time as a weekend, some are not met for decades.

The most popular award for VHF is VUCC. The next most popular is WAS. Quite a way down the list is DXCC.

The award requirements for VUCC have been spelled out previously in this column. Nevertheless, here is a brief summary: For 6 and 2 meters one must work 100 grid squares; for 135 and 70 cm the requirement is 50; for 33 and 23 cm one must work 25 grids; for 13 cm the requirement is 10; and for all other bands the requirement is five.

For 6 meters the accomplishment of the goal



Those big signals you hear on the bands from Rex, WB8TDG, eminate from all those antennas. From top to bottom: 70 cm, 135 cm, 2 meters, and 6 meters. (Photo via WB8TDG)

P.O. Box 73, Oklahoma City, OK 73101

is relatively simple from most areas of the country. The regular existence of sporadic-E allows for fairly easy completion of contacts in distant grid squares. In fact, contest stations, and many others, often complete contacts with stations in 100 different grid squares in one contest weekend.

On 2 meters the task gets a bit more difficult. If you live in the center of fairly densely populated areas and are surrounded by densely populated areas, with a little luck you can complete the goal fairly quickly. Here again, contest stations, and others, have been known to work stations in the required 100 grid squares in one weekend. However, if you live outside or even on the fringe of these dense population areas, the task becomes exponentially more difficult.

If, for example, you live in the west, you are surrounded by vast areas of little amateur population, let alone VHF+ operators. You are then compelled to use extended forms of propagation to meet your goal. Here is where meteor showers, sporadic-E, aurora, tropo, and EME become very important.

Of all of the above forms of propagation, meteor showers are probably the most predictable. Because of this, you can look on a calendar and make your plans accordingly.

Conversely, for those of you who are on a limited budget, EME is probably the least likely candidate for assisting you toward completion of your goal. Nevertheless, it should not be ruled out.

San Hutson, K5YY, presented an excellent paper on EME made easy and relatively inexpensive at the 1990 Central States VHF conference. His paper is part of the *Proceedings,* which can be purchased from the League for $12.00, plus $3.50 shipping. Additionally, Ray Soifer, W2RS, presented a very informative paper entitled "QRP EME on 144 MHz: How and Why" at the 1992 Central States VHF Society conference. His paper is part of the *Proceedings* for that year, which also can be obtained from the League for the same price. Both of these unlock some of the mystique of EME operation for the "little guy."

Let's get back to meteor showers. You can make the predictability of showers work for you by understanding when they occur and what type of showers they are. When they occur is pretty well documented. Your editor lists the current shower(s) for the month in the "VHF+ Calendar" sidebar. Additionally, many bulletin boards have software available that will help you predict when they will occur.

Understanding what type of showers they are will unlock two aspects of meteor-shower propagation. These are: How far you can work, and in what direction you can work.

Let's look at how far. Remember, meteor burn-up ionizes the E-layer. This means that you are limited to distances between approximately 700 and 1300 miles. So get a grid square map and draw a circle around your QTH that extends out to the 1000 mile mark. You can add subsequent circles at around the 700 and 1300 mile marks. These two other circles become the inner and outer limits for this mode.

In other words, within these two circles lie most of the possible grid squares that you can work via meteor scatter. You will notice, however, that there are not 100 grid squares within these two circles. More on that later.

How do you make meteor scatter work for you? Let's take the *Lyrids,* which is scheduled to peak around 21–22 April, for an example. For this shower the average height of ionization is around 65 miles. This means that the probability of completion of a meteor contact drops off significantly at distances over 1200 miles and that contacts between 800 and 1000 miles enjoy a high probability of completion.

What about direction? The *Lyrids* is a good north-south shower. Therefore, you will plan to work stations to your north or south.

Now you know two facets. The next thing to do is find stations located within your circle and within the directions of high probability of completion. Directories are available listing known active amateurs, their phone numbers and grid squares. Two sources are John Carter, KØIFL, who maintains one for the central part of the U.S., and Tim Marek, NC7K, who maintains one for the western part. Each charges a small fee for his publication. Contact them via their *Callbook* addresses for more information. Once armed with these lists, you can use them to call amateurs and set up skeds.

What about the remaining grid squares? The next most reliable mode of propagation is tropo. On any day contacts can be made between 100 and 150 miles with a modest station, that being a 150 watt brick and a 15- to 17-element long boom beam between 25 and 30 feet high. You can increase your distance out to about 350 or so miles by what some call "brute force." However, it is necessary that both your station and the distant station are optimized for low noise and efficient power transfer to the antenna. And it helps if the other station is running high power, not only so that you can locate the station, but also so that you know where to aim your antenna precisely and put a signal back to him or her in order to complete the contact.

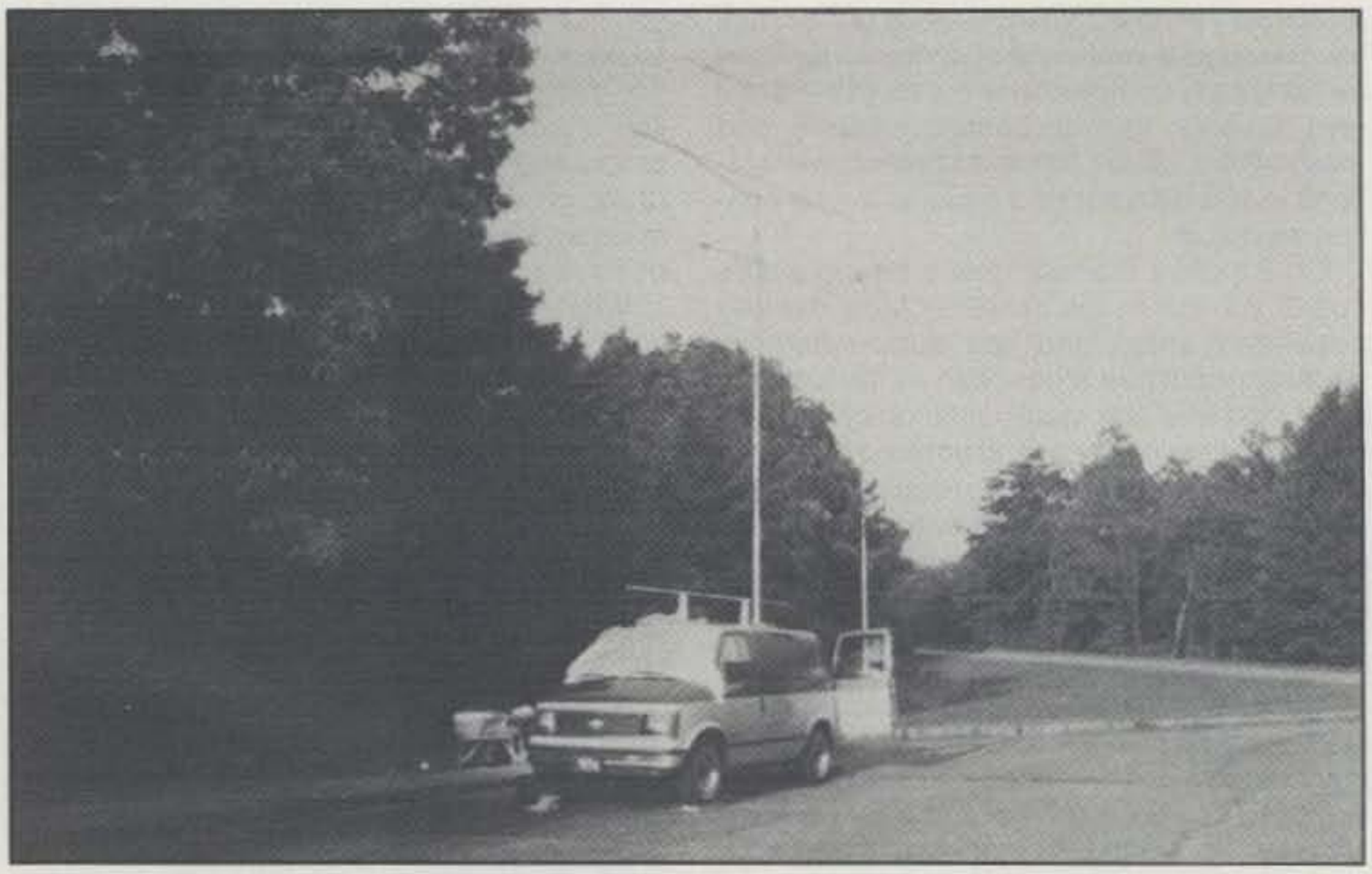
Additional contacts on tropo can be made in excess of 350 miles when the conditions are "just right." These conditions exist when a weather front is strategically located so as to cause the air to be stabilized for several hours to several days, thereby "trapping" the signals in a tropo "zone" over land or "duct" over water. Distances nearing 1000 miles can be reached under the right conditions over land and in excess of 2500 miles over water.

However, as you can see, with the exception of the over-water path, the long-haul tropo only replicates the area already covered by meteor scatter. Hence, the principal increase in grid squares worked remains the closer-in grids "skipped over" by meteor scatter.

The other forms of propagation are sporadic-E and aurora, neither one of which is predictable with any kind of degree of reliability.

Sporadic-E openings on 2 meters are most likely to occur during the months of May to July, with the peak month being June. Some rare openings can also occur during December to January. The only way of knowing when sporadic-E is occurring is to observe the lower bands, such as 6 meters, the commercial FM radio or low VHF TV frequencies. Then it is a matter of tracking the MUF (maximum usable frequency) until it reaches 2 meters, hoping that someone is on the air in the direction of the opening. However, again, sporadic-E only replicates the area already covered by meteor scatter.

Aurora has its own limitations. It is a form of propagation that, when it occurs, tends to only



John Baranyi, N8UM, last year operated from the Great Smokey Mountain National Park, EM85. He used a 22-element F9FT for 70 cm and two 9-element F9FT antennas for 2 meters. He used a Create Log Periodic for 6 meters and 135 cm. How did you get all that stuff inside that mini van, John? (Photo courtesy N8UM)

favor the higher latitudes. On rare occasions it may track lower in the (northern) hemisphere. However, this may occur only once every couple of years. If you are trying to work your 100 grids on a limited budget of time and especially if you live in the lower latitudes, don't even consider aurora as a viable possibility. However, it can and should be considered for those of you who live in the northern latitudes as a way of filling in some of those blanks on the grid square map.

This discussion brings us back to the moon. Although it takes more sophisticated equipment to get "on the moon," the terrestrial distance is limited only to your common lunar window with the station you want to work. Some who are close to their goal of working 100 grids have resorted to EME to get the last few grids. And there are plenty of high-power stations with good receivers who can complete a contact with your station, as Ray Sofier, W2RS, has indicated in the previously cited reference.

How about VUCC on 222 MHz? For the past several years this band has been neglected. As stated above, the uncertainty has kept people off "in droves." Now that we know that we have a protected segment, hopefully there should be a resurgence in popularity.

The requirement of 50 grid squares for this band reflects the lack of activity on it, not the lack of propagation. Insofar as propagation is concerned, this band enjoys the best of both worlds—it shares propagation traits with its neighbors, 144 MHz and 432 MHz. Meteor scatter, albeit harder, does exist regularly on this band. EME does exist, with slightly better conditions than 2 meters. Sporadic-E has been documented on very rare occasions. Tropo is considered by some to be better on this band. And aurora also occasionally shows up on this band.

So you have all the ingredients to work your 50 grid squares.

Owing to its higher popularity, 432 MHz presents a unique opportunity for VUCC. Because more stations are on the air, some operators find that the 50 grid square requirement is actually easier than the 100 grid square requirement for 144 MHz despite the fewer propagation opportunities on this band.

Let's look at these propagation opportunities. First, meteor scatter does exist, although it takes considerably more patience to complete a contact. Also, many of the so-called "lesser showers" just do not produce the propagation on this band as they do on 144 MHz. Additionally, owing to the dynamics of meteor-scatter propagation, contacts in excess of 1000 miles are very rare indeed!

The most popular way of filling in the blanks on the grid square map is via tropo. As explained above for 2 meters, tropo conditions exist regularly out to 150 miles. Brute-force tropo can extend that to 350 to 400 miles. And when the band opens, tropo conditions can extend to more than double that range. Because of the nature of enhancement, often tropo conditions will exist on this band ahead of the lower bands.

Again EME can be used to work more grid squares. However, it is unnecessary, because at least 50 grid squares fall within tropo limits.

As we go higher in the spectrum it becomes more difficult to complete VUCC for the respective bands. The requirements for 902 and 1296 MHz are the same—25 grid squares.

Tropo is the chief form of propagation on both of these bands. There are more than enough grid squares within the tropo limitations. However, owing to the lack of population on the 902 MHz band, ability to garner the necessary grid squares is much more difficult. It becomes necessary to work a station on another band and bring it with you to this band. Sometimes this is accomplished by actually working the station first on 1296 MHz!

Getting VUCC on all of the other higher bands involves soliciting help from your friends. Tropo is the chief form of propagation on these bands, and enough grids lie within average tropo limits. The problem is that not enough amateurs are active regularly from

them. Therefore, the *only* way of completing the requirements is to get others to activate the surrounding grids that you need.

What about WAS? This award has been issued to operators on 50, 144, 222, and 432 MHz. For 6 meters, depending on where you are located in the country and where we are in the solar cycle, it may take you between one summer and ten years to garner all the states. The most difficult are Alaska and Hawaii. For those of you who live in the southeast, you will most likely have to wait until the peak in an F2 propagation mode in order to work Alaska. However, it is possible to work Alaska *and* Hawaii on a multi-hop sporadic-E. Nevertheless, these events are rare, and one has to be watching for them.

For 2 meters you *must* rely on the moon. Only if you live within a circle that includes the eastern halves of Oklahoma and Kansas and the western halves of Arkansas and Missouri can you work all of the "lower 48." Even so, you still have to rely on EME for your Hawaiian and Alaskan contacts.

For the other two bands that have WAS awards issued for them, all of the recipients had to work some of the states via the moon.

Finally, let's look at DXCC. This sunspot cycle has seen a number of DXCC awards issued for 6 meters. However, it is not an award for the casual operator. If you are *very* fortunate, you can work 50 countries via sporadic-E. The rest have to be via some extended form of propagation, such as T-E or F2. And again, being in the right place in the country is a must. Nevertheless, if you like to travel, because of the DXCC rule that states that you can count contacts made anywhere within your home country, you can work all you can in the southwest, then move to Maine, work all the Europeans you can, then move to the west coast and work all the Asians you can. It is theoretically possible to achieve DXCC on the move! Here again, though, you must have quite a bit of luck. Nevertheless, if you plan to do it, this goal will probably take you at least ten years.

The only other band that has DXCC issued is 2 meters. Only a handful have achieved this milestone, and then after many kilo dollars invested in their station and many years of time invested in the goal.

So, there you have it: the requirements and limitations for the three most popular awards on the VHF+ frequencies. Which goal will you choose to achieve?

Coming Conference

Aurora '94: The 11th annual winter VHF gathering, Aurora '94, will be held on Saturday, February 12, 1994. As usual, it will be in conjunction with the Midwinter Madness hamfest. Full details of Aurora '94 were to have been announced in a mailing in early January.

For those of you who have not previously attended, at 3 PM the conference starts a formal program consisting of several short talks on an assortment of VHF/UHF/microwave topics. After a break for dinner, they will have a small fleamarket, another talk or slide show, and lots of ragchewing.

It will be a great opportunity to meet others who are active on VHF SSB/CW. There will also be door prizes, and hopefully VUCC award checking.

For more information, contact Paul Husby, WØUC, 1462 Midway Parkway, St. Paul, MN

55108, or call 612-642-1559. Last year's conference attracted a record 59 VHFers from 8 states and provinces. Plan to be one of those attending this year.

V31AA Now Active

Ed Askew, WAØRDZ, reports that he is now active as V31AA and will be on the air from San Pedro Town, grid square EK67, until the first part of April. He is using a TS-690 and a 3-element beam. Send your QSL card to Ed Askew, WAØRDZ, Box 187, Thurman, IA 51654.

Peter Island

The much touted Peter Island DXpedition that is scheduled to take place this month will include EME, according to a report from Paul Kelley, N1BUG. Not much is known at the time of writing this column except that Ralph, KØIR, will be the operator. For more up-to-date info, check with the EME nets on 14.345 MHz on Sundays.

On The Air

VP5/WA3HMK: Chris planned an EME DXpedition for the second week of the EME contest. If you haven't already heard, Chris had a lot of problems this time—first with the airline severely damaging his antennas and rotators, then with high wind and noise that wiped out everyone. On 7 November he did manage to work VE1BVL, OE5JFL, K5GW, and W5UN. On the 8th he worked HB9CRQ, PAØJMV, and K1MNS. Chris comments, "EME expeditions are definitely a two-man job!" *(Thanks to Paul Kelley, N1BUG, for this report.)*

Pete Heins, K1FJM, reports that he worked VE7BQH, K5GW, VE3ONT, WA6MGZ, and W5UN during the first weekend of the EME contest. Pete is using a 280 watt brick driving a 5-wavelength M^2 antenna with 40 degrees of elevation. He noted that he heard 25 stations and that there was plenty of QRM between 144.008 and 144.020 MHz.

Shep Shepard, W7HAH, reports that during the first weekend he was on 6 and 2 meters and 70 cm. That weekend he worked a total of 61 stations. He notes that SM7BAE, who has been previously very active on 2 meters, is now on 6 meters EME (contacts with him were noted in last month's column). During the second weekend he worked an additional 43 stations. Shep states that after his QSO with I5MXX on 6 meters, he got a telephone call from him. The fellow could not believe that Shep was running a single Yagi. Additionally, Shep reports that he worked EA8/ON5FF on 2 November for yet another new country on 2 meters. Finally, Shep conveys that VK3OT was active on 6 meters during the contest and W7FN and N7AVD are planning 6 meter EME arrays.

Randy Galloway, KN4QS, reports that he, along with others, experienced several days of sporadic-E openings on 6 meters 21–25 October. He says that most of the activity was to the west and southwest with at least one station (AB4KK) working double hop into California (N6RMJ). Among the other stations worked were several in Dallas, New Mexico, and Oklahoma. Also noted was a spot by K4TO indicating reception of VE1MQ at 2141 on 23 October. Randy says that he could not remember this much sporadic-E activity in October. He noted in his logs that he had worked stations via F2 the past four years but no sporadic-E during that month, and he wonders why we are having so much sporadic-E now.

Larry Lambert, NØLL, reports that he has only had propagation on 6 meters. He states on 17 October he was able to work XE2LQB via meteor scatter. The next day he worked WA8GME (EN91) and N4VC (EM66) via sporadic-E. Then between the 22nd and 23rd he initially had weak sporadic-E between Texas and Alabama, but later had good sporadic-E to Arizona, Nevada, and southern California. Over the next several days he reported more sporadic-E, mostly into the southwest and southeast. Larry writes in a subsequent report that 7 November was a big day for sporadic-E. He had conditions for almost two hours into Arizona, Nevada, and southern California. He states that the MUF got up to channel 5 TV. Finally, Larry reports that the family pet cat was electrocuted when it crawled into a live 2 meter linear power supply. He says that they have a new cat and he has cat proofed the linear. He writes that his family might ban him from the shack if they lose anymore cats!

Carl Smith, AA4H, writes that since he wrote to me initially with his appeal for 222 MHz activity he has worked over 20 stations. Hopefully, this count will increase after 1 February. Among the stations Carl has found active on that band are: N8UM (EM85), NS4W (EM76), WX4S (EM86), AA4ZZ (EM96), K4EJQ (EM86), WD4GSM (EM87), KE8FD (EM89), WA8WZG (EN81), AB4CR (EM78, before Jack had to QRT and move to the location of his new job), N4YZJ (EM96), WR3I (EM96), W4AQL (EM86), N8FMD (FM08), N4EQT (EM77), KA2DRH (EM64), WD4MOB (EM74), WB4DBB (FM07),

NW3C (EN90), WB4CTW (EM76), N8GHU (EM89), N8TLZ (FM09), and W8MGJ (EM79). Carl says that on one occasion he was listening and decided to call "CQ." He was immediately answered by NW3C. He wonders how many others are listening but not calling.

Herman Cone, WB4DBB, reports that on the night of 2 December he had a very decent 2 meter tropo opening. He worked KB4CTV (EM81), N4TWX (EL89), KE4GAI (EM91), KD4FTY (EM92), KB3NR (EL89), and KK4NO (EM92). Additionally he worked WB4JEM (EL89), WD4AFY (EM92), KB4CTV (EM81), N4TWX (EL89), and KK4NO (EM92) on 70 cm. Herman states that the tropo continued to the following morning. He says that he also worked numerous stations in South Carolina. However, his big disappointment was that he could find no one on 135 cm.

Andy Blackburn, WD4AFY (EM92), reports that on 8 December at 0420 he worked **Emilio, XE3EB (EL51),** on 2 meters SSB. Emilio asked him to QSY to 70 cm, where they again worked a couple of minutes later, also on SSB. Andy says that he is using a TS-790, a 170 watt brick with a pre-amp, and a Cushcraft 215WB up 45 feet for 2 meters, and the '790 with a 100 watt brick with a pre-amp and a 25-element K1FO designed beam up 55 feet for 70 cm.

Also reporting contacts with Emilio are **Marti, KM4XD,** and **Hal Perry, KC4YO.** These contacts seem to be the most northern made by Emilio during this unusual tropo event. Hal also reported very good conditions throughout the southeast, with contacts being made on 1296 MHz as well. Among stations heard by Hal were NI4Z on 1296 MHz working WA4CHA, who was running 50 mw!

Carl Huether, KM1H, reports that he was involved with a very good aurora opening on 2–3 December. Among the stations he worked were: WA2AEY (FN23), KA2RDO (FN12), K8DCO (EN89), WA8YUZ (EN82), K8NFO (EN90), W9YF (EN51), VE3VHB (FN24), N9AQ (EN51), WD8DTH (EN72), NN2T (FN21), KA3JWJ (FN00), WD8RPZ (EN90), VE3BFM (FN04), KA8DSS (EN73), W9ZR (EN80), K9VSW (EN51), KC2TA (FN20), VE3FAC (FN03), WØIZ (EN42, for a new one), W1KCS (FN41), N8JTB (EN82), N4PZ (EN51), N2PEB (FN13), WU2U (FN03), N8NQS (EN72), VE2HOG (FN07), K8RZB (EN70), W8IDT (EN83), WA9KRT (EN61), VE3MVV (FN15, for another new one), N9OO (EN62), NW3C (EN90), KA9ZAP (EN61), VE3CWJ (EN96, for another new one), N9JR (EN63), W9SR (EN70), KD2YB (FN03), and K3USC (EN92, for yet another new one). Carl reported that all the action took place between 2052 and 0055 UTC. He also reported weak aurora again between 0210–0330 UTC.

Ray King, WB8YFE, reports the following activity. On 24 October he had a 6 meter sporadic-E opening which included contacts into Florida, Texas, and Mexico. Among the highlights were WB2QLP (EL96), KB5OAI (EM22), N5CTE (EM12), and XE2LQB (DL98). On the next day he had a repeat of the sporadic-E propagation. Then on 20 November he had another sporadic-E opening, this time into North Dakota, which eventually spread to include practically everything north of him. Among the highlights were WØOSP (EN17), WBØLJC (EN34), VE5LY (DO70), WA1OUB/B (FN54), W3BTX/4 (EL98), AA4H (EM86), KA4YMY (EM95), N8PUM (EN66), AA2DR (FN30), and N2KYM (FN30, who was using a Squalo on the floor!).

Larry Jones, WB5KYK, reports his meteor activity during the *Leonids* as follows: On 6 meters, KB4TCU (EM81, who was running 10 watts into a halo antenna!), on 2 meters KDØDW (DN70), KAØRYT (EN34), KCØRP (DM88, who was running 70 watts into an 11-element beam on a TV mast). He reports that he has worked 121 stations on meteors during 1993.

Frank, AA2DR, reports the following during a 6 meteor sporadic-E opening on 20–21 November: N3IWJ (EM66), KA4OIG (EM72), KD4KAH (EM73), W4ZND (EM74), K6EID (EM73), KD4DLE (EM71), W9PWP (EN53), K5UR (EM35), N7JJS/5 (EM32), KØFF (EM49), KE4AEH (EM63), NN9K (EN41), KB5YUA (EM44), W9VA (EN63), K9AB (EN62), N9JFP (EN52), WA9CCQ (EN61), KA9DKF (EN51), N9RYH (EM69), N9NVY (EM69), KB5KGI (EM44), KB9GLS (EM69), WB8YFE (EN71), WB5WDF (EM69), KE8SS (EM89), WD5EWD (EM22), and WØKBZ (EM48). Frank also reports that N9RYH, N9NVY, and WB8YFE were worked by N2KYM running his TS-660 and the Squalo on the floor.

Joe, WA4AUX, reported sporadic-E openings on 6 meters over the Thanksgiving holiday weekend. Joe also reports that he has been quite busy giving out EM65 and is a bit behind on QSLing. He says that he had no idea how rare that grid was.

Steve Harrison, KOØU/4, sent me a FAX listing over 60 packet spots on 6 and 2 meters detailing propagation throughout the northeast, southeast, and midwest between 1–6

December. Steve reports that he had sporadic-E propagation on 6 meters, while on 2 meters guys to the north were experiencing aurora while guys to the south were experiencing tropo during those several days in early December. Steve also reports that he may be on from rare grid squares in New Mexico this month. More information, when available, will be put out on the 3.843 MHz Monday night net.

Bob, KA2DRH, sent me a FAX on the evening of 4 December. I had just settled down to reading a book after taking a break from this computer when the FAX phone rang. His note alerted me to a sporadic-E opening occurring at that moment. Well, I dropped everything and got on the air. It turns out that there was double-hop sporadic-E that almost was coast to coast across the southeast and southwest. I heard both sides of several QSOs between **Pete, WA7JTM,** and **Tom, N7AMA,** and stations to the east of me.

The next day Bob sent me another FAX detailing the possibility of some 2 meter FAI propagation that included him and WB4AZQ on their end and Dave, N5JHV. Although no contact took place, they did hear snatches of propagation from each other.

N6CL and Cuba

I had hoped to be on a trip in November, but my new responsibilities as the editor of the *QCWA Journal* kept me tied to the computer. This month, however, I am planning on being a part of a construction team sent from my church conference here in Oklahoma to repair a Methodist church in a small town about 180 miles from Havana. Because of the nature of the project, I doubt if I will have much time to visit my friend Arnie Coro, CO2KK.

Also, I would like to get on the air, but I think for this trip it will be out of the question. Nevertheless, I will use the trip to explore future possibilities and let you know of them via this column.

New 6 Meter FM Repeater In Chicago Area

Mark Thompson, WB9QZB, reports that he has installed a 6 meter repeater atop a 10-story office building in Palatine, Illinois, about 30 miles northwest of downtown Chicago. He says that the frequency is 52.05–53.05 MHz and that the equipment is an RCA commercial repeater, a new 4-cavity Wacom duplexer, and a commercial antenna. Incidentally, 6 meter FM is a growing phenomena. You who work so much SSB and are capable of FM might listen up the band and see what you hear during a sporadic-E opening (or anytime, for that matter). You could be pleasantly surprised as to whom you might meet "up the band."

And Finally

Your Goals and Your Integrity: Earlier in this column I discussed goal setting as it relates to the VHF+ frequencies. Coupled with goals is integrity. Integrity is a very personal trait of an individual. It may have been imprinted by religion or by a highly moral upbringing. However it was arrived at, it is a part of each one of us.

Most of us define integrity as including honesty. Honesty, as it relates to goal setting, basically asks the question, "Did you play by the rules in order to achieve your goals?" If your goals include working toward completion of the requirements of the various awards outlined at the beginning of this column, then the rules for these awards are clearly defined, and thus define the honesty you apply toward completion of the requirements for the awards.

Let's look at two aspects of these requirements: the definition of a QSO and the FCC requirement to "use the minimum power necessary to complete the contact."

First, what is a QSO? Our friends on HF have refined the meaning of a QSO, and especially in contests have defined it simply to mean that you hear the other station send your call and a signal report. In some net operations it has become even more streamlined. The net control tells each station the other's call and asks simply that they exchange signal reports. The contact lasts on the order of seconds, and the net control declares that a contact is "complete" when he or she hears both operators correctly repeat the other operator's signal report, even though sometimes it is clear that one operator simply has guessed at the signal report of the other.

We on VHF have a bit of a different standard. We will not accept that a QSO is complete until both operators acknowledge to each other that they have received both a signal report, or a grid square, or some other mutually agreed upon exchange, and the complete calls of both stations.

From where did this different standard come? Some believe that when what I call "fractional" QSOs started taking place (by "fractional" I mean that the contact takes place over a period of time mutually agreed upon ahead of time and by bits and pieces at a time), a definition of what was considered to be a QSO had to be defined.

Probably one of the earliest examples of this was the first 2 meter meteor-scatter contact, which occurred between Paul Wilson, W4HHK, and Tommy Thompson, W2UK. As this mode of propagation was experimental, no definition for what was considered a QSO existed. Therefore, Paul and Tommy looked to the League—specifically to Ed Tilton, W1HDQ, then editor of *QST*'s "The World Above 50 Mc." column—to define what was necessary for a complete contact. Ed's definition was both operators had to acknowledge to the other that they had received both calls and the correct signal report; the latter had to be confirmed by repeating the signal report received back to the other operator.

Reliance on Ed's definition caused their first claimed contact in August 1953 to be rejected. It wasn't until the second contact that both Paul and Tommy received enough information from each other for Ed to consider the QSO to be complete.

During the passage of time the definition of what is considered a QSO has undergone little change. The only slight change is that the signal report received need not be repeated back to the other operator. A simple acknowledgement by using the word "Roger" on voice or "R" on CW is considered enough.

So now we do not send information on every contact to the VHF editors of the various magazines or newsletters or to the sponsors of awards. We simply certify that we did make a complete contact or have complied with the rules. It is up to us and our integrity to complete the requirements according to the rules and to play by the unwritten rules of what is considered to be a QSO.

The other aspect I want to look at is the "minimum power" requirement. We all have heard the expression "California kilowatt." It has become defined as meaning one who runs in excess of the legal limit, particularly when chasing DX on the HF bands. Unfortunately, we would be fooling ourselves to say that such "kilowatts" do not exist on VHF.

The question is "On whatever band it is used, what has one accomplished when running excess power?" If excess power is the only way the contact was made, then what was proven to the rest of the world by running the excess power? The rest of the world still looks on the goal as impossible under the "rules."

Ultimately, one's integrity dictates that either the rules are kept or they are not. If the rules are adhered to, then the accomplishments are real and the person who makes the accomplishments is regarded as someone who can be emulated, and the goal is looked at as feasible. If not, then doubt continues concerning the viability of the accomplishment.

I feel fortunate to observe that within the VHF community there exists a high degree of integrity. Rarely do I hear of accounts of "skirting" the rules in order to complete the requirements. I am proud to know this, and I hope that such integrity will pervade all of amateur radio.

Until next month . . .

73 Joe, N6CL

AWARDS

BY NORM VAN RAAY, WA3RTY

NEWS OF CERTIFICATE AND AWARD COLLECTING

This time as our story of the month we feature:

Bruce Resseguie, KA6ZFX
USA-CA #738, January 7, 1992

Bruce was a latecomer to amateur radio. He and his wife received their Novice tickets in April 1983 and upgraded to General the next month. Bruce's wife Ginny holds a Technician class license.

Bruce Resseguie, KA6ZFX, USA-CA 738.

Bruce graduated from Los Angeles High School in 1937. After a short stint in a food processing plant, he enlisted in the U.S. Coast Guard and spent most of the next 24 years afloat, retiring in 1960 as Chief Engineman. Following his retirement, Bruce enrolled as a freshman at Long Beach State College and received his degree in 1965. He then received his graduate degree in Library Science and joined the Kern County Library as a Reference Librarian, retiring in 1976.

The Resseguie's only experience with amateur radio was with a shortwave radio Ginny picked up in a pawn shop while serving in Ketchikan, Alaska from 1958-59. They decided to look into amateur radio—when they had more time.

Finally, in 1982 while serving on a jury, Bruce met a lady who had just received her Novice ticket. The fire was rekindled and both became amateur radio license holders.

While working in the library he worked with Fran, WA6GQY, USA-CA #312. Fran got him started in County Hunting. He worked his first county on October 27, 1983 and the final one, Suffolk MA, eight years later on December 13, 1991.

Box 76, Pleasant Mount, PA 18453-0076

HONOR ROLL

3000		1500	
K3IMC	842	KFØYF	1086
KFØYF	843	WA2MUA	1087
WA2MUA	844	W2BUO	1088
W2BUO	845	WB3IET	1089
WB3IET	846		
2500		**1000**	
K3IMC	920	KFØYF	1298
KFØYF	921	WA2MUA	1299
WA2MUA	922	W2BUO	1300
W2BUO	923	WB3IET	1301
WB3IET	924	**500**	
2000		KFØYF	2725
K3IMC	996	WA2MUA	2726
KFØYF	997	W2BUO	2727
WA2MUA	998	WB3IET	2728
W2BUO	999	9A2AJ	2729
WB3IET	1000	JH1DTC	2730
		ZP5XHM	2731
		WB3LUF	2732

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. Initial application must be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 76 North Broadway, Hicksville, NY 11801 USA for $2.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 15, 1991. A complete copy of the rules may be obtained by sending an SASE to Norm Van Raay, WA3RTY, USA-CA Award Manager, Box 76, Pleasant Mount, PA 18453-0076 USA. DX stations must include extra postage for airmail reply.

Bruce expresses appreciation for the cooperation of innumerable mobiles and countless net controls. He was off and running the second time around.

Bravo Zulu (well done!) Bruce Resseguie, KA6ZFX, USA-CA #738.

SPECIAL HONOR ROLL

Donald Flynn, K3IMC
USA-CA All Counties #820
Mixed Band & Mode, 11-03-93

Rex Holford, KFØYF
USA-CA All Counties #821
Mixed Band & Mode, 11-08-93

John Miller, WA2MUA
USA-CA All Counties #822
Mixed Band & Mode, 11-14-93

Hans Ferencz, W2BUO
USA-CA All Counties #823
Mixed Band & Mode, 11-16-93

Vern Beard, WB3IET
USA-CA All Counties #824
Mixed Band & Mode, 11-25-93

Personal Notes

I traveled to Murfreesboro, Tennessee and enjoyed a fine weekend with my fellow County Hunters. About 50 of us traveled in a caravan (mobile radios giving out counties on the way) to the fabled Mrs. Mary Bo Bo's boarding house in Lynchburg, Tennessee (home of the Jack Daniel's distillery) for a delicious southern-style dinner.

The banquet Saturday evening was well attended by almost 200 amateurs and wives. I had the pleasure of personally congratulating AJ3X and K3IMC for

About 50 county hunters, including your author, WA3RTY, traveled caravan-style to Murfreesboro, Tennessee for a County Hunters' weekend.

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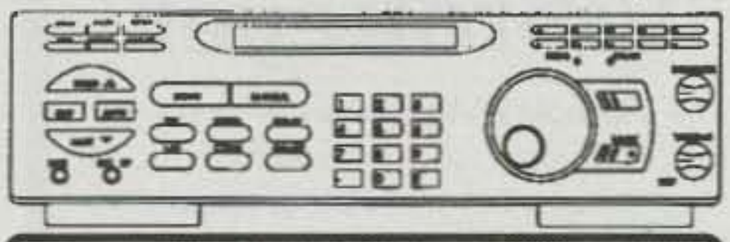

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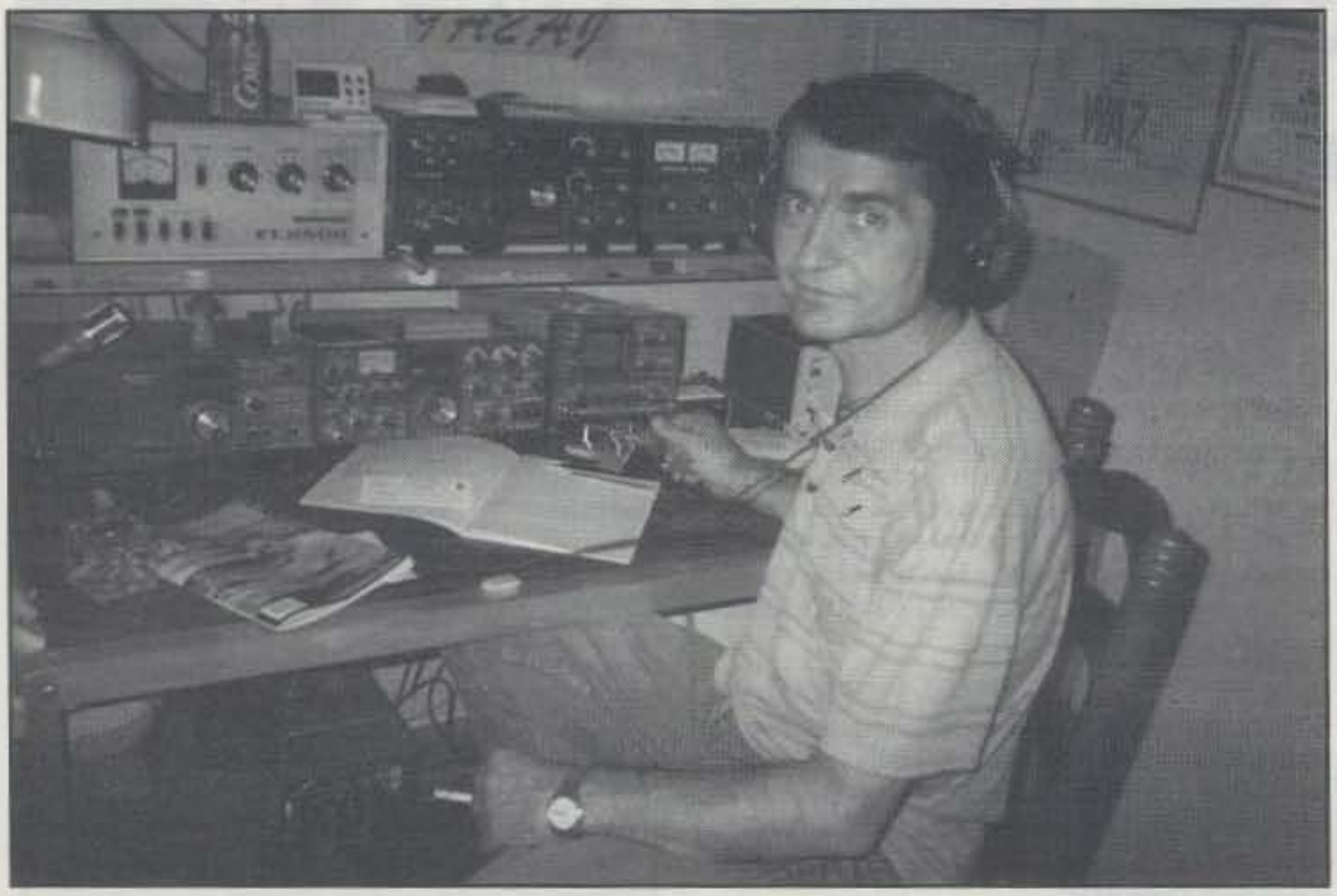

Tomislav Polak, 9A2AJ, sent along this picture with his USA-CA application.

their achievements in reaching USA-CA All Counties. As the photograph shows, the weather was chilly. (The overdressed guy on the left end of the fifth row is yours truly.)

It's not too early to be planning for the Mobile Amateur Radio Awards Club's annual County Hunter Convention to be held at the Bass Country Inn in Springfield, Arkansas. Steve Cope, K5KDG, and Bob Dyson, KØAYO, will be hosting. This will be the 25th anniversary of the first meeting of MARAC July 1969 in Mountain Home, Arkansas. Old timers are especially encouraged to attend. Registration packages were mailed the beginning of January. Is it possible that a certain former Governor of Arkansas will attend? I plan to be there.

Amateur radio is a great hobby. It can also help bring families together. As an example, two years ago I sent some QSL cards to the Dutch QSL Bureau in Arnhem, the Netherlands. I enclosed a note asking if they could locate any of my father's family. Two months later a letter from a cousin arrived, and we've exchanged several letters since. Now I'm planning a trip to my father's home—a lifelong dream of mine.

Our correspondence resolved a family mystery for me. I had been told as a teenager that my grandfather had hidden paratroopers under the floor boards of his restaurant during the battle of Arnhem (depicted in the film *A Bridge Too Far*) and that an aunt had been killed by the Germans. The true story is that my grandfather hid Jews in his home and that my aunt died of exposure when the women and children were evacuated during the battle. Pretty close.

My plans are incomplete at this time, but it looks like May or June. If any Dutch amateurs qualify for any USA-CA 500-3076 certificates, it would be my pleasure to award the certificate while I'm visiting the Netherlands. Drop me a note if this is interesting to anyone.

Address Correction

The correct address for the French TV-FV award is M. Pierre Fournier, F-10095 3 Bis Rue Pasteur, F-78000 Versailles, France. Sorry for any inconvenience. Thanks to Bob Parlin, WØSFU, an avid DX award chaser from Minneapolis, Minnesota for this correction.

Awards Issued

Donald Flynn, K3IMC, completed his book and received USA-CA 2000 #996, USA-CA 2500 #920, USA-CA 3000 #842, and USA-CA All Counties #820. I had the pleasure of meeting Don and his lovely wife (XYL) Carol at the Murfreesboro, Tennessee Mini Convention the first weekend in November.

Rex Holford, KFØYF, sent in a complete book and received USA-CA 500 #2725, USA-CA 1000 #1298, USA-CA 1500 #1086, USA-CA 2000 #997, USA-CA 2500 #921, USA-CA 3000 #843, and USA-CA All Counties #821.

John Miller, WA2MUA, completed his quest and received USA-CA 500 #2726, USA-CA 1000 #1299, USA-CA 1500 #1087, USA-CA 2000 #998, USA-CA 2500 #922, USA-CA 3000 #844, and USA-CA All Counties #822.

Hans Ferencz, W2BUO, with the help of Paul, WA3TUC, who signed his book, received USA-CA 500 #2727, USA-CA 1000 #1300, USA-CA 1500 #1088, USA-CA 2000 #999, USA-CA 2500 #923, USA-CA 3000 #845, and USA-CA All Counties #823.

Vern Beard, WB3IET, joined the elite group by receiving USA-CA 500 #2728, USA-CA 1000 #1301, USA-CA 1500 #1089, USA-CA 2000 #1000, USA-CA 2500 #924, USA-CA 3000 #846, and USA-CA All Counties #824.

The following qualified for the basic award, USA-CA 500: Tomislav Polak, 9A2AJ; Tomy M. Saki, JH1DTC; Hugo Alberto Molina, ZP5XHM; and James C. Smith, WB3LUF (All CW).

Congratulations to all our laureates for this month.

73, Norm, WA3RTY

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CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

CQ 1993 Contest Survey—The Final Results

February's Contest Tip

Maybe you read the rules for many of the small contests in *CQ* each month (there are 12 different contests in this month's calendar) but never try them out. Specialized contests (especially state QSO parties from **your** state) are an excellent way to hone your skills for the next big one. Try them out!

One of the principal goals of my contest surveys is not only to examine the current issues of the day, but to provide a forum for input that goes far beyond "yes or no" answers. Thanks to you, this goal has been achieved with 345 fascinating responses this year—a new record!

I think you'll agree that the results are intriguing. This year we learned that as contesters we are not driven primarily by our egos, but rather by the sport and competitive nature of contesting itself. On balance, we do not invest millions in our amateur radio stations, but probably the same as most other *active* amateurs. We have our ethical issues to deal with, as do DXers and even 20 meter ragchewers. And we certainly have our problems with the local zoning boards around the world.

Even though this is my fifth survey, your efforts never cease to amaze me. Our long-standing novelist, W5FO, had too many business commitments to maintain his leadership position in the "most voluminous survey by a supporting reader" category. His efforts were replaced this year by an extraordinary 7-page tome written by Larry Word, NF6S. Honorable mention should go to KC2X, NJ2L, WB4HFL, KC8HF, and others.

As I mentioned, we received 345 responses—up 4% from last year. This year's survey yielded an average level of contesting experience of 16.4 years (almost one year more than the 1992 survey . . . hmmm??) with responses from every state and 28 countries in 20 *CQ* WAZ zones. See Table II for the breakdown.

Calendar of Events

Jan.	**28-30**	**CQ WW 160 M CW Contest**
Jan.	29-30	U.B.A. Belgian SSB Contest
Jan.	29-Feb. 6	ARRL Novice Roundup
Feb.	5	North American CW Sprint
Feb.	5-6	Vermont QSO Party
Feb.	5-6	MARAC 10 Meter CW QSO Party
Feb.	6-7	1994 Classic Radio Exchange
Feb.	12	North American SSB Sprint
Feb.	12-13	QCWA CW QSO Party
Feb.	12-13	EA RTTY Contest
Feb.	12-13	Dutch PACC Contest
Feb.	12-14	New Hampshire QSO Party
Feb.	12-14	YLRL YL-OM SSB Contest
Feb.	19-20	MARAC 10 Meter SSB QSO Party
Feb.	19-20	ARRL CW DX Contest
Feb.	**25-27**	**CQ WW 160 M SSB Contest**
Feb.	26-27	U.B.A. Belgian Contest
Feb.	26-28	YLRL YL-OM CW Contest
Mar.	5-6	ARRL SSB DX Contest
Mar.	12-13	QCWA SSB QSO Party
Mar.	12-13	Kentucky QSO Party
Mar.	13-14	Wisconsin QSO Party
Mar.	15-16	CLARA & Family HF Contest
Mar.	19-20	Bermuda Amateur Radio Contest
Mar.	**26-27**	**CQ WW WPX SSB Contest**
Apr.	2-3	Holyland DX Contest
May	**28-29**	**CQ WW WPX CW Contest**

1993 Survey Results

What are the *primary* reasons why you participate in contests (circle the top one or two choices that apply):

Ego—32
The sport and competition factor—205
Camaraderie among participants—97
Developing personal technical competence—70
Enhancing operating ability—130
Other—92

It was encouraging to see that the vast majority of us engage in contesting simply for the sheer thrill of the sport and its competitive nature. It's so easy to let our egos take a leadership position, but as you can see from the results that factor was way down the list. Interestingly, those who did mention ego as a factor were not all users of large super-stations or perennial winners. One of the good things about contesting is the satisfaction it can provide even when you achieve your personal goals.

You'll note that 92 responses included other factors determining contest motivation. Some of these components were:

Award hunting
Helping the local club
Experimentation with the station/antennas
Collecting QSLs
Helping others in contests
Beating last year's score
Personal satisfaction
Fun, fun, fun!

What was encouraging to me was that 57 of the 92 "other-(f)" responses (61.9%) stated that they operate contests simply to have fun!

If possible from your experience, identify the single most common failure point in your contest station (e.g., amplifier, rotor, transceiver, computer, etc.):

Operator—48
Antenna—41
Rotator—32
Amplifier—31
Transceiver—20
Computer—20
Antenna Relays/Connectors—8
Keyer—4

There were a number of different responses to this question, but the winner was one that I didn't even think of—the operator! I think you'll agree there are no surprises here, with the usual station ingredients such as antennas, rotors, and amplifiers leading the pack. I did notice a number of respondents indicating computer trouble, leading me to believe that much of that is from contest software and not the physical machine itself. We all should have a moment of silence for several guys who have had multiple failures in several of the categories above.

Quantify the $$ investment you have made in your contest station over the following time periods:

Last 12 months—average $1,787
Total Investment—average $9,580

The results from this question were very interesting. In addition to the averages presented above, the total investments were impressive. Collectively, this year's survey pool spent $631,000 during the past 12 months and an even more amazing sum of $3.287 million for their total amateur radio investment. There was a nice balance in the total investment figures with many respondents well below $5K and a few exceeding $80K! If you take the $9,580 average, however, and divide it by the median years of contest experience (16.4 years), the total is a much more manageable $584 per year. There are few hobbies that provide so much enjoyment for such a small annual expenditure.

Do you feel the "small gun" deserves more recognition in contest reporting?

Yes—231
No—95

It comes as no surprise to me that the overwhelming view of contesters is that the "small gun" deserves more recognition—a position I've supported for a long time. What perplexed me was the hidden information in the 95 *negative* responses. As far as I could tell (and this is certainly not a scientific analysis), 60–70% of the "no votes" were from little guns themselves. This data revealed a certain measure of "acceptance of the status quo," or as indicated by some, a feeling that contest recognition should be earned by results, not circumstance.

If you answered Yes to Question #4, what enhancements would you recommend?

Scores adjusted by power
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Limit contests to 100 watts
More "small gun" awards
More power categories (e.g., 100–500 watts)
First-time participant
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"Small gun" contest
More reporting on little pistols in contest results
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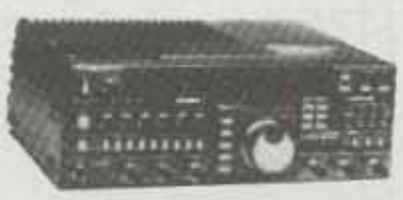

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AVIATION PORTABLE ICOM A-21
MOTOROLA MARINE KING KX 99

SCANNERS
AOR: 900, 1000, 1500, 2500, 2800, 3000A
ICOM: R-1, R100, R71A, R72A, R7000, R7100, R9000
Bearcat

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FLUKE 77, 83, 85, 87 Multimeters

Linear Amplifier
Ameritron, Icom, Kenwood, Yaesu

YAESU	ICOM
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FT411E-811-911	IC02AT/2SRA
FTH-2008/7008	IC2/4GAT/24AT
	IC-A21/U16

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M7, M56, M700
AVIATION ICOM: A21 A200 H.T., TAD

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Question #	Yes	No	Total	% Yes Responses
1	N/A			
2	N/A			
3	N/A			
4	231	95	326	70.9%
5	N/A			
6	105	212	317	33.1%
7A	205	108	313	65.5%
7B	177	145	322	55.0%
7C	153	155	308	49.7%
7D	104	187	291	35.7%
8	159	163	322	49.4%
9A	131	165	296	44.3%
9B	156	142	298	52.3%
9C	215	88	303	71.0%
10	281	56	337	83.4%
11	119	216	335	35.5%
12	103	153	256	40.2%
13	189	143	332	56.9%

Table I– Summary analysis of survey results.

Call Area	# Responses
W1	22
W2	35
W3	24
W4	39
W5	27
W6	38
W7	25
W8	18
W9	19
WØ	20
VE	9

None indicated: 25
Total: 344

DX Country	# Responses
G	3
DL	6
KL7	2
KP4	1
PY	1
F	2
YB	1
XE	1
5X	1
A2	1
VK	1
I	1
KH6	3
LU	1
ZL	2
HL	1
EA6	1
HB9	1
YV	1
ZS	4
HI	1
OY	1
EA8	1
V4	1
V8	1
EA	1
TL8	1
SP	1

Table II– Geographic response analysis.

Score based on number of hours operated
Various weighting schemes for scoring
Under "xx years as a ham" category/awards
Top five by zone/section reporting
More anecdotes, especially focused on small gun
SWL category
More regional reporting in contest results

There were about as many different answers to this question as there were responses. If you have been involved in any of the discussions on this topic lately, there is no easy answer. In fact, it's not even clear by some of the responses to this survey that enhancements are even required. All contest sponsors (including *CQ*!) should look at some of the suggestions. While I don't think there will ever be a master equalization scoring scheme, there are some very practical steps sponsors can take to give the small station his due recognition. I've taken the liberty of highlighting them above. What do you think?

There has been much debate about contest score equalization. Do you feel there is a need to implement a scoring equalization system to account for station/geographic differences?
Yes—105
No—212

The vast majority of responses to this question did not support any kind of score equalization system. This has been a heavily discussed topic in a number of circles over the past year, with the result being that even if the majority believed that a system should be put in place, there is no fair administrative method. Our survey supported this opinion with 76 of the 212 negative responses (35.8%) indicating the same administrative concern. Almost all of the comments indicated that score equalization was not the issue as much as recognition of the small stations who make contesting possible (see earlier question on small pistol recognition).

If you take an honest look at the impact of contesting on amateur radio, do you feel the following need to be addressed by the contest community?
Excessive Power
Yes—205
No—108
Disrespect for the operating privileges of the "non-contester" during contests
Yes—177
No—145
Improper equipment operation (e.g., speech processor levels)
Yes—153
No—155
Stretching the interpretation of governmental licensing laws
Yes—104
No—187

This was the first time I gave contesters the opportunity to publicly show some of their "dirty laundry" by admitting that certain operating practices are a potential problem that needs attention. If you accept these results at face value, then the next step is to identify ways that we can attack and solve them. My 25+ years of contest experience has led me to believe that respect for the non-contester while operating is our biggest issue, despite the strong concerns expressed about power abuse in this year's survey. I'd be interested in hearing more of your thoughts on power abuse. Are your views experiential or based on opinion? With enough input, it could be a very interesting column for the future.

Do you think that your contest log would be more closely scrutinized if it were to be submitted electronically on disk?
Yes—159
No—163

I have to admit that the results of this question both surprised and perplexed me. At least in the U.S. (with participation rapidly growing overseas), submitting your contest log electronically has become the way of life. Having said that, I'm sure many of us can name someone who is afraid of the issues raised by this question and therefore refuses to "go electronic" for those reasons—not because he or she has something to hide, but rather out of fear that the log may be more closely scrutinized. The reality is quite the opposite, however. Most contest sponsors, in the absence of a "disk" for a high scorer, will inevitably be forced to key in the log manually. This potentially creates many more errors than ever would be in the original log. Hopefully over time these fears will go away as an increasing percentage of contesters turn to their 1.44 MB diskettes for scoring.

Do you feel there is abuse of power limits in the following operating categories?
QRP
Yes—131
No—165
100 watts (low power)
Yes—156
No—142
KW (full power)
Yes—215
No—88

The intent of this question was not to focus on power abuse per se (as was the case earlier), but rather abuse of contest rules. As you can clearly see, abuse of power is inversely proportional to output levels, according to our responses. While all of this is circumstantial, QRPers should remain at ease, as most people believe that the majority play it by the rules. What was striking was the strong statement about abuse at the KW level. You were very consistent with your earlier comments about

this issue with three out of four responses indicating this is a problem in contesting. I wonder if some of the positive responses to this question were influenced by East Coast dominance in DX contests. For example, certainly you can't achieve consistent results like that without the assistance of a little extra power, right? Or how about those big ARRL SS signals? I think in the next survey we'll explore this topic in a little more detail.

Should contests continue to be excluded from the WARC bands?
Yes—281
No—56

Many people don't realize it, but my contest surveys have a number of "non-contesting" respondents. Not all of them are friendly and a few even touch on new forms of vulgarity. Nevertheless, the non-contester can breathe a sigh of relief, as there is overwhelming support to keep contests off the WARC bands. In fact, over 25% of those supporting WARC-band contesting included suggestions that limited operation to portions of the WARC frequencies, single-band WARC contests, and other self-policing policies. A slim 10% of the positive responses (10) openly suggested that contests such as the CQ WW or ARRL DX should include WARC-band operation.

Have antenna zoning restrictions modified your plans for contest participation?
Yes—119
No—216

Well, fellow contesters, are you being tormented by antenna zoning limitations? There are 119 others just like you, not that that is any consolation. With 35.5% of any active amateur group suffering in this way, this continues to be a major issue facing our hobby. Naturally, the situation is exaggerated for the contester because of the natural dependency on larger antennas to be successful. If you have a good story on how you "beat the system," I'd like to hear from you and share it with our readers!

Do you think there is room in radio contesting for an "off-the-air" computer-based contest that is exclusive of any current on-air activities?
Yes—103
No—153

Okay, I agree this was the unusual question in this year's survey. It also spawned some of the more humorous responses such as "what have you been smoking," "are you nuts," "what does this have to do with radio," etc. You'll notice that the lack of responses relative to the rest of the survey means that I confused more than one guy on this one. The intent of the question was to acknowledge some of the interesting contest simulation software being written in Japan and other locations, and its applicability to today's contesting world. Perhaps more known is the famous Dr. DX program that runs on the old Commodore computers. It's interesting to consider whether it's practical or even desirable to look at this emerging technology as a derivative form of contesting in the future.

Do you agree with the growing opinion that contesting is evolving into a sport of "10 super-stations and everyone else"?
Yes—189
No—143

Frankly, I thought that there would be more positive responses to this question. The most common comment on both sides of the responses was: "even if the premise of 10 super-

stations is true, who cares??" What seemed to be a subtle tone in many of the answers is that the respondents participate in contest for many personal reasons and the existence of "super-stations" is largely irrelevant to those goals and objectives.

Final Comments

I hope you enjoyed the results uncovered in this year's contest survey. Again, many thanks for the effort expended in each and every response. There is more analysis that I would like to share with you, but I'm rapidly running out of room this month. For example, it would be interesting to show opinion on some of the survey's topics by geographic region. For example, do stations in the Midwest or overseas feel stronger about a scoring equalization system than those on the East Coast? Space permitting, I'll try to cover this next time.

In the next column I will be touching on a topic that has been troubling me—rule abuse in various gray areas in contesting. In some cases the abuse is an outright violation. Yet others are going past the "spirit of the law." All are worthy of further discussion.

By the way, if you haven't noticed, one of our fellow contesters, Doug Grant, K1DG, has recently completed a new book for *CQ*—the *CQ 1994 Radio Amateur's Almanac*. In addition to countless facts and figures on amateur radio in general, you'll find a fascinating summary of contest history, records, and other "hard-to-find" data. We also have a new set of 1994 15-month calendars with incredible photography of some famous contest stations as well as a nostalgic version for lovers of the "old days." Be sure to check them out!

That's it for this month. As always, send your contest announcements to me by March 1st for the May column.

73, John, K1AR

Vermont QSO Party

0000Z Sat. to 0500Z Sun., Feb. 5–6

This is the 31st annual Vermont QSO Party sponsored by the Central Vermont Amateur Radio Club. This is a great opportunity to work one of the rarest states on several bands. Participation is open to all licensed radio amateurs worldwide on 160–2 meters.

Classes: Single or multi-operator all bands, rover, club.

Exchange: Vermont stations send RS(T) and county (14 total). Others sent RS(T) and state/province/DXCC country.

Frequencies: Phone—first 25 kHz up from the beginning of the General band and Novice 10 meter band. CW—40 kHz up from the bottom edge of the bands and 20 kHz up from the bottom of Novice portions. VHF—50.200 and 146.69 MHz.

Scoring: Credit 1 point per phone QSO and 2 points for CW, digital mode QSOs. Non-Vermont stations multiply total QSO points by the number of VT counties and special-event QSOs with W1BD. Vermont stations follow similar format with the addition of states/provinces/DXCC country multipliers. Stations may be worked up to four times per band (SSB, CW, RTTY, etc.).

Awards: Vermont stations submitting a log will receive a Vermont QSO Party Certificate. Plaques will be awarded to the three highest scoring Vermont stations. Special certificates will also be awarded for the highest scoring station in each state, province, and DXCC country.

Send your postmarked entries no later than March 1, 1994 to: Central Vermont Amateur Radio Club, Vermont QSO Party, P.O. Box 674, Montpelier, VT 05602. Be sure to include an SASE for final results.

1994 Classic Radio Exchange

2000Z Sat. to 0400Z Sun., Feb. 6–7

The Classic Radio Exchange ("CX") is celebration of the older commercial and homebrew equipment that was the pride of our ham shacks a few decades ago. Exchange your name, RST, QTH, receiver and transmitter type, and other interesting conversation.

Frequencies: CW—60 kHz up from lower band edge. Phone: 3880, 7290, 14280, 21380, 28320 kHz. Novice/Technician operate 20 kHz up from lower band edge.

Scoring: Multiply total QSOs by the sum of the total number of states, provinces, and DX countries plus the total number of different receivers and transmitters worked on each band/mode.

Send logs, comments, anecdotes, and pictures to: Jim Hanlon, W8KGI/5, P.O. Box 581, Sandia Park, NM 87047. Include an SASE for a copy of the club's next newsletter.

MARAC 10 Meter QSO Party

CW: 1200Z Sat. to 2400Z Sun., Feb. 5–6
SSB: 1200Z Sat. to 2400Z Sun., Feb. 19–20

The Mobile Amateur Radio Awards Club is proud to announce its 5th annual 10 Meter QSO Party open to any single operator mobile or fixed station.

Exchange: Single report, station designator (F for Fixed, M for Mobile) and location (US County, Canadian province, or DXCC country).

Scoring: Credit 10 points for a mobile QSO and 1 point for contacting a fixed station. Final score is total QSO points times the total number of US counties, Canadian provinces, and DXCC countries.

Awards: Plaques will be awarded to the highest scoring US mobile; fixed US, Canadian, and DX stations. Certificates will be sent to the top three mobiles and top fixed station in each state, province, and DX country. You will need a minimum of 10,000 points to be eligible for a plaque and 1000 points for a certificate.

All entries must be **received** by March 26, 1994 and should be sent to: Joyce Boothe, WB9NUL, Rt. 6, Box 748A, McLelland Road, Harlingen, TX 78552. Include an SASE for a copy of the club's newsletter and final results.

North American "Sprint"

CW: Feb. 5 SSB: Feb. 12
Sunday 0000Z to 0400Z (Sat. night)

This is the Spring edition of the "Sprint" run by the *National Contest Journal*. As the name implies, it's a shorty, only four hours long.

North Americans will be contacting other North American stations as well as stations in other countries, single operator only. North American boundaries are as defined by the rules used in the CQ WW DX Contest.

Exchange: Call, QSO no., name, and QTH (state, Canadian area, or country).

Scoring: Multiply total QSOs by the sum of

states, Canadian areas, and other North American countries worked for your final score (U.S. and VE not countries; KH6 not a state). There are eight Canadian multipliers: VE1/VO1/VO2/VE2–VE7/VY1/VE8. Non-North American countries do not count as a multiplier.

Frequencies: Three bands only: 80, 40, and 20 meters. CW—3540, 7040, 14040. SSB—3850, 7225, 14250. (Plus or minus QRM.)

Awards: A trophy to the highest scoring entrant. Certificates to the top scorer in each U.S. call area, Canada, and North American country. Also to the ten top scores, to each member of the winning team, and the highest scoring entrant on each team.

Team competition is limited to a maximum of 10 operators as a single unit. Pre-contest registration is required for each team before the start of the contest—with N6TR for the CW and K7GM for the SSB section.

There are other detailed rules, a special QSY rule, disqualifying penalties, etc. I suggest you write to WN4KKN or K7GM if you do not have a copy of the *National Contest Journal*.

Entries must be received no later than 30 days after the end of each "Sprint." Your CW results should be sent to: Larry Tyree, N6TR, 15125 S.E. Bartell Road, Boring, OR 97009. SSB goes to: Rick Niswander, K7GM, Box 3718, Greenville, NC 27386-1778.

YLRL YL-OM Contest

SSB: 1400Z Sat. to 1400Z Mon., Feb. 12–14
CW: 1400Z Sat. to 1400Z Mon., Feb. 26–28

Sponsored by the Young Ladies Radio League, this annual event is open to all licensed men and women operators around the world.

Exchange: Callsign, QSO number, RS(T), ARRL section/VE province/country.

Scoring: Phone and CW are considered separate contests. Score one point for each station worked. YLs only work OMs and OMs only work YLs. Credit a special multiplier of 1.5 if you are using 100 watts or less on CW and 200 watts PEP on SSB. Final score is the total QSO points times the sum of ARRL sections, provinces, and countries worked per band.

Frequencies: CW—3540–3725, 7040–70, 14040–070, 21120–150, and 28150–200 kHz. SSB—3940–70, 7240–70, 14175–280, 21380-410, 28300–610 kHz.

Awards: Special award cups will be awarded to the winning phone and CW YL and OM. Certificates will be sent to the high scorers in each US call area, VE province, and DX country, provided there are at least 10 valid QSOs in the log.

All logs are to be postmarked no later than 30 days after the contest and should be sent to: Carla Watson, WO6X, 473 Palo Verde Dr., Sunnyvale, CA 94086.

QCWA QSO Party

CW: 0001Z Sat. to 2400Z Sun., Feb. 12–13
SSB: 0001Z Sat. to 2400Z Sun., Mar. 12–13

This is the 37th annual edition of QCWA's fun and traditional QSO Party, which is open to QCWA members worldwide. Please note that CW QSOs are only valid in the CW section and visa versa for SSB.

Classes: Single operator, all bands.

Exchange: QSO number, operator's first name, chapter identification (members not belonging to a chapter should send "AL"), and state or DXCC country.

Scoring: Final score equals the total number of stations worked times the multiplier. Multipliers are the number of QCWA chapters worked during the contest (credit a chapter multiplier only once). **Frequencies:** CW—3530–3560, 7025–7055, 14030–14060, 21040–21070, 28040–28070. SSB—39003930, 7230–7260, 14260–14300, 2135021380, 28530–28560. No QSOs on the WARC bands. Check 160 meters at 0400–0500Z and 1200-1300Z.

Awards: Plaques will be awarded to the top scorer worldwide on each mode.

Separate logs and scores must be submitted for both modes. All logs must be received by April 8, 1994 and sent to: Bob Reed, WB2DIN, 597 Brewers Bridge Road, Jackson, NJ 08527.

EA RTTY Contest

1600Z Sat. to 1600Z Sun., Feb. 12–13

This is the 1994 edition of the Spanish RTTY Contest sponsored by U.R.A.D. It is open to participants worldwide on 80–10 meters.

Classes: Single operator, all bands and single band, multi-single, and SWL.

Exchange: Signal report and Spanish Province (for EA stations). All others use *CQ* zone.

Scoring: For non-EA stations—On 10–20 meters credit 1 point for contacts in your continent, 2 points for QSOs outside your continent. On 40 and 80 meters triple your QSO points (e.g., 3 within your continent). QSOs between stations in the same country are only valid for multiplier credit and have no QSO point value.

Multipliers: Non-EA stations count each DXCC country and EA province (maximum 52) per band. Spanish stations use CQ zones and DXCC countries per band.

Final Score: Multiply total QSO points times multiplier.

Awards: Trophies to the top entries in each class. Certificates will be awarded to winners in each class for every DXCC country and EA district (50 QSOs minimum).

Send your entries to: EA RTTY Contest, c/o EA1MV, Antonio Alcolado, P.O. Box 240, 09400 Aranda de Duero (Burgos), Spain. The mailing deadline for entries is April 9, 1994.

Dutch "PACC" Contest

1200Z Sat. to 1200Z Sun., Feb. 12–13

It's the world working The Netherlands on all six bands, 1.8 through 29.7 MHz, in the band sections recommended for contest operation by the IARU. The same station may be worked on each band, but on one mode only, phone or CW, for QSO and multiplier credit. Note that SSB QSOs are not allowed on 160 meters.

Categories: Single operator, multi-operator, and SWL.

Exchange: RS(T) plus a QSO number starting with 001. Dutch stations will add two letters to identify their province. There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, FL, ZH, and ZL.

Scoring: Each QSO with a PA/PB/PI station counts one point. DX stations determine their multiplier by the number of provinces worked on each band (maximum of 72).

Final Score: Total number of QSOs times the number of provinces worked on each band.

Awards: Certificates to the top scoring station in each category in each country and call areas of JA, LU, PY, UA9/Ø, VE/VO, VK, W/K, ZL, and ZS. Also second- and third-place awards if returns justify.

SWL's must log the call of the Dutch station as well as the station being worked and both serial numbers. Scoring same as above. Indicate the multiplier in a separate column in your log only the first time it is worked on each band. Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration.

Mailing deadline is March 31st to: PACC Contest, Att: F. Th. Oosthoek, PAØINA, P.O. Box 499, 4600 AL Bergen op Zoom, The Netherlands.

New Hampshire QSO Party

1900Z Sat. to 0700Z Sun., Feb. 12–13
1400Z Sun. to 0200Z Mon., Feb. 13–14

This year's party is again sponsored by the NH Amateur Radio Association. It is New Hampshire stations working all others. As with most QSO parties, the same station may be worked once on each band mode.

Exchange: RS(T) and QTH. County for NH stations; state, province, or country for others.

Scoring: All stations credit 1 point/SSB QSO and 2 points digital QSO (RTTY, CW, packet). NH stations multiply QSO points by number of NH counties, states, provinces, and DXCC countries. Others simply use counties. Twenty (20) bonus points/QSO may be added to your final score for working NHARA members: W1ET, WB1CAG, N$$CUH, WB1HBB, K1RD, AA1EX, W1GUA, WB1ASL, WW1G, K1BKE, N1LT, KD1GJ, and W1OC.

Final Score: Final score is calculated by multiplying QSO points times total multiplier and adding bonus points.

Frequencies: CW—1810, 3535, 7035, 14035, 21035, 28035. SSB—1875, 3935, 7235, 14280, 21380, 28320, 50115, 144205.

Logs must be received by March 31, 1994. Be sure to include an SASE for final results. Send logs and comments to: G.E.A.R.S., Conrad Ekstrom, WB1GXM, P.O. Box 1076, Claremont, NH 03746-1076.

YL ISSB QSO Party

0001Z Sat. to 2359Z Sun., Feb. 19–20

The party is open to all, but the emphasis is on membership participation. Rules and logging format are much too lengthy and complicated to list here. Send a large SASE to KØETA for more details.

Categories: Single operator, DX-US Partners, and YL-OM Teams.

Exchange: Call, name, QTH (state, province, territory, district, or country), name, ISSB number, YL-OM teammate, DX-US partner.

Points: One point for non-member contacts, 3 points for member contacts on the same continent, and 6 points if in a different continent.

Multiplier: Only contacts with member stations count as a multiplier. In addition, credit one multiplier for working both DX-W/K partners, each YL/OM team, US state, VE province, DXCC country, and each VK, ZL call area. Use multiplier of 5 for low power (less than 200 watts).

Frequencies: The General portions of the CW and phone bands, 10 through 80 meters. Avoid 14332 used by ISSB Net. Check 40 and 80 hourly.

Awards: Category and QTH area winners. Special certificate to the top combined CW and phone score.

Logs: Should be set up as outlined in the exchange and should indicate at least two 6 hour rest periods. A summary sheet showing the scoring and other essential information would be helpful.

Mailing for all entries is April 30th, and they go to: Fred Kujawa, KØETA, 13579 Y Street, Omaha, NE 68137-3009.

ARRL International DX Contest

CW: Feb. 19–20 Phone: March 5–6
0000Z Saturday to 2400Z Sunday

This is a great DX contest that you should not miss. Study the announcement in the December issue of *QST* for more details. Also send a large SASE (2 IRCs for DX) for sample log and entry forms.

All bands may be used, 1.8 through 28 MHz, but not 10, 18, or 24 MHz. Aeronautical or maritime mobile stations cannot be worked for contest credit. Following is a brief outline.

Categories: Single operator, both single and all band, and single operator assisted. Multi-operator, one transmitter and two transmitters. Also multi-operator, multi-transmitter. And QRP, all band only (5 watts or less output). Multi-transmitter stations must remain on a band at least 10 minutes once a contact is made.

Exchange: RS(T) and state or province for W/VE; RS(T) and power input for DX stations (three-digit number).

QSO points: W/VE stations earn three points for each W/VE contact.

Multiplier: Each DXCC country worked on each band for W/VEs. DX stations use US states (48), District of Columbia (DC), and VE provinces (13) for their multiplier. (Maximum mul–tiplier of 63 per band.)

Final Score: Total QSO points times the sum of the multiplier from each band. Entries with 500 or more QSOs must include a QSO check sheet.

Awards: Certificates given in each category, in each country, and in each ARRL section, plus a wide selection of plaques. Also certificates to DX stations making over 500 QSOs.

Log entries are accepted on 5¼" MS-DOS formatted diskettes. Submit an ASCII file along with a signed summary sheet. No paper logs are required with this method.

Disqualification regulations will be strictly enforced and are listed in the official rules. Mailing deadline for all entries is April 7th, and they go to: ARRL DX Contest, 225 Main Street, Newington, CT 06111.

CQ WW 160 Meter SSB Contest

2200Z Fri. to 1600Z Sun., Feb. 25–27

Just a reminder that the SSB section of our 160 Meter Contest will be coming up the last full weekend of this month.

Extensive coverage has been given to this event, with complete rules in the November issue. They are the same rules that have been used for many years, and they are well known around the world.

Mailing deadline for your entry in last month's CW contest is February 28th, and March 31st for this month's SSB section.

Entries may be sent directly to the 160 Contest Director, David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092. *(Be sure to indicate CW or SSB on the envelope.)*

DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Walvis Bay and the Penguin Islands

Walvis Bay ZS9 and the Penguin Islands ZSØ may well be the next two countries to be deleted from the current DXCC countries list. The Republic of South Africa (RSA) is scheduled to turn over both separate DXCC countries to the independent country of Namibia V5 at the end of February. However, continuing negotiations between RSA and Namibia will likely lead to a delay of months, or even years, before this transfer occurs. Whenever RSA does relinquish sovereignty over these regions, and Namibia takes over, the reasons for separate DXCC country status for both will disappear. It is then very likely that the two countries will be deleted from the current countries list.

Walvis Bay ZS9 holds the unique distinction of being the best-known piece of land in the world from which legitimate amateur radio contacts did not count for DXCC credit. From 1977 until Walvis Bay was added to the DXCC countries list in 1990, contacts with licensed stations in the 400 square mile South African enclave did not count for anything—not for South Africa, and not for neighboring South West Africa, then ZS3. It was as if Walvis Bay was adrift at sea, as shipboard QSOs likewise do not count for DXCC credit. The story of how this ridiculous situation was finally resolved shows why Walvis Bay and the Penguins will most likely be deleted countries in the near future.

Walvis Bay became British territory in 1878, when British Commander Dyer claimed the region. In 1884 the region was officially added to the British Colony of the Cape of Good Hope, which later became the Union of South Africa. Meanwhile, Germany claimed the rest of South West Africa. Early in World War I South African forces defeated German troops who were defending Germany's claim to South West Africa. At the end of that war the League of Nations established the Mandated Territory of South West Africa, administered by South Africa. South Africa had effective control over South West Africa for the next 40+ years.

South African dominance over South West Africa began to fall apart in the late 1960s. Although the International Court of Justice did not act on a formal complaint from Ethiopia and Liberia against South Africa's administration of South West Africa, the United Nation's General Assembly terminated South Africa's mandate over South West Africa in 1966, and two years later made Namibia the official name of the country. A combination of internal guerrilla warfare and external political pressure gradually drove South Africa out of power in Namibia in the 1970s. However, before RSA left Namibia, they formally transferred administration of Walvis Bay (and the Penguin Islands) back to the Cape Province of South Africa, effective September 1, 1977.

That's when the trouble began, DX-wise. South Africa considered Walvis Bay now under the jurisdiction of the Cape Province of South Africa, some 350+ miles away. Amateur radio licenses issued to Walvis Bay amateurs used the ZS1 prefix, while South West Africa/ Namibia amateurs continued to use the ZS3 prefix. However, the continued presence of South African troops in South West Africa/Namibia confused the issue. Walvis Bay was clearly no longer administered by South West Africa, but if SWA was under RSA control, how could Walvis Bay be considered separate?

The DXCC desk used the head-in-the-sand approach to this muddled situation: they simply refused to accept Walvis Bay contacts for DXCC credit for anything! While by no means a solution to the dilemma, this approach avoided many complex questions, questions that the Republic of South Africa was in no mood to consider.

Thanks to efforts of Bill Shipp, KA1AG, the ARRL DX Advisory Committee (the DXAC) resolved the question of country status of Walvis Bay in 1990. Bill's carefully researched and well-presented arguments showed clearly that Walvis Bay had been under the direct administration of RSA since Sept. 1, 1977, while Namibia was a separate, independent, country. Thus, Walvis Bay should have separate DXCC status under DXCC country criterion Point 3: separation by another DXCC country. Early in 1990 the DXAC voted unanimously, and the Awards committee concurred unanimously, to make Walvis Bay a separate DXCC country, effective with the change in administration on Sept. 1, 1977. Finally, contacts with Walvis Bay counted for DXCC credit!

(An interesting footnote to this story is the unique way Shipp got Namibia to state that Namibia didn't control amateur radio in Walvis Bay. Fellow New Country sleuth Ian Sutherland, ZS1IS (now ZS9A), wrote to the Postmaster General of South West Africa asking for an amateur radio license in Walvis Bay. The Postmaster General

All three active operators from St. Helena Island in the South Atlantic: Gervace, ZD9GC; Andy, ZD9BV; and Lorraine, ZD9CO. (G3SXW/ZD9SXW photo)

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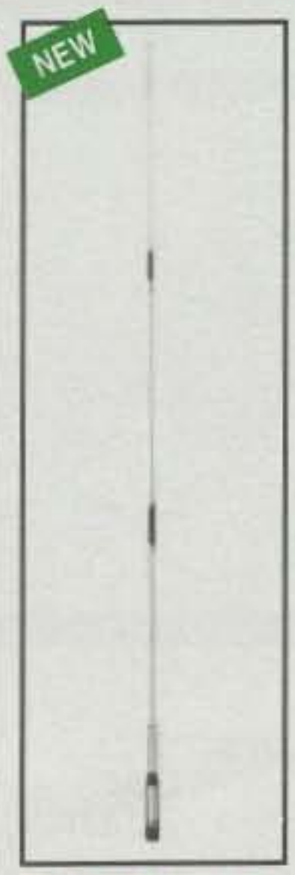
NEW

SB-5/SB-5NMO
Dual-Band 146/446MHz
Gain & Wave:
146MHz 3.0dBi 1/2 wave
446MHz 5.5dBi 5/8 wave x 2
VSWR: 1.5:1 or less
Max Power: 120W FM
Length: 38"
Connector: PL-259 or NMO style

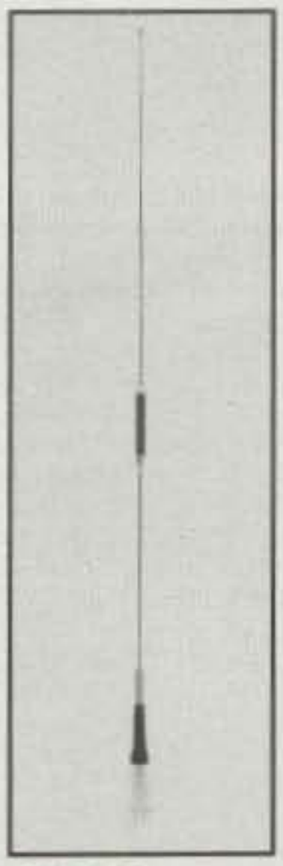
NEW



SB-7/SB-7NMO
Dual-Band 146/446MHz
Gain & Wave:
146MHz 4.5dBi 6/8 wave center load
446MHz 7.2dBi 5/8 wave x 3
VSWR: 1.5:1 or less
Max Power: 70W FM
Length: 4' 7"
Connector: PL-259 or NMO style

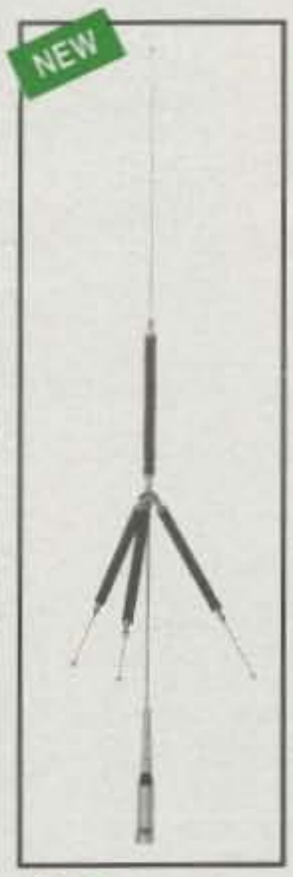
B-20/B-20NMO
Dual-Band 146/445 MHz
Gain & Wave:
146MHz 2.15dB 1/2 wave
446MHz 5.0dB 5/8 wave x 2
VSWR: Less than 1.5:1, 144-148MHz, 440-450MHz
Max Power: 50 watts
Length: 30"
Connector: PL-259 or NMO style
Construction: Black, w/fold-over w/Fold-Over

B-10/B-10NMO
Dual-Band 146/446 MHz
Gain & Wave:
146MHz –dB 1/4 wave
446MHz 2.15dB 1/2 wave
VSWR: Less than 1.5:1, 144-148MHz, 440-450MHz
Max Power: 50 watts
Length: 12"
Connector: PL-259 or NMO style
Construction: Black, cellular look-a-like w/Fold-Over



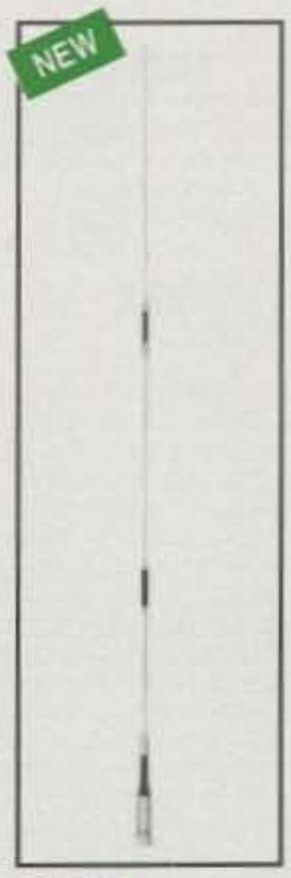
CX-224/ CX224NMO
Tri-Band 146/220/446MHz
Gain & Wave:
146MHz 2.15dB 1/2 wave
220MHz 3.6dB 5/8 wave
446MHz 6.0dB 5/8 wave x 2
VSWR: 1.5:1 or less
Max Power: 100 watts
Length: 3'
Connector:
CX-224 PL-259
CX-224NMO NMO Style

NEW

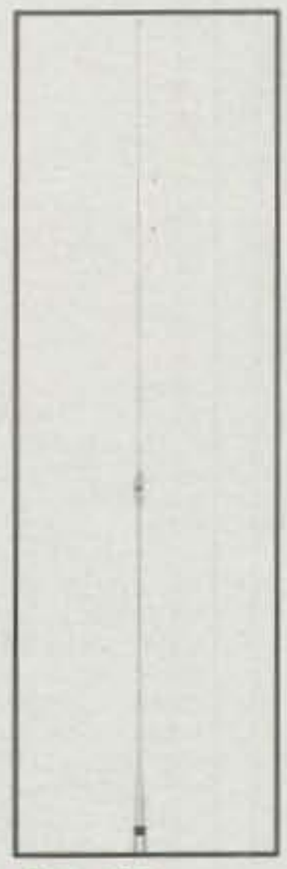


HA4S
Quad-Band HF Mobile
7, *14, 21, 24, 28MHz
Wave: 1/4 wave
VSWR: Less than 2:1
Weight: 1 lb. 14 ozs.
Length: 4' 4"
Connector: PL-259
Construction: Heavy Duty, w/Fold-Over
***L-14HS:** Optional 14MHz Coil

NEW

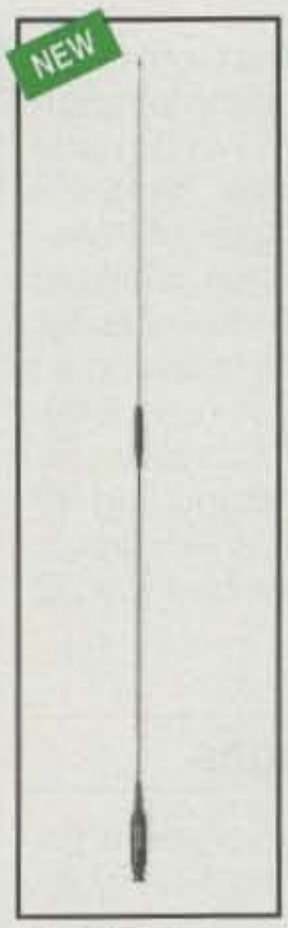


FJ-15S
Tri-Band Mobile
50/146/446MHz
Gain & Wave:
50MHz 2.15dBi 1/4 wave
146MHz 4.5dBi 5/8 wave center-loaded
446MHz 7.2dBi 5/8 wave x 3
VSWR: 1.5:1 or less
Max Power: 120 watts FM
Length: 4' 10"
Connector: PL-259



CHL-185
146MHz
Gain & Wave:
4.1dB 5/8 wave
VSWR: 1.5:1 or less
Max Power: 200 watts
Length: 4' 8"
Connector: PL-259

NEW



CH-722SA
146/446MHz HT Antenna
Gain & Wave:
146MHz 3.0dB 1/2 wave
446MHz 5.5dB 5/8 wave x 2
Max Power: 50 watts
Length: 36"
Weight: 3.9 ozs.
Connector: BNC

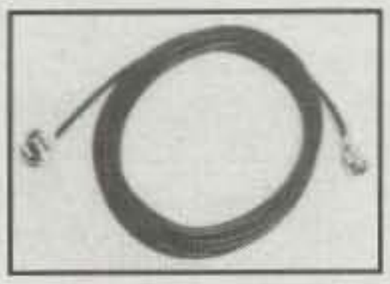
NEW

SH-55
146/446MHz HT Antenna
Gain & Wave:
146MHz 1.5dBi 1/4 wave
446MHz 3.2dBi 5/8 wave
Max Power: 10 watts
Length: 15.5"
Connector: BNC

CH-32
Miracle Baby 146/446MHz HT Antenna. Compact design, the smallest HT antenna available!
Gain & Wave: 0dB
VSWR: 1.5:1 or less
Max Power: 10 watts
Length: 1.75"
Connector: BNC

RS-21
Trunk, hatchback, rear door (van, blazer, etc.) mount. Adjustable to virtually ANY angle. Rubber-coated base protects vehicle paint.

RS-820
Heavy-duty low profile trunk lip or hatch back mount. Rubber coated base protects vehicle paint.

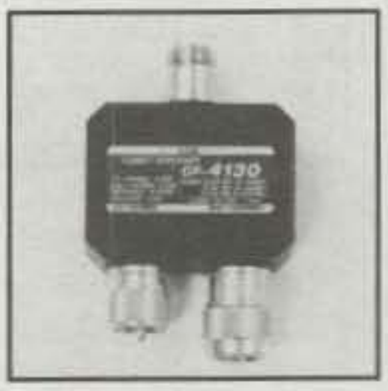


3D4M Standard Cable Assembly
13.5 feet of low loss coax. Gold plated UHF (PL-259/SO-239) connectors.

3D5M Standard Cable Assembly
Same as 3D4M, but 17 feet of coax.

CK-5M Deluxe Cable Assembly
13 feet double shielded very low loss coax. + 12" RG-188 teflon coax. Gold-plated UHF (PL-259/SO-239) connectors. Allows easy entry from a lip-mount w/o causing coax or weather strip damage.

CK-5M5 Deluxe Cable Assembly
Same as CK-5M, but 17 feet of coax.



CF-4160K, CF-4160I, CF-4160J
146/446 MHz
Band Pass, Ins. Loss, Max Power:
1.3-150MHz, 0.1dB, 800w PEP
400-540MHz, 0.2dB, 500w PEP
Isolation: 60dB
CONNECTORS:

	CF-4160K	CF-4160I	CF-4160J
Output:	SO-239	SO-239	SO-239
Low In:	PL-259	PL-259	SO-239
High In:	PL-259	N-Male	SO-239

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The WPX Program

SSB

2419	SM5DAC	2423	EA1ET
2420	KY7M	2424	ND3A
2421	N7UJJ	2425	WWØE
2422	WD8O	2426	JA7DOT

CW

2798	N1ETC	2801	JA7DOT
2799	KY7M	2802	JR6LLN
2800	JA3CJL		

MIXED

1622	KY7M	1628	OH2BFK
1623	ON4APU	1629	IK7CSA
1624	I4KKY	1630	ND3A
1625	JA3AKG	1631	KL7OH
1626	IT9ORA	1632	WA4JJW
1627	EA7IY	1633	JA7DOT

VPX

277 ..... SM3BQE

Mixed: 450 KY7M, SM2BQE, ON4APU, KB8NTY, IØKKY, JR3AKG, IT9ORA, EA7IY, ND3A, WA4JJW. 500 K1SF, KY7M, SM2BQE, ON4APU, KB8NTY, JR3AKG, PA-2164, EA7IY, ND3A, WA4JJW. 550 K1SF, KY7M, SM2BQE, PA-2164, ON4APU, JR3AKG, ND3A, WA4JJW. 600 K1SF, KY7M, SM2BQE, ND3A, ON4APU, JR3AKG, WA4JJW. 650 K1SF, KY7M, SM2BQE, ND3A, N4APU, JR3AKG, KD1CJ. 700 K1SF, KY7M, SM2QE, ND3A, ON4APU, NR3AKG. 750 K1SF, WWØE, KY7M, ND3A, SM2BQE, ON4APU, JR3AKG. 800 K1SF, KY7M, SM2BQE, ON4APU, JR3AKG, ND3A. 850 K1SF, KY7M, SM2BQE, JR3AKG, ND3A. 900 KY7M, SM2BQE, JR3AKG, ND3A. 950 KY7M, SM2BQE, JR3AKG, ND3A. 1000 KY7M, SM2BQE, JR3AKG, ND3A. 1050 SM2BQE, ND3A. 1100 KF4FP, SM2BQE, ND3A. 1150 SM2BQE, ND3A. 1200 SM2BQE, ND3A. 1250 ND3A. 2050 9A1BHI. 2300 WB2YQH. 2400 I1POR. 2450 I1POR. 2500 I1POR. 2550 I1POR. 2600 I1POR. 2650 I1POR. 2700 I1POR. 2750 I1POR. 2800 I1POR. 2850 I1POR. 3000 IN3ANE. 3100 N9AF. 3150 N9AF. 3200 N9AF. 3250 N9AF. 3300 N9AF.

SSB: 350 SM5DAC, KY7M, EA1ET, ND3A. 400 SM5DAC, KY7M, N2JNZ, ND3A. 450 SM5DAC, KY7M, N2JNZ, ND3A. 450 SM5DAC, KY7M, ND3A. 500 KY7M, ND3A. 550 KY7M, ND3A, 600 KY7M, ND3A, CT4UW. 650 KY7M, ND3A, N3DRO. 700 WU1F, KY7M, JR3TOE, ND3A. 750 JR3TOE, ND3A. 800 ND3A. 850 ND3A. 900 N9ICH, KWØU, ND3A. 950 N9ICH, ND3A. 1000 N3VCG, VE6LB. 1050 NF4FP, VE6LB. 1100 VE6LB. 1150 VE6LB. 1200 VE6LB. 1550 KAØZFX. 1850 IK8GCS, KD9OT. 1900 IK8GOS, KD9OT. 1950 IK8GCS, KD9OT. 2000 I 1POR. 2050 I1POR. 2100 I1POR. 2150 I1POR. 2200 I1POR. 2250 I1POR. 2300 I1POR.

CW: 350 DF6SW, KF4FP, KY7M, JA3CJL, ND3A, JR6LLN. 400 DF6SW, KY7M, JA3CJL, ND3A, VE2ABO, JR6LLN. 450 KY7M, JA3CJL, ND3A. 500 KY7M, JA3CJL, ND3A. 550 KY7M, JA3CJL,ND3A. 600 KY7M, JA3CJL, ND3A. 650 KY7M, JA3CJL, ND3A. 700 ND3A. 750 ND3A, I1POR. 800 I1POR. 850 I1POR. 900 I1POR. 950 I1POR. 1000 I1POR. 1050 I1POR. 1450 VR2UW. 1600 KAØZFX. 1650 JA9CWJ. 1700 JA9CWJ. 1750 JA9CWJ. 1800 JA9CWJ. 1850 JA9CWJ.

10 Meters: KY7M
15 Meters: WU1F, KY7M, EC1CTH
20 Meters: KY7M
40 Meters: KY7M
80 Meters: KY7M
160 Meters: DK7NP

Asia: KY7M, JF6LLN
Africa: SM5DAC, KY7M, HB9BHY
No. Amer.: KY7M, JA7DOT
So. Amer.: KY7M, DK7NP
Europe: KY7M, JAØSU, WD8O, KD1CJ, JA7DOT
Oceania: KY7M

Award of Excellence: W5ODD
Award of Excellence With 160 Meter Bar: W5ODD

Award of Excellence Plaque Holders: I8YRK, W4CRW, SMØAJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, W4BQY, IØJX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, KØJN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KBØG, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, YBØTK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NXØI, W9NUF, N4NX, SMØDJZ, WB4RUA, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, N4MM, KC7EM, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HWB, KC8PG, NE4F, VE3MS, K9LJN, ZS6EZ, YU2AA, I1WXY, IK2ILH, DEØDAQ, LU1DOW, N1IR, IK4GME, WX3N, KC7X, N6IBP, W5ODD.

Award of Excellence Plaque Holders with 160 Meter Endorsement: FM5WD, SMØDJZ, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SMØAJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KBØG, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YBØTK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, NXØI, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DEØDXM, VE7IG, K9BG, I1EEW, AB9O, CT1YH, IV3PVD, KA5RNH, ZP5JCY.

Complete rules and application forms may be obtained by sending a business-size self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to: "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101-9511 USA.

DX-Pedition August 1993

ERITREA E31A

Asmara

OPs: K5VT Vince
DJ9ZB Franz
JH1AJT Zorro

Three well-known DXpeditioners put the new DXCC country of Eritrea on the air last August: Vince, K5VT; Franz, DJ9ZB; and Zorro, JH1AJT operated as E31A.

said that Namibia "does not have the authority to issue amateur radio licenses in Walvis Bay. All applications for such licenses should be directed to the Postmaster General, Pretoria [RSA]." Thus, Shipp clearly demonstrated that Walvis Bay was part of RSA, and not Namibia, at least as far as amateur radio licenses!)

While researching the Walvis Bay situation, Bill Shipp and Ian Sutherland noticed that South Africa's 1977 claim was over "Walvis Bay and certain islands" off the South West African coast. What were these "certain islands"? Might there be yet another new DXCC country in the region? Their work, combined with the similar investigation of Hans Hannappel, DK9KX, revealed that South Africa's claim to Walvis Bay included a series of tiny, guano-covered rocks just off the coast of Namibia, collectively called the Penguin Islands.

The similarity between the Penguins and Walvis Bay made the petition for separate DXCC country status easier, while the size of the islands and the relative lack of information about them hindered such efforts. Both areas were clearly under the administration of the Republic of South Africa, but separated from that country by more than 75 miles of another DXCC country: Namibia. Thus, both met the requirements for separate DXCC status of DXCC country criterion 3. In the end the petitioners were successful, with the DXAC voting 9 to 5 (with two abstentions) to recommend separate DXCC country status for the islands. The Awards Committee concurred unanimously, and the Penguin Islands became the 323rd current DXCC country in May 1991.

In both cases the claim for separate country status is based on South African control over the regions. If, as currently set for the end of this month, control over these regions reverts to Namibia, the reason for separate DXCC status disappears. While the DXCC Deletion Criteria do not specifically cover this situation, the deletion of Abu Ail Islands when Yemen took control from the Red Sea Lights Corporation provides a precedent for such deletion. The key to when Walvis Bay and the Penguins will lose their separate DXCC status, and become part of Namibia, may well hinge on when Namibia starts issuing amateur radio licenses for the regions. Meanwhile, don't pass up an opportunity to work ZS9A or one of the handful of other active Walvis Bay stations. Before long they'll be sporting V5 callsigns, and you'll have missed forever an opportunity to work another DXCC country!

Callsign Prefix Changes

Keeping track of who's who on the amateur bands is a never-ending activity for DXers. The International Telecommunication Union (ITU) issues new prefix blocks to emerging countries, such as the new ones in eastern Europe. Individual administrations change amateur callsign allocation for various reasons, sometimes at the request of amateurs, and sometimes in a near random fashion. Here are examples of each of these changes.

First, New Brunswick, Canada amateurs may change their prefix from the existing VE1 to VE9. Amateurs in New Brunswick may either retain their existing VE1 call, adopt the new VE9 prefix while retaining their existing suffix, or apply for a new VE9 callsign, with a suffix of their choice. All new amateur licenses in New Brunswick will be assigned VE9 callsigns.

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NEW AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing . . . it also runs cooler because its Eimac 3-500Z tube completely turns off between words . . .

Ameritron's all NEW AL-80B kilowatt *output* desktop linear can *double* your average SSB power output with high-level RF processing using Ameritron's exclusive *Dynamic ALC™*.

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube between words. It saves hundreds of watts wasted as heat.

You get a full kilowatt PEP *output* from a whisper quiet desktop linear. It's a compact 8½"H x14"D x15¼" W and plugs into your nearest 120 VAC wall outlet. Covers all bands 160-15 Meters, including WARC and MARS bands (user modified for 10/12 Meters with license).

You get 1000 watts *output* on SSB, 850 watts *output* on CW, 500 watts *output* on RTTY, an extra heavy duty power supply, genuine Eimac 3-500Z tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatibility, Two-Year Warranty, Made in USA, plus much more for only $1195.

Dynamic ALC™ doubles average SSB power

The AL-80B's exclusive *Dynamic ALC™* gives you high-level low-distortion RF processing. When activated, it can more than double your *average* SSB power and produce up to 6 dB improvement in intelligibilty. It maximizes your talk power without distortion and splatter.

A convenient front panel control lets you adjust your output power level.

Instantaneous RF Bias™ eliminates heat

The AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube (except filaments) between words and dots and dashes. It eliminates hundreds of watts wasted as heat to give you cooler operation and longer component life.

Gutsy Heavy-Duty Power Supply

The guts of the AL-80B is its heavy ***heavy*** duty power supply. A 26 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Many amplifiers using *two* 3-500Zs use such small power supplies they don't deliver much more power output than the AL-80B.

NEW! $1195 Ameritron AL-80B Suggested Retail

Genuine Eimac® 3-500Z Tube

The AL-80B uses a *genuine* Eimac® 3-500Z tube warranted by Eimac® -- not cheaper, less reliable 3-500Zs used by some competitors.

600 WATTS OUT . . . $649

A tough low cost linear with REAL transmitting tubes!

Ameritron's new AL-811 linear amplifier gives you plenty of power to bust thru QRM. You get a quiet desk top linear that's so compact it'll slide right into your operating position – you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet.

You get three tough vertically mounted 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC, standby switch, transmit LED, UPS shippable and much more.

Select the 3 tube 600 watt out AL-811, $649 – or the new 4 tube 800 watt out AL-811H, $795.

70% efficiency

The AL-80B is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

Superb RF design and layout, Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. Your power goes into your antenna instead of heating up your amplifier.

A whisper quiet internal fan draws in cool air over power supply components and pressurizes the 3-500Z tube compartment to remove heat for longest life.

Tuned Input lets your rig deliver full output

A 50 ohm broadband Pi-Network *tuned input* is used.

Pi/Pi-L Output Network

A carefully designed Pi/Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide matching range, full band coverage and peak performance at all power levels.

Has ball bearing vernier reduction drives with logging scales on plate and load controls.

Step-Start Inrush Protection™

Step-Start Inrush Protection™ stops damaging inrush current with a start up sequence that's *easy* on your tube and power supply components.

Multi-Voltage Power Transformer

Ameritron's exclusive *Multi-Voltage Power Transformer* lets you optimize for different line voltage. You can select from 14 different *primary* voltages from 90 to 140 VAC and 205 to 250 VAC.

Dual Illuminated Cross-Needle Meters

Ameritron's dual illuminated cross-needle meters give you *four separate meters* to monitor your operating conditions -- you can tell right away if something is wrong.

QSK Compatible

The fast *custom* T/R (transmit/receive) relay in the AL-80B switches nearly as fast as some vacuum relay QSK T/R switches.

For *lightning fast* QSK operation use the optional external Ameritron *electronic PIN diode* QSK-5 T/R switch or the internal QSK-5PC. Please contact Ameritron for details.

Plus more . . .

An *Standby* switch lets you run barefoot, but you can instantly switch to full power if you need it.

Has transmit LED; 12 VDC, 200 mA jack; 12 VDC keying relay for solid state and tube rigs; tough, nearly indestructible Lexan-over-aluminum front panel. Two year limited warranty.

AMERITRON offers the best selection of legal limit linears!

These 3 rugged linears all use a super heavy duty hypersil power supply capable of 2500 watts!

Ameritron's most powerful amplifier

AL-1500 **$2625** Suggested Retail

Ameritron super power amplifier uses the herculean Eimac® 8877 ceramic tube.

It's so powerful that 65 watts drive gives you full legal output—and it's just loafing because the power supply is capable of 2500 watts PEP.

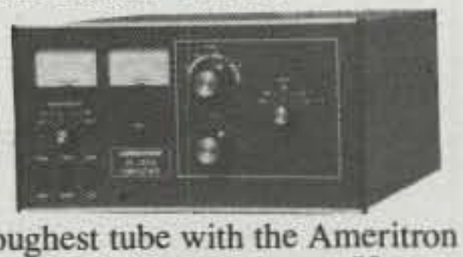
Ameritron's Dual 3-500Z linear

AL-82 **$1995** Suggested Retail

This linear gives you full legal output using a pair of Eimac® 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

Ameritron's 3CX1200A7 linear

AL-1200 **$2095** Suggested Retail



Get ham radio's toughest tube with the Ameritron AL-1200—the Eimac 3CX1200A7. It has a 50 watt control grid dissipation—12 times tougher than the 4 watt rating of the 3CX800A7—yet you get the same full legal output as you get from a *pair* of 3CX800A7s.

AMERITRON brings you the finest high power accessories!

Legal limit antenna tuner

ATR-15 **$399** Suggested Retail

Ameritron — *the high power specialist* — brings you the ATR-15 antenna tuner that's designed for legal limit amplifiers. Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

Legal Limit Dummy Load

Oil cooled 50 ohm dummy load. Handle 1500 W for 5 min. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz. 7½" H x 6 5/8" D. **ADL-1500X** without oil, $39.95. **ADL-1500** with oil, $59.95

ADL-1500X **$39.50** Suggested Retail

Remote Coax Switches

RCS-8V **$149** Suggested Retail

RCS-8V, DC-UHF 5 KW Coax Switch. Replace 5 coax feedlines with one with this Remote Coax switch. Weatherproof box mounts outdoors on your tower or mast. Attractive control unit sits on your operating desk. Low SWR to 450 MHz. Low loss. Rated at 5 KW to 30 MHz, 1 KW at 150 MHz. **RCS-8VN, $169.95** with "N" connectors.

RCS-4, $134.50. 4 position HF switch. Similar to RCS-8V. No control cable needed. Handles 2500 watts PEP.

RCS-4 **$134.50** Suggested Retail

QSK-5 Pin Diode T/R Switch

$349 QSK-5 Suggested Retail

Self-contained, connects externally to most HF amplifiers. Handles 2.5 KW PEP, 2 KW CW. Six time faster then vacuum relay. 6x4x9½ inches.

Step-Start Inrush Current Protector

Stops power up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V or ICP-240 for 220-240 VAC.

ICP120/240 **$79** Suggested Retail

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CIRCLE 9 ON READER SERVICE CARD

The WAZ Program

Single Band WAZ

10 Meter SSB

469 ..... F5PYI 470 ..... DHØLAI

15 Meter SSB

456 ..... ON4ACG

20 Meter SSB

933 ..... K1RB 935 ..... IV3GOW
934 ..... IKØFVC

40 Meter SSB

80 ..... SM5FQQ

12 Meter CW

10 ..... ON4AGX

15 Meter CW

253 ..... AF5M

17 Meter CW

10 ..... ON4AGX

20 Meter CW

439 ..... JA3ARM 440 ..... JA5CKD

40 Meter CW

171 ..... I6DQE 172 ..... KF2O

All CW

36 ..... JA2BL 37 ..... KB5EK

RTTY

82 ..... WØIZ 83 ..... NI4H

Satellite

7 ..... W1NU 8 ..... DC8TS

All Band WAZ

SSB

4119 ..... IK4HLU 4123 ..... JHØAUY
4120 ..... KB2MY 4124 ..... WD9FLI
4121 ..... K1CMI 4125 ..... IK2PZG
4122 ..... EA4BZF 4126 ..... LA7FD

CW/Phone

7393 ..... PA2SAM (CW) 7401 ..... JW7FD
7394 ..... EA7IY 7402 ..... JA1FUI
7395 ..... W9NIP 7403 ..... F5JNE (CW)
7396 ..... F5MPS 7404 ..... W1OO
7397 ..... OK1FIW (CW) 7405 ..... JA9ENB (CW)
7398 ..... WA2VZQ (CW) 7406 ..... WO9S (CW)
7399 ..... CT3FT 7407 ..... KD1CO
7400 ..... KV1P 7408 ..... IK2IGE

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4¼ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all *CQ* awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

(The VE9 prefix was formerly reserved for experimental stations.) The change came as a result of a request from the New Brunswick amateurs themselves, who voted strongly in favor of a unique prefix for their province. Previously, New Brunswick shared VE1 with Nova Scotia; now every Canadian province has a unique prefix. For QSLing VE9 stations, first try the corresponding VE1 callsign.

Next the new country of Macedonia (or, if you're Greek, the Former Yugoslavian Republic of Macedonia) received the prefix allocation Z3 from the ITU. Effective last June, Macedonia amateurs began using their new callsigns. See the accompanying table for details. Note that the prefix reveals the license class of the station, a valuable clue to weak signals. For example, most Macedonian stations heard on the higher bands will be signed Z31 or Z32 prefixes, except during contests or special events, when Z38, Z39, and Z30 prefixes will be aired. If you work a Z37 station, you have worked a club station, and you should make special note of the operator's name, to aid in QSLing. (Trivia question #1: In the United Nations General Assembly, countries are seated alphabetically. Under what letter in the alphabet would one look for Macedonia?)

Finally, in the random category, many French stations are sporting new prefixes, effective at the beginning of the year. In most cases suffixes will remain the same, but many prefixes will be switched. DXers can still locate French amateurs in callsign directories, by noting the following changes: FC1xxx becomes F1xxx (V/U/SHF, no-code licensees); FD1xxx and FE1xxx become F5xxx (all HF privileges); FE2, 3 ,5, 6, and 8 no change, but the E is voluntary; TK3 becomes TK1, TK4 becomes TK5; FG, FM, FR, etc.: 3x becomes 1x; 4x becomes 5x; 5x no change. Thus, FP4DX is now FP5DX. FF5xx, FF6xx, FF8xx become F5Kxx, F6Kxx, or F8Kxx (club stations). Since prefixes don't change (except for club stations, which add the K at the beginning of the suffix), DXers will be able to locate most French stations in callsign directories with this information. For example, F5ABC is ex-FD1ABC or FE1ABC. (In France, as in Great Britain and some other countries, the same suffix identifies an individual amateur regardless of prefix.) French amateurs neither requested this change, nor particularly welcomed it; it just happened.

The subject of callsigns, their allocation, and structure is a vast one. We'll come back to this topic again soon, complete with a look at the new allocations in the countries of the former Soviet Union, once the picture there becomes a bit clearer. Stay tuned.

February DXpeditions

The Peter I Island DXpedition remains on track. In addition to the tons of equipment and supplies that Peter, ON6TT, helped load onto the 430 foot Russian icebreaker Kaptain Khlebnikov, many more tons of radio gear, tents, and other supplies were air-lifted to Uruguay. The ship will load that gear prior to picking up the ten DXpeditioners in the Falkland Islands on January 23. Operation as 3YØPI is still set to begin on Feb. 1, weather permitting, and last until Feb. 16, when the team will tear down the stations prior to the arrival of their pickup ship. The operators hope to make a record 70,000+ contacts from Peter I, but even at that level, each QSO will have cost the operators and contributors some $3. Keep this in mind when you send your SSB QSL cards to AA6BB, and CW contacts to KA6V. (No, the operators don't *expect* $3/QSO, nor even request it; but every little bit of help included with the cards will reduce the heavy financial burden of this trip, and perhaps encourage the members of the DXpedition to head out to yet another remote spot that you need. Please be generous.)

In addition to providing thousands of DXers with a contact with the Number

5 Band WAZ

As of October 31, 1993, 368 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

DL7PR

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
K6YRA, 199 (34)
PY7ZZ, 199 (34)
KØCS, 199 (34, 40m)
AA4KT, 199 (26)
K7UR, 199 (34)
NAØY, 199 (26)
VE7DX, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
W9WAQ, 199 (26)
K6EID, 199 (34)
W1JR, 199 (23)
W8SEY, 199 (26)
N7RT, 199 (34)
VE7AHA, 199 (34)
W1FZ, 199 (26)
IK2GNW, 199 (1)
W9CH, 199 (26)
ACØM, 199 (34)
G3MXJ, 199 (12)
IK8BQE, 199 (31)
SM6AHS, 198 (12, 31)
K1ST, 198 (19, 26)
4X6DK, 198 (4, 6)
ABØP, 198 (23, 34)
UA3AGW, 198 (1, 12)
KL7Y, 198 (34, 36)
VO1FB, 198 (19, 27)
W6TC, 198 (34, 37)
EA5BCX, 198 (27, 39)
KZ4V, 198 (22, 26)
K4PI, 198 (23, 26)
G3KDB, 198 (1, 12)

The following have qualified for the basic 5 Band WAZ Award:

EA8PP, 180 Zones
WA5IPS, 169 Zones
N1QY, 173 Zones
AB5C, 164 Zones
JA2IVK, 199 Zones
K1RB, 152 Zones
WA1G, 175 Zones
ON4ON, 181 Zones
DL7PR, 200 Zones

Endorsements:

N5FG, 193 Zones
N4DW, 192 Zones
HB9DDZ, 184 Zones
F6HMJ, 188 Zones
W2UE, 195 Zones
KF2O, 187 Zones
W4YV, 190 Zones

863 Stations have attained the 150 Zone level as of October 31, 1993.

Rules and applications for the WAZ program may be obtained by sending a large SASE with two units of postage or an address label and $1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a CQ checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ Master Prefix List. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or confirmation of, present total. If no up-date, file will be made inactive. Lifetime Honor Roll fee is $4.00 (U.S.) for each mode, with no fee for additions.

MIXED

4532 9A2AA	2973 ZP5JCY	2683 YU7BCD	2203 HAØIT	1893 HA5NK	1688 WB2ABD	1430 LU8DY	1178 K7LAY	937 WB2PCF
4434 F9RM	2972 KØFLT	2652 I6SF	2147 K5UR	1880 WE2L	1674 S51NU	1365 I2EAY	1164 CT3CU	920 AA7TF
4148 K2VV	2964 W1BWS	2639 N4UU	2142 I1WXY	1868 N2AIF	1638 VE1RJ	1364 HA9PP	1160 KØIFL	902 JN3SAC
3553 IT9TQH	2954 N4MM	2609 YT7DX	2141 K8LJG	1814 NV9S	1631 W8CNL	1325 KC7V	1125 WØULU	854 VE6BMX
3498 EA2IA	2924 I2UIY	2604 SM7TV	2118 3A2LF	1811 KBØG	1628 WB8ZRL	1318 NJ1T	1122 K7KBN	851 VE7CBH
3400 K6JG	2905 WA8YTM	2589 N2AC	2095 WB2YQH	1802 KS4S	1577 PY2DBU	1298 KI3L	1119 NH6T	840 VE3OMM
3322 VE3XN	2904 YU1AB	2557 K9BG	2091 W4UW	1785 DF6EX	1560 CT1QF	1271 KC6X	1118 G4SDJ	770 N3KR
3234 N4NO	2898 KA5W	2556 HA8XX	2091 I2DMK	1782 SM6CST	1546 EA1JO	1248 NE6I	1104 HP2CWB	762 JR3TOE
3210 K6XP	2855 PY4OD	2449 IT9QDS	2052 KL7AF	1780 G4OBK	1532 CT1YH	1229 ND3A	1074 WK3Z	753 OZ-2044
3206 N9AF	2852 W9DWQ	2435 K9AGB	2041 DK5AD	1767 W9IL	1531 KA5TQF	1224 K9BQL	1072 EA3CWK	738 JA4DUD
3174 N6JV	2841 PAØSNG	2431 I2MQP	2016 N6JM	1762 WB4RUA	1487 DK7NP	1213 W9IAL	1061 HB9DDZ	737 WU1F
3066 W2FXA	2840 IN3ANE	2332 K9QFR	1993 W8UMR	1740 WA1JMP	1484 K5IID	1211 WØIZV	1032 I1ZQD	671 WB9IHH
3025 I2PJA	2817 I1EEW	2318 HAØHW	1955 9A1BHI	1724 W3KH	1470 WB3DNA	1194 N6IBP	956 JH1IED	
3008 SM3EVR	2814 9A2NA	2303 I2EOW	1902 K2OLG	1714 K5DB	1462 S58MU	1189 I1-50156	945 W4USW	
3003 W4BQY	2725 YU7SF	2221 S53EO	1897 W6OUL	1694 IK2ILH	1452 IØAOF			

SSB

4320 F9RM	2576 EA2IA	2291 WA8YTM	2046 CT4UW	1757 CT1BY	1534 YU7SF	1317 N2AIF	1156 KB2DE	1010 KB4HU
3895 IØZV	2558 OZ5EV	2286 I5ZJK	2004 EA3AQC	1742 WE2L	1510 CT1UE	1305 WN5MBS	1154 K8MDU	744 JR3TOE
3534 IT9TQH	2539 N4NO	2179 I1POR	1985 PY4OY	1714 N4UU	1490 LU8DY	1287 DK5WQ	1153 K5IID	739 CE5FSB
3522 K2VV	2533 NJØC	2175 9A2NA	1933 KD9OT	1711 KC8YM	1476 IK2DUU	1285 CT1BWW	1148 IK2AEQ	720 WU1F
3420 ZL3NS	2525 I2UIY	2171 K9QFR	1930 EA3FHT	1708 CX6BZ	1482 K8LJG	1279 K3IXD	1123 NG9L	710 JA4DUD
3361 VE1YX	2517 PAØSNG	2129 PY4OD	1925 K5RPC	1700 EA2AOM	1442 I8LEL	1272 KBØC	1117 FE6FNA	687 SM6CST
3106 K6JG	2483 F2VX	2110 LU8ESU	1917 W4UW	1659 I2TZK	1402 K2EEK	1258 W6OUL	1112 WA2FKF	644 EA8BGY
3018 WD8MGQ	2458 I1EEW	2105 WA4QMQ	1902 CT1AHU	1605 KF7RU	1392 IT9JKY	1254 KA5TQF	1101 K9BQL	611 EA8BWW
3015 I2PJA	2439 I4CSP	2098 W9DWQ	1849 IK8GCS	1600 KL7AF	1363 KS4S	1228 I1-21171	1096 HA5NK	606 KE4BM
2893 ZP5JCY	2437 WØYDB	2087 YU7BCD	1841 4X6DK	1589 KAØZFX	1341 LU7HJM	1226 IKØEIM	1073 WB6SRK	603 HB9DDZ
2833 K6XP	2416 KA5W	2067 I8KCI	1840 K5UR	1586 HAØIT	1339 W5AWT	1193 G4OBK	1063 CT4RH	600 JA2OCU
2797 CT4NH	2319 HA8XX	2065 WF4V	1779 IN3QCI	1583 N6FX	1337 I2DML	1180 EA9LZ	1019 KC7V	600 IK6JYY
2635 N4MM	2296 W4BQY	2049 I2EOW	1778 IK5ACO	1535 I6NOA	1327 CT1DIZ	1174 I3SZX	1017 KC6X	

CW

3547 IT9TQH	2460 YU7SF	2146 YU7BCD	1801 N4YB	1598 W9PWM	1503 NBØG	1297 3A2LF	1002 EA6AAK	787 PY4WS
3518 K2VV	2401 I6SF	2132 KA5W	1790 EA7AZA	1596 HA8XX	1443 VR2UW	1280 ZP5JCY	952 W9IAL	776 ND3A
3486 WA2HZR	2400 K6XP	1996 N4MM	1737 I2DMK	1588 K8LJG	1402 W6OUL	1277 EA1JO	944 FE1JUD	749 VE3OMM
3365 W8RSW	2354 W4BQY	1940 I2UIY	1721 IT9VDQ	1576 S51NU	1379 I1EEW	1244 NJ1T	916 W4UW	710 HB9DDZ
3156 N6JV	2320 N2AC	1918 G4UOL	1719 G3VQO	1569 W1WAI	1364 IK3GER	1233 KS4S	908 KC7V	688 N5GFX
2910 VE7CNE	2311 W9DWQ	1861 9A2NA	1700 K5UR	1567 VE1RJ	1363 G4OBK	1225 I2EAY	907 K5IID	669 NH6T
2787 N4NO	2302 N4UU	1860 W8IQ	1673 G4SSH	1559 I7PXV	1354 DJ1YH	1179 LU2YA	860 NE6I	637 I2MQP
2605 YU7LS	2284 JH3CXL	1856 IKØADY	1668 HAØIT	1555 W5AWT	1324 SM5DAC	1131 K9QFR	852 KA5TQF	630 AA6WJ
2577 PY4OD	2209 LZ1XL	1830 KA7T	1668 SM6CST	1539 HA5NK	1317 G4MVA	1110 KA1CLV	827 WB5MTV	611 KI4UZ
2570 K6JG	2206 WA8YTM	1814 JA9CWJ	1646 N6FX	1534 ZS6EZ	1312 DL2HBX	1102 IK2ECP	821 KC6X	
2554 EA2IA	2165 VE7DP	1808 TI4SU	1599 KL7AF	1506 N2AIF	1307 S58MU	1004 AH6JF	789 KL7UR	

This all-wet German team operated from several spots in the Pacific a year ago. From left: Tom, DL2RUM; Frank, DL7UFR; Ragnar, DL7URH; Joe, DL7VTK; Sigi, DL7UUO; and Tom, DL7UTR.

Dirk Samyn, ON7SD, earned the first RTTY WAZ Award from Belgium.

One Most Wanted country, the 1994 Peter I Island DXpedition will also provide DX-ers with their best chance to complete the most difficult of all the major DX awards: the 30 Meter Worked All Zones Award. The reason the 30 Meter WAZ is so difficult is Zone 12, which consists of Chile, its off-shore islands, and a wedge of Antarctica. Since Chile does not permit 30 meter operation, Zone 12 is almost impossible to work on that band. Peter I Island lies in Zone 12, and 30 meter contacts with the 1994 3YØPI DXpedition will provide zone hunters their best shot at earning the 30 Meter WAZ certificate. (K1MM did manage to earn the first 30 Meter WAZ certificate by catching South Pole station KC4AAA on 20 meters and moving the operator to 30 meters. Since all seven zones in the Antarctic region converge on the South Pole, contacts with KC4AAA can be credited with any of the seven zones.) Look for more 30 Meter WAZ awards after the Peter I Island operation. (Trivia question #2: What is the only other major award issued for 30 meter contacts?)

Callsigns	License Class	Privileges
Z31aa–Z31zz	Class A	HF full power
Z32aa–Z32zz	Class B	HF 250 watts
Z33aaa–Z33zzz	Class C	40/80 meters
Z34aaa–Z34zzz	Class D	VHF only
Z35aaa-Z35zzz	Repeaters, Beacons, etc.	
Z36aaa–Z36zzz	Class E	VHF only
Z37aaa–Z37zzz	Club Stations	
Z38aaa–Z30zzz	Reserved by radio society for special events	

Table I– Details of Macedonia's Z3 prefix allocation from the ITU.

In other February DXpeditions, Art Phillips NN7A/V31JZ, and Mike Sharp, NG7S/V31RL, will operate as V31JZ from South Water Caye (IOTA NA-180) Feb. 13–17. This second operation from this island group will concentrate on CW, with some SSB on the IOTA frequencies of 14260 and 21260 kHz. After the island DXpedition they will operate as V31RL in the ARRL CW DX contest from the Belize mainland. QSL V31JZ via NN7A and V31RL via NG7S.

Finally, look for special-event stations from Norway this month, celebrating the 17th Winter Olympics. Among these should be LI10WG from Lillehammer, LI20WG from Hamar, LI30WG from Gjovik, and LI40WG from Gudbrandsdalen.

DXCC News

Bill Kennamer, K5FUV, DXCC Specialist, reports the following operations are accredited for DXCC, as of the given start date:

9G1XA, 23 August 1993; **9H3RU**, 9 August 1993; **BV/K4IQJ**, 19 May 1991; **C21/KC6DX**, 7 September 1993; **C21/KC6ZM**, 7 September 1993; **CY9/WV2B**, 9 July 1993; **CY9/WAUJH**, 9 July 1993; **CY9R**, 2 September 1993; **ET3RP**, 20 September 1993; **JT1/JE7RJZ**, 5 January 1993; **JT/JE7RJZ**, 19 August 1990; **SV5/N6MZ**, 16 June 1993; **T5/N3HQW**, 31 August 1993; **UAS/JE7RJZ**, 28 October 1991; **UAS/JM1SVJ**, 28 October 1991; **UAS/JJ2HVK**, 28 October 1991; **UAS/JK2NBE**, 28 October 1991; **VS6/K4IQJ**, 27 May 1991; **ZB2/DL7URA**, 6 April 1993; **ZB2/DL7VEE**, 5 April 1993.

Visalia Convention

The 1994 International DX Convention will be held April 15–17 at the Holiday Inn-

CQ DX Awards Program

SSB

2054 ..... AA2HM
2055 ..... KJ9N
2056 ..... EA1AYN

CW

890 ..... XE1MD

SSB Endorsements

320 ..... K4MZU/329
320 ..... K2TQC/329
320 ..... K2FL/329
320 ..... W9DWQ/329
320 ..... W9SS/329
320 ..... WA4IUM/329
320 ..... DJ9ZB/329
320 ..... XE1AE/329
320 ..... EA2IA/329
320 ..... WB1DQC/329
320 ..... K2ENT/329
320 ..... OZ5EV/329
320 ..... KA3HXO/329
320 ..... CX4HS/329
320 ..... F9RM/329
320 ..... I4EAT/329
320 ..... KB8DB/329
320 ..... VE3XN/329
320 ..... YU1AB/329
320 ..... ZS9LW/329
320 ..... OE2EGL/328
320 ..... W4NKI/328
320 ..... KZ4V/328
320 ..... EA4DO/328
320 ..... K3UA/328
320 ..... WD8PUG/327
320 ..... KE4VU/327
320 ..... LA7JO/327
320 ..... K7LAY/327
320 ..... IK8CNT/326
320 ..... WZ4I/326
320 ..... K1HDO/325
320 ..... W5XQ/324
320 ..... KB1JU/321
320 ..... WE2L/320
300 ..... IØSGF/309
300 ..... WA9BDX/303
275 ..... KJ9N/298
275 ..... YB1RED/289
275 ..... EA5GKE/276
200 ..... EC1CTH/211

CW Endorsements

320 ..... K2TQC/329
320 ..... K1MEM/329
320 ..... W9DWQ/329
320 ..... K2FL/329
320 ..... K3UA/329
320 ..... K2ENT/329
320 ..... K2OWE/329
320 ..... K4CEB/329
320 ..... I4EAT/329
320 ..... KZ4V/328
320 ..... WØHZ/326
320 ..... N7MC/326
320 ..... W9WAQ/326
320 ..... EA2IA/325
320 ..... KB8DB/325
310 ..... K1HDO/317
310 ..... N4AH/316
310 ..... AA2X/311
300 ..... N1HN/306
250 ..... XE1MD/257
250 ..... LA7JO/252
250 ..... G3DPX/251
250 ..... IKØADY/250
200 ..... 3A2LF/204

Total number of active countries is 329. The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

QSL Information

3A/GØSLY to WA3CGE
3D2YA to W6YA
3D2YO to K6JYO
4L1AB to UF6AB
4L5A to IK3HHX
4N7W to YU7BJ
4O1V to YU1DX
4O9S to YU7KMN
4U1UN to W8CZN
4X1VF to K1FJ
5T5JC to F6FNU
5X/DL6OBY to 9X5HG
5X1A to WB1DQC
6W6/F5OWB to F5OWB
6W6/K3IPK to K3IPK
7Q7LA to G0IAS
7Q7RM to G0IAS
7Q7XX to JH3RRA
7X4AN to DJ2BW
9A3GF to YU2LQM
9J2BO to W6ORD
9K2JC to VE3OMC
9M6HF to WE2K
9M8R to W7EJ
9Y4H to K6NA
A22MN to WA8JOC
A35UZ to GØHUZ
A41KJ to N5FTR
A61AD to WB2DND
C51A to W3HNK
C56/KF7AY to KF7AY
C6A/W9ILY to W9ILY
C91AI to CT1DGZ
C91AJ to CT4RM
C91J to W8GIO
C91S to W8GIO
C91W to W8GIO
C93BM to I3QAI
C94BE to CT4DK
CH9NS to VE1NS
CO2VG to IØWDX
CT1ENG to CT5EPG
CT3EU to G3PFS
DPØGVN to DL1JCW
EA8BR to EA4KR
EL2PP to N2CYL
EP2A to EP2HZ
ER1AM to SP9HWN
ER8ZAL to UB5ZAL
ET3BH to SM3EVR
EW/R3AW to GW3CDP
FG5CP to F6FNU
FG5FZ to F6FNU
FK8GJ to F6CXJ
FK8GM to WB2RAJ
FY5GJ to F2YT
HG75ØERD to HA7UL
HH2LQ to KM6ON
HH2PK to KA9RLJ
HH9HH to KJ6YR
HL93IWD to HL3IWD
HP1XBH to W4YC
HP1XOY to KA1ZGS
HV3SJ to IØDUD
HV4NAC to IKØFVC
IR2PH to IK2GPV
J28BM to K1SE
J37AJ to W2KF
J37K to W8KKF
J5UAI to NW8F
J88BS to WA4WIP
JT8AA to JR1PFO
KP2/CT1BOH to CT1AHU
LXØRL to LX1JX
LZ9A to LZ2KTS
NP2V to WB4FLB
OL5PLZ to OK1DRQ
OX3XR to OZ3PZ
PJ2/OH1VR to OH1VR
PJ4/WA3LRO to K2SB
PZ5JR to K3BYV
RM7M to DF8WS
RT4U to DK1RV
RX3RXX to UZ3RXX
S21ZG to W4FRU
S21ZW to VK2DFL
S54ZZ to OE8SKQ
S79KMB to KN2N
SU1ER/3 to OE6EEG
SV/WY3V to WB2RQW
TI1C to W3HNK
TL8GR to F5XX
TL8NG to WA1ECA
TM4IPA to F5LGQ
TO5MM to N3ADL
TT8OBO to WA4OBO
UH2E/UA9TZ to DF7RX
UH3E/UA9TF to KB6MXH
UH5E/UA9TX to DL1FCM
UJ8JMM to DL8WN
UZ2FWA to DK4VW
V26B to WT3Q
V47KP to K2DOE
V47RM to AA5DX
V62A to WB3DNA
V73IO to AH6IO
V85KX to G3JKX
VK9LO to K6VNX
VO5TK to VO1TK
VP2EC to N5AU
VP2V/K4ADK to AB4OI
VP5/K8JP to K8JP
VP5/NO4J to K4UTE
VP5JM to W3HNK
VP5P to WB3DNA
VP8GAV to GMØLYL
VQ9KC to AA7AN
VS6CT to KA6V
VU2IIS to VU2ADC
X5EBL to YU1FW
XE2AAF to KD8IW
XF3/XE1L to WA3HUP
YB3OSE to W7TSQ
YL75R to YL1XX
YN/SMØOIG to SMØKCR
YV5ZZ to K8EFS
Z31PK to YU5XLD
ZD8M to G3UOF
ZD8VJ to G4ZVJ
ZD9BV to W4FRU
ZD9SXW to G3SXW
ZF2VV to NX1L
3XØDEX to Did, P.O. Box 104, 22650 Fleubalay, France
9G1UW to Werner, P.O. Box 781, Accra, Ghana
A71AN to P.O. Box 22199, Doha, Qatar
BZ4SBA to Young, P.O. Box 51, Suzhou City, China
ET3YU to P.O. Box 60349, Addis Ababa, Ethiopia
H5AKP to P.O. Box 59, Sun City 03016, Bophuthatswana
HKØDPA to P.O. Box 0890, San Andres, Colombia
TA3D to Yasar, P.O. Box 963, Izmir, Turkey
TR8XX to P.O. Box 4069, Libreville, Gabon
VR6CB to Clarice, P.O. Box 11, Pitcairn Island, via New Zealand
VR6TA to Trent, P.O. Box 30, Pitcairn Island, via New Zealand
ZD7DP to Des, P.O. Box 86, St. Helena Island, Atlantic Ocean
ZD7GWM to P.O. Box 66, St. Helena Island, Atlantic Ocean

Plaza Park, in Visalia, California. Preregistration (prior to March 15, 1994) is $45, and includes the Saturday evening banquet and Sunday morning brunch, as well as all the programs, cocktail parties, and more. Send your check, made out to the International DX Convention, to registrar Don Bostrom, N6IC, 4447 Atoll Ave., Sherman Oaks, CA 91423. Tentative program for Saturday evening is the 1994 Peter I Island DXpedition. Other noteworthy events include the Friday morning golf tournament and the Friday evening cocktail party sponsored by *The DX Bulletin*. The Holiday Inn's telephone number is 209-651-5000. If they're sold out, try the Radisson in downtown Visalia at 209-636-1111, or the nearby Lamplighter Hotel at (209) 732-4511.

QSL Information

QSL the CQ WW SSB operation of **ZWØJR** via operator Sergio Lima de Almedia PP5JR, Av. Rubens Arruda Ramos 1416/501, Cep 88015-700, Florianopolis SC Brasil.

OK1DRQ says he is QSL manager for: **OL5PLZ, OK5IPA, OK1OFM, OKØITU (1993 only),** and **OM5PLZ (1991–92)**.

QSL the October St. Martin operations as follows: **FS/JG1RXQ** via JA1VPO, and **FS/JL1MUT** via JH1EDB.

QSL **V47NF** via WB8GEW (SASE).

PY5CC says he handles QSL cards for: **PT9ZZ, PP5XX, ZV9ZZ, PX9A, PX5A, ZX5C, ZZ5A, ZW9A, ZZ9A, ZX9A, PS5C, PR5A, PU5A, PY5CC/PYØF,** and **PYØFM,** except QSL the Nov.–Dec. 1992 PYØFM operation via AH3C.

Bill Delage, K1SE, handles cards for **A45ZW, J28BM, VK8SD,** and **7Z2AB**. Bill's new address is P.O. Box 685, Manassas Park, VA 22111-0685.

Aldo Aste, **CE2NFT**, has a new address: P.O. Box 322, Vina del Mar, Chile.

QSL **8P9EA, 8R1RPN,** and **8R1K** via OHØXX, either via the Finland bureau or direct to Olli Rissanen, 1313 South Military Trail, Suite 599, Deerfield Beach, FL 33442.

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

BY FREDERICK O. MAIA, W5YI

Getting Started in Amateur Radio

Every once in a while we devote our monthly column to non-amateurs—people who want to know more about becoming an amateur radio operator. Well, this is one of those months! To most of us amateur radio is a life-long hobby. And since communications technology is constantly changing, so does the hobby! Amateur radio of today bears little resemblance to that of just a decade ago. Just about anyone can qualify for the license. And it is easier to do than ever before. You certainly do not have to be technically inclined to be a "ham." There are eight-year-old amateur radio operators and many past 80 years old.

What is Amateur Radio?

According to the dictionary, an amateur is " . . . a person who engages in a study, sport or other activity for pleasure rather than for financial benefit or professional reasons." The word originates from the Latin "amare," to love. Amateur radio operators love to contact other amateurs, and they love to tinker with electronics.

Anyone can be an amateur radio operator, and just about anyone is! You don't even have to be a U.S. citizen! You do have to be licensed by your government, however. In amateur radio there are no race, age, creed, color, sex, or class distinctions. It is a service which emphasizes people's common interests, not their differences. Everyone is eligible.

Amateur radio exists in nearly every country of the world, and on the same frequencies. This allows two-way communication with other amateurs around the world. CBers may only radiate a few watts using AM (or sideband, which is a form of AM) on a relatively few channels of one band. Amateurs can legally run up to 1500 watts on thousands of frequencies on many different bands. Each band has different radio wave propagation characteristics which allow various communications capabilities. And there is no limit on transmission modes.

Amateur radio is a hobby of self-education and emergency preparedness. It is to our country's benefit to have a reservoir of trained operators, technicians, and electronics experts. Amateur radio operators stand ready on a moment's notice to assist whenever normal communications channels are overloaded, damaged, or disrupted. Amateur radio is officially recognized as our nation's backup communications network during times of emergency, disaster, international crisis, and even war!

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

What Can You Do With It?

Besides talking to other amateurs in foreign countries, amateurs can, and do, operate their own FM voice stations, increase their communications range using "repeaters" (automatic relay stations), tie into the public telephone system, operate through orbiting satellites, run their own television stations, operate computer-to-computer over radio, and more! As a general rule, all transmissions are restricted to two-way communications with other licensed amateurs. Amateurs are permitted, however, to command objects by radio, such as by radio-controlling model aircraft.

Licensed amateurs may transmit and receive non-emergency messages on behalf of others within the United States or its possessions and to people in foreign countries, providing the U.S. has entered into an agreement with that nation to allow "third party" message traffic. Traffic handling is one of the many offshoot hobbies within amateur radio.

What Can You NOT Do On The Amateur Bands?

Since amateur radio is primarily a hobby, business communications are generally not permitted. You can, however, use amateur radio for your own personal business needs, such as making a hotel reservation for yourself or ordering food over the telephone autopatch.

While there are exceptions, you can generally use your amateur radio communications capability for just about any legitimate purpose. But all communications must be voluntarily provided. You may not get paid for providing the communications. You may assist the police or sponsors of a public event, help in an emergency, or operate for any other worthwhile purpose. However, you may not provide communications for your employer. Amateurs may even provide communications for organizations that are eligible to obtain their own radio frequen- cies, but this should be the exception rather than the rule.

"Broadcasting" to the public, broadcast program production, news gathering for broadcast purposes, and transmitting music over the amateur bands are strictly prohibited. You may, however, provide one-way information bulletins and license training intended for other hobby radio enthusiasts over the amateur bands. Even though they may be getting paid, it is not against the rules for classroom teachers to occasionally use amateur radio transmissions to supplement their instruction.

The primary thing to remember is that amateur radio is just that—noncommercial. The control operator or his employer may not profit from amateur communications. Anyone can be an amateur—and just about anyone is! Over 600,000 Americans from all walks of life are amateur radio operators. Japan has over a million amateurs!

How Do I Become An Amateur Radio Operator?

There are now two ways you can become an amateur radio operator. You can enter the "old-fashioned way" by passing a written and a Morse code examination, or the new way by passing two small written tests. More and more newcomers are choosing the No-Code Technician route into amateur radio. These exams, Element 2 (25 questions) and Element 3A (30 questions), are selected from known and widely published question pools. The Novice and Technician amateur radio levels are the first two of five amateur radio license classes. These tests are administered by other amateurs holding senior-level licenses who serve as volunteer examiners (VEs).

Most people can pass the Codeless Technician requirements with just a couple of weeks of study. Passing an amateur radio exam is now basically the same as passing the written portion of an automobile driving test. You simply study the questions and then take a multiple-choice test when you think you are ready. All word-for-word questions, their multiple

choices, and the answers appearing in every test are known and published. There will be no surprises.

The questions are on nine different subjects. These topics are: FCC rules, operating procedures, radio-wave propagation, amateur radio practices, electrical principles, station equipment, electronic circuits, transmission modes, and amateur station antennas.

The FCC still issues the license, but all testing is now conducted by volunteer examiners holding the higher class licenses. Most examination sessions are conducted evenings or during the weekend at times and locations readily accessible to applicants. You can usually locate a test session by asking any local amateur.

Applicants apply to take an examination by completing FCC Form 610, *Application for Amateur Radio Station and/or Operator License*, available from the FCC (1270 Fairfield Road, Gettysburg, PA 17325). The Form 610 consists of three sections. Section 1 is completed by the applicant. The three volunteer examiners certify your eligibility for a license by completing the *Administering VE's Report* in Section 2. Section 3 (on the back of the form) is completed by a physician if a handicapped applicant wishes to be excused from the higher speed telegraphy requirements.

Taking the test is easy. The volunteer examiner (VE) simply selects a specified number of questions from each topic in the question pool. You qualify for the Codeless Technician if you answer 41 questions correctly out of 55; it is that simple! You will receive a credit certificate (good for one year) if you only pass one of the two test elements. At present it takes about 6 to 8 weeks for a license to be received from the FCC.

Rights of A "Codeless Tech" On The Amateur Bands?

Amateur radio is a structured hobby. The more knowledge you have, which is demonstrated by passing various examinations, the more privileges you are permitted. Up until recently every amateur had to learn the Morse code before becoming an operator. The times have changed, and communications technology is now very sophisticated. What was once a Morse code and long-range communications hobby is now widely diversified. No longer must you learn the code to obtain some very desirable privileges.

The Codeless Technician entry level allows operators to use any transmission mode on any frequency above 30 MHz at full amateur power. This includes the popular 2 meter band, where most amateurs socialize with other amateurs. Phone patching, talking through amateur satellites, packet (computer-to-computer) radio, mobile FM communications through repeaters, and even two-way amateur television are all authorized modes to the Codeless Technician. You must still pass a 5 word-per-minute code test, however, to operate below 30 MHz. Most amateur radio communications today are conducted at the VHF and higher frequency level.

What Is The Best Way To Get Started?

There are basically three ways to become an amateur. Joining an instruction class, usually conducted by an amateur radio club, is a very common way. You can be individually taught by another amateur radio operator—known as an "Elmer" in amateur radio circles. Or you can do it on your own by self-study. There is no shortage of amateur radio license preparation material! There is bound to be a ham operator right in your neighborhood. Most are very willing to assist newcomers in entering the hobby. You usually can locate one by looking for a big antenna on the roof or in a backyard, or by a callsign license plate on a car.

Be certain that you get up-to-date versions of the questions if you choose the self-study route. They are revised periodically to coincide with changes in FCC

rules and technology. Your author heads up a very large testing organization and question manuals are available by writing or telephoning us (phone 817-461-6443) A personal computer has become basic equipment for just about every amateur radio operator. We even have computer-aided instruction software for those who own IBM-compatible PCs. (See W5YI's advertisement in this issue!)

Every amateur, newcomer and experienced alike, must be thoroughly familiar with the FCC regulations governing the Amateur Radio Service. These are contained in §Part 97 of the Code of Federal Regulations. Failure to adhere to these rules can result in severe fines and even imprisonment! The §Part 97 Rule Book can be completely read in just a few hours and is available from us (W5YI, P.O. Box 565101, Dallas, TX 75356) for $2.95 pp.

The Part 97 Rules and Regulations was completely rewritten by our government in 1989 and details everything you can and can't do on the amateur airwaves. You are required to know the rules before transmitting! The rule book consists of six sections: General Provisions, Station Operation Standards, Special Operations, Technical Standards, Emergency Communications, and Qualifying Examination Systems. In addition, there are two appendices detailing the places where the Amateur Service is regulated by the FCC and the various testing regions.

Why Are There Different Levels?

Amateur radio is a hobby of communications education and knowledge. However, you certainly don't need to know very much about electronics and amateur radio operations to get your initial license. As amateurs develop more operating skill and technical knowledge, they are allowed more privileges. This is called the incentive system of amateur radio licensing. There are five amateur operator license classes: Novice, Technician, General, Advanced, and Amateur Extra Class.

A sixth class, "Technician Plus," is actually an extension of the Technician Class. Tech Plus amateurs are Techs who have passed the 5 words per minute telegraphy examination and are allowed some operating privileges on the HF bands. As of 1984 amateur operator and station licenses are valid for a period of 10 years. All license classes may be indefinitely renewed without cost or re-examination. Amateurs no longer have to designate a location for their fixed transmitter location.

How Does The Amateur Testing System Work?

It used to be that the Federal Communications Commission administered all amateur radio examinations at their various field offices around the country. The FCC announced in late 1983 that they would be turning over the amateur radio testing program to the amateur community the following year as a cost-saving measure.

The FCC selected multiple examination administrators from the private sector, called Volunteer Examiner Coordinators (VECs), to set up testing programs. The Novice testing program had been successfully run by volunteer examiners for years. Your author offered to be a VEC in early 1984. The ARRL became a VEC later, once Senator Barry Goldwater, K7UGA, arranged for passage of amateur test expense reimbursement legislation. While there are currently 18 VEC organizations, only two, the W5YI-VEC and ARRL-VEC, account for 85% of all amateur testing. VECs "accredit" General, Advanced, and Extra Class amateurs to administer examinations. The questions used are developed by an internal VEC panel called the QPC (*Question Pool Committee).* The QPC on which I serve as Vice-Chairman periodically revises all amateur radio examination questions.

Over the years our W5YI-VEC amateur testing operation has reached mammoth proportions indeed! We have 15,000 VEs (volunteer examiners) organized into nearly 1000 testing teams who regularly conduct examination sessions around

the world. Last year our group administered some 60,000 examination elements to 35,000 applicants at nearly 4000 examination sessions. There is sure to be a testing team in your area! Ask any amateur, and he will tell you where the nearest examination session is held.

Code Exemptions For The Handicapped

Not only did the FCC drop the code requirement to enter amateur radio, they also relaxed the code requirement for handicapped amateurs. Disabled hams who have passed at least the five words-per-minute code requirement in some manner can now exempted from having to pass a higher speed in order to upgrade their license. They automatically get credit for the 20 words-per-minute Extra Class code requirement. The Amateur Extra Class is ham radio's highest license level. A doctor must certify that the amateur is incapable of passing a higher speed code test because of his severe disability.

Amateur Radio Callsigns

Many state legislatures have recognized the value of amateur radio as a public emergency service by authorizing amateurs to have their callsigns on their automobile license plates. No callsigns are issued to CB operators, and most use nicknames or "handles."

Amateur radio stations are issued their own station callsign primarily as an aide to enforcement of the radio rules. Every country has a different prefix. K, W, N, and certain prefixes beginning with A are allocated to the United States by the *International Telecommunication Union*. The ITU, a part of the United Nations, governs worldwide telecommunications. On the DX airwaves amateurs can readily identify the origin of the signal they hear by the callsign prefix.

Amateur callsigns contain a numeral after the international prefix denoting the area in the United States in which the applicant has his mailing address. Most beginning amateurs will obtain a "2-by-3" letter format callsign. That is two prefix letters (the first one being "K") followed by the area designator (to 9) and three suffix letters.

Vanity & Temporary Callsigns

Callsigns are of monumental importance to amateur radio operators. They become their name on the bands. At present all U.S. amateur callsigns are systematically assigned in strict alphabetical order by the FCC (see Table I). An amateur radio operator may not select specific call letters. This may soon change, however.

Continental United States
Group A—Extra Class *(1-by-2, 2-by-1, 2-by-2 format)*
K#¢¢, N#¢¢, W#¢¢, AA#¢–AK#¢, KA#¢–KZ#¢, NA#¢–NZ#¢, WA#¢–WZ#¢, and AA#¢¢–AK#¢¢ (Then Group B)
(Except prefixes beginning with AH, KH, KL, NH, NL, WH, WL, WP.)
Group B—Advanced Class *(2-by-2 format)*
KB#¢¢–KZ#¢¢, NA#¢¢–NZ#¢¢, WA#¢¢–WZ#¢¢ (Then Group C)
(Except prefixes beginning with KH, KL, KP, NH, NP, WH, WL, WP.)
Group C—Technician & General Class *(1-by-3 format)*
N#¢¢¢ (Then Group D)
Group D—Novice *(2-by-3 format)*
KA#¢¢¢–KZ#¢¢¢, WA#¢¢¢–WZ#¢¢¢
(Except KH, KP, WC, WH, WK, WL, WM, WP, WR, WT.)

Outside of 48 Contiguous States
Pacific Area (2 letter prefix with second letter H)
Group A: AH#¢, KH#¢, NH#¢, WH#¢ (Group B)
Group B: AH#¢¢ (Group C)
Group C: KH#¢¢, NH#¢¢, WH#¢¢ (Group D)
Group D: KH#¢¢¢, WH#¢¢¢
Alaska Area (2 letter prefix with second letter L)
Group A: AL7¢, KL7¢, NL7¢, WL7¢ (Group B)
Group B: AL7¢¢ (Group C)
Group C: KL7¢¢, NL7¢¢, WL7¢¢ (Group D)
Group D: KL7¢¢¢, WL7¢¢¢
Atlantic Area Caribbean (2 letter prefix with second letter P)
Group A: KP#¢, NP#¢, WP#¢ (Group B)
Group B: KP#¢ (Group C)
Group C: NP#¢¢, WP#¢¢ (Group D)
Group D: KP#¢¢¢, WP#¢¢¢

Table I– U.S. amateur callsign assignment system, where # = number, ¢ = sequential letters. (Note: A 2-by-3 format callsign has two prefix letters, a callsign area number, plus three suffix letters. Only the "N" by 3 letters will be assigned to Group C. Most "N" by 3 format callsigns have been assigned, so most newcomers will receive 2-by-3 Group C format. K and W prefix by 3 letters will not be assigned. When all callsigns have been allocated from a group, callsigns from the next lower group are assigned. Amateur stations located outside the continental United States have two-letter prefixes with L, P, or H as the second letter; first letter is A, K, N, or W. An amateur station is not required to change callsign when upgrading to a higher class.)

The FCC is in the process of adopting regulations which will permit amateurs to purchase "vanity" callsigns in much the same way people purchase a "vanity" automobile license plates. Unlicensed applicants will even be able to reserve a callsign which will be assigned to them when they become eligible! This is certain to be a popular program!

Another new program the FCC has proposed is extending "temporary operating authority" to new licensees. At present it takes about 6 to 8 weeks to receive a first-time amateur radio license from the FCC once the exam requirements are passed. It should come as no surprise that many newcomers get very impatient waiting for that license to arrive, especially if the beginner has purchased new transmitting equipment. Since beginners can't get on the amateur airwaves until they have a callsign, they start calling everybody after about the first month of waiting! This is very costly and time consuming to the VEC System and the FCC, who must field hundreds of phone calls monthly from beginners asking about their license status.

Currently licensed amateurs do not have to wait to use their new privileges once they pass the required exams! When a licensed amateur upgrades to a higher class license, he/she may begin using the new privileges immediately, since the rules provide for "temporary operating authority." Upgrading amateurs merely append a two-letter identifier to their existing callsign to denote their new license class, and may begin using their newly acquired frequency privileges immediately. Newcomers without a callsign, however, have to wait.

The new procedure, if approved, will allow a beginner to operate temporarily (up to 6 months) with a self-assigned callsign. The temporary callsign will consist of the prefix "WZ" followed by the area numeral and the examinee's three initials. For example, Robert A. Smith, a new amateur with a New York mailing address, becomes WZ2RAS for up to 120 days. By that time Bob Smith will have received his regular assigned callsign from the FCC.

The letter "Z" is used if the applicant does not have a middle initial.

Still a third new planned program will allow electronic filing of amateur radio license applications. This too will greatly speed up license receipt. The FCC will operate what amounts to a computer bulletin board at their Gettysburg, Pennsylvania, licensing facility. VECs will be able to transmit amateur license application data to them over the phone lines. After review, the FCC will simply dump the data into their computer system, which will issue the license.

What Do Amateurs Talk About?

Amateurs talk different from CBers. Our lingo is based on communications used by professional (especially maritime) radio operators over the years, rather than the language of the road. They don't use "10" signals (such as 10-4), call each other "good buddy," or give "smoky reports." These give way to using other "numbers" such as "73" (meaning best regards), QTH (Q-signals are used mostly on CW), "Old Man" (all men are OMs; ladies are always young—YLs), and signal reports ("read you five-by-nine") once you become an amateur radio operator.

If you want to be accepted by other amateurs, you will have to act like one. It is a good idea to listen to the jargon for a while, even before you are licensed, so that you won't stand out in the crowd as a newcomer. First-time shortwave contacts usually consist of an exchange of signal reports, first (but not last) names, and a description of the station location and amateur equipment. "Ragchewing" (social contacts made for no special reason) is perhaps the most popular amateur activity.

There are various amateur operating awards to achieve. "Collecting" radio contacts and QSL confirmations is a way of life for many hams. Many amateurs specialize in working DX (distant stations). Some go on DXpeditions (excursions to operate from a "rare" country). "Working" 100 confirmed countries qualifies you for DXCC, the coveted DX Century Club. You can get awards for contacting different station callsign prefixes, states, counties, regions, zones—you name it! Usually the award is a certificate, sometimes a trophy, but never money or some other material gift! Amateurs are prohibited from being paid directly, or indirectly, for their operations.

On-the-air contesting—contacting as many amateur stations in a particular category or time frame—pits operator against operator. Some amateurs go "fox hunting" (locating hidden transmitters with commercial or homemade direction-finding equipment). There is something for everybody in amateur radio. The end result is a more knowledgeable, better qualified radio operator.

Two Meter Repeaters The Social Party Line

Usually the first purchase a new amateur makes is a 2 meter hand-held transceiver. These usually cost in the $200 to $400 range, although used ones can be purchased for much less. Chatting on the 2 meter "machine" (amateur radio lingo for "repeater") is where most Technician Class amateurs start their amateur radio career. You can learn practically all you have to know about operating on the "machine" simply by listening. Repeaters are usually sponsored by a group of amateurs or an amateur radio club. Repeater protocol is quite different from HF operation. It is less formal, like chatting on the telephone.

A repeater is somewhat similar to the old rural "party line." Everything you transmit can be overheard by everyone else tuned to the repeater output frequency. Two frequencies, an input and an output, are assigned by a person designated as the area frequency coordinator. His job is to assign frequency pairs to stations far enough apart to minimize interference to one another.

Users transmit on one (input) frequency, and the "machine" retransmits ("repeats") the transmission out on a different (output) frequency. On 2 meters the separation difference is 600 kHz. A common channel is input on 146.22 MHz and output by the "machine" on 146.82. We call this channel by the last two numbers of the input and output frequency; 146.22/146.82 is simply referred to as 2282.

The primary reason repeaters exist is they greatly increase communications range, which in the VHF and higher frequency range is "line-of-sight." Users who can't "see" each other directly can usually "see" each other through a repeater the antenna of which is on a hilltop. Repeater users can transmit relatively low power and use inefficient whip antennas to reach the machine. The machine repeats these received signals out at much higher power and from high, efficient antennas. Thus, the low-powered hand-held or mobile transceiver ultimately has the power of a hundred watt repeater and a high-gain antenna. This accounts for the increased range.

A machine can be "open" to all users, or it can be "closed." A closed repeater usually requires an access code of some type, such as sub-audible tones or touch-tone combinations. A machine with an autopatch allows users to switch their 2 meter radio signals onto the public telephone lines and to make free phone calls from your car or handie-talkie.

Get Working on Becoming A Radio Amateur!

There you have it. A beginner's rundown on amateur radio, the world's greatest hobby! The next move is yours! All you have to do is obtain study material, or sign up for a license preparation class, and you will be on your way in no time. Remember, the hardest part about becoming an FCC licensed amateur radio operator is getting started. Once you make the commitment to do it, the rest is easy, and faster than you would have guessed! See you on the amateur bands.

Until next month . . .

73, Fred, W5YI

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Sunspot Cycle 22 Progress

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 55 for October 1993. This results in a smoothed running sunspot number of 63 centered on April 1993. The present sunspot cycle is continuing to decline at a steady rate. A smoothed index of approximately 45 is forecast for February 1994.

Canada's Dominion Radio Astrophysical Observatory in Penticton, BC reports a corresponding mean 10.7 cm solar flux level of 100 for October 1993. This results in a smoothed level of 118 centered on April 1993 and a predicted level of approximately 115 for February 1994.

For an excellent analysis of expected 10 meter band propagation during the remaining years of low solar activity, read the DX column in the December issue of *CQ*, "DX—Getting The Most Out of 10 Meters in a Declining Cycle."

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for February 1994

Propagation Index.....	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 1, 7, 13-14, 28	A	A	B	C
High Normal: 2-3, 6, 11-12, 17, 26	A	B	C	C-D
Low Normal: 4-5, 10, 15-16, 18-19, 24-25, 27	B	C	D	D-E
Below Normal: 8-9, 20, 23	C	C-D	D-E	E
Disturbed: 21-22	C-D	D	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index,* use the above table to find the expected signal quality associated with the band opening for any date of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be excellent (A) on Feb. 1, good (B) on the 2nd and 3rd, fair (C) on the 4th and 5th, good (B) on the 6th, etc.

Flash!

Mother Nature cooperated with amateur radio during the CQ World-Wide DX CW Contest weekend of November 27 and 28. In fact, conditions on the HF bands were somewhat better than expected. My forecast called for generally High Normal conditions. Early results appear to confirm this forecast. In fact, conditions may have been in the Above Normal range for a good deal of time during the CW Contest weekend. A 10.7 cm solar flux level of 90 was reported for November 27th. This increased to 93 on the 28th. The corresponding sunspot count was reported to be 48 and 66, respectively. The world-wide index for geomagnetic activity (A_p) was reported as 4 on both contest days. This relationship of solar flux and geomagnetic indices indicates a quiet and stable ionosphere. All in all, the 1993 WW Contest periods, both SSB and CW, enjoyed relatively good propagation conditions, despite the decline in the solar cycle. While no new records may be set, expect some impressive scores.

February Propagation

In the Northern Hemisphere during February expect a seasonal decrease in the range of frequencies that will propagate long distances during the daylight hours (i.e., 10 and 12 meter bands), and an increase during the hours of darkness (i.e., 30 and 40 meter bands).

Towards the end of February and continuing through March and early April, an *equinoctial* effect should be noticeable on the HF bands. This usually means an improvement in conditions for openings between the Northern and Southern Hemispheres—for example, between the United States and South America, southern Africa, Australasia and Oceania, and the southern areas of Asia. Equinoctial propagation occurs during the spring and fall months, when the sun is most directly overhead at the equator. This results in similar ionospheric characteristics over large areas of the world. It tends to maximize during sunrise and sunset periods and over short and long paths.

Declining sunspot activity, coupled with normal seasonal changes in HF propagation conditions, is expected to result in few 10 and 12 meter openings during February. The bands occasionally may open to Europe and the east from the eastern states between 10 AM and noon. There is a slightly better chance for openings to Africa between the same hours, and some of these may extend to the western states. Somewhat better conditions should exist towards South America, with openings possible between noon and 4 PM, and occasionally as early as 10 AM from all sections of the country. The western states are favored for openings towards the South Pacific and Asia, with some possible between 2 and 5 PM. When conditions are better than normal, some of these openings may extend towards the eastern states between 3 and 6 PM local time.

While some fairly good openings are forecast for 15 and 17 meters, the bands are expected to open considerably less frequently and to fewer areas of the world than during the earlier winter months, or when compared with February propagation during periods of high solar activity. Both bands are expected to open first towards Europe, Africa, and the east between 9 AM and 2 PM in the eastern states, and until noon in the western states. Openings towards South America should be possible throughout much of the daylight period, with conditions peaking between noon and 4 PM. Openings towards Australasia and the South Pacific and to a lesser extent to the Far East and Asia should be possible on some days between 4 and 8 PM local time. These openings favor locations in the western half of the country, but may extend further east when conditions are High Normal or better. The path to Antarctica should peak between 3 and 6 PM.

Twenty meters should be the best overall band for DX propagation during February. Look for a window of fairly good openings in almost all directions for an hour or two after sunrise. The band should peak again towards Europe and the east between noon and 3 PM in the eastern states and between 11 AM and 1 PM in the west. Propagation should be best towards Africa between 3 and 6 PM in the east, and to 4 PM in western states. Look for l*ong-path* openings from the western states to Europe and Africa for an hour or two after sunrise. Openings towards the south should peak again during the late afternoon, with the band remaining open to as late as 8 PM. Check until 10 PM for regular openings deep into South America and to Antarctica. Evening openings to the South Pacific, Far East, and Asia

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February, 1994

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HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302

February 15–April 15, 1994
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Central Europe & North Africa	10-12 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-18 (1)	17-18 (1) 18-19 (2) 19-00 (3) 00-02 (2) 02-04 (1) 18-20 (1)* 20-21 (2)* 21-23 (3)* 23-00 (2)* 00-02 (1)*
Northern Europe & European USSR	*Nil*	08-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-16 (1)	17-19 (1) 19-02 (2) 02-03 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Eastern Mediterranean & Middle East	*Nil*	08-09 (1) 09-10 (2) 10-12 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-15 (3) 15-16 (2) 16-19 (1)	18-20 (1) 20-22 (2) 22-23 (1) 20-23 (1)*
West Africa	10-13 (1)	08-10 (1) 10-12 (3) 12-14 (4) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	18-20 (1) 20-00 (2) 00-02 (1) 22-01 (1)*
East & Central Africa	11-13 (1)	09-11 (1) 11-15 (2) 15-16 (1)	13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	19-22 (1) 22-00 (2) 00-01 (1)*
South Africa	10-13 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	18-20 (1) 20-22 (2) 22-00 (1) 21-23 (1)*
Central & South Asia	*Nil*	08-10 (1) 16-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-20 (1)	19-22 (1) 04-06 (1)
Southeast Asia	*Nil*	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	19-22 (1) 05-07 (1)
Far East	*Nil*	16-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 05-07 (1)*
South Pacific & New Zealand	13-14 (1) 14-16 (2) 16-17 (1)	12-15 (1) 15-18 (2) 18-20 (1)	15-19 (1) 19-23 (2) 23-07 (1) 07-09 (2) 09-11 (1)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	15-18 (1)	09-11 (1) 14-16 (1) 16-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-15 (1) 15-17 (2) 17-18 (1) 18-21 (2) 21-23 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Central America & Northern Countries of South America	09-12 (1) 12-16 (2) 16-17 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	09-13 (1) 13-15 (2) 15-16 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-10 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	19-21 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound, Antarctica	*Nil*	14-15 (1) 15-18 (2) 18-19 (1)	17-19 (1) 19-22 (2) 22-00 (1) 06-08 (1)	22-00 (1) 00-04 (2) 04-06 (1)

Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Southern Europe & North Africa	*Nil*	08-09 (1) 09-13 (2) 13-14 (1)	06-07 (1) 07-09 (2) 09-11 (2) 11-13 (2) 13-14 (3) 14-16 (2) 16-17 (1)	17-19 (1) 19-22 (2) 22-00 (1) 00-02 (2) 02-03 (1) 19-21 (1)* 21-00 (2)* 00-01 (1)*
Northern & Central Europe & European USSR	*Nil*	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-13 (2) 13-15 (1)	19-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Eastern Mediterranean & Middle East	*Nil*	08-11 (1)	07-12 (1) 12-14 (2) 14-17 (1) 22-00 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
West Africa	09-12 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	07-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	18-20 (1) 20-22 (2) 22-01 (1) 21-00 (1)*
East & Central Africa	*Nil*	08-11 (1) 11-14 (2) 14-15 (1)	07-12 (1) 12-14 (2) 14-15 (3) 15-17 (2) 17-19 (1)	19-22 (1)
South Africa	09-12 (1)	07-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 23-01 (1)	19-22 (1) 20-21 (1)*
Central & South Asia	*Nil*	08-10 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	05-07 (1) 18-20 (1)
Southeast Asia	*Nil*	10-12 (1) 17-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-21 (1)	05-07 (1) 18-20 (1)
Far East	*Nil*	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-20 (2) 20-21 (1)	19-22 (1) 05-07 (1)*
South Pacific & New Zealand	*Nil*	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	19-22 (1) 05-07 (1)
Australasia	*Nil*	14-15 (1) 16-19 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-15 (1) 15-17 (2) 17-18 (1) 18-21 (2) 21-23 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Central America & Northern Countries of South America	09-12 (1) 12-16 (2) 16-17 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	09-13 (1) 13-15 (2) 15-16 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-10 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	19-21 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound, Antarctica	*Nil*	14-15 (1) 15-18 (2) 18-19 (1)	17-19 (1) 19-22 (2) 22-00 (1) 06-08 (1)	22-00 (1) 00-04 (2) 04-06 (1)

should peak between 6 and 9 PM in the eastern states and between 7 and 11 PM in the west.

During the hours of darkness 40 and 30 meter DX propagation is expected to be optimum. Check between 6 PM and 2 AM for openings to Europe, Africa, and the east from eastern states, and until midnight in western states. South America should be within range between 7 PM and 5 AM. From the west coast, the band should open to the South Pacific, the Far East, and Asia between 2 and 7 AM, with openings to the South Pacific often extending towards the east coast between 5 and 7 AM local time.

Eighty meter openings are also forecast to many areas of the world during the hours of darkness. Best bet for Europe and the east is between 8 PM and 1 AM in eastern states and between 8 and 10 PM in the west. Check openings towards South America between 8 PM and 4 AM from all sections in the country. From western states there is a chance for some good openings towards the South Pacific between 4 and 7 AM, with possibilities in the eastern states between 4 and 7 AM local time. Conditions to the Far East and Asia are expected to be poor, but an occasional opening should be possible from western states between 3 and 7 AM.

DX openings to several areas of the world are forecast for 160 meters during the hours of darkness. While signal levels may be weaker, and the band will open less frequently than 80 meters, conditions this February are expected to be considerably better than during the years of high solar activity. Look for openings to Europe and Latin America, and possibly to the South Pacific area.

Remember that DX conditions on 40, 80, and 160 meters peak when it is just breaking dawn at the *eastern* end of a path.

A seasonal increase in static levels is expected during February.

Short-Skip Conditions

On 160 meters no significant skip is expected during the daylight hours. Up to at least 1300 miles should be possible at night, often extending up to a one-hop short-skip limit of 2300 miles. On 80 meters expect openings up to around 250 miles during most of the daylight hours, with the skip lengthening to between 350 and 1300 miles just after sundown, and between 750 and 2300 miles by midnight. On 40 and 30 meters daytime skip should be possible between 250 and 750 miles, extending to between 750 and 2300 miles during the evening hours to about 8 PM, and then from between 1500 and 2300 miles until shortly after sunrise. Daytime skip on 20 meters should range between 750 and 2300 miles to about 4 PM. Be-

Far East	14-18 (1)	14-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	10-12 (1) 12-14 (2) 14-16 (1) 16-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-18 (1) 18-20 (2) 20-21 (3) 21-23 (2) 23-01 (1)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-05 (2)* 05-07 (1)*
Australasia	14-17 (1)	08-10 (1) 13-16 (1) 16-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-01 (1)	01-04 (1) 04-06 (3) 06-07 (2) 07-08 (1) 04-05 (1) 05-06 (2)* 06-07 (1)*
Central America & Northern Countries Of South America	09-13 (1) 13-15 (2) 15-16 (1)	07-08 (1) 08-10 (2) 10-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-02 (3) 02-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	11-13 (1) 13-14 (2) 14-16 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	14-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-01 (1) 04-06 (1) 06-08 (2) 08-14 (1)	19-20 (1) 20-02 (2) 02-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	*Nil*	13-16 (1) 16-18 (2) 18-20 (1)	16-19 (1) 19-22 (2) 22-01 (1) 07-10 (1)	22-02 (1) 02-04 (2) 04-06 (1)

Time Zone: PST (24-Hour Time) WESTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Southern Europe & North Africa	*Nil*	08-12 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-15 (1) 22-00 (1)	19-22 (1) 22-00 (2) 00-01 (1) 20-22 (1)*
Central & Northern Europe & European USSR	*Nil*	08-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (1) 22-00 (1)	19-21 (1) 21-22 (2) 22-23 (1) 20-22 (1)*
Eastern Mediterranean & Middle East	*Nil*	08-11 (1)	07-11 (1) 11-13 (2) 13-15 (1) 22-00 (1)	18-21 (1)
West Africa	09-12 (1)	07-09 (1) 09-11 (2) 11-12 (3) 12-14 (2) 14-15 (1)	04-06 (1) 06-08 (2) 08-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	18-22 (1) 20-21 (1)*
East & Central Africa	*Nil*	08-10 (1) 10-12 (2) 12-13 (1)	06-08 (1) 12-14 (1) 14-16 (2) 16-17 (1)	18-20 (1)
South Africa	09-12 (1)	08-10 (1) 10-13 (2) 13-15 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-17 (2) 17-18 (1) 23-01 (1)	18-21 (1) 20-21 (1)*
Central & South Asia	*Nil*	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	05-07 (1) 19-21 (1)
Southeast Asia	16-18 (1)	08-10 (1) 15-16 (1) 16-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-11 (1) 21-23 (1) 02-04 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)
Far East	*Nil*	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-11 (1) 11-13 (2) 13-16 (1) 16-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-03 (1)* 03-05 (2)* 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-20 (2) 20-21 (1)	06-08 (1) 08-11 (2) 11-17 (1) 17-19 (2) 19-20 (3) 20-22 (4) 22-23 (3) 23-04 (2) 04-05 (1)	19-21 (1) 21-22 (2) 22-05 (3) 05-07 (2) 07-08 (1) 22-01 (1)* 01-05 (2)* 05-07 (1)*
Australasia	14-17 (1)	09-12 (1) 14-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-11 (2) 11-17 (1) 17-19 (2) 19-21 (3) 21-23 (2) 23-03 (1)	00-02 (1) 02-03 (2) 03-05 (3) 05-07 (2) 07-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)
Central America & Northern Countries Of South America	09-12 (1) 12-14 (2) 14-15 (1)	07-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	06-07 (1) 07-09 (3) 09-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-22 (2) 22-02 (1)	18-20 (1) 20-00 (3) 00-03 (2) 03-06 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	10-12 (1) 12-14 (2) 14-16 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-16 (3) 16-17 (2) 17-19 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-22 (2) 22-00 (1)	18-20 (1) 20-01 (2) 01-03 (1) 22-02 (1)*
McMurdo Sound, Antarctica	*Nil*	12-15 (1) 15-18 (2) 18-20 (1)	16-19 (1) 19-22 (2) 22-02 (1) 06-07 (1) 07-09 (2) 09-10 (1)	22-02 (1) 02-04 (2) 04-06 (1)

*indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.

For 12 meter openings interpolate between 10 and 15 meter openings.

For 17 meter openings interpolate between 15 and 20 meter openings.

For 30 meter openings interpolate between 40 and 20 meter openings.

tween 4 and 6 PM the skip should lengthen to between 1500 and 2300 miles during most of the daylight hours between 9 AM and 6 PM, with the bands dead for short-skip an hour or so after sundown. An occasional F-layer short-skip opening may be possible on 10 meters during the afternoon hours over distances between approximately 1300 and 2300 miles. An occasional sporadic-E opening over shorter distances may also be possible.

VHF Ionospheric Openings

Best chances for ionospheric openings on the VHF bands are during periods of radio storminess, when HF conditions are Below Normal or Disturbed. Such openings on 2 and 6 meters usually are characterized by flutter fading and distortion, and result from the intense regions of ionization that accompany auroral displays. Auroral-type openings usually range in distance from a few hundred up to approximately 1300 miles. Check the Last Minute Forecast at the beginning of this column for those days during February that are expected to be Disturbed or Below Normal.

No significant meteor showers are scheduled for February, so few, if any, meteor-type ionospheric openings are likely to occur.

This month's Propagation Charts contain band-opening predictions for major DX paths for the period February 15 through April 15, 1994. A short-skip propagation forecast for February appeared in last month's column. Instructions for the proper use of these charts appear in this column.

73, George, W3ASK

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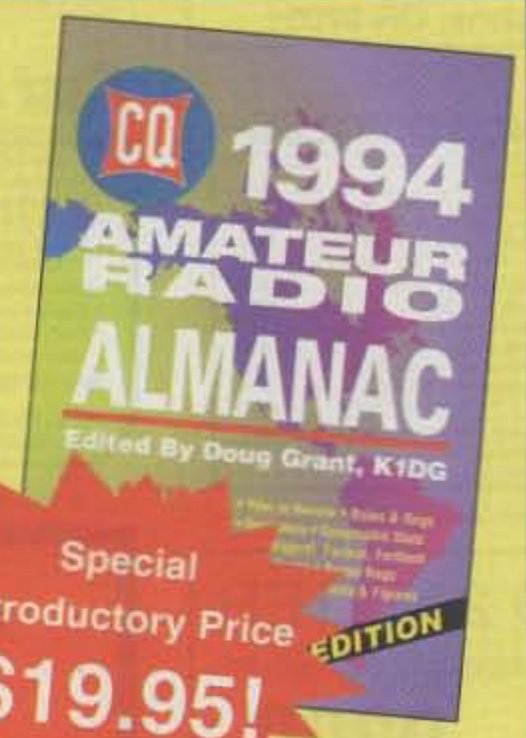

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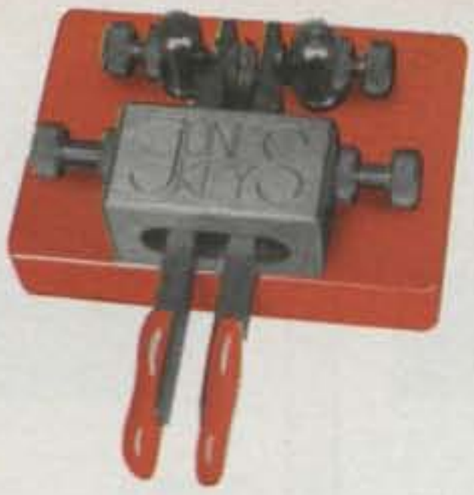

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The Palomar R-X Noise Bridge tells you if your antenna is resonant or not and, if not, whether it is too long or too short. All this in one measurement reading.

It works on dipoles, inverted Vees, quads, beams, multiband trap dipoles and verticals from 1 to 100 MHz.

Why work in the dark? SWR meters tell only half the story. Get the instrument that really works, the Palomar R-X Noise Bridge.

Order yours today! Model RX-100 $79.95 + $4 shipping/handling in U.S. & Canada.

SmartBridge. This computer program lets you use the noise bridge at the transmitter end of the transmission line instead of at the antenna terminals. Also it will graph resistance, reactance, and SWR on the computer screen and printer. Requires AT-compatible computer with 640K RAM, floppy drive and a CGA or better video card and monitor. 5-1/2" diskette and manual. Highly useful to the antenna experimenter.

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"Built-in VOX? Right!"

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"Wow, a real Battery Voltage Readout!"

"Yaesu did it again!"

FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W-21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	YES
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	YES
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest".

FT-530
Dual Band Handheld

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
  NC-42 1-Hour Desk Charger
  FNB-25 600 mAh Battery (2 watt)
  FNB-26 1000 mAh Battery (2 watt)
  FNB-27 600 mAh Battery (5 watt)
  FBA-12 6 AA Cell Holder
  CSC-56 Vinyl Case w/ FNB-25
  CSC-58 Vinyl Case w/ FNB-26/27
  E-DC-5B 12 VDC Adaptor
  YH-2 Headset for VOX
  MH-12A2B Speaker Mic
  MH-18A2B Lapel Speaker Mic
  MH-19A2B Mini Earpiece Mic
  MH-29A2B LCD Display Mic with Remote Functions
  MMB-54 Mobile Mounting Hanger

No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

Performance without compromise.℠

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

NEW

"What a great field radio. Mobile, too! I couldn't afford an HF rig until now.."

"What a great price! Terrific features, high performance – and within my budget."

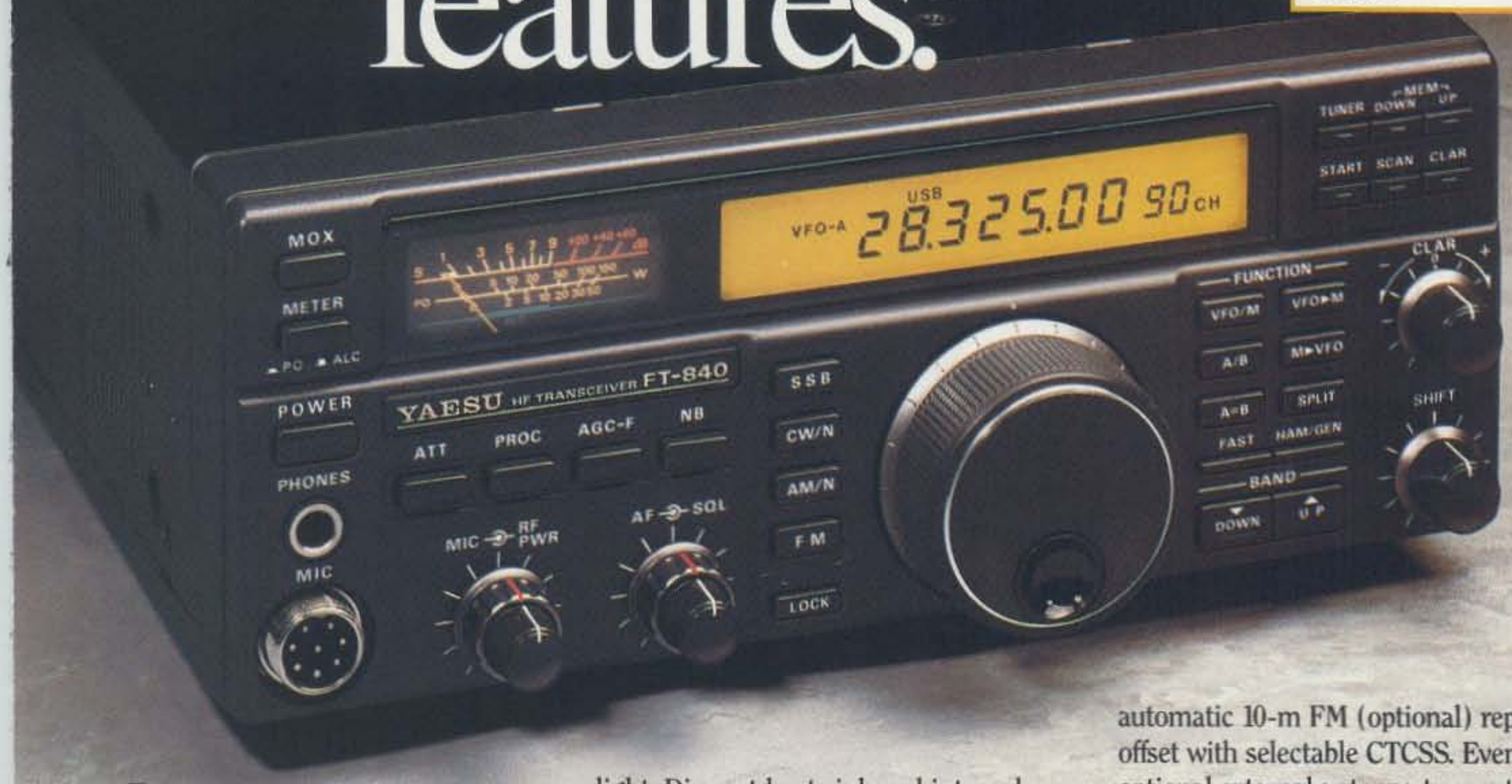
"Yaesu did it again!"

It's a small price to pay for such a wealth of features.

FT-840
Compact HF Transceiver

- Direct Digital Synthesis (DDS)
- Frequency coverage:
  RX: 100 kHz-30 MHz
  TX: 160-10 m
- IF Shift
- 100 Memory Channels (Independent TX/RX per memory)
- Twin Band Stacking VFOs
- FM* Repeater Operation Automatic 10-Meter Repeater Offset w/Selectable CTCSS Encode
- CW Reverse Feature
- Choice of Two Optional Antenna Tuners:
  FC-10 Matching External Antenna Tuner
  FC-800 External Remote Antenna Tuner
- **Accessories:**
  Contact your Dealer for full details.

* Optional



If you're trading up from an older rig, but have a budget, you want the most you can afford in top-notch HF. Then the FT-840 is for you. It's right on the money! Considering a mobile HF or field radio and doubt the quality and features of tiny HF rigs? Then the FT-840 is for you. It won't disappoint you!

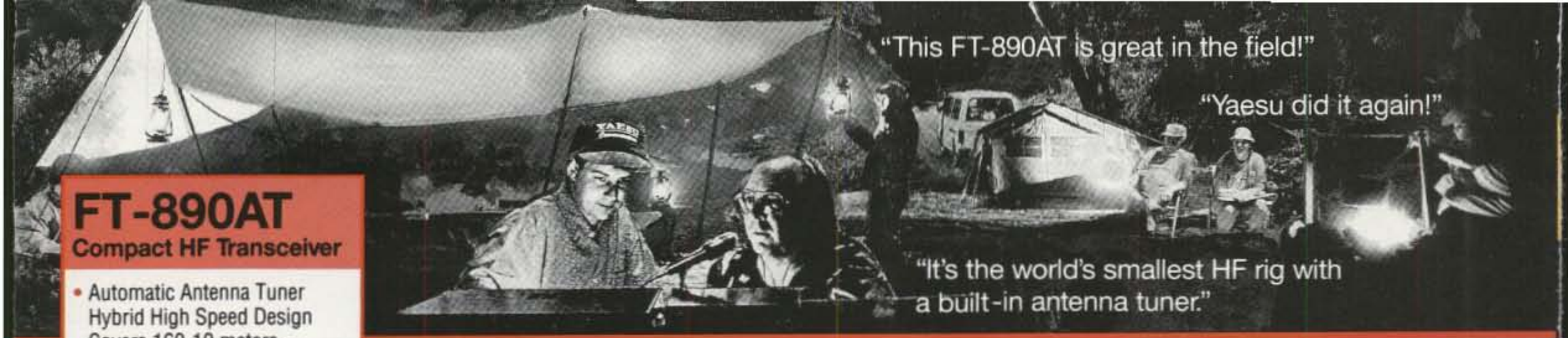
Built to handle rigorous field operation, the new intense LCD display affords sharp visibility in bright sunlight. Die-cast heat sink and internal thermally switched fan keep the FT-840 running cool. Modular design circuit boards ensure operating efficiency – manufacturing excellence you'd expect in much higher priced radios.

For high performance, the FT-840 features a low noise front end that uses the latest in FET RF amplifier design. Two DDSs and magnetic encoder for silent, smooth tuning and fast switching. Twin band-stacking VFOs. And, automatic 10-m FM (optional) repeater offset with selectable CTCSS. Even two optional external antenna tuners to customize your rig.

Top of the line quality and features at a remarkably low price. Just what you'd expect from Yaesu! For high-tech performance, and a wealth of features that won't break your budget ask your dealer about the FT-840.

YAESU

Performance without compromise.℠



FT-890AT
Compact HF Transceiver

- Automatic Antenna Tuner Hybrid High Speed Design Covers 160-10 meters
- I.P.O. Intercept Point Optimization
- DDS-Direct Digital Synthesis
- F.S.P. Frequency Shift Speech Processor
- General Coverage Receiver 100 KHz to 30 MHz
- Pass Band Shift and 30db Notch Filter
- Noise Blanker with Adjustable Pulse Width
- Built-In Iambic Keyer
- 32 Memories plus 20 VFOs
- FM Repeater Operation Automatic 10 Meter Repeater Offset w/Selectable CTCSS Encode
- All Mode Squelch
- DFCS-Duct Flow Cooling System
- **Accessories:** Contact your Dealer for full details.

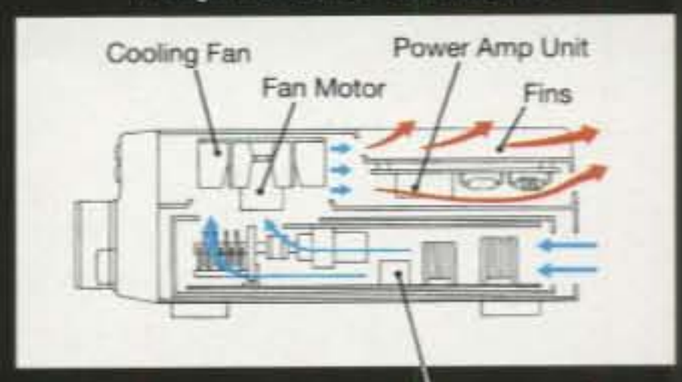
Field days and contesting are challenging. We built the FT-890AT for times when you need the high performance of a base station – like the FT-1000 – but the practicality of a compact, rugged mobile. In fact, the FT-890AT is the mobile version of the FT-1000. Designed to be the world's smallest HF with a built-in antenna tuner, its superior receiving performance is a direct result of FT-1000 technology.

Since field work is demanding, the front panel has been simplified. Seldom used VOX controls are on the back. For faster TX/RX switching, the FT-890AT has two direct digital synthesizers (DDSs). With its unique duct flow cooling system, die-cast aluminum upper case and heat sink, the FT-890AT can't be beat for superior field work and DX-peditions.

Not just a "field" radio, with the optional FP-800 AC Power Supply, MD-1C8 Desk Mic and YH-77ST Headphones you've got a performance-plus base station loaded with features and affordably priced.

To see what that means for you, contact your Yaesu dealer today.

Duct Flow Cooling System (DFCS)
Rugged aluminum top panel heat sink and internal thermally switched fan draws air through the heart of the transceiver.



Built-in Antenna Tuner
Tunes most antennas 160-10 meters.

YAESU
Performance without compromise.℠

If you can get an HF this compact with a built-in antenna tuner -- why not!

DVS-2 (Optional)
Digital Voice Recorder with 16 seconds of memory each on RX and TX.

Specifications subject to change without notice. Specifications guaranteed only within amateur bands.
Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

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For more information, see your ICOM dealer or call our Brochure Hotline 1-206-450-6088.

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